Workshop Manual

Audi A3 2004 ➤
Audi A3 Sportback 2005 ➤

4-cylinder TDI engine (2.0 ltr. 4-valve common rail - generation II), mechanics

Engine ID	CFFA	CFFB	CFGB	CLJA					

Edition 12.2018

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Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions for working on motor vehicles must, as a matter of course, be observed.

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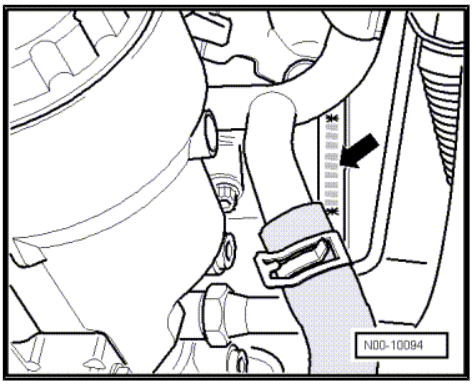
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00 – Technical data

1 Engine number/engine data

(ARL006203; Edition 12.2018)

Engine number



- The engine number (“engine code” and “serial number”) -arrow- can be found at the front of the joint between engine and gearbox.
- There is also a sticker with “engine code” and “serial number” attached to the toothed belt cover.
- Engine codes starting with the letter “C” have four letters (previously three letters).
- The first 3 characters of the engine code stand for the engine capacity and the mechanical construction and design. They are stamped onto the cylinder block together with the serial number.
- The 4th character indicates the power output and torque of the engine and is determined by the engine control unit.
- The four-letter engine code is found on the type plate (certain countries only), vehicle data sticker and engine control unit.
- Fitting locations of the type plate (certain countries only) and the vehicle data sticker ⇒ Maintenance ; Booklet 808 .

For engine data refer to ⇒ Technical data for engines; Rep. gr. 00 ; Overview of engines .

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2 Safety precautions

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⇒ “2.2 Safety precautions when working on the cooling system”, page 3

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⇒ “2.4 Using testers and measuring instruments during a road test”, page 3

⇒ “2.5 Safety precautions when working on the exhaust system”, page 3

2.1 Safety precautions when working on the fuel supply system

Risk of fire due to escaping fuel

If the battery is connected, the door contact switch activates the fuel pump when the driver's door is opened. Escaping fuel may ignite, causing a fire.

– Before opening the fuel system, disconnect power supply to fuel pump.

Risk of injury - fuel system operates under high pressure

The fuel system is pressurised. There is a risk of injury as fuel may spray out.

Before opening the fuel system:

– Put on safety goggles.

– Put on protective gloves.

– Release pressure (wrap a clean cloth around connection and open connection carefully).

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If components of the fuel system between the fuel tank and the high-pressure pump are removed or renewed, the fuel system must be bled.

Risk of irreparable damage to fuel pump

After working on the fuel system, the fuel pump may be irreparably damaged if it is allowed to run while empty.

– Never allow fuel pump to run while it is empty.

– Fill/bleed fuel pump.

Risk of irreparable damage to electronic components

When disconnecting the battery there is a risk of irreparable damage to electronic components.

– Always switch off the ignition before disconnecting the battery.

– Remove fuse for fuel pump control unit - J538- in fuse holder B - SB- in electronics box in engine compartment; for identification of fuses refer to ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.

2.2 Safety precautions when working on the cooling system

When working on the cooling system note the following warnings:

Risk of scalding as hot coolant can escape

The cooling system is under pressure when the engine is hot. Risk of scalding due to hot steam and hot coolant.

– Put on protective gloves.

– Put on safety goggles.

– Cover filler cap on expansion tank with a cloth and open carefully to release pressure.

2.3 Safety precautions when working on vehicles with start/stop system

Risk of injury - engine may start unexpectedly

The engine can start unexpectedly if the vehicle's start/stop system is activated. A message in the instrument cluster indicates whether the start/stop system is activated.

– To deactivate the start/stop system, switch off the ignition.

2.4 Using testers and measuring instruments during a road test

Risk of injury if test equipment is not secured

If an accident occurs and the front passenger's airbag is triggered, test equipment which is not secured adequately may be catapulted through the vehicle with potentially serious consequences.

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– Secure test equipment on the rear seat with a strap.

Or:

– Have a second mechanic operate test equipment on the rear seat.

2.5 Safety precautions when working on the exhaust system

Do not dismantle exhaust gas temperature sender - risk of injury.

Risk of injury when disconnecting the exhaust system

There is a risk of eye irritation caused by soot particles in the air.

– Put on safety goggles.

Danger from toxic exhaust gases

Auxiliary/supplementary heater produces toxic exhaust gases. There is a risk of poisoning and of damage to the respiratory tract.

– In enclosed spaces, only switch on the auxiliary/supplementary heater if there is an exhaust extraction system.

– In enclosed spaces without an exhaust extraction system, switch off the auxiliary/supplementary heater.

Risk of damage to flexible joint

The flexible joint can be damaged or develop leaks if it is handled incorrectly.

– Do not bend flexible joint more than 10°.

– Install flexible joint so that it is not under tension.

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3 General repair instructions

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⇒ “3.3 Checking for leaks in the fuel system”, page 6

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3.1 Rules for cleanliness

Even small quantities of dirt can lead to defects. For this reason, please observe the following rules when working on the fuel supply system, injection system and turbocharger:

- Clean connections and surrounding area thoroughly with engine cleaner or brake cleaner and dry cleaned area before loosening.
- Seal off open pipes and connections immediately with clean plugs, e.g. from engine bung set - VAS 6122- .
- Do not remove sealing caps from components until immediately prior to installation. Keep components that are to be re-used in new, sealable plastic bags.
- After removal, place parts on a clean surface and cover them. Only use 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 not been stored in the proper packaging (e.g. in tool boxes etc.).
- Do not work with compressed air when the system is open. If possible, do not move vehicle.
- Make sure that no fuel runs onto the fuel hoses. Should this occur, the fuel hoses must be cleaned again immediately.
- Also ensure that no diesel fuel comes into contact with the coolant hoses. Should this occur, the hoses must be cleaned immediately. Damaged hoses must be renewed.
- Protect unplugged electrical connectors against dirt and moisture and make sure connections are dry when attaching.

3.2 General repair instructions

- Clean tools and workbench etc. before working on the injection system.
- Before installing, check the injectors and their surroundings visually; they must be undamaged and clean. Make sure the injector bores in the cylinder head are clean. Wipe out if necessary using a clean cloth, taking care not to cause damage. Do not use sharp objects of any kind.
- If the high-pressure fuel lines are to be re-used, you must mark them before removal. High-pressure pipes must always be re-installed on the same cylinder.

- Take care not to damage the injectors when removing the old copper seals.
- Check all new O-rings for damage before installing. Lubricate O-rings with engine oil or assembly oil before installing.
- Position high-pressure pipes so they are free of stress. Tighten all unions lightly to start with before tightening to final torque.
- Never attempt to bend high-pressure fuel lines to shape.
- When working on any parts of the high-pressure fuel system, tools may only be used for loosening and tightening pipe unions. All other components must always be removed and installed by hand without using tools or other equipment.
- Press the fuel return hoses onto the injectors by hand from above so that they engage audibly on each injector (do not press in the release pins when doing this). Then press down the release pin after connecting the return line. Check that the fuel return hoses are seated securely and sealed properly by pulling them by hand from above.
- Do not dismantle individual common rail components. If there is a fault, the complete components must be renewed.
- When the engine is running, do not perform any repairs to the common rail system.
- Do not bleed the common rail system by unfastening high-pressure components after the engine has been started.
- All cable ties which are released or cut open when removing must be refitted in the same position when installing.
- Fuel hoses in engine compartment must only be secured with spring-type clips. O-type clips or screw-type clips must not be used.

3.3 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 system again for leakage.

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3.4 Foreign particles in engine

When working on the engine, all open inlet and exhaust ports must be sealed with suitable plugs (e.g. from engine bung set - VAS 6122-) to prevent foreign particles from entering the engine.

Note

If the turbocharger has suffered mechanical damage
⇒ page 241

3.5 Contact corrosion

Contact corrosion can occur if unsuitable fasteners are used (e.g. bolts, nuts, washers, etc.).

For this reason, only fasteners with a special surface coating are fitted.

Additionally, all rubber and plastic parts and all adhesives are made of non-conductive materials.

Always install new parts if you are not sure whether used parts can be re-fitted ⇒ Electronic parts catalogue .

Please note:

- We recommend using only genuine replacement parts; these have been tested and are compatible with aluminium.
- We recommend using Audi Genuine Accessories.
- Damage caused by contact corrosion is not covered by warranty.

3.6 Routing and attachment of pipes, hoses and wiring

- Mark fuel lines, hydraulic lines, vacuum lines, lines for activated charcoal filter and electrical wiring etc. before removal so they can be re-installed in the original positions and correctly connected. Make sketches or take photographs if necessary.
- To avoid damaging pipes, hoses and wiring, ensure sufficient clearance from all moving or hot components in engine compartment (limited space in engine compartment).

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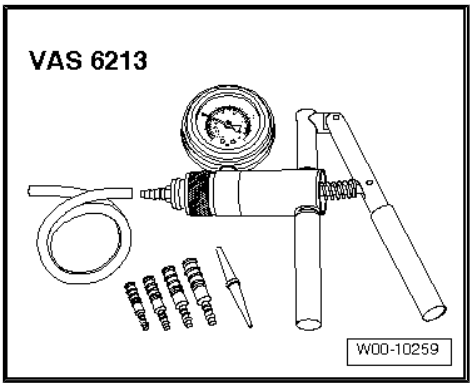
3.7 Installing radiators, condensers and charge air coolers

Even when the radiator, condenser and charge air cooler are correctly installed, slight impressions may be visible on the fins of these components. This does not mean that the components are damaged. If the fins are only very slightly distorted, this does not justify renewal of the radiator, charge air cooler or condenser.

3.8 Checking vacuum system

Special tools and workshop equipment required

- Hand vacuum pump - VAS 6213-



Procedure

– Check all vacuum lines in the complete vacuum system for:

- Cracks
- Traces of animal bites
- Kinked or crushed lines
- Porous or leaking lines

– Check vacuum line to solenoid valve and from solenoid valve to corresponding component.
– If a fault is stored in the event memory, check the vacuum lines leading to the relevant component and also check the remaining vacuum lines in the system.
– If it is not possible to build up a vacuum with the hand vacuum pump - VAS 6213- or if the vacuum pressure drops again immediately, check the hand vacuum pump and connecting hoses for leaks.

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10 – Removing and installing engine

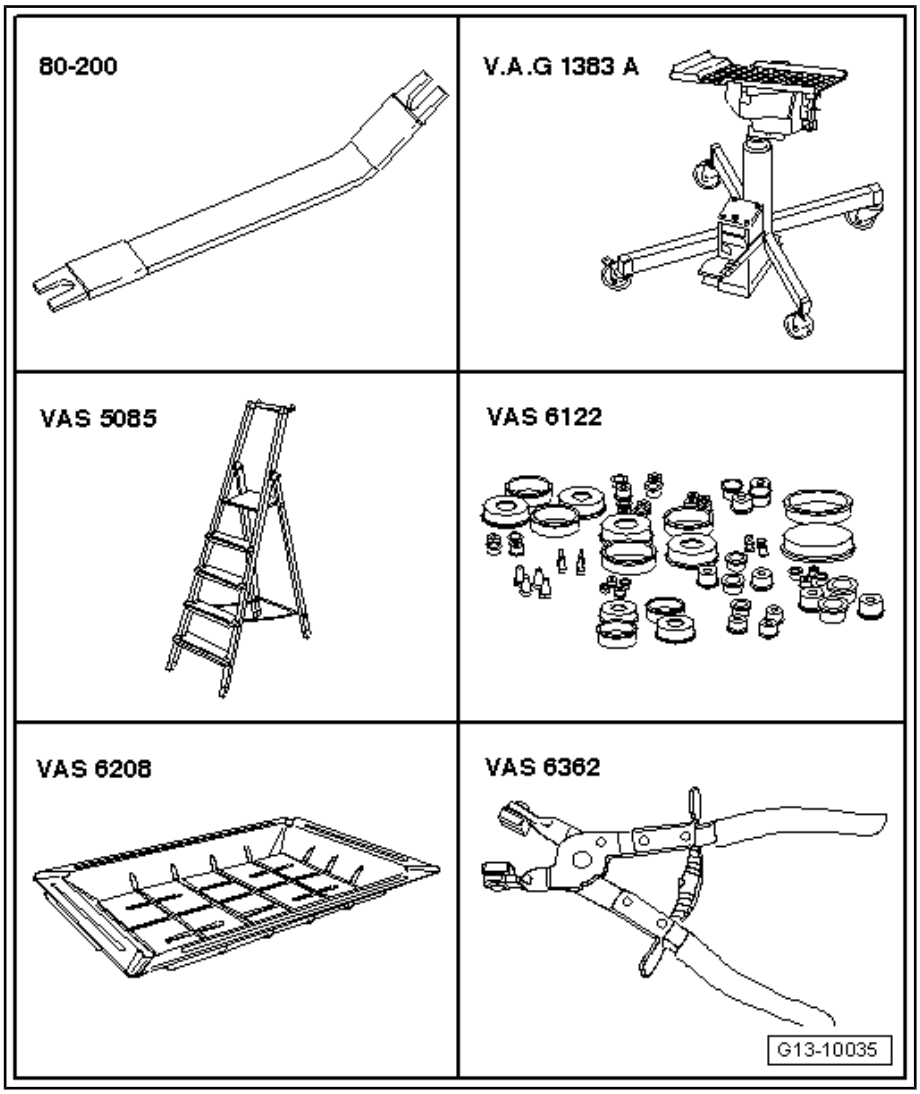
1 Removing engine

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Caution

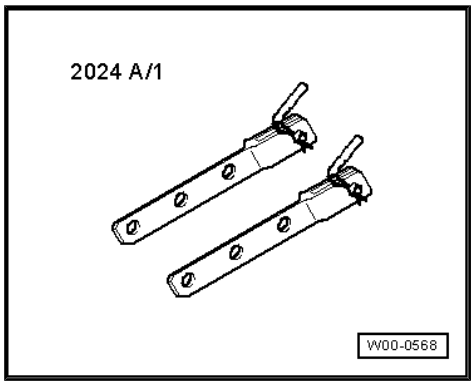
When installing a new base engine, it is essential that the clamping pieces for the injectors are tightened to the specified torque after installing the high-pressure pipes ⇒ Rep. gr. 23 . The clamping pieces are only secured hand-tight at the factory so the injectors can be aligned during installation. If these instructions are not observed, the engine could be damaged.

Special tools and workshop equipment required

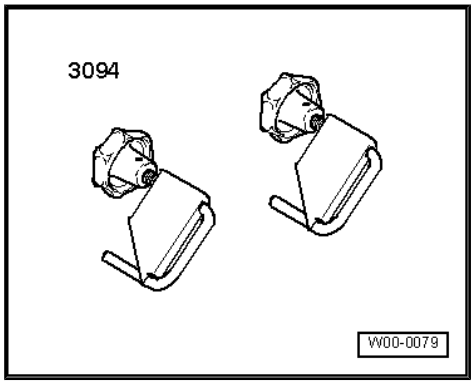


- Removal lever - 80 - 200-
- Engine and gearbox jack - V.A.G 1383 A-
- Stepladder - VAS 5085-
- Engine bung set - VAS 6122-
- Drip tray for workshop hoist - VAS 6208-

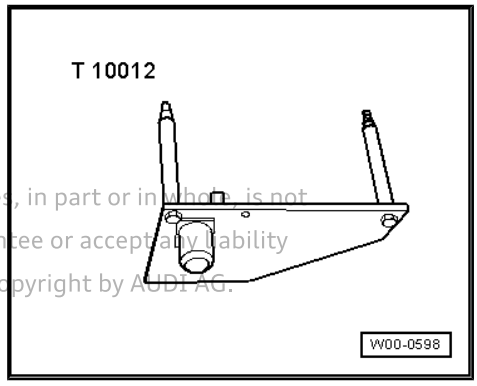
- Hose clip pliers - VAS 6362-
- Hooks -2024 A /1- of lifting tackle - 2024 A- for vehicles with four-wheel drive



- Hose clamps, up to 25 mm - 3094-

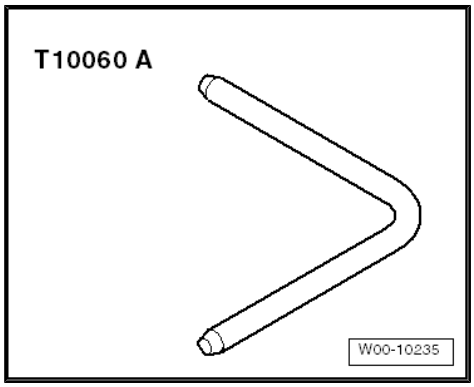


- Engine bracket - T10012-



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- Locking pin - T10060 A- for vehicles with air conditioner compressor and tensioner



- Safety goggles
- Protective gloves

Procedure

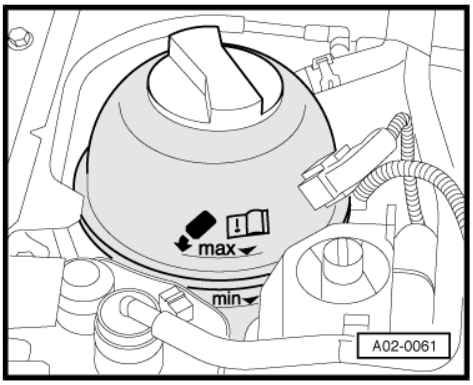
Note

- *The engine is removed from underneath together with the gearbox.*
- *Fit cable ties in the original positions when installing.*
- *Fit heat insulation sleeves in the original positions when installing.*

WARNING

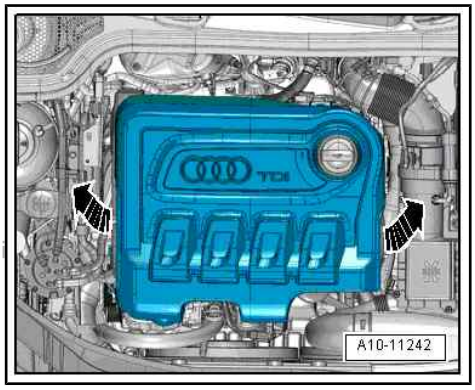
Risk of scalding due to hot steam and hot coolant.

- ***The cooling system is under pressure when the engine is hot.***
- ***To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.***



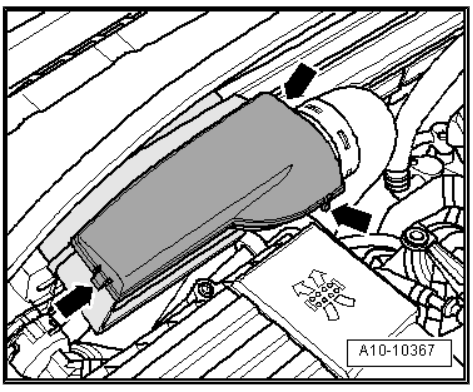
– Open filler cap on coolant expansion tank.

– Remove engine cover panel -arrows-.

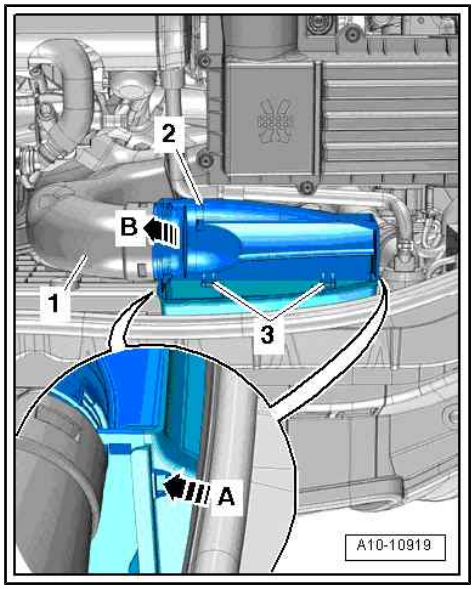


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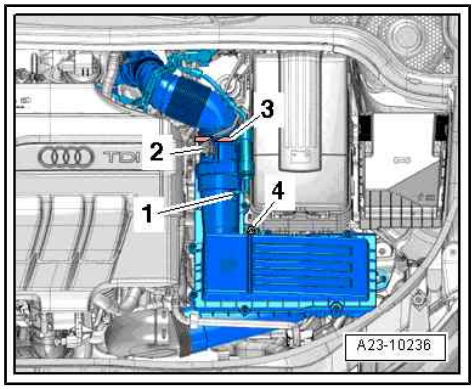
– Pull cover off air duct (release clips on sides) -arrows-.



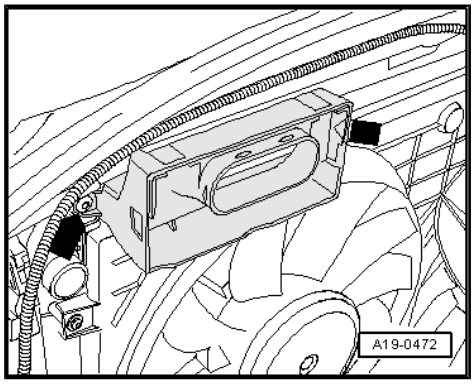
– Release clips on left and right -arrow A- and unclip air duct at bottom -2-.
– Swivel air duct (bottom) slightly to the rear and detach air duct (bottom) from retainers -3-.
– Detach air pipe -1- from air duct (bottom) -arrow B-.



– Unplug electrical connector -2- at air mass meter - G70- .
– Detach hose -1-.
– Release hose clip -3- and detach air hose.
– Unscrew bolt -4- and remove air cleaner housing.



– Remove bolts -arrows- and detach air duct from lock carrier.

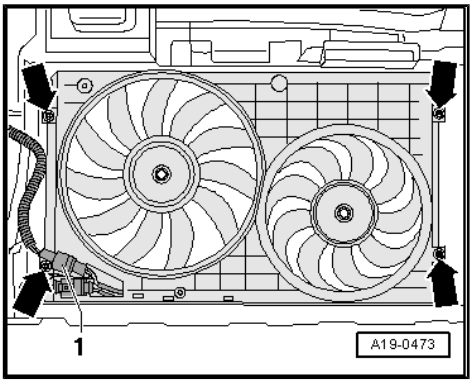


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WARNING

Risk of injury as the radiator fans may start up automatically.

- ***Even when the ignition is switched off, the radiator fans can start up without warning due to accumulated heat in the engine compartment, etc.***



– Remove bolts -top arrows- for radiator cowl.

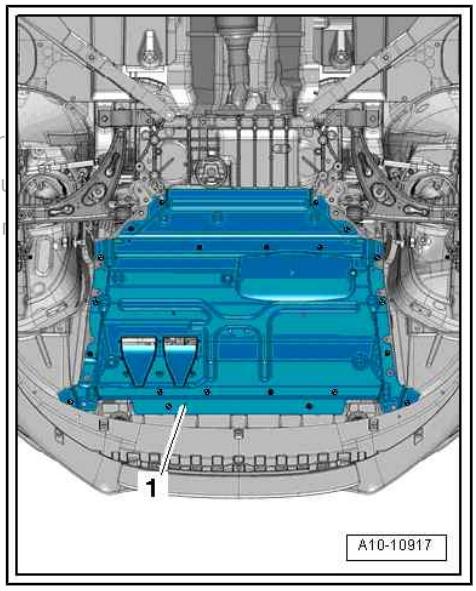
Note

- *The bolts -bottom arrows- are removed at a later stage.*
- *Disregard -item 1-.*

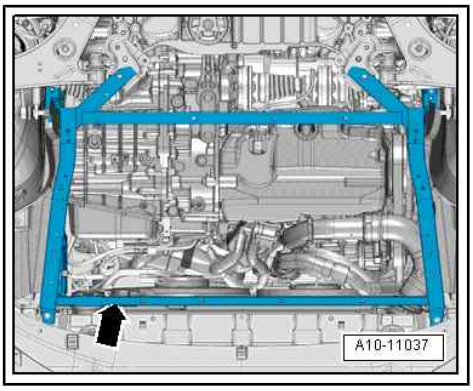
– Remove both front wheels.

– Remove noise insulation -1- ⇒ Rep. gr. 50 .

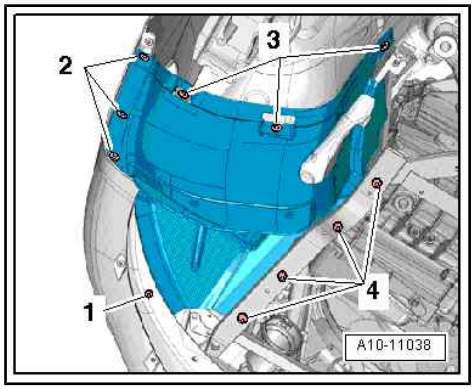
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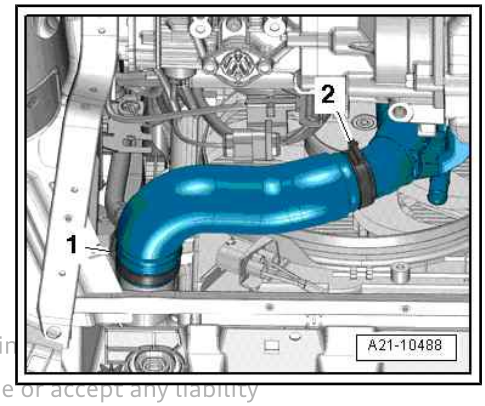
– A3 Cabriolet: Remove noise insulation frame -arrow- ⇒ Rep. gr. 50 .



– Remove front left and front right wheel housing liners (front section) ⇒ Rep. gr. 66 .

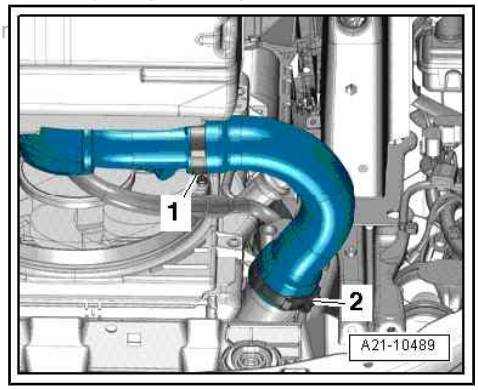


– Release hose clips -1- and -2- and remove air hose.

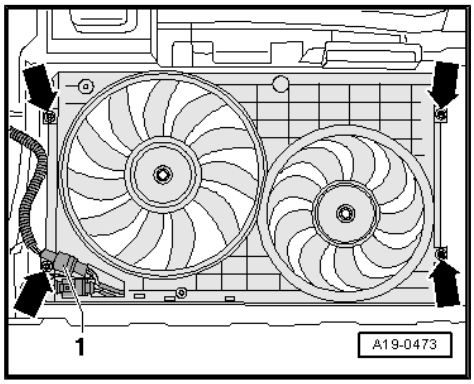


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– Release hose clips -1- and -2- and remove air hose.
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .



– Unplug electrical connector -1-.
– Remove bolts -bottom arrows- and take out air cowl downwards.



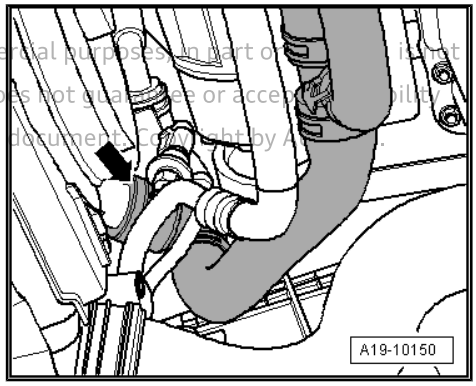
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Note

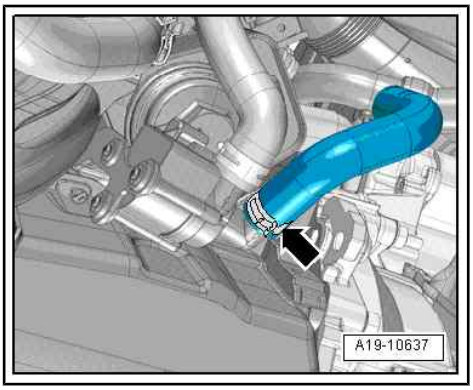
Collect drained coolant in a clean container for re-use or disposal.

– Place drip tray for workshop hoist - VAS 6208- beneath engine.

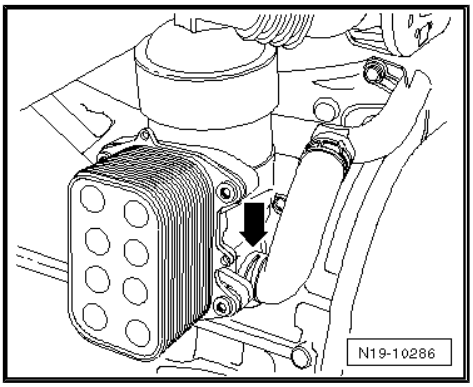
– Lift retaining clip -arrow-, disconnect coolant hose (bottom right) from radiator and drain off coolant.



– Open hose clip -arrow-, disconnect coolant hose (bottom) leading to pump for exhaust gas recirculation cooler - V400- and drain off coolant.



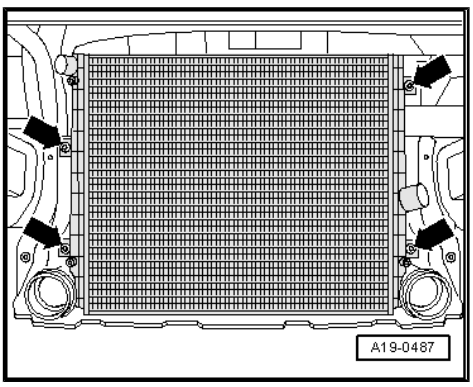
– Release hose clip -arrow-, disconnect coolant hose at oil filter housing and drain off remaining coolant.



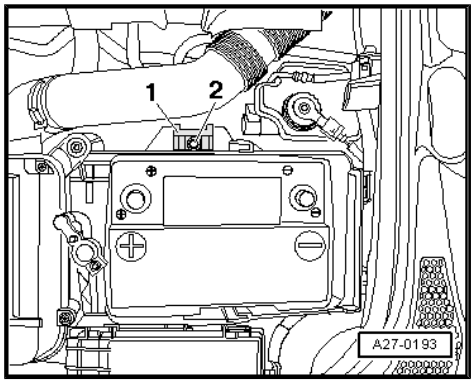
– Remove bolts -bottom arrows- on rear side of radiator.

Note

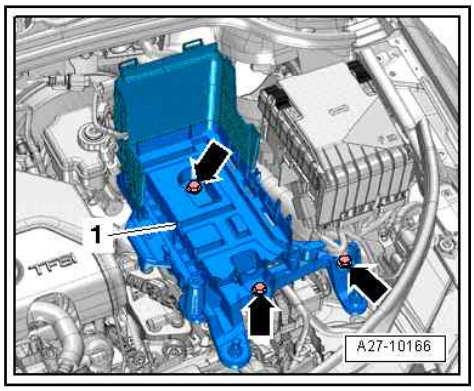
The bolts -top arrows- are removed at a later stage.



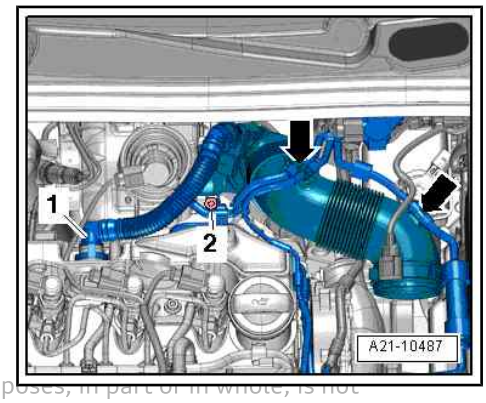
– Remove battery ⇒ Electrical system; Rep. gr. 27 .



– Remove bolts -arrows- and take out battery tray -1-.

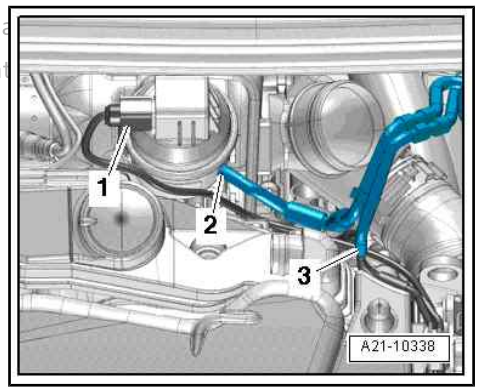


– Press release tabs and disconnect crankcase breather hose -1- from cylinder head cover.
– Move clear vacuum hoses -arrows- at air pipe.
– Remove bolt -2-, swivel intake pipe with connection to rear and detach from turbocharger.



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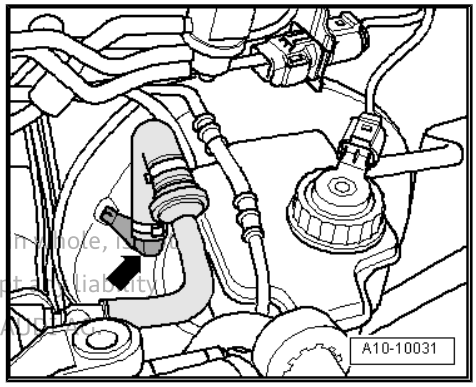
– Detach vacuum hose -2- from vacuum unit of turbocharger.
– Disconnect vacuum hose -3-.



Note

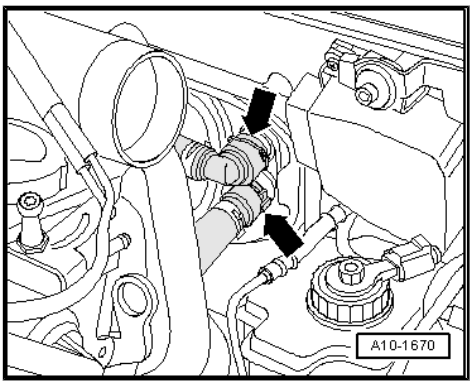
Disregard -item 1-.

– Detach vacuum hose from brake servo -arrow-.



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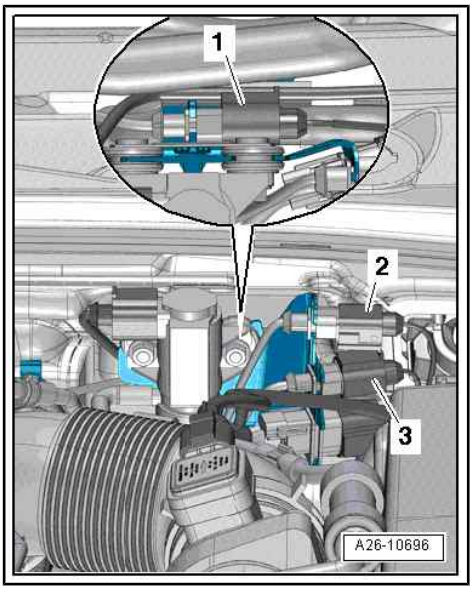
– Place drip tray for workshop hoist - VAS 6208- under connection.
– Lift retaining clips -arrows- and disconnect coolant hoses from heat exchanger for heater.
– Guide coolant hoses downwards and drain off coolant.



– Detach electrical connector -3- from bracket, unplug and move clear.
– Move clear electrical wiring from turbocharger.

Note

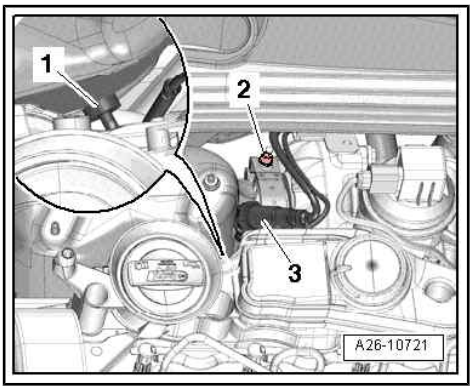
Disregard items -1 and 2-.



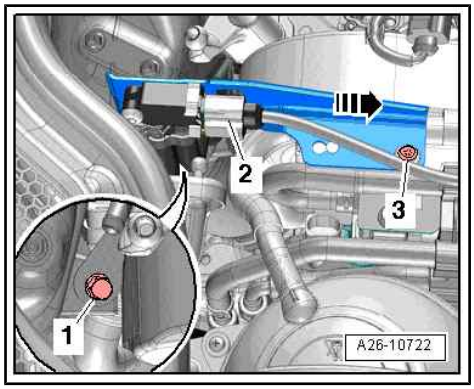
– Slacken bolt -2- and remove clamp.

Note

Disregard items -1 and 3-.



– Unplug electrical connector -2-.
– Remove bolt -3- and detach pressure differential sender - G505- from bracket -arrow-.
– Remove top bolt -1- at bracket for particulate filter.

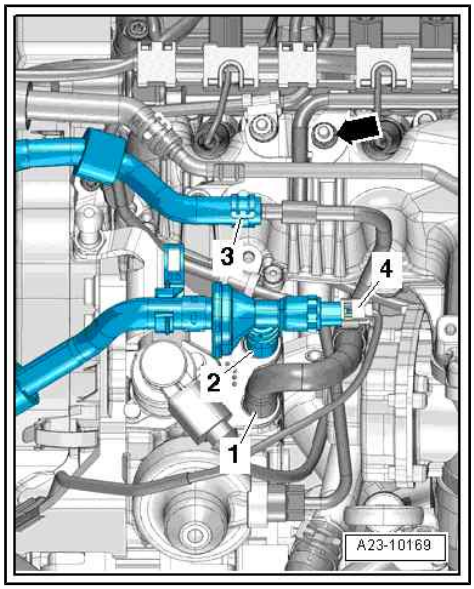


– Unplug electrical connector -4- on fuel temperature sender - G81- .

WARNING

Very hot fuel - risk of burn injuries!

- *After switching off the engine, the temperature of fuel pipes and the fuel itself can be up to 100 °C in extreme cases. Let fuel cool off before opening any connections; otherwise there is a danger of scalding!*
- *Put on protective gloves.*
- *Put on safety goggles.*



– Release hose clips -2- and -3- and disconnect fuel supply hose and fuel return hose.
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .

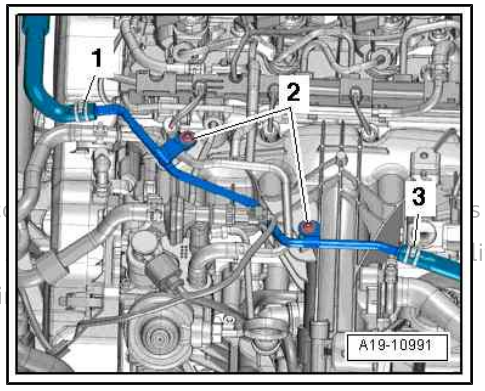
Note

Disregard -item 1- and -arrow-.

– Release hose clip -1- and detach coolant hose.

Note

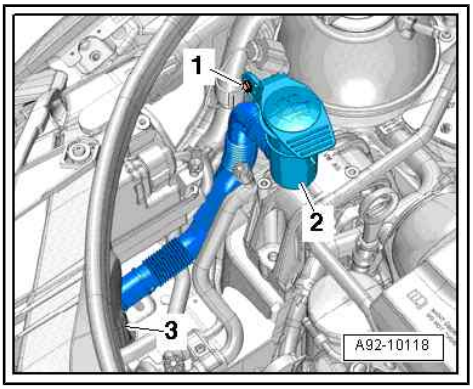
Disregard items -2 and 3-.



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– Remove bolt -1-.

– Push filler pipe with filler neck -2- for washer fluid reservoir to side.



Note

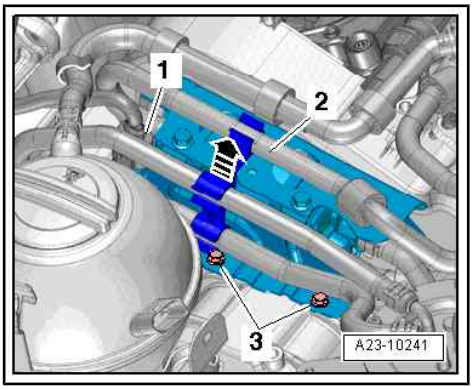
- *Disregard -item 3-.*
- *For illustration purposes, the installation position is shown with the fuel filter removed.*

– Disengage fuel hose -2- at bracket.

– Pull off bracket for fuel lines upwards -arrow- and move clear to one side.

– Unplug electrical connector -1- at supplementary fuel pump - V393- .

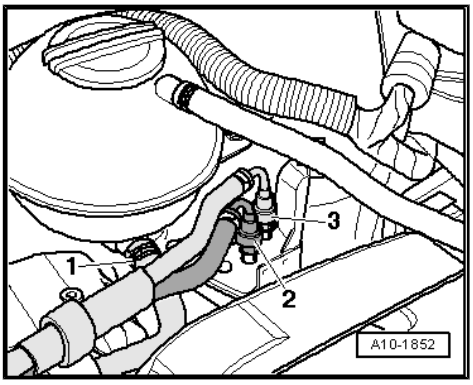
– Remove bolts -3-, detach bracket with supplementary fuel pump - V393- and move clear to one side.



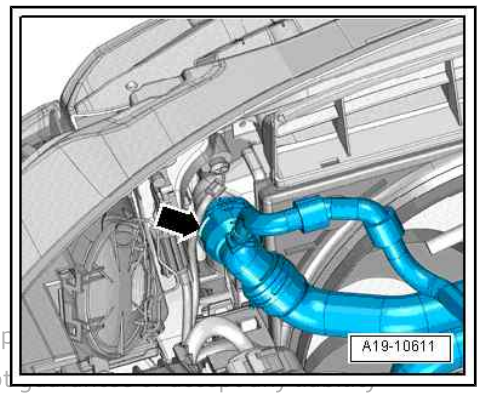
– Release hose clip -1-, detach coolant hose from coolant expansion tank and move coolant hose clear.

Note

Disregard items -2 and 3-.



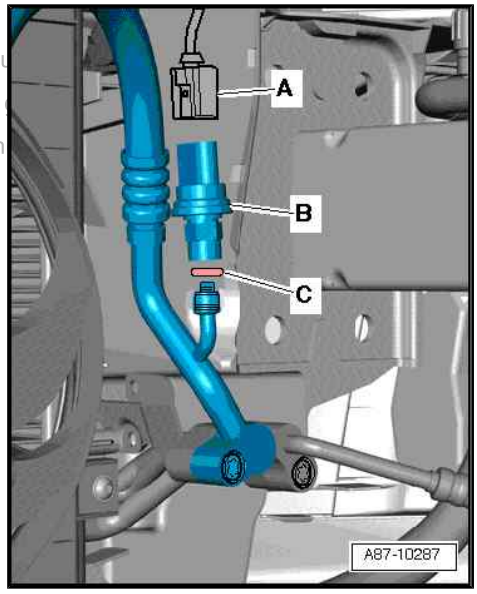
– Lift retaining clip -arrow- and disconnect coolant hose (top left) from radiator.



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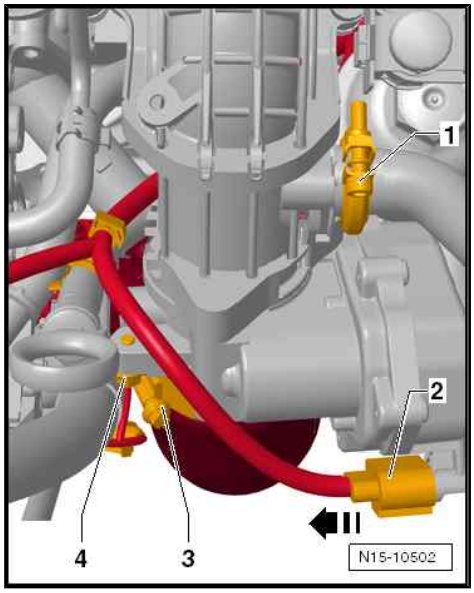
– Unplug electrical connector -A- at high-pressure sender - G65- -item B-.



Note

Disregard -item C-.

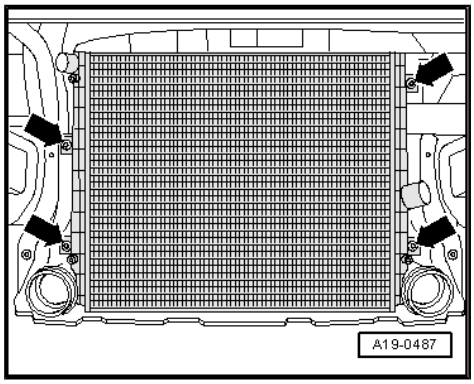
– Unplug electrical connector -2- at throttle valve module - J338- -arrow-.



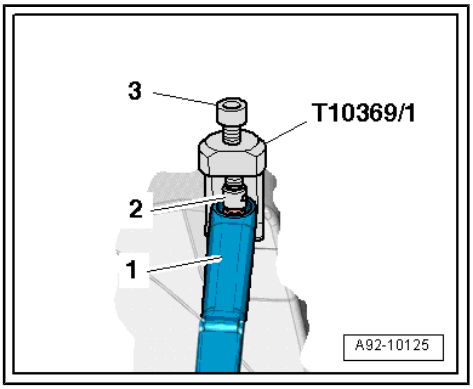
Note

Disregard -items 1, 3, 4-.

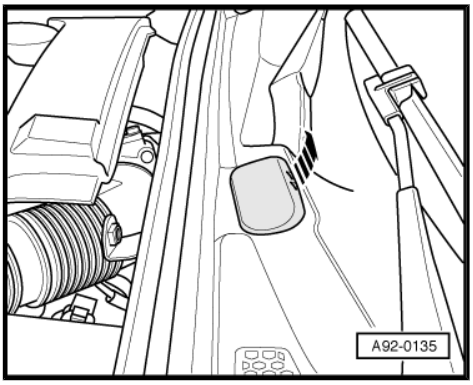
– Detach sealing lip at lock carrier (top).
– Remove bolts -top arrows- at rear and lift out radiator.



– Remove wiper arms ⇒ Electrical system; Rep. gr. 92 .



– Unclip washer jets -arrow-.
– Push washer jets through assembly opening back into plenum chamber, leaving hoses connected.

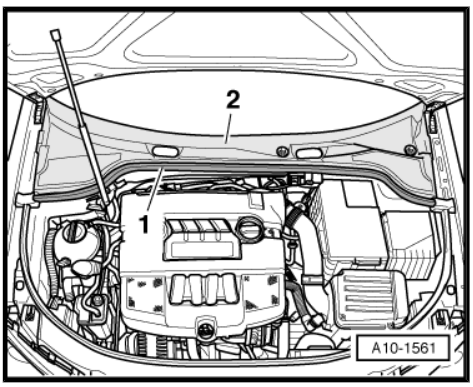


– Pull off seal -1-.

Caution

Risk of damage to plenum chamber cover.

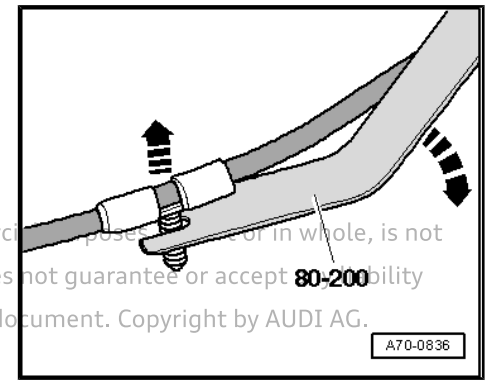
- *Apply a small quantity of soap solution to transition between windscreen and plenum chamber cover -2-. Then, starting at edge of windscreen, carefully pull plenum chamber cover upwards off retainer at windscreen.*



– Pull off plenum chamber cover.

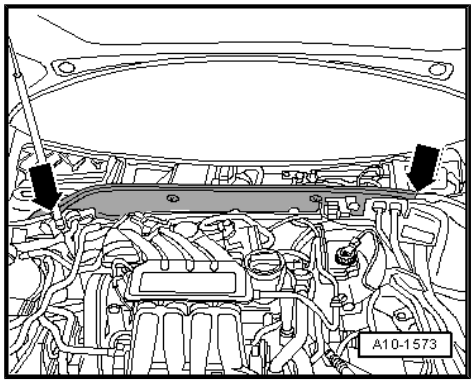
Note

Use removal lever - 80 - 200- to lever out the wiring clips when performing the next work steps.



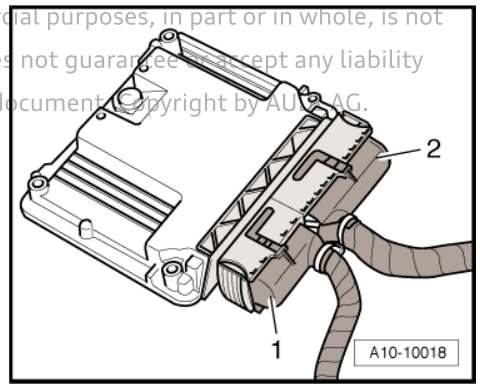
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– Move clear engine wiring harness at rear of plenum chamber partition panel.
– Remove bolts -arrows- and detach plenum chamber partition panel.



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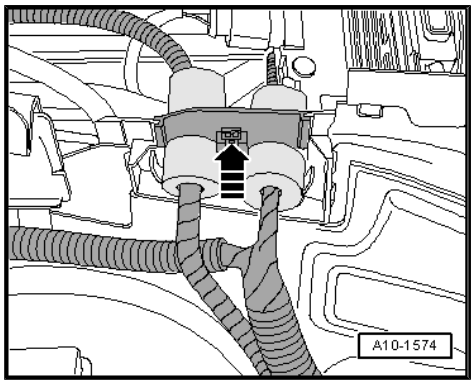
– Remove engine control unit ⇒ Rep. gr. 23 .
– Unplug electrical connector -1- for engine wiring harness.



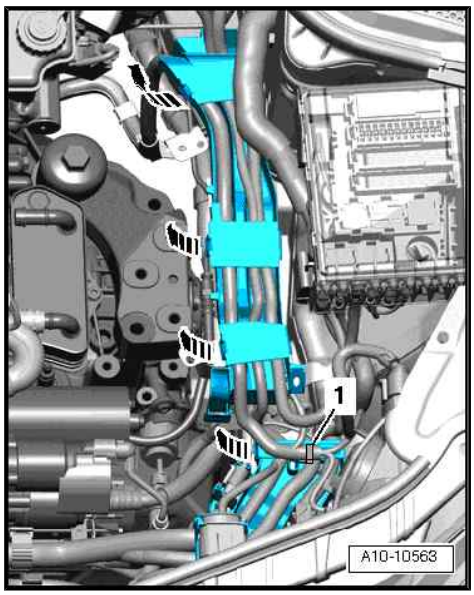
Note

Disregard -item 2-.

– Release wiring protector for engine wiring harness -arrow- and lift protector off.



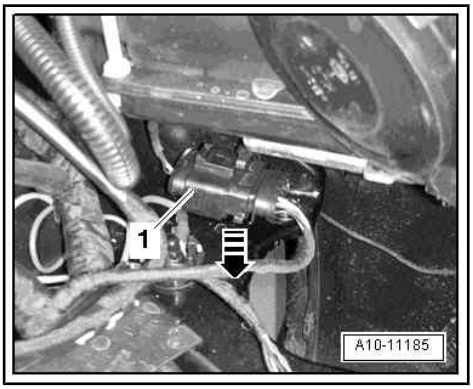
– Open retainers for wiring duct -arrows-.



Note

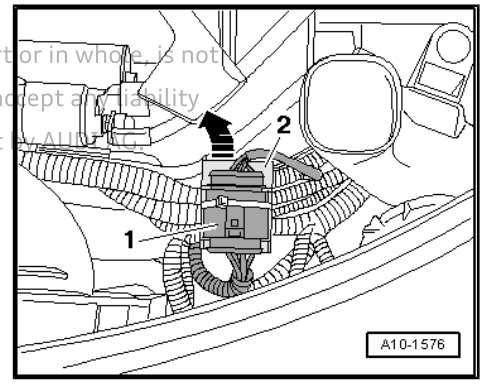
Disregard -item 1-.

– Release catch -arrow-, detach electrical connector -1- and unplug.



– Move clear and unplug electrical connector -1-.
– Open retainer -2- for wiring duct -arrow-.
– Remove wiring harness for engine control unit from wiring duct and place on engine.

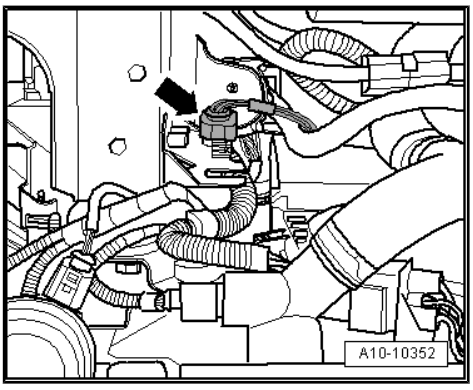
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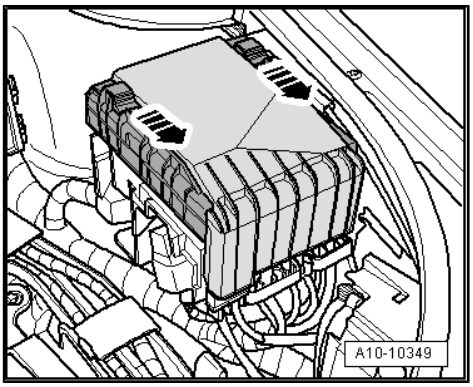
– Unplug electrical connector -arrow- at longitudinal member (bottom left).

Note

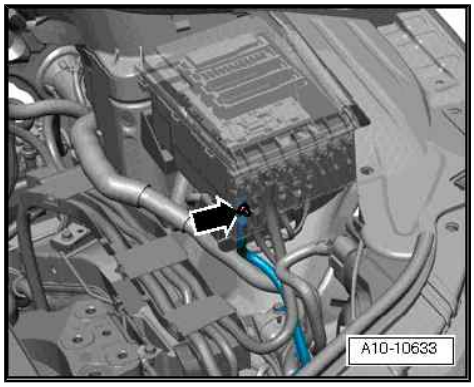
For illustration purposes, the installation position is shown from below.



– Slide the two clips in the direction of the -arrows- and remove cover from electronics box in engine compartment.



– Remove nut -arrow-, detach terminal 30 wire from electronics box in engine compartment and move it clear.

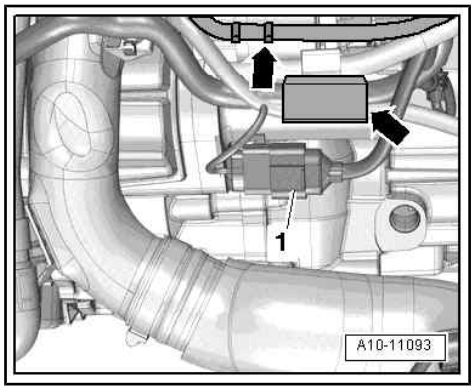


Vehicles with manual gearbox:

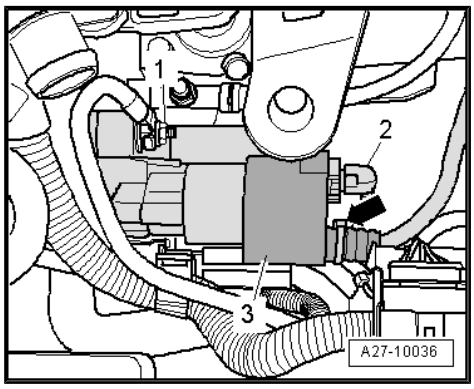
– Unplug electrical connector -1-.

Note

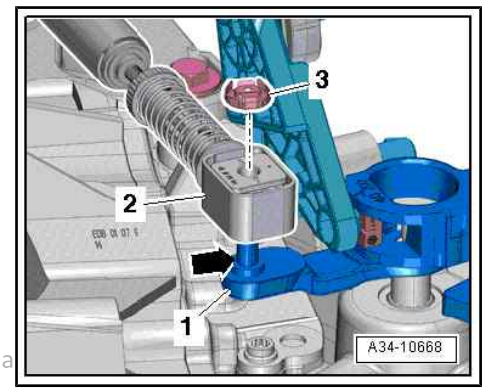
Disregard -arrows-.



– Cut open cable tie -arrow- for protective cover -3-.
– Unplug electrical connector -2-.
– Push back protective cover and unscrew B+ cable at starter solenoid switch
– Remove nut -1- for earth wire.
– Remove top starter bolt.



– Lift clip and detach retaining clip -3- for gear selector cable from gearbox selector lever -1-.
– Detach gear selector cable -2- from pin -arrow-.

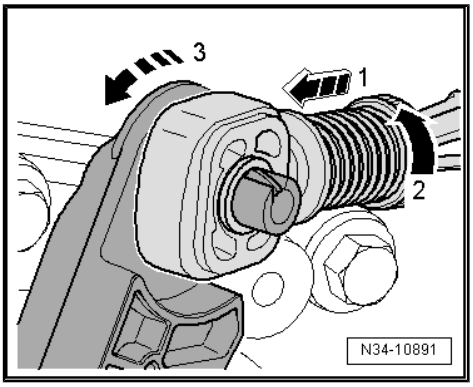


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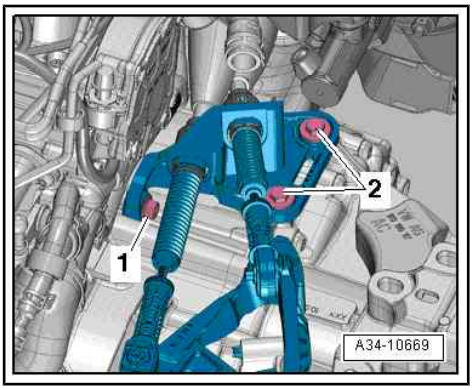
- To prevent damage to gate selector cable, cable end-piece must be detached from gate selector cable before removing.

– Pull locking device forwards onto stop -arrow 1- and lock by turning anti-clockwise -arrow 2-.

– Press gate relay lever towards front -arrow 3-.

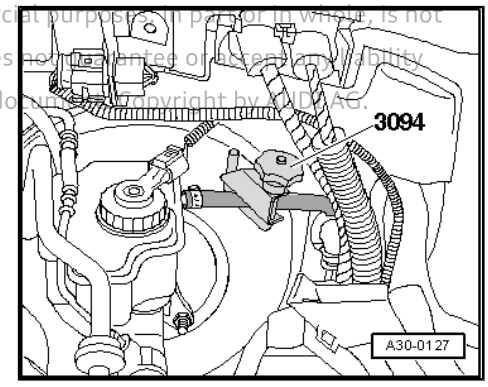


– Remove nut -1- and bolts -2-, detach cable support bracket and place to one side (selector cables remain fitted).

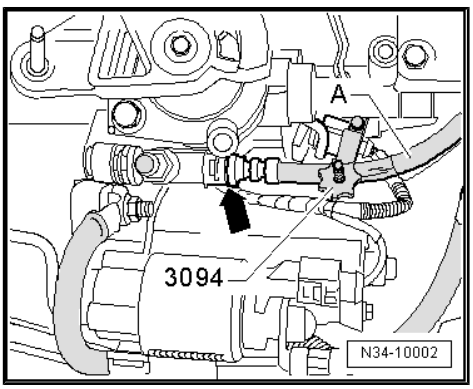


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– Vehicles with plastic pipe between clutch master cylinder and slave cylinder: clamp off supply hose at brake fluid reservoir using hose clamp -3094- .



– Vehicles with pipe/hose assembly between clutch master cylinder and slave cylinder: clamp off hose -A- at pipe/hose assembly using hose clamp - 3094- .



Note

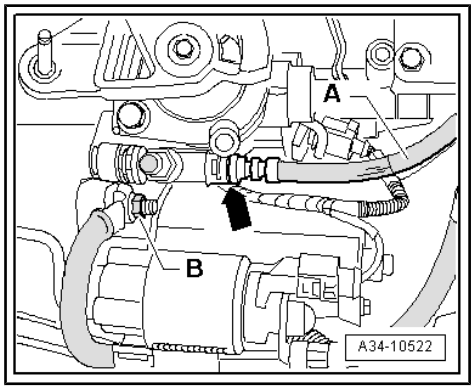
Disregard -arrow-.

Note

Make sure brake fluid does not come into contact with starter or gearbox when performing the following operations. If it does, clean affected area thoroughly.

– Pull out clip -arrow- as far as stop.

– Pull plastic pipe or pipe/hose assembly -A- out of bleeder connection for clutch slave cylinder.



Note

Disregard -item B-.

– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .

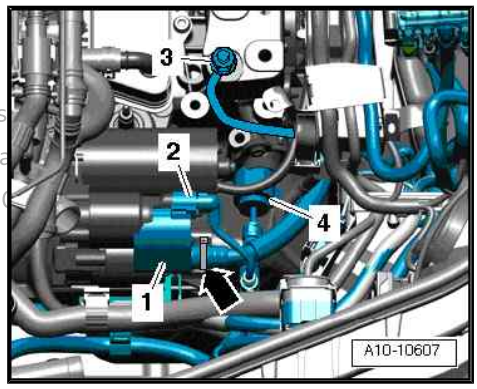
Vehicles with dual clutch gearbox:

– Cut open cable tie -arrow- for protective cover -1-.

– Unplug electrical connector -2-.

– Push back protective cover and unscrew B+ cable at starter solenoid switch

– Remove nut -3- and detach earth wire.



Caution

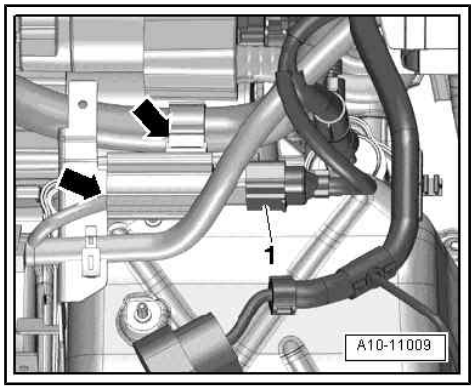
Risk of damage to control unit (mechatronic unit) by static discharge.

- ***Do NOT touch connector contacts in gearbox connector with your hands.***

– Touch vehicle earth with bare hands to eliminate any static charge.

– Turn retainer catch anti-clockwise and unplug electrical connector -4- at gearbox.

– Unplug electrical connector -1-.



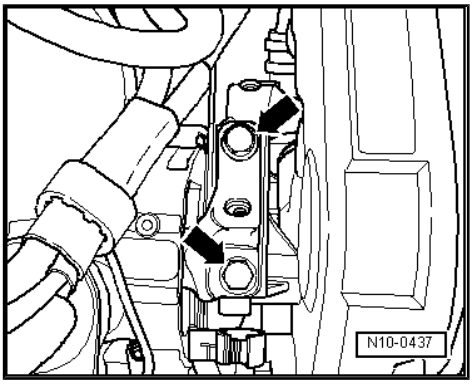
Note

Disregard -arrows-.

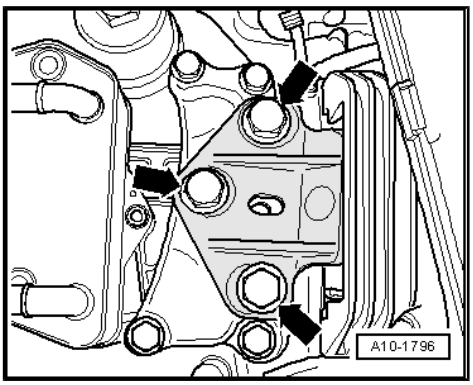
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All vehicles (continued):

– Unscrew bolts -arrows- at engine mounting approx. 2 turns.



– Loosen bolts -arrows- at gearbox mounting approx. 2 turns.

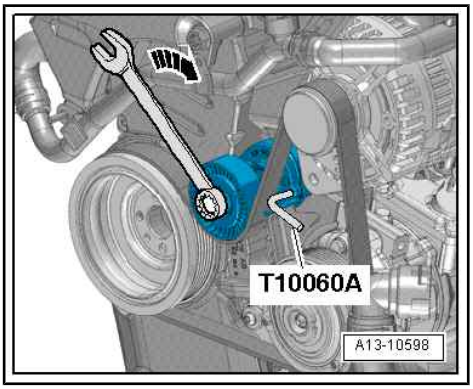


Vehicles with air conditioner compressor and tensioner:

Caution

Running a used poly V-belt in the opposite direction could cause irreparable damage.

- *Before removing the poly V-belt, mark the direction of rotation with chalk or a felt-tip pen for re-installation.*



– Move tensioner in clockwise direction -arrow- to slacken poly V-belt.

– Lock tensioner with locking pin - T10060 A- .

– Take off poly V-belt.

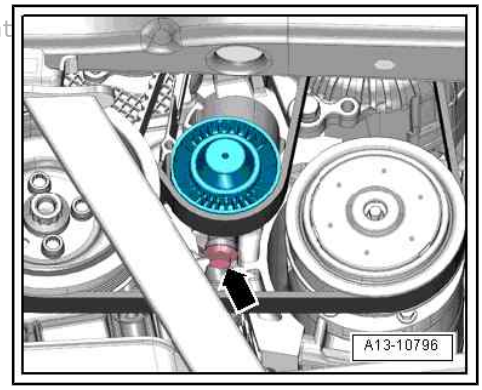
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Vehicles with air conditioner compressor and tensioning roller:

Caution

Running a used poly V-belt in the opposite direction could cause irreparable damage.

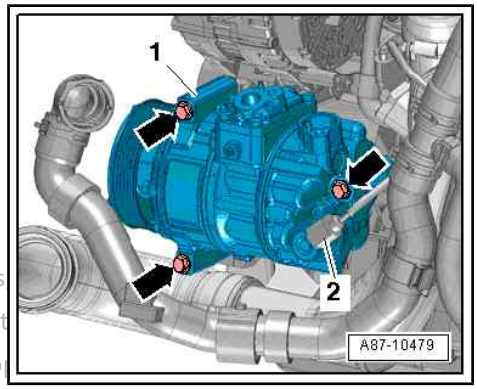
- *Before removing the poly V-belt, mark the direction of rotation with chalk or a felt-tip pen for re-installation.*



– Remove bolt -arrow- and detach tensioner to slacken poly V-belt.

– Take off poly V-belt.

All vehicles with air conditioner compressor (continued):



– Unplug electrical connector -2- on air conditioner compressor regulating valve - N280- .

Caution

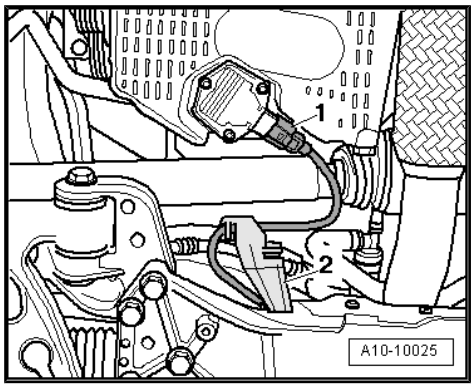
Risk of damage to air conditioner compressor and refrigerant pipes/hoses.

- ***Do NOT stretch, kink or bend refrigerant lines and hoses.***

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– Remove bolts -arrow-, detach air conditioner compressor -1- with refrigerant lines connected and tie up to front.

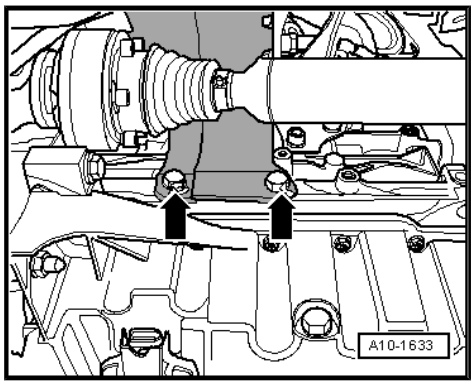
All vehicles (continued):



– Unplug electrical connector -1- at oil level and oil temperature sender - G266- .

– Unclip bracket -2- for wire to oil level and oil temperature sender - G266- from subframe.

Vehicles with front-wheel drive:



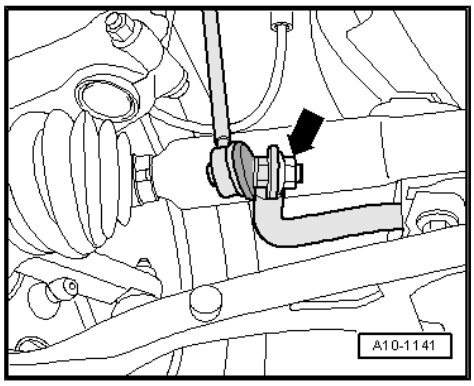
– Remove bolts -arrows- and detach heat shield for drive shaft (right-side).

– Unbolt drive shaft (left and right) from gearbox flange shaft.

– Tie up drive shaft (left-side).

Note

Take care not to damage the surface coating of the drive shaft.

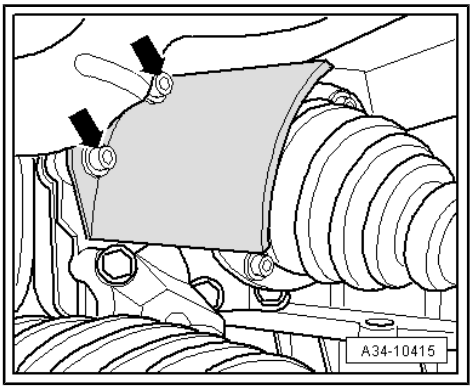


– Remove nuts -arrow- for coupling rod on anti-roll bar on both sides.

Vehicles with four-wheel drive:

– Remove bolts -arrows- and detach heat shield for drive shaft (right-side).

– Detach drive shaft (left-side) from flange shaft of gearbox and tie up.



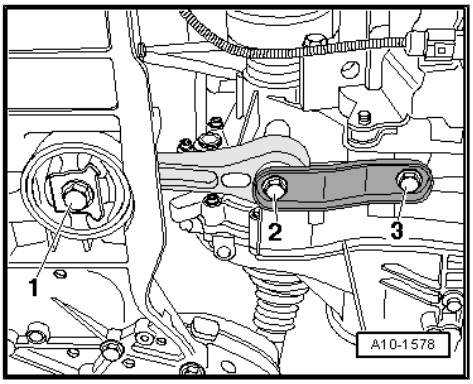
Note

Take care not to damage the surface coating of the drive shaft.

– Detach drive shaft (right-side) from flange shaft of bevel box.

All vehicles (continued):

– Remove bolts -1, 2, 3- and remove pendulum support.

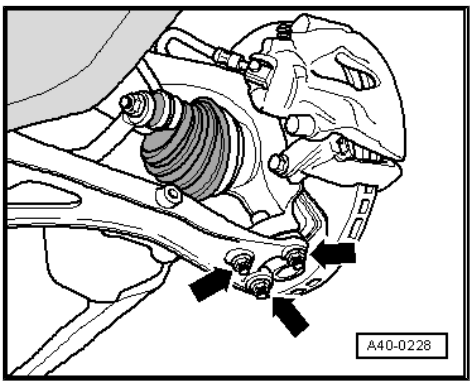


– Mark position of nuts -arrows- securing swivel joint.

– Remove nuts for swivel joint (right-side).

– If fitted, unscrew nut on bracket for front left vehicle level sender - G78- .

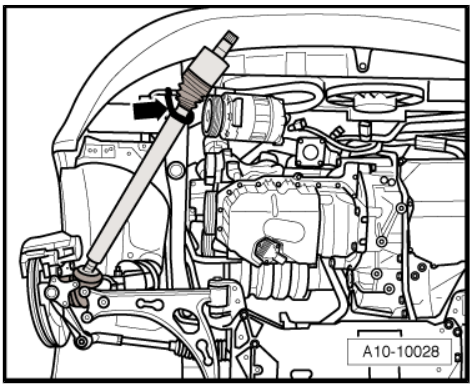
– Detach swivel joint from wishbone.



Vehicles with front-wheel drive:

– Pivot drive shaft (right-side) forwards; to do so, push engine/ gearbox assembly slightly forwards.

– Tie up drive shaft to longitudinal member -arrow-.



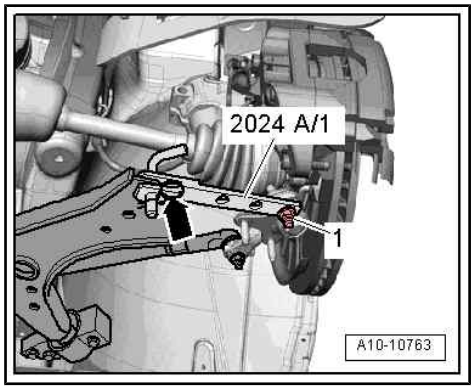
Note

Take care not to damage the surface coating of the drive shaft.

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Vehicles with four-wheel drive:

– Swing suspension strut (right-side) outwards and support with hook -2024 A /1- as shown in illustration.



WARNING

Accident risk from loose components of support bracket.

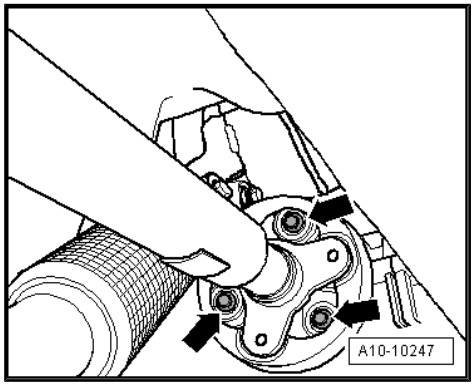
- ***Secure retaining pin and swivel joint with locking pin -arrow- and nut -1-.***

Note

The illustration shows the installation position on front suspension (left-side).

– Mark position of flexible coupling and flange for bevel box in relation to each other.

– Unbolt flexible coupling for propshaft at bevel box -arrows- (counterhold using a suitable lever at the triangular flange).



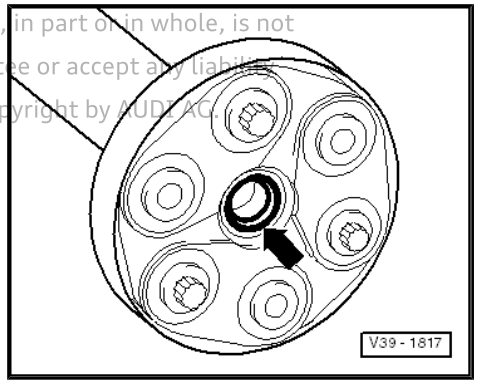
– Push engine/gearbox assembly forward slightly (towards front end) and pull propshaft off bevel box.

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Caution

Make sure not to damage the oil seal -arrow- in the propshaft flange.

- ***Push the propshaft horizontally to the rear and towards the right side of the vehicle as far as possible.***

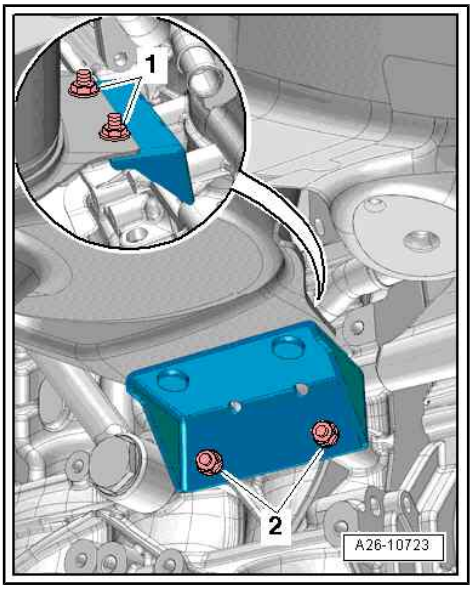


Note

The propshaft must be renewed if the oil seal is damaged.

All vehicles (continued):

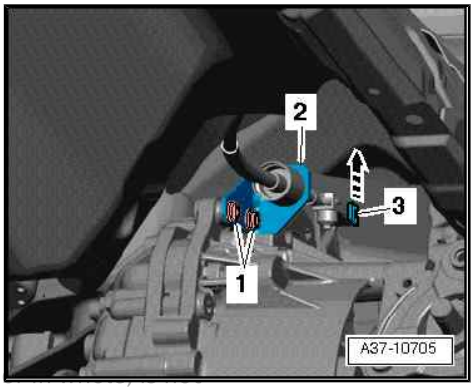
– Remove nuts -1- and -2- and detach bracket for particulate filter.



Vehicles with dual clutch gearbox:

– Remove bolts -1- for cable support bracket.

– Pull off securing clip -3- -arrow- and remove selector lever cable from gearbox.



Note

Disregard -item 2-.

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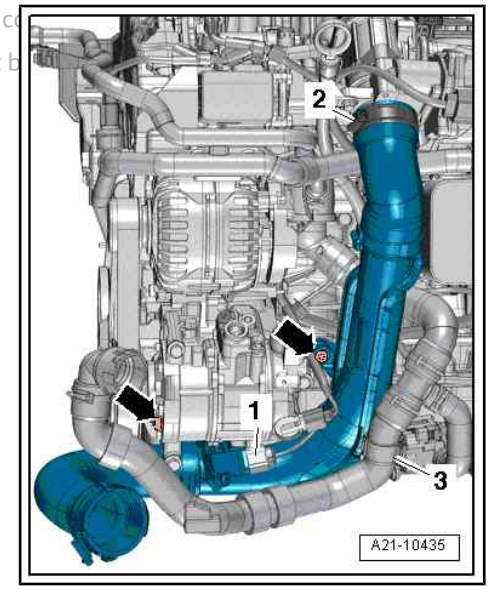
All vehicles (continued):

– Remove bolts -arrows-.

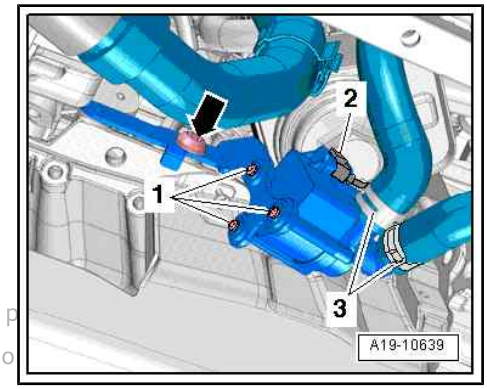
– Move coolant hose -3- clear.

– Release hose clip -2-.

– Unplug electrical connector -1- at charge pressure sender - G31- / intake air temperature sender - G42- and detach air pipe (right-side).



– Remove bolt -arrow- and push pump for exhaust gas recirculation cooler - V400- to the side.



Note

Disregard -items 1, 2, 3-.

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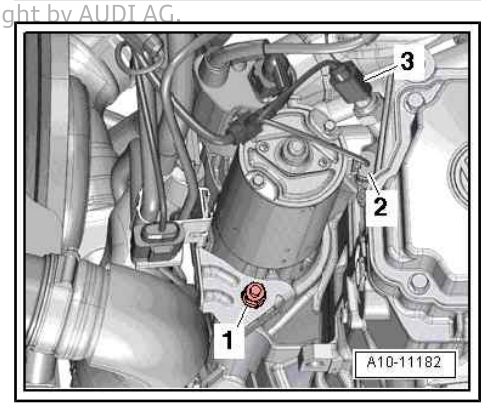
Vehicles with start/stop system:

– Unplug electrical connector -3- for gearbox neutral position sender - G701- .

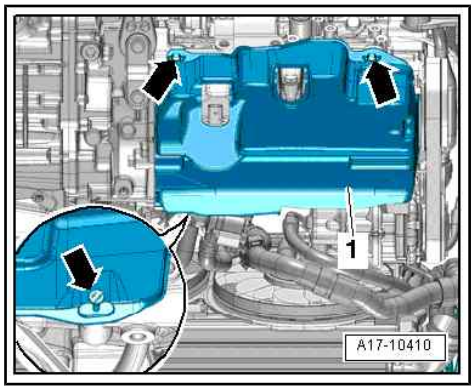
All vehicles (continued):

– Unplug electrical connector -2- at reversing light switch - F4- .

– Unscrew nut -1- and detach bracket for electrical wiring.

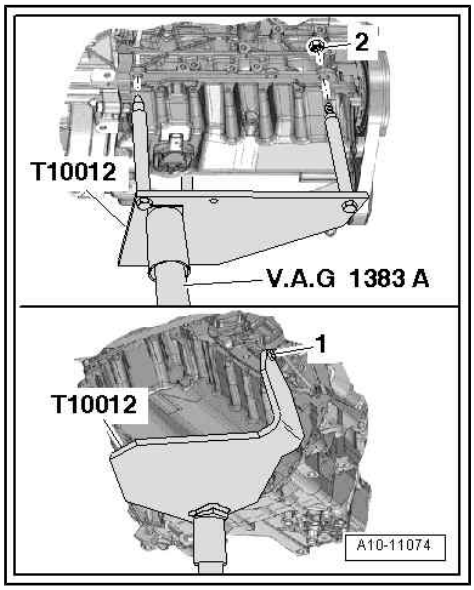


– Release fasteners -arrows- and remove noise insulation -1- for sump.



– Secure engine bracket - T10012- to cylinder block with bolt -1- and nut -2- (tightening torque: approx. 20 Nm).

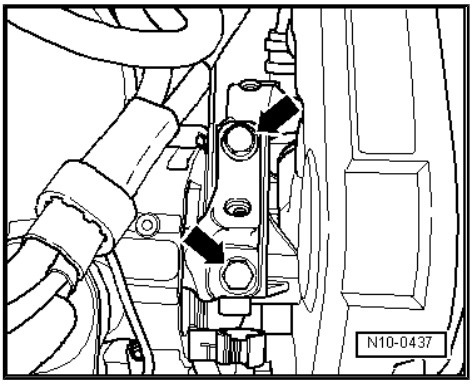
– Insert engine and gearbox jack - V.A.G 1383 A- in engine bracket - T10012- and raise engine/gearbox assembly slightly.



Note

To unscrew bolts for assembly mounting use stepladder - VAS 5085- .

– Remove bolts -arrows- securing engine mounting.

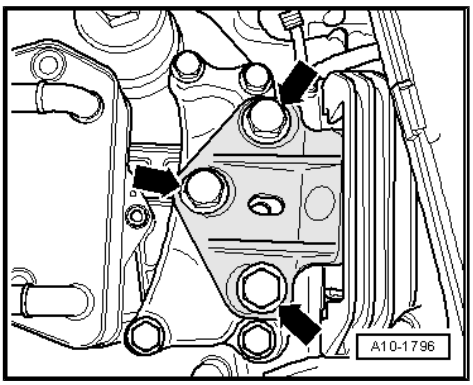


– Remove bolts -arrows- securing gearbox mounting.

Caution

Danger of damage to hydraulic lines, vacuum lines or electrical wiring and to engine compartment.

- ***Check that all hydraulic lines, vacuum lines and electrical wiring between engine, gearbox, subframe and body have been detached.***
- ***Carefully guide out engine/gearbox assembly with subframe from engine compartment when lowering.***



– First lower engine/gearbox assembly only slightly.

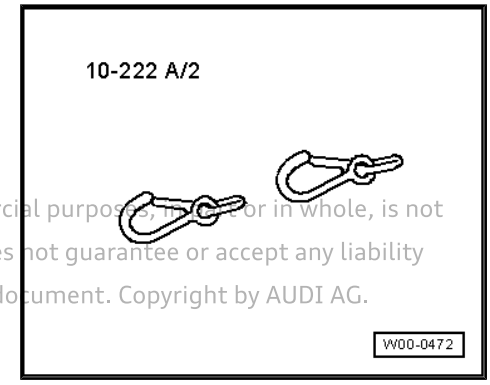
– Then swing gearbox end of engine/gearbox assembly forwards and only then lower further.

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2 Separating engine and manual gearbox

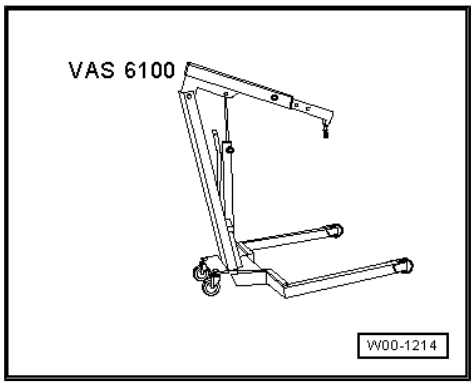
Special tools and workshop equipment required

- Hooks - 10 - 222 A /2-

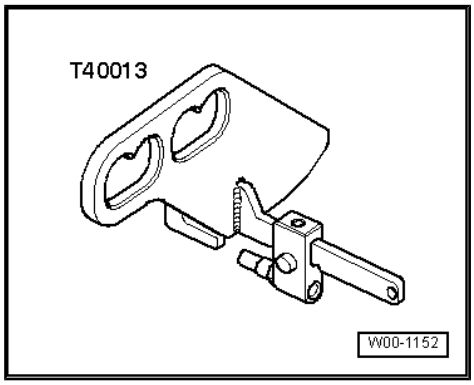


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- Workshop hoist - VAS 6100-



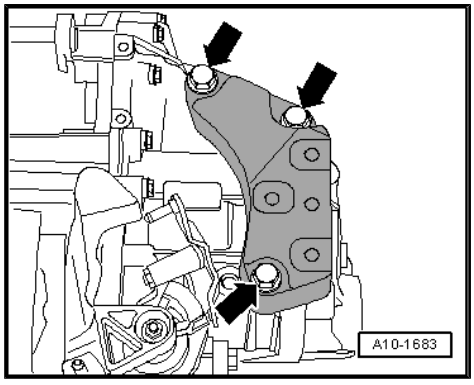
- Lifting tackle - T40013-



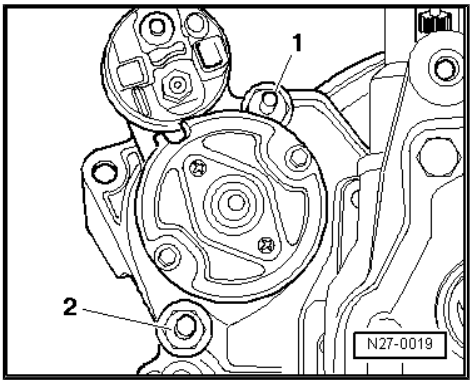
Procedure

- Engine/gearbox assembly removed and attached to engine bracket - T10012- .

– Unscrew bolts -arrows- and detach gearbox support.



– Unscrew bolts -1- and -2- and remove starter from gearbox.

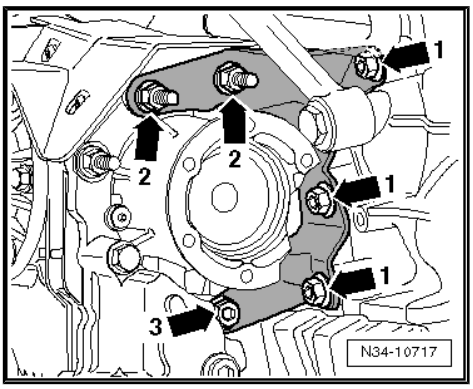


Vehicles with four-wheel drive:

– Remove bolts -arrows 2, 3- securing bracket for bevel box.

Note

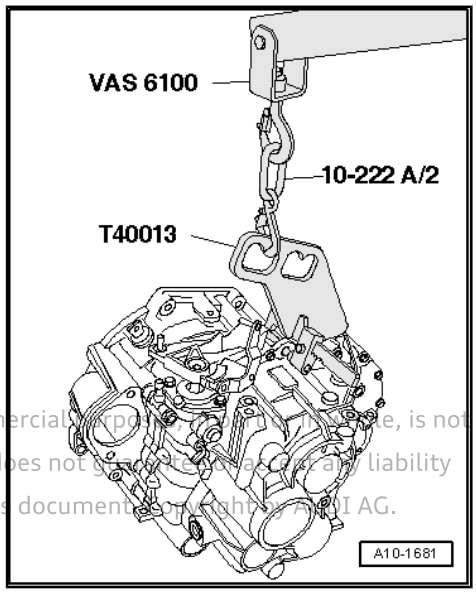
Disregard -arrows 1-.



All vehicles (continued):

– Attach lifting tackle - T40013- to gearbox and close lock.

– Attach workshop hoist - VAS 6100- with hooks - 10 - 222 A / 2- to the lifting tackle.



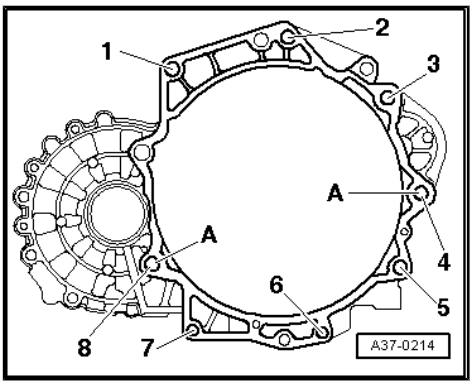
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– Remove bolts -1, 2, 5, 6, 7, 8- securing gearbox to engine.

Note

Disregard -items 3 and 4- and -A-.

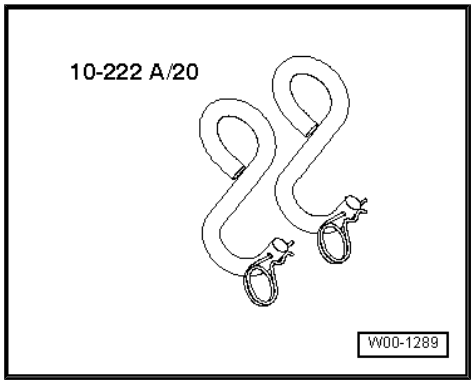
– Detach gearbox from engine.



3 Separating engine and dual clutch gearbox

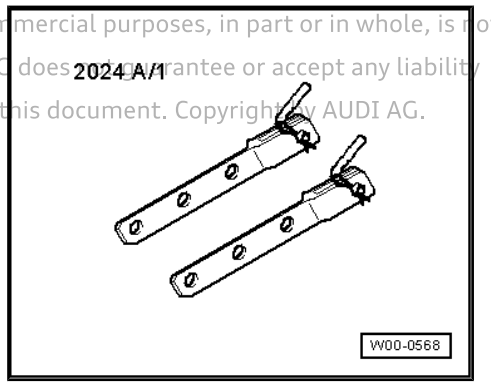
Special tools and workshop equipment required

- Adapters - 10 - 222 A /20-

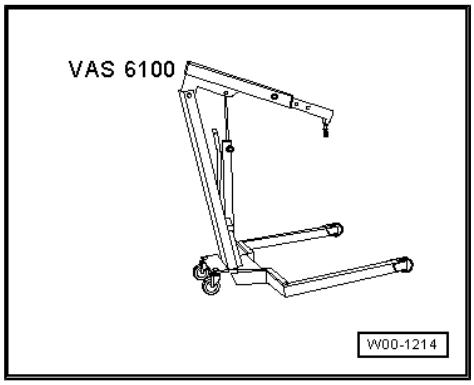


- Hook -2024 A /1- of lifting tackle - 2024 A-

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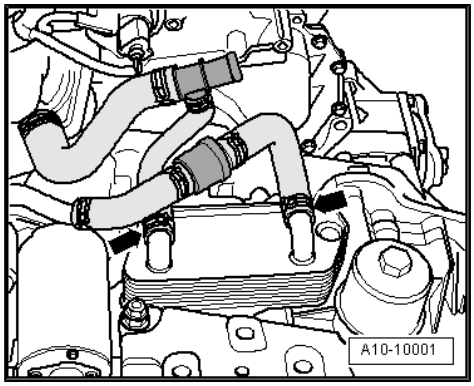
- Workshop hoist - VAS 6100-



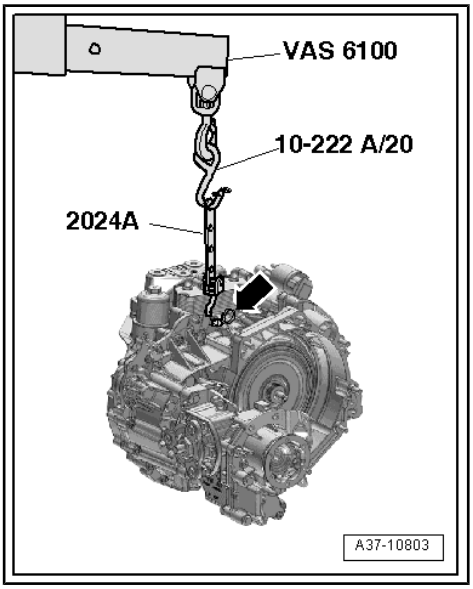
Procedure

- Engine/gearbox assembly removed and attached to engine bracket - T10012- .

– Slacken hose clips -arrows- and detach coolant hoses from gear oil cooler.

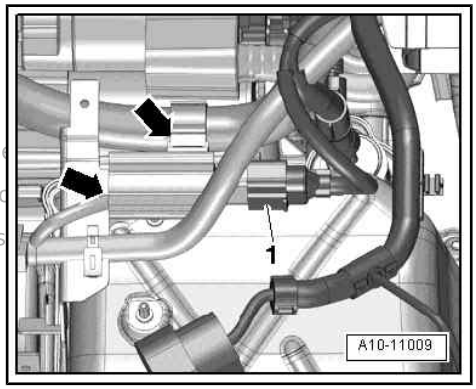


– Engage hook of lifting tackle - 2024 A- in gearbox lifting eye and secure with locking pin -arrow-.
– Engage workshop hoist - VAS 6100- with adapter - 10 - 222 A /20- in lifting tackle.

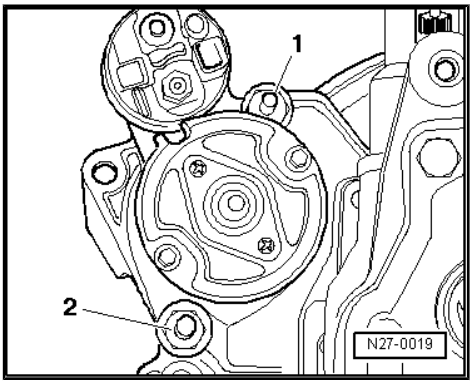


– Move clear wiring harnesses -arrows- and electrical connector -1- at bracket.

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– Unscrew bolts -1- and -2- and remove starter from gearbox.

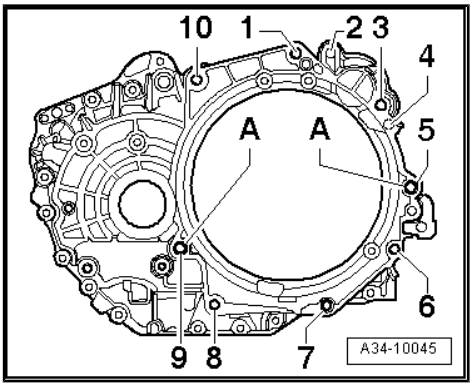


– Remove remaining bolts -1, 3, 5, 6, 7, 8, 9, 10- securing gearbox to engine.

Note

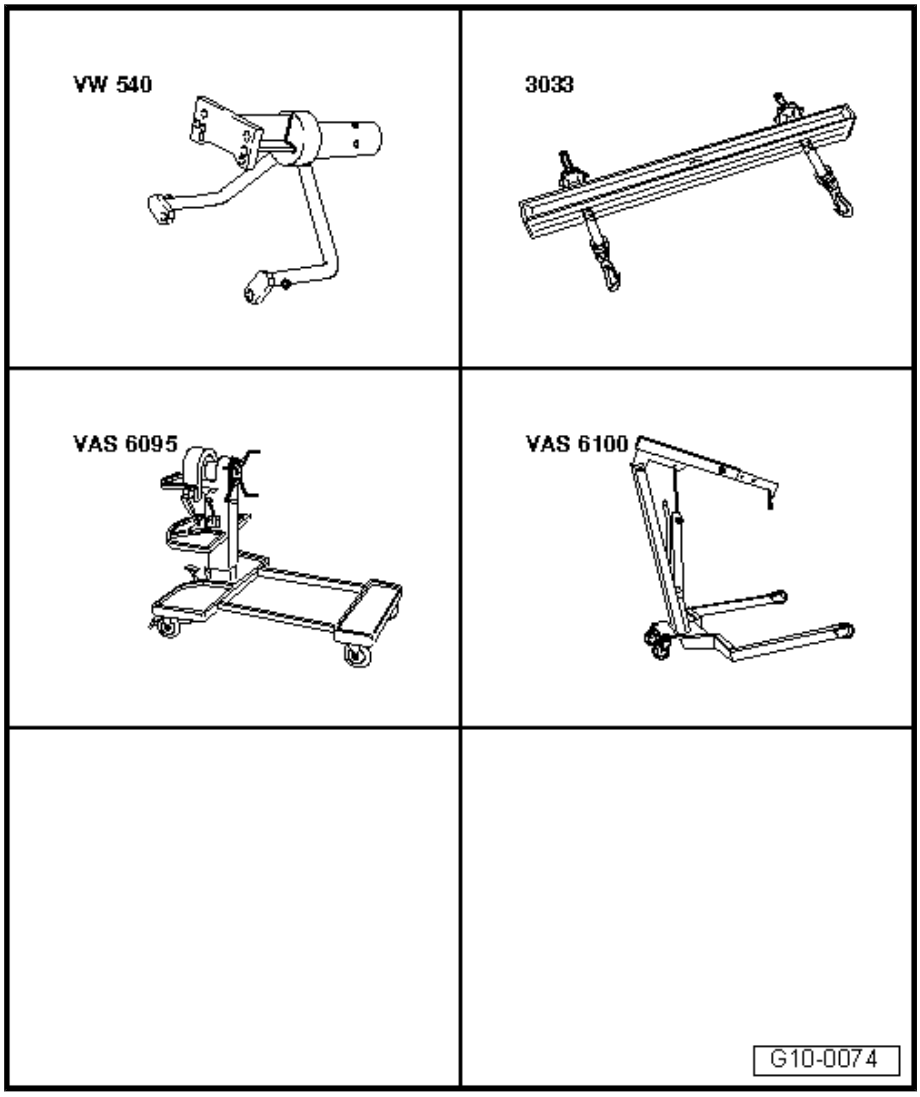
- *Bolt -3- can be accessed only after removing starter.*
- *Disregard -items 2 and 4- and -A-.*

– Detach gearbox from engine.



4 Securing engine to engine and gearbox support

Special tools and workshop equipment required

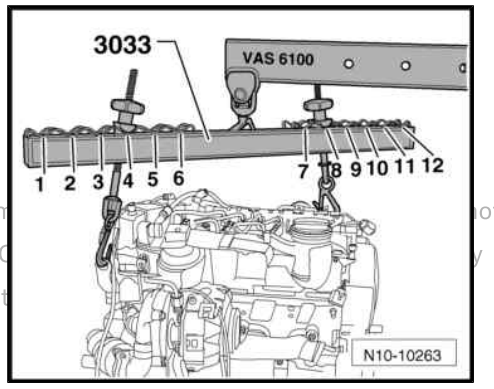


- Engine and gearbox support - VW 540-
- Lifting tackle - 3033-
- Engine and gearbox support - VAS 6095-
- Workshop hoist - VAS 6100-

Procedure

- Gearbox detached from engine.

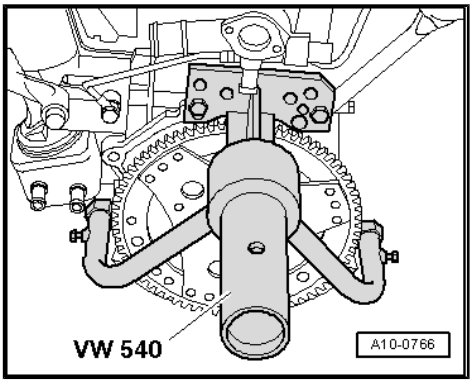
– Attach lifting tackle - 3033- to engine and workshop hoist - VAS 6100- as shown in illustration.



– Lift engine off engine bracket - T10012- using workshop hoist - VAS 6100- .

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– Secure engine to engine and gearbox support - VW 540- using engine and gearbox support - VAS 6095- .



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5 Installing engine

Tightening torques

Note

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

Component		Nm
Bolts/nuts	M6	10
	M7	15
	M8	20
	M10	40
	M12	65
Except for the following:		
Underbody cross member (front) to body		23

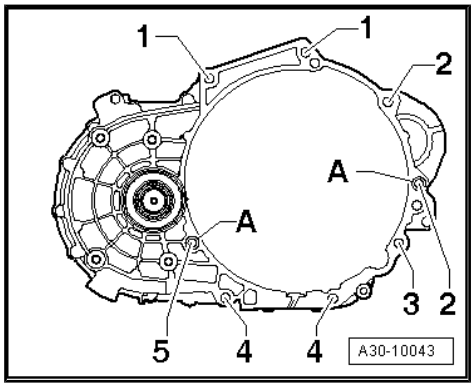
Assembly mountings

⇒ “6.1 Exploded view - assembly mountings”, page 45

Securing manual gearbox to engine

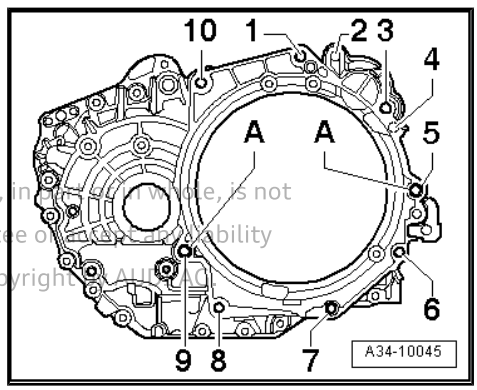
Item	Bolt	Nm
1[1)]	M12x55	80
2[1)]	M12x165	80
3	M10x105	40
4	M10x50	40
5[2)]	M12x65	80
A	Dowel sleeves for centralising	

- [1)] Bolt with M8 threaded pin
- [2)] Screwed into gearbox from engine side



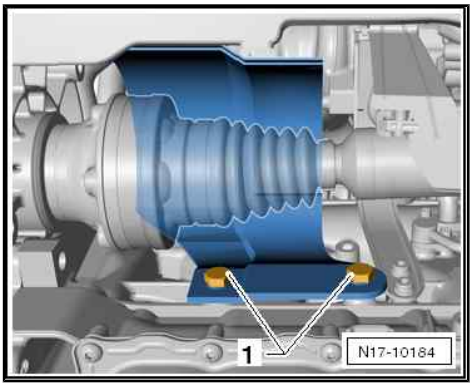
Securing dual-clutch gearbox to engine

Item	Bolt	Nm
1, 3, 10	M12x55	80
5	M12x65	80
6, 7, 8	M10x50	40
9	M12x70	80
2, 4	Securing starter ⇒ Electrical system; Rep. gr. 27	
A	Dowel sleeves for centralising	



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Heat shield for drive shaft (right-side) - tightening torque



Note

Illustration shows heat shield on vehicles with front-wheel drive as an example.

– Tighten bolts -arrows- to 35 Nm.

Procedure

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

Note

- *Vehicles with dual clutch gearbox: The needle bearing in the crankshaft must always be renewed if the engine has been separated from the gearbox ⇒ "3.5 Extracting and driving in needle bearing for crankshaft", page 91 .*
- *Renew the bolts tightened with specified tightening angle.*
- *Renew self-locking nuts and bolts as well as seals, gaskets and O-rings.*
- *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *Fit all cable ties in the original positions when installing.*

– Install intermediate plate ⇒ page 80 .

Vehicles with manual gearbox:

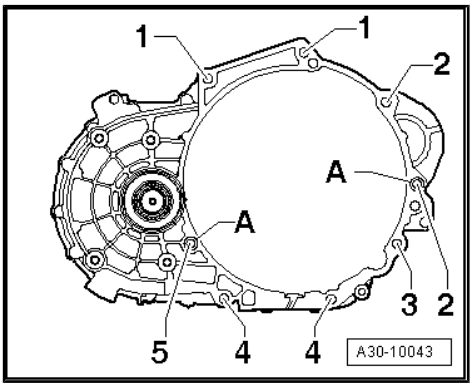
– If not already fitted, install dowel sleeves -A- for centring engine and gearbox in cylinder block.

– Remove needle bearing in crankshaft if fitted ⇒ page 91 .

– Renew clutch release bearing if worn ⇒ Rep. gr. 30 .

– Lubricate splines of gearbox input shaft lightly with grease for clutch plate splines ⇒ Electronic parts catalogue .

– Make sure that clutch plate is properly centred.

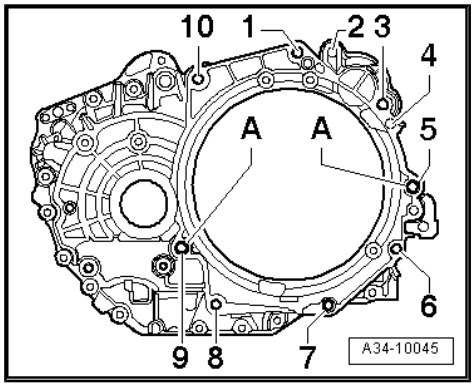


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Vehicles with dual clutch gearbox:

– If not already fitted, install dowel sleeves -A- for centring engine and gearbox in cylinder block.

– Install needle bearing if not fitted in crankshaft ⇒ “3.5 Extracting and driving in needle bearing for crankshaft”, page 91 .



All vehicles (continued):

– Secure gearbox to engine.

– Install gearbox support ⇒ Rep. gr. 34 .

– Take up engine/gearbox assembly with engine bracket - T10012- .

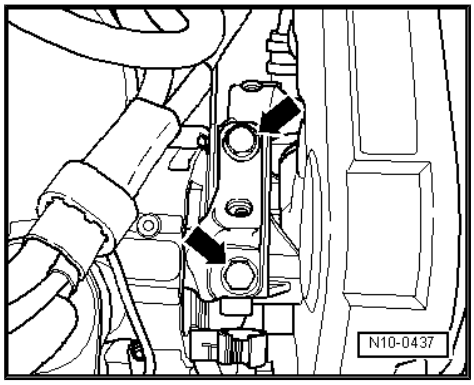
Vehicles with four-wheel drive:

– Install bracket for bevel box ⇒ Rep. gr. 34 .

All vehicles (continued):

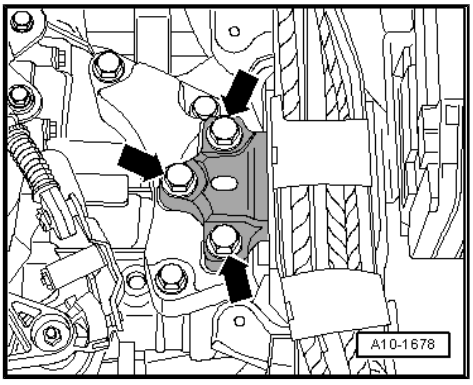
– Guide engine/gearbox assembly into body.

– Initially screw in bolts -arrows- for engine mounting by hand until they make contact.



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– Initially screw in bolts -arrows- for gearbox mounting by hand until they make contact.



Note

The bolts are tightened to final torque only after adjusting the assembly mountings ⇒ page 53 .

– Remove engine bracket - T10012- from engine.
– Install starter ⇒ Electrical system; Rep. gr. 27 .
– Install pump for exhaust gas recirculation cooler - V400- ⇒ page 211 .
– Install air pipe ⇒ page 252 .
– Install intake connecting pipe ⇒ page 240 .
– Install air hoses with screw-type clips ⇒ page 253 .

Vehicles with dual clutch gearbox:

– Install and adjust selector lever cable ⇒ Rep. gr. 34 .

All vehicles (continued):

When installing a new base engine, you must check whether there is a sticker on the cylinder head cover.

If a sticker is attached which states `Spannpratzen auf vorgeschriebenes Drehmoment angezogen` (clamping pieces tightened to specified torque), the clamping pieces have already been tightened to the specified final torque at the factory.

If no sticker is attached, it is essential that the clamping pieces for the injectors are tightened to the specified torque after installing the high-pressure pipes. If these instructions are not observed, the engine could be damaged.

– Install particulate filter ⇒ page 260 .
– Install drive shafts, wishbones and coupling rod ⇒ Rep. gr. 40 .
– Install heat shield for drive shaft (right-side) ⇒ page 41 .
– Install air conditioner compressor ⇒ Rep. gr. 87 .
– Install poly V-belt:

◆ ⇒ “1.4 Removing and installing poly V-belt - vehicles with air conditioner compressor and tensioner”, page 62

◆ ⇒ “1.7 Removing and installing poly V-belt - vehicles with air conditioner compressor and tensioning roller”, page 68

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– Install front sections of wheel housing liner ⇒ Rep. gr. 66 .
– Fit front wheels ⇒ Wheels and tyres; Rep. gr. 44 .
– Install engine control unit ⇒ Rep. gr. 23 .
– Install radiator ⇒ page 232 .
– Connect coolant hoses with plug-in connectors to heat exchanger for heater ⇒ page 232 .
– Install supplementary fuel pump - V393- ⇒ Rep. gr. 20 .
– Install pressure differential sender - G505- ⇒ Rep. gr. 23 .
– Install filler pipe with filler neck for washer fluid reservoir ⇒ Electrical system; Rep. gr. 92 .

Vehicles with manual gearbox:

– Connect clutch slave cylinder and bleed clutch hydraulics ⇒ Rep. gr. 30 .

– Install cables with cable support bracket ⇒ Rep. gr. 34 .

All vehicles (continued):

– Install pendulum support ⇒ Rep. gr. 34 .

– Adjust assembly mountings ⇒ page 53 .

– Install battery mounting and battery ⇒ Electrical system; Rep. gr. 27 .

– Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.

– Connect vacuum hoses ⇒ page 238 .

– Install plenum chamber partition panel ⇒ Rep. gr. 55 .

– Install and adjust wiper arms ⇒ Electrical system; Rep. gr. 92 .

– Install air cleaner housing ⇒ Rep. gr. 23 .

– Check oil level ⇒ Maintenance ; Booklet 808 .

Caution

Risk of irreparable damage to control units because of excessive voltage.

- ***Never use battery charging equipment for boost starting.***

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– Fill up with coolant ⇒ page 198 .

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.*

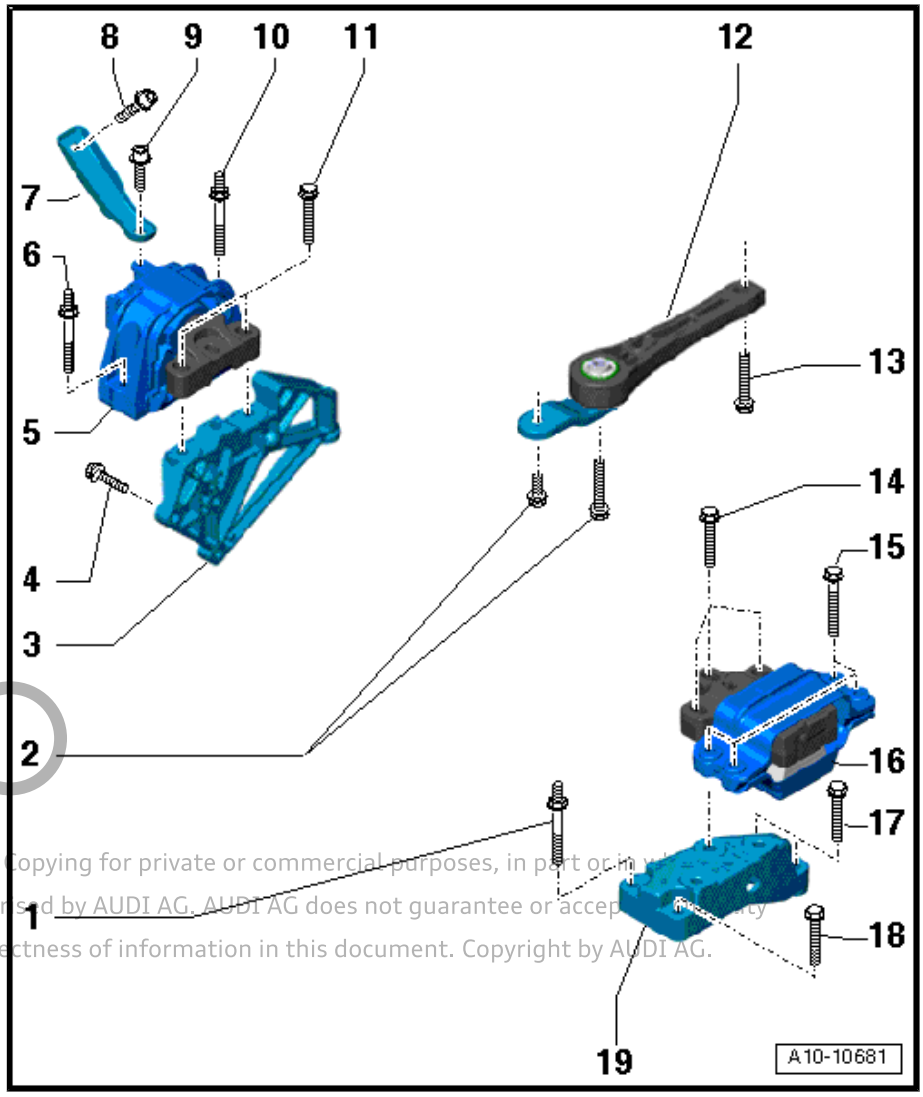
– Install noise insulation frame (if fitted) and noise insulation panels ⇒ Rep. gr. 50 .

6 Assembly mountings

Overview

- ⇒ “6.1 Exploded view - assembly mountings”, page 45
- ⇒ “6.2 Removing and installing engine mountings”, page 47
- ⇒ “6.3 Removing and installing engine support”, page 50
- ⇒ “6.4 Checking adjustment of assembly mountings (engine/ gearbox mountings)”, page 52
- ⇒ “6.5 Adjusting assembly mountings”, page 53

6.1 Exploded view - assembly mountings



1 - Bolt
- ❑ Gearbox support to gearbox
- ❑ Tightening torque ⇒ Rep. gr. 34

2 - Bolts
- ❑ Pendulum support to gearbox
- ❑ Tightening torque ⇒ Rep. gr. 34

3 - Engine support
- ❑ Version fitted in vehicle may differ from illustration
- ❑ Removing and installing ⇒ “6.3 Removing and installing engine support”, page 50

4 - Bolt
- ❑ Engine support to engine
- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 46

5 - Engine mounting
- ❑ With support arm
- ❑ Removing and installing ⇒ “6.2 Removing and installing engine mountings”, page 47

6 - Bolt
- ❑ Engine mounting to body
- ❑ Renew
- ❑ 40 Nm +90°

7 - Connecting bracket

8 - Bolt
- ❑ Connecting bracket to engine mounting
- ❑ Renew

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- ❑ 20 Nm +90°

9 - Bolt

- ❑ Connecting bracket to body
- ❑ Renew
- ❑ 20 Nm +90°

10 - Bolt

- ❑ Engine mounting to body
- ❑ Renew
- ❑ 40 Nm +90°

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11 - Bolt

- ❑ Engine mounting to engine support
- ❑ Renew
- ❑ 60 Nm +90°

12 - Pendulum support

13 - Bolt

- ❑ Pendulum support to subframe
- ❑ Tightening torque ⇒ Rep. gr. 34

14 - Bolt

- ❑ Gearbox mounting to gearbox support
- ❑ Tightening torque ⇒ Rep. gr. 34

15 - Bolt

- ❑ Gearbox mounting to body
- ❑ Tightening torque ⇒ Rep. gr. 34

16 - Gearbox mounting

- ❑ With support arm

17 - Bolt

- ❑ Gearbox support to gearbox
- ❑ Tightening torque ⇒ Rep. gr. 34

18 - Bolt

- ❑ Gearbox support to gearbox
- ❑ Tightening torque ⇒ Rep. gr. 34

19 - Gearbox support

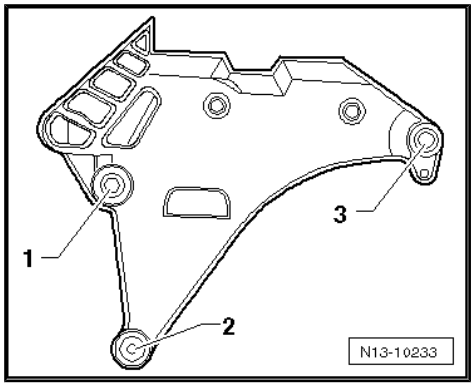
Engine support - tightening torque and sequence

Note

Renew the bolts tightened with specified tightening angle.

– Tighten bolts in 3 stages in the sequence shown:

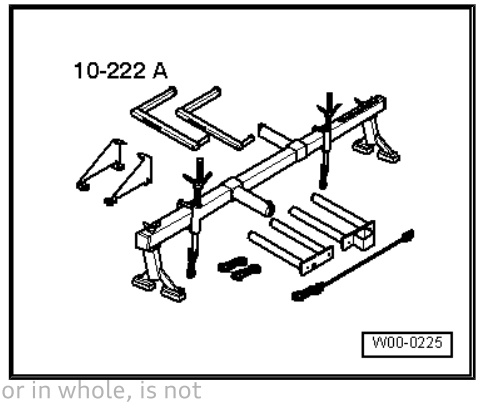
Stage	Bolts	Tightening torque/angle specification
1.	-1 … 3-	7 Nm
2.	-1 … 3-	40 Nm
3.	-1 … 3-	Turn 180° further



6.2 Removing and installing engine mountings

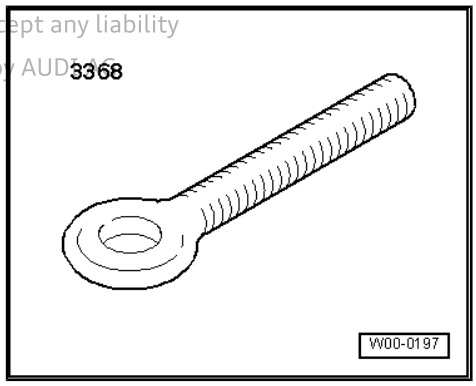
Special tools and workshop equipment required

- Support bracket - 10 - 222 A- with hexagon nut - 10 - 222 A / 27-

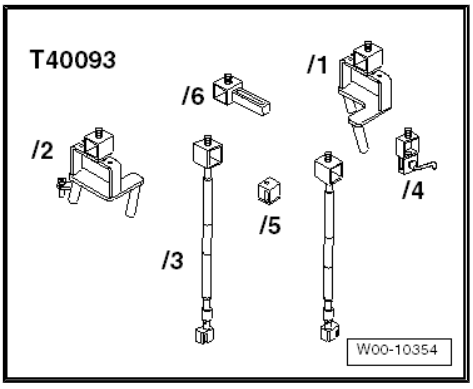


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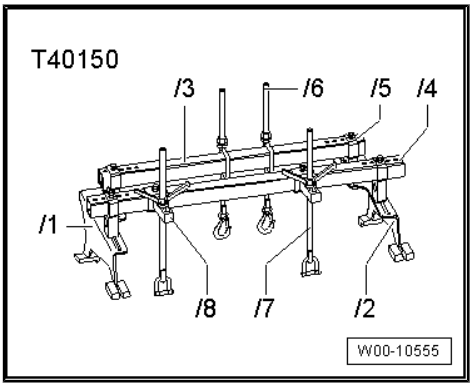
- Eye-head bolt - 3368-



- Engine support bracket (supplementary set) - T40093-



- Nut from spindle -T40150/6-



- Flange nut M10 or nut M10 with washer

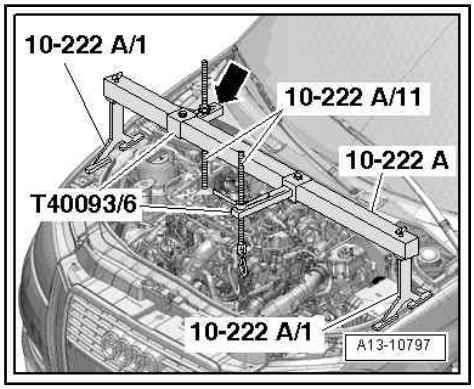
Removing

– Position support bracket - 10 - 222 A- on bolted flanges of wing panels using the following tools:

- Rack - 10 - 222 A /1- (2x)
- Spindle - 10 - 222 A /11- (2x)
- Adapter -T40093/6- (2x)
- Hexagon nut - 10 - 222 A /27-

– Replace wing nut from spindle - 10 - 222 A /11- (rear right) with hexagon nut - 10 - 222 A /27- -arrow -.

– Attach hook of spindle to engine lifting eye (left-side).

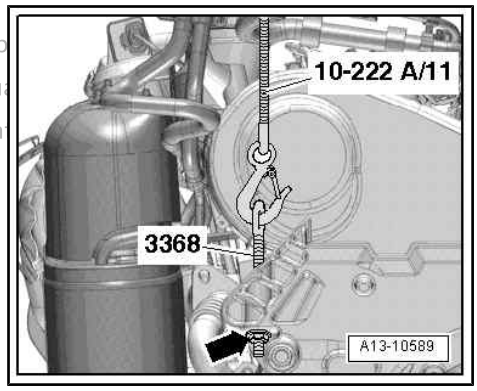


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WARNING

Risk of accident because of loose bolt connections.

- ***Screw on flange nut or nut with washer -arrow- at least 6 turns to ensure that eye-head bolt - 3368- is properly secured.***



– Secure eye-head bolt - 3368- with flange nut M10 or nut with washer to engine support as shown in illustration.

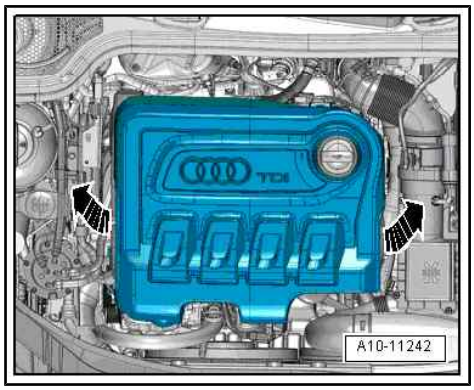
– Attach spindle - 10 - 222 A /11- (right-side) to eye-head bolt - 3368- .

– Take up weight of engine evenly with both spindles (but do not raise engine).

Procedure

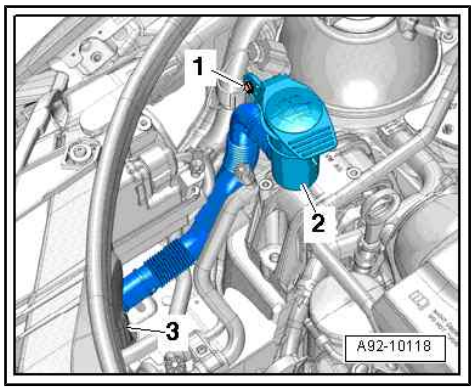
- Tightening torques
⇒ “6.1 Exploded view - assembly mountings”, page 45

– Remove engine cover panel -arrows-.



– Remove bolt -1-.

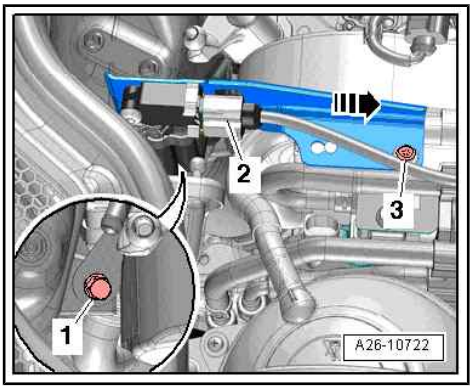
– Push filler pipe with filler neck -2- for washer fluid reservoir to side.



Note

- *Disregard -item 3-.*
- *For illustration purposes, the installation position is shown with the fuel filter removed.*

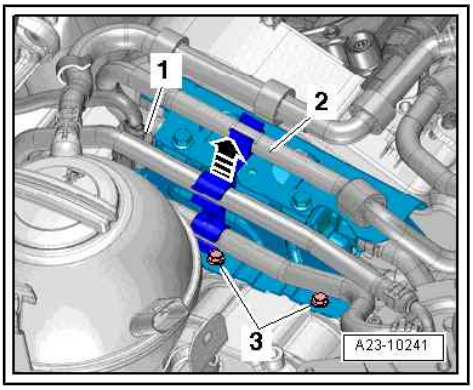
– Unplug electrical connector -2- at pressure differential sender - G505- .
– Remove bolt -3- and detach pressure differential sender - G505- from bracket -arrow- and move clear.



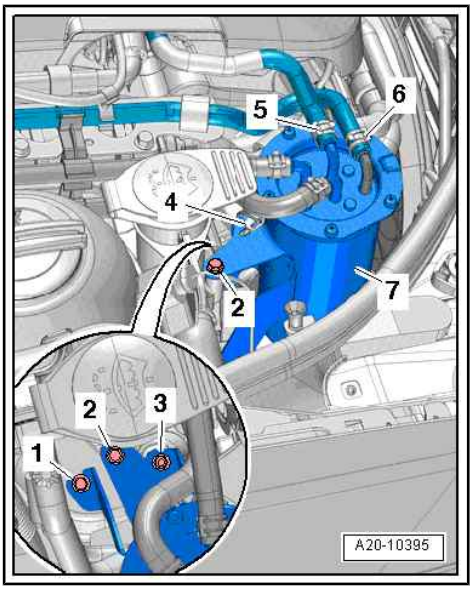
Note

Disregard -item 1-.

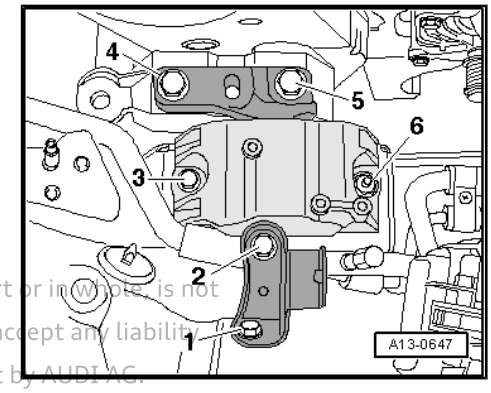
– Disengage fuel hose -2- at bracket.
– Pull off bracket for fuel lines upwards -arrow- and move clear to one side.
– Unplug electrical connector -1- at supplementary fuel pump - V393- .
– Remove bolts -3-, detach bracket with supplementary fuel pump - V393- and move clear to one side.



– Loosen bolt -1-.
– Remove bolt -2- and nut -3-.
– Detach retainer -4- from fuel filter, move fuel filter -7- clear to one side with fuel hoses -5- and -6- connected.



– Remove bolts -1- and -2- and remove connecting bracket.
– Remove bolts -3 to 6- and detach engine mounting.



Installing

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

- Tightening torques
  ⇒ “6.1 Exploded view - assembly mountings”, page 45

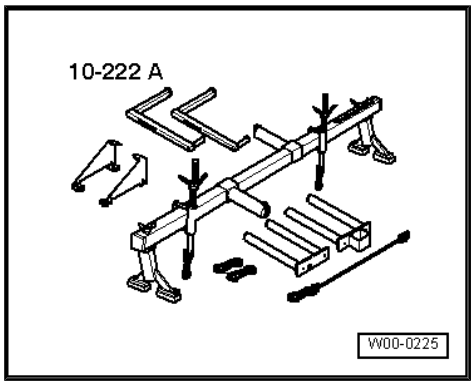
– Check adjustment of assembly mountings (engine/gearbox mountings) ⇒ page 52 .

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6.3 Removing and installing engine support

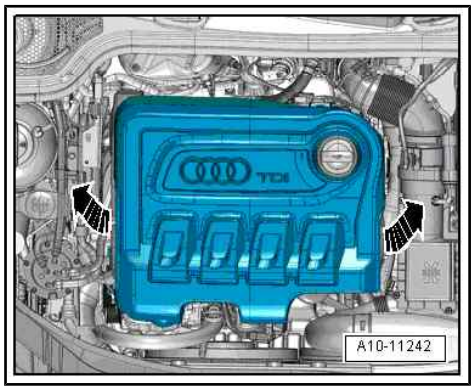
Special tools and workshop equipment required

- Support bracket - 10 - 222 A-

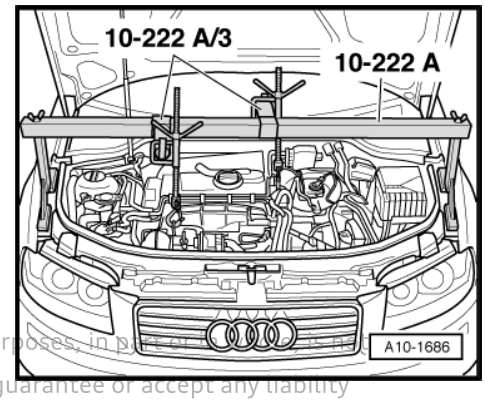


Procedure

– Remove engine cover panel -arrows-.

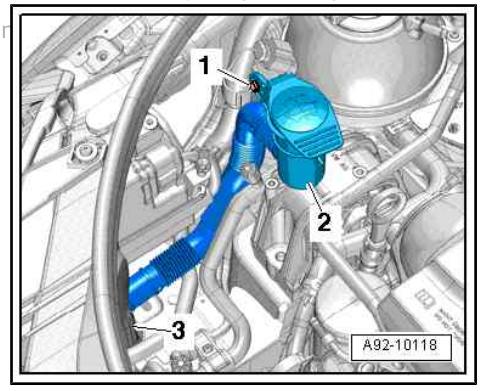


– Set up support bracket - 10 - 222 A- with adapters -10 - 222 A /3- on bolted flanges of wing panels.
– Attach hooks of spindles to engine lifting eyes.
– Take up weight of engine/gearbox assembly evenly with both spindles; do not lift.



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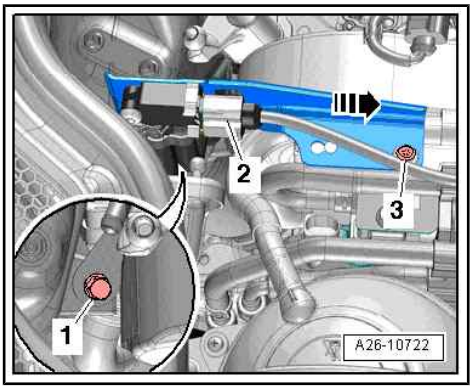
– Remove bolt -1-.
– Push filler pipe with filler neck -2- for washer fluid reservoir to side.



Note

- *Disregard -item 3-.*
- *For illustration purposes, the installation position is shown with the fuel filter removed.*

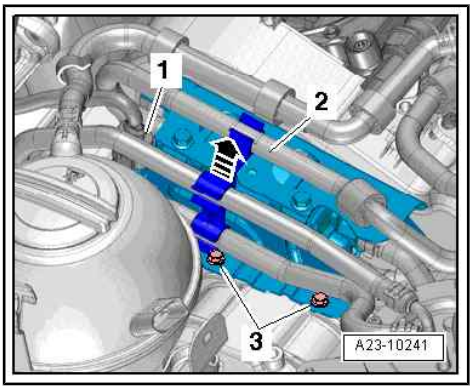
– Unplug electrical connector -2- at pressure differential sender - G505- .
– Remove bolt -3- and detach pressure differential sender - G505- from bracket -arrow- and move clear.



Note

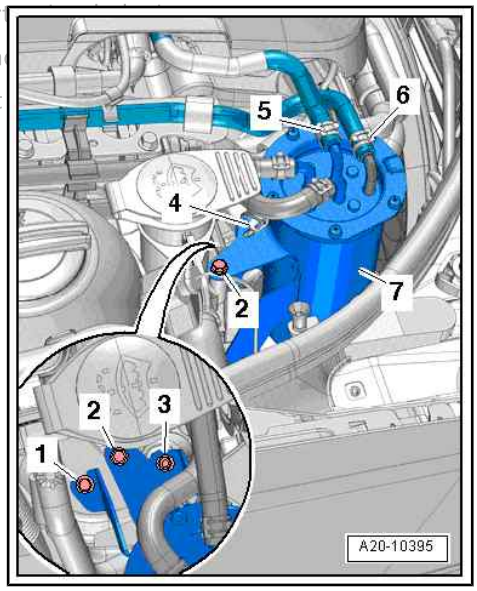
Disregard -item 1-.

– Disengage fuel hose -2- at bracket.
– Pull off bracket for fuel lines upwards -arrow- and move clear to one side.
– Unplug electrical connector -1- at supplementary fuel pump - V393- .
– Remove bolts -3-, detach bracket with supplementary fuel pump - V393- and move clear to one side.

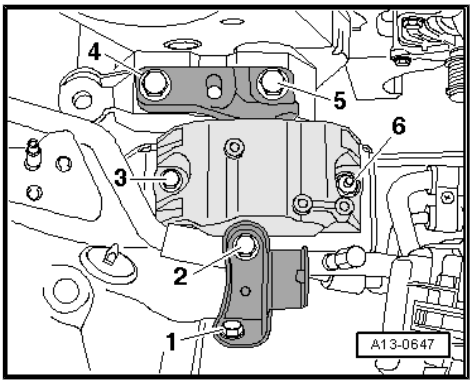


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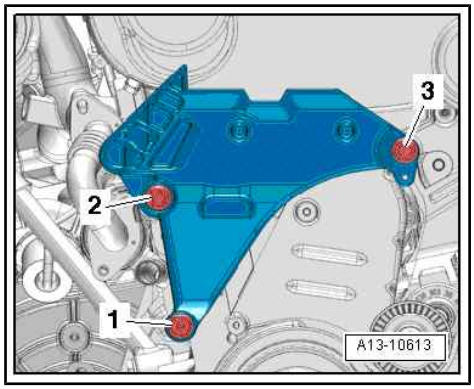
– Loosen bolt -1-.
– Remove bolt -2- and nut -3-.
– Detach retainer -4- from fuel filter, move fuel filter -7- clear to one side with fuel hoses -5- and -6- connected.



– Remove bolts -1- and -2- and remove connecting bracket.
– Remove bolts -3 to 6- and detach engine mounting.



– Remove bolts -1 to 3- and detach engine support.



Installing

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

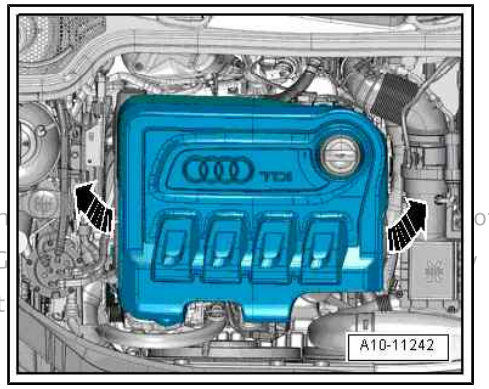
- Tightening torques
  ⇒ “6.1 Exploded view - assembly mountings”, page 45

– Check adjustment of assembly mountings (engine/gearbox mountings)
  ⇒ “6.4 Checking adjustment of assembly mountings (engine/gearbox mountings)”, page 52 .

6.4 Checking adjustment of assembly mountings (engine/gearbox mountings)

Procedure

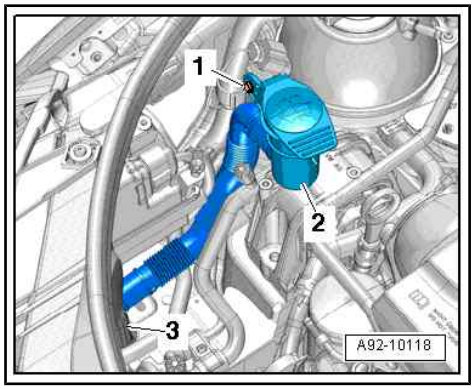
– Remove engine cover panel -arrows-.



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– Remove bolt -1-.

– Push filler pipe with filler neck -2- for washer fluid reservoir to side.



Note

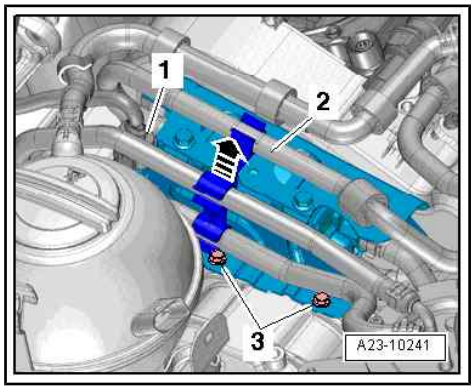
- *Disregard -item 3-.*
- *For illustration purposes, the installation position is shown with the fuel filter removed.*

– Disengage fuel hose -2- at bracket.

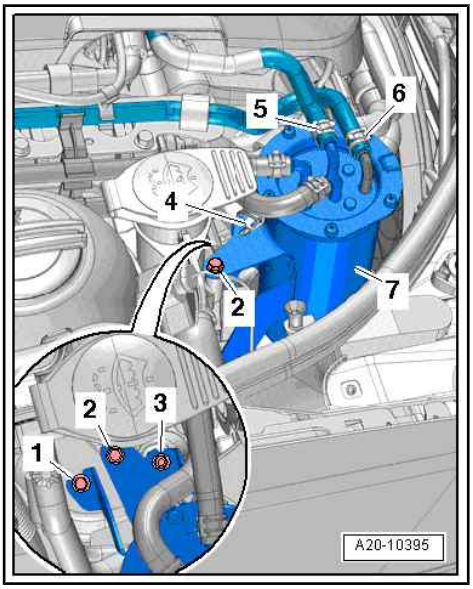
– Pull off bracket for fuel lines upwards -arrow- and move clear to one side.

– Unplug electrical connector -1- at supplementary fuel pump - V393- .

– Remove bolts -3-, detach bracket with supplementary fuel pump - V393- and move clear to one side.

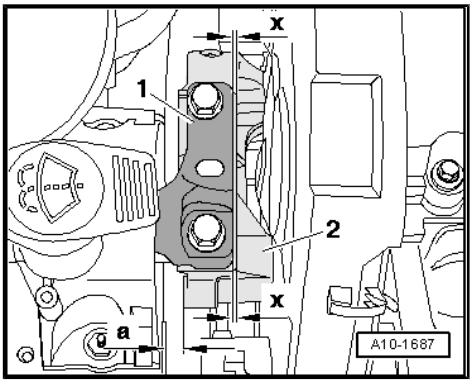


– Loosen bolt -1-.
– Remove bolt -2- and nut -3-.
– Detach retainer -4- from fuel filter, move fuel filter -7- clear to one side with fuel hoses -5- and -6- connected.



The following specifications must be obtained:

- There must be a distance of -a- = 13.5 mm between engine support -2- and longitudinal member (right-side).
- The side of the engine support casting -2- must be aligned parallel to the support arm -1- (distance -x- = distance -x-).



Note

Distance -a- = 13.5 mm can also be checked with a metal rod of suitable size, or similar.

– If the distance measured is too large or small, the assembly mountings must be adjusted ⇒ page 53 .

Assembling

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

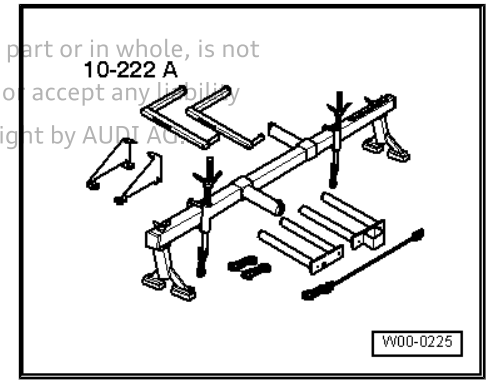
– Install supplementary fuel pump - V393- and fuel filter ⇒ Rep. gr. 20 .
– Install filler pipe with filler neck for washer fluid reservoir ⇒ Electrical system; Rep. gr. 92 .

6.5 Adjusting assembly mountings

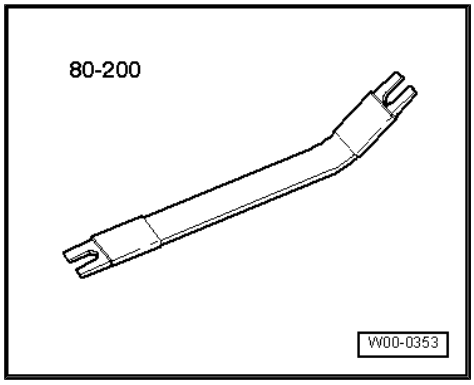
Special tools and workshop equipment required

♦ Support bracket - 10 - 222 A-

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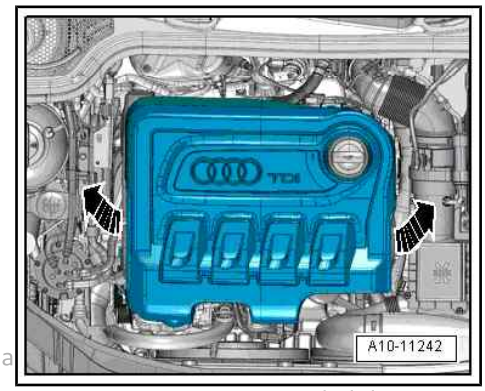
♦ Removal lever - 80 - 200-



Procedure

- Tightening torques
  ⇒ “6.1 Exploded view - assembly mountings”, page 45

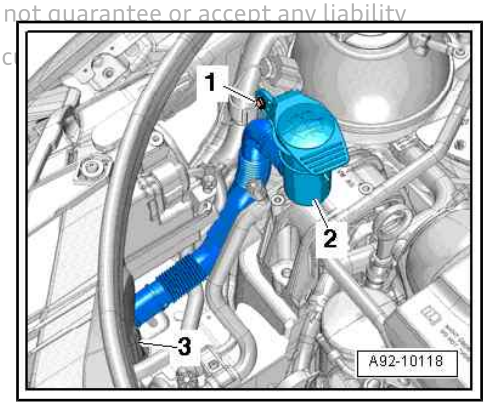
– Remove engine cover panel -arrows-.



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– Remove bolt -1-.

– Push filler pipe with filler neck -2- for washer fluid reservoir to side.



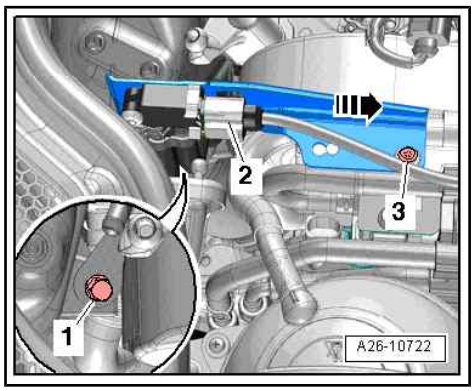
Note

♦ *Disregard -item 3-.*

♦ *For illustration purposes, the installation position is shown with the fuel filter removed.*

– Unplug electrical connector -2- at pressure differential sender - G505- .

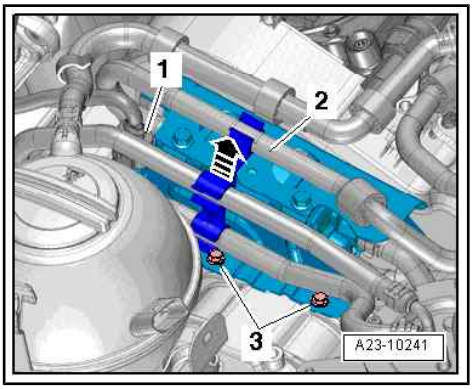
– Remove bolt -3- and detach pressure differential sender - G505- from bracket -arrow- and move clear.



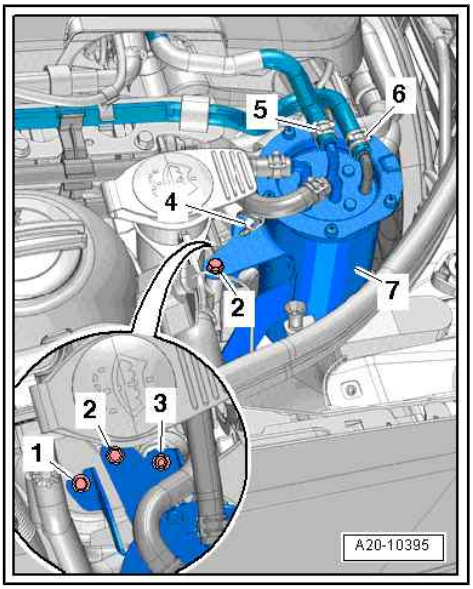
Note

Disregard -item 1-.

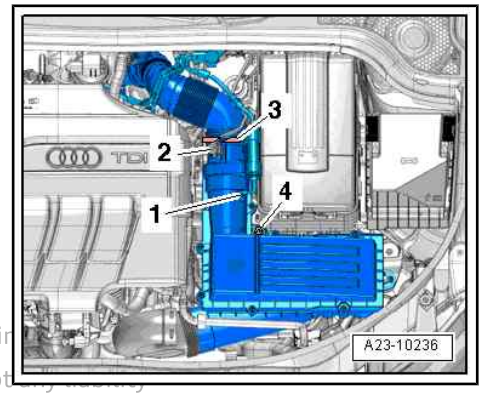
– Disengage fuel hose -2- at bracket.
– Pull off bracket for fuel lines upwards -arrow- and move clear to one side.
– Unplug electrical connector -1- at supplementary fuel pump - V393- .
– Remove bolts -3-, detach bracket with supplementary fuel pump - V393- and move clear to one side.



– Loosen bolt -1-.
– Remove bolt -2- and nut -3-.
– Detach retainer -4- from fuel filter, move fuel filter -7- clear to one side with fuel hoses -5- and -6- connected.

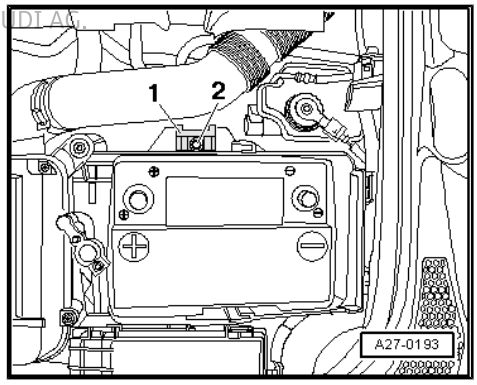


– Remove air cleaner housing ⇒ Rep. gr. 23 .

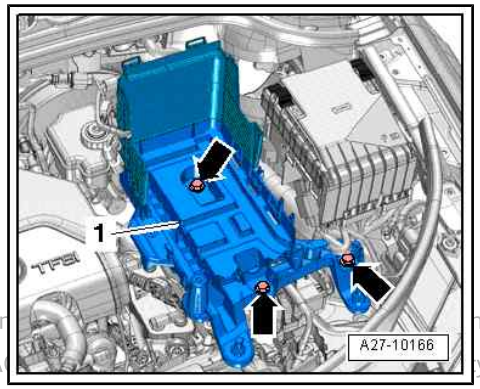


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– Remove battery ⇒ Electrical system; Rep. gr. 27 .

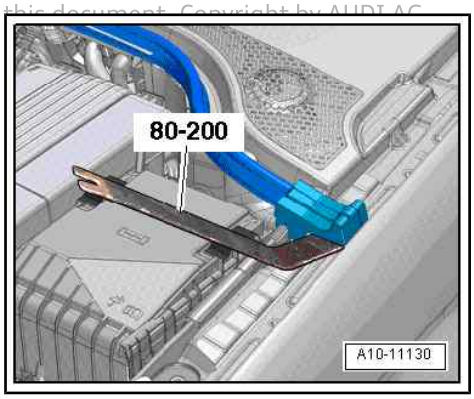


– Remove bolts -arrows- and take out battery tray -1-.

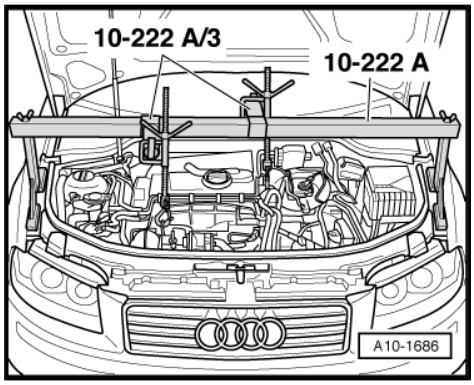


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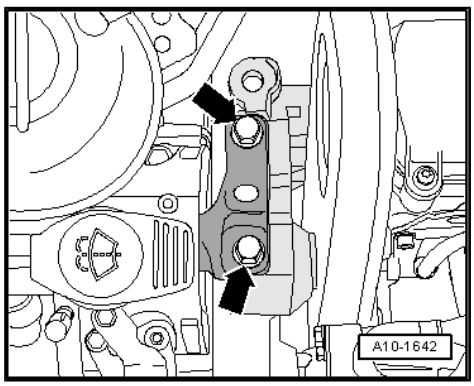
– Unclip sealing element using removal lever - 80 - 200- .



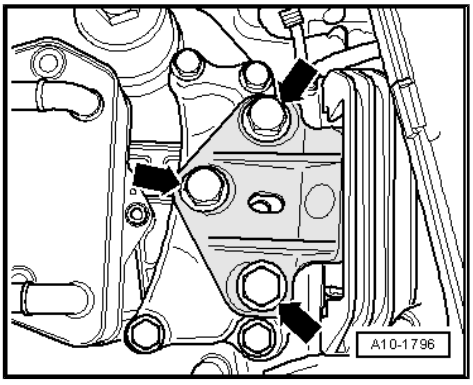
– Set up support bracket - 10 - 222 A- with adapters -10 - 222 A /3- on bolted flanges of wing panels.
– Attach hooks of spindles to engine lifting eyes.
– Take up weight of engine/gearbox assembly evenly with both spindles; do not lift.



– Remove bolts -arrows- for engine mounting one by one and renew (if they were not renewed when installing engine).
– Initially fit bolts hand-tight.

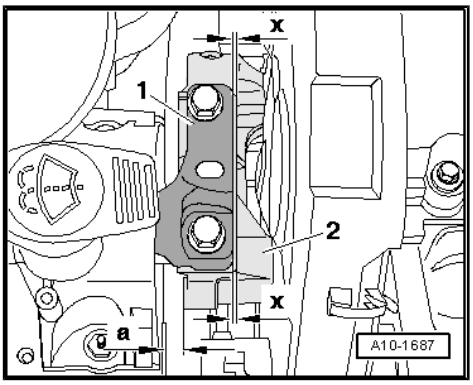


– Remove bolts -arrows- for gearbox mounting one by one and renew (if they were not renewed when installing engine).
– Initially fit bolts hand-tight.



– Using assembly lever, adjust engine/gearbox assembly between engine mounting and support arm -1- until specifications listed below are attained:

• There must be a distance of -a- = 13.5 mm between engine support -2- and longitudinal member (right-side).
• The side of the engine support casting -2- must be aligned parallel to the support arm -1- (distance -x- is the same on both sides).

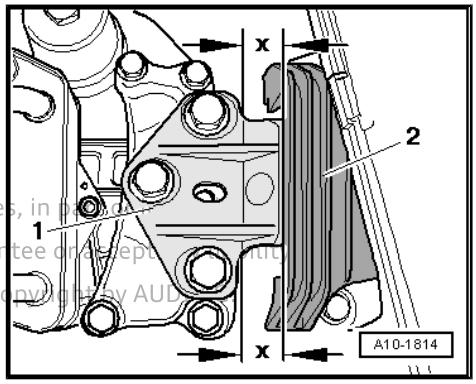


Note

Distance -a- = 13.5 mm can also be checked with a metal rod of suitable size, or similar.

– Tighten bolts for engine mounting.

– Ensure that edges of support arm (on gearbox side) -2- and gearbox mounting -1- are parallel.
• Dimension -x- must be identical on both sides of mounting.
– Tighten bolts for gearbox mounting.



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

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– Install battery mounting and battery ⇒ Electrical system; Rep. gr. 27 .
– Install air cleaner housing and pressure differential sender - G505- ⇒ Rep. gr. 23 .
– Install supplementary fuel pump - V393- and fuel filter ⇒ Rep. gr. 20 .
– Install filler neck for washer fluid reservoir ⇒ Electrical system; Rep. gr. 92 .

13 – Crankshaft group

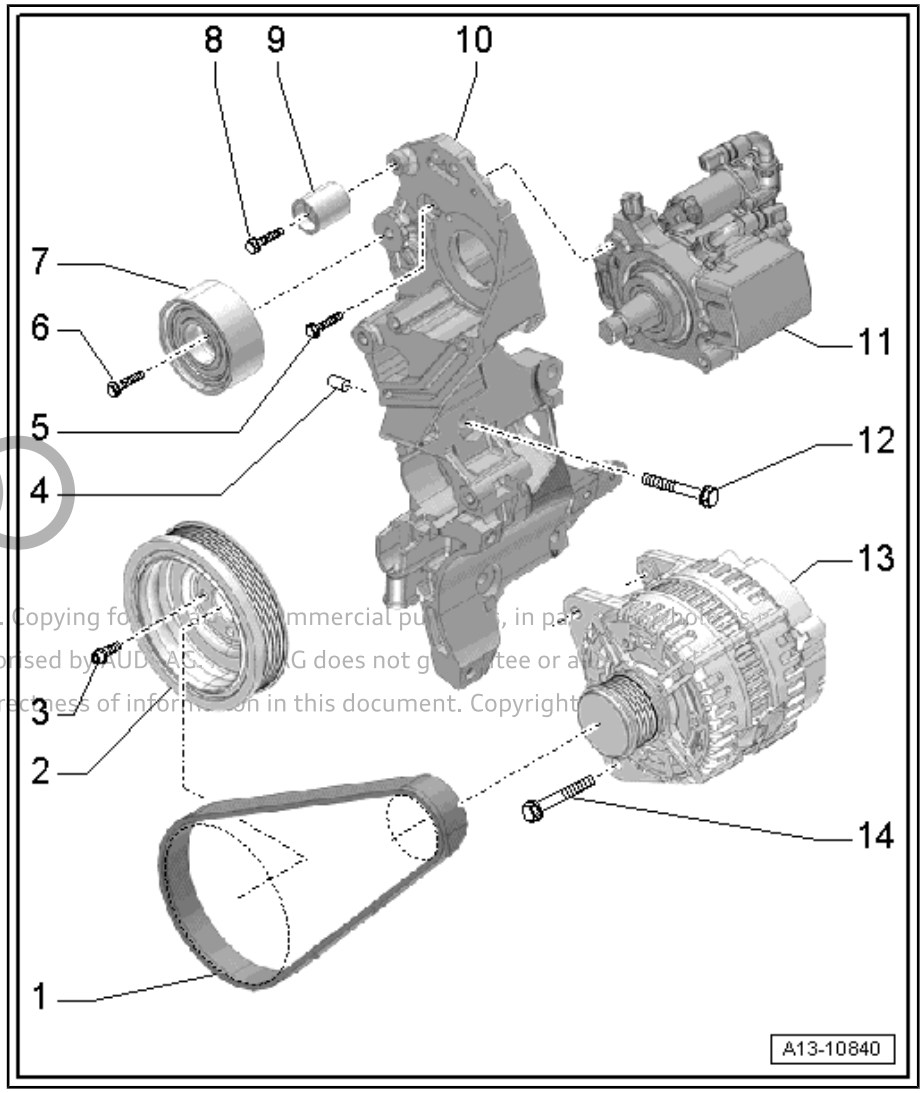
1 Cylinder block (pulley end)

Overview

- ⇒ “1.1 Exploded view - poly V-belt drive, vehicles without air conditioner compressor”, page 58
- ⇒ “1.2 Removing and installing poly V-belt - vehicles without air conditioner compressor”, page 59
- ⇒ “1.3 Exploded view - poly V-belt drive, vehicles with air conditioner compressor and tensioner”, page 60
- ⇒ “1.4 Removing and installing poly V-belt - vehicles with air conditioner compressor and tensioner”, page 62
- ⇒ “1.5 Removing and installing tensioner for poly V-belt”, page 64
- ⇒ “1.6 Poly V-belt drive for vehicles with air conditioner compressor and tensioning roller - exploded view”, page 65
- ⇒ “1.7 Removing and installing poly V-belt - vehicles with air conditioner compressor and tensioning roller”, page 68
- ⇒ “1.8 Removing and installing vibration damper”, page 69
- ⇒ “1.9 Removing and installing bracket for ancillaries”, page 70
- ⇒ “1.10 Exploded view - sealing flange (pulley end)”, page 72
- ⇒ “1.11 Renewing crankshaft oil seal (pulley end)”, page 73
- ⇒ “1.12 Removing and installing sealing flange (pulley end)”, page 75

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1.1 Exploded view - poly V-belt drive, vehicles without air conditioner compressor



1 - Poly V-belt

- ❑ Renew.
- ❑ Removing and installing ⇒ page 59

2 - Vibration damper

- ❑ With poly V-belt pulley
- ❑ Installation position: hole in vibration damper must be positioned over raised section of crankshaft sprocket
- ❑ Removing and installing ⇒ page 69

3 - Bolt

- ❑ Tightening torque ⇒ Item 4 (page 61)

4 - Dowel sleeve

- ❑ 2x
- ❑ Ensure correct seating in bracket for ancillaries

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5 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 23

6 - Bolt

- ❑ Tightening torque ⇒ Item 22 (page 105)

7 - Idler roller

- ❑ For toothed belt

8 - Bolt

- ❑ Tightening torque ⇒ Item 8 (page 104)

9 - Idler roller

- ❑ For toothed belt

10 - Bracket for ancillaries

- ❑ Removing and installing ⇒ page 70

11 - High-pressure pump

- ❑ Removing and installing ⇒ Rep. gr. 23

12 - Bolt

- ❑ Different lengths ⇒ page 62
- ❑ Tightening torque and sequence ⇒ page 62

13 - Alternator

- ❑ Removing and installing ⇒ Electrical system; Rep. gr. 27

14 - Bolt

- ❑ Tightening torque ⇒ Electrical system; Rep. gr. 27

1.2 Removing and installing poly V-belt - vehicles without air conditioner compressor

Special tools and workshop equipment required

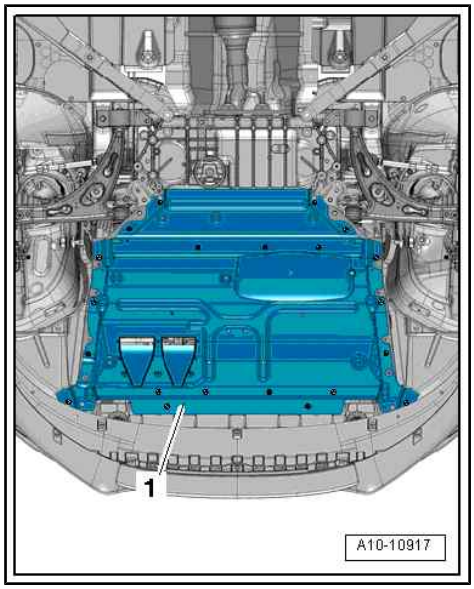
♦ Poly V-belt repair set with assembly tool ⇒ Electronic parts catalogue

Procedure

Note

The poly V-belt repair set with assembly tool contains the assembly tool -T10367- and illustrated instructions.

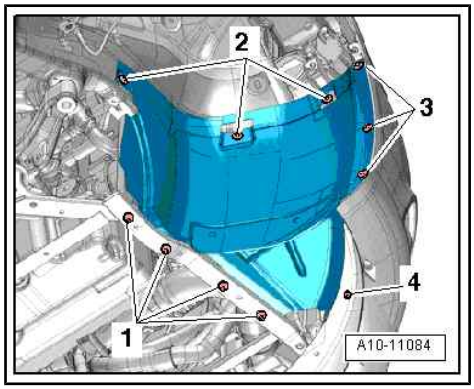
– Remove noise insulation -1- ⇒ Rep. gr. 50 .



– A3 Cabriolet: Remove front wheel housing liner (front section, right-side) ⇒ Rep. gr. 66 .
– Follow procedure specified in illustrated instructions.

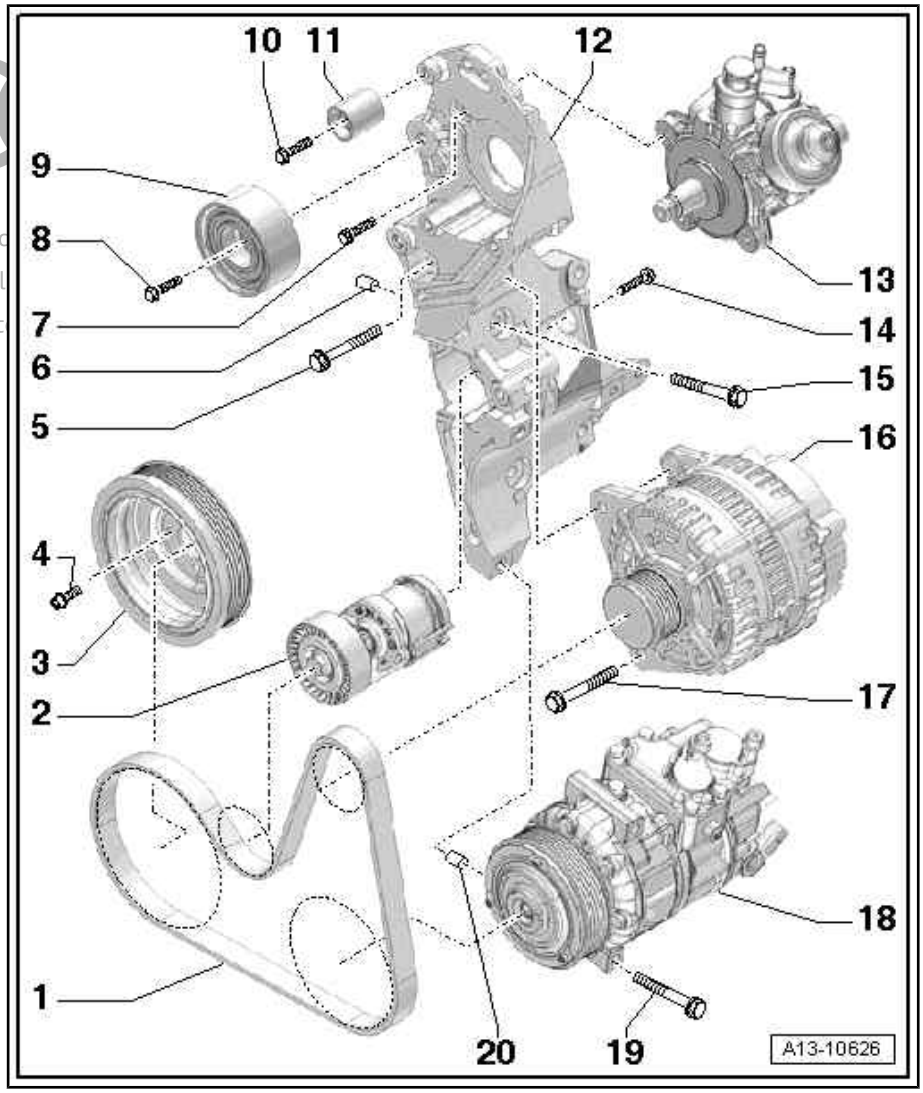
Installation is carried out in reverse order; note the following:

– A3 Cabriolet: Install wheel housing liner (front section) ⇒ Rep. gr. 66 .
– Install noise insulation ⇒ Rep. gr. 50 .



1.3 Exploded view - poly V-belt drive, vehicles with air conditioner compressor and tensioner

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1 - Poly V-belt

- ❑ Check for wear
- ❑ Before removing, mark direction of rotation with chalk or felt-tip pen
- ❑ Removing and installing ⇒ page 62
- ❑ Do not kink
- ❑ When installing, make sure it is properly seated on pulleys.

2 - Poly V-belt tensioner

- ❑ Removing and installing ⇒ page 64

3 - Vibration damper

- ❑ With poly V-belt pulley
- ❑ Installation position: hole in vibration damper must be positioned over raised section of crankshaft sprocket
- ❑ Removing and installing ⇒ page 69

4 - Bolt

- ❑ Renew
- ❑ Use only genuine bolts ⇒ Electronic parts catalogue
- ❑ 10 Nm +90°

5 - Bolt

- ❑ Tightening torque ⇒ Electrical system; Rep. gr. 27

6 - Dowel sleeve

- ❑ Ensure correct seating in bracket for ancillaries

7 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 23

8 - Bolt

- ❑ Tightening torque ⇒ Item 22 (page 105)

9 - Idler roller

- ❑ For toothed belt

10 - Bolt

- ❑ Tightening torque ⇒ Item 8 (page 104)

11 - Idler roller

- ❑ For toothed belt

12 - Bracket for ancillaries

- ❑ Removing and installing ⇒ page 70

13 - High-pressure pump

- ❑ Removing and installing ⇒ Rep. gr. 23

14 - Bolt

- ❑ Bolt can be re-used; tightening torque for re-used bolt: 20 Nm + 90°

- ❑ New bolt: 20 Nm +180°

15 - Bolt

- ❑ Tightening torque and sequence ⇒ page 62

16 - Alternator

- ❑ Removing and installing ⇒ Electrical system; Rep. gr. 27

17 - Bolt

- ❑ Tightening torque ⇒ Electrical system; Rep. gr. 27

18 - Air conditioner compressor

- ❑ Removing and installing ⇒ Rep. gr. 87

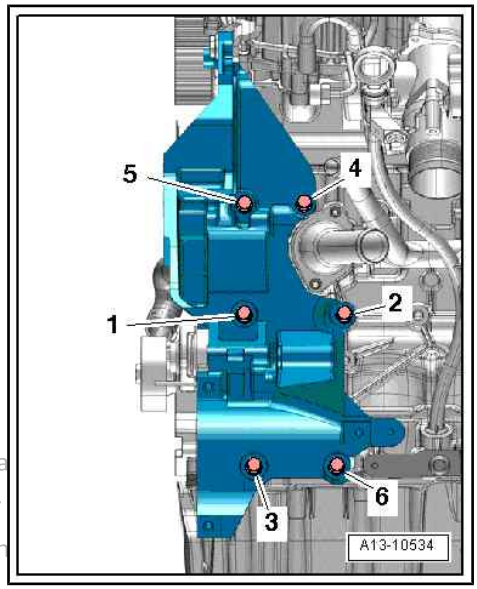
19 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 87

20 - Dowel sleeve

- ❑ Ensure correct seating in bracket for ancillaries

Bracket for ancillaries - tightening torque and tightening sequence



Note

Renew the bolts tightened with specified tightening angle.

– Fit bolts in the following sequence:

- ♦ Bolts -1- and -2- M10x52.
- ♦ Bolts -3- and -6- M10x30.
- ♦ Bolts -4- and -5- M10x60.

– Tighten bolts in 4 stages in the sequence shown:

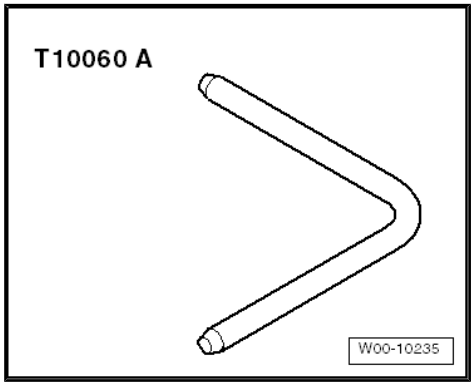
Stage	Bolts	Tightening torque/angle specification
1.	-1 - 6-	Screw in by hand until contact is made
2.	-1 - 6-	40 Nm
3.	-3- and -6-	Turn 45° further
4.	-1, 2, 4, 5-	Turn 90° further

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1.4 Removing and installing poly V-belt - vehicles with air conditioner compressor and tensioner

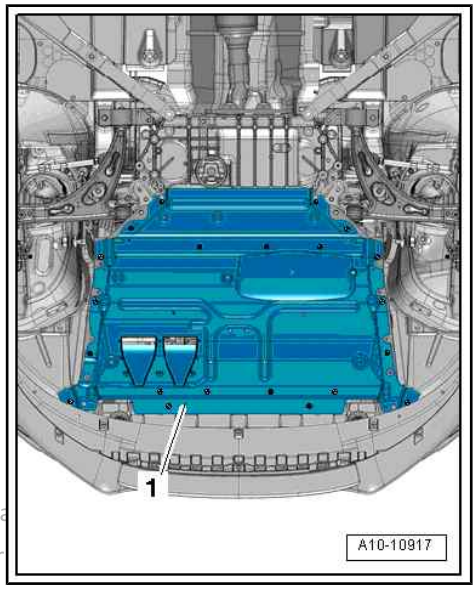
Special tools and workshop equipment required

- ♦ Locking pin - T10060 A-



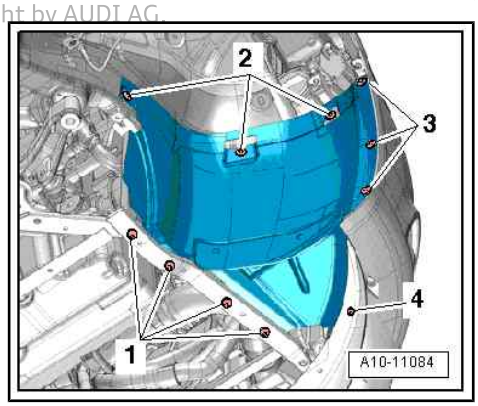
Removing

– Remove noise insulation -1- ⇒ Rep. gr. 50 .



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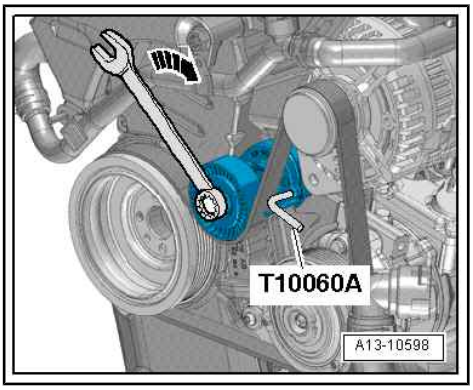
– A3 Cabriolet: Remove front wheel housing liner (front section, right-side) ⇒ Rep. gr. 66 .



Caution

Running a used poly V-belt in the opposite direction could cause irreparable damage.

- *Before removing the poly V-belt, mark the direction of rotation with chalk or a felt-tip pen for re-installation.*



– Move tensioner in clockwise direction -arrow- to slacken poly V-belt.
– Lock tensioner with locking pin - T10060 A- .
– Take off poly V-belt.

Installing

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

Note

Before fitting poly V-belt, make sure all mechanical units (alternator and air conditioner compressor) are firmly in position.

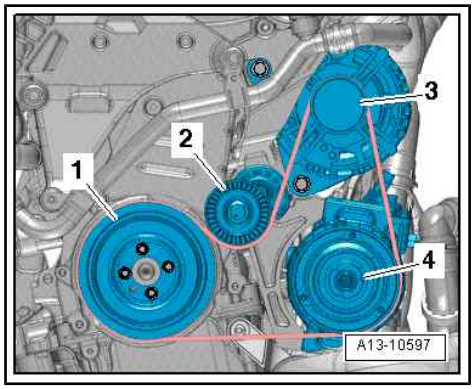
– Fit poly V-belt on poly V-belt pulleys:

1 - Crankshaft

2 - Tensioner

3 - Alternator

4 - Air conditioner compressor



– Hold tensioner with ring spanner and remove locking pin - T10060 A- .

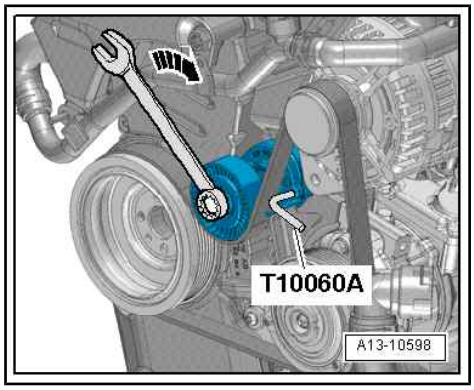
– Release tensioner.

– Check that poly V-belt is in correct position.

– Start engine and check that poly V-belt(s) run properly.

– A3 Cabriolet: Install wheel housing liner (front section) ⇒ Rep. gr. 66 .

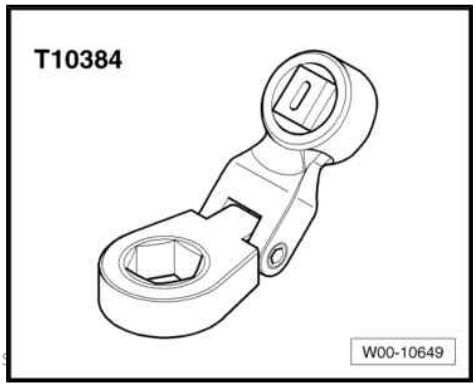
– Install noise insulation ⇒ Rep. gr. 50 .



1.5 Removing and installing tensioner for poly V-belt

Special tools and workshop equipment required

♦ Ratchet wrench 13 mm - T10384-

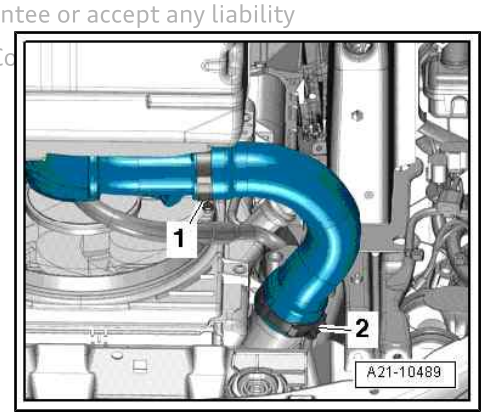


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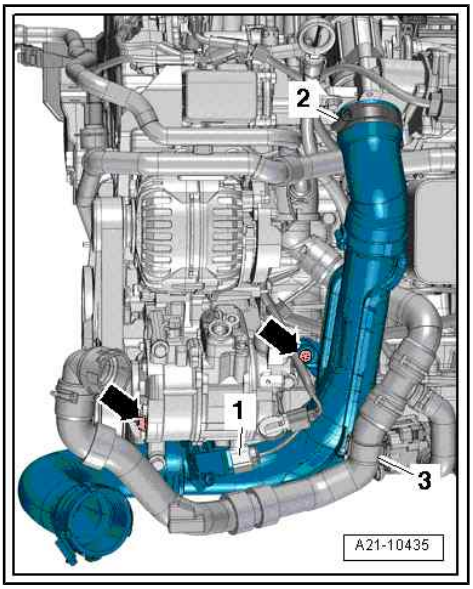
Removing

– Detach poly V-belt from tensioner ⇒ “1.4 Removing and installing poly V-belt - vehicles with air conditioner compressor and tensioner”, page 62 .

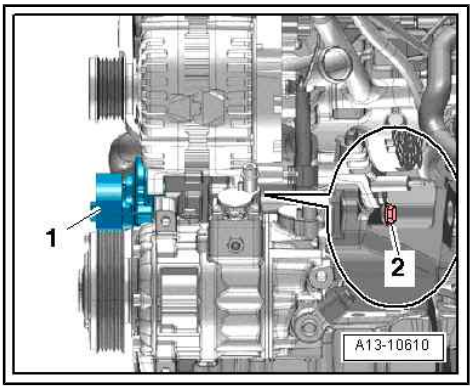
– Release hose clips -1- and -2- and remove air hose.



– Remove bolts -arrows-.
– Move coolant hose -3- clear.
– Release hose clip -2-.
– Unplug electrical connector -1- at charge pressure sender - G31- / intake air temperature sender - G42- and detach air pipe (right-side).



– Remove bolt -2- and take off poly V-belt tensioner -1-.



Note

- *If bolt -2- makes contact, leave it in installation position.*
- *Due to lack of space, the tensioner must be guided out upwards by rotating it.*

Installing

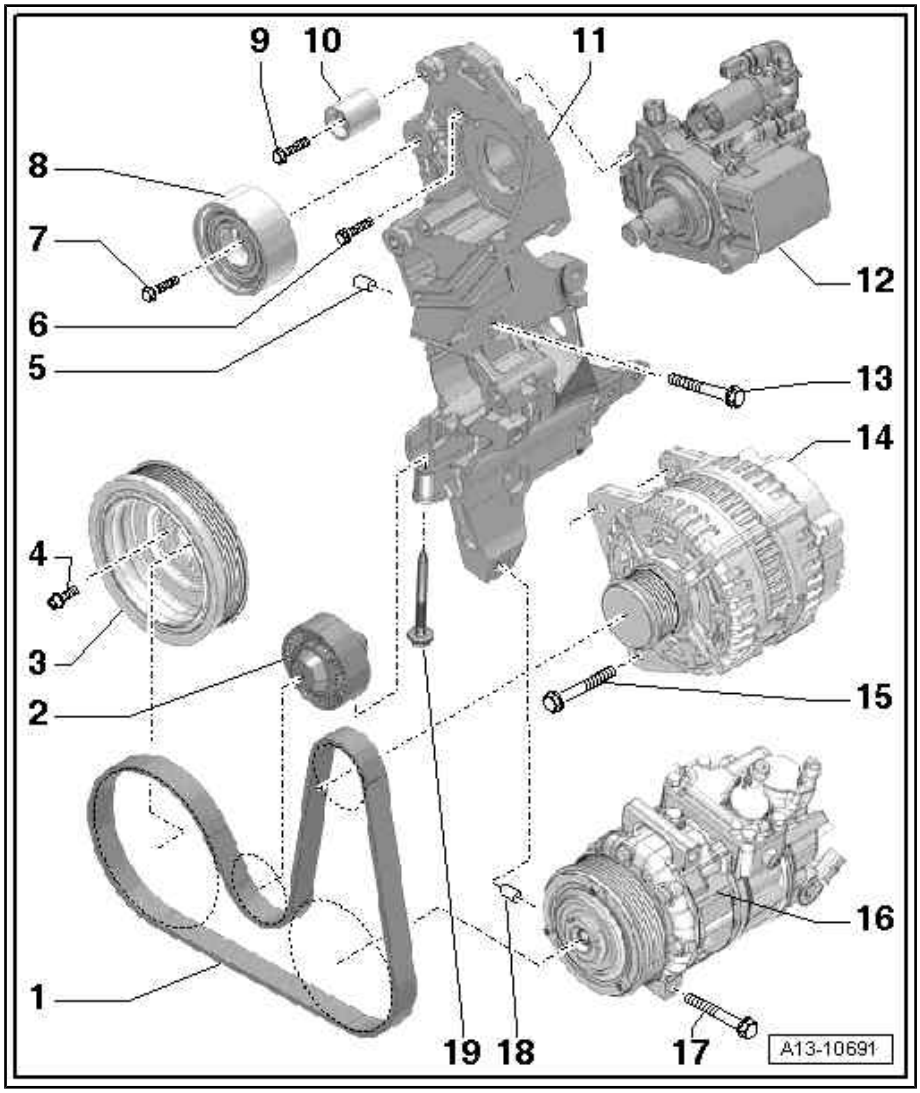
Installation is carried out in reverse order; note the following:

- Tightening torque
  ⇒ “1.3 Exploded view - poly V-belt drive, vehicles with air conditioner compressor and tensioner”, page 60

– Install air pipe ⇒ page 252 .
– Install air hoses with screw-type clips ⇒ page 253 .
– Install poly V-belt ⇒ page 62 .

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1.6 Poly V-belt drive for vehicles with air conditioner compressor and tensioning roller - exploded view



1 - Poly V-belt

- ❑ Check for wear
- ❑ Before removing, mark direction of rotation with chalk or felt-tip pen
- ❑ Removing and installing ⇒ page 62
- ❑ Do not kink
- ❑ When installing, make sure it is properly seated on pulleys

2 - Tensioning roller

- ❑ For poly V-belt
- ❑ Removing and installing ⇒ “1.7 Removing and installing poly V-belt - vehicles with air conditioner compressor and tensioning roller”, page 68
- ❑ Coat contact surfaces with lubricating paste; for lubricating paste refer to ⇒ Electronic parts catalogue

3 - Vibration damper

- ❑ With poly V-belt pulley
- ❑ Installation position: hole in vibration damper must be positioned over raised section of crankshaft sprocket
- ❑ Removing and installing ⇒ page 69

4 - Bolt

- ❑ Tightening torque ⇒ Item 4 (page 61)

5 - Dowel sleeve

- ❑ Ensure correct seating in bracket for ancillaries

6 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 23

7 - Bolt

- ❑ Tightening torque ⇒ Item 22 (page 105)

8 - Idler roller

- ❑ For toothed belt

9 - Bolt

- ❑ Tightening torque ⇒ Item 8 (page 104)

10 - Idler roller

- ❑ For toothed belt

11 - Bracket for ancillaries

- ❑ Removing and installing ⇒ page 70

12 - High-pressure pump

- ❑ Removing and installing ⇒ Rep. gr. 23

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13 - Bolt

❑ Tightening torque and sequence ⇒ page 62

14 - Alternator

❑ Removing and installing ⇒ Electrical system; Rep. gr. 27

15 - Bolt

❑ Tightening torque ⇒ Electrical system; Rep. gr. 27

16 - Air conditioner compressor

❑ Removing and installing ⇒ Rep. gr. 87

17 - Bolt

❑ Tightening torque ⇒ Rep. gr. 87

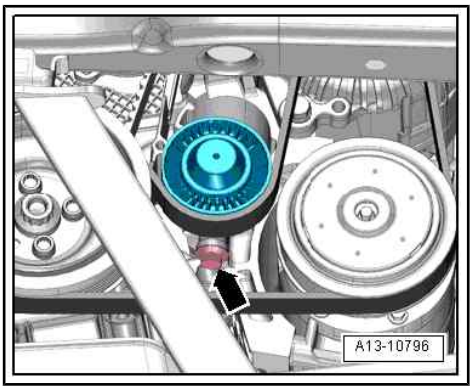
18 - Dowel sleeve

❑ Ensure correct seating in bracket for ancillaries

19 - Bolt

❑ Tightening torque and sequence ⇒ page 67

Tensioning roller for poly V-belt - tightening torque and tightening sequence



Note

- *Renew bolt for tensioning roller.*
- *Use a brush to coat guide surfaces of tensioning roller with lubricating paste; lubricating paste ⇒ Electronic parts catalogue .*

– Tighten bolt in 5 stages as follows:

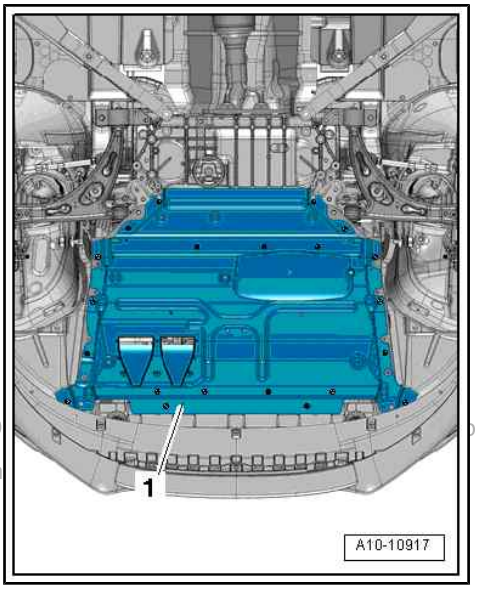
Stage	Bolt	Tightening torque/angle specification
1.	-arrow-	Screw in by hand until contact is made • The poly V-belt is tensioned
2.	-arrow-	Turn until the pin on the tensioning roller has contacted the stop • The poly V-belt is tensioned further
3.	-arrow-	Loosen by 90°
4.	-arrow-	30 Nm
5.	-arrow-	Turn 90° further

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1.7 Removing and installing poly V-belt - vehicles with air conditioner compressor and tensioning roller

Removing

– Remove noise insulation -1- ⇒ Rep. gr. 50 .

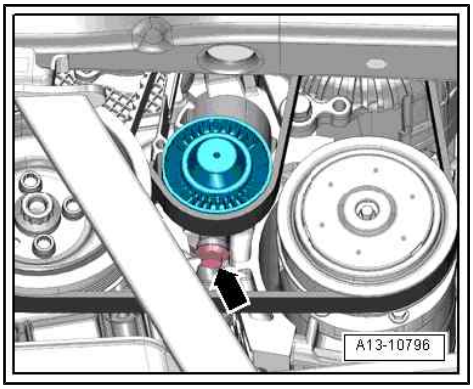


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Caution

Running a used poly V-belt in the opposite direction could cause irreparable damage.

- *Before removing the poly V-belt, mark the direction of rotation with chalk or a felt-tip pen for re-installation.*



– Remove tensioning bolt -arrow- and detach tensioning roller to slacken poly V-belt.

– Take off poly V-belt.

Installing

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

Note

- *Renew bolt for tensioning roller.*
- *Before fitting poly V-belt, make sure all mechanical units (alternator and air conditioner compressor) are firmly in position.*

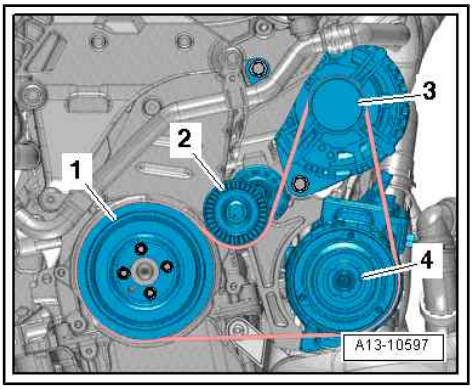
– Fit poly V-belt on poly V-belt pulleys:

1 - Vibration damper

2 - Tensioning roller

3 - Alternator

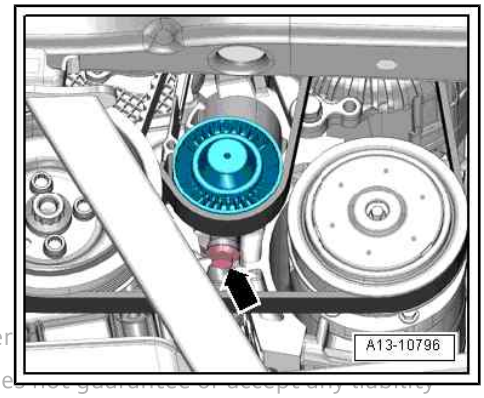
4 - Air conditioner compressor



– Use a brush to coat guide surfaces of tensioning roller with lubricating paste; lubricating paste ⇒ Electronic parts catalogue .

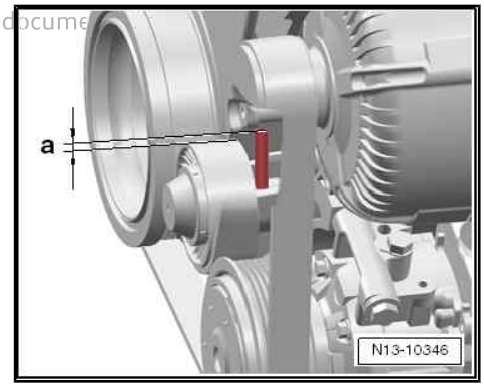
– Insert tensioning roller with pin into guide on bracket for ancillaries.

– Tightening bolt for tensioning roller ⇒ page 67 .



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– Check that end of bolt for tensioning roller protrudes beyond contact surface of tensioning roller as far as dimension -a-.



- Distance -a- = approx. 2.5 mm.
- This ensures that the pin is at its limit stop.

– Start engine and check that poly V-belt(s) run properly.

– Install noise insulation ⇒ Rep. gr. 50 .

1.8 Removing and installing vibration damper

Removing

- Front wheel housing liner removed (front section, right-side) ⇒ Rep. gr. 66 .

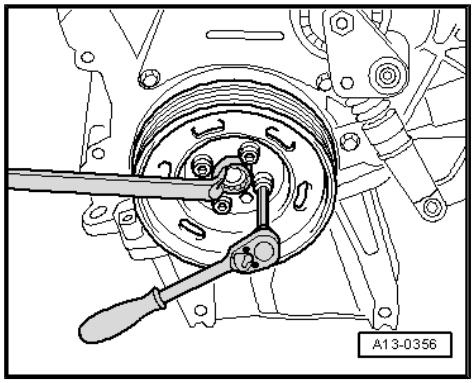
– Remove poly V-belt:

◆ ⇒ “1.2 Removing and installing poly V-belt - vehicles without air conditioner compressor”, page 59

◆ ⇒ “1.4 Removing and installing poly V-belt - vehicles with air conditioner compressor and tensioner”, page 62

◆ ⇒ “1.7 Removing and installing poly V-belt - vehicles with air conditioner compressor and tensioning roller”, page 68

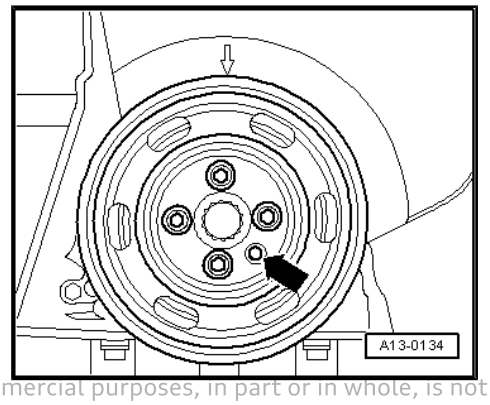
– Counterhold by applying ring spanner to bolt for crankshaft sprocket and slacken bolts for vibration damper.
– Remove bolts and take off vibration damper.



Installing

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

- Tightening torque
  ⇒ “1.3 Exploded view - poly V-belt drive, vehicles with air conditioner compressor and tensioner”, page 60



Note

Renew the bolts tightened with specified tightening angle.

- Installation position: hole -arrow- in vibration damper must be positioned over raised section of crankshaft sprocket.

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– Install poly V-belt:

◆ ⇒ “1.2 Removing and installing poly V-belt - vehicles without air conditioner compressor”, page 59
◆ ⇒ “1.4 Removing and installing poly V-belt - vehicles with air conditioner compressor and tensioner”, page 62
◆ ⇒ “1.7 Removing and installing poly V-belt - vehicles with air conditioner compressor and tensioning roller”, page 68

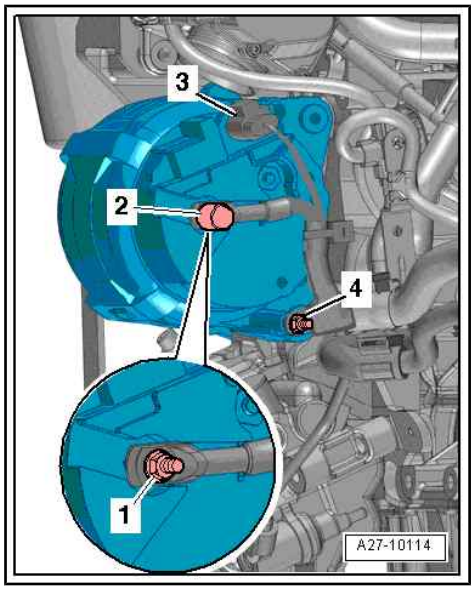
1.9 Removing and installing bracket for ancillaries

Removing

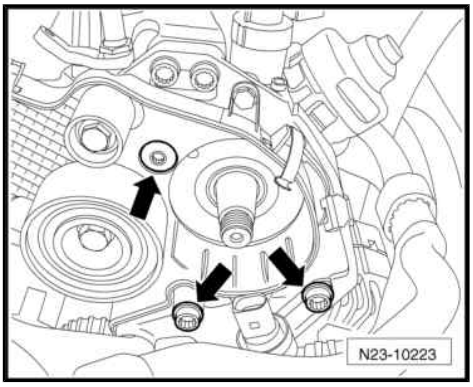
Note

The procedure describes removal on vehicles with air conditioner compressor.

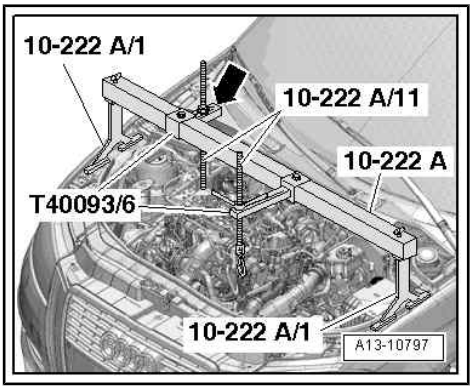
– Remove engine mounting ⇒ page 47 .
– Remove alternator ⇒ Electrical system; Rep. gr. 27 .



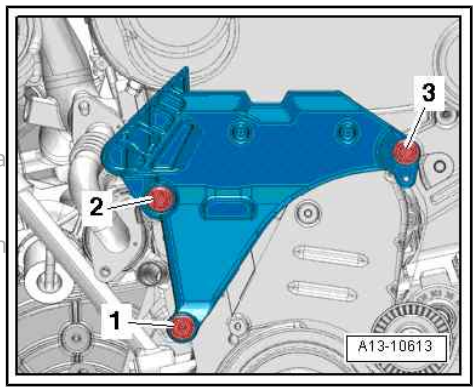
– Remove high-pressure pump ⇒ Rep. gr. 23 .



– Pull engine upwards with spindle -arrow-.



– Remove bolt -3- from engine support; insert new bolt, but do not screw in.

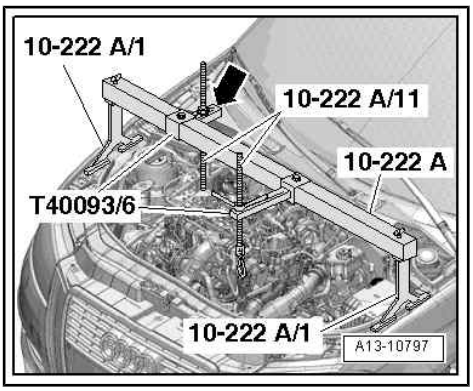


Note

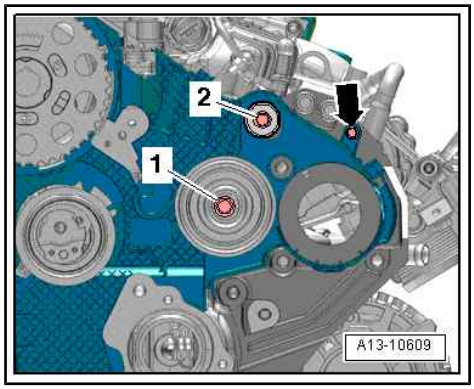
Disregard items -1 and 2-.

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– Lower engine again with spindle -arrow-.



– Remove bolt -arrow-.
– Remove bolts -1- and -2- and remove idler rollers for toothed belt.



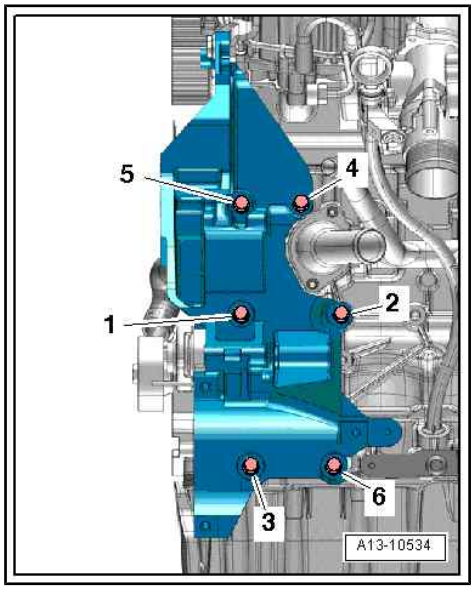
– Remove bolts -1 ... 6- and detach bracket for ancillaries.

Installing

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

Note

Renew the bolts tightened with specified tightening angle.



– Check that dowel sleeve at top right between bracket for ancillaries and cylinder block is fitted; insert dowel sleeve if necessary.
– Tighten bolts for bracket for ancillaries ⇒ page 62 .
– Install engine support ⇒ page 45 .
– Install high-pressure pump ⇒ Rep. gr. 23 .
– Install toothed belt (adjust valve timing) ⇒ page 111 .
– Install alternator ⇒ Electrical system; Rep. gr. 27 .
– Install engine mountings ⇒ page 45 .

1.10 Exploded view - sealing flange (pulley end)

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1 - Bolt

- ❑ Tightening torque ⇒ Item 27 (page 105)

2 - Crankshaft sprocket

- ❑ Contact surface between sprocket and crankshaft must be free of oil
- ❑ Can only be installed in one position

3 - Oil seal for crankshaft (pulley end)

- ❑ Renewing ⇒ page 73
- ❑ Do not lubricate with oil

4 - Sealing flange (pulley end)

- ❑ Should be positioned on dowel pins
- ❑ Removing and installing ⇒ page 75

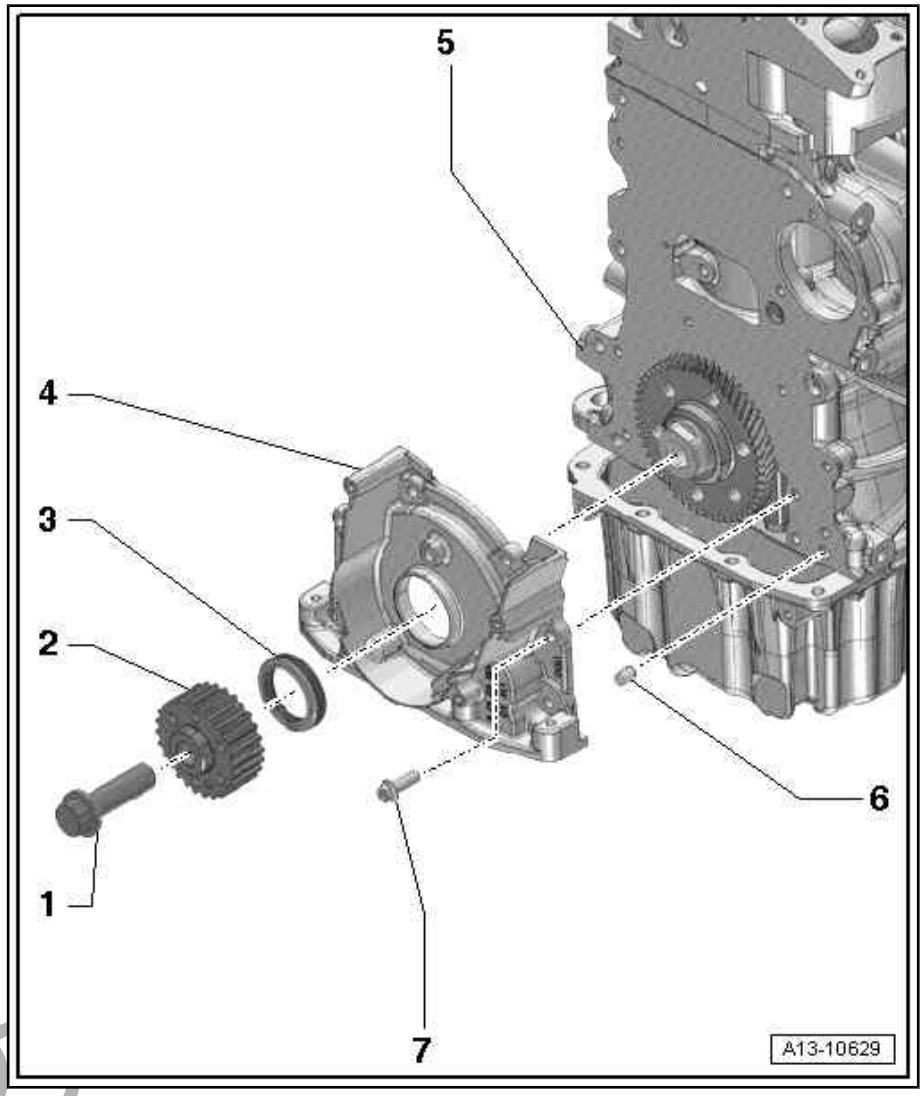
5 - Cylinder block

6 - Dowel pin

- ❑ 2x

7 - Bolt

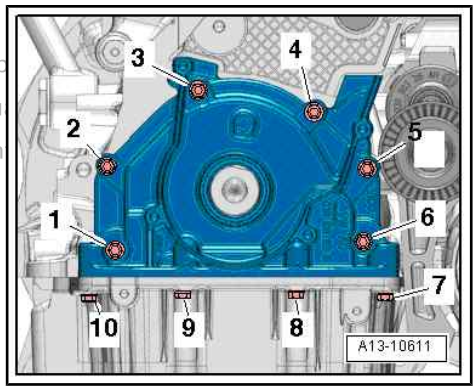
- ❑ Tightening torque and sequence ⇒ page 73



Sealing flange (pulley end) - tightening torque and sequence

– Tighten bolts in 3 stages in the sequence shown:

Stage	Bolts	Tightening torque
1.	-1 … 10-	Screw in by hand until contact is made
2.	-1 … 6-	Tighten in stages and in diagonal sequence; final torque 15 Nm
3.	-7 … 10-	15 Nm

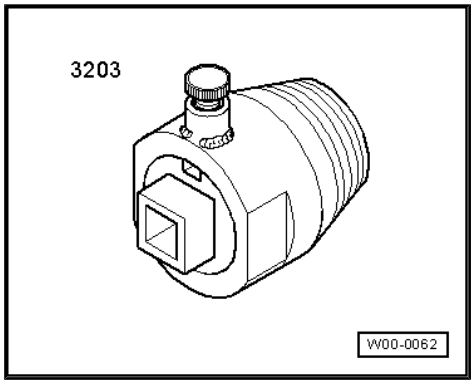


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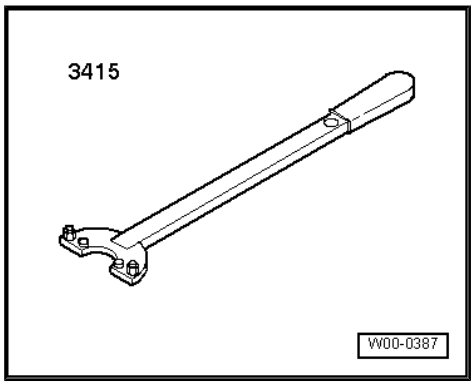
1.11 Renewing crankshaft oil seal (pulley end)

Special tools and workshop equipment required

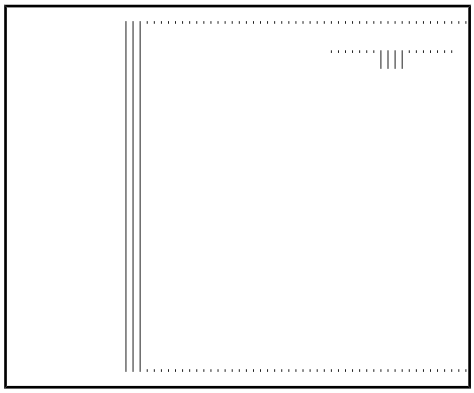
- Oil seal extractor - 3203-



- Counterhold tool - 3415-



- Assembly tool - T10053-

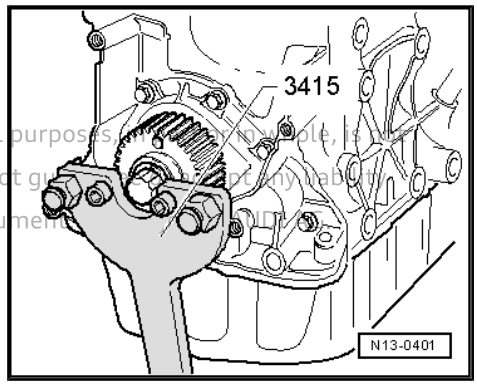


Procedure

– Remove toothed belt ⇒ page 106 .

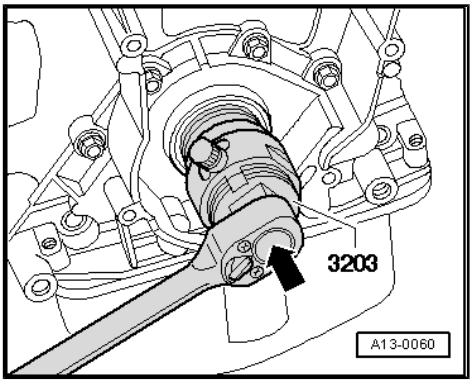
– Loosen bolt for crankshaft sprocket using counterhold tool - 3415- .

– Remove bolt and detach crankshaft sprocket.



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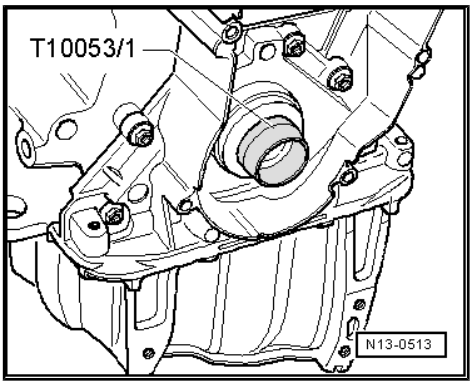
– Adjust inner section of oil seal extractor -3203- so it is flush with the outer section and lock in position with knurled screw.
– Lubricate threaded head of oil seal extractor, place it in position and screw it into oil seal as far as possible (applying firm pressure).
– Loosen knurled screw and turn inner part against crankshaft until the oil seal is pulled out.
– Clamp flats of oil seal extractor in vice and use pliers to remove oil seal.
– Clean contact surface and sealing surface for oil seal.
– Remove oil residue from crankshaft journal with a clean cloth.



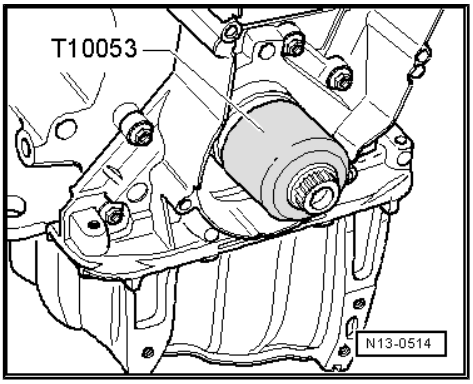
Note

Do not lubricate sealing lip and outer rim of oil seal before pressing in.

– Fit guide sleeve -T10053/1- onto crankshaft journal.
– Push oil seal over guide sleeve onto crankshaft journal.



– Press in oil seal using bolt for crankshaft sprocket and thrust sleeve of assembly tool - T10053- until flush.
– Install crankshaft sprocket ⇒ page 104 .
– Install toothed belt (adjust valve timing) ⇒ page 111 .

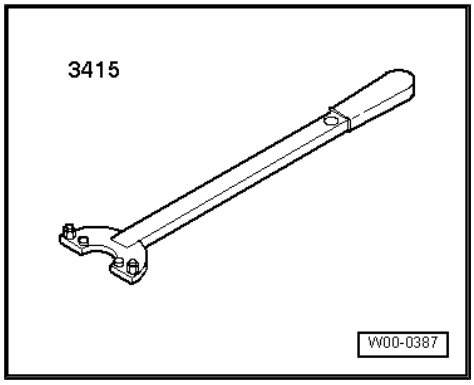


1.12 Removing and installing sealing flange (pulley end)

Special tools and workshop equipment required

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- Counterhold tool - 3415-



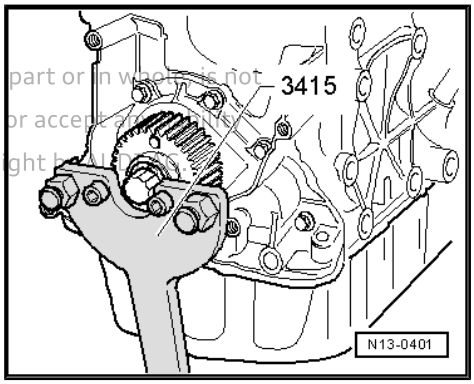
- Electric drill with plastic brush attachment
- Safety goggles
- Sealant ⇒ Electronic parts catalogue

Removing

– Remove toothed belt ⇒ page 106 .

– Loosen bolt for crankshaft sprocket using counterhold tool - 3415- .

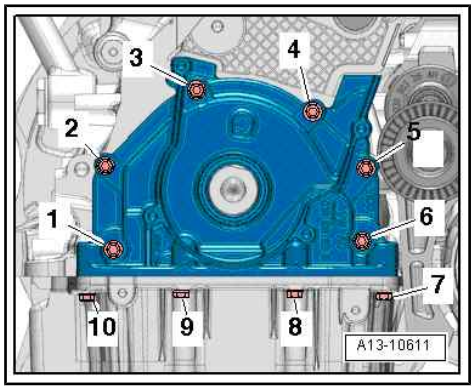
– Remove bolt and detach crankshaft sprocket.



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– Remove bolts -1 ... 10- and carefully release sealing flange from bonded joint.

– Drive out oil seal with sealing flange removed.



Installing

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

Tightening torques

- ⇒ Fig. ""Sealing flange (pulley end) - tightening torque and sequence"" , page 73
- ⇒ Item 27 (page 105)

Caution

Make sure sealant residue does not enter lubrication system.

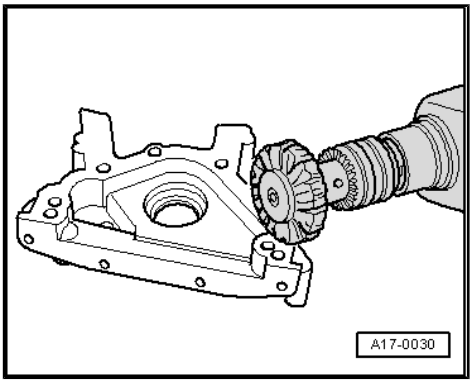
- ***Place a clean cloth over the exposed section of the sump.***

– Carefully remove sealant residue on cylinder block and sump.

WARNING

Risk of eye injury.

- *Put on safety goggles.*



– Use e.g. rotating plastic brush to remove sealant residue on sealing flange.

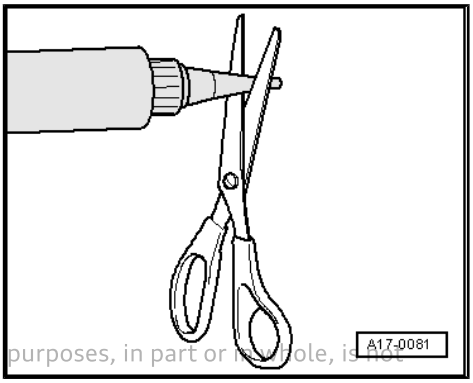
– Clean sealing surfaces; they must be free of oil and grease.

– Check that dowel pins for positioning sealing flange are fitted in cylinder block; insert if necessary.

Note

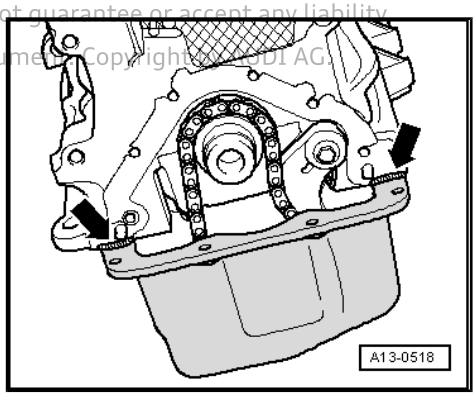
Note the use-by date of the sealant.

– Cut off nozzle of tube at front marking (nozzle ∅ approx. 2 mm).



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– Apply a thin bead of sealant at the edge of the joint between the cylinder block and the sump -arrows-.



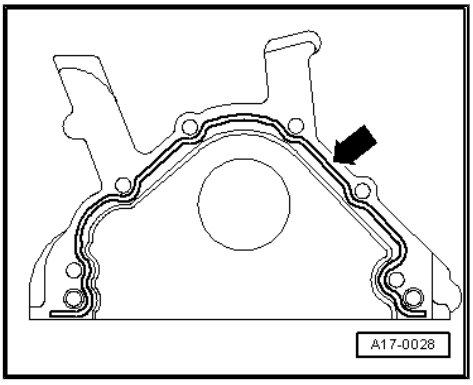
Caution

Make sure lubrication system is not clogged by excess sealant.

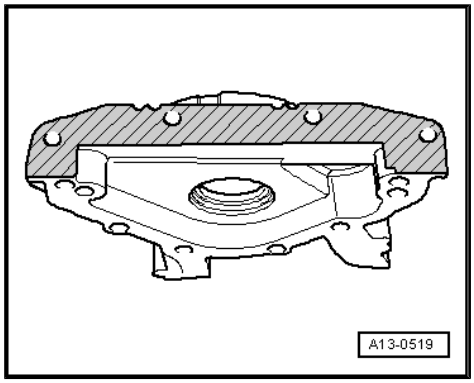
- *The sealant bead must not be thicker than specified.*

– Apply sealant bead -arrow- onto clean sealing surface of sealing flange as shown in illustration.

• Thickness of sealant bead: 2 ... 3 mm



– Apply a thin coat of sealant to bottom sealing surface -shaded- on sealing flange.



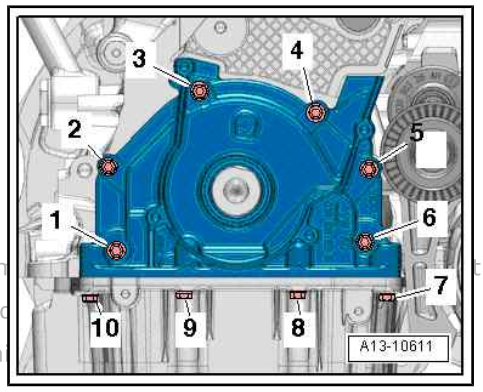
Note

The sealing flange must be installed within 5 minutes after applying the sealant.

– Carefully fit sealing flange onto dowel pins in cylinder block.

– Tighten sealing flange bolts ⇒ page 73 .

– Install crankshaft oil seal (pulley end) ⇒ page 73 .



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2 Cylinder block (gearbox end)

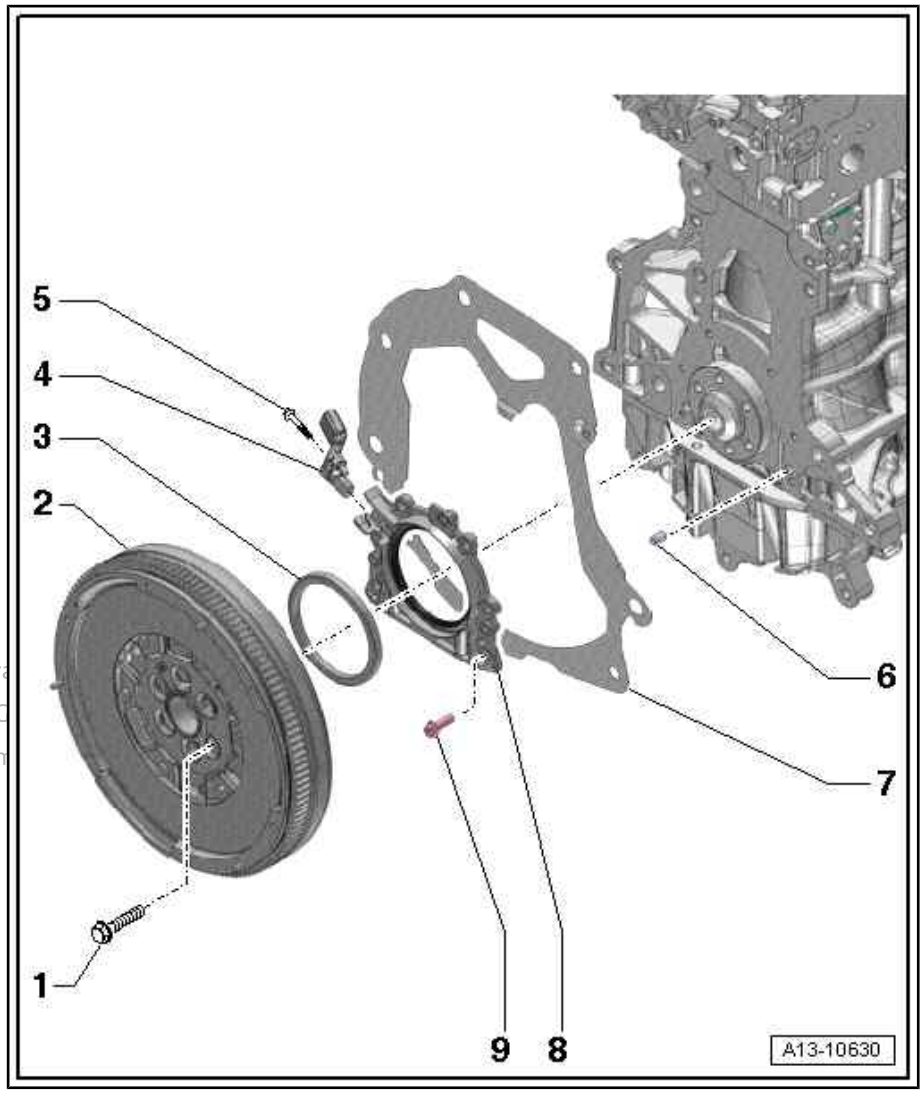
Overview

- ⇒ “2.1 Exploded view - dual-mass flywheel and sealing flange (gearbox end)”, page 79
- ⇒ “2.2 Removing and installing dual-mass flywheel”, page 80
- ⇒ “2.3 Renewing sealing flange (gearbox end)”, page 81

Note

Servicing clutch ⇒ Rep. gr. 30

2.1 Exploded view - dual-mass flywheel and sealing flange (gearbox end)



1 - Bolt
- ❑ Renew
- ❑ 60 Nm +90°

2 - Dual-mass flywheel
- ❑ Removing and installing ⇒ page 80
- ❑ Can only be installed in one position (holes are off-set)

3 - Sender wheel
- ❑ For engine speed sender - G28-
- ❑ Removing and installing ⇒ “2.3 Renewing sealing flange (gearbox end)”, page 81

4 - Engine speed sender - G28-
- ❑ Removing and installing ⇒ Rep. gr. 28

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5 - Bolt
- ❑ Tightening torque ⇒ Rep. gr. 28

6 - Dowel pin
- ❑ 2x

7 - Intermediate plate
- ❑ Do not damage or bend when assembling
- ❑ Installing ⇒ page 80

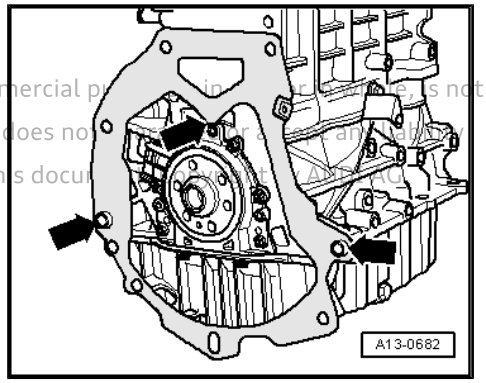
8 - Sealing flange (gearbox end)
- ❑ With oil seal
- ❑ Renewing ⇒ page 81

9 - Bolt
- ❑ Tightening torque and sequence ⇒ page 80

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Installing intermediate plate

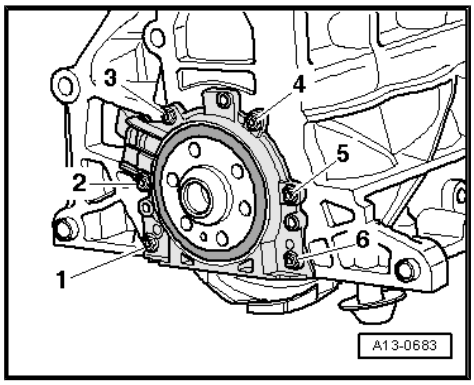
– Engage intermediate plate on sealing flange -top arrow- and push onto dowel sleeves -bottom arrows-.



Sealing flange (gearbox end) - tightening torque and sequence

– Tighten bolts in 2 stages in the sequence shown:

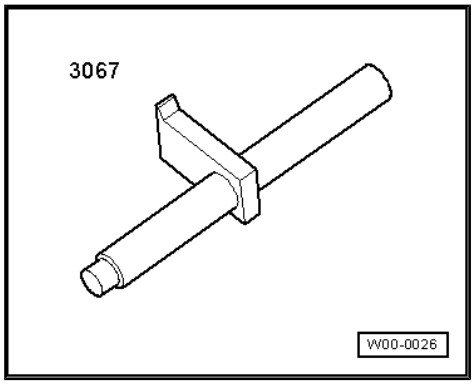
Stage	Bolts	Tightening torque
1.	-1 … 6-	Screw in by hand until contact is made
2.	-1 … 6-	Tighten in stages and in diagonal sequence; final torque 15 Nm



2.2 Removing and installing dual-mass flywheel

Special tools and workshop equipment required

♦ Counterhold tool - 3067-



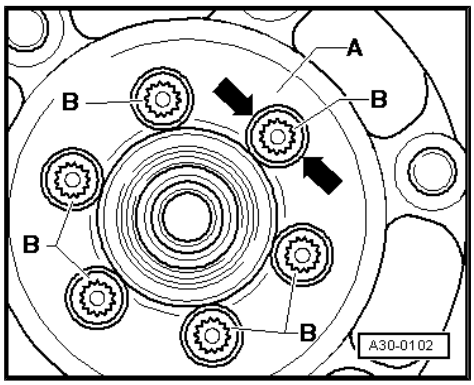
Removing

• Gearbox removed

Caution

Risk of irreparable damage to dual-mass flywheel.

- ♦ *Remove bolts -B- using normal hand tools (do not use pneumatic wrench or impact driver, etc.).*
- ♦ *When removing the bolts, make sure that the bolt heads do not come into contact with the dual-mass flywheel.*
- ♦ *Rotate the dual-mass flywheel -A- so that the bolts -B- align centrally with the holes -arrows-.*

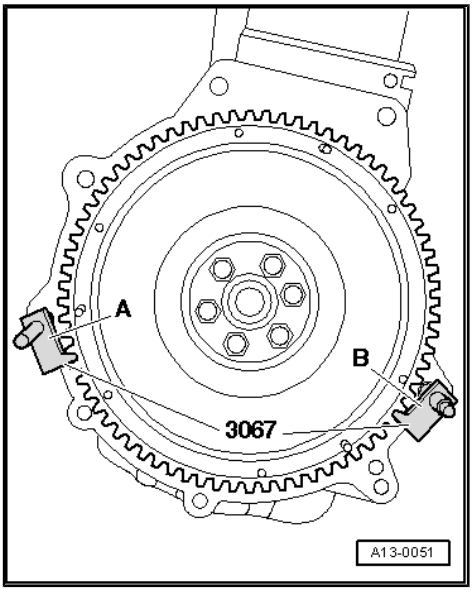


– Insert counterhold tool - 3067- in hole on cylinder block -item B-, slacken bolts for dual-mass flywheel.
– Remove bolts and take off dual-mass flywheel.

Installing

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

- Tightening torque
⇒ "2.1 Exploded view - dual-mass flywheel and sealing flange (gearbox end)", page 79



Note

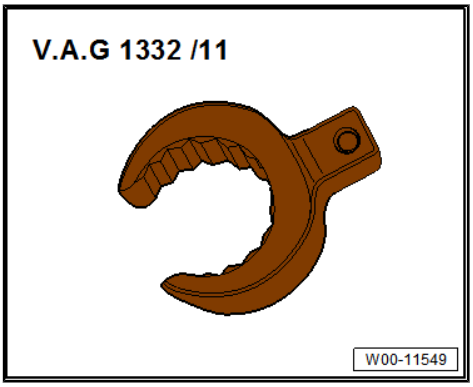
Renew the bolts tightened with specified tightening angle.

– Insert counterhold - 3067- in hole on cylinder block -item A-.

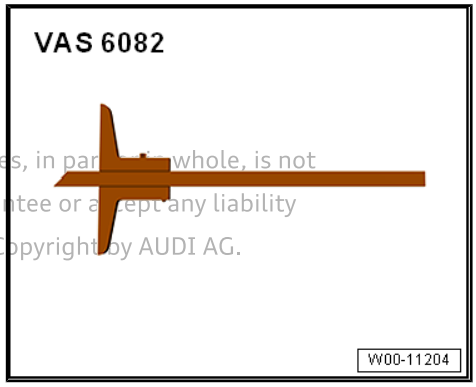
2.3 Renewing sealing flange (gearbox end)

Special tools and workshop equipment required

♦ Open end spanner insert, AF 24 - V.A.G 1332/11-

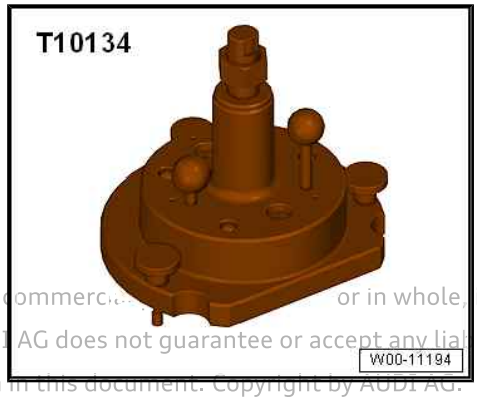


♦ Depth gauge - VAS 6082-



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- Assembly tool - T10134-



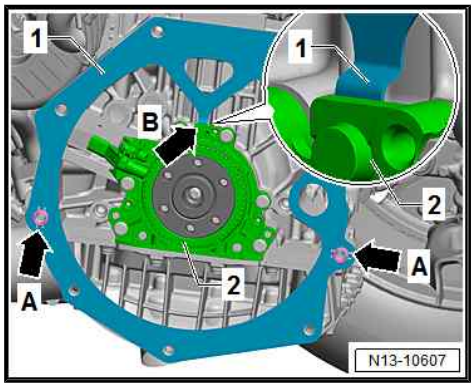
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- Bolt, M6x35 (3x)
- Bolt, M7x35 (2x)

Pressing out sealing flange with sender wheel

- Gearbox removed

– Remove flywheel ⇒ page 80 .



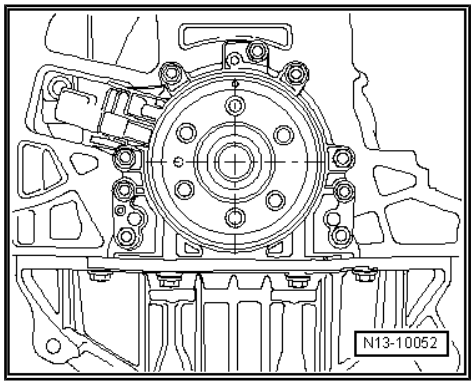
Note

For clarity, the engine is removed in the following illustrations.

– Detach intermediate plate -1- from dowel sleeves -arrows A-.

– Guide intermediate plate upwards; at the same time, pull retaining tab -arrow B- out of opening behind sealing flange -2-.

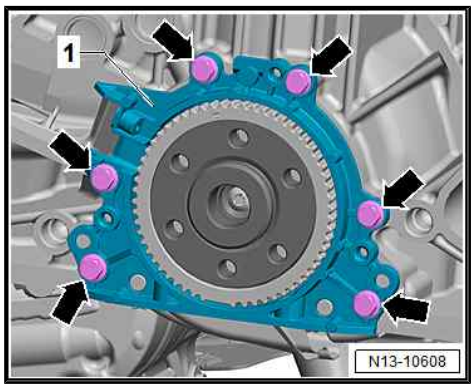
– Rotate crankshaft by turning bolt for toothed belt sprocket until crankshaft is positioned at “TDC”, as shown in illustration.



– Remove sump ⇒ page 164 .

– Remove engine speed sender - G28- ⇒ Rep. gr. 28 .

– Remove bolts -arrows- for sealing flange -1-.

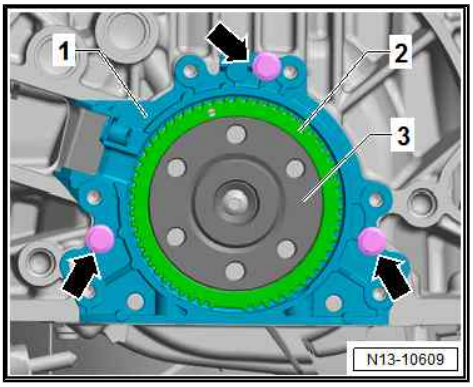


Note

The sealing flange -1- is pressed off the crankshaft -3- together with the sender wheel -2-.

– To press off, screw 3 bolts M6x35 -arrows- alternately into sealing flange not more than $^1/_2$ turn at a time.

– Detach sealing flange together with sender wheel.

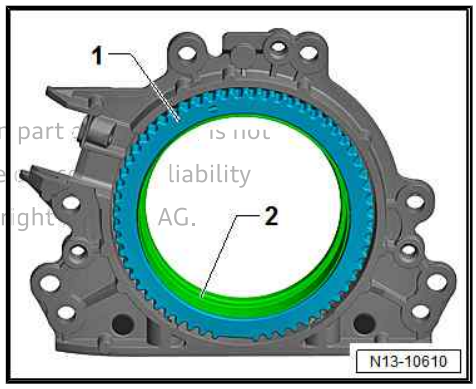


Pressing in sealing flange with sender wheel

Note

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- *The sealing flange with PTFE oil seal is fitted with a sealing lip support ring -2-. This support ring acts as an assembly sleeve and must not be removed before installation.*
- *Sealing flange and sender wheel -1- must not be separated or rotated out of position after removal from packaging.*
- *The sender wheel is held in its installation position by a locating pin on the assembly tool - T10134- .*
- *The sealing flange and oil seal are one unit and can only be replaced together with the sender wheel.*
- *The assembly tool - T10134- is held in the correct position relative to the crankshaft by a guide pin which is inserted into a hole in the crankshaft.*



Construction of assembly tool - T10134- :

A - Tensioning flats

B - Nut

C - Assembly housing

D - Locating pin

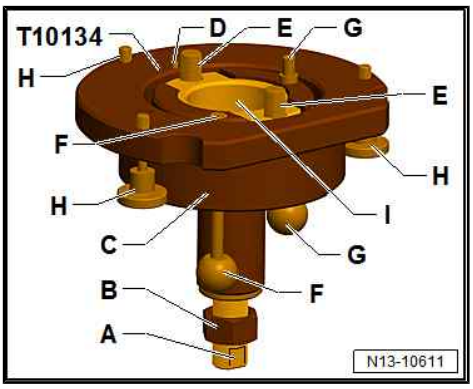
E - Hexagon socket head bolts (2x)

F - Guide pin for diesel engines (black handle)

G - Guide pin for petrol engines (red handle)

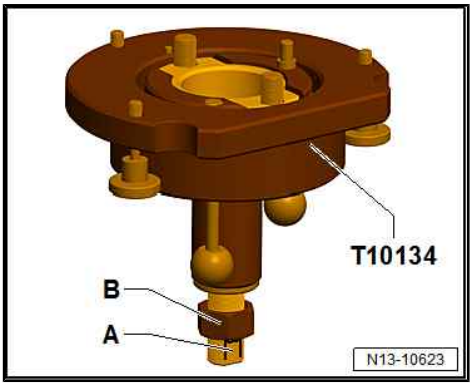
H - Knurled screws (3x)

I - Inner section

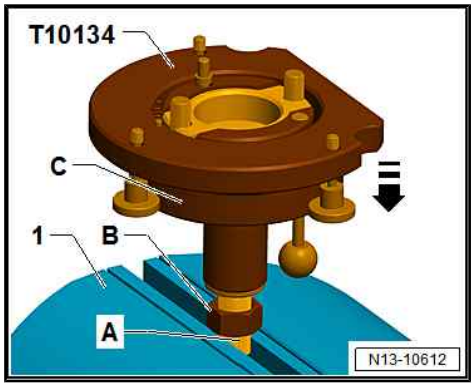


Fitting sealing flange with sender wheel onto assembly tool - T10134- :

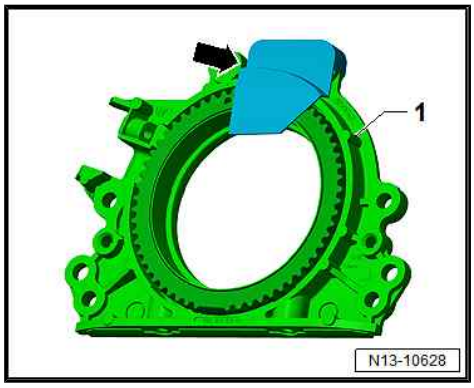
– Unscrew nut -B- until it is just in front of tightening flats -A- on threaded spindle.



– Clamp assembly tool - T10134- in a vice -1- on tightening flats -A- of threaded spindle.
– Press assembly housing -C- downwards -arrow- so that it rests on nut -B-.
• Inner part of assembly device and assembly housing must align (be level) with each other.



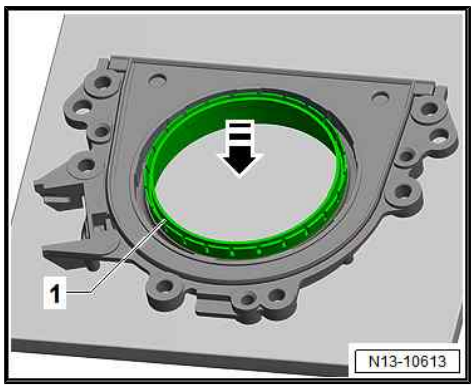
– If fitted, remove securing clip -arrow- from new sealing flange.



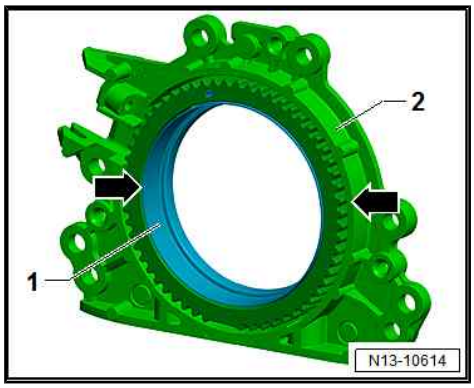
Note

Do not take the sender wheel out of the sealing flange or rotate it out of position.

– Place sealing flange (with front side downwards) on a clean flat surface.
– Press sealing lip support ring -1- downwards in direction of -arrow- until it touches flat surface.



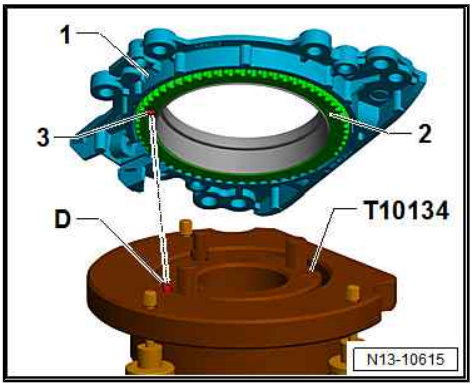
• Upper edge of sealing lip support ring -1- must be flush -arrows- with front edge of sealing flange -2-.



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– Place front side of sealing flange -1- on assembly tool - T10134- so that locating pin -D- is seated in hole -3- in sender wheel -2-.

• Ensure that sealing flange lies flat on assembly tool.

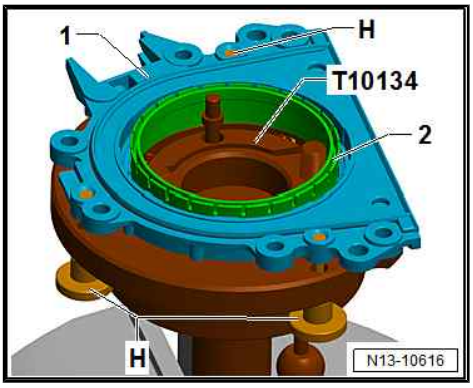


– Screw knurled screws -H- onto sealing flange -1-.

– When tightening, press sealing flange and sealing lip support ring -2- against surface of assembly tool - T10134- .

– This prevents locating pin from sliding out of hole in sender wheel.

– Ensure that sender wheel remains fixed on assembly tool when installing sealing flange.



Securing assembly tool - T10134- with sealing flange -1- on crankshaft flange:

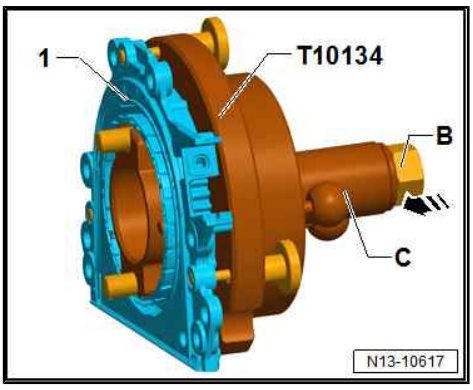
• Crankshaft flange must be free of oil and grease.

• Engine is at “TDC” position.

– Screw nut -B- to end of threaded spindle.

– Press threaded spindle of assembly tool - T10134- in direction of -arrow- until nut -B- makes contact with assembly housing -C-.

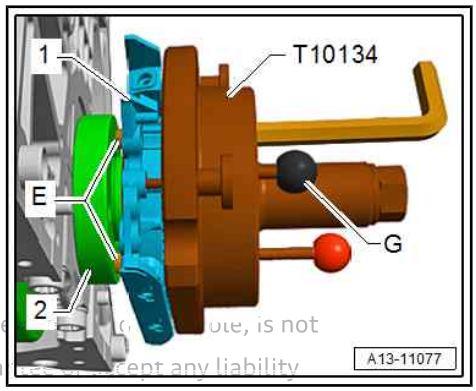
– Position flat edge of assembly housing towards sealing surface for sump on cylinder block.



– Secure assembly tool - T10134- with sealing flange -1- to crankshaft flange -2-.

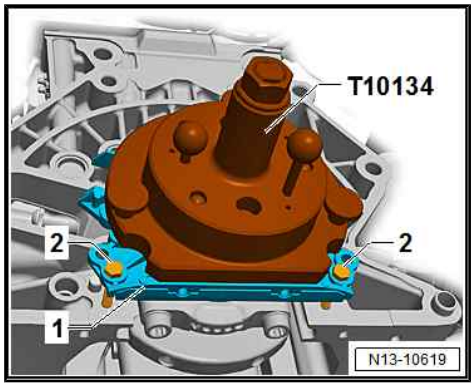
– To do so, screw hexagon socket head bolts -E- approx. 5 turns into crankshaft flange with hexagon key.

– Insert guide pin for diesel engines (black handle) -G- into crankshaft flange.



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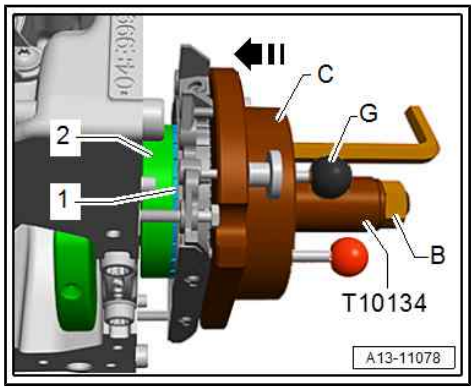
– Screw 2 bolts M6x35 -item 2- into cylinder block to guide sealing flange -1-.



Securing assembly tool - T10134- on crankshaft flange:

– Press assembly housing -C- by hand in direction of -arrow- until sealing lip support ring -1- touches surface of crankshaft flange -2-.

– Check that guide pin for diesel engines (black handle) -G- is fitted correctly in hole in crankshaft. This ensures that sender wheel reaches its final installation position.



Note

The guide pin for PETROL engines (red handle) MUST NOT be inserted into the threaded hole in the crankshaft.

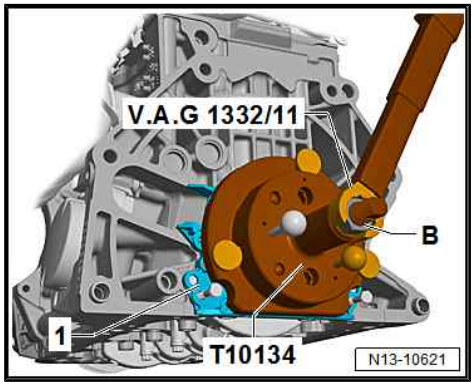
– Tighten the two hexagon socket head bolts on assembly tool hand-tight.

– Screw nut -B- onto threaded spindle by hand until it touches assembly housing -C-.

Pressing sender wheel onto crankshaft flange with assembly tool - T10134- :

– Tighten nut -B- on assembly tool - T10134- to 35 Nm.

• There must be a small gap between cylinder block and sealing flange -1- after nut has been tightened to 35 Nm.



Checking installation position of sender wheel on crankshaft:

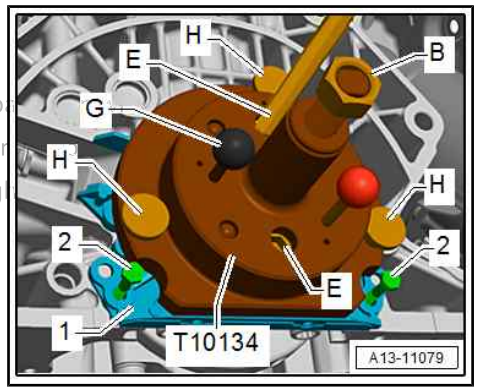
– Screw nut -B- to end of threaded spindle.

– Remove both bolts -2- from cylinder block.

– Unscrew knurled screws -H- from sealing flange -1-.

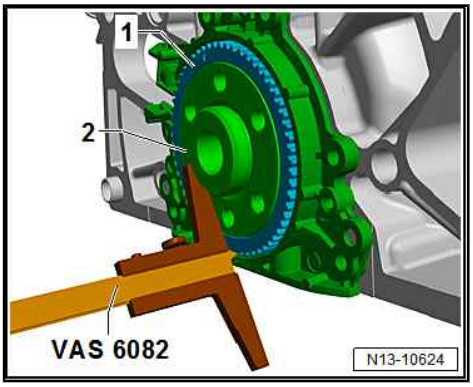
– Unbolt assembly tool - T10134- from crankshaft flange (remove hexagon socket head bolts -E- from crankshaft flange).

– Detach sealing lip support ring.



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– Apply depth gauge - VAS 6082- to crankshaft flange -2-.

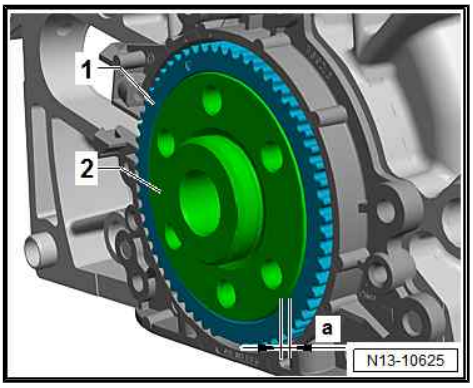


– Measure distance -a- between crankshaft flange -2- and sender wheel -1-.

• Specification: Distance -a- = 0.5 mm.

– Press sender wheel in further if measurement is too small ⇒ page 87 .

– If reading matches specification, continue with assembly ⇒ page 88 .



Pressing sender wheel in further:

– Secure assembly tool - T10134- to crankshaft flange.

– Ensure that locating pin of assembly tool - T10134- is fitted in hole in sender wheel.

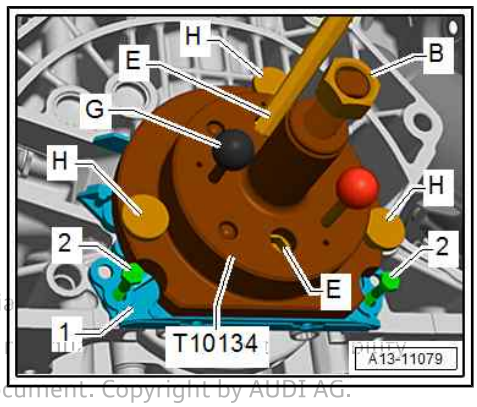
– Hand-tighten hexagon socket head bolts -E-.

– Slide assembly tool - T10134- onto sealing flange -1- by hand.

– Screw nut -B- onto threaded spindle by hand until it touches assembly tool - T10134- .

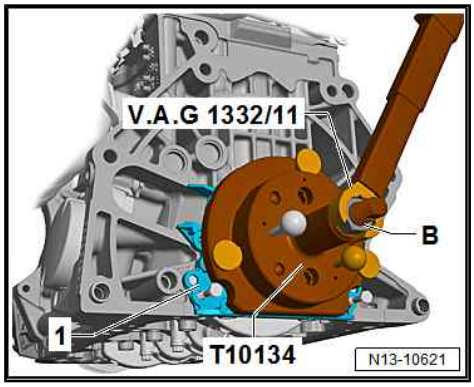
– Insert guide pin for diesel engines (black handle) -G- into crankshaft flange.

– Screw 2 bolts M6x35 -item 2- into cylinder block to guide sealing flange -1-.



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– Tighten nut -B- on assembly tool - T10134- to 40 Nm.
– Check installation position of sender wheel on crankshaft again ⇒ page 86 .
– Tighten nut on assembly tool - T10134- to 45 Nm if measurement is too small.
– Check installation position of sender wheel on crankshaft again ⇒ page 86 .



Assembling:

Assembly is performed in reverse sequence; note the following:

– Install sump ⇒ page 164 .
– Install intermediate plate ⇒ page 80 .
– Install flywheel ⇒ page 80 .

Tightening torques

◆ ⇒ Fig. ""Sealing flange (gearbox end) - tightening torque and sequence"" , page 80

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3 Crankshaft

Overview

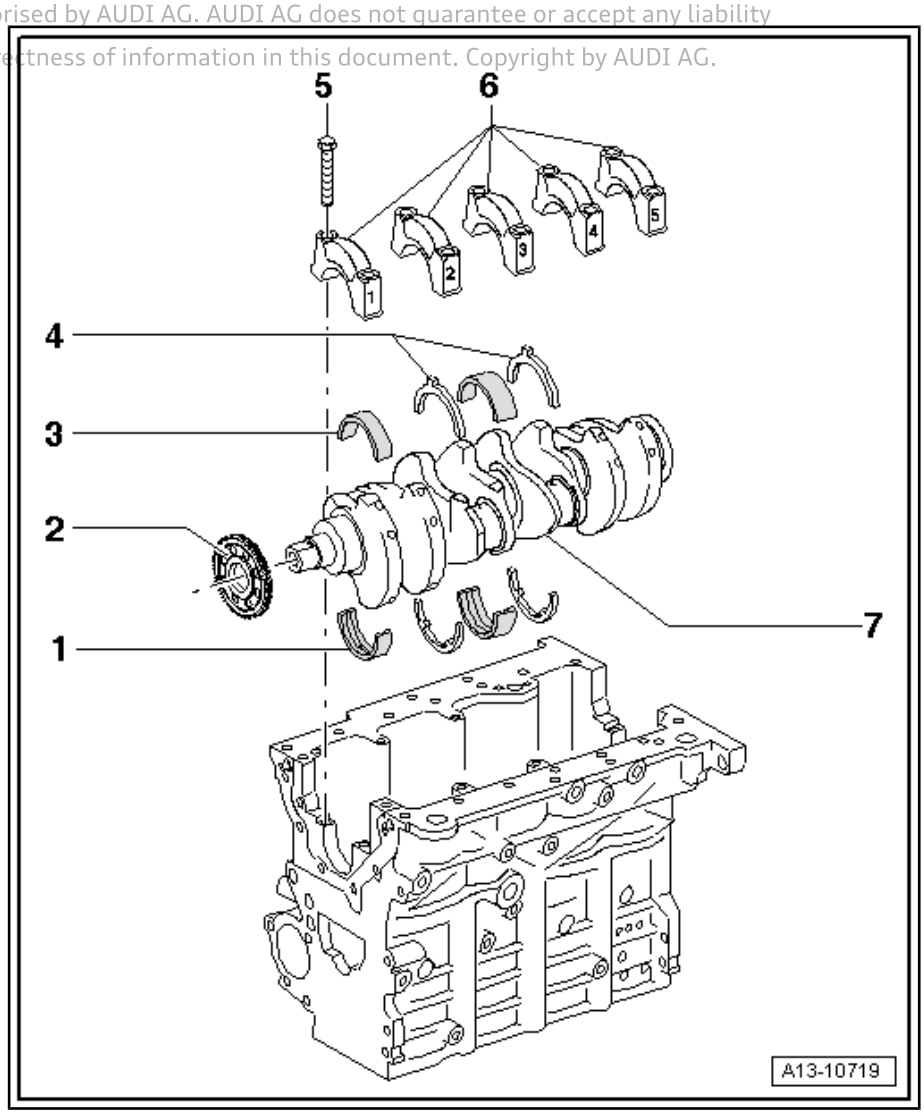
- ⇒ “3.1 Exploded view - crankshaft”, page 89
- ⇒ “3.2 Crankshaft dimensions”, page 90
- ⇒ “3.3 Measuring axial clearance of crankshaft”, page 90
- ⇒ “3.4 Measuring radial clearance of crankshaft”, page 91
- ⇒ “3.5 Extracting and driving in needle bearing for crankshaft”, page 91
- ⇒ “3.6 Pulling spur gear off crankshaft and shrink-fitting new spur gear”, page 93

Note

When performing assembly work, secure engine to engine and gearbox support ⇒ page 38 .

3.1 Exploded view - crankshaft

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1 - Bearing shell
- ❑ For cylinder block (with oil groove)
- ❑ Renew used bearing shells

2 - Spur gear
- ❑ For balance shaft assembly
- ❑ Pulling spur gear off crankshaft and shrink-fitting new spur gear ⇒ page 93

3 - Bearing shell
- ❑ For bearing cap (without oil groove)
- ❑ Renew used bearing shells

4 - Thrust washers
- ❑ For bearing No. 3
- ❑ Different types for cylinder block and bearing cap
- ❑ Note location

5 - Bolts
- ❑ Renew
- ❑ 65 Nm +90°
- ❑ When measuring radial clearance, tighten used bolt to 65 Nm and turn 90° further

6 - Bearing caps
- ❑ Bearing cap 1: Pulley end

- ❑ Bearing cap 3 with recesses for thrust washers
- ❑ Installation position: retaining lugs on bearing shells in cylinder block and bearing caps must be on the same side

7 - Crankshaft

- ❑ There should be no needle bearing fitted in the crankshaft on vehicles with manual gearbox; remove needle bearing if necessary ⇒ page 91
- ❑ A needle bearing must be fitted in the crankshaft on vehicles with dual-clutch gearbox; install needle bearing if not yet fitted ⇒ page 91 .
- ❑ Measuring axial clearance ⇒ page 90
- ❑ Measuring radial clearance ⇒ page 91
- ❑ Crankshaft dimensions ⇒ page 90

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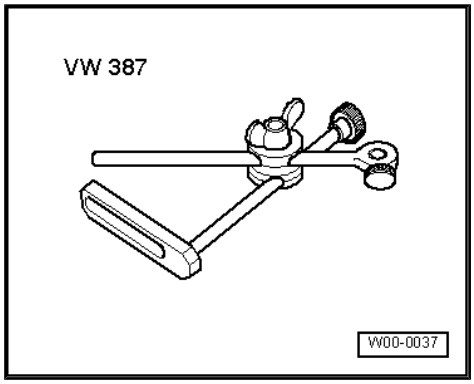
3.2 Crankshaft dimensions

Honing dimension	Main bearing journal ∅ mm	Conrod journal ∅ mm
Basic dimension	54.00 -0.022 -0.042	50.90 -0.022 -0.042

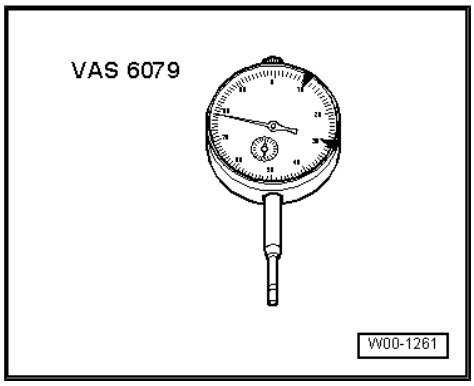
3.3 Measuring axial clearance of crankshaft

Special tools and workshop equipment required

- ♦ Universal dial gauge bracket - VW 387-



- ♦ Dial gauge - VAS 6079-



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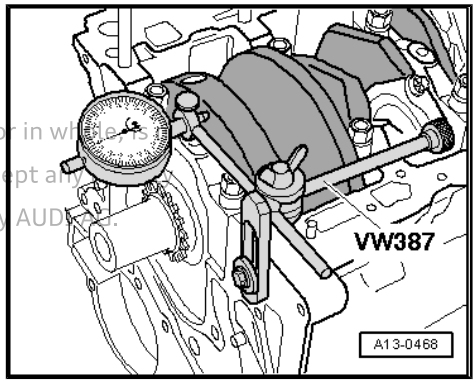
Procedure

– Bolt dial gauge - VAS 6079- with universal dial gauge bracket - VW 387- onto cylinder block (as shown in illustration) and set it against crank web.

– Press crankshaft against dial gauge by hand.

– Set dial gauge to “0”.

– Push crankshaft away from dial gauge and read off value.



Axial clearance:

- New: 0.07 ... 0.17 mm
- Wear limit: 0.37 mm

3.4 Measuring radial clearance of crankshaft

Special tools and workshop equipment required

♦ Plastigauge

Procedure

– Remove bearing cap and clean bearing journal.

– Place a length of Plastigauge corresponding to the width of the bearing on the bearing journal or in the bearing shell.

- The Plastigauge must be positioned in the centre of the bearing shell.

– Fit bearing cap and secure with old bolts ⇒ Item 5 (page 89) without rotating crankshaft.

– Remove bearing cap again.

– Compare width of Plastigauge with measurement scale.

Radial clearance:

- New: 0.03 ... 0.08 mm.
- Wear limit: 0.17 mm.

3.5 Extracting and driving in needle bearing for crankshaft

Only fitted on vehicles with dual clutch gearbox

Note

♦ *A needle bearing must be fitted in the crankshaft on vehicles with dual clutch gearbox ⇒ Electronic parts catalogue .*

♦ *The needle bearing must always be renewed if the engine is separated from the gearbox.*

Special tools and workshop equipment required

- Pin - VW 207 C-

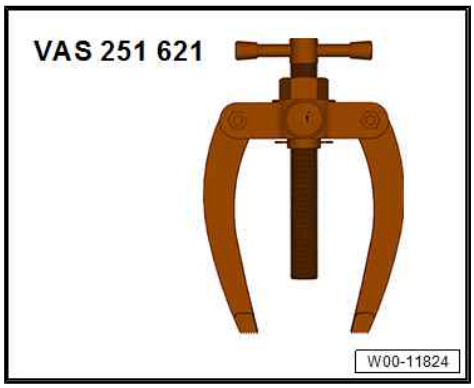


- Internal puller - VAS 251 635-



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- Counter-support - VAS 251 621-



Extracting needle bearing

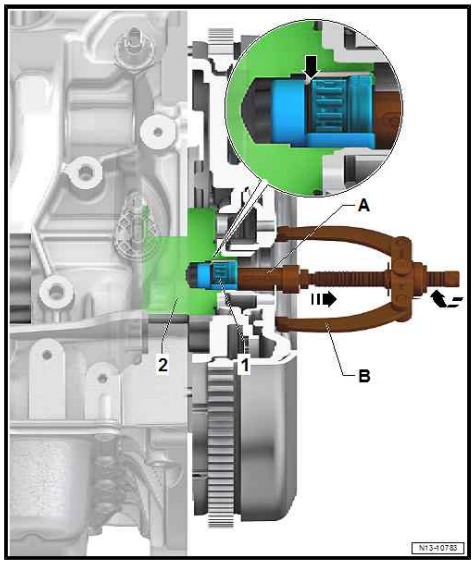
– Remove needle bearing -1- from crankshaft -2- using internal puller - VAS 251 635- -A- and counter-support - VAS 251 621- -B-.

– Internal puller must be positioned behind needle roller -arrow-.

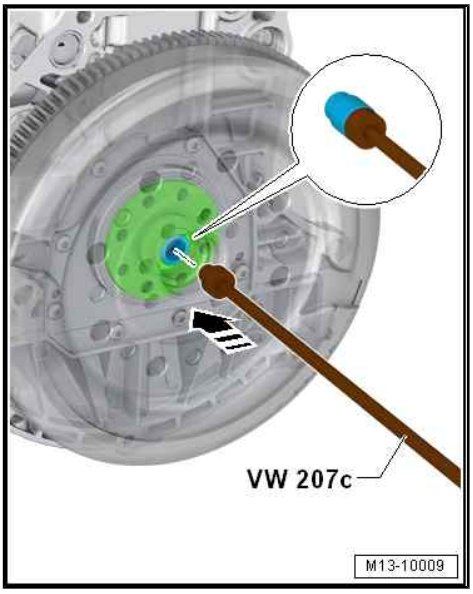
Installing

– The lettering on the needle bearing must be visible when installed.

– Clean bearing seat in crankshaft and grease lightly.



– Drive in with drift - VW 207 C- or centring mandrel - 3176- .



Installation depth: dimension -a- = 2.0 mm

Note:

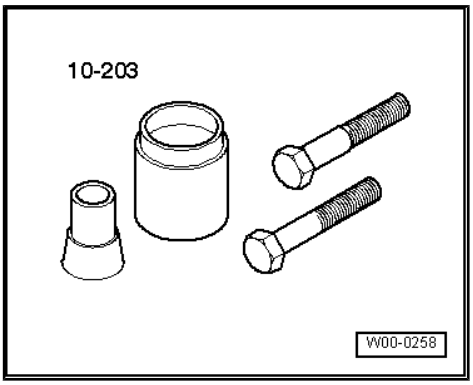
Renew needle bearing if you drive it in too far (needle bearing is damaged when it is pulled out again).

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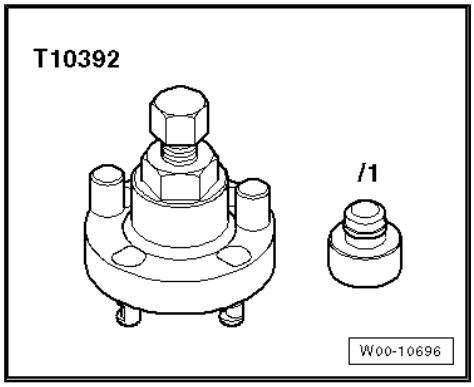


3.6 Pulling spur gear off crankshaft and shrink-fitting new spur gear

♦ Fitting tool - 10 - 203-

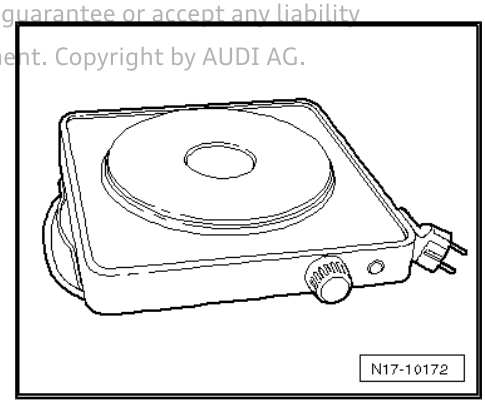


- Puller - T10392-



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- Temperature gauge - VAS 6519-
- Hotplate (commercially available)



- Protective gloves

Procedure

– Remove sealing flange (pulley end) ⇒ page 75 .

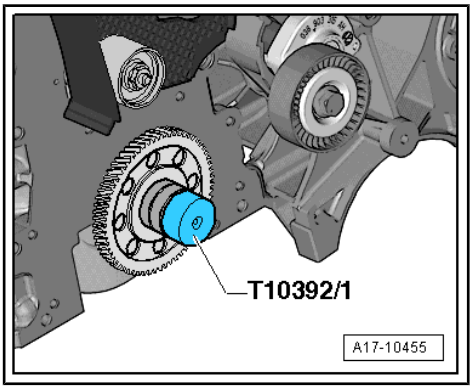
– Remove sump ⇒ page 164 .

Note

- *If the balance shaft assembly does not have to be renewed, it is sufficient just to remove the idler gear.*
- *If the bolt for the idler gear for the balance shaft assembly has been slackened or the spur gear on the crankshaft or the crankshaft itself have been renewed, you must install a new idler gear with the appropriate coating. Procedure for installation*
  ⇒ "1.6 Installing a new balance shaft assembly", page 171 .

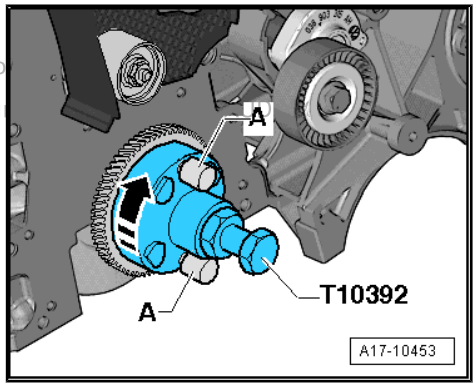
– Remove idler gear ⇒ Item 13 (page 161) for balance shaft assembly or remove balance shaft assembly ⇒ page 169 .

– Insert thrust piece -T10392/1- in end of crankshaft.

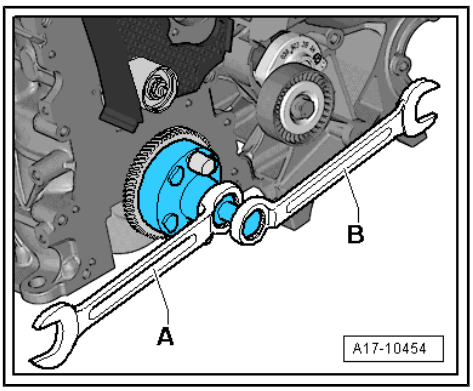


– Insert puller -T10392- in holes in spur gear, turn clockwise -arrow- and screw in locking pins -A-.

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– Counterhold crankshaft with ring spanner -A- and pull spur gear off end of crankshaft by screwing in spindle with ring spanner -B-.



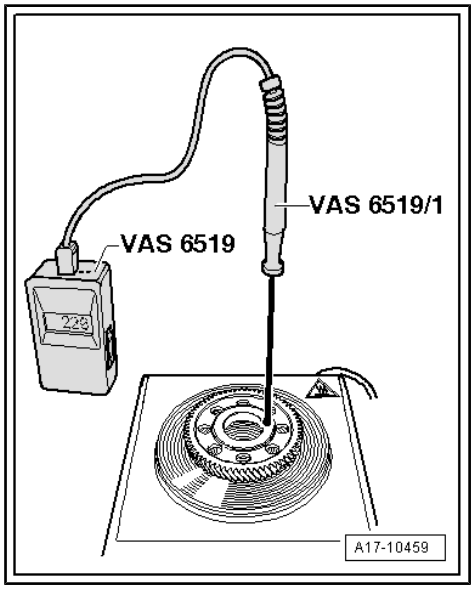
Note

- *While heating up the new spur gear, monitor the temperature with the temperature gauge - VAS 6519- .*
- *When the temperature reaches 200 °C, you have approx. 4 seconds to fit the spur gear on the crankshaft.*
- *A higher temperature increases the amount of time available (220 °C = approx. 6 seconds).*
- *Make sure the end of the crankshaft is clean.*

Caution

Do not exceed a maximum temperature of 240 °C; otherwise the spur gear can become discoloured and distorted.

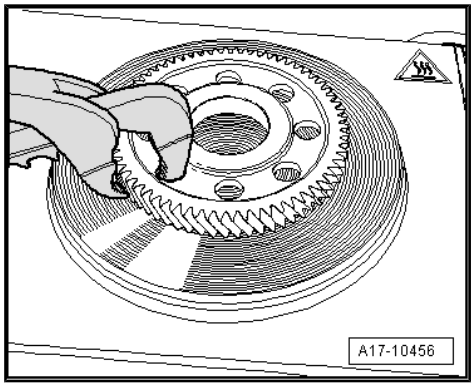
– Place the new spur gear flat on a commercially available hot-plate and heat it up to at least 200 °C, but not more than 240 ° C. Lettering faces upwards.
– Set temperature gauge - VAS 6519- to measuring range 2.
– Position temperature sensor -VAS 6519/1- on collar of spur gear (as shown) and read off temperature at temperature gauge.



WARNING

Risk of burns. Use suitable protective gloves for the following steps.

– When the required temperature has been reached, pick up the spur gear with pliers as illustrated.



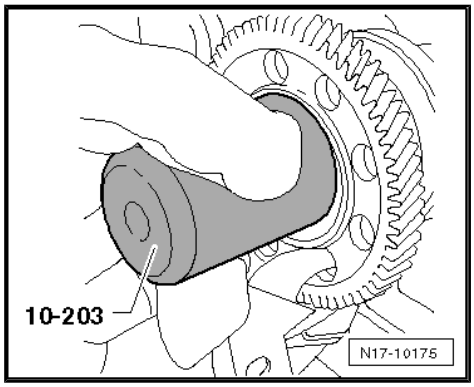
Note

Take care not to damage the teeth of the spur gear.

– With the aid of fitting tool - 10 - 203- , slide spur gear by hand onto end of crankshaft as far as stop. This must be done without delay, taking care to keep the gear straight.
– Wait a few minutes to allow the spur gear to cool down.
– Install balance shaft assembly
⇒ “1.6 Installing a new balance shaft assembly”, page 171 .

Or

– Install idler gear for balance shaft assembly
⇒ “1.6 Installing a new balance shaft assembly”, page 171 .
– Install sealing flange (pulley end) ⇒ page 75 .



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4 Pistons and conrods

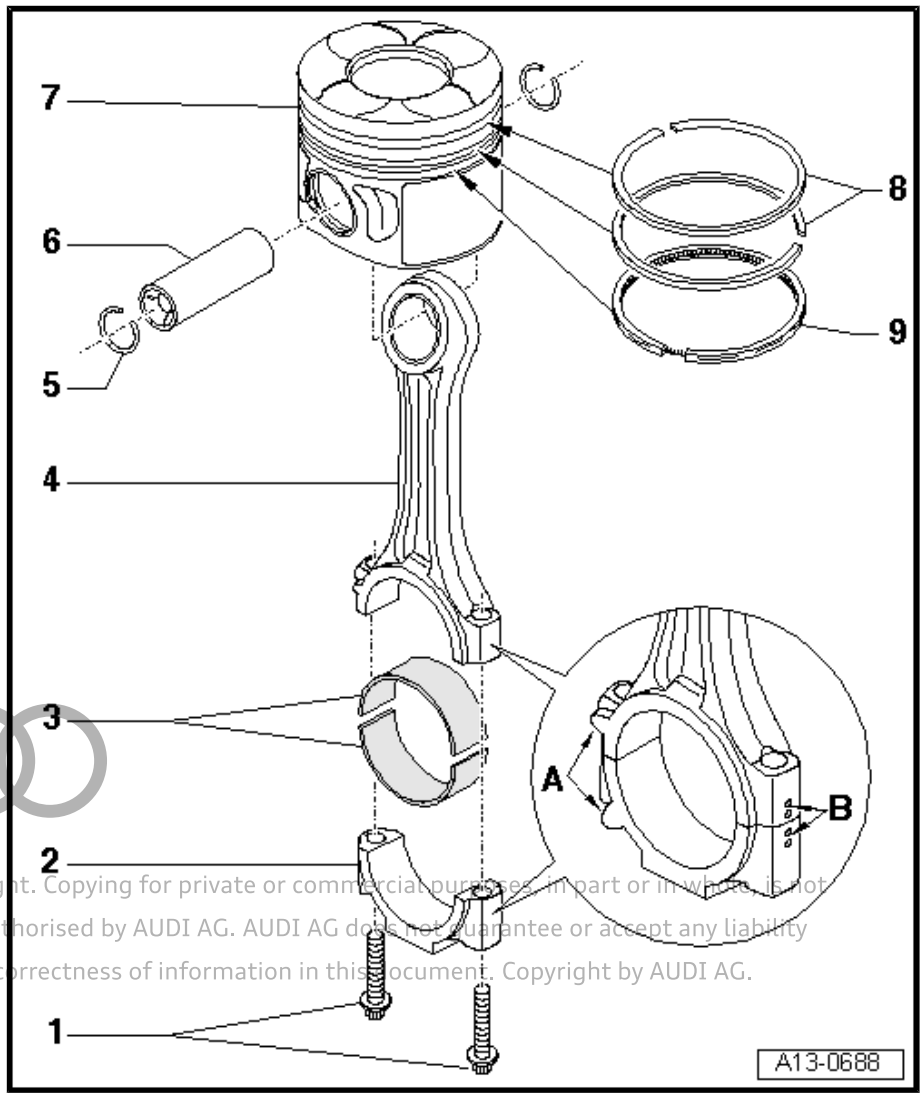
Overview

- ⇒ “4.1 Exploded view - pistons and conrods”, page 97
- ⇒ “4.2 Measuring piston projection at TDC ”, page 101
- ⇒ “4.3 Piston and cylinder dimensions”, page 102
- ⇒ “4.4 Measuring radial clearance of conrods”, page 102

Note

Oil spray jet and pressure relief valve ⇒ page 100

4.1 Exploded view - pistons and conrods



1 - Bolt

- ❑ Renew
- ❑ When measuring radial clearance, tighten used bolt to 30 Nm and turn 90° further
- ❑ Lubricate threads and contact surface
- ❑ 30 Nm +90°

2 - Conrod bearing cap

- ❑ Due to the cracking method used to separate the bearing cap from the conrod in manufacture, the caps only fit in one position and only on the appropriate conrod
- ❑ Mark cylinder allocation in colour -B-
- ❑ Installation position: Markings -A- face towards pulley end

3 - Bearing shell

- ❑ Installation position ⇒ page 100
- ❑ Renew used bearing shells
- ❑ Note version: Upper bearing shell (closest to piston) is constructed from a more wear-resistant material; refer to ⇒ Electronic parts catalogue
- ❑ Check that it is securely seated

4 - Conrod

- ❑ Only renew as a complete set
- ❑ With industrially cracked conrod bearing cap
- ❑ Separating parts of new conrod ⇒ page 100

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- ❑ Mark cylinder allocation in colour -B-
- ❑ Installation position: Markings -A- face towards pulley end
- ❑ Axial clearance: wear limit: 0.37 mm
- ❑ Measuring radial clearance ⇒ page 102

5 - Circlip

- ❑ Renew

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
- ❑ Version fitted in vehicle may differ from illustration
- ❑ Mark installation position and cylinder number ⇒ page 99
- ❑ Checking ⇒ page 99
- ❑ Install using piston ring clamp
- ❑ Piston and cylinder dimensions ⇒ page 102
- ❑ Measuring cylinder bore ⇒ page 99
- ❑ Measuring piston projection at “TDC” ⇒ page 101

8 - Piston rings

- ❑ Compression rings
- ❑ Offset gaps by 120°
- ❑ Use piston ring pliers to remove and install
- ❑ Installation position: marking “TOP” or side with lettering faces towards piston crown
- ❑ Measuring ring gap ⇒ page 98
- ❑ Measuring ring-to-groove clearance ⇒ page 99

9 - Piston ring

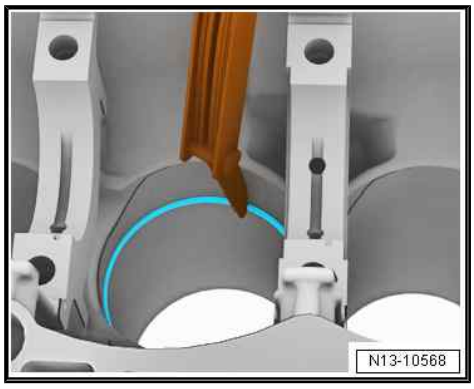
- ❑ Oil scraper ring
- ❑ Offset gap 120° from bottom compression ring
- ❑ Use piston ring pliers to remove and install
- ❑ Installation position: marking “TOP” or side with lettering faces towards piston crown
- ❑ Measuring ring gap ⇒ page 98
- ❑ Measuring ring-to-groove clearance ⇒ page 99

Measuring 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	new mm	Wear limit mm
1st compression ring	0.25 … 0.40	1.00
2nd compression ring	0.25 … 0.40	1.00
Oil scraper ring	0.25 … 0.50	1.00

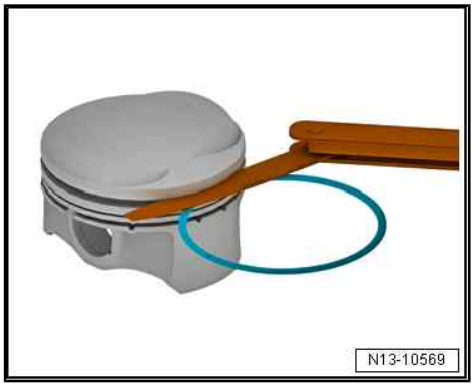


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Measuring ring-to-groove clearance

– Clean groove in piston before checking clearance.

Piston ring	new mm	Wear limit mm
1st compression ring	0.06 … 0.09	0.25
2nd compression ring	0.05 … 0.08	0.25
Oil scraper ring	0.03 … 0.06	0.15

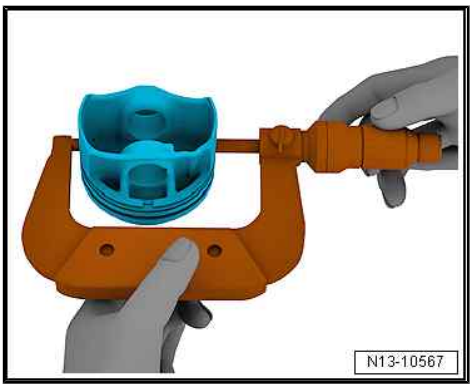


Checking piston

– Using a micrometer (75 ... 100 mm), measure approx. 15 mm from the lower edge, perpendicular to the piston pin axis.

• Maximum deviation from nominal dimension: 0.04 mm.

Nominal dimension
⇒ “4.3 Piston and cylinder dimensions”, page 102 .

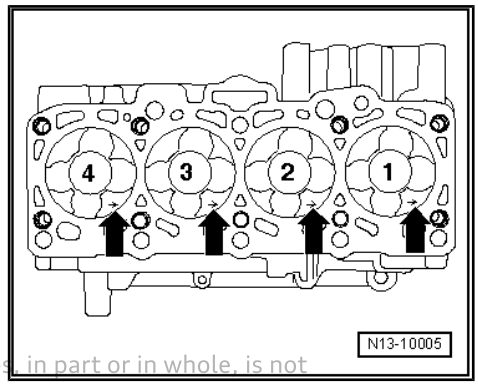


Note

Renew piston if cracking is visible on piston skirt.

Installation position of pistons and allocation of piston/cylinder

• Arrow on piston crown points to pulley end -arrows-.



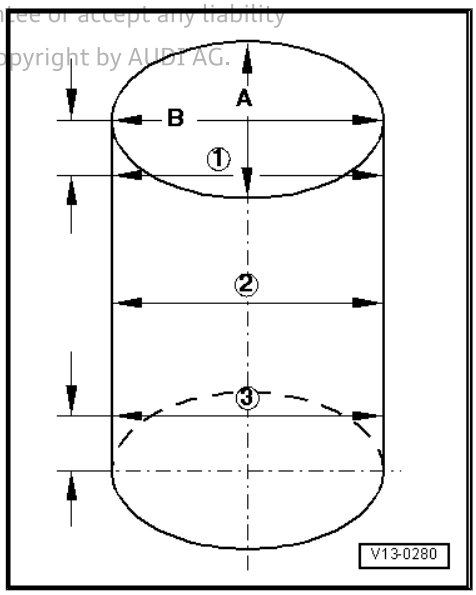
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Measuring cylinder bore

– Use a cylinder gauge - VAS 6078- to take measurements at 3 points in transverse direction -A- and in longitudinal direction -B-.

• Maximum deviation from nominal dimension: 0.10 mm.

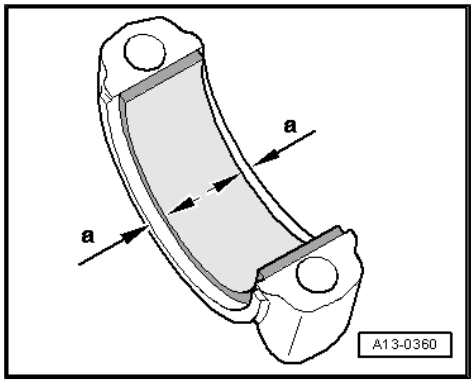
Nominal dimension
⇒ “4.3 Piston and cylinder dimensions”, page 102 .



Installation position of bearing shells in conrods

– Insert bearing shells centrally in conrod and conrod bearing cap.

• Dimension -a- = 2.5 mm



Separating parts of new conrod

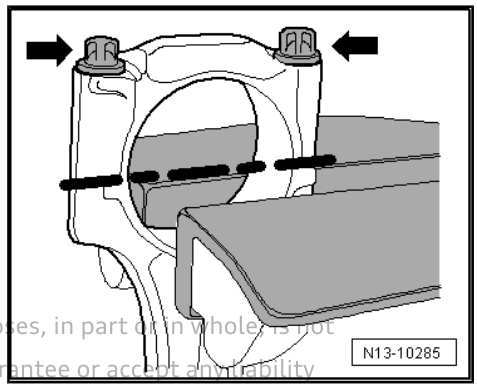
It is possible that the two parts of a new conrod are not completely separated as intended. If it is not possible to take off the conrod bearing cap by hand, proceed as follows:

– To avoid any risk of damage, the conrod should only be clamped lightly in a vice using jaw covers as shown in illustration.

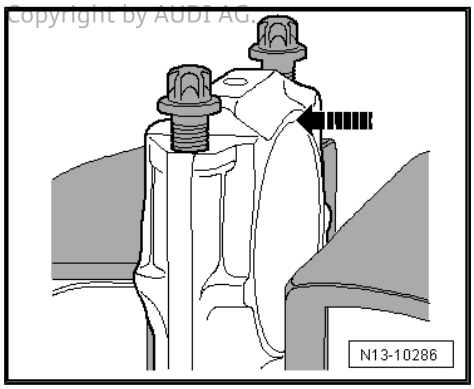
• The conrod is clamped in position below the dotted line.

– Unscrew bolts -arrows- approx. 5 turns.

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– Using a plastic hammer, carefully knock conrod bearing cap loose -arrow-.



Oil spray jet and pressure relief valve

1 - Bolt with pressure relief valve, 27 Nm

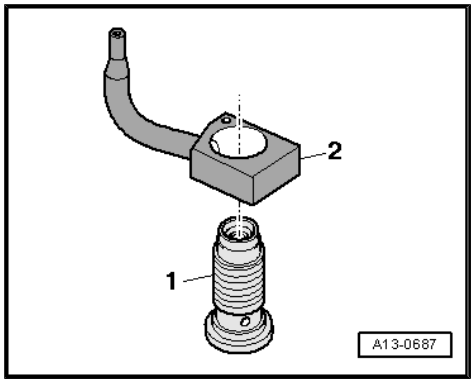
2 - Oil spray jet (for cooling of pistons)

• Installation position: align locating edge of oil spray jet with machined surface of cylinder block.

Note

♦ *Take care not to bend oil spray jets.*

♦ *Always renew bent oil spray jets.*



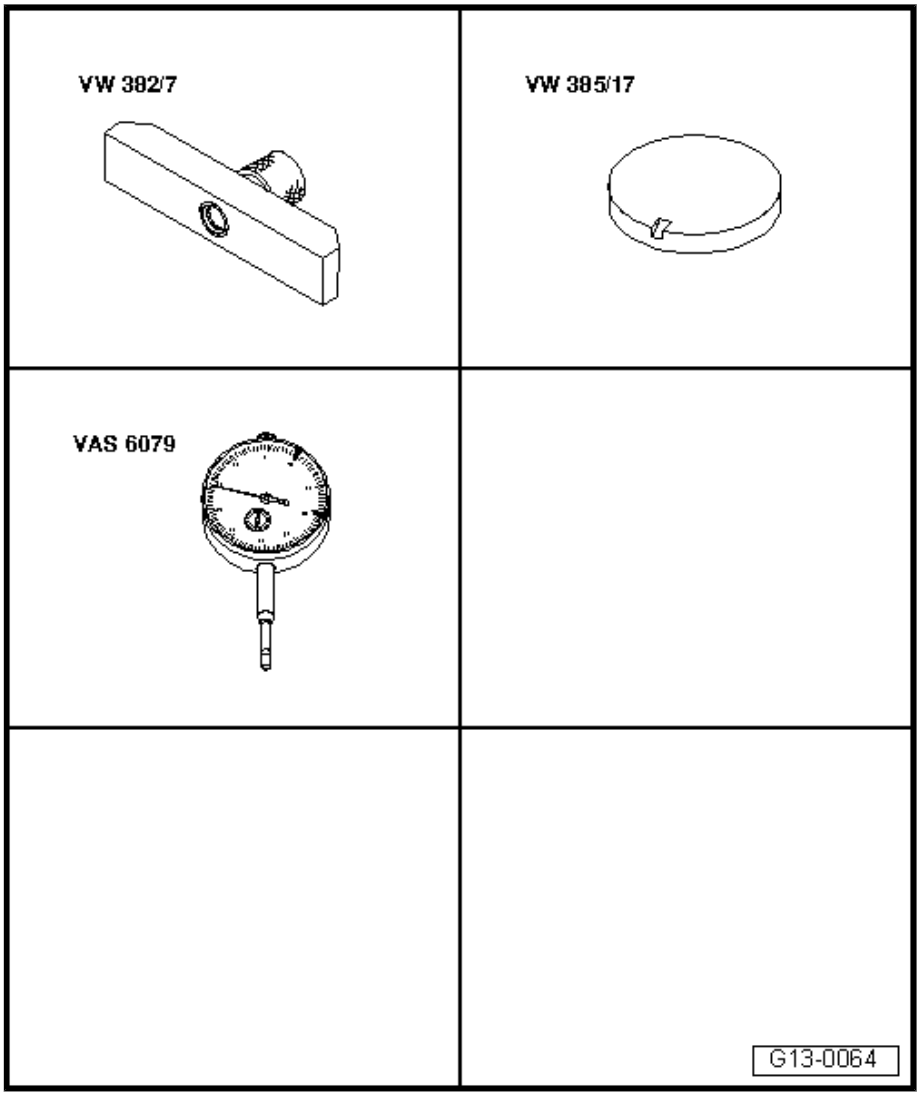
4.2 Measuring piston projection at “TDC”

Note

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

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Special tools and workshop equipment required



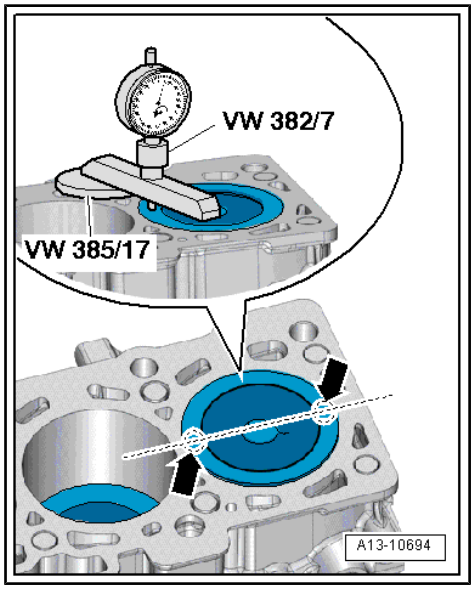
- Measuring bridge -VW 382/7- from measuring tool - VW 382-
- Measuring plate -VW 385/17- from universal measuring tool - VW 385-
- Dial gauge - VAS 6079-

Procedure

– Secure dial gauge - VAS 6079- with measuring bridge - VW 382/7- and measuring plate -VW 385/17- to cylinder block as shown in illustration.

– Measure projection at each piston at both locations marked with -arrows- (seen in longitudinal direction of engine: at front and rear of piston).

– Depending on piston projection, install corresponding cylinder head gasket according to following table:



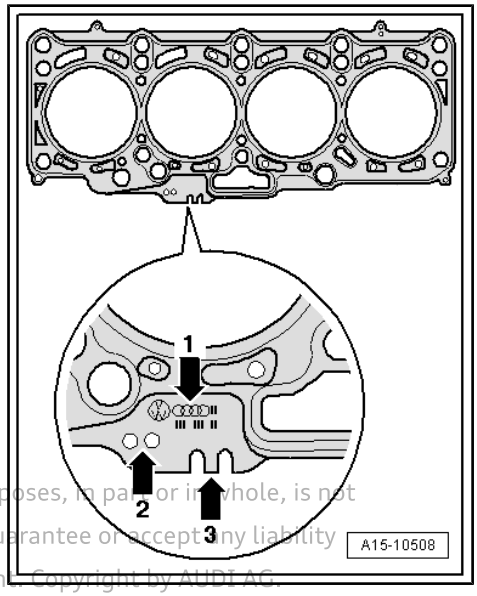
Piston projection above top surface of cylinder block mm	Identification (no. of holes)
0.91 … 1.00	1
1.01 … 1.10	2
1.11 … 1.20	3

Identification of cylinder head gasket

1 - Part number

2 - Holes

3 - Ignore



Note

If the measured values for piston projection are not the same for all pistons, use the highest value to determine the correct cylinder head gasket size.

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4.3 Piston and cylinder dimensions

Honing dimension	Piston ∅ mm	Cylinder bore ∅ mm
Basic dimension	80.96[1)]	81.01

• [1)] Dimensions including coating (thickness 0.02 mm). The coating will wear down in service.

4.4 Measuring radial clearance of conrods

Special tools and workshop equipment required

♦ Plastigauge

Procedure

– Remove conrod bearing cap. Clean bearing cap and bearing journal.

– Place a length of Plastigauge corresponding to the width of the bearing on the bearing journal or in the bearing shell.

– Fit conrod bearing cap and secure with old bolts ⇒ Item 1 (page 97) without rotating crankshaft.
– Remove conrod bearing cap again.
– Compare width of Plastigauge with measurement scale.

Radial clearance:

• Wear limit: 0.08 mm.

– Renew conrod bolts.

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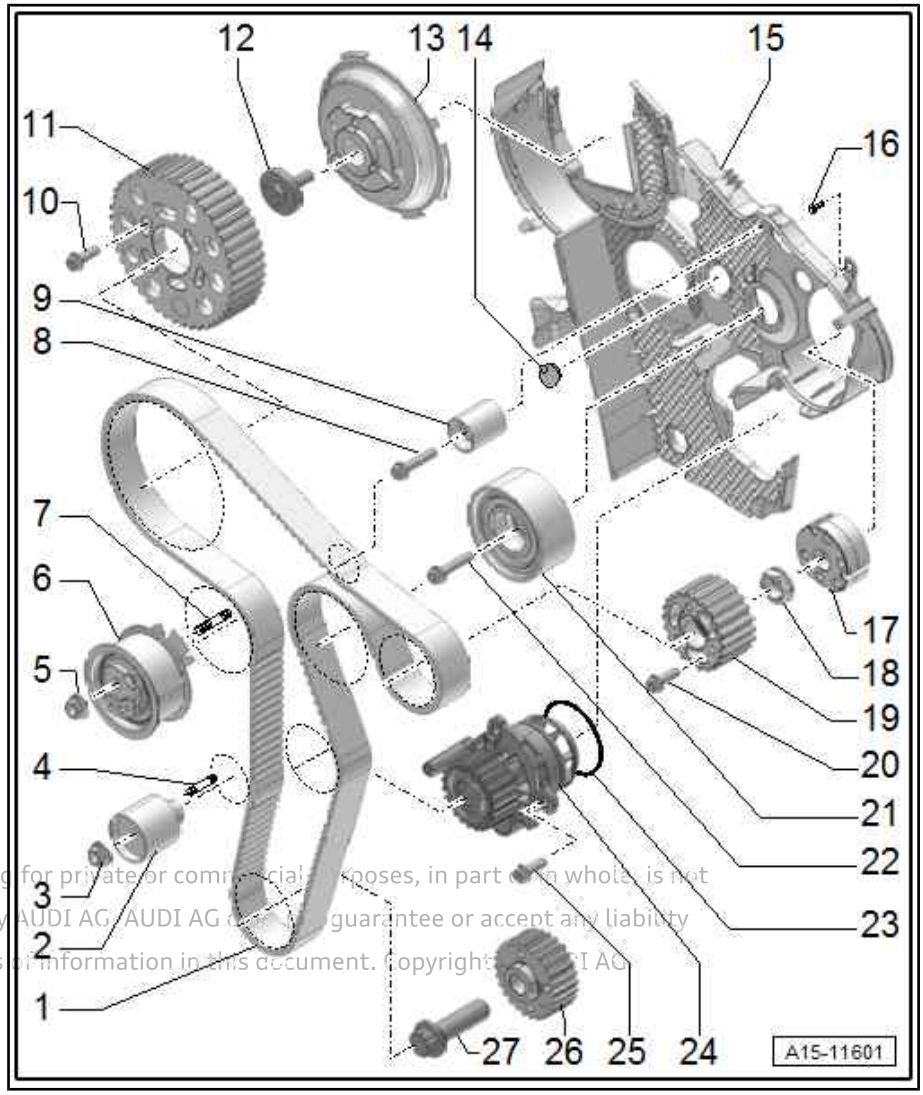
15 – Cylinder head, valve gear

1 Toothed belt drive

Overview

- ⇒ “1.1 Exploded view - toothed belt”, page 104
- ⇒ “1.2 Removing and installing toothed belt”, page 106

1.1 Exploded view - toothed belt



1 - Toothed belt

- ❑ Before removing, mark direction of rotation with chalk or felt-tip pen
- ❑ Check for wear
- ❑ Removing ⇒ page 106
- ❑ Installing (adjusting valve timing) ⇒ page 111

2 - Idler roller

3 - Nut

- ❑ Make sure that stud is fitted securely
- ❑ 20 Nm

4 - Stud

- ❑ 15 Nm

5 - Nut

- ❑ Renew nut
- ❑ Make sure that stud is fitted securely
- ❑ 20 Nm + 45°

6 - Tensioning roller

- ❑ Before renewing, toothed belt, engine mounting and engine support must be removed ⇒ “6.3 Removing and installing engine support”, page 50

7 - Stud

- ❑ 15 Nm

8 - Bolt

- ❑ 20 Nm

9 - Idler roller

10 - Bolt

- ❑ Renew
- ❑ 20 Nm +45°

11 - Camshaft sprocket

12 - Bolt

- ❑ Slacken and tighten with counterhold tool - T10051-

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- ❑ 100 Nm

13 - Camshaft hub

- ❑ Removing and installing ⇒ “3.5 Removing and installing camshafts”, page 145

14 - Plug

15 - Toothed belt cover (rear)

16 - Bolt

- ❑ 9 Nm

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17 - High-pressure pump hub

- ❑ Removing and installing ⇒ Rep. gr. 23

18 - Nut

- ❑ 95 Nm

19 - High-pressure pump sprocket

20 - Bolt

- ❑ Renew
- ❑ 20 Nm

21 - Idler roller

22 - Bolt

- ❑ Renew
- ❑ 50 Nm +90°

23 - O-ring

- ❑ Renew

24 - Coolant pump

- ❑ Removing and installing ⇒ page 206

25 - Bolt

- ❑ Tightening torque ⇒ Item 2 (page 205)

26 - Crankshaft sprocket

- ❑ Contact surface between sprocket and crankshaft must be free of oil
- ❑ Can only be installed in one position

27 - Bolt

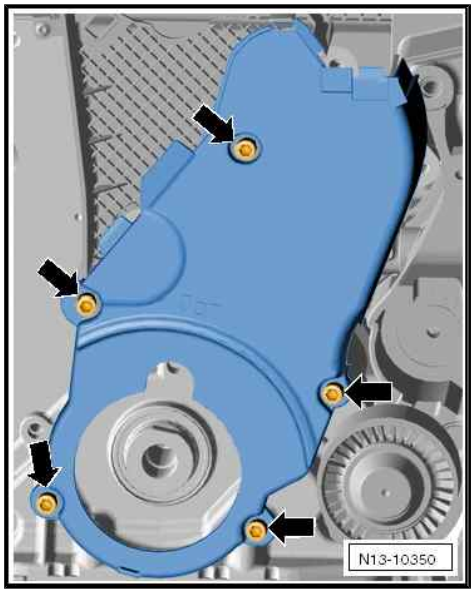
- ❑ Renew
- ❑ Slacken and tighten with counterhold tool - 3415-
- ❑ Do not additionally oil threads and shoulder

Tighten in three stages as follows:

- ♦ 1st stage: 180 Nm
- ♦ 2nd stage: Use rigid wrench to turn 90° further
- ♦ 3rd stage: Use rigid wrench to turn 45° further

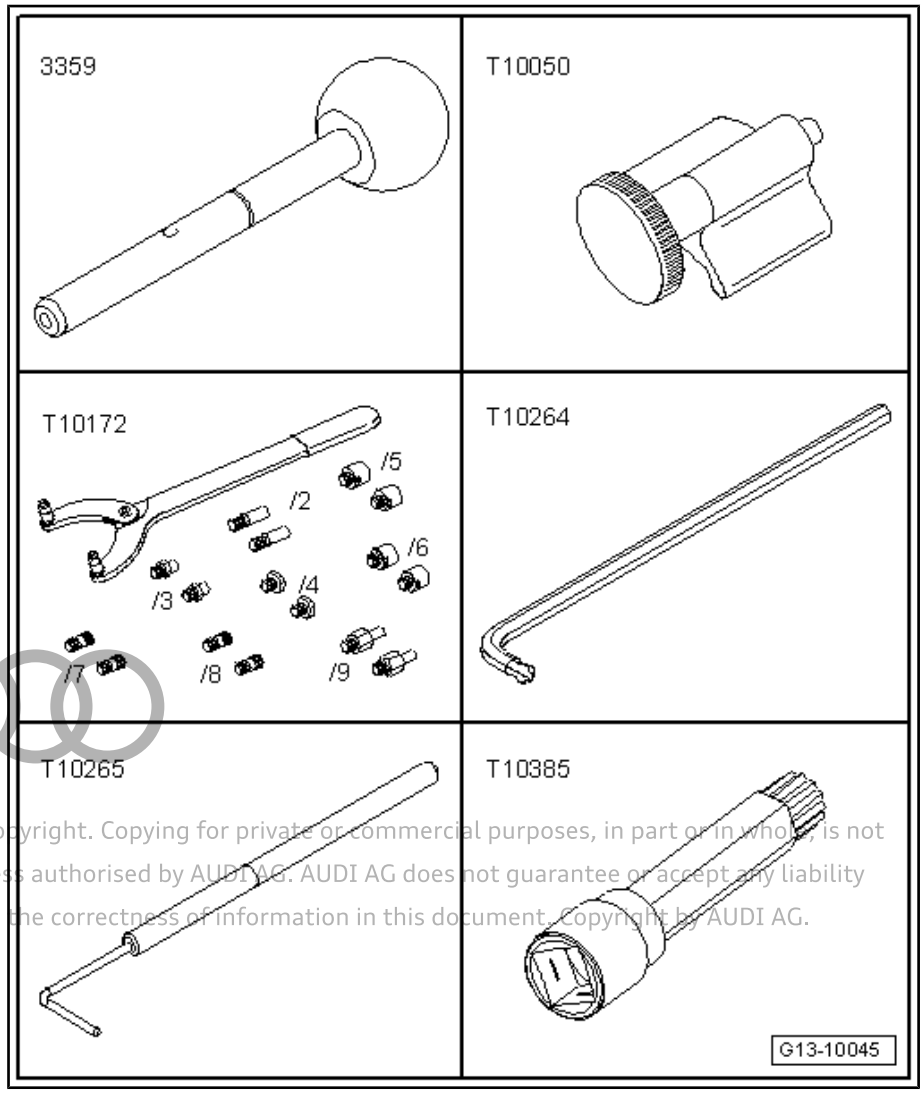
Toothed belt cover (bottom and centre) - tightening torque

– Tighten bolts -arrows- to 9 Nm.



1.2 Removing and installing toothed belt

Special tools and workshop equipment required



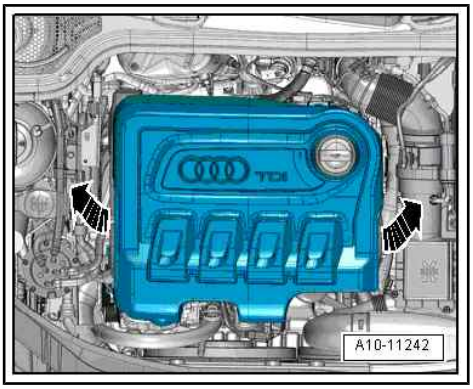
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♦ 2x diesel injection pump locking pin - 3359-

- Crankshaft stop - T10050-
- Counterhold tool - T10172-
- Offset screwdriver - T10264-
- Locking tool - T10265-
- Bit XZN 10 - T10385-

Removing

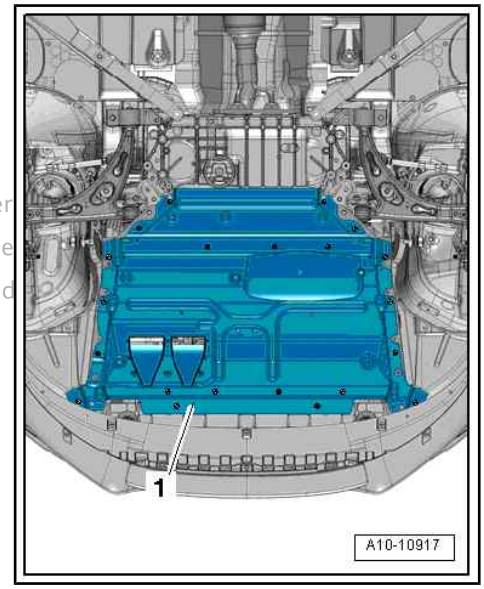
– Remove engine cover panel -arrows-.



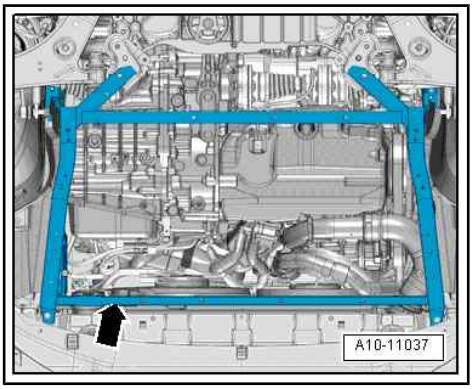
– Remove front right wheel.

– Remove noise insulation -1- ⇒ Rep. gr. 50 .

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– A3 Cabriolet: Remove noise insulation frame -arrow- ⇒ Rep. gr. 50 .

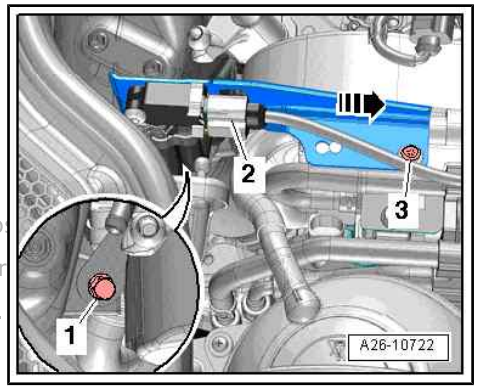


Note

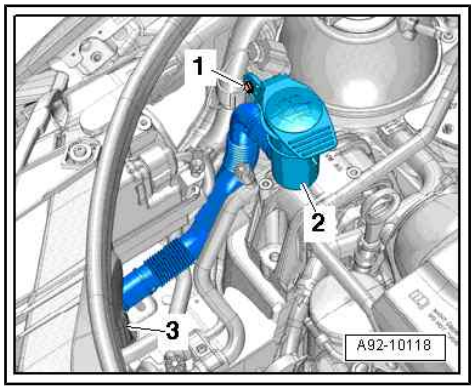
The engine mounting and engine support must be removed if you also need to renew the tensioning roller
⇒ "6.3 Removing and installing engine support", page 50 .

– Unplug electrical connector -2- at pressure differential sender - G505- .
– Remove bolt -3- and detach pressure differential sender - G505- from bracket -arrow- and move clear.

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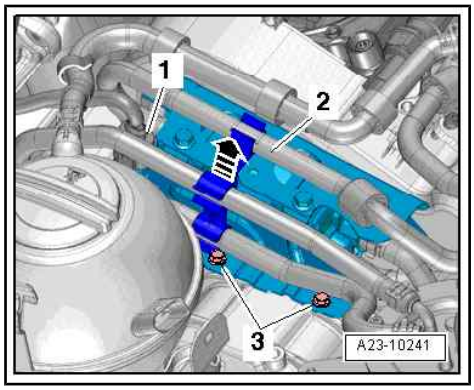
– Remove bolt -1-.
– Push filler pipe with filler neck -2- for washer fluid reservoir to side.



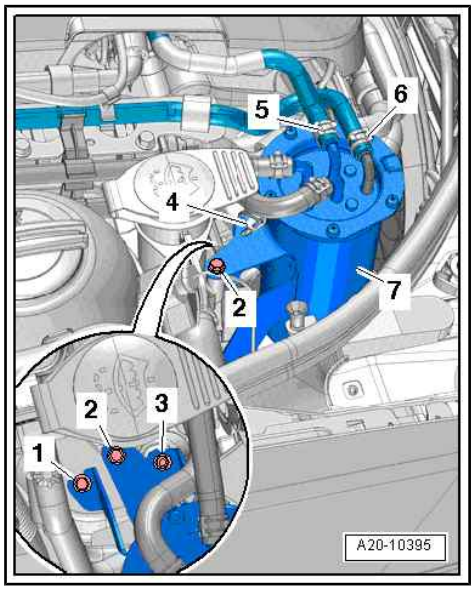
Note

- *Disregard -item 3-.*
- *For illustration purposes, the installation position is shown with the fuel filter removed.*

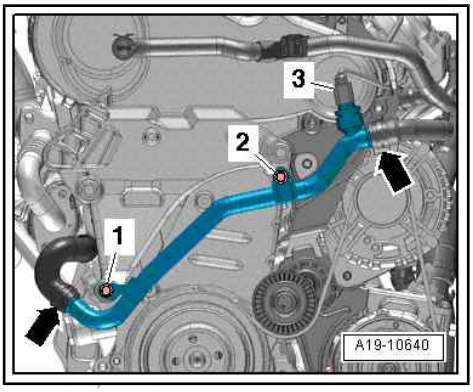
– Disengage fuel hose -2- at bracket.
– Pull off bracket for fuel lines upwards -arrow- and move clear to one side.
– Unplug electrical connector -1- at supplementary fuel pump - V393- .
– Remove bolts -3-, detach bracket with supplementary fuel pump - V393- and move clear to one side.



– Loosen bolt -1-.
– Remove bolt -2- and nut -3-.
– Detach retainer -4- from fuel filter, move fuel filter -7- clear to one side with fuel hoses -5- and -6- connected.

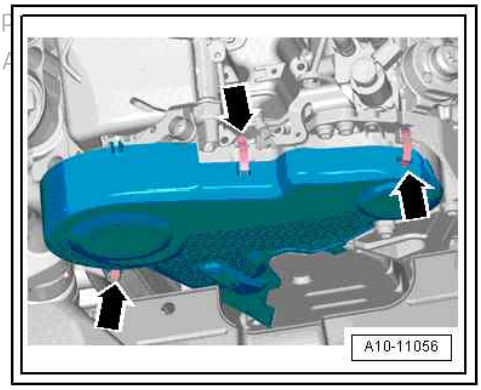


– Unplug electrical connector -3- at radiator outlet coolant temperature sender - G83- .
– Remove nut -1- and bolt -2-.
– Move coolant pipe (right-side) -arrows- to side (coolant hoses remain connected).

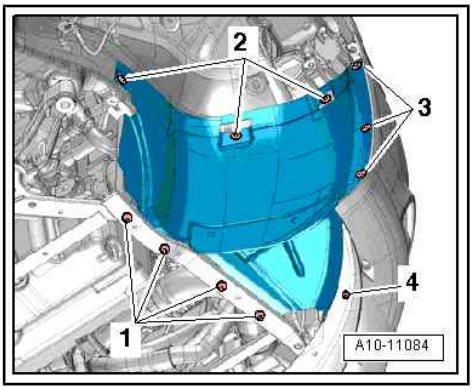


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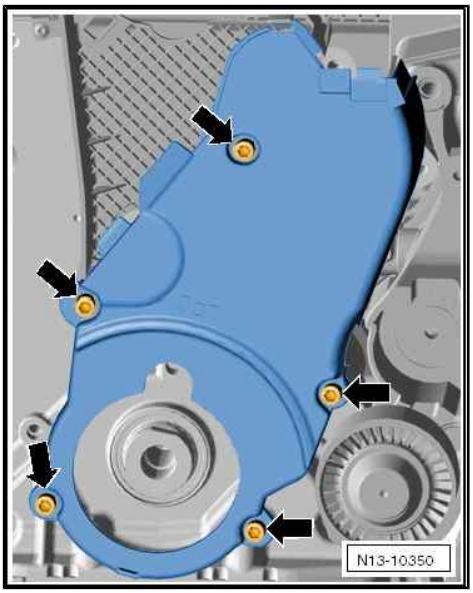
– Release retaining clips -arrows- and detach toothed belt cover (top).



– Remove front wheel housing liner (front section, right-side) ⇒ Rep. gr. 66 .
– Remove vibration damper ⇒ page 69 .



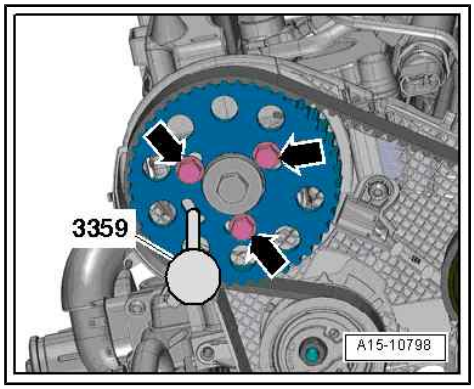
– Remove bolts -arrows-.
– Detach toothed belt cover (bottom and centre).



Caution

Irreparable damage can be caused if the toothed belt slips.

- *Only turn crankshaft in direction of engine rotation.*



– Rotate crankshaft by turning bolt on crankshaft sprocket until camshaft sprocket is positioned at “TDC”.

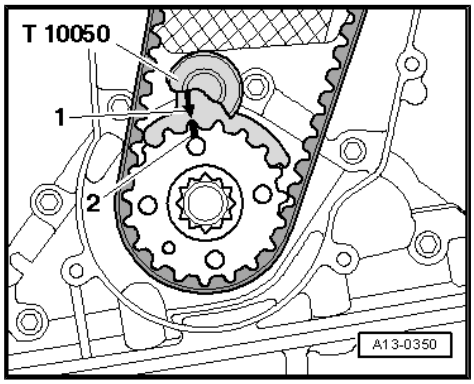
– Lock camshaft hub with diesel injection pump locking pin -3359- .

Note

Disregard -arrows-.

– Lock crankshaft sprocket in position with crankshaft stop -T10050- .

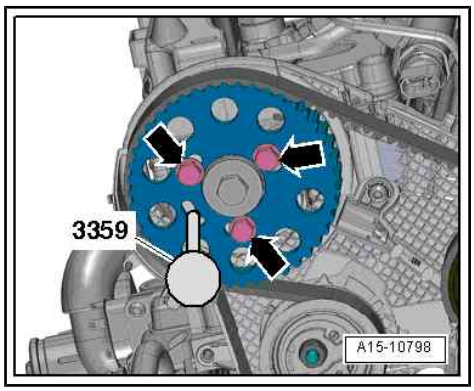
• The markings on the sprocket -2- and the crankshaft stop -1- must align -arrow-. The pin of the crankshaft stop must engage in the aperture in the sealing flange.



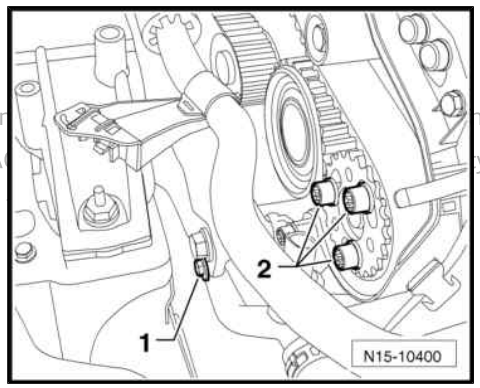
Note

The crankshaft stop can only be pushed onto the sprocket from the front face of the teeth.

– Slacken bolts -arrows- for camshaft sprocket approx. 90°.



– Using bit XZN 10 - T10385- , loosen bolts -2- for high-pressure pump sprocket approx. 90°.



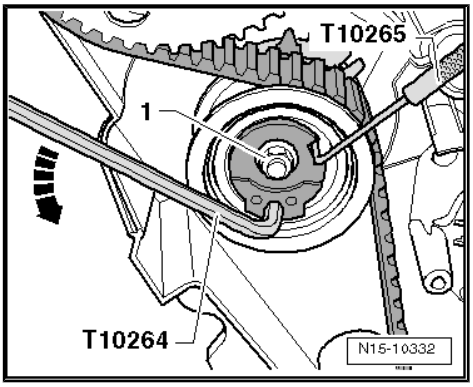
Note

Disregard -item 1-.

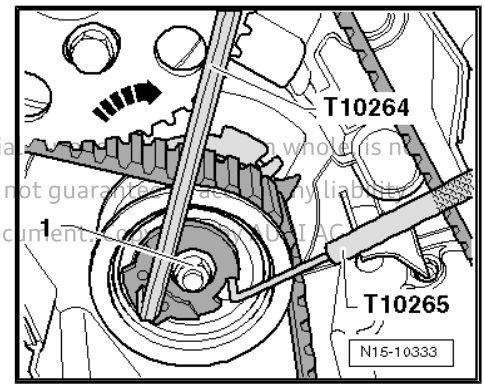
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– Slacken nut -1- for tensioning roller.

– Turn eccentric adjuster of tensioning roller with offset screwdriver - T10264- anti-clockwise -arrow- until tensioning roller can be secured with locking tool - T10265- .



– Then use offset screwdriver - T10264- to turn eccentric adjuster of tensioning roller clockwise -arrow- as far as stop and tighten nut -1- by hand.



Caution

If a used belt runs in the opposite direction when it is refitted, this can cause breakage.

- ***Before removing, mark direction of rotation of toothed belt with chalk or felt-tip pen for re-installation.***

– Take off toothed belt first from idler roller and then from remaining sprockets.

Installing (adjusting valve timing)

- Tightening torques
⇒ “1.1 Exploded view - toothed belt”, page 104

Note

Perform adjustments on toothed belt only when engine is cold.

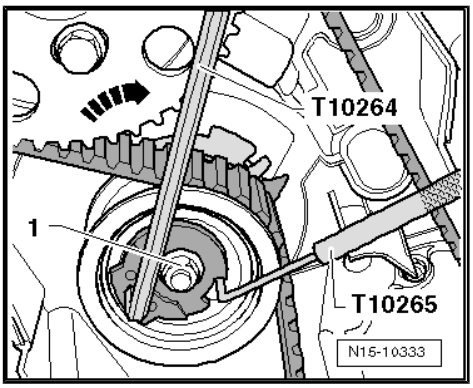
Caution

Risk of damage to valves and piston crowns.

- ***The crankshaft must not be at “TDC” at any cylinder when the camshaft is turned.***

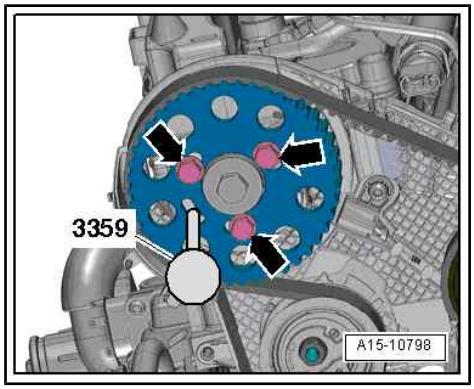
Requirements:

- Tensioning roller is locked with locking tool - T10265- and secured at right stop with nut -1-.



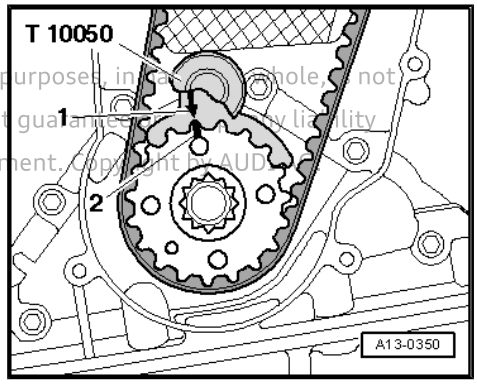
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- Camshaft hub locked with diesel injection pump locking pin - 3359- .
- Bolts -arrows- are fitted but not tightened.
- It should just be possible to turn the sprocket on the camshaft without axial movement.

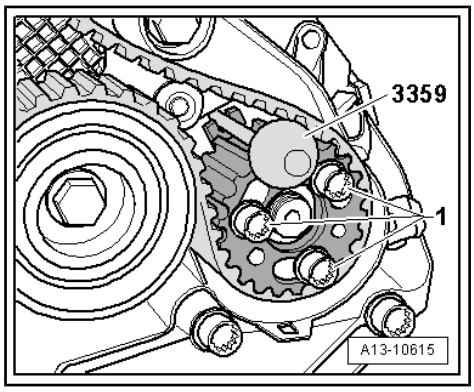


- Crankshaft is locked in position with crankshaft stop - T10050- .

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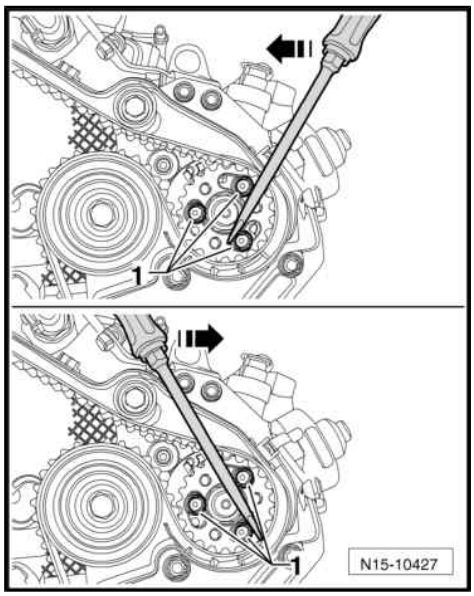


- Hub of high-pressure pump locked with diesel injection pump locking pin - 3359- .
- Bolts -1- are fitted but not tightened.
- The high-pressure pump sprocket should still just turn, but there must be no axial movement.



Note

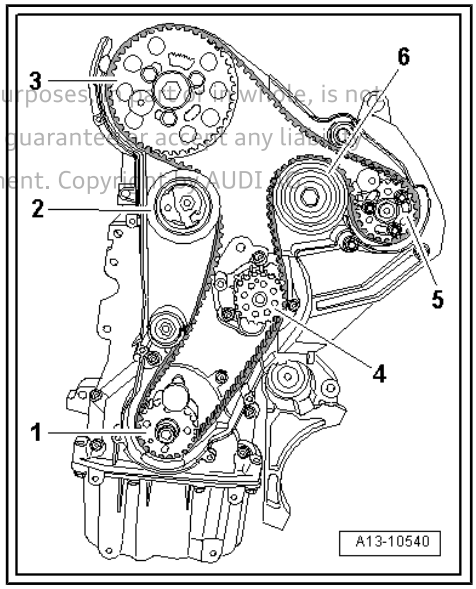
If necessary, apply a screwdriver -arrows- to bolt heads -1- and turn the high-pressure pump hub until it can be locked with the locking pin.



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– Turn the camshaft sprocket and high-pressure pump sprocket in their elongated holes clockwise as far as the stop.
– Install toothed belt in the specified sequence:

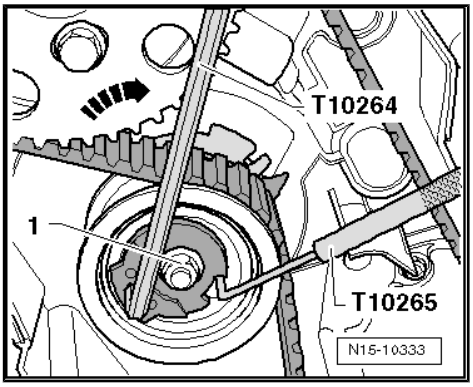
1 - Crankshaft sprocket
2 - Tensioning roller
3 - Camshaft sprocket
4 - Coolant pump sprocket
5 - High-pressure pump sprocket
6 - Idler roller



– Loosen nut -1- for tensioning roller and detach locking tool - T10265- .

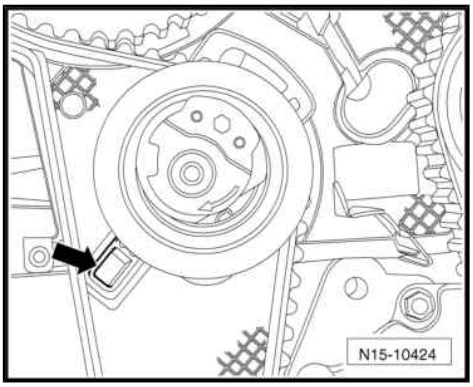
Note

Disregard -arrow-.



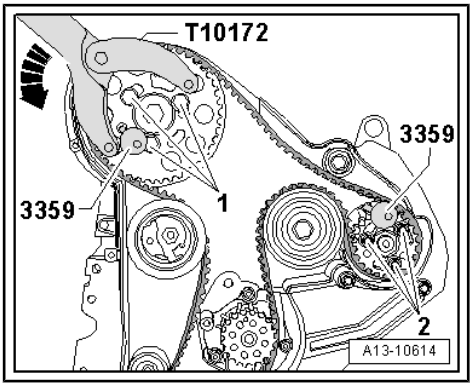
Note

Ensure that tensioning roller is seated properly in toothed belt cover (rear) -arrow-.

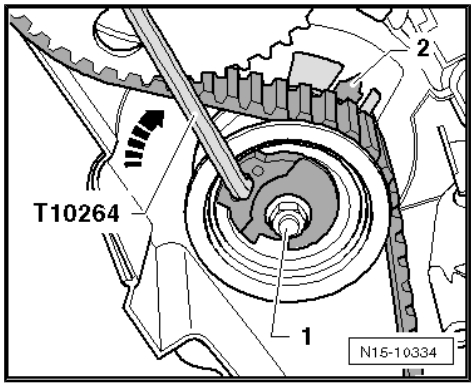


– Position counterhold tool - T10172- on camshaft sprocket as shown in illustration.
– Apply force to counterhold tool in anti-clockwise direction -arrow- and maintain tension.
– Tighten bolts -1- for camshaft sprocket and bolts -2- for high-pressure pump sprocket in this position.

• Initial tightening torque: 20 Nm



– Carefully turn eccentric adjuster of tensioning roller clockwise -arrow- using offset screwdriver - T10264- until pointer -2- aligns with centre of slot on base plate.



- Nut -1- must not turn.

– Hold tensioning roller in this position and tighten nut.

– Remove locking pins -3359- and crankshaft stop - T10050- .

Checking valve timing:

Caution

Irreparable damage can be caused if the toothed belt slips.

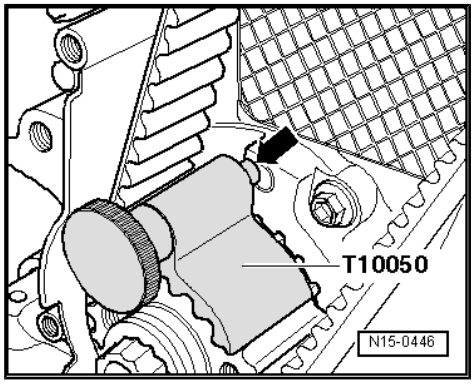
- *Only turn crankshaft in direction of engine rotation.*

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– Turn crankshaft two rotations in direction of engine rotation by turning bolt for crankshaft sprocket until crankshaft is just before “TDC”.

– Fit crankshaft stop - T10050- to crankshaft sprocket again.

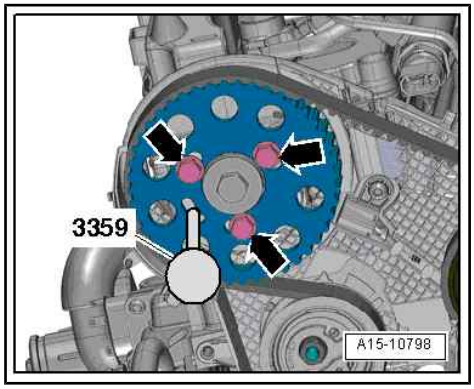
– Turn crankshaft in direction of engine rotation until pin -arrow- on crankshaft stop engages in sealing flange as crankshaft rotates.



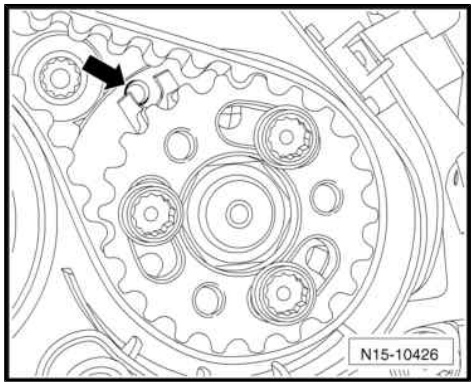
- It should now be possible to lock camshaft hub with diesel injection pump locking pin - 3359- .

Note

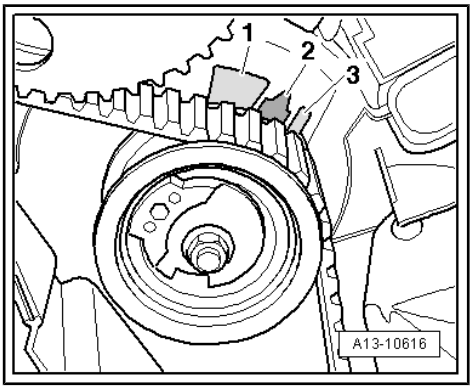
Disregard -arrows-.



- It is very difficult to reproduce the locking position of the high-pressure pump hub. However, a slight deviation -arrow- does not influence engine operation.



- Pointer -2- on tensioner roller must be centred between tabs -1- and -3- on base plate.



Note

The maximum permissible sideways deviation from the specified position is 5 mm.

- Re-adjust valve timing if requirements are not met ⇒ page 115 .
- If requirements are met, continue with procedure after adjusting valve timing correctly as described below ⇒ page 115 .

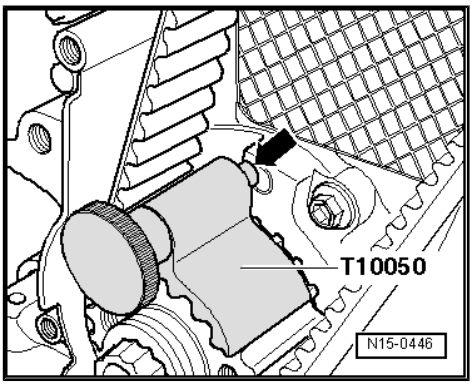
Re-adjusting valve timing:

– If camshaft hub cannot be locked, withdraw crankshaft stop - T10050- until pin is clear of bore.

– Turn crankshaft in opposite direction of engine rotation slightly past “TDC”.

– Now turn crankshaft slowly in direction of engine rotation until it is possible to lock camshaft hub.

– Loosen bolts for camshaft sprocket after locking hub.



A - If pin of crankshaft stop - T10050- is on left side of bore:

– Turn crankshaft in direction of engine rotation until pin -arrow- on crankshaft stop engages in sealing flange as crankshaft rotates.

– Tighten camshaft sprocket bolts to 20 Nm initially.

B - If pin of crankshaft stop - T10050- is on right side of bore:

– Turn crankshaft slightly in opposite direction to engine rotation.

– Turn crankshaft in direction of engine rotation again until pin of crankshaft stop engages in sealing flange as crankshaft rotates.

– Tighten camshaft sprocket bolts to 20 Nm initially.

Procedure after adjusting valve timing correctly:

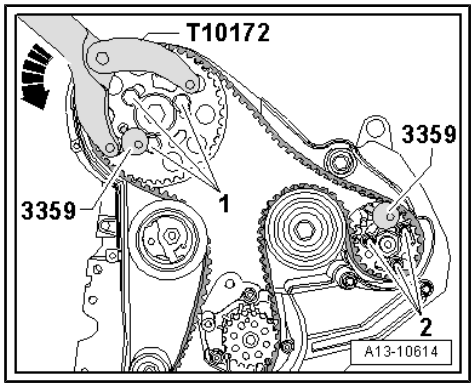
– Remove diesel injection pump locking pin - 3359- and crankshaft stop - T10050- .

– Turn crankshaft two rotations in direction of engine rotation by turning bolt for crankshaft sprocket until crankshaft is just before “TDC”.

– Check valve timing once again ⇒ page 114 .

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– If camshaft hub can now be locked, tighten camshaft sprocket bolts -1- to final torque ⇒ Item 10 (page 104) .
– Tighten bolts -2- for high-pressure pump sprocket to final torque ⇒ Rep. gr. 23 .
– Check valve timing once again ⇒ page 114 .



Assembling

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

Note

- *Renew seals and/or gaskets.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

– Install vibration damper ⇒ page 69 .
– Install front section of wheel housing liner ⇒ Rep. gr. 66 .
– Install coolant pipe (right-side) ⇒ page 227 .
– Install fuel filter and supplementary fuel pump - V393- ⇒ Rep. gr. 20 .
– Install filler neck for washer fluid reservoir ⇒ Electrical system; Rep. gr. 92 .
– Install pressure differential sender - G505- ⇒ Rep. gr. 23 .
– Install noise insulation frame (if fitted) and noise insulation panels ⇒ Rep. gr. 50 .
– Fit front wheel (right-side) ⇒ Wheels and tyres; Rep. gr. 44 .

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2 Cylinder head

Overview

- ⇒ “2.1 Exploded view - cylinder head cover”, page 117
- ⇒ “2.2 Removing and installing cylinder head cover”, page 119
- ⇒ “2.3 Renewing injector seals”, page 121
- ⇒ “2.4 Exploded view - cylinder head”, page 122
- ⇒ “2.5 Removing and installing cylinder head”, page 125
- ⇒ “2.6 Checking compression”, page 137

Note

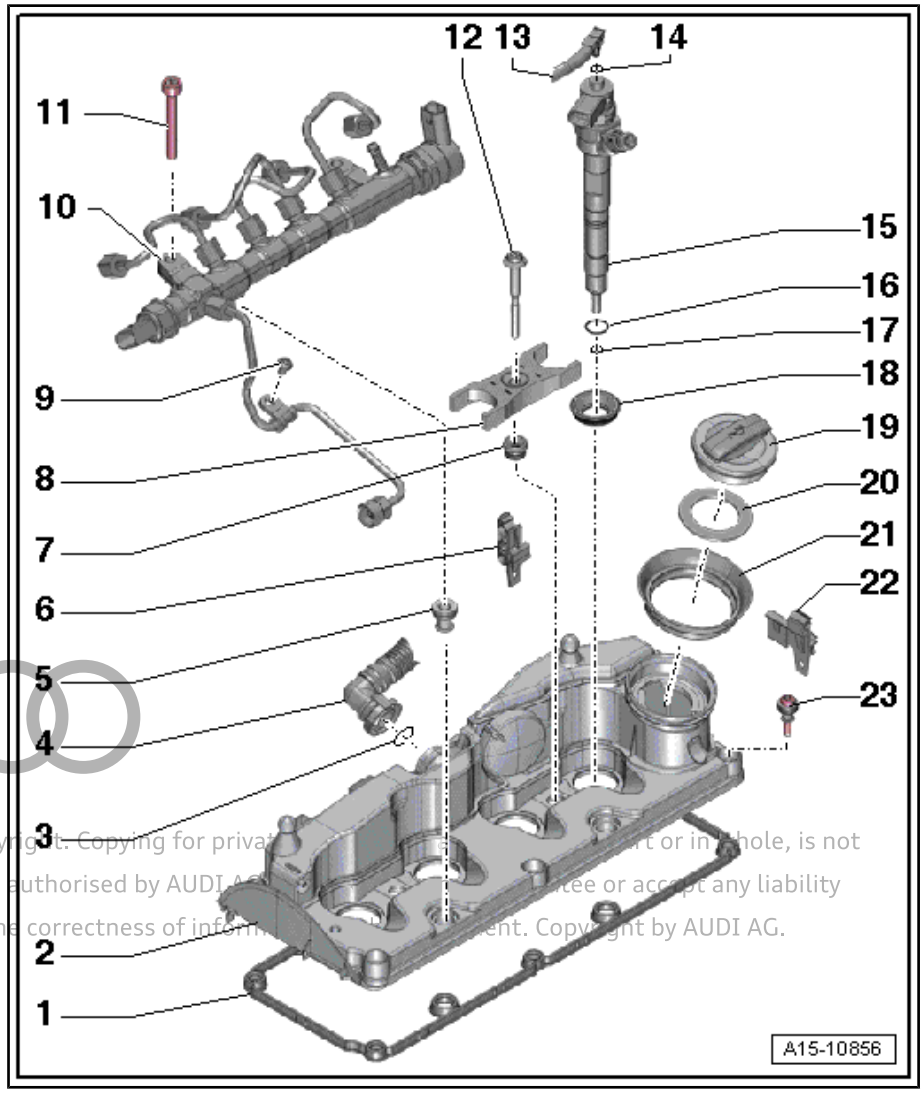
Audi A3 models with 2.0 ltr. 4-valve common rail TDI engine are always equipped with steel glow plugs.

2.1 Exploded view - cylinder head cover

Caution

When installing a new base engine, it is essential that the clamping pieces for the injectors are tightened to the specified torque after installing the high-pressure pipes ⇒ Rep. gr. 23 . The clamping pieces are only secured hand-tight at the factory so the injectors can be aligned during installation. If these instructions are not observed, the engine could be damaged.

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1 - Gasket
- ❑ Renew if damaged or leaking

2 - Cylinder head cover
- ❑ Removing and installing ⇒ page 119

3 - O-ring
- ❑ Renew

4 - Hose
- ❑ For crankcase breather
- ❑ Press release tabs to detach

5 - Sealing bush
- ❑ For fuel rail
- ❑ Renew if damaged or leaking

6 - Bracket
- ❑ For electrical wiring

7 - Grommet

8 - Clamping piece

9 - Bolt
- ❑ Tightening torque ⇒ Rep. gr. 23

10 - Fuel rail (high-pressure reservoir)
- ❑ Observe rules for cleanliness ⇒ page 5
- ❑ Do not attempt to bend high-pressure pipes to a different shape
- ❑ Installing high-pressure pipes ⇒ Rep. gr. 23

11 - Bolt
- ❑ Tightening torque ⇒ Rep. gr. 23

12 - Bolt
- ❑ Tightening torque ⇒ Rep. gr. 23

13 - Fuel return line

14 - O-ring
- ❑ Renew

15 - Injector
- ❑ Observe rules for cleanliness ⇒ page 5
- ❑ Removing and installing ⇒ Rep. gr. 23

16 - O-ring
- ❑ Renew

17 - Insulating seal
- ❑ Renew

18 - Seal
- ❑ For injector
- ❑ Renewing ⇒ page 121

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19 - Filler cap

20 - Seal

- ❑ For filler cap

21 - Grommet

22 - Bracket

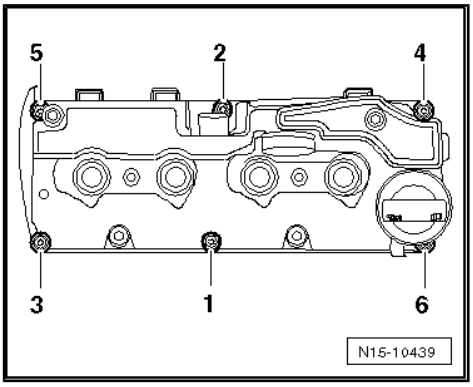
- ❑ For electrical wiring

23 - Bolt

- ❑ Renew if gasket is damaged
- ❑ Tightening torque and sequence ⇒ page 119

Cylinder head cover - tightening torque and sequence

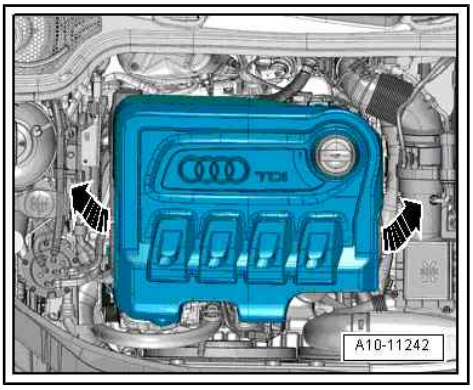
– Tighten bolts for cylinder head cover in the sequence -1 ... 6- to 9 Nm.



2.2 Removing and installing cylinder head cover

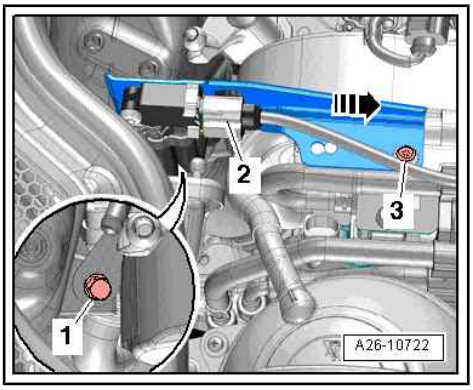
Removing

– Remove engine cover panel -arrows-.



– Unplug electrical connector -2- at pressure differential sender - G505- .

– Remove bolt -3- and detach pressure differential sender - G505- from bracket -arrow- and move clear.

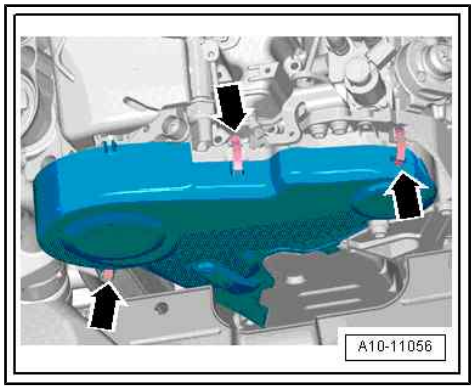


Note

Disregard -item 1-.

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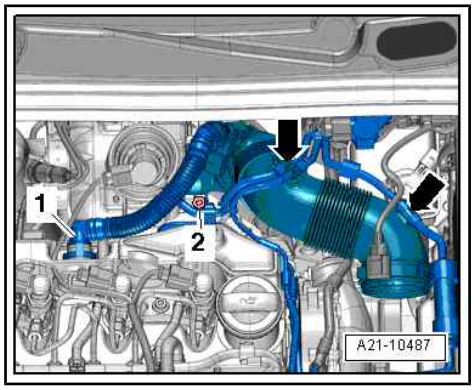
– Release retaining clips -arrows- and detach toothed belt cover (top).
– Remove injectors and fuel rail ⇒ Rep. gr. 23 .



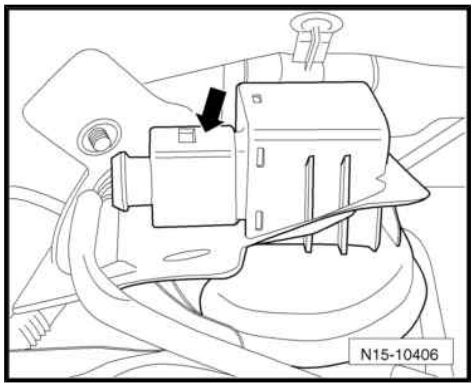
– Press release tabs and disconnect crankcase breather hose -1- from cylinder head cover.

Note

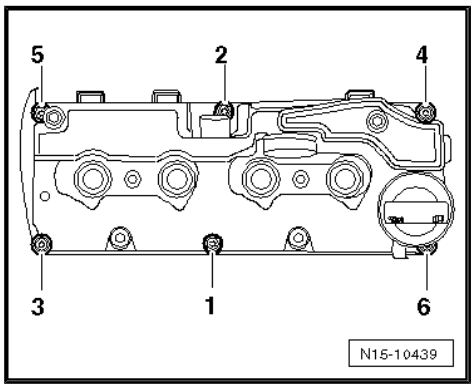
-Item 2- and -arrows- can be disregarded.



– Unplug electrical connector -arrow- at position sender for charge pressure positioner - G581- .
– Detach vacuum lines from bracket at cylinder head cover.



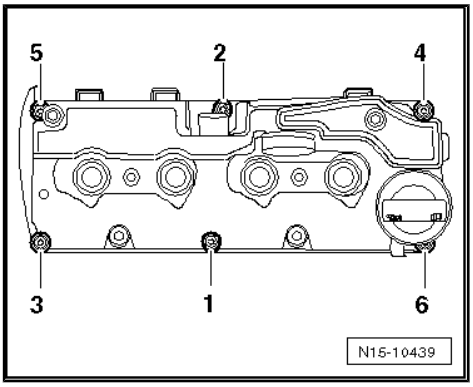
– Slacken cylinder head cover bolts in the sequence -6 ... 1- and remove.
– Detach cylinder head cover.



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Installing

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

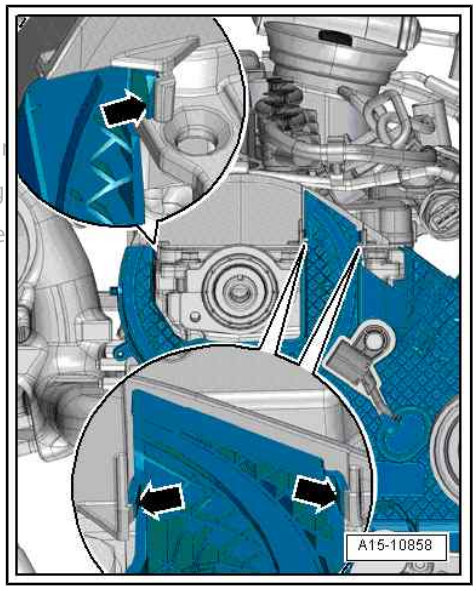


Note

- *Renew gasket for cylinder head cover and bolts for cylinder head cover if damaged or leaking.*
- *Renew grommets and seals for injectors if damaged or leaking.*

– Tighten cylinder head cover bolts ⇒ page 119 .

– Make sure that cylinder head cover is clipped properly to toothed belt cover -arrows-.



Note

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For illustration purposes, the installation position is shown with the camshaft sprocket removed.

– Make sure there is a clearance between hub and toothed belt cover.

– Install coolant return line ⇒ page 211 .

– Install intake connecting pipe ⇒ page 240 .

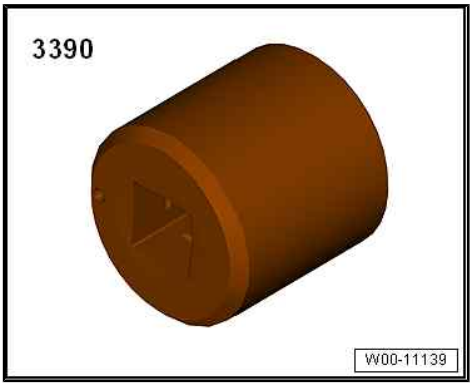
– Install fuel rail and injectors ⇒ Rep. gr. 23 .

– Install pressure differential sender - G505- ⇒ Rep. gr. 23 .

2.3 Renewing injector seals

Special tools and workshop equipment required

- Pliers -VAS 211 007- (not illustrated)
- Carrier - 3390-

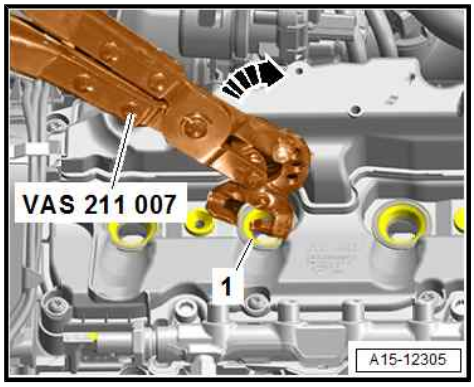


Procedure

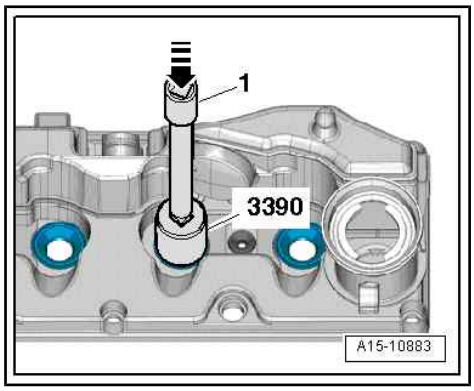
– Remove corresponding injector ⇒ Rep. gr. 23 .

– Screw oil seal extractor - T40195- into seal -1-.

– Pull off seal -1- using pliers -VAS 211 007- -arrow-.

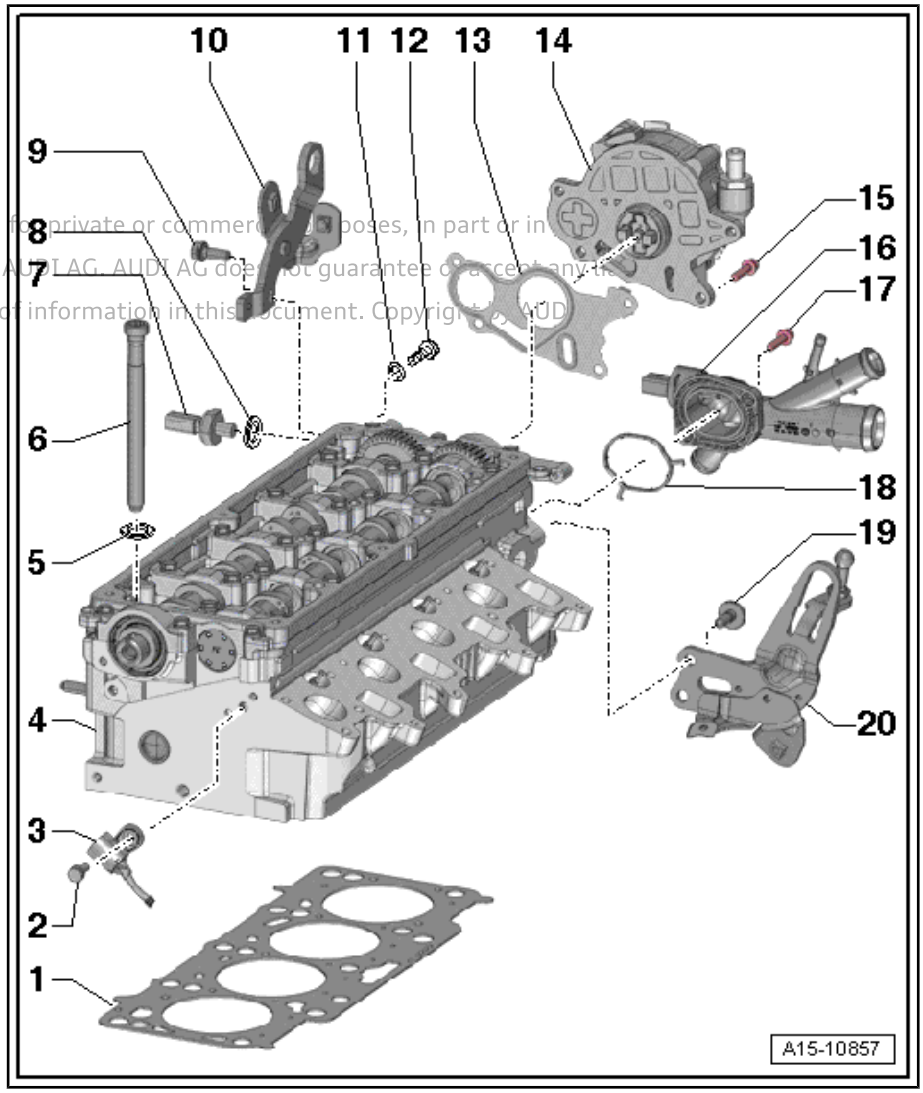


– Use suitable thrust piece (e.g. carrier - 3390-) and short extension -1- to press new injector seal in from above -arrow- as far as stop.



2.4 Exploded view - cylinder head

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1 - Cylinder head gasket

- ❑ Renewing ⇒ "2.5 Removing and installing cylinder head", page 125
- ❑ Identification of cylinder head gasket ⇒ page 124
- ❑ If renewed, change coolant and engine oil

2 - Bolt

- ❑ Apply locking fluid when installing; refer to ⇒ Electronic parts catalogue
- ❑ 10 Nm

3 - Hall sender - G40-

- ❑ For camshaft position

4 - Cylinder head

- ❑ Removing and installing ⇒ page 125
- ❑ To prevent damage to glow plugs, always place cylinder head on a soft foam surface after removal.
- ❑ Checking for distortion ⇒ page 124
- ❑ Must not be machined
- ❑ Before installing, check that the two dowel sleeves for centring cylinder head are fitted on cylinder block
- ❑ If renewed, change coolant and engine oil

5 - Washer

6 - Bolt

- ❑ Renew
- ❑ Correct sequence when slackening ⇒ page 133
- ❑ Tightening torque and sequence ⇒ page 125

7 - Oil pressure switch - F1-

- ❑ Opening/closing pressure 0.3 ... 0.6 bar
- ❑ Removing and installing ⇒ page 189
- ❑ Checking ⇒ page 190
- ❑ 20 Nm

8 - Seal

- ❑ Renew (cut seal open to do so)

9 - Bolt

- ❑ 20 Nm

10 - Engine lifting eye

11 - Seal

- ❑ Renew

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12 - Plug

- ❑ 20 Nm

13 - Gasket

- ❑ Renew

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14 - Vacuum pump

- ❑ Removing and installing ⇒ Rep. gr. 47

15 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 47

16 - Connection

- ❑ For coolant hoses
- ❑ with coolant temperature sender - G62-

17 - Bolt

- ❑ Tightening torque ⇒ Item 22 (page 213)

18 - Gasket

- ❑ Renew

19 - Bolt

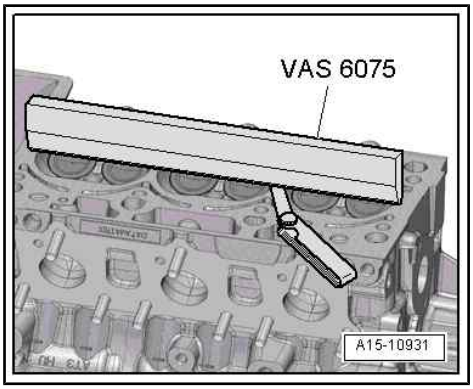
- ❑ 20 Nm

20 - Engine lifting eye

Checking cylinder head for distortion

– Use straight edge 500 mm - VAS 6075- and feeler gauge to measure cylinder head for distortion at several points.

• Max. permissible distortion: 0.1 mm.



Note

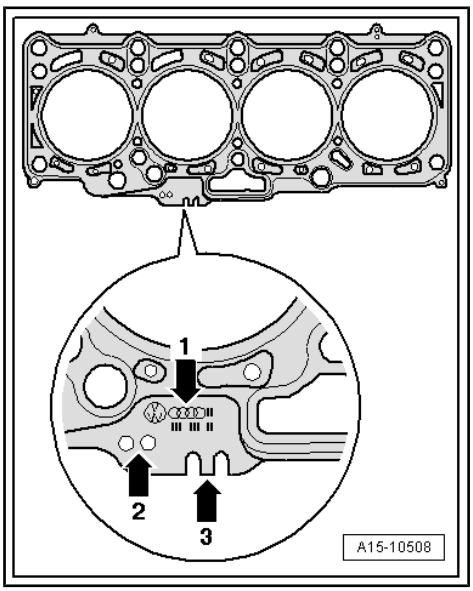
Cylinder heads must not be reworked on TDI engines.

Identification of cylinder head gasket

1 - Part number

2 - Holes

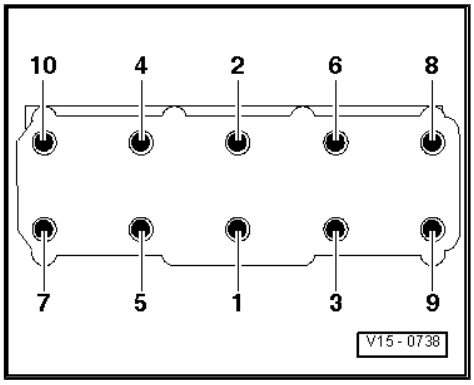
3 - Ignore



Note

Cylinder head gaskets of different thicknesses are fitted depending on the amount of piston projection ⇒ page 101 . When renewing only the cylinder head gasket, the new gasket should have the same identification as the old one.

Cylinder head - tightening torque and sequence



Note

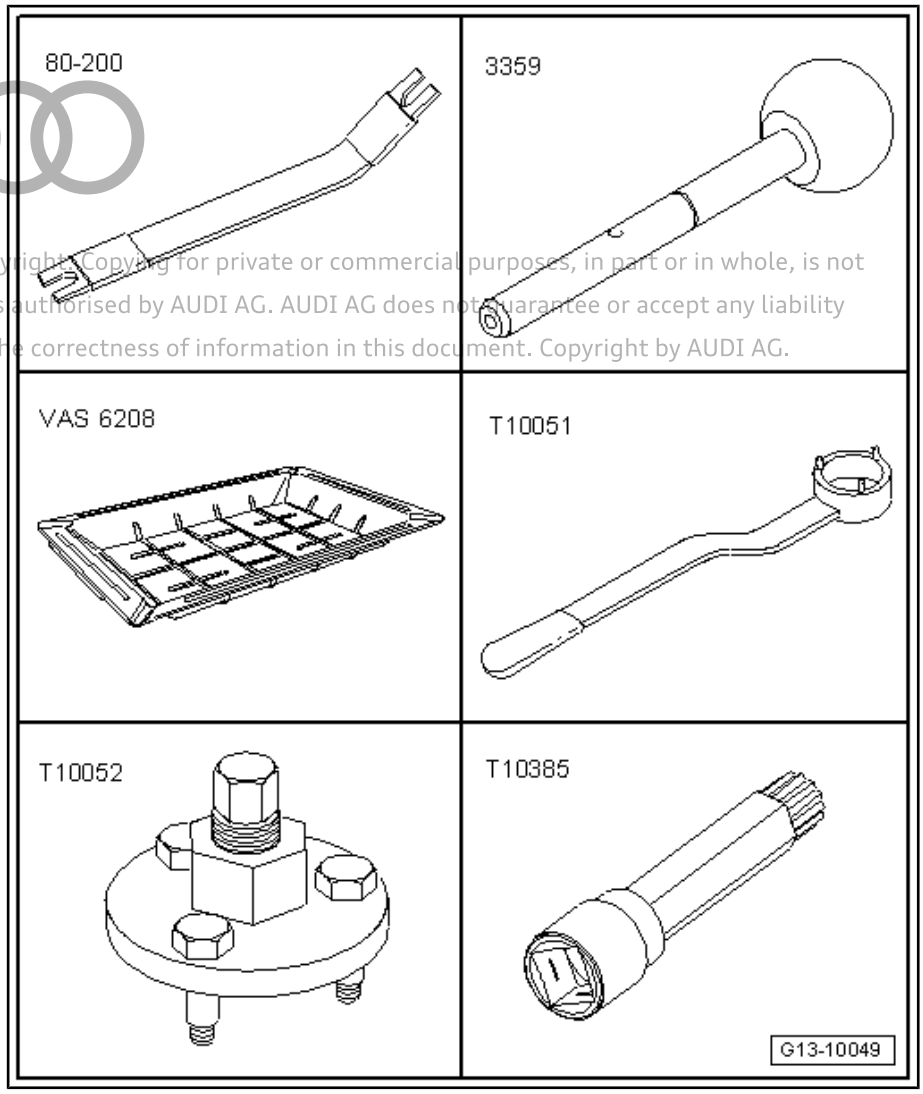
Renew the bolts tightened with specified tightening angle.

– Tighten bolts in 4 stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1.	-1 … 10-	30 Nm
2.	-1 … 10-	50 Nm
3.	-1 … 10-	Turn 90° further
4.	-1 … 10-	Turn 90° further

2.5 Removing and installing cylinder head

Special tools and workshop equipment required



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- Removal lever - 80 - 200-
- Diesel injection pump locking pin - 3359-
- Drip tray for workshop hoist - VAS 6208- for vehicles with four-wheel drive

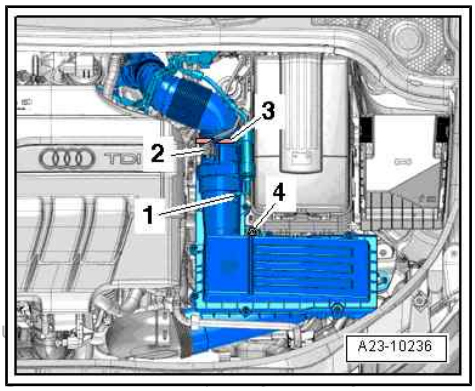
- Counterhold tool - T10051-
- Puller - T10052-
- Bit XZN 10 - T10385-

Removing

– Drain coolant ⇒ page 195 .

– Remove radiator cowl ⇒ page 234 .

– Remove air cleaner housing ⇒ Rep. gr. 23 .

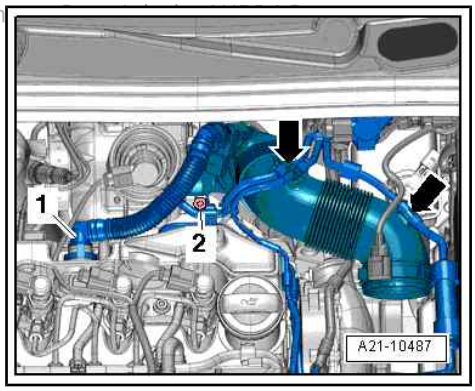


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– Press release tabs and detach crankcase breather hose -1-.

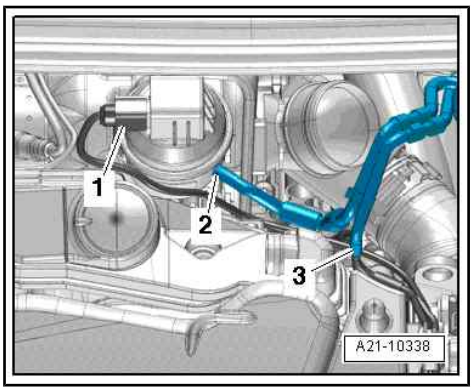
– Move clear vacuum hoses -arrows-.

– Remove bolt -2-, swivel intake pipe with connection to rear and detach from turbocharger.



– Detach vacuum hose -2- from vacuum unit of turbocharger.

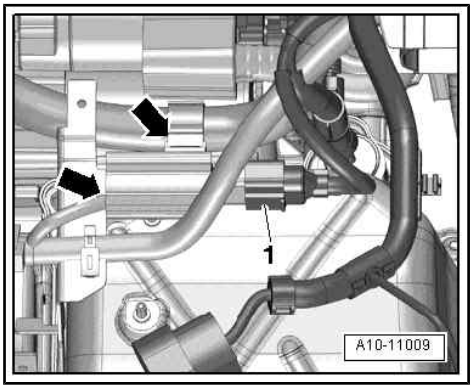
– Disconnect vacuum hose -3-.



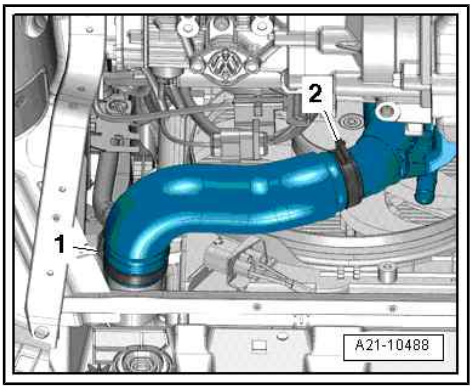
Note

Disregard -item 1-.

– Move clear wiring harnesses -arrows- and electrical connector -1- at bracket.



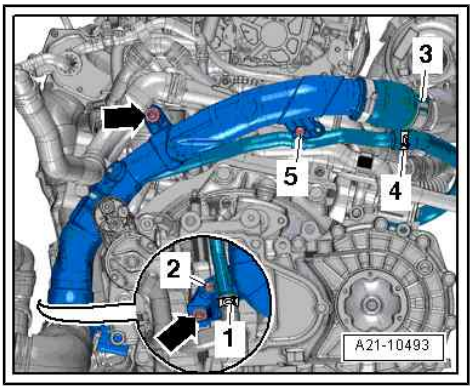
– Release hose clips -1- and -2- and remove air hose.



– Remove bolts -2, 5- and -arrows-.
– Using removal lever - 80 - 200- , move clear electrical wiring and hoses at air pipe (left-side).
– Loosen hose clip -3- and detach air pipe (left-side).

Note

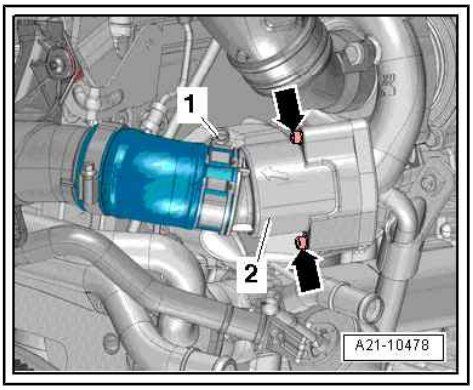
Disregard items -1 and 4-.



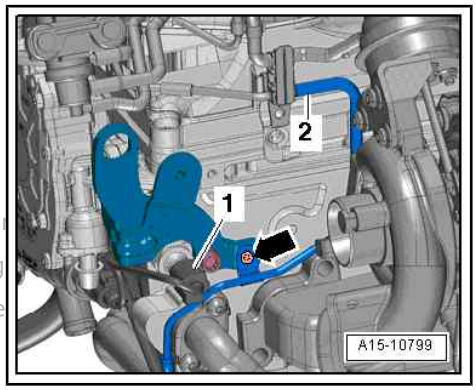
– Remove bolts -arrows- and detach pulsation damper -2-.

Note

Disregard -item 1-.

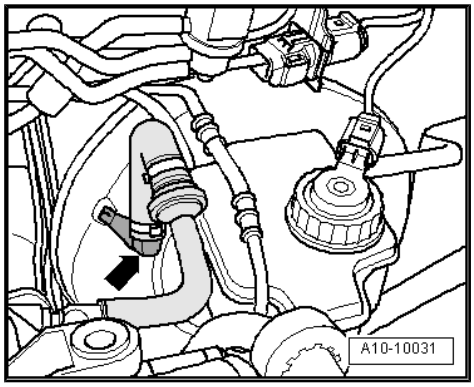


– Unplug electrical connector -1- on oil pressure switch - F1- .
– Remove bolt -arrow-.
– Disconnect vacuum hose -2-.



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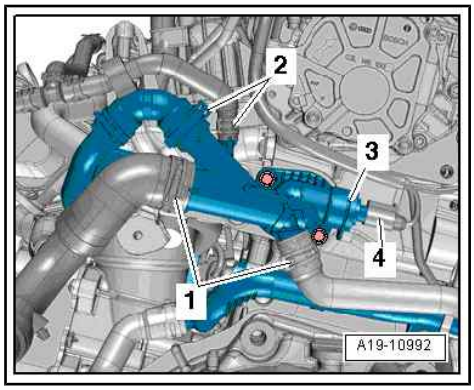
– Detach vacuum hose from brake servo -arrow-.



– Unplug electrical connector -4- at coolant temperature sender - G62- .
– Release hose clips -1- and -2- and disconnect coolant hoses from connection.

Note

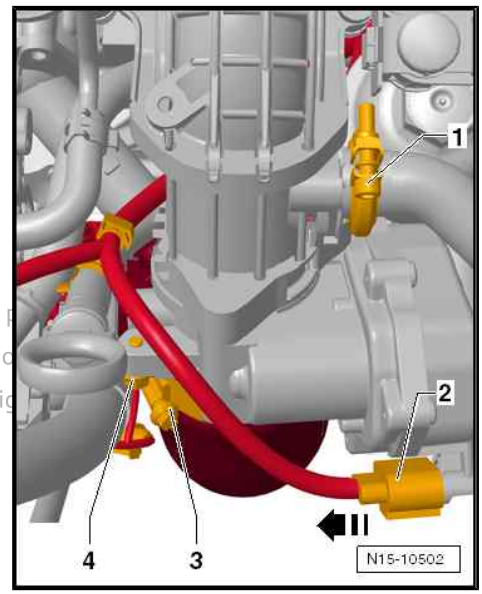
Disregard -item 3-.



– Unplug electrical connector -2- at throttle valve module - J338- -arrow-.
– Remove bolt -4- for dipstick guide tube.

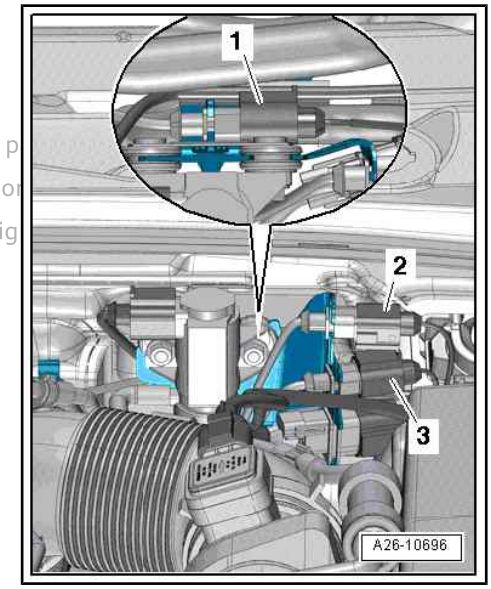
Note

Disregard items -1 and 3-.



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– Detach electrical connector -3- from bracket and unplug.
– Move clear electrical wiring at turbocharger.

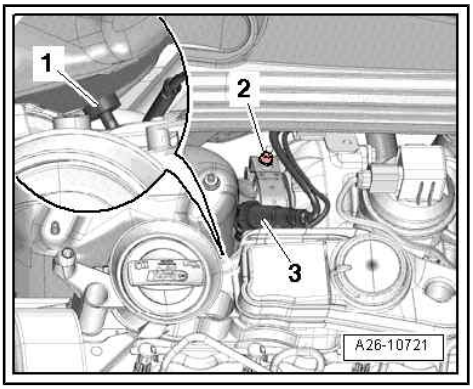


Note

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Disregard items -1 and 2-.

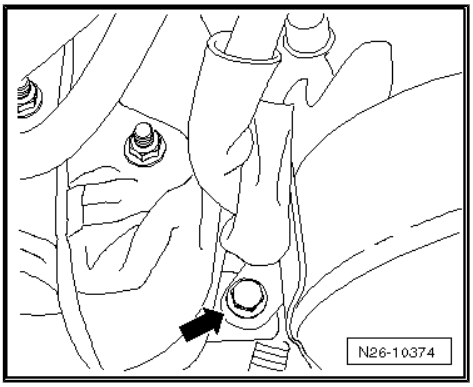
– Slacken bolt -2- and remove clamp.



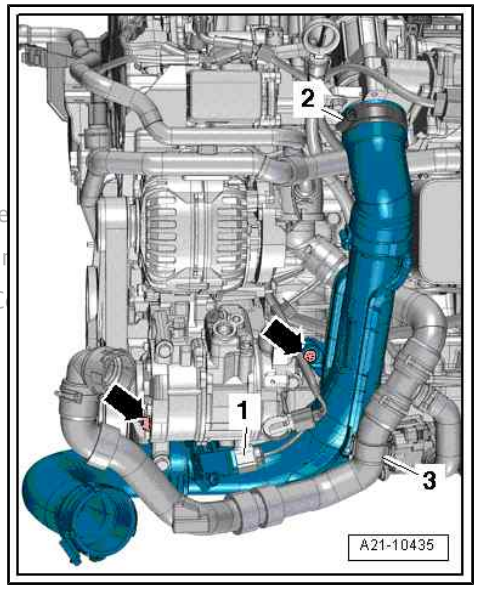
Note

Disregard items -1 and 3-.

– Remove bolt -arrow- securing top bracket for particulate filter.

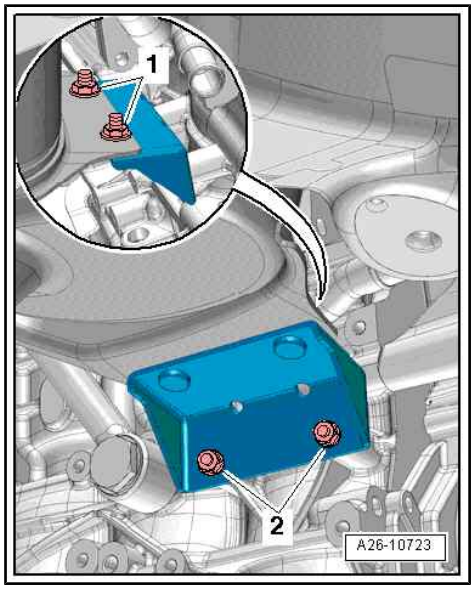


– Remove bolts -arrows-.
– Move coolant hose -3- clear.
– Release hose clip -2-.
– Unplug electrical connector -1- at charge pressure sender - G31- / intake air temperature sender - G42- and detach air pipe (right-side).



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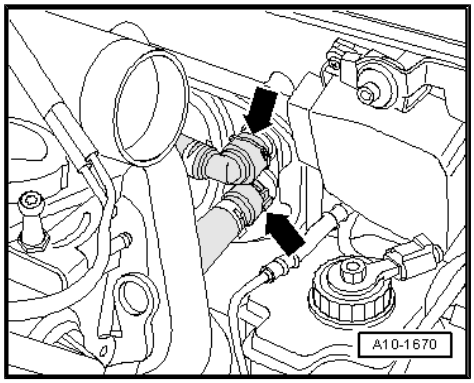
– Remove nuts -2-, tie up particulate filter to rear.



Note

Disregard -item 1-.

Vehicles with four-wheel drive:



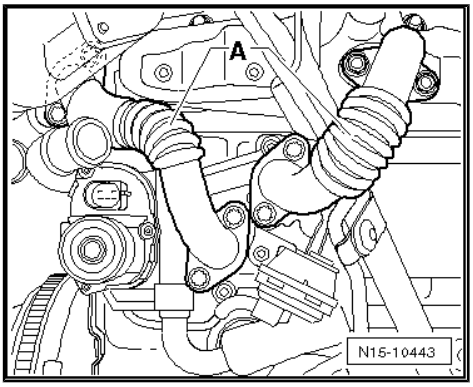
Note

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

– Place drip tray for workshop hoist - VAS 6208- under connection.
– Lift retaining clips -arrows- and disconnect coolant hoses from heat exchanger for heater.
– Guide coolant hoses downwards and drain off coolant.

All vehicles (continued):

– Remove bolts and detach exhaust gas recirculation pipes -A-.

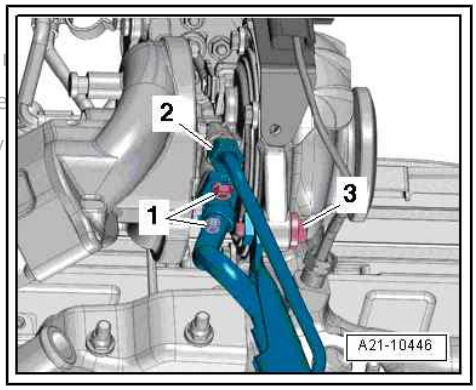


– Unscrew union nut -2- and bolt -3-.

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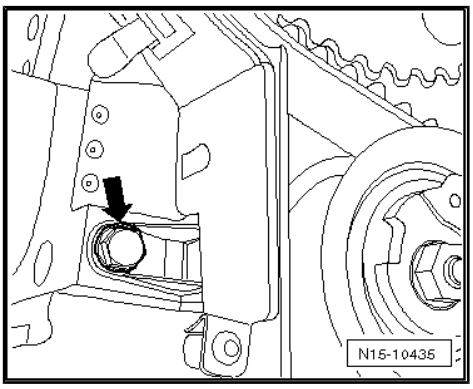
Note

Disregard -item 1-.



– Remove bolt -arrow- for toothed belt cover (rear).

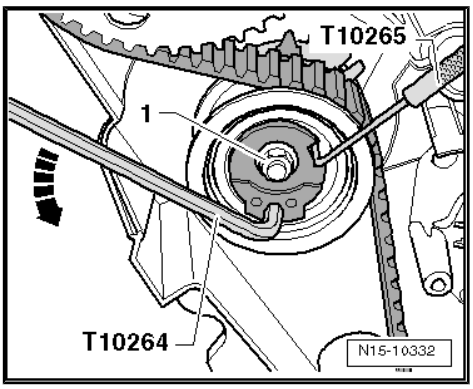
– Take toothed belt off camshaft sprocket ⇒ page 106 .



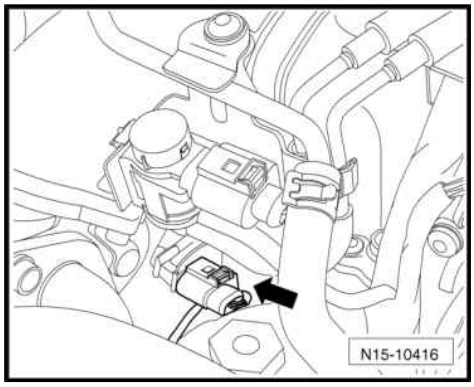
– Unscrew nut -1-.

Note

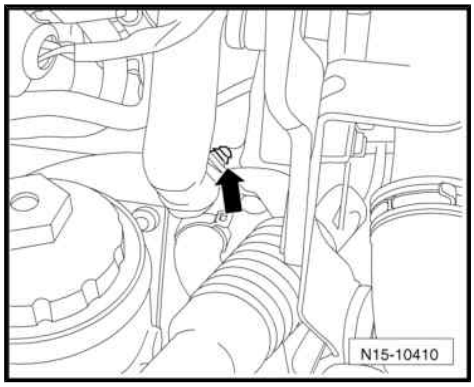
Disregard -arrow- and -T10264- .



– Unplug electrical connector -arrow- at Hall sender - G40- .
– Remove cylinder head cover ⇒ page 119 .

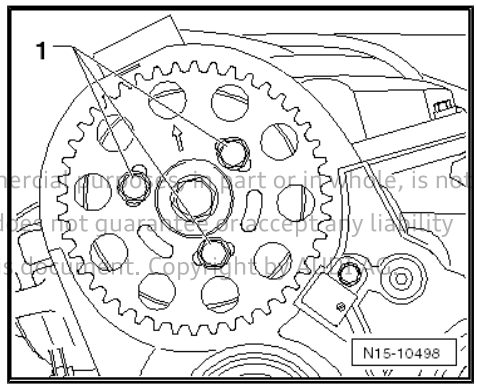


– Unclip wiring harness from retainer -arrow-.

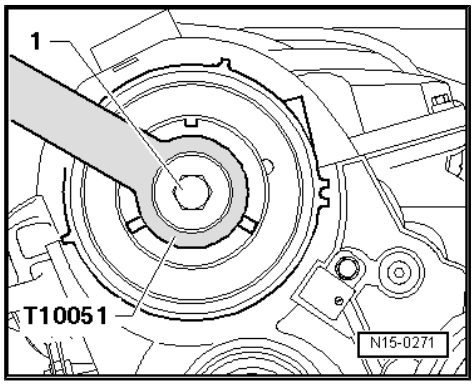


– Remove bolts -1- and detach camshaft sprocket.

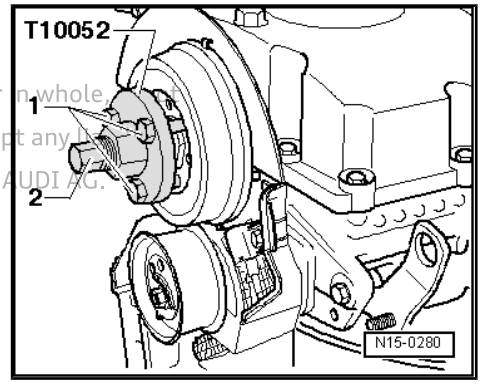
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– Counterhold using counterhold tool - T10051- and loosen bolt -1- for camshaft hub.
– Unscrew bolt approx. 2 turns.

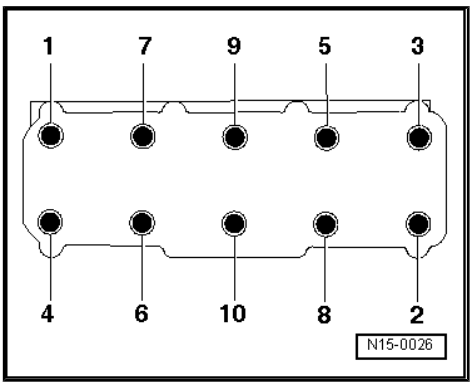


– Apply puller - T10052- to camshaft hub and screw bolts -1- into hub.
– Counterhold on hexagon flats (30 mm) of puller and screw in bolt -2- to pull off camshaft hub.
– Detach hub from taper of camshaft.



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– Slacken cylinder head bolts in the sequence -1 ... 10-.



Note

A second mechanic is required for removal of the cylinder head.

– Swivel cylinder head to left and out of rear toothed belt cover and detach tensioning roller at the same time.
– Take care not to damage oil return line for turbocharger.
– Take care to place cylinder head down without bending oil return line. If necessary, place a block of wood below exhaust manifold.

Caution

Risk of damage to glow plugs when putting down cylinder head.

- ***After removal, the cylinder head must not be put down on the gasket side with the glow plugs still installed, because the glow plugs project slightly beyond the gasket surface.***

Note

Audi A3 models with 2.0 ltr. 4-valve common rail TDI engine are always equipped with steel glow plugs.

Installing

- Tightening torques
⇒ “2.4 Exploded view - cylinder head”, page 122



Note

- *Use of impermissible abrasive materials can lead to subsequent damage to the turbocharger, conrod bearings, etc.*
- *Do NOT use abrasive materials (sandpaper, sanding discs, sanding pads, abrasive web, wire wool, etc.).*
- *Sealing surface (see photo) must not be raised.*
- *Dark discolouration (see photo) does not have to be removed.*
- *When removing sealant residue, make sure none of the residue enters the open channels of the engine.*
- *Ensure that nearby workspaces are kept clean and that the abrasive materials listed above are not being used there.*

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– Sealant residue may only be removed from the cylinder head and cylinder block using a commercially available blade scraper.

• Sealing surfaces must NOT be damaged.

• No oil or coolant must be allowed to remain in the blind holes for the bolts.

• Do not remove new cylinder head gasket from packaging until it is ready to be fitted.

• If a new cylinder head is installed, the contact surfaces between the roller rocker fingers and the running surface of the cam must be lubricated.

• Handle the cylinder head gasket very carefully to prevent damage to the silicone coating or the indented area of the gasket.

• Turn the crankshaft carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.

• After fitting a new cylinder head or cylinder head gasket, change the engine oil and the coolant in the entire cooling system.

– Remove loose residue with a lint-free cloth.

– Before fitting cylinder head, remove crankshaft stop - T10050- and turn crankshaft against normal direction of rotation until all pistons are positioned approximately equally below “TDC”.

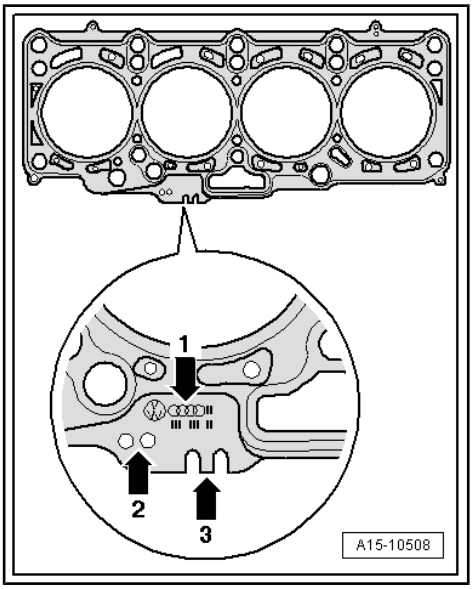
– If not already fitted, install dowel sleeves for centring cylinder block and cylinder head in cylinder block.

– Note cylinder head gasket identification:

1 - Part number

2 - Holes

3 - Ignore

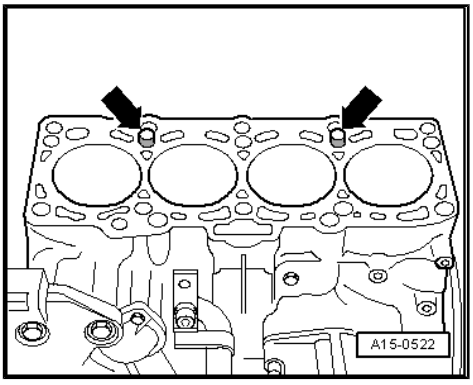


Note

- *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 101 .

– Fit cylinder head gasket onto dowel sleeves -arrows- in cylinder block.

• Installation position of cylinder head gasket: the word "oben" (top) or the part number should face towards the cylinder head.



Note

A second mechanic is required for fitting cylinder head.

– Swivel cylinder head so that stud for toothed belt tensioning roller is inserted into aperture in toothed belt cover (rear) and attach tensioning roller at the same time.

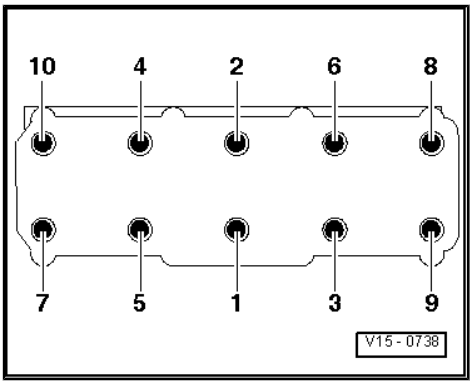
Note

Make sure that electrical wiring to Hall sender - G40- is properly routed.

– Fit cylinder head.

– Screw in cylinder head bolts by hand until they make contact.

– Tighten cylinder head bolts ⇒ page 125 .



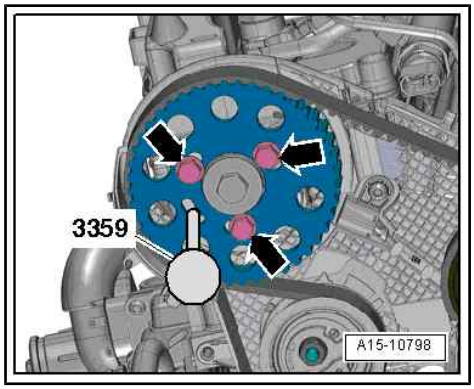
Note

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

– Install rear toothed belt cover, camshaft hub and sprocket ⇒ page 104 .

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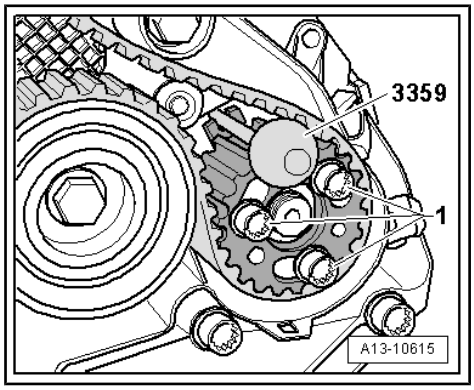
– Lock camshaft hub with diesel injection pump locking pin - 3359- .



Note

Disregard -arrows-.

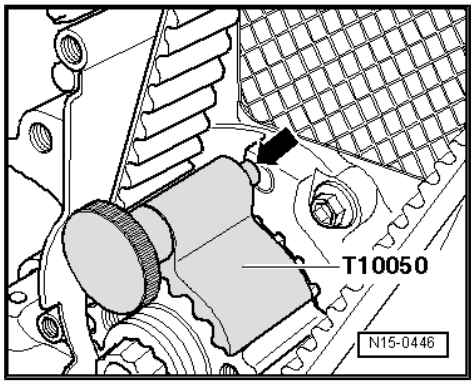
– Lock high-pressure pump hub with diesel injection pump locking pin - 3359- .



Note

Disregard -item 1-.

– Then turn crankshaft in direction of engine rotation until pin -arrow- on crankshaft stop - T10050- engages in sealing flange as crankshaft rotates.



– Install toothed belt (adjust valve timing) ⇒ page 111 .

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

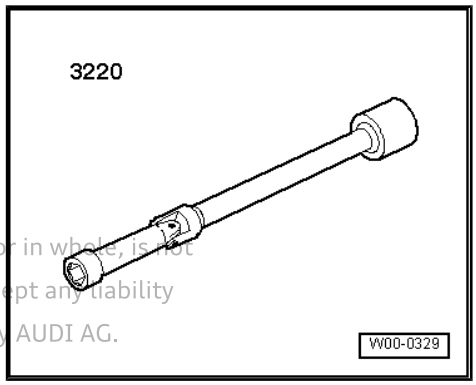
– Install cylinder head cover ⇒ page 119 .
– Install support for turbocharger with oil supply line ⇒ page 240 .
– Install exhaust gas recirculation pipes ⇒ page 282 .
– Connect coolant hoses with plug-in connectors to heat exchanger for heater ⇒ page 232 .
– Install air pipes ⇒ page 252 .
– Install particulate filter ⇒ page 260 .
– Install dipstick guide tube ⇒ page 160 .
– Install vacuum line to exhaust gas recirculation cooler ⇒ page 282 .
– Install intake connection and pulsation damper ⇒ page 240 .
– Connect vacuum hoses ⇒ page 238 .
– Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
– Install air hoses with screw-type clips ⇒ page 253 .
– Install air cleaner housing ⇒ Rep. gr. 23 .
– Install radiator cowl ⇒ page 234 .
– Change engine oil ⇒ Maintenance ; Booklet 808 .
– Fill cooling system with fresh coolant ⇒ page 198 .

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2.6 Checking compression

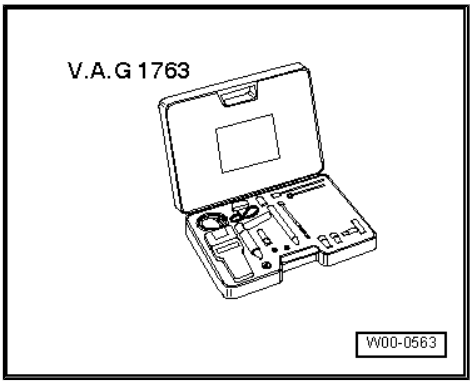
Special tools and workshop equipment required

- Jointed spanner - 3220-



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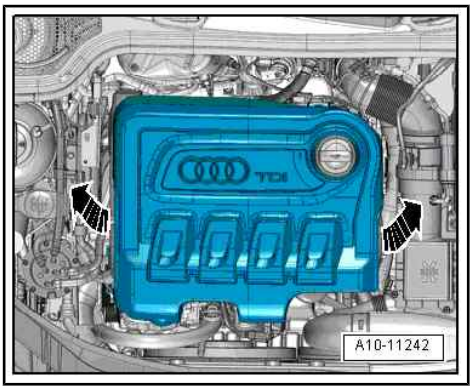
- Compression tester - V.A.G 1763- with adapter - V.A.G 1763/8-



Procedure

- Engine oil temperature at least 30 °C
- Battery voltage at least 12.5 V

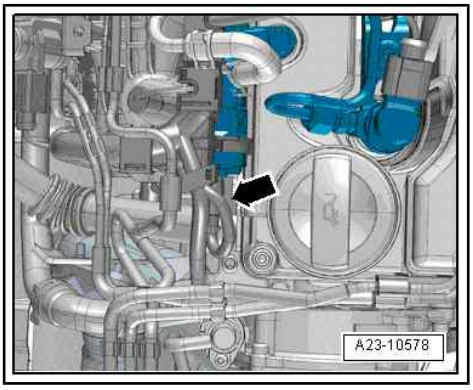
– Remove engine cover panel -arrows-.



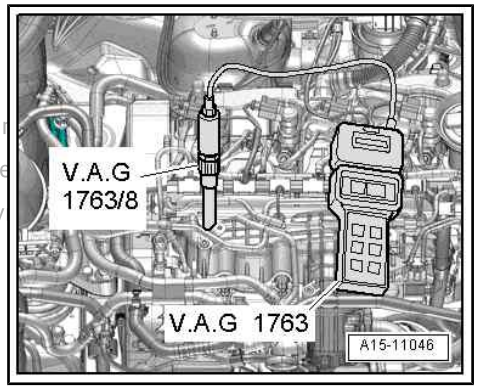
– Unplug electrical connector -arrow- for fuel pressure regulating valve - N276- at fuel rail.

– Briefly start engine to relieve fuel pressure in fuel rail.

– Remove all glow plugs ⇒ Rep. gr. 28 .



– Screw in adapter - V.A.G 1763/8- in place of corresponding glow plug and connect compression tester - V.A.G 1763- .



Note

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Using the compression tester ⇒ Operating instructions .

– Have a second mechanic operate starter until tester shows no further pressure increase.

– Repeat procedure on each cylinder.

Compression pressure	bar
When new	25.0 … 31.0
Wear limit	19.0
Maximum difference between cylinders	5.0

Assembling

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

– Install glow plugs ⇒ Rep. gr. 28 .

– Entries are stored in event memory of engine control unit because electrical connectors were unplugged and the engine was started: `Interrogate event memory` in `Vehicle self-diagnosis` ⇒ Vehicle diagnostic tester.

3 Valve gear

Overview

- ⇒ “3.1 Exploded view - valve gear”, page 139
- ⇒ “3.2 Measuring axial clearance of camshafts”, page 141
- ⇒ “3.3 Measuring radial clearance of camshafts”, page 142
- ⇒ “3.4 Renewing camshaft oil seal”, page 143
- ⇒ “3.5 Removing and installing camshafts”, page 145
- ⇒ “3.6 Renewing valve stem oil seals with cylinder head installed”, page 151
- ⇒ “3.7 Renewing valve stem oil seals with cylinder head removed”, page 154
- ⇒ “3.8 Valve dimensions”, page 158
- ⇒ “3.9 Machining valve seats”, page 158
- ⇒ “3.10 Checking valve guides”, page 158
- ⇒ “3.11 Checking valves”, page 159

Caution

Risk of damage to valves and piston crowns after working on valve gear.

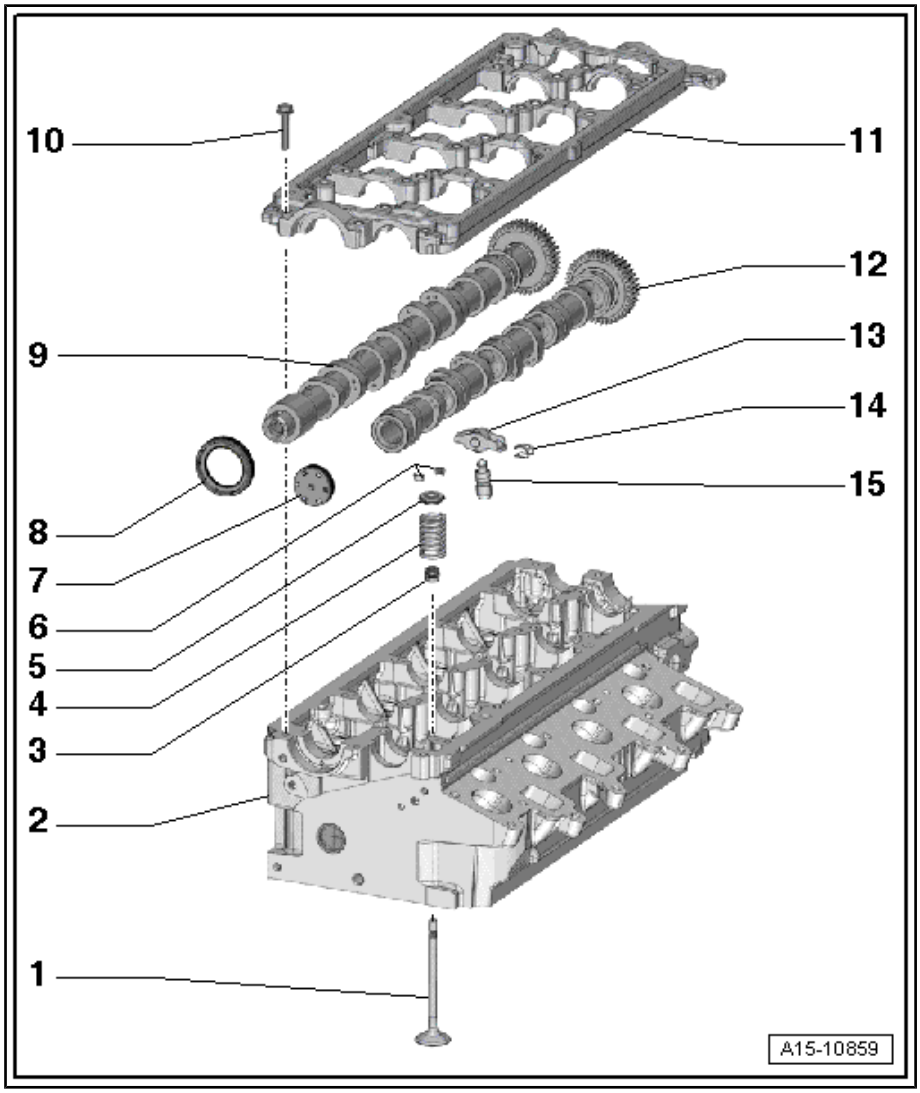
- *The hydraulic tappets have to settle; wait for approx. 30 minutes after installing camshafts before starting engine.*
- *Turn the crankshaft carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.*

Note

Cylinder heads with cracks between the valve seats may be used without reducing engine life, provided the cracks are small and not more than 0.5 mm wide.

3.1 Exploded view - valve gear

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1 - Valve

- ❑ Must not be machined; only grinding-in is permissible
- ❑ Mark installation position for re-installation
- ❑ Checking ⇒ page 159
- ❑ Valve dimensions ⇒ page 158
- ❑ Checking valve guides ⇒ page 158

2 - Cylinder head

3 - Valve stem oil seal

- ❑ Renewing with cylinder head installed ⇒ page 151
- ❑ Renewing with cylinder head removed ⇒ page 154

4 - Valve spring

5 - Valve spring plate

6 - Valve cotters

7 - Sealing cap

- ❑ Renew
- ❑ Removing sealing cap with retaining frame installed: pierce on one side with an awl and pry out
- ❑ Installing: drive in without sealant using suitable thrust piece
- ❑ Installation depth 1 ... 2 mm

8 - Oil seal

- ❑ Different versions available; for allocation refer to ⇒ Electronic parts catalogue
- ❑ Renewing ⇒ page 143

9 - Exhaust camshaft

- ❑ Removing and installing ⇒ page 145
- ❑ Measuring axial clearance ⇒ page 141
- ❑ Measuring radial clearance ⇒ page 142

10 - Bolt

- ❑ Correct sequence when slackening ⇒ page 148
- ❑ Tightening torque and sequence ⇒ page 141

11 - Retaining frame

- ❑ With integrated camshaft bearings
- ❑ Removing and installing ⇒ “3.5 Removing and installing camshafts”, page 145

12 - Inlet camshaft

- ❑ Removing and installing ⇒ page 145
- ❑ Measuring axial clearance ⇒ page 141
- ❑ Measuring radial clearance ⇒ page 142

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13 - Roller rocker finger

- ❑ Removing and installing ⇒ “3.5 Removing and installing camshafts”, page 145
- ❑ Mark installation position for re-installation
- ❑ Check roller bearings for ease of movement
- ❑ Lubricate contact surfaces before installing

14 - Securing clip

- ❑ For hydraulic compensation element

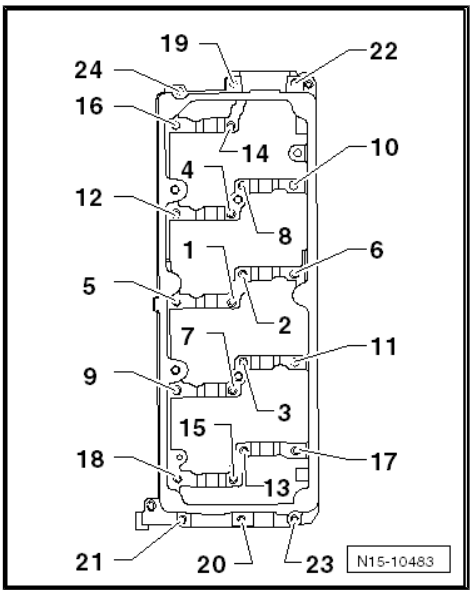
15 - Hydraulic compensation element

- ❑ Mark installation position for re-installation
- ❑ Lubricate contact surfaces before installing

Retaining frame - tightening torque and sequence

– Tighten bolts in 2 stages in the sequence shown:

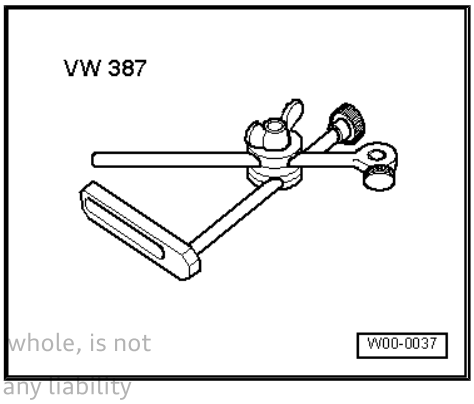
Stage	Bolts	Tightening torque
1.	-1 … 24-	Screw in by hand until contact is made • The retaining frame should make contact with the cylinder head over the full surface
2.	-1 … 24-	10 Nm



3.2 Measuring axial clearance of camshafts

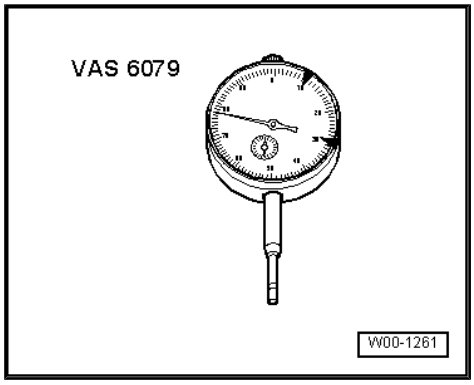
Special tools and workshop equipment required

♦ Universal dial gauge bracket - VW 387-



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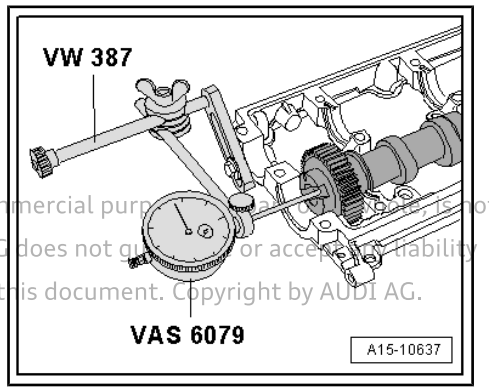
♦ Dial gauge - VAS 6079-



Procedure

– Remove retaining frame
⇒ “3.5 Removing and installing camshafts”, page 145 .

– Secure dial gauge - VAS 6079- with universal dial gauge bracket - VW 387- to cylinder head as shown in illustration.



– Press camshaft against dial gauge by hand.

– Set dial gauge to “0”.

– Press camshaft away from dial gauge and read off value.

Axial clearance on inlet camshaft and exhaust camshaft:

- Specification: 0.048 … 0.118 mm.
- Wear limit: 0.17 mm.

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3.3 Measuring radial clearance of camshafts

Special tools and workshop equipment required

♦ Plastigauge

Procedure

– Remove roller rocker fingers
⇒ “3.5 Removing and installing camshafts”, page 145 .

– Clean bearings and bearing journals.

– Place a length of Plastigauge corresponding to the width of the bearing on the bearing journal or bearing shell to be measured.

- The Plastigauge must be positioned in the centre of the bearing.

– Fit retaining frame and tighten to specified torque
⇒ page 141 without rotating camshafts.

– Remove retaining frame again.

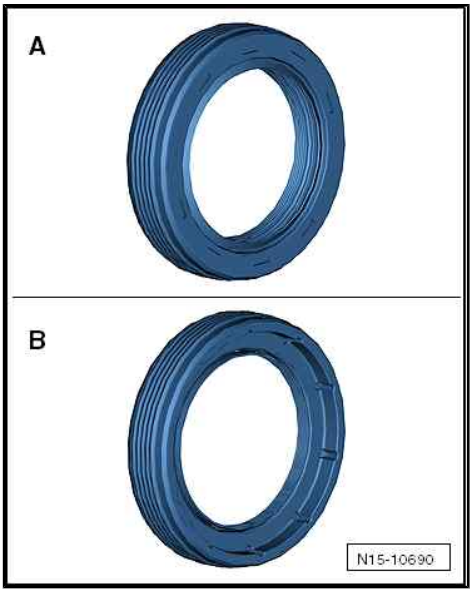
– Compare width of Plastigauge with measurement scale.

- Radial clearance: 0.035 ... 0.085 mm

3.4 Renewing camshaft oil seal

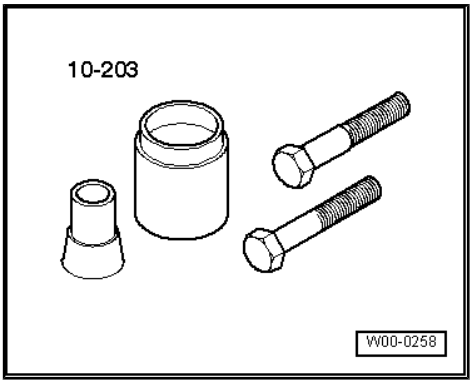
Note

- *A modified oil seal is being phased in.*
- *The “old” version oil seal -item A- forms a continuous surface between the camshaft and the cylinder head.*
- *The “new” version oil seal -item B- has a shoulder between the camshaft and the cylinder head.*

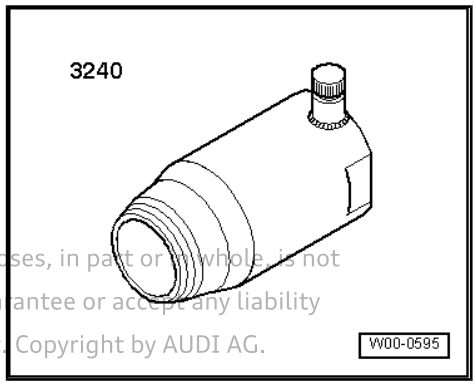


Special tools and workshop equipment required

- Fitting tool - 10 - 203-

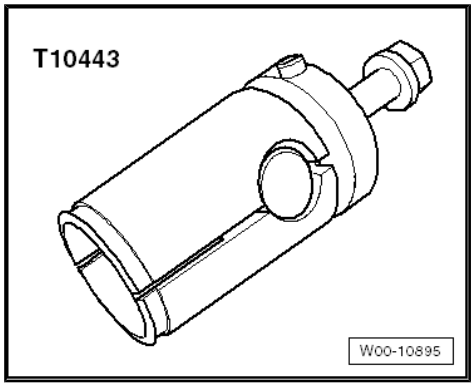


- Oil seal extractor - 3240- for “old” version oil seal



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- Puller - T10443- for “new” version oil seal



- Bolt M12x1.5x75

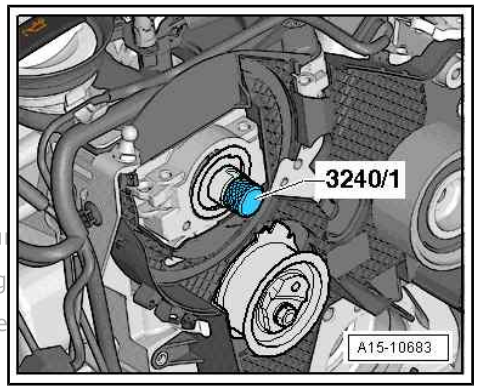
Procedure

– Remove camshaft sprocket and hub
⇒ “3.5 Removing and installing camshafts”, page 145 .

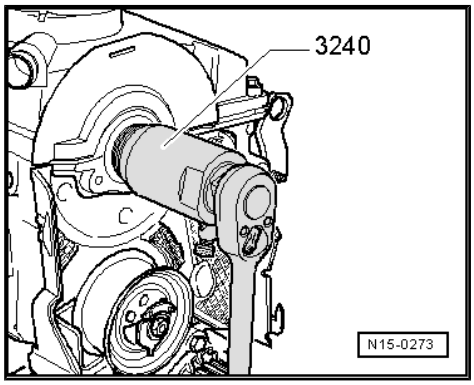
“Old” version oil seal:

– Insert thrust piece -3240/1- in camshaft.

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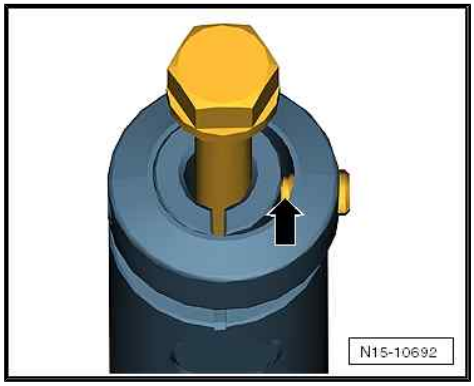
– Screw inner section of oil seal extractor -3240- two turns out of outer section (approx. 3 mm) and lock with knurled screw.
– Lubricate threaded head of oil seal extractor, place it in position and screw it into oil seal as far as possible (applying firm pressure).
– Loosen knurled screw and turn inner section against camshaft until oil seal is pulled out.
– Clamp flats of oil seal extractor in vice and use pliers to remove oil seal.



“New” version oil seal:

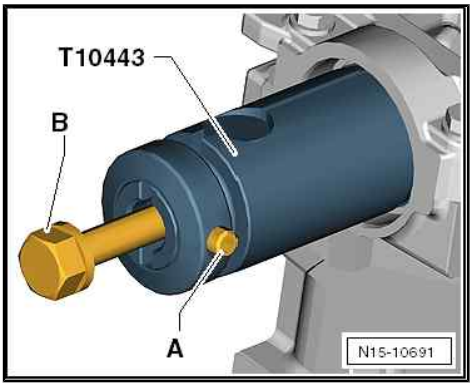
Caution

- *If the grub screw is unscrewed too far the thrust plate inside the puller -T10443- will come loose from the thrust bolt. If this happens, the thrust plate must be pushed back onto the thrust bolt.*



– Carefully unscrew grub screw -arrow- of puller -T10443- until slight resistance is felt.

– Apply puller - T10443- in a straight line, as shown in illustration, and lock by screwing in grub screw.-A-.
– Screw in thrust bolt -B- until oil seal is pulled out.



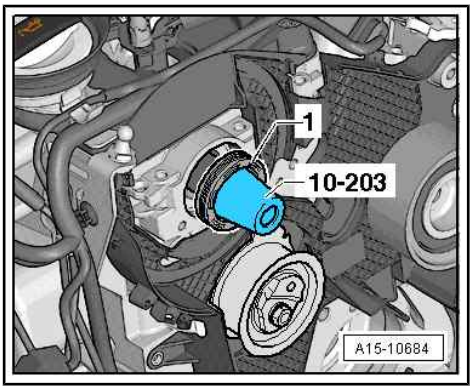
All types of oil seal (continued):

– Clean contact surface and sealing surface.

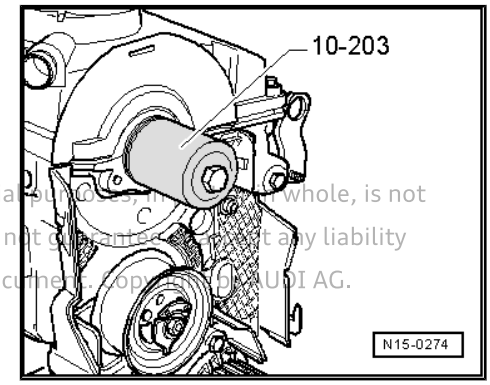
Note

The sealing lip of the oil seal must not be additionally oiled or greased.

– Apply guide sleeve of fitting tool - 10 - 203- to camshaft as shown in illustration.
– Carefully push oil seal -1- over guide sleeve and onto camshaft.



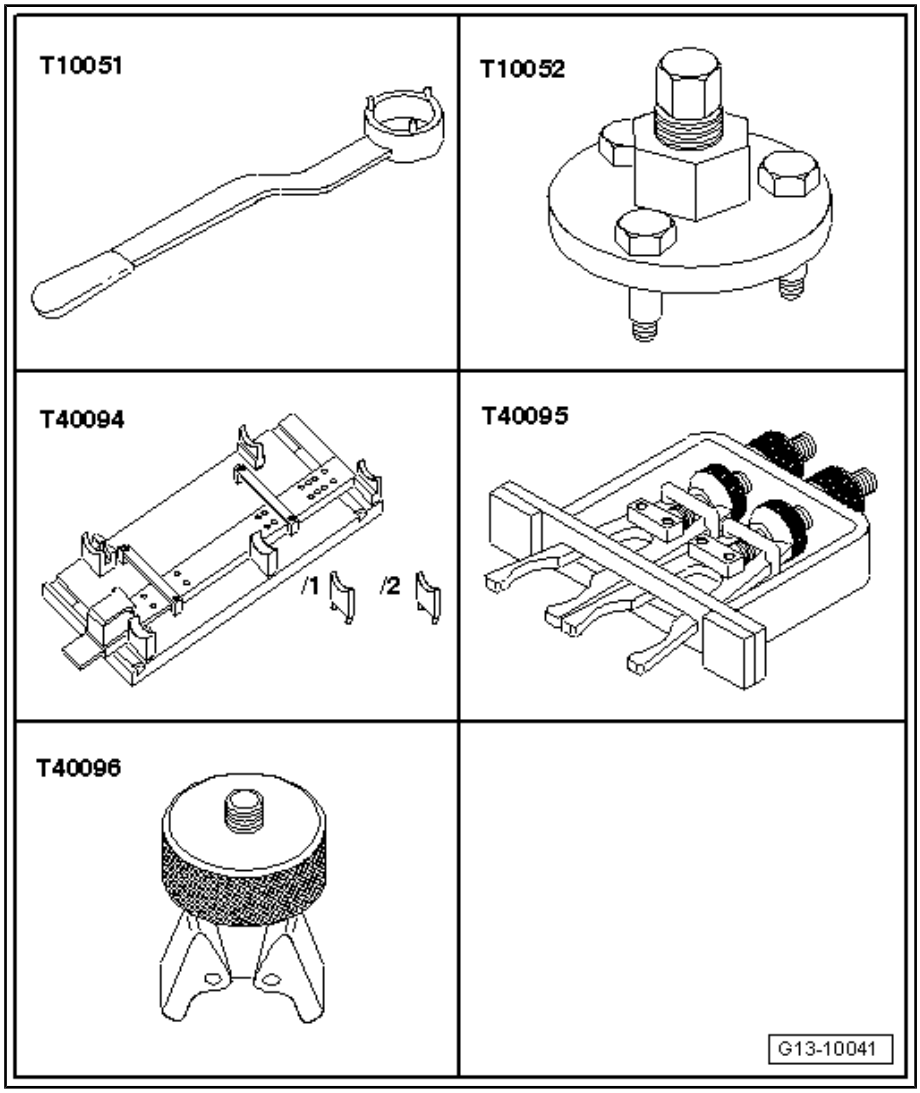
– Press in oil seal onto stop using thrust piece of fitting tool - 10 - 203- and bolt M12×1.5×75.
– Install camshaft sprocket and hub ⇒ “3.5 Removing and installing camshafts”, page 145 .
– Install toothed belt (adjust valve timing) ⇒ page 111 .



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3.5 Removing and installing camshafts

Special tools and workshop equipment required



- Counterhold tool - T10051-
- Puller - T10052-
- Camshaft fitting tool - T40094-
- Camshaft fitting tool - T40095-
- Clamping tool -T40096/1- for vehicles with two-piece camshaft gear
- Electric drill with plastic brush attachment
- Safety goggles
- Sealant ⇒ Electronic parts catalogue

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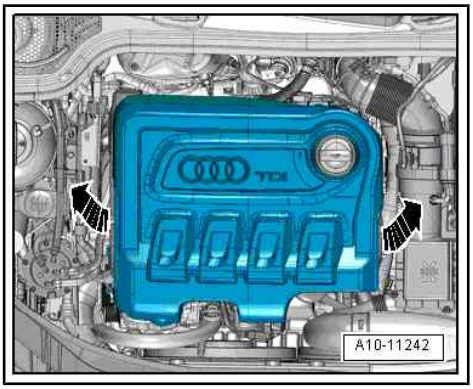
Removing

- Cylinder head installed.

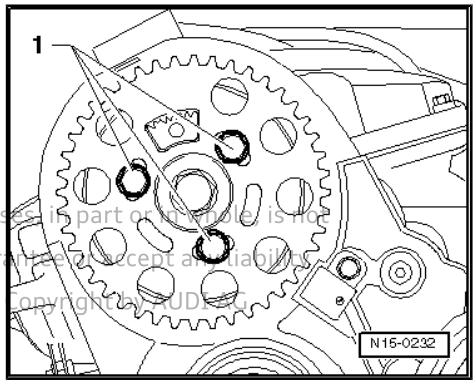
– Remove engine cover panel -arrows-.

– Take toothed belt off camshaft sprocket and high-pressure pump sprocket ⇒ page 106 .

– Remove cylinder head cover ⇒ page 119 .



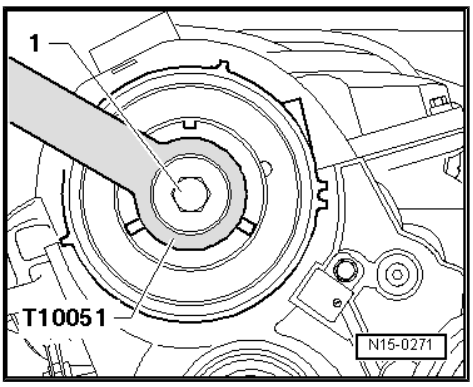
– Remove bolts -1- and detach camshaft sprocket.



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– Counterhold using counterhold tool - T10051- and loosen bolt -1- for camshaft hub.

– Unscrew bolt approx. 2 turns.

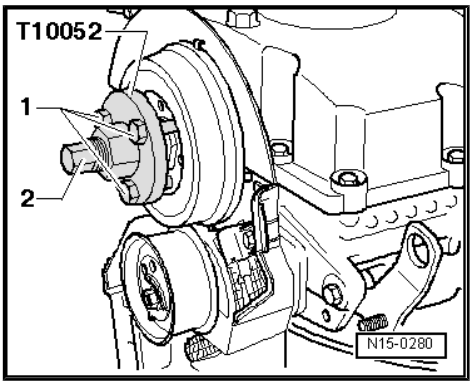


– Apply puller - T10052- to camshaft hub and screw bolts -1- into hub.

– Counterhold on hexagon flats (30 mm) of puller and screw in bolt -2- to pull off camshaft hub.

– Detach hub from taper of camshaft.

– Remove vacuum pump ⇒ Rep. gr. 47 .



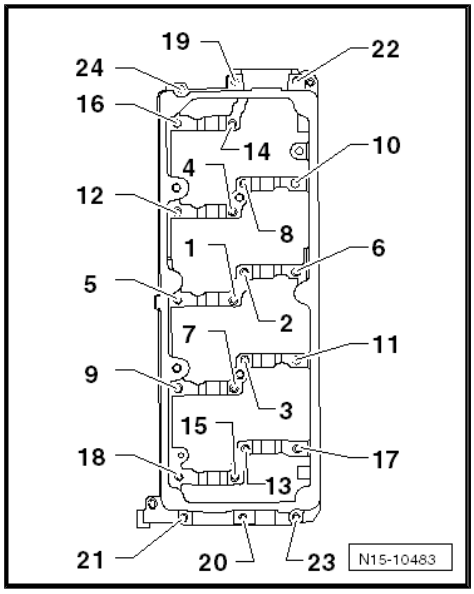
– Slacken retaining frame bolts in the sequence -24 ... 1-.

– Remove bolts and carefully release retaining frame from bonded joint.

– Mark fitting location of camshafts for re-installation and remove.

Installing

- Tightening torques
⇒ “3.1 Exploded view - valve gear”, page 139



Caution

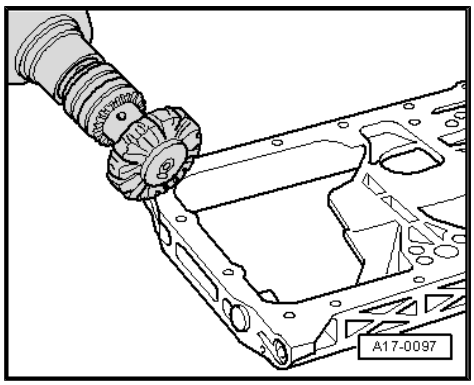
Make sure axial bearings in retaining frame are not damaged.

- *The camshafts MUST be installed using the camshaft fitting tool - T40094- as described in the following.*

Caution

Protect lubrication system and bearings against contamination.

- *Cover exposed parts of the engine.*



WARNING

Risk of eye injury.

- *Put on safety goggles.*

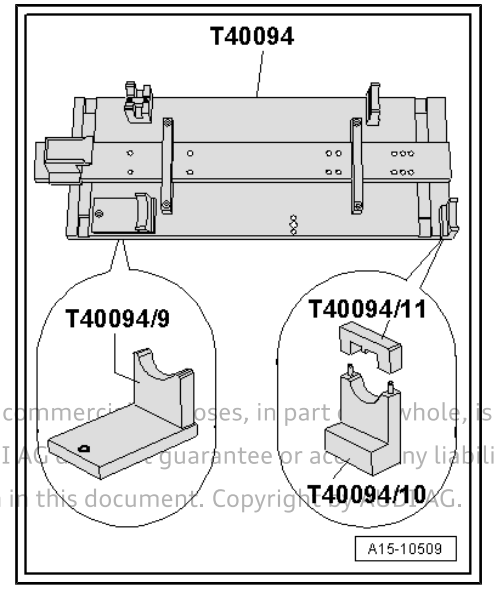
– Remove remaining sealant from cylinder head and retaining frame using rotating plastic brush or similar.

– Clean sealing surfaces; they must be free of oil and grease.

– Oil running surfaces of both camshafts.

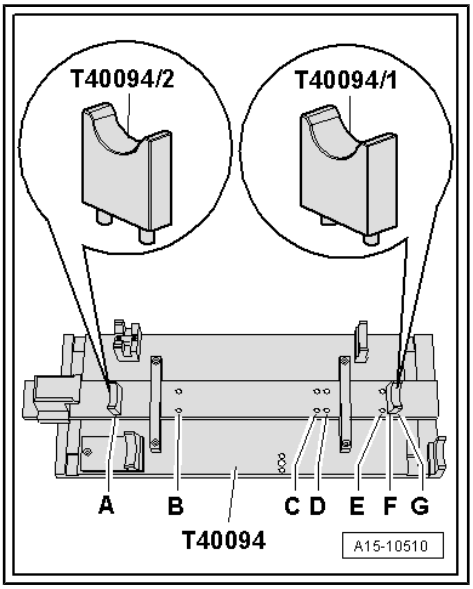
Set up camshaft fitting tool - T40094- as follows:

– Secure supports -T40094/9- and -T40094/10- (with -T40094/11-) to base plate, as shown in illustration. If necessary, remove any supports already attached at these positions.



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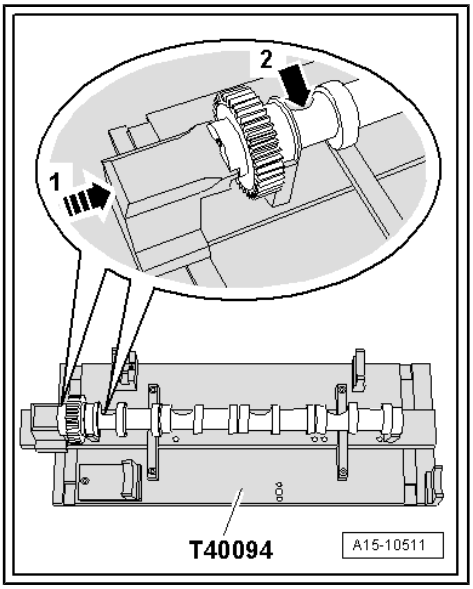
– Fit support -T40094/1- onto position -F- and support -T40094/2- onto position -A-.



– Place inlet camshaft in supports -T40094/1- and -T40094/2- .

– Turn inlet camshaft in such a way that it can be locked in “TDC” position using locking device -arrow 1-.

• Recess -arrow 2- for cylinder head bolt must face outwards.



– Place exhaust camshaft in supports -T40094/9- and -T40094/10- .

– Lock exhaust camshaft with top section -T40094/11- .

• The lug -1- on the top section must engage in the slot -2- in the camshaft,

Vehicles with two-piece camshaft gear:

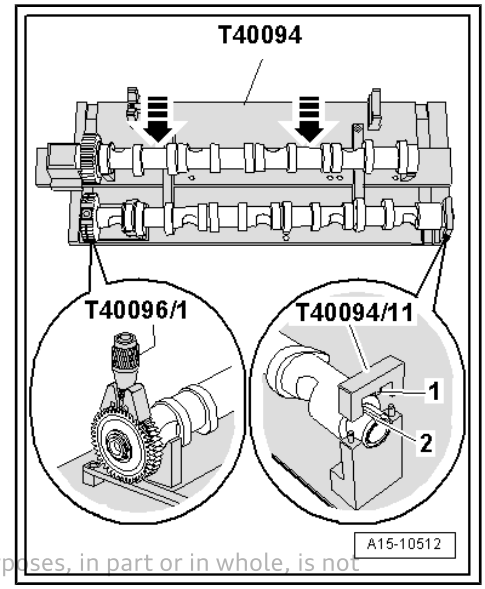
– Place clamping tool -T40096/1- on teeth of exhaust camshaft in such a way that the two arms of the tool engage on the two halves of the gear (one in each half, as shown in illustration).

• The wider arm must engage in the wider half of the gear.

– Tighten the clamping tool using the knurled wheel so that the faces of the gear teeth are in alignment.

All vehicles (continued):

– Slide inlet camshaft towards exhaust camshaft, until gear teeth engage -arrows-.



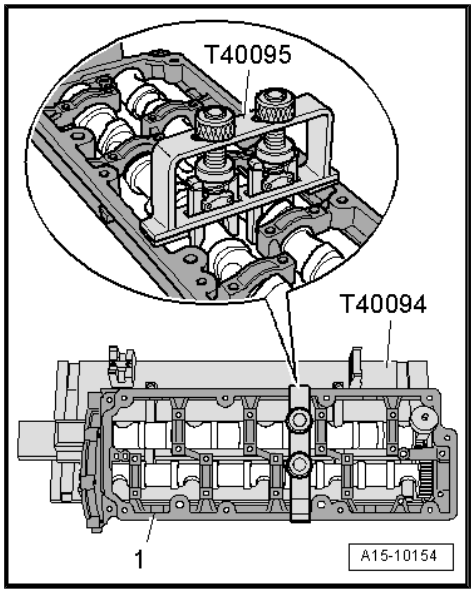
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– Fit retaining frame on camshafts.

• All camshaft bearings must be seated on the camshafts.

– Position camshaft fitting tool - T40095- and fix camshafts in position in retaining frame, as shown in illustration.

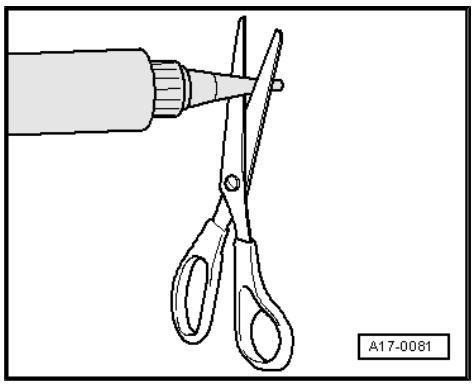
– Detach top section -T40094/11- .



Note

Note the use-by date of the sealant.

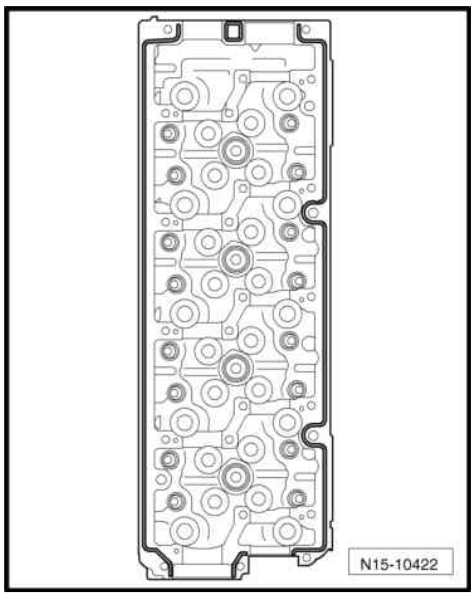
– Cut off nozzle of tube at front marking (nozzle ∅ approx. 2 mm).



Caution

Make sure excess sealant does not contaminate camshaft bearings.

- ***The sealant beads must not be thicker than specified.***



– Apply beads of sealant onto clean sealing surfaces of cylinder head as shown in illustration.

• Thickness of sealant beads: 2 ... 3 mm

Note

- *The retaining frame should be fitted and secured without delay, as the sealant starts hardening immediately.*
- *After installing the retaining frame, wait about 30 minutes for the sealant to dry.*

– Take camshafts together with retaining frame, camshaft fitting tool - T40095- and, if necessary, clamping tool -T40096/1- out of camshaft fitting tool - T40094- and insert components carefully into cylinder head.

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– Screw in retaining frame bolts in the sequence -1 ... 24- evenly by hand until they make contact.

• The retaining frame should make contact with the cylinder head over the full surface.

– Tighten bolts ⇒ page 141 .

– Remove camshaft fitting tool - T40095- and, if necessary, clamping tool -T40096/1- .

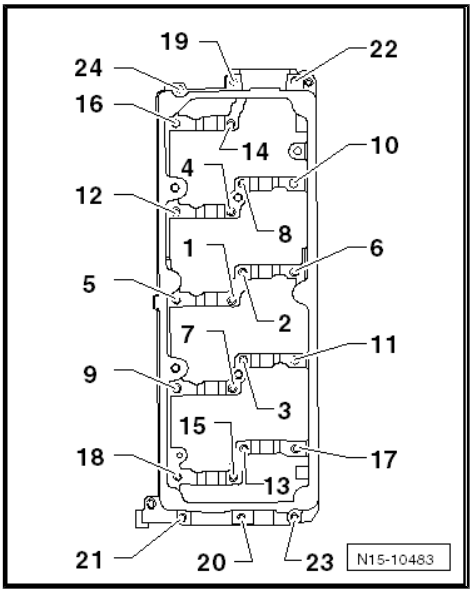
Remaining installation steps are carried out in reverse sequence; note the following:

– Install camshaft oil seal ⇒ page 143 .

– Drive new sealing cap ⇒ Item 7 (page 140) into cylinder head to a depth of approx. 1 ... 2 mm using suitable thrust piece.

– Install vacuum pump ⇒ Rep. gr. 47 .

– Install cylinder head cover ⇒ page 119 .



Caution

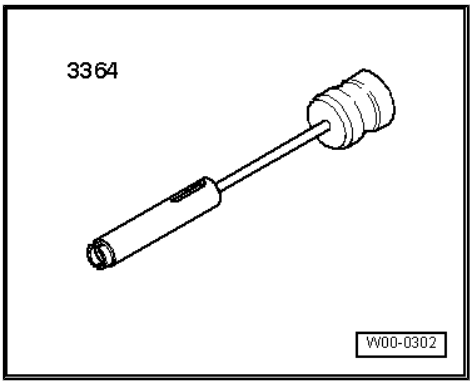
Risk of damage to valves and piston crowns after working on valve gear.

- *The hydraulic tappets have to settle; wait for approx. 30 minutes after installing camshafts before starting engine.*
- *Turn the crankshaft carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.*

3.6 Renewing valve stem oil seals with cylinder head installed

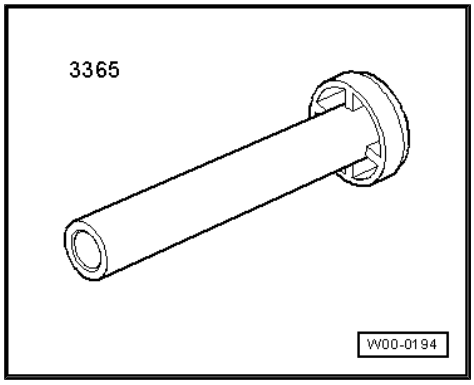
Special tools and workshop equipment required

♦ Valve stem seal puller - 3364-

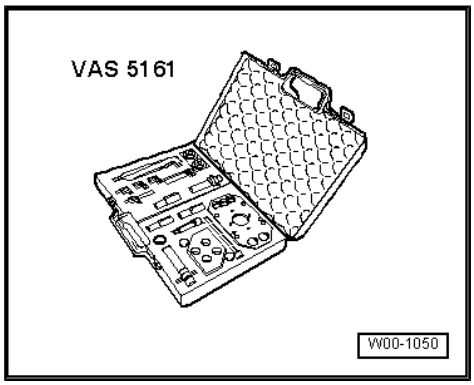


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- Valve stem seal fitting tool - 3365-



- Removal and installation device for valve cotters - VAS 5161- with guide plate for 3.0 ltr. TDI engine - VAS 5161/23- and sleeve -VAS 5161/23-1-



- Bolt, M6x30 (2x)

Procedure

– Remove all glow plugs ⇒ Rep. gr. 28 .

– Remove camshafts ⇒ page 145 .

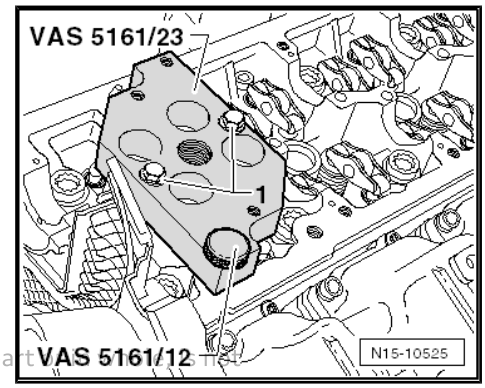
– Mark original positions of roller rocker fingers and hydraulic compensation elements for re-installation.

– Remove roller rocker fingers together with hydraulic compensation elements and put down on a clean surface.

– Set piston of appropriate cylinder to “bottom dead centre”.

– Fit guide plate for 3.0 ltr. TDI engine - VAS 5161/23- onto cylinder head.

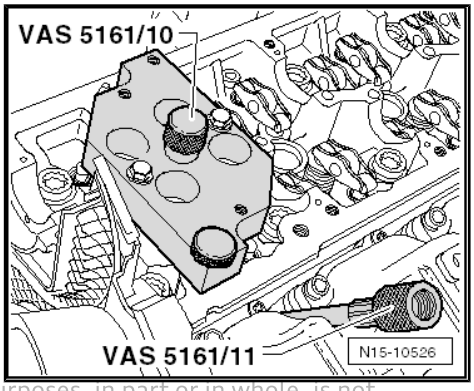
– Secure guide plate on intake manifold side with knurled screw -VAS 5161/12- and 2 M6x30 bolts -item 1- by hand until they make contact.



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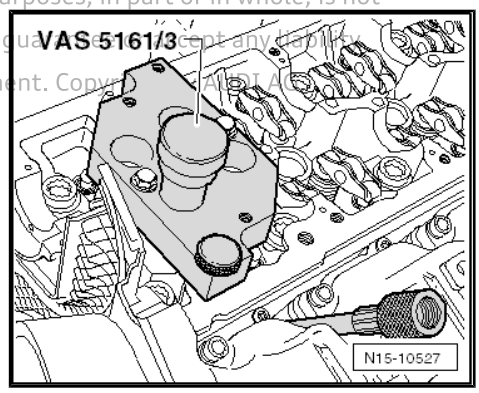
– Screw sealing pin -VAS 5161/10- into guide plate.

– Screw adapter -VAS 5161/11- hand-tight into corresponding glow plug thread.



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– Insert drift -VAS 5161/3- into guide plate and use plastic-headed hammer to release sticking valve cotters.



– Screw snap-in device -VAS 5161/6- with engaging fork -VAS 5161/5- into guide plate.

– Slide sleeve -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.

• Minimum pressure: 6 bar

– Attach pressure fork -VAS 5161/2- to snap-in device and push assembly cartridge down.

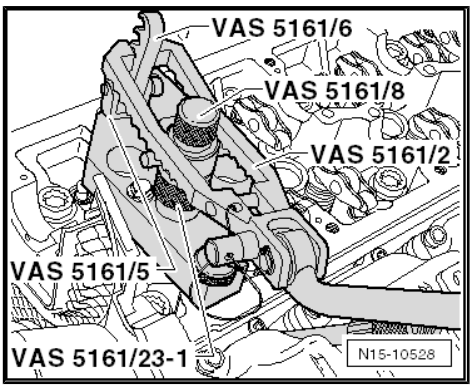
– At the same time, turn knurled screw of assembly cartridge clockwise until tips engage in valve cotters.

– Move knurled screw back and forth slightly; the valve cotters are thus forced apart and taken up by the assembly cartridge.

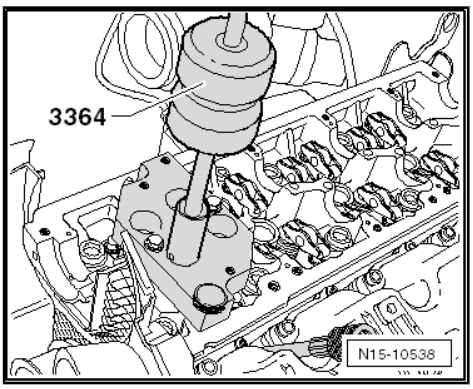
– Release pressure fork.

– Take off assembly cartridge with sleeve.

– Detach valve spring with valve spring plate.



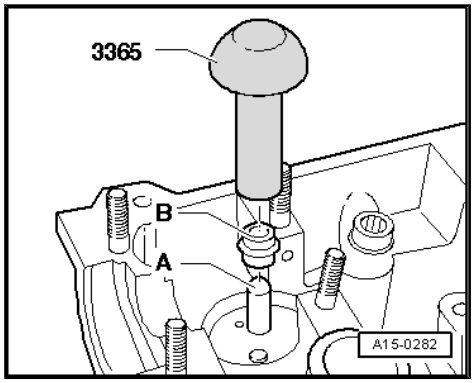
– Pull off valve stem oil seal with valve stem seal puller - 3364- .



Caution

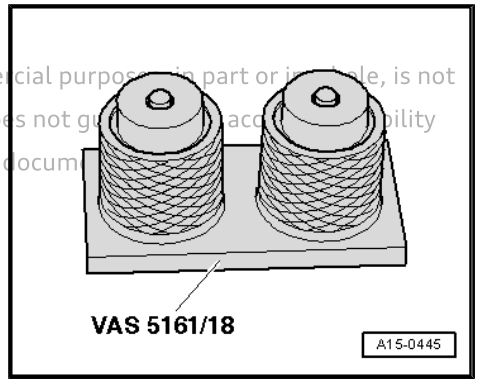
Make sure valve stem oil seals are not damaged when installing.

- *New valve stem oil seals -B- are supplied with plastic sleeve; fit plastic sleeve -A- onto valve stem.*



– Lightly oil sealing lip of valve stem oil seal.
– Slide valve stem oil seal onto plastic sleeve.
– Carefully press valve stem oil seal onto valve guide using valve stem seal fitting tool - 3365- .
– Take off plastic sleeve.

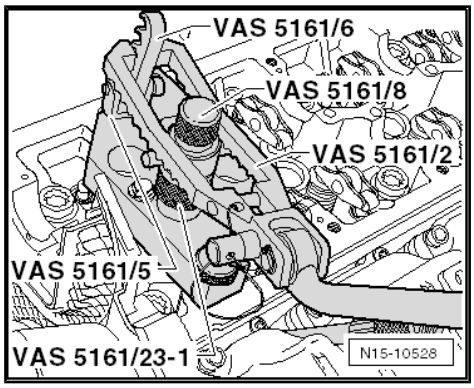
If valve cotters have been removed from assembly cartridge, they must first be inserted in insertion device -VAS 5161/18- .



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- Larger diameter of valve cotters faces upwards.

– Insert valve spring and valve spring plate.
– Press assembly cartridge onto insertion device from above and take up valve cotters.



– Insert assembly cartridge in guide plate for 3.0 ltr. TDI engine - VAS 5161/23- again.
– Press down pressure fork and pull knurled screw upwards while turning screw in both directions - this will insert the valve cotters.
– Release pressure fork with knurled screw still in pulled position.
– Repeat procedure for each valve.

Assembling

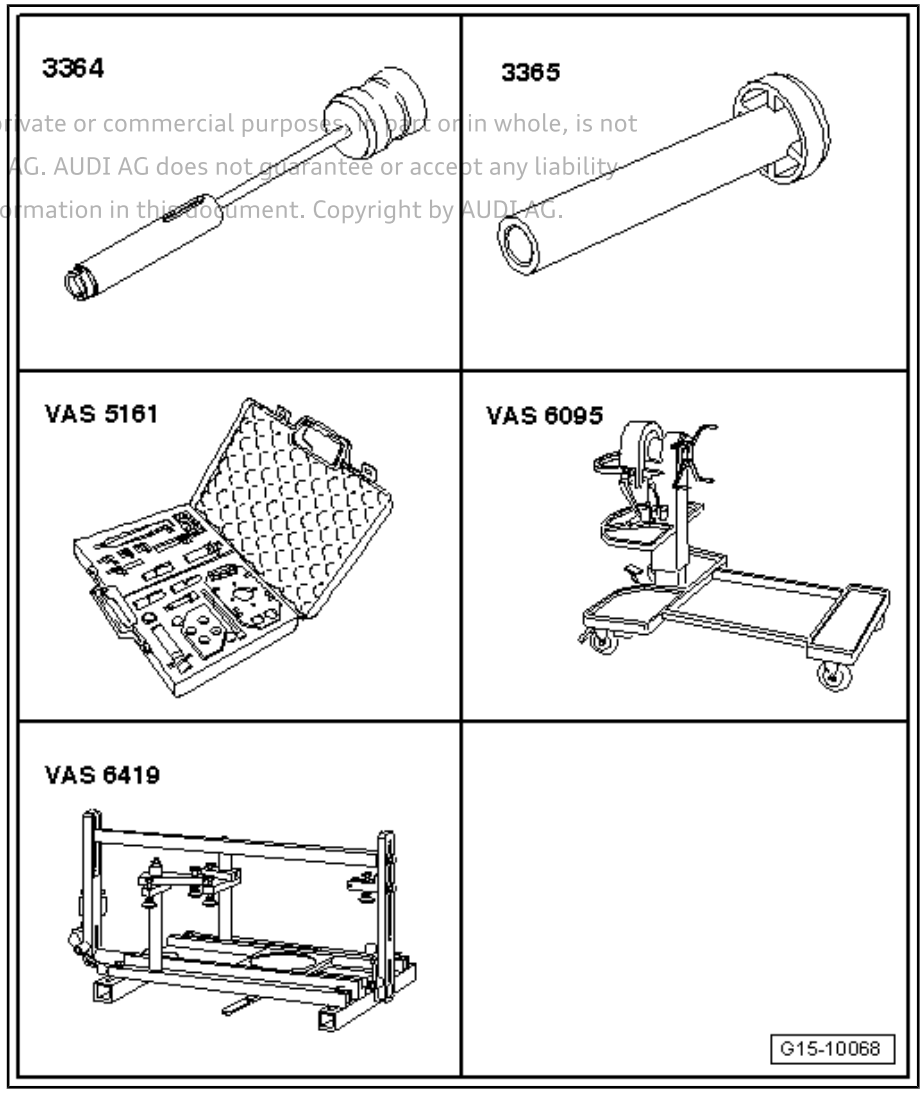
Installation is carried out in the reverse order; note the following:

– Ensure that all roller rocker fingers make contact with the ends of the valve stems correctly and are clipped onto their respective hydraulic compensation elements.
– Install camshafts ⇒ page 145 .
– Install glow plugs ⇒ Rep. gr. 28 .

3.7 Renewing valve stem oil seals with cylinder head removed

Special tools and workshop equipment required

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- Valve stem seal puller - 3364-
- Valve stem seal fitting tool - 3365-
- Removal and installation device for valve cotters - VAS 5161- with guide plate for 3.0 ltr. TDI engine - VAS 5161/23- and sleeve -VAS 5161/23-1-
- Engine and gearbox support - VAS 6095-
- Cylinder head tensioning device - VAS 6419-
- Bolt, M6x30 (2x)

Procedure

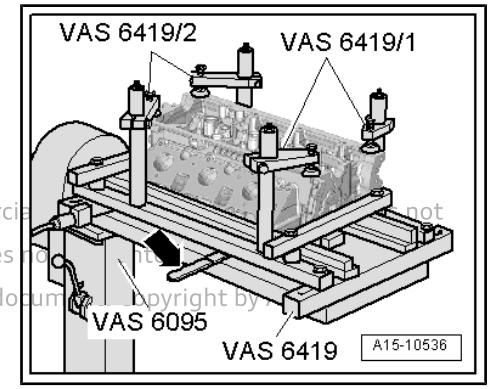
– Remove camshafts ⇒ page 145 .

– Mark original positions of roller rocker fingers and hydraulic compensation elements for re-installation.

– Remove roller rocker fingers together with hydraulic compensation elements and put down on a clean surface.

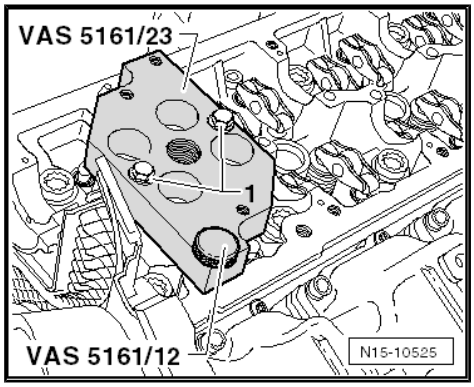
– Insert cylinder head tensioning device - VAS 6419- into engine and gearbox support - VAS 6095- .

– Secure cylinder head in cylinder head tensioning device, as shown in illustration.
– Connect cylinder head tensioning device to compressed air supply.
– Using lever -arrow-, slide air pad under combustion chamber where valve stem oil seal is to be removed.
– Apply just enough compressed air to bring air pad into contact with valve heads.

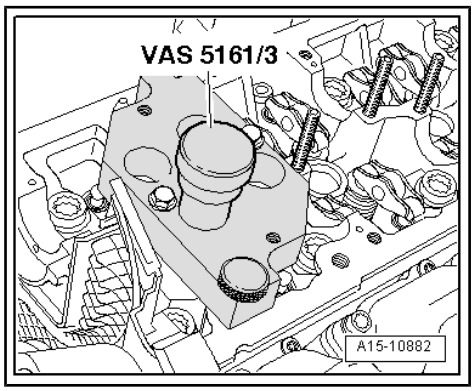


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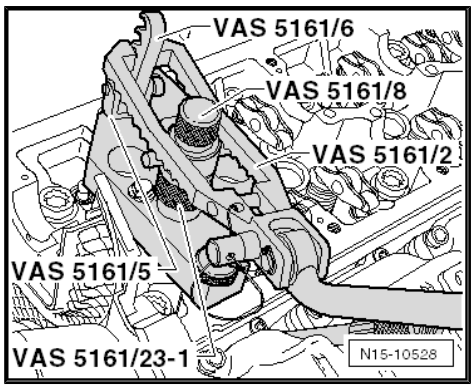
– Fit guide plate for 3.0 ltr. TDI engine - VAS 5161/23- onto cylinder head.
– Secure guide plate on intake manifold side with knurled screw -VAS 5161/12- and 2 M6x30 bolts -item 1- by hand until they make contact.



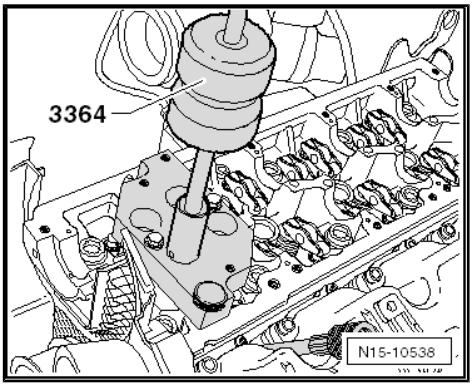
– Insert drift -VAS 5161/3- into guide plate and use plastic-headed hammer to release sticking valve cotters.



– Screw snap-in device -VAS 5161/6- with engaging fork -VAS 5161/5- into guide plate.
– Slide sleeve -VAS 5161/23-1- onto assembly cartridge -VAS 5161/8- .
– 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 pressure fork.
– Take off assembly cartridge with sleeve.
– Detach valve spring with valve spring plate.



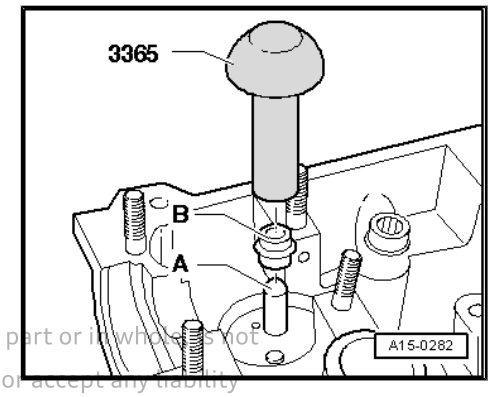
– Pull off valve stem oil seal with valve stem seal puller - 3364- .



Caution

Make sure valve stem oil seals are not damaged when installing.

- ***New valve stem oil seals -B- are supplied with plastic sleeve; fit plastic sleeve -A- onto valve stem.***

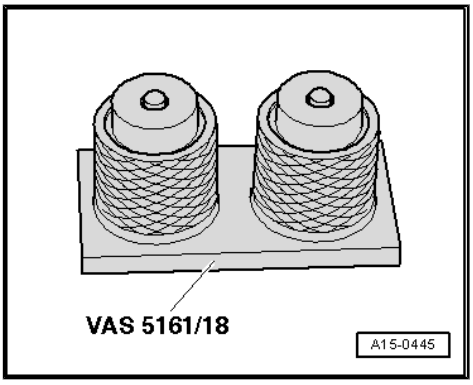


– Lightly oil sealing lip of valve stem oil seal.
– Slide valve stem oil seal onto plastic sleeve.
– Carefully press valve stem oil seal onto valve guide using valve stem seal fitting tool - 3365- .

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– Take off plastic sleeve.

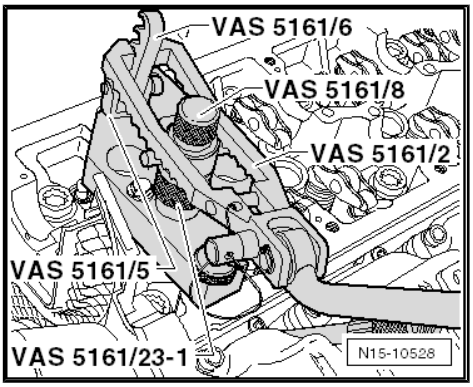
If valve cotters have been removed from assembly cartridge, they must first be inserted in insertion device -VAS 5161/18- .



- Larger diameter of valve cotters faces upwards.

– Insert valve spring and valve spring plate.
– Press assembly cartridge onto insertion device from above and take up valve cotters.

– Insert assembly cartridge in guide plate for 3.0 ltr. TDI engine - VAS 5161/23- again.
– Press down pressure fork and pull knurled screw upwards while turning screw in both directions - this will insert the valve cotters.
– Release pressure fork with knurled screw still in pulled position.
– Repeat procedure for each valve.

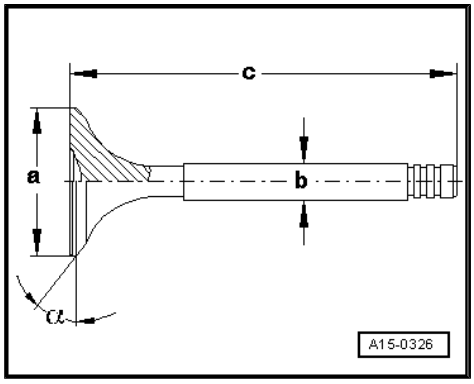


Assembling

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

– Ensure that all roller rocker fingers make contact with the ends of the valve stems correctly and are clipped onto their respective hydraulic compensation elements.
– Install camshafts ⇒ page 145 .

3.8 Valve dimensions



Note

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

Dimension		Inlet valve	Exhaust valve
∅ a	mm	28.10	26.00
∅ b	mm	5.975	5.965
c	mm	99.30	99.10
α	∠°	45	45

3.9 Machining valve seats

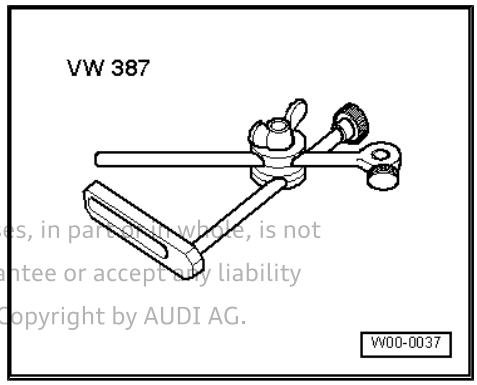
Note

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

3.10 Checking valve guides

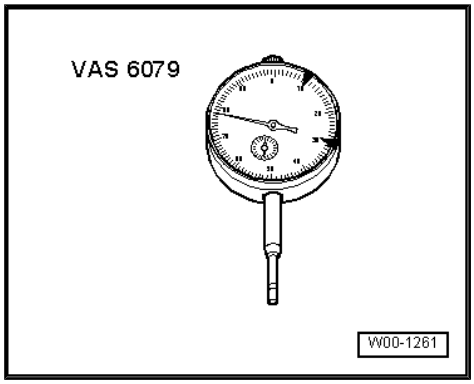
Special tools and workshop equipment required

- Universal dial gauge bracket - VW 387-



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- Dial gauge - VAS 6079-



Procedure

Note

- *If the valve has to be renewed as part of a repair, use a new valve for the measurement.*
- *Only insert inlet valve into inlet valve guide and exhaust valve into exhaust valve guide, as the stem diameters are different.*

– Attach dial gauge - VAS 6079- with universal dial gauge bracket - VW 387- to cylinder head.

– Insert valve into guide.

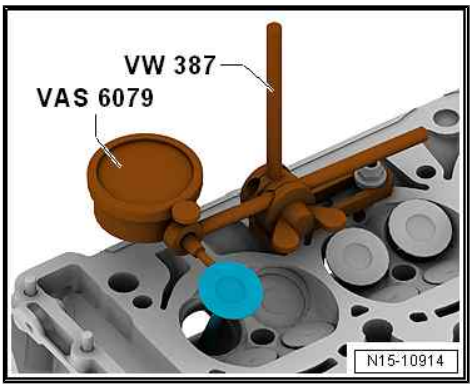
• End of valve stem must be flush with guide.

– Measure the amount of sideways play.

• Wear limit: 1.0 mm.

– If the wear limit is exceeded, repeat the measurement with new valves.

– Renew cylinder head if wear limit is still exceeded.



Note

Valve guides cannot be renewed.

3.11 Checking valves

– Visually inspect for scoring on valve stems and valve seat surfaces.

– Renew valve if scoring is clearly visible.

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17 – Lubrication

1 Oil pump, sump - engines with balance shaft assembly

Overview

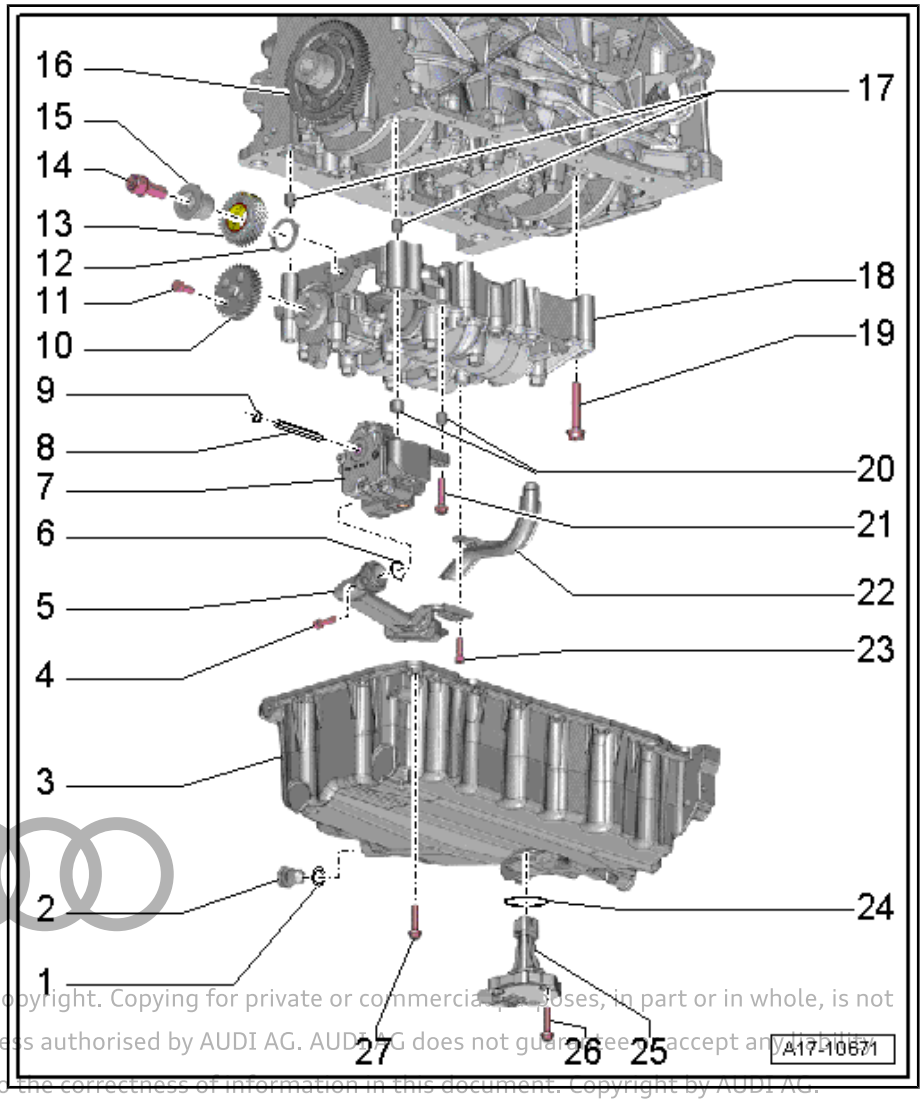
- ⇒ “1.1 Exploded view - oil pump, sump - engines with balance shaft assembly”, page 160
- ⇒ “1.2 Removing and installing oil level and oil temperature sender G266 ”, page 163
- ⇒ “1.3 Removing and installing sump”, page 164
- ⇒ “1.4 Removing and installing oil pump”, page 169
- ⇒ “1.5 Removing balance shaft assembly”, page 169
- ⇒ “1.6 Installing a new balance shaft assembly”, page 171
- ⇒ “1.7 Re-installing a used balance shaft assembly”, page 174

Note

- *If large quantities of metal shavings or abrasion are found when performing engine repairs, this may be an indication of damage to the crankshaft or conrod bearings. To prevent further damage, the following steps are required after completion of repair work: clean the oil passages carefully and renew the oil spray jets, engine oil cooler and oil filter.*
- *Oil capacities, oil specifications and viscosity grades ⇒ Maintenance tables .*
- *Oil spray jet and pressure relief valve ⇒ page 100*

1.1 Exploded view - oil pump, sump - engines with balance shaft assembly

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1 - Seal
- ❑ Renew

2 - Oil drain plug
- ❑ 30 Nm

3 - Sump
- ❑ Removing and installing ⇒ page 164

4 - Bolt
- ❑ 9 Nm

5 - Suction pipe
- ❑ Clean strainer if dirty

6 - O-ring
- ❑ Renew

7 - Oil pump
- ❑ Removing and installing ⇒ page 169
- ❑ Before installing, check that the two dowel sleeves for centring oil pump are fitted onto balance shaft assembly

8 - Drive shaft
- ❑ For oil pump

9 - Circlip
- ❑ Must fit securely in groove
- ❑ Renew circlip if damaged or stretched

10 - Spur gear
- ❑ For balance shaft

11 - Bolt
- ❑ Renew
- ❑ 20 Nm +90°

12 - Thrust washer
- ❑ For idler gear
- ❑ Renew
- ❑ Installation position ⇒ page 163
- ❑ When installing idler gear, apply grease to hold washer on balance shaft assembly

13 - Idler gear
- ❑ For balance shaft assembly
- ❑ If the bolt for the idler gear has been slackened or the spur gear on the crankshaft or the crankshaft itself have been renewed, you must install a new idler gear with the appropriate coating. Procedure for installation ⇒ “1.6 Installing a new balance shaft assembly”, page 171
- ❑ To achieve the correct backlash a suitably thick coating is already applied to the new idler gear; the required clearance is achieved as the coating is worn down
- ❑ Installation position: Part No. must be visible.
- ❑ Make sure thrust washer is properly seated ⇒ page 163

14 - Bolt
- ❑ With washer
- ❑ Renew

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- ❑ If the bolt for the idler gear has been slackened or the spur gear on the crankshaft or the crankshaft itself have been renewed, you must install a new idler gear with the appropriate coating. Procedure for installation ⇒ “1.6 Installing a new balance shaft assembly”, page 171
- ❑ 90 Nm +90°

15 - Hub

- ❑ For idler gear
- ❑ Renew

16 - Spur gear

- ❑ Pulling spur gear off crankshaft and shrink-fitting new spur gear ⇒ page 93

17 - Dowel sleeves

- ❑ For centring balance shaft assembly on cylinder block

18 - Balance shaft assembly

- ❑ Removing ⇒ page 169
- ❑ Before installing, check that the two dowel sleeves for centring balance shaft assembly are fitted on cylinder block
- ❑ Installing new balance shaft assembly ⇒ page 171
- ❑ Re-installing "old" balance shaft assembly ⇒ page 174

19 - Bolt

- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 163

20 - Dowel sleeves

21 - Bolt

- ❑ 9 Nm

22 - Oil intake pipe

23 - Bolt

- ❑ 9 Nm

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24 - Seal

- ❑ Renew

25 - Oil level and oil temperature sender - G266-

- ❑ Removing and installing ⇒ page 163

26 - Bolt

- ❑ Self-locking
- ❑ Renew
- ❑ 9 Nm

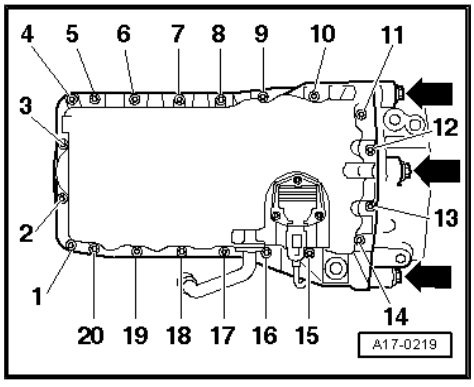
27 - Bolt

- ❑ Tightening torque and sequence ⇒ page 162

Sump - tightening torque and sequence

– Tighten bolts in 3 stages as follows:

Stage	Bolts	Tightening torque
1.	-1 … 20-	5 Nm in diagonal sequence
2.	-arrows-	40 Nm
3.	-1 … 20-	Tighten in stages and in diagonal sequence; final torque 13 Nm

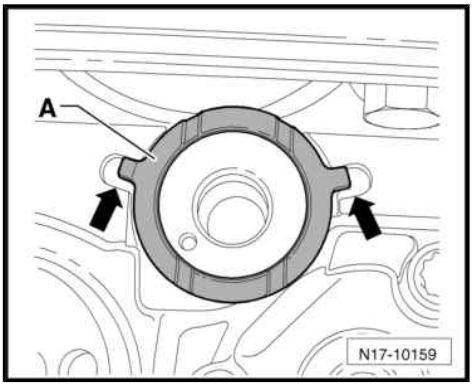


Installation position of thrust washer

Caution

Thrust washer can slip out of position behind idler gear.

- *Make sure that thrust washer -A- does not slip out of the recesses in the balance shaft assembly -arrows- when fitting the idler gear. If this is neglected, the thrust washer can become trapped. If necessary, apply grease to hold washer on balance shaft assembly.*



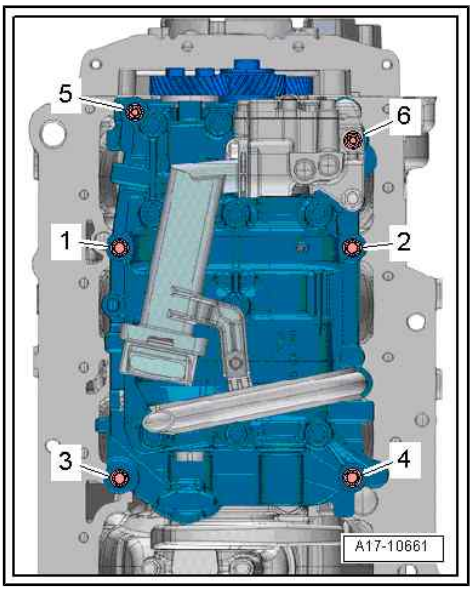
Balance shaft assembly - tightening torque and sequence

Note

Renew the bolts tightened with specified tightening angle.

– Tighten bolts in 5 stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1.	-1 … 6-	Screw in hand-tight in this sequence
2.	-1 … 6-	Pre-tighten bolts in this sequence to 6 Nm
3.	-1 … 4-	Tighten to 20 Nm
4.	-5 and 6-	Tighten to 13 Nm
5.	-1 … 6-	Use rigid wrench to turn 90° further in this sequence

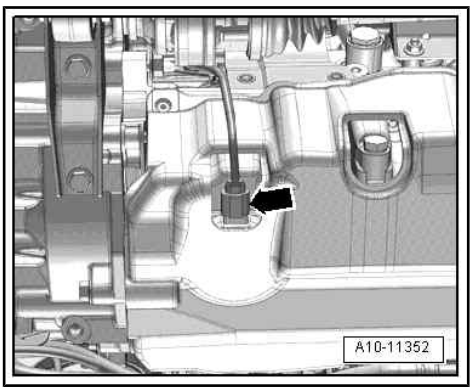


1.2 Removing and installing oil level and oil temperature sender - G266-

Removing

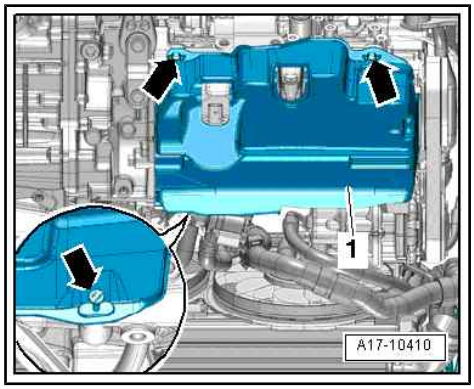
– Drain off engine oil ⇒ Maintenance ; Booklet 808 .

– Unplug electrical connector -arrow- at oil level and oil temperature sender - G266- .

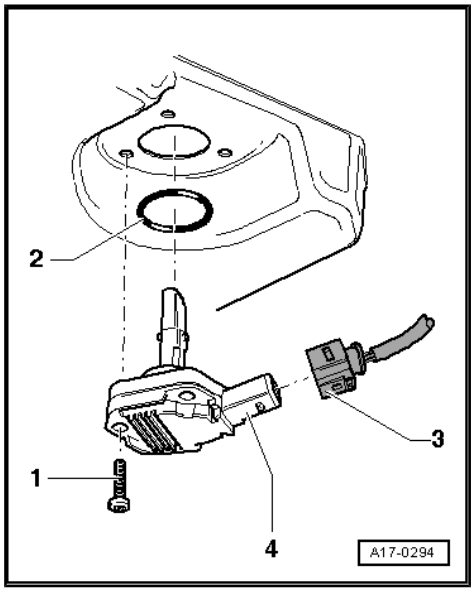


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– Release fasteners -arrows- and remove noise insulation -1- for sump.



– Remove bolts -1- and detach oil level and oil temperature sender - G266- -item 4-.



Note

Disregard -item 3-.

Installing

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

- Tightening torque
⇒ “1.1 Exploded view - oil pump, sump - engines with balance shaft assembly”, page 160

Note

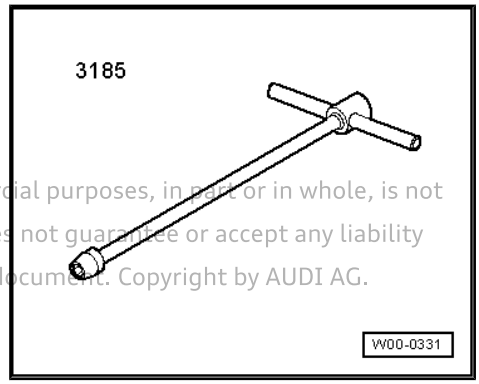
Renew seal -2- and self-locking bolts -1-.

– Fill with engine oil and check oil level ⇒ Maintenance ; Booklet 808 .

1.3 Removing and installing sump

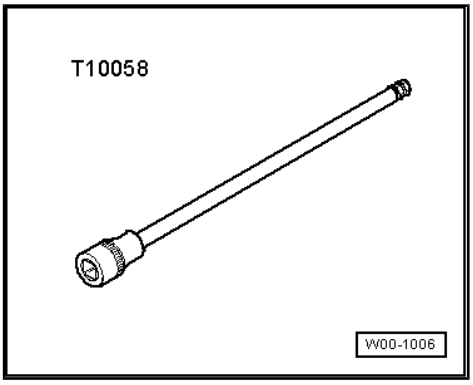
Special tools and workshop equipment required

◆ Articulated wrench, 10 mm - 3185-



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- Socket - T10058-



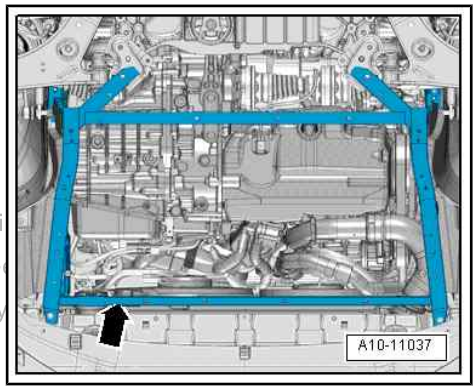
- Electric drill with plastic brush
- Sealant ⇒ Electronic parts catalogue
- Safety goggles

Removing

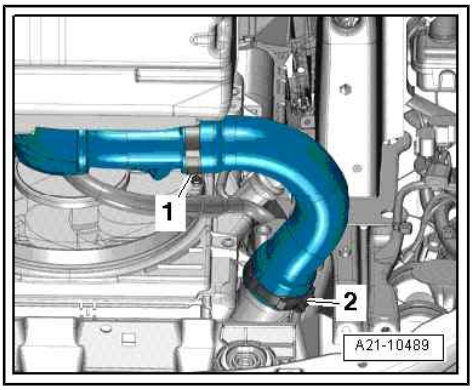
– Drain off engine oil ⇒ Maintenance ; Booklet 808 .

– A3 Cabriolet: Remove noise insulation frame -arrow- ⇒ Rep. gr. 50 .

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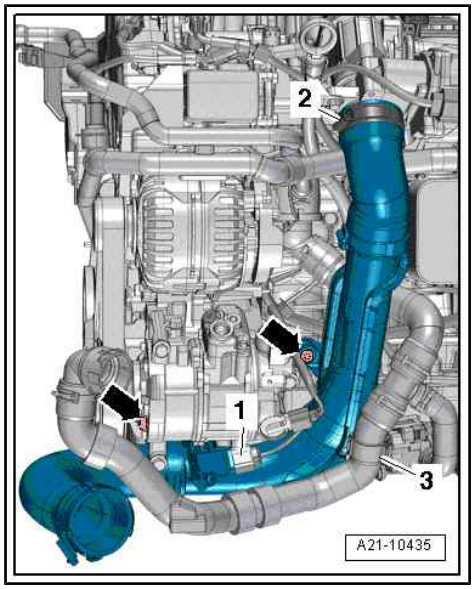
– Release hose clip -2-, lift retaining clip -1- and remove air hose.



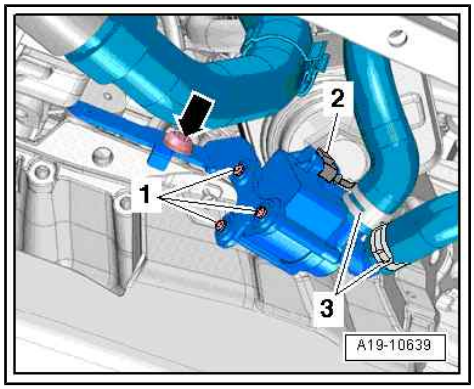
WARNING

Risk of injury as the radiator fans may start up automatically.

- *Even when the ignition is switched off, the radiator fans can start up without warning due to accumulated heat in the engine compartment, etc.*



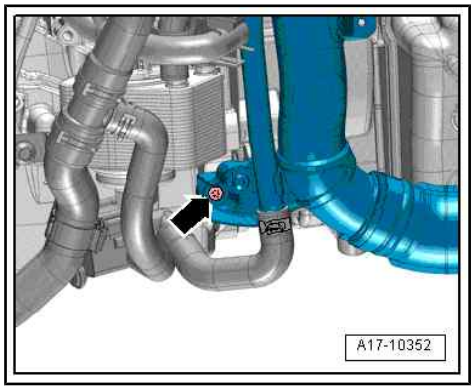
– Remove bolts -arrows-.
– Move coolant hose -3- clear.
– Release hose clip -2-.
– Unplug electrical connector -1- at charge pressure sender - G31- and detach air pipe (right-side).



– Remove bolt -arrow- and push pump for exhaust gas recirculation cooler - V400- to the side.

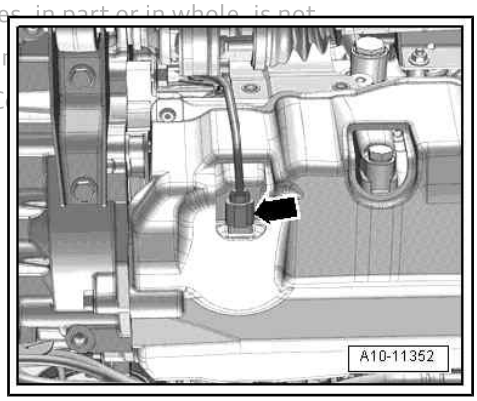
Note

Disregard -items 1, 2, 3-.



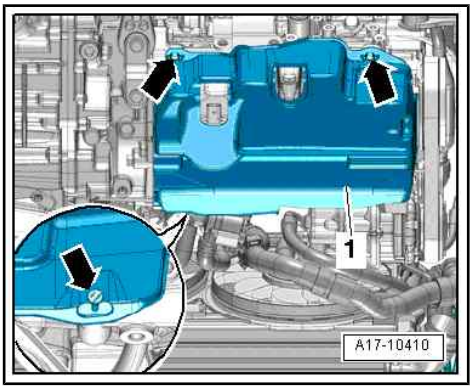
– Remove bolt -arrow- at air pipe (left-side).

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– Unplug electrical connector -arrow- at oil level and oil temperature sender - G266-.

– Release fasteners -arrows- and remove noise insulation -1- for sump.



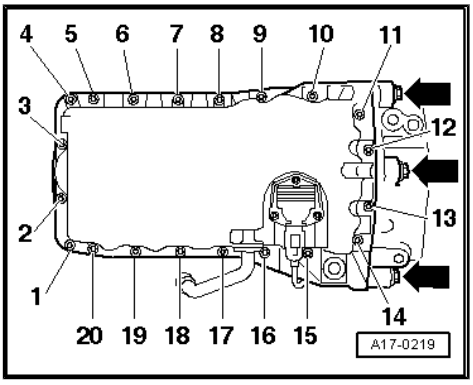
– Remove bolts securing sump to gearbox -arrows-.
– Slacken bolts -1 ... 20- in diagonal sequence and remove.
– Carefully release sump from bonded joint.

Installing

Caution

Protect lubrication system and bearings against contamination.

- ***Cover exposed parts of the engine.***

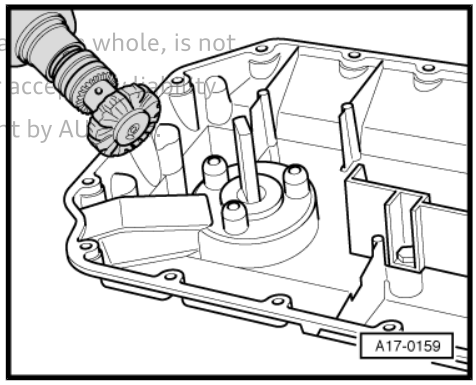


WARNING

Risk of eye injury.

- ***Put on safety goggles.***

– Remove sealant residue from sump and cylinder block using rotating plastic brush or similar.
– Clean sealing surfaces; they must be free of oil and grease.

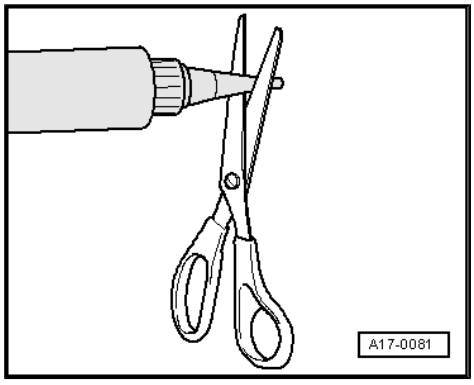


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Note

Note the use-by date of the sealant.

– Cut off nozzle of tube at front marking (nozzle ∅ approx. 2 mm).



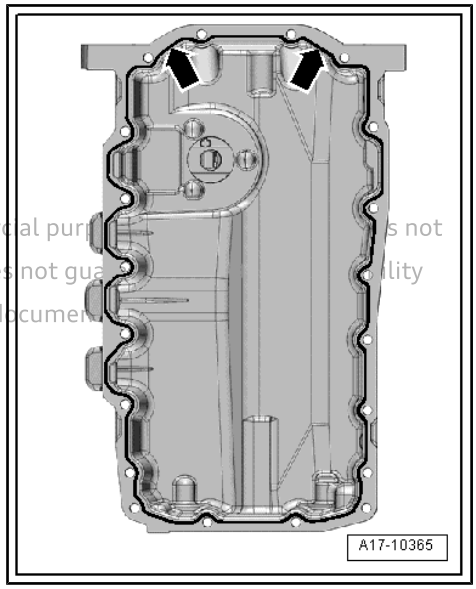
Caution

Make sure lubrication system is not clogged by excess sealant.

- ***The sealant bead must not be thicker than specified.***

– Apply sealant bead onto clean sealing surface of sump as illustrated.

- Thickness of sealant bead: 2 ... 3 mm.



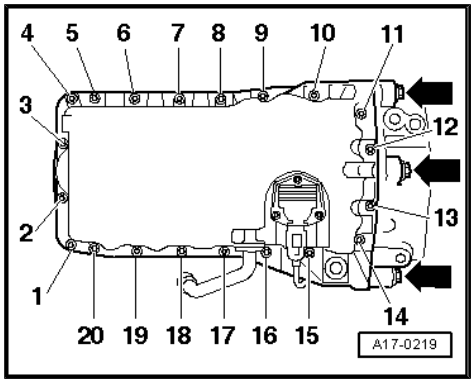
Note

- *Take particular care when applying sealant bead in area of rear sealing flange -arrows-.*
- *The sealant must be installed within 5 minutes after applying the sealant.*

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– Fit sump and tighten bolts ⇒ page 162 .

- The sump must make flush contact with intermediate plate/ gearbox flange.



Note

- *When installing sump with engine removed from vehicle, ensure that sump is positioned flush with cylinder block at flywheel end.*
- *After fitting sump, sealant must dry for approx. 30 minutes. Then (and only then) fill the engine with engine oil.*

– Install pump for exhaust gas recirculation cooler - V400- ⇒ page 211 .

– Install air pipes ⇒ page 252 .

– Install air hoses with screw-type clips ⇒ page 253 .

– Install noise insulation frame (if fitted) and noise insulation ⇒ Rep. gr. 50 .

– Fill with engine oil and check oil level ⇒ Maintenance ; Booklet 808 .

1.4 Removing and installing oil pump

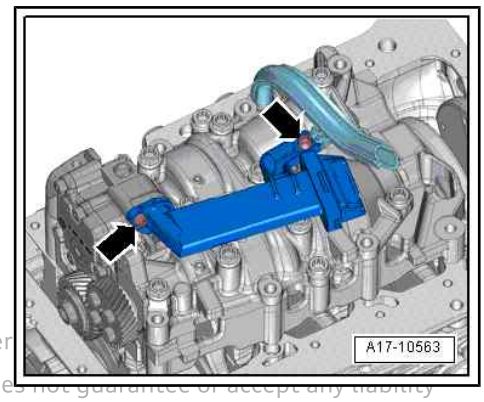
Special tools and workshop equipment required

- Circlip pliers (commercially available)
- M3 bolt

Removing

– Remove sump ⇒ page 164 .

– Remove bolts -arrows- and detach suction pipe from oil pump.

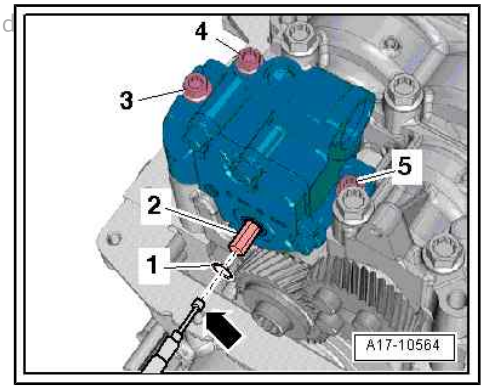


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– Remove circlip -1- using circlip pliers.

– Pull drive shaft -2- out of oil pump using a magnet -arrow-.

– Remove bolts -3, 4, 5- and detach oil pump.



Caution

The bolt on the idler gear must NOT be loosened.

Installing

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

- Tightening torque
  ⇒ "1.1 Exploded view - oil pump, sump - engines with balance shaft assembly", page 160

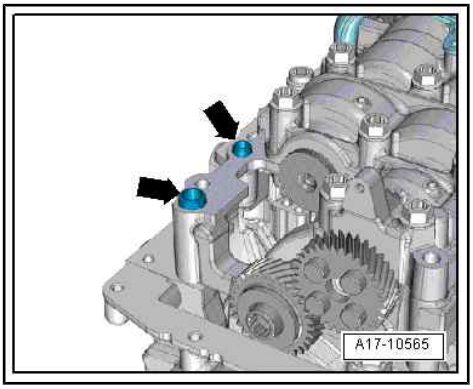
Note

- *Fit new O-ring.*
- *Renew circlip if damaged or stretched.*
- *Circlip must fit securely in groove.*

– Insert dowel sleeves -arrows- in oil pump, if not fitted.

– If no dowel sleeves for centring the oil pump are fitted in the balance shaft assembly, install missing dowel sleeves.

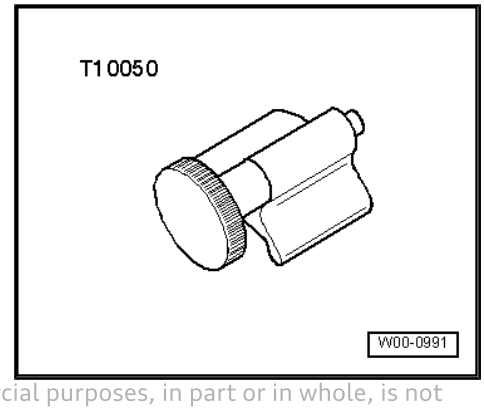
– Install sump ⇒ page 164 .



1.5 Removing balance shaft assembly

Special tools and workshop equipment required

- Crankshaft stop - T10050-



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Procedure

– Pull out oil dipstick.

– Remove vibration damper ⇒ page 69 .

Caution

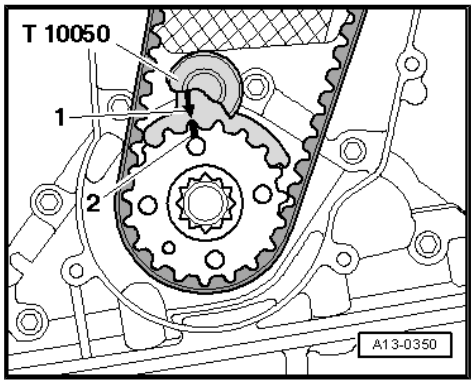
Irreparable damage can be caused if the toothed belt slips.

- ***Only turn crankshaft in direction of engine rotation.***

– Rotate crankshaft by turning bolt for toothed belt sprocket until crankshaft is positioned at “TDC”.

– Lock crankshaft in position with crankshaft stop - T10050- .

- The markings on the sprocket -2- and the crankshaft stop -1- must align -arrow-. The pin of the crankshaft stop must engage in the aperture in the sealing flange.



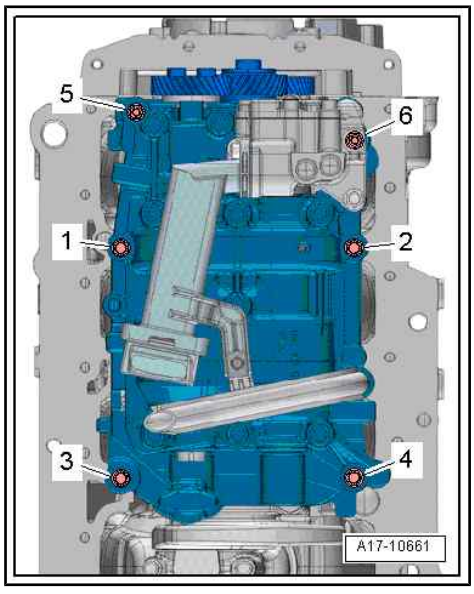
Note

The crankshaft stop can only be pushed onto the sprocket from the front face of the teeth.

– Remove sump ⇒ page 164 .

– Loosen bolts in the sequence -6 ... 1-.

– Remove bolts and detach balance shaft assembly with oil pump.



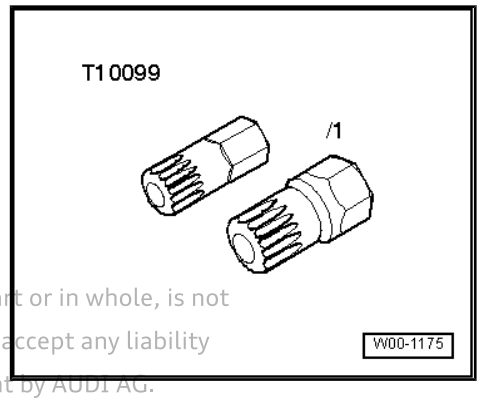
Note

- *Installing a new balance shaft assembly ⇒ page 171 .*
- *Re-installing the "old" balance shaft assembly ⇒ page 174 .*

1.6 Installing a new balance shaft assembly

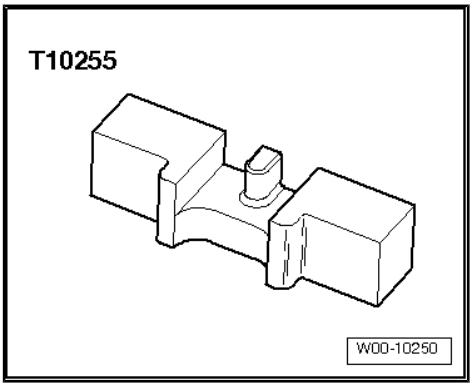
Special tools and workshop equipment required

- Bits - T10099-

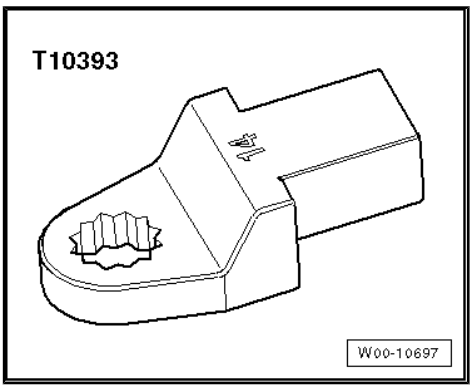


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- Locking tool - T10255-



- Insert tool, 14 mm - T10393-



Procedure

- Tightening torques
  ⇒ “1.1 Exploded view - oil pump, sump - engines with balance shaft assembly”, page 160
- Crankshaft locked in position with crankshaft stop - T10050- .

Note

- *The spur gear drive of the balance shaft assembly must be installed with a specified backlash.*
- *To achieve the correct backlash, a coating is already applied to the new idler gear.*
- *The coating is worn down rapidly and the backlash is then correct.*
- *Therefore, a new balance shaft assembly must always be installed in conjunction with a new idler gear which has the correct coating.*
- *Renew the bolts tightened with specified tightening angle.*

Caution

Thrust washer can slip out of position behind idler gear.

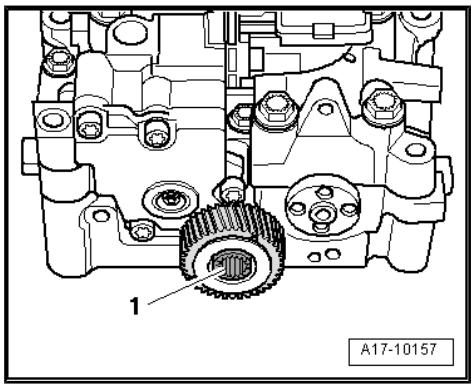
- ***Before positioning balance shaft assembly, slacken off bolt for idler gear as specified below, but not further. Installation position of thrust washer*** ***⇒ page 163***

– Loosen bolt -1- for idler gear approx. 45° using e.g. bits - T10099- and insert tool, 14 mm - T10393- .

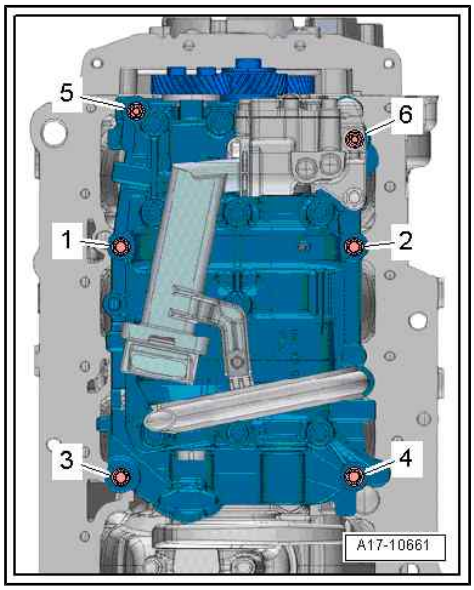
– If not already fitted, fit dowel sleeves into cylinder block for centring balance shaft assembly.

– Attach balance shaft assembly to cylinder block.

• Take care not to damage the coating of the idler gear.



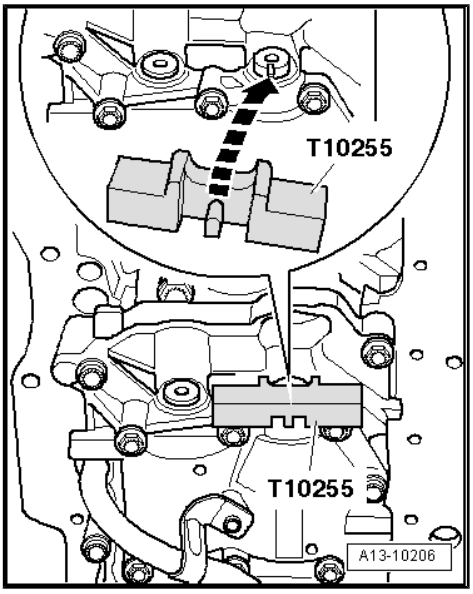
– Tighten bolts securing balance shaft assembly ⇒ page 163 .



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– Lock balance shaft with locking tool - T10255- , turning balance shaft as required.

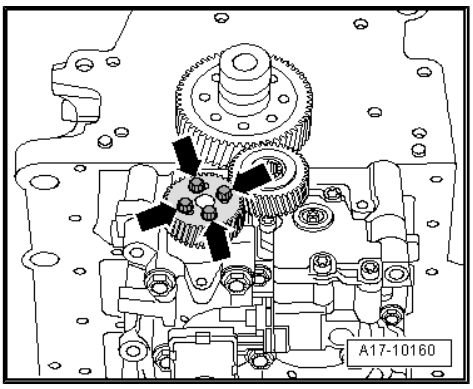
• The lug of the locking tool must engage in the groove of the balance shaft.



– Carefully fit balance shaft gear onto balance shaft; to do so, push idler gear slightly to one side.

• Take care not to damage the coating of the idler gear.

• The threaded holes in the balance shaft should be aligned as centrally as possible with the elongated holes in the balance shaft gear.



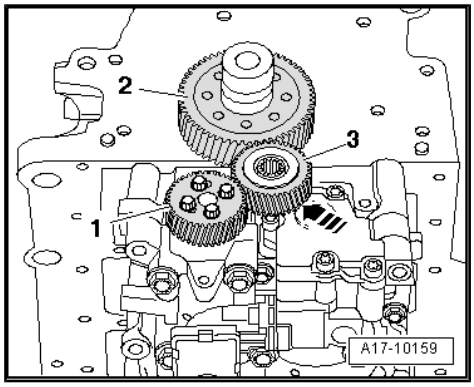
Note

If it is not possible to align the elongated holes in the balance shaft gear with the threaded holes, you must turn the gear some teeth further as required and then fit it again.

– Tighten bolts -arrows- for balance shaft gear.

– Remove locking tool - T10255- .

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Note

The following three steps have to be performed simultaneously (a second mechanic is therefore required):

- Push idler gear -3- firmly in direction of -arrow- into teeth on spur gear -2- and balance shaft gear -1-. If necessary use a wooden rod to do so.
- At the same time, turn balance shaft gear slightly anti-clockwise.
- Tighten bolt securing idler gear.
- Remove crankshaft stop - T10050- .

Note

After installation the idler gear must have no backlash. This can be checked by exerting light pressure by hand.

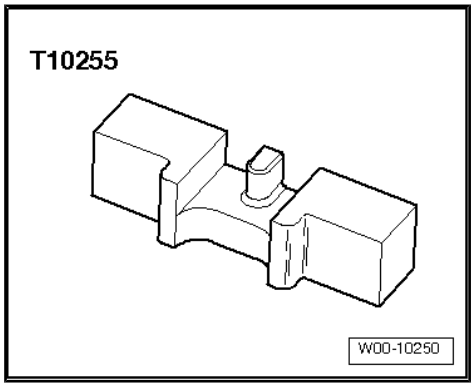
Remaining installation steps are carried out in reverse sequence; note the following:

- Install sump ⇒ page 164 .
- Install vibration damper ⇒ page 69 .

1.7 Re-installing a used balance shaft assembly

Special tools and workshop equipment required

- Locking tool - T10255-



Procedure

Note

- *If re-installing the "old" balance shaft assembly and neither the spur gear on the crankshaft nor the crankshaft itself have been renewed, proceed as described in the following. It is also essential that the idler gear has NOT been slackened.*
- *If the bolt for the idler gear has been slackened or the spur gear on the crankshaft or the crankshaft itself have been renewed, you must install a new idler gear with the appropriate coating. Procedure for installation ⇒ "1.6 Installing a new balance shaft assembly", page 171 .*
- *Renew the bolts tightened with specified tightening angle.*

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– Lock balance shaft with locking tool - T10255- , turning balance shaft as required.

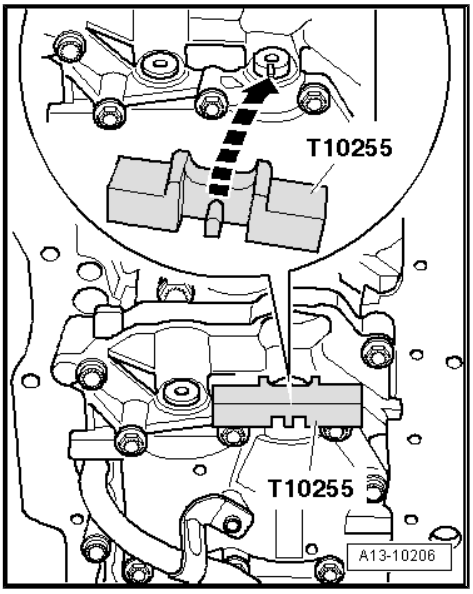
• The lug of the locking tool must engage in the groove of the balance shaft.

– If not already fitted, fit dowel sleeves for centring balance shaft assembly in cylinder block.

– Attach balance shaft assembly to cylinder block.

• With the balance shaft locked in position, the idler gear must engage in the spur gear on the crankshaft.

• Idler gear must have noticeable backlash.



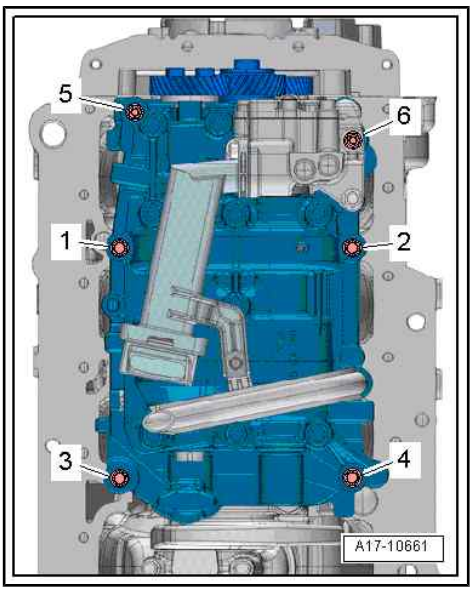
– Tighten bolts securing balance shaft assembly ⇒ page 163 .

– Remove crankshaft stop - T10050- .

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

– Install sump ⇒ page 164 .

– Install vibration damper ⇒ page 69 .



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2 Exploded view - oil pump, sump - engines without balance shaft assembly

Overview

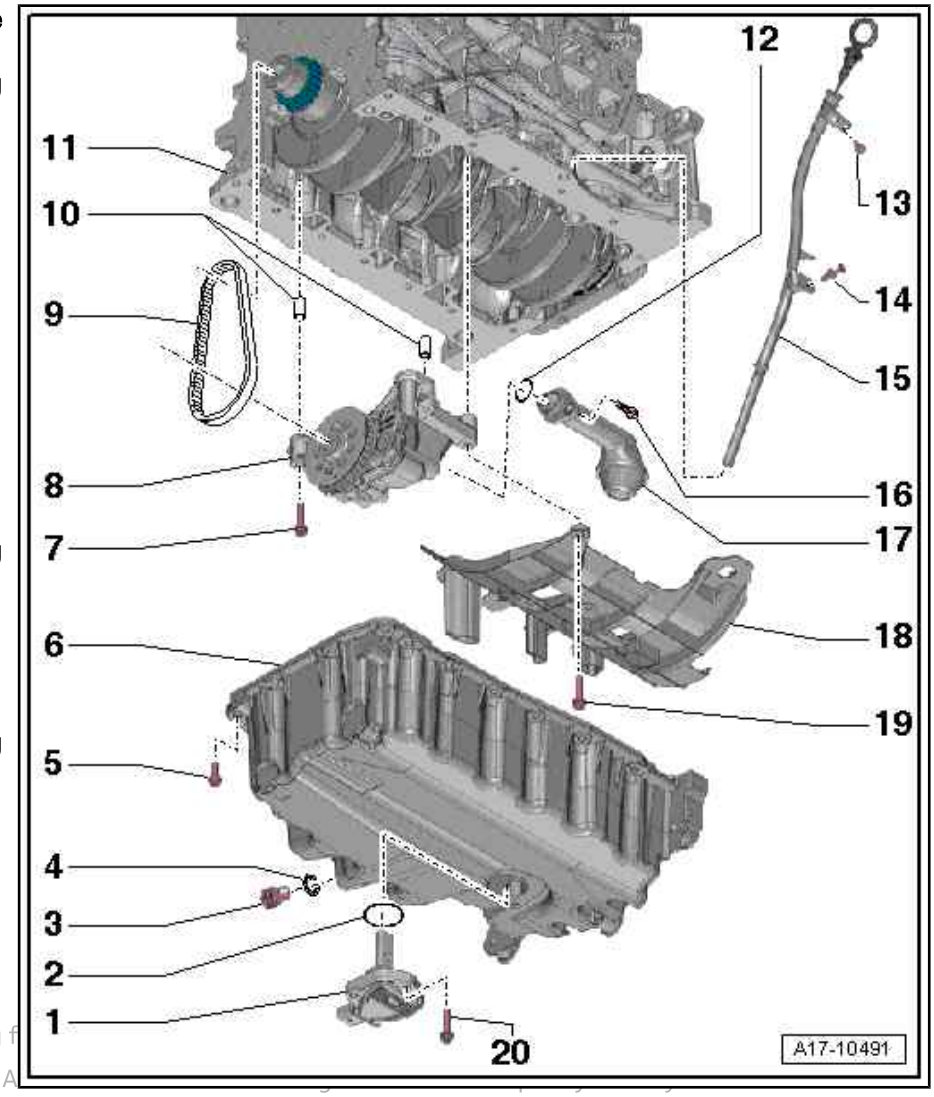
- ⇒ “2.1 Exploded view - oil pump, sump - engines without balance shaft assembly”, page 176
- ⇒ “2.2 Removing and installing oil level and oil temperature sender G266 ”, page 178
- ⇒ “2.3 Removing and installing sump”, page 179
- ⇒ “2.4 Removing and installing oil pump”, page 184

Note

- *If large quantities of metal shavings or abrasion are found when performing engine repairs, this may be an indication of damage to the crankshaft or conrod bearings. To prevent further damage, the following steps are required after completion of repair work: clean the oil passages carefully and renew the oil spray jets, engine oil cooler and oil filter.*
- *Oil capacities, oil specifications and viscosity grades ⇒ Maintenance tables .*
- *Oil spray jet and pressure relief valve ⇒ page 100*

2.1 Exploded view - oil pump, sump - engines without balance shaft assembly

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1 - Oil level and oil temperature sender - G266-

- ❑ Removing and installing ⇒ page 178

2 - O-ring

- ❑ Renew

3 - Oil drain plug

- ❑ 30 Nm

4 - Seal

- ❑ Renew

5 - Bolt

- ❑ Tightening torque and sequence ⇒ page 178

6 - Sump

- ❑ Removing and installing ⇒ page 179

7 - Bolt

- ❑ 16 Nm

8 - Oil pump

- ❑ Removing and installing ⇒ page 184

9 - Toothed belt

10 - Dowel sleeves

11 - Cylinder block

12 - O-ring

- ❑ Renew

13 - Bolt

- ❑ 9 Nm

14 - Clip

15 - Dipstick guide tube

16 - Bolt

- ❑ 9 Nm

17 - Oil intake pipe

18 - Baffle plate

19 - Bolt

- ❑ 16 Nm

20 - Bolt

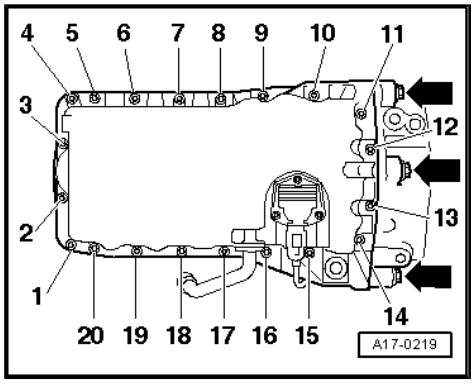
- ❑ Self-locking
- ❑ Renew
- ❑ 9 Nm

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Sump - tightening torque and sequence

– Tighten bolts in 3 stages as follows:

Stage	Bolts	Tightening torque
1.	-1 … 20-	5 Nm in diagonal sequence
2.	-arrows-	40 Nm
3.	-1 … 20-	Tighten in stages and in diagonal sequence; final torque 13 Nm

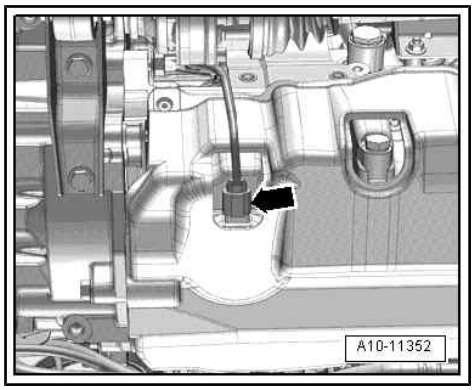


2.2 Removing and installing oil level and oil temperature sender - G266-

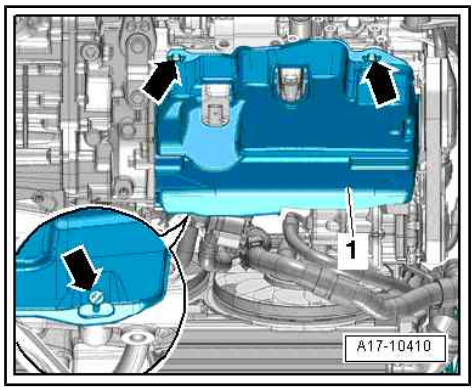
Removing

– Drain off engine oil ⇒ Maintenance ; Booklet 808 .

– Unplug electrical connector -arrow- at oil level and oil temperature sender - G266- .

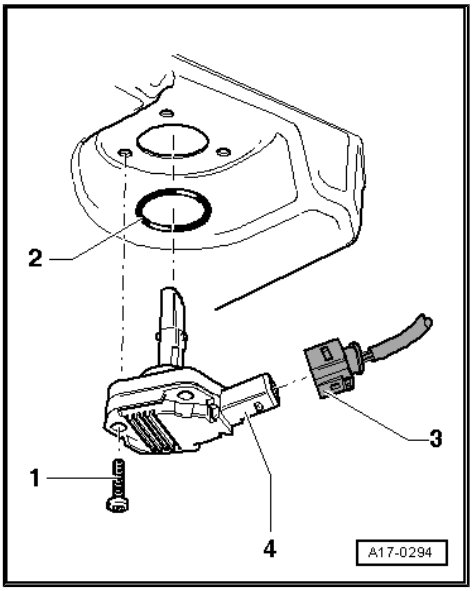


– Release fasteners -arrows- and remove noise insulation -1- for sump.



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– Remove bolts -1- and detach oil level and oil temperature sender - G266- -item 4-.



Note

Disregard -item 3-.

Installing

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

- Tightening torque
⇒ “2.1 Exploded view - oil pump, sump - engines without balance shaft assembly”, page 176

Note

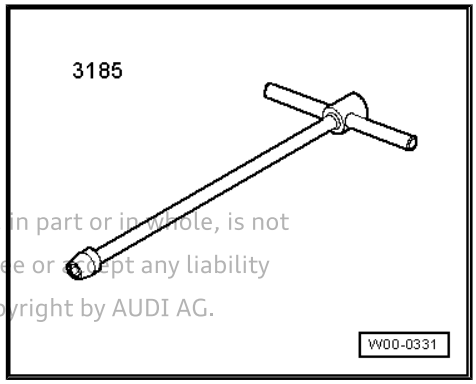
Renew seal -2- and self-locking bolts -1-.

– Fill with engine oil and check oil level ⇒ Maintenance ; Booklet 808 .

2.3 Removing and installing sump

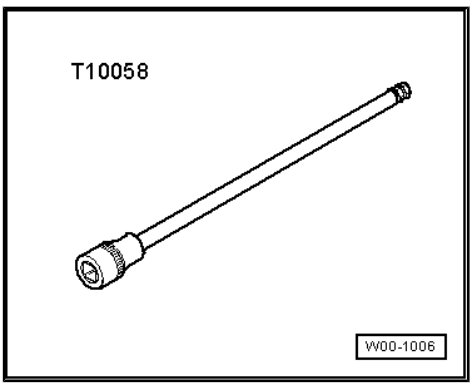
Special tools and workshop equipment required

♦ Articulated wrench, 10 mm - 3185-



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♦ Socket - T10058-



♦ Electric drill with plastic brush

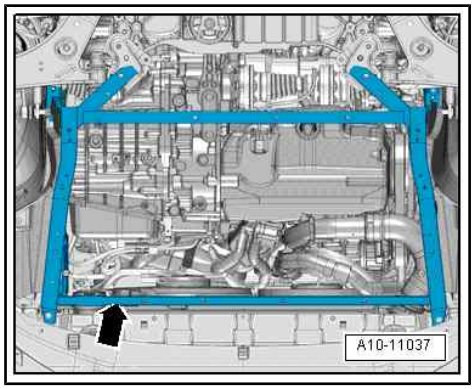
♦ Sealant ⇒ Electronic parts catalogue

♦ Safety goggles

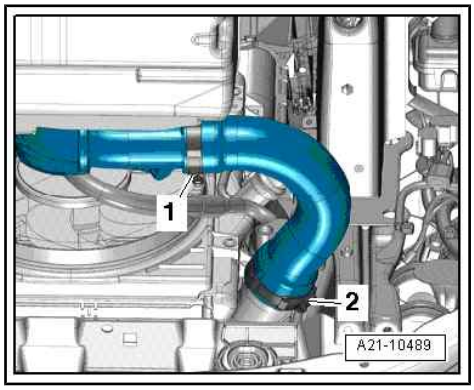
Removing

– Drain off engine oil ⇒ Maintenance ; Booklet 808 .

– A3 Cabriolet: Remove noise insulation frame -arrow- ⇒ Rep. gr. 50 .



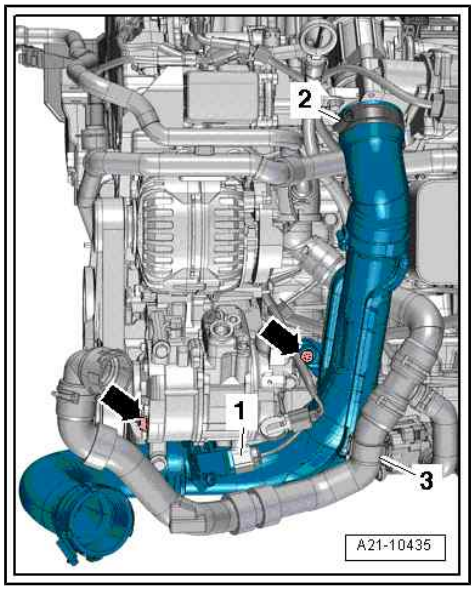
– Release hose clips -1- and -2- and remove air hose.



WARNING

Risk of injury as the radiator fans may start up automatically.

- *Even when the ignition is switched off, the radiator fans can start up without warning due to accumulated heat in the engine compartment, etc.*



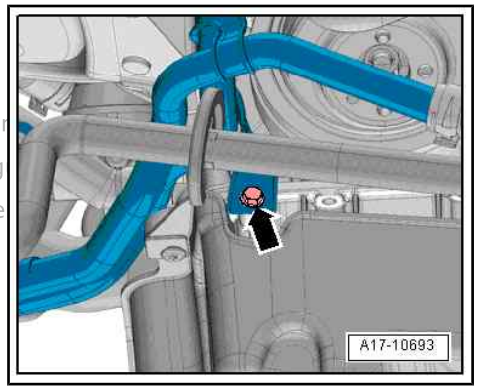
– Remove bolts -arrows-.

– Move coolant hose -3- clear.

– Release hose clip -2-.

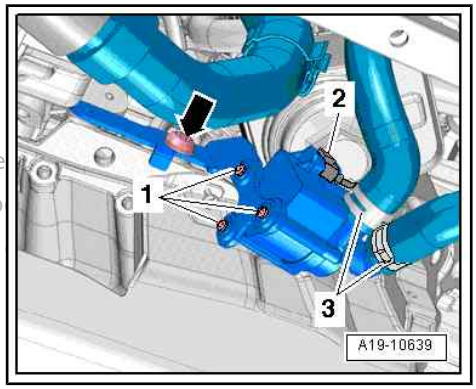
– Unplug electrical connector -1- at charge pressure sender - G31- / intake air temperature sender - G42- and detach air pipe (right-side).

– Vehicles with auxiliary heater: remove bolt -arrow- for coolant pipes (right-side).



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– Remove bolt -arrow- and push pump for exhaust gas recirculation cooler - V400- to the side.

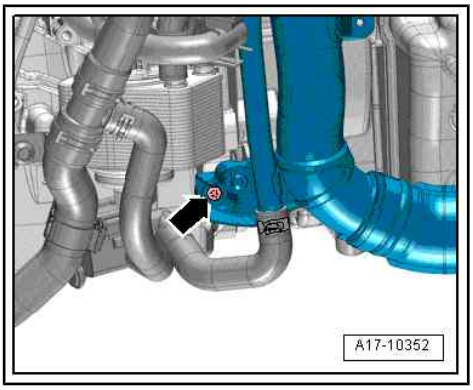


Note

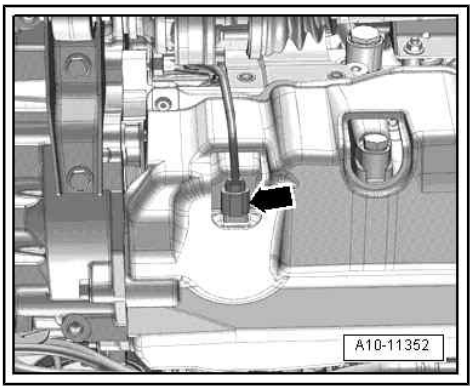
Disregard -items 1, 2, 3-.

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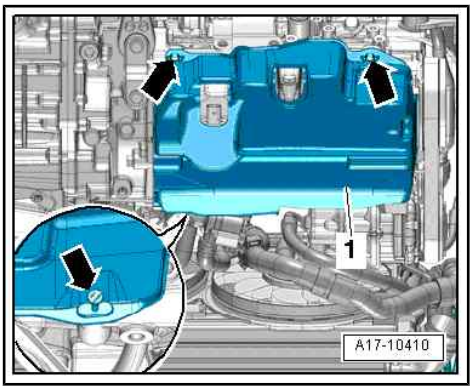
– Remove bolt -arrow- at air pipe (left-side).



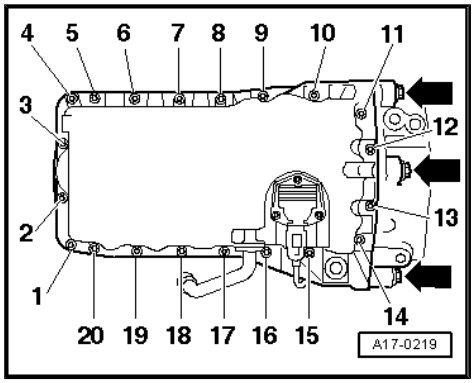
– Unplug electrical connector -arrow- at oil level and oil temperature sender - G266- .



– Release fasteners -arrows- and remove noise insulation -1- for sump.



– Remove bolts securing sump to gearbox -arrows-.
– Slacken bolts -1 ... 20- in diagonal sequence and remove.
– Carefully release sump from bonded joint.



Installing

Caution

Protect lubrication system and bearings against contamination.

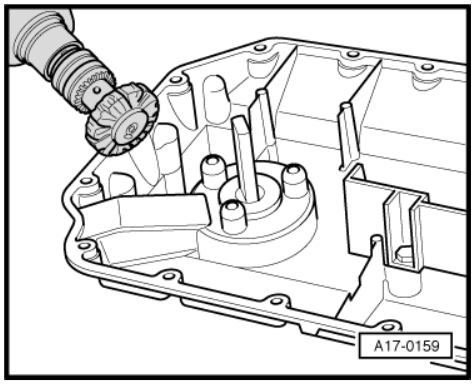
- *Cover exposed parts of the engine.*

WARNING

Risk of eye injury.

- *Put on safety goggles.*

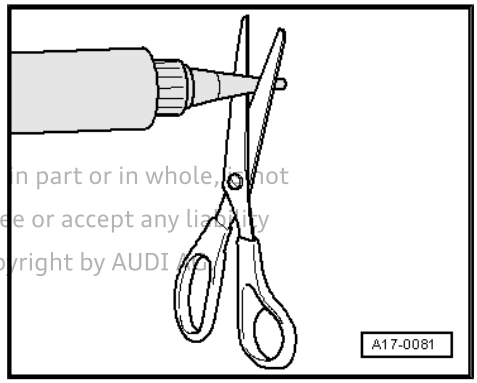
– Remove sealant residue from sump and cylinder block using rotating plastic brush or similar.
– Clean sealing surfaces; they must be free of oil and grease.



Note

Note the use-by date of the sealant.

– Cut off nozzle of tube at front marking (nozzle ∅ approx. 2 mm).



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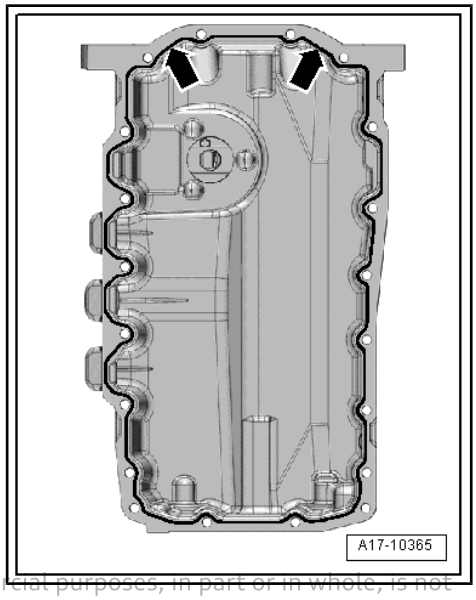
Caution

Make sure lubrication system is not clogged by excess sealant.

- *The sealant bead must not be thicker than specified.*

– Apply sealant bead onto clean sealing surface of sump as illustrated.

- Thickness of sealant bead: 2 ... 3 mm.



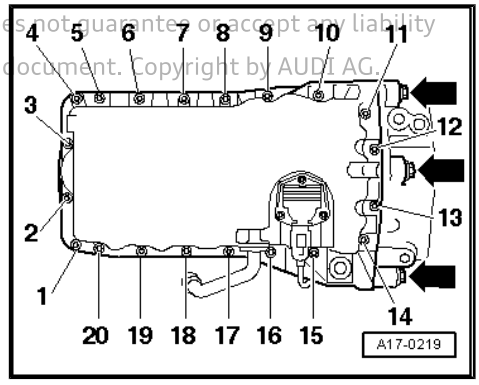
Note

- *Take particular care when applying sealant bead in area of rear sealing flange -arrows-.*
- *The sump must be installed within 5 minutes after applying the sealant.*

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– Fit sump and tighten bolts ⇒ page 178 .

- The sump must make flush contact with intermediate plate/ gearbox flange.



Note

- *When installing sump with engine removed from vehicle, ensure that sump is positioned flush with cylinder block at flywheel end.*
- *After fitting sump, sealant must dry for approx. 30 minutes. Then (and only then) fill the engine with engine oil.*

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

Note

- *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

– Install pump for exhaust gas recirculation cooler - V400- ⇒ page 211 .

– Vehicles with auxiliary heater: secure coolant pipes (right-side) ⇒ page 213 .

– Install air pipes ⇒ page 252 .

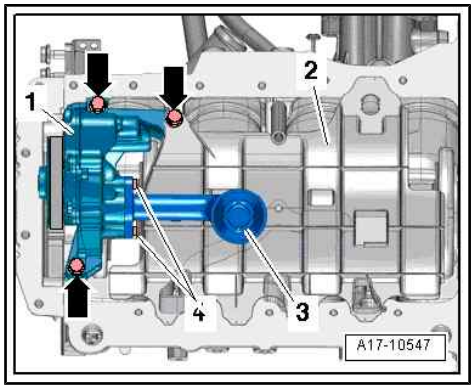
– Install air hoses with screw-type clips ⇒ page 253 .

– Install noise insulation frame (if fitted) and noise insulation ⇒ Rep. gr. 50 .

– Fill with engine oil and check oil level ⇒ Maintenance ; Booklet 808 .

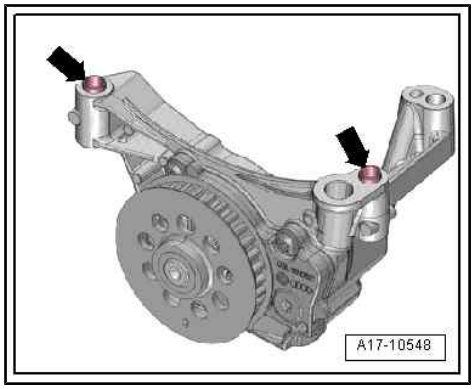
2.4 Removing and installing oil pump

Removing



– Remove sump ⇒ page 179 .
– Remove bolts -4- and detach oil intake pipe -3- if oil pump must be renewed.
– Unscrew bolts -arrows- and remove baffle plate -2-.
– Disengage oil pump -1- from toothed belt and detach.

Installing



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

- Tightening torques
  ⇒ “2.1 Exploded view - oil pump, sump - engines without balance shaft assembly”, page 176

Note

Fit new O-ring.

– If no dowel sleeves -arrows- for centring the oil pump are fitted in the oil pump housing, install missing dowel sleeves.
– Turn toothed belt sprocket by hand to check oil pump for ease of movement.

Note

Renew oil pump if resistance can be felt.

– Check toothed belt for oil pump.

Note

- *Renew toothed belt if damaged.*
- *It is normal that the toothed belt is slack after a certain running period; this is not a fault.*

– Engage oil pump with toothed belt sprocket into toothed belt and secure together with baffle plate.
– Install sump ⇒ page 179 .
– Fill with engine oil and check oil level ⇒ Maintenance ; Booklet 808 .

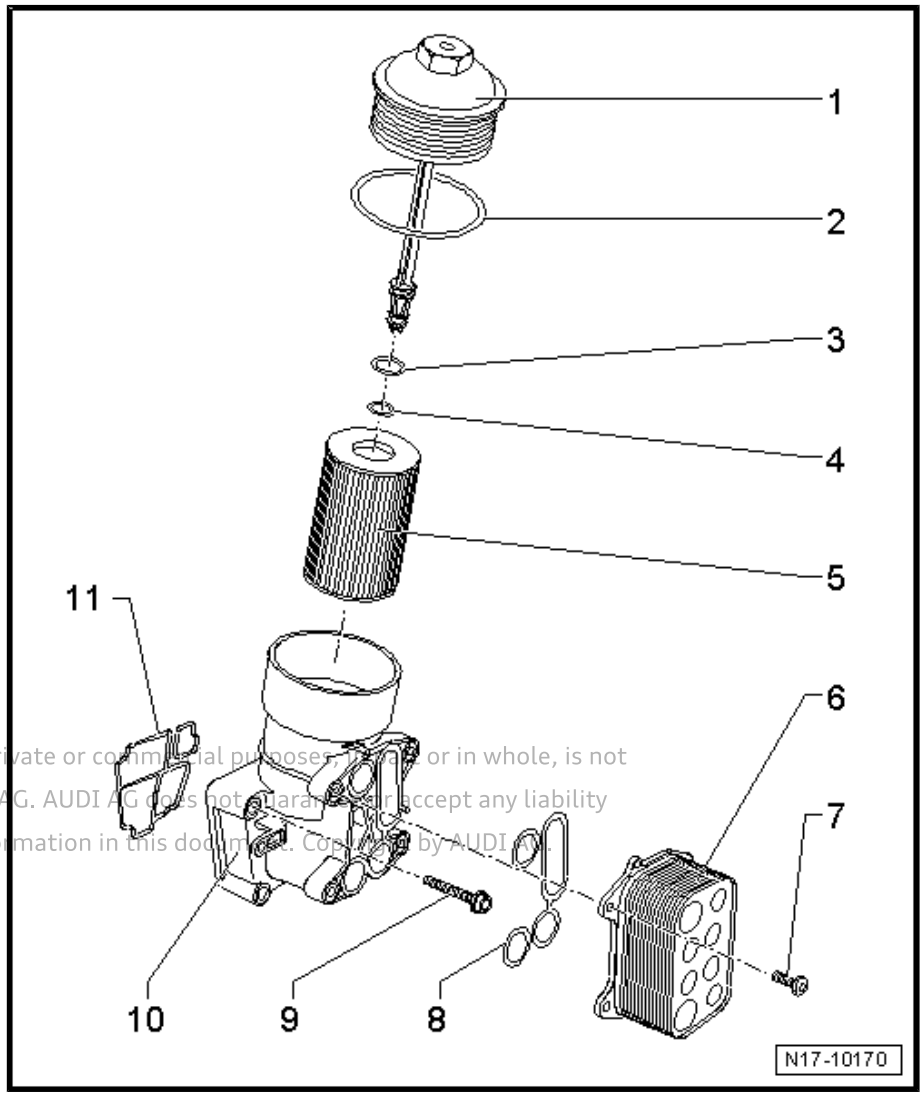
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3 Oil filter bracket and engine oil cooler

Overview

- ⇒ “3.1 Exploded view - oil filter bracket and engine oil cooler”, page 185
- ⇒ “3.2 Removing and installing oil filter bracket with engine oil cooler”, page 186
- ⇒ “3.3 Removing and installing oil pressure switch F1 ”, page 189
- ⇒ “3.4 Checking oil pressure switch F1 ”, page 190
- ⇒ “3.5 Checking oil pressure”, page 192
- ⇒ “3.6 Engine oil”, page 192
- ⇒ “3.7 Checking oil level”, page 192

3.1 Exploded view - oil filter bracket and engine oil cooler



1 - Sealing cap
- ❑ 25 Nm

2 - O-ring
- ❑ Renew

3 - O-ring
- ❑ Renew

4 - O-ring
- ❑ Renew

5 - Oil filter element
- ❑ See note ⇒ page 160
- ❑ Removing and installing ⇒ Maintenance ; Booklet 808

6 - Engine oil cooler
- ❑ See note ⇒ page 160
- ❑ Connection diagram - coolant hoses ⇒ page 193
- ❑ Removing and installing ⇒ “3.2 Removing and installing oil filter bracket with engine oil cooler”, page 186
- ❑ If renewed, refill system with fresh coolant

7 - Bolt
- ❑ 11 Nm

8 - Gaskets
- ❑ Renew

9 - Bolt
- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 186

10 - Oil filter bracket
- ❑ With integrated oil retention valve

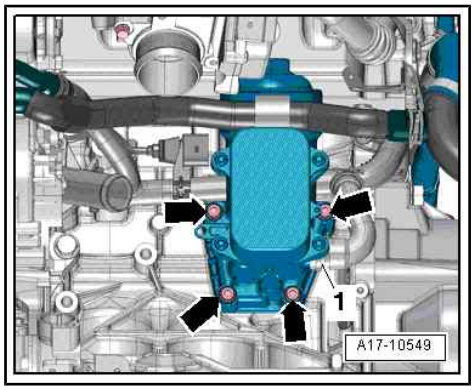
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❑ Removing and installing
⇒ “3.2 Removing and installing oil filter bracket with engine oil cooler”, page 186

11 - Gaskets

❑ Renew

Oil filter bracket - tightening torque and sequence



Note

Renew the bolts tightened with specified tightening angle.

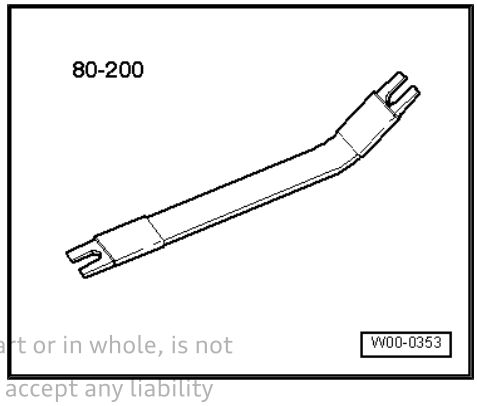
– Fit bolts at top left and bottom right first.
– Tighten bolts in 2 stages as follows:

Stage	Bolts	Tightening torque/angle specification
1.	-arrows-	14 Nm in diagonal sequence
2.	-arrows-	Turn 90° further in diagonal sequence

3.2 Removing and installing oil filter bracket with engine oil cooler

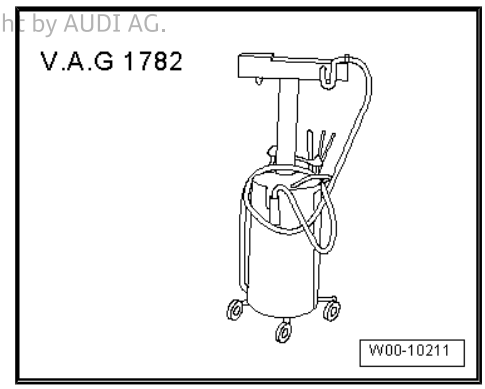
Special tools and workshop equipment required

♦ Removal lever - 80 - 200-

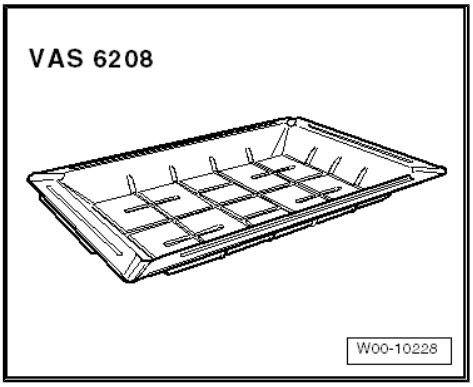


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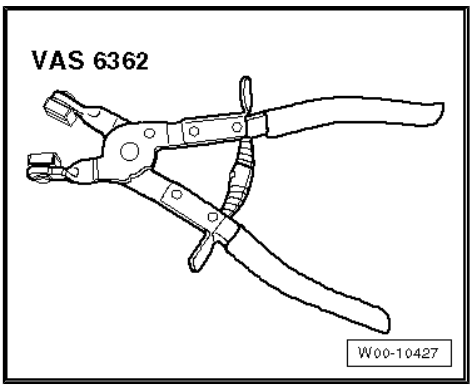
♦ Used oil collection and extraction unit - V.A.G 1782-



♦ Drip tray for workshop hoist - VAS 6208-



♦ Hose clip pliers - VAS 6362-

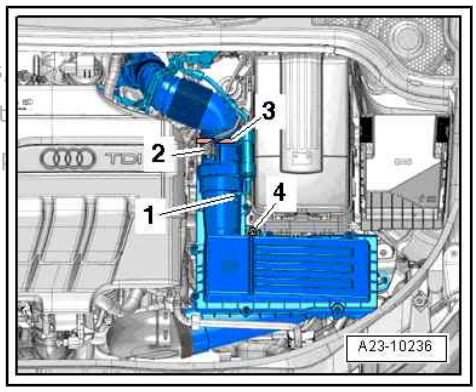


Removing

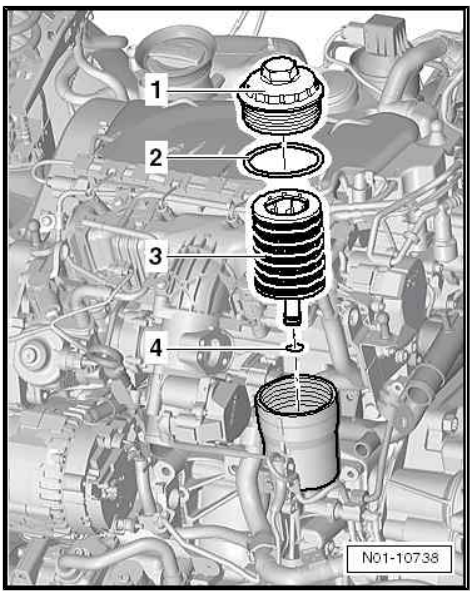
– Drain coolant ⇒ page 195 .

– Remove radiator cowl ⇒ page 234 .

– Remove air cleaner housing ⇒ Rep. gr. 23 .



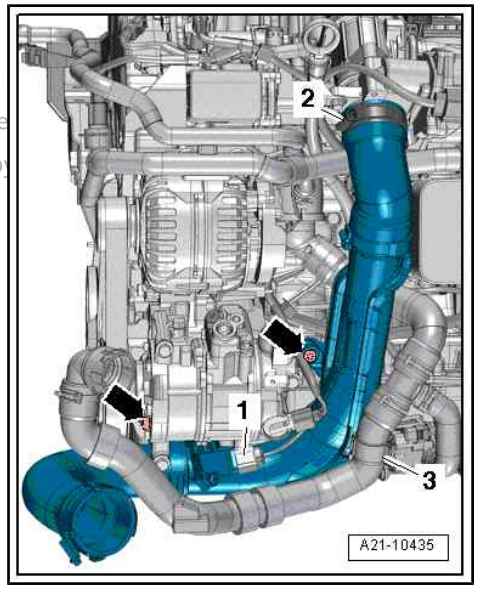
– Remove oil filter element ⇒ Maintenance ; Booklet 808 .



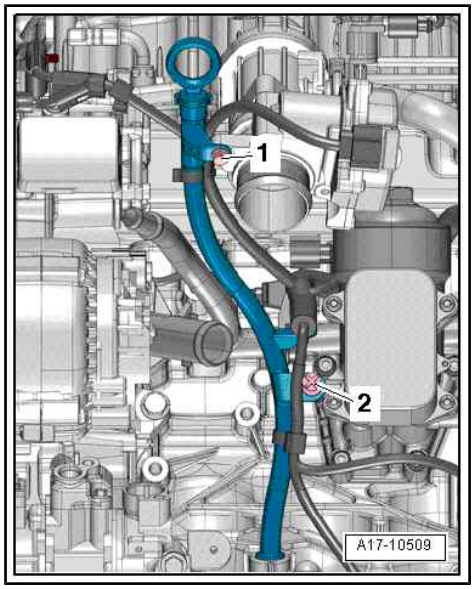
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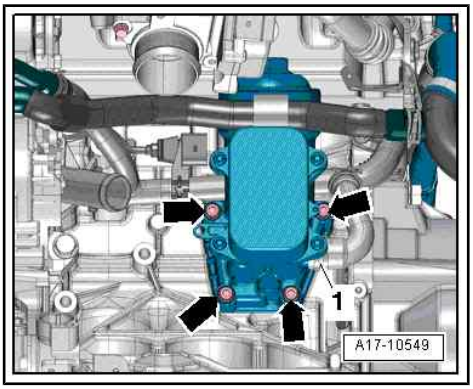
– Remove bolts -arrows-.
– Move coolant hose -3- clear.
– Release hose clip -2-.
– Unplug electrical connector -1- at charge pressure sender - G31- / intake air temperature sender - G42- and detach air pipe (right-side).



– Pull oil dipstick out slightly and remove bolt -1-.
– Release clip -2- with removal lever - 80 - 200- .
– Pull guide tube for oil dipstick upwards out of cylinder block and push to one side.



– Place drip tray for workshop hoist - VAS 6208- under connection.
– Release hose clip -1- and detach coolant hose.
– Position used oil collection and extraction unit - V.A.G 1782- below engine.
– Unscrew bolts -arrows- and remove oil filter bracket with engine oil cooler.



Installing

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

- Tightening torques
⇒ "3.1 Exploded view - oil filter bracket and engine oil cooler", page 185

Note

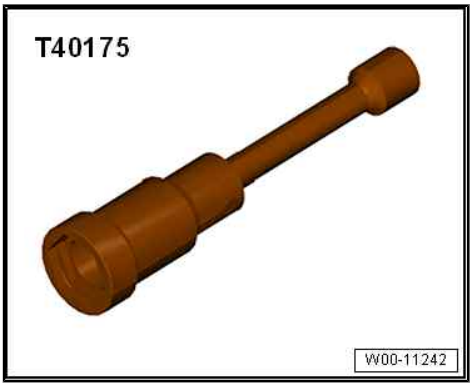
- *Renew gaskets, seals and O-rings.*
- *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

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– Install dipstick guide tube ⇒ page 160 .
– Install air pipe ⇒ page 252 .
– Install air hoses with screw-type clips ⇒ page 253 .
– Install air cleaner housing ⇒ Rep. gr. 23 .
– Install radiator cowl ⇒ page 234 .
– Install oil filter element, fill up with engine oil and check oil level ⇒ Maintenance ; Booklet 808 .
– Fill up cooling system (or change coolant if the engine oil cooler has been renewed) ⇒ page 198 .

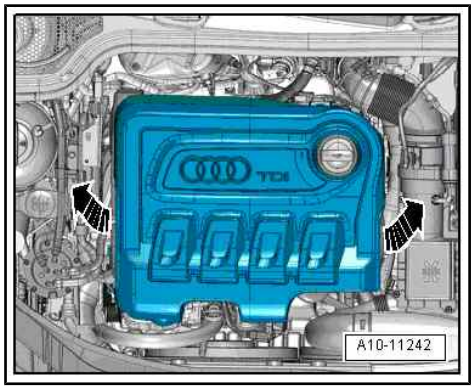
3.3 Removing and installing oil pressure switch - F1-

Articulated wrench, 24 mm - T40175-

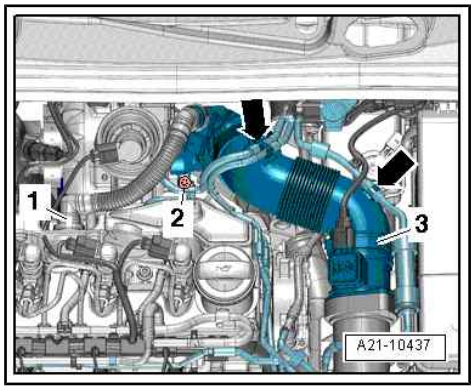


Removing

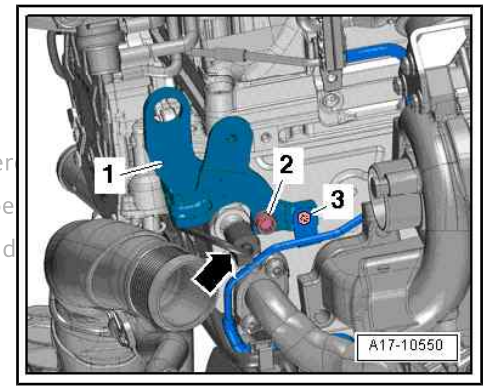
– Remove engine cover panel -arrows-.



– Press release tabs and detach crankcase breather hose -1-.
– Move clear vacuum hoses -arrows-.
– Release hose clip -3- and detach air pipe from air cleaner housing.
– Remove bolt -2-, swivel intake pipe with pulsation damper to rear and detach from turbocharger.



– Remove bolts -2- and -3- and detach engine lifting eye -1-.
– Unplug electrical connector -arrow-.
– Unscrew oil pressure switch - F1- .



Installing

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

– Renew seal for oil pressure switch - F1- after removal.
– Cut seal open to renew.

Tightening torques

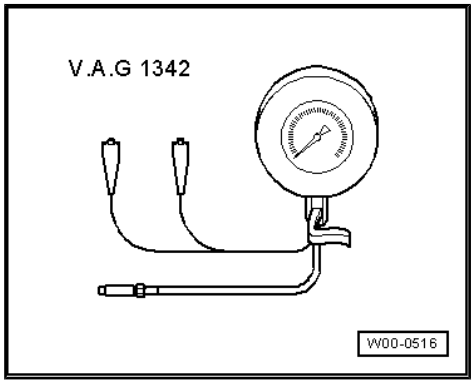
◆ ⇒ “2.4 Exploded view - cylinder head”, page 122

– Install vacuum line to exhaust gas recirculation cooler ⇒ page 282 .
– Install pulsation damper ⇒ page 240 .

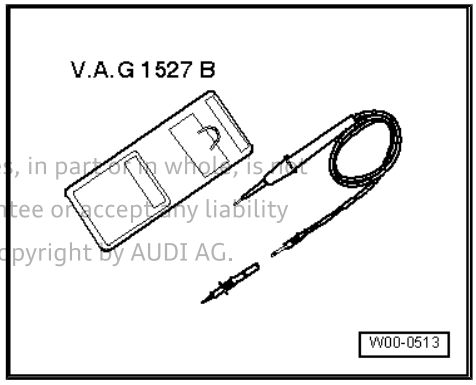
3.4 Checking oil pressure switch - F1-

Special tools and workshop equipment required

◆ Oil pressure tester - V.A.G 1342-

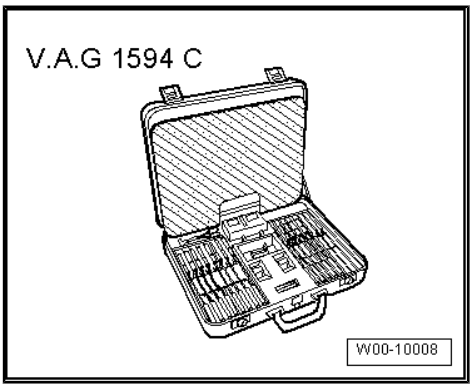


♦ Voltage tester - V.A.G 1527B-



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♦ Auxiliary measuring set - V.A.G 1594C-



Procedure

- Oil level OK

– Remove oil pressure switch - F1- ⇒ page 189 .

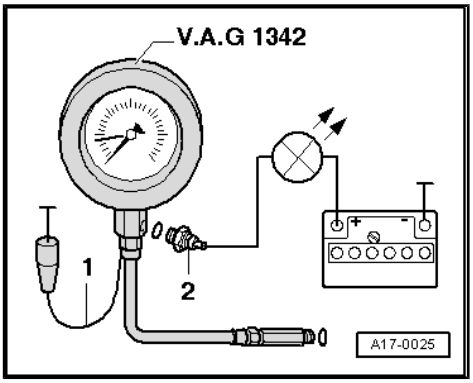
– Connect oil pressure tester - V.A.G 1342- to bore for oil pressure switch.

– Screw a used oil pressure switch into hole -item 2- on oil pressure tester - V.A.G 1342- to seal hole.

– Connect brown wire -1- of oil pressure tester to earth (–).

– Connect voltage tester - V.A.G 1527B- with adapter lead from auxiliary measuring set - V.A.G 1594C- to oil pressure switch - F1- and battery positive (+).

- LED should not light up.



Note

Renew oil pressure switch - F1- if LED lights up at this stage.

– Start engine.

Note

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

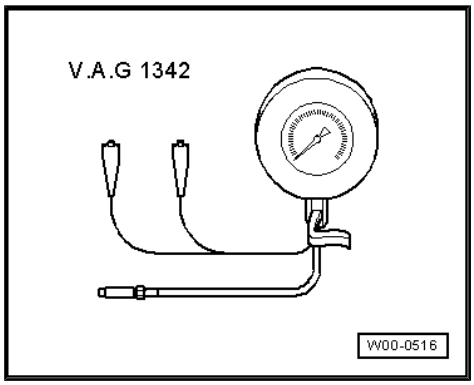
- LED should light up at 0.3 ... 0.6 bar.

– Renew oil pressure switch - F1- if LED does not light up ⇒ page 189 .

3.5 Checking oil pressure

Special tools and workshop equipment required

- Oil pressure tester - V.A.G 1342-



Procedure

- Oil level OK

– Remove oil pressure switch - F1- ⇒ page 189 .

– Connect oil pressure tester - V.A.G 1342- to threaded hole for oil pressure switch - F1- .

– Screw a used oil pressure switch into threaded hole on oil pressure tester - V.A.G 1342- to seal hole.

– Start engine.

- Oil pressure when starting and then at idling speed: at least 0.6 bar

If specification is not obtained, switch off engine immediately and check oil pump drive, renew oil pump if necessary ⇒ “1.4 Removing and installing oil pump”, page 169 .

If specification is obtained, let engine warm up.

- Oil pressure specification at operating temperature and 2000 rpm: at least 1.0 bar

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3.6 Engine oil

Oil capacities, oil specifications and viscosity grades ⇒ Maintenance tables .

3.7 Checking oil level

Check oil level ⇒ Maintenance ; Booklet 808 .

19 – Cooling

1 Cooling system

Overview

- ⇒ “1.1 Connection diagram - coolant hoses”, page 193
- ⇒ “1.2 Draining and filling cooling system”, page 195
- ⇒ “1.3 Checking cooling system for leaks”, page 202

WARNING

Risk of scalding due to hot steam and hot coolant.

- *The cooling system is under pressure when the engine is hot.*
- *To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.*

Note

- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *The arrow markings on coolant pipes and on ends of hoses must align.*

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1.1 Connection diagram - coolant hoses

1 - Radiator

- ❑ If renewed, refill system with fresh coolant

2 - Pump for exhaust gas recirculation cooler - V400-

3 - Engine oil cooler

4 - 4/2-way valve

- ❑ Removing and installing ⇒ page 206

5 - Coolant pump

6 - Cylinder head and cylinder block

- ❑ If renewed, refill system with fresh coolant

7 - Coolant expansion tank

- ❑ With filler cap
- ❑ Checking pressure relief valve in filler cap ⇒ page 204

8 - Exhaust gas recirculation cooler

9 - Auxiliary heater

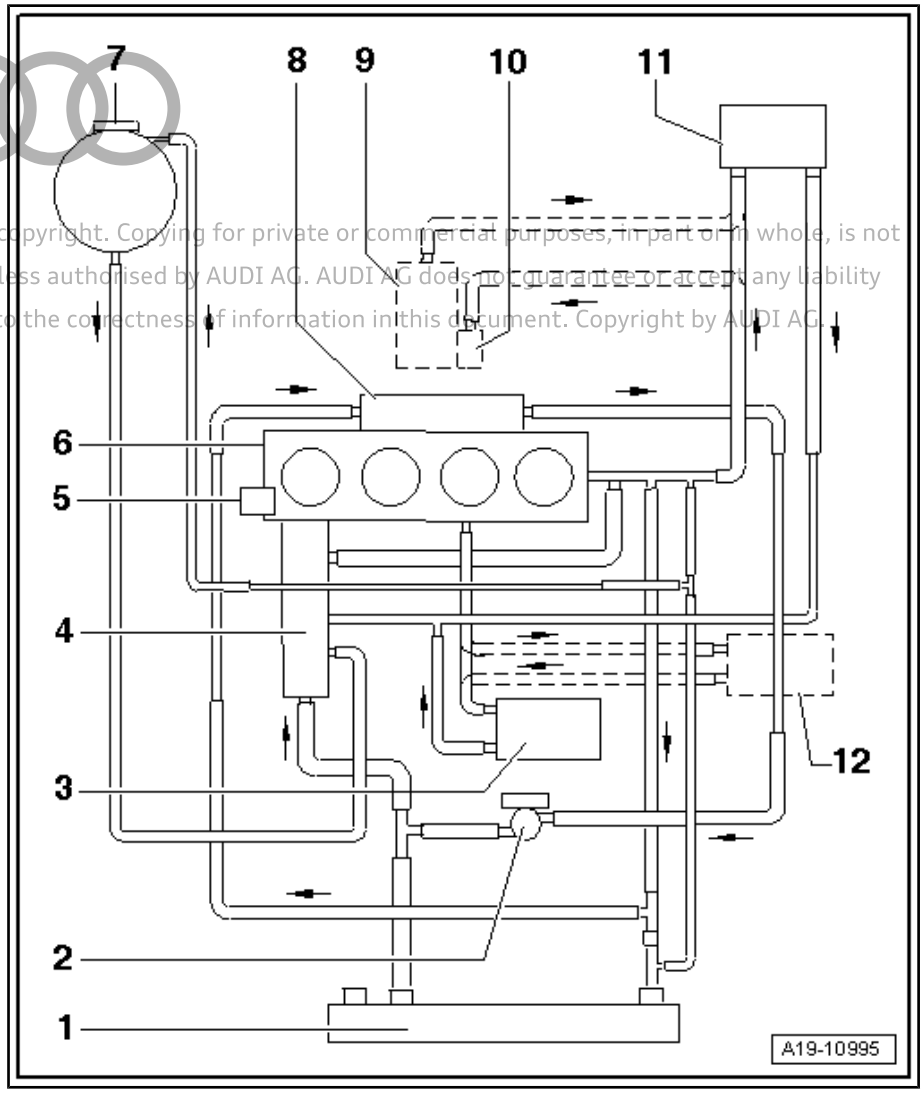
10 - Circulation pump - V55-

11 - Heat exchanger for heater

- ❑ If renewed, refill system with fresh coolant

12 - Gear oil cooler

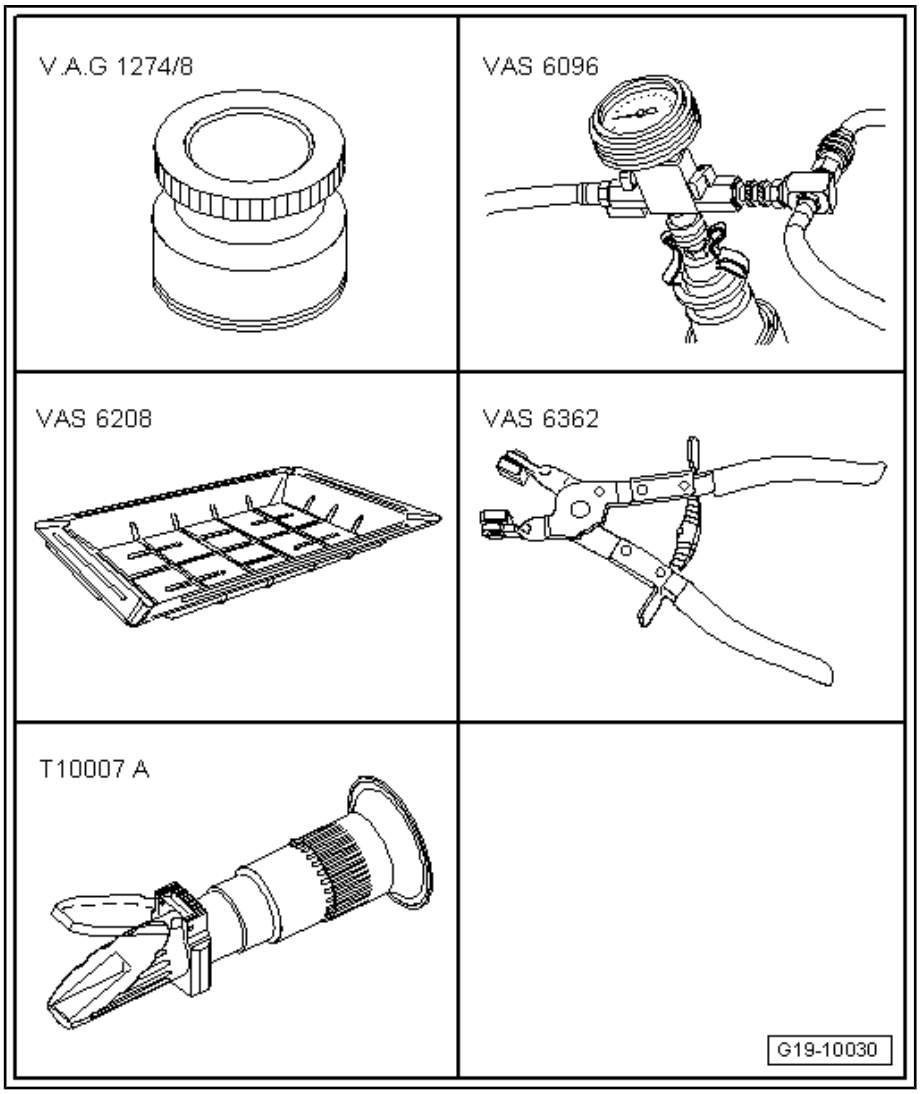
- ❑ For dual clutch gearbox
- ❑ If renewed, refill system with fresh coolant



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1.2 Draining and filling cooling system

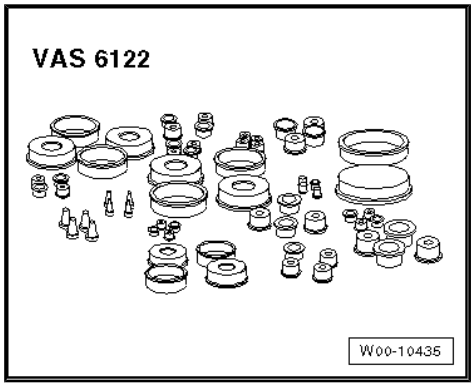
Special tools and workshop equipment required



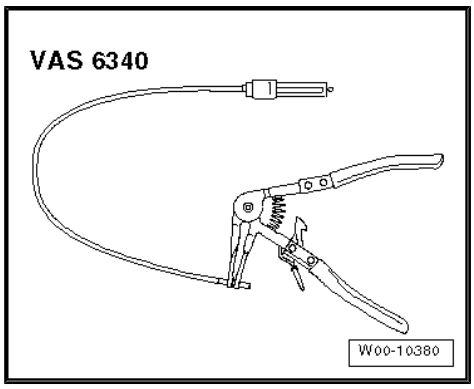
- Adapter for cooling system tester - V.A.G 1274/8-
- Cooling system charge unit - VAS 6096-
- Drip tray for workshop hoist - VAS 6208-
- Hose clip pliers - VAS 6362-
- Refractometer - T10007 A-

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- Engine bung set - VAS 6122-



- Hose clip pliers - VAS 6340-



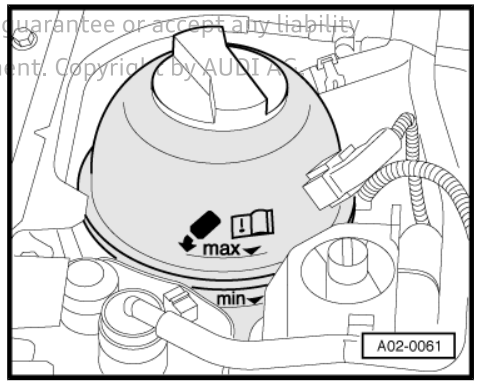
- Safety goggles
- Protective gloves

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Draining

Note

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



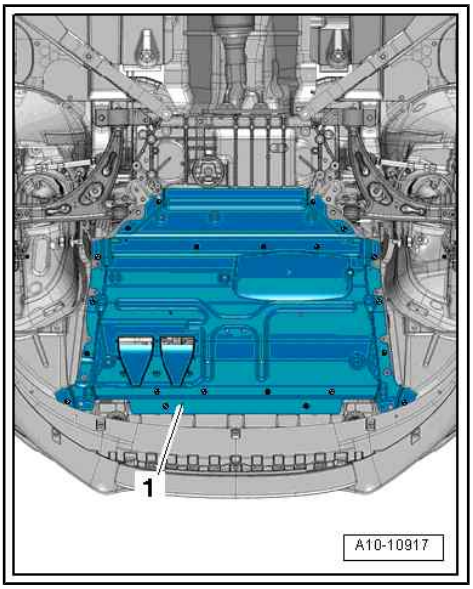
WARNING

Risk of scalding due to hot steam and hot coolant.

- ***The cooling system is under pressure when the engine is hot.***
- ***To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.***

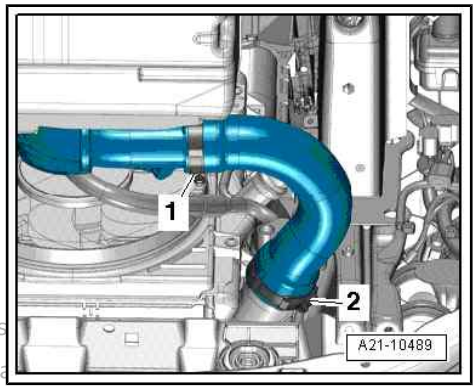
– Open filler cap on coolant expansion tank.

– Remove noise insulation -1- ⇒ Rep. gr. 50 .



– Release hose clips -1- and -2- and remove air hose.

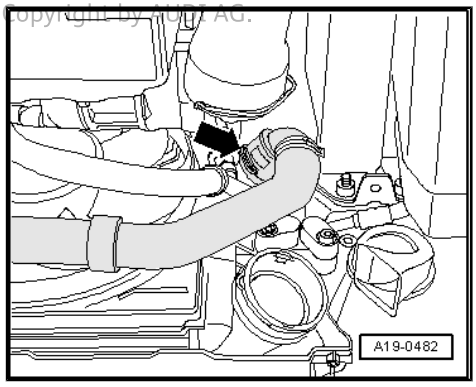
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .



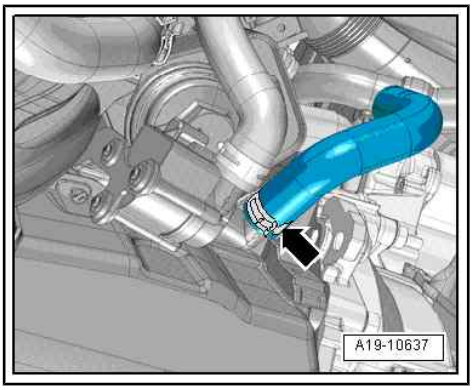
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– Place drip tray for workshop hoist - VAS 6208- beneath engine.

– Lift retaining clip -arrow-, disconnect coolant hose (bottom) from radiator and drain off coolant.



– Open hose clip -arrow-, disconnect coolant hose (bottom) leading to pump for exhaust gas recirculation cooler - V400- and drain off coolant.

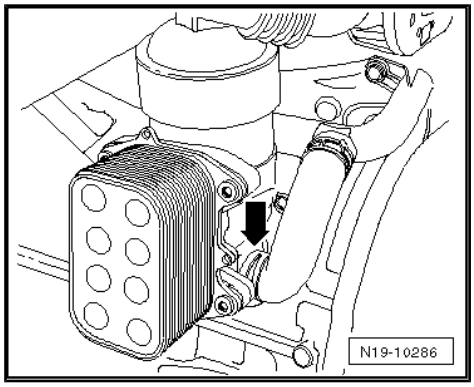


WARNING

Risk of injury as the radiator fans may start up automatically.

- *Even when the ignition is switched off, the radiator fans can start up without warning due to accumulated heat in the engine compartment, etc.*

– Release hose clip -arrow-, disconnect coolant hose at oil filter housing and drain off remaining coolant.

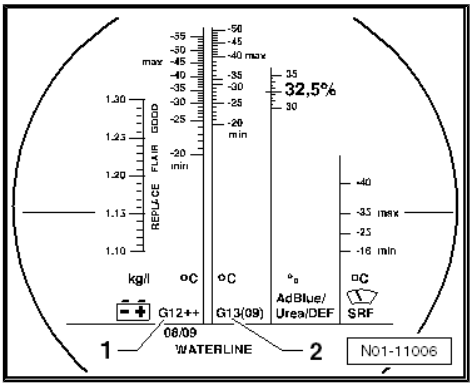


Filling

Caution

To ensure optimal corrosion protection, only distilled water may be mixed with coolant additives.

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Note

- *The effectiveness of the coolant is greatly influenced by the quality of the water with which it is mixed. Because water may contain different substances depending on the country or even the region, the water quality to be used for cooling systems has been specified. Distilled water meets all the requirements and is therefore recommended for use when topping up or filling up with coolant.*
- *Use only coolant additives listed in the ⇒ Electronic parts catalogue (ETKA) . If you use other coolant additives, this can significantly impair in particular the corrosion protection effect. The resulting damage could lead to loss of coolant and consequently to serious engine damage.*
- *Coolant with the recommended mixture ratio prevents frost and corrosion damage and stops scaling. At the same time it raises the boiling point of the fluid in the system. For this reason the cooling system must be filled all year round with the correct coolant additive.*
- *Because of its high boiling point, the coolant improves engine reliability under heavy loads, particularly in countries with tropical climates.*
- *The refractometer - T10007A- MUST be used to determine the current level of frost protection.*
- *The mixture must guarantee frost protection down to at least -25 °C (in countries with arctic climate: down to -36 °C). The amount of antifreeze should only be increased if greater frost protection is required in very cold climates. This must only be down to -48 °C, however, as otherwise the cooling efficiency of the coolant is impaired.*
- *The coolant concentration must not be reduced by adding water even in warmer seasons and in warmer countries. Frost protection must be provided to at least -25 °C.*
- *Read off the level of frost protection on the scale for the relevant coolant additive.*
- *The temperature indicated on the refractometer - T10007A- corresponds to the temperature at which the first ice crystals can form in the coolant.*
- *Do not reuse coolant.*
- *Only use water/coolant additive as a lubricant for coolant hoses.*

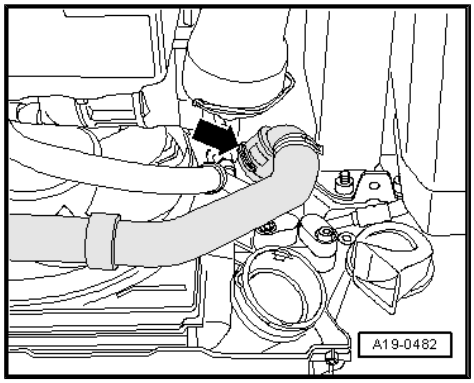
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Recommended mixture ratio for coolant

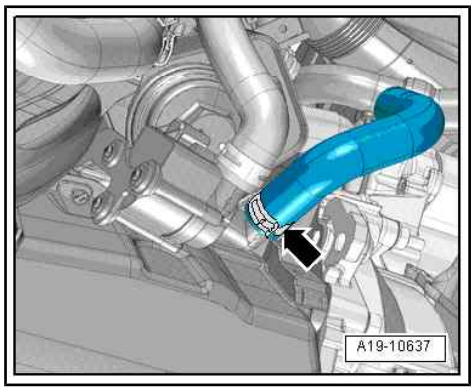
- Coolant (40 %) and distilled water (60 %) for frost protection to -25 °C
- Coolant (50 %) and distilled water (50 %) for frost protection to -36 °C
- Coolant additive ⇒ Electronic parts catalogue (ETKA)

Procedure

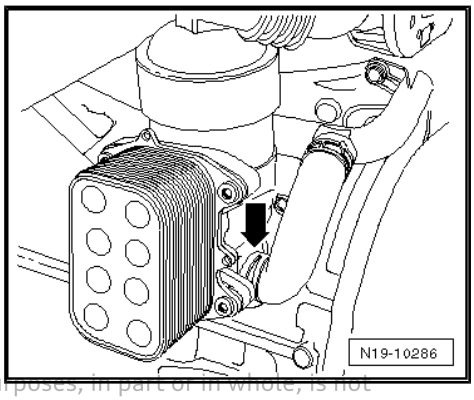
– Connect coolant hose with plug-in connector to radiator (bottom) ⇒ page 232 .



– Connect coolant hose (bottom) at pump for exhaust gas recirculation cooler - V400- -arrow-.

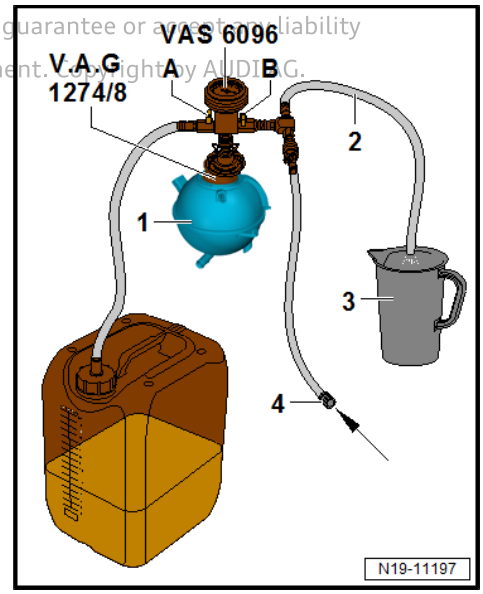


– Connect coolant hose (top) to oil filter housing -arrow-.



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– Fill reservoir of -VAS 6096- with at least 8 litres of premixed coolant (according to recommended ratio):
– Fit adapter for cooling system tester - V.A.G 1274/8- onto coolant expansion tank.
– Attach cooling system charge unit - VAS 6096- to adapter - V.A.G 1274/8- .
– Run vent hose -2- into a small container -3-.



Note

The vented air draws along a small amount of coolant, which should be collected.

– Close both valves -A- and -B- (turn lever at right angles to direction of flow).
– Connect hose -4- to compressed air supply.
• Pressure: 7 ... 10 bar.

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– 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 of -VAS 6096- can fill with coolant.

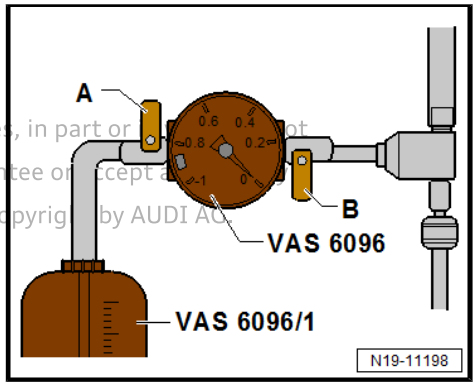
– Close valve -A- again.

– Leave valve -B- open for another 2 minutes.

• The suction jet pump continues to generate a partial 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.



Note

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

♦ *Check cooling system for leaks if the vacuum is not maintained.*

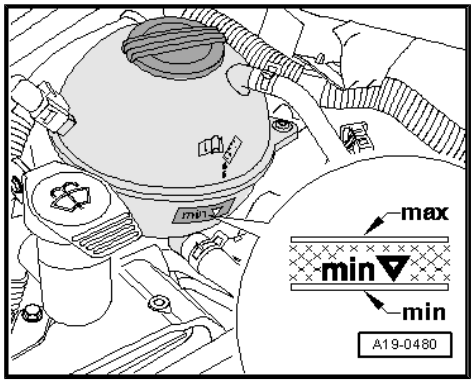
– Detach compressed air hose.

– Open valve -A-.

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

– Detach cooling system charge unit - VAS 6096- from coolant expansion tank.

– Top up coolant to “max” mark.



Note

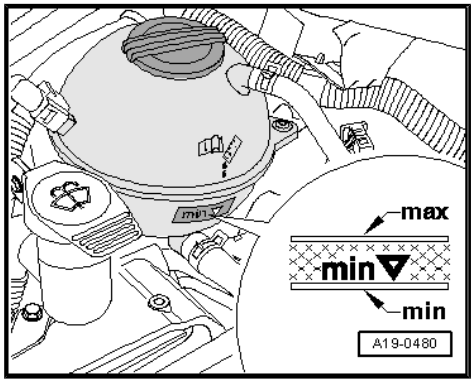
Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.

– Install air hoses with screw-type clips ⇒ page 253 .
– Install noise insulation ⇒ Rep. gr. 50 .
– Start engine.
– Set temperature to “HI”.
– Switch off air conditioner compressor (press ECON button).
– Set fresh air blower to lowest setting.
– Run engine for 2 minutes (maximum) at approx. 1500 rpm.
– Top up coolant to overflow hole on expansion tank with engine running.
– Close filler cap on coolant expansion tank (make sure it engages).
– Allow engine to run at idling speed until both large coolant hoses at radiator become warm.
– Switch off ignition and allow engine to cool down.

– Check coolant level.

- The coolant level must be between the “min” and “max” markings when the engine is cold.
- The coolant level can be at the “max” marking when the engine is warm.

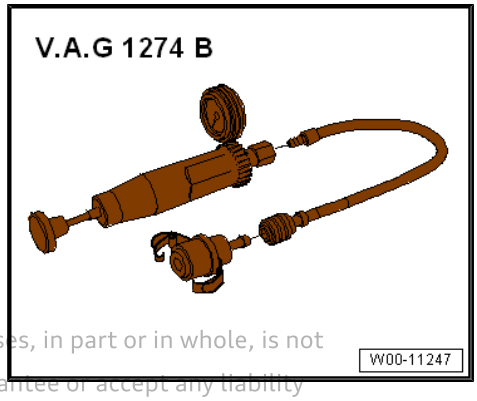
– Top up with coolant again if necessary.



1.3 Checking cooling system for leaks

Special tools and workshop equipment required

♦ Cooling system tester - V.A.G 1274 B-



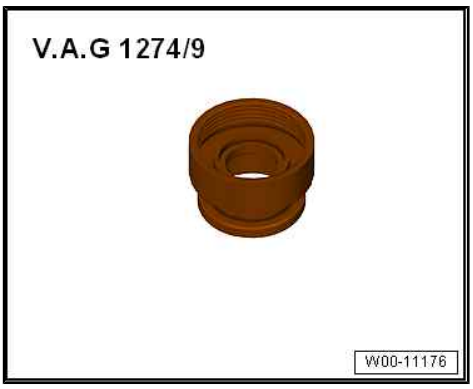
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♦ Adapter for cooling system tester - V.A.G 1274/8-



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♦ Adapter for cooling system tester - V.A.G 1274/9-



Procedure

- To ensure that the leak test is carried out correctly, a self-test must first be performed on the cooling system tester - V.A.G 1274 B- .

Checking cooling system tester - V.A.G 1274 B- (self-test)

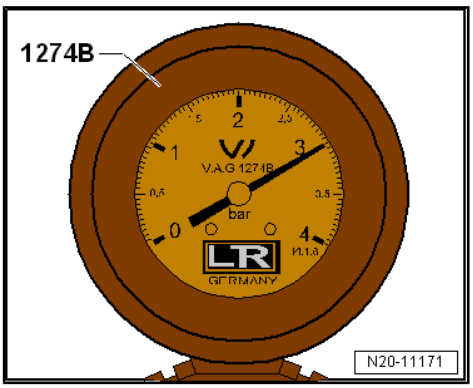
– Operate cooling system tester - V.A.G 1274 B- several times.

– Build up a pressure of 3.0 bar on cooling system tester.

– Monitor pressure on pressure gauge of cooling system tester - V.A.G 1274 B- for 30 seconds.

If pressure does not build up, or if pressure dissipates again:

- Cooling system tester - V.A.G 1274 B- is leaking and must not be used.



Checking cooling system for leaks

- Engine must be warm.
- Ignition switched off.

WARNING

Risk of scalding due to hot steam and hot coolant.

- ***The cooling system is under pressure when the engine is hot.***
- ***To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.***

– Open filler cap on coolant expansion tank.

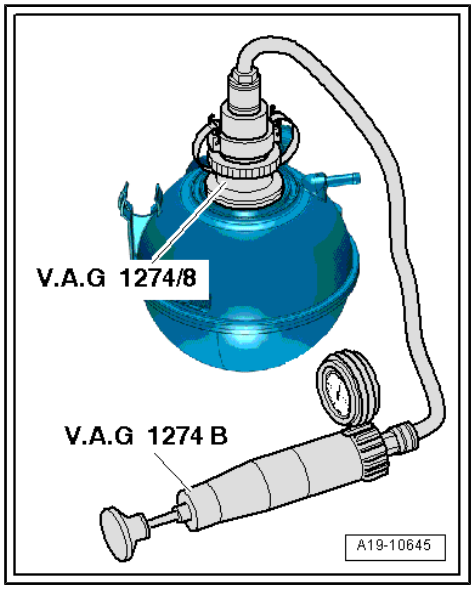
– Fit cooling system tester - V.A.G 1274 B- with adapter - V.A.G 1274/8- onto coolant expansion tank.
– Using hand pump on cooling system tester, build up a pressure of approx. 1.5 bar.
• The pressure should not drop more than 0.2 bar within 10 minutes.
• The drop in pressure of 0.2 bar within 10 minutes is caused by the decrease in coolant temperature. The colder the engine is, the less the pressure will fall. If necessary, check again when the engine is cold.

If the pressure drops by more than 0.2 bar:

– Examine engine and radiator to find and eliminate the leak.
– If no leaks found:

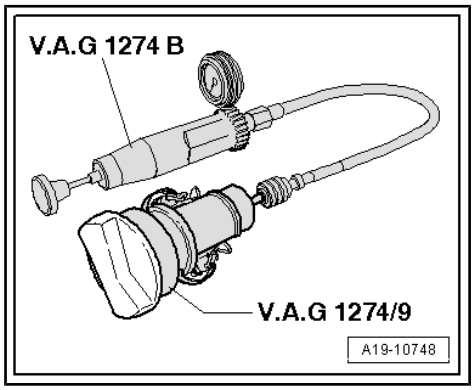
♦ Check water-cooled charge air cooler for leaks
⇒ “2.4 Checking charge air system for leaks”, page 255 .

♦ Check exhaust gas recirculation cooler for leaks.



Checking pressure relief valve in filler cap

– Fit cooling system tester - V.A.G 1274 B- with adapter - V.A.G 1274/9- onto filler cap.
– Build up pressure with hand pump on cooling system tester.
• The pressure relief valve should open at a pressure of 1.4 ... 1.6 bar.
– Renew filler cap if pressure relief valve does not open as described.



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2 Coolant pump and 4/2-way valve

Overview

- ⇒ “2.1 Coolant pump and 4/2-way valve - exploded view”, page 205
- ⇒ “2.2 Removing and installing coolant pump”, page 206
- ⇒ “2.3 Removing and installing 4/2-way valve”, page 206
- ⇒ “2.4 Checking thermostat”, page 210

2.1 Coolant pump and 4/2-way valve - exploded view

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1 - Coolant pump
- ❑ Removing and installing ⇒ page 206

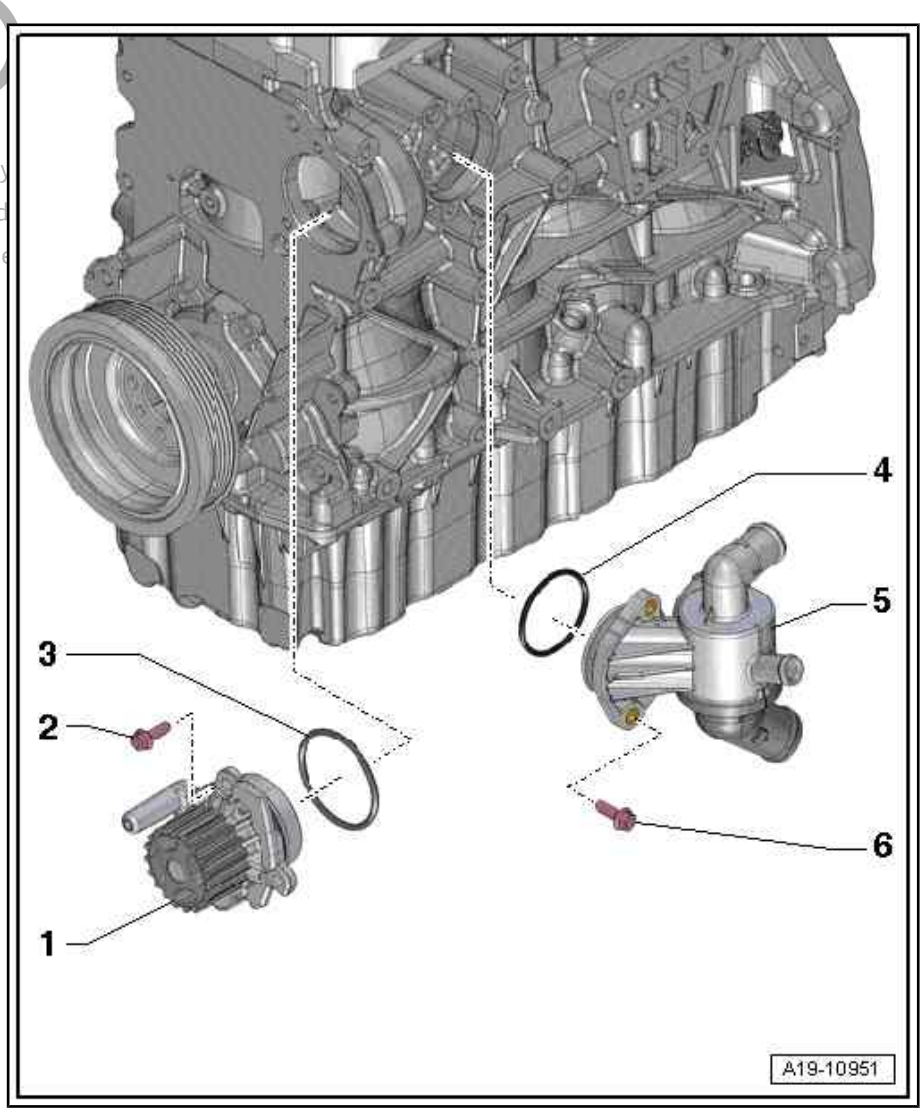
2 - Bolt
- ❑ 15 Nm

3 - O-ring
- ❑ Renew

4 - O-ring
- ❑ Renew

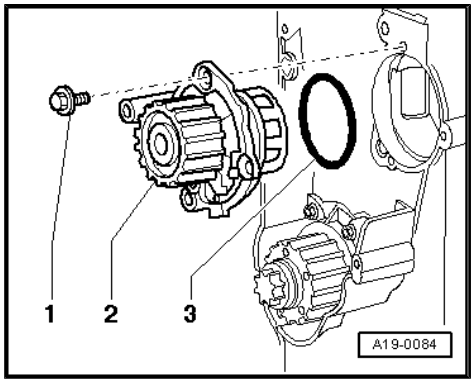
5 - 4/2-way valve
- ❑ The thermostat is located in the interior of the 4/2-way valve and cannot be renewed separately
- ❑ Removing and installing ⇒ page 206

6 - Bolt
- ❑ 15 Nm



2.2 Removing and installing coolant pump

Removing



– Drain coolant ⇒ page 195 .
– Remove toothed belt ⇒ page 106 .
– Unscrew bolts -1- and remove coolant pump -2-.
– Detach O-ring -3-.

Installing

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

- Tightening torque
  ⇒ “2.1 Coolant pump and 4/2-way valve - exploded view”, page 205

Note

Fit new O-ring.

– Clean and smoothen sealing surface for O-ring.
– Lightly lubricate O-ring -3- with coolant.
– Fit coolant pump -2-.
- Installation position: Sealing plug in housing faces downwards.

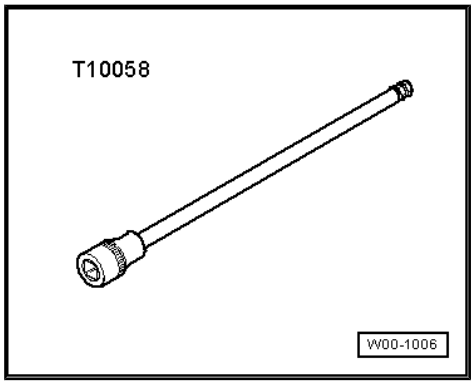
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– Install toothed belt (adjust valve timing) ⇒ page 111 .
– Fill up with coolant ⇒ page 198 .

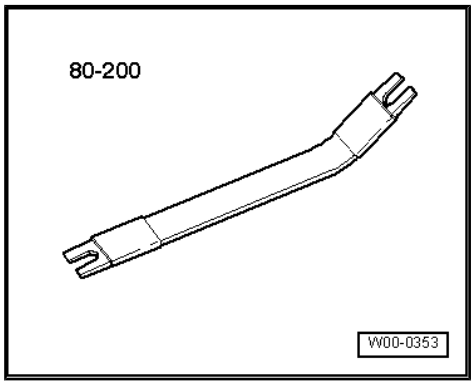
2.3 Removing and installing 4/2-way valve

Special tools and workshop equipment required

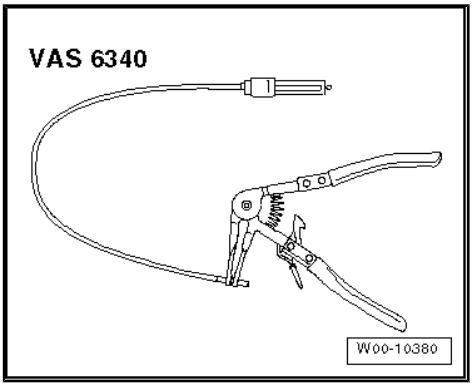
♦ Socket - T10058-



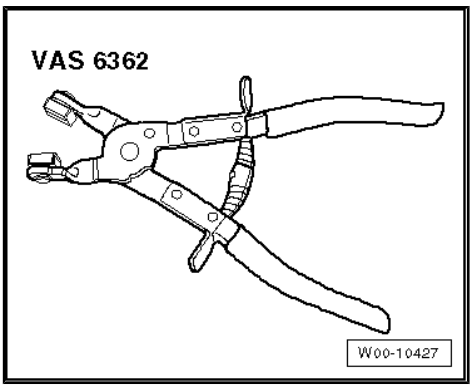
♦ Removal lever - 80 - 200-



♦ Hose clip pliers - VAS 6340-



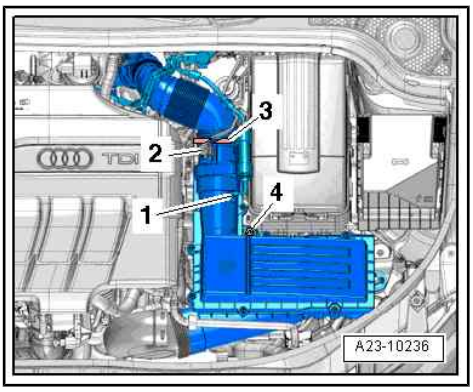
♦ Hose clip pliers - VAS 6362-



Removing

– Drain coolant ⇒ page 195 .

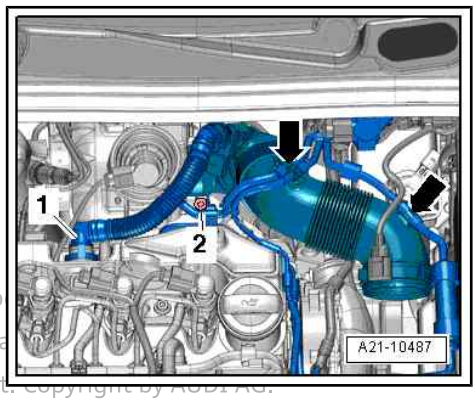
– Remove air cleaner housing ⇒ Rep. gr. 23 .



– Press release tabs and disconnect crankcase breather hose -1- from cylinder head cover.

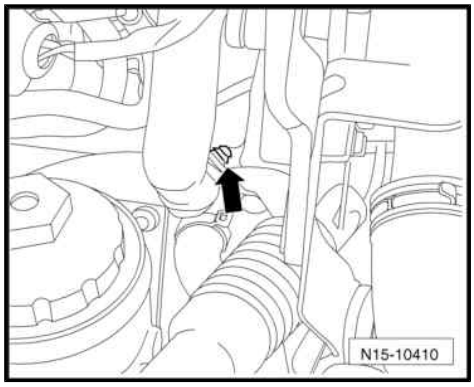
– Move clear vacuum hoses -arrows- at air pipe.

– Remove bolt -2-, swivel intake pipe with connection to rear and detach from turbocharger.

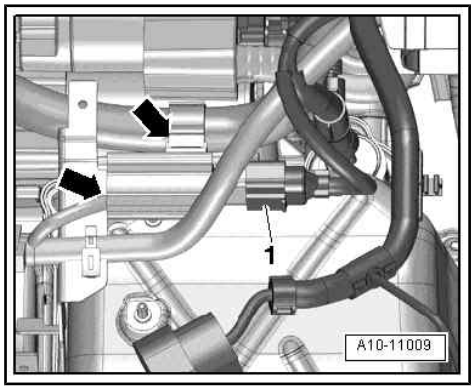


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– Unclip wiring harness from retainer -arrow-.



– Move clear wiring harnesses -arrows- and electrical connector -1- at bracket.



WARNING

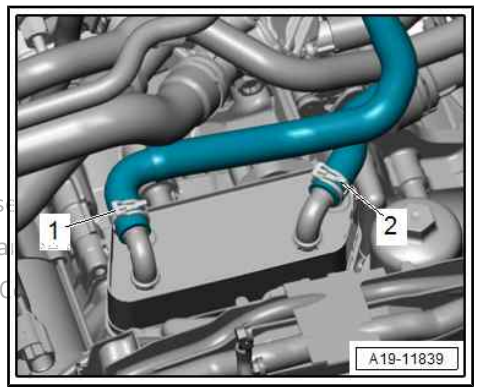
Risk of injury as the radiator fans may start up automatically.

- *Even when the ignition is switched off, the radiator fans can start up without warning due to accumulated heat in the engine compartment, etc.*

Vehicles with dual clutch gearbox only:

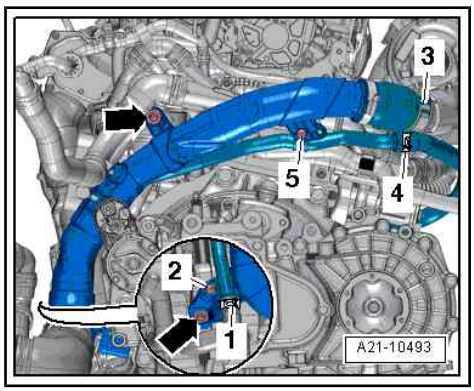
– Unfasten hose clips -1 and 2- from gear oil cooler and pull off coolant hoses.

All vehicles:

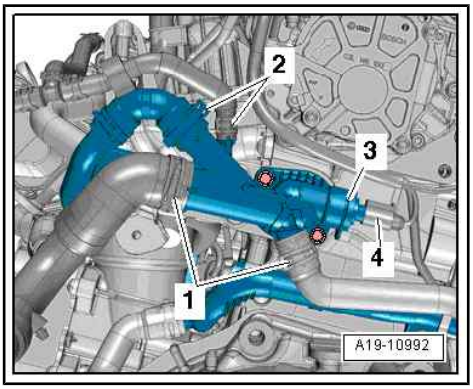


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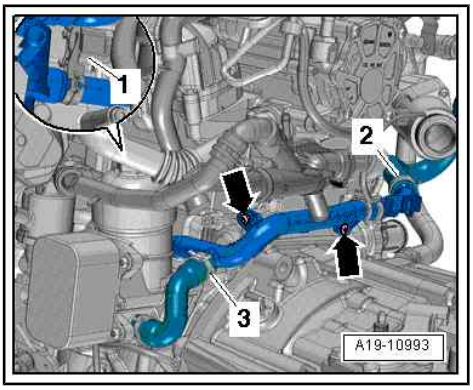
– Remove bolts -2, 5- and -arrows-.
– Using removal lever - 80 - 200- , move clear electrical wiring and hoses at air pipe (left-side).
– Loosen hose clip -3- and detach air pipe (left-side).



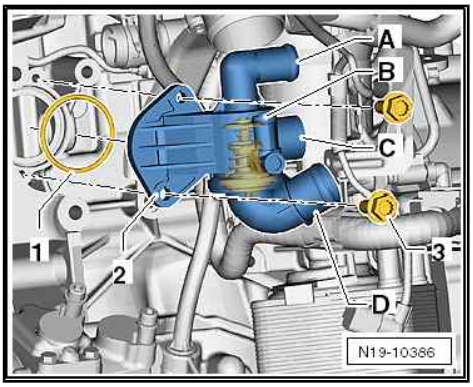
– Release hose clips -1- and detach coolant hoses.



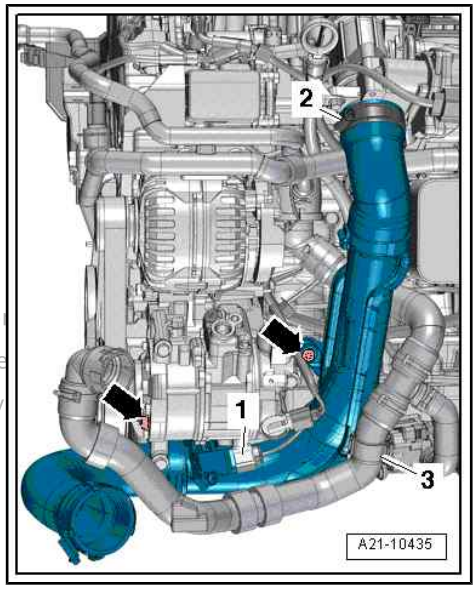
– Take electrical connector -1- for Hall sender - G40- out of retainer.
– Remove bolts -arrows- and detach coolant pipe (front) from 4/2-way valve to side. Do not loosen hose clips -2 and 3-.



– Pull coolant pipe off connection -C- of 4/2-way valve. Leave coolant pipe in its fitting location.

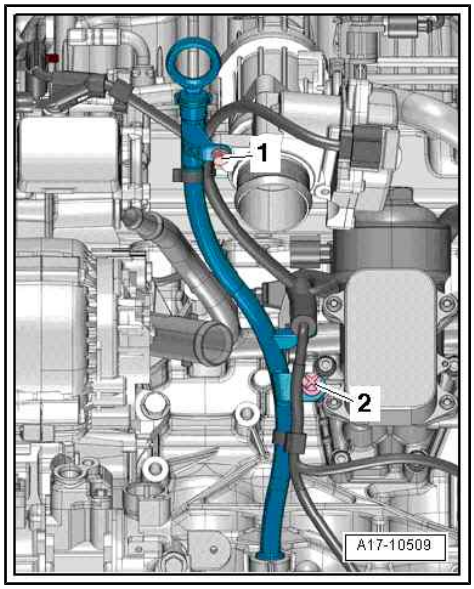


– Remove bolts -arrows-.
– Move coolant hose -3- clear.
– Release hose clip -2-.
– Unplug electrical connector -1- at charge pressure sender - G31- / intake air temperature sender - G42- and detach air pipe (right-side).

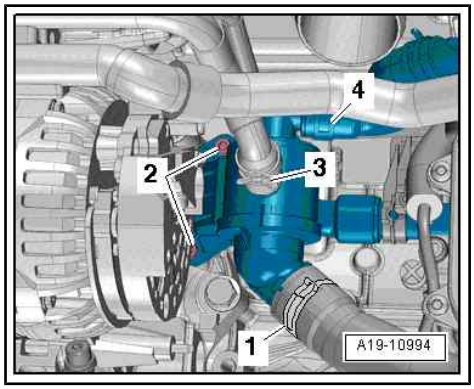


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– Pull oil dipstick out slightly and remove bolt -1-.
– Release clip -2- with removal lever - 80 - 200- .
– Pull guide tube for oil dipstick upwards out of cylinder block and push to one side.



– Unscrew bolts -2- using socket - T10058- .
– Loosen hose clips -1, 3, 4-, detach coolant hoses and remove 4/2-way valve.



Installing

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

- Tightening torque ⇒ "2.1 Coolant pump and 4/2-way valve - exploded view", page 205

– Install dipstick guide tube.
– Install coolant pipe (front) ⇒ page 219 .
– Install air pipes ⇒ page 252 .
– Install intake connecting pipe ⇒ page 240 .
– Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
– Install battery mounting and battery ⇒ Electrical system; Rep. gr. 27 .
– Install air cleaner housing ⇒ Rep. gr. 23 .
– Install air hoses with screw-type clips ⇒ page 253 .
– Fill up with coolant ⇒ page 198 .

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2.4 Checking thermostat

– Remove thermostat and heat it in a water bath.

Starts to open	Fully open	Opening travel
approx. 92 °C	approx. 107 °C[1)]	at least 7 mm

- [1)] Cannot be tested.

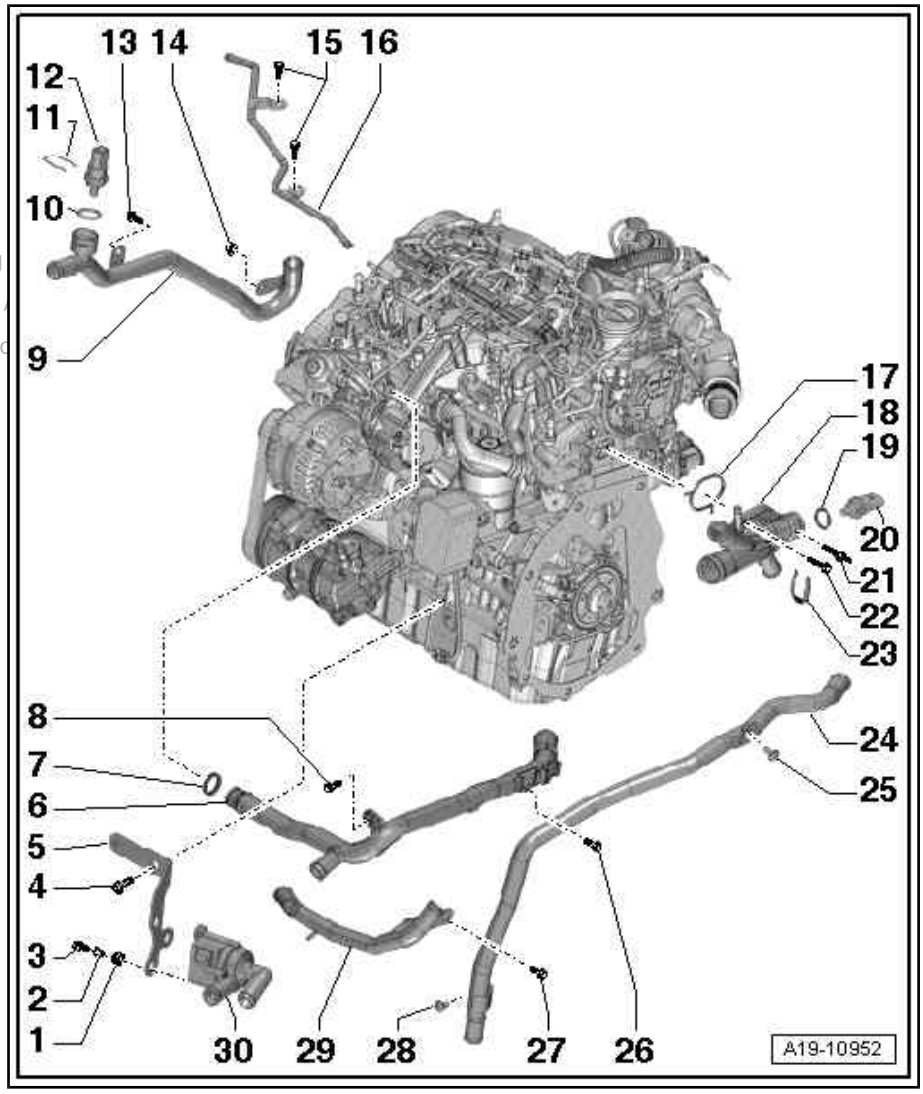
3 Coolant pipes, coolant temperature senders, coolant circulation pump

Overview

- ⇒ “3.1 Exploded view - coolant pipes, coolant temperature senders, coolant circulation pump”, page 211
- ⇒ “3.2 Removing and installing coolant temperature sender G62 ”, page 213
- ⇒ “3.3 Removing and installing radiator outlet coolant temperature sender G83 ”, page 215
- ⇒ “3.4 Removing and installing pump for exhaust gas recirculation cooler V400 ”, page 217
- ⇒ “3.5 Removing and installing coolant pipe (front)”, page 219
- ⇒ “3.6 Removing and installing coolant pipe (top front)”, page 223
- ⇒ “3.7 Removing and installing coolant pipe (left-side)”, page 224
- ⇒ “3.8 Removing and installing coolant pipe (right-side)”, page 227

3.1 Exploded view - coolant pipes, coolant temperature senders, coolant circulation pump

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1 - Grommet
- ❑ Not supplied separately

2 - Sleeve
- ❑ Not supplied separately

3 - Bolt
- ❑ 2.7 Nm

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4 - Bolt
- ❑ 40 Nm

5 - Bracket
- ❑ For pump for exhaust gas recirculation cooler - V400-

6 - Coolant pipe (front)
- ❑ Removing and installing ⇒ page 219

7 - O-ring
- ❑ Renew

8 - Bolt
- ❑ 9 Nm

9 - Coolant pipe (right-side)
- ❑ Removing and installing ⇒ page 227

10 - O-ring
- ❑ Renew

11 - Retaining clip

12 - Radiator outlet coolant temperature sender - G83-
- ❑ Removing and installing ⇒ page 215

13 - Bolt
- ❑ 9 Nm

14 - Nut
- ❑ 9 Nm

15 - Bolts
- ❑ 9 Nm

16 - Coolant pipe

17 - Gasket
- ❑ Renew

18 - Connection
- ❑ For coolant hoses

19 - O-ring
- ❑ Renew

20 - Coolant temperature sender - G62-
- ❑ Removing and installing ⇒ page 213

21 - Centre hex stud
- ❑ 9 Nm

22 - Bolt

- ❑ 9 Nm

23 - Retaining clip

24 - Coolant pipe (left-side)

- ❑ Removing and installing ⇒ page 224

25 - Nut

- ❑ 9 Nm

26 - Bolt

- ❑ 9 Nm

27 - Bolt

- ❑ 9 Nm

28 - Nut

- ❑ 9 Nm

29 - Coolant pipe (top front)

- ❑ Removing and installing ⇒ page 223

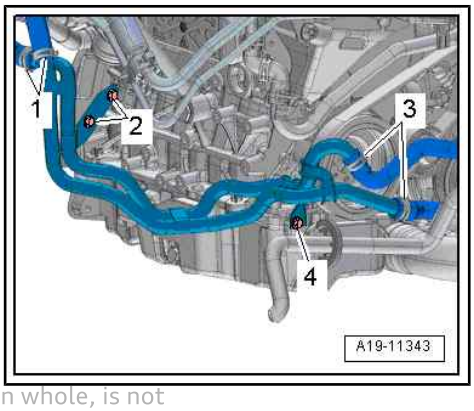
30 - Pump for exhaust gas recirculation cooler - V400-

- ❑ Removing and installing ⇒ page 217

Coolant pipes (right-side) - vehicles with auxiliary heater

2 - Bolts, 9 Nm

4 - Bolt, 9 Nm

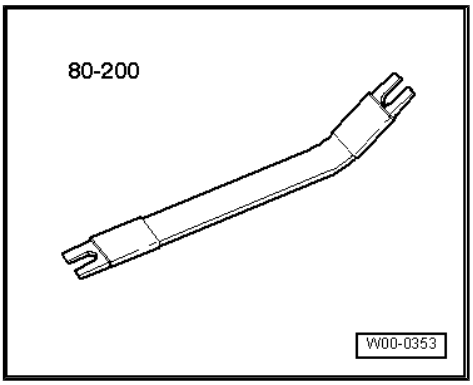


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3.2 Removing and installing coolant temperature sender - G62-

Special tools and workshop equipment required

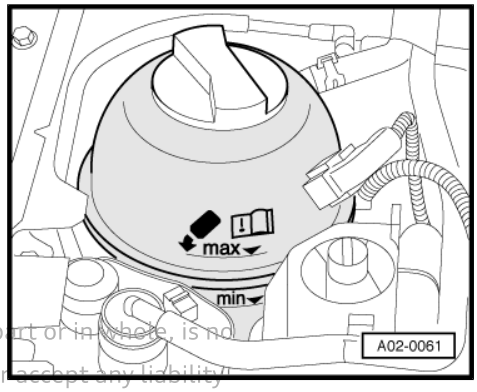
- ♦ Removal lever - 80 - 200-



Removing

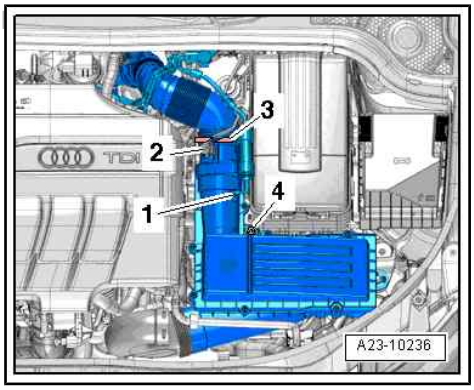
- Engine cold.

– Open filler cap on coolant expansion tank briefly and allow residual pressure in cooling system to dissipate.

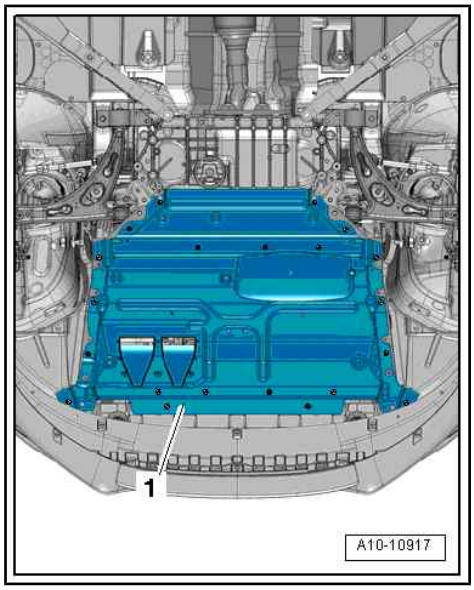


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– Remove air cleaner housing ⇒ Rep. gr. 23 .



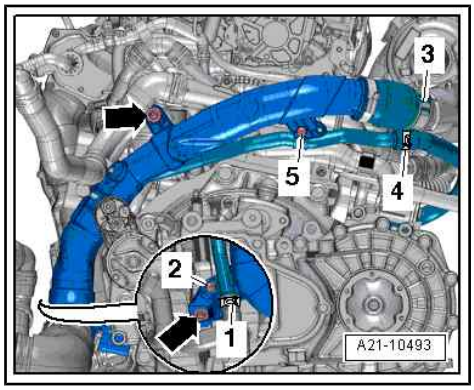
– Remove noise insulation -1- ⇒ Rep. gr. 50 .



– Remove bolts -arrows-.

– Using removal lever - 80 - 200- , move clear electrical wiring and hoses at air pipe (left-side).

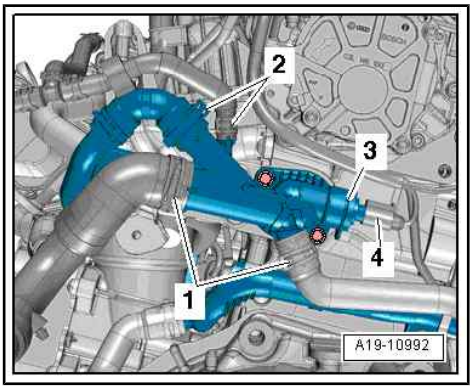
– Release hose clip -3- and push air pipe (left-side) with coolant pipe towards the left.



Note

Disregard -items 1, 2, 4, 5-.

– Unplug electrical connector -4- at coolant temperature sender - G62- .



Note

Place a cloth underneath the connection to catch escaping coolant.

– Pull off retaining clip -3- and pull coolant temperature sender - G62- out of connection.

Note

Disregard items -1 and 2-.

Installing

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

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Note

- *Fit new O-ring.*
- *To avoid loss of coolant, insert new coolant temperature sender - G62- immediately into connection.*

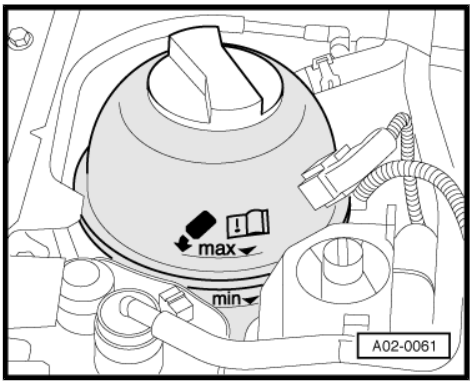
– Install air pipe ⇒ page 252 .
– Install noise insulation ⇒ Rep. gr. 50 .
– Install air cleaner housing ⇒ Rep. gr. 23 .
– Check coolant level ⇒ page 202 .

3.3 Removing and installing radiator outlet coolant temperature sender - G83-

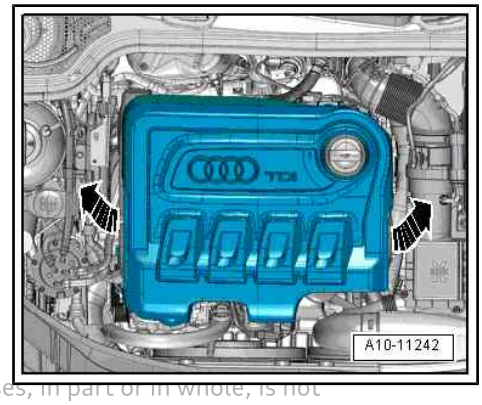
Removing

- Engine cold.

– Open filler cap on coolant expansion tank briefly and allow residual pressure in cooling system to dissipate.

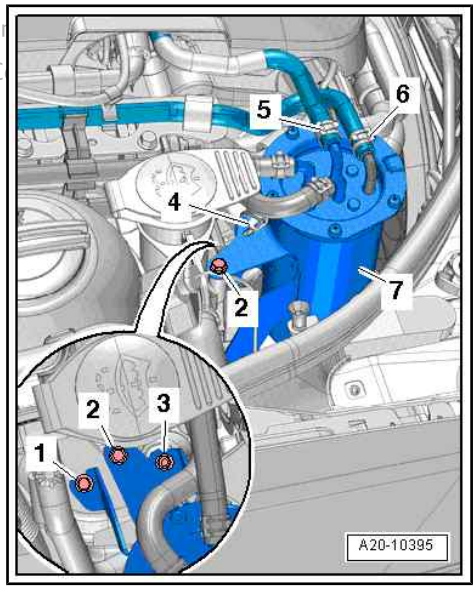


– Remove engine cover panel -arrows-.

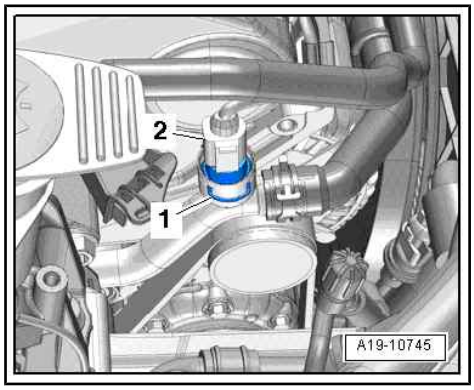


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– Loosen bolt -1-.
– Remove bolt -2- and nut -3-.
– Detach retainer -4- from fuel filter, move fuel filter -7- clear to one side with fuel hoses -5- and -6- connected.



– Unplug electrical connector -2- at radiator outlet coolant temperature sender - G83- .



Note

Place a cloth underneath to catch escaping coolant.

– Pull off retaining clip -1- and pull radiator outlet coolant temperature sender - G83- out of connection on coolant pipe.

Installing

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

Note

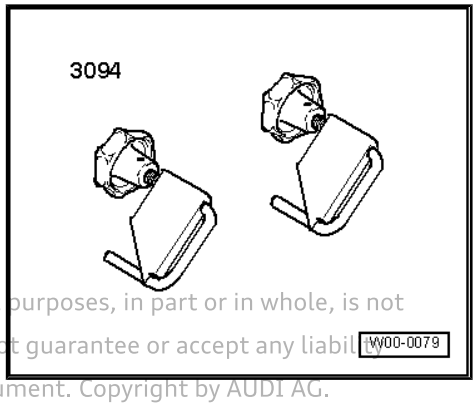
- *Fit new O-ring.*
- *To avoid loss of coolant, fit new radiator outlet coolant temperature sender - G83- into coolant pipe immediately.*

– Install fuel filter ⇒ Rep. gr. 20 .
– Check coolant level ⇒ page 202 .

3.4 Removing and installing pump for exhaust gas recirculation cooler - V400-

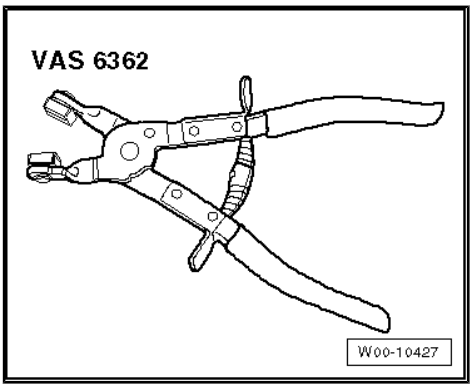
Special tools and workshop equipment required

- Hose clamps, up to 25 mm - 3094-



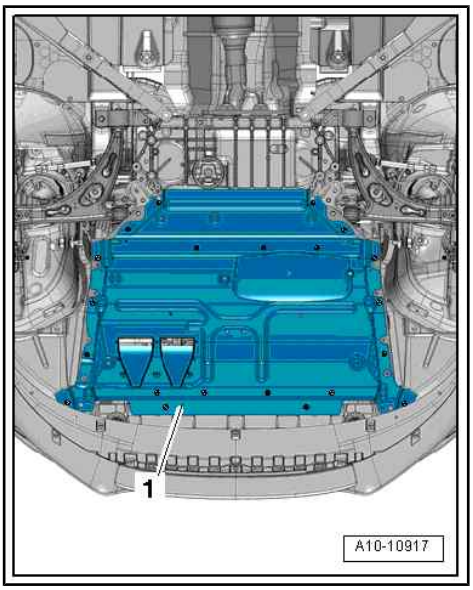
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- Hose clip pliers - VAS 6362-

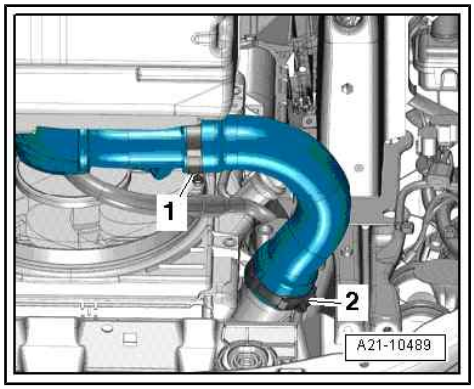


Removing

– Remove noise insulation -1- ⇒ Rep. gr. 50 .



– Release hose clips -1- and -2- and remove air hose.



WARNING

Risk of injury as the radiator fans may start up automatically.

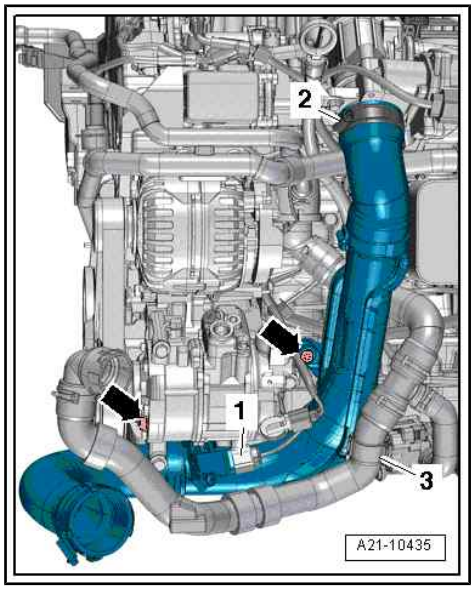
- ***Even when the ignition is switched off, the radiator fans can start up without warning due to accumulated heat in the engine compartment, etc.***

– Remove bolts -arrows-.

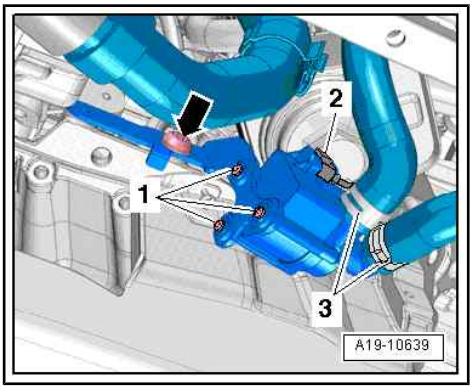
– Release hose clip -2- and push right air pipe towards the right.

Note

Disregard items -1 and 3-.



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Note

Place a cloth underneath pump for exhaust gas recirculation cooler - V400- to catch escaping coolant.

– Clamp off coolant hoses using hose clamps -3094- , release the two hose clips -3- and disconnect coolant hoses.
– Unplug electrical connector -2-.
– Unscrew bolts -1- and remove pump for exhaust gas recirculation cooler - V400- .

Note

Disregard -arrow-.

Installing

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

- Tightening torque
  ⇒ “3.1 Exploded view - coolant pipes, coolant temperature senders, coolant circulation pump”, page 211

Note

- *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

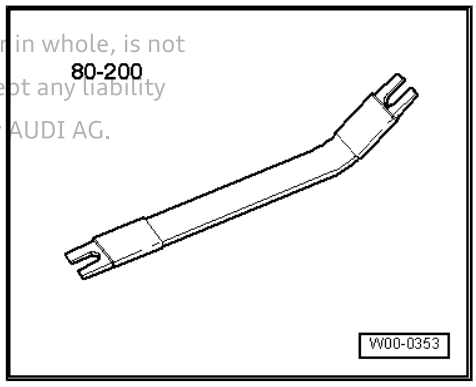
– Install air pipe ⇒ page 252 .
– Install air hoses with screw-type clips ⇒ page 253 .
– Install noise insulation ⇒ Rep. gr. 50 .
– Check coolant level ⇒ page 202 .

3.5 Removing and installing coolant pipe (front)

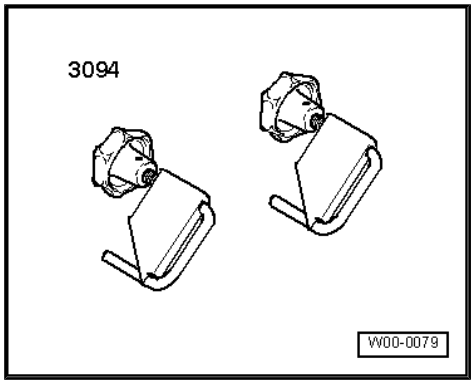
Special tools and workshop equipment required

- Removal lever - 80 - 200-

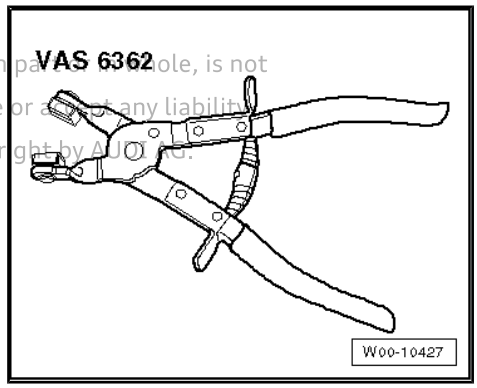
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- Hose clamps, up to 25 mm - 3094- for vehicles with dual clutch gearbox



- Hose clip pliers - VAS 6362-

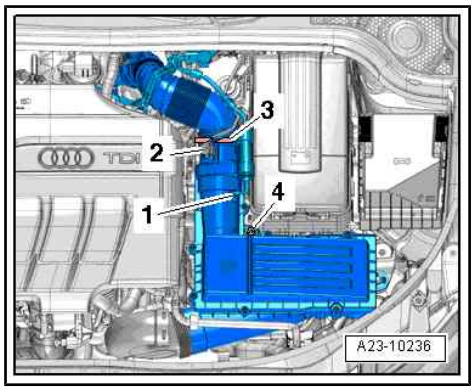


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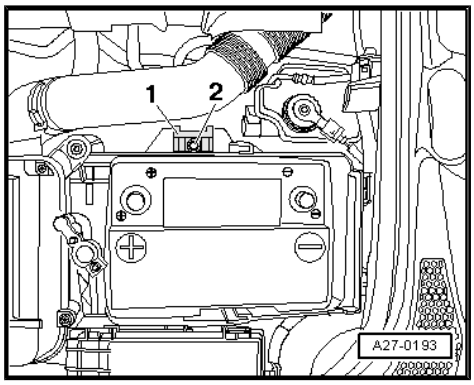
Removing

– Drain coolant ⇒ page 195 .

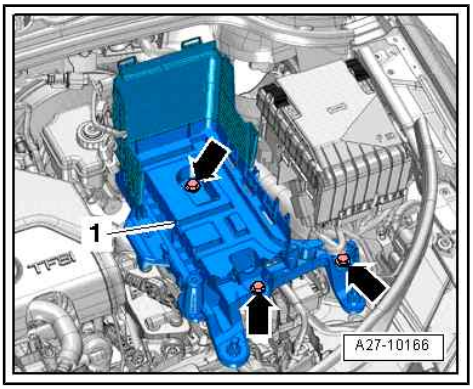
– Remove air cleaner housing ⇒ Rep. gr. 23 .



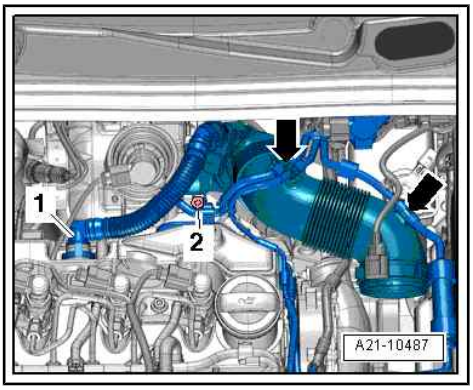
– Remove battery ⇒ Electrical system; Rep. gr. 27 .



– Remove bolts -arrows- and take out battery tray -1-.

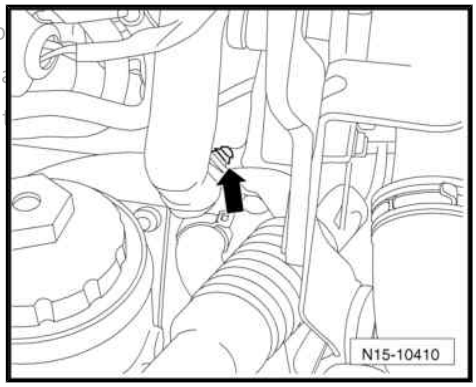


– Press release tabs and disconnect crankcase breather hose -1- from cylinder head cover.
– Move clear vacuum hoses -arrows- at air pipe.
– Remove bolt -2-, swivel intake pipe with connection to rear and detach from turbocharger.



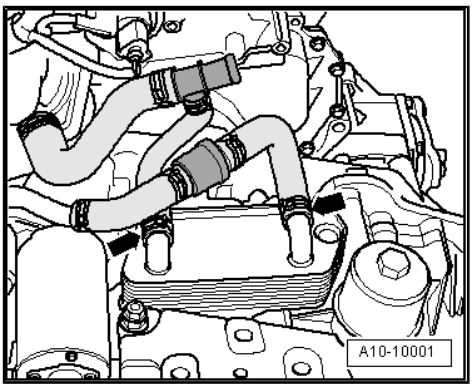
– Unclip wiring harness from retainer -arrow-.

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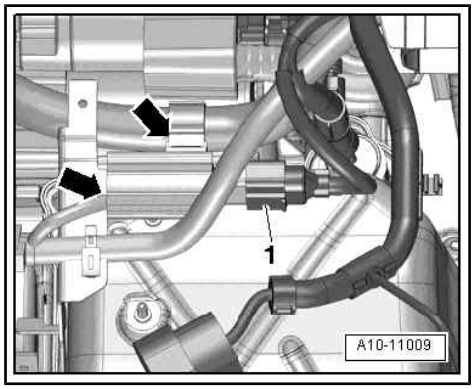
Vehicles with dual clutch gearbox:

– Clamp off coolant hoses using hose clamps -3094- , release hose clips -arrows- and disconnect coolant hoses from gear oil cooler.

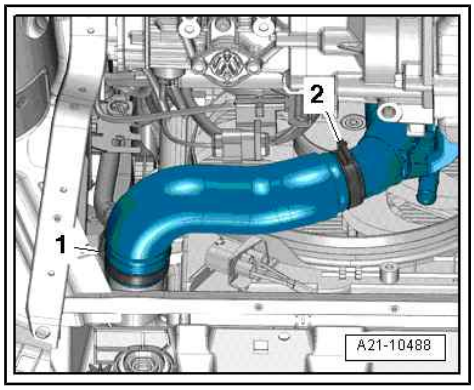


All vehicles (continued):

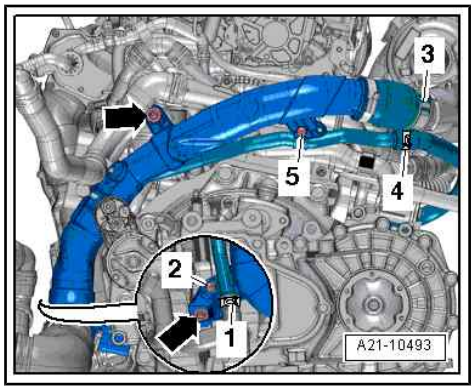
– Move clear wiring harnesses -arrows- and electrical connector -1- at bracket.



– Release hose clips -1- and -2- and remove air hose.



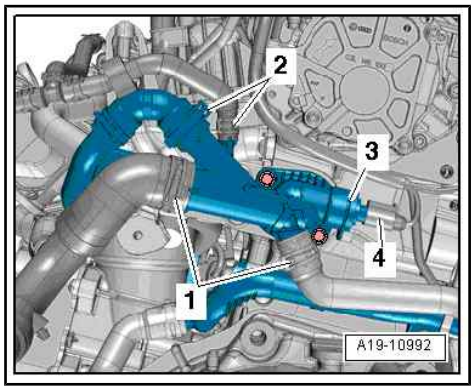
– Remove bolts -2, 5- and -arrows-.
– Using removal lever - 80 - 200- , move clear electrical wiring and hoses at air pipe (left-side).
– Loosen hose clip -3- and detach air pipe (left-side).



Note

Disregard items -1 and 4-.

– Release hose clips -1- and detach coolant hoses.

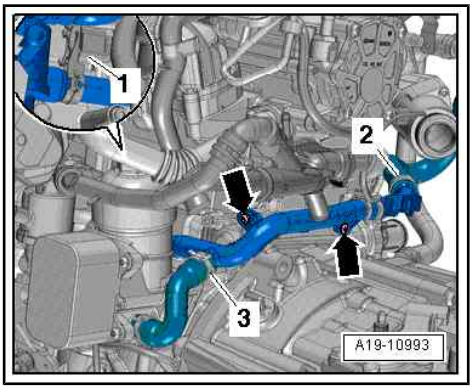


Note

Disregard -items 2, 3, 4-.

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– Take electrical connector -1- for Hall sender - G40- out of retainer.
– Detach bracket from coolant pipe (front).
– Release hose clips -2- and -3- and disconnect coolant hoses.
– Remove bolts -arrows- and detach coolant pipe (front) from 4/2-way valve to left side.



Installing

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

- Tightening torques
⇒ "3.1 Exploded view - coolant pipes, coolant temperature senders, coolant circulation pump", page 211

Note

- *Renew gaskets, seals and O-rings.*
- *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

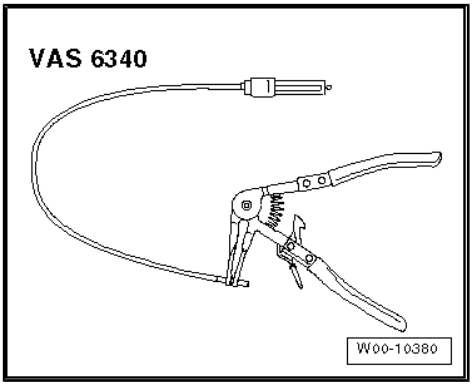
– Clean and smoothen sealing surface for O-ring.
– Lightly lubricate O-ring with coolant and slide O-ring onto coolant pipe (front).
– Push coolant pipe (front) into 4/2-way valve.
– Install air pipe ⇒ page 252 .
– Install intake connecting pipe ⇒ page 240 .
– Install air hoses with screw-type clips ⇒ page 253 .
– Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
– Install battery mounting and battery ⇒ Electrical system; Rep. gr. 27 .
– Install air cleaner housing ⇒ Rep. gr. 23 .
– Fill up with coolant ⇒ page 198 .

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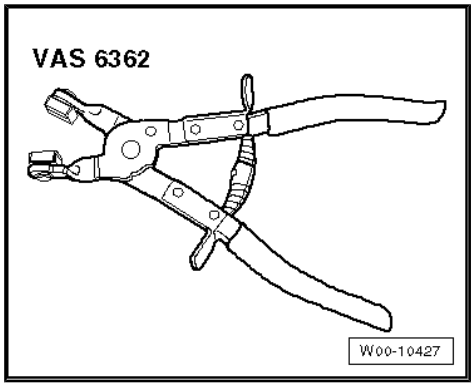
3.6 Removing and installing coolant pipe (top front)

Special tools and workshop equipment required

- Hose clip pliers - VAS 6340-



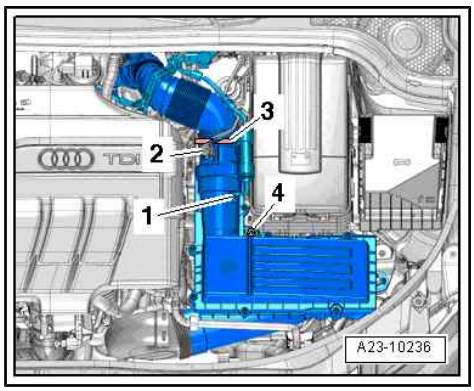
♦ Hose clip pliers - VAS 6362-



Removing

– Drain coolant ⇒ page 195 .

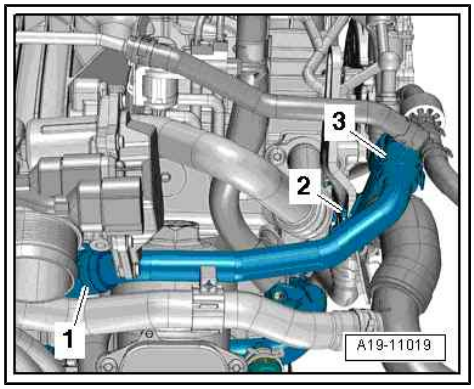
– Remove air cleaner housing ⇒ Rep. gr. 23 .



– Remove bolt -2-.

– Release hose clips -1- and -3- and disconnect coolant hoses.

– Detach coolant pipe (top front).



Installing

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

- Tightening torques
  ⇒ “3.1 Exploded view - coolant pipes, coolant temperature senders, coolant circulation pump”, page 211

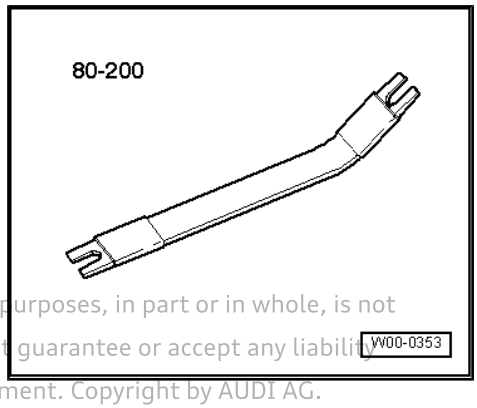
– Install air cleaner housing ⇒ Rep. gr. 23 .

– Fill up with coolant ⇒ page 198 .

3.7 Removing and installing coolant pipe (left-side)

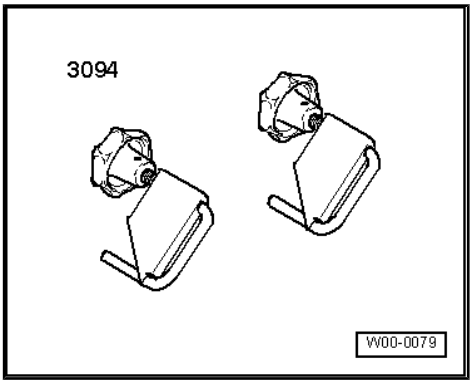
Special tools and workshop equipment required

♦ Removal lever - 80 - 200-

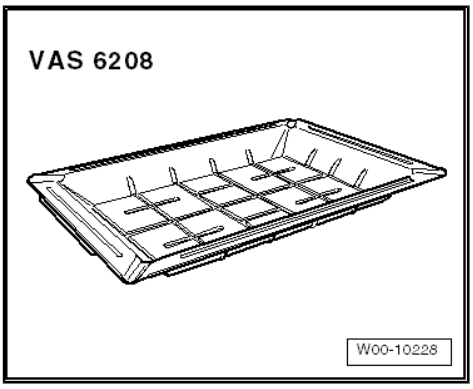


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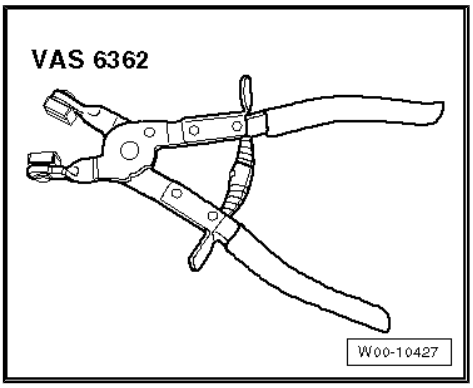
♦ Hose clamps, up to 25 mm - 3094-



♦ Drip tray for workshop hoist - VAS 6208-



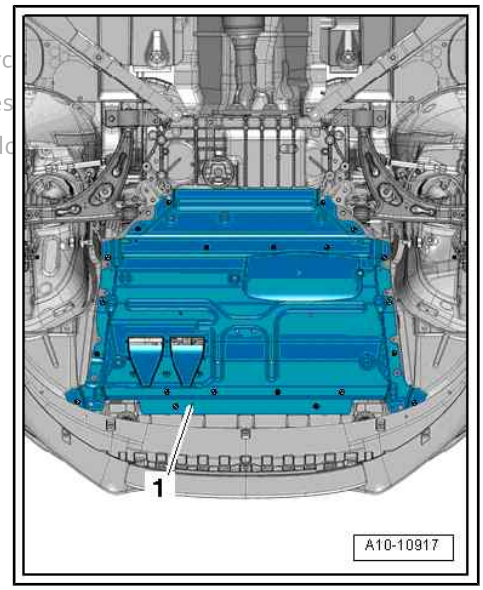
♦ Hose clip pliers - VAS 6362-



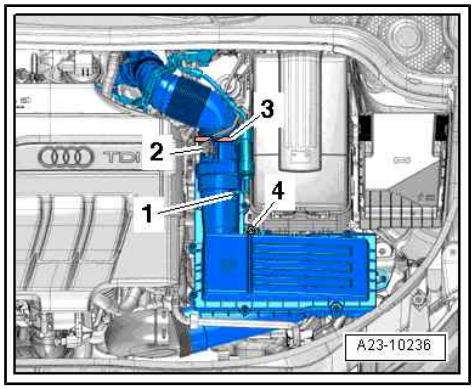
Removing

– Remove noise insulation -1- ⇒ Rep. gr. 50 .

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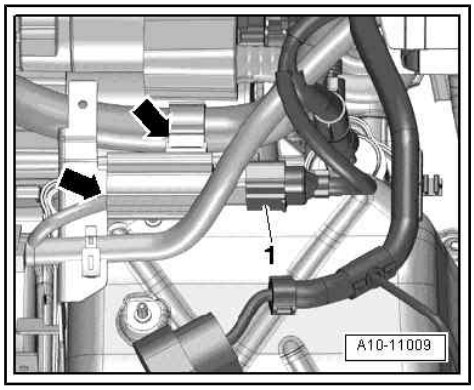
– Remove air cleaner housing ⇒ Rep. gr. 23 .



WARNING

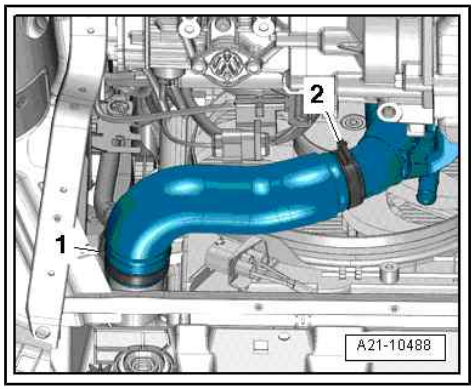
Risk of injury as the radiator fans may start up automatically.

- ***Even when the ignition is switched off, the radiator fans can start up without warning due to accumulated heat in the engine compartment, etc.***



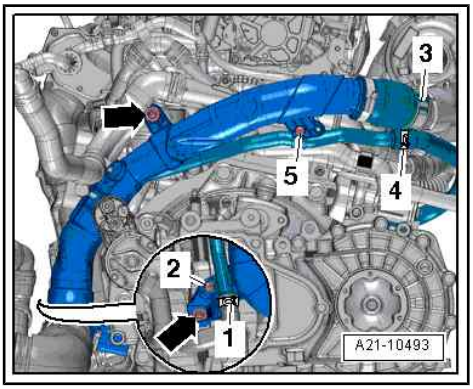
– Move clear wiring harnesses -arrows- and electrical connector -1- at bracket.

– Release hose clips -1- and -2- and remove air hose.



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– Remove bolts -2, 5- and -arrows-.
– Using removal lever - 80 - 200- , move clear electrical wiring and hoses at air pipe (left-side).
– Loosen hose clip -3- and detach air pipe (left-side).
– Place drip tray for workshop hoist - VAS 6208- beneath engine.
– Clamp off coolant hoses using hose clamps -3094- , release hose clips -1- and -4- and disconnect coolant hoses from coolant pipe (left-side).
– Detach coolant pipe (left-side).



Installing

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

- Tightening torque
⇒ “3.1 Exploded view - coolant pipes, coolant temperature senders, coolant circulation pump”, page 211

Note

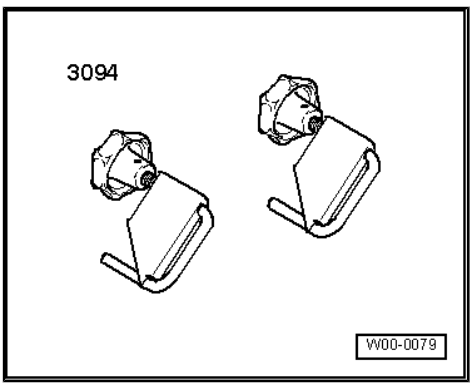
♦ *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
♦ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

– Install air pipe ⇒ page 252 .
– Install air hoses with screw-type clips ⇒ page 253 .
– Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
– Install air cleaner housing ⇒ Rep. gr. 23 .
– Install noise insulation ⇒ Rep. gr. 50 .
– Fill up with coolant ⇒ page 198 .

3.8 Removing and installing coolant pipe (right-side)

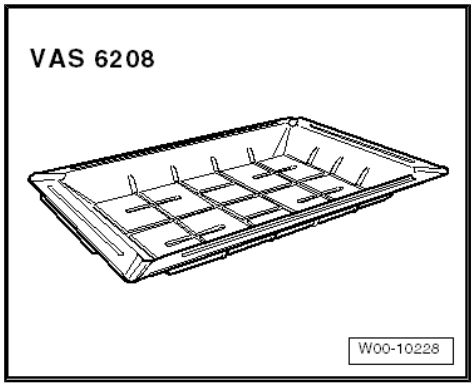
Special tools and workshop equipment required

♦ Hose clamps, up to 25 mm - 3094-

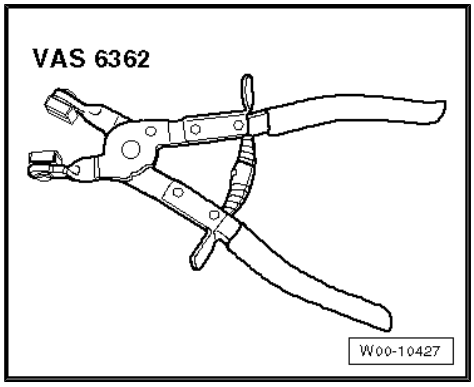


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♦ Drip tray for workshop hoist - VAS 6208-

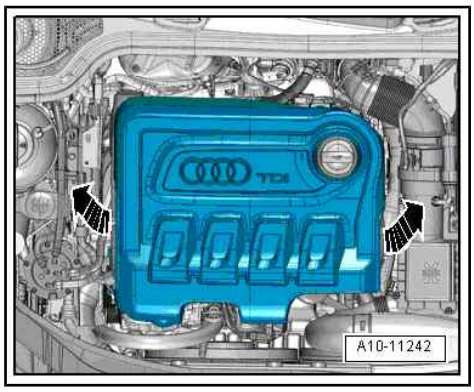


♦ Hose clip pliers - VAS 6362-



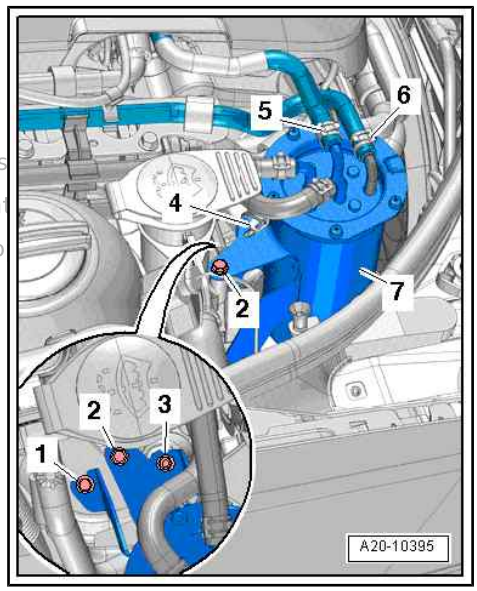
Removing

– Remove engine cover panel -arrows-.

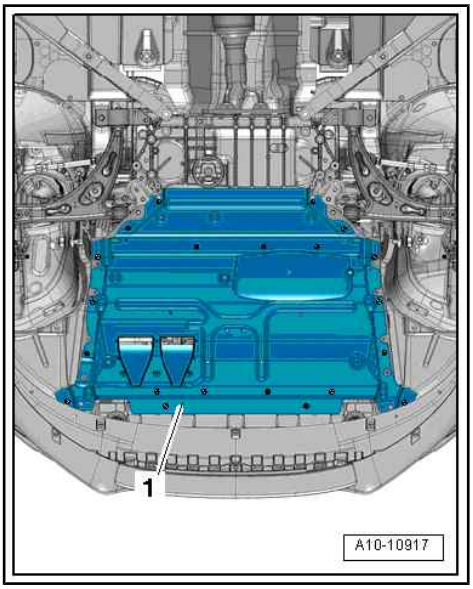


– Loosen bolt -1-.
– Remove bolt -2- and nut -3-.
– Detach retainer -4- from fuel filter, move fuel filter -7- clear to one side with fuel hoses -5- and -6- connected.

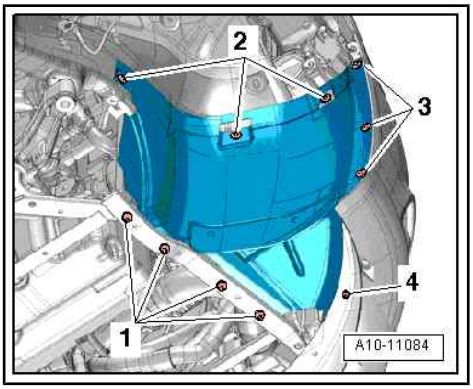
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– Remove noise insulation -1- ⇒ Rep. gr. 50 .

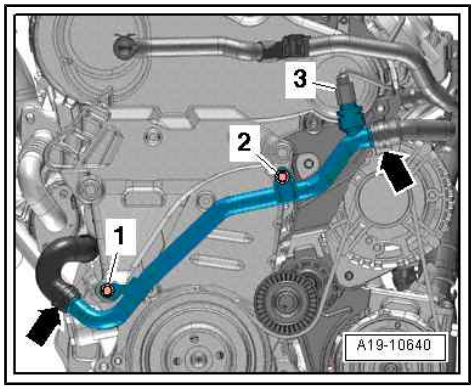


– Remove front wheel housing liner (front section, right-side) ⇒ Rep. gr. 66 .



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– Place drip tray for workshop hoist - VAS 6208- beneath engine.
– Unplug electrical connector -3- at radiator outlet coolant temperature sender - G83- .
– Clamp off coolant hoses using hose clamps -3094- , release hose clips -arrows- and disconnect coolant hoses from coolant pipe (right-side).
– Remove nut -1- and bolt -2- and take off coolant pipe (right-side).



Installing

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

- Tightening torque
⇒ "3.1 Exploded view - coolant pipes, coolant temperature senders, coolant circulation pump", page 211

Note

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

– Install front section of wheel housing liner ⇒ Rep. gr. 66 .
– Install noise insulation ⇒ Rep. gr. 50 .
– Install fuel filter ⇒ Rep. gr. 20 .
– Check coolant level ⇒ page 202 .

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4 Radiator and radiator fans

Overview

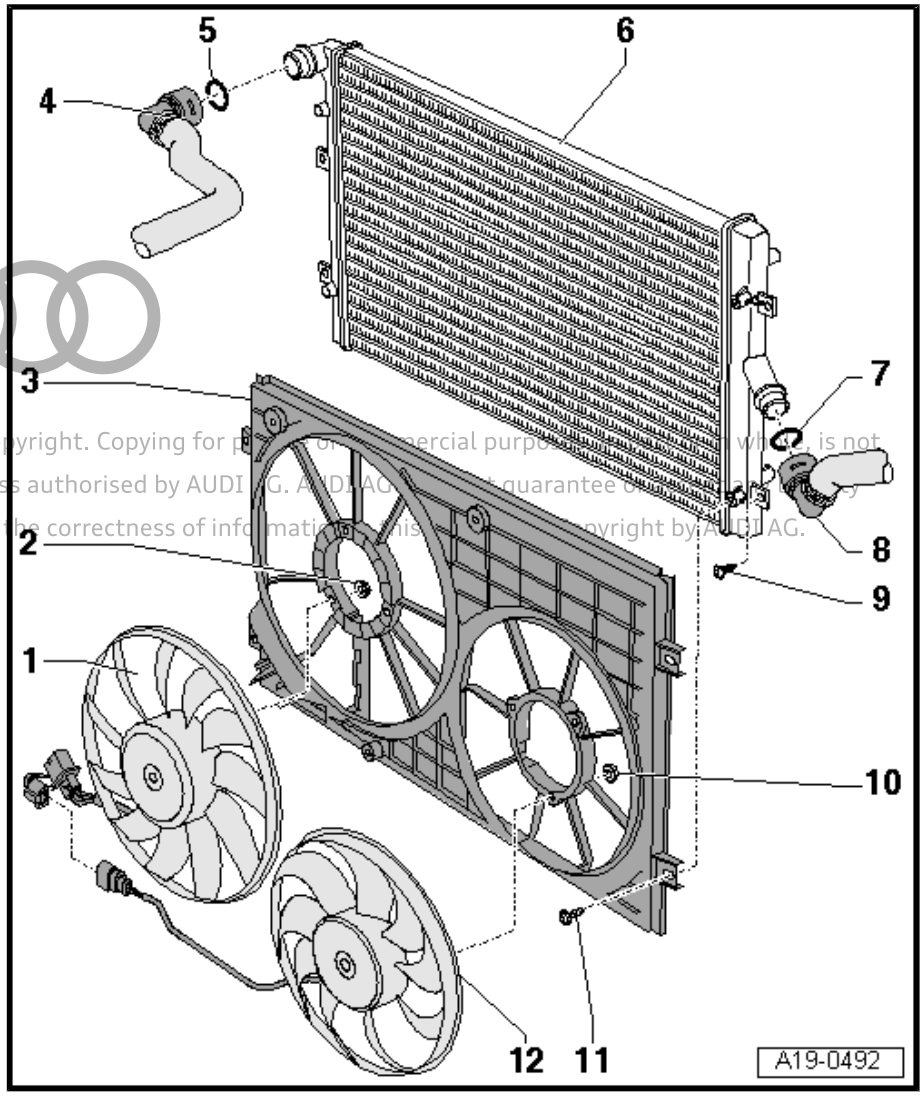
- ⇒ “4.1 Exploded view - radiator and radiator fans”, page 231
- ⇒ “4.2 Removing and installing radiator”, page 232
- ⇒ “4.3 Removing and installing radiator cowl”, page 234
- ⇒ “4.4 Removing and installing radiator fans V7 and V177 ”, page 237

WARNING

Risk of injury as the radiator fans may start up automatically.

- *Unplug electrical connectors before working in vicinity of radiator cowl.*

4.1 Exploded view - radiator and radiator fans



1 - Radiator fan - V7-
- ❑ With radiator fan control unit - J293-
- ❑ Removing and installing ⇒ page 237

2 - Nut
- ❑ 5 Nm

3 - Radiator cowl
- ❑ Removing and installing ⇒ page 234

4 - Coolant hose (top)
- ❑ Lift retaining clip to detach
- ❑ Connecting to radiator ⇒ page 232

5 - O-ring
- ❑ Renew if damaged
- ❑ Lubricate with coolant

6 - Radiator
- ❑ Removing and installing ⇒ page 232
- ❑ If renewed, refill system with fresh coolant

7 - O-ring
- ❑ Renew if damaged
- ❑ Lubricate with coolant

8 - Coolant hose (bottom)
- ❑ Lift retaining clip to detach
- ❑ Connecting to radiator ⇒ page 232

9 - Bolt
- ❑ 5 Nm

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10 - Nut

- ❑ 5 Nm

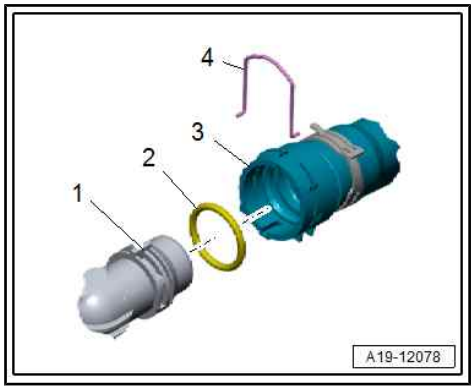
11 - Bolt

- ❑ 5 Nm

12 - Radiator fan 2 - V177-

- ❑ Removing and installing ⇒ page 237

Connecting coolant hose with plug-in connector



- If damaged, renew retaining clip -4-.

– If damaged, renew O-ring. To do so, remove O-ring -2- from plug-in connector -3- using a suitable tool (do not use a sharp tool). Take care not to damage the plug-in connector or the surface on which the O-ring is seated.

– Lightly lubricate new O-ring with coolant and fit O-ring in coolant hose.

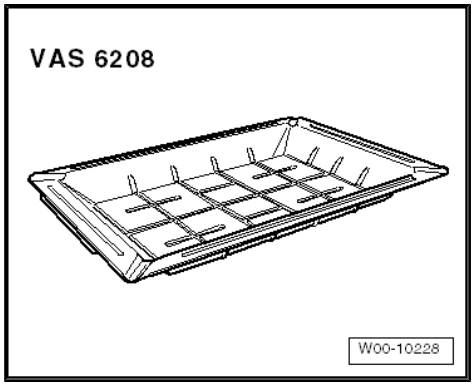
– Press coolant hose onto connection -1- until it engages audibly.

– Press coolant hose in again and then pull to check that plug-in connector is correctly engaged.

4.2 Removing and installing radiator

Special tools and workshop equipment required

♦ Drip tray for workshop hoist - VAS 6208-

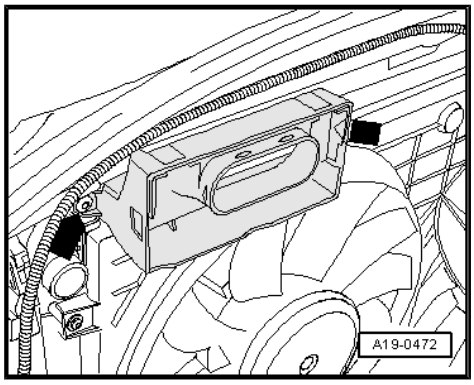


Removing

– Drain coolant ⇒ page 195 .

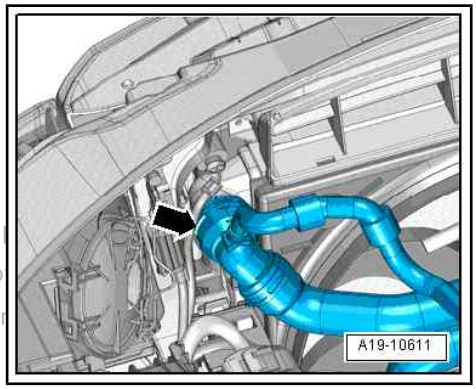
– Remove radiator cowl ⇒ page 234 .

– Remove bolts -arrows- and detach air duct from lock carrier.



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– Lift retaining clip -arrow- and disconnect coolant hose (top left) from radiator.

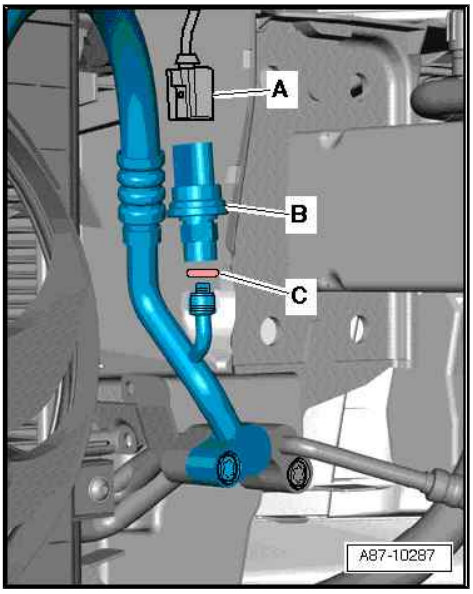


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– Unplug electrical connector -A- at high-pressure sender - G65- -item B-.

Note

Disregard -item C-.

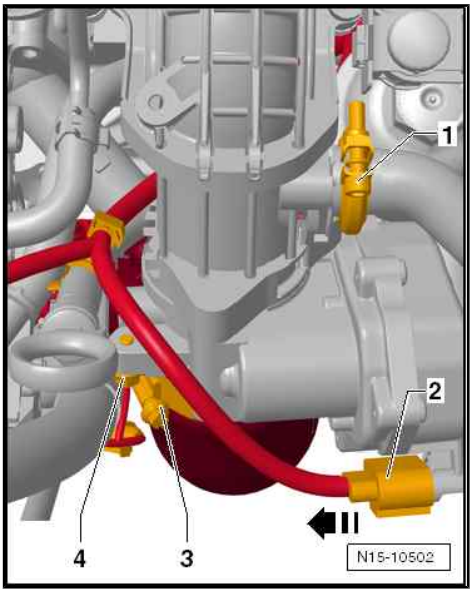


– Unplug electrical connector -2- at throttle valve module - J338- -arrow-.

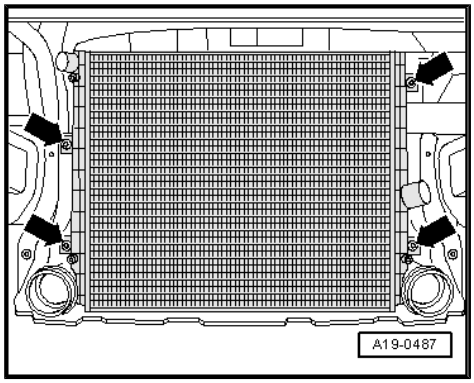
Note

Disregard -items 1, 3, 4-.

– Detach sealing lip at lock carrier (top).



– Place drip tray for workshop hoist - VAS 6208- beneath engine.
– Remove bolts -arrows- at rear and lift out radiator.



Installing

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

- Tightening torque
  ⇒ "4.1 Exploded view - radiator and radiator fans", page 231

Note

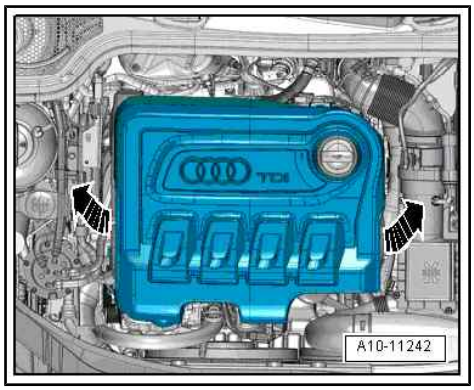
- *If there are slight impressions on the fins, refer to ⇒ page 7 .*
- *Renew seals and O-rings.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

– Install radiator cowl ⇒ page 234 .
– Install air cleaner housing ⇒ Rep. gr. 23 .
– Connect coolant hose with plug-in connector to radiator ⇒ page 232 .
– Fill up with coolant ⇒ page 198 .

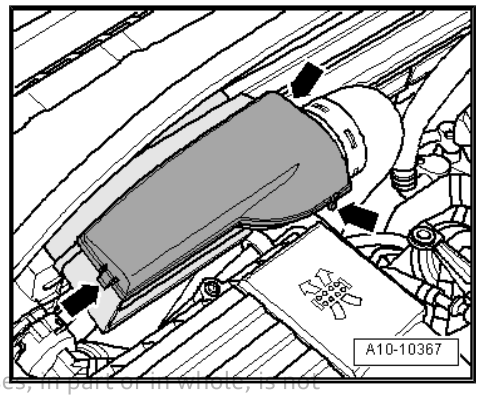
4.3 Removing and installing radiator cowl

Removing

– Remove engine cover panel -arrows-.

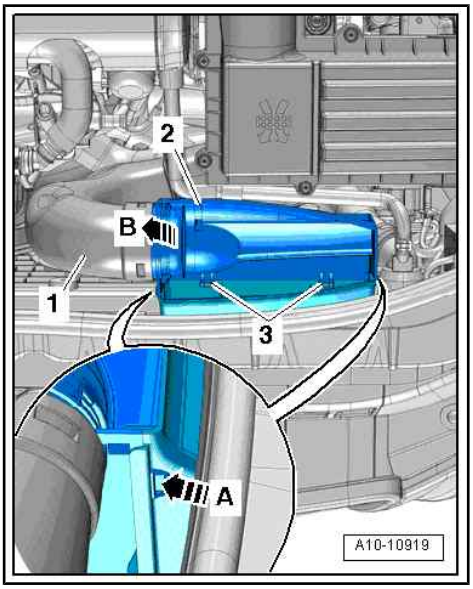


– Pull cover off air duct (release clips on sides) -arrows-.



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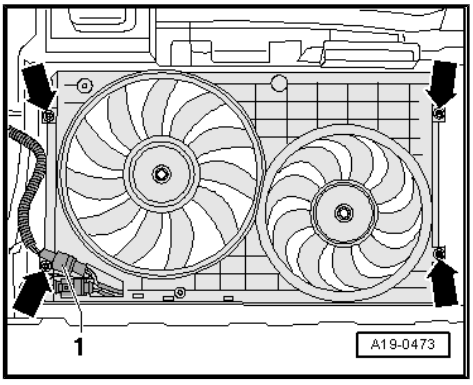
– Release clips on left and right -arrow A- and unclip air duct at bottom -2-.
– Swivel air duct (bottom) slightly to the rear and detach air duct (bottom) from retainers -3-.
– Detach air pipe -1- from air duct (bottom) -arrow B-.



WARNING

Risk of injury as the radiator fans may start up automatically.

- ***Even when the ignition is switched off, the radiator fans can start up without warning due to accumulated heat in the engine compartment, etc.***

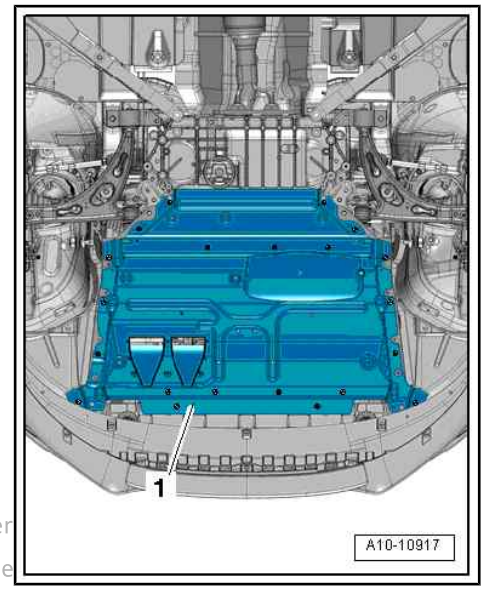


– Remove bolts -top arrows- for radiator cowl.

Note

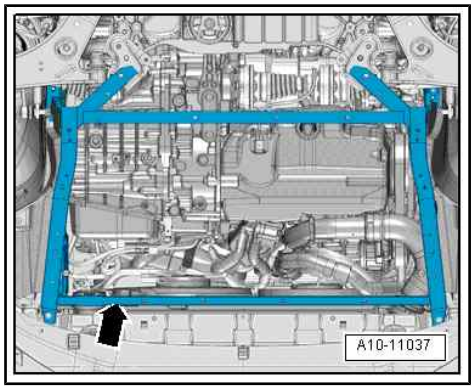
- *The bolts -bottom arrows- are removed at a later stage.*
- *Disregard -item 1-.*

– Remove noise insulation -1- ⇒ Rep. gr. 50 .

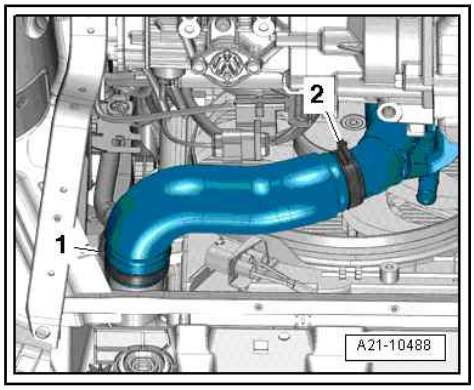


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– A3 Cabriolet: Remove noise insulation frame -arrow- ⇒ Rep. gr. 50 .

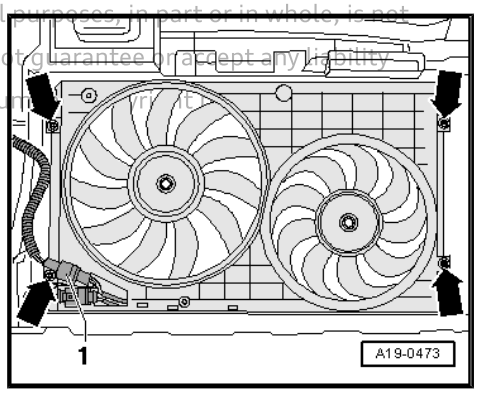


– Release hose clips -1- and -2- and remove air hose.



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– Unplug electrical connector -1-.
– Remove bolts -bottom arrows- and take out air cowl downwards.

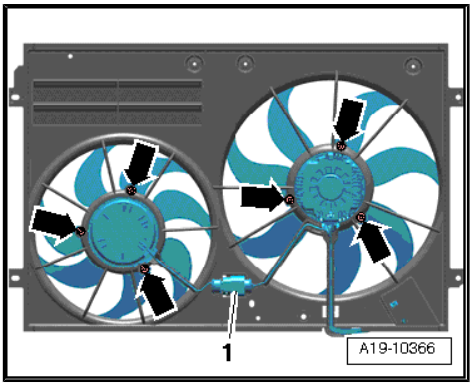


Installing

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

- Tightening torque
  ⇒ “4.1 Exploded view - radiator and radiator fans”, page 231
– Install air hoses with screw-type clips ⇒ page 253 .
– Install noise insulation frame (if fitted) and noise insulation panels ⇒ Rep. gr. 50 .

4.4 Removing and installing radiator fans - V7- and -V177-



Removing

– Remove radiator cowl ⇒ page 234 .

– Unplug electrical connector -1- and move clear.

– Unscrew nuts -arrows- and remove radiator fans.

Installing

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

- Tightening torque
  ⇒ “4.1 Exploded view - radiator and radiator fans”, page 231

Note

Fit all cable ties in the original positions when installing.

– Install radiator cowl ⇒ page 234 .

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21 – Turbocharging/supercharging

1 Turbocharger

Overview

- ⇒ “1.1 Diagram of vacuum connections”, page 238
- ⇒ “1.2 Exploded view - turbocharger”, page 240
- ⇒ “1.3 Removing and installing turbocharger”, page 241
- ⇒ “1.4 Renewing vacuum unit with position sender for charge pressure positioner G581 ”, page 246

Note

Observe rules for cleanliness ⇒ page 5 .

1.1 Diagram of vacuum connections

Caution

When routing vacuum lines, make sure they are not kinked, twisted or crushed. Otherwise the engine can stop or fail to start.

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1 - Vacuum unit

- ❑ On turbocharger
- ❑ With position sender for charge pressure positioner - G581-

2 - Charge pressure control solenoid valve - N75-

3 - Noise insulation

4 - Air cleaner housing

5 - To brake servo

6 - Connection piece

- ❑ On vacuum pump

7 - Non-return valve

- ❑ Note installation position

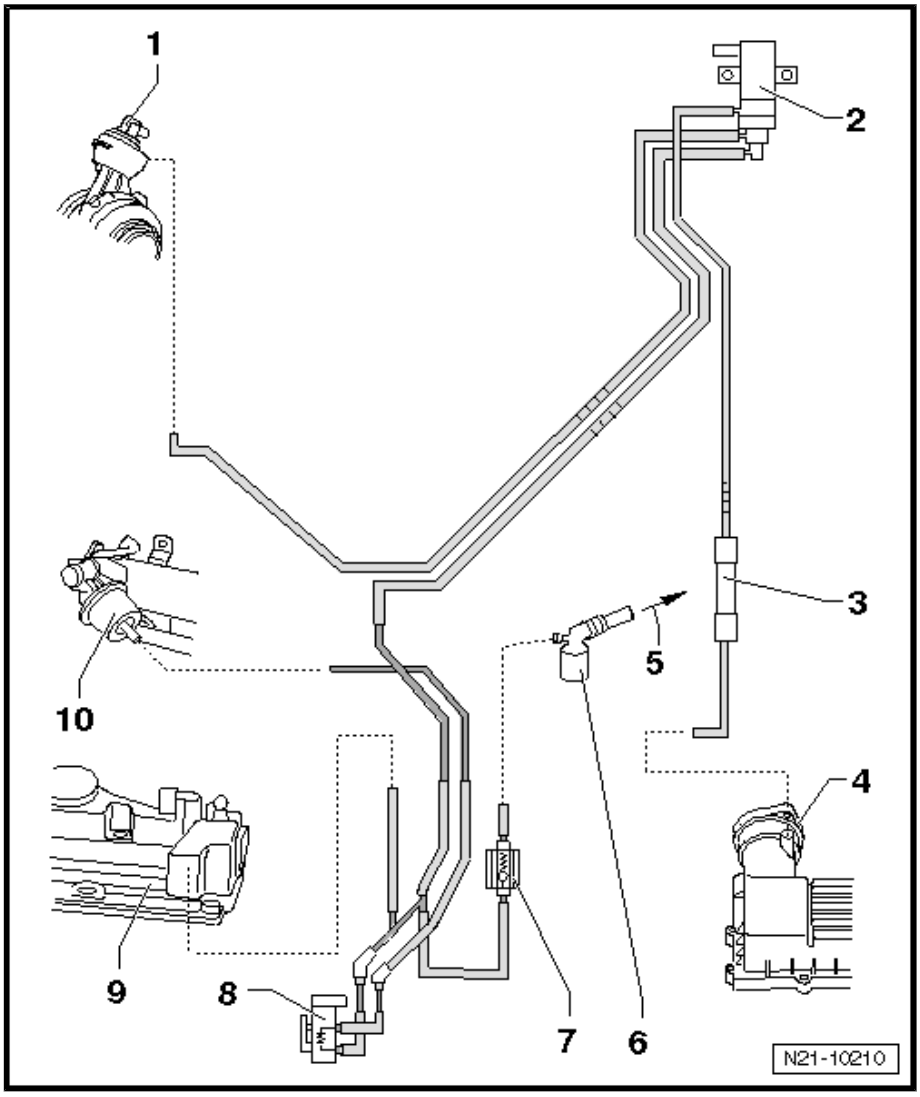
8 - Exhaust gas recirculation cooler change-over valve - N345-

- ❑ Checking change-over function ⇒ page 283

9 - Cylinder head cover

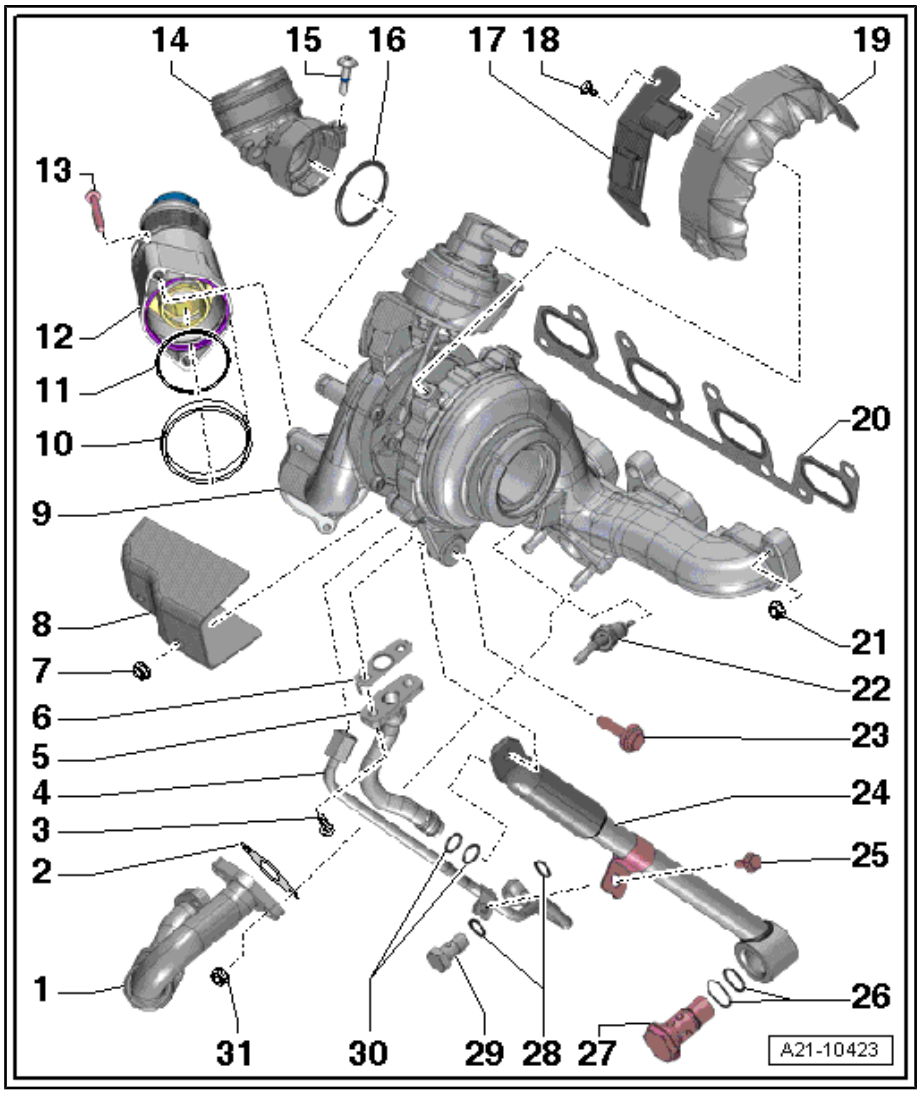
10 - Vacuum unit

- ❑ For change-over function for exhaust gas recirculation cooler



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1.2 Exploded view - turbocharger



1 - Exhaust gas recirculation pipe

- ❑ With flexible joint; do not bend joint - risk of cracking

2 - Gasket

- ❑ Renew

3 - Ribbed bolt

- ❑ Renew
- ❑ 17 Nm

4 - Oil supply line

- ❑ Check for obstructions
- ❑ Before installing, fill turbocharger with engine oil at connection for oil supply line
- ❑ Tighten union nuts to 22 Nm
- ❑ Different connection points on turbocharger

5 - Oil return line

6 - Gasket

- ❑ Renew

7 - Nut

- ❑ 24 Nm

8 - Heat shield

9 - Turbocharger

- ❑ Can only be renewed together with exhaust manifold and vacuum unit as one unit
- ❑ Adaption must be performed after renewing this component
- ❑ Select `01 - Engine electronics, functions` and perform Guided Function `01 - Adaption after replacing positioner`
- ❑ Removing and installing ⇒ page 241

10 - Retaining ring

- ❑ Can only be installed in one position

11 - O-ring

- ❑ Renew

12 - Pulsation damper

13 - Bolt

- ❑ 9 Nm

14 - Intake connecting pipe

15 - Bolt

- ❑ 9 Nm
- ❑ Captive in intake connecting pipe

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16 - O-ring
- ❑ Renew

17 - Bracket
- ❑ For electrical wiring

18 - Bolt
- ❑ 15 Nm

19 - Heat shield

20 - Gasket
- ❑ Renew

21 - Nut
- ❑ Renew
- ❑ 24 Nm
- ❑ Lubricate exhaust manifold studs with high-temperature paste
- ❑ If studs are renewed, too, tighten them to 15 Nm

22 - Exhaust gas temperature sender 1 - G235-
- ❑ Exploded view ⇒ page 275

23 - Bolt
- ❑ 20 Nm

24 - Support
- ❑ For turbocharger

25 - Bolt
- ❑ 9 Nm

26 - O-rings
- ❑ Different diameters
- ❑ Renew

27 - Banjo bolt
- ❑ Renew
- ❑ 60 Nm
- ❑ Tighten banjo bolt using a commercially available open-end spanner insert (27 mm) and a suitable torque wrench

28 - O-rings
- ❑ Renew

29 - Banjo bolt
- ❑ 30 Nm

30 - Seals
- ❑ Renew

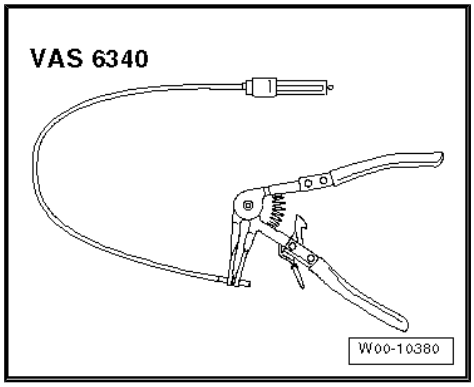
31 - Nut
- ❑ Renew
- ❑ 24 Nm

1.3 Removing and installing turbocharger

Special tools and workshop equipment required

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- Hose clip pliers - VAS 6340-



Removing

Note

Secure the heat insulation sleeve in the original position when installing.

– Observe rules for cleanliness ⇒ page 5 .

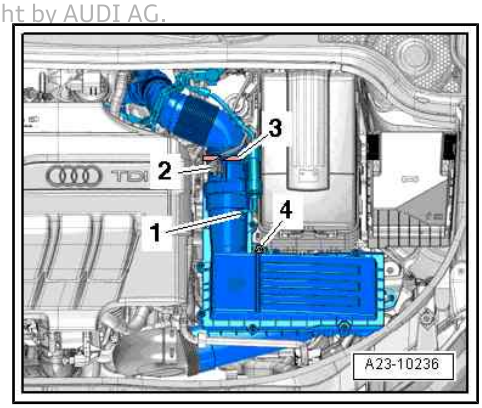
Caution

If the turbocharger has suffered mechanical damage (e.g. damaged compressor wheel), it is not sufficient merely to fit a new turbocharger. The following work must be performed in order to avoid further damage:

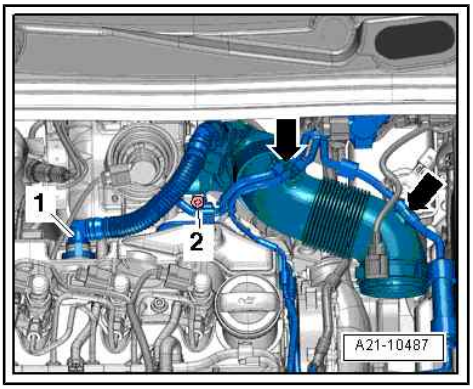
- ***Check air cleaner housing, air filter element and air hoses for dirt and foreign particles.***
- ***Check the entire charge air system (including the charge air cooler) for foreign matter.***
- ***If foreign matter is found in the charge air system, clean all relevant ducts and hoses and renew charge air cooler if necessary.***

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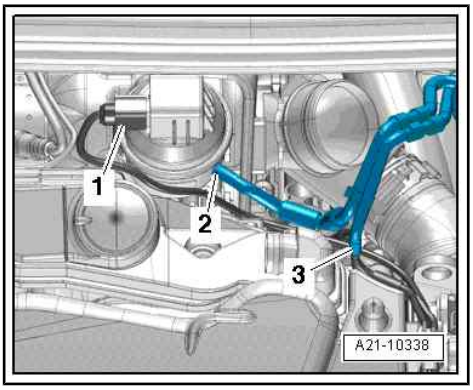
– Remove particulate filter ⇒ page 260 .
– Remove air cleaner housing ⇒ Rep. gr. 23 .



– Press release tabs and disconnect crankcase breather hose -1- from cylinder head cover.
– Move clear vacuum hoses -arrows-.
– Remove bolt -2-, swivel intake pipe with connection to rear and detach from turbocharger.

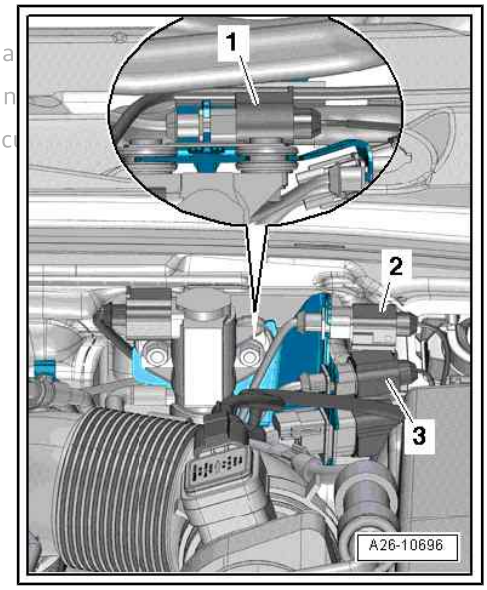


– Detach heat insulation sleeve.
– Detach vacuum hose -2- from vacuum unit of turbocharger.
– Disconnect vacuum hose -3-.
– Unplug electrical connector -1- at position sender for charge pressure positioner - G581- .

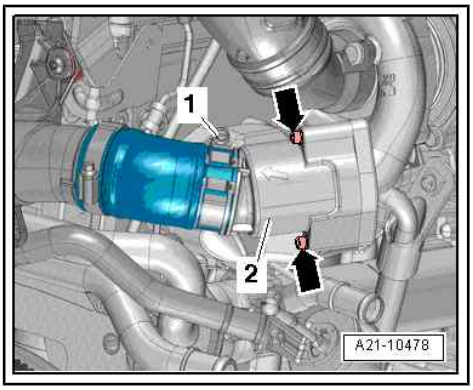


– Move clear electrical connector -3- for exhaust gas temperature sender 1 - G235- and electrical wiring.

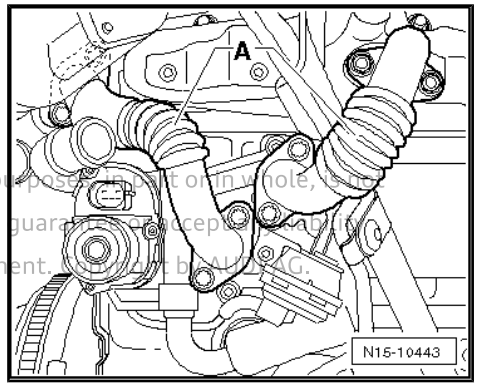
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– Remove bolts -arrows-.
– Loosen hose clip -1- and detach pulsation damper -2-.



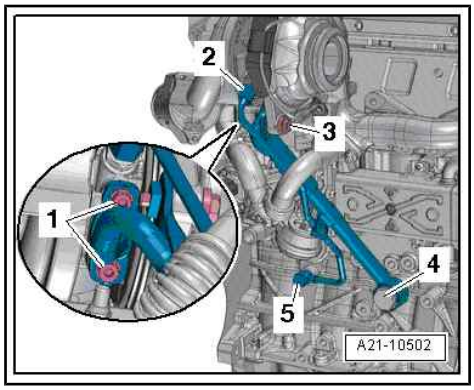
– Remove bolts and detach exhaust gas recirculation pipes -A-.



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Vehicles with front-wheel drive

– Remove bolts -1, 3-, union nut -2- and banjo bolts -4, 5- and detach support for turbocharger with oil supply line.

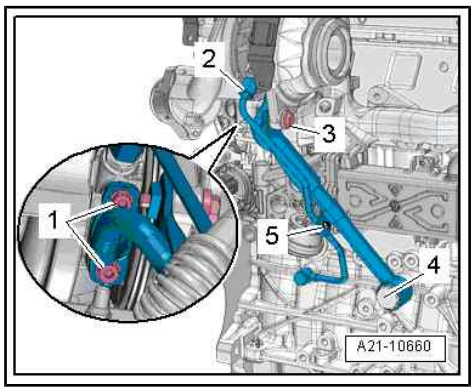


Vehicles with four-wheel drive

– Remove drive shaft (right-side) ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .

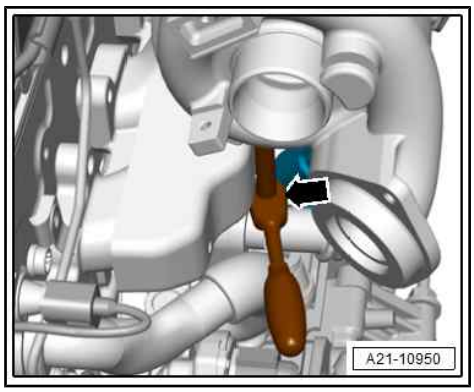
– Pull flange shaft (right-side) out of bevel box ⇒ Rep. gr. 39 ; Front final drive; Exploded view - front final drive .

– Remove bolts -1, 3, 5-, union nut -2- and banjo bolt -4- and detach support for turbocharger.



Note

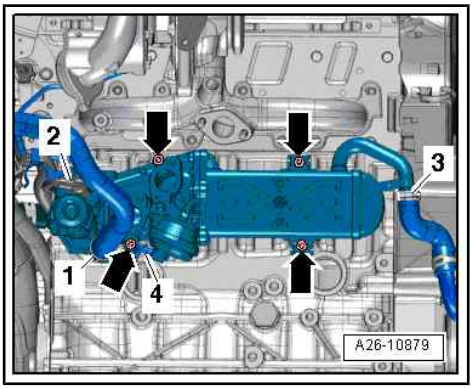
On four-wheel drive vehicles, bolt -1- for the oil return line is accessible from above. Use a small ratchet -arrow- to unscrew it.



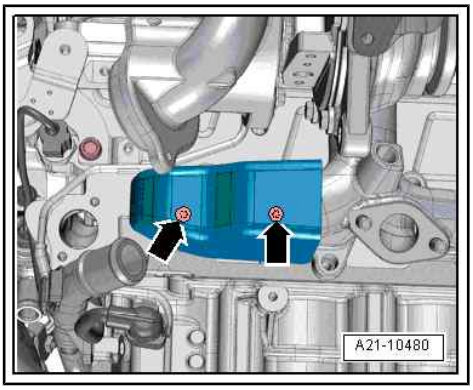
– If necessary, remove bracket between bevel box and cylinder block ⇒ Rep. gr. 34 ; Bevel box; Removing and installing bevel box .

All vehicles (continued)

– Remove bolts -arrows- and move exhaust gas recirculation cooler towards rear.

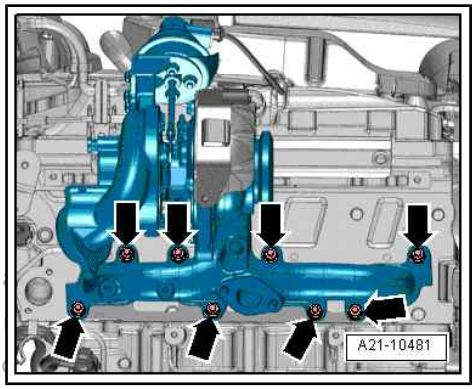


– Remove bolts -arrows- and detach heat shield.



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– Remove nuts -arrows- and detach turbocharger with exhaust manifold from cylinder head.



Installing

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

- Tightening torques
  ⇒ “1.2 Exploded view - turbocharger”, page 240

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Note

- *Renew seals, gaskets, O-rings and self-locking nuts.*
- *Fill turbocharger with engine oil at connection for oil supply line.*
- *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *After installing the turbocharger, allow the engine to idle for approx. 1 minute without pressing the accelerator to ensure that the turbocharger is supplied with oil.*
- *Fit heat insulation sleeves in the original positions when installing.*

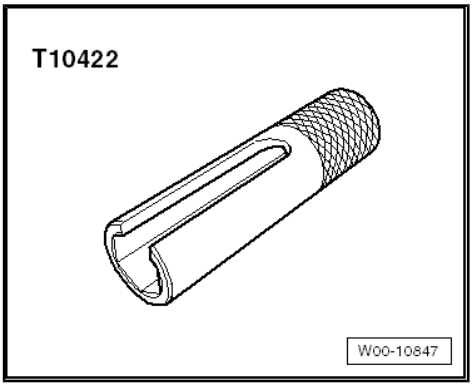
– Install particulate filter ⇒ page 260 .
– Install air hoses with screw-type clips ⇒ page 253 .
– Install exhaust gas recirculation pipes ⇒ page 282 .
– Connect vacuum hoses ⇒ page 238 .
– Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
– Install air cleaner housing ⇒ Rep. gr. 23 .
– Adaption must be performed after renewing this component:
– Connect ⇒ Vehicle diagnostic tester.
– Select `Diagnosis` mode and then `Start diagnosis`.
– Choose `Select own test` tab and select following options one after the other:

- `Drive train`
- `Select engine code and engine`
- `01 - Self-diagnosis compatible systems`
- `01 - Engine electronics`
- `01 - Engine electronics, functions`
- `01 - Adaption after replacing positioner`

1.4 Renewing vacuum unit with position sender for charge pressure positioner - G581-

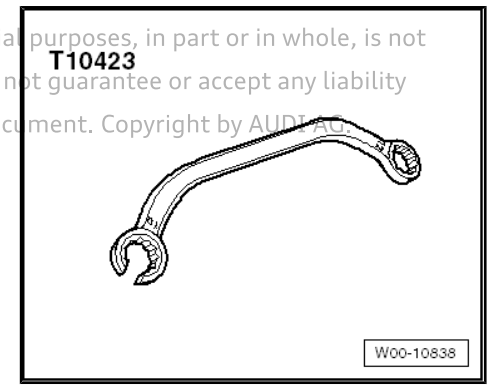
Special tools and workshop equipment required

- Socket, AF 10 mm - T10422- / socket, AF 10 mm - T10422 A-

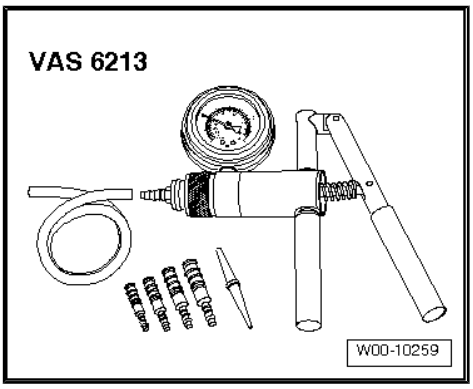


- Ring spanner - T10423-

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- Hand vacuum pump - VAS 6213-



- Vehicle diagnostic tester
- Red paint, e.g. paint pen L 0A3 A01 (Mars Red)

Note

- *Replacement part kit is available for renewing vacuum unit with position sender for charge pressure positioner - G581- ⇒ Electronic parts catalogue .*
- *Renewing vacuum unit with position sender for charge pressure positioner - G581- is only possible with certain engine codes. Refer to ⇒ Electronic parts catalogue for correct replacement part kit and for information on its availability.*
- *Socket, AF 10 mm - T10422 A- replaces socket, AF 10 mm - T10422- . If your workshop still has T10422 sockets, these can continue to be used.*

Caution

The special tools listed, in particular the socket, AF 10 mm - T10422- / socket, AF 10 mm - T10422 A- , are only intended for use according to the procedure described in the following; do NOT use the tools for other bolted connections. There is danger of deformation if the specified torques are exceeded.

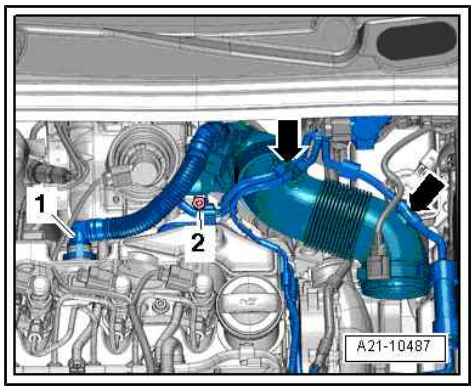
Removing

– Press release tabs and disconnect crankcase breather connecting pipe -1- from cylinder head cover.

– Move clear vacuum hoses -arrows-.

– Unscrew captive bolt -2-, swivel air pipe with connection to rear and detach from turbocharger.

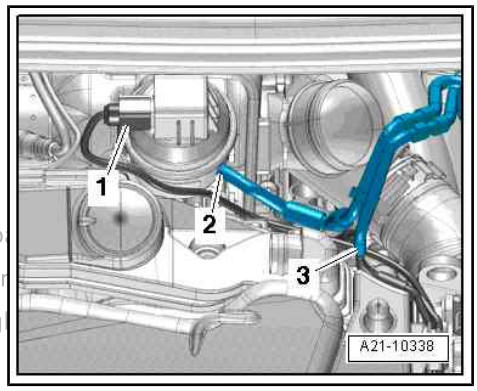
– Seal opening on turbocharger with sealing cap from replacement part kit.



– Detach heat shield sleeve around electrical connector -1-.

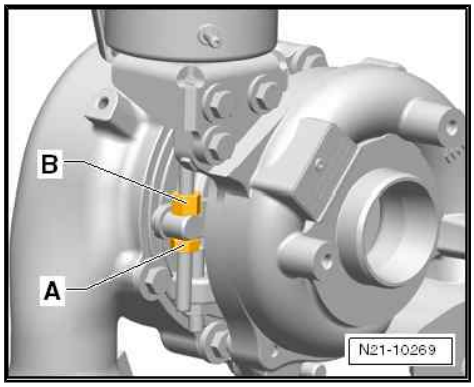
– Unplug electrical connector -1- at position sender for charge pressure positioner - G581- .

– Detach vacuum hose -2- from vacuum unit of turbocharger.

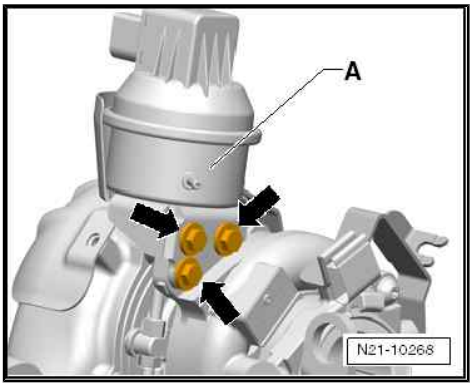


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– Counterhold lock nut -B- and remove securing nut -A- from control rod using socket, AF 10 mm - T10422- / socket, AF 10 mm - T10422 A- .



– Unscrew bolts -arrows- securing vacuum unit and detach vacuum unit with position sender for charge pressure positioner - G581- -A-.



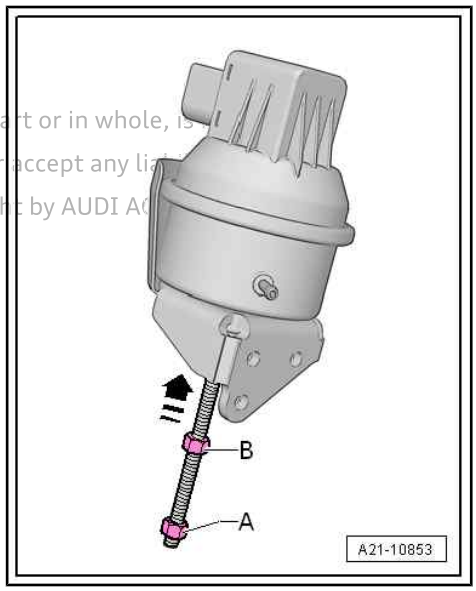
Installing

Caution

Only use new bolts and nuts from replacement part kit.

– If necessary, remove bottom nut -A- securing control rod from new vacuum unit.

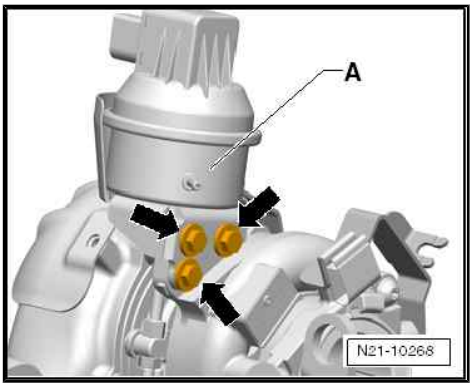
– Screw lock nut -B- onto control rod by hand as far as stop in direction of -arrow-.



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– Guide control rod through adjusting lever on turbocharger, fit vacuum unit -A- and secure bolts -arrows-.

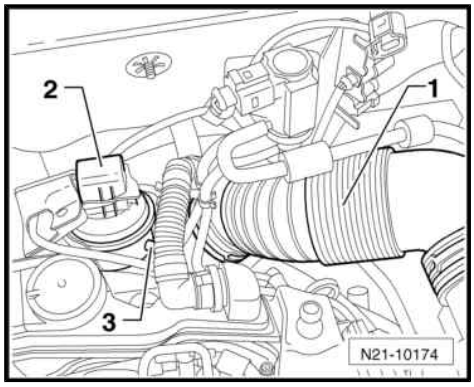
– Tighten securing bolts -arrows- to 8 Nm.



Note

Please ensure that guide can be moved easily on control rod.

– Plug in connector -2- at position sender for charge pressure positioner - G581- and fasten heat shield sleeve.



Checking adjustment of vacuum unit

– Use ⇒ Vehicle diagnostic tester.

– From the list in `Self-diagnosis` under `Measured values`, select `Turbine actuator 1 bank 1, position feedback, raw voltage`.

– Connect hand vacuum pump - VAS 6213- to vacuum unit.

– Create voltage of 760 mV by generating a maximum vacuum of 0.65 bar (observe measured value shown).

Caution

During the following adjustment procedure for the control rod, the vacuum and the voltage of 0.760 V must be maintained.

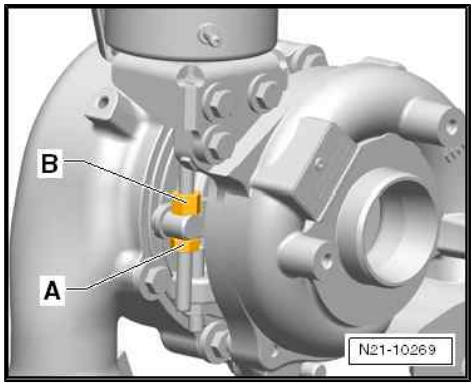
– Slowly screw lock nut -B- for control rod downwards by hand. Adjusting lever is on bottom stop.

– Counterhold lock nut -B- and screw securing nut -A- on control rod against adjusting lever. Tighten slightly using ring spanner - T10423- .

– Release vacuum pressure from vacuum unit.

– Observe measured value shown; a value of 3000 ... 3400 mV should be displayed (unpressurised).

– Fit socket, AF 10 mm - T10422- / socket, AF 10 mm - T10422 A- , counterhold lock nut -B- and tighten securing nut -A-.



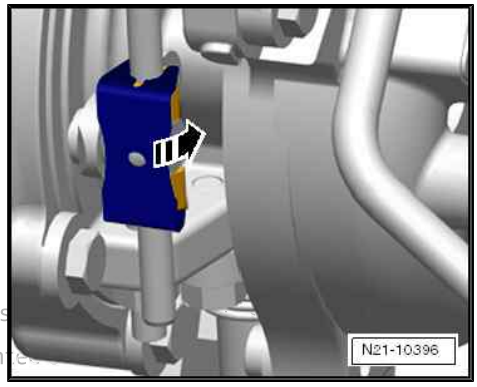
Caution

Create vacuum of 0.65 ± 0.05 bar for vacuum unit to ensure that adjusting lever is positioned at stop. A voltage of 760 mV should build up.

Voltage value OK

– Press locking plate onto control rod by hand and, if possible, turn by 90° in direction of -arrow-.

– Mark housing of vacuum unit with a dot of red paint (e.g. using paint pen) in a clearly visible location.

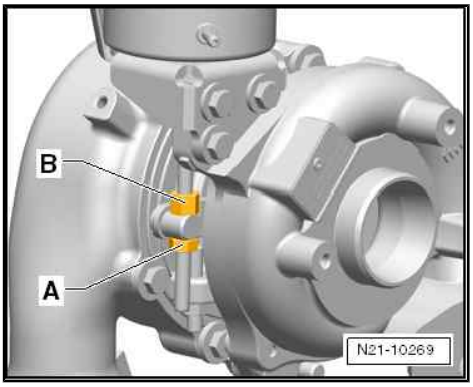


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Voltage value not OK

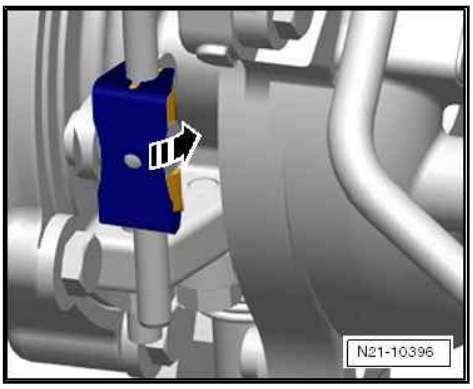
– Counterhold lock nut -B-, loosen securing nut -A- on control rod and adjust value by turning lock nut -B-.

– Counterhold lock nut -B-, screw securing nut -A- in other direction and tighten using socket, AF 10 mm - T10422- / socket, AF 10 mm - T10422 A- .



– Press locking plate onto control rod by hand and, if possible, turn by 90° in direction of -arrow-.

– Seal connection between control rod and securing nut with sealing paint from replacement part kit.



Continued

– Remove sealing cap from turbocharger.

– Fully assemble engine components.

– Start engine and erase event memory ⇒ Vehicle diagnostic tester.

– Check adjustment as follows:

Selecting diagnostic function:

– On touch screen, press button for “Basic setting”.

– Select “Adaption of turbocharger” from list.

– On bottom right of touch screen, press button for “Measured values”.

– Select “Actuator for turbocharger high-pressure, actual value raw voltage” from list.

– On bottom right of touch screen, press button for “Start”.

– Observe value on bottom part of display: value should fluctuate between 650 ... 850 mV and 3000 ... 3400 mV (vacuum unit is moved to both limit stops alternately).

Voltage values OK:

– Exit basic setting.

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2 Charge air cooling

Overview

- ⇒ “2.1 Exploded view - charge air cooler”, page 252
- ⇒ “2.2 Removing and installing charge pressure sender G31 / intake air temperature sender G42 ”, page 253
- ⇒ “2.3 Removing and installing charge air cooler”, page 254
- ⇒ “2.4 Checking charge air system for leaks”, page 255

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Note

- *Check that all air pipes and hoses and vacuum lines are correctly fitted and that there are no leaks before carrying out tests or repairs.*
- *Observe rules for cleanliness ⇒ page 5 .*

2.1 Exploded view - charge air cooler

1 - Air hose

2 - Air pipe (left-side)

3 - Sleeve

4 - Bolt

- ❑ 9 Nm

5 - Grommet

- ❑ Renew if damaged

6 - Air hose

7 - Seal

8 - Charge air cooler

- ❑ Removing and installing ⇒ page 254

9 - Seal

10 - Bolt

- ❑ 5 Nm

11 - Mounting

12 - Mounting

13 - Air hose

14 - Air hose

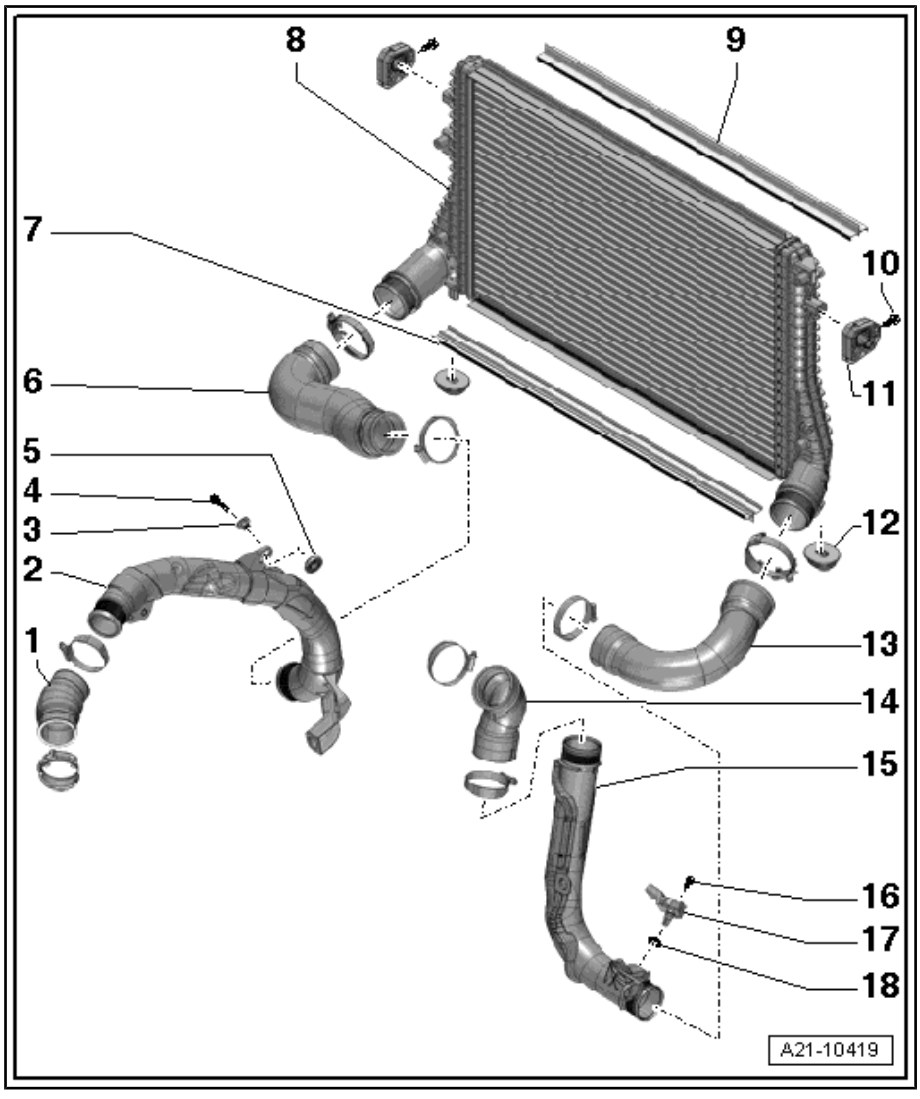
15 - Air pipe (right-side)

16 - Bolt

- ❑ 5 Nm

17 - Charge pressure sender - G31- / intake air temperature sender - G42-

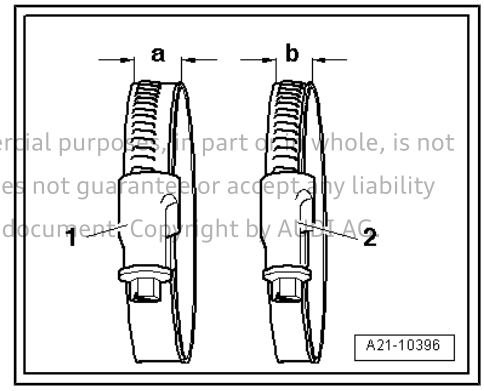
- ❑ Removing and installing ⇒ page 253



18 - O-ring

❑ Renew

Installing air hoses with screw-type clips



Note

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- *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *The screw sections of used screw-type clips must be sprayed with rust remover prior to fitting so that the air hoses can be attached securely to the hose connections.*

Tightening torque for

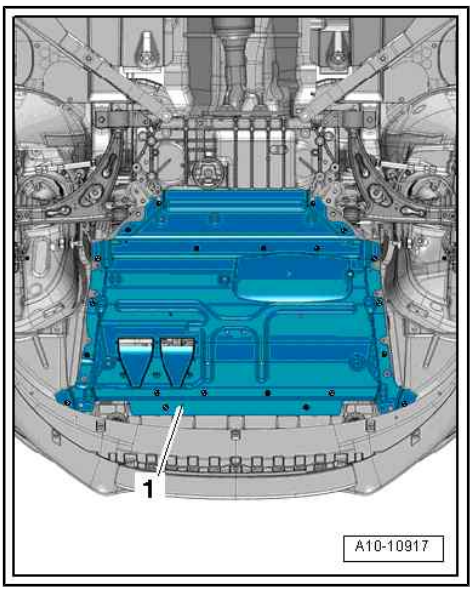
1 - Hose clip with width -a- = 13 mm: 5.5 Nm

2 - Hose clip with width -b- = 9 mm: 3 Nm

2.2 Removing and installing charge pressure sender - G31- / intake air temperature sender - G42-

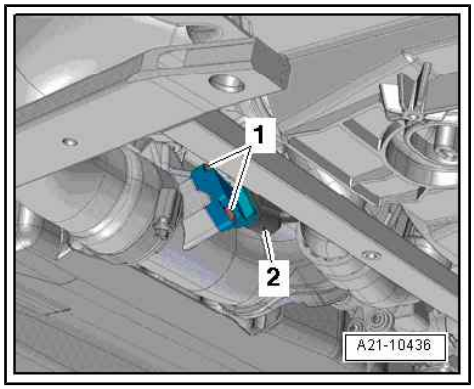
Removing

– Remove noise insulation -1- ⇒ Rep. gr. 50 .



– Unplug electrical connector -2-.

– Remove bolts -1- and pull charge pressure sender - G31- / intake air temperature sender - G42- out of air pipe.



Installing

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

- Tightening torque
  ⇒ “2.1 Exploded view - charge air cooler”, page 252

Note

Fit new O-ring.

– Install noise insulation ⇒ Rep. gr. 50 .

2.3 Removing and installing charge air cooler

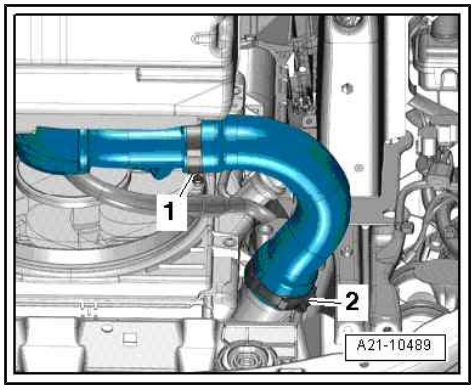
Removing

– Remove radiator ⇒ page 232 .

– Remove bumper cover (front) ⇒ Rep. gr. 63 .

– Unbolt air ducts on left and right sides of charge air cooler.

– Release hose clips -1- and -2- and remove air hose.



WARNING

Risk of injury caused by refrigerant.

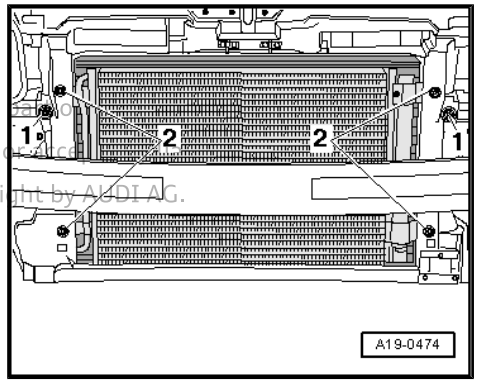
- ***The air conditioner refrigerant circuit must not be opened.***

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Caution

Risk of damage to condenser and refrigerant pipes/hoses.

- ***Do NOT stretch, kink or bend refrigerant lines and hoses.***

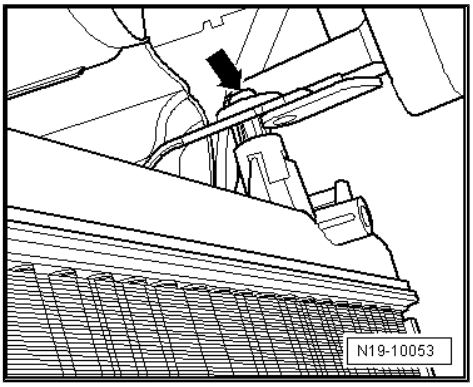


– Remove bolt on retaining clip for refrigerant line in vicinity of longitudinal member.

– Remove bolts -1- for charge air cooler and -2- for condenser.

– Swivel charge air cooler slightly to rear.

– Remove bolt at bracket for refrigerant line (bottom right) at charge air cooler.
– Swivel condenser forward into opening in lock carrier.
– Detach charge air cooler upwards from lock carrier and remove by guiding it out diagonally from below.



Installing

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

- Tightening torques
  ⇒ “2.1 Exploded view - charge air cooler”, page 252

Note

- *If there are slight impressions on the fins, refer to ⇒ page 7 .*
- *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

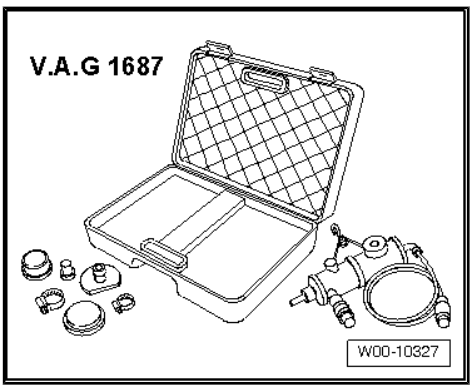
– Install condenser ⇒ Rep. gr. 87 .
– Install air hoses with screw-type clips ⇒ page 253 .
– Install bumper cover (front) ⇒ Rep. gr. 63 .
– Install radiator ⇒ page 232 .

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2.4 Checking charge air system for leaks

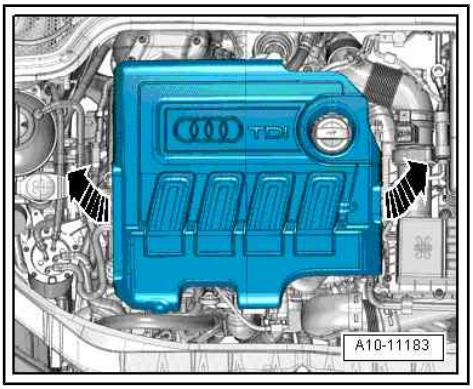
Special tools and workshop equipment required

- Charge air system tester - V.A.G 1687- with adapter - V.A.G 1687/12-

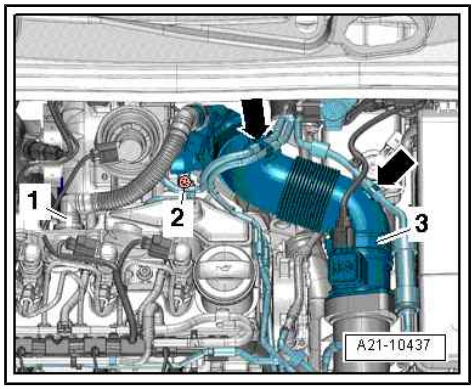


Procedure

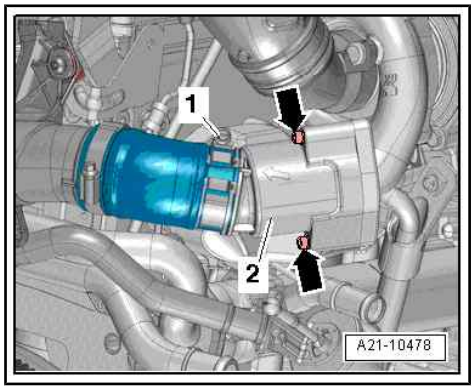
– Remove engine cover panel -arrows-.



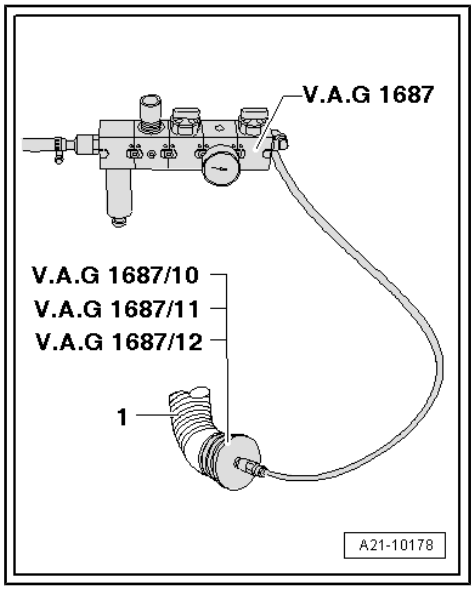
– Press release tabs and detach crankcase breather hose -1-.
– Move clear vacuum hoses -arrows-.
– Release hose clip -3- and detach air pipe from air cleaner housing.
– Remove bolt -2-, swivel intake pipe with connection to rear and detach from turbocharger.



– Remove bolts -arrows-.
– Loosen hose clip -1- and detach pulsation damper -2-.

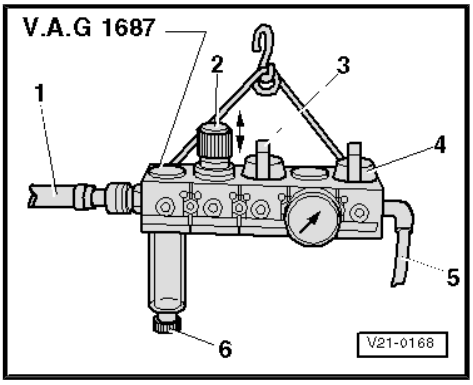


– Insert adapter - 1687/12- into air hose -1- and secure with hose clip.
– Connect charge air system tester - V.A.G 1687- to adapter.



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Prepare charge air system tester - V.A.G 1687- as follows:



– Unscrew pressure control valve -2- completely and close valves -3- and -4-.

• Make sure knob is pulled out before turning pressure control valve -2-.

– Using a commercially available connection piece, connect charge air system tester - V.A.G 1687- to compressed air -1-.

Note

If there is water in sight glass, remove drain plug -6- and drain water.

– Open valve -3-.

Caution

Risk of damage if pressure is set too high.

- ***The pressure must not exceed 0.5 bar.***

– Adjust pressure to 0.5 bar via pressure control valve -2-.

– Open valve -4- and wait until test system is pressurised. If necessary, adjust pressure to 0.5 bar again.

– Check charge air system for audible leaks or leaks that can be felt with the hand; apply commercially available leak detection spray or use ultrasonic tester - V.A.G 1842- .

Note

- *A small amount of air escapes through the valves and enters the engine. Therefore it is not possible to perform a pressure retention test.*
- *For operation of ultrasonic tester -V.A.G 1842- , refer to ⇒ Operating instructions .*
- *Release pressure in test circuit by detaching hose coupling from adapter before removing adapter.*

Assembling

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

Note

- *Renew gasket and O-rings.*
- *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

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– Install intake connection and pulsation damper ⇒ page 240 .

– Install air hoses with screw-type clips ⇒ page 253 .

26 – Exhaust system

1 Silencers

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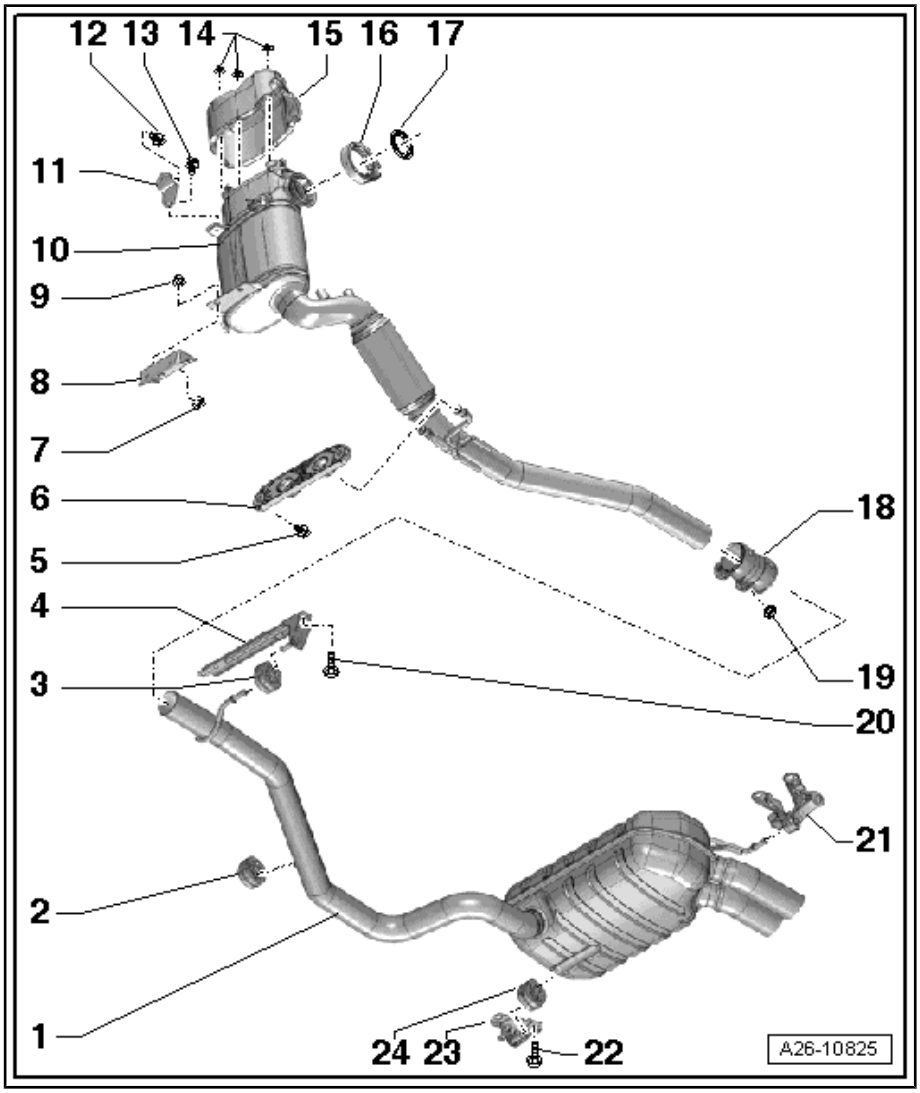
Overview

- ⇒ “1.1 Exploded view - silencers”, page 258
- ⇒ “1.2 Removing and installing particulate filter”, page 260
- ⇒ “1.3 Renewing flexible joint”, page 272
- ⇒ “1.4 Stress-free alignment of exhaust system”, page 273
- ⇒ “1.5 Aligning tailpipes”, page 274
- ⇒ “1.6 Checking exhaust system for leaks”, page 274

Note

- *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 clamp and align silencers and exhaust pipe so that sufficient clearance is maintained to the body at all points and the mountings are evenly loaded.*
- *Use screwdriver to unfasten and tighten clamping washers for heat shields. Tightening torque: 2 Nm*

1.1 Exploded view - silencers



1 - Rear silencer

- ❑ Align exhaust system so it is free of stress ⇒ page 273

2 - Mounting

- ❑ Renew if damaged

3 - Mounting

- ❑ Renew if damaged

4 - Mounting

5 - Bolt

- ❑ 23 Nm

6 - Bracket

- ❑ Renew if damaged

7 - Nut

- ❑ 23 Nm

8 - Bracket (bottom)

- ❑ For particulate filter

9 - Nut

- ❑ 23 Nm

10 - Particulate filter with catalytic converter

- ❑ Removing and installing ⇒ page 260
- ❑ After renewing, perform `Adaption` in `Guided Functions` ⇒ Vehicle diagnostic tester
- ❑ Detach flexible joint from particulate filter ⇒ page 272

11 - Bracket (top)

- ❑ For particulate filter

12 - Bolt

- ❑ 23 Nm

13 - Bolt

- ❑ 23 Nm

14 - Nuts

- ❑ 9 Nm

15 - Heat shield

16 - Clamp

- ❑ For particulate filter
- ❑ Renew
- ❑ Installation position ⇒ page 260
- ❑ 7 Nm

17 - Seal

- ❑ Renew

18 - Clamp

- ❑ Before tightening, align exhaust system so it is free of stress ⇒ page 273

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- ❑ Installation position ⇒ page 260
- ❑ Tighten bolted connections evenly

19 - Nut

- ❑ 23 Nm

20 - Bolt

- ❑ 23 Nm

21 - Mounting

- ❑ Renew if damaged

22 - Bolt

- ❑ 23 Nm

23 - Mounting

- ❑ Renew if damaged

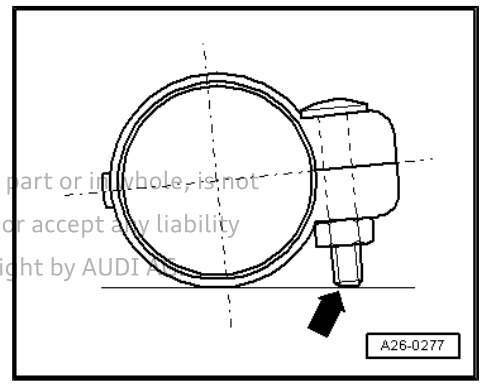
24 - Mounting

- ❑ Renew if damaged

Installation position of clamp

– Install clamp so that ends of bolts do not protrude beyond bottom of clamp -arrow-.

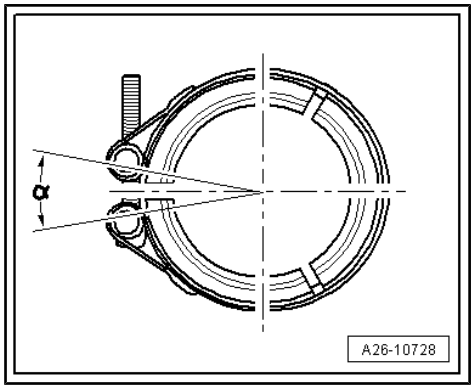
- Bolted connection facing towards right



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Installation position of clamp for particulate filter

- Angle -α- = 0 ± 10°
- Bolt connection faces to rear



1.2 Removing and installing particulate filter

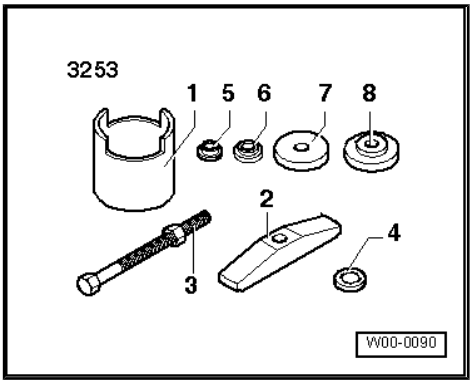
⇒ “1.2.1 Removing and installing particulate filter, vehicles with front-wheel drive”, page 260

⇒ “1.2.2 Removing and installing particulate filter - vehicles with four-wheel drive”, page 268

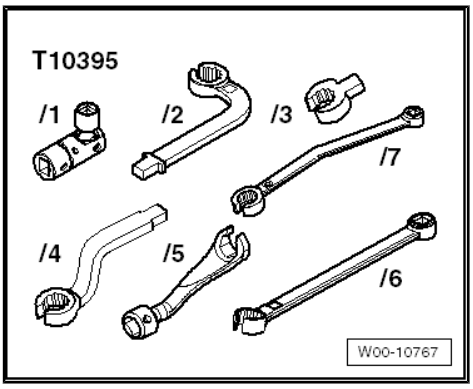
1.2.1 Removing and installing particulate filter, vehicles with front-wheel drive

Special tools and workshop equipment required

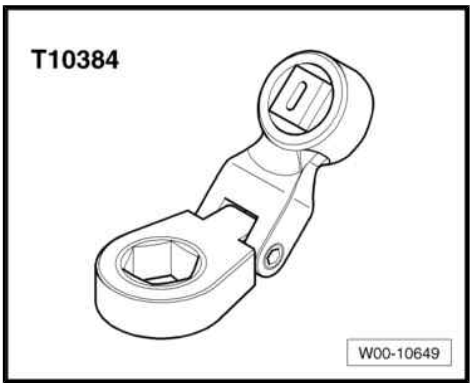
♦ -3253/5- from assembly tool - 3253-



♦ Tool set, 17 mm - T10395-



♦ Ratchet wrench (13 mm) - T10384-



♦ Flange bolt M10x35

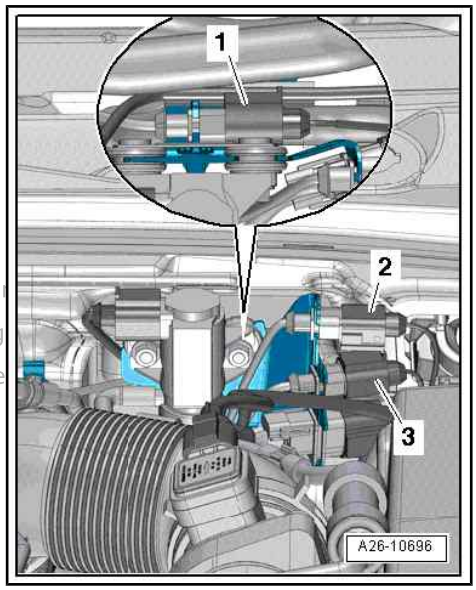
Removing

– Unplug electrical connector -1- for exhaust gas temperature sender 3 - G495- and move electrical wiring clear.

WARNING

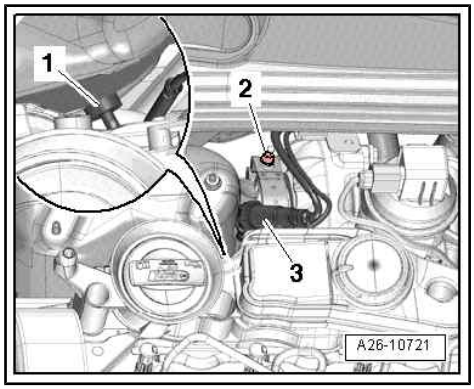
When working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system***
  ⇒ "2.5 Safety precautions when working on the exhaust system", page 3 .



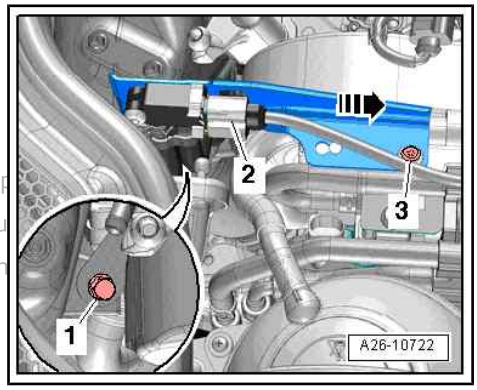
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– Remove Lambda probe - G39- -3- ⇒ Rep. gr. 23 ; Mixture preparation - injection; Lambda probe; Removing and installing Lambda probe G39 .
– Remove exhaust gas temperature sender 3 - G495- -1- ⇒ “2.3 Removing and installing exhaust gas temperature sender 3 G495 ”, page 278 .
– Slacken bolt -2- and remove clamp.

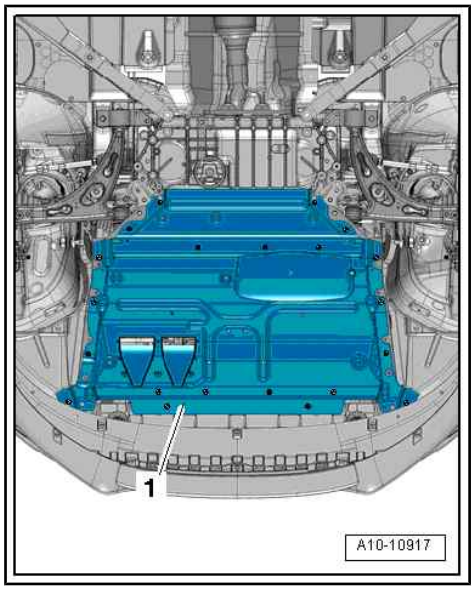


– Unplug electrical connector -2- at pressure differential sender - G505- .

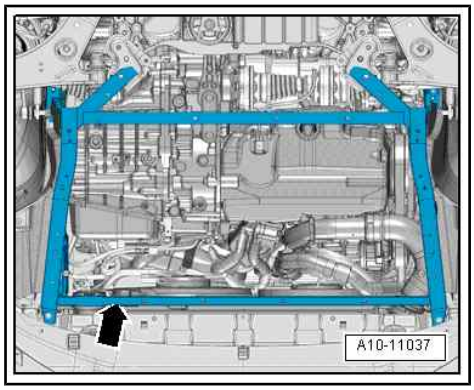
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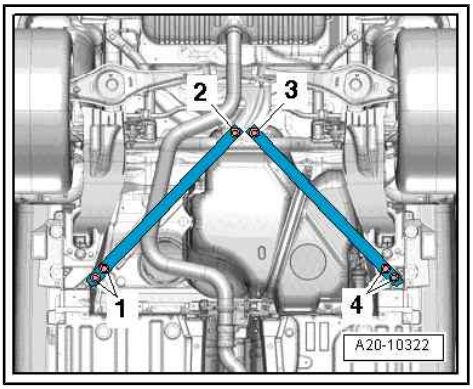
– Remove bolts -1- and -3- and detach pressure differential sender - G505- from bracket -arrow-.
– Remove front right wheel.
– Remove noise insulation -1- ⇒ Rep. gr. 50 .



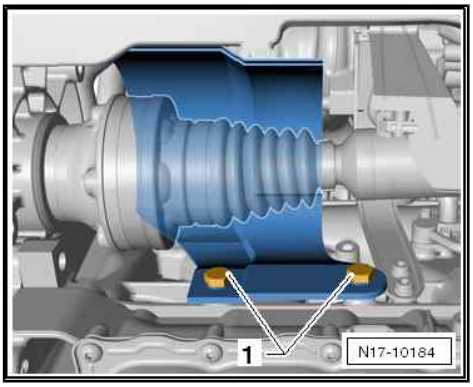
– A3 Cabriolet: Remove noise insulation frame -arrow- ⇒ Rep. gr. 50 .



– A3 Cabriolet: Remove bolts -1- and -2- and take off diagonal strut (left-side).



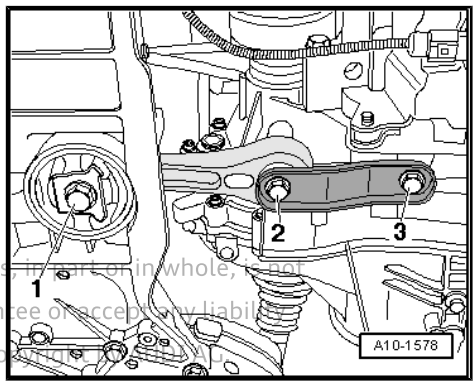
– Remove bolts -arrows- and detach heat shield for drive shaft (right-side).
– Unbolt drive shaft (right-side) from gearbox flange ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .



– Remove bolts -2- and -3- securing pendulum support.

Note

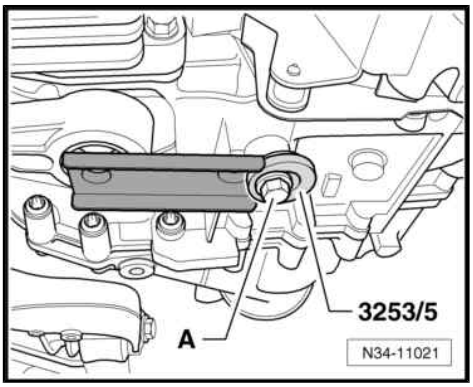
Disregard -item 1-.



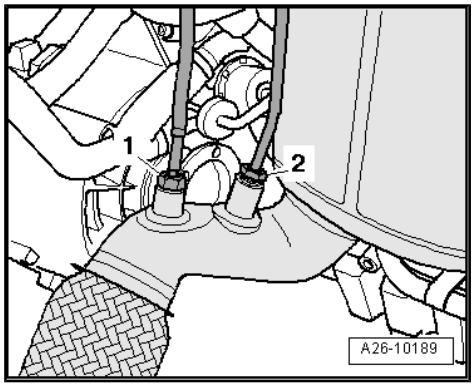
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– Press engine/gearbox assembly towards lock carrier and support with assembly tool - 3253- via pendulum support as shown in illustration.

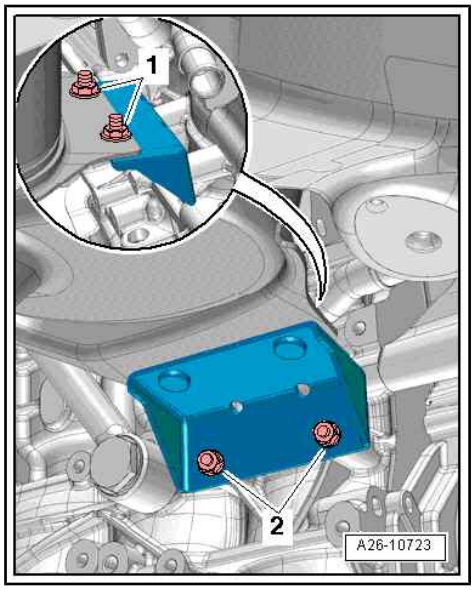
A - Flange bolt M10x35



– Unscrew exhaust gas temperature sender 4 - G648- -1- from exhaust pipe behind particulate filter using a tool from tool set, 17 mm - T10395- .



– Unscrew securing nuts -1- above bracket for particulate filter using ratchet wrench - T10384- and unscrew nuts -2-.
– Detach bracket for particulate filter.

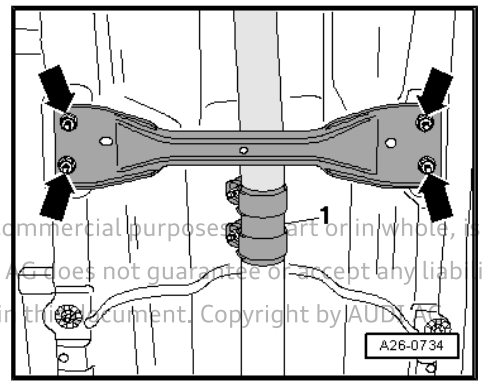


– Loosen nuts for clamp -1- and push clamp to rear.

Caution

Risk of damage to flexible joint.

- *Do NOT bend flexible joint in front exhaust pipe more than 10°.*

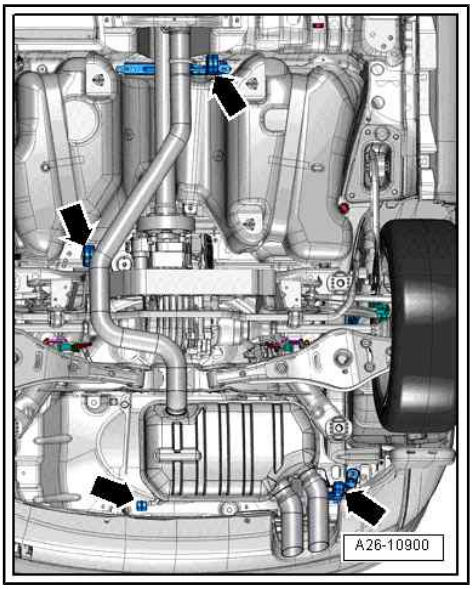


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Note

Disregard -arrows-.

– Remove nuts -arrows- and detach rear cross member on vehicle underside.



Note

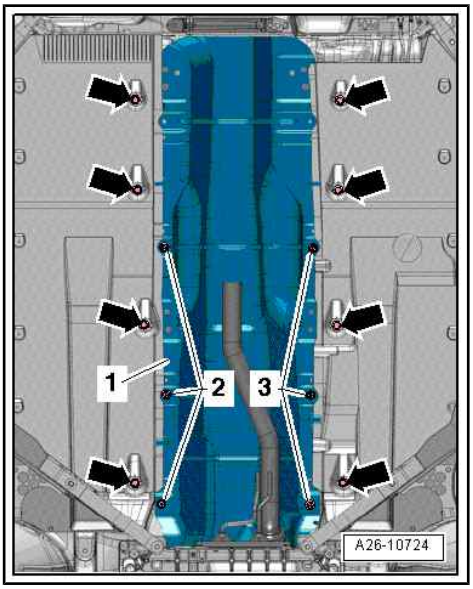
A second mechanic is required for removing the rear section of the exhaust system.

– Unhook rear silencer and centre silencer at rubber mountings -arrows- and remove rear section of exhaust system.

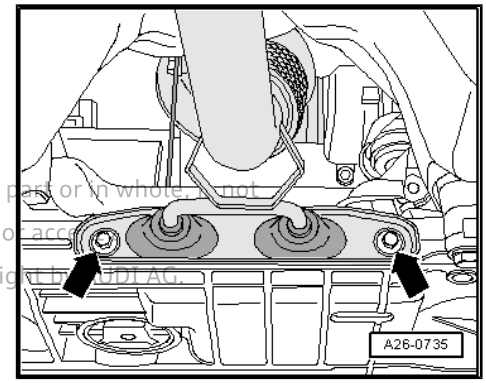
– Remove nuts -arrows-.

– Remove clamping washers -2- and -3-.

– Pull inner side of cover on vehicle underside down slightly until heat shield -1- for centre tunnel can be detached.

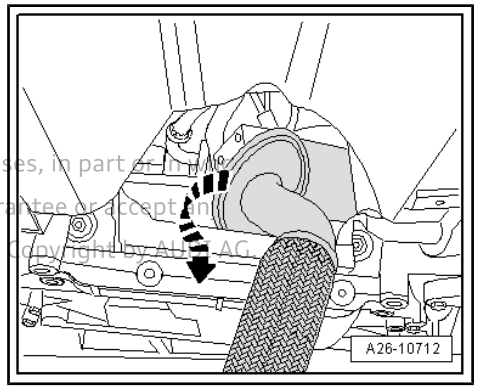


– Remove bolts -arrows- securing bracket for exhaust system.



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– Remove particulate filter by rotating through 180° and about its own axis.



Installing

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

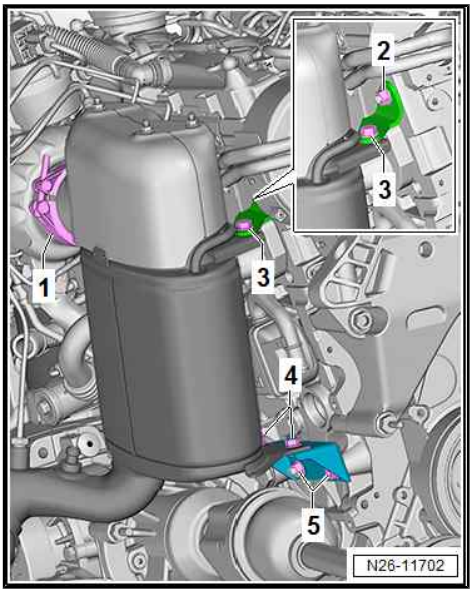
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Note

- *Renew gaskets, self-locking nuts and clamp for particulate filter.*
- *Fit all cable ties in the original positions when installing.*

– Note sequence when installing particulate filter:

1.	Fit particulate filter to turbocharger, attach clip -1- without tightening
2.	Fit bolts -2 ... 5- by hand without tightening • It must still be possible to move particulate filter and bracket
3.	Tighten clamp -1-
4.	Tighten bolts -2- and -5-.
5.	Tighten bolts -3- and -4-.



- Tightening torques for particulate filter
⇒ “1.1 Exploded view - silencers”, page 258

– Install underbody cover ⇒ Rep. gr. 66 .

– A3 Cabriolet: Install noise insulation frame ⇒ Rep. gr. 50 .

– Install pendulum support.

◆ ⇒ Rep. gr. 34 ; Exploded view - assembly mountings, vehicles with front-wheel drive

– A3 Cabriolet: Install diagonal strut ⇒ Rep. gr. 42 .

– Install exhaust gas temperature sender 4 - G648-
⇒ “2.4 Removing and installing exhaust gas temperature sender 4 G648 ”, page 280 .

– Install drive shaft (right-side) ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .

– Install heat shield for drive shaft (right-side) ⇒ page 41.

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– Fit front wheel (right-side) ⇒ Wheels and tyres; Rep. gr. 44 .

– Align the exhaust system so it is free of stress
⇒ “1.4 Stress-free alignment of exhaust system”, page 273 .

– Install Lambda probe - G39- and pressure differential sender - G505- ⇒ Rep. gr. 23 ; Mixture preparation - injection; Lambda probe; Removing and installing Lambda probe G39 .

– Install exhaust gas temperature sender 3 - G495- -1-
⇒ “2.3 Removing and installing exhaust gas temperature sender 3 G495 ”, page 278 .

– Adaption must be performed using ⇒ Vehicle diagnostic tester after renewing particulate filter.

– Connect ⇒ Vehicle diagnostic tester.

– Interrogate event memory and erase entries if necessary.

– Select `Diagnosis` mode and then `Start diagnosis`.

– Choose `Select own test` tab and select following options one after the other:

◆ `Drive train`

◆ `Select engine code and engine`

◆ `01 - Self-diagnosis compatible systems`

◆ `01 - Engine electronics`

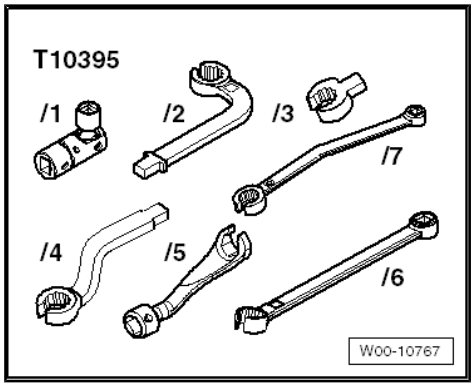
◆ `01 - Engine electronics, functions`

◆ `01 - Adaptions after replacing engine CU/particulate filter`

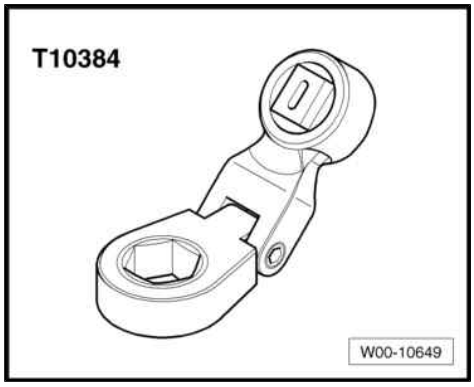
1.2.2 Removing and installing particulate filter - vehicles with four-wheel drive

Special tools and workshop equipment required

- Tool set, 17 mm - T10395-



- Ratchet wrench (13 mm) - T10384-



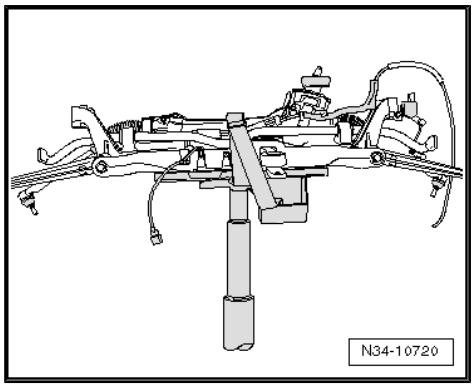
Removing

WARNING

When working on all parts of the exhaust system:

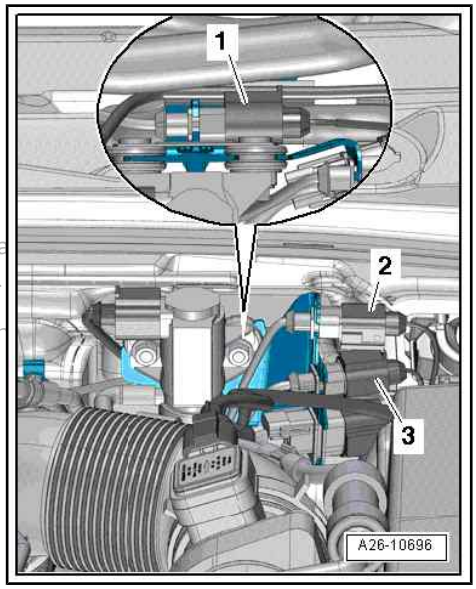
- *Observe safety precautions when working on the exhaust system*
  ⇒ "2.5 Safety precautions when working on the exhaust system", page 3 .

– Remove subframe with steering rack; to do so install locating pins - T10096- ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Removing and installing subframe with steering rack .



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– Unplug electrical connector -1- for exhaust gas temperature sender 3 - G495- and move electrical wiring clear.

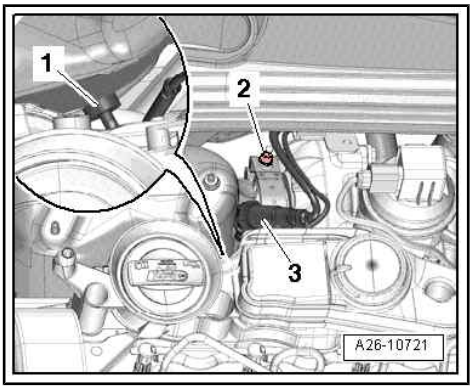


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– Remove exhaust gas temperature sender 3 - G495- -1- ⇒ “2.3 Removing and installing exhaust gas temperature sender 3 G495 ”, page 278 .

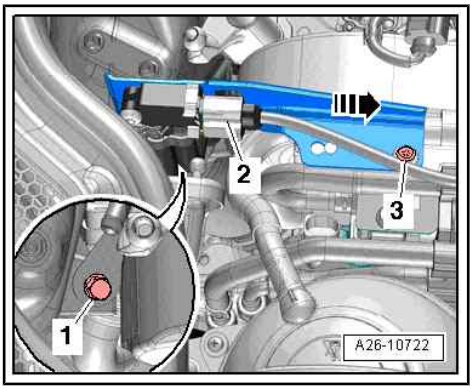
– Remove Lambda probe - G39- -3- ⇒ Rep. gr. 23 ; Mixture preparation - injection; Lambda probe; Removing and installing Lambda probe G39 .

– Slacken bolt -2- and remove clamp.



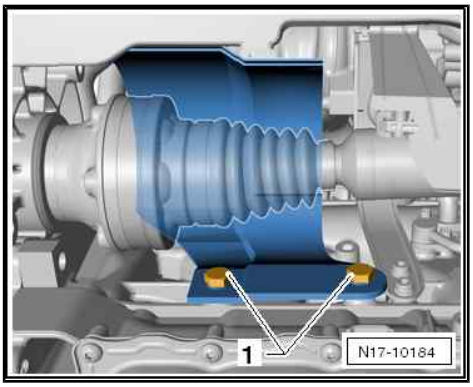
– Unplug electrical connector -2- at pressure differential sender - G505- .

– Remove bolts -1- and -3- and detach pressure differential sender - G505- from bracket -arrow-.

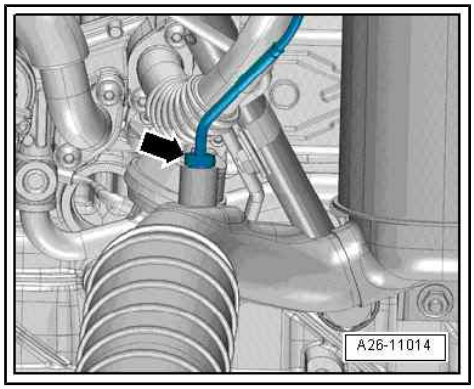


– Remove bolts -arrows- and detach heat shield for drive shaft (right-side).

– Unbolt drive shaft (right-side) from bevel box ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .



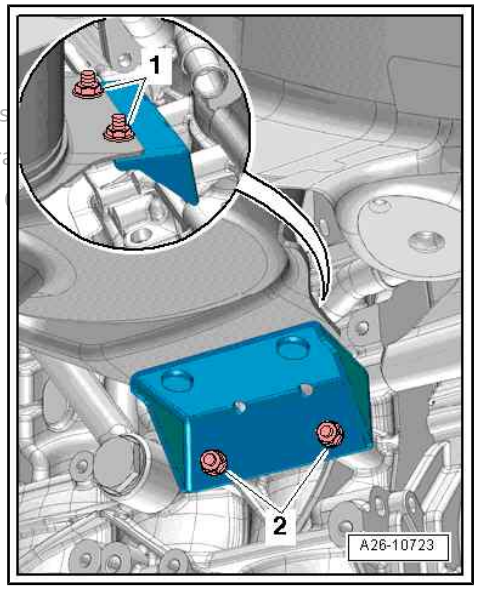
– Unscrew exhaust gas temperature sender 4 - G648- -arrow- from exhaust pipe behind particulate filter using a tool from tool set, 17 mm - T10395- .



– Unscrew securing nuts -1- above bracket for particulate filter using ratchet wrench - T10384- and unscrew nuts -2-.

– Detach bracket for particulate filter.

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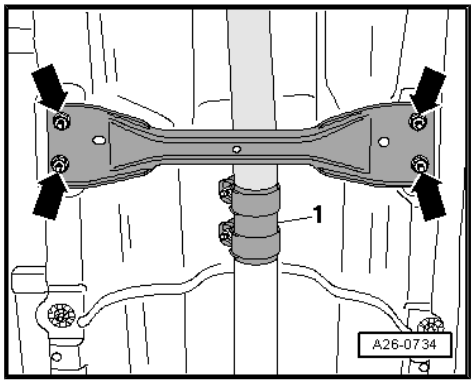


– Loosen nuts for clamp -1- and push clamp to rear.

Caution

Risk of damage to flexible joint.

- ***Do NOT bend flexible joint in front exhaust pipe more than 10°.***



– Remove bolts -arrows- securing bracket for exhaust system.

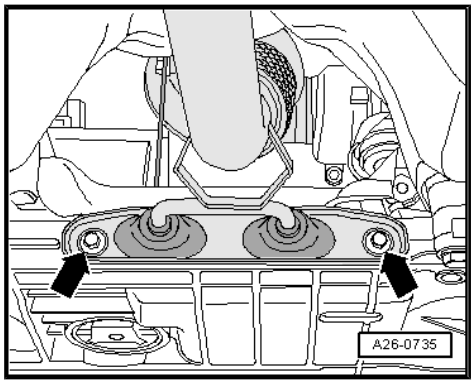
– Remove particulate filter downwards.

Installing

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

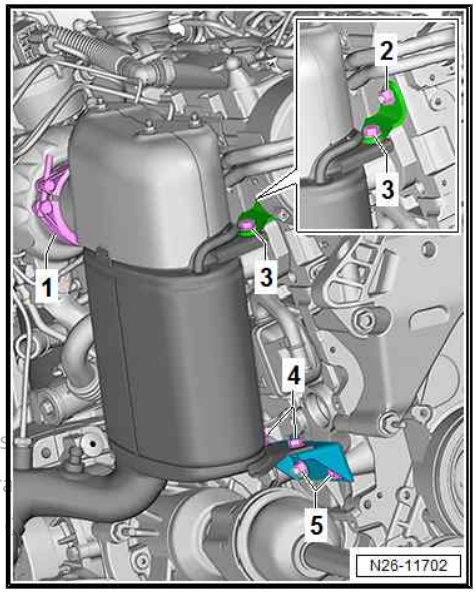
Note

- *Renew gaskets, self-locking nuts and clamp for particulate filter.*
- *Fit all cable ties in the original positions when installing.*



– Note sequence when installing particulate filter:

1.	Fit particulate filter to turbocharger, attach clip -1- without tightening
2.	Fit bolts -2 ... 5- by hand without tightening • It must still be possible to move particulate filter and bracket
3.	Tighten clamp -1-
4.	Tighten bolts -2- and -5-.
5.	Tighten bolts -3- and -4-.



- Tightening torques for particulate filter
⇒ “1.1 Exploded view - silencers”, page 258

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– Install exhaust gas temperature sender 4 - G648-
⇒ “2.4 Removing and installing exhaust gas temperature sender 4 G648 ”, page 280 .

– Bolt drive shaft (right-side) onto bevel box ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .

– Install heat shield for drive shaft (right-side) ⇒ page 41 .

– Install subframe with steering rack ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Removing and installing subframe with steering rack .

– Align the exhaust system so it is free of stress
⇒ “1.4 Stress-free alignment of exhaust system”, page 273 .

– Install Lambda probe - G39- and pressure differential sender - G505- ⇒ Rep. gr. 23 ; Mixture preparation - injection; Lambda probe; Removing and installing Lambda probe G39 .

– Install exhaust gas temperature sender 3 - G495- -1-
⇒ “2.3 Removing and installing exhaust gas temperature sender 3 G495 ”, page 278 .

– Adaption must be performed using ⇒ Vehicle diagnostic tester after renewing particulate filter.

– Connect ⇒ Vehicle diagnostic tester.

– Interrogate event memory and erase entries if necessary.

– Select `Diagnosis` mode and then `Start diagnosis`.

– Choose `Select own test` tab and select following options one after the other:

♦ `Drive train`

♦ `Select engine code and engine`

♦ `01 - Self-diagnosis compatible systems`

♦ `01 - Engine electronics`

♦ `01 - Engine electronics, functions`

♦ `01 - Adaptions after replacing engine CU/particulate filter`

1.3 Renewing flexible joint

WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system*
  ⇒ "2.5 Safety precautions when working on the exhaust system", page 3 .

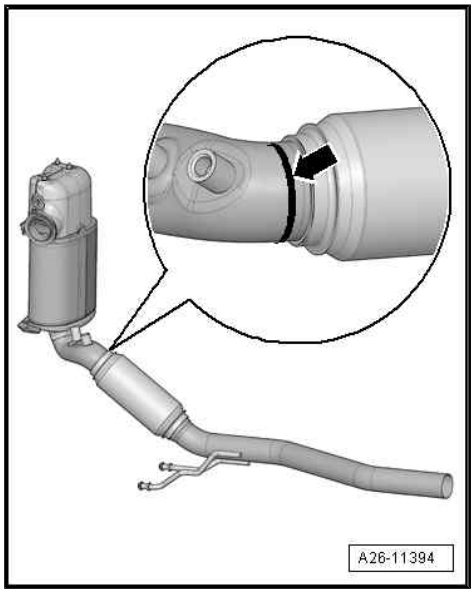
– Remove particulate filter ⇒ page 260 .

– Cut through particulate filter at point indicated by -arrow- in illustration by applying angle grinder to weld seam for flexible joint.

– Deburr cutting point on particulate filter and clean if necessary.

– Refit particulate filter (just bring it into installation position).

– Install flexible joint with transport lock (just bring it into installation position and align it stress-free).



Caution

Warning! Component can be damaged before installation

Transport lock must not be removed until particulate filter has been fully installed.

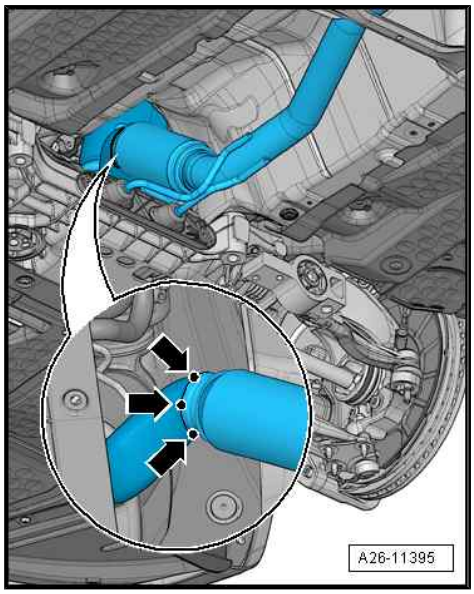
Note

Use welding wire, Albronze - V.A.G 1867- or welding wire, Albronze - V.A.G 1867/1- for welding work.

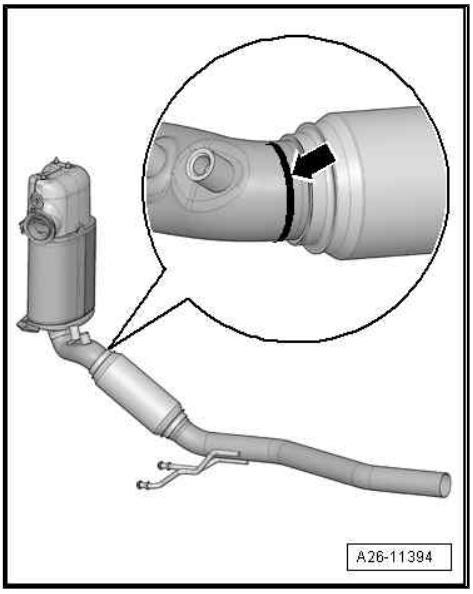
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– Join both parts with 3 or more single welds, as shown in illustration -arrows-.

– Remove flexible joint with particulate filter again.



– Arc-weld continuous seam, as shown in illustration -arrow-.



Caution

The transport lock must not be removed until the particulate filter has been fully installed to avoid damage to the part.

– Install particulate filter ⇒ page 260 .

– Check exhaust system for leaks.

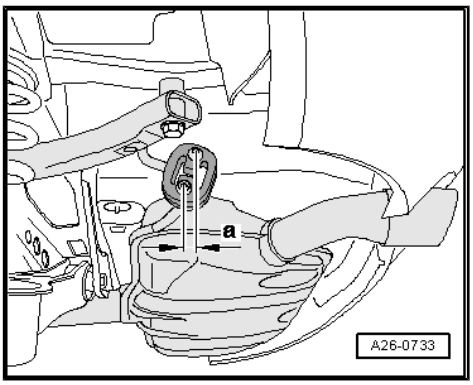
1.4 Stress-free alignment of exhaust system

Procedure

- The exhaust system must be aligned when it is cool.
- Tightening torque
  ⇒ “1.1 Exploded view - silencers”, page 258

– Loosen bolt connections for clamp.

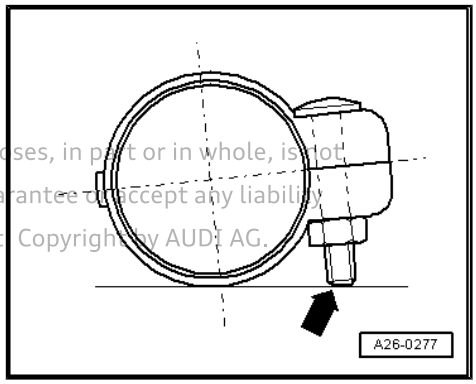
– Push exhaust system towards front of vehicle until preloading at mounting for rear silencer -a- = 15 ... 17 mm.



– Install clamp so that ends of bolts do not protrude beyond bottom of clamp -arrow-.

- Bolted connection facing towards right

– Tighten bolt connections on clamp evenly.



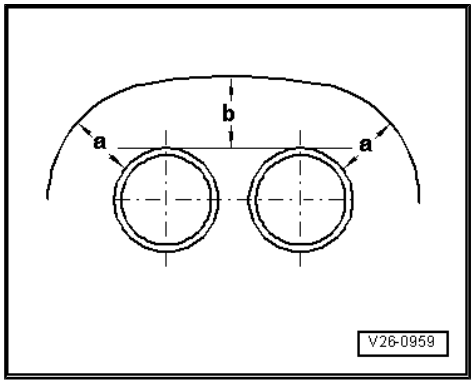
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1.5 Aligning tailpipes

Procedure

– Align rear silencer so that there is an equal distance -a- and -b- between bumper cut-out and tailpipes.

– Unfasten rear silencer mounting to align tailpipes.



1.6 Checking exhaust system for leaks

– Start the engine and run at idling speed.

– Plug tailpipes during leak test (e.g. with cloth or plug).

– Listen for noise at the connection points of cylinder head/exhaust manifold, turbocharger/front exhaust pipe etc. to locate any leaks.

– Rectify any leaks that are found.

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2 Exhaust gas temperature control

Overview

- ⇒ “2.1 Exploded view - exhaust gas temperature control”, page 275
- ⇒ “2.2 Removing and installing exhaust gas temperature sender 1 G235 ”, page 277
- ⇒ “2.3 Removing and installing exhaust gas temperature sender 3 G495 ”, page 278
- ⇒ “2.4 Removing and installing exhaust gas temperature sender 4 G648 ”, page 280

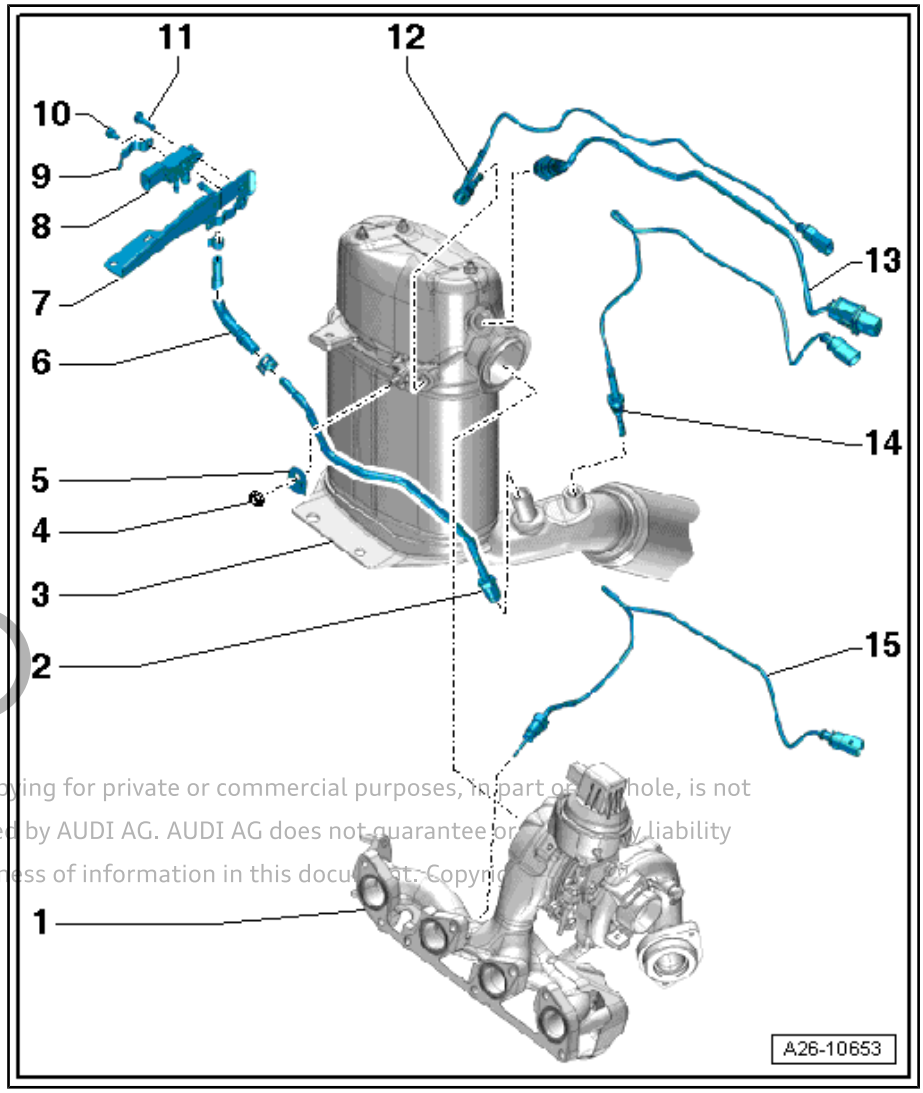
2.1 Exploded view - exhaust gas temperature control

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Caution

Risk of malfunctions caused by improperly secured exhaust gas temperature senders.

- ***The threads of the exhaust gas temperature senders - G495- and -G648- are coated. It is important that you do NOT coat them additionally with high-temperature paste and that you tighten them to the specified torque.***



1 - Turbocharger

2 - Control pipe

- ❑ 45 Nm

3 - Particulate filter

4 - Nut

- ❑ 9 Nm

5 - Bracket

- ❑ Bolted to particulate filter

6 - Hose

7 - Bracket

- ❑ For pressure differential sender - G505-

8 - Pressure differential sender - G505-

- ❑ Removing and installing ⇒ Rep. gr. 23

9 - Bracket

10 - Bolt

- ❑ 4.5 Nm

11 - Bolt

- ❑ 8 Nm

12 - Exhaust gas temperature sender 3 - G495-

- ❑ Removing and installing ⇒ page 278
- ❑ The thread of the exhaust gas temperature sender is coated; it must not additionally be greased with high-temperature paste
- ❑ 60 Nm

13 - Lambda probe - G39- with Lambda probe heater - Z19-

- ❑ Removing and installing ⇒ Rep. gr. 23

14 - Exhaust gas temperature sender 4 - G648-

- ❑ Removing and installing ⇒ page 280
- ❑ The thread of the exhaust gas temperature sender is coated; it must not additionally be greased with high-temperature paste
- ❑ 60 Nm

15 - Exhaust gas temperature sender 1 - G235-

- ❑ Removing and installing ⇒ page 277
- ❑ Coat with high-temperature paste when installing; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 45 Nm

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2.2 Removing and installing exhaust gas temperature sender 1 - G235-

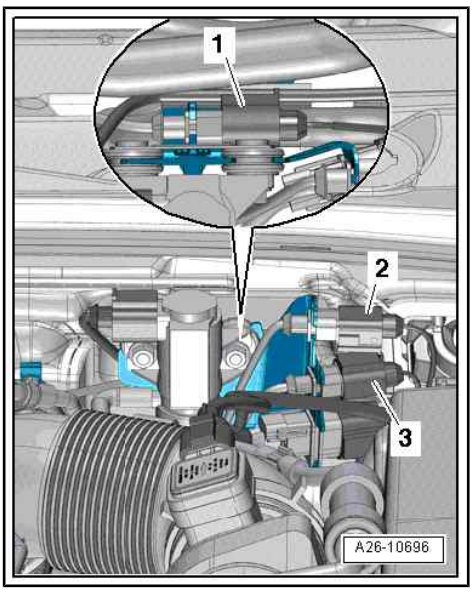
Removing

WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system*
  ⇒ "2.5 Safety precautions when working on the exhaust system", page 3 .

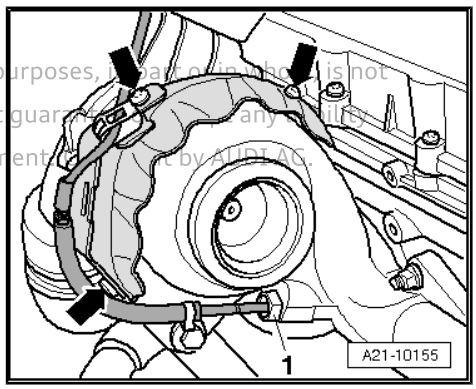
– Unplug electrical connector -3- for exhaust gas temperature sender 1 - G235- and move electrical wiring clear.



Note

Disregard items -1 and 2-.

– Unscrew exhaust gas temperature sender 1 - G235- -item 1- from exhaust manifold.



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Note

Disregard -arrows-.

Installing

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

Tightening torques

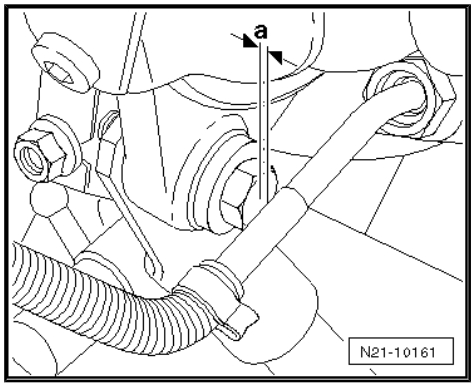
- ⇒ "2.1 Exploded view - exhaust gas temperature control", page 275

Note

- *Coat threads of exhaust gas temperature sender with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .*
- *Fit all cable ties in the original positions when installing.*

Installation position of exhaust gas temperature sender 1 - G235- :

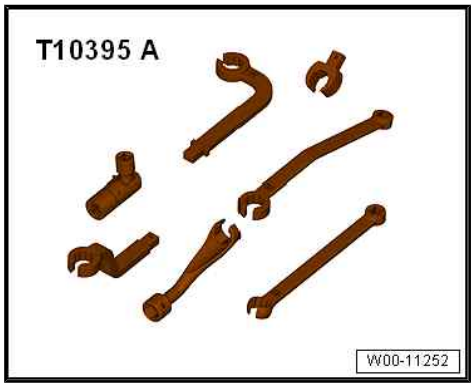
- The angled part of the pipe must have a clearance of -a- = 3 … 5 mm from the bolt on the turbocharger support.



2.3 Removing and installing exhaust gas temperature sender 3 - G495-

Special tools and workshop equipment required

- Tool set - T10395 A/B-



- Supplement tool set - T10395/8-/10-

Removing

WARNING

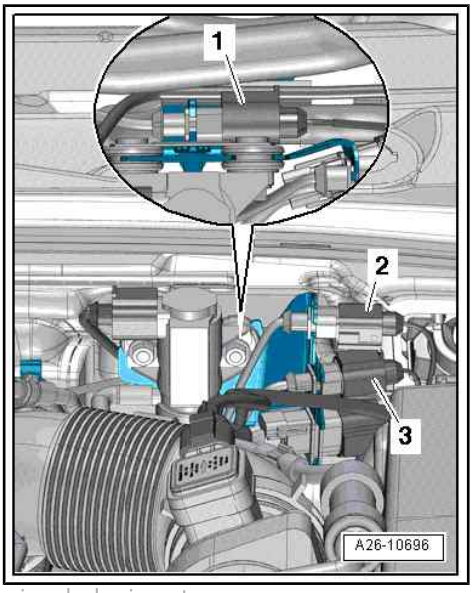
When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system*
  ⇒ "2.5 Safety precautions when working on the exhaust system", page 3 .

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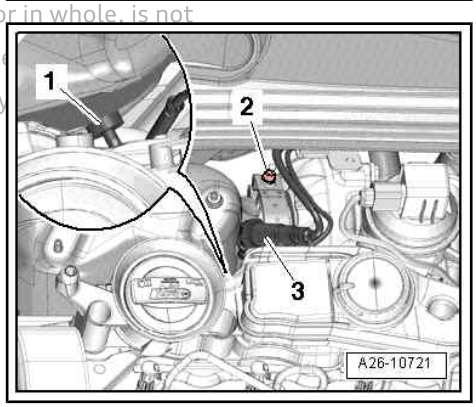
– Remove Lambda probe - G39- ⇒ Rep. gr. 23 .

– Unplug electrical connector -1- for exhaust gas temperature sender 3 - G495- and move electrical wiring clear.



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– Unscrew exhaust gas temperature sender 3 - G495- -item 1- using a tool from tool set, 17 mm - T10395- .



Installing

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

Caution

Risk of malfunctions caused by improperly secured exhaust gas temperature senders.

- ***The threads of the exhaust gas temperature senders - G495- and -G648- are coated. It is important that you do NOT coat them additionally with high-temperature paste and that you tighten them to the specified torque.***

Tightening torques

- ⇒ “2.1 Exploded view - exhaust gas temperature control”, page 275

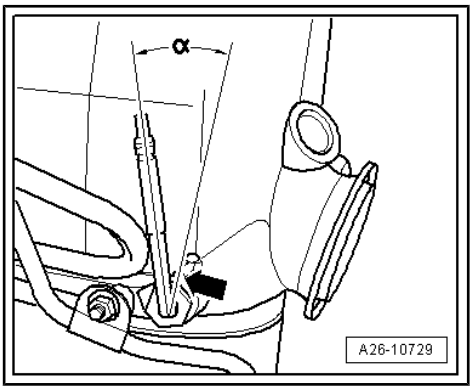
Note

Fit all cable ties in the original positions when installing.

Installation position of exhaust gas temperature sender 3 - G495-

- Angled section of pipe faces towards left side of vehicle.
- Angle -α- between pipe and marking -arrow- = approx. 17°.

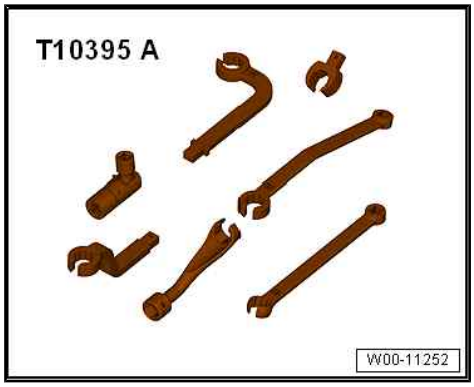
– Install Lambda probe - G39- ⇒ Rep. gr. 23



2.4 Removing and installing exhaust gas temperature sender 4 - G648-

Special tools and workshop equipment required

- Tool set - T10395 A/B-

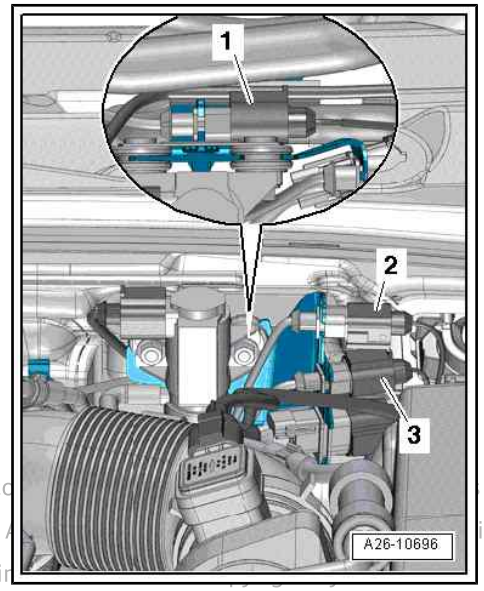


- Supplement tool set - T10395/8-/10-

Removing

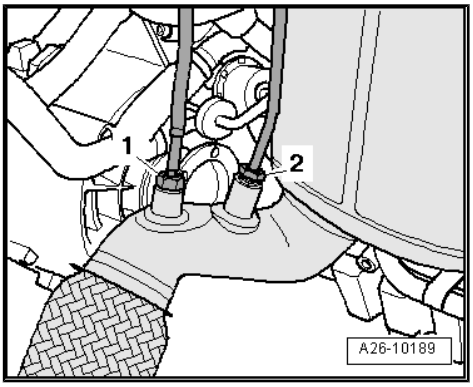
> **WARNING**
>
> *When working on all parts of the exhaust system:*
>
> - *Observe safety precautions when working on the exhaust system*
> *⇒ "2.5 Safety precautions when working on the exhaust system", page 3 .*

– Unplug electrical connector -2- for exhaust gas temperature sender 4 - G648- and move electrical wiring clear.



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– Unscrew exhaust gas temperature sender 4 - G648- -item 1- from exhaust pipe behind particulate filter using a tool from tool set, 17 mm - T10395- .



Caution

Risk of malfunctions caused by improperly secured exhaust gas temperature senders.

- ***The threads of the exhaust gas temperature senders - G495- and -G648- are coated. It is important that you do NOT coat them additionally with high-temperature paste and that you tighten them to the specified torque.***

Installing

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

Tightening torques

- ⇒ “2.1 Exploded view - exhaust gas temperature control”, page 275

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3 Exhaust gas recirculation system

Overview

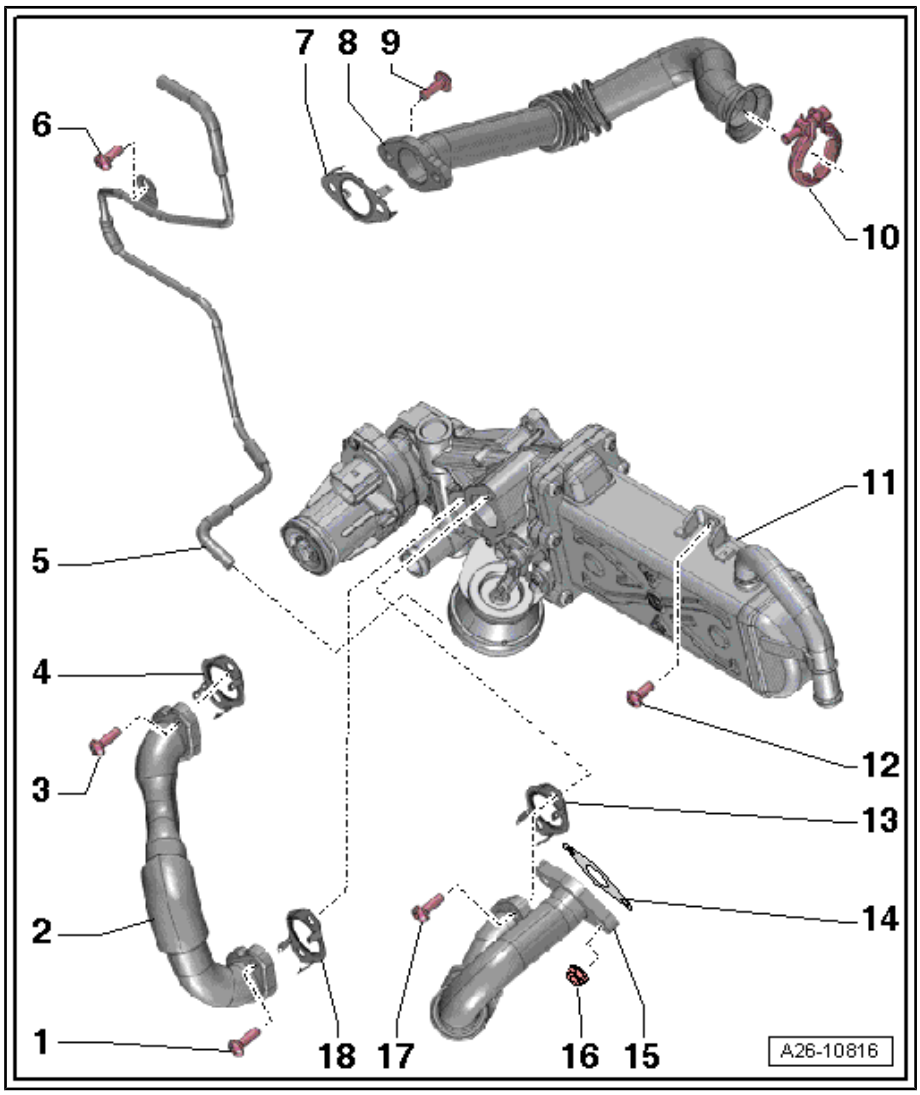
- ⇒ “3.1 Diagram of vacuum connections”, page 282
- ⇒ “3.2 Exploded view - exhaust gas recirculation with exhaust gas recirculation cooler”, page 282
- ⇒ “3.3 Checking exhaust gas recirculation cooler change-over”, page 283
- ⇒ “3.4 Removing and installing exhaust gas recirculation cooler”, page 284
- ⇒ “3.5 Cleaning exhaust gas recirculation system”, page 288

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3.1 Diagram of vacuum connections

⇒ “1.1 Diagram of vacuum connections”, page 238

3.2 Exploded view - exhaust gas recirculation with exhaust gas recirculation cooler



1 - Bolt
- ❑ 9 Nm

2 - Exhaust gas recirculation pipe
- ❑ With flexible joint; do not bend joint - risk of cracking

3 - Bolt
- ❑ 9 Nm

4 - Gasket
- ❑ Renew

5 - Vacuum line
- ❑ Do not alter shape

6 - Bolt
- ❑ 9 Nm

7 - Gasket
- ❑ Renew

8 - Exhaust gas recirculation pipe
- ❑ With flexible joint; do not bend joint - risk of cracking

9 - Bolt
- ❑ 9 Nm

10 - Clamp
- ❑ Renew
- ❑ 5 Nm

11 - Exhaust gas recirculation cooler
- ❑ With integrated exhaust gas recirculation valve - N18- with exhaust gas recirculation potentiometer - G212-

- ❑ Checking change-over function
  ⇒ “3.3 Checking exhaust gas recirculation cooler change-over”, page 283
- ❑ Cleaning ⇒ “3.5 Cleaning exhaust gas recirculation system”, page 288
- ❑ Removing and installing ⇒ “3.4 Removing and installing exhaust gas recirculation cooler”, page 284
- ❑ After renewing exhaust gas recirculation control motor - V338- , learnt values must be re-adapted; see `Guided Functions` of ⇒ Vehicle diagnostic tester, `01 - Adaption elec. adjuster with checkback`

12 - Bolt

- ❑ 9 Nm

13 - Gasket

- ❑ Renew

14 - Gasket

- ❑ Renew

15 - Exhaust gas recirculation pipe

- ❑ With flexible joint; do not bend joint - risk of cracking

16 - Nut

- ❑ Renew
- ❑ 24 Nm

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17 - Bolt

- ❑ 9 Nm

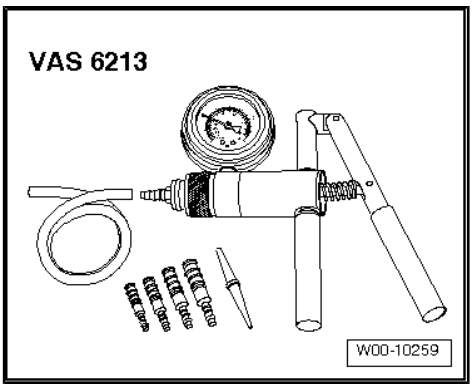
18 - Gasket

- ❑ Renew

3.3 Checking exhaust gas recirculation cooler change-over

Special tools and workshop equipment required

- ♦ Hand vacuum pump - VAS 6213-



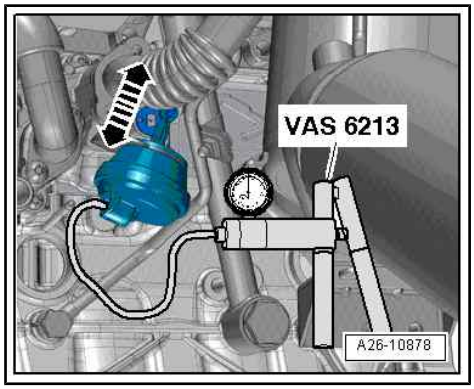
Procedure

– Detach heat shield sleeve.

– Disconnect vacuum hose from vacuum unit and connect hand vacuum pump - VAS 6213- in its place.

– Operate hand vacuum pump to produce a vacuum.

• The linkage of the exhaust gas recirculation cooler change-over should move -arrows-.



If the linkage does not move or only moves jerkily:

♦ The vacuum unit is defective.

♦ The change-over flap for exhaust gas recirculation is sticking.

Note

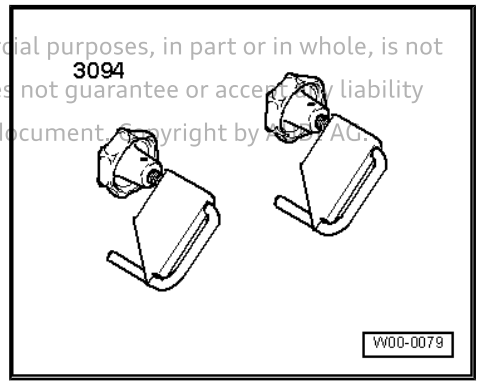
Secure the heat insulation sleeve in the original position when installing.

3.4 Removing and installing exhaust gas re-circulation cooler

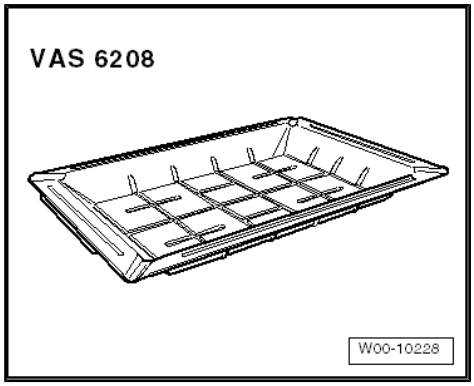
Special tools and workshop equipment required

♦ Hose clamps, up to 25 mm - 3094-

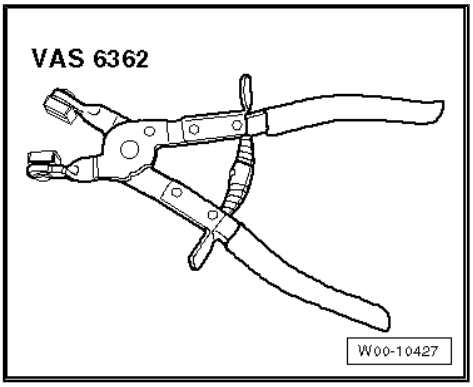
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♦ Drip tray for workshop hoist - VAS 6208-



♦ Hose clip pliers - VAS 6362-

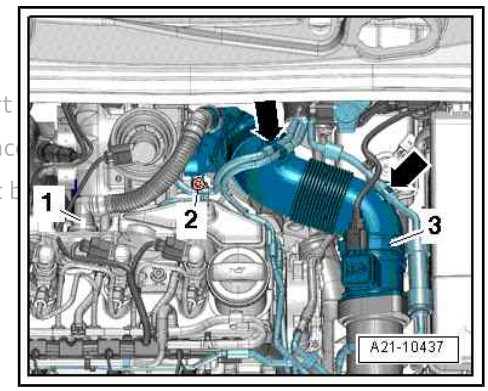


Removing

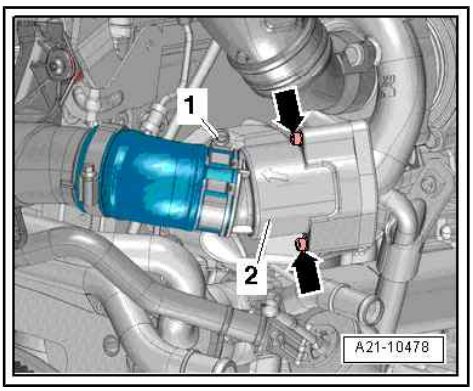
– Remove particulate filter
⇒ “1.2 Removing and installing particulate filter”, page 260 .

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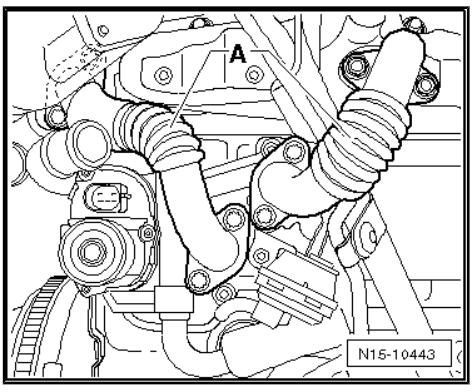
– Press release tabs and detach crankcase breather hose -1-.
– Move clear vacuum hoses -arrows-.
– Release hose clip -3- and detach air pipe from air cleaner housing.
– Remove bolt -2-, swivel intake pipe with connection to rear and detach from turbocharger.



– Remove bolts -arrows-.
– Loosen hose clip -1- and detach pulsation damper -2-.

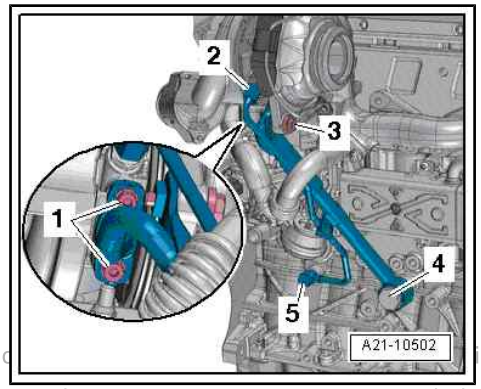


– Remove bolts and detach both exhaust gas recirculation pipes -A-.



Vehicles with front-wheel drive:

– Remove bolts -1, 3-, union nut -2- and banjo bolts -4, 5- and detach support for turbocharger with oil supply line.



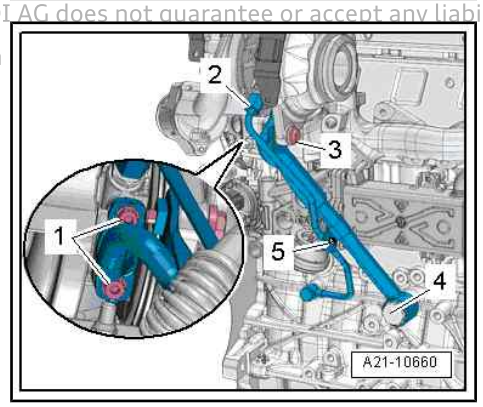
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Vehicles with four-wheel drive:

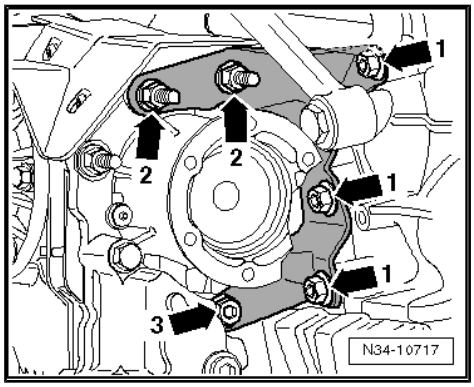
– Remove drive shaft (right-side) ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .

– Unbolt flange shaft (right-side) from bevel box ⇒ Rep. gr. 39 ; Final drive - front differential; Exploded view - flange shaft and oil seals on bevel box .

– Remove bolts -1, 3, 5-, union nut -2- and banjo bolt -4- and detach support for turbocharger.

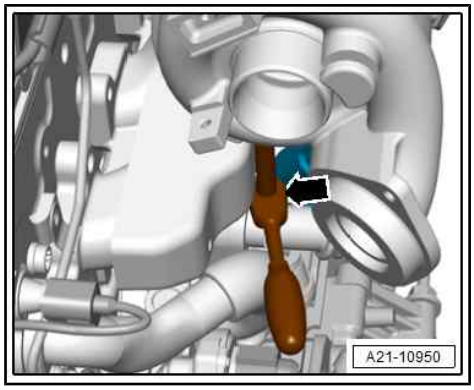


– If necessary, remove bracket between bevel box and cylinder block ⇒ Rep. gr. 34 ; Bevel box; Removing and installing bevel box .



Note

On four-wheel drive vehicles, bolt -1- for the oil return line is accessible from above. Use a small ratchet -arrow- to unscrew it.



All vehicles (continued):

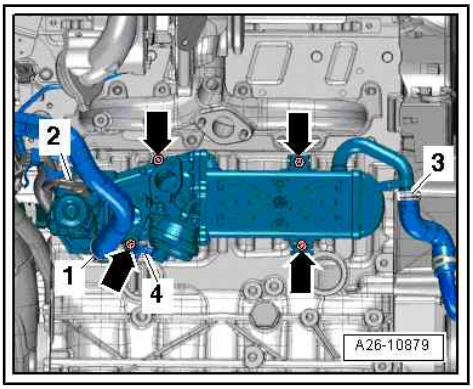
– Place drip tray for workshop hoist - VAS 6208- beneath engine.

– Clamp off coolant hoses -1- and -3- using hose clamps -3094- , release hose clips and disconnect coolant hoses from exhaust gas recirculation cooler.

– Unplug electrical connector -2-.

– Disconnect vacuum hose -4- from vacuum unit and move clear.

– Remove bolts -arrows- and detach exhaust gas recirculation cooler.



Installing

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

Note

♦ *Renew gaskets, seals and self-locking nuts.*

♦ *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*

♦ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

♦ *Fit heat insulation sleeve in the original position when installing.*

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Tightening torque

• ⇒ “3.2 Exploded view - exhaust gas recirculation with exhaust gas recirculation cooler”, page 282

– Install support for turbocharger with oil supply line, intake connecting pipe and pulsation damper ⇒ page 240 .

– Install air hoses with screw-type clips ⇒ page 253 .

– Install particulate filter ⇒ page 260 .

– Vehicles with four-wheel drive: Install flange shaft (right-side) on bevel box ⇒ Rep. gr. 39 ; Front final drive; Exploded view - front final drive .

– Check coolant level ⇒ page 202 .

– Learnt values must be re-adapted after renewal.

– Connect ⇒ Vehicle diagnostic tester.

– Interrogate event memory and erase entries if necessary.

– Select `Diagnosis` mode and then `Start diagnosis`.

– Choose `Select own test` tab and select following options one after the other:

♦ `Drive train`

♦ `Select engine code and engine`

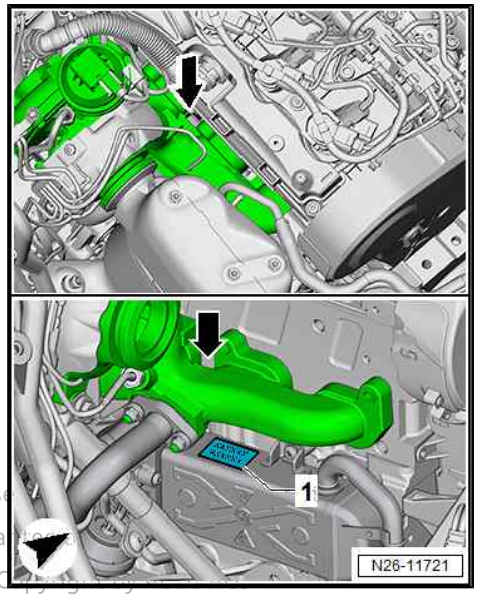
♦ `01 - Self-diagnosis compatible systems`

♦ `01 - Engine electronics`

♦ `01 - Engine electronics, functions`

♦ `01 - Adaption elec. adjuster with checkback`

3.5 Cleaning exhaust gas recirculation system



Note

- *The exhaust gas recirculation module consists of the exhaust gas recirculation cooler and the exhaust gas recirculation valve - N18- which is integrated in it.*
- *The cleaning procedure is only possible for vehicles with exhaust gas recirculation modules from part number - 03L 131 512 DQ/DP- onwards.*
- *Before starting the procedure, check the part number -1- using an endoscope (e.g. VAS 6748A/1).*
- *To do so, guide the endoscope between the cylinder head and exhaust manifold, through the opening in the exhaust manifold -arrow- and slightly to the right (as seen in the direction of travel).*
- *For greater clarity, the particulate filter has been removed in the lower part of the illustration.*

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Explanation

Certain extreme driving modes (e.g. short distances) may result in varnish formation/carbon deposits inside the exhaust gas recirculation cooler. In this case, the exhaust emissions warning lamp in the instrument cluster lights up and one of the following codes appears in the event memory:

- P401 EGR system throughput too low
- P046C Sensor 1 for exhaust gas recirculation implausible signal

In most cases, these carbon deposits can be removed by carrying out the rinsing/cleaning procedure described below
⇒ page 288 .

3.5.1 Starting cleaning procedure for exhaust gas recirculation system

Special tools and workshop equipment required

- Cooler rinsing system for exhaust gas recirculation - VAS 542 007-

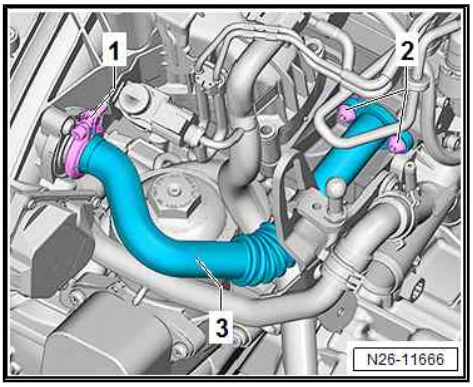


- Adapter - VAS 542 007/7- , 2x
- Ultrasonic cleaning unit - VAS 6418-

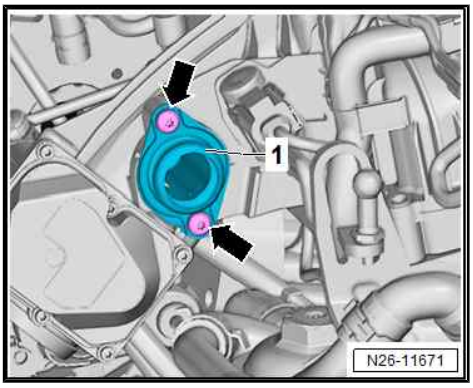
– Remove engine cover panel.

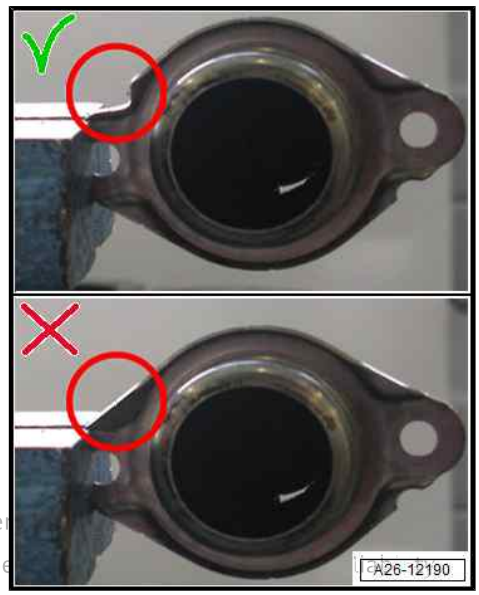
– Open clamp -1- and detach.

– Remove bolts -2- and detach connecting pipe -3- going to intake manifold.



– Remove bolts -arrows- and pull pipe connection -1- out of intake manifold.



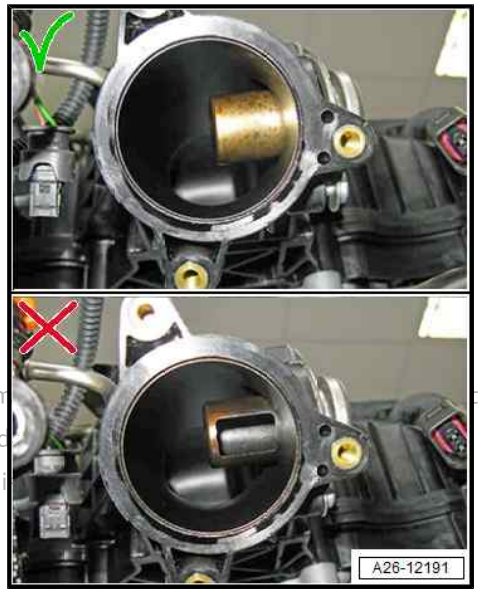


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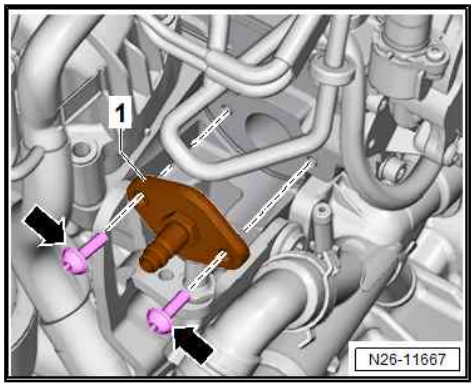
Note

- *Check whether the opening of the pipe connection faces towards the cylinder head; if not, the pipe connection must be installed rotated through 180°.*
- *If necessary, use a suitable file to create a new recess in addition to the existing recess in the support plate of the pipe connection.*
- *The pipe connection that has been modified in this way can then be installed rotated through 180° after it has been cleaned.*
- *When installing the pipe connection, make sure that the opening faces towards the cylinder head.*

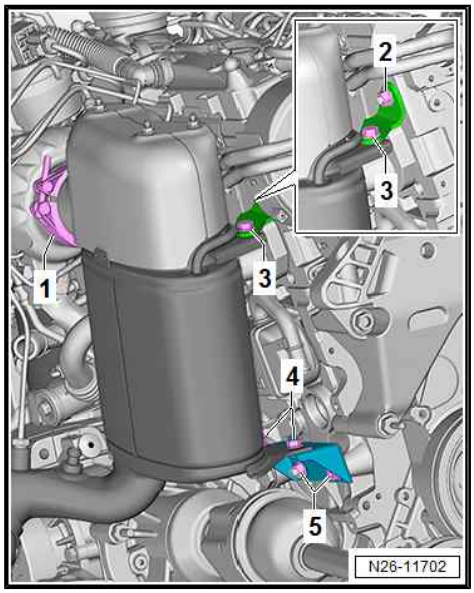
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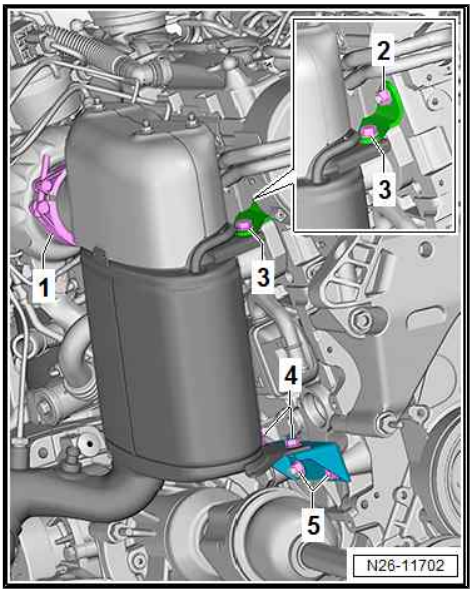
– Fit adapter - VAS 542 007/7- -1- onto opening on cylinder head.
– Screw in original bolts -arrows- from connecting pipe and hand-tighten. Ensure that seal on adapter is not pinched.



– Remove bolt -3-.
– Remove noise insulation ⇒ Rep. gr. 50 .
– Unscrew nuts -4- and bolts -5-, and remove bracket.

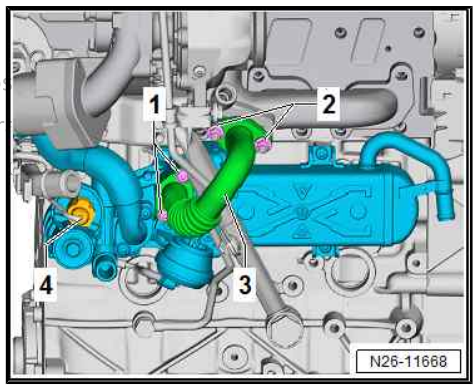


– Open and detach clamp -1-, and push particulate filter to side.



– Remove bolts -1- and nuts -2-.
– Detach connecting pipe -3- between exhaust manifold and exhaust gas recirculation cooler.
– Release and unplug electrical connector -4- from exhaust gas recirculation valve - N18-.

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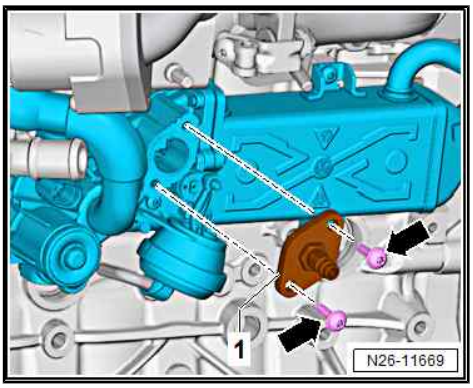


Note

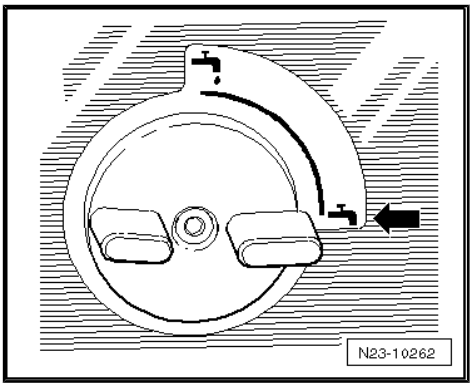
For greater clarity, support for turbocharger has been removed in illustration; it does not need to be removed.

– Fit adapter - VAS 542 007/7- -1- onto opening on exhaust gas recirculation cooler.
– Screw in original bolts -arrows- from connecting pipe and hand-tighten. Ensure that seal on adapter is not pinched.

Cleaning connecting pipes and pipe connection for exhaust gas recirculation:



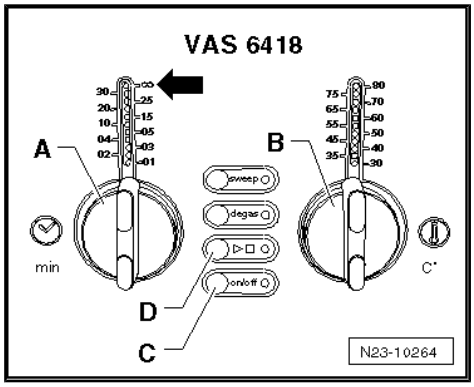
– Close drain tap -arrow- on ultrasonic cleaning unit - VAS 6418- (located on right side of housing).



Note

The ultrasonic bath can be heated up more quickly by using hot tap water.

– Fill ultrasonic cleaning unit - VAS 6418- with 1800 ml of hot (approx. 60 °C) tap water and 200 ml of cleaning fluid -D 600 200 A2- .
– Put connecting pipes and pipe connection for exhaust gas re-circulation in. If necessary, change position of connecting pipes in ultrasonic bath occasionally.



– Switch on cleaning unit by pressing on/off button -C-.
– Turn rotary temperature control -B- until LED for heating temperature is at 60 °C.
– Set rotary control for operating time -A- to -10-.
– Press ▶ -D- button to start unit running.

Note

After a temperature of 60 °C has been reached, the cleaning process must last for at least 10 minutes.

– After cleaning successfully, rinse connecting pipes and pipe connection for exhaust gas recirculation with clean water and blow out with compressed air.

On vehicle (continued):

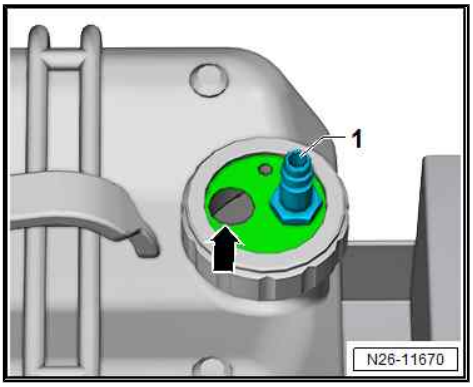
– Connect intake hose - VAS 542 007/2-2- of cleaning unit to adapter on exhaust gas recirculation cooler.
– Connect return hose - VAS 542 007/2-3- of cleaning unit to adapter on cylinder head.
– Connect battery charger to vehicle battery.
– Connect battery clamps of valve actuator - VAS 542 007/6- to vehicle battery.
– Connect battery clamps of pump - VAS 542 007/3- to vehicle battery.

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Preparing cooler rinsing system for exhaust gas recirculation - VAS 542 007-

– Fill canister - VAS 542 007/1- with 9 litres of warm (approx. 60 °C – 50° C) tap water.
– Pour 1 litre of cleaning solution - D 600 200 A2- into canister.
– Connect intake hose - VAS 542 007/2-1- of pump to connection -1- on canister lid.

– Insert open end of return hose - VAS 542 007/2-3- into opening -arrow- on canister lid to approx half height of canister.
– Plug connector of valve actuator - VAS 542 007/6- into exhaust gas recirculation valve - N18- .
– Switch on valve actuator - VAS 542 007/6- to open exhaust gas recirculation valve.



Note

- *Ensure that the bleeder screw tap on the intake hose - VAS 542007/2-2- is closed.*
- *If the pressure (approx. 1.6 bar) provided by the pump - VAS 542007/3- is not sufficient to activate the exhaust gas recirculation valve via the valve actuator - VAS 542007/6- , the pump will switch itself off after a short period.*
- *In this case, the exhaust gas recirculation valve has a mechanical fault or is not supplied with current. The exhaust gas recirculation cooler must be renewed.*
- *Before disconnecting the intake hose - VAS 542007/2-2- the pressure must be released by carefully opening the bleeder screw tap and escaping cleaning solution must be caught.*

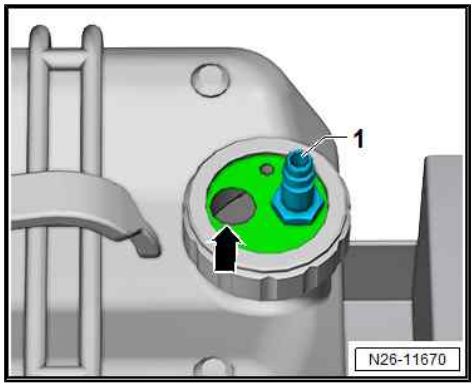
Operate pump - VAS 542007/3- as follows:

Pump - VAS 542 007/3-	Time	Action
Switch on	25 minutes	Cleaning
Switch off	10 minutes	Cleaning solution taking effect
Switch on	25 minutes	Cleaning
Switch off	---	End of cleaning procedure

– Disconnect intake hose - VAS 542007/2-1- from canister and leave pump switched on until no more cleaning solution is extracted (empty the system).
– Pull return hose - VAS 542007/2-3- out of canister (cleaning solution may come out).
– Empty canister (observe country-specific requirements for disposal).
– Fill canister with 10 litres of warm (approx. 40 °C – 50 °C) tap water.

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– Connect intake hose - VAS 542 007/2-1- of pump to connection -1- on canister lid.
– Guide open end of return hose - VAS 542 007/2-3- into a suitable container (minimum capacity of 12 litres) and fix in position.
– Switch on pump - VAS 542 007/3- and leave it on until the contents of the canister have fully flowed through the exhaust gas recirculation system.
– Release and detach supply hose - VAS 542 007/2-2- from adapter on exhaust gas recirculation cooler.
– Connect compressed air adapter - VAS 542 007/5- to adapter on exhaust gas recirculation cooler.
– Insert open end of return hose - VAS 542 007/2-3- into opening -arrow- on canister lid to approx half height of canister.
– Intake hose - VAS 542 007/2-1- of pump must be connected to connection -1- on canister lid.
– Connect compressed air line to compressed air adapter - VAS 542 007/5- and blow all remaining water out of exhaust gas recirculation system (minimum 2 minutes).



Caution

All water must be removed from the exhaust gas recirculation system. Otherwise the engine could be damaged.

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– Release and unplug compressed air adapter - VAS 542 007/5- .
– Remove adapter from exhaust gas recirculation cooler.
– Unplug connector for valve actuator - VAS 542 007/6- on exhaust gas recirculation valve - N18- and plug in original connector.
– After cleaning, the effectiveness of the cleaning process must be checked with ⇒ Vehicle diagnostic tester.
– Connect ⇒ Vehicle diagnostic tester.
– Select `Diagnosis` mode and then `Start diagnosis`.
– Choose `Select own test` tab and select following options one after the other:

- `Drive train`
- `Select engine code and engine`
- `01 - Self-diagnosis compatible systems`
- `01 - Engine electronics`
- `01 - Engine electronics, functions`
- `01 - Check exhaust gas recirculation valve 1 -GX5 after cleaning according to the repair manual`

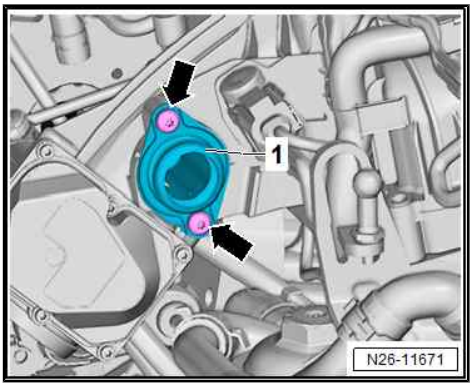
If the result of the test is »not OK«, the exhaust gas recirculation cooler with integrated exhaust gas recirculation valve - N18- must be renewed ⇒ page 284 .

Continued after successful cleaning:

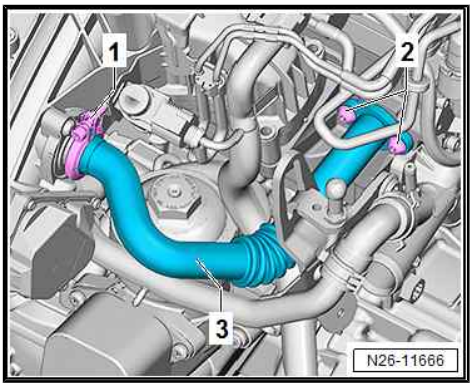
– Install connecting pipe with new gaskets and new nuts ⇒ “3.2 Exploded view - exhaust gas recirculation with exhaust gas recirculation cooler”, page 282 .

– Bring particulate filter with new seal and new clamp into installation position and secure it ⇒ Item 16 (page 259) .
– Install noise insulation ⇒ Rep. gr. 50 .
– Release and detach return hose from adapter on cylinder head.

– Position pipe connection -1- with new gasket on cylinder head with opening facing intake manifold.
– Screw in bolts -arrows- and tighten to 9 Nm.



– Remove adapter from cylinder head and install connecting pipe with new gasket ⇒ TDI injection and glow plug system (4-cyl. 2.0 ltr. 4-valve common rail, generation II); Rep. gr. 23 ; Intake manifold; Exploded view - intake manifold .
– Install engine cover panel.
– Interrogate event memory and erase entries if necessary.
– Perform road test.



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