Workshop Manual

Audi A4 2008 ➤
Audi A5 Cabriolet 2009 ➤
Audi A5 Coupé 2008 ➤
Audi Q5 2008 ➤

4-cylinder TDI engine, 2.0 ltr. 4-valve common rail (EA 288 Gen. I)									
Engine ID	CNH A	CNH C	CSU A	CSU B					

Edition 01.2019

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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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00 – Technical data

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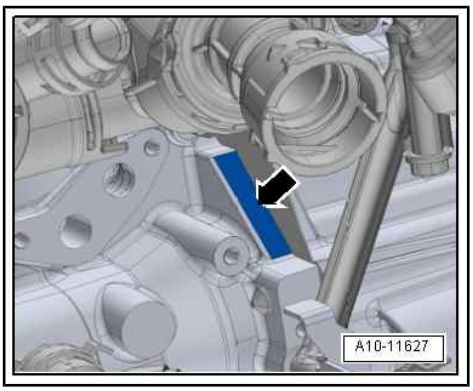
1 Identification

(ARL006262; Edition 01.2019)

⇒ “1.1 Engine number/engine data”, page 1

1.1 Engine number/engine data

Engine number



- The engine number (“engine code” and “serial number”) is located on the front of the joint between the engine and the gearbox -arrow-.
- Additionally there is a sticker on the toothed belt cover (top) with engine code and serial number.
- 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 type plate (certain countries only) and vehicle data sticker:

- A5 Coupé ⇒ Maintenance ; Booklet 811
- A4 ⇒ Maintenance ; Booklet 812
- A5 Cabriolet ⇒ Maintenance ; Booklet 818
- Q5 ⇒ Maintenance ; Booklet 817

For engine data refer to:

- A4 ⇒ Technical data for diesel engines; Rep. gr. 00 ; Overview of engines
- A5 Coupé ⇒ Technical data for diesel engines; Rep. gr. 00 ; Overview of engines
- A5 Cabriolet ⇒ Technical data for engines; Rep. gr. 00 ; Overview of engines
- Q5 ⇒ Technical data for engines; Rep. gr. 00 ; Overview of engines

2 Safety precautions

⇒ “2.1 Safety precautions when working on the fuel system”, page 2

⇒ “2.2 Safety precautions when using testers and measuring instruments during a road test”, page 3

⇒ “2.3 Safety precautions when working on the cooling system”, page 3

⇒ “2.4 Safety precautions when working on vehicles with start/stop system”, page 4

⇒ “2.5 Safety precautions when working on the SCR system”, page 4

⇒ “2.6 Safety precautions when working on the exhaust system”, page 5

2.1 Safety precautions when working on the fuel system

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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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).

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
⇒ “1.3 Filling and bleeding fuel system”, page 249 .

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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.

2.2 Safety precautions when 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.

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

Or:

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

2.3 Safety precautions when working on the cooling system

Risk of scalding as hot coolant can escape

The cooling system is under pressure when the power unit 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.

Caution

Overheating can occur if the filler cap is not fitted properly.

- *The filler cap must engage positively and audibly when it is closed.*

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

Please note the following 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.

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2.5 Safety precautions when working on the SCR system

When working on the SCR system, note the following warnings:

Risk of injury caused by reducing agent

Reducing agent can cause eye and skin irritation, damage to the respiratory tract and poisoning.

– Put on safety goggles.

– Put on protective gloves.

– Wear protective clothing.

– Ensure that there is sufficient fresh air. In enclosed spaces, switch on the exhaust extraction system.

Risk of damage caused by reducing agent

Reducing agent which has come into contact with trim or body components can crystallise after some time and damage the affected surfaces.

– Ensure that no reducing agent makes contact with parts of trim or body.

– Clean any surfaces which have come into contact with reducing agent immediately with water and a cloth.

When removing and installing components at the SCR system, note the following:

♦ When working on the SCR system, the reducing agent tank must be empty. Refer to the corresponding work description to find out when the reducing agent must be drained from the tank. Drain tank if necessary; procedure ⇒ page 369 .

When removing and installing tank, note the following:

♦ The reducing agent tank must be empty. Drain tank if necessary; procedure ⇒ page 369 .

Automatic drawing back of reducing agent

• After the ignition is switched off, the reducing agent is automatically drawn back into the tank from the metering line leading to the injector for reducing agent - N474- .

- Before performing work in this area, you must therefore wait until the reducing agent has been drawn back; this can take up to 10 minutes after the ignition has been switched off.
- It is also important to wait until the reducing agent has been drawn back (i.e. 10 minutes after the ignition is switched off) before disconnecting the battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .

WARNING

Safety risk due to escaping reducing agent.

- *To prevent large amounts of reducing agent from escaping when the metering line is opened, wait until the reducing agent has been drawn back automatically ⇒ page 4 .*

2.6 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 Repair instructions

⇒ “3.1 Rules for cleanliness”, page 6

⇒ “3.2 General notes”, page 6

⇒ “3.3 General repair instructions”, page 7

⇒ “3.4 Bolts, nuts”, page 7

⇒ “3.5 Foreign particles in engine”, page 8

⇒ “3.6 Contact corrosion”, page 8

⇒ “3.7 Routing and attachment of pipes, hoses and wiring”, page 8

⇒ “3.8 Installing radiators and condensers”, page 8

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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 reused 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 notes

- The engine control unit has a self-diagnosis capability. Before carrying out repairs and fault finding, the event memory must be interrogated. The vacuum hoses and connections must also be checked (unmetered air).
- A voltage of at least 11.5 V is required for proper operation of the electrical components.
- Do not use sealants containing silicone. Particles of silicone drawn into the engine will not be burnt in the engine and will damage the Lambda probe.

- The vehicles are fitted with a crash/fuel shut-off system. This system is designed to reduce the risk of a vehicle fire after a crash by deactivating the fuel pump via the fuel pump relay.
- At the same time, this system also improves the engine's starting performance. When the driver's door is opened, the fuel pump is activated for 2 seconds in order to build up pressure in the fuel system ⇒ page 2 .

3.3 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.

3.4 Bolts, nuts

- Loosen bolts in reverse sequence to specified tightening sequence.
- Bolts and nuts used to secure covers and housings must be tightened in steps according to the specified tightening sequence and method.

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- Bolts and nuts which secure covers and housings should be loosened and tightened in diagonal sequence and in stages if no tightening sequence is specified.
- Always renew self-locking bolts/nuts.
- Unless otherwise specified, use a wire brush to clean the threads of bolts which are secured with locking fluid. Then install bolts with locking fluid; for locking fluid refer to ⇒ Electronic parts catalogue .
- Threaded holes which take self-locking bolts or bolts coated with locking fluid must be cleaned using a thread tap or similar. Otherwise there would be a danger of the bolts shearing off on renewed disassembly.
- The tightening torques stated apply to non-oiled nuts and bolts.

3.5 Foreign particles in engine

When performing assembly work on the engine, all open passages in the intake and exhaust systems 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 224*

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3.6 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 the use of Audi Genuine Parts.
- Damage caused by contact corrosion is not covered by warranty.

3.7 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).

3.8 Installing radiators and condensers

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.

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10 – Removing and installing engine

1 Removing and installing engine

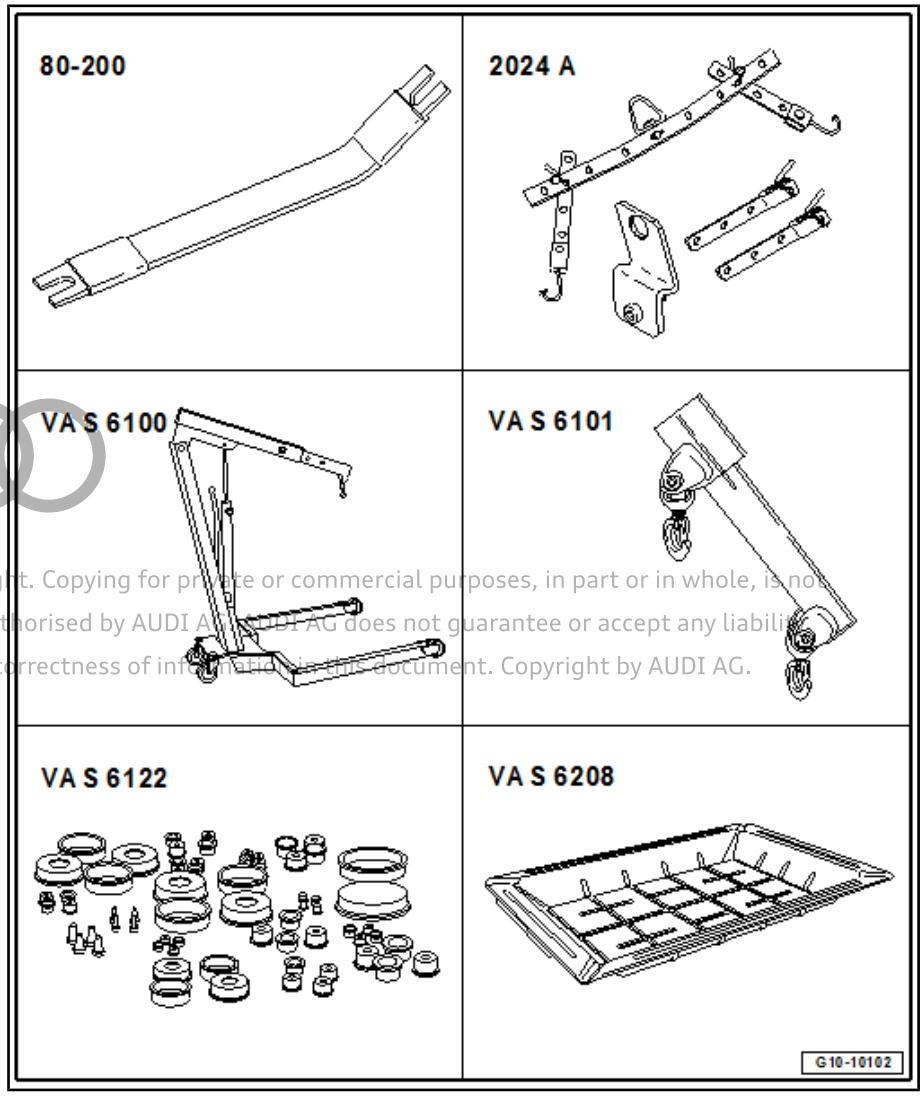
⇒ “1.1 Removing engine”, page 10

⇒ “1.2 Securing engine to engine and gearbox support”, page 22

⇒ “1.3 Installing engine”, page 23

1.1 Removing engine

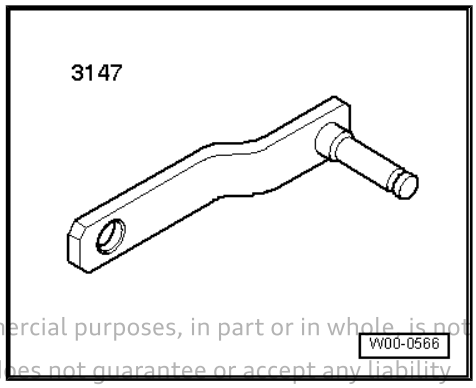
Special tools and workshop equipment required



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- Removal lever - 80 - 200-
- Lifting tackle - 2024 A-
- Workshop hoist - VAS 6100-
- Lift arm extension/workshop hoist - VAS 6101-
- Engine bung set - VAS 6122-
- Drip tray for workshop hoist - VAS 6208-
- Safety goggles

- Protective gloves
- Gearbox support - 3147-



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- Hose clip pliers - VAS 6362-



- Safety goggles
- Protective gloves

Procedure

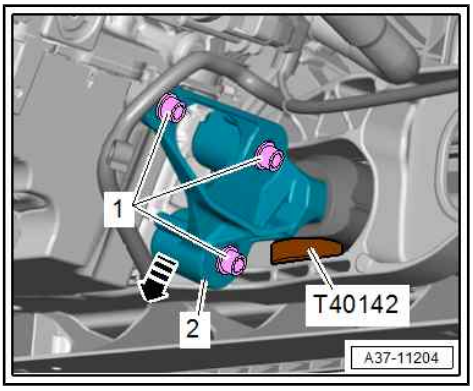
Note

- *The engine is removed upwards with gearbox removed.*
- *Re-install all cable ties in original positions.*

– Remove gearbox ⇒ Rep. gr. 34 ; Removing and installing gearbox; Removing gearbox or ⇒ Rep. gr. 37 ; Removing and installing gearbox; Removing gearbox .

• Engine secured to keep it from tipping, as shown in illustration.

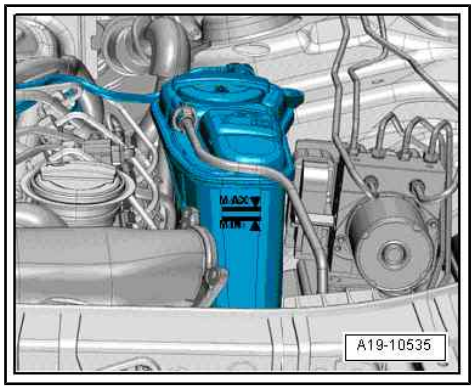
– Discharge refrigerant circuit ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit .



WARNING

Risk of scalding due to hot steam and hot coolant.

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



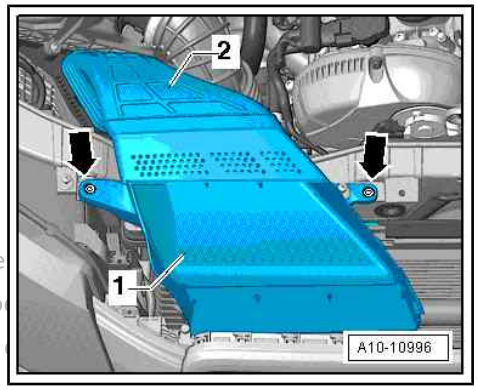
– Open filler cap on coolant expansion tank.

– Remove wheel housing liners (front left and front right) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front) .

– Remove lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Lock carrier; Exploded view - lock carrier .

– Remove bolts -arrows-.

– Detach air ducts -1, 2- from air cleaner housing.



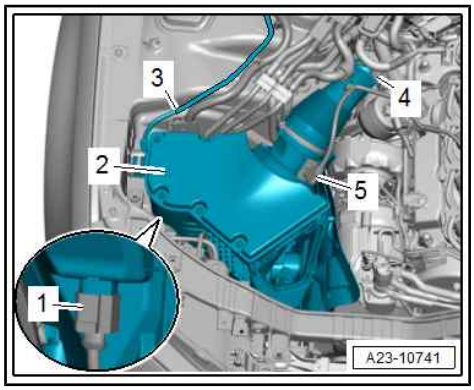
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– Unplug electrical connector -5- at air mass meter - G70- .

– Release hose clip -4- and detach air hose.

– If fitted, disconnect vacuum hose -3- and move clear.

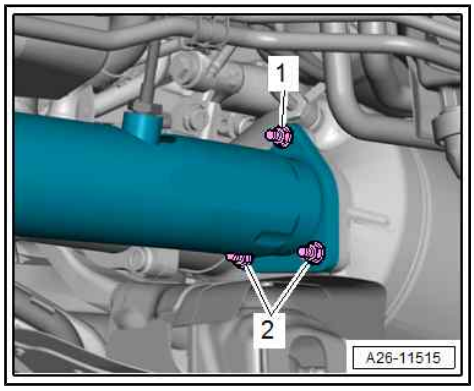
– Detach air cleaner housing -2- and, if fitted, unplug electrical connector -1- at air filter bypass flap valve - N275- on underside of air cleaner.



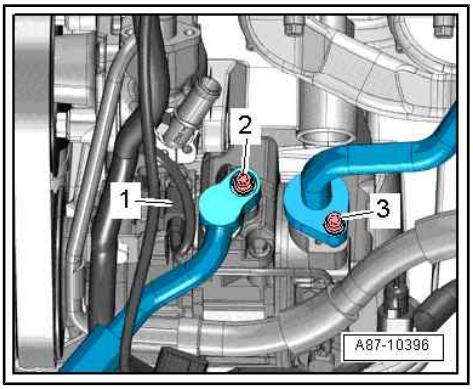
– Unscrew nut -1-.

Note

Nuts -2- do not have to be removed at this stage.



– Unplug electrical connector -1- 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.***

– Remove bolt -2-, disconnect refrigerant line from air conditioner compressor and move to one side.

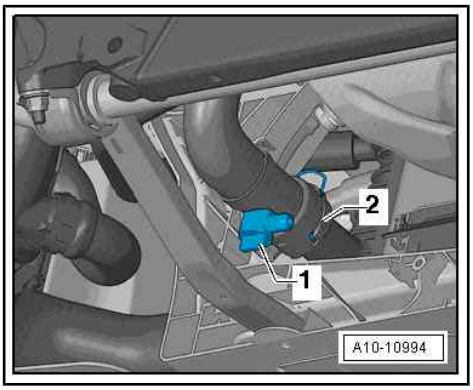
– Seal off open lines and connections with clean plugs from engine bung set - VAS 6122- .

Note

Disregard -item 3-.

– Place drip tray for workshop hoist - VAS 6208- underneath.

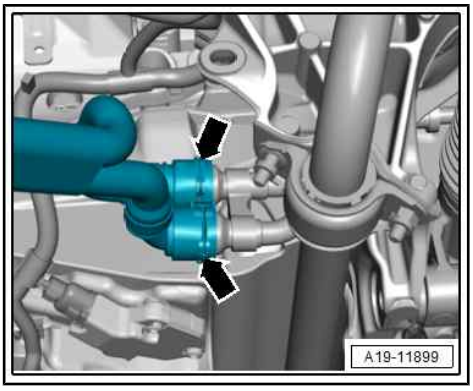
– Open drain plug -1- at connection and drain off coolant.



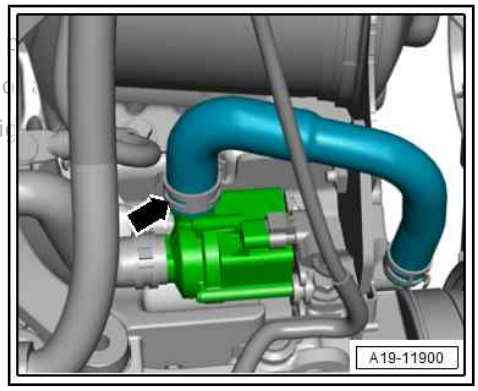
Note

Disregard -item 2-.

– Lift retaining clips -arrows-, disconnect coolant hoses and drain off coolant.



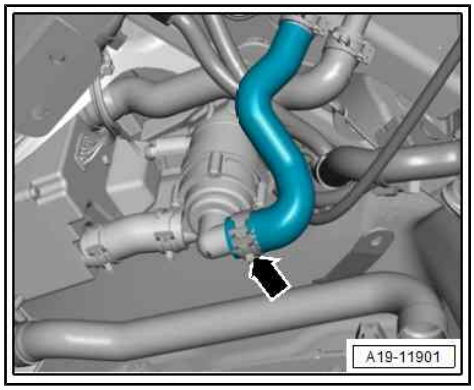
– Release hose clip -arrow-, disconnect coolant hose and drain off coolant.



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Vehicles with auxiliary heater:

– Release hose clip -arrow-, disconnect coolant hose and drain off coolant.

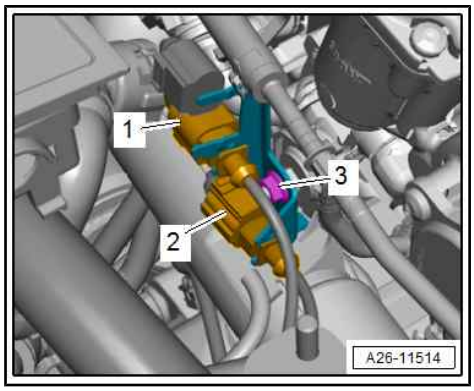


All vehicles (continued):

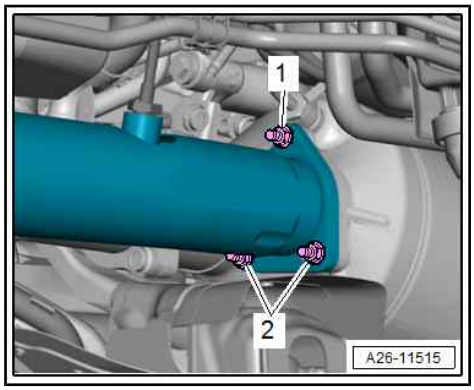
– Take electrical connector -2- out of bracket, unplug it and move electrical wiring clear.

Note

Disregard items -1 and 3-.



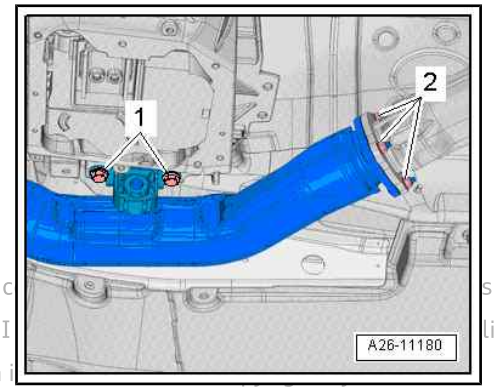
– Remove nuts -2-.



Caution

Risk of damage to flexible joint in front exhaust pipe.

- ***Do NOT bend flexible joint in front exhaust pipe more than 10°.***



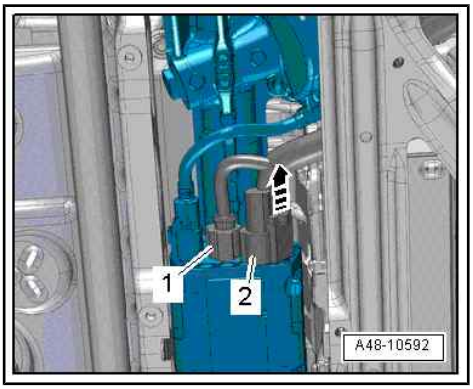
– Remove nuts -2- and detach front exhaust pipe.

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Note

Disregard -item 1-.

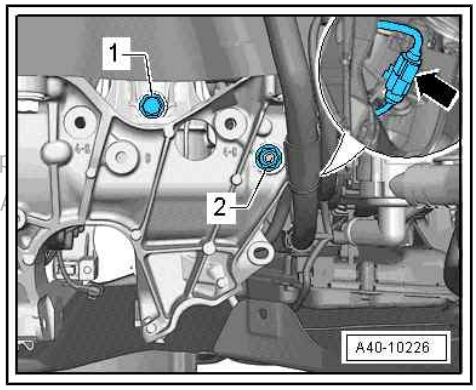
– Unplug electrical connector -1- at power steering control unit - J500- .
– Move electrical wiring harness clear.



Note

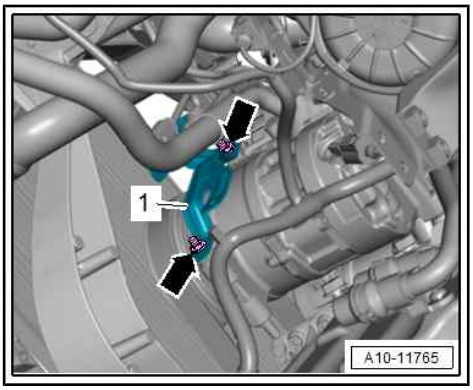
Disregard -item 2- and -arrow-.

– Remove bolt -1- for engine mounting on both sides.
– Remove nut -2- and move bracket with electrical wiring clear.
– Take electrical connectors (left and right) -arrow- out of bracket and unplug connectors.

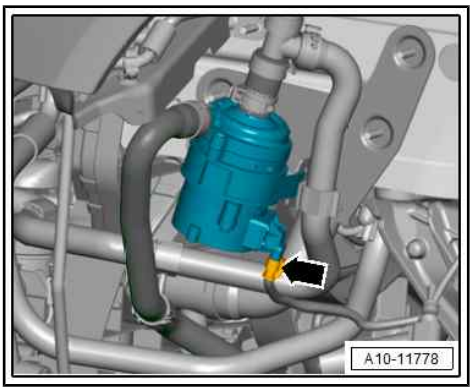


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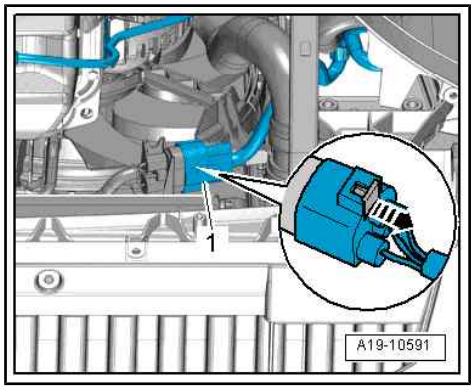
– Remove nuts -arrows- and move bracket -1- clear.



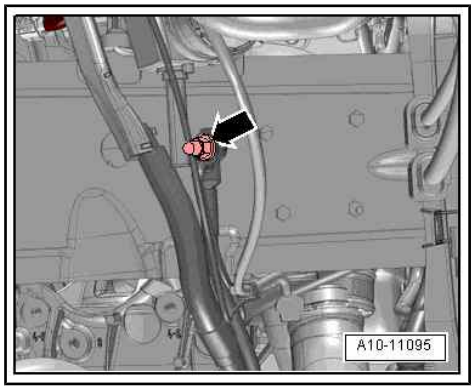
– Unplug electrical connector -arrow- from charge air cooling pump - V188- and move electrical wiring clear.



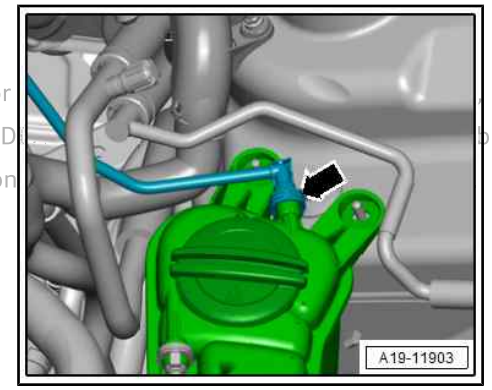
– Take electrical connector -1- for radiator fan out of bracket and unplug connector (push retainer to the rear -arrow- and press down release catch).



– Unscrew nut -arrow- on longitudinal member (right-side) and move earth cables clear.

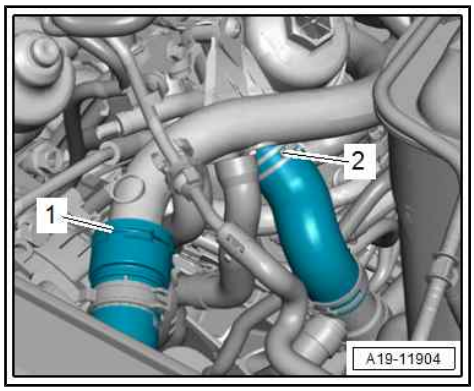


– Lift retaining clip -arrow- and disconnect coolant hose.

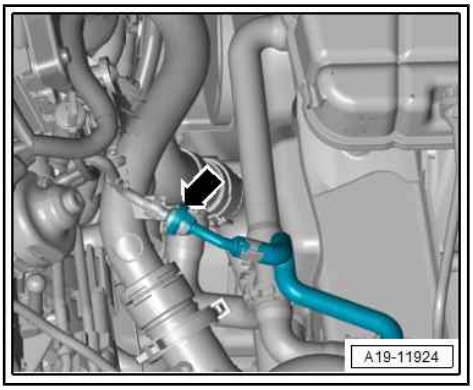


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– Lift retaining clip -1-, release hose clip -2- and disconnect coolant hoses.



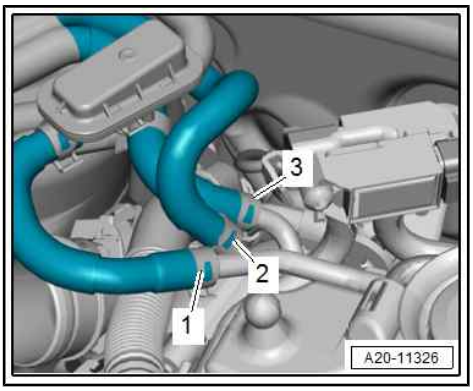
– Lift retaining clip -1- and disconnect coolant hose.



Caution

Protect fuel system against contamination.

- *Rules for cleanliness when working on the injection system ⇒ page 6 .*



– Release hose clips and disconnect fuel hoses.

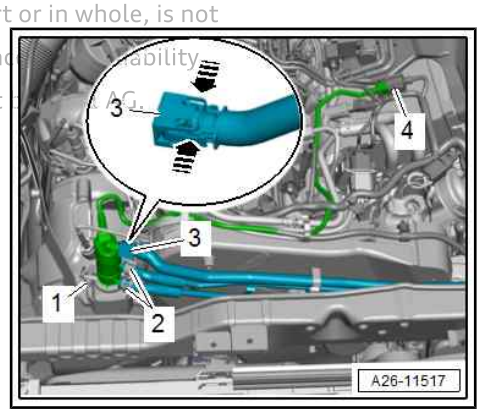
1 - Fuel hose (blue)

2 - Fuel hose (yellow)

3 - Fuel hose (white)

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– Take electrical connector -4- out of bracket, unplug it and move electrical wiring clear.



– Release hose clip -1-.

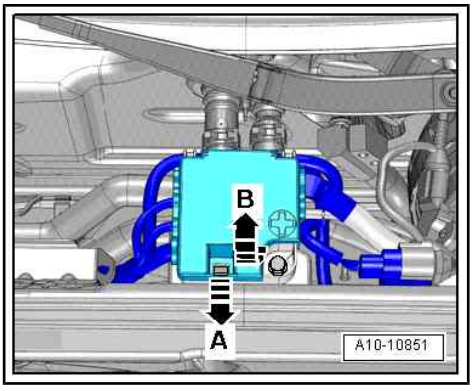
– Move coolant hoses -2- and SCR line -3- clear.

– Detach injector for reducing agent - N474- and place to left side.

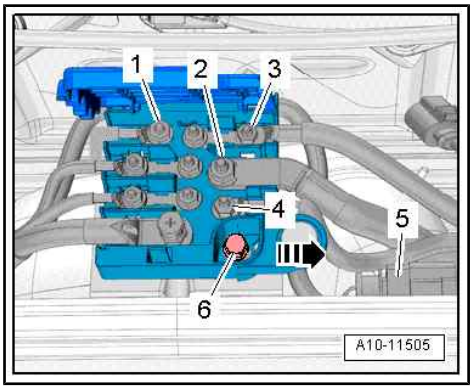
Note

Disregard -arrows-.

– Release retainer -arrow A- and open cover -arrow B-.



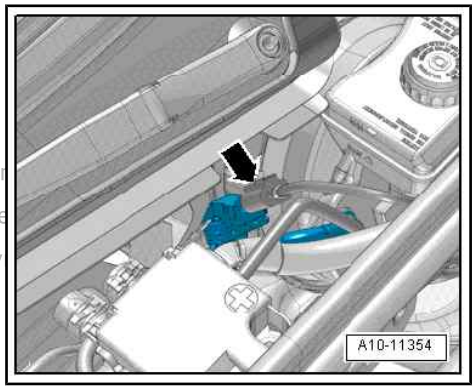
– Remove nuts -1 ... 4- for electrical wiring.
– Unplug electrical connector -5-.



Note

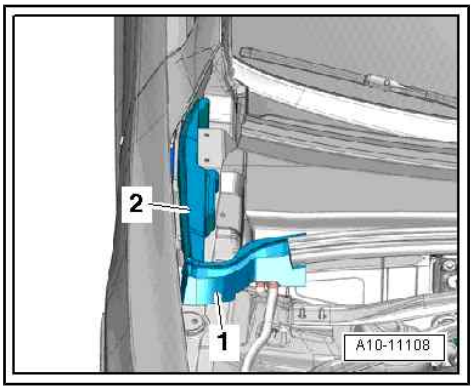
Disregard -item 6- and -arrow-.

– Unplug electrical connector -arrow- on brake servo pressure sensor - G294- .

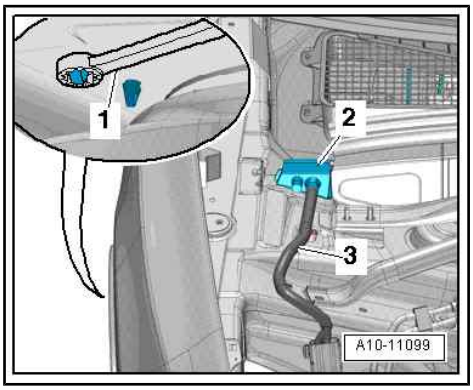


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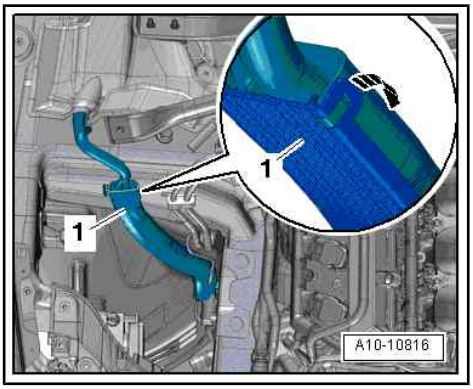
– Q5 only: Pull off profiled seal -1- and seal -2- (right-side) upwards.



– Working from wheel housing, release catches using a 5.5 mm ring spanner -item 1- and remove wiring protector -2- upwards.
– Release wiring harness -3- leading to alternator and starter using removal lever - 80 - 200- and move clear.

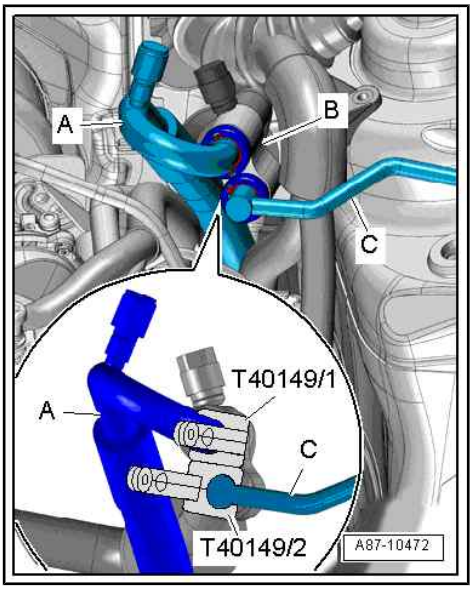


– Release catch -arrow- to open wiring duct -1- and move electrical wiring harness clear.



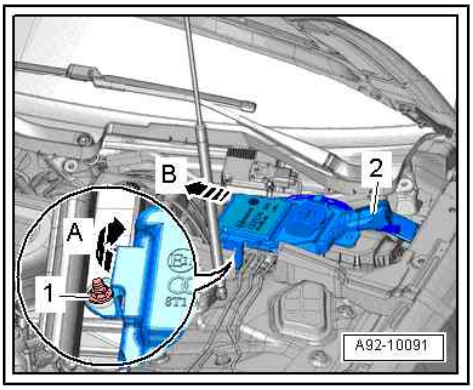
– Detach refrigerant lines -A, C- from inner heat exchanger ⇒ Heating, air conditioning; Rep. gr. 87 ; Overview of fitting locations - air conditioner; Overview of fitting locations - components not located in passenger compartment .

A4 and A5:



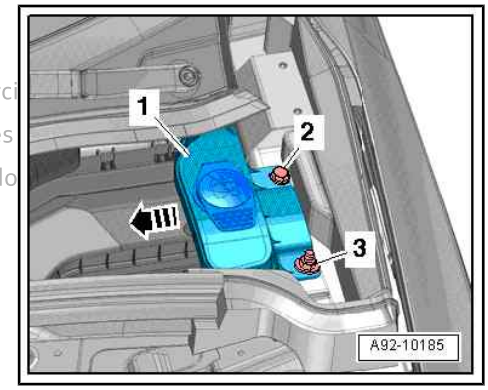
– Pull filler neck -2- with filler pipe out of washer fluid reservoir and through opening in body -arrow B-.

Q5 only:



– Remove nut -3- and bolt -2-.

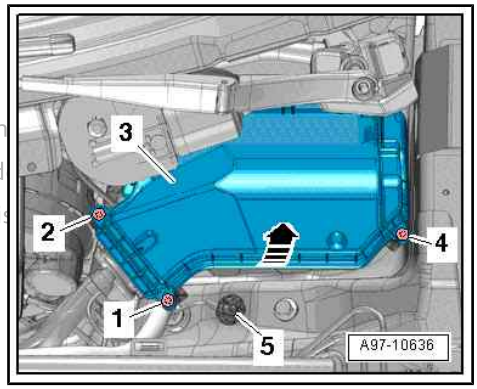
– Pull filler neck -1- with filler pipe out of washer fluid reservoir and through opening in body -arrow-.



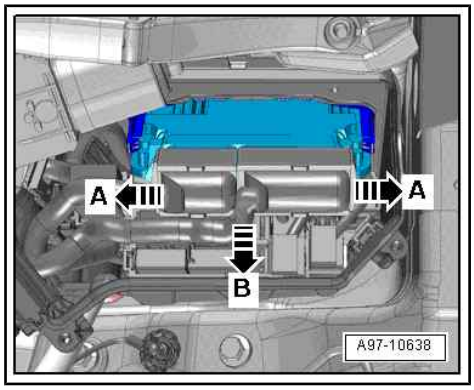
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– Remove bolts -1, 2, 4- and detach cover -3- for electronics box in engine compartment.
– Remove nut -5- and move earth wire clear.

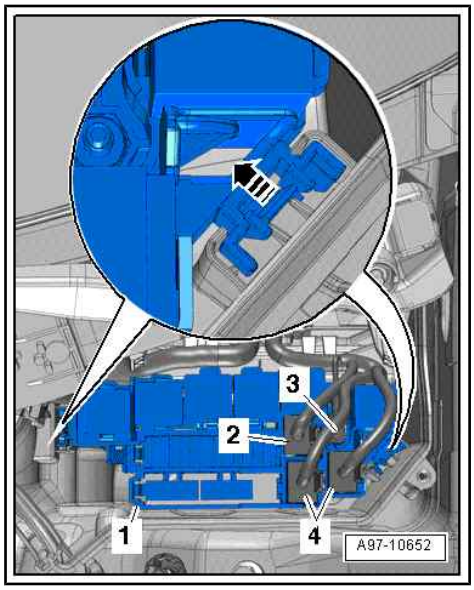
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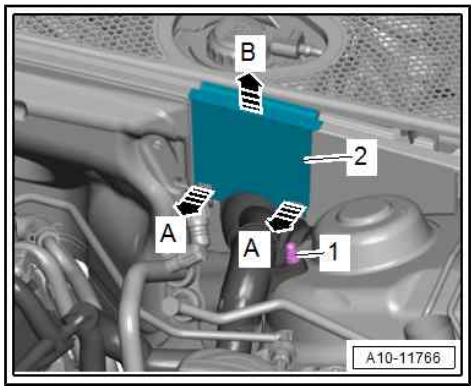
– Release catches -arrows A- and take out engine control unit -arrow B-.



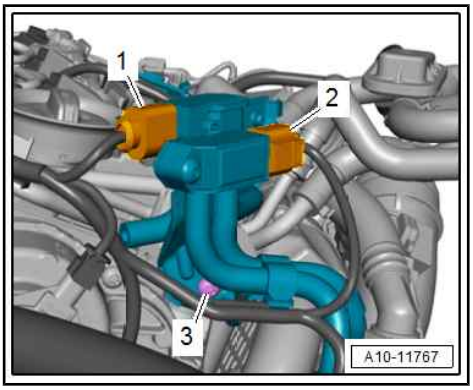
– If fitted, unplug electrical connector -2-.
– Unplug electrical connectors -4- and unscrew nut -3- for wiring.
– Release catches -arrow- and detach relay carrier with fuse holder -1-.
– Disengage engine wiring harness at electronics box in engine compartment and move clear.



– Release catches -arrows A- and lift off wiring protector -2- -arrow B-.
– Unscrew earth stud -1- and move wiring harness clear.
– Move wiring harness clear, place on engine and secure engine control unit to prevent it from dropping.



– Unplug electrical connectors -1, 2-.



Caution

Risk of irreparable damage to exhaust gas pressure sensor 1 - G450- and differential pressure sender - G505- .

- *Connections of exhaust gas pressure sensor 1 - G450- and differential pressure sender - G505- can break off if too much pressure is applied.*

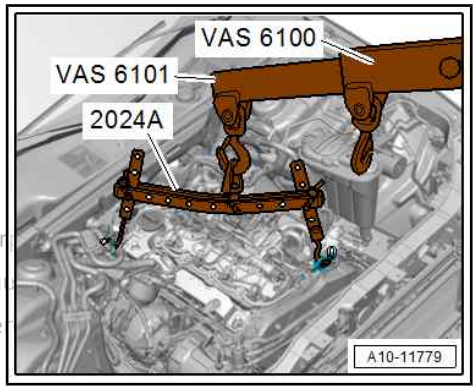
– Remove bolt -3- and move bracket with exhaust gas pressure sensor 1 - G450- and pressure differential sender - G505- carefully to one side.

– Remove lifting eye of lifting tackle - 2024 A- (pull out split pin and press out pin).

– Reinsert lifting eye in 4th hole from front on lifting tackle.

– Secure pin with split pin again.

– Attach lifting tackle - 2024 A- to engine and workshop hoist - VAS 6100- with lift arm extension/workshop hoist - VAS 6101- as shown in illustration.



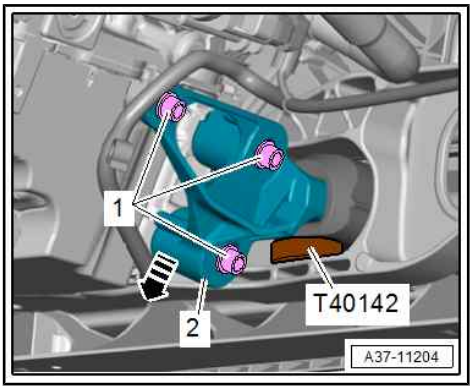
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WARNING

Accident risk from loose components of lifting tackle.

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

– Unscrew bolts -1- and remove torque reaction support -2- and piston compressing tool - T40142- previously inserted as a spacer.



Note

Disregard -arrow-.

Caution

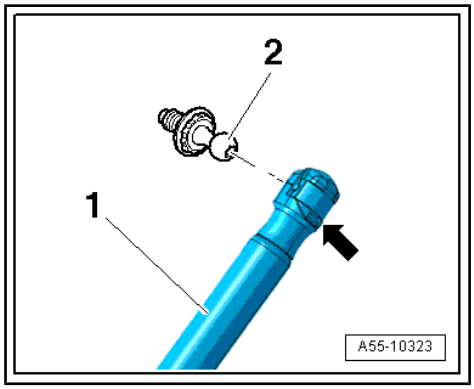
Danger of damage to hoses, pipes and wiring connections and to engine compartment.

- *Check that all hoses and wiring connections between engine, subframe and body have been detached.*
- *Carefully guide engine out of engine compartment when lifting out.*

Note

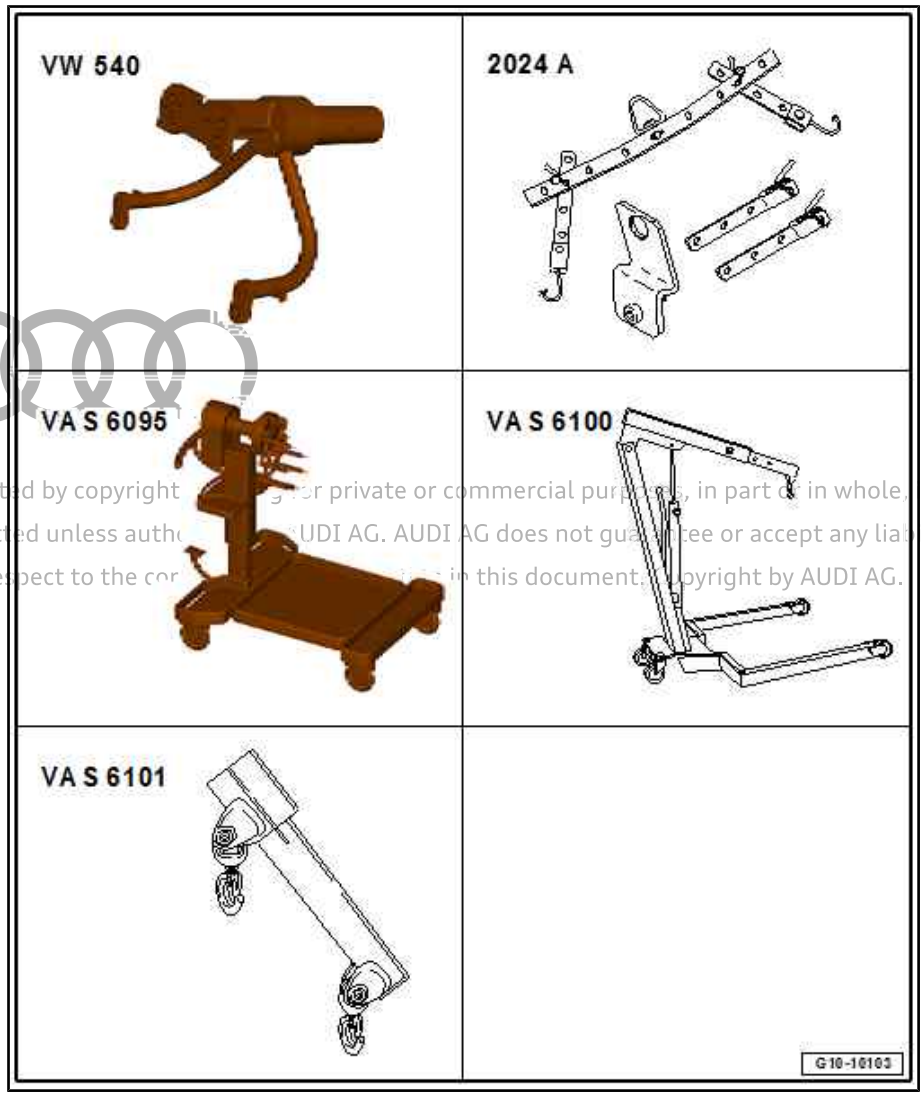
A second mechanic is required to carefully open bonnet as much as possible when lifting engine out.

- Use small screwdriver to slightly lift retaining clip -arrow- at both ends and detach gas strut -1- from ball stud -2- at top.
- Lift engine out of engine compartment, paying attention to electrical wiring.
- Press gas struts back onto ball studs.



1.2 Securing engine to engine and gearbox support

Special tools and workshop equipment required



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- Engine and gearbox support - VW 540-
- Lifting tackle - 2024 A-
- Engine and gearbox support - VAS 6095-
- Workshop hoist - VAS 6100-
- Lift arm extension/workshop hoist - VAS 6101-

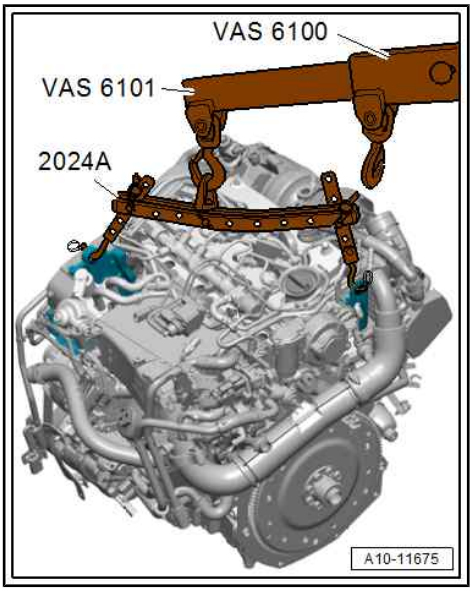
Procedure

– Remove lifting eye of lifting tackle - 2024 A- (pull out split pin and press out pin).

– Reinsert lifting eye in 4th hole from front on lifting tackle.

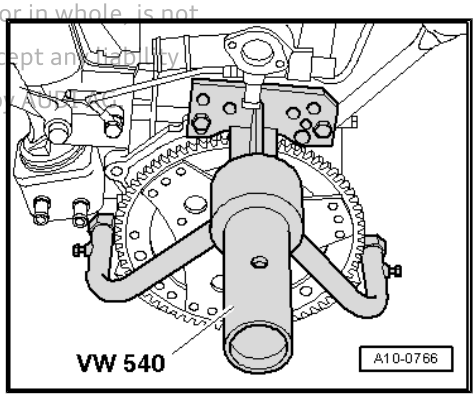
– Secure pin with split pin again.

– Attach lifting tackle - 2024 A- to engine and workshop hoist - VAS 6100- with lift arm extension/workshop hoist - VAS 6101- as shown in illustration.



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



1.3 Installing engine

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 ⇒ page 265 after installing the high-pressure pipes. If these instructions are not observed, the engine could be damaged.

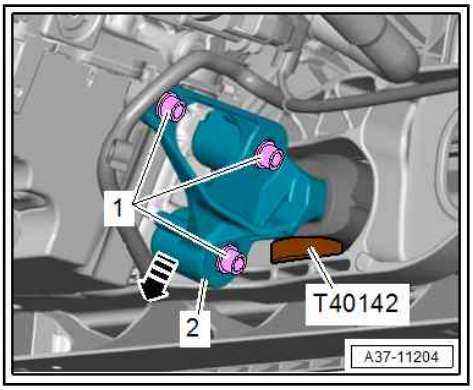
Procedure

Note

- *Renew 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 correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .*
- *Re-install all cable ties in original positions.*

– Lower workshop hoist and place engine/gearbox assembly onto engine mountings.

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- Move torque reaction support -2- into correct installation position.
- Fit bolts -1- and screw in by hand until they make contact.
- Tilt engine slightly towards rear, press torque reaction support downwards -arrow- and tighten bolts.
- Insert piston compressing tool - T40142- as a spacer.
- Secure engine mounting ⇒ page 27 .
- Detach workshop hoist - VAS 6100- and lifting tackle - 2024 A- .
- Install front exhaust pipe ⇒ page 321 .
- Secure bracket for SCR line ⇒ Item 21 (page 36) .
- Install injector for reducing agent - N474- ⇒ page 375 .
- Install air cleaner housing ⇒ page 253 .
- Secure bracket for exhaust gas pressure sensor 1 - G450- / pressure differential sender - G505- ⇒ page 307 .
- Install filler neck for washer fluid reservoir ⇒ Electrical system; Rep. gr. 92 ; Windscreen washer system; Removing and installing washer fluid reservoir .
- Electrical connections and routing ⇒ Electrical system; Rep. gr. 97 ; Electrical connectors and ⇒ Current flow diagrams, Electrical fault finding and Fitting locations
- Install electrical wiring, terminal 30 wiring junction 2 - TV22- and cover for electronics box in engine compartment ⇒ Electrical system; Rep. gr. 97 ; Relay carriers, fuse carriers, electronics boxes .
- Install air hoses with screw-type clips ⇒ page 254 .
- Install refrigerant line ⇒ Heating, air conditioning; Rep. gr. 87 ; Overview of fitting locations - air conditioner; Overview of fitting locations - components not located in passenger compartment .
- Charge refrigerant circuit ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit .
- Install gearbox ⇒ Rep. gr. 34 ; Removing and installing gearbox; Installing gearbox or ⇒ Rep. gr. 37 ; Removing and installing gearbox; Installing gearbox .
- Connect vacuum hoses ⇒ page 251 .
- Check oil level.

◆ A5 Coupé ⇒ Maintenance ; Booklet 811

◆ A4 ⇒ Maintenance ; Booklet 812

◆ A5 Cabriolet ⇒ Maintenance ; Booklet 818

◆ Q5 ⇒ Maintenance ; Booklet 817

Caution

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

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

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- Bleed fuel system ⇒ page 249 .
- Connect coolant hoses with plug-in connector ⇒ page 202 .

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Note

Do not reuse coolant.

– Fill up with coolant ⇒ page 167 .

– Install front wheel housing liners ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front) .

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

- ⇒ “2.1 Exploded view - assembly mountings”, page 27

2 Assembly mountings

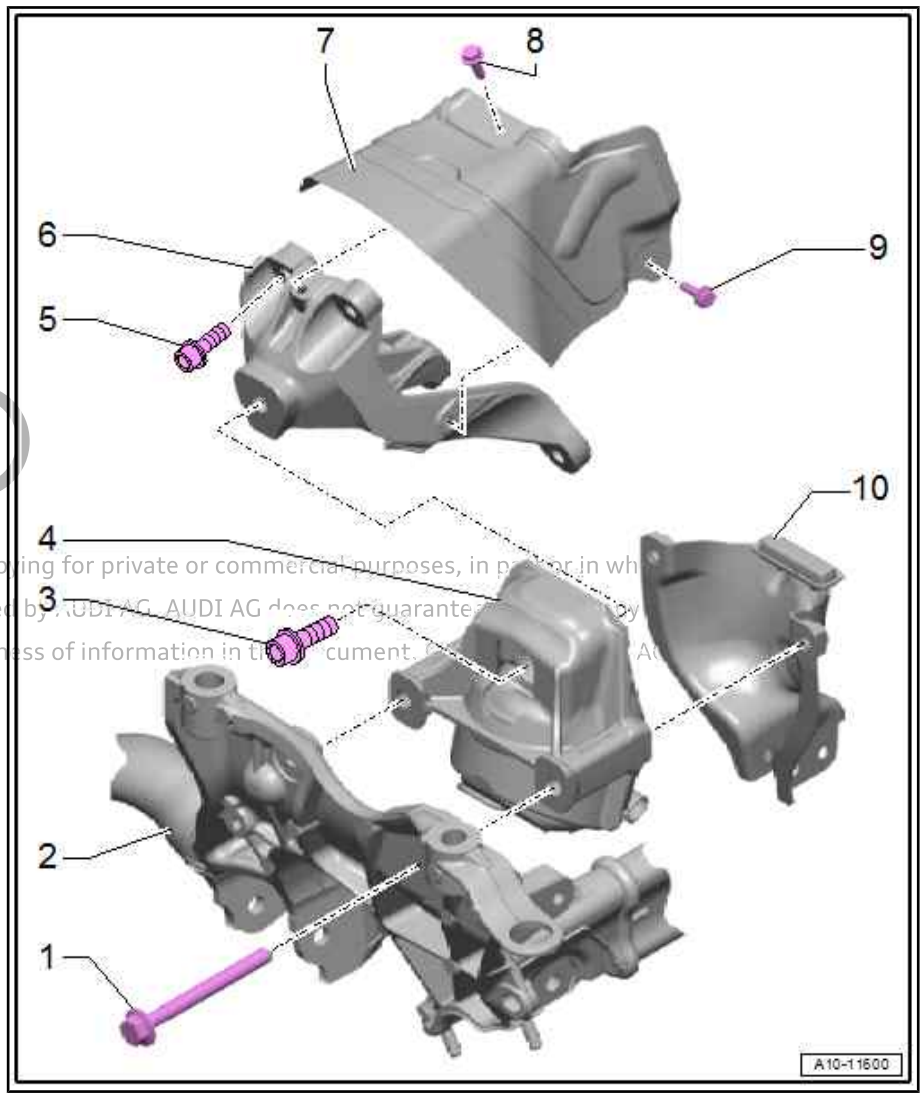
⇒ "2.1 Exploded view - assembly mountings", page 27

⇒ "2.2 Supporting engine in installation position", page 28

⇒ "2.3 Removing and installing engine mountings", page 29

⇒ "2.4 Removing and installing torque reaction support and cross member", page 30

2.1 Exploded view - assembly mountings



1 - Bolt
- ❑ 55 Nm

2 - Subframe

3 - Bolt
- ❑ Renew
- ❑ 90 Nm +90°

4 - Engine mounting
- ❑ With left electrohydraulic engine mounting solenoid valve - N144- (left-side only)
- ❑ On some vehicle versions, the engine mounting on the other side of the vehicle has to be renewed as well; for allocation refer to ⇒ Electronic parts catalogue
- ❑ Removing and installing ⇒ page 29

5 - Bolt
- ❑ 40 Nm

6 - Engine support

7 - Heat shield

8 - Bolt
- ❑ 9 Nm

9 - Bolt
- ❑ 9 Nm

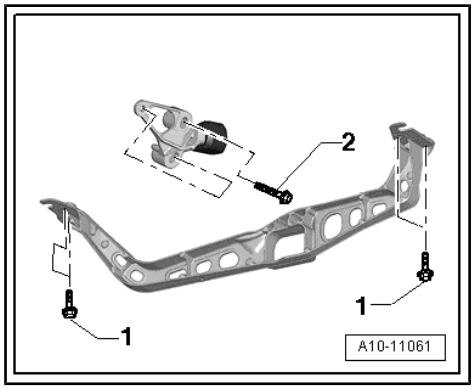
10 - Bracket
- ❑ Tighten to 20 Nm
- ❑ For engine mounting
- ❑ Renew retaining plate if engine mounting is defective
- ❑ Check retaining plate on opposite side; renew if necessary

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Torque reaction support and cross member - tightening torques

1 - Bolt, 25 Nm

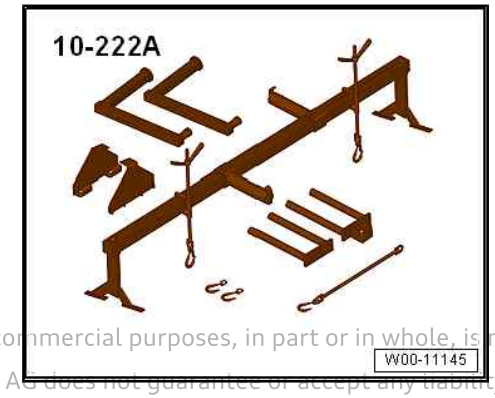
2 - Bolt, 40 Nm



2.2 Supporting engine in installation position

Special tools and workshop equipment required

♦ Support bracket - 10 - 222 A-



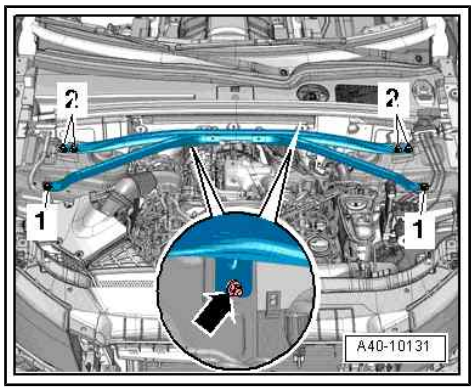
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Procedure

- Gearbox installed

– Remove engine cover panel ⇒ page 34 .

– Q5 only: Remove body brace ⇒ Running gear, axles, steering; Rep. gr. 40 ; Suspension strut, upper links; Removing and installing body brace .

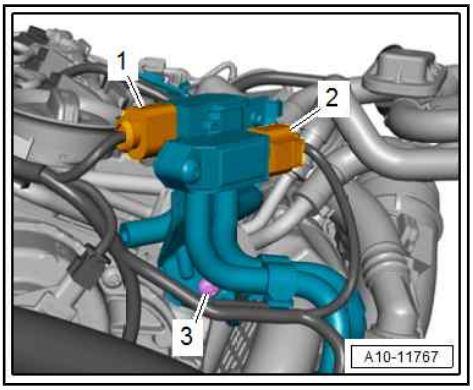


– Unplug electrical connectors -1, 2-.

Caution

Risk of irreparable damage to exhaust gas pressure sensor 1 - G450- and differential pressure sender - G505- .

- ***Connections of exhaust gas pressure sensor 1 - G450- and differential pressure sender - G505- can break off if too much pressure is applied.***

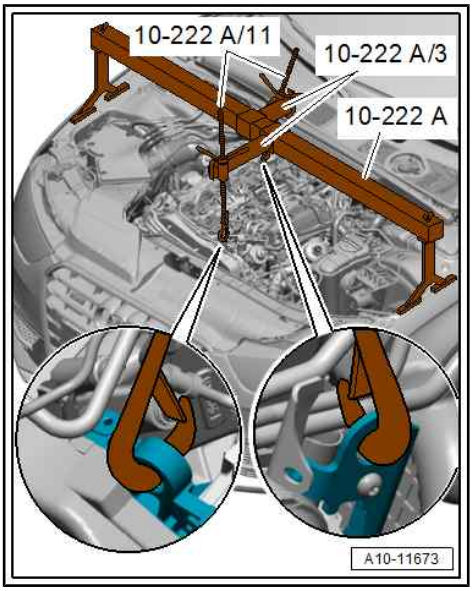


– Remove bolt -3- and move bracket with exhaust gas pressure sensor 1 - G450- and pressure differential sender - G505- carefully to one side.

– Set up support bracket - 10 - 222 A- on wing mounting flanges (left and right) as illustrated.

– Attach spindles -10 - 222 A /11- to engine lifting eyes.

– Partly take up weight of engine with spindles.



Attaching

Assembly is performed in reverse sequence; note the following:

– Q5 only: Install body brace ⇒ Running gear, axles, steering; Rep. gr. 40 ; Suspension strut, upper links; Removing and installing body brace .

– Install engine cover panel ⇒ page 34 .

2.3 Removing and installing engine mountings

Note

- *To avoid repeat repairs, proceed as follows if an engine mounting is defective:*
- *Renew engine mounting and corresponding retaining plate.*
- *On some vehicle versions, the engine mounting on the other side of the vehicle has to be renewed as well; for allocation refer to ⇒ Electronic parts catalogue .*

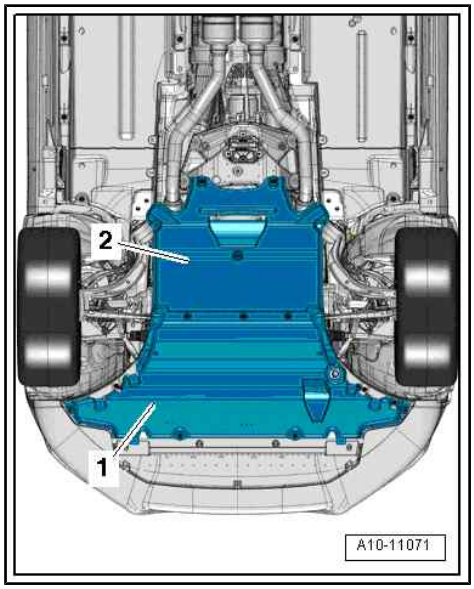
Removing

– Support engine in installation position ⇒ page 28 .

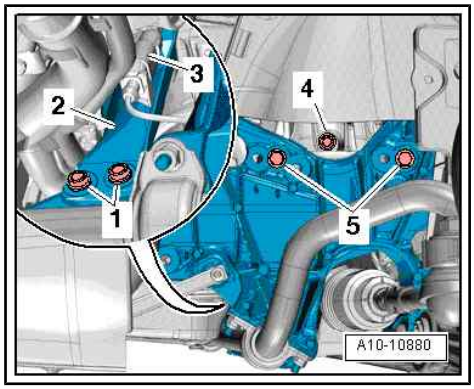
– Remove wheel housing liners (left and right) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front) .

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– Remove front noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .



– Move clear and unplug electrical connector -3- for electrohydraulic engine mounting solenoid valve.
– Remove bolts -1, 4, 5- for engine mounting.
– Detach bracket -2- and engine mounting.



Installing

Installation is carried out in reverse sequence.

Tightening torques

- ⇒ “2.1 Exploded view - assembly mountings”, page 27
- Noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation
- Wheel housing liner ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front)

2.4 Removing and installing torque reaction support and cross member

Removing

Q5 only:

– Briefly open filler cap on coolant expansion tank.

WARNING

Risk of scalding due to hot steam and hot coolant.

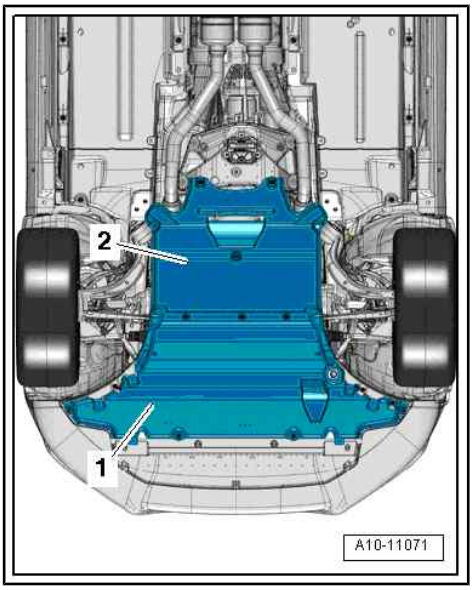
- *The cooling system is under pressure when the power unit is hot.*
- *To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.*

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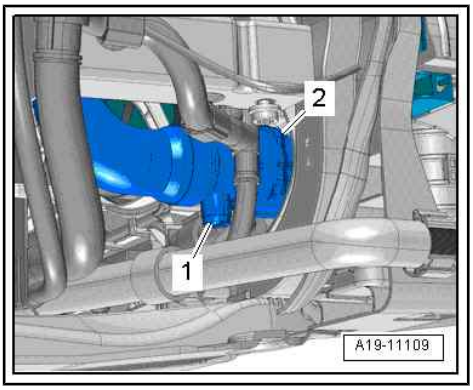
All vehicles (continued):

– Remove front noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .

Q5 only:

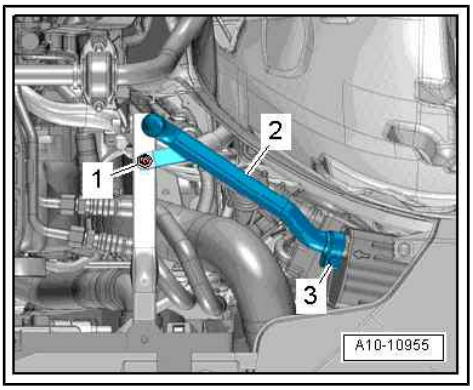


– Place drip tray for workshop hoist - VAS 6208- beneath engine.
– Remove drain plug -1- and drain off coolant.
– Lift retaining clip -2- and disconnect coolant hose from radiator.



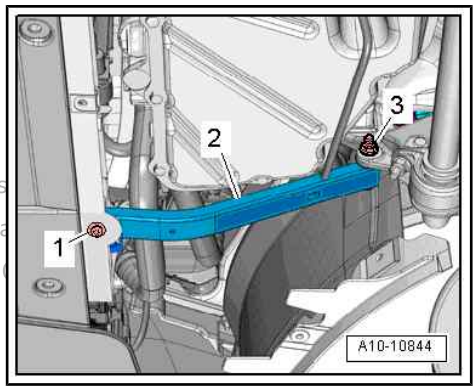
Vehicles with auxiliary heater:

– Remove nut -1-, loosen clamp -3- and detach exhaust pipe -2- for auxiliary heater.



All vehicles (continued):

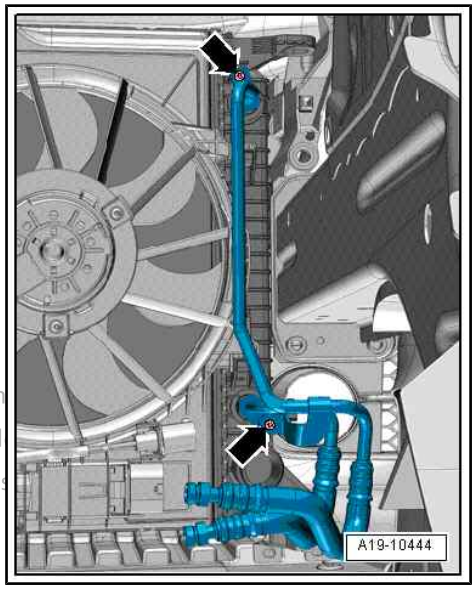
– Remove bolt -1- and nut -3- and detach strut -2- for lock carrier.



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Vehicles with multitronic gearbox:

– Position used oil collection and extraction unit - VAS 6622A- below connection point.



Note

Observe rules for cleanliness when working on gearbox ⇒ Rep. gr. 00 ; Repair instructions; Rules for cleanliness .

– Unscrew bolts -arrows- and detach ATF lines from radiator.

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Note

Tie ATF lines up onto longitudinal member to prevent fluid escaping.

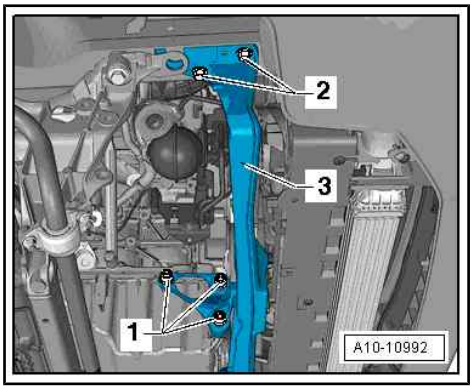
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .

All vehicles (continued):

– Move electrical wiring -3- clear at cross member.

– Remove bolts -1- and take torque reaction support out of cross member.

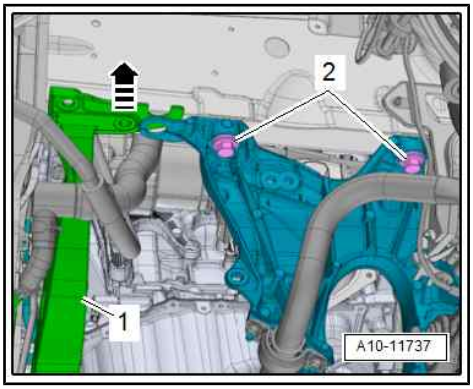
– Remove bolts -2- on both sides and detach cross member -3-.



Note

If an electric coolant pump is fitted at the front left, the subframe must be unfastened on the right side (as seen in direction of travel). In this case, the bolts on the left must not be released.

– Loosen subframe bolts -2- (left-side as seen in direction of travel) only as much as is necessary for cross member -1- to move freely in direction of -arrow-.

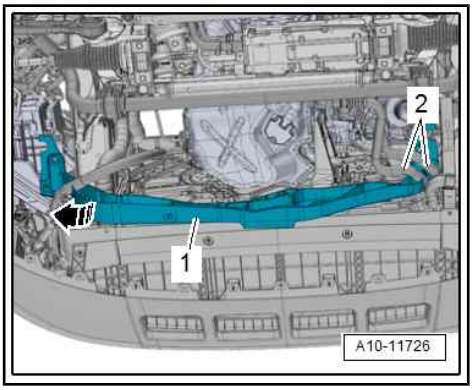


WARNING

Accident risk if subframe mountings are detached.

- ***Subframe bolts must not be fully removed.***

– Push cross member -1- slightly towards left side -arrow- so that cross member can be removed from below at longitudinal member (right-side); if fitted, push ATF hoses -2- to side.



Installing

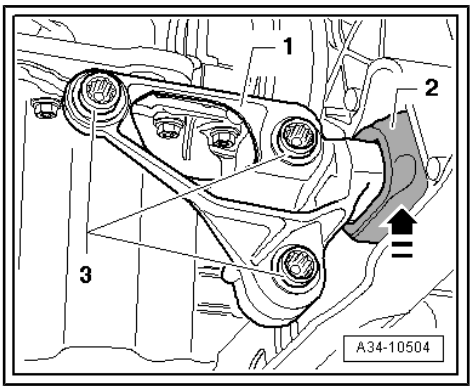
Installation is carried out in reverse order; note the following:

Note

- *Renew bolts tightened with specified tightening angle.*
- *Remove and renew both subframe bolts one after the other.*

– Note installation position and marking of buffer stop.

– Push torque reaction support -1- upwards -arrow- until it makes contact with cross member.



• The buffer stop -2- must be free of stress and must lie against the cross member without play.

– Tighten bolts -3- in this position.

– Install ATF lines (if originally fitted) ⇒ Rep. gr. 37 ; ATF circuit; Removing and installing ATF lines .

– If coolant has been drained, fill up with coolant ⇒ page 167 .

Tightening torques

- ⇒ Fig. ""Torque reaction support and cross member - tightening torques"" , page 28
- Subframe ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Exploded view - subframe
- Lock carrier brace ⇒ General body repairs, exterior; Rep. gr. 50 ; Lock carrier; Exploded view - lock carrier
- Exhaust pipe for auxiliary heater ⇒ Auxiliary heater, supplementary heater; Rep. gr. 82 ; Overview of fitting locations - auxiliary/supplementary heater; Overview of fitting locations - components not located in passenger compartment
- Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .

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3 Engine cover panel

⇒ “3.1 Removing and installing engine cover panel”, page 34

3.1 Removing and installing engine cover panel

Removing



– Carefully pull engine cover panel off retaining pins one after another -arrows-. Do not jerk engine cover panel away, and do not try to pull on one side only.

Installing

– To avoid damage, do not strike the engine cover panel with your fist or with any kind of tool.

– Position engine cover panel, paying attention to oil filler neck and dipstick.

– Press engine cover panel into rubber grommets first on left side, then on right side.

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13 – Crankshaft group

1 Cylinder block (pulley end)

⇒ "1.1 Exploded view - cylinder block (pulley end)", page 35

⇒ "1.2 Exploded view - sealing flange (pulley end)", page 37

⇒ "1.3 Removing and installing poly V-belt", page 38

⇒ "1.4 Removing and installing tensioner for poly V-belt", page 40

⇒ "1.5 Removing and installing vibration damper", page 40

⇒ "1.6 Removing and installing bracket for ancillaries", page 42

⇒ "1.7 Removing and installing sealing flange (pulley end)", page 43

1.1 Exploded view - cylinder block (pulley end)

1 - Poly V-belt

- ❑ Check for wear
- ❑ Before removing, mark direction of rotation with chalk or felt-tip pen
- ❑ Do not kink
- ❑ Routing of poly V-belt ⇒ page 37
- ❑ Removing and installing ⇒ page 38
- ❑ When installing, make sure it is properly seated on pulleys.

2 - Tensioner for poly V-belt

- ❑ Removing and installing ⇒ page 40

3 - Bolt

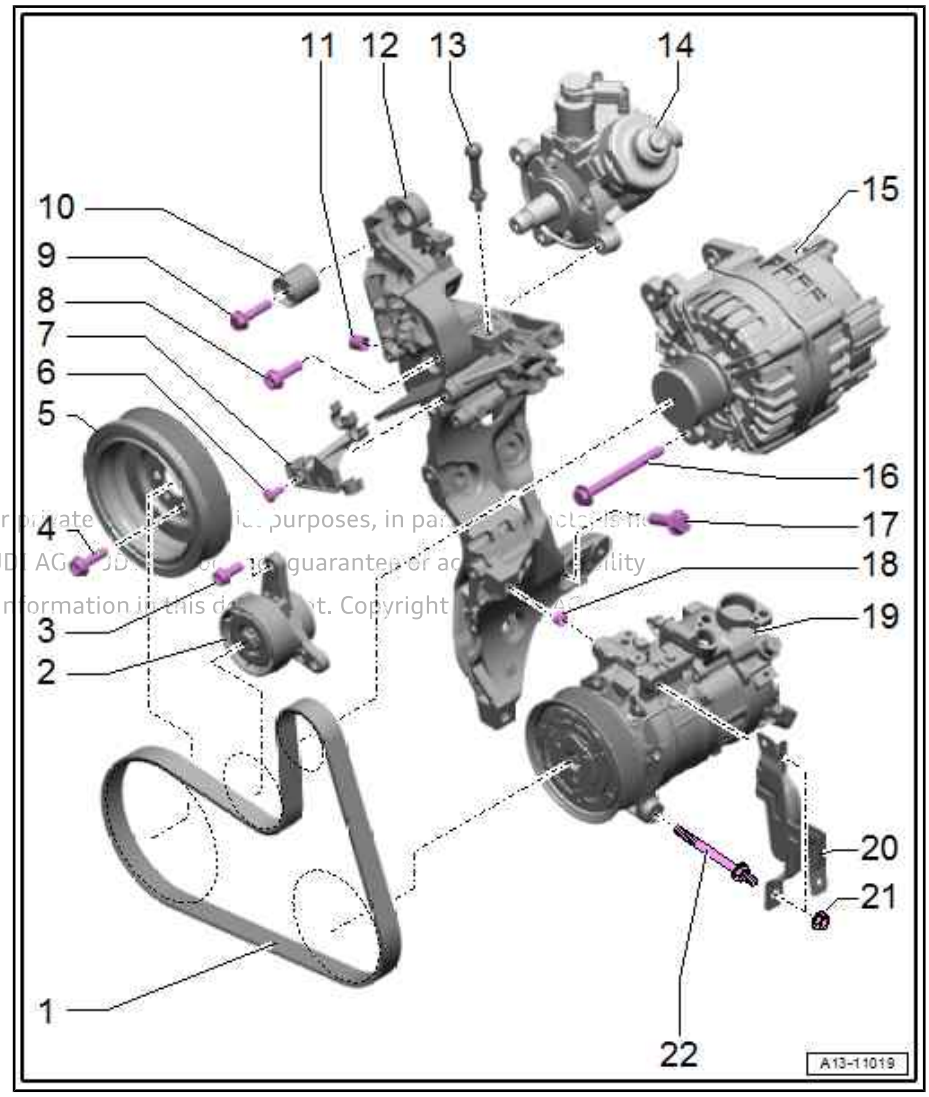
- ❑ Renew after removing
- ❑ 20 Nm +90°

4 - Bolt

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

5 - 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 40



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6 - Bolt

- ❑ 8 Nm

7 - Bracket

- ❑ For coolant hose

8 - Bolt

- ❑ Tightening torque ⇒ Item 2 (page 286)

9 - Bolt

- ❑ Tightening torque ⇒ Item 14 (page 69)

10 - Damper wheel

11 - Dowel sleeve

- ❑ Ensure correct seating in bracket for ancillaries

12 - Bracket for ancillaries

- ❑ Removing and installing ⇒ page 42

13 - Ball stud

- ❑ For engine cover panel

14 - High-pressure pump

- ❑ Exploded view ⇒ page 286

15 - Alternator

- ❑ Removing and installing ⇒ Electrical system; Rep. gr. 27 ; Alternator; Exploded view - alternator

16 - Bolt

- ❑ Tightening torque ⇒ Electrical system; Rep. gr. 27 ; Alternator; Exploded view - alternator

17 - Bolt

- ❑ Renew after removing
- ❑ Different lengths ⇒ page 37
- ❑ Tightening torque and sequence ⇒ page 37

18 - Dowel sleeve

- ❑ 2x
- ❑ Ensure correct seating in air conditioner compressor

19 - Air conditioner compressor

- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Detaching and attaching air conditioner compressor at bracket

20 - Bracket

- ❑ For SCR line

21 - Nut

- ❑ 20 Nm

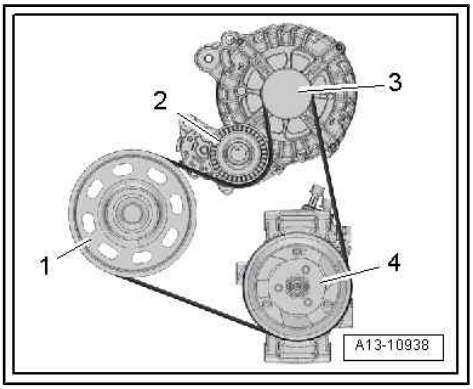
22 - Centre hex stud

- ❑ Tightening torque ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Exploded view - air conditioner compressor drive unit

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Routing of poly V-belt

1 - Vibration damper
2 - Tensioning roller
3 - Alternator
4 - Air conditioner compressor



Bracket for ancillaries - tightening torque and tightening sequence

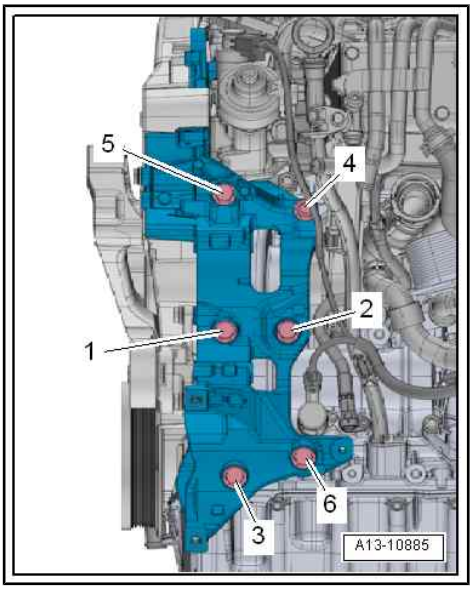
Note

After removing, renew bolts tightened with specified tightening angle.

– Fit bolts in the following sequence:
- Bolts -1, 2, 3, 6- M10x35
- Bolt -4- M10x115
- Bolt -5- M10x175

– Tighten bolts in 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.	-4- and -5-	Turn 180° further
4.	-1, 2, 3, 6-	Turn 45° further



1.2 Exploded view - sealing flange (pulley end)

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1 - Sealing flange (pulley end)

- ❑ With crankshaft oil seal
- ❑ Renew after removing
- ❑ Removing and installing ⇒ page 43

2 - Bolt

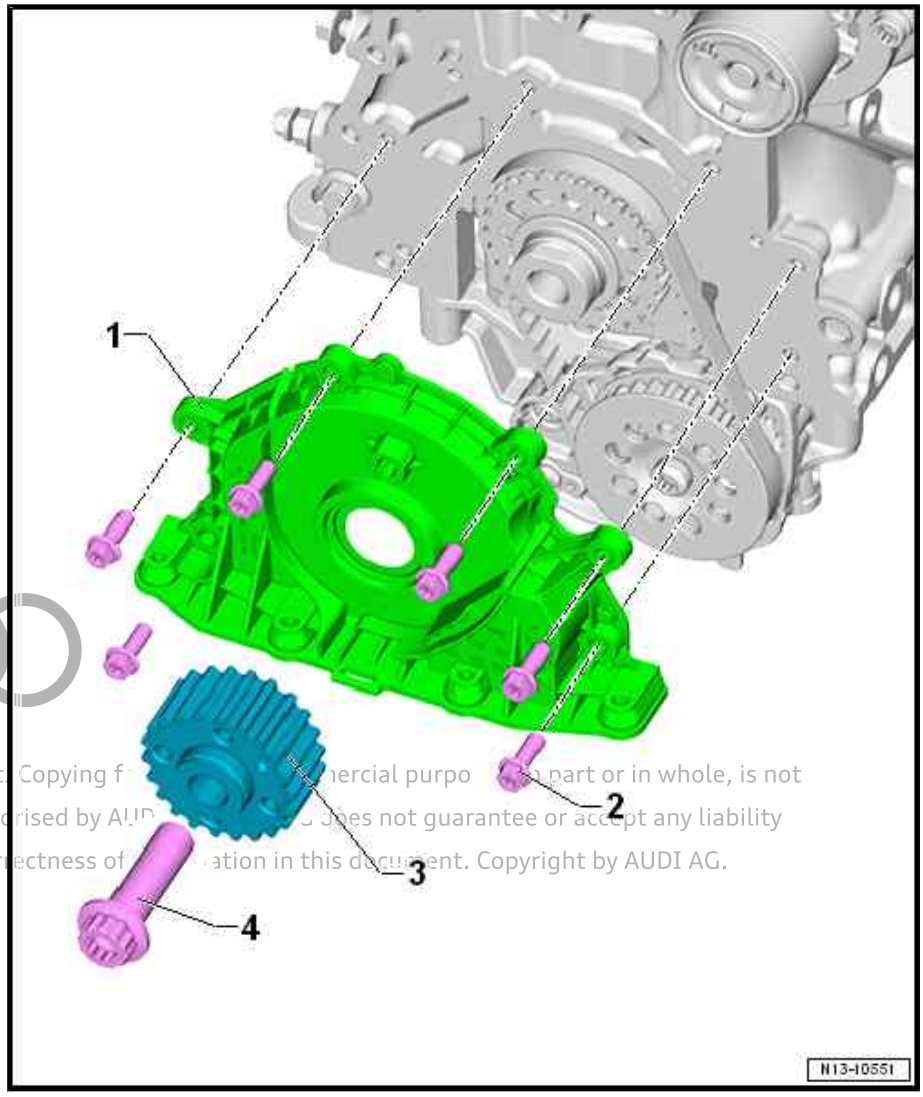
- ❑ Tightening torque and sequence ⇒ page 38

3 - Crankshaft sprocket

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

4 - Bolt

- ❑ Tightening torque ⇒ Item 1 (page 68)

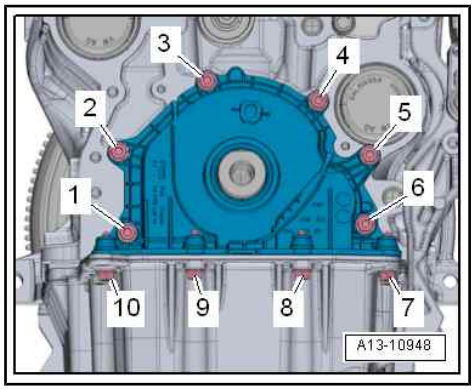


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Sealing flange (pulley end) - tightening torque and sequence

– Tighten bolts in stages in the sequence shown:

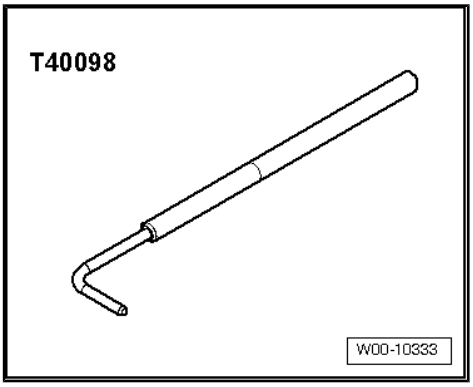
Stage	Bolts	Tightening torque
1.	-1 … 10-	Screw in by hand until contact is made
2.	-1 … 6-	Tighten in stages and in diagonal sequence; final torque 13 Nm
3.	-7 … 10-	13 Nm



1.3 Removing and installing poly V-belt

Special tools and workshop equipment required

♦ Locking tool - T40098-



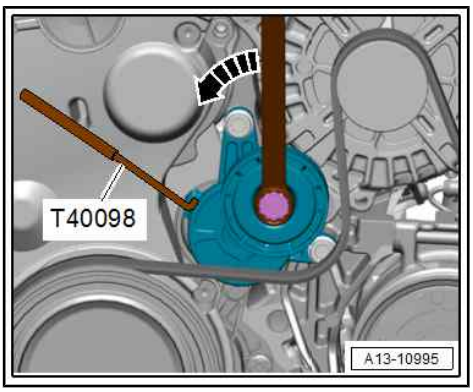
Removing

– Remove engine cover panel ⇒ page 34 .

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.***



– To slacken poly V-belt turn tensioner in anti-clockwise direction -arrow- using ring spanner.

– Lock tensioner with locking tool - T40098- .

– Take off poly V-belt.

Installing

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

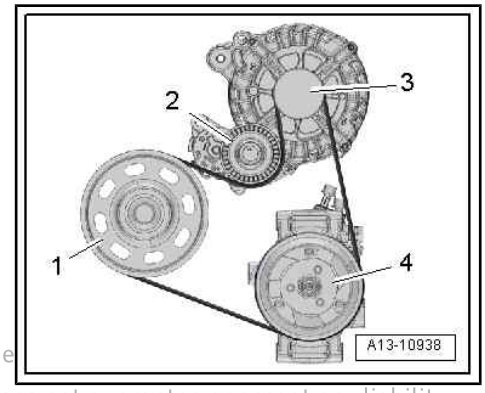
– Fit poly V-belt on poly V-belt pulleys:

1 - Vibration damper

2 - Tensioning roller

3 - Alternator

4 - Air conditioner compressor



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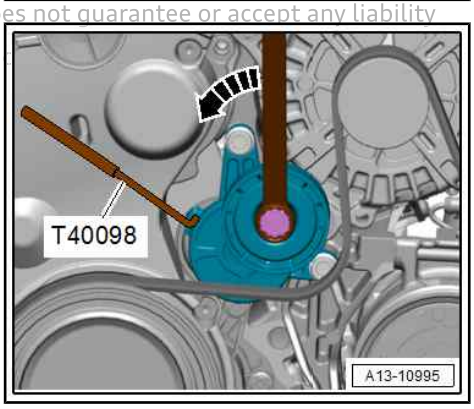
– Hold tensioner with ring spanner and remove locking tool - T40098- .

– Release tensioner.

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

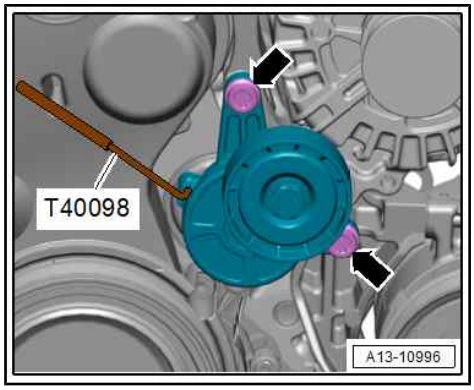
– Start engine and check that poly V-belt(s) run properly.

– Install engine cover panel ⇒ page 34 .



1.4 Removing and installing tensioner for poly V-belt

Removing



– Remove toothed belt cover (top) ⇒ page 69 .
– Remove poly V-belt ⇒ page 38 .
– Remove bolts -arrows- and take off poly V-belt tensioner.

Installing

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

Note

Renew bolts tightened with specified tightening angle.

– Install poly V-belt ⇒ page 38 .
– Install toothed belt cover (top) ⇒ page 69 .

Tightening torques

♦ ⇒ “1.1 Exploded view - cylinder block (pulley end)”, page 35

1.5 Removing and installing vibration damper

Special tools and workshop equipment required

♦ Torque wrench - VAS 6583 A-



♦ Tool insert - T10572-



♦ Multi-point bit (10 mm), e.g. from plug socket set - VAS 6928-
♦ Offset ring spanner (19 mm)

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Removing

A4, A5 and Cabriolet models only:

– Remove torque reaction support -1- and cross member -3- ⇒ “2.4 Removing and installing torque reaction support and cross member”, page 30 .

– Remove radiator fan control unit - J293- ⇒ page 220 .

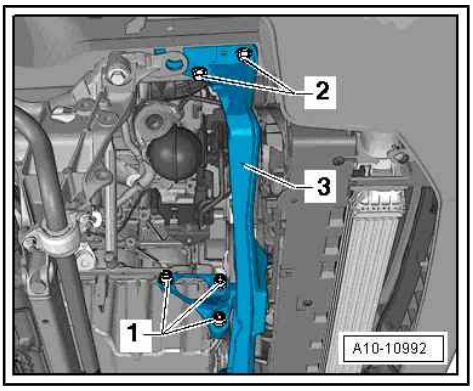
Q5 only:

– Remove radiator cowl ⇒ “4.4 Removing and installing radiator cowl”, page 211 .

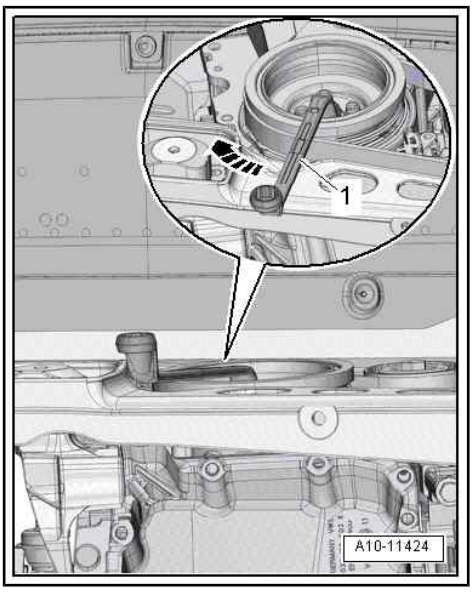
All vehicles:

– Remove poly V-belt ⇒ “1.3 Removing and installing poly V-belt”, page 38 .

– Detach cap from vibration damper.

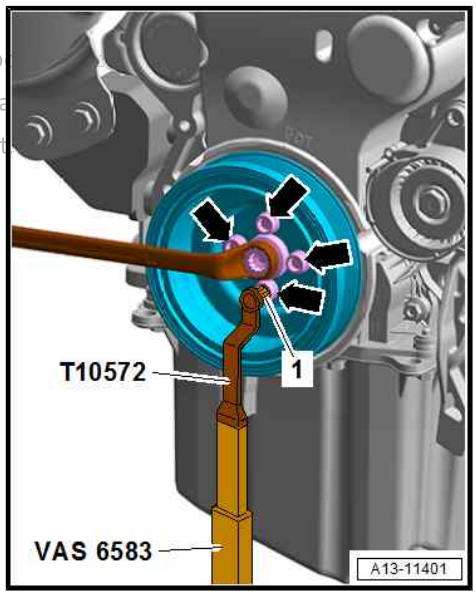


– Counterhold crankshaft on central bolt using angled ring spanner -1- when loosening bolts for vibration damper.



– Loosen bolts -arrows- on vibration damper using insert tool - T10572- and multi-point bit (10 mm) -1-.

– Remove bolts and take off vibration damper.



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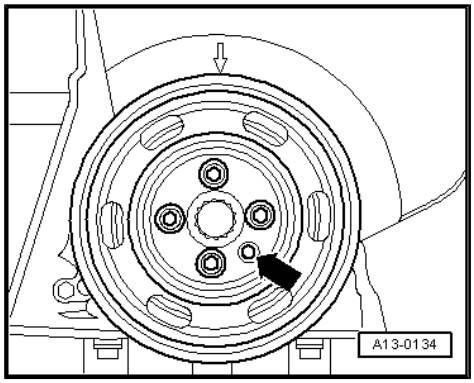
Installing

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

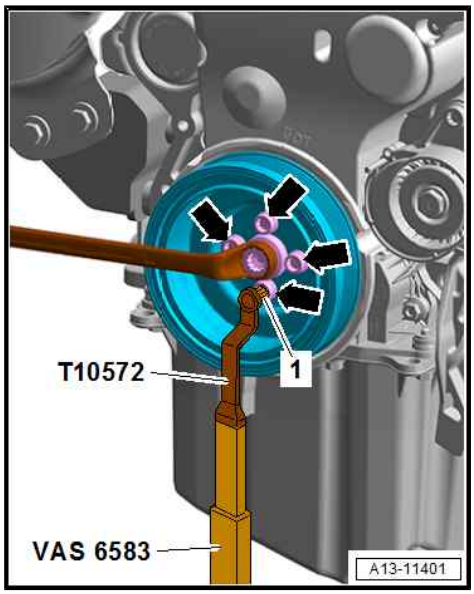
Note

Renew bolts tightened with specified tightening angle.

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



– Tighten bolts -arrows- using torque wrench - VAS 6583A- and insert tool - T10572- and using multi-point bit (10 mm) -1-.
– Install poly V-belt ⇒ page 38 .
– If fitted previously, install torque reaction support and cross member
⇒ “2.4 Removing and installing torque reaction support and cross member”, page 30 .
– Q5 only: Install radiator cowl
⇒ “4.4 Removing and installing radiator cowl”, page 211 .



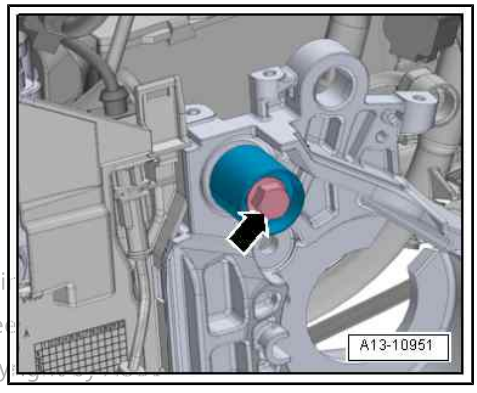
Tightening torques

- ⇒ “1.1 Exploded view - cylinder block (pulley end)”, page 35
- Radiator fan control unit - J293-
⇒ “4.1 Exploded view - radiators/radiator fans”, page 201
- ⇒ Fig. ““Torque reaction support and cross member - tightening torques”“ , page 28

1.6 Removing and installing bracket for ancillaries

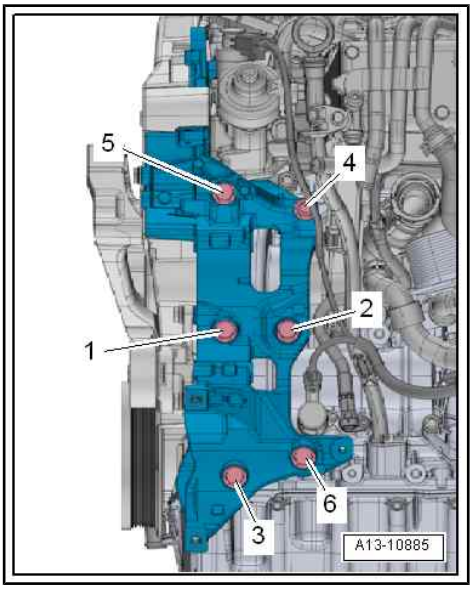
Removing

– Remove alternator ⇒ Electrical system; Rep. gr. 27 ; Alternator; Exploded view - alternator .
– Remove high-pressure pump ⇒ page 287 .
– Remove air conditioner compressor from bracket and tie up to longitudinal member ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Detaching and attaching air conditioner compressor at bracket .
– Remove bolt -arrow- and detach damper wheel.



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– Loosen bolts in the sequence -6 ... 1-.
– Remove bolts and detach bracket for ancillaries.



Installing

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

Note

Renew bolts tightened with specified tightening angle.

– Check that a dowel sleeve is fitted between bracket for ancillaries and cylinder block.
– Install air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Detaching and attaching air conditioner compressor at bracket .
– Install high-pressure pump ⇒ page 287 .
– Install alternator ⇒ Electrical system; Rep. gr. 27 ; Alternator; Exploded view - alternator .

Tightening torques

♦ ⇒ Fig. ""Bracket for ancillaries - tightening torque and tightening sequence"" , page 37
♦ ⇒ "1.2 Exploded view - toothed belt", page 68

1.7 Removing and installing sealing flange (pulley end)

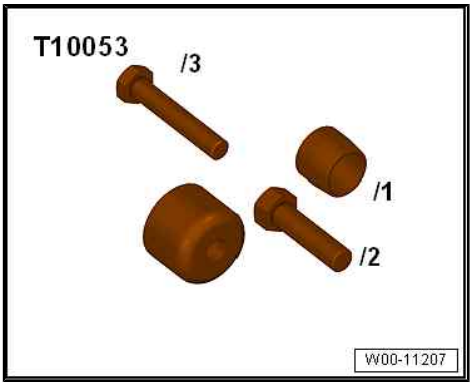
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Special tools and workshop equipment required

♦ Counterhold tool - 3415-



♦ Assembly tool - T10053-



♦ Electric drill with plastic brush attachment
♦ Safety goggles

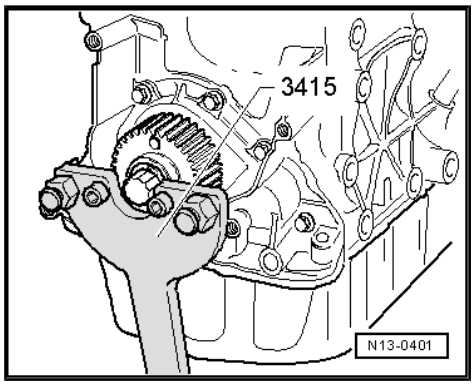
♦ Sealant ⇒ Electronic parts catalogue

Removing

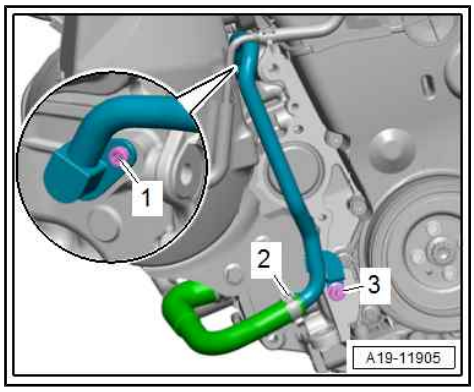
– Remove toothed belt ⇒ page 82 .

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

– Remove bolt and detach crankshaft sprocket.



– Remove bolt -3- and push coolant pipe -2- slightly to side.



Caution

Avoid damage to coolant pipe.

♦ *Do not bend coolant pipe when pushing to side.*

– Remove sump
⇒ “1.3 Removing and installing sump”, page 142 .

– Remove remaining bolts and carefully release sealing flange from bonded joint.

Installing

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

WARNING

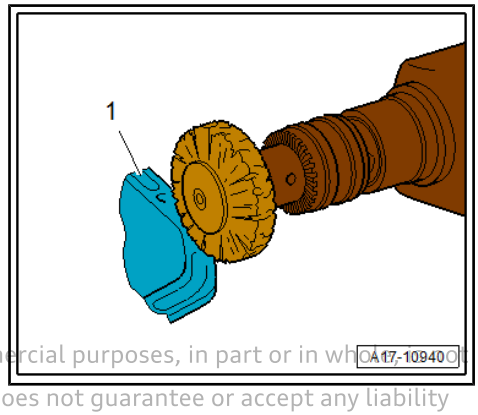
Risk of eye injury.

♦ *Put on safety goggles.*

– Remove sealant residue from sump -1- using rotating plastic brush or similar.

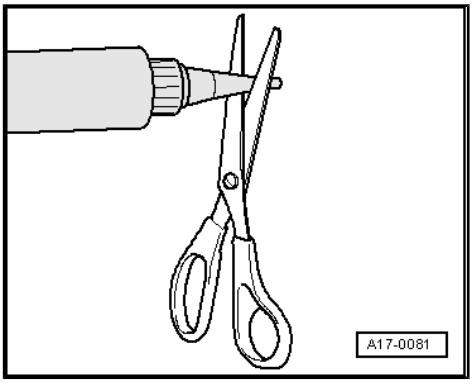
– Clean sealing surfaces using commercially available chemical sealant remover; they must be free of oil and grease.

• Note the use-by date of the sealant.



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

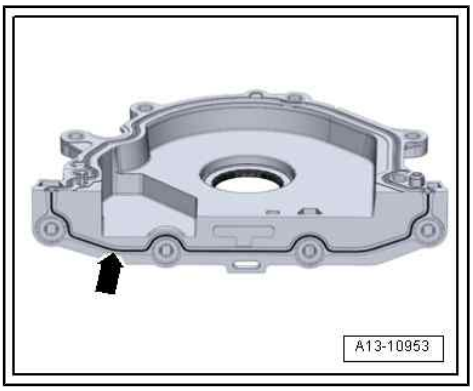


– Apply sealant bead -arrow- onto clean sealing surface of sealing flange as shown in illustration.

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

• The sealant bead must not be thicker than specified.

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



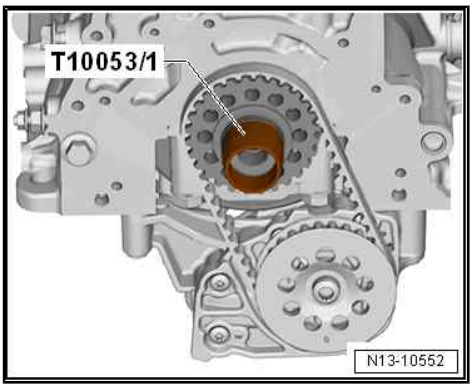
– Position assembly sleeve - T10053/1- on crankshaft journal.

– Slide sealing flange over assembly sleeve - T10053/1- .

• Dowel pins should then engage in bores on cylinder block.

– Detach assembly tool - T10053/1- .

– Tighten sealing flange bolts ⇒ page 38 .



Note

It is important to tighten the bolts in the correct sequence.

– Install sump
⇒ “1.3 Removing and installing sump”, page 142 .

– Install toothed belt (adjust valve timing) ⇒ page 86 .

Tightening torques

♦ ⇒ Fig. ““Sealing flange (pulley end) - tightening torque and sequence”“ , page 38

♦ Crankshaft sprocket ⇒ Item 1 (page 68)

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2 Cylinder block (gearbox end)

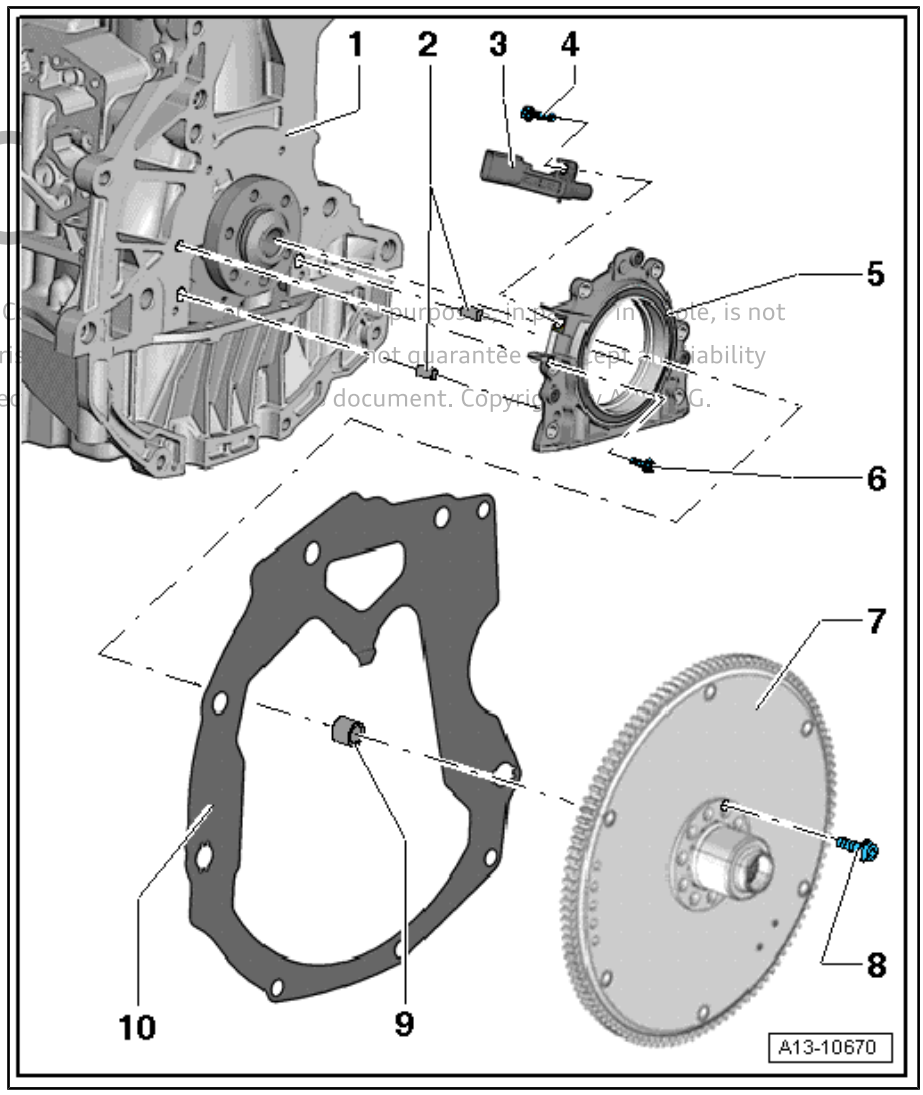
⇒ “2.1 Exploded view - cylinder block (gearbox end)”, page 46

⇒ “2.2 Removing and installing drive plate”, page 47

⇒ “2.3 Removing and installing sealing flange (gearbox end)”, page 48

⇒ “2.4 Renewing needle bearing in drive plate”, page 55

2.1 Exploded view - cylinder block (gearbox end)



1 - Cylinder block

2 - Dowel pins

3 - Engine speed sender - G28-

- Removing and installing ⇒ page 410

4 - Bolt

- Tightening torque ⇒ Item 7 (page 406)

5 - Sealing flange (gearbox end)

- With oil seal
- Renewing ⇒ page 48

6 - Bolt

- Tightening torque and sequence ⇒ page 47

7 - Drive plate

- Lock with counterhold tool - 3067- to slacken off bolts
- A needle bearing must be fitted in the drive plate on vehicles with manual gearbox; install needle bearing if not yet fitted ⇒ page 55
- There should be no needle bearing fitted in the drive plate on vehicles with multitronic/dual clutch gearbox; remove needle bearing if necessary ⇒ page 55
- Removing and installing ⇒ page 47

8 - Bolt

- Renew after removing
- 60 Nm +90°

9 - Needle bearing

- For vehicles with manual gearbox
- Removing and installing ⇒ page 55

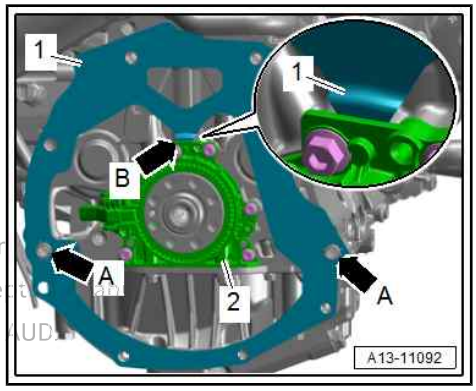
10 - Intermediate plate

- Do not damage or bend when assembling

❑ Installing ⇒ page 47

Installing intermediate plate

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

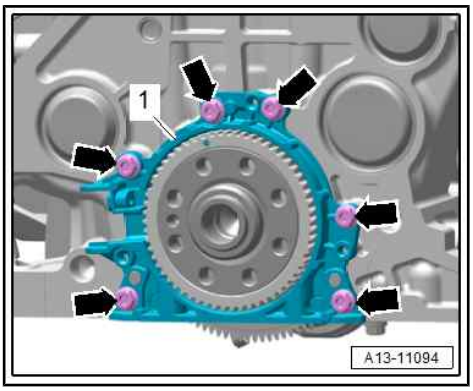


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Sealing flange (gearbox end) - tightening torque and sequence

– Tighten bolts in stages in the sequence shown:

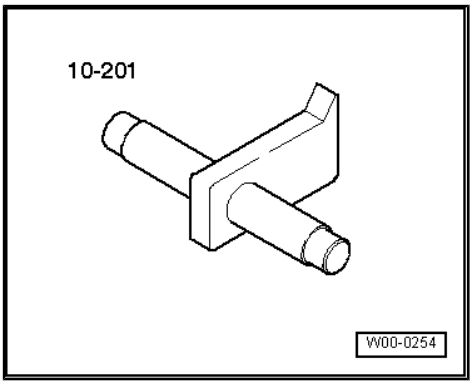
Stage	Bolts	Tightening torque
1.	-arrows-	Screw in by hand until contact is made
2.	-arrows-	Tighten in stages and in diagonal sequence; final torque 15 Nm



2.2 Removing and installing drive plate

Special tools and workshop equipment required

♦ Counterhold tool - 10 - 201-



Removing

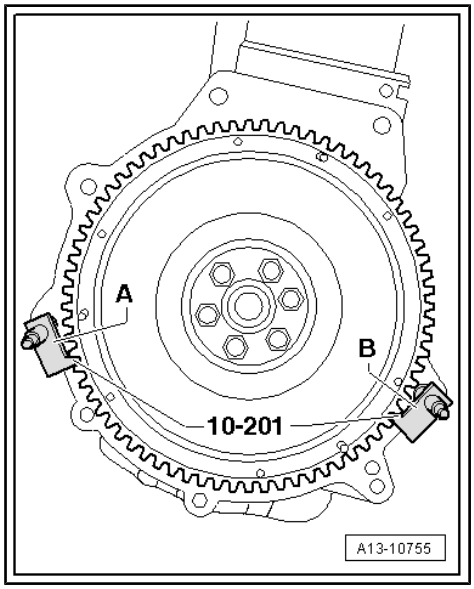
- Gearbox removed

– Insert counterhold tool - 10 - 201- in hole on cylinder block -item B-, slacken bolts for drive plate.

Caution

Take care not to damage outer surface of bearing flange on drive plate.

- ***Use a multi-point socket bit with a length of at least 40 mm to slacken and tighten the drive plate bolts.***



– Remove bolts and take off drive plate.

Installing

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

Note

- *Renew bolts tightened with specified tightening angle.*
- *On vehicles with manual gearbox, a needle bearing is fitted in the drive plate. Before installing, check that the needle bearing is fitted. Removing and installing needle bearing in drive plate (pressing in and out)* *⇒ page 55* *.*

– Pay attention to dowel pin when installing drive plate.

– Insert counterhold tool - 10 - 201- in hole on cylinder block -item A-, tighten bolts for drive plate.

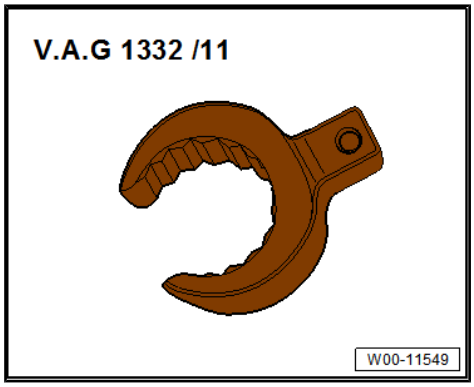
Tightening torques

- ⇒ “2.1 Exploded view - cylinder block (gearbox end)”, page 46

2.3 Removing and installing sealing flange (gearbox end)

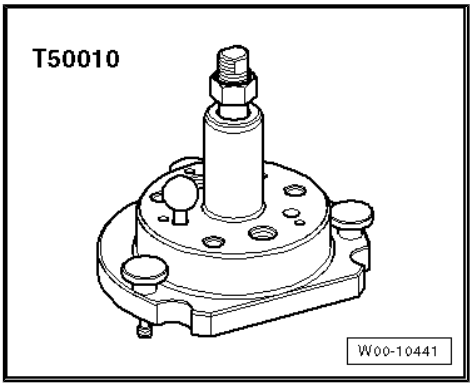
Special tools and workshop equipment required

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

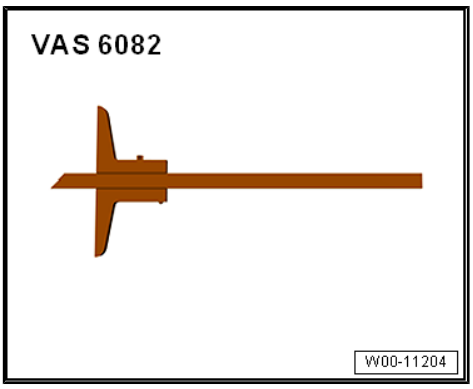


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♦ Assembly tool - T50010-



♦ Depth gauge - VAS 6082-



♦ Bolt, M6x35 (3x)

♦ Bolt, M7x35 (2x)

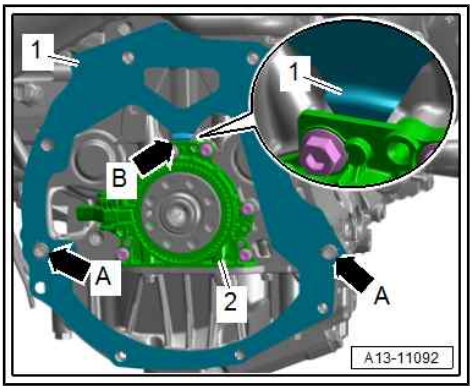
Pressing out sealing flange with sender wheel

• Gearbox removed

– Remove drive plate ⇒ page 47 .

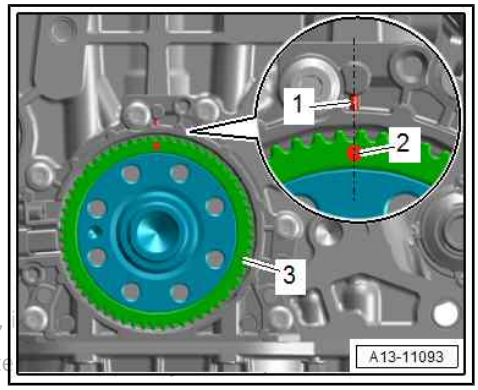
– Detach intermediate plate -1- from dowel sleeves -arrows A-.

– 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.

• The hole -2- in the sender wheel -3- must be aligned with the vertical rib -1- on the sealing flange.

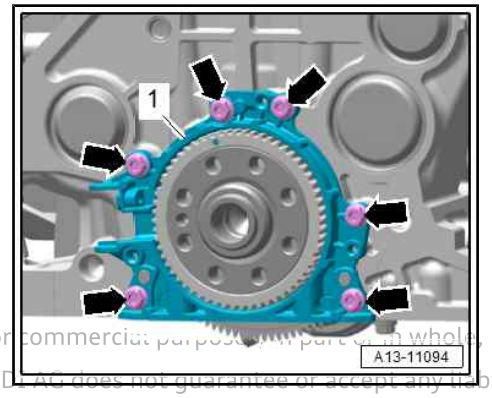


– Remove sump ⇒ page 142 .

– Remove engine speed sender - G28- ⇒ page 410 .

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



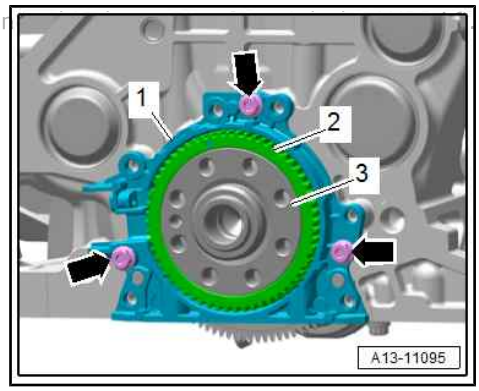
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Note

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.

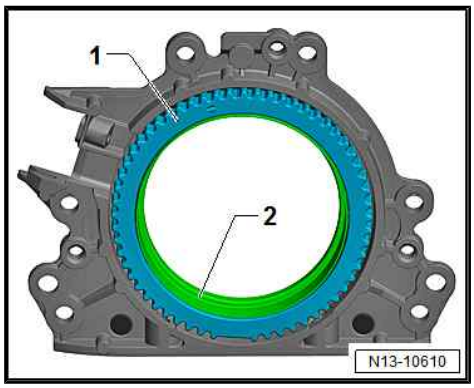
– Detach sealing flange together with sender wheel.



Pressing in sealing flange with sender wheel

Note

- *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 - T50010- .*
- *The sealing flange and oil seal are one unit and can only be replaced together with the sender wheel.*
- *The assembly tool - T50010- 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 - T50010- :

A - Tensioning flats

B - Nut

C - Guide pin

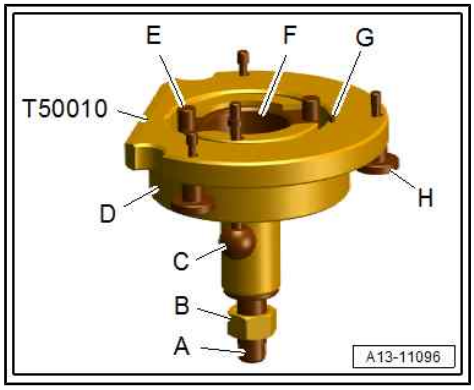
D - Assembly housing

E - Hexagon socket head bolts (2x)

F - Inner section

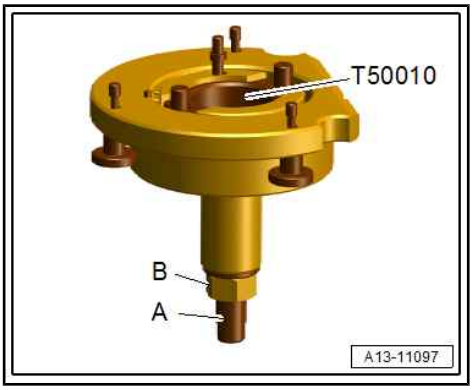
G - Locating pin

H - Knurled screw (3x)



Fitting sealing flange with sender wheel onto assembly tool - T50010- :

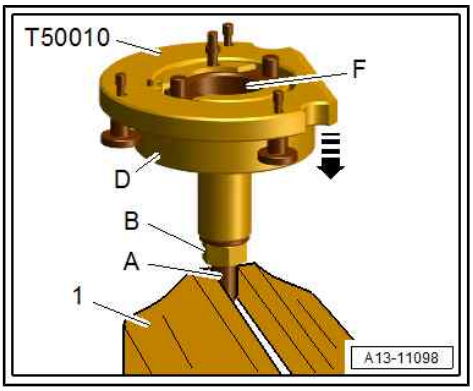
– Unscrew nut -B- until it is just in front of tightening flats -A- on threaded spindle.



– Clamp assembly tool - T50010- in a vice -1- on tightening flats -A- of threaded spindle.

– Press assembly housing -D- downwards -arrow- so that it rests on nut -B-.

• Inner part -F- of assembly device and assembly housing -D- must be level with each other.

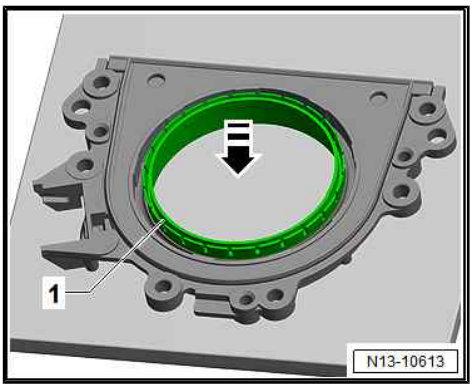


– Place sealing flange (with front side downwards) on a clean flat surface.

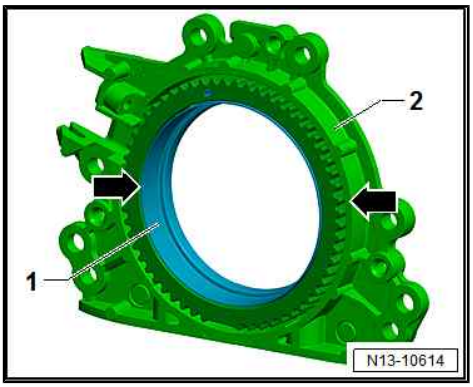
Note

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

– Press sealing lip support ring -1- downwards in direction of -arrow- until it touches flat surface.



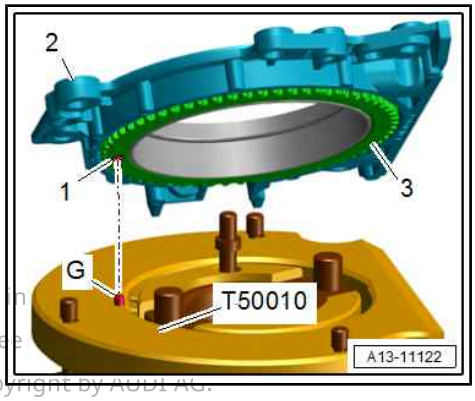
• Upper edge of sealing lip support ring -1- must be flush -arrows- with front edge of sealing flange -2-.



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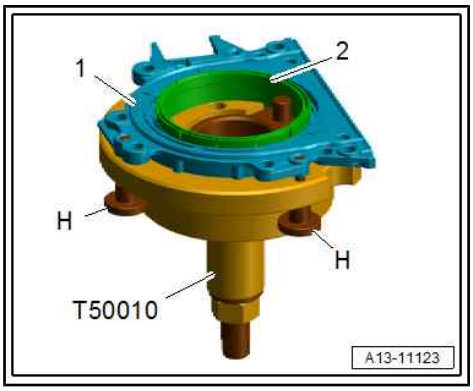
– Place front side of sealing flange -2- on assembly tool - T50010- so that locating pin -G- is seated in hole -1- in sender wheel -3-.

• Ensure that sealing flange lies flat on assembly tool.



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



Note

Only the two knurled screws shown in the illustration can be screwed on.

– When tightening, press sealing flange and sealing lip support ring -2- against surface of assembly tool - T50010- .

– 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 - T50010- with sealing flange -1- on crankshaft flange:

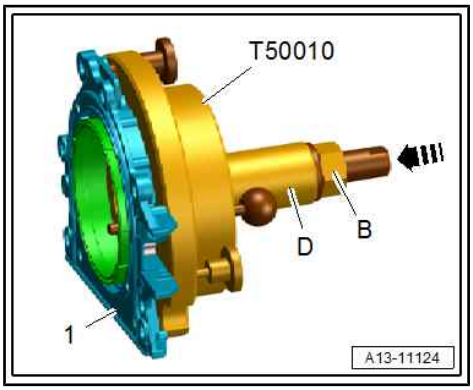
• Crankshaft flange must be free of oil and grease.

• Engine is at “TDC” position.

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

– Press threaded spindle of assembly tool - T50010- in direction of -arrow- until nut -B- makes contact with assembly housing -D-.

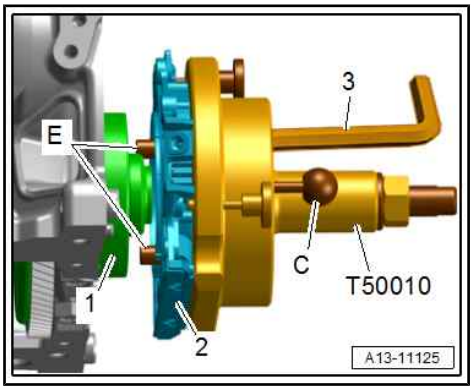
– Position flat edge of assembly housing towards sealing surface for sump on cylinder block.



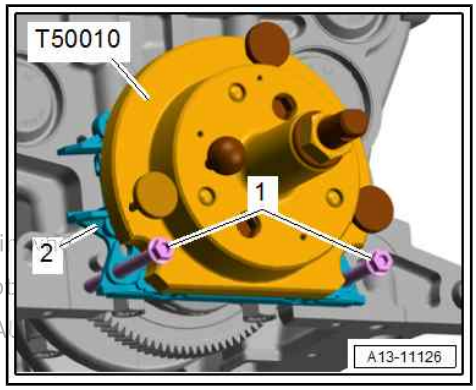
– Secure assembly tool - T50010- with sealing flange -2- to crankshaft flange -1-.

– To do so, screw hexagon socket head bolts -E- approx. 5 turns into crankshaft flange with hexagon key -3-.

– Insert guide pin -C- into crankshaft flange.



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



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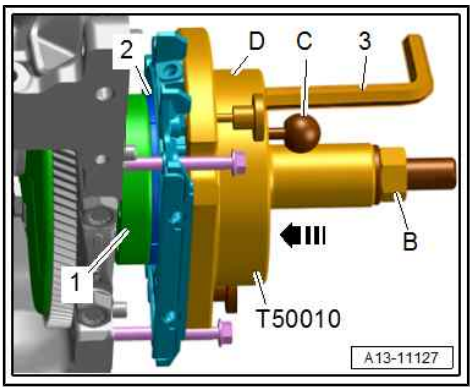
Securing assembly tool - T50010- on crankshaft flange:

– Press assembly housing -D- by hand in direction of -arrow- until sealing lip support ring -2- makes contact with crankshaft flange -1-.

– Check that guide pin -C- is fitted correctly in hole in crankshaft. This ensures that sender wheel reaches its final installation position.

– Use hexagon key -3- to tighten the two hexagon socket head bolts on assembly tool - T50010- hand-tight.

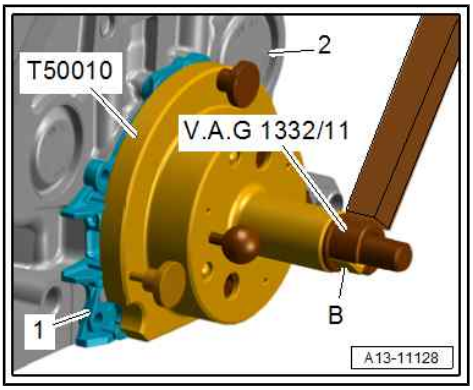
– Screw nut -B- onto threaded spindle by hand until it touches assembly housing -D-.



Pressing sender wheel onto crankshaft flange with assembly tool - T50010- :

– Tighten nut -B- on assembly tool - T50010- to 35 Nm.

• There must be a small gap between cylinder block -2- and sealing flange -1- after nut has been tightened to 35 Nm.



Checking installation position of sender wheel on crankshaft:

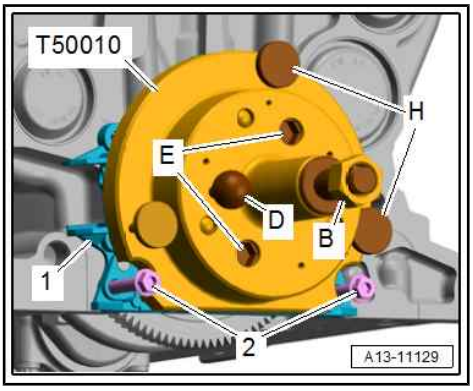
– Screw nut -B- to end of threaded spindle.

– Remove both bolts -2- from cylinder block.

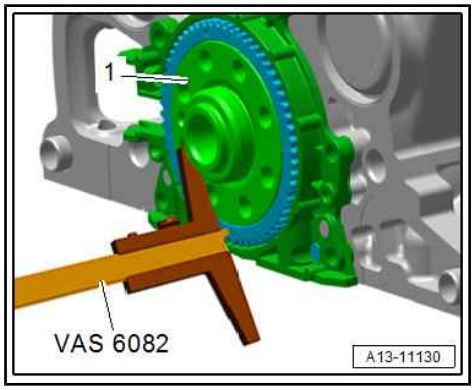
– Unscrew knurled screws -H- from sealing flange -1-.

– Unbolt assembly tool - T50010- from crankshaft flange (remove hexagon socket head bolts -E- from crankshaft flange).

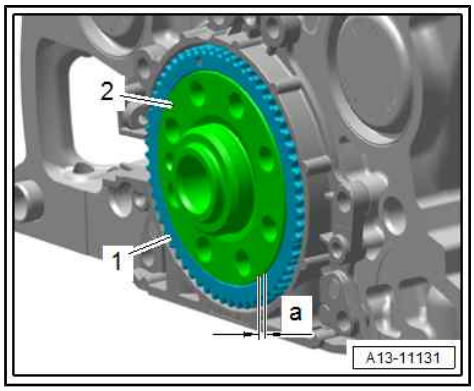
– Detach sealing lip support ring.



– Apply depth gauge - VAS 6082- to crankshaft flange -1-.

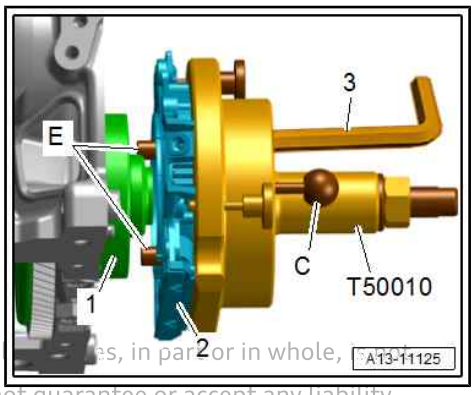


– Measure distance -a- between crankshaft flange -2- and sender wheel -1-.
• Specification: Distance -a- = 0.5 mm.
– Press sender wheel in further if measurement is too small ⇒ page 54 .
– If reading matches specification, continue with assembly ⇒ page 55 .



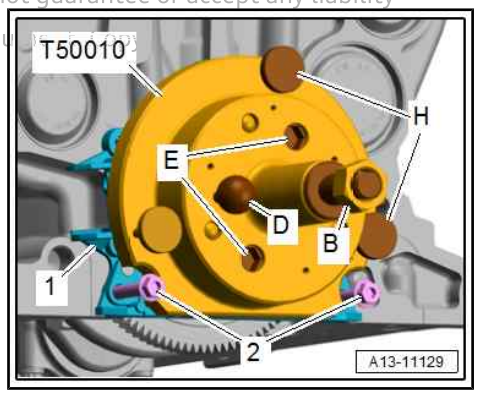
Pressing sender wheel in further:

– Secure assembly tool - T50010- to crankshaft flange.
– Ensure that locating pin of assembly tool - T50010- is fitted in hole in sender wheel.
– Use hexagon key -3- to tighten the two hexagon socket head bolts -E- hand-tight.

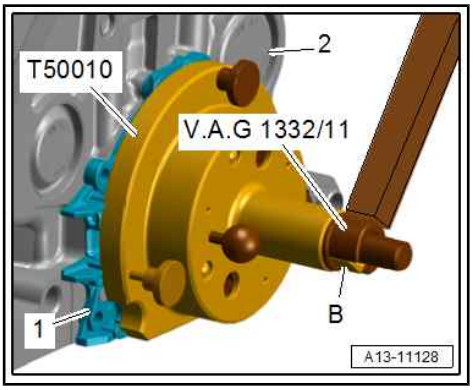


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– Slide assembly tool - T50010- onto sealing flange -1- by hand.
– Screw nut -B- onto threaded spindle by hand until it touches assembly tool - T50010- .
– Insert guide pin -D- into crankshaft flange.
– Screw 2 bolts M6x35 -item 2- into cylinder block to guide sealing flange -1-.



– Tighten nut -B- on assembly tool - T50010- to 40 Nm.
– Check installation position of sender wheel on crankshaft again ⇒ page 53 .
– Tighten nut on assembly tool - T50010- to 45 Nm if measurement is too small.
– Check installation position of sender wheel on crankshaft again ⇒ page 53 .



Assembling:

Assembly is performed in reverse sequence; note the following:

– Install engine speed sender - G28- ⇒ “1.1 Exploded view - glow plug system”, page 406 .
– Install sump ⇒ page 142 .
– Install intermediate plate ⇒ page 47 .
– Install drive plate ⇒ page 47 .

Tightening torques

♦ ⇒ Fig. ““Sealing flange (gearbox end) - tightening torque and sequence”“ , page 47

2.4 Renewing needle bearing in drive plate

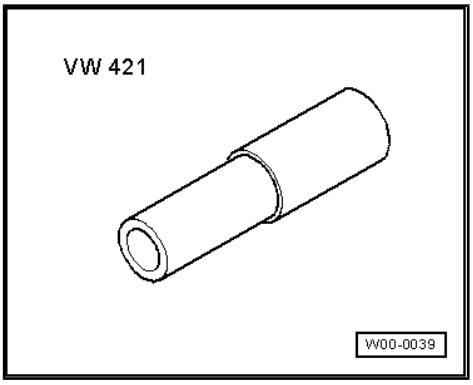
Special tools and workshop equipment required

♦ Tube - VW 418 A-

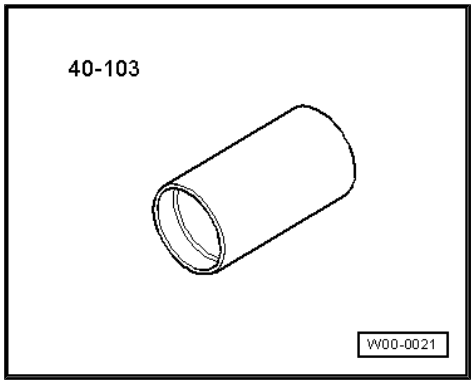


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♦ Tube - VW 421-



♦ Support - 40 - 103-



Procedure

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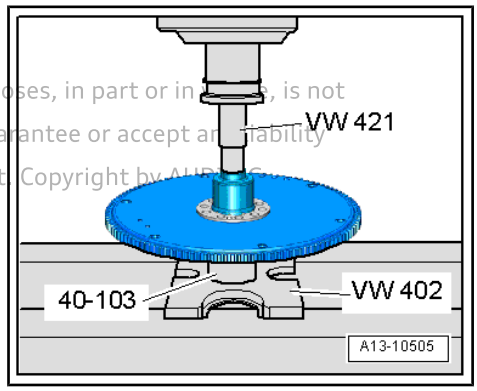
- Gearbox removed

– Remove drive plate ⇒ page 47 .

– Place support - 40 - 103- under drive plate when pressing needle bearing out/in.

– Use tube - VW 421- and workshop press and press out needle bearing.

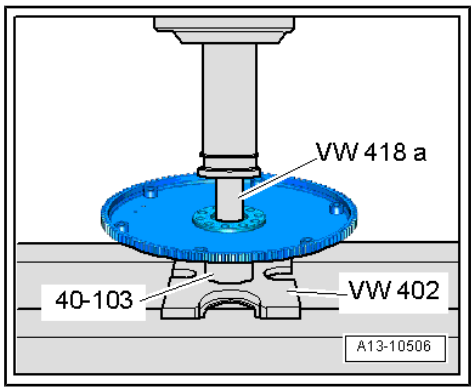
- Smaller diameter of tube -VW 421- faces drive plate.



– Carefully press in needle bearing as far as stop, using tube - VW 418 A- and workshop press.

- Installation position: closed side of needle bearing faces engine.

– Install drive plate ⇒ page 47 .



3 Crankshaft

There is currently no provision for removing and installing the crankshaft.

⇒ “3.1 Crankshaft dimensions”, page 57

⇒ “3.2 Measuring axial clearance of crankshaft”, page 57

3.1 Crankshaft dimensions

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

3.2 Measuring axial clearance of crankshaft

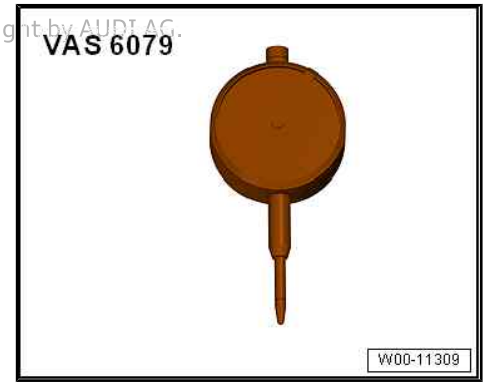
Special tools and workshop equipment required

- Universal dial gauge bracket - VW 387-



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- Dial gauge - VAS 6079-



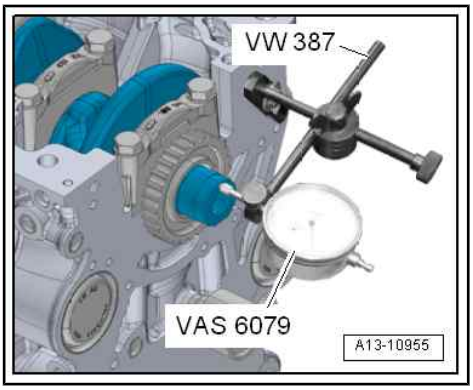
Procedure

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

– 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

4 Pistons and conrods

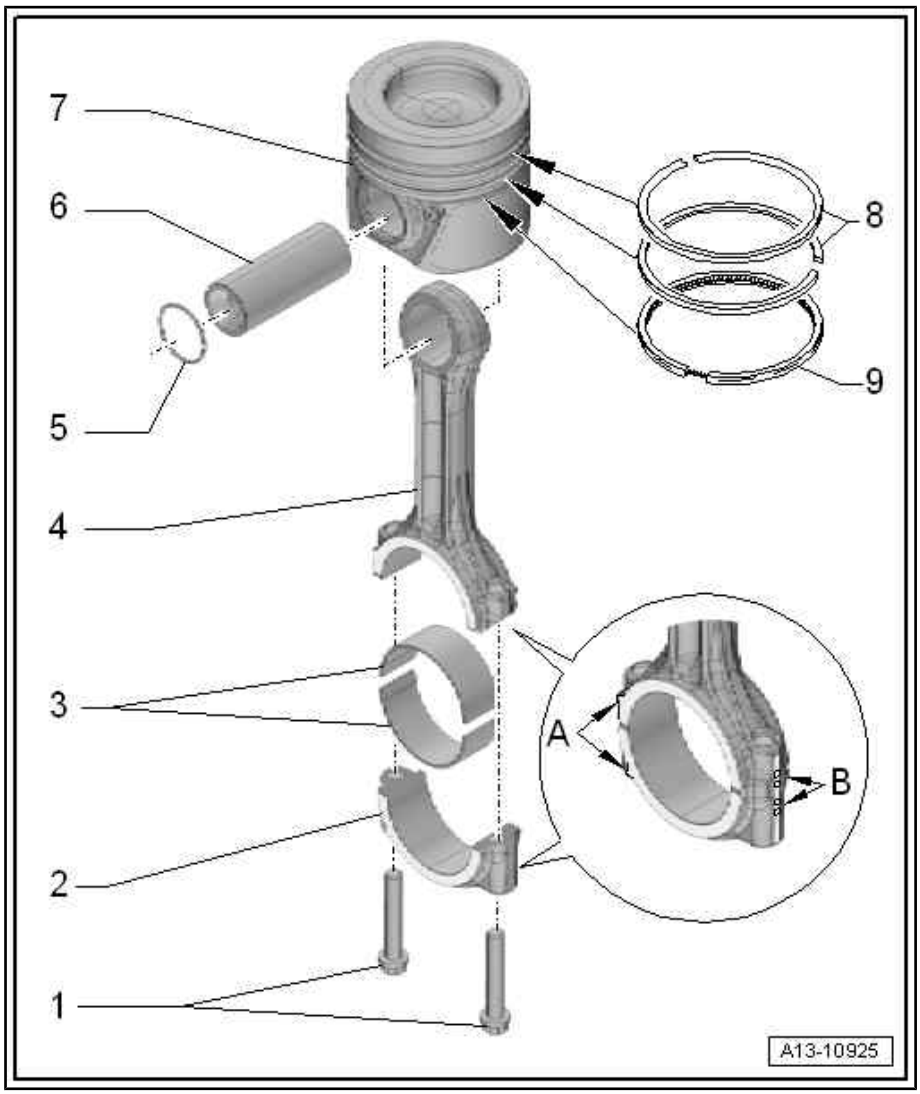
⇒ “4.1 Exploded view - pistons and conrods”, page 58
⇒ “4.2 Removing and installing pistons”, page 61
⇒ “4.3 Measuring piston projection at TDC”, page 62
⇒ “4.4 Checking pistons and cylinder bores”, page 64
⇒ “4.5 Separating parts of new conrod”, page 65
⇒ “4.6 Checking radial clearance of conrod bearings”, page 65

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4.1 Exploded view - pistons and conrods

Note

Oil spray jet and pressure relief valve ⇒ page 61



1 - Bolts

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

2 - Conrod bearing cap

- ❑ Note installation position
- ❑ 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 conrod and cylinder allocation with paint -B-
- ❑ Installation position: Markings -A- face towards pulley end

3 - Bearing shells

- ❑ Installation position ⇒ page 60
- ❑ 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

- ❑ With industrially cracked conrod bearing cap
- ❑ Only renew as a complete set
- ❑ Mark conrod bearing cap and cylinder allocation with paint -B-
- ❑ Axial clearance: wear limit: 0.37 mm
- ❑ Measuring radial clearance ⇒ page 65
- ❑ Separating parts of new conrod ⇒ page 65
- ❑ Installation position: Markings -A- face towards pulley end

5 - Circlip

- ❑ 2x
- ❑ Renew after removing

6 - Piston pin

- ❑ Removing and installing ⇒ page 61

7 - Piston

- ❑ With combustion chamber
- ❑ Renew piston if cracking is visible on piston crown or piston skirt
- ❑ Mark installation position and cylinder number ⇒ page 60
- ❑ Removing and installing ⇒ page 61
- ❑ Checking pistons and cylinder bores ⇒ page 64
- ❑ Measuring piston projection at “TDC” ⇒ page 62

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8 - Compression rings

- ❑ Measuring ring gap ⇒ page 64
- ❑ Measuring ring-to-groove clearance ⇒ page 65
- ❑ Use piston ring pliers (commercially available) to remove and install
- ❑ Installation position: marking “TOP” or side with lettering faces towards piston crown
- ❑ Offset gaps by 120°

9 - Oil scraper ring

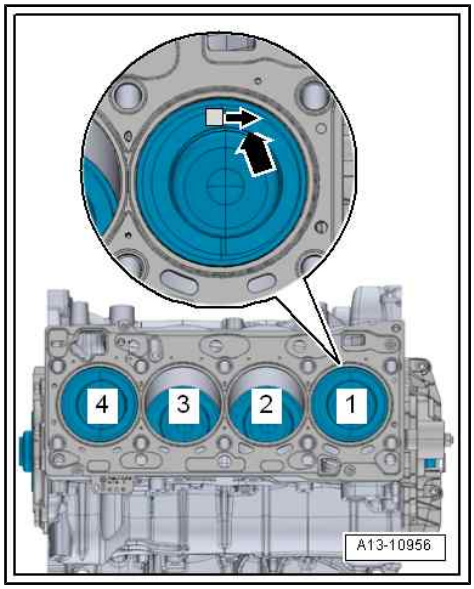
- ❑ Measuring ring gap ⇒ page 64
- ❑ Measuring ring-to-groove clearance ⇒ page 65
- ❑ Use piston ring pliers to remove and install
- ❑ Installation position: marking “TOP” or side with lettering faces towards piston crown
- ❑ Offset gap by 120° to bottom compression ring

Installation position of pistons and allocation of piston/cylinder

Caution

Risk of damage to piston crown.

- *If you intend to re-install used pistons, mark the cylinder number on the piston crown using paint. Do not attempt to mark the piston crown with a centre punch or by making a scratch, notch or similar.*

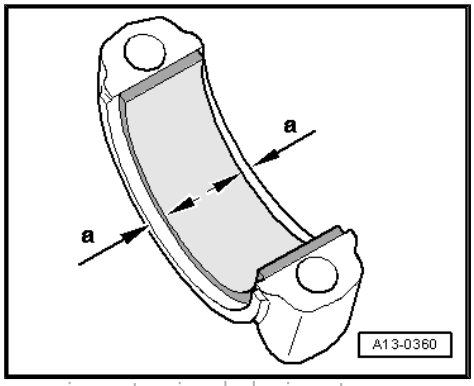


- Arrow on piston crown points to pulley end -arrow-.

Installation position of bearing shells in conrods

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

- Dimension -a- = 2.5 mm



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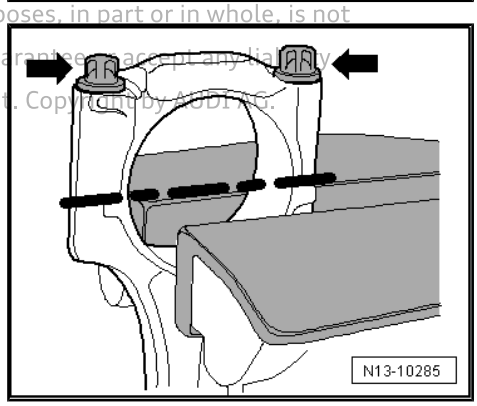
Separating parts of new conrod

On new conrods, the rod and the bearing cap may be very firmly attached to one another. If it is not possible to take off the conrod bearing cap by hand, proceed as follows:

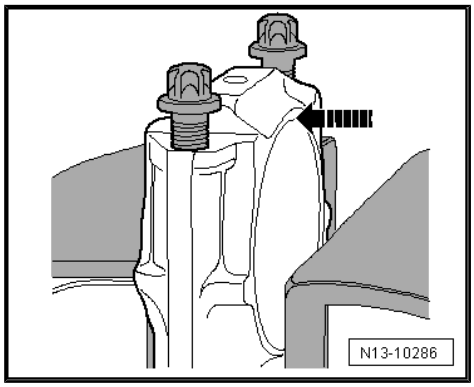
– To avoid any risk of damage, the conrod should only be clamped lightly in a vice using jaw covers as shown in illustration.

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

– Unscrew bolts -arrows- approx. 5 turns.



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

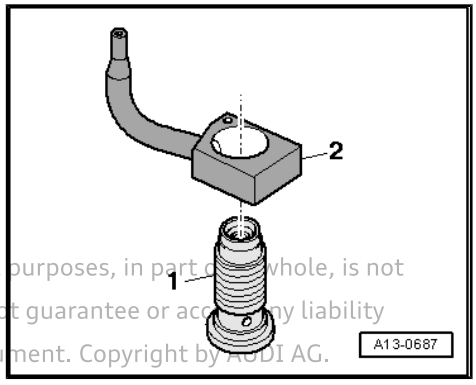


Oil spray jet and pressure relief valve

1 - Bolt with pressure relief valve, 24 Nm

2 - Oil spray jet (for cooling of pistons)

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



Caution

Risk of damage to oil spray jets.

- ***Do not bend oil spray jets.***
- ***Check that oil spray jets have adequate clearance after re-installing pistons.***
- ***Always renew bent oil spray jets.***

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4.2 Removing and installing pistons

Special tools and workshop equipment required

- Pin - VW 222 A-



- Piston ring clamp, commercially available

Removing

- Engine secured to engine and gearbox support ⇒ page 22 .
- – Remove cylinder head ⇒ page 97 .
- – Remove oil pump ⇒ page 147 .
- – Mark installation position and matching of conrod bearing caps to cylinder and to conrods for re-installation ⇒ Item 2 (page 58) .
- – Unbolt conrod bearing caps.
- – Pull out pistons upwards with conrods.

Note

If piston pin is difficult to remove, heat piston to approx. 60 °C.

- – Take circlip out of piston pin boss.
- – Use drift - VW 222 A- to drive out piston pin.

Installing

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

Note

After removing, renew bolts tightened with specified tightening angle.

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– Oil running surfaces of bearing shells.
– Install pistons using piston ring clamp.

Installation position:

- Pistons ⇒ page 60
- Bearing shells in conrods ⇒ page 60

– Install conrod bearing caps according to markings.
– Install oil pump ⇒ page 147 .
– Install cylinder head ⇒ page 97 .

Tightening torques

♦ ⇒ “4.1 Exploded view - pistons and conrods”, page 58

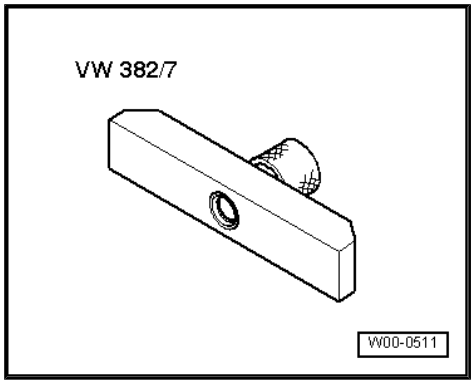
4.3 Measuring piston projection at TDC

Note

Measure piston projection at “TDC” when installing new pistons or a short engine.

Special tools and workshop equipment required

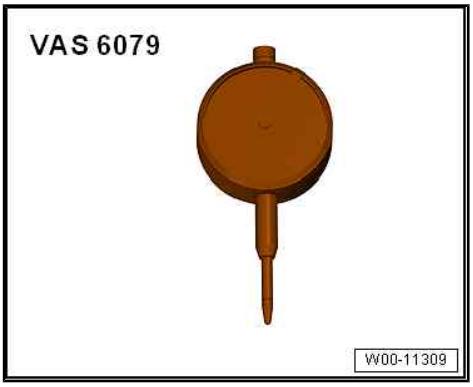
♦ Measuring bridge -VW 382/7- from measuring tool - VW 382-



♦ Measuring plate -VW 385/17- from universal measuring tool - VW 385-



♦ Dial gauge - VAS 6079-

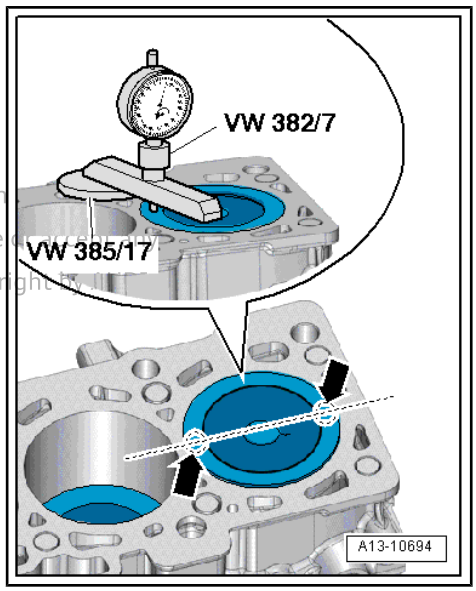


Procedure

– 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:



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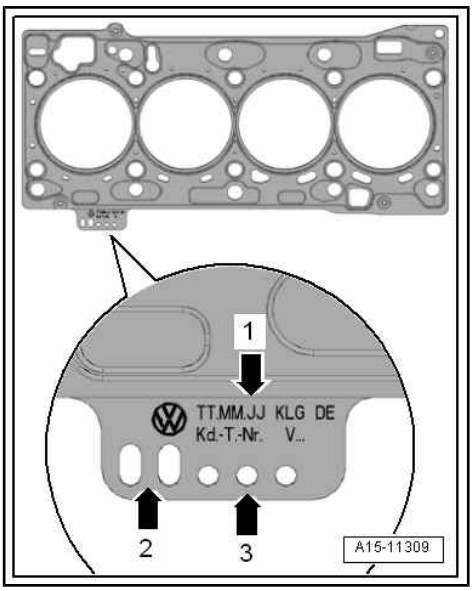
Piston projection above top surface of cylinder block mm	Identification (no. of holes)
0.91 … 1.00	1
1.01 … 1.10	2
1.11 … 1.20	3

Identification of cylinder head gasket

1 - Part number

2 - Ignore

3 - Holes

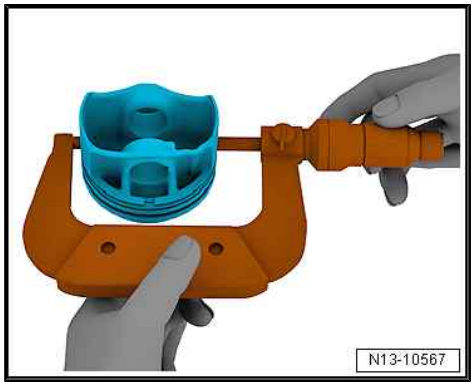


Note

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

4.4 Checking pistons and cylinder bores

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.

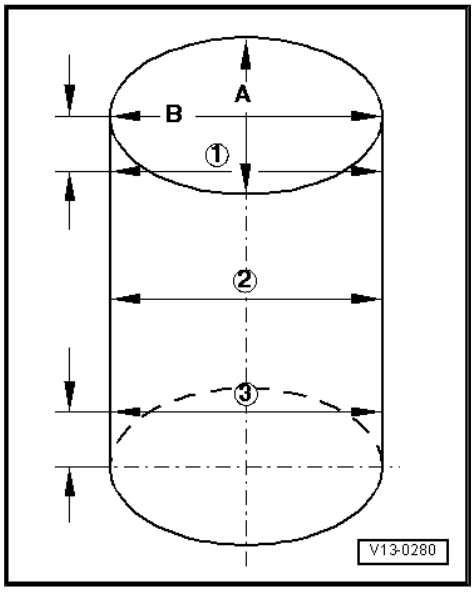
Note

♦ *Check for wear on piston skirt coating and for any carbon deposits.*

♦ *Renew piston if cracking is visible on piston skirt.*

Piston Ø mm	
Nominal dimension	80.92 [1]
• [1] Dimensions including coating (thickness 0.02 mm). The coating will wear down in service.	

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.

Checking cylinder bore

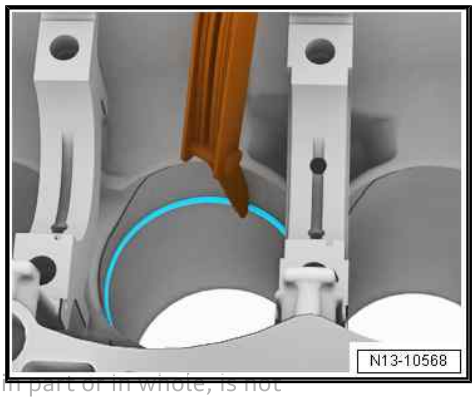
– Check cylinder bore for wear, scoring and other abnormalities.

Cylinder bore Ø mm	
Nominal dimension	81.0

Note

Measuring the cylinder bores must not be done when the cylinder block is mounted to the engine and gearbox support - VAS 6095- , as incorrect measurements may result.

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.

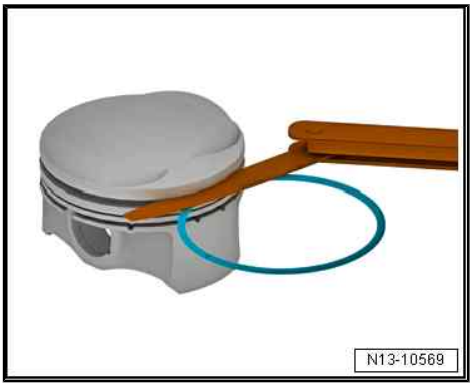
Piston ring	new mm	Wear limit mm
1st compression ring	0.3 … 0.40	0.55
2nd compression ring	0.20 … 0.45	0.95
Oil scraper ring	0.25 … 0.50	0.75

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Measuring ring-to-groove clearance

– Clean groove in piston before checking clearance.

Piston ring	Wear limit mm
1st compression ring	0.08
2. Compression ring	0.08
Oil scraper ring	0.08



4.5 Separating parts of new conrod

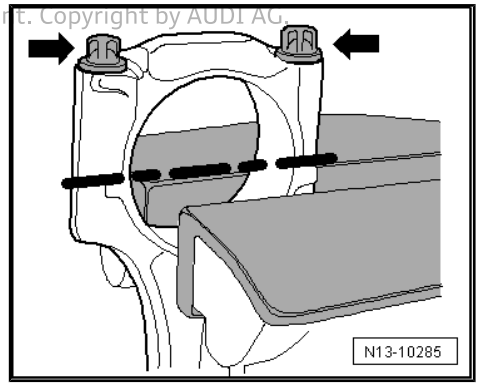
On new conrods, the rod and the bearing cap may be very firmly attached to one another. If it is not possible to take off the conrod bearing cap by hand, proceed as follows:

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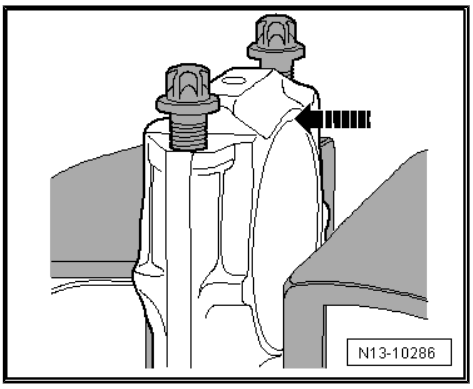
– To avoid any risk of damage, the conrod should only be clamped lightly in a vice using jaw covers as shown in illustration.

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

– Unscrew bolts -arrows- approx. 5 turns.



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



4.6 Checking radial clearance of conrod bearings

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 58) 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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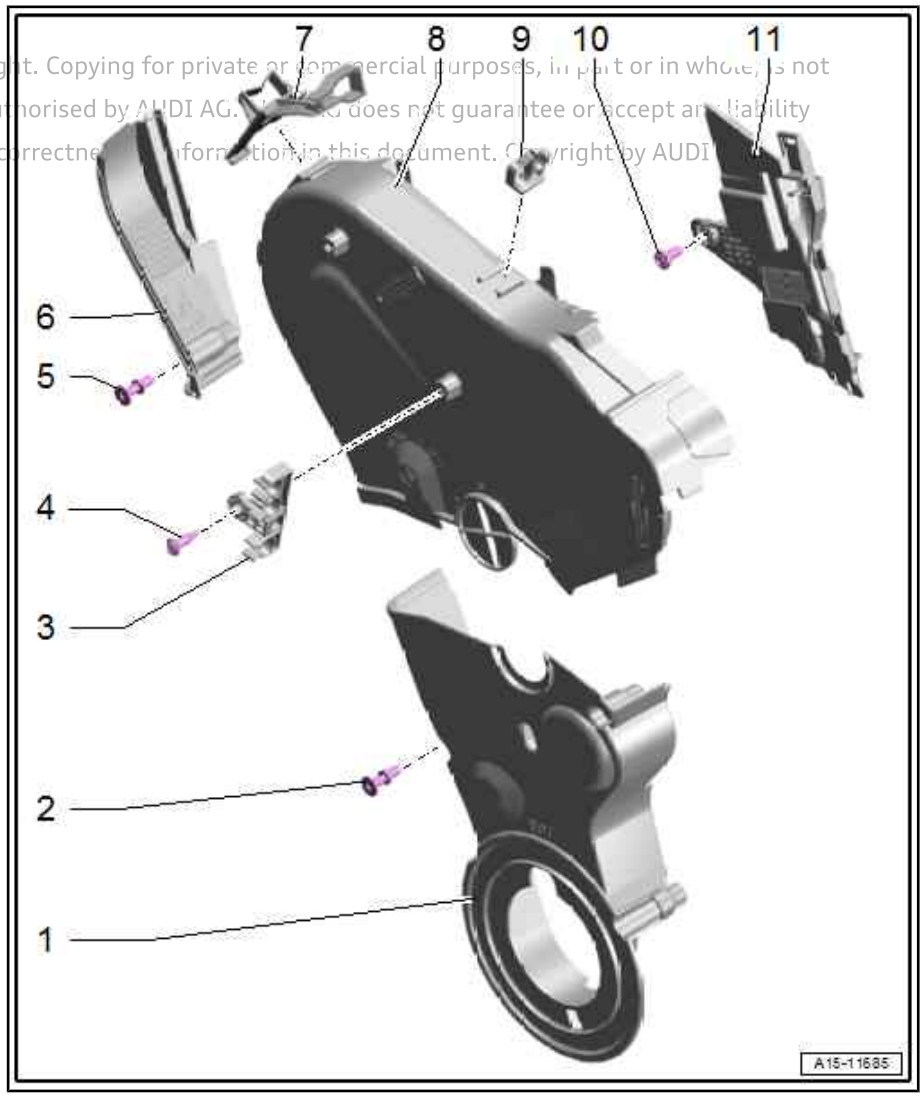
15 – Cylinder head, valve gear

1 Toothed belt drive

⇒ "1.1 Exploded view - toothed belt cover", page 67
⇒ "1.2 Exploded view - toothed belt", page 68
⇒ "1.3 Removing and installing toothed belt cover", page 69
⇒ "1.4 Detaching toothed belt from camshaft", page 71
⇒ "1.5 Removing and installing toothed belt", page 82

1.1 Exploded view - toothed belt cover

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1 - Toothed belt cover (bottom)
- ❑ Removing and installing ⇒ page 70

2 - Bolt
- ❑ With collar
- ❑ Captive in toothed belt cover (bottom)
- ❑ 12 Nm

3 - Bracket

4 - Bolt
- ❑ 5 Nm

5 - Bolt
- ❑ With collar
- ❑ Captive in toothed belt cover (bottom)
- ❑ 12 Nm

6 - Toothed belt cover (side)

7 - Bracket

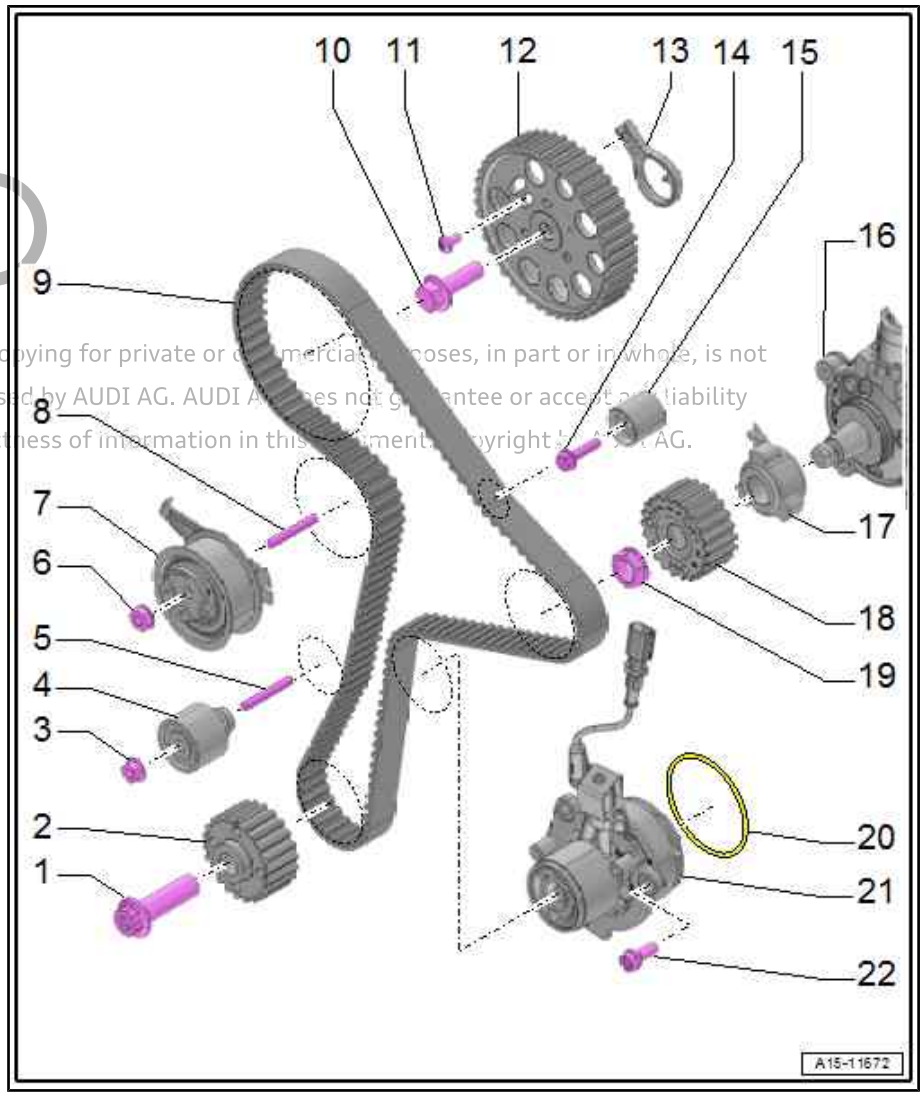
8 - Toothed belt cover (top)
- ❑ Removing and installing ⇒ page 69

9 - Bracket

10 - Bolt
- ❑ Clean threaded hole for bolt using a thread tap or similar
- ❑ Apply locking fluid when installing; refer to ⇒ Electronic parts catalogue
- ❑ 12 Nm

11 - Toothed belt cover (rear)
- ❑ To remove, take out coolant pump ⇒ page 183

1.2 Exploded view - toothed belt



1 - Bolt

- ❑ Renew after removing
- ❑ 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

2 - Crankshaft sprocket

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

3 - Nut

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

4 - Damper wheel

5 - Stud

- ❑ 15 Nm

6 - Nut

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

7 - Tensioning roller

8 - Stud

- ❑ 15 Nm

9 - Toothed belt

- ❑ Before removing, mark direction of rotation with chalk or felt-tip pen
- ❑ Check for wear
- ❑ Removing ⇒ page 82
- ❑ Installing (adjusting valve timing) ⇒ page 86

10 - Bolt

- ❑ Use counterhold tool - T10172- with adapters -T10172/11- to loosen and tighten
- ❑ Do not additionally oil threads and shoulder
- ❑ 100 Nm
- ❑ The following tool can be used if access is difficult:

• Insert tool, 18 mm - T40036- and torque wrench - V.A.G 1332- (tighten to 85 Nm in this case)

11 - Locking pin

- ❑ 9 Nm

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12 - Camshaft sprocket

- ❑ Contact surface between sprocket and camshaft must be free of oil

13 - Locating arm for camshaft

- ❑ Removing and installing ⇒ page 105

14 - Bolt

- ❑ 20 Nm

15 - Damper wheel

16 - High-pressure pump

- ❑ Exploded view ⇒ page 286

17 - High-pressure pump hub

- ❑ Exploded view ⇒ page 286
- ❑ Contact surface between hub and toothed belt sprocket must be free of oil

18 - High-pressure pump sprocket

- ❑ Exploded view ⇒ page 286
- ❑ Contact surface between hub and toothed belt sprocket must be free of oil

19 - Nut

- ❑ Do not additionally oil threads and shoulder
- ❑ Use counterhold tool - T10051- when loosening and tightening
- ❑ 95 Nm

20 - O-ring

- ❑ Renew after removing
- ❑ Lubricate with coolant

21 - Coolant pump

- ❑ Removing and installing ⇒ page 183

22 - Bolt

- ❑ Tightening torque ⇒ Item 1 (page 176)

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1.3 Removing and installing toothed belt cover

⇒ "1.3.1 Removing and installing toothed belt cover (top)", page 69

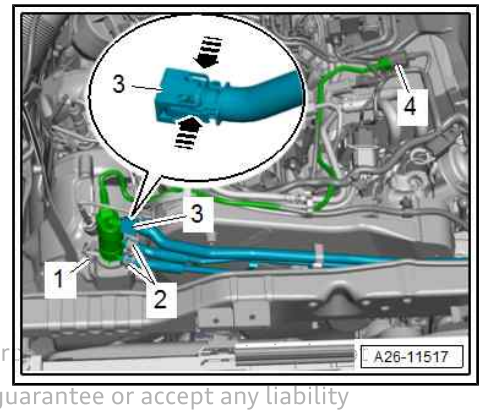
⇒ "1.3.2 Removing and installing toothed belt cover (bottom)", page 70

1.3.1 Removing and installing toothed belt cover (top)

Removing

– Remove engine cover panel ⇒ page 34 .

– Take electrical connector -4- out of bracket, unplug it and move electrical wiring clear.
– Loosen clamp -1-.
– Move coolant hoses -2- and SCR line -3- clear.
– Detach injector for reducing agent - N474- and place to left side.

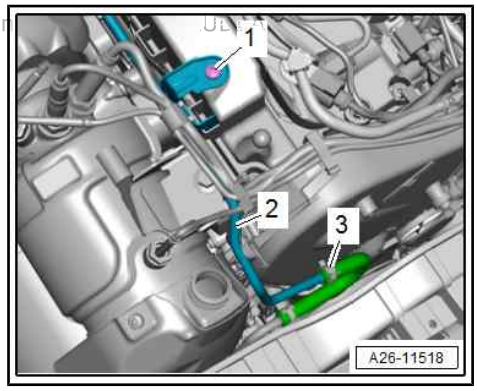


Note

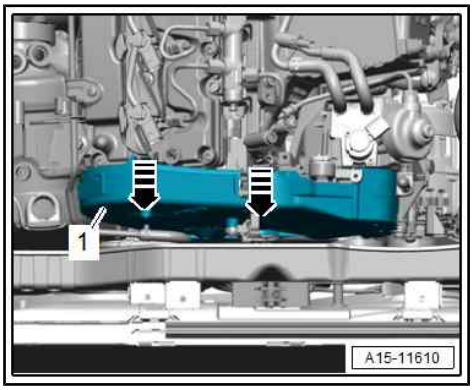
Disregard -arrows-.

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– Remove bolt -1- and push measuring tube -2- to right side.



– Move electrical wiring and fuel hose clear.
– Release catches -arrows-, disengage toothed belt cover (top) -1- and detach.



Installing

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

– Install injector for reducing agent - N474- ⇒ page 375 .
– Install engine cover panel ⇒ page 34 .

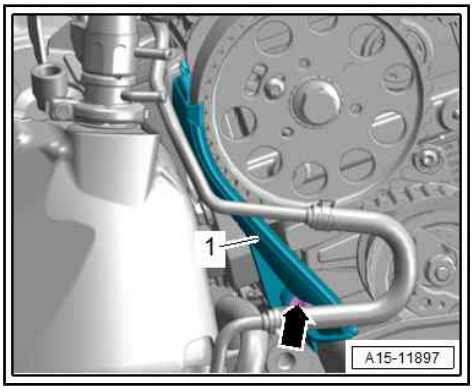
Tightening torques

♦ Measuring tube ⇒ Item 7 (page 94)

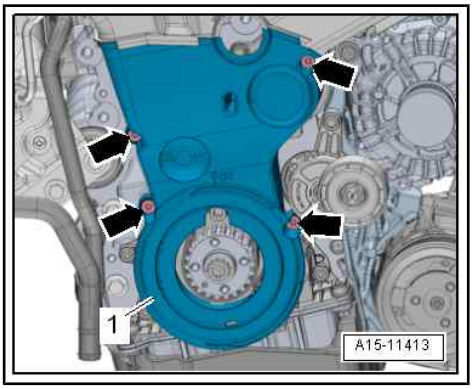
1.3.2 Removing and installing toothed belt cover (bottom)

Removing

– Remove vibration damper ⇒ page 40 .
– Remove toothed belt cover (top) ⇒ page 69 .
– Remove bolt -arrow- and detach toothed belt cover (side) -1-.



– Remove bolts -arrows-.
– Disengage toothed belt cover (bottom) -1- and detach.

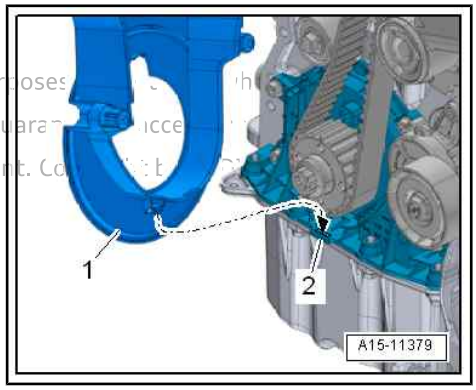


Installing

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

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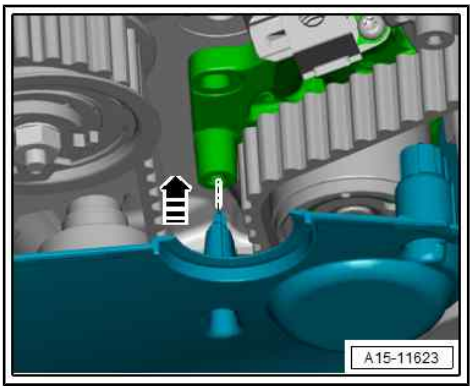
– Insert toothed belt cover (bottom) -1- into sealing flange (front) -2- -arrow-.



– Fit toothed belt cover (note position of dowel pin -arrow-).
– Install toothed belt cover (top) ⇒ page 69 .
– Install vibration damper ⇒ page 40 .

Tightening torques

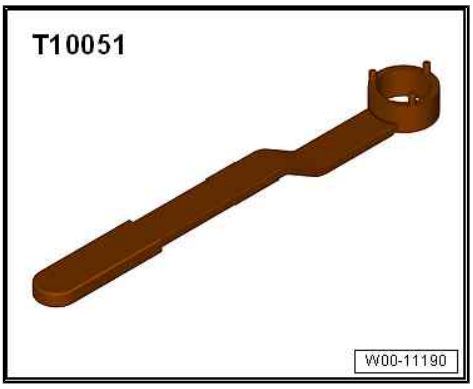
♦ ⇒ “1.1 Exploded view - toothed belt cover”, page 67



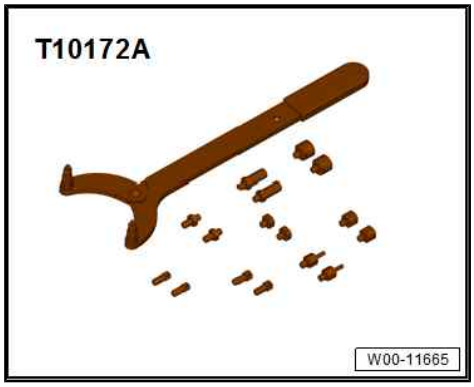
1.4 Detaching toothed belt from camshaft

Special tools and workshop equipment required

♦ Counterhold tool - T10051-



- Counterhold tool - T10172A- with adapters -T10172/11-

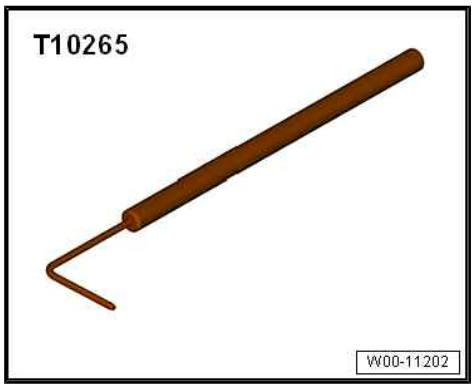


- Offset screwdriver - T10264-

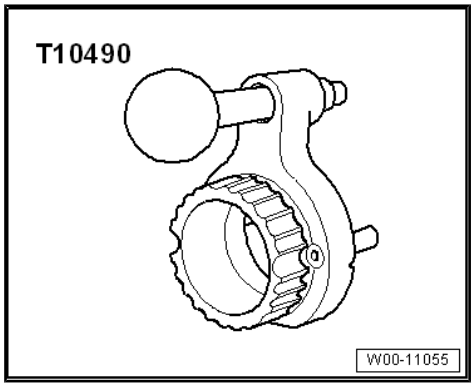


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- Locking tool - T10265-



- Crankshaft stop - T10490-



- Locking pin - T10492-



- Diesel injection pump locking pin - 3359-
- Locking pin - T10492-



- Locking pin - T10492-



Note

Diesel injection pump locking pin - 3359- or locking pin - T10492- can be used to lock camshaft sprocket and high-pressure pump sprocket.

Removing

– Remove toothed belt cover (top) ⇒ page 69 .
– Remove vibration damper ⇒ page 40 .

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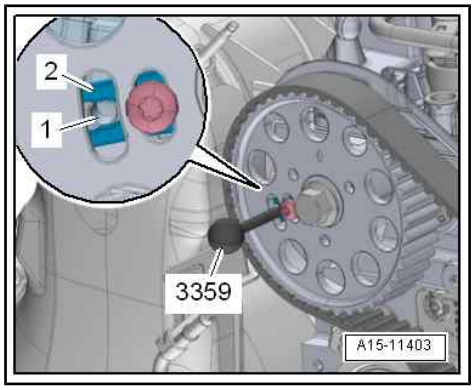
Caution

Irreparable damage can be caused if the toothed belt slips.

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

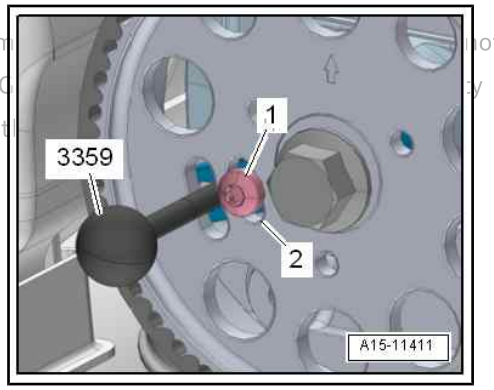
– Rotate crankshaft by turning bolt on crankshaft sprocket until camshaft sprocket is positioned at “TDC”.

– Lock camshaft hub with diesel injection pump locking pin -3359- ; to do so, insert locking pin into fork on locating arm -2- and into hole -1- behind it in cylinder head.



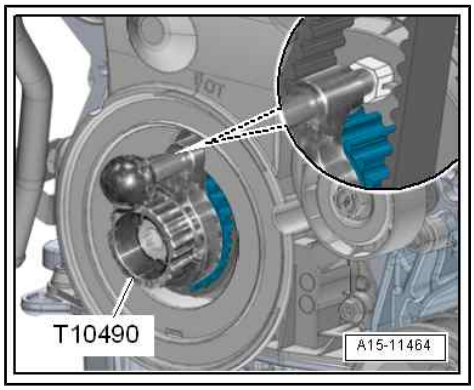
– Loosen locking bolt -1- in camshaft sprocket one half turn, but do not remove.

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– Lock crankshaft sprocket in position with crankshaft stop -T10490- .

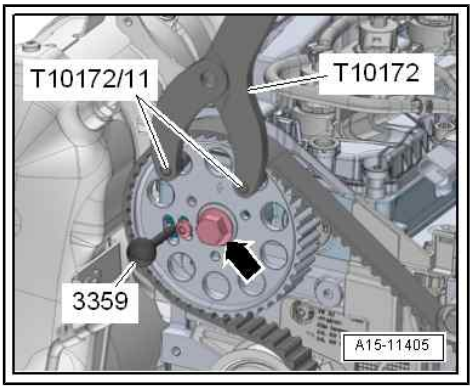
- Pins of crankshaft stop - T10490- must engage in threaded holes of sprocket.
- Locking pin of crankshaft stop - T10490- must engage in hole on sealing flange.



Caution

Risk of damage to engine.

- *The torque applied to loosen or tighten the central bolts on the camshaft and high-pressure pump MUST NOT be transferred to the respective locking pin. This can cause damage to the locating arms, even if counterhold tools are used. This damage may not be visible in some cases, but can cause damage to the engine. When loosening or tightening the central bolt, pull out the locking pin and re-insert it later if necessary.*

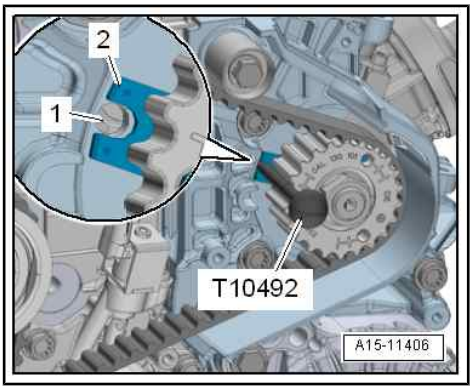


– Pull out locking pin and slacken bolt for camshaft slightly, but insert pin again before fully slackening bolt.

– Slacken bolt -arrow- for camshaft sprocket using counterhold tool - T10172- with adapters -T10172/11- .

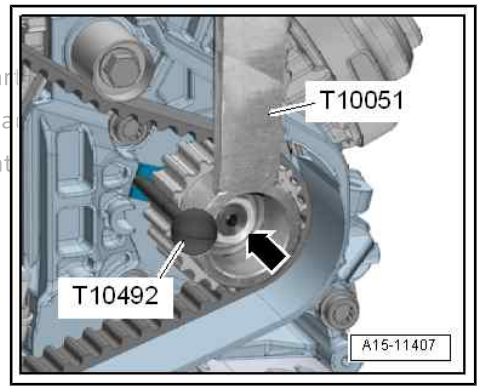
– Lock hub of high-pressure pump in position with locking pin - T10492- ; to do so, insert locking pin into fork -2- on hub and into hole -1- behind it in bracket for ancillaries.

– Pull out locking pin and slacken nut for high-pressure pump sprocket slightly, but insert pin again before fully slackening nut.



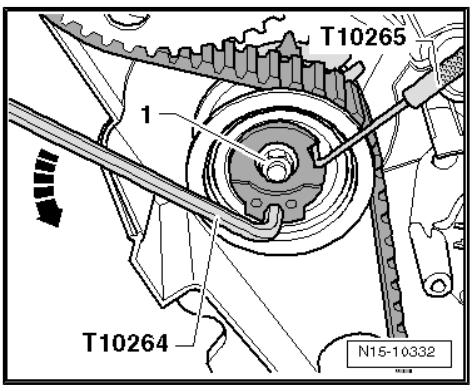
– Slacken nut -arrow- for toothed belt sprocket of high-pressure pump approx. 90° using counterhold tool - T10051- .

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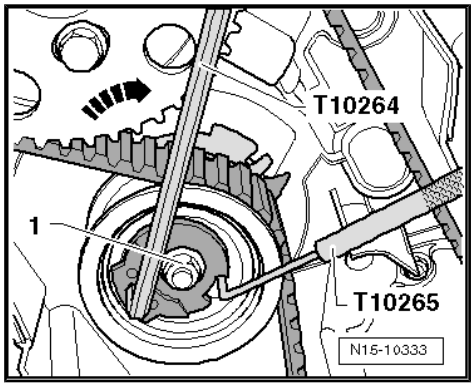


– Slacken nut -1- for tensioning roller.

– Turn eccentric adjuster of tensioning roller with offset screw-driver - 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.
– Take toothed belt off camshaft sprocket.



Installing (adjusting valve timing)

Note

Perform adjustments on toothed belt only when engine is cold.

Caution

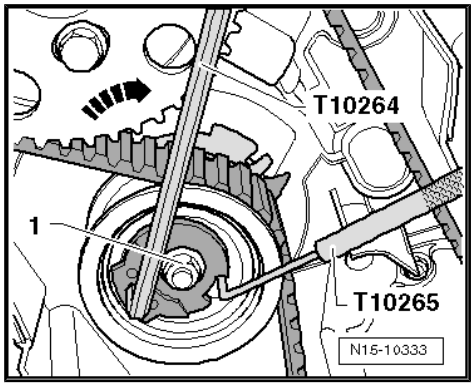
Risk of damage to valves and piston crowns.

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

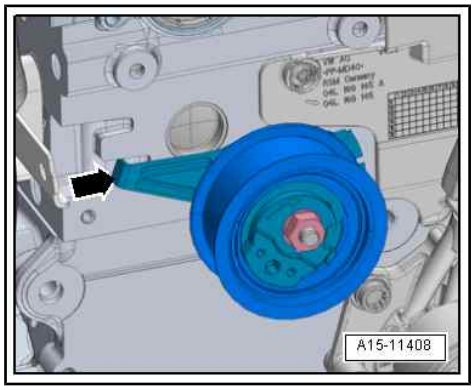
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Requirements:

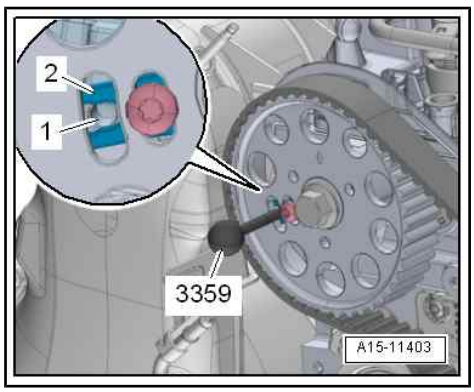
- Tensioning roller is locked with locking tool - T10265- and secured at right stop with nut -1-.



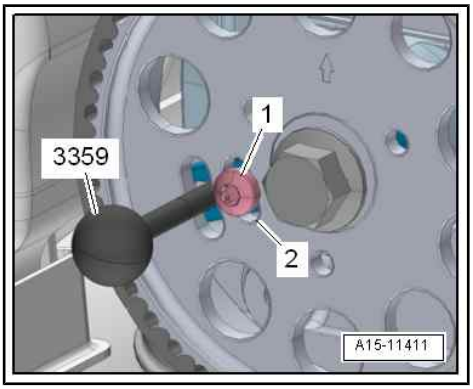
- Metal lug -arrow- of tensioning roller must engage in cast recess on cylinder head.



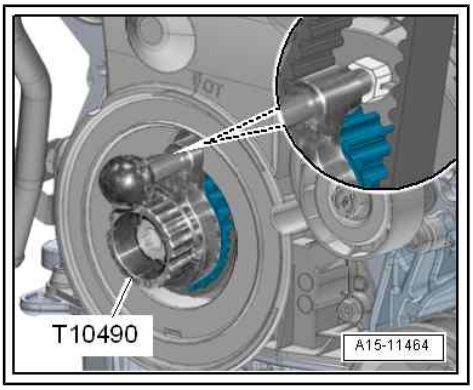
- Camshaft hub locked with diesel injection pump locking pin - 3359- .
- Bolt fitted but not tightened.
- It should just be possible to turn the sprocket on the camshaft without axial movement.



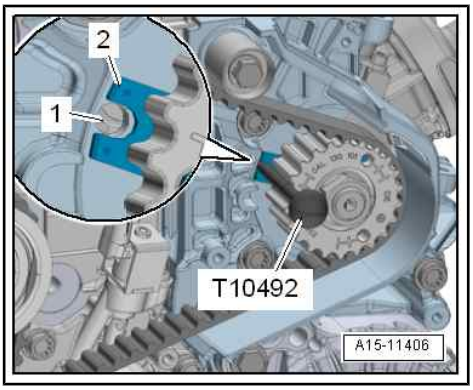
- Locking bolt -1- in locating arm loosened one half turn, positioned in centre of elongated hole -2-.



- Crankshaft is locked in position with crankshaft stop - T10490- .

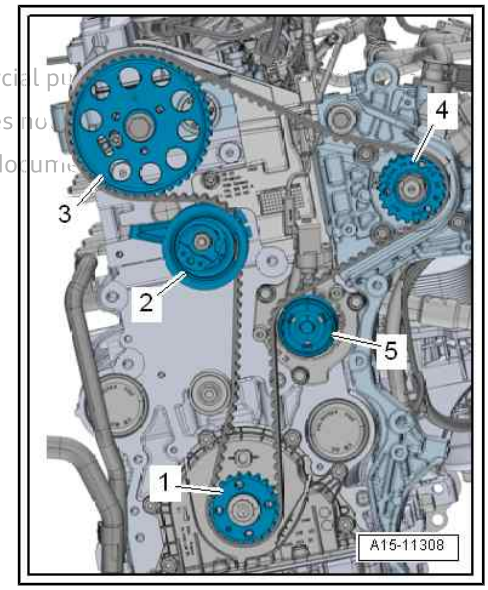


- High-pressure pump hub is locked with locking pin - T10492- .
- Nut fitted but not tightened.
- The high-pressure pump sprocket should still just turn, but there must be no axial movement.



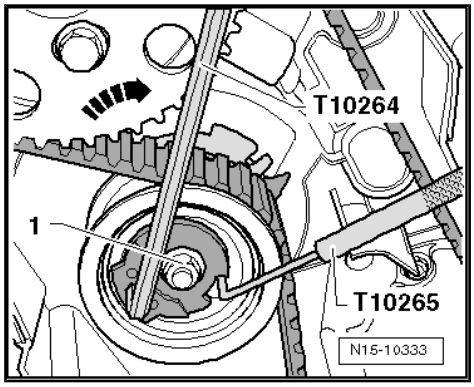
– Turn the camshaft sprocket and high-pressure pump sprocket in their elongated holes clockwise as far as the stop.
– Install toothed belt in the specified sequence:

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

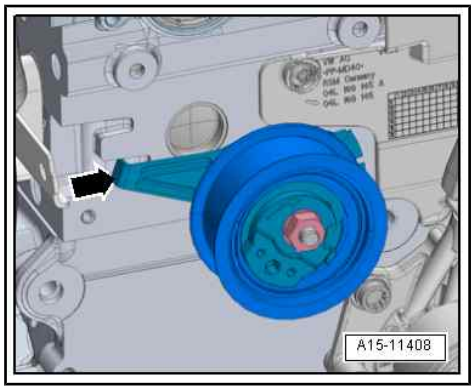


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– Loosen nut -1- for tensioning roller and detach locking tool - T10265- .

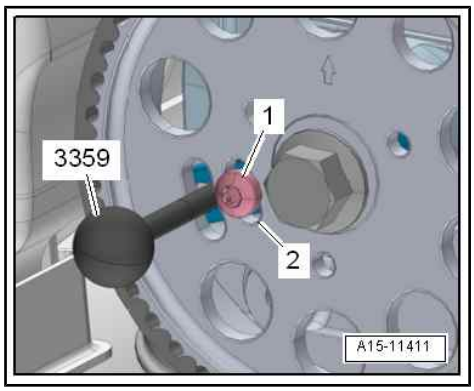


• Metal lug of tensioning roller must remain engaged in cast recess on cylinder head.



Locking bolt -1- must not come into contact with upper end of elongated hole after toothed belt has been tensioned.

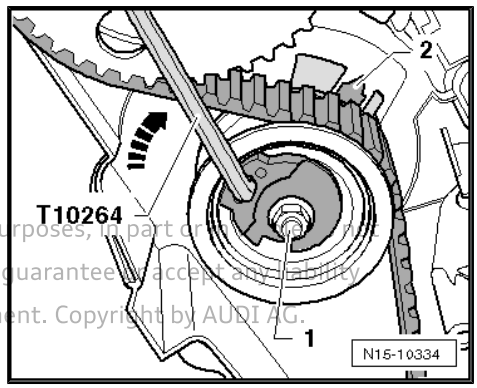
– Check that locking bolt -1- is located between centre and lower end -2- of elongated hole. If necessary, adjust position of camshaft sprocket by moving it one tooth clockwise then fit toothed belt again.



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

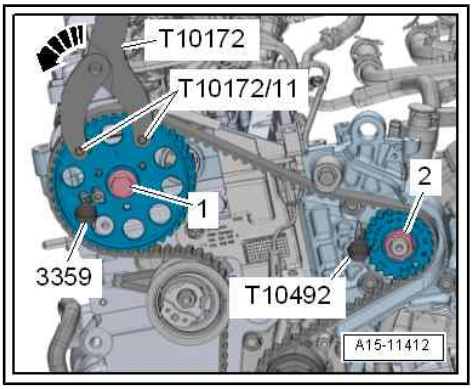
• Nut -1- must not turn.

– Hold tensioning roller in this position and tighten nut.



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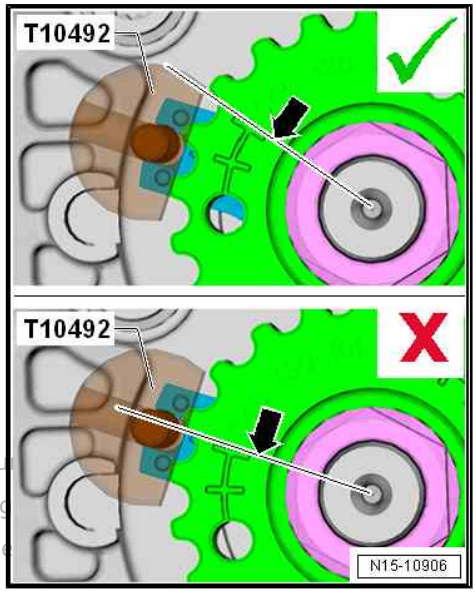
– Position counterhold tool - T10172- with adapters -T10172/11- on camshaft sprocket as shown in illustration.
– Apply force to counterhold tool in anti-clockwise direction -arrow- and maintain tension.
– Tighten bolt -1- for camshaft sprocket and nut -2- for high-pressure pump sprocket to 20 Nm.



Note

High-pressure pump sprocket can only be turned to a limited extent. It is therefore very important to check that the sprocket is not at the end of the area within which it can turn.

– Check that marking on high-pressure pump sprocket is not aligned with locking pin. If necessary, adjust position of high-pressure pump sprocket by one tooth in clockwise direction and fit toothed belt again.
– Remove locking pins -3359- , -T10492- and crankshaft stop -T10490- , and check valve timing ⇒ page 79 .



Checking valve timing:

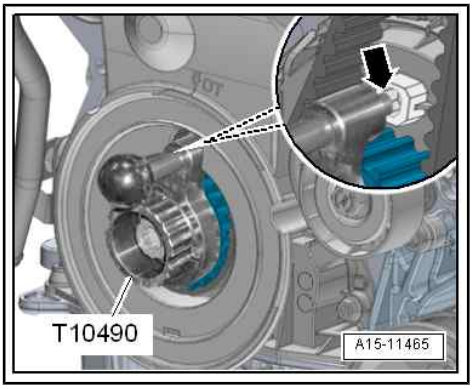
Caution

Irreparable engine 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 - T10490- to crankshaft sprocket again.
– Turn crankshaft in direction of engine rotation until pin -arrow- on crankshaft stop engages in sealing flange as crankshaft rotates.

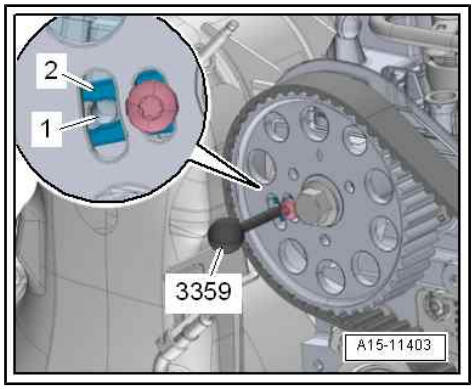


Caution

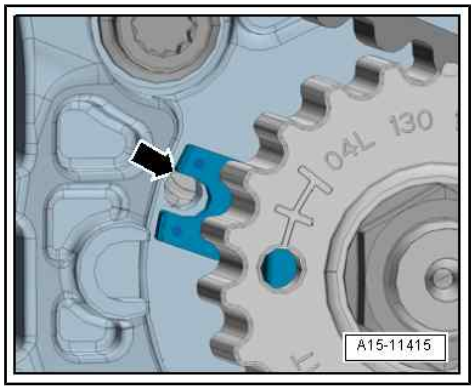
The crankshaft must be exactly in “TDC” position to ensure accurate valve timing adjustment.

- ***If crankshaft has been turned past “TDC” position, turn crankshaft two further rotations until it is again positioned just before “TDC”. Then turn further in the same direction and lock crankshaft with crankshaft stop - T10490- .***

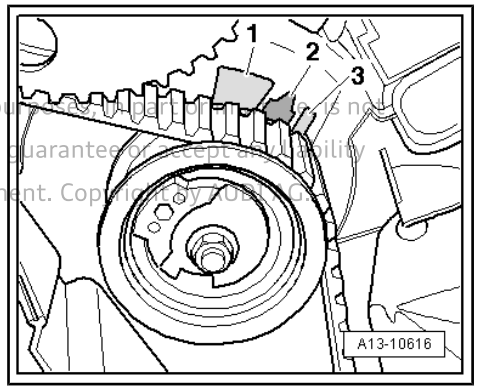
- It should now be possible to lock camshaft hub with diesel injection pump locking pin - 3359- .



- 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.



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Note

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

If requirements are met, continue with procedure after adjusting valve timing correctly as described below ⇒ page 81 .

Re-adjust valve timing if requirements are not met ⇒ page 80 .

Re-adjusting valve timing:

– If camshaft hub cannot be locked, withdraw crankshaft stop - T10490- 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.

Procedure if crankshaft stop - T10490- is now 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.

Procedure if crankshaft stop - T10490- is now 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.

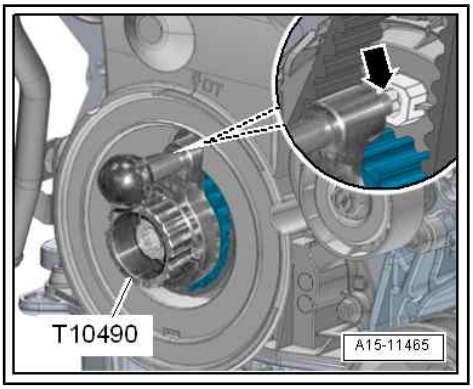
– Tighten camshaft sprocket bolt to 20 Nm.

Procedure after adjusting valve timing correctly:

– Remove diesel injection pump locking pin - 3359- and crankshaft stop - T10490- .

– 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 79 .



Caution

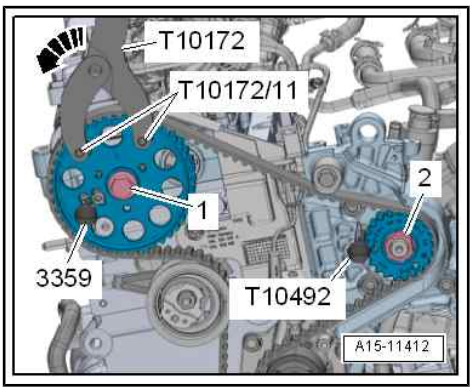
Risk of damage to engine.

- *The torque applied to loosen or tighten the central bolts on the camshaft and high-pressure pump MUST NOT be transferred to the respective locking pin. This can cause damage to the locating arms, even if counterhold tools are used. This damage may not be visible in some cases, but can cause damage to the engine. When loosening or tightening the central bolt, pull out the locking pin and re-insert it later if necessary.*

– If camshaft hub can now be locked, tighten camshaft sprocket bolt -1- to final torque using counterhold tool - T10172- with adapters -T10172/11- .

– Tighten nut -2- for high-pressure pump sprocket to final torque ⇒ page 286 ; to do so, use counterhold tool - T10051- .

– Check valve timing once again ⇒ page 79 .



Attaching

Further installation is carried out in the reverse order; note the following:

Note

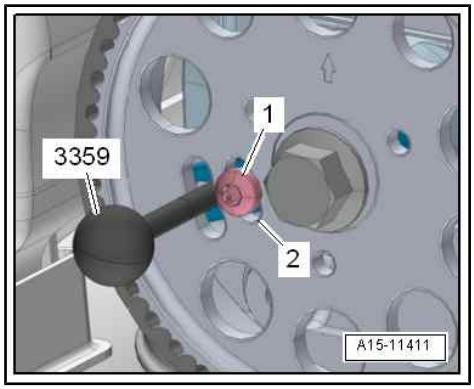
- *Renew seals.*
- *Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .*

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– Tighten locking pin -1-.
– Install vibration damper ⇒ page 40 .
– Install toothed belt cover (top) ⇒ page 69 .

Tightening torques

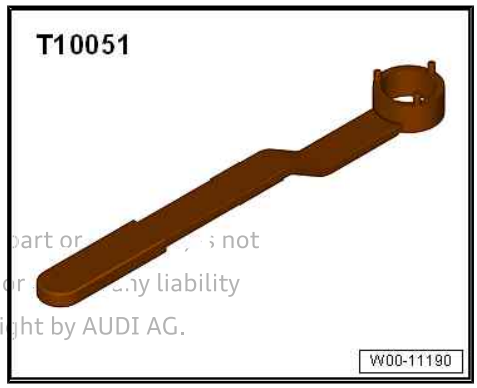
♦ ⇒ “1.2 Exploded view - toothed belt”, page 68



1.5 Removing and installing toothed belt

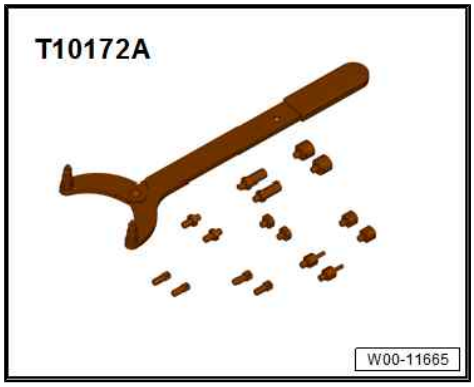
Special tools and workshop equipment required

♦ Counterhold tool - T10051-



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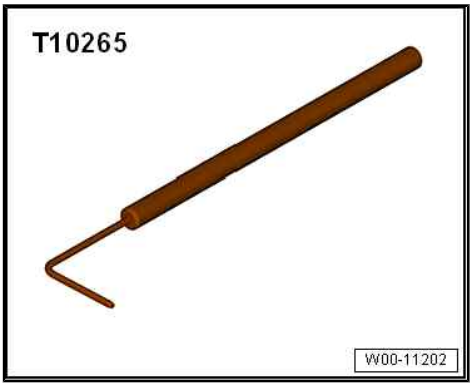
♦ Counterhold tool - T10172A- with adapters -T10172/11-



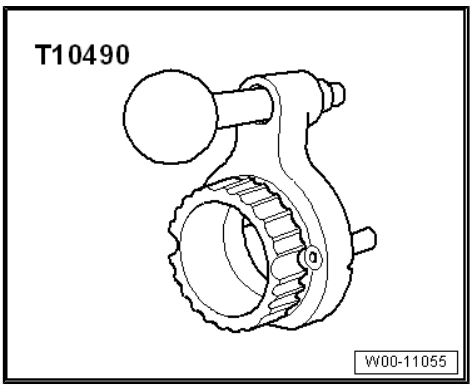
♦ Offset screwdriver - T10264-



- Locking tool - T10265-



- Crankshaft stop - T10490-



- Locking pin - T10492-



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- Diesel injection pump locking pin - 3359-
- Locking pin - T10492-



- Locking pin - T10492-



Note

Diesel injection pump locking pin - 3359- or locking pin - T10492- can be used to lock camshaft sprocket and high-pressure pump sprocket.

Removing

– Remove toothed belt cover (bottom) ⇒ page 70 .

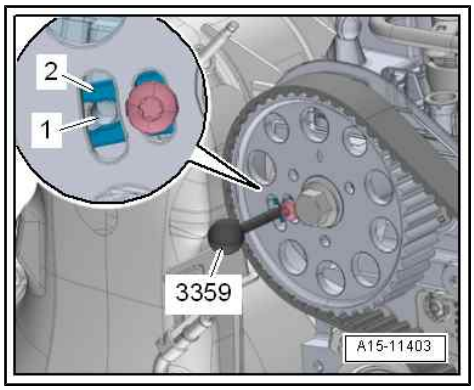
Caution

Irreparable damage can be caused if the toothed belt slips.

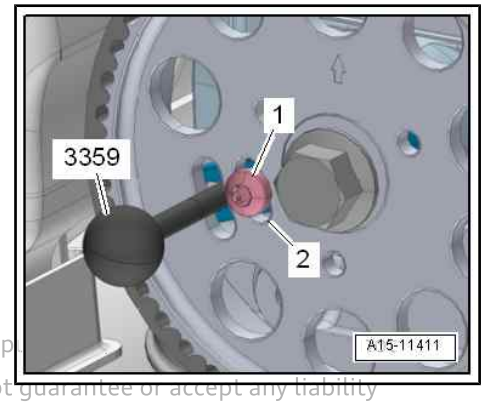
- ***Only turn crankshaft in direction of engine rotation.***

– 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- ; to do so, insert locking pin into fork on locating arm -2- and into hole -1- behind it in cylinder head.



– Loosen locking bolt -1- in camshaft sprocket one half turn, but do not remove.

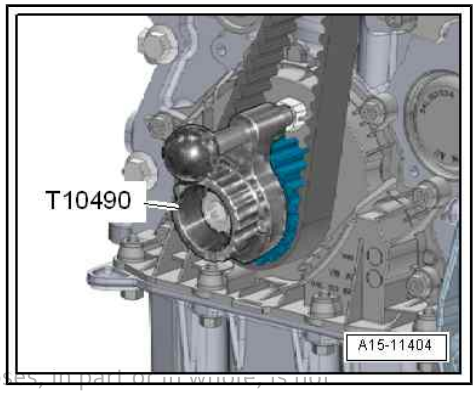


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– Lock crankshaft sprocket in position with crankshaft stop - T10490- .

• Pins of crankshaft stop - T10490- must engage in threaded holes of sprocket.

• Locking pin of crankshaft stop - T10490- must engage in hole on sealing flange.

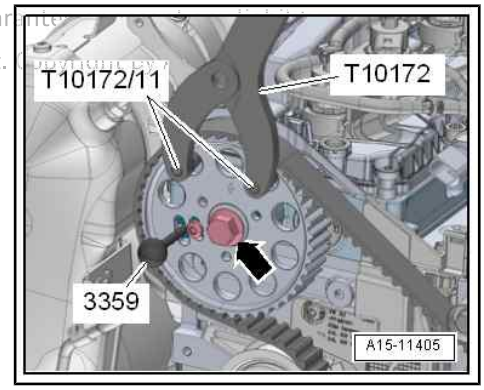


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Caution

Risk of damage to engine.

- *The torque applied to loosen or tighten the central bolts on the camshaft and high-pressure pump MUST NOT be transferred to the respective locking pin. This can cause damage to the locating arms, even if counterhold tools are used. This damage may not be visible in some cases, but can cause damage to the engine. When loosening or tightening the central bolt, pull out the locking pin and re-insert it later if necessary.*



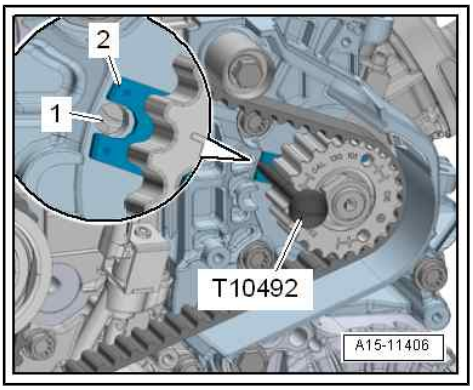
– Pull out locking pin and slacken bolt for camshaft slightly, but insert pin again before fully slackening bolt.

– Slacken bolt -arrow- for camshaft sprocket using counterhold tool - T10172- with adapters -T10172/11- .

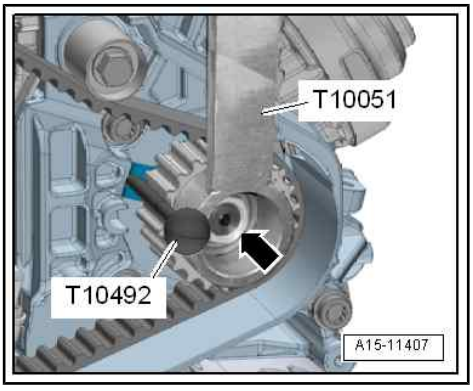
– Pull out locking pin and slacken bolt for camshaft slightly, but insert pin again before fully slackening bolt.

– Lock hub of high-pressure pump in position with locking pin - T10492- ; to do so, insert locking pin into fork -2- on hub and into hole -1- behind it in bracket for ancillaries.

– Pull out locking pin and slacken nut for high-pressure pump sprocket slightly, but insert pin again before fully slackening nut.

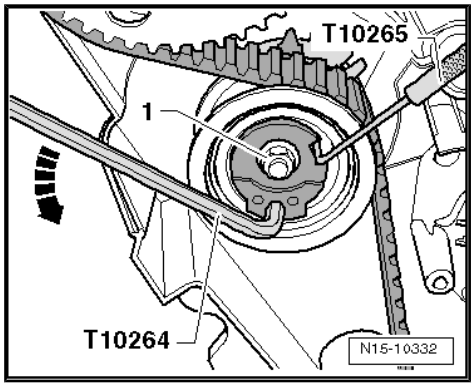


– Slacken nut -arrow- for toothed belt sprocket of high-pressure pump approx. 90° using counterhold tool - T10051- .

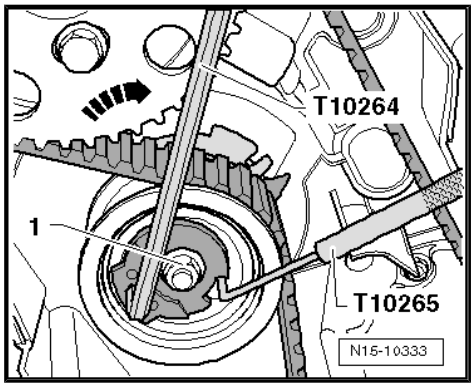


– Slacken nut -1- for tensioning roller.

– 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 coolant pump and then from remaining sprockets.

Installing (adjusting valve timing)

Note

Perform adjustments on toothed belt only when engine is cold.

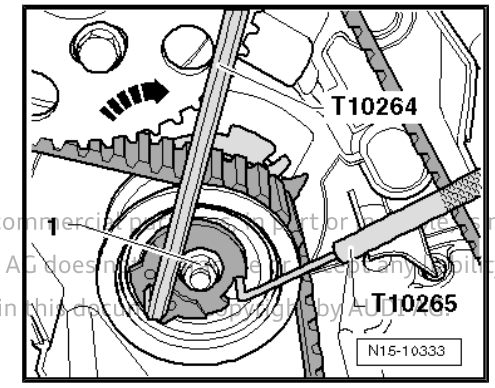
Caution

Risk of damage to valves and piston crowns.

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

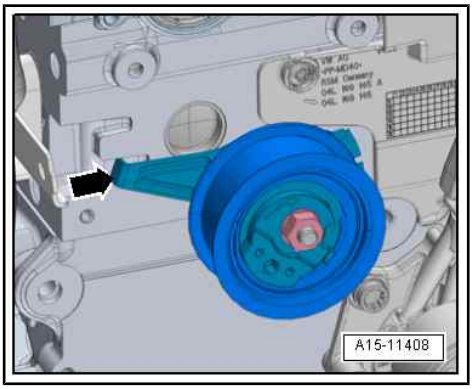
Requirements:

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



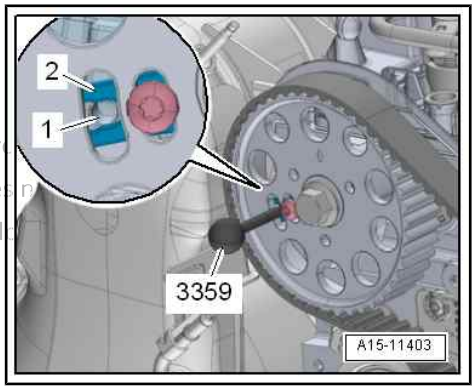
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- Metal lug -arrow- of tensioning roller must engage in cast recess on cylinder head.

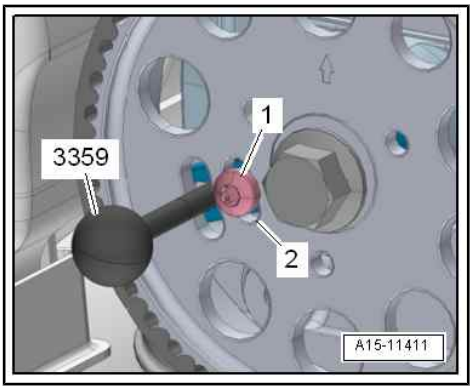


- Camshaft hub locked with diesel injection pump locking pin - 3359- .
- Bolt fitted but not tightened.
- It should just be possible to turn the sprocket on the camshaft easily without axial movement.

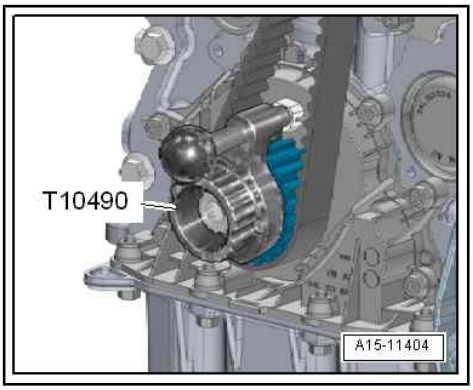
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- Locking bolt -1- in locating arm loosened one half turn, positioned in centre of elongated hole -2-.

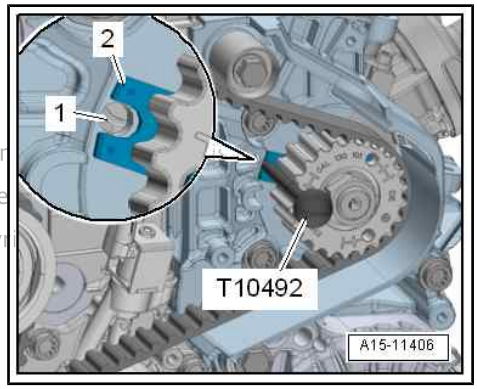


- Crankshaft is locked in position with crankshaft stop - T10490- .



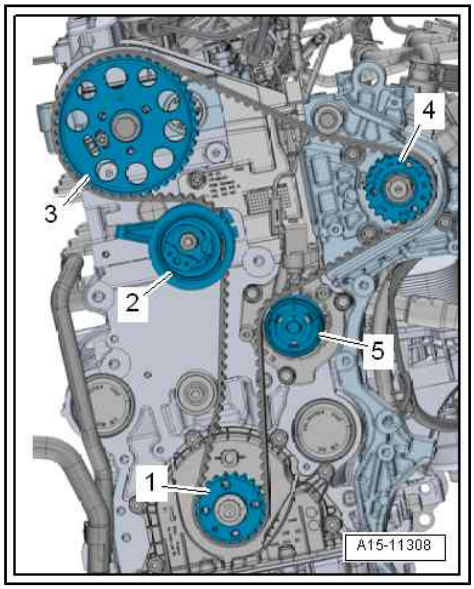
- High-pressure pump hub is locked with locking pin - T10492- .
- Nut fitted but not tightened.
- It should just be possible to easily turn the high-pressure pump sprocket, but there must be no axial movement.

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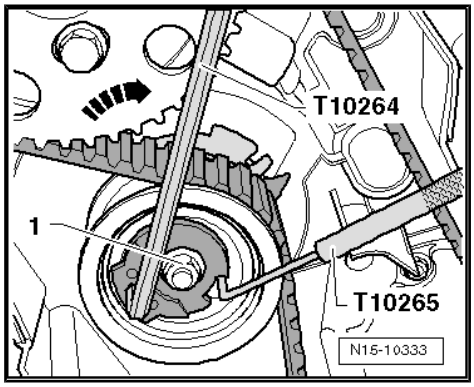


– Turn the camshaft sprocket and high-pressure pump sprocket in their elongated holes clockwise as far as the stop.
– Install toothed belt in the specified sequence:

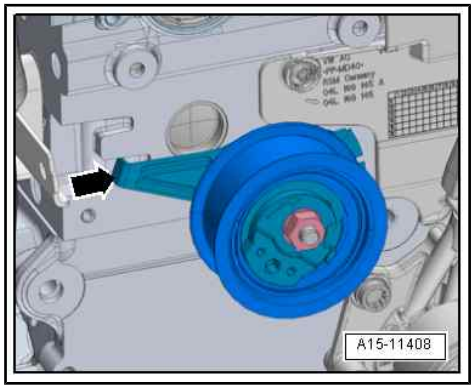
1 - Crankshaft sprocket
2 - Tensioning roller
3 - Camshaft sprocket
4 - High-pressure pump sprocket
5 - Coolant pump sprocket



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

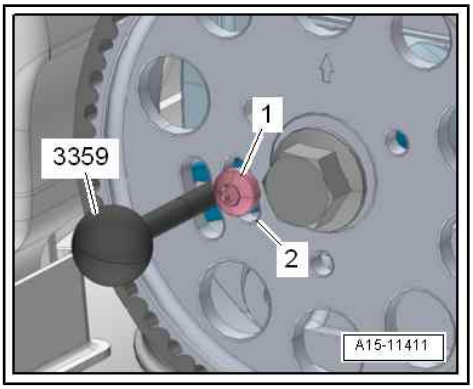


- Metal lug -arrow- of tensioning roller must engage in cast recess on cylinder head.



Locking bolt -1- must not come into contact with upper end of elongated hole after toothed belt has been tensioned.

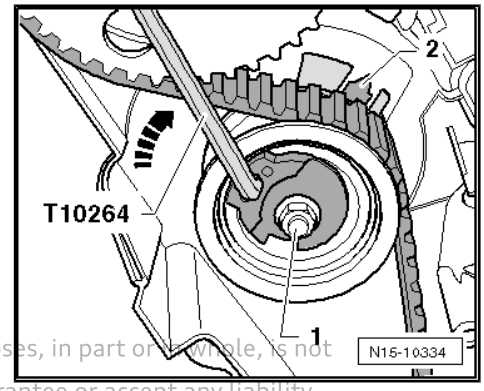
– Check that locking bolt -1- is located between centre and lower end -2- of elongated hole. If necessary, adjust position of camshaft sprocket by moving it one tooth clockwise then fit toothed belt again.



– 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 -1-.

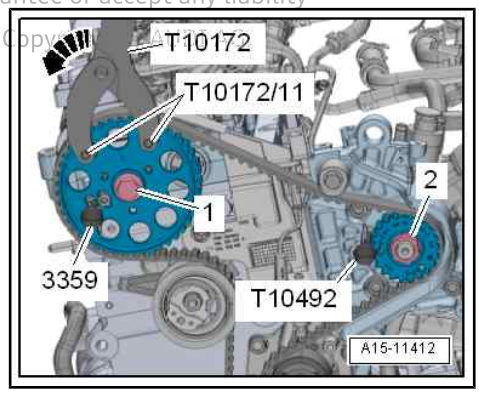


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– Position counterhold tool - T10172- with adapters -T10172/11- on camshaft sprocket as shown in illustration.

– Apply force to counterhold tool in anti-clockwise direction -arrow- and maintain tension.

– Tighten bolt -1- for camshaft sprocket and nut -2- for high-pressure pump sprocket to 20 Nm.



Note

High-pressure pump sprocket can only be turned to a limited extent. It is therefore very important to check that the sprocket is not at the end of the area within which it can turn.

– Check that marking on high-pressure pump sprocket is not aligned with locking pin. If necessary, adjust position of high-pressure pump sprocket by one tooth in clockwise direction and fit toothed belt again.

– Remove locking pins -3359- , -T10492- and crankshaft stop - T10490- and check valve timing ⇒ page 89 .

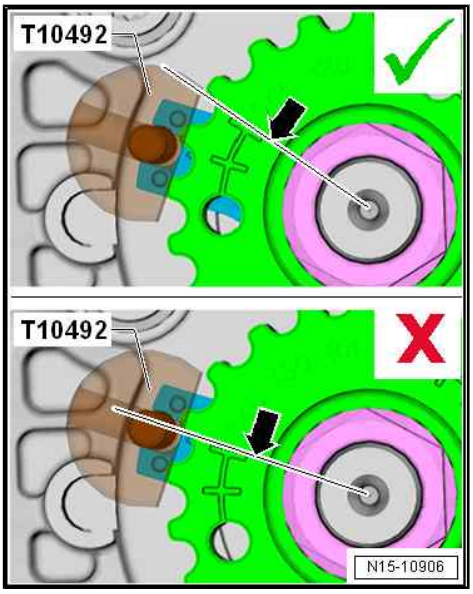
Checking valve timing:

Caution

Irreparable engine damage can be caused if the toothed belt slips.

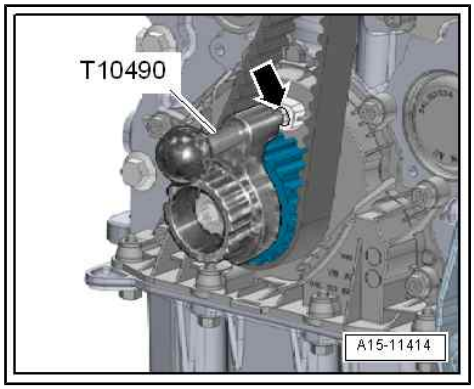
- ***Only turn crankshaft in direction of engine rotation.***

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



– Fit crankshaft stop - T10490- to crankshaft sprocket again.

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



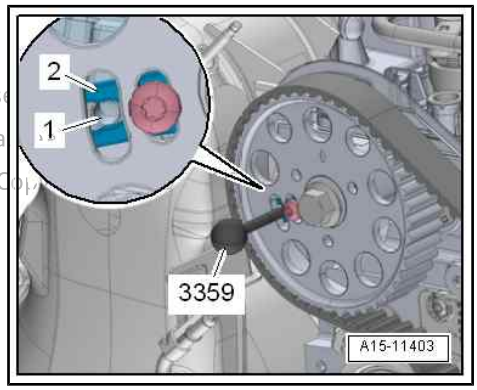
Caution

The crankshaft must be exactly in "TDC" position to ensure accurate valve timing adjustment.

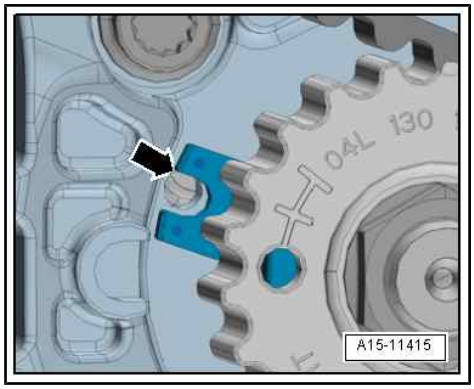
- ***If crankshaft has been turned past "TDC" position, turn crankshaft two further rotations until it is again positioned just before "TDC". Then turn further in the same direction and lock crankshaft with crankshaft stop - T10490- .***

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

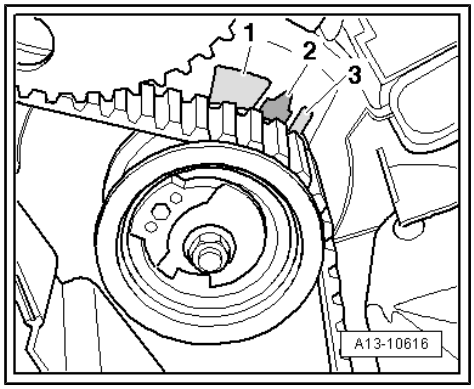
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- It is very difficult to reproduce the locking position of the high-pressure pump hub. However, a slight deviation -arrow- does not influence engine operation.



- 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.

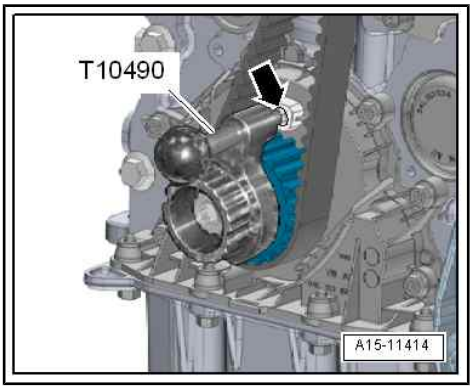
If requirements are met, continue with procedure after adjusting valve timing correctly as described below ⇒ page 92 .

Re-adjust valve timing if requirements are not met ⇒ page 91 .

Re-adjusting valve timing:

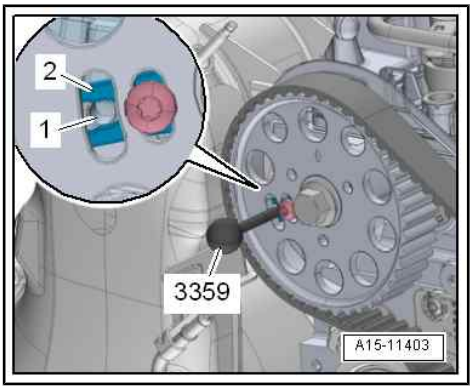
– If camshaft hub cannot be locked, withdraw crankshaft stop - T10490- until pin -arrow- is clear of bore.

– 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.

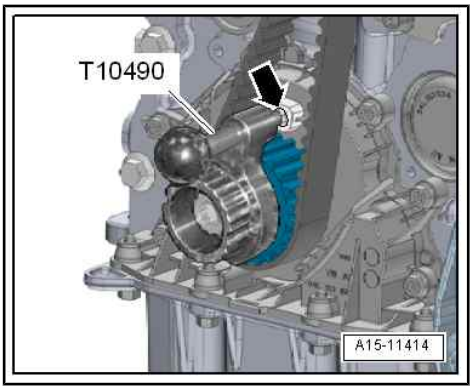
– Loosen bolt for camshaft sprocket after locking.



Procedure if crankshaft stop - T10490- is now on left side of bore:

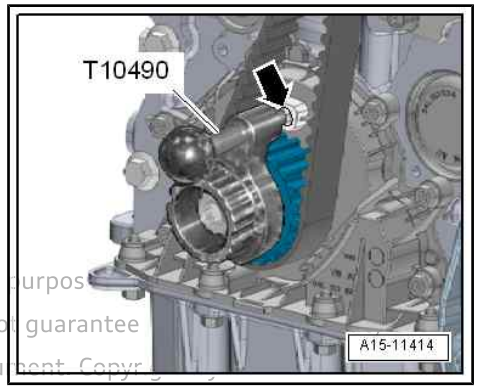
– Turn crankshaft in direction of engine rotation until pin -arrow- on crankshaft stop engages in sealing flange as crankshaft rotates.

– Tighten camshaft sprocket bolt to 20 Nm.



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Procedure if crankshaft stop - T10490- is now 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 bolt to 20 Nm.

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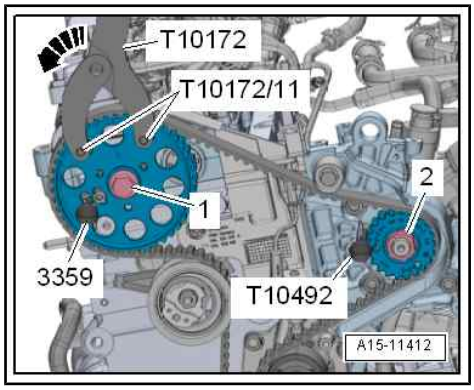
Procedure after adjusting valve timing correctly:

- Remove diesel injection pump locking pin - 3359- and crankshaft stop - T10490- .
- 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 89 .

Caution

Risk of damage to engine.

- *The torque applied to loosen or tighten the central bolts on the camshaft and high-pressure pump MUST NOT be transferred to the respective locking pin. This can cause damage to the locating arms, even if counterhold tools are used. This damage may not be visible in some cases, but can cause damage to the engine. When loosening or tightening the central bolt, pull out the locking pin and reinsert it later if necessary.*



- If locating arm for camshaft can now be locked, tighten bolt -1- for camshaft sprocket to final torque; to do so, remove diesel injection pump locking pin - 3359- and counterhold camshaft sprocket using counterhold tool - T10172A- and adapters -T10172/11- .
- Tighten nut -2- for high-pressure pump sprocket to final torque; to do so, use counterhold tool - T10051- .
- Check valve timing once again ⇒ page 89 .

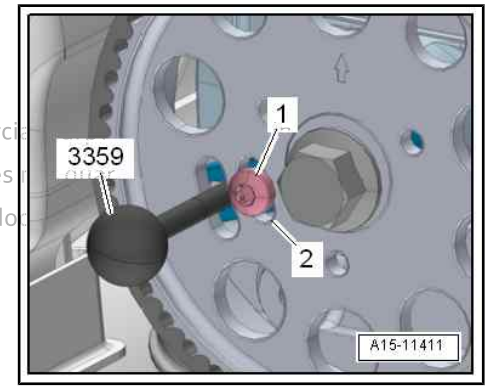
Attaching

Further installation is carried out in the reverse order; note the following:

Note

- *Renew seals.*
- *Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .*

– Tighten locking pin -1-.
– Install toothed belt cover (bottom) ⇒ page 70 .



Tightening torques

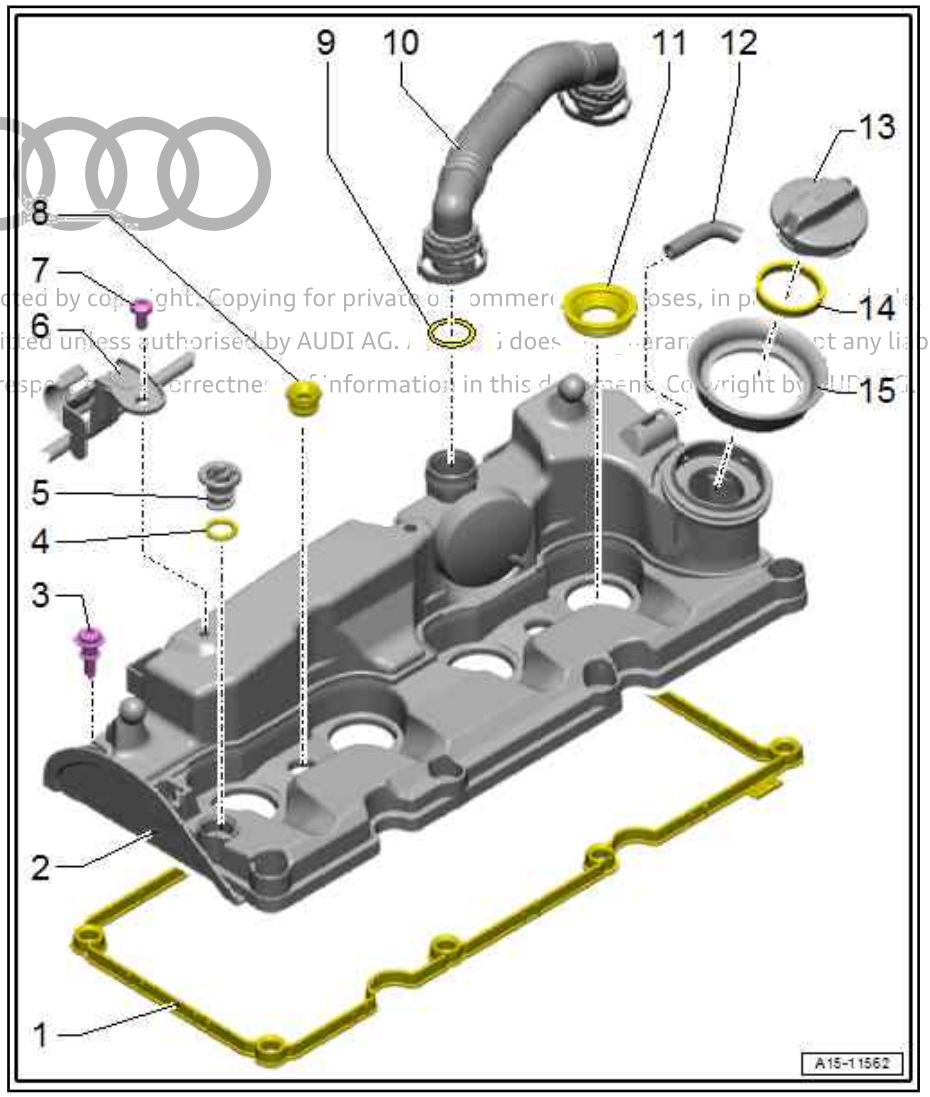
- ⇒ “1.2 Exploded view - toothed belt”, page 68
- ⇒ “1.1 Exploded view - toothed belt cover”, page 67

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2 Cylinder head

⇒ “2.1 Exploded view - cylinder head cover”, page 94
⇒ “2.2 Exploded view - cylinder head”, page 95
⇒ “2.3 Removing and installing cylinder head”, page 97
⇒ “2.4 Removing and installing cylinder head cover”, page 103
⇒ “2.5 Removing and installing seals for injectors”, page 105
⇒ “2.6 Removing and installing camshaft housing”, page 105
⇒ “2.7 Checking compression”, page 111

2.1 Exploded view - cylinder head cover



1 - Gasket
- ❑ Renew if damaged or leaking

2 - Cylinder head cover
- ❑ Removing and installing ⇒ page 103

3 - Bolt
- ❑ Renew if gasket is damaged
- ❑ Tightening torque and sequence ⇒ page 95

4 - O-ring
- ❑ Renew after removing

5 - Sealing plug

6 - Measuring tube
- ❑ To pressure differential sender - G505-

7 - Bolt
- ❑ 8 Nm

8 - Grommet
- ❑ In cylinder head cover

9 - O-ring
- ❑ Renew after removing

10 - Hose
- ❑ For crankcase breather
- ❑ Press release tabs on both sides to detach

11 - Seal
- ❑ For injector
- ❑ Renewing ⇒ page 105

12 - Vacuum hose
- ❑ Connection can break off if vacuum hose is pulled off
- ❑ To detach vacuum hose, insert screwdriver between hose and cover and tilt it; this will release hose from connection

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13 - Filler cap

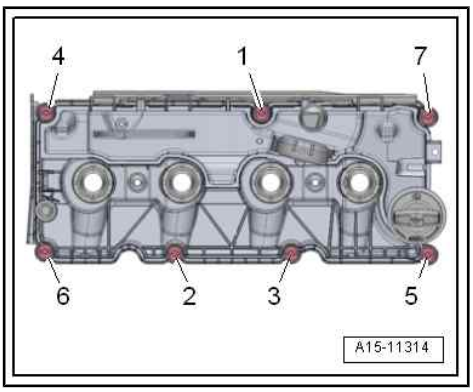
14 - Seal

- ❑ For filler cap

15 - Grommet

Cylinder head cover - tightening torque and sequence

– Tighten bolts for cylinder head cover in the sequence -1 ... 7- to 9 Nm.



2.2 Exploded view - cylinder head

1 - Cylinder block

2 - Cylinder head gasket

- ❑ Renewing ⇒ page 97
- ❑ Identification of cylinder head gasket ⇒ page 96
- ❑ If renewed, change coolant and engine oil

3 - Cylinder head

- ❑ Removing and installing ⇒ page 97
- ❑ To prevent damage to glow plugs, always place cylinder head on a soft foam surface after removal.
- ❑ Checking for distortion ⇒ page 96
- ❑ 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

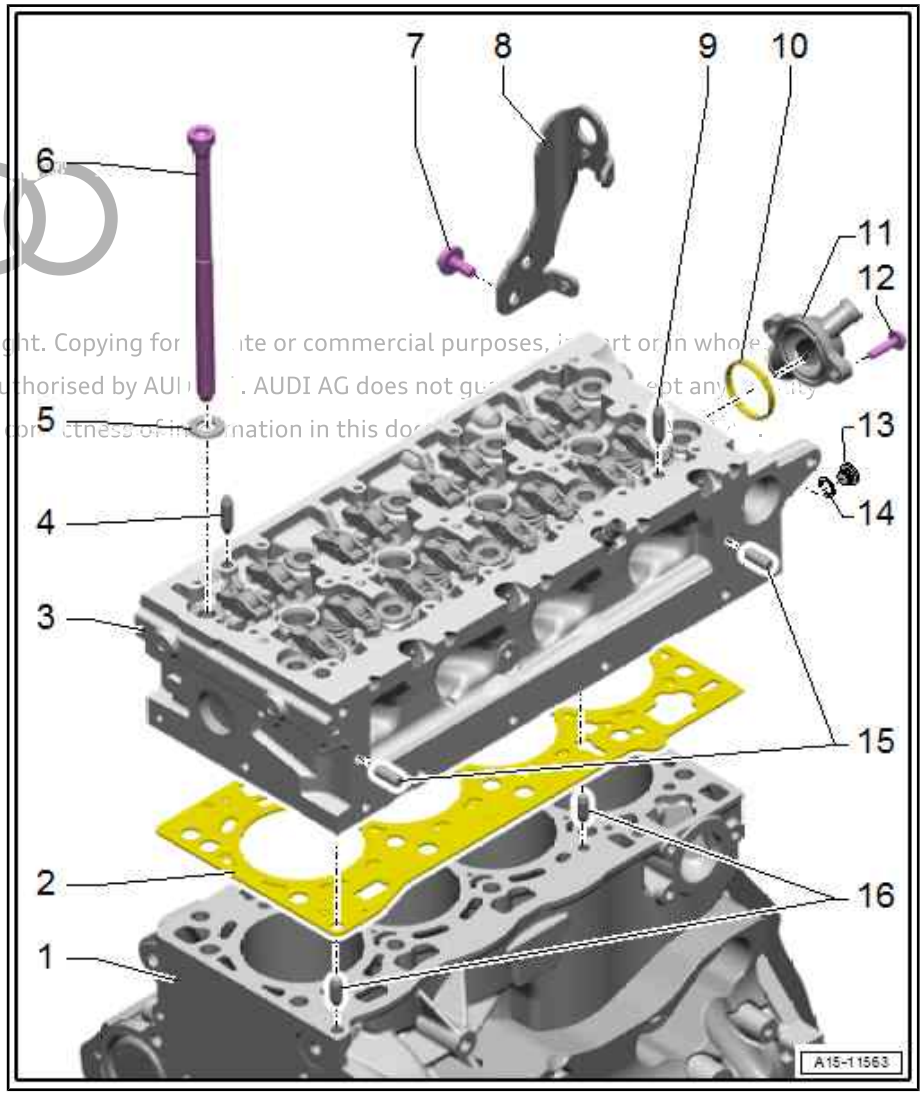
4 - Dowel pin

- ❑ For camshaft housing

5 - Washer

6 - Bolt

- ❑ Renew after removing
- ❑ Correct sequence when slackening ⇒ page 100
- ❑ Tightening torque and sequence ⇒ page 97



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7 - Bolt

- ❑ 20 Nm

8 - Engine lifting eye

9 - Dowel pin

- ❑ For camshaft housing

10 - Seal

- ❑ Renew after removing
- ❑ Lubricate with coolant

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11 - Connection

- ❑ For coolant hoses

12 - Bolt

- ❑ 10 Nm

13 - Plug

- ❑ 9 Nm

14 - Seal

- ❑ Renew after removing
- ❑ Lubricate with coolant

15 - Dowel pins

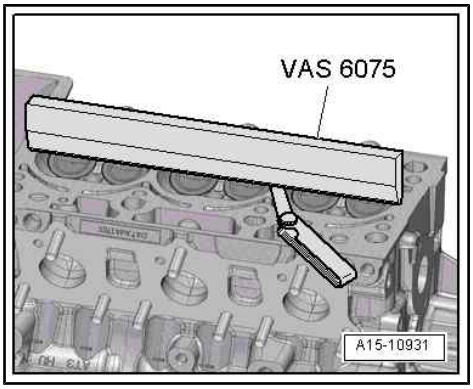
- ❑ For intake manifold with charge air cooler

16 - Dowel sleeves

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

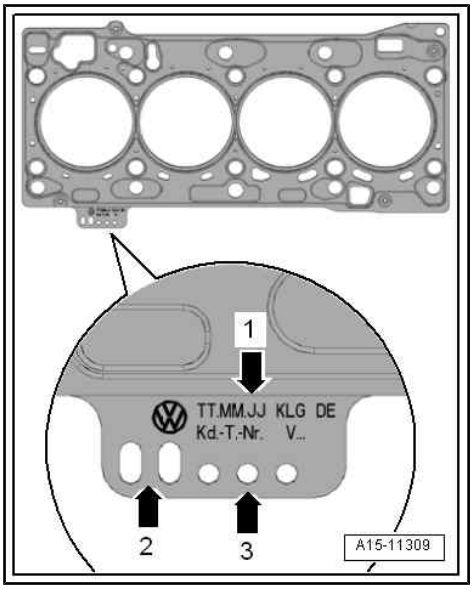
Cylinder heads must not be reworked on TDI engines.

Identification of cylinder head gasket

1 - Part number

2 - Ignore

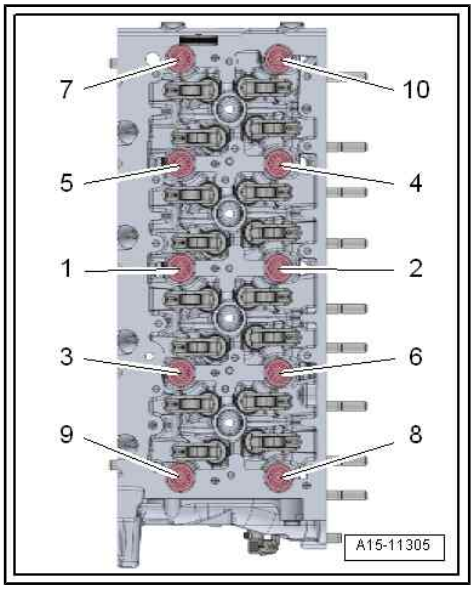
3 - Holes



Note

Cylinder head gaskets of different thicknesses are fitted depending on the amount of piston projection ⇒ page 62 . 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 bolts tightened with specified tightening angle.

– Tighten bolts in stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1.	-1 … 10-	30 Nm
2.	-1 … 10-	70 Nm
3.	-1 … 10-	Turn 90° further
4.	-1 … 10-	Turn 90° further
5.	-1 … 10-	Turn 90° further

2.3 Removing and installing cylinder head

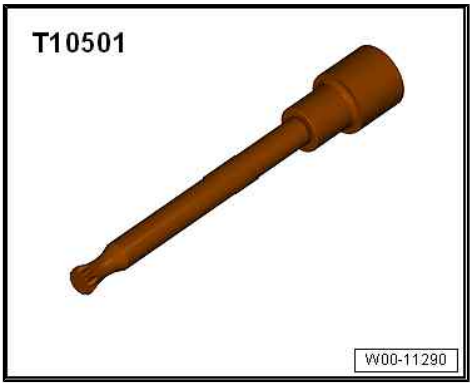
Special tools and workshop equipment required

♦ Hose clip pliers - VAS 6362-



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♦ Bit XZN 10 - T10501-

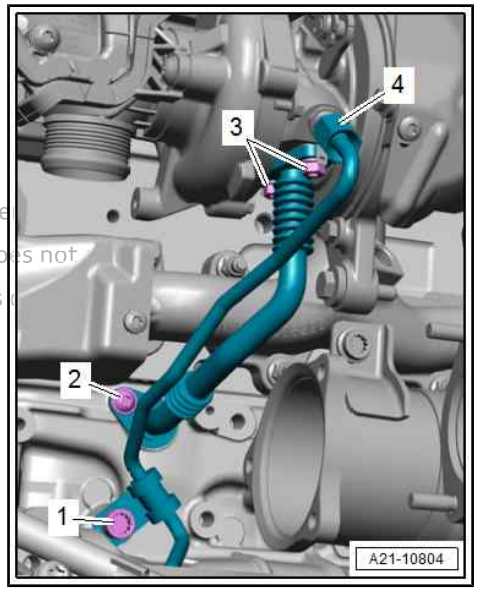


Removing

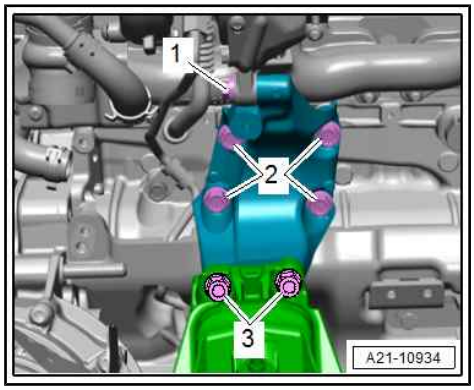
– Remove coolant pipes (rear left) ⇒ page 190 .
– Remove coolant pipe (top left) ⇒ page 192 .
– Remove throttle valve module - J338- with connection ⇒ page 258 .
– Remove emission control module ⇒ page 335 .

– Unscrew bolt -1- and union nut -4-.
– Unscrew bolts -2 and 3- and detach oil return line.

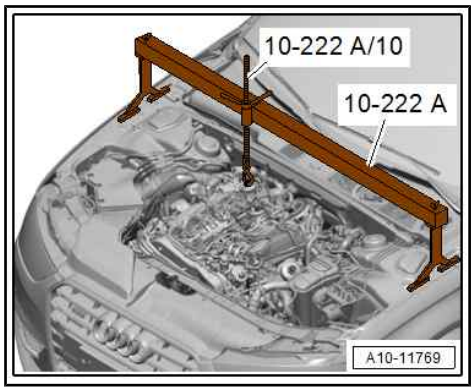
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– Remove bolt -1-; slacken bolts -2 and 3- by one turn, but do not remove them.
– Push bracket for emission control module towards front.



– Lower engine onto engine mounting on right side and detach support bracket - 10 - 222 A- .

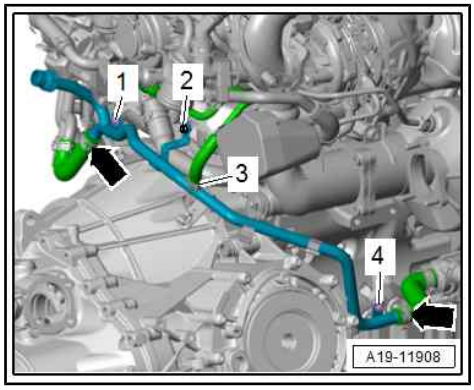


– Release hose clip -3- and disconnect coolant hose.
– Loosen bolt -4-.
– Unscrew bolt -1- and nut -2- and push coolant pipe (rear) slightly towards rear.

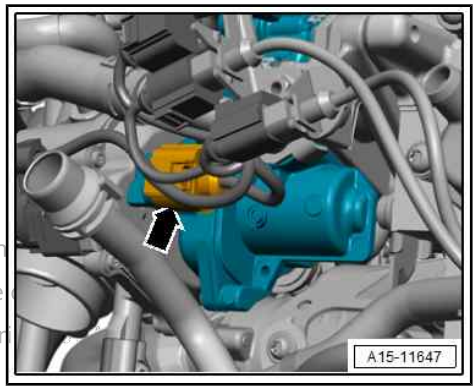
Note

Disregard -arrows-.

– Remove camshaft housing ⇒ page 105 .



– Unplug electrical connector -arrow- from exhaust gas recirculation control motor - V338- and move electrical wiring clear.



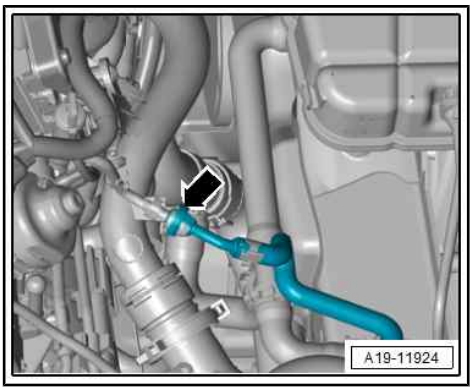
Q5 only:

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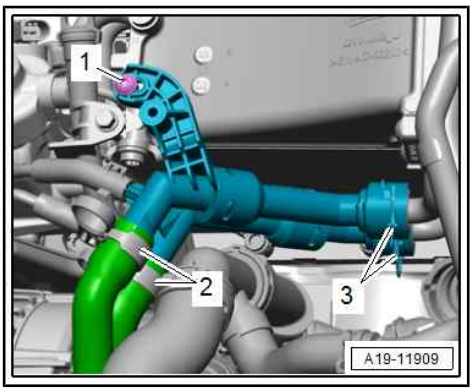
– Lift retaining clip -1- and disconnect coolant hose.

All vehicles:

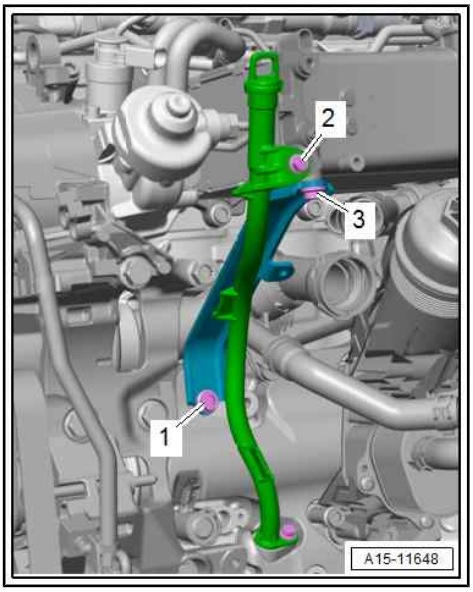
– Remove nut -2- and move bracket clear.



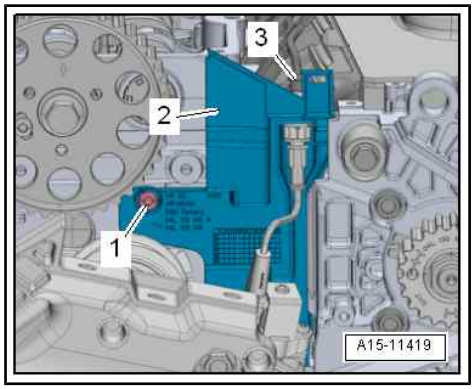
– Release hose clips -2- and disconnect coolant hoses.
– Remove bolt -1-.
– Lift retaining clips -3- and detach coolant connection.



– Loosen bolt -1-.
– Remove centre hex stud -2- for dipstick guide tube.
– Remove bolt -3- for bracket for intake manifold.



– Unplug electrical connector -3-.
– Remove bolt -1- but leave cover -2- in installation position.

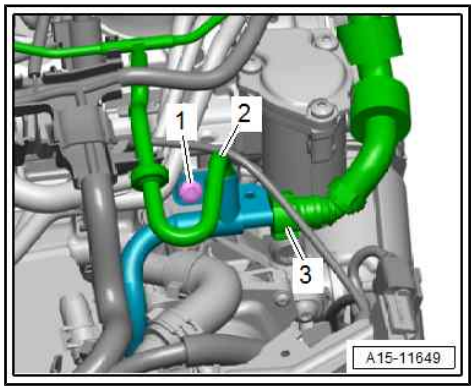


– Remove bolt -1-.

Note

Disregard items -2 and 3-.

– Unplug electrical connector at glow plug for cylinder 1 ⇒ page 407 .
– Move electrical wiring harness clear and place to one side.

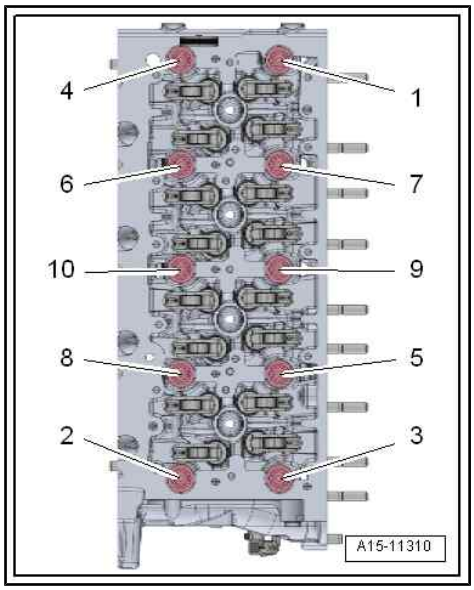


– Slacken cylinder head bolts in the sequence -1 ... 10-.

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.



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.***

– Take care to place cylinder head down without bending oil return line. If necessary, place a block of wood below exhaust manifold.

Installing

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Note

- *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.*
- *Use of impermissible abrasive materials can lead to subsequent damage to the turbocharger, conrod bearings, etc.*

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– Remove sealant residue from the cylinder head and cylinder block using a commercially available ceramic hob 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 - T10490- and turn crankshaft against normal direction of rotation until all pistons are positioned approximately equally below “TDC”.

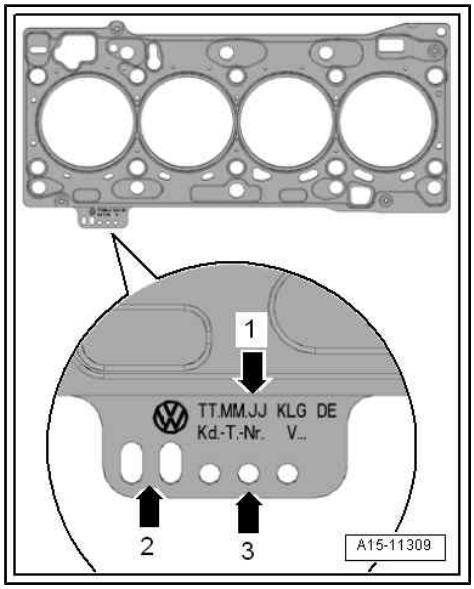
– If not already fitted, install dowel sleeves for centring cylinder block and cylinder head in cylinder block.

– Note cylinder head gasket identification:

1 - Part number

2 - Ignore

3 - Holes

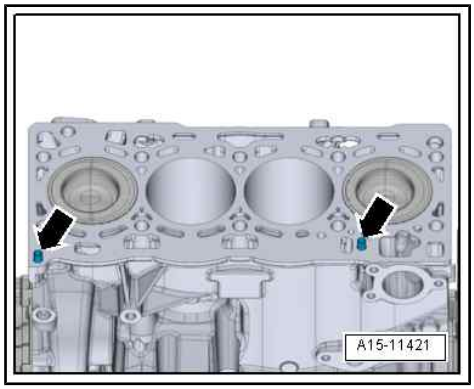


Note

- *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 62 .

– 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.

– Fit cylinder head.

– Fit and tighten cylinder head bolts ⇒ page 97 .

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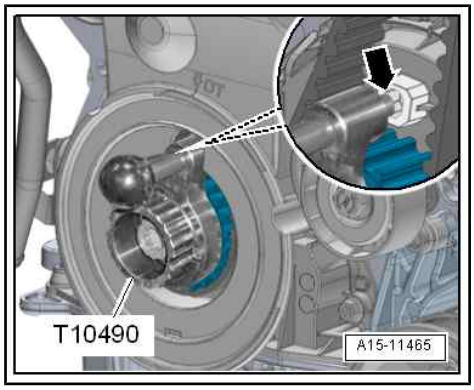
Note

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

– Install camshaft housing ⇒ page 105 .

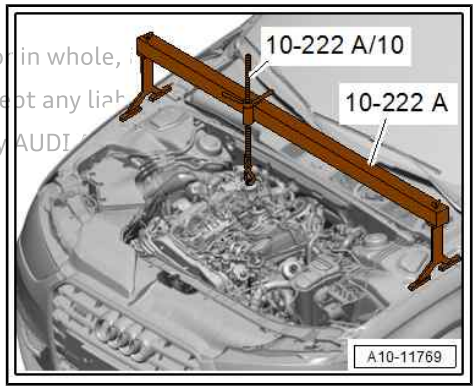
– Then turn crankshaft in direction of engine rotation until pin -arrow- on crankshaft stop - T10490- engages in sealing flange as crankshaft rotates.

– Install toothed belt (adjust valve timing) ⇒ page 76 .



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



– Set up support bracket - 10 - 222 A- again on wing mounting flanges (left and right) as illustrated.
– Attach hook - 10 - 222 A /10- to engine lifting eye (rear right).
– Raise engine with hook until load on engine mounting (right-side) is relieved.
– Install bracket for emission control module ⇒ page 223 .
– Install emission control module ⇒ page 335 .
– Electrical connections and routing ⇒ Electrical system; Rep. gr. 97 ; Electrical connectors and ⇒ Current flow diagrams, Electrical fault finding and Fitting locations
– Install throttle valve module - J338- ⇒ page 258 .
– Install coolant pipe (top left) ⇒ page 192 .
– Install rear coolant pipes (left-side) ⇒ page 190 .
– Change engine oil.
♦ A5 Coupé ⇒ Maintenance ; Booklet 811
♦ A4 ⇒ Maintenance ; Booklet 812
♦ A5 Cabriolet ⇒ Maintenance ; Booklet 818
♦ Q5 ⇒ Maintenance ; Booklet 817
– Fill cooling system with fresh coolant ⇒ page 167 .

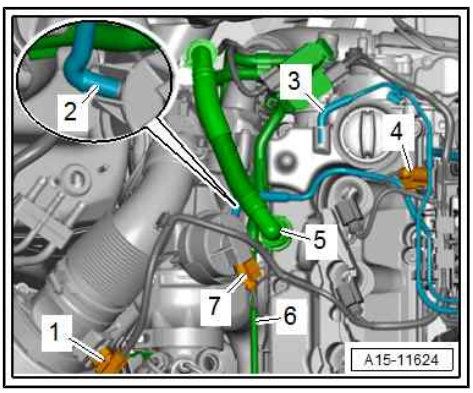
Tightening torques

♦ ⇒ “2.2 Exploded view - cylinder head”, page 95
♦ ⇒ “1.1 Exploded view - turbocharger”, page 222
♦ ⇒ “4.1 Exploded view - intake manifold”, page 256

2.4 Removing and installing cylinder head cover

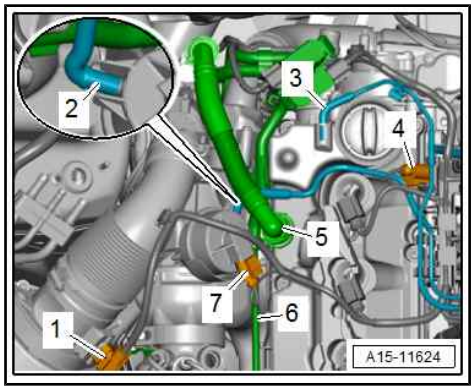
Removing

– Remove toothed belt cover (top) ⇒ page 69 .
– Remove exhaust gas pressure sensor 1 - G450- ⇒ “7.6 Removing and installing exhaust gas pressure sensor 1 G450 ”, page 302 .
– Remove injectors ⇒ page 277 .
– Unplug electrical connectors and move wiring clear:



1 - For air mass meter - G70-
4 - For fuel pressure regulating valve - N276-
7 - For position sender for charge pressure positioner - G581-

– Detach vacuum hose -2- from vacuum unit and move clear.



Note

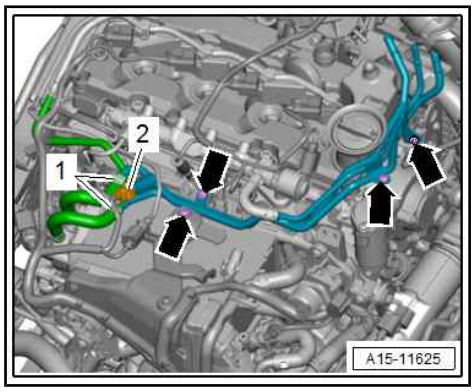
- *The connection for the vacuum hose -3- can break off if the hose is pulled off.*
- *To detach the vacuum hose, insert a screwdriver between the hose and the cover and tilt it; this will release the hose from the connection.*

– Detach vacuum hose -3- and move clear.

– Press release tabs on both sides of crankcase breather hose -5- and disconnect hose from cylinder head cover.

– Move line -6- clear and place to one side.

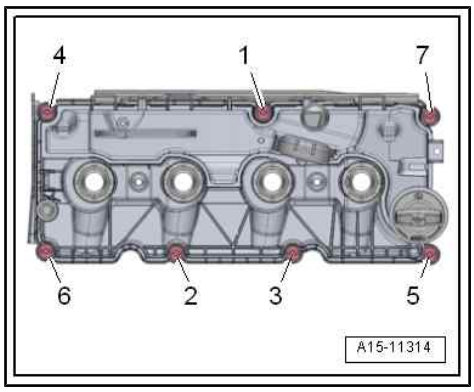
– Remove bolts -arrows- and move fuel lines slightly to rear.



– Move electrical wiring harness clear.

– Slacken cylinder head cover bolts in the sequence -7 ... 1- and remove.

– Detach cylinder head cover.



Installing

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

Note

- *Renew O-ring.*
- *Renew gasket and bolts for cylinder head cover if damaged or leaking.*

– Electrical connections and routing ⇒ Electrical system; Rep. gr. 97 ; Electrical connectors and ⇒ Current flow diagrams, Electrical fault finding and Fitting locations

– Install injectors ⇒ page 277 .

– Install toothed belt cover (top) ⇒ page 69 .

Tightening torques

- ⇒ Fig. ""Cylinder head cover - tightening torque and sequence"" , page 95
- ⇒ "5.2 Exploded view - high-pressure reservoir (rail)", page 268
- ⇒ "8.1 Exploded view - Lambda probe", page 307

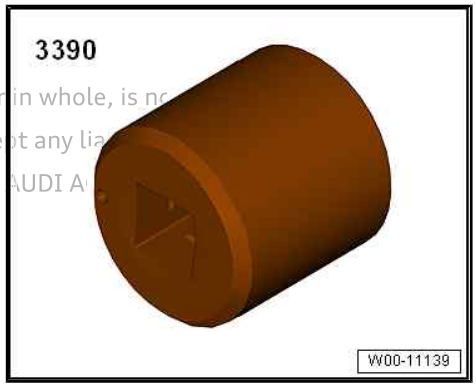
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2.5 Removing and installing seals for injectors

Special tools and workshop equipment required

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

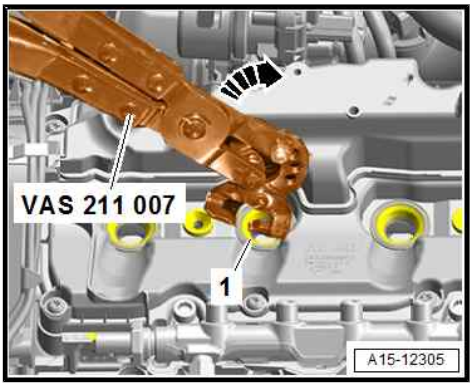
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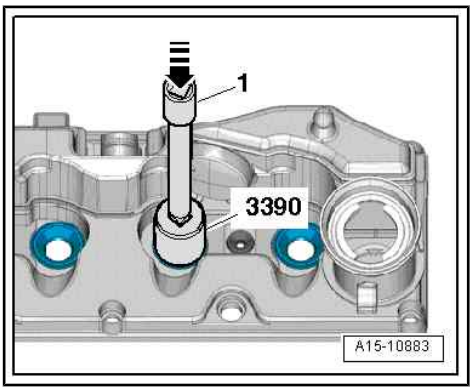
Procedure

– Remove corresponding injector
⇒ “5.8 Removing and installing injectors”, page 277 .

– 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.



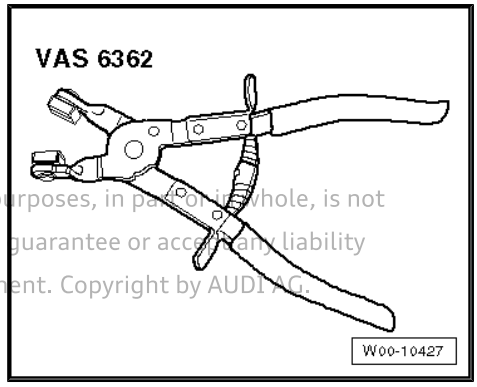
2.6 Removing and installing camshaft housing

Special tools and workshop equipment required

- Bit XZN 10 - T10501- or ball head Torx T30 (commercially available)



- Hose clip pliers - VAS 6362-



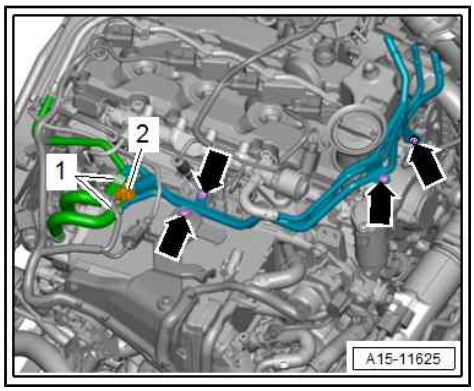
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- Electric drill with plastic brush attachment
- Safety goggles
- Sealant ⇒ Electronic parts catalogue

Removing

- Cylinder head installed.

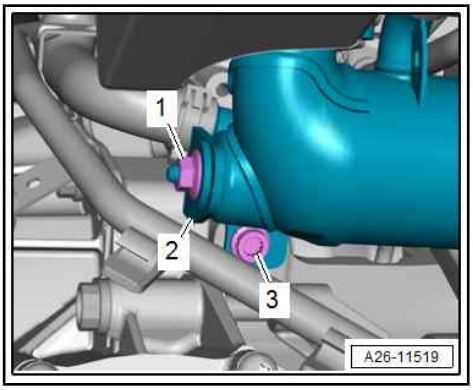
– Detach toothed belt from camshaft ⇒ page 71 .
– Remove cylinder head cover ⇒ page 103 .
– Remove high-pressure reservoir (rail) ⇒ page 284 .
– Remove front exhaust pipe ⇒ page 321 .
– Remove camshaft adjuster housing ⇒ page 122 .
– Move electrical wiring and vacuum hoses clear.
– Unplug electrical connector at glow plug for cylinder 4 ⇒ page 407 .
– Unplug electrical connector -2- for fuel temperature sender - G81- .
– Release hose clips -1- and detach fuel hoses from fuel lines.
– Place fuel lines to right side.



Note

Disregard -arrows-.

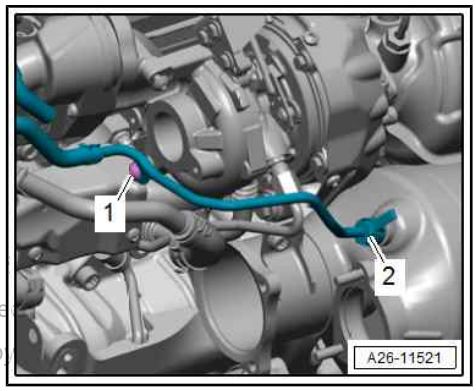
– Loosen nut -1- and bolt -3-.



Note

To loosen bolt -3-, use bit XZN 10 - T10501- or ball head Torx T30 (commercially available).

– Remove union nut -2-.

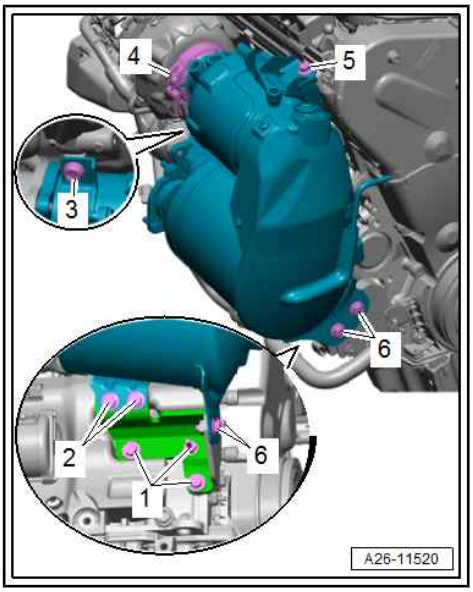


Note

Disregard -item 1-.

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– Loosen bolt -4- and remove screw-type clip.
– Slacken bolts -2- and remove bolts -3, 5, 6-.

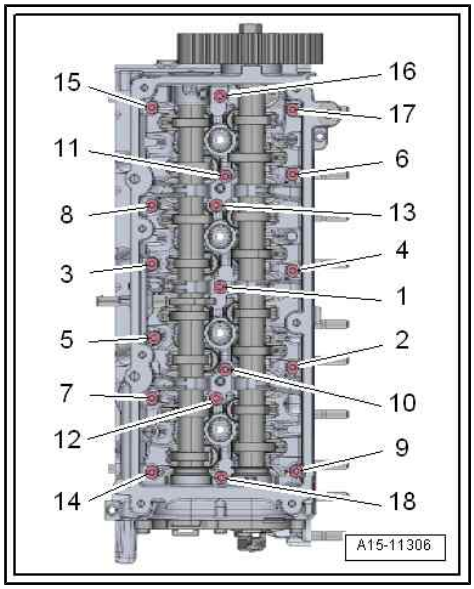


Note

Disregard -item 1-.

– Press emission control module slightly to right side.

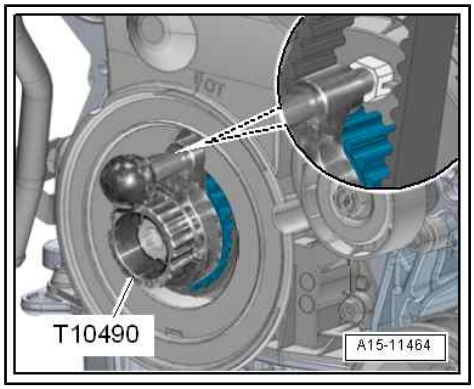
– Slacken camshaft housing bolts in the sequence -18 ... 1-.
– Remove bolts and carefully release and detach camshaft housing from bonded joint.



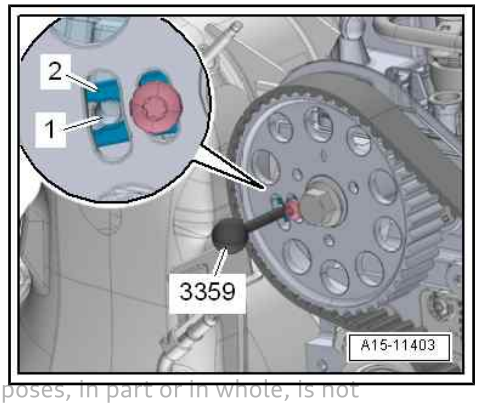
Installing

Requirements:

- Crankshaft is locked in position with crankshaft stop -T10490- .



- Camshaft hub locked with diesel injection pump locking pin -3359- .
- Bolt fitted but not tightened.



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Caution

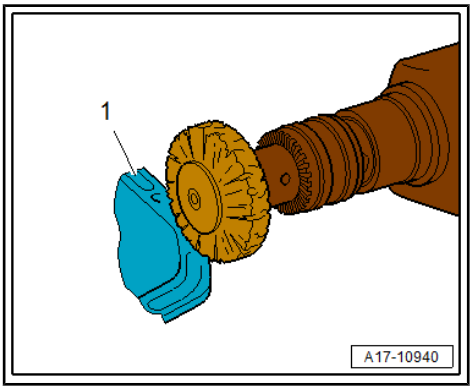
Protect lubrication system and bearings against contamination.

- *Cover exposed parts of the engine.*

WARNING

Risk of eye injury.

- *Put on safety goggles.*

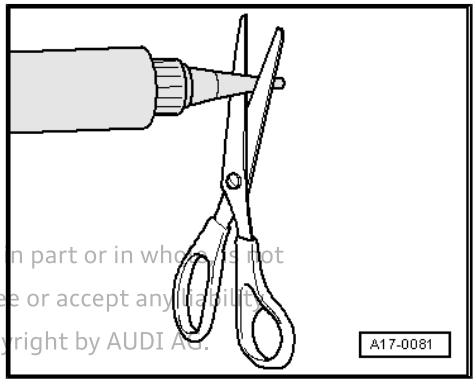


– Remove remaining sealant from cylinder head and camshaft housing -1- using rotating plastic brush or similar.
– Clean surfaces; they must be free of oil and grease.

Note

Note expiry date of sealant.

– Cut off nozzle of tube at front marking (nozzle ∅ approx. 1.5 mm).

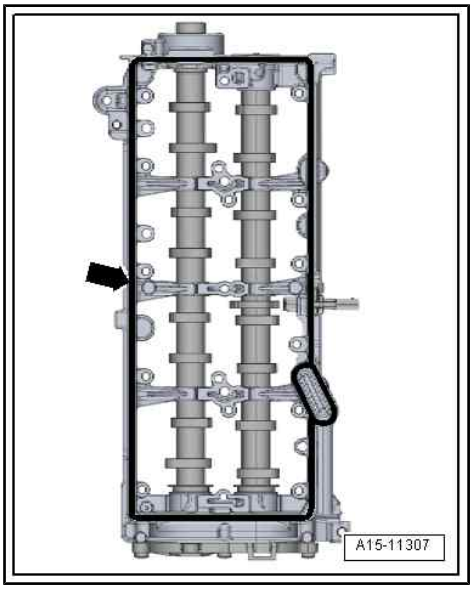


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Caution

Make sure excess sealant does not contaminate camshaft bearings.

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



– Apply sealant bead -arrow- onto clean sealing surfaces of camshaft housing as shown in illustration.

• Width of sealant beads: 2 mm.

Note

- *The camshaft housing must be installed within 5 minutes after applying the sealant.*
- *After installing the camshaft housing, wait about 30 minutes for the sealant to dry.*

– Carefully fit camshaft housing on cylinder head, paying attention to dowel pins.

– Tighten camshaft housing bolts ⇒ page 116 .

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

– Electrical connections and routing ⇒ Electrical system; Rep. gr. 97 ; Electrical connectors and ⇒ Current flow diagrams, Electrical fault finding and Fitting locations

– Install camshaft adjuster housing ⇒ page 122 .

– Install emission control module ⇒ page 335 .

– Install camshaft oil seal ⇒ page 116 .

– Install high-pressure reservoir (rail) ⇒ page 284 .

– Install cylinder head cover ⇒ page 103 .

– Install toothed belt (adjust valve timing) ⇒ page 76 .

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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.***

Tightening torques

- ⇒ Fig. ""Camshaft housing - tightening torque and sequence"" , page 116
- ⇒ Fig. ""Exhaust gas recirculation cooler - tightening torque and sequence"" , page 400
- ⇒ "2.1 Exploded view - emission control system", page 332

2.7 Checking compression

Compression pressure can be checked with ⇒ Vehicle diagnostic tester or with compression tester - V.A.G 1763- .

Procedure using ⇒ Vehicle diagnostic tester

– Connect a ⇒ Vehicle diagnostic tester.

– Switch on ignition.

– Select `Engine electronics` in vehicle self-diagnosis.

– Then select `Subsystems, conditions`.

– Select `Compression test` from the list.

If the result for one of the cylinders is unusual, check the compression using the compression tester - V.A.G 1763- .

Special tools and workshop equipment required

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



Procedure using compression tester - V.A.G 1763-

• Engine oil temperature at least 30 °C

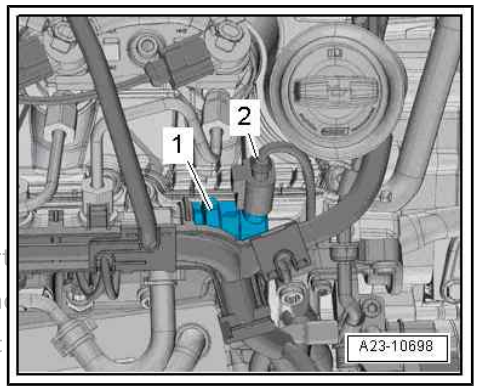
• Battery voltage at least 12.5 V

– Remove engine cover panel ⇒ page 34 .

– Unplug electrical connector on fuel pressure regulating valve - N276- -item 2-.

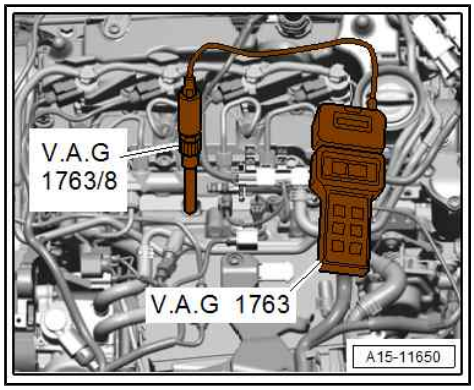
– Briefly start engine to relieve fuel pressure in high-pressure reservoir.

– Remove all glow plugs ⇒ page 407 .



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



Note

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

Attaching

Assembly is performed in reverse sequence; note the following:

– Install engine cover panel ⇒ page 34 .
– Erase any entries in event memory resulting from testing ⇒ Vehicle diagnostic tester, `Guided Functions`, then `Interrogate event memory`.

Tightening torques

◆ ⇒ “1.1 Exploded view - glow plug system”, page 406

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3 Valve gear

⇒ “3.1 Exploded view - valve gear”, page 113

⇒ “3.2 Removing and installing camshaft oil seal”, page 116

⇒ “3.3 Removing and installing camshaft control valve 1 N205 ”, page 120

⇒ “3.4 Removing and installing camshaft adjuster”, page 122

⇒ “3.5 Removing and installing control valve from camshaft control valve 1 N205 ”, page 125

⇒ “3.6 Removing and installing valve stem oil seals”, page 128

3.1 Exploded view - valve gear

Caution

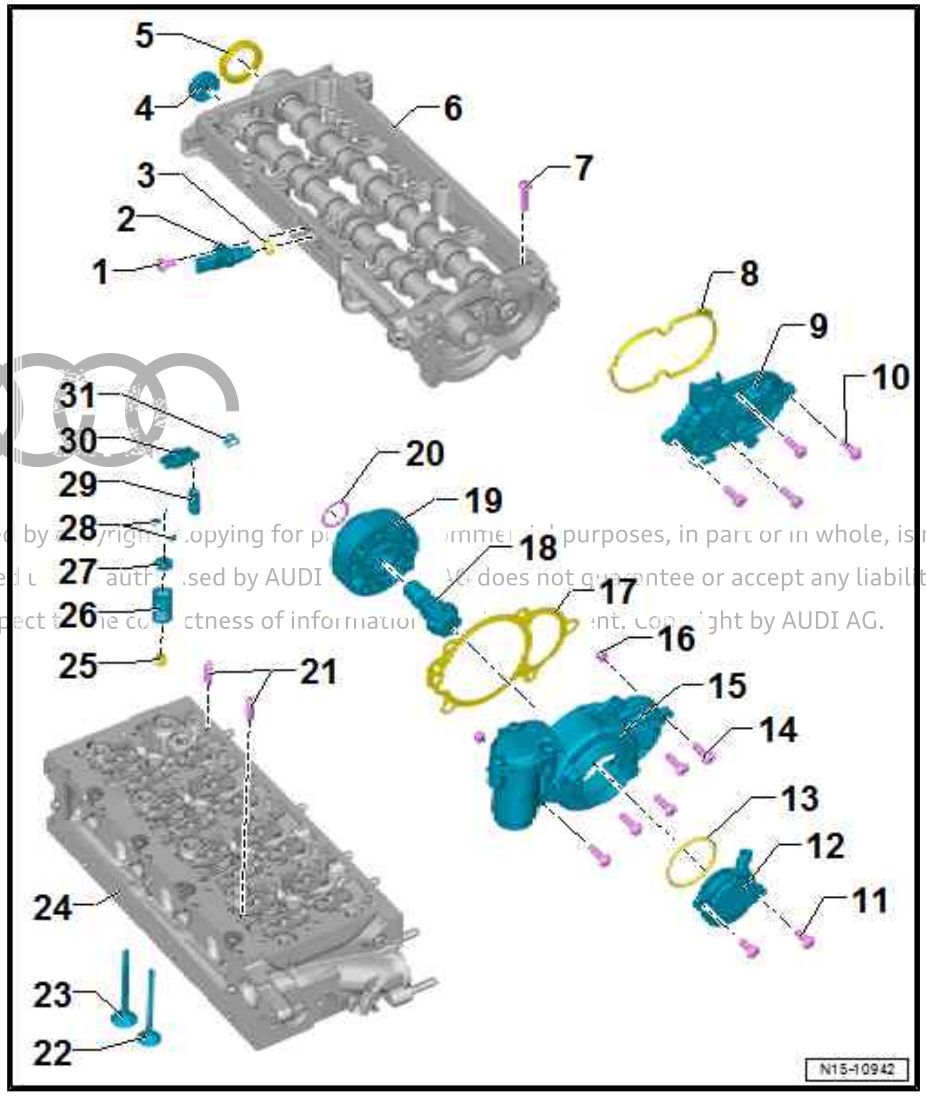
Risk of damage to valves and piston crowns after working on valve gear.

- *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.*

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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.



1 - Bolt

- ❑ Tightening torque ⇒ Item 5 (page 406)

2 - Hall sender - G40-

- ❑ Exploded view ⇒ page 406

3 - O-ring

- ❑ Renew after removing

4 - Sealing cap

- ❑ Renew after removing
- ❑ Removing: With camshaft housing installed, pierce one side of sealing cap with an awl and pry out
- ❑ Installing: Drive in without sealant until flush using suitable thrust piece, e.g. carrier - 3390-

5 - Camshaft oil seal

- ❑ Renewing ⇒ page 116

6 - Camshaft housing

- ❑ With integrated camshafts
- ❑ Removing and installing ⇒ page 105

7 - Bolt

- ❑ Renew after removing
- ❑ Correct sequence when slackening ⇒ page 116
- ❑ Tightening torque and sequence ⇒ page 116

8 - Gasket

- ❑ Renew after removing

9 - Cover

10 - Bolt

- ❑ 8 Nm

11 - Bolt

- ❑ 8 Nm

12 - Camshaft control valve 1 - N205-

- ❑ Adaption must be performed after renewal or removal and installation of camshaft control valve 1 - N205- ; to do so, use ⇒ Vehicle diagnostic tester, `Guided Functions`, `01 - Adaption elec. adjuster with checkback`
- ❑ Removing and installing ⇒ page 120

13 - Seal

- ❑ Renew after removing

14 - Bolt

- ❑ Tightening torque and sequence ⇒ page 116

15 - Housing

- ❑ For camshaft adjuster

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16 - Dowel sleeve

17 - Gasket

- ❑ Renew after removing

18 - Control valve

- ❑ Adaption must be performed after renewal or removal and installation; to do so, use ⇒ Vehicle diagnostic tester, `Guided Functions`, `01 - Adaption elec. adjuster with checkback`
- ❑ Removing and installing ⇒ page 125
- ❑ 50 Nm

19 - Camshaft adjuster

- ❑ Make sure that friction washer is fitted (risk of damage to engine)
- ❑ Adaption must be performed after renewal or removal and installation; to do so, use ⇒ Vehicle diagnostic tester, `Guided Functions`, `01 - Adaption elec. adjuster with checkback`
- ❑ Removing and installing ⇒ page 122

20 - Friction washer

- ❑ Check whether this component is fitted before installing camshaft adjuster

21 - Dowel pins

- ❑ For camshaft housing

22 - Exhaust valve

- ❑ Must not be machined; only grinding-in is permissible
- ❑ Mark installation position for re-installation
- ❑ Checking ⇒ page 138
- ❑ Valve dimensions ⇒ page 138
- ❑ Checking valve guides ⇒ page 137

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23 - Inlet valve

- ❑ Must not be machined; only grinding-in is permissible
- ❑ Mark installation position for re-installation
- ❑ Checking ⇒ page 138
- ❑ Valve dimensions ⇒ page 138
- ❑ Checking valve guides ⇒ page 137

24 - Cylinder head

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

25 - Valve stem oil seal

- ❑ Renewing ⇒ page 128

26 - Valve spring

27 - Valve spring plate

28 - Valve cotters

29 - Hydraulic compensation element

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

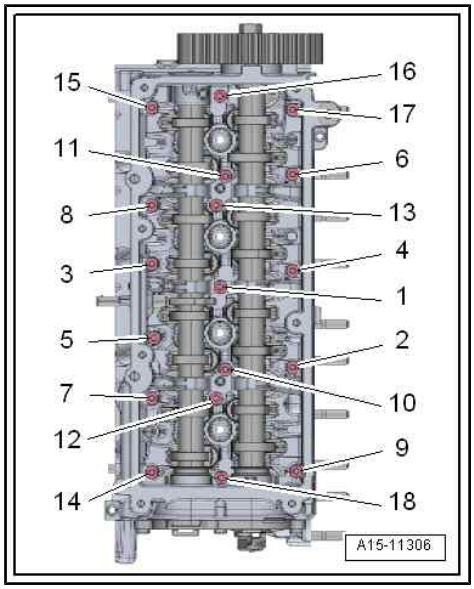
30 - Roller rocker finger

- ❑ Removing and installing ⇒ “2.6 Removing and installing camshaft housing”, page 105
- ❑ Mark installation position for re-installation
- ❑ Check roller bearings for ease of movement
- ❑ Lubricate contact surfaces before installing

31 - Securing clip

- ❑ For hydraulic compensation element

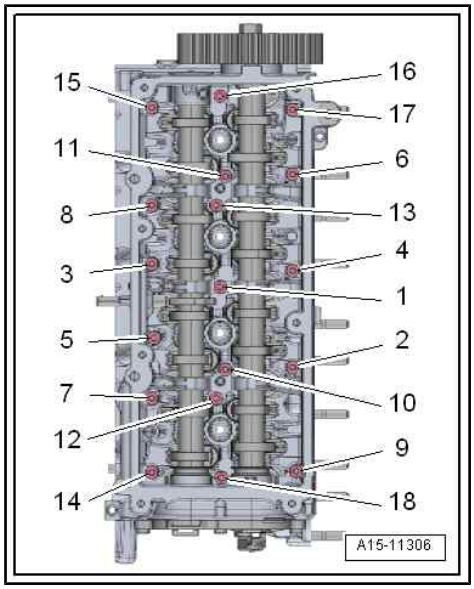
Slacken camshaft housing bolts in the sequence -18 ... 1-.



Camshaft housing - tightening torque and sequence

– Tighten bolts in stages in the sequence shown:

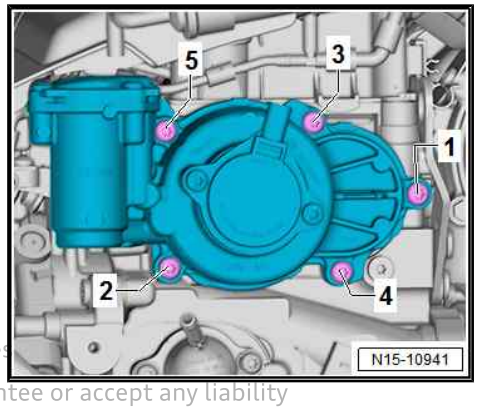
Stage	Bolts	Tightening torque
1.	-1 … 18-	Screw in by hand until contact is made • The camshaft housing should make contact with the cylinder head over the full surface.
2.	-1 … 18-	10 Nm



Camshaft adjuster housing - tightening torque and sequence

– Tighten bolts in stages in the sequence shown:

Stage	Bolts	Tightening torque
1.	-1 … 5-	Screw in by hand until contact is made
2.	-1 … 5-	8 Nm

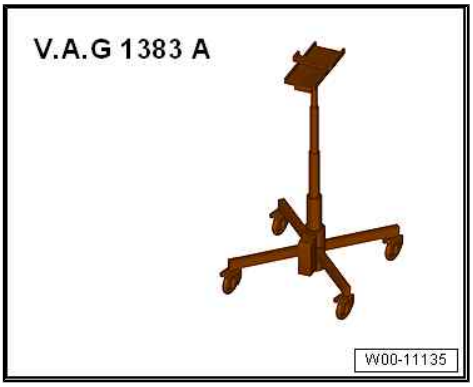


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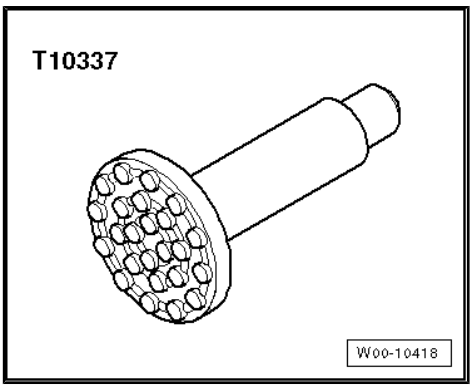
3.2 Removing and installing camshaft oil seal

Special tools and workshop equipment required

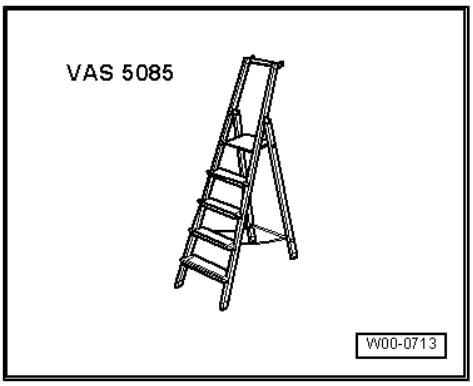
- Engine and gearbox jack - V.A.G 1383 A-



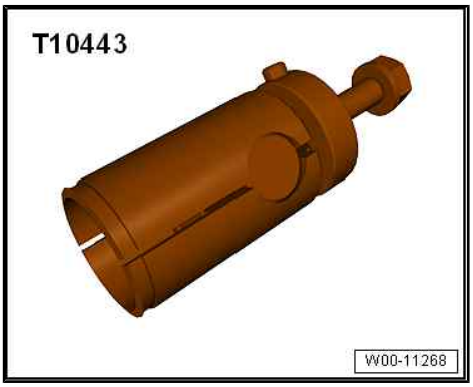
- Gearbox support - T10337-



- Stepladder - VAS 5085-

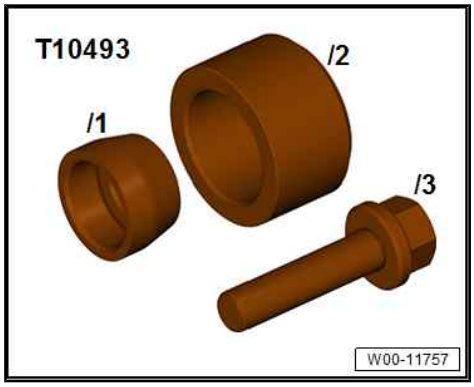


- Puller - T10443-



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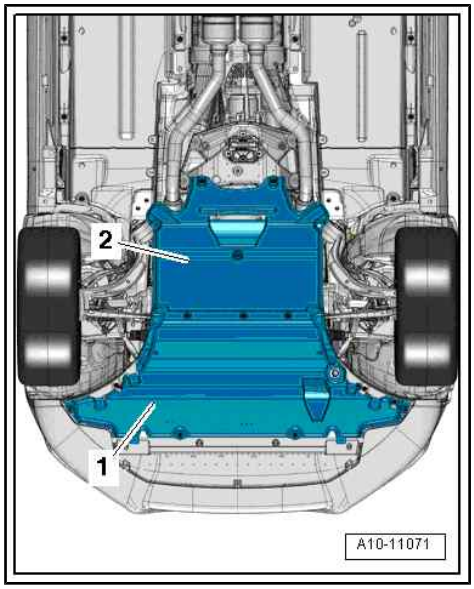
- Assembly tool - T10493-



Procedure

– Detach toothed belt from camshaft ⇒ page 71 .

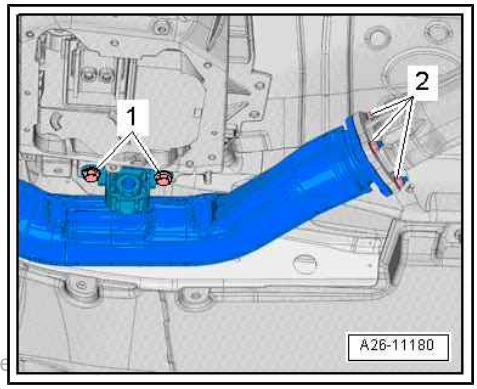
– Remove rear noise insulation -2- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .



– Unscrew bolts -1- and detach mounting from exhaust pipe.

Note

Disregard -item 2-.



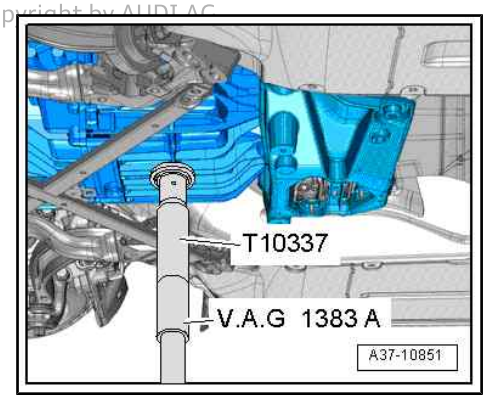
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– Position engine and gearbox jack -V.A.G 1383 A- (with gearbox support - T10337- attached) underneath gearbox.

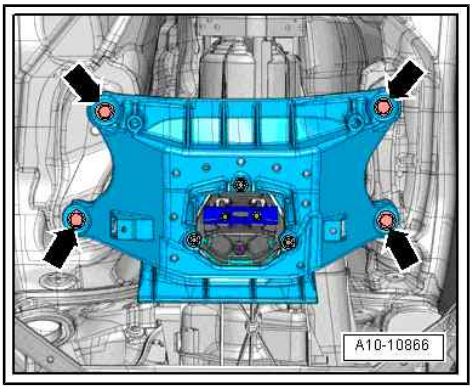
WARNING

Risk of accident.

- ***Engine and gearbox jack - V.A.G 1383 A- must remain in position when work is being carried out and must not be left unattended.***

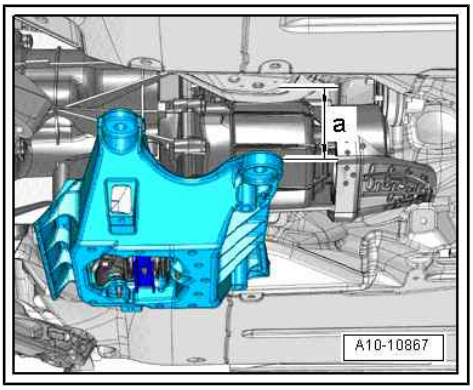


– Remove bolts -arrows- for tunnel cross member.



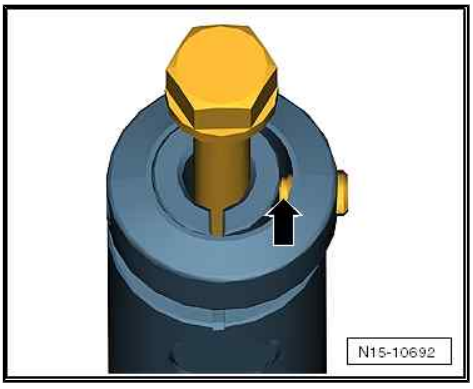
– Lower engine and gearbox jack - V.A.G 1383 A- as far as distance -a-.

• Dimension -a- = 50 mm



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.*



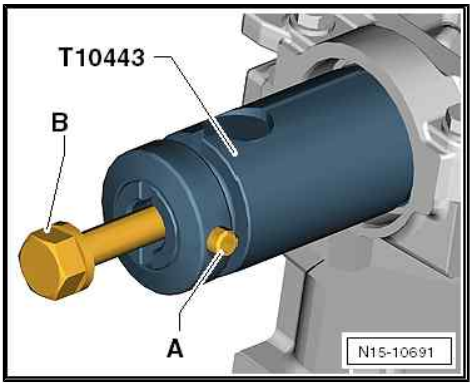
– Carefully unscrew grub screw -arrow- of puller -T10443- until slight resistance is felt.

– 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.

– Completely remove any oil residue on running and sealing surfaces using degreasing agent.

– Clean entire outer circumference of sealing lip of new oil seal using degreasing agent (remove wax layer).



Note:

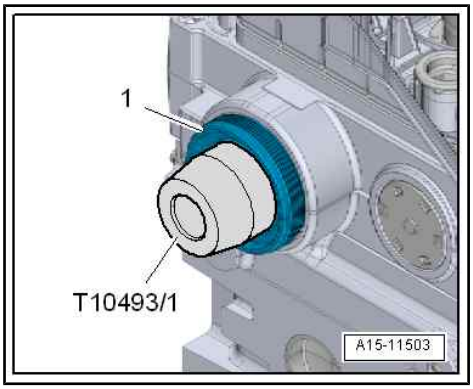
Use silicone adhesive sealant D 176 501 A1 to seal off oil seal.

– Apply silicone adhesive sealant evenly onto sealing lip of oil seal.

• Sealant bead must be applied evenly over entire circumference.

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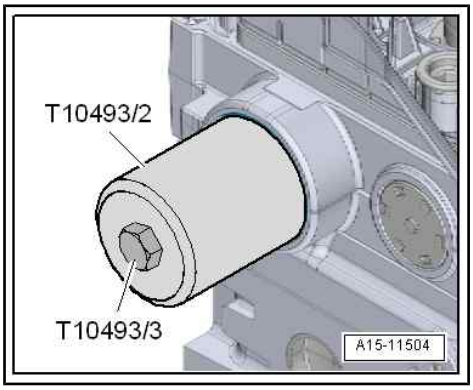
– Apply guide sleeve -T10493/1- to camshaft as shown in illustration.
– Carefully push oil seal -1- over guide sleeve and onto camshaft.



Note

When pressing in oil seal, guide sleeve remains on camshaft as a stop.

– Press oil seal in onto stop using press tool -T10493/2- and bolt -T10493/3- .
– Install toothed belt (adjust valve timing) ⇒ page 76 .
– Install tunnel cross-piece ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings or ⇒ Rep. gr. 37 ; Assembly mountings; Exploded view - assembly mountings .



Tightening torques

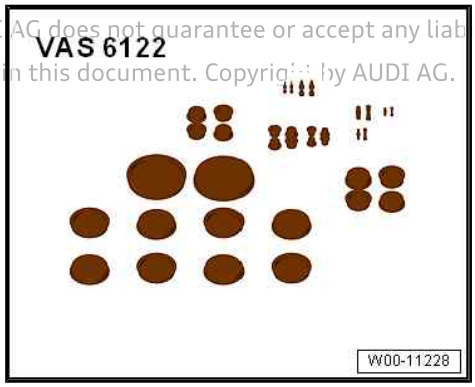
- ⇒ “1.1 Exploded view - silencers”, page 318
- Noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

3.3 Removing and installing camshaft control valve 1 - N205-

Special tools and workshop equipment required

- Engine bung set - VAS 6122-

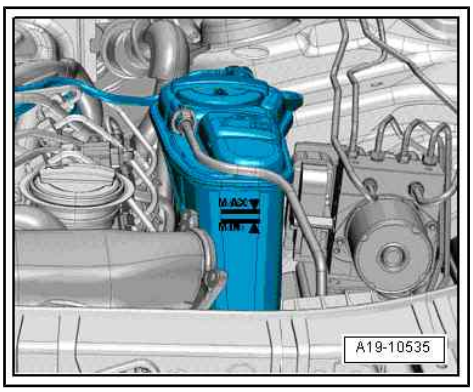
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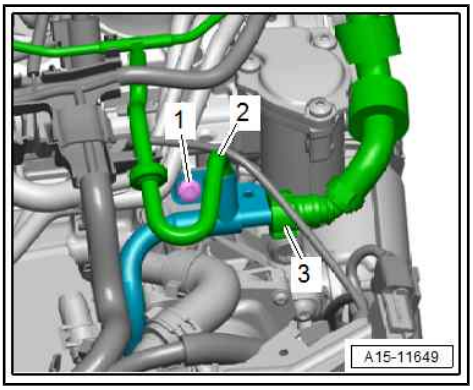
Removing

- Engine cold.

– To relieve residual pressure in cooling system: cover filler cap -arrow- on coolant expansion tank with a cloth and carefully open briefly and close again.
– Remove engine cover panel ⇒ page 34 .



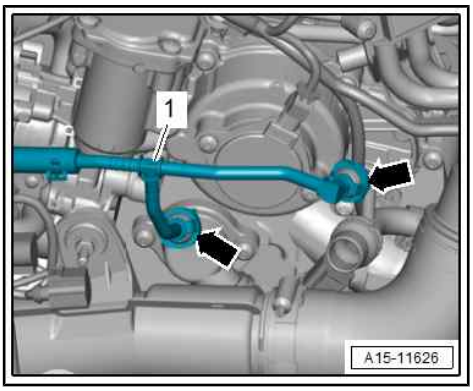
– Press release tabs on both sides and detach vacuum hose -3-.



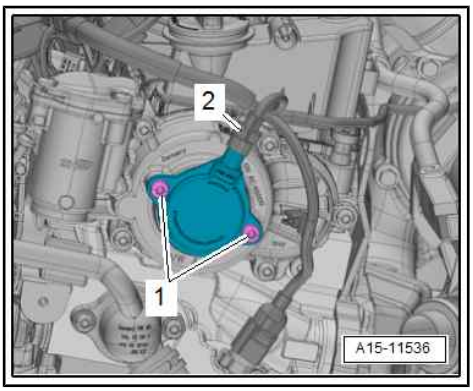
Note

Disregard items -1 and 2-.

– Lift retaining clips -arrows-, detach coolant hose -1- and place it to one side.
– Seal off open lines and connections with clean plugs from engine bung set - VAS 6122- .



– Unplug electrical connector -2-.
– Unscrew bolts -1- and remove camshaft control valve 1 - N205- .



Installing

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

Note

Renew O-ring.

– Bleed cooling system ⇒ page 172 .
– Install engine cover panel ⇒ page 34 .

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 elec. adjuster with checkback`

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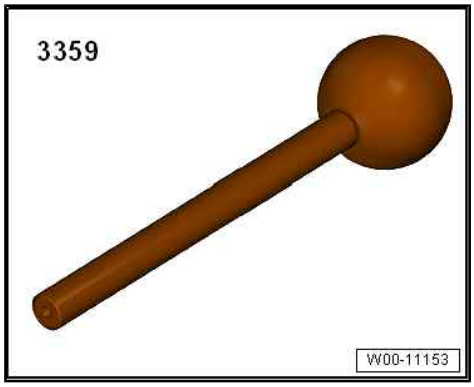
Tightening torques

- ⇒ “3.1 Exploded view - valve gear”, page 113

3.4 Removing and installing camshaft adjuster

Special tools and workshop equipment required

- Diesel injection pump locking pin - 3359-



Removing

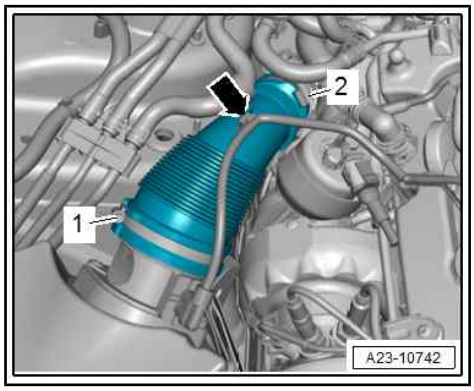
– Drain coolant ⇒ page 164 .

– Remove plenum chamber partition panel ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Exploded view - plenum chamber partition panel .

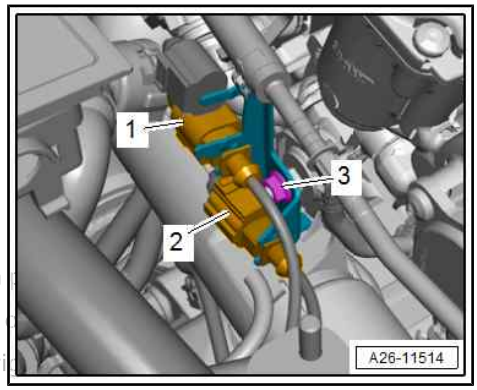
– Remove toothed belt cover (top) ⇒ page 69 .

– Move clear electrical wiring harness -arrow-.

– Release hose clips -1, 2- and detach air pipe.

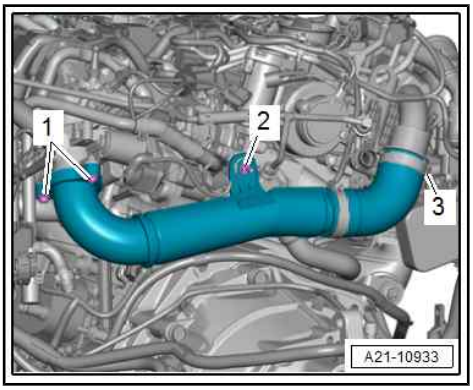


– Remove nut -3- and move bracket with electrical connectors -1, 2- to one side.

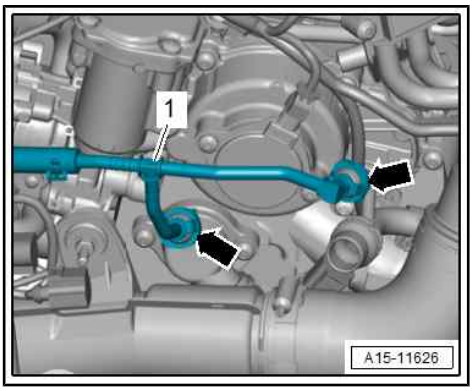


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– Remove bolts -1- and centre hex stud -2-.
– Release hose clip -3- and detach air pipe.



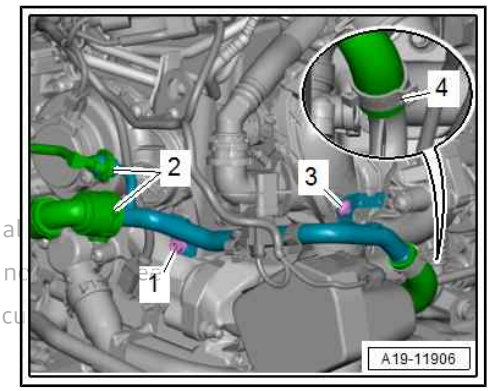
– Lift retaining clips -arrows-, detach coolant hose -1- and place it to one side.



– Unscrew nut -1-.
– Remove bolt -3- and press coolant pipe (rear right) slightly towards rear.

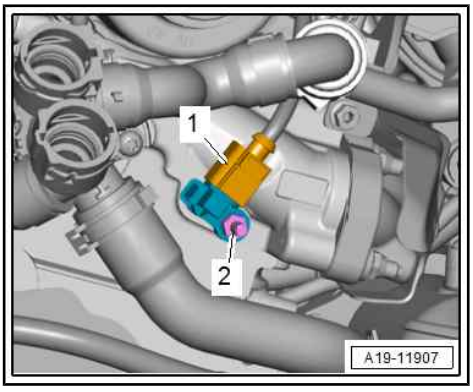
Note

Disregard items -2 and 4-.

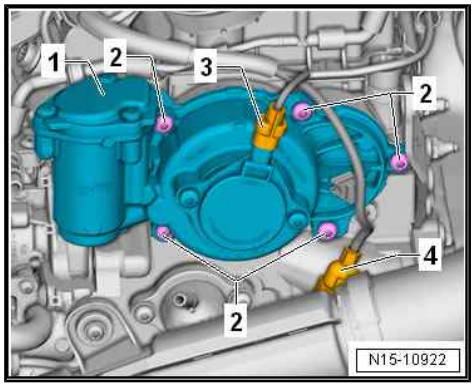


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– Unplug electrical connector -1- for coolant temperature sender - G62- and move electrical wiring clear.



– Unplug electrical connectors -3- and -4-. Pull retaining clip off housing.
– Remove bolts -2- and detach housing -1-.

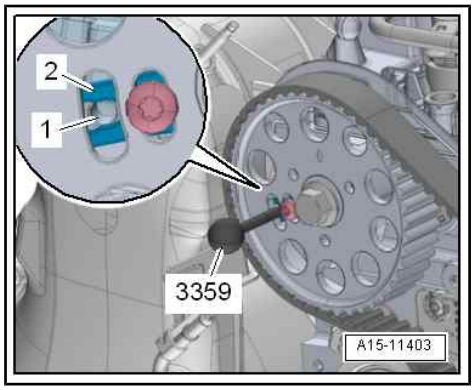


Caution

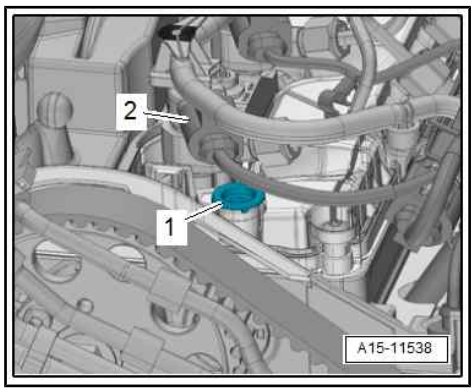
Irreparable damage can be caused if the toothed belt slips.

- *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- ; to do so, insert locking pin into fork on locating arm -2- and into hole -1- behind it in cylinder head.



– Unplug electrical connector -2- at injector for cylinder 1.
– Release plugs -1- on cylinder head cover by turning anti-clockwise and detach plugs.

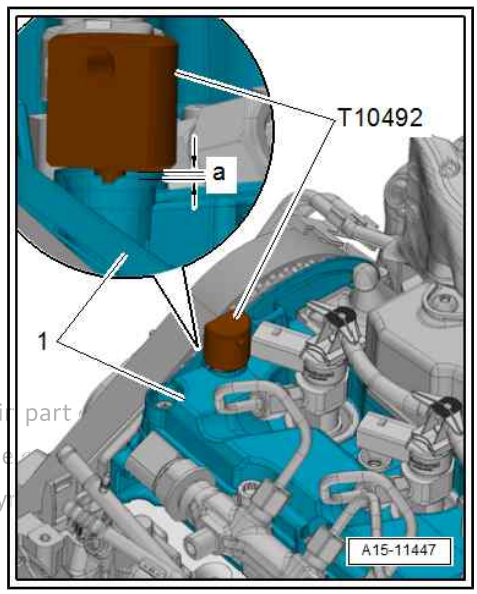


– Lock inlet camshaft with locking pin - T10492- ; note the following:

• Distance -a- must be about 1 mm.

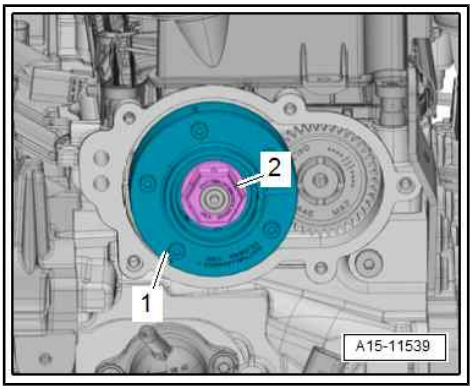
Caution

Before removing the control valve, check that the small piston in the centre of the control valve moves freely. Press the piston with your finger to check that it can be pressed in, and that it then returns to its end position. If the piston sticks, the control valve must be renewed, otherwise the engine may be damaged.



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– Unscrew control valve -2- and detach camshaft adjuster -1-.



Installing

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

Caution

A friction washer (diamond-coated washer) is fitted between the camshaft adjuster and the stub on the camshaft to ensure a secure fit. Before installing, it is very important to ensure that this friction washer is fitted in the camshaft adjuster, otherwise the camshaft adjuster may become detached when the engine is run, causing damage to the engine.

– Make sure that friction washer is fitted.
– Install toothed belt cover (top) ⇒ page 69 .
– Fill up with coolant ⇒ page 167 .
– Adaption must be performed after renewal or re-installation of camshaft adjuster; to do so, use ⇒ Vehicle diagnostic tester, `Guided Functions`, `01 - Adaption elec. adjuster with checkback`.

Tightening torques

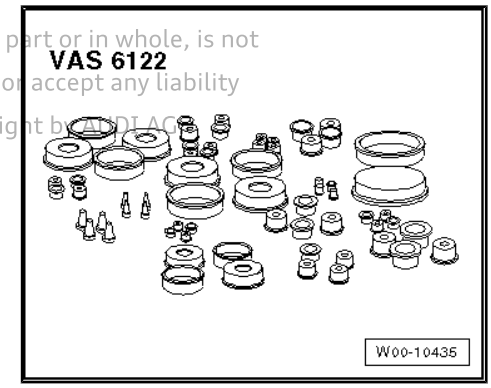
- ⇒ “3.1 Exploded view - valve gear”, page 113
- ⇒ “3.1 Exploded view - coolant pipes”, page 187
- ⇒ “2.1 Exploded view - charge air system”, page 235
- ⇒ “3.1 Exploded view - air cleaner housing”, page 253
- Plenum chamber partition panel ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Exploded view - plenum chamber partition panel

3.5 Removing and installing control valve from camshaft control valve 1 - N205-

Removing

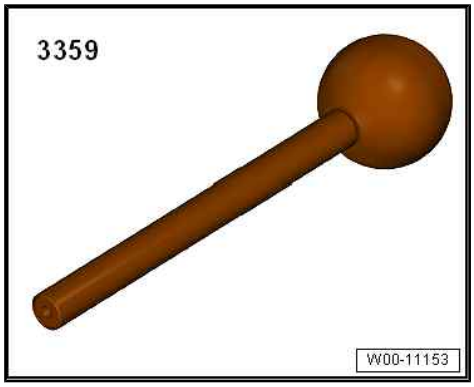
Special tools and workshop equipment required

- Engine bung set - VAS 6122-



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♦ Diesel injection pump locking pin - 3359-



♦ Locking pin - T10492-



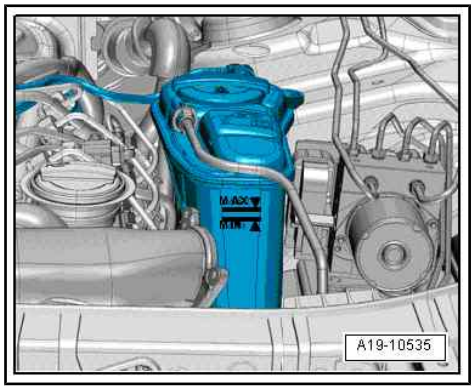
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Removing

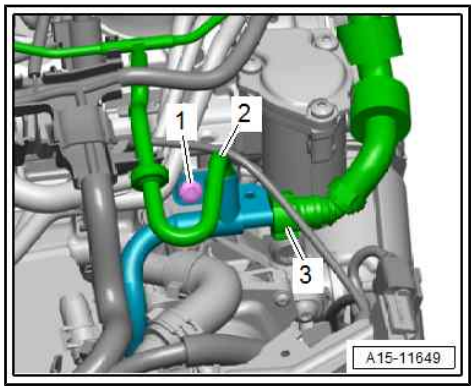
• Engine cold.

– Open filler cap on coolant expansion tank briefly and allow residual pressure in cooling system to dissipate.

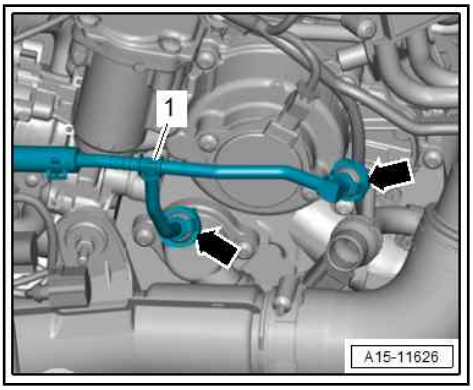
– Remove engine cover panel ⇒ page 34 .



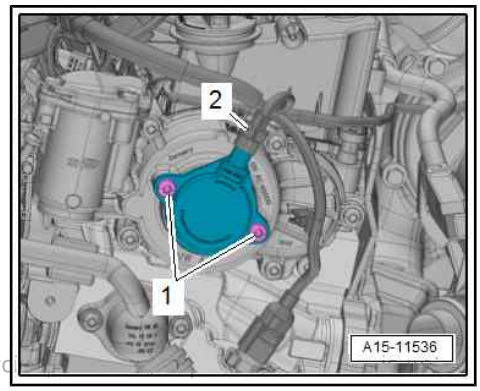
– Press release tabs on both sides and detach vacuum hose -3-.



– Lift retaining clips -arrows-, detach coolant hose -1- and place it to one side.
– Seal off open lines and connections with clean plugs from engine bung set - VAS 6122- .



– Unplug electrical connector -2-.
– Unscrew bolts -1- and remove camshaft control valve 1 - N205- .
– Remove toothed belt cover (top) ⇒ page 69 .



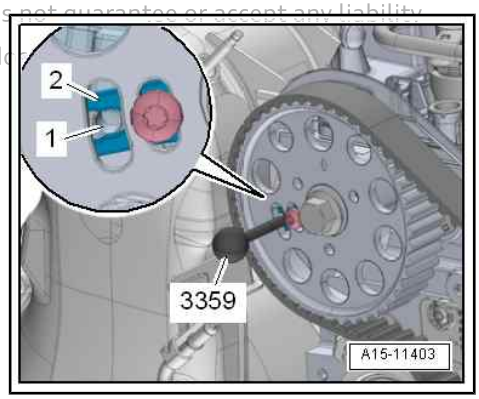
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– Rotate crankshaft by turning bolt on crankshaft sprocket until camshaft sprocket is positioned at “TDC”.

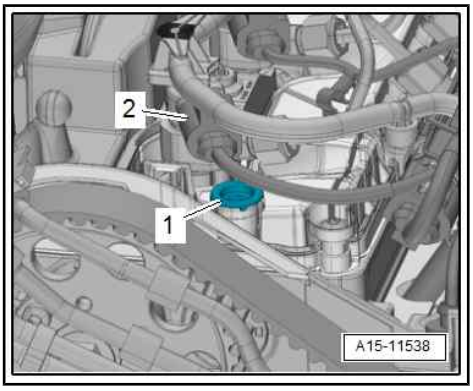
Caution

Irreparable damage can be caused if the toothed belt slips.

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

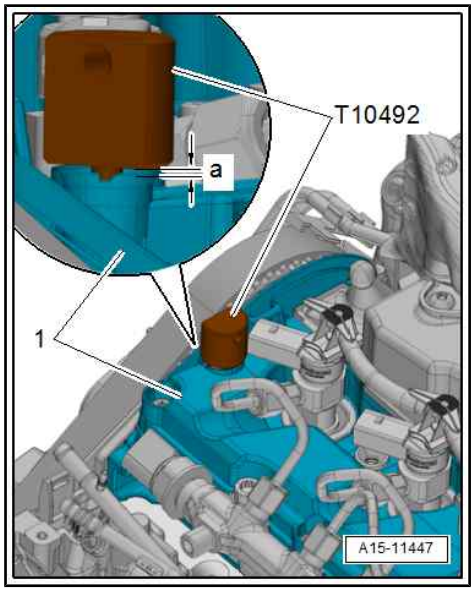


– Lock camshaft hub with diesel injection pump locking pin - 3359- ; to do so, insert locking pin into fork on locating arm -2- and into hole -1- behind it in cylinder head.
– Unplug electrical connector -2- at injector for cylinder 1.
– Release plugs -1- on cylinder head cover by turning anti-clockwise and detach plugs.

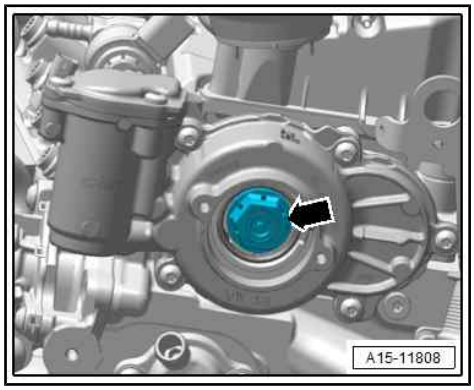


– Lock inlet camshaft with locking pin - T10492- ; note the following:

• Distance -a- must be about 1 mm.



– Unscrew and pull out control valve -arrow-.



Installing

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

Note

Renew O-ring after removal.

– Install toothed belt cover (top) ⇒ page 69 .

– Connect coolant line with plug-in connector ⇒ page 202 .

– Bleed cooling system ⇒ page 172 .

– Install engine cover panel ⇒ page 34 .

– Adaption must be performed after renewal or removal and installation; to do so, use ⇒ Vehicle diagnostic tester, `Guided Functions`, `01 - Adaption elec. adjuster with check-back`.

Tightening torques

♦ ⇒ “3.1 Exploded view - valve gear”, page 113

3.6 Removing and installing valve stem oil seals

⇒ “3.6.1 Removing and installing valve stem oil seals (cylinder head installed)”, page 128

⇒ “3.6.2 Removing and installing valve stem oil seals (cylinder head removed)”, page 132

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3.6.1 Removing and installing valve stem oil seals (cylinder head installed)

Special tools and workshop equipment required

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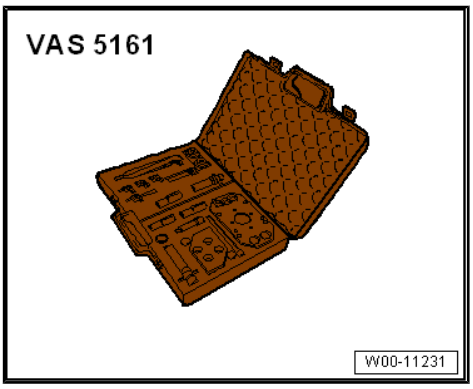
- Valve stem seal puller - 3364-



- Valve stem seal fitting tool - 3365-



- Removal and installation device for valve cotters - VAS 5161 A- with sealing pin -VAS 5161/29-2- , guide plate -VAS 5161 A/31- and sleeve -VAS 5161 A/31-1- .



Procedure

– Remove all glow plugs ⇒ page 407 .

– Remove camshaft housing ⇒ page 105 .

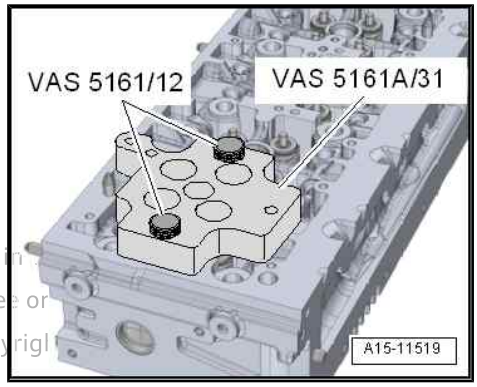
– Mark original positions of roller rocker fingers and hydraulic compensation elements for re-installation.

– 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”.

Cylinders 1, 3, 4:

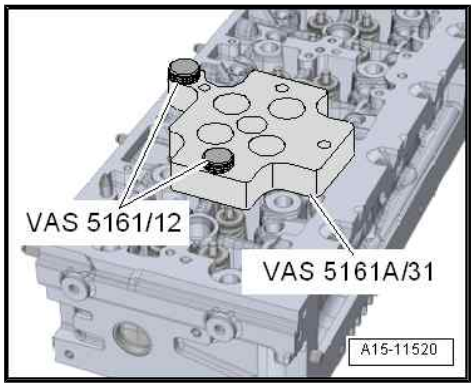
– Fit guide plate -VAS 5161 A/31- onto cylinder head.
• The lettering -A- faces towards turbocharger side
• The lettering -E- faces towards intake manifold side
– Secure guide plate with knurled screws -VAS 5161/12- by hand.
• Position of knurled screws, as shown in illustration



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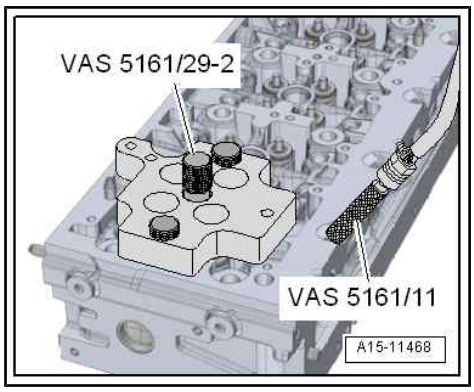
Cylinder 2:

– Fit guide plate -VAS 5161 A/31- onto cylinder head.
• The lettering -A- faces towards turbocharger side
• The lettering -E- faces towards intake manifold side
– Secure guide plate with knurled screws -VAS 5161/12- by hand.
• Position of knurled screws, as shown in illustration

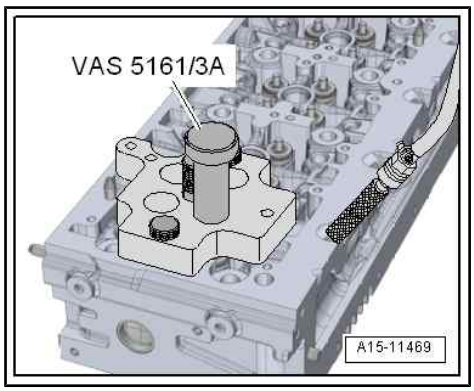


Continued for all cylinders:

– Screw sealing pin -VAS 5161/29-2- into guide plate.
– Screw adapter -VAS 5161/11- hand-tight into corresponding glow plug thread.



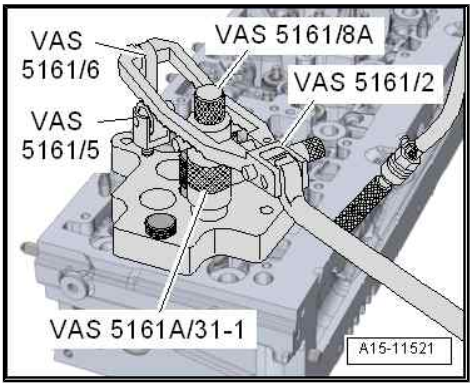
– Insert drift -VAS 5161/3A- into guide plate and use plastic-headed hammer to release sticking valve cotters.



– Screw snap-in device -VAS 5161/6- with engaging fork -VAS 5161/5- into guide plate.
– Insert assembly cartridge -VAS 5161/8A- (slide on sleeve -VAS 5161 A/31-1-) in guide plate.
– Connect adapter to compressed air line using a commercially available connection piece and apply constant air pressure.

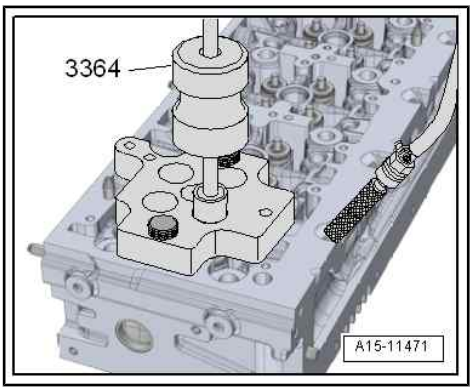
• Minimum pressure: 6 bar

– 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.



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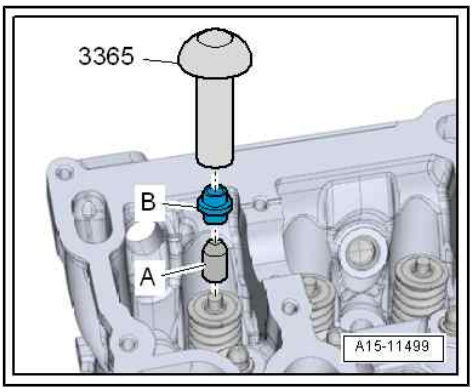
– Pull off valve stem oil seal with valve stem seal puller - 3364- .



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.***



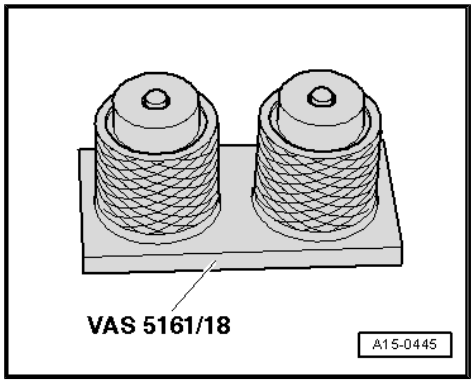
– Lightly oil sealing lip of valve stem oil seal.
– Slide valve stem oil seal onto plastic sleeve.
– Carefully press valve stem oil seal onto valve guide using valve stem seal fitting tool - 3365- .
– Take off plastic sleeve.

If valve cotters have been removed from assembly cartridge, they must first be inserted in insertion device -VAS 5161/18- .

- 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.

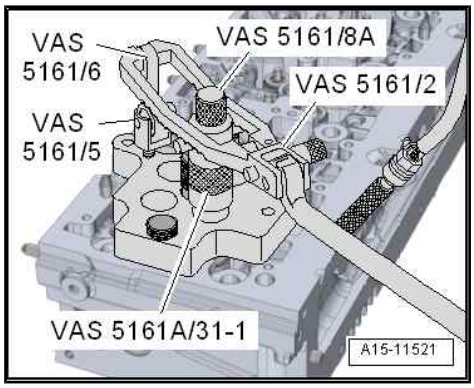


– Insert assembly cartridge in guide plate -VAS 5161 A/31- again.

– 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.



Attaching

Assembly is performed in reverse sequence; 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.

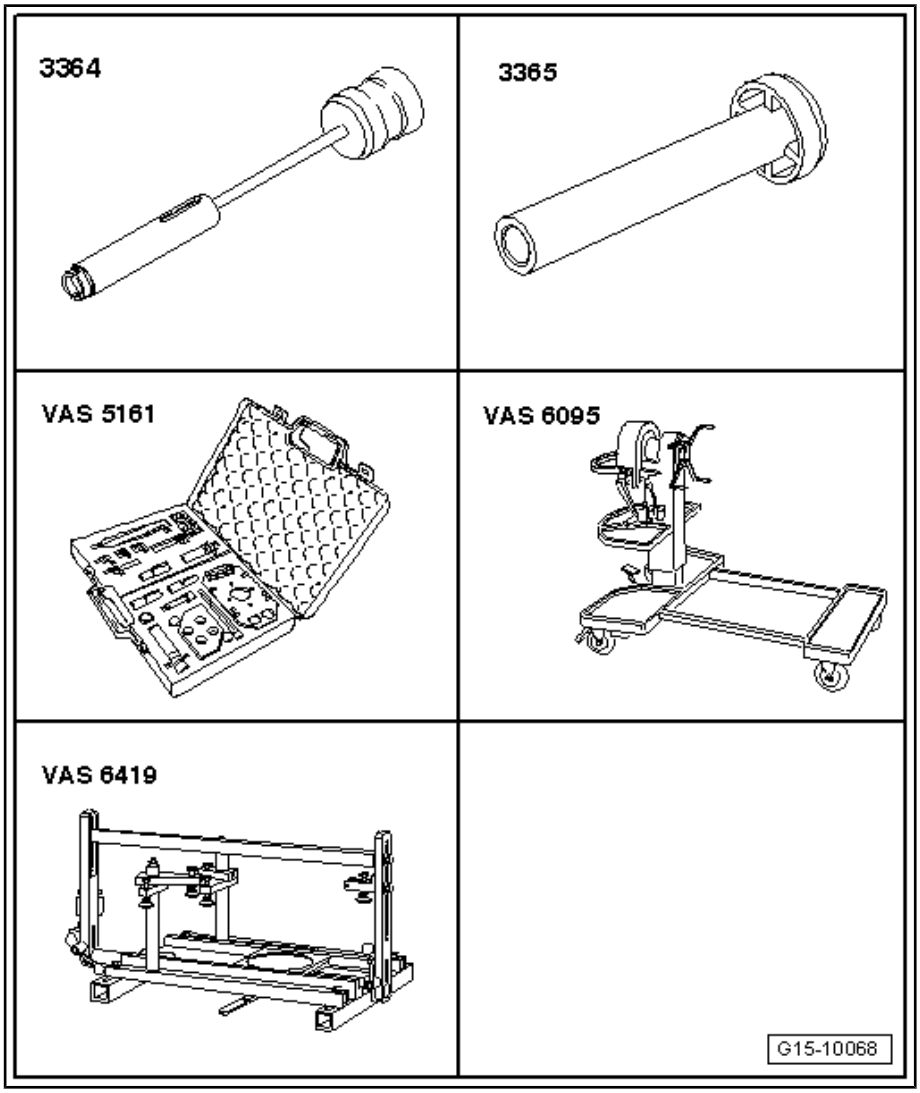
– Install camshaft housing ⇒ page 105 .

– Install glow plugs ⇒ page 406 .

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3.6.2 Removing and installing valve stem oil seals (cylinder head removed)

Special tools and workshop equipment required



- Valve stem seal puller - 3364-
- Valve stem seal fitting tool - 3365-
- Removal and installation device for valve cotters - VAS 5161 A- with guide plate -VAS 5161 A/31- and sleeve -VAS 5161 A/31-1- .
- Engine and gearbox support - VAS 6095-
- Cylinder head tensioning device - VAS 6419-

Procedure

– 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.

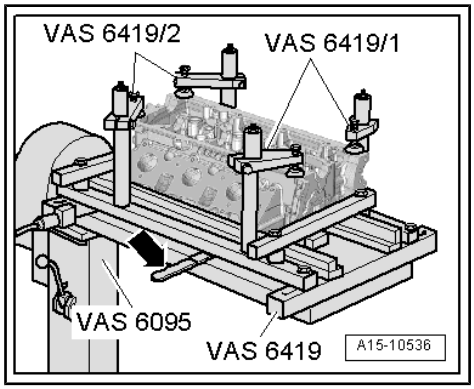
– Remove cylinder head ⇒ page 97 .

Note

Intake manifold and exhaust manifold must be detached from cylinder head after it has been removed.

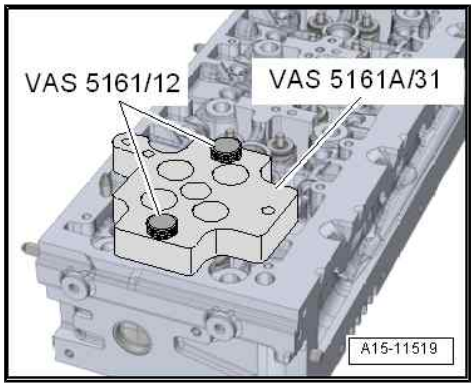
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– Insert cylinder head tensioning device - VAS 6419- into engine and gearbox support - VAS 6095- .
– Secure cylinder head in cylinder head tensioning device, as shown in illustration.
– Connect cylinder head tensioning device to compressed air supply.
– 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.



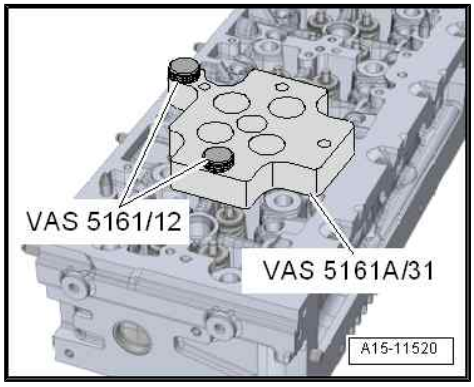
Cylinders 1, 3, 4:

– Fit guide plate -VAS 5161 A/31- onto cylinder head.
• The lettering -A- faces towards turbocharger side
• The lettering -E- faces towards intake manifold side
– Secure guide plate with knurled screws -VAS 5161/12- by hand.
• Position of knurled screws, as shown in illustration



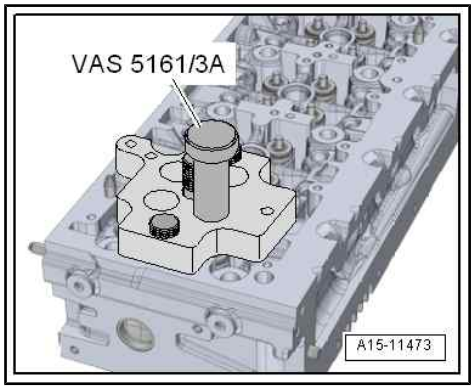
Cylinder 2:

– Fit guide plate -VAS 5161 A/31- onto cylinder head.
• The lettering -A- faces towards turbocharger side
• The lettering -E- faces towards intake manifold side
– Secure guide plate with knurled screws -VAS 5161/12- by hand.
• Position of knurled screws, as shown in illustration



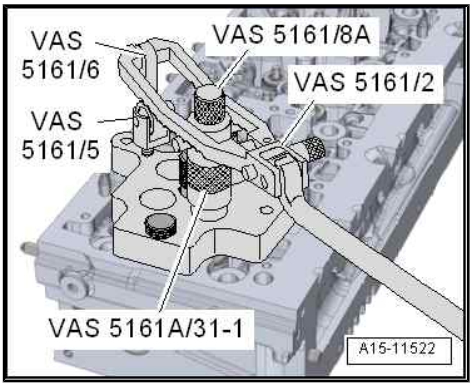
Continued for all cylinders:

– Insert drift -VAS 5161/3A- into guide plate and use plastic-headed hammer to release sticking valve cotters.

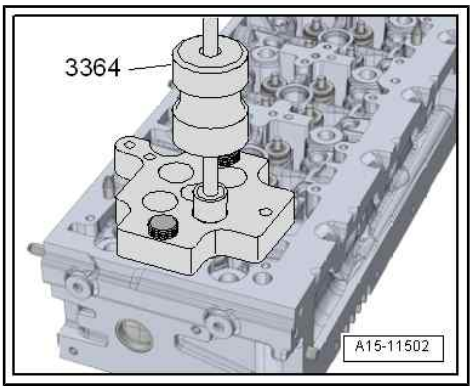


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– Screw snap-in device -VAS 5161/6- with engaging fork - VAS 5161/5- into guide plate.
– Insert assembly cartridge -VAS 5161/8A- (slide on sleeve - VAS 5161 A/31-1-) in guide plate.
– Attach pressure fork -VAS 5161/2- to snap-in device and push assembly 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.



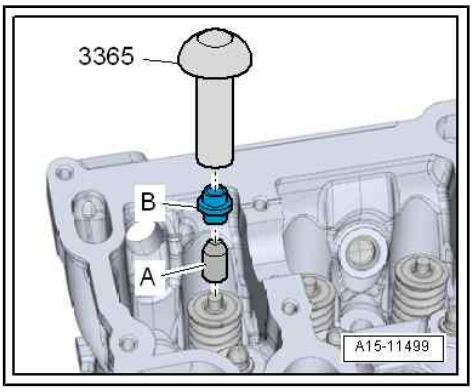
– Pull off valve stem oil seal with valve stem seal puller - 3364- .



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.***

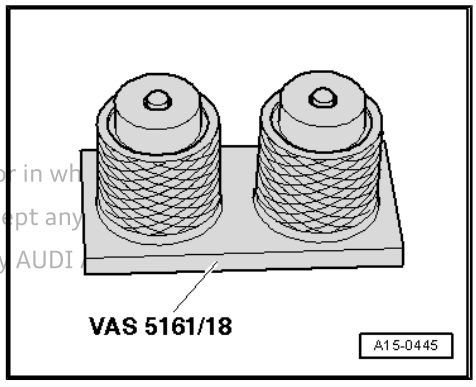


– Lightly oil sealing lip of valve stem oil seal.
– Slide valve stem oil seal onto plastic sleeve.
– Carefully press valve stem oil seal onto valve guide using valve stem seal fitting tool - 3365- .
– Take off plastic sleeve.

If valve cotters have been removed from assembly cartridge, they must first be inserted in insertion device -VAS 5161/18- .

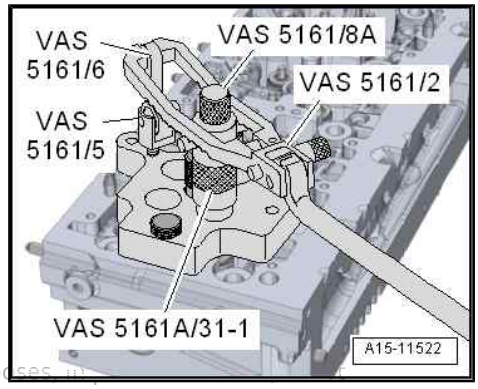
- Larger diameter of valve cotters faces upwards.

– Press assembly cartridge onto insertion device from above and take up valve cotters.
– Insert valve spring and valve spring plate.



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- Insert assembly cartridge in guide plate -VAS 5161 A/31- 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.



Attaching

Assembly is performed in reverse sequence; 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.

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4 Inlet and exhaust valves

⇒ “4.1 Checking valve guides”, page 137

⇒ “4.2 Checking valves”, page 138

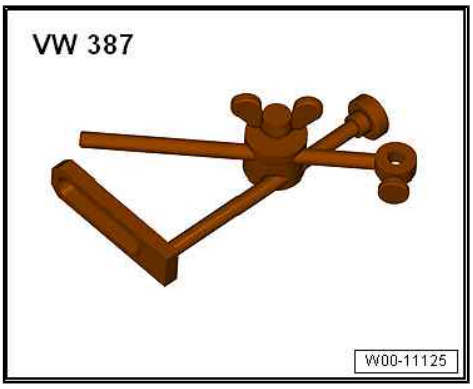
⇒ “4.3 Valve dimensions”, page 138

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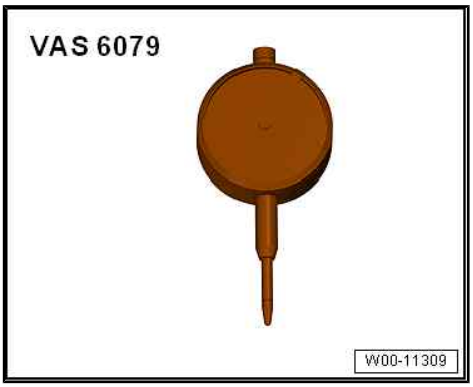
4.1 Checking valve guides

Special tools and workshop equipment required

- Universal dial gauge bracket - VW 387-



- Dial gauge - VAS 6079-

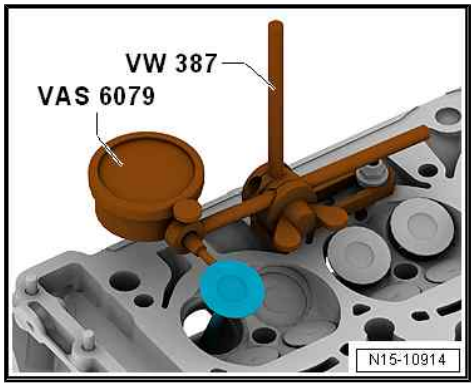


Procedure

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.

4.2 Checking valves

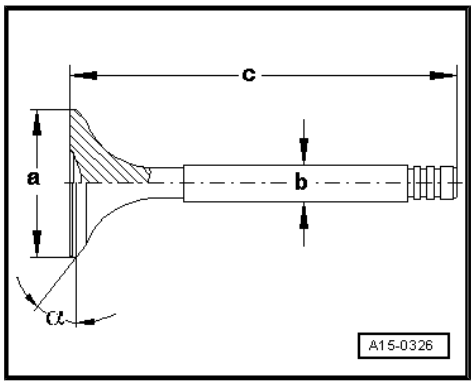
– Visually inspect for scoring on valve stems and valve seat surfaces.
– Renew valve if scoring is clearly visible.

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4.3 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

17 – Lubrication

1 Sump/oil pump

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⇒ “1.1 Exploded view - sump/oil pump”, page 139

⇒ “1.2 Engine oil”, page 142

⇒ “1.3 Removing and installing sump”, page 142

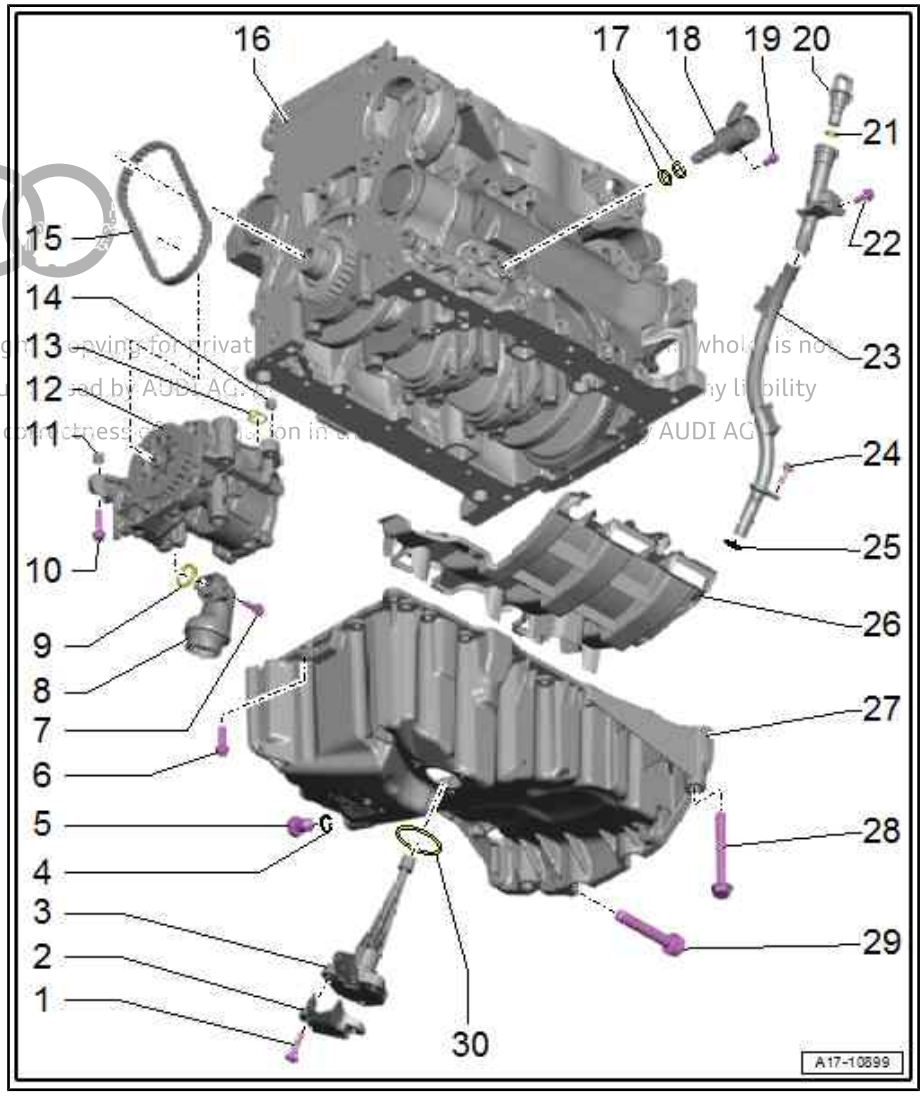
⇒ “1.4 Removing and installing oil pump”, page 147

⇒ “1.5 Removing and installing oil level and oil temperature sender G266 ”, page 147

1.1 Exploded view - sump/oil pump

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, oil filter housing with engine oil cooler and oil filter.*
- *Oil spray jet and pressure relief valve ⇒ page 61*



1 - Bolt
- ❑ Self-locking
- ❑ Renew after removing
- ❑ Clean threaded holes for bolts using a thread tap or similar
- ❑ 8 Nm

2 - Cover

3 - Oil level and oil temperature sender - G266-
- ❑ Removing and installing ⇒ page 147

4 - Seal
- ❑ Renew after removing

5 - Oil drain plug
- ❑ 30 Nm

6 - Bolt
- ❑ Tightening torque and sequence ⇒ page 141

7 - Bolt
- ❑ 8 Nm +90°

8 - Oil intake pipe

9 - O-ring
- ❑ Renew after removing

10 - Bolt
- ❑ Tightening torque and sequence ⇒ Fig. ""Oil pump - tightening torque and sequence"" , page 142

11 - Dowel sleeve

12 - Oil pump
- ❑ With vacuum pump
- ❑ Removing and installing ⇒ page 147

13 - Gasket
- ❑ Renew after removing

14 - Dowel sleeve

15 - Toothed belt
- ❑ Removing:
- – Remove oil pump ⇒ page 147 .
- – Remove sealing flange (pulley end) ⇒ page 43 .

Caution

Do not kink or twist toothed belt, or allow it to be damaged on sharp edges.

16 - Cylinder block

17 - O-rings

- ❑ Renew after removing

18 - Valve for oil pressure control - N428-

- ❑ Removing and installing ⇒ page 158

19 - Bolt

- ❑ 8 Nm

20 - Oil dipstick

21 - O-ring

- ❑ Renew after removing

22 - Centre hex stud

- ❑ 8 Nm

23 - Dipstick guide tube

24 - Bolt

- ❑ 8 Nm

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25 - O-ring

- ❑ Renew after removing

26 - Baffle plate

27 - Sump

- ❑ Removing and installing ⇒ page 142

28 - Bolt

- ❑ Tightening torque and sequence ⇒ page 141

29 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 34 ; Removing and installing gearbox; Tightening torques for gearbox or ⇒ Rep. gr. 37 ; Removing and installing gearbox; Tightening torques for gearbox

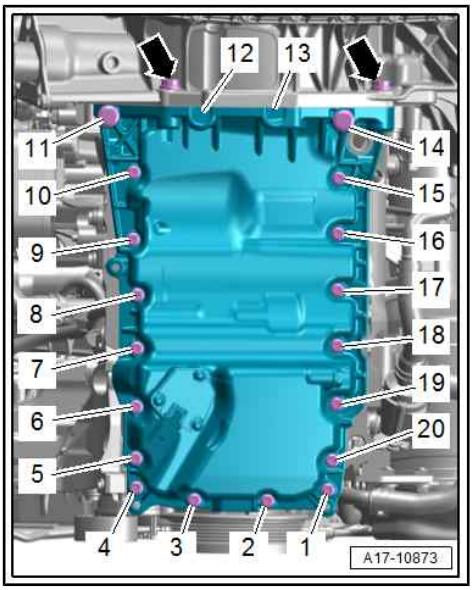
30 - Seal

- ❑ Renew after removing

Sump - tightening torque and sequence

– Tighten bolts in stages as follows:

Stage	Bolts	Tightening torque
1.	-1 … 10-, -12 and 13-, -15 … 20-	5 Nm in diagonal sequence
2.	-arrows-	⇒ Gearbox; Rep. gr. 34 ; Removing and installing gearbox; Tightening torques for gearbox
3.	-1 … 10-, -12 and 13-, -15 … 20-	Tighten in stages and in diagonal sequence; final torque 13 Nm
4.	-11 and 14-	40 Nm

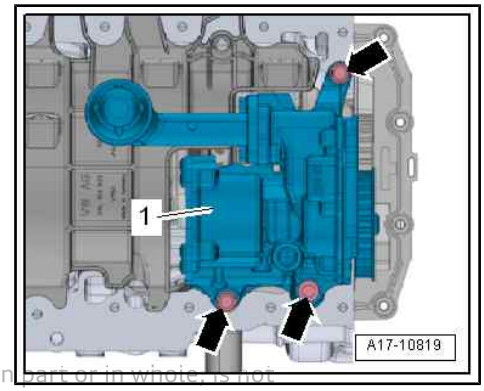


Oil pump - tightening torque and sequence

- After removing, renew bolts tightened with specified tightening angle.

– Tighten bolts -1, 2, 3- in stages in the sequence shown:

Stage	Tightening torque/angle specification
1.	Screw in by hand until contact is made
2.	12 Nm
3.	Turn 180° further



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1.2 Engine oil

Oil capacities, oil specifications and viscosity grades ⇒ Maintenance tables .

Caution

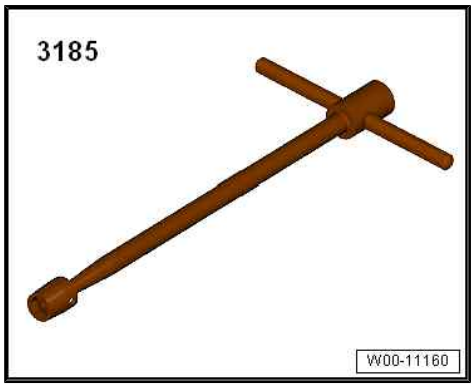
Risk of damage to catalytic converter.

- *The oil level must not be above the "MAX" mark on the dipstick.*

1.3 Removing and installing sump

Special tools and workshop equipment required

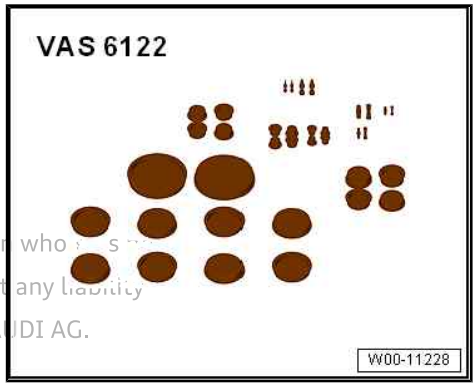
- Articulated wrench, 10 mm - 3185-



- Socket - T10058-



♦ Engine bung set - VAS 6122-



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♦ Electric drill with plastic brush

♦ Sealant ⇒ Electronic parts catalogue

♦ Safety goggles

Removing

• Engine oil drained.

♦ A5 Coupé ⇒ Maintenance ; Booklet 811

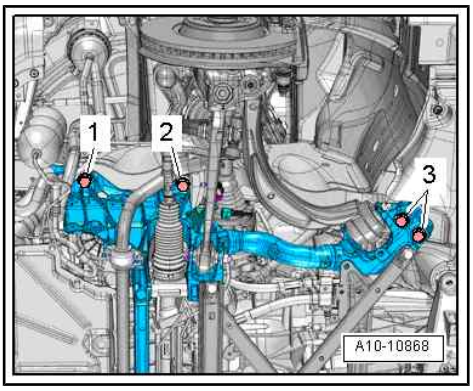
♦ A4 ⇒ Maintenance ; Booklet 812

♦ A5 Cabriolet ⇒ Maintenance ; Booklet 818

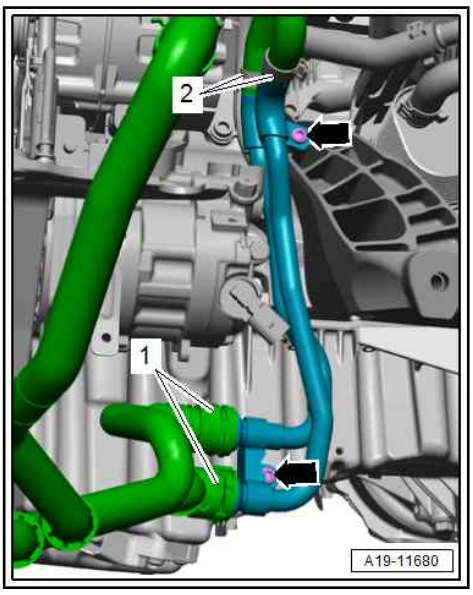
♦ Q5 ⇒ Maintenance ; Booklet 817

– Remove subframe ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Exploded view - subframe .

– Remove torque reaction support ⇒ page 30 .



– Remove bolts -arrows-.

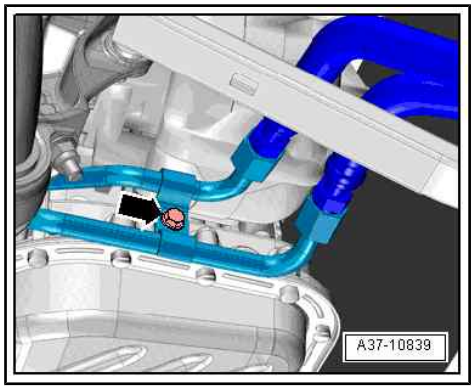


Note

Disregard items -1 and 2-.

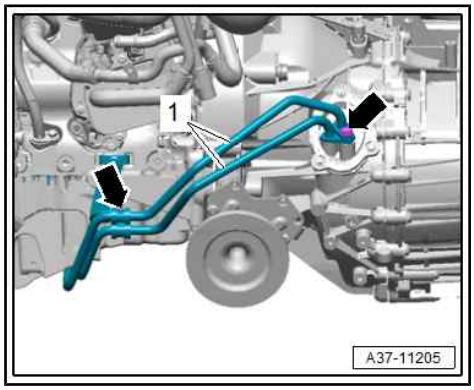
Vehicles with multitronic gearbox:

– Remove bolt -arrow- for ATF lines.



Note

- *Lay a clean cloth under the separating point to catch escaping ATF.*
- *Illustration shows A4.*



– Remove bolts -arrows -, detach ATF lines -1- from gearbox and tie to side.

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

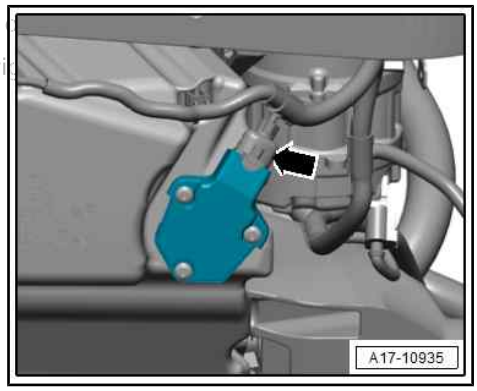
All vehicles (continued):

– Remove noise insulation for sump.

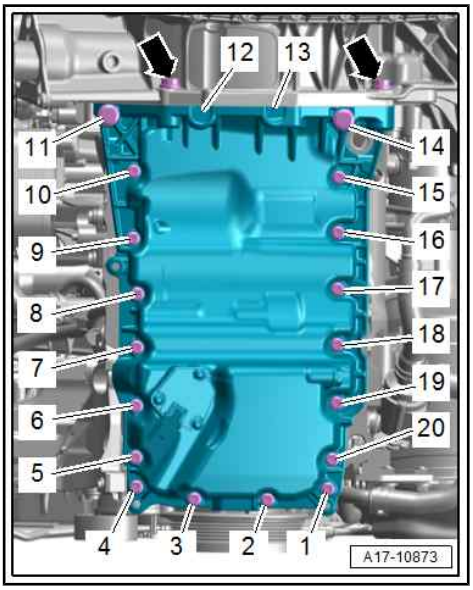
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– Unplug electrical connector -arrow- at oil level and oil temperature sender - G266- .

– Move electrical wiring harness clear at 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.

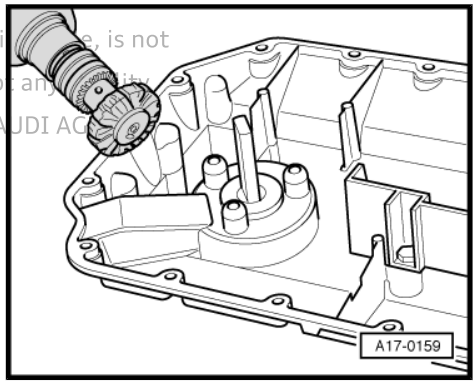
- ***Cover exposed parts of the engine.***

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.

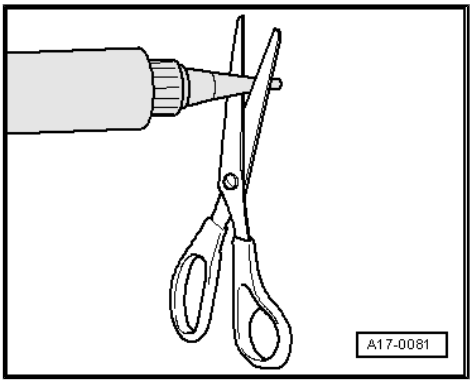


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Note

Note the use-by date of the sealant.

– Cut off nozzle of tube at front marking (nozzle ∅ approx. 1.5 mm).



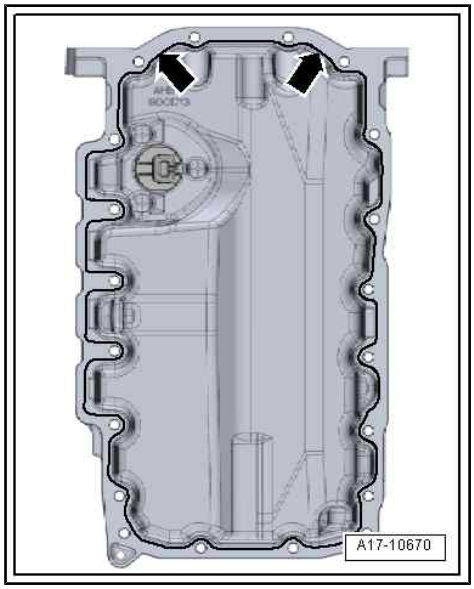
Caution

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: 1.6 ... 1.9 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.*

– Insert baffle plate.

– Fit sump and tighten bolts ⇒ page 141 .

• 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.*

– Fill with engine oil and check oil level.

- A5 Coupé ⇒ Maintenance ; Booklet 811
- A4 ⇒ Maintenance ; Booklet 812
- A5 Cabriolet ⇒ Maintenance ; Booklet 818
- Q5 ⇒ Maintenance ; Booklet 817

Tightening torques

- ⇒ Fig. ""Sump - tightening torque and sequence"" , page 141
- Subframe ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Exploded view - subframe
- ⇒ Fig. ""Torque reaction support and cross member - tightening torques"" , page 28
- ⇒ "3.1 Exploded view - coolant pipes", page 187

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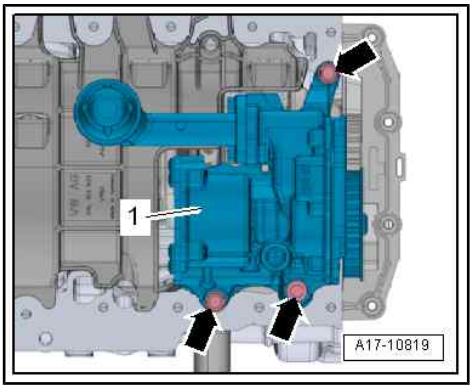
1.4 Removing and installing oil pump

Removing

– Remove sump ⇒ page 142 .

Caution

Do not kink or twist toothed belt, or allow it to be damaged on sharp edges.



– Remove bolts -arrows- and detach oil pump -1-.

Caution

The bolt on the pump impeller must NOT be loosened.

Installing

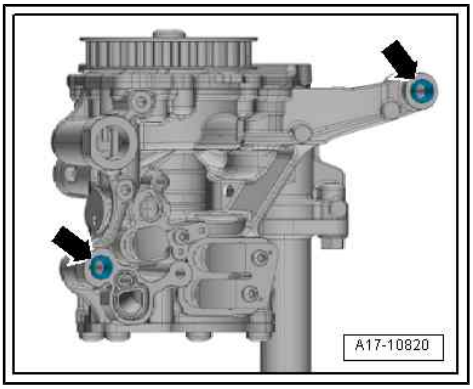
Installation is carried out in reverse order; note the following:

Note

- *Renew gasket.*
- *Renew bolts tightened with specified tightening angle.*

– Insert dowel sleeves -arrows- in oil pump, if not fitted.

– Install sump ⇒ page 142 .



Tightening torques

- ⇒ “1.1 Exploded view - sump/oil pump”, page 139

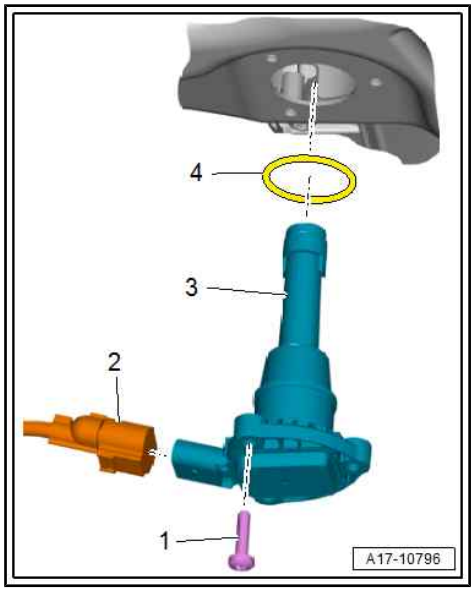
1.5 Removing and installing oil level and oil temperature sender - G266-

Removing

- Engine oil drained.
- A5 Coupé ⇒ Maintenance ; Booklet 811
- A4 ⇒ Maintenance ; Booklet 812
- A5 Cabriolet ⇒ Maintenance ; Booklet 818
- Q5 ⇒ Maintenance ; Booklet 817

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– Unplug electrical connector -3-.
– 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:

Note

Renew seal -4- and self-locking bolts -1-.

– Fill with engine oil and check oil level.
- A5 Coupé ⇒ Maintenance ; Booklet 811
- A4 ⇒ Maintenance ; Booklet 812
- A5 Cabriolet ⇒ Maintenance ; Booklet 818
- Q5 ⇒ Maintenance ; Booklet 817

Tightening torques

- ⇒ “1.1 Exploded view - sump/oil pump”, page 139

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2 Engine oil cooler

Engine oil cooler must not be separated from oil filter housing. If defective, engine oil cooler must be renewed together with oil filter housing ⇒ page 156 **.**

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3 Oil filter/oil pressure switches

⇒ “3.1 Exploded view - oil filter housing/oil pressure switch”, page 150

⇒ “3.2 Removing and installing oil pressure switch F22 ”, page 151

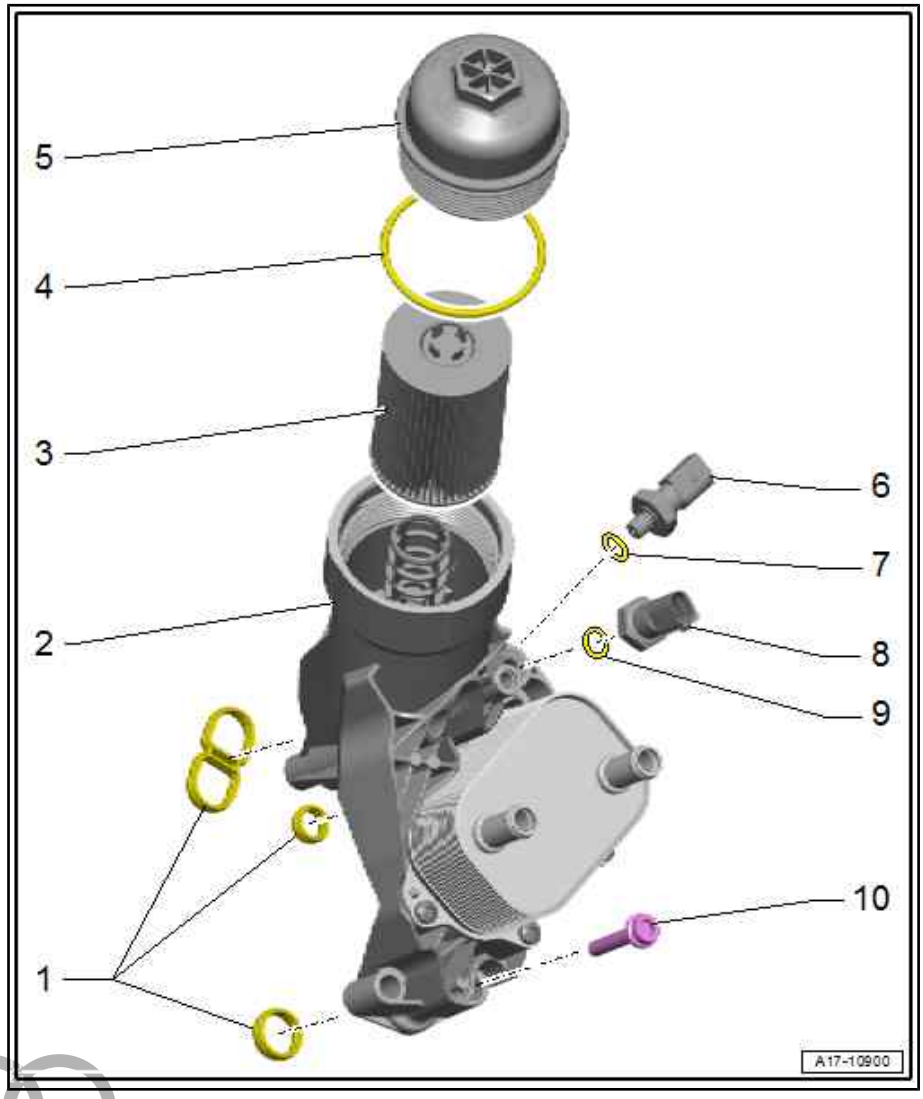
⇒ “3.3 Removing and installing oil pressure switch for reduced oil pressure F378 ”, page 154

⇒ “3.4 Removing and installing oil filter housing”, page 156

⇒ “3.5 Removing and installing valve for oil pressure control N428 ”, page 158

⇒ “3.6 Checking oil pressure”, page 159

3.1 Exploded view - oil filter housing/oil pressure switch



1 - Seals

- ❑ Renew after removing

2 - Oil filter housing with engine oil cooler

- ❑ Do not separate oil filter housing and engine oil cooler
- ❑ Removing and installing ⇒ page 156

3 - Oil filter element

- ❑ See note ⇒ page 139
- ❑ Removing and installing: refer to Maintenance Manual

- ♦ A5 Coupé ⇒ Maintenance ; Booklet 811
- ♦ A4 ⇒ Maintenance ; Booklet 812
- ♦ A5 Cabriolet ⇒ Maintenance ; Booklet 818
- ♦ Q5 ⇒ Maintenance ; Booklet 817

4 - Seal

- ❑ Renew after removing

5 - Sealing cap

- ❑ 25 Nm

6 - Oil pressure switch for reduced oil pressure - F378-

- ❑ Green insulation
- ❑ Removing and installing ⇒ page 154
- ❑ 20 Nm

7 - Seal

- ❑ Renew (cut seal open to do so)
- ❑ If seal is not available separately, refer to ⇒ Electronic parts catalogue ; renew oil pressure switch after removal

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8 - Oil pressure switch - F22-

- ❑ Brown insulation
- ❑ Removing and installing ⇒ page 151
- ❑ 20 Nm

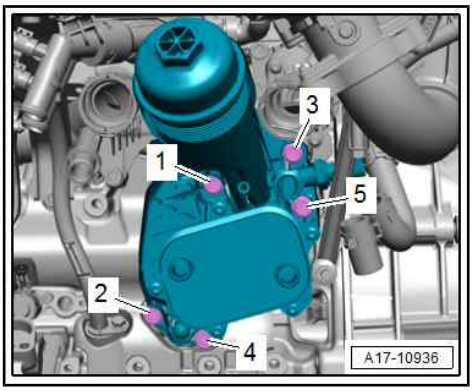
9 - Seal

- ❑ Renew (cut seal open to do so)
- ❑ If seal is not available separately, refer to ⇒ Electronic parts catalogue ; renew oil pressure switch after removal

10 - Bolt

- ❑ Renew after removing
- ❑ Tightening torque and sequence ⇒ page 151

Oil filter housing - tightening torque and sequence



Note

Renew bolts tightened with specified tightening angle.

– Fit bolts at top left and bottom right first.

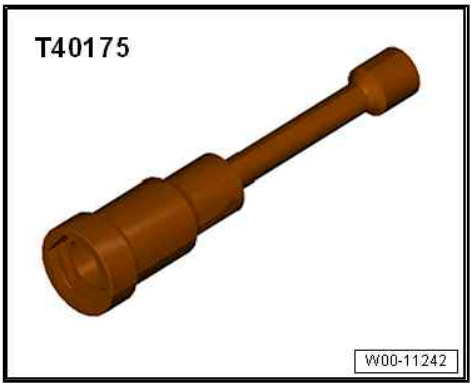
– Tighten bolts in stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1.	-1 … 5-	20 Nm
2.	-1 … 5-	Turn 90° further

3.2 Removing and installing oil pressure switch - F22-

Special tools and workshop equipment required

♦ Articulated wrench, 24 mm - T40175-

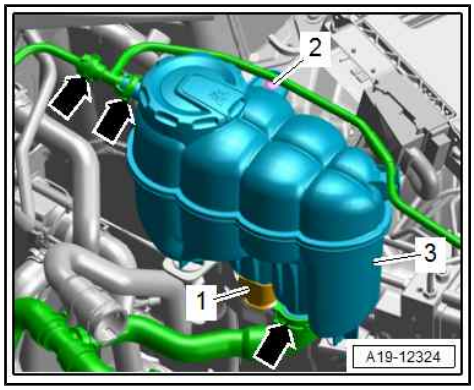


♦ Crow-foot ring spanner, 24 mm (commercially available) can also be used.

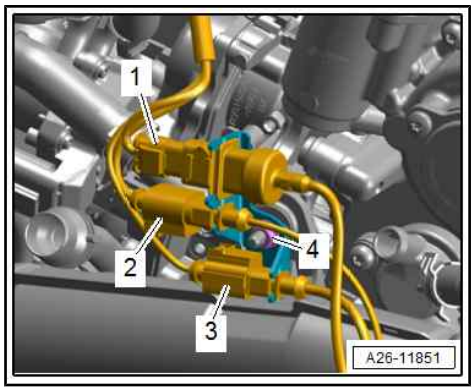
Removing

– Remove engine cover panel ⇒ page 34 .

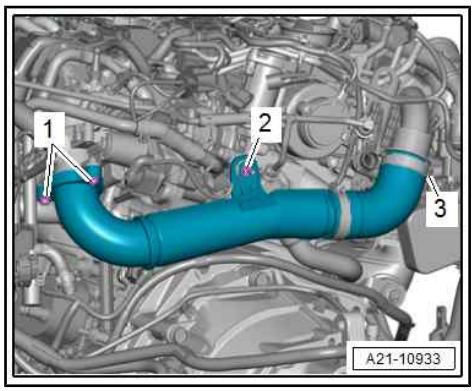
– Remove bolt -2-, detach coolant expansion tank towards front and place to one side.



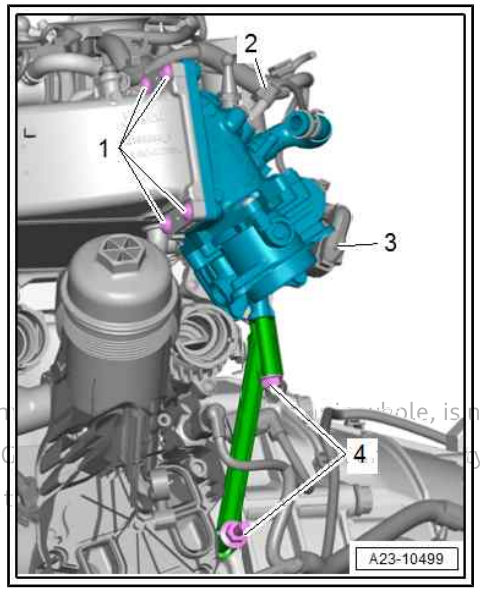
– Remove nut -4- and move bracket with electrical connectors -1, 2, 3- to one side.



– Remove bolts -1- and centre hex stud -2-.
– Detach air pipe towards rear and place to one side.

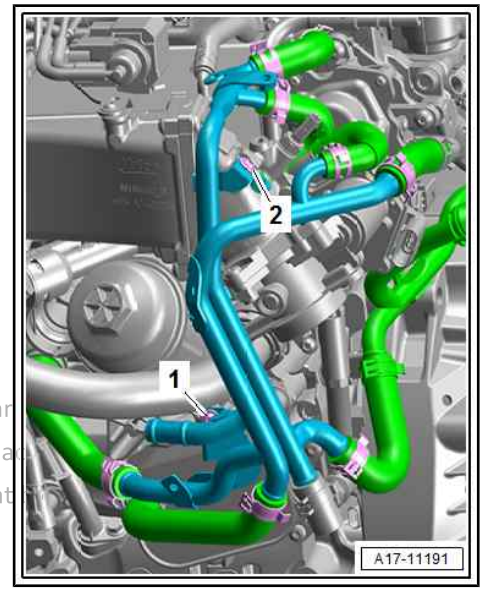


– Remove bolts -4- and detach support for throttle valve module - J338- .



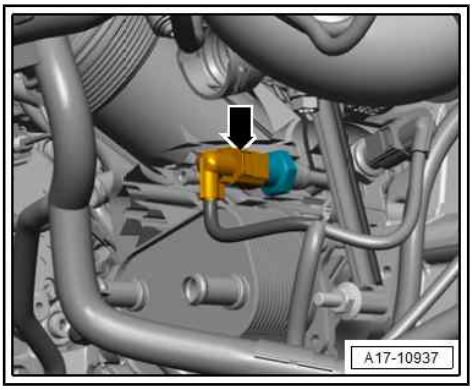
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– Remove bolt -1-.
– Remove two bolts -2-.

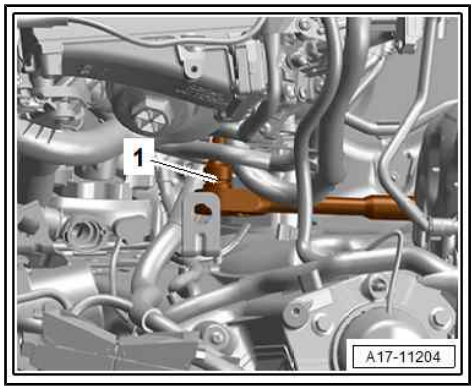


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– Unplug electrical connector -arrow- at oil pressure switch -F22- .
– Place a cloth underneath to catch escaping engine oil.



– Insert a tool between arms of coolant pipe and remove oil pressure switch - F22- .



Note

Alternatively, a commercially available crow-foot ring spanner, 24 mm can be inserted from rear in order to release oil pressure switch - F22- .

Installing

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

– If old oil pressure switch - F22- is to be reinstalled, renew seal for oil pressure switch - F22- after removal.

– Cut seal open to renew.

– Insert air pipe (take care not to damage O-ring).

– Check oil level.

♦ A5 Coupé ⇒ Maintenance ; Booklet 811

♦ A4 ⇒ Maintenance ; Booklet 812

♦ A5 Cabriolet ⇒ Maintenance ; Booklet 818

♦ Q5 ⇒ Maintenance ; Booklet 817

– Install engine cover panel ⇒ page 34 .

Tightening torques

♦ ⇒ “3.1 Exploded view - oil filter housing/oil pressure switch”, page 150

♦ ⇒ “3.1 Exploded view - coolant pipes”, page 187

3.3 Removing and installing oil pressure switch for reduced oil pressure - F378-

Special tools and workshop equipment required

♦ T-bar and socket, 24 mm - T40175- or socket, 24 mm - T40363- (not illustrated)

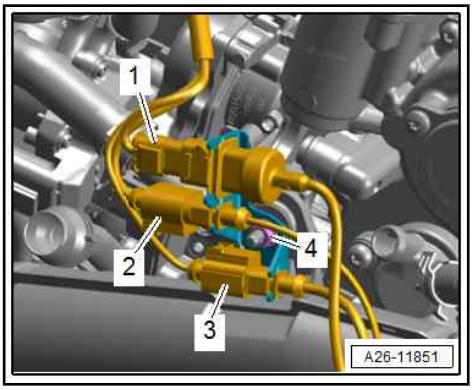


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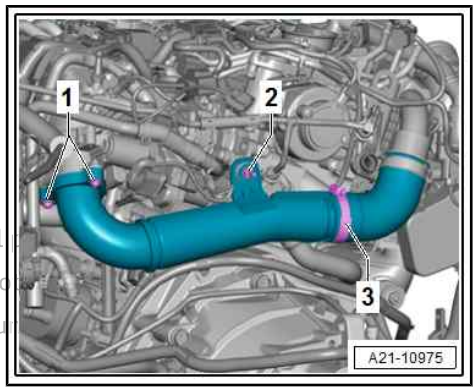
Removing

– Remove engine cover panel ⇒ page 34 .

– Remove nut -4- and move bracket with electrical connectors -1, 2, 3- to one side.

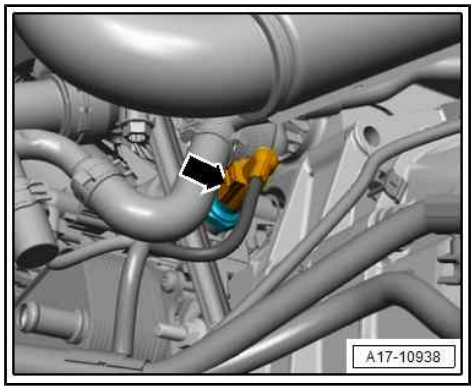


– Remove bolts -1- and centre hex stud -2-.
– Loosen hose clip -3- and move air pipe clear towards rear.



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– Unplug electrical connector -arrow-.
– Place a cloth underneath to catch escaping engine oil.



Note

On the Q5, the oil pressure switch for reduced oil pressure - F378- can also be unscrewed from below (noise insulation must be removed).

– Unscrew oil pressure switch for reduced oil pressure - F378- .

Installing

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

– If old oil pressure switch for reduced oil pressure - F378- is to be reinstalled, renew seal for oil pressure switch for reduced oil pressure - F378- after removal.
– Cut seal open to renew.
– Install air pipe.

Note

Renew O-ring on air pipe.

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– Check oil level.

♦ A5 Coupé ⇒ Maintenance ; Booklet 811
♦ A4 ⇒ Maintenance ; Booklet 812
♦ A5 Cabriolet ⇒ Maintenance ; Booklet 818
♦ Q5 ⇒ Maintenance ; Booklet 817

– Install engine cover panel ⇒ page 34 .

Tightening torques

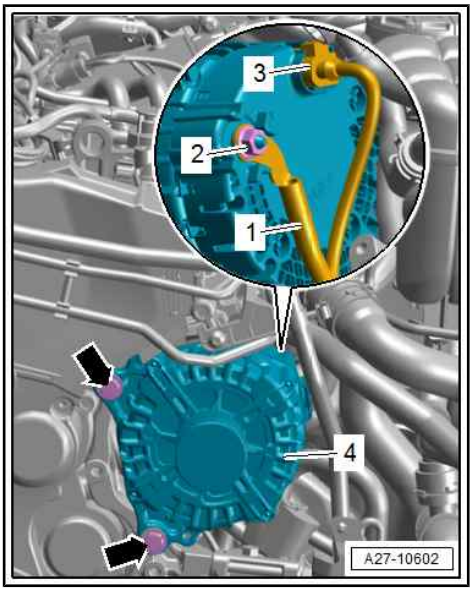
♦ ⇒ “3.1 Exploded view - oil filter housing/oil pressure switch”, page 150

3.4 Removing and installing oil filter housing

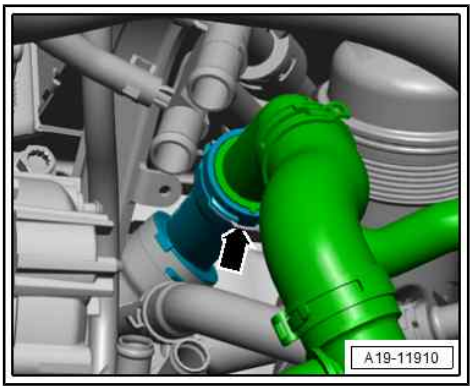
Removing

– Remove coolant pipes (rear left) ⇒ page 190 .
– Remove coolant pipes (bottom left) ⇒ page 192 .
– Remove coolant pipe (top left) ⇒ page 192 .
– Remove engine mounting (left-side) ⇒ page 29 .

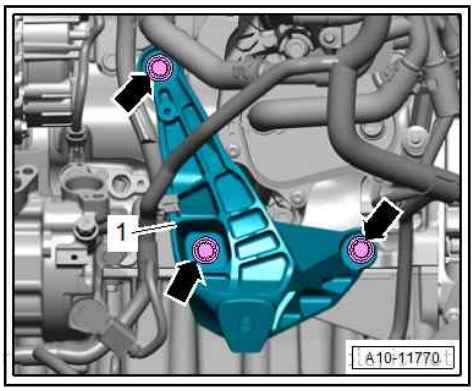
– Unplug electrical connector -3- at alternator -4-.



– Lift retaining clip -arrow- and detach coolant connection.

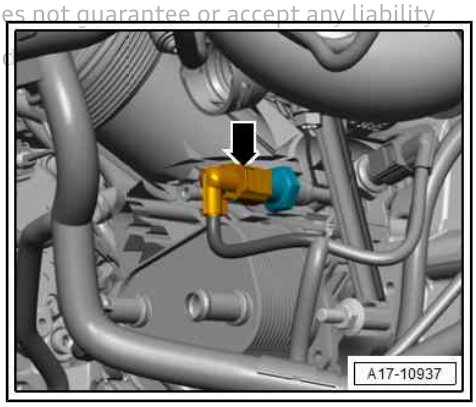


– Move electrical wiring harness clear.
– Remove bolts -arrows- and detach engine support -1-.

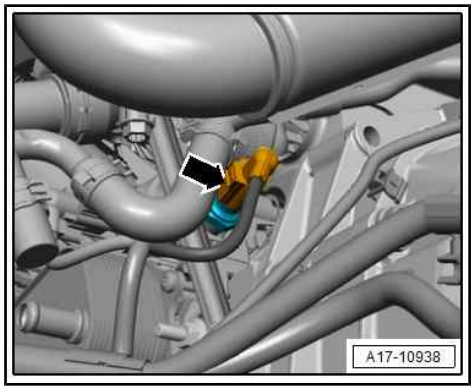


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– Unplug electrical connector -arrow- on oil pressure switch - F22- .



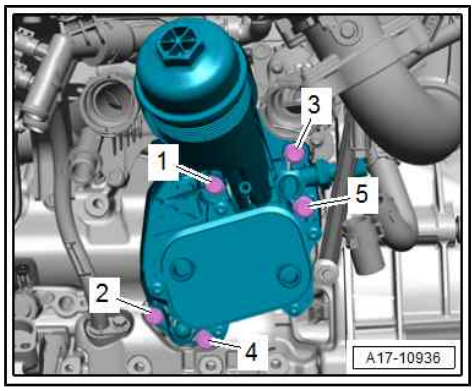
– Unplug electrical connector -arrow- at oil pressure switch for reduced oil pressure - F378- .



Note

Place a cloth underneath to catch escaping engine oil.

– Unscrew bolts in the sequence -5 ... 1- and detach oil filter housing together with engine oil cooler.



Installing

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

Note

- *Renew seals and O-ring.*
- *Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .*
- *Do not reuse coolant.*

– Connect coolant hose with plug-in connector ⇒ page 202 .

– Fill up with coolant ⇒ page 167 .

Tightening torques

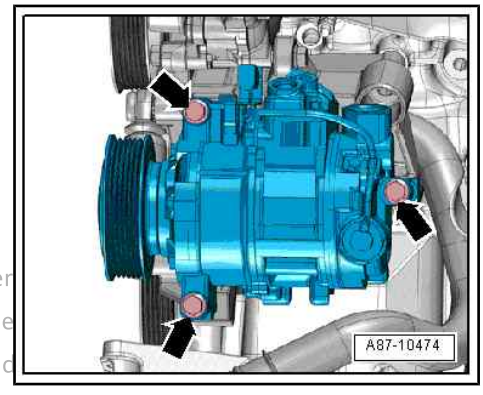
- ⇒ “3.1 Exploded view - oil filter housing/oil pressure switch”, page 150
- ⇒ “3.1 Exploded view - coolant pipes”, page 187

3.5 Removing and installing valve for oil pressure control - N428-

Removing

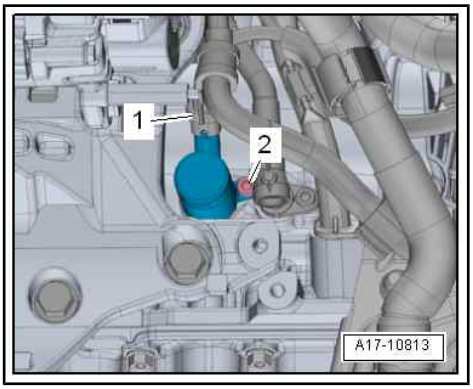
– Remove poly V-belt ⇒ page 38 .

– Remove air conditioner compressor from bracket with refrigerant lines still attached and tie up to side ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Detaching and attaching air conditioner compressor at bracket .



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– Unplug electrical connector -1-.



Note

Place a cloth underneath to catch escaping engine oil.

– Unscrew bolt -2- and remove valve for oil pressure control - N428- .

Installing

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

Note

Renew O-ring.

– Install air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Detaching and attaching air conditioner compressor at bracket .
– Install poly V-belt ⇒ page 38 .
– Check oil level.
♦ A5 Coupé ⇒ Maintenance ; Booklet 811
♦ A4 ⇒ Maintenance ; Booklet 812
♦ A5 Cabriolet ⇒ Maintenance ; Booklet 818
♦ Q5 ⇒ Maintenance ; Booklet 817

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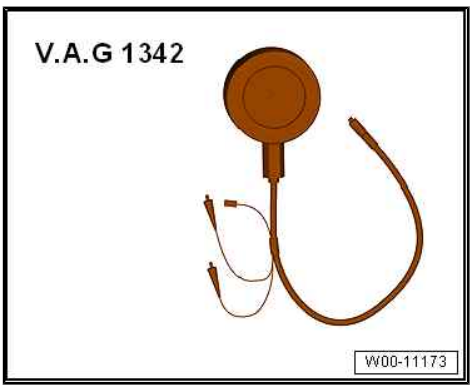
Tightening torques

♦ ⇒ “1.1 Exploded view - sump/oil pump”, page 139

3.6 Checking oil pressure

Special tools and workshop equipment required

♦ Oil pressure tester - V.A.G 1342-



Procedure

• Oil level OK
– Remove oil pressure switch for reduced oil pressure - F378- ⇒ page 154 .
– Connect oil pressure tester - V.A.G 1342- to threaded hole for oil pressure switch for reduced oil pressure - F378- .
– 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 1.4 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 147 .

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19 – Cooling

1 Cooling system/coolant

⇒ “1.1 Connection diagram - coolant hoses”, page 161

⇒ “1.2 Draining and filling cooling system”, page 164

⇒ “1.3 Checking cooling system for leaks”, page 173

1.1 Connection diagram - coolant hoses

⇒ “1.1.1 Connection diagram - coolant hoses, vehicles without auxiliary heater”, page 161

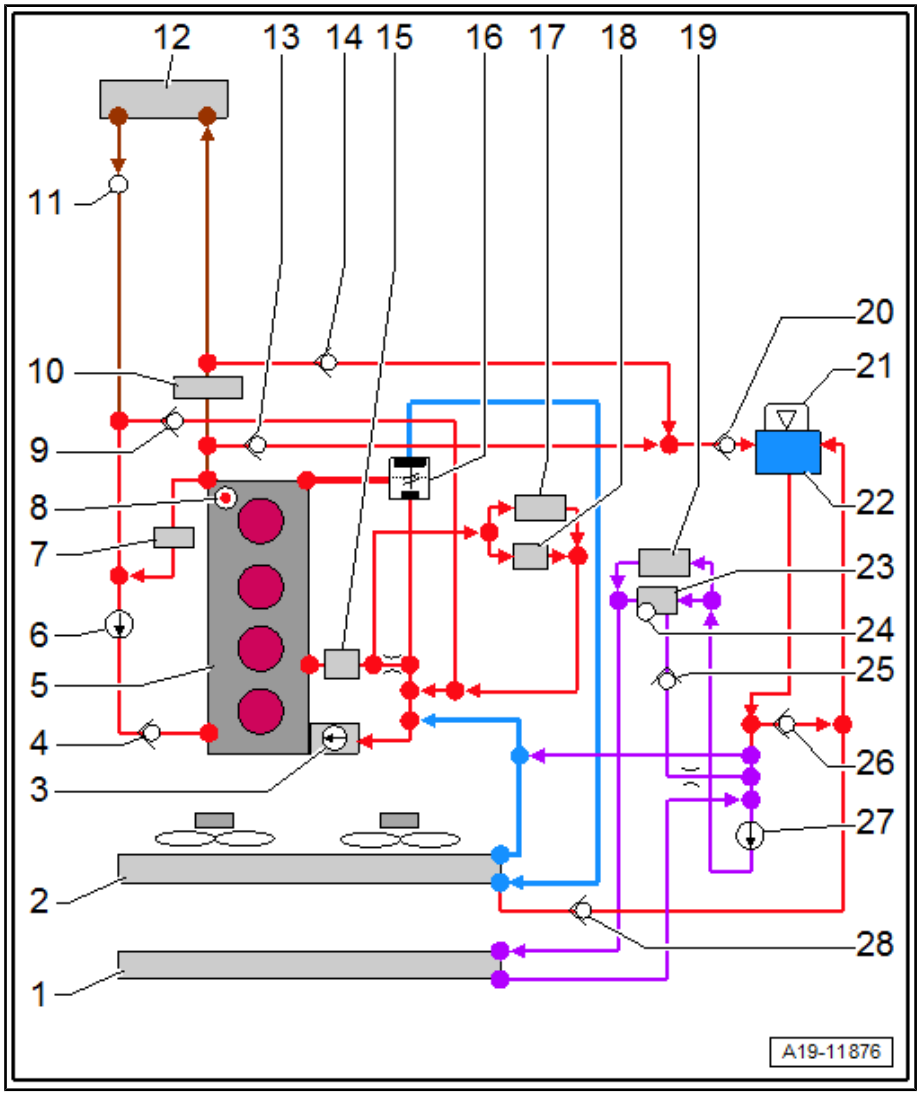
⇒ “1.1.2 Connection diagram - coolant hoses, vehicles with auxiliary heater”, page 163

1.1.1 Connection diagram - coolant hoses, vehicles without auxiliary heater

Note

- *Blue = Large coolant circuit*
- *Red = Small coolant circuit*
- *Violet = Coolant circuit for charge air cooler.*
- *Brown = Heating circuit*
- *Arrows show direction of coolant flow.*

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1 - Water radiator for charge air cooling circuit

2 - Radiator

3 - Coolant pump

4 - Non-return valve

5 - Cylinder head/cylinder block

6 - Auxiliary pump for heating - V488-

- ❑ Removing and installing ⇒ page 181

7 - Turbocharger

8 - Coolant temperature sender - G62-

- ❑ Removing and installing ⇒ page 184

9 - Non-return valve

10 - Exhaust gas recirculation cooler

11 - Bleeder hole

12 - Heat exchanger for heater

13 - Non-return valve

14 - Non-return valve

15 - Engine oil cooler

16 - Thermostat

17 - Throttle valve module - J338-

- ❑ Removing and installing ⇒ page 258

18 - Exhaust gas recirculation control motor - V338-

- ❑ Removing and installing ⇒ page 401

19 - Injector for reducing agent - N474-

- ❑ Removing and installing ⇒ page 375

20 - Non-return valve

21 - Filler cap

- ❑ For coolant expansion tank
- ❑ Checking pressure relief valve ⇒ page 173

22 - Coolant expansion tank

23 - Charge air cooler

24 - Bleeder connection

- ❑ With sealing cap
- ❑ Not fitted on Audi Q5

25 - Non-return valve

26 - Non-return valve

27 - Charge air cooling pump - V188-

- ❑ Removing and installing ⇒ page 179

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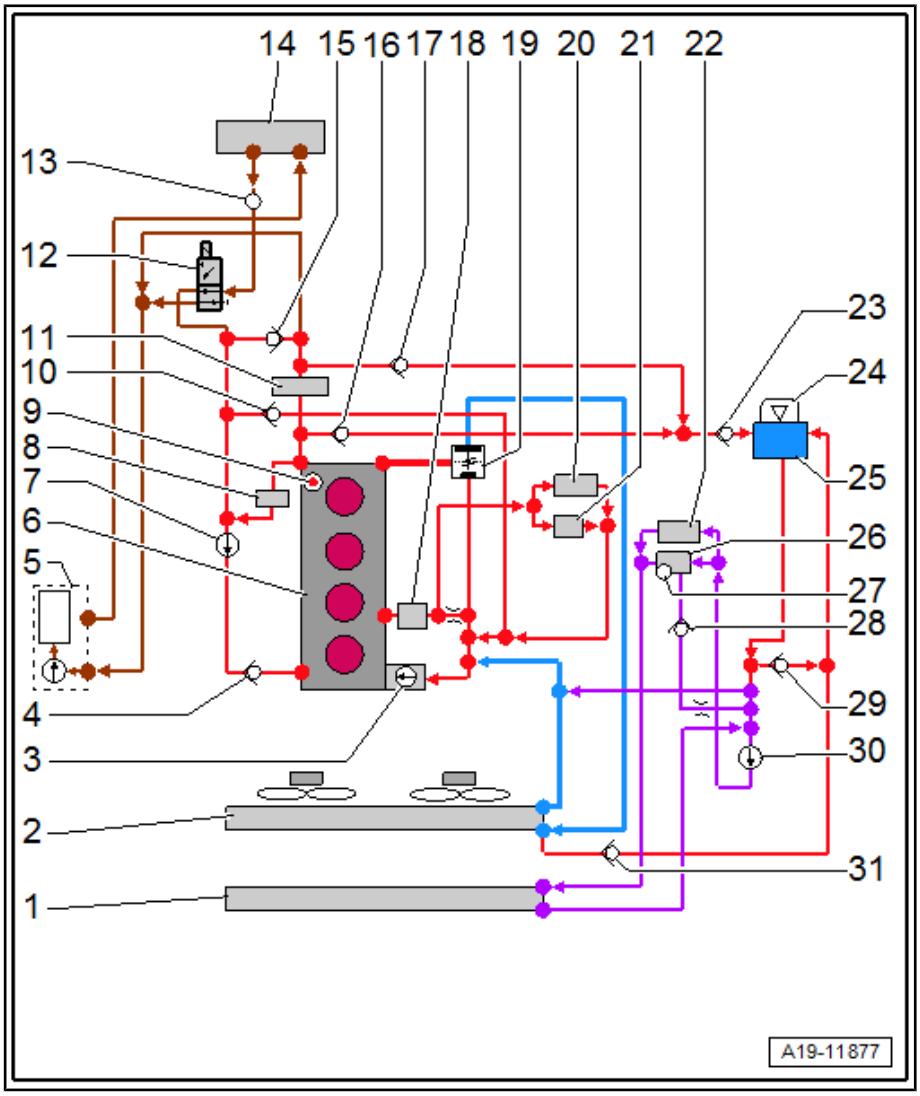
28 - Non-return valve

1.1.2 Connection diagram - coolant hoses, vehicles with auxiliary heater

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Note

- *Blue = Large coolant circuit*
- *Red = Small coolant circuit*
- *Violet = Coolant circuit for charge air cooler.*
- *Brown = Heating circuit*
- *Arrows show direction of coolant flow.*



1 - Water radiator for charge air cooling circuit

2 - Radiator

3 - Coolant pump

4 - Non-return valve

5 - Auxiliary heater
- ❑ Optional equipment

6 - Cylinder head/cylinder block

7 - Auxiliary pump for heating - V488-
- ❑ Removing and installing ⇒ page 181

8 - Turbocharger

9 - Coolant temperature sender - G62-
- ❑ Removing and installing ⇒ page 184

10 - Non-return valve

11 - Exhaust gas recirculation cooler

12 - Heater coolant shut-off valve - N279-

13 - Bleeder hole

14 - Heat exchanger for heater

15 - Non-return valve

16 - Non-return valve

17 - Non-return valve

18 - Engine oil cooler

19 - Thermostat

20 - Throttle valve module - J338-
- ❑ Removing and installing ⇒ page 258

21 - Exhaust gas recirculation control motor - V338-

- ❑ Removing and installing ⇒ page 401

22 - Injector for reducing agent - N474-

- ❑ Removing and installing ⇒ page 375

23 - Non-return valve

24 - Filler cap

- ❑ For coolant expansion tank
- ❑ Checking pressure relief valve ⇒ page 173

25 - Coolant expansion tank

26 - Charge air cooler

27 - Bleeder connection

- ❑ With sealing cap
- ❑ Not fitted on Audi Q5

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28 - Non-return valve

29 - Non-return valve

30 - Charge air cooling pump - V188-

- ❑ Removing and installing ⇒ page 179
- ❑ Removing and installing

31 - Non-return valve

1.2 Draining and filling cooling system

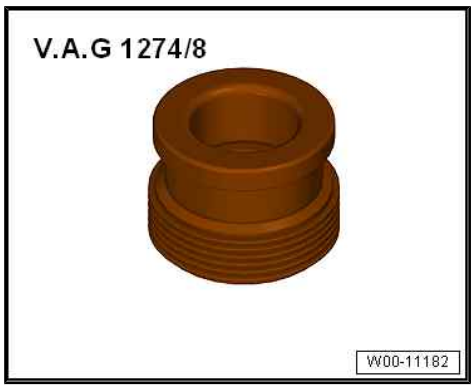
Drain coolant ⇒ page 166 .

Fill and bleed coolant circuit ⇒ page 167 .

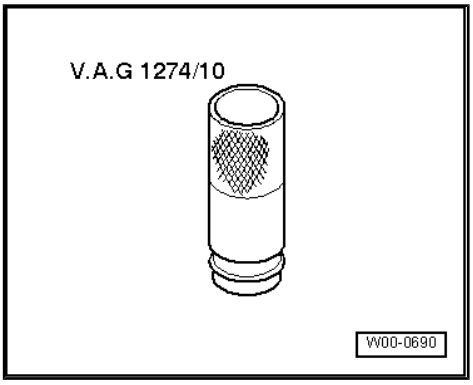
Bleed cooling system ⇒ page 172 .

Special tools and workshop equipment required

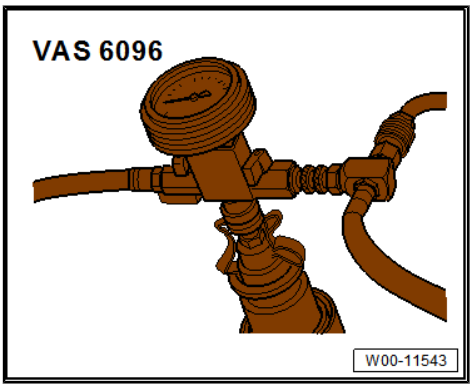
- ♦ Vehicle diagnostic tester
- ♦ Adapter for cooling system tester - V.A.G 1274/8-



- Pipe for cooling system tester - V.A.G 1274/10-

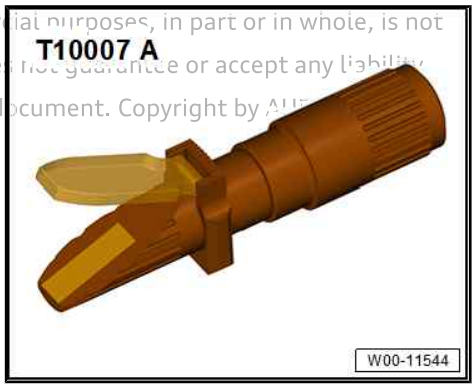


- Cooling system charge unit - VAS 6096-



- Refractometer - T10007A-

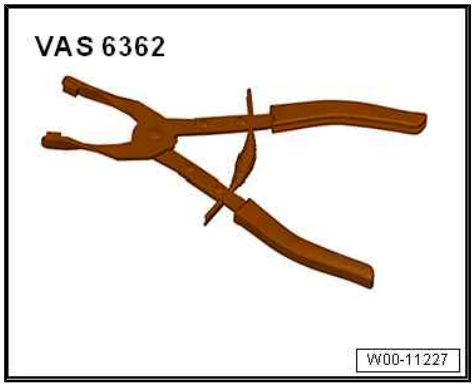
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-
- Coolant collecting system - VAS 5014- or drip tray for workshop hoist - VAS 6208-



- Hose clip pliers - VAS 6362-



- Safety goggles
- Protective gloves

Draining

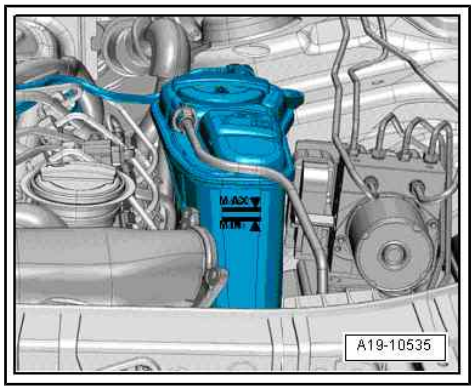
– Open filler cap on coolant expansion tank.

WARNING

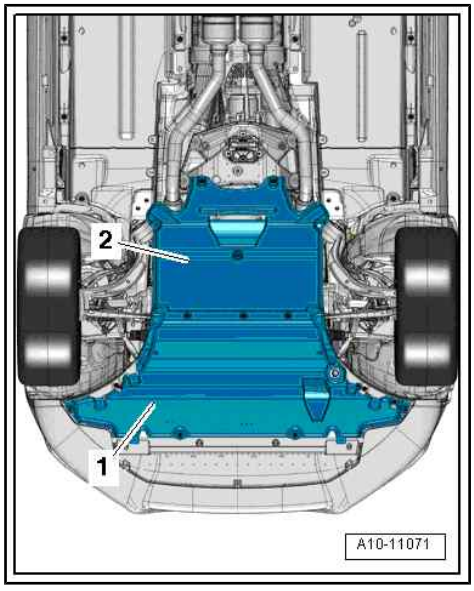
Risk of scalding due to hot steam and hot coolant.

The cooling system is under pressure when the power unit is hot.

Cover filler cap on coolant expansion tank with a cloth and open carefully to dissipate pressure.

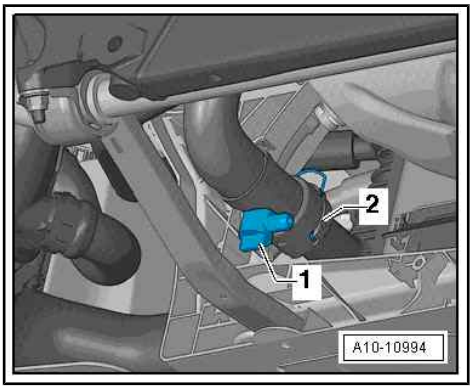


– Remove front noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .

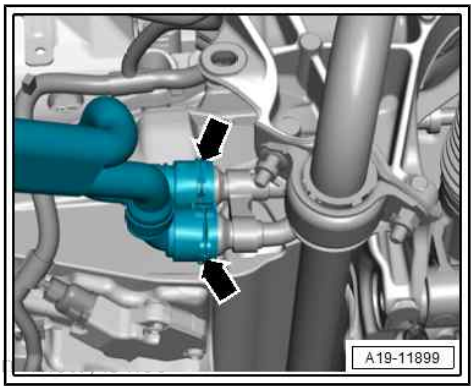


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– Place drip tray for workshop hoist - VAS 6208- underneath.
– Open drain plug -1- at connection and drain off coolant.

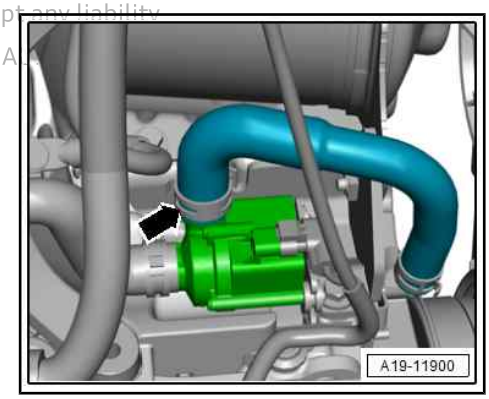


– Lift retaining clips -arrows-, disconnect coolant hoses and drain off coolant.



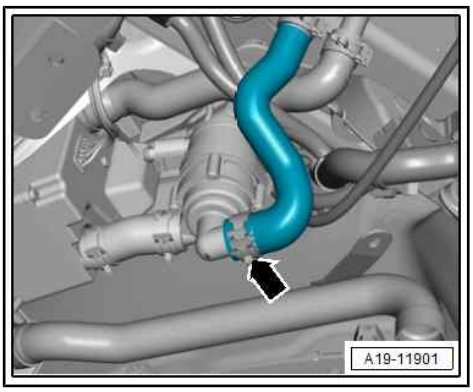
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– Release hose clip -arrow-, disconnect coolant hose and drain off coolant.



Vehicles with auxiliary heater:

– Release hose clip -arrow-, disconnect coolant hose and drain off coolant.

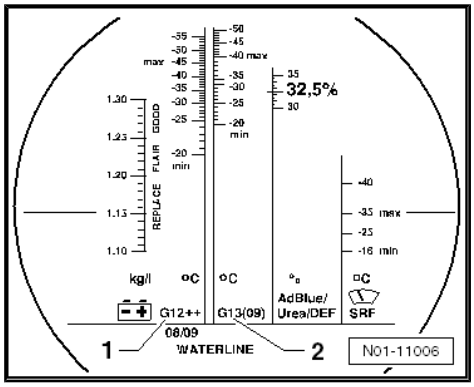


Filling and bleeding coolant circuit:

Caution

Risk of damage to power unit if cooling system is insufficiently filled/bled.

- ***After filling cooling system, only fill up/bleed system using ⇒ Vehicle diagnostic tester.***



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 damage to the power unit.*
- *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 power unit 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.*

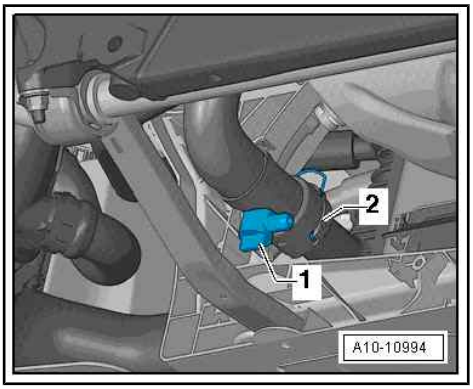
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Recommended mixture ratio for coolant

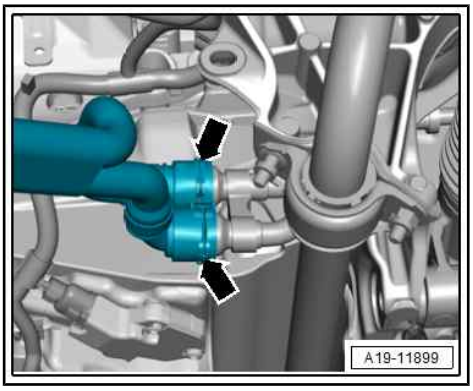
- Coolant (40 %) and distilled water (60 %) for frost protection to -25 °C
- Coolant (50 %) and distilled water (50 %) for frost protection to -36 °C
- Coolant ⇒ Electronic parts catalogue (ETKA)

Only if coolant has been drained off:

– Close drain plug -1- on connection.

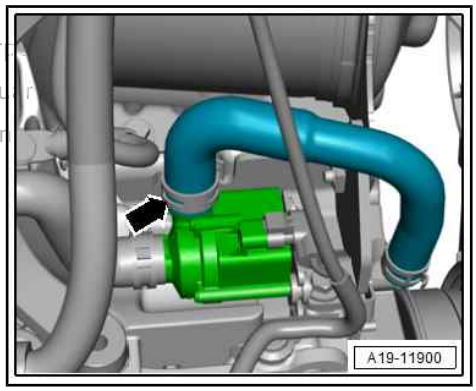


– Connect coolant hoses -arrows- with plug-in connector ⇒ page 202 .



– Connect coolant hose using hose clip -arrow-.

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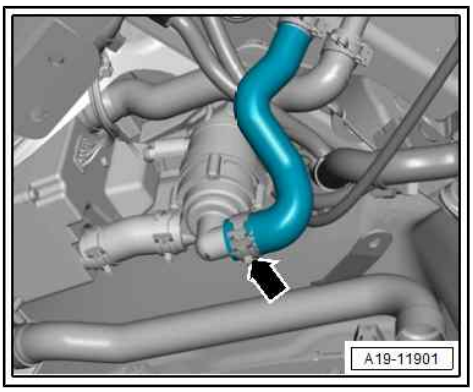


Vehicles with auxiliary heater:

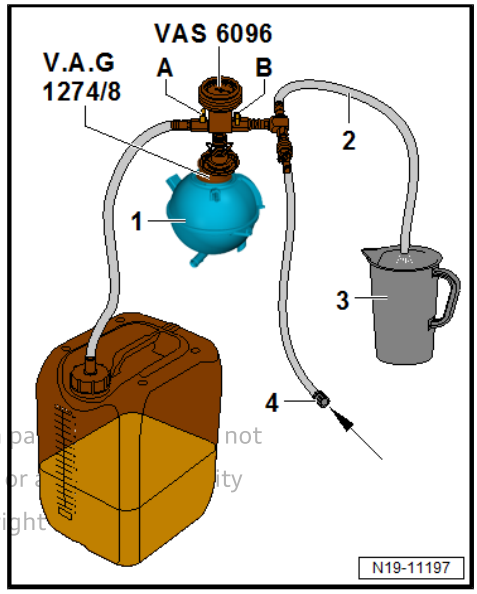
– Connect coolant hose using hose clip -arrow-.

To fill up with coolant:

• Ignition switched off.



– Fill reservoir of -VAS 6096- with at least 8 litres of premixed coolant (according to recommended ratio):
– To simplify filling procedure, place reservoir on as high a surface as possible, e.g. on a workshop trolley or the engine and gearbox jack.
– 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-.



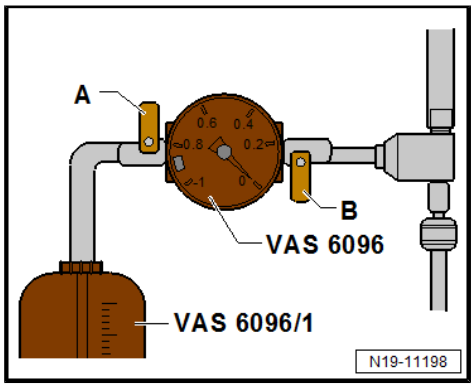
Note

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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.

– 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.

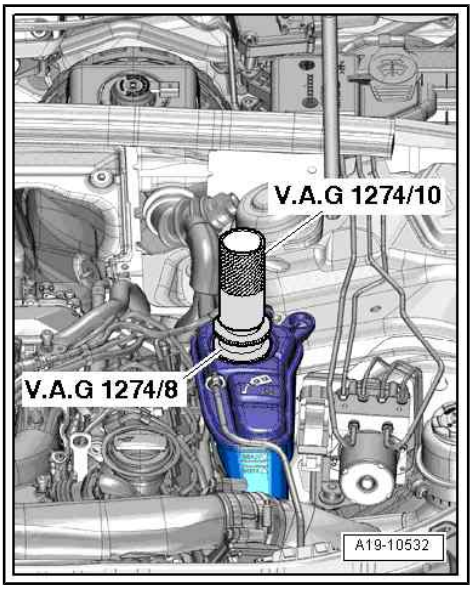


Note

◆ *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 adapter -V.A.G 1274/8- on coolant expansion tank.

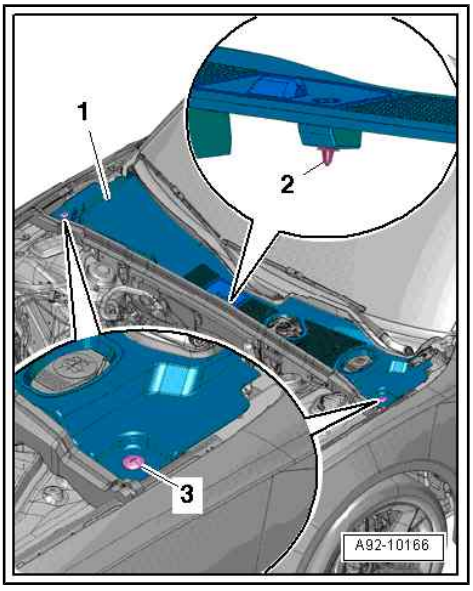
– Fit pipe for cooling system tester - V.A.G 1274/10- onto adapter for cooling system tester - V.A.G 1274/8- .
– Fill up pipe for cooling system tester - V.A.G 1274/10- with coolant.



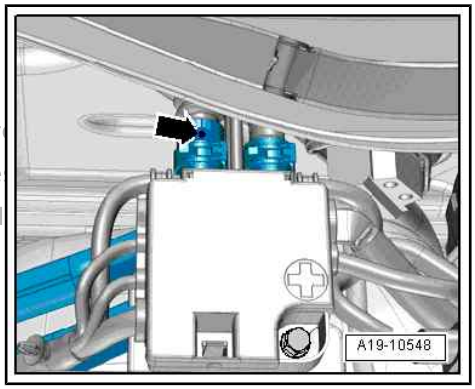
– Remove plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .

Note

Illustration shows A4.



– Release coolant hose going to heat exchanger for heater and pull back hose until bleeder hole -arrow- in hose is no longer blocked by connection.
– Fill up with coolant until it comes out at bleeder hole in coolant hose.
– Push coolant hose back onto connection and secure with spring-type hose clip.
– Detach pipe for cooling system tester - V.A.G 1274/10- and close filler cap on coolant expansion tank.



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Bleeding cooling system:



– Coolant must be topped up to “max” mark.
– Start engine.
– Set temperature to “HI”.
– Switch off air conditioner compressor (press AC button).
• LED in button should not light up.
– Set fresh air blower to lowest setting.
– Connect ⇒ Vehicle diagnostic tester.
– Start Guided Fault Finding.
– 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 - Coolant circuit charge`
– Follow instructions shown on ⇒ Vehicle diagnostic tester.
– Switch off engine.

Checking coolant level:

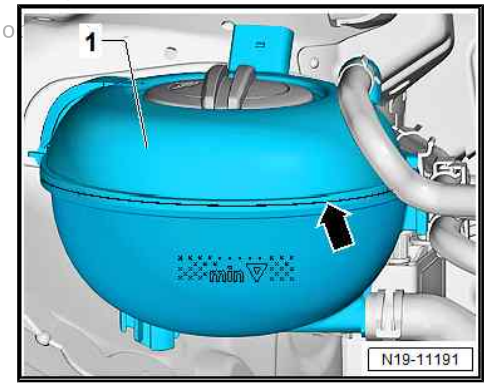
WARNING

Risk of scalding due to hot steam and hot coolant.

- *The cooling system is under pressure when the power unit is hot.*
- *Cover filler cap on coolant expansion tank with a cloth and open carefully to dissipate pressure.*

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– The coolant level must not be above the -seam- -arrow- when the engine is warm.



– The coolant level should be about 5 mm above the MAX mark -arrow- when the engine is cold.



Note

The increased coolant level is necessary as the coolant level can drop during the bleeding process.

– Top up with coolant again if necessary.
– Erase event memory ⇒ Vehicle diagnostic tester.
– Install engine cover panel ⇒ page 34 .
– Install plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .

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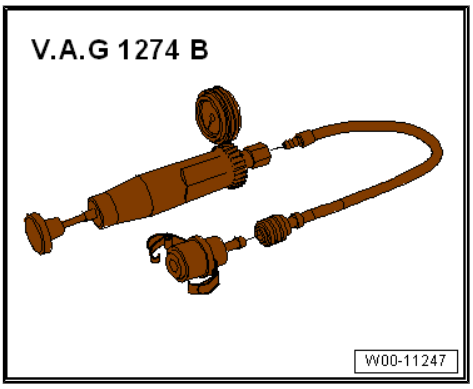
Tightening torques

♦ Noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

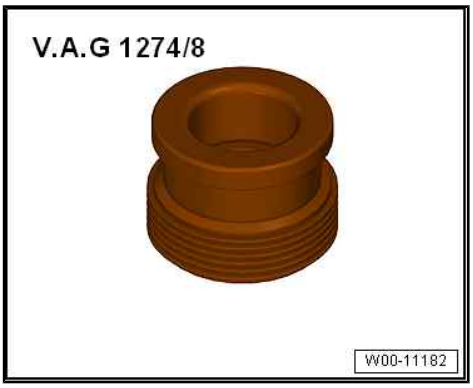
1.3 Checking cooling system for leaks

Special tools and workshop equipment required

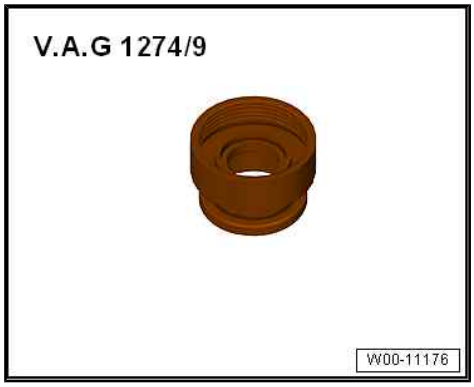
♦ Cooling system tester - V.A.G 1274 B-



♦ Adapter for cooling system tester - V.A.G 1274/8-

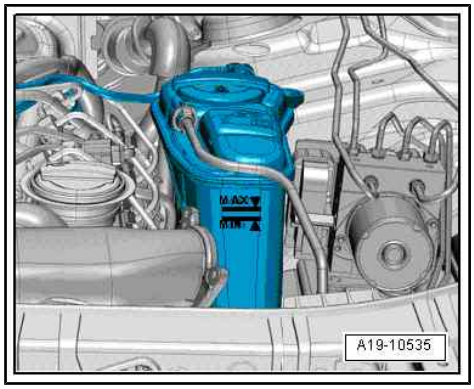


- Adapter for cooling system tester - V.A.G 1274/9-



Procedure

- Engine must be warm.
- Ignition switched off.



WARNING

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

Danger of scalding skin and other parts of the body.

- *Put on protective gloves.*
- *Put on safety goggles.*
- *Cover filler cap on expansion tank with a cloth and open carefully to release pressure.*

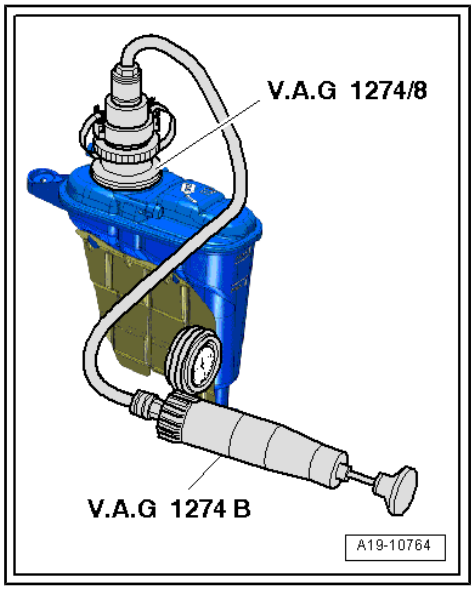
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– Open filler cap on coolant expansion tank.

– Fit adapter for cooling system tester - V.A.G 1274/8- 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.



Note

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 can be found, check for leaks in water-cooled charge air cooler and exhaust gas recirculation cooler.

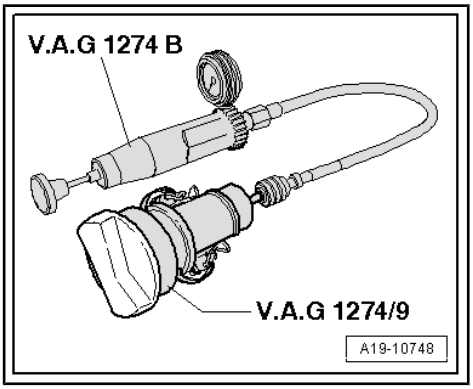
Checking pressure relief valve in filler cap

– 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/thermostat assembly

⇒ “2.1 Exploded view - coolant pump/thermostat”, page 176

⇒ “2.2 Exploded view - electric coolant pump”, page 178

⇒ “2.3 Exploded view - coolant temperature senders”, page 179

⇒ “2.4 Removing and installing electric coolant pump”, page 179

⇒ “2.5 Removing and installing coolant pump”, page 183

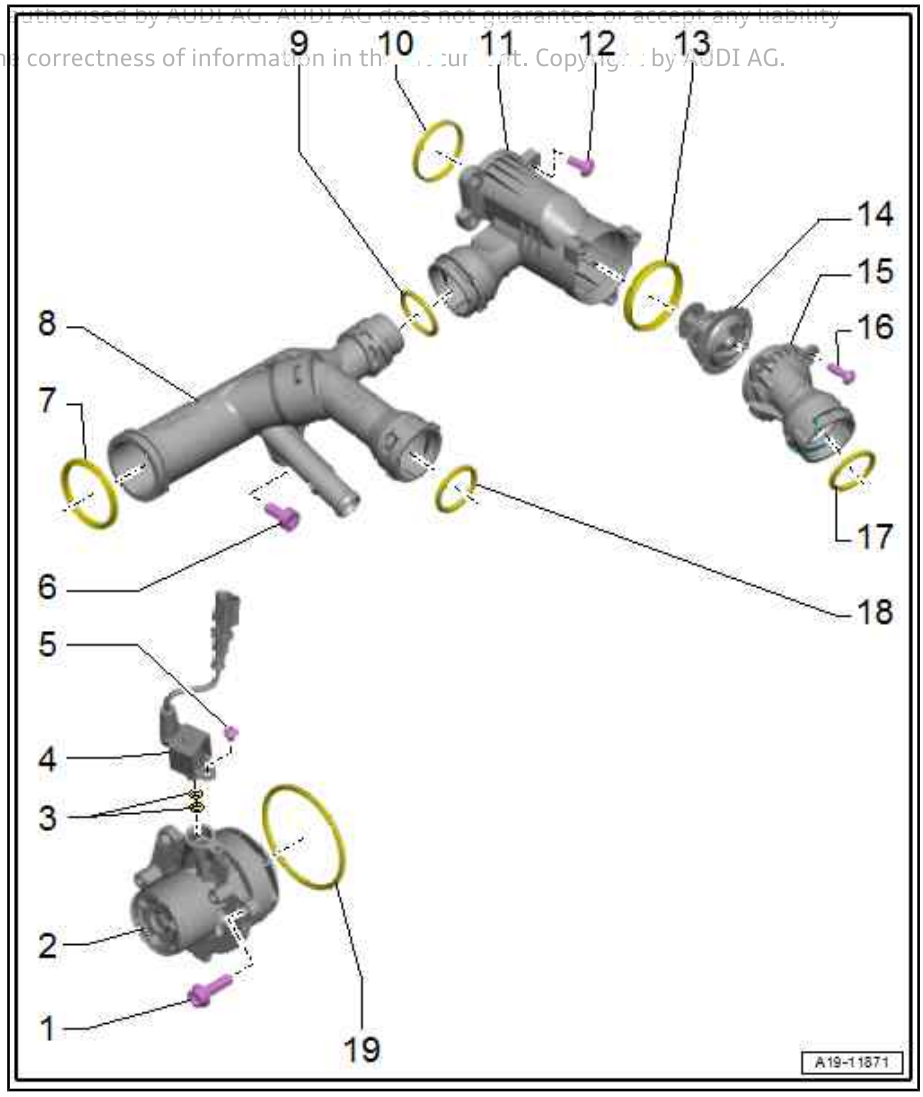
⇒ “2.6 Checking thermostat”, page 183

⇒ “2.7 Removing and installing coolant valve for cylinder head N489 ”, page 183

⇒ “2.8 Removing and installing coolant temperature sender G62 ”, page 184

2.1 Exploded view - coolant pump/thermostat

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1 - Bolt
- ❑ Renew after removing
- ❑ 20 Nm +45°

2 - Coolant pump
- ❑ Removing and installing ⇒ page 183

3 - O-rings
- ❑ Renew after removing
- ❑ Lubricate with coolant

4 - Coolant valve for cylinder head - N489-
- ❑ Removing and installing ⇒ page 183

5 - Bolt
- ❑ 8 Nm

6 - Bolt
- ❑ 20 Nm

7 - O-ring
- ❑ Renew after removing
- ❑ Lubricate with coolant

8 - Coolant pipe (left-side)
- ❑ Removing and installing ⇒ page 189

9 - O-ring
- ❑ Renew after removing
- ❑ Lubricate with coolant

10 - O-ring
- ❑ Renew after removing
- ❑ Lubricate with coolant

11 - Thermostat housing

12 - Bolt

- ❑ 20 Nm

13 - O-ring

- ❑ Renew after removing
- ❑ Lubricate with coolant

14 - Thermostat

- ❑ Thermostat must be removed together with coolant pipe (left-side) as they are combined as one component and cannot be ordered separately
- ❑ Removing and installing coolant pipe (left-side) ⇒ page 189

15 - Connection

16 - Bolt

- ❑ 8 Nm

17 - O-ring

- ❑ Renew after removing
- ❑ Lubricate with coolant

18 - O-ring

- ❑ Renew after removing
- ❑ Lubricate with coolant

19 - O-ring

- ❑ Renew after removing
- ❑ Lubricate with coolant

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2.2 Exploded view - electric coolant pump

1 - Auxiliary pump for heating - V488-
- ❑ Removing and installing ⇒ page 181

2 - Retaining bracket

3 - Nut
- ❑ 9 Nm

4 - Charge air cooling pump - V188-
- ❑ Removing and installing ⇒ page 179

5 - Bracket
- ❑ For charge air cooling pump - V188-

6 - Nut
- ❑ 9 Nm

7 - Retainer
- ❑ For electrical wiring

8 - Nut
- ❑ 9 Nm

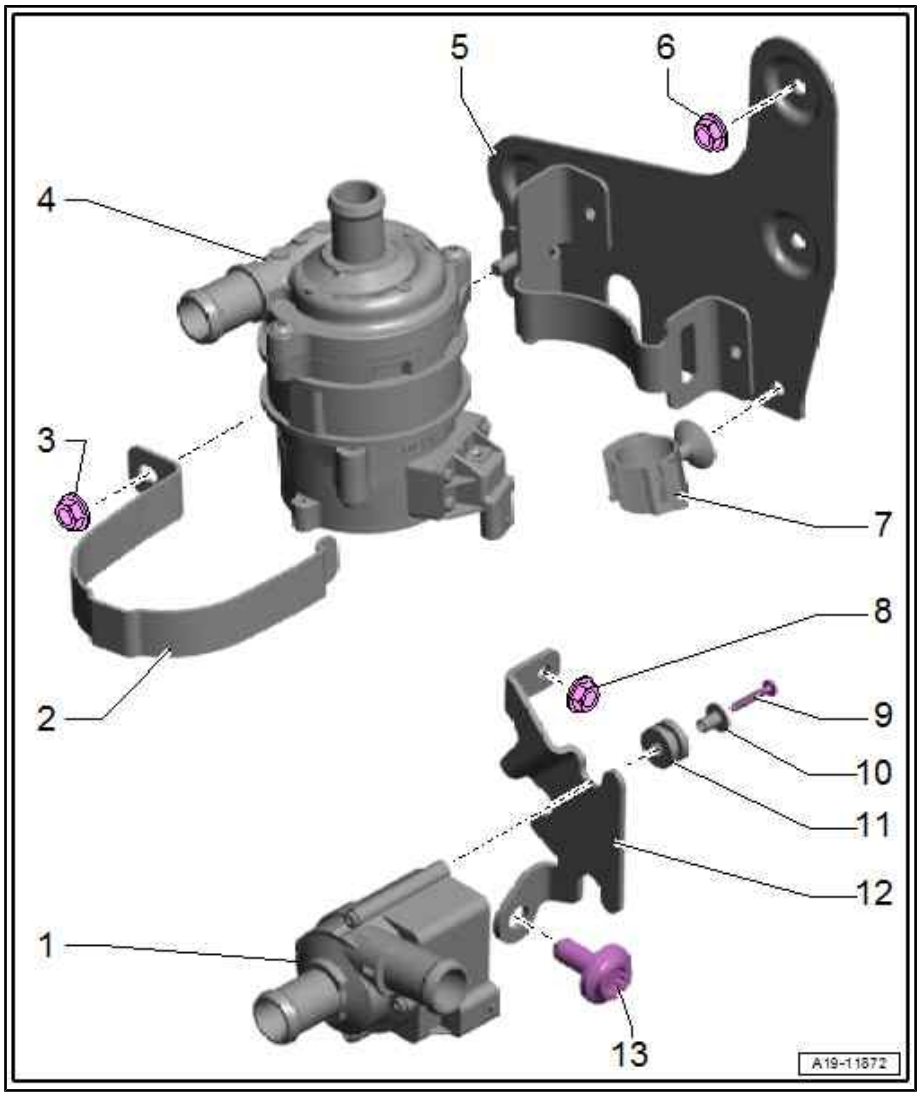
9 - Bolt
- ❑ 2.7 Nm

10 - Spacer bush

11 - Rubber grommet

12 - Bracket
- ❑ For auxiliary pump for heating - V488-

13 - Bolt
- ❑ 40 Nm



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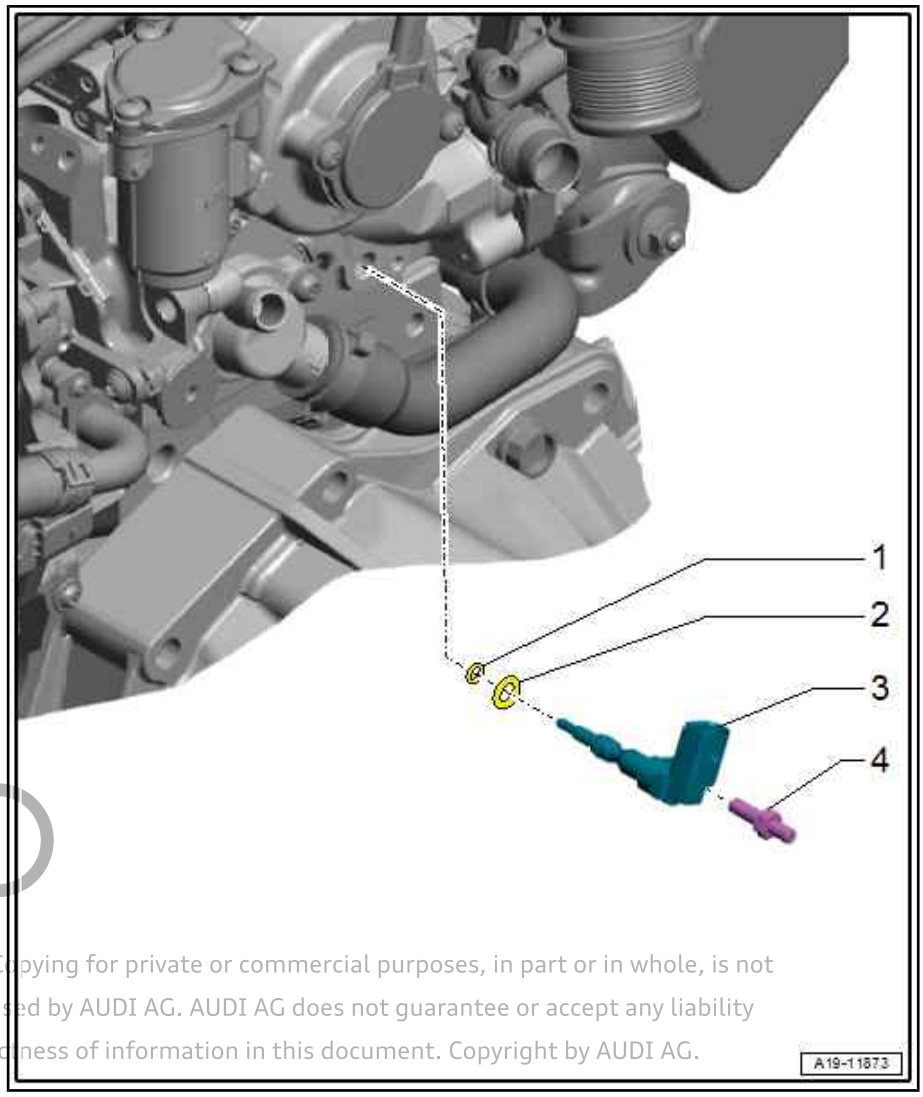
2.3 Exploded view - coolant temperature senders

1 - Spacer ring
- ❑ Renew if damaged

2 - O-ring
- ❑ Renew after removing
- ❑ Lubricate with coolant

3 - Coolant temperature sender - G62-
- ❑ Removing and installing ⇒ page 184

4 - Centre hex stud
- ❑ 8 Nm



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2.4 Removing and installing electric coolant pump

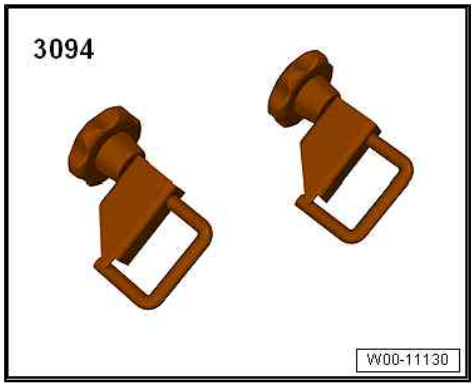
⇒ "2.4.1 Removing and installing charge air cooling pump V188", page 179

⇒ "2.4.2 Removing and installing auxiliary pump for heating V488", page 181

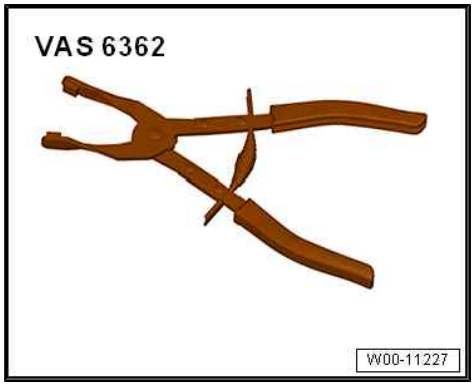
2.4.1 Removing and installing charge air cooling pump - V188-

Special tools and workshop equipment required

♦ Hose clamps, up to 25 mm - 3094-



♦ Hose clip pliers - VAS 6362-



Removing

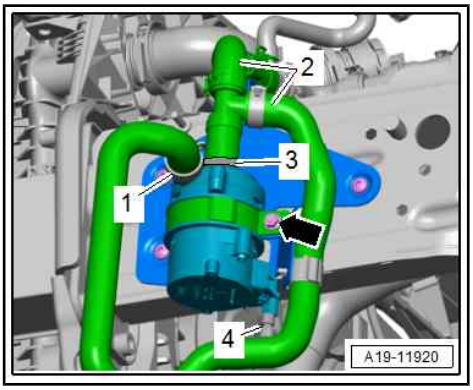
- Engine cold.

– To relieve residual pressure in cooling system: cover filler cap on coolant expansion tank with a cloth and carefully open briefly and close again.

– Remove wheel housing liner (front left) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front) .

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– Unplug electrical connector -4-.
– Clamp off coolant hoses -2- with hose clamps -3094- .
– Clamp off coolant hose using hose clamps -3094- , release hose clip -1- and disconnect coolant hose.
– Release hose clip -3- and disconnect coolant hose.
– Remove nut -arrow-, release retainer and detach charge air cooling pump - V188- .



Installing

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

Note

Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .

– Bleed cooling system ⇒ page 172 .

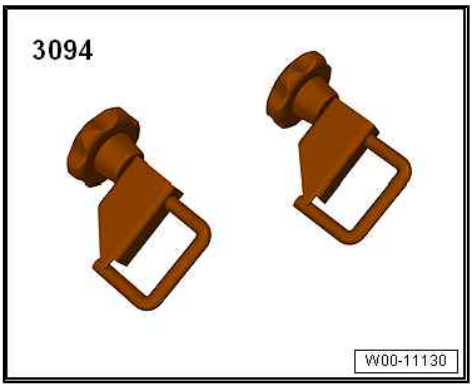
Tightening torques

♦ ⇒ “2.2 Exploded view - electric coolant pump”, page 178
♦ Wheel housing liner ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front)

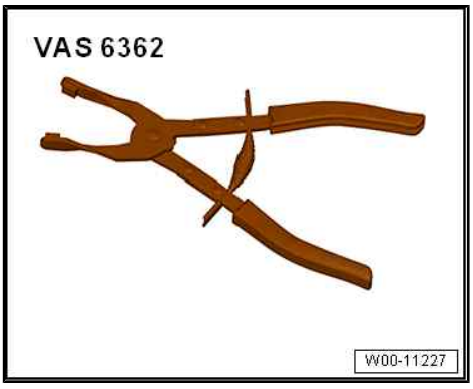
2.4.2 Removing and installing auxiliary pump for heating - V488-

Special tools and workshop equipment required

♦ Hose clamps, up to 25 mm - 3094-



♦ Hose clip pliers - VAS 6362-

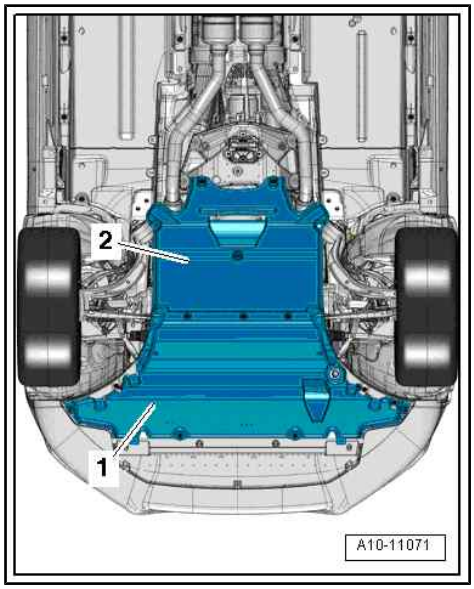


Removing

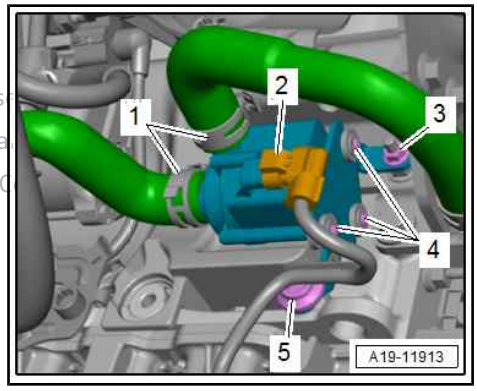
• Engine cold.

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– To relieve residual pressure in cooling system: cover filler cap on coolant expansion tank with a cloth and carefully open briefly and close again.
– Remove front noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .



– Unplug electrical connector -2-.



Note

Place a cloth underneath to catch escaping coolant.

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– Clamp off coolant hoses with hose clamps -3094- .
– Release hose clips -1- and disconnect coolant hoses.
– Unscrew nut -3- and bolt -5- and disengage auxiliary pump for heating - V488- with bracket.
– Remove bolts -4- to detach auxiliary pump for heating from bracket.

Installing

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

Note

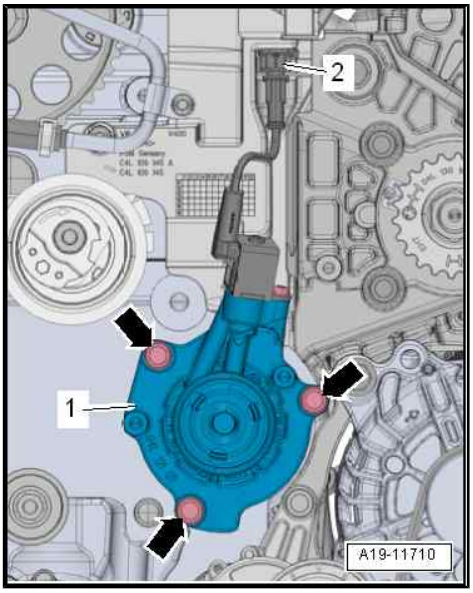
Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .

– Bleed cooling system ⇒ page 172 .

Tightening torques

♦ Noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

2.5 Removing and installing coolant pump



Removing

– Drain coolant ⇒ page 164 .

– Remove toothed belt ⇒ page 82 .

– Unplug electrical connector -2- and move wiring clear.

– Remove bolts -arrows- and detach coolant pump -1-.

Installing

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

Caution

Do NOT pull the modulating mechanism of the coolant pump with your hand to check its function.

This can cause damage within the coolant pump, resulting in an insufficient coolant supply to the engine.

- Do not hold or carry the coolant pump by the connector or modulating mechanism.
- Do not operate the modulating mechanism.
- Renew O-rings.

– Clean and smoothen sealing surfaces for O-rings.

– Lubricate O-rings with coolant.

– Install toothed belt (adjust valve timing) ⇒ page 86 .

Note

Do not reuse coolant.

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– Fill and bleed coolant circuit ⇒ page 167 .

Tightening torques

◆ ⇒ “2.1 Exploded view - coolant pump/thermostat”, page 176

2.6 Checking thermostat

– Remove thermostat and heat it in a water bath.

Starts to open	Fully open	Opening travel
87 ± 2 °C	approx. 102 °C[1)]	at least 9 mm
• [1)] Cannot be tested.		

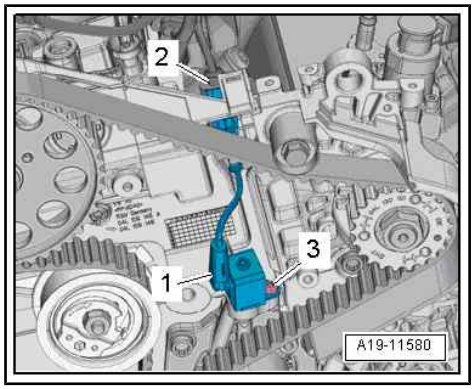
2.7 Removing and installing coolant valve for cylinder head - N489-

Removing

- Engine cold.

– To relieve residual pressure in cooling system: cover filler cap on coolant expansion tank with a cloth and carefully open briefly and close again.

– Remove toothed belt cover (top) ⇒ page 69 .
– Unplug electrical connector -2- and move wiring clear.
– Remove bolt -3- and detach coolant valve for cylinder head - N489- -item 1-.



Installing

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

Note

Renew O-rings.

– Install toothed belt cover (top) ⇒ page 69 .
– Bleed cooling system ⇒ page 172 .

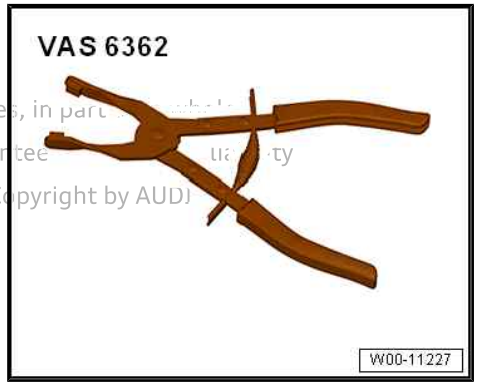
Tightening torques

♦ ⇒ “2.1 Exploded view - coolant pump/thermostat”, page 176

2.8 Removing and installing coolant temperature sender - G62-

Special tools and workshop equipment required

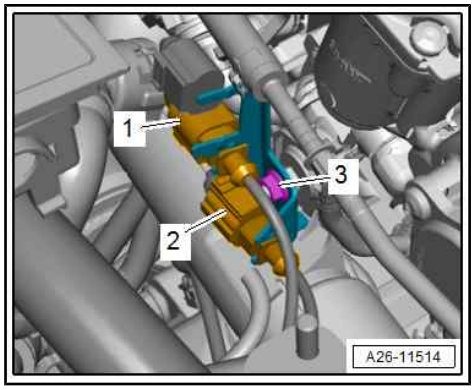
♦ Hose clip pliers - VAS 6362-



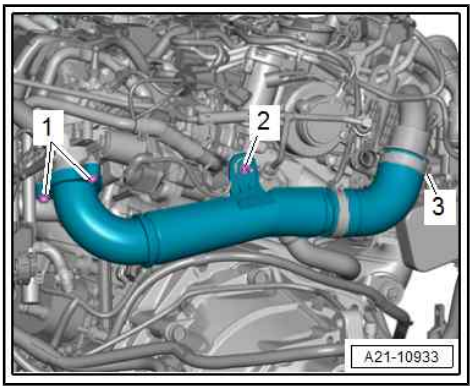
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Removing

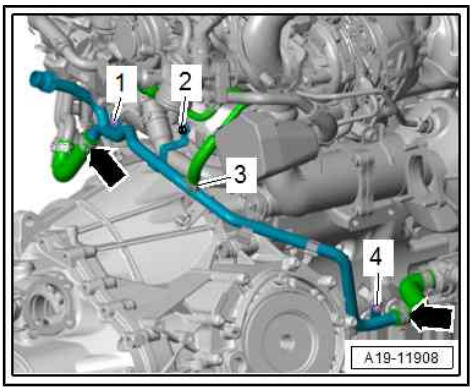
• Engine cold.
– To relieve residual pressure in cooling system: cover filler cap on coolant expansion tank with a cloth and carefully open briefly and close again.
– Remove plenum chamber partition panel ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Exploded view - plenum chamber partition panel .
– Remove nut -3- and move bracket with electrical connectors -1, 2- to one side.



– Remove bolts -1- and centre hex stud -2-.
– Release hose clip -3- and detach air pipe.

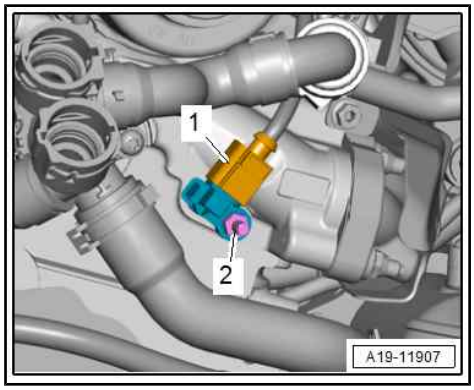


– Unscrew bolts -1, 4- and nut -2- and push coolant pipe (rear) slightly to right side.



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– Unplug electrical connector -1-.
– Unscrew centre hex stud -2- and pull off coolant temperature sender - G62- .



Note

If an O-ring or spacer ring remains lodged in cylinder head, lift it out with a piece of wire, taking care not to damage sealing surface.

Installing

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

Note

- *Renew O-rings.*
- *Renew spacer ring if damaged.*
- *Before fitting, check vacuum hoses for damage and renew if necessary.*
- *Do not reuse coolant.*

– Bleed cooling system ⇒ page 172 .

Tightening torques

- ⇒ “3.1 Exploded view - coolant pipes”, page 187
- Plenum chamber partition panel ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Exploded view - plenum chamber partition panel
- ⇒ “2.1 Exploded view - charge air system”, page 235
- ⇒ Fig. ““Installing air ducts with hose clips”“ , page 254

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3 Coolant pipes

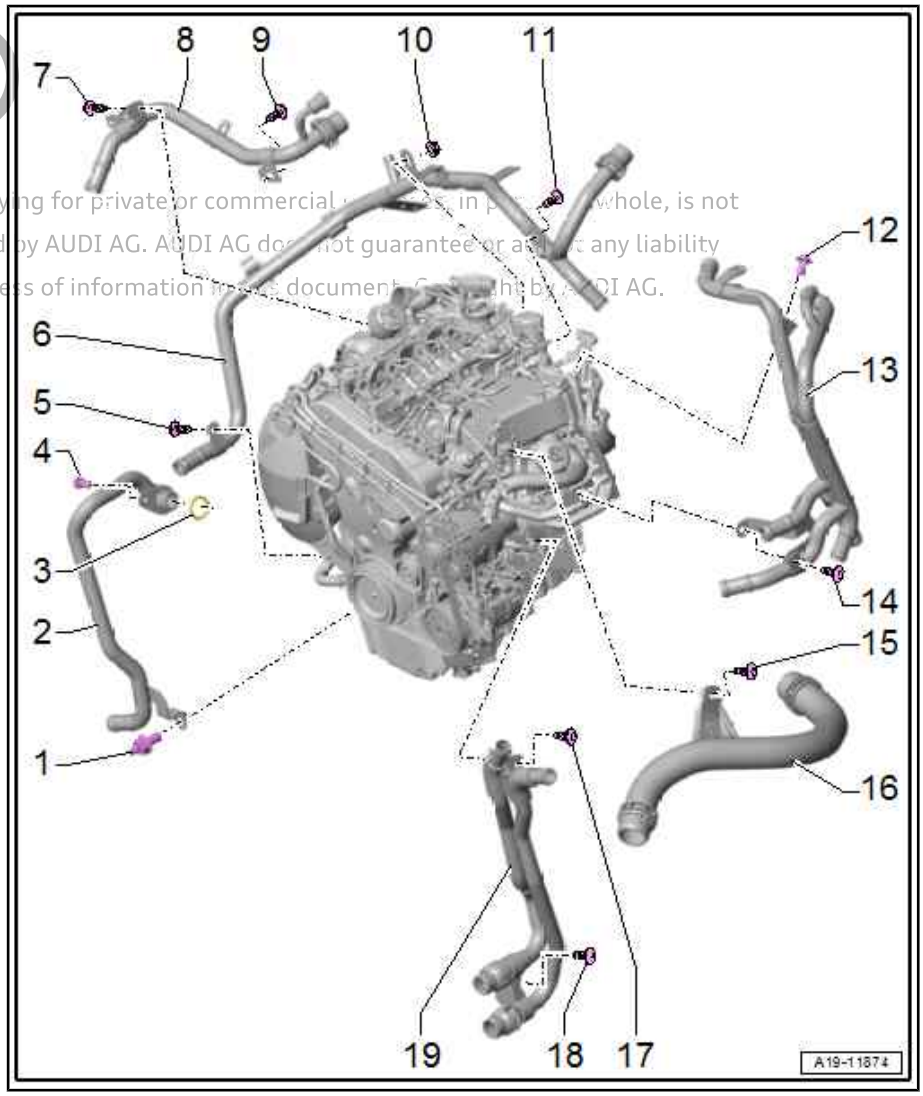
⇒ "3.1 Exploded view - coolant pipes", page 187

⇒ "3.2 Removing and installing coolant pipes", page 188

3.1 Exploded view - coolant pipes

Note

The arrow markings on coolant pipes and on ends of hoses must align.



1 - Bolt
- ❑ 20 Nm

2 - Coolant pipe (right-side)
- ❑ Removing and installing ⇒ page 194

3 - O-ring
- ❑ Renew after removing
- ❑ Lubricate with coolant

4 - Bolt
- ❑ 10 Nm

5 - Bolt
- ❑ 10 Nm

6 - Coolant pipe (rear)
- ❑ Removing and installing ⇒ page 198

7 - Bolt
- ❑ 10 Nm

8 - Coolant pipe (rear right)
- ❑ Removing and installing ⇒ page 195

9 - Bolt
- ❑ 10 Nm

10 - Nut
- ❑ 10 Nm

11 - Bolt
- ❑ 10 Nm

12 - Bolt
- ❑ 10 Nm

13 - Coolant pipe (rear left)
- ❑ Removing and installing ⇒ page 190

14 - Bolt
- ❑ 10 Nm

15 - Bolt
- ❑ 10 Nm

16 - Coolant pipe (top left)
- ❑ Removing and installing ⇒ page 192

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17 - Bolt

- ❑ 10 Nm

18 - Bolt

- ❑ 10 Nm

19 - Coolant pipes (bottom left)

- ❑ Removing and installing ⇒ page 192

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3.2 Removing and installing coolant pipes

⇒ "3.2.1 Installing coolant hoses with pre-tensioned spring-type clips", page 188

⇒ "3.2.2 Removing and installing coolant pipe (left-side)", page 189

⇒ "3.2.3 Removing and installing coolant pipes (rear left)", page 190

⇒ "3.2.4 Removing and installing coolant pipe (top left)", page 192

⇒ "3.2.5 Removing and installing coolant pipes (bottom left)", page 192

⇒ "3.2.6 Removing and installing coolant pipe (right-side)", page 194

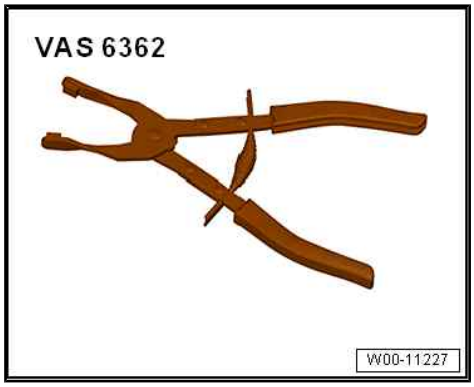
⇒ "3.2.7 Removing and installing coolant pipe (rear right)", page 195

⇒ "3.2.8 Removing and installing coolant pipe (rear)", page 198

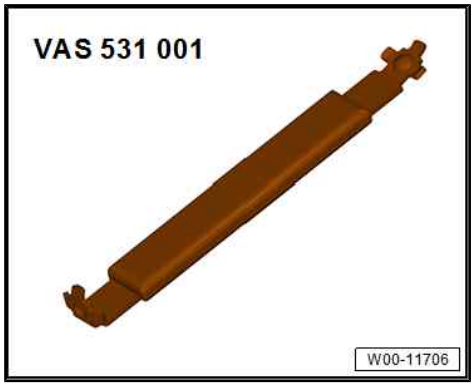
3.2.1 Installing coolant hoses with pre-tensioned spring-type clips

Special tools and workshop equipment required

- ♦ Hose clip pliers - VAS 6362-



- ♦ Release tool - VAS 531 001-



Opening clip:

– Use hose clip pliers to compress spring-type clips until clip engages.

– This opens clip, and coolant hose can be detached.

– Clip cannot be removed from coolant hose.

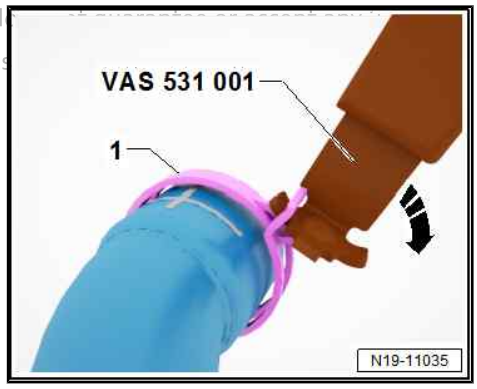
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Closing clip:

– Fit coolant hose.

– Release pre-tensioned spring-type clip by inserting release tool - VAS 531 001- into spring-type clip -1-, as shown. Release catch.

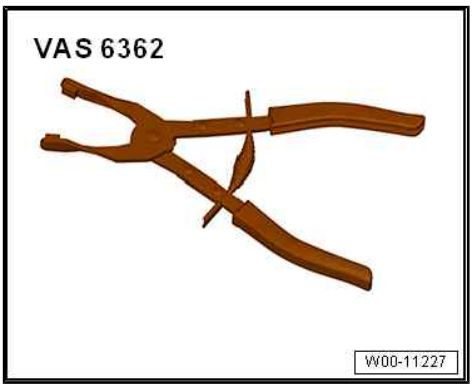
– Depending on space, use a suitable hook for releasing clip.



3.2.2 Removing and installing coolant pipe (left-side)

Special tools and workshop equipment required

♦ Hose clip pliers - VAS 6362-

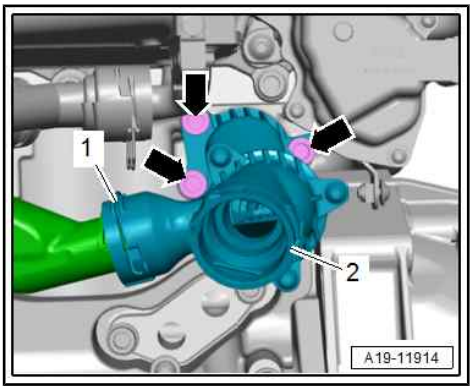


Removing

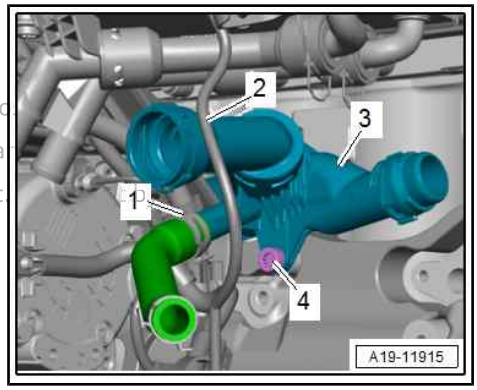
– Remove oil filter housing ⇒ page 156 .

– Remove throttle valve module - J338- ⇒ page 258 .

– Remove bolts -arrows-.



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– Release hose clip -1- and disconnect coolant hose.
– Remove bolt -4-.
– Release clip for vacuum line -2-.
– Detach and remove coolant pipe (left-side) with thermostat -3-, taking care not to damage vacuum line -2-.

Installing

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

Note

- *Renew seals and O-rings.*
- *Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .*

– Clean and smoothen sealing surfaces for seals and O-rings.
– Lubricate seals and O-rings with coolant.
– Install throttle valve module - J338- ⇒ page 258 .
– Install oil filter housing ⇒ page 156 .
– Connect coolant hose with plug-in connector ⇒ page 202 .

Note

Do not reuse coolant.

– Fill and bleed coolant circuit ⇒ page 167 .

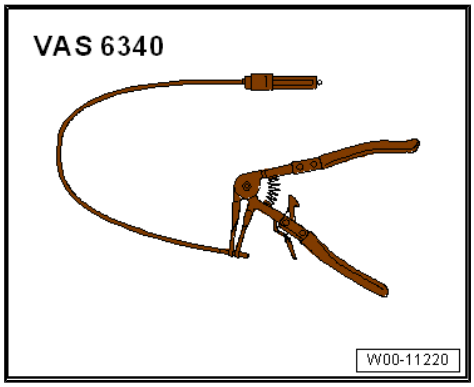
Tightening torques

- ⇒ “3.1 Exploded view - coolant pipes”, page 187

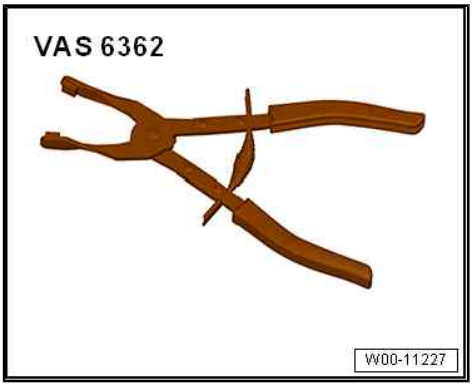
3.2.3 Removing and installing coolant pipes (rear left)

Special tools and workshop equipment required

- Hose clip pliers - VAS 6340-

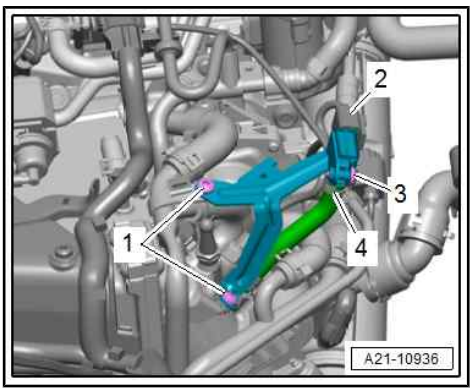


♦ Hose clip pliers - VAS 6362-



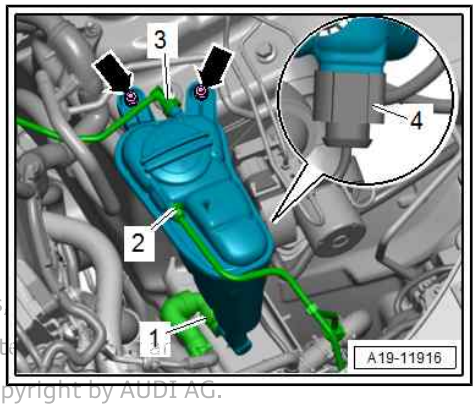
Removing

– Remove engine cover panel ⇒ page 34 .
– Drain coolant ⇒ page 164 .
– Unplug electrical connector -2-.
– Remove bolts -1- and press charge pressure sender - G31- to side.



A4 and A5 only:

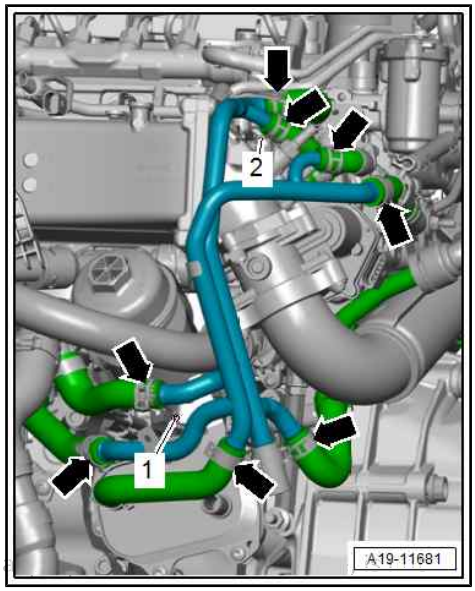
– Lift retaining clips -1, 2, 3- and disconnect coolant hoses.
– Remove bolts -arrows-.
– Detach coolant expansion tank and unplug electrical connector -4-.



All vehicles:

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– Move electrical wiring clear.
– Release hose clips -arrows- and disconnect coolant hoses.



Note

Take care not to damage coolant hoses when disconnecting.

– Remove bolts -1 and 2- and detach coolant pipes (rear left).

Installing

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

Note

- *Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .*
- *Do not reuse coolant.*

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– Connect coolant hose with plug-in connector ⇒ page 202 .
– Fill and bleed coolant circuit ⇒ page 167 .

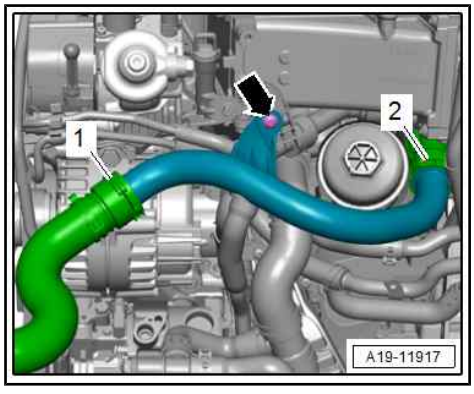
Tightening torques

- ⇒ “3.1 Exploded view - coolant pipes”, page 187
- ⇒ “2.1 Exploded view - charge air system”, page 235

3.2.4 Removing and installing coolant pipe (top left)

Removing

– Remove engine cover panel ⇒ page 34 .
– Drain coolant ⇒ page 164 .
– Lift retaining clip -1- and disconnect coolant hose.
– Remove bolt -arrow-, lift retaining clip -2- and detach coolant pipe (top left).



Installing

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

Note

- *Renew O-ring.*
- *Do not reuse coolant.*

– Connect coolant hose with plug-in connector ⇒ page 202 .
– Fill and bleed coolant circuit ⇒ page 167 .

Tightening torques

- ⇒ “3.1 Exploded view - coolant pipes”, page 187

3.2.5 Removing and installing coolant pipes (bottom left)

Special tools and workshop equipment required

- Hose clamps, up to 25 mm - 3094-

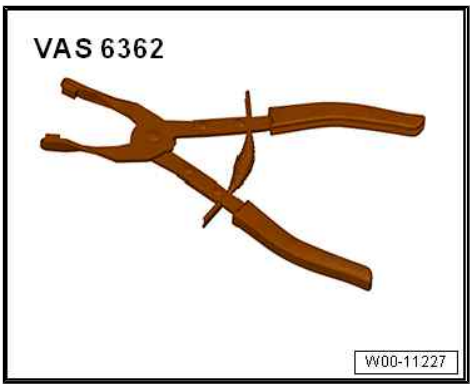


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- Drip tray for workshop hoist - VAS 6208-

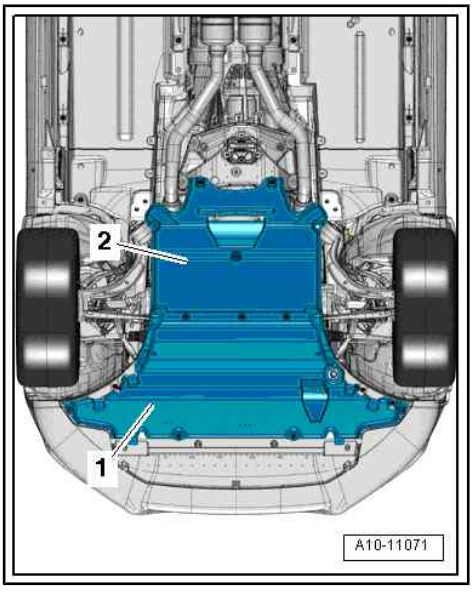


- Hose clip pliers - VAS 6362-

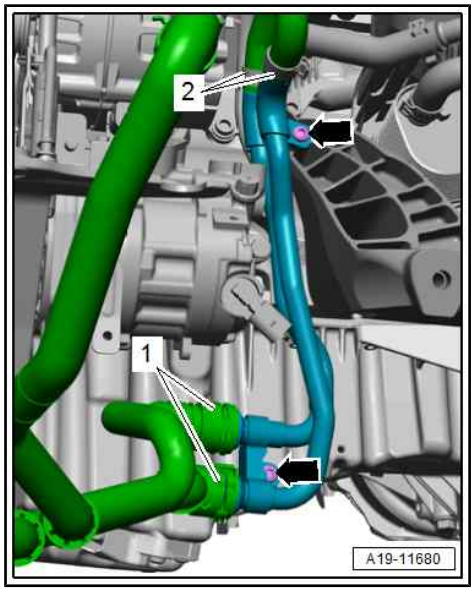


Removing

– Remove front noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .



– Place drip tray for workshop hoist - VAS 6208- underneath.
– Clamp off coolant hoses with hose clamps -3094- .
– Lift retaining clips -1-, release hose clips -2- and disconnect coolant hoses.
– Remove bolts -arrows- and detach coolant pipes (bottom left).



Installing

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

Note

Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .

– Connect coolant hose with plug-in connector ⇒ page 202 .
– Fill and bleed coolant circuit ⇒ page 167 .

Tightening torques

- ⇒ “3.1 Exploded view - coolant pipes”, page 187
- Noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

3.2.6 Removing and installing coolant pipe (right-side)

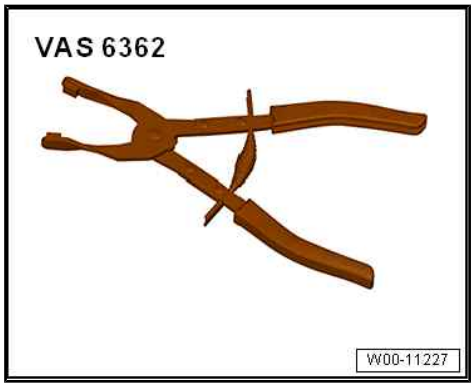
Special tools and workshop equipment required

- Drip tray for workshop hoist - VAS 6208-



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- Hose clip pliers - VAS 6362-



- U/J extension adapter with socket insert (commercially available)

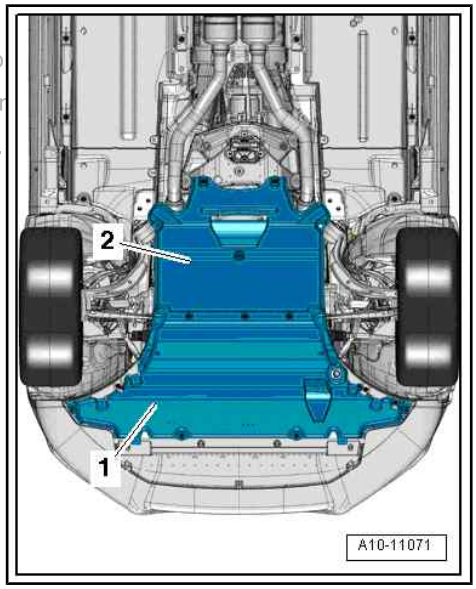
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Removing

– Remove front wheel housing liner (right-side) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front) .

– Remove air cleaner housing ⇒ page 254 .

– Remove front noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .

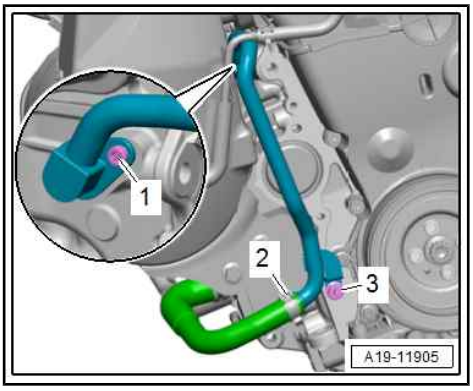


– Place drip tray for workshop hoist - VAS 6208- underneath.

– Release hose clip -2- and disconnect coolant hose.

– Remove bolt -1- using U/J extension adapter with socket insert (commercially available).

– Unscrew bolt -3- and remove coolant pipe (right-side).



Installing

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

Note

- *Renew O-ring.*
- *Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .*

– Install air cleaner housing ⇒ page 254 .

Note

Do not reuse coolant.

– Fill and bleed coolant circuit ⇒ page 167 .

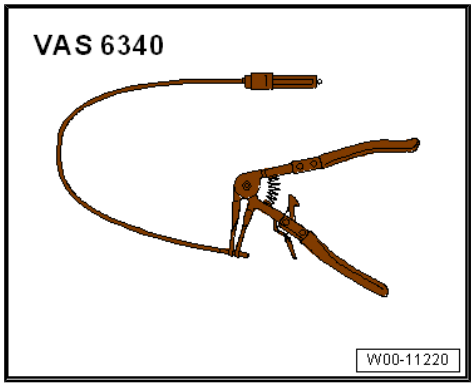
Tightening torques

- ⇒ “3.1 Exploded view - coolant pipes”, page 187
- Noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation
- Wheel housing liner ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front)

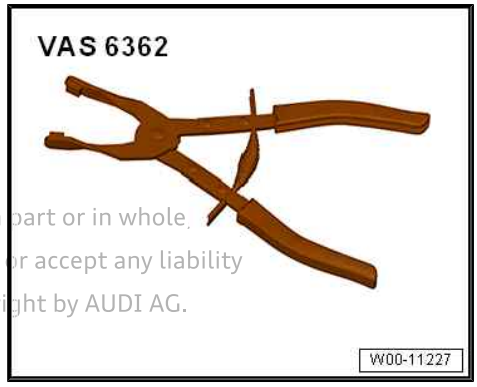
3.2.7 Removing and installing coolant pipe (rear right)

Special tools and workshop equipment required

- Hose clip pliers - VAS 6340-



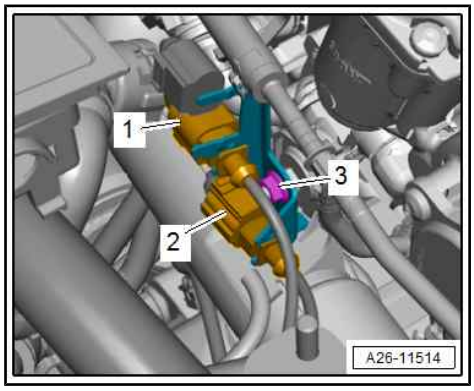
- Hose clip pliers - VAS 6362-



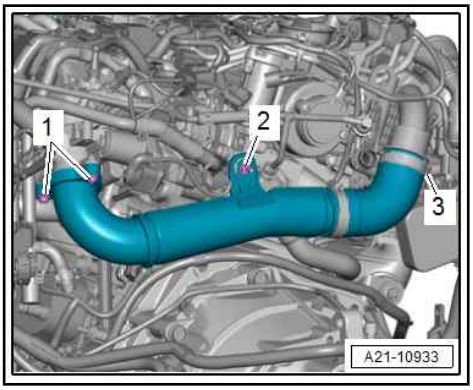
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Removing

– Drain coolant ⇒ page 164 .
– Remove air cleaner housing ⇒ page 254 .
– Remove exhaust gas temperature sender 4 - G648- ⇒ page 395 .
– Remove plenum chamber partition panel ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Exploded view - plenum chamber partition panel .
– Remove nut -3- and move bracket with electrical connectors -1, 2- to one side.



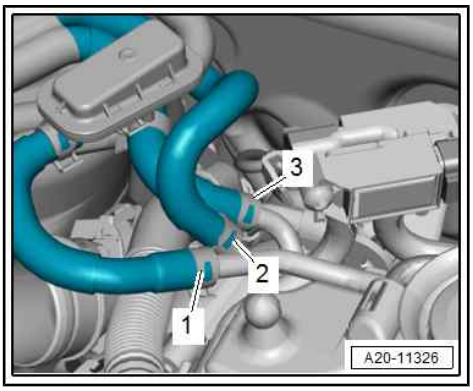
– Remove bolts -1- and centre hex stud -2-.
– Release hose clip -3- and detach air pipe.



Caution

Protect fuel system against contamination.

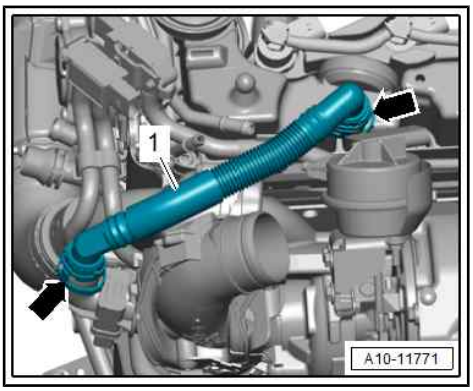
- ***Rules for cleanliness when working on the injection system ⇒ page 6 .***



– Release hose clips and disconnect fuel hoses.

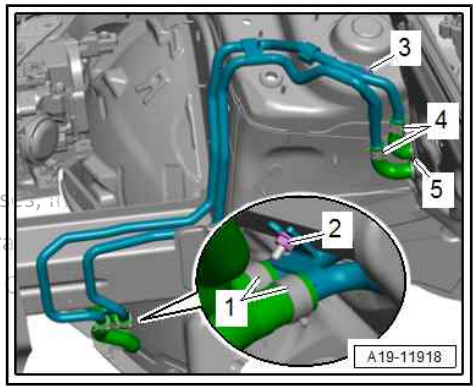
1 - Fuel hose (blue)
2 - Fuel hose (yellow)
3 - Fuel hose (white)

– Press release tabs -arrows- on both sides and disconnect crankcase breather hose -1-.



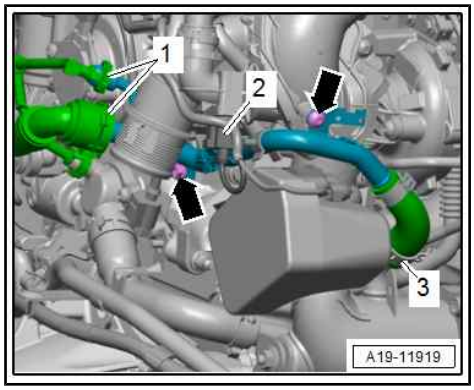
A4 and A5 only:

– Loosen nut -2-.
– Release hose clips -1- and disconnect coolant hoses.
– Unscrew nut -3-.
– Release hose clips -4- and disconnect coolant hoses.
– Push coolant hoses with protector -5- into plenum chamber.
– Swivel coolant pipes towards front.



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All vehicles:



- Move electrical wiring harness clear and unplug electrical connector -2-.
- Lift retaining clips -1- and disconnect coolant hoses.
- Remove bolts -arrows-.
- Loosen hose clip -3- and detach coolant pipe (rear right).

Note

It is difficult to access the bolt -top arrow-; for this reason, use a small ratchet with a short bit to unscrew it.

Installing

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

Note

Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .

- Install air cleaner housing ⇒ page 254 .

Note

Do not reuse coolant.

- Connect coolant hose with plug-in connector ⇒ page 202 .
- Fill and bleed coolant circuit ⇒ page 167 .

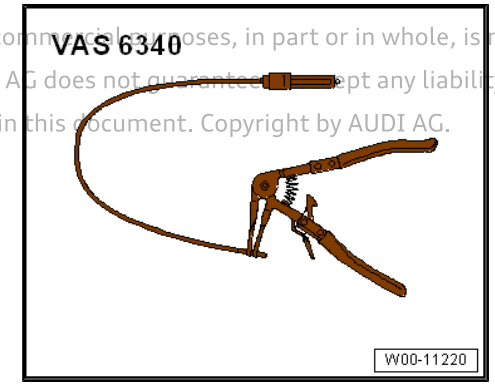
Tightening torques

- ⇒ “3.1 Exploded view - coolant pipes”, page 187
- ⇒ “4.1 Exploded view - exhaust gas temperature control”, page 389
- Plenum chamber partition panel ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Exploded view - plenum chamber partition panel

3.2.8 Removing and installing coolant pipe (rear)

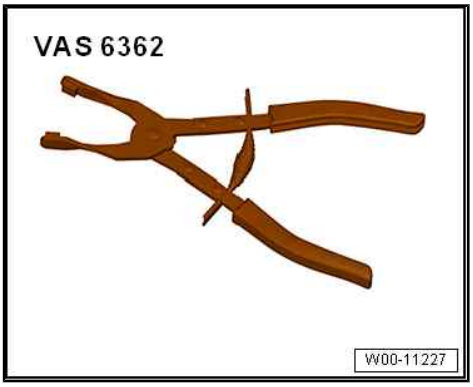
Special tools and workshop equipment required

- Hose clip pliers - VAS 6340-



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♦ Hose clip pliers - VAS 6362-

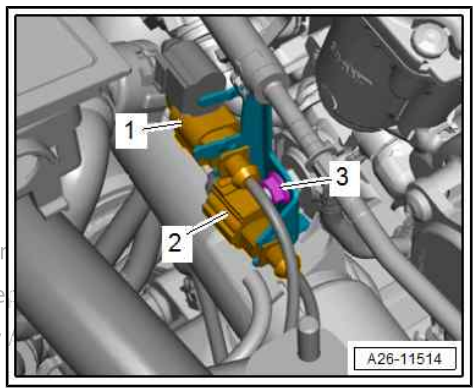


Removing

– Drain coolant ⇒ page 164 .

– Remove plenum chamber partition panel ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Exploded view - plenum chamber partition panel .

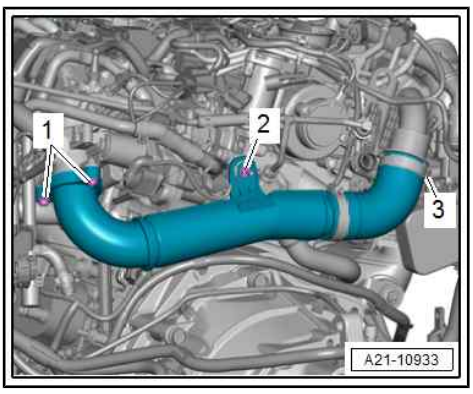
– Remove nut -3- and move bracket with electrical connectors -1, 2- to one side.



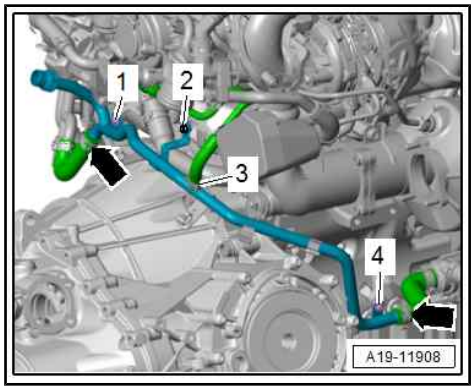
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– Remove bolts -1- and centre hex stud -2-.

– Release hose clip -3- and detach air pipe.



– Move electrical wiring clear.
– Remove nut -2- and bolts -1 and 4-.
– Release hose clips -3- and -arrows- and disconnect coolant hoses.
– Remove engine mounting (right-side) ⇒ page 29 .
– Detach rear coolant pipe.



Installing

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

Note

- *Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .*
- *Do not reuse coolant.*

– Fill and bleed coolant circuit ⇒ page 167 .

Tightening torques

- ⇒ “3.1 Exploded view - coolant pipes”, page 187
- ⇒ “2.1 Exploded view - charge air system”, page 235
- ⇒ Fig. ““Installing air ducts with hose clips”“ , page 254
- Plenum chamber partition panel ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Exploded view - plenum chamber partition panel

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4 Radiators/radiator fans

⇒ “4.1 Exploded view - radiators/radiator fans”, page 201

⇒ “4.2 Removing and installing radiator”, page 203

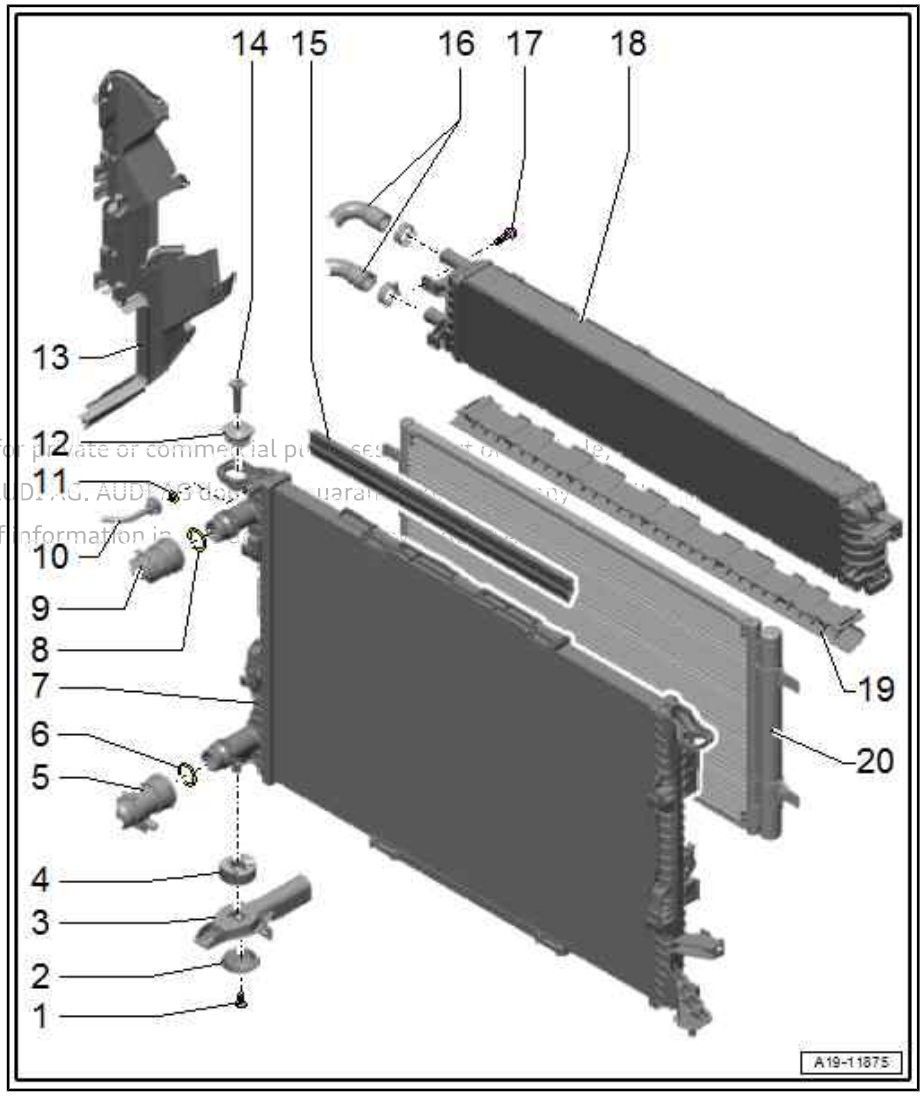
⇒ “4.3 Removing and installing water radiator for charge air cooling circuit”, page 208

⇒ “4.4 Removing and installing radiator cowl”, page 211

⇒ “4.5 Removing and installing radiator fan V7 ”, page 219

⇒ “4.7 Removing and installing radiator fan control unit”, page 220

4.1 Exploded view - radiators/radiator fans



1 - Bolt
- ❑ 3.5 Nm

2 - Washer

3 - Radiator bracket

4 - Rubber mounting

5 - Connection
- ❑ With drain plug

6 - O-ring
- ❑ Renew if damaged
- ❑ Lubricate with coolant

7 - Radiator
- ❑ Removing and installing ⇒ page 203
- ❑ If renewed, refill system with fresh coolant

8 - O-ring
- ❑ Renew if damaged
- ❑ Lubricate with coolant

9 - Connection

10 - Coolant pipe

11 - O-ring
- ❑ Check and renew component if damaged
- ❑ Lubricate with coolant

12 - Rubber bush
- ❑ For radiator

13 - Air duct

14 - Retaining pin
- ❑ Use screwdriver to release and pull off

15 - Air duct

16 - Coolant hoses

17 - Bolt
- ❑ 3.5 Nm

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18 - Water radiator for charge air cooling circuit

❑ Removing and installing ⇒ page 208

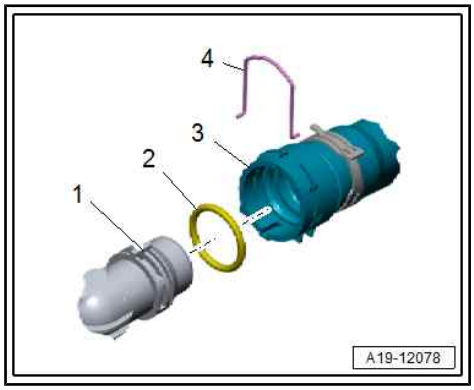
19 - Air duct

20 - Condenser

❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit; Removing and installing condenser

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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.

Radiator cowl and radiator fans

1 - Radiator fan control unit - J293-

- ❑ Removing and installing ⇒ page 220

2 - Bolt

- ❑ 3.5 Nm

3 - Bolt

- ❑ 5 Nm

4 - Radiator cowl

- ❑ Removing and installing ⇒ page 211

5 - Radiator fan - V7-

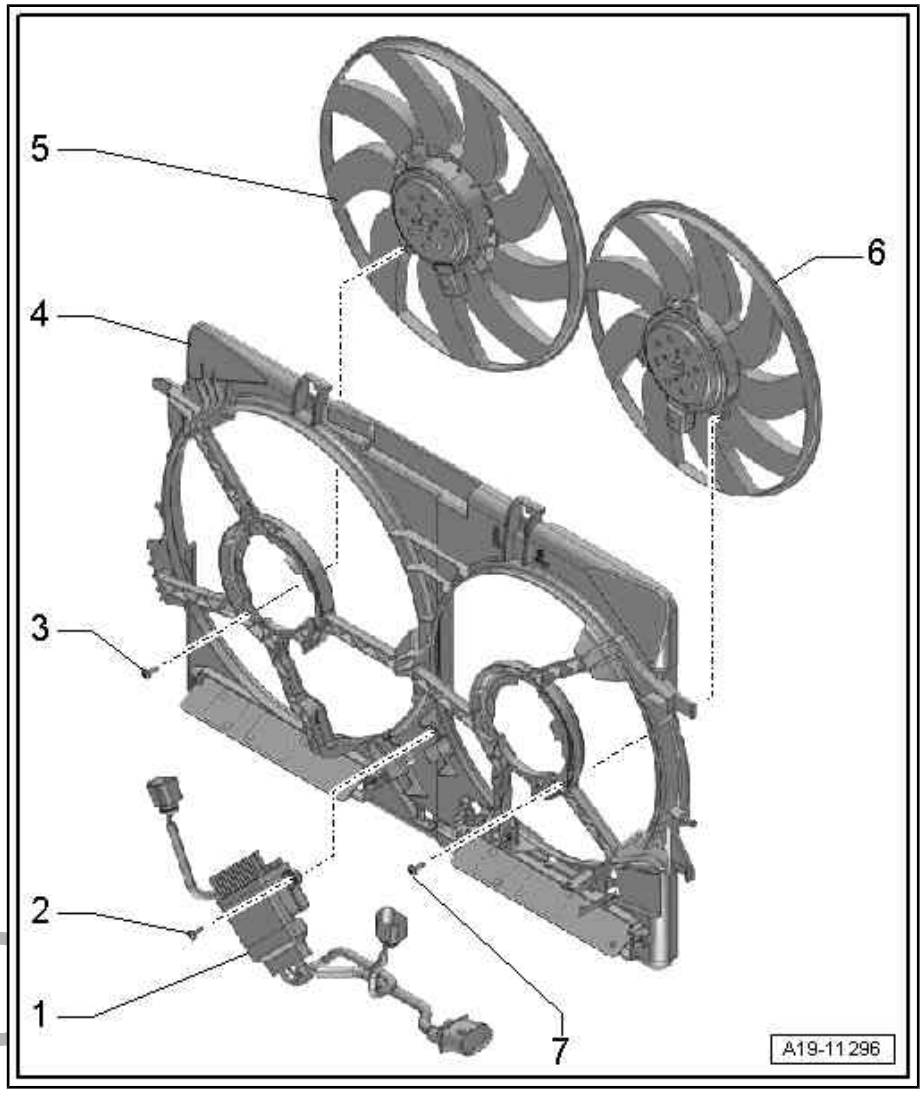
- ❑ Removing and installing ⇒ page 219

6 - Radiator fan 2 - V177-

- ❑ Removing and installing ⇒ page 219

7 - Bolt

- ❑ 5 Nm



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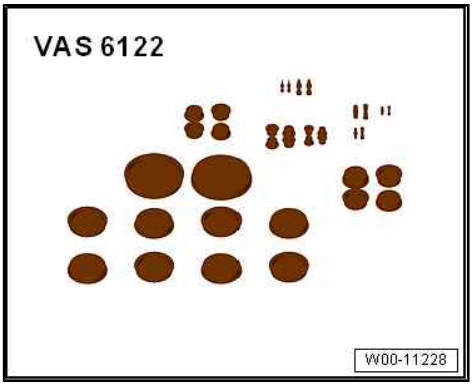
4.2 Removing and installing radiator

Note

The radiator is removed together with the radiator cowl.

Special tools and workshop equipment required

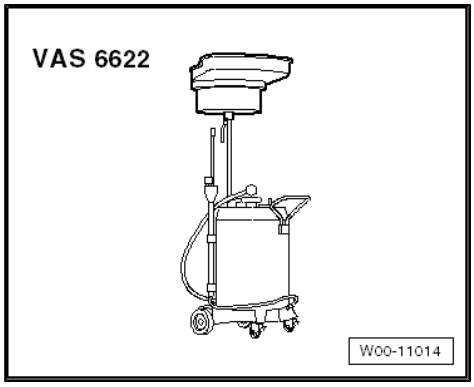
- ♦ Engine bung set - VAS 6122- for vehicles with multitronic gearbox



- Drip tray for workshop hoist - VAS 6208-

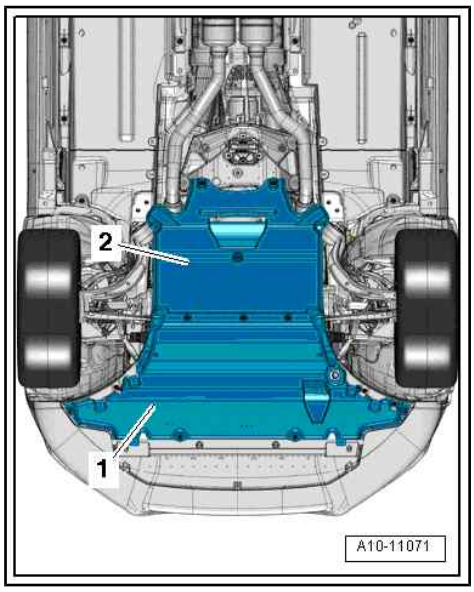


- Used oil collection and extraction unit - VAS 6622A-



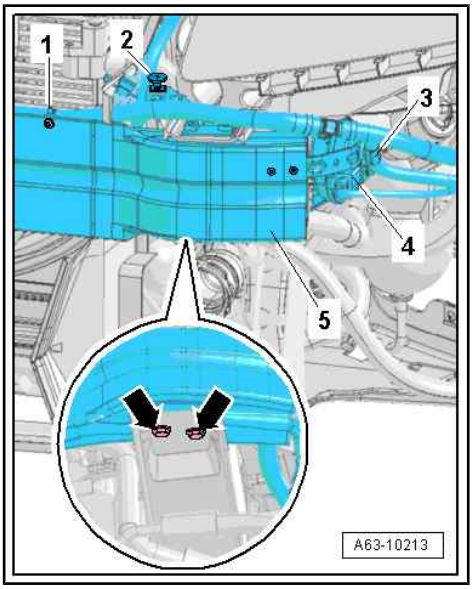
Removing

– Remove front noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .



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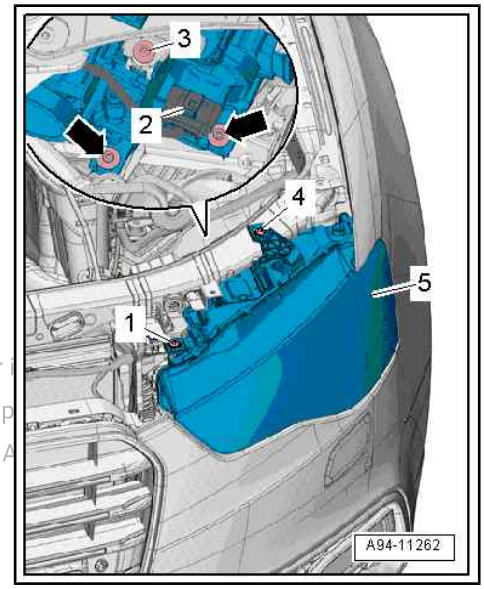
– Remove impact bar -5- ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - impact bar .



A4 only:

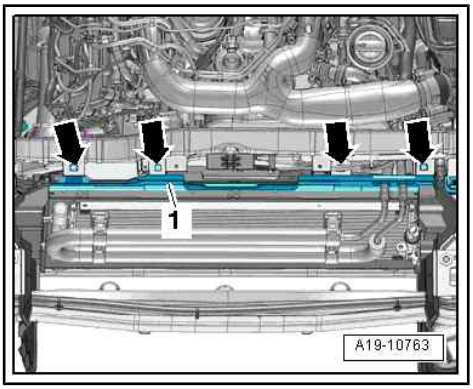
– Remove headlight (left-side) ⇒ Electrical system; Rep. gr. 94 ; Headlights; Removing and installing headlights .

Q5 only:



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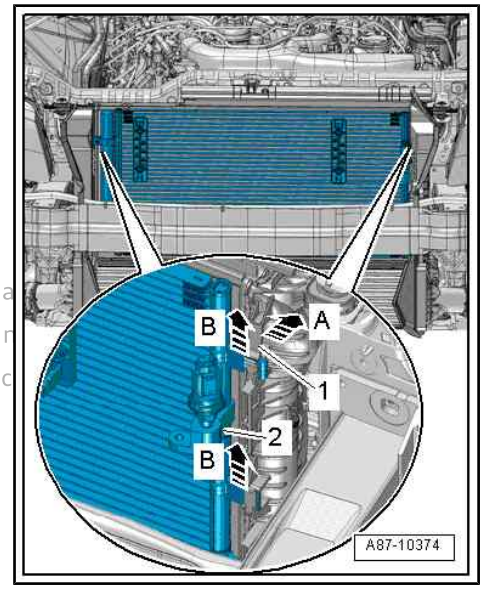
– Detach top air duct -1- (release catches -arrows-).



All vehicles:

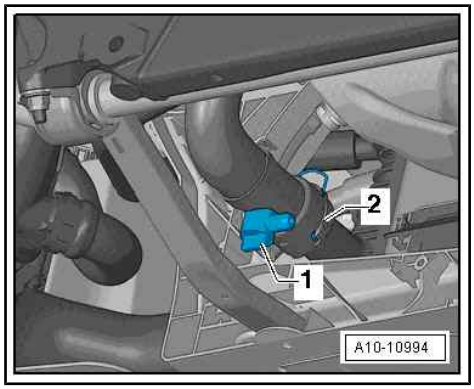
– Remove water radiator for charge air cooling circuit ⇒ page 208 .

– Remove condenser ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit; Removing and installing condenser .



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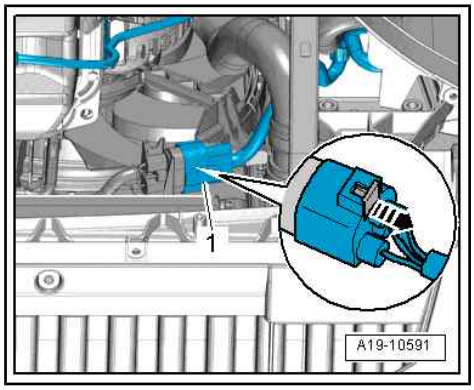
– Place drip tray for workshop hoist - VAS 6208- underneath.
– Open drain plug -1- at connection and drain off coolant.
– Then lift retaining clip -2- and disconnect coolant hose from radiator.



WARNING

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

- *Unplug electrical connectors before working in vicinity of radiator cowl.*



– Take electrical connector -1- for radiator fan out of bracket and unplug connector (push retainer to the rear -arrow- and press down release catch).

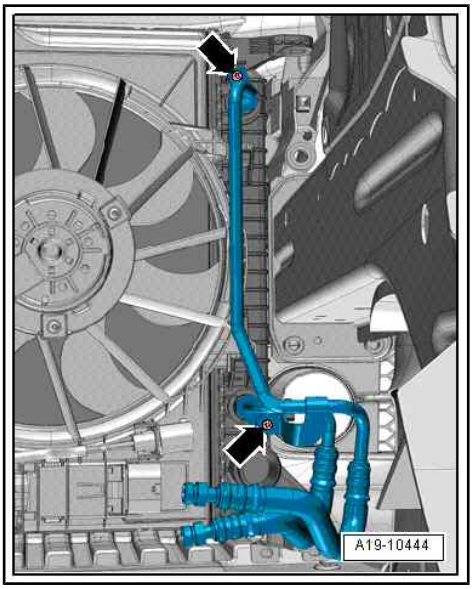
Vehicles with multitronic gearbox:

– Position used oil collection and extraction unit - VAS 6622A- below connection point.

Note

Observe rules for cleanliness when working on gearbox ⇒ Rep. gr. 00 ; Repair instructions; Rules for cleanliness .

– Unscrew bolts -arrows- and detach ATF lines from radiator.



Note

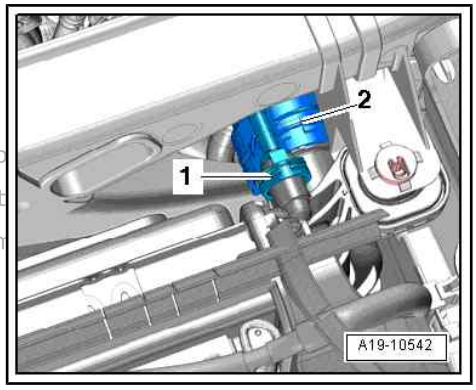
Tie ATF lines up onto longitudinal member to prevent fluid escaping.

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

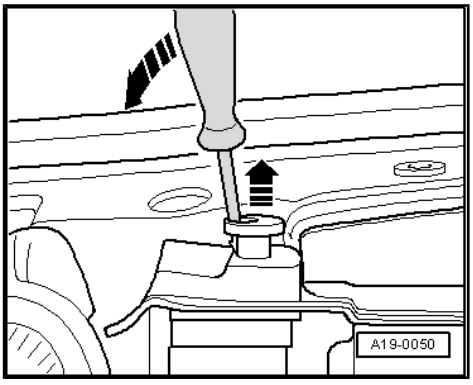
All vehicles (continued):

– Lift retaining clips -1- and -2- and detach connection from radiator.

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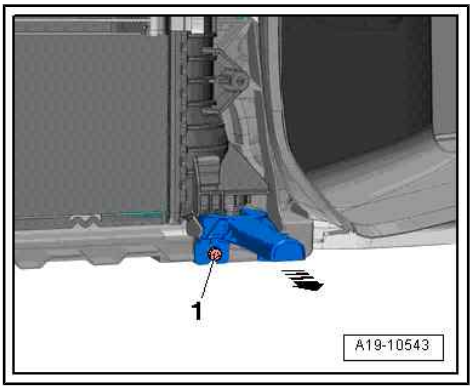


– Release retaining pins for radiator on both sides and pull out upwards -arrows-.

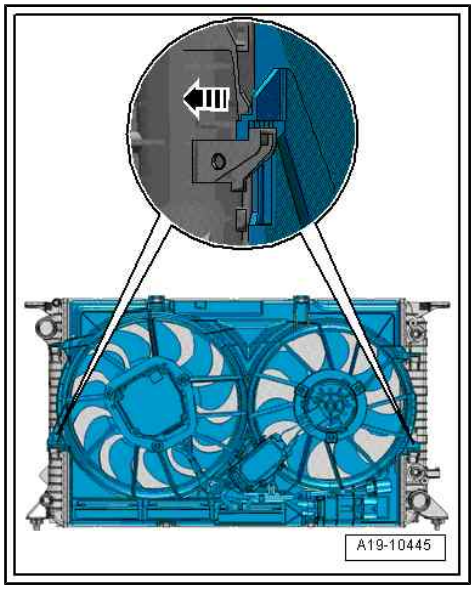


– Remove bolt -1- on both sides and detach radiator bracket with radiator from lock carrier -arrow-.

– Detach radiator.



– Press locking tabs on left and right sides of radiator cowl together -arrow- and lift radiator cowl off radiator.



Installing

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

Note

If there are slight impressions on the fins, refer to ⇒ page 8 .

– Install condenser ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit; Removing and installing condenser .
– Install water radiator for charge air cooling circuit ⇒ page 208 .
– A4 only: Install headlight ⇒ Electrical system; Rep. gr. 94 ; Headlights; Removing and installing headlights .
– Connect coolant hose with plug-in connector ⇒ page 202 .
– Install ATF lines (if originally fitted) ⇒ Rep. gr. 37 ; ATF circuit; Removing and installing ATF lines .

Note

- *Renew O-rings.*
- *Do not reuse coolant.*

– Fill and bleed coolant circuit ⇒ page 167 .

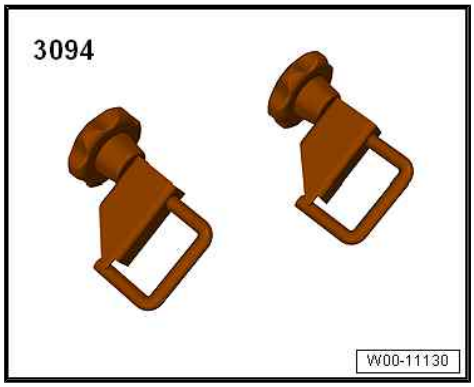
Tightening torques

- ⇒ “4.1 Exploded view - radiators/radiator fans”, page 201
- Noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation
- Impact bar ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - impact bar

4.3 Removing and installing water radiator for charge air cooling circuit

Special tools and workshop equipment required

- Hose clamps, up to 25 mm - 3094-

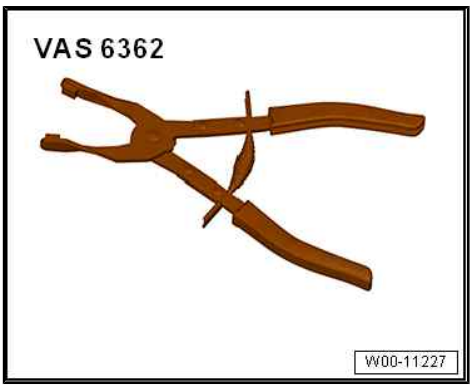


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♦ Drip tray for workshop hoist - VAS 6208-



♦ Hose clip pliers - VAS 6362-



Removing

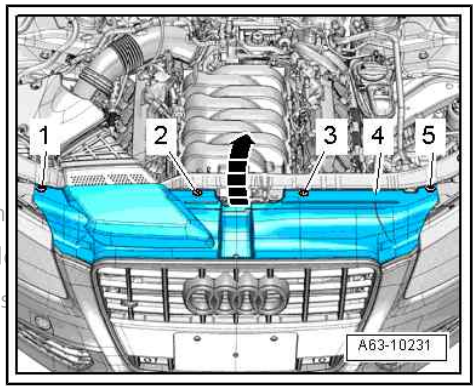
The following step is only required on allroad models:

– Detach bumper cover (front) ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing bumper cover .

All vehicles except allroad models:

– Remove lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .

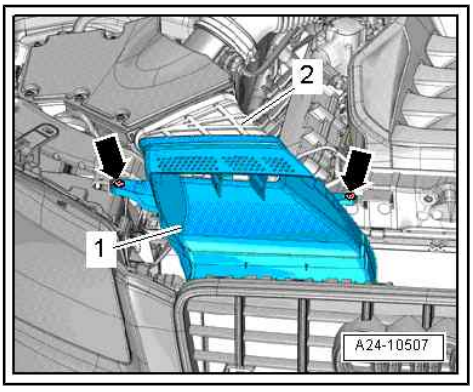
– Lift lock carrier cover -4- -arrow- and detach from radiator grille.



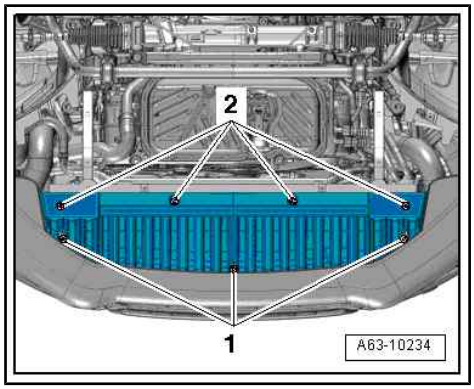
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– Remove bolts -arrows-.

– Detach air duct -1- from intermediate flange -2- for air cleaner housing.



– Remove closure plate at bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .

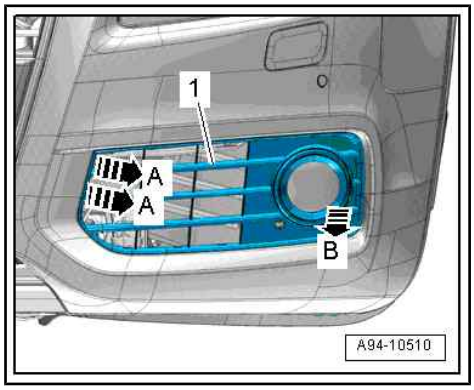


– Remove air intake grille -1- on both sides ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .

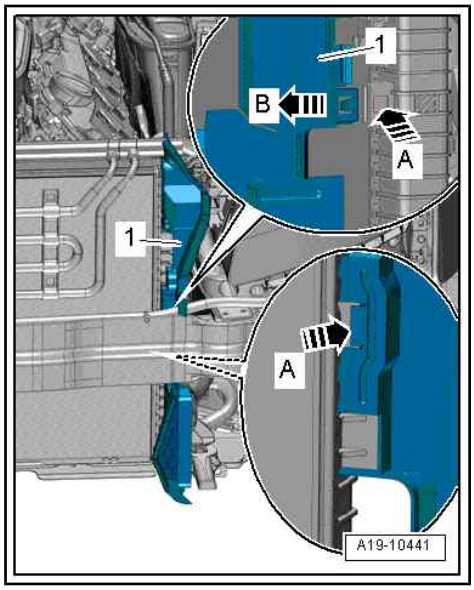
All vehicles:

Note

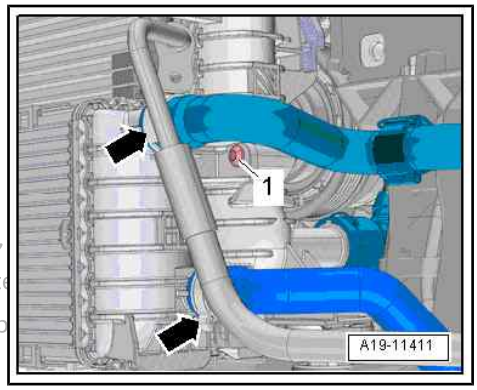
For illustration purposes, the installation position is shown in the following illustrations with the bumper removed.



– Release catches -arrows A- and swivel air duct -1- on left and right to centre of vehicle -arrow B-.

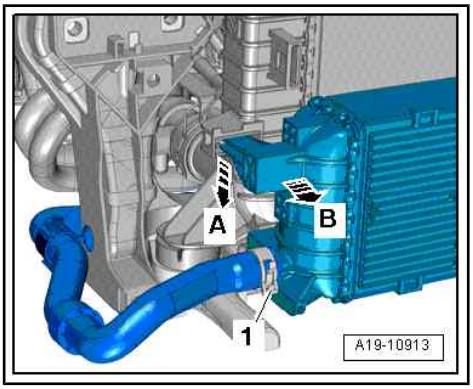


– Place drip tray for workshop hoist - VAS 6208- underneath.
– Clamp off coolant hoses using hose clamps -3094- , release hose clips -arrows- and disconnect hoses.
– Remove bolt -1-.



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– Push catch down -arrow A- and move water radiator (front) for charge air cooling circuit slightly in direction of -arrow B-.

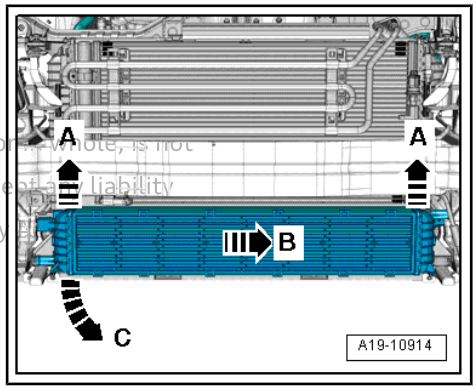


Note

-Item 1- and hose are not fitted.

– Lift water radiator (front) for charge air cooling circuit off radiator -arrows A- and swivel in direction of -arrow B-.

– Detach water radiator (front) for charge air cooling circuit from right side downwards -arrow C-.



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Installing

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

Note

- *If there are slight impressions on the fins, refer to ⇒ page 8 .*
- *Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .*
- *Do not reuse coolant.*

– Fill and bleed coolant circuit ⇒ page 167 .

Tightening torques

- ⇒ “4.1 Exploded view - radiators/radiator fans”, page 201
- Air duct
  ⇒ “3.1 Exploded view - air cleaner housing”, page 253

– Install lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .

– On allroad models: Install bumper cover (front) ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing bumper cover .

4.4 Removing and installing radiator cowl

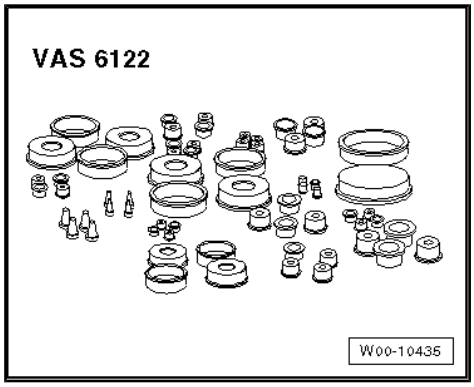
⇒ “4.4.1 Removing and installing radiator cowl - Audi A4 and A5”, page 211

⇒ “4.4.2 Removing and installing radiator cowl - Audi Q5”, page 215

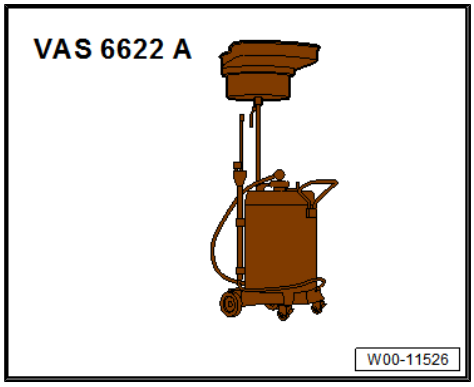
4.4.1 Removing and installing radiator cowl - Audi A4 and A5

Special tools and workshop equipment required

- Engine bung set - VAS 6122- for vehicles with multitronic gearbox

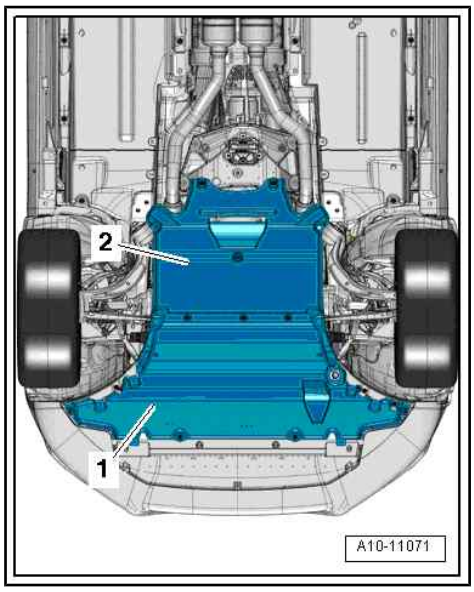


- Used oil collection and extraction unit - VAS 6622A- (for vehicles with multitronic)

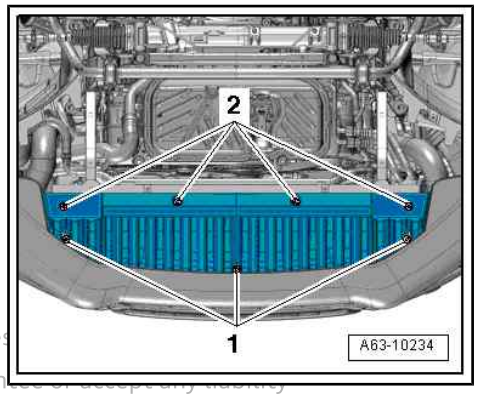


Removing

– Remove front noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .

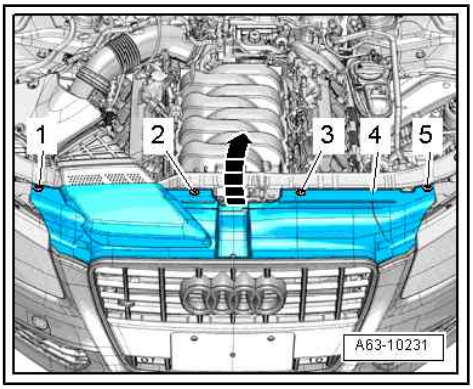


– Remove closure plate at bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .

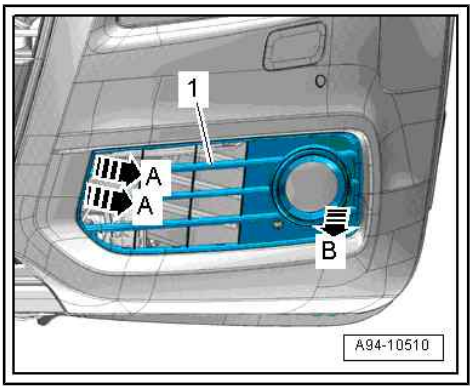


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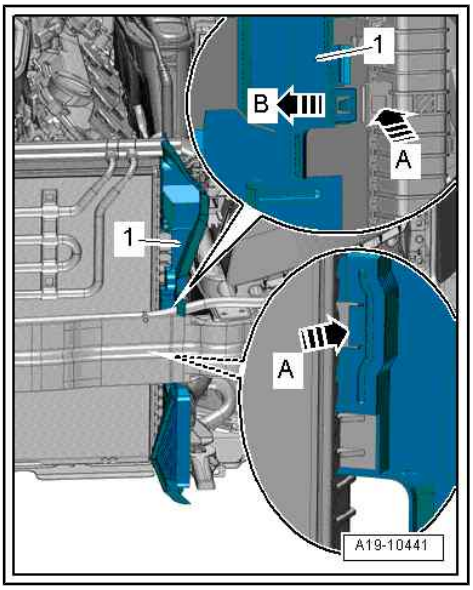
– Remove lock carrier cover -4- ⇒ General body repairs, exterior; Rep. gr. 50 ; Lock carrier; Exploded view - lock carrier .
– Remove air intake grilles on both sides.



– Release retaining hooks -arrows A- with a screwdriver.
– Detach air intake grille -1- from bumper cover (bottom section) -arrow B-.



– Release catches -arrows A-, swivel air duct -1- on left and right to centre of vehicle -arrow B- and detach.



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Vehicles with multitronic gearbox:

– Position used oil collection and extraction unit - VAS 6622A- below connection point.

Note

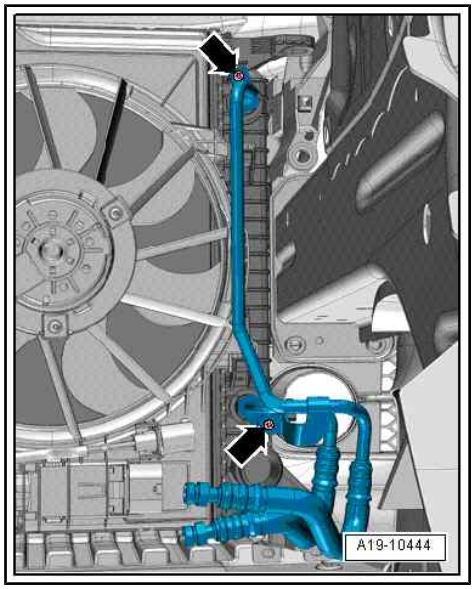
Observe rules for cleanliness when working on gearbox ⇒ Rep. gr. 00 ; Repair instructions; Rules for cleanliness .

– Unscrew bolts -arrows- and detach ATF lines from radiator.

Note

Tie ATF lines up onto longitudinal member to prevent fluid escaping.

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



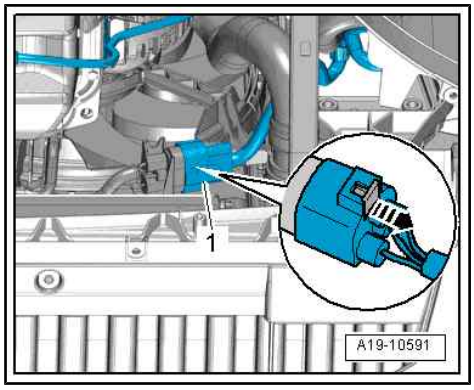
All vehicles (continued):

WARNING

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

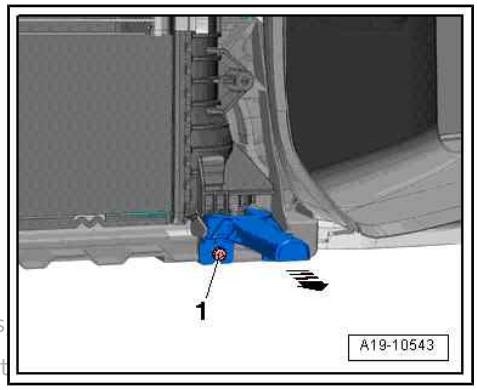
- ***Unplug electrical connectors before working in vicinity of radiator cowl.***

– Take electrical connector -1- for radiator fan out of bracket and unplug connector (push retainer to the rear -arrow- and press down release catch).



– Remove bolt -1- on both sides.

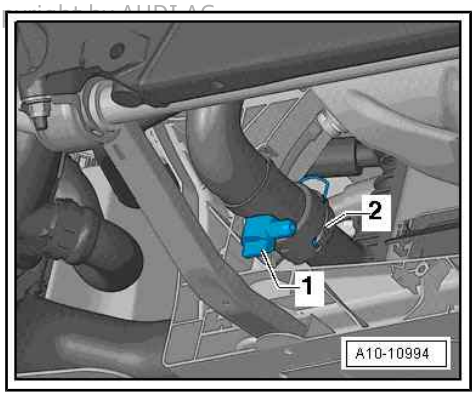
– Press bottom of radiator upwards, and then press radiator towards front -arrow-.



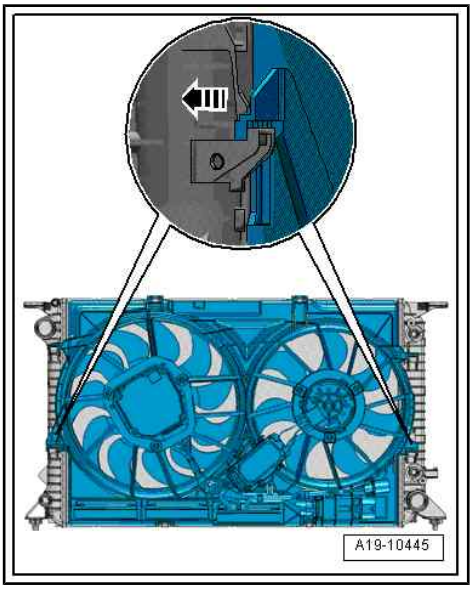
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Note

The radiator must be pressed upwards to make sure the drain plug -1- is not damaged.



– Press locking tabs for radiator cowl simultaneously (left and right) -arrow-.
– Lift radiator cowl off radiator and remove it downwards.



Installing

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

– Install ATF lines ⇒ Rep. gr. 37 ; ATF circuit; Removing and installing ATF lines .
– Install air intake grilles on both sides.

Tightening torques

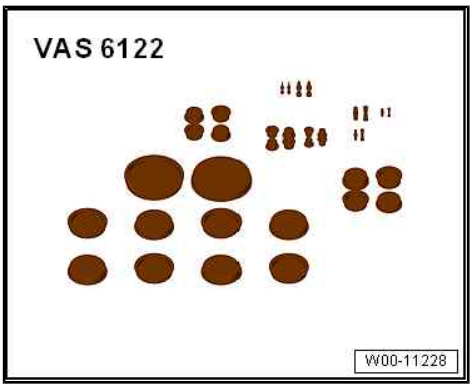
♦ ⇒ “4.1 Exploded view - radiators/radiator fans”, page 201
♦ Lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Lock carrier; Exploded view - lock carrier and closure plate at bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover
♦ Noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

4.4.2 Removing and installing radiator cowl - Audi Q5

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Special tools and workshop equipment required

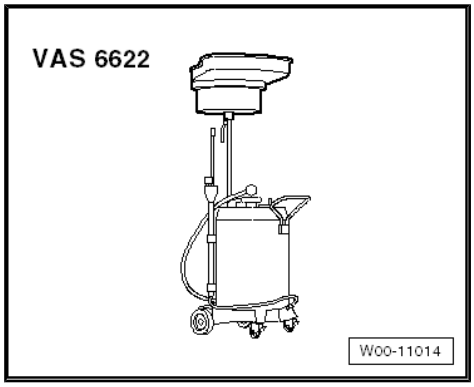
♦ Engine bung set - VAS 6122-



♦ Drip tray for workshop hoist - VAS 6208-



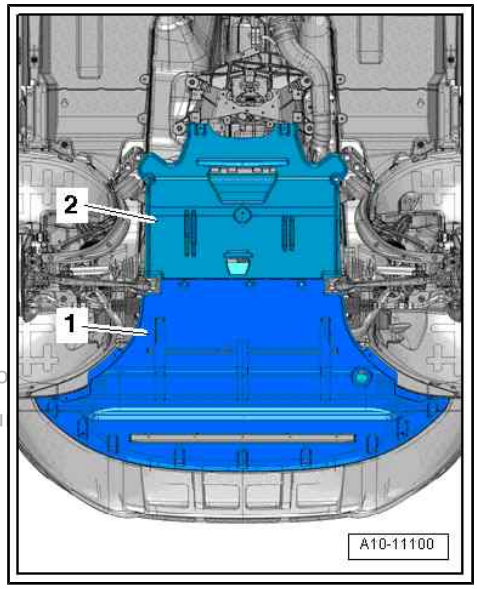
♦ Used oil collection and extraction unit - VAS 6622A-



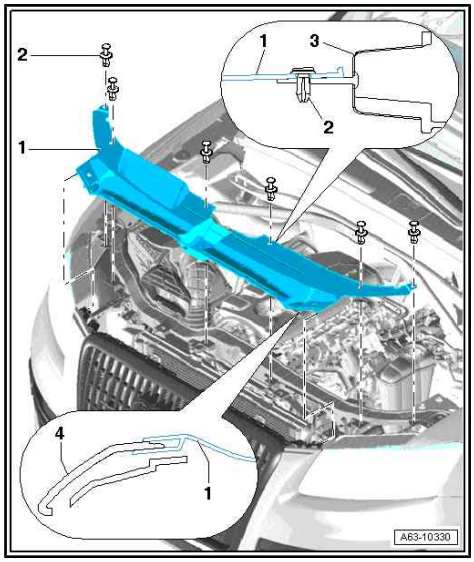
Removing

– Remove front noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .

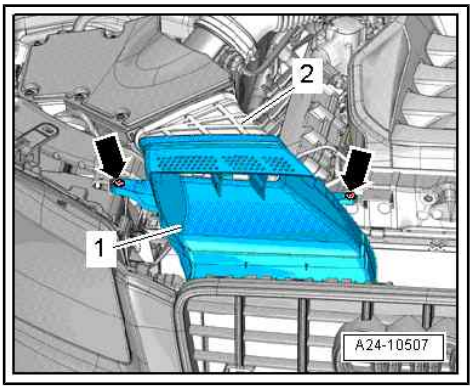
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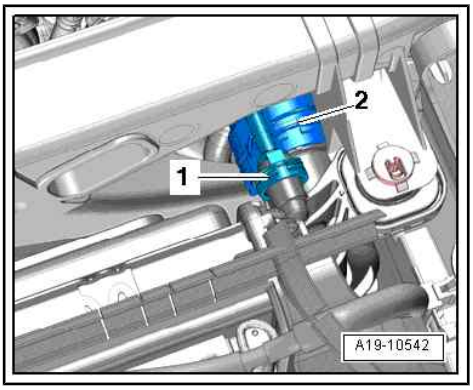
– Remove lock carrier cover -1- ⇒ General body repairs, exterior; Rep. gr. 50 ; Lock carrier .



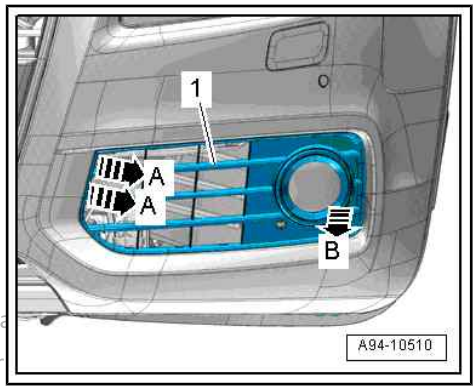
– Remove bolts -arrows-.
– Detach air duct -1- from intermediate flange -2- for air cleaner housing.



– Lift retaining clips -1- and -2- and detach connection from radiator.

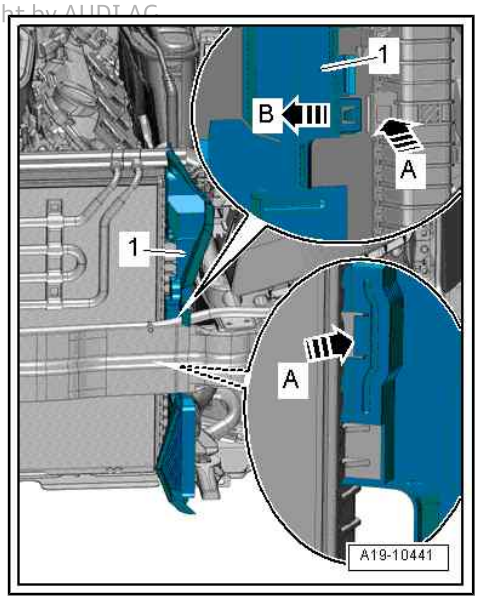


– Remove air intake grille -1- on both sides ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .



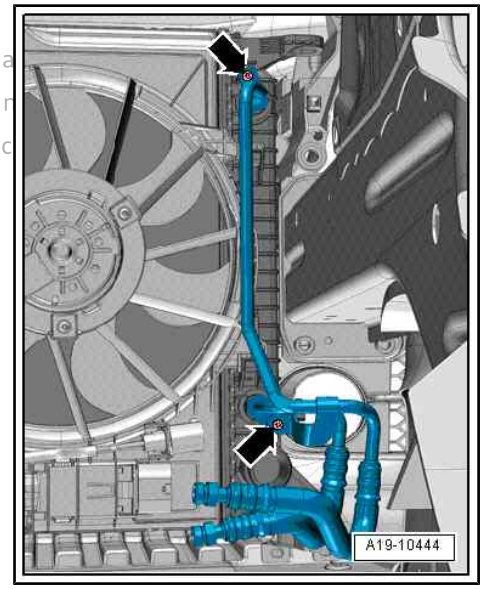
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– Release catches -arrows A-, swivel air duct -1- on left and right to centre of vehicle -arrow B- and detach.



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– Position used oil collection and extraction unit - VAS 6622A- below connection point.



Note

Observe rules for cleanliness when working on gearbox ⇒ Rep. gr. 00 ; Repair instructions; Rules for cleanliness .

– Unscrew bolts -arrows- and detach ATF lines from radiator.

Note

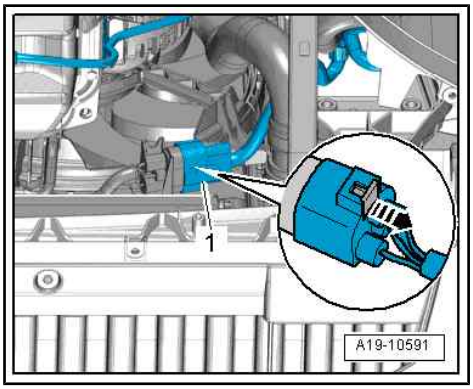
Tie ATF lines up onto longitudinal member to prevent fluid escaping.

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

WARNING

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

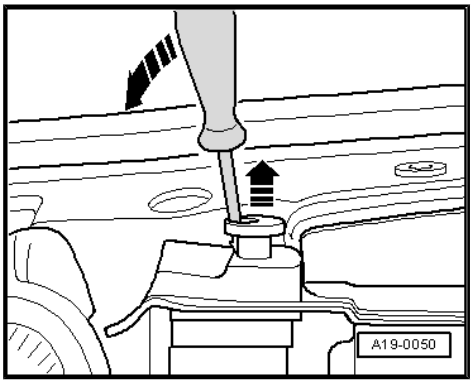
- ***Unplug electrical connectors before working in vicinity of radiator cowl.***



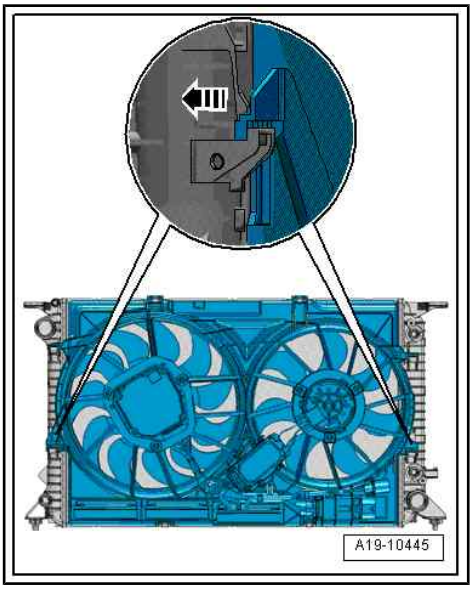
– Take electrical connector -1- for radiator fan out of bracket and unplug connector (push retainer to the rear -arrow- and press down release catch).

– Release retaining pins for radiator on both sides and pull out upwards -arrows-.

– Push radiator towards the front.



– Press locking tabs (left and right) for radiator cowl -arrow- and simultaneously lift radiator cowl off radiator.



Installing

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

– Install ATF lines ⇒ Rep. gr. 34 ; ATF circuit; Removing and installing ATF lines .

– Connect coolant hose with plug-in connector ⇒ page 202 .

Note

Do not reuse coolant.

– Fill up with coolant ⇒ page 167 .

Tightening torques

- ⇒ “4.1 Exploded view - radiators/radiator fans”, page 201
- Lock carrier cover (⇒ General body repairs, exterior; Rep. gr. 50 ; Lock carrier; Exploded view - lock carrier) and closure plate for bumper cover (⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover)
- Noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

4.5 Removing and installing radiator fan - V7-

Removing

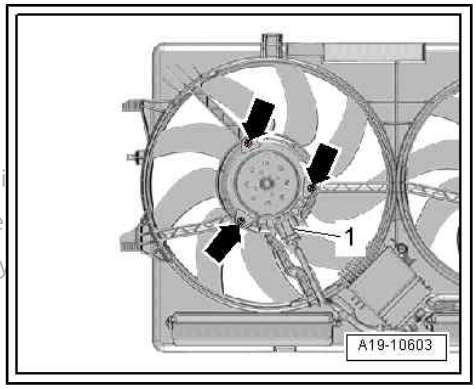
Note

Re-install all cable ties in original positions.

– Remove radiator cowl ⇒ page 211 .

– Unplug electrical connector -1-.

– Unscrew bolts -arrows- and remove radiator fan - V7- (left-side).



Installing

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

– Install radiator cowl ⇒ “4.4 Removing and installing radiator cowl”, page 211 .

Tightening torques

- ⇒ “4.1 Exploded view - radiators/radiator fans”, page 201

4.6 Removing and installing radiator fan 2 - V177-

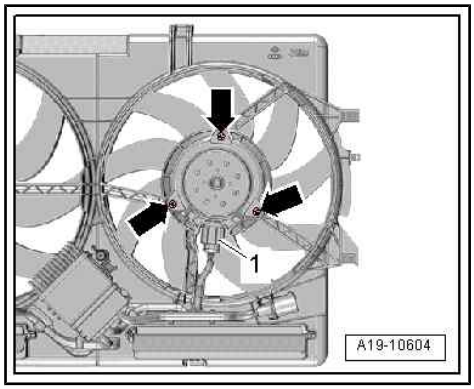
Removing

Note

Re-install all cable ties in original positions.

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– Remove radiator cowl
⇒ “4.4 Removing and installing radiator cowl”, page 211 .
– Unplug electrical connector -1-.
– Unscrew bolts -arrows- and remove radiator fan 2 - V177- (right-side).



Installing

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

– Install radiator cowl
⇒ “4.4 Removing and installing radiator cowl”, page 211 .

Tightening torques

◆ ⇒ “4.1 Exploded view - radiators/radiator fans”, page 201

4.7 Removing and installing radiator fan control unit

Note

The following procedure refers to the radiator fan with separate radiator fan control unit.

Removing

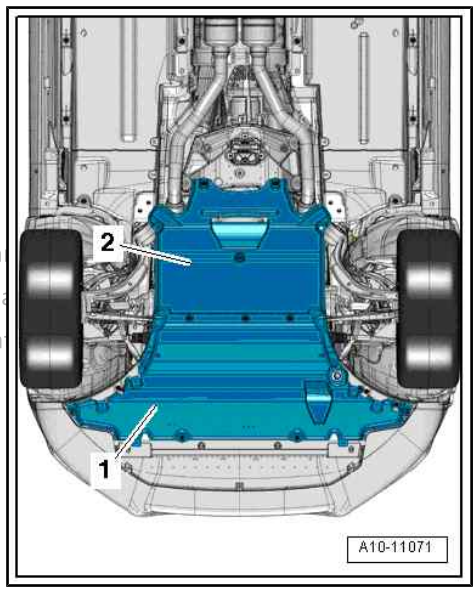
– Remove front noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .

WARNING

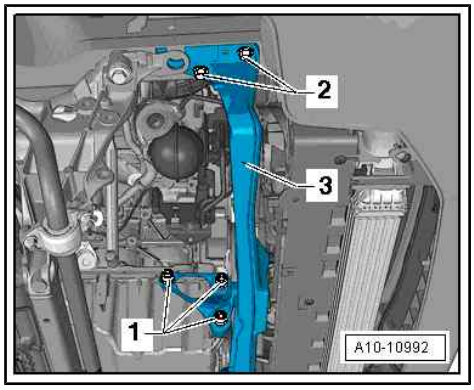
Risk of injury as the radiator fans may start up automatically.

- ***Unplug electrical connectors before working in vicinity of radiator cowl.***

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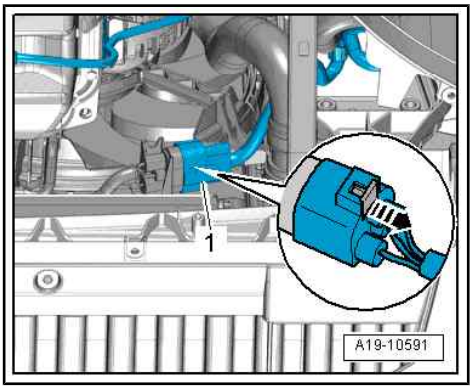
– On vehicles with cross member -3-, remove bolts -1- for torque reaction support.
– Remove bolts -2- from cross member -3- on both sides.



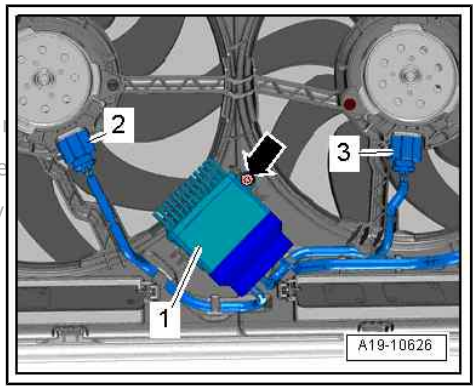
Note

- *Due to the limited space available, the cross member cannot be removed.*
- *Cross member must only be detached; leave it in installation position.*

– Take electrical connector -1- for radiator fan out of bracket and unplug connector (push retainer to the rear -arrow- and press down release catch).
– Move clear electrical wiring harness going to radiator fan control unit.



– Unplug electrical connectors -2- and -3-.
– Unscrew bolt -arrow- and remove radiator fan control unit -1-.



Installing

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

– Install electrical wiring ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
– If previously fitted, re-install cross member ⇒ page 30 .

Tightening torques

♦ ⇒ “4.1 Exploded view - radiators/radiator fans”, page 201
♦ Noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

21 – Turbocharging/supercharging

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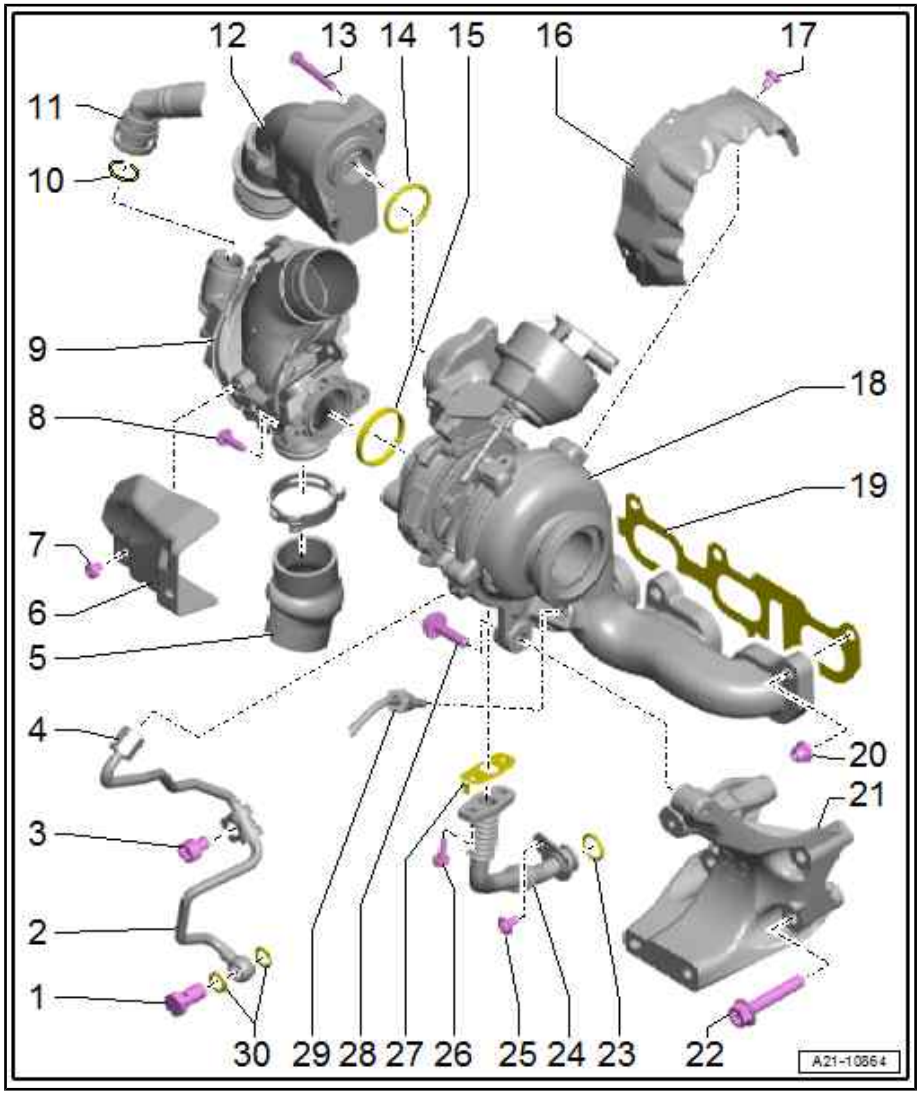
1 Turbocharger

⇒ “1.1 Exploded view - turbocharger”, page 222

⇒ “1.2 Removing and installing turbocharger”, page 224

⇒ “1.3 Renewing vacuum unit for turbocharger”, page 228

1.1 Exploded view - turbocharger



1 - Banjo bolt
- ❑ 30 Nm

2 - Oil supply line
- ❑ Check for obstructions
- ❑ Before installing turbocharger, fill connection for oil supply line with engine oil

3 - Bolt
- ❑ 20 Nm

4 - Union nut
- ❑ 16 Nm

5 - Air hose

6 - Heat shield

7 - Bolt
- ❑ 15 Nm

8 - Bolt
- ❑ 8 Nm

9 - Intake connecting pipe

10 - O-ring
- ❑ Renew after removing

11 - Hose
- ❑ For crankcase breather
- ❑ Press release tabs on both sides to detach

12 - Pulsation damper

13 - Bolt
- ❑ 8 Nm

14 - O-ring
- ❑ Renew after removing

15 - Seal
- ❑ Renew after removing

16 - Heat shield

17 - Bolt
- ❑ 15 Nm

18 - Turbocharger
- ❑ Adaption must be performed after renewing this component

- ❑ Select `01 - Engine electronics, functions` and perform Guided Function `01 - Adaption elec. adjuster with checkback`
- ❑ Removing and installing ⇒ page 224
- ❑ Renewing vacuum unit (not approved for all engines)
⇒ “1.3 Renewing vacuum unit for turbocharger”, page 228

19 - Gasket

- ❑ Renew after removing

20 - Nut

- ❑ Renew after removing
- ❑ Tightening torque and sequence ⇒ page 224
- ❑ Lubricate exhaust manifold studs with high-temperature paste
- ❑ If studs are renewed, too, tighten them to 15 Nm

21 - Bracket

- ❑ For emission control module

22 - Bolt

- ❑ Tightening torque and sequence ⇒ page 223

23 - O-ring

- ❑ Renew after removing
- ❑ Lubricate lightly with engine oil

24 - Oil return line

25 - Bolt

- ❑ 10 Nm

26 - Ribbed bolt

- ❑ 14 Nm

27 - Gasket

- ❑ Renew after removing

28 - Bolt

- ❑ Tightening torque and sequence ⇒ page 223

29 - Exhaust gas temperature sender 1 - G235-

- ❑ Exploded view ⇒ page 389

30 - Seals

- ❑ Renew after removing

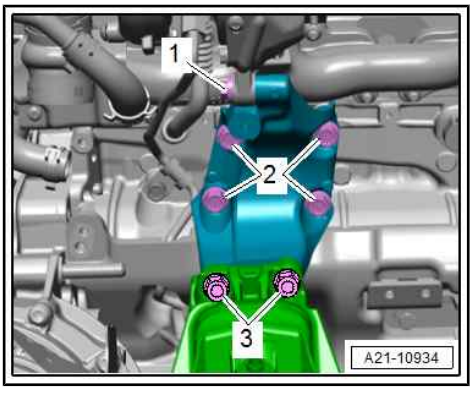
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Bracket for emission control module - tightening torque and tightening sequence

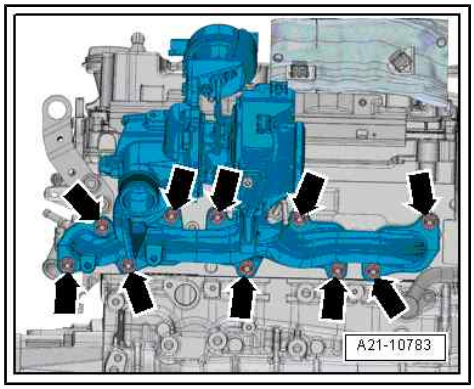
– Fit bracket in correct installation position.

– Tighten bolts in stages in the sequence described:

Stage	Bolts	Tightening torque
1.	-1, 2-	Screw in by hand until contact is made
2.	-1-	20 Nm
3.	-2-	40 Nm



Turbocharger - tightening torque and sequence



– Tighten nuts in stages in the sequence given:

Stage	Nuts	Tightening torque
1.	-arrows-	Tighten to 11 Nm in diagonal sequence, working from centre outwards
2.	-arrows-	Tighten to 22 Nm in diagonal sequence, working from centre outwards
3.	-arrows-	Tighten to 22 Nm in diagonal sequence, working from centre outwards • This procedure has been specified in order to compensate for the settling of the components.

1.2 Removing and installing turbocharger

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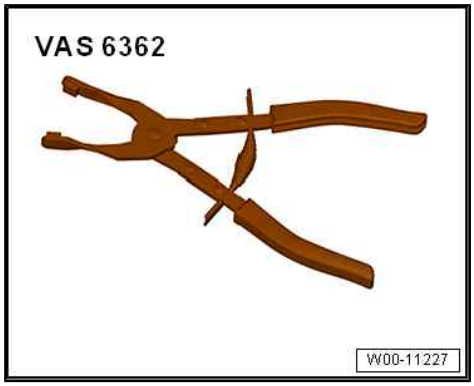
Caution

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.*

Special tools and workshop equipment required

- Hose clip pliers - VAS 6362-



♦ Bit XZN 10 - T10501-



Removing

Caution

Risk of malfunctions caused by dirt.

♦ *Observe ⇒ "3.1 Rules for cleanliness", page 6 .*

– Disconnect battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .

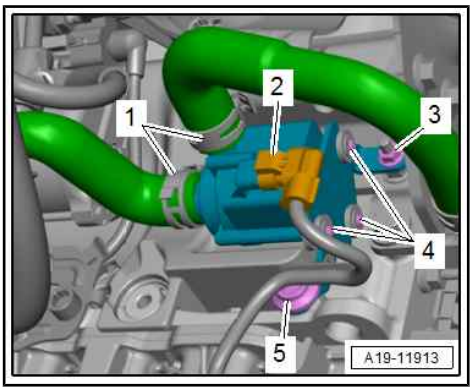
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– Remove emission control module ⇒ page 335 .

– Remove engine mounting (right-side) ⇒ page 29 .

– Unplug electrical connector -2-.

– Remove nut -3- and bolt -5- and push auxiliary pump for heating - V488- clear to one side.



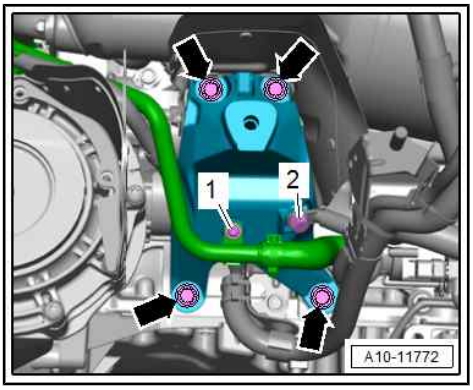
Note

Disregard items -1 and 4-.

– Remove bolt -1- for coolant pipe (rear).

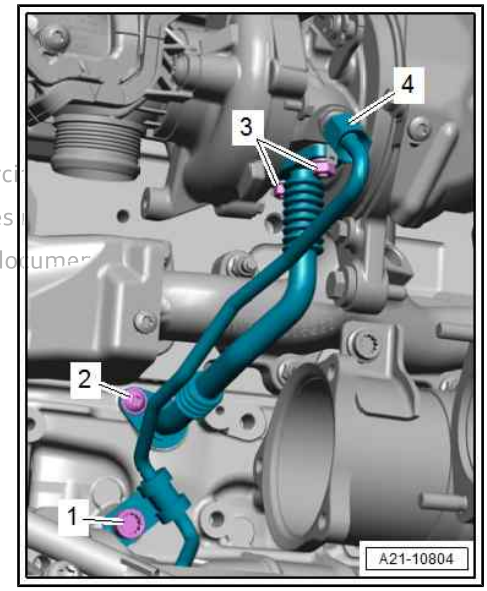
– Remove bolt -2- for earth wire.

– Unscrew bolts -arrows- and remove engine support (right-side).



– Unscrew bolt -1- and union nut -4-.
– Unscrew bolts -2 and 3- and detach oil return line.

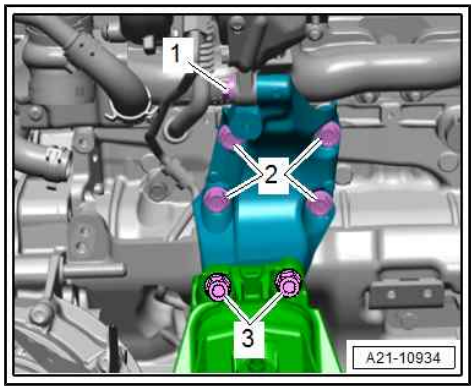
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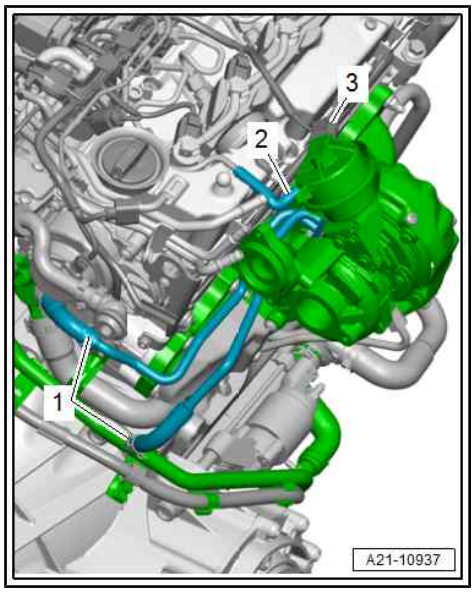
– Remove bolts -1, 2- and detach bracket for emission control module.

Note

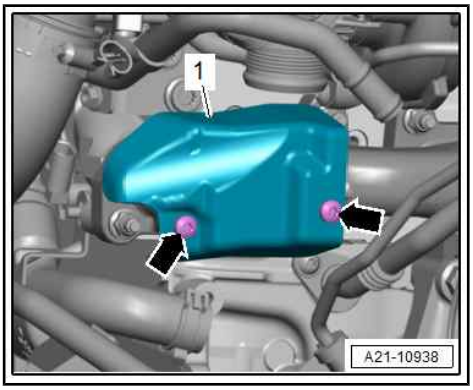
Disregard -item 3-.



– Unplug electrical connector -3-.
– Disconnect vacuum hose -2-.
– Release hose clips -1- and disconnect coolant hoses.



– Remove bolts -arrows- and detach heat shield -1-.
– Mask suspension turret (right-side) with adhesive tape to avoid damaging suspension turret when lifting out turbocharger.

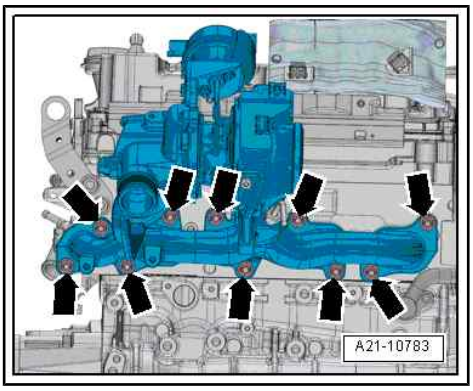


– Remove nuts -arrows- and detach turbocharger with exhaust manifold from cylinder head (pay attention to oil supply line).

Caution

Risk of damage to oil supply line.

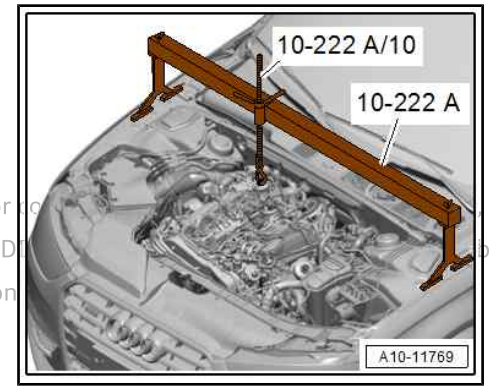
- *Take care not to bend oil supply line when detaching turbocharger.*



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Note

If necessary, use hook - 10 - 222 A /10- to lift engine as far as necessary (approx. 25 mm).



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Installing

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

- Renew gaskets, seals, O-rings and self-locking nuts.
- Fill turbocharger with engine oil at connection for oil supply line.
- 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.

– Electrical connections and routing ⇒ Electrical system; Rep. gr. 97 ; Electrical connectors and ⇒ Current flow diagrams, Electrical fault finding and Fitting locations

– Install emission control module ⇒ page 335 .

– Connect vacuum hose ⇒ page 251 .

– Install engine cover panel ⇒ page 34 .

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 elec. adjuster with checkback`

Tightening torques

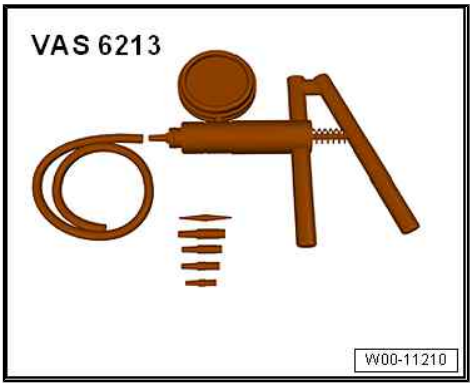
- ⇒ “1.1 Exploded view - turbocharger”, page 222
- ⇒ Fig. ““Bracket for emission control module - tightening torque and tightening sequence”“ , page 223
- ⇒ “2.2 Exploded view - electric coolant pump”, page 178
- ⇒ “2.1 Exploded view - assembly mountings”, page 27

1.3 Renewing vacuum unit for turbocharger

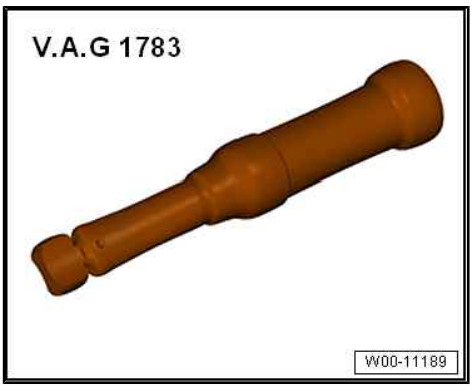
Special tools and workshop equipment required

- Vehicle diagnostic tester

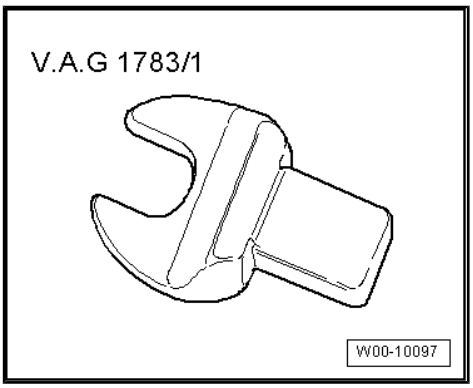
♦ Hand vacuum pump - VAS 6213-



♦ Torque wrench - V.A.G 1783-

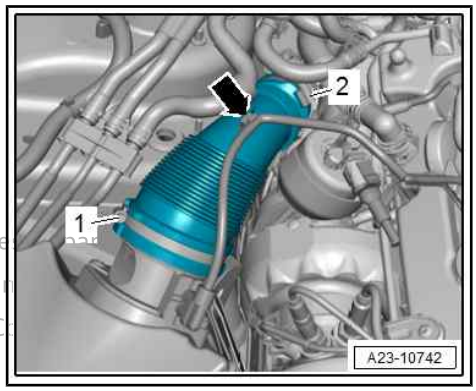


♦ Open-end spanner insert AF 10 - V.A.G 1783/1-



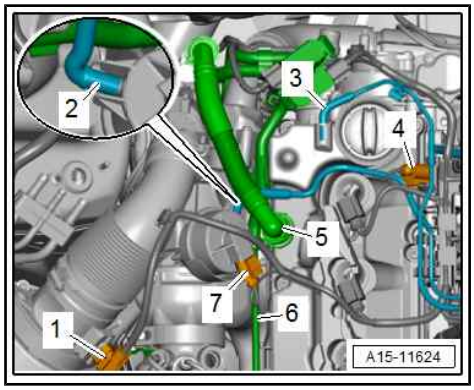
Removing

– Remove engine cover panel ⇒ page 34 .
– Unclip fuel lines from air hose.
– Release hose clips -1, 2- and detach air hose.

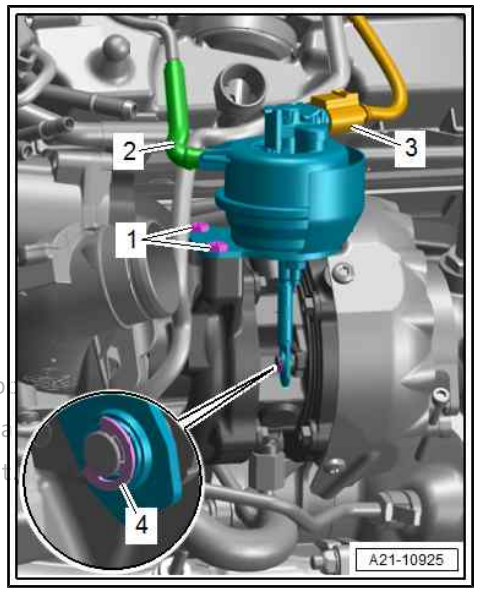


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– Unplug electrical connector -7- at position sender for charge pressure positioner - G581- .
– Press release tabs on both sides of crankcase breather hose -5- and disconnect hose from cylinder head cover.
– Detach vacuum hose -2- from vacuum unit of turbocharger.



– Remove circlip -4-.
– Remove bolts -1- for vacuum unit.
– Disengage control rod at adjusting lever and detach vacuum unit.



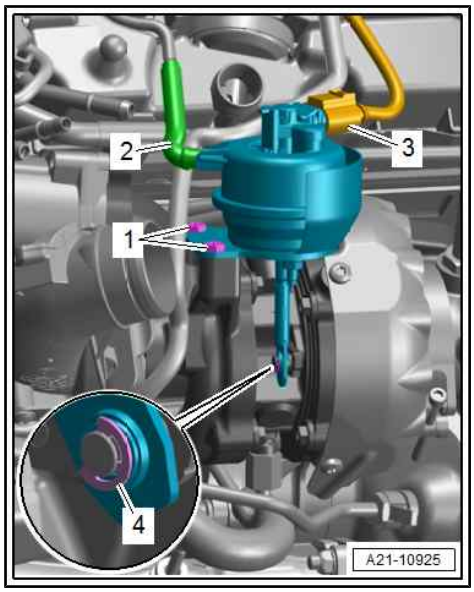
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Installing

Note

Use new bolts and a new circlip from the repair kit.

– Attach control rod at adjusting lever, position vacuum unit and tighten bolts -1- to 10 Nm.



Note

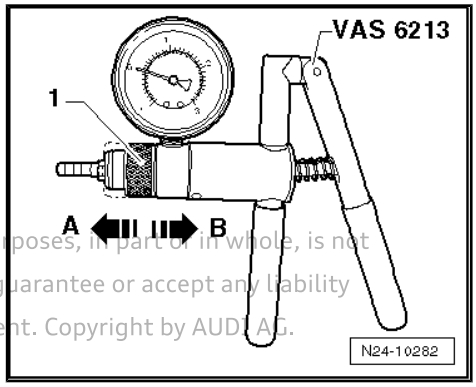
Do not insert circlip -4- at adjusting lever yet.

– Plug in electrical connector -3- at position sender for charge pressure positioner - G581- .

Checking adjustment of vacuum unit

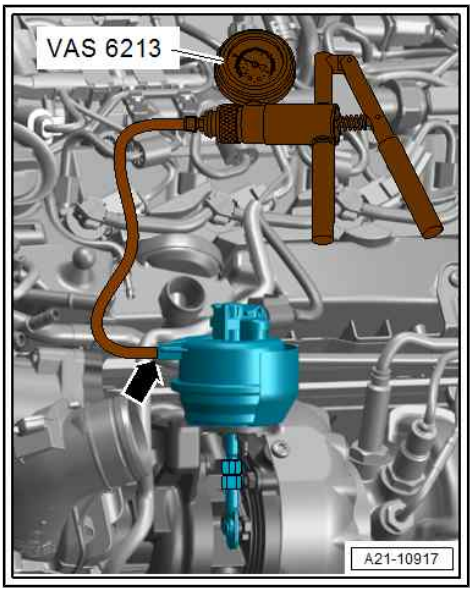
– Use ⇒ Vehicle diagnostic tester.
– From the list in `Self-diagnosis` under `Measured values`, select `Turbine actuator 1 bank 1, position feedback, raw voltage`.

– Move adjuster ring -1- on hand vacuum pump - VAS 6213- to position -A- to select “vacuum”.



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– Connect hand vacuum pump - VAS 6213- to vacuum unit -arrow-.



Caution

Risk of damage to vacuum unit on account of excessive vacuum.

- ***Vacuum must NOT exceed -800 mbar.***

– Operate hand vacuum pump - VAS 6213- until a vacuum between -650 ... -700 mbar is displayed on pressure gauge.

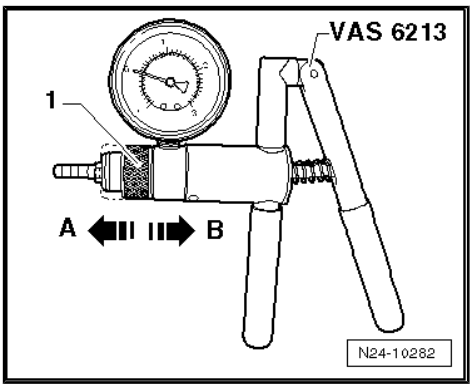
- Specification: 0.75 ± 0.05 V

If reading matches specification ⇒ page 231 .

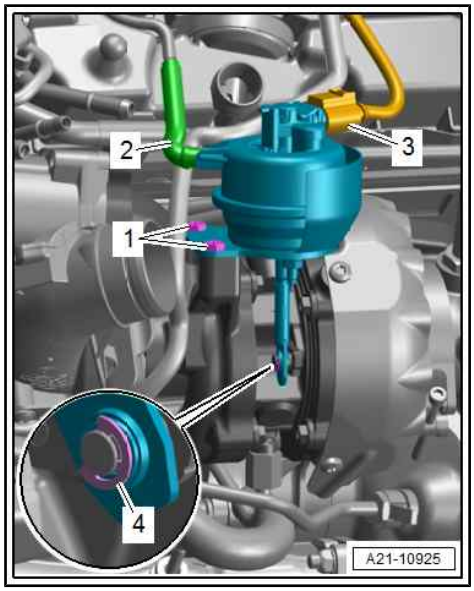
If specification is not obtained ⇒ page 233 .

If specification is obtained:

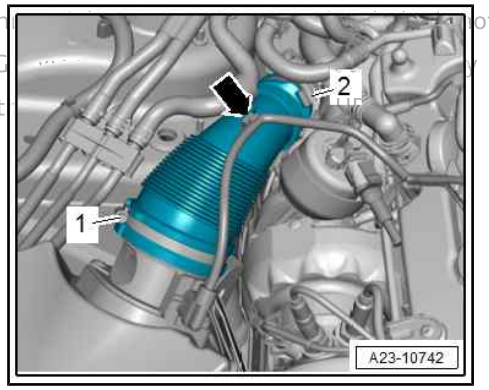
– Move adjuster ring -1- on hand vacuum pump - VAS 6213- to position -B- to vent vacuum in vacuum unit to ambient pressure.



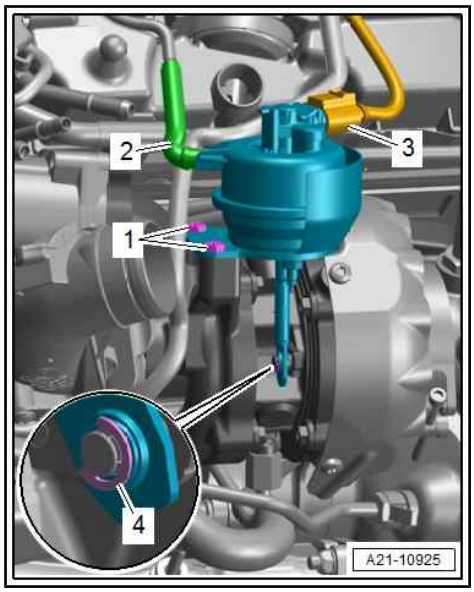
– Fit circlip -4-.



– Install air hose; to do so, tighten hose clips -1, 2- and clip fuel lines into place.



– Plug in electrical connector -3- at position sender for charge pressure positioner - G581- .
– Attach vacuum hose -2- to vacuum unit of turbocharger.

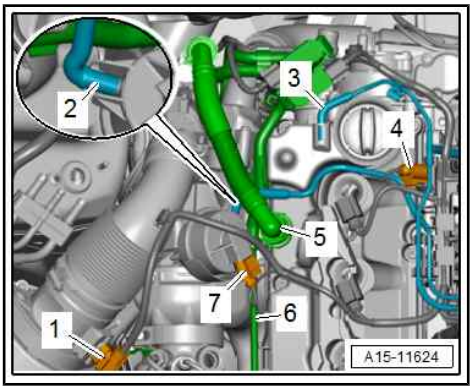


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– Fit crankcase breather -5- onto cylinder head cover.
– Perform adaption ⇒ page 234 .

If specification is not obtained:

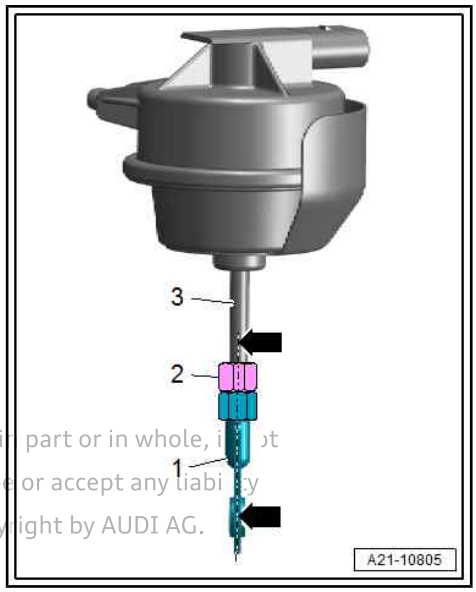
– Remove vacuum unit again.



– Mark position of grommet -1- in relation to control rod -3- for re-installation -arrow-.
– Loosen union nut -2- on control rod and extend or retract rod as appropriate.

Note

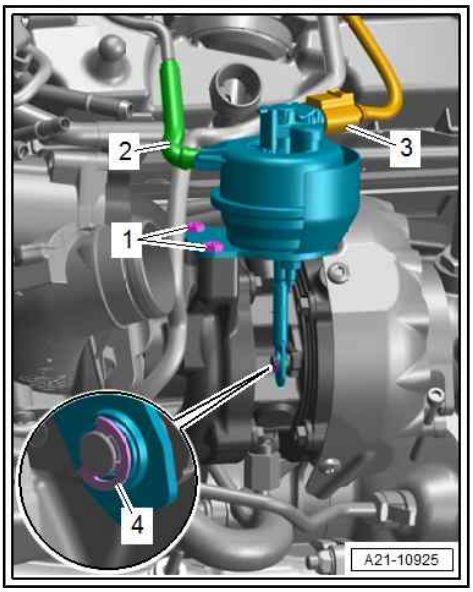
- *180 degrees (half a turn) = 0.05 volts.*
- *If specification is too high, extend rod.*
- *Control rod must only be tightened after it has been installed.*



– Re-install vacuum unit; engage control rod on adjusting lever to do so.

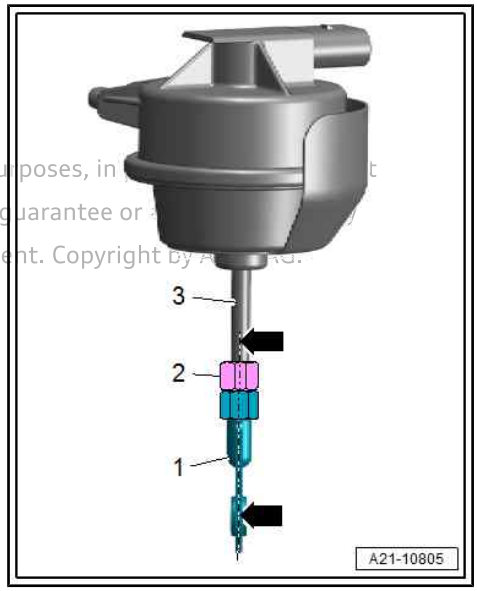
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– Tighten bolts -1- for vacuum unit to 10 Nm.



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– Align grommet of control rod exactly.
– Tighten union nut -2- to 7.5 Nm using torque wrench - V.A.G 1783- and open-end spanner insert AF 10 - V.A.G 1783/1- . Counterhold with a commercially available 10 mm open-end spanner.
– Then check adjustment of vacuum unit again ⇒ page 230 .



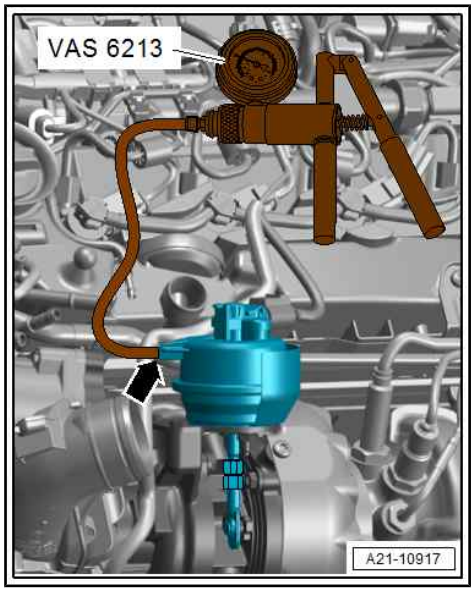
Performing adaption

– Switch to `Guided Functions` and select `01 - Adaption after replacing positioner`.
– Perform adaption.

Check voltage value again after adaption.

– Switch to `Self-diagnosis` and in the list under `Measured values`, select `Turbine actuator 1 bank 1, position feedback, raw voltage`.

– Connect hand vacuum pump - VAS 6213- to vacuum unit -arrow-.



Caution

Risk of damage to vacuum unit on account of excessive vacuum.

- *Vacuum must NOT exceed -800 mbar.*

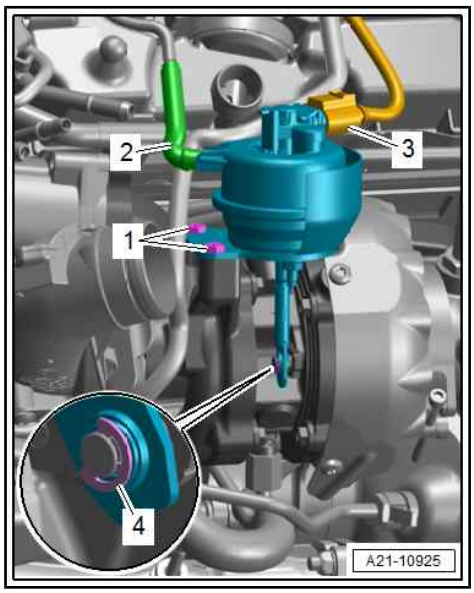
– Operate hand vacuum pump - VAS 6213- until a vacuum between -650 ... -700 mbar is displayed on pressure gauge.
– A voltage of 0.75 ± 0.05 V should now be shown in the `Measured values` display zone.

Voltage value not OK

– Adjust voltage value again ⇒ page 233 .

Voltage value OK

– Attach vacuum hose -2- to vacuum unit of turbocharger.
– Fit circlip -4-.
– Secure bolts and union nut on control rod with sealing paint.
– Install engine cover panel ⇒ page 34 .
– Erase all event memories ⇒ Vehicle diagnostic tester.



2 Charge air system

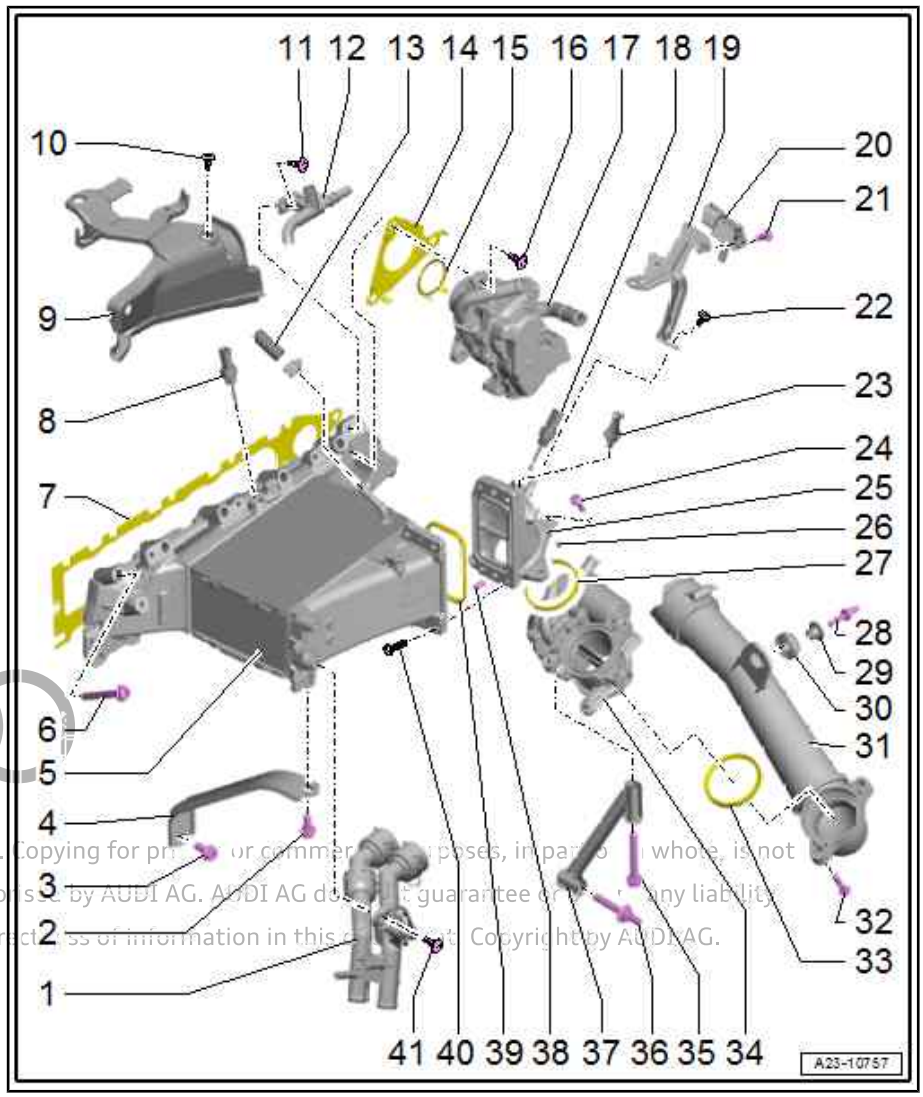
⇒ "2.1 Exploded view - charge air system", page 235

⇒ "2.2 Removing and installing charge pressure sender G31 ", page 237

⇒ "2.3 Removing and installing charge air temperature sender", page 237

⇒ "2.4 Checking charge air system for leaks", page 238

2.1 Exploded view - charge air system



1 - Coolant connection

2 - Bolt

- ❑ Tightening torque and sequence ⇒ page 258

3 - Bolt

- ❑ Tightening torque and sequence ⇒ page 258

4 - Bracket

- ❑ For intake manifold

5 - Intake manifold with charge air cooler

- ❑ Intake manifold and charge air cooler are combined as one unit
- ❑ Removing and installing ⇒ page 260

6 - Bolt

- ❑ Tightening torque and sequence ⇒ page 258

7 - Gasket

- ❑ Renew after removing

8 - Charge air temperature sender after charge air cooler - G811-

- ❑ Removing and installing ⇒ page 237
- ❑ 22 Nm

9 - Bracket

- ❑ For electrical wiring harness

10 - Bolt

- ❑ Tightening torque ⇒ Item 10 (page 256)

11 - Bolt

- ❑ Tightening torque ⇒ Item 11 (page 256)

12 - Vacuum line

- ❑ Leading from vacuum pump

13 - Sealing plug

14 - Gasket

- ❑ Renew after removing

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15 - Gasket
- ❑ Renew after removing

16 - Bolt
- ❑ Tightening torque ⇒ Item 1 (page 398)

17 - Exhaust gas recirculation control motor - V338-
- ❑ Removing and installing ⇒ page 401

18 - Charge air temperature sender before charge air cooler - G810-
- ❑ Removing and installing ⇒ page 237

19 - Bracket
- ❑ For charge pressure sender - G31-

20 - Charge pressure sender - G31-
- ❑ Removing and installing ⇒ page 237

21 - Bolt
- ❑ 8 Nm

22 - Bolt
- ❑ 8 Nm

23 - Ball stud
- ❑ For engine cover panel

24 - Bolt
- ❑ Tightening torque ⇒ Item 24 (page 257)

25 - Connection
- ❑ For throttle valve module - J338-

26 - Dowel pin

27 - Seal
- ❑ Check and renew if damaged

28 - Centre hex stud
- ❑ 8 Nm

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29 - Spacer sleeve

30 - Rubber buffer

31 - Air pipe

32 - Bolt
- ❑ 8 Nm

33 - Seal
- ❑ Renew

34 - Throttle valve module - J338-
- ❑ Removing and installing ⇒ page 258

35 - Bolt
- ❑ Tightening torque and sequence ⇒ page 258

36 - Bolt
- ❑ Tightening torque and sequence ⇒ page 258

37 - Bracket
- ❑ For throttle valve module - J338-

38 - Dowel pin

39 - Gasket
- ❑ Renew after removing

40 - Bolt

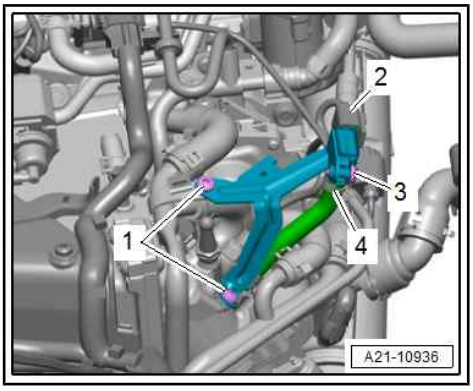
❑ Tightening torque ⇒ Item 40 (page 258)

41 - Bolt

❑ Tightening torque ⇒ Item 41 (page 258)

2.2 Removing and installing charge pressure sender - G31-

Removing



– Remove engine cover panel ⇒ page 34 .

– Unplug electrical connector -2-.

– Before disconnecting hose from charge pressure sender - G31- , spray hose with suitable release agent.

Caution

Irreparable damage to charge pressure sender can be caused if the connection breaks off.

- *Carefully disconnect hose from connection, taking care to keep hose straight.*

– Remove bolt -3-.

– Detach charge pressure sender - G31- , release hose clip -4- and detach hose.

Note

Disregard -item 1-.

Installing

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

– Install engine cover panel ⇒ page 34 .

Tightening torques

- ⇒ "2.1 Exploded view - charge air system", page 235

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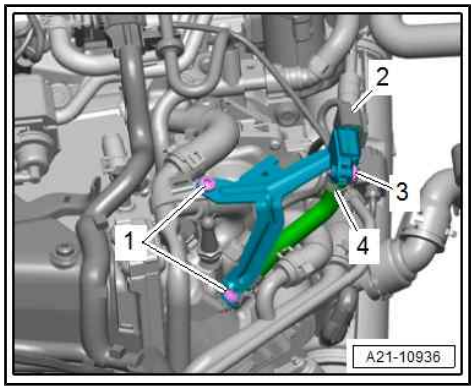
2.3 Removing and installing charge air temperature sender

Removing

– Remove engine cover panel ⇒ page 34 .

Charge air temperature sender before charge air cooler - G810-

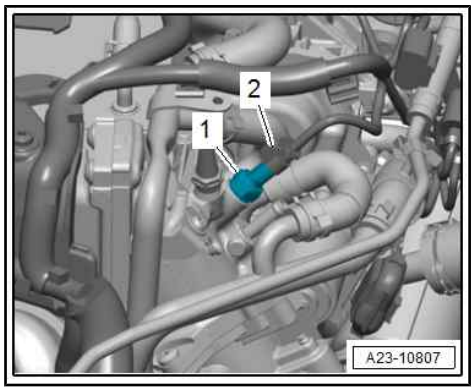
– Unplug electrical connector -2-.
– Remove bolts -1- and press charge pressure sender - G31- with bracket to side.



Note

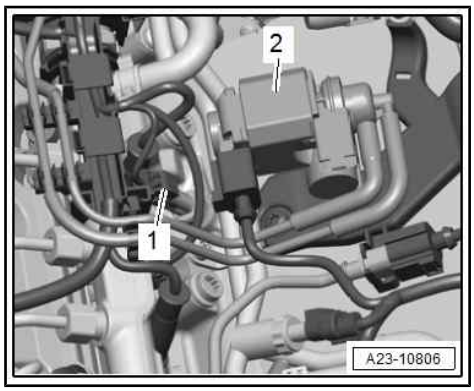
Disregard items -3 and 4-.

– Unplug electrical connector -2-.
– Unscrew charge air temperature sender before charge air cooler - G810- -item 1-.



Charge air temperature sender after charge air cooler - G811-

– Detach charge pressure control solenoid valve - N75- -item 2- from bracket and move it clear to the side.
– Unplug electrical connector -1-.
– Unscrew charge air temperature sender after charge air cooler - G811- .



Installing

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

– Install engine cover panel ⇒ page 34 .

Tightening torques

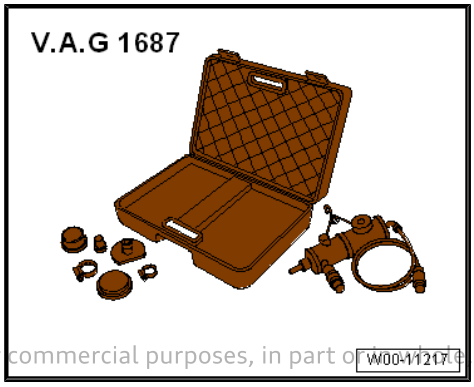
♦ ⇒ “4.1 Exploded view - intake manifold”, page 256

2.4 Checking charge air system for leaks

Water-cooled charge air cooler is integrated in intake manifold (combined as one part).

Special tools and workshop equipment required

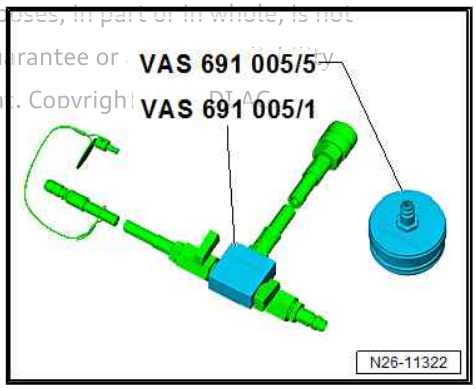
♦ Charge air system tester - V.A.G 1687-



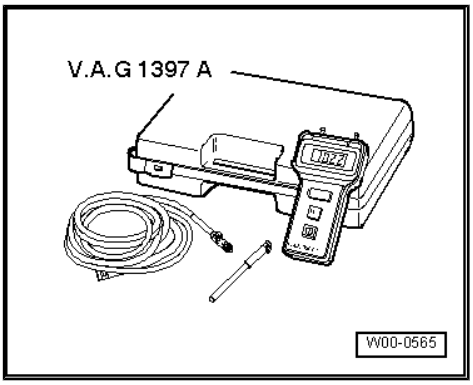
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- Adapter - V.A.G 1687/11-
- Adapter - V.A.G 1687/15- for exhaust pipes with 60 mm and 65 mm diameter
- Adapter - V.A.G 1687/16- for exhaust pipe with 55 mm diameter
- Y-connector - VAS 691 005/1-

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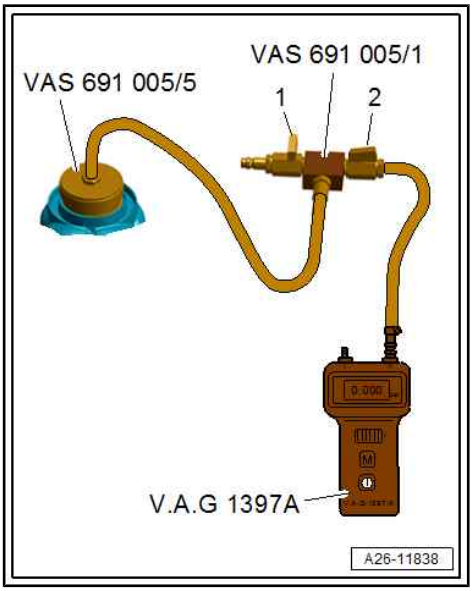
- Test instrument adapter - VAS 691 005/5-
- Turbocharger tester - V.A.G 1397A-



Procedure

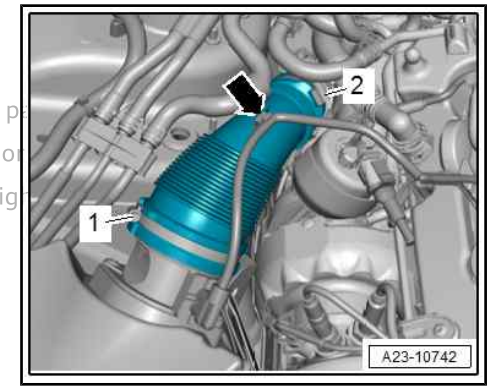
– Remove engine cover panel ⇒ page 34 .
– Fit test adapter - VAS 691 005/5- onto coolant expansion tank.
– Fit Y-connector - VAS 691 005/1- onto test adapter - VAS 691 005/5- .
– Close valve -1- for connection »C« and open valve -2- for connection »A«.
– Attach hose from connection »A« on Y-connector to connection »II« on turbocharger tester - V.A.G 1397A- .
– Set turbocharger tester - V.A.G 1397A- to switch position »II« (relative pressure measurement) and switch it on. The »II« must be visible.

Connecting tester - V.A.G 1687- :



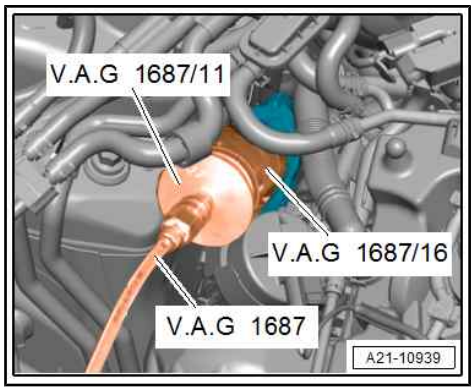
– Move hose clear -arrow-.
– Release hose clips -1, 2- and detach air pipe.

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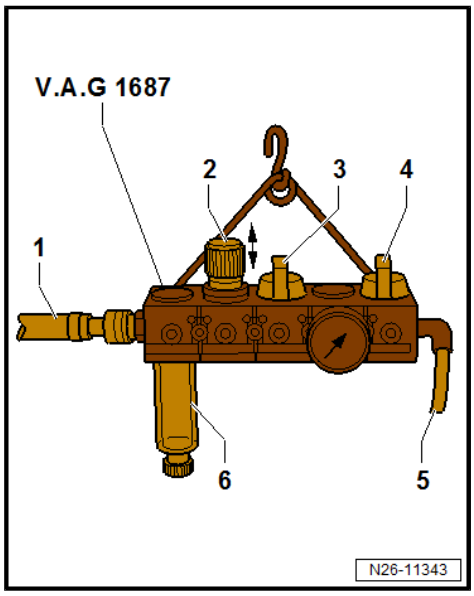


– Connect adapter - V.A.G 1687/11- with -V.A.G 1687/16- to turbocharger.

Prepare charge air system tester - V.A.G 1687- as follows:



– Connect charge air system tester - V.A.G 1687- to adapter.
– Pull pressure control valve -2- upwards, then unscrew completely and close valves -3- and -4-.
– Using a commercially available connection piece, connect charge air system tester - V.A.G 1687- to compressed air -1-.
– If there is water in sight glass, remove drain plug -6- and drain water.
– Open valve -3-.



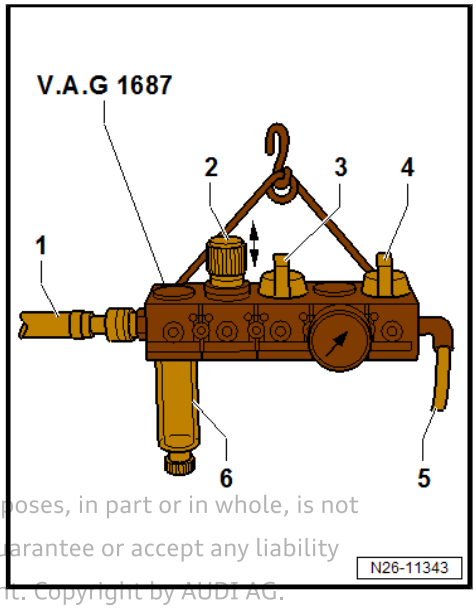
Caution

Risk of damage if pressure is set too high.

- *The pressure must not exceed 0.2 bar.*

– Adjust pressure to 0.2 bar via pressure control valve -2-.
– Open valve -4- and wait until test system is pressurised. If necessary, adjust pressure to 0.2 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- .
– Check entire charge air system for leaks:

♦ By listening
♦ By feeling
♦ Using a commercially available leak detection spray
♦ Using ultrasonic tester - V.A.G 1842-



Note:

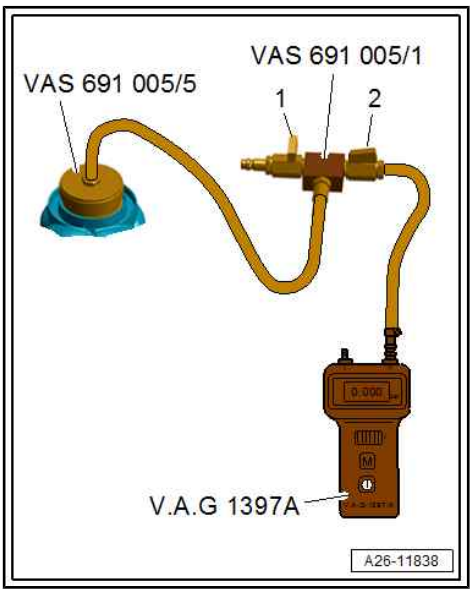
A small amount of air escapes through the valves and enters the engine. Therefore it is not possible to perform a pressure retention test.

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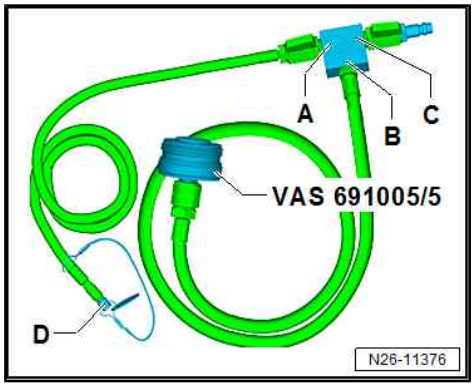
If no leak is found in the charge air system, check water-cooled charge air cooler for leaks.

Reading off values from turbocharger tester - V.A.G 1397A- :

– Pressure must remain set to 0.2 bar.
• Observe turbocharger tester for approx. 5 minutes.
• The pressure displayed on the turbocharger tester must not rise.
– If pressure displayed on turbocharger tester rises, this means that compressed air is escaping into the cooling system.
– Charge air cooler has a leak, renew intake manifold with charge air cooler.
• If there are no leaks in the charge air cooler, a vacuum may form when the coolant cools down. A minus sign on the turbocharger tester indicates that a vacuum has formed.



Cleaning Y-connector - VAS 691 005/1- :



- After the leak test has been completed, the Y-connector - VAS 691 005/1- must be cleaned to remove any water which may have entered.

– Insert cleaning nozzle -D- in hose from connection -A- on Y connector .

– Fit test adapter - VAS 691 005/5- onto hose from connection -B-.

– Fit compressed air hose on connection -C-.

– Open cut-off valves and blow through hose for approx. 15 seconds.

– Release pressure in test circuit by detaching hose coupling from adapter before removing adapter.

Attaching

Assemble in reverse order.

Note

Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .

– Install engine cover panel ⇒ page 34 .

Tightening torques

◆ ⇒ Fig. ""Installing air ducts with hose clips"" , page 254

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23 – Mixture preparation - injection

1 Injection system

⇒ “1.1 Overview of fitting locations - injection system”, page 243

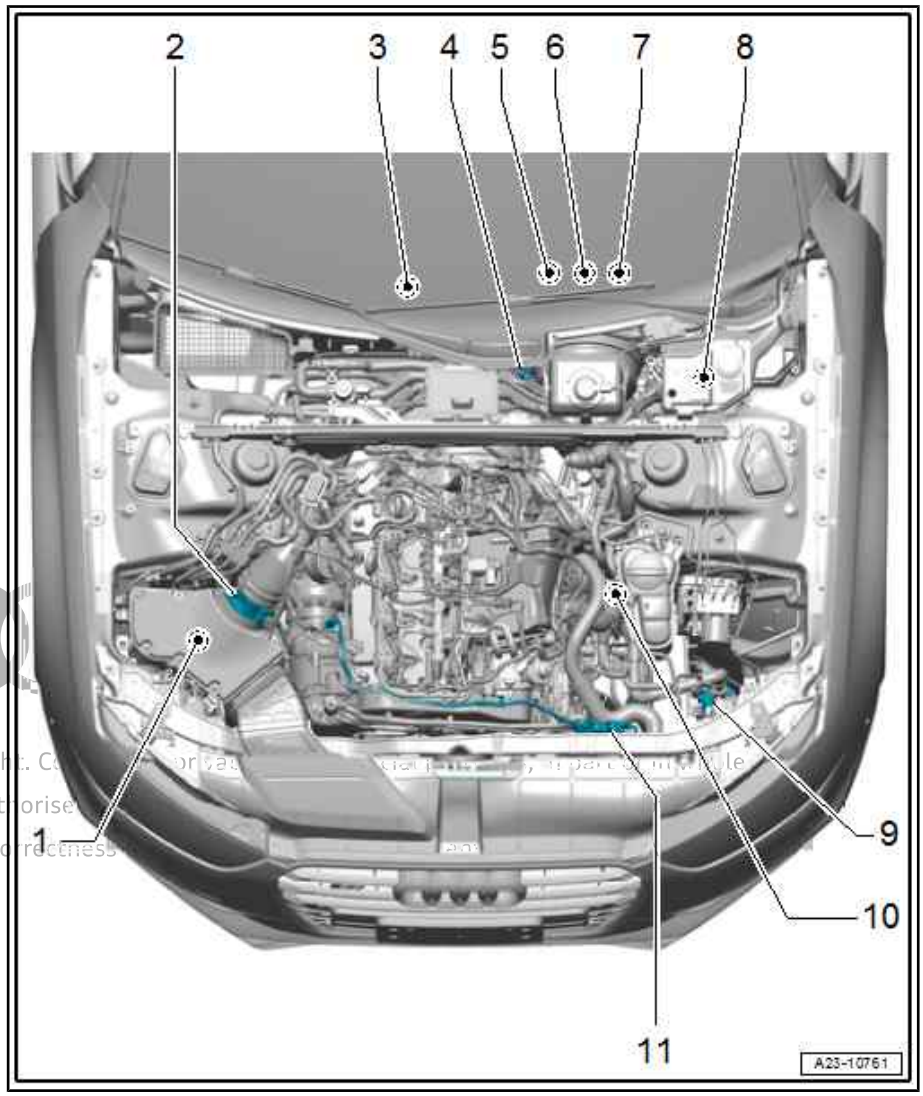
⇒ “1.2 Overview - fuel system”, page 248

⇒ “1.3 Filling and bleeding fuel system”, page 249

⇒ “1.4 Checking fuel system for leaks”, page 250

1.1 Overview of fitting locations - injection system

Overview of fitting locations - engine compartment



1 - Air filter bypass flap valve - N275-

- ❑ Country-specific version
- ❑ Fitting location ⇒ page 244

2 - Air mass meter - G70-

- ❑ Exploded view ⇒ page 253

3 - Gear detection sensor - G604-

- ❑ Fitting location ⇒ page 245

4 - Brake servo pressure sensor - G294-

5 - Accelerator position sender - G79- and accelerator position sender 2 - G185-

- ❑ Fitting location ⇒ page 244

6 - Brake light switch - F-

- ❑ Fitting location ⇒ page 244

7 - Clutch position sender - G476-

- ❑ Fitting location ⇒ page 244

8 - Engine control unit - J623-

- ❑ Fitting location ⇒ page 244
- ❑ Removing and installing ⇒ page 310

9 - Charge air cooling pump - V188-

- ❑ Exploded view ⇒ page 178

10 - Left electrohydraulic engine mounting solenoid valve - N144-

- ❑ Fitting location: on engine mounting (left-side)

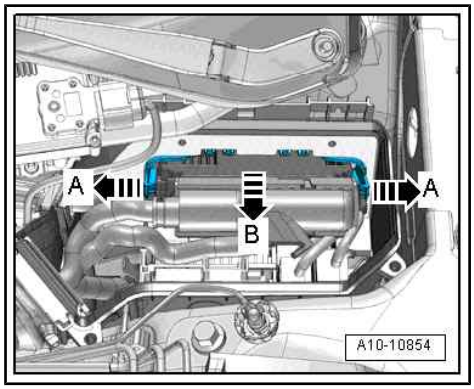
11 - Control unit for NOx sender - J583-

- ❑ Exploded view ⇒ page 307

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Fitting location of engine control unit - J623-

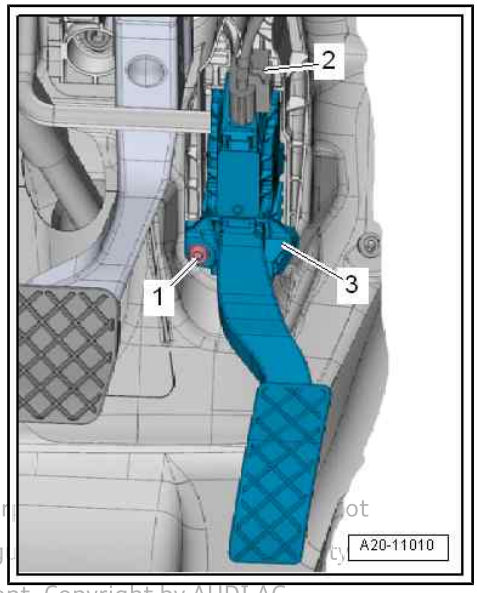
- On left side of plenum chamber



Fitting location of accelerator position sender - G79- / accelerator position sender 2 - G185-

- In accelerator pedal module

2 - Electrical connector for accelerator pedal module



Note

The accelerator position sender - G79- and accelerator position sender 2 - G185- are integrated in the accelerator pedal module and cannot be renewed individually.

Removing and installing ⇒ Fuel supply system; Rep. gr. 20 ; Accelerator mechanism; Exploded view - accelerator pedal module

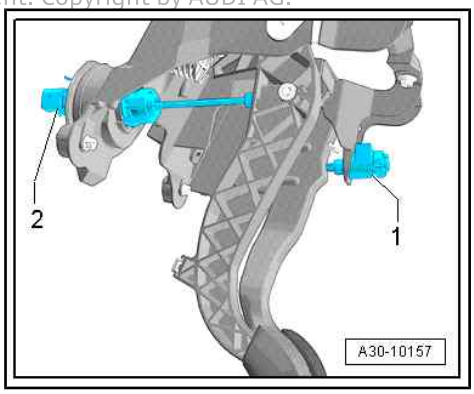
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Fitting location of brake light switch - F- / clutch position sender - G476-

- On mounting bracket for pedal cluster

1 - Brake light switch - F-

2 - Clutch position sender - G476- with clutch pedal switch - F36- / clutch pedal switch for engine start - F194- for vehicles with manual gearbox

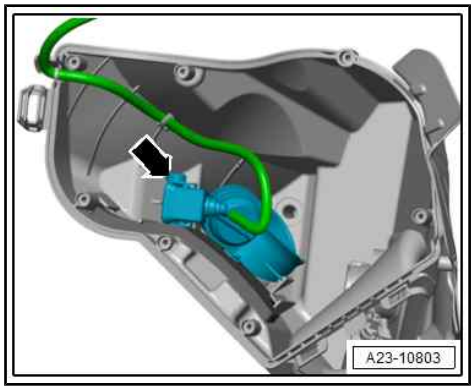


Removing and installing brake light switch - F- ⇒ Brake system; Rep. gr. 45 ; Sensors; Removing and installing brake light sensor

Removing and installing clutch position sender - G476- with clutch pedal switch - F36- / clutch pedal switch for engine start - F194- ⇒ Rep. gr. 30 ; Clutch mechanism; Exploded view - pedal cluster

Fitting location of air filter bypass flap valve - N275-

- In air cleaner (bottom section) -arrow-

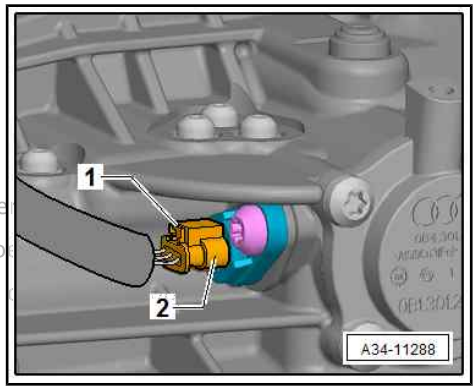


Fitting location of gear detection sensor - G604-

- ♦ At top right of manual gearbox

1, 2 - Electrical connector with fuse

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Overview of fitting locations - engine (view from left side)

1 - Oil level and oil temperature sender - G266-

- ❑ Exploded view ⇒ page 139

2 - Valve for oil pressure control - N428-

- ❑ Exploded view ⇒ page 139

3 - Hall sender - G40- (camshaft position sensor)

- ❑ Exploded view ⇒ page 406

4 - Throttle valve module - J338-

- ❑ With throttle valve potentiometer - G69-
- ❑ Exploded view ⇒ page 256

5 - Oil pressure switch for reduced oil pressure - F378-

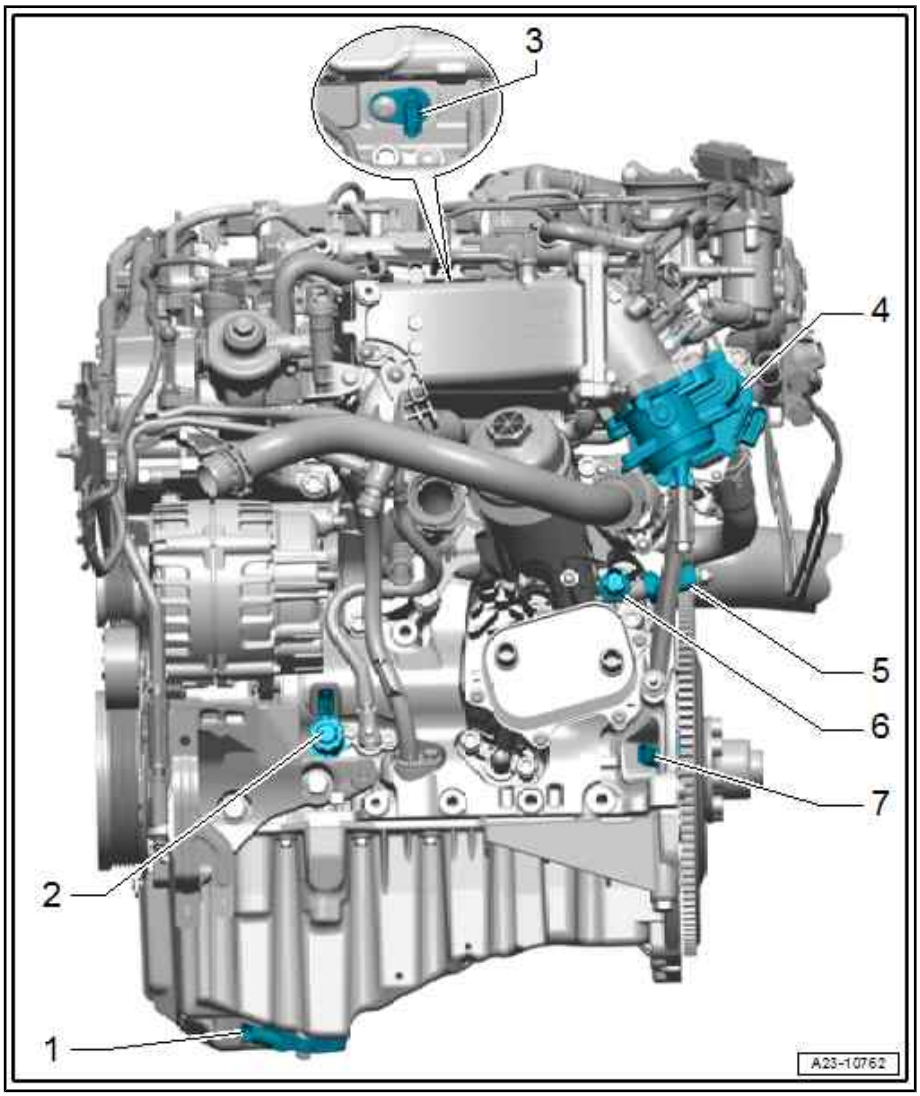
- ❑ Exploded view ⇒ page 150

6 - Oil pressure switch - F22-

- ❑ Exploded view ⇒ page 150

7 - Engine speed sender - G28-

- ❑ Exploded view ⇒ page 406



Overview of fitting locations - engine (view from right side)

1 - Exhaust gas temperature sender 4 - G648-

- ❑ Exploded view ⇒ page 307

2 - Exhaust gas recirculation control motor 2 - V339-

- ❑ With exhaust gas recirculation potentiometer 2 - G466-
- ❑ Exploded view ⇒ page 398

3 - NOx sender - G295-

- ❑ Exploded view ⇒ page 307

4 - Lambda probe - G39- with Lambda probe heater - Z19-

- ❑ Exploded view ⇒ page 307

5 - Injector for reducing agent - N474-

- ❑ Exploded view ⇒ page 362

6 - Exhaust gas temperature sender 3 - G495-

- ❑ Exploded view ⇒ page 307

7 - Exhaust gas temperature sender 2 - G448-

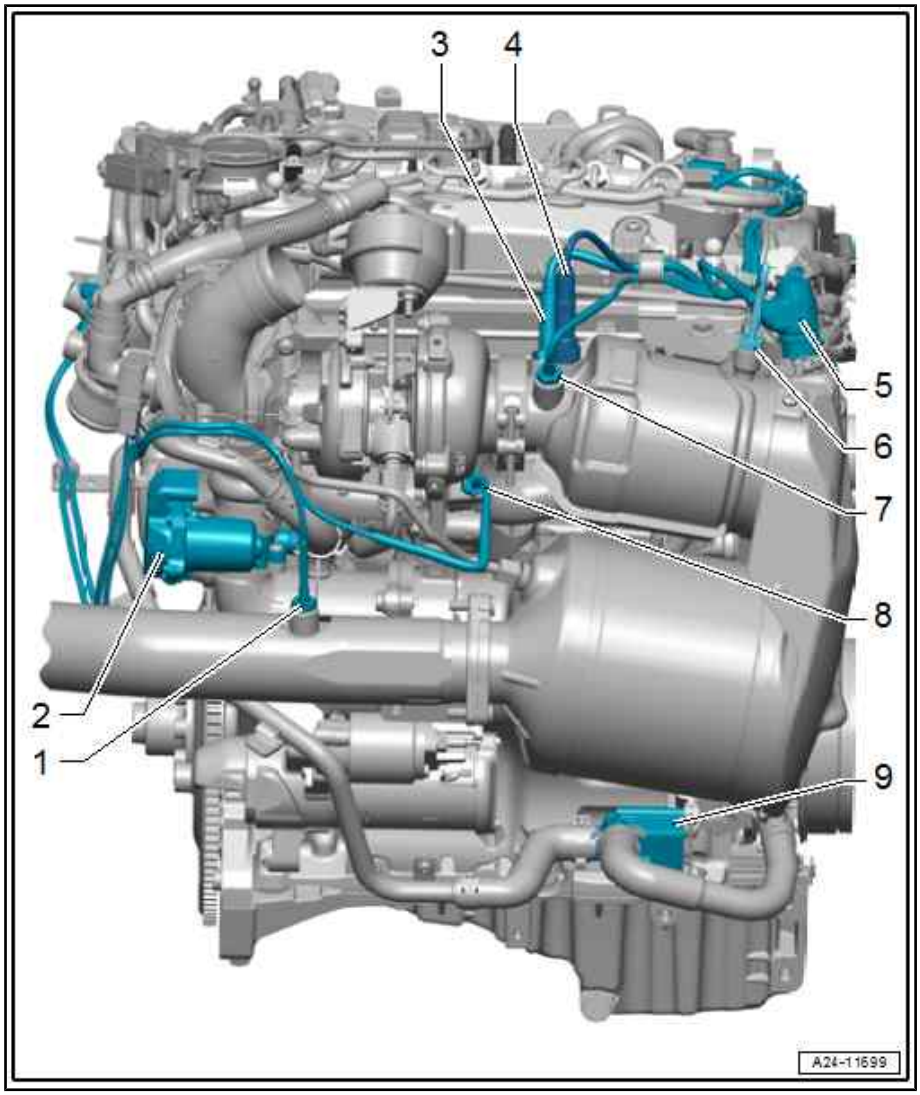
- ❑ Exploded view ⇒ page 307

8 - Exhaust gas temperature sender 1 - G235-

- ❑ Exploded view ⇒ page 307

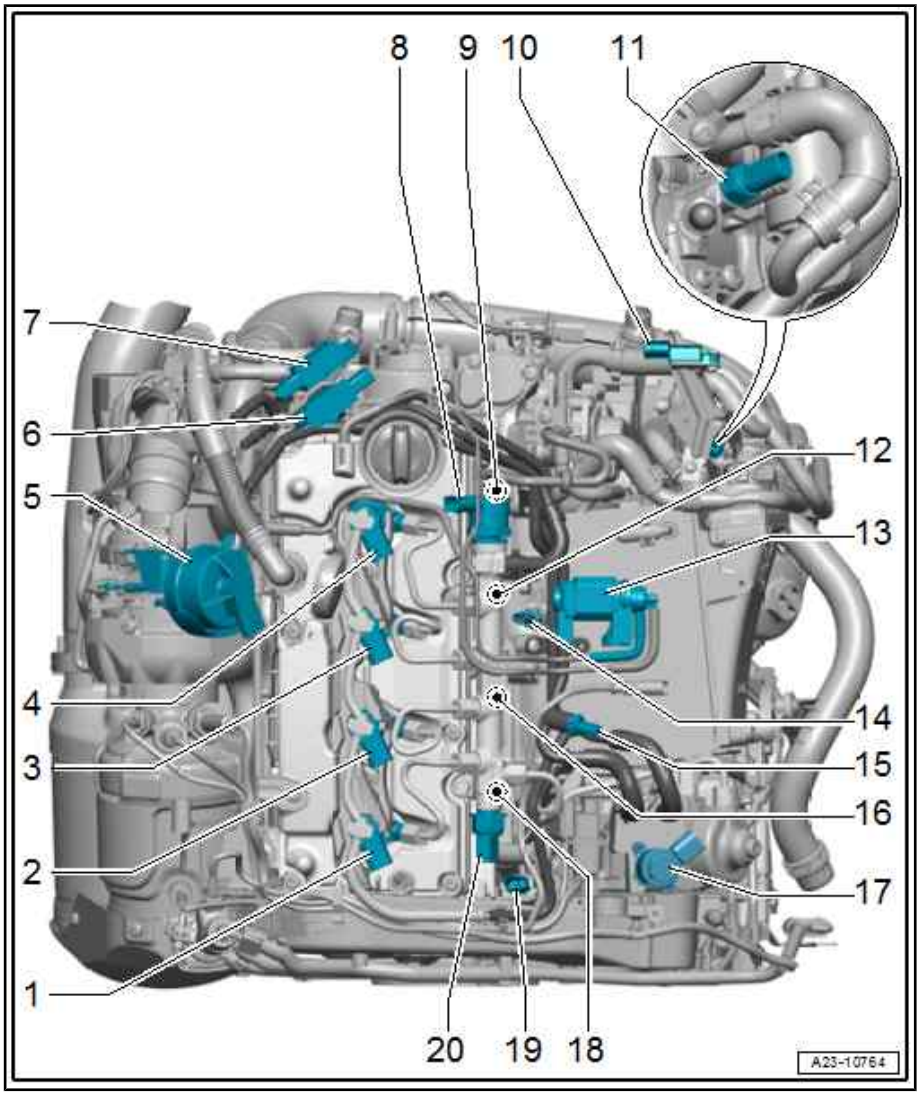
9 - Auxiliary pump for heating - V488-

- ❑ Exploded view ⇒ page 178



Overview of fitting locations - engine (view from above)

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1 - Injector, cylinder 1 - N30-

- ❑ Exploded view ⇒ page 265

2 - Injector, cylinder 2 - N31-

- ❑ Exploded view ⇒ page 265

3 - Injector, cylinder 3 - N32-

- ❑ Exploded view ⇒ page 265

4 - Injector, cylinder 4 - N33-

- ❑ Exploded view ⇒ page 265

5 - Position sender for charge pressure positioner - G581-

6 - Exhaust gas pressure sensor 1 - G450-

- ❑ Exploded view ⇒ page 307

7 - Pressure differential sender - G505-

- ❑ Exploded view ⇒ page 307

8 - Fuel pressure regulating valve - N276-

- ❑ Exploded view ⇒ page 268

9 - Glow plug 4 - Q13-

- ❑ Exploded view ⇒ page 406

10 - Charge pressure sender - G31-

- ❑ Exploded view ⇒ page 235

11 - Charge air temperature sender before charge air cooler - G810-

- ❑ Exploded view ⇒ page 256

12 - Glow plug 3 - Q12-

- ❑ With internal cylinder pressure sender for cylinder 3 - G622-
- ❑ Exploded view ⇒ page 406

13 - Charge pressure control solenoid valve - N75-

14 - Charge air temperature sender after charge air cooler - G811-

- ❑ Exploded view ⇒ page 256

15 - Fuel temperature sender - G81-

- ❑ In fuel supply line
- ❑ Removing and installing ⇒ page 291

16 - Glow plug 2 - Q11-

- ❑ Exploded view ⇒ page 406

17 - Fuel metering valve - N290-

18 - Glow plug 1 - Q10-

- ❑ Exploded view ⇒ page 406

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19 - Coolant valve for cylinder head - N489-

20 - Fuel pressure sender - G247-

- ❑ Exploded view ⇒ page 268

Overview of fitting locations - engine (view from rear)

1 - Exhaust gas recirculation control motor - V338-

- ❑ With exhaust gas recirculation potentiometer - G212-
- ❑ Exploded view ⇒ page 398

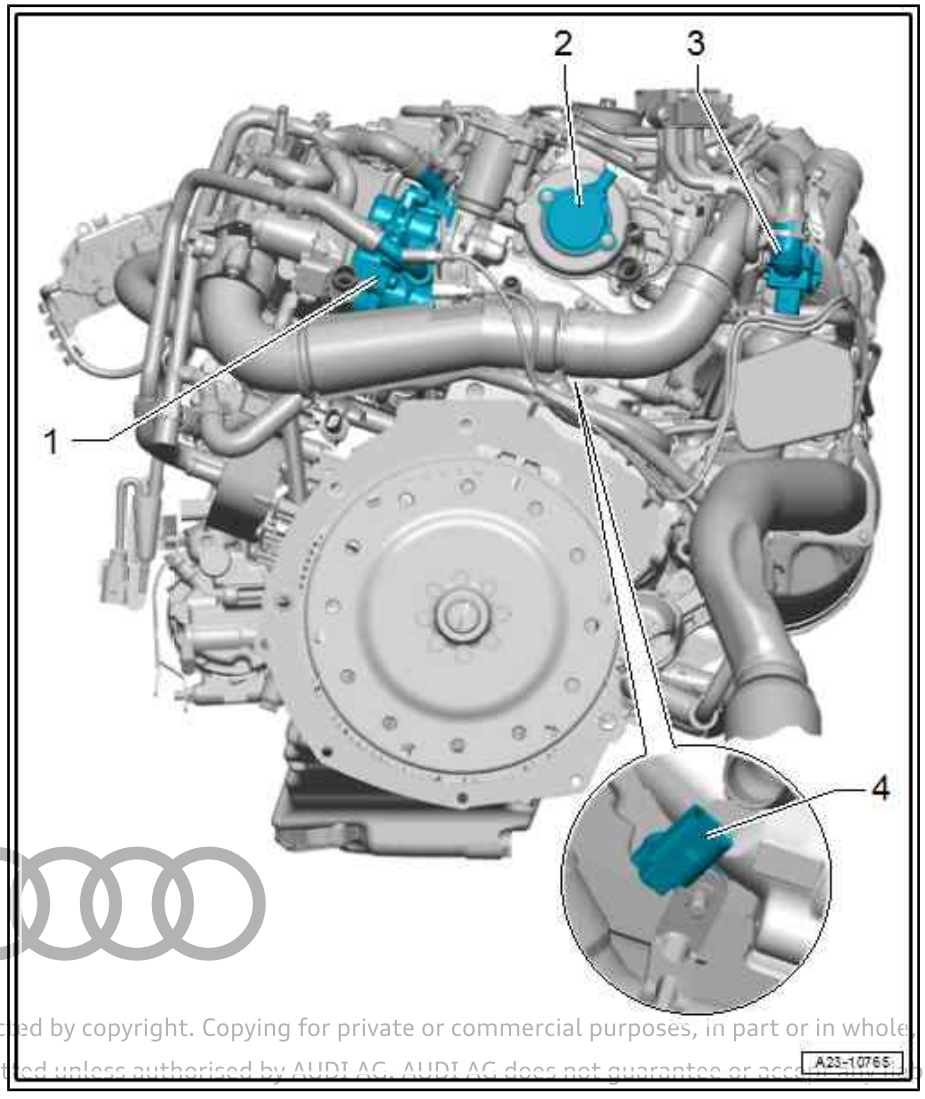
2 - Camshaft control valve 1 - N205-

- ❑ Exploded view ⇒ page 113

3 - Heating element for crankcase breather - N79-

4 - Coolant temperature sender - G62-

- ❑ Exploded view ⇒ page 179



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1.2 Overview - fuel system

Note

- ♦ *Red = Fuel supply lines*
- ♦ *Blue = Fuel return lines*
- ♦ *Arrows show direction of fuel flow.*

1 - Fuel filter

- ❑ Exploded view ⇒ Fuel supply system; Rep. gr. 20 ; Fuel filter; Exploded view - fuel filter

2 - High-pressure pump

- ❑ Exploded view ⇒ page 286

3 - Fuel metering valve - N290-

4 - Fuel temperature sender - G81-

5 - Restrictor

6 - Fuel pressure sender - G247-

- ❑ Exploded view ⇒ page 268

7 - High-pressure reservoir (rail)

- ❑ Exploded view ⇒ page 268

8 - Fuel pressure regulating valve - N276-

- ❑ Exploded view ⇒ page 268

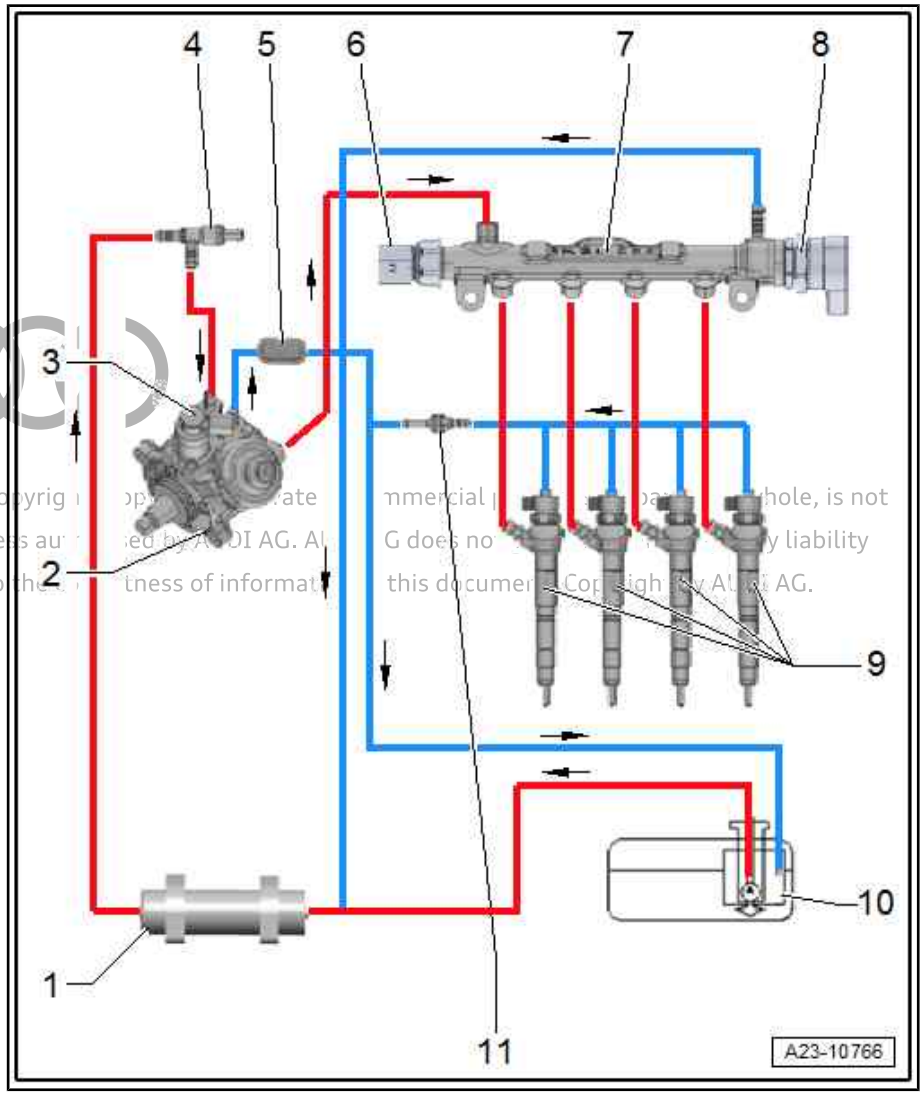
9 - Injectors

- ❑ Exploded view ⇒ page 265

10 - Fuel tank

- ❑ With fuel system pressurisation pump - G6-
- ❑ Exploded view ⇒ Fuel supply system; Rep. gr. 20 ; Fuel tank; Exploded view - fuel tank

11 - Restrictor



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1.3 Filling and bleeding fuel system

Special tools and workshop equipment required

♦ Vehicle diagnostic tester

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.

Proceed as follows to fill high-pressure pump with fuel.

- Check fuel gauge in instrument cluster; fuel gauge needle must indicate that fuel is above reserve level.

– 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`

♦ `Activate fuel pump`

♦ Press `Carry out check`

♦ Select 120 seconds.

– The fuel pump must run for 120 seconds to ensure that the fuel system is filled sufficiently with fuel.

– Start engine after filling fuel system.

– Run engine at moderate speed for several minutes and then switch off.

– Check fuel system for leaks.

– Road-test vehicle and accelerate with full throttle at least once.

– Then check high-pressure system again for leaks.

1.4 Checking fuel system for leaks

Procedure

– Run engine at idling speed for several minutes (do not press accelerator) and then switch off. Fuel system will bleed itself automatically.

– Check complete fuel system for leaks.

– If leaks are found although the connections have been tightened to the correct torque, the relevant component must be renewed.

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– Road-test vehicle and accelerate with full throttle at least once.

– Then check high-pressure system again for leaks.

2 Vacuum system

⇒ "2.1 Connection diagram - vacuum system", page 251

⇒ "2.2 Checking vacuum system", page 251

2.1 Connection diagram - vacuum system

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1 - To vacuum pump

2 - Vacuum line

- ❑ Leading from vacuum pump to brake servo

3 - Vacuum supply line

4 - Cylinder head cover

- ❑ With vacuum reservoir

5 - Vacuum unit for charge pressure control

- ❑ With position sender for charge pressure positioner - G581-
- ❑ On turbocharger

6 - Control pipe for vacuum

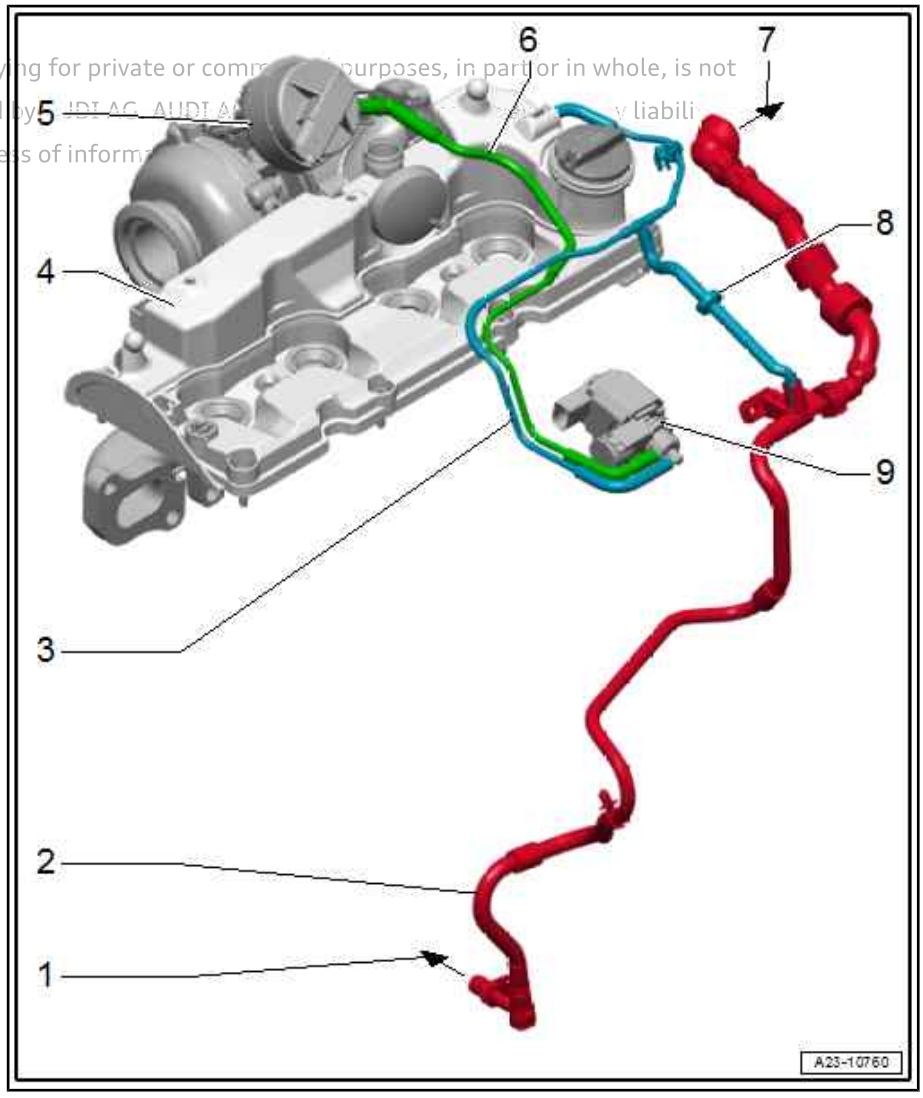
- ❑ From charge pressure control solenoid valve - N75- to vacuum unit on turbocharger

7 - To brake servo

8 - Non-return valve

- ❑ Note installation position

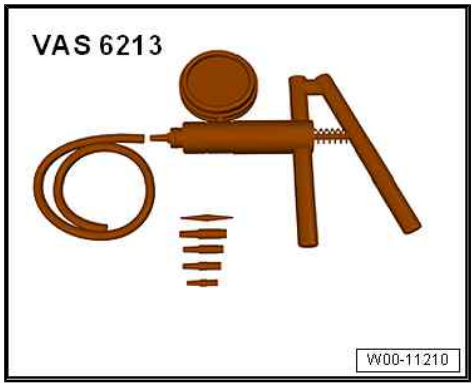
9 - Charge pressure control solenoid valve - N75-



2.2 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 an entry is stored in the event memory, check all vacuum lines leading to the corresponding component and also check the remaining vacuum lines leading to other components.

– 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.

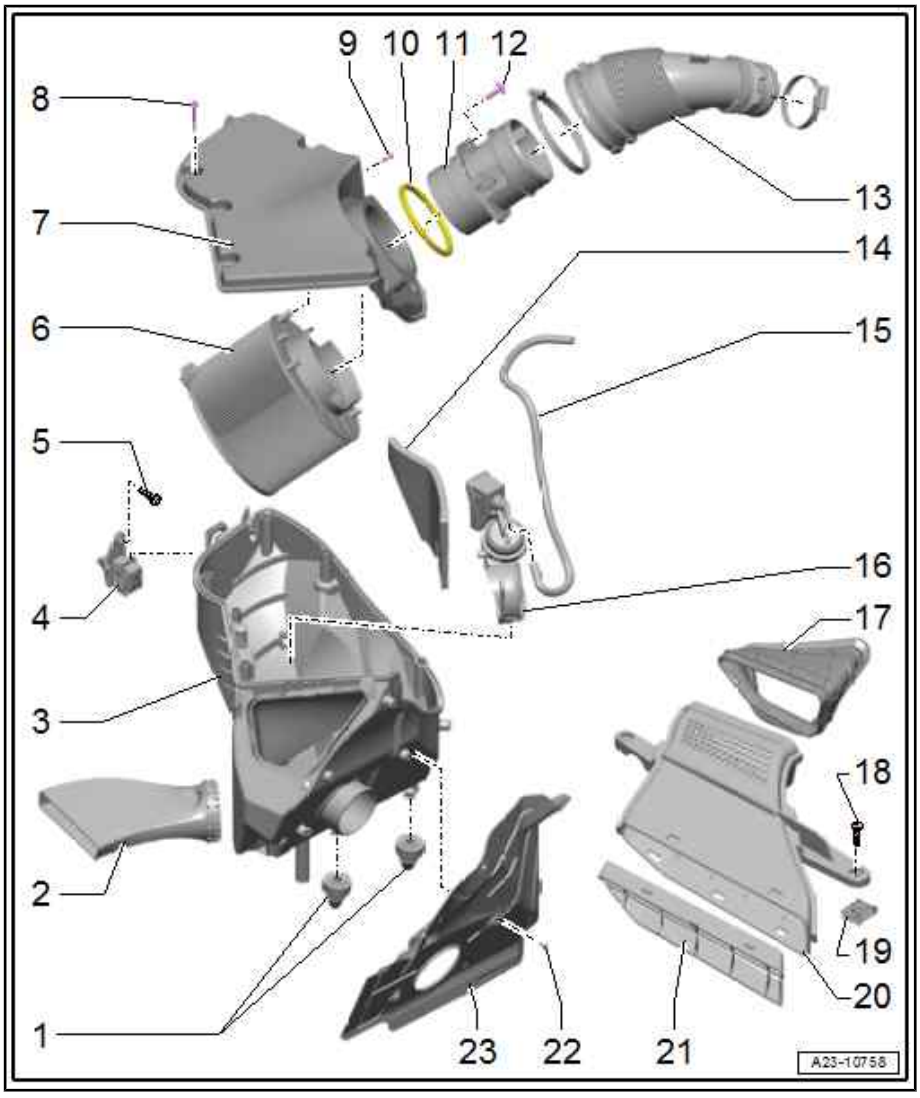
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3 Air cleaner

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⇒ "3.1 Exploded view - air cleaner housing", page 253
⇒ "3.2 Removing and installing air cleaner housing", page 254

3.1 Exploded view - air cleaner housing



1 - Rubber grommets

2 - Air duct

- ❑ On air cleaner (bottom section)

3 - Air cleaner (bottom section)

- ❑ Remove any salt residue, dirt and leaves
- ❑ Removing and installing ⇒ page 254

4 - Retainer for air cleaner (bottom section)

- ❑ Must engage positively
- ❑ Do not use any lubricants

5 - Bolt

- ❑ 4.8 Nm

6 - Air filter element

- ❑ Use genuine air filter element ⇒ Electronic parts catalogue
- ❑ Change intervals ⇒ Maintenance tables
- ❑ Removing and installing: refer to Maintenance Manual

- ♦ A5 Coupé ⇒ Maintenance ; Booklet 811
- ♦ A4 ⇒ Maintenance ; Booklet 812
- ♦ A5 Cabriolet ⇒ Maintenance ; Booklet 818
- ♦ Q5 ⇒ Maintenance ; Booklet 817

7 - Air cleaner (top section)

- ❑ Remove any salt residue, dirt and leaves

8 - Bolt

- ❑ 2 Nm

9 - Bolt

- ❑ 1.5 Nm

10 - O-ring

- ❑ Renew if damaged

11 - Air mass meter - G70-

- ❑ Removing and installing ⇒ page 291

12 - Bolt
- ❑ 4.8 Nm

13 - Air pipe

14 - Insulation

15 - Vacuum hose

16 - Air filter bypass flap valve - N275-
- ❑ Country-specific version

17 - Air duct

18 - Bolt
- ❑ 4.8 Nm

19 - Speed nut

20 - Air duct

21 - Snow screen
- ❑ Country-specific version
- ❑ Clean

22 - Bolt
- ❑ 1.5 Nm

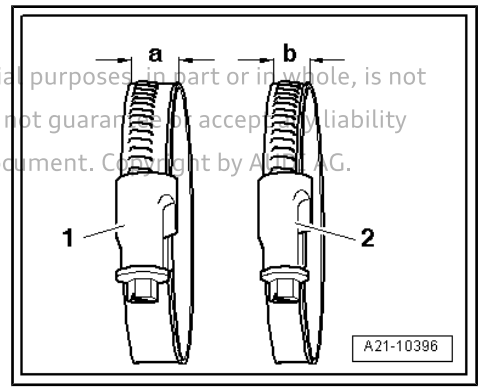
23 - Heat shield

Installing air ducts with hose clips

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Note

- *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- *Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .*
- *The screw sections of used hose 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

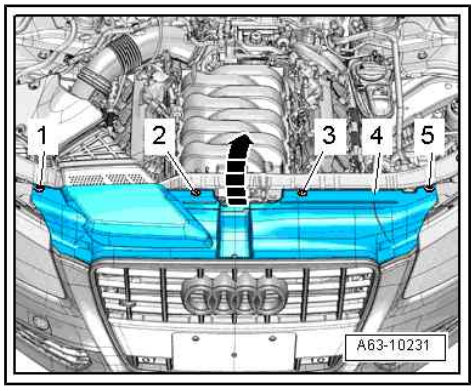
2 - Hose clip with width -b- = 9 mm: 3 Nm

3.2 Removing and installing air cleaner housing

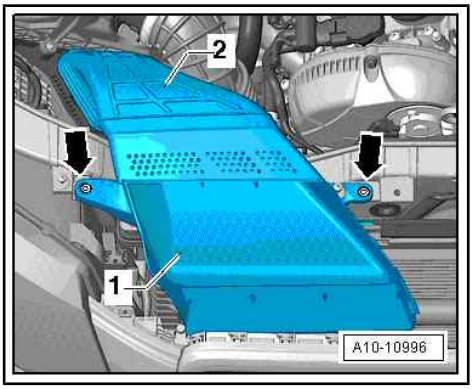
Removing

– Remove engine cover panel ⇒ page 34 .

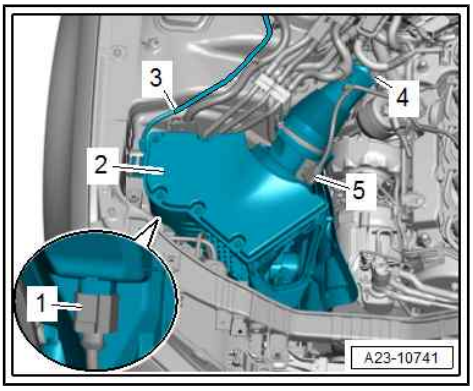
– Remove lock carrier cover -4- ⇒ General body repairs, exterior; Rep. gr. 50 ; Lock carrier; Exploded view - lock carrier .



– Remove bolts -arrows-.
– Detach air ducts -1, 2- from air cleaner housing.



– Unplug electrical connector -5- at air mass meter - G70- .
– Release hose clip -4- and detach air hose.
– If fitted, disconnect vacuum hose -3- and move clear.
– Unclip vacuum hose from air hose.
– Detach air cleaner housing -2- and, if fitted, unplug electrical connector -1- at air filter bypass flap valve - N275- on underside of air cleaner.



Installing

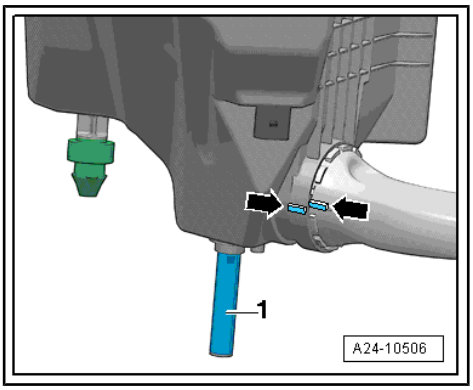
Installation is carried out in reverse order; note the following:

Note

- *The air cleaner housing must always be clean.*
- *To prevent malfunctions, cover critical parts of the engine air intake (air mass meter, air pipes etc.) with a clean cloth when blowing out the air cleaner housing with compressed air.*
- *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- *Use silicone-free lubricant when installing air hose.*
- *Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .*

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– If hot air intake is fitted (for countries with cold climates only), make sure that air intake connection has engaged properly -arrows- (pay attention to marking).
- The water drain hose -1- must be routed straight downwards and must not be kinked.
– Install engine cover panel ⇒ page 34 .



Tightening torques

- ⇒ “3.1 Exploded view - air cleaner housing”, page 253
- Lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Lock carrier; Exploded view - lock carrier

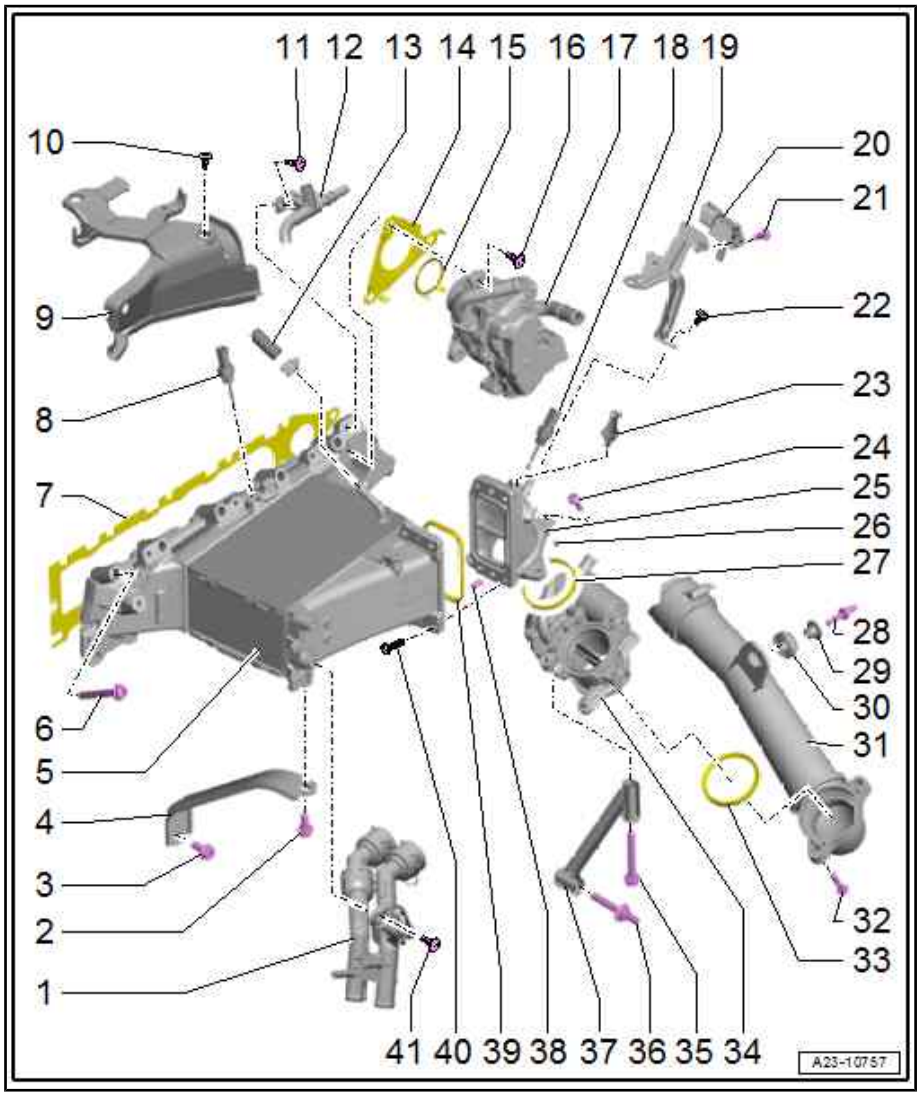
4 Intake manifold

⇒ “4.1 Exploded view - intake manifold”, page 256

⇒ “4.2 Removing and installing throttle valve module J338 ”, page 258

⇒ “4.3 Removing and installing intake manifold”, page 260

4.1 Exploded view - intake manifold



1 - Coolant connection

2 - Bolt

- ❑ Tightening torque and sequence ⇒ page 258

3 - Bolt

- ❑ Tightening torque and sequence ⇒ page 258

4 - Bracket

- ❑ For intake manifold

5 - Intake manifold with charge air cooler

- ❑ Intake manifold and charge air cooler are combined as one unit
- ❑ Removing and installing ⇒ page 260

6 - Bolt

- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 258

7 - Gasket

- ❑ Renew after removing

8 - Charge air temperature sender after charge air cooler - G811-

- ❑ 22 Nm
- ❑ Removing and installing ⇒ page 237

9 - Bracket

- ❑ For electrical wiring harness

10 - Bolt

- ❑ 8 Nm

11 - Bolt

- ❑ 8 Nm

12 - Vacuum line

- ❑ Leading from vacuum pump

13 - Sealing plug

14 - Gasket

- ❑ Renew after removing

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15 - Gasket
- ❑ Renew after removing

16 - Bolt
- ❑ Tightening torque ⇒ Item 1 (page 398)

17 - Exhaust gas recirculation control motor - V338-
- ❑ Removing and installing ⇒ page 401

18 - Charge air temperature sender before charge air cooler - G810-
- ❑ 22 Nm
- ❑ Removing and installing ⇒ page 237

19 - Bracket
- ❑ For charge pressure sender - G31-

20 - Charge pressure sender - G31-
- ❑ Removing and installing ⇒ page 237

21 - Bolt
- ❑ Tightening torque ⇒ Item 21 (page 236)

22 - Bolt
- ❑ Tightening torque ⇒ Item 22 (page 236)

23 - Ball stud
- ❑ For engine cover panel

24 - Bolt
- ❑ 8 Nm

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25 - Connection
- ❑ For throttle valve module - J338-

26 - Dowel pin

27 - Seal
- ❑ Renew after removing

28 - Centre hex stud
- ❑ Tightening torque ⇒ Item 28 (page 236)

29 - Spacer sleeve

30 - Rubber buffer

31 - Air pipe

32 - Bolt
- ❑ Tightening torque ⇒ Item 32 (page 236)

33 - Seal
- ❑ Renew after removing

34 - Throttle valve module - J338-
- ❑ Removing and installing ⇒ page 258

35 - Bolt
- ❑ Tightening torque and sequence ⇒ page 258

36 - Bolt
- ❑ Tightening torque and sequence ⇒ page 258

37 - Bracket
- ❑ For throttle valve module - J338-

38 - Dowel pin

39 - Gasket

- ❑ Renew after removing

40 - Bolt

- ❑ 8 Nm

41 - Bolt

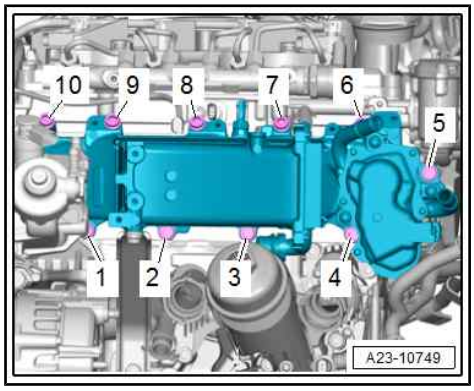
- ❑ 8 Nm

Intake manifold with charge air cooler - tightening torque and sequence

– Renew bolts.

– Tighten bolts in 3 stages:

Stage	Bolts	Tightening torque
1.	-1 … 10-	Screw in by hand until contact is made
2.	-1 … 10-	Tighten to 20 Nm
3.	-1 … 10-	Turn 90° further



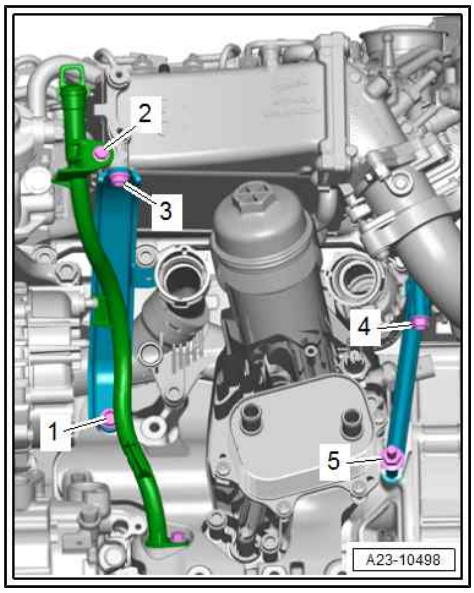
Bracket for intake manifold and bracket for throttle valve module - tightening torque and sequence

– Tighten bolts in stages:

Note

When installing bracket for intake manifold/bracket for throttle valve module, it is very important to ensure that the bracket is not bolted on while under tension.

Stage	Bolts	Tightening torque
1.	-1, 3, 4, 5-	Screw in hand-tight as far as stop
2.	-1, 3, 4, 5-	Tighten to 20 Nm
3.	-2-	Tighten to 10 Nm



4.2 Removing and installing throttle valve module - J338-

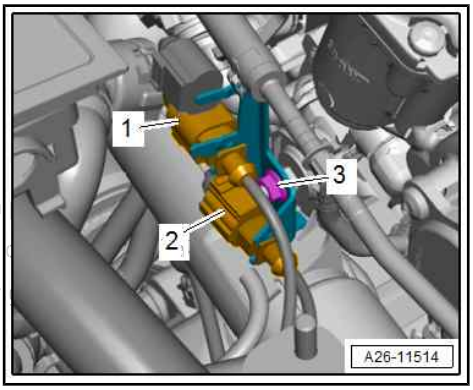
Removing

– Remove engine cover panel ⇒ page 34 .

– Remove coolant pipes (rear left) ⇒ page 190 .

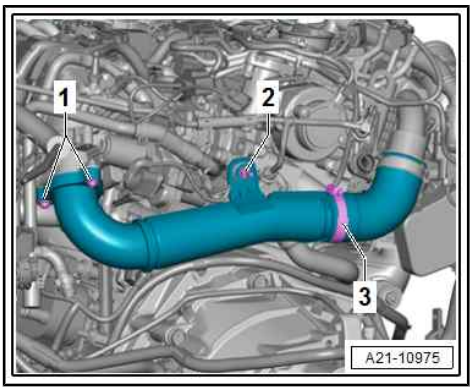
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– Remove nut -3- and move bracket with electrical connectors -1, 2- to one side.

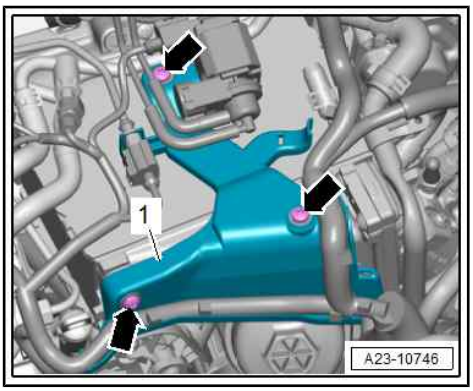


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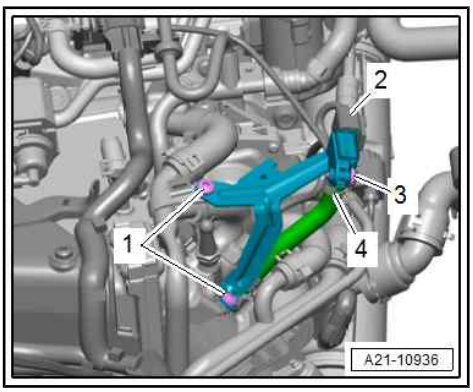
– Remove bolts -1- and centre hex stud -2-.
– Loosen hose clip -3- and move air pipe clear towards rear.



– Remove bolts -arrows- and push bracket -1- slightly to one side.



– Unplug electrical connector -2- at charge pressure sender -G31- .



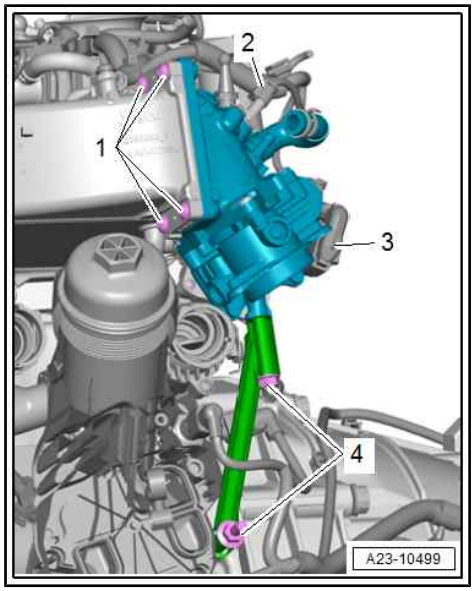
– Unplug electrical connectors:

2 - For charge air temperature sender before charge air cooler - G810-

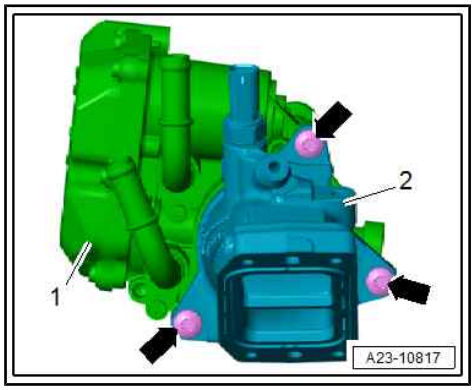
3 - For throttle valve module - J338-

– Remove bolts -4- and detach support.

– Remove bolts -1- and detach connection with throttle valve module - J338- .



– Remove bolts -arrows- and disconnect throttle valve module - J338- -item 2- from connection -1-.



Installing

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

Note

Renew gaskets, seals and O-ring.

– When fitting connection with throttle valve module - J338- , pay attention to dowel pins.

– Install engine cover panel ⇒ page 34 .

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 elec. adjuster with checkback`

Tightening torques

- ⇒ “4.1 Exploded view - intake manifold”, page 256
- ⇒ “3.1 Exploded view - coolant pipes”, page 187

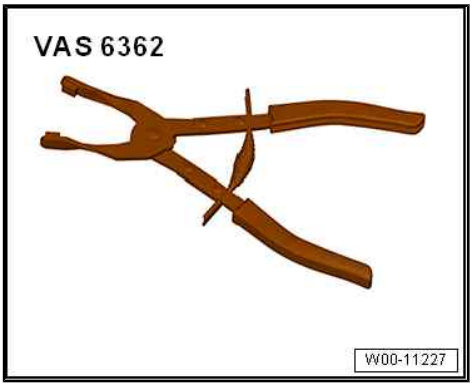
4.3 Removing and installing intake manifold

Intake manifold and charge air cooler are combined as one unit.

Special tools and workshop equipment required

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- Hose clip pliers - VAS 6362-

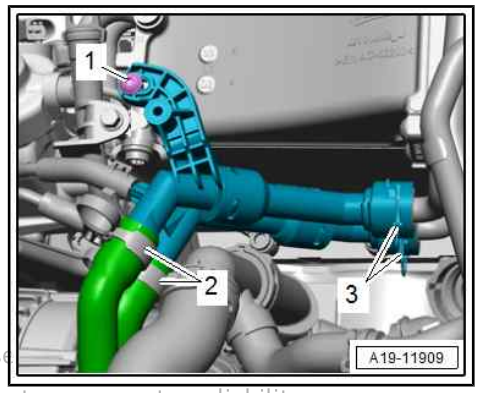


- Bit XZN 10 - T10501-



Removing

– Remove high-pressure pipe ⇒ page 281 .
– Remove throttle valve module - J338- ⇒ page 258 .
– Remove coolant pipe (top left) ⇒ page 192 .
– Release hose clips -2- and disconnect coolant hoses.
– Remove bolt -1-.
– Lift retaining clips -3-, detach coolant connection and place to side.



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– Unplug electrical connectors and move clear:

1 - For injectors

2 - For fuel pressure sender - G247-

3 - For glow plugs

4 - For fuel pressure regulating valve - N276-

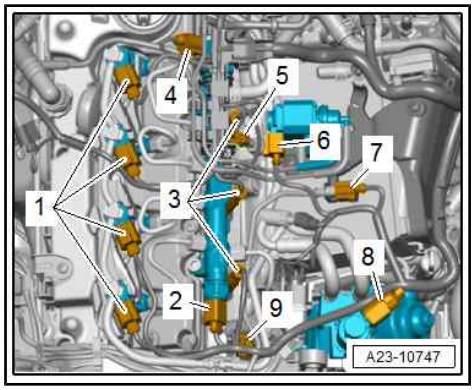
5 - For charge air temperature sender after charge air cooler - G811-

6 - Remove electrical connector for charge pressure control solenoid valve - N75- from bracket and place to one side.

7 - For injector for reducing agent - N474-

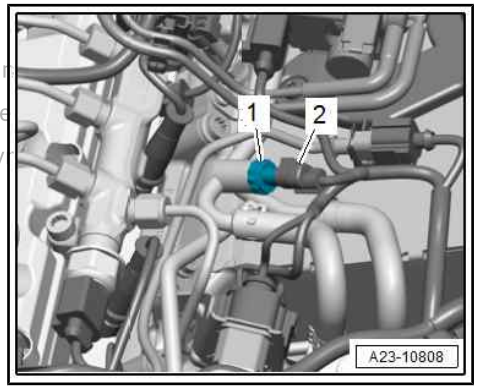
8 - For high-pressure pump

9 - For coolant valve for cylinder head - N489-



– Unplug electrical connector -2-.

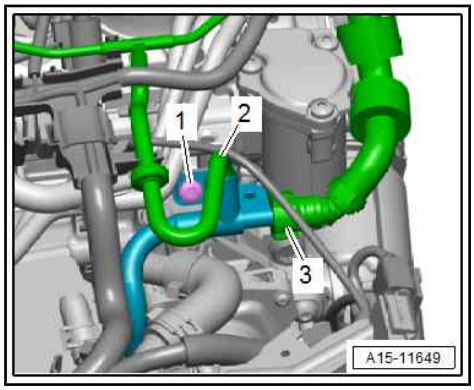
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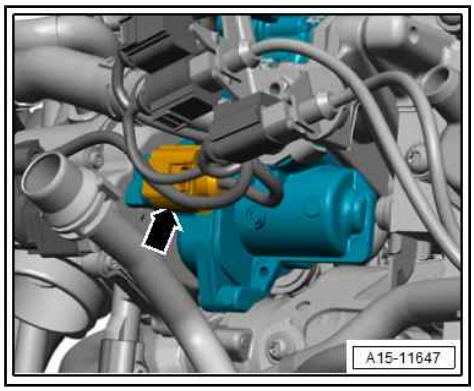
– Press release tabs on both sides and detach vacuum hose -3-.

– Disconnect vacuum hose -2-.

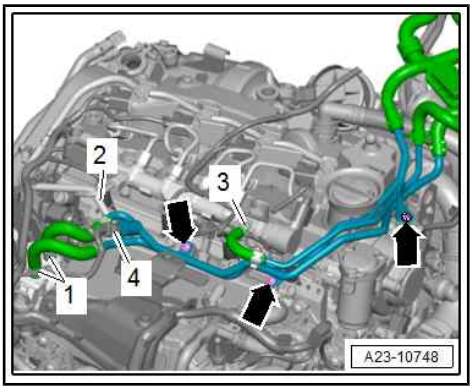
– Remove bolt -1- at vacuum line.



– Unplug electrical connector -arrow- from exhaust gas recirculation control motor - V338- and move electrical wiring clear.

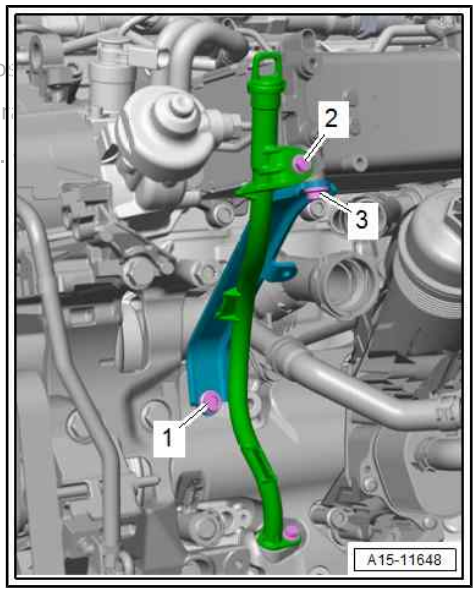


– Release hose clips -1 and 3- and detach fuel hoses.
– Disconnect fuel hose -2-.
– Unplug electrical connector -4- on fuel temperature sender - G81- .
– Remove bolts -arrows- and place fuel lines to one side.

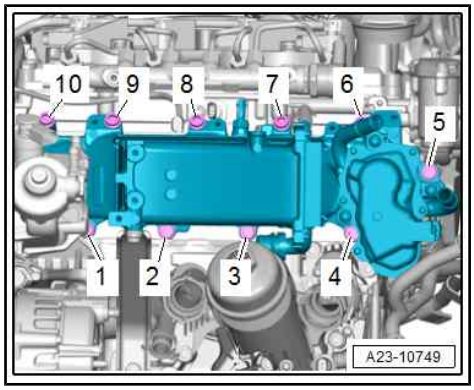


– Loosen bolt -1-.
– Remove bolts -2, 3-.

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– Using bit XZN 10 - T10501- , slacken and remove bolts in the sequence: -10 ... 1-.



Installing

Note

Renew gasket.

– Fit new gasket onto dowel pins in cylinder block.

Caution

Risk of damage to sealing surface of intake manifold.

- ***When fitting intake manifold, ensure that sealing surface does not come into contact with dowel pins.***

– Fit intake manifold onto dowel pins in cylinder block and tighten bolts ⇒ page 258 .

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

– Electrical connections and routing ⇒ Electrical system; Rep. gr. 97 ; Electrical connectors and ⇒ Current flow diagrams, Electrical fault finding and Fitting locations

– Install throttle valve module - J338- ⇒ page 258 .

– Install high-pressure pipe ⇒ page 281 .

– Fill up with coolant ⇒ page 167 .

Tightening torques

- ⇒ Fig. ""Intake manifold with charge air cooler - tightening torque and sequence"" , page 258
- ⇒ "4.1 Exploded view - intake manifold", page 256
- ⇒ "1.1 Exploded view - sump/oil pump", page 139
- ⇒ "5.2 Exploded view - high-pressure reservoir (rail)", page 268
- ⇒ "3.1 Exploded view - coolant pipes", page 187

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5 Injectors/high-pressure reservoir (rail)

⇒ “5.1 Exploded view - injectors”, page 265

⇒ “5.2 Exploded view - high-pressure reservoir (rail)”, page 268

⇒ “5.3 Checking injectors”, page 269

⇒ “5.5 Checking for injectors sticking open”, page 270

⇒ “5.4 Performing adaption of correction values for injectors”, page 269

⇒ “5.6 Checking return flow rate of injectors with engine running”, page 272

⇒ “5.7 Checking return flow rate of injectors at starter cranking speed”, page 275

⇒ “5.8 Removing and installing injectors”, page 277

⇒ “5.9 Removing and installing high-pressure pipes”, page 281

⇒ “5.10 Removing and installing high-pressure reservoir (rail)”, page 284

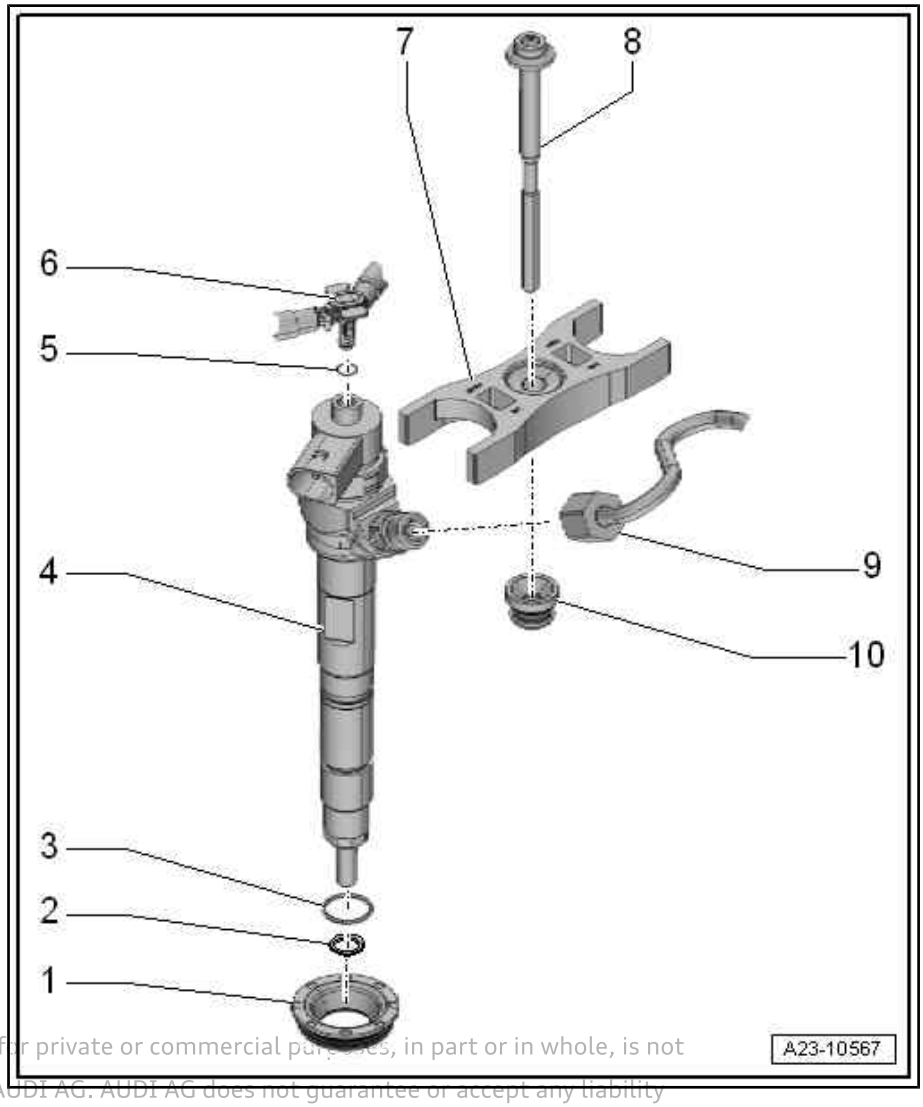
5.1 Exploded view - injectors

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 ⇒ page 265 after installing the high-pressure pipes. If these instructions are not observed, the engine could be damaged.

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1 - Seal

- ❑ In cylinder head cover
- ❑ Renew if leaking ⇒ page 105

2 - Copper seal

- ❑ Renew after removing

3 - O-ring

- ❑ Renew after removing

4 - Injector

- ❑ Use a coloured pen to mark allocation of injectors to corresponding clamping piece and high-pressure pipe, and to corresponding cylinder for re-installation; pay attention to markings when installing
- ❑ Renew copper seal after removing
- ❑ To remove carbon deposits from the injector sealing surface, clean the injector bore in the cylinder head with cleaning kit - VAS 6811- (it is important to do this to avoid leaks)
- ❑ Removing and installing ⇒ page 277

5 - O-ring

- ❑ Renew after removing

6 - Fuel return line

- ❑ To fuel tank
- ❑ Must not be kinked, damaged or clogged
- ❑ Do not dismantle
- ❑ Fill and bleed fuel system after renewing ⇒ page 249

7 - Clamping piece

- ❑ Use a coloured pen to mark injectors and corresponding clamping piece and cylinder for re-installation; pay attention to markings when installing
- ❑ The clamping pieces can be re-used when installing new injectors
- ❑ Each clamping piece secures two injectors
- ❑ Installation position ⇒ page 267

8 - Bolt

- ❑ Renew
- ❑ Tighten initially to 2 Nm, then screw on union nuts for high-pressure pipes hand-tight and align injectors
- ❑ 8 Nm + 270° (3x 90° further)
- ❑ Note warning instructions for clamping piece ⇒ Item 7 (page 266)

9 - High-pressure pipe

- ❑ From high-pressure reservoir (rail) to injector
- ❑ Do not alter shape
- ❑ Check for damage before re-installing
- ❑ Lubricate threads of union nuts with clean engine oil

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❑ If an injector is renewed, the corresponding high-pressure pipe must also be renewed

❑ Tightening torques:

♦ 28 Nm if re-installing high-pressure pipe

♦ 15 Nm +60° if installing a new high-pressure pipe

❑ Removing and installing ⇒ page 281

10 - Grommet

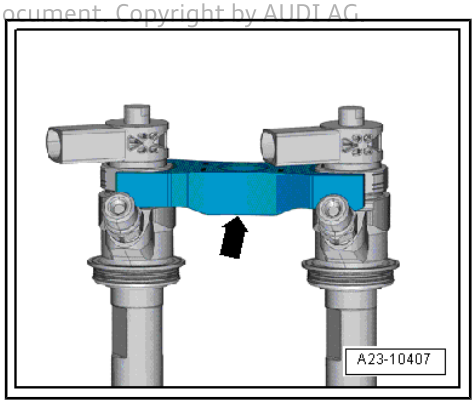
❑ In cylinder head cover

❑ Renew if damaged

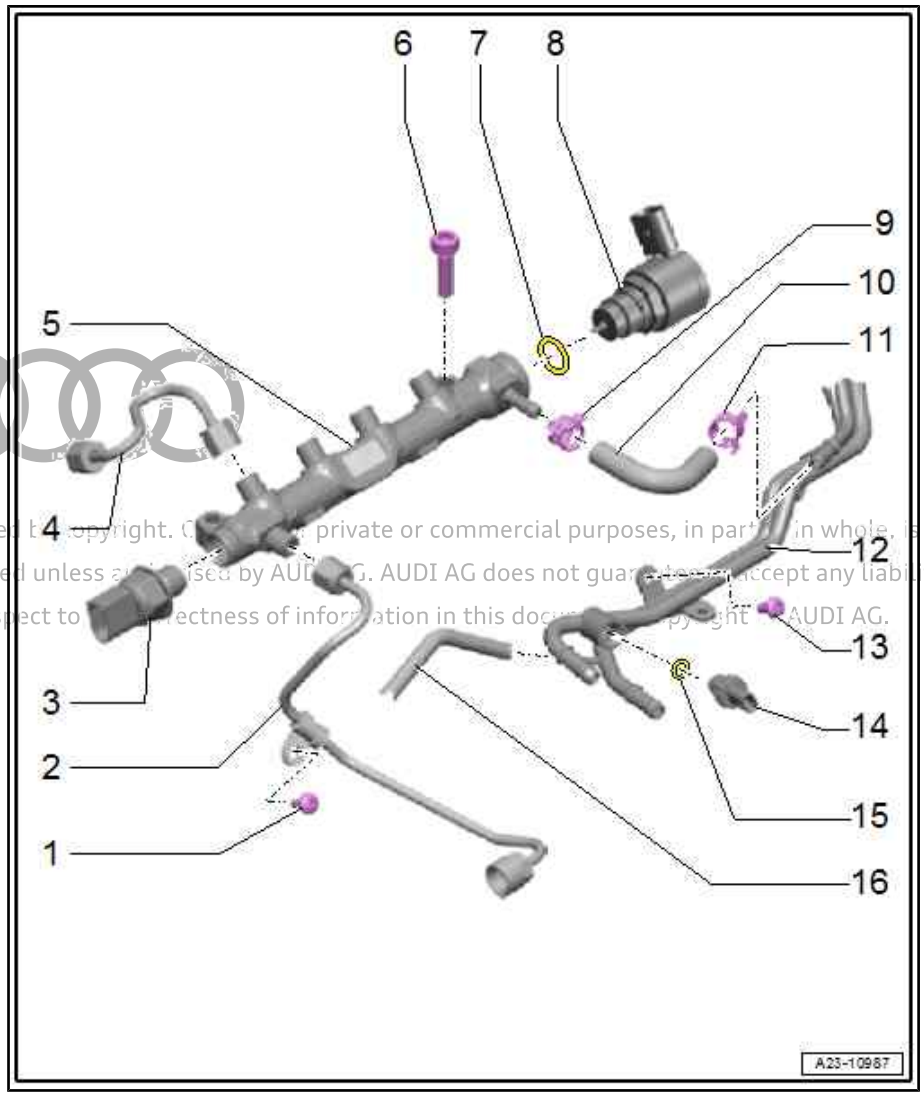
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Installation position of clamping piece

- Each clamping piece secures two injectors.
- The bulge -arrow- of the clamping piece should point downwards.



5.2 Exploded view - high-pressure reservoir (rail)



1 - Bolt

- ❑ 8 Nm

2 - High-pressure pipe

- ❑ Between high-pressure pump and high-pressure reservoir (rail)
- ❑ Do not alter shape
- ❑ Check for damage before re-installing
- ❑ Lubricate threads of union nuts with clean engine oil
- ❑ If the high-pressure pump is renewed, the corresponding high-pressure pipe must also be renewed
- ❑ Tightening torques:

♦ 28 Nm if re-installing high-pressure pipe

♦ 15 Nm +60° if installing a new high-pressure pipe

3 - Fuel pressure sender - G247-

- ❑ If deformable sealing lip and thread of fuel pressure sender - G247- are not damaged, sender can be re-used once.
- ❑ Removing and installing ⇒ page 299
- ❑ 100 Nm

4 - High-pressure pipe

- ❑ From high-pressure reservoir (rail) to injector
- ❑ Do not alter shape
- ❑ Check for damage before re-installing
- ❑ Lubricate threads of union nuts with clean engine oil
- ❑ If an injector is renewed, the corresponding high-pressure pipe must also be renewed
- ❑ Tightening torques:

♦ 28 Nm if re-installing high-pressure pipe

♦ 15 Nm +60° if installing a new high-pressure pipe

5 - High-pressure reservoir (rail)

- ❑ Removing and installing ⇒ page 284

6 - Bolt

- ❑ 20 Nm

7 - O-ring

- ❑ Renew after removing

8 - Fuel pressure regulating valve - N276-

- ❑ Renew after removing
- ❑ Checking ⇒ page 292

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- ❑ Removing and installing ⇒ page 294
- ❑ Reset learnt values after renewing ⇒ Vehicle diagnostic tester, `Guided Functions`, `01 - Reset learnt values`
- ❑ 80 Nm

9 - Spring-type clip

- ❑ Renew after removing

10 - Fuel return hose

11 - Spring-type clip

- ❑ Renew after removing

12 - Fuel lines

13 - Bolt

- ❑ 8 Nm

14 - Fuel temperature sender - G81-

- ❑ 2 Nm

15 - O-ring

- ❑ Renew after removing

16 - Fuel return hose

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5.3 Checking injectors

There are four different tests for checking the operation of the injectors.

- ⇒ “5.4 Performing adaption of correction values for injectors”, page 269
- ⇒ “5.5 Checking for injectors sticking open”, page 270
- ⇒ “5.6 Checking return flow rate of injectors with engine running”, page 272
- ⇒ “5.7 Checking return flow rate of injectors at starter cranking speed”, page 275

Perform the following tests first if the engine does not start at all:

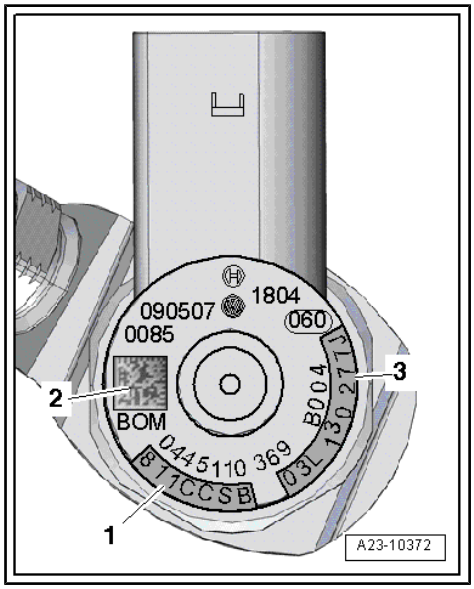
- ⇒ “5.5 Checking for injectors sticking open”, page 270
- ⇒ “5.7 Checking return flow rate of injectors at starter cranking speed”, page 275
- ⇒ “7.3 Checking fuel pressure regulating valve N276 ”, page 292

5.4 Performing adaption of correction values for injectors

- The “Injector delivery calibration values” function serves to correct the injection rates for each cylinder of a common rail system individually across the entire operating range.
- The 7-digit adaption values are marked on each injector. The values may consist of letters and/or numbers.



Injector (view from above)



1 - Adaption value (checksum; details in illustration are only an example)

2 - Data matrix code

3 - Part number

- When a new injector is installed, the adaption value must be written into the engine control unit.
- When a new engine control unit is installed, the “Adaption values for injectors” must be written into the new control unit.
- Additionally, check that the “injector delivery calibration values” are correctly entered for all the other injectors. Do NOT attempt to re-enter these values if the correct values are already stored in the engine control unit.
- The adaption procedure is described in `Guided Functions` mode of ⇒ Vehicle diagnostic tester.

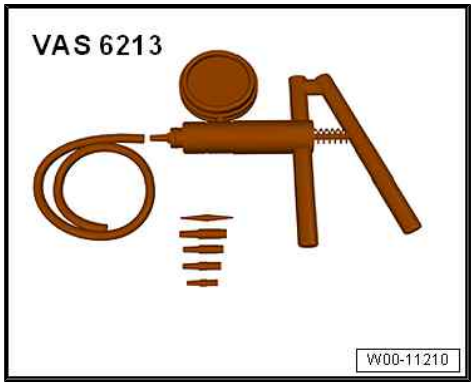
5.5 Checking for injectors sticking open

Note

If one of the injectors is sticking open, this means that the injector needle is not closing fully and fuel escapes into the cylinder.

Special tools and workshop equipment required

- Hand vacuum pump - VAS 6213-



- Adapter of return flow meter - VAS 6684-

Procedure

– Remove engine cover panel ⇒ page 34 .

– Detach noise insulation.

Caution

Risk of malfunctions caused by dirt.

- ***Observe ⇒ “3.1 Rules for cleanliness”, page 6 .***

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– Clean all connections (with commercial cleaning solution or similar) before removing.

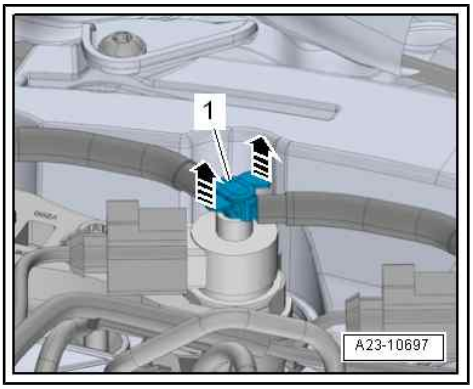
Note

- *Make sure all parts are clean; no dirt must be allowed to enter the fuel system.*
- *Check all cylinders in turn.*

– Dry all components after cleaning.

Start with cylinder No. 1.

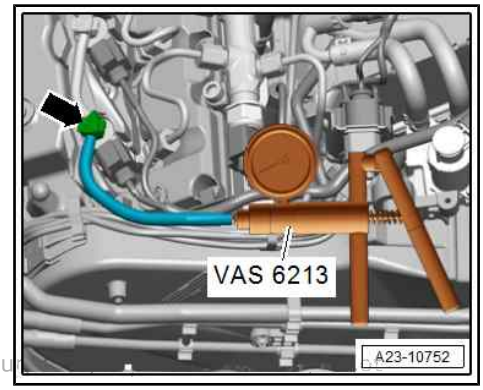
– Pull release tabs upwards -arrows- and pull return line connections -1- off injectors.



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– Connect adapter -arrow- of return flow meter - VAS 6684- to return line connection of injector to be tested after adapter has been cleaned and blown out.
– Generate a vacuum of -500 mbar using the hand vacuum pump - VAS 6213- .

• If the vacuum reading remains the same for 30 seconds, the injector is OK.
• If the injector is faulty, the vacuum reading will fall back to 0 bar within 2 to 3 seconds.



Repeat test if necessary; note drop in vacuum reading on hand vacuum pump - VAS 6213- .

– Renew faulty injectors ⇒ page 277.

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Installing fuel return lines

– Check O-ring for fuel return line connection for damage and deformation.

If O-ring is damaged or deformed, renew O-ring.

Note

Lubricate all seals with engine oil or assembly oil before installing.

– Push return line connections carefully over seals and onto injectors. The catch should engage audibly. Then press release pin down carefully.
– Erase entry in event memory using ⇒ Vehicle diagnostic tester.

Checking fuel system for leaks

– Run engine at idling speed for several minutes (do not press accelerator) and then switch off. Fuel system will bleed itself automatically.
– Check the entire fuel system for leaks.

Renew the affected component if leakage occurs.

– Road-test vehicle and accelerate with full throttle at least once.
– Then check high-pressure system again for leaks.
– Install engine cover panel ⇒ page 34 .

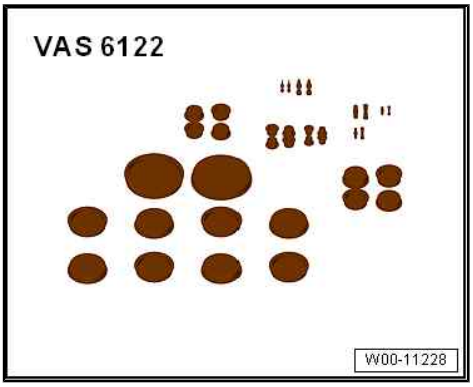
5.6 Checking return flow rate of injectors with engine running

Checking return flow rate of all injectors

Special tools and workshop equipment required

♦ Fuel-resistant measuring container

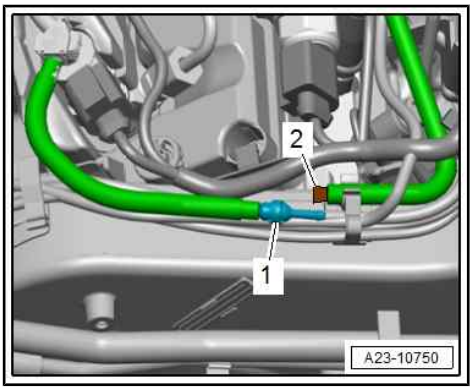
♦ Engine bung set - VAS 6122-



Procedure

– Remove engine cover panel ⇒ page 34 .

– Disconnect hose at non-return valve -1-.



Caution

Risk of malfunctions caused by dirt.

♦ *Observe ⇒ "3.1 Rules for cleanliness", page 6 .*

– Seal off open return hose with clean plug -2- from engine bung set - VAS 6122- .

– Hold end of fuel return hose (lengthen if necessary) in a measuring container to measure the total return flow rate.

– Start engine and let it idle for 2 minutes.

• Specification for 2 minutes: 0 ml to 50 ml

– If specification is attained, increase engine speed to 2000 ... 2500 rpm for approx. 2 minutes and then check return flow rate again.

• Specification for 2 minutes: less than 250 ml

Note

1000 ml = 1 litre

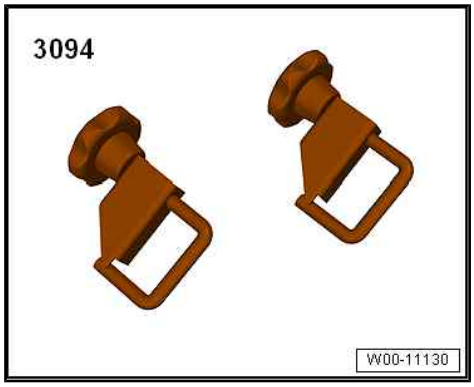
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If specification is exceeded, this indicates that one or more injectors are defective. Check return flow rate from each injector individually.

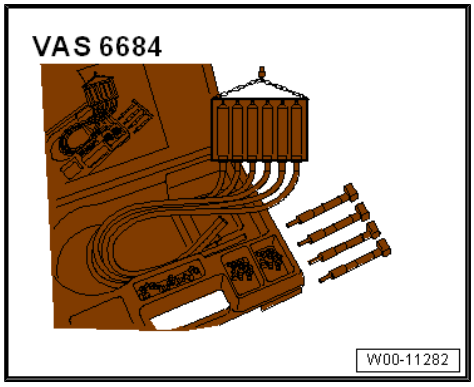
Checking return flow rate of individual injectors

Special tools and workshop equipment required

- Hose clamps, up to 25 mm - 3094-



- Return flow meter - VAS 6684-



Note

Each injector normally has a relatively low fuel return flow rate. If the return flow rate at one injector is relatively high compared to the other injectors, that injector is probably defective.

Caution

Risk of malfunctions caused by dirt.

- ***Observe ⇒ "3.1 Rules for cleanliness", page 6 .***

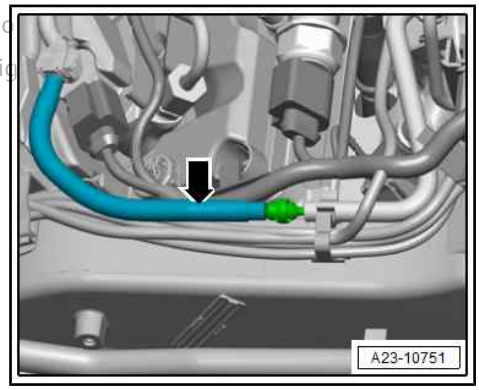
– Clean all return line connections (e.g. with commercial cleaning solution etc.) before removing.

– Dry all components after cleaning.

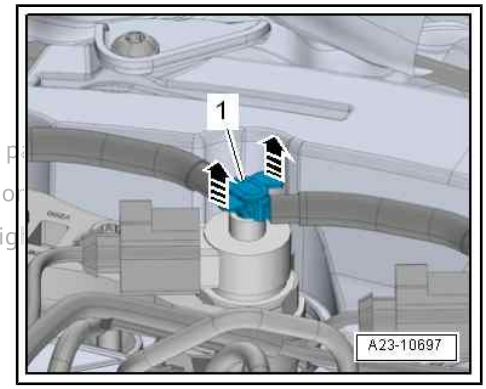
– Clamp off fuel return hose -arrow- with a hose clamp -3094-.

– Detach noise insulation.

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– Pull release tabs upwards -arrows- and pull return line connections -1- off injectors.



– Connect adapters of return flow meter - VAS 6684- to return line connections of all 4 injectors.

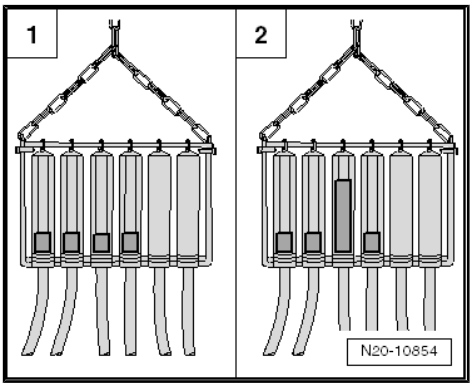
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Caution

Risk of damage to injectors when return lines are disconnected.

- ***Do NOT press the accelerator during this test; the engine must only run at idling speed.***

– Start engine and let it idle for several minutes.



– When the engine is warm and running at idling speed, the return flow rates at each of the 4 return lines must not differ by more than a small amount (example -1-).

– If one injector has a significantly higher return flow rate than the others (example -2-), it must be renewed ⇒ page 277 .

– When the engine is warm and running at idling speed, the return flow rates at each of the 4 return lines must not differ by more than a small amount.

Installing fuel return lines

– Check O-ring for fuel return line connection for damage and deformation.

If O-ring is damaged or deformed, renew O-ring.

Note

Lubricate all seals with engine oil or assembly oil before installing.

– Push return line connections carefully onto injectors. The catch should engage audibly. Then press release pin down carefully.

– Erase entry in event memory using ⇒ Vehicle diagnostic tester.

Checking fuel system for leaks

– Run engine at idling speed for several minutes (do not press accelerator) and then switch off. Fuel system will bleed itself automatically.

– Check the entire fuel system for leaks.

Renew the affected component if leakage occurs.

– Road-test vehicle and accelerate with full throttle at least once.

– Then check high-pressure system again for leaks.

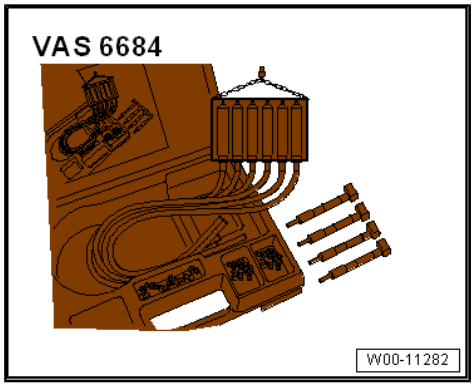
– Install engine cover panel ⇒ page 34 .

5.7 Checking return flow rate of injectors at starter cranking speed

Only perform this test if the engine does not start at all.

Special tools and workshop equipment required

- Adapter of return flow meter - VAS 6684-



Procedure

Caution

Risk of malfunctions caused by dirt.

- *Observe ⇒ "3.1 Rules for cleanliness", page 6 .*

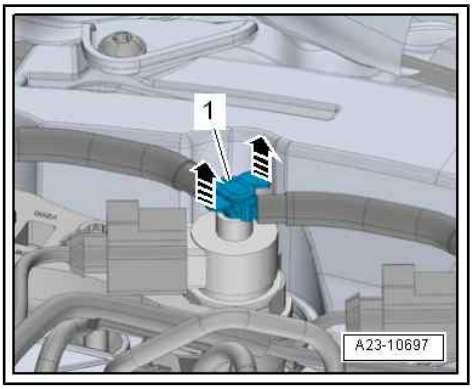
Each injector normally has a relatively low fuel return flow rate. If the return flow rate at one injector is relatively high compared to the other injectors, that injector is probably defective.

– Remove engine cover panel ⇒ page 34 .

– Clean all return line connections (e.g. with commercial cleaning solution etc.) before removing.

– Dry all components after cleaning.

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– Pull release tabs upwards -arrows- and pull return line connections -1- off injectors.
– Connect adapters of return flow meter - VAS 6684- to return line connections of all 4 injectors.
– Connect hoses of return flow meter - VAS 6684- to return line connections of all four injectors.
– Operate starter three times (wait approx. 20 seconds each time after operating starter to prevent it from overheating).
• Specification of return flow rate: 0 ml
– If fuel comes out of an injector, that injector must be renewed.

Installing fuel return lines

– Check O-ring for fuel return line connection for damage and deformation.

If O-ring is damaged or deformed, renew O-ring.

Note

Lubricate all seals with engine oil or assembly oil before installing.

– Push return line connections carefully onto injectors. The catch should engage audibly. Then press release pin down carefully.
– Erase entry in event memory using ⇒ Vehicle diagnostic tester.

Checking fuel system for leaks

– Run engine at idling speed for several minutes (do not press accelerator) and then switch off. Fuel system will bleed itself automatically.
– Check the entire fuel system for leaks.

Renew the affected component if leakage occurs.

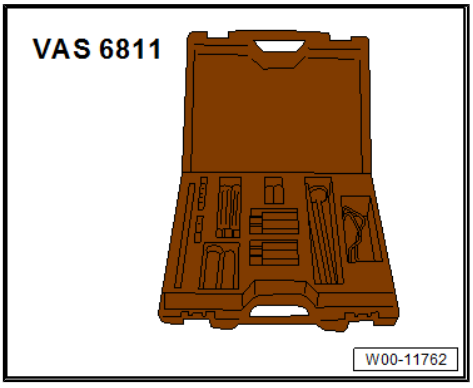
– Road-test vehicle and accelerate with full throttle at least once.
– Then check high-pressure system again for leaks.
– Install engine cover panel ⇒ page 34 .

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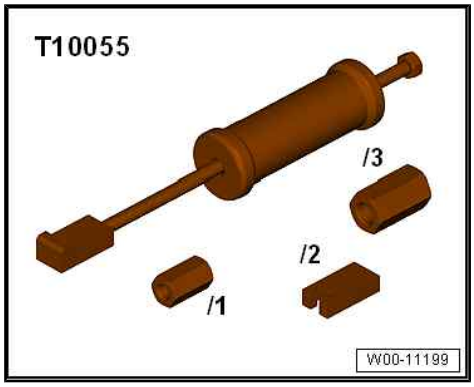
5.8 Removing and installing injectors

Special tools and workshop equipment required

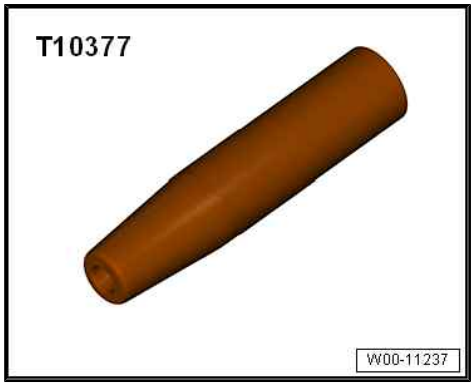
♦ Cleaning kit - VAS 6811-



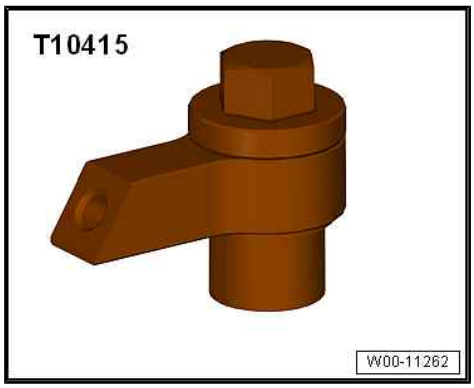
- Puller - T10055-



- Assembly sleeve - T10377-



- Puller - T10415-



Removing

– Remove engine cover panel ⇒ page 34 .

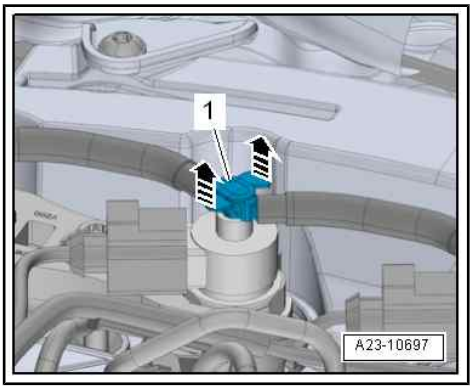
Caution

Risk of malfunctions caused by dirt.

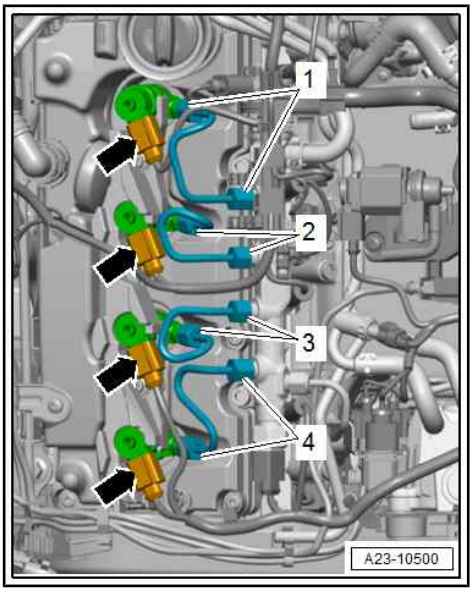
- *Observe ⇒ "3.1 Rules for cleanliness", page 6 .*

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– Pull release tabs upwards -arrows- and pull return line connections -1- off injectors.



– Unplug electrical connectors -arrows- at injectors.



WARNING

The fuel system is pressurised.

Risk of injury as fuel may spray out.

- *Put on safety goggles.*
- *Put on protective gloves.*
- *Release pressure (wrap a clean cloth around connection and open connection carefully).*

– Unscrew union nut on corresponding high-pressure pipe (-1 to 4-) and detach corresponding high-pressure pipe.

– Seal off open lines and connections with clean plugs.

– Move electrical wiring harness clear and detach noise insulation.

Note

Each clamping piece always secures two injectors and can only be taken out if both injectors are removed.

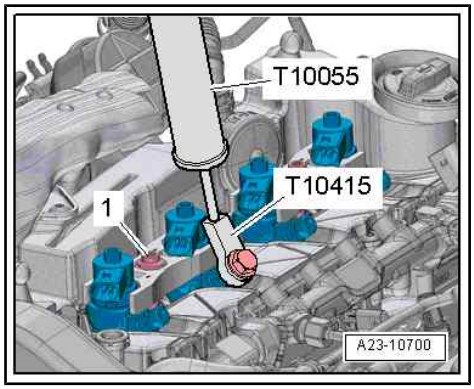
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– Unscrew bolt -1- and detach clamping piece.

• Sequence for removing injectors: First remove injector for cylinder 2, then for cylinder 1/cylinder 4, and then for cylinder 3.

– Apply puller - T10055- with puller - T10415- as shown in illustration, and pull out injectors upwards.

– Detach clamping piece before taking injector out.



Note

To avoid damaging the sealing lip, rotate the injector while pulling it out.

– Place removed injectors on a clean cloth.

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Installing

Installing new injectors

When installing new injectors, the following components must be renewed:

♦ Bolt for clamping piece

♦ O-ring for injector bore

♦ O-ring for fuel return line connection

– Observe all instructions for installing high-pressure pipes ⇒ page 281 .

Installing used injectors

When re-installing used injectors, the following components must be renewed:

♦ Bolt for clamping piece

♦ Copper seal

♦ O-ring for injector bore

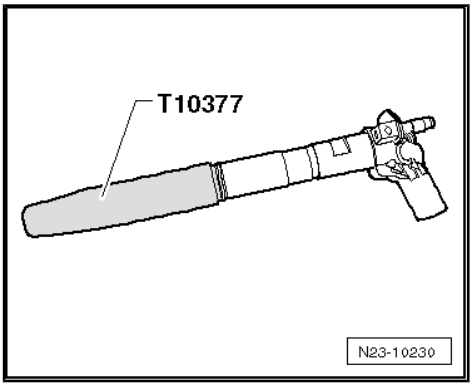
♦ O-ring for fuel return line connection

– Spray tip of injector nozzle with rust-releasing spray. Wait approx. 5 minutes and wipe off soot particles and oil with a cloth.

– To remove the old copper seal from the injector, clamp the seal carefully in a vice so that it is just held between the jaws without turning. Then carefully pull and twist the injector out of the copper seal by hand.

– Clean off deposits under the copper seal using a suitable scraper.

– Renew seal for injector using assembly sleeve - T10377- .



Continued (same procedure for used and new injectors):

Note

Lubricate all O-rings with assembly oil, engine oil or diesel fuel before installing.

Caution

Risk of damage to injector sealing surface.

- ***To remove carbon deposits from the injector sealing surface, clean the injector bore in the cylinder head with cleaning kit - VAS 6811- .***

– Install injectors after cleaning seat in cylinder head.

– Push the return line connections carefully over the new seals and onto the injectors. The catch should engage audibly. Then press release pin down carefully.

– Tighten union nuts on high-pressure pipes hand-tight initially. Make sure that connections are not under tension.

– When one or more injectors have been renewed, the adaption of the correction values for the new injectors must be written into the engine control unit ⇒ page 269 .

– Install engine cover panel ⇒ page 34 .

– Check fuel system for leaks ⇒ page 250 .

Tightening torques

- ⇒ “5.1 Exploded view - injectors”, page 265

5.9 Removing and installing high-pressure pipes

⇒ “5.9.1 Removing high-pressure pipe between high-pressure reservoir (rail) and high-pressure pump”, page 281

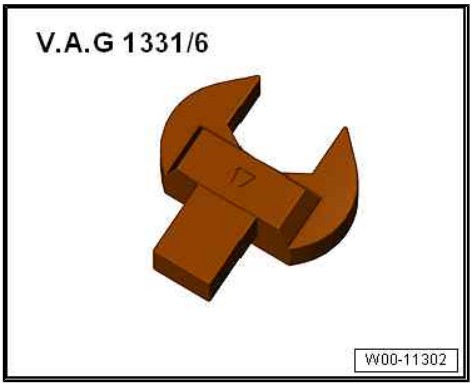
⇒ “5.9.2 Installing high-pressure pipe”, page 282

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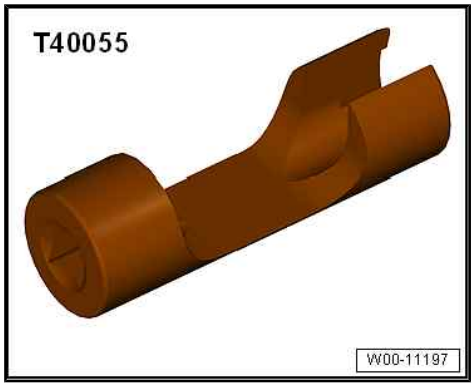
5.9.1 Removing high-pressure pipe between high-pressure reservoir (rail) and high-pressure pump

Special tools and workshop equipment required

- Open end spanner insert, AF 17 - V.A.G 1331/6-



- Socket - T40055-

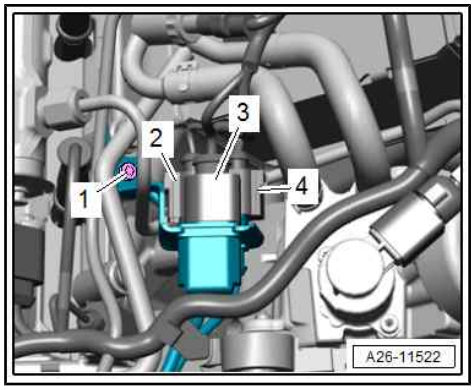


Removing

– Remove engine cover panel ⇒ page 34 .

– Detach electrical connectors -2, 3, 4- from bracket and unplug connectors.

– Remove bolt -1- and detach bracket.



Caution

Risk of malfunctions caused by dirt.

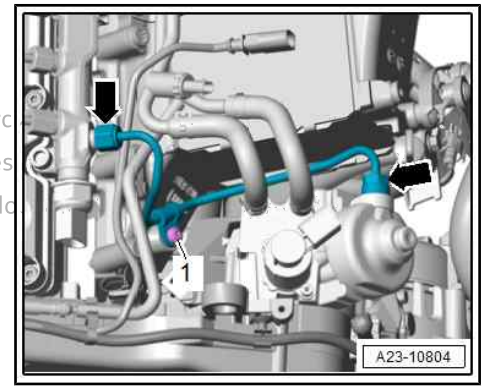
- *Observe ⇒ "3.1 Rules for cleanliness", page 6 .*

– Use vacuum cleaner to remove dirt from taper seat at high-pressure reservoir.

– Clean fuel pipe and end of pipe using cleaning solution and dry with compressed air.

– Remove bolt -1-.

– Unscrew union nuts -arrows- and detach high-pressure pipe.

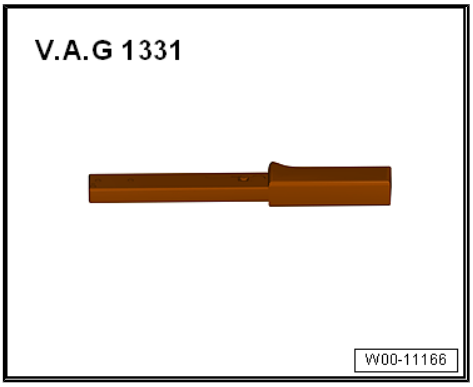


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5.9.2 Installing high-pressure pipe

Special tools and workshop equipment required

- Torque wrench - V.A.G 1331-

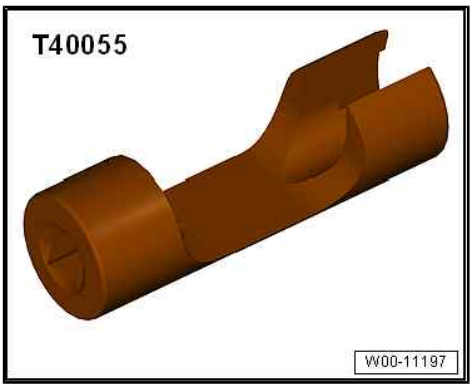


- Open end spanner insert, AF 17 - V.A.G 1331/6-

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- Socket - T40055-



Installing

Note

- *Note identification marks for cylinder allocation when re-installing high-pressure pipes.*
- *The high-pressure pipes can be re-used after performing the following checks:*
- *Check taper seats of high-pressure pipes for deformation and cracks.*
- *The bore of the pipe must not be distorted, restricted or otherwise damaged.*
- *Corroded pipes must not be used again.*

Caution

Risk of malfunctions caused by dirt.

- *Observe ⇒ "3.1 Rules for cleanliness", page 6 .*

Risk of high-pressure pipe breaking if it is under tension.

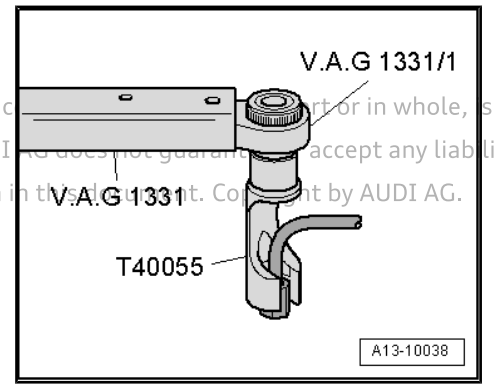
- *If necessary, the high-pressure reservoir can be slackened and moved slightly so that the injector pipes are not installed under tension. Never bend the pipes or subject them to tension.*

– Use vacuum cleaner to remove dirt from taper seat at high-pressure reservoir.

– Lubricate threads of union nuts with clean engine oil.

– Hand-tighten union nuts on high-pressure pipes (ensure that pipes are not under tension).

– To tighten unions of high-pressure pipes at high-pressure reservoir and injectors, use torque wrench - V.A.G 1331- with open end spanner insert, AF 17 - V.A.G 1331/6- or socket - T40055- .



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– Check fuel system for leaks ⇒ page 250 .

– Install engine cover panel ⇒ page 34 .

Tightening torques

- ⇒ "5.1 Exploded view - injectors", page 265
- ⇒ "5.2 Exploded view - high-pressure reservoir (rail)", page 268

5.10 Removing and installing high-pressure reservoir (rail)

Removing

Caution

Risk of malfunctions caused by dirt.

- *Observe ⇒ "3.1 Rules for cleanliness", page 6 .*

– Remove high-pressure pipe between high-pressure reservoir (rail) and high-pressure pump ⇒ page 281 .

– Unplug electrical connectors and move clear:

1 - For air mass meter - G70-

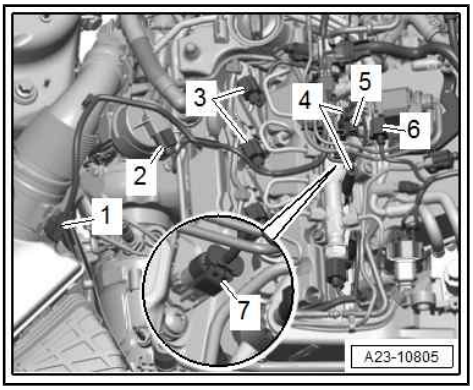
2 - For turbocharger

3 - For injectors for cylinders 3, 4

4 - For glow plugs for cylinders 2, 3

5 - For charge air temperature sender after charge air cooler - G811-

7 - For Hall sender - G40-



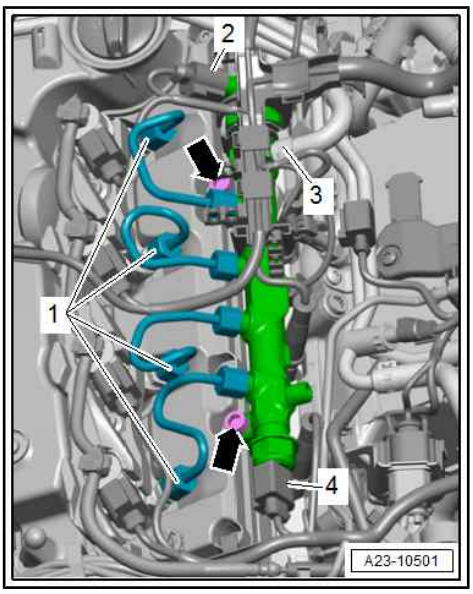
– Unplug electrical connector -6-, take charge pressure control solenoid valve - N75- out of bracket and place to one side.

– Detach bracket for electrical wiring harness from high-pressure reservoir (rail) and place to one side.

– Unplug electrical connectors:

2 - For fuel pressure regulating valve - N276-

4 - For fuel pressure sender - G247-



– Release hose clip -3- and detach fuel return hose.

– Remove union nuts -1- for high-pressure pipes.

– Remove bolts -arrows- and detach high-pressure reservoir.

Installing

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

– Observe all instructions for installing high-pressure pipes ⇒ page 281 .

Tightening torques

- ⇒ “5.1 Exploded view - injectors”, page 265
- ⇒ “5.2 Exploded view - high-pressure reservoir (rail)”, page 268

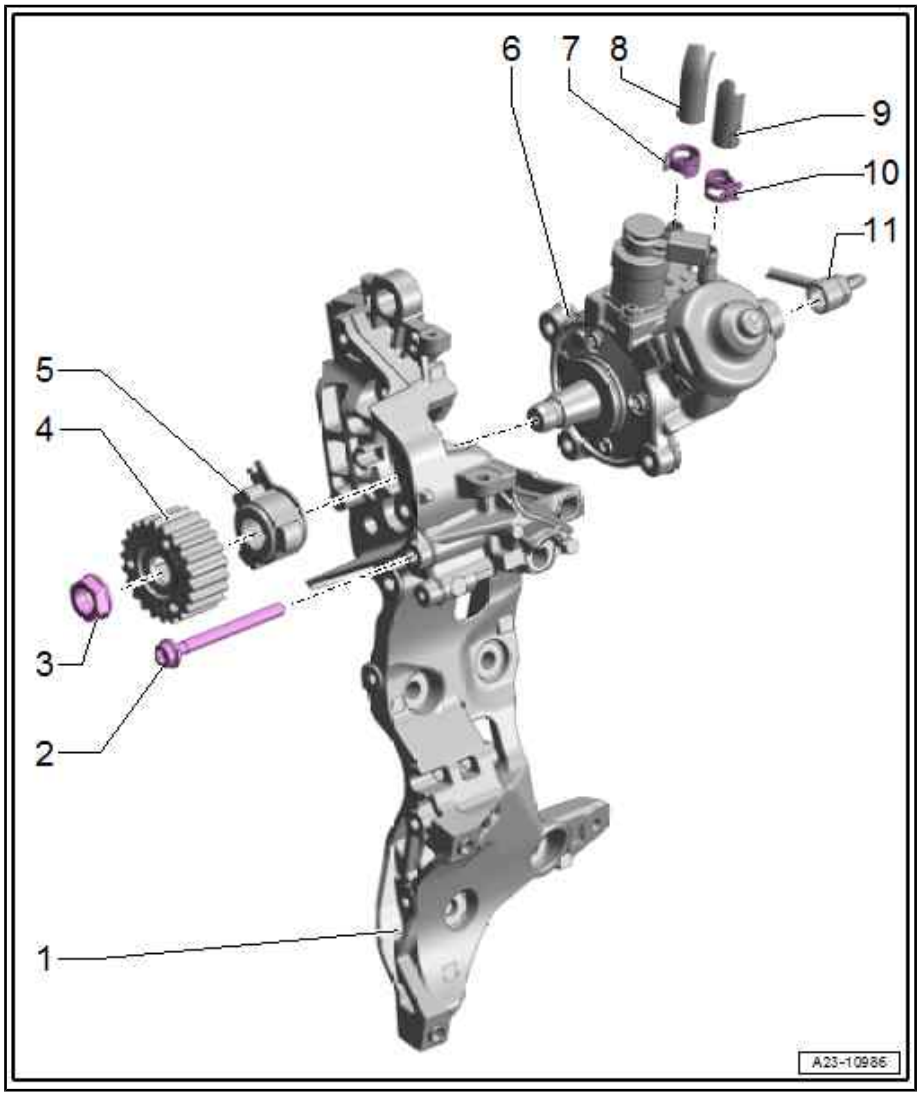
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6 High-pressure pump

⇒ "6.1 Exploded view - high-pressure pump", page 286

⇒ "6.2 Removing and installing high-pressure pump", page 287

6.1 Exploded view - high-pressure pump



1 - Bracket for ancillaries

- ❑ Removing and installing ⇒ page 42

2 - Bolt

- ❑ 3x
- ❑ Renew after removing
- ❑ Different lengths
- ❑ Different tightening torques:

- ◆ Short bolt, 20 Nm + 45°
- ◆ Long bolt, 20 Nm + 180°

3 - Nut

- ❑ Use counterhold tool - T10051- when loosening and tightening
- ❑ 95 Nm

4 - High-pressure pump sprocket

5 - Hub

- ❑ To remove, use puller - T10489-

6 - High-pressure pump

- ❑ With fuel metering valve - N290- (do not open)
- ❑ Removing and installing ⇒ page 287

Caution

Running when dry causes irreparable damage to high-pressure pump.
If the high-pressure pump is removed or renewed, it is important to fill and bleed the fuel system before the engine is started for the first time ⇒ page 249 .

- ❑ Reset learnt values after renewing ⇒ Vehicle diagnostic tester, `Guided Functions`, `01 - Reset learnt values`

7 - Spring-type clip

- ❑ Renew after removing

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8 - Fuel supply hose

9 - Fuel return hose

10 - Spring-type clip

- ❑ Renew after removing

11 - High-pressure pipe

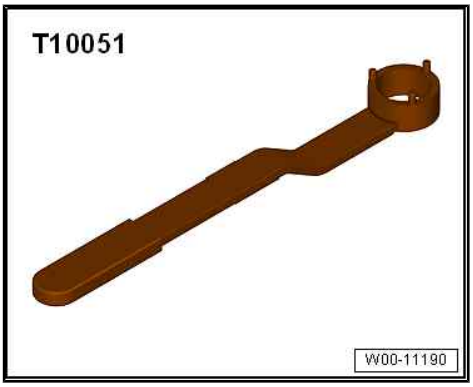
- ❑ Between high-pressure pump and high-pressure reservoir (rail)
- ❑ Do not alter shape
- ❑ Check for damage before re-installing
- ❑ Lubricate threads of union nuts with clean engine oil
- ❑ If the high-pressure pump is renewed, the corresponding high-pressure pipe must also be renewed
- ❑ Tightening torques:

- ♦ 28 Nm if re-installing high-pressure pipe
- ♦ 15 Nm +60° if installing a new high-pressure pipe

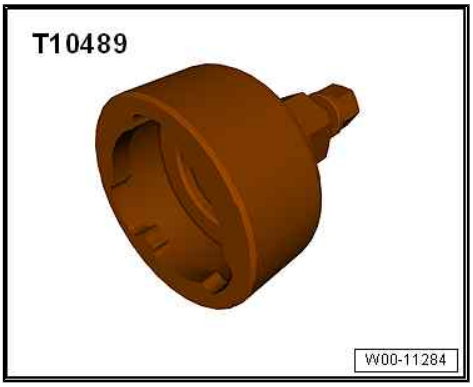
6.2 Removing and installing high-pressure pump

Special tools and workshop equipment required

- ♦ Counterhold tool - T10051-



- ♦ Puller - T10489-



♦ Locking pin - T10492-



Removing

– Detach toothed belt from camshaft ⇒ page 71 .

– Remove high-pressure pipe between high-pressure reservoir (rail) and high-pressure pump ⇒ page 281 .

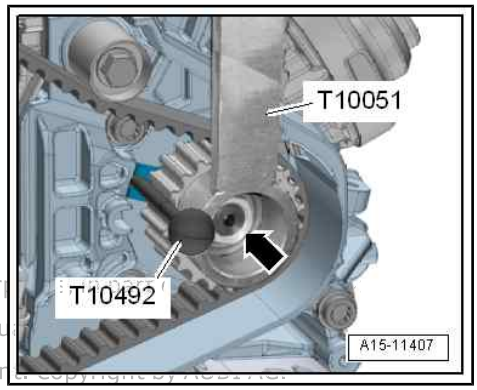
– Apply counterhold tool - T10051- to high-pressure pump sprocket.

– Hand-tighten nut -arrow-.

– Detach locking pin - T10492- and slowly turn high-pressure pump shaft to a position in which it is not under tension.

– Remove nut -arrow- and detach counterhold tool - T10051- .

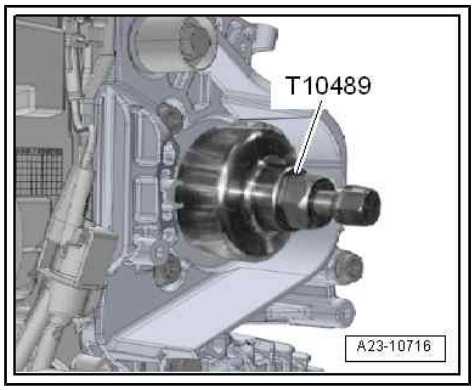
– Detach high-pressure pump sprocket.



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– Engage puller - T10489- at hub of high-pressure pump by turning it clockwise.

– Detach hub of high-pressure pump.

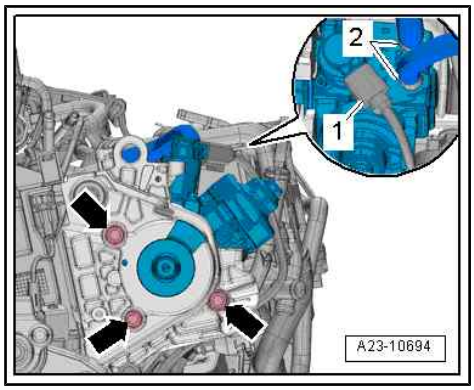


– Detach fuel return hoses -2-.

– Unplug electrical connector -1-.

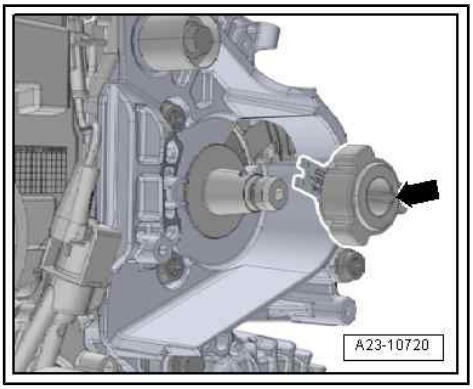
– Remove bolts -arrows-.

– Carefully take out high-pressure pump.



Installing

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



Note

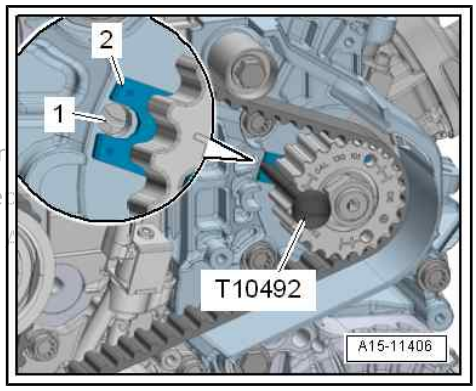
- ♦ *After removing, renew bolts tightened with specified tightening angle.*
- ♦ *Renew spring-type clips after removing.*

– Apply hub -arrow- to high-pressure pump shaft.

• The parallel key on the high-pressure pump shaft must engage in the groove in the hub.

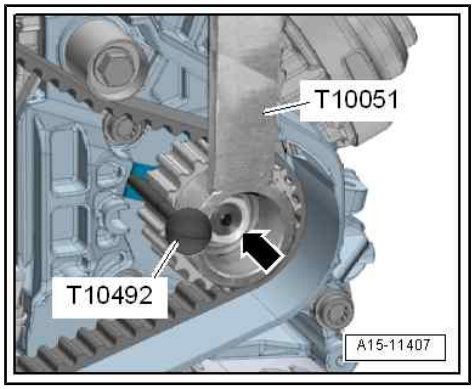
– Place high-pressure pump sprocket on hub.

• Contact surface between counterhold tool and toothed belt sprocket must be free of oil.



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– Screw nut -arrow- onto thread of high-pressure pump shaft.
– Apply counterhold tool to toothed belt sprocket and hand-tighten nut -arrow-.
– Turn high-pressure pump sprocket with counterhold tool - T10051- until it can be locked in position with locking pin - T10492- .
– To do so, insert locking pin - T10492- into fork -2- on hub and into hole -1- behind it in bracket for ancillaries.
– Loosen nut -arrow- again.
• The high-pressure pump sprocket should still just turn, but there must be no axial movement.
– Install toothed belt (adjust valve timing) ⇒ page 86 .
– Install high-pressure pipe ⇒ page 281 .



Caution

Running when dry causes irreparable damage to high-pressure pump.

- ***If the high-pressure pump has been removed or renewed, it is important to fill and bleed the fuel system before the engine is started for the first time ⇒ page 249 .***

– Check fuel system for leaks ⇒ page 250 .
– Learnt values must be reset on engine control unit after renewing high-pressure pump.
– 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 - Reset learnt values`

Tightening torques

- ⇒ “6.1 Exploded view - high-pressure pump”, page 286

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7 Senders and sensors

⇒ “7.1 Removing and installing fuel temperature sender G81 ”, page 291

⇒ “7.2 Removing and installing air mass meter G70 ”, page 291

⇒ “7.3 Checking fuel pressure regulating valve N276 ”, page 292

⇒ “7.4 Removing and installing fuel pressure regulating valve N276 ”, page 294

⇒ “7.5 Removing and installing fuel pressure sender G247 ”, page 299

⇒ “7.6 Removing and installing exhaust gas pressure sensor 1 G450 ”, page 302

⇒ “7.7 Removing and installing pressure differential sender G505 ”, page 304

⇒ “7.8 Removing and installing NOx sender G295 ”, page 305

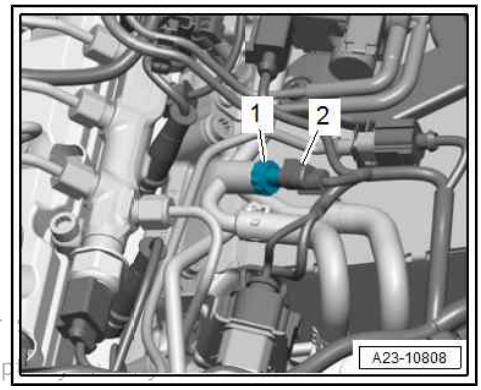
7.1 Removing and installing fuel temperature sender - G81-

Removing

– Remove engine cover panel ⇒ page 34 .

– Unplug electrical connector -2-.

– Unscrew fuel temperature sender - G81- -1-.



Installing

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

Note

Renew O-ring after removal.

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– Check fuel system for leaks ⇒ page 250 .

– Install engine cover panel ⇒ page 34 .

Tightening torques

◆ ⇒ “5.2 Exploded view - high-pressure reservoir (rail)”, page 268

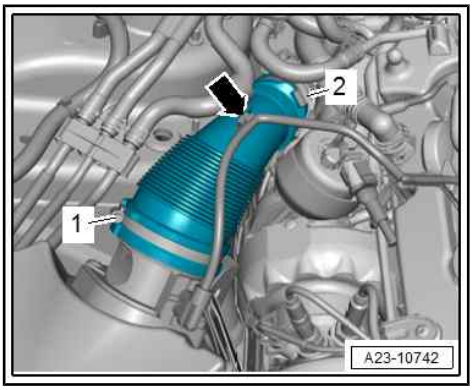
7.2 Removing and installing air mass meter - G70-

Removing

– Remove engine cover panel ⇒ page 34 .

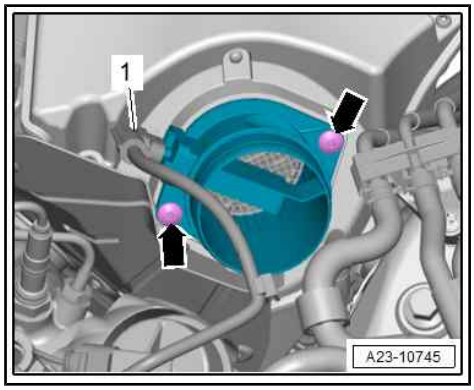
– Unclip vacuum line from air hose.

– Release hose clips -1, 2- and detach air hose.



– Unplug electrical connector -1-.

– Unscrew bolts -arrows- and detach air mass meter - G70- .



Installing

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

Note

- *If the air filter element is very dirty or wet, dirt particles or water can reach the air mass meter and falsify the detected air mass values. This will cause a loss of power as the calculated injection quantities will be too low.*
- *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- *Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .*

– Check air filter element and inside of air cleaner housing for dirt and clean if necessary.

- A5 Coupé ⇒ Maintenance ; Booklet 811
- A4 ⇒ Maintenance ; Booklet 812
- A5 Cabriolet ⇒ Maintenance ; Booklet 818
- Q5 ⇒ Maintenance ; Booklet 817

– Install engine cover panel ⇒ page 34 .

Tightening torques

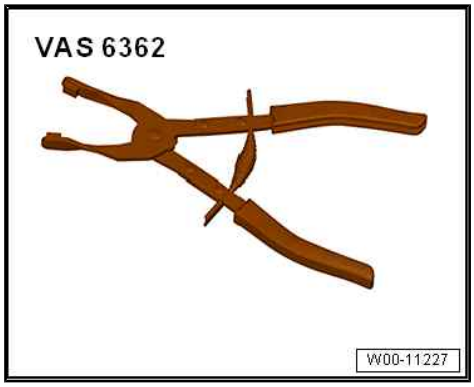
- ⇒ “3.1 Exploded view - air cleaner housing”, page 253
- ⇒ Fig. ““Installing air ducts with hose clips”“ , page 254

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7.3 Checking fuel pressure regulating valve - N276-

Special tools and workshop equipment required

- Hose clip pliers - VAS 6362-



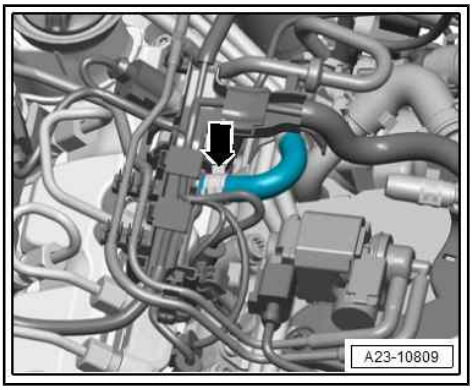
- Fuel-resistant measuring container

Procedure

– Remove engine cover panel ⇒ page 34 .

– Release hose clip -arrow- and detach fuel return hose from high-pressure reservoir.

– Seal off open return line connection with a plug.



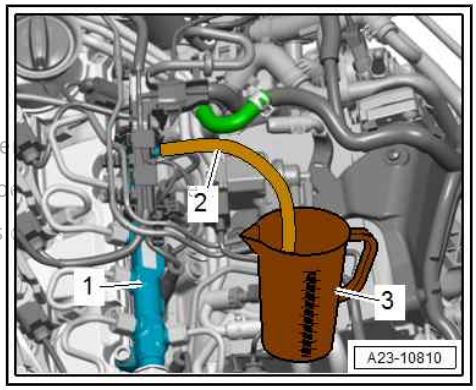
Caution

- *The fuel system is under increased pressure during the testing procedure.*

Risk of malfunctions caused by dirt.

- *Observe ⇒ "3.1 Rules for cleanliness", page 6 .*

– Connect test hose -2- to return line connection of high-pressure reservoir -1- and place end of hose in a measuring container -3-.



1) Checking while engine is running

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– Start the engine and run at idling speed.

- Specification: more than 75 ml in 30 seconds

If specification is not obtained, fuel pressure regulating valve - N276- is defective.

2) Checking while engine is running

If condition for 1) is met, restart engine and increase engine speed to ≥ 2000 rpm.

- Fuel is still discharged in the first few seconds after the engine is started
- Specification after a few seconds: return flow rate = 0 ml
- Drip leaks are permissible

If specification is not obtained, fuel pressure regulating valve - N276- is defective.

3) If engine can no longer be started

Perform check at cranking speed.

- Specification of return flow rate: 0 ml
- Drip leaks are permissible
- If specification is not obtained, fuel pressure regulating valve - N 276- is defective.

Attaching

Assembly is performed in reverse sequence; note the following:

Note

Renew spring-type clips after removing.

– Install engine cover panel ⇒ page 34 .

7.4 Removing and installing fuel pressure regulating valve - N276-

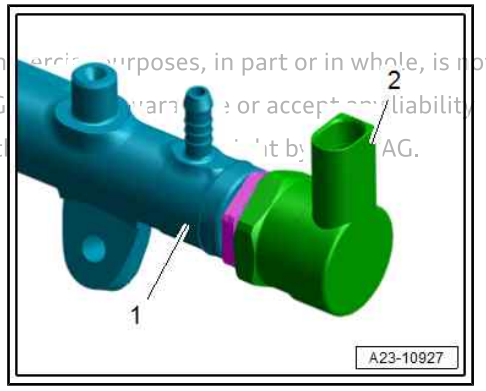
Different versions of the fuel pressure regulating valve are fitted.

– Before removing and installing, check which version is fitted.

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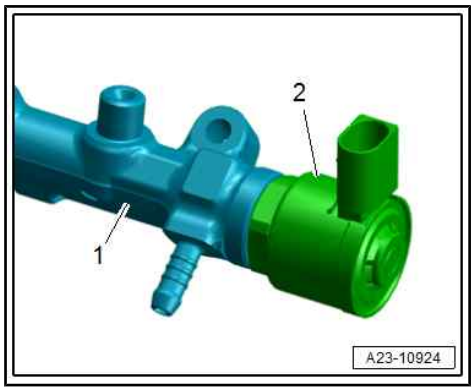
Version 1

– Removing and installing (version 1)
⇒ “7.4.1 Removing and installing fuel pressure regulating valve N276 - version 1”, page 294



Version 2

– Removing and installing (version 2)
⇒ “7.4.2 Removing and installing fuel pressure regulating valve N276 - version 2”, page 297



7.4.1 Removing and installing fuel pressure regulating valve - N276- - version 1

Special tools and workshop equipment required

♦ Open-end spanner insert, 30 mm - T10553-



♦ Torque wrench - V.A.G 1332-



Removing

– Remove engine cover panel ⇒ page 34 .

– Move clear fuel return hose -1-.

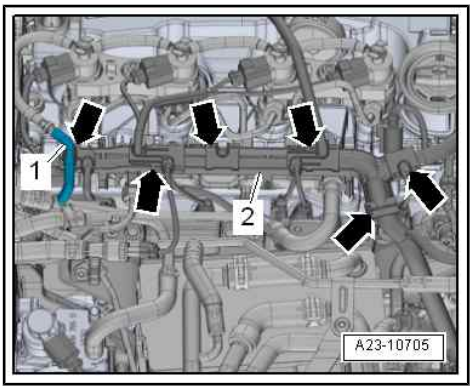
– Open retaining clips -arrows-, and unclip and detach wiring duct -2-.

– Before removal, clean area around thread for fuel pressure regulating valve - N276- using e.g. commercial cleaning solution.

• Make sure no dirt gets into opening in high-pressure reservoir.

• Clean carefully; cleaning solution must not enter the electrical connector.

– Dry off fuel pressure regulating valve - N276- .



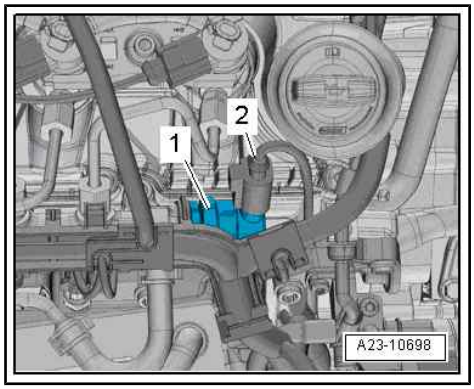
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– Unplug electrical connector -2-.

– Loosen union nut -1- using open-end spanner insert, 30 mm - T10553- (at the same time, counterhold at hexagon flats on housing). Then unscrew and remove by hand.

– Extract dirt from opening in high-pressure reservoir (thread and sealing surface) using a vacuum cleaner. Do not use metal tools, etc.

– Seal off open connection in high-pressure reservoir with clean plug.



Installing

• Fuel pressure regulating valve - N276- must always be renewed after it has been removed.

– Also check sealing surface at opening in high-pressure reservoir for damage.

– The beginning of the thread and the deformable sealing lip of the fuel pressure regulating valve - N276- must be coated with diesel fuel.

– Screw on union nut by hand.

– Align new regulating valve so that connecting wire is free of tension after connector is attached.

– Hold regulating valve in this position by counterholding hexagon flats on housing of regulating valve with open-end spanner or pliers (water pump pliers or similar).

– Tighten union nut using open-end spanner insert, 30 mm - T10553- (at the same time, counterhold at hexagon flats on housing).

Tightening torques

♦ ⇒ “5.2 Exploded view - high-pressure reservoir (rail)”, page 268

– Learnt values must be reset in engine control unit after renewing fuel pressure regulating valve - N276- .

– 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 - Reset learnt values`

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After installing fuel pressure regulating valve - N276- , leave engine running at moderate speed for a few minutes to bleed fuel system and then switch off again.

Note

♦ The fuel system is “self-bleeding”; do NOT open the high-pressure connections.

– Interrogate event memory.

– Switch off ignition.

– Carefully check the entire fuel system for leaks.

Renew affected component if leakage still occurs after tightening to correct torque.

– Road-test vehicle and accelerate with full throttle at least once.
– Then check high-pressure system again for leaks.
– After road test, interrogate event memory again.
– Install engine cover panel ⇒ page 34 .

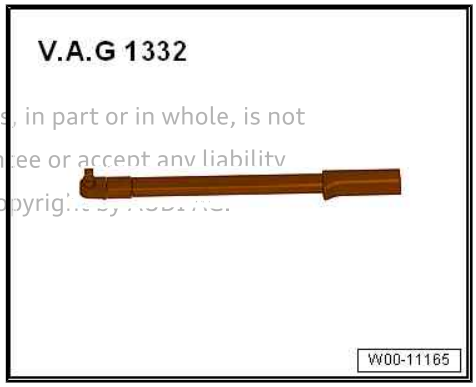
7.4.2 Removing and installing fuel pressure regulating valve - N276- - version 2

Special tools and workshop equipment required

♦ Open-end spanner insert, 30 mm - T10553-



♦ Torque wrench - V.A.G 1332-



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Removing

– Remove engine cover panel ⇒ page 34 .
– Remove high-pressure reservoir (rail) ⇒ page 284 .
– Before removal, clean area around thread for fuel pressure regulating valve - N276- using e.g. commercial cleaning solution.
• Make sure no dirt gets into opening in high-pressure reservoir.
• Clean carefully; cleaning solution must not enter the electrical connector.
– Dry off fuel pressure regulating valve - N276- .

Note

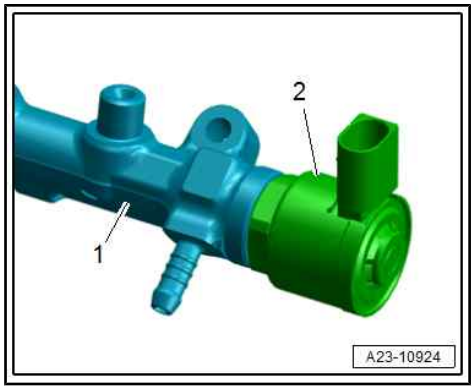
The high-pressure reservoir can be clamped in a vice in order to remove the pressure regulating valve; however, it is essential that protective jaw covers are used. Do NOT take up the weight of the high-pressure reservoir by the threaded connections for the high-pressure pipes or the retaining tabs for the cylinder head.

– Mark installation position of connector of fuel pressure regulating valve - N276- relative to high-pressure reservoir.

– Unscrew fuel pressure regulating valve - N276- -item 2- from high-pressure reservoir -1- using insert tool (30 mm) - T10553- .

– Extract dirt from opening in high-pressure reservoir (thread and sealing surface) using a vacuum cleaner. Do not use metal tools, etc.

– Seal off open connection in high-pressure reservoir with clean plug.

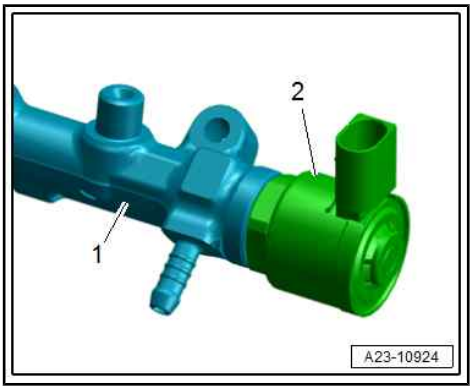


Installing

- Renew fuel pressure regulating valve - N276- after removing.
- Check sealing surface at opening in high-pressure reservoir.
- Check that the deformable sealing lip and the thread on the new regulating valve are not damaged.
- Coat beginning of thread, deformable sealing lip and O-ring of regulating valve lightly with diesel fuel.

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– Tighten fuel pressure regulating valve - N276- -item 2- using insert tool (30 mm) - T10553- .
– Turn valve body to align connector of fuel pressure regulating valve - N276- with high-pressure reservoir according to mark made previously.
– Install high-pressure reservoir (rail) ⇒ page 284 .
– If necessary, turn valve body to align regulating valve so that connecting wire is free of tension after connector is attached.



Tightening torques

♦ ⇒ “5.2 Exploded view - high-pressure reservoir (rail)”, page 268

– Learnt values must be reset in engine control unit after renewing fuel pressure regulating valve - N276- .
– 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 - Reset learnt values`

After installing fuel pressure regulating valve - N276- , leave engine running at moderate speed for a few minutes to bleed fuel system and then switch off again.

Note

♦ The fuel system is “self-bleeding”; do NOT open the high-pressure connections.

– Interrogate event memory.
– Switch off ignition.
– Carefully check the entire fuel system for leaks.

Renew affected component if leakage still occurs after tightening to correct torque.

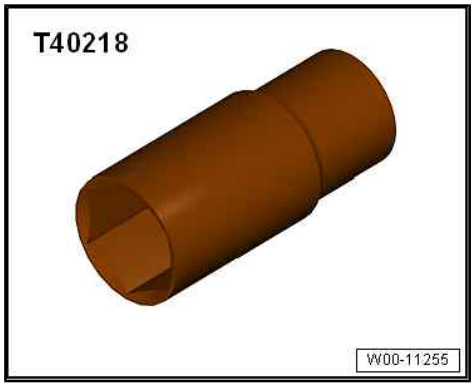
– Road-test vehicle and accelerate with full throttle at least once.
– Then check high-pressure system again for leaks.
– After road test, interrogate event memory again.
– Install engine cover panel ⇒ page 34

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7.5 Removing and installing fuel pressure sender - G247-

Special tools and workshop equipment required

- Socket, 27 mm - T40218-



Note

- *The fuel pressure sender - G247- continuously measures the fuel pressure in the high-pressure system. It transmits a corresponding voltage signal to the engine control unit - J623- .*
- *Should the fuel pressure sender fail, the engine control unit will control the fuel pressure via a mapped open-loop backup function. Maximum engine speed in this mode is restricted.*
- *The fuel pressure sender - G247- does not have a seal; instead, it has a deformable sealing lip.*

Removing

– Remove engine cover panel ⇒ page 34 .

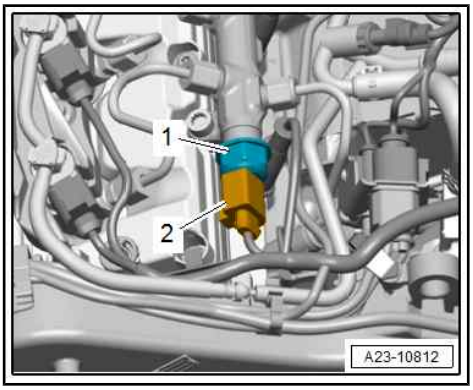
– Before removal, clean area around thread for fuel pressure sender - G247- using e.g. commercial cleaning solution.

- Make sure no dirt gets into opening in high-pressure reservoir.
- Clean carefully; cleaning solution must not enter the electrical connector.

– Dry off fuel pressure sender - G247- .

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– Unplug electrical connector -2-.
– Unscrew fuel pressure sender - G247- -item 1- using socket, 27 mm - T40218- .



Note

Do not use an open-end spanner for loosening or tightening.

– Extract dirt from opening in high-pressure reservoir (thread and sealing surface) using a vacuum cleaner. Do not use metal tools, etc.
– Seal off opening in high-pressure reservoir with a plug.

Installing

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

Note

- *If the deformable sealing lip and the thread of the fuel pressure sender - G247- are not damaged, the sender can be re-used once.*
- *Also check sealing surface at opening in high-pressure reservoir.*
- *The beginning of the thread and the deformable sealing lip of the fuel pressure sender - G247- must be coated with diesel fuel.*

– Screw in fuel pressure sender - G247- by hand.
– Then tighten fuel pressure sender - G247- to specified torque.

Tightening torques

- ⇒ “5.2 Exploded view - high-pressure reservoir (rail)”, page 268

After installing fuel pressure sender - G247- , leave engine running at moderate speed for a few minutes when bleeding fuel system and then switch off again.

Note

The fuel system is “self-bleeding”; do NOT open the high-pressure connections.

– Switch off ignition.
– Carefully check the entire fuel system for leaks.

Renew affected component if leakage still occurs after tightening to correct torque.

– Road-test vehicle and accelerate with full throttle at least once.
– Then check high-pressure system again for leaks.

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Note

If there is any air left in the fuel system, the engine may switch to the backup mode ('emergency running' mode) during the road test. Switch off the engine and erase the event memory. Then continue the road test.

– After road test, interrogate event memory again.

– Install engine cover panel ⇒ page 34 .

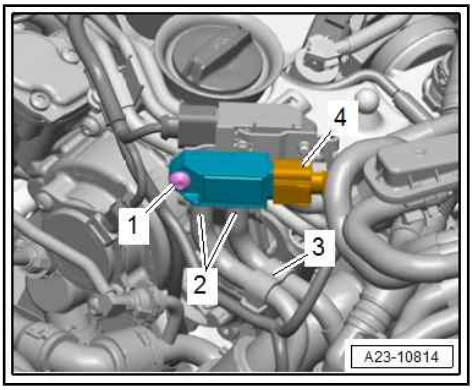
7.6 Removing and installing exhaust gas pressure sensor 1 - G450-

Removing

– Remove engine cover panel ⇒ page 34 .

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– Unplug electrical connector -4-.
– Remove bolt -1- and detach exhaust gas pressure sensor 1 - G450- from bracket.
– Before disconnecting hoses from exhaust gas pressure sender 1 - G450- , spray hoses with suitable release agent.
– Release hose clips -2-.



Caution

Risk of irreparable damage to pressure sensor if the connection breaks off.

- ***Carefully disconnect hose from connection, taking care to keep hose straight.***

– Disconnect hoses.

Installing

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

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Note

- *Before installing, blow out control lines from exhaust gas pressure sensor 1 - G450- to emission control module towards emission control module with compressed air (pipes can become obstructed or may ice up due to condensation).*
- *Make sure that hose is securely fitted and that there are no leaks.*
- *Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .*

– Install engine cover panel ⇒ page 34 .
– Learnt values must be adapted on engine control unit after renewing exhaust gas pressure sensor 1 - G450- .
– 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 - Reset learnt values`

Tightening torques

- ⇒ “8.1 Exploded view - Lambda probe”, page 307
- ⇒ “2.1 Exploded view - emission control system”, page 332

7.7 Removing and installing pressure differential sender - G505-

Note

The pressure differential sender - G505- detects the amount of deposits in the particulate filter.

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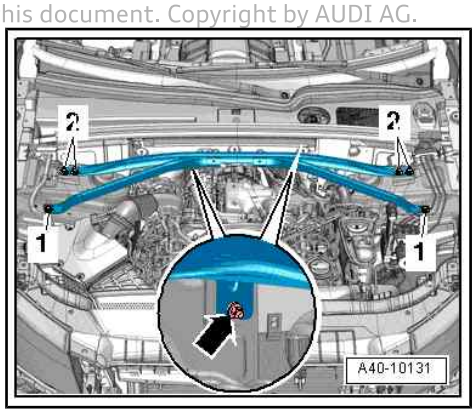
Removing

– Remove engine cover panel ⇒ page 34 .

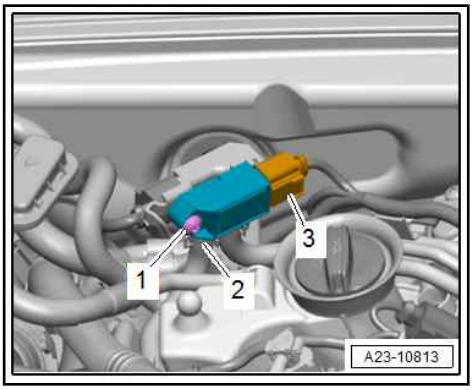
Q5 only:

– Remove body brace ⇒ Running gear, axles, steering; Rep. gr. 40 ; Suspension strut, upper links; Removing and installing body brace .

All vehicles:



– Unplug electrical connector -3-.
– Remove bolt -1- and detach pressure differential sender - G505- from bracket.
– Before disconnecting hose from pressure differential sender - G505- , spray hose with suitable release agent.
– Release hose clip -2- and disconnect hose.



Caution

Irreparable damage to pressure differential sender can be caused if the connection breaks off.

- ***Carefully disconnect hose from connection, taking care to keep hose straight.***

Installing

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

Note

- *Before installing, blow out control pipes from pressure differential sender - G505- to particulate filter towards particulate filter with compressed air (pipes can become obstructed or may ice up due to condensation).*
- *Make sure that hose is securely fitted and that there are no leaks.*
- *Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .*

– Install engine cover panel ⇒ page 34 .
– Learnt values must be reset on engine control unit after renewing pressure differential sender - G505- .
– 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 - Reset learnt values`

Tightening torques

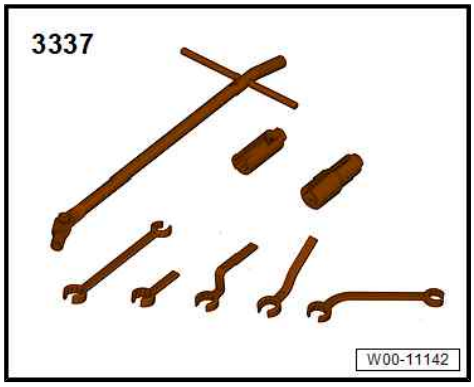
- ⇒ “8.1 Exploded view - Lambda probe”, page 307

7.8 Removing and installing NOx sender - G295-

Special tools and workshop equipment required

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♦ Lambda probe open ring spanner set - 3337-



♦ High-temperature paste ⇒ Electronic parts catalogue

Removing

WARNING

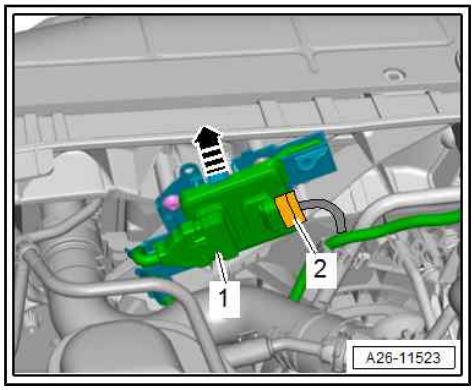
When working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system***
  ⇒ "2.6 Safety precautions when working on the exhaust system", page 5 .

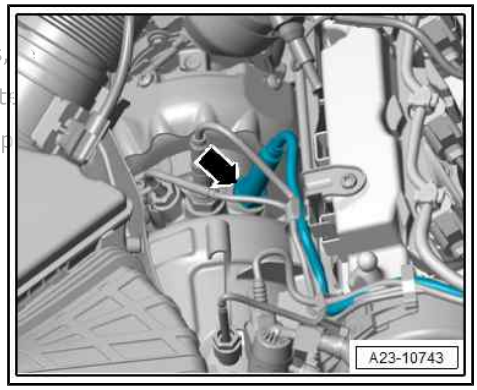
– Remove engine cover panel ⇒ page 34 .

– Unplug electrical connector -2-.

– Release fastener -arrow- and detach control unit for NOx sender - J583- -1- from bracket.



– Unscrew NOx sender - G295- -arrow- using a tool from Lambda probe open ring spanner set - 3337- and move electrical wiring clear.



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Installing

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

– Install engine cover panel ⇒ page 34 .

Tightening torques

♦ ⇒ "8.1 Exploded view - Lambda probe", page 307

8 Lambda probe

⇒ "8.1 Exploded view - Lambda probe", page 307

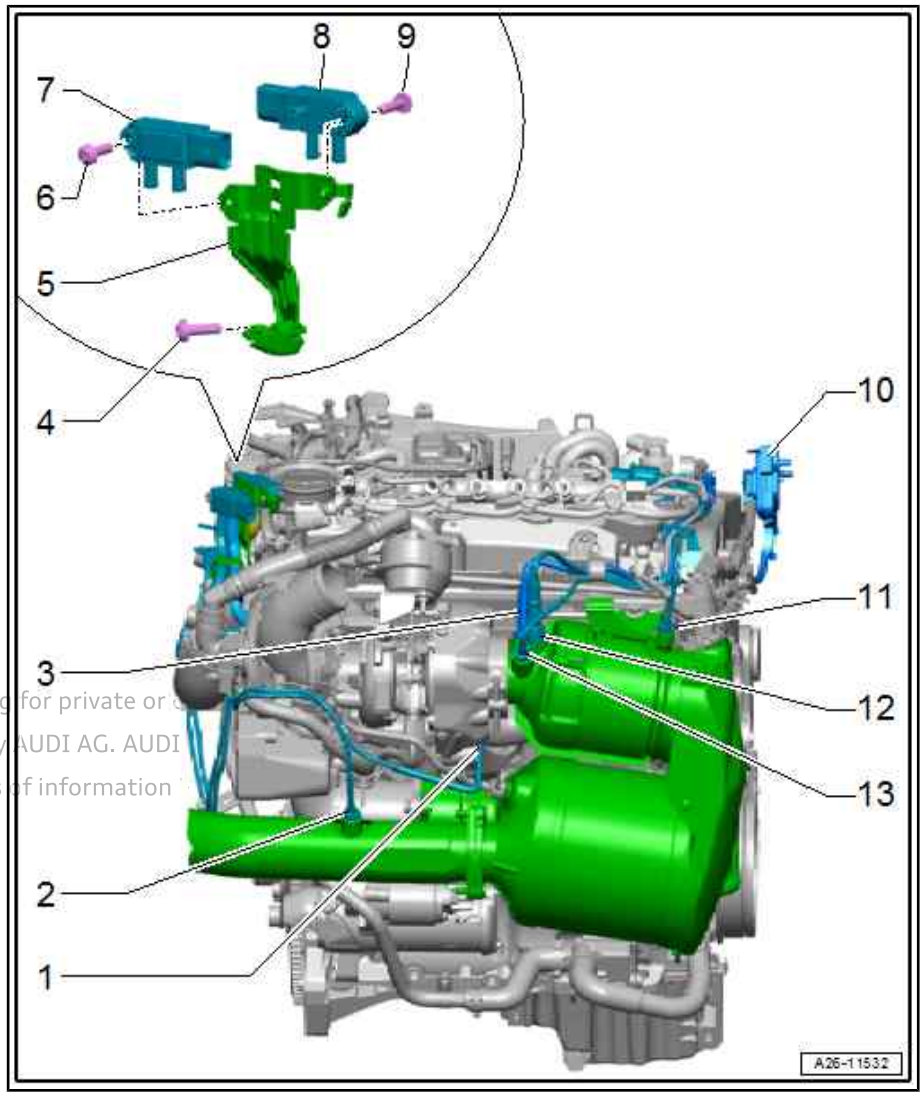
⇒ "8.2 Removing and installing Lambda probe", page 308

8.1 Exploded view - Lambda probe

WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system ⇒ "2.6 Safety precautions when working on the exhaust system", page 5 .*



1 - Exhaust gas temperature sender 1 - G235-

- ❑ Removing and installing ⇒ page 390
- ❑ 45 Nm

2 - Exhaust gas temperature sender 4 - G648-

- ❑ Removing and installing ⇒ page 395
- ❑ 60 Nm

3 - NOx sender - G295-

- ❑ Removing and installing ⇒ "7.8 Removing and installing NOx sender G295 ", page 305
- ❑ 55 Nm

4 - Bolt

- ❑ 8 Nm

5 - Bracket

- ❑ For pressure differential sender

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6 - Bolt

- ❑ 8 Nm

7 - Exhaust gas pressure sensor 1 - G450-

- ❑ Removing and installing ⇒ "7.6 Removing and installing exhaust gas pressure sensor 1 G450 ", page 302

8 - Pressure differential sender - G505-

- ❑ Removing and installing ⇒ "7.7 Removing and installing pressure differential sender G505 ", page 304

9 - Bolt

- ❑ 8 Nm

10 - Control unit for NOx sender - J583-

- ❑ Removing and installing ⇒ "7.8 Removing and installing NOx sender G295 ", page 305

11 - Exhaust gas temperature sender 3 - G495-

- ❑ Removing and installing ⇒ page 393
- ❑ 60 Nm

12 - Lambda probe - G39- with Lambda probe heater - Z19-

- ❑ Removing and installing ⇒ page 308
- ❑ Observe fitting instructions ⇒ page 309
- ❑ 55 Nm

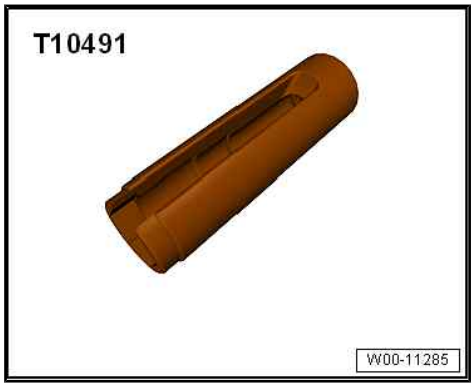
13 - Exhaust gas temperature sender 2 - G448-

- ❑ Removing and installing ⇒ page 392
- ❑ 60 Nm

8.2 Removing and installing Lambda probe

Special tools and workshop equipment required

- ♦ Socket AF 22 mm - T10491-



Removing

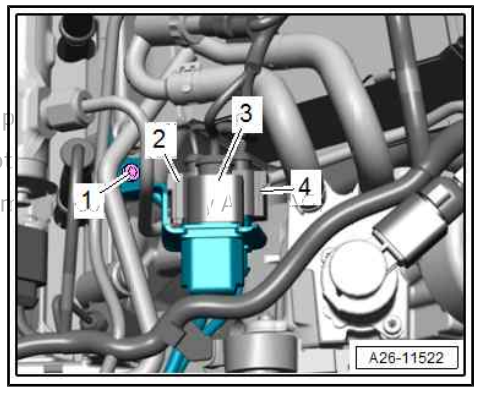
– Remove engine cover panel ⇒ page 34 .

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WARNING

When working on all parts of the exhaust system:

- ♦ ***Observe safety precautions when working on the exhaust system***
  ⇒ "2.6 Safety precautions when working on the exhaust system", page 5 .

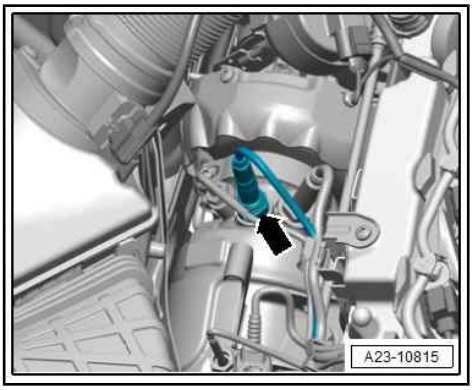


– Take electrical connector -3- for Lambda probe - G39- out of bracket, unplug and move wiring clear.

Note

Disregard -items 1, 2, 4-.

– Unscrew Lambda probe - G39- -arrow- using socket AF 22 mm - T10491- .



Installing

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

Note

- *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the Lambda probe body. For high-temperature paste refer to ⇒ Electronic parts catalogue*
- *When installing, the Lambda probe wiring must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*

– Install engine cover panel ⇒ page 34 .

Tightening torques

- ⇒ “8.1 Exploded view - Lambda probe”, page 307

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9 Engine control unit

⇒ “9.1 Removing and installing engine/motor control unit J623 ”, page 310

9.1 Removing and installing engine/motor control unit - J623-

⇒ “9.1.1 Removing and installing engine control unit J623 without protective housing”, page 310

⇒ “9.1.2 Removing and installing engine control unit J623 with protective housing”, page 313

9.1.1 Removing and installing engine control unit - J623- without protective housing

Special tools and workshop equipment required

- Vehicle diagnostic tester

Removing

– If the engine control unit - J623- is renewed, the adaption values must be read out and stored before the engine control unit - J623- is removed.

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– Connect ⇒ Vehicle diagnostic tester.
– Select `Diagnosis` mode and then `Start diagnosis`.
– Choose `Select own test` tab and select following options one after the other:

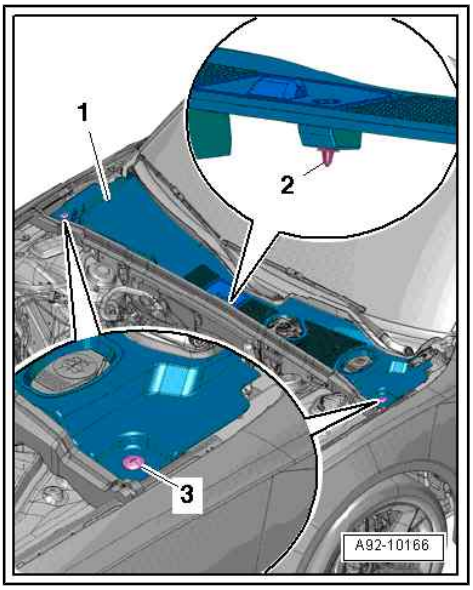
- `Drive train`
- `Select engine code and engine`
- `01 - Self-diagnosis compatible systems`
- `01 - Engine electronics`
- `01 - Engine electronics, functions`
- `01 - Replace control unit`

– Switch off ignition and remove ignition key after storing electronic file containing adaption values.

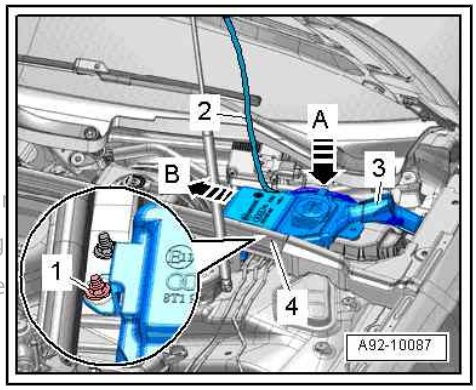
- If the adaption values of the injectors cannot be read out of the old (defective) engine control unit, the adaption values must be entered into the new engine control unit manually and the adaption procedure must be performed accordingly.

A4 and A5:

– Remove plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .



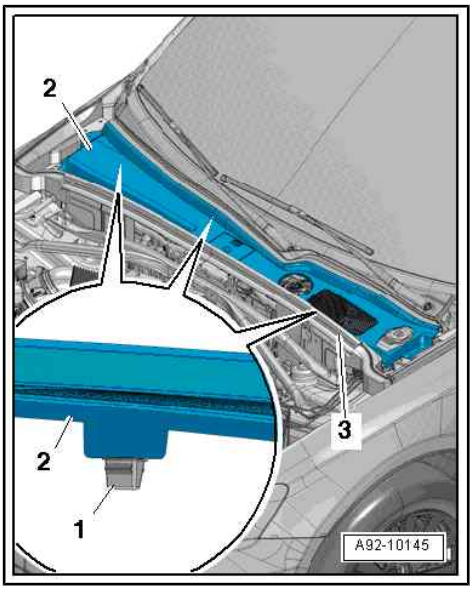
– Slightly pull off rubber seal in front of nut -1- on plenum chamber cover.
– Unhook wiring harness -2- from retainers -A-.
– Unscrew nut -1-.
– Pull filler neck -3- with filler pipe out of washer fluid reservoir and through opening in body.



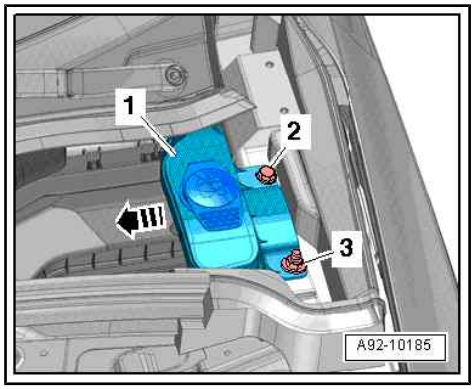
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Q5 only:

– Remove plenum chamber cover -2- ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .

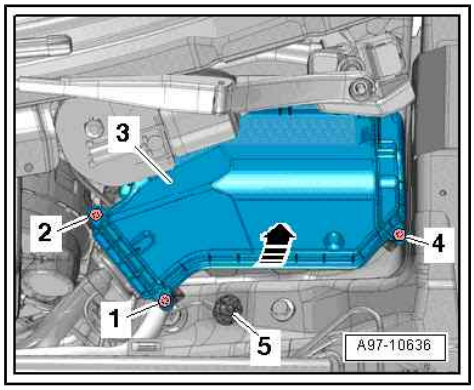


– Remove nut -3- and bolt -2-.
– Pull filler neck -1- with filler pipe out of washer fluid reservoir and through opening in body -arrow-.

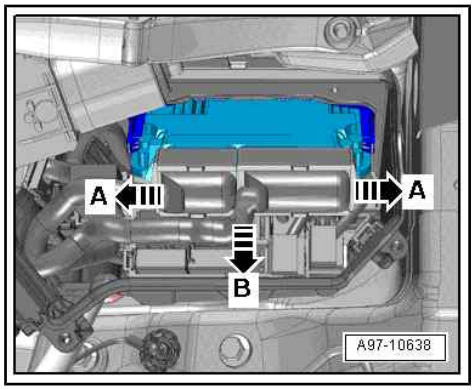


All vehicles:

– Remove bolts -1, 2, 4- and detach cover -3- for electronics box in engine compartment.
– Remove nut -5- and move earth wire clear.



– Release catches -arrows A- and take out engine control unit -arrow B-.



Installing

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

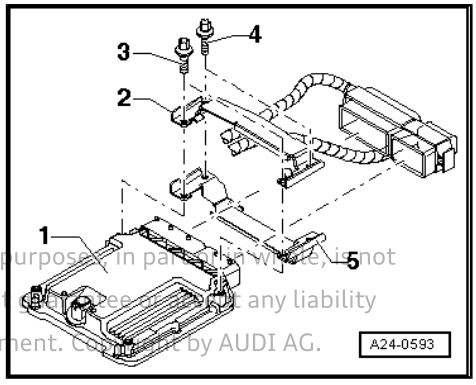
– Install cover for electronics box in engine compartment ⇒ Electrical system; Rep. gr. 97 ; Relay carriers, fuse carriers, electronics boxes; Removing and installing electronics box .
– Install filler neck for washer fluid reservoir ⇒ Electrical system; Rep. gr. 92 ; Windscreen washer system; Removing and installing washer fluid reservoir .
– Install plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .

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After installing a new engine control unit, the following operation must be performed:

– If the engine control unit - J623- has been renewed, the adaption values must be written into the new engine control unit - J623- .

9.1.2 Removing and installing engine control unit - J623- with protective housing

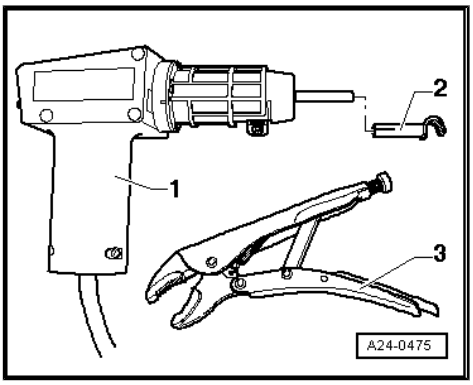


Note

- *Not every engine control unit is bolted to a protective housing. Whether a protective housing is fitted depends on the engine/ gearbox combination.*
- *The engine control unit -1- is bolted to a protective casing -2 and 5-. To make it more difficult to unscrew the shear bolts -4- for locking plate -2-, their threads have been coated with locking fluid.*
- *The metal housing has to be removed before the connectors can be unplugged from the engine control unit (e.g. to connect the test box or renew the engine control unit).*

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Special tools and workshop equipment required



- Hot air blower - VAS 1978/14A- -item 1- with nozzle attachment -2- from wiring harness repair set - VAS 1978 B-
- Small grinder (commercially available)
- Vehicle diagnostic tester

Removing

– If the engine control unit - J623- is renewed, the adaption values must be read out and stored before the engine control unit - J623- is removed.

– 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 - Replace control unit`

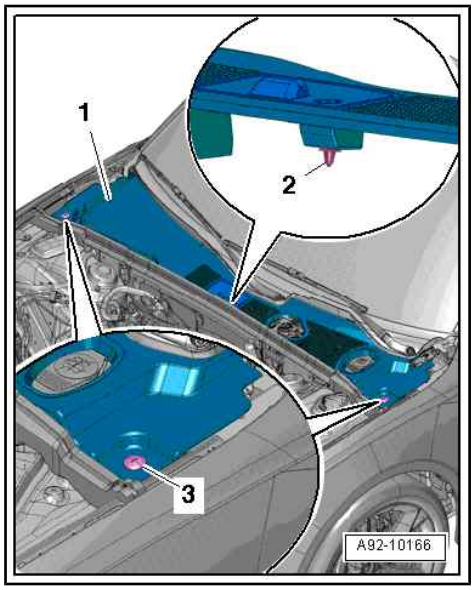
– Switch off ignition and remove ignition key after storing electronic file containing adaption values.

• If the adaption values of the injectors cannot be read out of the old (defective) engine control unit, the adaption values must

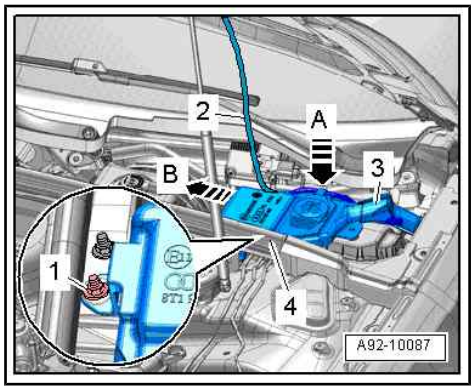
be entered into the new engine control unit manually and the adaption procedure must be performed accordingly.

A4 and A5:

– Remove plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .

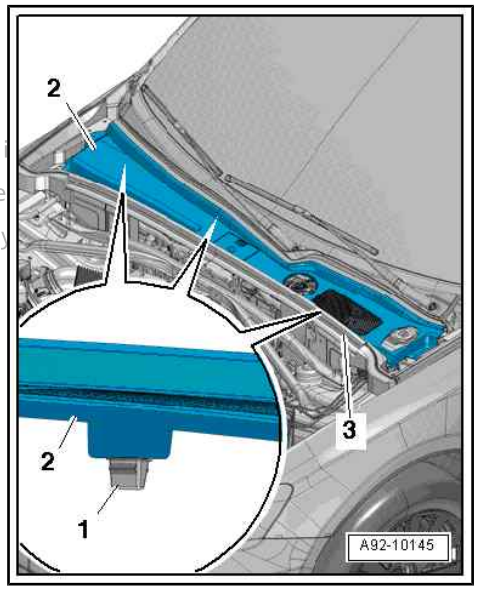


– Slightly pull off rubber seal in front of nut -1- on plenum chamber cover.
– Unhook wiring harness -2- from retainers -A-.
– Unscrew nut -1-.
– Pull filler neck -3- with filler pipe out of washer fluid reservoir and through opening in body.



Q5 only:

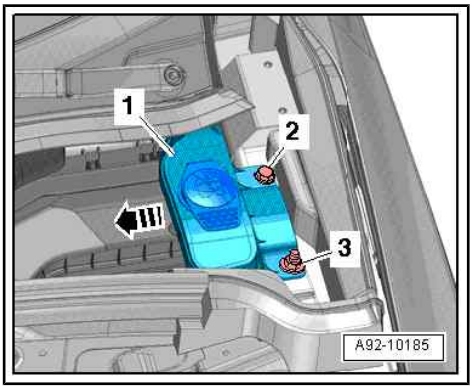
– Remove plenum chamber cover -2- ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .



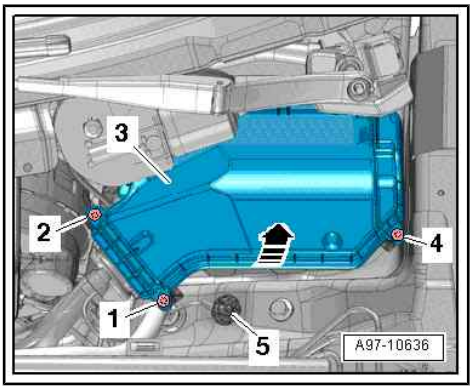
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– Remove nut -3- and bolt -2-.
– Pull filler neck -1- with filler pipe out of washer fluid reservoir and through opening in body -arrow-.

All vehicles:

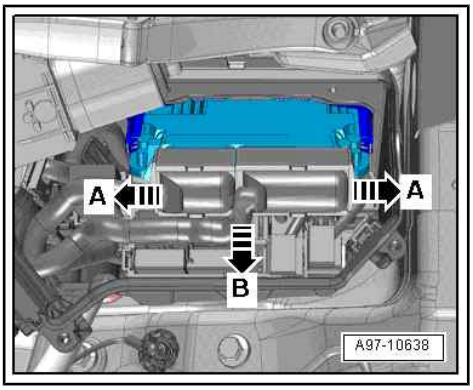


– Remove bolts -1, 2, 4- and detach cover -3- for electronics box in engine compartment.
– Remove nut -5- and move earth wire clear.



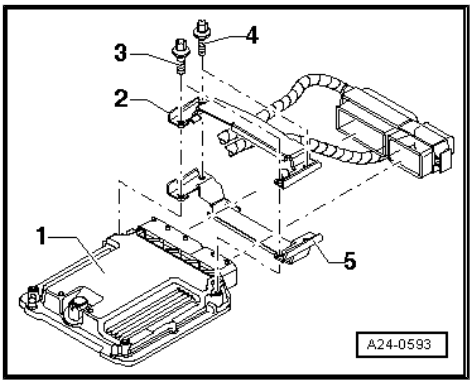
– Release catches -arrows A- and take out engine control unit -arrow B-.

> **Caution**
>
> *Wiring, connectors, insulation and control units can be burnt and damaged.*
>
> - *Keep exactly to the following procedure. Observe the instructions for operating the hot air blower.*



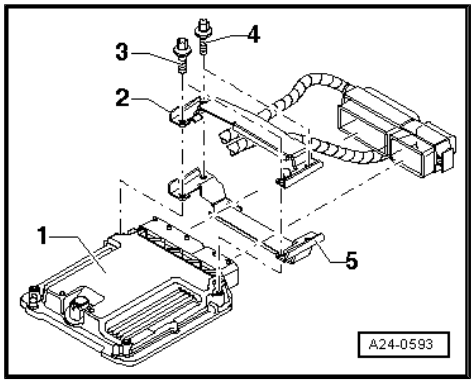
To help prevent unauthorised access to the connectors on the engine control unit, the engine control unit -1- is bolted to a protective housing -5- by means of shear bolts -3 and 4- and a locking plate -2-.

The threads of the two shear bolts -4- which are not screwed into the engine control unit are secured with locking fluid. To unscrew these two bolts, the threads must therefore be heated with the hot air blower.

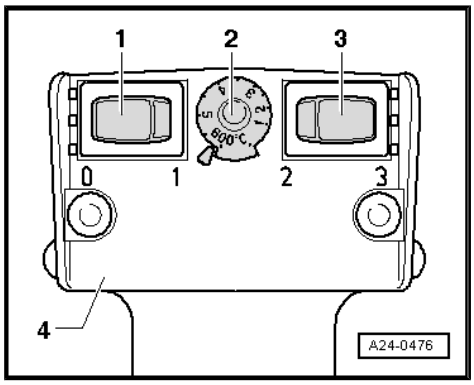


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The threads of the two shear bolts -3- which are screwed into the engine control unit are not secured with locking fluid. Do not apply heat to the threads in the control unit housing; this is not necessary and would cause overheating of the control unit.



– Select settings on hot air blower as shown in illustration, i.e. set temperature potentiometer -2- to maximum heat output and two-stage air flow switch -3- to position 3.

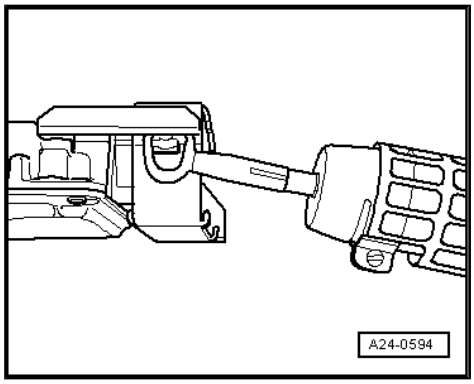


WARNING

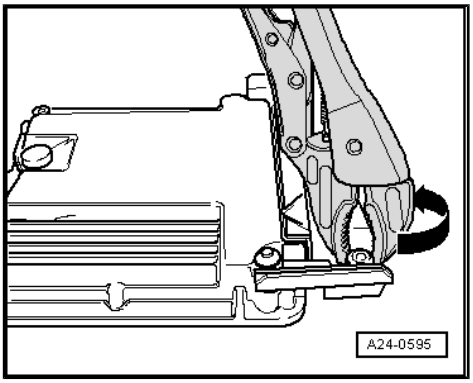
Risk of burns from hot air blower.

- *Parts of the protective housing will become very hot as a result of heating the threads. It is also important to ensure that only the thread is heated and none of the surrounding components if at all possible. These should be covered if necessary.*

– Switch on the hot air blower and heat the bolt for approximately 20 ... 30 seconds.



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– Unscrew shear bolts using suitable vice-grip pliers (see arrow in illustration).
– The two shear bolts screwed into the engine control unit do not need to be heated. They should be removed without being heated.
– Detach protective housing from control unit connectors.
– Release connectors on engine control unit and unplug connectors.

Installing

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

– Make sure you fit protective housing back on engine control unit - J623- .
– Clean threaded holes for shear bolts to remove any residue from locking fluid. This can be done using a thread tap.
– Always use new shear bolts.
– Install cover for electronics box in engine compartment ⇒ Electrical system; Rep. gr. 97 ; Relay carriers, fuse carriers, electronics boxes; Removing and installing electronics box .
– Install filler neck for washer fluid reservoir ⇒ Electrical system; Rep. gr. 92 ; Windscreen washer system; Removing and installing washer fluid reservoir .
– Install plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .

After installing a new engine control unit, the following operation must be performed:

– If the engine control unit - J623- has been renewed, the adaption values must be written into the new engine control unit - J623- .

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26 – Exhaust system

1 Exhaust pipes/silencers

⇒ “1.1 Exploded view - silencers”, page 318
⇒ “1.2 Removing and installing front exhaust pipe”, page 321
⇒ “1.3 Separating exhaust pipes/silencers”, page 325
⇒ “1.4 Removing and installing silencers”, page 328
⇒ “1.5 Stress-free alignment of exhaust system”, page 329
⇒ “1.6 Checking exhaust system for leaks”, page 331

1.1 Exploded view - silencers

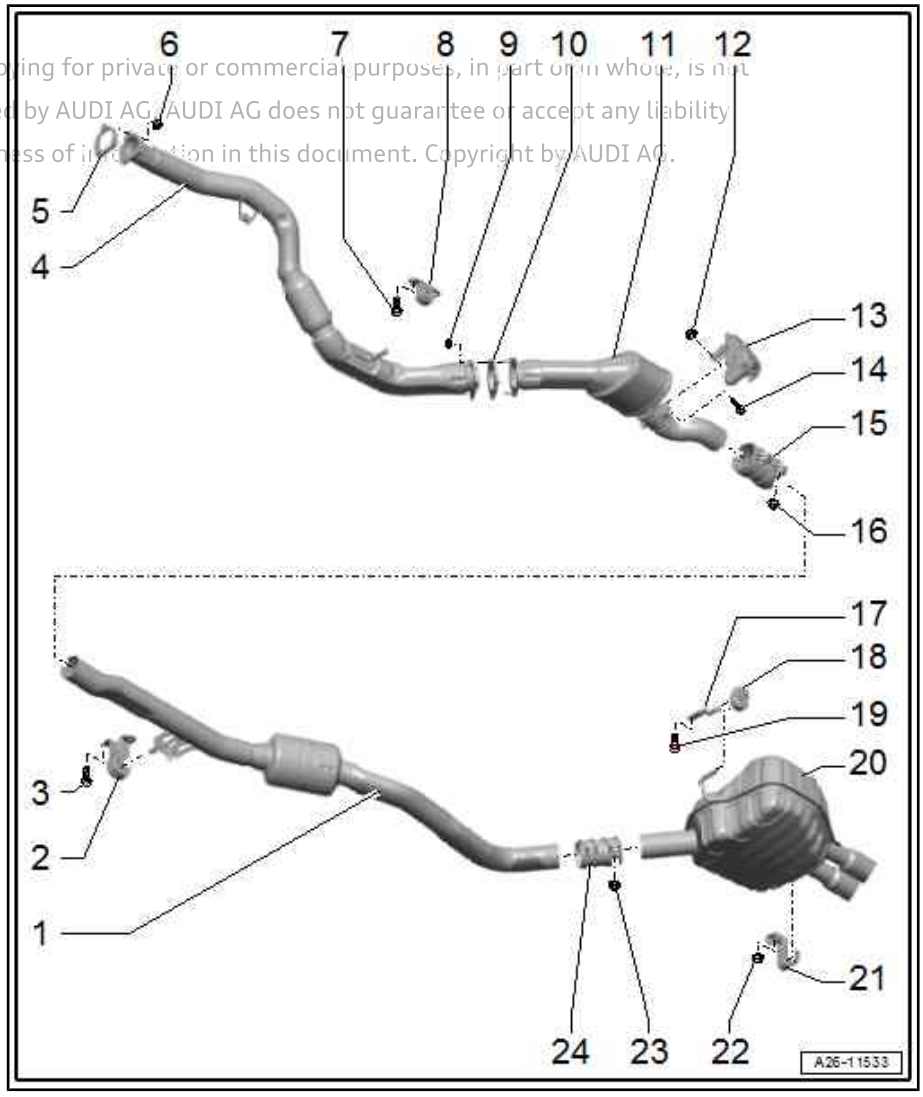
WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system*
  ⇒ “2.6 Safety precautions when working on the exhaust system”, page 5 .

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1 - Centre silencer

- ❑ Combined in one unit with rear silencers as original equipment. Can be renewed separately for repair purposes
- ❑ Cutting point between centre silencer and rear silencer ⇒ page 325
- ❑ Align exhaust system so it is free of stress ⇒ page 329

2 - Mounting

- ❑ Renew if damaged
- ❑ Check preload ⇒ page 329

3 - Bolt

- ❑ 23 Nm

4 - Front exhaust pipe

- ❑ With flexible joint; do not bend flexible joint more than 10° – otherwise it can be damaged
- ❑ Protect against knocks and impact
- ❑ Mounting components ⇒ page 321
- ❑ Removing and installing ⇒ page 321
- ❑ Align exhaust system so it is free of stress ⇒ page 329

5 - Gasket

- ❑ Renew

6 - Nut

- ❑ Renew
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 23 Nm

7 - Bolt

- ❑ 23 Nm

8 - Mounting

- ❑ Renew if damaged
- ❑ Check preload ⇒ page 329

9 - Nut

- ❑ Renew
- ❑ 23 Nm

10 - Gasket

- ❑ Renew

11 - Catalytic converter

- ❑ Catalytic trap functions like an SCR catalytic converter or oxidation catalytic converter
- ❑ Protect against knocks and impact
- ❑ Removing and installing ⇒ page 334

12 - Nut
- ❑ 10 Nm

13 - Exhaust flap control unit - J883-
- ❑ Removing and installing ⇒ page 355

14 - Bolt

15 - Clamp (front)
- ❑ Before tightening, align exhaust system so it is free of stress ⇒ page 329
- ❑ Installation position ⇒ page 321
- ❑ Tighten bolted connections evenly

16 - Nut
- ❑ 23 Nm

17 - Retainer

18 - Mounting
- ❑ Renew if damaged

19 - Bolt
- ❑ 23 Nm

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20 - Rear silencer
- ❑ Combined in one unit with centre silencer as original equipment. Can be renewed separately for repair purposes
- ❑ Cutting point between centre silencer and rear silencer ⇒ page 325
- ❑ Removing and installing ⇒ page 328
- ❑ Align exhaust system so it is free of stress ⇒ page 329

21 - Mounting
- ❑ Renew if damaged
- ❑ Check preload ⇒ page 329

22 - Bolt
- ❑ 20 Nm

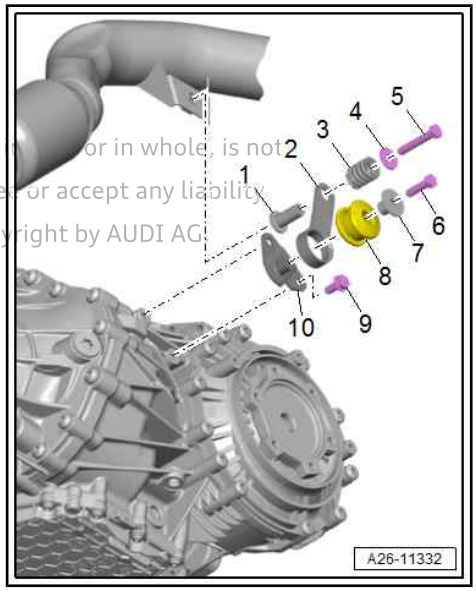
23 - Nut
- ❑ 23 Nm

24 - Clamp (rear)
- ❑ For separate replacement of centre and rear silencers
- ❑ Before tightening, align exhaust system so it is free of stress ⇒ page 329
- ❑ Installation position ⇒ page 321
- ❑ Tighten bolted connections evenly

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Components of mountings for front exhaust pipe

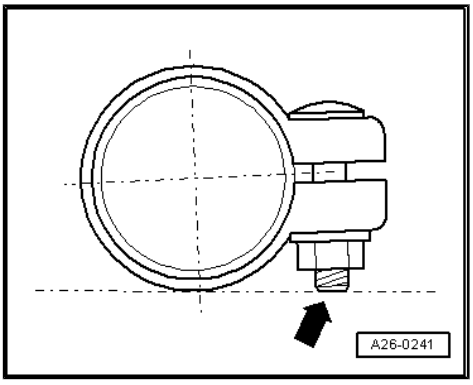
1 - Spacer sleeve
2 - Bracket
3 - Compression spring
4 - Washer
5 - Bolt, 23 Nm
6 - Bolt, 23 Nm
7 - Spacer sleeve
8 - Buffer
9 - Bolt, 23 Nm
10 - Bracket



Installation position of front clamp

– Install clamp so that ends of bolts do not protrude beyond bottom of clamp.

• Bolt connection faces to right.



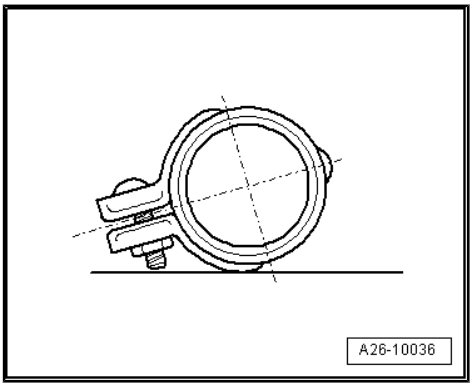
Installation position of rear clamp

– Install clamp so that ends of bolts do not protrude beyond bottom of clamp.

• Bolted connection faces to left.

Tightening torques

♦ ⇒ “1.1 Exploded view - silencers”, page 318

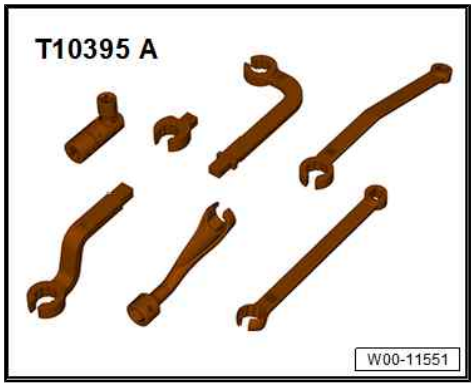


1.2 Removing and installing front exhaust pipe

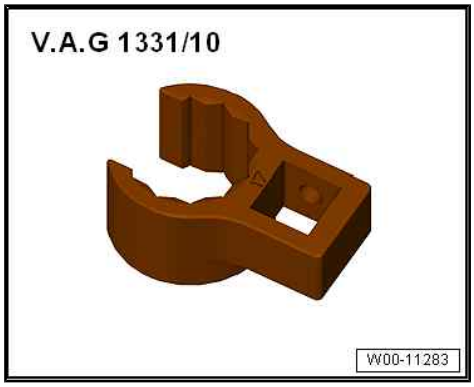
Removing

Special tools and workshop equipment required

- Tool set - T10395 A- with suitable tool insert



- Supplement tool set - T10395/8-/10-
- Flared ring spanner tool insert (17 mm) - V.A.G 1331/10-



WARNING

When working on all parts of the exhaust system:

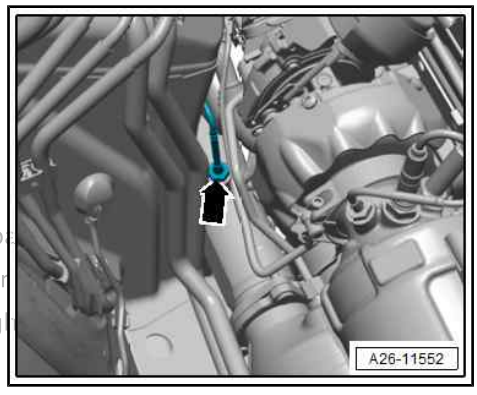
- ***Observe safety precautions when working on the exhaust system***
  ⇒ "2.6 Safety precautions when working on the exhaust system", page 5 .

– Remove drive shaft (right-side); to do so, loosen bolt securing drive shaft (right-side) before raising vehicle ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Loosening and tightening bolt securing drive shaft .

– Remove front right wheel.

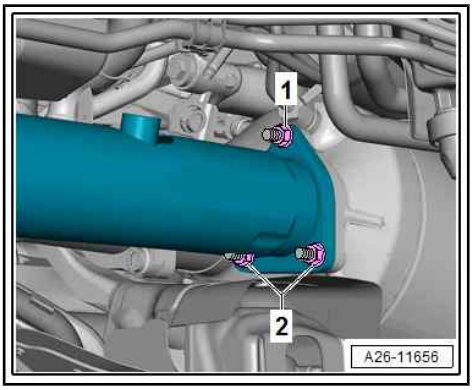
– Remove air cleaner housing ⇒ page 254 .

– Unscrew exhaust gas temperature sender 4 - G648- -arrow- from front exhaust pipe using a tool from tool set - T10395 A- .

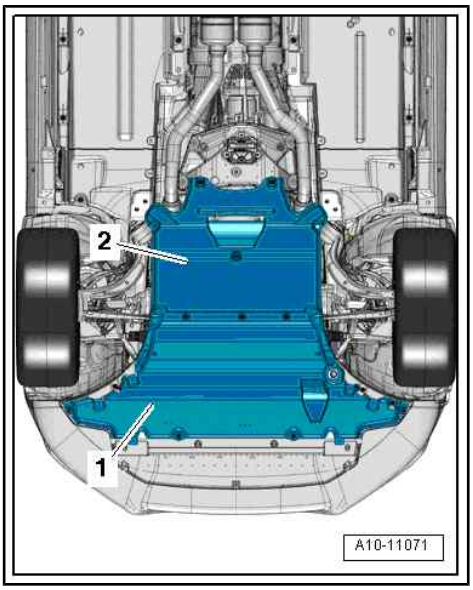


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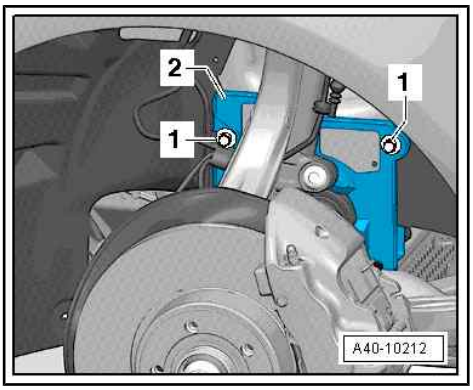
– Unscrew nut -1-. (Nuts -2- do not have to be removed at this stage.)



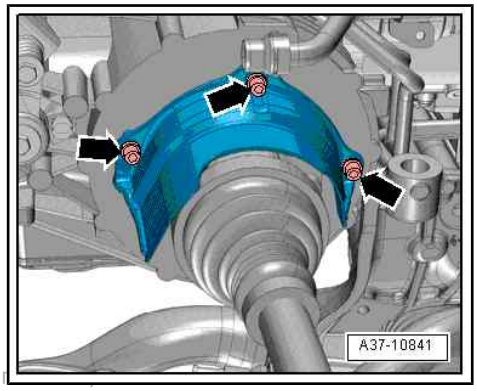
– Remove rear noise insulation -2- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .



– Unscrew nuts -1- and remove drive shaft cover (right-side) -2-.

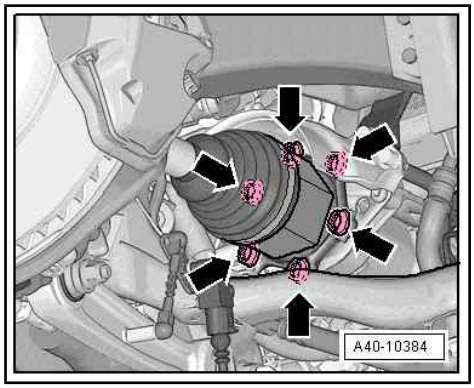


– Remove bolts -arrows- and detach heat shield for drive shaft (right-side).



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– Remove bolts -arrows- securing drive shaft to flange shaft and take out drive shaft.
– Detach drive shaft, taking care not to damage boot and coating on drive shaft.



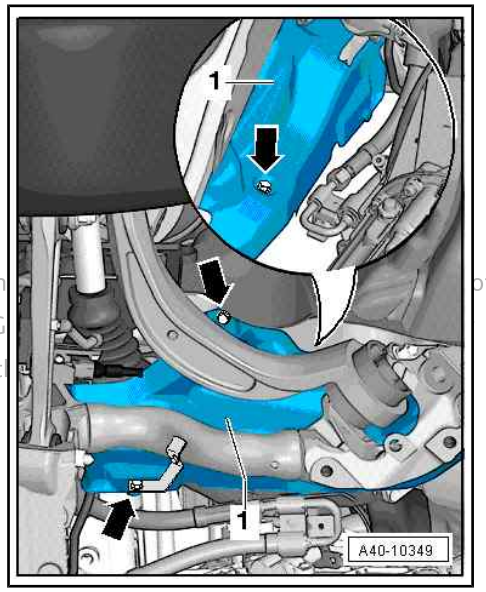
Applies to vehicles with subframe shield:

– Remove bolts -arrows- and take out subframe shield (right-side).

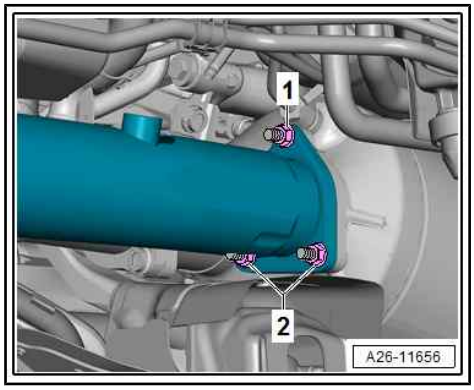
Note

Guide shield out through opening by turning it (only possible in one position).

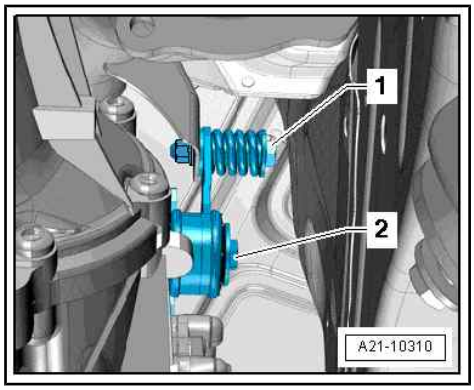
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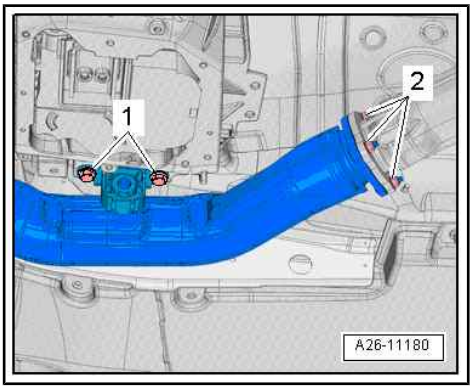
– Remove nuts -2- using a small jointed socket wrench with an extension.



– Remove bolt -1- and turn retaining tab downwards.



– Remove nuts -2- and bolts -1- and detach front exhaust pipe.



Caution

Risk of damage to flexible joints in front exhaust pipe

- *Do not bend flexible joints in front exhaust pipe more than 10°.*

Installing

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

Note

Renew gaskets and nuts after removing.

– Install exhaust gas temperature sender 4 - G648- ⇒ “4.2.4 Removing and installing exhaust gas temperature sender 4 G648 ”, page 395 .

– Install air cleaner housing ⇒ page 254 .

– Install drive shaft ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .

– Align the exhaust system so it is free of stress ⇒ page 329 .

Tightening torques

- ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing heat shield for drive shaft
- ⇒ “1.1 Exploded view - silencers”, page 318
- Noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation
- ⇒ “4.1 Exploded view - exhaust gas temperature control”, page 389

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1.3 Separating exhaust pipes/silencers

⇒ “1.3.1 Separating exhaust pipes/silencers - Audi A4 and A5”, page 325

1.3.1 Separating exhaust pipes/silencers - Audi A4 and A5

WARNING

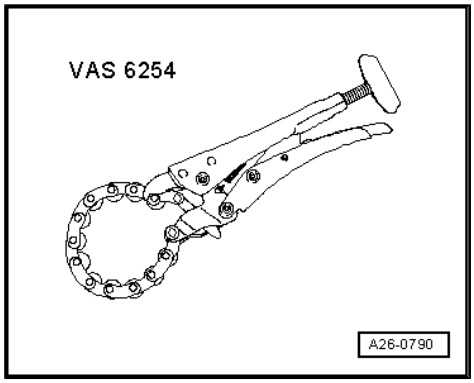
When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system ⇒ “2.6 Safety precautions when working on the exhaust system”, page 5 .*

- The connecting pipe can be cut through at the cutting location in order to renew the centre and rear silencers separately.
- The cutting point is marked by an indentation on the circumference of the exhaust pipe.

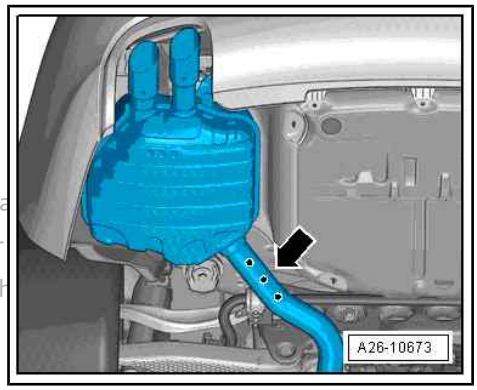
Special tools and workshop equipment required

◆ Chain pipe cutter - VAS 6254-



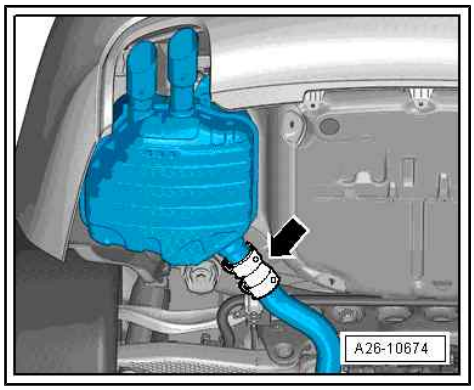
Procedure

– Cut through exhaust pipe at right angles at the position marked -arrow- using chain pipe cutter - VAS 6254- .

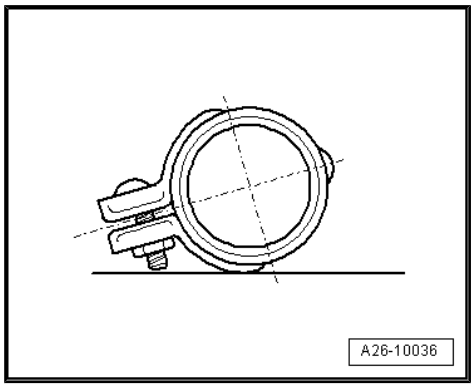


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– Position centre of clamp -arrow- over cutting location.



– Install clamp so that ends of bolts do not protrude beyond bottom of clamp.
• Bolted connection faces to left.



– Align the exhaust system so it is free of stress ⇒ page 329 .

Tightening torques

◆ ⇒ “1.1 Exploded view - silencers”, page 318

1.3.2 Separating exhaust pipes/silencers - Audi Q5

WARNING

When working on all parts of the exhaust system:

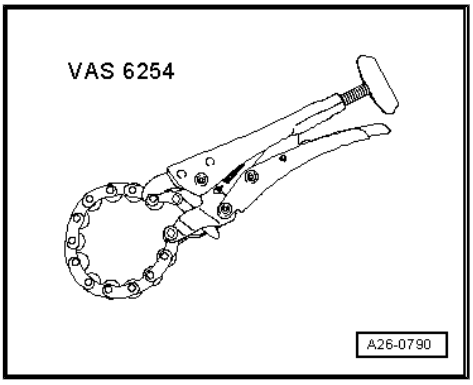
- *Observe safety precautions when working on the exhaust system*
  ⇒ "2.6 Safety precautions when working on the exhaust system", page 5 .

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- The connecting pipe can be cut through at the cutting location in order to renew the centre and rear silencers separately.
- The cutting point is marked by an indentation on the circumference of the exhaust pipe.

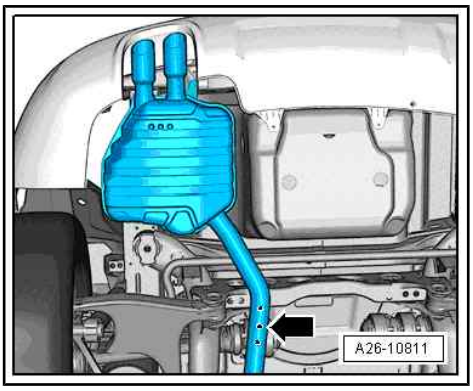
Special tools and workshop equipment required

- Chain pipe cutter - VAS 6254-

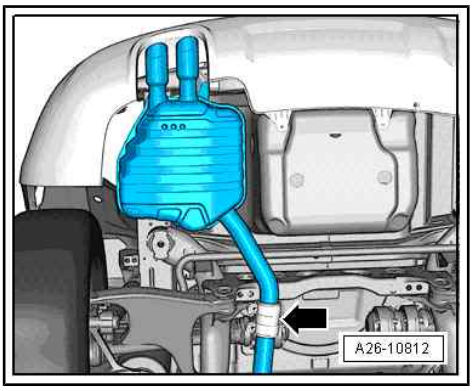


Procedure

– Cut through exhaust pipe at right angles at the position marked -arrow- using chain pipe cutter - VAS 6254- .



– Position centre of clamp -arrow- over cutting location.



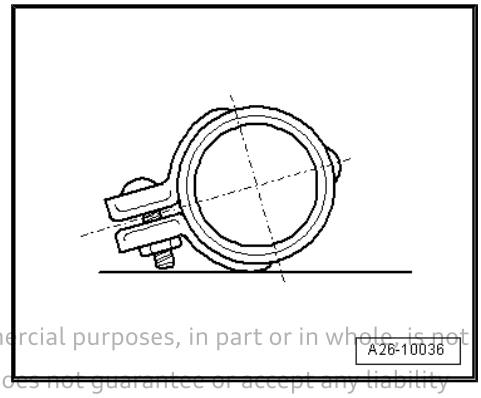
– Install clamp so that ends of bolts do not protrude beyond bottom of clamp.

• Bolted connection faces to left.

– Align the exhaust system so it is free of stress ⇒ page 329 .

Tightening torques

♦ ⇒ “1.1 Exploded view - silencers”, page 318



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1.4 Removing and installing silencers

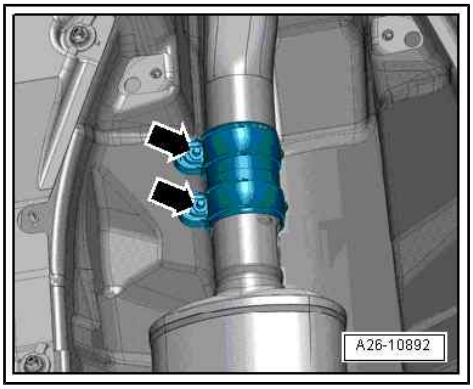
WARNING

When working on all parts of the exhaust system:

♦ *Observe safety precautions when working on the exhaust system ⇒ “2.6 Safety precautions when working on the exhaust system”, page 5 .*

Removing

– Loosen bolted connections -arrows- and push clamp towards rear.



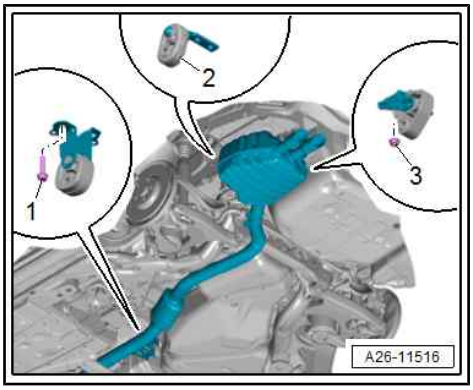
WARNING

Risk of accident caused by weight of exhaust system

♦ *A second mechanic is required for detaching the exhaust system (rear).*

– Disengage rubber mounting -2-.

– Unscrew bolts -1, 3- and remove silencers.



Installing

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

Note

Renew gaskets and nuts.

– Align the exhaust system so it is free of stress ⇒ page 329 .

Tightening torques

♦ ⇒ “1.1 Exploded view - silencers”, page 318

1.5 Stress-free alignment of exhaust system

⇒ "1.5.1 Stress-free alignment of exhaust system - Audi A4 and A5", page 329

⇒ "1.5.2 Stress-free alignment of exhaust system - Audi Q5", page 330

1.5.1 Stress-free alignment of exhaust system - Audi A4 and A5

Procedure

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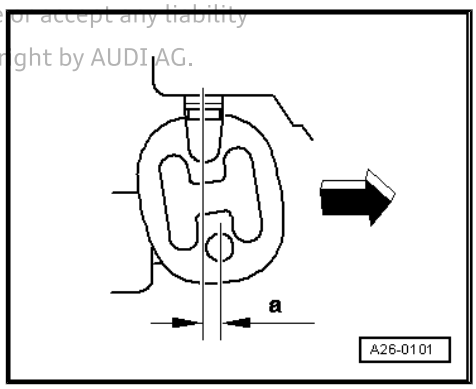
- The exhaust system must be aligned when it is cool.

Vehicles without clamps between centre silencer and rear silencer

– Loosen bolted connections on front clamp.

– Push exhaust system towards front of vehicle -arrow- so that rear mountings for rear silencer are preloaded by -a- = 6 ... 10 mm.

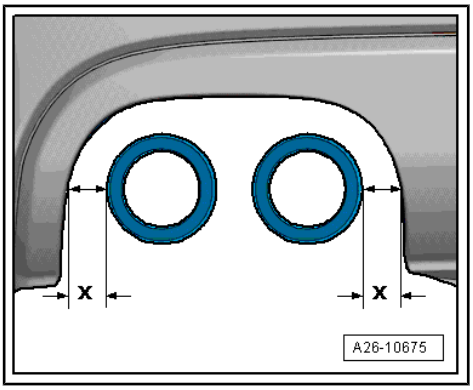
– Align rear silencer so it is horizontal.



– Check clearance between tailpipes and bumper:

- Dimension -x- (left-side) = dimension -x- (right-side)

– Tighten bolt connections on clamp evenly.

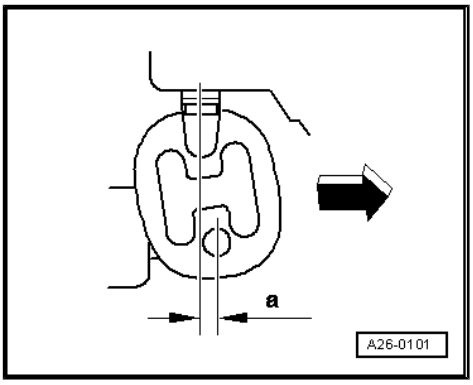


Vehicles with clamp between centre silencer and rear silencer

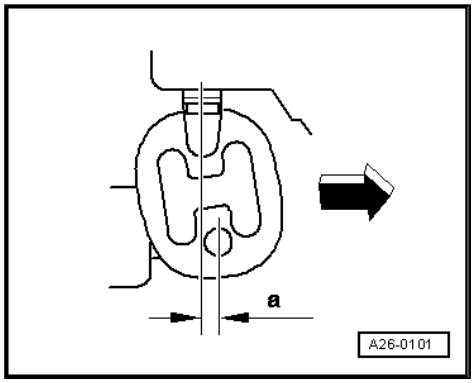
– Loosen bolted connections on front and rear clamps.

– Push centre silencer towards front of vehicle -arrow- until mounting for centre silencer is preloaded by -a- = 6 ... 10 mm.

– Tighten bolt connections on front clamp evenly.



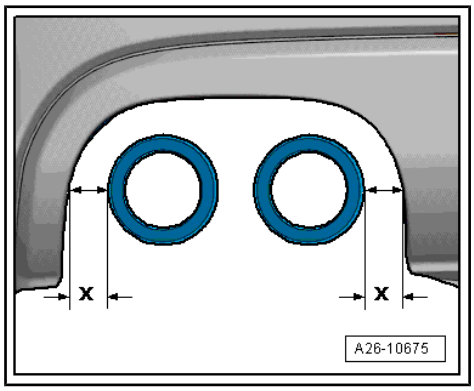
– Push rear silencer towards front of vehicle -arrow- so that rear mounting for rear silencer is preloaded by -a- = 11 ... 15 mm.
– Align rear silencer so it is horizontal.



– Check clearance between tailpipes and bumper:
• Dimension -x- (left-side) = dimension -x- (right-side)
– Tighten bolt connections on clamp evenly.

Tightening torques

◆ ⇒ “1.1 Exploded view - silencers”, page 318



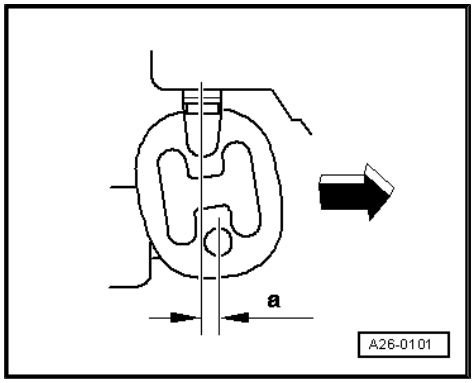
1.5.2 Stress-free alignment of exhaust system - Audi Q5

Procedure

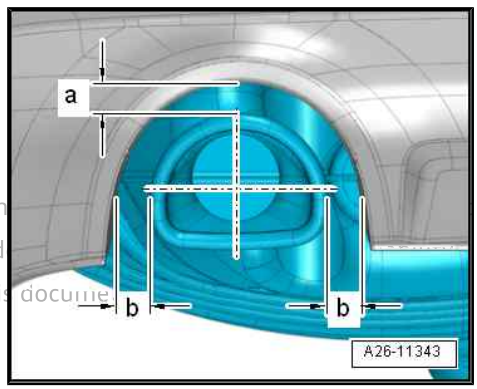
• The exhaust system must be aligned when it is cool.

Vehicles without clamps between centre silencer and rear silencer

– Loosen bolted connections on front clamp.
– Push exhaust system towards front of vehicle -arrow- so that rear mountings for rear silencer are preloaded by -a- = 6 ... 10 mm.
– Align rear silencer so it is horizontal.



– Check clearance between tailpipes and bumper:
• Dimension -b- is the same on both sides.
– Tighten bolt connections on clamp evenly.



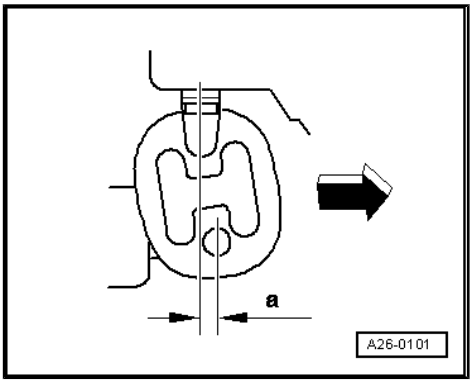
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Vehicles with clamp between centre silencer and rear silencer

– Loosen bolted connections on front and rear clamps.

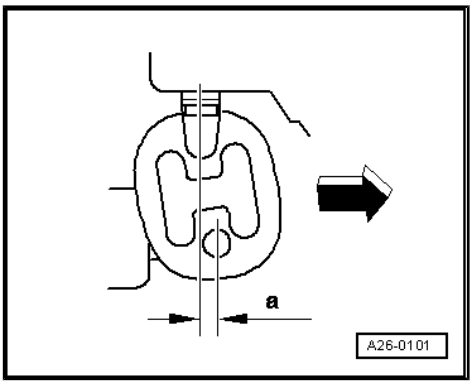
– Push centre silencer towards front of vehicle -arrow- until mounting for centre silencer is preloaded by -a- = 6 ... 10 mm.

– Tighten bolt connections on front clamp evenly.



– Push rear silencer towards front of vehicle -arrow- so that rear mounting for rear silencer is preloaded by -a- = 11 ... 15 mm.

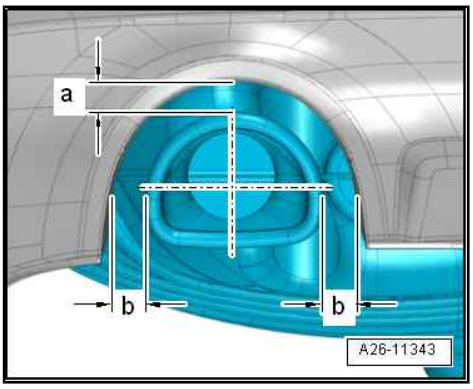
– Align rear silencer so it is horizontal.



– Check clearance between tailpipes and bumper:

- Dimension -a- = 18 mm
- Dimension -b- is the same on both sides.

– Tighten bolt connections on clamp evenly.



Tightening torques

◆ ⇒ “1.1 Exploded view - silencers”, page 318

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1.6 Checking exhaust system for leaks

WARNING

When working on all parts of the exhaust system:

◆ *Observe safety precautions when working on the exhaust system*
⇒ “2.6 Safety precautions when working on the exhaust system”, page 5 .

– 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.

2 Emission control system

⇒ "2.1 Exploded view - emission control system", page 332

⇒ "2.2 Removing and installing catalytic converter", page 334

⇒ "2.3 Removing and installing emission control module", page 335

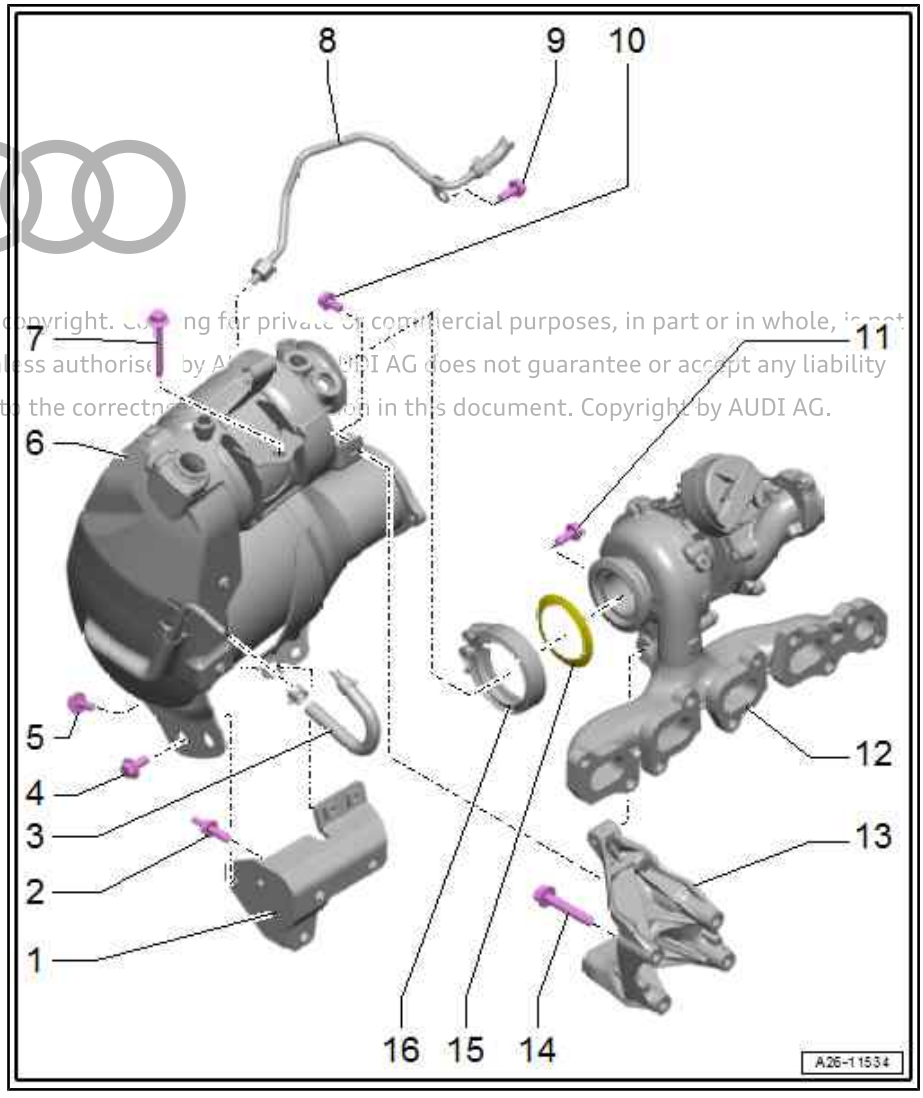
⇒ "2.4 Removing and installing exhaust flap control unit J883 ", page 355

2.1 Exploded view - emission control system

WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system ⇒ "2.6 Safety precautions when working on the exhaust system", page 5 .*



1 - Bracket

- For emission control module

2 - Bolt

- Renew after removing
- Tightening torque and sequence ⇒ page 223

3 - Hose

- To exhaust gas pressure sensor 1 - G450-
- Tightening torque for union nut: 45 Nm

4 - Bolt

- Renew after removing
- Tightening torque and sequence ⇒ page 344

5 - Bolt

- Renew after removing
- Tightening torque and sequence ⇒ page 223

6 - Emission control module

- Diesel particulate filter with oxidation catalytic converter
- After renewal, perform adaptions listed in Guided Function `01 - Replace engine CU/particulate filter` ⇒ Vehicle diagnostic tester
- Removing and installing ⇒ page 335

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7 - Bolt

- ❑ Renew after removing
- ❑ Tightening torque and sequence ⇒ page 344

8 - Measuring tube

- ❑ To pressure differential sender - G505-
- ❑ Depending on version, an additional measuring tube to exhaust gas pressure sensor 1 - G450- may be fitted
- ❑ Tightening torque for union nut: 45 Nm

9 - Bolt

- ❑ Hexagon bolt replaces Torx bolt
- ❑ 9 Nm

10 - Bolt

- ❑ Renew after removing
- ❑ Tightening torque and sequence ⇒ page 223

11 - Bolt

- ❑ Renew after removing

Tightening torque and sequence ⇒ page 223

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12 - Turbocharger

- ❑ Removing and installing ⇒ page 224

13 - Bracket

- ❑ For emission control module

14 - Bolt

- ❑ Tightening torque and sequence ⇒ page 223

15 - Seal

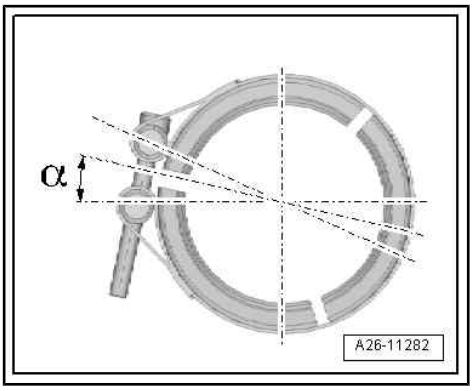
- ❑ Renew after removing
- ❑ Fit on emission control module

16 - Screw-type clip

- ❑ Renew after removing
- ❑ Installation position ⇒ page 333
- ❑ Tightening torque and sequence ⇒ page 344

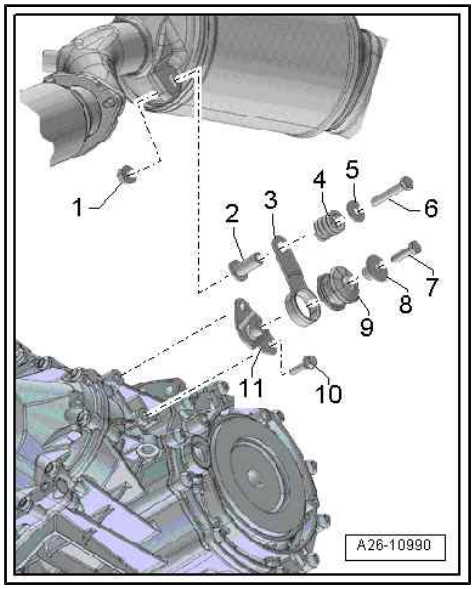
Installation position of screw-type clip for emission control module

- Angle -α- = 20° ± 10°.



Mounting components for emission control module

1 - Nut
2 - Spacer sleeve
3 - Bracket
4 - Compression spring
5 - Washer
6 - Bolt, 23 Nm
7 - Bolt, 23 Nm
8 - Spacer sleeve
9 - Buffer
10 - Bolt, 23 Nm
11 - Bracket



2.2 Removing and installing catalytic converter

Removing

WARNING

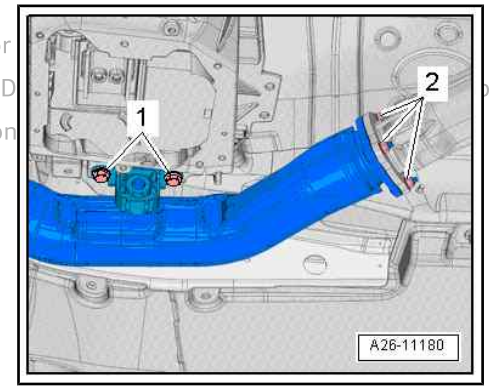
When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system*
  ⇒ "2.6 Safety precautions when working on the exhaust system", page 5 .

– Remove nuts -2-.

Note

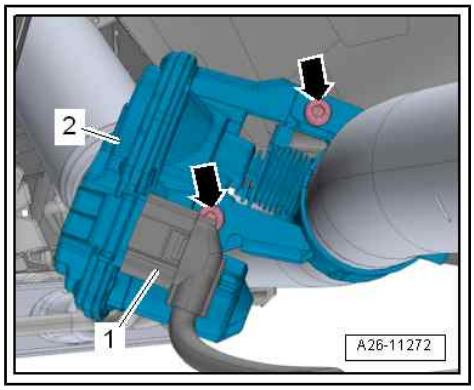
Disregard -item 1-.



– Unplug electrical connector -1- for exhaust flap control unit - J883- -item 2-.

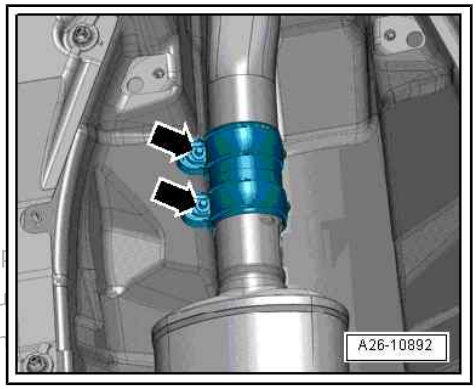
Note

Disregard -arrows-.



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– Loosen bolts -arrows-, push back clamp and detach catalytic converter.



Installing

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

Note

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with regard to the correctness of information in this documen

Renew gaskets and nuts.

– Align the exhaust system so it is free of stress ⇒ page 329 .

Tightening torques

◆ ⇒ “1.1 Exploded view - silencers”, page 318

2.3 Removing and installing emission control module

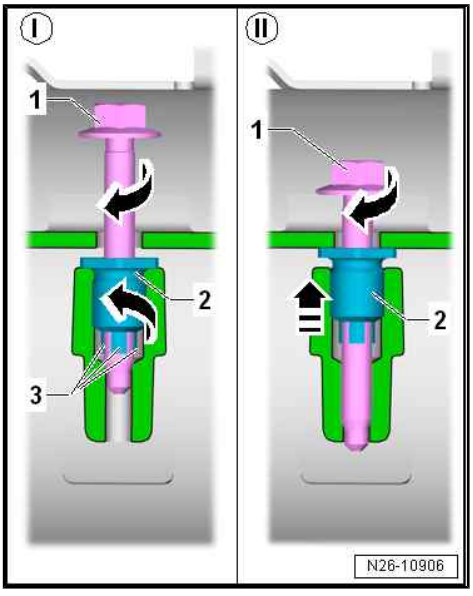
⇒ “2.3.1 Removing and installing emission control module - Audi A4 and A5”, page 335

⇒ “2.3.2 Removing and installing emission control module - Audi Q5”, page 346

2.3.1 Removing and installing emission control module - Audi A4 and A5

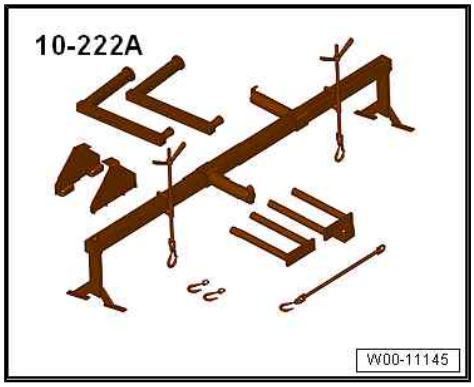
Note

The emission control module is secured to the engine in part by a compensation element. This compensation element has a left-hand thread on the outside. When the bolt -1- is screwed in, the friction against the retaining tabs -3- initially causes the compensation element -2- to turn as well. Even though the bolt is turned clockwise, the left-hand thread causes the compensation element to move towards the bolt head, which compensates for the play between the components. The compensation element must rotate freely on the left-hand thread, otherwise the retaining tabs will not produce enough friction on the bolt to turn the compensation element. To avoid impairing the required friction, ensure that the retaining tabs do not come in contact with any lubricant.

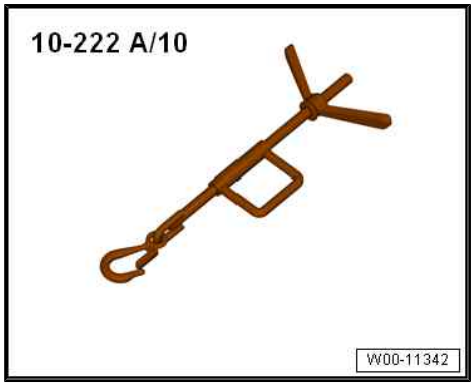


Special tools and workshop equipment required

- Support bracket - 10 - 222 A-



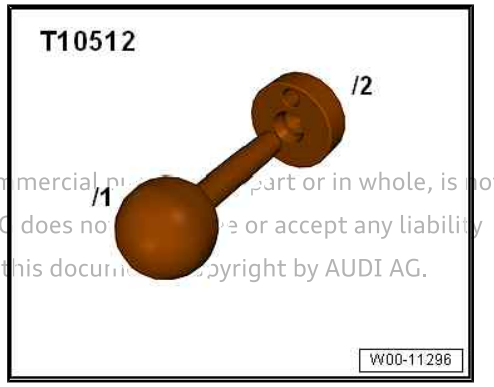
- Hook - 10 - 222 A /10-



- Socket (8 mm) - 3247-



- Calibration tool - T10512-



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Removing

WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system*
  ⇒ "2.6 Safety precautions when working on the exhaust system", page 5 .

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– Remove toothed belt cover (top) ⇒ page 69 .

Step required on vehicles with auxiliary heater:

– Remove rear coolant pipe (right-side)
⇒ "3.2.7 Removing and installing coolant pipe (rear right)", page 195 .

All vehicles:

– Remove exhaust gas recirculation control motor 2 - V339-
⇒ "5.3 Removing and installing exhaust gas recirculation control motor 2 V339 ", page 401 .

– Remove front exhaust pipe
⇒ "1.2 Removing and installing front exhaust pipe", page 321 .

– Remove exhaust gas recirculation cooler
⇒ "5.4 Removing and installing exhaust gas recirculation cooler", page 404 .

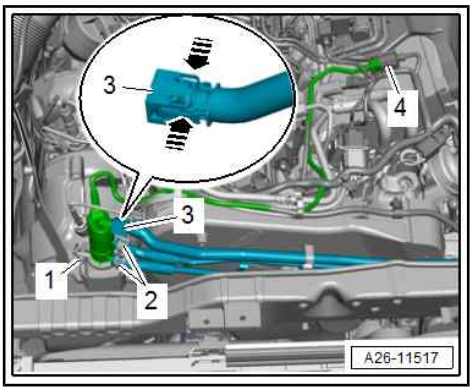
– Remove torque reaction support
⇒ "2.4 Removing and installing torque reaction support and cross member", page 30 .

– Remove front wheel housing liner (right-side) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front) .

– Release hose clip -1-.

– Move coolant hoses -2- and SCR hose -3- clear.

– Detach injector for reducing agent - N474- and place to one side.

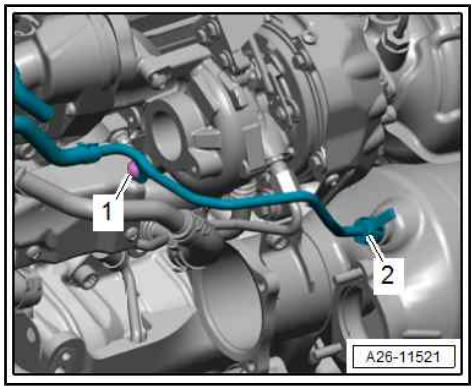


Note

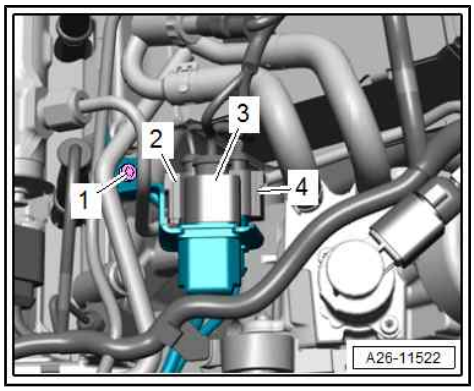
-Item 4- and -arrows- can be disregarded.

– Remove toothed belt cover (top)
⇒ "1.3.1 Removing and installing toothed belt cover (top)", page 69 .

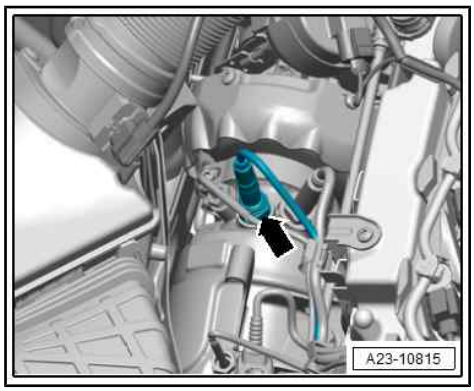
– Remove union nut -2- and bolt -1- and move measuring tube to one side.



– Unplug electrical connector -3- for Lambda probe - G39- .

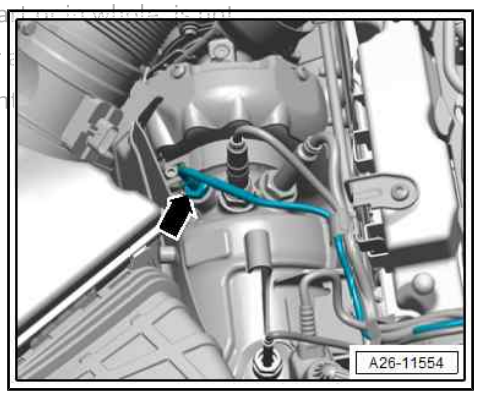


– Remove Lambda probe - G39- -arrow-.

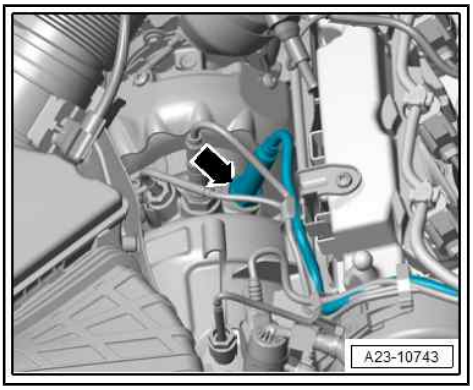


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– Unscrew exhaust gas temperature sender 2 - G448- -arrow-.

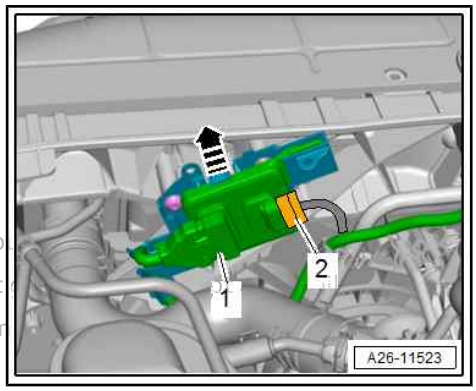


– Unscrew NOx sender - G295- -arrow-.



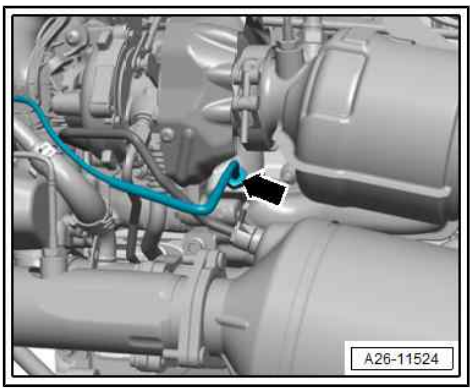
– Unplug electrical connector -2-.
– Release fastener -arrow- and move control unit for NOx sender - J583- -item 1- clear.

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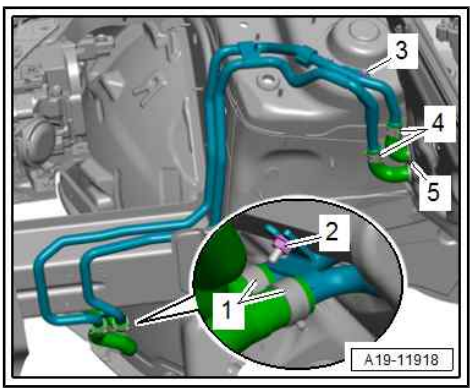


– Unscrew exhaust gas temperature sender 1 - G235- -arrow-.

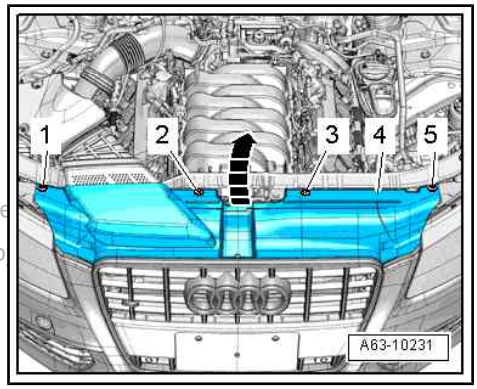
Step only required on vehicles with auxiliary heater:



– Loosen nut -2-.
– Release hose clips -1- and disconnect coolant hoses.
– Unscrew nut -3-.
– Release hose clips -4- and disconnect coolant hoses.
– Push coolant hoses with protector -5- into plenum chamber.
– Remove coolant pipes.

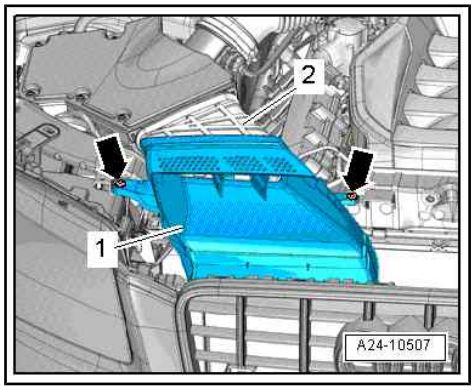


– Remove lock carrier cover -4- ⇒ General body repairs, exterior; Rep. gr. 50 ; Lock carrier; Exploded view - lock carrier .

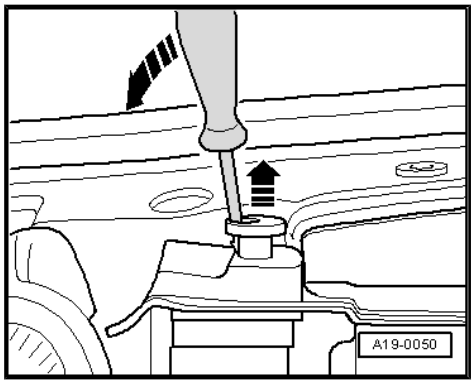


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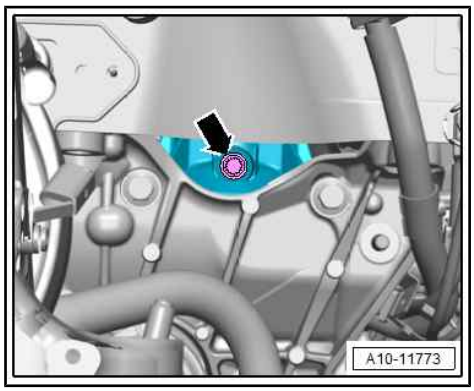
– Remove bolts -arrows-.
– Detach air duct -1- from intermediate flange -2- for air cleaner housing.



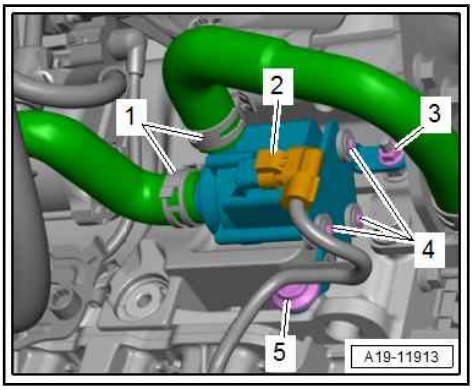
– Release retaining pins for radiator on both sides and pull out upwards -arrows-.



– Remove bolt -arrow- for engine mounting (right-side).



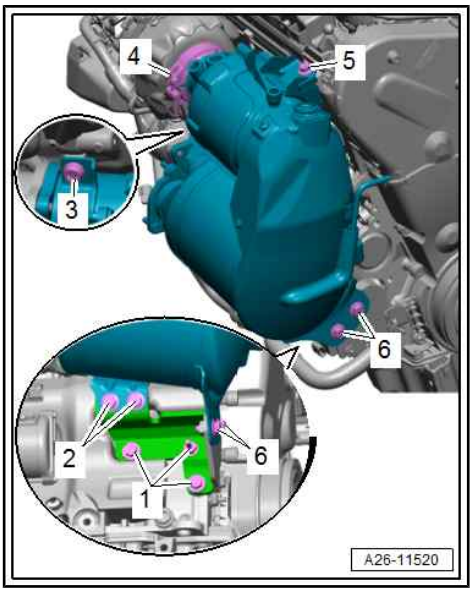
– Remove nut -3- and bolt -5- and push auxiliary pump for heating - V488- clear to one side.



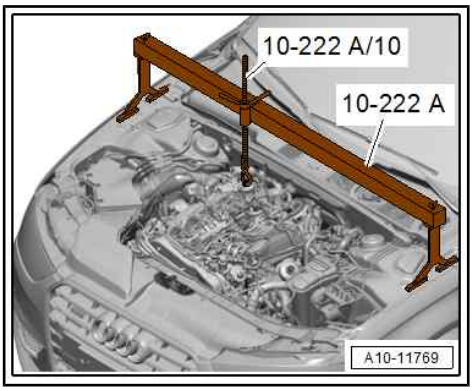
Note

To avoid damaging the longitudinal member when lifting out the emission control module, mask the longitudinal member (right-side) with adhesive tape.

– Open clip -4- and place it on intake funnel of emission control module.
– Remove bolts in the sequence: -5, 6, 2, 3- and slacken bolts -1-.



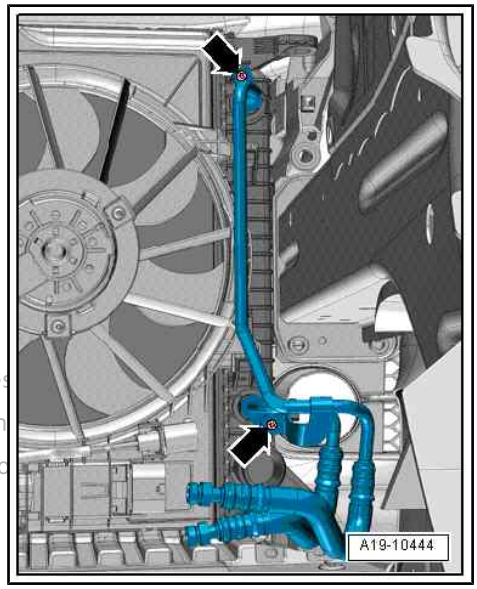
– Set up support bracket - 10 - 222 A- on wing mounting flanges (left and right) as illustrated.
– Attach hook - 10 - 222 A /10- to engine lifting eye (rear right).



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Note

On vehicles with four-wheel drive and automatic gearbox, there is very little space to take out the emission control module due to the ATF lines leading to the ATF cooler.



– Press radiator as far as possible towards front.
– Use hook to raise engine until emission control module can be detached.
– Lift out emission control module.

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Installing

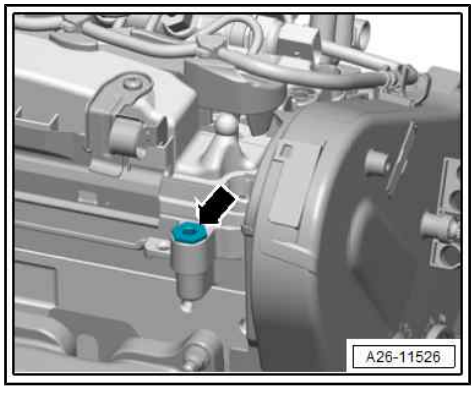
Note

- *Renew bolts tightened with specified tightening angle.*
- *Renew seals, self-locking nuts and screw-type clips for emission control module.*
- *Re-fit all cable ties and heat insulation sleeves in the same locations when installing.*

Caution

Emission control module must be installed free of tension to avoid risk of stress fractures and engine damage.

- ***Prior to installation, ensure that the compensation element moves easily and does not stick.***
- ***Compensation element must turn easily on its threads.***
- ***Only apply lubricant to thread; retainer tabs must remain clean.***
- ***The retainer tabs for the bolt must be bent together so that when the bolt is screwed in, the compensation element turns as well.***



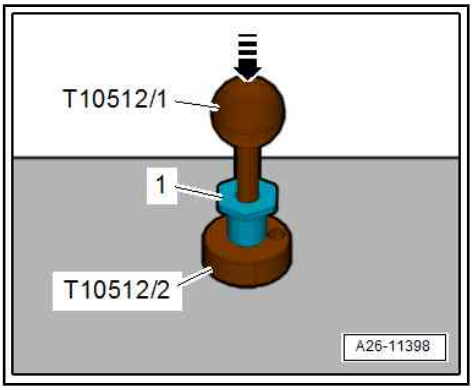
– Check to ensure freedom of movement of compensation element -arrow-.
– Unscrew compensation element completely in clockwise direction (left-hand thread).
– Clean thread if it does not turn easily and lubricate lightly with rust remover if necessary.

Caution

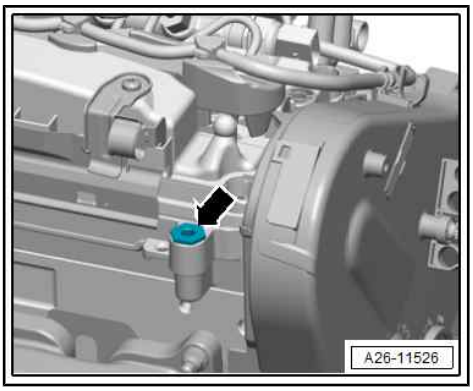
Do not use any kind of lubricant on the retaining tabs of the compensation element, as this will reduce the build-up of friction and compromise the function of the compensation element.

– Adjust retainer tabs to functional dimension using calibration tool -T10512/1-2- as follows:

– Slide compensation element -1- onto pin -T10512/1- , insert into centring sleeve -T10512/2- and bend back retainer tabs by gently striking -arrow- ball head with heel of your hand.



– Tighten compensation element -arrow- to 3 Nm and slacken again by 90°.



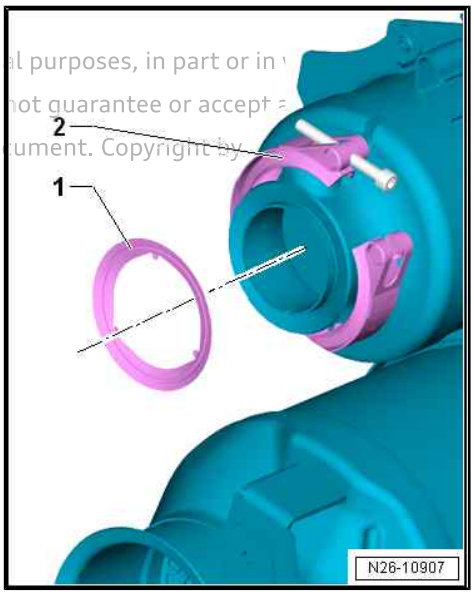
Note

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Renew seal -1- and screw-type clip -2-.

– Fit seal -1- onto emission control module.

– Disengage screw on clip -2- and move clip all the way onto intake funnel of emission control module. Do not bend clip open.



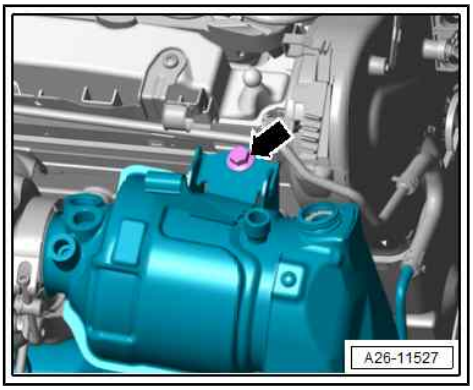
– Guide emission control module into installation position.

– Insert bolt -arrow- to secure in place.

• Emission control module is now suspended approximately in installation position with its weight supported.

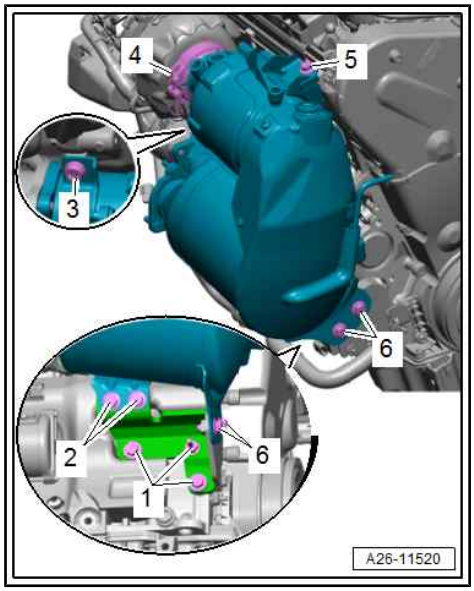
Note

Renew all securing bolts for emission control module.

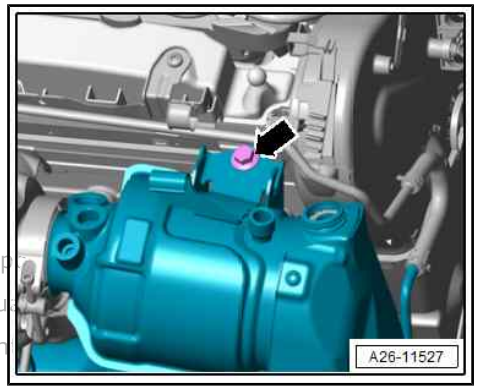


Tightening sequence for emission control module

Stage	Bolt	Step
1.	Screw-type clip -4-	Fit over sealing flange, engage screw and tighten to 1 Nm
2.	Bolt -3-	Tighten to 2 Nm and loosen immediately by 90°
3.	Screw-type clip -4-	Tighten to 7 Nm
4.	Bolt -3-	Tighten to 20 Nm
5.	Bolts -1-	Tighten to 2 Nm and loosen immediately by 90°
6.	Bolts -2-	Tighten to 2 Nm and loosen immediately by 90°
7.	Bolts -6-	Tighten to 2 Nm
8.	Bolts -1-	Tighten to 20 Nm
9.	Bolt -6-	Tighten to 20 Nm
10.	Bolt -2-	Tighten to 20 Nm

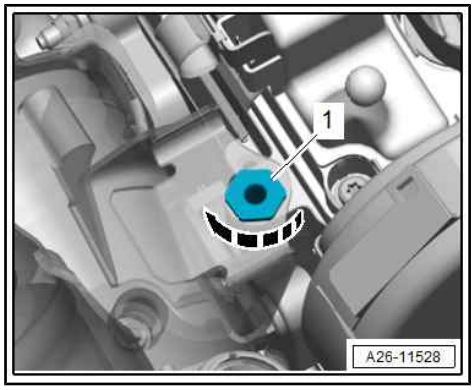


– Remove bolt -arrow- previously inserted to secure in place.



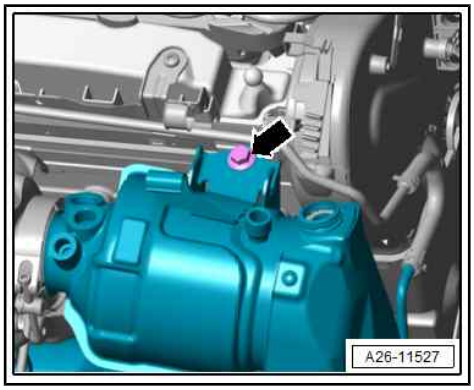
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– Using socket, 8 mm - 3247- , unscrew compensation element (left-hand thread) -1- on cylinder head in direction of -arrow- to 2 Nm until it makes contact, then turn 90° further.



Tightening sequence continued

Stage	Bolt	Step
11.	Bolt -arrow-	Insert and press until it engages
12.	Bolt -arrow-	Tighten to 20 Nm
13.	Bolt -arrow-	Turn 90° further
14.	Bolt -arrow-	Turn another 45° further



Further installation is carried out in the reverse order; note the following:

– Install exhaust gas temperature sender 1 - G235- ⇒ page 390 .

– Install injector for reducing agent - N474- ⇒ page 375 .

– Install exhaust gas recirculation cooler ⇒ page 404 .

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 - Replacing engine CU / particulate filter`

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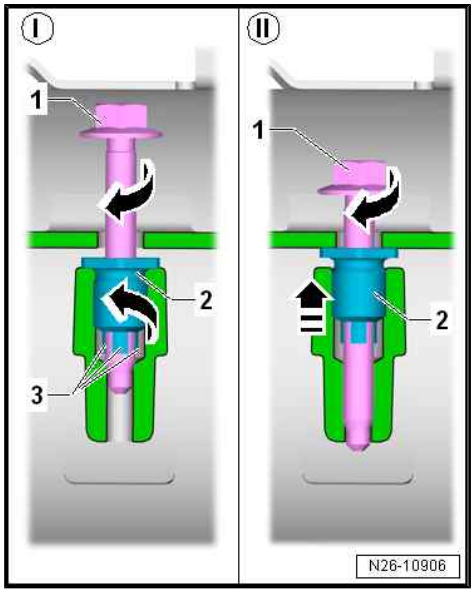
Tightening torques

- ⇒ “8.1 Exploded view - Lambda probe”, page 307
- Measuring tube ⇒ “2.1 Exploded view - cylinder head cover”, page 94
- ⇒ “2.2 Exploded view - electric coolant pump”, page 178
- ⇒ “2.1 Exploded view - assembly mountings”, page 27
- ⇒ Fig. ““Torque reaction support and cross member - tightening torques”“ , page 28
- Wheel housing liner ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front)

2.3.2 Removing and installing emission control module - Audi Q5

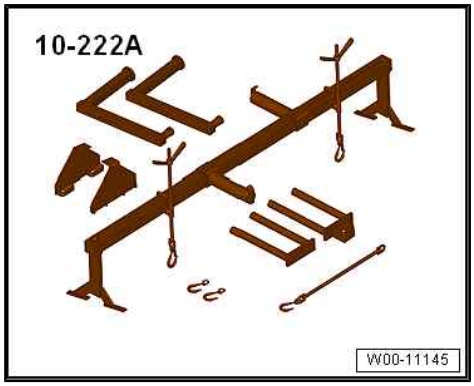
Note

The emission control module is secured to the engine in part by a compensation element. This compensation element has a left-hand thread on the outside. When the bolt -1- is screwed in, the friction against the retaining tabs -3- initially causes the compensation element -2- to turn as well. Even though the bolt is turned clockwise, the left-hand thread causes the compensation element to move towards the bolt head, which compensates for the play between the components. The compensation element must rotate freely on the left-hand thread, otherwise the retaining tabs will not produce enough friction on the bolt to turn the compensation element. To avoid impairing the required friction, ensure that the retaining tabs do not come in contact with any lubricant.

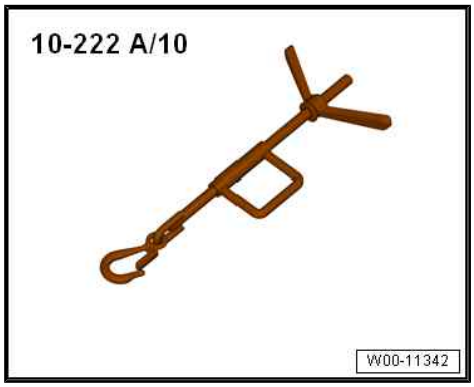


Special tools and workshop equipment required

- Support bracket - 10 - 222 A-



- Hook - 10 - 222 A /10-

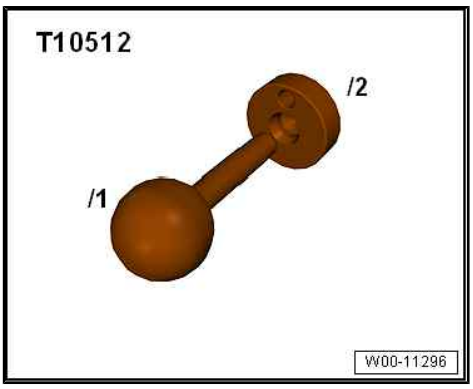


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♦ Socket (8 mm) - 3247-



♦ Calibration tool - T10512-



Removing

– Remove exhaust gas recirculation cooler ⇒ page 404 .

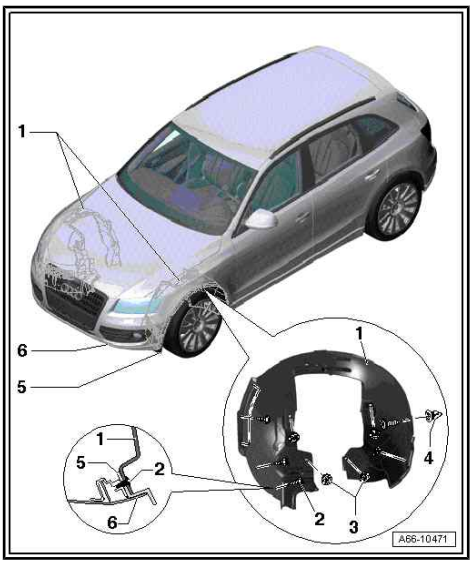
– Remove torque reaction support ⇒ page 30 .

– Remove front wheel housing liner (right-side) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front) .

WARNING

When working on all parts of the exhaust system:

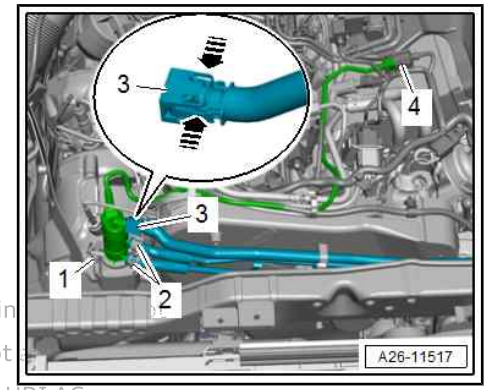
- ***Observe safety precautions when working on the exhaust system***
  ⇒ "2.6 Safety precautions when working on the exhaust system", page 5 .



– Release hose clip -1-.

– Move coolant hoses -2- and SCR hose -3- clear.

– Detach injector for reducing agent - N474- and place to one side.

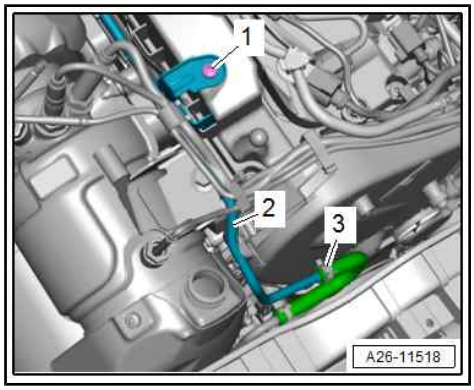


Note

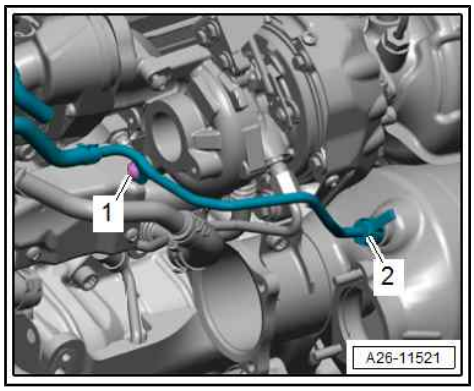
-Item 4- and -arrows- can be disregarded.

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– Release hose clip -3- and detach hose.
– Remove bolt -1- and push measuring tube -2- to side.



– Remove union nut -2- and bolt -1- and move measuring tube to one side.

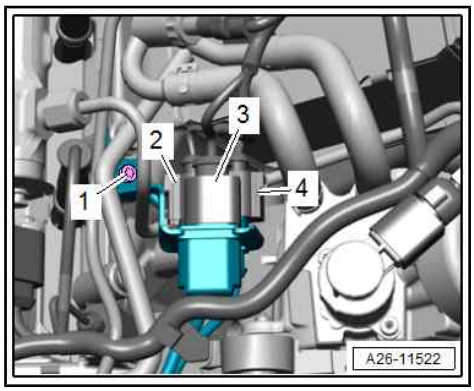


– Detach electrical connectors from bracket, unplug connectors and move electrical wiring clear:

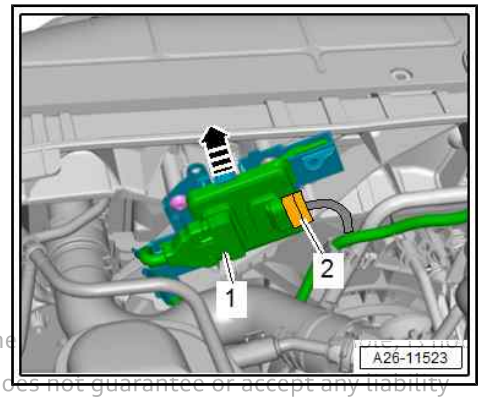
2 - For exhaust gas temperature sender 3 - G495-

3 - For Lambda probe - G39-

4 - For exhaust gas temperature sender 2 - G448-



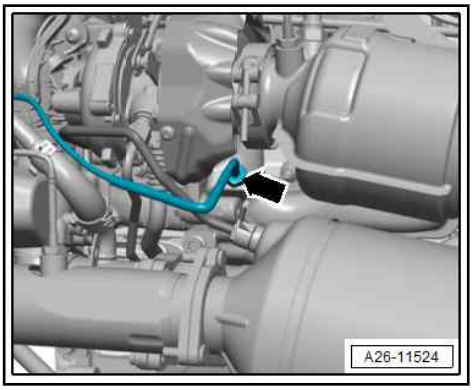
– Unplug electrical connector -2-.
– Release fastener -arrow- and move control unit for NOx sender - J583- -item 1- clear.



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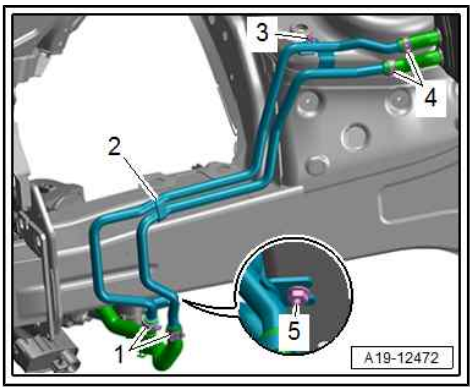
– Unscrew exhaust gas temperature sender 1 - G235- -arrow-.

Step only required on vehicles with auxiliary heater:

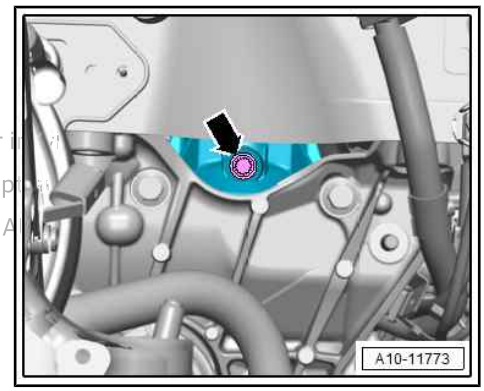


– Loosen nut -5-.
– Release hose clips -1- and -4- and disconnect coolant hoses.
– Unscrew nut -3-.
– Remove coolant pipes -2-.

All vehicles:

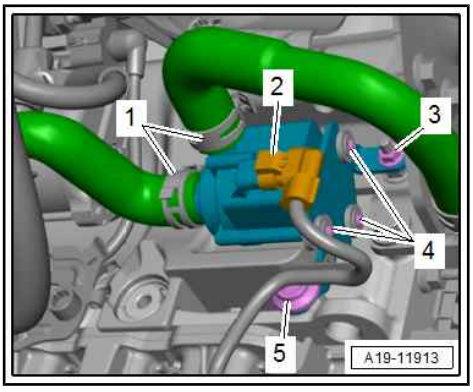


– Remove bolt -arrow- for engine mounting (right-side).

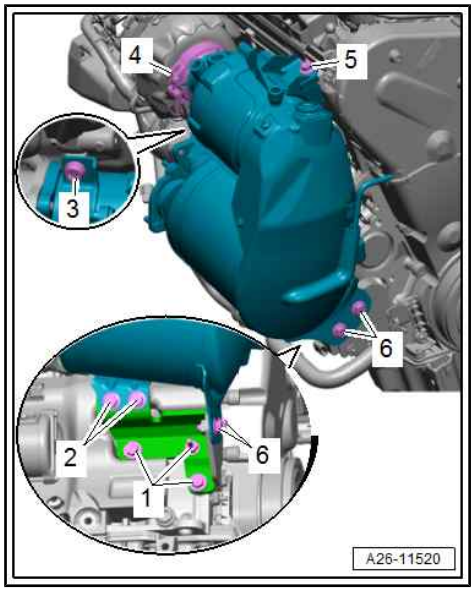


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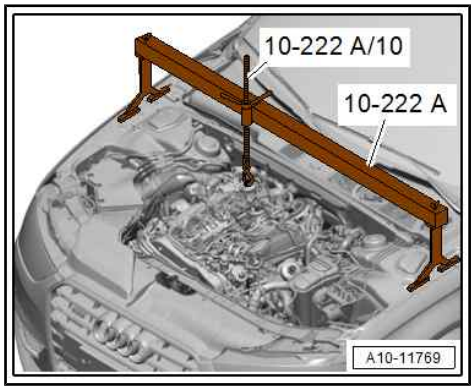
– Remove nut -3- and bolt -5- and push auxiliary pump for heating - V488- clear to one side.



– Open clip -4- and place it on intake funnel of emission control module.
– Remove bolts in the sequence: -5, 6, 2, 3- and slacken bolts -1-.



– Set up support bracket - 10 - 222 A- on wing mounting flanges (left and right) as illustrated.
– Attach hook - 10 - 222 A /10- to engine lifting eye (rear right).
– Use hook to raise engine until emission control module can be detached.
– Lift out emission control module.



Installing

Note

- *Renew bolts tightened with specified tightening angle.*
- *Renew seals, self-locking nuts and screw-type clips for emission control module.*
- *Re-fit all cable ties and heat insulation sleeves in the same locations when installing.*

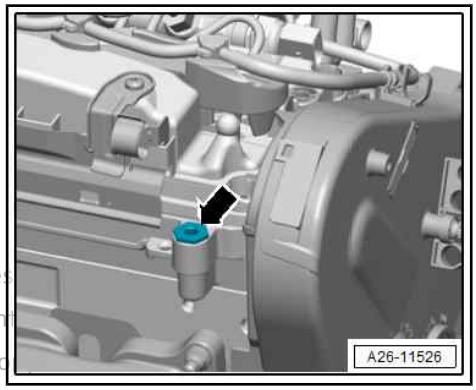
Caution

Emission control module must be installed free of tension to avoid risk of stress fractures and engine damage.

- ***Prior to installation, ensure that the compensation element moves easily and does not stick.***
- ***Compensation element must turn easily on its threads.***
- ***Only apply lubricant to thread; retainer tabs must remain clean.***
- ***The retainer tabs for the bolt must be bent together so that when the bolt is screwed in, the compensation element turns as well.***

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– Check to ensure freedom of movement of compensation element -arrow-.
– Unscrew compensation element completely in clockwise direction (left-hand thread).
– Clean thread if it does not turn easily and lubricate lightly with rust remover if necessary.

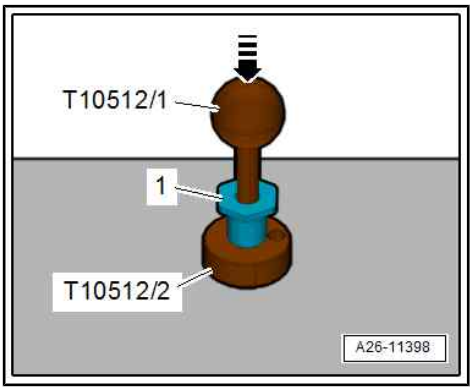


Caution

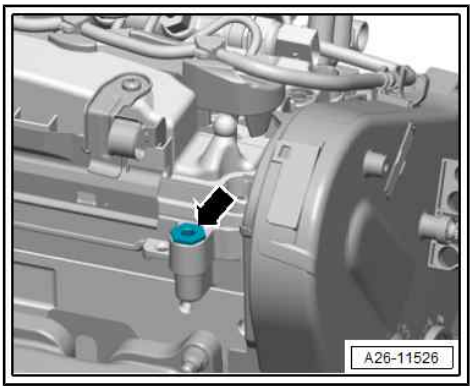
Do not use any kind of lubricant on the retaining tabs of the compensation element, as this will reduce the build-up of friction and compromise the function of the compensation element.

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– Adjust retainer tabs to functional dimension using calibration tool -T10512/1-2- as follows:
– Slide compensation element -1- onto pin -T10512/1- , insert into centring sleeve -T10512/2- and bend back retainer tabs by gently striking -arrow- ball head with heel of your hand.



– Tighten compensation element -arrow- to 3 Nm and slacken again by 90°.

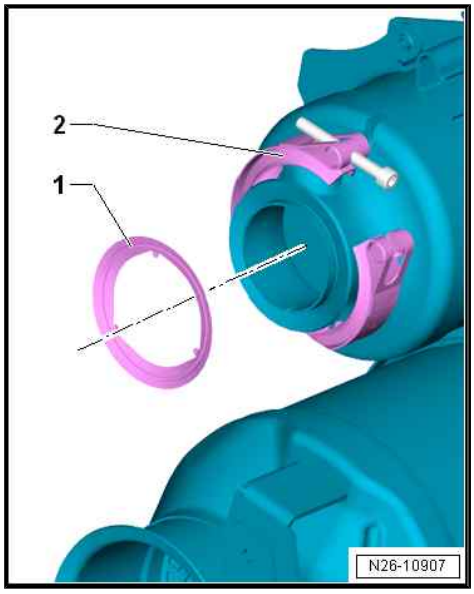


Note

Renew seal -1- and screw-type clip -2-.

– Fit seal -1- onto emission control module.

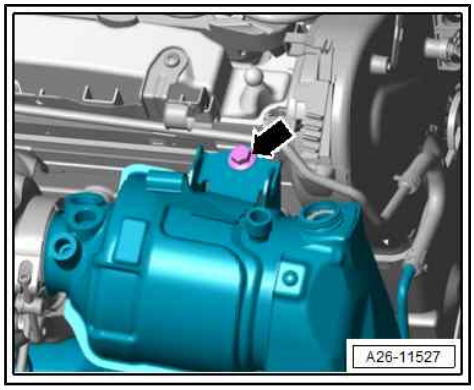
– Disengage screw on clip -2- and move clip all the way onto intake funnel of emission control module. Do not bend clip open.



– Guide emission control module into installation position.

– Insert bolt -arrow- to secure in place.

• Emission control module is now suspended approximately in installation position with its weight supported.

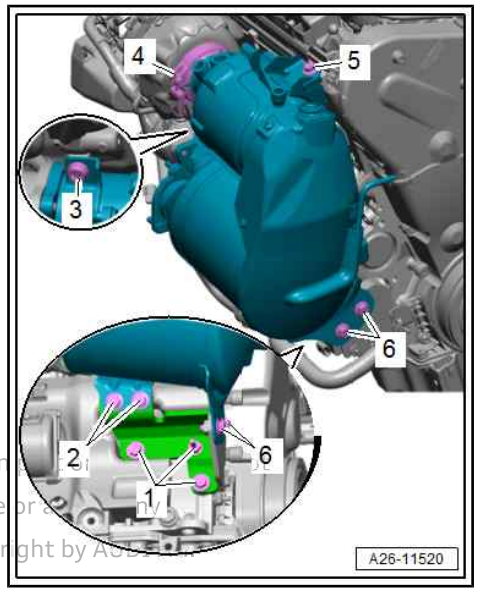


Note

Renew all securing bolts for emission control module.

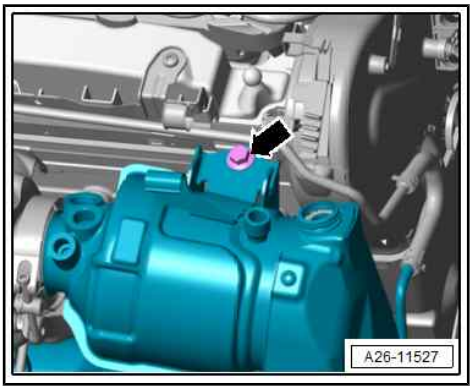
Tightening sequence for emission control module

Stage	Bolt	Step
1.	Screw-type clip -4-	Fit over sealing flange, engage screw and tighten to 1 Nm
2.	Bolt -3-	Tighten to 2 Nm and loosen immediately by 90°
3.	Screw-type clip -4-	Tighten to 7 Nm
4.	Bolt -3-	Tighten to 20 Nm
5.	Bolts -1-	Tighten to 2 Nm and loosen immediately by 90°
6.	Bolts -2-	Tighten to 2 Nm and loosen immediately by 90°
7.	Bolts -6-	Tighten to 2 Nm
8.	Bolts -1-	Tighten to 20 Nm
9.	Bolt -6-	Tighten to 20 Nm
10.	Bolt -2-	Tighten to 20 Nm

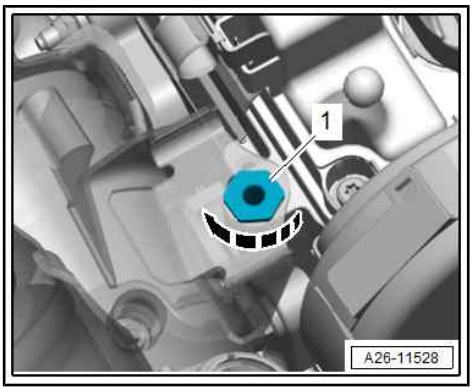


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– Remove bolt -arrow- previously inserted to secure in place.



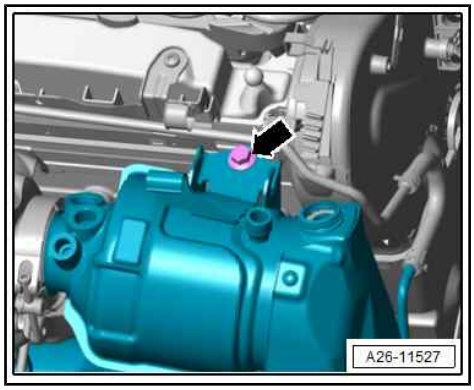
– Using socket, 8 mm - 3247- , unscrew compensation element (left-hand thread) -1- on cylinder head in direction of -arrow- to 2 Nm until it makes contact, then turn 90° further.



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Tightening sequence continued

Stage	Bolt	Step
11.	Bolt -arrow-	Insert and press until it engages
12.	Bolt -arrow-	Tighten to 20 Nm
13.	Bolt -arrow-	Turn 90° further
14.	Bolt -arrow-	Turn another 45° further



Further installation is carried out in the reverse order; note the following:

– Install exhaust gas temperature sender 1 - G235-
⇒ “4.2.1 Removing and installing exhaust gas temperature sender 1 G235 ”, page 390 .

– Install injector for reducing agent - N474-
⇒ “3.8 Removing and installing injector for reducing agent N474 ”, page 375 .

– Install exhaust gas recirculation cooler
⇒ “5.4 Removing and installing exhaust gas recirculation cooler”, page 404 .

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 - Replacing engine CU / particulate filter`

Tightening torques

- Measuring tube
⇒ “2.1 Exploded view - cylinder head cover”, page 94
- ⇒ “2.2 Exploded view - electric coolant pump”, page 178
- ⇒ “2.1 Exploded view - assembly mountings”, page 27
- ⇒ Fig. ““Torque reaction support and cross member - tightening torques”“, page 28
- Wheel housing liner ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front)

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2.4 Removing and installing exhaust flap control unit - J883-

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WARNING

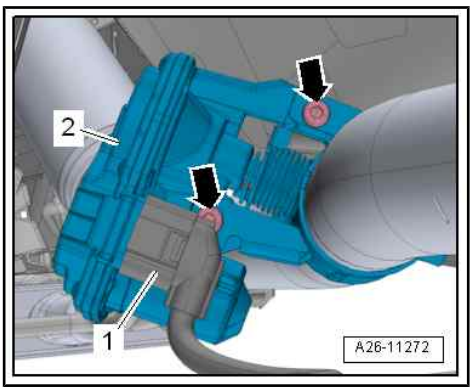
When working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system***
  ⇒ "2.6 Safety precautions when working on the exhaust system", page 5 .

Removing

– Unplug electrical connector -1-.

– Unscrew bolts -arrows- and remove exhaust flap control unit - J883- .

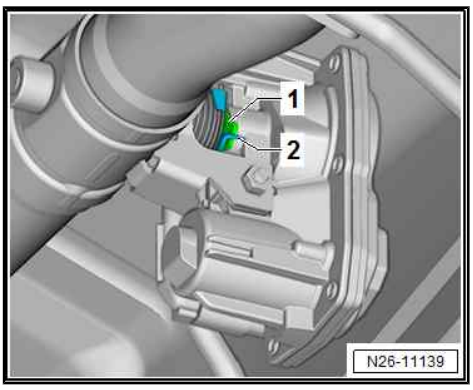


Installing

– Fit exhaust flap control unit.

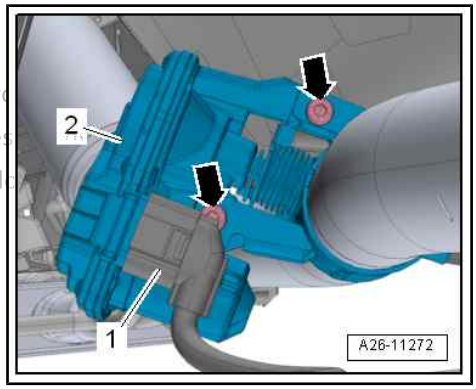
• Coupling -1- must engage in retainer of exhaust flap -2-.

– Fit new securing bolts and nuts.



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– Tighten upper bolt first, then tighten lower bolt.
– Remove protective cap for electrical connector and plug connector -1- in. Secure heat insulation sleeve if necessary.



Tightening torques

◆ ⇒ Item 12 (page 320)

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 elec. adjuster with checkback`

3 SCR (selective catalytic reduction) system

⇒ “3.1 Exploded view - reducing agent tank”, page 357

⇒ “3.2 Exploded view - reducing agent supply line”, page 362

⇒ “3.3 Exploded view - delivery unit for reducing agent”, page 364

⇒ “3.4 Exploded view - control unit for reducing agent metering system”, page 366

⇒ “3.5 Disconnecting reducing agent supply line”, page 367

⇒ “3.6 Draining reducing agent tank”, page 369

⇒ “3.7 Removing and installing delivery unit for reducing agent”, page 372

⇒ “3.8 Removing and installing injector for reducing agent N474 ”, page 375

⇒ “3.9 Removing and installing reducing agent tank”, page 377

⇒ “3.10 Removing and installing transfer pump for reducing agent V436 ”, page 383

⇒ “3.11 Removing and installing control unit for reducing agent metering system J880 ”, page 385

⇒ “3.12 Resetting SCR learnt values”, page 387

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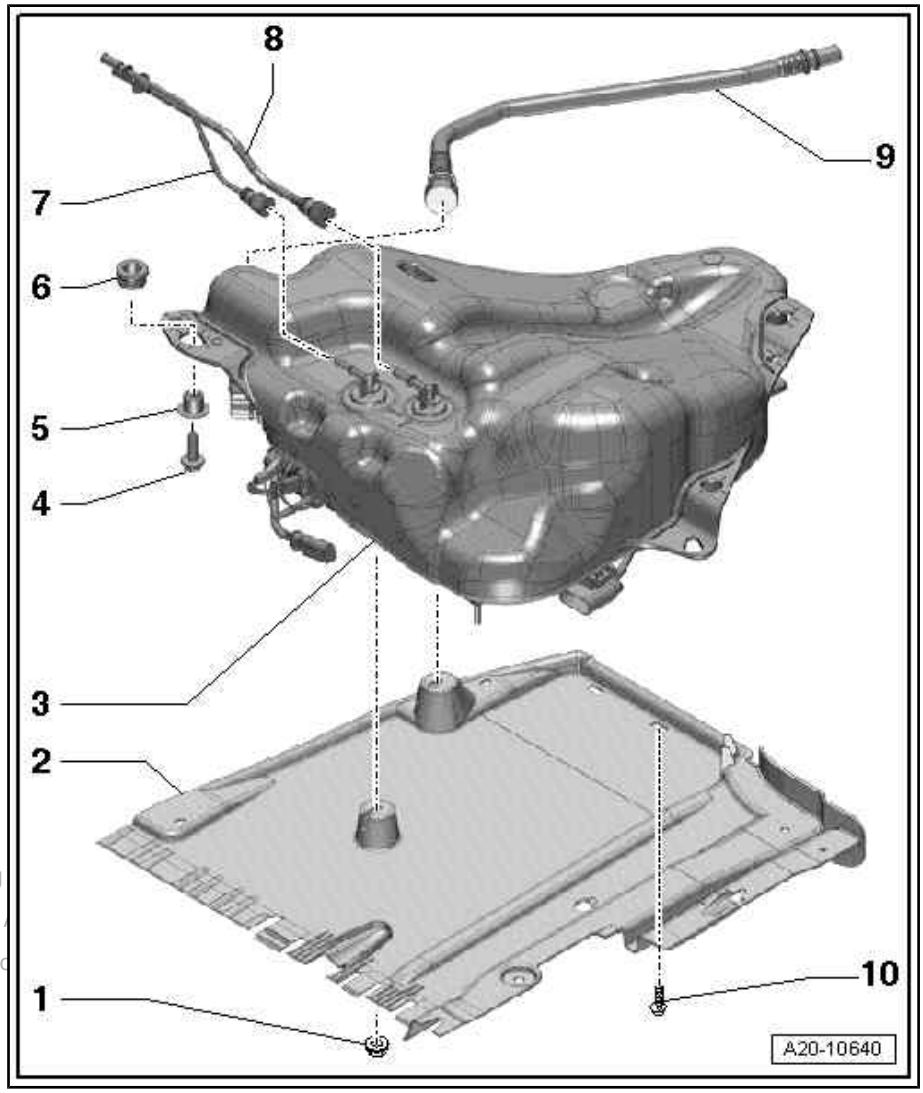
3.1 Exploded view - reducing agent tank

⇒ “3.1.1 Exploded view - reducing agent tank, Audi A4 and A5”, page 357

⇒ “3.1.2 Exploded view - reducing agent tank, Audi Q5”, page 361

3.1.1 Exploded view - reducing agent tank, Audi A4 and A5

Active tank



1 - Nut
- ❑ 2 Nm

2 - Cover
- ❑ For active tank

3 - Active tank
- ❑ For reducing agent
- ❑ Removing and installing ⇒ page 377

4 - Bolt
- ❑ 20 Nm

5 - Sleeve

6 - Grommet

7 - Transfer line
- ❑ From transfer pump for reducing agent - V436- to active tank

> **WARNING**
> *Safety risk due to escaping reducing agent. Observe safety measures for handling reducing agent ⇒ page 4 .*

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8 - Breather line
- ❑ From filler neck

> **WARNING**
> *Safety risk due to escaping reducing agent. Observe safety measures for handling reducing agent ⇒ page 4 .*

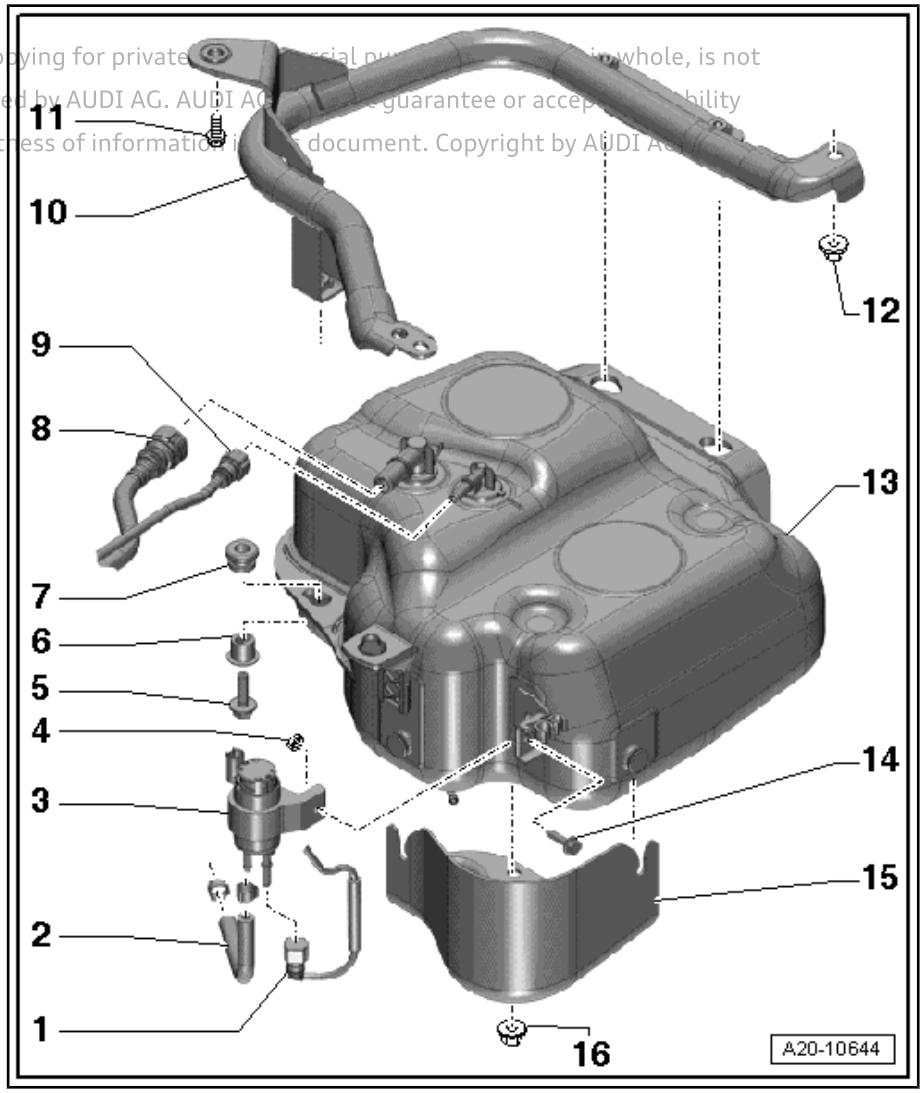
9 - Filler line
- ❑ From filler neck

> **WARNING**
> *Safety risk due to escaping reducing agent. Observe safety measures for handling reducing agent ⇒ page 4 .*

10 - Bolt
- ❑ 4.2 Nm

Passive tank

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1 - Transfer line

- ❑ To active tank
- ❑ Clip onto fuel tank

> **WARNING**
> *Safety risk due to escaping reducing agent. Observe safety measures for handling reducing agent ⇒ page 4 .*

2 - Connecting hose

- ❑ From passive tank to transfer pump for reducing agent - V436-

3 - Transfer pump for reducing agent - V436-

- ❑ Removing and installing ⇒ page 383

4 - Nut

- ❑ 1.8 Nm

5 - Bolt

- ❑ 20 Nm

6 - Sleeve

7 - Grommet

8 - Filler line

- ❑ From filler neck

> **WARNING**
> *Safety risk due to escaping reducing agent. Observe safety measures for handling reducing agent ⇒ page 4 .*

9 - Breather line

- ❑ To filler neck
- ❑ Clip onto fuel tank

10 - Retaining frame

- ❑ For passive tank

11 - Bolt

- ❑ 20 Nm

12 - Nut

- ❑ 20 Nm

13 - Reducing agent tank

- ❑ Passive tank
- ❑ Fitting location: on underbody (rear right)
- ❑ Removing and installing ⇒ page 371

14 - Bolt

- ❑ 1.8 Nm

15 - Cover

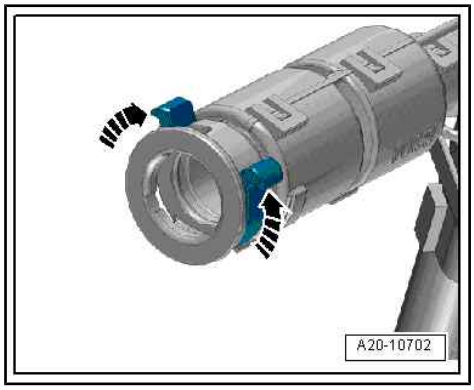
- ❑ For transfer pump for reducing agent - V436-

16 - Nut

- ❑ 2.1 Nm

Disconnecting breather line

– To disconnect breather line, press release catches in direction of -arrows-.

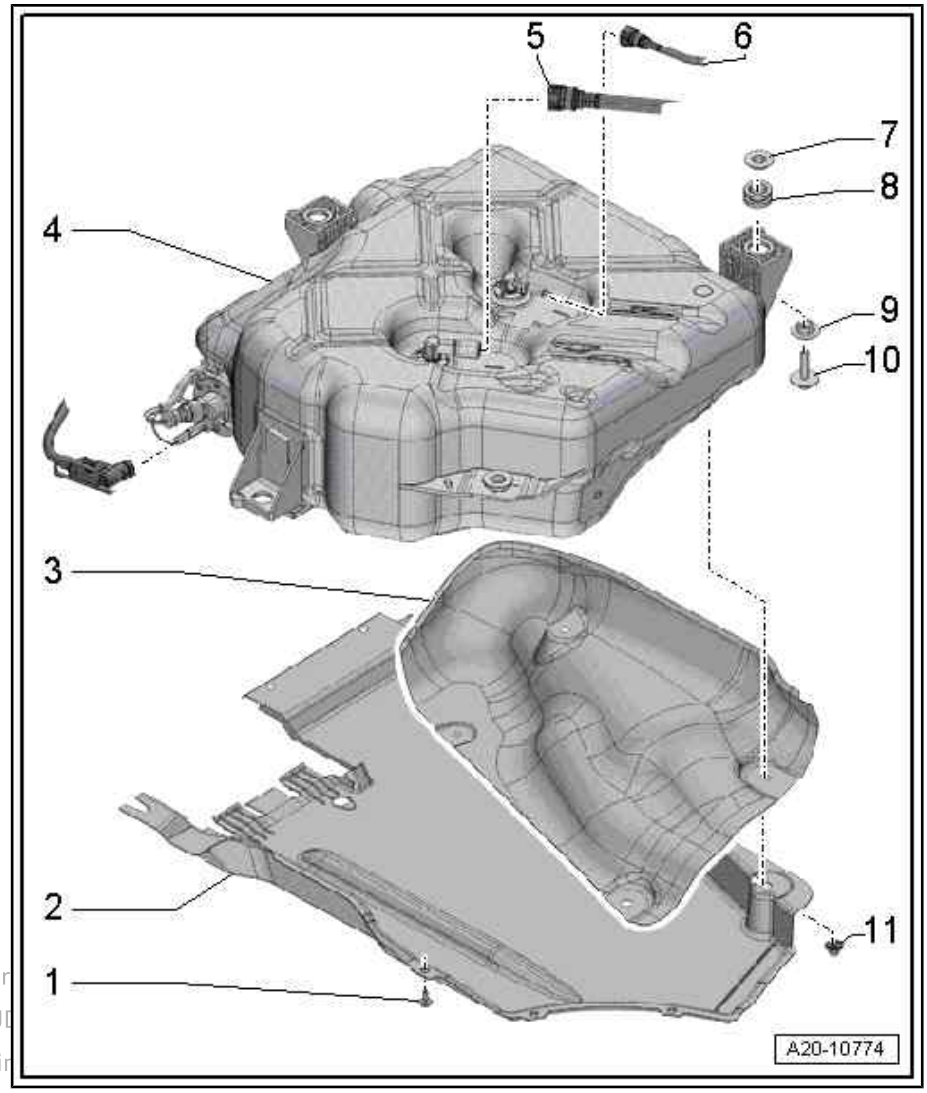


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3.1.2 Exploded view - reducing agent tank, Audi Q5

Note

Fitting location: Beneath left rear seat on underside of vehicle.



1 - Bolt

- ❑ 4.2 Nm

2 - Aerodynamic fairing (rear left)

- ❑ Removing and installing ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim; Exploded view - underbody trim

3 - Heat shield

- ❑ For reducing agent tank

4 - Reducing agent tank

- ❑ Removing and installing ⇒ page 377

5 - Filler line

- ❑ Disconnecting reducing agent lines ⇒ “3.5 Disconnecting reducing agent supply line”, page 367
- ❑ From filler neck

WARNING

Safety risk due to escaping reducing agent. To prevent large amounts of reducing agent from escaping when the reducing agent line is opened, wait until the reducing agent has been drawn back automatically ⇒ page 4 .

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6 - Breather line

- ❑ Disconnecting reducing agent lines ⇒ “3.5 Disconnecting reducing agent supply line”, page 367
- ❑ From filler neck

WARNING

Safety risk due to escaping reducing agent. To prevent large amounts of reducing agent from escaping when the reducing agent line is opened, wait until the reducing agent has been drawn back automatically ⇒ page 4 .

7 - Sleeve

8 - Grommet

9 - Sleeve

10 - Bolt

- ❑ 20 Nm

11 - Nut

- ❑ Tightening torque ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim; Exploded view - underbody trim

3.2 Exploded view - reducing agent supply line

1 - Emission control module

- ❑ Particulate filter with catalytic converter
- ❑ Removing and installing ⇒ page 335

2 - Retaining clamp

- ❑ Renew after removing

3 - Bolt

- ❑ 5 Nm

4 - Seal

- ❑ Renew after removing

5 - Injector for reducing agent - N474-

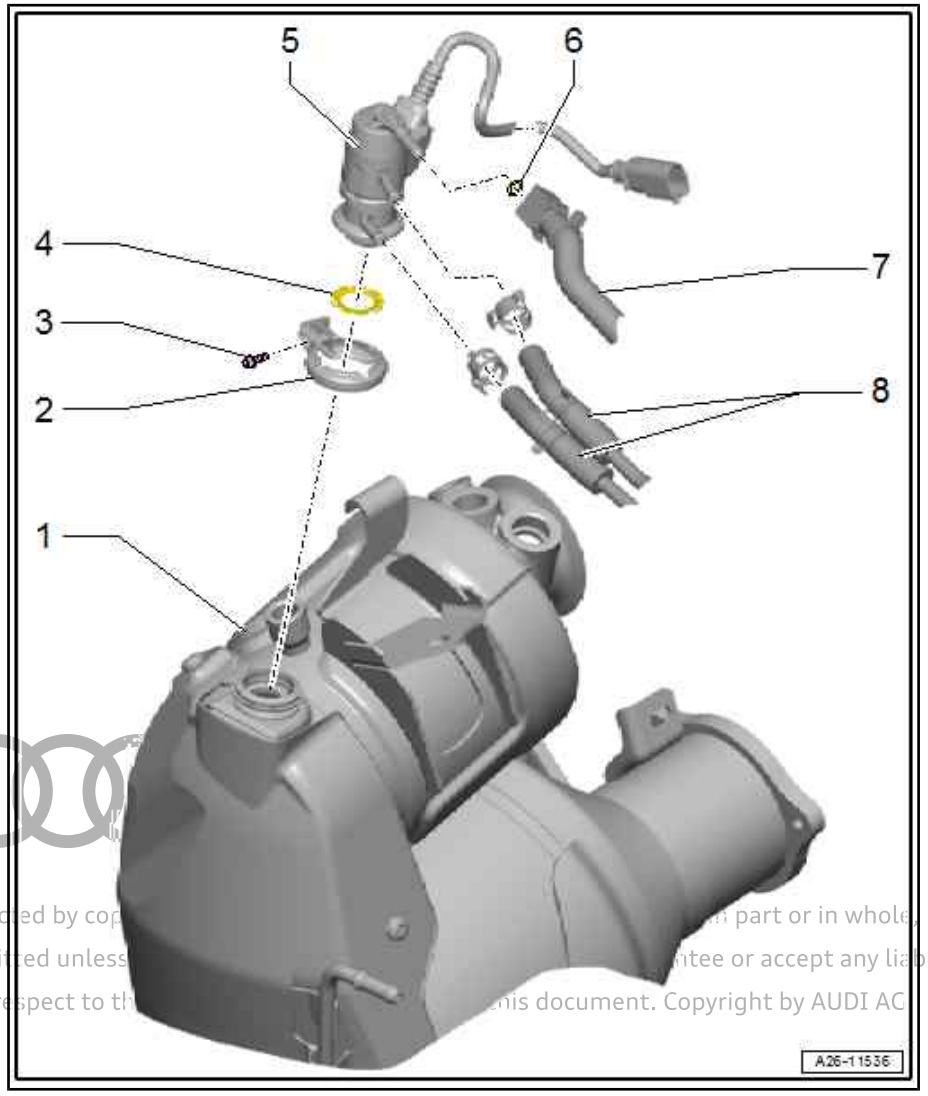
- ❑ Removing and installing ⇒ page 375
- ❑ Lugs in injector for reducing agent - N474- must be inserted in corresponding mountings in front exhaust pipe.

6 - O-ring

- ❑ Check for damage; reducing agent line must be renewed if O-ring is damaged

7 - Reducing agent line

- ❑ From reducing agent pump - V437-
- ❑ With heater
- ❑ Press release tabs to disconnect
- ❑ Clip onto fuel tank



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WARNING

Safety risk due to escaping reducing agent.
To prevent large amounts of reducing agent from escaping when the reducing agent line is opened, wait until the reducing agent has been drawn back automatically *⇒ page 4* *.*

8 - Coolant hoses

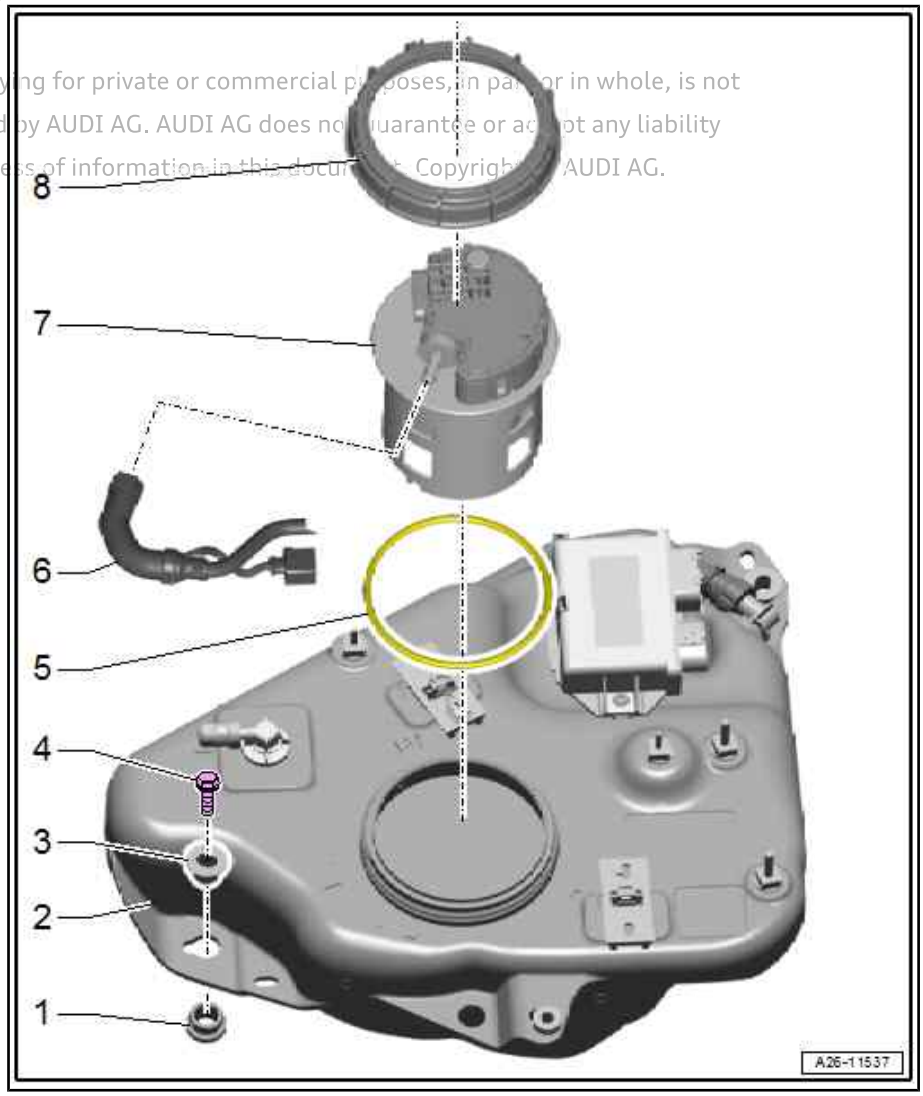
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3.3 Exploded view - delivery unit for reducing agent

⇒ "3.3.1 Exploded view - delivery unit for reducing agent, Audi A4 and A5", page 364

⇒ "3.3.2 Exploded view - delivery unit for reducing agent, Audi Q5", page 365

3.3.1 Exploded view - delivery unit for reducing agent, Audi A4 and A5



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1 - Rubber grommet

2 - Reducing agent tank

- ❑ Active tank
- ❑ Removing and installing ⇒ page 377

3 - Spacer bush

4 - Bolt

- ❑ 20 Nm

5 - Seal

- ❑ Renew
- ❑ Install dry
- ❑ Must not be twisted

6 - Reducing agent line

- ❑ To injector for reducing agent - N474-
- ❑ With heater for reducing-agent line - Z104-
- ❑ Press release tabs to disconnect
- ❑ Clip onto fuel tank

WARNING

Safety risk due to escaping reducing agent.
To prevent large amounts of reducing agent from escaping when the reducing agent line is opened, wait until the reducing agent has been drawn back automatically ⇒ page 4 .

7 - Delivery unit

- ❑ With:

- ♦ Filter
- ♦ Pump for reducing agent - V437-
- ♦ Pressure sender for reducing agent metering system - G686-
- ♦ Reducing agent level sender - G697-
- ♦ Heater for reducing agent tank - Z102-

- ❑ Removing and installing delivery unit ⇒ page 372
- ❑ Do not kink heating mats when installing

8 - Union nut

- ❑ Renew after removing
- ❑ Remove and install using key - T40283-
- ❑ Tightening ⇒ page 373

3.3.2 Exploded view - delivery unit for reducing agent, Audi Q5

1 - Reducing agent tank

2 - Seal

- ❑ Renew
- ❑ Install dry

3 - Delivery unit

- ❑ With:
  - ♦ Tank sender for reducing agent - G684-
  - ♦ Temperature sender for reducing agent - G685-
  - ♦ Pressure sender for reducing agent metering system - G686-
  - ♦ Pump for reducing agent - V437-
  - ♦ Heater for reducing agent tank - Z102-
  - ♦ With filter
    - ❑ Removing and installing ⇒ page 372

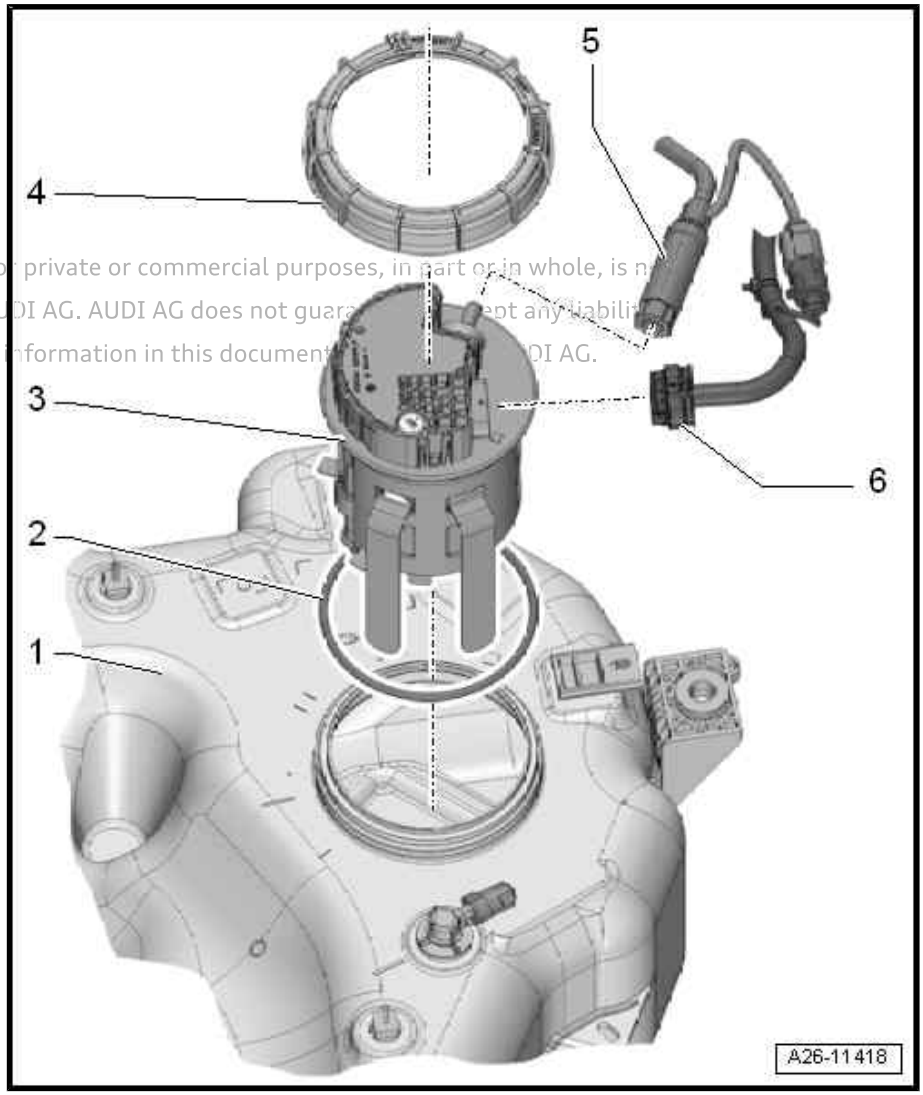
4 - Union nut

- ❑ Remove and install using key - T40283-

5 - Reducing agent line

- ❑ To injector for reducing agent - N474-
- ❑ With heater for reducing agent line (heater circuit 2) - Z104-
- ❑ Disconnecting reducing agent lines ⇒ page 367

6 - Electrical connector



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3.4 Exploded view - control unit for reducing agent metering system

⇒ "3.4.1 Exploded view - control unit for reducing agent metering system J880 , Audi A4 and A5", page 366

⇒ "3.4.2 Exploded view - control unit for reducing agent metering system J880 , Audi Q5", page 367

3.4.1 Exploded view - control unit for reducing agent metering system - J880- , Audi A4 and A5

Note

Fitting location: control unit for reducing agent metering system - J880- is underneath tank.

1 - Control unit for reducing agent metering system - J880-

- ❑ Check in `Guided Fault Finding` ⇒ Vehicle diagnostic tester
- ❑ After renewal, parameters of control unit for reducing agent metering system - J880- must be set; see `Guided Functions` ⇒ Vehicle diagnostic tester `01 - Reduction agent metering control unit parameter setting`
- ❑ Removing and installing ⇒ page 385

2 - Electrical wiring harness

- ❑ With relay carrier and fuse carriers

3 - Base plate

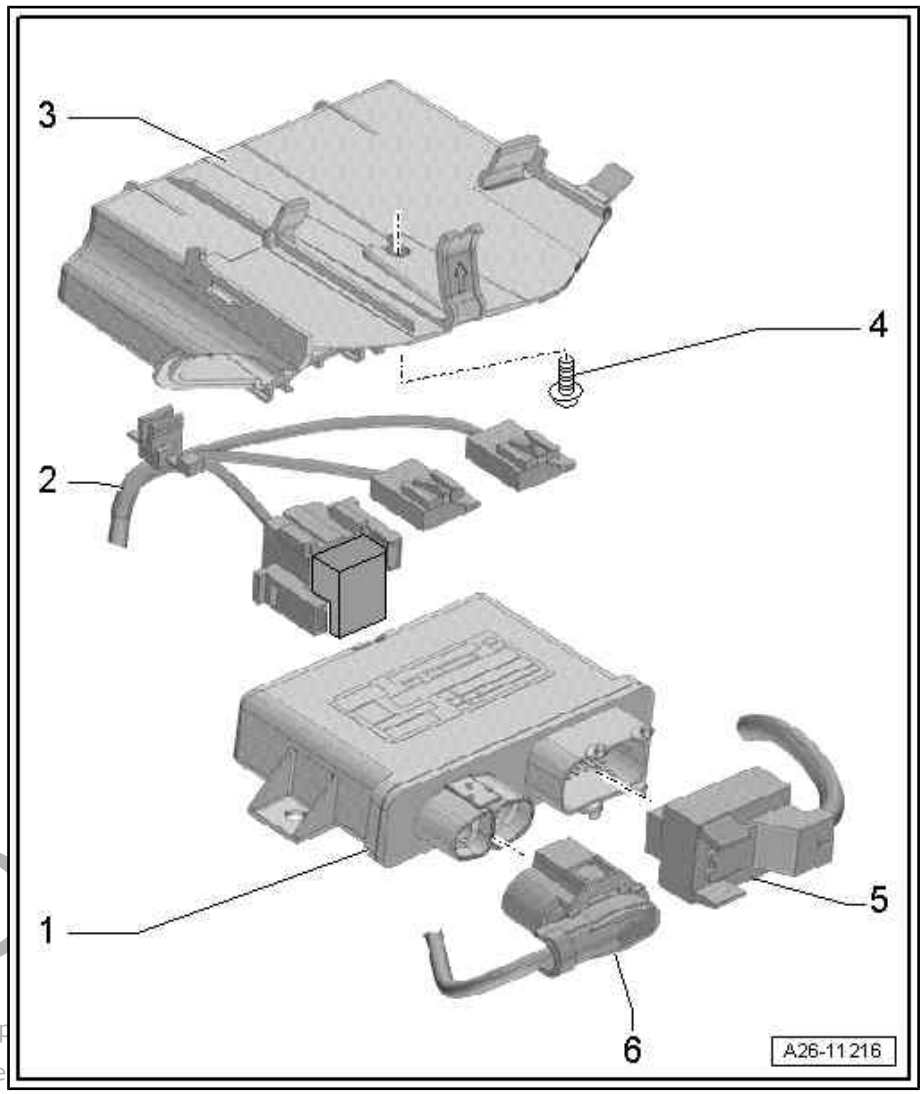
- ❑ For control unit for reducing agent metering system - J880-
- ❑ Part of tank

4 - Bolt

- ❑ 8 Nm

5 - Electrical connector

6 - Electrical connector



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3.4.2 Exploded view - control unit for reducing agent metering system - J880- , Audi Q5

Note

Fitting location: control unit for reducing agent metering system - J880- is fitted on underbody (left-side) in line with B-pillar.

1 - Electrical connector

2 - Control unit for reducing agent metering system - J880-

- ❑ Check in `Guided Fault Finding` ⇒ Vehicle diagnostic tester
- ❑ After renewal, parameters of control unit for reducing agent metering system - J880- must be set; see `Guided Functions` ⇒ Vehicle diagnostic tester `01 - Reduction agent metering control unit parameter setting`
- ❑ Removing and installing ⇒ page 385

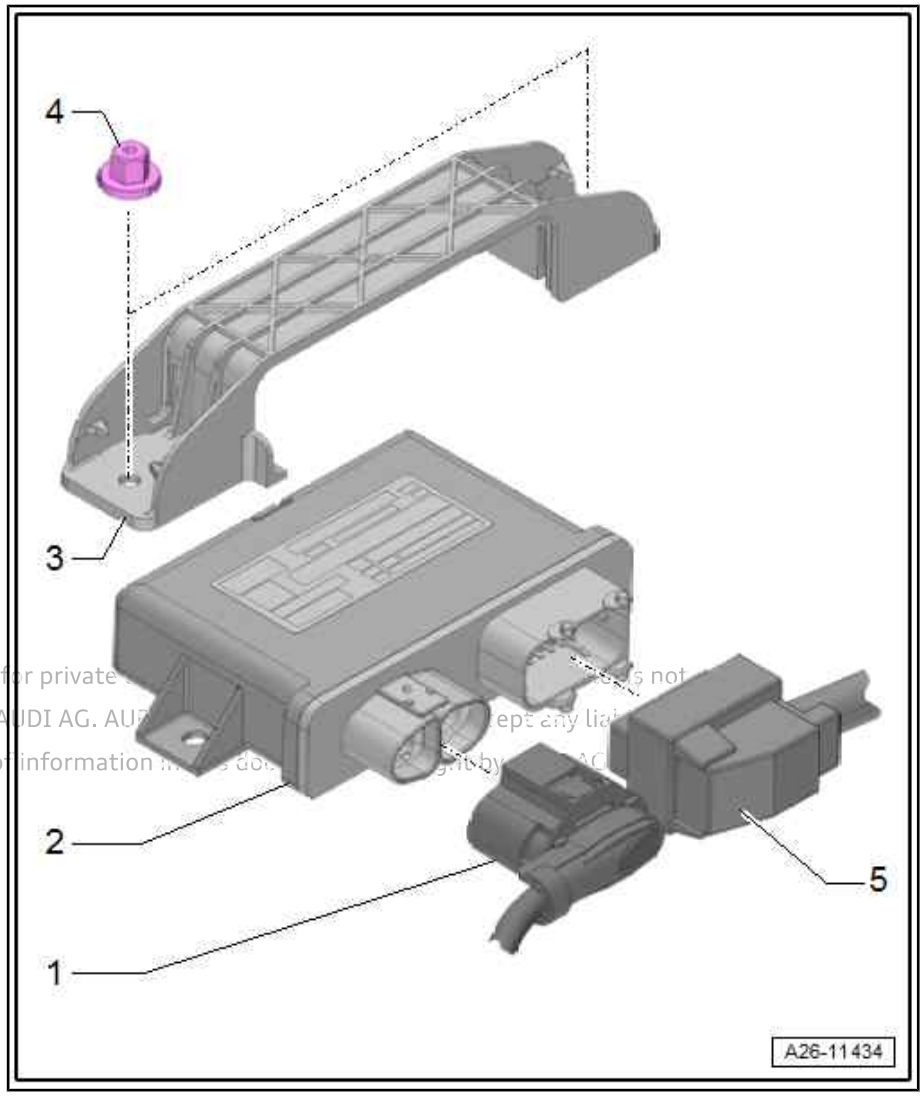
3 - Bracket

- ❑ For control unit for reducing agent metering system - J880-

4 - Nut

- ❑ 5 Nm

5 - Electrical connector



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3.5 Disconnecting reducing agent supply line

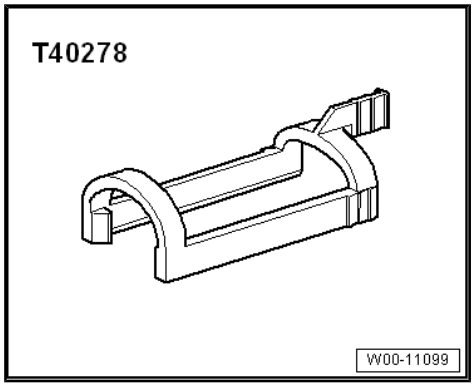
Different types of reducing agent lines are installed depending on the model year.

Release tool - T40278- does not have to be used on all lines.

In some cases the reducing agent lines can be disconnected by hand without using the tool.

Special tools and workshop equipment required

♦ Release tool - T40278-



Procedure

WARNING

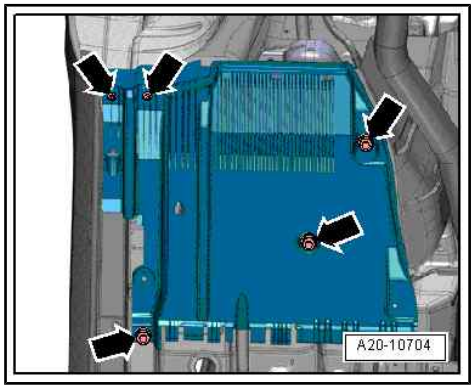
Safety risk due to escaping reducing agent.

- ***Observe safety measures for handling reducing agent*** ***⇒ page 4*** ***.***
- ***To prevent large amounts of reducing agent from escaping when the reducing agent line is opened, wait until the reducing agent has been drawn back automatically*** ***⇒ page 4*** ***.***
- ***Put on safety goggles.***

– Remove wheel spoiler (rear left) ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim; Exploded view - underbody trim .

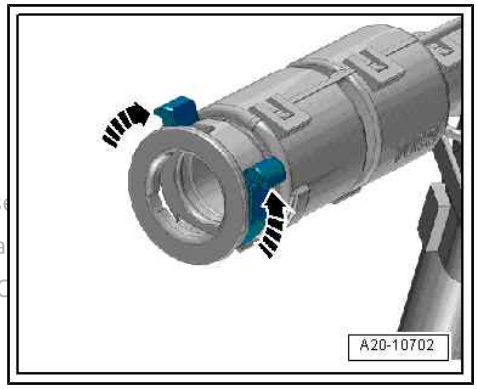
– Place drip tray underneath.

Different connectors may be installed, depending on vehicle version.



Version 1

– Press release catches in direction of -arrows- and detach reducing agent line.

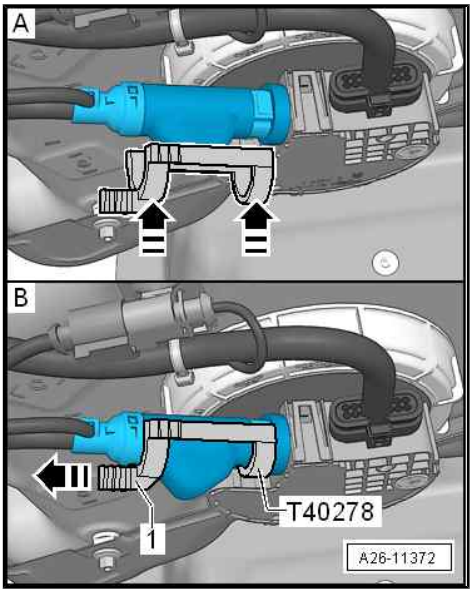


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Version 2

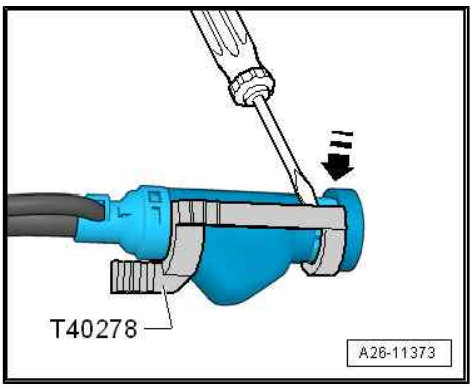
– Push release tool - T40278- onto connector in direction of -arrows-, as shown in illustration A.

– Pull release tool - T40278- by retainer -1- in direction of -arrow-, as shown in illustration B.



– Use a small screwdriver to remove release tool - T40278- , as shown in illustration.

– Electrical connector must be unplugged in order to remove reducing agent line.



After re-installing, the following step must be carried out:

– Adapt learnt value after draining reducing agent or renewing components
⇒ “3.12 Resetting SCR learnt values”, page 387 .

3.6 Draining reducing agent tank

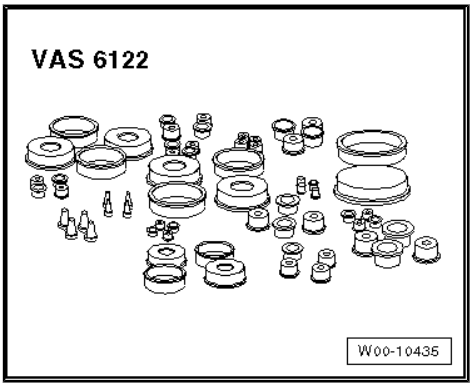
⇒ “3.6.1 Draining reducing agent tank - active tank”, page 369
⇒ “3.6.2 Draining reducing agent tank - passive tank”, page 371

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3.6.1 Draining reducing agent tank - active tank

Special tools and workshop equipment required

♦ Engine bung set - VAS 6122-



♦ Drip tray

Procedure

WARNING

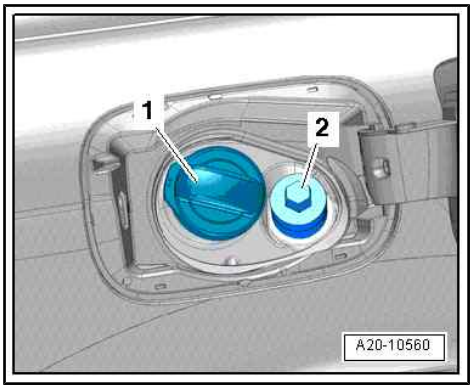
Safety risk due to escaping reducing agent.

- ***Observe safety measures for handling reducing agent ⇒ page 4 .***
- ***To prevent large amounts of reducing agent from escaping when the metering line is opened, wait until the reducing agent has been drawn back automatically ⇒ page 4 .***

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– Open tank flap.

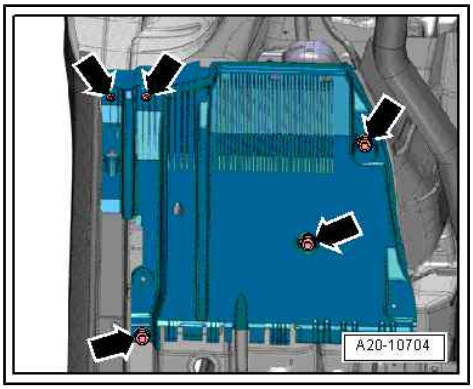
– Unscrew filler cap -2- from filler neck for reducing agent.



Note

Disregard -item 1-.

– Remove wheel spoiler (rear left) ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim; Exploded view - underbody trim .



– Place drip tray underneath.

– Press release tab to remove plug -arrow-, drain off reducing agent into a drip tray and refit plug.

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

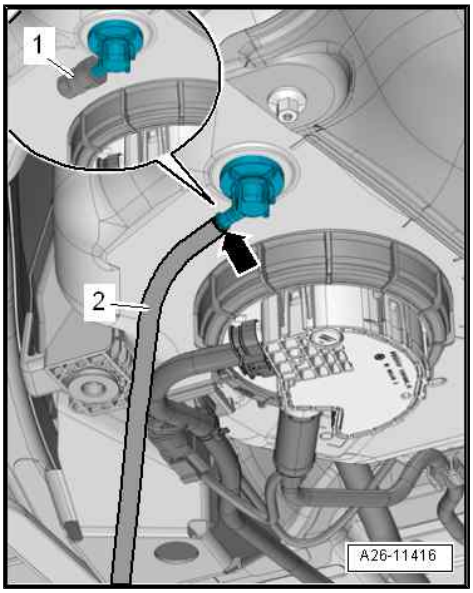
After re-filling, the following step must be carried out:

– Adapt learnt value after draining reducing agent or renewing components
⇒ “3.12 Resetting SCR learnt values”, page 387 .

Tightening torques

- Rear wheel spoiler ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim; Exploded view - underbody trim

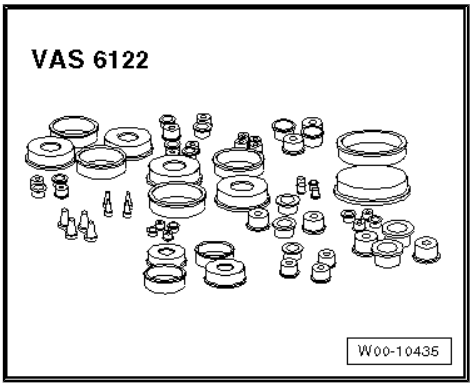
– Adapt learnt value after draining reducing agent or renewing components
⇒ “3.12 Resetting SCR learnt values”, page 387 .



3.6.2 Draining reducing agent tank - passive tank

Special tools and workshop equipment required

- Engine bung set - VAS 6122-



- Drip tray

Procedure

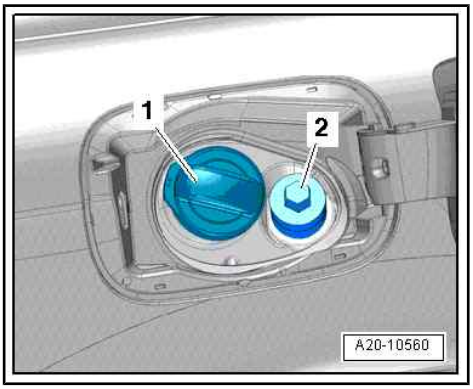
WARNING

Safety risk due to escaping reducing agent.

- *Observe safety measures for handling reducing agent ⇒ page 4 .*
- *To prevent large amounts of reducing agent from escaping when the metering line is opened, wait until the reducing agent has been drawn back automatically ⇒ page 4 .*

– Open tank flap.

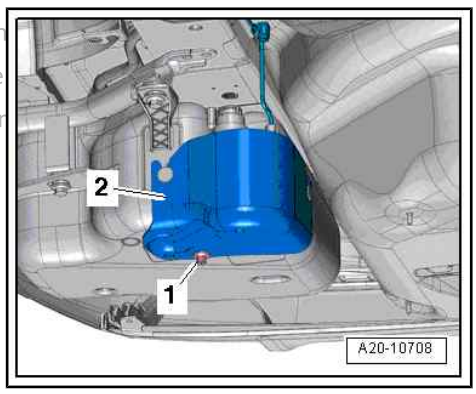
– Unscrew filler cap -2- from filler neck for reducing agent.



Note

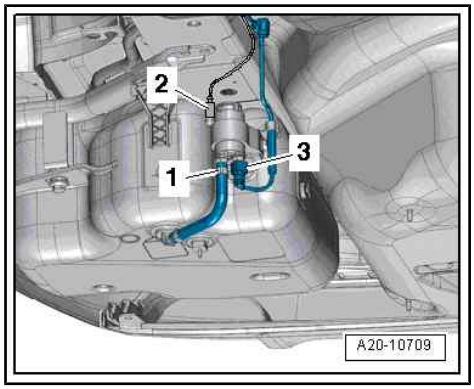
Disregard -item 1-.

– Unscrew nut -1- and detach cover -2- for transfer pump for reducing agent - V436- .



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– Place drip tray underneath.



Note

Hold a clean cloth under the separating point to catch escaping reducing agent.

– Release hose clip and disconnect connecting hose -1- from transfer pump for reducing agent - V436- . Then press hose down and hold end of hose into drip tray.
– Allow reducing agent to drain off into drip tray.
– Seal off open lines and connections with clean plugs from engine bung set - VAS 6122- .

Note

Disregard items -2 and 3-.

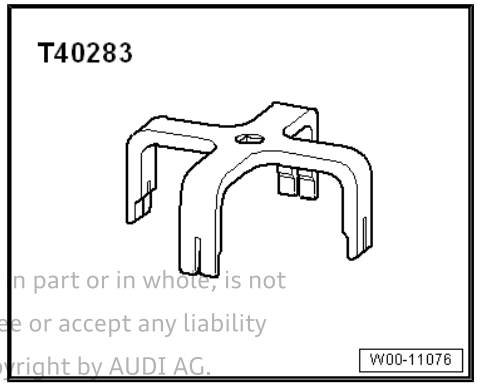
After re-filling, the following step must be carried out:

– Adapt learnt value after draining reducing agent or renewing components
⇒ “3.12 Resetting SCR learnt values”, page 387 .

3.7 Removing and installing delivery unit for reducing agent

Special tools and workshop equipment required

♦ Key - T40283-

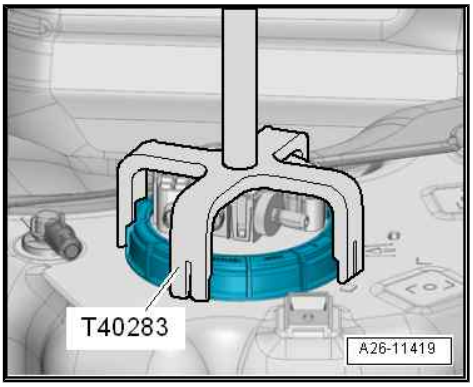


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Removing

– Remove reducing agent tank ⇒ page 377 .

– Unscrew union nut -2- using special wrench - T40283- and carefully lift off reservoir -1-.



WARNING

Reducing agent can cause skin irritation.

- *Observe safety measures when handling reducing agent ⇒ page 4 .*
- *To prevent large amounts of reducing agent from escaping when the metering line is opened, wait until the reducing agent has been drawn back automatically ⇒ page 4 .*
- *Put on safety goggles.*

Safety risk due to escaping reducing agent.

- *Keep in mind that the tank and the reservoir still contain a small amount of reducing agent.*

Installing

Note

- *Renew seal.*
- *Thoroughly clean sealing surfaces for seal.*

Different types may be installed, depending on vehicle version.

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Type A:

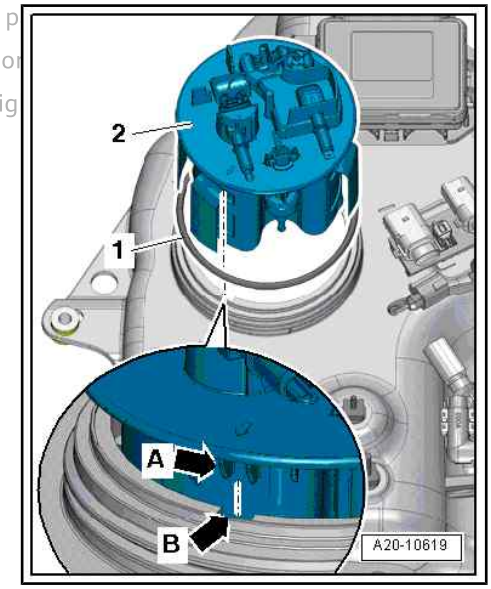
– Insert delivery unit -2- in active tank; while doing so, carefully slide heating mats into active tank through gap between delivery unit and installation opening.

– Slip new seal -1- over delivery unit so that it makes contact at installation opening.

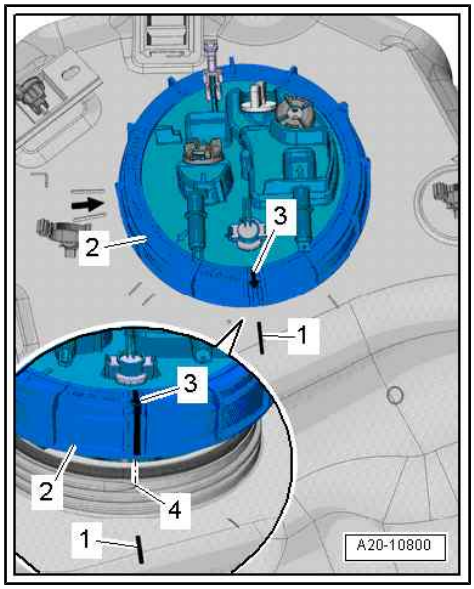
• The seal must not be twisted.

– Move delivery unit into installation position:

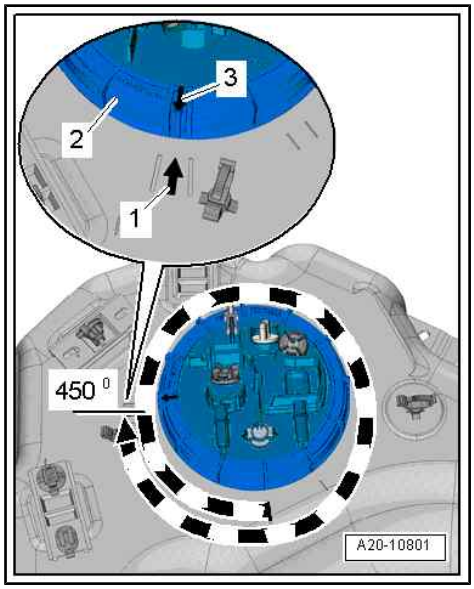
• Lug -arrow A- on delivery unit must engage in groove -arrow B- on edge of installation opening of tank.



– Position union nut -2- so that mark -3- is positioned above the first thread -4-. At this position there is an arrow -1- on the active tank.



– First tighten union nut by hand and then use special wrench -T40283- to tighten it a total of $^{5}/_{4}$ turns (450°).



Caution

When tightening union nut, make sure that reservoir does not rotate.

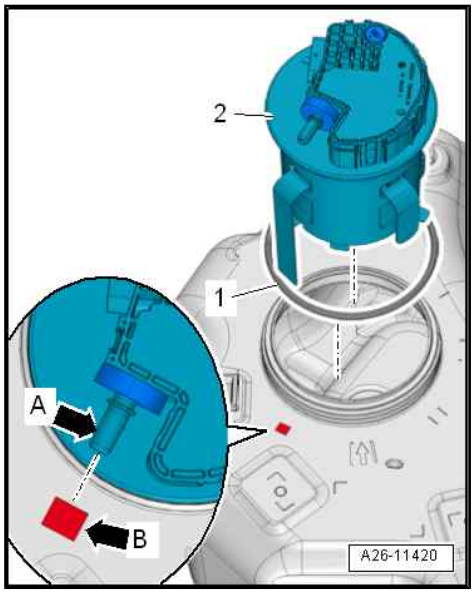
The reservoir must not be rotated out of its installation position.

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

– Install reducing agent tank ⇒ page 377 .

– Adapt learnt value after draining reducing agent or renewing components
⇒ “3.12 Resetting SCR learnt values”, page 387 .

Type B:



• Connection for reducing agent line -arrow A- must align with installation marking (square recess) -arrow B- on reducing agent tank.

– Insert delivery unit -2- in tank; while doing so, carefully slide heating element into tank through gap between delivery unit and installation opening.

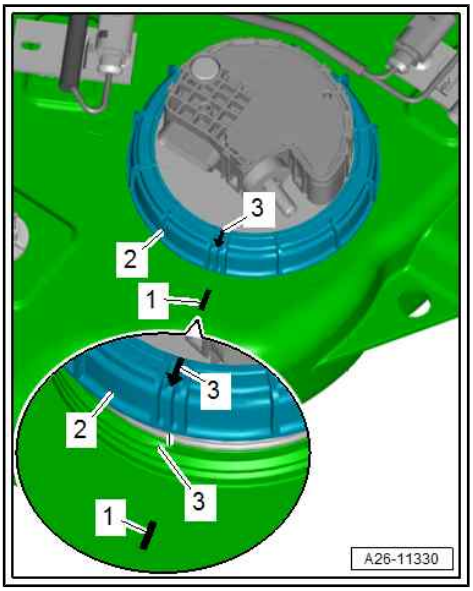
– Slip new seal -1- over delivery unit so that it makes contact at installation opening.

• The seal must not be twisted.

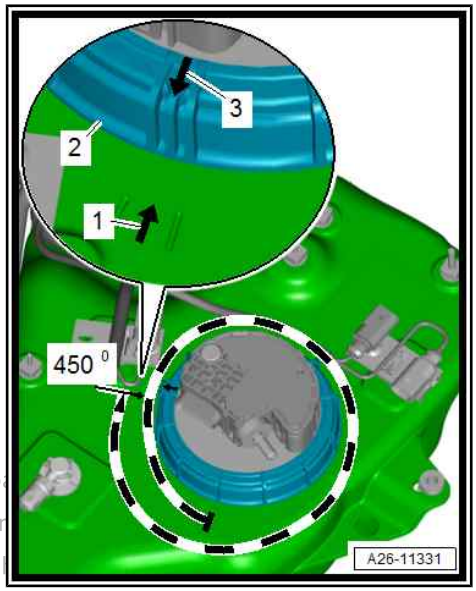
– Move delivery unit into installation position:

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– Mark -3- on new union nut -2- and mark -1- (arrow with a line on each side) must be aligned.



– First tighten union nut by hand and then use special wrench - T40283- to tighten it a total of $^{5}/_{4}$ turns (450°).



Caution

When tightening union nut, make sure that reservoir does not rotate.

The reservoir must not be rotated out of its installation position.

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

– Install reducing agent tank ⇒ page 377 .

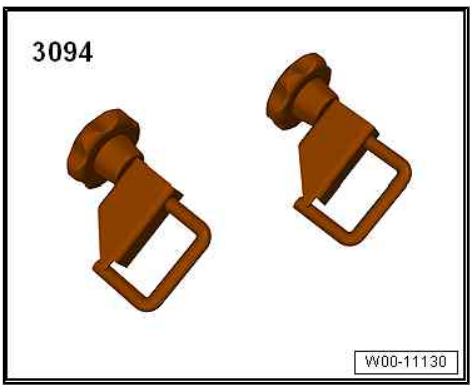
– Adapt learnt value after draining reducing agent or renewing components ⇒ "3.12 Resetting SCR learnt values", page 387 .

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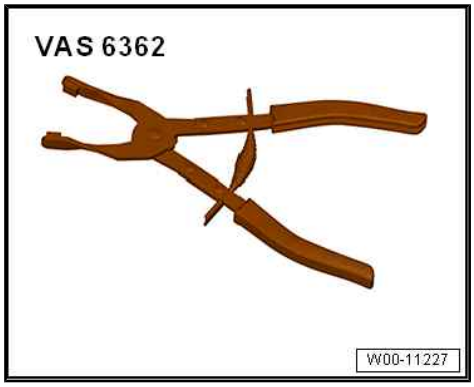
3.8 Removing and installing injector for reducing agent - N474-

Special tools and workshop equipment required

♦ Hose clamps, up to 25 mm - 3094-



- Hose clip pliers - VAS 6362-



Removing

WARNING

Reducing agent can cause skin irritation.

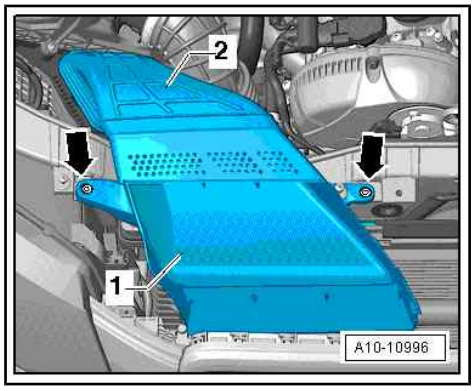
- *Observe safety measures when handling reducing agent ⇒ page 4 .*
- *To prevent large amounts of reducing agent from escaping when the metering line is opened, wait until the reducing agent has been drawn back automatically ⇒ page 4 .*
- *Put on safety goggles.*

– Remove engine cover panel ⇒ page 34 .

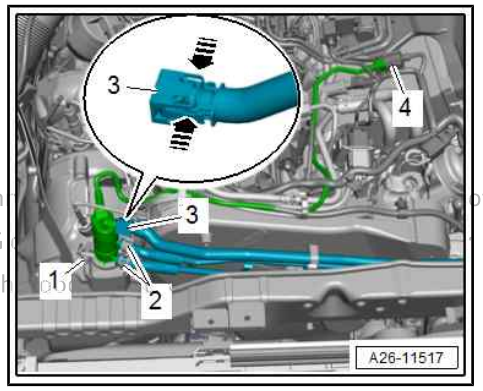
– Remove lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Lock carrier .

– Remove bolts -arrows-.

– Detach air ducts -1, 2- from air cleaner housing.



– Detach electrical connector -4- from bracket, unplug and move clear.



Note

Hold a clean cloth under the separating point to catch escaping reducing agent.

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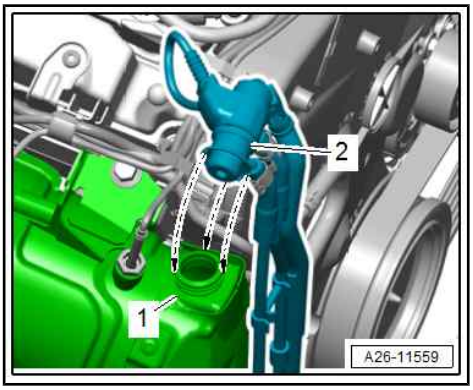
– Press release tabs -arrows- and disconnect reducing agent line -3- from injector for reducing agent - N474- .

– Clamp off coolant hoses using hose clamps -3094- , release hose clips -2- and disconnect coolant hoses.

– Release retaining clip -1- and detach injector for reducing agent - N474- .

Installing

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



Note

Renew retaining clip and seal.

- Installation position: lugs in injector for reducing agent - N474- -item 2- must be inserted -arrows- in corresponding mountings in emission control module -1-.

– Install engine cover panel ⇒ page 34 .

– Adapt learnt value after draining reducing agent or renewing components
⇒ “3.12 Resetting SCR learnt values”, page 387 .

Tightening torques

♦ ⇒ “3.2 Exploded view - reducing agent supply line”, page 362

3.9 Removing and installing reducing agent tank

⇒ “3.9.1 Removing and installing active tank for reducing agent - Audi A4 and A5”, page 377

⇒ “3.9.2 Removing and installing passive tank for reducing agent - Audi A4 and A5”, page 379

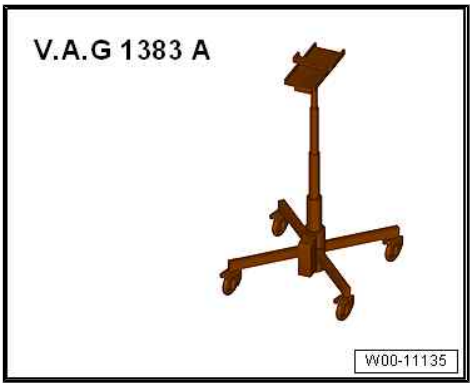
⇒ “3.9.3 Removing and installing reducing agent tank - Audi Q5”, page 381

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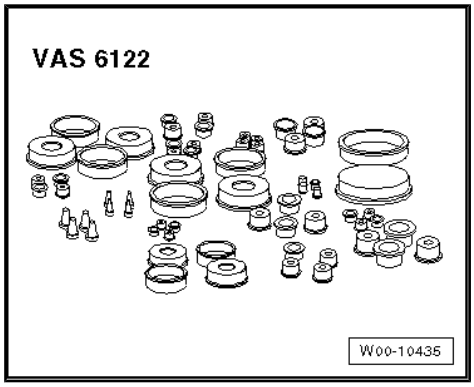
3.9.1 Removing and installing active tank for reducing agent - Audi A4 and A5

Special tools and workshop equipment required

♦ Engine and gearbox jack - V.A.G 1383 A-



- Engine bung set - VAS 6122-



Removing

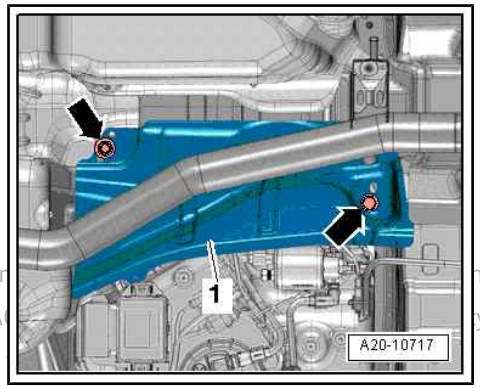
WARNING

Safety risk due to escaping reducing agent.

- *Observe safety measures for handling reducing agent ⇒ page 4 .*
- *To prevent large amounts of reducing agent from escaping when the metering line is opened, wait until the reducing agent has been drawn back automatically ⇒ page 4 .*

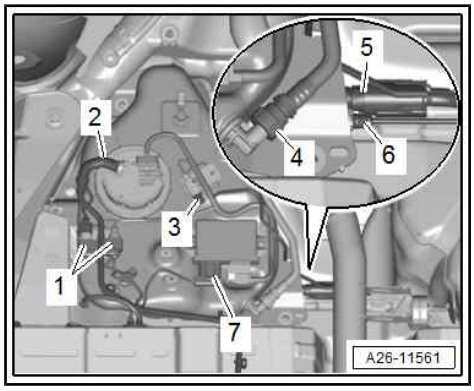
– Drain active tank for reducing agent ⇒ page 369 .

– Remove bolts -arrows- and detach heat shield -1-.



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– Unplug electrical connectors -1, 3, 7- and move electrical wiring clear.



Note

Hold a clean cloth under the separating point to catch escaping reducing agent.

– Press release tab and disconnect transfer line -6-.

– Disconnect breather line -5- ⇒ page 367 .

– Press release tab and disconnect filler line -4-.

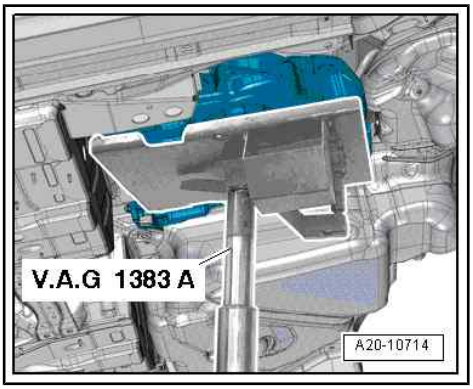
– Press release tabs on both sides and disconnect reducing agent line -2-.

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

WARNING

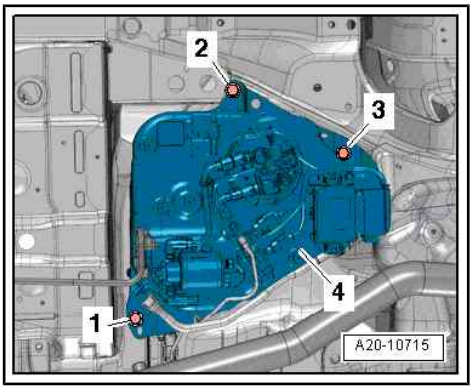
Risk of accident caused by weight of active tank.

- *Active tank must be empty when it is removed.*



– Position engine and gearbox jack - V.A.G 1383 A- underneath active tank with a soft foam surface in between for support.

– Remove bolts -2- and -3- (have a second mechanic support the active tank -4- by hand).



Note

- *For greater clarity the active tank is shown without the engine and gearbox jack.*
- *Disregard -item 1-.*

– Lower active tank using engine and gearbox jack - V.A.G 1383 A- (keep guiding tank down by hand).

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

Installing

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

– Check that lines are clipped onto active tank.

– Adapt learnt value after draining reducing agent or renewing components ⇒ “3.12 Resetting SCR learnt values”, page 387 .

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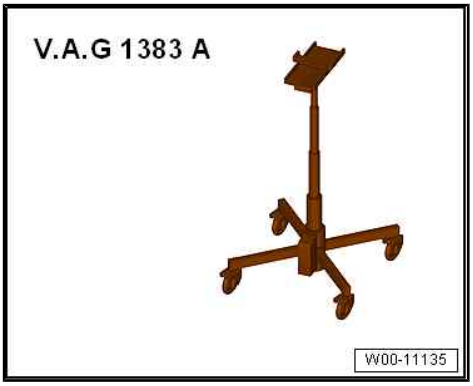
Tightening torques

- ⇒ “3.1 Exploded view - reducing agent tank”, page 357
- Heat shield ⇒ General body repairs, exterior; Rep. gr. 66 ; Strips / trim panels / extensions; Exploded view - heat shield

3.9.2 Removing and installing passive tank for reducing agent - Audi A4 and A5

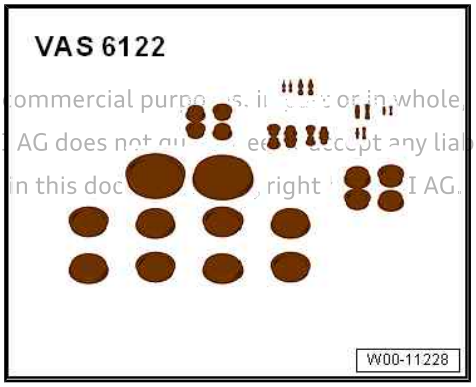
Special tools and workshop equipment required

- Engine and gearbox jack - V.A.G 1383 A-



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- Engine bung set - VAS 6122-



Removing

WARNING

Safety risk due to escaping reducing agent.

- ***Observe safety measures for handling reducing agent*** ***⇒ page 4*** ***.***
- ***To prevent large amounts of reducing agent from escaping when the metering line is opened, wait until the reducing agent has been drawn back automatically*** ***⇒ page 4*** ***.***

– Drain passive tank for reducing agent ⇒ page 371 .

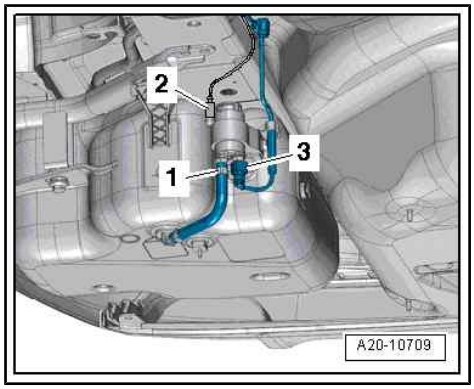
Note

Hold a clean cloth under the separating point to catch escaping reducing agent.

– Unclip transfer line -3- from bracket and detach it from transfer pump for reducing agent - V436- (press release tab).

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

– Unplug electrical connector -2- and move wiring clear.



Note

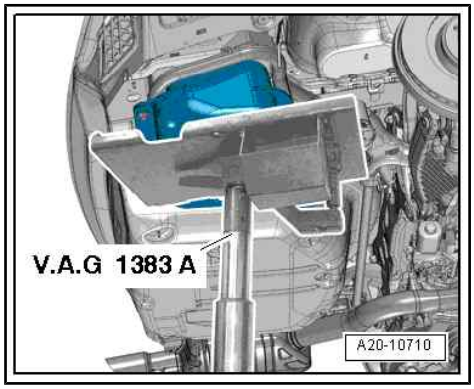
Disregard -item 1-.

WARNING

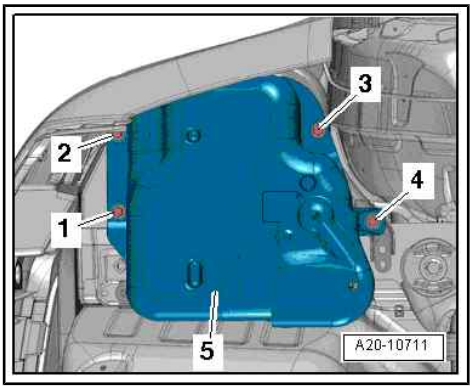
Risk of accident caused by weight of passive tank.

- ***When removing passive tank, support it with engine and gearbox jack - V.A.G 1383 A- .***

– Position engine and gearbox jack - V.A.G 1383 A- below vehicle to support passive tank.



– Remove bolts -1 ... 4-.



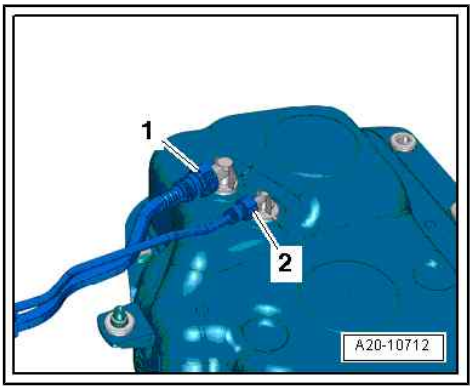
Note

For greater clarity the passive tank is shown without the engine and gearbox jack.

– Lower passive tank -5- about 100 mm using engine and gearbox jack - V.A.G 1383 A- (guide tank down by hand).

Note

Lay a clean cloth under the separating point to catch escaping reducing agent.



– Press release tab and disconnect filler line -1- and breather line -2-.
– Seal off open lines and connections with clean plugs from engine bung set - VAS 6122- .
– Continue lowering passive tank using engine and gearbox jack - V.A.G 1383 A- (keep guiding tank down by hand).

Installing

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

– Check that lines are clipped onto passive tank.
– Adapt learnt value after draining reducing agent or renewing components
⇒ “3.12 Resetting SCR learnt values”, page 387 .

Tightening torques

♦ ⇒ “3.1 Exploded view - reducing agent tank”, page 357

3.9.3 Removing and installing reducing agent tank - Audi Q5

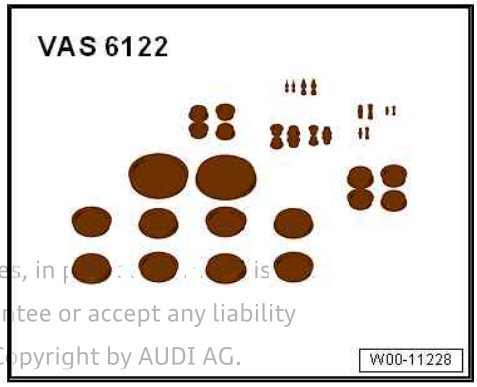
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Special tools and workshop equipment required

♦ Engine and gearbox jack - V.A.G 1383 A-



- Engine bung set - VAS 6122-



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Removing

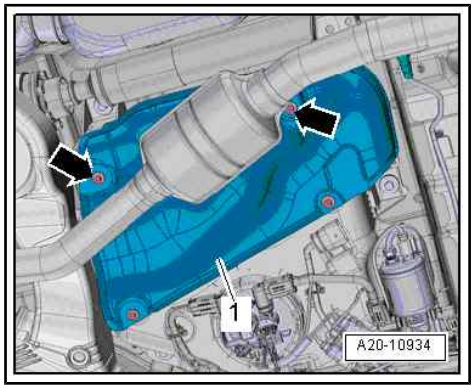
WARNING

Safety risk due to escaping reducing agent.

- *To prevent large amounts of reducing agent from escaping when the reducing agent line is opened, wait until the reducing agent has been drawn back automatically ⇒ page 4 .*

– Drain reducing agent tank ⇒ page 369 .

– Remove bolts -arrows- and detach heat shield -1-.



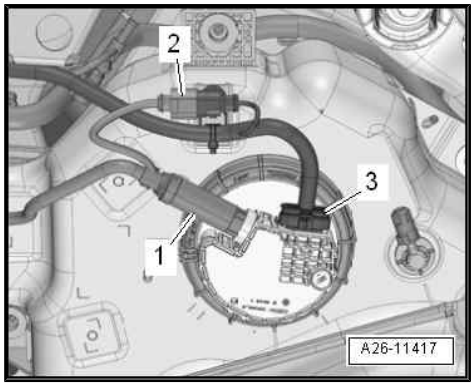
WARNING

Reducing agent can cause skin irritation.

- *Observe safety measures when handling reducing agent ⇒ page 4 .*
- *Put on safety goggles.*

– Unplug electrical connectors -2, 3- and move electrical wiring harness clear.

– Disconnect reducing agent line -1- and move it clear ⇒ “3.5 Disconnecting reducing agent supply line”, page 367 .



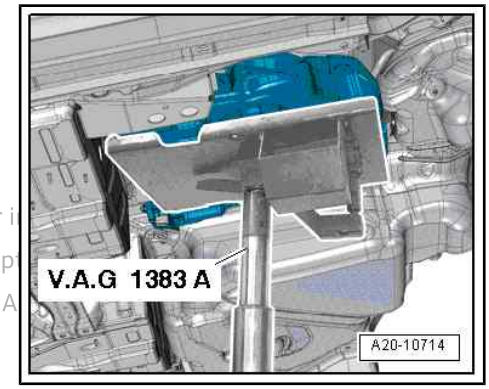
WARNING

Risk of accident caused by weight of tank

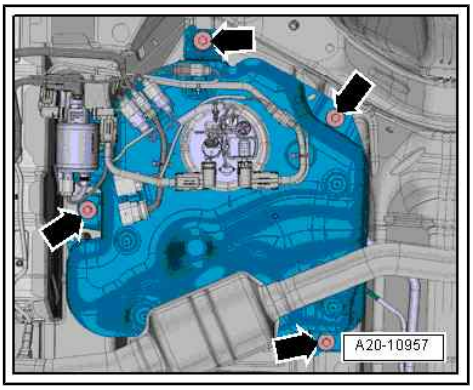
- ***Tank must be empty when it is removed.***

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– Position engine and gearbox jack - V.A.G 1383 A- underneath vehicle with a soft foam surface to support tank.



– Remove bolts -arrows- (have a second mechanic support the tank by hand).



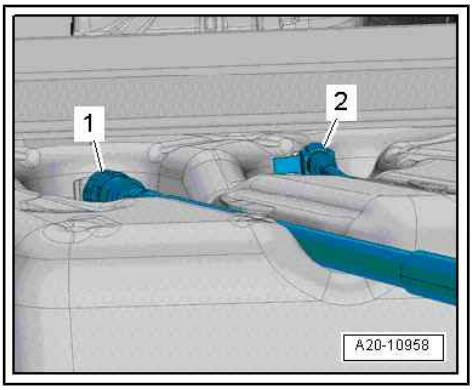
Note

For greater clarity the tank is shown without the engine and gearbox jack.

– Lower tank by about 100 mm using engine and gearbox jack - V.A.G 1383 A- (guide tank down by hand).

Note

Hold a clean cloth under the separating point to catch escaping reducing agent.



– Disconnect transfer line -1-
⇒ “3.5 Disconnecting reducing agent supply line”, page 367 .
– Disconnect breather line -2-
⇒ “3.5 Disconnecting reducing agent supply line”, page 367 .
– Seal off open lines and connections with clean plugs from engine bung set - VAS 6122- .
– Continue lowering tank using engine and gearbox jack - V.A.G 1383 A- (also guiding tank down by hand).

Installing

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

– Check that lines are clipped onto tank.
– Adapt learnt value after draining reducing agent or renewing components
⇒ “3.12 Resetting SCR learnt values”, page 387 .

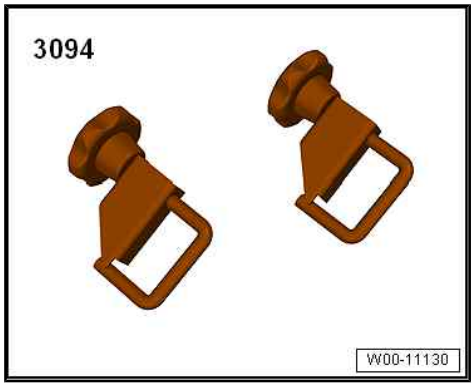
Tightening torques

- ⇒ “3.1 Exploded view - reducing agent tank”, page 357

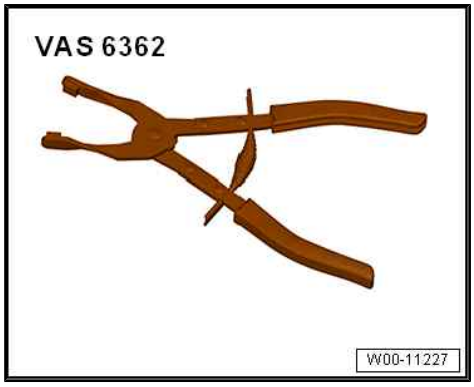
3.10 Removing and installing transfer pump for reducing agent - V436-

Special tools and workshop equipment required

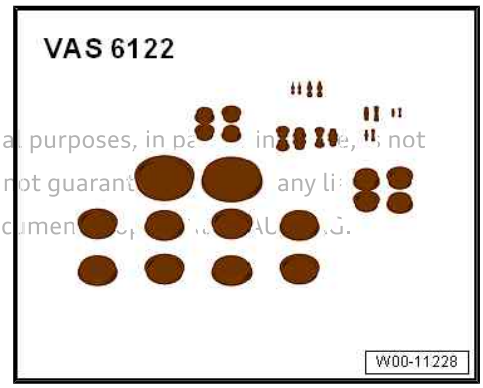
- Hose clamps, up to 25 mm - 3094-



- Hose clip pliers - VAS 6362-



- Engine bung set - VAS 6122-



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Removing

WARNING

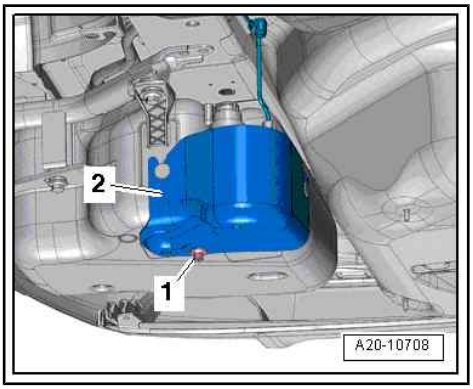
Safety risk due to escaping reducing agent.

- *To prevent large amounts of reducing agent from escaping when the reducing agent line is opened, wait until the reducing agent has been drawn back automatically* *⇒ page 4* *.*
- *Observe safety measures for handling reducing agent* *⇒ page 4* *.*

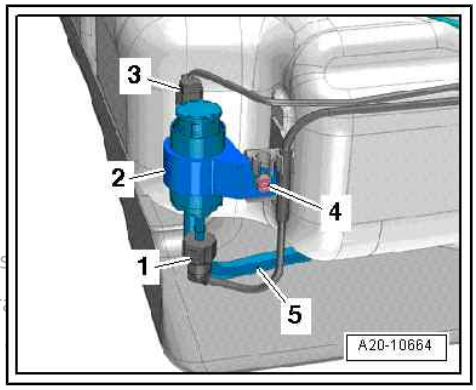
Note

Hold a clean cloth under the separating point to catch escaping reducing agent.

– Unscrew bolt -1- and remove cover -2- for transfer pump.



– Clamp off connecting hose -5- with hose clamp -3094- .
– Press release tab and disconnect transfer line -1-.
– Carefully detach connecting hose from connection at transfer pump for reducing agent - V436- .
– Seal off open lines and connections with clean plugs from engine bung set - VAS 6122- .
– Unplug electrical connector -3-.
– Unscrew bolt -4- and detach transfer pump for reducing agent - V436- -item 2- with rubber retainer.



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Installing

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

Note

Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .

– Adapt learnt value after draining reducing agent or renewing components
⇒ “3.12 Resetting SCR learnt values”, page 387 .

Tightening torques

♦ ⇒ “3.1 Exploded view - reducing agent tank”, page 357

3.11 Removing and installing control unit for reducing agent metering system - J880-

⇒ “3.11.1 Removing and installing control unit for reducing agent metering system J880 - Audi A4 and A5”, page 385

⇒ “3.11.2 Removing and installing control unit for reducing agent metering system J880 - Audi Q5”, page 386

3.11.1 Removing and installing control unit for reducing agent metering system - J880- - Audi A4 and A5

Special tools and workshop equipment required

♦ Vehicle diagnostic tester

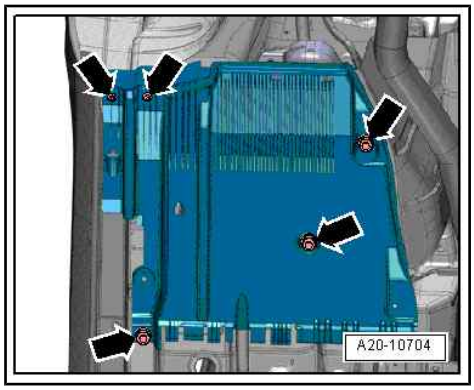
Note

Fitting location: control unit for reducing agent metering system - J880- is underneath reducing agent tank.

Removing

– Switch off ignition.

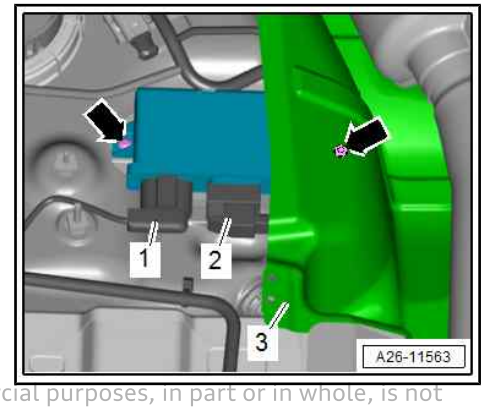
– Remove wheel spoiler (rear left) ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim; Exploded view - underbody trim .



– Push heat shield -3- slightly to one side.

– Remove bolts -arrows- and detach control unit for reducing agent metering system - J880- .

– Unplug electrical connectors -1, 2-.



Installing

Installation is carried out in reverse sequence.

– After renewal, parameters of control unit for reducing agent metering system - J880- must be set; see `Guided Functions` ⇒ Vehicle diagnostic tester `01 - Reduction agent metering control unit parameter setting`.

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Tightening torques

- ⇒ "3.4 Exploded view - control unit for reducing agent metering system", page 366
- Rear wheel spoiler ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim; Exploded view - underbody trim

3.11.2 Removing and installing control unit for reducing agent metering system - J880- - Audi Q5

Special tools and workshop equipment required

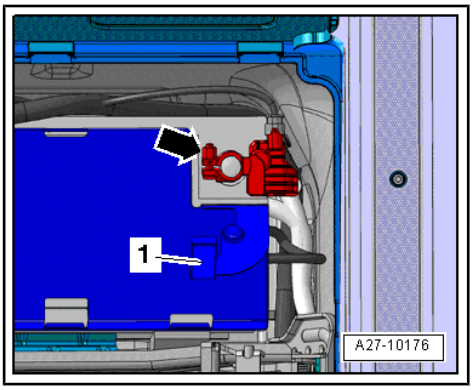
- Vehicle diagnostic tester

Note

Fitting location: control unit for reducing agent metering system - J880- is underneath reducing agent tank.

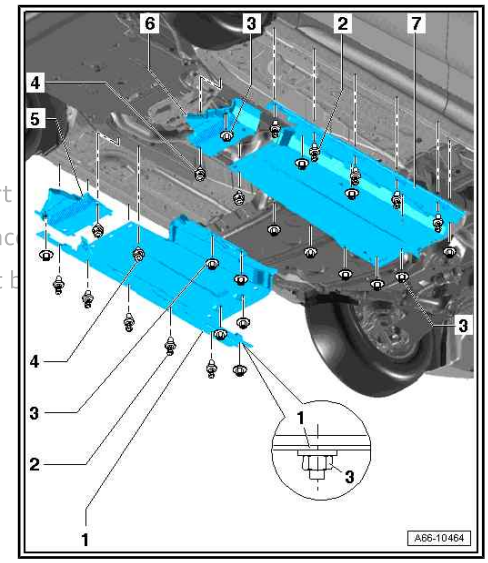
Removing

Observe safety precautions ⇒ page 4 .



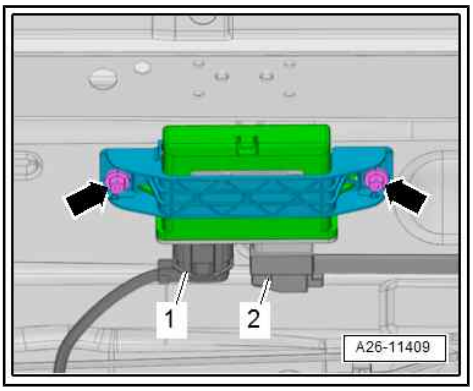
– Remove aerodynamic fairing (left-side) -7- ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim; Exploded view - underbody trim .

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– Unplug electrical connectors -1, 2-.

– Remove nuts -arrows- and detach control unit for reducing agent metering system - J880- .



Installing

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

– After renewal, parameters of control unit for reducing agent metering system - J880- must be set; see Guided Functions ⇒ Vehicle diagnostic tester 01 - Reduction agent metering control unit parameter setting.

– Install aerodynamic fairing (rear left) ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim; Exploded view - underbody trim .

– Connect battery and perform steps required after re-connecting battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .

Tightening torques

◆ ⇒ “3.4 Exploded view - control unit for reducing agent metering system”, page 366

3.12 Resetting SCR learnt values

Special tools and workshop equipment required

◆ Vehicle diagnostic tester

The learnt value in the engine control unit must be re-adapted using the ⇒ Vehicle diagnostic tester if reducing agent has been drained or any of the following components have been renewed:

- Reducing agent tank
- Pump for reducing agent
- Injector for reducing agent - N474-
- Reducing agent line
- Engine control unit

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– 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 - Reset reduction agent system learned values`

4 Exhaust gas temperature control

⇒ “4.1 Exploded view - exhaust gas temperature control”, page 389

⇒ “4.2 Removing and installing parts of exhaust gas temperature control”, page 390

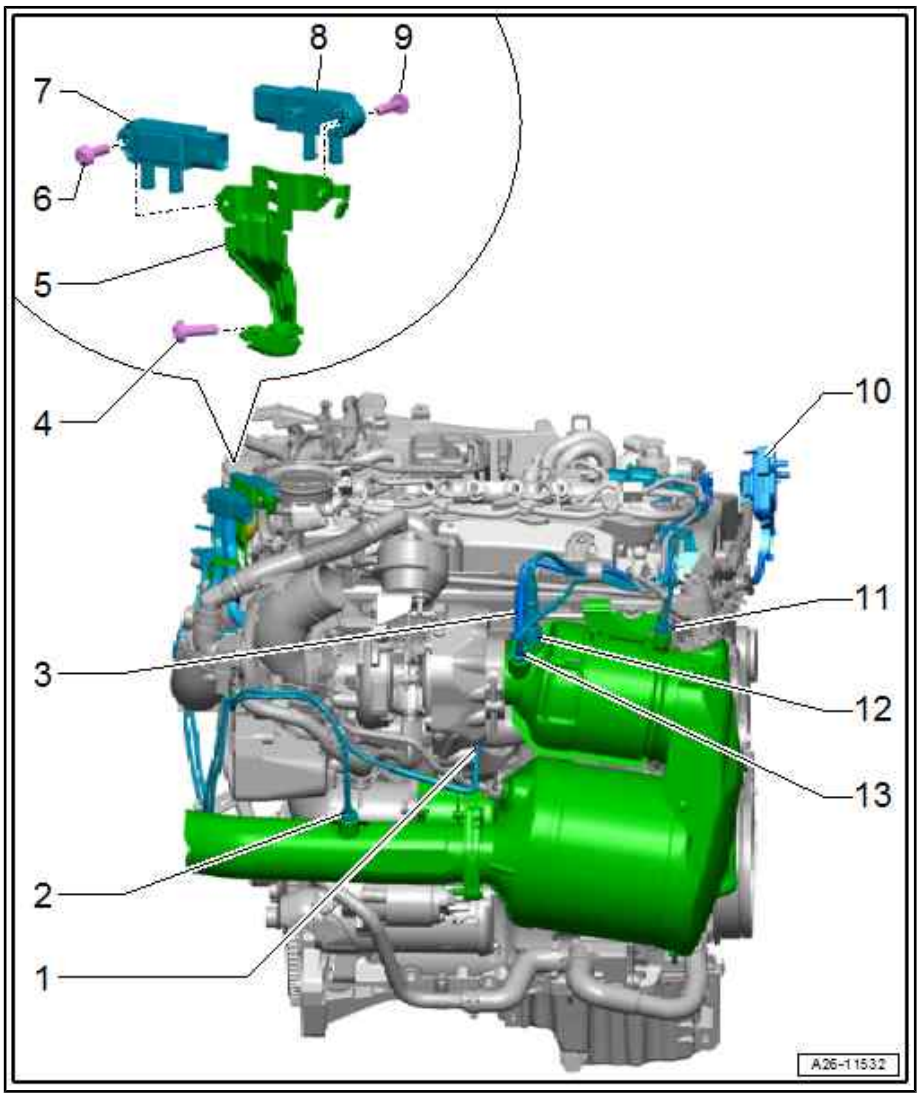
4.1 Exploded view - exhaust gas temperature control

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.***

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1 - Exhaust gas temperature sender 1 - G235-

- ❑ Removing and installing ⇒ page 390
- ❑ Coat with high-temperature paste when installing; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 45 Nm

2 - Exhaust gas temperature sender 4 - G648-

- ❑ Removing and installing ⇒ page 395
- ❑ The thread of the exhaust gas temperature sender is coated; it must not additionally be greased with high-temperature paste
- ❑ 60 Nm

3 - NOx sender - G295-

- ❑ Removing and installing ⇒ “7.8 Removing and installing NOx sender G295 ”, page 305
- ❑ 55 Nm

4 - Bolt

- ❑ Tightening torque ⇒ Item 4 (page 307)

5 - Bracket

- ❑ For pressure differential sender

6 - Bolt

- ❑ Tightening torque ⇒ Item 6 (page 307)

7 - Exhaust gas pressure sensor 1 - G450-

- ❑ Removing and installing
  ⇒ “7.6 Removing and installing exhaust gas pressure sensor 1 G450 ”, page 302

8 - Pressure differential sender - G505-

- ❑ Removing and installing ⇒ “7.7 Removing and installing pressure differential sender G505 ”, page 304

9 - Bolt

- ❑ Tightening torque ⇒ Item 9 (page 307)

10 - Control unit for NOx sender - J583-

- ❑ Removing and installing ⇒ “7.8 Removing and installing NOx sender G295 ”, page 305

11 - Exhaust gas temperature sender 3 - G495-

- ❑ Removing and installing ⇒ page 393
- ❑ The thread of the exhaust gas temperature sender is coated; it must not additionally be greased with high-temperature paste
- ❑ 60 Nm

12 - Lambda probe - G39- with Lambda probe heater - Z19-

- ❑ 55 Nm
- ❑ Removing and installing ⇒ page 308

13 - Exhaust gas temperature sender 2 - G448-

- ❑ Removing and installing ⇒ page 392
- ❑ 60 Nm

4.2 Removing and installing parts of exhaust gas temperature control

⇒ “4.2.1 Removing and installing exhaust gas temperature sender 1 G235 ”, page 390

⇒ “4.2.2 Removing and installing exhaust gas temperature sender 2 G448 ”, page 392

⇒ “4.2.3 Removing and installing exhaust gas temperature sender 3 G495 ”, page 393

⇒ “4.2.4 Removing and installing exhaust gas temperature sender 4 G648 ”, page 395

4.2.1 Removing and installing exhaust gas temperature sender 1 - G235-

Special tools and workshop equipment required

- ♦ Tool set - T10395 A/B-



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- ♦ Supplement tool set - T10395/8-/10-

- Flared ring spanner tool insert (17 mm) - V.A.G 1331/10-



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Removing

Note

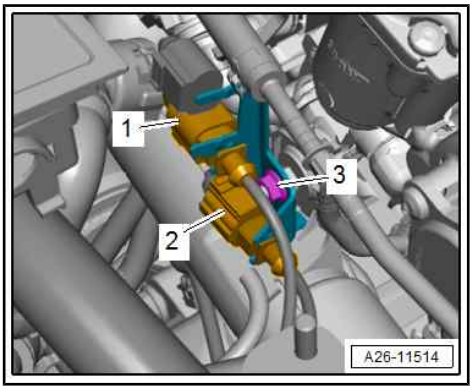
- *Re-install all cable ties in original positions.*
- *When removing, the electrical wiring must not be cut, otherwise a fault diagnosis would no longer be possible.*

WARNING

When working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system***
  ⇒ "2.6 Safety precautions when working on the exhaust system", page 5 .

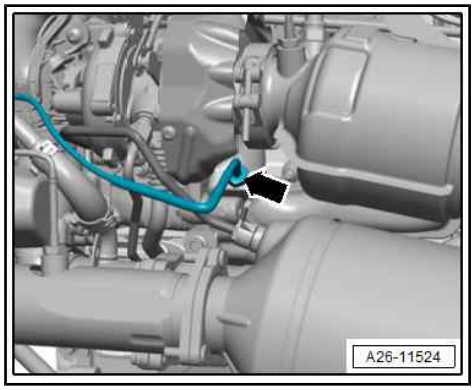
– Remove engine cover panel ⇒ page 34 .
– Remove air cleaner housing ⇒ page 254 .
– Detach electrical connector -1- for exhaust gas temperature sender 1 - G235- from bracket, unplug connector and move electrical wiring clear.



Note

Disregard items -2 and 3-.

– Unscrew exhaust gas temperature sender 1 - G235- -arrow- using flared ring spanner tool insert (17 mm) - V.A.G 1331/10- .



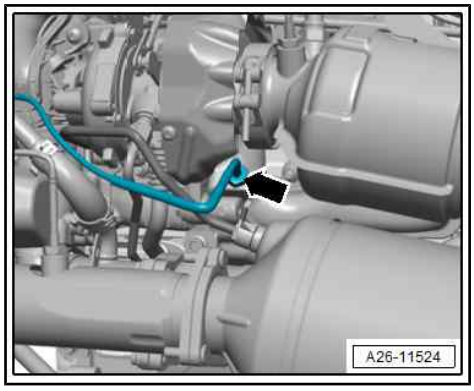
Installing

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

Note

- *Take care to protect exhaust gas temperature sender from knocks and impact; if dropped, the exhaust gas temperature sender can no longer be used.*
- *Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .*

Installation position of exhaust gas temperature sender 1 - G235- :



- Angled part of line -arrow- must point vertically downwards.

– Electrical connections and routing ⇒ Electrical system; Rep. gr. 97 ; Electrical connectors and ⇒ Current flow diagrams, Electrical fault finding and Fitting locations

– Install air cleaner housing ⇒ page 254 .

– Install engine cover panel ⇒ page 34 .

Tightening torques

- ⇒ “4.1 Exploded view - exhaust gas temperature control”, page 389

4.2.2 Removing and installing exhaust gas temperature sender 2 - G448-

Special tools and workshop equipment required

- Tool set - T10395 A-



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- Supplement tool set - T10395/8-/10-

Removing

Note

- *Re-install all cable ties in original positions.*
- *When removing, the electrical wiring must not be cut, otherwise a fault diagnosis would no longer be possible.*

WARNING

When working on all parts of the exhaust system:

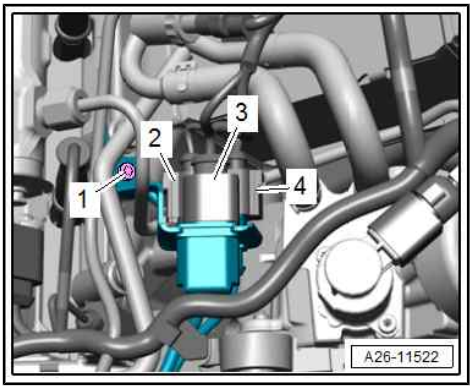
- ***Observe safety precautions when working on the exhaust system***
  ⇒ "2.6 Safety precautions when working on the exhaust system", page 5 .

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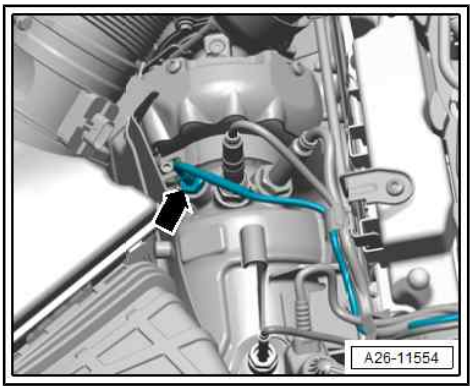
– Remove engine cover panel ⇒ page 34 .

– Detach electrical connector -3- from bracket.

– Take electrical connector -4- out of bracket, unplug it and move electrical wiring clear.



– Unscrew exhaust gas temperature sender 2 - G448- -arrow-.



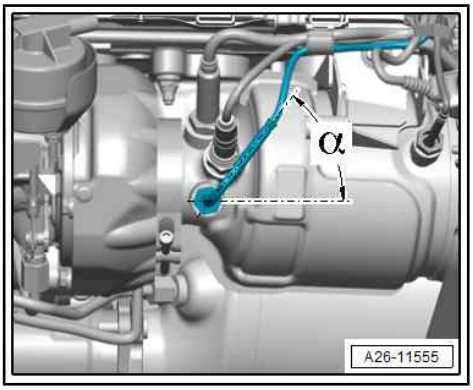
Installing

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

Note

Take care to protect exhaust gas temperature sender from knocks and impact; if dropped, the exhaust gas temperature sender can no longer be used.

Installation position of exhaust gas temperature sender 2 - G448- :



- Angle -α- = 80°

– Install engine cover panel ⇒ page 34 .

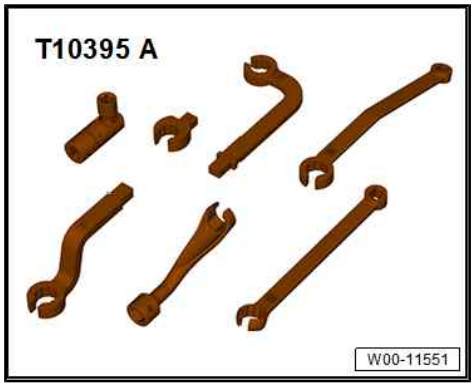
Tightening torques

- ⇒ "4.1 Exploded view - exhaust gas temperature control", page 389

4.2.3 Removing and installing exhaust gas temperature sender 3 - G495-

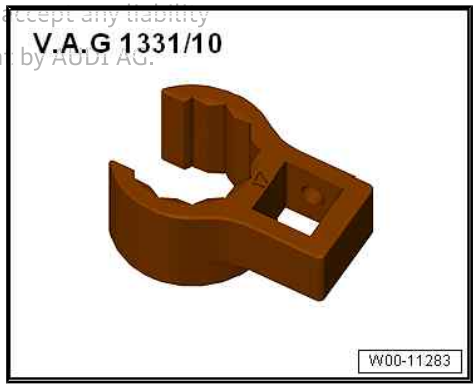
Special tools and workshop equipment required

- Tool set - T10395 A/B-



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- Supplement tool set - T10395/8-/10-
- Flared ring spanner tool insert (17 mm) - V.A.G 1331/10-



Removing

Note

- *Re-install all cable ties in original positions.*
- *When removing, the electrical wiring must not be cut, otherwise a fault diagnosis would no longer be possible.*

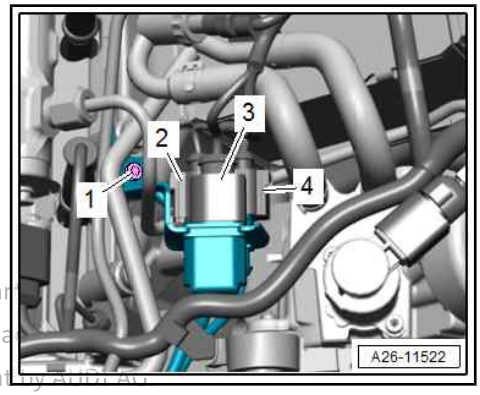
WARNING

When working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system***
  ⇒ "2.6 Safety precautions when working on the exhaust system", page 5 .

– Remove engine cover panel ⇒ page 34 .

– Detach electrical connector -3- from bracket.
– Take electrical connector -2- out of bracket, unplug it and move electrical wiring clear.

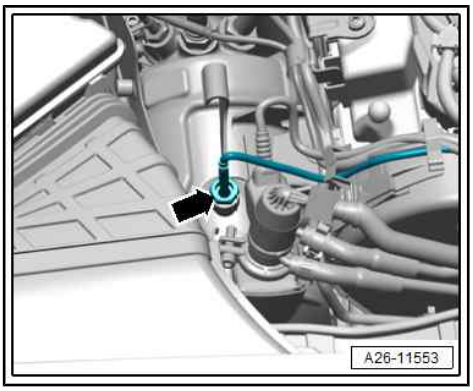


Note

Disregard items -1 and 4-.

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– Unscrew exhaust gas temperature sender 3 - G495- -arrow- using T10395/8.



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.***

Note

Take care to protect exhaust gas temperature sender from knocks and impact; if dropped, the exhaust gas temperature sender can no longer be used.

– Install engine cover panel ⇒ page 34 .

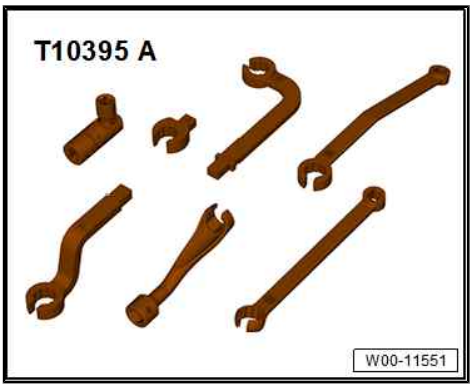
Tightening torques

- ⇒ “4.1 Exploded view - exhaust gas temperature control”, page 389

4.2.4 Removing and installing exhaust gas temperature sender 4 - G648-

Special tools and workshop equipment required

- Tool set - T10395 A-



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- Supplement tool set - T10395/8-/10-
- Flared ring spanner tool insert (17 mm) - V.A.G 1331/10-



Removing

Note

- *Re-install all cable ties in original positions.*
- *When removing, the electrical wiring must not be cut, otherwise a fault diagnosis would no longer be possible.*

WARNING

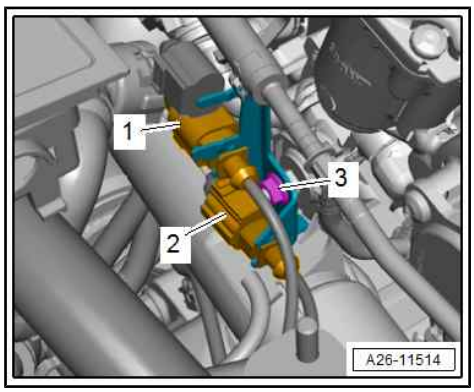
When working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system***
  ⇒ "2.6 Safety precautions when working on the exhaust system", page 5 .

– Remove engine cover panel ⇒ page 34 .

– Remove air cleaner housing ⇒ page 254 .

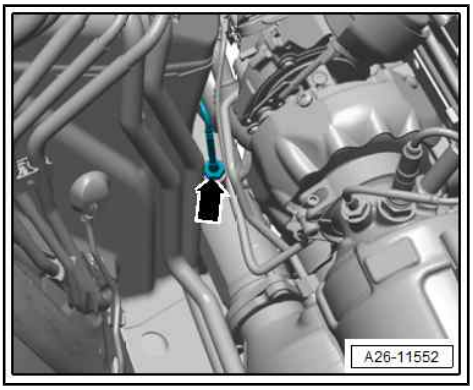
– Detach electrical connector -2- for exhaust gas temperature sender 4 - G648- from bracket, unplug connector and move electrical wiring clear.



Note

Disregard items -1 and 3-.

– Unscrew exhaust gas temperature sender 4 - G648- -arrow-.



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.***

Note

Take care to protect exhaust gas temperature sender from knocks and impact; if dropped, the exhaust gas temperature sender can no longer be used.

– Install air cleaner housing ⇒ page 254 .

– Install engine cover panel ⇒ page 34 .

Tightening torques

- ⇒ “4.1 Exploded view - exhaust gas temperature control”, page 389

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5 Exhaust gas recirculation

⇒ “5.1 Exploded view - exhaust gas recirculation system”, page 398

⇒ “5.2 Removing and installing exhaust gas recirculation control motor V338 ”, page 401

⇒ “5.3 Removing and installing exhaust gas recirculation control motor 2 V339 ”, page 401

⇒ “5.4 Removing and installing exhaust gas recirculation cooler”, page 404

5.1 Exploded view - exhaust gas recirculation system

Exhaust gas recirculation control motor - V338-

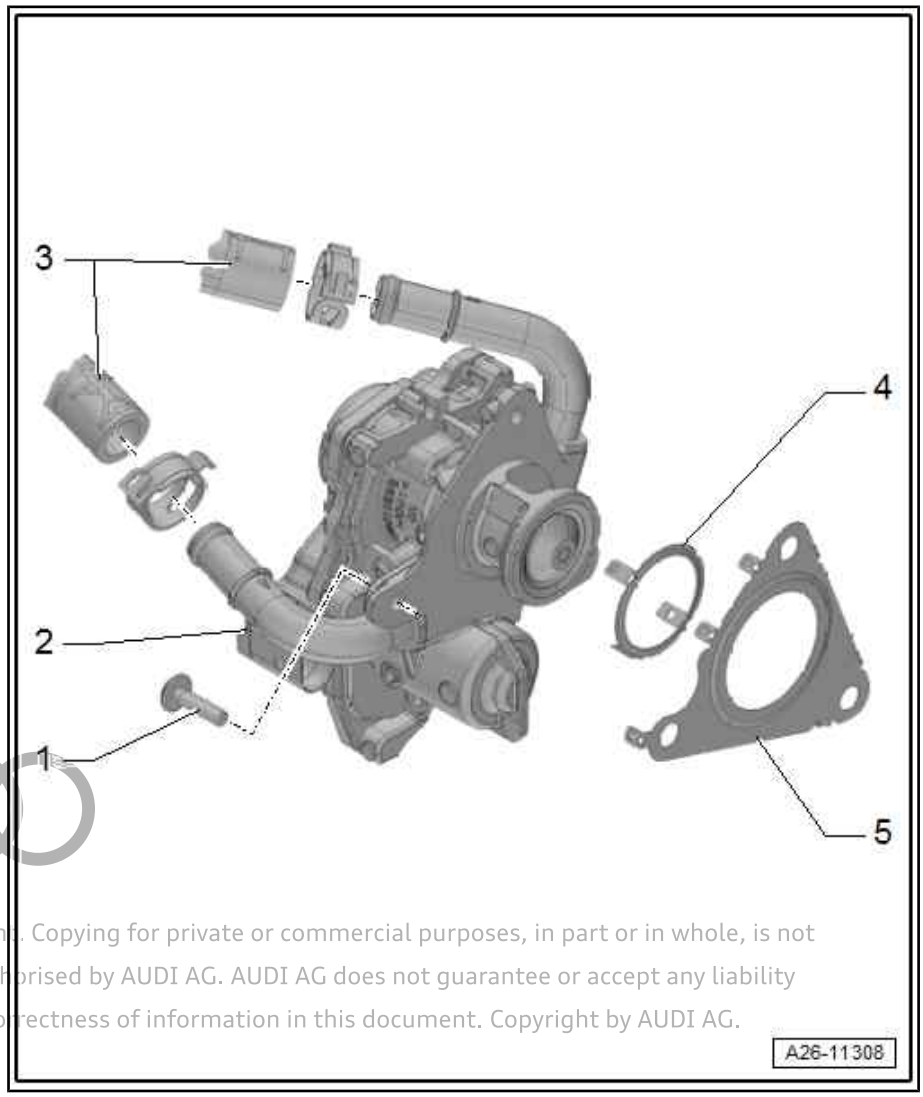
1 - Bolt
- ❑ 9 Nm

2 - Exhaust gas recirculation control motor - V338-
- ❑ With exhaust gas recirculation potentiometer - G212-
- ❑ Removing and installing ⇒ page 401
- ❑ After renewing exhaust gas recirculation control motor - V338- , adaption must be performed; see “Guided Functions” ⇒ Vehicle diagnostic tester `01 - Adaption elec. adjuster with checkback`

3 - Coolant hoses

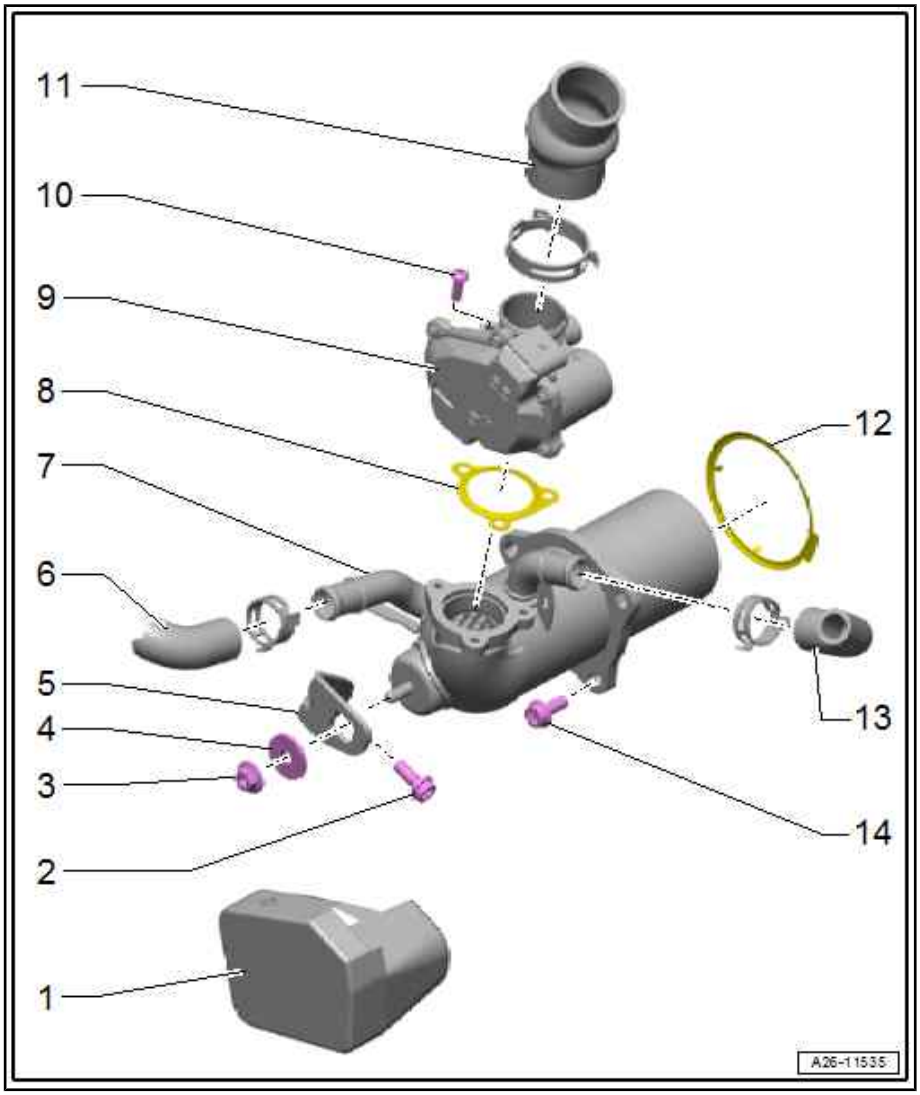
4 - Gasket
- ❑ Renew after removing

5 - Gasket
- ❑ Renew after removing



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Exhaust gas recirculation control motor 2 - V339-



1 - Insulation mat

2 - Bolt

- ❑ Tightening torque and sequence ⇒ page 400 if only exhaust gas recirculation cooler was removed

3 - Washer

4 - Nut

- ❑ Tightening torque and sequence ⇒ page 400 if only exhaust gas recirculation cooler was removed

5 - Bracket

- ❑ For exhaust gas recirculation cooler

6 - Coolant hose

7 - Exhaust gas recirculation cooler

- ❑ Removing and installing ⇒ page 404

8 - Gasket

- ❑ Renew after removing

9 - Exhaust gas recirculation control motor 2 - V339-

- ❑ With exhaust gas recirculation potentiometer 2 - G466-
- ❑ Removing and installing ⇒ page 401
- ❑ The control motor for exhaust gas recirculation is protected from heat damage by an insulation mat.
- ❑ If the insulation mat is damaged, it must be renewed. The control motor must then be checked for heat damage and renewed if necessary.
- ❑ After renewing exhaust gas recirculation control motor 2 - V339- , adaption must be performed; see “Guided Functions” ⇒ Vehicle diagnostic tester `01 - Adaption elec. adjuster with checkback`

10 - Bolt

- ❑ 9 Nm

11 - Air hose

12 - Seal

- ❑ Renew after removing

13 - Coolant hose

14 - Bolt

- ❑ Tightening torque and sequence ⇒ page 400 if only exhaust gas recirculation cooler was removed

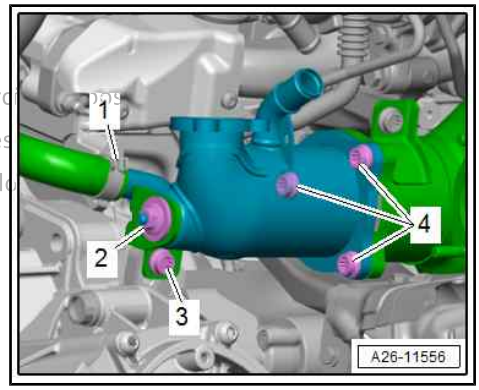
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Exhaust gas recirculation cooler - tightening torque and sequence

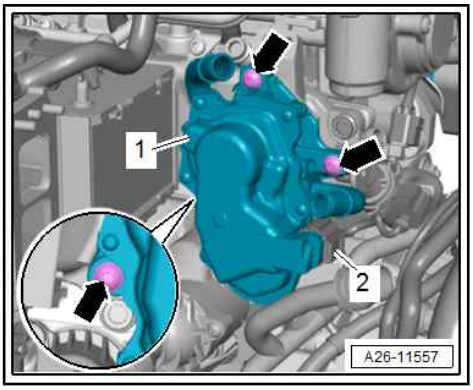
– Tighten bolts in stages in the sequence shown:

Stage	Bolts/nuts	Tightening torque
1.	-4-	20 Nm
2.	-1, 2, 3-	Screw in by hand until contact is made
3.	-1, 2, 3-	20 Nm



5.2 Removing and installing exhaust gas recirculation control motor - V338-

Removing



Note

Observe rules for cleanliness.

– Remove throttle valve module - J338- ⇒ page 258 .
– Unplug electrical connector -2-.
– Unscrew bolts -arrows- and detach exhaust gas recirculation control motor - V338- -1-.

Installing

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

Note

- *Renew seals.*
- *Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .*

– Install throttle valve module - J338- ⇒ page 258 .

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 elec. adjuster with checkback`

Tightening torques

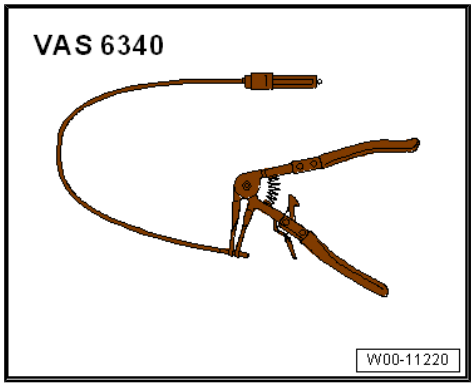
- ⇒ "5.1 Exploded view - exhaust gas recirculation system", page 398

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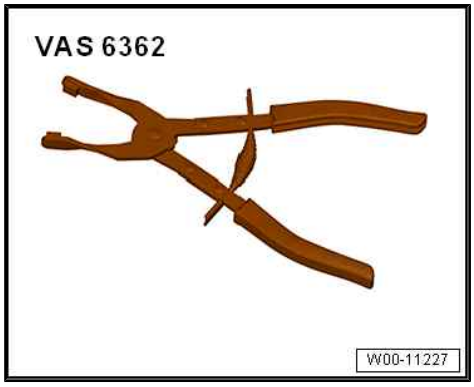
5.3 Removing and installing exhaust gas recirculation control motor 2 - V339-

Special tools and workshop equipment required

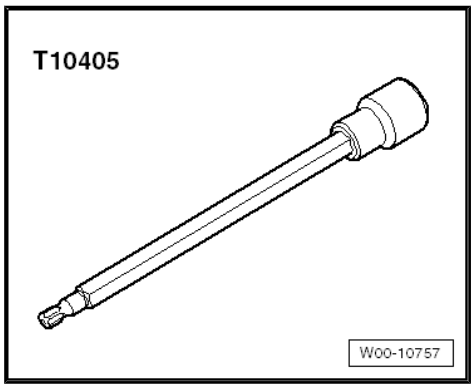
- Hose clip pliers - VAS 6340-



- Hose clip pliers - VAS 6362-



- Socket Torx T30 - T10405-



Removing

– Remove rear coolant pipe (right-side) ⇒ page 195 .

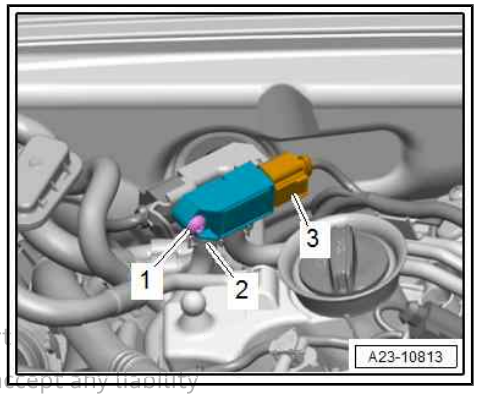
Caution

Risk of irreparable damage to exhaust gas pressure sensor 1 - G450- and differential pressure sender - G505- .

- ***Connections of exhaust gas pressure sensor 1 - G450- and differential pressure sender - G505- can break off if too much pressure is applied.***

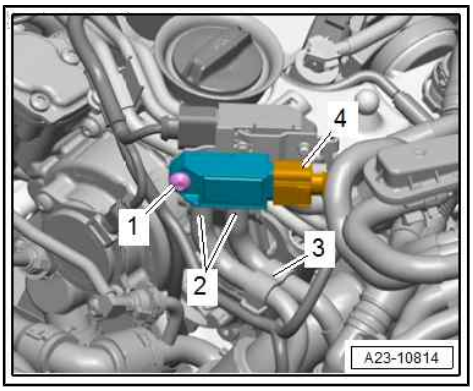
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– Unplug electrical connector -3-.
– Remove bolt -1- and move exhaust gas pressure sensor 1 - G450- to side with hose -2- attached.

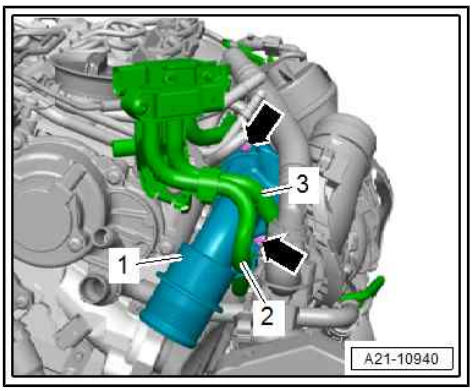


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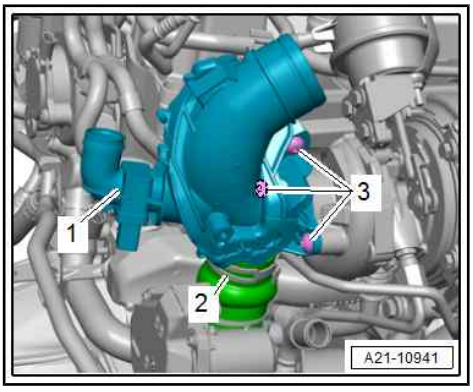
– Unplug electrical connector -4-.
– Detach retaining clip -3-.
– Remove bolt -1- and move pressure differential sender - G505- to one side with hoses -2- attached.



– Detach hose -3- from intake connecting pipe.
– Unscrew bolts -arrows- using socket Torx T30 - T10405- and move hose -2- clear.
– Detach pulsation damper -1-.

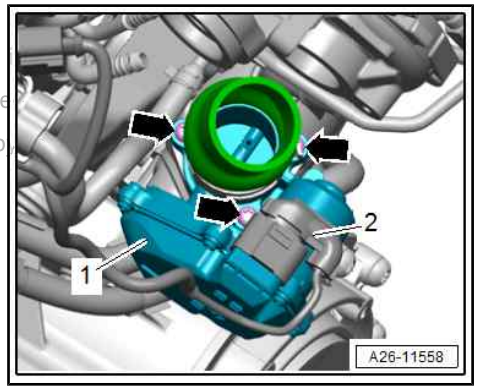


– Remove bolts -3-.
– Open hose clip -2- and detach intake connecting pipe -1-.



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– Unplug electrical connector -2-.
– Unscrew bolts -arrows- and detach exhaust gas recirculation control motor 2 - V339- -item 1-.



Installing

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

Note

- *Renew seal and O-ring.*
- *Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .*

– Install coolant pipe (rear right) ⇒ page 195 .
– Install engine cover panel ⇒ page 34 .

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 elec. adjuster with checkback`

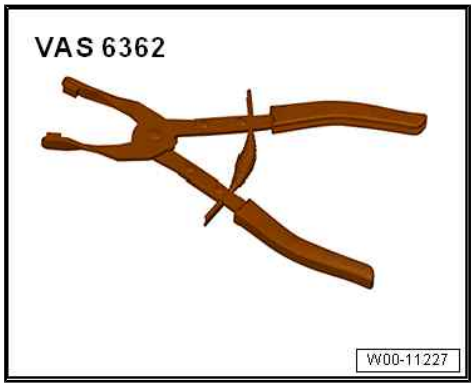
Tightening torques

- ⇒ “5.1 Exploded view - exhaust gas recirculation system”, page 398
- ⇒ “1.1 Exploded view - turbocharger”, page 222
- ⇒ “8.1 Exploded view - Lambda probe”, page 307

5.4 Removing and installing exhaust gas re-circulation cooler

Special tools and workshop equipment required

- Hose clip pliers - VAS 6362-

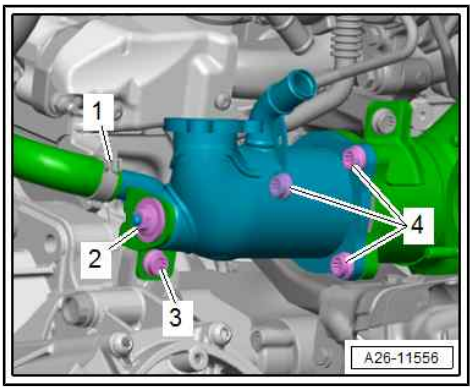


- Bit XZN 10 - T10501-



Removing

– Remove exhaust gas recirculation control motor 2 - V339- ⇒ page 401 .
– Remove front exhaust pipe ⇒ page 321 .
– Release hose clip -1- and disconnect coolant hose.
– Remove bolt -3- and nut -2- and detach bracket.
– Unscrew bolts -4- using bit XZN 10 - T10501- .
– Detach exhaust gas recirculation cooler.



Installing

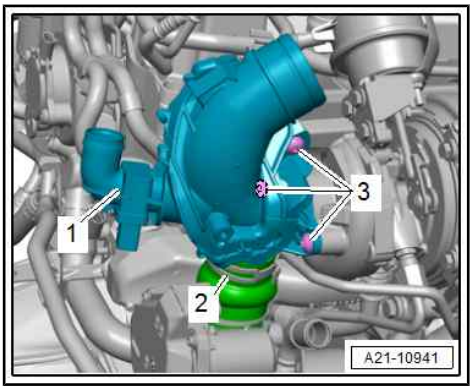
Installation is carried out in reverse order; note the following:

Note

- *Renew gasket.*
- *Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .*

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– Install exhaust gas recirculation control motor 2 - V339- ⇒ page 401 .
– Install intake connecting pipe -1- ⇒ page 222 .
– Tighten bolts securing exhaust gas recirculation cooler ⇒ page 400 .



Tightening torques

- ⇒ Fig. ""Exhaust gas recirculation cooler - tightening torque and sequence"" , page 400
- ⇒ "5.1 Exploded view - exhaust gas recirculation system", page 398
- ⇒ "1.1 Exploded view - silencers", page 318

28 – Glow plug system

1 Glow plug system

⇒ “1.1 Exploded view - glow plug system”, page 406

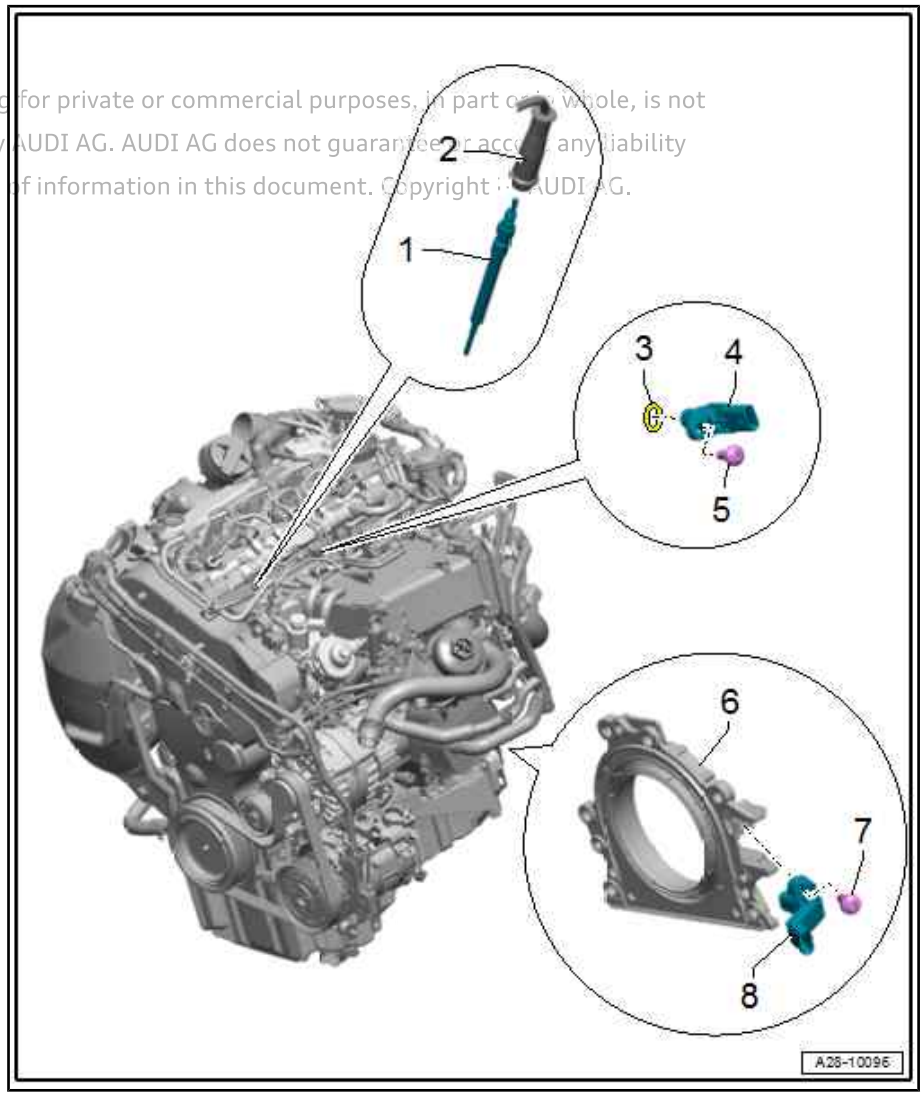
⇒ “1.2 Removing and installing glow plug”, page 407

⇒ “1.3 Removing and installing automatic glow period control unit J179 ”, page 409

⇒ “1.4 Removing and installing Hall sender G40 ”, page 409

⇒ “1.5 Removing and installing engine speed sender G28 ”, page 410

1.1 Exploded view - glow plug system



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1 - Glow plug

- ♦ Glow plug 1 - Q10-
- ♦ Glow plug 2 - Q11-
- ♦ Only for cylinder 3: glow plug 3 - Q12- with internal cylinder pressure sender for cylinder 3 - G622-
- ♦ Glow plug 4 - Q13-
  - ❑ Glow plug versions and tightening torques ⇒ page 407
  - ❑ Removing and installing ⇒ page 407

2 - Electrical connector

3 - O-ring

- ❑ Renew Hall sender - G40- if damaged

4 - Hall sender - G40-

- ❑ Removing and installing ⇒ page 409

5 - Bolt

- ❑ 9 Nm

6 - Sealing flange (gearbox end)

- ❑ With sender wheel for engine speed sender - G28-
- ❑ Cannot be dismantled
- ❑ Removing and installing ⇒ page 48

7 - Bolt

- ❑ 4.5 Nm

8 - Engine speed sender - G28-

- ❑ Removing and installing ⇒ page 410

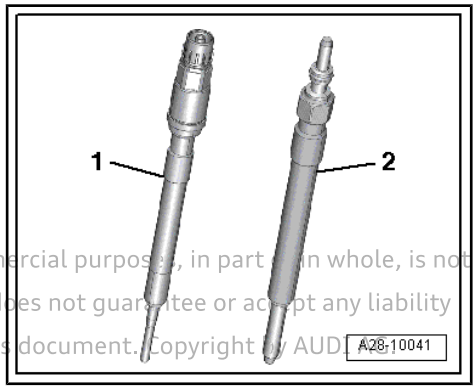
Glow plug versions and tightening torques

1 - Glow plug with internal cylinder pressure sender - for cylinder 3 only

- 12 Nm

2 - Glow plug without combustion chamber pressure sender

- 17 Nm

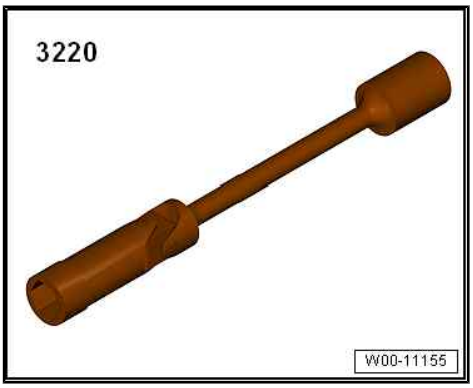


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1.2 Removing and installing glow plug

Special tools and workshop equipment required

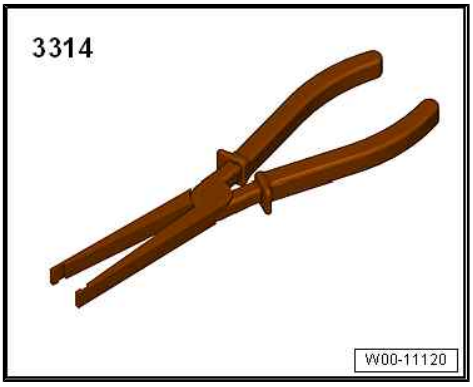
- Articulated wrench, 10 mm - 3220-



- Socket insert AF 12 for glow plugs 4-cyl.TDI CR diesel - VAS 6454- for cylinder 3



- Pliers - 3314-



Removing

– Switch off ignition.

– Remove engine cover panel ⇒ page 34 .

Caution

Risk of damage to support sleeves.

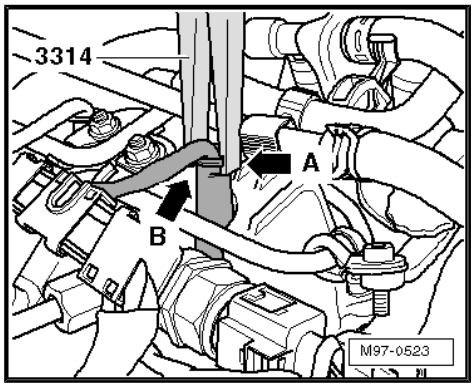
- *Use pliers - 3314- to remove glow plug connectors, squeezing just enough to grasp the collar of the support sleeve securely without damaging it.*

– Release retaining clips at wiring harness and detach electrical connectors from glow plugs as follows.

– Apply groove -arrow A- of pliers - 3314- to collar of support sleeve -arrow B- as shown in illustration.

– Carefully detach glow plug connectors from glow plugs.

– Clean glow plug openings in cylinder head; make sure no dirt gets into cylinder.



WARNING

Risk of eye injury.

- *Put on safety goggles.*

Note

- *Cleaning procedure:*
- *Use a vacuum cleaner to remove coarse dirt.*
- *Spray brake cleaner or suitable cleaning agent into glow plug openings, let it work in briefly, and blow out with compressed air.*
- *Then clean the glow plug openings using a cloth moistened with oil.*

– Loosen glow plugs using tool and unscrew by hand:

Use U/J extension and socket, 10 mm - 3220- for cylinders 1, 2 and 4.



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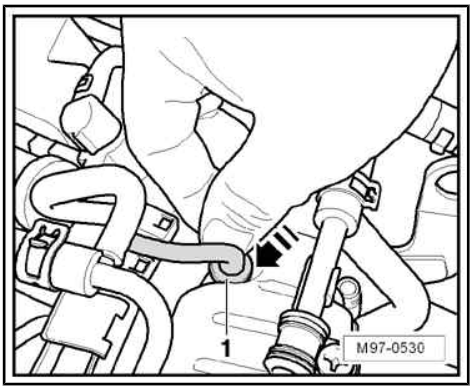
Use socket insert AF 12 for glow plugs 4-cyl.TDI CR diesel - VAS 6454- for cylinder 3.



Installing

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

– Fit glow plug connectors -1- back onto glow plugs -arrow-.



Note

Check that glow plug connectors are securely seated.

– Install engine cover panel ⇒ page 34 .

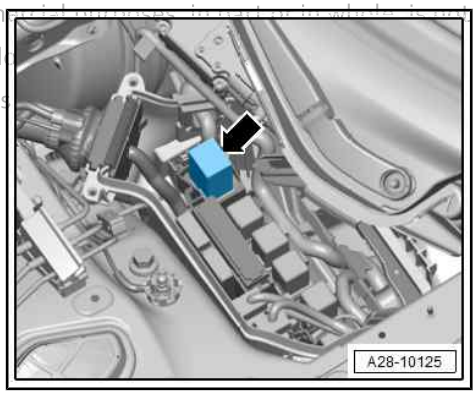
Tightening torques

◆ ⇒ Fig. ""Glow plug versions and tightening torques"" , page 407

1.3 Removing and installing automatic glow period control unit - J179-

Removing

– Detach engine control unit - J623- from bracket and move aside ⇒ page 310 .



– Pull automatic glow period control unit - J179- -arrow- off slot in electronics box in engine compartment.

Installing

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

– Install engine control unit - J623- ⇒ page 310 .

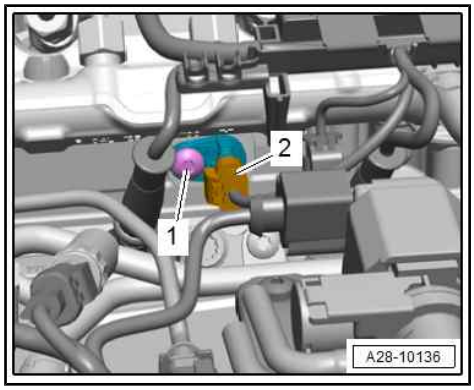
1.4 Removing and installing Hall sender - G40-

Removing

– Remove engine cover panel ⇒ page 34 .

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– Unplug electrical connector -2-.
– Unscrew bolt -1- and detach Hall sender - G40- .



Installing

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

– Install engine cover panel ⇒ page 34 .

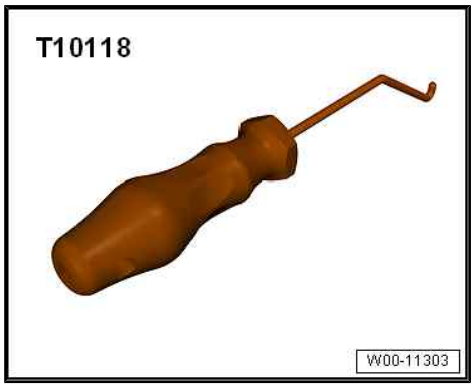
Tightening torques

♦ ⇒ “1.1 Exploded view - glow plug system”, page 406

1.5 Removing and installing engine speed sender - G28-

Special tools and workshop equipment required

♦ Assembly tool - T10118-



♦ Socket (4 mm) - T10370-

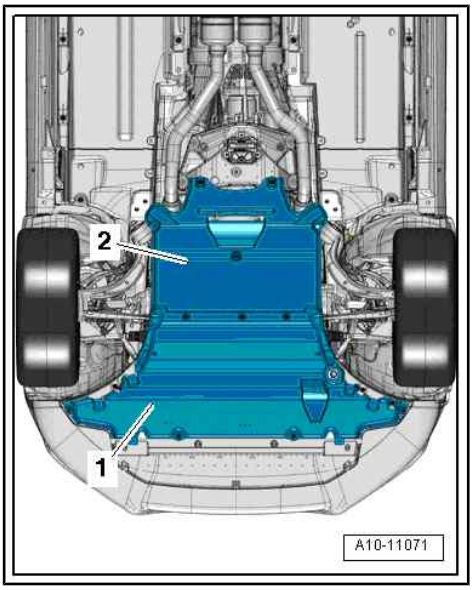


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Removing

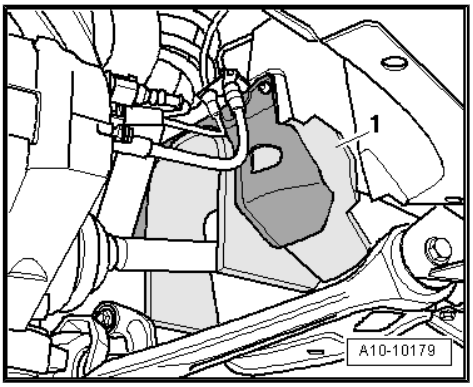
– Remove rear noise insulation -2- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .

– Remove front left wheel.



– Remove cover -1- for drive shaft in wheel housing (left-side).

– Detach drive shaft (left-side) from gearbox ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .

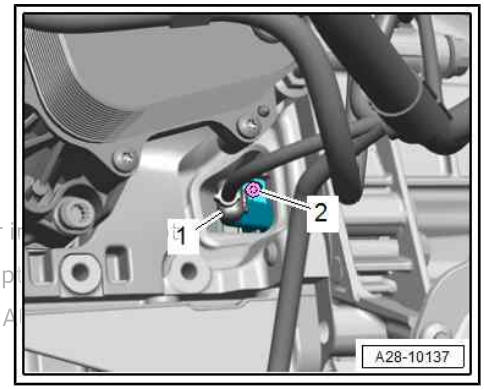


– Use assembly tool - T10118- to unplug electrical connector -1-.

Note

- *To release electrical connector without assembly tool - T10118- , use a screwdriver.*
- *Press in connector on engine speed sender.*
- *At the same time, lift release tab with a thin wire hook.*

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– Unscrew bolt -2- and detach engine speed sender - G28- .

Installing

Installation is carried out in reverse sequence.

Tightening torques

- ⇒ “1.1 Exploded view - glow plug system”, page 406
- ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft