

Workshop Manual Audi Q7 2007 >

6-cylinder TDI engine (3.0 ltr. 4-valve common rail), mechanics

Edition 01.2006

Engine code	BUN	BUG							
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Audi 6-cylinder TDI engine (3.0 ltr. 4-valve common rail), mechanics 01.2006

00 – Technical data

1 Technical data

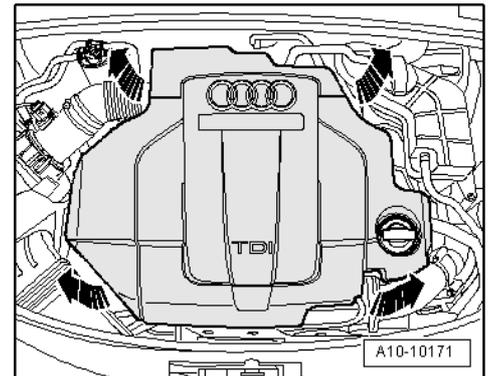
1.1 Engine number

 **Note**

The engine code is also included on the vehicle data sticker.

The following steps are required to make the stamped engine number visible.

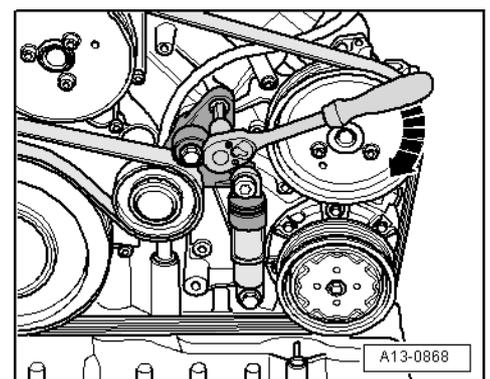
- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



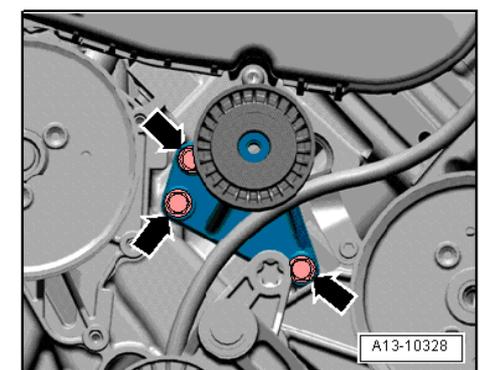
 **Note**

Before removing, mark direction of rotation of poly V-belt with chalk or felt-tipped pen. If the belt runs in the opposite direction when it is refitted, this can cause breakage.

- Slacken poly V-belt by swivelling tensioner in direction of -arrow-, using a lever with TORX 60 bit.
- Remove poly V-belt from tensioning roller.



- Unscrew bolts -arrows- and detach idler roller from front sealing flange.

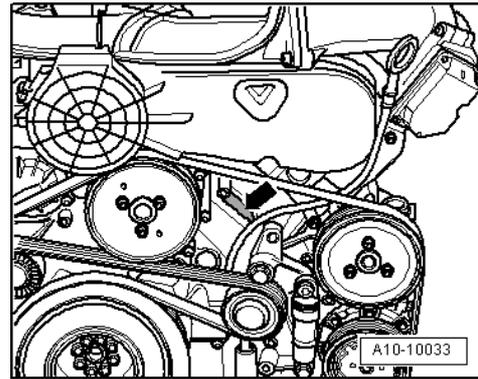




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Audi 6-cylinder TDI engine (3.0 ltr. 4-valve common rail), mechanics 01.2006

- ◆ The engine number ("engine code" and "serial number") can be found at the front below the toothed belt for the high-pressure pump (left-side) -arrow-.
- ◆ There is also a sticker on the toothed belt cover showing the "engine code" and "serial number".



1.2 Engine data

Code letters		BUG	BUN
Capacity	ltr.	2.967	2.967
Power output	kW at rpm	171/4000	1551/4000
Torque	Nm at rpm	500/1500 ... 2750	500/1400 ... 2750
Bore	∅ in mm	83.0	83.0
Stroke	mm	91.4	91.4
Compression ratio		17	17
CN	at least	51	51
Firing order		1-4-3-6-2-5	1-4-3-6-2-5
Exhaust gas recirculation		yes	yes
Turbocharging/supercharging		yes	yes
Self-diagnosis		yes	yes
Glow plugs		Steel glow plugs	Steel glow plugs
Catalytic converter		yes	yes
Charge air cooling		yes	yes
Lambda control		yes	yes

Note

Audi Q7 models with a 3.0 ltr. TDI engine are always equipped with steel glow plugs.

2 General repair instructions

2.1 Rules for cleanliness when working on the injection system

Even small amounts of dirt can cause faults in the injection system. When working on the fuel supply/injection system, pay careful attention to the following basic rules:

- ◆ Carefully clean connection points and the surrounding area with engine cleaner or brake cleaner and allow to dry thoroughly before opening.
- ◆ Plug open lines and connections with suitable protective caps immediately.
- ◆ Place parts that have been removed on a clean surface and cover them over. Use only lint-free cloths.
- ◆ Only install clean components; replacement parts should only be unpacked immediately prior to installation. Do not use parts that have been previously unpacked and stored away loose (e.g. in toolboxes, etc.).
- ◆ When the system is open: Do not work with compressed air. Do not move the vehicle unless absolutely necessary.

2.2 Checking for leaks in the fuel system

- Start the engine and let it run at medium speed for a few minutes.
- Switch off ignition.
- Check the entire fuel system for leaks.
- If leaks are found although the connections have been tightened to the correct torque, the relevant component must be renewed.
- Then carry out a test drive with at least one full-power acceleration.
- Then check high-pressure part of fuel system again for leakage.



10 – Removing and installing engine

1 Removing and installing engine

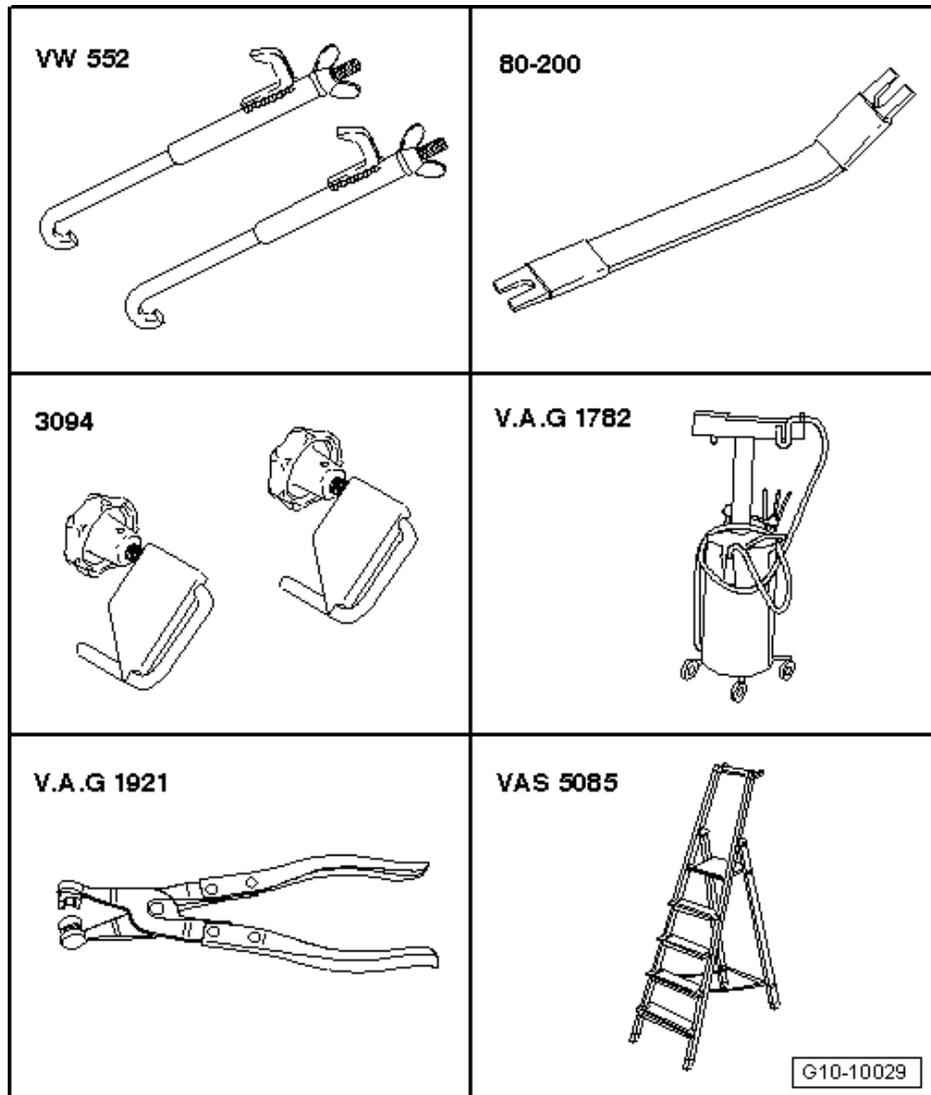
i *Note*

- ◆ *The engine is removed from underneath together with the gearbox and subframe (with lock carrier installed).*
- ◆ *All cable ties which are released or cut open when removing must be fitted in the same position when installing.*
- ◆ *Collect drained coolant in a clean container for re-use or disposal.*

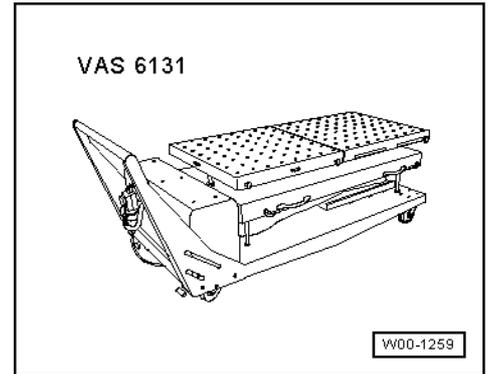
1.1 Removing engine

Special tools and workshop equipment required

- ◆ Spring tensioner -VW 552-
- ◆ Removal lever -80-200-
- ◆ Hose clamps for hoses up to 25 mm Ø -3094-
- ◆ Used oil collection and extraction unit -V.A.G 1782-
- ◆ Hose clip pliers -V.A.G 1921-
- ◆ Stepladder -VAS 5085-



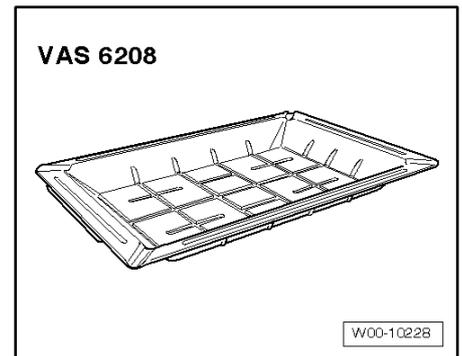
- ◆ Scissor-type assembly platform -VAS 6131- with support set for Audi -VAS 6131/10- and support set -VAS 6131/11-, -VAS 6131/13- and 3x -VAS 6131/10-2-



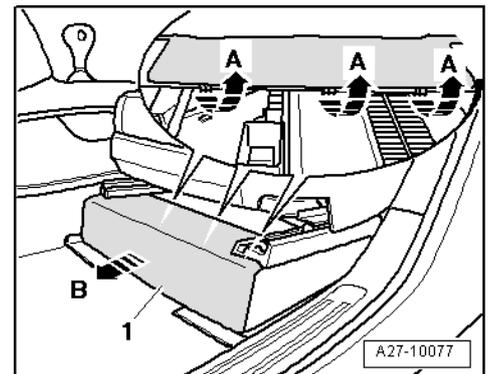
- ◆ Drip tray for workshop hoist -VAS 6208-

Procedure

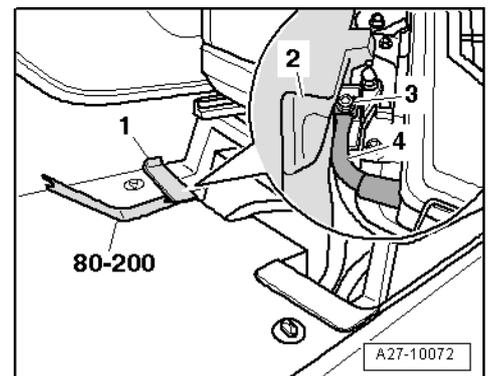
- Activate jacking-up mode on vehicles with air suspension ⇒ Rep. Gr. 43.
- Move driver's seat as far back as possible and to highest position, using range of full seat adjustment.
- Switch off ignition.



- Reach under driver's seat and release retaining clips on rear side of cover -1- in direction of -arrow A-.
- Then detach cover from driver's seat console in direction of -arrow B-.



- Use removal lever -80-200- to pry out cover -1- from floor covering.
- Lift floor covering -2- slightly around earth wire.
- Unscrew nut -3- and detach earth wire -4- from earth point.
- Discharge the refrigerant system ⇒ Air conditioner system - with refrigerant R134a.
- Extract hydraulic fluid for power steering from reservoir using used oil collection and extraction unit -V.A.G 1782-.



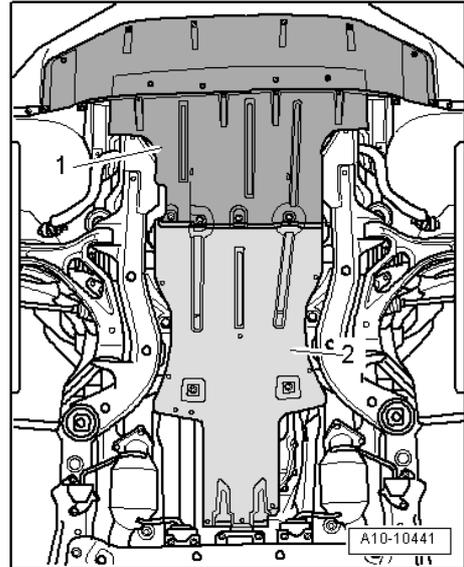
! WARNING!

Hot steam or hot coolant can escape when expansion tank is opened; cover filler cap with cloth and open carefully.

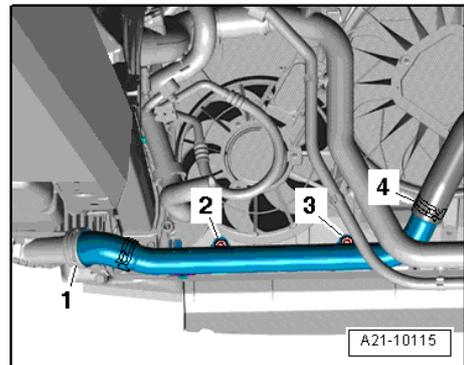
- Open filler cap on coolant expansion tank.



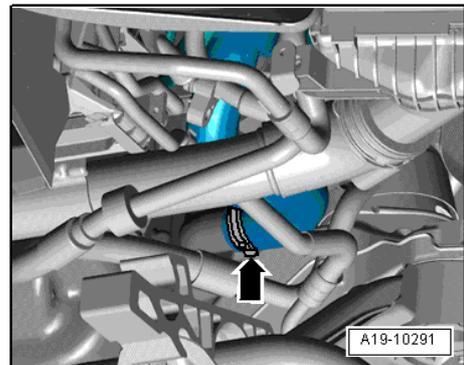
- Remove both front wheels.
- Unscrew bolts and take off front noise insulation -1- and rear noise insulation -2-.
- Remove front wheel housing liners (right and left)
⇒ Rep. Gr. 66.



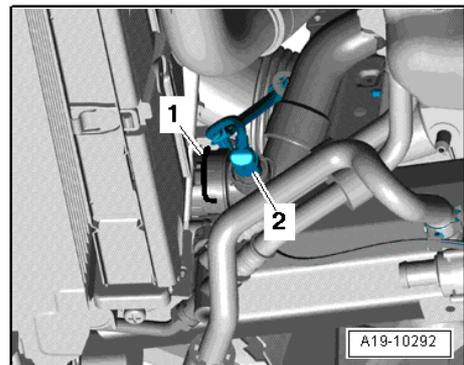
- Disconnect air intake hoses -1- and -4-.
- Unscrew bolts -2- and -3- and remove air pipe (bottom).



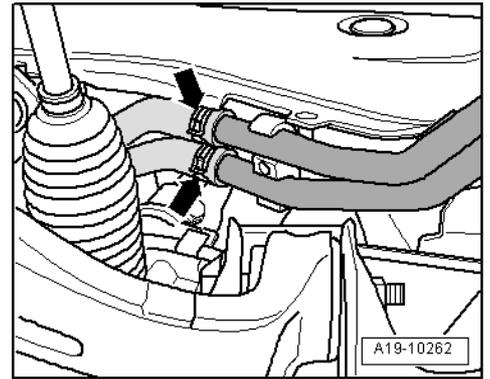
- Place drip tray for workshop hoist -VAS 6208- under engine.
- Disconnect coolant hose -arrow- from coolant pipe (left-side) and drain off coolant.



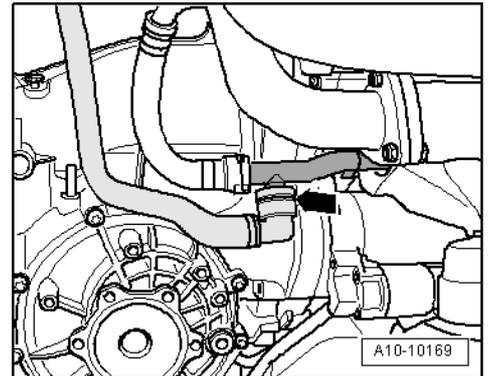
- Unplug electrical connector -2- at radiator outlet coolant temperature sender -G83-.
- Disconnect coolant hose (bottom right) -1- at radiator and drain off coolant.



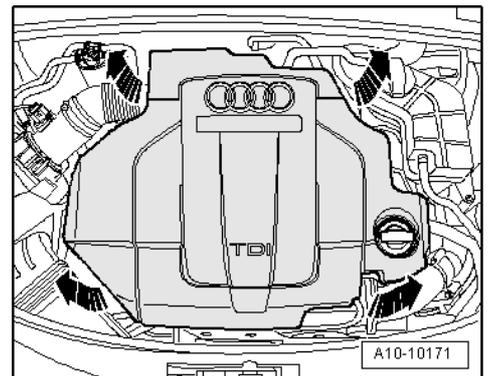
- Disconnect coolant hoses from coolant pipes -arrows- and drain off coolant.



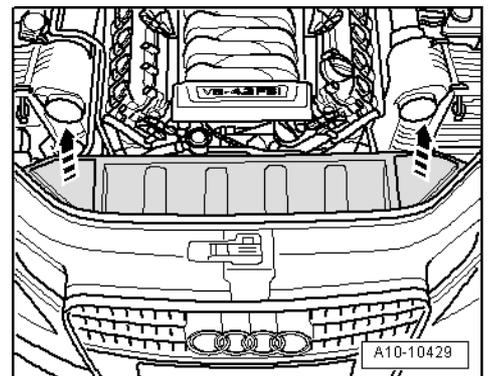
- Disconnect coolant hose from coolant pipe (right-side) -arrow- and drain off remaining coolant.



- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.

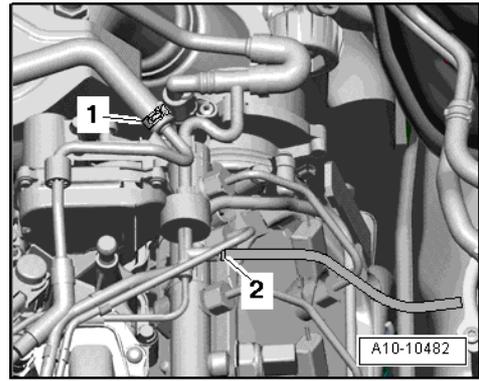


- Detach cover above radiator -arrows-.





- Detach coolant hose -1-.
- Disconnect vacuum hose going to vacuum reservoir -2-.

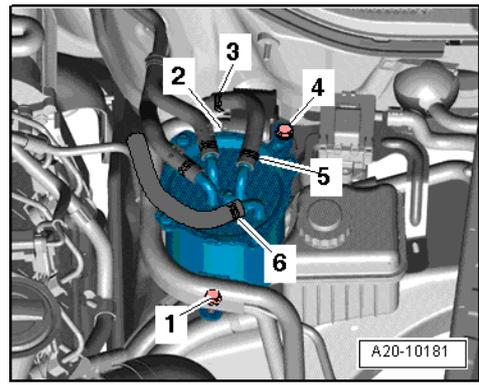


- Lay a clean cloth under the separating points to catch escaping fuel.

! Caution!

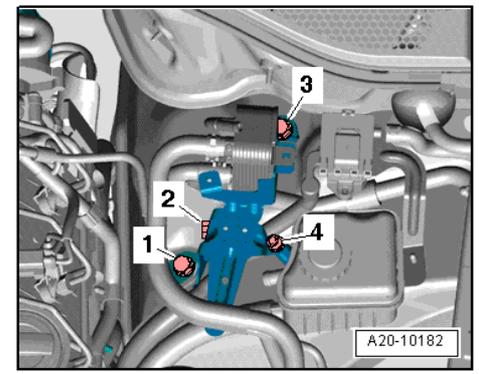
Observe rules for cleanliness when working on the injection system → **page 2.**

- Detach fuel supply hose -6- from fuel filter.
- Detach fuel hose going to fuel cooler at the connections marked -3- and -5-.
- Remove bolts -1- and -2- and nut -4-.
- Move fuel lines at bulkhead clear and lay aside fuel filter with fuel hoses connected.
- Remove bolts -1 ... 4-.

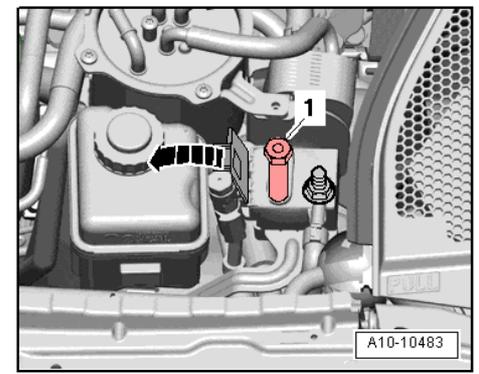


i Note

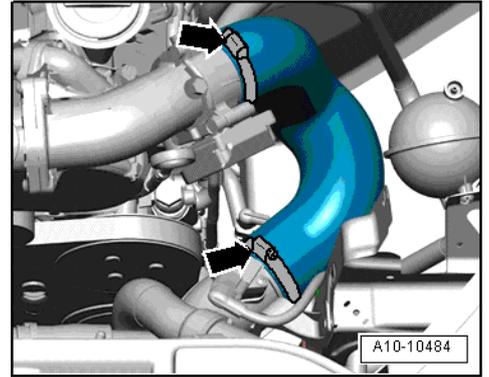
The fuel filter bracket remains installed.



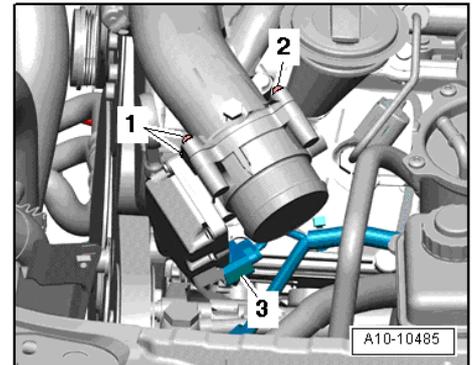
- Open cover above terminal B+ -arrow-.
- Unscrew positive cable -1- going to starter and alternator and move electrical wiring clear.



- Remove air intake hose -arrows-.



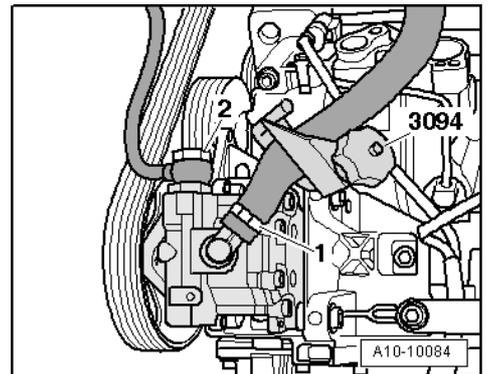
- Unplug electrical connector -3-.
- Remove bolts -1- and -2- and detach throttle valve module -J338- from intake connecting pipe.



i Note

Lay a cloth under the separating point to catch escaping hydraulic fluid.

- Clamp off hydraulic hose for power steering pump using a hose clamp -3094-.
- Disconnect hydraulic hose -1- from power steering pump.



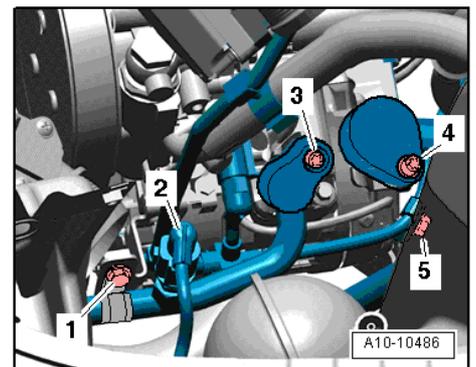
i Note

Disregard -item 2-.

i Note

To prevent damage to the refrigerant lines, ensure that the pipes and hoses are not stretched, kinked or bent.

- Unplug electrical connector -2-.
- Remove retaining clips -1- and -5-.
- Disconnect refrigerant lines -3- and -4- from air conditioner compressor.

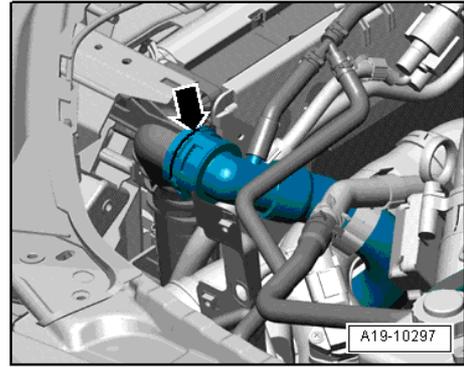


i Note

Seal open pipes and connections at air conditioner compressor with suitable caps (to prevent ingress of dirt and moisture).



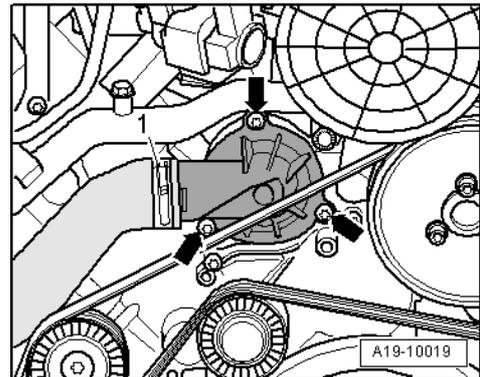
- Detach coolant hose (top left) -arrow- from radiator.



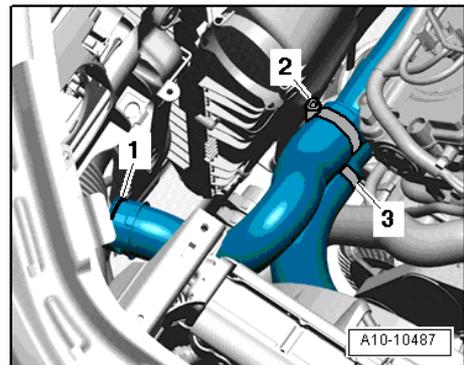
- Detach coolant hose -1-.

i Note

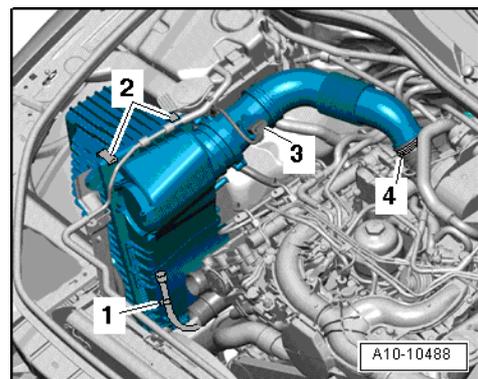
Ignore -arrows-.



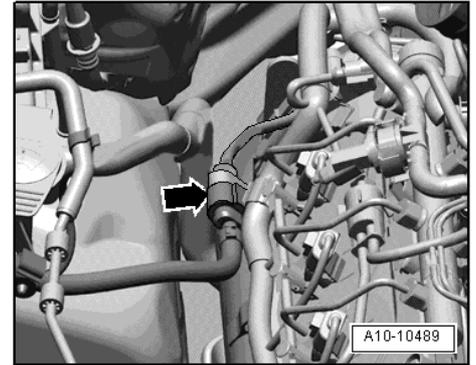
- Detach air intake hose (top) at the connections marked -1- and -2-.
- Detach air intake hose (bottom) -3-.



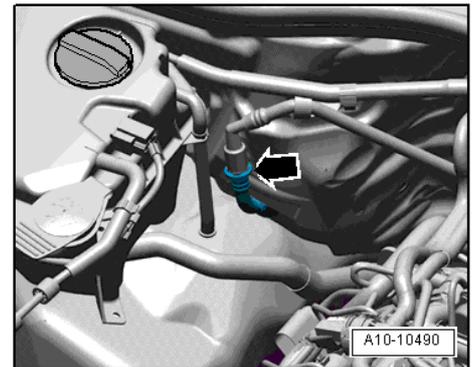
- Unclip differential breather hose -1- from air cleaner housing (top section).
- Unplug electrical connector -3- at air mass meter -G70-.
- Detach air intake hose -4- from turbocharger.
- Release retaining clips -2- and detach top section of air cleaner housing.



- Take electrical connector -arrow- out of bracket and unplug it.
- Unbolt bracket for electrical connector at cylinder head cover.



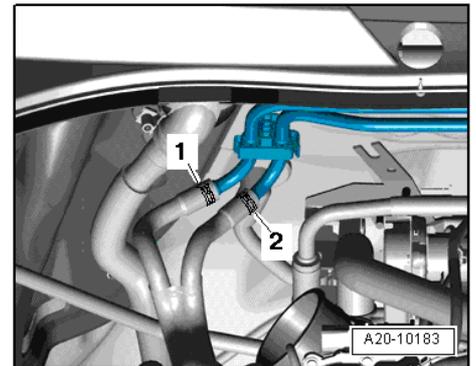
- Disconnect vacuum hose -arrow- going to exhauster pump.



 **WARNING!**

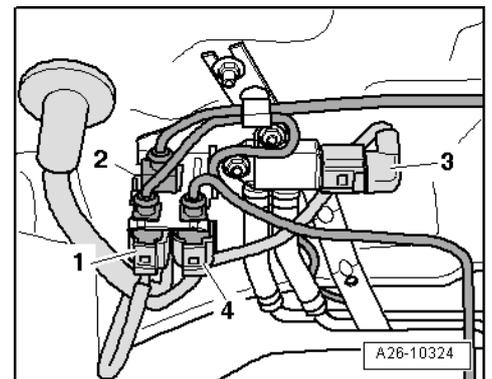
The fuel system is pressurised. Before opening the system place a clean cloth around the connection. Then dissipate pressure by carefully unfastening the connection.

- Disconnect fuel supply pipe -1- and fuel return pipe -2- at bulkhead.
- Remove fuel filter together with fuel hoses (fuel hoses remain connected to filter).
- Detach electrical connectors -1- and -2- for exhaust gas temperature sender 1 -G235- and Lambda probe -G39- from bracket.
- Unplug electrical connectors and move wiring clear.



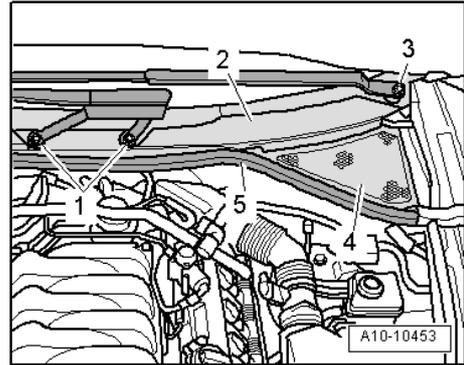
 **Note**

Disregard items marked -3- and -4-.





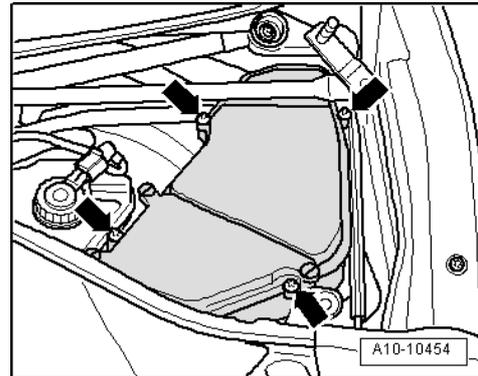
- Pry off caps on windscreen wiper arms with a screwdriver.
- Unscrew nuts -1- and -3- several turns.
- Tilt windscreen wiper arms one by one and loosen from wiper shafts.
- Remove nuts completely and take off wiper arms.



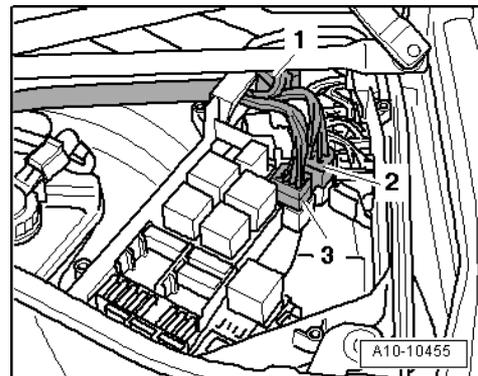
i Note

Use puller (commercially available) to remove wiper arm if necessary.

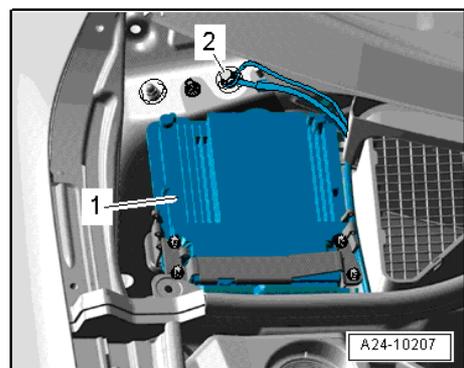
- Pull off rubber seal -5- on plenum chamber covers.
- Detach plenum chamber covers -2- and -4-.
- Remove cover for electronics box in plenum chamber -arrows-.



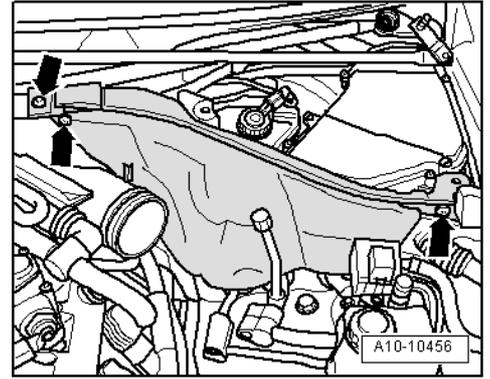
- Unplug electrical connectors -1 ... 3- at electronics box connector point in plenum chamber.
- Move electrical wiring harness clear.



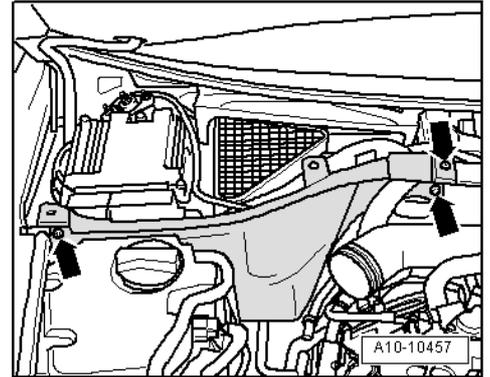
- Unscrew earth connection -2-.
- Remove engine control unit -1- => Rep. Gr. 23.
- Move clear wiring harness leading to engine.



- Remove bolts -arrows- and take off bulkhead plate at rear left of engine compartment.



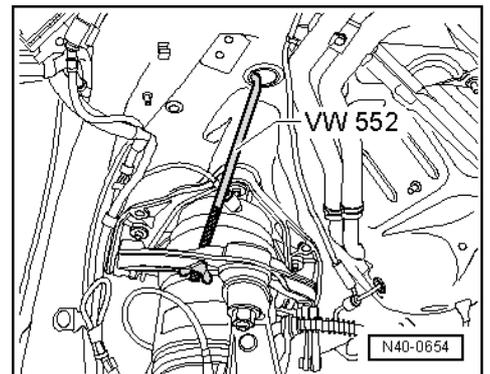
- Remove bolts -arrows- and take off bulkhead plate at rear right of engine compartment.



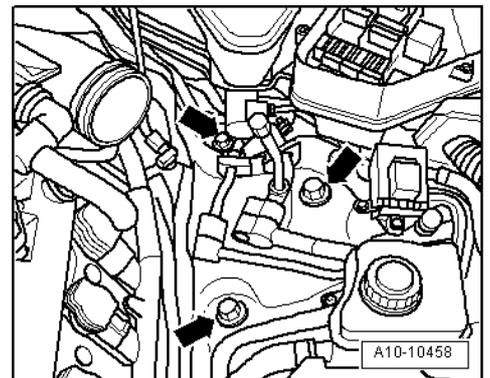
- Remove grommets from drillings above suspension struts.
- Secure suspension struts (left and right) using spring tensioner -VW 552-.

i Note

Securing the suspension struts ensures the drive shafts are not under load after removing the top suspension strut bolts at a later stage.

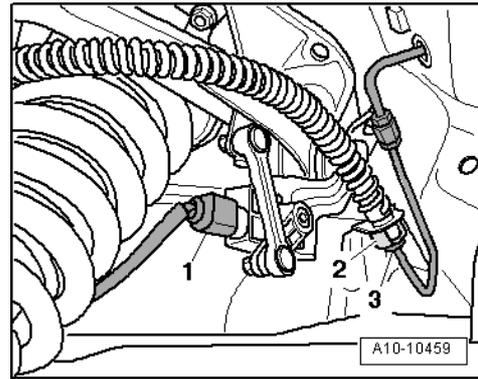


- Unscrew suspension struts (left and right) from suspension turret -arrows-.

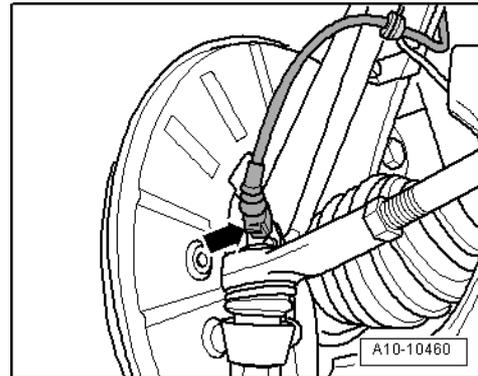




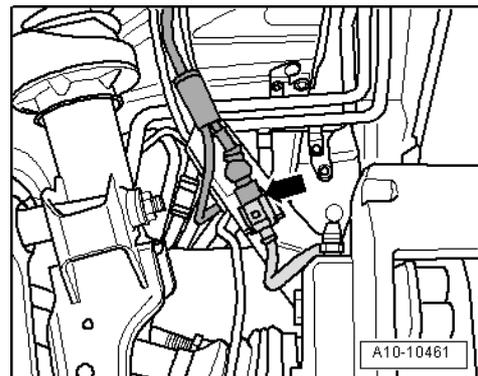
- Unplug electrical connector -1- at front left vehicle level sender -G78- in wheel housing.
- Disconnect brake lines -3- on both sides of vehicle
⇒ Rep. Gr. 46.
- Detach retaining clips -2- for brake lines.
- Plug brake lines with suitable bleeder valve cap.



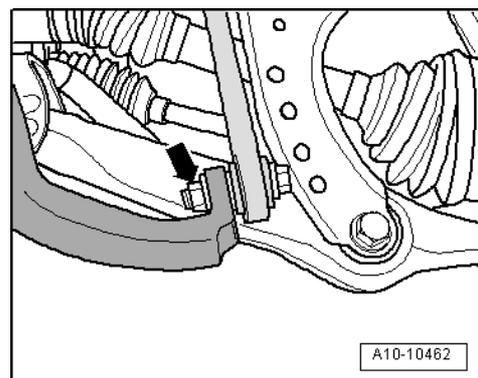
- Unplug electrical connectors -arrow- at speed sensors for left and right front wheels.
- Move wiring clear.



- Release electrical connectors -arrow- for pad wear limit sensors on left and right side of vehicle.
- Release electrical connectors from retainer and move wiring clear.



- Unbolt coupling rod from anti-roll bar -arrow- on left and right side of vehicle.



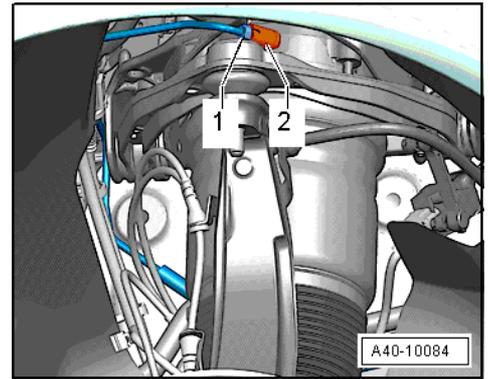
Vehicles with air suspension:

- Clean area around air hose connection at top of suspension strut.
- Remove connection piece -1- at residual pressure holding valve -2- (you will hear air escaping).

 **Note**

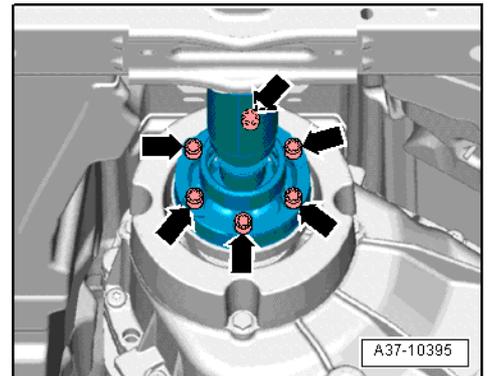
Do not loosen or remove residual pressure holding valve.

- Plug both connections. Make sure that no dirt particles get into the connections.

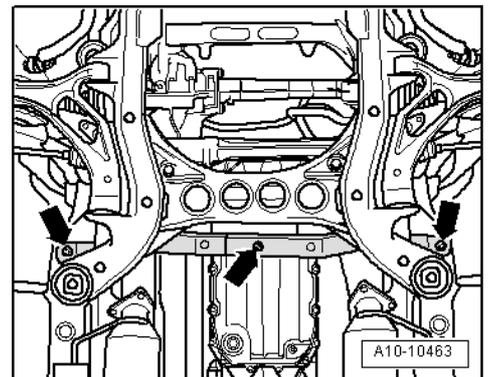


All models:

- Unscrew bolts -arrows- connecting transfer box to rear propshaft.
- Slide rear propshaft together towards rear final drive; the constant velocity joints can be moved axially.



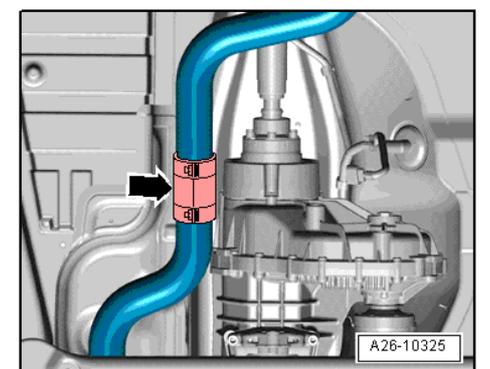
- Unbolt bracket for noise insulation -arrows-.



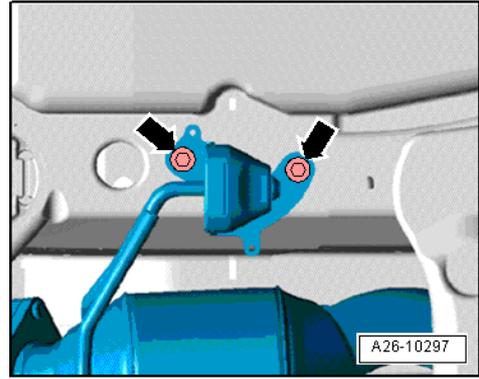
 **Note**

To avoid any damage, the flexible joint at the starter catalytic converter must not be bent more than 10°.

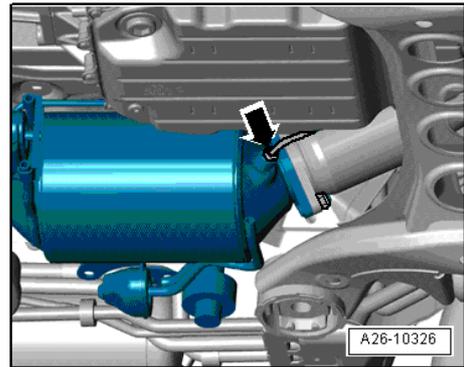
- Disconnect exhaust system at clamp -arrow-.



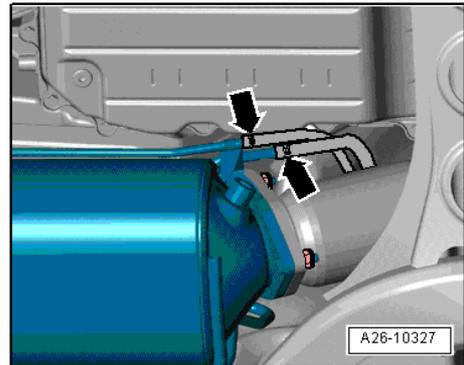
- Unscrew bracket for exhaust system from longitudinal member -arrows-.



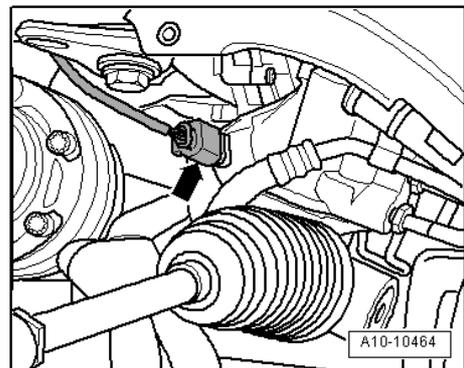
- Unscrew temperature sender before particulate filter -G506- -arrow-.



- Detach connecting hoses -arrows- going to exhaust gas pressure sensor 1 -G450- from pressure pipes at particulate filter.



- Unplug electrical connector -arrow- at steering box.

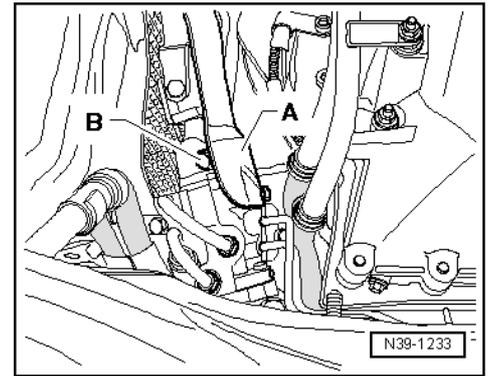


- Unbolt heat shield -A- from steering box.

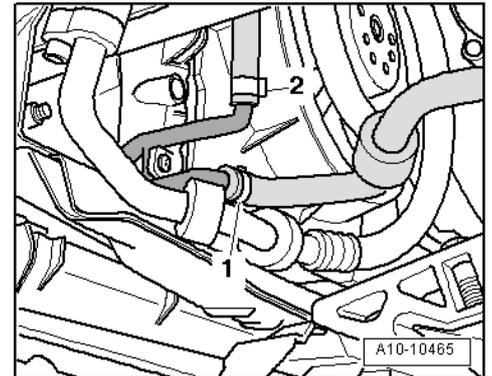
 **Caution!**

- ◆ **Make sure that front wheels are in straight-ahead position before removing universal joint from steering box.**
- ◆ **Do not alter position of steering wheel and steering box (locate steering wheel with adhesive tape if necessary).**

- Remove bolt -B- securing universal joint ⇒ Rep. Gr. 48.
- Separate universal joint from steering box.



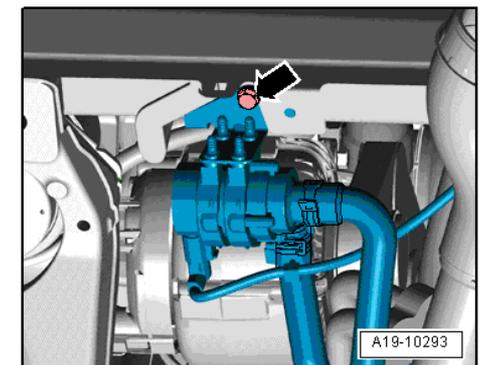
- Place used oil collection and extraction unit -V.A.G 1782- under engine.
- Detach hydraulic line -1- going to cooler for power steering at left of lock carrier.



 **Note**

Disregard -item 2-.

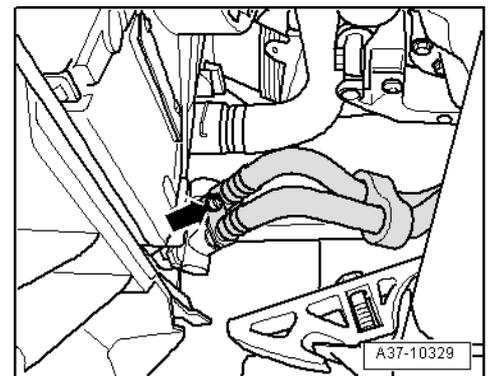
- Unscrew bolt -arrow- and move coolant pump for continued circulation -V51- clear to one side.



 **Note**

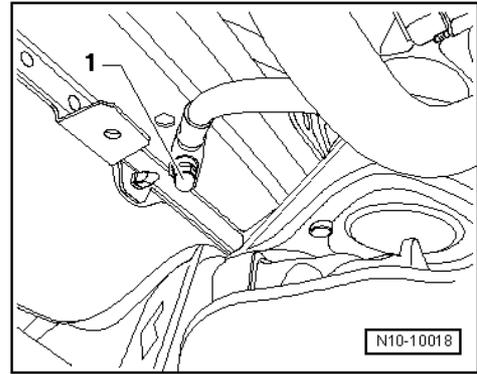
Observe rules for cleanliness when working on automatic gearbox ⇒ Rep. Gr. 37.

- Unscrew bolt -arrow- and detach ATF pipes from ATF temperature regulator.

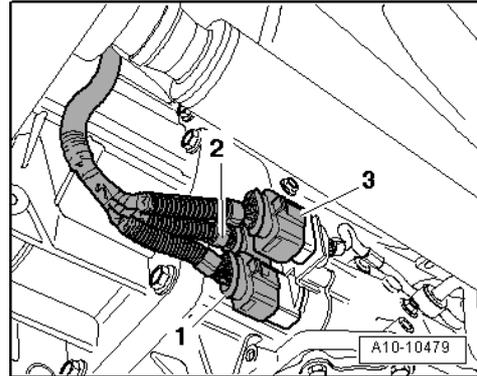




- Unbolt earth connection -1- at longitudinal member (right-side).



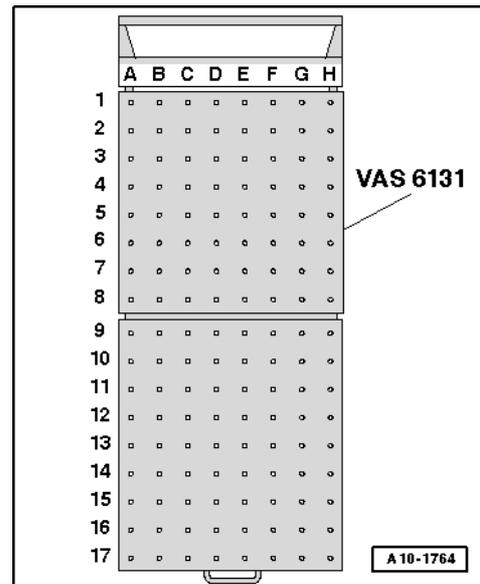
- Unplug electrical connectors -1 ... 3- for automatic gear-box 09D.



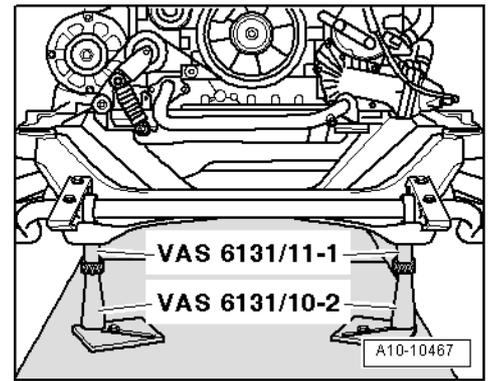
Set up the scissor-type assembly platform as follows:

- Set up scissor-type assembly platform -VAS 6131- with support set for Audi -VAS 6131/10-, supplementary set -VAS 6131/11- and -VAS 6131/13- as follows:

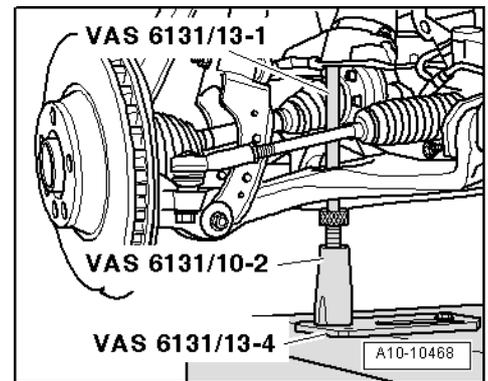
Platform coordinates	Parts from support set for Audi -VAS 6131/10-, supplementary set -VAS 6131/11- and -VAS 6131/13-			
B2	/10-1	/10-2	/10-5	/11-1
G2	/10-1	/10-2	/10-5	/11-1
A4 and C4	/13-5	-	-	/13-2
F4 and H4	/13-6	-	-	/13-2
B5	/13-4	/10-2	/10-5	/13-1
G5	/13-4	/10-2	/10-5	/13-1
C7	/10-1	/10-2	/10-5	/10-8
F7	/10-1	/10-2	/10-5	/10-8
B14	/10-1	/10-3	/10-5	/10-7
G14	/10-1	/10-3	/10-5	/10-7



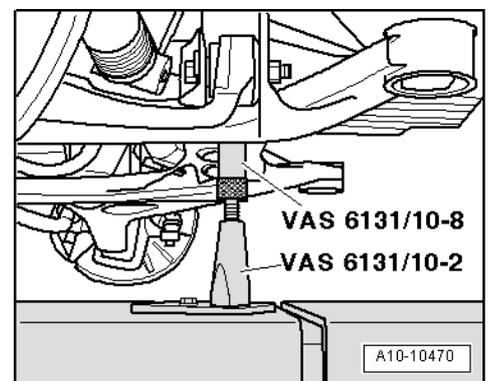
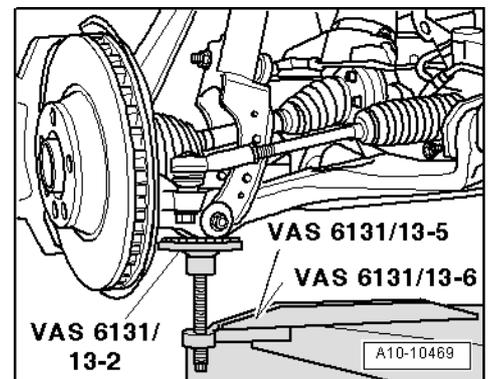
- Initially tighten the support elements on the assembly platform only hand-tight.
- Adjust the scissor-type assembly platform -VAS 6131- so that it is horizontal.
- Take note of spirit level (bubble gauge).
- Place scissor-type assembly platform under engine/gear-box assembly.
- Position the support elements from -VAS 6131/10- or -VAS 6131/11- at front of subframe, as shown in the illustration.
- Make sure that threaded spindles are screwed in completely.
- Position support elements from -VAS 6131/10- and -VAS 6131/13- at engine cross member, as shown in the illustration.



- Position support elements from -VAS 6131/13- at suspension struts, as shown in the illustration.

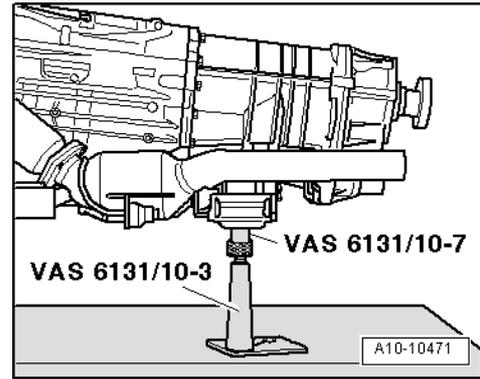


- Position support elements from -VAS 6131/10- at rear of subframe, as shown in the illustration.

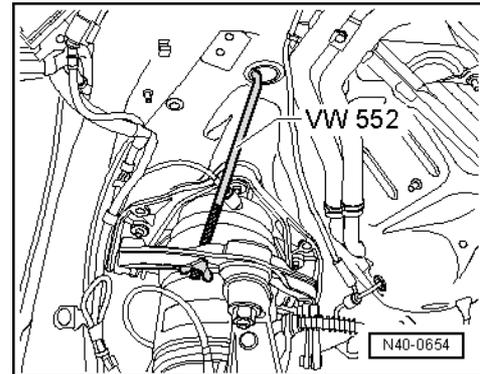




- Position the support elements from -VAS 6131/10- at left and right of gearbox carrier, as shown in the illustration.
- Turn spindles for the support elements upwards until all locating lugs make contact with the mounting points.
- Tighten base plates for support elements to 20 Nm on scissor-type assembly platform -VAS 6131-.



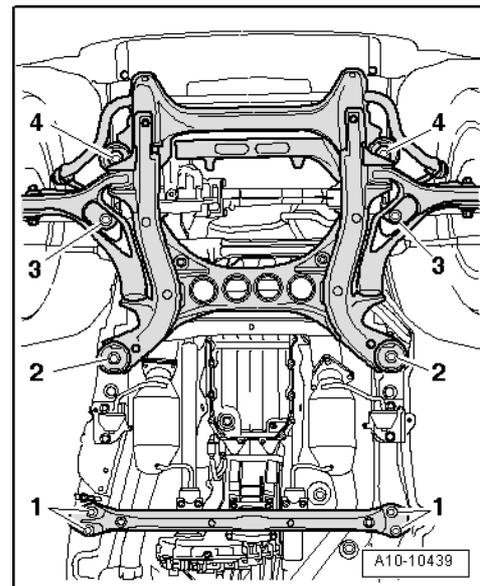
- Disengage both spring tensioners -VW 552- from drillings in wheel housing.



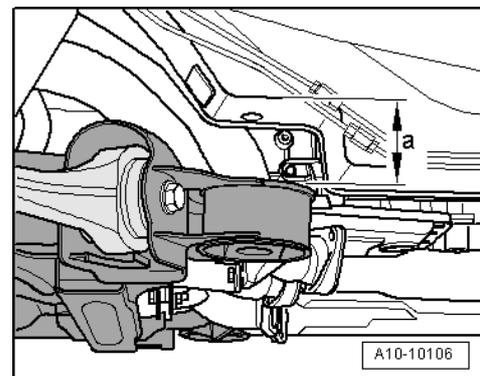
- Mark the installation position of the subframe, the engine cross member and the gearbox carrier on longitudinal members with felt-tip pen.
- Unscrew bolts -1 ... 4- in diagonal sequence and in stages.

i Note

- ◆ Check that all hoses and other connections between engine/gearbox assembly and body have been detached.
- ◆ Carefully guide out engine/gearbox assembly from engine compartment when lowering to avoid damage.
- ◆ Carefully guide suspension struts past longitudinal members.



- Lower the engine/gearbox assembly using scissor-type assembly platform -VAS 6131- initially only as far as distance -a-.
- Dimension -a- = 200 mm.

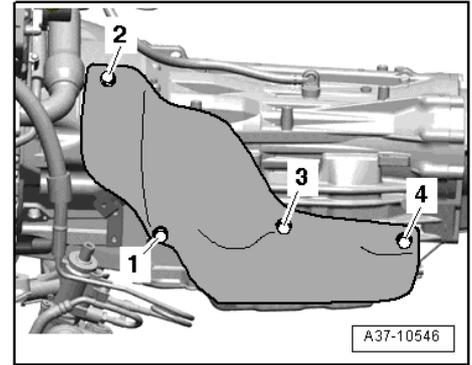


- Unscrew bolts -1, 3, 4- securing heat shield for selector lever cable.

 **Note**

Disregard -item 2-.

- Swivel heat shield slightly to the side.

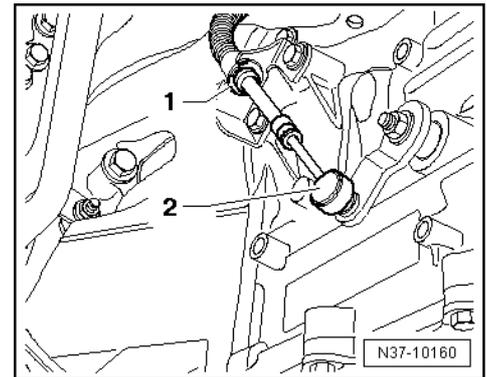


- Pry ball head -2- of selector lever cable off selector shaft lever -arrow- using removal lever -80-200-.
- Pull off securing clip -1- and remove selector lever cable from gearbox.

 **Note**

Take care not to bend or kink selector lever cable.

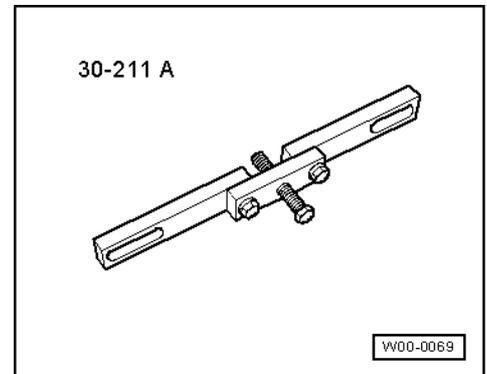
- Lower engine/gearbox assembly.
- Pull out scissor-type assembly platform -VAS 6131- with engine/gearbox assembly from beneath vehicle.



1.2 Separating engine and gearbox

Special tools and workshop equipment required

- ◆ Support bridge -30-211 A-
- ◆ Support set for Audi -VAS 6131/10-, supplementary set -VAS 6131/12- and -VAS 6131/13-



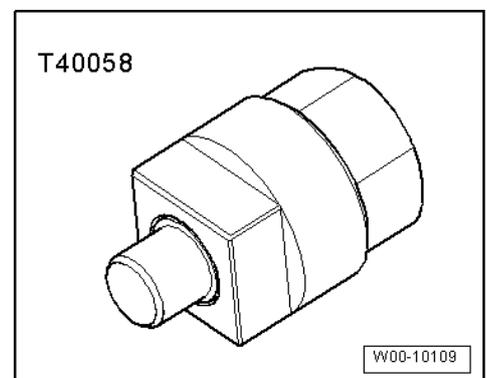
- ◆ Adapter -T40058-

Procedure

- Engine/gearbox assembly removed and secured to scissor-type assembly platform -VAS 6131-.

 **Note**

All cable ties which are released or cut open when removing must be fitted in the same position when installing.

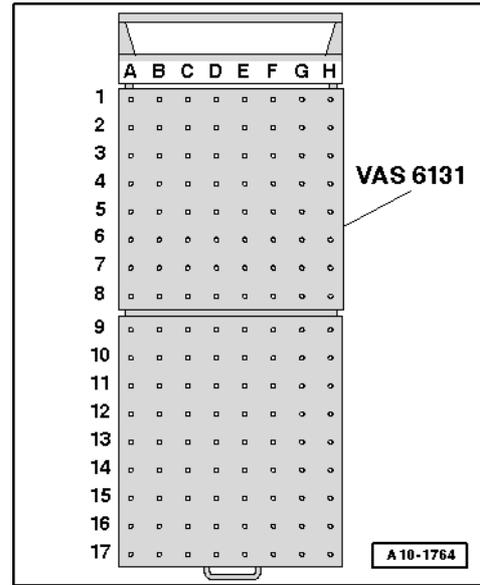


- Set up scissor-type assembly platform -VAS 6131- with support set for Audi -VAS 6131/10- and additional parts from supplementary set -VAS 6131/12- and -VAS 6131/13- as follows:

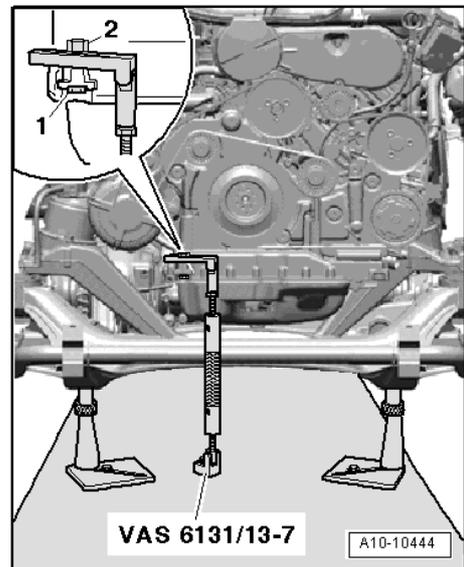
i Note

The other support elements remain unchanged.

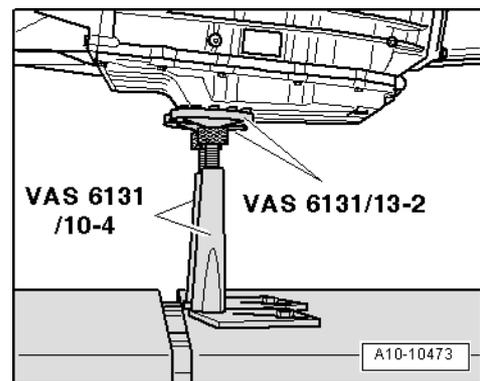
Platform coordinates	Parts from support set for Audi -VAS 6131/10-, supplementary set -VAS 6131/12- and -VAS 6131/13-			
E1	/13-7			
C10	/10-1	/10-4	/10-5	/13-2
E10	/10-1	/10-4	/10-5	/13-2
G10	/10-1	/12-2	/10-5	/13-3



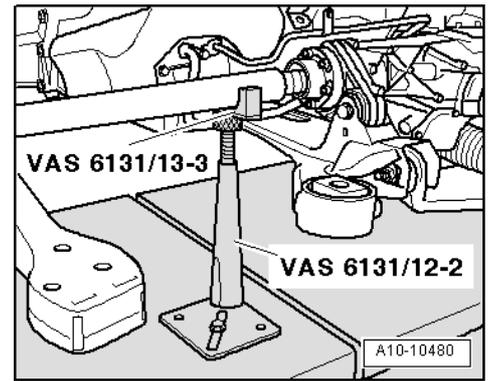
- Fit support -VAS 6131/13-7- into drillings at front of engine and secure with bolt M10x45 -item 1- and nut -2-.
- Secure support -VAS 6131/13-7- to scissor-type assembly platform.



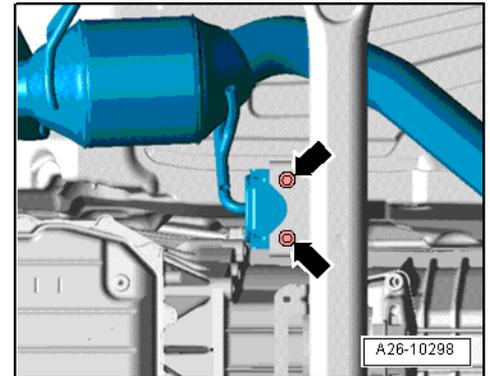
- Place support elements from -VAS 6131/10- and -VAS 6131/13- under front of ATF oil pan, as shown in illustration.



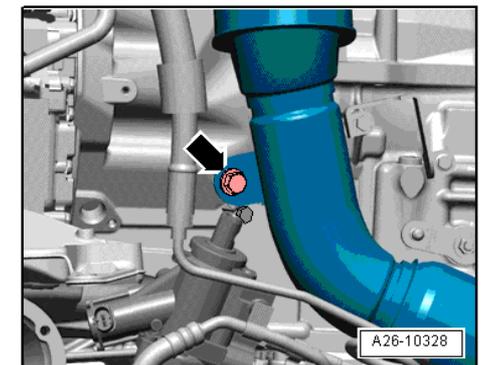
- Move support elements from -VAS 6131/10-, -VAS 6131/12- and -VAS 6131/13- in position to support propshaft, as shown in illustration.



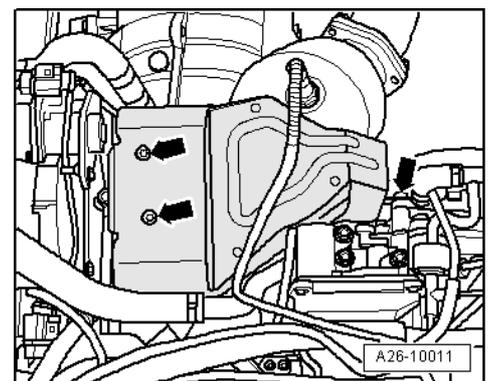
- Remove bolts -arrows- on bracket for particulate filter.



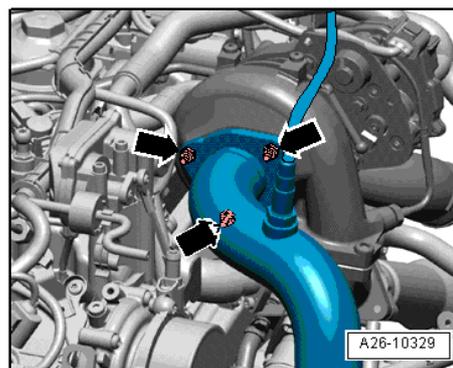
- Unscrew bolt -arrow- at bracket for starter catalytic converter.



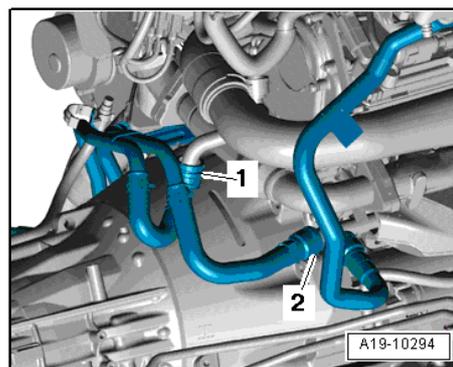
- Remove heat shield for turbocharger -arrows-.



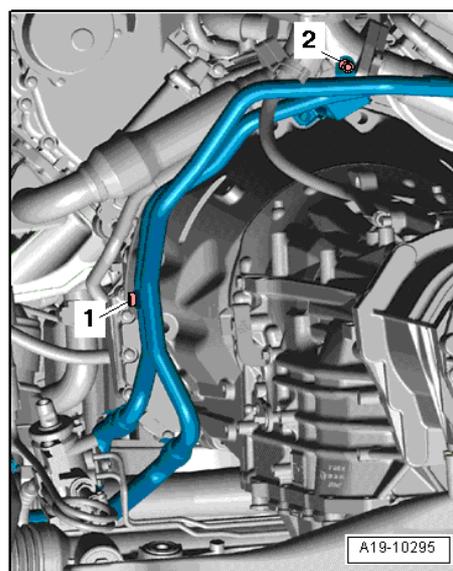
- Unscrew nuts -arrows-.
- Detach starter catalytic converter with particulate filter.



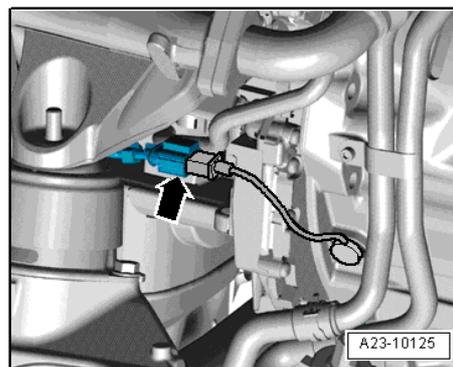
- Detach coolant hoses -1- and -2- at right of engine.



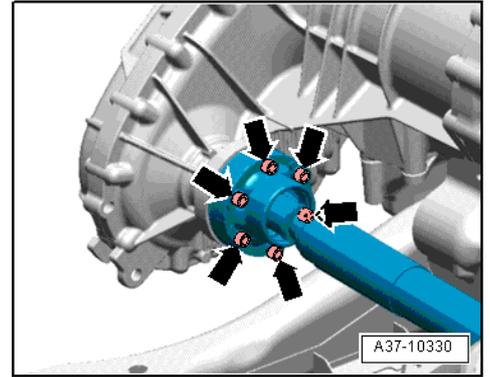
- Remove bolts -1- and -2-.
- Detach both coolant pipes (rear left) together with coolant hoses.



- Take electrical connector -arrow- for engine speed sender -G28- out of bracket and unplug it.

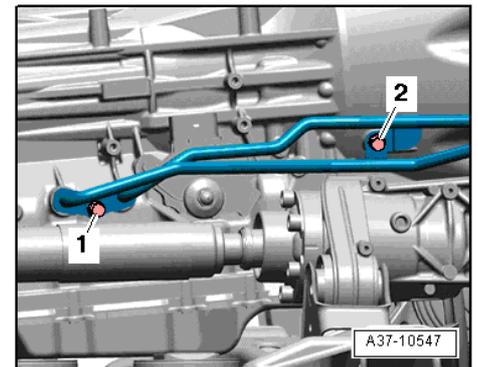


- Unscrew bolts -arrows- connecting transfer box to front propshaft.

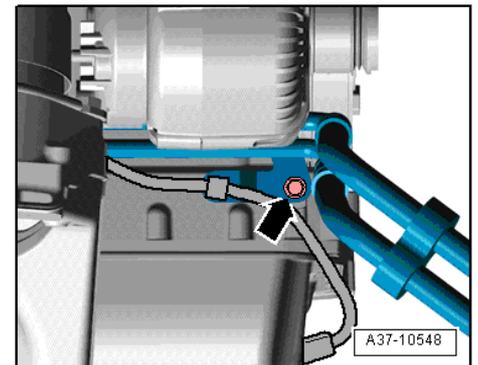


i Note

- ◆ Lay a cloth under the connection to catch escaping ATF.
 - ◆ Observe rules for cleanliness when working on automatic gearbox ⇒ Rep. Gr. 37.
- Unscrew bolts -1- and -2- and detach ATF pipes from gear-box.



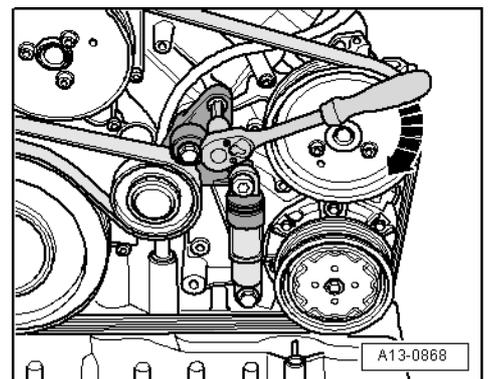
- Unscrew bolt -arrow- and detach ATF pipes.



i Note

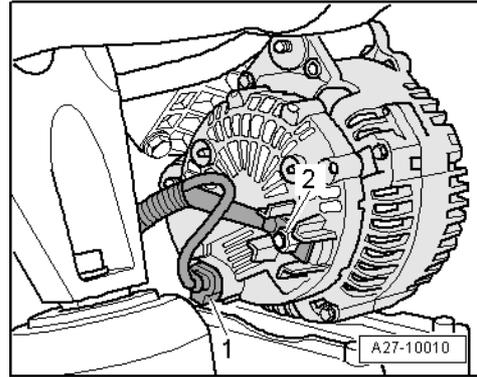
Before removing, mark direction of rotation of poly V-belt with chalk or felt-tipped pen. If the belt runs in the opposite direction when it is refitted, this can cause breakage.

- Slacken poly V-belt by swivelling tensioner in direction of -arrow-, using a lever with TORX 60 bit.
- Remove poly V-belt from tensioning roller.





- Detach electrical wiring -1- and -2- at alternator.
- Move wiring clear.

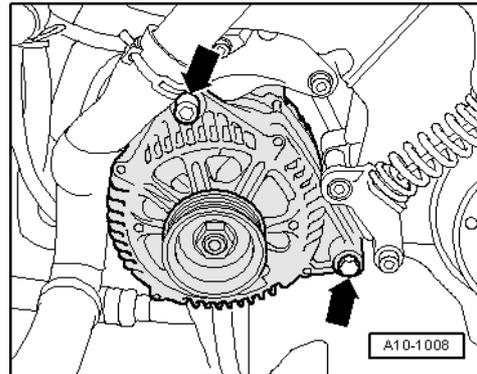


- Remove bolts -arrows- at alternator.

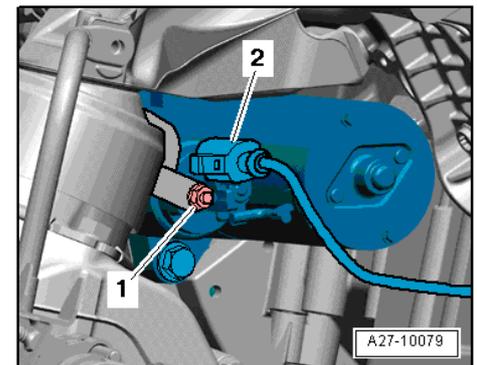
i Note

- ◆ If alternator sticks in its bracket, screw bolt back in again down to the last 2 turns.
- ◆ Tap carefully on bolt heads with flat side of hammer to release bushes of alternator mountings.

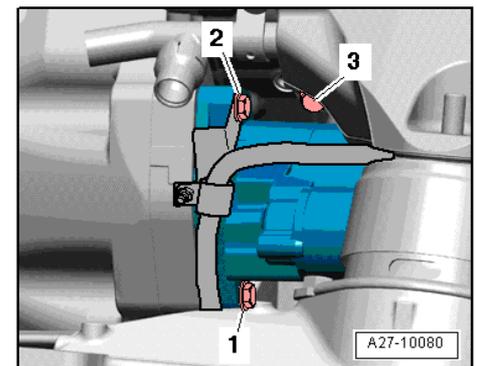
- Remove alternator.



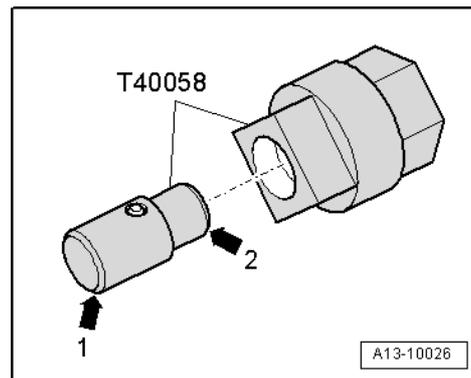
- Unplug electrical connector -2-.
- Unscrew B+ wiring -1-.



- Remove bolt -3- for engine support.
- Remove bolts -1- and -2- and detach starter.



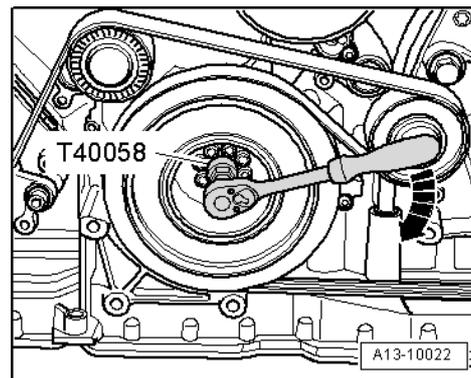
- Insert guide pin of adapter -T40058- with the larger-diameter section -arrow 1- pointing towards the engine. The smaller-diameter section -arrow 2- faces the adapter.



- When loosening torque converter bolts, counterhold crankshaft using adapter -T40058-.

 **Note**

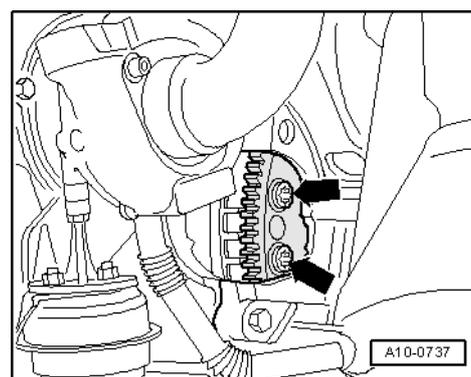
Ignore -arrow-.



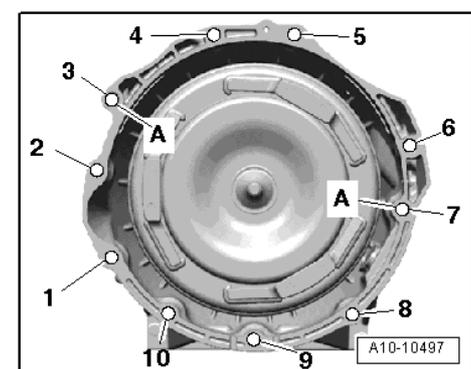
 **Caution!**

Do not rotate crankshaft in opposite direction of engine rotation.

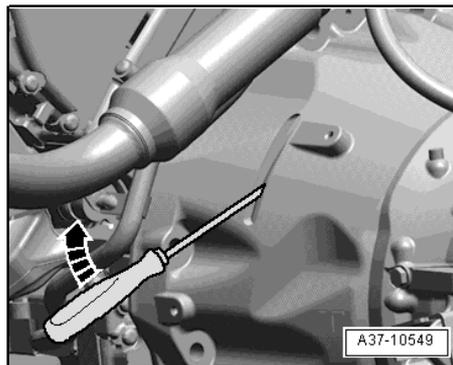
- Unscrew 3 bolts -arrow- for torque converter, working through opening of removed starter (turn crankshaft $\frac{1}{3}$ turn in direction of engine rotation each time).



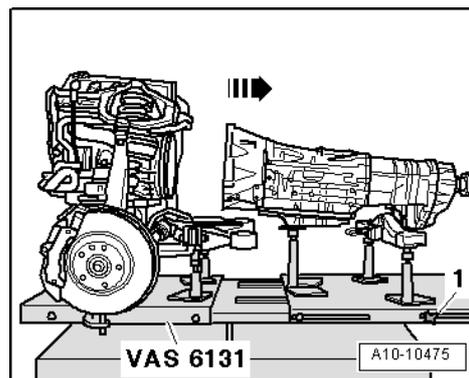
- Remove bottom engine/gearbox securing bolts -3 ... 10-.



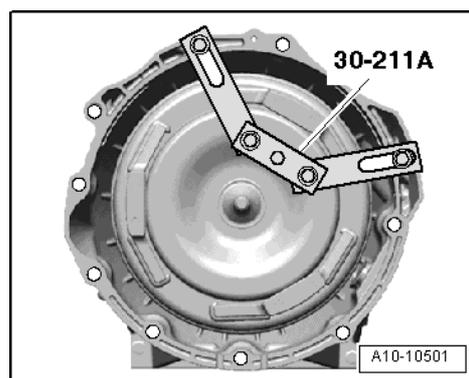
- Separate gearbox from engine and simultaneously detach torque converter from drive plate -arrow-.



- Loosen clamping bolts -1- on sides of scissor-type assembly platform -VAS 6131- and pull rear section of platform together with gearbox slightly towards the rear to start with.



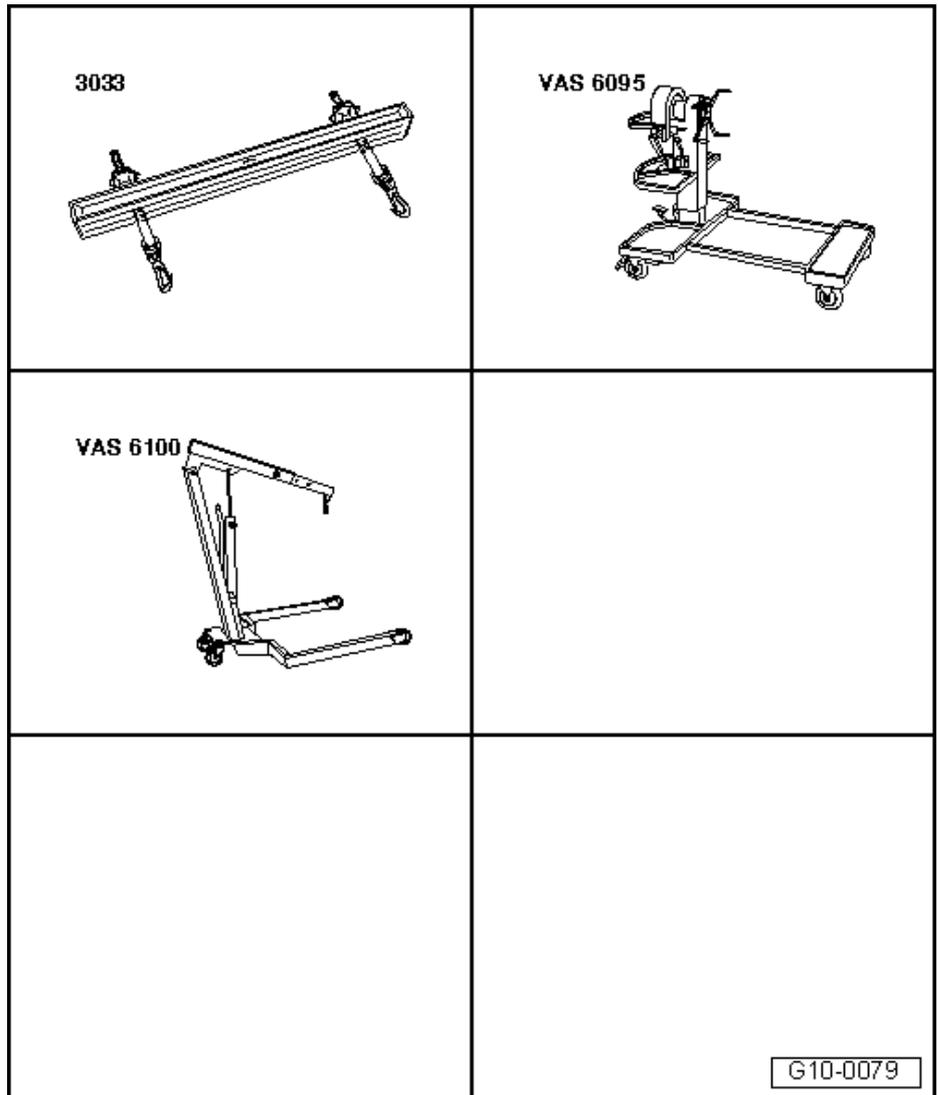
- Secure the torque converter in the gearbox using support bridge -30-211 A- to prevent it falling out.



1.3 Securing engine to assembly stand

Special tools and workshop equipment required

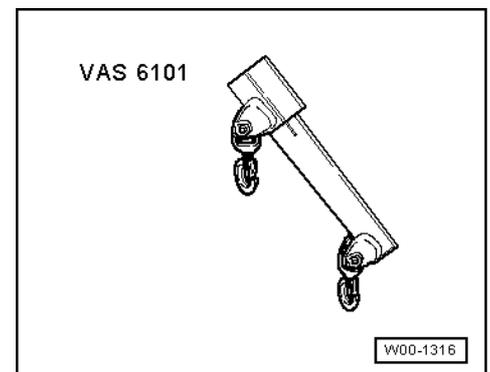
- ◆ Lifting tackle -3033-
- ◆ Engine and gearbox support -VAS 6095- with support bracket for V6 TDI engine -VAS 6095/1-4-
- ◆ Workshop hoist -VAS 6100-



- ◆ Lift arm extension (workshop hoist) -VAS 6101-

Procedure

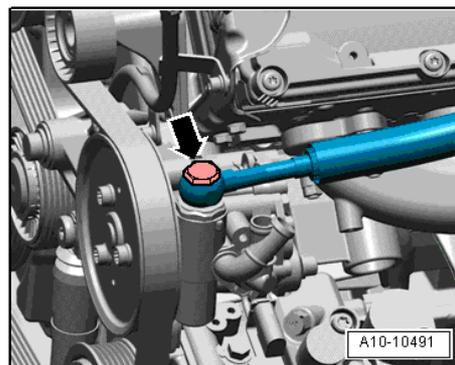
- Engine/gearbox assembly removed and secured to scissor-type assembly platform -VAS 6131- (with engine detached from gearbox) => [page 21](#).
- Engine secured with support -VAS 6131/13-7-.



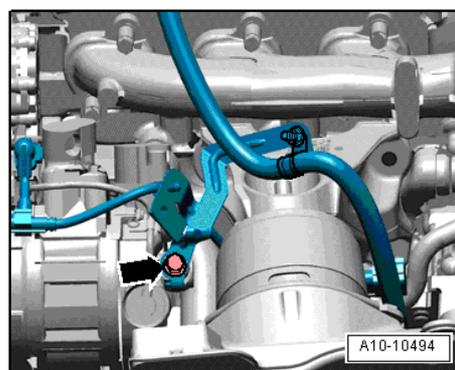
 **Note**

Lay a cloth under the separating point to catch escaping hydraulic fluid.

- Unscrew banjo bolt -arrow- for power steering pressure pipe.



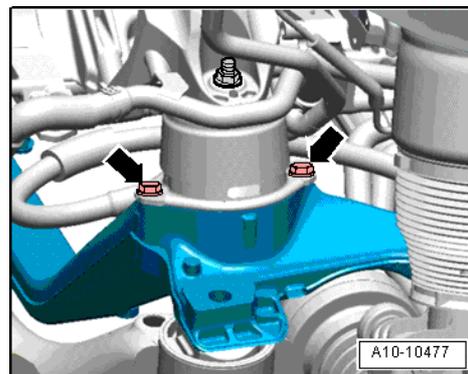
- Unbolt bracket for wiring harness from air conditioner compressor -arrow-.



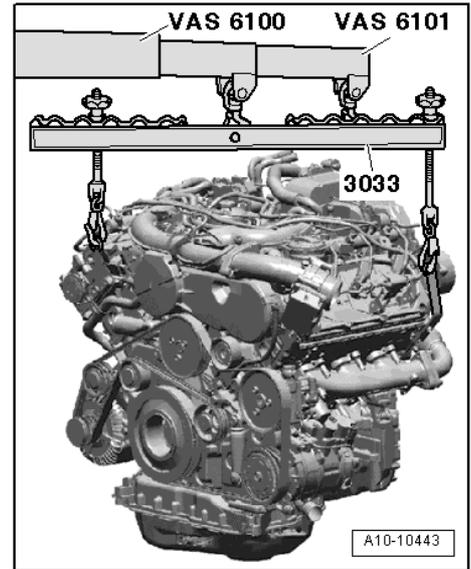
- Remove bolts for engine mountings -arrows- on both sides.

 **Note**

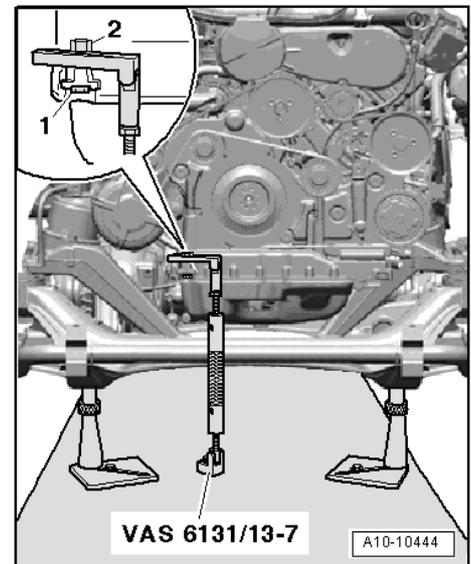
Engine cross member remains in installation position.



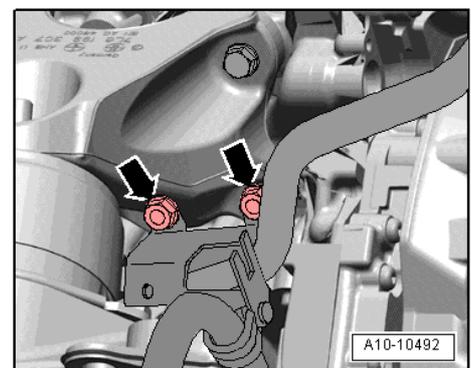
- Attach the lifting tackle -3033- to engine lifting eyes and workshop hoist -VAS 6100- with lift arm extension (workshop hoist) -VAS 6101- as shown in the illustration.
- Use workshop hoist to take up some of the weight of the engine (do not lift).



- Remove support -VAS 6131/13-7- from engine.
- Lift off engine from engine cross member.



- Unscrew nuts -arrows- and detach bracket for connector from engine support (left-side).

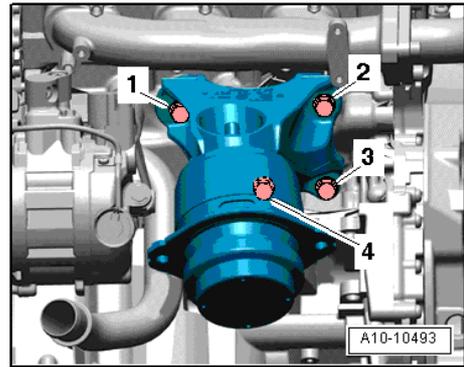




- Remove bolts -1 ... 4- on left and right and detach engine supports.

i Note

Illustration shows engine support (left-side).



- Using support bracket for V6 TDI engine -VAS 6095/1-4-, secure engine to engine and gearbox support -VAS 6095- as shown in the illustration.

1.4 Installing engine

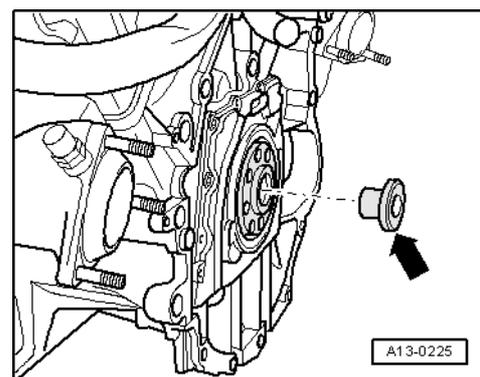
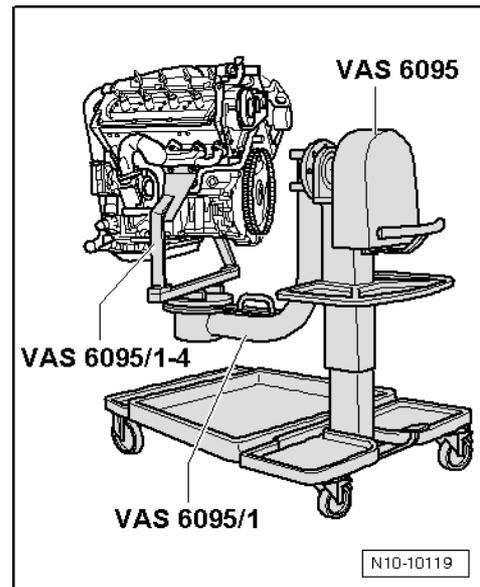
i Note

- ♦ *Renew self-locking nuts and bolts when performing assembly work.*
- ♦ *Renew bolts which are tightened to a specified angle as well as oil seals and gaskets.*
- ♦ *Hose connections and hoses for charge air system must be free of oil and grease before assembly.*
- ♦ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue.*
- ♦ *Fit all cable ties in the original positions when installing.*

- Install engine supports (left and right).
- Check whether dowel sleeves for centring the engine/gearbox assembly are fitted in the cylinder block; install dowel sleeves if necessary.

Bearing bush for torque converter

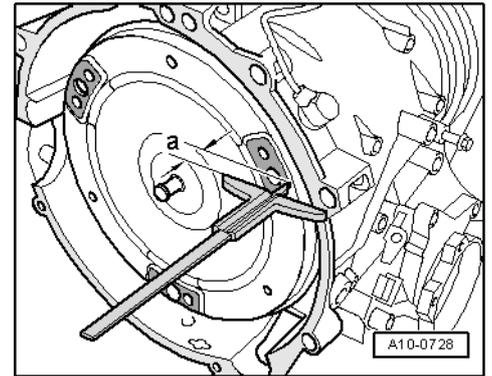
- On vehicles with automatic gearbox, check that bearing bush -arrow- is inserted in rear of crankshaft. Drive in bearing bush if necessary.



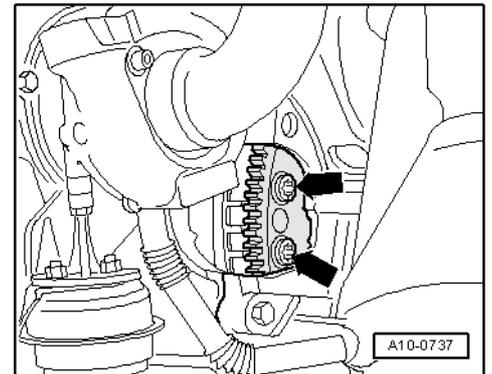
Checking installation depth of torque converter

If the torque converter has been correctly installed, the distance -a- between the bottom contact surfaces at the threaded holes in the torque converter and the contact surface on the torque converter bell housing (with automatic gearbox 09D) is approx. 22 mm.

If the torque converter has not been completely inserted, this distance will be approx. 10 mm.



- Before bringing engine and gearbox together, turn torque converter and drive plate on engine so that the holes or tapped holes are in line with the opening for the removed starter -arrows-.
- To secure torque converter on drive plate, use only new ribbed bolts of the correct type (same as original equipment) as specified in ⇒ Parts catalogue.
- Bolt gearbox to engine.

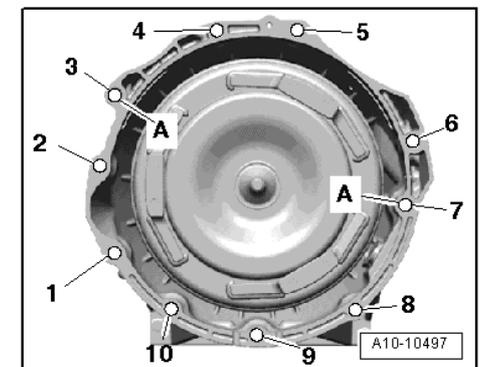


Note

- ◆ Tightening torques apply only to lightly greased, oiled, phosphated or black-finished nuts and bolts.
- ◆ Additional lubricant such as engine oil or gearbox oil may be used, but do not use lubricant containing graphite.
- ◆ Do not use degreased parts.
- ◆ Tolerance for tightening torques ± 15%.

Securing engine to gearbox

Item	Bolt	Nm
1, 2	M10x70	45
3 ... 5, 7	M12x80	80
6	M12x70	80
8 ... 10	M10x70	45
A	Dowel sleeves for centralising	

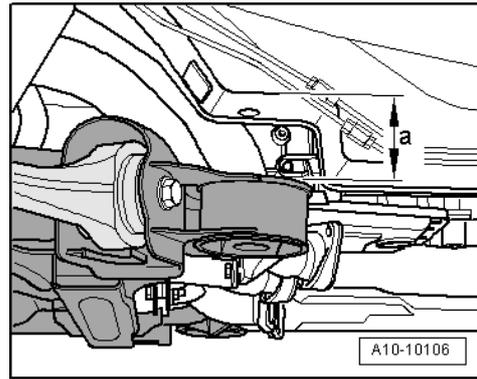


Installation is carried out in the reverse order; note the following:

- Install power steering pressure line ⇒ Rep. Gr. 48.
- Install starter ⇒ Rep. Gr. 27.
- Install alternator ⇒ Rep. Gr. 27.
- Install poly V-belt ⇒ [page 39](#).
- Install ATF pipes ⇒ Rep. Gr. 37.
- Secure front propshaft to transfer box ⇒ Rep. Gr. 39.
- Install coolant pipes (rear left) ⇒ [page 176](#).
- Install starter catalytic converter ⇒ [page 204](#).
- Install particulate filter ⇒ [page 207](#).

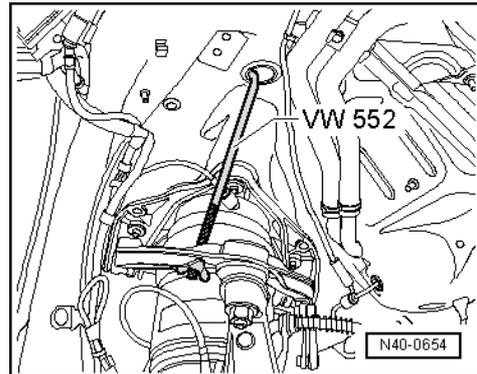


- Carefully guide engine/gearbox assembly together with subframe into the body from below as far as distance -a- using scissor-type assembly platform -VAS 6131-.
- Distance -a- = 200 mm.
- Install selector lever cable and check adjustment if necessary ⇒ Rep. Gr. 37.
- Raise engine/gearbox assembly together with subframe further using scissor-type assembly platform -VAS 6131-.
- Secure suspension struts (left and right) using spring tensioner -VW 552-.



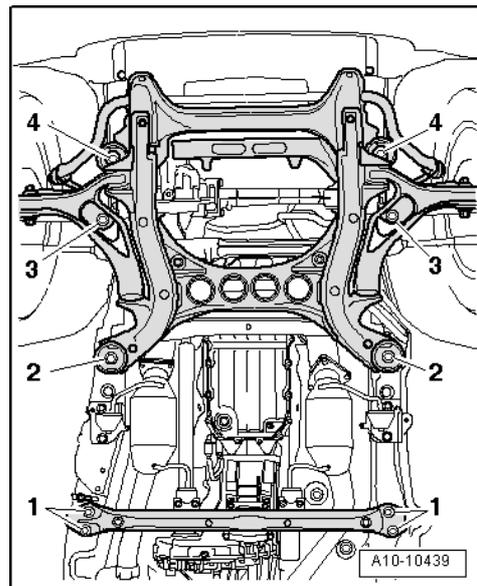
i Note

Securing the suspension struts ensures the drive shafts are not under load when lowering scissor-type assembly platform.



- Adjust the subframe, engine cross member and gearbox carrier according to the markings made on the longitudinal members during removal.
- Tighten bolts for subframe, engine cross member and gearbox carrier only to the specified torque (do not turn further); tighten bolts to final setting only after performing wheel alignment check.

- 1 - 50 Nm
- 2 - 120 Nm
- 3 - 120 Nm
- 4 - 120 Nm



⚠ WARNING!

The vehicle must not be driven at this stage.

Remaining installation steps are carried out in reverse sequence; note the following:

- Fit universal joint to steering box ⇒ Rep. Gr. 48.
- Install temperature sender before particulate filter -G506- ⇒ **page 219**.
- Align exhaust system so it is free of stress ⇒ **page 217**.
- Secure rear propshaft to transfer box ⇒ Rep. Gr. 39.
- Install anti-roll bar ⇒ Rep. Gr. 40.
- Install brake lines ⇒ Rep. Gr. 46.
- Install suspension struts (coil spring) ⇒ Rep. Gr. 40.
- Install suspension struts (air suspension) ⇒ Rep. Gr. 40 and connect air hose.

- Install engine control unit ⇒ Rep. Gr. 23.
- Install refrigerant lines ⇒ Rep. Gr. 87.
- Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- Observe notes on procedures required after connecting battery ⇒ Rep. Gr. 27.

 **Caution!**

Do not use a battery charger to boost starting. There is danger of damaging the vehicle's control units.

- Bleed brake system ⇒ Rep. Gr. 47.
- Install and adjust wiper arms ⇒ Rep. Gr. 92.
- Fill up with engine oil and check oil level ⇒ [page 157](#).
- Before starting engine, top-up hydraulic fluid in power steering reservoir ⇒ Rep. Gr. 48.

 **Note**

The power steering pump must not be run when dry.

- Fill cooling system ⇒ [page 162](#).

 **Note**

- ◆ *Drained-off coolant may only be used again if the original cylinder head and cylinder block are re-installed.*
- ◆ *Contaminated or dirty coolant must not be used again.*
- Charge the refrigerant system ⇒ Air conditioner system - with refrigerant R134a.
- Adjust subframe, engine cross member and gearbox carrier ⇒ Rep. Gr. 40.
- Adjust gearbox carrier and tighten bolts ⇒ Rep. Gr. 37.
- Perform wheel alignment check ⇒ Rep. Gr. 44.



WARNING!

Tighten bolts for subframe to final setting after performing wheel alignment check.

Tightening torques

 **Note**

- ◆ *Tightening torques apply only to lightly greased, oiled, phosphated or black-finished nuts and bolts.*
- ◆ *Additional lubricant such as engine oil or gearbox oil may be used, but do not use lubricant containing graphite.*
- ◆ *Do not use degreased parts.*
- ◆ *Tolerance for tightening torques ± 15 %.*



Audi Q7 2007 ▶

Audi 6-cylinder TDI engine (3.0 ltr. 4-valve common rail), mechanics 01.2006

Component		Nm
Bolts/nuts	M6	9
	M8	20
	M10	40
	M12	65
Except for the following:		
Engine support to cylinder block		60
Engine mounting to engine cross member		60
Drive plate to torque converter		85 ¹⁾
Engine cross member to longitudinal member		120 + 180° ₁₎₂₎
Bracket for continued circulation coolant pump -V51- to longitudinal member		25
Bracket for noise insulation to body		9
Throttle valve module -J338- to intake connecting pipe		9
Fuel filter to bracket		9
Air pipe (bottom) to radiator cowl		9
<ul style="list-style-type: none"> • ¹⁾ Renew bolts. • ²⁾ 180° = one half turn. 		

13 – Crankshaft group

1 Servicing work on pulley end

1.1 Poly V-belt drive - exploded view of components

1 - Poly V-belt

- Before removing, mark direction of rotation with chalk or felt-tipped pen. If the belt runs in the opposite direction when it is refitted, this can cause breakage.
- Removing and installing ⇒ [page 39](#)
- Check for wear
- When installing, make sure it is properly seated on pulleys.

2 - 27 Nm

- Bolt strength rating 10.9

3 - Cover for idler roller

4 - Alternator

- Removing and installing ⇒ Rep. Gr. 27
- To facilitate attachment of alternator, knock back threaded bushes for alternator securing bolts slightly

5 - 22 Nm

6 - Cover for idler roller

7 - 25 Nm

- Bolt strength rating 10.9

8 - Idler roller for poly V-belt

- Note installation position

9 - 40 Nm

10 - Bracket for alternator and idler roller

11 - 22 Nm

- Bolt strength rating 10.9

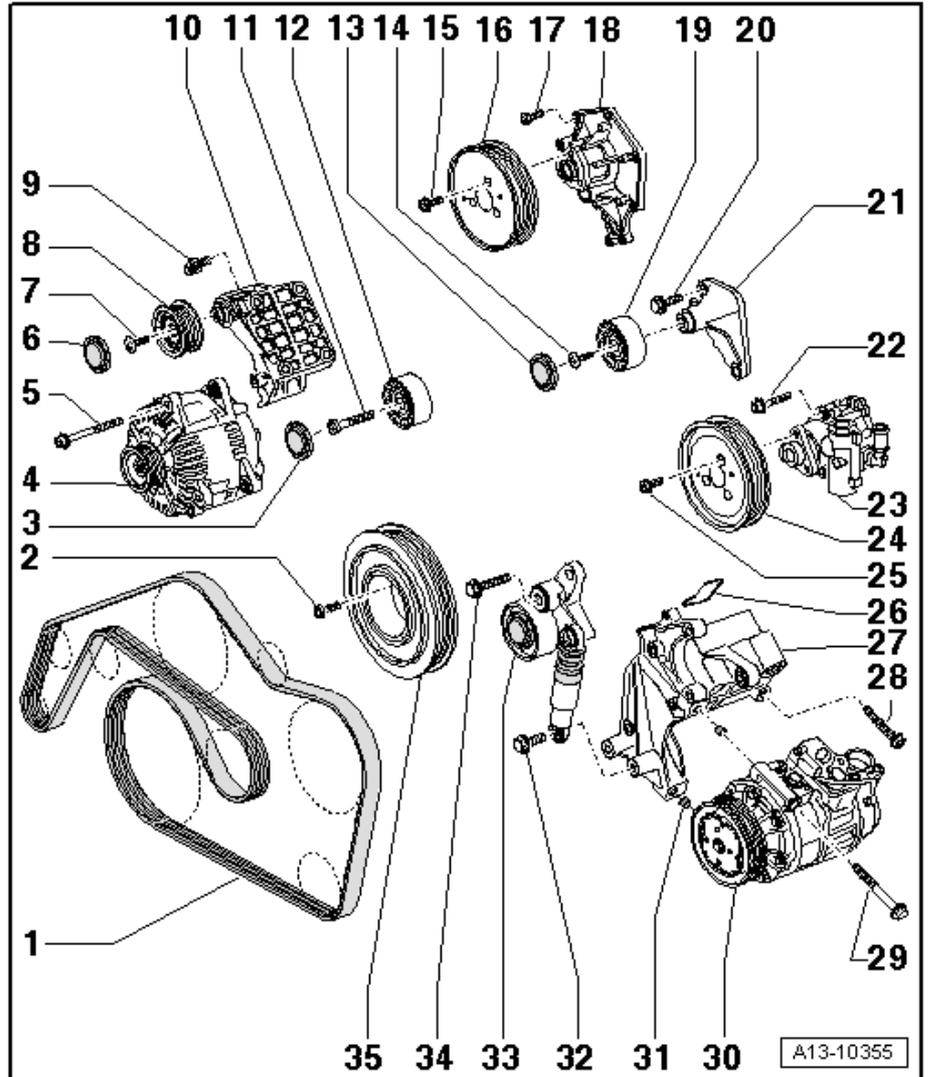
12 - Idler roller for poly V-belt

- Note installation position

13 - Cover for idler roller

14 - 25 Nm

- Bolt strength rating 10.9





15- 22 Nm

16- Poly V-belt pulley for coolant pump

- Counterhold with 2-hole pin wrench -3212- when loosening and tightening ⇒ Fig..
- Installation position: marking “vorne” (front) faces in direction of travel.

17- 9 Nm

18- Coolant pump

- Removing and installing ⇒ page 167

19- Idler roller for poly V-belt

- Note installation position

20- 22 Nm

21- Bracket for idler roller

22- 22 Nm

23- Power steering pump

- Removing and installing ⇒ Rep. Gr. 48

24- Poly V-belt pulley for power steering pump

- Counterhold with 2-hole pin wrench -3212- when loosening and tightening ⇒ Fig..
- Installation position: marking “vorne” (front) faces in direction of travel.

25- 22 Nm

26- Seal

- Renew

27- Bracket for ancillaries

28- 40 Nm

29- 25 Nm

30- Air conditioner compressor

- Do not unscrew or disconnect refrigerant hoses or pipes.
- Removing and installing ⇒ Rep. Gr. 87
- When installing check dowel sleeves ⇒ item 31

31- Dowel sleeve

- 2 x
- Check for correct seating in bracket

32- 25 Nm

33- Poly V-belt tensioner

- Removing and installing ⇒ page 40

34- 40 Nm

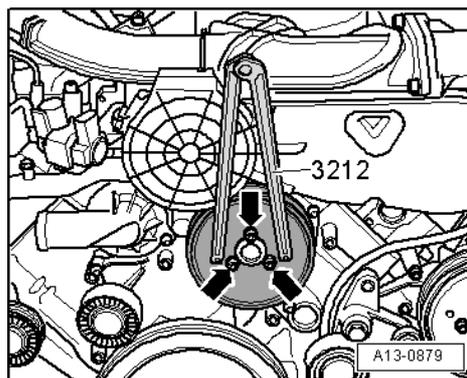
- Bolt strength rating 10.9

35- Vibration damper

- With poly V-belt pulley
- Removing and installing ⇒ page 40

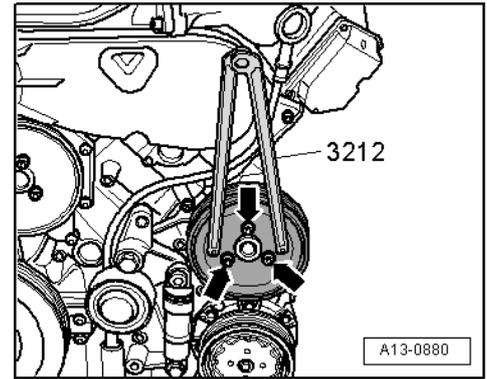
Loosening poly V-belt pulley for coolant pump

- Poly V-belt removed.
- Counterhold using pin wrench -3212- when loosening bolts -arrows- on poly V-belt pulley for coolant pump.



Loosening poly V-belt pulley for power steering pump

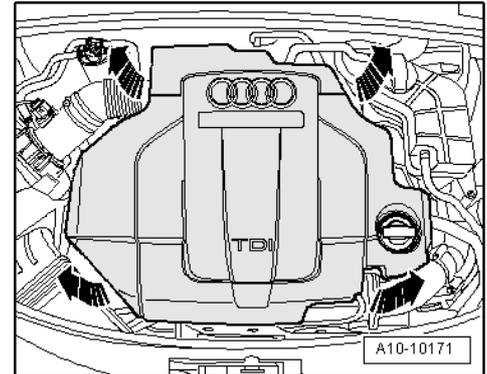
- Poly V-belt removed.
- Counterhold using pin wrench -3212- when loosening bolts -arrows- on poly V-belt pulley for power steering pump.



1.2 Removing and installing poly V-belt

Removing

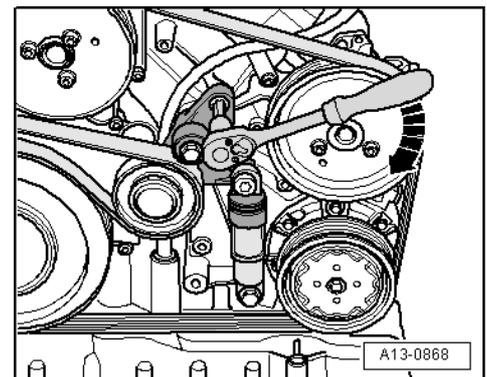
- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



Note

Before removing, mark direction of rotation of poly V-belt with chalk or felt-tipped pen. If the belt runs in the opposite direction when it is refitted, this can cause breakage.

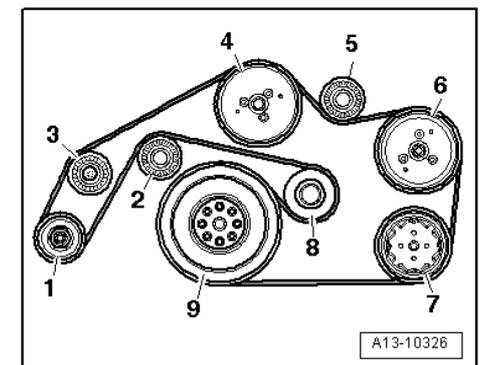
- Slacken poly V-belt by swivelling tensioner in direction of -arrow-, using a lever with TORX 60 bit.
- Remove poly V-belt from tensioning roller.



Installing

Installation is carried out in the reverse order; note the following:

- Fit poly V-belt on pulleys.
 - 1 - Alternator
 - 2 - Idler roller
 - 3 - Idler roller
 - 4 - Coolant pump
 - 5 - Idler roller
 - 6 - Power steering pump
 - 7 - Air conditioner compressor
 - 8 - Poly V-belt tensioner
 - 9 - Crankshaft



Note

When installing poly V-belt, make sure it is properly seated on pulleys.

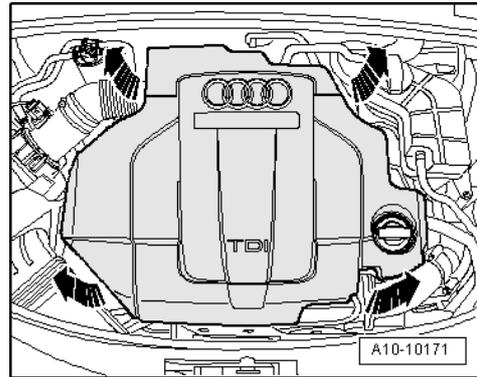
- Start engine and check that belt runs properly.



1.3 Removing and installing tensioner for poly V-belt

Removing

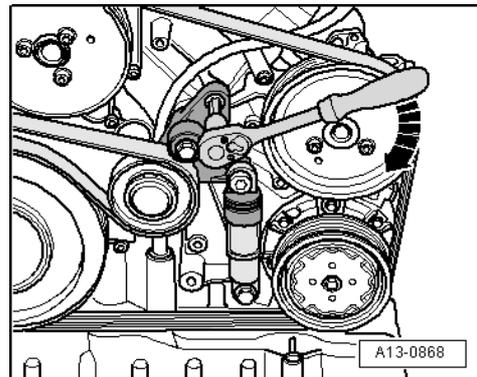
- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



i Note

Before removing, mark direction of rotation of poly V-belt with chalk or felt-tipped pen. If the belt runs in the opposite direction when it is refitted, this can cause breakage.

- Slacken poly V-belt by swivelling tensioner in direction of -arrow-, using a lever with TORX 60 bit.
- Remove poly V-belt from tensioning roller.

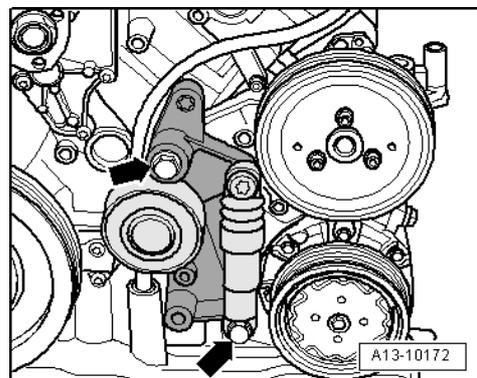


- Unscrew bolts -arrows- and remove poly V-belt tensioner.

Installing

Installation is carried out in the reverse order; note the following:

- Install poly V-belt ⇒ [page 39](#).



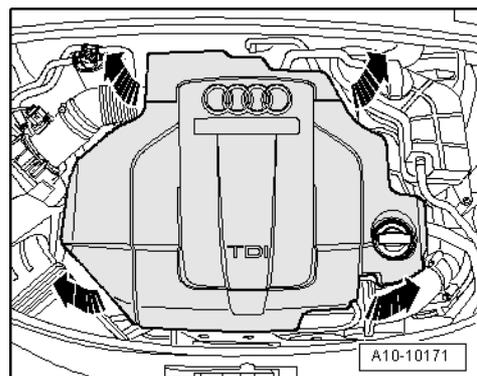
Tightening torques

Component		Nm
Poly V-belt tensioner to engine	M8	25
	M10	40

1.4 Removing and installing vibration damper

Removing

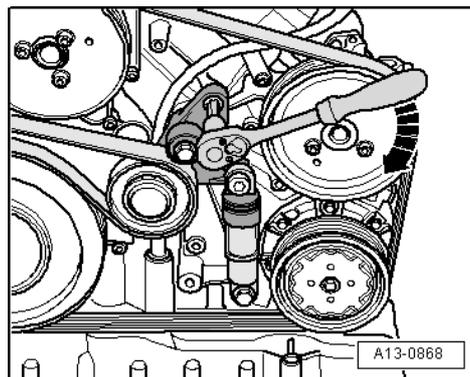
- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



 **Note**

Before removing, mark direction of rotation of poly V-belt with chalk or felt-tipped pen. If the belt runs in the opposite direction when it is refitted, this can cause breakage.

- Slacken poly V-belt by swivelling tensioner in direction of -arrow-, using a lever with TORX 60 bit.
- Remove poly V-belt from tensioning roller.

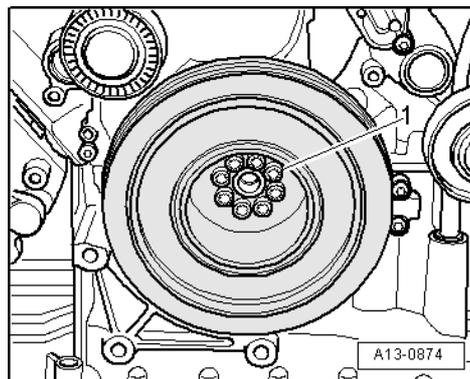


- Mark position of vibration damper for re-installation.
- Unscrew bolts -1- and remove vibration damper.

Installing

Installation is carried out in the reverse order; note the following:

- Install poly V-belt => [page 39](#).



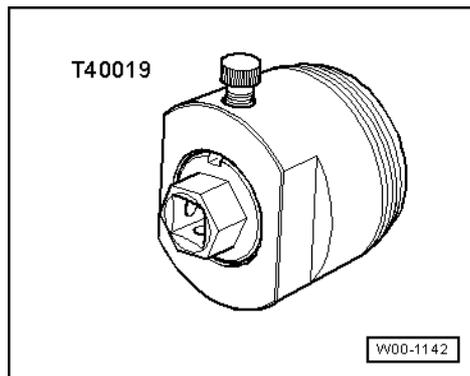
Tightening torque

Component	Nm
Vibration damper to crankshaft	27 ¹⁾
<ul style="list-style-type: none"> • ¹⁾ Bolt strength rating 10.9 	

1.5 Renewing crankshaft oil seal (pulley end)

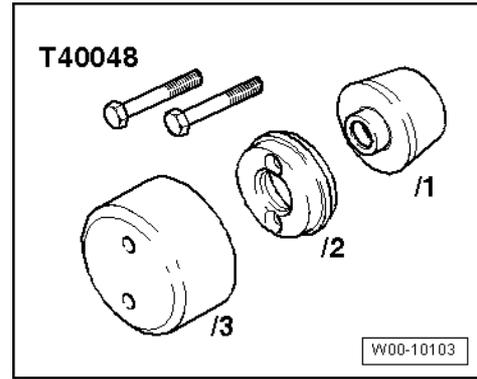
Special tools and workshop equipment required

- ◆ Oil seal extractor -T40019-



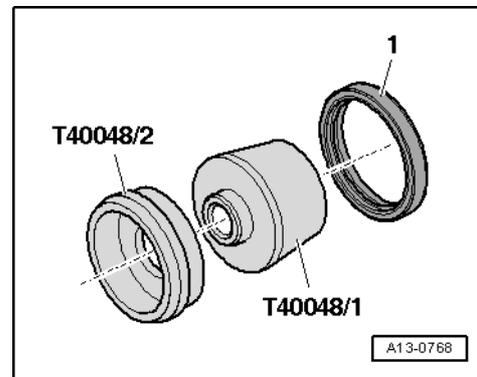
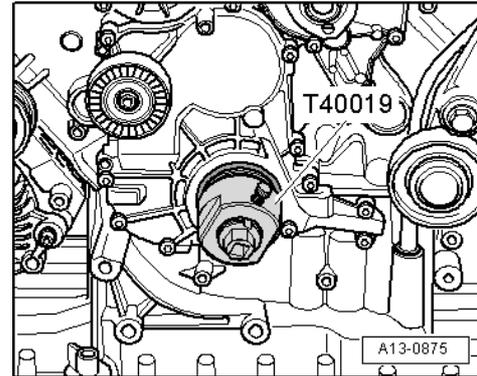


◆ Assembly appliance -T40048- with -T40048/4-



Procedure

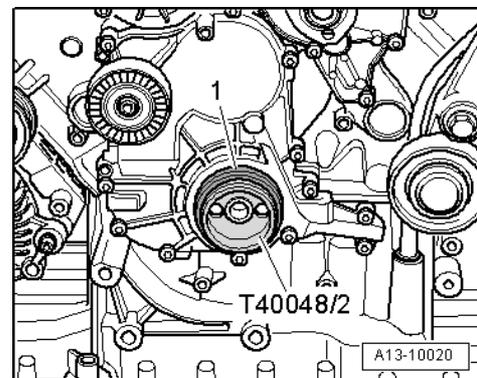
- Remove vibration damper ⇒ [page 40](#).
- Adjust inner part of oil seal extractor -T40019- so that it is level with the outer part and lock in position with knurled screw.
- Lubricate threaded head of oil seal extractor, place it in position and screw it into oil seal as far as possible (applying firm pressure).
- Loosen knurled screw and turn inner part against crankshaft until the oil seal is pulled out.
- Clamp flats of oil seal extractor in vice.
- Remove oil seal with pliers.
- Clean running surface and sealing surface.
- Fit assembly aid -T40048/1- onto assembly sleeve -T40048/2- and slide oil seal -1- onto assembly sleeve.
- Take off assembly aid.



- Fit assembly sleeve -T40048/2- on crankshaft and slide oil seal -1- into sealing surface in engine.

i Note

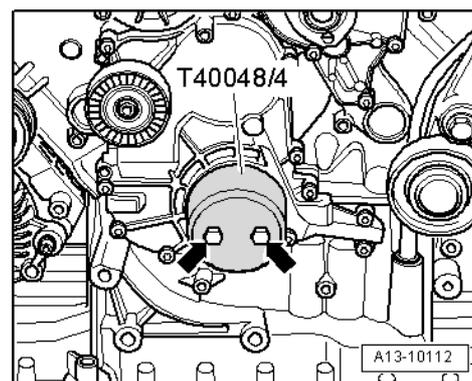
Leave assembly sleeve -T40048/2- in position on crankshaft for pressing in seal.



- Apply press sleeve -T40048/4- (installation depth 5 mm) to crankshaft using M8×55 mm bolts.
- Screw in bolts -arrows- hand-tight to start with.
- Tighten bolts alternately, $\frac{1}{2}$ turn at a time, to press in oil seal onto stop.

Remaining installation steps are carried out in reverse sequence; note the following:

- Install vibration damper ⇒ [page 40](#).
- Install poly V-belt ⇒ [page 39](#).



1.6 Removing and installing sealing flange (front)

Special tools and workshop equipment required

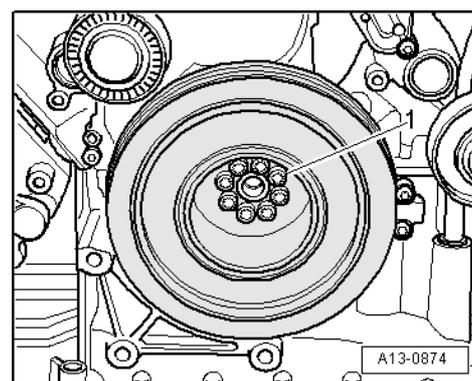
- ◆ Electric drill with plastic brush attachment
- ◆ Safety goggles
- ◆ Sealant ⇒ Parts catalogue

Removing

Caution!

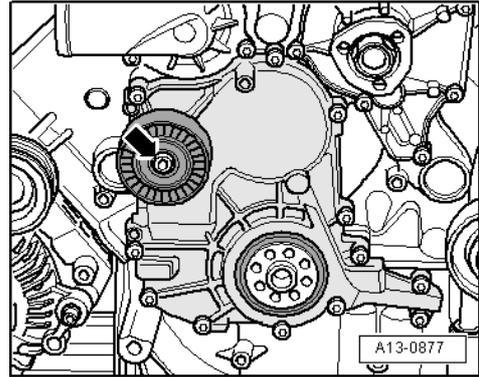
Observe notes on procedure for disconnecting the battery
⇒ **Rep. Gr. 27.**

- Disconnect earth wire at battery with ignition switched off.
- Drain off coolant ⇒ [page 161](#).
- Remove poly V-belt ⇒ [page 39](#).
- Remove toothed belt for high-pressure pump ⇒ [page 48](#).
- Remove coolant pipe (right-side) ⇒ [page 177](#).
- Mark position of vibration damper for re-installation.
- Unscrew bolts -1- and remove vibration damper.

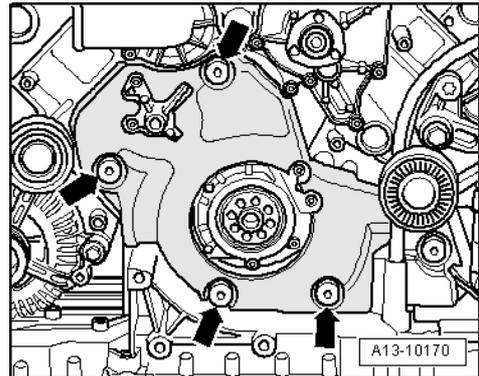




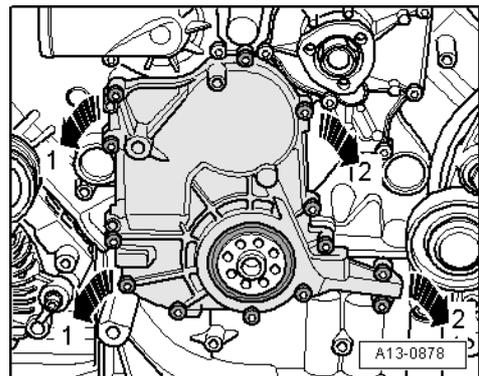
- Pry off cover from idler roller for poly V-belt.
- Unscrew bolt -arrow- and detach idler roller from front sealing flange.



- If fitted, detach noise insulation panel at front sealing flange -arrows-.



- Remove bolts.
- Pull off front sealing flange (right-side first -arrows 1-, then left-side -arrows 2-).
- Drive out oil seal with sealing flange removed.



Installing



Note

Renew gaskets, seals and O-rings.

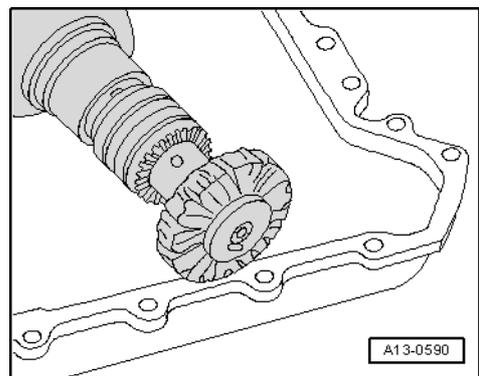
- Remove old sealant from grooves in sealing flange and from sealing surfaces.



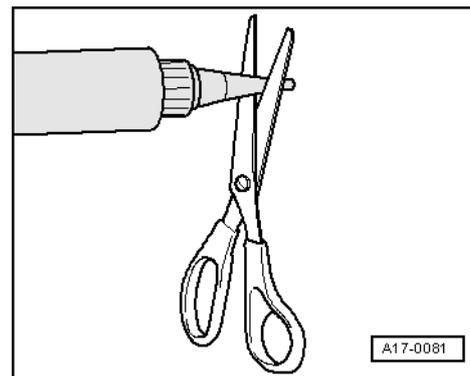
WARNING!

Wear safety goggles.

- Remove remaining sealant from sealing flange and cylinder block/sump (top section) with rotating plastic brush or similar.
- Clean sealing surfaces; they must be free of oil and grease.



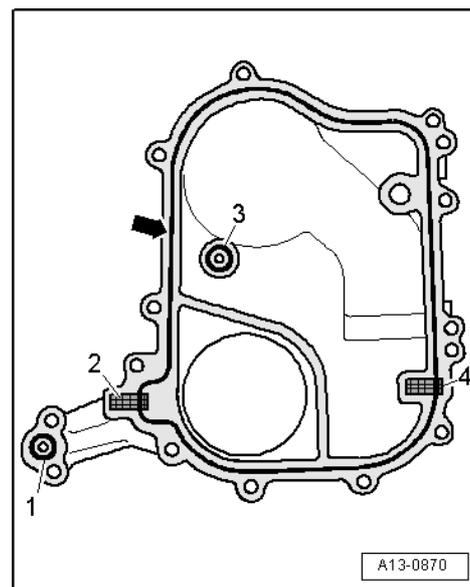
- Cut off tube nozzle at front marking (nozzle approx. 1.5 mm Ø).



- Install sealing elements -2- and -4- and O-rings -1- and -3-.
- Apply bead of sealant -arrow- onto clean sealing surface of front sealing flange as illustrated.
- The bead of sealant must project 1.5 ... 2.0 mm above the sealing surface.

 **Note**

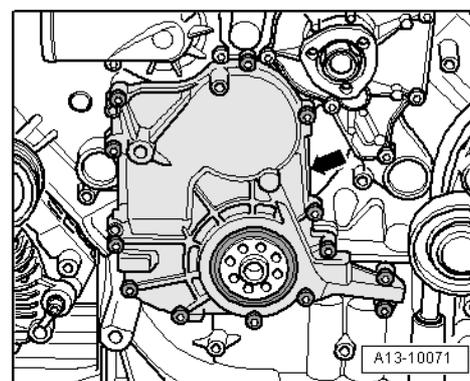
- ◆ *The sealant bead must not be thicker than specified, otherwise excess sealant could enter the sump and clog the strainer in the oil pump.*
- ◆ *The front sealing flange must be installed within 5 minutes after applying sealant.*



- Tighten bolts securing front sealing flange -arrow- in diagonal sequence and in stages.

Remaining installation steps are carried out in reverse sequence; note the following:

- Install crankshaft oil seal (pulley end) ⇒ [page 41](#).
- Install vibration damper ⇒ [page 40](#).
- Install coolant pipe (right-side) ⇒ [page 177](#).
- Install toothed belt for high-pressure pump ⇒ [page 48](#).
- Install poly V-belt ⇒ [page 39](#).



Tightening torques

Component	Nm
Front sealing flange to cylinder block	9
Noise insulation to engine	9
Idler wheel to cylinder block	22
Poly V-belt pulley to coolant pump	22



1.7 Toothed belt for high-pressure pump - exploded view of components

1 - Toothed belt cover (front)

- ❑ Engage in position at the bottom at clip on at the side

2 - 70 Nm

- ❑ Use counterhold tool -3036- when loosening and tightening ⇒ Fig. on page 47

3 - Damper weight

- ❑ Use counterhold tool -3036- when loosening and tightening central nut ⇒ Fig. on page 47

4 - 23 Nm

5 - Toothed belt sprocket for high-pressure pump

- ❑ Remove using puller -T40064- ⇒ Fig. on page 47

6 - Toothed belt tensioning roller

7 - 9 Nm

8 - Toothed belt cover (rear)

9 - Toothed belt drive sprocket

- ❑ Use counterhold tool -3036- when loosening and tightening central bolt ⇒ Fig. on page 47

- ❑ Remove using puller -T10320- ⇒ Fig. on page 47

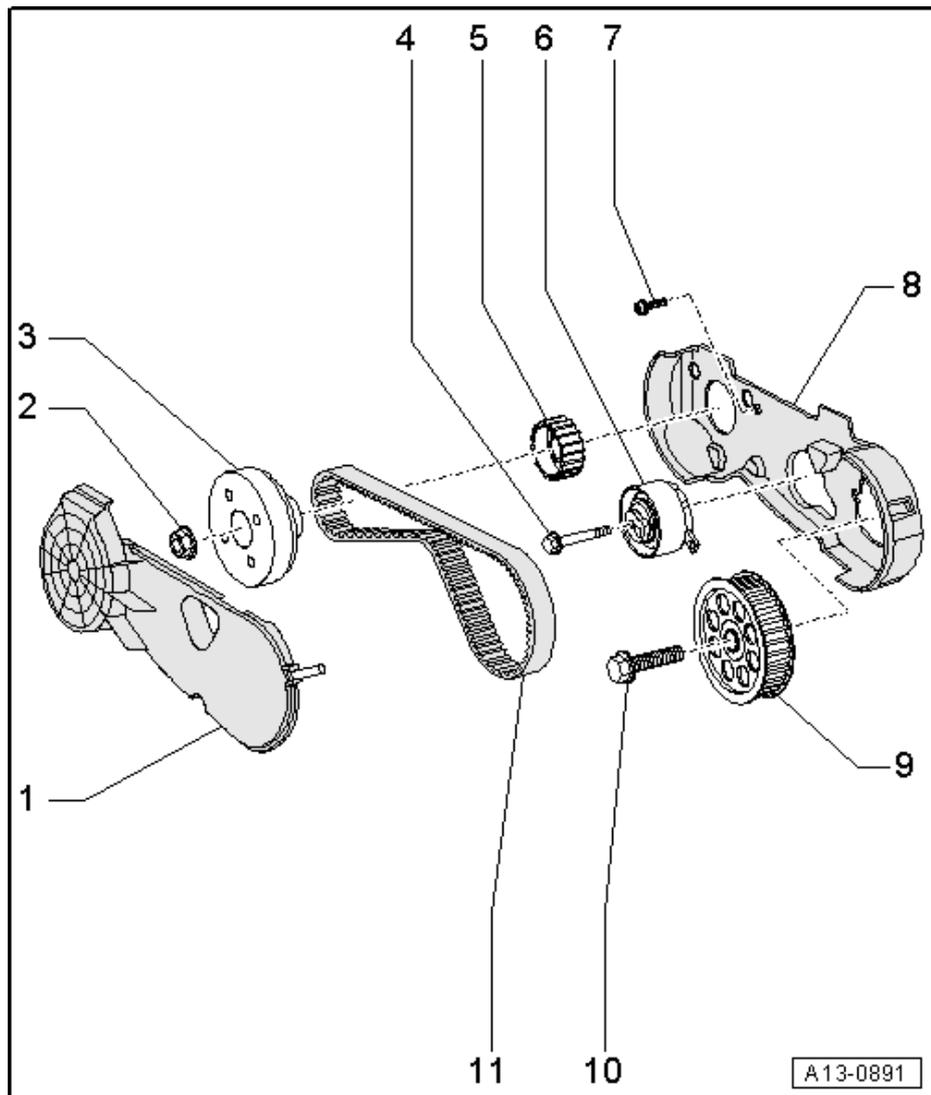
10 - 75 Nm

- ❑ With washer

- ❑ Use counterhold tool -3036- when loosening and tightening ⇒ Fig. on page 47

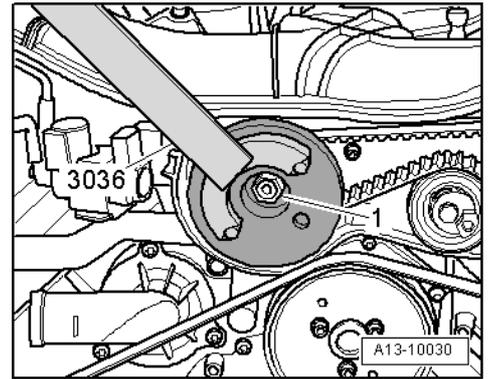
11 - Toothed belt for high-pressure pump

- ❑ Before removing, mark direction of rotation with chalk or felt-tipped pen. If the belt runs in the opposite direction when it is refitted, this can cause breakage
- ❑ Removing and installing ⇒ page 48
- ❑ Check for wear



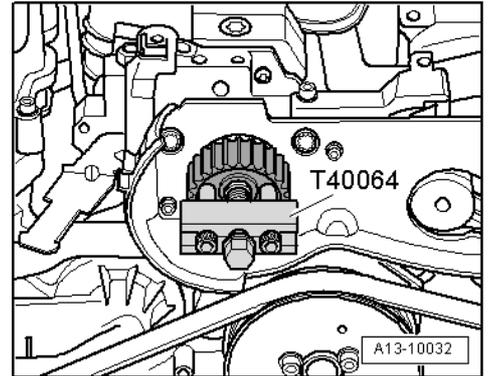
Loosening and tightening central nut for high-pressure pump shaft

- Use counterhold tool -3036- when loosening and tightening central nut -1-.



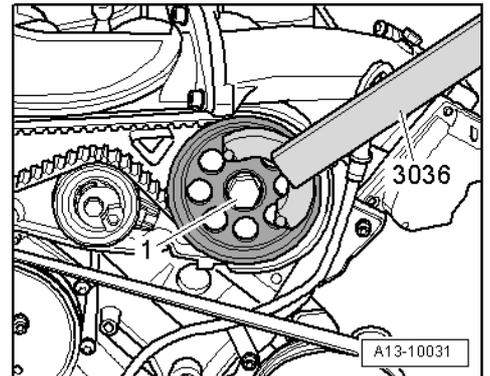
Pulling off toothed belt sprocket for high-pressure pump

- Use puller -T40064- to pull off belt sprocket for high-pressure pump.



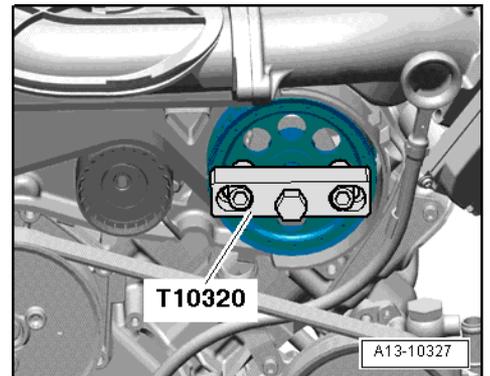
Loosening and tightening central bolt for toothed belt drive sprocket

- Use counterhold tool -3036- when loosening and tightening central bolt -1-.



Removing toothed belt drive sprocket

- Use puller -T10320- to pull off toothed belt drive sprocket.

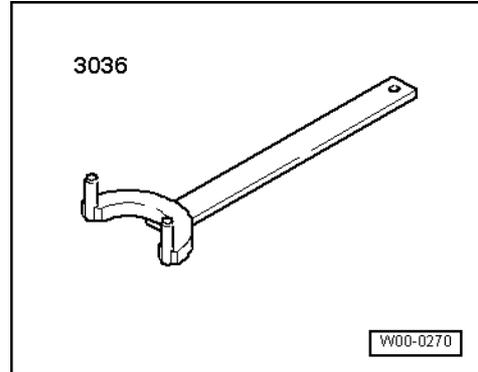




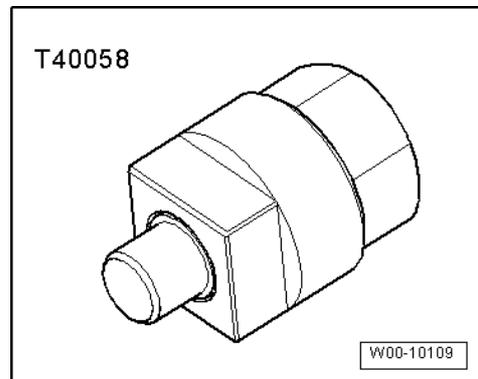
1.8 Removing and installing toothed belt for high-pressure pump

Special tools and workshop equipment required

- ◆ Counterhold tool -3036-

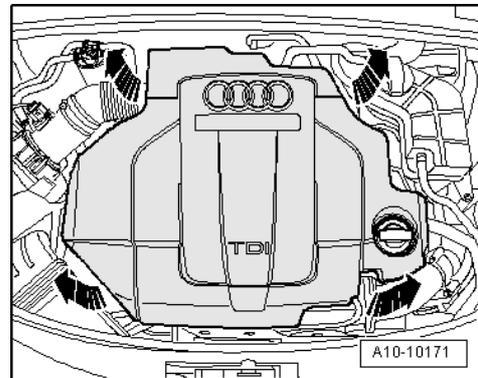


- ◆ Adapter -T40058-

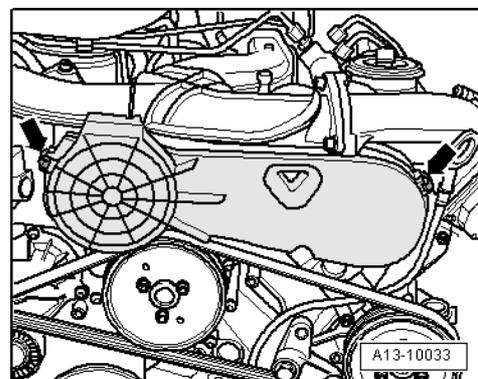


Removing

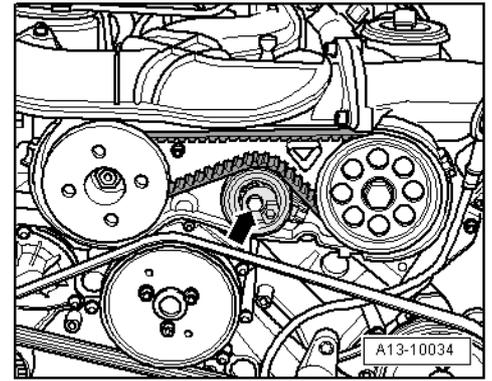
- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



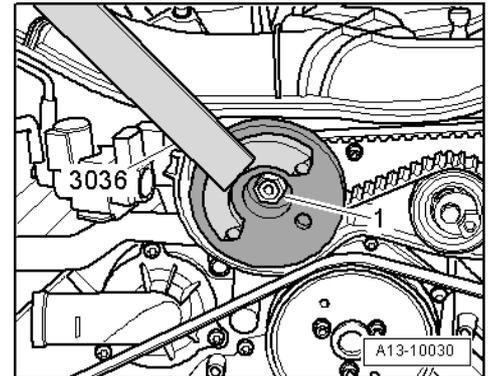
- Loosen clamps -arrows-.
- Pivot toothed belt cover forward and disengage retaining pegs on bottom side of toothed belt cover.



- Loosen bolt -arrow- for toothed belt tensioning roller approx. 2 turns.

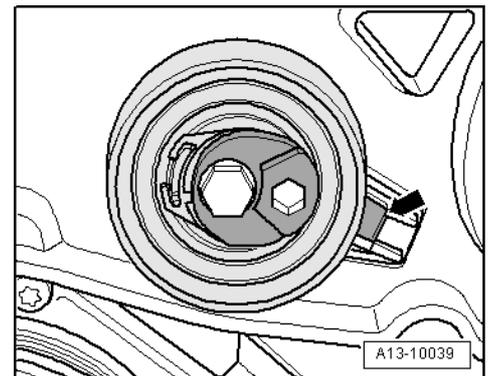


- Loosen central nut -1- for high-pressure pump shaft using counterhold tool -3036-.
- Detach damper weight and toothed belt.

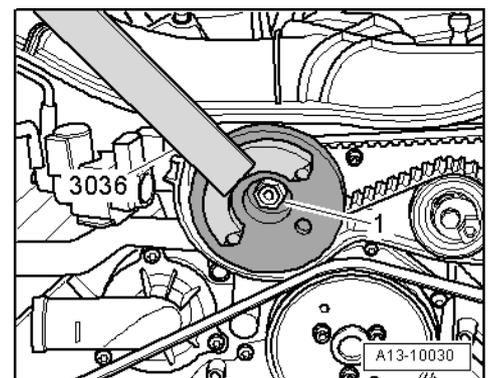


Installing

- Check installation position of toothed belt tensioning roller.
- Retaining lug -arrow- must engage in slot on front bracket for high-pressure pump.
- Hand-tighten securing bolt for toothed belt tensioning roller.
- Fit toothed belt.

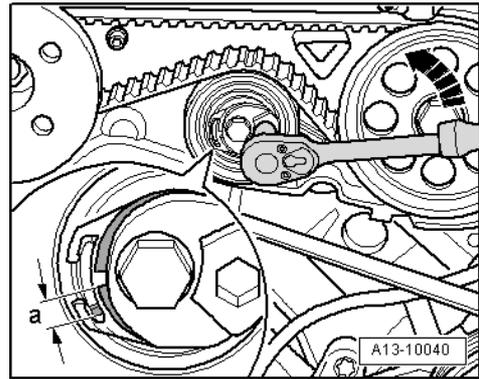


- Tighten central nut -1- for high-pressure pump shaft (use counterhold tool -3036-).

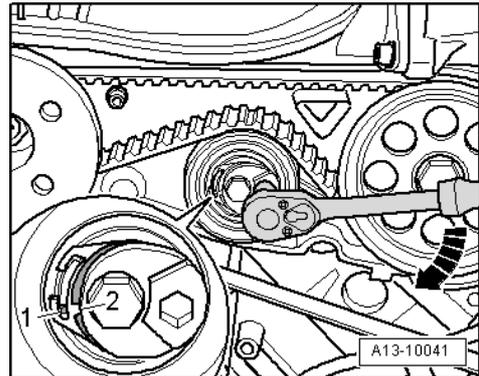




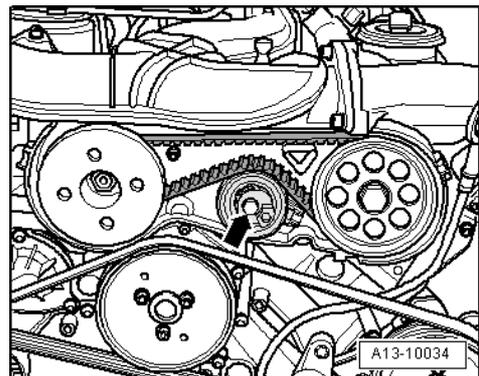
- Using hexagon key, apply tension to toothed belt by turning tensioning roller in direction indicated by -arrow- until the lug remains approx. 5 mm (distance -a-) below the notch.



- Then release toothed belt tensioning roller until lug -1- and notch -2- are exactly in line.

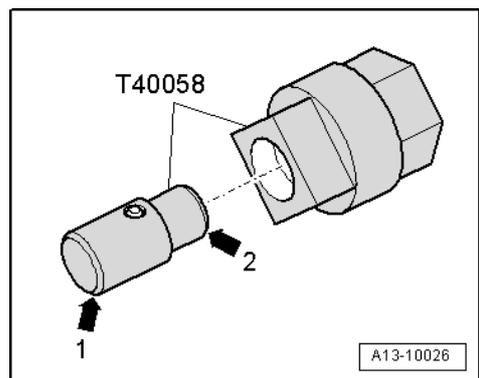


- Hold toothed belt tensioning roller in this position and tighten securing bolt -arrow-.



Turn crankshaft one complete revolution to check toothed belt tension. To do this:

- Insert guide pin of adapter -T40058- with the larger-diameter section -arrow 1- pointing towards the engine. The smaller-diameter section -arrow 2- faces the adapter.



⚠ Caution!

Do not rotate crankshaft in opposite direction of engine rotation.

- Turn crankshaft at least one complete revolution in normal running direction -arrow-.

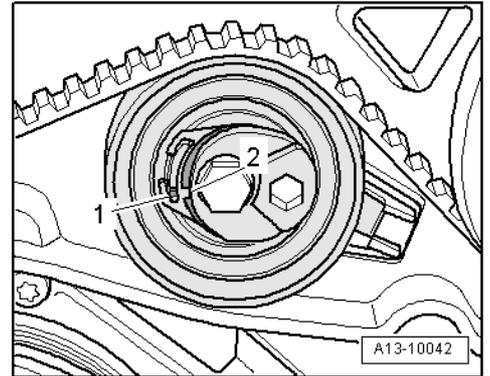
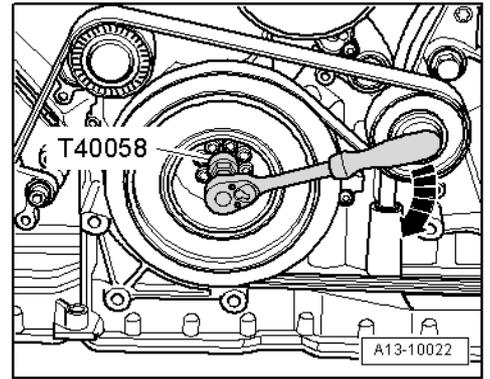
- Check toothed belt tension.
- Lug -1- should align with notch -2-.

If specification is not obtained:

- Adjust the toothed belt tension again.

Tightening torques

Component	Nm
Damper weight to high-pressure pump	70
Toothed belt tensioning roller to front bracket	23





1.9 Exhauster pump - exploded view of components

1 - 9 Nm

2 - Exhauster pump

- Removing and installing => [page 52](#)

3 - Vacuum hose

- Secure with correct type of hose clips (as original equipment) => Parts catalogue

4 - 5 Nm

5 - O-ring

- Renew

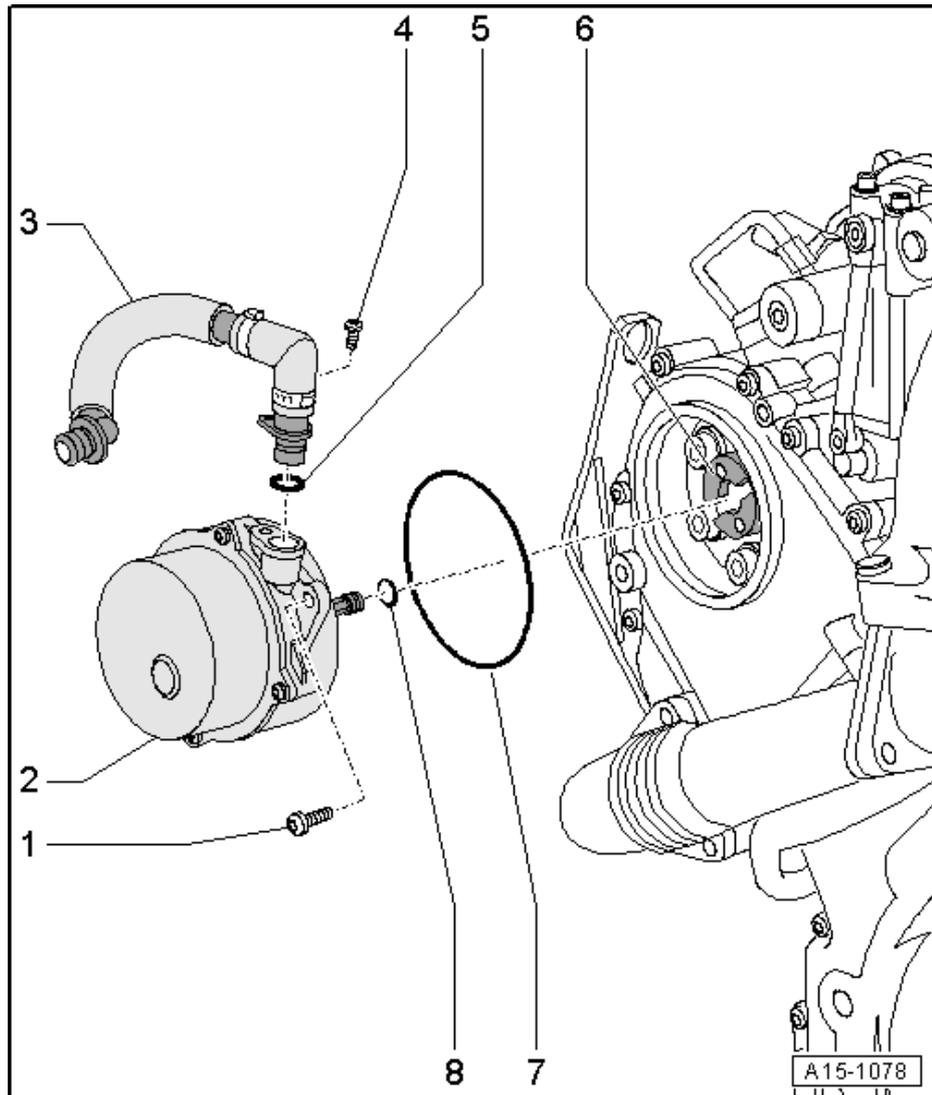
6 - Inlet camshaft

7 - O-ring

- Renew

8 - O-ring

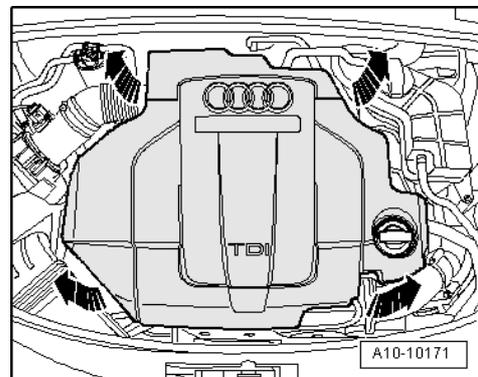
- Renew



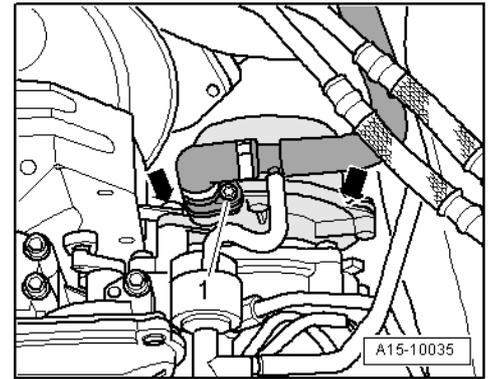
1.10 Removing and installing exhauster pump

Removing

- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



- Unscrew bolt -1- and pull out vacuum hose at exhauster pump together with hose connection.
- Remove bolts -arrows- and detach exhauster pump.



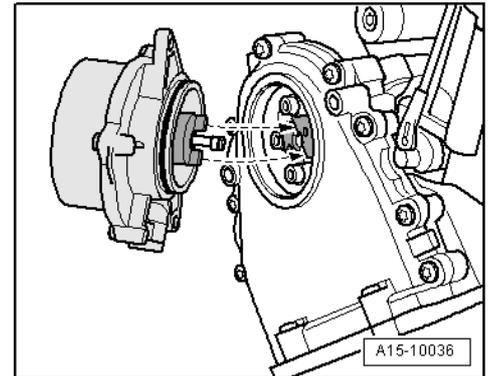
Installing

Installation is carried out in the reverse order; note the following:

 **Note**

Renew O-rings.

- Set drive lugs of exhauster pump so they engage in slots on camshaft when pump is fitted -arrow-.



Tightening torques

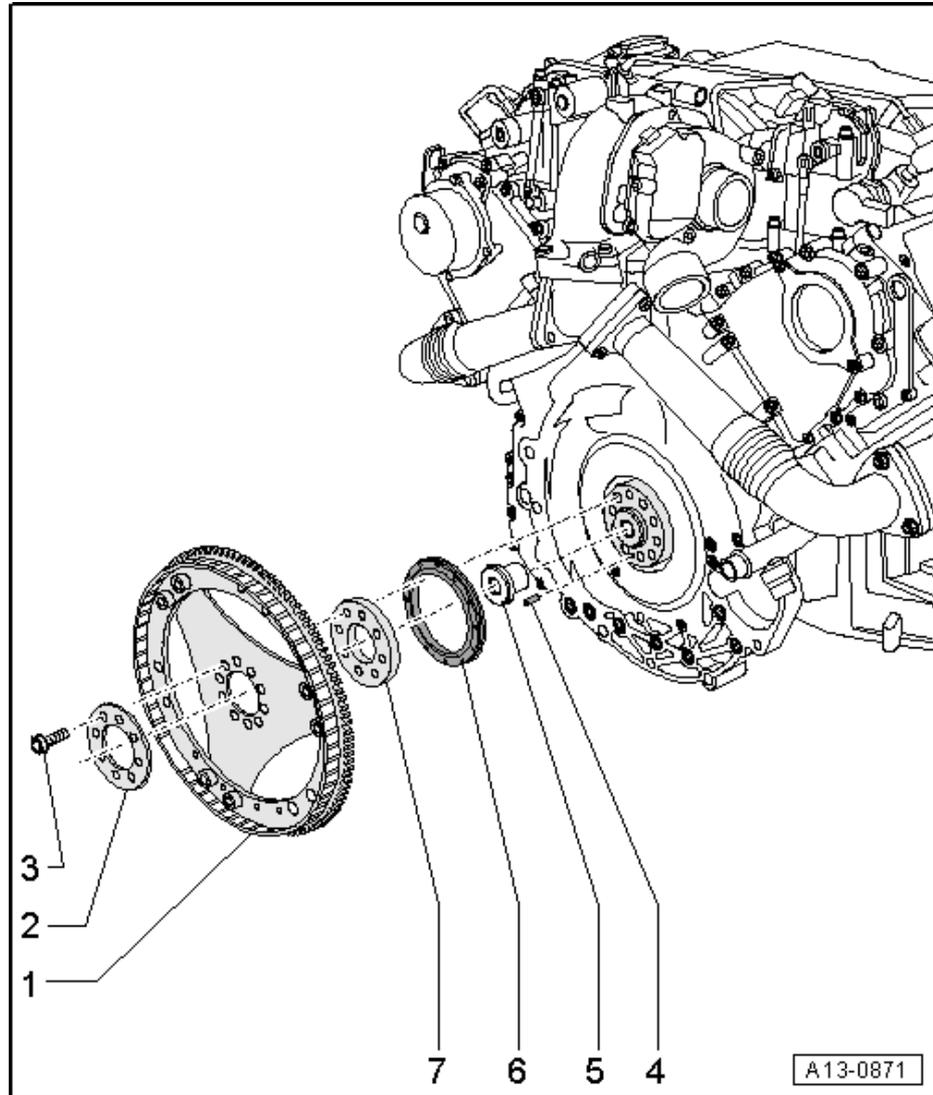
Component	Nm
Exhauster pump to timing chain cover	9
Vacuum hose connection to exhauster pump	5



2 Servicing work on timing chain end

2.1 Drive plate - exploded view of components

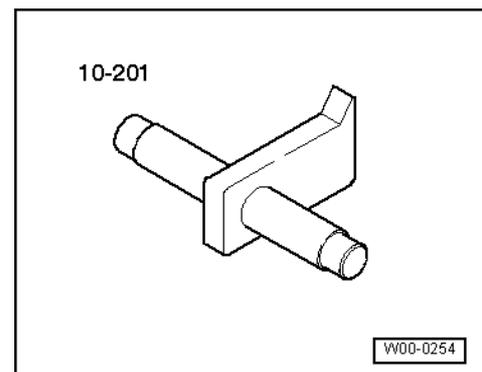
- 1 - Drive plate
 - Removing and installing ⇒ [page 54](#)
- 2 - Washer
 - Thickness 3.4 mm
- 3 - 30 Nm + 90° (1/4 turn) further
 - Renew
- 4 - Dowel sleeve
- 5 - Centring sleeve for torque converter
- 6 - Crankshaft oil seal (on timing chain end)
 - Removing and installing ⇒ [page 55](#)
- 7 - Shim
 - Thickness 1.5 mm



2.2 Removing and installing drive plate

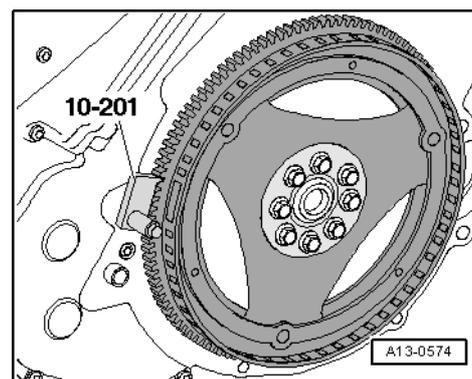
Special tools and workshop equipment required

- ◆ Counterhold tool -10-201-



Removing

- Engine/gearbox removed.
- Mark installation position of drive plate on crankshaft.
- Attach counterhold tool -10-201- in order to loosen bolts.
- Unbolt drive plate.
- Take out shim located behind.



Installing

Installation is carried out in the reverse order; note the following:

- Fit shim (1.5 mm) onto crankshaft.
- Install drive plate with washer (3.4 mm).
- Use new bolts for securing.
- Reverse position of counterhold tool -10-201- in order to tighten bolts.

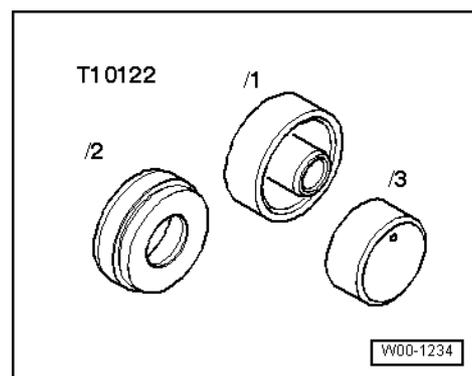
Tightening torque

Component	Nm
Drive plate to crankshaft	30 + 90° ¹⁾²⁾
<ul style="list-style-type: none"> • ¹⁾ Renew bolts. • ²⁾ 90° = one quarter turn. 	

2.3 Renewing crankshaft oil seal (timing chain end)

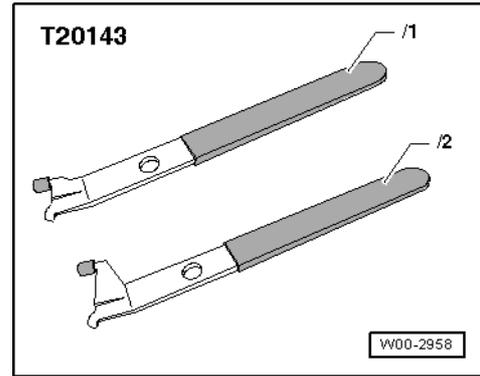
Special tools and workshop equipment required

- ◆ Fitting tool -T10122-





◆ Oil seal extractor lever -T20143/2-

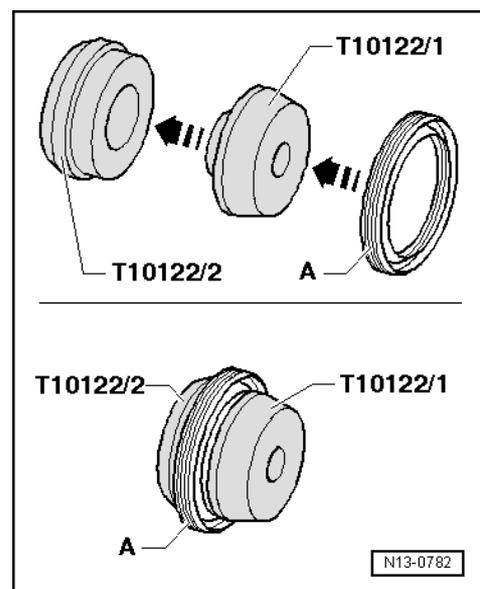
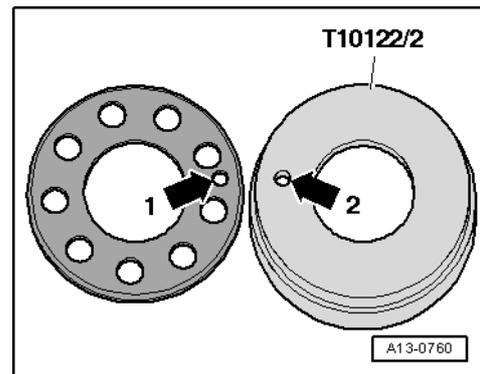
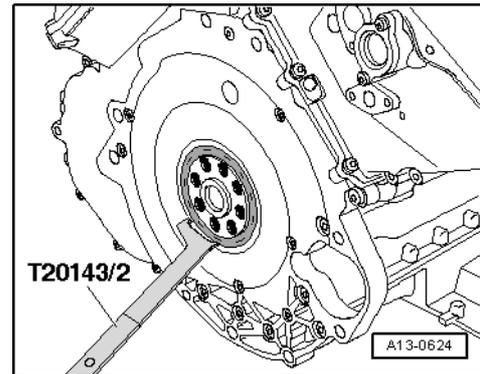


Procedure

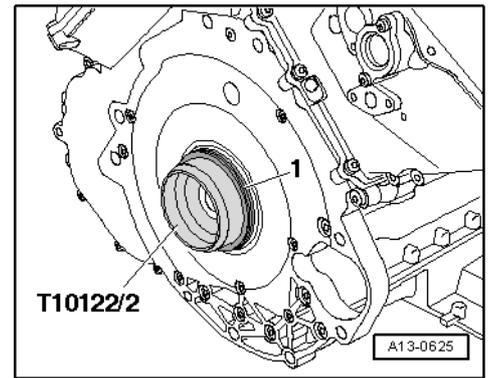
- Engine/gearbox removed.
- Remove drive plate => [page 54](#).
- Pry out the oil seal using the oil seal extractor lever -T20143/2-.

- Modify assembly sleeve -T10122/2- by drilling an 8 mm \varnothing hole -arrow 2- for the dowel sleeve.
- Use hole -arrow 1- in washer as a drilling template.

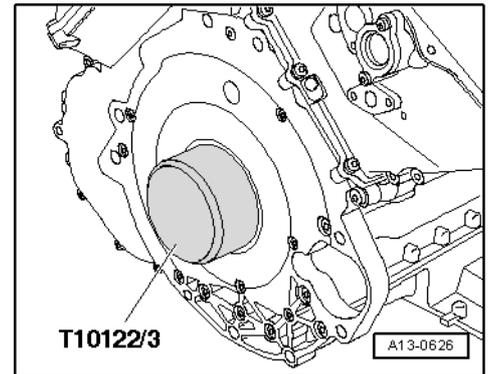
- Clean running surface and sealing surface.
- Fit assembly aid -T10122/1- onto assembly sleeve -T10122/2- and slide oil seal -A- onto assembly sleeve.
- Take off assembly aid.



- Fit assembly sleeve -T10122/2- with oil seal onto crankshaft.



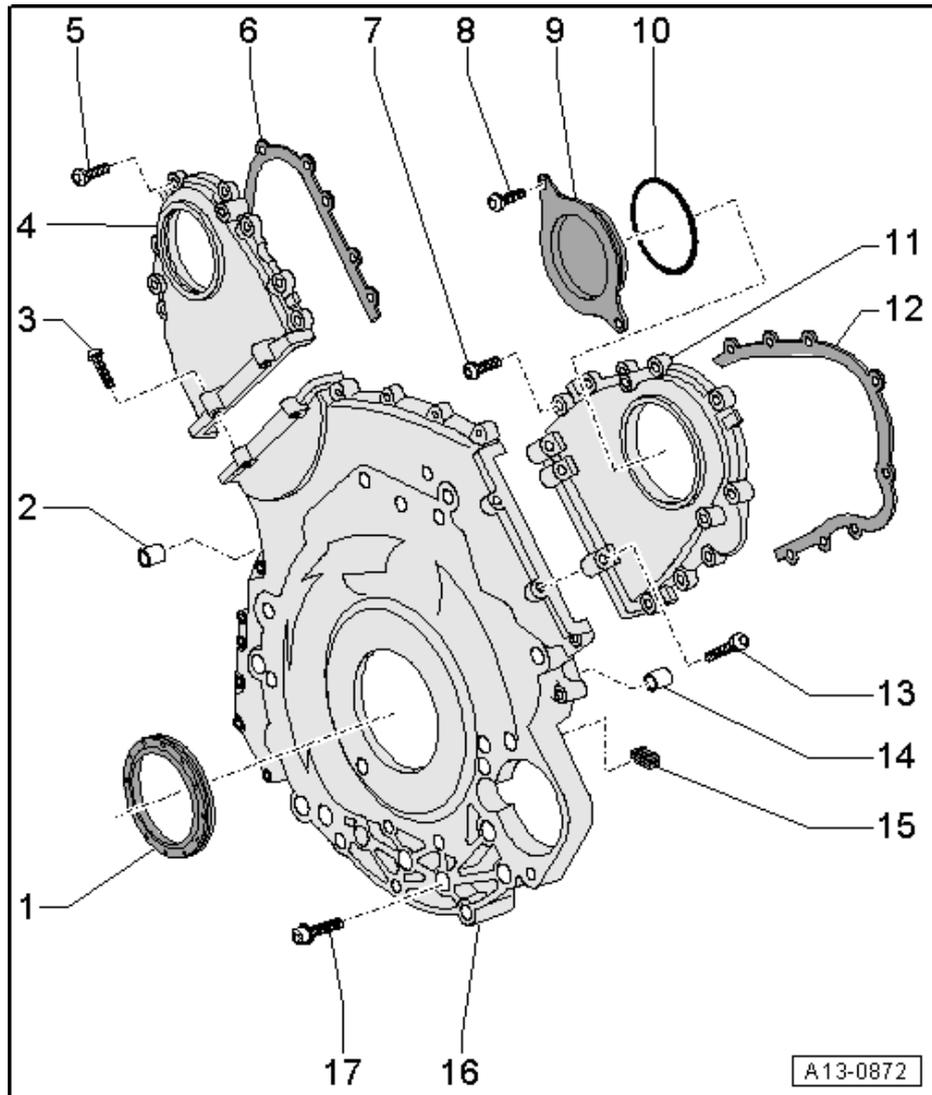
- Press in the oil seal with press tool -T10122/3- evenly so that it is flush.
- Install drive plate => [page 54](#).





2.4 Timing chain covers - exploded view of components

- 1 - Crankshaft oil seal (on timing chain end)
 - Removing and installing ⇒ [page 55](#)
- 2 - Dowel sleeve
 - 2 x
- 3 - 9 Nm
 - Note correct sequence when tightening ⇒ [page 62](#)
- 4 - Timing chain cover (left-side)
- 5 - 9 Nm
 - Note correct sequence when tightening ⇒ [page 62](#)
- 6 - Gasket
 - Renew
- 7 - 9 Nm
 - Note correct sequence when tightening ⇒ [page 62](#)
- 8 - 9 Nm
- 9 - Sealing cap
- 10 - O-ring
 - Renew
- 11 - Timing chain cover (right-side)
- 12 - Gasket
 - Renew
- 13 - 9 Nm
 - Note correct sequence when tightening ⇒ [page 62](#)
- 14 - Dowel sleeve
 - 2 x
- 15 - Sealing element
 - 2 x
- 16 - Timing chain cover (bottom)
- 17 - M6 = 9 Nm; M8 = 22 Nm
 - Note correct sequence when tightening ⇒ [page 61](#)



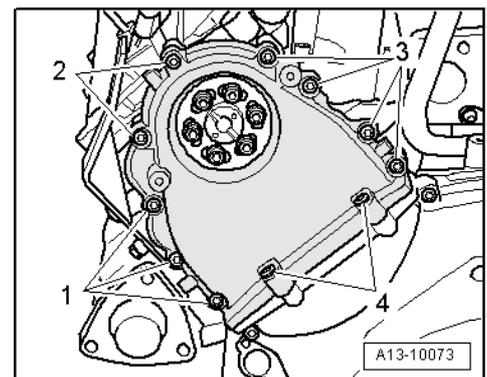
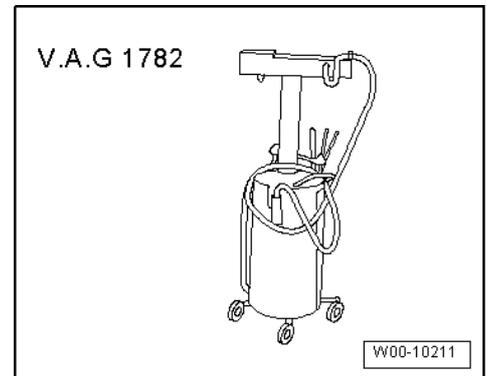
2.5 Removing and installing timing chain covers

Special tools and workshop equipment required

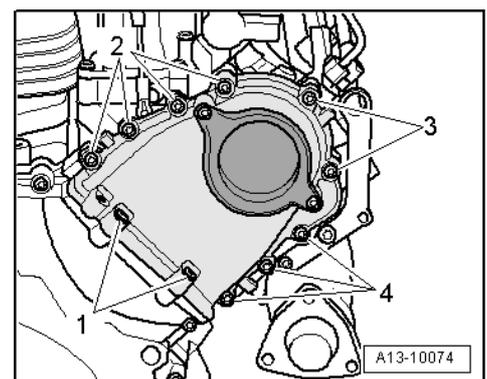
- ◆ Used oil collection and extraction unit -V.A.G 1782-
- ◆ Electric drill with plastic brush attachment
- ◆ Safety goggles
- ◆ Sealant ⇒ Parts catalogue

Removing

- Remove automatic gearbox ⇒ Rep. Gr. 37.
- Remove drive plate ⇒ [page 54](#).
- Remove coolant pipe (rear right) ⇒ [page 181](#).
- Remove turbocharger ⇒ [page 195](#).
- Remove intermediate pipe: left-side ⇒ [page 213](#), right-side ⇒ [page 215](#).
- Place used oil collection and extraction unit -V.A.G 1782- under engine and drain engine oil.
- Remove bolts -1 ... 4- and detach timing chain cover (left-side).

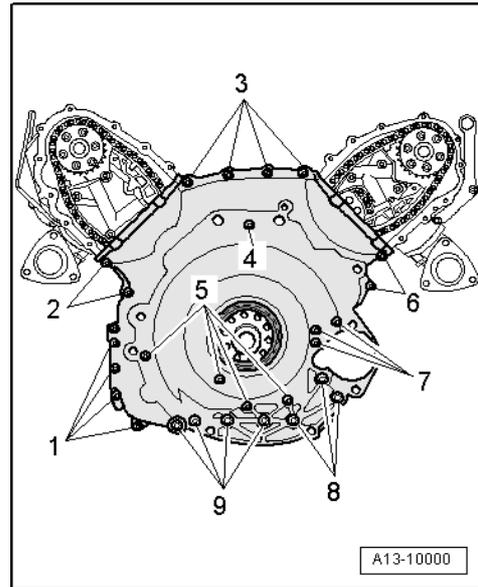


- Remove bolts -1 ... 4- and detach timing chain cover (right-side).





- Remove bolts -1 ... 9- and detach timing chain cover (bottom).
- Press out crankshaft oil seal (timing chain end) from the timing chain cover (bottom).

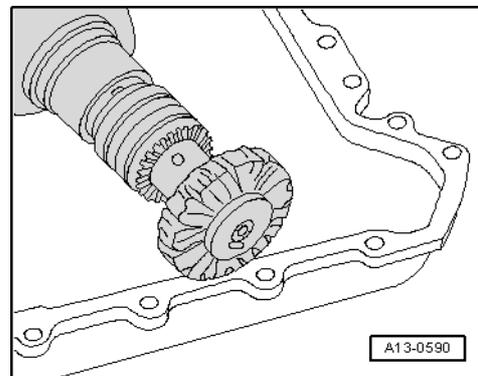


Installing

i Note

Renew gaskets, seals and O-rings.

- Remove old sealant from grooves in timing chain covers and from sealing surfaces.

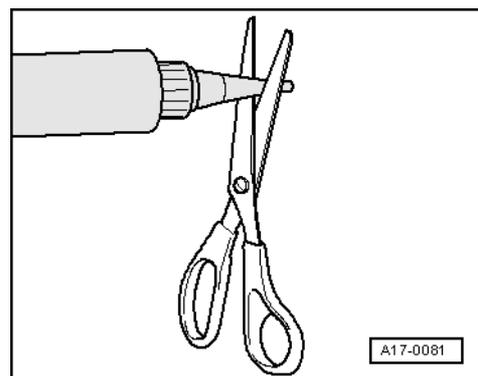


! WARNING!
Wear safety goggles.

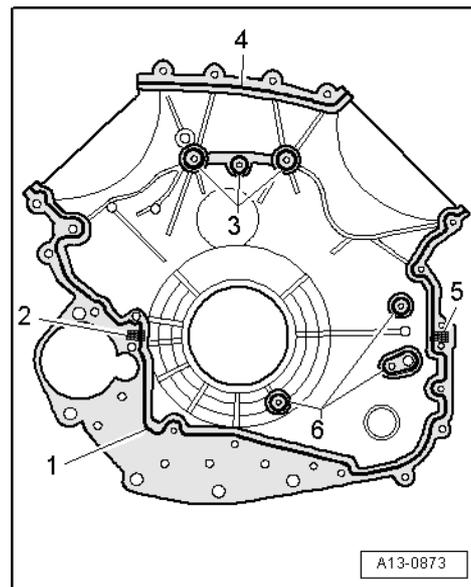
- Remove remaining sealant on timing chain covers and cylinder block / cylinder head using rotating plastic brush or similar.
- Clean sealing surfaces; they must be free of oil and grease.
- Cut off tube nozzle at front marking (nozzle approx. 1.5 mm Ø).

i Note

- ♦ The sealant beads must not be thicker than specified, otherwise excess sealant could enter the sump and clog the strainer in the oil pump.
- ♦ The timing chain covers must be installed within 5 minutes after applying sealant.

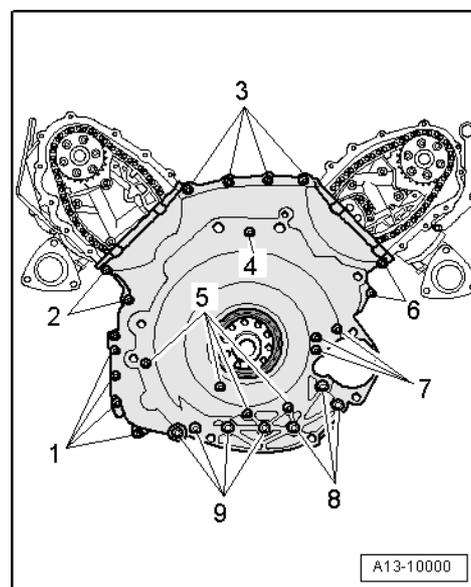


- Insert sealing elements -2- and -5-
- Apply beads of sealant -1- and -4- onto clean sealing surfaces of timing chain cover (bottom) as illustrated.
- The grooves on the sealing surfaces must be completely filled with sealant.
- The bead of sealant must project 1.5 ... 2.0 mm above the sealing surface.
- The beads of sealant round drillings -3- and -6- must be 1.5 ... 2.0 mm thick
- Check whether the two dowel sleeves are fitted in the cylinder block; install if necessary.

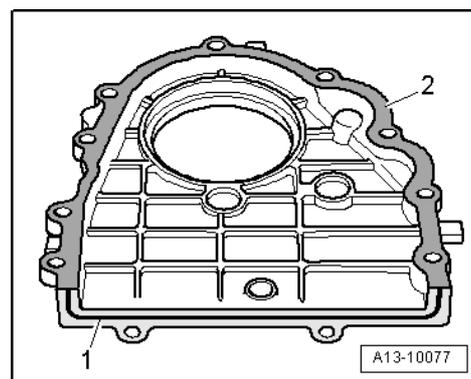


- Fit timing chain cover (bottom) and tighten bolts as follows:

Stage	Tighten
I	– Tighten bolts -1 ... 9- to 5 Nm in diagonal sequence starting from inside and working outwards.
II	– Tighten bolts -1 ... 7- to 9 Nm in diagonal sequence starting from inside and working outwards.
III	– Tighten bolts -8- and -9- to 22 Nm.



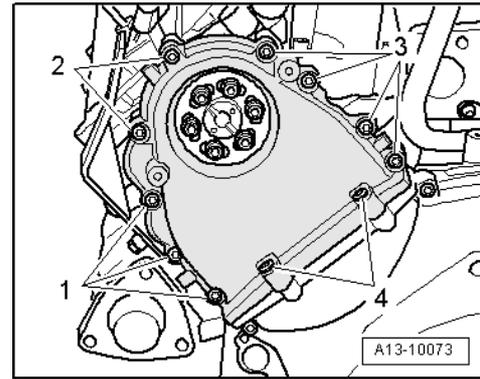
- Apply bead of sealant onto clean sealing surface of timing chain cover (left-side) as illustrated.
- The groove -1- on the sealing surface must be completely filled with sealant.
- The bead of sealant must project 1.5 ... 2.0 mm above the sealing surface.
- Fit gasket -2-.



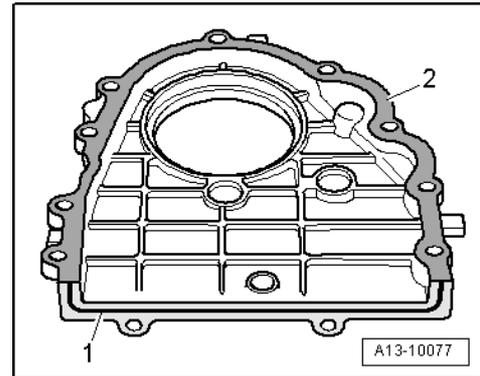


- Fit timing chain cover (left-side) and tighten bolts as follows:

Stage	Tighten
I	- Tighten bolts -1 ... 3- in diagonal sequence to 5 Nm.
II	- Tighten bolts -4- to 9 Nm.
III	- Tighten bolts -1 ... 3- in diagonal sequence to 9 Nm.

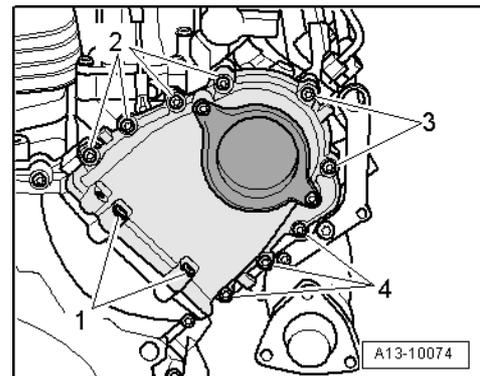


- Apply bead of sealant onto clean sealing surfaces of timing chain cover (right-side) as illustrated.
- The groove -1- on the sealing surface must be completely filled with sealant.
- The bead of sealant must project 1.5 ... 2.0 mm above the sealing surface.
- Fit gasket -2-.



- Fit timing chain cover (right) and tighten bolts as follows:

Stage	Tighten
I	- Tighten bolts -2 ... 4- in diagonal sequence to 5 Nm.
II	- Tighten bolts -1- to 9 Nm.
III	- Tighten bolts -2 ... 4- in diagonal sequence to 9 Nm.



Remaining installation steps are carried out in reverse sequence; note the following:

- Install crankshaft oil seal (timing chain end) ⇒ [page 55](#).
- Install drive plate ⇒ [page 54](#).
- Install intermediate pipe: left-side ⇒ [page 213](#), right-side ⇒ [page 215](#).
- Install turbocharger ⇒ [page 195](#).
- Install coolant pipe (rear right) ⇒ [page 181](#).
- Install automatic gearbox ⇒ Rep. Gr. 37.
- Fill up with engine oil and check oil level ⇒ [page 157](#).

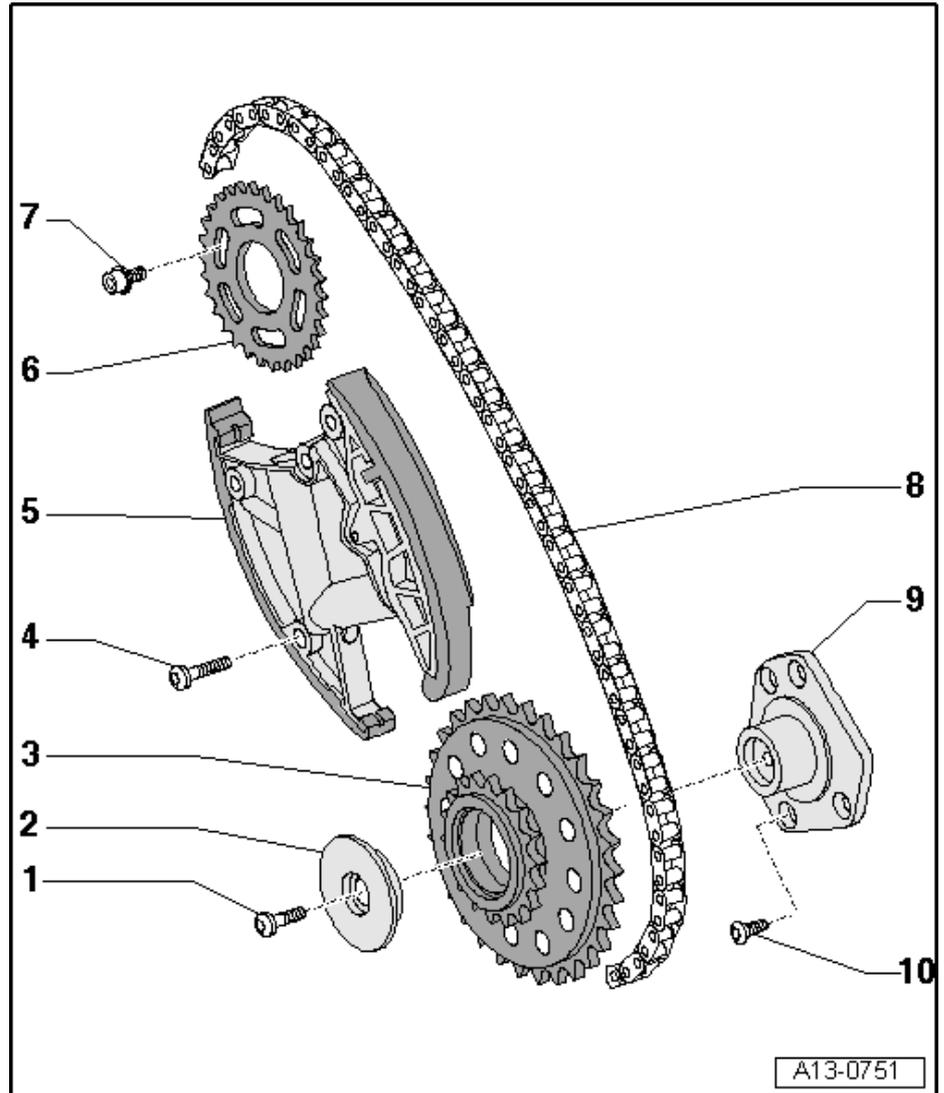
Tightening torques

Component		Nm
Timing chain cover (bottom) to engine	M6	9
	M8	22
Timing chain covers (left and right) to engine		9

2.6 Camshaft timing chains - exploded view of components

Camshaft timing chain (left-side)

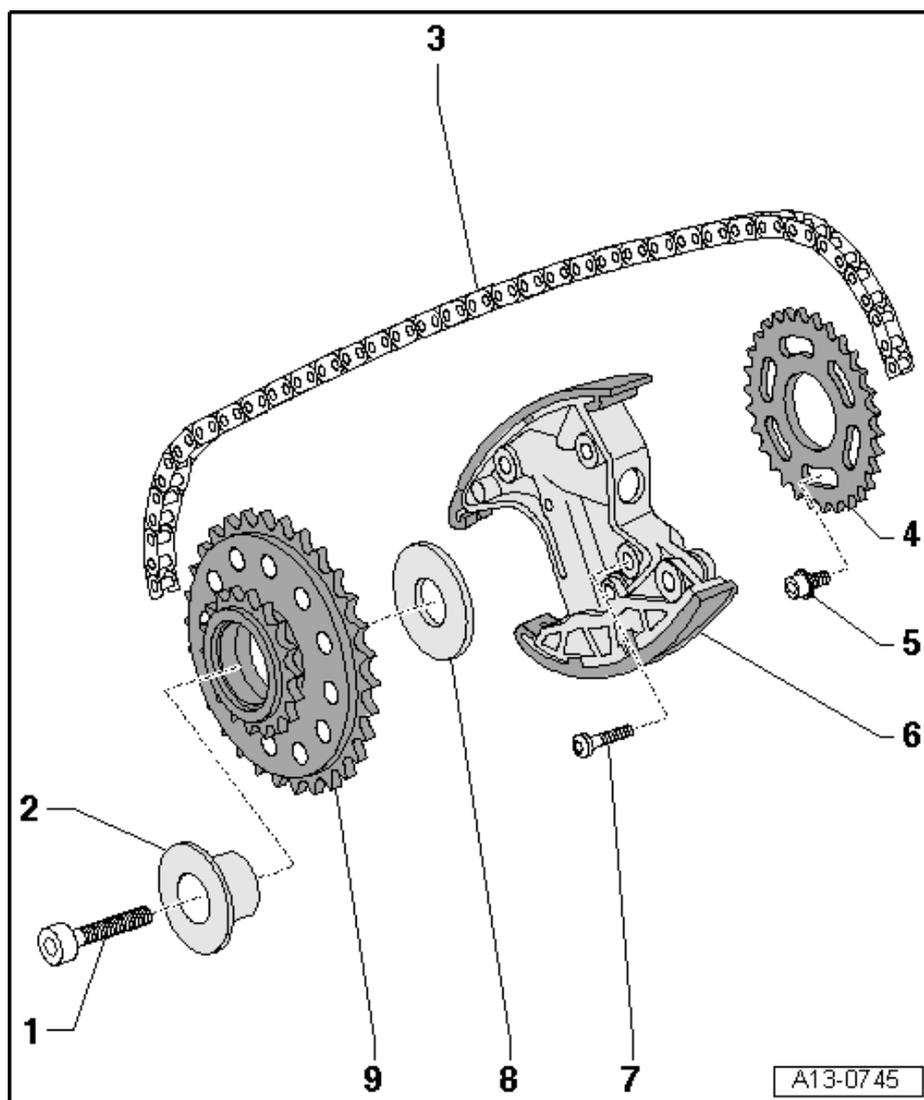
- 1 - 5 Nm + 90° (1/4 turn) further
 Renew
- 2 - Thrust washer for drive sprocket
- 3 - Drive sprocket for timing chain (left-side)
- 4 - 5 Nm + 90° (1/4 turn) further
 Renew
- 5 - Chain tensioner for timing chain (left-side)
- 6 - Chain sprocket for inlet camshaft
 Side with lettering faces towards gear-box
- 7 - 24 Nm
- 8 - Timing chain (left-side)
 Before removing, mark running direction with paint
- 9 - Bearing bracket for drive sprocket
- 10 - 9 Nm





Camshaft timing chain (right-side)

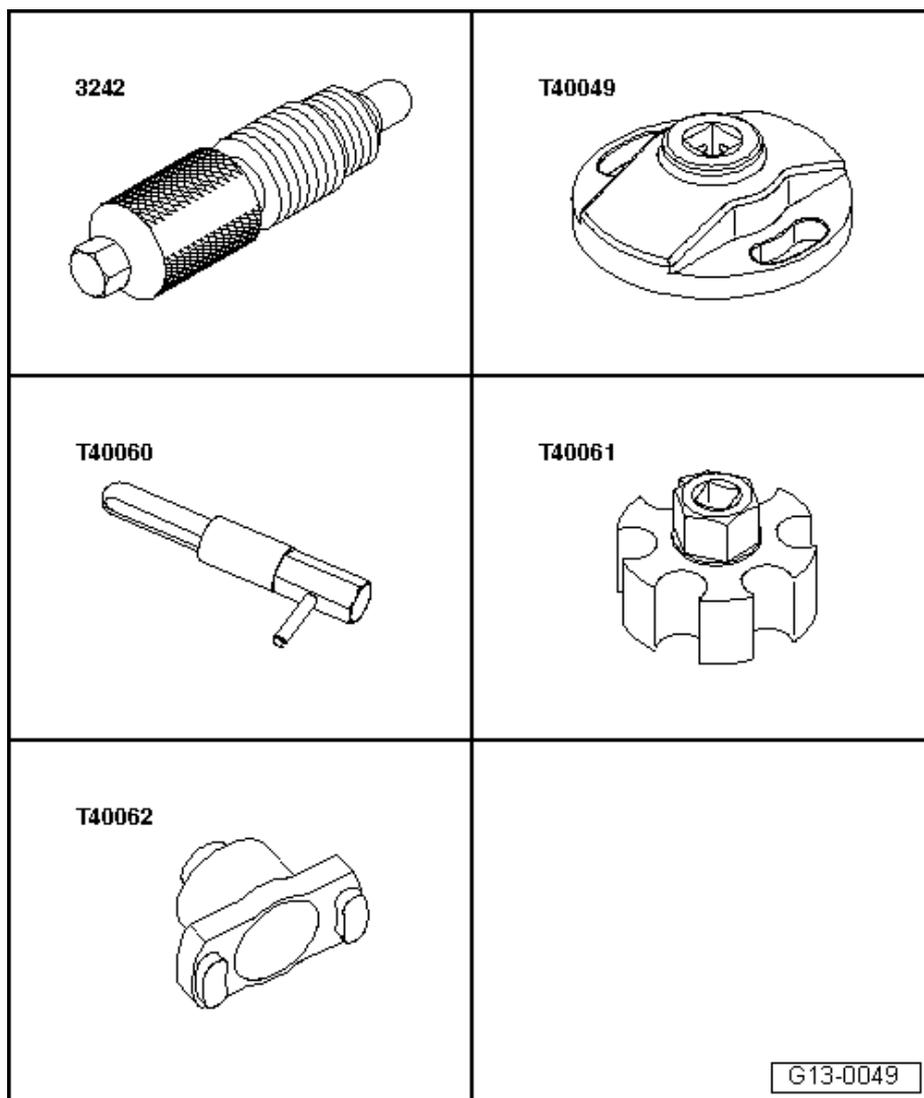
- 1 - 45 Nm
- 2 - Bearing mounting for drive sprocket
- 3 - Timing chain (right-side)
 - Before removing, mark running direction with paint
- 4 - Chain sprocket for inlet camshaft
 - Side with lettering faces towards gearbox
- 5 - 24 Nm
- 6 - Chain tensioner for timing chain (right-side)
- 7 - 5 Nm + 90° (1/4 turn) further
 - Renew
- 8 - Thrust washer for drive sprocket
- 9 - Drive sprocket for timing chain (right-side)



2.7 Removing and installing camshaft timing chains

Special tools and workshop equipment required

- ◆ Locking pin -3242-
- ◆ Adapter -T40049-
- ◆ Locking pin -T40060- (2x)
- ◆ Adapter -T40061-
- ◆ Adapter -T40062-
- ◆ Drill bit 3.3 mm \varnothing (2x)



Removing

 **Note**

The crankshaft and camshafts must only be turned with the chain drive mechanism fully installed. Otherwise the valves may strike the pistons, causing damage to valves and piston crowns.

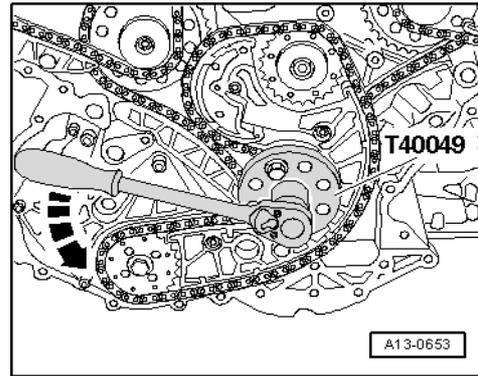
- Remove timing chain covers ⇒ [page 59](#).



- Attach adapter -T40049- at rear end of crankshaft using two old securing bolts for drive plate.

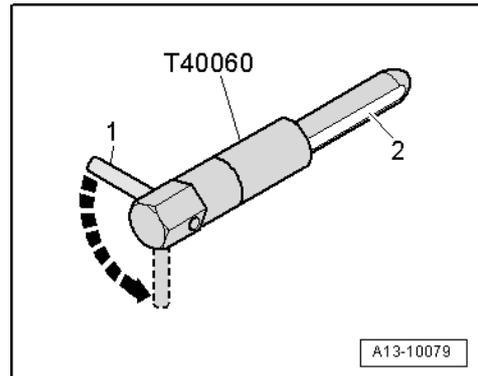
i Note

Ignore -arrow-.



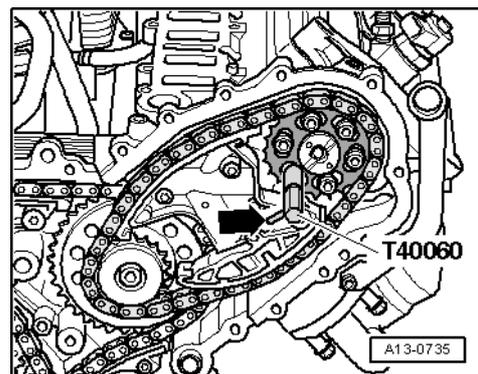
i Note

- ◆ The locking pin -T40060- has a flat -2- which makes it easier to insert when the locating bores in the camshaft and cylinder head are not exactly in line.
- ◆ The locking pin is inserted initially so that the side pin -1- is perpendicular to the imaginary line between the locking pin and the centre of the camshaft.
- ◆ To obtain the correct "TDC" position, the side pin -1- must then be turned 90°-arrow- so it is in line with the imaginary line between the locking pin and the centre of the camshaft.

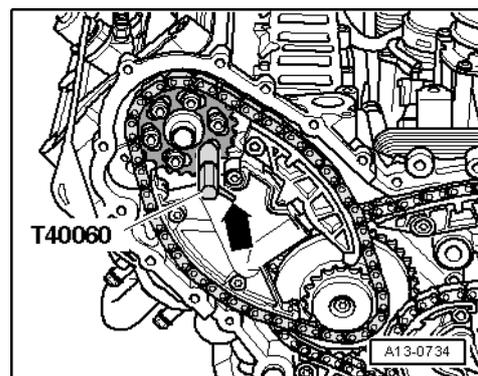


- Turn crankshaft in normal direction of rotation to "TDC" position:
- It should be possible to lock camshafts with locking pins -T40060-.
- The side pin -arrow- in each locking pin -T40060- must be in line with the imaginary line between the locking pin and the centre of the camshaft.

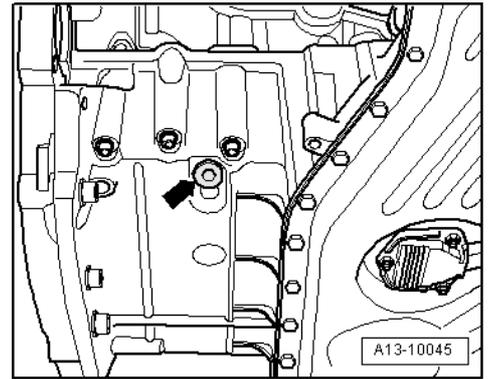
Cylinder bank 1 (right-side):



Cylinder bank 2 (left-side):



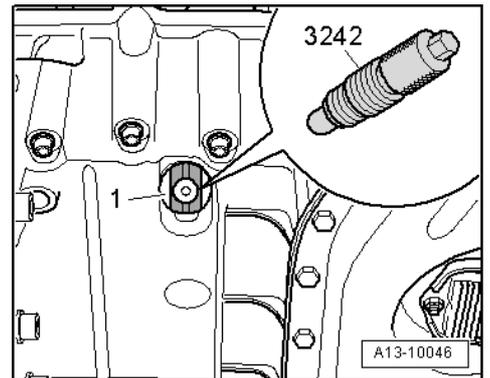
- Unscrew plug -arrow- from sump (top section).



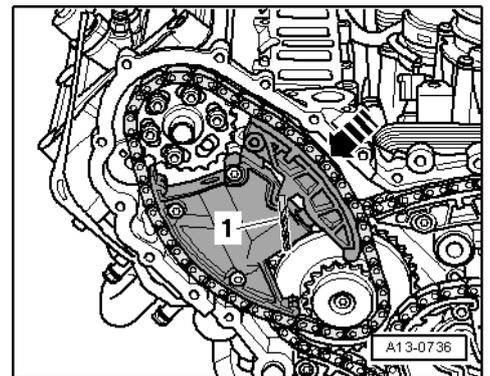
! WARNING!

To avoid any risk of injury, do not rotate the crankshaft while feeling for the "TDC" hole with your finger.

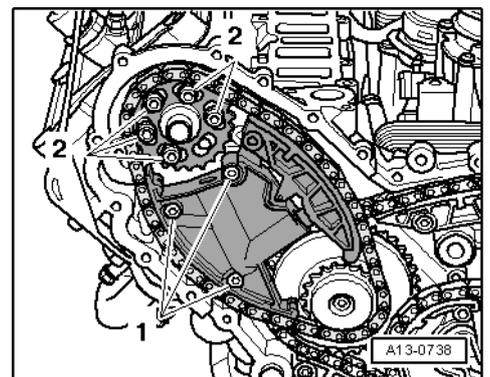
- Screw locking pin -3242- into bore (20 Nm); if necessary, turn crankshaft -1- backwards and forwards slightly to fully centralise locking pin.



- Press guide rail of chain tensioner for timing chain (left-side) in direction of -arrow- and lock chain tensioner by inserting a 3.3 mm Ø drill bit -item 1-.
- Mark running direction of timing chain (left-side) with paint.
- Remove locking pins -T40060- from both camshafts.



- Unscrew bolts -1- from chain tensioner and -2- from camshaft sprocket.
- Take off camshaft sprocket, chain tensioner and timing chain (left-side).

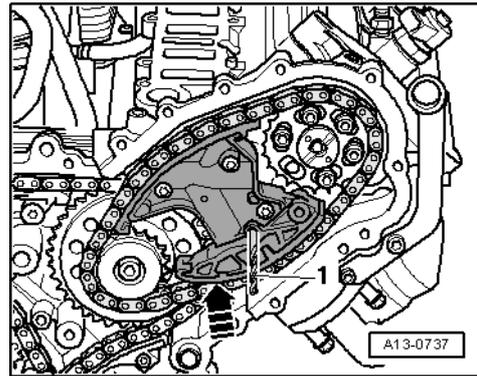




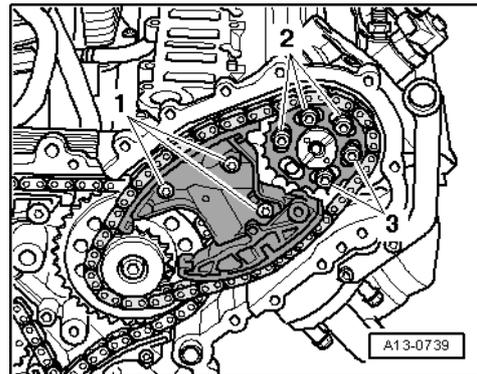
Audi Q7 2007 ▶

Audi 6-cylinder TDI engine (3.0 ltr. 4-valve common rail), mechanics 01.2006

- Press guide rail of chain tensioner for timing chain (right-side) in direction of -arrow- and lock chain tensioner by inserting a 3.3 mm Ø drill bit -item 1-.
- Mark running direction of timing chain (right-side) with paint.



- Unscrew bolts -1- from chain tensioner and -2- from camshaft sprocket.
- Take off camshaft sprocket, chain tensioner and timing chain (right-side).

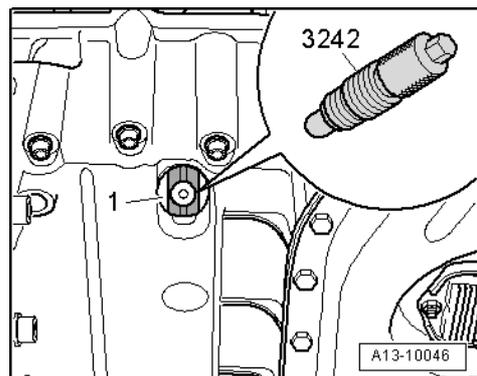


Installing

- Crankshaft -1- locked in "TDC" position with locking pin -3242-.
- Drive chain for valve gear installed ⇒ [page 83](#)

Note

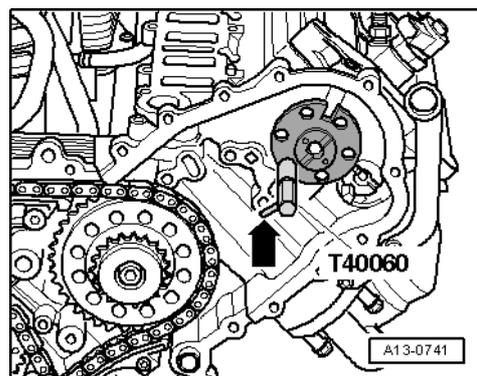
- ♦ Renew seal.
- ♦ Renew the bolts tightened with specified tightening angle.



Caution!

The crankshaft must not be at "TDC" at any cylinder when the camshafts are turned. Otherwise, there is a risk of damage to valves and piston crowns.

- Check that camshafts on both cylinder heads are positioned at "TDC".
- It should be possible to lock camshafts with locking pins -T40060-.
- The side pin -arrow- in each locking pin -T40060- must be in line with the imaginary line between the locking pin and the centre of the camshaft.



Cylinder bank 1 (right-side):

Cylinder bank 2 (left-side):

- Remove locking pins -T40060- from both camshafts.

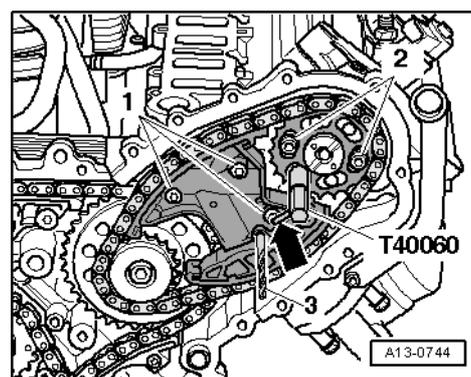
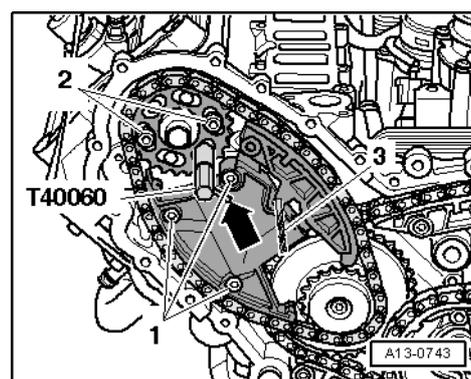
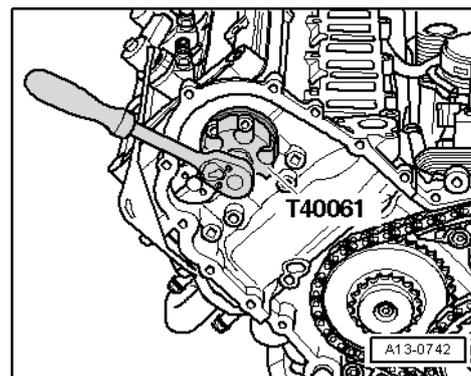
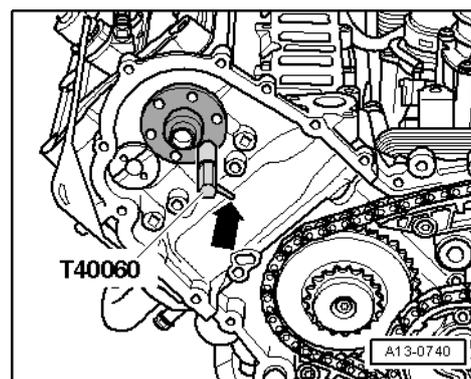
 **Note**

If the locking pins cannot be inserted in the camshafts, the camshafts can be turned slightly using adapter -T40061-. To do so, screw securing bolts for camshaft sprocket into camshaft.

 **Caution!**

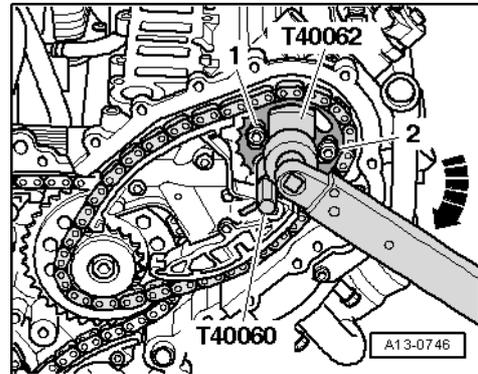
The crankshaft must not be at "TDC" at any cylinder when the camshafts are turned. Otherwise, there is a risk of damage to valves and piston crowns.

- Install timing chain (left-side) with camshaft sprocket and chain tensioner.
- The elongated holes in the sprocket must be aligned centrally over the tapped holes in the camshaft.
- Tighten bolts -1- for chain tensioner.
- Screw in two bolts -2- for sprocket, but do not tighten bolts.
- It should just be possible to turn the sprocket on the camshaft without axial movement.
- Lock camshaft (left-side) with locking pin -T40060-.
- The side pin -arrow- on the locking pin -T40060- must be in line with the imaginary line between the locking pin and the centre of the camshaft.
- Pull drill bit -3- from locating hole, this releases the chain tensioner (left-side).
- Install timing chain (right-side) with camshaft sprocket and chain tensioner.
- The elongated holes in the sprocket must be aligned centrally over the tapped holes in the camshaft.
- Tighten bolts -1- for chain tensioner.
- Screw in two bolts -2- for sprocket, but do not tighten bolts.
- It should just be possible to turn the sprocket on the camshaft without axial movement.

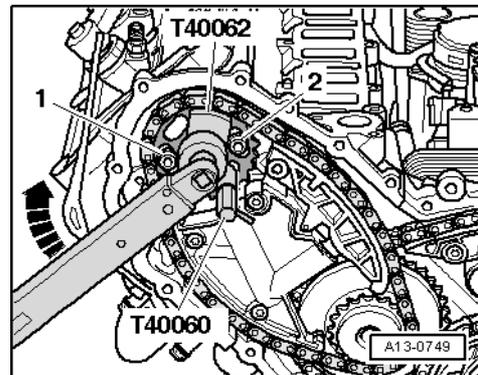




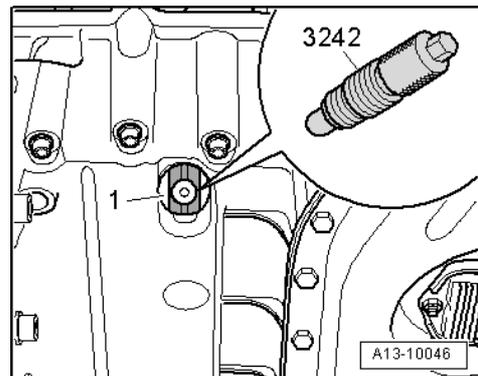
- Lock camshaft (right-side) with locking pin -T40060-.
- The side pin -arrow- on the locking pin -T40060- must be in line with the imaginary line between the locking pin and the centre of the camshaft.
- Pull drill bit -3- out of locating hole; this releases the chain tensioner (right-side).
- Using a torque wrench and adapter -T40062-, apply a torque of 30 Nm to camshaft sprocket (right-side) in the direction indicated (-arrow-). Maintain this torque for the following step.
- Tighten bolts -1- and -2-.
- Take off adapter -T40062- and pull out locking pin -T40060-.
- Tighten remaining bolts for sprocket (right-side).



- Using a torque wrench and adapter -T40062-, apply a torque of 15 Nm to camshaft sprocket (left-side) in the direction indicated (-arrow-). Maintain this torque for the following step.
- Tighten bolts -1- and -2-.
- Take off adapter -T40062- and pull out locking pin -T40060-.
- Tighten remaining bolts for sprocket (left-side).



- Remove locking pin -3242-.

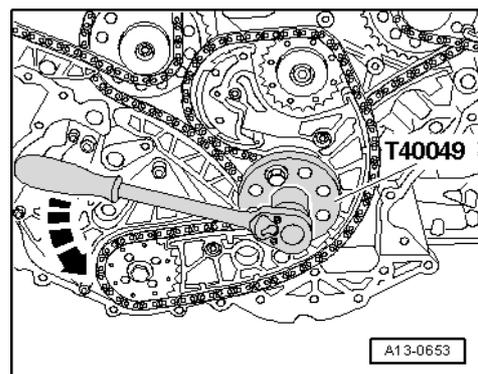


Checking valve timing

! *Caution!*

Do not rotate crankshaft in opposite direction of engine rotation.

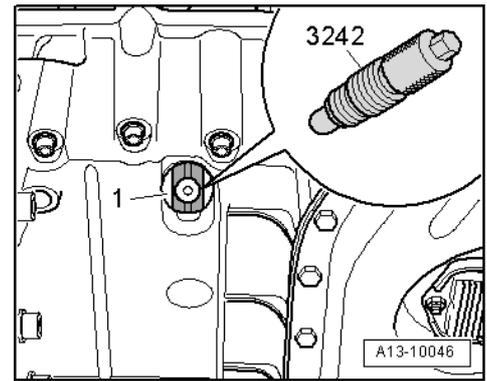
- Using adapter -T40049-, turn crankshaft two rotations in normal direction of rotation -arrow- until crankshaft is just before "TDC" again.



- While turning in this direction, lock crankshaft -1- with locking pin -3242-. Tighten locking pin to 20 Nm.

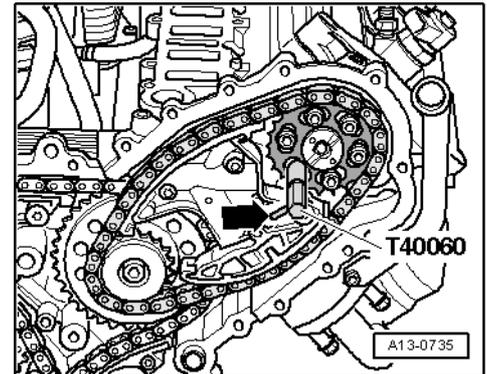
! Caution!

If the crankshaft has been rotated even only slightly beyond the "TDC" position, turn it back approx. 10° so you can then reset it to "TDC" by turning in the normal direction of rotation.

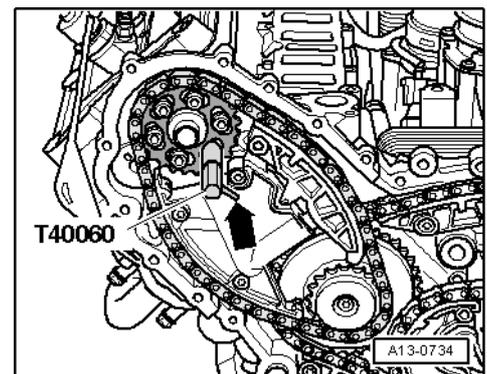


- Check that it is now possible to lock the camshafts with locking pins -T40060-.
- The side pin -arrow- in each locking pin -T40060- must be in line with the imaginary line between the locking pin and the centre of the camshaft.

Cylinder bank 1 (right-side):



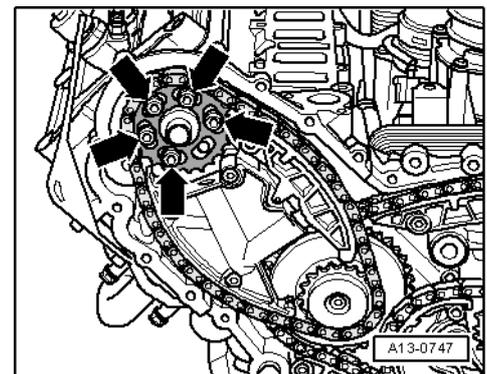
Cylinder bank 2 (left-side):



Adjusting valve timing

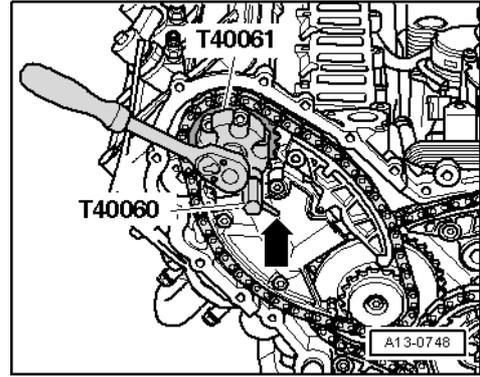
If the locking pin cannot be inserted in one of the camshafts:

- Loosen all bolts -arrows- on the relevant sprocket approx. 1 turn.



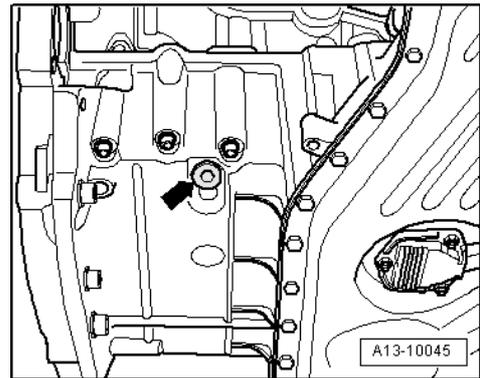


- Apply adapter -T40061- to the heads of the loosened bolts.
- Turn camshaft slightly backwards and forwards with adapter -T40061- until locking pin -T40060- can be inserted.
- The side pin -arrow- on the locking pin -T40060- must be in line with the imaginary line between the locking pin and the centre of the camshaft.
- With adapter -T40061- and locking pin -T40060- still in position, tighten bolts on sprocket to approx: 5 Nm.
- Remove locking pin -T40060- and adapter -T40061-.
- Tighten bolts on sprocket to final torque.
- Repeat this procedure on the other cylinder bank if necessary.
- Remove locking pin -3242-.
- Check valve timing once again => [page 70](#).



Remaining installation steps are carried out in reverse sequence; note the following:

- Screw plug -arrow- for "TDC" mark into top section of sump with a new seal.
- Install timing chain covers => [page 60](#).



Tightening torques

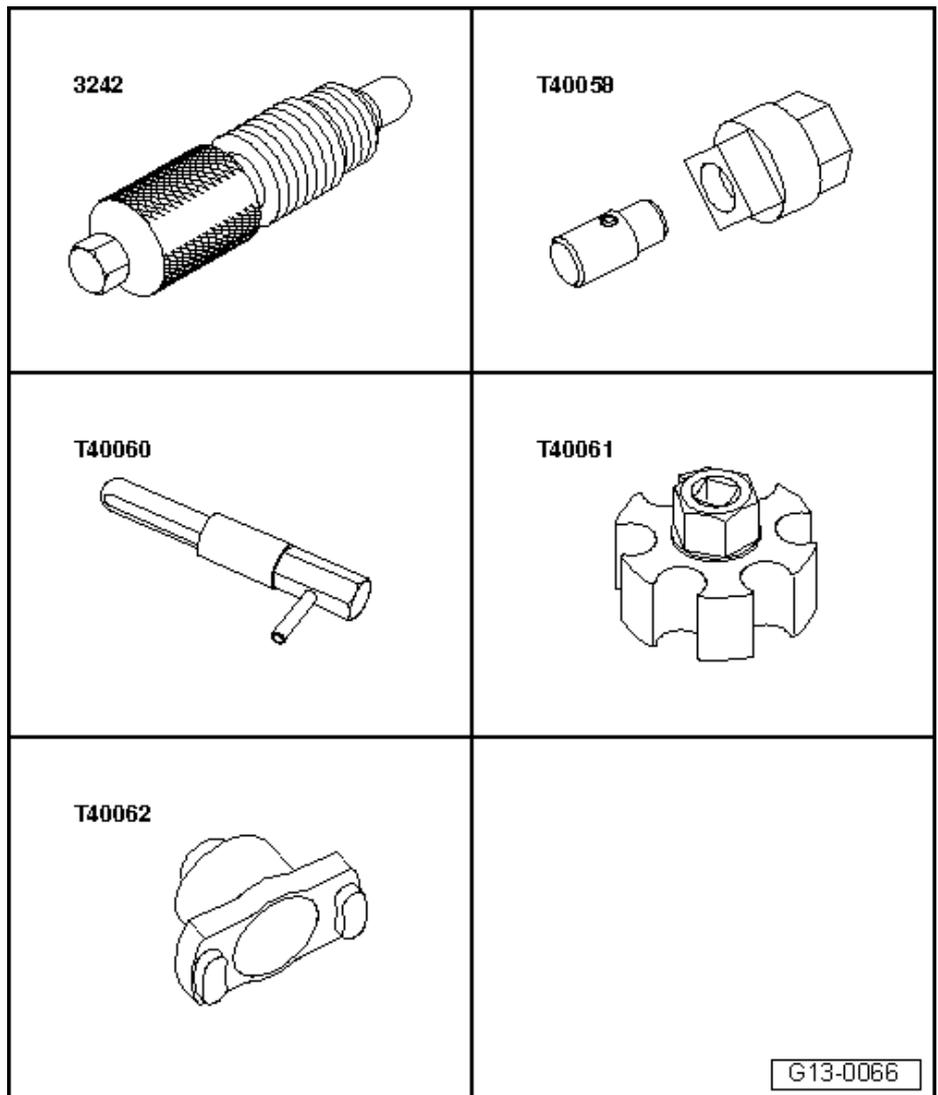
Component	Nm
Chain tensioner to cylinder head	5 + 90° ¹⁾²⁾
Camshaft sprocket to camshaft	24
Screw plug in top section of sump	35

- ¹⁾ Renew bolts.
- ²⁾ 90° = one quarter turn.

2.8 Detaching camshaft timing chains from camshafts

Special tools and workshop equipment required

- ◆ Locking pin -3242-
- ◆ Adapter -T40058-
- ◆ Locking pin -T40060- (2x)
- ◆ Adapter -T40061-
- ◆ Adapter -T40062-
- ◆ Drill bit 3.3 mm \varnothing (2x)



Note

- ◆ *When working on one cylinder head only, it is not necessary to remove the timing chain cover on the opposite cylinder head as well. In this case it is only necessary to remove the exhaust pump or the sealing cap, because the timing chain on this cylinder head stays in place.*
- ◆ *However, the valve timing for both cylinder heads must be adjusted in all cases as described below.*

Procedure

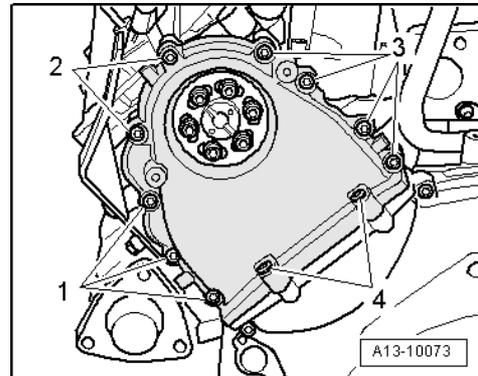
- Engine and gearbox in vehicle
- Drain off coolant ⇒ [page 161](#).
- Remove starter catalytic converter ⇒ [page 204](#).
- Remove exhaust pump ⇒ [page 52](#).
- Remove coolant pipe (rear right) ⇒ [page 181](#).



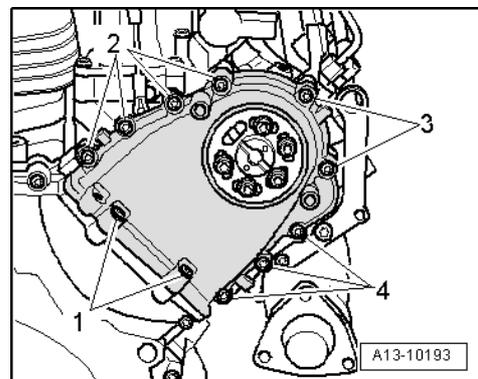
i Note

For illustration purposes, the following work on the timing chains is shown from the rear with the engine removed

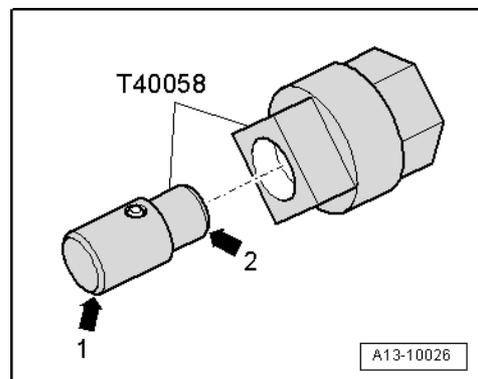
- Remove bolts -1 ... 4- and detach timing chain cover (left-side).



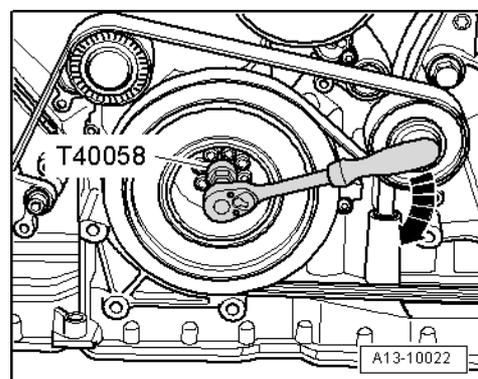
- Remove bolts -1 ... 4- and detach timing chain cover (right-side).



- Insert guide pin of adapter -T40058- with the larger-diameter section -arrow 1- pointing towards the engine. The smaller-diameter section -arrow 2- faces the adapter.

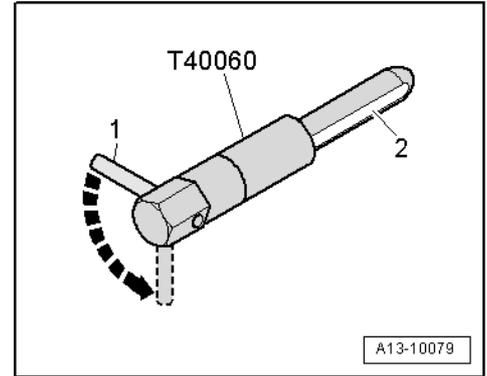


- Using adapter -T40058- turn the crankshaft in the normal direction of rotation -arrow- to "TDC".

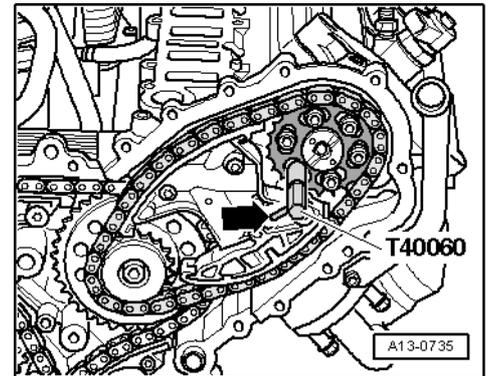


 **Note**

- ◆ *The locking pin -T40060- has a flat -2- which makes it easier to insert when the locating bores in the camshaft and cylinder head are not exactly in line.*
- ◆ *The locking pin is inserted initially so that the side pin -1- is perpendicular to the imaginary line between the locking pin and the centre of the camshaft.*
- ◆ *To obtain the correct "TDC" position, the side pin -1- must then be turned 90° -arrow- so it is in line with the imaginary line between the locking pin and the centre of the camshaft.*

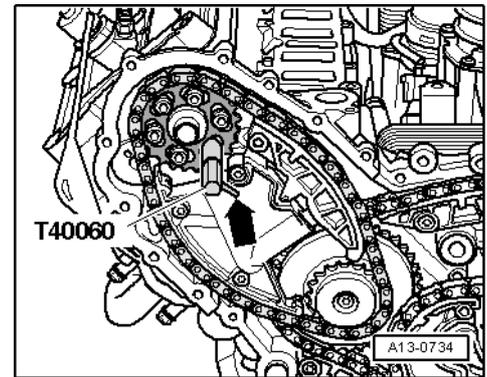


- Check that camshafts on both cylinder heads are positioned at "TDC".
- It should be possible to lock camshafts with locking pins -T40060-.
- The side pin -arrow- in each locking pin -T40060- must be in line with the imaginary line between the locking pin and the centre of the camshaft.

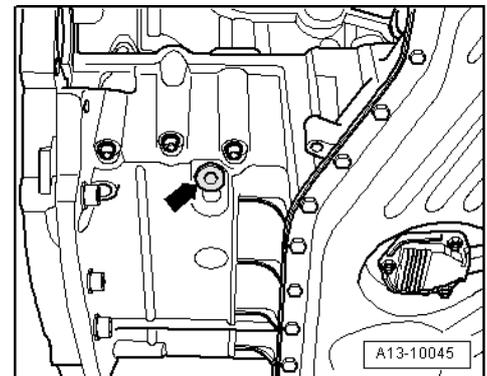


Cylinder bank 1 (right-side):

Cylinder bank 2 (left-side):



- Lay a cloth beneath sump (top section) to catch engine oil.
- Unscrew plug -arrow- from sump (top section).

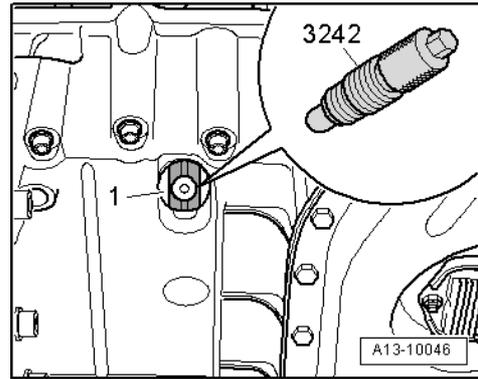




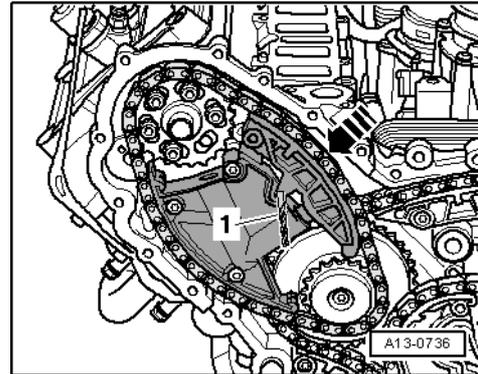
WARNING!

To avoid any risk of injury, do not rotate the crankshaft while feeling for the "TDC" hole with your finger.

- Screw locking pin -3242- into bore (20 Nm); if necessary, turn crankshaft -1- backwards and forwards slightly to fully centralise locking pin.
- Press guide rail of chain tensioner for timing chain (left-side) in direction of -arrow- and lock chain tensioner by inserting a 3.3 mm Ø drill bit -item 1-.

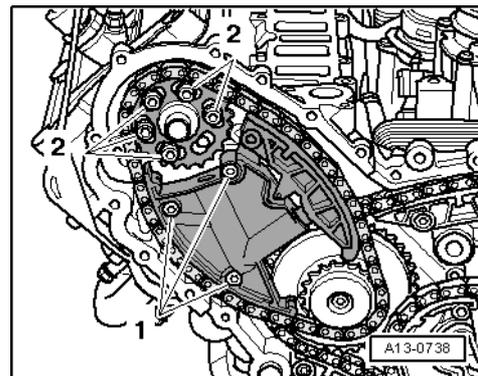


- Unscrew bolts -1- from chain tensioner and -2- from camshaft sprocket.
- Remove camshaft sprocket and chain tensioner (left-side)

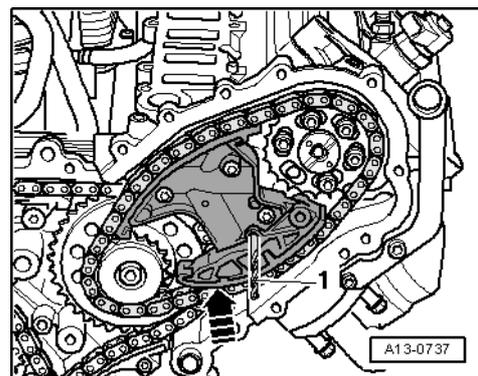


Note

Cover chain tensioner opening with a cloth or similar to stop small parts dropping in.



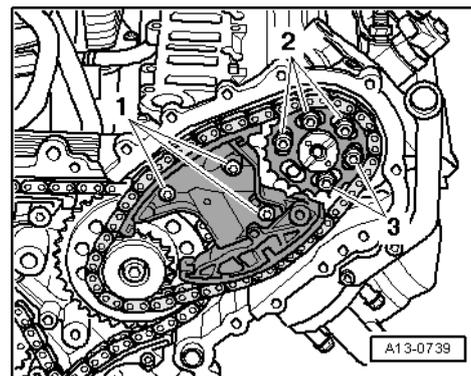
- Press guide rail of chain tensioner for timing chain (right-side) in direction of -arrow- and lock chain tensioner by inserting a 3.3 mm Ø drill bit -item 1-.



- Unscrew bolts -1- from chain tensioner and -2- from camshaft sprocket.
- Remove camshaft sprocket and chain tensioner (right-side).

i Note

Cover chain tensioner opening with a cloth or similar to stop small parts dropping in.

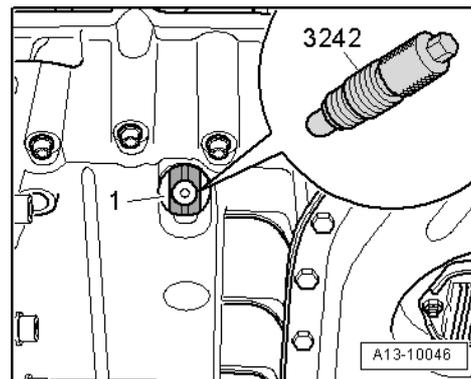


Installing

- Crankshaft -1- locked in "TDC" position with locking pin -3242-.

i Note

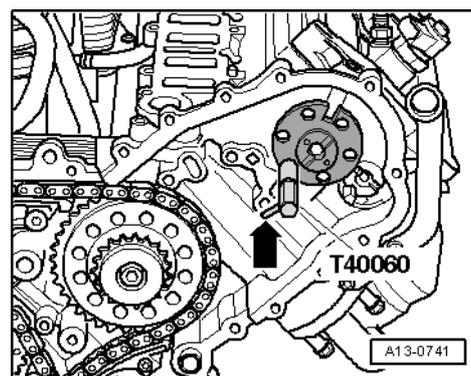
- ◆ Renew gaskets, seals and O-rings.
- ◆ Renew the bolts tightened with specified tightening angle.



! Caution!

The crankshaft must not be at "TDC" at any cylinder when the camshafts are turned. Otherwise, there is a risk of damage to valves and piston crowns.

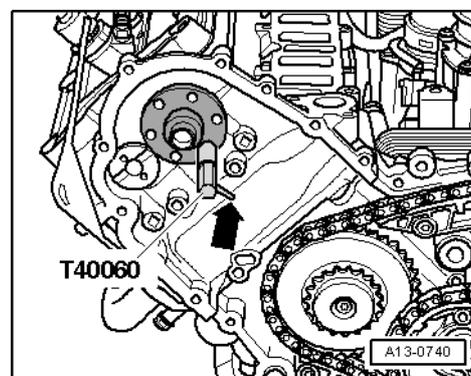
- Check that camshafts on both cylinder heads are positioned at "TDC".
- It should be possible to lock camshafts with locking pins -T40060-.
- The side pin -arrow- in each locking pin -T40060- must be in line with the imaginary line between the locking pin and the centre of the camshaft.



Cylinder bank 1 (right-side):

Cylinder bank 2 (left-side):

- Remove locking pins -T40060- from both camshafts.





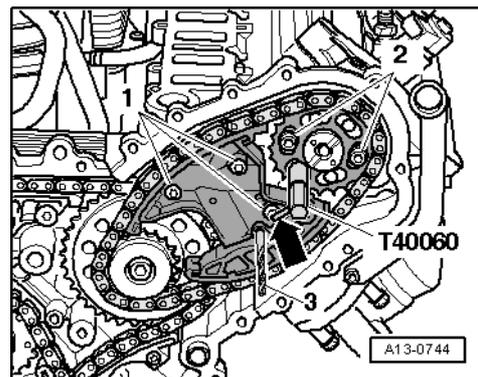
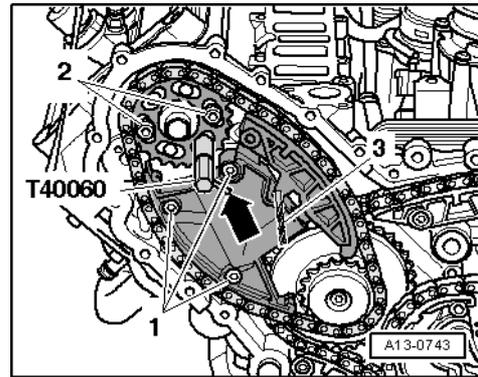
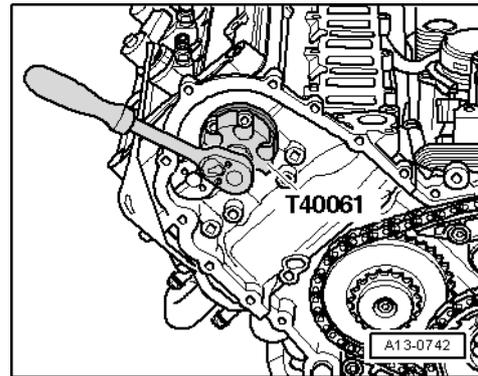
i Note

If the locking pins cannot be inserted in the camshafts, the camshafts can be turned slightly using adapter -T40061-. To do so, screw securing bolts for camshaft sprocket into camshaft.

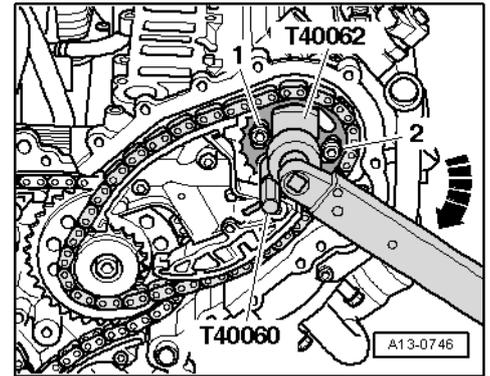
! Caution!

The crankshaft must not be at "TDC" at any cylinder when the camshafts are turned. Otherwise, there is a risk of damage to valves and piston crowns.

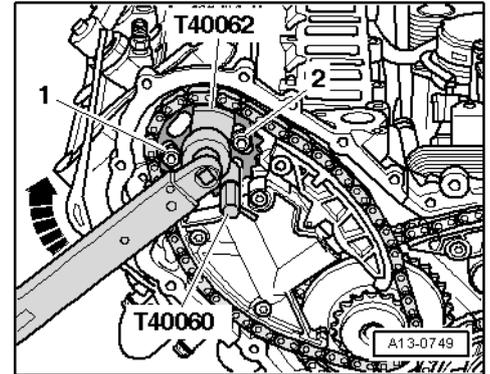
- Install timing chain (left-side) with camshaft sprocket and chain tensioner.
- The elongated holes in the sprocket must be aligned centrally over the tapped holes in the camshaft.
- Tighten bolts -1- for chain tensioner.
- Screw in two bolts -2- for sprocket, but do not tighten bolts.
- It should just be possible to turn the sprocket on the camshaft without axial movement.
- Lock camshaft (left-side) with locking pin -T40060-.
- The side pin -arrow- on the locking pin -T40060- must be in line with the imaginary line between the locking pin and the centre of the camshaft.
- Pull drill bit -3- from locating hole, this releases the chain tensioner (left-side).
- Install timing chain (right-side) with camshaft sprocket and chain tensioner.
- The elongated holes in the sprocket must be aligned centrally over the tapped holes in the camshaft.
- Tighten bolts -1- for chain tensioner.
- Screw in two bolts -2- for sprocket, but do not tighten bolts.
- It should just be possible to turn the sprocket on the camshaft without axial movement.
- Lock camshaft (right-side) with locking pin -T40060-.
- The side pin -arrow- on the locking pin -T40060- must be in line with the imaginary line between the locking pin and the centre of the camshaft.
- Pull drill bit -3- out of locating hole; this releases the chain tensioner (right-side).



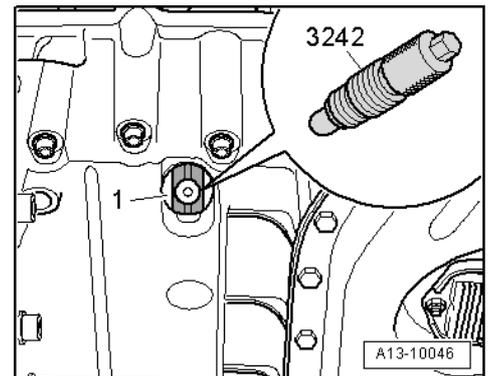
- Using a torque wrench and adapter -T40062-, apply a torque of 30 Nm to camshaft sprocket (right-side) in the direction indicated (-arrow-). Maintain this torque for the following step.
- Tighten bolts -1- and -2-.
- Take off adapter -T40062- and pull out locking pin -T40060-.
- Tighten remaining bolts for sprocket (right-side).



- Using a torque wrench and adapter -T40062-, apply a torque of 15 Nm to camshaft sprocket (left-side) in the direction indicated (-arrow-). Maintain this torque for the following step.
- Tighten bolts -1- and -2-.
- Take off adapter -T40062- and pull out locking pin -T40060-.
- Tighten remaining bolts for sprocket (left-side).



- Remove locking pin -3242-.

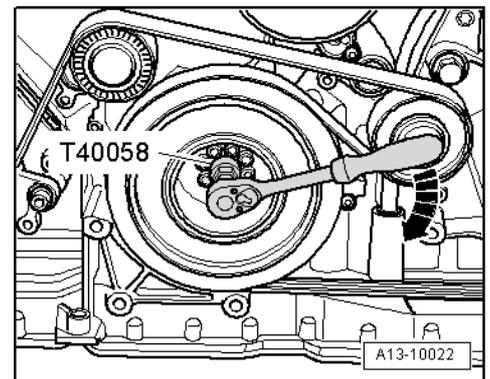


Checking valve timing

 **Caution!**

Do not rotate crankshaft in opposite direction of engine rotation.

- Turn crankshaft two rotations in normal direction of rotation -arrow- until the crankshaft is just before "TDC" again.

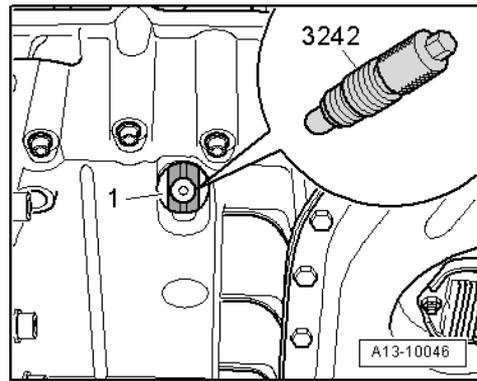




- While turning in this direction, lock crankshaft -1- with locking pin -3242-. Tighten locking pin to 20 Nm.

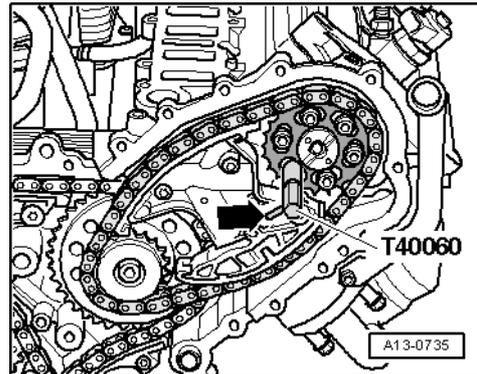
! Caution!

If the crankshaft has been rotated even only slightly beyond the "TDC" position, turn it back approx. 10° so you can then reset it to "TDC" by turning in the normal direction of rotation.

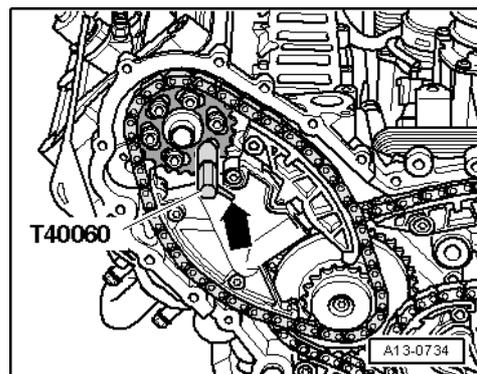


- Check that it is now possible to lock the camshafts with locking pins -T40060-.
- The side pin -arrow- in each locking pin -T40060- must be in line with the imaginary line between the locking pin and the centre of the camshaft.

Cylinder bank 1 (right-side):



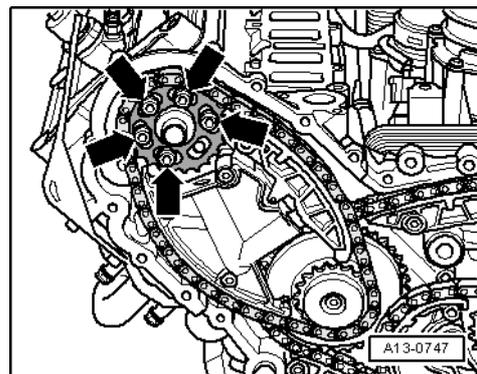
Cylinder bank 2 (left-side):



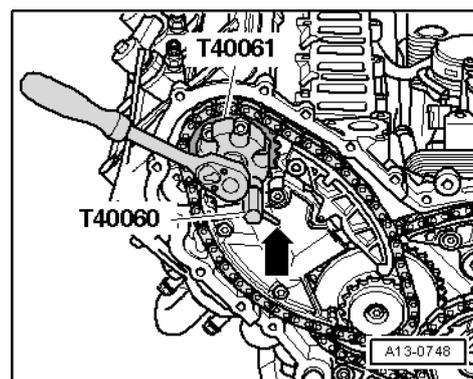
Adjusting valve timing

If the locking pin cannot be inserted in one of the camshafts:

- Loosen all bolts -arrows- on the relevant sprocket approx. 1 turn.

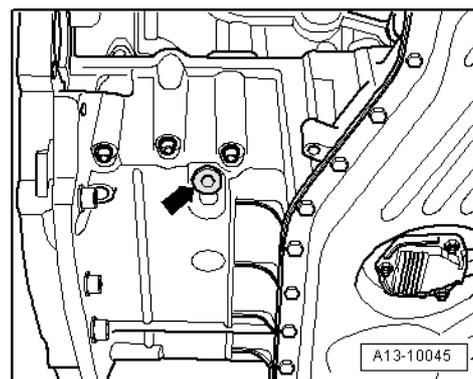


- Apply adapter -T40061- to the heads of the loosened bolts.
- Turn camshaft slightly backwards and forwards with adapter -T40061- until locking pin -T40060- can be inserted.
- The side pin -arrow- on the locking pin -T40060- must be in line with the imaginary line between the locking pin and the centre of the camshaft.
- With adapter -T40061- and locking pin -T40060- still in position, tighten bolts on sprocket to approx: 5 Nm.
- Remove locking pin -T40060- and adapter -T40061-.
- Tighten bolts on sprocket to final torque.
- Repeat this procedure on the other cylinder bank if necessary.
- Remove locking pin -3242-.
- Check valve timing once again ⇒ [page 79](#).



Remaining installation steps are carried out in reverse sequence; note the following:

- Screw plug -arrow- for "TDC" mark into top section of sump with a new seal.
- Install timing chain covers ⇒ [page 60](#).
- Install coolant pipe (rear right) ⇒ [page 181](#).
- Install exhauster pump ⇒ [page 52](#).
- Install starter catalytic converter ⇒ [page 204](#).
- Fill cooling system ⇒ [page 162](#).



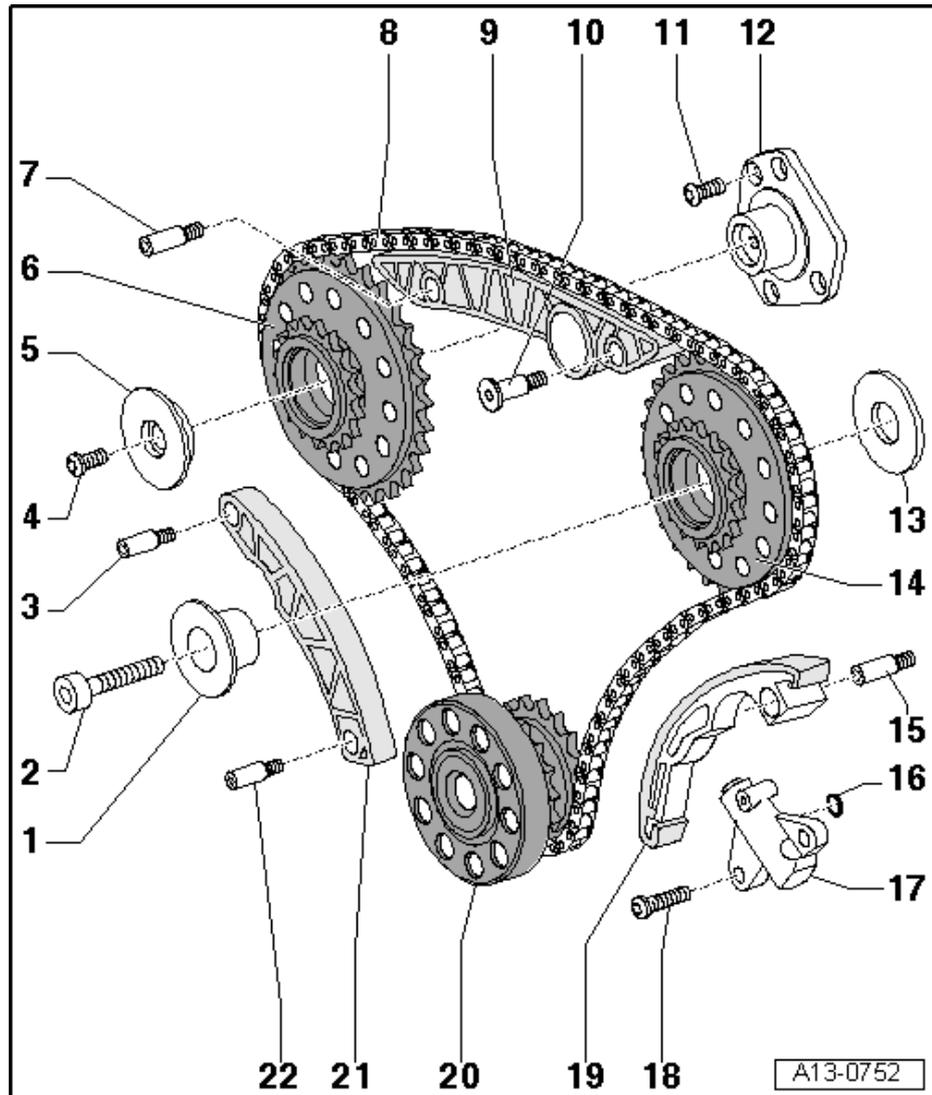
Tightening torques

Component	Nm
Chain tensioner to cylinder head	5 + 90° ¹⁾²⁾
Camshaft sprocket to camshaft	24
Screw plug in top section of sump	35
<ul style="list-style-type: none"> • ¹⁾ Renew bolts. • ²⁾ 90° = one quarter turn. 	



2.9 Drive chain for valve gear - exploded view of components

- 1 - Bearing mounting for drive sprocket
- 2 - 45 Nm
- 3 - Mounting pin, 12 Nm
 - Install using locking fluid; for locking fluid refer to ⇒ Parts catalogue
- 4 - 5 Nm + 90° (1/4 turn) further
 - Renew
- 5 - Thrust washer for drive sprocket
- 6 - Drive sprocket for timing chain (left-side)
- 7 - Mounting pin, 12 Nm
 - Install using locking fluid; for locking fluid refer to ⇒ Parts catalogue
- 8 - Drive chain for valve gear
 - Before removing, mark running direction with paint
 - Removing and installing ⇒ [page 83](#)
- 9 - Guide rail
- 10 - Mounting pin, 12 Nm
 - Install using locking fluid; for locking fluid refer to ⇒ Parts catalogue
- 11 - 9 Nm
- 12 - Bearing bracket for drive sprocket
- 13 - Thrust washer
- 14 - Drive sprocket for timing chain (right-side)
- 15 - Mounting pin, 12 Nm
 - Install using locking fluid; for locking fluid refer to ⇒ Parts catalogue
- 16 - O-ring
 - Renew
- 17 - Chain tensioner
- 18 - 10 Nm
- 19 - Guide rail for chain tensioner
- 20 - Crankshaft
- 21 - Guide rail
 - Note installation position
- 22 - Mounting pin, 9 Nm



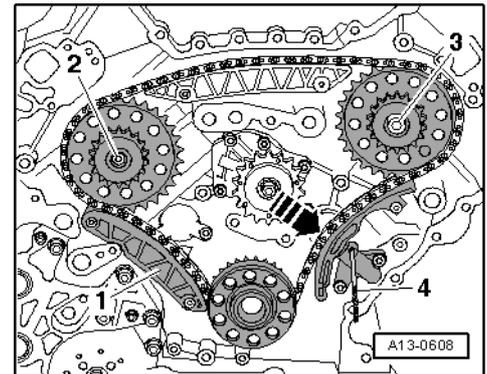
2.10 Removing and installing drive chain for valve gear

Special tools and workshop equipment required

- ◆ Drill bit, \varnothing 3.3 mm

Removing

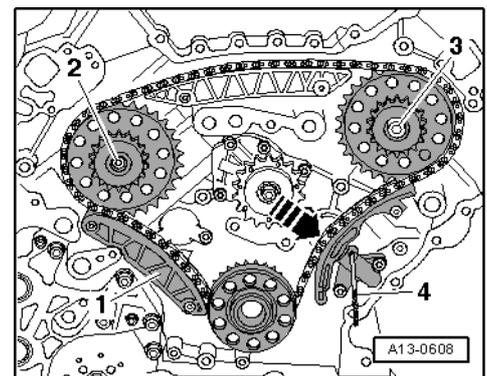
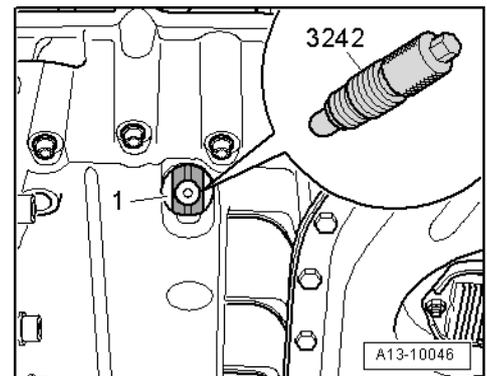
- Remove timing chain covers ⇒ [page 59](#).
- Remove camshaft timing chains ⇒ [page 65](#).
- Remove chain for oil pump and balance shaft ⇒ [page 85](#).
- Press guide rail of chain tensioner for drive chain in direction of -arrow- and lock chain tensioner by inserting a 3.3 mm \varnothing drill bit -item 4-.
- Mark running direction of chain with paint.
- Remove bolts -2- and -3- and detach chain sprockets together with drive chain and guide rail -1-.



Installing

Installation is carried out in the reverse order; note the following:

- Crankshaft -1- locked in "TDC" position with locking pin -3242-.
- First install sprocket for camshaft timing chain (left-side) -2-.
- Install guide rail -1- with drive chain fitted.
- Now install sprocket for camshaft timing chain (right-side) -3-.
- Push guide rail of chain tensioner for drive chain in direction of -arrow- and pull drill bit -4- out of chain tensioner.
- Install chain for oil pump and balance shaft ⇒ [page 85](#)
- Install camshaft timing chains ⇒ [page 65](#).
- Install timing chain covers ⇒ [page 60](#).



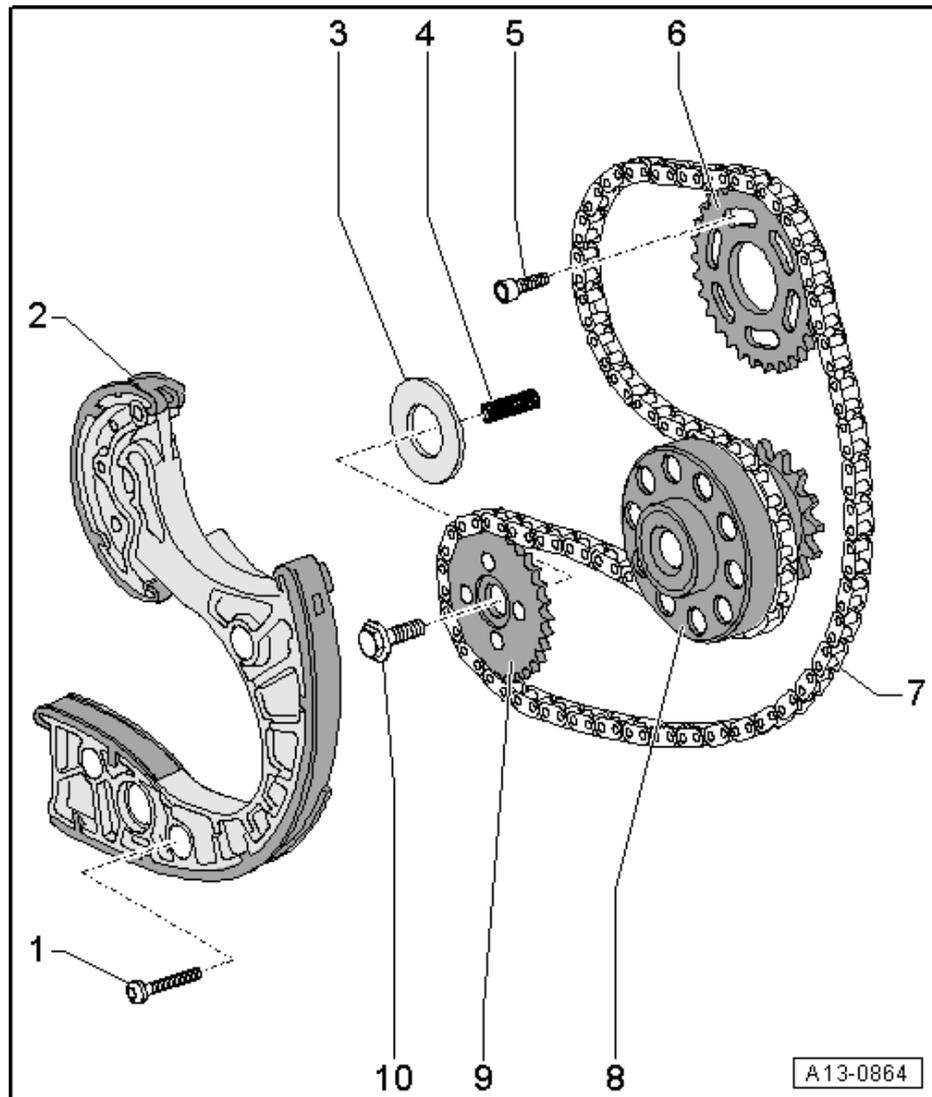
Tightening torques



Component	Nm
Drive chain sprocket (left-side) to bearing bracket	5 + 90° ¹⁾²⁾
Drive chain sprocket (right-side) to cylinder block	45
<ul style="list-style-type: none"> • ¹⁾ Renew bolts. • ²⁾ 90° = one quarter turn. 	

2.11 Drive chain for oil pump and balance shaft - exploded view of components

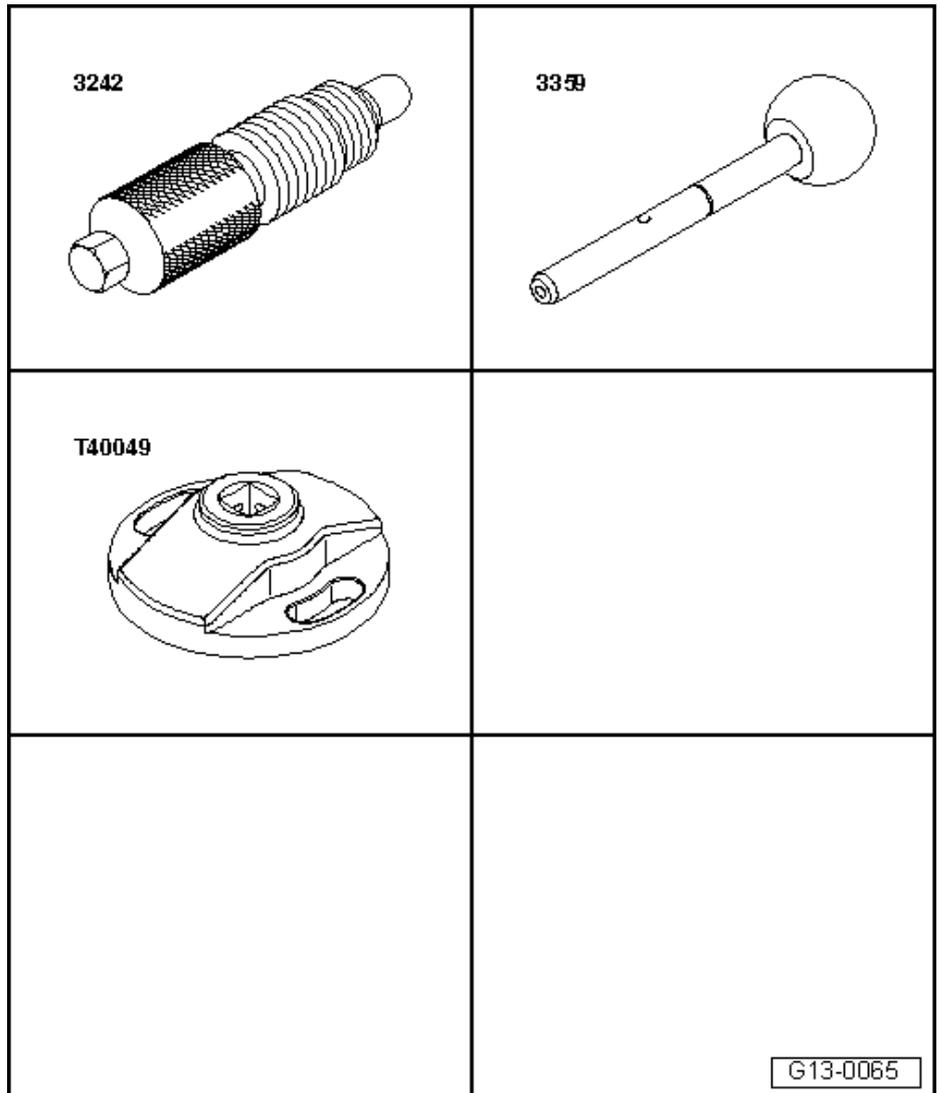
- 1 - 9 Nm
- 2 - Chain tensioner
 - With guide rail
- 3 - Thrust washer
- 4 - Compression spring
- 5 - 24 Nm
- 6 - Chain sprocket for balance shaft
 - Side with lettering faces towards gearbox
- 7 - Chain for oil pump and balance shaft
 - Before removing, mark running direction with paint
 - Removing and installing ⇒ [page 85](#)
- 8 - Crankshaft
- 9 - Chain sprocket for oil pump
 - Installation position: Side with lettering faces engine
- 10 - 62 Nm
 - If bolt cannot be tightened to torque, remove sump (bottom section) with baffle plate and counterhold oil pump drive shaft using an open-end spanner.



2.12 Removing and installing drive chain for oil pump and balance shaft

Special tools and workshop equipment required

- ◆ Locking pin -3242-
- ◆ Diesel injection pump locking pin -3359-
- ◆ Adapter -T40049-
- ◆ Drill bit, \varnothing 3.3 mm

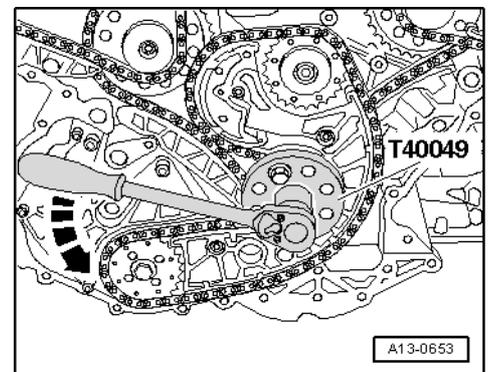


Removing

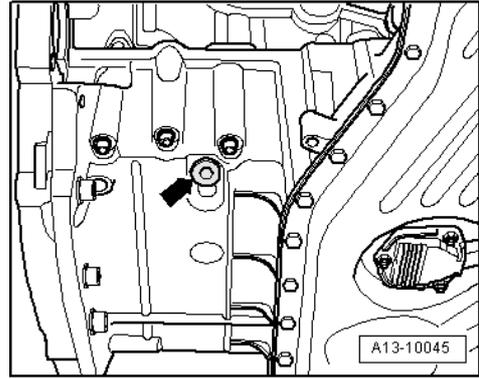
- Remove timing chain covers ⇒ [page 59](#).
- Attach adapter -T40049- at rear end of crankshaft using two old securing bolts for drive plate.

Note

Ignore -arrow-.



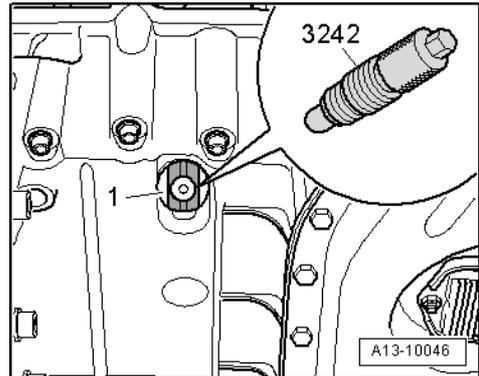
- Unscrew plug -arrow- from sump (top section).



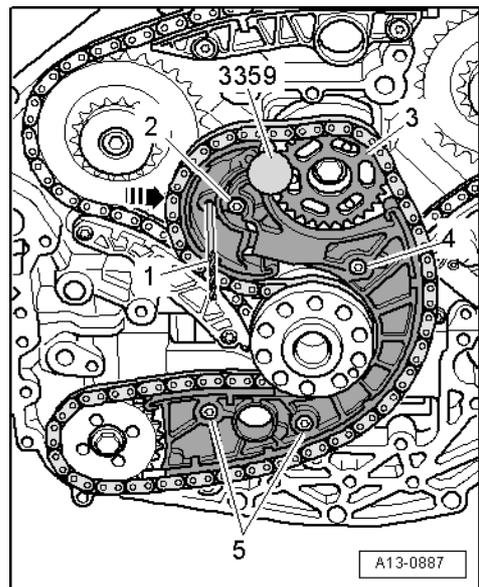
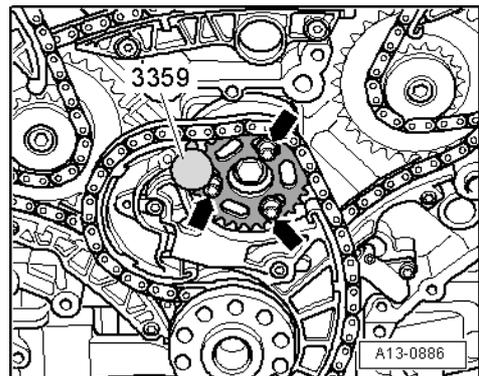
⚠ WARNING!

To avoid any risk of injury, do not rotate the crankshaft while feeling for the "TDC" hole with your finger.

- Screw locking pin -3242- into bore (20 Nm); if necessary, turn crankshaft -1- backwards and forwards slightly to fully centralise locking pin.
- Mark running direction of chain for oil pump and balance shaft with paint.
- Lock balance shaft with diesel injection pump locking pin -3359- and loosen bolts -arrows- for balance shaft sprocket.

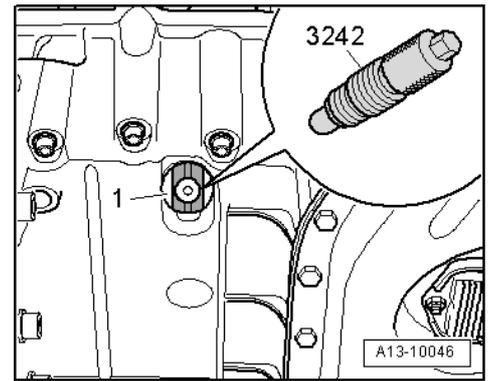


- Press guide rail of chain tensioner in direction of -arrow- and lock chain tensioner by inserting a 3.3 mm Ø drill bit -item 1-.
- Remove bolts -2, 4, 5- and take out chain tensioner, balance shaft sprocket -3- and chain.

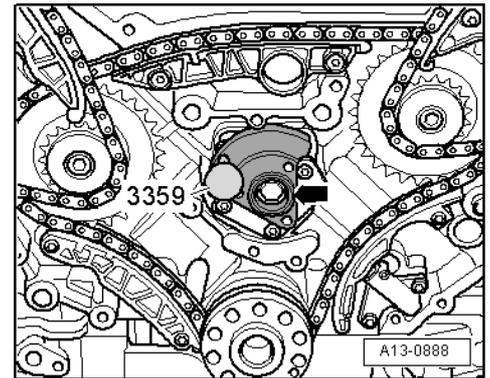


Installing

- Crankshaft -1- locked in "TDC" position with locking pin -3242-



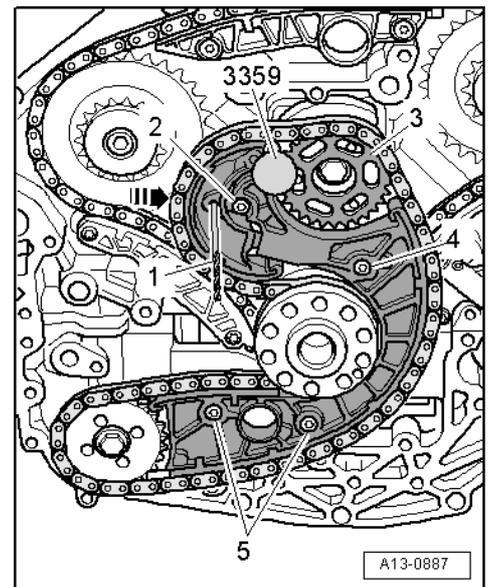
- Lock balance shaft -arrow- with diesel injection pump locking pin -3359-



- Install chain tensioner with chain and balance shaft sprocket.

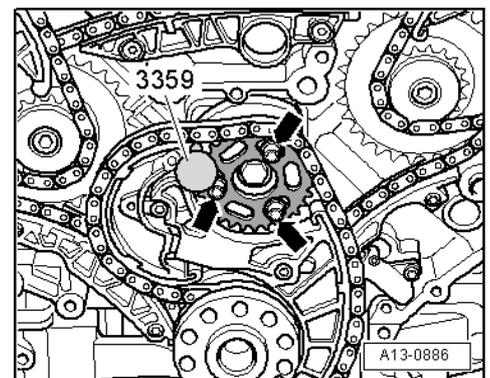
- The elongated holes in the sprocket -3- must be aligned centrally over the tapped holes in the balance shaft.

- Tighten bolts -2-, -4- and -5- for chain tensioner.



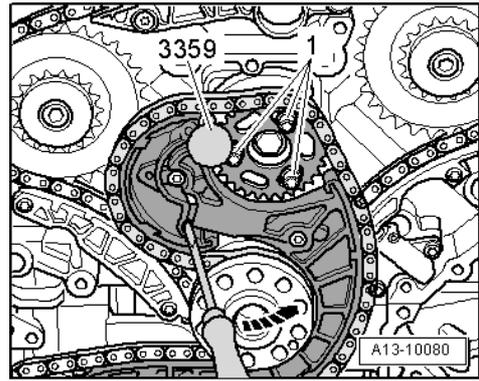
- Screw in bolts -arrows- for chain sprocket, but do not tighten.

- It should just be possible to turn the sprocket on the balance shaft without axial movement.





- Pull drill bit out of locating hole to release chain tensioner.
- Press against guide rail of chain tensioner in direction of -arrow- using a screwdriver, and at the same time tighten bolts -arrows- securing chain sprocket.
- Pull diesel injection pump locking pin -3359- out of balance shaft.



Remaining installation steps are carried out in reverse sequence; note the following:

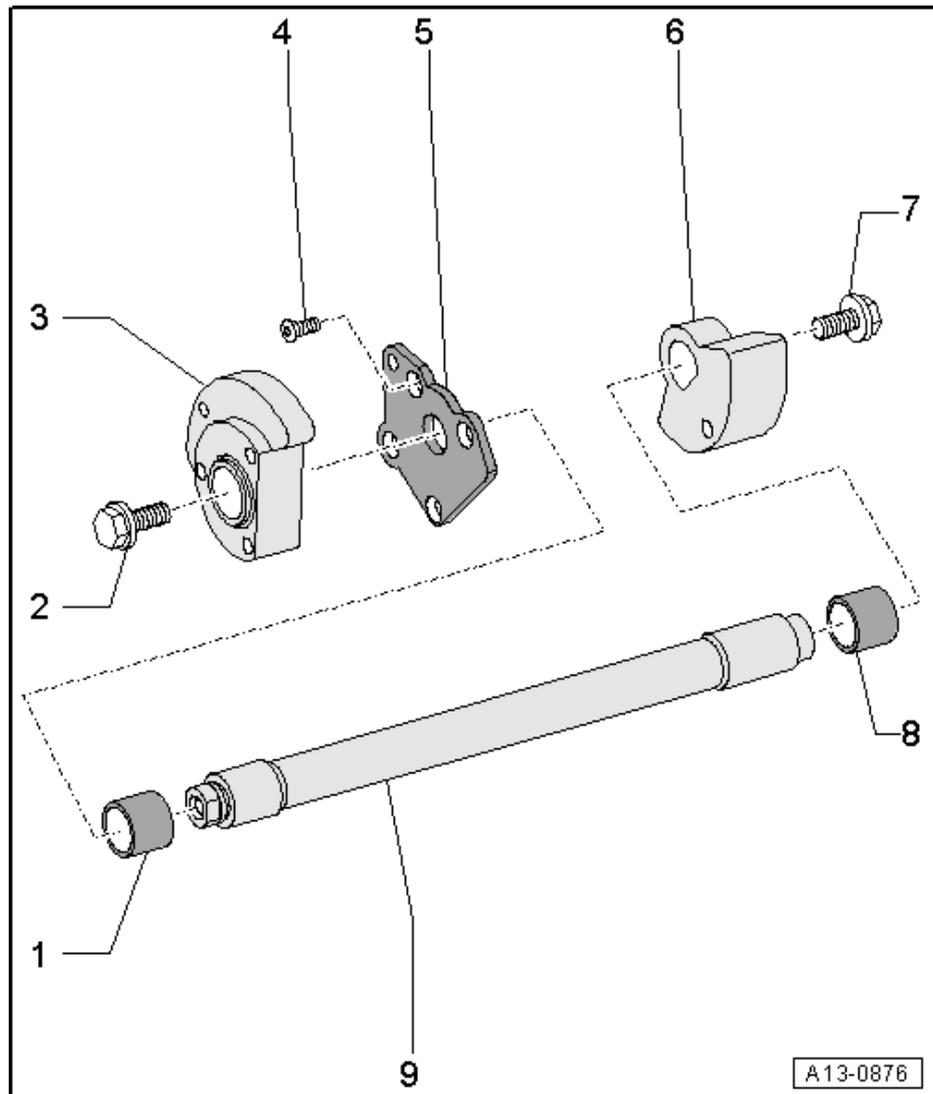
- Install timing chain covers => [page 60](#).

Tightening torques

Component	Nm
Chain tensioner to cylinder block	9
Chain sprocket for balance shaft to balance weight	24

2.13 Balance shaft - exploded view of components

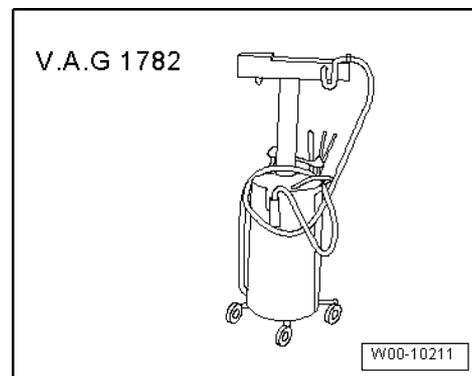
- 1 - Sleeve bearing
- 2 - 60 Nm
 - Counterhold with diesel injection pump locking pin -3359- when loosening and tightening
- 3 - Balance weight (timing chain end)
- 4 - 9 Nm
- 5 - Bearing plate
- 6 - Balance weight (pulley end)
- 7 - 60 Nm
 - Counterhold with diesel injection pump locking pin -3359- when loosening and tightening
- 8 - Sleeve bearing
- 9 - Balance shaft
 - Removing and installing => [page 89](#)



2.14 Removing and installing balance shaft

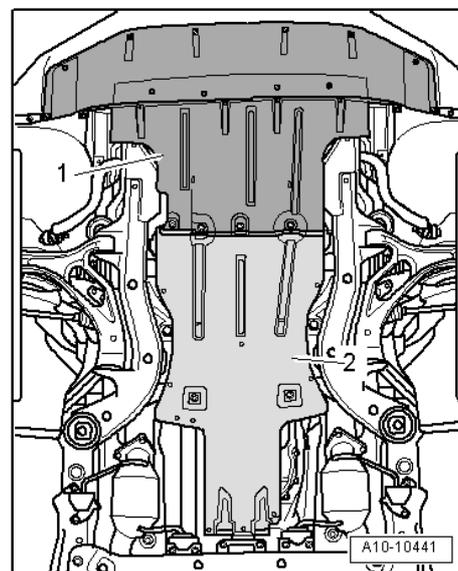
Special tools and workshop equipment required

- ◆ Used oil collection and extraction unit -V.A.G 1782-



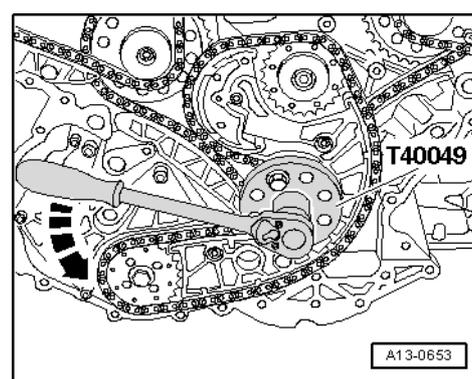
Removing

- Unscrew bolts and take off front noise insulation -1- and rear noise insulation -2-.
- Place used oil collection and extraction unit -V.A.G 1782- under engine.
- Drain off engine oil.
- Remove engine ⇒ [page 4](#).
- Separate engine from gearbox ⇒ [page 21](#).
- Secure engine to engine stand ⇒ [page 29](#). Alternatively, leave engine in position on scissor-type assembly platform -VAS 6131-.
- Remove sealing flange (front) ⇒ [page 43](#).
- Remove drive plate ⇒ [page 54](#).
- Remove timing chain covers ⇒ [page 59](#).
- Attach adapter -T40049- at rear end of crankshaft using two old securing bolts for drive plate.



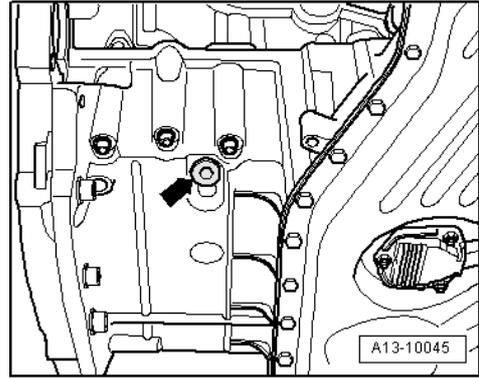
Note

Ignore -arrow-.



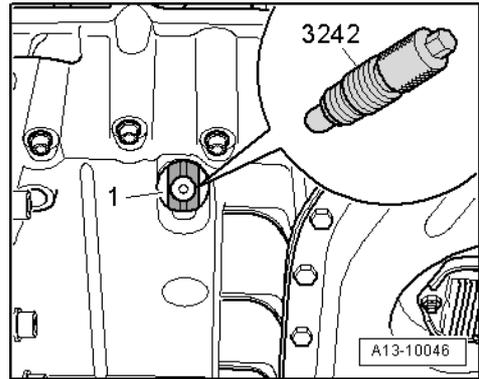


- Unscrew plug -arrow- from sump (top section).

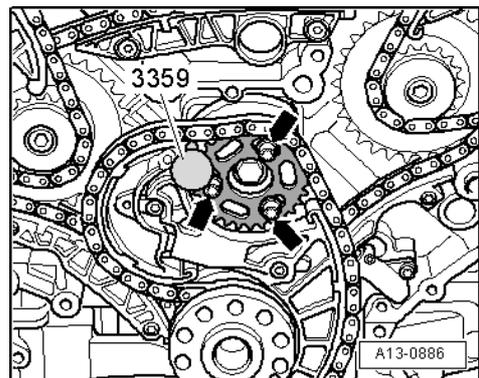
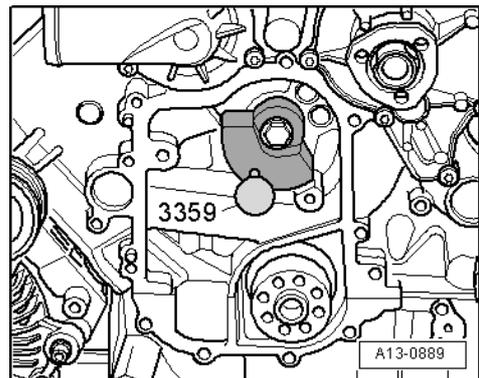


⚠ WARNING!
To avoid any risk of injury, do not rotate the crankshaft while feeling for the "TDC" hole with your finger.

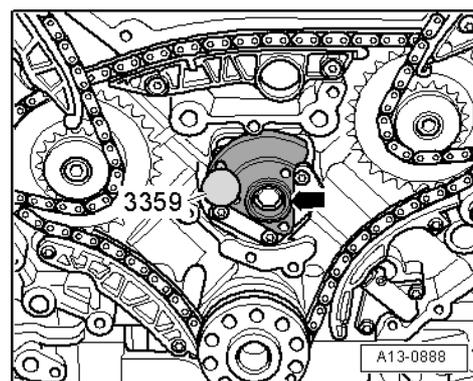
- Screw locking pin -3242- into bore (20 Nm); if necessary, turn crankshaft -1- backwards and forwards slightly to fully centralise locking pin.
- Lock balance shaft at front of engine with diesel injection pump locking pin -3359-
- Unscrew bolt and detach balance weight from balance shaft.



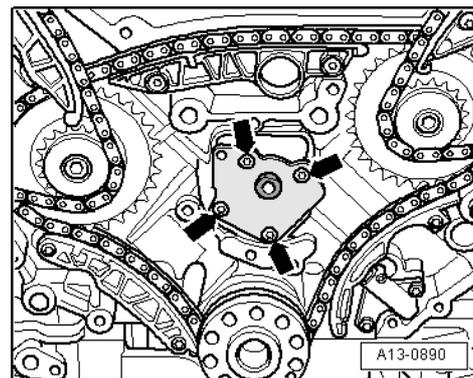
- Lock balance shaft at rear of engine with diesel injection pump locking pin -3359-
- Unscrew bolts -arrows- and detach chain sprocket from balance weight.



- Unscrew bolt -arrow- and detach balance weight from balance shaft.



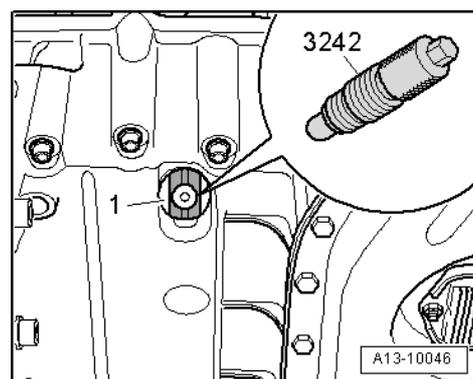
- Unscrew bolts -arrows- and detach bearing plate for balance shaft.
- Pull balance shaft out of cylinder block.



Installing

Installation is carried out in the reverse order; note the following:

- Crankshaft -1- locked in "TDC" position with locking pin -3242-.
- Install chain for oil pump and balance shaft ⇒ [page 85](#)
- Install timing chain covers ⇒ [page 60](#).
- Install drive plate ⇒ [page 54](#).
- Install sealing flange (front) ⇒ [page 43](#).
- Bolt gearbox to engine and install engine/gearbox assembly ⇒ [page 32](#).
- Fill up with engine oil and check oil level ⇒ [page 157](#).



Tightening torques

Component	Nm
Cover to cylinder block	9
Balance weight to balance shaft	60



3 Removing and installing crankshaft

3.1 Crankshaft - exploded view of components



Note

When carrying out repairs, secure engine to engine and gearbox support -VAS 6095- ⇒ [page 29](#).

1 - Crankshaft

- Measuring axial clearance ⇒ [page 94](#)
- Measuring radial clearance ⇒ [page 95](#)
- Do not rotate the crankshaft when checking the radial clearance
- Crankshaft dimensions ⇒ [page 94](#)

2 - Dowel sleeve

- 2 x
- Insert in cylinder block

3 - Retaining frame

- Installing ⇒ [Fig. on page 93](#)

4 - Bolt

- Renew
- Tightening sequence ⇒ [Fig. on page 93](#)

5 - Thrust washer

- Only fitted on 3rd crankshaft bearing
- Oil grooves face outwards
- Note location
- Measuring axial clearance of crankshaft ⇒ [page 94](#)

6 - Bearing shell

- For retaining frame
- Do not interchange used bearing shells (mark positions)
- Bearing shells worn down to nickel layer must be renewed
- Install new bearing shells for retaining frame with correct coloured markings ⇒ [Fig. on page 94](#)

7 - Centring sleeve for torque converter

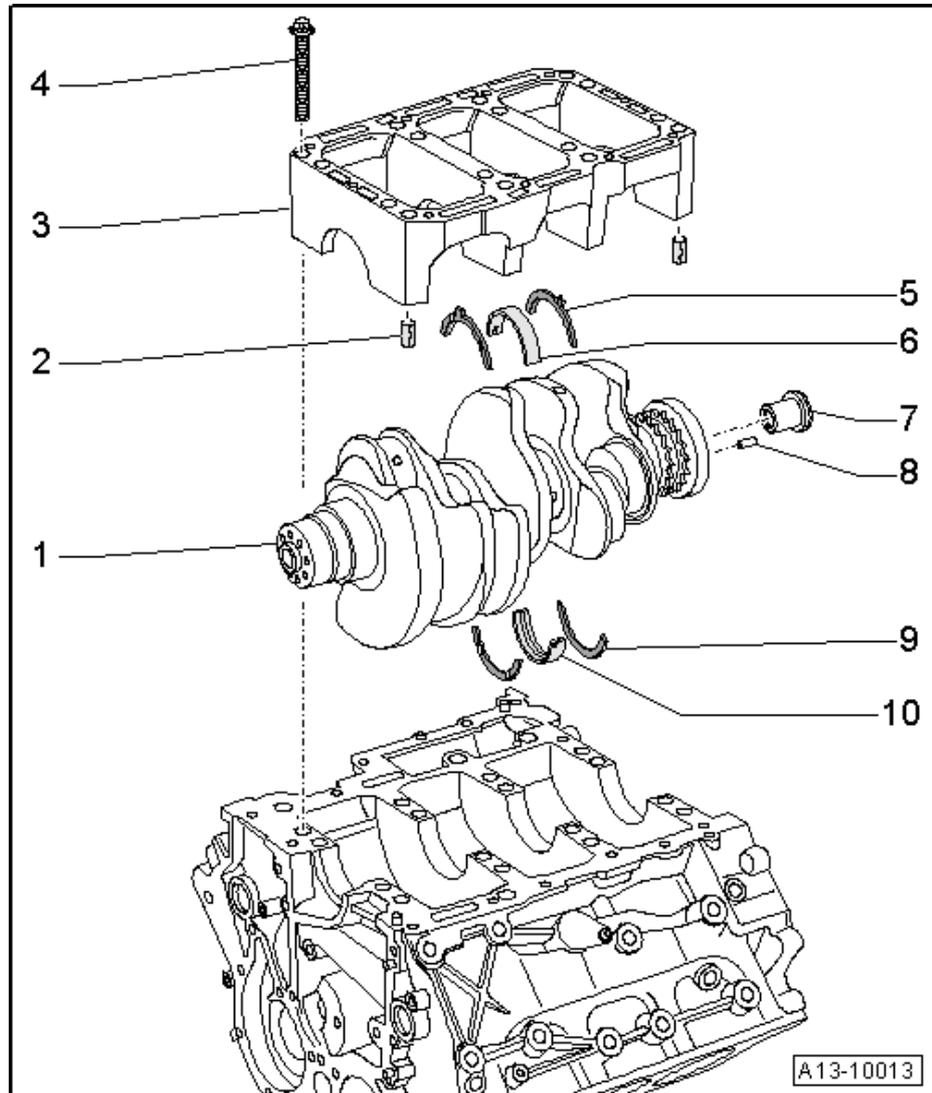
- For vehicles with automatic gearbox ⇒ [Fig. on page 94](#)

8 - Dowel pin

- Check that pin is firmly seated in crankshaft

9 - Thrust washer

- Only fitted on 3rd crankshaft bearing
- Oil grooves face outwards



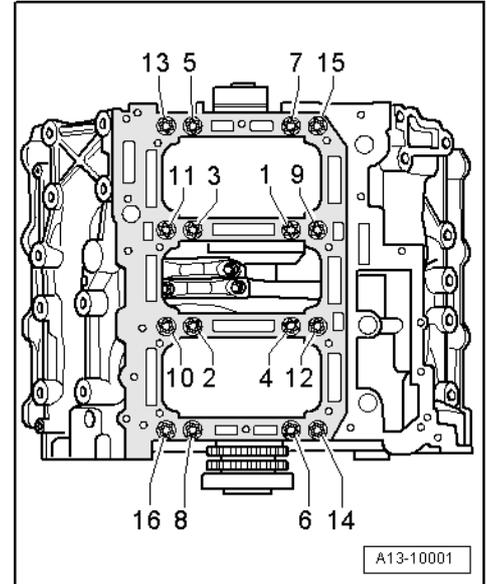
- Note location
- Measuring axial clearance of crankshaft ⇒ [page 94](#)

10- Bearing shell

- For cylinder block (with oil groove)
- Do not interchange used bearing shells (mark positions)
- Install new bearing shells for the cylinder block with the correct coloured markings ⇒ [Fig.](#)

Installing retaining frame

- Renew bolts -1 ... 16-
- Fit both dowel sleeves into retaining frame.
- Then tighten retaining frame bolts in the sequence -1 ... 16- as follows:
 1. Tighten bolts to 30 Nm using torque wrench.
 2. Tighten bolts to 50 Nm using torque wrench.
 3. Turn bolts 90° (1/4 turn) further using a rigid wrench.



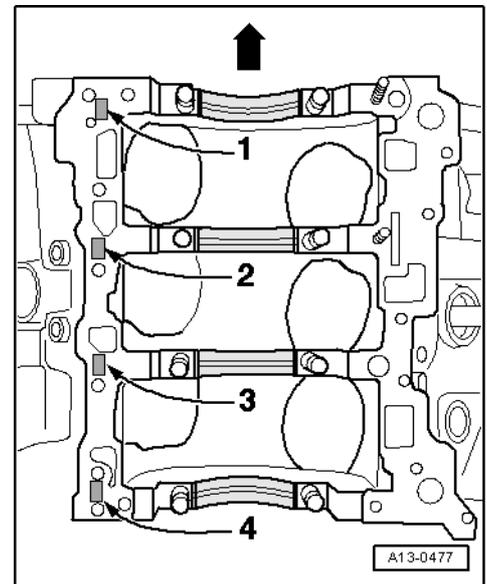
Matching crankshaft bearing shells to bearings in cylinder block

Bearing shells of the correct thickness are matched to the bearings in the cylinder block at the factory. Coloured dots on bearing shell are used to identify bearing shell thickness.

- The -arrow- points to pulley end.

The allocation of the bearing shells to the cylinder block is identified by a code letter next to the relevant bearing.

Letter on cylinder block	Colour coding of bearing
R =	Red
G =	Yellow
B =	Blue

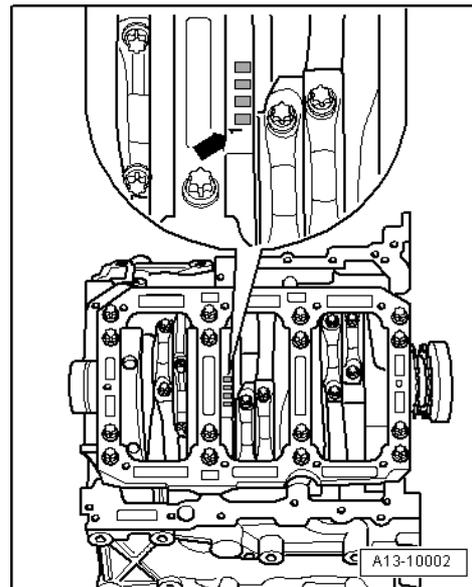




Matching crankshaft bearing shells to bearings in retaining frame

- ◆ Bearing shells of the correct thickness are assigned to the bearing caps at the factory. Coloured dots on bearing shell are used to identify bearing shell thickness.
- ◆ The correct allocation of bearing shells to crankshaft is indicated by a sequence of letters on the crankshaft webs. The number "1" -arrow- preceding the sequence of letters indicates the colour code for No. 1 bearing.

Letter on crankshaft	Colour coding of bearing
R =	Red
G =	Yellow
B =	Blue

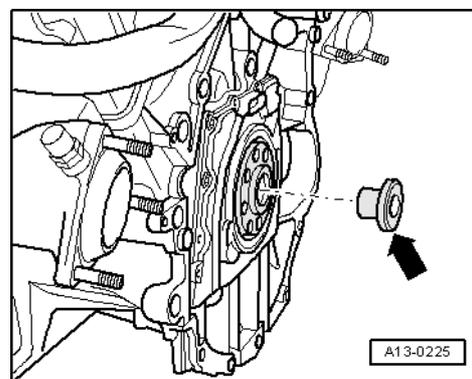


Bearing bush for torque converter

- On vehicles with automatic gearbox, check that bearing bush -arrow- is inserted in rear of crankshaft. Drive in bearing bush if necessary.

3.2 Crankshaft dimensions

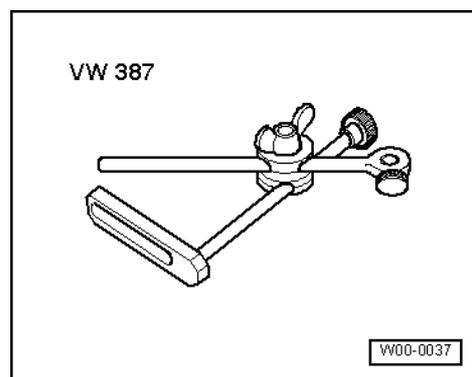
Honing dimension (in mm)	Crankshaft main bearing journal \varnothing	Crankshaft conrod journal \varnothing
Basic dimension	65.00 - 0.022 - 0.042	60.00 - 0.022 - 0.042



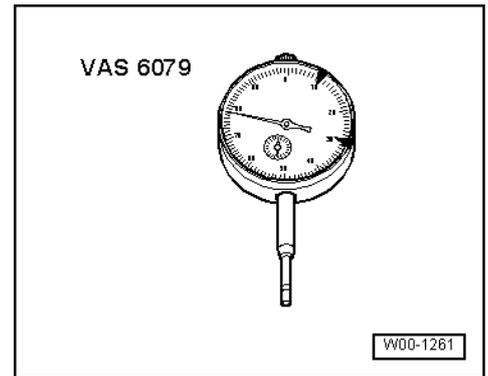
3.3 Measuring axial clearance

Special tools and workshop equipment required

- ◆ Universal dial gauge bracket -VW 387-



- ◆ Dial gauge -VAS 6079-

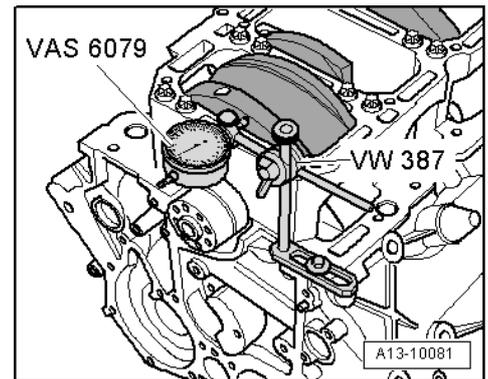


Procedure

- Bolt dial gauge with dial gauge bracket -VW 387- onto cylinder block and apply gauge against crank web.
- Push crankshaft against dial gauge by hand and set gauge to "0".
- Push crankshaft away from dial gauge and read off value.

Axial clearance:

- New: 0.090 ... 0.215 mm.
- Wear limit: 0.280 mm.



3.4 Measuring radial clearance

Special tools and workshop equipment required

- ◆ Plastigage

Procedure

Note

- ◆ *Do not interchange used bearings.*
- ◆ *Bearing shells worn down to nickel layer must be renewed.*
- Remove retaining frame and clean bearing journals.
- Place a length of Plastigage corresponding to the width of the bearing on the bearing journal or bearing shell.
- The Plastigage must be positioned in the centre of the bearing shell
- Fit retaining frame and tighten to 30 Nm. Do not rotate crankshaft.
- Remove retaining frame once more.
- Compare width of Plastigage with measurement scale:

Radial clearance:

- New: 0.018 ... 0.045 mm.
- Wear limit: 0.10 mm.



4 Dismantling and assembling pistons and conrods

4.1 Pistons and conrods - exploded view of components



Note

Oil spray jet for piston cooling ⇒ [Fig. on page 97](#).

1 - Conrod bolts, 30 Nm + 90° (1/4 turn) further

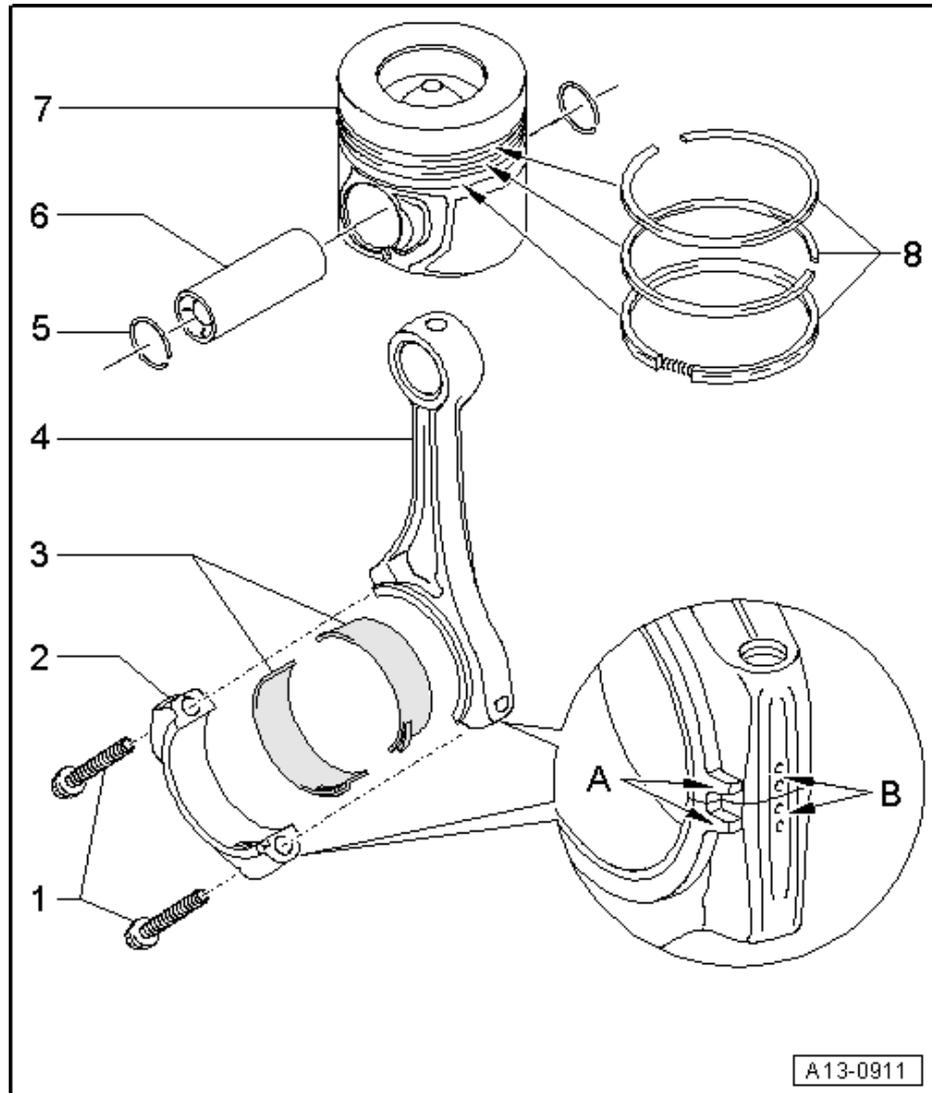
- Renew
- Lubricate threads and contact surface
- To measure radial clearance, tighten to 30 Nm but do not turn further

2 - Conrod bearing cap

- Do not interchange
- Mark cylinder allocation with a coloured pen -B- ⇒ [Fig. on page 98](#)
- Installation position: Note position of lugs on casting -A-

3 - Bearing shells

- Note installation position
- Do not interchange used bearing shells (mark positions)
- Bearing shells worn down to nickel layer must be renewed
- Measuring radial clearance ⇒ [page 100](#)
- To measure radial clearance, tighten bolts ⇒ [item 1](#) to 30 Nm but not further



4 - Conrod

- Only renew as a complete set
- Mark cylinder allocation with a coloured pen -B- ⇒ [Fig. on page 98](#)
- Installation position: Note position of lugs on casting -A-
- Axial clearance for each conrod pair (when new): 0.20 ... 0.44 mm

5 - Circlip

6 - Piston pin

- If difficult to move, heat piston to approx. 60 °C
- Remove and install using drift -VW 222 A-

7 - Piston

- With combustion chamber
- Mark installation position and cylinder number ⇒ [Fig. on page 98](#)

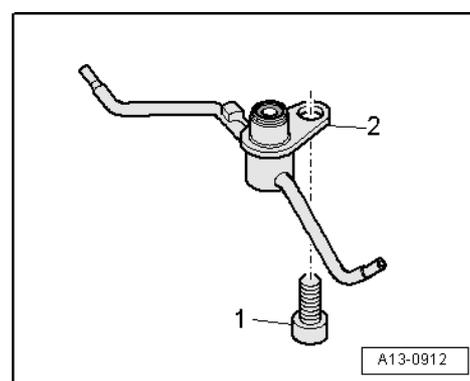
- Checking ⇒ Fig. on page 98
- Install using piston ring clamp
- If cracking is visible on piston skirt, renew piston
- Piston and cylinder dimensions ⇒ page 100
- Checking piston projection at "TDC" ⇒ page 99
- Checking cylinder bore ⇒ Fig. on page 98

8 - Piston rings

- Offset gaps by 120°
- Remove and install using piston ring clamp
- "TOP" must face towards piston crown
- Checking ring gap ⇒ Fig.
- Checking ring-to-groove clearance ⇒ Fig.

Oil spray jet for piston cooling

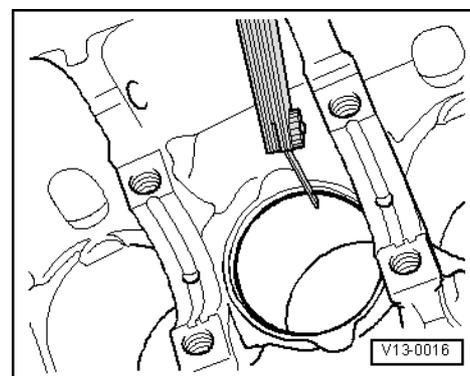
- 1 - Bolt, 9 Nm
- 2 - Oil spray jet with spray nozzle valve for piston cooling



Checking piston ring gap

- Insert ring at right angle to cylinder wall from above and push down into lower cylinder opening approx. 15 mm from bottom of cylinder. To do so, use a piston without rings.

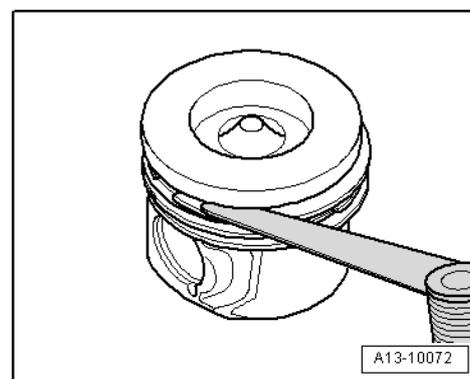
Piston ring Dimensions in mm	New	Wear limit
1st compression ring	0.25 ... 0.38	0.80
2nd compression ring	0.70 ... 0.90	1.30
Oil scraper ring	0.40 (maximum)	0.70



Checking ring-to-groove clearance

- Clean groove in piston before checking clearance.

Piston ring Dimensions in mm	New	Wear limit
1st compression ring	0.120 ... 0.160	0.175
2nd compression ring	0.020 ... 0.090	0.115
Oil scraper ring	0.020... 0.090	0.115



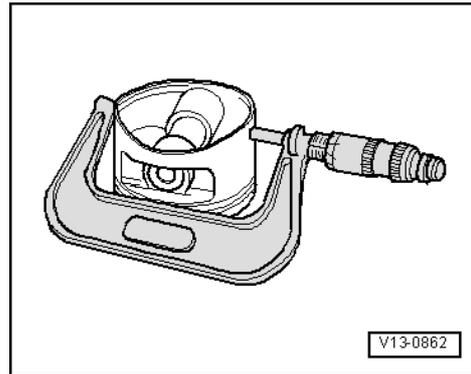


Checking piston

– Using a micrometer (75 ... 100 mm), measure approx. 10 mm from the lower edge, perpendicular to the piston pin axis.

- Maximum deviation from nominal dimension: 0.05 mm.

Nominal dimension ⇒ “4.3 Piston and cylinder dimensions” on page 100.

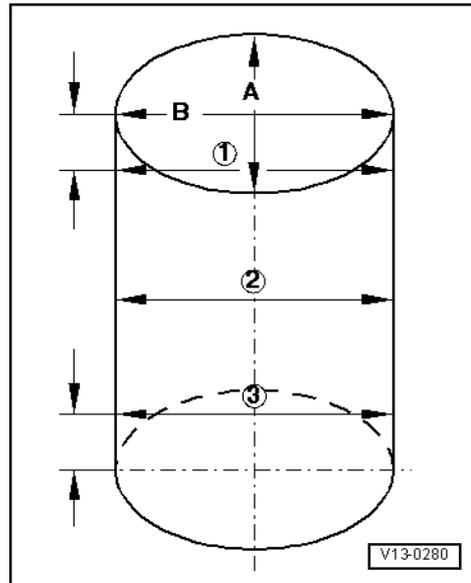


Checking cylinder bore

– Use 50 ... 100 mm internal dial gauge to take measurements at 3 points in transverse direction -A- and longitudinal direction -B-.

- Maximum deviation from nominal dimension: 0.08 mm.

Nominal dimension ⇒ “4.3 Piston and cylinder dimensions” on page 100.



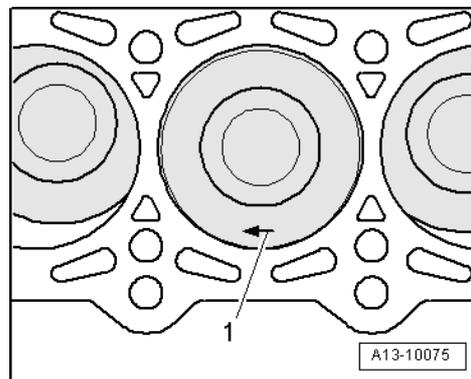
Installation position of pistons

- Installation position: Arrow -item 1- on piston crown points to pulley end.



Note

- ♦ If used pistons are being re-installed, use chalk or waterproof felt-tip pen to mark installation position and cylinder number on piston crown.
- ♦ Do not use a centre punch or scribe, as this would damage the coating of the piston crown.



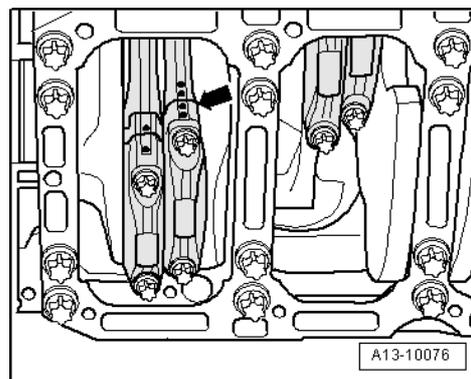
Marking conrods

– Before removing, mark mating positions of conrods and conrod bearing caps with coloured pen -arrow-.



Note

- ♦ Only renew conrods as a complete set.
- ♦ Do not interchange conrod bearings.

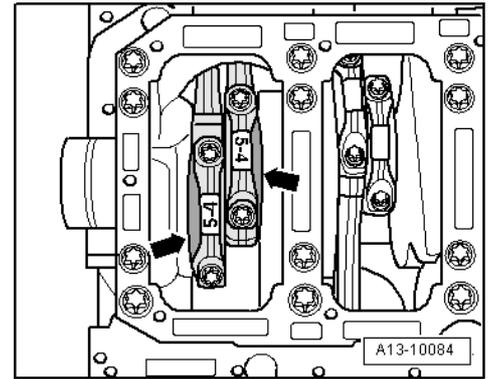


Conrod installation position

The larger contact shoulder on the conrod -arrows- faces towards the adjacent main bearing.

 **Note**

Illustration shows front pair of conrods.



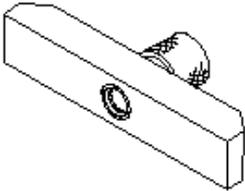
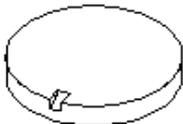
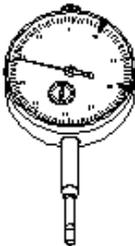
4.2 Checking piston projection at "TDC"

 **Note**

- ◆ Piston projection at "TDC" must be measured when installing new pistons or a short engine. Depending upon piston projection, install the corresponding cylinder head gasket according to the table below:
- ◆ If the measured values for piston projection are not the same for all pistons, use the highest value to determine the correct gasket size.
- ◆ The cylinder head gasket must be determined separately for each cylinder bank.

Special tools and workshop equipment required

- ◆ -VW 382/7- from measuring tool -VW 382-
- ◆ -VW 385/17- from universal measuring tool -VW 385-
- ◆ Dial gauge -VAS 6079-

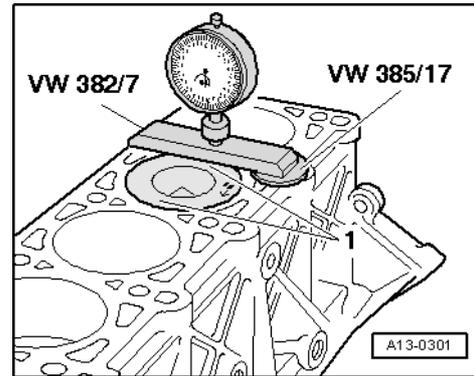
<p>VW 382/7</p> 	<p>VW 385/17</p> 
<p>VAS 6079</p> 	
	<p>G13-0064</p>



Procedure

- Set up dial gauge -VAS 6079- with -VW 382/7- and -VW 385/17-.
- Measure piston projection at two points -1- for each piston.

Piston projection above top surface of cylinder block	Identification (No. of holes)
0.39 ... 0.49 mm	1
0.49 ... 0.54 mm	2
0.54 ... 0.65 mm	3



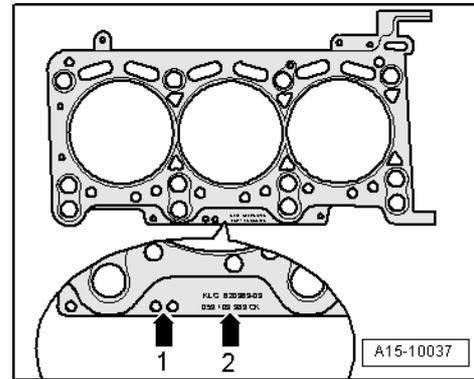
Cylinder head gasket identification

- 1 - Holes
- 2 - Part No.



Note

The gaskets for the left and right cylinder heads have different shapes and cannot be interchanged.



4.3 Piston and cylinder dimensions

Honing dimension (in mm)	Piston \varnothing	Cylinder bore \varnothing
Basic dimension	82.939 ... 82.951 1)	83.006 ... 83.014
Repair oversize	82.979 ... 82.991 1)	83.046 ... 83.054

• 1) Dimensions not including graphite coating (thickness 0.02 mm). The graphite coating will wear down in service.

4.4 Checking radial clearance of conrod bearings

Special tools and workshop equipment required

- ◆ Plastigage

Procedure

- Remove conrod bearing cap. Clean bearing cap and bearing journal.
- Place a length of Plastigage corresponding to the width of the bearing on the bearing journal or bearing shell.
- Fit conrod bearing cap and tighten to 30 Nm. Do not rotate crankshaft.
- Remove conrod bearing cap once more.
- Compare width of Plastigage with measurement scale:

Radial clearance:

- New: 0.015 ... 0.062 mm.
- Wear limit: 0.12 mm.
- Renew bolts for conrod bearings.



15 – Cylinder head, valve gear

1 Removing and installing cylinder head

Note

Audi Q7 models with a 3.0 ltr. TDI engine are always equipped with steel glow plugs.

1.1 Cylinder head - exploded view of components

Note

The diagram shows the cylinder head on cylinder bank 2 (left-side).

1 - Cylinder head

- To prevent damage to glow plugs, always place cylinder head on a soft foam surface after removal.
- Removing ⇒ [page 112](#)
- Checking for distortion ⇒ [Fig. on page 104](#)
- Cylinder heads must not be machined on diesel engines
- Installing ⇒ [page 114](#)
- If renewed, refill system with fresh coolant

2 - Toothed belt drive sprocket

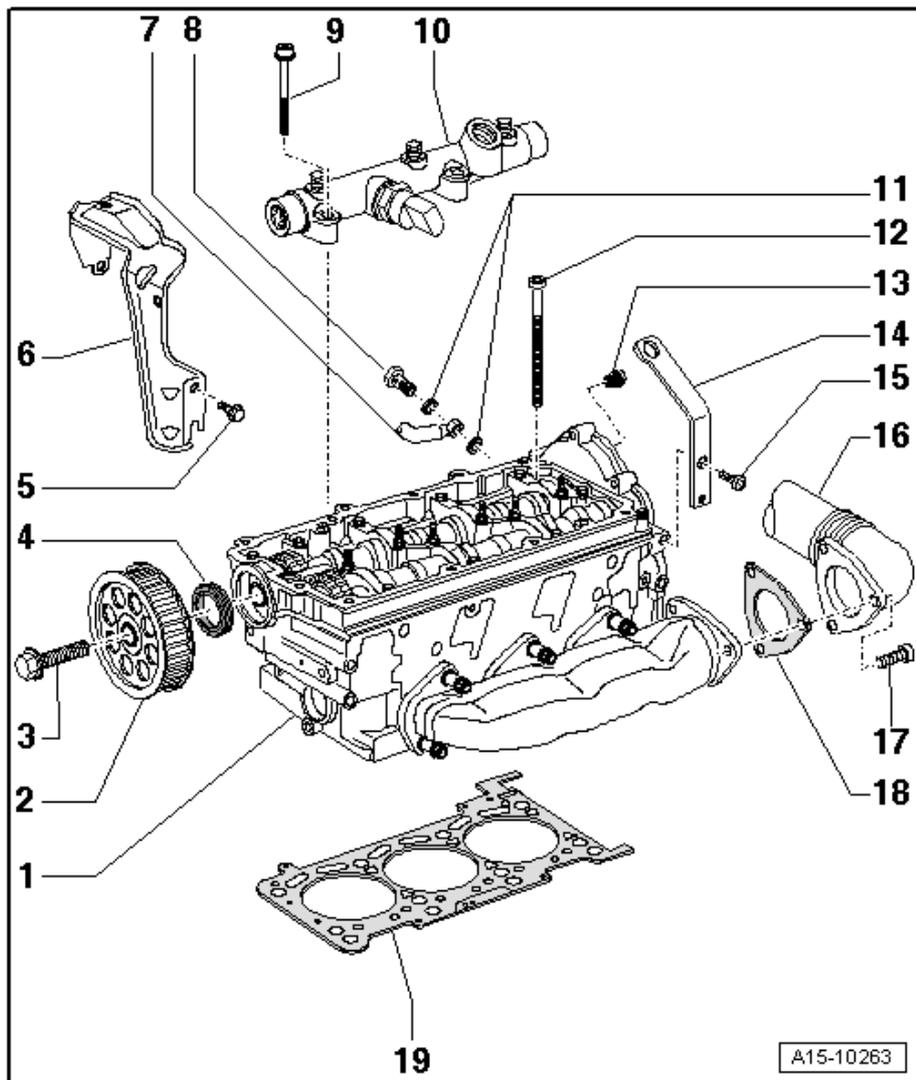
- Use counterhold tool -3036- when loosening and tightening central bolt ⇒ [Fig. on page 103](#)
- Remove using puller -3032- ⇒ [Fig. on page 104](#)

3 - 75 Nm

- Use counterhold tool -3036- when loosening and tightening ⇒ [Fig.](#)

4 - Oil seal for toothed belt sprocket for high-pressure pump

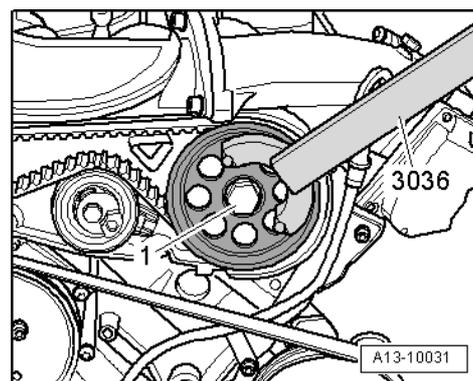
- Renewing ⇒ [page 120](#)



- 5 - 9 Nm
- 6 - Bracket for oil dipstick
- 7 - Coolant pipe
- 8 - Banjo bolt, 12 Nm
- 9 - 22 Nm
- 10 - Rail element
 - Observe rules for cleanliness ⇒ [page 2](#)
 - Do not attempt to bend high-pressure pipes to a different shape
 - Tightening high-pressure pipe connections at rail elements ⇒ [Fig. on page 106](#)
- 11 - Seals
 - Renew
- 12 - Cylinder head bolt
 - Renew
 - Note correct sequence when loosening ⇒ [page 114](#)
 - Note correct sequence when tightening ⇒ [page 116](#)
- 13 - Oil retention valve
 - Tighten to 25 Nm
- 14 - Lifting eye
- 15 - M6: 9 Nm; M8: 22 Nm
- 16 - Intermediate pipe (left-side)
 - Removing and installing ⇒ [page 213](#)
- 17 - 25 Nm
 - Coat with high-temperature lubricant; for high-temperature lubricant refer to ⇒ Parts catalogue
- 18 - Gasket
 - Renew
- 19 - Cylinder head gasket
 - Renewing ⇒ ["1.4 Removing and installing cylinder head"](#) on [page 112](#)
 - Identification ⇒ [Fig. on page 104](#)
 - Installation position: Part No. towards cylinder head
 - If renewed, refill system with fresh coolant

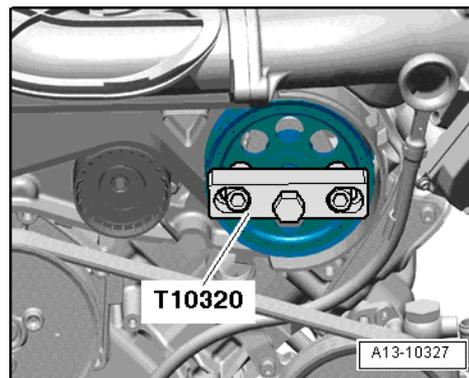
Loosening and tightening central bolt for toothed belt drive sprocket

- Use counterhold tool -3036- when loosening and tightening central bolt -1-.



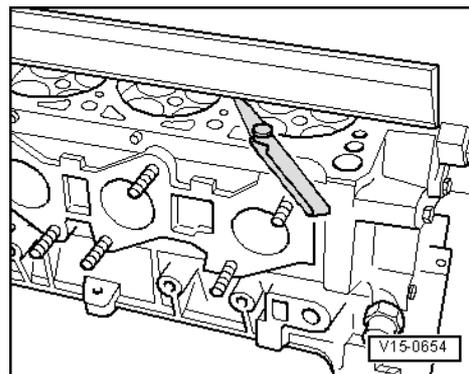
Removing toothed belt drive sprocket

- Use puller -T10320- to pull off toothed belt drive sprocket.



Checking cylinder head for distortion

- Use straight edge and feeler gauge to measure for distortion at several points.
- Max. permissible distortion: 0.1 mm

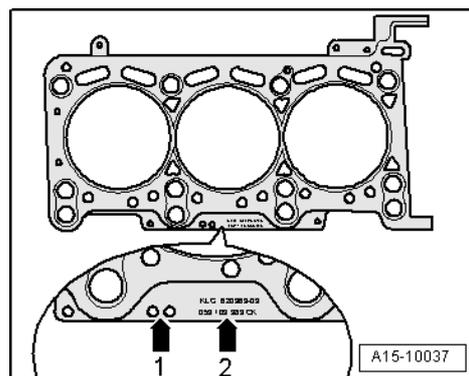


Cylinder head gasket identification

- 1 - Holes
- 2 - Part No.

 **Note**

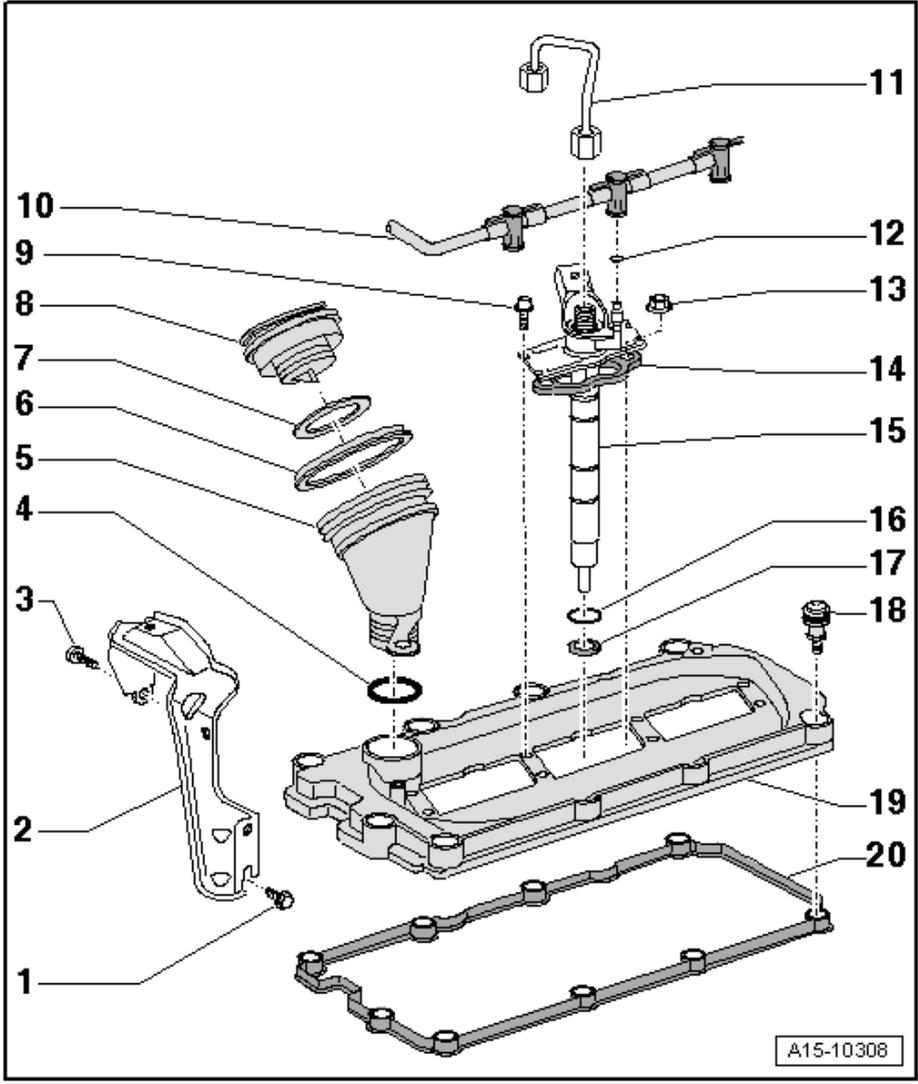
The gaskets for the left and right cylinder heads have different shapes and cannot be interchanged.



1.2 Cylinder head cover - exploded view of components

Note

Diagram shows cylinder head cover on cylinder bank 2 (left-side).

- 
- 1 - 9 Nm
 - 2 - Bracket for intake connecting pipe
 - 3 - 9 Nm
 - 4 - O-ring
 - Renew
 - 5 - Oil filler neck
 - To remove: Lift tab, turn oil filler neck anti-clockwise and take out
 - 6 - Seal
 - 7 - Seal
 - Renew if damaged or leaking
 - 8 - Filler cap
 - 9 - 5 Nm
 - 10 - Fuel return pipe
 - Observe rules for cleanliness ⇒ [page 2](#)
 - 11 - High-pressure pipe
 - Observe rules for cleanliness ⇒ [page 2](#)
 - Mark high-pressure pipes to ensure they are re-connected to the same injectors.
 - Do not attempt to bend high-pressure pipes to a different shape
 - Tightening high-pressure pipe connections at rail elements ⇒ [Fig. on page 106](#)
 - Tightening high-pressure pipes at injectors ⇒ [Fig. on page 106](#)
 - 12 - O-ring
 - Renew
 - 13 - 9 Nm
 - Tighten alternately in stages
 - 14 - Clamping piece
 - Must be renewed if injector is renewed
 - 15 - Injector
 - Observe rules for cleanliness ⇒ [page 2](#)
 - Removing and installing ⇒ ["1.3 Removing and installing cylinder head cover" on page 107](#)
 - When an injector is renewed, also renew the high-pressure pipe and clamping piece at the same time
 - 16 - O-ring
 - Renew



17 - Copper seal

- Renew

18 - Special bolt, 9 Nm

- Renew if damaged or leaking
- Tighten in stages and in diagonal sequence

19 - Cylinder head cover

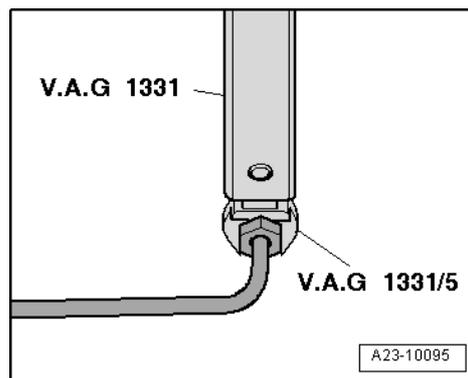
- Removing and installing => [page 107](#)

20 - Gasket for cylinder head cover

- Renew if damaged or leaking

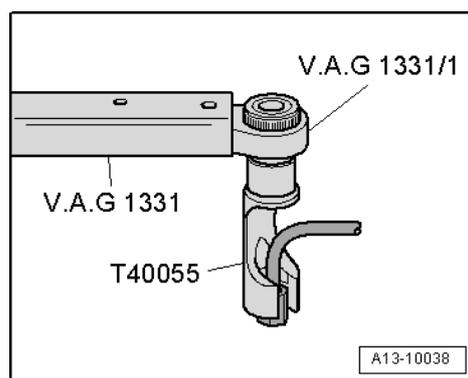
Tightening high-pressure pipe connections at rail elements

- Tighten union nuts on high-pressure pipes finger-tight initially.
- Ensure that high-pressure pipes are not under tension.
- To tighten unions of high-pressure pipes, use torque wrench -V.A.G 1331- and tool insert, 19 mm -V.A.G 1331/5-.
- Tightening torque: 25 Nm.



Tightening high-pressure pipes at injectors

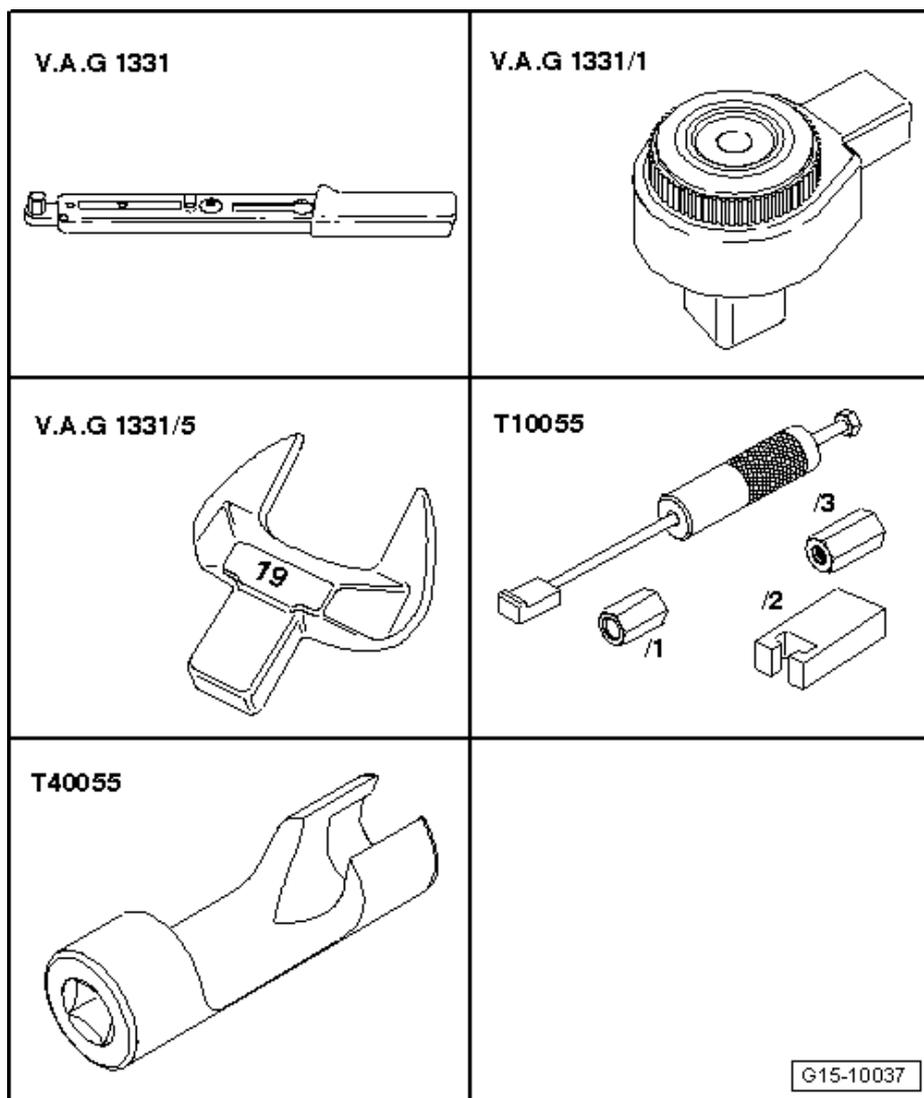
- Tighten union nuts on high-pressure pipes finger-tight initially.
- Ensure that high-pressure pipes are not under tension.
- To tighten unions of high-pressure pipes at injectors, use torque wrench -V.A.G 1331- with ratchet -V.A.G 1331/1- and socket, 17 mm -T40055-.
- Tightening torque: 25 Nm.



1.3 Removing and installing cylinder head cover

Special tools and workshop equipment required

- ◆ Torque wrench -V.A.G 1331-
- ◆ Ratchet -V.A.G 1331/1-
- ◆ Tool insert, AF 19 -V.A.G 1331/5-
- ◆ Puller -T10055- with adapter -T10055/1-
- ◆ Socket, 17 mm -T40055-



Removing

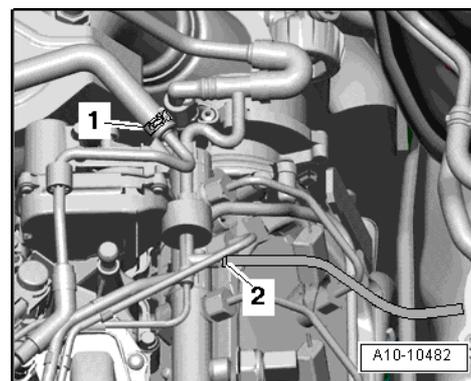
 **Note**

The following description shows the removal and installation of the left cylinder head cover. The procedure for the other side is the same, except that some steps are not required.

- Disconnect vacuum hose going to vacuum reservoir -2-.

 **Note**

Disregard -item 1-.

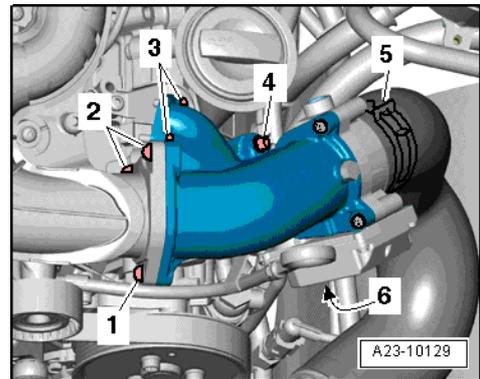
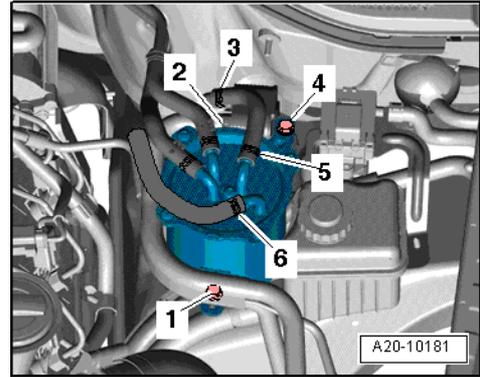


- Lay a clean cloth under the separating points to catch escaping fuel.

 **Caution!**

Observe rules for cleanliness when working on the injection system ⇒ **page 2.**

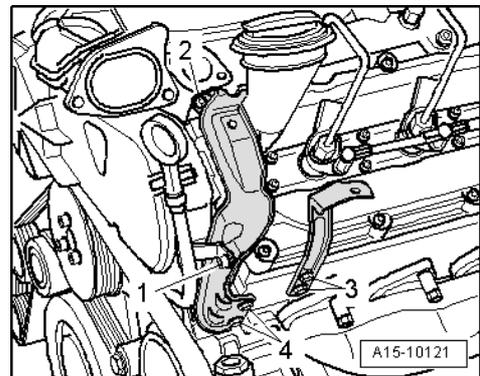
- Detach fuel supply hose -6- from fuel filter.
- Detach fuel hose going to fuel cooler at the connections marked -3- and -5-.
- Remove bolts -1- and -2- and nut -4-.
- Move fuel lines at bulkhead clear and lay aside fuel filter with fuel hoses connected.
- Detach air intake hose -5- from throttle valve module -J338-.
- Unplug electrical connector -6- at throttle valve module -J338-.
- Remove bolts -1 ... 4- and remove intake connecting pipe together with throttle valve module -J338-.



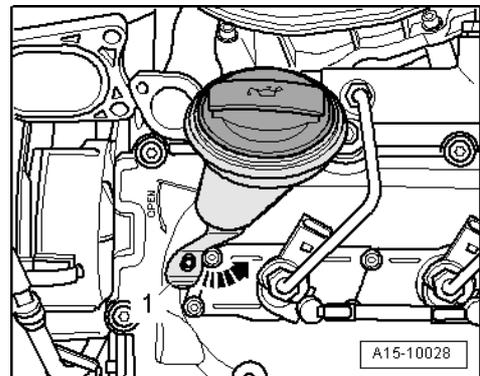
- Remove bolts -1, 2, 4- and detach bracket for intake connecting pipe from cylinder head.

 **Note**

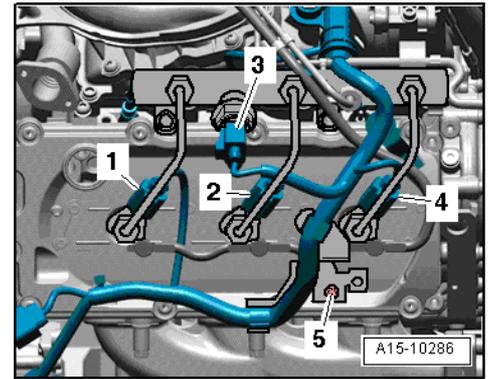
Disregard -item 3-.



- Remove oil filler neck. To do so, lift tab -1- and turn oil filler neck anti-clockwise -arrow-.



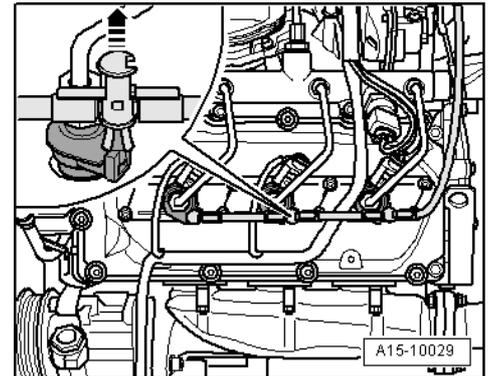
- Unbolt bracket -5- for wiring harness at cylinder head cover.
- Unplug electrical connectors -1 ... 4- at rail element and at injectors.
- Move electrical wiring harness clear.



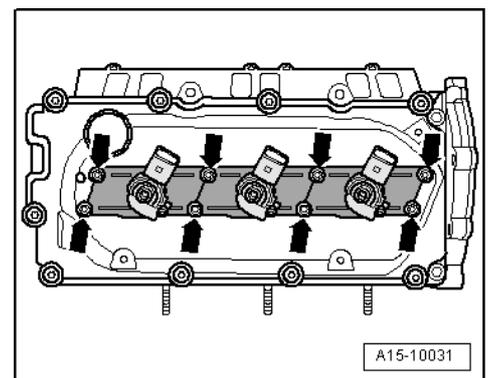
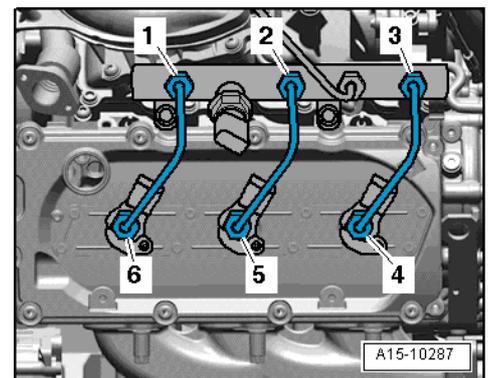
! *Caution!*

Observe rules for cleanliness when working on the injection system => page 2.

- Pull release pins upwards -arrow- and pull return line connections off injectors.
- Mark high-pressure pipes to ensure they are re-connected to the same injectors.
- Loosen union nuts for high-pressure pipes -1 ... 6- using tool insert -V.A.G 1331/5- and socket, 17 mm -T40055-.
- Detach high-pressure pipes.



- Unbolt covers for injectors -arrows-.

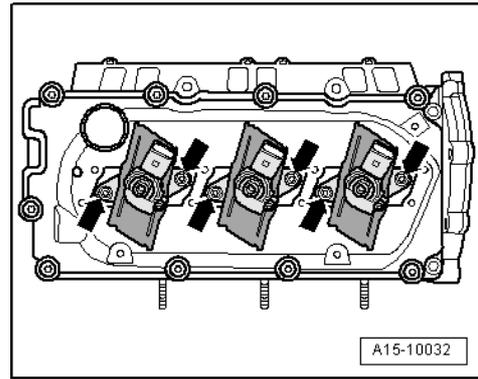




Audi Q7 2007 >

Audi 6-cylinder TDI engine (3.0 ltr. 4-valve common rail), mechanics 01.2006

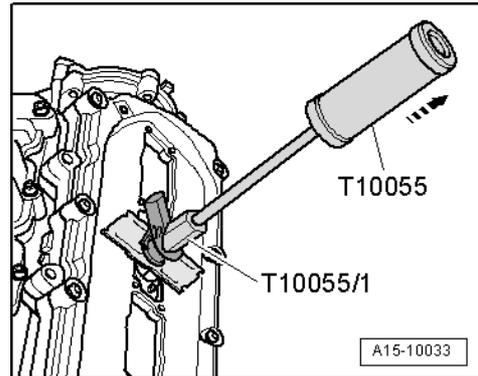
- Pull covers upwards and turn them 1/4 turn (90°).
- Unbolt injectors -arrows-.



- Pull out injector units using puller -T10055- with adapter -T10055/1-.

! Caution!

- ◆ *Mark cylinder numbers on injector units.*
- ◆ *Used injectors must always be re-installed on the same cylinder.*



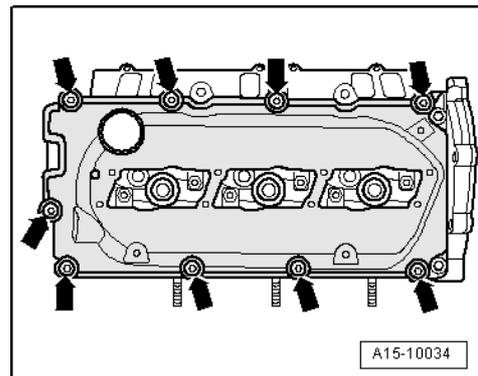
- Loosen cylinder head cover bolts -arrows- in diagonal sequence.
- Remove bolts and take off cylinder head cover.

Installing

Installation is carried out in the reverse order; note the following:

i Note

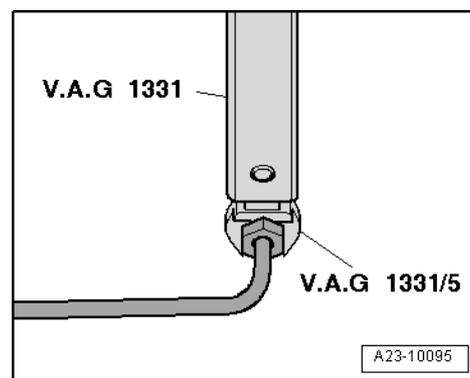
- ◆ *Renew cylinder head cover gaskets if damaged.*
- ◆ *Renew gaskets, seals and O-rings.*
- ◆ *Hose connections and hoses for charge air system must be free of oil and grease before assembly.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue.*
- Tighten cylinder head cover bolts diagonally and in stages.



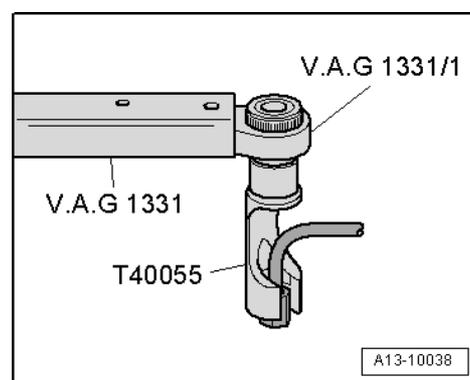
Instructions for installing injectors:

- Before installation, make sure the injectors and their surroundings are clean. If necessary use a clean cloth to wipe out the injector slot, taking care not to cause damage (do not use sharp-edged tools).
- Always install new seals and gaskets. Lubricate all seals and gaskets lightly with engine oil or assembly oil before installing.

- The injectors must be completely undamaged. To remove the old copper seal from the injector, clamp the seal carefully in a vice so that it is just held between the jaws without turning. Then carefully pull and twist the injector out of the copper seal by hand.
 - When an injector is renewed, also renew the injector pipe and clamping piece at the same time.
 - Used injectors and injector pipes may only be re-installed on the same cylinder.
- Install injectors.
 - Tighten union nuts on high-pressure pipes hand-tight initially.
 - Ensure that high-pressure pipes are not under tension.
 - To tighten unions of high-pressure pipes at rail elements, use torque wrench -V.A.G 1331- with tool insert, AF 19 -V.A.G 1331/5-.



- To tighten unions of high-pressure pipe at high-pressure pump, use torque wrench -V.A.G 1331- with ratchet -V.A.G 1331/1- and socket, 17 mm -T40055-.
- Check fuel system for leaks => [page 3](#).



Tightening torques

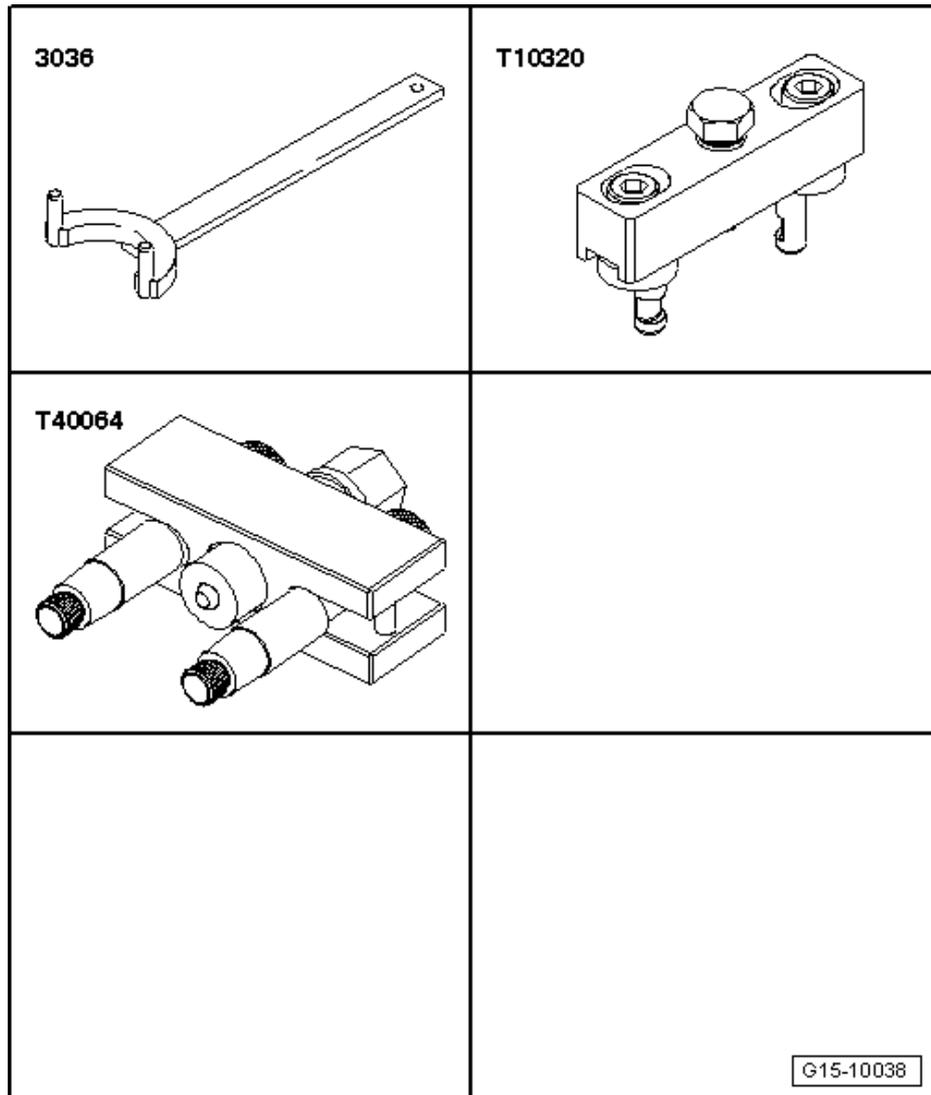
Component	Nm	
Cylinder head cover to cylinder head	9	
Injector in cylinder head	9	
Cover for injector to cylinder head	5	
High-pressure pipes	25	
Bracket for wiring harness to cylinder head	9	
Bracket for intake connecting pipe to cylinder head	9	
Throttle valve module -J338- with intake connecting pipe to:	intake manifold	9
	bracket	9
	connecting pipe for mechanical exhaust gas recirculation valve	9
Hose clips (13 mm wide)	5.5	



1.4 Removing and installing cylinder head

Special tools and workshop equipment required

- ◆ Counterhold tool -3036- (for cylinder head, left-side)
- ◆ Puller -T10320- (for cylinder head, left-side)
- ◆ Puller -T40064- (for cylinder head, left-side)

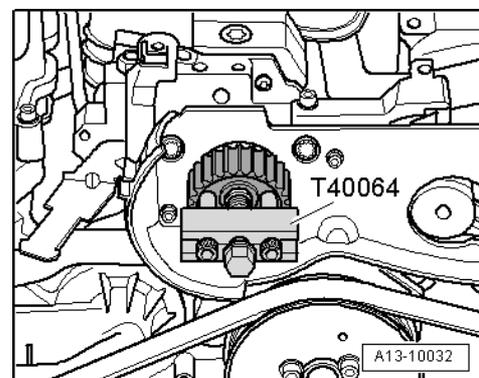


Removing

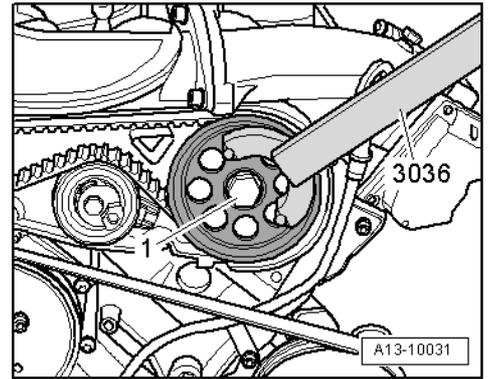
- Drain off coolant ⇒ [page 161](#).

Cylinder head (left-side):

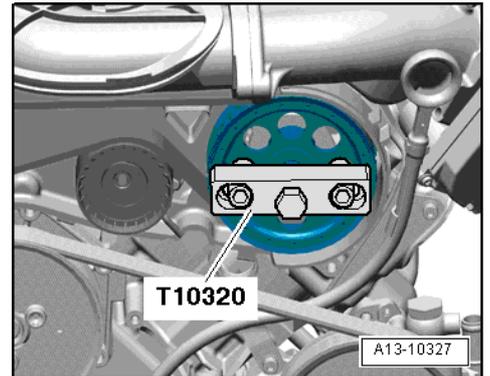
- Remove toothed belt for high-pressure pump ⇒ [page 48](#).
- Use puller -T40064- to pull off belt sprocket for high-pressure pump.



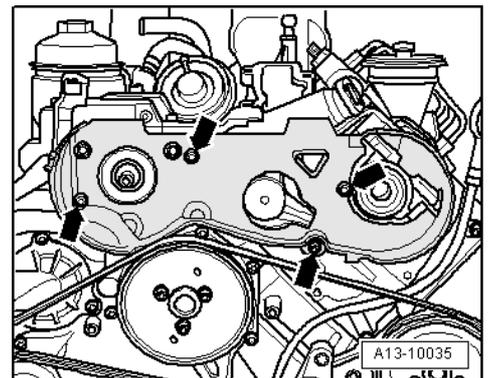
- Loosen central bolt -1- for toothed belt drive sprocket approx. 2 turns using counterhold tool -3036-.



- Use puller -T10320- to pull off toothed belt drive sprocket.
- Take off toothed belt drive sprocket together with toothed belt.



- Remove bolts -arrows- and detach toothed belt cover (rear).

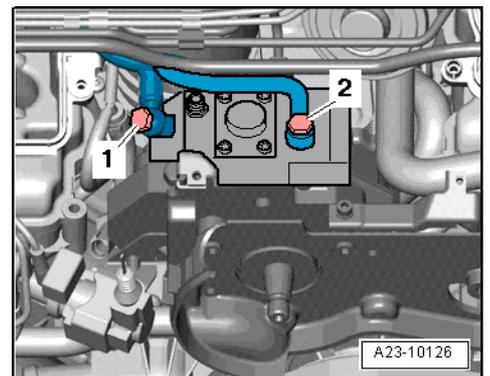


Cylinder head (right-side):

- Disconnect fuel supply line -2- and fuel return line -1- from high-pressure pump and move lines clear to the side.

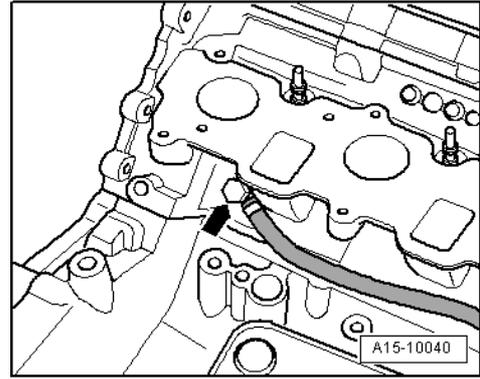
Continuation for both sides:

- Remove intake manifold (top section) ⇒ Rep. Gr. 23.
- Remove bottom section of intake manifold (left or right) ⇒ Rep. Gr. 23.



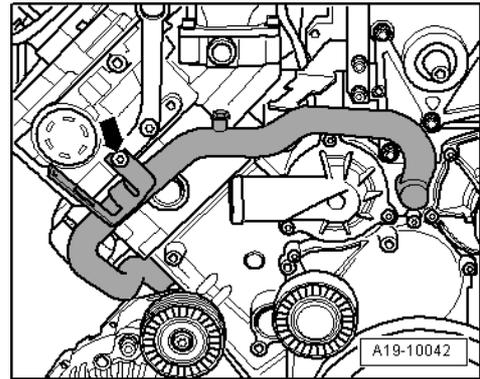


- Disconnect coolant line -arrow- (left or right).



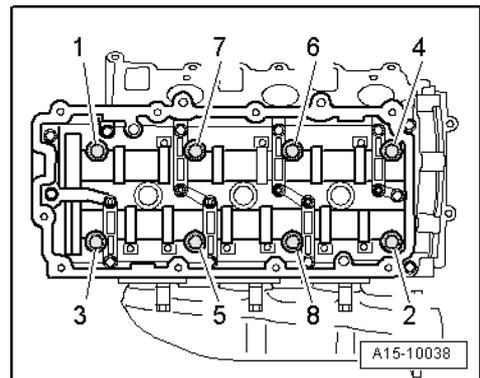
Cylinder head (right-side):

- Unbolt coolant pipe (right-side) from cylinder head -arrow-.



Continuation for both sides:

- Remove timing chain from camshaft ⇒ [page 73](#) on relevant cylinder bank.
- Remove intermediate pipe: left-side ⇒ [page 213](#), right-side ⇒ [page 215](#).
- Remove cylinder head cover (left or right) ⇒ [page 107](#).
- Loosen cylinder head bolts in the sequence shown.
- Remove bolts and carefully detach cylinder head.



! Caution!

After removal, the cylinder head must NOT be put down with weight resting on the ends of the glow plugs.

i Note

Audi Q7 models with a 3.0 ltr. TDI engine are always equipped with steel glow plugs.

Installing

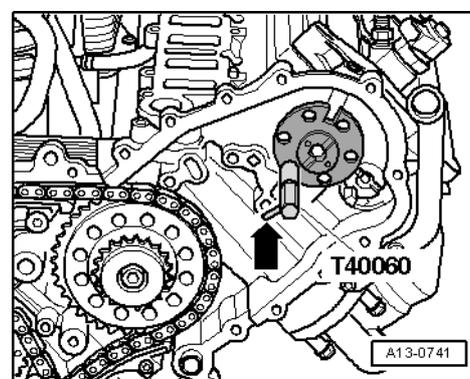
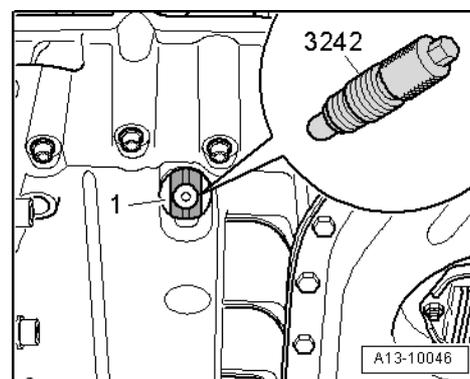
i Note

- ◆ *The cylinder heads of diesel engines must not be machined.*
- ◆ *Renew the cylinder head bolts.*
- ◆ *Renew self-locking nuts and bolts when performing assembly work.*
- ◆ *Renew bolts which are tightened to a specified angle as well as oil seals and gaskets.*

- ◆ *If repairing, carefully remove any remaining gasket material from the cylinder head and cylinder block. Ensure that no long scores or scratches are made on the surfaces.*
- ◆ *Carefully remove any remaining emery and abrasive material.*
- ◆ *No oil or coolant must be allowed to remain in the blind holes for the cylinder head bolts in the cylinder block.*
- ◆ *Do not remove new cylinder head gasket from packaging until it is ready to be fitted.*
- ◆ *Handle gasket very carefully. Damage to the silicone coating or the indented area will lead to leaks.*
- ◆ *The plastic protectors fitted to protect the open valves should not be removed until the cylinder head is ready to be fitted.*
- ◆ *When installing an exchange cylinder head with fitted camshafts, oil the contact surfaces between the roller rocker fingers and cams.*
- ◆ *After working on the valve gear, turn the engine carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue.*
- ◆ *Hose connections and hoses for charge air system must be free of oil and grease before assembly.*
- ◆ *When fitting a new cylinder head or cylinder head gasket, drain off all the old coolant and refill with new coolant.*

Installation is carried out in the reverse order; note the following:

- Set crankshaft and camshafts to “TDC” before fitting cylinder head:
- Locking pin -3242- must be screwed in with crankshaft at “TDC” position -1-.
- The camshafts on both cylinder heads must be locked with locking pins -T40060-.



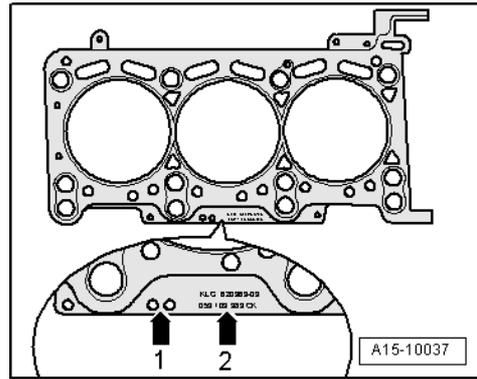


– Note identification markings on cylinder head gasket:

- 1 - Holes
- 2 - Part No.

i Note

- ♦ If the cylinder head gasket or cylinder head have been replaced, select the new cylinder head gasket according to the number of holes on the old gasket.
- ♦ If parts of the crankshaft drive have been renewed, the new cylinder head gasket must be selected by measuring the piston projection at "TDC" ⇒ [page 99](#).
- ♦ The gaskets for the left and right cylinder heads have different shapes and cannot be interchanged.

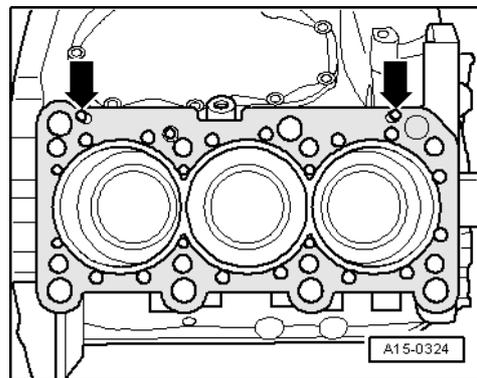


– Fit cylinder head gasket.

- Pay attention to dowel sleeves -arrows- in cylinder block.
- Check installation position of cylinder head gasket: the word "oben" (top) or the Part No. should face towards the cylinder head.

– Fit the cylinder head.

– Insert new cylinder head bolts and tighten finger-tight.

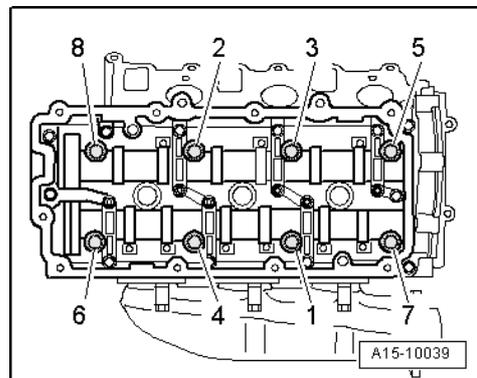


– Tighten cylinder head bolts as follows in the sequence -1 ... 8-:

1. Tighten with torque wrench to 35 Nm.
2. Tighten with torque wrench to 60 Nm.
3. Turn 90° (1/4 turn) further using a rigid wrench.
4. Turn 90° (1/4 turn) further using a rigid wrench.

i Note

Cylinder head bolts do not have to be torqued down again later after repair work.



– Install cylinder head cover (left and right) ⇒ [page 107](#).

– Install camshaft timing chains ⇒ [page 68](#).

– Install intermediate pipe: left-side ⇒ [page 213](#), right-side ⇒ [page 215](#).

– Install bottom section of intake manifold (left or right) ⇒ Rep. Gr. 23.

– Install intake manifold (top section) ⇒ Rep. Gr. 23.

Cylinder head (left-side):

– Install toothed belt for high-pressure pump ⇒ [page 48](#).

Continuation for both sides:

– Fill cooling system with fresh coolant ⇒ [page 162](#).

– Check fuel system for leaks ⇒ [page 3](#).

Tightening torques

Component	Nm
Coolant line to cylinder head	15
Coolant pipe (right-side) to cylinder head	9
Toothed belt drive sprocket to camshaft	75
Toothed belt cover (rear) to engine	9
Fuel supply and return lines to high-pressure pump	25

1.5 Checking compression

To check compression, select function "Systems with self-diagnosis capability" in "Guided Fault Finding" ⇒ Vehicle diagnosis, testing and information system VAS 5051.

Procedure

- Check compression via "Cylinder-selective engine speed".

2 Servicing valve gear



Note

- ◆ *After installing camshafts, wait for approx. 30 minutes before starting engine. Hydraulic valve compensation elements have to settle (otherwise valves will strike pistons).*
- ◆ *After working on the valve gear, turn the engine carefully at least 2 rotations by hand to ensure that none of the valves make contact when the starter is operated.*
- ◆ *The following diagrams show the cylinder head on cylinder bank 2 (left-side).*



2.1 Valve gear - exploded view of components

1 - Valve

- Do not machine, only grinding-in is permitted
- Mark installation position for re-installation
- Valve dimensions ⇒ [page 132](#)
- Checking valve guides ⇒ [page 133](#)

2 - Cylinder head

- See note ⇒ [page 117](#)
- Checking valve guides ⇒ [page 133](#)
- Machining valve seats ⇒ [page 133](#)

3 - Valve stem oil seal

- Renewing ⇒ [page 129](#)

4 - Valve springs

5 - Valve spring plate

6 - Valve cotters

7 - Camshaft oil seal

- Renewing ⇒ [page 120](#)

8 - 9 Nm

- Observe correct tightening sequence ⇒ [page 127](#)

9 - 9 Nm

- Observe correct tightening sequence ⇒ [page 127](#)

10 - Retaining frame

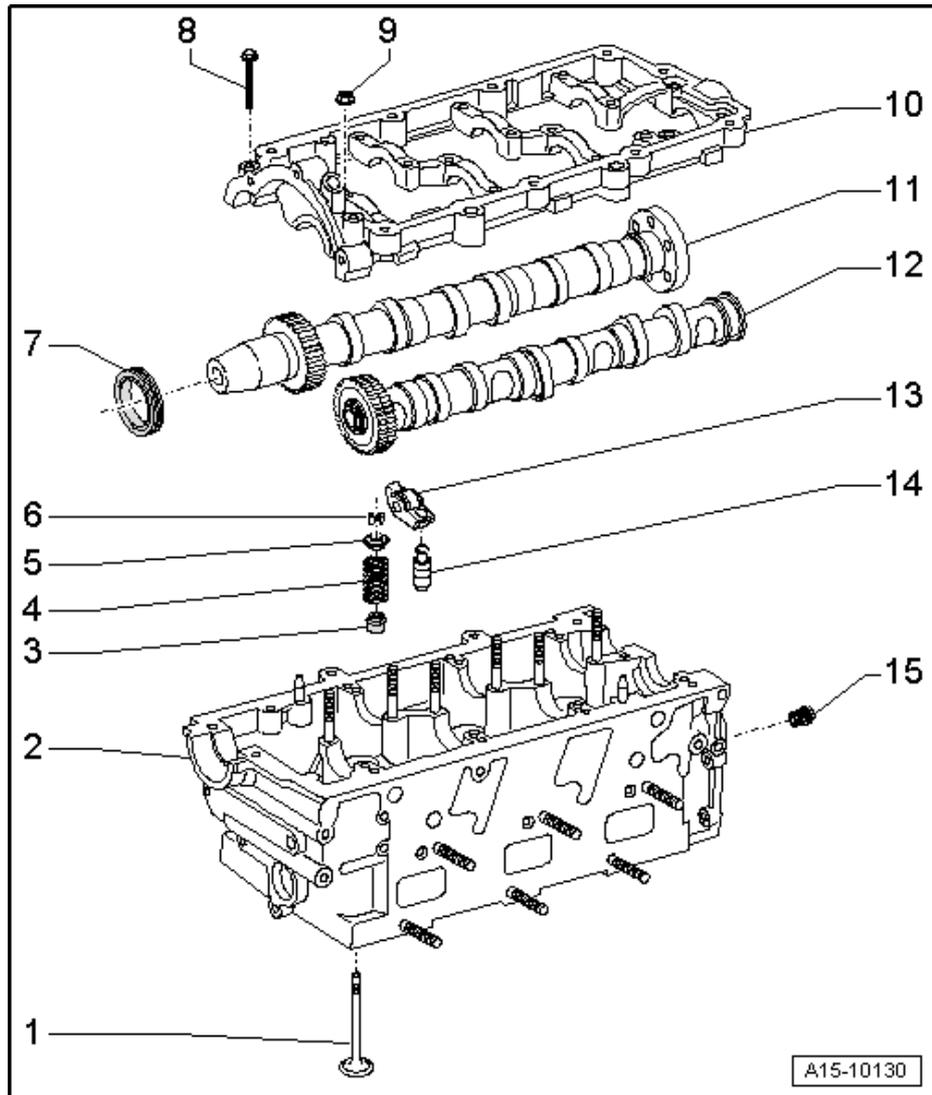
- With integrated camshaft bearings
- Removing and installing ⇒ ["2.4 Removing and installing camshafts" on page 123](#)

11 - Inlet camshaft

- Removing and installing ⇒ [page 123](#)
- Checking axial clearance ⇒ [page 119](#)
- Check radial clearance with Plastigage (roller rocker fingers removed)
- Radial clearance (new): 0.035 ... 0.085 mm
- Radial clearance: wear limit: 0.1 mm
- Runout: max. 0.01 mm

12 - Exhaust camshaft

- Removing and installing ⇒ [page 123](#)
- Checking axial clearance ⇒ [page 119](#)
- Check radial clearance with Plastigage (roller rocker fingers removed)
- Radial clearance (new): 0.035 ... 0.085 mm
- Radial clearance: wear limit: 0.1 mm
- Runout: max. 0.01 mm



13- Roller rocker finger

- Mark installation position with a coloured pen
- Do not interchange
- Check roller bearings for ease of movement
- Lubricate contact surface

14- Hydraulic valve compensation element

- Mark installation position with a coloured pen
- Checking => **page 128**
- Lubricate contact surfaces before installing

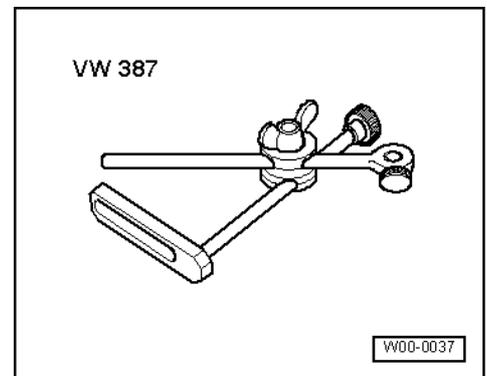
15- Pressure limiting valve 1.0 bar, 25 Nm

- For lubricating points in cylinder head

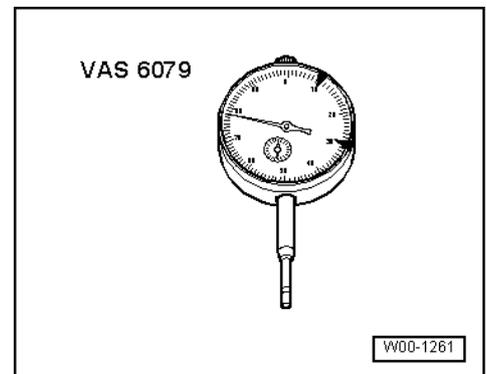
2.2 Checking axial clearance of camshafts

Special tools and workshop equipment required

- ◆ Universal dial gauge bracket -VW 387-



- ◆ Dial gauge -VAS 6079-

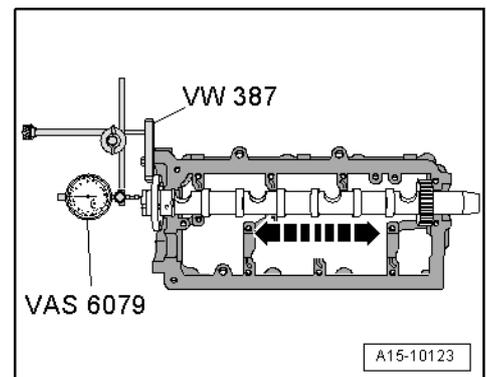


Procedure

- Perform measurement with retaining frame removed.

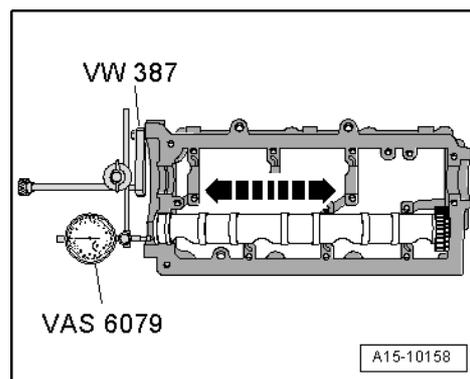
Axial clearance (inlet camshaft)

- Specification: 0.03 ... 0.08 mm.
- Wear limit: 0.12 mm.



Axial clearance (exhaust camshaft)

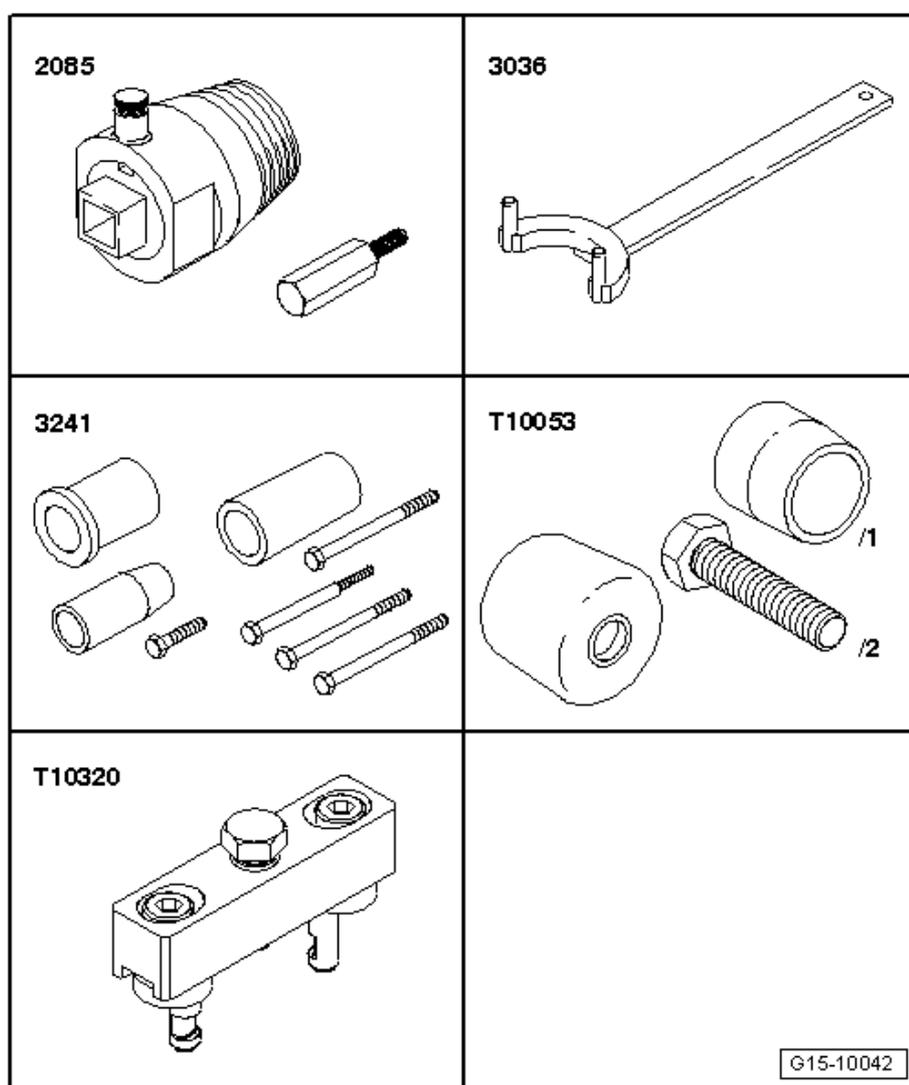
- Specification: 0.03 ... 0.08 mm.
- Wear limit: 0.12 mm.



2.3 Renewing camshaft oil seal

Special tools and workshop equipment required

- ◆ Oil seal extractor -2085-
- ◆ Counterhold tool -3036-
- ◆ Assembly tool -T10053-
- ◆ Puller -T10320-
- ◆ Hexagon bolt M10 x 1.25 x 40, (e.g. from fitting sleeves -3241-)



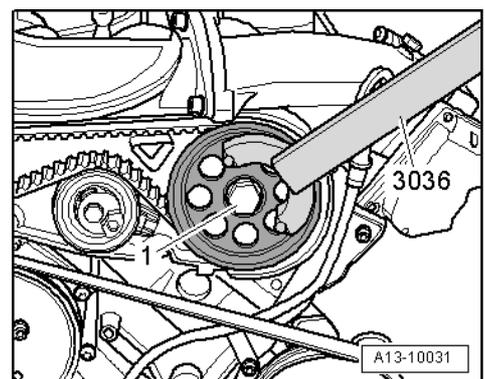
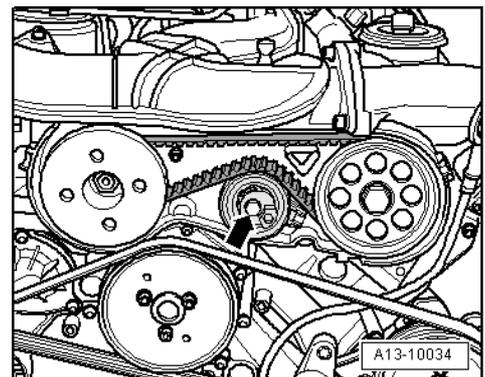
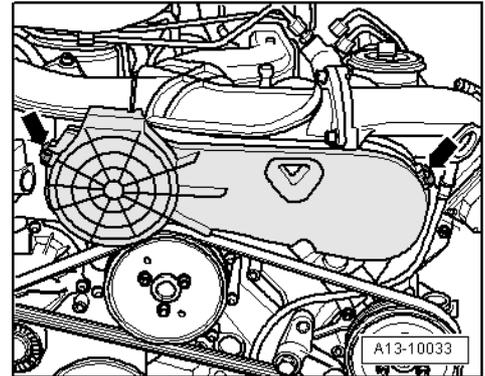
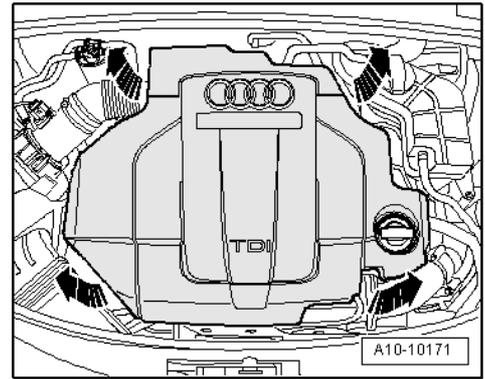
Procedure

- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.

- Loosen clamps -arrows-.
- Pivot toothed belt cover forward and disengage retaining pegs on bottom side of toothed belt cover.

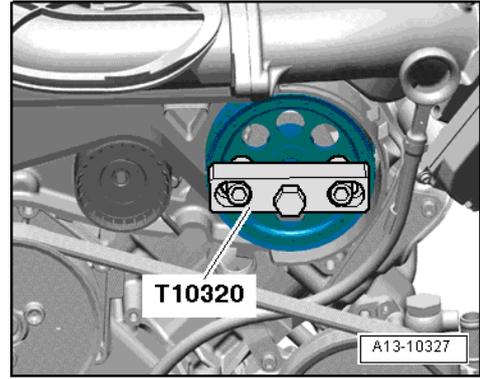
- Loosen bolt -arrow- for tensioning roller approx. 2 turns.

- Loosen central bolt -1- for toothed belt drive sprocket approx. 2 turns using counterhold tool -3036-.

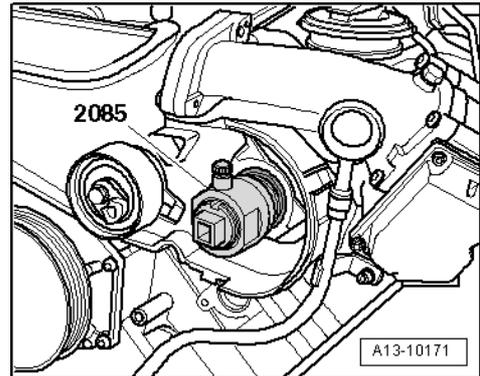




- Use puller -T10320- to pull off toothed belt drive sprocket.
- Take off toothed belt drive sprocket together with toothed belt.



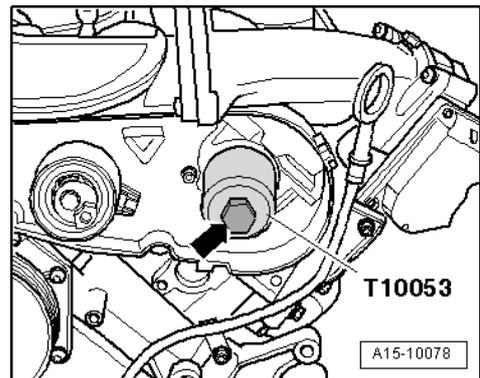
- Unscrew inner section of oil seal extractor -2085- 3 turns out of outer section and lock with knurled screw.
- Lubricate threaded head of oil seal extractor, place it in position and screw it into oil seal as far as possible (applying firm pressure).
- Loosen knurled screw and turn inner part against crankshaft until the oil seal is pulled out.
- Clamp flats of oil seal extractor in vice and use pliers to remove seal.
- Clean running surface and sealing surface.



- Press in new oil seal as far as stop using press sleeve -T10053- and hexagon bolt M10 x 1.25 x 40 -arrow-, (e.g. from fitting sleeves -3241-

Installation is carried out in the reverse order; note the following:

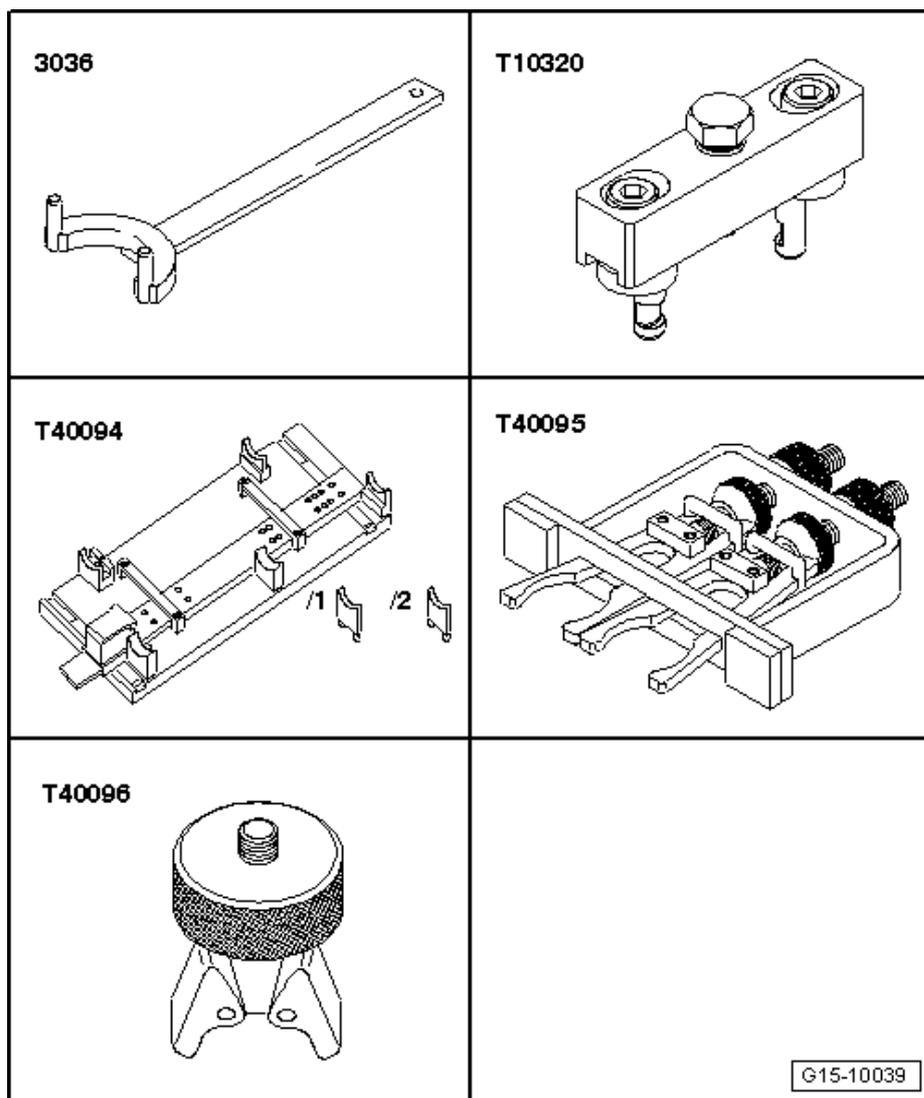
- Install toothed belt for high-pressure pump ⇒ [page 48](#).



2.4 Removing and installing camshafts

Special tools and workshop equipment required

- ◆ Counterhold tool -3036-
- ◆ Puller -T10320-
- ◆ Camshaft insert tool -T40094-
- ◆ Bracket -T40095-
- ◆ Tensioner -T40096-
- ◆ Electric drill with plastic brush attachment
- ◆ Safety goggles
- ◆ Sealant ⇒ Parts catalogue



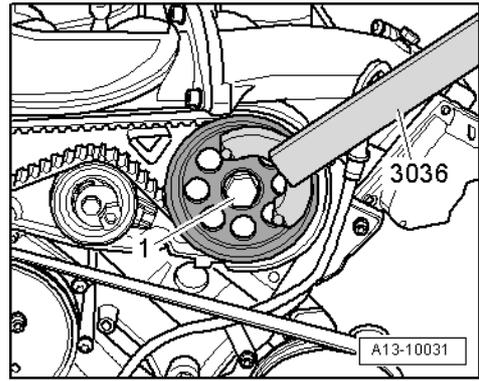
Removing

- Remove timing chain from camshaft ⇒ [page 73](#) on relevant cylinder bank.

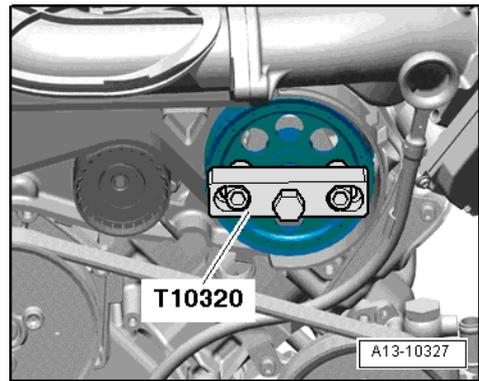
Cylinder head (left-side):

- Remove intake manifold (top section) ⇒ Rep. Gr. 23.
- Remove toothed belt for high-pressure pump ⇒ [page 48](#).

- Loosen central bolt -1- for toothed belt drive sprocket approx. 2 turns using counterhold tool -3036-.



- Use puller -T10320- to pull off toothed belt drive sprocket.



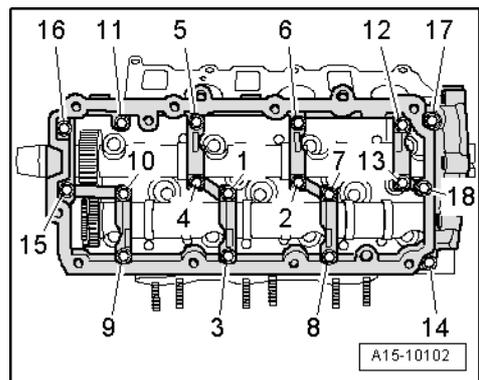
Continuation for both sides:

- Remove cylinder head cover (left or right) => [page 107](#).
- Unscrew retaining frame bolts and nuts in the sequence -18 ... 1-.

 **Note**

Make sure you do not damage roller rocker fingers and compensation elements when removing camshafts.

- Carefully remove retaining frame and camshafts.



Installing

 **Caution!**

*The camshafts **MUST** be installed using the camshaft insert tool -T40094- as described in the following, as the thrust bearings in the retaining frame would otherwise be destroyed. The cylinder head would then have to be renewed.*

 **WARNING!**

Wear safety goggles.

- Remove sealant residue from cylinder head and retaining frame using a rotating plastic brush or similar.

 **Caution!**

Make sure that no sealant residue gets into the cylinder head or the bearings.

- Clean sealing surfaces; they must be free of oil and grease.
- Lubricate running surfaces of camshafts.

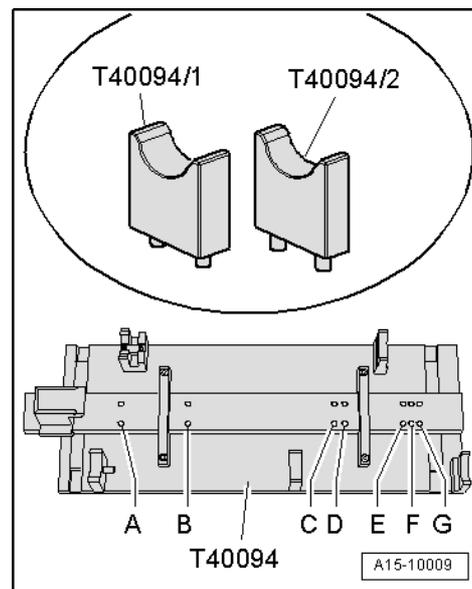
Set up camshaft insert tool -T40094- as follows:

Cylinder head (left-side):

- Insert support -T40094/2- in position -A-.
- Insert support -T40094/1- in position -D-.

Cylinder head (right-side):

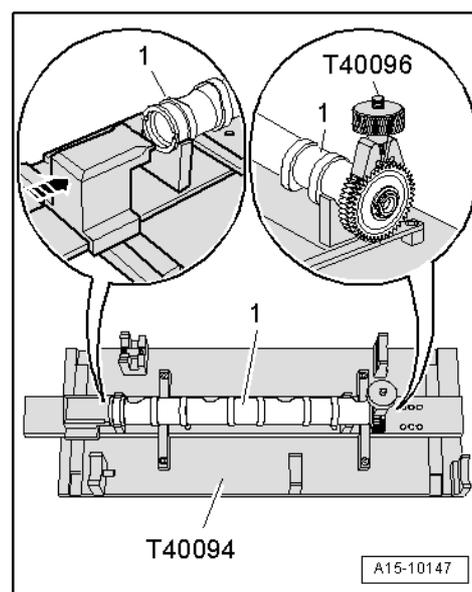
- Insert support -T40094/2- in position -B-.
- Insert support -T40094/1- in position -C-.



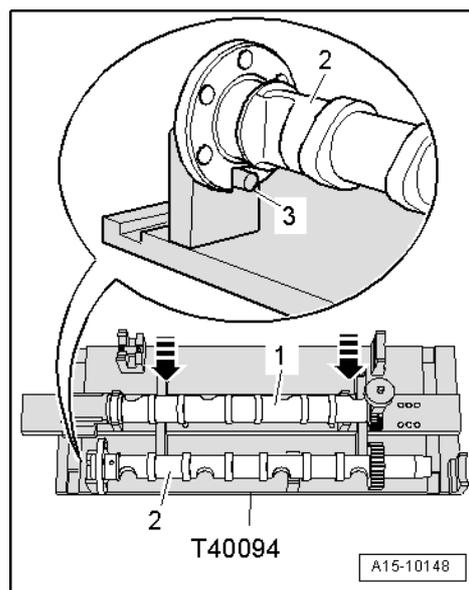
Continuation for both sides:

 **Note**

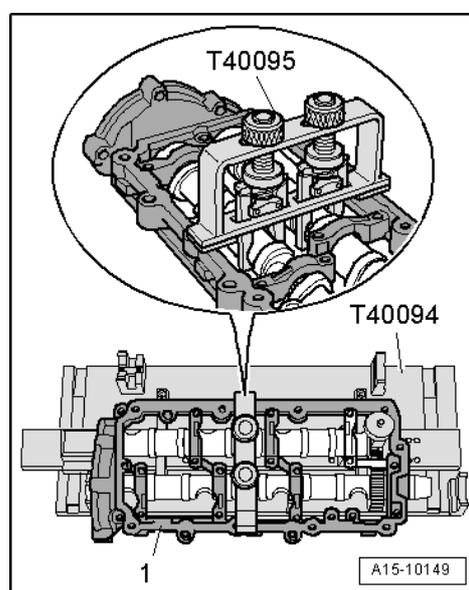
- ◆ *In the following the procedure is described for the left cylinder head.*
- ◆ *The procedure for the right cylinder head is similar and is performed in the same sequence.*
- Place exhaust camshaft -1- in support -T40094/1- and support -T40094/2-.
- Turn camshaft in such a way that it can be locked in "TDC" position using locking device -arrow-.
- Place tensioner -T40096- on teeth of camshaft gear in such a way that the two arms of the tool engage on the two halves of the gear (one in each half, as shown in illustration).
- Tighten the clamping tool using the knurled wheel so that the faces of the gear teeth are in alignment.



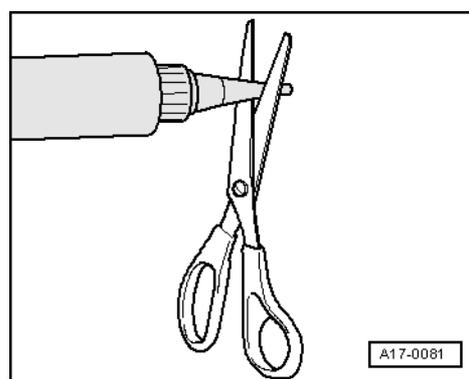
- Place inlet camshaft -2- in camshaft insert tool -T40094-.
- The locating pin -3- must engage in the slot on the camshaft.
- Slide exhaust camshaft -1- towards inlet camshaft until gear teeth engage.



- Fit retaining frame -1- onto camshafts.
- All camshaft bearings must be seated on the camshafts.
- Attach bracket -T40095- to camshafts (align arms of bracket as required and tighten knurled nuts).
- Note the different shapes for inlet and exhaust camshaft.



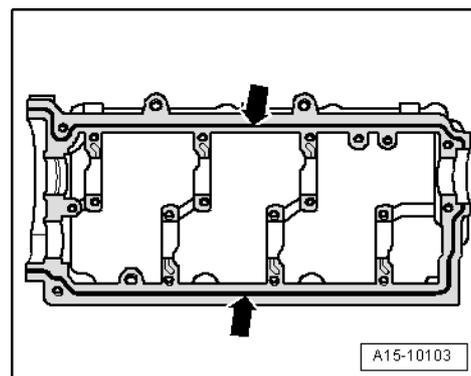
- Cut off nozzle of tube at front marking (\varnothing of nozzle approx. 1.5 mm).



i Note

The retaining frame is shown without camshafts for illustration purposes.

- Turn retaining frame upside down.
- Apply the beads of sealant -arrows- onto the clean sealing surfaces of the retaining frame as illustrated.
- The grooves -arrows- on the sealing surface must be completely filled with sealant.
- The beads of sealant must project 1.5 ... 2.0 mm above the sealing surface.



i Note

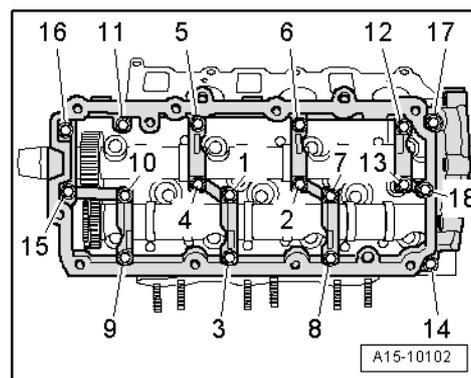
- ◆ The sealant beads must not be thicker than specified, otherwise excess sealant could enter the camshaft bearings.
- ◆ The retaining frame must be installed within 5 minutes after applying sealant.

- Ensure that all roller rocker fingers contact the valve ends and compensation elements correctly.
- Fit retaining frame together with both camshafts and bracket -T40095- onto cylinder head.

i Note

After installing the retaining frame, wait about 30 minutes for the sealant to dry.

- Tighten retaining frame bolts in the sequence -1 ... 18- evenly, initially only hand-tight.
- The retaining frame should make contact with the cylinder head over the full surface.
- Tighten retaining frame bolts to final torque in the sequence -1 ... 18-.
- Detach bracket -T40095- and tensioner -T40096-.



Remaining installation steps are carried out in reverse sequence; note the following:

i Note

- ◆ After installing camshafts, wait for approx. 30 minutes before starting engine. Hydraulic valve compensation elements have to settle (otherwise valves will strike pistons).
- ◆ After working on the valve gear, turn the engine carefully at least 2 rotations by hand to ensure that none of the valves make contact when the starter is operated.

- Install cylinder head cover (left and right) ⇒ [page 107](#).

Cylinder head (left-side):

- Renew camshaft oil seal ⇒ [page 120](#).
- Install toothed belt for high-pressure pump ⇒ [page 48](#).



- Install intake manifold (top section) ⇒ Rep. Gr. 23.

Cylinder head (right-side):

- Renew sealing cap (front) on cylinder head.
- Using a suitable drift, knock in new sealing cap (core plug) until flush.

Continuation for both sides:

- Install camshaft timing chains ⇒ [page 77](#).

Tightening torques

Component	Nm
Retaining frame to cylinder head	9
Toothed belt drive sprocket to camshaft	75

2.5 Checking hydraulic valve compensation elements

i Note

- ♦ *Hydraulic valve compensation elements cannot be serviced.*
- ♦ *Irregular valve noises when starting engine are normal.*

Special tools and workshop equipment required

- ♦ Feeler gauge

Procedure

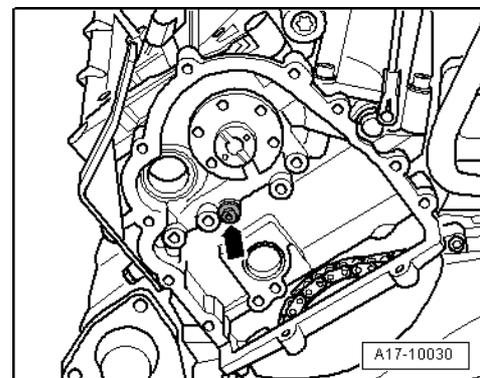
- Start engine and run until coolant temperature reaches approx. 80 °C.
- Increase engine speed to approx. 2500 rpm for 2 minutes (perform road test if necessary).

i Note

If the irregular valve noise stops but repeatedly re-occurs when driving short distances, the oil retention valve -arrow- at the rear end of the respective cylinder head must be renewed.

If the hydraulic tappets are still noisy, locate defective tappet as follows:

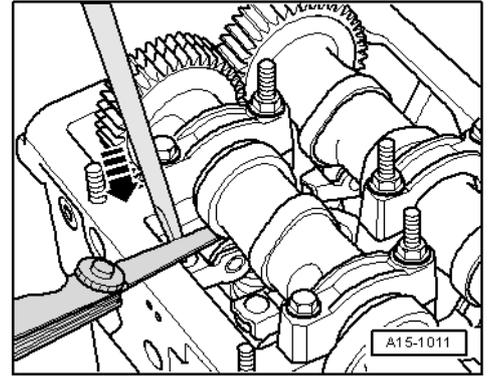
- Remove cylinder head cover (left or right) ⇒ [page 107](#).
- Rotate crankshaft until cam of hydraulic compensation element to be checked faces upwards (remove noise insulation panel and rotate crankshaft clockwise via central bolt for vibration damper).



- Determine clearance between cam and roller rocker finger.
- Press roller rocker finger down -arrow- using a screwdriver.

If it is possible to insert a feeler gauge of 0.20 mm between camshaft and roller rocker finger:

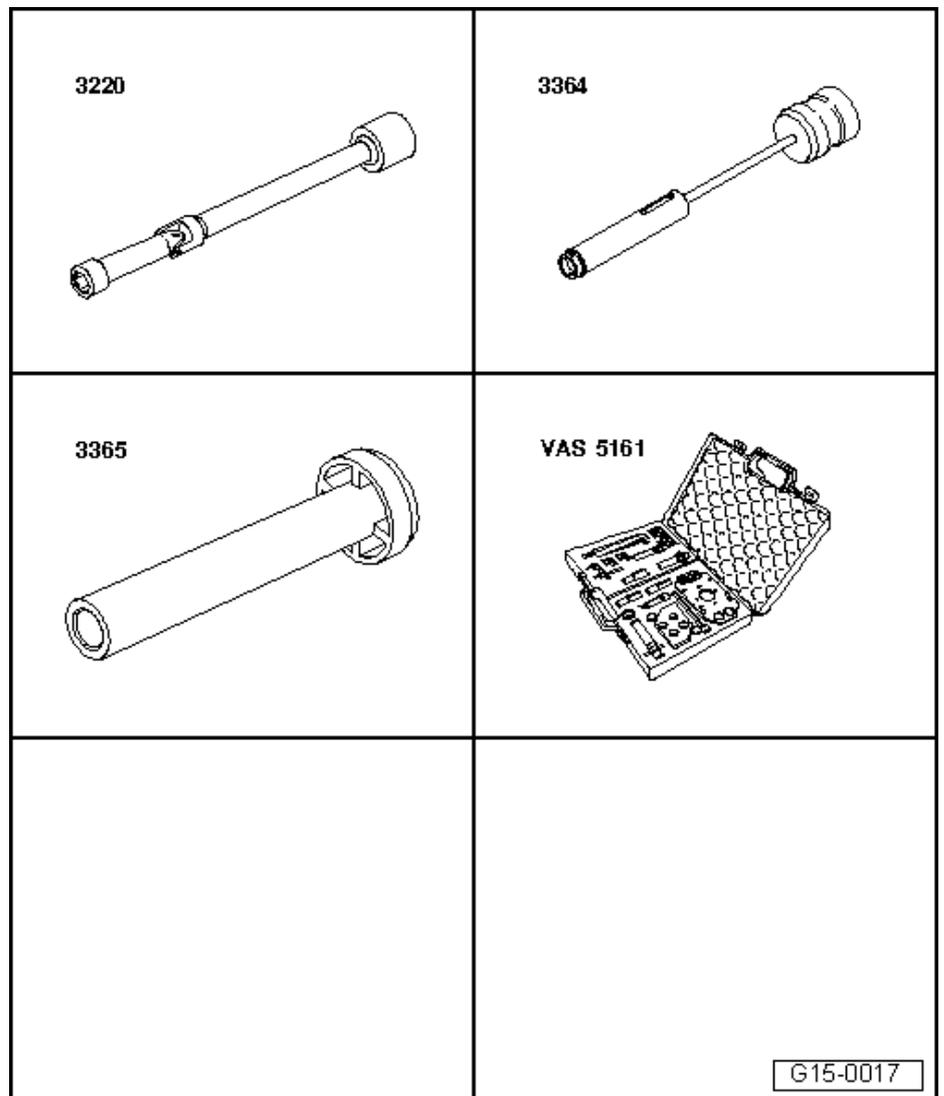
- Renew hydraulic compensation element => "2.4 Removing and installing camshafts" on page 123.



2.6 Renewing valve stem oil seals

Special tools and workshop equipment required

- ◆ U/J extension and socket, 10 mm -3220-
- ◆ Valve stem seal puller -3364-
- ◆ Valve stem seal fitting tool -3365-
- ◆ Assembly and removal device for valve cotters -VAS 5161- with knurled spacer ring -VAS 5161/23-1- and guide plate -VAS 5161/23-





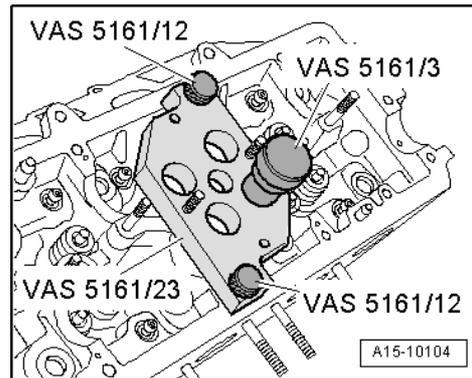
Procedure

- Remove camshafts ⇒ [page 123](#).
- Mark fitting location of roller rocker fingers for re-installation and remove.

i Note

Audi Q7 models with a 3.0 ltr. TDI engine are always equipped with steel glow plugs.

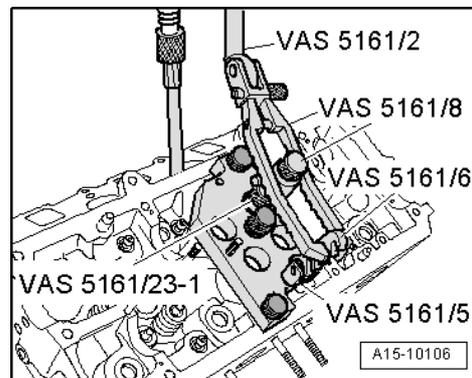
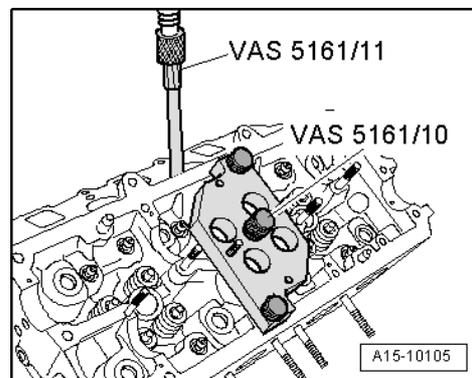
- Remove all glow plugs using U/J extension and socket -3220-.
- Fit guide plate -VAS 5161/23- onto cylinder head.
- Secure guide plate using the knurled screws -VAS 5161/12-.
- Insert drift -VAS 5161/3- into guide plate and knock valve cotters loose using a plastic hammer.
- Screw sealing pin -VAS 5161/10- into guide plate.
- Screw adapter -VAS 5161/11- hand-tight into the glow plug hole of the relevant cylinder.



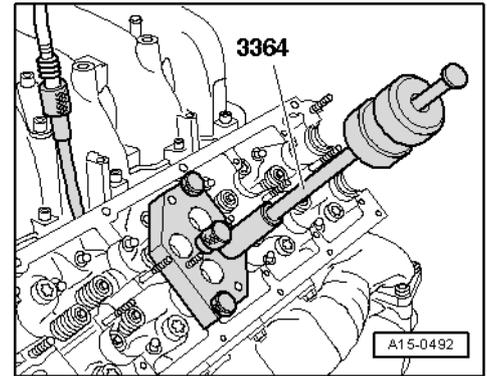
- Screw snap-in device -VAS 5161/6- with engaging fork -VAS 5161/5- into guide plate.
- Slide knurled spacer ring -VAS 5161/23-1- onto assembly cartridge -VAS 5161/8-.
- Connect adapter to compressed air line using a commercially available connection piece, and apply constant air pressure.

• Air pressure: at least 6 bar

- Attach pressure fork -VAS 5161/2- to snap-in device and push assembly cartridge down.
- At the same time, turn knurled screw of assembly cartridge clockwise until tips engage in valve cotters.
- Move knurled screw back and forth slightly; the valve cotters are thus forced apart and taken up by the assembly cartridge.
- Release the pressure fork.
- Take off assembly cartridge with knurled spacer ring.
- Remove valve spring plate and valve spring.

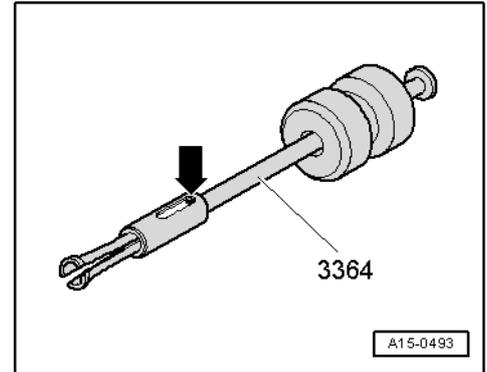


- Remove valve stem oil seals using the valve stem seal puller -3364-.

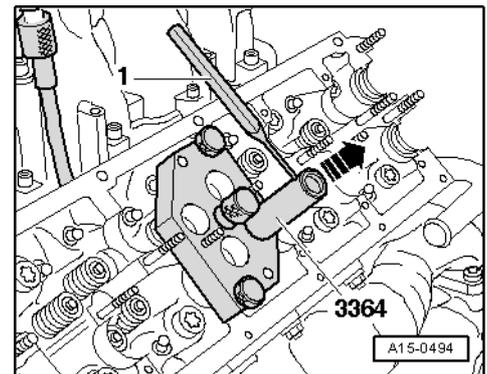


If the puller cannot be used on some of the valve stem oil seals due to the confined space, proceed as follows:

- Knock out pin -arrow- of puller using a punch and remove the extractor attachment.



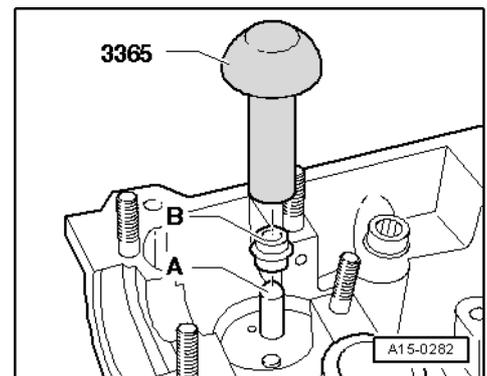
- Apply lower part of puller to valve stem oil seal.
- Secure puller with a punch -1- or other suitable tool as shown in the illustration.
- Apply a suitable tool to puller and pull out valve stem oil seal -arrow-.



i Note

A plastic sleeve -A- is included with the new valve stem oil seals.

- Fit plastic sleeve -A- onto the valve stem to prevent damage to the new valve stem oil seal -B-.
- Lightly lubricate sealing lip of valve stem oil seal.
- Slip valve stem oil seal over plastic sleeve.
- Carefully press valve stem oil seal onto valve guide using valve stem seal fitting tool -3365-.
- Remove the plastic sleeve.





Audi Q7 2007 >

6-cylinder TDI engine (3.0 ltr. 4-valve common rail), mechanics 01.2006

- If valve cotters have been removed from assembly cartridge -VAS 5161/8-, they need to be put into valve insertion device -VAS 5161/18- first.

i Note

Larger diameter of valve cotters faces upwards.

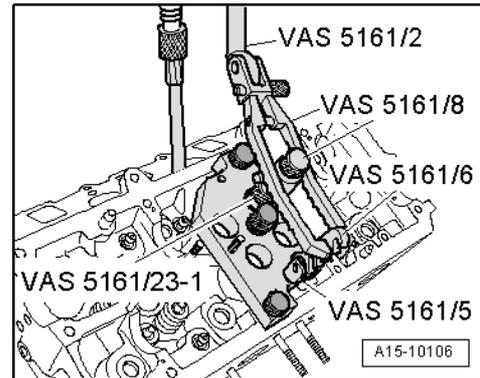
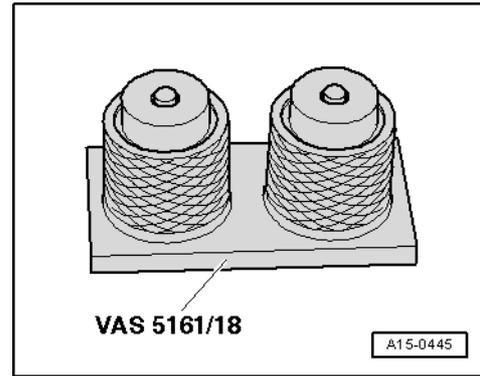
- Insert valve spring and valve spring plate.
- Press assembly cartridge onto valve insertion device from above and take up valve cotters.
- Re-insert assembly cartridge into guide plate -VAS 5161/23-.
- Push pressure fork down and pull knurled screw upwards while turning screw in both directions - this will insert the valve cotters.
- Release the pressure fork with knurled screw still in pulled position.

Installation is carried out in the reverse order; note the following:

- Install glow plugs ⇒ Rep. Gr. 28.
- Install camshafts ⇒ [page 123](#).

i Note

- ♦ Audi Q7 models with a 3.0 ltr. TDI engine are always equipped with steel glow plugs.
- ♦ Engine is not to be rotated for approx. 30 minutes after installing camshafts. Hydraulic valve compensation elements have to settle (otherwise valves will strike pistons).
- ♦ After working on the valve gear, turn the engine carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.

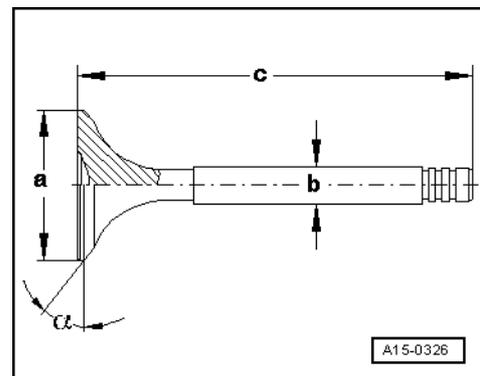


2.7 Valve dimensions

i Note

Inlet and exhaust valves must not be machined. Only grinding-in is permitted.

Dimension		Inlet valve	Exhaust valve
∅ a	mm	28.60 ... 28.80	26.70 ... 26.90
∅ b	mm	5.968 ... 5.982	5.958 ... 5.972
c	mm	97.25 ... 97.45	97.35 ... 97.55
α	∠°	45° 10'	45° 10'



 **WARNING!**

- ◆ *Care must be taken when disposing of old sodium-cooled exhaust valves.*
- ◆ *The valves must be sawn in two with a metal saw between the centre of the stem and valve head. When doing so, the valves must not come into contact with water. After preparing the valves, throw a maximum of ten into a bucket of water. Then step away immediately, since a chemical reaction will occur in which the sodium filling burns.*
- ◆ *After performing these steps the valves can be disposed of in the normal way.*

2.8 Machining valve seats

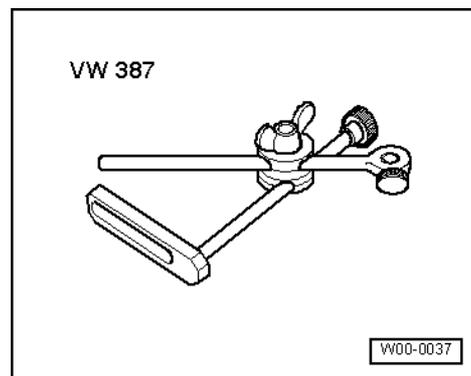
 **Note**

Valve seats may not be machined due to the very small tolerances.

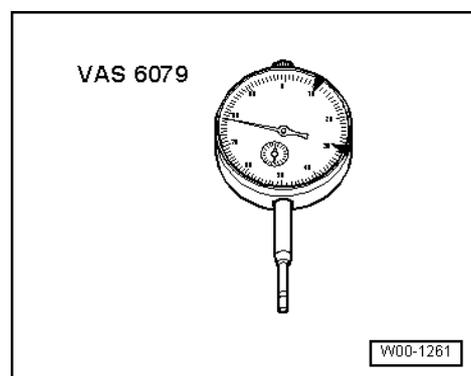
2.9 Checking valve guides

Special tools and workshop equipment required

- ◆ Universal dial gauge bracket -VW 387-



- ◆ Dial gauge -VAS 6079-





Procedure

- Insert valve into valve guide.
- End of valve stem must be flush with valve guide.



Note

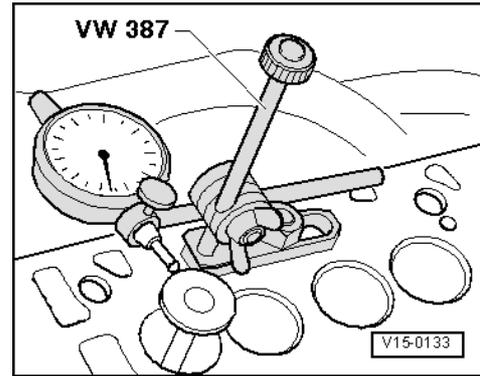
Only insert inlet valve into inlet guide and exhaust valve into exhaust guide, as the stem diameters are different.

- Determine amount of sideways play:
- Wear limit: 1.0 mm.



Note

- ◆ If the wear limit is exceeded, repeat the measurement with new valves. Renew cylinder head if wear limit is still exceeded. Valve guides cannot be renewed.
- ◆ If the valve has to be renewed as part of a repair, use a new valve for the measurement.



2.10 Checking valves

- Visually inspect for scoring on valve stem and on surface of seat.

If scoring is clearly visible:

- Renew the relevant valve.

17 – Lubrication

1 Removing and installing parts of lubrication system

 **Note**

- ◆ *If large quantities of metal shavings or particles are found in the engine oil when repairing the engine, the oil passages must be cleaned carefully, and the oil cooler must be renewed in order to prevent further damage occurring later.*
- ◆ *The oil level must not be above max. mark on dipstick - danger of damage to catalytic converter.*

Viscosity grades and oil specifications ⇒ Maintenance; Booklet 406.

Oil capacities ⇒ Maintenance tables.

Oil spray jet for piston cooling ⇒ [Fig. on page 137](#).

Oil retention valves ⇒ [Fig. on page 137](#)



1.1 Oil pump, sump (bottom section) - exploded view of components

1 - Sump (bottom section)

- Removing and installing ⇒ [page 138](#)
- With oil level and oil temperature sender -G266-
- Removing and installing oil level and oil temperature sender -G266- ⇒ [Fig. on page 137](#)

2 - 9 Nm

- Tighten in stages and in diagonal sequence

3 - 9 Nm

4 - Baffle plate

5 - Oil pump

- Do not dismantle
- With pressure relief valve for cold condition (11 bar) and pressure control valve (3.5 bar)
- Removing and installing ⇒ [page 142](#)

6 - 23 Nm

7 - Dowel sleeves

8 - Oil pump drive shaft

9 - Coupling

10 - Compression spring

11 - Thrust washer

12 - Chain sprocket for oil pump

- Installation position: Side with lettering faces engine

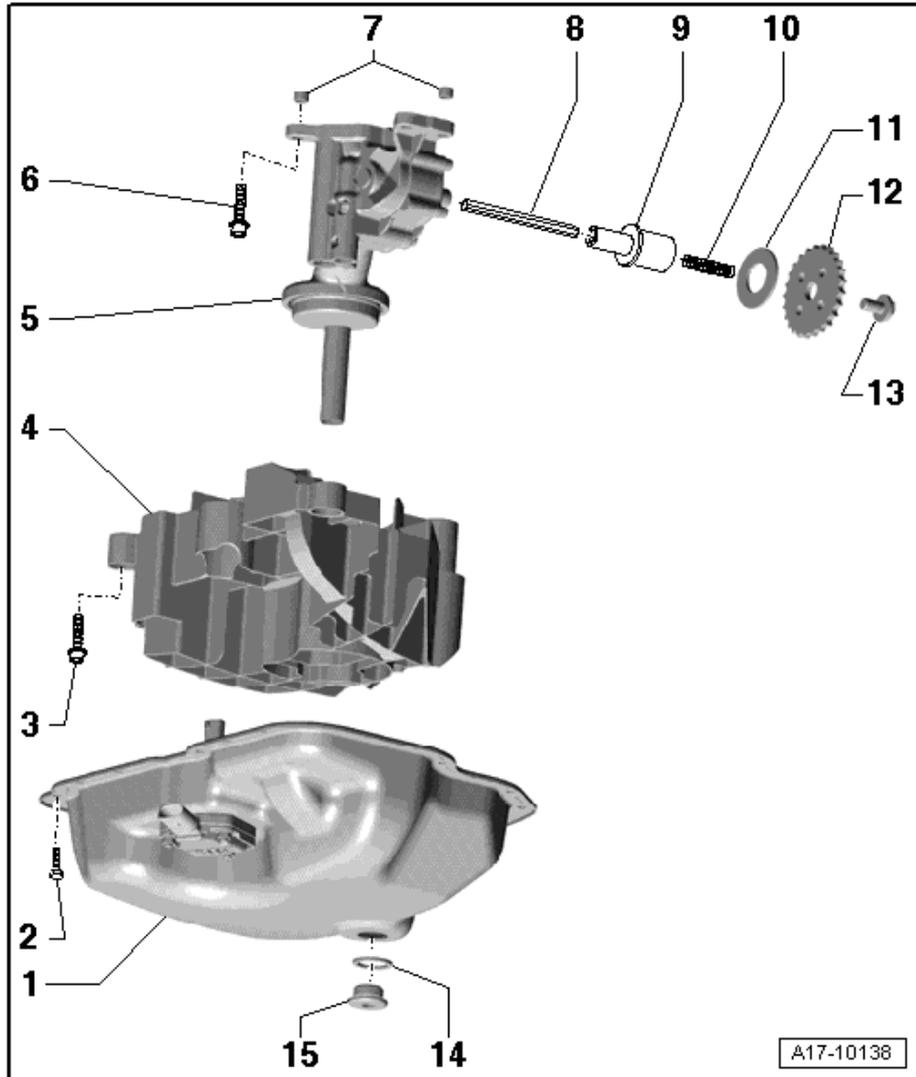
13 - 64 Nm

- Bolt strength rating 10.9
- To loosen, use 2-hole pin wrench -3212- to counterhold chain sprocket
- If bolt cannot be tightened to torque, remove sump (bottom section) with baffle plate and counterhold oil pump drive shaft using an open-end spanner.

14 - Seal

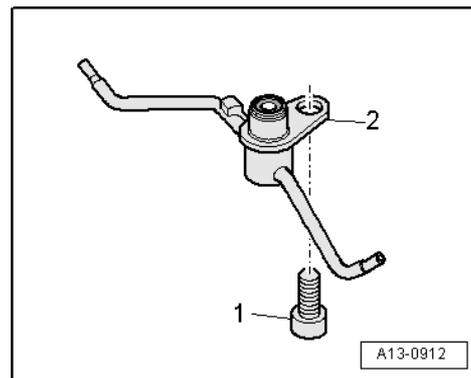
- Renew

15 - Oil drain plug, 50 Nm



Oil spray jet for piston cooling

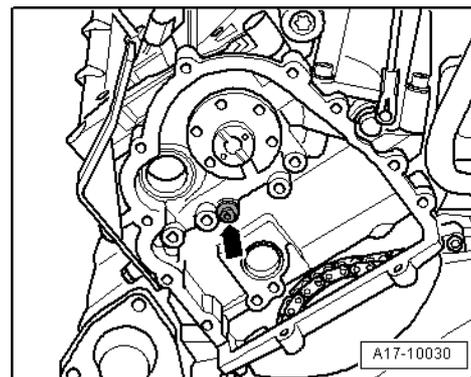
- 1 - Bolt, 9 Nm
- 2 - Oil spray jet with spray nozzle valve for piston cooling



Oil retention valves

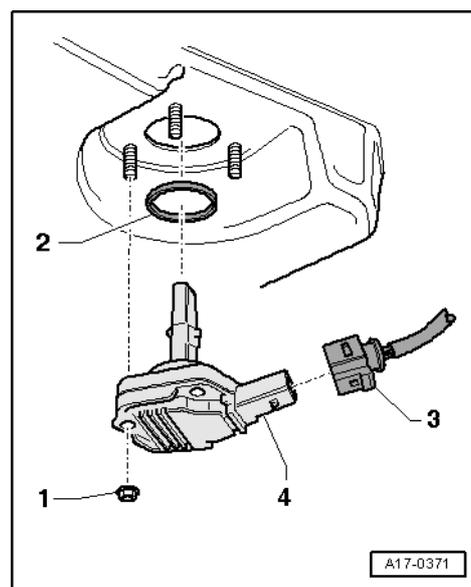
The oil retention valves are located at the rear end of the cylinder heads (left and right) -arrow-. They are accessible after removing the timing chains from the camshafts (left or right) => [page 73](#).

- Tightening torque: 25 Nm.



Removing and installing oil level and oil temperature sender -G266-

- 1 - Nut, 9 Nm
- 2 - Seal; renew
- 3 - Electrical connector
- 4 - Oil level and oil temperature sender -G266-

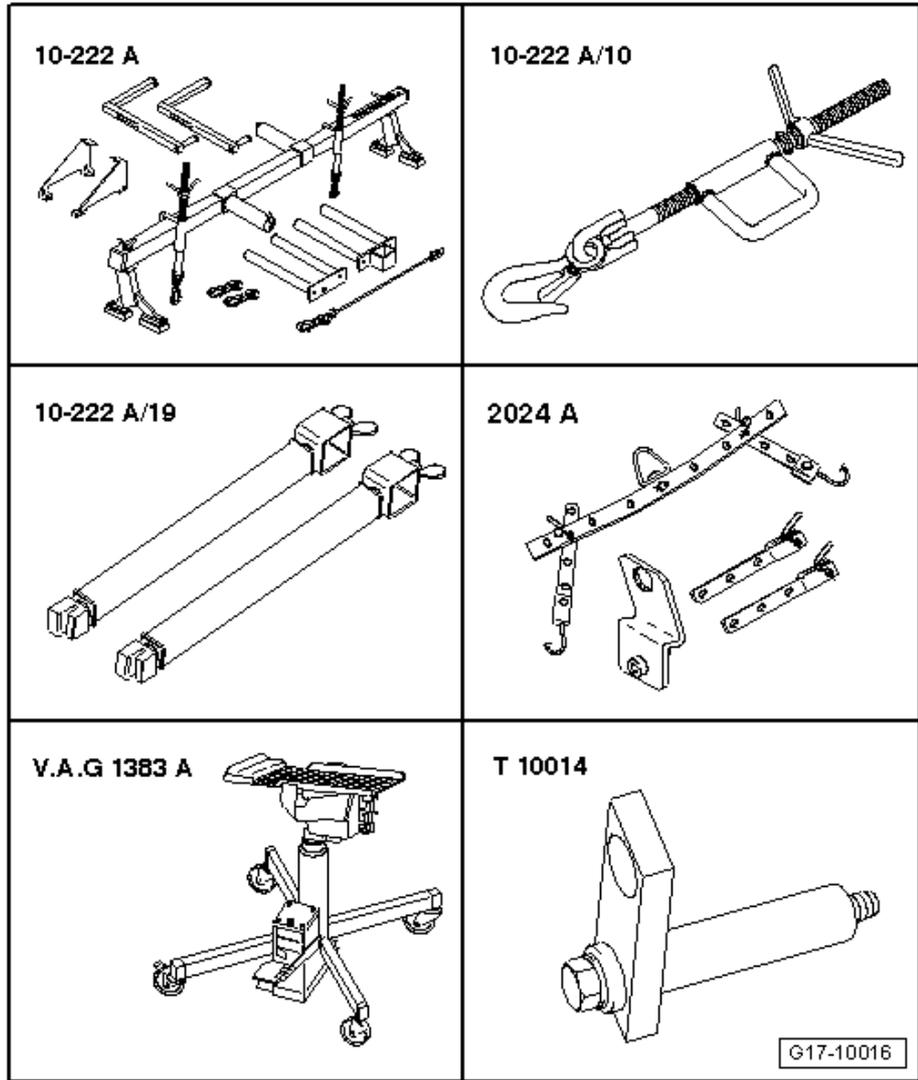




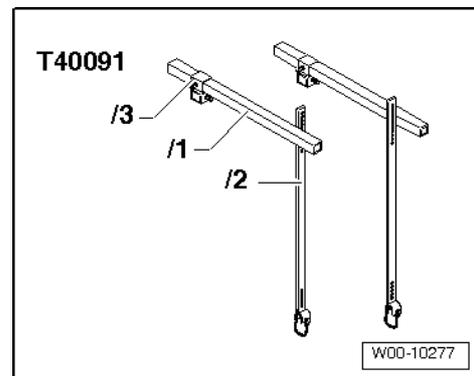
1.2 Removing and installing sump (bottom section)

Special tools and workshop equipment required

- ◆ Support bracket -10-222 A-
- ◆ Spindle -10-222 A/10-
- ◆ Support -10-222 A/19-
- ◆ Lifting tackle -2024 A- with extension -2024 A/1-
- ◆ Engine and gearbox jack -V.A.G 1383 A-
- ◆ Retainer -T10014-



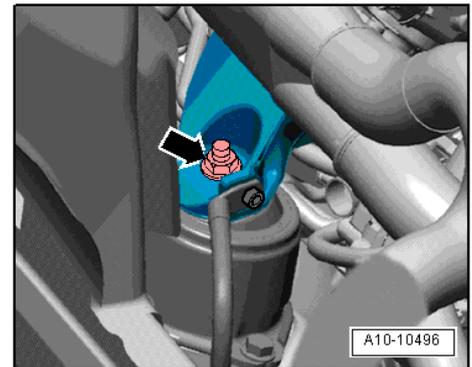
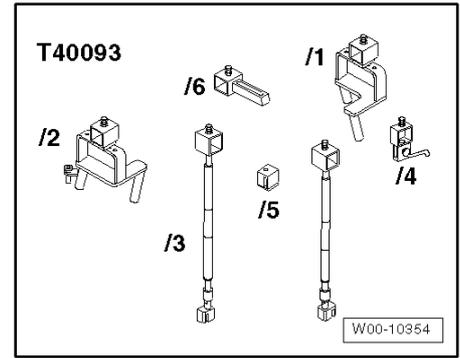
- ◆ Engine support bracket (basic set) -T40091-



- ◆ Engine support bracket (supplementary set) -T40093-
- ◆ Electric drill with plastic brush attachment
- ◆ Safety goggles
- ◆ Sealant ⇒ Parts catalogue

Removing

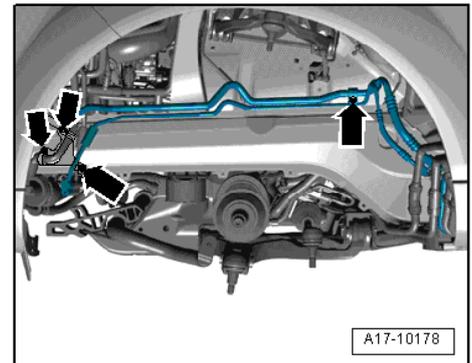
- Remove poly V-belt ⇒ [page 39](#).
- Remove poly V-belt tensioner ⇒ [page 40](#).
- Remove coolant pipe (left-side) ⇒ [page 174](#).
- Remove air cleaner housing ⇒ Rep. Gr. 23.
- Remove nuts for engine mountings -arrow- on both sides.
- Remove front left wheel housing liner ⇒ Rep. Gr. 66.



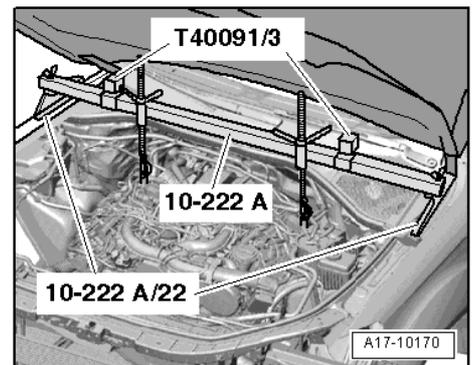
- Unscrew nuts and bolts -arrows- for retaining clips for refrigerant line.

Note

When the clips have been loosened, the refrigerant lines can be moved slightly to one side in order to position supports -10-222 A/19- onto longitudinal members.

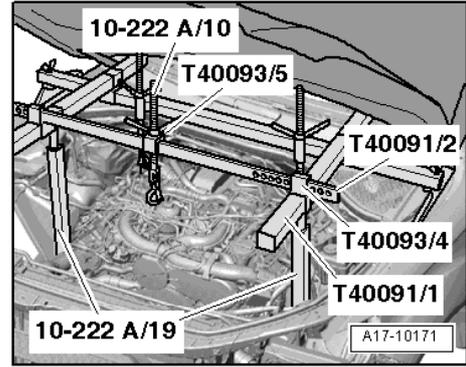


- Set up support bracket -10-222 A- with connecting pieces -T40091/3- and 2 spindles on wing panel flanges.
- The spindles face forwards.
- Attach both spindles to both rear engine lifting eyes.



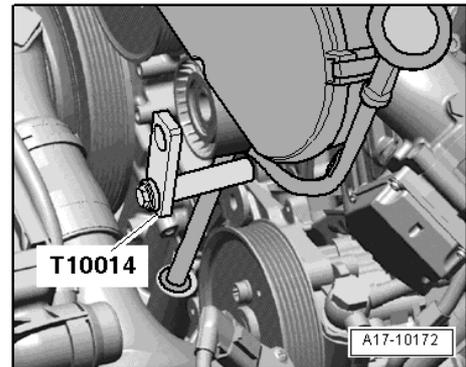


- Position further components of support bracket
-10-222 A- as shown in illustration. Position supports
-10-222 A/19- onto flanges of longitudinal members.
- Push support -T40091/2- with slider support -T40093/5-
into both connecting pieces -T40093/4-.

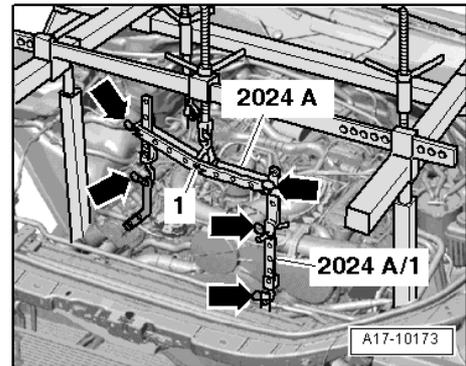


! WARNING!
Secure support -T40091/2- with pins and split pins of connecting pieces -T40093/4-.

- Screw retainer -T10014- in mounting hole for poly V-belt
tensioner.

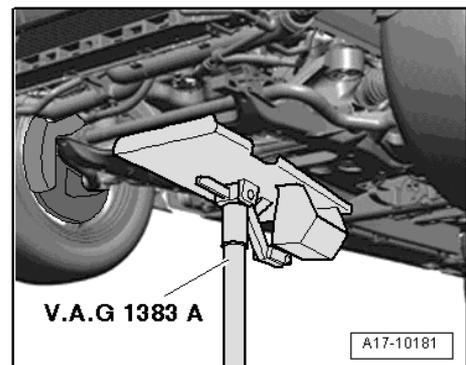


- Remove eyelet of lifting tackle -2024 A-.
- Re-insert pin -1- in centre hole of lifting tackle and secure
with split pin.
- Hang pin of lifting tackle onto front spindle of support
bracket.
- Fit extension -2024 A/1- to left side of lifting tackle.
- Engage lifting tackle -2024 A- in front right lifting eye on
engine and on retainer -T10014-.



! WARNING!
**The support hooks and retaining pins on the lifting tackle
must be secured with locking pins -arrows-.**

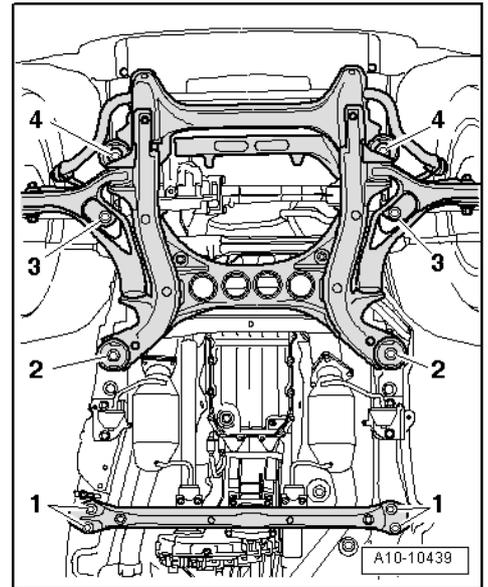
- Lift engine until engine supports are positioned above
studs of engine mountings (take up weight at all spindles
evenly).
- Position engine and gearbox jack -V.A.G 1383 A- on sub-
frame from below.



- Remove bolts -4- and lower subframe carefully using engine and gearbox jack -V.A.G 1383 A-.
- Unscrew bolts -3- for engine cross member and position engine cross member onto subframe.

 **Note**

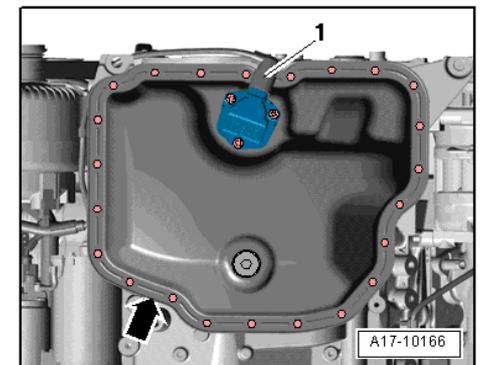
Disregard items marked -1- and -2-.



- Unplug electrical connector at oil level and oil temperature sender -G266- -item 1-.
- Place used oil collection and extraction unit -V.A.G 1782- under engine.
- Drain off engine oil.
- Unbolt bottom section of sump -arrow-.

 **Note**

There will still be some oil in the bottom section of sump when removing.



Installing

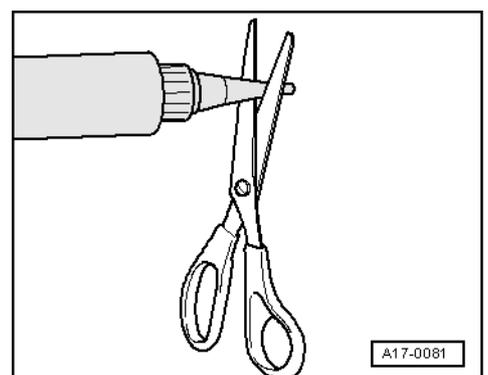
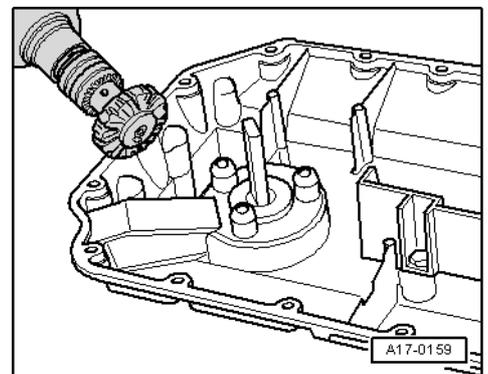
 **Note**

Renew seals.

 **WARNING!**

Wear safety goggles.

- Remove sealant residue from bottom section of sump and top section of sump with rotating plastic brush or similar.
- Clean sealing surfaces; they must be free of oil and grease.
- Cut off tube nozzle at front marking (nozzle approx. 1.5 mm Ø).



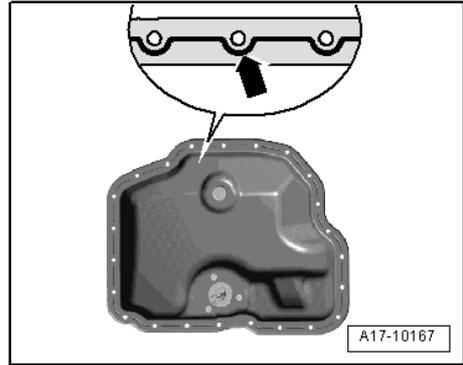


- Apply bead of sealant -arrow- onto clean sealing surface of sump (bottom section) as illustrated.
- Width of sealant bead: 2 mm.

i Note

- ♦ *The sealant bead must not be thicker than specified, otherwise excess sealant could enter the sump and clog the strainer in the oil pump.*
- ♦ *The sump (bottom section) must be installed within 5 minutes after applying sealant.*

- Fit sump (bottom section) and tighten all bolts initially to 5 Nm in diagonal sequence.
- Tighten bolts on sump (bottom section) in diagonal sequence.
- Install subframe ⇒ Rep. Gr. 40.
- Install air cleaner housing ⇒ Rep. Gr. 23.
- Install coolant pipe (left-side) ⇒ [page 174](#).
- Install poly V-belt tensioner ⇒ [page 40](#).
- Install poly V-belt ⇒ [page 39](#).
- Fill up with engine oil and check oil level ⇒ [page 157](#).



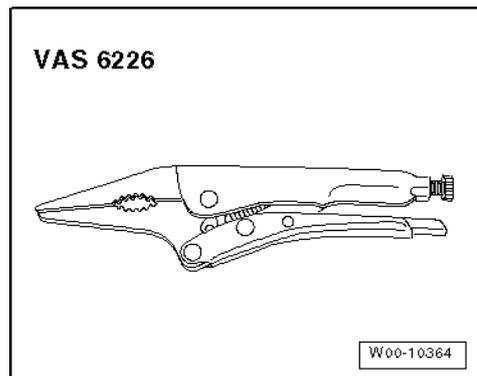
Tightening torques

Component	Nm
Sump (bottom section) to sump (top section)	9
Engine cross member to longitudinal member	120 + 180° 1)2)
Engine mounting to engine support	75
Oil drain plug	50
<ul style="list-style-type: none"> • 1) Renew bolts. • 2) 180° = one half turn. 	

1.3 Removing and installing oil pump

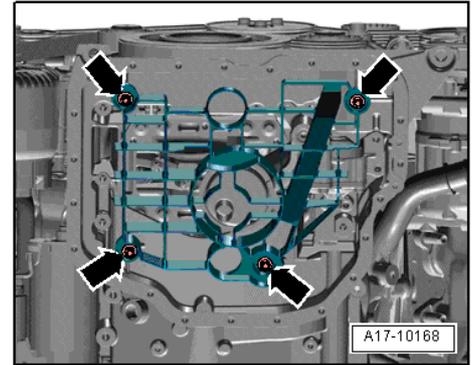
Special tools and workshop equipment required

- ♦ Long-nose grip pliers -VAS 6226-



Removing

- Remove sump (bottom section) ⇒ [page 138](#).
- Detach baffle plate -arrows-.



- Unscrew bolts -1- and -2-.
- Hold oil pump drive shaft -3- firmly with long-nose grip pliers -VAS 6226- and push shaft back against spring pressure.
- Take out oil pump.

 **Note**

Oil pump drive shaft remains in position.

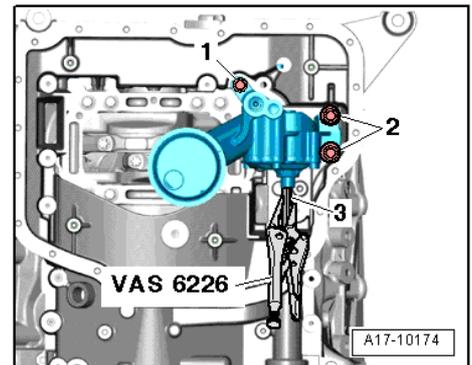
Installing

Installation is carried out in the reverse order; note the following:

 **Note**

Renew seals and O-rings.

- Check that the two dowel sleeves are fitted in the oil pump; install if necessary.
- Install sump (bottom section) ⇒ [page 141](#).
- Fill up with engine oil and check oil level ⇒ [page 157](#).



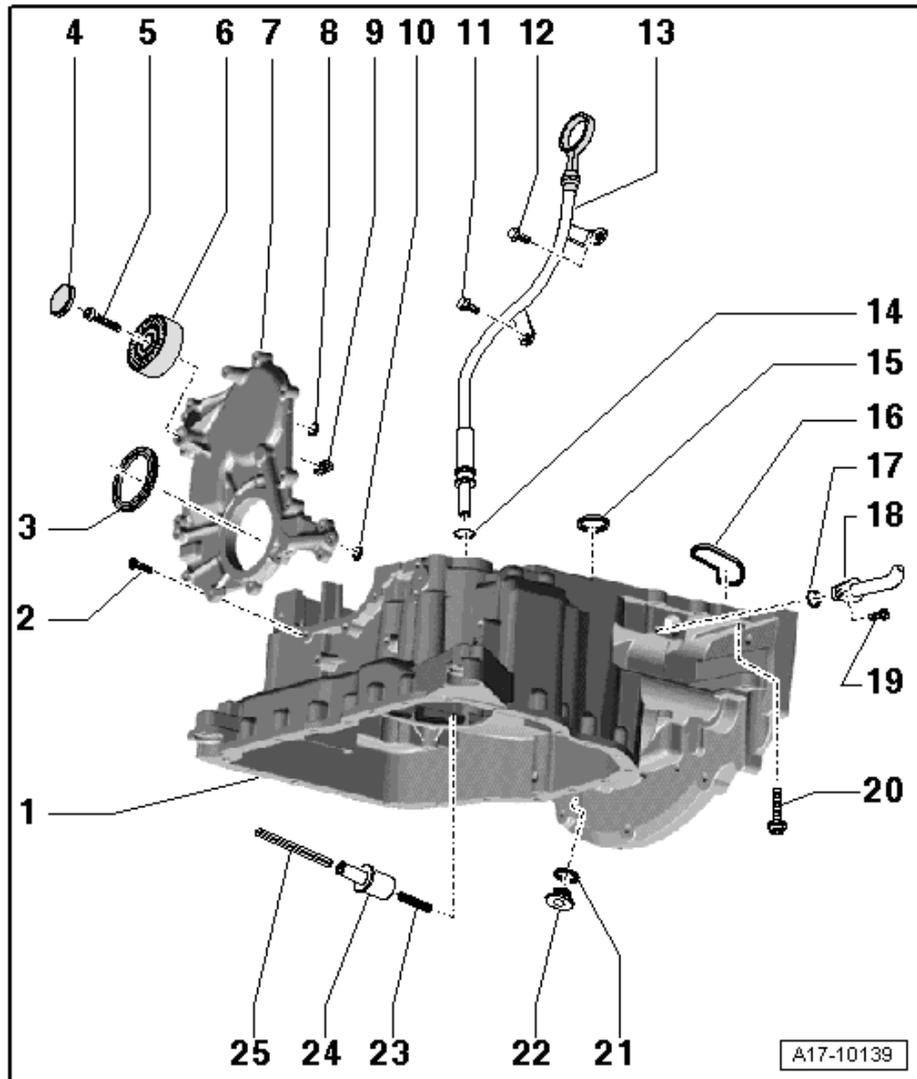
Tightening torques

Component	Nm
Oil pump to sump (top section)	23
Baffle plate to sump (top section)	9



1.4 Sump (top section) - exploded view of components

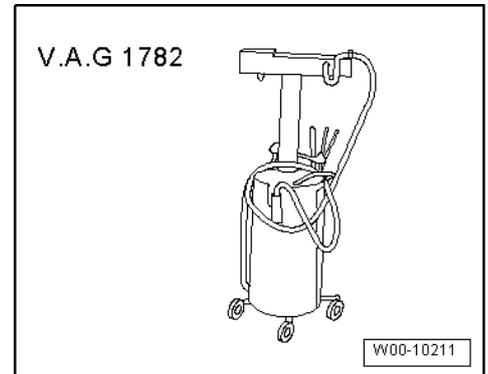
- 1 - Sump (top section)
 - Removing and installing => [page 145](#)
- 2 - 9 Nm
 - Tighten in stages and in diagonal sequence
- 3 - Crankshaft oil seal (pulley end)
 - Renewing => [page 41](#)
- 4 - Cover for idler roller
- 5 - 22 Nm
- 6 - Idler roller for poly V-belt
 - Note installation position
- 7 - Sealing flange (front)
 - Removing and installing => [page 43](#)
- 8 - O-ring
 - Renew
- 9 - Sealing element
 - 2 x
- 10 - O-ring
 - Renew
- 11 - 9 Nm
- 12 - 9 Nm
- 13 - Guide tube for oil dipstick
- 14 - O-ring
 - Renew
- 15 - Seal
 - Renew
- 16 - Seal
 - Renew
- 17 - O-ring
 - Renew
- 18 - Oil return pipe
 - From turbocharger
- 19 - 9 Nm
- 20 - 14 Nm
 - Tighten in stages and in diagonal sequence
- 21 - Seal
 - Renew
- 22 - Plug for "TDC" drilling, 35 Nm
- 23 - Compression spring
- 24 - Coupling
- 25 - Oil pump drive shaft



1.5 Removing and installing sump (top section)

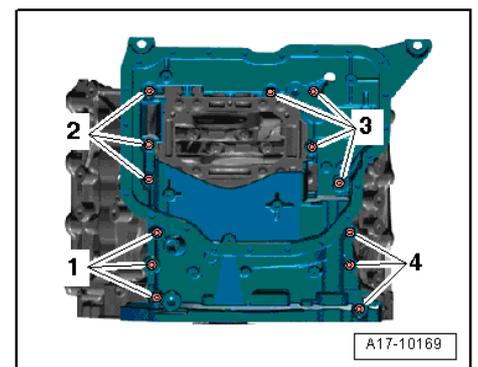
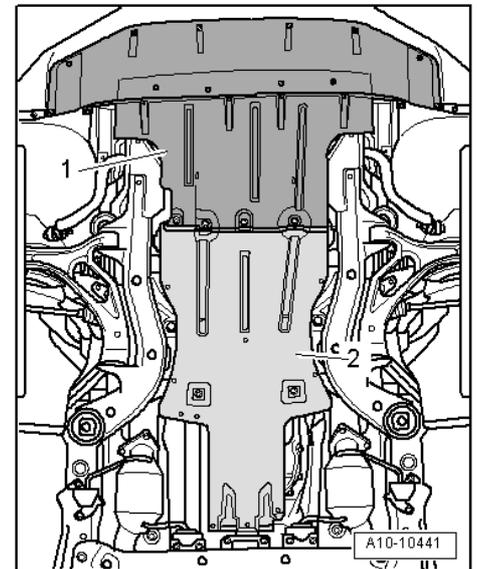
Special tools and workshop equipment required

- ◆ Used oil collection and extraction unit -V.A.G 1782-
- ◆ Safety goggles
- ◆ Electric drill with plastic brush attachment
- ◆ Sealant ⇒ Parts catalogue



Removing

- Unscrew bolts and take off front noise insulation -1- and rear noise insulation -2-.
- Place used oil collection and extraction unit -V.A.G 1782- under engine.
- Drain off engine oil.
- Remove engine ⇒ [page 4](#).
- Separate engine from gearbox ⇒ [page 21](#).
- Secure engine to engine stand ⇒ [page 29](#).
- Remove timing chain covers ⇒ [page 59](#).
- Remove chain for oil pump and balance shaft ⇒ [page 85](#).
- Remove sealing flange (front) ⇒ [page 43](#).
- Remove sump (bottom section) ⇒ [page 138](#).
- Remove oil pump ⇒ [page 142](#).
- Remove bolts -1 ... 4- for sump (top section).
- Press sump (top section) off spring pins on cylinder block.





Installing



Note

Renew gaskets, seals and O-rings.

- Remove old sealant from grooves on sump (top section) and from sealing surfaces.



WARNING!

Wear safety goggles.

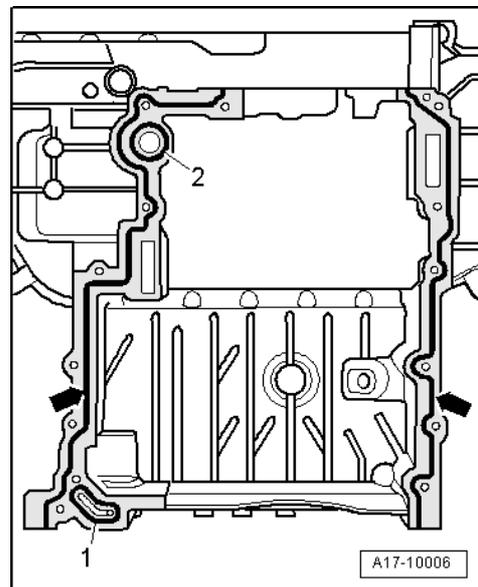
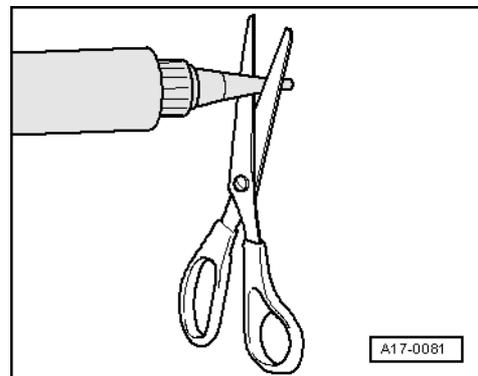
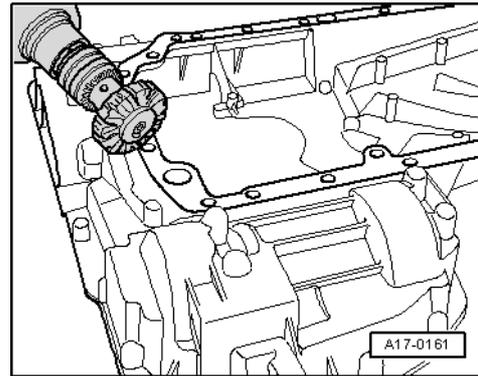
- Remove sealant residue from sump (top section) and cylinder block with rotating plastic brush or similar.
- Clean sealing surfaces; they must be free of oil and grease.
- Cut off tube nozzle at front marking (nozzle approx. 1.5 mm \varnothing).

- Install seals -1- and -2- in top section of sump.
- Apply beads of sealant -arrows- onto clean sealing surface of sump (top section) as illustrated.
- The grooves -arrows- on the sealing surfaces must be completely filled with sealant.
- The beads of sealant must project 1.5 ... 2.0 mm above the sealing surface.



Note

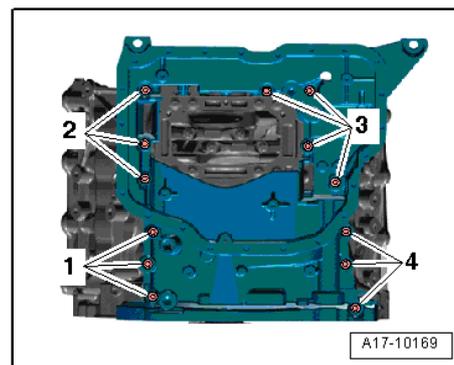
- ♦ *The sealant beads must not be thicker than specified, otherwise excess sealant could enter the sump and clog the strainer in the oil pump.*
- ♦ *The sump (top section) must be installed within 5 minutes after applying sealant.*



- Fit sump (top section) and tighten bolts -1 ... 4- in diagonal sequence initially to 5 Nm.
- Tighten bolts -1 ... 4- in diagonal sequence.

Remaining installation steps are carried out in reverse sequence; note the following:

- Install oil pump ⇒ [page 143](#).
- Install sump (bottom section) ⇒ [page 141](#).
- Install sealing flange (front) ⇒ [page 44](#).
- Install chain for oil pump and balance shaft ⇒ [page 85](#)
- Install timing chain covers ⇒ [page 60](#).
- Bolt gearbox to engine ⇒ [page 32](#).
- Fill up with engine oil and check oil level ⇒ [page 157](#).



Tightening torques

Component	Nm
Sump (top section) to cylinder block	14
Oil pipe to:	
Sump (top section)	9
Cylinder block	9



1.6 Oil cooler, pressure control valve, and oil filter housing - exploded view of components

1 - Mounting plate

- For oil cooler, pressure control valve of crankcase breather system, oil filter housing
- Removing and installing ⇒ [page 153](#)

2 - 9 Nm

3 - Seal

- Renew

4 - Oil pressure switch -F1-

- Opening/closing pressure 0.9 bar
- Grey insulation
- Checking ⇒ [page 156](#)
- Removing and installing ⇒ [page 154](#)
- Tighten to 20 Nm

5 - O-rings

- Renew

6 - Seal

- Renew

7 - O-ring

- Renew

8 - 9 Nm

9 - Oil supply pipe

- To turbocharger

10 - O-ring

- Renew

11 - Oil filter element

- When removing, pull out of sealing cap ⇒ [item 13](#)
- When installing, fit connection at bottom of oil filter element in bore in oil filter housing
- Observe change intervals ⇒ Maintenance; Booklet 406

12 - Seal

- Renew

13 - Sealing cap, 35 Nm

- Use 32 mm socket to loosen and tighten

14 - 9 Nm

15 - Retaining clip

16 - Oil filter housing

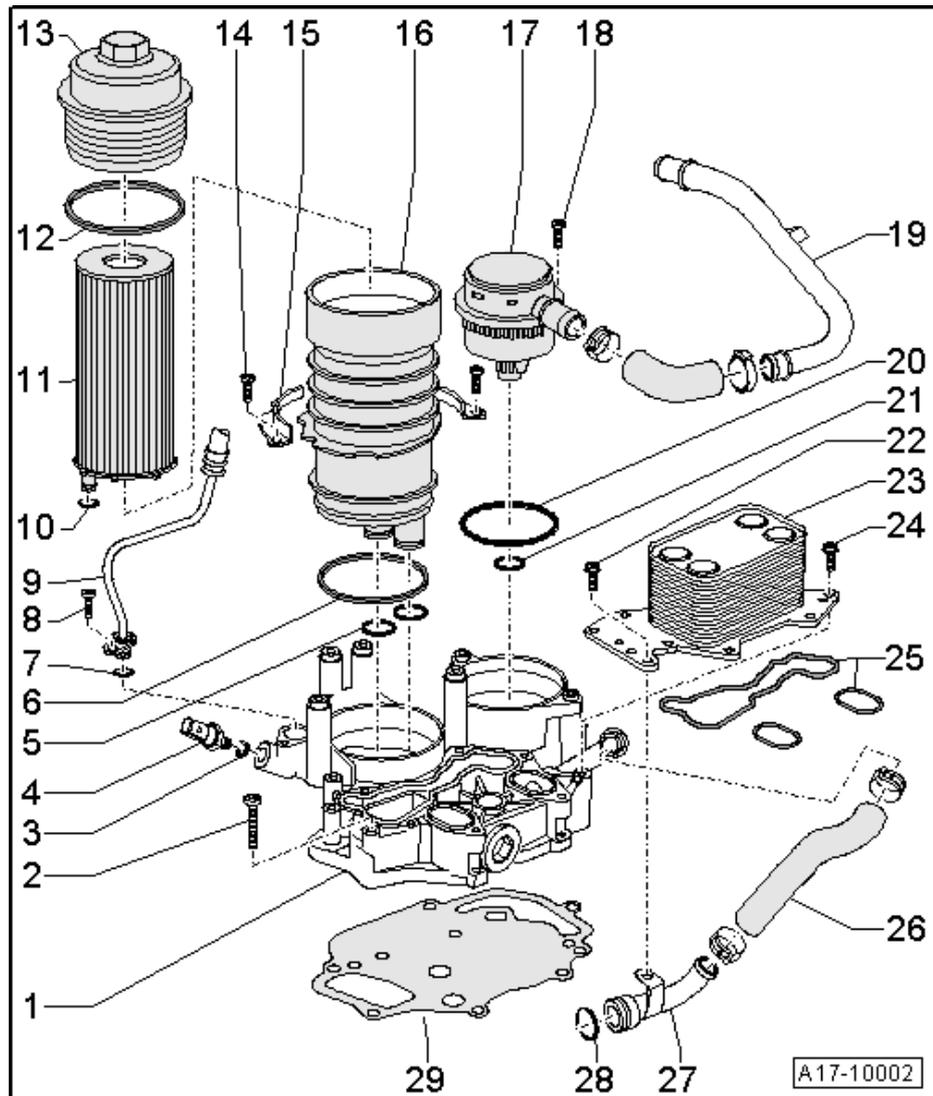
- Removing and installing ⇒ [page 150](#)
- With oil filter bypass valve, 2.0 ... 3.0 bar (pressure differential upstream/downstream of filter)

17 - Pressure control valve for crankcase breather system

- Removing and installing ⇒ [page 152](#)

18 - 9 Nm

19 - Crankcase breather pipe



20 - O-ring

- Renew

21 - O-ring

- Renew

22 - 9 Nm**23 - Oil cooler**

- See note ⇒ [page 135](#)
- Removing and installing ⇒ [page 149](#)
- With oil cooler bypass valve, 2.0 ... 3.0 bar (pressure differential upstream/downstream of oil cooler)

24 - 9 Nm**25 - Gaskets**

- Renew

26 - Coolant hose**27 - Coolant pipe****28 - O-ring**

- Renew

29 - Gasket

- Renew

1.7 Removing and installing oil cooler

Removing

- Drain off coolant ⇒ [page 161](#).
- Remove intake manifold (top section) ⇒ Rep. Gr. 23.
- Remove bottom section of intake manifold (left and right) ⇒ Rep. Gr. 23.
- Remove toothed belt for high-pressure pump ⇒ [page 48](#).
- Remove high-pressure pump ⇒ Rep. Gr. 23.
- Remove exhaust gas recirculation cooler ⇒ [page 221](#).
- Spread out rags round oil cooler to catch escaping oil.
- Remove bolts -1 ... 4- and take out oil cooler.

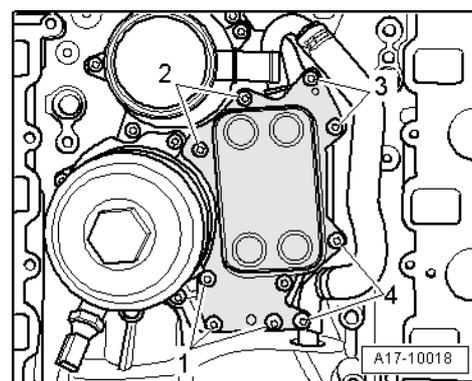
Installing

Installation is carried out in the reverse order; note the following:

**Note**

Renew seals and O-ring for front coolant pipe.

- Install exhaust gas recirculation cooler ⇒ [page 221](#).
- Install high-pressure pump ⇒ Rep. Gr. 23.
- Install toothed belt for high-pressure pump ⇒ [page 48](#).
- Install bottom section of intake manifold (left and right) ⇒ Rep. Gr. 23.
- Install intake manifold (top section) ⇒ Rep. Gr. 23.





- Fill up with engine oil and check oil level => [page 157](#).
- Fill cooling system => [page 162](#).

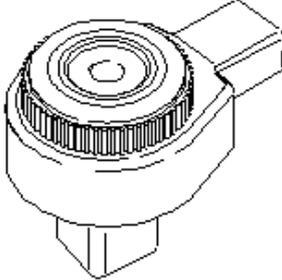
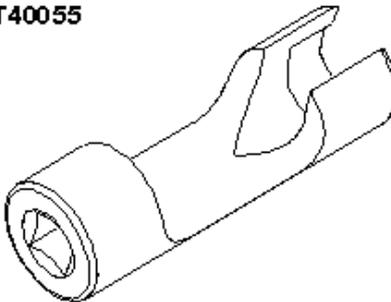
Tightening torques

Component	Nm
Oil cooler to mounting plate	9
Front coolant pipe to oil cooler	9

1.8 Removing and installing oil filter housing

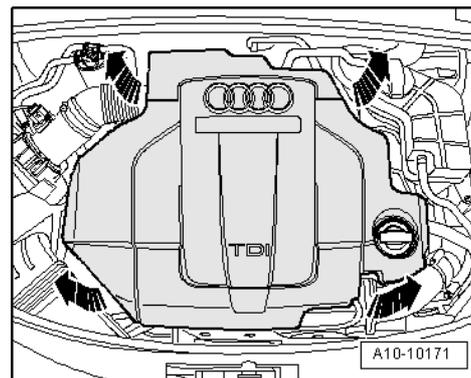
Special tools and workshop equipment required

- ◆ Torque wrench
-V.A.G 1331-
- ◆ Ratchet -V.A.G 1331/1-
- ◆ Tool insert, AF 19
-V.A.G 1331/5-
- ◆ Socket, 17 mm
-T40055-

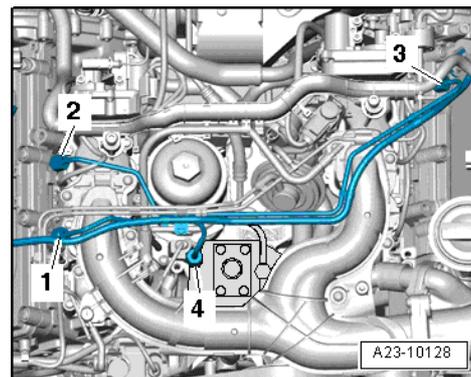
<p>V.A.G 1331</p> 	<p>V.A.G 1331/1</p> 
<p>V.A.G 1331/5</p> 	<p>T40055</p> 
	<p>G15-10041</p>

Removing

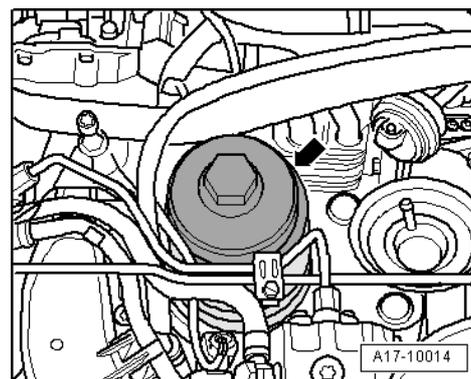
- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



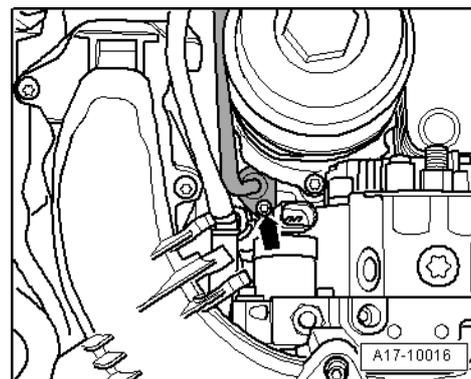
- Unscrew union nuts -1 ... 4- and detach high-pressure pipes.
- Remove intake manifold (top section) ⇒ Rep. Gr. 23.



- Loosen sealing cap -arrow- using 32 mm socket. Take off sealing cap together with oil filter element.
- Pull oil filter element off sealing cap.



- Disconnect oil supply pipe -arrow- from mounting plate.





- Unbolt retaining clip -arrows-.
- Spread out rags round oil filter housing to catch escaping oil.
- Pull out oil filter housing.

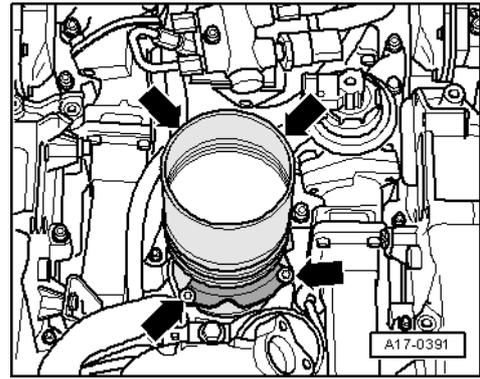
Installing

Installation is carried out in the reverse order; note the following:

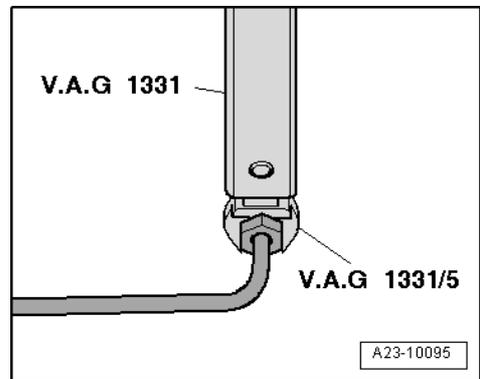
Note

Renew gaskets, seals and O-rings.

- Install intake manifold (top section) ⇒ Rep. Gr. 23.
- Tighten union nuts on high-pressure pipes finger-tight initially.
- Ensure that high-pressure pipes are not under tension.
- To tighten unions of high-pressure pipes at rail elements, use torque wrench -V.A.G 1331- with ratchet -V.A.G 1331/1- and tool insert, AF 19 -V.A.G 1331/5-.

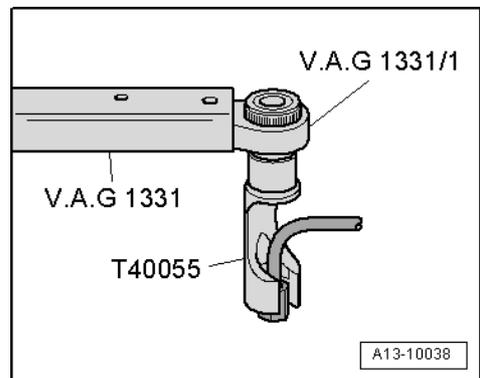


- To tighten unions of high-pressure pipe at high-pressure pump, use torque wrench -V.A.G 1331- with ratchet -V.A.G 1331/1- and socket, 17 mm -T40055-.
- Check fuel system for leaks ⇒ Rep. Gr. 23.



Tightening torques

Component	Nm
Oil filter housing to mounting plate	9
Oil supply pipe to mounting plate	9
Screw plug to mounting plate	35
High-pressure pipes	25



1.9 Removing and installing pressure control valve for crankcase breather system

Removing

- Drain off coolant ⇒ [page 161](#).
- Remove coolant pipe (rear) ⇒ [page 181](#).
- Remove intake manifold (top section) ⇒ Rep. Gr. 23.
- Remove bottom section of intake manifold (left and right) ⇒ Rep. Gr. 23.

- Remove exhaust gas recirculation cooler ⇒ [page 221](#).
- Detach crankcase breather hose -arrow- from pressure control valve.
- Unscrew bolts -1- and -2- and remove pressure control valve for crankcase breather system.

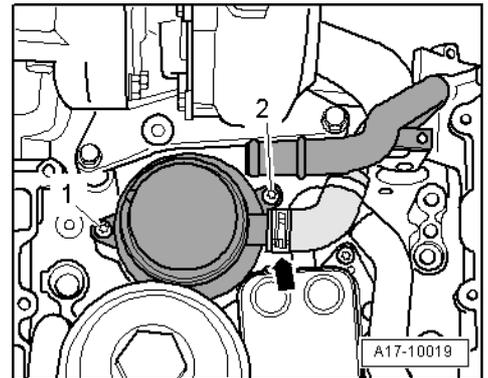
Installing

Installation is carried out in the reverse order; note the following:



Note

- ◆ *Renew O-rings.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ [Parts catalogue](#).*
- Install exhaust gas recirculation cooler ⇒ [page 221](#).
- Install coolant pipe (rear) ⇒ [page 181](#).
- Install bottom section of intake manifold (left and right) ⇒ Rep. Gr. 23.
- Install intake manifold (top section) ⇒ Rep. Gr. 23.
- Fill cooling system ⇒ [page 162](#).



Tightening torque

Component	Nm
Pressure control valve for crankcase breather system to mounting plate	9

1.10 Removing and installing mounting plate for oil cooler, pressure control valve and oil filter housing

Removing

- Drain off coolant ⇒ [page 161](#).
- Remove intake manifold (top section) ⇒ Rep. Gr. 23.
- Remove bottom section of intake manifold (left and right) ⇒ Rep. Gr. 23.
- Remove coolant pipe (rear) ⇒ [page 181](#).
- Remove toothed belt for high-pressure pump ⇒ [page 48](#).
- Remove high-pressure pump ⇒ Rep. Gr. 23.
- Remove exhaust gas recirculation cooler ⇒ [page 221](#).



- Unscrew bolts -1 ... 8-
- Take out mounting plate with oil cooler, pressure control valve and oil filter housing

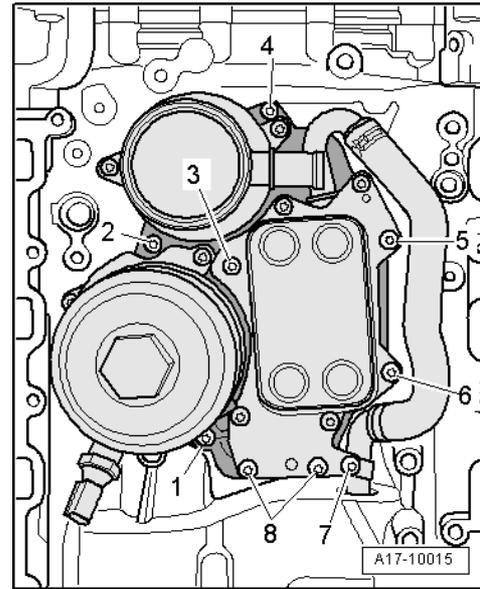
Installing

Installation is carried out in the reverse order; note the following:

i Note

Renew gaskets, seals and O-rings.

- Tighten bolts securing mounting plate from the inside outwards.
- Install exhaust gas recirculation cooler => [page 221](#).
- Install high-pressure pump => Rep. Gr. 23.
- Install toothed belt for high-pressure pump => [page 48](#).
- Install coolant pipe (rear) => [page 181](#).
- Install bottom section of intake manifold (left and right) => Rep. Gr. 23.
- Install intake manifold (top section) => Rep. Gr. 23.
- Fill up with engine oil and check oil level => [page 157](#).
- Fill cooling system => [page 162](#).



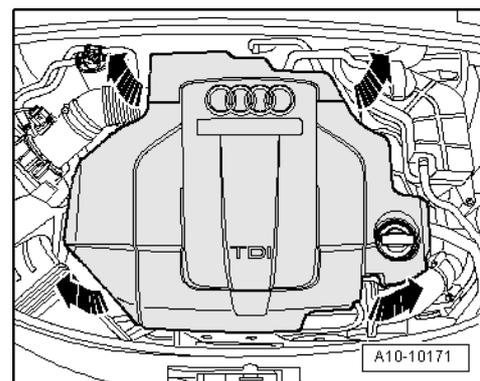
Tightening torque

Component	Nm
Mounting plate to cylinder block	9

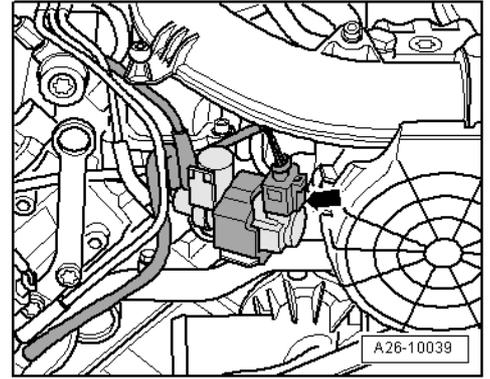
1.11 Removing and installing oil pressure switch -F1-

Removing

- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



- Detach exhaust gas recirculation valve -N18- -arrow- from retainer.



- Unplug electrical connector -arrow-.
- Unscrew oil pressure switch -F1-.

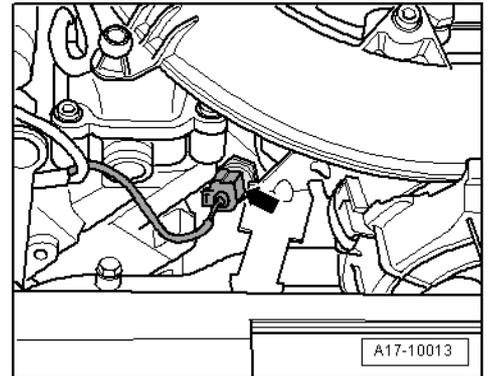
Installing

Installation is carried out in the reverse order; note the following:

 **Note**

Renew seal.

Tightening torque



Component	Nm
Oil pressure switch to engine	20



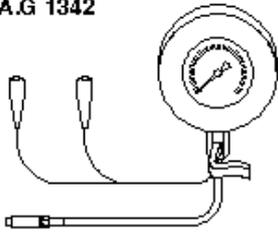
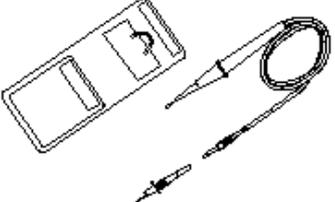
Audi Q7 2007 >

Audi 6-cylinder TDI engine (3.0 ltr. 4-valve common rail), mechanics 01.2006

1.12 Checking oil pressure

Special tools and workshop equipment required

- ◆ Oil pressure tester
-V.A.G 1342-
- ◆ Voltage tester
-V.A.G 1527 B-
- ◆ Auxiliary measuring set
-V.A.G 1594 C-

<p>V.A.G 1342</p> 	<p>V.A.G 1527 B</p> 
<p>V.A.G 1594 C</p> 	
	<div style="border: 1px solid black; padding: 2px;">G17-0023</div>

Procedure

- Oil level OK
- Engine oil temperature approx. 80 °C
- Remove oil pressure switch -F1- ⇒ [page 154](#).
- Connect oil pressure tester -V.A.G 1342- to threaded hole for oil pressure switch.

- Screw oil pressure switch -2- into oil pressure tester -V.A.G 1342-.

Checking oil pressure switch

- Connect brown wire -1- of oil pressure tester to earth ("–").
- Connect voltage tester -V.A.G 1527 B- with test leads from auxiliary measuring set -V.A.G 1594 C- to oil pressure switch and battery positive ("+").

- LED should not light up.

If LED lights up now:

- Renew oil pressure switch.
- Start engine.



Note

Observe tester and LED while starting, as switching point of oil pressure switch may already be exceeded when starting.

- Test lamp should light up at 0.7 ... 1.1 bar.

If LED does not light up:

- Renew oil pressure switch.

Checking oil pressure

- Start engine.
- Minimum oil pressure at idling speed: 1.8 bar
- Minimum oil pressure at 2000 rpm: 4.0 bar

The pressure relief valve or oil pump is defective if the specifications are not attained.

- Renew oil pump ⇒ [page 142](#).

Assembling

- Install oil pressure switch -F1- ⇒ [page 154](#).

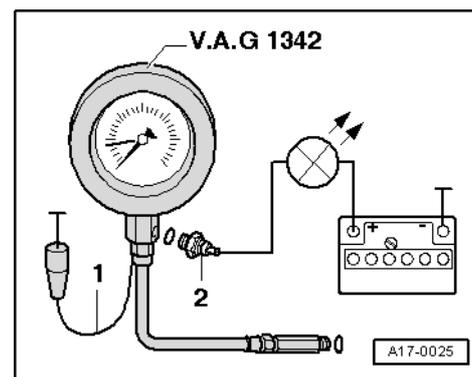
1.13 Engine oil

Viscosity grades and oil specifications ⇒ Maintenance; Booklet 803

1.14 Checking oil level

Procedure

- Engine oil temperature at least 60 °C.
- Vehicle must be level (horizontal)
- Wait a few minutes after switching off the engine to allow the oil to flow back into the sump.
- Pull out the dipstick, wipe off with a clean cloth and insert it again as far as it will go.





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Audi 6-cylinder TDI engine (3.0 ltr. 4-valve common rail), mechanics 01.2006

– Pull out the dipstick again and read off the oil level.

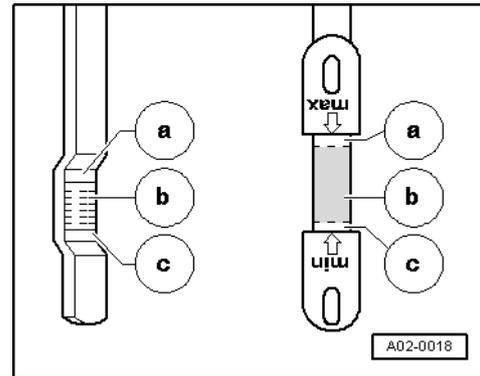
Markings on oil dipstick:

- a - Do not top up oil.
- b - Oil may be topped up.
- c - Oil must be topped up. It is sufficient if the oil level is somewhere in area -b- (grooved area on dipstick) after topping up.



Note

The oil level must not be above the MAX marking -a- and not below the MIN marking -c-.



19 – Cooling

1 Removing and installing parts of cooling system



WARNING!

Hot steam or hot coolant can escape when expansion tank is opened; cover filler cap with cloth and open carefully.



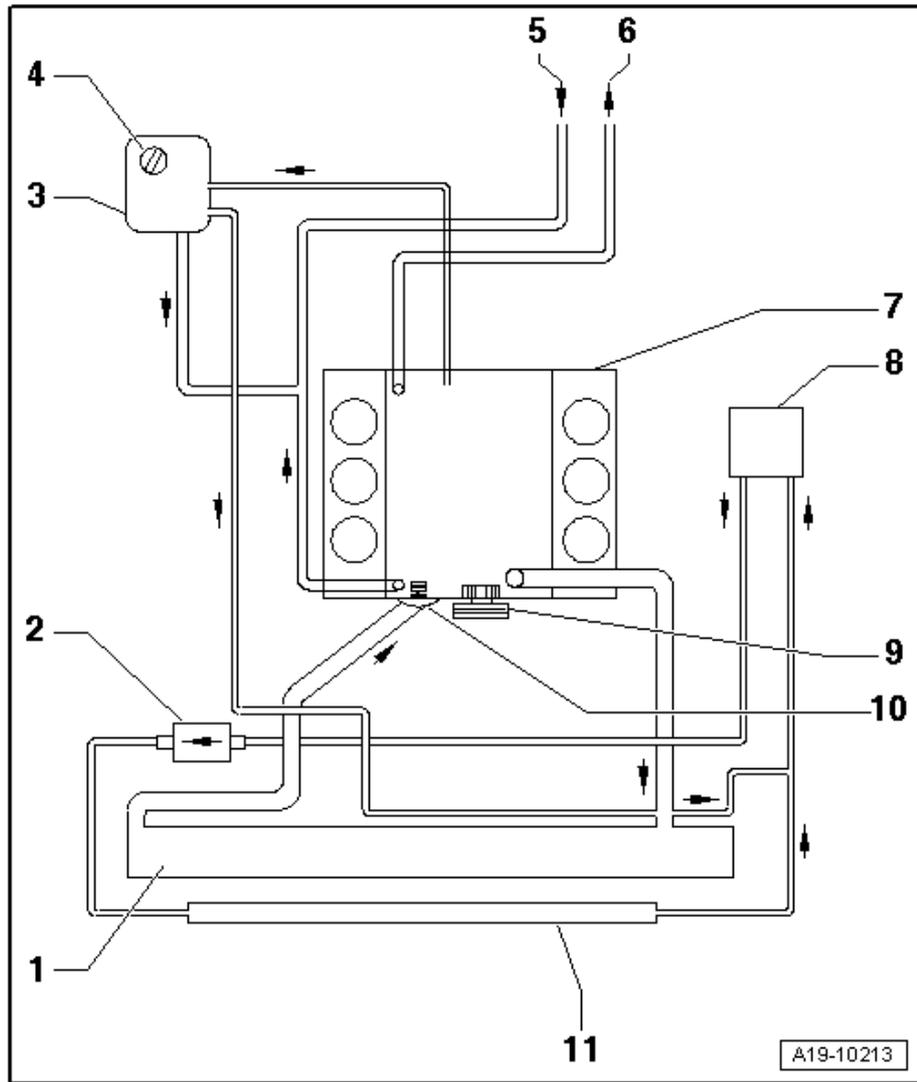
Note

- ◆ *The cooling system is under pressure when the engine is hot. If necessary, relieve pressure before commencing repair work.*
- ◆ *Renew gaskets, seals and O-rings.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue.*
- ◆ *The arrow markings on coolant pipes and on ends of hoses must align.*



1.1 Diagram of coolant hose connections

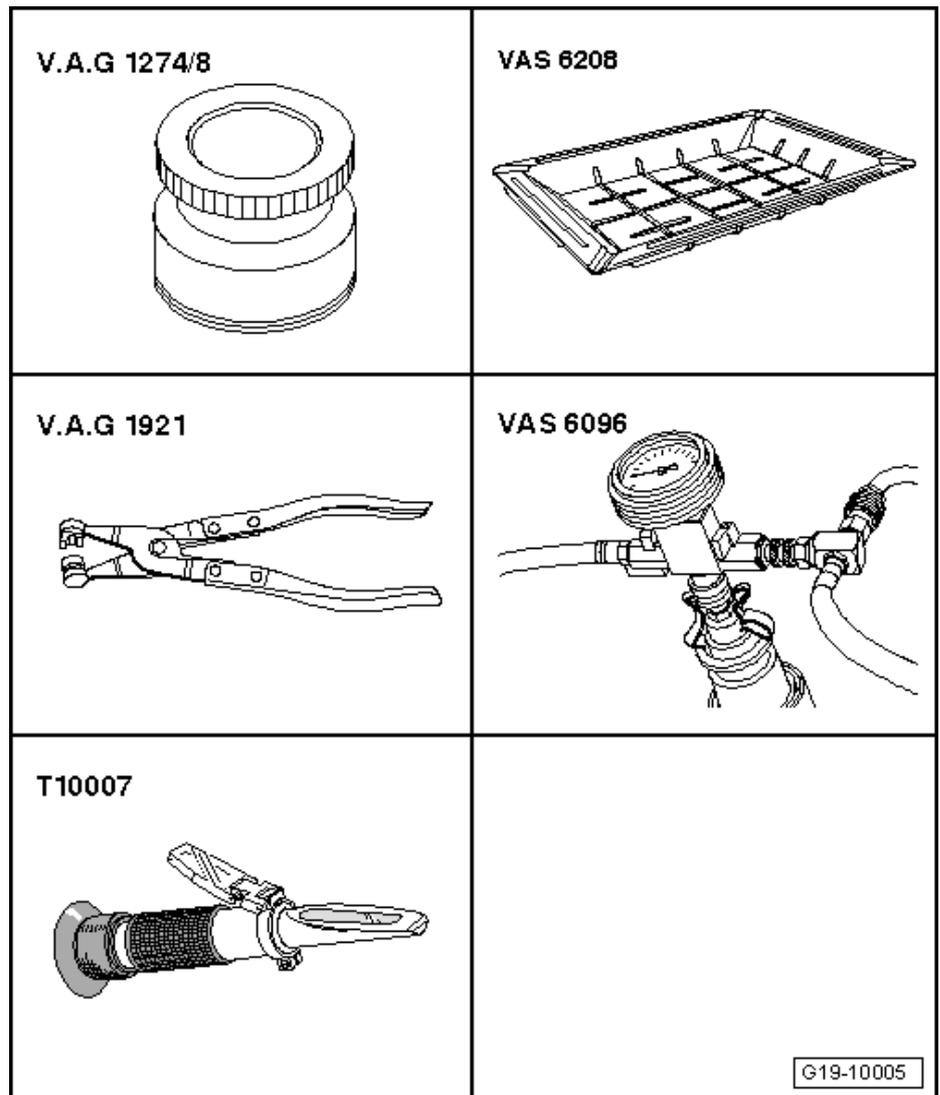
- 1 - Radiator**
 - Removing and installing ⇒ [page 184](#)
 - If renewed, refill system with fresh coolant
- 2 - Continued coolant circulation pump -V51-**
 - For fuel cooling system
 - Removing and installing ⇒ [page 169](#)
- 3 - Expansion tank**
- 4 - Filler cap**
 - Checking pressure relief valve in filler cap ⇒ [page 189](#)
- 5 - From heat exchanger**
- 6 - To heat exchanger**
- 7 - Cylinder head/cylinder block**
 - If renewed, refill system with fresh coolant
- 8 - Fuel cooler**
 - On fuel filter
- 9 - Coolant pump**
 - Removing and installing ⇒ [page 167](#)
- 10 - Thermostat**
 - Removing and installing ⇒ [page 171](#)
- 11 - Fuel cooler**
 - Removing and installing ⇒ [page 187](#)



1.2 Draining and filling cooling system

Special tools and workshop equipment required

- ◆ Adapter -V.A.G 1274/8-
- ◆ Drip tray for workshop hoist -VAS 6208-
- ◆ Hose clip pliers -V.A.G 1921-
- ◆ Cooling system charge unit -VAS 6096-
- ◆ Refractometer -T10007-



Draining

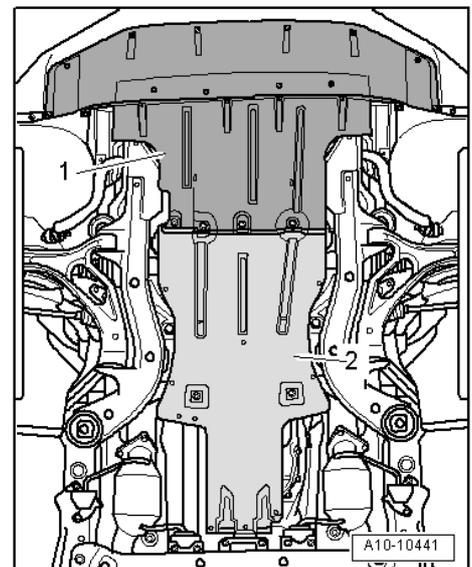
Note

Collect drained coolant in a clean container for re-use or disposal.

WARNING!

Hot steam or hot coolant can escape when expansion tank is opened; cover filler cap with cloth and open carefully.

- Open filler cap on coolant expansion tank.
- Unscrew bolts and remove front noise insulation -1-.

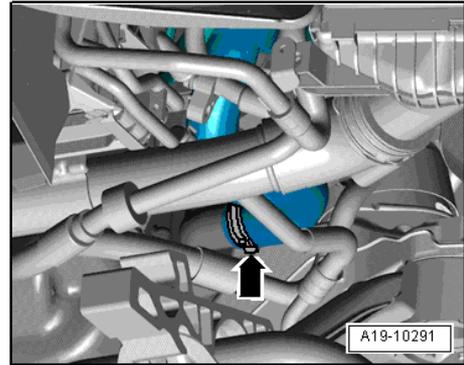




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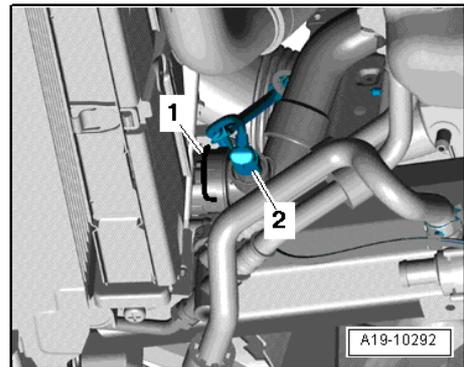
- Place drip tray for workshop hoist -VAS 6208- under engine.
- Disconnect coolant hose -arrow- from coolant pipe (left-side) and drain off coolant.



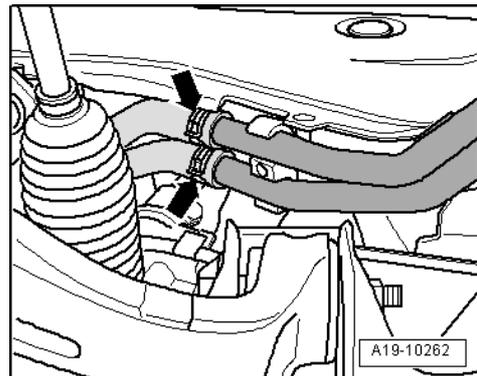
- Disconnect coolant hose (bottom right) -1- at radiator and drain off coolant.

i Note

Disregard -item 2-.



- Disconnect coolant hoses from coolant pipes -arrows- and drain off coolant.

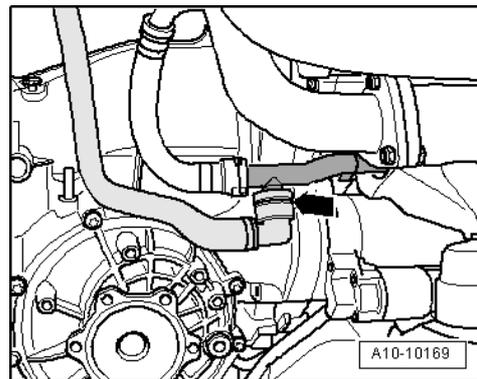


- Disconnect coolant hose from coolant pipe (right-side) -arrow- and drain off remaining coolant.

Filling

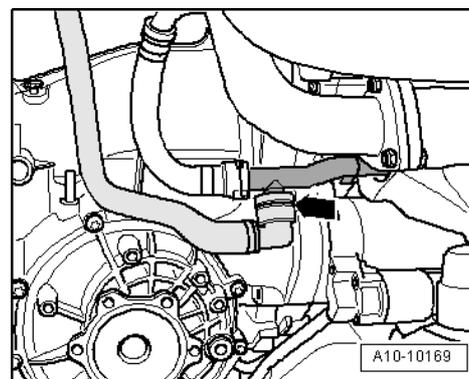
i Note

- ♦ The cooling system is filled all year round with a mixture of water and radiator antifreeze/anti-corrosion agent.
- ♦ It is important to use only coolant additive Plus -G 012 A8F A1- (also designated as "G12+") "meeting specification TL VW 774 F". Other coolant additives could seriously impair in particular the anticorrosion properties. The resulting damage could lead to loss of coolant and consequently to serious engine damage.
- ♦ Coolant additive "G12+" may be mixed with additives "G11" and "G12".
- ♦ "G12+" and coolant additives marked "Meets specification TL VW 774 F" prevent frost and corrosion damage and stop scale from forming. Such additives also raise the

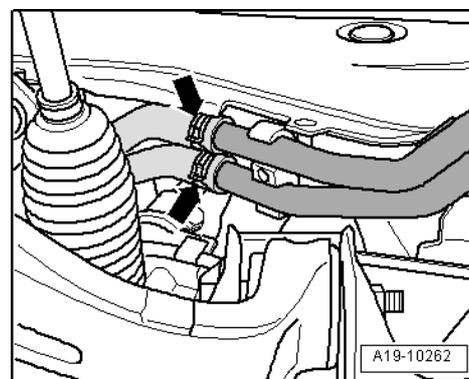


boiling point of the coolant. For these reasons the cooling system must be filled all year round with the correct anti-freeze and anticorrosion additive.

- ◆ *Because of its high boiling point, the coolant improves engine reliability under heavy loads, particularly in countries with tropical climates.*
 - ◆ *Frost protection is required down to about -25 °C (in countries with arctic climate: down to about -35 °C).*
 - ◆ *The coolant concentration must not be reduced by adding water even in warmer seasons and in warmer countries. The antifreeze percentage must be at least 40 %.*
 - ◆ *If greater frost protection is required in very cold climates, the amount of "G 12+" can be increased, but only up to 60 % (this gives frost protection to about -40 °C). If the antifreeze percentage exceeds 60%, frost protection decreases again and cooling efficiency is also impaired.*
 - ◆ *Use only clean tap water for mixing coolant.*
 - ◆ *If radiator, heat exchanger, cylinder head, cylinder head gasket or cylinder block have been renewed, do not re-use old coolant.*
 - ◆ *Contaminated or dirty coolant must not be used again.*
 - ◆ *To check frost protection level of coolant additive "G12+" you must use a refractometer -T10007-.*
 - ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue.*
- Push coolant hose -arrow- onto coolant pipe (right-side) until it engages.

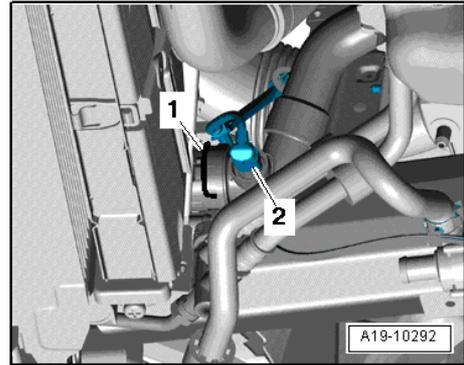


- Connect coolant hoses to coolant pipes -arrows-.

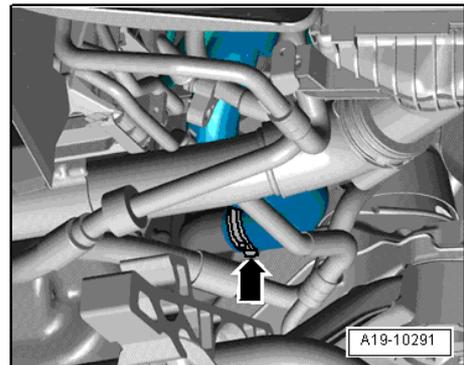




– Connect coolant hose -1- (bottom right) at radiator.



– Connect coolant hose -arrow- at coolant pipe (left-side).



– Fill reservoir -VAS 6096/1- with at least 12 litres of premixed coolant (based on recommended ratio):

- “G12+” (40 %) and water (60 %) for frost protection to -25 °C.
- “G12+” (50 %) and water (50 %) for frost protection to -35 °C
- “G12+” (60 %) and water (40 %) for frost protection to -40 °C

– Screw adapter -V.A.G 1274/8- onto coolant expansion tank.

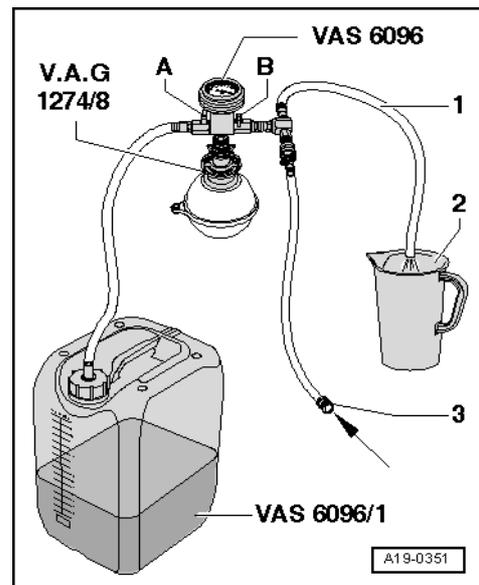
– Attach cooling system charge unit -VAS 6096- onto adapter -V.A.G 1274/8-.

– Run vent hose -1- into a small container -2-. (The vented air draws along a small amount of coolant, which should be collected.)

– Close the two valves -A- and -B- by setting lever at right angle to direction of flow.

– Connect hose -3- to compressed air.

- Pressure: 6 ... 10 bar.



- Open valve -B- by setting lever in direction of flow.

The suction jet pump generates a partial vacuum in the cooling system.

- The needle on the gauge should move into the green zone.
- Also briefly open valve -A- (turn lever in direction of flow) so that hose on reservoir -VAS 6096/1- can fill with coolant.
- Close valve -A- again.
- Leave valve -B- open for another 2 minutes.
- The suction jet pump will continue generating a vacuum in the cooling system.
- The needle on the gauge should remain in the green zone.
- Close valve -B-.
- The needle on the gauge should stop in the green zone.
The vacuum level in the cooling system is then sufficient for subsequent filling.

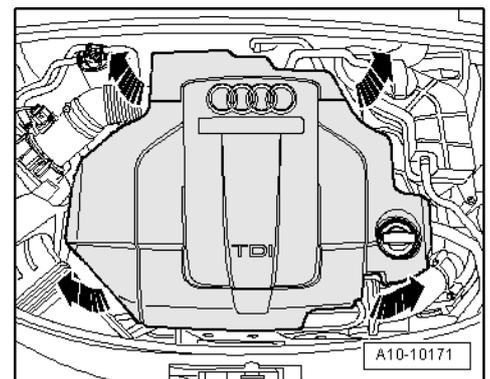
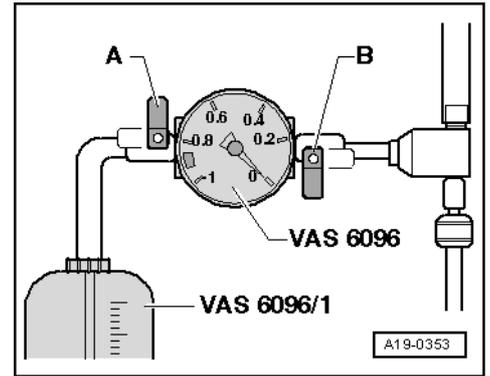
If the needle does not reach the green zone, repeat the process.

If the vacuum level drops, there is a leak in the cooling system.

- Detach compressed air hose.
- Open valve -A-.

The partial vacuum in the cooling system causes the coolant to be drawn up out of the reservoir -VAS 6096/1-; the cooling system is then filled.

- Detach cooling system charge unit -VAS 6096- from expansion tank.
- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.

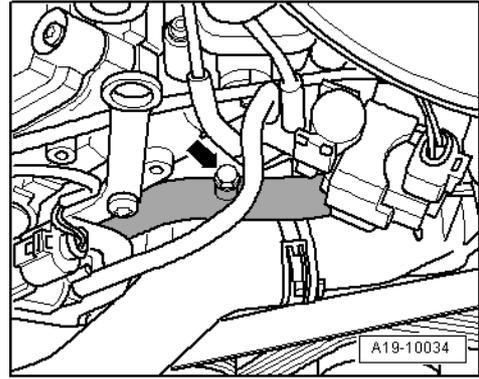




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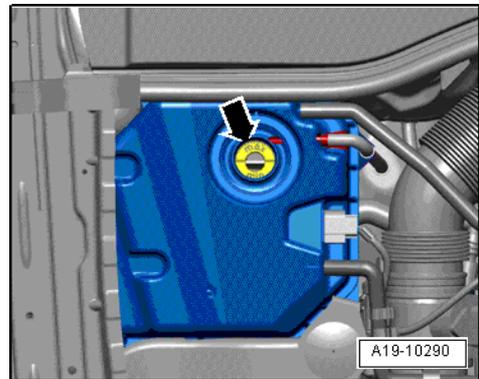
Audi 6-cylinder TDI engine (3.0 ltr. 4-valve common rail), mechanics 01.2006

- Unscrew bleeder screw -arrow- at front of engine.
- Fill up with coolant until it comes out at bleeder hole with no air bubbles.
- Close the bleeder screw.
- On vehicles with auxiliary heater, switch heater on (for about 30 seconds) and then off again.
- Tighten filler cap on expansion tank.
- Start engine.
- Set heater/air conditioner (front and rear) to "HI".
- Run the engine for 3 minutes at 2000 rpm.
- Allow the engine to run at idling speed until the two large coolant hoses at main radiator become warm.
- Run the engine for 1 minute at 2000 rpm.
- Switch off ignition and allow to cool down.
- Check coolant level.
- The coolant level must be at the MAX marking -arrow- when the engine is cold.
- The coolant level can be above the MAX marking when the engine is warm.



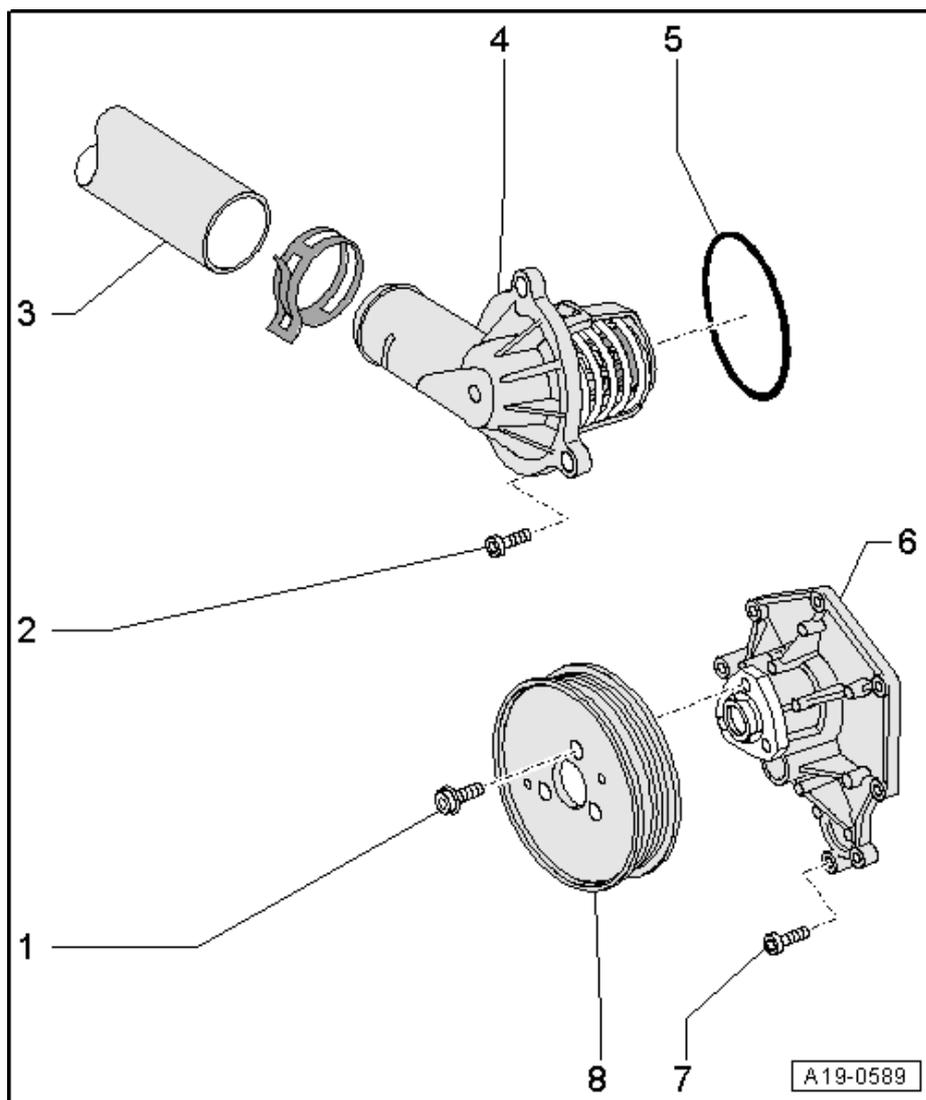
Tightening torque

Component	Nm
Bleeder screw to coolant pipe	8



1.3 Coolant pump and thermostat - exploded view of components

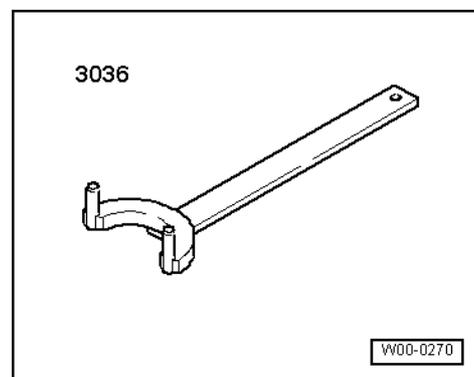
- 1 - 22 Nm
- 2 - 9 Nm
- 3 - Coolant hose
 - To radiator (bottom right)
- 4 - Hose connection with thermostat
 - Removing and installing ⇒ [page 171](#)
- 5 - Seal
 - Renew
- 6 - Coolant pump
 - Removing and installing ⇒ [page 167](#)
- 7 - 9 Nm
- 8 - Poly V-belt pulley for coolant pump
 - Installation position: marking "vorne" (front) faces in direction of travel.



1.4 Removing and installing coolant pump

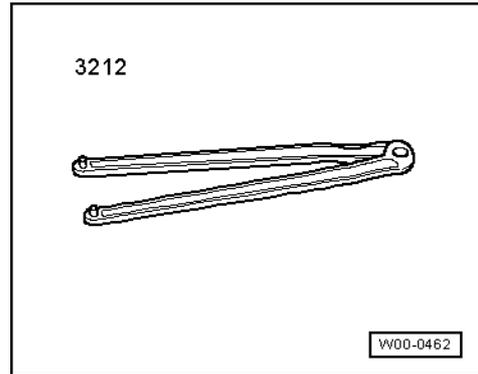
Special tools and workshop equipment required

- ◆ Counterhold tool -3036-



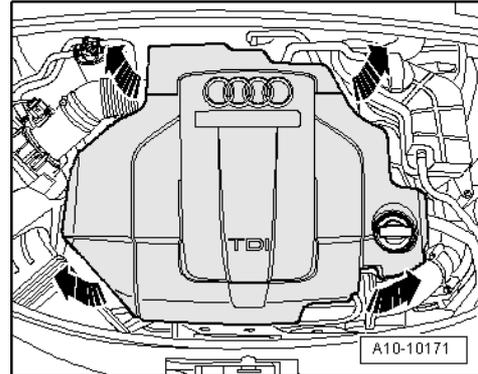


- ◆ 2-hole pin wrench -3212-



Removing

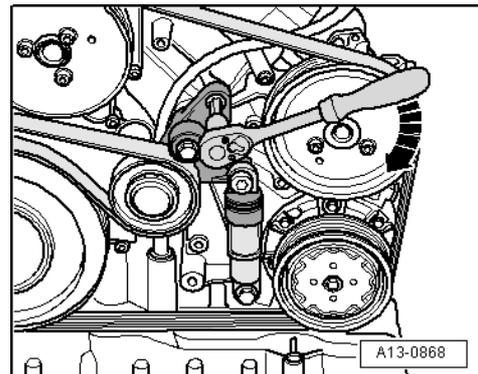
- Drain off coolant ⇒ [page 161](#).
- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



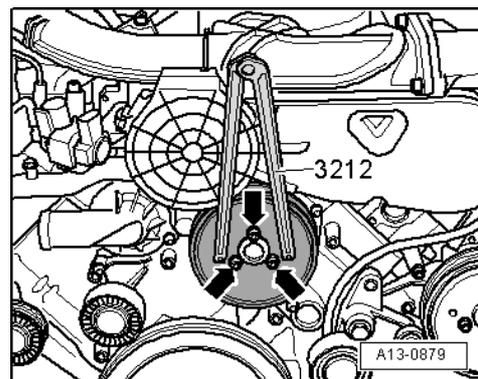
Note

Before removing, mark direction of rotation of poly V-belt with chalk or felt-tipped pen. If the belt runs in the opposite direction when it is refitted, this can cause breakage.

- Slacken poly V-belt by swivelling tensioner in direction of -arrow-, using a lever with TORX 60 bit.
- Remove poly V-belt from tensioning roller.



- Unbolt poly V-belt pulley from coolant pump -arrows- (counterhold with 2-hole pin wrench -3212-).



- Unscrew bolts and take out coolant pump -arrow-.

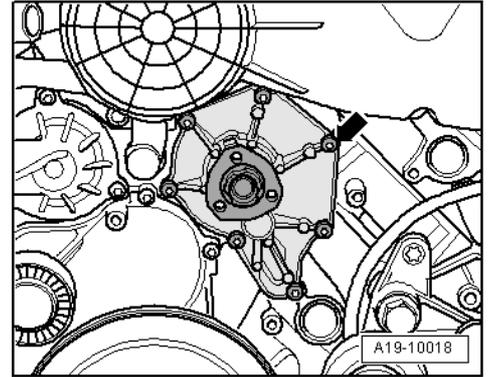
Installing

Installation is carried out in the reverse order; note the following:

- Clean sealing surface.
- Install poly V-belt ⇒ [page 39](#).
- Fill cooling system ⇒ [page 162](#).

Tightening torques

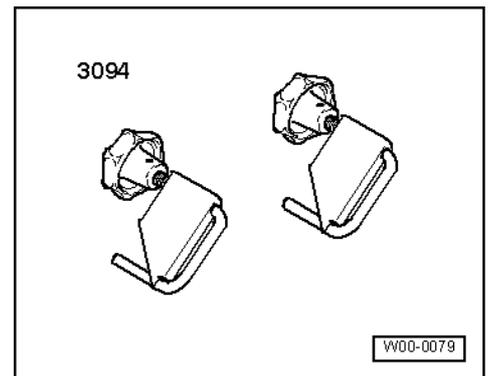
Component	Nm
Coolant pump to cylinder block	9
Poly V-belt pulley to coolant pump	22



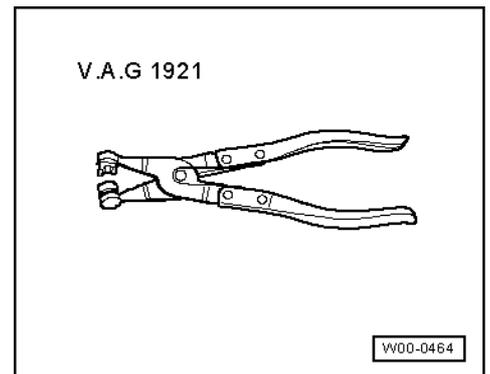
1.5 Removing and installing continued coolant circulation pump -V51-

Special tools and workshop equipment required

- ◆ Hose clamps for hoses up to 25 mm Ø -3094-



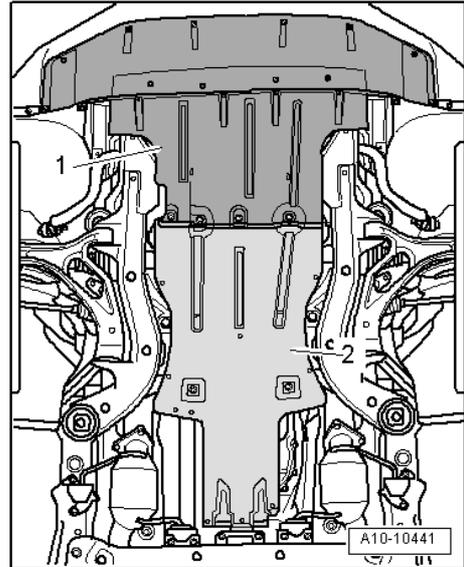
- ◆ Hose clip pliers -V.A.G 1921-



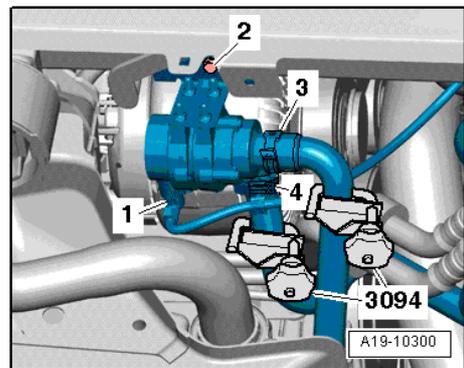


Removing

- Unscrew bolts and remove front noise insulation -1-.



- Unplug electrical connector -1- at continued coolant circulation pump -V51-.
- Clamp off hoses -3- and -4- using hose clamps -3094- and detach from continued coolant circulation pump -V51-.
- Unscrew bolt -2- and remove continued coolant circulation pump -V51-.



Installing

Installation is carried out in the reverse order; note the following:

i Note

Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue.

- Check coolant level ⇒ [page 166](#).

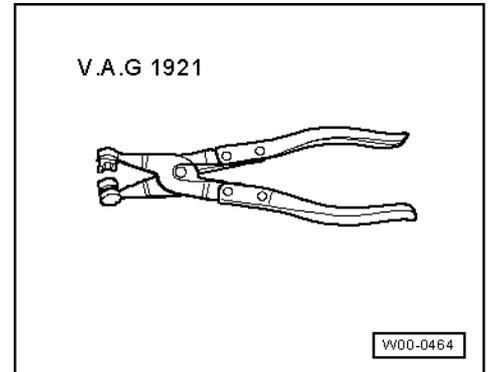
Tightening torques

Component	Nm
Bracket for continued coolant circulation pump -V51- to longitudinal member	22

1.6 Removing and installing hose connection with thermostat

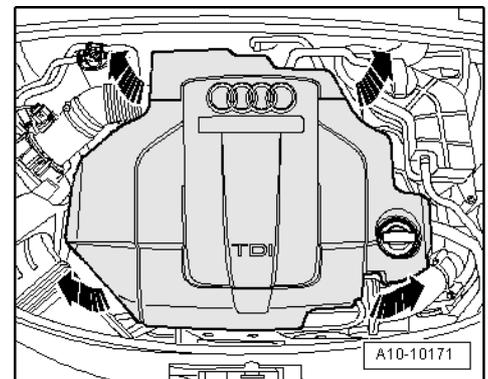
Special tools and workshop equipment required

- ◆ Hose clip pliers -V.A.G 1921-



Removing

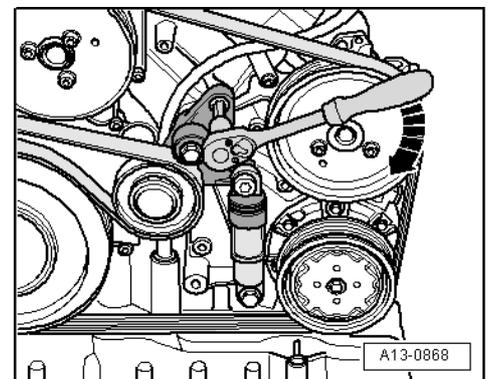
- Drain off coolant ⇒ [page 161](#).
- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



Note

Before removing, mark direction of rotation of poly V-belt with chalk or felt-tipped pen. If the belt runs in the opposite direction when it is refitted, this can cause breakage.

- Slacken poly V-belt by swivelling tensioner in direction of -arrow-, using a lever with TORX 60 bit.
- Remove poly V-belt from tensioning roller.



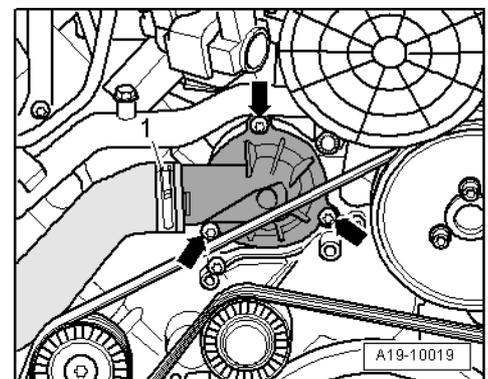
- Detach coolant hose -1-.
- Unscrew bolts -arrows- and take out hose connection with thermostat.

Installing

Installation is carried out in the reverse order; note the following:

Note

- ◆ Renew O-ring.
- ◆ Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ [Parts catalogue](#).
- Clean sealing surface.





- Install poly V-belt ⇒ [page 39](#).
- Fill cooling system ⇒ [page 162](#).

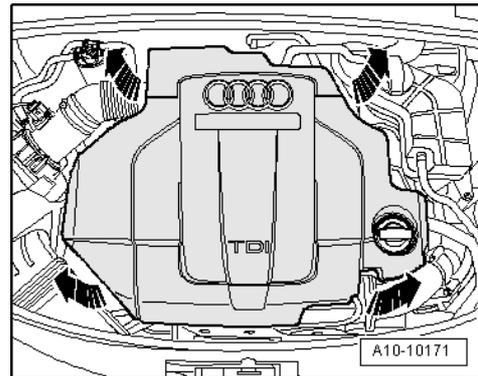
Tightening torque

Component	Nm
Hose connection with thermostat to engine	9

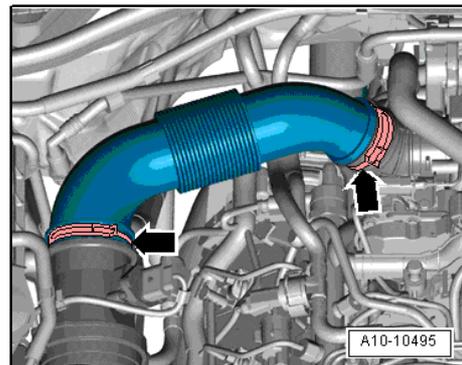
1.7 Removing and installing coolant temperature sender -G62-

Removing

- Drain off coolant ⇒ [page 161](#).
- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



- Remove air intake hose -arrows-.



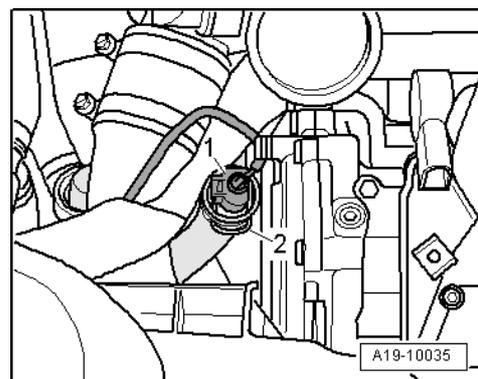
- Unplug electrical connector -1- at coolant temperature sender -G62-.
- Detach retaining clip -2- and remove coolant temperature sender -G62-.

Installing

Installation is carried out in the reverse order; note the following:

i Note

- ◆ *Renew O-ring.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue.*
- Fill cooling system ⇒ [page 162](#).



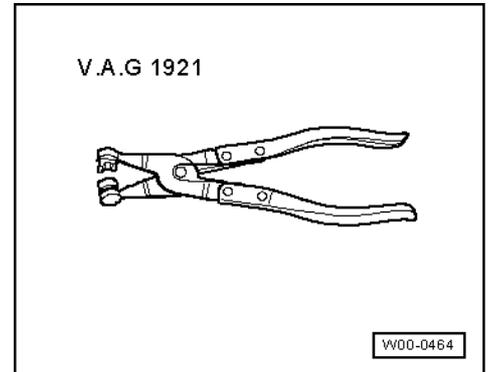
1.8 Removing and installing coolant pipe (front)

Special tools and workshop equipment required

- ◆ Hose clip pliers -V.A.G 1921-

Removing

- Drain off coolant ⇒ [page 161](#).
- Remove intake manifold (top section) ⇒ Rep. Gr. 23.
- Remove toothed belt for high-pressure pump ⇒ [page 48](#).
- Remove high-pressure pump ⇒ Rep. Gr. 23.



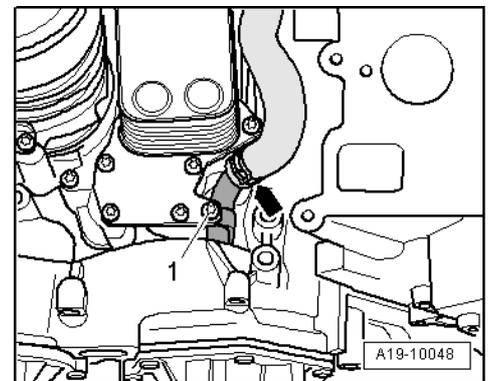
- Disconnect coolant hose -arrow-.
- Unscrew bolt -1- and pull coolant pipe (top) out of cylinder block.

Installing

Installation is carried out in the reverse order; note the following:

Note

- ◆ *Renew O-ring.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue.*
- Before installing, clean and smoothen sealing surface for O-ring.
- Lubricate new O-ring with "G12 +" and slide onto coolant pipe.
- Install high-pressure pump ⇒ Rep. Gr. 23.
- Install toothed belt for high-pressure pump ⇒ [page 48](#).
- Install intake manifold (top section) ⇒ Rep. Gr. 23.
- Fill cooling system ⇒ [page 162](#).



Tightening torque

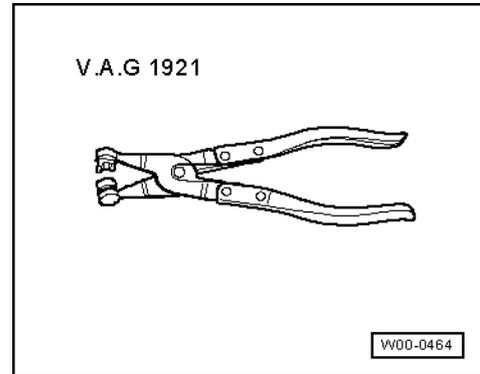
Component	Nm
Front coolant pipe to oil cooler	9



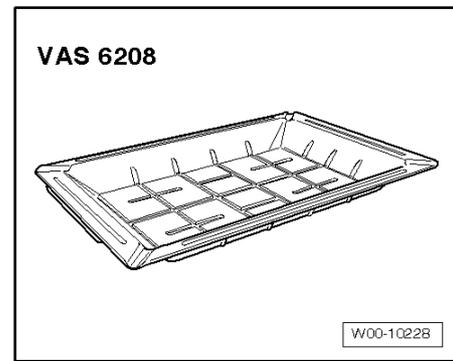
1.9 Removing and installing coolant pipe (left-side)

Special tools and workshop equipment required

- ◆ Hose clip pliers -V.A.G 1921-

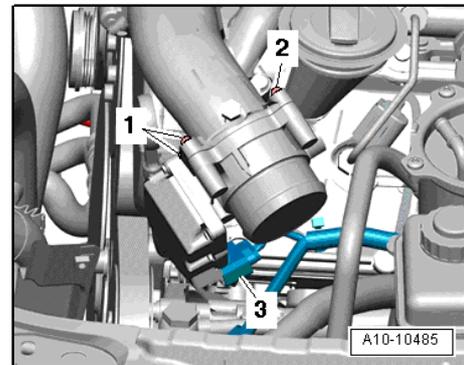


- ◆ Drip tray for workshop hoist -VAS 6208-



Removing

- Remove power steering pump ⇒ Rep. Gr. 48.
- Remove air conditioner compressor ⇒ Rep. Gr. 87.
- Unplug electrical connector -3-.
- Remove bolts -1- and -2- and detach throttle valve module -J338- from intake connecting pipe.



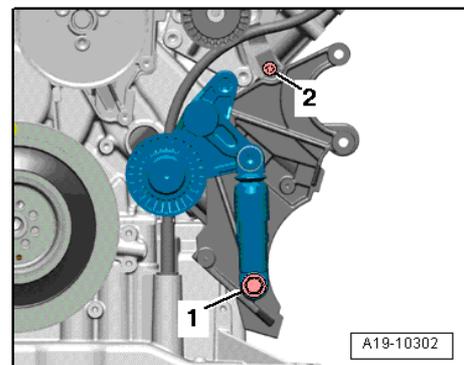
- Remove bolt -2- at guide tube for oil dipstick.
- Remove bolt -1- for poly V-belt tensioner.



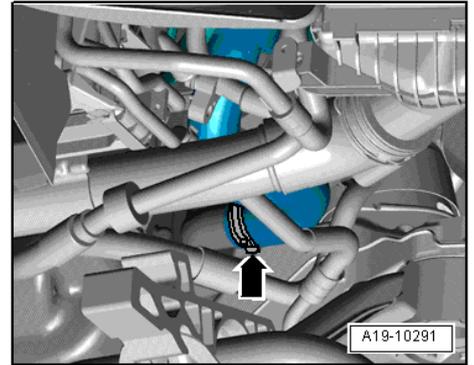
WARNING!

Hot steam or hot coolant can escape when expansion tank is opened; cover filler cap with cloth and open carefully.

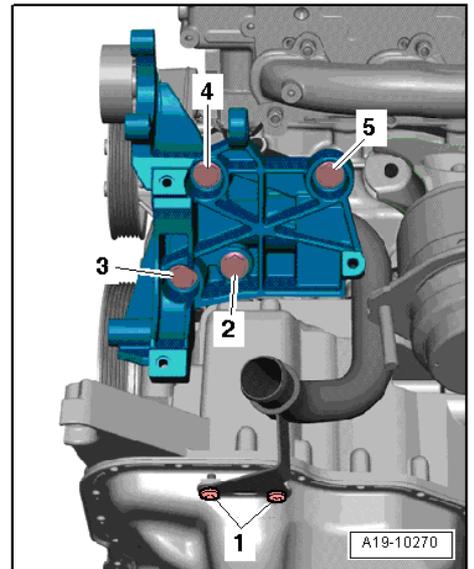
- Open filler cap on coolant expansion tank.



- Place drip tray for workshop hoist -VAS 6208- under engine.
- Disconnect coolant hose -arrow- from coolant pipe (left-side) and drain off coolant.



- Unscrew bolts -1 ... 5- and remove bracket for ancillaries.



- Unscrew bolt -arrow- and remove coolant pipe (left-side) from bracket for ancillaries.

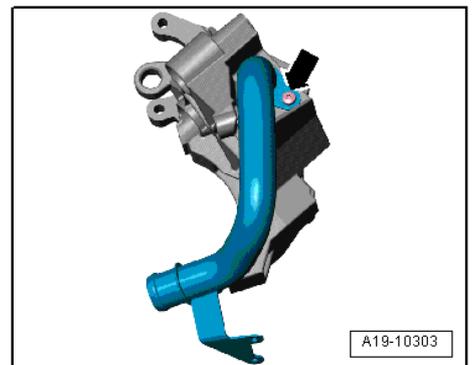
Installing

Installation is carried out in the reverse order; note the following:



Note

- ◆ *Renew seal and O-ring.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue.*
- Before installing, clean and smoothen sealing surface for seal and O-ring.
- Lubricate new seal and new O-ring with "G12 +" and slide onto coolant pipe.
- Install air conditioner compressor ⇒ Rep. Gr. 87.
- Install power steering pump ⇒ Rep. Gr. 48.
- Fill cooling system ⇒ [page 162](#).



Tightening torques

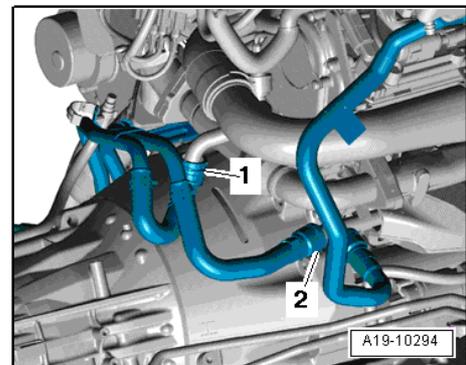


Component		Nm
Coolant pipe (top) to:	Bracket for ancillaries	9
	Sump (top section)	9
Bracket for ancillaries to cylinder block		40
Tensioner for poly V-belt to bracket for ancillaries		25
Guide tube for oil dipstick to bracket for ancillaries		9
Throttle valve module -J338- to intake connecting pipe		9

1.10 Removing and installing coolant pipes (rear left)

Removing

- Drain off coolant ⇒ [page 161](#).
- Remove starter catalytic converter ⇒ [page 204](#).
- Detach coolant hoses -1- and -2- at right of engine.



- Remove bolts -1- and -2-.
- Detach both coolant pipes (rear left) together with coolant hoses.

Installing

Installation is carried out in the reverse order; note the following:

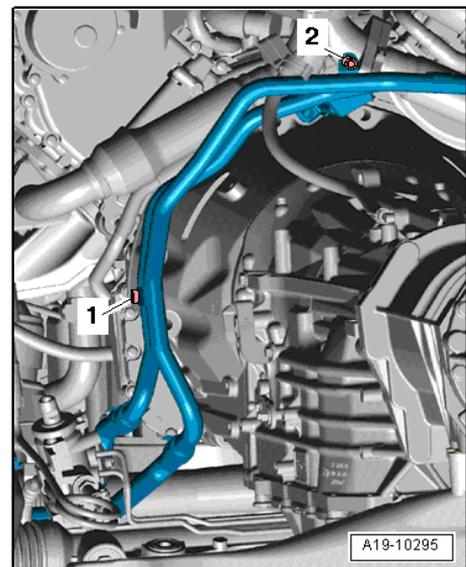
Note

Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ [Parts catalogue](#).

- Install starter catalytic converter ⇒ [page 204](#).
- Fill cooling system ⇒ [page 162](#).

Tightening torques

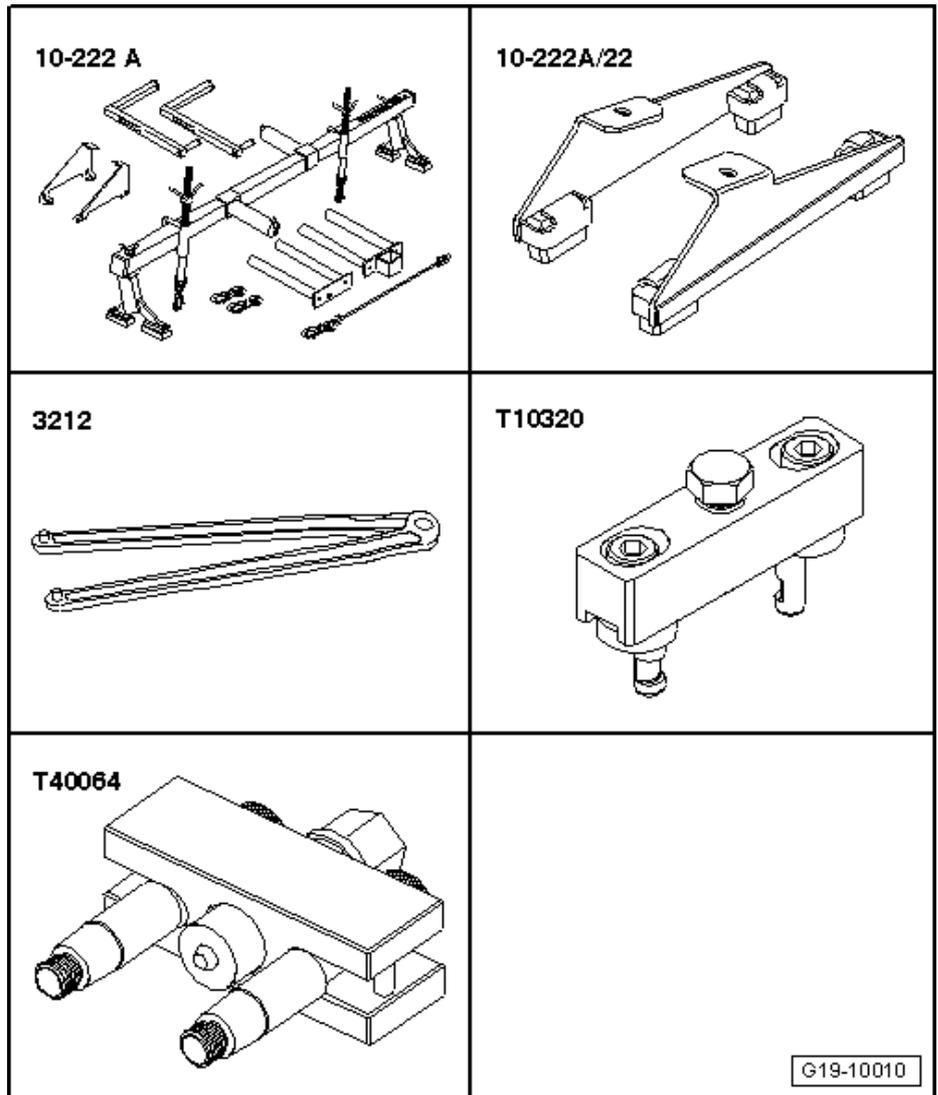
Component	Nm
Coolant pipe (rear left) to gearbox	9



1.11 Removing and installing coolant pipe (right-side)

Special tools and workshop equipment required

- ◆ Support bracket -10-222 A-
- ◆ Adapter -10-222 A /22-
- ◆ 2-hole pin wrench -3212-
- ◆ Puller -T10320-
- ◆ Puller -T40064-



Removing

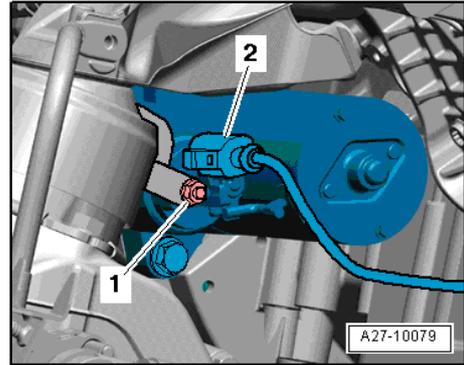
 **Caution!**

Observe notes on procedure for disconnecting the battery
⇒ **Electrical system; Rep. Gr. 27.**

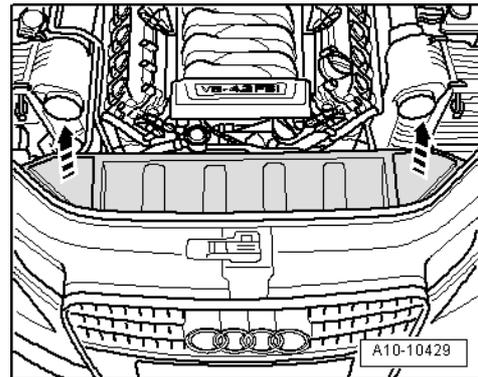
- Disconnect earth wire at battery with ignition switched off.
- Drain off coolant ⇒ [page 161](#).
- Remove alternator ⇒ Rep. Gr. 27.



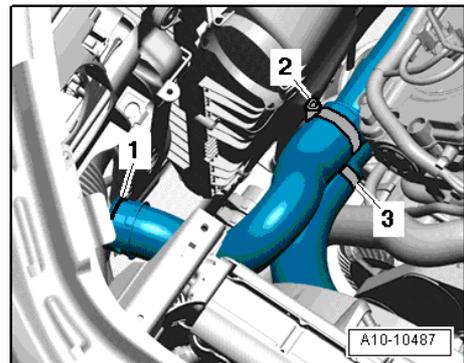
- Unplug electrical connector -2-.
- Unscrew B+ wiring -1-.



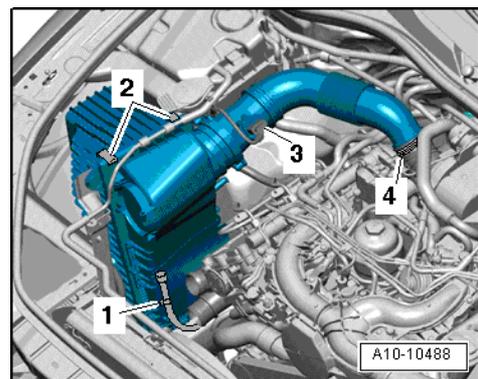
- Detach cover above radiator -arrows-.



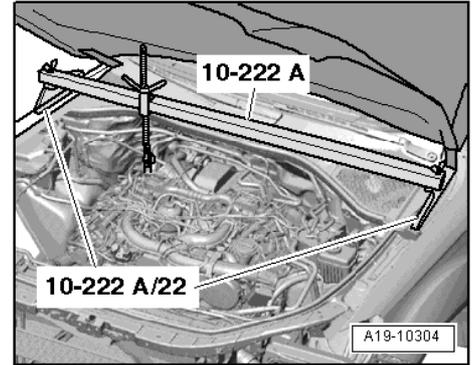
- Detach air intake hose (top) at the connections marked -1- and -2-.
- Detach air intake hose (bottom) -3-.



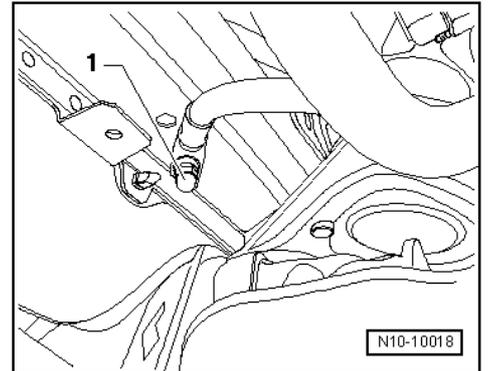
- Unclip differential breather hose -1- from air cleaner housing (top section).
- Unplug electrical connector -3- at air mass meter -G70-.
- Detach air intake hose -4- from turbocharger.
- Release retaining clips -2- and detach top section of air cleaner housing.



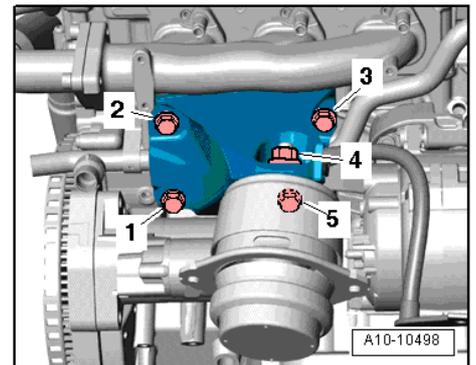
- Set up support bracket -10-222 A- on wing panel flanges.
- The spindle is located at the front.
- Attach spindle of support bracket -10-222 A- to rear right engine lifting eye.
- Take up weight of engine using spindle of support bracket.



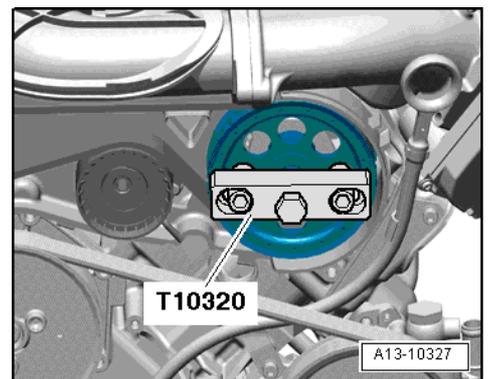
- Unbolt earth connection -1- at longitudinal member (right-side).



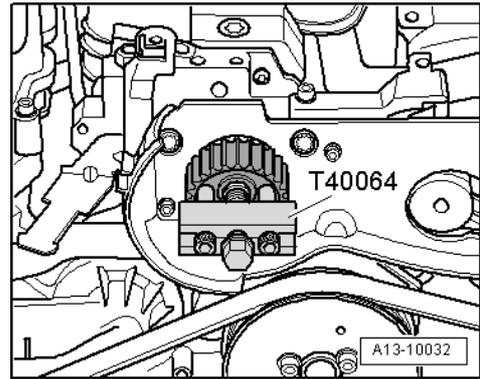
- Unscrew bolts and nuts -1 ... 5- and lift off engine support (right-side).



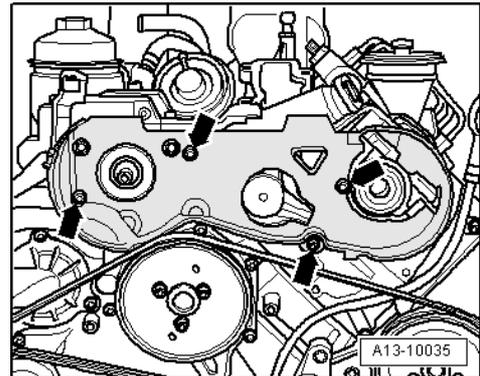
- Remove toothed belt for high-pressure pump => [page 48](#).
- Use puller -T10320- to pull off toothed belt drive sprocket.



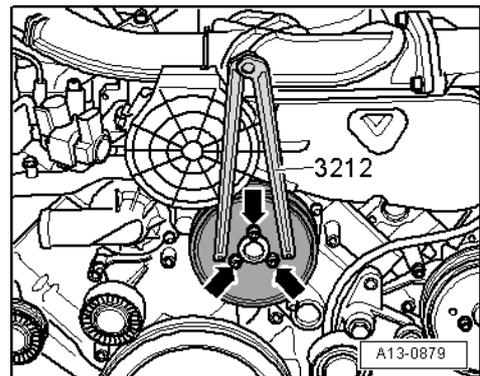
- Use puller -T40064- to pull off belt sprocket for high-pressure pump.



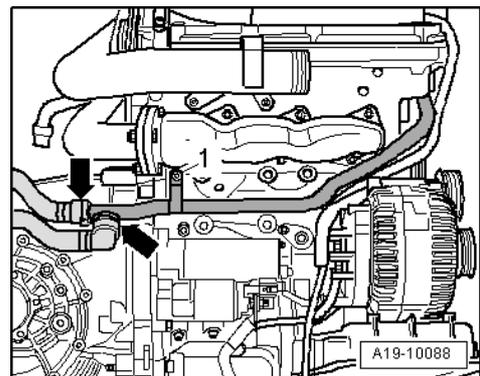
- Remove bolts -arrows- and detach toothed belt cover (rear).



- Unbolt poly V-belt pulley from coolant pump -arrows- (counterhold with 2-hole pin wrench -3212-).



- Remove bolt -1-.
- Disconnect coolant hoses from coolant pipe (right-side) -arrows-.



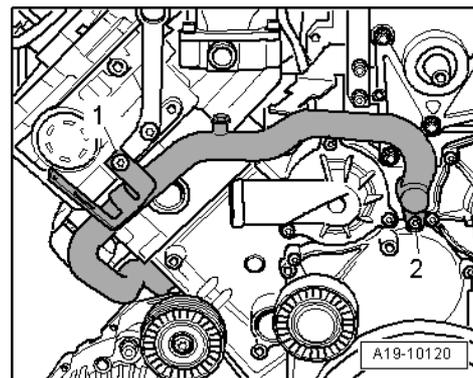
- Remove bolts -1- and -2-.
- Pull coolant pipe (right-side) towards front and out of cylinder block and remove.

Installing

Installation is carried out in the reverse order; note the following:

Note

- ◆ *Renew O-rings.*
- ◆ *Hose connections and hoses for charge air system must be free of oil and grease before assembly.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue.*
- Before installing, clean and smoothen sealing surface for O-ring.
- Lubricate new O-ring with "G12 +" and slide onto coolant pipe.
- Install toothed belt for high-pressure pump ⇒ [page 48](#).
- Remove alternator ⇒ Rep. Gr. 27.
- Install poly V-belt ⇒ [page 39](#).
- Observe notes on procedures required after connecting battery ⇒ Rep. Gr. 27.
- Fill cooling system ⇒ [page 162](#).



Tightening torques

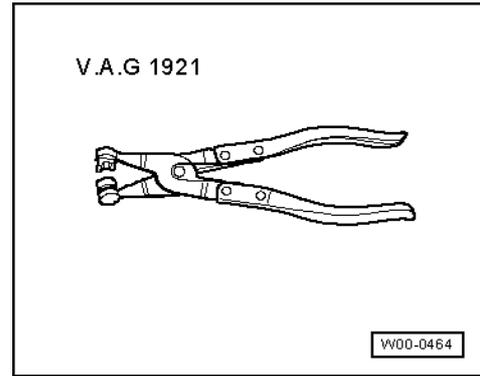
Component	Nm	
Coolant pipe (right-side) to engine	9	
Poly V-belt pulley to coolant pump	22	
Toothed belt cover (rear) to:	cylinder head	9
	mounting bracket	9
Toothed belt sprocket to high-pressure pump	70	
Toothed belt sprocket to camshaft	75	
Engine support to cylinder block	60	
Engine support to engine mounting	75	
Battery plus (+) cable to starter	16	
Hose clips	Width 9 mm	3
	Width 13 mm	5.5

1.12 Removing and installing coolant pipe (rear right)

Special tools and workshop equipment required

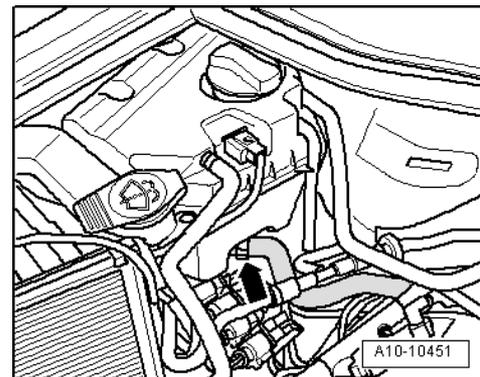
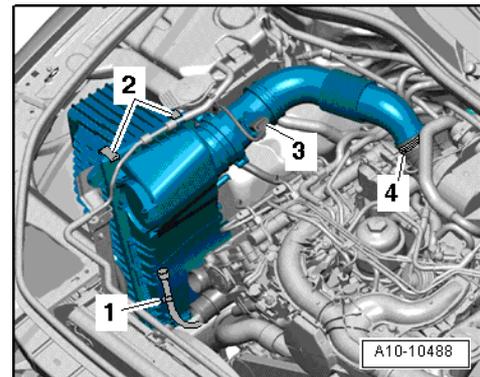
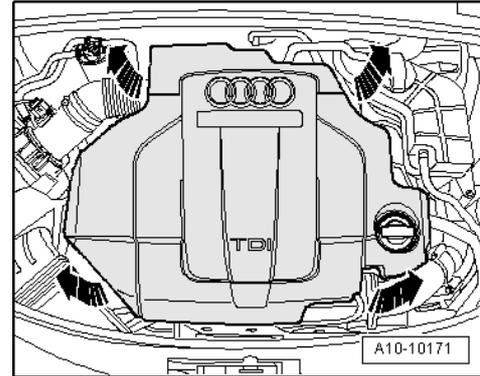


- ◆ Hose clip pliers -V.A.G 1921-

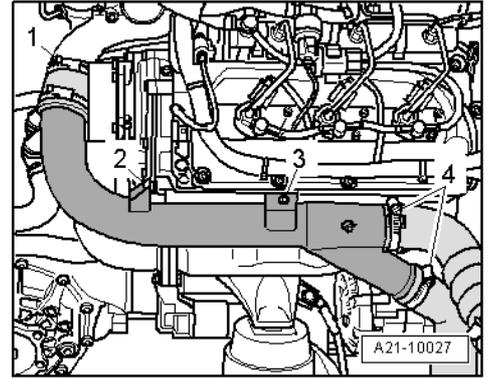


Removing

- Drain off coolant ⇒ [page 161](#).
- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.
- Unclip differential breather hose -1- from air cleaner housing (top section).
- Unplug electrical connector -3- at air mass meter -G70-.
- Detach air intake hose -4- from turbocharger.
- Release retaining clips -2- and detach top section of air cleaner housing.
- Detach coolant hose -arrow- at coolant expansion tank.



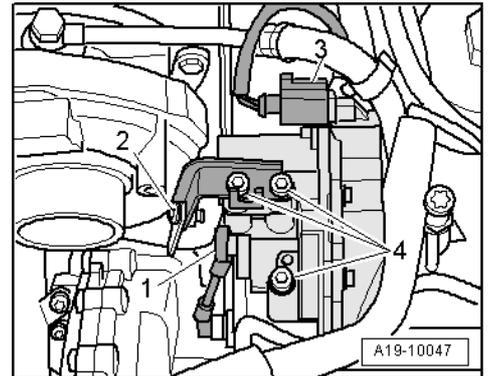
- Remove bolts -2- and -3-.
- Detach air pipe from hoses -1- and -4- and remove pipe downwards.



- Detach electrical connector -3- at intake manifold flap motor -V157-.
- Remove bolts -2- and -4- and move intake manifold flap motor -V157- clear to the side (with connecting rod installed).

i Note

In order to prevent damage to the intake manifold flap motor -V157-, the connecting rod -1- is not detached.



- Unplug electrical connector -1- at coolant temperature sender -G62-.
- Remove bolt -2-.
- Disconnect coolant hoses -arrows- and take out coolant pipe (rear).

Installing

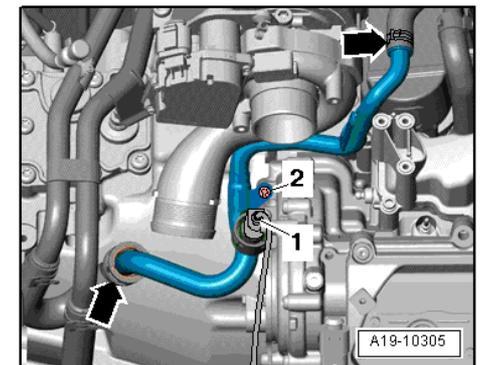
Installation is carried out in the reverse order; note the following:

i Note

- ◆ *Renew O-rings.*
- ◆ *Hose connections and hoses for charge air system must be free of oil and grease before assembly.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue.*

- Fill cooling system ⇒ [page 162](#).

Tightening torques



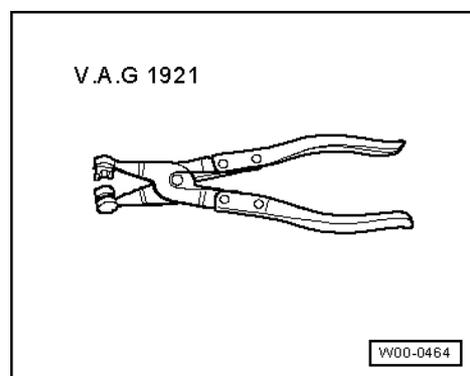


Component		Nm
Coolant pipe to cylinder head		9
Bracket to cylinder head		9
Intake manifold flap motor -V157- to intake manifold (bottom section)		9
Air pipe to engine lifting eye		9
Air pipe to bracket		9
Hose clips	Width 9 mm	3
	Width 13 mm	5.5

1.13 Removing and installing radiator

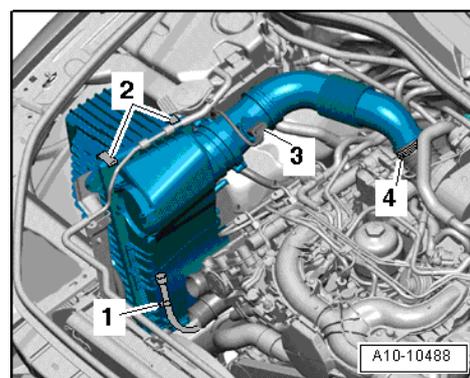
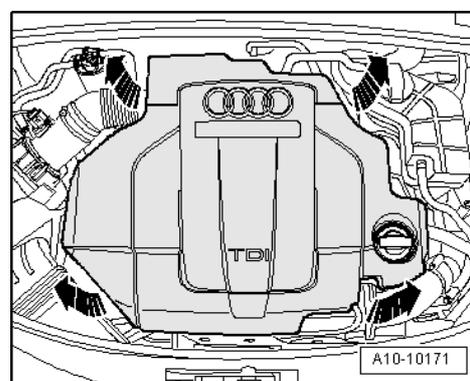
Special tools and workshop equipment required

- ◆ Hose clip pliers -V.A.G 1921-

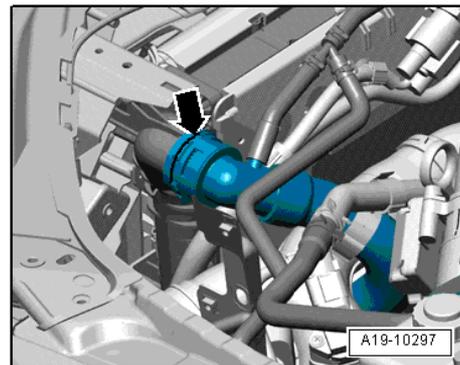


Removing

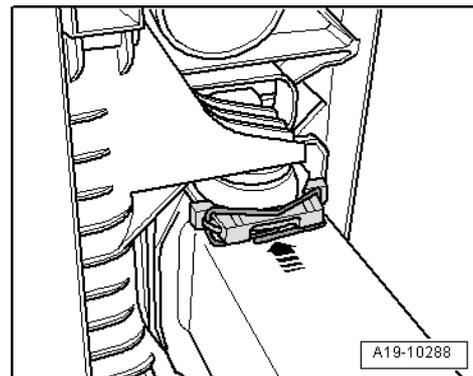
- Drain off coolant ⇒ [page 161](#).
- Remove radiator cowl ⇒ [page 189](#).
- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.
- Unclip differential breather hose -1- from air cleaner housing (top section).
- Unplug electrical connector -3- at air mass meter -G70-.
- Detach air intake hose -4- from turbocharger.
- Release retaining clips -2- and detach top section of air cleaner housing.



- Disconnect coolant hose (top) -arrow- from radiator.



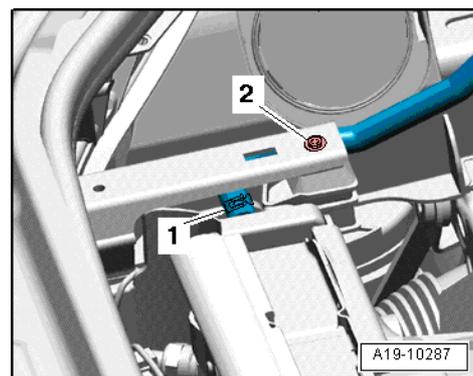
- Remove locking elements for radiator on left and right (press latch from below -arrow-).



- Unscrew bolts -2- on left and right of lock carrier.
- Disengage radiator and swivel to rear.

 **Note**

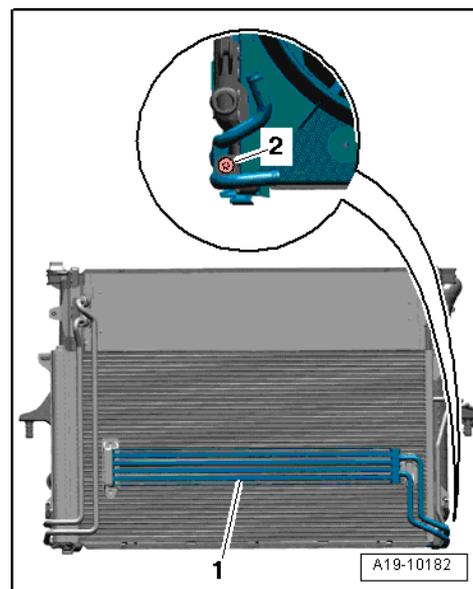
Disregard -item 1-.



- Unscrew bolt -2- on rear of radiator.
- Disengage cooler for power steering -1- at air conditioner condenser.

 **Note**

Hydraulic hoses remain connected.

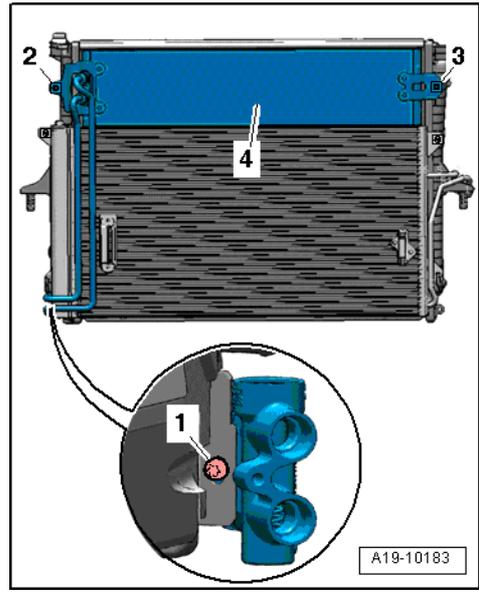




- Unscrew bolt -1- on rear of radiator.
- Press off retaining clips -2- and -3-.
- Detach ATF cooler -4- from radiator.

i Note

ATF hoses remain connected.



- Unscrew bolts -3- on rear of radiator.
- Press off retaining clips -2- and -4-.
- Detach air conditioner condenser -1- from radiator.

i Note

- ♦ *Refrigerant lines remain connected.*
- ♦ *To prevent damage to the refrigerant lines, ensure that the pipes and hoses are not stretched, kinked or bent.*

- Lift out radiator from above.

Installing

Installation is carried out in the reverse order; note the following:

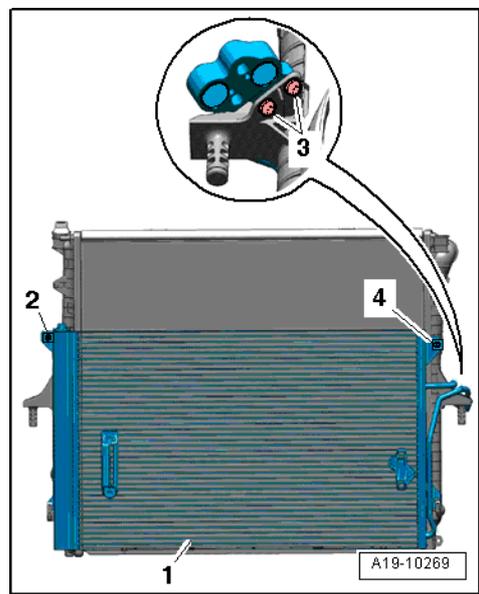
i Note

- ♦ *Hose connections and hoses for charge air system must be free of oil and grease before assembly.*
- ♦ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue.*

- Install radiator cowl ⇒ [page 189](#).
- Fill cooling system ⇒ [page 162](#).

i Note

The coolant in the entire system must be changed if the radiator is renewed.



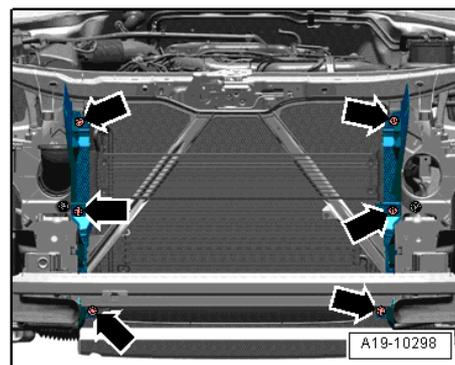
Tightening torques

Component	Nm
Condenser to radiator	9
ATF cooler to radiator	9
Cooler for power steering to radiator	9
Radiator to lock carrier	6.5

1.14 Removing and installing fuel cooler

Removing

- Drain off coolant ⇒ [page 161](#).
- Remove bumper cover (front) ⇒ Rep. Gr. 63.
- Remove air duct (left and right) -arrows-.



- Remove bolts -2 ... 5- and detach auxiliary radiator from coolant hoses -1- and -6-.

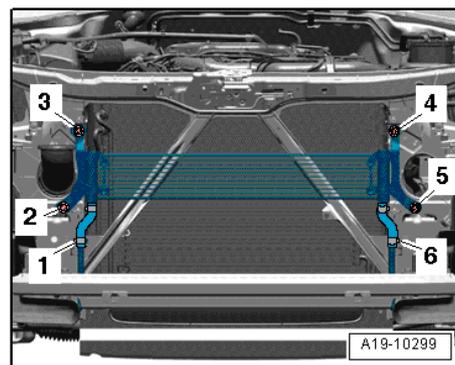
Installing

Installation is carried out in the reverse order; note the following:

Note

Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ *Parts catalogue*.

- Install bumper cover (front) ⇒ Rep. Gr. 63.
- Fill cooling system ⇒ [page 162](#).



Tightening torque

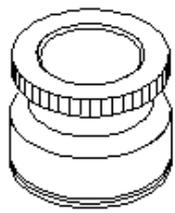
Component	Nm
Auxiliary radiator to lock carrier	4.5



1.15 Checking cooling system for leaks

Special tools and workshop equipment required

- ◆ Cooling system tester -V.A.G 1274-
- ◆ Adapter for cooling system tester -V.A.G 1274/8-
- ◆ Adapter for cooling system tester -V.A.G 1274/9-

<p>V.A.G 1274</p> 	<p>V.A.G 1274/8</p> 
<p>V.A.G 1274/9</p> 	
	<div style="border: 1px solid black; padding: 2px; width: fit-content; margin-left: auto;">G19-0002</div>

Procedure

- Engine must be warm.



WARNING!

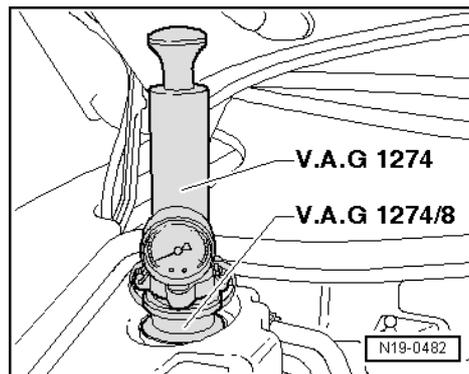
Hot steam or hot coolant can escape when expansion tank is opened; cover filler cap with cloth and open carefully.

- Open filler cap on coolant expansion tank.

- Attach cooling system tester -V.A.G 1274- with adapter -V.A.G 1274/8- to expansion tank.
- Use hand pump on cooling system tester to create a pressure of approx. 1.0 bar.

If the pressure drops:

- Trace leak and repair.

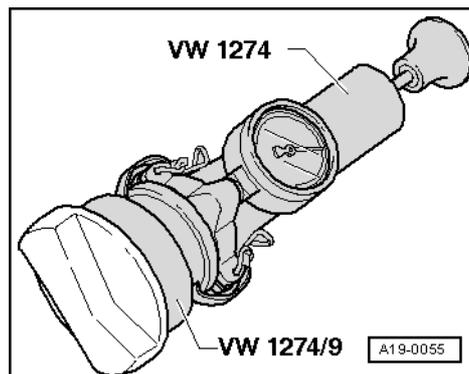


Checking pressure relief valve in filler cap

- Attach cooling system tester -V.A.G 1274- with adapter -V.A.G 1274/9- to filler cap.
- Use hand pump on cooling system tester to create pressure.
- The pressure relief valve should open at pressure of 1.4 ... 1.6 bar.

If the relief valve does not open as described:

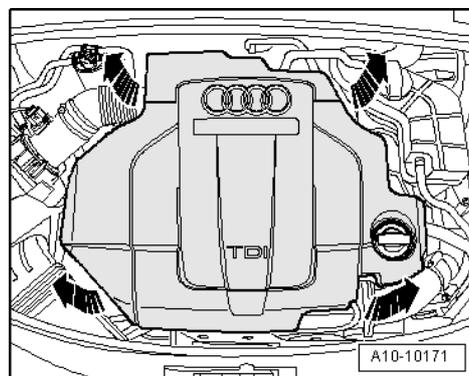
- Renew filler cap.



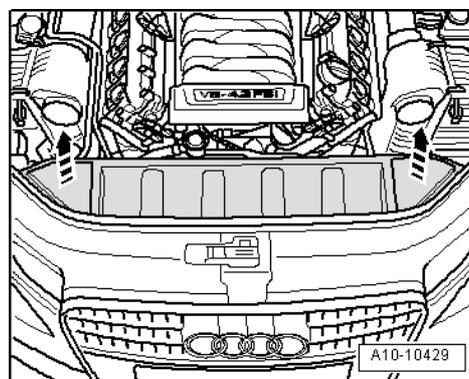
1.16 Removing and installing radiator cowl

Removing

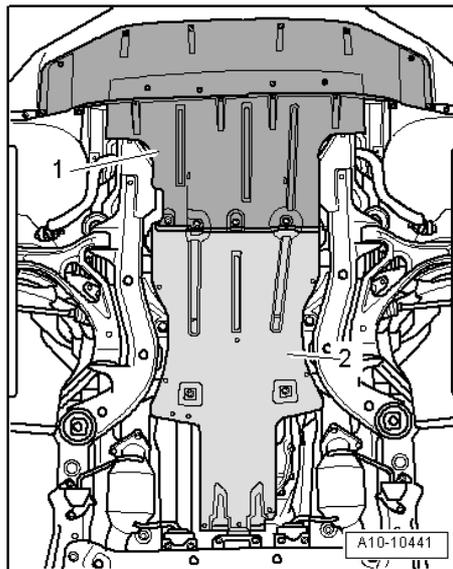
- Switch off ignition and remove ignition key.
- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



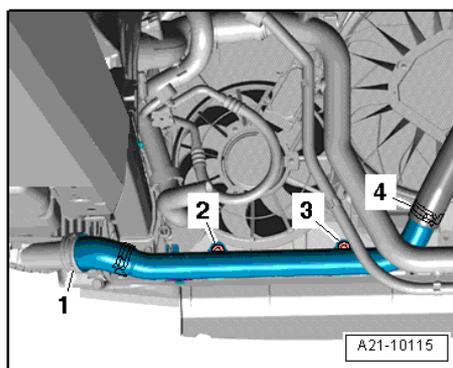
- Detach cover above radiator -arrows-.



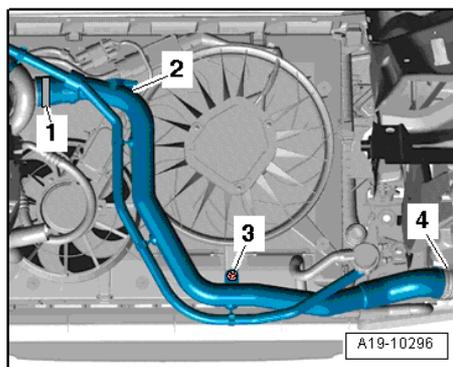
- Unscrew bolts and remove front noise insulation -1-.



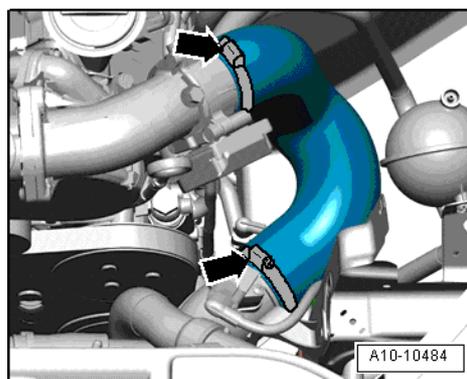
- Disconnect air intake hoses -1- and -4-.
- Unscrew bolts -2- and -3- and remove air pipe (bottom).



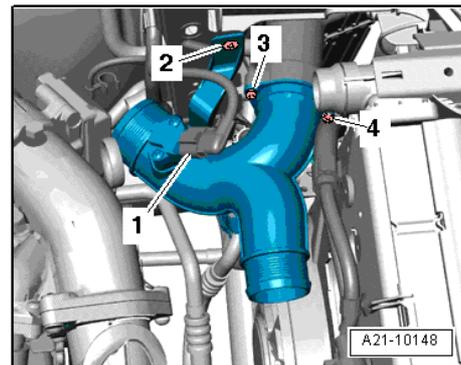
- Remove bolts -2- and -3-.
- Detach air pipe from air intake hoses -1- and -4- and remove pipe downwards.



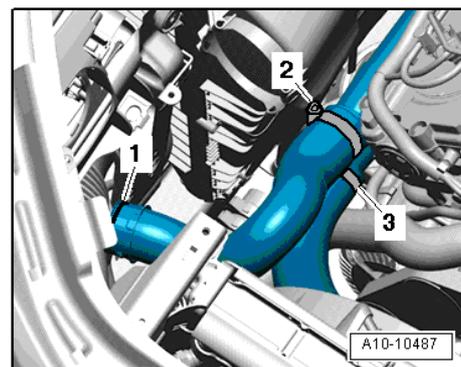
- Remove air intake hose -arrows-.



- Unplug electrical connector -1-.
- Unscrew bolts -2 ... 4- and detach air pipe from charge air cooler.



- Detach air intake hose (top) at the connections marked -1- and -2-.
- Detach air intake hose (bottom) -3-.



! WARNING!
The radiator fan can start up by itself. Therefore unplug electrical connectors before touching radiator cowl.

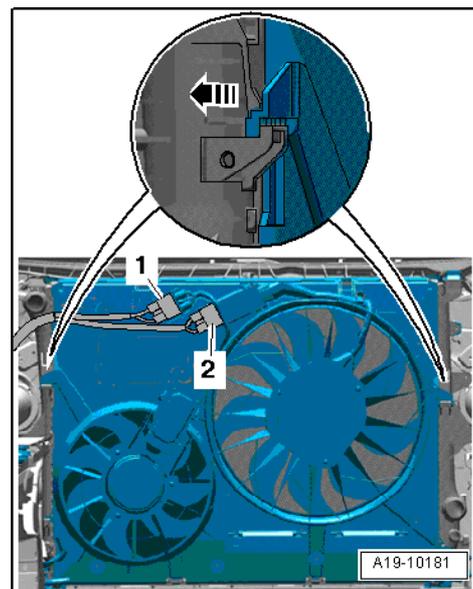
- Unplug the electrical connectors -1- and -2- and move wiring clear.
- Press locking tabs at left and right of radiator cowl and lift out radiator cowl from engine compartment.

Installing

Installation is carried out in the reverse order; note the following:

i Note

- ◆ *Hose connections and hoses for charge air system must be free of oil and grease before assembly.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue.*
- Press radiator cowl onto radiator until locking tabs engage.



Tightening torques

Component		Nm
Air pipe to charge air cooler		9
Air duct to bracket		9
Air pipe to radiator cowl		9
Hose clips	Width 9 mm	3
	Width 13 mm	5.5



1.17 Removing and installing radiator fans -V7- and -V177-

Removing

- Remove radiator cowl ⇒ [page 189](#).
- Move wiring clear.
- Remove bolts -1, 2, 3, 4, 8- and remove radiator fan 2 -V177- with radiator fan control unit 2 -J671-.
- Remove bolts -5, 6, 7- and remove radiator fan -V7- with radiator fan control unit -J293-.

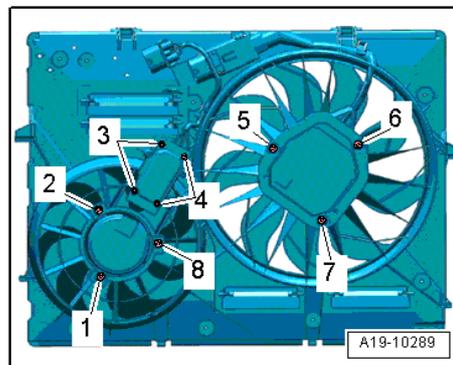
Installing

Installation is carried out in the reverse order; note the following:

- Install radiator cowl ⇒ [page 189](#).

Tightening torque

Component	Nm
Radiator fan to radiator cowl	4



21 – Turbocharging/supercharging

1 Servicing charge air system with turbocharger

1.1 Rules for cleanliness

When working on the turbocharger, pay careful attention to the following "5 rules":

- ◆ Thoroughly clean all unions and surrounding areas before disconnecting.
- ◆ Place parts that have been removed on a clean surface and cover them over. Use only lint-free cloths.
- ◆ Carefully cover or seal open components if repairs cannot be carried out immediately.
- ◆ Only install clean components; replacement parts should only be unpacked immediately prior to installation. Do not use parts that have been previously unpacked and stored away loose (e.g. in toolboxes, etc.).
- ◆ When the system is open: Do not work with compressed air if this can be avoided. Do not move the vehicle unless absolutely necessary.



1.2 Turbocharger - exploded view of components

1 - 30 Nm + 90° (1/4 turn) further

- Bolt strength rating 10.9
- Renew
- Coat with high-temperature lubricant; for high-temperature lubricant refer to ⇒ Parts catalogue
- Note tightening sequence: (left-side) ⇒ page 213, (right-side) ⇒ page 215

2 - Gasket

- Renew

3 - Intermediate flange

- Removing and installing ⇒ page 197

4 - Seal

- Renew

5 - Gasket

- Renew

6 - 9 Nm

- Coat with high-temperature lubricant; for high-temperature lubricant refer to ⇒ Parts catalogue

7 - Connecting pipe to changeover flap for exhaust gas recirculation cooler

8 - 9 Nm

9 - O-ring

- Renew

10 - Gasket

- Renew

11 - Exhaust gas temperature sender 1 -G235-

- Coat with high-temperature lubricant; for high-temperature lubricant refer to ⇒ Parts catalogue
- Tighten union nut to 25 Nm.

12 - 25 Nm

- Coat with high-temperature lubricant; for high-temperature lubricant refer to ⇒ Parts catalogue

13 - Gasket

- Renew

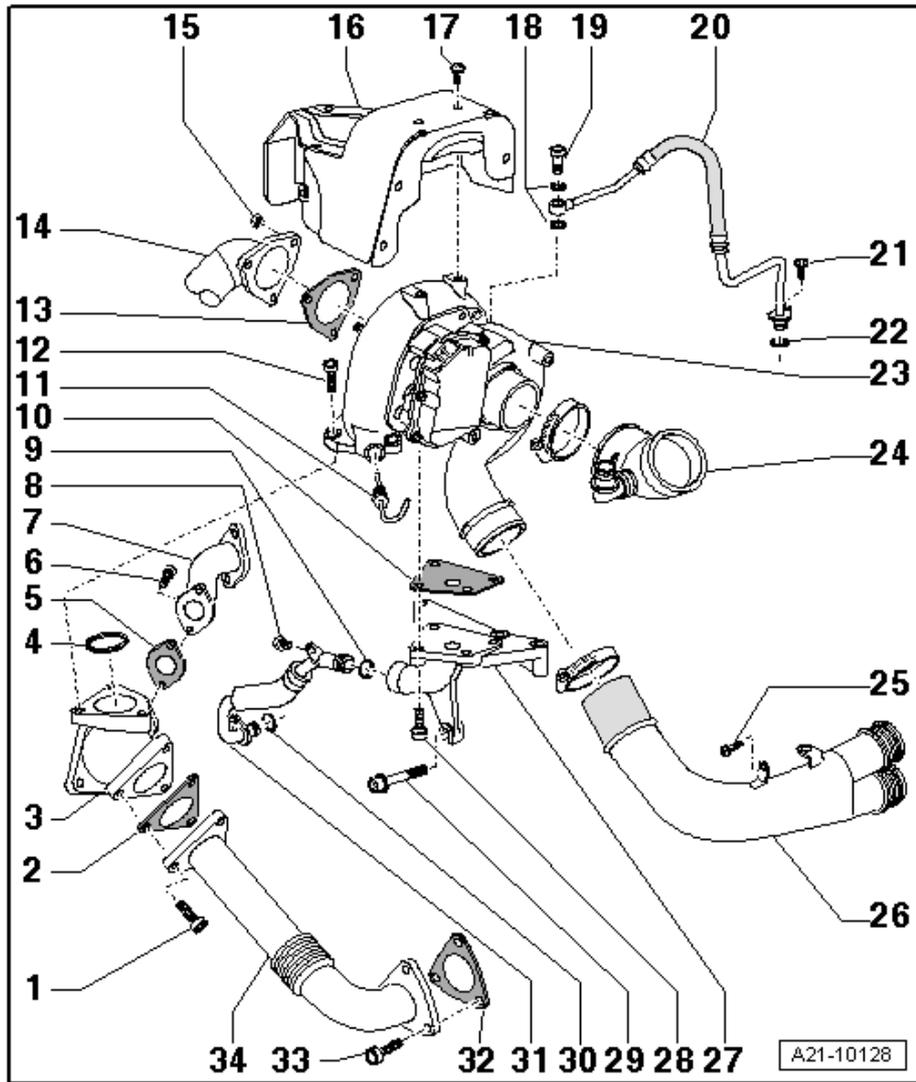
14 - Starter catalytic converter

- Removing and installing ⇒ page 204

15 - 23 Nm

- Coat with high-temperature lubricant; for high-temperature lubricant refer to ⇒ Parts catalogue

16 - Heat shield for turbocharger



- 17- 9 Nm
- 18- Seals
 - Renew
- 19- Banjo bolt, 15 Nm
- 20- Oil supply pipe
 - From cylinder block
- 21- 9 Nm
- 22- O-ring
 - Renew
- 23- Turbocharger
 - Removing and installing ⇒ [page 195](#)
- 24- Connecting piece for air intake hose
 - From air mass meter -G70- to turbocharger
 - Must be free of oil and grease when installing
- 25- 9 Nm
- 26- Air pipe (right-side)
- 27- Bracket for turbocharger
- 28- 20 Nm
 - Coat with high-temperature lubricant; for high-temperature lubricant refer to ⇒ Parts catalogue
- 29- 22 Nm
- 30- O-ring
 - Renew
- 31- Oil return pipe
 - To cylinder block
- 32- Gasket
 - Renew
- 33- 30 Nm + 90° (1/4 turn) further
 - Bolt strength rating 10.9
 - Renew
 - Coat with high-temperature lubricant; for high-temperature lubricant refer to ⇒ Parts catalogue
 - Note tightening sequence: (left-side) ⇒ [page 213](#), (right-side) ⇒ [page 215](#)
- 34- Intermediate pipe
 - Removing and installing: left-side ⇒ [page 213](#), right-side ⇒ [page 215](#)

1.3 Removing and installing turbocharger

Removing

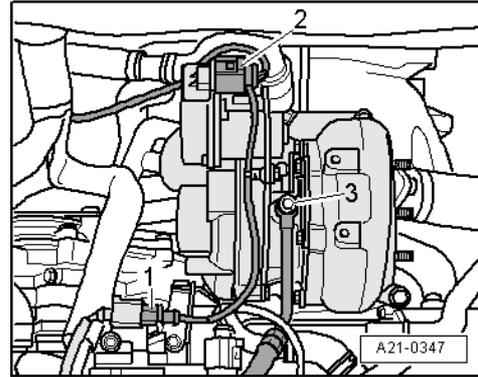
- Drain off coolant ⇒ [page 161](#).
- Remove starter catalytic converter ⇒ [page 204](#).
- Remove coolant pipe (rear right) ⇒ [page 181](#).



- Unplug electrical connector -2-.
- Remove banjo bolt -3- and disconnect oil supply pipe from turbocharger.

i Note

Disregard -item 1-.

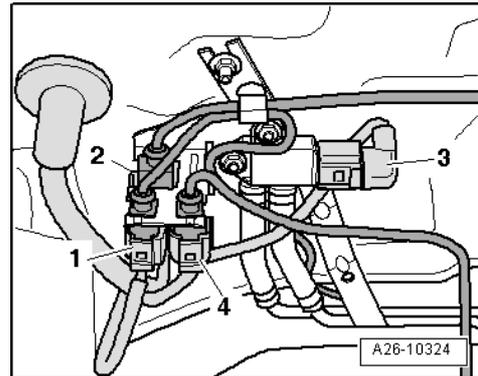


- Take electrical connector -1- for exhaust gas temperature sender 1 -G235- out of bracket.
- Unplug electrical connector and move wiring clear.

i Note

Disregard -items 2 ... 4-.

- Remove coolant pipe (rear) => [page 181](#).



- Unscrew bolts -arrows- and detach turbocharger from intermediate flange.

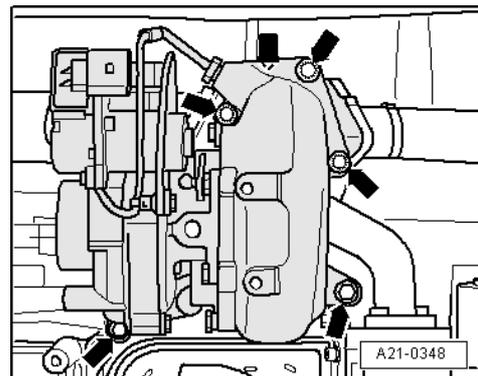
Installing

Installation is carried out in the reverse order; note the following:

i Note

- ◆ *Renew gaskets, seals and O-rings.*
- ◆ *Fill turbocharger with engine oil at connection for oil supply pipe.*
- ◆ *After installing turbocharger, allow engine to idle for approx. 1 minute and do not rev up immediately to ensure turbocharger is supplied with oil.*

- Install starter catalytic converter => [page 204](#).
- Install coolant pipe (rear) => [page 181](#).
- Fill cooling system => [page 162](#).



Tightening torques

Component		Nm
Turbocharger to:	intermediate flange	25 ¹⁾
	engine	22
Oil return line to:	turbocharger	9
	cylinder block	9
Oil supply pipe to turbocharger		15
<ul style="list-style-type: none"> • ¹⁾ Coat with high-temperature paste; refer to ⇒ Parts catalogue. 		

1.4 Removing and installing intermediate flange

Removing

- Remove starter catalytic converter ⇒ [page 204](#).
- Remove turbocharger ⇒ [page 195](#).
- Unscrew bolts -arrows- and detach intermediate flange with connecting pipe for exhaust gas recirculation.

Installing

Installation is carried out in the reverse order; note the following:

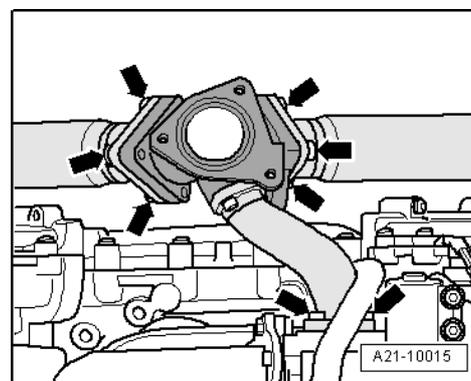
Note

Renew seals and gaskets.

- Tighten bolts securing intermediate pipe to intermediate flange as follows:
 1. Tighten with torque wrench initially to 10 Nm.
 2. Tighten with torque wrench to 30 Nm.
 3. Turn 90° (¹/₄ turn) further using a rigid wrench.
- Install turbocharger ⇒ [page 195](#).
- Install starter catalytic converter ⇒ [page 204](#).

Tightening torques

Component		Nm
EGR connecting pipe to:	intermediate flange	9 ¹⁾
	change-over flap for exhaust gas recirculation cooler	25
Intermediate pipe to intermediate flange		30 ¹⁾²⁾³⁾
<ul style="list-style-type: none"> • ¹⁾ Renew bolts. • ²⁾ 90° = one quarter turn. • ³⁾ Coat with high-temperature paste; refer to ⇒ Parts catalogue. 		





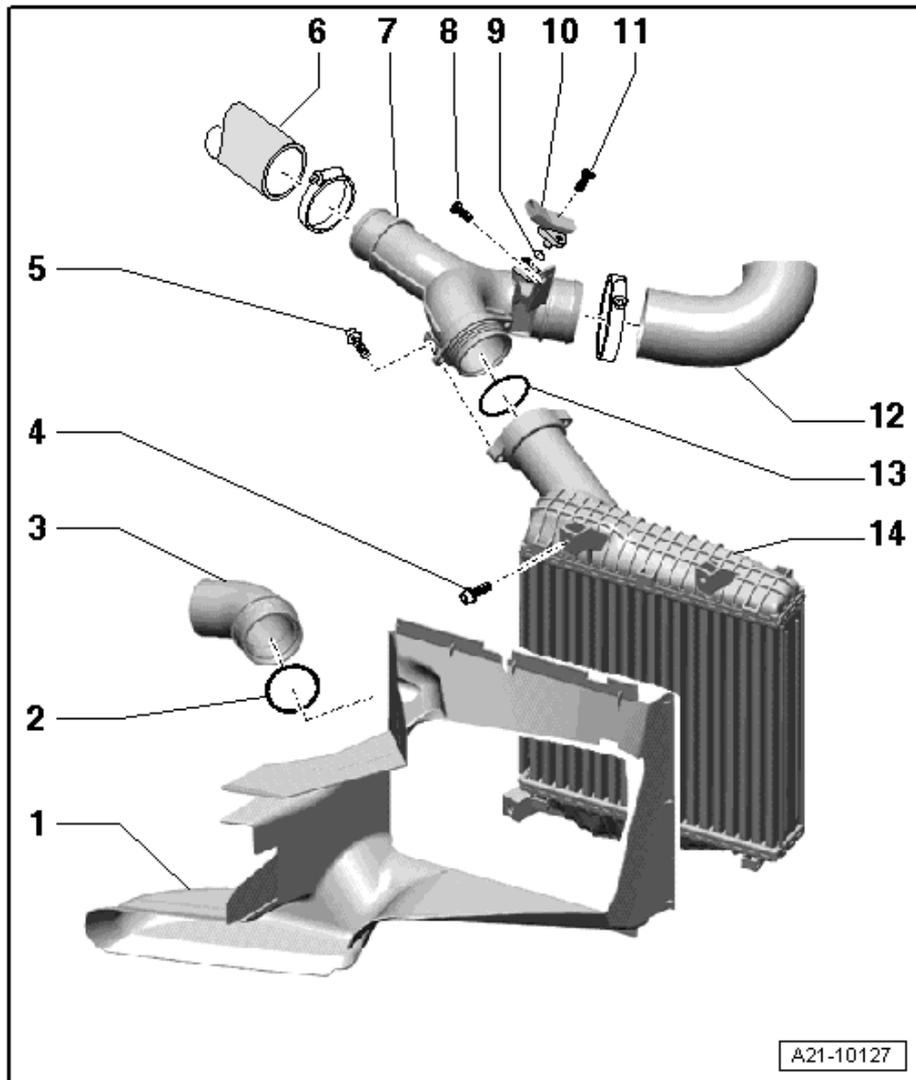
1.5 Charge air cooler - exploded view of components



Note

Illustration shows left-side charge air cooler.

- 1 - Front air duct
- 2 - Seal
 - Renew if damaged or leaking
- 3 - Air intake hose
 - To turbocharger
 - Must be free of oil and grease when installing
- 4 - 9 Nm
- 5 - 9 Nm
- 6 - Air intake hose
 - To charge air cooler (right-side)
 - Must be free of oil and grease when installing
- 7 - Connection
- 8 - 9 Nm
- 9 - O-ring
 - Renew
- 10 - Charge pressure sender -G31-
 - Removing and installing => [page 200](#)
- 11 - 5 Nm
- 12 - Air intake hose
 - To intake manifold
 - Must be free of oil and grease when installing
- 13 - O-ring
 - Renew
- 14 - Charge air cooler
 - Removing and installing => [page 199](#)



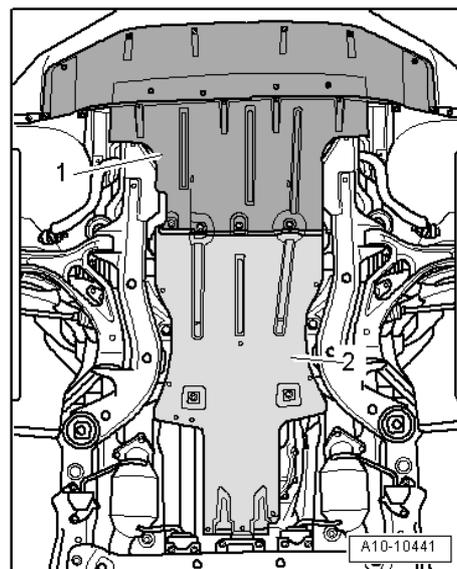
1.6 Removing and installing charge air cooler

Removing

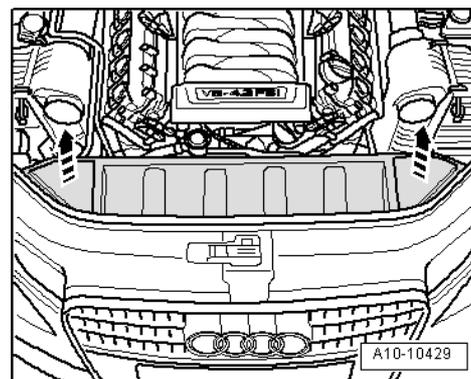
 **Note**

The following description shows the removal and installation of the left-side charge air cooler.

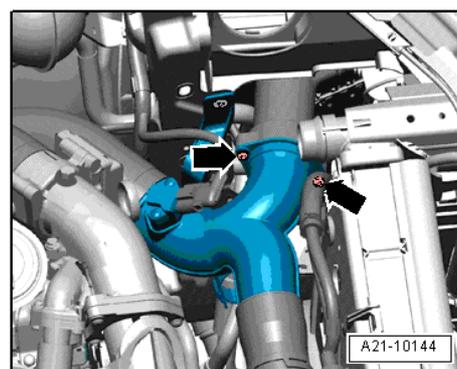
- Unscrew bolts and remove front noise insulation -1-.
- Remove bumper cover (front) ⇒ Rep. Gr. 63.



- Detach cover above radiator -arrows-.



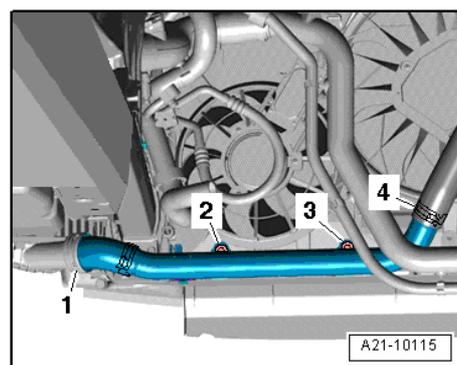
- Unscrew bolts -arrows- at top of charge air cooler.



- Unscrew bolts -2- and -3- and detach air pipe from charge air cooler.

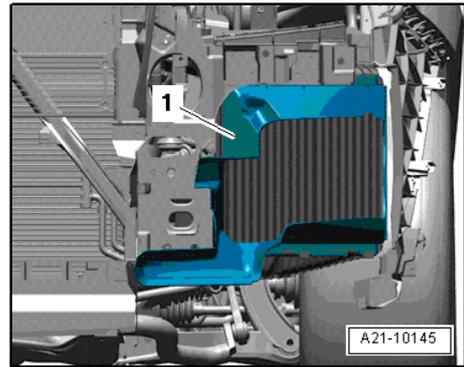
 **Note**

Disregard items marked -1- and -4-.





- Unclip air duct -1- from charge air cooler.



- Remove bolts and nut -1 ... 3- and take out charge air cooler.

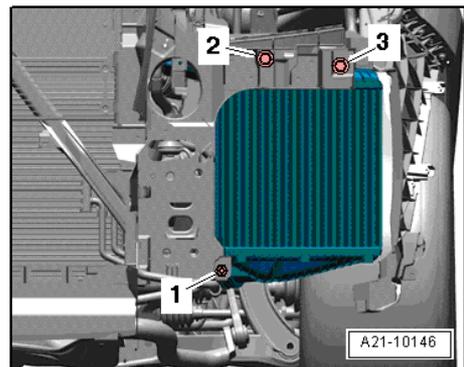
Installing

Installation is carried out in the reverse order; note the following:

Note

- ◆ *Hose connections and hoses for charge air system must be free of oil and grease before assembly.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue.*

- Install bumper cover (front) ⇒ Rep. Gr. 63.



Tightening torques

Component		Nm
Hose clips	Width 9 mm	3
	Width 13 mm	5.5

1.7 Removing and installing charge air pressure sender -G31-

Removing

- Unplug electrical connector -arrow- at charge air pressure sender -G31-.
- Remove bolts and pull charge air pressure sender -G31- out of connection.

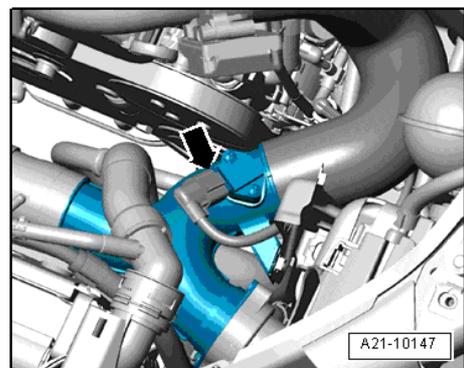
Installing

Installation is carried out in the reverse order; note the following:

Note

Renew O-ring.

Tightening torque



Component	Nm
Charge air pressure sender -G31- to charge air cooler	5



26 – Exhaust system

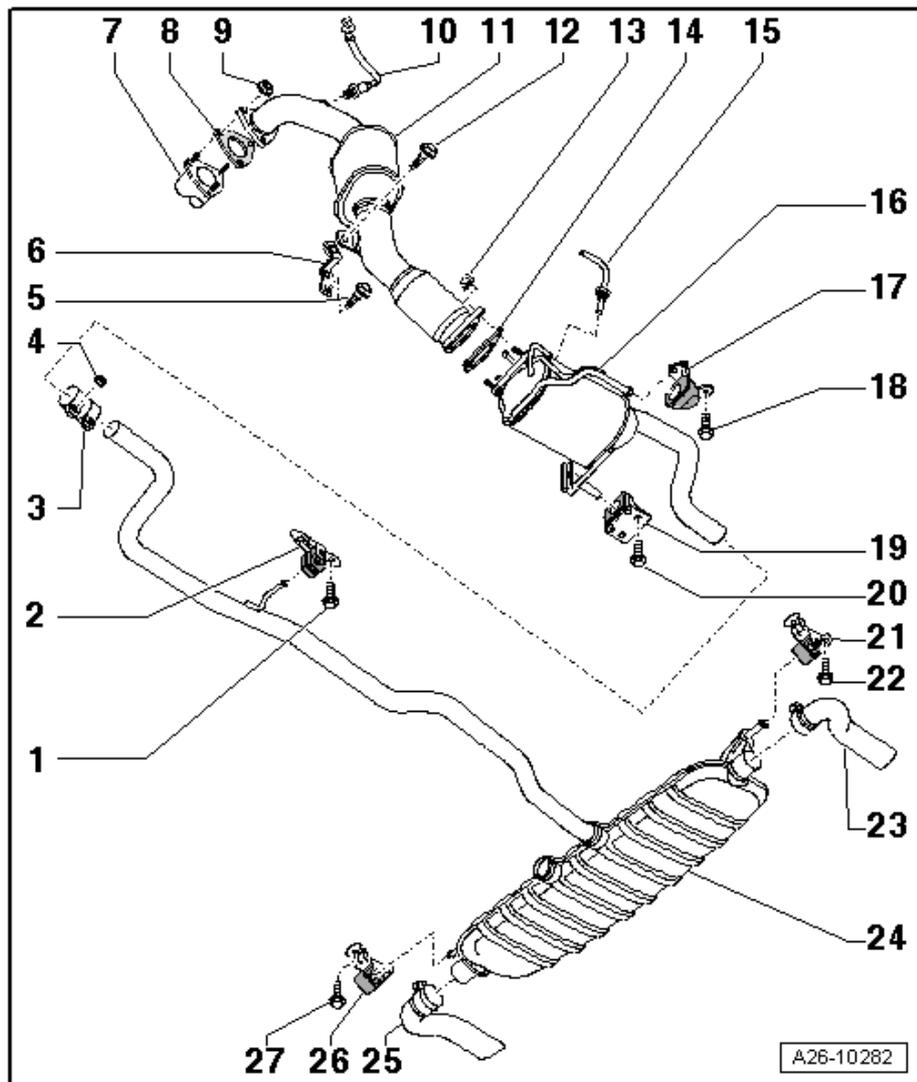
1 Removing and installing parts of exhaust system

Note

- ♦ Renew gaskets and self-locking nuts.
- ♦ After working on the exhaust system, ensure that the system is not under stress and that it has sufficient clearance from the body. If necessary, loosen clamps and align silencers and exhaust pipes so that sufficient clearance is maintained to the body at all points and the mountings are evenly loaded.

1.1 Exhaust system - exploded view of components

- 1 - 23 Nm
 - Renew
- 2 - Mounting
 - Renew if damaged
 - Check preload
 - ⇒ "1.10 Stress-free alignment of exhaust system" on page 217
- 3 - Clamp
 - Before tightening, align exhaust system so it is free of stress ⇒ page 217
 - Installation position ⇒ Fig. on page 204
 - Tighten bolt connections evenly
- 4 - 23 Nm
- 5 - 23 Nm
- 6 - Bracket
- 7 - Turbocharger
- 8 - Gasket
 - Renew
- 9 - 23 Nm
 - Renew
- 10 - Lambda probe -G39-
 - The screw threads on the new Lambda probes are coated with a special paste.
 - Coat thread with high-temperature paste when re-using old Lambda probes; High-temperature paste ⇒ Parts catalogue.
 - The assembly/high-temperature paste must not get into the slots on the probe body.
 - Remove and install using ring spanner for Lambda probe -3337- ⇒ Rep. Gr. 23

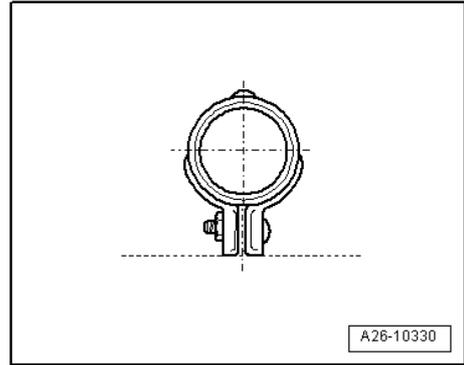


- Tighten to 55 Nm
- 11- Starter catalytic converter**
 - With flexible joint
 - Do not bend flexible joint more than 10° - otherwise it can be damaged
 - Protect against knocks and impact
 - Removing and installing ⇒ [page 204](#)
 - Stress-free alignment of exhaust system with cutting point ⇒ [page 217](#)
- 12- 23 Nm**
- 13- 23 Nm**
 - Renew
- 14- Gasket**
 - Renew
- 15- Temperature sender before particulate filter -G506-**
 - Tighten to 45 Nm
 - Coat thread with high-temperature paste; refer to ⇒ Parts catalogue
- 16- Particulate filter**
 - Removing and installing ⇒ [page 207](#)
 - After renewing particulate filter, perform adaption in "Guided Functions" ⇒ Vehicle diagnosis, testing and information system VAS 5051
- 17- Mounting**
 - Renew if damaged
- 18- 23 Nm**
- 19- Mounting**
 - Renew if damaged
- 20- 23 Nm**
- 21- Mounting**
 - Renew if damaged
- 22- 23 Nm**
- 23- Tailpipe**
 - For left side of vehicle
 - Renewing ⇒ [page 204](#)
- 24- Rear silencer**
 - Stress-free alignment of exhaust system with cutting point ⇒ [page 217](#)
- 25- Tailpipe**
 - For right side of vehicle
 - Renewing ⇒ [page 204](#)
- 26- Mounting**
 - Renew if damaged
- 27- 23 Nm**



Installation position of clamp

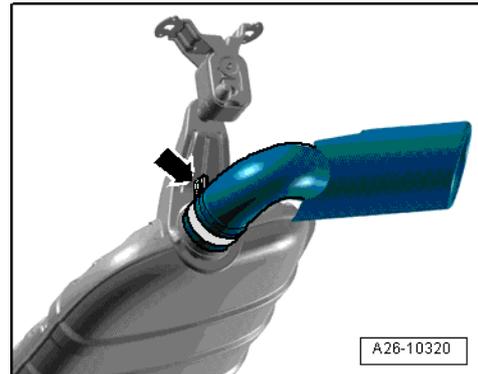
- Install clamp with bolts at the bottom.



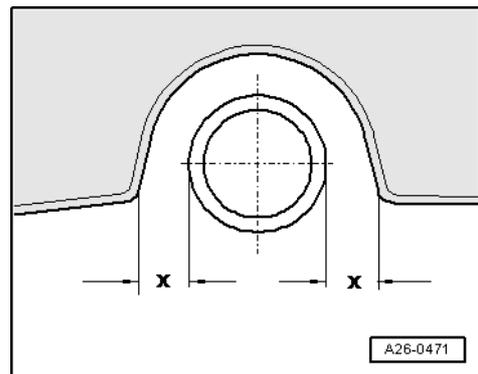
1.2 Renewing tailpipes

Procedure

- Remove tailpipe -arrow-.



- Fit tailpipe onto rear silencer and align.
- Check clearance between tailpipes and bumper on both sides.
- Dimension -x- (left-side) = dimension -x- (right-side)



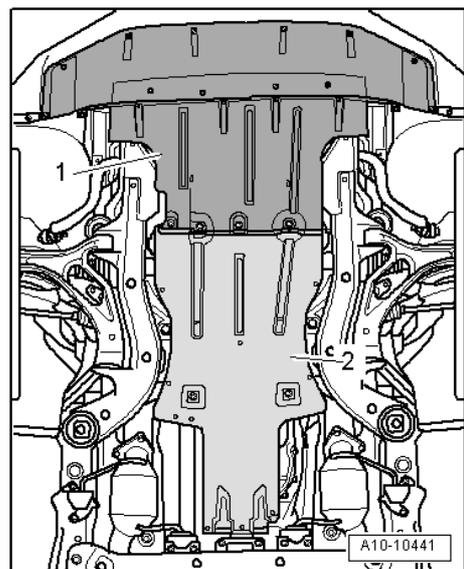
1.3 Removing and installing starter catalytic converter

Removing

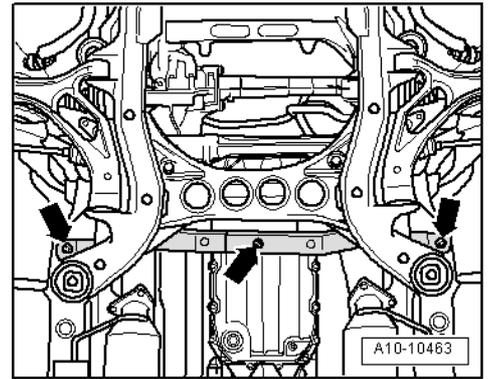


All cable ties which are released or cut open when removing must be fitted in the same position when installing.

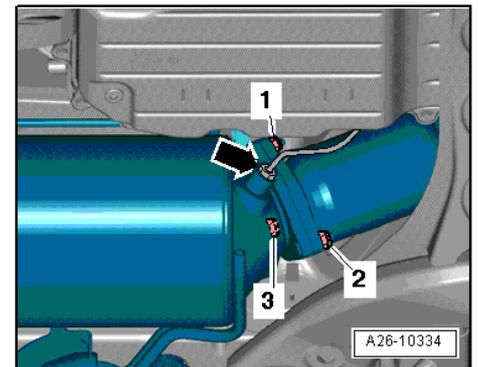
- Unscrew bolts and take off front noise insulation -1- and rear noise insulation -2-.



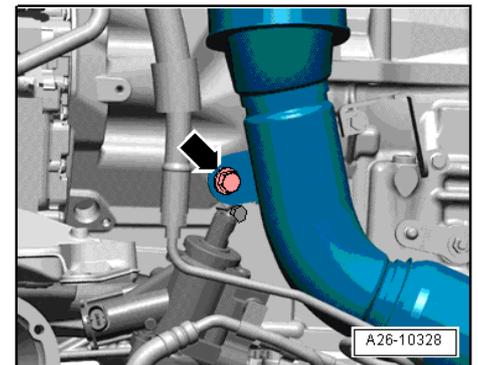
- Unbolt bracket for noise insulation -arrows-.



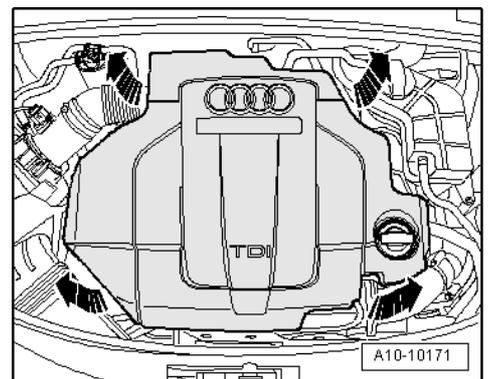
- Unscrew temperature sender before particulate filter -G506- -arrow-.
- Unscrew nuts -1 ... 3-.



- Unscrew bolt -arrow- at bracket for starter catalytic converter.

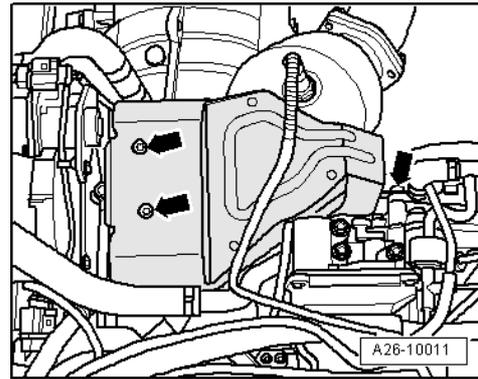


- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.





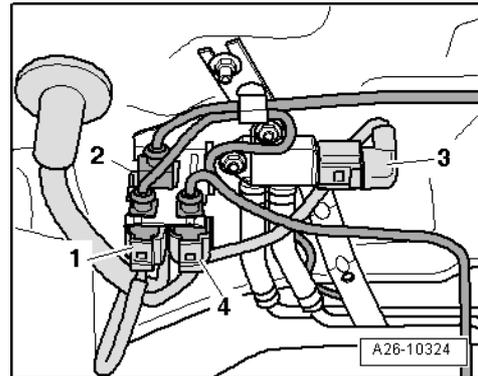
- Remove heat shield for turbocharger -arrows-.
- Remove exhauster pump ⇒ [page 52](#).



- Remove electrical connector -2- for Lambda probe -G39- from bracket.
- Unplug electrical connector and move wiring clear.

i Note

Ignore -Items 1, 3 and 4-



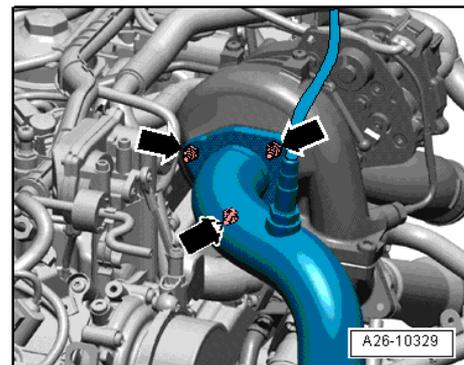
- Unscrew nuts -arrows-.
- Remove starter catalytic converter from engine compartment.

Installing

Installation is carried out in the reverse order; note the following:

i Note

- ♦ Renew gaskets and self-locking nuts.
- ♦ Fit all cable ties in the original positions when installing.
- Install exhauster pump ⇒ [page 52](#).
- Install temperature sender before particulate filter -G506- ⇒ [page 219](#).
- Align exhaust system so it is free of stress ⇒ [page 217](#).



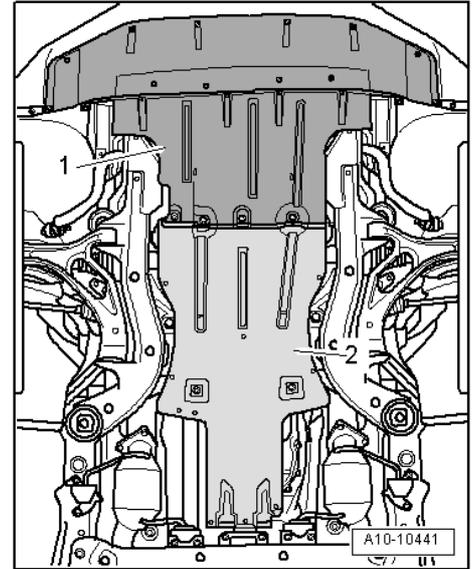
Tightening torques

Component	Nm
Starter catalytic converter to turbocharger	23 ¹⁾
Heat shield to turbocharger	9
Starter catalytic converter to bracket	23
Starter catalytic converter to particulate filter	23 ¹⁾
Bracket for noise insulation to body	9
● ¹⁾ Renew nuts.	

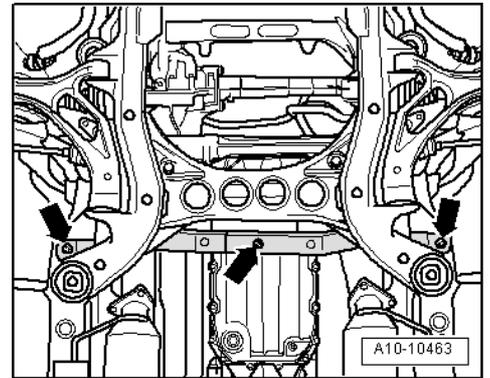
1.4 Removing and installing particulate filter

Removing

- Unscrew bolts and take off front noise insulation -1- and rear noise insulation -2-.



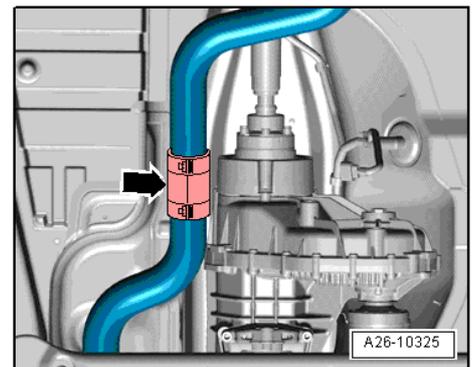
- Unbolt bracket for noise insulation -arrows-.



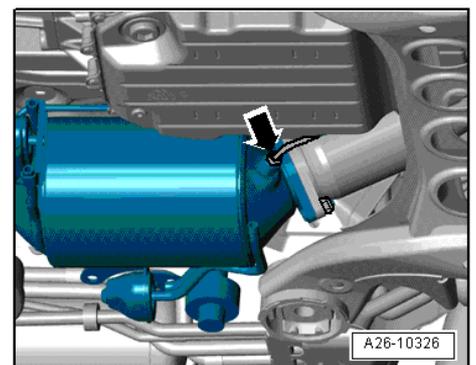
Note

To avoid any damage, the flexible joint at the starter catalytic converter must not be bent more than 10°.

- Disconnect exhaust system at clamp -arrow-.

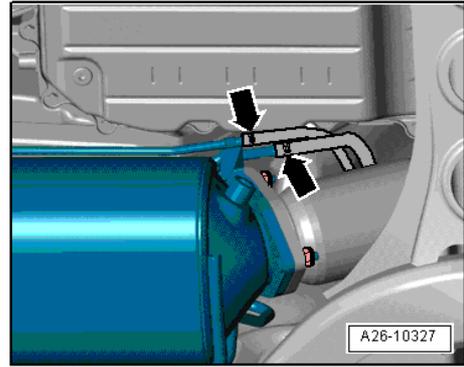


- Unscrew temperature sender before particulate filter -G506- -arrow-.





- Detach connecting hoses -arrows- going to exhaust gas pressure sensor 1 -G450- from pressure pipes at particulate filter.



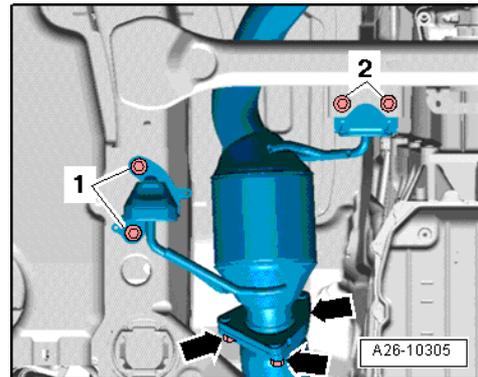
- Remove bolts -1- and -2- on bracket for particulate filter.
- Unscrew nuts -arrows- and remove particulate filter.

Installing

Installation is carried out in the reverse order; note the following:

Note

- ◆ Renew gaskets and self-locking nuts.
- ◆ Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue.
- Install temperature sender before particulate filter -G506- ⇒ page 219.
- Align exhaust system so it is free of stress ⇒ page 217.
- After renewing particulate filter, perform adaption in "Guided Functions" ⇒ Vehicle diagnosis, testing and information system VAS 5051



Tightening torques

Component		Nm
Particulate filter to starter catalytic converter		23 ¹⁾
Bracket for particulate filter to:	gearbox carrier	23
	longitudinal member	23
● ¹⁾ Renew nuts.		

1.5 Exhaust manifold - exploded view of components

Note

Illustration shows left-side exhaust manifold with intermediate pipe.

1 - 25 Nm

- Renew
- Coat with high-temperature lubricant; for high-temperature lubricant refer to ⇒ Parts catalogue

2 - Exhaust manifold

- Removing and installing: left-side ⇒ [page 210](#), right-side ⇒ [page 211](#)

3 - Gasket

- Renew

4 - Gasket

- Renew

5 - 25 Nm

- Coat with high-temperature lubricant; for high-temperature lubricant refer to ⇒ Parts catalogue

6 - Intermediate pipe

- Removing and installing: left-side ⇒ [page 213](#), right-side ⇒ [page 215](#)

7 - 30 Nm + 90° (1/4 turn) further

- Bolt strength rating 10.9

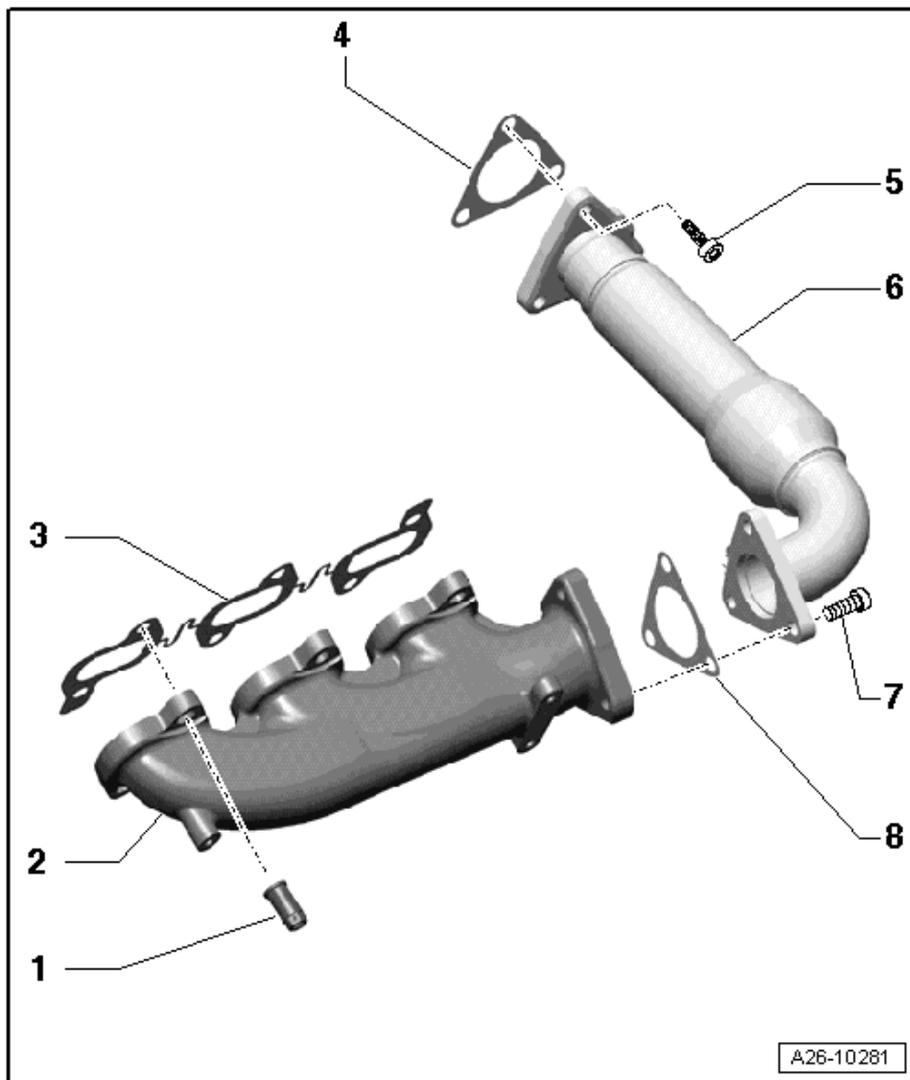
- Renew

- Coat with high-temperature lubricant; for high-temperature lubricant refer to ⇒ Parts catalogue

- Note tightening sequence: (left-side) ⇒ [page 213](#), (right-side) ⇒ [page 215](#)

8 - Gasket

- Renew

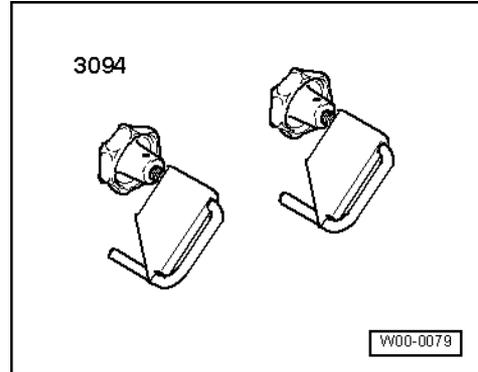




1.6 Removing and installing exhaust manifold (left-side)

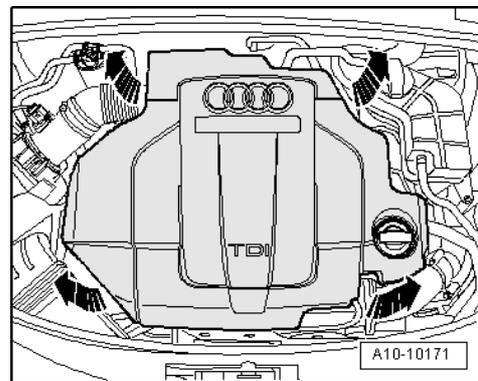
Special tools and workshop equipment required

- ◆ Hose clamps for hoses up to 25 mm Ø -3094-

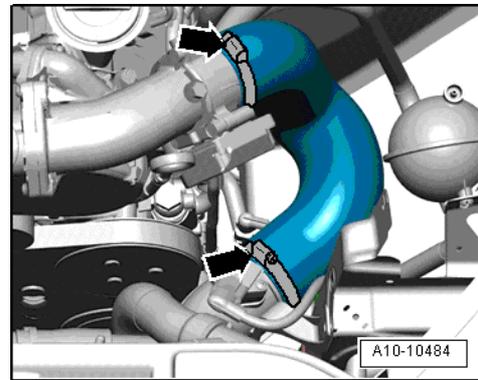


Removing

- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



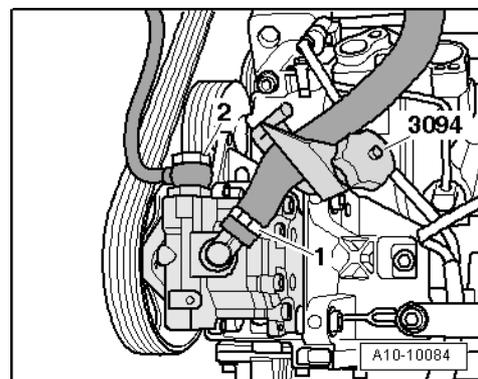
- Remove air intake hose -arrows-.



i Note

Lay a cloth under the separating point to catch escaping hydraulic fluid.

- Clamp off hydraulic hose for power steering pump using a hose clamp -3094-.
- Disconnect hydraulic hose -1- from power steering pump.
- Unscrew banjo bolt -2- and move pressure line to side.
- Remove exhauster pump => [page 52](#).



- Remove bolts -1 ... 8- and remove exhaust manifold.

Installing

Installation is carried out in the reverse order; note the following:

Note

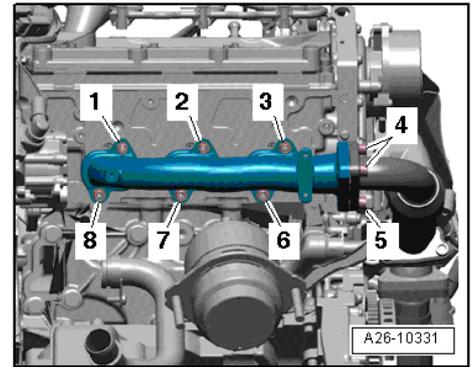
- ◆ Renew gaskets, seals, O-rings and self-locking nuts.
- ◆ Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue.

- Tighten bolts securing intermediate pipe to exhaust manifold as follows:

1. Tighten with torque wrench initially to 10 Nm.
2. Tighten with torque wrench to 30 Nm.
3. Turn 90° (1/4 turn) further using a rigid wrench.

- Align exhaust system so it is free of stress ⇒ page 217.

- Check hydraulic fluid level of power steering ⇒ Rep. Gr. 48.



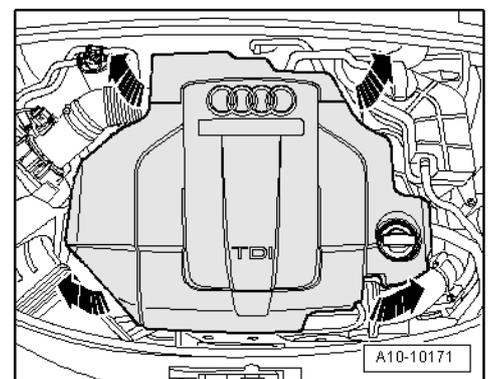
Tightening torques

Component	Nm
Exhaust manifold to cylinder head	23 ¹⁾²⁾
Intermediate pipe to exhaust manifold	30 + 90° ₁₎₂₎₃₎
Banjo bolt for pressure line to power steering pump	50
Hose clips (13 mm wide)	5.5
<ul style="list-style-type: none"> ● ¹⁾ Renew bolts. ● ²⁾ 90° = one quarter turn. ● ³⁾ Coat with high-temperature paste; refer to ⇒ Parts catalogue. 	

1.7 Removing and installing exhaust manifold (right-side)

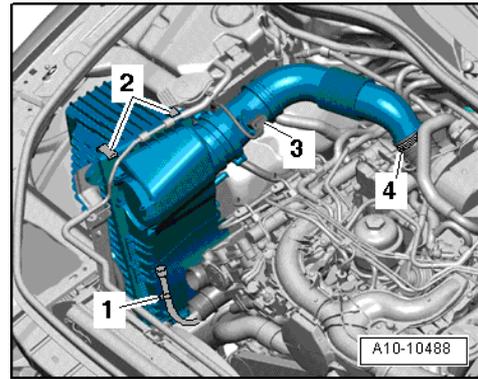
Removing

- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.
- Drain off coolant ⇒ page 161.

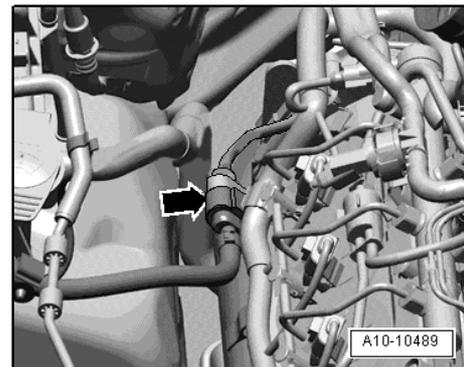




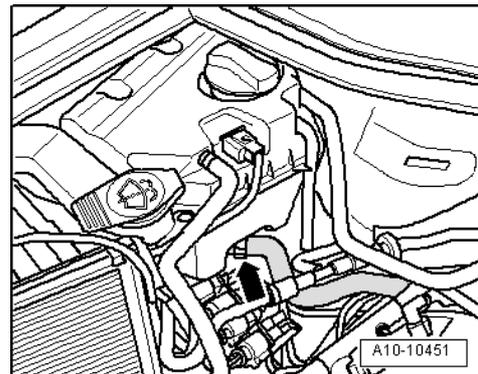
- Unclip differential breather hose -1- from air cleaner housing (top section).
- Unplug electrical connector -3- at air mass meter -G70-.
- Detach air intake hose -4- from turbocharger.
- Release retaining clips -2- and detach top section of air cleaner housing.



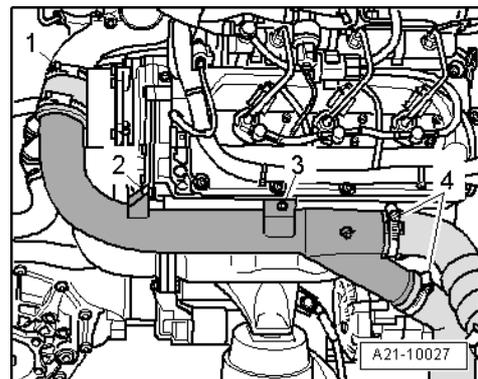
- Take electrical connector -arrow- out of bracket and unplug it.
- Unbolt bracket for electrical connector at cylinder head cover.



- Detach coolant hose -arrow- at coolant expansion tank.



- Remove bolts -2- and -3-.
- Detach air pipe from hoses -1- and -4- and remove pipe downwards.



- Remove bolts -1 ... 8- and remove exhaust manifold.

Installing

Installation is carried out in the reverse order; note the following:

Note

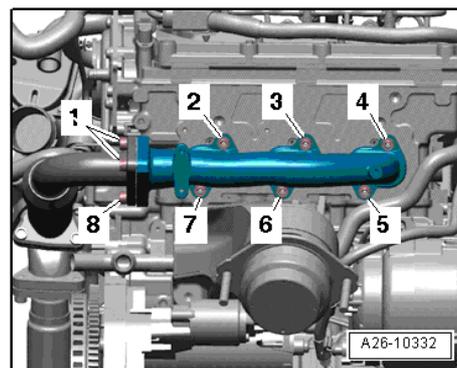
- ◆ Renew gaskets and self-locking nuts.
- ◆ Hose connections and hoses for charge air system must be free of oil and grease before assembly.
- ◆ Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue.

- Tighten bolts securing intermediate pipe to exhaust manifold as follows:

1. Tighten with torque wrench initially to 10 Nm.
2. Tighten with torque wrench to 30 Nm.
3. Turn 90° (1/4 turn) further using a rigid wrench.

Tightening torques

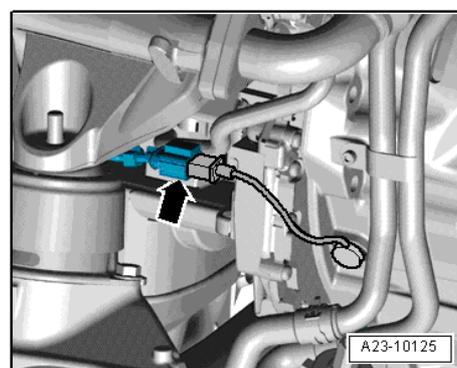
Component	Nm
Exhaust manifold to cylinder head	25 ¹⁾²⁾
Intermediate pipe to exhaust manifold	30 + 90° ¹⁾²⁾³⁾
Air pipe to:	
bracket	9
engine lifting eye	9
Hose clips (13 mm wide)	5.5
<ul style="list-style-type: none"> • ¹⁾ Renew bolts. • ²⁾ 90° = one quarter turn. • ³⁾ Coat with high-temperature paste; refer to ⇒ Parts catalogue. 	



1.8 Removing and installing intermediate pipe (left-side)

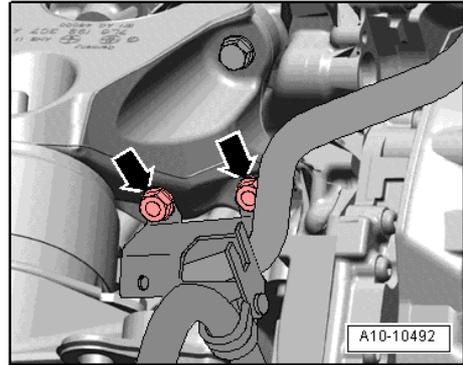
Removing

- Remove starter catalytic converter ⇒ page 204.
- Take electrical connector -arrow- for engine speed sender -G28- out of bracket and unplug it.





- Unscrew nuts -arrows- and detach bracket for connector from engine support (left-side).

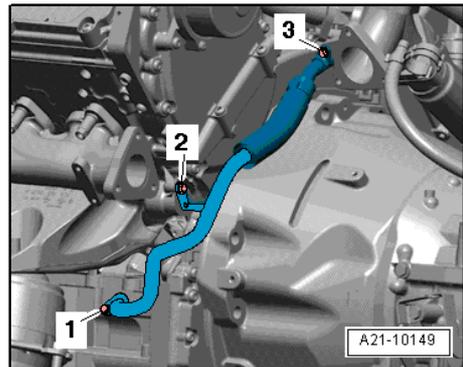


- Unscrew bolts -1 ... 3- and remove oil return pipe.



Note

Shown in illustration with engine removed and intermediate pipe detached.



- Unbolt intermediate pipe -arrows-.

Installing

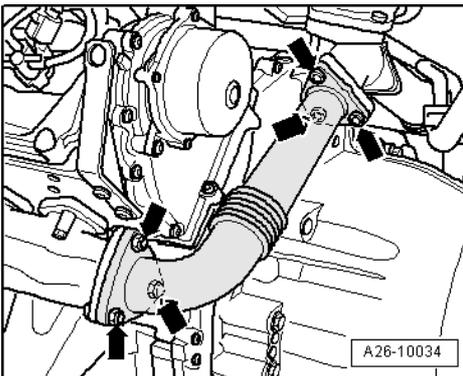
Installation is carried out in the reverse order; note the following:



Note

Renew gaskets, seals and O-rings.

- Tighten bolts securing intermediate pipe to exhaust manifold as follows:
 1. Tighten with torque wrench initially to 10 Nm.
 2. Tighten with torque wrench to 30 Nm.
 3. Turn 90° (1/4 turn) further using a rigid wrench.
- Install starter catalytic converter => [page 204](#).



Tightening torques

Component		Nm
Intermediate pipe to:	exhaust manifold	30 + 90° 1)2)3)
	intermediate flange	30 + 90° 1)2)3)
Oil return line to:	cylinder block	9
	intermediate flange	9
	sump (top section)	9

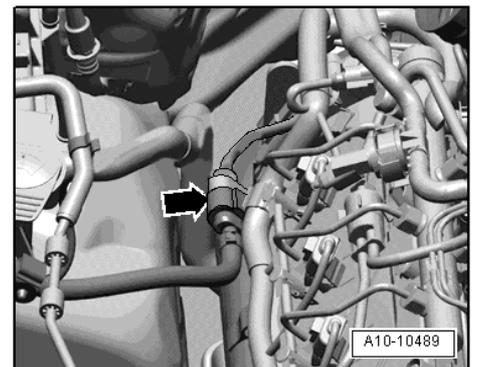
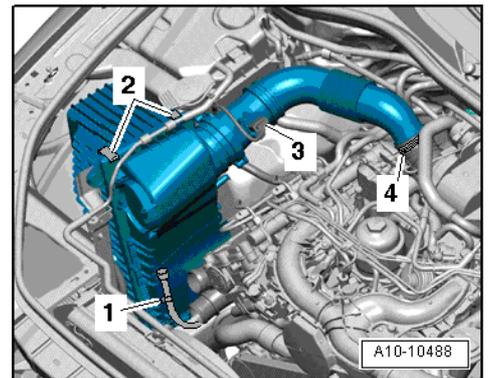
- 1) Renew bolts.
- 2) 90° = one quarter turn.
- 3) Coat with high-temperature paste; refer to ⇒ Parts catalogue.

1.9 Removing and installing intermediate pipe (right-side)

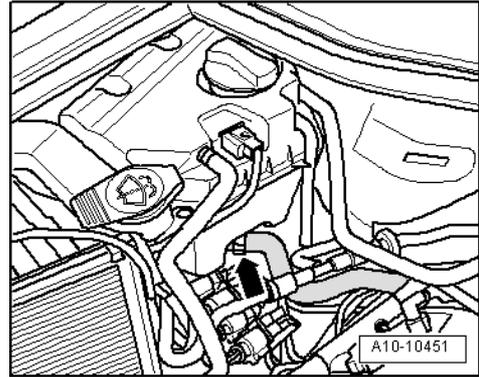
Removing

- Unclip differential breather hose -1- from air cleaner housing (top section).
- Unplug electrical connector -3- at air mass meter -G70-.
- Detach air intake hose -4- from turbocharger.
- Release retaining clips -2- and detach top section of air cleaner housing.

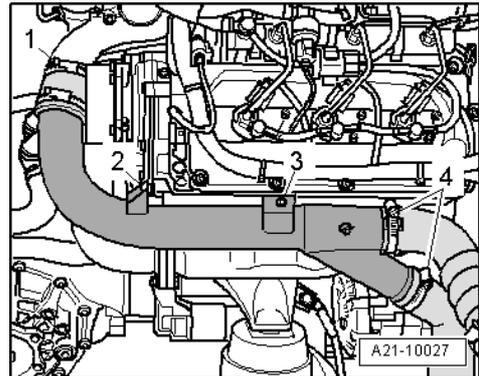
- Take electrical connector -arrow- out of bracket and unplug it.
- Unbolt bracket for electrical connector at cylinder head cover.



- Detach coolant hose -arrow- at coolant expansion tank.



- Remove bolts -2- and -3-.
- Detach air pipe from hoses -1- and -4- and remove pipe downwards.



- Unscrew bolts -1 ... 4- and remove intermediate pipe.

i Note

Shown in illustration with engine removed.

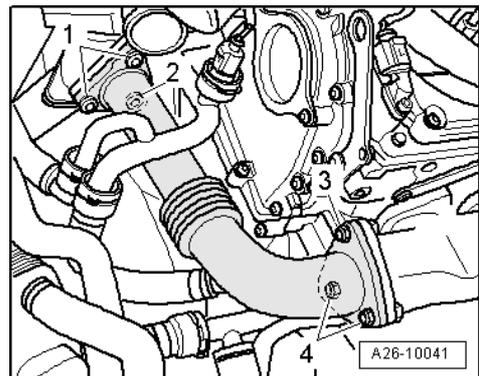
Installing

Installation is carried out in the reverse order; note the following:

i Note

Renew seals and gaskets.

- Tighten bolts securing intermediate pipe to exhaust manifold as follows:
 1. Tighten with torque wrench initially to 10 Nm.
 2. Tighten with torque wrench to 30 Nm.
 3. Turn 90° (1/4 turn) further using a rigid wrench.
- Fill cooling system ⇒ [page 162](#).

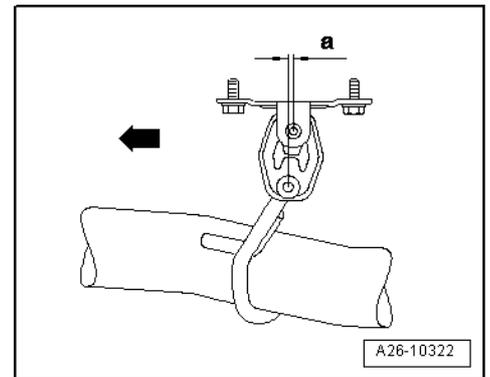


Tightening torques

Component		Nm
Intermediate pipe to:	exhaust manifold	30 + 90° 1)2)3)
	intermediate flange	30 + 90° 1)2)3)
Air pipe to:	bracket	9
	lifting eye	9
Bracket for electrical connector to cylinder head cover		9
<ul style="list-style-type: none"> • 1) Renew bolts. • 2) 90° = one quarter turn. • 3) Coat with high-temperature paste; refer to ⇒ Parts catalogue. 		

1.10 Stress-free alignment of exhaust system

- The exhaust system must be aligned when it is cool.
- Loosen bolts of clamp ⇒ [item 3 on page 202](#).
- Press exhaust system to front -arrow- until the rubber mountings are pre-loaded to the specified dimensions:
- Rubber mounting (front left): dimension -a- = 4 mm.

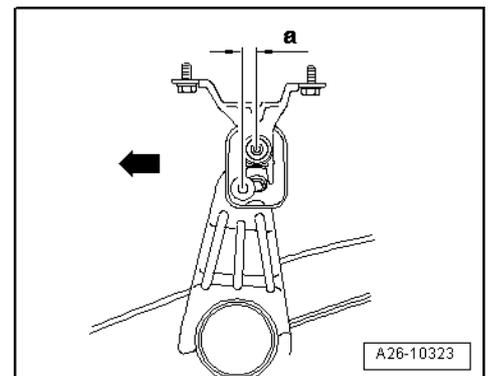


- Rubber mounting (rear left and right): dimension -a- = 10 mm.
- Make sure exhaust system remains in this position and tighten clamping bolts evenly to 23 Nm.

Note

If any of the specified dimensions is not attained, remove relevant brackets from body and adjust as required.

- Align tailpipes ⇒ [page 204](#).



1.11 Checking exhaust system for leaks

- Start engine and run at idling speed.
- Seal off tailpipes for duration of leak test with cloths or plugs, etc.
- Listen for leaks at joints between cylinder head/exhaust manifold, exhaust manifold/intermediate pipe, intermediate pipe/intermediate flange, intermediate flange/turbocharger, etc.
- Repair any leaks that are found.

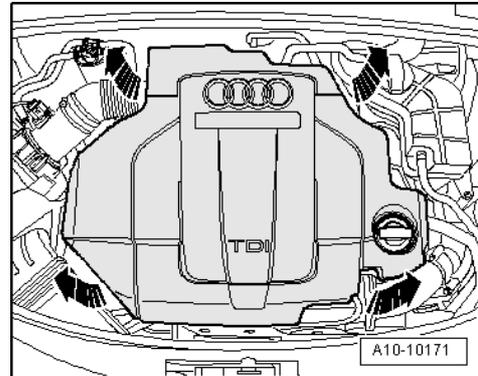


2 Removing and installing parts of exhaust gas temperature control

2.1 Removing and installing exhaust gas temperature sender 1 -G235-

Removing

- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.

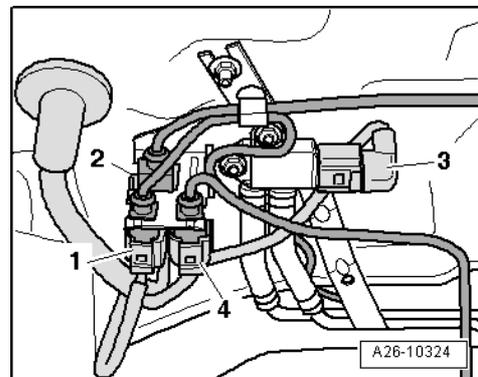


- Take electrical connector -1- for exhaust gas temperature sender 1 -G235- out of bracket.
- Unplug electrical connector and move wiring clear.

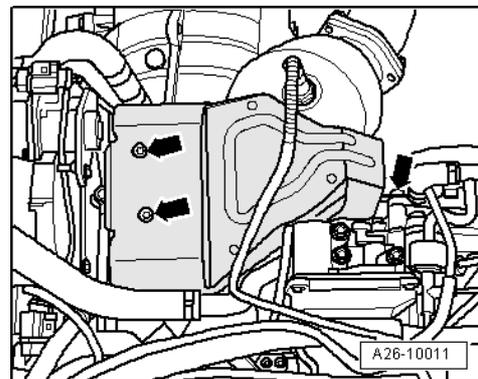


Note

Disregard -items 2 ... 4-.



- Remove heat shield for turbocharger -arrows-.



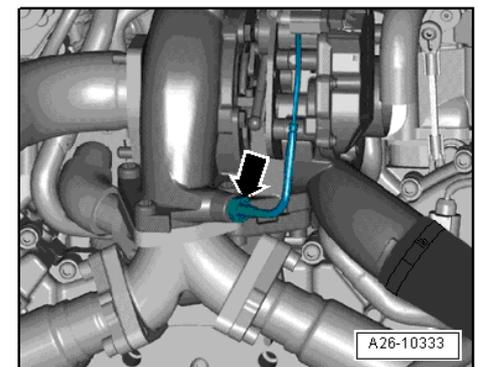
- Unscrew exhaust gas temperature sender 1 -G235- -arrow-.

Installing

Installation is carried out in the reverse order; note the following:

- Installation position: the exhaust gas temperature sender 1 -G235- faces upwards.

Tightening torque

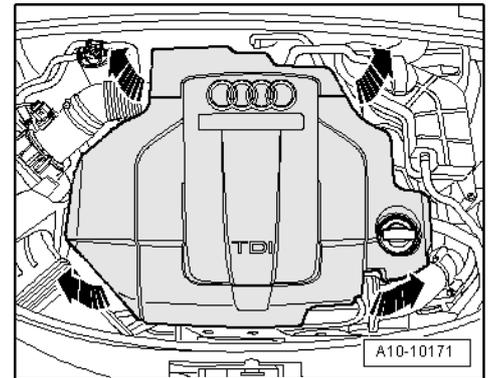


Component	Nm
Exhaust gas temperature sender 1 -G235- to turbocharger	45 ¹⁾
Heat shield to:	
turbocharger	9
cylinder head	9
<ul style="list-style-type: none"> ¹⁾ Coat with high-temperature paste; refer to ⇒ Parts catalogue. 	

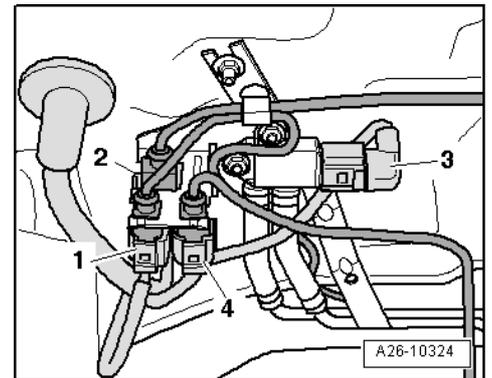
2.2 Removing and installing temperature sender before particulate filter -G506-

Removing

- Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



- Take electrical connector -4- for temperature sender before particulate filter -G506- out of bracket.
- Unplug electrical connector and move wiring towards bottom of vehicle.



Note

Disregard -items 1 ... 3-.

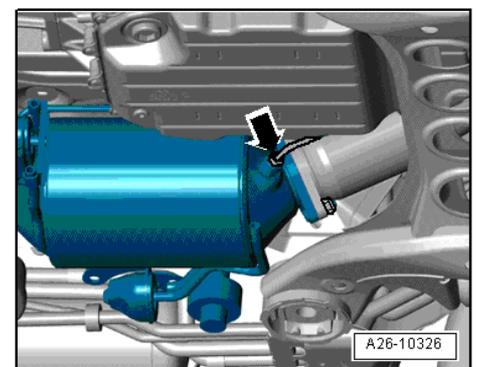
- Unscrew temperature sender before particulate filter -G506- -arrow-.

Installing

Install in reverse order.

Tightening torque

Component	Nm
Temperature sender before particulate filter -G506- to particulate filter	45 ¹⁾
<ul style="list-style-type: none"> ¹⁾ Coat thread with high-temperature paste; refer to ⇒ Parts catalogue. 	

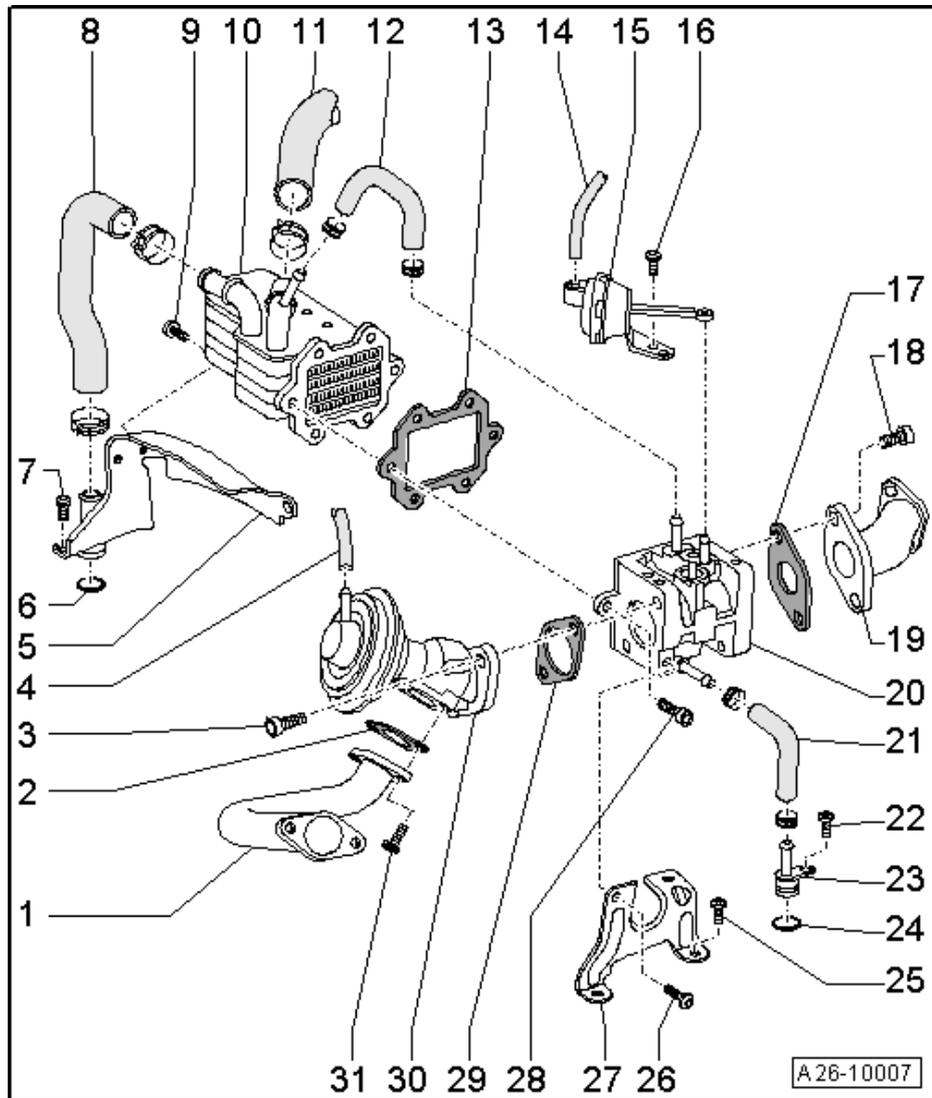




3 Exhaust gas recirculation system

3.1 Exhaust gas recirculation system - exploded view of components

- 1 - Connecting pipe for exhaust gas recirculation
- 2 - Gasket
 Renew
- 3 - 25 Nm
- 4 - Vacuum hose
- 5 - Bracket for exhaust gas recirculation cooler
 With connection for coolant hose
- 6 - O-ring
 Renew
- 7 - 9 Nm
- 8 - Coolant hose
- 9 - 9 Nm
- 10 - Exhaust gas recirculation cooler
 Removing and installing => page 221
- 11 - Coolant hose
- 12 - Coolant hose
- 13 - Gasket
 Renew
- 14 - Vacuum hose
 From change-over valve for exhaust gas recirculation cooler -N345-
- 15 - Vacuum unit for exhaust gas recirculation changeover function
- 16 - 4 Nm
- 17 - Gasket
 Renew
- 18 - 25 Nm
- 19 - Connecting pipe for exhaust gas recirculation
- 20 - Change-over flap for exhaust gas recirculation cooler
- 21 - Coolant hose
- 22 - 9 Nm
- 23 - Connection for coolant hose
- 24 - O-ring
 Renew
- 25 - 9 Nm
- 26 - 9 Nm
- 27 - Bracket for change-over flap for exhaust gas recirculation cooler
- 28 - 9 Nm



29 - Gasket

- Renew

30 - Mechanical exhaust gas recirculation valve

- Removing and installing ⇒ [page 221](#)

31 - 9 Nm

3.2 Removing and installing mechanical exhaust gas recirculation valve

Removing

- Remove intake manifold (top section) ⇒ Rep. Gr. 23.
- Detach vacuum hose at mechanical exhaust gas recirculation valve.
- Remove bolts -arrows- and take off mechanical exhaust gas recirculation valve with connecting pipe.

Installing

Installation is carried out in the reverse order; note the following:



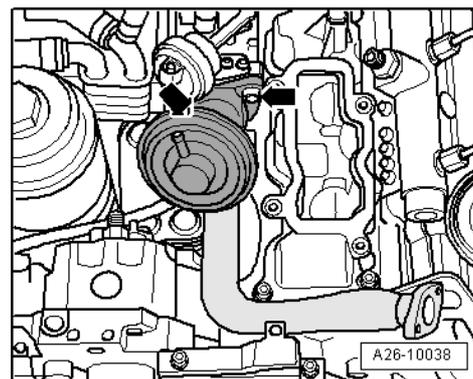
Note

Renew seals and gaskets.

- Install intake manifold (top section) ⇒ Rep. Gr. 23.

Tightening torques

Component	Nm
Mechanical exhaust gas recirculation valve to connecting flange	22
Connecting pipe to mechanical exhaust gas recirculation valve	9



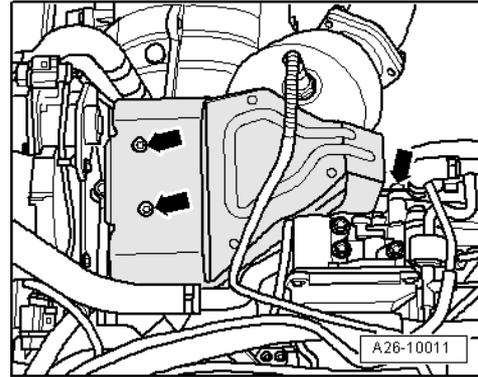
3.3 Removing and installing exhaust gas recirculation cooler

Removing

- Drain off coolant ⇒ [page 161](#).
- Remove coolant pipe (rear) ⇒ [page 181](#).
- Remove intake manifold (top section) ⇒ Rep. Gr. 23.
- Remove bottom section of intake manifold (left and right) ⇒ Rep. Gr. 23.



- Remove heat shield for turbocharger -arrows-.
- Remove bolts -arrows- and take off mechanical exhaust gas recirculation valve with connecting pipe.



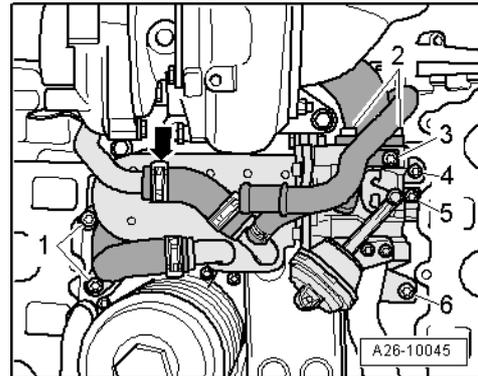
- Detach hose -arrow-.
- Unscrew bolts -1 ... 6-.
- Lift off cooler for exhaust gas recirculation from cylinder block.

Installing

Installation is carried out in the reverse order; note the following:

i Note

- ♦ *Renew gaskets, seals and O-rings.*
- ♦ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue.*



- Install mechanical exhaust gas recirculation valve ⇒ [page 221](#).
- Install bottom section of intake manifold (left and right) ⇒ Rep. Gr. 23.
- Install intake manifold (top section) ⇒ Rep. Gr. 23.
- Install coolant pipe (rear) ⇒ [page 181](#).
- Fill cooling system ⇒ [page 162](#).

Tightening torques

Component	Nm
Exhaust gas recirculation cooler to cylinder block	9
Connecting pipe to exhaust gas recirculation cooler	25
Heat shield to:	
turbocharger	9
cylinder head	9