

61 20 ... Battery replacement information

A vehicle battery is constructed for the installation location and the individual power requirements of the particular vehicle. These individual power requirements depend on the motorisation and different types of equipment. The individually assigned vehicle battery is the ideal compromise between the power requirements of the vehicle electrical system and the weight and service life of the vehicle battery.

If the vehicle electrical system of electric vehicles is not accessible due to a faulty 12 V battery, proceed as follows:

[Battery exchange in electrified vehicles](#)

Vehicles with the automatic engine start-stop function or particular engine types and optional equipment are equipped with a special vehicle battery (AGM battery), since only this battery type can provide elevated power requirements over the extended service life. Installing a different vehicle battery can cause problems with vehicle electronics, can reduce functions or can cause leakage of battery acid.

In the event of an accident where the airbags are deployed in vehicles with a vehicle battery in the luggage compartment, the electrical connection between the vehicle battery and the trigger is automatically disconnected through pyrotechnics. This prevents possible short-circuiting.

Proper operation of all of these safety and convenience functions requires a battery that conforms with specifications and that is properly registered in vehicles with energy management systems (IBS, power module).

Vehicles with energy management systems (IBS, power module): Register battery exchange

The vehicle electrical system is informed about the vehicle battery characteristic data, such as type, size, age and current power capacity. Therefore, there will always be only one work scope provided that is permitted by the current status of information.

If the performance readiness drops below a defined minimum, a Check Control message will be generated to advise the driver that the battery must be replaced.

When installing a new vehicle battery, the battery must be registered and thus must also be registered with the vehicle electrical system.

Note:

Only this registration/logon will ensure that the corresponding Check Control message will go out again.

Diagnosis system:

Register battery exchange

- Service functions
- Body
- Voltage supply
- Register battery exchange

When retrofitting, a more powerful battery may be used. Standard batteries may always be replaced by AGM batteries with the same specifications.

When installing a battery of a different size or a different battery type, this change in vehicle data must be programmed into the vehicle data in accordance with specifications.

Programming system:

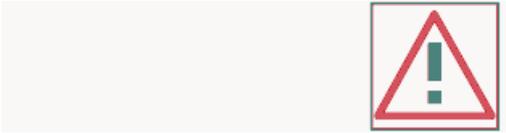
- Battery retrofitting

61 13 ... Butt connector for repairing a plug connection



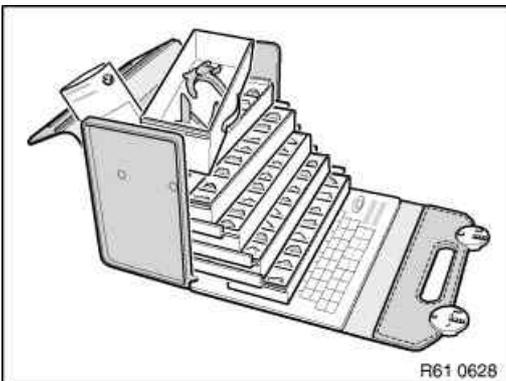
Special tools required:

- [61 0 300](#)
- [61 4 340](#)
- [61 0 240](#)



Important!

1. Identify cause of damage (e.g. sharp-edged body components, faulty electrical loads, jammed mechanisms, corrosion caused by ingress of water, etc.).
2. Read out fault memory
3. Eliminate cause of damage.
4. Disconnect battery negative terminal
5. Make sure that no safety-related system according to circuit diagram (e.g. antilock braking system, active rear-axle kinematics, airbags, etc.) are influenced. Otherwise replace faulty wiring harness or use repair cable (sourcing reference: BMW Parts Department)
6. Carry out function test and read out fault memories again
7. Eliminate new faults if applicable and clear fault memories

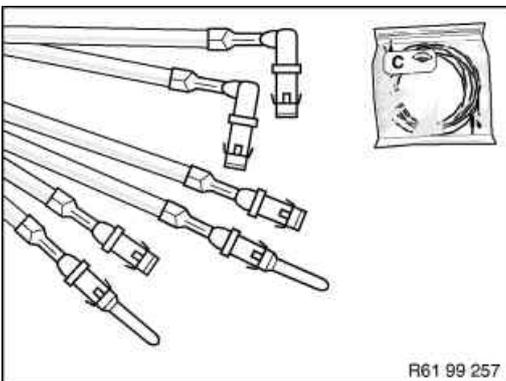


Note:

The repair range IV for vehicle electrical system contained the required special tools and individual parts for retrofitting and repair work with the aid of fan connectors.

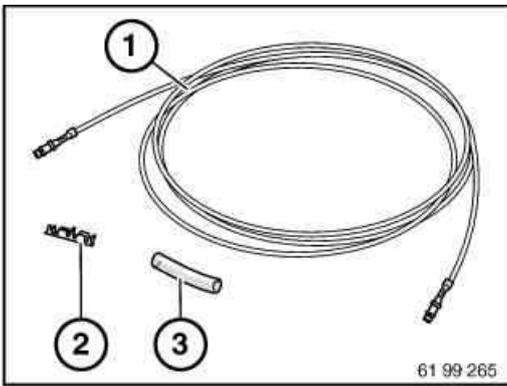
The case can no longer be ordered. Order individual parts for wiring harness repair through BMW Parts Department.

- Refer to Service Information:
[SI02 04 07 341](#)



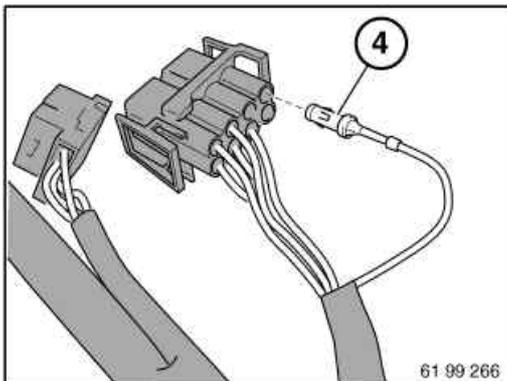
Choose repair kit.

Example: Repair kit, circular connector system D 2.5.



Remove following parts:

- (1) Pre-packaged end of cable with requisite wire cross-section
- (2) Crimp connector for selected wire cross-section
- (3) Shrink-fit hose

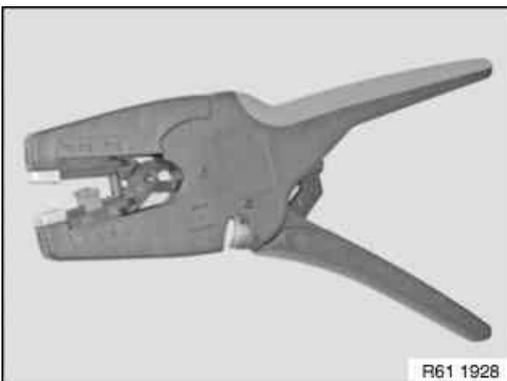


Open secondary lock on housing.

Mark damaged contact (4) with socket number of housing and press it out of housing using appropriate special tool contained in special tool set [61 0 300](#)).

See *repair instructions*

[Notes for opening contacts and locks](#) of different plug contact systems.



Important!

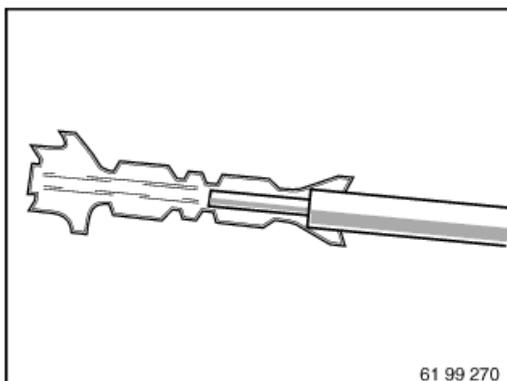
- Check maximum length of repair cable
- If more than one wire is to be repaired, the individual interfaces must be offset so that the wiring harness is not too thick at the repaired point.

Adhere to following procedure:

- Cut off wire with faulty contact at point which is easily accessible
- Strip insulation from end of wire at wiring harness end
- Cut preassembled wire end to length and strip insulation

Refer also to *repair instruction*:

[Cutting to length and stripping insulation from cables](#)



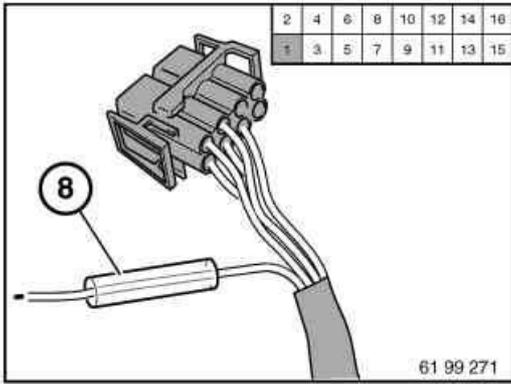
Crimp butt connector on preassembled wire end.

Special tools:

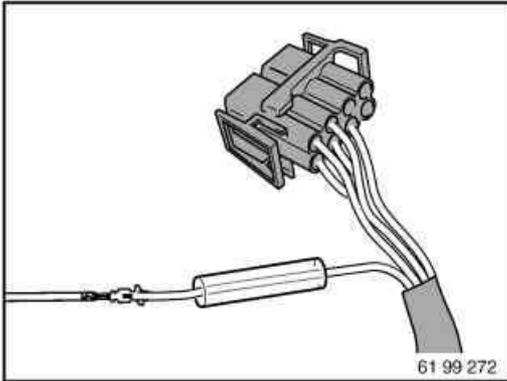
- [61 4 340](#) (0.35 - 2.5 sq mm)
- [61 0 240](#) (4.0 - 6.0 sq mm)

See *repair instructions*

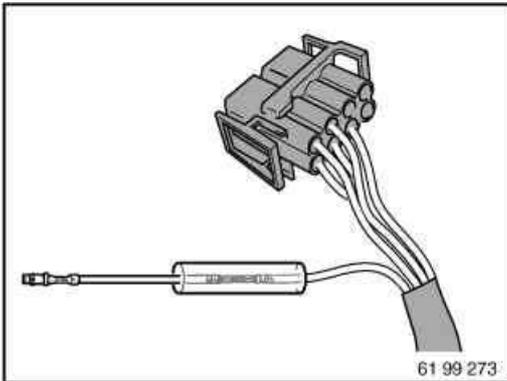
[Crimping on stop parts](#)



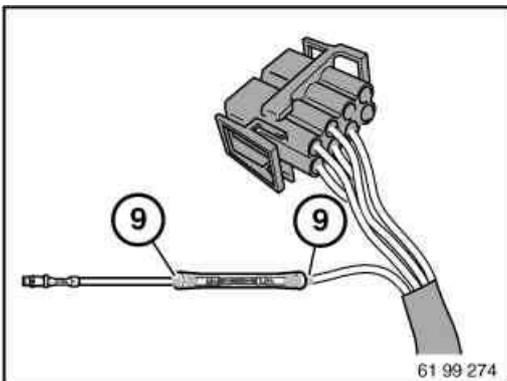
Push shrink-fit hose (8) onto free wire end.



Crimp unused wire end to butt connector.



Pull shrink-on sleeve over butt connector.



Important!

Do not burn shrink-on sleeve.

With hot air blower, shrink the shrink-on sleeve on both sides (9) of shrink-fit hose until glue emerges uniformly all round.

Insert contact in housing.

Close secondary lock on housing.

11 00 ... Handling components after flood damage

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

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

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

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

12 00 ... Instructions for removal and replacement of control units

Important!

- Disconnecting the vehicle battery will cancel the fault memories of control units. Consequently, before disconnecting the car's battery, always interrogate the fault memories. Investigate stored faults and, once any faults have been remedied, cancel the fault memory.
- Control unit plugs should only ever be connected and disconnected while the ignition is turned off.
- The removal and installation of components, relays, fuses etc. can cause faults to be stored in fault memories capable of self diagnosis. Always interrogate the fault memories after completing work on the electrical system.
- Investigate stored faults and, once any faults have been remedied, cancel the fault memory.
- If necessary, initialise power window regulator [Initialise power window regulator](#)

On replacement of the DME/DDE control unit note the following:

- In every case use the diagnosis system to read out the hardware/software version of the corresponding control unit.
Comply with the diagnosis system instructions for the encoding and programming work operations.
On vehicles with an electronic immobiliser, comply with the diagnosis system instructions.
- In every control unit certain mean values are stored that are the basic values. The control unit receives different input values according to the engine condition. The teachable system compares the input values against the stored basic values and then forms the associated control commands. The control commands are forwarded to the corresponding actuators.
- When the DME control unit is de-energized for a long period (over one hour), the teachable system then loses the stored values. When a deleted control unit is returned to service or a new control unit is installed, the teachable system itself must read in and store the input value of the associated engine as new basic values.
- This process may cause uneven idle and faults in coasting mode after starting. Depending on the engine characteristics, it may take some time until all values have been compared with the engine condition.
- Therefore, comply with the following procedure before replacement or reinstallation of a DME/ DDE control unit is carried out:
 1. If possible, bring the engine up to its operating temperature prior to replacement of the control unit.
 2. Change control units and drive the vehicle with changing engine speeds.

61 00 ... Notes for disconnecting and connecting the vehicle battery

Observe [safety informations for handling vehicle battery](#).

Before disconnecting vehicle battery:

Turn off the ignition and other electrical loads/consumers to prevent sparking when reconnecting.

Note:

If the ignition is not switched off when the vehicle battery is disconnected, fault memories may be set in some control units.

Attention!

- There is a danger of mixing up battery cables: if the positive battery cable and battery earth lead are the same colour and you are in doubt, follow the polarity to the vehicle battery, then mark and cover the leads
- The on-board computer and clock may lose your data.

General notes on disconnecting the vehicle battery:

- Do not disconnect battery leads and leads from alternator and starter motor while engine is running.
- Disconnect terminal of [battery earth lead](#) from the battery. Cover battery negative terminal(s) and secure.
- Disconnect [both battery earth leads](#) in version with auxiliary battery. Cover battery negative terminal(s) and secure.
- When work is carried out on the electrical system, faults may be caused in the fault memories of some control units when the vehicle battery is connected.
- When installing battery terminal: Tightening torque [61 21 1AZ](#).

Only lead AGM battery:

- On vehicles with IBS at negative battery terminal:
Do not under any circumstances pull/lever off pole shoes by force.
Do not under any circumstances release the hexagon socket screw of the IBS.

Note the following after having connected the vehicle battery:

Attention!

The scope of application of some systems may be restricted after an open circuit.

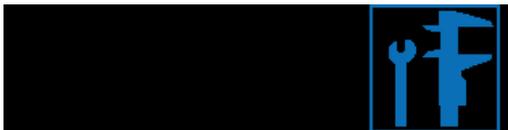
Personal Profiles may also be lost.

Settings or activations must be carried out, depending on the equipment specification.

For example:

- Activate [slide/tilt sunroof](#), if necessary
- Activate [power window](#), if necessary

Refer to the diagnosis system for further vehicle-specific information.

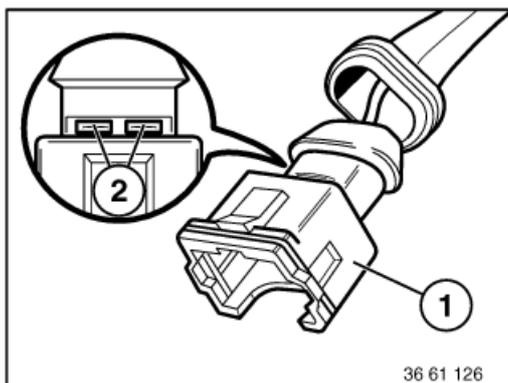


Special tools required:

- [61 0 300](#)
- [61 0 400](#)
- [61 1 100](#)

Abbreviations of contacts and what they mean:

ELA	Strand seal
D 1.5 / 2.5 / 3.5	Round contacts with 1.5 mm, 2.5 mm or 3.5 mm diameter
MDK	Miniature double flat spring contact
JPT	Junior Power timer
DFK	Double flat spring contacts
Elo	Electronic contacts
Elo Power	Electronic contacts for heavy load
MQS	Micro Quadlock system
MPQ	Micro Power Quadlock
MLK	Mini laminated contact
SLK	Sensor laminated contact
LSK	Load current contact
MLK	Mini laminated contact
Mcon	Multi contact



Important!

The contacts can be changed on ultrasonically welded connectors (1).
 Ultrasonically welded connectors (1) must be replaced completely.
 Ultrasonic-welded connectors (1) can be identified by the welds (2) on their longitudinal side.



Note:

Special tools referred to in the repair instructions below are contained in the following special tool sets:

- Unlocking and pressing-off tool 61 1 150
 is replaced as of 09/2005 by [61 0 300](#) (BMW) and [61 0 400](#) (MINI)
- Release and pressing-off tool [61 1 100](#) (engine)

Repair instructions for opening connector housings and removing contacts of different connector systems:

Connector system D 1.5/D 2.5:

- [Circular connectors, 7- or 8-pin, system D 2.5](#)
- [Circular connectors, 13-pin, system D 2.5](#)
- [Circular connectors, 20-pin, system D 2.5](#)
- [Circular connectors, 4-, 7-, 10-, 12- or 25-pin, system D 1.5/D 2.5](#)
- [In-line connectors, 15-pin, system D 2.5](#)
- [In-line connectors, 8-, 12-pin, system D 2.5](#)
- [In-line connectors, 30-pin, system D 2.5](#)
- [In-line connectors, 20-pin, system D 2.5](#)

Connector system JPT/MDK/DFK:

- [In-line connectors, 2-pin, System JPT ELA](#)
- [In-line plugs, 2-pin, System MDK 3 plus 2.8](#)
- [In-line plugs, 4-pin, System DFK ELA](#)

Connector system Elo/Elo Power:

- [Inline plugs, 4-, 10-pin, System Elo](#)
- [In-line connectors, 6- to 50-pin, System Elo](#)
- [Inline plugs, 3-, 6-pin, System Elo-Power 2.8](#)

Connector system LSK:

- [Connector housing LSK contact](#)

Connector system MQS/MPQ:

- [Inline connectors, 6-, 8-pin, System MQS](#)
- [Inline plugs, 2-pin, System MPQ 2.8](#)
- [Control unit connectors, 25-, 35-, 55-, 83-, 88-pin](#)
- [In-line plugs, 24-pin, Hybrid System MQS/MPQ](#)
- [Socket housing 42-, 43-pin, Hybrid System MQS / MPQ](#)
- [Socket housings 2x21-, 2x27-pin, Hybrid System MQS/MPQ, Elo/Elo Power](#)
- [In-line connectors, 30-pin, Hybrid System MQS/MPQ](#)
- [Socket housings, 5-, 8-pin, System MQS/MPQ](#)
- [Socket housing \(radio connector\), Hybrid System MQS/MPQ](#)

For connector contact systems not listed, refer to Service Information:

[SI 2 05 05 217](#)

[SI 2 05 06 294](#)

[SI 2 03 08 440](#)

[SI 2 08 06 312](#)

[SI 2 02 08 439](#)

[SI 2 01 08 438](#)



The following applies in general:

To avoid damage, observe the following instructions:

- Avoid compressive and tensile loads
- To ensure professional repairs, perform repair work only with BMW-approved or recommended special tools and spare parts
- Make sure cables are laid without kinks or abrasions
- Ensure non-contacting routing at sharp-edged body parts; use edge protection if necessary
- Secure additionally laid cables/leads with cable ties

The following additionally applies:

Shielded lines

Interference radiation and interference resistance can lead to neutral zones at contact points in the shielding. Consequently, distinctions have to be drawn between the following types:

Coaxial lines

- Shielded coaxial cables RTK031 may only be repaired with a special [crimping tool](#).
- For aerial lines only the bushing contact may be repaired.
- RG174 Lines and the bushing contact may not be repaired.

CVBS lines

- CVBS cables may not be repaired.
- CVBS cables must be replaced in their entirety.

HSD lines

- HSD cables may not be repaired.
- HSD cables must be replaced in their entirety.

Optical fibre cable:

Note:

Fibre-optic cables are coloured differently as follows:

- Green = **MOST** (**M**edia **O**riented **S**ystems **T**ransport) optical fibres
- Yellow = **ISIS** (**I**ntelligent **S**afety and **I**ntegration **S**ystem) optical fibres
- Orange=repair fibre-optic cables

Attention!

- Optical fibres are permitted to show only one junction point (bridge). Replace optical fibres if necessary
- Smallest permissible bending radius is 25 mm
- Avoid effects of heat $\geq 85^\circ$

[Treating cables and fibre-optic cables](#)

FlexRay (twisted cables):

It is possible to repair the FlexRay. In the event of damage, the cables can be joined with conventional [butt connectors and heat-shrink tubing](#).

Note:

- FlexRay lines may only reveal one separation point (bride); renew complete line if necessary.
- If possible, maintain twisted cable after repair.
- After repairs, twist cables as close as possible to the connector/separation point.
- Twisting must be as symmetrical as possible.

Airbag lines:

[Repairing airbag cables](#)

Ribbon cables:

[Repairing ribbon cables](#)

Replacing wiring harnesses

Repair wiring harnesses mainly cover the full equipment of the vehicle. If certain optional equipment is not installed in the vehicle, note the following:

- If necessary, secure the remaining connectors.
- If necessary, seal the remaining connectors outside the vehicle interior, for example, with butyl tape in such a way that moisture ingress can be eliminated permanently.
- [If necessary, repair the connector of the repair wiring harness.](#)

Note:

Repair wiring harnesses can be equipped with an **additional socket housing** (30-pin, for example), **which was not provided on the previous vehicle-side wiring harness**. This socket housing also cannot be found in the wiring diagram.

Procedure

The separation point between the vehicle-side wiring harness and the repair wiring harness is located **in the vehicle interior** (in the footwell, for example):

- Cut the additional socket housing and connect the lines to the vehicle-side wiring harness using a butt connector.
- Alternatively, a suitable pin housing can be fitted on the vehicle-side wiring harness and connected to the additional socket housing.

However, this is permitted only if the following conditions are met:

- Carpets must not protrude visibly or become deformed due to the installation of the additional plug connection.
- It must be possible to install the adjacent components (for example, trims, trim panels, etc.) correctly after installing the additional plug connection.
- All the attachment points of the adjacent components (for example, trims, trim panels, etc.) must engage correctly.
- There must be no rattling noise due to the installation of the additional plug connection.
- The additional plug connection must not damage the adjacent components/wiring harnesses, etc..

The separation point between the vehicle-side wiring harness and the repair wiring harness is located **outside the vehicle interior** (in the wheel arch, for example):

- Cut the additional socket housing and connect the lines to the vehicle-

side wiring harness using a butt connector.

- **Using the additional socket housing is not permitted with a separation point outside the vehicle interior.**

12 00 ... Notes/information on start assistance (jump starting)

Do not start the engine with help of starting sprays.

Preparation:

Conform with the following when starting the engine with a jump starting cable.

- Ensure that the jump starting cable wires are of appropriate cross-section size.
- Only use fuse-protected jump starting cables.
- Check whether the current-supplying battery has 12 V voltage.
- If the engine is started from the battery of another vehicle, ensure that there is no contact between the bodies of both vehicles.

Important!

Never touch electrically live ignition system components: high voltage - danger of injury!

If the battery in the vehicle supplying power is weak, start the engine of this vehicle and let it run at idling speed.

Operation:

It is essential to conform to the procedures so as to avoid injury to persons or damage to parts.

- Automatic transmission: select drive position "P", apply parking brake.
- Manual transmission: move gear lever to neutral position, apply parking brake.
- Ensure that the jump leads cannot get caught in rotating parts, e.g. fan.
- First connect both positive poles of the batteries with one jump starting cable (red).
- Use the battery positive terminal in the engine compartment for vehicles with the battery in the luggage compartment.
- Then use the second jump starting cable (black) to connect the negative post of the current-supplying battery with the earth/ground point (not the negative pole or the body) of the vehicle to be started.

Important!

Do not connect the second jump starting cable (black) with the negative pole of the battery in the vehicle to be started. Produced gas could be ignited by sparks.

Risk of explosion!

After the engine of the vehicle to be started has fired, first disconnect the jump starting cable between the negative pole and the earth/ground point. Then remove the starting cable from the positive poles.

00 Safety information for working on vehicles with automatic engine start-stop function (MSA)



Warning!

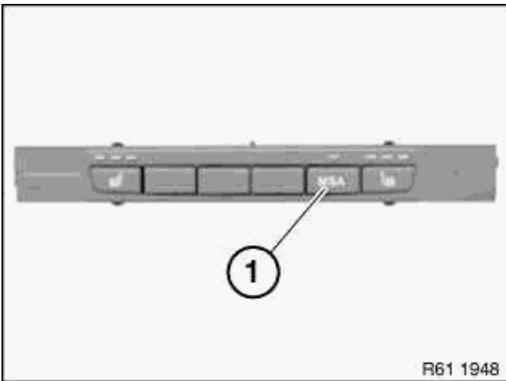
If the engine hood/bonnet contact is pulled upwards (workshop mode), the information "switch closed" is output. The automatic engine start-stop function is active.

An automatic engine start is possible.

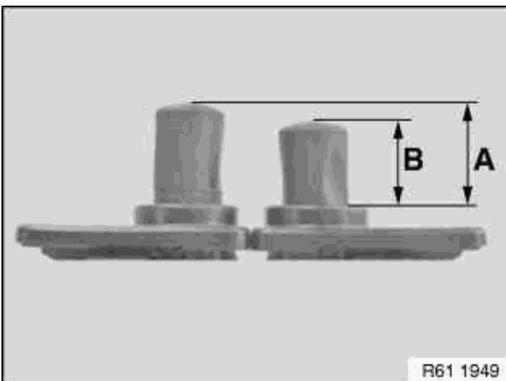
Observe safety precautions when working on MSA vehicles.

Before carrying out practical work on the engine, always ensure that the MSA functionality is deactivated so as to prevent automatic engine starting while work is being carried out in the engine compartment.

MSA function is deactivated by:



- Deactivate MSA by means of button (1) in passenger compartment
- Open seat belt buckle and driver's door



- Open engine bonnet/hood and ensure that engine hood/bonnet contact is not in workshop mode
 - Workshop mode
A = 10 mm
 - Basic setting (engine hood/bonnet open)
B = 7 mm

To make sure that the engine hood/bonnet contact is at the basic setting, if necessary press the hood/bonnet contact up to the limit position before starting work and slowly release.



When working with diagnosis tools:

- Observe instructions in diagnosis tool



Note:

For further information on automatic engine start-stop function (MSA):

- Refer to the Service Information (bulletin) (for manual transmissions) [Service Information \(bulletin\) 61 01 07 335](#)
- Refer to the Service Information (bulletin) (for automatic transmissions or twin-clutch gearboxes) [Service Information \(bulletin\) 61 01 10 629](#)

61 00 ... Safety information on handling hybrid cars

1. Qualification:

All repair work on high-voltage components may **only be performed by specially trained personnel** (qualification: Work on high-voltage inherently safe vehicles) must be performed by qualified technicians. Each hybrid car requires additional vehicle specific training with training achievement controls. Required training is offered by the BMW Training Academy.

2. Identification:

Observe **warning notices** on high-voltage components. When replacing individual high-voltage components, check if warning stickers are present. Independently attaching warnings is only allowed on the locations provided for them. Use only approved and appropriately identified original new parts.

3. Rules of conduct/protective measures:

- Note operating instructions for handling high-voltage battery units.
- Do not under any circumstances touch open high-voltage cables and high-voltage components on damaged vehicle before shutting down the high-voltage electrical system.
- In the event of damage (mechanical, thermal) transition metal oxides, carbon, electrolyte solvents and their products of decomposition may be released.
Suitable acid-resistant protective clothing/equipment must therefore be used when handling the vehicle!
 - Hand protection: Gloves
 - Eye protection: Safety goggles

Damaged high-voltage battery units must be stored in an acid-resistant pan in a location in the open that is protected against the weather (sun, rain) and secured against unauthorised access. Do not inhale escaping gasses.

- Prevent escaping substances from entering drains, pits and the sewer system.
- Collect any material that is discharged and have it disposed of according to the work instruction, wear acid-resistant protective clothing when doing so.
- Notify the fire brigade if fire breaks out, clear the area immediately and make accident scene safe. Attempt to extinguish the fire without putting persons in danger (suitable extinguishant: water and water foam).
- A cut 2nd emergency separation point must be repaired with a butt connector.

4. Measures before starting work:

- Each job on the vehicle must be assigned by appropriately trained personnel. Before work is started, this electrician must place the vehicle in the operating condition required to perform the relevant activity. The qualified personnel's instructions and directions absolutely must be followed. **No work may be carried out without this qualified personnel being consulted first.**
- It is **not** permitted to work on the high voltage system or on high voltage components while the engine is running.
- The readiness to drive must be ended before shutting off the voltage of the high-voltage system. The readiness to drive is ended when the driver is absent only under the following conditions:
 1. seat belt buckle unlocked **and**
 2. the driver's door is open **and**
 3. no brake activated **and**
 4. the accelerator pedal is not activated **and**
 5. speed < 3 km/h (2 mph)
- Work on live high-voltage components is expressly prohibited. Before each operation on the high-voltage system, the system must be isolated from the power supply by qualified personnel (high-voltage safety connector Off) and secured against unauthorised recommissioning (padlock).
- After each deactivation of the high-voltage system, it is essential to observe a **waiting period** of at least **10 seconds** prior to further work.
- Before beginning work, it is mandatory to check that the equipment is de-energised and is protected against being energised again.
Work is only permitted to begin if:
 1. Corresponding display in the KOMBI **High-voltage system deactivated** or
When a high-voltage warning is active (indicator light, Check Control, etc.), it is essential to determine and eliminate the cause of this warning via the diagnosis system before continuing with any other work. **If it cannot be definitively established that the equipment is de-energised**, work is not permitted to begin. **Danger to life!** Before work begins, a qualified electrician (1000 V AC) must verify that the system is de-energised using appropriate measuring devices and procedures.
=> In this case, Technical Support must be contacted!
- Do not perform any work on the vehicle while it is charging. Before starting work, disconnect the charging

cable from the vehicle.

Battery charging may result in heating of the high-voltage battery unit. This heating may lead to sporadic launches of the electric fan (switch-on request from the electric fan). Therefore, work in the vicinity of the electric fan during the charging procedure is prohibited. Ensure freedom of movement of the battery charge lines in the vicinity of the electric fan.

5. *Measures during/after activities:*

- Identifiable mechanical damage to or tampering with high-voltage components must be reported immediately to the qualified personnel in charge.
- When carrying out any work on the high-voltage system, it is prohibited to drive externally all the drivetrain components (wheels, gearbox, drive shafts, etc.).
- *E72 only:* When the "Power Electronic Box Cover" is removed, the high-voltage system is not permitted to be activated. The high-voltage service disconnect must only be used when the "Power Electronics Box Cover" is completely installed.
- High-voltage cables (orange coating) and their connectors and stop parts **may not** be repaired. If damaged, a cable must always be replaced completely.
- When working in the vicinity of high-voltage components (identified accordingly with warning stickers and orange-coloured coating), protect these components against damage.
- The specified work steps in the repair instructions must be adhered to exactly.
- High-voltage components and their holders must be screwed/bolted to the defined tightening torque. Tightening torques and tightening specifications must be observed.
- Connecting high-voltage components to body ground is crucial to safety for reasons of equipotential bonding. For this reason, it is prohibited to operate any high-voltage components without them being correctly connected to body ground. The measurements (insulation/potential equalisation measurement) are performed automatically by the vehicle. Manual measurement is not therefore necessary. For a correct earthing connection, the retaining elements of high-voltage components must not be painted. Follow further [painting notes](#).
- Removed high-voltage battery units must be stored in a manner that protects them from misuse and damage.
- Damaged or warning stickers that are no longer legible on high-voltage components must always be replaced.

6. *Potential compensation:*

Equipotential bonding lines, high-voltage cables and the battery negative lead to the EME are fitted with safety screws.

- Clean contact faces and have then checked by a second person.
- Tighten down screws/bolts to specified torque.
- Have tightening torque checked by a second person.
- Both persons must document that the work has been carried out correctly in the vehicle records.

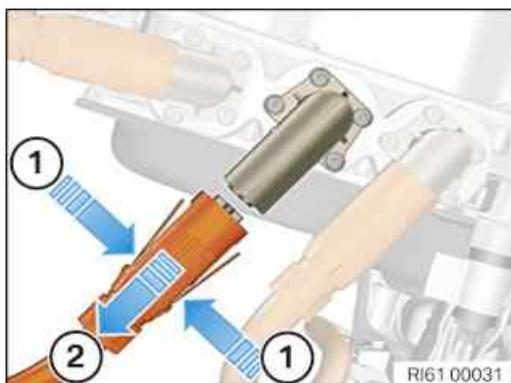
61 13 ... Unlocking and disconnecting various plug connections in electrical and hybrid vehicles



Attention!

Observe the following instructions for handling high-voltage plug connections:

- Damaged high-voltage plug connections must be replaced completely. Repair is not permitted.
- Dirt contamination must be removed before opening the plug connection.



Disconnect the Hirschmann high-voltage connector:

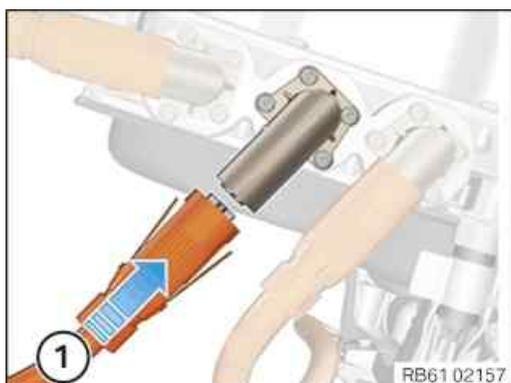
Press the lock (1) on the left and right on the connector in the direction of the arrow.

Pull off connector (2) in direction of arrow.

Attention!

Connector (2) is difficult to pull off.

In the event of damage to high-voltage connector (2), the complete high-voltage cable must be replaced!

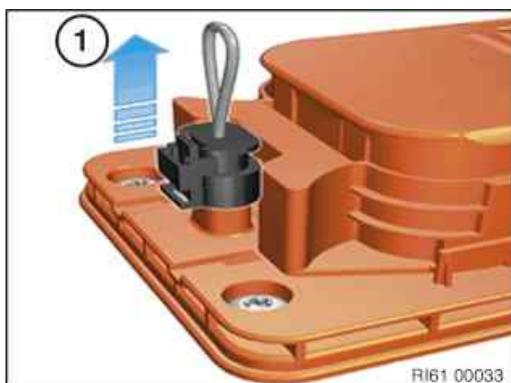


Connect the Hirschmann high-voltage connectors:

Slide the connector (1) on in the direction of the arrow.

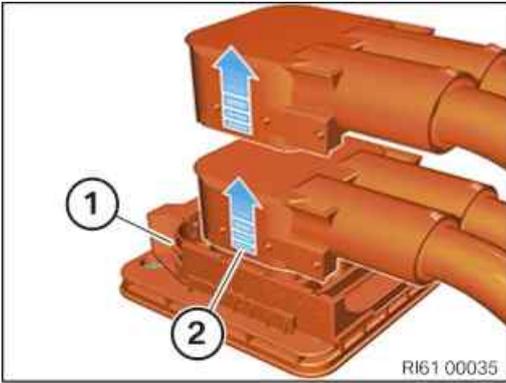
Note:

Connector (2) must lock audibly.



Disconnect the Kostal high-voltage connector:

Unlock and disconnect high-voltage interlock loop (1).



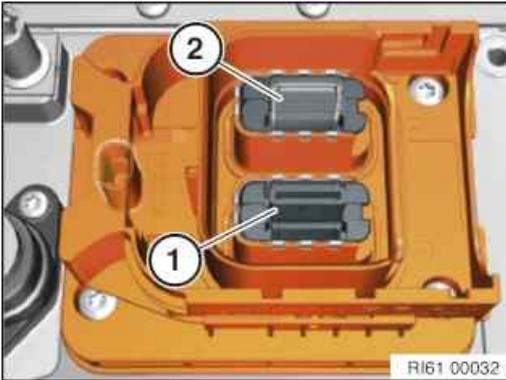
Push the lock (1) fully to the front.

Lift the connector (2) and remove it entirely.

Attention!

Plug connection (3) is difficult to pull off.

The connector (2) must be completely pulled off the opposite housing in one step. Damage may be caused to contact protection if connector is only partly pulled off and then closed again!



Check the Kostal high-voltage connector and connection for damage:

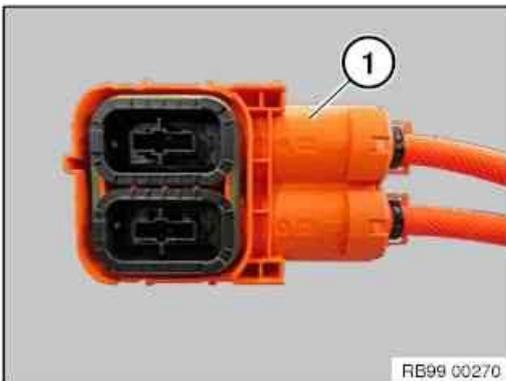
Check the touch protection for damage and correct positioning (1).

Warning!

Do not touch unprotected connector (2)!

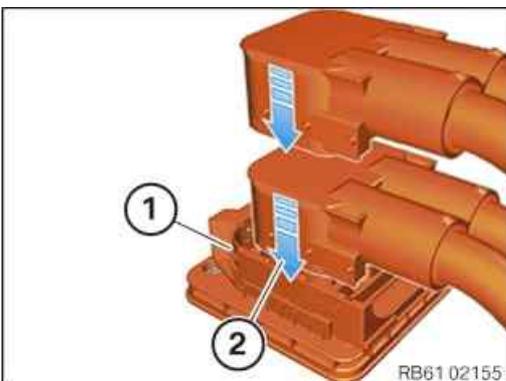
If the contact protection (1) has been pushed to the bottom (2), the high-voltage connector must be refitted.

If contact protection (1) remains in bottom position (2) after reinstallation, the contact protection is faulty and the component must be replaced!



Check the high-voltage connector (1) for damage. **Warning!**

In the event of damage to the high-voltage connector (1), the complete high-voltage cable must be replaced!



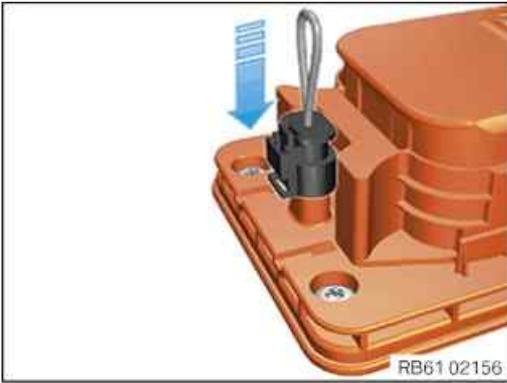
Connect the Kostal high-voltage connector:

Connect the connector (2) in one single movement to the counter-housing.

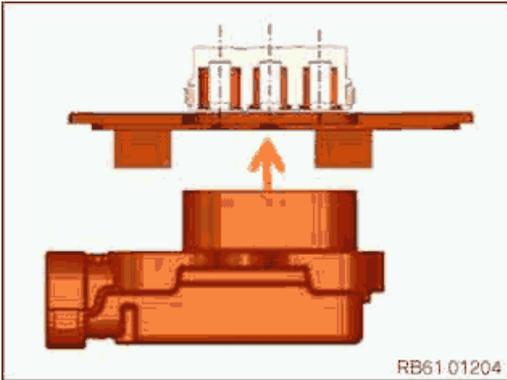
Push the lock (1) fully to the rear.

Attention!

Plug connection (3) must be correctly locked by lock (2), otherwise there is a risk of damage.

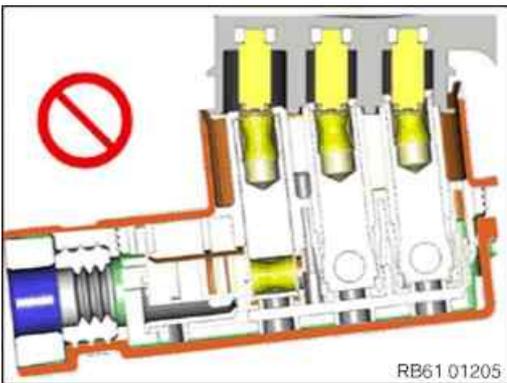


Connect the connector for the high-voltage interlock.



Three-phase high-voltage connector:

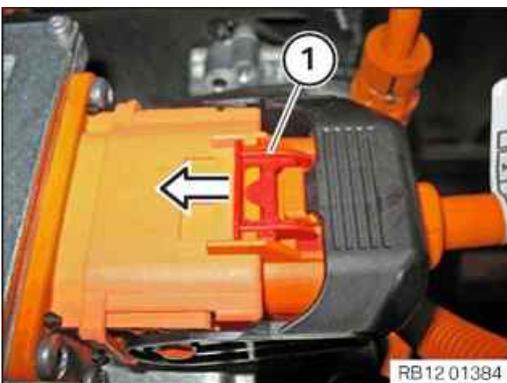
Connect and disconnect the connector straight.



Attention!

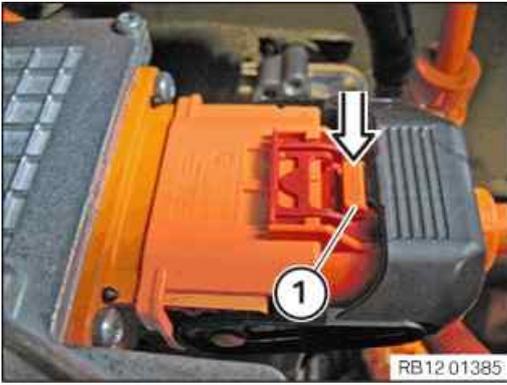
The system is designed to only offer limited protection against damage caused by connectors that are inserted at an angle.

Increased tilted connections will increase the connecting force and the risk of danger.

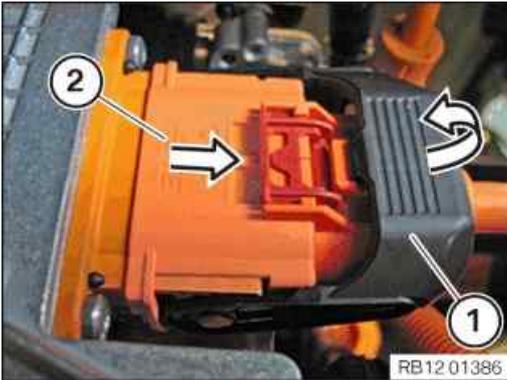


Disconnect the high-voltage connector from the high-voltage connection of the KLE:

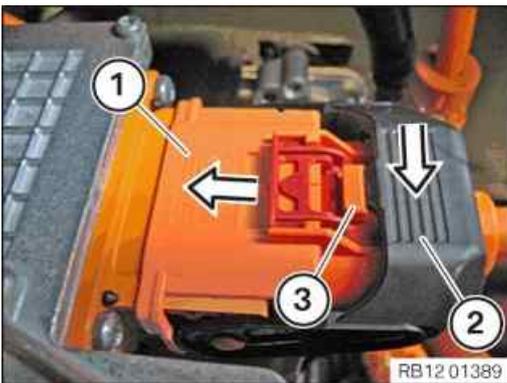
Slide lock (1) in direction of arrow up to stop.



Press lock (1).



Open the lock (1) completely and disconnect the connector (2).



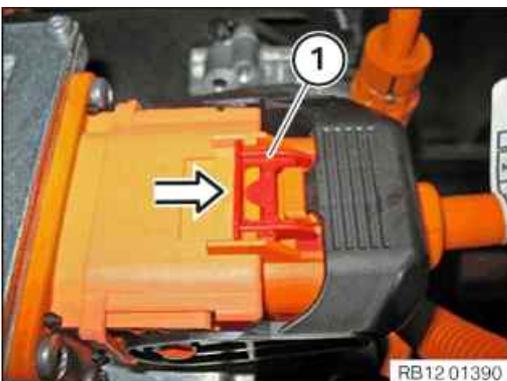
Connect the high-voltage connector to the high-voltage connection of the KLE:

Connect the connector (1) to the limit position and close the lock (2).

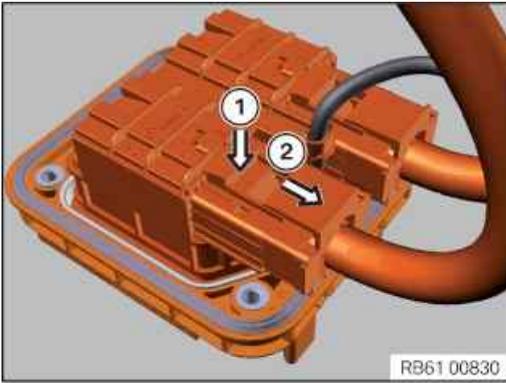
Attention!

Lock (2) must snap audibly into place.

The retaining lug of the lock (2) must be positioned completely under the lock (2).



Slide the lock (1) on to the stop in the direction of the arrow.



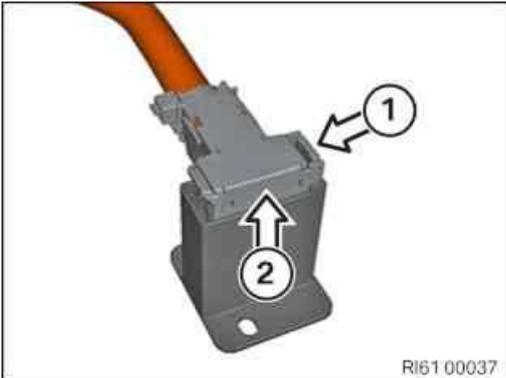
High-voltage connector on the high-voltage connection of the high-voltage battery unit:

Press down unlocking (1) in direction of arrow and pull off connector in direction of arrow (2).

Attention!

Contact protection is no longer provided in the event of a damaged connector housing.

In this case, contact technical support.



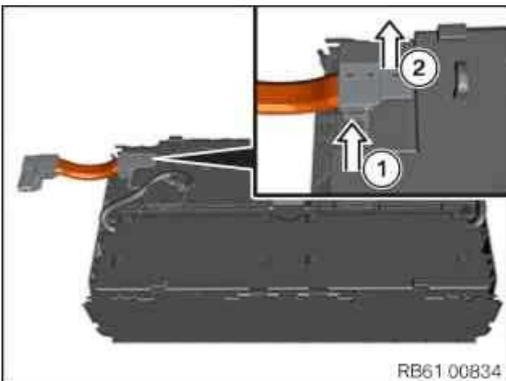
High-voltage connector on the cell module I01:

Press unlocking device (1) together and pull off connector upwards (2).

Attention!

Contact protection is no longer provided in the event of a damaged connector housing.

In this case, contact technical support.



High-voltage connector on the cell module (cell module connecting line):

Press unlocking (1) in direction of arrow and pull off connector in direction of arrow (2).

Attention!

Contact protection is no longer provided in the event of a damaged connector housing.

In this case, contact technical support.

Switch off ignition.



Connect diagnosis system.

Switch the ignition on.

Select "Programming".

Follow the instructions in the diagnosis system.

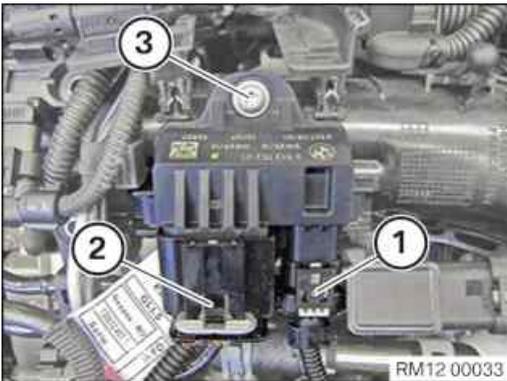
Adjust the following control units:

- EWS (electronic immobiliser)
- DME (Digital Motor Electronics) or
- DDE (Digital Diesel Electronics)

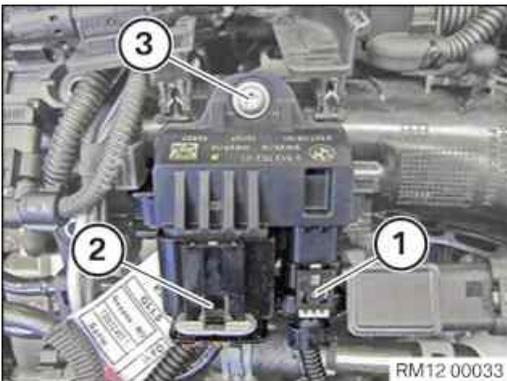
Follow Service Information "Diagnosis and Encoding" on the topic of programming.

**Necessary preliminary tasks:**

- Remove [acoustic cover](#)

**Removal:**

Unlock and release connector (1) from preheating control unit.
 Unlock and release connector (2) from preheating control unit.
 Release screw (3).
 Remove preheating control unit.

**Installation:**

Install preheating control unit.
 Tighten screw (3).
 Tightening torque [12 23 2AZ](#).
 Connect and lock connector (1) at preheating control unit.
 Connect and lock connector (2) at preheating control unit.
 Connectors (1 and 2) must engage audibly.

**Required follow-up work:**

- Install [acoustic cover](#)

12 23 505 Replace all glow elements

PRELIMINARY WORK

1 – Removing the acoustic cover



WARNING

Hot surfaces.

Risk of burning!

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



RISK OF DAMAGE

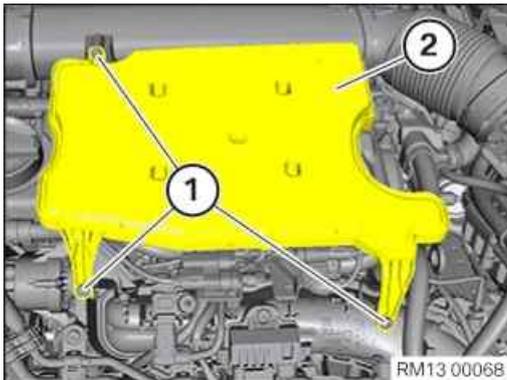
Damage to the acoustic cover.

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

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

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

2 – Remove resonator



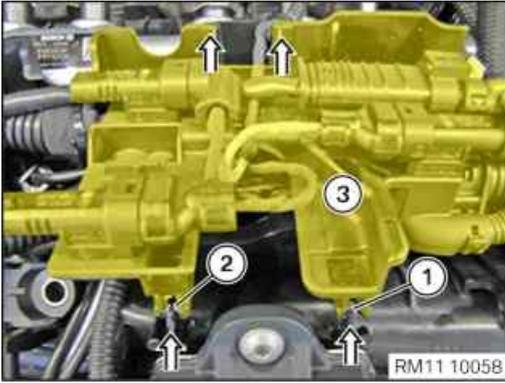
- Loosen screws (1).
- Guide out and remove the resonator (2).

3 – Remove the acoustic cover for the injectors



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

4 – Removing the cable clips from the intake plenum



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

MAIN WORK

5 – Removing glow elements



WARNING

Hot surfaces.

Risk of burning!

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



RISK OF DAMAGE

Damage to the glow elements.

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

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



RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

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



RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

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



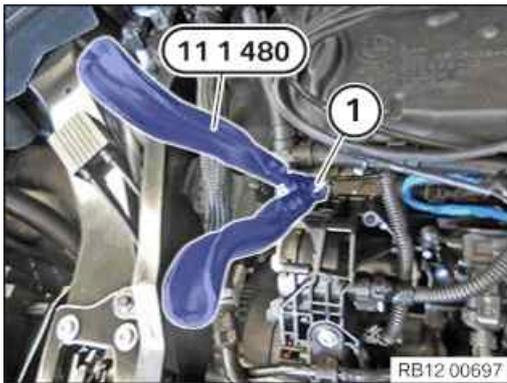
RISK OF DAMAGE



Electrostatic discharge.

Damage to or destruction of electrical components.

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

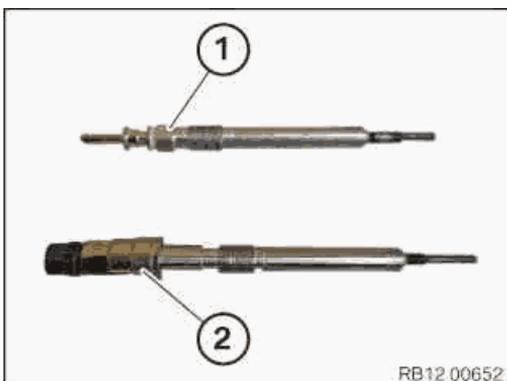


- Unlock and disconnect plug connection (1) using special tool **0 490 796 (11 1 480)**.



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

6 – Install glow elements



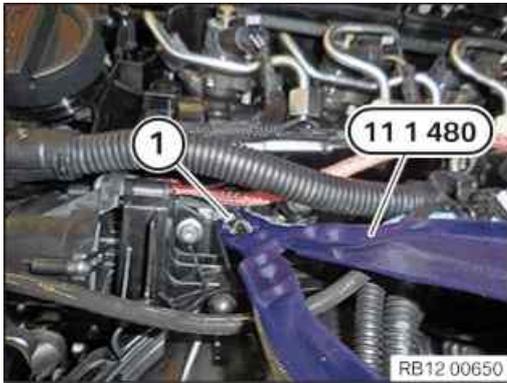
- Install glow elements (1) in cylinders 1, 2, 3 and 4.
- If fitted: Glow element (2) with the **combustion chamber pressure sensor** must be installed in cylinder 2.



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

Glow elements to cylinder head

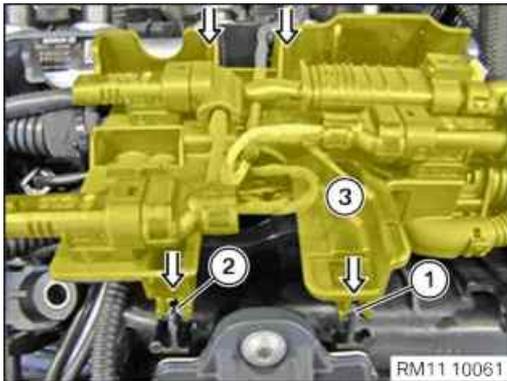
Glow element	Tightening torque	13 Nm
--------------	-------------------	-------



- Connect connectors (1) and lock.
The connector (1) must engage audibly.

POSTPROCESSES

7 – Installing the cable clip for the intake plenum



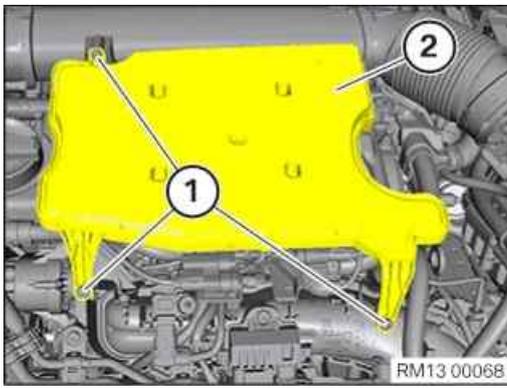
- Feed in and install the cable clip (3) in the direction of arrow.
- Engage clips (1) and (2).

8 – Install the acoustic cover for the injectors



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

9 – Install resonator



- Insert and install the resonator (2).
 - Renew screws (1).
- Parts:** Bolts
- Tighten the screws (1).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm
-----------	--------------	-------------------	------

10 – Install acoustic cover



RISK OF DAMAGE

Damage to the acoustic cover.

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

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



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



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

Additional Information

Overview of Tightening Torques

Glow elements to cylinder head

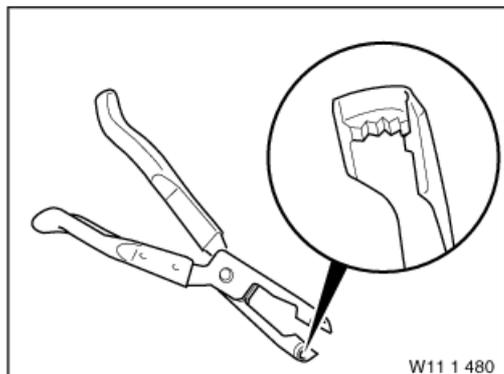
Used in step 6

Glow element	Tightening torque	13 Nm
--------------	-------------------	-------

Screw TS6	Renew screw.	Tightening torque	5 Nm
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Overview of Special Tools

0 490 796 (11 1 480) Pliers



Common

Used in step 5

Usage	For removing valve stem seal
-------	------------------------------

Included in the tool or work	
------------------------------	--

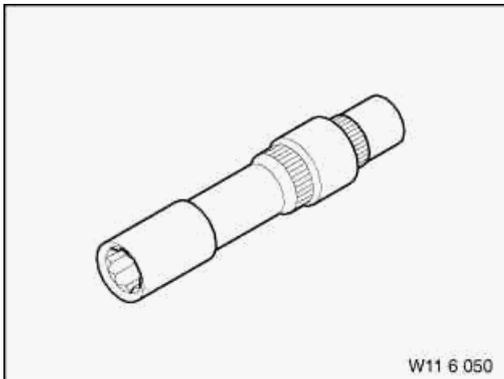
Storage location	A10
------------------	-----

Replaced by	
-------------	--

In connection with	
--------------------	--

SI-Number	01 01 93 (621)
-----------	----------------

0 491 068 (11 6 050) Socket wrench insert



Common

Used in step 5 6

Usage	(Wrench socket AF 10) bi-hexagon/glow elements
-------	------------------------------------------------

Included in the tool or work	
------------------------------	--

Storage location	B10
------------------	-----

Replaced by	
-------------	--

In connection with	
--------------------	--

SI-Number	01 06 98 (306)
-----------	----------------

Links

Repair instructions

Used in step

61 35 ... Notes on ESD protection (Electro Static Discharge)	5
------------------------------------------------------------------------------	---

12 23 505 Replacing all glow elements (B37)



Special tools required:

- [11 1 480](#)
- [11 6 050](#)



Note:

If malfunctions have occurred at the glow elements, it is essential to check the safety fuse.

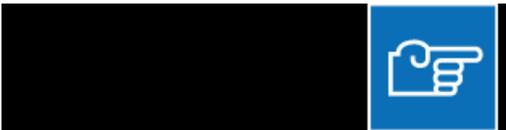
For further troubleshooting information refer to the BMW diagnosis system.

Switch off ignition.

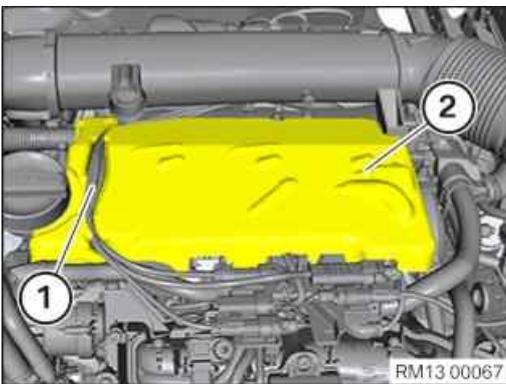


Necessary preliminary tasks:

- Remove [resonator](#).

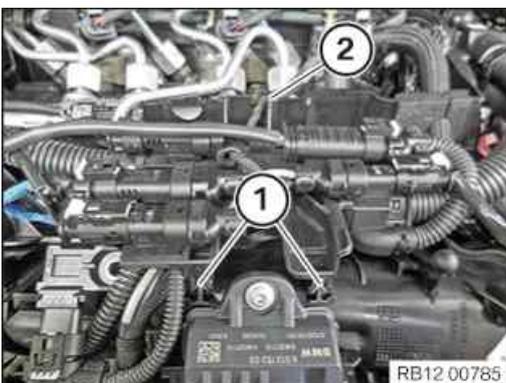


Removal:



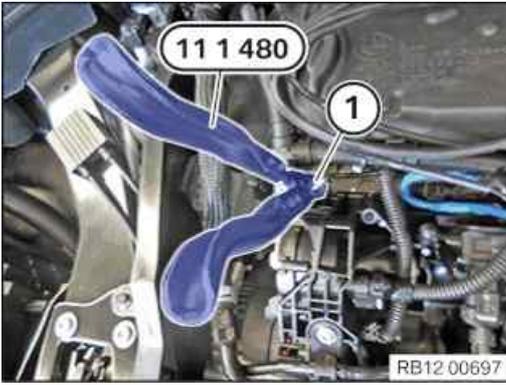
Release cable (1) from sound insulation (2).

Remove sound insulation (2) upwards.



Release clamp (1).

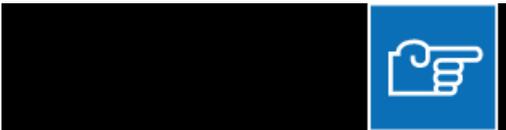
Thread out cable clip (2) and place to side.



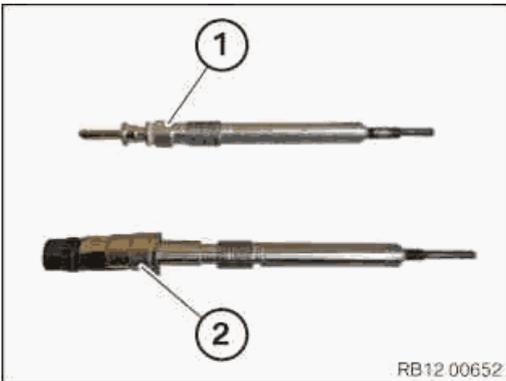
Unlock and remove connector (1) with special tool [11 1 480](#) .



Unscrew the glow elements with the special tool [11 6 050](#) or conventional tools.



Installation:



Note: Install glow element (1) for cylinders 1,2,3.

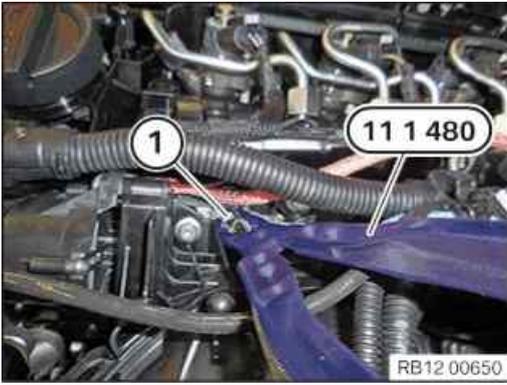
Attention: Install glow element (2) with **combustion chamber pressure sensor**, if fitted, in cylinder 2.



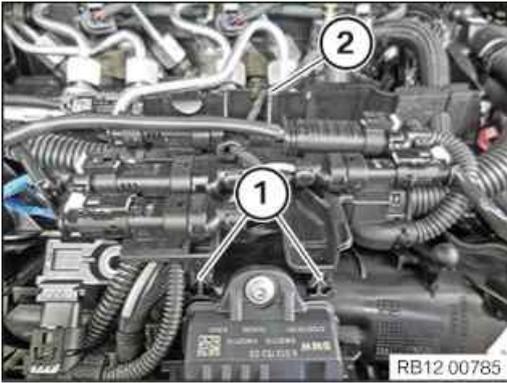
Screw in and tighten glow elements for cylinders **1,3** with special tool [11 6 050](#) .

Tighten the glow element cylinder **2** with standard tools.

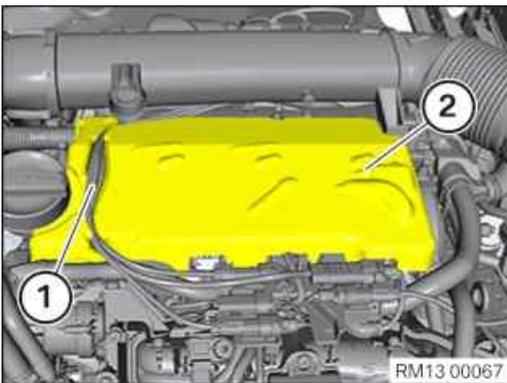
Tightening torque [12 23 1AZ](#).



Attach and lock connector (1).
Connector (1) must engage audibly.



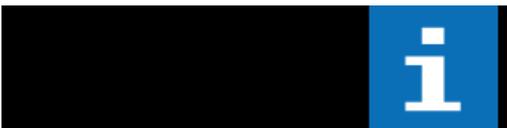
Feed in and install the cable clip (2).
Secure clamp (1).



Install sound insulation (2).
Secure cable (1) to sound insulation (2).



Note:
Follow the diagnosis instructions.
Teach the glow elements in as needed.



Required follow-up work:

- Install [resonator](#).

12 31 020 Removing and installing/replacing alternator

PRELIMINARY WORK

1 – Disconnecting all battery earth leads



- See additional information.

2 – Removing the acoustic cover



WARNING

Hot surfaces.

Risk of burning!

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



RISK OF DAMAGE

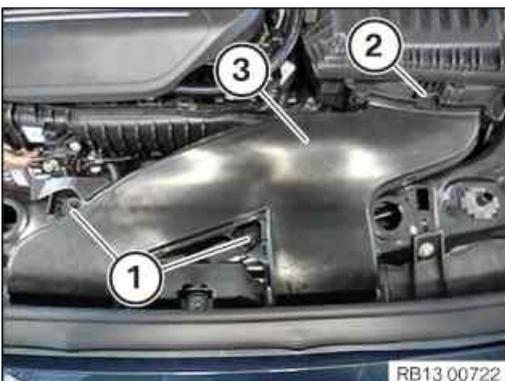
Damage to the acoustic cover.

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

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

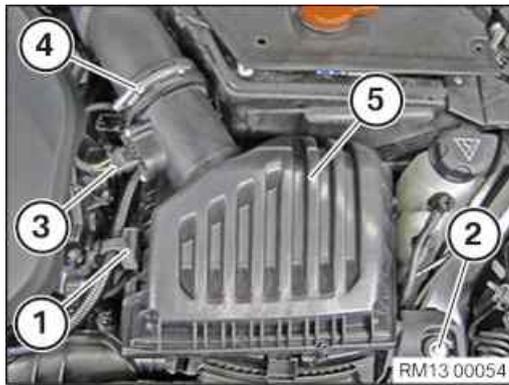
- Unclip the acoustic cover from the marked areas towards the top.

3 – Remove the intake neck for intake silencer housing



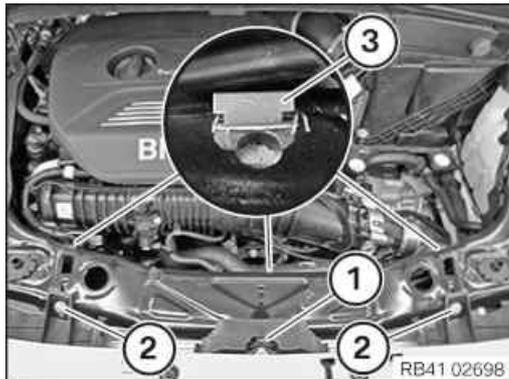
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

4 – Removing intake silencer housing

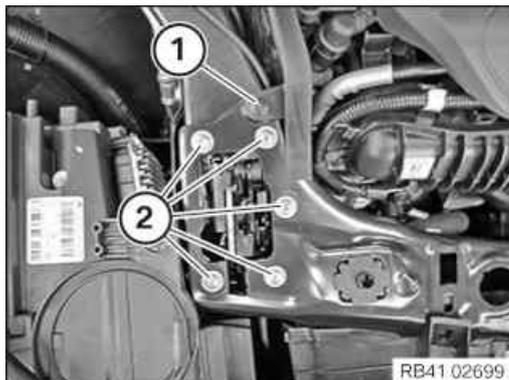


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

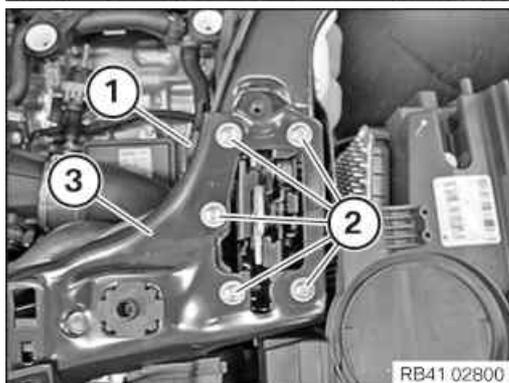
5 – Remove cross connection



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

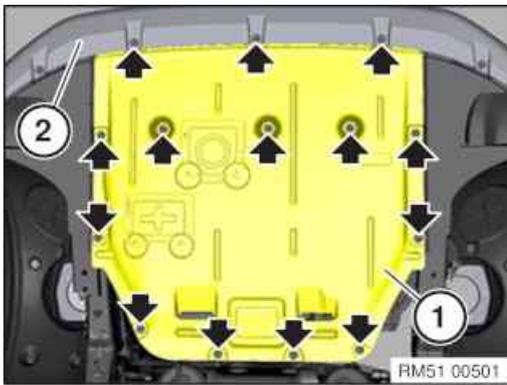


- Lever out expanding rivet (1).
- Loosen screws (2).



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

6 – Removing the front underbody protection



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

7 – Remove front right wheel



TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.



TECHNICAL INFORMATION

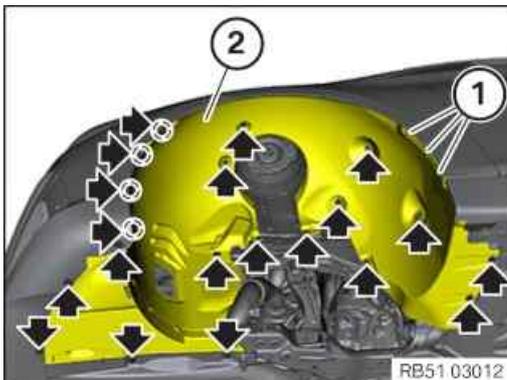
Strictly observe the specified procedure to prevent clamping errors and imbalance.



- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

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

8 – Removing the front right wheel arch cover

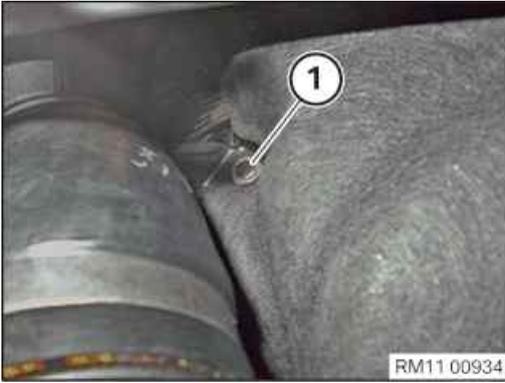


- Loosen the expanding rivet (1).
- Unscrew all bolts and nuts (arrows).
- Feed the wheel arch cover (2) out at the front right and remove it.

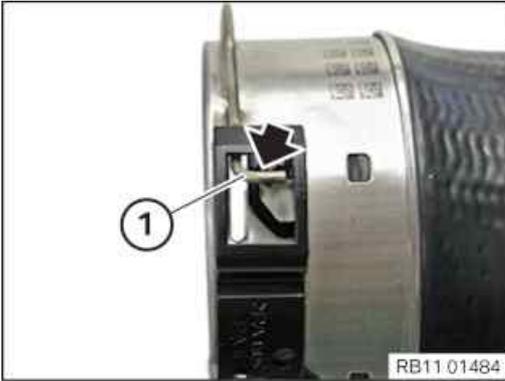
9 – Remove right charge-air line



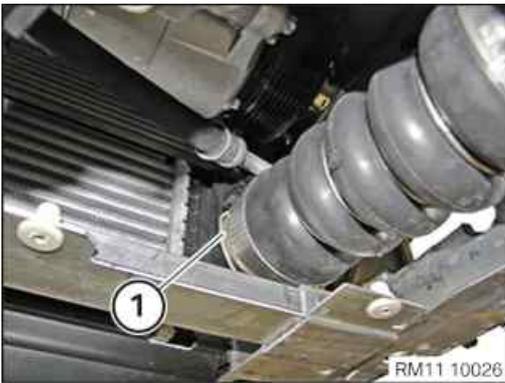
- Release charge air duct screws (1) on oil sump.



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



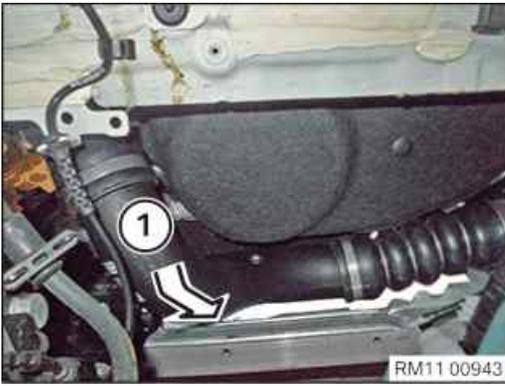
- Unfasten lock (1) on exhaust turbocharger and charge air cooler.
- Let the lock (1) engage at the holder (arrow).



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

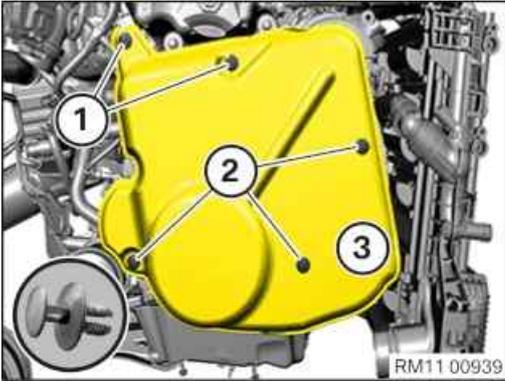


- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.



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

10 – Removing the acoustic cover for the engine at the front



- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

11 – Removing the drive belt for alternator



CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.



CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.



TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

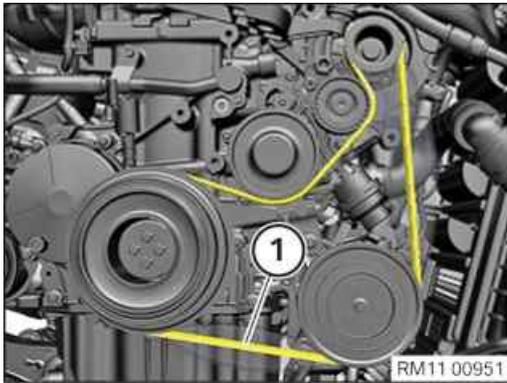


TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.



- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool .



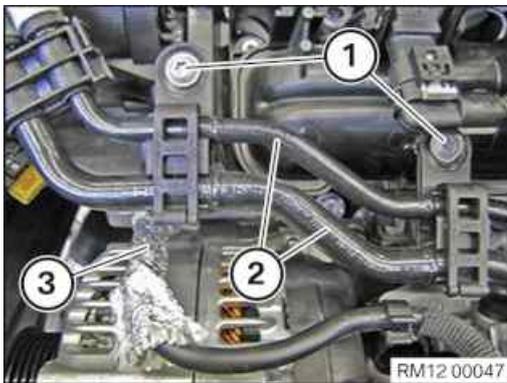
- Guide out the drive belt for the alternator (1) and remove it.

MAIN WORK

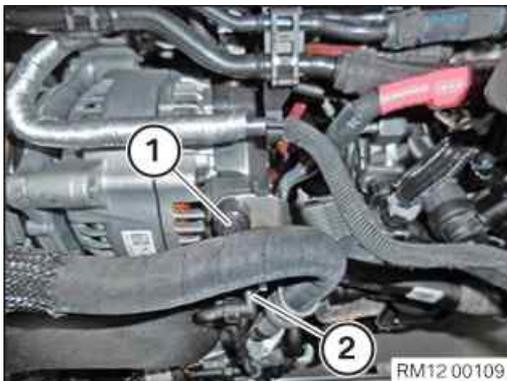
12 – Removing the alternator

Prerequisite

Battery earth lead is disconnected.



- Loosen screws (1).
- Place fuel feed and return line (2) to one side.
- Unlock the coolant ventilation line (3) and pull it off the cylinder head.
- Catch and dispose of escaping coolant.



- Remove the cover (1) and loosen the nut below.
- Disconnect positive battery cable from alternator.
- Unlock the plug connection (2) and pull off from the alternator.



- Loosen screws (1).



- Feed the alternator (1) out toward the top and remove it.

13 – Renew alternator

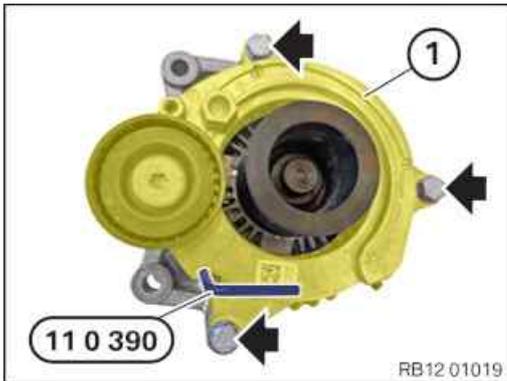


CAUTION

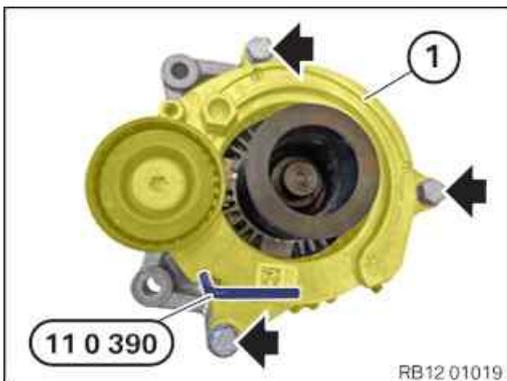
Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.



- Remove screws (arrows).
- Feed out and remove the tensioning device for the drive belt for alternator (1) on the alternator.



- Feed in and install the tensioning device for the drive belt for alternator (1) on the alternator.
- Make sure that the special tool is fitted correctly.
- Tighten screws (arrows).

Belt tensioner to alternator

M8X30	Tightening torque	28 Nm
-------	-------------------	-------

14 – Installing the alternator



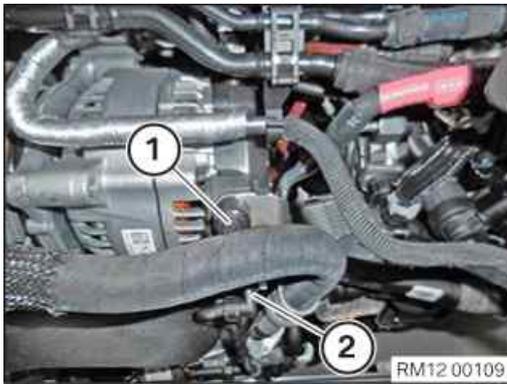
- Insert and install the alternator (1).



- Tighten the screws (1).

Alternator to component carrier

M10x75 / M10x125		Tightening torque	38 Nm
---------------------	--	-------------------	-------

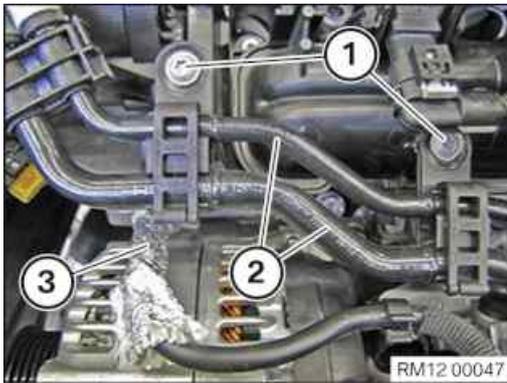


- Mount the positive battery cable to the alternator and secure it with the nut.
- Tighten nut.

Positive battery cable to alternator

M8		Tightening torque	19 Nm
----	--	-------------------	-------

- Mount the cover (1) on the nut.
- Connect the connector (2) to the alternator and lock audibly.



- Mount fuel supply and return line (2).
- Tighten the screws (1).

Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm
--------	--	-------------------	------

- Connect the coolant ventilation line (3) to the cylinder head and audibly lock.

POSTPROCESSES

15 – Installing the drive belt for alternator



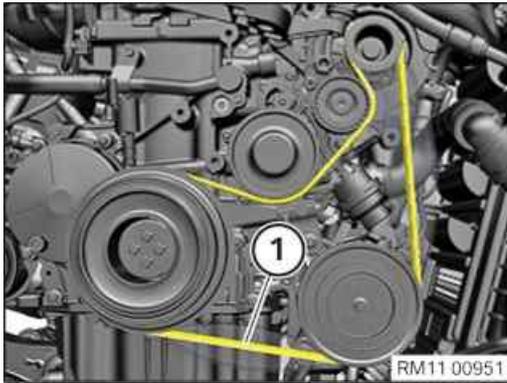
TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.



TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

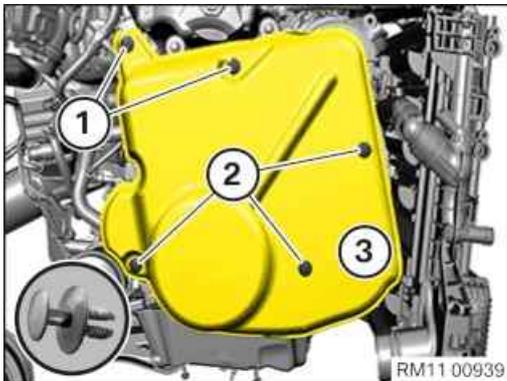


- Feed in the drive belt for the alternator (1) and install it.



- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool out of the belt tensioner and remove it.

16 – Install the acoustic cover for the engine at the front



- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.

17 – Install right charge air duct

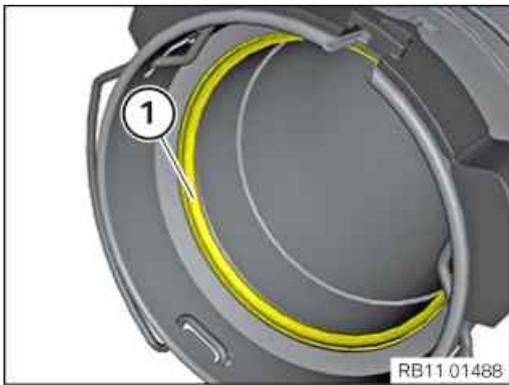


RISK OF DAMAGE

Damage to the exhaust turbocharger.

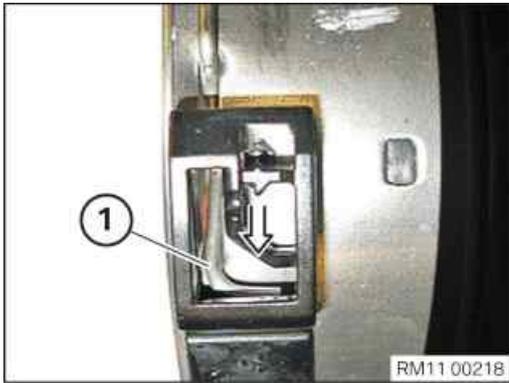
A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.



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

Parts: Gasket



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

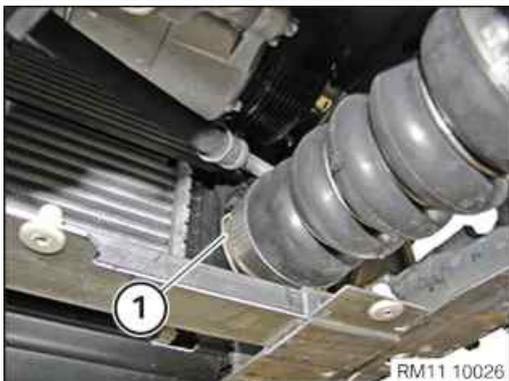


- Feed in charge air duct (1) to the side and upwards through the wheel arch between the side member and front axle support and install.



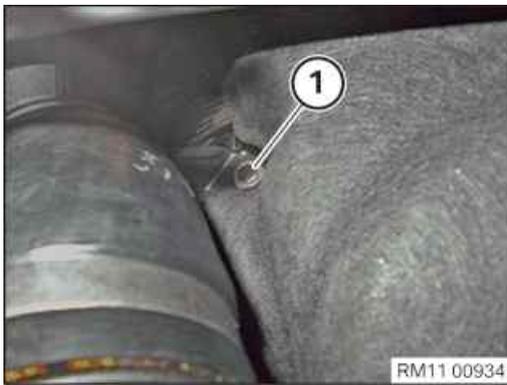
- Attach charge air duct on the exhaust turbocharger until locks (1) engage on both side.

The lock (1) must audibly engage.



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

The lock (1) must audibly engage.



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

Charge air line to crankcase

M6x25		Tightening torque	5 Nm
-------	--	-------------------	------

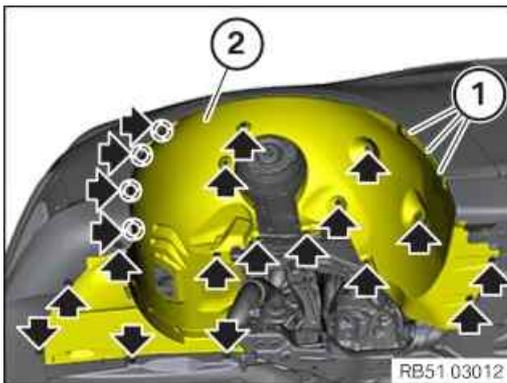


- Tighten charge air duct screws (1) on oil sump.

Charge air duct to oil sump

M6		Tightening torque	8 Nm
----	--	-------------------	------

18 – Installing the front right wheel arch cover



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

Wheel arch cover

Screw			3 Nm
Plastic nut			2,6 Nm

- Secure expanding rivet (1).

19 – Installing the front right wheel



- ▶ Clean the contact surfaces between the brake disc and the wheel rim



TECHNICAL INFORMATION

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

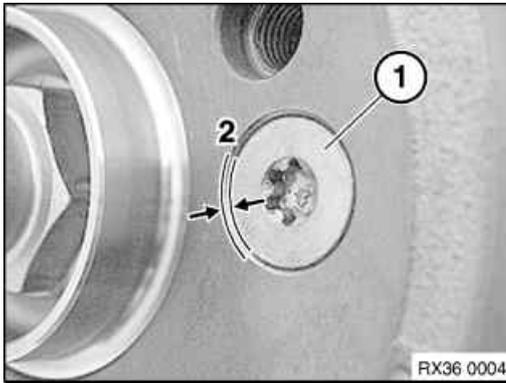
- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.
Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue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



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

Do not operate special tool **2 344 011** with an impact screwdriver.

- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

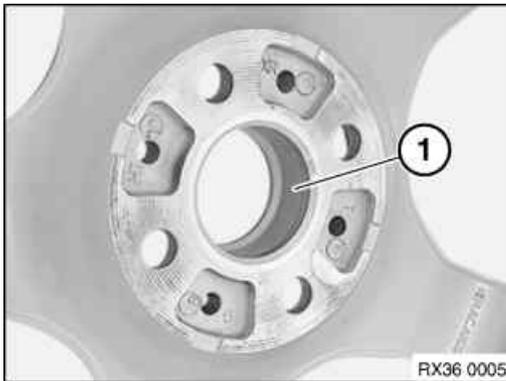


- Check the mounting bolt for the brake disc (1) for secure fit.

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

Brake disc to front wheel hub

M8	Renew screw.		16 Nm
----	--------------	--	-------



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



TECHNICAL INFORMATION

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

The wheel rim must rest uniformly against the brake disc.

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

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

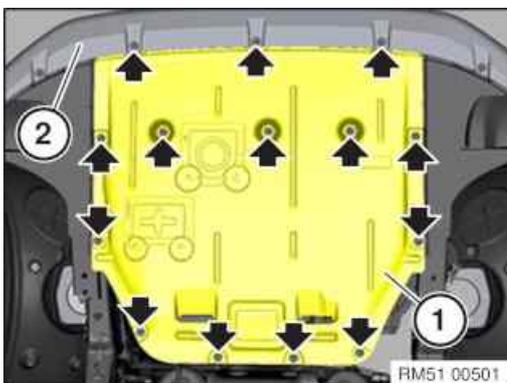
Parts: Wheel bolts

- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

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

20 – Installing the front underbody protection

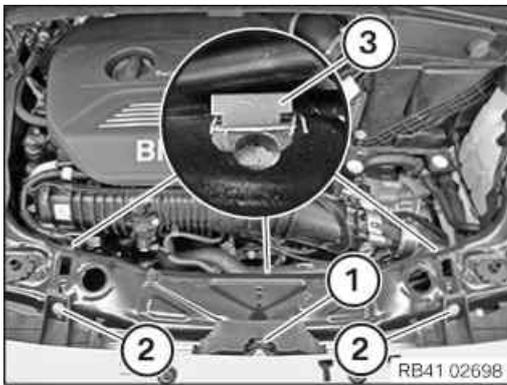


- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm
--	--	--	------

21 – Install cross connection



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

Bracing strut to top cross connection

M8		Tightening torque	25 Nm
----	--	-------------------	-------

- Tighten down screws (2).

Air duct to deformation element/cross connection

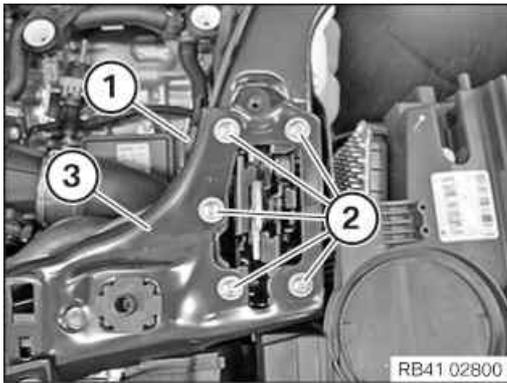
M6x20 screw		Tightening torque	6 Nm
-------------	--	-------------------	------

- Fasten clamps (3) for bonnet lock Bowden cable to cross connection.
- Tighten screws (2) of cross connection (3).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm
-------	--	-------------------	-------

- Fasten expanding rivet (1).

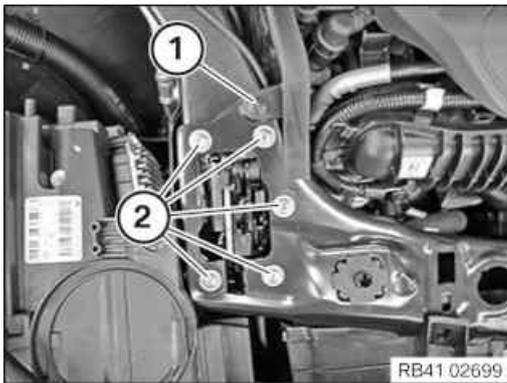


- Tighten down screws (2).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm
-------	--	-------------------	-------

- Fasten expanding rivet (1).



22 – Installing intake silencer housing



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

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm
-------	--	-------------------	------

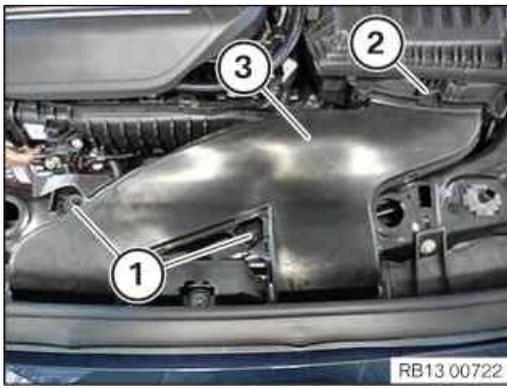
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm
-------	--	-------------------	------

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

23 – Install the intake neck for the intake filter housing



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

Intake neck to cross connection

M6		Tightening torque	8 Nm
----	--	-------------------	------

24 – Install acoustic cover



RISK OF DAMAGE

Damage to the acoustic cover.

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

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



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



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

25 – Disconnecting all battery earth leads



- See additional information.

26 – Checking coolant level and topping up if needed



CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

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



TECHNICAL INFORMATION

Follow notes for repair work on the cooling system.

For additional information see:

Main group 17

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



TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

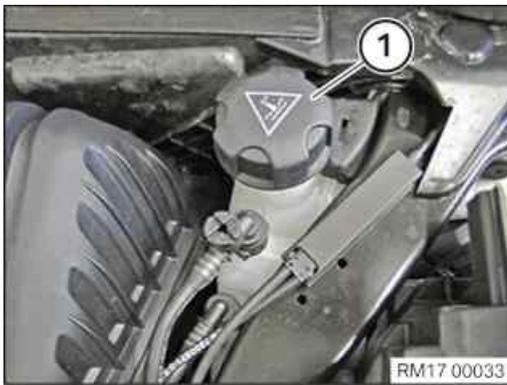
When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

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



TECHNICAL INFORMATION

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



- Check coolant level in coolant expansion tank (1) and adjust to the maximum if needed.

Additional Information

Overview of Tightening Torques

Belt tensioner to alternator			Used in step	13
M8X30		Tightening torque		28 Nm
Alternator to component carrier			Used in step	14
M10x75 / M10x125		Tightening torque		38 Nm
Positive battery cable to alternator			Used in step	14
M8		Tightening torque		19 Nm
Fuel line to intake plenum			Used in step	14
TS6x20		Tightening torque		5 Nm
Charge air line to crankcase			Used in step	17
M6x25		Tightening torque		5 Nm
Charge air duct to oil sump			Used in step	17
M6		Tightening torque		8 Nm
Wheel arch cover			Used in step	18
Screw				3 Nm
Plastic nut				2,6 Nm
Brake disc to front wheel hub			Used in step	19
M8	Renew screw.			16 Nm
Wheel bolts			Used in step	19
M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque		140 Nm
		Check		140 Nm
Underbody protection front			Used in step	20
				3 Nm

Bracing strut to top cross connection			Used in step 21
M8		Tightening torque	25 Nm
Air duct to deformation element/cross connection			Used in step 21
M6x20 screw		Tightening torque	6 Nm
Cross connection on support for cross connection			Used in step 21
M6x20		Tightening torque	12 Nm
Intake silencer housing to lock bridge			Used in step 22
M6X30		Tightening torque	8 Nm
Clean air pipe to intake silencer housing			Used in step 22
Clamp		Tightening torque	3 Nm
Intake neck to cross connection			Used in step 23
M6		Tightening torque	8 Nm

Overview of Special Tools

2 344 011 Tool



Common

Used in step [19](#)

Usage Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.

Included in the tool or work

Storage location

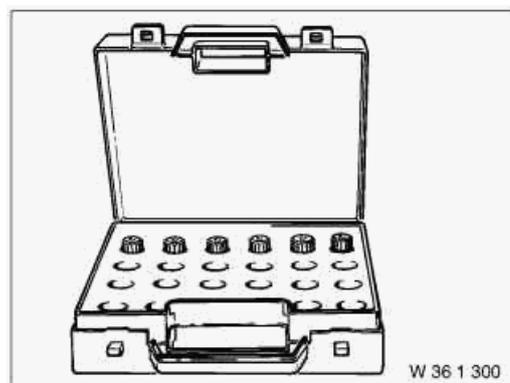
Replaced by

In connection with

SI-Number 08 08 12 (872)

Replacement tools:

0 495 221 (36 1 323) Wheel stud



Common

Used in step [7](#)

Usage (Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259

Included in the tool or work 0 492 518

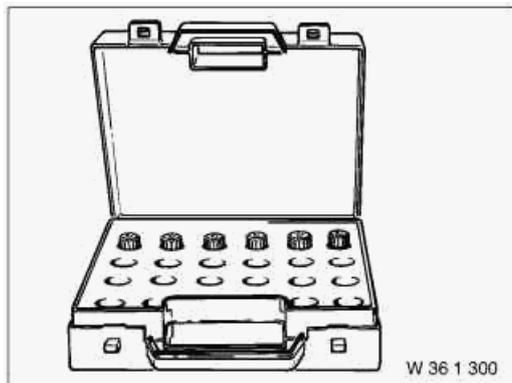
Storage location

Replaced by

In connection with

SI-Number

0 495 224 (36 1 326) Wheel stud



Common

Used in step 7

Usage (Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546

Included in the tool or work 0 492 518

Storage location

Replaced by

In connection with

SI-Number

0 495 225 (36 1 327) Wheel stud



Common

Used in step 7

Usage (Code 34) With centring bore available separately, (see EPC) under 36 13 6 765 547

Included in the tool or work 0 492 518

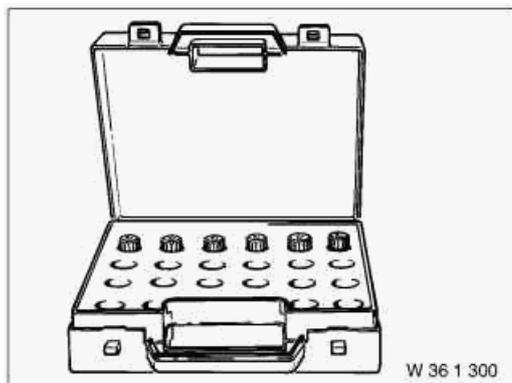
Storage location

Replaced by

In connection with

SI-Number

0 495 226 (36 1 328) Wheel stud



Common

Used in step 7

Usage (Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340

Included in the tool or work 0 492 518

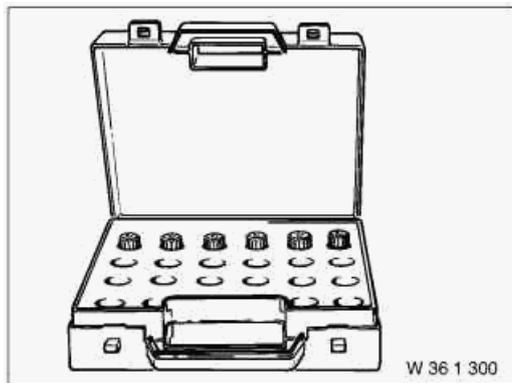
Storage location

Replaced by

In connection with

SI-Number

0 495 227 (36 1 329) Wheel stud



Common

Used in step 7

Usage (Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341

Included in the tool or work 0 492 518

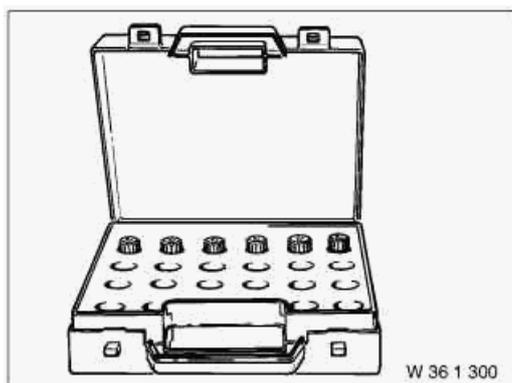
Storage location

Replaced by

In connection with

SI-Number

0 495 228 (36 1 331) Wheel stud



Common

Used in step 7

Usage (Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342

Included in the tool or work 0 492 518

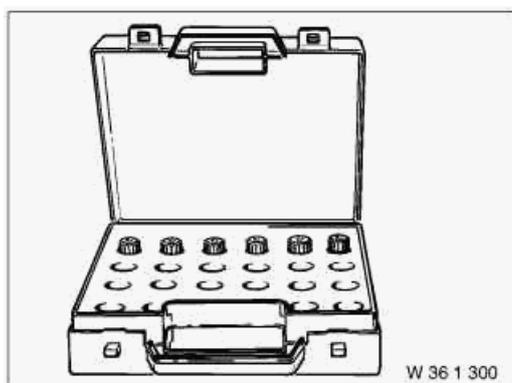
Storage location

Replaced by

In connection with

SI-Number

0 495 229 (36 1 332) Wheel stud



Common

Used in step 7

Usage (Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343

Included in the tool or work 0 492 518

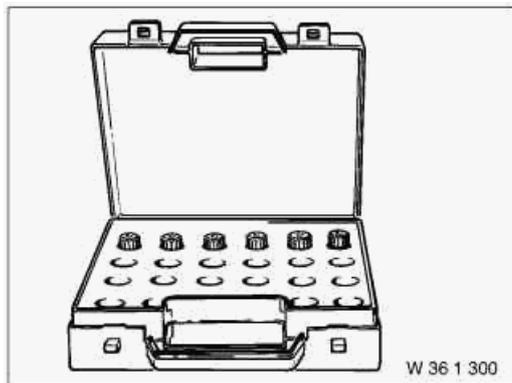
Storage location

Replaced by

In connection with

SI-Number

0 495 230 (36 1 333) Wheel stud



Common

Used in step 7

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

Links

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1 25
61 20 900 Disconnecting and connecting battery earth lead	1 25
61 20 900 Disconnecting and connecting battery earth lead	1 25
61 20 900 Disconnecting and connecting battery earth lead	1 25
61 20 900 Disconnecting and connecting battery earth lead	1 25
61 20 900 Disconnecting and connecting battery earth lead	1 25
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 25
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 25
61 20 900 Disconnecting and connecting battery earth lead	1 25
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 25
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1 25
61 20 900 Disconnecting and connecting battery earth lead	1 25
61 20 900 Disconnecting and connecting battery earth lead	1 25
61 20 900 Disconnecting and connecting battery earth lead	1 25
61 20 900 Disconnecting and connecting battery earth lead	1 25
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61 20 900 Disconnecting and connecting battery earth lead	1 25

61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 25
61 20 900 Disconnecting and connecting battery earth lead	1 25
61 20 900 Disconnecting and connecting battery earth lead	1 25
61 20 900 Disconnecting and connecting battery earth lead	1 25
61 20 900 Disconnecting and connecting battery earth lead	1 25
61 20 900 Disconnecting and connecting battery earth lead	1 25
61 20 900 Disconnecting and connecting battery earth lead	1 25
61 20 900 Disconnecting and connecting battery earth lead	1 25
17 00 ... Instructions for working on cooling system	26

Operating materials	Used in step
----------------------------	---------------------

2.0 Grease for wheel centring	19
-----------------------------------------------	----

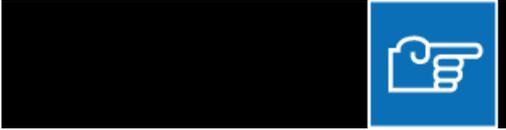
Operating materials	Used in step
----------------------------	---------------------

Main group 17	26
-------------------------------	----

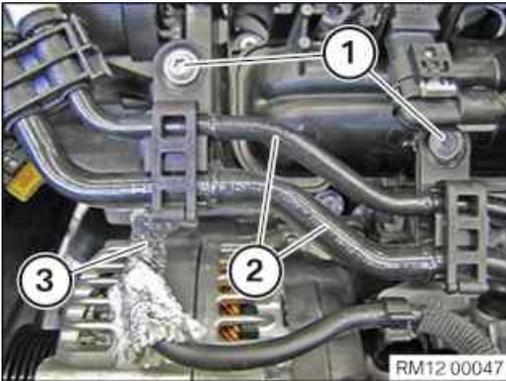


Necessary preliminary tasks:

- Disconnect [negative battery cable](#).
- Loosen [drive belt for alternator](#), **do not** remove.
- Remove [cross connection](#).



Removal:

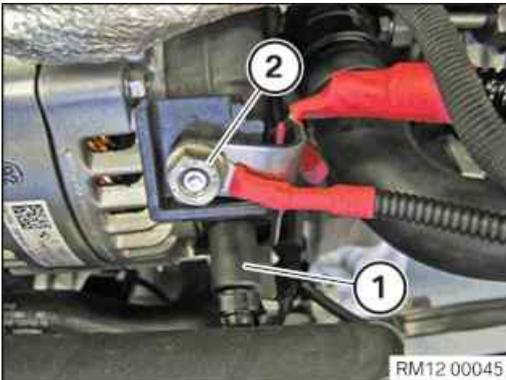


Release screws (1).

Place fuel feed and return line (2) to one side.

Unlock coolant tank ventilation line (3) and pull off from cylinder head.

Catch and dispose of escaping coolant.



Release connector (1) and remove.

Release nut (3) on alternator.

Disconnect positive battery cable from alternator.

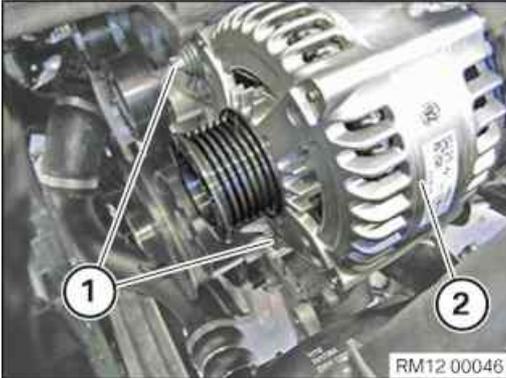


Release screws (1).

Feed out alternator (2) toward top and remove.



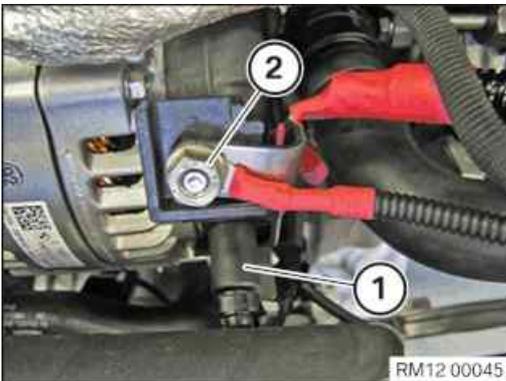
Installation:



Install alternator (2).

Tighten down screws (1).

Tightening torque [12 31 1AZ](#).



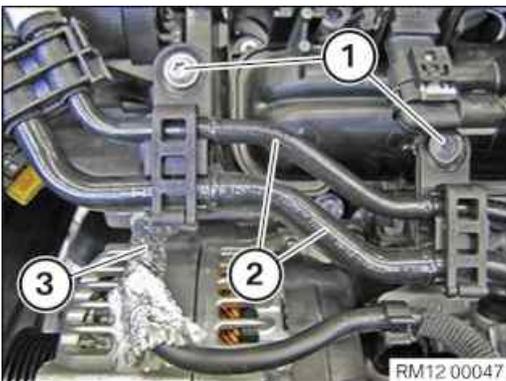
Connect connector (1) to alternator.

Connector (1) must engage audibly.

Connect positive battery cables to alternator.

Tighten nut (2).

Tightening torque [12 52 2AZ](#).



Connect coolant ventilation line (3) to cylinder head.

Coolant tank ventilation line (3) must audibly engage.

Install fuel feed and return line (2) on intake plenum.

Tighten down screws (1).

Tightening torque [13 53 7AZ](#).



Required follow-up work:

- Install [cross connection](#).
- Install [drive belt for alternator](#).
- Install [battery earth lead](#).

11 00 ... Handling components after flood damage

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

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

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

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

12 41 020 Removing and installing/replacing starter motor



WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

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

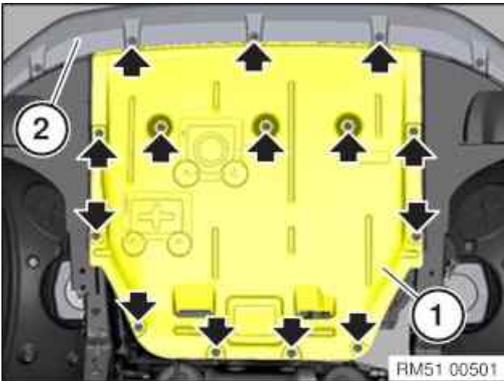
PRELIMINARY WORK

1 – Disconnecting all battery earth leads



- See additional information.

2 – Removing the front underbody protection



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

MAIN WORK

3 – Removing starter motor



WARNING

Hot surfaces.

Risk of burning!

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



WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

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



RISK OF DAMAGE



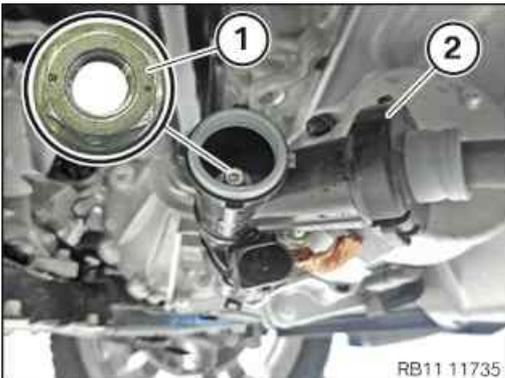
Electrostatic discharge.

Damage to or destruction of electrical components.

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



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



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



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

4 – Installing starter motor



CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

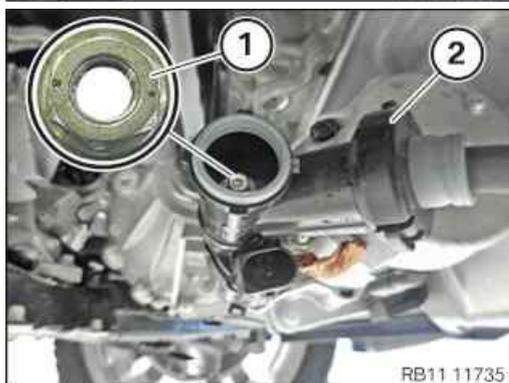
- Route the positive battery cable without abrasions and do not trap.



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

Starter motor to transmission

M8x45		Tightening torque	19 Nm
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- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

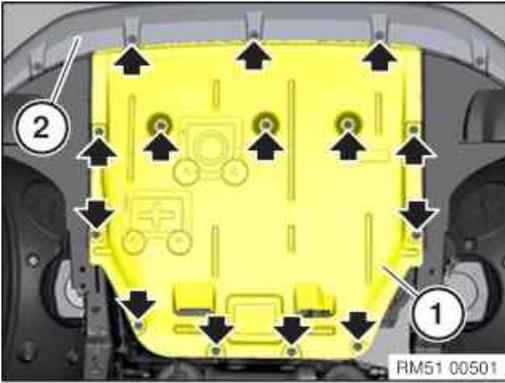
Battery positive lead to starter

M8		Tightening torque	13,5 Nm
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- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

5 – Installing the front underbody protection



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

Underbody protection front

				3 Nm
--	--	--	--	------

6 – Disconnecting all battery earth leads



- See additional information.

Additional Information

Overview of Tightening Torques

Starter motor to transmission			Used in step	4
M8x45		Tightening torque		19 Nm
Battery positive lead to starter			Used in step	4
M8		Tightening torque		13,5 Nm
Underbody protection front			Used in step	5
				3 Nm

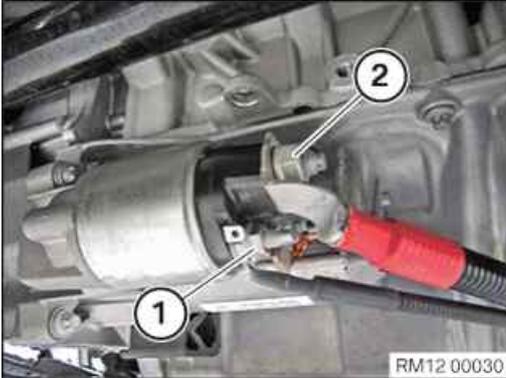
Links

Repair instructions	Used in step
----------------------------	---------------------

61 20 900 Disconnecting and connecting battery earth lead	1 6
61 20 900 Disconnecting and connecting battery earth lead	1 6
61 20 900 Disconnecting and connecting battery earth lead	1 6
61 20 900 Disconnecting and connecting battery earth lead	1 6
61 20 900 Disconnecting and connecting battery earth lead	1 6
61 20 900 Disconnecting and connecting battery earth lead	1 6
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 6
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 6
61 20 900 Disconnecting and connecting battery earth lead	1 6
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 6
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1 6
61 20 900 Disconnecting and connecting battery earth lead	1 6
61 20 900 Disconnecting and connecting battery earth lead	1 6
61 20 900 Disconnecting and connecting battery earth lead	1 6
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61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 6
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61 20 900 Disconnecting and connecting battery earth lead	1 6
61 20 900 Disconnecting and connecting battery earth lead	1 6

**Necessary preliminary work:**

- Clamp off [battery earth lead](#).
- Remove front [underbody protection](#).



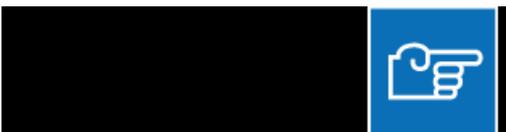
Release nut (1) and remove terminal 50 from starter motor.

Release nut (2) and disconnect positive battery cable from starter motor.



Release screws (1).

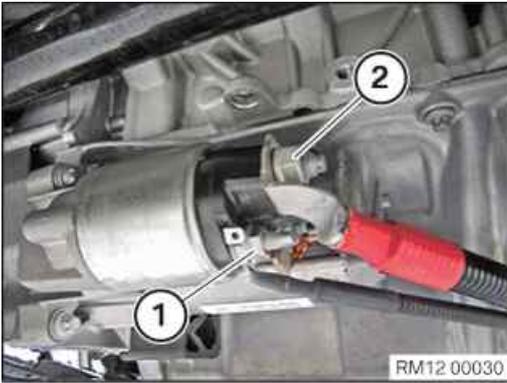
Remove starter motor.

**Installation:**

Install starter.

Screw in and tighten screws (1).

Tightening torque [12 41 1AZ](#)



Connect terminal 50 to starter motor and tighten nut (1).

Tightening torque [12 52 1AZ](#).

Connect positive battery cable to starter motor and tighten nut (2).

Tightening torque [12 52 3AZ](#).



Required follow-up work:

- Connect [battery earth lead](#).
- Install front [underbody protection](#).



Only during starter replacement and on vehicles with MSA (automatic engine start-stop function):

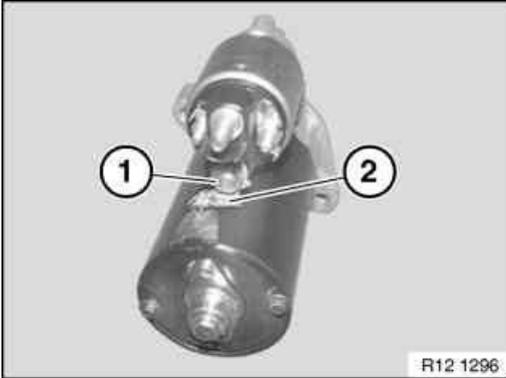
- Reset start counter using BMW diagnosis system.

12 41 041 Replacing the engagement solenoid switch



Necessary preliminary work:

- Switch off ignition.
- Remove [starter motor](#).



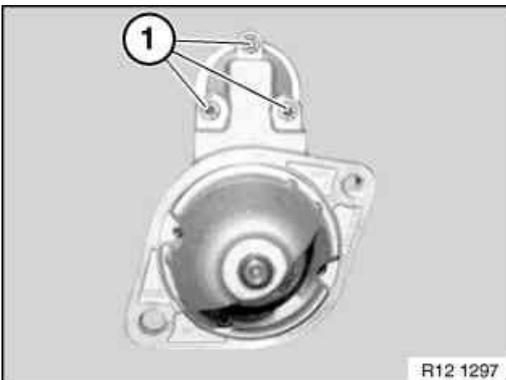
Slacken nut (1).

Remove the cable shoe (2).

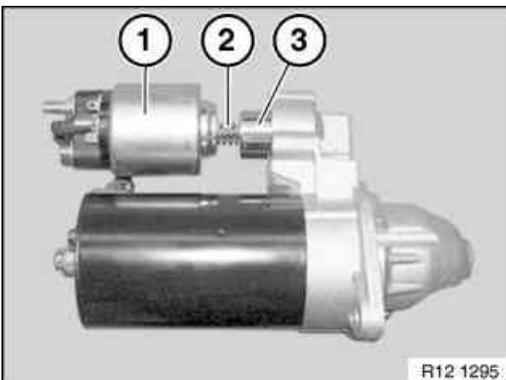
Attention!

Do not twist the cable shoe (2) when tightening, risk of shorting to starter motor housing.

Tightening torque [12 41 1AZ](#).



Release screws (1).



Remove the solenoid switch (1) and the spring (2).

Detach the bolt (3).

Installation note:

Check the bolt (3) for wear and grease the bolt.

12 42 500 Removing and installing/replacing the positive battery cable



TECHNICAL INFORMATION



- When the engine is stopped after the end of the journey, it may be necessary to run the electric fan. In rare cases, operation of the electric fan can last up to 11 min. This protects the components. In this case, replacing the electric fan will not remedy the problem!

PRELIMINARY WORK

1 – Disconnecting all battery earth leads



- See additional information.

2 – Removing the acoustic cover



WARNING

Hot surfaces.

Risk of burning!

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



RISK OF DAMAGE

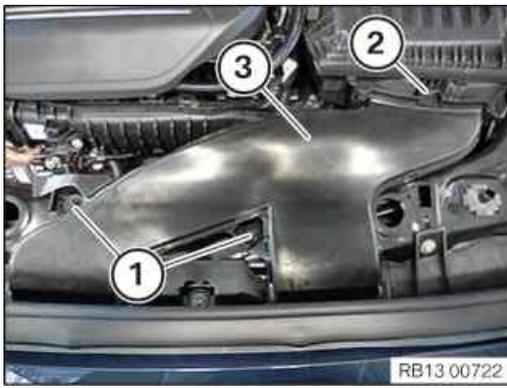
Damage to the acoustic cover.

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

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

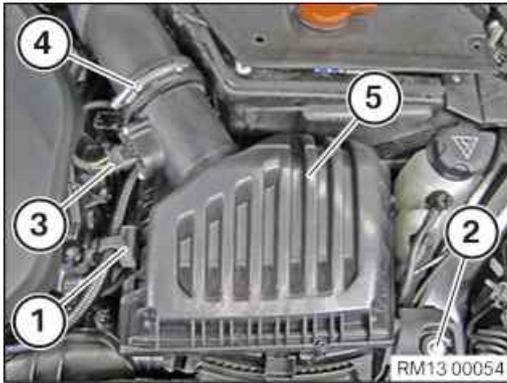
- Unclip the acoustic cover from the marked areas towards the top.

3 – Remove the intake neck for intake silencer housing



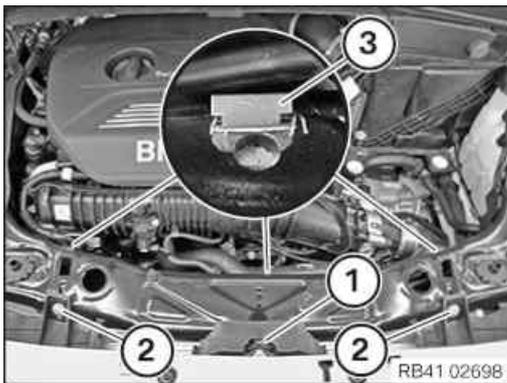
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

4 – Removing intake silencer housing

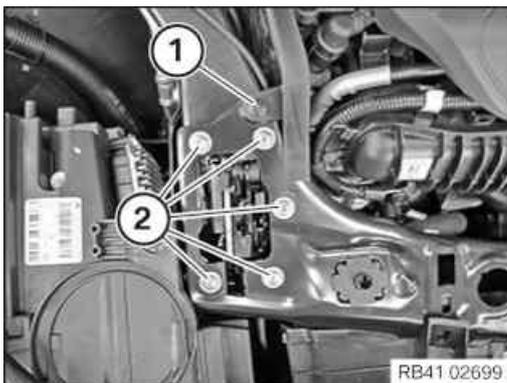


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

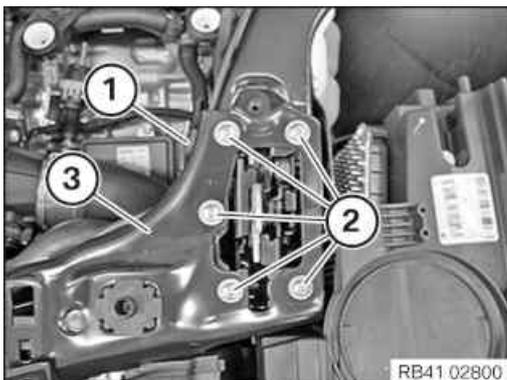
5 – Remove cross connection



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



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



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

6 – Removing the fan cowl with electric fan



WARNING

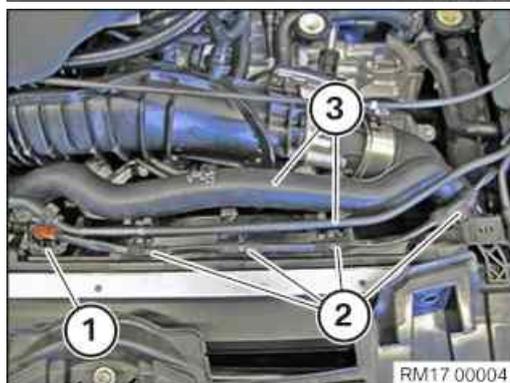
Hot surfaces.

Risk of burning!

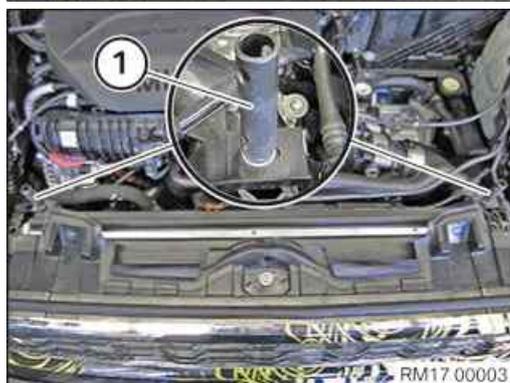
- Perform all work only on components that have cooled down.



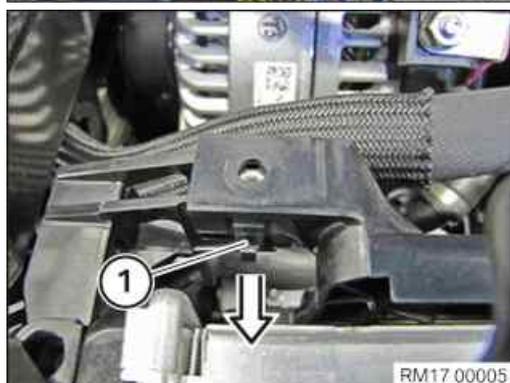
- Feed out and remove the sealing (1) from the radiator.



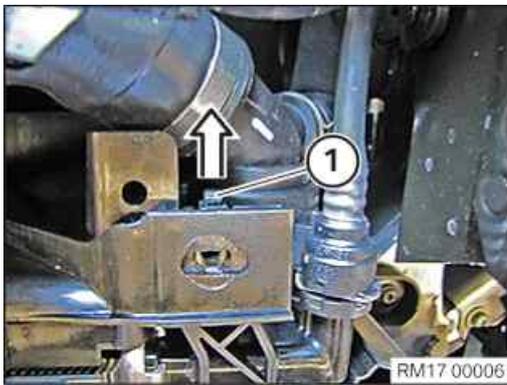
- Unlock plug connection (1) and disconnect.
- Unlock and loosen the clamps (2).
- Feed out connector (1) and place to one side.
- Thread off coolant line (3) and place to the side.



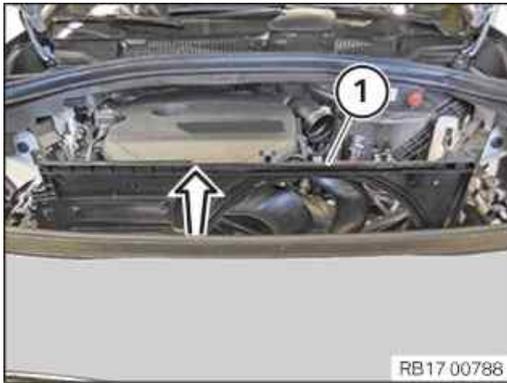
- Loosen screws (1).



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

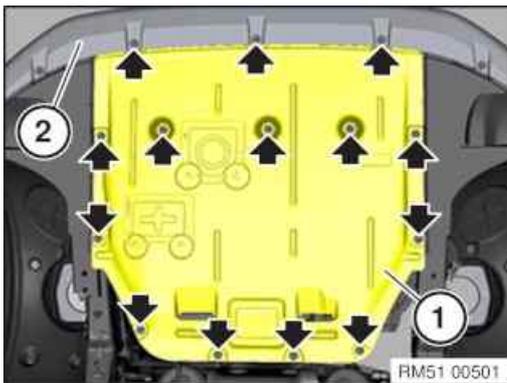


- Unlock the left lock (1) on the fan cowl in the direction of the arrow.



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

7 – Removing the front underbody protection



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

8 – Remove front right wheel



TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.



TECHNICAL INFORMATION

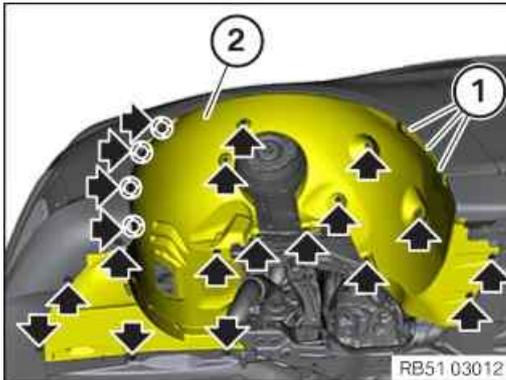
Strictly observe the specified procedure to prevent clamping errors and imbalance.



- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

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

9 – Removing the front right wheel arch cover



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

10 – Remove right charge-air line



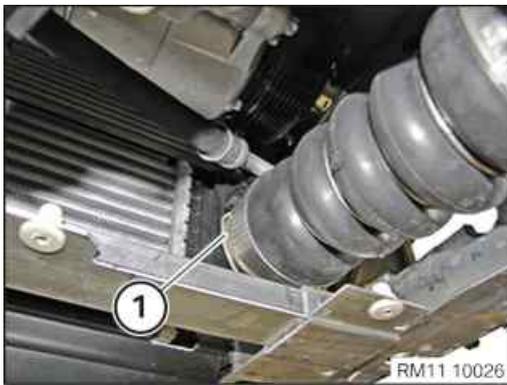
- Release charge air duct screws (1) on oil sump.



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



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



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

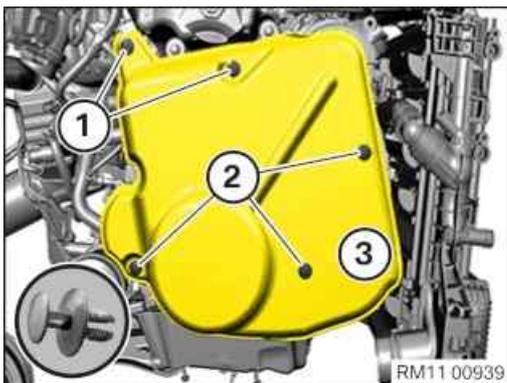


- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.



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

11 – Removing the acoustic cover for the engine at the front



- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

12 – Removing the drive belt for alternator



CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.



CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.



TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

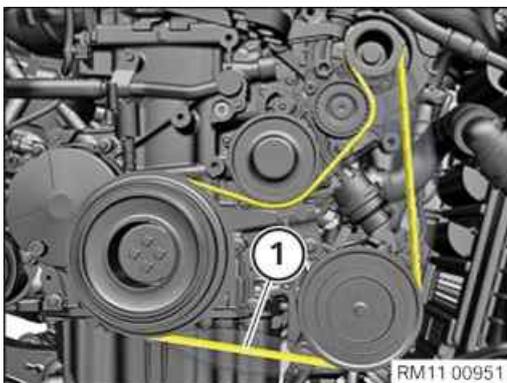


TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.



- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool .



- Guide out the drive belt for the alternator (1) and remove it.

MAIN WORK

13 – Removing positive battery cable from the battery to the starter motor



WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

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

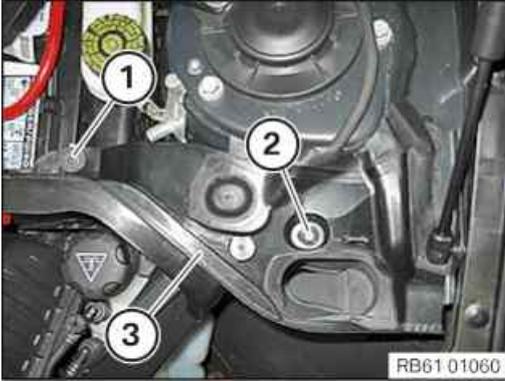


WARNING

Hot surfaces.

Risk of burning!

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



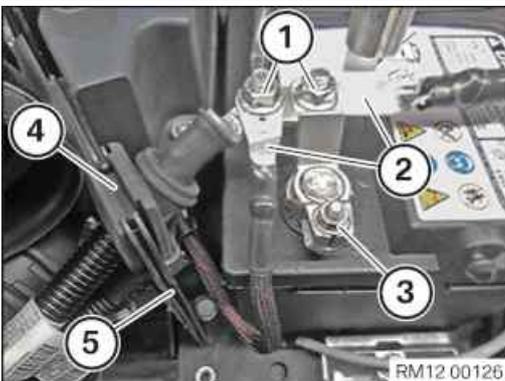
- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).



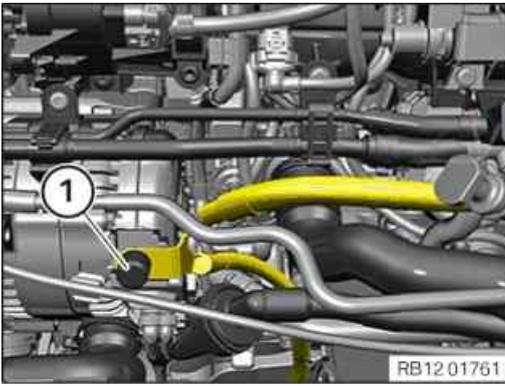
- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.



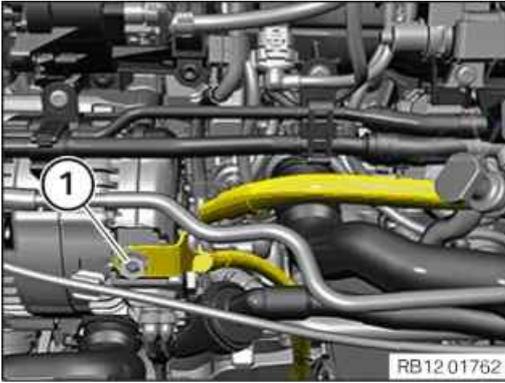
- Remove screws (arrows).
- Guide out tension strut (1) and remove.



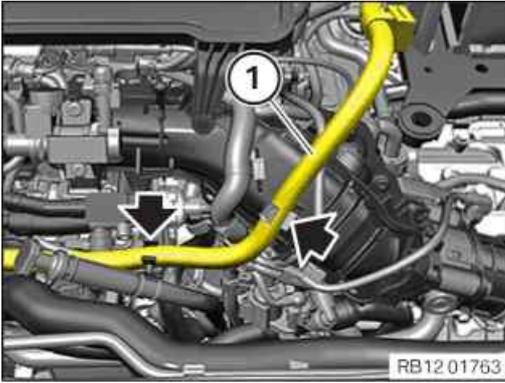
- Loosen nuts (1).
- Feed out positive battery cables (2) and place to one side.
- Undo positive battery terminal (3).
- Feed out positive battery cable (4) from the engine bulkhead (5) and place it aside.



- Remove the cover (1).



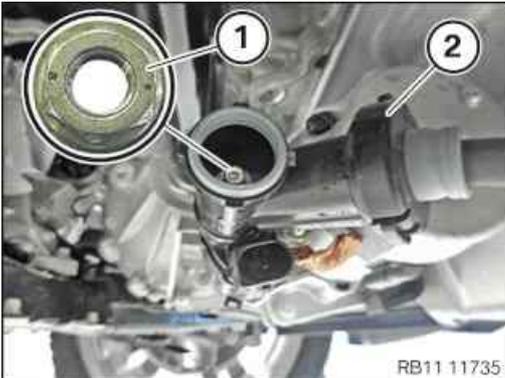
- Unfasten nut (1).



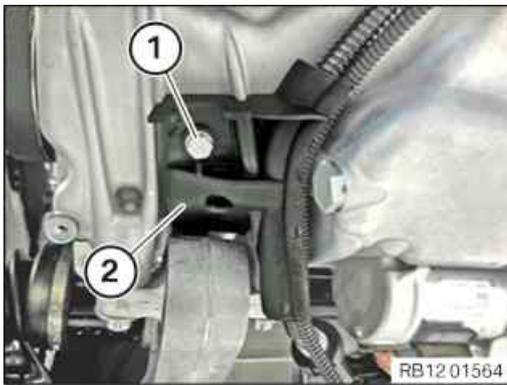
- Release the positive battery cable (1) from the clamps (arrows).



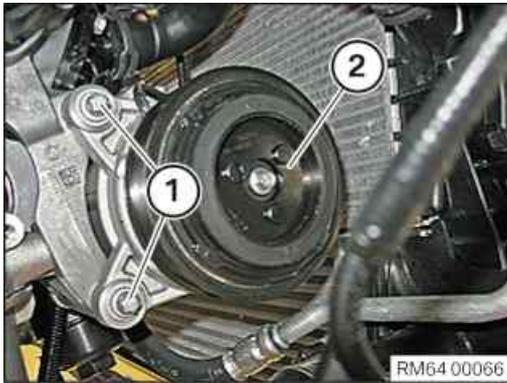
- Unlock and loosen connector (1).
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).



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



- Loosen screw (1).
- Guide out and remove holder (2).



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TECHNICAL INFORMATION

Only loosen the air conditioning compressor, do not remove it.
Do not draw off the refrigerant.
Do not loosen the refrigerant lines.

- Protect the air conditioning compressor (2) from falling.
- Loosen screws (1).
- Slide the air conditioning compressor (2) out and set it aside.
- Feed out positive battery cable from the clamps (1) and remove.



14 – Installing positive battery cable from the battery to the starter motor



CAUTION

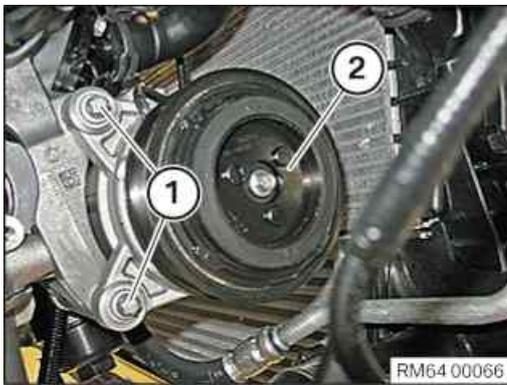
Improper routing of the positive battery cable.

Risk of short circuits!

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



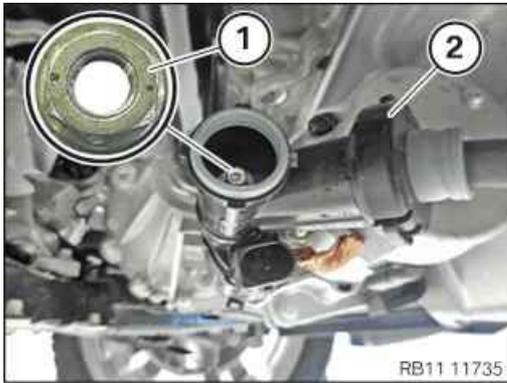
- Feed in and install positive battery cable at the clamps (1).



- Position the air conditioning compressor (2).
- Tighten the screws (1).

Air conditioning compressor in component carrier

M10		Tightening torque	38 Nm
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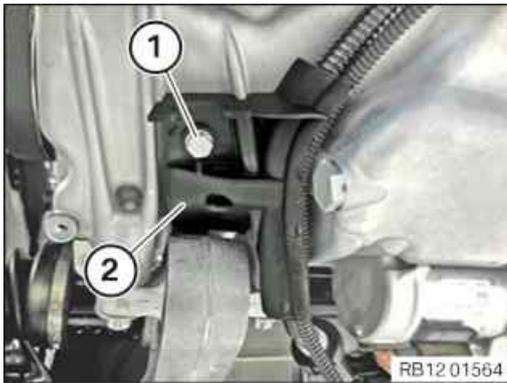
- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

M8		Tightening torque	13,5 Nm
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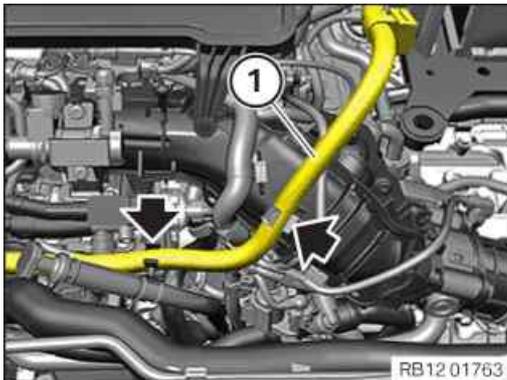
- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.



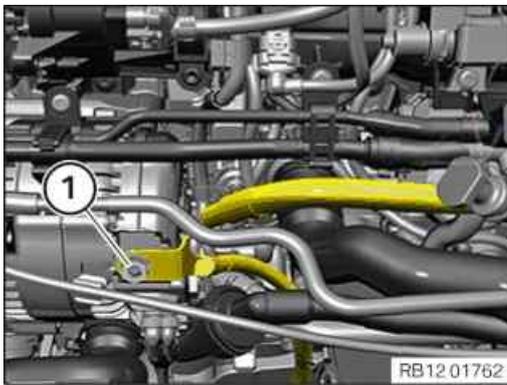
- Insert and install the holder (2).
- Tighten down screw (1).

Bracket to oil sump

M6		Tightening torque	8 Nm
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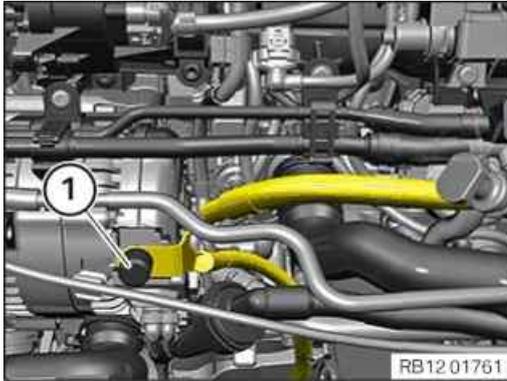
- Insert the positive battery cable (1) into the clamps (arrows).



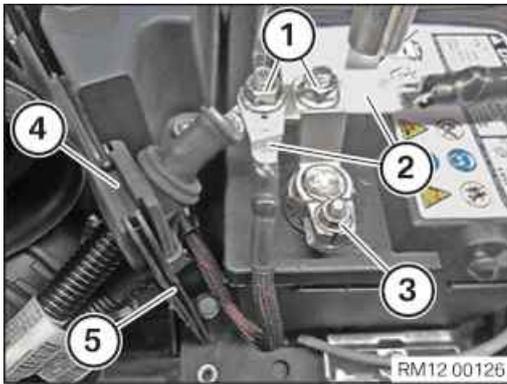
- Tighten nut (1).

Positive battery cable to alternator

M8		Tightening torque	19 Nm
----	--	-------------------	-------



- Install the cover (1).



- Feed in and install positive battery cable (4) at the partition wall (5).
- Tighten positive battery terminal (3).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm
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- Feed in and install the positive battery cables (2).
- Tighten nuts (1).

Positive battery cable to positive battery terminal

M8		Tightening torque	15 Nm
----	--	-------------------	-------



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

Tension strut to spring strut dome/battery tray

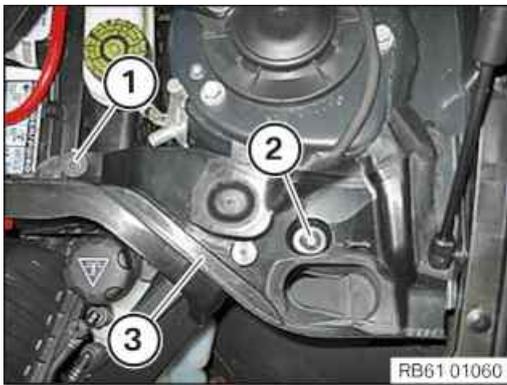
M8		Tightening torque	19 Nm
----	--	-------------------	-------



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

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm
--	--	-------------------	------



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

Battery cover

Screw		2,8 Nm
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POSTPROCESSES

15 – Installing the drive belt for alternator



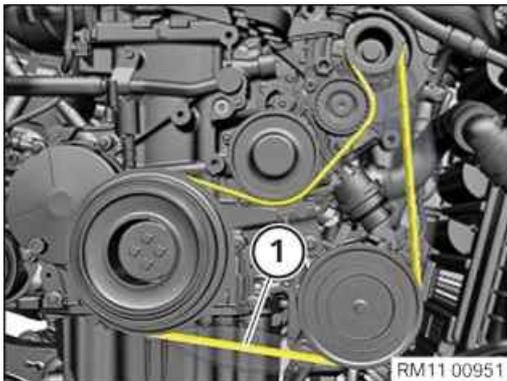
TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.



TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

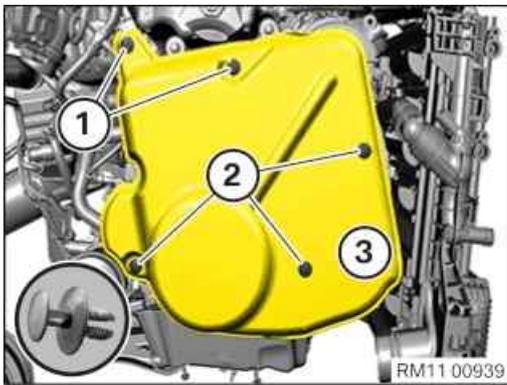


- Feed in the drive belt for the alternator (1) and install it.



- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool out of the belt tensioner and remove it.

16 – Install the acoustic cover for the engine at the front



- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.

17 – Install right charge air duct

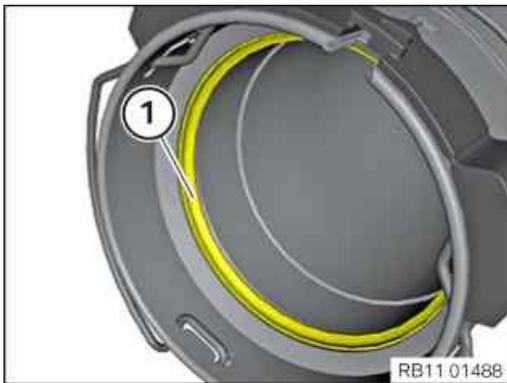


RISK OF DAMAGE

Damage to the exhaust turbocharger.

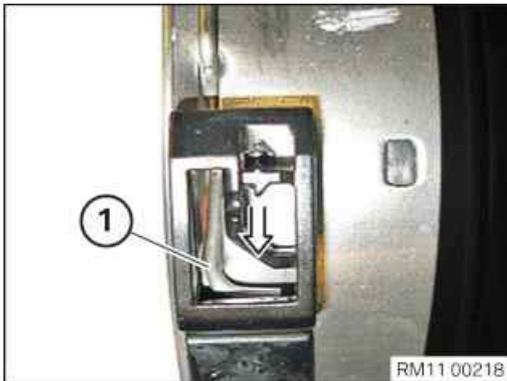
A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.



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

Parts: Gasket



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

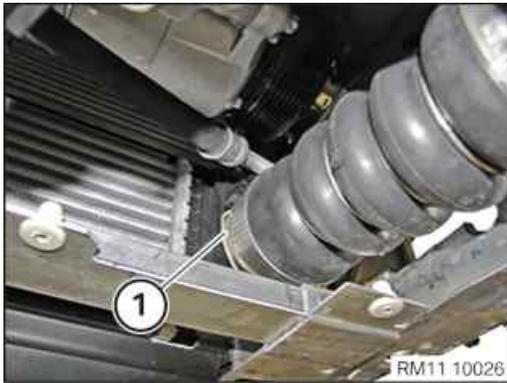


- Feed in charge air duct (1) to the side and upwards through the wheel arch between the side member and front axle support and install.



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

The lock (1) must audibly engage.



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

The lock (1) must audibly engage.



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

Charge air line to crankcase

M6x25		Tightening torque	5 Nm
-------	--	-------------------	------

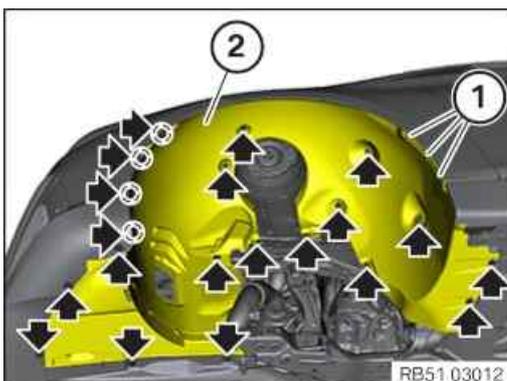


- Tighten charge air duct screws (1) on oil sump.

Charge air duct to oil sump

M6		Tightening torque	8 Nm
----	--	-------------------	------

18 – Installing the front right wheel arch cover



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

Wheel arch cover

Screw		3 Nm
Plastic nut		2,6 Nm

- Secure expanding rivet (1).

19 – Installing the front right wheel

► Clean the contact surfaces between the brake disc and the wheel rim



i

TECHNICAL INFORMATION

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

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

Do not operate special tool **2 344 011** with an impact screwdriver.

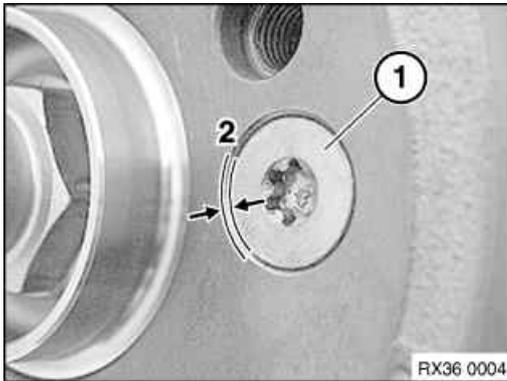
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.



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

Do not operate special tool **2 344 011** with an impact screwdriver.

- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

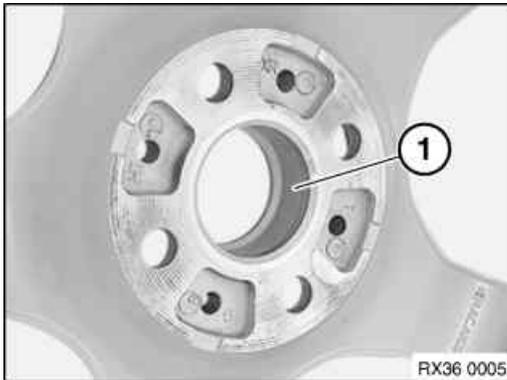


- Check the mounting bolt for the brake disc (1) for secure fit.

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

Brake disc to front wheel hub

M8	Renew screw.	16 Nm
----	--------------	-------



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



i

TECHNICAL INFORMATION

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

The wheel rim must rest uniformly against the brake disc.

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

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

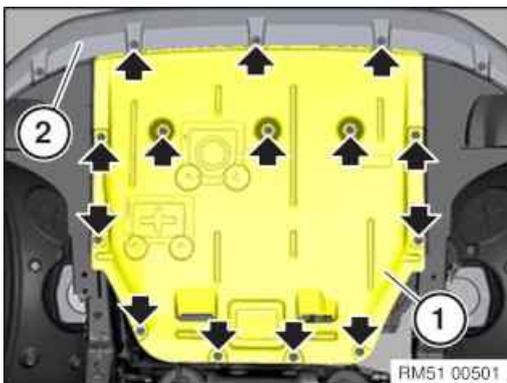
Parts: Wheel bolts

- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

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

20 – Installing the front underbody protection

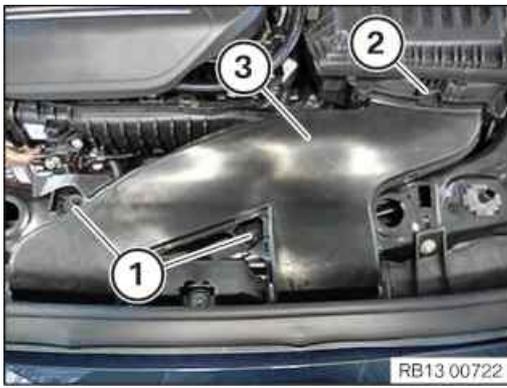


- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm
--	--	--	------

21 – Install the intake neck for the intake filter housing

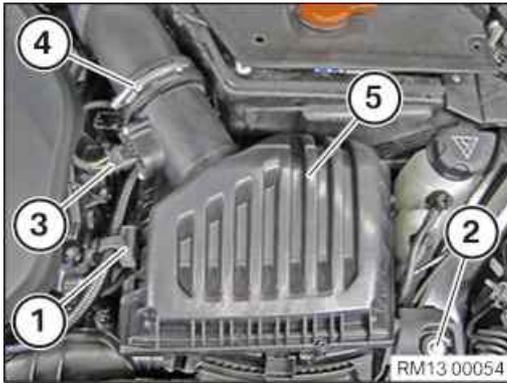


- Insert and install the intake neck (3).
The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm
----	--	-------------------	------

22 – Installing intake silencer housing



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

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm
-------	--	-------------------	------

- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm
-------	--	-------------------	------

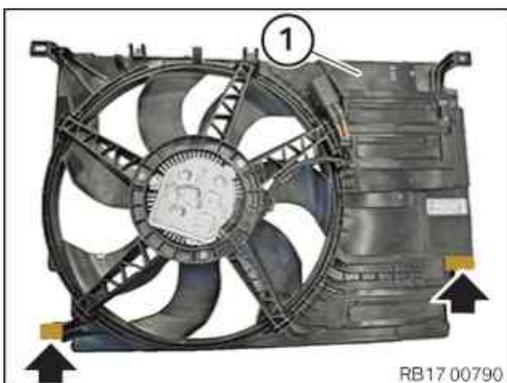
- Connect and lock the connector (3).
The connector (3) must engage audibly.
- Insert and install the holder (1).

23 – Installing fan cowl with electric fan

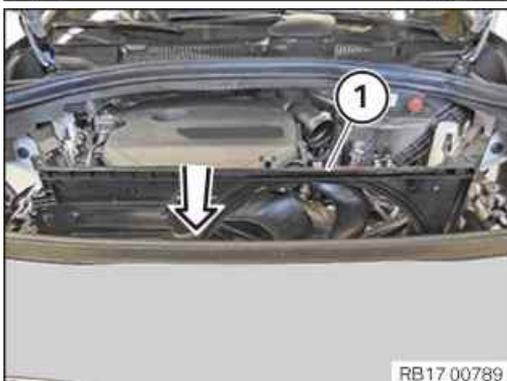


TECHNICAL INFORMATION

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



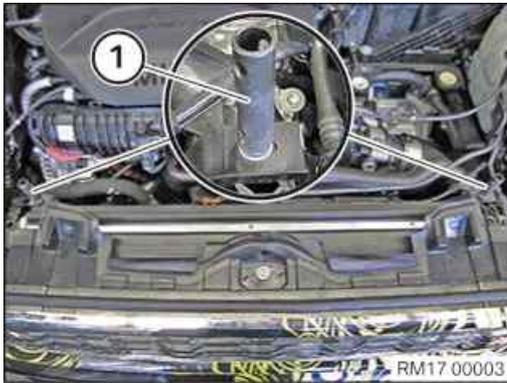
- Feed the guides (arrows) of the fan cowl (1) into the charge air cooler.



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



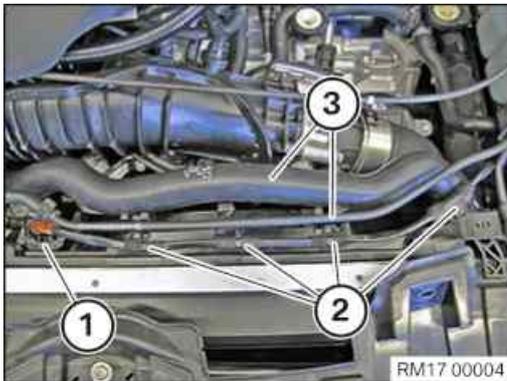
- Lock the left and right locks (arrows).



- Tighten the screws (1).

Fan cowl on radiator

M6X12		Tightening torque	6 Nm
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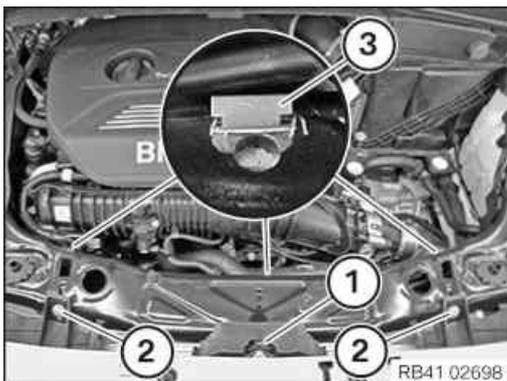


- Connect connectors (1) and lock.
The connector (1) must engage audibly.
- Secure clamps (2).
- Thread in and install coolant line (3).



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

24 – Install cross connection



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

Bracing strut to top cross connection

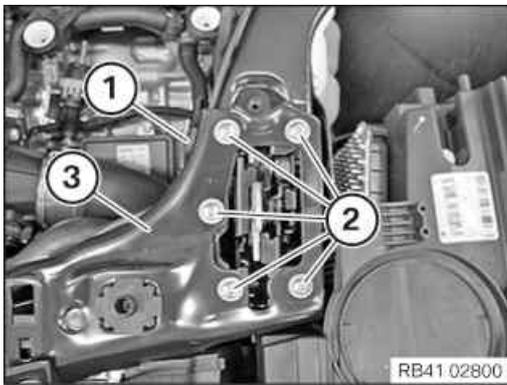
M8		Tightening torque	25 Nm
----	--	-------------------	-------

- Tighten down screws (2).

Air duct to deformation element/cross connection

M6x20 screw		Tightening torque	6 Nm
-------------	--	-------------------	------

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

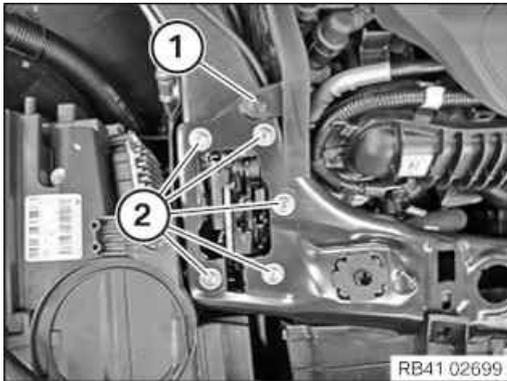


- Tighten screws (2) of cross connection (3).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm
-------	--	-------------------	-------

- Fasten expanding rivet (1).



- Tighten down screws (2).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm
-------	--	-------------------	-------

- Fasten expanding rivet (1).

25 – Install acoustic cover



RISK OF DAMAGE

Damage to the acoustic cover.

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

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



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



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

26 – Disconnecting all battery earth leads



- See additional information.

Additional Information

Overview of Tightening Torques

Air conditioning compressor in component carrier			Used in step 14
M10		Tightening torque	38 Nm
Battery positive lead to starter			Used in step 14
M8		Tightening torque	13,5 Nm
Bracket to oil sump			Used in step 14
M6		Tightening torque	8 Nm
Positive battery cable to alternator			Used in step 14
M8		Tightening torque	19 Nm
Positive battery terminal to battery			Used in step 14
NutM6		Tightening torque	5 Nm
Positive battery cable to positive battery terminal			Used in step 14
M8		Tightening torque	15 Nm
Tension strut to spring strut dome/battery tray			Used in step 14
M8		Tightening torque	19 Nm
Positive battery connection point cover to engine compartment partition wall			Used in step 14
		Tightening torque	3 Nm
Battery cover			Used in step 14
Screw			2,8 Nm
Charge air line to crankcase			Used in step 17
M6x25		Tightening torque	5 Nm
Charge air duct to oil sump			Used in step 17
M6		Tightening torque	8 Nm
Wheel arch cover			Used in step 18
Screw			3 Nm
Plastic nut			2,6 Nm

Brake disc to front wheel hub

Used in step 19

M8	Renew screw.		16 Nm
----	--------------	--	-------

Wheel bolts

Used in step 19

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

Underbody protection front

Used in step 20

			3 Nm
--	--	--	------

Intake neck to cross connection

Used in step 21

M6		Tightening torque	8 Nm
----	--	-------------------	------

Intake silencer housing to lock bridge

Used in step 22

M6X30		Tightening torque	8 Nm
-------	--	-------------------	------

Clean air pipe to intake silencer housing

Used in step 22

Clamp		Tightening torque	3 Nm
-------	--	-------------------	------

Fan cowl on radiator

Used in step 23

M6X12		Tightening torque	6 Nm
-------	--	-------------------	------

Bracing strut to top cross connection

Used in step 24

M8		Tightening torque	25 Nm
----	--	-------------------	-------

Air duct to deformation element/cross connection

Used in step 24

M6x20 screw		Tightening torque	6 Nm
-------------	--	-------------------	------

Cross connection on support for cross connection

Used in step 24

M6x20		Tightening torque	12 Nm
-------	--	-------------------	-------

Overview of Special Tools**2 344 011 Tool****Common**

Used in step 19

Usage Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.

Included in the tool or work

Storage location

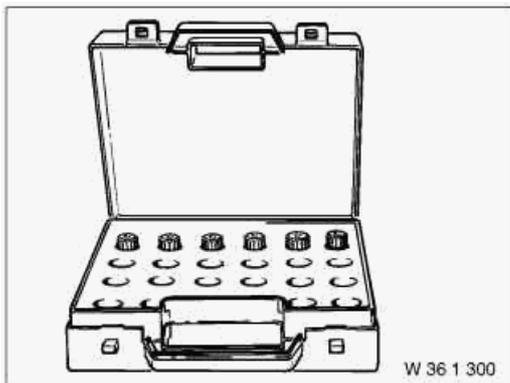
Replaced by

In connection with

SI-Number 08 08 12 (872)

Replacement tools:

0 495 221 (36 1 323) Wheel stud



Common

Used in step 8

Usage (Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259

Included in the tool or work 0 492 518

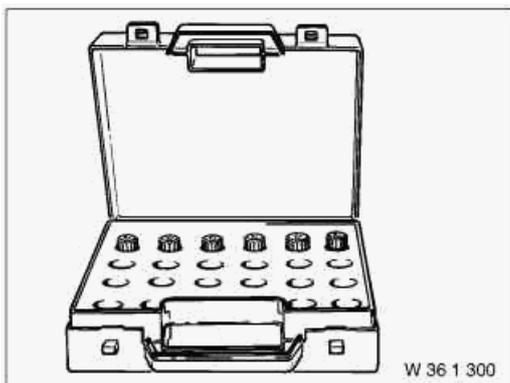
Storage location

Replaced by

In connection with

SI-Number

0 495 224 (36 1 326) Wheel stud



Common

Used in step 8

Usage (Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546

Included in the tool or work 0 492 518

Storage location

Replaced by

In connection with

SI-Number

0 495 225 (36 1 327) Wheel stud



Common

Used in step 8

Usage (Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547

Included in the tool or work 0 492 518

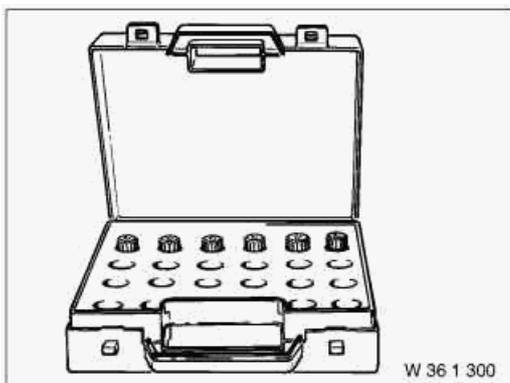
Storage location

Replaced by

In connection with

SI-Number

0 495 226 (36 1 328) Wheel stud



Common

Used in step 8

Usage (Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340

Included in the tool or work 0 492 518

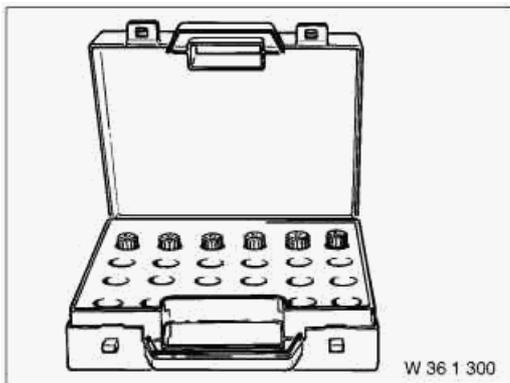
Storage location

Replaced by

In connection with

SI-Number

0 495 227 (36 1 329) Wheel stud



Common

Used in step 8

Usage (Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341

Included in the tool or work 0 492 518

Storage location

Replaced by

In connection with

SI-Number

0 495 228 (36 1 331) Wheel stud



Common

Used in step 8

Usage (Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342

Included in the tool or work 0 492 518

Storage location

Replaced by

In connection with

SI-Number

0 495 229 (36 1 332) Wheel stud



Common

Used in step 8

Usage (Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343

Included in the tool or work 0 492 518

Storage location

Replaced by

In connection with

SI-Number

0 495 230 (36 1 333) Wheel stud



Common

Used in step 8

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

Links

Repair instructions

Used in step

61 20 900 Disconnecting and connecting battery earth lead	1 26
61 20 900 Disconnecting and connecting battery earth lead	1 26
61 20 900 Disconnecting and connecting battery earth lead	1 26
61 20 900 Disconnecting and connecting battery earth lead	1 26
61 20 900 Disconnecting and connecting battery earth lead	1 26
61 20 900 Disconnecting and connecting battery earth lead	1 26
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 26
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 26
61 20 900 Disconnecting and connecting battery earth lead	1 26
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 26
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1 26
61 20 900 Disconnecting and connecting battery earth lead	1 26
61 20 900 Disconnecting and connecting battery earth lead	1 26
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61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 26
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61 20 900 Disconnecting and connecting battery earth lead	1 26
61 20 900 Disconnecting and connecting battery earth lead	1 26
61 20 900 Disconnecting and connecting battery earth lead	1 26

Operating materials

Used in step

2.0 Grease for wheel centring	19
-----------------------------------------------	----



Necessary preliminary tasks:

- Disconnect [negative battery cable](#).
- Remove [fan cowl](#).
- Remove [alternator drive belt](#).
- Remove front [underbody protection](#).
- Remove [upper bulkhead cover](#).

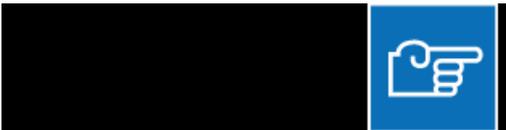


Note:

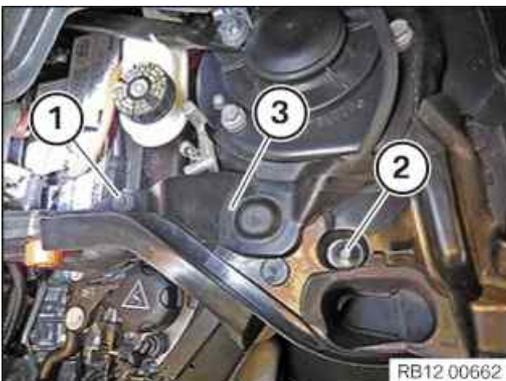
To remove the positive battery cable, it is necessary to **remove** the [air conditioning compressor](#).

In so doing:

- Do **not** draw off air conditioning refrigerant.
- Do **not** detach refrigerant lines from A/C compressor.
- Do **not** remove air conditioning compressor; instead, release from bracket only and place to one side.



Removal:



Loosen screw (1).

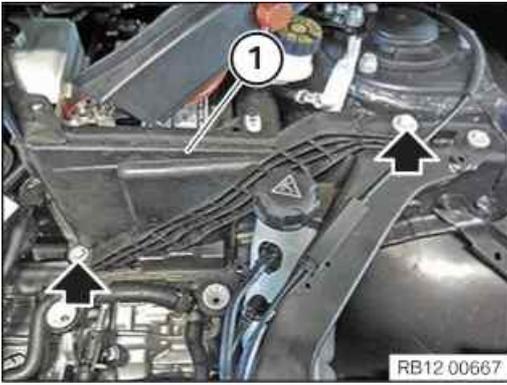
Release expanding rivet (2).

Remove cover (3).

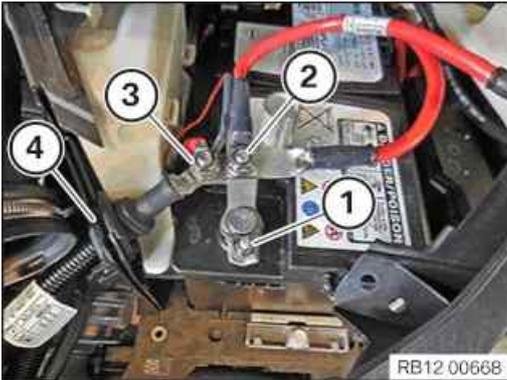


Loosen screw (1).

Lay the cover (2) of the positive battery connection point to one side.



Release screws along the arrows and remove tension strut (1).



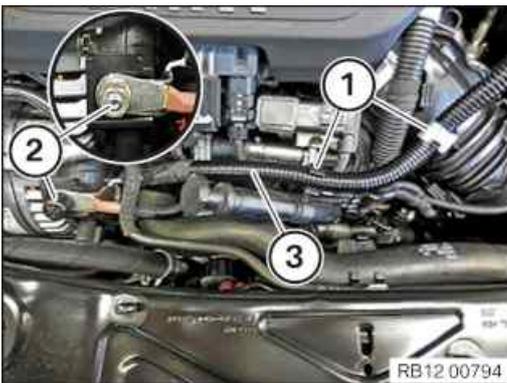
Release nuts (2) and (3).

Detach positive battery cables from positive battery terminal.

Slacken nut (1).

Remove positive battery terminal from battery.

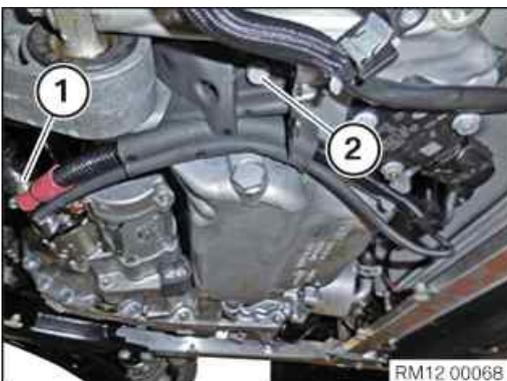
Release positive battery cable (4) from partition wall.



Release positive battery cable (3) from clamps (1).

Slacken nut (2).

Detach the positive battery cable (3) from the alternator.



Slacken nut (1).

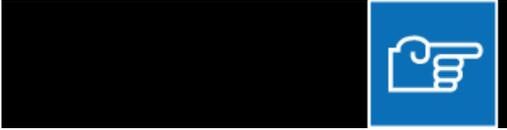
Detach positive battery cable from starter motor.

Release screw (2).

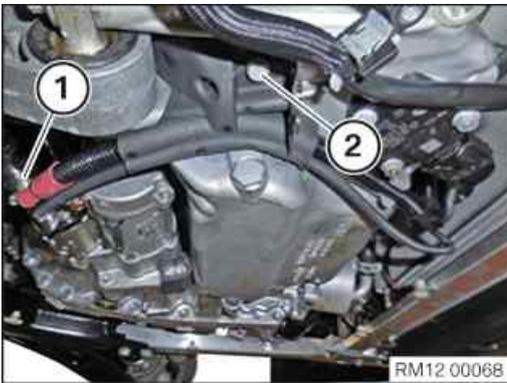
Detach cable clip.



Release positive battery cable from retainers (1).
Feed out positive battery cable and remove.



Installation:



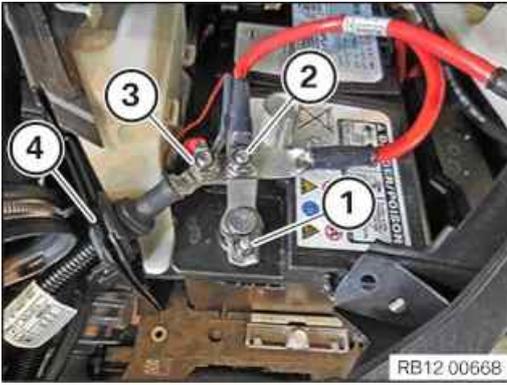
Feed in and install positive battery cable.
Connect positive battery cable to starter motor.
Tighten nut (1).
Tightening torque [12 52 3AZ](#)
Install cable clip and tighten screw (2).
Tightening torque [12 52 4AZ](#)



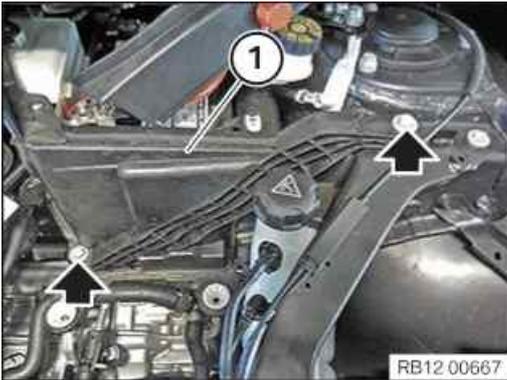
Secure positive battery cable with clamps (1).



Connect the positive battery cable (3) to the alternator.
Tighten nut (2).
Tightening torque [12 52 2AZ](#).
Secure the positive battery cable (3) in the clamp (1).



Install positive battery cable (4) on partition wall.
Ensure rubber grommet is correctly fitted on partition wall.
Connect positive battery cables to positive battery terminal.
Tighten nuts (2) and (3).
Tightening torque [61 21 3AZ](#).
Connect positive battery terminal to battery.
Tighten nut (1).
Tightening torque [61 21 1AZ](#).



Join tension strut (1) and tighten with screws.
Tightening torque [17 10 8AZ](#).



Install cover (2) of the positive battery connection point.
Tighten screw (1).
Tightening torque [17 10 10AZ](#)



Install cover (3).
Install expanding rivet (2).
Tighten screw (1).
Tightening torque [17 10 10AZ](#)



Required follow-up work:

- Connect [battery earth lead](#).
- [Install air conditioning compressor](#).
- Install [drive belt for alternator](#).
- Install [fan cowl](#).
- Install front [underbody protection](#).
- Install [top bulkhead cover](#).

Caution!

Observe [safety regulations](#).

Investigate cause of triggering of safety battery terminal.

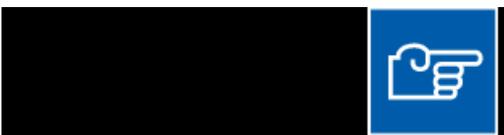
To do so, read out fault memory of airbag control unit. Note fault messages stored in memory. Rectify faults. Then clear fault memory.



Use of safety battery terminal:

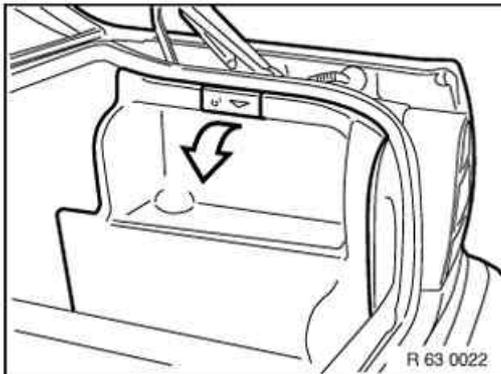
- From model year 1998 in Series E38, E39, E46
- From 4/99 in E36/Z3
- in each of following new Series

The different models have different installation locations:

**Battery in engine compartment**

Safety battery terminal is replaced with cable up to battery positive support point.

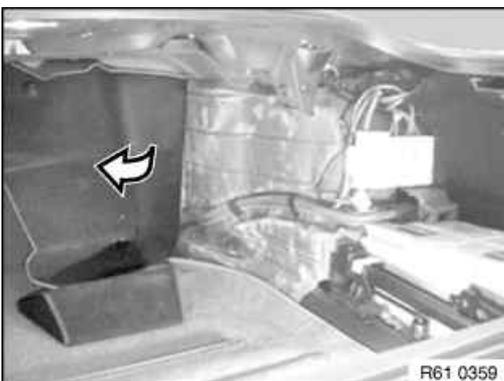
Safety battery terminal is omitted as from 03/2002 from all E46 LHD models with 4-cylinder engines.

**Battery in luggage compartment behind side trim panel**

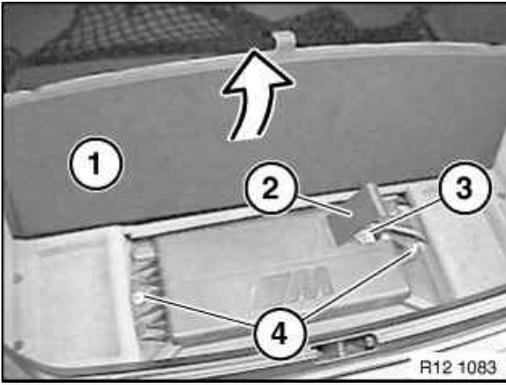
Remove side trim panel.

Follow instructions for [disconnecting and connecting battery](#).

Disconnect and cover battery negative lead.



Release front side trim panel partly and fold forward.



Battery in luggage compartment under floor trim panel

Follow instructions for [disconnecting and connecting battery](#).

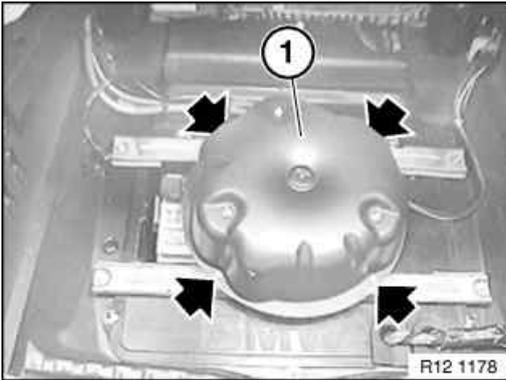
Fold back floor trim panel (1).

Lift cover (2) on battery negative lead.

Disconnect and cover battery negative lead (3).

Release nuts (4).

Remove battery cover.



Battery in luggage compartment under spare wheel

Remove spare wheel.

Release screws.

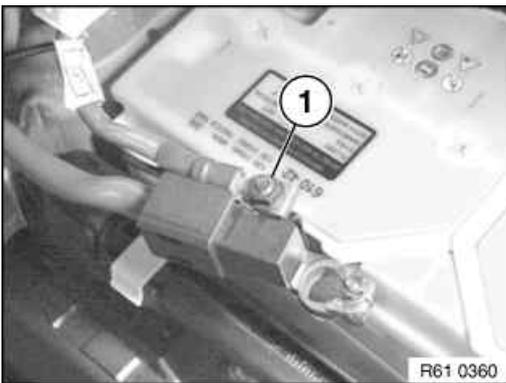
Caution!

Do not kink air pipes.

Set air supply system (1) to one side.

Follow instructions for [disconnecting and connecting battery](#).

Disconnect battery negative lead.



Disconnect supply cable (1) for vehicle electrical system. **Installation:**

Remove faulty fuses and carry out troubleshooting.



Caution!

Pay attention to interface.

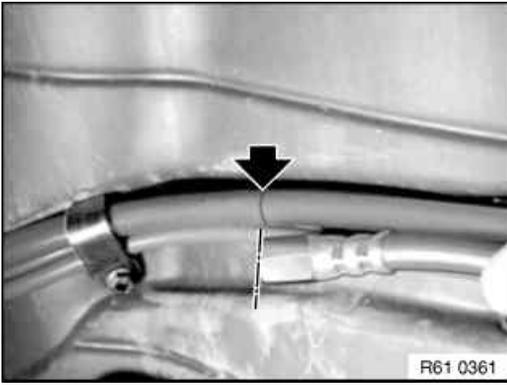
The repair cable is always a standard length.

The heavy-current connector of the repair cable has a larger diameter than the battery positive lead.

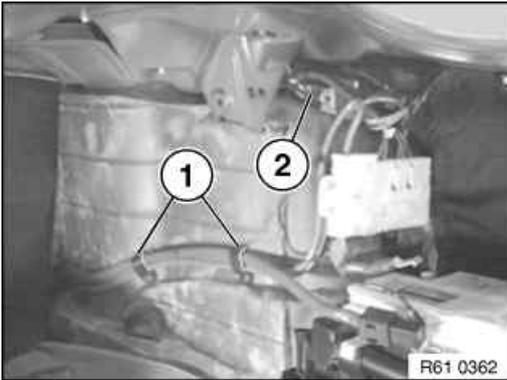
In some Series (e.g. E46 touring), the heavy-current connector of the repair cable can lead to installation problems.

This is the case when the interface is in the area of the close-fitting trim panels.

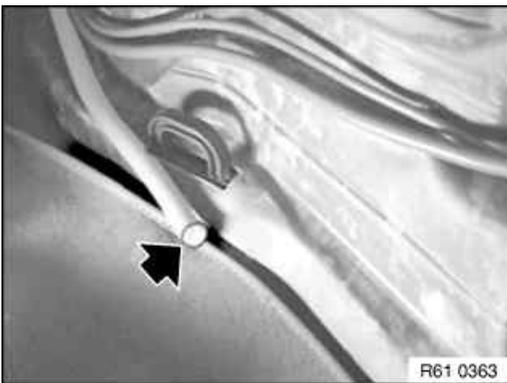
Find matching interface (e.g. approx. 10 cm behind rear seat backrest in E46 touring).



Lay repair cable parallel to battery positive lead.
Mark interface of battery positive lead at end of repair cable.



Release cable ties (1).
Disconnect plug connection (2).

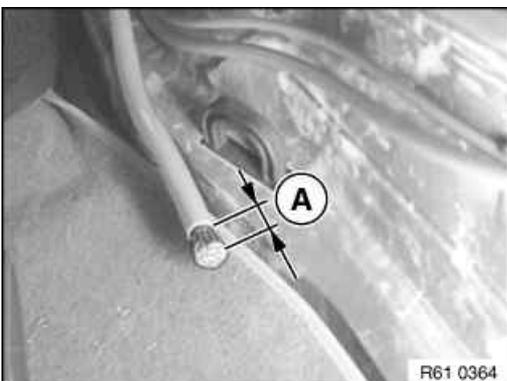


Caution!

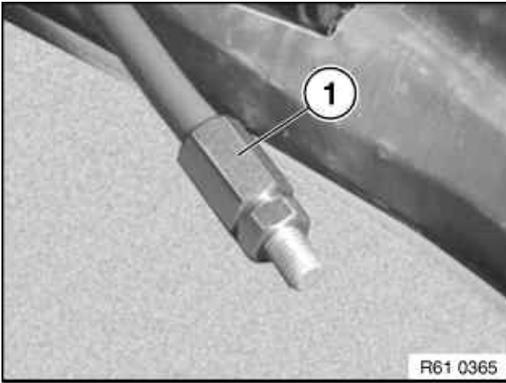
Do not use bolt cutters or similar tools to cut through the cable.

A cable end that has been squashed flat will no longer fit into the clamping sleeve.

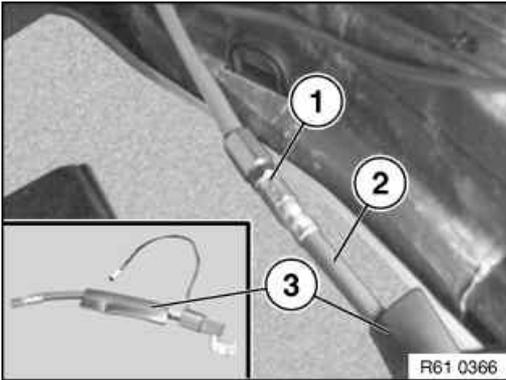
Saw through battery positive cable at marked point with an iron saw.



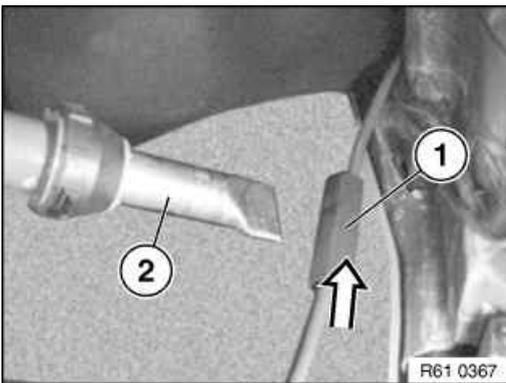
Strip insulation - length (A) - from cable end.
Distance (A) = 15 mm.



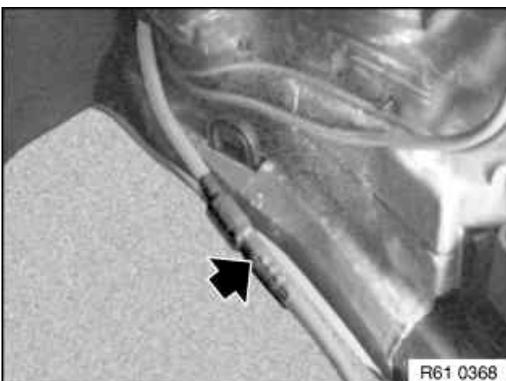
Push heavy-current connector (1) over stripped cable end and screw into position.



Push shrink-fit hose (3) over repair cable.
Screw threaded sleeve (1) of repair cable (2) to heavy-current connector.



Push shrink-fit hose (1) over connecting point and shrink on with a hot-air blower (2).

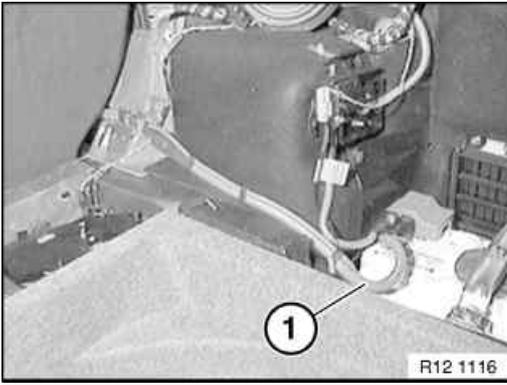


Note:
Heat up shrink-fit hose until it has settled completely around the connection point.



When laying the repaired battery positive cable, observe the following:

- The shrink-fit hose must not be scuffed during any movement.
- The repair cable must not cause any disturbing noises during driving operation.



Note:

Offsetting cutting line by approx. 10 cm produces excess length of battery positive lead (1).

Lay battery positive lead (1) without kinks or abrasions.

(Shown on E46 touring.)

12 51 001 Replace wiring harness section for engine

PRELIMINARY WORK

1 – Disconnecting all battery earth leads



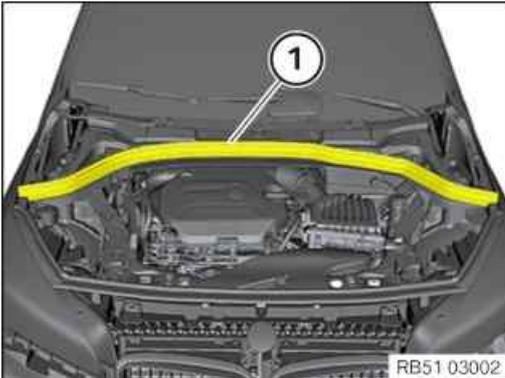
- See additional information.

2 – Remove the seal for the rear bonnet



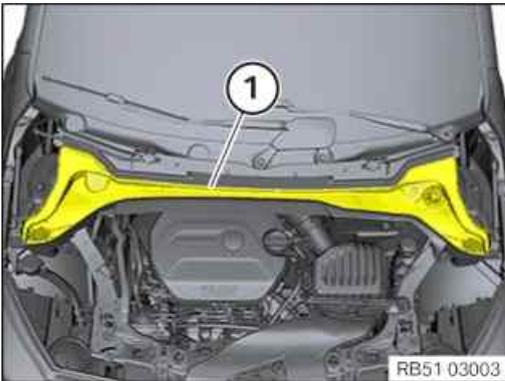
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

3 – Removing front cowl panel cover



- Guide the front cowl panel cover (1) out toward the top and remove it.

4 – Remove left and right wiper arm



NOTICE

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

► Remove the wiper arm

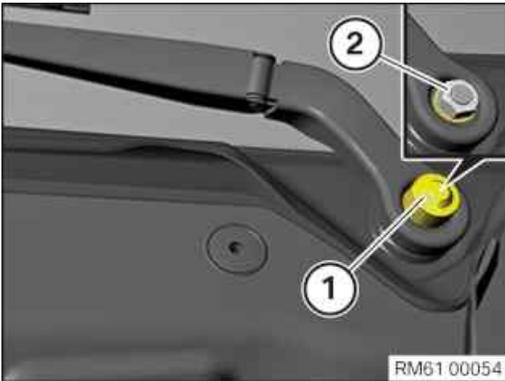


RISK OF DAMAGE

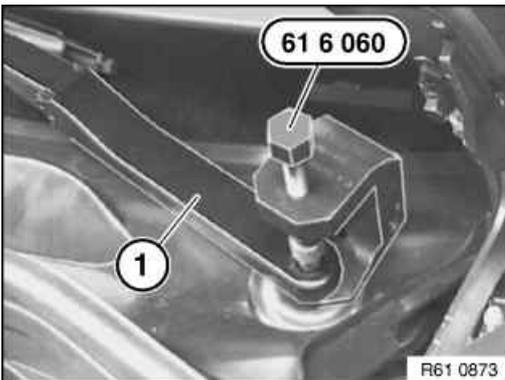
Damage to wiper console

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

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



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



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

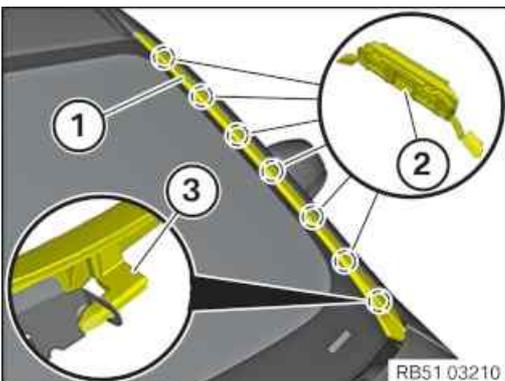
5 – Remove the gutter strip on the windscreen on the left and right



NOTICE

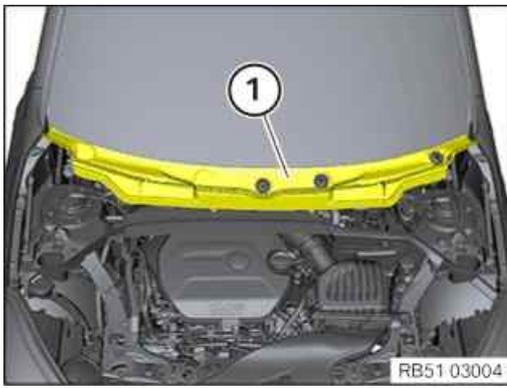
Description is for left component only. Procedure on the right side is identical.

► Remove the gutter strip on the windscreen



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

6 – Remove the rear cowl panel cover

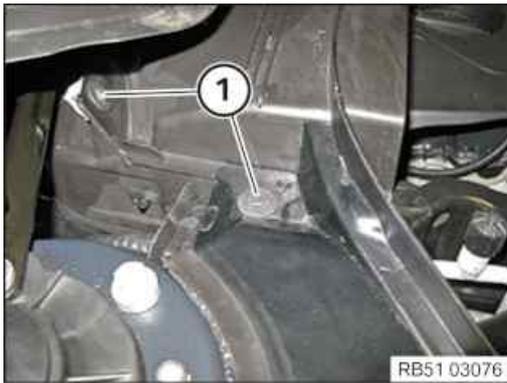


- Disengage and guide out the rear cowl panel cover (1) towards the top.

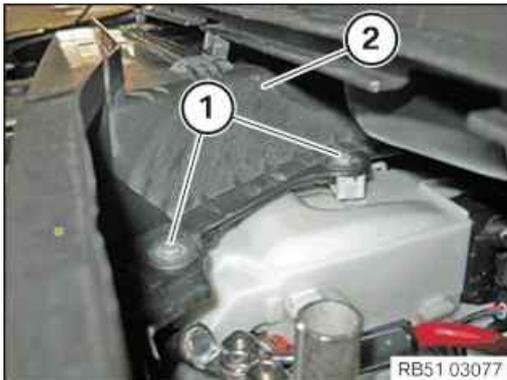
7 – Removing the upper bulkhead cover



- Loosen screws (1).



- Loosen screws (1).



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

8 – Removing the acoustic cover



WARNING

Hot surfaces.

Risk of burning!

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



RISK OF DAMAGE

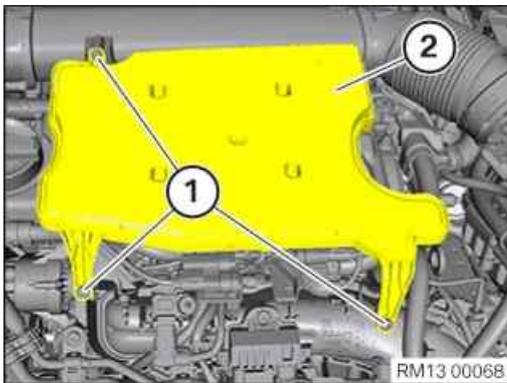
Damage to the acoustic cover.

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

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

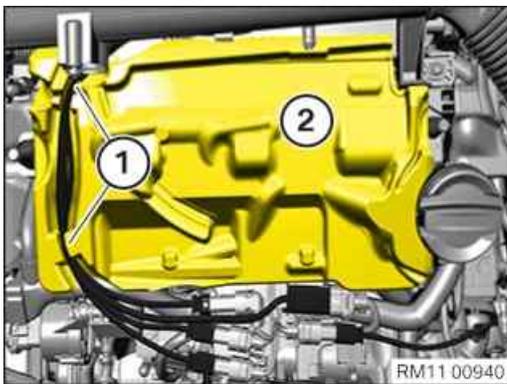
- Unclip the acoustic cover from the marked areas towards the top.

9 – Remove resonator



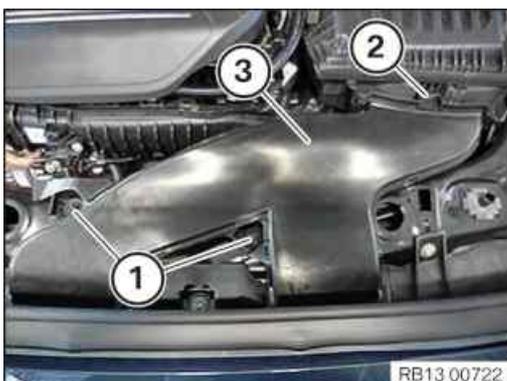
- Loosen screws (1).
- Guide out and remove the resonator (2).

10 – Remove the acoustic cover for the injectors



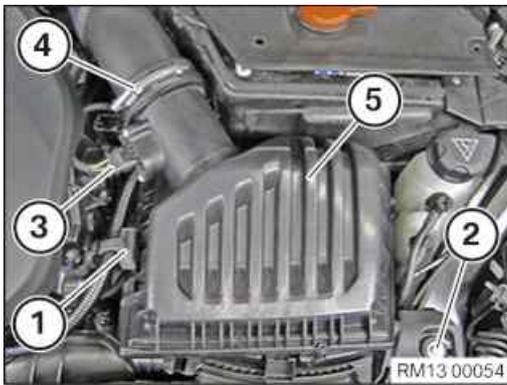
- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

11 – Remove the intake neck for intake silencer housing



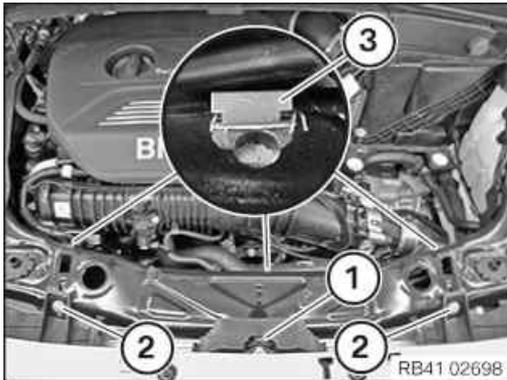
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

12 – Removing intake silencer housing

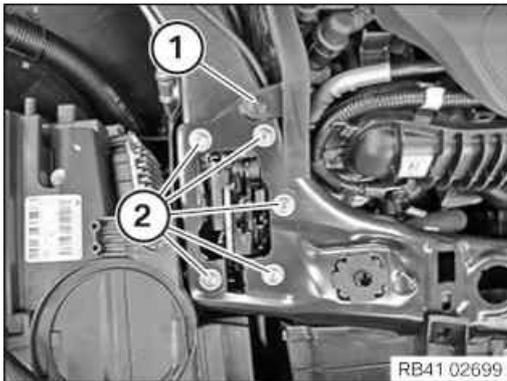


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

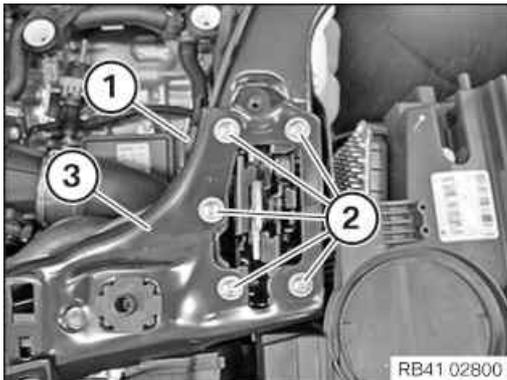
13 – Remove cross connection



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



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



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

14 – Removing the fan cowl with electric fan

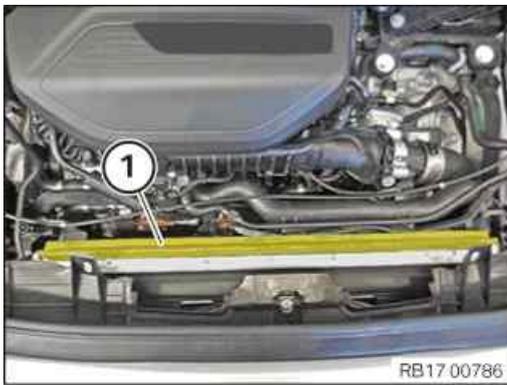


WARNING

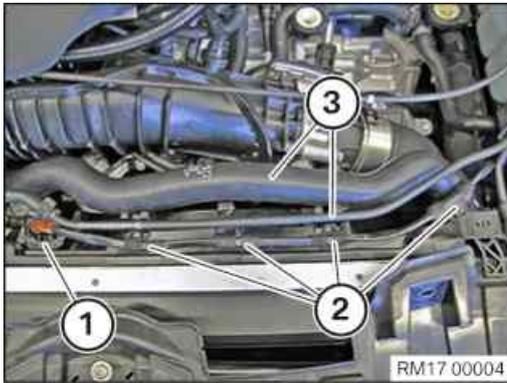
Hot surfaces.

Risk of burning!

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



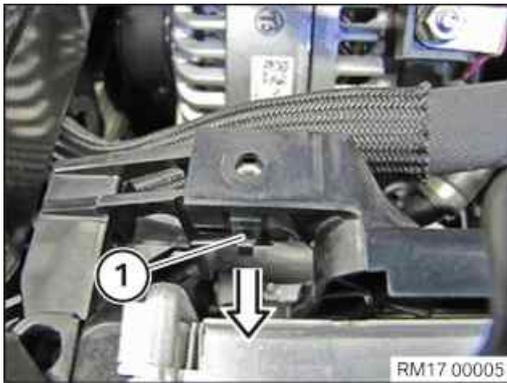
- Feed out and remove the sealing (1) from the radiator.



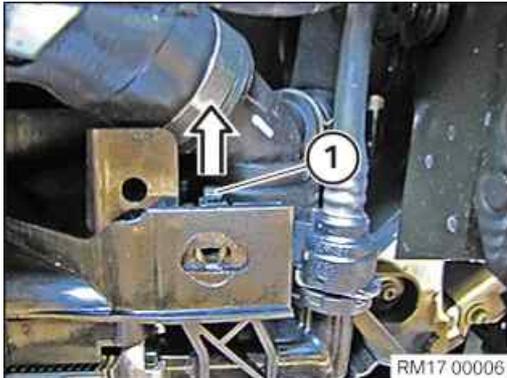
- Unlock plug connection (1) and disconnect.
- Unlock and loosen the clamps (2).
- Feed out connector (1) and place to one side.
- Thread off coolant line (3) and place to the side.



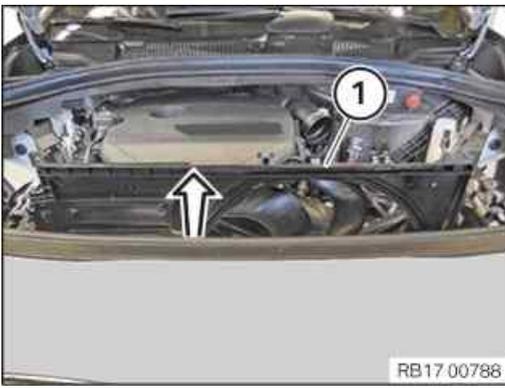
- Loosen screws (1).



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

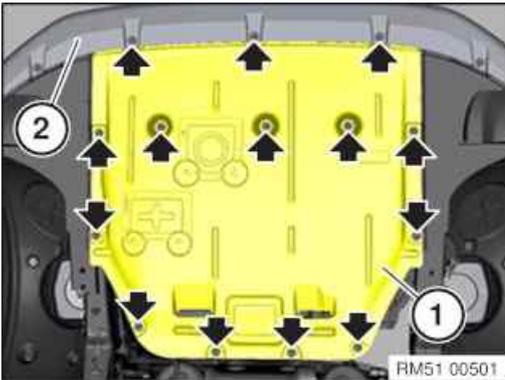


- Unlock the left lock (1) on the fan cowl in the direction of the arrow.



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

15 – Removing the front underbody protection



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

16 – Remove front right wheel



TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.



TECHNICAL INFORMATION

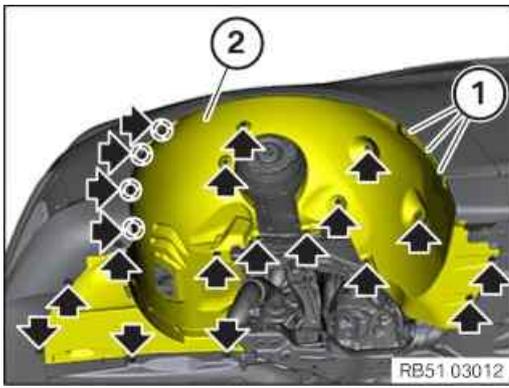
Strictly observe the specified procedure to prevent clamping errors and imbalance.



- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

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

17 – Removing the front right wheel arch cover

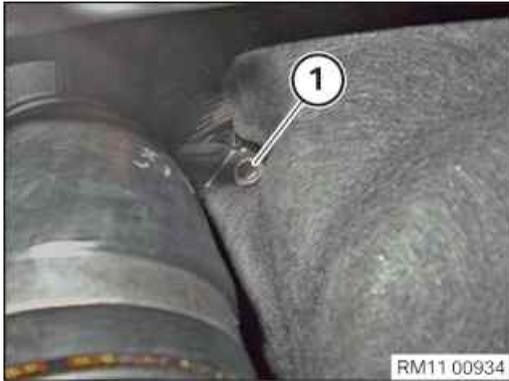


- Loosen the expanding rivet (1).
- Unscrew all bolts and nuts (arrows).
- Feed the wheel arch cover (2) out at the front right and remove it.

18 – Remove right charge-air line



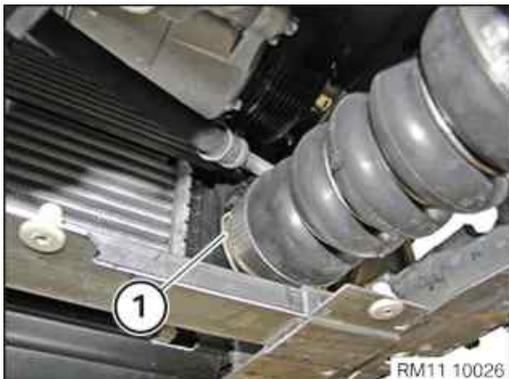
- Release charge air duct screws (1) on oil sump.



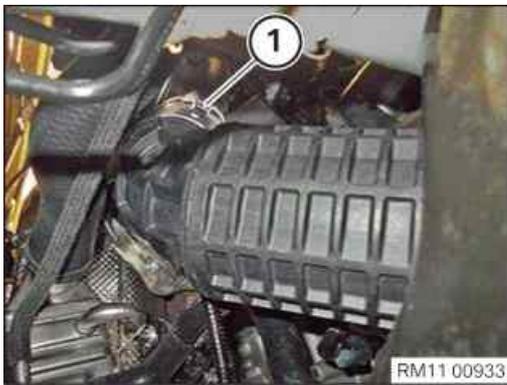
- Detach charge air duct screw connection (1) on crankcase.



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



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

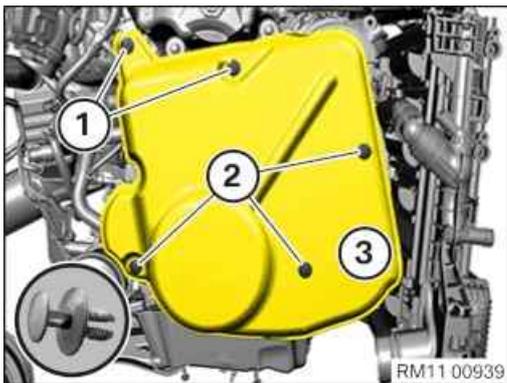


- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.



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

19 – Removing the acoustic cover for the engine at the front



- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

20 – Removing the drive belt for alternator



CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.



CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.



TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

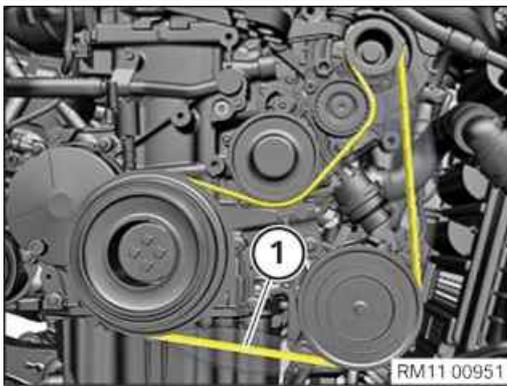


TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.



- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool .

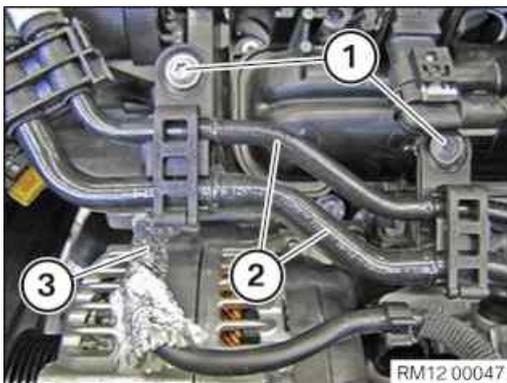


- Guide out the drive belt for the alternator (1) and remove it.

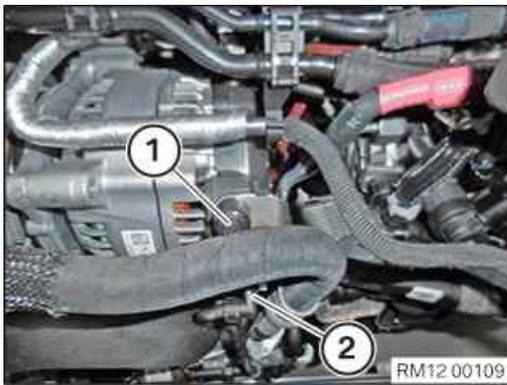
21 – Removing the alternator

Prerequisite

Battery earth lead is disconnected.



- Loosen screws (1).
- Place fuel feed and return line (2) to one side.
- Unlock the coolant ventilation line (3) and pull it off the cylinder head.
- Catch and dispose of escaping coolant.



- Remove the cover (1) and loosen the nut below.
- Disconnect positive battery cable from alternator.
- Unlock the plug connection (2) and pull off from the alternator.

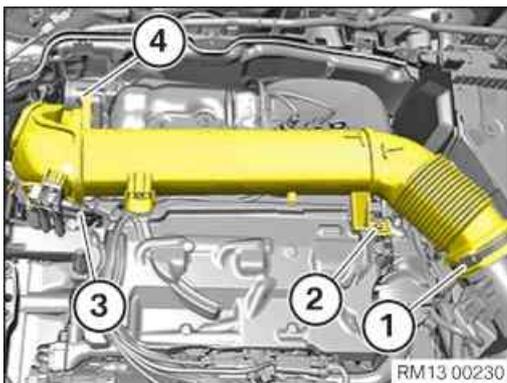


- Loosen screws (1).

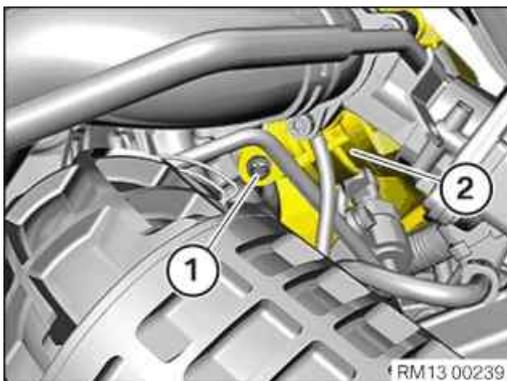


- Feed the alternator (1) out toward the top and remove it.

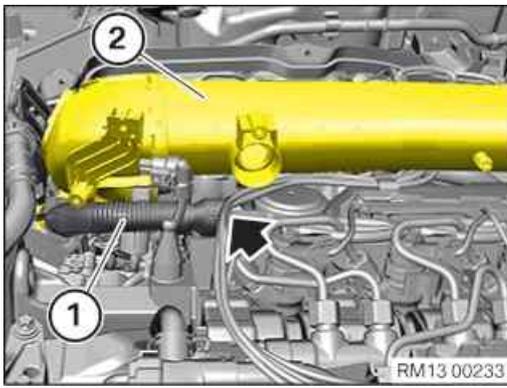
22 – Partially detach the clean air pipe



- Release the screw clamp (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Loosen screw (4).



- Unscrew the screw (1) from the clean air pipe (2).



- Detach ventilation line (1) from clean air pipe (2) and set it aside.
- Detach ventilation line (1) from cylinder head cover (arrow).
- Remove the ventilation line (1).

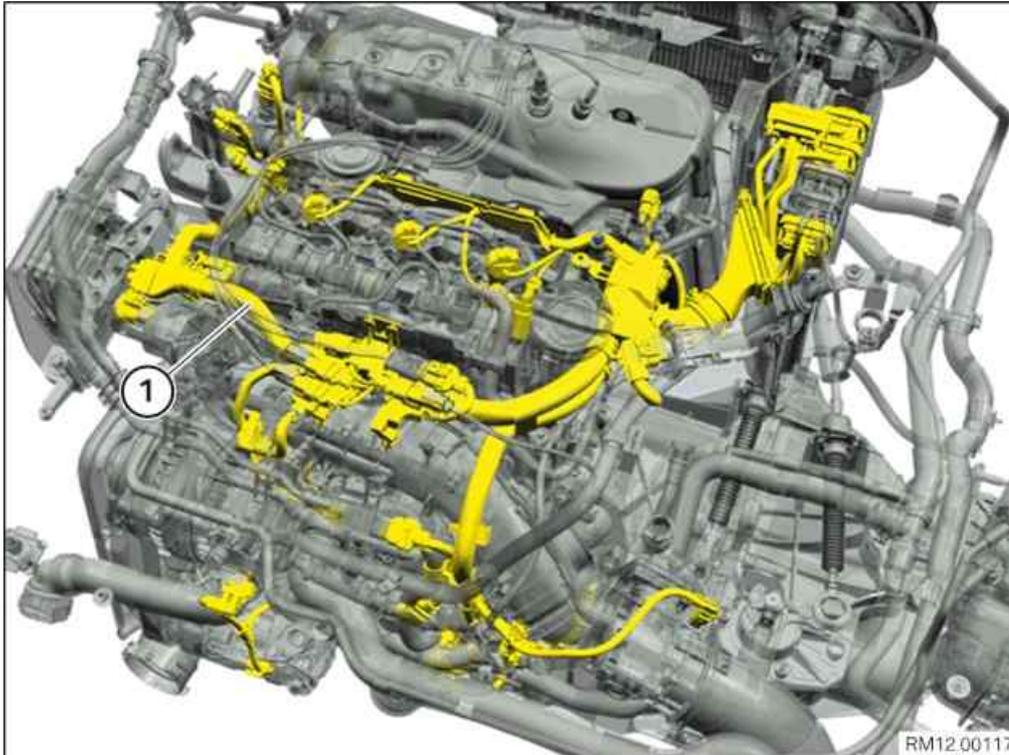


- Thread out the clean air pipe (1) and set it aside as shown.

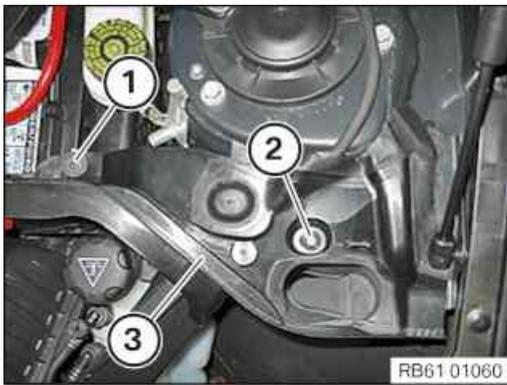
MAIN WORK

23 – Removing wiring harness section for engine

Overview: Wiring harness section for the engine



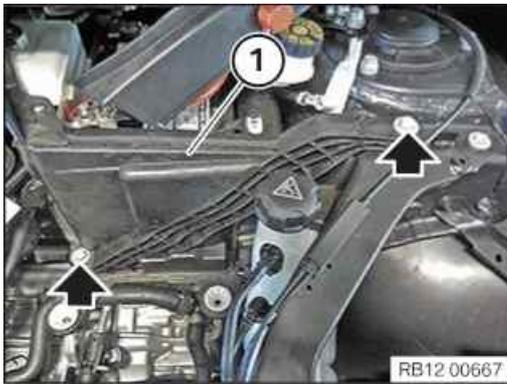
1 Wiring harness section for the engine



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



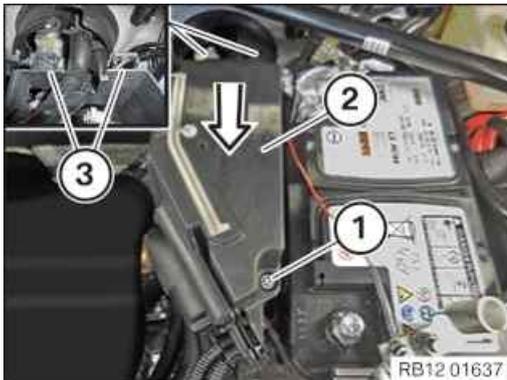
- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.



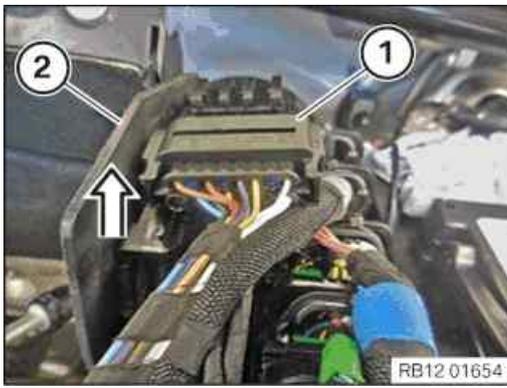
- Remove screws (arrows).
- Guide out tension strut (1) and remove.



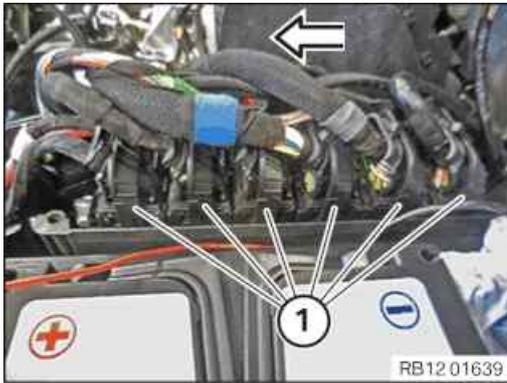
- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



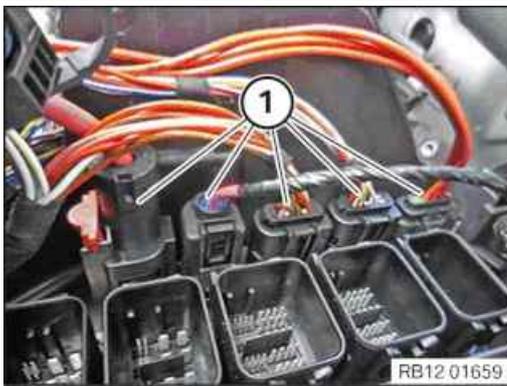
- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



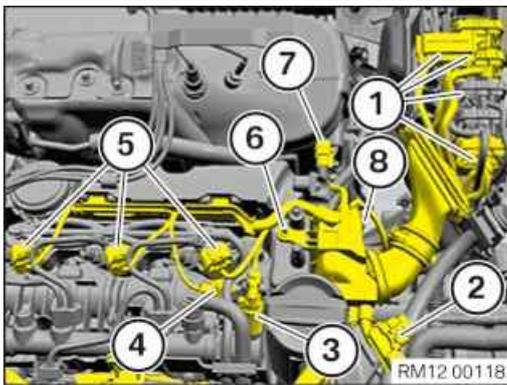
- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



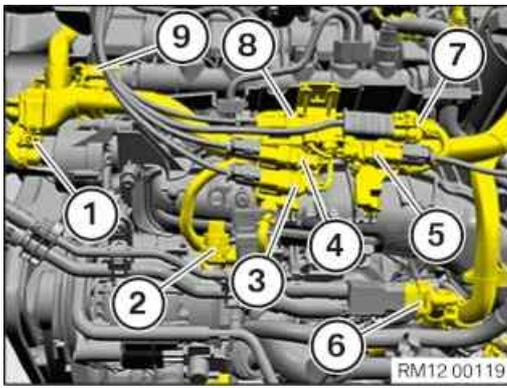
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



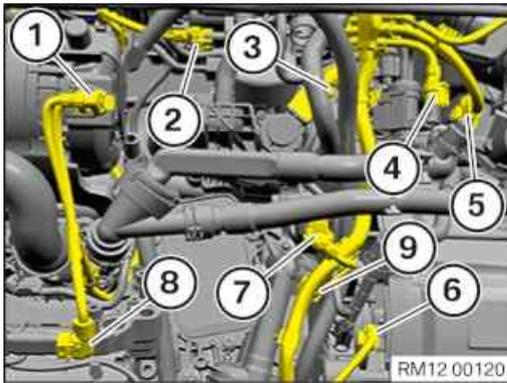
- Unlock and loosen connector (1).



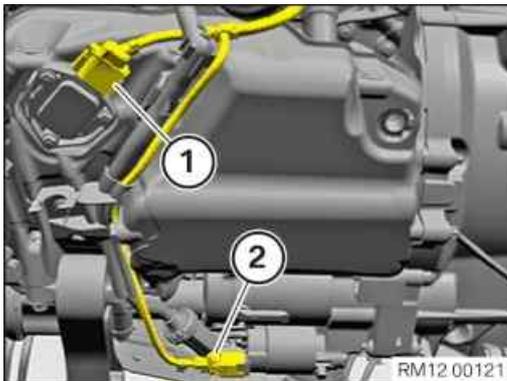
- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock connector (2) and pull off from hot film air mass meter.
- Unlock connector (3) and pull off from fuel pressure regulator.
- Unlock connector (4) and disconnect from camshaft sensor.
- Unlock the connector (5) and pull off from the injectors.
- Loosen screw (6).
- Unlock connector (7) and disconnect from differential pressure sensor.
- Unlock connector (8) and pull off from exhaust-gas recirculation valve.



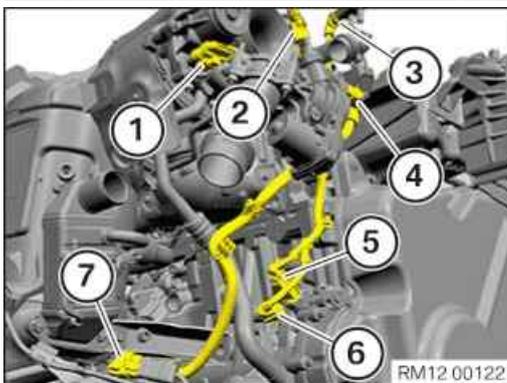
- Unlock connector (1) and pull it off the servomotor for the swirl flap.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock connector (3) and pull off from exhaust temperature sensor downstream from the diesel particulate filter.
- Unlock connector (4) and pull off from exhaust gas pressure sensor for the low pressure exhaust-gas recirculation cooler.
- Unlock connector (5) and pull off from exhaust gas pressure sensor for the exhaust-gas recirculation cooler.
- Unlock connector (6) and pull off from the fuel pressure and temperature sensor.
- Unlock and disconnect the connector (7) from the front oxygen sensor.
- Unlock connector (8) and pull off from exhaust gas pressure sensor upstream from the diesel particulate filter.
- Unlock connector (9) and pull off from the rail pressure sensor.



- Unlock and disconnect the connector (1) from the alternator.
- Unlock and disconnect the connector (2) from the electric changeover valve.
- Unlock the connector (3) and pull it off the high pressure pump.
- Unlock and disconnect the connector (4) from the electric changeover valve.
- Unlock connector (5) and pull off from throttle body.
- Unlock the connector (6) and pull it off the crankshaft sensor.
- Unlock the connector (7) and disconnect it from the oil pressure sensor.
- Unlock the connector (8) and disconnect it from the air conditioning compressor.
- Unlock and disconnect the connector (9) from the solenoid valve.



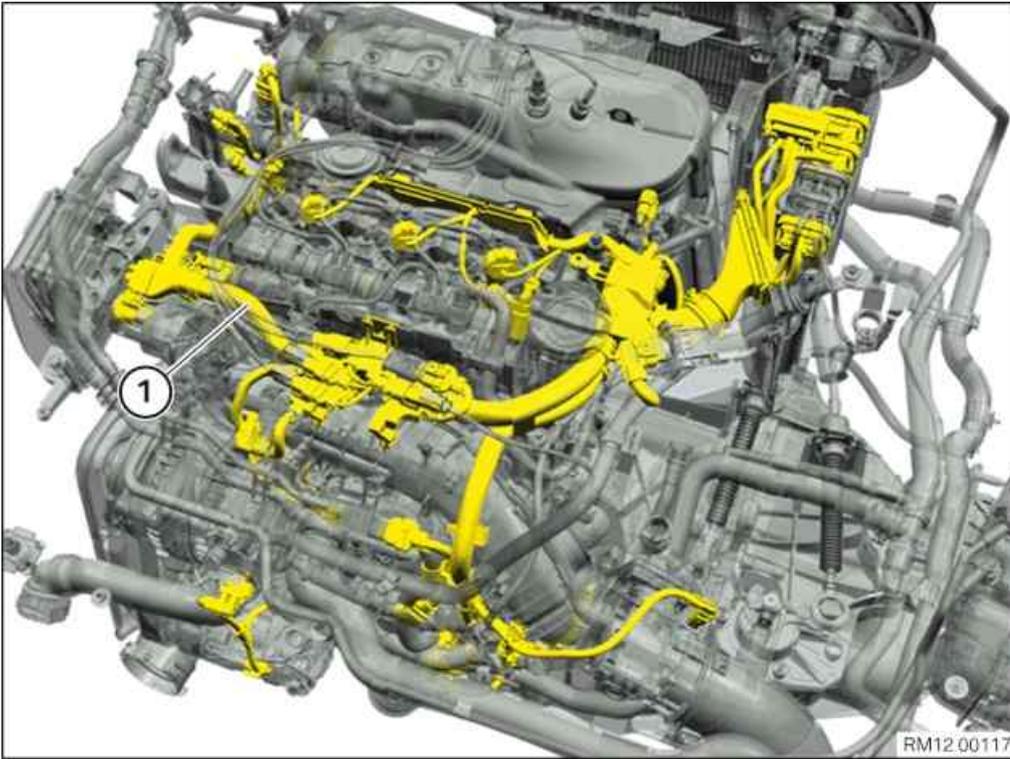
- Unlock the connector (1) and pull off of the oil-level sensor.
- Unlock connector (2) and remove from starter motor.



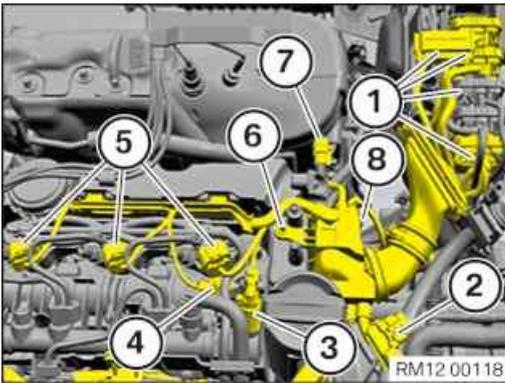
- Unlock the connector (1) and pull it off the exhaust turbocharger.
- Release and unplug connector (2) from exhaust gas pressure sensor.
- Unlock connector (3) and disconnect from differential pressure sensor.
- Unlock connector (4) and pull off from low pressure exhaust-gas recirculation valve.
- Unlock the connector (5) and pull it off the oil pressure switch .
- Unlock connector (6) and disconnect from switching valve.
- Unlock and disconnect the connector (7) from the monitoring oxygen sensor.
- Detach, feed out and remove the wiring harness from the clamps.

24 – Installing wiring harness section for engine

Overview: Wiring harness section for the engine



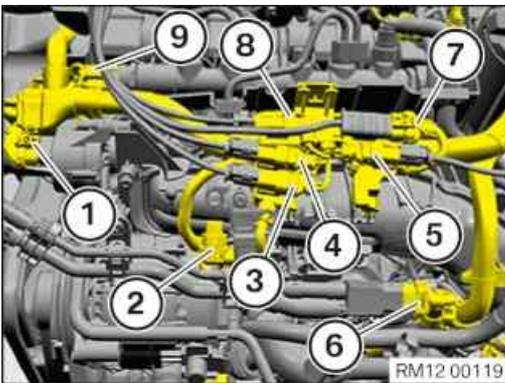
1 Wiring harness section for the engine



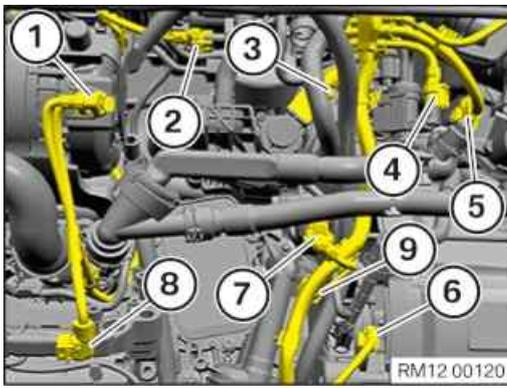
- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Connect and audibly lock the connector (2) to the hot film air mass meter.
- Attach connector (3) to the fuel pressure regulator and lock it audibly.
- Attach connector (4) to the camshaft sensor and lock it audibly.
- Attach connector (5) to the injectors and lock it audibly.
- Tighten down screw (6).

Wiring harness to cylinder head cover

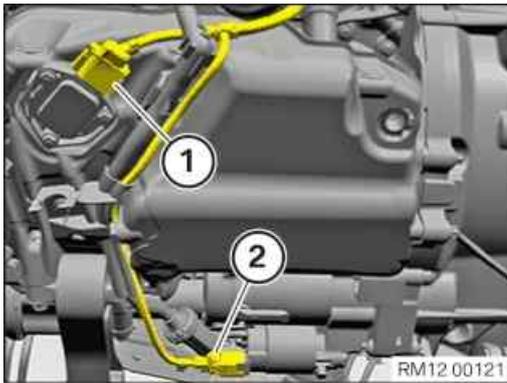
TS5x20	Tightening torque	3,5 Nm
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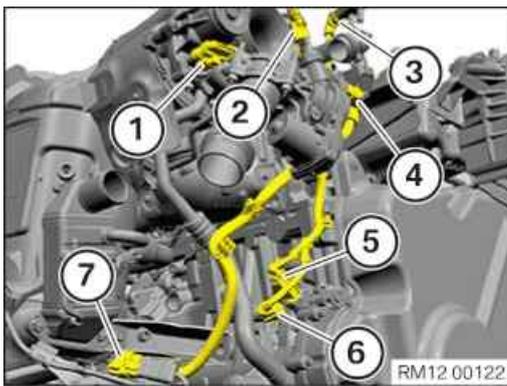
- Attach connector (7) to the differential pressure sensor and lock it audibly.
- Attach connector (8) to the exhaust-gas recirculation valve and lock audibly.
- Attach connector (1) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Attach connector (4) to the exhaust temperature sensor for the low pressure exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (5) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (6) to the fuel pressure and temperature sensor and lock it audibly.
- Connect the connector (7) to the front oxygen sensor and lock audibly.
- Attach connector (8) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (9) to the rail pressure sensor and lock it audibly.



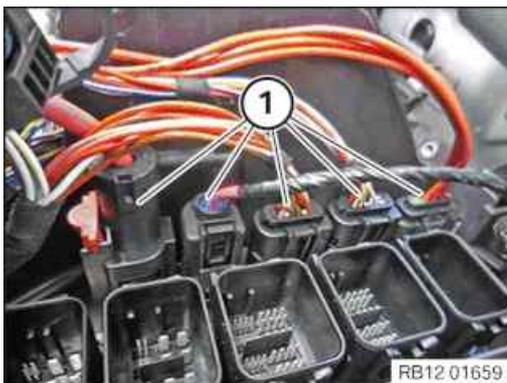
- Connect the connector (1) to the alternator and lock audibly.
- Connect the connector (2) to the electric changeover valve and lock audibly.
- Connect the connector (3) to the high pressure pump and lock audibly.
- Connect the connector (4) to the electric changeover valve and lock audibly.
- Attach connector (5) to the throttle bodies and lock it audibly.
- Connect the connector (6) to the crankshaft sensor and lock it audibly.
- Connect the connector (7) to the oil pressure sensor and lock it audibly.
- Connect the connector (8) to the air conditioning compressor and lock audibly.
- Connect the connector (9) to the solenoid valve and lock audibly.



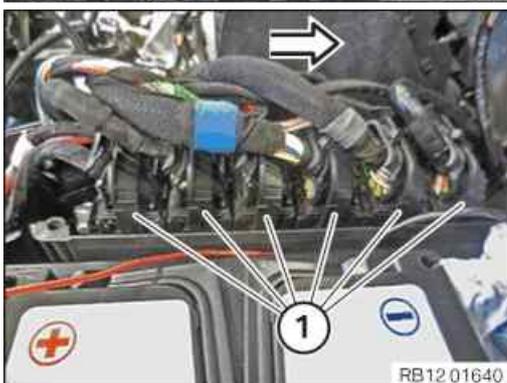
- Connect the connector (1) to the oil-level sensor and lock it audibly.
- Connect connector (2) to the starter motor and lock audibly.



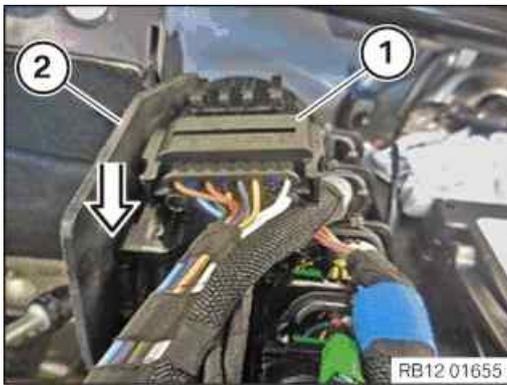
- Attach connector (1) to the exhaust turbocharger and lock it audibly.
- Attach connector (2) to the exhaust gas pressure sensor and lock it audibly.
- Attach connector (3) to the differential pressure sensor and lock it audibly.
- Attach connector (4) to the low pressure exhaust-gas recirculation valve and lock it audibly.
- Attach connector (5) to the oil pressure switch and lock it audibly.
- Attach connector (6) to the switching valve and lock it audibly.
- Connect the connector (7) to the monitoring oxygen sensor and lock audibly.



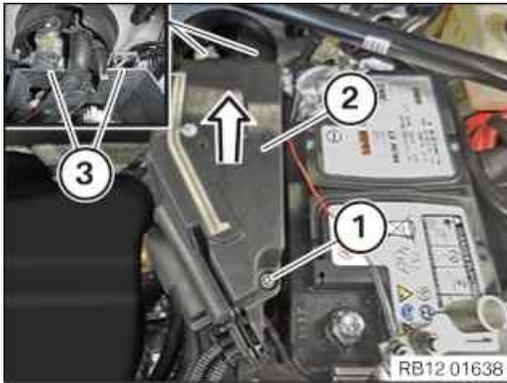
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



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



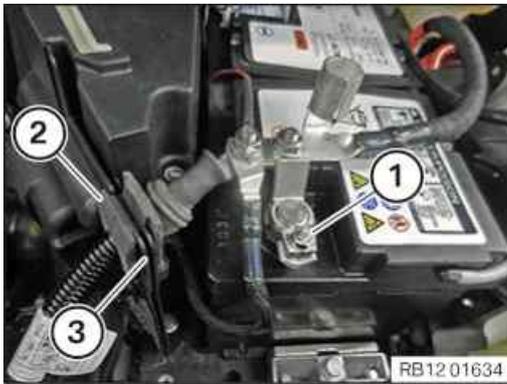
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



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

Cover to electronics box

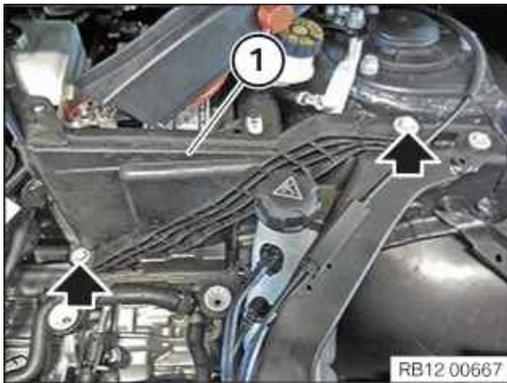
RF5x26.5		Tightening torque	2,5 Nm
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- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm
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- Feed in and install tension strut (1).
- Tighten screws (arrows).

Tension strut to spring strut dome/battery tray

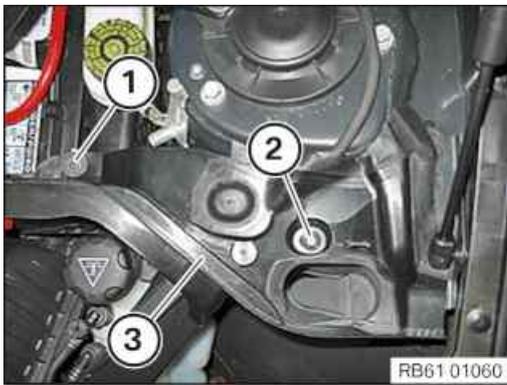
M8		Tightening torque	19 Nm
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- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

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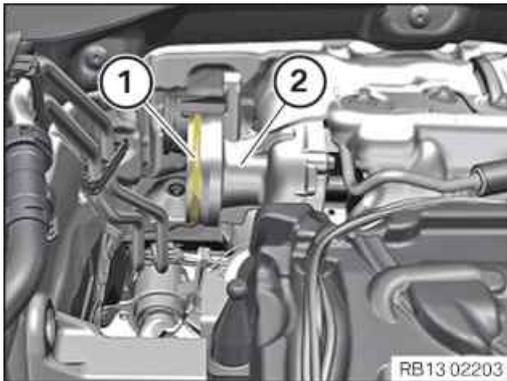
- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm
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POSTPROCESSES

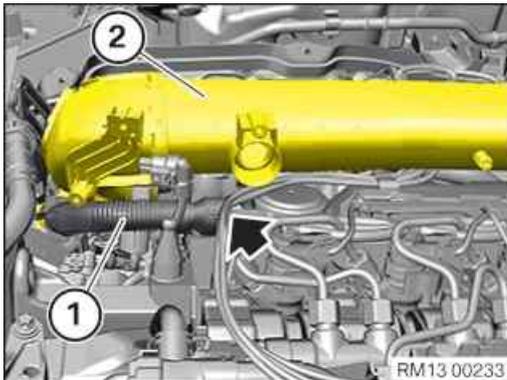
25 – Partially securing clean air pipe



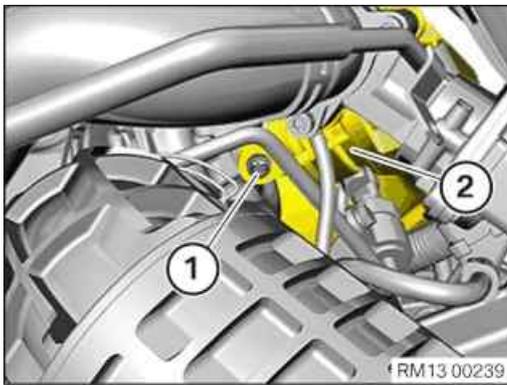
- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.



- Feed in clean air pipe (1) and install.



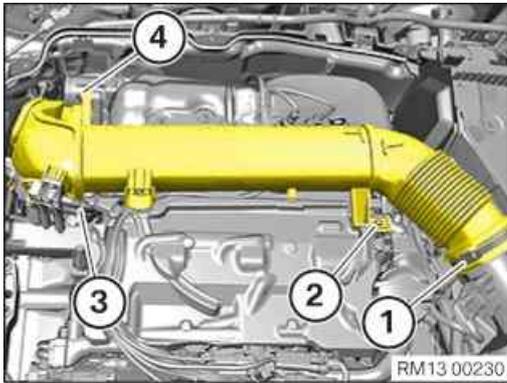
- Feed in ventilation line (1) at clean air pipe (2) and install.
- Feed in ventilation line (1) at cylinder head cover (arrow) and install.



- Tighten screw (1) from clean air pipe (2).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm
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- Tighten down screw (4).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm
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- Connect and lock the connector (3).
The connector (3) must engage audibly.
- Renew the screw (2).

Parts: Screw

- Tighten down screw (2).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm
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- Tighten the screw clamp (1).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm
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26 – Installing the alternator



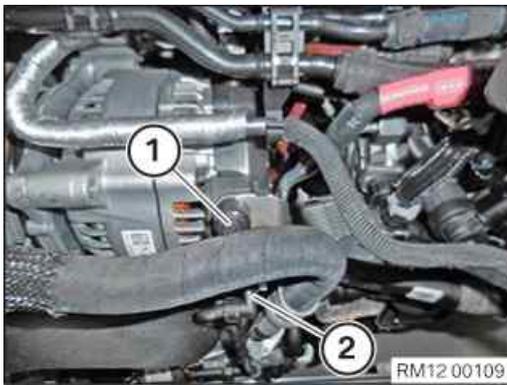
- Insert and install the alternator (1).



- Tighten the screws (1).

Alternator to component carrier

M10x75 / M10x125		Tightening torque	38 Nm
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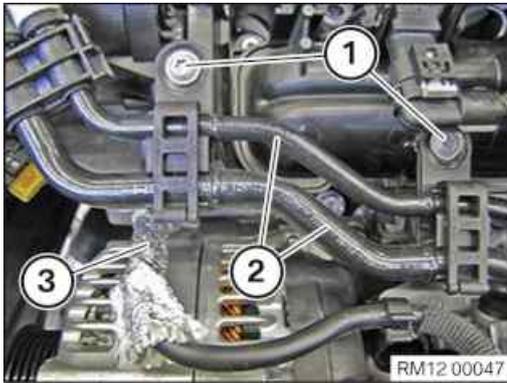


- Mount the positive battery cable to the alternator and secure it with the nut.
- Tighten nut.

Positive battery cable to alternator

M8		Tightening torque	19 Nm
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- Mount the cover (1) on the nut.
- Connect the connector (2) to the alternator and lock audibly.



- Mount fuel supply and return line (2).
- Tighten the screws (1).

Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm
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- Connect the coolant ventilation line (3) to the cylinder head and audibly lock.

27 – Installing the drive belt for alternator



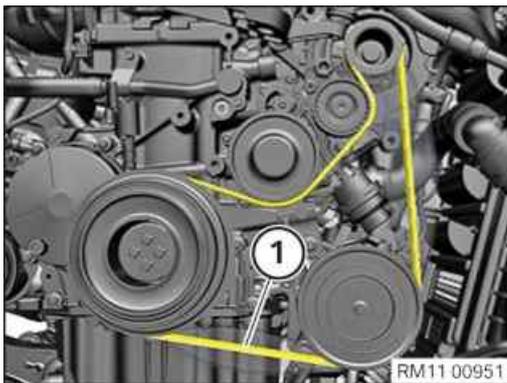
TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.



TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

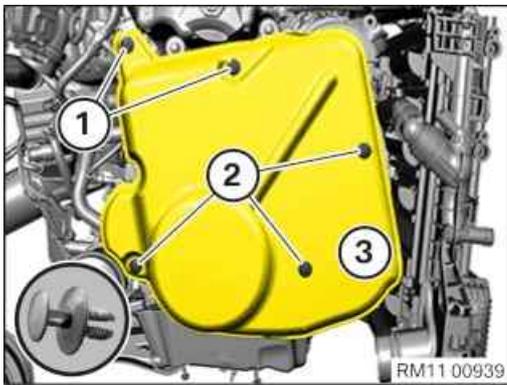


- Feed in the drive belt for the alternator (1) and install it.



- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool out of the belt tensioner and remove it.

28 – Install the acoustic cover for the engine at the front



- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.

29 – Install right charge air duct

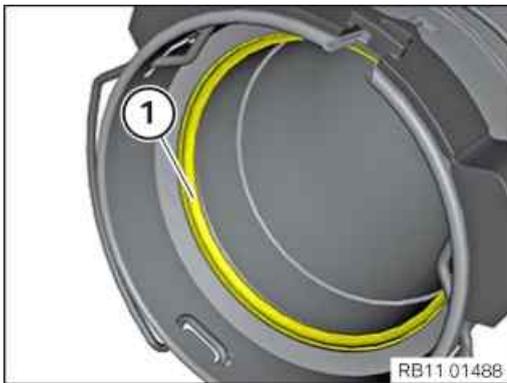


RISK OF DAMAGE

Damage to the exhaust turbocharger.

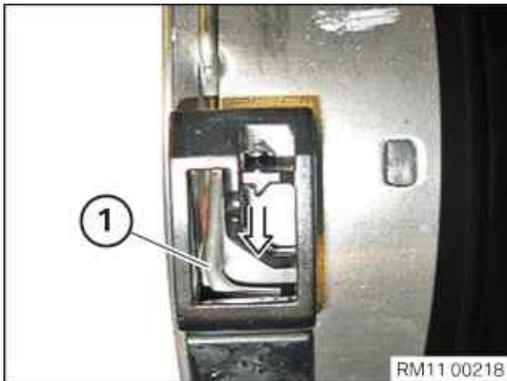
A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.



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

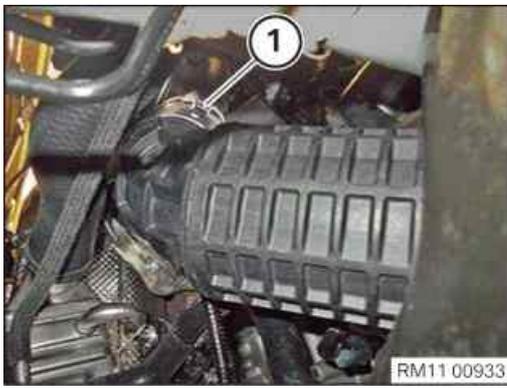
Parts: Gasket



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

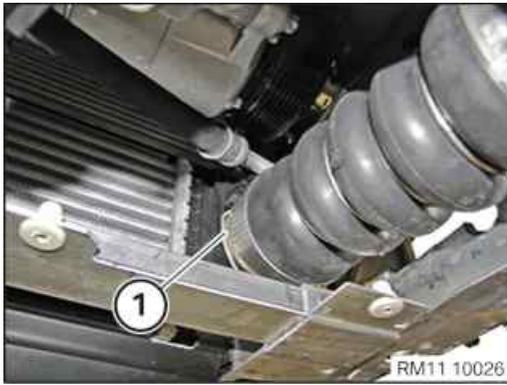


- Feed in charge air duct (1) to the side and upwards through the wheel arch between the side member and front axle support and install.



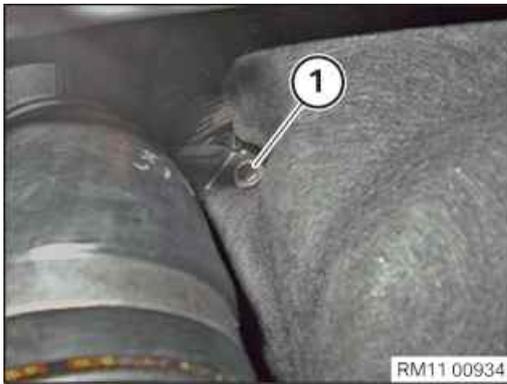
- Attach charge air duct on the exhaust turbocharger until locks (1) engage on both side.

The lock (1) must audibly engage.



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

The lock (1) must audibly engage.



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

Charge air line to crankcase

M6x25		Tightening torque	5 Nm
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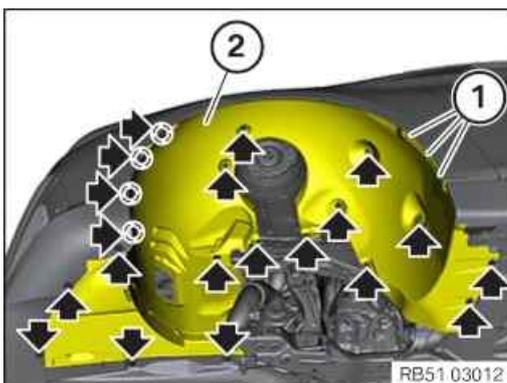


- Tighten charge air duct screws (1) on oil sump.

Charge air duct to oil sump

M6		Tightening torque	8 Nm
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30 – Installing the front right wheel arch cover



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

Wheel arch cover

Screw		3 Nm
Plastic nut		2,6 Nm

- Secure expanding rivet (1).

31 – Installing the front right wheel

► Clean the contact surfaces between the brake disc and the wheel rim



i

TECHNICAL INFORMATION

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

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

Do not operate special tool **2 344 011** with an impact screwdriver.

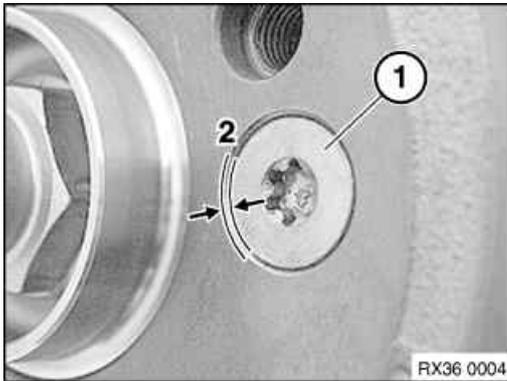
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.



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

Do not operate special tool **2 344 011** with an impact screwdriver.

- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

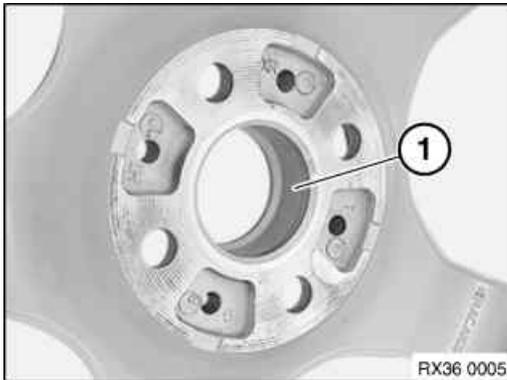


- Check the mounting bolt for the brake disc (1) for secure fit.

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

Brake disc to front wheel hub

M8	Renew screw.	16 Nm
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- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.



TECHNICAL INFORMATION

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

The wheel rim must rest uniformly against the brake disc.

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

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

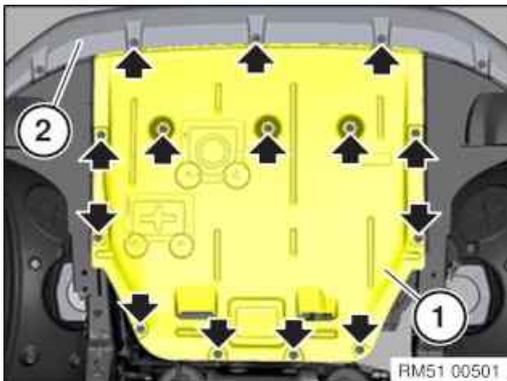
Parts: Wheel bolts

- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

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

32 – Installing the front underbody protection



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

Underbody protection front

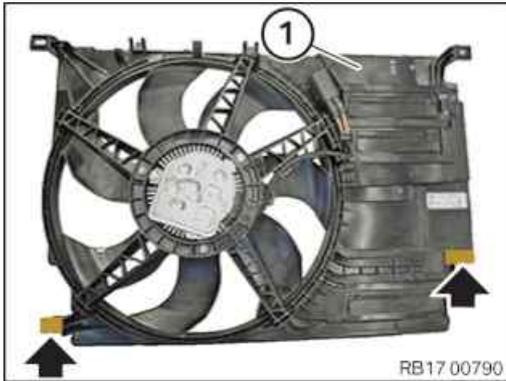
			3 Nm
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33 – Installing fan cowl with electric fan

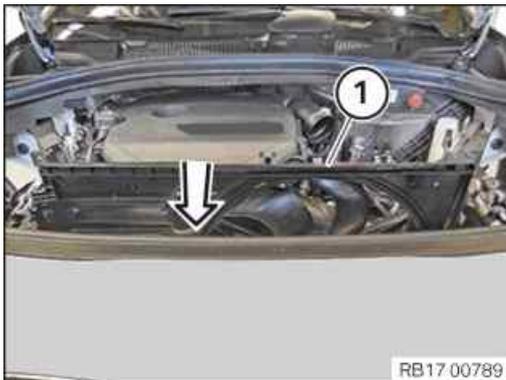


TECHNICAL INFORMATION

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



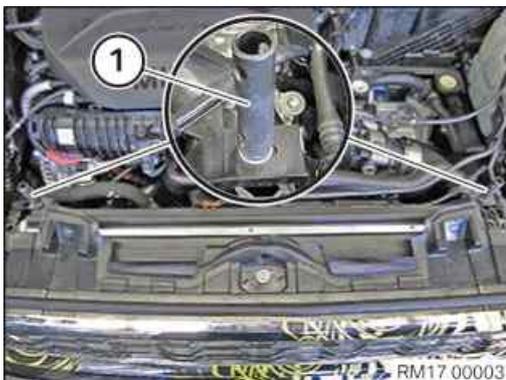
- Feed the guides (arrows) of the fan cowl (1) into the charge air cooler.



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



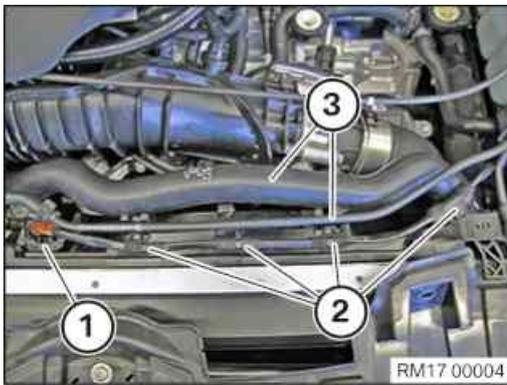
- Lock the left and right locks (arrows).



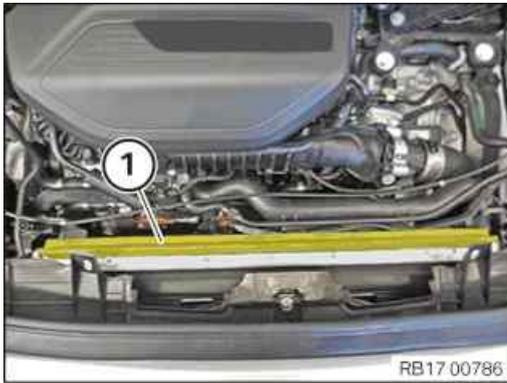
- Tighten the screws (1).

Fan cowl on radiator

		Tightening torque	
M6X12			6 Nm

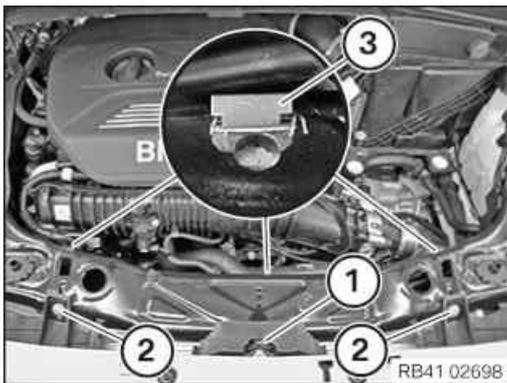


- Connect connectors (1) and lock.
The connector (1) must engage audibly.
- Secure clamps (2).
- Thread in and install coolant line (3).



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

34 – Install cross connection



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

Bracing strut to top cross connection

M8		Tightening torque	25 Nm
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- Tighten down screws (2).

Air duct to deformation element/cross connection

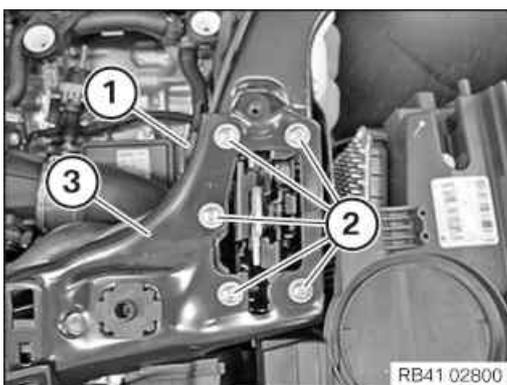
M6x20 screw		Tightening torque	6 Nm
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- Fasten clamps (3) for bonnet lock Bowden cable to cross connection.
- Tighten screws (2) of cross connection (3).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm
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- Fasten expanding rivet (1).

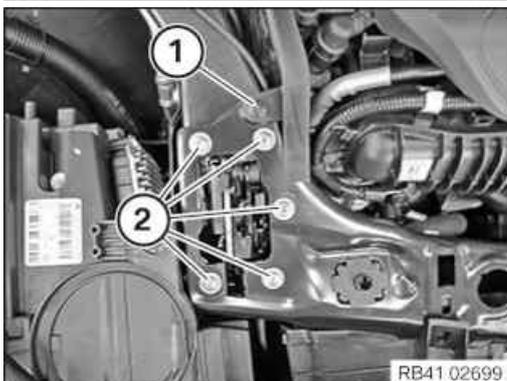


- Tighten down screws (2).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm
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- Fasten expanding rivet (1).



35 – Installing intake silencer housing



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

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm
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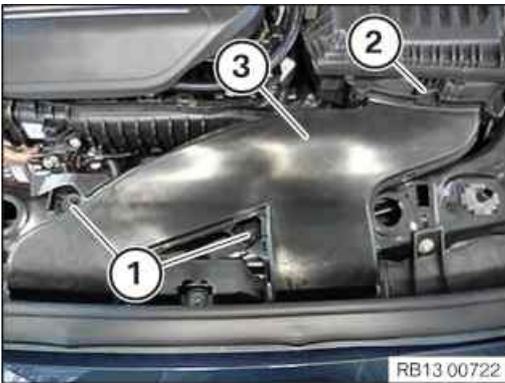
- Tighten clamp (4).

Clean air pipe to intake silencer housing

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

36 – Install the intake neck for the intake filter housing



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

Intake neck to cross connection

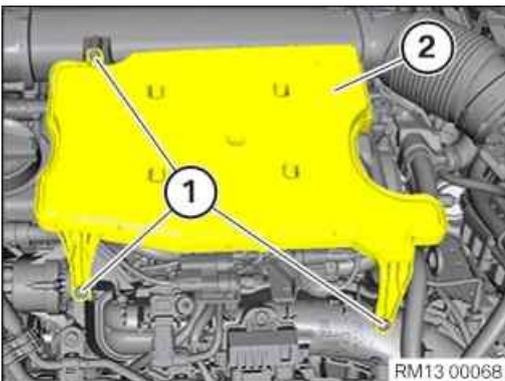
M6		Tightening torque	8 Nm
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37 – Install the acoustic cover for the injectors



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

38 – Install resonator



- Insert and install the resonator (2).
 - Renew screws (1).
- Parts:** Bolts
- Tighten the screws (1).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm
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39 – Install acoustic cover



RISK OF DAMAGE

Damage to the acoustic cover.

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

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

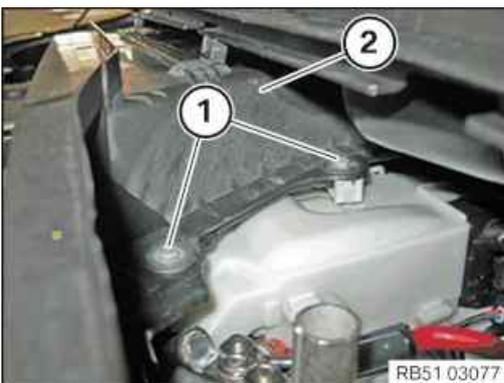


- Check for correct installation of all rubber mounts in the acoustic cover (1).



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

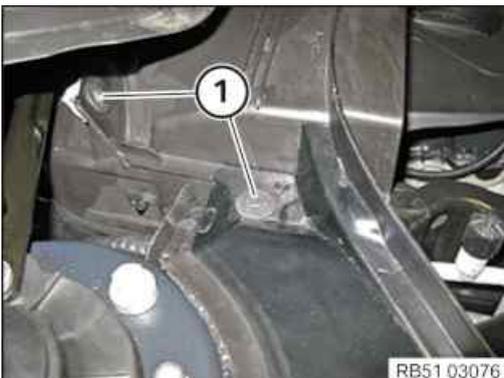
40 – Installing the upper bulkhead cover



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

Bulkhead cover, top

Screw		Tightening torque	3 Nm
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- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm
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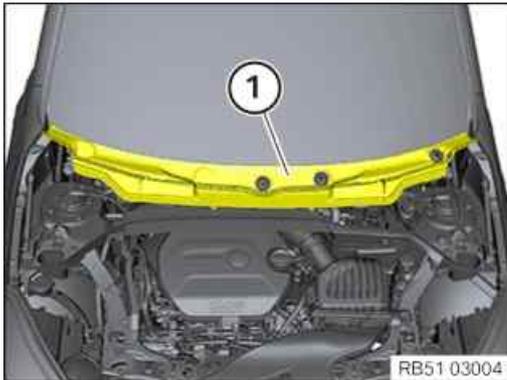


- Tighten the screws (1).

Bulkhead cover, top

Screw	Tightening torque
	3 Nm

41 – Install the rear cowl panel cover



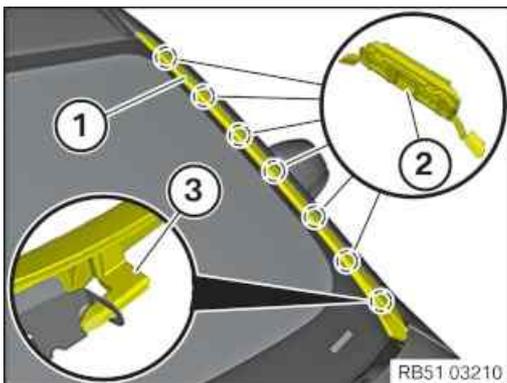
- Feed in and engage the rear cowl panel cover (1).

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



NOTICE

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



► Install the gutter strip on the windscreen

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

43 – Install left and right wiper arm



NOTICE

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

► Install the wiper arm

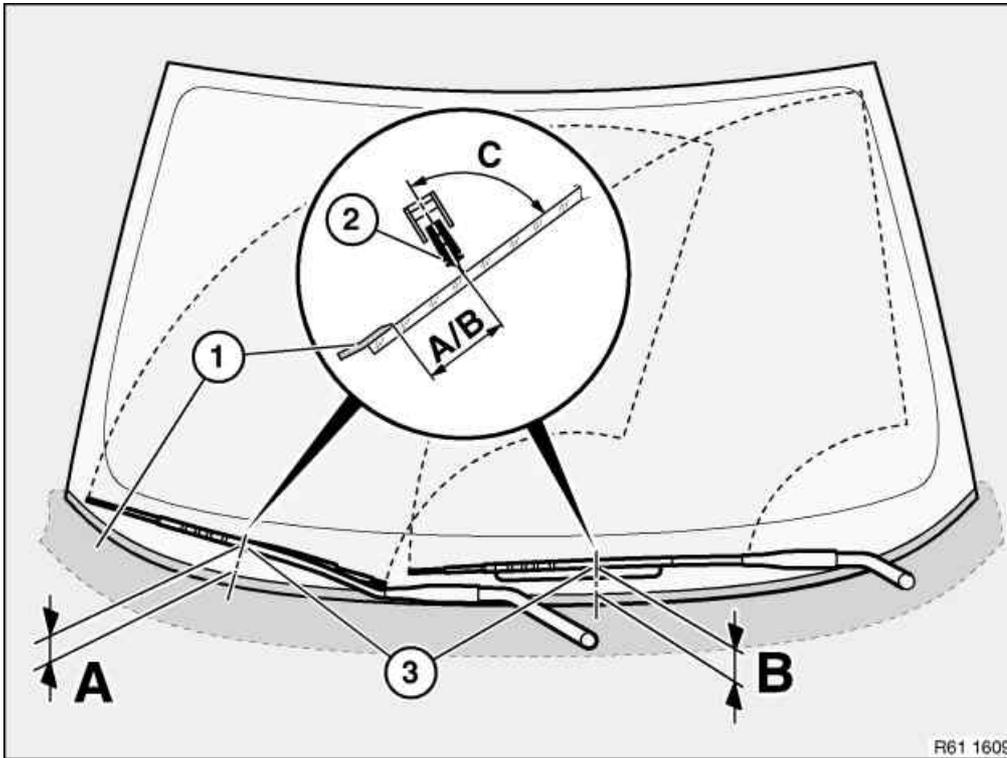


TECHNICAL INFORMATION

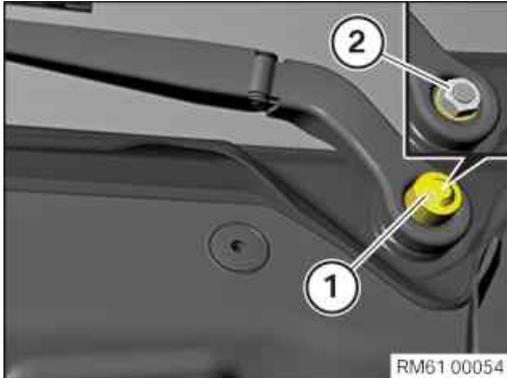
The wiper system must be in zero position.

After installing the cowl panel cover and before fitting the wiper arm:

Activate the wiper system once to ensure that it has the correct installation position.



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



NOTICE

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

- Tighten nut (2).

Windscreen wiper arm

Combination hexagon nut		Tightening torque	35 Nm
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- Connect the protective cap (1).

44 – Installing front cowl panel cover



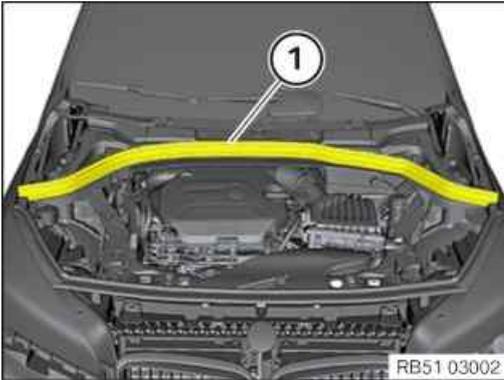
- Insert the cowl panel cover front (1) to the rear and install.
- Check cowl panel cover at front is correctly seated (1).

45 – Install the seal for the bonnet



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

46 – Disconnecting all battery earth leads



- See additional information.

47 – Checking coolant level and topping up if needed



CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

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



TECHNICAL INFORMATION

Follow notes for repair work on the cooling system.

For additional information see:

Main group 17

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



TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

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

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



TECHNICAL INFORMATION

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



- Check coolant level in coolant expansion tank (1) and adjust to the maximum if needed.

Additional Information

Overview of Tightening Torques

Wiring harness to cylinder head cover

Used in step [24](#)

TS5x20	Tightening torque	3,5 Nm
--------	-------------------	--------

Cover to electronics box

Used in step [24](#)

RF5x26.5	Tightening torque	2,5 Nm
----------	-------------------	--------

Positive battery terminal to battery

Used in step [24](#)

NutM6	Tightening torque	5 Nm
-------	-------------------	------

Tension strut to spring strut dome/battery tray

Used in step [24](#)

M8	Tightening torque	19 Nm
----	-------------------	-------

Positive battery connection point cover to engine compartment partition wall

Used in step [24](#)

	Tightening torque	3 Nm
--	-------------------	------

Battery cover

Used in step [24](#)

Screw		2,8 Nm
-------	--	--------

Clean air pipe to exhaust turbocharger

Used in step [25](#)

Torx bolt BM8x25	Tightening torque	8 Nm
------------------	-------------------	------

Clean air pipe to cylinder head cover Used in step 25

Oval-head screw	Renew screw.	Tightening torque	8 Nm
-----------------	--------------	-------------------	------

Clean air pipe to intake silencer housing Used in step 25 35

Clamp		Tightening torque	3 Nm
-------	--	-------------------	------

Alternator to component carrier Used in step 26

M10x75 / M10x125		Tightening torque	38 Nm
------------------	--	-------------------	-------

Positive battery cable to alternator Used in step 26

M8		Tightening torque	19 Nm
----	--	-------------------	-------

Fuel line to intake plenum Used in step 26

TS6x20		Tightening torque	5 Nm
--------	--	-------------------	------

Charge air line to crankcase Used in step 29

M6x25		Tightening torque	5 Nm
-------	--	-------------------	------

Charge air duct to oil sump Used in step 29

M6		Tightening torque	8 Nm
----	--	-------------------	------

Wheel arch cover Used in step 30

Screw			3 Nm
Plastic nut			2,6 Nm

Brake disc to front wheel hub Used in step 31

M8	Renew screw.		16 Nm
----	--------------	--	-------

Wheel bolts Used in step 31

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

Underbody protection front Used in step 32

			3 Nm
--	--	--	------

Fan cowl on radiator Used in step 33

M6X12		Tightening torque	6 Nm
-------	--	-------------------	------

Bracing strut to top cross connection Used in step 34

M8		Tightening torque	25 Nm
----	--	-------------------	-------

Air duct to deformation element/cross connection Used in step 34

M6x20 screw		Tightening torque	6 Nm
-------------	--	-------------------	------

Cross connection on support for cross connectionUsed in step [34](#)

M6x20		Tightening torque	12 Nm
-------	--	-------------------	-------

Intake silencer housing to lock bridgeUsed in step [35](#)

M6X30		Tightening torque	8 Nm
-------	--	-------------------	------

Intake neck to cross connectionUsed in step [36](#)

M6		Tightening torque	8 Nm
----	--	-------------------	------

Resonator to manifold and clean air pipeUsed in step [38](#)

Screw TS6	Renew screw.	Tightening torque	5 Nm
-----------	--------------	-------------------	------

Bulkhead cover, topUsed in step [40](#)

Screw		Tightening torque	3 Nm
-------	--	-------------------	------

Windscreen wiper armUsed in step [43](#)

Combination hexagon nut		Tightening torque	35 Nm
-------------------------	--	-------------------	-------

Overview of Special Tools**2 344 011 Tool****Common**Used in step [31](#)

Usage Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.

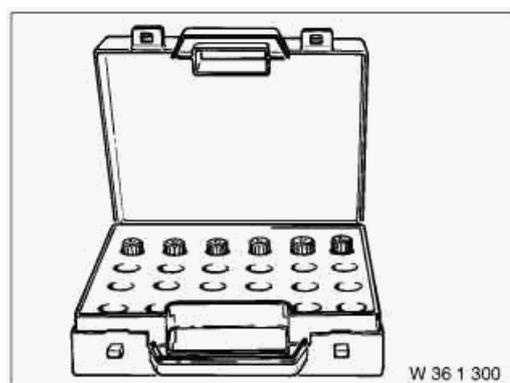
Included in the tool or work

Storage location

Replaced by

In connection with

SI-Number 08 08 12 (872)

Replacement tools:**0 495 221 (36 1 323) Wheel stud****Common**Used in step [16](#)

Usage (Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259

Included in the tool or work 0 492 518

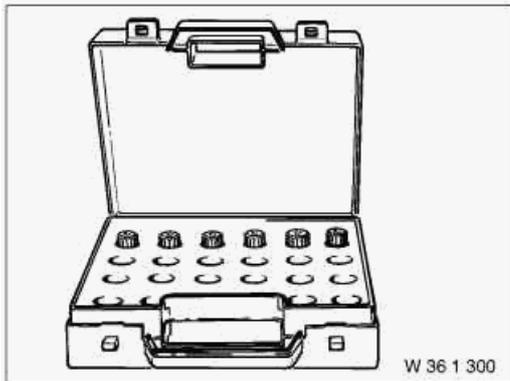
Storage location

Replaced by

In connection with

SI-Number

0 495 224 (36 1 326) Wheel stud



Common

Used in step [16](#)

Usage (Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546

Included in the tool or work 0 492 518

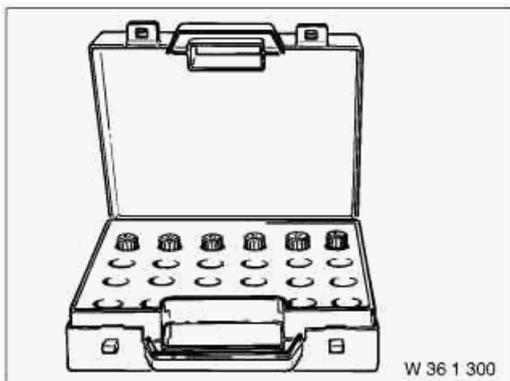
Storage location

Replaced by

In connection with

SI-Number

0 495 225 (36 1 327) Wheel stud



Common

Used in step [16](#)

Usage (Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547

Included in the tool or work 0 492 518

Storage location

Replaced by

In connection with

SI-Number

0 495 226 (36 1 328) Wheel stud



Common

Used in step [16](#)

Usage (Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340

Included in the tool or work 0 492 518

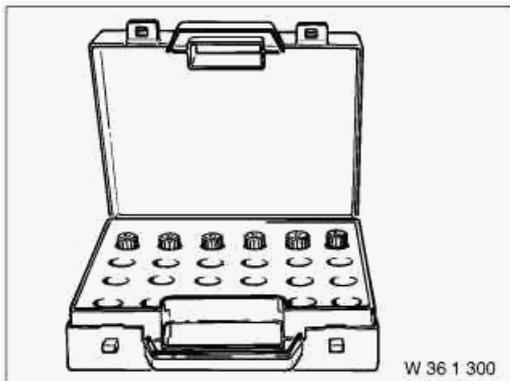
Storage location

Replaced by

In connection with

SI-Number

0 495 227 (36 1 329) Wheel stud



Common

Used in step [16](#)

Usage (Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341

Included in the tool or work 0 492 518

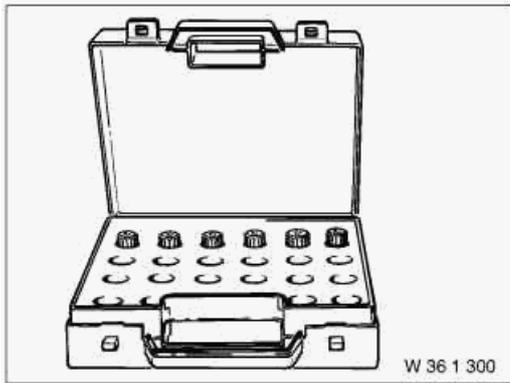
Storage location

Replaced by

In connection with

SI-Number

0 495 228 (36 1 331) Wheel stud



Common

Used in step 16

Usage (Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342

Included in the tool or work 0 492 518

Storage location

Replaced by

In connection with

SI-Number

0 495 229 (36 1 332) Wheel stud



Common

Used in step 16

Usage (Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343

Included in the tool or work 0 492 518

Storage location

Replaced by

In connection with

SI-Number

0 495 230 (36 1 333) Wheel stud



Common

Used in step 16

Usage (Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344

Included in the tool or work 0 492 518

Storage location

Replaced by

In connection with

SI-Number

Overview Technical Data

Links

Repair instructions

Used in step

[61 20 900 Disconnecting and connecting battery earth lead](#)

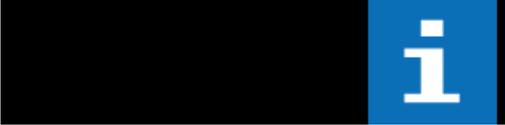
1 46

[61 20 900 Disconnecting and connecting battery earth lead](#)

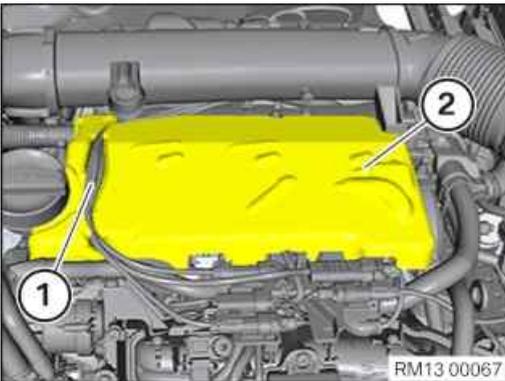
1 46

**Important!**

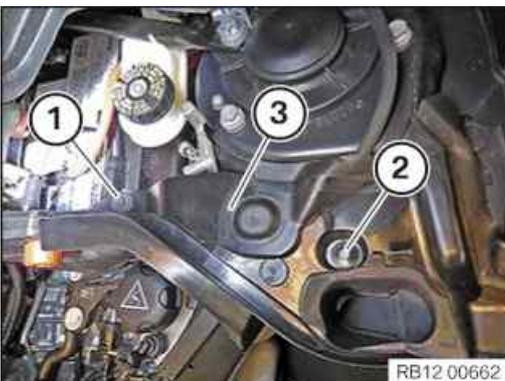
[Read and comply with notes on protection against electrostatic damage \(ESD protection\).](#)

**Necessary preliminary tasks:**

- Disconnect [battery negative lead](#).
- Remove [upper bulkhead cover](#).
- Remove [clean air pipe](#).
- Remove [fan cowl](#).
- Remove front [underbody protection](#).

**Removal:**

Release cable (1) from sound insulation (2).
Remove sound insulation (2) upwards.

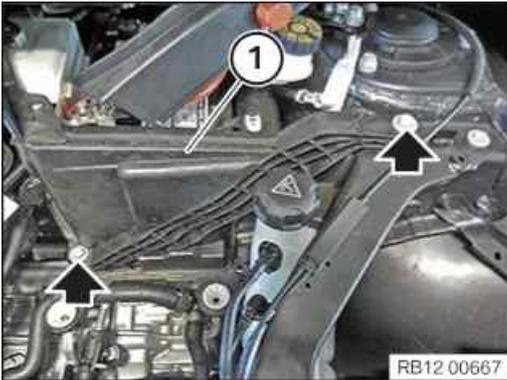


Loosen screw (1).
Release expanding rivet (2).
Remove cover (3).



Loosen screw (1).

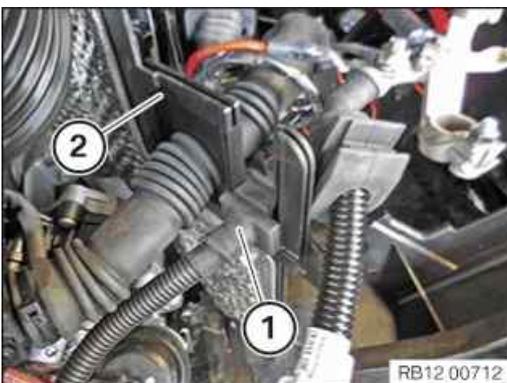
Lay the cover (2) of the positive battery connection point to one side.



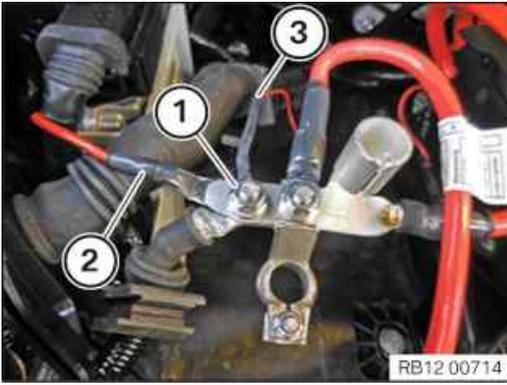
Release the screws along the arrows and remove the tension strut (1).



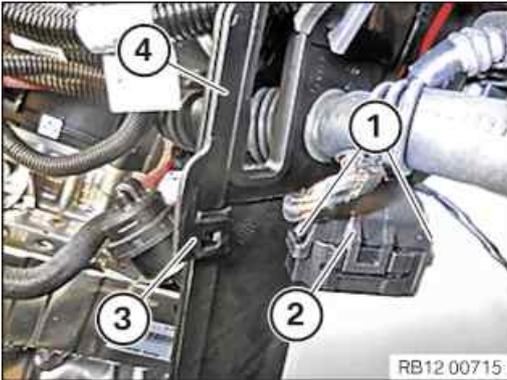
Remove cable (1) from cable clip (2).



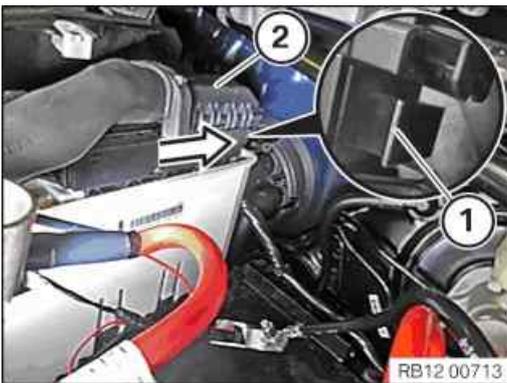
Remove cable (1) from cable clip (2).



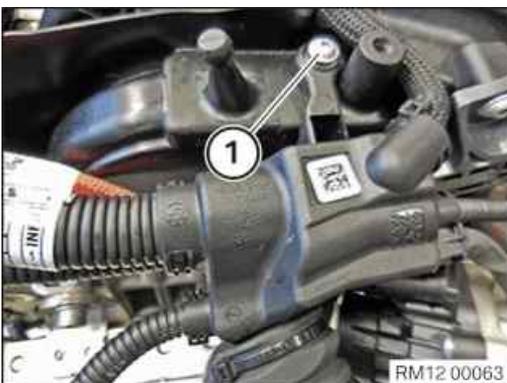
Slacken nut (1).
Feed out cables (2) and (3) and lay to one side.



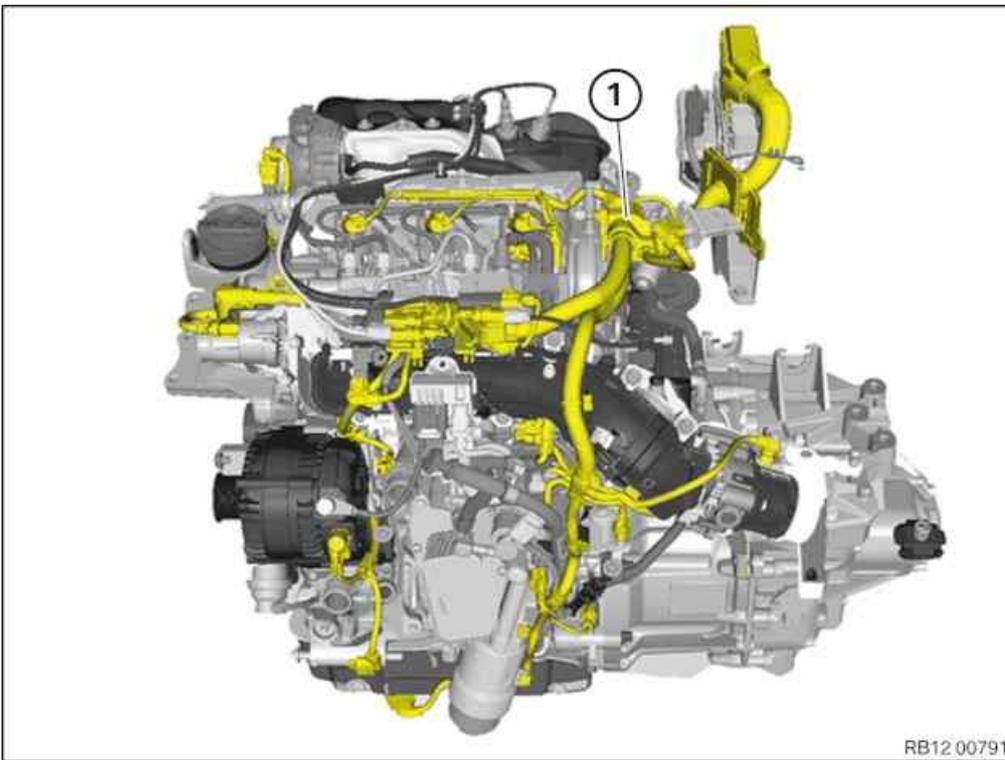
Release lock (1).
Remove connector (2).
Release lock (3).
Remove cable clip (4) with connector.



Undo lock (1) as shown by arrow.
Remove connector (2).



Release screw (1). Remove the wiring harness from the cylinder head cover.



Overview of the wiring harness section for the engine.

Unlock and disconnect following connectors and lines	Note
Release and unplug connector from DDE control unit.	
Unlock connector on differential pressure sensor and disconnect	
Unlock connector on exhaust-gas recirculation valve and disconnect	
Release and pull off connector from injectors	
Unlock connector on fuel pressure sensor and remove	
Unlock connector on fuel pressure controller and remove	
Unlock and pull off connectors of camshaft sensors	
Unlock connector on exhaust-gas recirculation temperature sensor and disconnect	
Unlock connector on fuel pressure sensor and remove	
Unlock connector on preheating control unit and remove	
Unlock connector on pressure converter and disconnect	
Unlock connector on oil pressure switch and disconnect	
Release connector on fuel measuring unit (high-pressure pump) and pull off	
Release and pull off connector for oil pump solenoid valve	
Unlock connector on coolant temperature sensor and disconnect	
Release and pull off connector from exhaust-gas temperature sensors	
Release and pull off connector from lambda sensors	
Release connector on swirl-flap controller and remove	
Unlock connector on air conditioning compressor and disconnect	
Unlock connector on alternator and disconnect.	
Unlock and pull off connector of charging pressure sensor	
Unlock connector on throttle body and disconnect	
Release nut on starter motor, detach cable (terminal 50)	
Release and pull off connector from exhaust turbocharger adjustment	

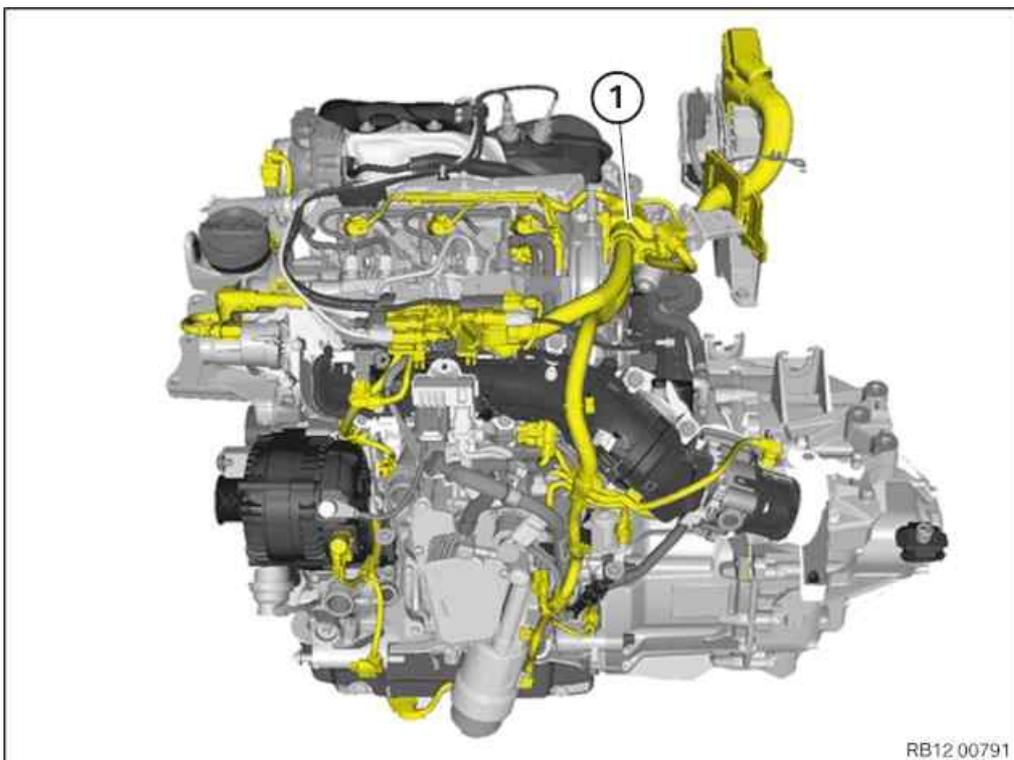
Release and unplug connector from exhaust gas pressure sensor	
Unlock connector on oil level sensor and disconnect	



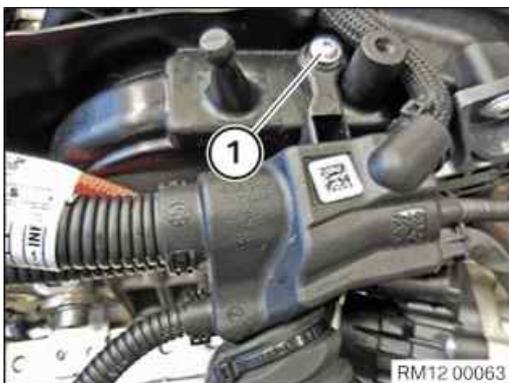
Release wiring harness from clips and retainers.
Feed out wiring harness and remove.



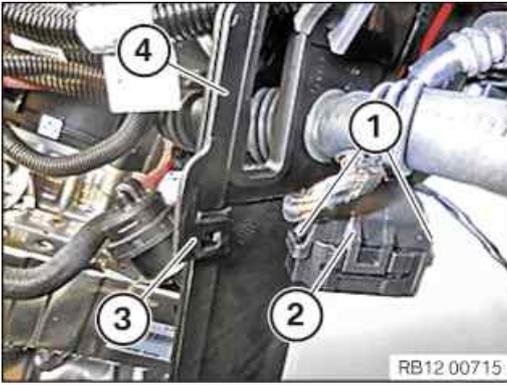
Installation:



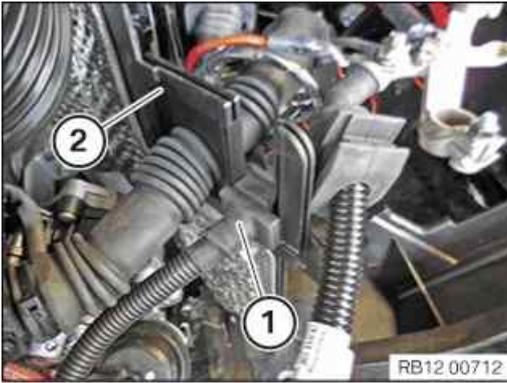
Route and install wiring harness (1).
Plug in all connectors as specified in table.
All connectors must audibly engage.



Install wiring harness on cylinder head cover.
Tighten screw (1).



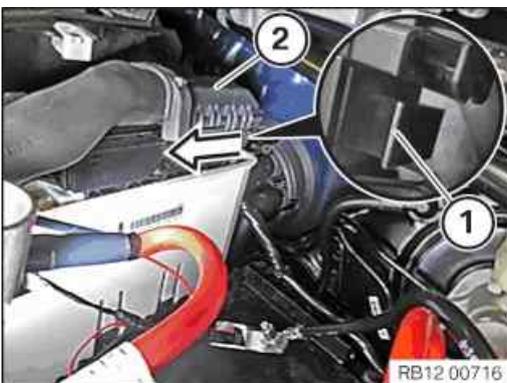
Connect connector (2) and lock.
Lock (1) must snap audibly into place.
Install cable clip (4) with connector.
Lock (3) must snap audibly into place.



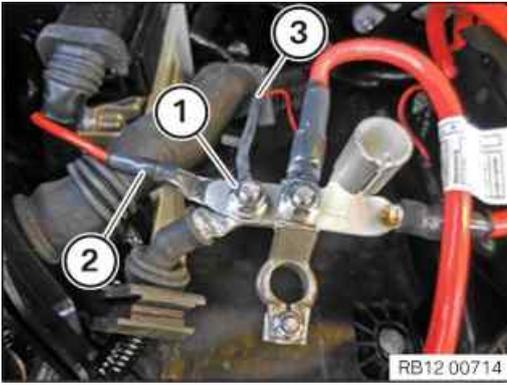
Feed cable (1) into the cable clip (2) and install.



Feed cable (1) into the cable clip (2) and install.



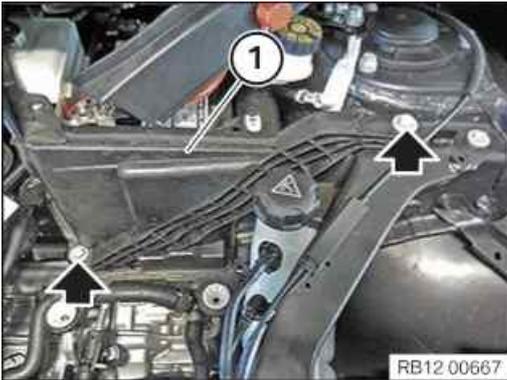
Fit connector (2).
Engage the lock (1) as shown by arrow.
Lock (1) must snap audibly into place.



Feed in and install cables (2) and (3).

Tighten nut (1).

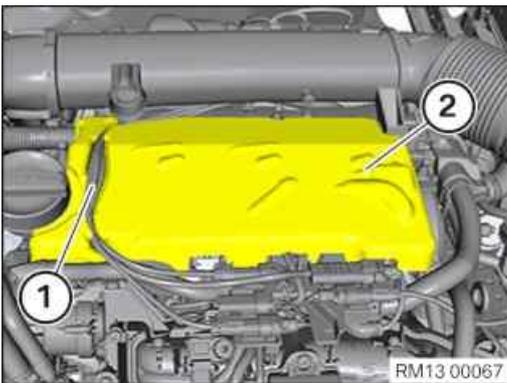
Tightening torque [61 21 3AZ](#).



Install tension strut (1).

Tighten screws along arrows.

Tightening torque [17 10 8AZ](#).



Install sound insulation (2).

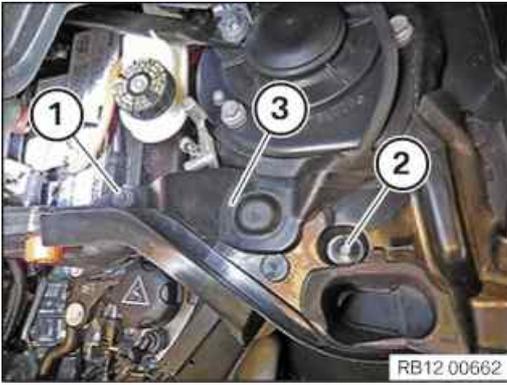
Secure cable (1) to sound insulation (2).



Install cover (2) of the positive battery connection point.

Tighten screw (1).

Tightening torque [17 10 10AZ](#).

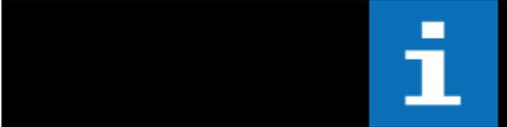


Install cover (3).

Install expanding rivet (2).

Tighten screw (1).

Tightening torque [17 10 10AZ](#).



Route and install wiring harness.

Plug in all connectors as specified in table.

All connectors must audibly engage.



Required follow-up work:

- Install [clean air pipe](#).
- Install [fan cowl](#).
- Install front [underbody protection](#).
- Install [upper bulkhead cover](#).
- Connect [battery earth lead](#).

12 51 010 Replacing wiring harness section for preheating system



WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

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



RISK OF DAMAGE



Electrostatic discharge.

Damage to or destruction of electrical components.

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



TECHNICAL INFORMATION

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

PRELIMINARY WORK

1 – Disconnecting all battery earth leads



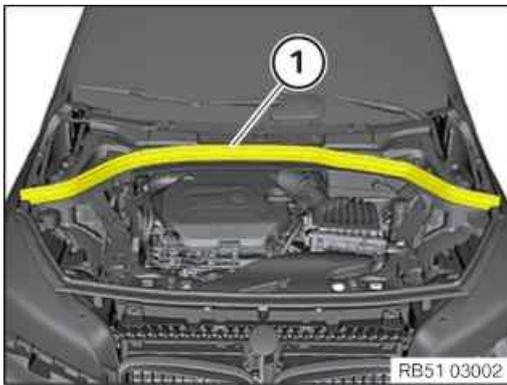
- See additional information.

2 – Remove the seal for the rear bonnet



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

3 – Removing front cowl panel cover



- Guide the front cowl panel cover (1) out toward the top and remove it.

4 – Remove left and right wiper arm



NOTICE

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

► Remove the wiper arm

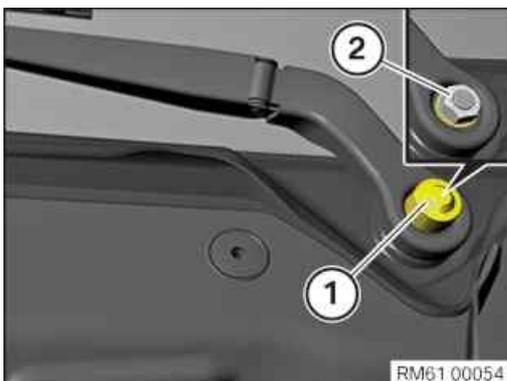


RISK OF DAMAGE

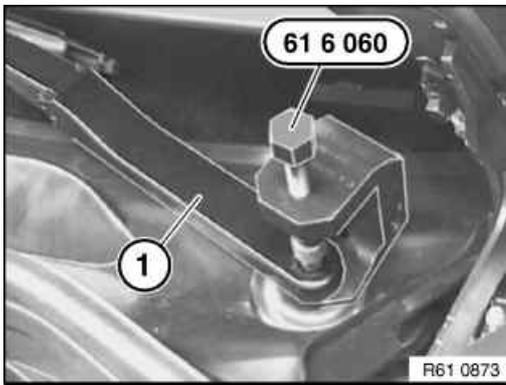
Damage to wiper console

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

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



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



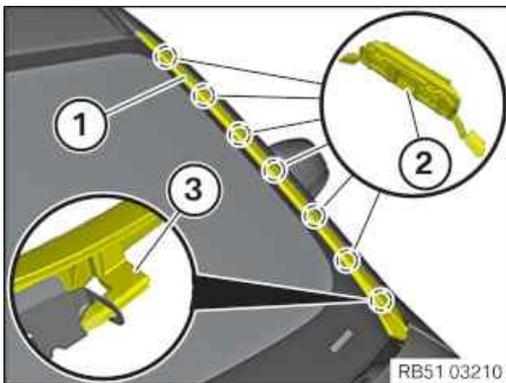
- Pull off the wiper arm (1) using special tool .

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



NOTICE

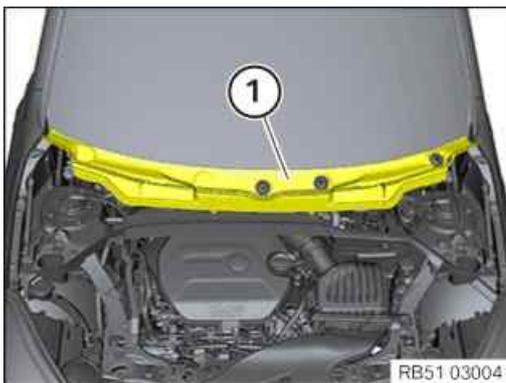
Description is for left component only. Procedure on the right side is identical.



► Remove the gutter strip on the windscreen

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

6 – Remove the rear cowl panel cover

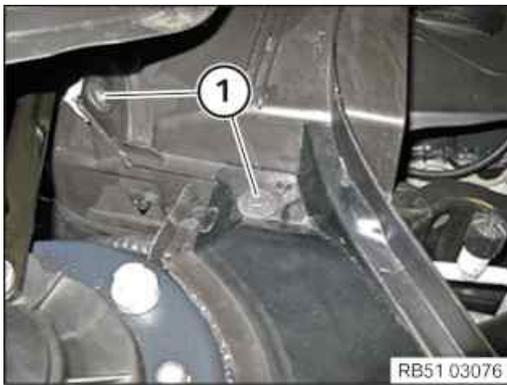


- Disengage and guide out the rear cowl panel cover (1) towards the top.

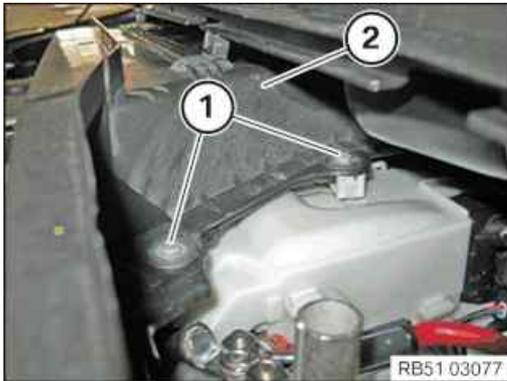
7 – Removing the upper bulkhead cover



- Loosen screws (1).

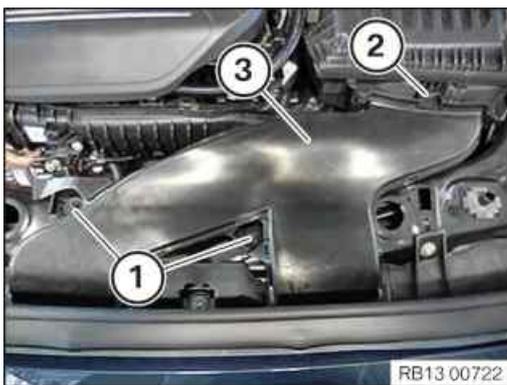


- Loosen screws (1).



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

8 – Remove the intake neck for intake silencer housing



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

9 – Removing intake silencer housing



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

10 – Removing the acoustic cover



WARNING

Hot surfaces.

Risk of burning!

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



RISK OF DAMAGE

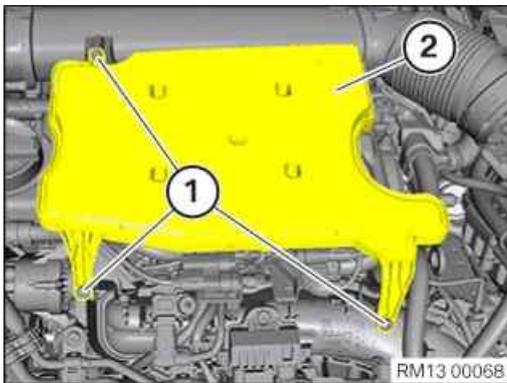
Damage to the acoustic cover.

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

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

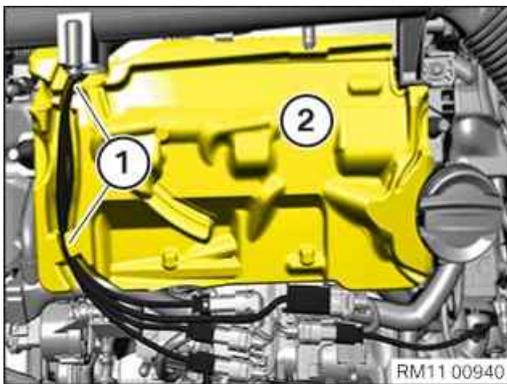
- Unclip the acoustic cover from the marked areas towards the top.

11 – Remove resonator



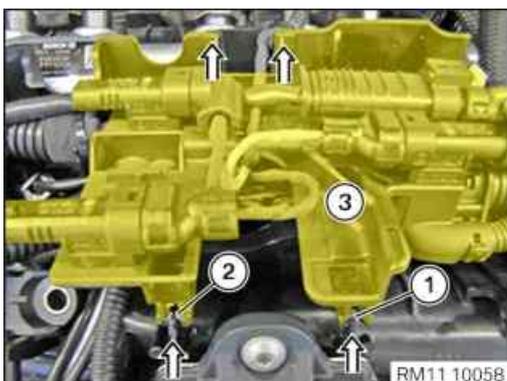
- Loosen screws (1).
- Guide out and remove the resonator (2).

12 – Remove the acoustic cover for the injectors



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

13 – Removing the cable clips from the intake plenum

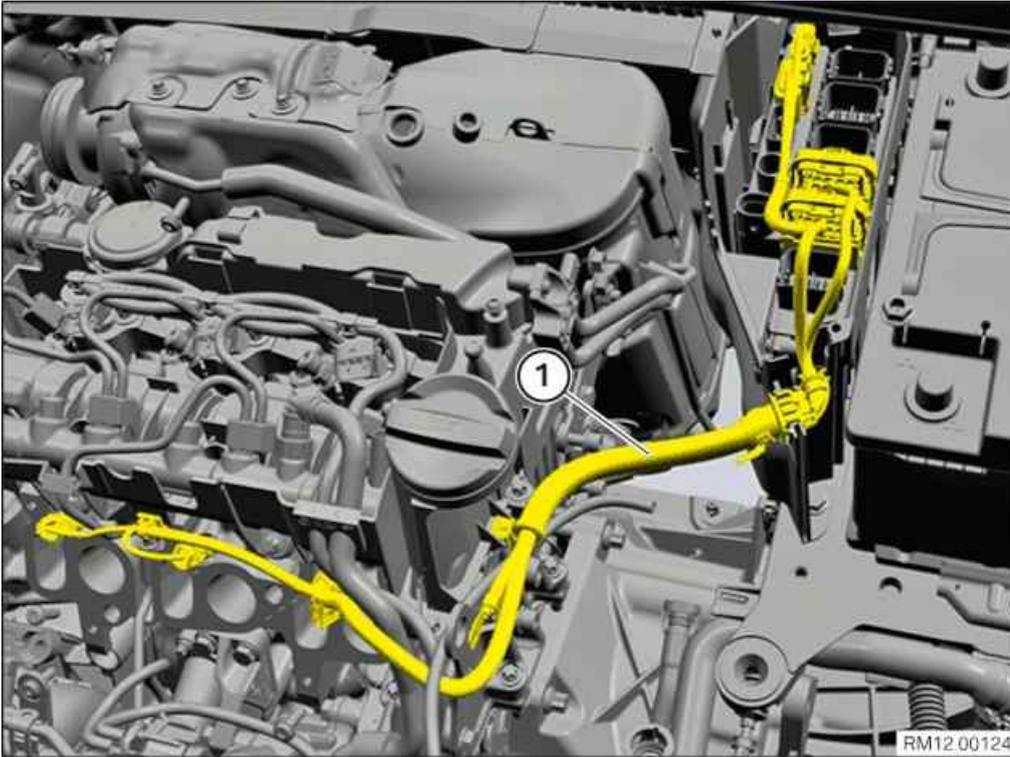


- Release the clips (1) and (2).
- Feed out the cable clip (3) in the direction of the arrow and set it aside.

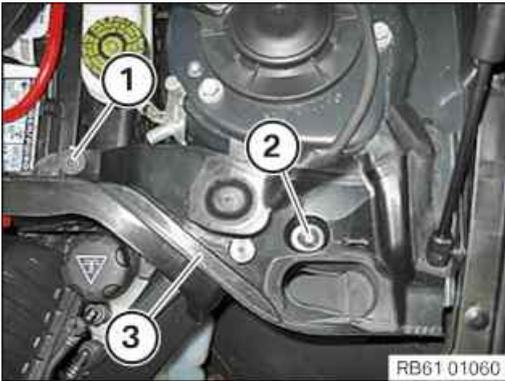
MAIN WORK

14 – Removing vehicle wiring harness for glow elements

Overview of the wiring harness for the glow elements



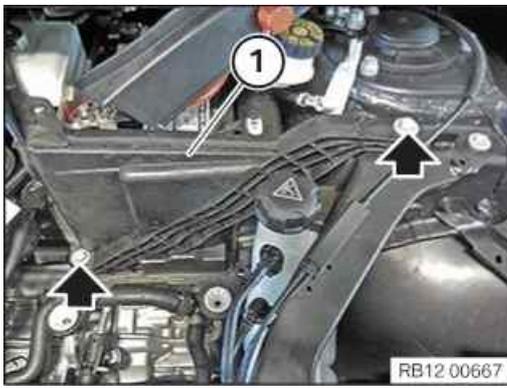
1. Wiring harness for the glow elements



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



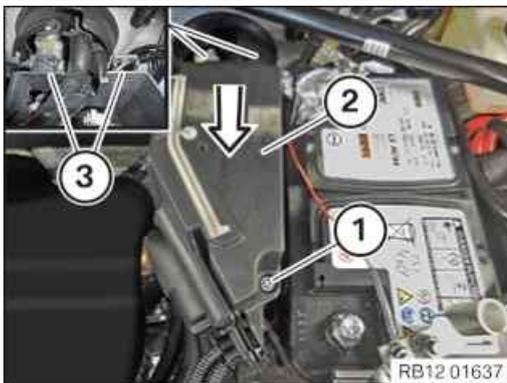
- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.



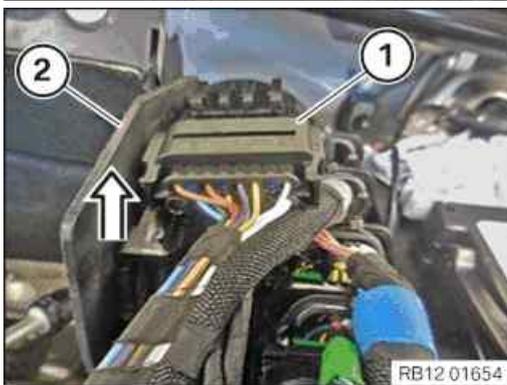
- Remove screws (arrows).
- Guide out tension strut (1) and remove.



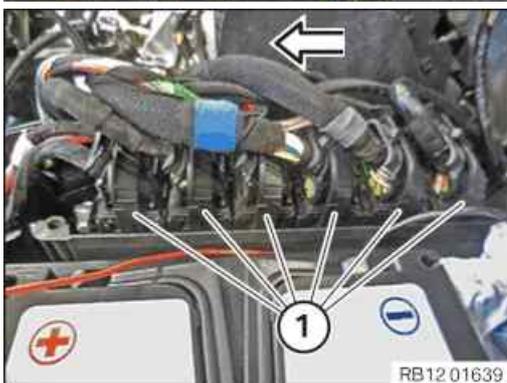
- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



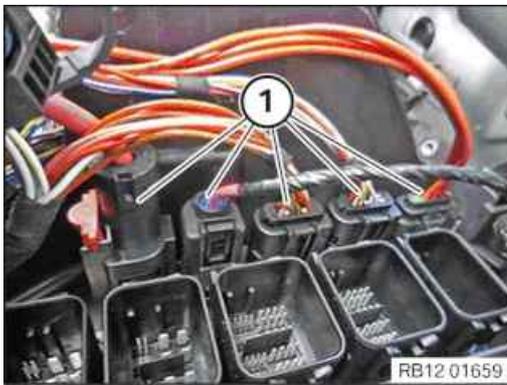
- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



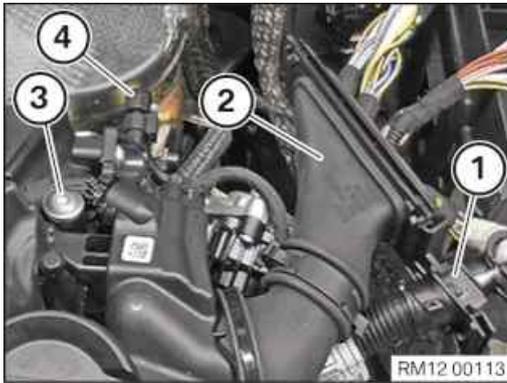
- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



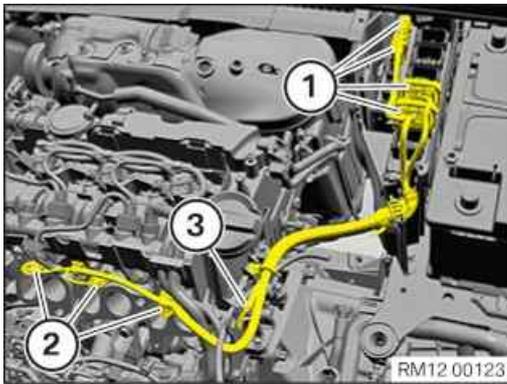
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



- Unlock and loosen connector (1).

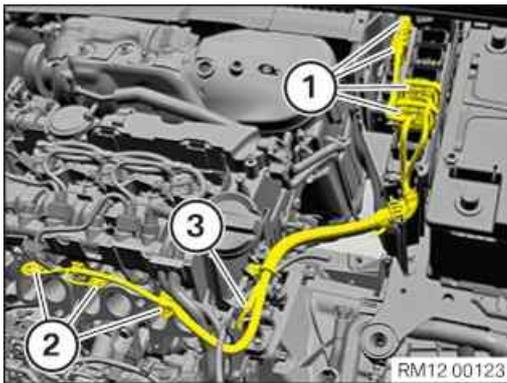


- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.



- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Pull off all connectors (2) from glow element using special tool **0 490 796 (11 1 480)**.
- Loosen screw (3) and remove the ground strap.
- Detach, feed out and remove the wiring harness from the clamps.

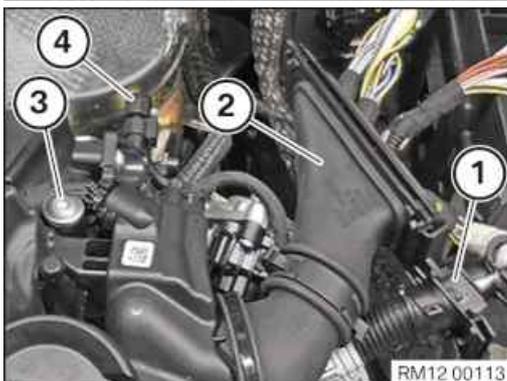
15 – Installing vehicle wiring harness for glow elements



- Lay vehicle wiring harness and fasten with clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Connect all connectors (2) to the glow elements and engage them audibly.
- Mount ground strap and tighten screw (3).

Ground cable to cylinder head

M6x12		Tightening torque	8 Nm
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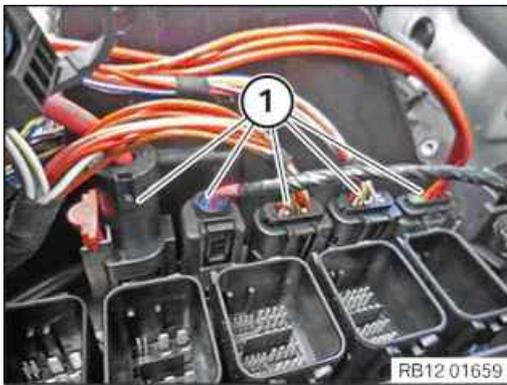


- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

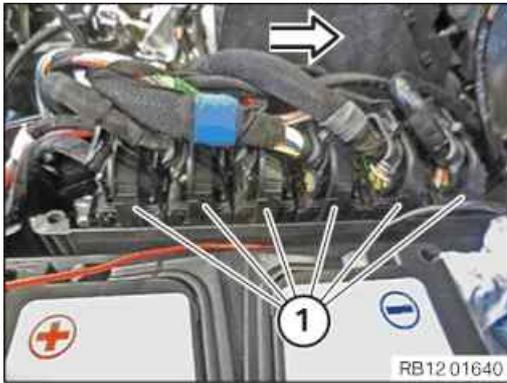
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm
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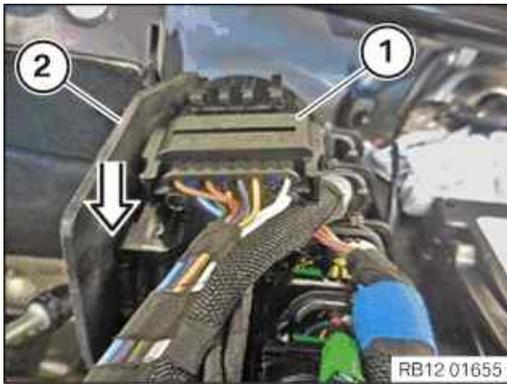
- Attach connector (4) to the differential pressure sensor and lock it audibly.



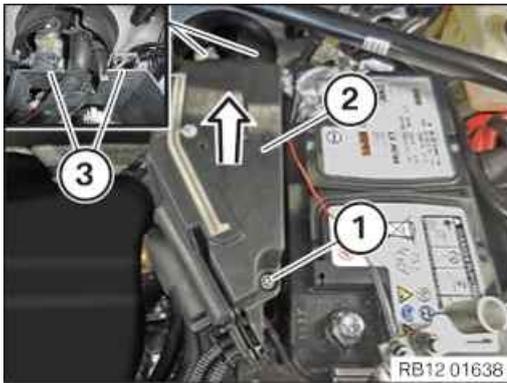
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



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



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



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

Cover to electronics box

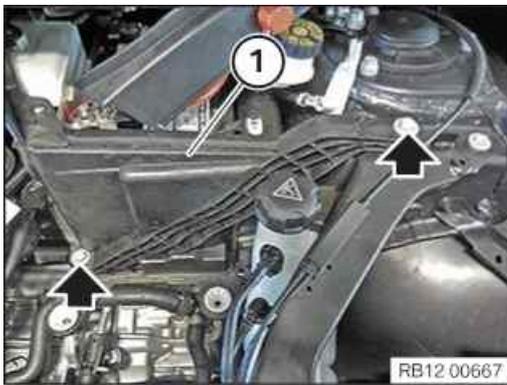
RF5x26.5	Tightening torque	2,5 Nm
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- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6	Tightening torque	5 Nm
-------	-------------------	------



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

Tension strut to spring strut dome/battery tray

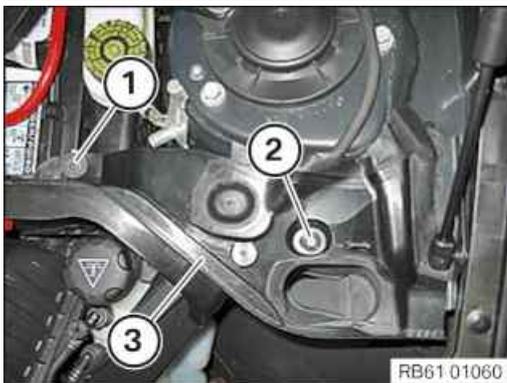
M8		Tightening torque	19 Nm
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- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

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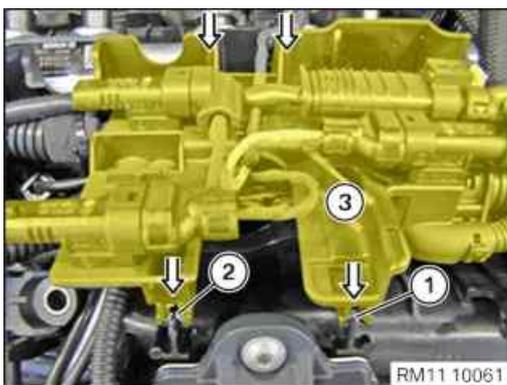
- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw			2,8 Nm
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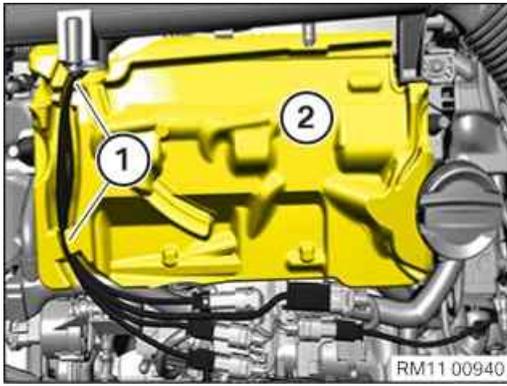
POSTPROCESSES

16 – Installing the cable clip for the intake plenum



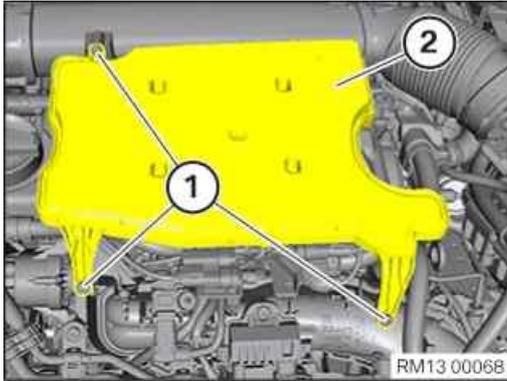
- Feed in and install the cable clip (3) in the direction of arrow.
- Engage clips (1) and (2).

17 – Install the acoustic cover for the injectors



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

18 – Install resonator



- Insert and install the resonator (2).
 - Renew screws (1).
- Parts:** Bolts
- Tighten the screws (1).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm
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19 – Install acoustic cover



RISK OF DAMAGE

Damage to the acoustic cover.

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

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

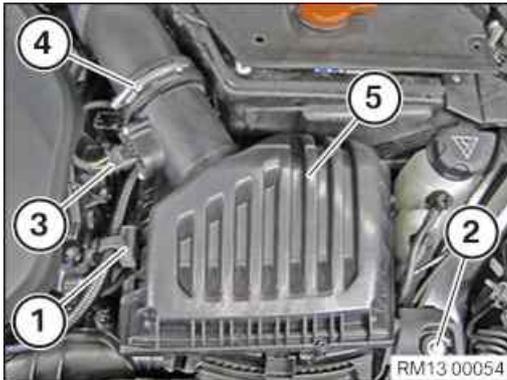


- Check for correct installation of all rubber mounts in the acoustic cover (1).



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

20 – Installing intake silencer housing



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

Intake silencer housing to lock bridge

M6X30	Tightening torque	8 Nm
-------	-------------------	------

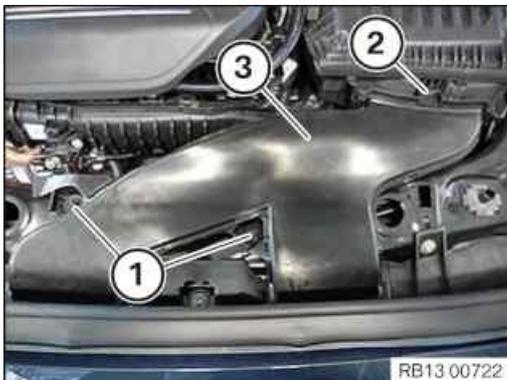
- Tighten clamp (4).

Clean air pipe to intake silencer housing

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

21 – Install the intake neck for the intake filter housing

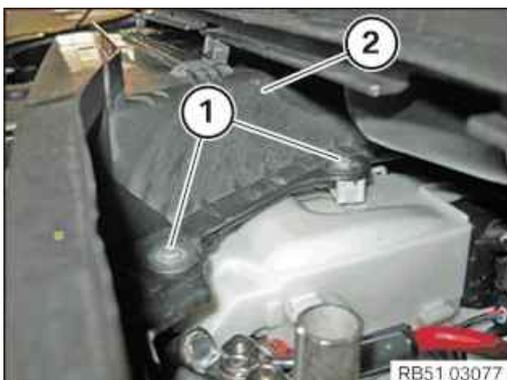


- Insert and install the intake neck (3). The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6	Tightening torque	8 Nm
----	-------------------	------

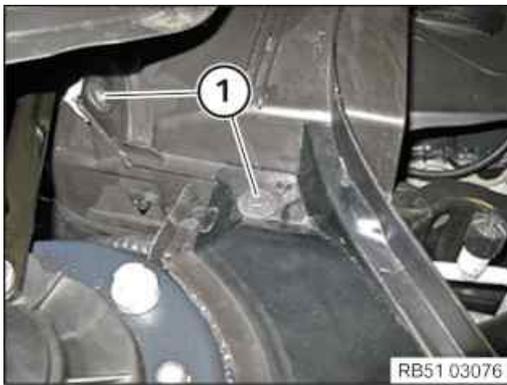
22 – Installing the upper bulkhead cover



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

Bulkhead cover, top

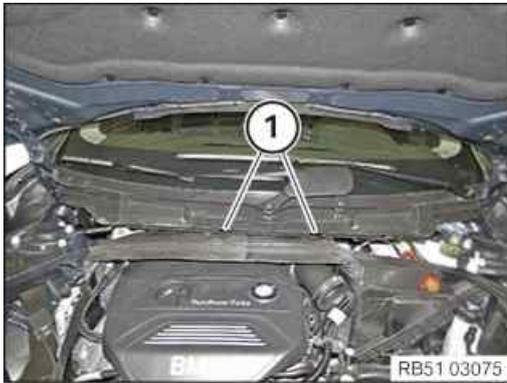
Screw	Tightening torque	3 Nm
-------	-------------------	------



- Tighten the screws (1).

Bulkhead cover, top

Screw	Tightening torque
	3 Nm



- Tighten the screws (1).

Bulkhead cover, top

Screw	Tightening torque
	3 Nm

23 – Install the rear cowl panel cover



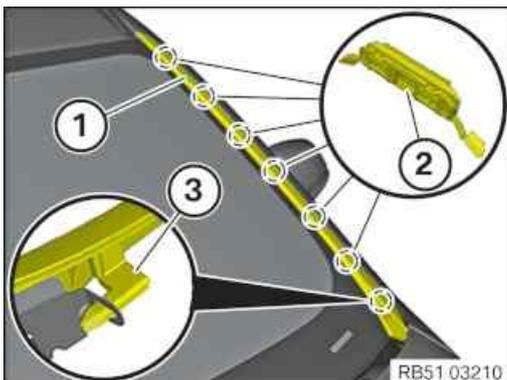
- Feed in and engage the rear cowl panel cover (1).

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



NOTICE

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



► Install the gutter strip on the windscreen

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

25 – Install left and right wiper arm



NOTICE

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

► Install the wiper arm

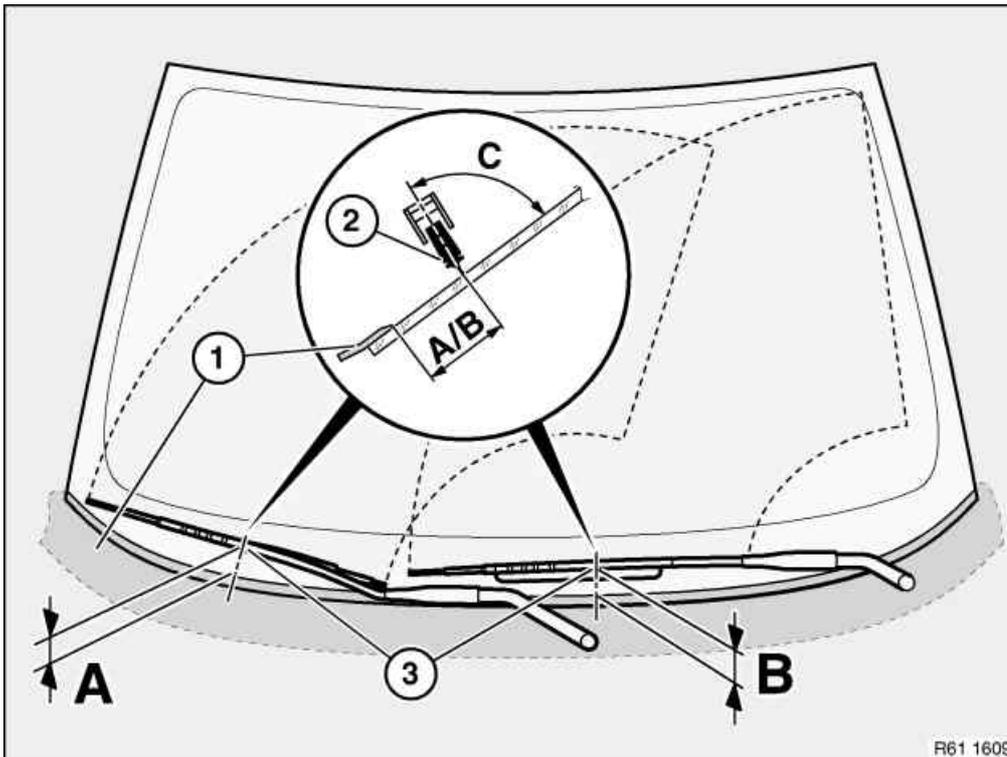


TECHNICAL INFORMATION

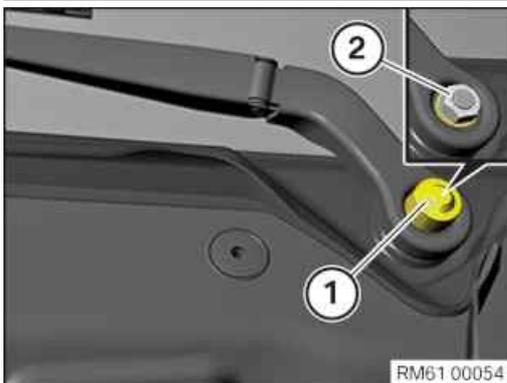
The wiper system must be in zero position.

After installing the cowl panel cover and before fitting the wiper arm:

Activate the wiper system once to ensure that it has the correct installation position.



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



NOTICE

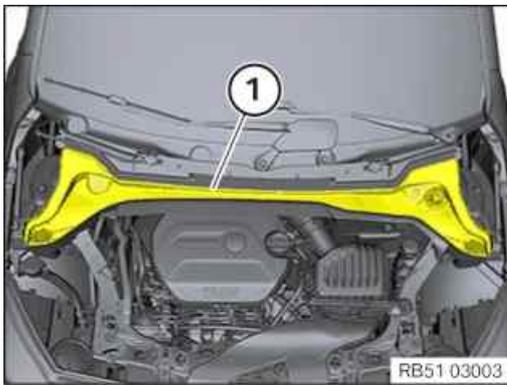
Description is for left component only. Procedure on the right side is identical.

- Tighten nut (2).

Windscreen wiper arm

Combination hexagon nut		Tightening torque	35 Nm
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- Connect the protective cap (1).



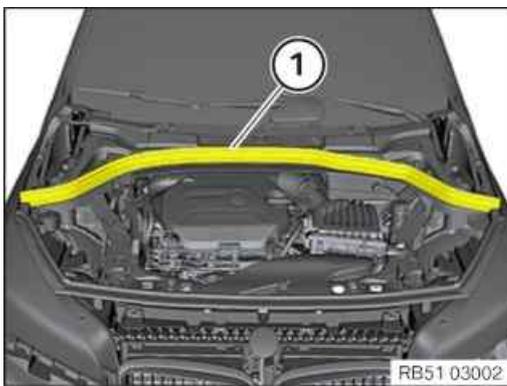
- Insert the cowl panel cover front (1) to the rear and install.
- Check cowl panel cover at front is correctly seated (1).

27 – Install the seal for the bonnet



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

28 – Disconnecting all battery earth leads



- See additional information.

Additional Information

Overview of Tightening Torques

Ground cable to cylinder head

Used in step [15](#)

M6x12	Tightening torque	8 Nm
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Wiring harness to cylinder head cover

Used in step [15](#)

TS5x20	Tightening torque	3,5 Nm
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Cover to electronics box

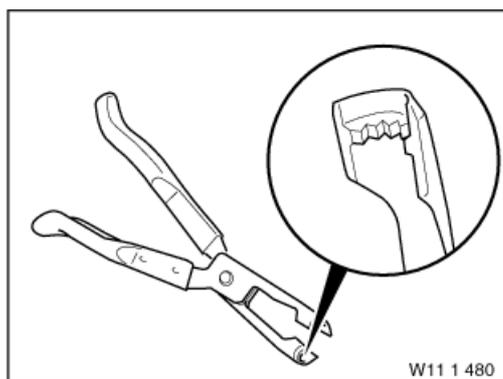
Used in step [15](#)

RF5x26.5	Tightening torque	2,5 Nm
----------	-------------------	--------

Positive battery terminal to battery			Used in step 15
NutM6		Tightening torque	5 Nm
Tension strut to spring strut dome/battery tray			Used in step 15
M8		Tightening torque	19 Nm
Positive battery connection point cover to engine compartment partition wall			Used in step 15
		Tightening torque	3 Nm
Battery cover			Used in step 15
Screw			2,8 Nm
Resonator to manifold and clean air pipe			Used in step 18
Screw TS6	Renew screw.	Tightening torque	5 Nm
Intake silencer housing to lock bridge			Used in step 20
M6X30		Tightening torque	8 Nm
Clean air pipe to intake silencer housing			Used in step 20
Clamp		Tightening torque	3 Nm
Intake neck to cross connection			Used in step 21
M6		Tightening torque	8 Nm
Bulkhead cover, top			Used in step 22
Screw		Tightening torque	3 Nm
Windscreen wiper arm			Used in step 25
Combination hexagon nut		Tightening torque	35 Nm

Overview of Special Tools

0 490 796 (11 1 480) Pliers



Common	Used in step 14
Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

Overview Technical Data

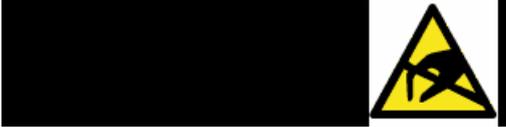
Links

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1 28

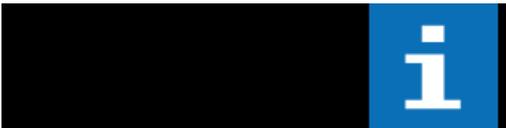
61 20 900 Disconnecting and connecting battery earth lead	1 28
61 20 900 Disconnecting and connecting battery earth lead	1 28
61 20 900 Disconnecting and connecting battery earth lead	1 28
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61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 28
61 20 900 Disconnecting and connecting battery earth lead	1 28
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 28
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1 28
61 20 900 Disconnecting and connecting battery earth lead	1 28
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61 20 900 Disconnecting and connecting battery earth lead	1 28
61 20 900 Disconnecting and connecting battery earth lead	1 28
61 35 ... Notes on ESD protection (Electro Static Discharge)	

**Special tools required:**

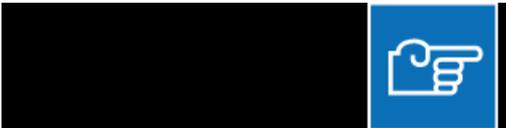
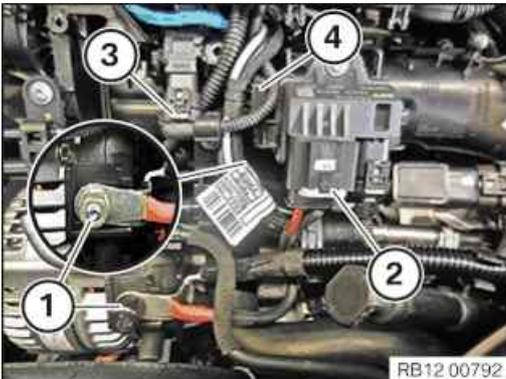
- [11 1 480](#)

**Important!**

[Read and comply with notes on protection against electrostatic damage \(ESD protection\).](#)

**Necessary preliminary tasks:**

- Disconnect [battery negative lead](#).
- Remove [resonator](#).

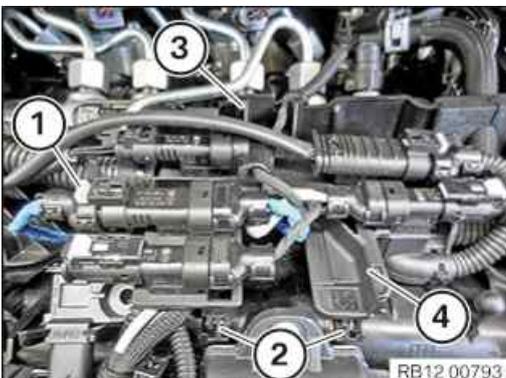
**Removal:**

Slacken nut (1).

Unlock connector (2) on preheating control unit and release.

Unlock connector (3) on charging pressure sensor and release.

Release clamp (4).

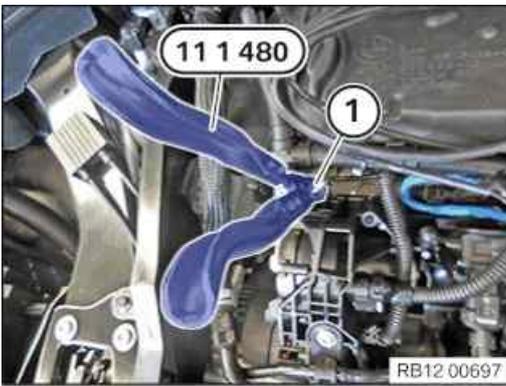


Unlock and disconnect plugs (1).

Release clamp (2).

Release cable clip (4) from guide (3).

Feed out the cable clip (4) and lay to one side.

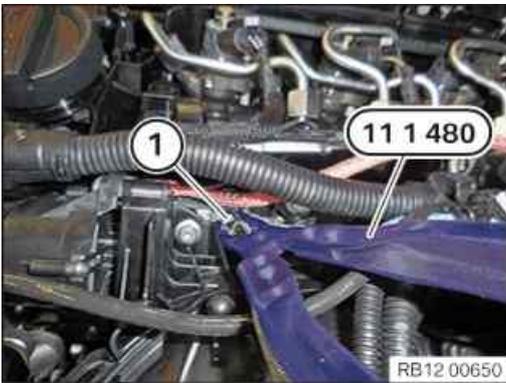


Unlock and remove connector (1) for glow elements with special tool [11 1 480](#) .

Feed out and remove the wiring harness section for the preheating system.



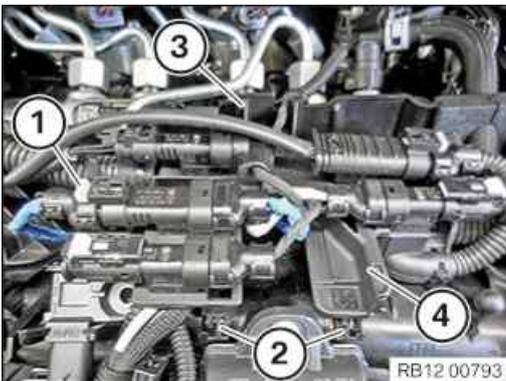
Installation:



Feed in the wiring harness section for the preheating system and install.

Attach and lock connector (1) for glow elements.

All connectors (1) for glow elements must engage audibly.



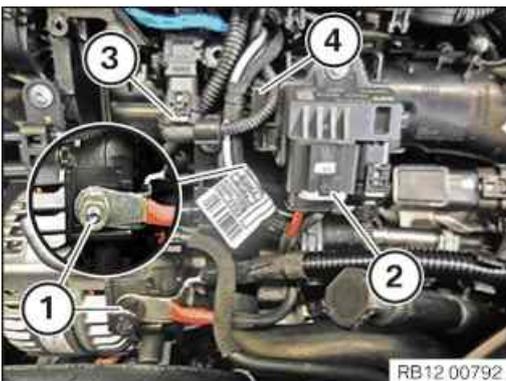
Insert cable clip (4) into the guide (3).

Feed in and install the cable clip (4).

Secure clamp (2).

Attach and lock connector (1).

Connector (1) must engage audibly.



Secure clamp (4).

Connect and lock connector (2) on preheating control unit.

Connect and lock connector (3) on charging pressure sensor.

All connectors must audibly engage.

Tighten nut (1).

Tightening torque [12 52 2AZ](#).



Required follow-up work:

- Install [resonator](#).
- Connect [battery earth lead](#).

61 00 ... Safety information on handling hybrid cars

1. *Qualification:*

All repair work on high-voltage components may **only be performed by specially trained personnel** (qualification: Work on high-voltage inherently safe vehicles) must be performed by qualified technicians. Each hybrid car requires additional vehicle specific training with training achievement controls. Required training is offered by the BMW Training Academy.

2. *Identification:*

Observe **warning notices** on high-voltage components. When replacing individual high-voltage components, check if warning stickers are present. Independently attaching warnings is only allowed on the locations provided for them. Use only approved and appropriately identified original new parts.

3. *Rules of conduct/protective measures:*

- Note operating instructions for handling high-voltage battery units.
- Do not under any circumstances touch open high-voltage cables and high-voltage components on damaged vehicle before shutting down the high-voltage electrical system.
- In the event of damage (mechanical, thermal) transition metal oxides, carbon, electrolyte solvents and their products of decomposition may be released.
Suitable acid-resistant protective clothing/equipment must therefore be used when handling the vehicle!
 - Hand protection: Gloves
 - Eye protection: Safety goggles

Damaged high-voltage battery units must be stored in an acid-resistant pan in a location in the open that is protected against the weather (sun, rain) and secured against unauthorised access. Do not inhale escaping gasses.

- Prevent escaping substances from entering drains, pits and the sewer system.
- Collect any material that is discharged and have it disposed of according to the work instruction, wear acid-resistant protective clothing when doing so.
- Notify the fire brigade if fire breaks out, clear the area immediately and make accident scene safe. Attempt to extinguish the fire without putting persons in danger (suitable extinguishant: water and water foam).
- A cut 2nd emergency separation point must be repaired with a butt connector.

4. *Measures before starting work:*

- Each job on the vehicle must be assigned by appropriately trained personnel. Before work is started, this electrician must place the vehicle in the operating condition required to perform the relevant activity. The qualified personnel's instructions and directions absolutely must be followed. **No work may be carried out without this qualified personnel being consulted first.**
- It is **not** permitted to work on the high voltage system or on high voltage components while the engine is running.
- The readiness to drive must be ended before shutting off the voltage of the high-voltage system. The readiness to drive is ended when the driver is absent only under the following conditions:
 1. seat belt buckle unlocked **and**
 2. the driver's door is open **and**
 3. no brake activated **and**
 4. the accelerator pedal is not activated **and**
 5. speed < 3 km/h (2 mph)
- Work on live high-voltage components is expressly prohibited. Before each operation on the high-voltage system, the system must be isolated from the power supply by qualified personnel (high-voltage safety connector Off) and secured against unauthorised recommissioning (padlock).
- After each deactivation of the high-voltage system, it is essential to observe a **waiting period** of at least **10 seconds** prior to further work.
- Before beginning work, it is mandatory to check that the equipment is de-energised and is protected against being energised again.
Work is only permitted to begin if:
 1. Corresponding display in the KOMBI **High-voltage system deactivated** or
When a high-voltage warning is active (indicator light, Check Control, etc.), it is essential to determine and eliminate the cause of this warning via the diagnosis system before continuing with any other work. **If it cannot be definitively established that the equipment is de-energised**, work is not permitted to begin. **Danger to life!** Before work begins, a qualified electrician (1000 V AC) must verify that the system is de-energised using appropriate measuring devices and procedures.
=> In this case, Technical Support must be contacted!
- Do not perform any work on the vehicle while it is charging. Before starting work, disconnect the charging

cable from the vehicle.

Battery charging may result in heating of the high-voltage battery unit. This heating may lead to sporadic launches of the electric fan (switch-on request from the electric fan). Therefore, work in the vicinity of the electric fan during the charging procedure is prohibited. Ensure freedom of movement of the battery charge lines in the vicinity of the electric fan.

5. *Measures during/after activities:*

- Identifiable mechanical damage to or tampering with high-voltage components must be reported immediately to the qualified personnel in charge.
- When carrying out any work on the high-voltage system, it is prohibited to drive externally all the drivetrain components (wheels, gearbox, drive shafts, etc.).
- *E72 only:* When the "Power Electronic Box Cover" is removed, the high-voltage system is not permitted to be activated. The high-voltage service disconnect must only be used when the "Power Electronics Box Cover" is completely installed.
- High-voltage cables (orange coating) and their connectors and stop parts **may not** be repaired. If damaged, a cable must always be replaced completely.
- When working in the vicinity of high-voltage components (identified accordingly with warning stickers and orange-coloured coating), protect these components against damage.
- The specified work steps in the repair instructions must be adhered to exactly.
- High-voltage components and their holders must be screwed/bolted to the defined tightening torque. Tightening torques and tightening specifications must be observed.
- Connecting high-voltage components to body ground is crucial to safety for reasons of equipotential bonding. For this reason, it is prohibited to operate any high-voltage components without them being correctly connected to body ground. The measurements (insulation/potential equalisation measurement) are performed automatically by the vehicle. Manual measurement is not therefore necessary. For a correct earthing connection, the retaining elements of high-voltage components must not be painted. Follow further [painting notes](#).
- Removed high-voltage battery units must be stored in a manner that protects them from misuse and damage.
- Damaged or warning stickers that are no longer legible on high-voltage components must always be replaced.

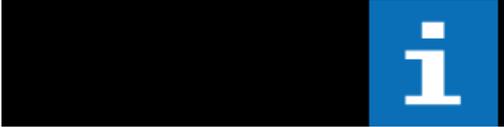
6. *Potential compensation:*

Equipotential bonding lines, high-voltage cables and the battery negative lead to the EME are fitted with safety screws.

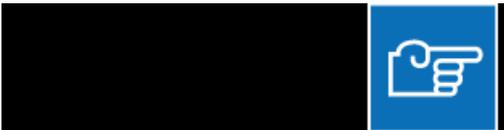
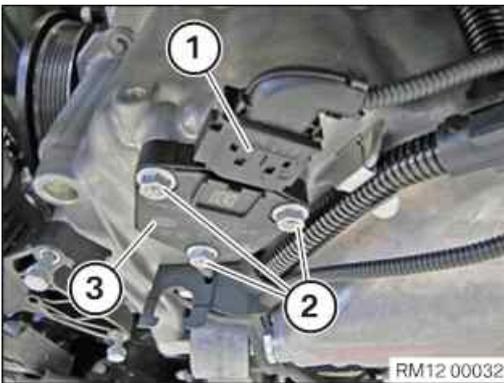
- Clean contact faces and have then checked by a second person.
- Tighten down screws/bolts to specified torque.
- Have tightening torque checked by a second person.
- Both persons must document that the work has been carried out correctly in the vehicle records.

**Attention!**

Read and comply with notes on [protection against electrostatic discharge \(ESD protection\)](#)!

**Necessary preliminary tasks:**

- Remove front [underbody protection](#).
- Drain [engine oil](#).

**Removal:**

Unlock connector (1) and pull off.

Unscrew nuts (2).

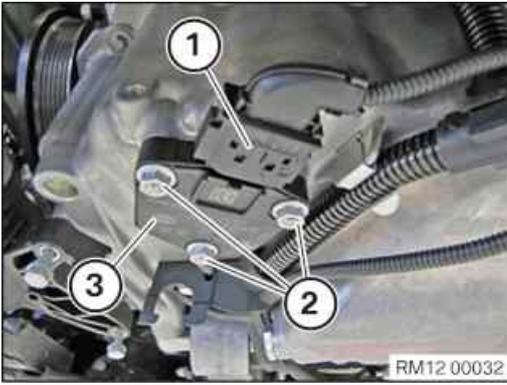
Remove oil level sensor (3).

**Preparation for installation:**

Replace sealing ring (1).

Part: Sealing ring

**Installation:**



Install oil-level sensor (3).

Tighten down nuts (2).

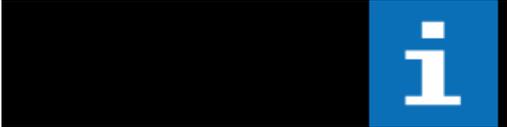
If tightening torque value is too low oil leaks will result.

If tightening torque value is too high damage to the oil-level sensor will result.

Tightening torque [12 61 1AZ](#).

Connect connector (1) on oil-level sensor.

Connector (1) must engage audibly.



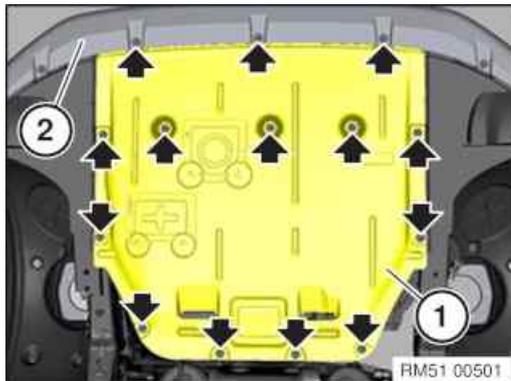
Required follow-up work:

- Install front [underbody protection](#).
- Top up [engine oil](#).
- Check stored error/fault messages.
- Delete the fault memory.

12 61 280 Removing and installing/replacing oil pressure switch

PRELIMINARY WORK

1 – Removing the front underbody protection



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

MAIN WORK

2 – Removing the oil pressure switch



WARNING

Hot fluids.

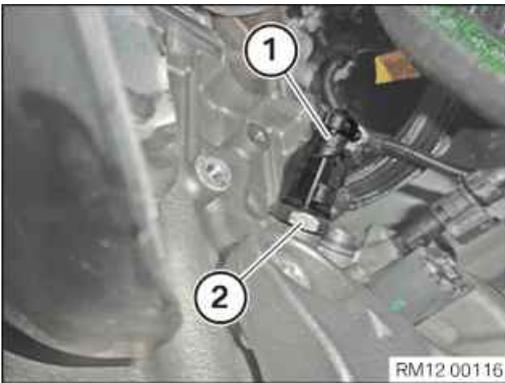
Risk of scalding!

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



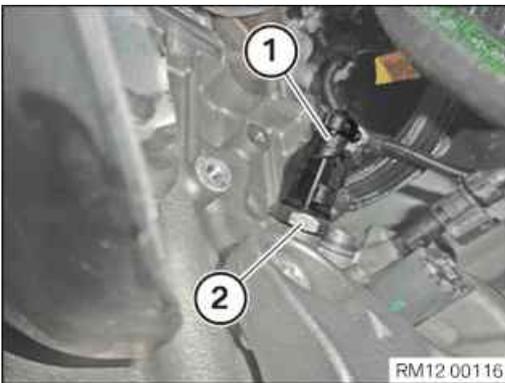
TECHNICAL INFORMATION

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



- Unlock and disconnect the plug connection (1).
- Loosen and remove the oil pressure switch (2).
- Catch and dispose of emerging engine oil.

3 – Installing the oil pressure switch



- Renew oil pressure switch (2).

Parts: Oil pressure sensor

- Guide in and install oil pressure switch (2).
- Tighten oil pressure switch (2).

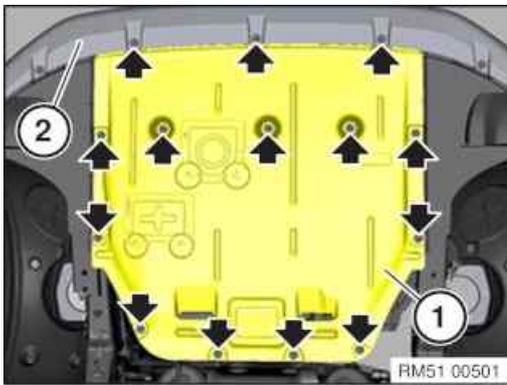
Oil pressure switch to crankcase

Sensor	Replace oil pressure switch.	Tightening torque	22 Nm
--------	------------------------------	-------------------	-------

- Connect connectors (1) and lock.
The connector (1) must engage audibly.

POSTPROCESSES

4 – Installing the front underbody protection



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

Underbody protection front

			3 Nm
--	--	--	------

5 – Check engine oil level

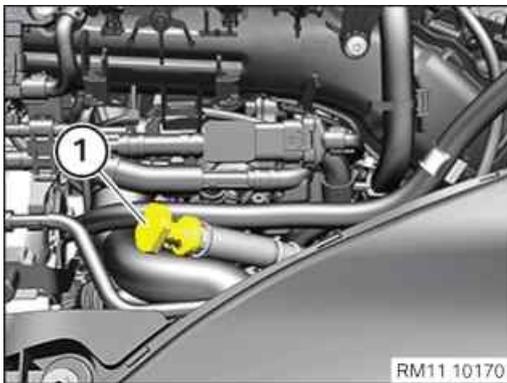
- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.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

► Check engine oil level



TECHNICAL INFORMATION

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



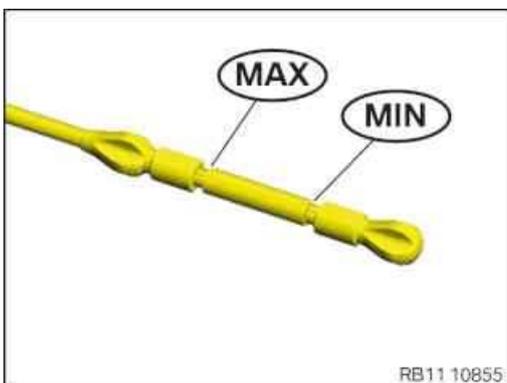
- Park vehicle on a horizontal surface.
- Stop the engine and wait for 5 minutes.
- Pull out the oil dipstick (1) and wipe off using a lint-free cloth.



TECHNICAL INFORMATION

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

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



TECHNICAL INFORMATION

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

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

Additional Information

Overview of Tightening Torques

Oil pressure switch to crankcaseUsed in step [3](#)

Sensor	Replace oil pressure switch.	Tightening torque	22 Nm
--------	------------------------------	-------------------	-------

Underbody protection frontUsed in step [4](#)

			3 Nm
--	--	--	------

Overview Technical Data

**Necessary preliminary tasks:**

- Remove [fan cowl](#).

**Removal:**

The oil pressure switch is located beneath the high pressure pump.

Attention!

A small amount of engine oil emerges when oil pressure switch is removed.

Keep a lint-free cleaning cloth ready.

Catch and dispose of engine oil.

Unlock connector (1) and pull off.

Release and remove oil pressure switch (2).

**Installation:**

Replace sealing ring.

Part: Sealing ring

Install and tighten oil pressure switch (2).

Tightening torque [12 61 2AZ](#).

Attach connector (1).

Connector (1) must engage audibly.

**Required follow-up work:**

- Install [fan cowl](#).
- Check engine oil level.

12 61 586 Replace oil pressure sensor



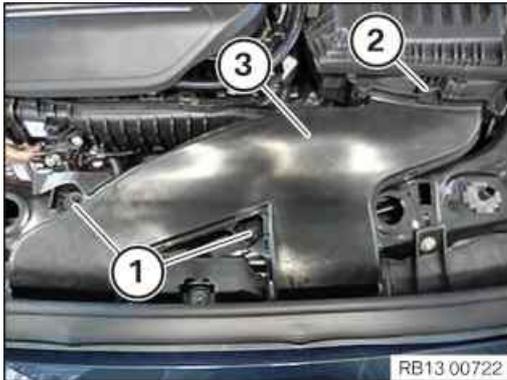
TECHNICAL INFORMATION



- When the engine is stopped after the end of the journey, it may be necessary to run the electric fan. In rare cases, operation of the electric fan can last up to 11 min. This protects the components. In this case, replacing the electric fan will not remedy the problem!

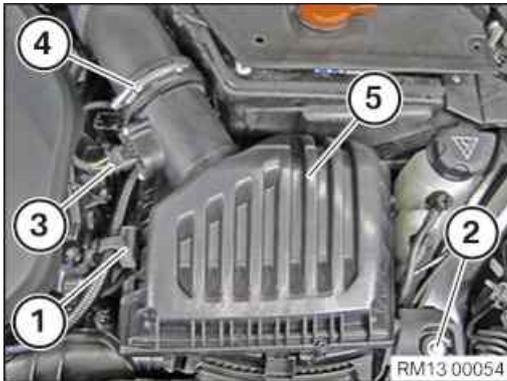
PRELIMINARY WORK

1 – Remove the intake neck for intake silencer housing



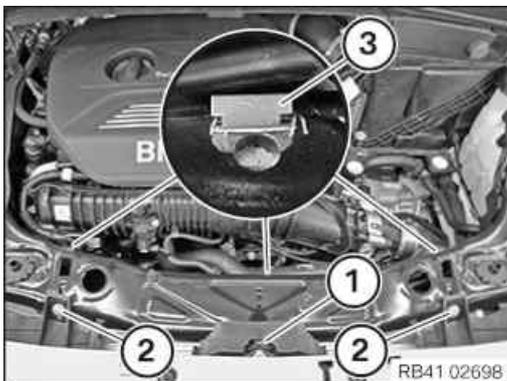
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

2 – Removing intake silencer housing

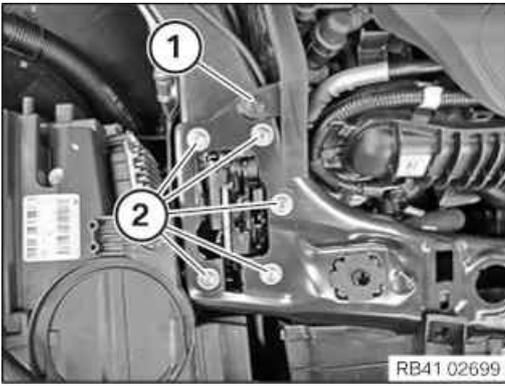


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

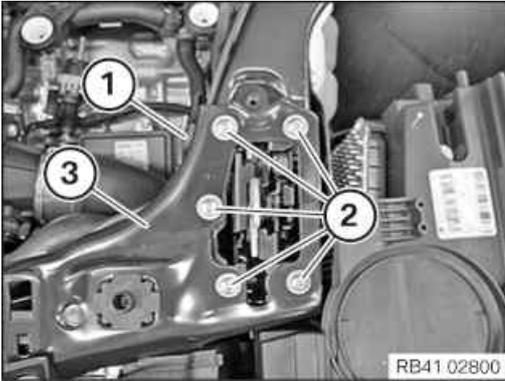
3 – Remove cross connection



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



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



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

4 – Removing the fan cowl with electric fan

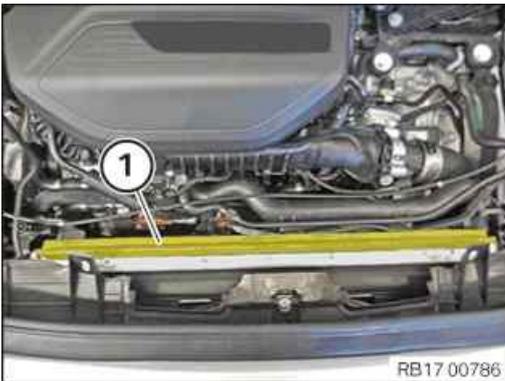


WARNING

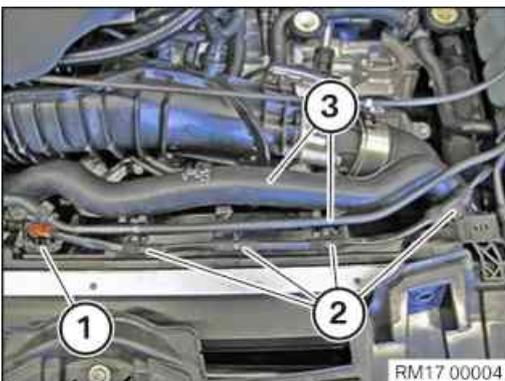
Hot surfaces.

Risk of burning!

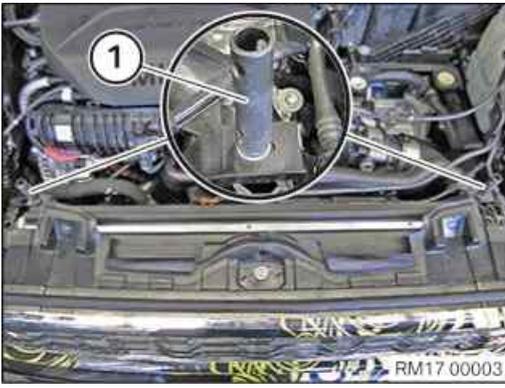
- Perform all work only on components that have cooled down.



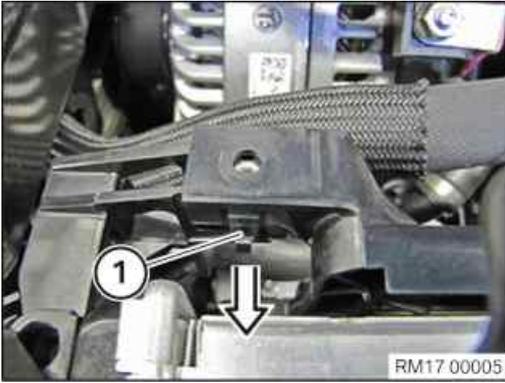
- Feed out and remove the sealing (1) from the radiator.



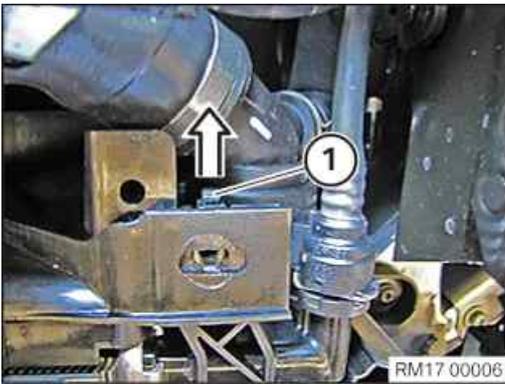
- Unlock plug connection (1) and disconnect.
- Unlock and loosen the clamps (2).
- Feed out connector (1) and place to one side.
- Thread off coolant line (3) and place to the side.



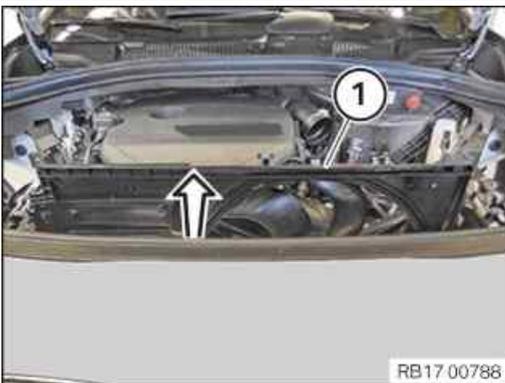
- Loosen screws (1).



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



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



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

MAIN WORK

5 – Remove oil pressure sensor



WARNING

Hot fluids.

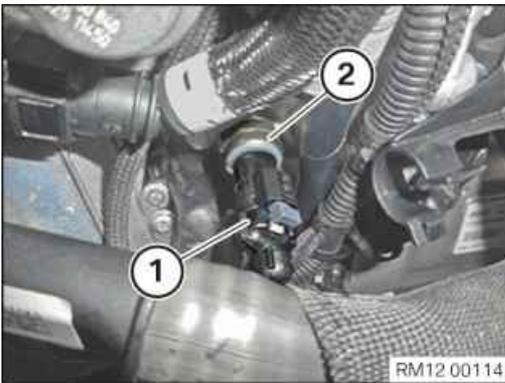
Risk of scalding!

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



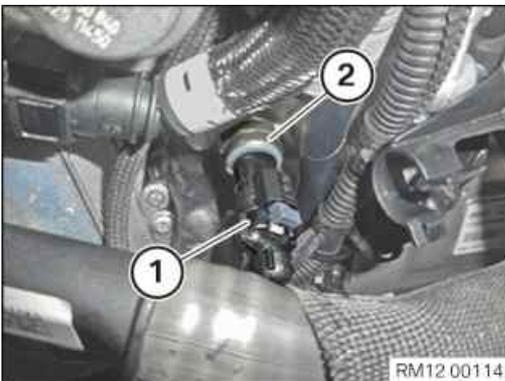
TECHNICAL INFORMATION

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



- Unlock and disconnect the plug connection (1).
- Release and remove oil pressure sensor (2) under the high pressure pump.
- Catch and dispose of emerging engine oil.

6 – Install oil pressure sensor



- Guide in and install the oil pressure sensor (2).
- Tighten the oil pressure sensor (2).

Oil pressure sensor on crankcase

Sensor	Tightening torque
	15 Nm

- Connect connectors (1) and lock.
The connector (1) must engage audibly.

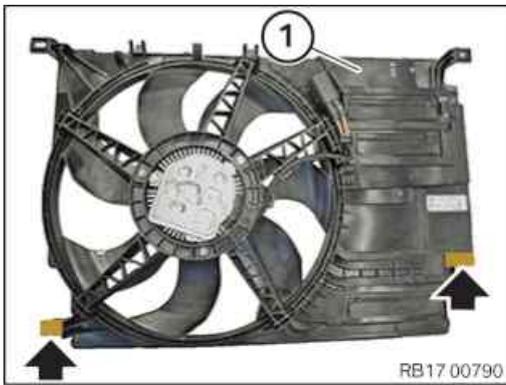
POSTPROCESSES

7 – Installing fan cowl with electric fan

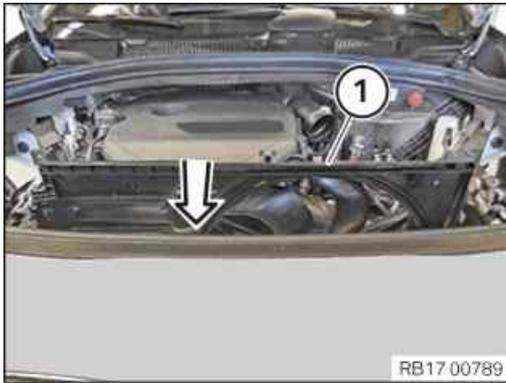


TECHNICAL INFORMATION

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



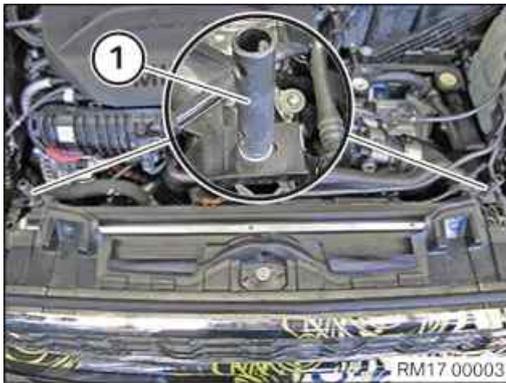
- Feed the guides (arrows) of the fan cowl (1) into the charge air cooler.



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



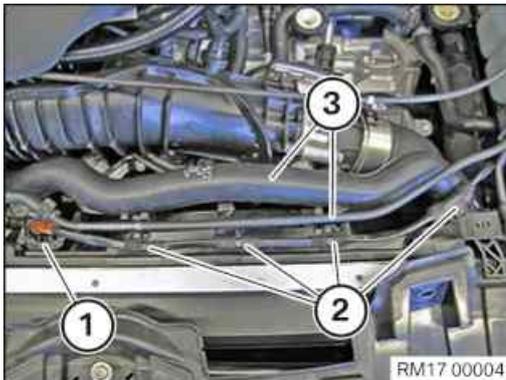
- Lock the left and right locks (arrows).



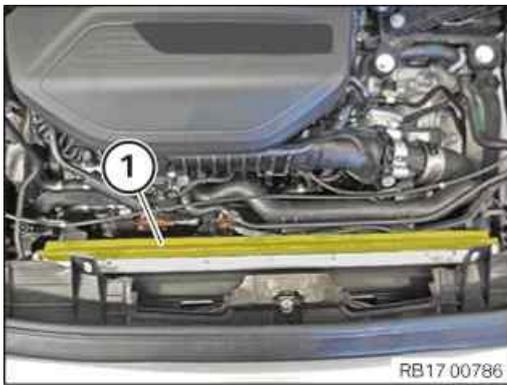
- Tighten the screws (1).

Fan cowl on radiator

M6X12	Tightening torque	6 Nm
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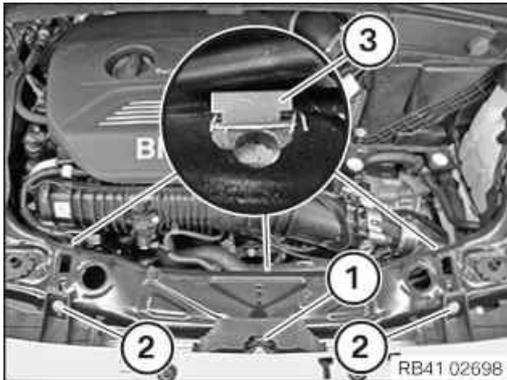


- Connect connectors (1) and lock.
The connector (1) must engage audibly.
- Secure clamps (2).
- Thread in and install coolant line (3).



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

8 – Install cross connection



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

Bracing strut to top cross connection

M8		Tightening torque	25 Nm
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- Tighten down screws (2).

Air duct to deformation element/cross connection

M6x20 screw		Tightening torque	6 Nm
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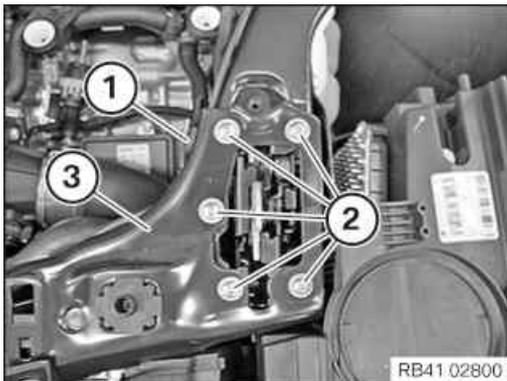
- Fasten clamps (3) for bonnet lock Bowden cable to cross connection.

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

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm
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- Fasten expanding rivet (1).

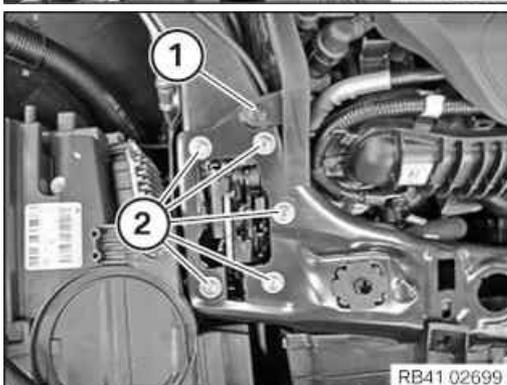


- Tighten down screws (2).

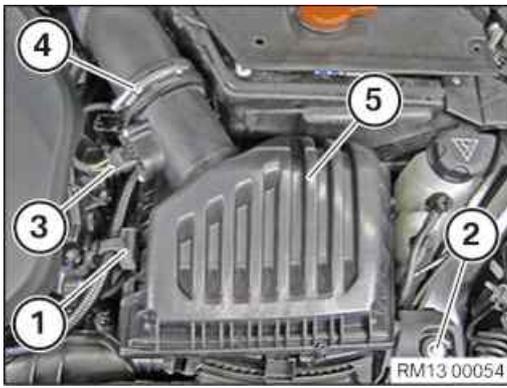
Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm
-------	--	-------------------	-------

- Fasten expanding rivet (1).



9 – Installing intake silencer housing



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

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm
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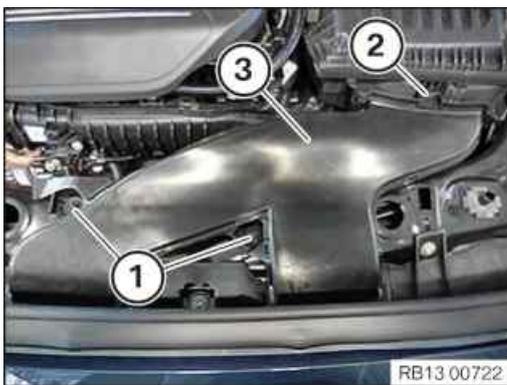
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm
-------	--	-------------------	------

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

10 – Install the intake neck for the intake filter housing



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

Intake neck to cross connection

M6		Tightening torque	8 Nm
----	--	-------------------	------

11 – Check engine oil level

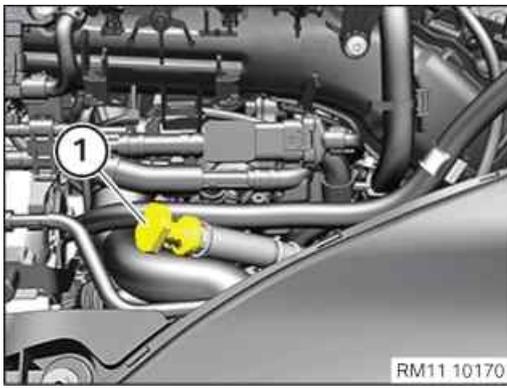
- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.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

► Check engine oil level



TECHNICAL INFORMATION

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



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

i

TECHNICAL INFORMATION

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

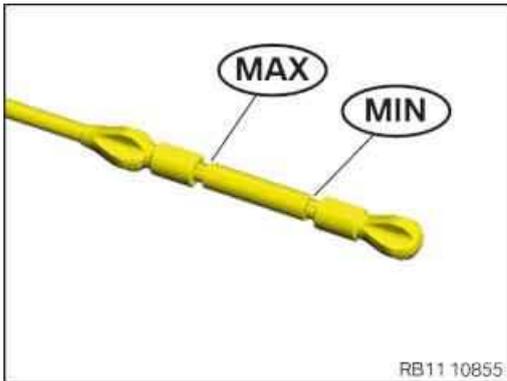
- Push the oil dipstick (1) into the guide tube up to the limit position and pull it out again.

i

TECHNICAL INFORMATION

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

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



Additional Information

Overview of Tightening Torques

Oil pressure sensor on crankcase			Used in step 6
Sensor		Tightening torque	15 Nm
Fan cowl on radiator			Used in step 7
M6X12		Tightening torque	6 Nm
Bracing strut to top cross connection			Used in step 8
M8		Tightening torque	25 Nm
Air duct to deformation element/cross connection			Used in step 8
M6x20 screw		Tightening torque	6 Nm
Cross connection on support for cross connection			Used in step 8
M6x20		Tightening torque	12 Nm
Intake silencer housing to lock bridge			Used in step 9
M6X30		Tightening torque	8 Nm
Clean air pipe to intake silencer housing			Used in step 9
Clamp		Tightening torque	3 Nm
Intake neck to cross connection			Used in step 10
M6		Tightening torque	8 Nm

Overview Technical Data

12 61 285 Replacing engine oil level sensor



RISK OF DAMAGE



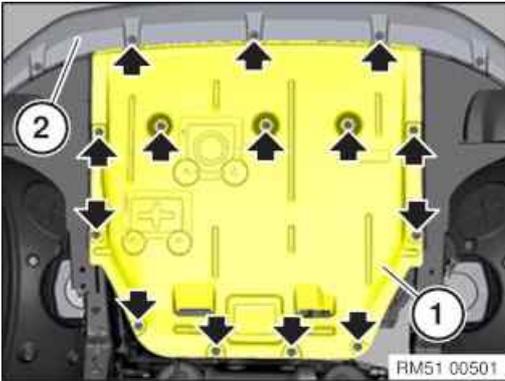
Electrostatic discharge.

Damage to or destruction of electrical components.

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

PRELIMINARY WORK

1 – Removing the front underbody protection



- Remove screws (arrows).
- Pull the front underbody protection (1) from underneath the bumper panel (2).

MAIN WORK

2 – Removing the engine oil-level sensor



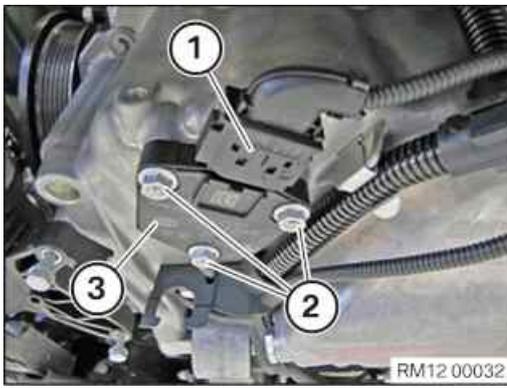
RISK OF DAMAGE



Electrostatic discharge.

Damage to or destruction of electrical components.

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



- Unlock connector (1) and pull off.
- Loosen nuts (2).
- Feed out and remove the oil-level sensor (3).

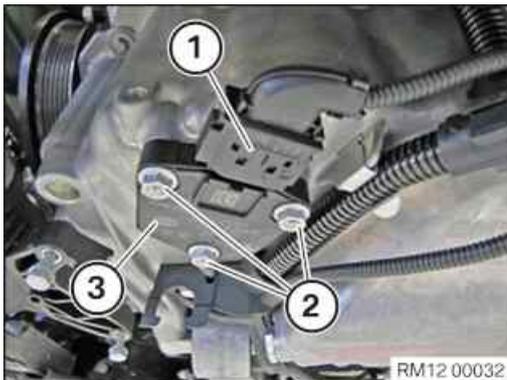
3 – Installing the oil-level sensor for engine oil

► Prepare the oil-level sensor



- Renew sealing ring (1).

Parts: Sealing ring



- Clean sealing surface on oil sump.
- Insert and install the oil-level sensor (3).
- Tighten nuts (2).

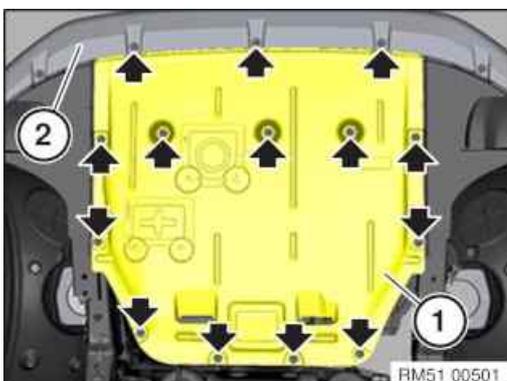
Oil level sensor to oil sump

M6		Jointing torque	2 Nm
		Tightening torque	8 Nm

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

POSTPROCESSES

4 – Installing the front underbody protection



- Position the front underbody protection (1) under the bumper panel (2).
- Tighten screws (arrows).

Underbody protection to body

Screw		Tightening torque	2.5 Nm
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5 – Check engine oil level

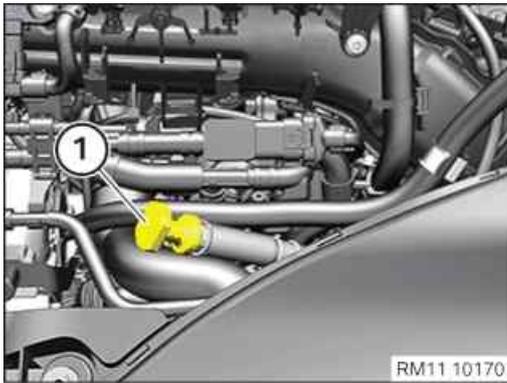
- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.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

► **Check engine oil level**



TECHNICAL INFORMATION

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



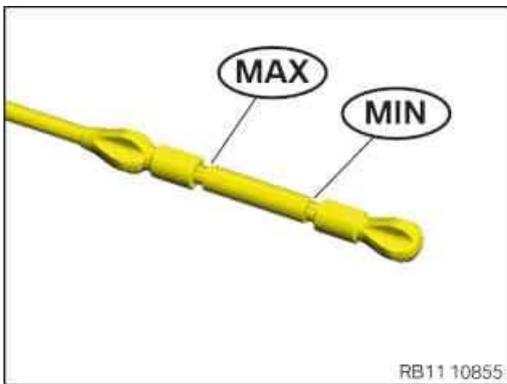
- Park vehicle on a horizontal surface.
- Stop the engine and wait for 5 minutes.
- Pull out the oil dipstick (1) and wipe off using a lint-free cloth.



TECHNICAL INFORMATION

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

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



TECHNICAL INFORMATION

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

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

6 – Reading out the fault memory



- Connect diagnosis system.

Check

- Read out fault memory.

Result

» A fault memory entry is present.

Measure

- Delete the fault memory, work through the test module if applicable.

Additional Information

Overview of Tightening Torques

Oil level sensor to oil sump

Used in step 3

M6		Jointing torque	2 Nm
		Tightening torque	8 Nm

Underbody protection to body

Used in step 4

Screw		Tightening torque	2.5 Nm
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Overview Technical Data

Links

Repair instructions

Used in step

[61 35 ... Notes on ESD protection \(Electro Static Discharge\)](#)

2

Operating materials

Used in step

[3.0 Technically appropriate engine oils for BMW Group engines](#)

12 61 285 Replacing engine oil level sensor

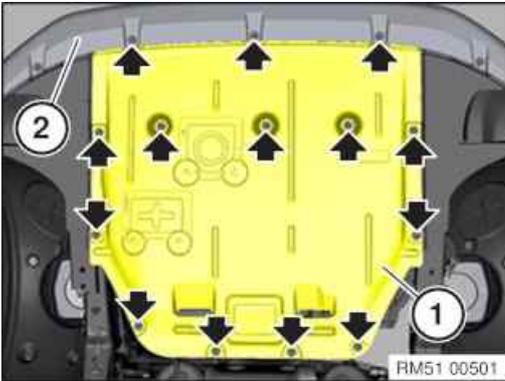
PRELIMINARY WORK

1 – Removing the oil filler cap



- Open oil filler cap (1).

2 – Removing the front underbody protection



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

3 – Releasing the oil drain plug



WARNING

Hot fluids.

Risk of scalding!

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



TECHNICAL INFORMATION

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

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

4 – Removing the engine oil-level sensor



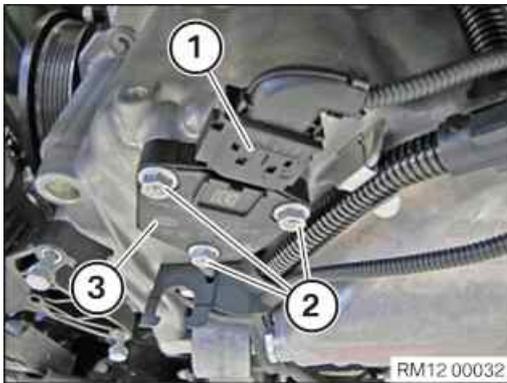
RISK OF DAMAGE



Electrostatic discharge.

Damage to or destruction of electrical components.

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



- Unlock connector (1) and pull off.
- Loosen nuts (2).
- Feed out and remove the oil-level sensor (3).

5 – Installing the oil-level sensor for engine oil

► **Prepare the oil-level sensor**

- Renew sealing ring (1).

Parts: Sealing ring

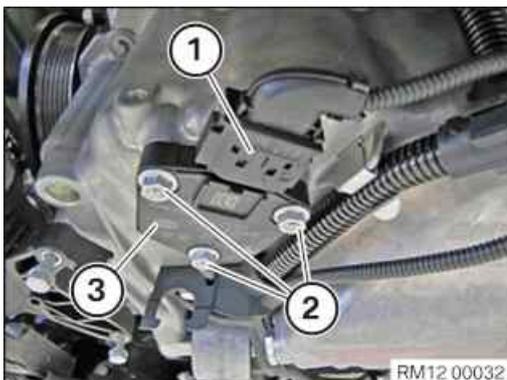


- Clean sealing surface on oil sump.
- Insert and install the oil-level sensor (3).
- Tighten nuts (2).

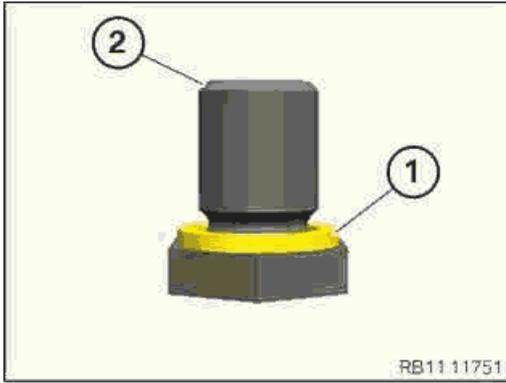
Oil level sensor to oil sump

M6	Jointing torque	2 Nm
	Tightening torque	8 Nm

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



6 – Tightening the oil drain plug



- Renew sealing ring (1) on the oil drain plug (2).
- Parts:** Sealing ring
- Guide in the sealing ring (1) on the oil drain plug (2) and install.

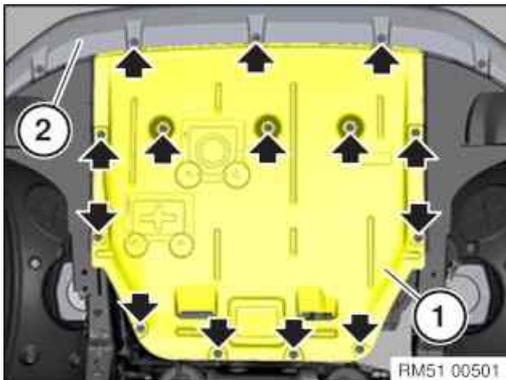


- Renew the sealing ring.
- Parts:** Sealing ring
- Position oil drain plug (1) on the oil sump and tighten.

Oil drain plug on oil sump

M12x1.5	Renew the sealing ring.	Tightening torque	25 Nm
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7 – Installing the front underbody protection



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

Underbody protection front

			3 Nm
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8 – Topping up the engine oil



RISK OF DAMAGE

Damage to the petrol particulate filter.

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

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



RISK OF DAMAGE

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

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

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

- Pour in engine oil.

Engine oil B37C15U1

Capacity of engine oil

4,8 l

Engine oil: Technically suitable engine oils for BMW Group engines

9 – Installing the oil filler cap



- Close oil filler cap (1).

10 – Check engine oil level

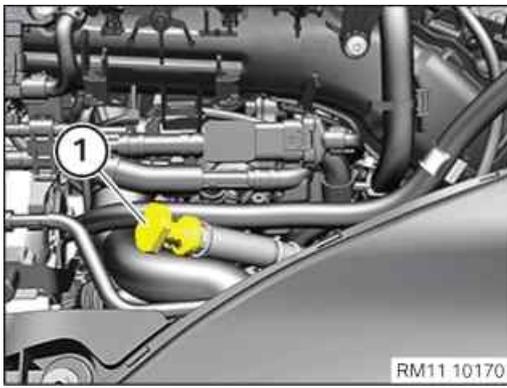
- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.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

► Check engine oil level



TECHNICAL INFORMATION

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



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



TECHNICAL INFORMATION

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

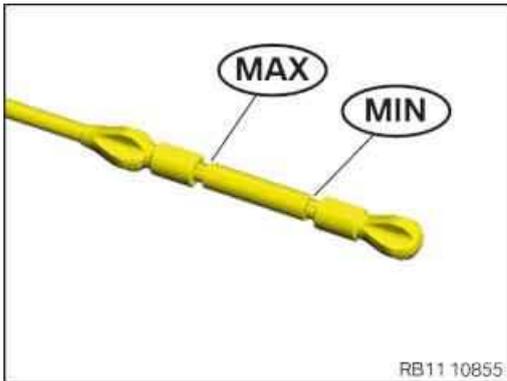
- Push the oil dipstick (1) into the guide tube up to the limit position and pull it out again.



TECHNICAL INFORMATION

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

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



Additional Information

Overview of Tightening Torques

Oil level sensor to oil sump			Used in step
M6		Jointing torque	2 Nm
		Tightening torque	8 Nm
Oil drain plug on oil sump			Used in step
M12x1.5	Renew the sealing ring.	Tightening torque	25 Nm
Underbody protection front			Used in step
			3 Nm

Overview Technical Data

Engine oil B37C15U1		Used in step
Capacity of engine oil		4,8 l
Engine oil: Technically suitable engine oils for BMW Group engines		

Links

Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	4
Operating materials	Used in step
3.0 Technically appropriate engine oils for BMW Group engines	8

12 63 586 Replacing power distribution box



WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

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

PRELIMINARY WORK

1 – Disconnecting all battery earth leads



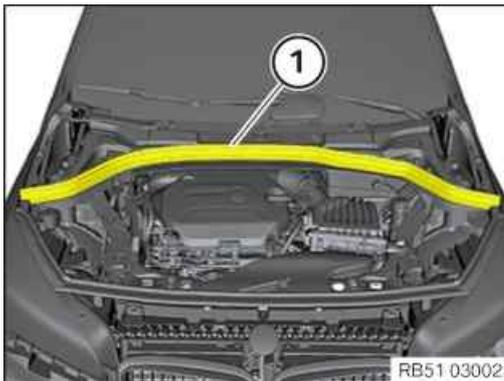
- See additional information.

2 – Remove the seal for the rear bonnet



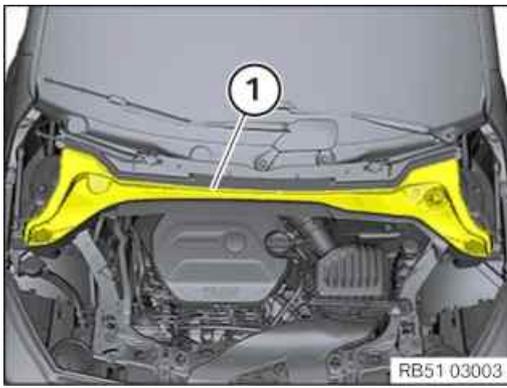
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



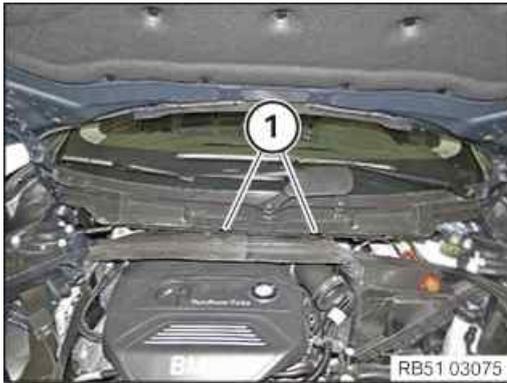
- Pull off rear bonnet seal (1) towards the top and remove.

3 – Removing front cowl panel cover

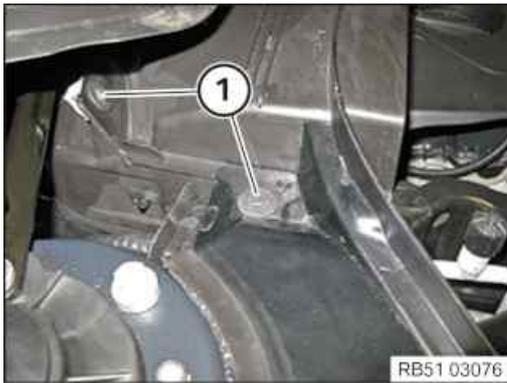


- Guide the front cowl panel cover (1) out toward the top and remove it.

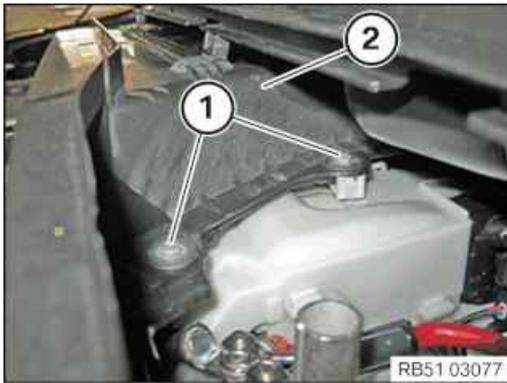
4 – Removing the upper bulkhead cover



- Loosen screws (1).

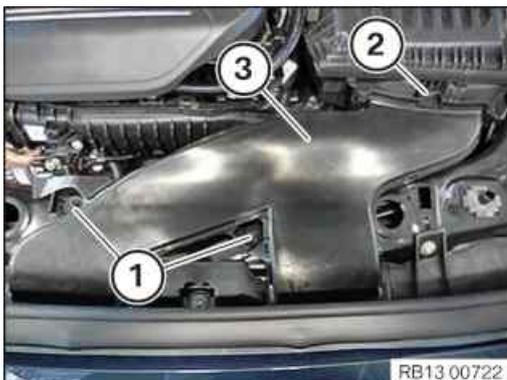


- Loosen screws (1).



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

5 – Remove the intake neck for intake silencer housing



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

6 – Removing intake silencer housing



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

7 – Remove DDE control unit

Prerequisite

Disconnect battery.



RISK OF DAMAGE



Electrostatic discharge.

Damage to or destruction of electrical components.

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



RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

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



TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

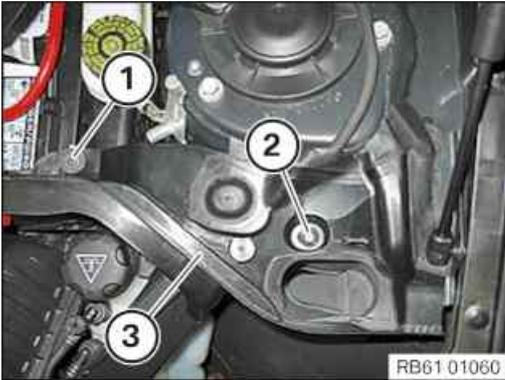
For additional information see: 12 00 ... Notes on removal and installation of control units



TECHNICAL INFORMATION

In a warranty case, you must always provide a fault memory printout with the defective part, even if the fault memory does not contain an entry.

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



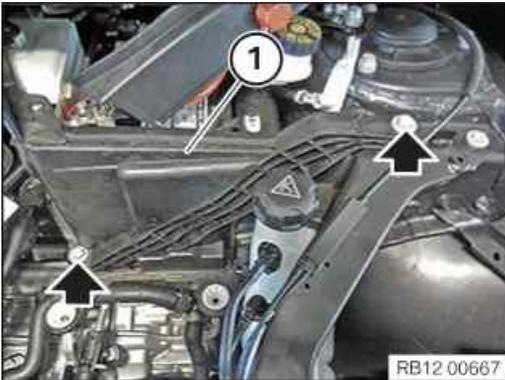
RB61 01060

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



RB12 00663

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



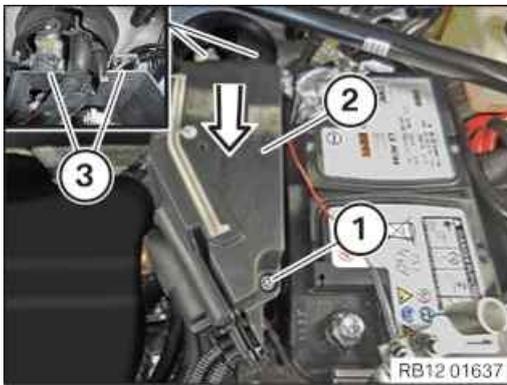
RB12 00667

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

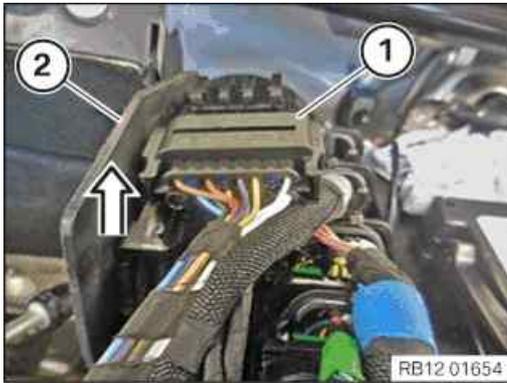


RB12 01634

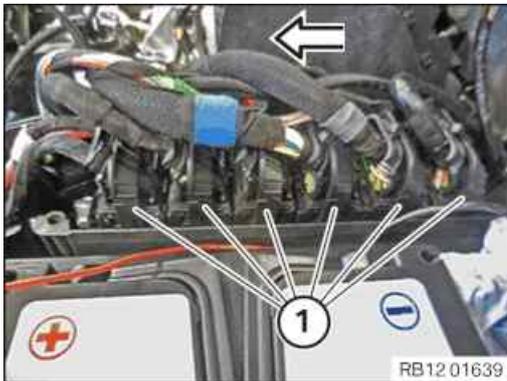
- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



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



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



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



- Thread out and remove DDE control unit (1) toward the top.

MAIN WORK

8 – Removing integrated supply module (PDM)



RISK OF DAMAGE



Electrostatic discharge.

Damage to or destruction of electrical components.

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

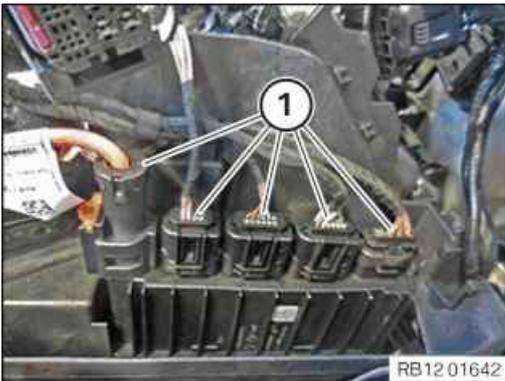


RISK OF DAMAGE

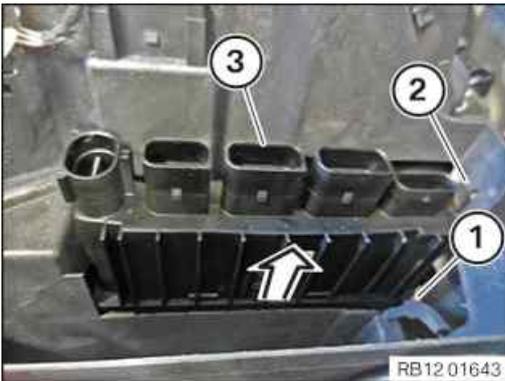
Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

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



- Unlock and disconnect the plug connection (1).



- Disengage locks (1) and (2).
- Guide out and remove the integrated supply module (3) in the direction of the arrow.

9 – Installing the integrated supply module (PDM)

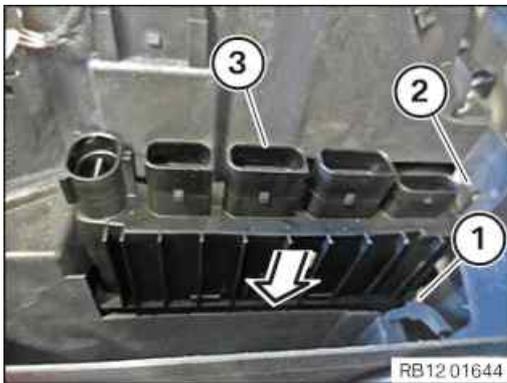


RISK OF DAMAGE

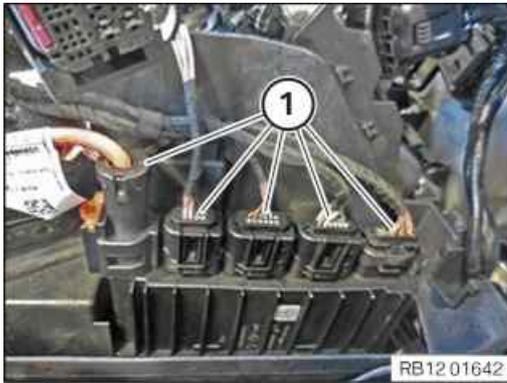
Improper routing of cables and wiring harnesses.

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

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



- Insert and install the integrated supply module (3) in the direction of the arrow.
- Make sure you can hear the locks (1) and (2) engage.



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

POSTPROCESSES

10 – Install DDE control unit

Prerequisite

Disconnect battery.



RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

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

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

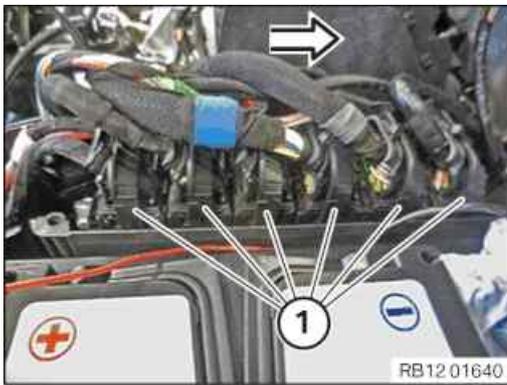


TECHNICAL INFORMATION

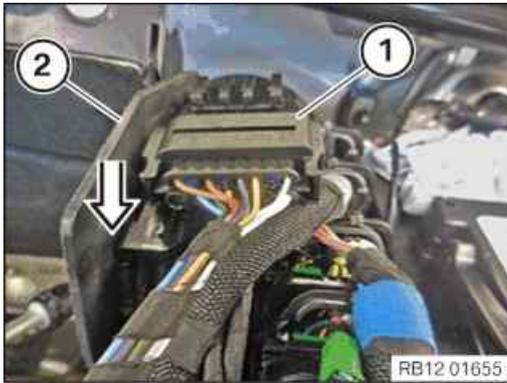
In a warranty case, you must always provide a fault memory printout with the defective part, even if the fault memory does not contain an entry.



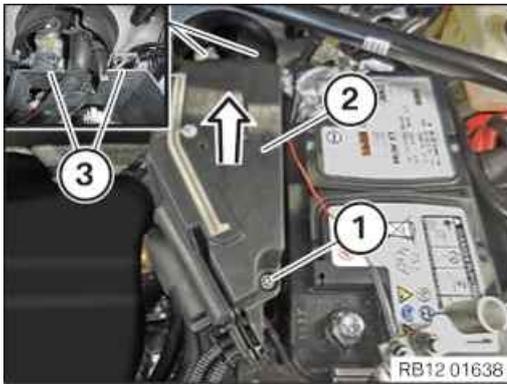
- Install DDE control unit(1).



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



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



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

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm
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- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm
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- Feed in and install tension strut (1).
- Tighten screws (arrows).

Tension strut to spring strut dome/battery tray

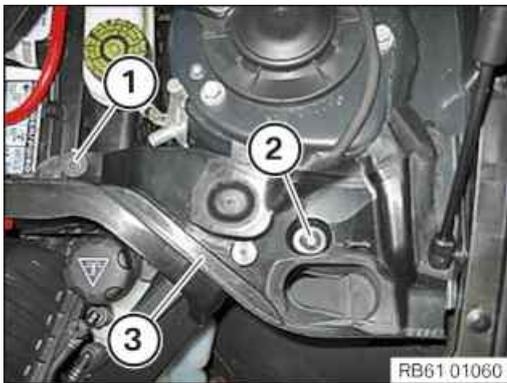
M8		Tightening torque	19 Nm
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- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

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

Battery cover

Screw			2,8 Nm
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11 – Installing intake silencer housing



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

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm
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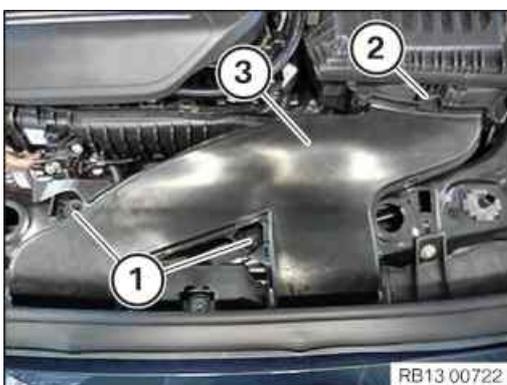
- Tighten clamp (4).

Clean air pipe to intake silencer housing

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

12 – Install the intake neck for the intake filter housing

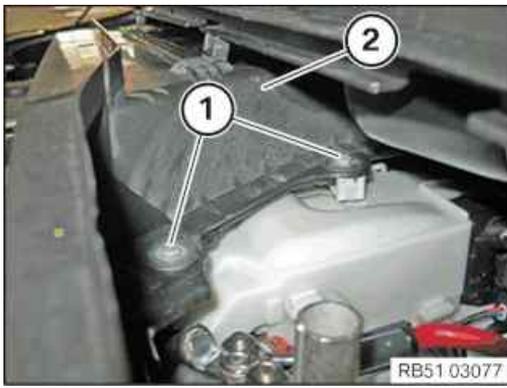


- Insert and install the intake neck (3). The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm
----	--	-------------------	------

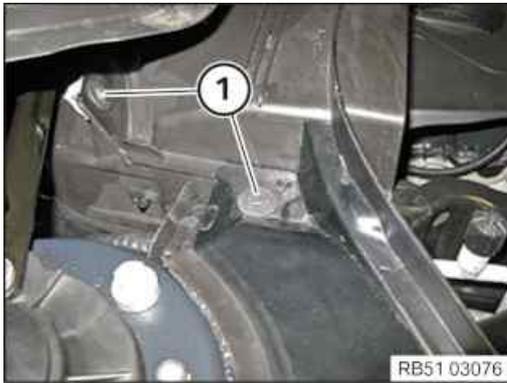
13 – Installing the upper bulkhead cover



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

Bulkhead cover, top

Screw	Tightening torque
	3 Nm



- Tighten the screws (1).

Bulkhead cover, top

Screw	Tightening torque
	3 Nm

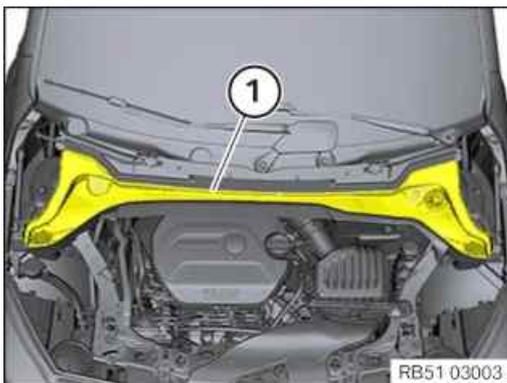


- Tighten the screws (1).

Bulkhead cover, top

Screw	Tightening torque
	3 Nm

14 – Installing front cowl panel cover



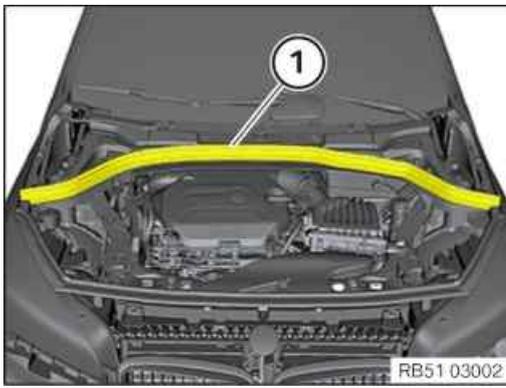
- Insert the cowl panel cover front (1) to the rear and install.
- Check cowl panel cover at front is correctly seated (1).

15 – Install the seal for the bonnet



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

16 – Disconnecting all battery earth leads



- See additional information.

Additional Information

Overview of Tightening Torques

Cover to electronics box			Used in step 10
RF5x26.5	Tightening torque		2,5 Nm
Positive battery terminal to battery			Used in step 10
NutM6	Tightening torque		5 Nm
Tension strut to spring strut dome/battery tray			Used in step 10
M8	Tightening torque		19 Nm
Positive battery connection point cover to engine compartment partition wall			Used in step 10
	Tightening torque		3 Nm
Battery cover			Used in step 10
Screw			2,8 Nm
Intake silencer housing to lock bridge			Used in step 11
M6X30	Tightening torque		8 Nm
Clean air pipe to intake silencer housing			Used in step 11
Clamp	Tightening torque		3 Nm
Intake neck to cross connection			Used in step 12
M6	Tightening torque		8 Nm

Screw	Tightening torque	3 Nm
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Links

General repair instructions	Used in step
12 00 ... Instructions for removal and replacement of control units	7 10
Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1 16
61 20 900 Disconnecting and connecting battery earth lead	1 16
61 20 900 Disconnecting and connecting battery earth lead	1 16
61 20 900 Disconnecting and connecting battery earth lead	1 16
61 20 900 Disconnecting and connecting battery earth lead	1 16
61 20 900 Disconnecting and connecting battery earth lead	1 16
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 16
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 16
61 20 900 Disconnecting and connecting battery earth lead	1 16
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 16
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1 16
61 20 900 Disconnecting and connecting battery earth lead	1 16
61 20 900 Disconnecting and connecting battery earth lead	1 16
61 20 900 Disconnecting and connecting battery earth lead	1 16
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61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 16
61 20 900 Disconnecting and connecting battery earth lead	1 16
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61 20 900 Disconnecting and connecting battery earth lead	1 16
61 20 900 Disconnecting and connecting battery earth lead	1 16
61 20 900 Disconnecting and connecting battery earth lead	1 16
61 20 900 Disconnecting and connecting battery earth lead	1 16
61 20 900 Disconnecting and connecting battery earth lead	1 16
61 13 ... Unlocking and disconnecting different plug connections	7 8 9
61 35 ... Notes on ESD protection (Electro Static Discharge)	7 8 9

12 90 120 Removing and installing/replacing control unit holder



WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

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

PRELIMINARY WORK

1 – Disconnecting all battery earth leads



RB61 04141

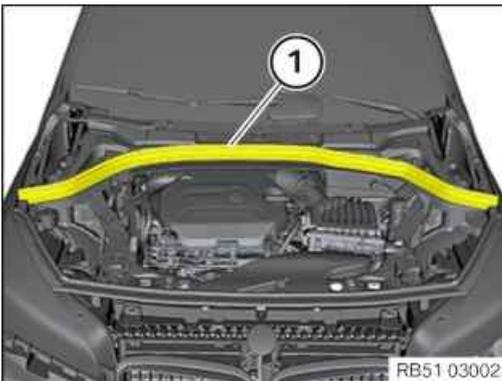
- See additional information.

2 – Remove the seal for the rear bonnet



NOTICE

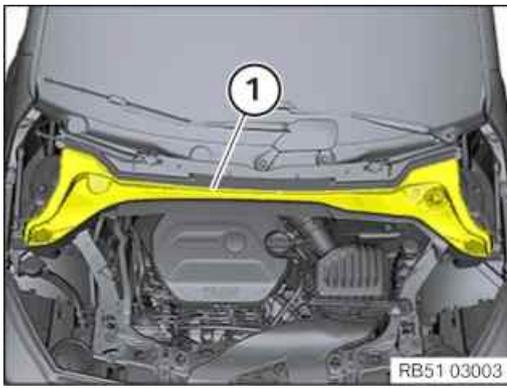
Schematic diagram is for example purposes. Some parts may differ in certain details.



RB51 03002

- Pull off rear bonnet seal (1) towards the top and remove.

3 – Removing front cowl panel cover

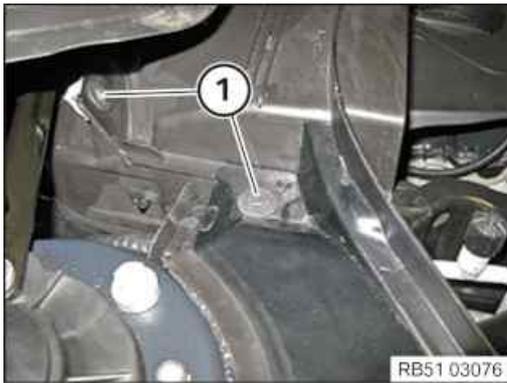


- Guide the front cowl panel cover (1) out toward the top and remove it.

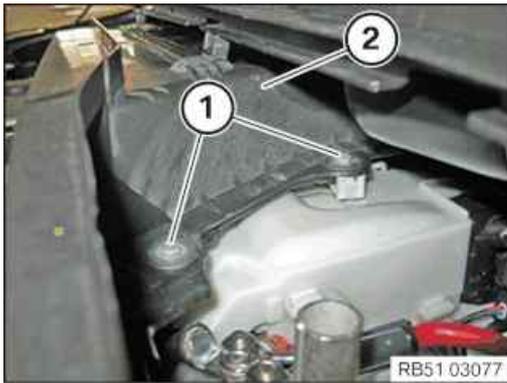
4 – Removing the upper bulkhead cover



- Loosen screws (1).

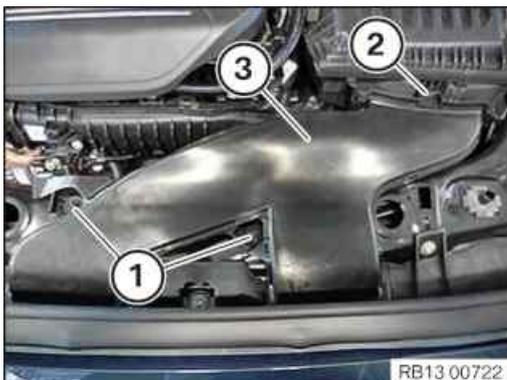


- Loosen screws (1).



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

5 – Remove the intake neck for intake silencer housing



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

6 – Removing intake silencer housing



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

MAIN WORK

7 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.



RISK OF DAMAGE



Electrostatic discharge.

Damage to or destruction of electrical components.

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



RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

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



TECHNICAL INFORMATION

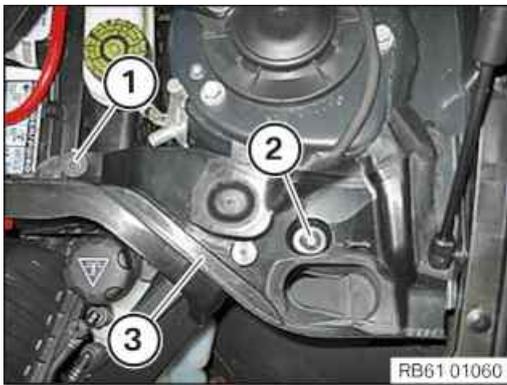
Follow instructions for removing and installing control units.

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



TECHNICAL INFORMATION

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



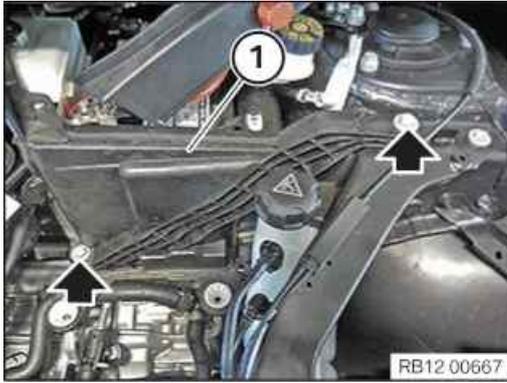
RB61 01060

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



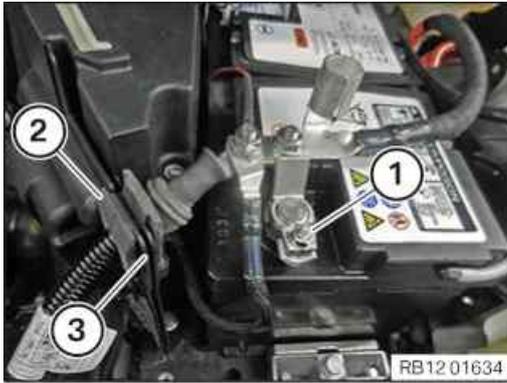
RB12 00663

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



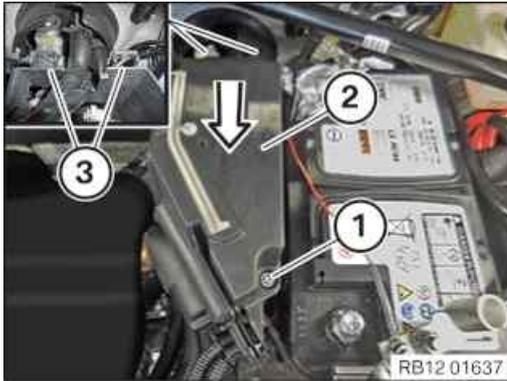
RB12 00667

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



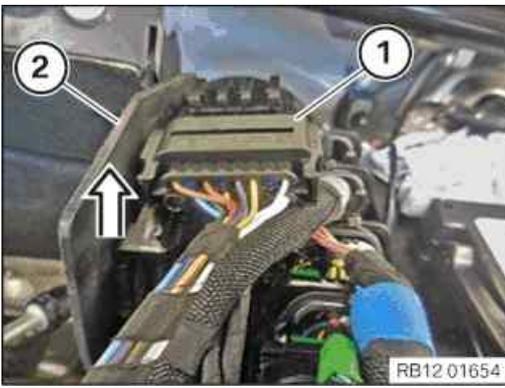
RB12 01634

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

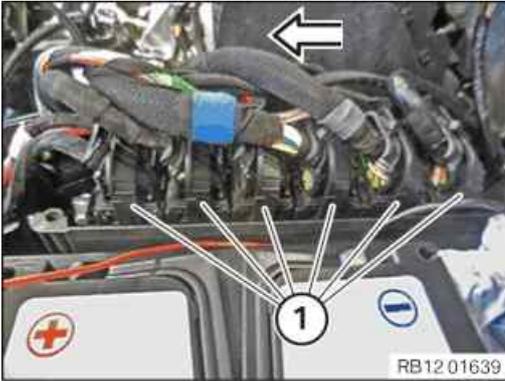


RB12 01637

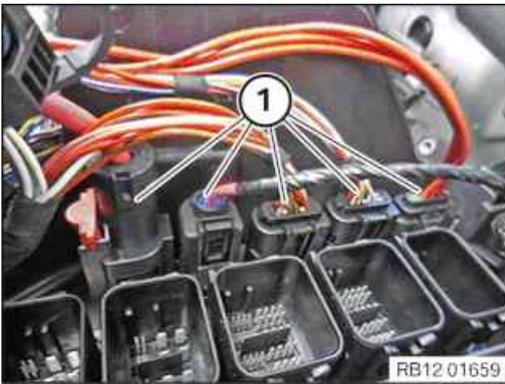
- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



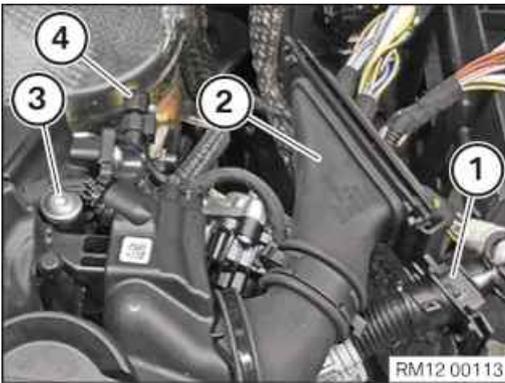
- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



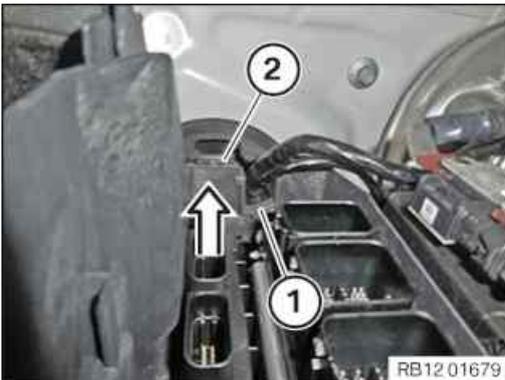
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



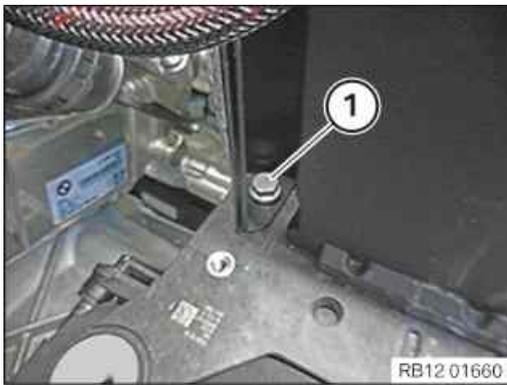
- Unlock and loosen connector (1).



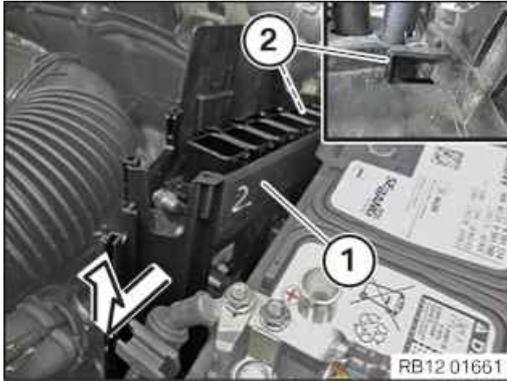
- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.



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



- Loosen screw (1).



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

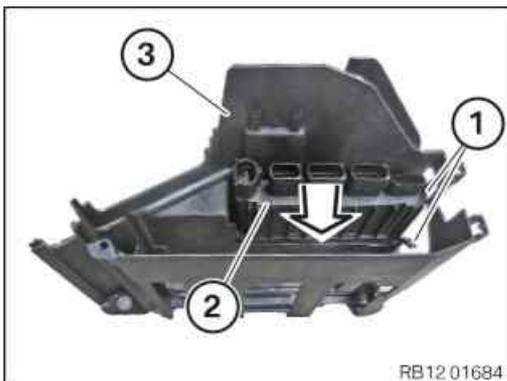
8 – Replacement: Remount DDE control unit and integrated supply module (PDM)



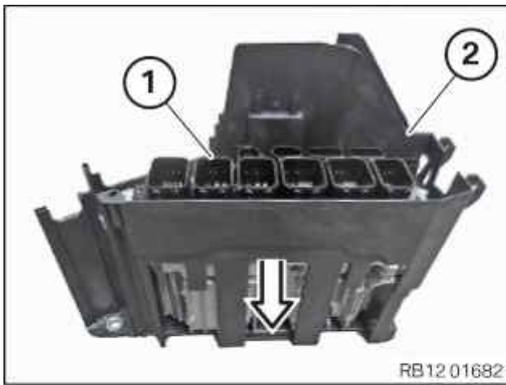
- Feed out DDE control unit (1) from the electronics box (2) and remove in direction of arrow.



- Unlock the locks (1).
- Feed out integrated supply module (2) from the electronics box (3) and remove in direction of arrow.



- Guide in and install integrated supply module (2) in the electronics box (3) in direction of arrow.
- Ensure that the locks (1) engage audibly.



- Guide in and install DDE control unit (1) in the electronics box (2) in direction of arrow.

9 – Install electronics box

Prerequisite

Battery earth lead is disconnected.

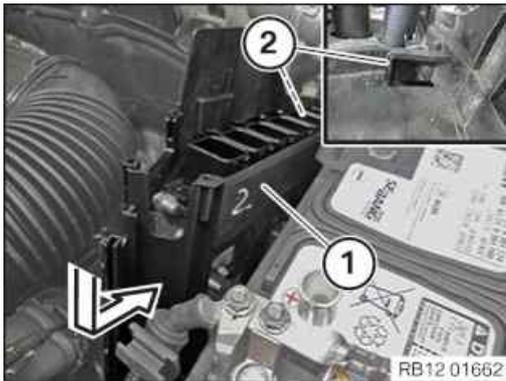


RISK OF DAMAGE

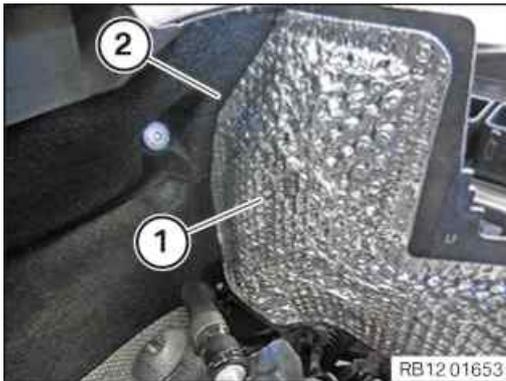
Improper routing of cables and wiring harnesses.

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

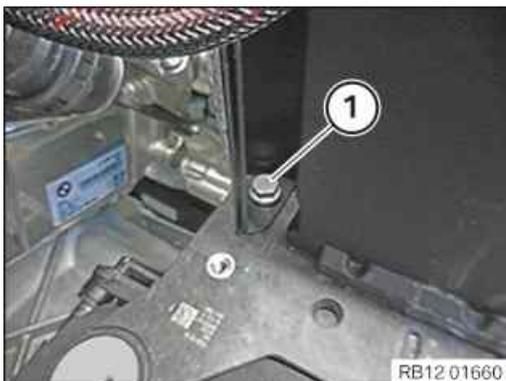
- Route all cables without abrasions, do not trap and crush.



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



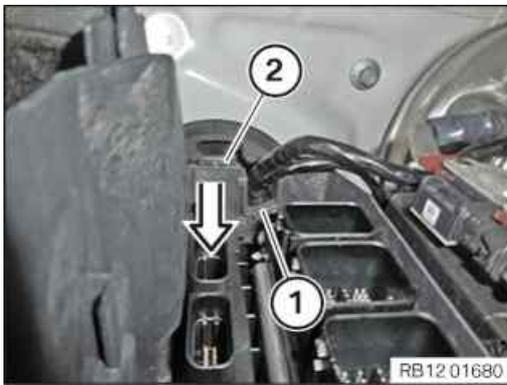
- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).



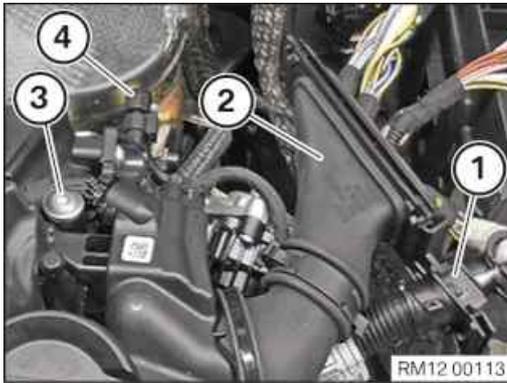
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm
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- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.

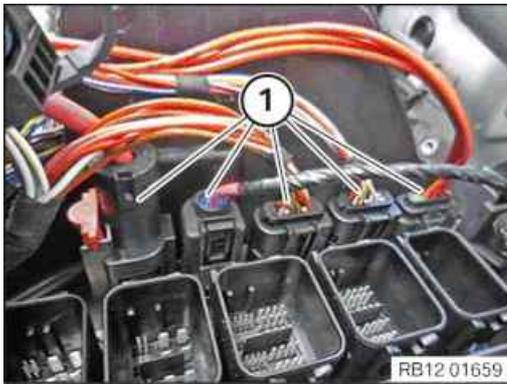


- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

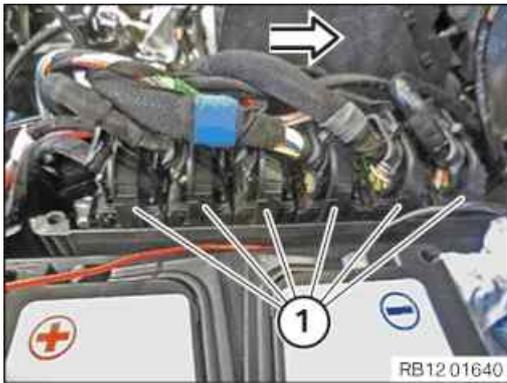
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm
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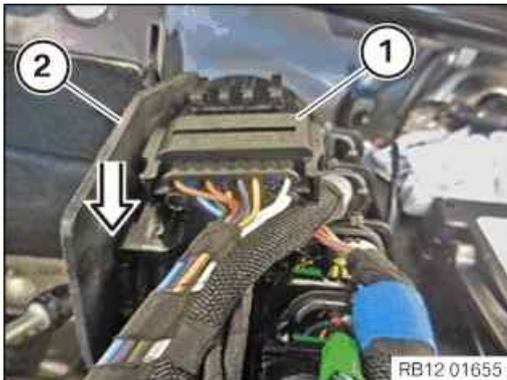
- Attach connector (4) to the differential pressure sensor and lock it audibly.



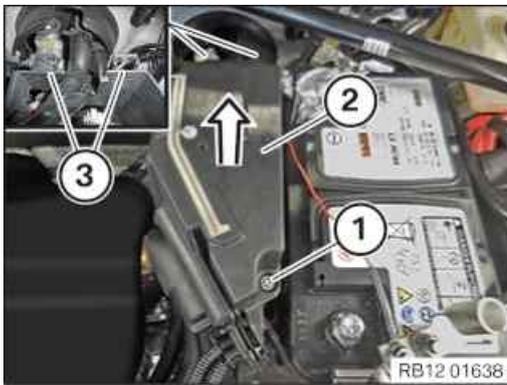
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



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



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



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

Cover to electronics box

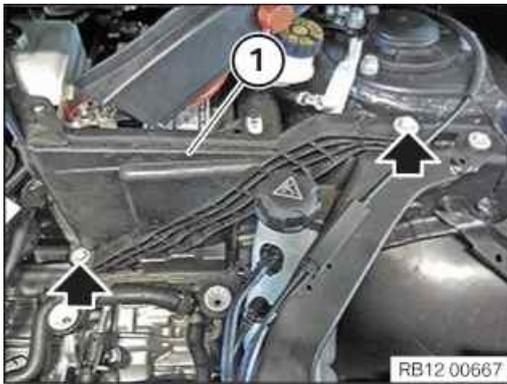
RF5x26.5		Tightening torque	2,5 Nm
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- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm
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- Feed in and install tension strut (1).
- Tighten screws (arrows).

Tension strut to spring strut dome/battery tray

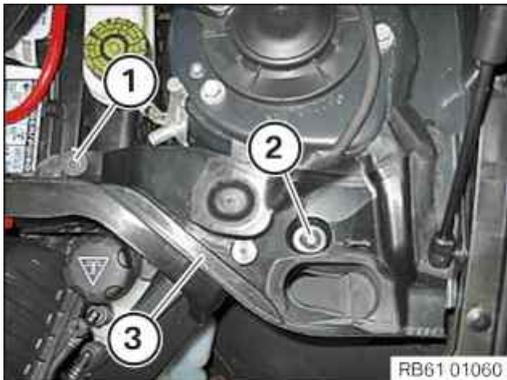
M8		Tightening torque	19 Nm
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- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

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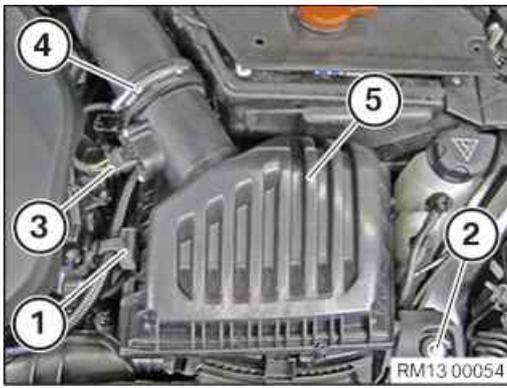
- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw			2,8 Nm
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POSTPROCESSES

10 – Installing intake silencer housing



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

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm
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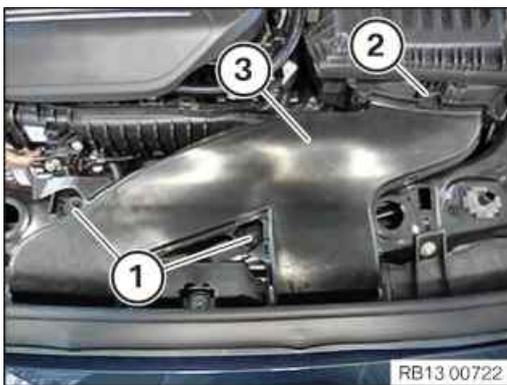
- Tighten clamp (4).

Clean air pipe to intake silencer housing

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

11 – Install the intake neck for the intake filter housing

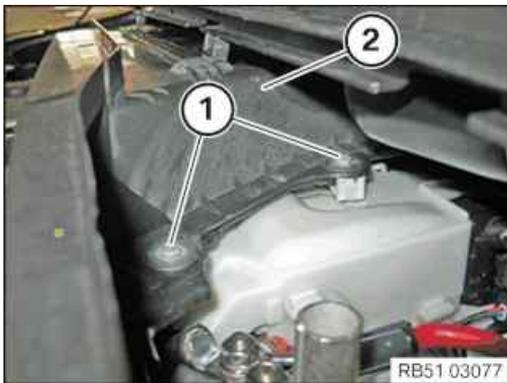


- Insert and install the intake neck (3). The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm
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12 – Installing the upper bulkhead cover



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

Bulkhead cover, top

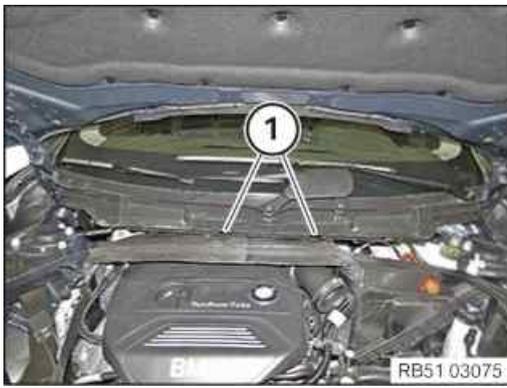
Screw		Tightening torque	3 Nm
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- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm
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- Tighten the screws (1).

Bulkhead cover, top

Screw	Tightening torque
	3 Nm

13 – Installing front cowl panel cover



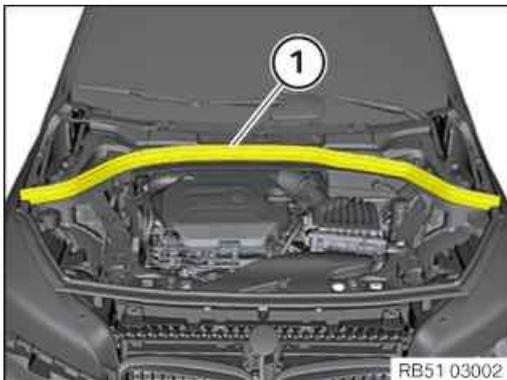
- Insert the cowl panel cover front (1) to the rear and install.
- Check cowl panel cover at front is correctly seated (1).

14 – Install the seal for the bonnet



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

15 – Disconnecting all battery earth leads



- See additional information.

Additional Information

Overview of Tightening Torques

Electronics box to battery tray			Used in step 9
M8X16		Tightening torque	15 Nm
Wiring harness to cylinder head cover			Used in step 9
TS5x20		Tightening torque	3,5 Nm
Cover to electronics box			Used in step 9
RF5x26.5		Tightening torque	2,5 Nm
Positive battery terminal to battery			Used in step 9
NutM6		Tightening torque	5 Nm
Tension strut to spring strut dome/battery tray			Used in step 9
M8		Tightening torque	19 Nm
Positive battery connection point cover to engine compartment partition wall			Used in step 9
		Tightening torque	3 Nm
Battery cover			Used in step 9
Screw			2,8 Nm
Intake silencer housing to lock bridge			Used in step 10
M6X30		Tightening torque	8 Nm
Clean air pipe to intake silencer housing			Used in step 10
Clamp		Tightening torque	3 Nm
Intake neck to cross connection			Used in step 11
M6		Tightening torque	8 Nm
Bulkhead cover, top			Used in step 12
Screw		Tightening torque	3 Nm

Links

General repair instructions	Used in step
12 00 ... Instructions for removal and replacement of control units	
Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1 15
61 20 900 Disconnecting and connecting battery earth lead	1 15
61 20 900 Disconnecting and connecting battery earth lead	1 15
61 20 900 Disconnecting and connecting battery earth lead	1 15
61 20 900 Disconnecting and connecting battery earth lead	1 15
61 20 900 Disconnecting and connecting battery earth lead	1 15
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 15
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 15
61 20 900 Disconnecting and connecting battery earth lead	1 15

61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 15
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1 15
61 20 900 Disconnecting and connecting battery earth lead	1 15
61 20 900 Disconnecting and connecting battery earth lead	1 15
61 20 900 Disconnecting and connecting battery earth lead	1 15
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61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 15
61 20 900 Disconnecting and connecting battery earth lead	1 15
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61 35 ... Notes on ESD protection (Electro Static Discharge)	7