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Workshop Manual

Audi A4 2008 ➤
Audi A5 Cabriolet 2009 ➤
Audi A5 Coupé 2008 ➤
Audi A5 Sportback 2010 ➤

6-cylinder TDI engine (3.0 ltr. 4-valve common rail - generation II)									
Engine ID	CDUC	CLAB	CKVB	CKVC	CKVD				

Edition 09.2018

List of Workshop Manual Repair Groups

Repair Group

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15 - Cylinder head, valve gear
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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

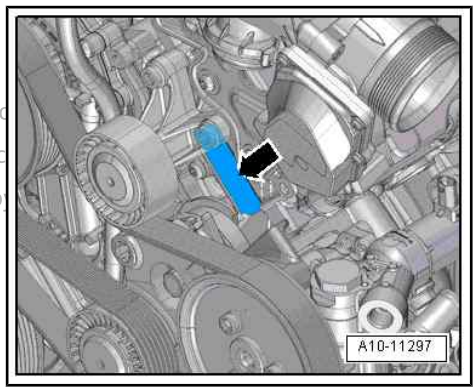
1 Identification

(ARL005993; Edition 09.2018)

⇒ "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 top of the cylinder block at the front -arrow-.
- There is also a sticker on the intake manifold showing the 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.

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Note

- *The four-letter engine code is found on the type plate (certain countries only), vehicle data sticker and engine control unit.*
- *Fitting locations of the type plate (certain countries only) and the vehicle data sticker ⇒ Maintenance ; Booklet 811 ; ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .*

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

2 Safety precautions

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

⇒ “2.2 Working on the reducing agent metering system - vehicles with SCR catalytic converter”, page 4

⇒ “2.3 Adapting learnt value after draining reducing agent or renewing components”, page 5

⇒ “2.4 Safety precautions when working on vehicles with start/stop system”, page 5

⇒ “2.5 Safety precautions when using testers and measuring instruments during a road test”, page 5

⇒ “2.6 Safety precautions when working on the cooling system”, page 6

⇒ “2.7 Safety precautions when working on the subframe”, page 6

⇒ “2.8 Safety precautions when working on the exhaust system”, page 6

2.1 Safety precautions when working on the fuel supply system

When working on the fuel system note the following warnings:

WARNING

Fuel under pressure - risk of injuries!

- *Wrap a cloth around the connection before opening the fuel system. Then carefully loosen the connection to relieve the pressure.*

The fuel can become extremely hot. This can cause injuries.

- *In extreme cases the temperature of the fuel lines and the fuel can be up to 100 °C after the engine is switched off. Let fuel cool off before opening any connections; otherwise there is a danger of scalding!*
- *Put on protective gloves.*
- *Put on safety goggles.*

Danger due to escaping fuel.

- *Depending on the version, the power supply for the fuel system pressurisation pump - G6- must be disconnected before opening the fuel system, since -G6- will be activated briefly when the driver's door is opened with the battery still connected.*
- *Remove fuse for fuel pump control unit - J538- ; for identification of fuses refer to ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.*

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Caution

The high-pressure pump has very close tolerances and must not be allowed to run without fuel. To prevent this and to enable the engine to start quickly after parts have been renewed, it is important to observe the following:

- *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 ⇒ page 332 .*
- *If the high-pressure pump is removed or renewed, the first fuel filling operation must be performed before the engine is started for the first time ⇒ page 332 .*

Observe the following points to prevent personal injuries and damage to the injection and glow plug system:

- Persons wearing a cardiac pacemaker must at all times maintain a safe distance from high-voltage components such as injectors and gas-discharge headlights.
- Always switch off the ignition before connecting or disconnecting tester cables or electrical wiring for the injection or glow plug system.
- Do not open any fuel line connections while the engine is running.
- Always switch off ignition before washing engine.
- Erase any entries in event memory resulting from repairs ⇒ Vehicle diagnostic tester, `Guided Functions`, then `Interrogate event memory`.

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Caution

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

- *Observe notes on procedure for disconnecting the battery.*
- *Always switch off the ignition before disconnecting the battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .*

WARNING

Danger due to escaping fuel.

- *The power supply for the fuel system pressurisation pump - G6- must be disconnected before opening the fuel system, since -G6- will be activated briefly when the driver's door is opened with the battery still connected.*

2.2 Working on the reducing agent metering system - vehicles with SCR catalytic converter

When working on the reducing agent metering system, note the following warnings:

WARNING

Reducing agent can cause skin irritation.

- *Avoid contact with the skin and eyes. Wear protective gloves.*
- *If your skin has come into contact with reducing agent, rinse it off with soap and water.*
- *If reducing agent gets into your eyes, rinse them out with water for several minutes.*
- *Do not breathe in or swallow reducing agent.*
- *If you have swallowed reducing agent, rinse your mouth, drink lots of water and consult a paramedic or doctor immediately.*

When removing and installing components at the reducing agent metering system, note the following:

- The active and passive tanks for reducing agent must be empty when you are working on the reducing agent metering system. Refer to the corresponding work description to find out when the active or passive tank must be drained. Drain the active or passive tank if necessary. Procedure for active tank ⇒ page 431 ; procedure for passive tank ⇒ page 436 .

When removing and installing the active or passive tank, note the following:

- The active or passive tank for reducing agent must be empty. Drain the active or passive tank if necessary. Procedure for active tank ⇒ page 431 ; procedure for passive tank ⇒ page 436 .

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Automatic drawing back of reducing agent

- After the ignition is switched off, the reducing agent is automatically drawn back into the active 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) before disconnecting the battery ⇒ Electrical system; Rep. gr. 27 .

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 .*

2.3 Adapting learnt value after draining reducing agent or renewing components

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.

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- ♦ Active tank
- ♦ Pump for reducing agent
- ♦ Injector for reducing agent
- ♦ Reducing agent line
- ♦ Engine control unit

– Perform adaption using ⇒ vehicle diagnostic tester (“Guided Functions”) under “01 - Adapting learnt values for reducing-agent tank”.

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

Please note the following when working on vehicles with start/stop system:

WARNING

Risk of injury due to automatic engine start on vehicles with start/stop system.

- ♦ *On vehicles with activated start/stop system (indicated by a message in the instrument cluster), the engine may start automatically if it needs to.*
- ♦ *Therefore it is important to ensure that the start/stop system is deactivated when performing repairs (switch off ignition, if required switch on ignition again).*

2.5 Safety precautions when using testers and measuring instruments during a road test

Note the following if testers and measuring instruments have to be used during a road test:

WARNING

Accidents can be caused if the driver is distracted by test equipment while road-testing, or if test equipment is not properly secured.

Persons sitting in the front passenger's seat could be injured if the airbag is triggered in an accident.

- *The use of test equipment while driving causes distraction.*
- *There is an increased risk of injury if test equipment is not secured.*
- ♦ *Test equipment must always be secured on the rear seat with a strap and operated from the rear seat by a second person.*

2.6 Safety precautions when working on the cooling system

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When working on the cooling system note the following warnings:

WARNING

Risk of scalding due to hot steam and hot coolant.

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

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

- *Unplug electrical connectors before working in vicinity of radiator cowl.*

Caution

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

- *Close filler cap on coolant expansion tank (make sure it engages).*

2.7 Safety precautions when working on the subframe

When working on the subframe note the following warnings:

Caution

Risk of damage to running gear components.

- *The vehicle must NOT be lowered onto its wheels if the engine/gearbox mountings, steering rack or subframe cross brace are not properly installed.*
- *The vehicle must NOT be supported by applying a trolley jack or similar to the subframe or subframe cross brace.*

2.8 Safety precautions when working on the exhaust system

WARNING

Please note the following warnings when working on all parts of the exhaust system:

- *Wear gloves (e.g. rubber, not textile) and safety goggles to avoid contact with eyes and skin - risk of injury.*
- *Do not dismantle exhaust gas temperature sender - risk of injury.*

Caution

Risk of damage to flexible joint.

- *Do not bend flexible joint more than 10°.*
- *Install flexible joint so that it is not under tension.*
- *Take care not to damage wire mesh on flexible joint.*

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3 Repair instructions

⇒ “3.1 Rules for cleanliness”, page 8

⇒ “3.2 General notes”, page 8

⇒ “3.3 General repair instructions”, page 9

⇒ “3.4 Foreign particles in engine”, page 10

⇒ “3.5 Contact corrosion”, page 10

⇒ “3.6 Routing and attachment of pipes, hoses and wiring”, page 10

⇒ “3.7 Installing radiators and condensers”, page 10

⇒ “3.8 Checking vacuum system”, page 10

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.
- Immediately seal open lines and connections with clean plugs, for example 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.

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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

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Caution

The high-pressure pump has very close tolerances and must not be allowed to run without fuel. To prevent this and to enable the engine to start quickly after parts have been renewed, it is important to observe the following:

- ***If components of the fuel system between the fuel tank and the high-pressure pump are removed or renewed, the fuel system must be filled and bled before the engine is started for the first time ⇒ page 332 .***

- 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 Foreign particles in engine

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

3.5 Contact corrosion

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

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

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

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

Please note:

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

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3.6 Routing and attachment of pipes, hoses and wiring

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

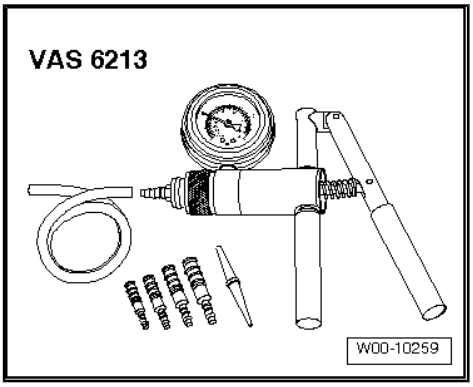
3.7 Installing radiators and condensers

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, condenser or charge air cooler.

3.8 Checking vacuum system

Special tools and workshop equipment required

- Hand vacuum pump - VAS 6213-



Procedure

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

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

– Check vacuum line to solenoid valve and from solenoid valve to corresponding component.

– If a fault is stored in the event memory, check the vacuum lines leading to the corresponding component and also check the remaining vacuum lines in the system.

– If it is not possible to build up a vacuum with the hand vacuum pump - VAS 6213- or if the vacuum pressure drops again immediately, check the hand vacuum pump and connecting hoses for leaks.

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10 – Removing and installing engine

1 Removing and installing engine

⇒ “1.1 Removing engine”, page 12

⇒ “1.2 Separating engine and gearbox”, page 64

⇒ “1.3 Securing engine to engine and gearbox support”, page 81

⇒ “1.4 Installing engine”, page 84

1.1 Removing engine

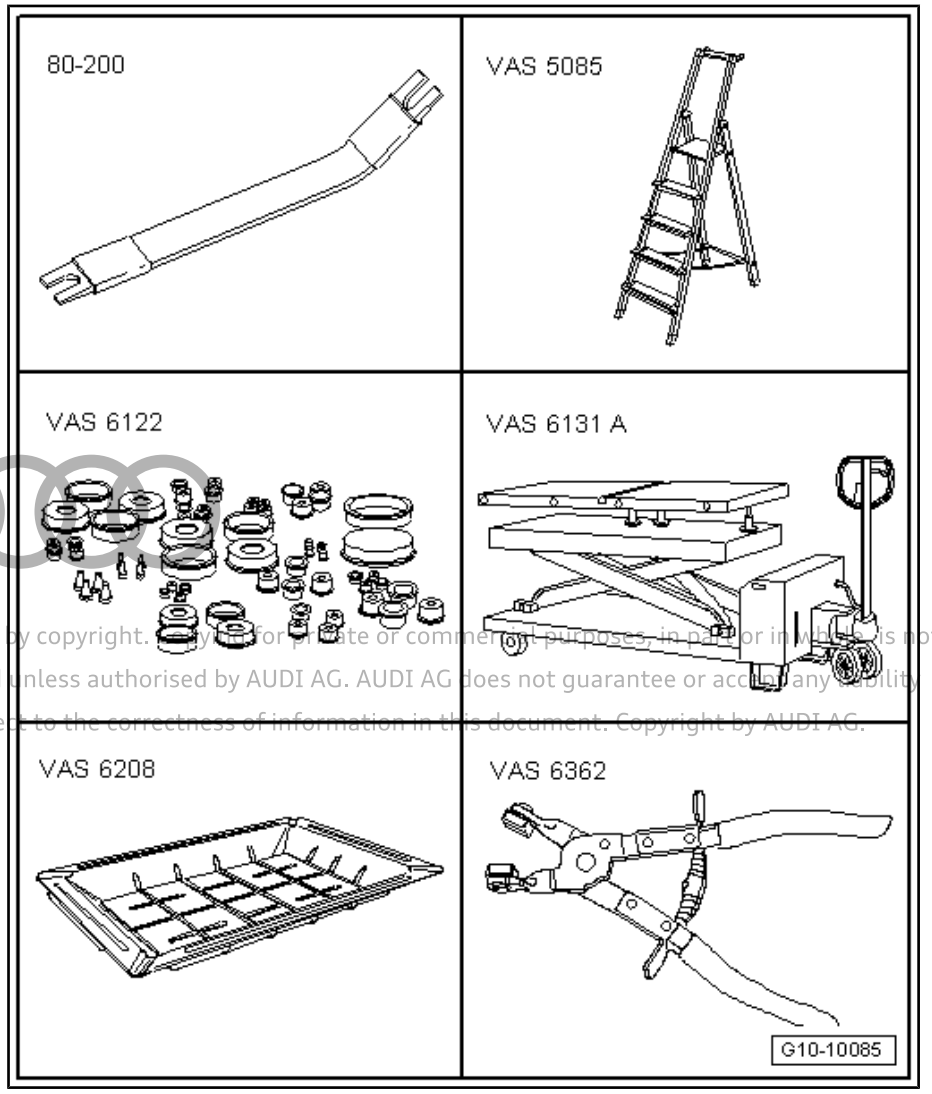
⇒ “1.1.1 Removing engine - vehicles with manual gearbox”, page 12

⇒ “1.1.2 Removing engine - vehicles with multitronic gearbox 0AW”, page 29

⇒ “1.1.3 Removing engine - vehicles with dual clutch gearbox 0B5”, page 46

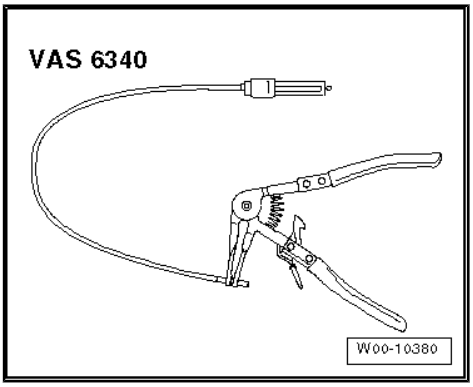
1.1.1 Removing engine - vehicles with manual gearbox

Special tools and workshop equipment required



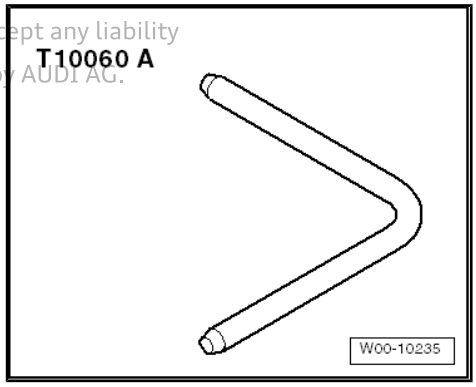
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- Removal lever - 80 - 200-
- Stepladder - VAS 5085-
- Engine bung set - VAS 6122-
- Scissor-type assembly platform - VAS 6131 A- with support set for Audi - VAS 6131/10- and supplementary set - VAS 6131/11- , -VAS 6131/13-
- Drip tray for workshop hoist - VAS 6208-
- Hose clip pliers - VAS 6362-
- Hose clip pliers - VAS 6340-

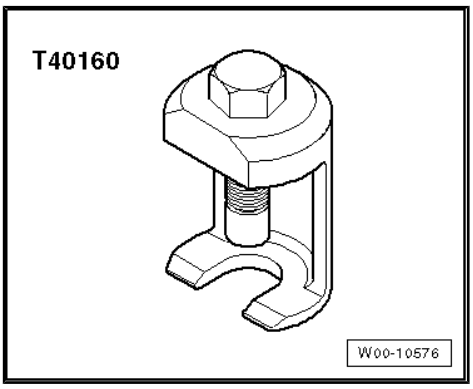


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- Locking pin - T10060 A-



- Puller - T40160-



Procedure

Note

- *The engine is removed from underneath together with the gearbox and subframe (with lock carrier installed).*
- *Fit cable ties in the original positions when installing.*

WARNING

Make sure the vehicle cannot tip over when the engine is removed.

- *Secure the vehicle, to do so, the luggage compartment must be empty.*

The fuel system operates at extremely high pressure. This can cause injury.

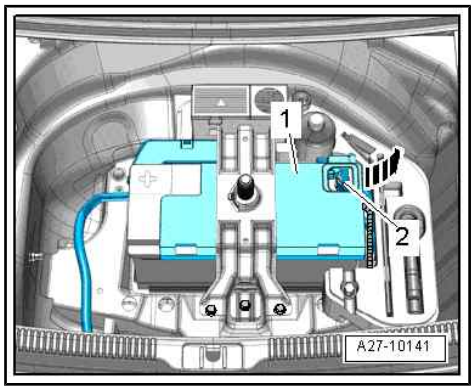
- *The fuel pressure in the high-pressure section of the injection system must be reduced to a residual pressure prior to opening the system.*

– Bring front wheels into straight-ahead position.

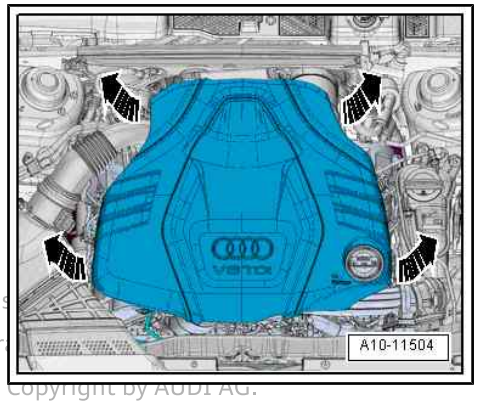
Caution

Risk of irreparable damage to electronic components.

- *Observe notes on procedure for disconnecting the battery.*



– Switch off ignition and remove ignition key.
– Disconnect earth wire -2- from battery terminal ⇒ Electrical system; Rep. gr. 27 ; Battery, Disconnecting and connecting battery .



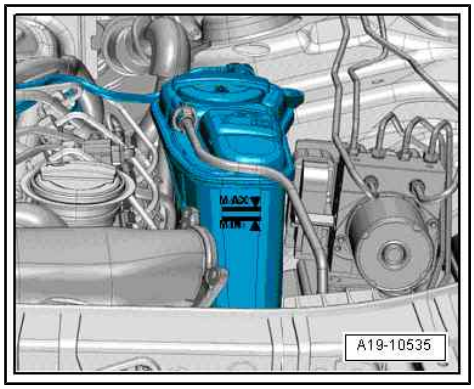
– Remove engine cover panel -arrows-.
– Discharge refrigerant circuit ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit .

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WARNING

Risk of scalding due to hot steam and hot coolant.

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

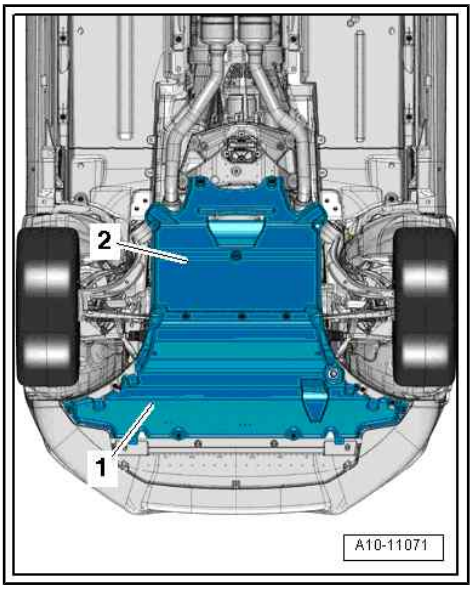


– Open filler cap on coolant expansion tank.

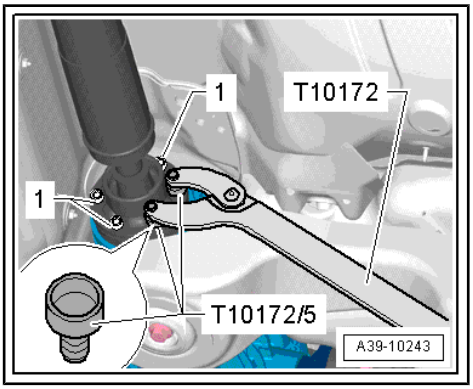
– Remove both front wheels.

– 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 noise insulation -1- and -2- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .



– Vehicles with four-wheel drive: Remove propshaft ⇒ Rear final drive; Rep. gr. 39 ; Propshaft; Removing and installing propshaft .



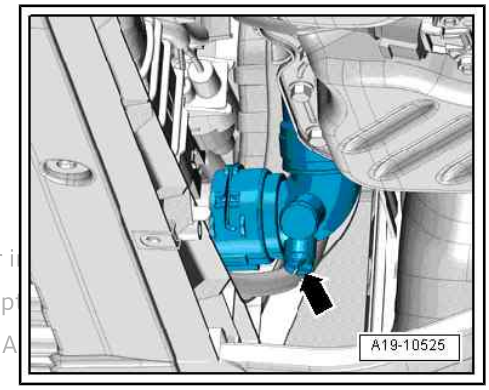
Note

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

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

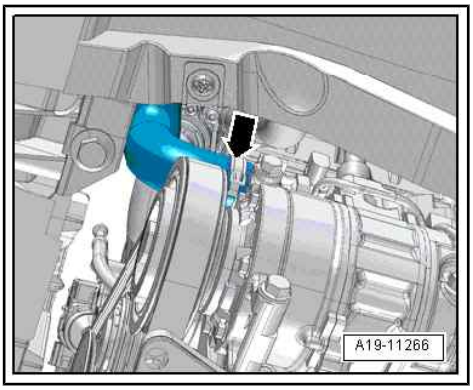
– Remove drain plug -arrow- at connection and drain off coolant.

– Then detach connection from radiator (lift retaining clip).

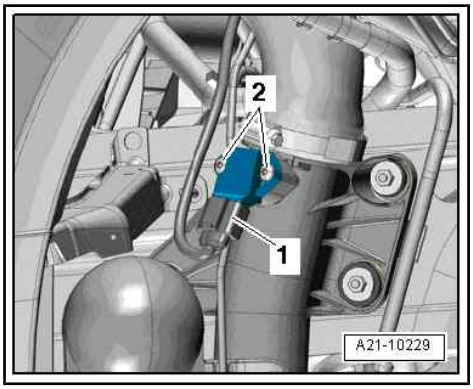


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– Release hose clip -arrow-, disconnect coolant hose from coolant pipe (bottom left) and drain off coolant.



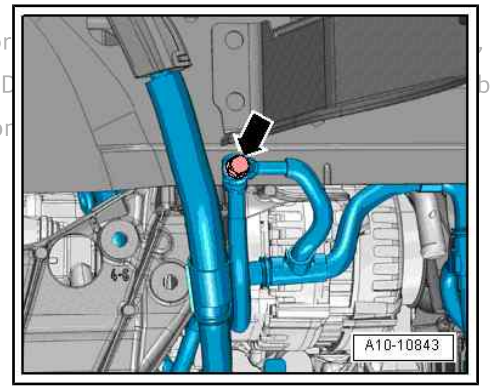
– Unplug electrical connector -1- on charge pressure sender - G31- / intake air temperature sender - G42- and move clear electrical wiring.



Note

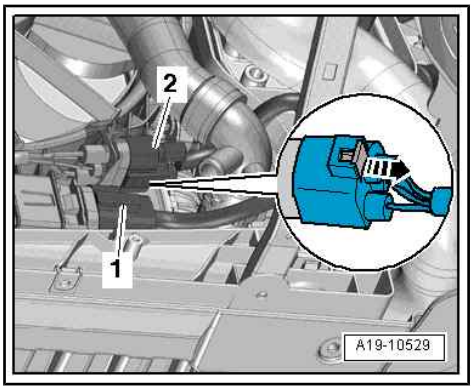
Disregard -item 2-.

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

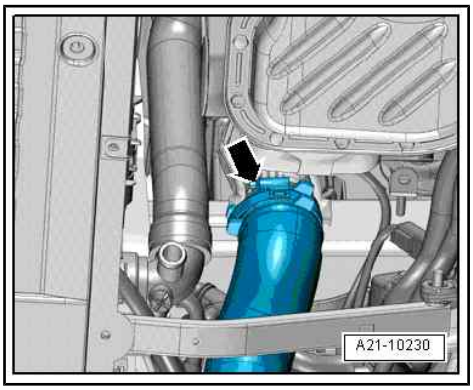


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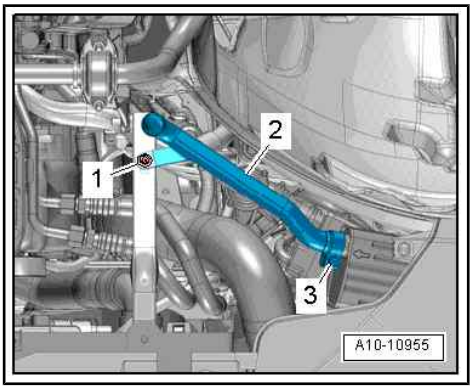
– Unplug electrical connector -1- and, if fitted, -2- for radiator fan (push retainer to the rear -arrow- and press down release catch).
– Move electrical wiring harness clear.



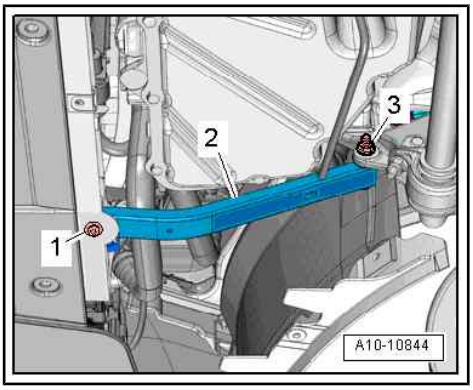
– Release hose clip -arrow-, disconnect air hose from air pipe and move to one side.



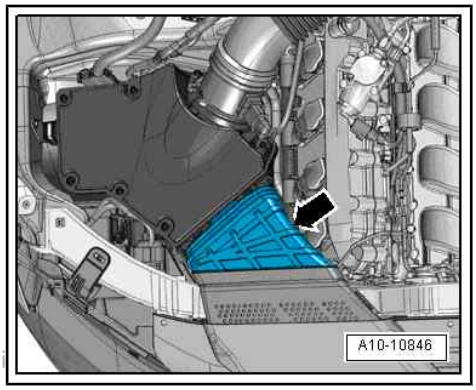
– On vehicles with auxiliary heater: remove nut -1-, loosen clamp -3- and detach exhaust pipe -2- for auxiliary heater



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

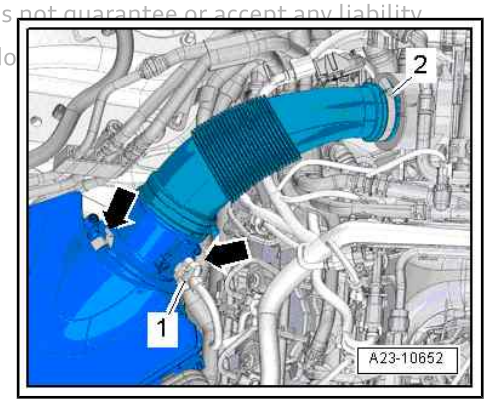


– Remove air duct -arrow-.



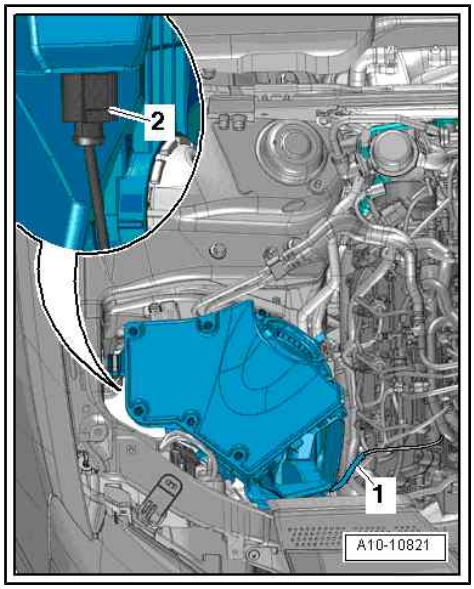
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– Unplug electrical connector -1- at air mass meter - G70- .
– Remove air hose and air mass meter - G70- . To do so, release hose clip -2- and clamps -arrows-.



– Disconnect vacuum line -1-.

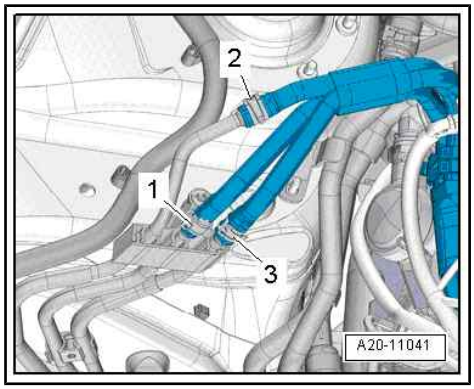
– Detach air cleaner housing, unplug electrical connector -2- at air filter bypass flap valve - N275- on reverse side of air cleaner and move electrical wiring clear.



Caution

Take care to keep components clean.

- *Observe rules for cleanliness when working on the fuel supply system ⇒ page 8 .*



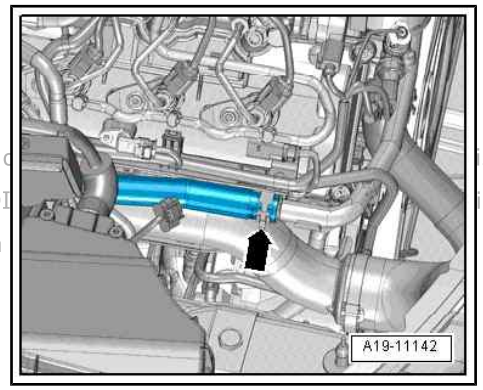
– Release hose clips and detach fuel hoses:

1 - Fuel hose (yellow)

2 - Fuel hose (blue)

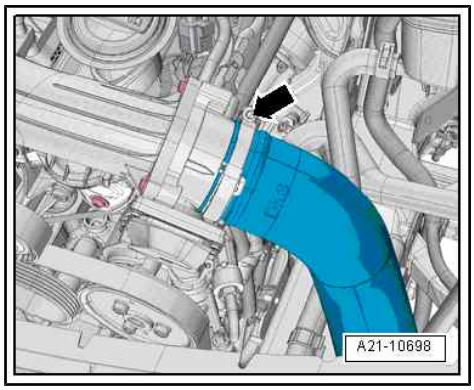
3 - Fuel hose (white)

– Release hose clip -arrow- and disconnect coolant hose from coolant pipe (front).



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



Caution

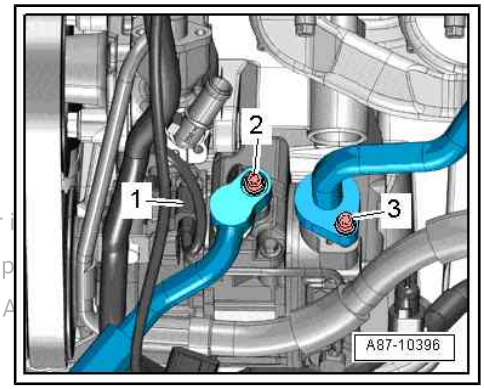
Risk of damage to refrigerant lines and hoses

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

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

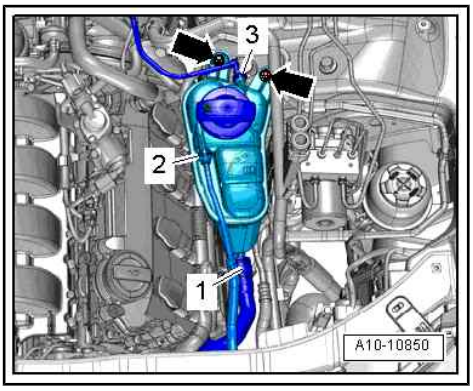
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .



Note

Disregard items -1 and 3-.

– Disconnect coolant hose -3- from coolant expansion tank.

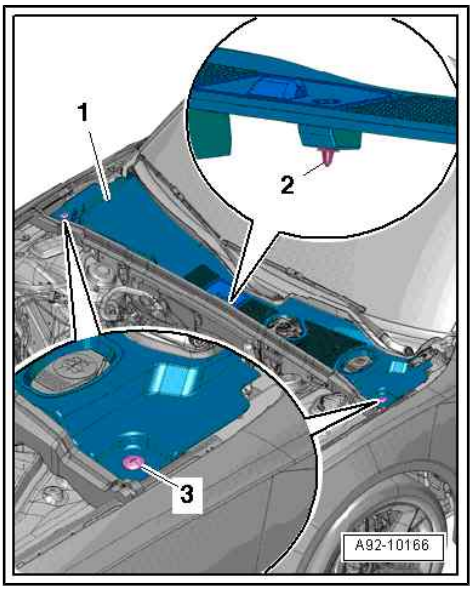


Note

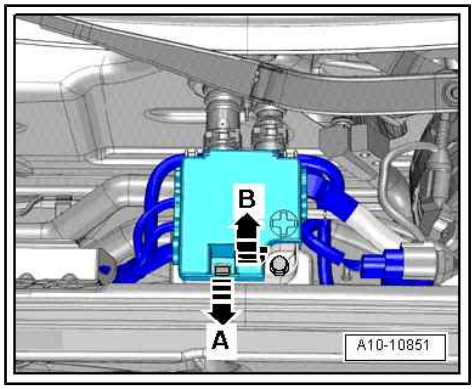
Disregard items marked -1, 2- and -arrows-.

– Pull seal off plenum chamber partition panel.

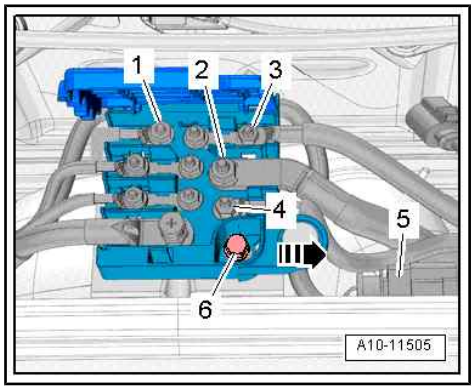
– Remove plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .



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

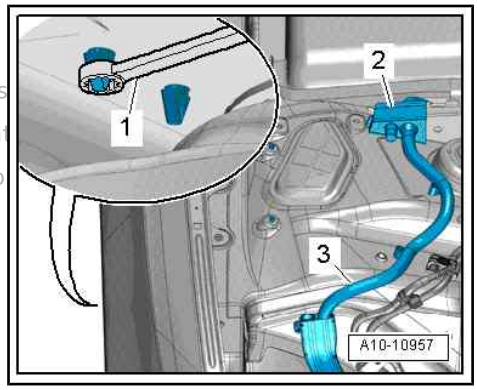


– Remove nuts -1 ... 4- for electrical wiring.
– Detach electrical connector -5- from bracket and unplug.
– Remove bolt -6- and detach terminal 30 wiring junction 2 - TV22- from body brace -arrow-.

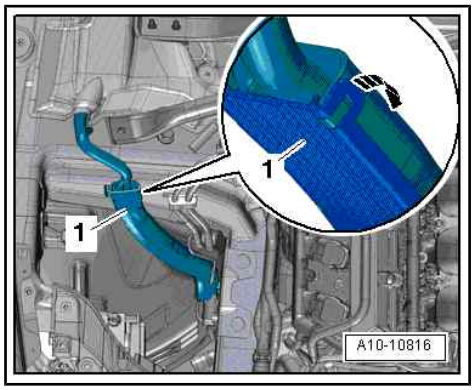


– Working from wheel housing, release catches using a 5.5 mm ring spanner -item 1- and remove wiring protector -2- from above.
– Release wiring harness -3- leading to alternator and starter using removal lever - 80 - 200- and move clear.

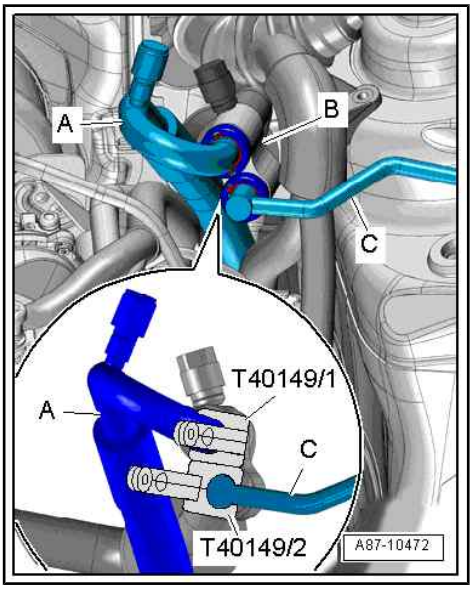
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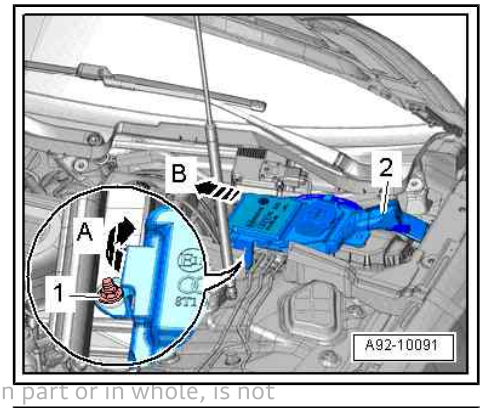
– Release catch -arrow- to open wiring duct -1- and move wiring harness clear.



– Detach refrigerant lines -A- and -C- from inner heat exchanger ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit .

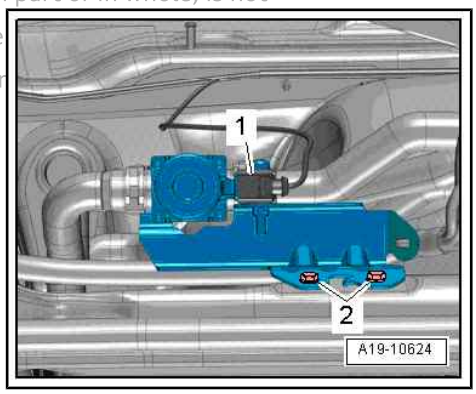


– Remove nut -1- and swivel filler neck for washer fluid reservoir slightly upwards -arrow A-.
– Pull filler neck -2- with filler pipe out of washer fluid reservoir and through opening in body -arrow B-.

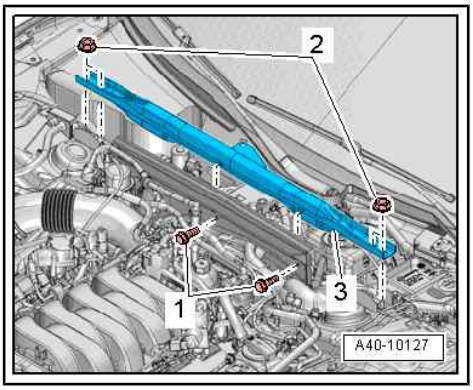


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– On vehicles with auxiliary heater: remove bolts -2- and move pump unit -1- clear to one side.

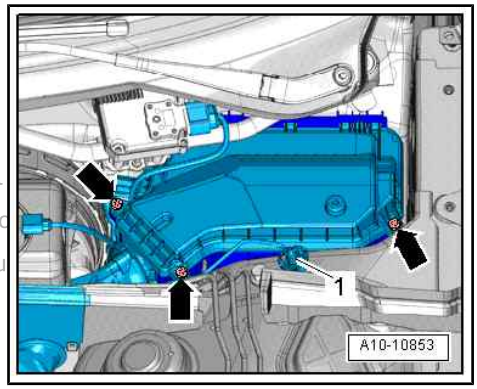


– Remove bolts -1- and nuts -2- and detach body brace -3-.

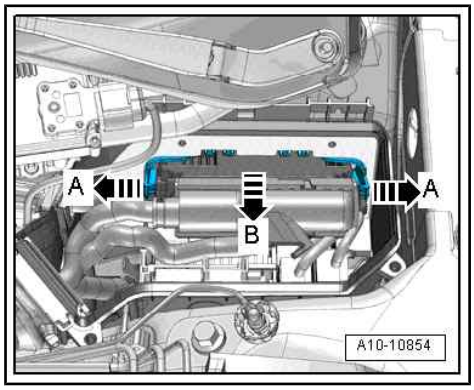


– Remove bolts -arrows- and detach cover for electronics box in engine compartment.
– Remove nut -1- and move electrical wiring clear.

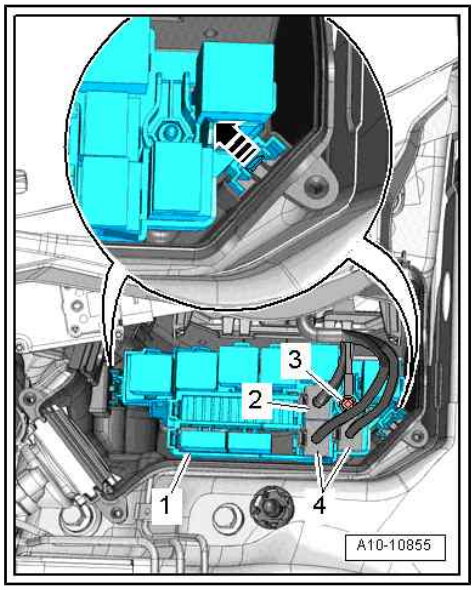
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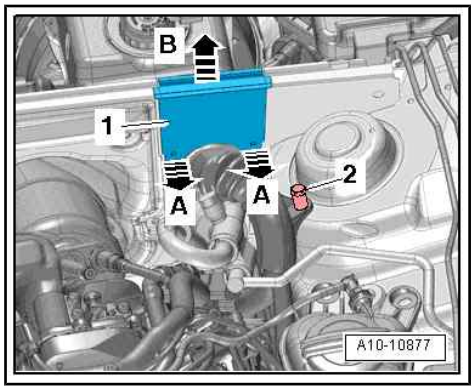
– Release catches -arrows A- and take out engine control unit -arrow B-.



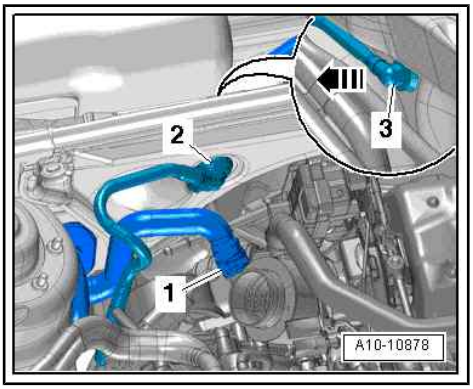
– If fitted, unplug electrical connector -2-.
– Unplug electrical connectors -4- and unscrew nut -3- for wiring.
– Release catches -arrow- and detach relay carrier with fuse holder -1-.
– Disengage engine wiring harness at electronics box in engine compartment and move clear.



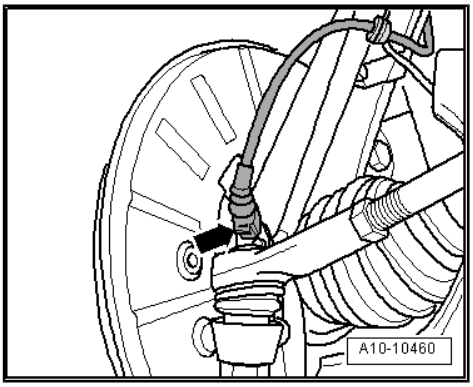
– Release catches -arrows A- and lift off wiring protector -1- -arrow B-.
– Unscrew earth stud -2- and move wiring harness clear.
– Place wiring harness on engine and secure engine control unit to prevent it from dropping.



– Release hose clip -1- and detach coolant hose.
– Disconnect vacuum hose -3- on rear of plenum chamber partition panel -arrow- and detach vacuum connection -2- from plenum chamber partition panel.

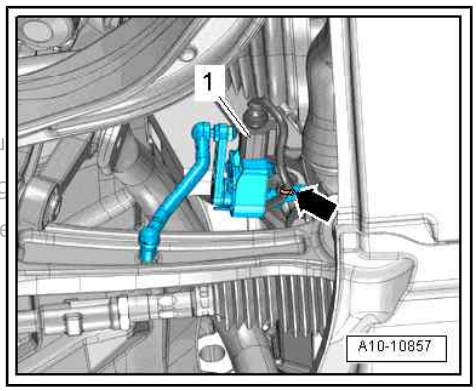


– Unplug electrical connectors -arrow- at front wheel speed sensors on both sides.

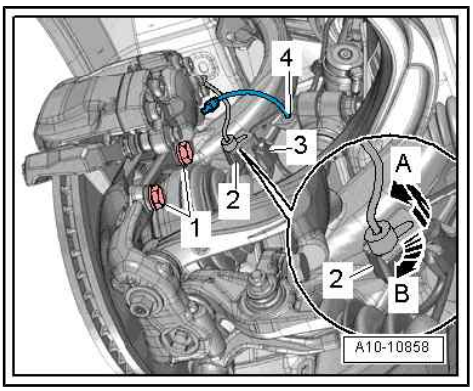


– If fitted, unplug electrical connector -1- from front left vehicle level sender - G78- and front right vehicle level sender - G289- and move wiring clear -arrow-.

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– Release electrical connector -2- at bracket by pulling retainer catch to the rear -arrow A- and turning connector approx. 90° clockwise -arrow B-.
– Move clear electrical wire -3- and brake hose -4- at bracket.
– Remove bolts -1- and tie up brake caliper with attached brake hose in wheel housing.

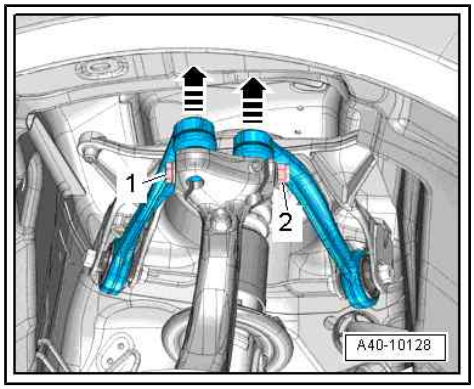


Caution

Risk of damage to brake pistons.

- *Do not operate brake pedal with brake caliper removed.*

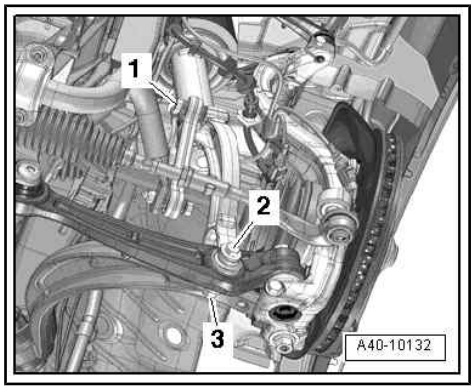
– Remove nut -2- and pull out bolt -1-.
– Pull upper suspension links upwards out of wheel bearing housing -arrows-.
– Repeat procedure on opposite side of vehicle.



– Remove bolt -1- for anti-roll bar on both sides.
– Remove nut -3- on both sides.

Note

The bolts -2- are removed at a later stage.

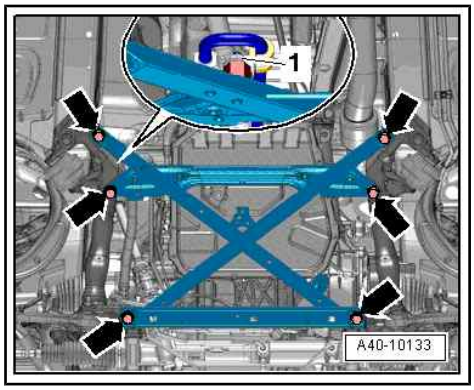


– Remove subframe cross brace ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Removing and installing subframe cross brace .

Caution

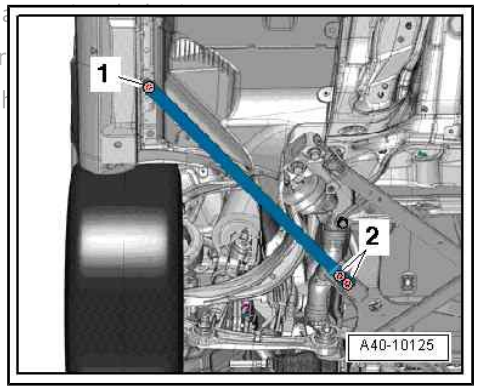
Risk of damage to running gear components.

- ***The vehicle must NOT be lowered onto its wheels if the engine/gearbox mountings, steering rack or subframe cross brace are not properly installed.***



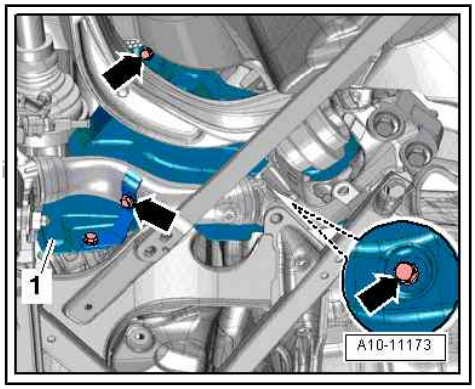
– Audi A5 Cabriolet/Sportback: Remove diagonal struts ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Exploded view - subframe .

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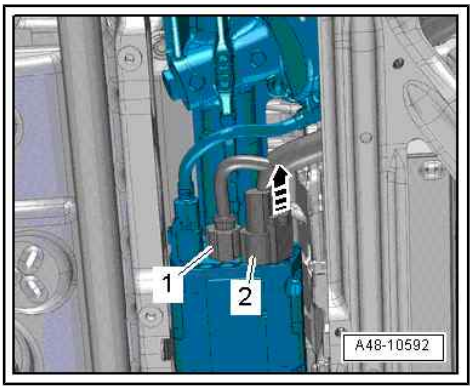


– Remove bolts -arrows- on both sides and detach heat shield -1-.

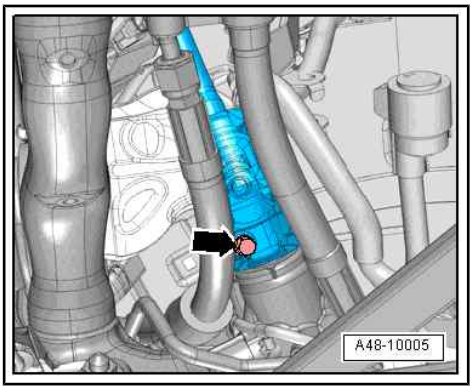
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– Unplug electrical connector -2- at power steering control unit - J500- (release retainer -arrow- and press down release catch).
– Unplug electrical connector -1- at power steering control unit - J500- .
– Move electrical wiring harness clear.



– Detach intermediate steering shaft from steering rack and slide splines together ⇒ Running gear, axles, steering; Rep. gr. 48 ; Steering column; Exploded view - steering column .

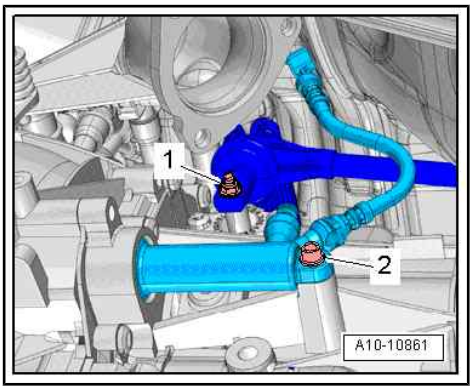


– Remove bolt -2- and tie up clutch slave cylinder at side of engine compartment.

Caution

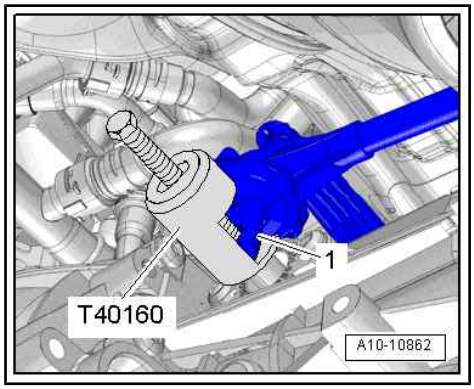
Risk of damage to clutch slave cylinder.

- ***Do not press clutch pedal after removing slave cylinder.***



– Remove nut -1- for selector rod.

– Apply puller -T40160- and pull off selector rod -1-.

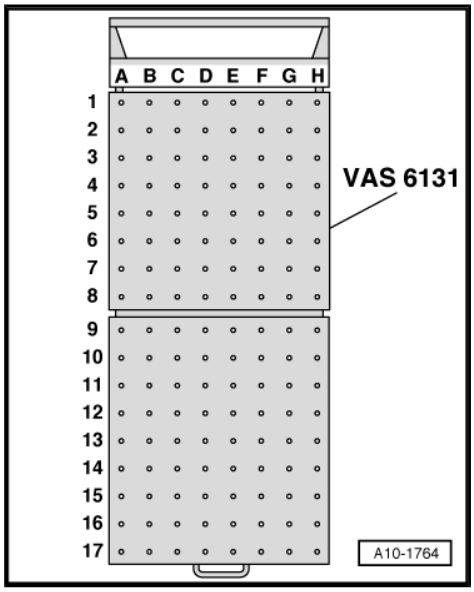


Note

If separating the engine from the gearbox for subsequent work, unscrew the bolted connection securing the drive plate to the flywheel/torque converter ⇒ page 68 .

Set up the scissor-type assembly platform as follows:

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



Platform coordinates	Parts of support set for Audi - VAS 6131/10- , support set -VAS 6131/11- and supplementary set -VAS 6131/13-			
B4	/13-4	/10-4	/10-5	/13-1
G4	/13-4	/10-4	/10-5	/13-1
B6	/10-1	/10-2	/10-5	/11-2
G6	/10-1	/10-2	/10-5	/11-2
A8+C8	/13-6	–	–	/13-2
F8+H8	/13-5	–	–	/13-2
C14	/10-1	/10-3	/10-5	/10-13
F14	/10-1	/10-3	/10-5	/10-10
F17	/10-1	/10-4	/10-5	/13-2

– Initially hand-tighten the support elements on the scissor-type assembly platform.

– Position scissor-type assembly platform - VAS 6131 A- horizontally.

• Take note of spirit level (bubble gauge).

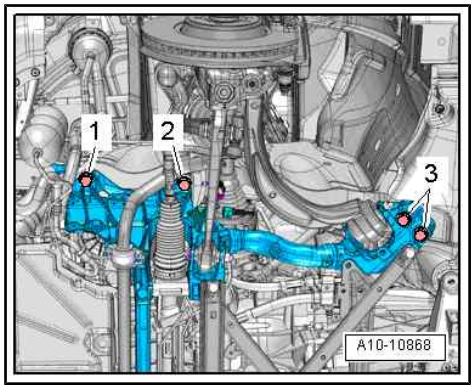
– Position scissor-type assembly platform - VAS 6131 A- below engine/gearbox assembly.

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WARNING

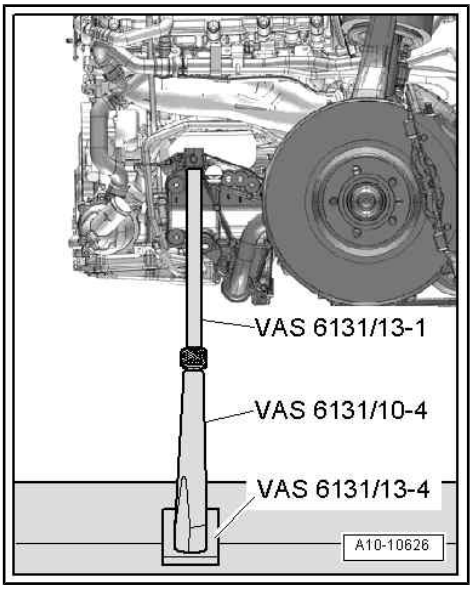
Accident risk if subframe mountings are detached.

- ***Subframe bolts -2- and -3- must not be loosened.***

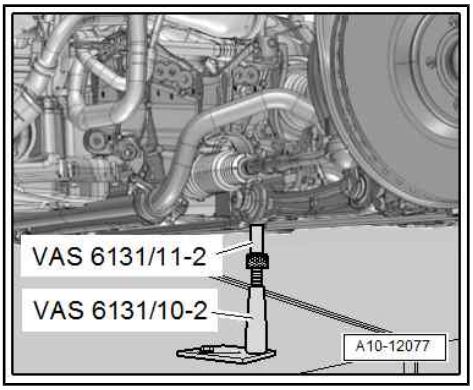


– Remove subframe bolts -1- on both sides.

– Position support elements from -VAS 6131/10- and -VAS 6131/13- at front left and right of subframe as shown.
– Make sure that threaded spindles are screwed in completely.



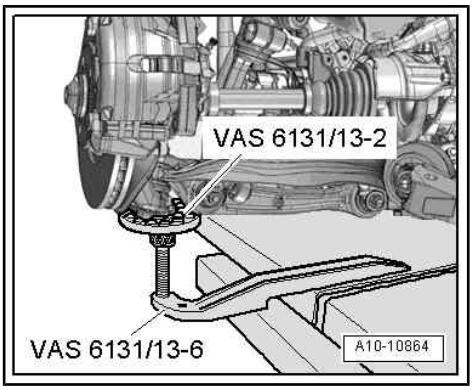
– Position support elements from -VAS 6131/10- and -VAS 6131/11- (rear left and right) at front attachment points of subframe cross brace as shown.



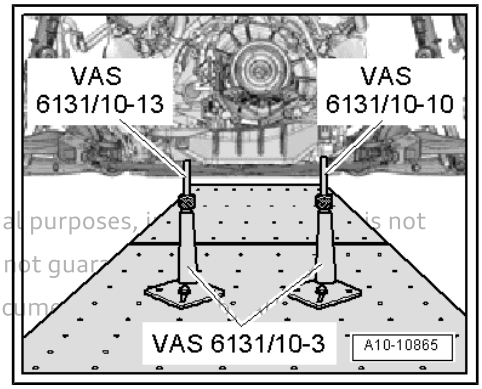
– Position support elements from -VAS 6131/13- under left and right wheel bearing housings as shown.

Note

The illustration shows the left side of the vehicle; use -VAS 6131/13-5- for the right side.



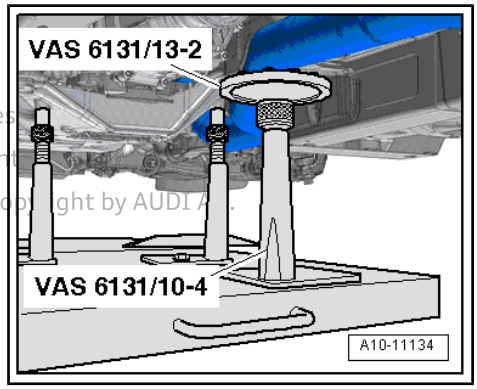
– Detach retaining clips for noise insulation from tunnel cross member.
– Position support elements from -VAS 6131/10- (rear left and right) at tunnel cross member as shown.



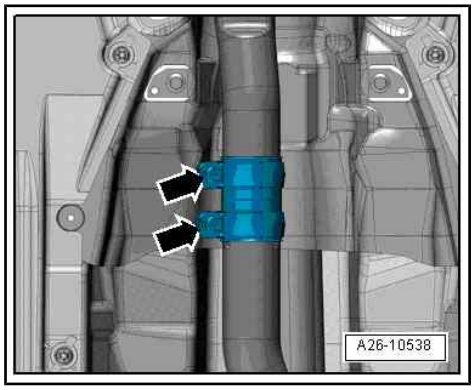
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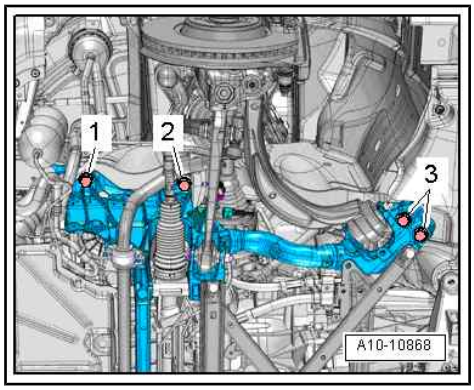
– Position support elements from -VAS 6131/10- and -VAS 6131/13- underneath front exhaust pipe, as shown in illustration.
– Turn all spindles for support elements upwards until all locating lugs make contact with mounting points.
– Tighten base plates for support elements to 20 Nm on scissor-type assembly platform - VAS 6131 A- .



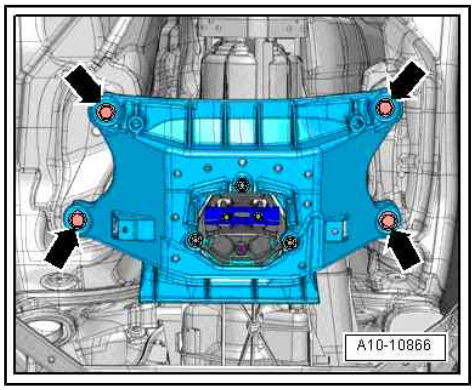
– Vehicles with front-wheel drive: Loosen bolted connections -arrows- and push clamp towards rear.



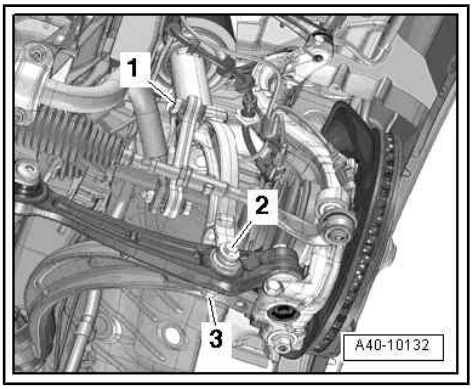
– Mark installation position of subframe and tunnel cross member on longitudinal members with felt-tip pen.
– Unscrew subframe bolts -2- and -3- on both sides in several stages and in diagonal sequence.



– Remove bolts -arrows- for tunnel cross member.



– Remove bolt -2- on both sides.



Caution

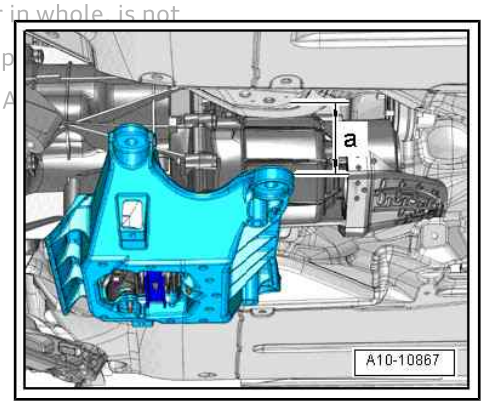
Danger of damage to hoses, pipes and wiring connections and to engine compartment.

- *Check that all hoses and wiring connections between engine, gearbox, subframe and body have been detached.*
- *Carefully guide out engine/gearbox assembly with subframe from engine compartment when lowering.*
- *Carefully guide suspension struts past longitudinal members.*

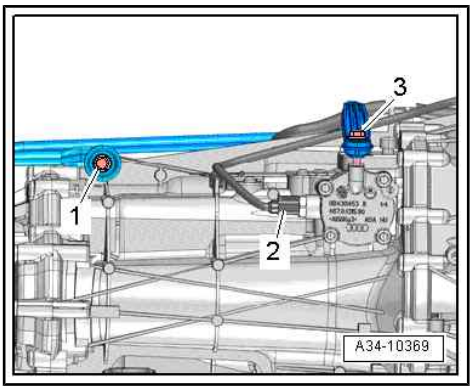
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– Lower engine/gearbox assembly using scissor-type assembly platform - VAS 6131 A- initially only as far as distance -a-.

• Dimension -a- = 100 mm (maximum).



– Remove bolts -1- and -3- for selector rod and push rod.



Note

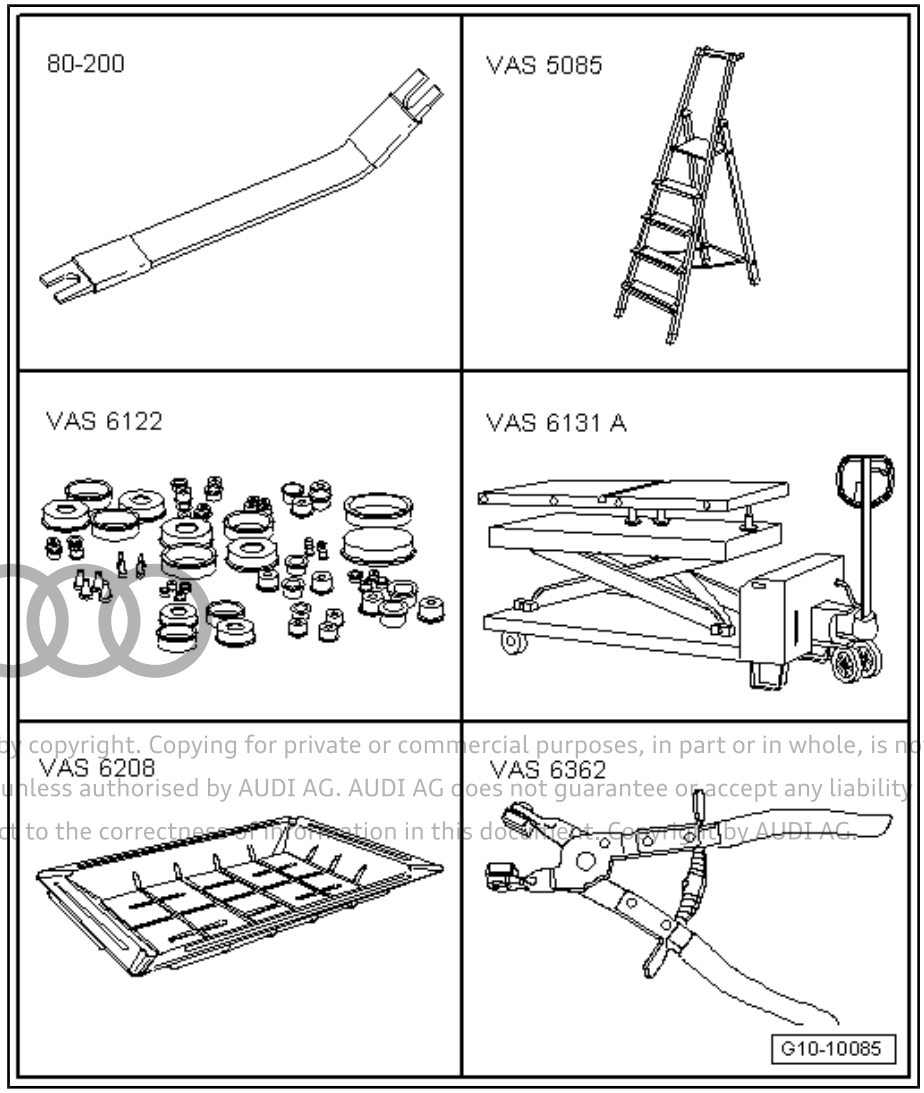
Disregard -item 2-.

– Lower engine/gearbox assembly further.

– Pull out scissor-type assembly platform - VAS 6131 A- with engine/gearbox assembly from underneath vehicle.

1.1.2 Removing engine - vehicles with multitronic gearbox 0AW

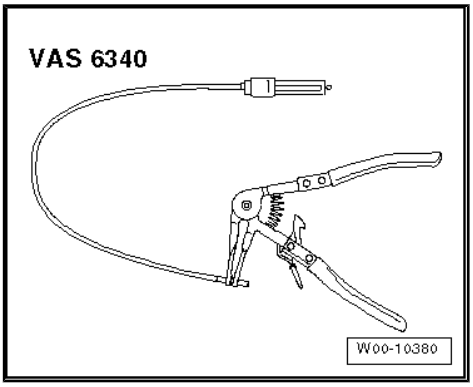
Special tools and workshop equipment required



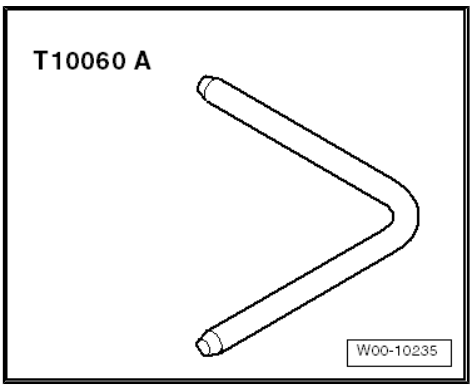
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- Removal lever - 80 - 200-
- Stepladder - VAS 5085-
- Engine bung set - VAS 6122-
- Scissor-type assembly platform - VAS 6131 A- with support set for Audi - VAS 6131/10- and supplementary set - VAS 6131/11- , -VAS 6131/13-
- Drip tray for workshop hoist - VAS 6208-
- Hose clip pliers - VAS 6362-

- Hose clip pliers - VAS 6340-



- Locking pin - T10060 A-



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Procedure

Note

- *The engine is removed from underneath together with the gearbox and subframe (with lock carrier installed).*
- *Fit cable ties in the original positions when installing.*

WARNING

Make sure the vehicle cannot tip over when the engine is removed.

- ***Secure the vehicle, to do so, the luggage compartment must be empty.***

The fuel system operates at extremely high pressure. This can cause injury.

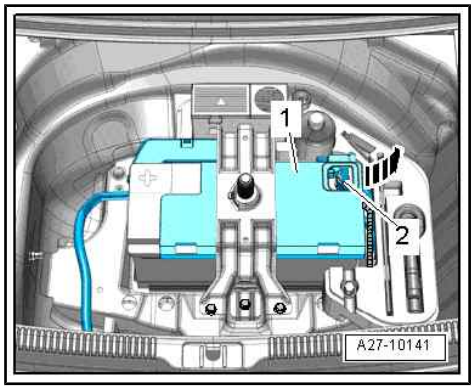
- ***The fuel pressure in the high-pressure section of the injection system must be reduced to a residual pressure prior to opening the system.***

– Bring front wheels into straight-ahead position.

Caution

Risk of irreparable damage to electronic components.

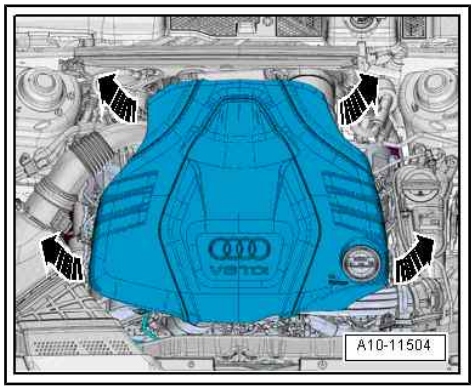
- *Observe notes on procedure for disconnecting the battery.*



– Switch off ignition and remove ignition key.

– Disconnect earth wire -2- from battery terminal ⇒ Electrical system; Rep. gr. 27 ; Battery, Disconnecting and connecting battery .

– Remove engine cover panel -arrows-.

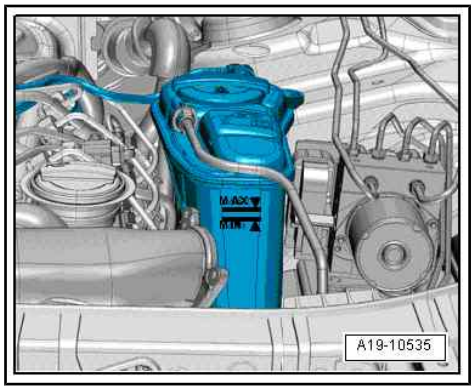


– Discharge refrigerant circuit ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit .

WARNING

Risk of scalding due to hot steam and hot coolant.

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

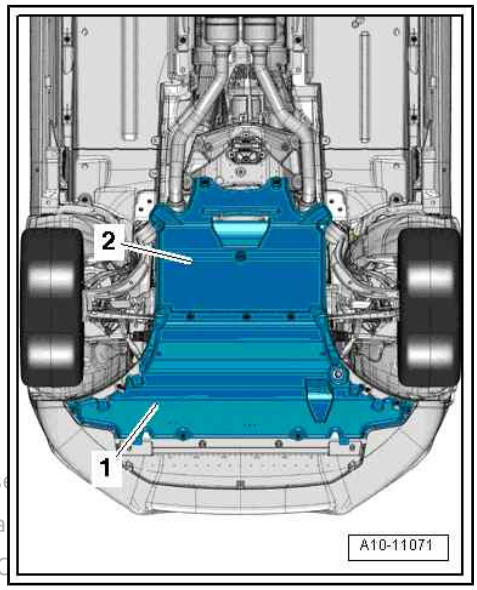


– Open filler cap on coolant expansion tank.

– Remove both front wheels.

– 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 noise insulation -1- and -2- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .

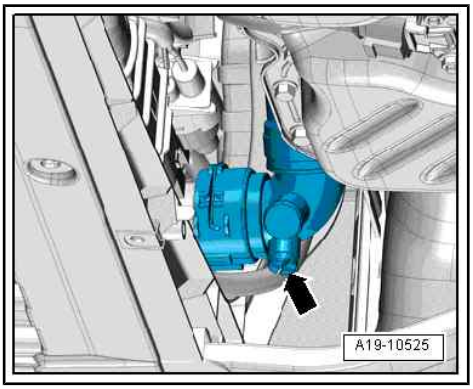


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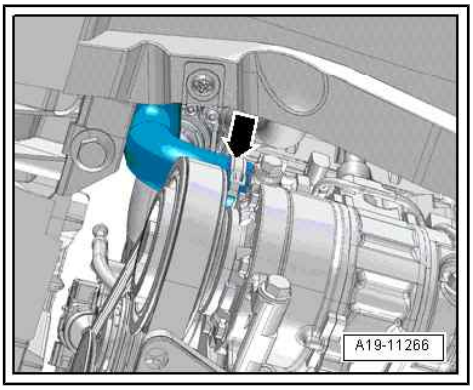
Note

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

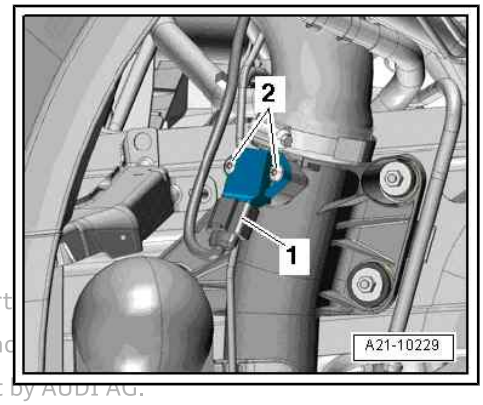
– Place drip tray for workshop hoist - VAS 6208- beneath engine.
– Remove drain plug -arrow- at connection and drain off coolant.
– Then detach connection from radiator (lift retaining clip).



– Release hose clip -arrow-, disconnect coolant hose from coolant pipe (bottom left) and drain off coolant.



– Unplug electrical connector -1- on charge pressure sender - G31- / intake air temperature sender - G42- and move clear electrical wiring.

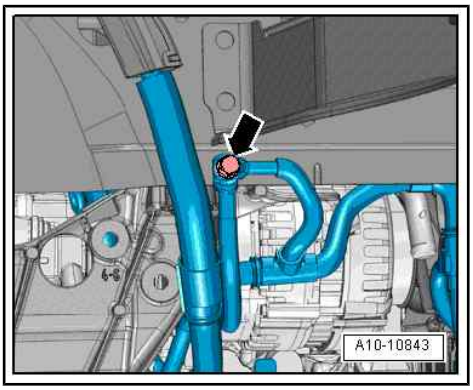


Note

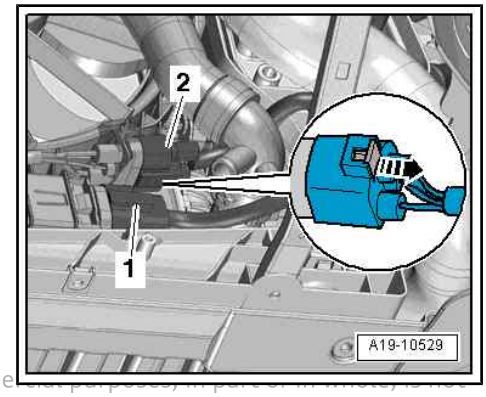
Disregard -item 2-.

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

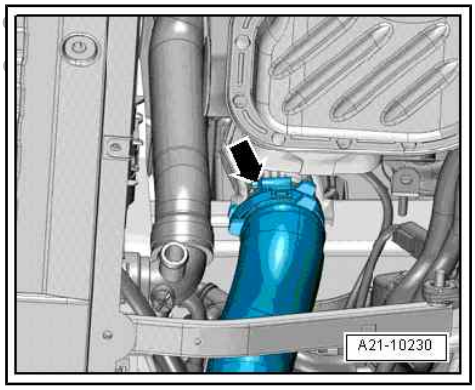


– Unplug electrical connector -1- and, if fitted, -2- for radiator fan (push retainer to the rear -arrow- and press down release catch).
– Move electrical wiring harness clear.

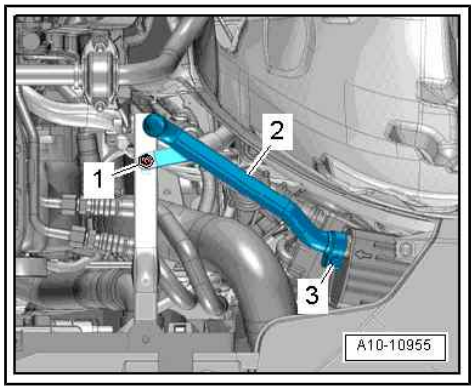


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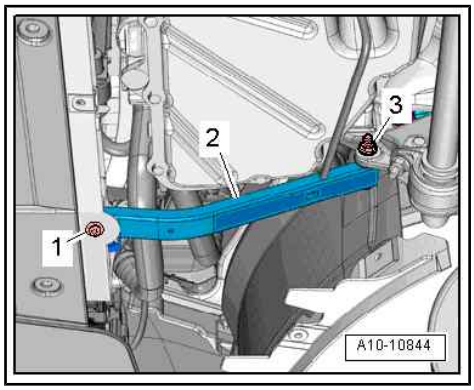
– Release hose clip -arrow-, disconnect air hose from air pipe and move to one side.



– On vehicles with auxiliary heater: remove nut -1-, loosen clamp -3- and detach exhaust pipe -2- for auxiliary heater



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

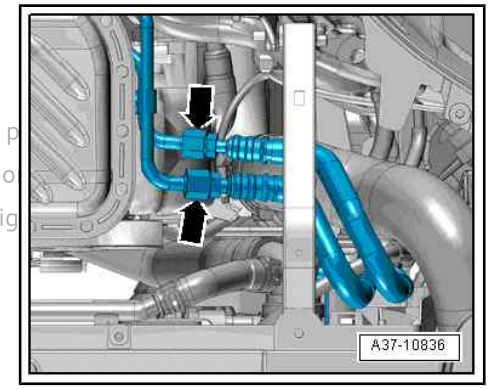


Note

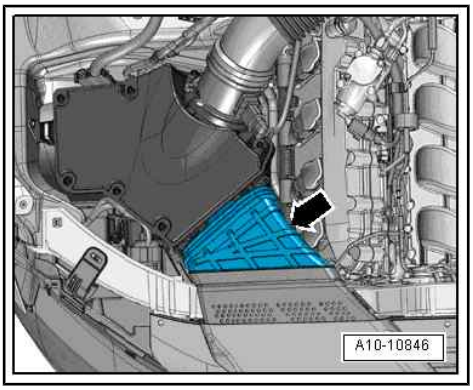
Observe rules for cleanliness when working on gearbox ⇒ Rep. gr. 00 ; Repair instructions; Rules for cleanliness .

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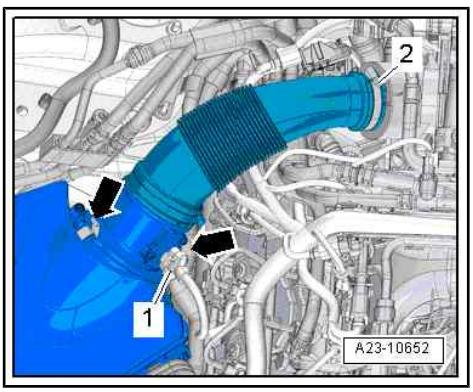
– Position used oil collection and extraction unit - V.A.G 1782- below connection points.
– Disconnect ATF lines -arrows- at connections on right side of engine.
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .



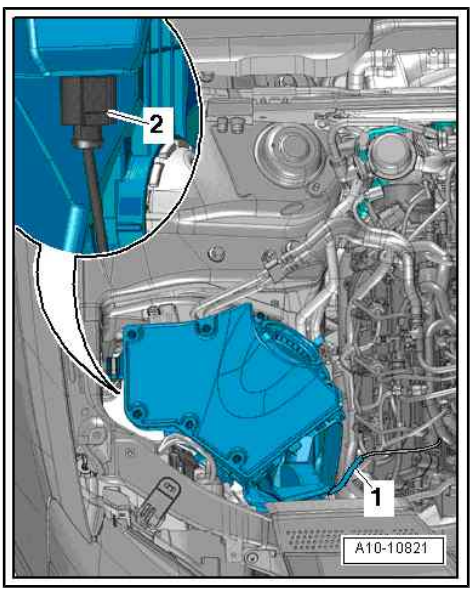
– Remove air duct -arrow-.



– Unplug electrical connector -1- at air mass meter - G70- .
– Remove air hose and air mass meter - G70- . To do so, release hose clip -2- and clamps -arrows-.



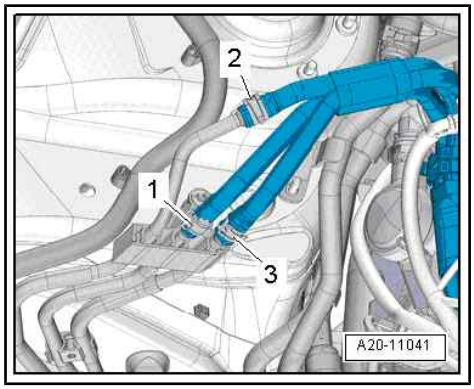
– Disconnect vacuum line -1-.
– Detach air cleaner housing, unplug electrical connector -2- at air filter bypass flap valve - N275- on reverse side of air cleaner and move electrical wiring clear.



Caution

Take care to keep components clean.

- *Observe rules for cleanliness when working on the fuel supply system ⇒ page 8 .*



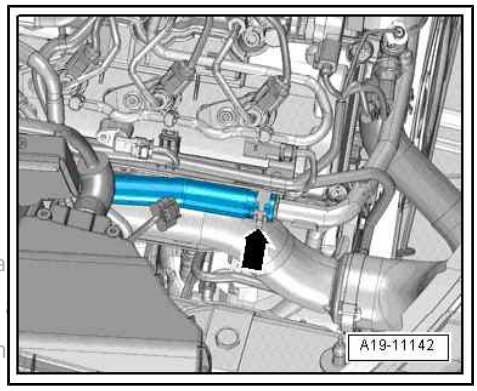
– Release hose clips and detach fuel hoses:

1 - Fuel hose (yellow)

2 - Fuel hose (blue)

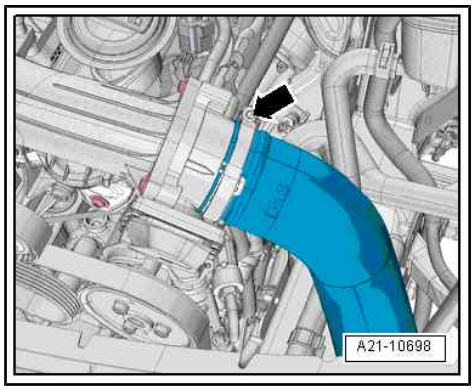
3 - Fuel hose (white)

– Release hose clip -arrow- and disconnect coolant hose from coolant pipe (front).



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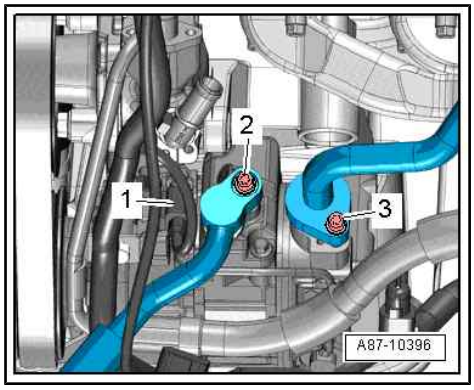
– Release hose clip -arrow- and detach air hose.



Caution

Risk of damage to refrigerant lines and hoses

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



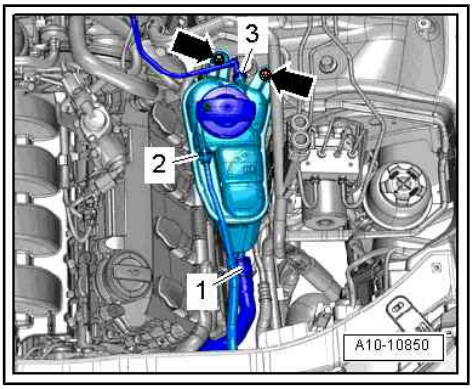
– Remove bolt -2-, disconnect refrigerant line from air conditioner compressor and move to one side.

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

Note

Disregard items -1 and 3-.

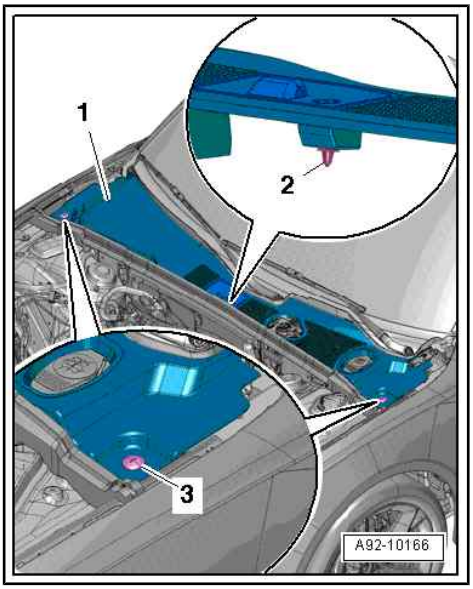
– Disconnect coolant hose -3- from coolant expansion tank.



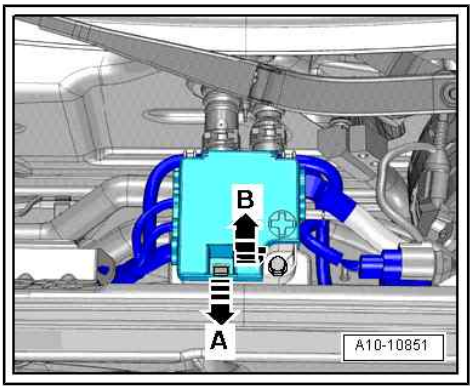
Note

Disregard items marked -1, 2- and -arrows-.

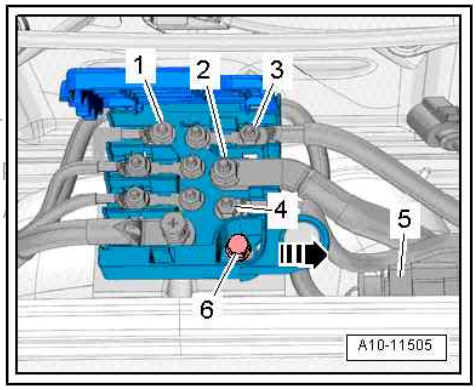
– Pull seal off plenum chamber partition panel.
– Remove plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .



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

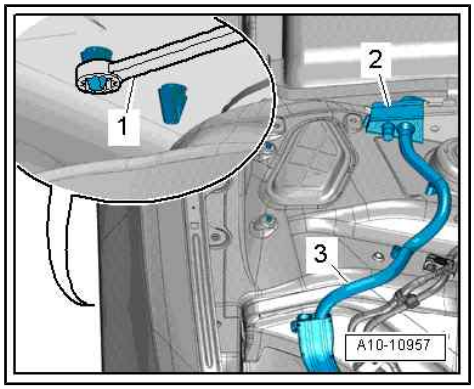


– Remove nuts -1 ... 4- for electrical wiring.
– Detach electrical connector -5- from bracket and unplug.
– Remove bolt -6- and detach terminal 30 wiring junction 2 - TV22- from body brace -arrow-.

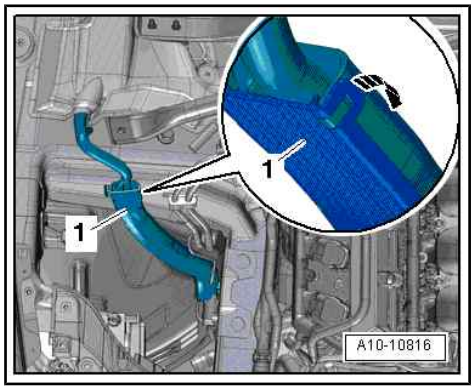


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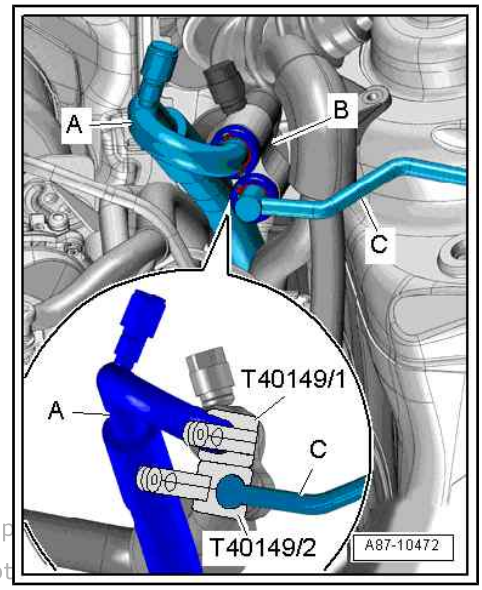
– Working from wheel housing, release catches using a 5.5 mm ring spanner -item 1- and remove wiring protector -2- from above.
– Release wiring harness -3- leading to alternator and starter using removal lever - 80 - 200- and move clear.



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

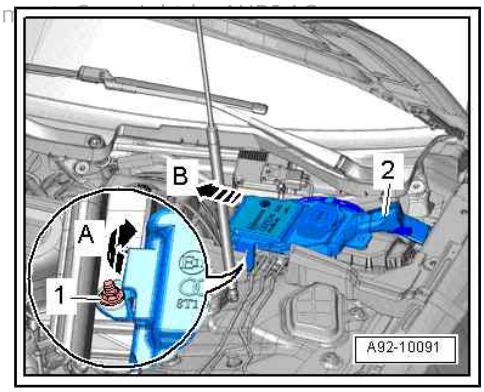


– Detach refrigerant lines -A- and -C- from inner heat exchanger ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit .

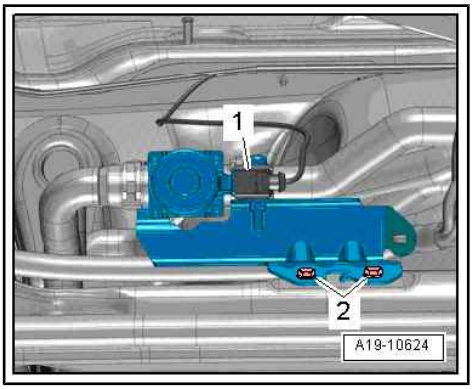


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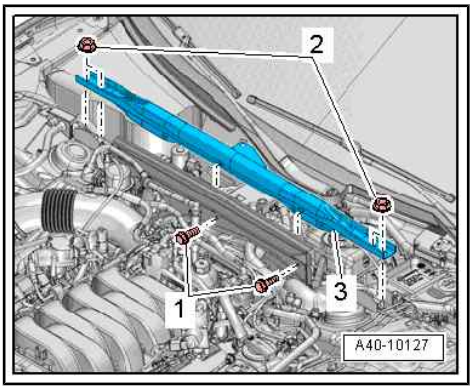
– Remove nut -1- and swivel filler neck for washer fluid reservoir slightly upwards -arrow A-.
– Pull filler neck -2- with filler pipe out of washer fluid reservoir and through opening in body -arrow B-.



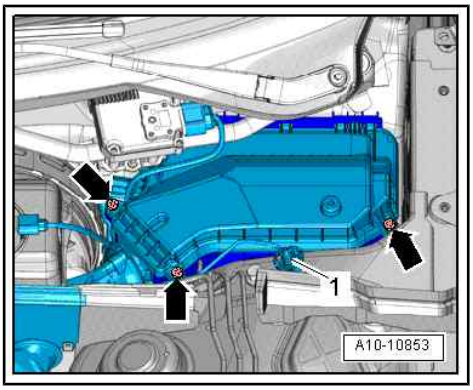
– On vehicles with auxiliary heater: remove bolts -2- and move pump unit -1- clear to one side.



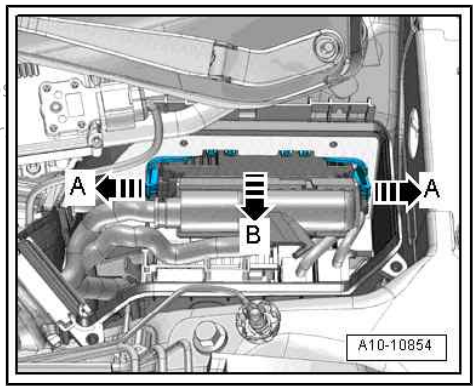
– Remove bolts -1- and nuts -2- and detach body brace -3-.



– Remove bolts -arrows- and detach cover for electronics box in engine compartment.
– Remove nut -1- and move electrical wiring clear.



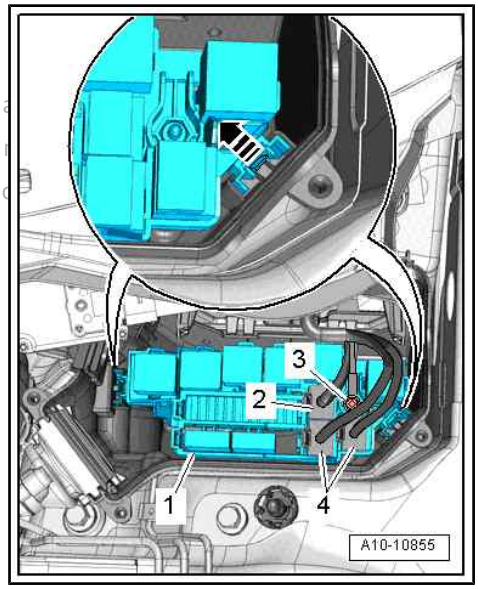
– Release catches -arrows A- and take out engine control unit -arrow B-.



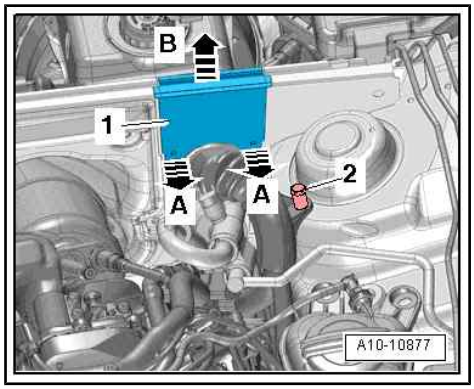
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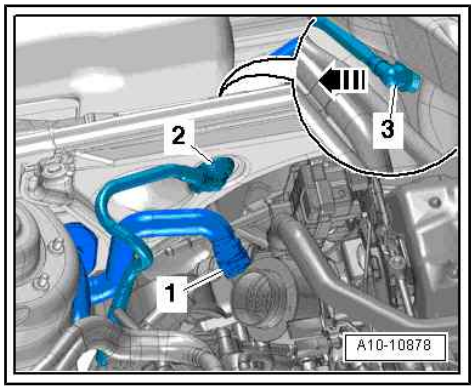
– If fitted, unplug electrical connector -2-.
– Unplug electrical connectors -4- and unscrew nut -3- for wiring.
– Release catches -arrow- and detach relay carrier with fuse holder -1-.
– Disengage engine wiring harness at electronics box in engine compartment and move clear.



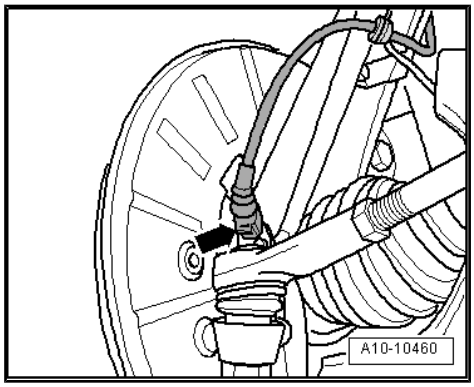
– Release catches -arrows A- and lift off wiring protector -1- -arrow B-.
– Unscrew earth stud -2- and move wiring harness clear.
– Place wiring harness on engine and secure engine control unit to prevent it from dropping.



– Release hose clip -1- and detach coolant hose.
– Disconnect vacuum hose -3- on rear of plenum chamber partition panel -arrow- and detach vacuum connection -2- from plenum chamber partition panel.

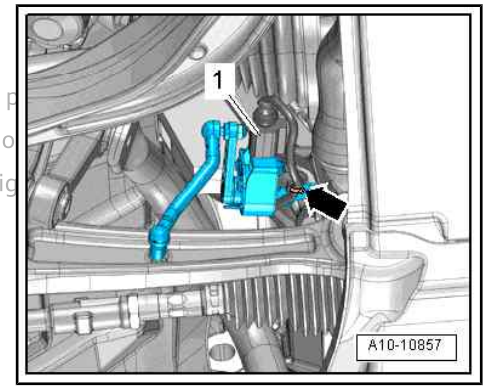


– Unplug electrical connectors -arrow- at front wheel speed sensors on both sides.

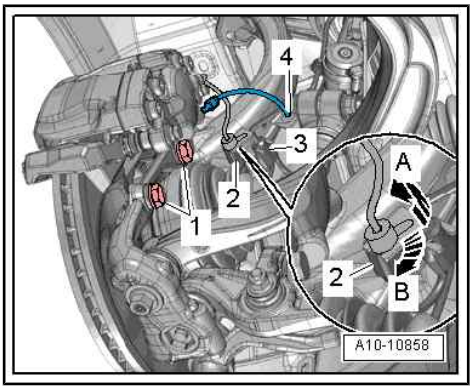


– If fitted, unplug electrical connector -1- from front left vehicle level sender - G78- and front right vehicle level sender - G289- and move wiring clear -arrow-.

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– Release electrical connector -2- at bracket by pulling retainer catch to the rear -arrow A- and turning connector approx. 90° clockwise -arrow B-.
– Move clear electrical wire -3- and brake hose -4- at bracket.
– Remove bolts -1- and tie up brake caliper with attached brake hose in wheel housing.

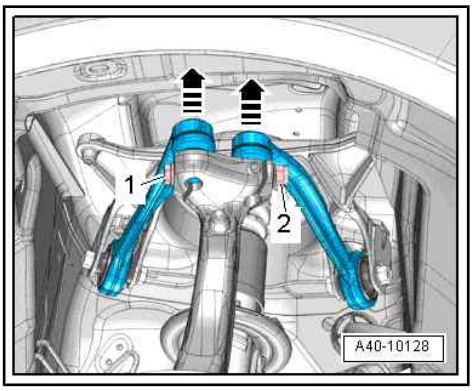


Caution

Risk of damage to brake pistons.

- *Do not operate brake pedal with brake caliper removed.*

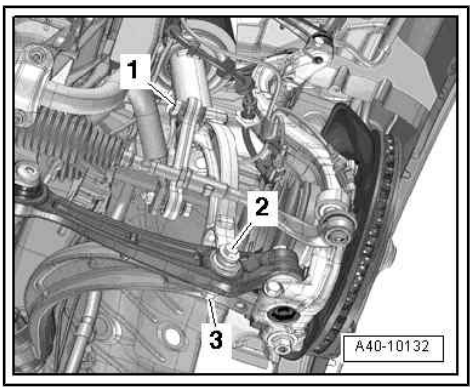
– Remove nut -2- and pull out bolt -1-.
– Pull upper suspension links upwards out of wheel bearing housing -arrows-.
– Repeat procedure on opposite side of vehicle.



– Remove bolt -1- for anti-roll bar on both sides.
– Remove nut -3- on both sides.

Note

The bolts -2- are removed at a later stage.

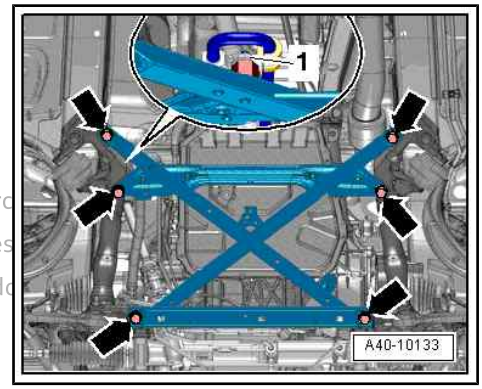


– Remove subframe cross brace ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Removing and installing subframe cross brace .

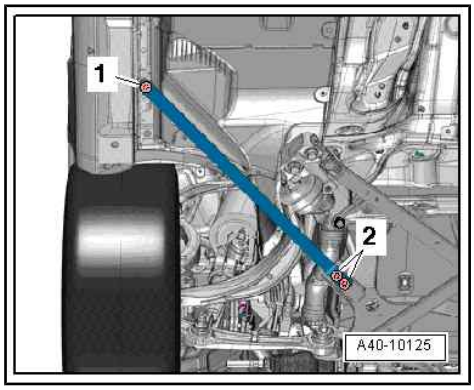
Caution

Risk of damage to running gear components.

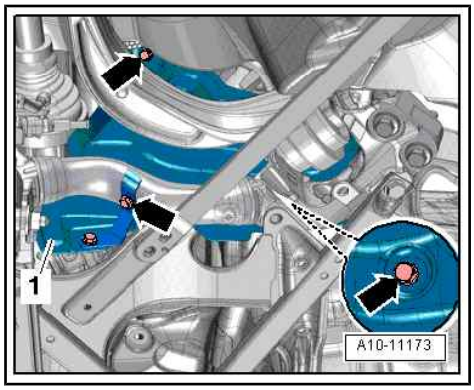
- ***The vehicle must NOT be lowered onto its wheels if the engine/gearbox mountings, steering rack or subframe cross brace are not properly installed.***



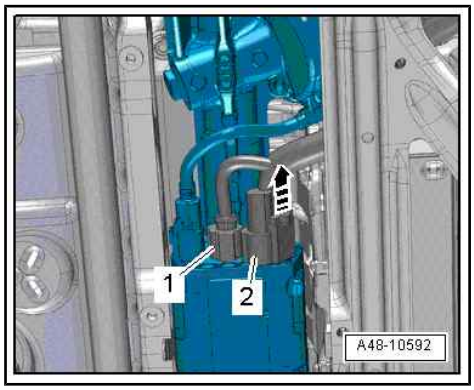
– Audi A5 Cabriolet/Sportback: Remove diagonal struts ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Exploded view - subframe .



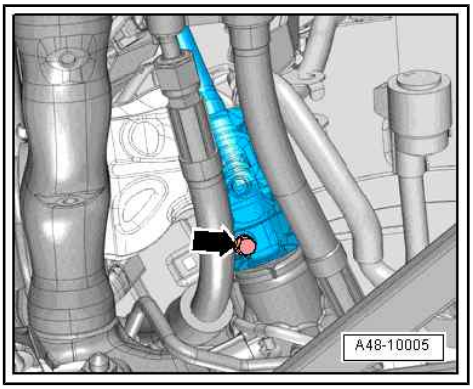
– Remove bolts -arrows- on both sides and detach heat shield -1-.



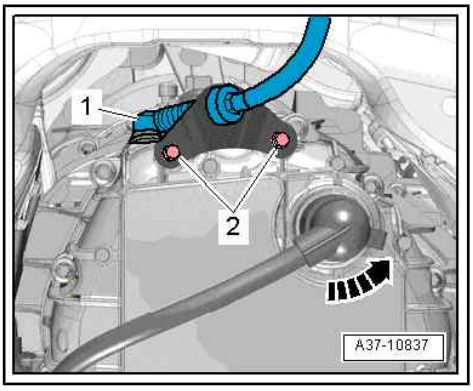
– Unplug electrical connector -2- at power steering control unit - J500- (release retainer -arrow- and press down release catch).
– Unplug electrical connector -1- at power steering control unit - J500- .
– Move electrical wiring harness clear.



– Detach intermediate steering shaft from steering rack and slide splines together ⇒ Running gear, axles, steering; Rep. gr. 48 ; Steering column; Exploded view - steering column .



– Pry ball socket -1- of selector lever cable off gearbox selector lever using removal lever - 80 - 200- .
– Remove bolts -2- for cable support bracket.
– Move selector lever cable clear.

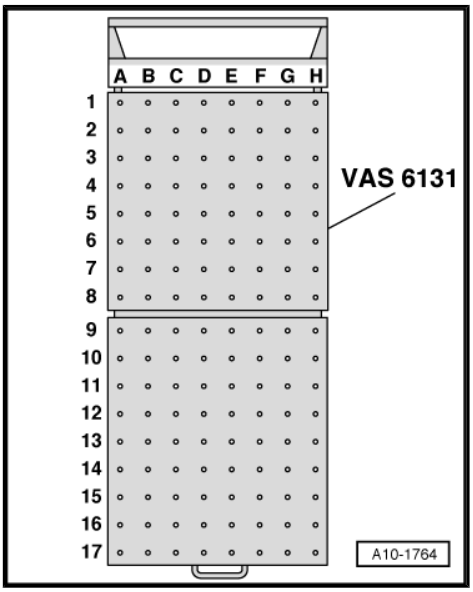


Note

- *Take care not to bend or kink selector lever cable.*
- *Disregard -arrow-.*
- *If separating the engine from the gearbox for subsequent work, unscrew the bolted connection securing the drive plate to the flywheel/torque converter ⇒ page 73 .*

Set up the scissor-type assembly platform as follows:

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



Platform coordinates	Parts of support set for Audi - VAS 6131/10- , support set -VAS 6131/11- and supplementary set - VAS 6131/13-			
B4	/13-4	/10-4	/10-5	/13-1
G4	/13-4	/10-4	/10-5	/13-1
B6	/10-1	/10-2	/10-5	/11-2
G6	/10-1	/10-2	/10-5	/11-2
A8+C8	/13-6	–	–	/13-2
F8+H8	/13-5	–	–	/13-2
C14	/10-1	/10-3	/10-5	/10-13
F14	/10-1	/10-3	/10-5	/10-10
F17	/10-1	/10-4	/10-5	/13-2

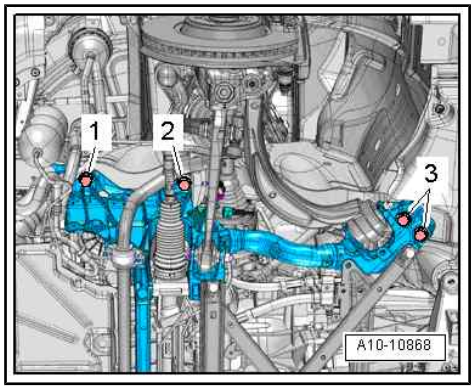
– Initially hand-tighten the support elements on the scissor-type assembly platform.
– Position scissor-type assembly platform - VAS 6131 A- horizontally.
• Take note of spirit level (bubble gauge).
– Position scissor-type assembly platform - VAS 6131 A- below engine/gearbox assembly.

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WARNING

Accident risk if subframe mountings are detached.

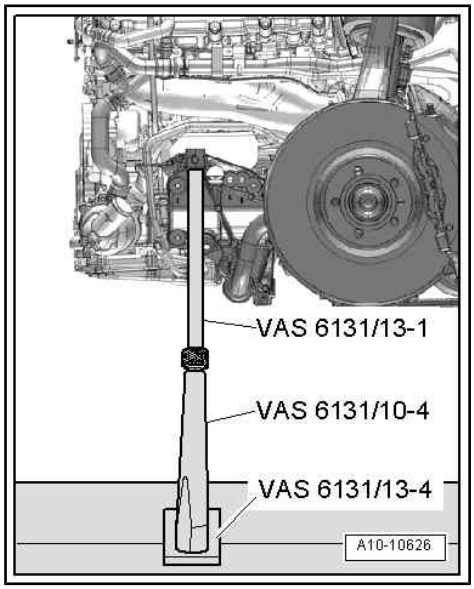
- *Subframe bolts -2- and -3- must not be loosened.*



– Remove subframe bolts -1- on both sides.

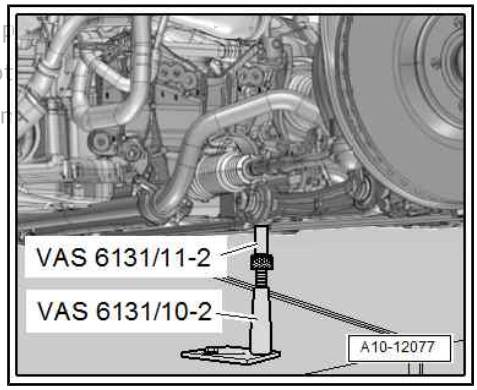
– Position support elements from -VAS 6131/10- and -VAS 6131/13- at front left and right of subframe as shown.

– Make sure that threaded spindles are screwed in completely.



– Position support elements from -VAS 6131/10- and -VAS 6131/11- (rear left and right) at front attachment points of subframe cross brace as shown.

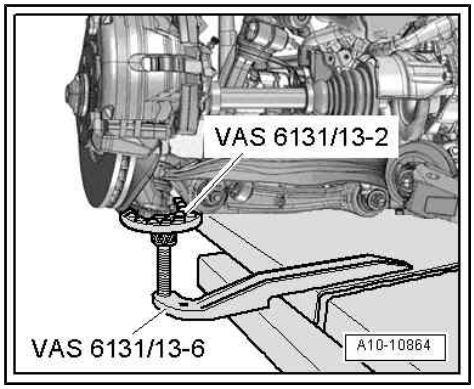
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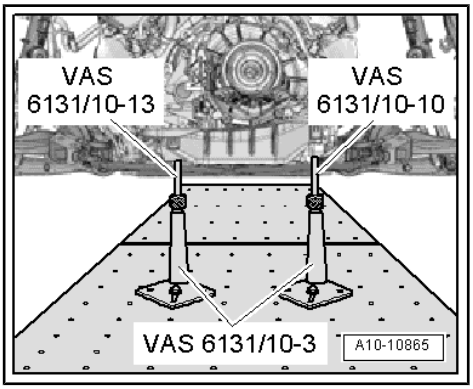
– Position support elements from -VAS 6131/13- under left and right wheel bearing housings as shown.

Note

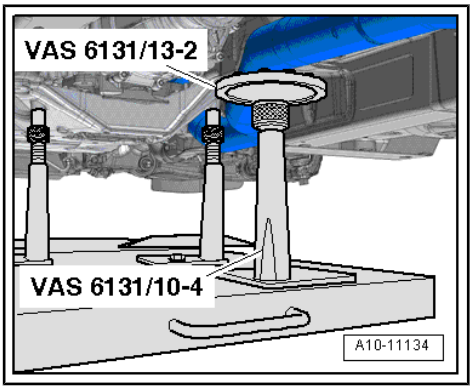
The illustration shows the left side of the vehicle; use -VAS 6131/13-5- for the right side.



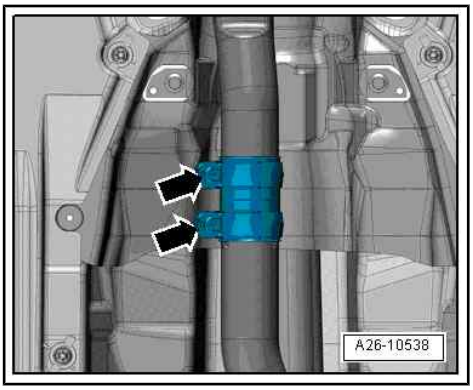
– Detach retaining clips for noise insulation from tunnel cross member.
– Position support elements from -VAS 6131/10- (rear left and right) at tunnel cross member as shown.



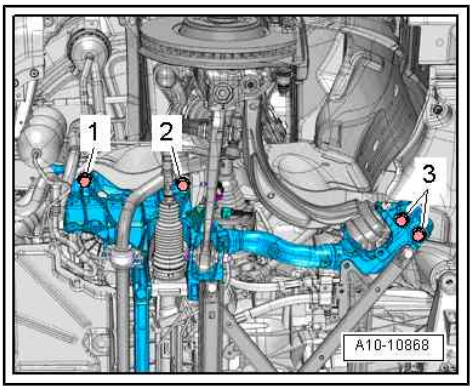
– Position support elements from -VAS 6131/10- and -VAS 6131/13- underneath front exhaust pipe, as shown in illustration.
– Turn all spindles for support elements upwards until all locating lugs make contact with mounting points.
– Tighten base plates for support elements to 20 Nm on scissor-type assembly platform - VAS 6131 A- .



– Loosen bolted connections -arrows- and push clamp towards rear.

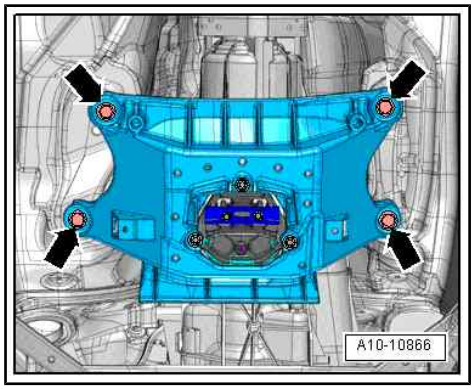


– Mark installation position of subframe and tunnel cross member on longitudinal members with felt-tip pen.
– Unscrew subframe bolts -2- and -3- on both sides in several stages and in diagonal sequence.

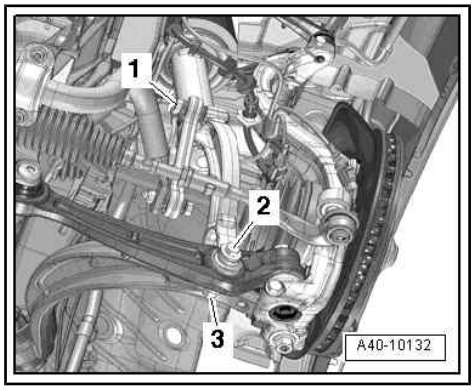


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– Remove bolts -arrows- for tunnel cross member.



– Remove bolt -2- on both sides.



Caution

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

- ***Check that all hoses and wiring connections between engine, gearbox, subframe and body have been detached.***
- ***Carefully guide out engine/gearbox assembly with subframe from engine compartment when lowering.***
- ***Carefully guide suspension struts past longitudinal members.***

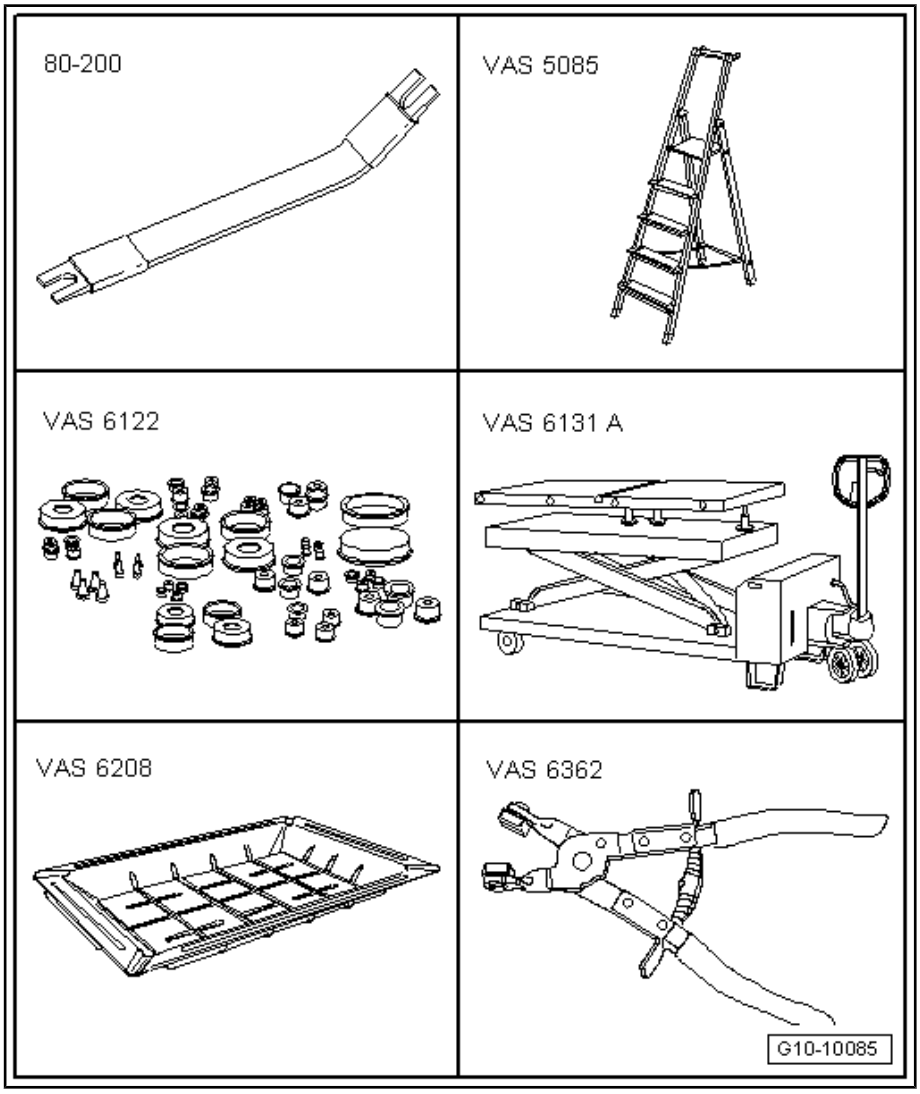
– Lower engine/gearbox assembly using scissor-type assembly platform - VAS 6131 A- .

– Pull out scissor-type assembly platform - VAS 6131 A- with engine/gearbox assembly from underneath vehicle.

1.1.3 Removing engine - vehicles with dual clutch gearbox 0B5

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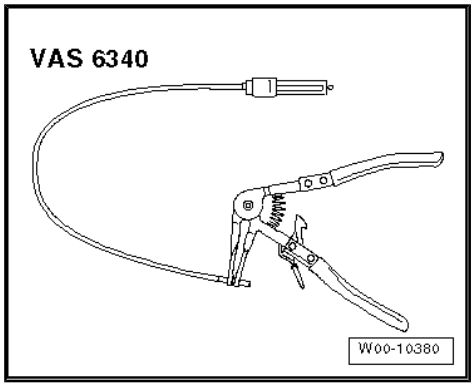
Special tools and workshop equipment required



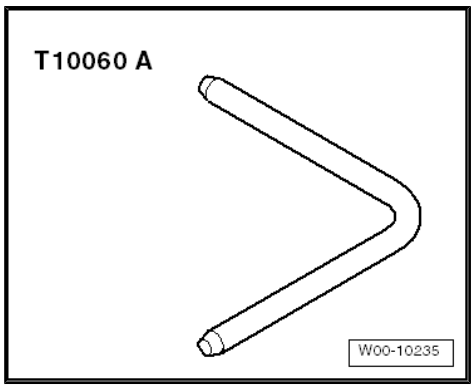
- Removal lever - 80 - 200-
- Stepladder - VAS 5085-
- Engine bung set - VAS 6122-
- Scissor-type assembly platform - VAS 6131 A- with support set for Audi - VAS 6131/10- and supplementary set - VAS 6131/11- , -VAS 6131/13-
- Drip tray for workshop hoist - VAS 6208-
- Hose clip pliers - VAS 6362-

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- Hose clip pliers - VAS 6340-



- Locking pin - T10060 A-



Procedure

Note

- *The engine is removed from underneath together with the gearbox and subframe (with lock carrier installed).*
- *Fit cable ties in the original positions when installing.*

WARNING

Make sure the vehicle cannot tip over when the engine is removed.

- ***Secure the vehicle, to do so, the luggage compartment must be empty.***

The fuel system operates at extremely high pressure. This can cause injury.

- ***The fuel pressure in the high-pressure section of the injection system must be reduced to a residual pressure prior to opening the system.***

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– Bring front wheels into straight-ahead position.

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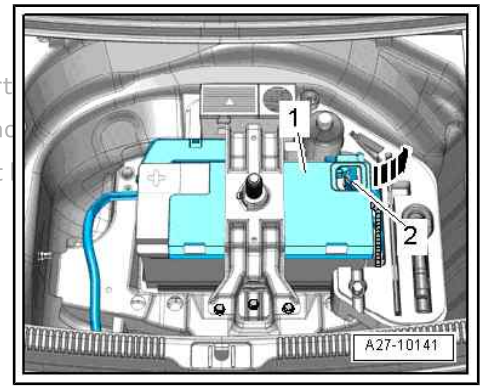
Caution

Risk of irreparable damage to electronic components.

- ***Observe notes on procedure for disconnecting the battery.***

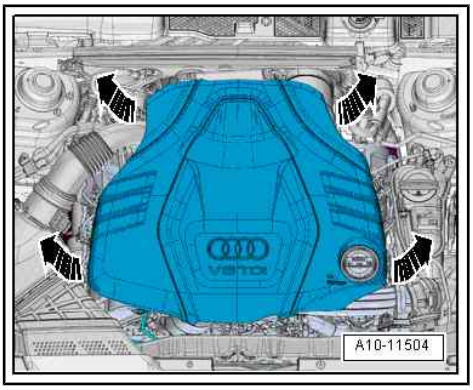
– Switch off ignition and remove ignition key.

– Disconnect earth wire -2- from battery terminal ⇒ Electrical system; Rep. gr. 27 ; Battery, Disconnecting and connecting battery .



– Remove engine cover panel -arrows-.

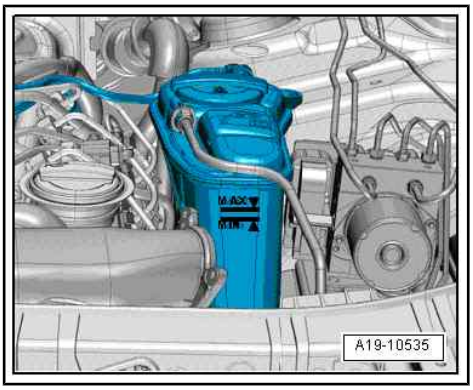
– Discharge refrigerant circuit ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit .



WARNING

Risk of scalding due to hot steam and hot coolant.

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

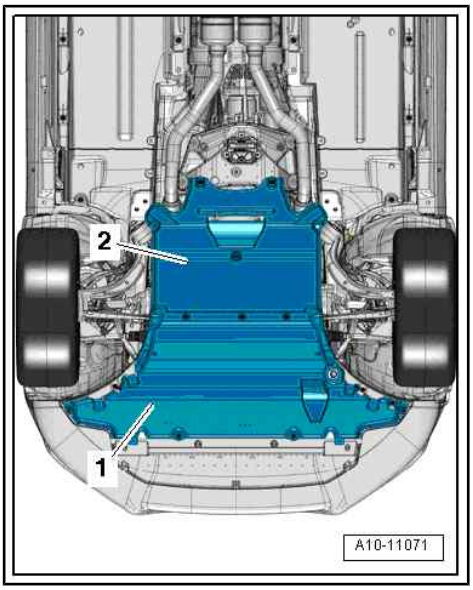


– Open filler cap on coolant expansion tank.

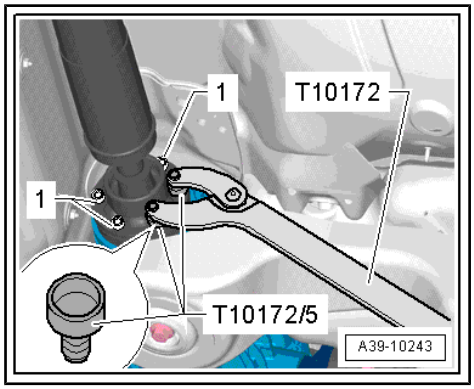
– Remove both front wheels.

– 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 noise insulation -1- and -2- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .



– Remove propshaft ⇒ Rear final drive; Rep. gr. 39 ; Propshaft; Removing and installing propshaft .



Note

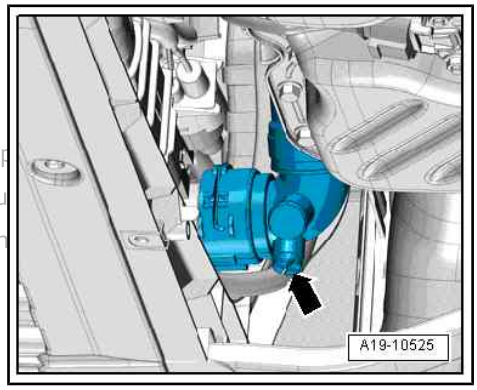
Collect drained coolant in a clean container for re-use or disposal.

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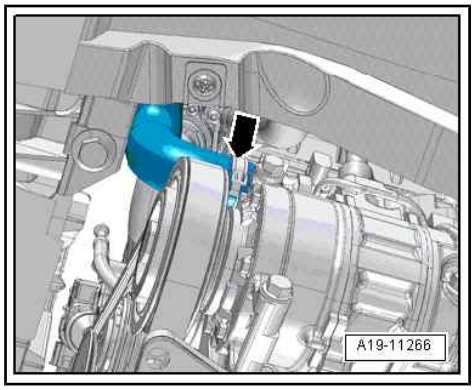
– Place drip tray for workshop hoist - VAS 6208- beneath engine.

– Remove drain plug -arrow- at connection and drain off coolant.

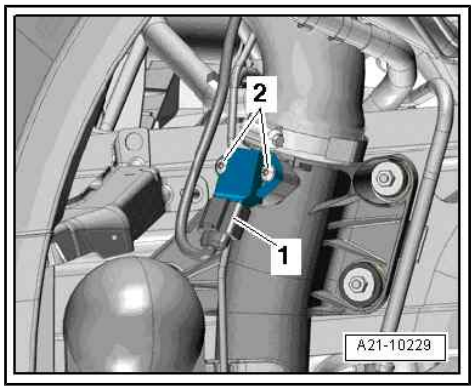
– Then detach connection from radiator (lift retaining clip).



– Release hose clip -arrow-, disconnect coolant hose from coolant pipe (bottom left) and drain off coolant.



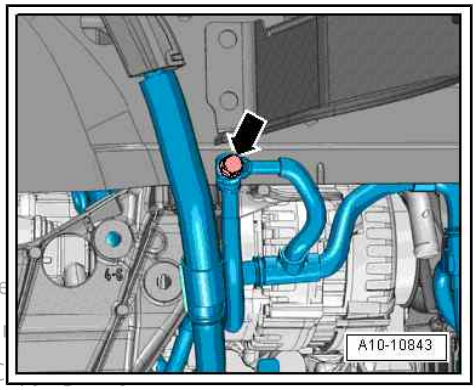
– Unplug electrical connector -1- on charge pressure sender - G31- / intake air temperature sender - G42- and move clear electrical wiring.



Note

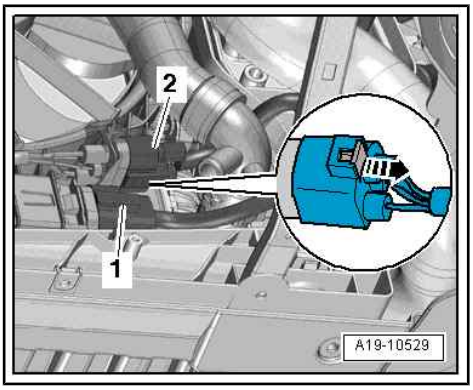
Disregard -item 2-.

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

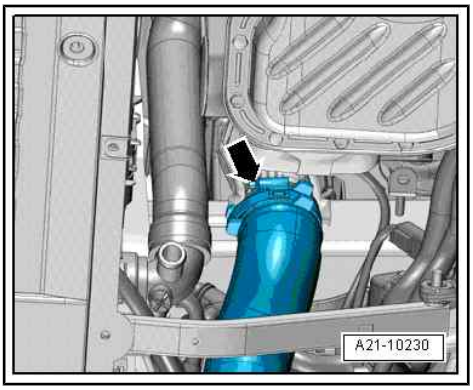


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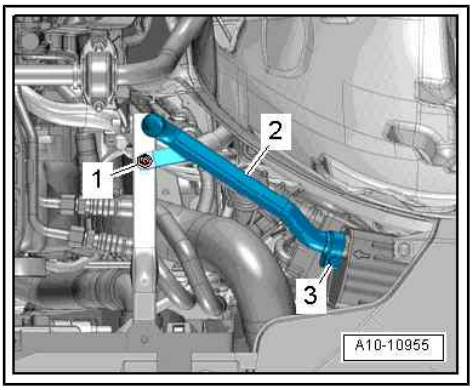
– Unplug electrical connector -1- and, if fitted, -2- for radiator fan (push retainer to the rear -arrow- and press down release catch).
– Move electrical wiring harness clear.



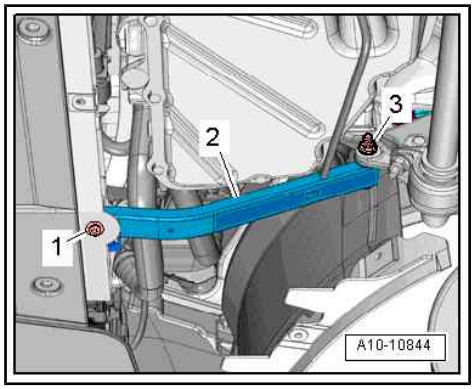
– Release hose clip -arrow-, disconnect air hose from air pipe and move to one side.



– On vehicles with auxiliary heater: remove nut -1-, loosen clamp -3- and detach exhaust pipe -2- for auxiliary heater



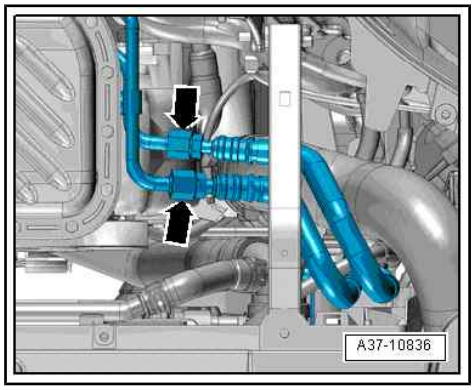
– Remove bolt -1- and nut -3- on both sides and detach strut -2- for lock carrier.



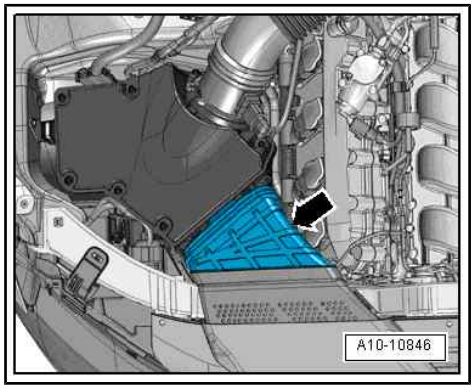
Note

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

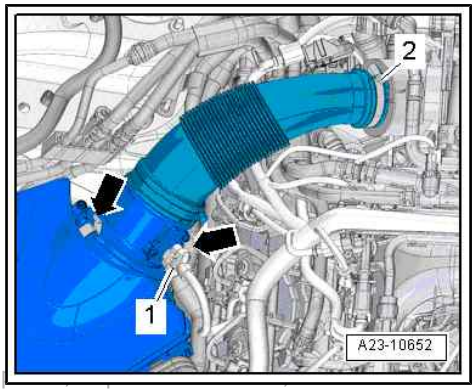
– Position used oil collection and extraction unit - V.A.G 1782- below connection points.
– Disconnect ATF lines -arrows- at connections on right side of engine.
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .



– Remove air duct -arrow-.



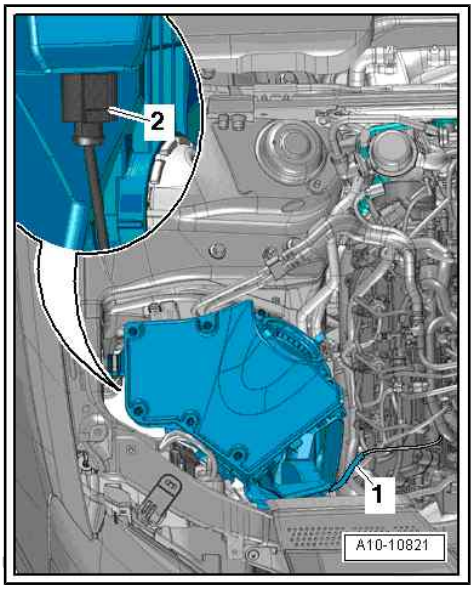
– Unplug electrical connector -1- at air mass meter - G70- .
– Remove air hose and air mass meter - G70- . To do so, release hose clip -2- and clamps -arrows-.



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– Disconnect vacuum line -1-.

– Detach air cleaner housing, unplug electrical connector -2- at air filter bypass flap valve - N275- on reverse side of air cleaner and move electrical wiring clear.

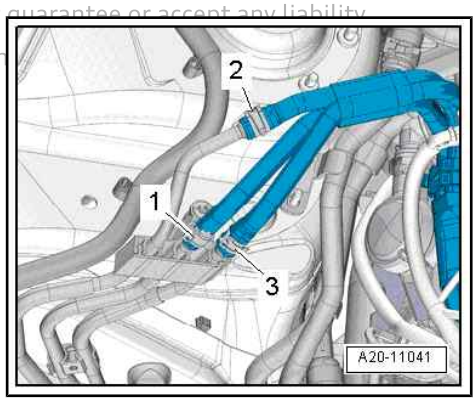


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Caution

Take care to keep components clean.

- ***Observe rules for cleanliness when working on the fuel supply system*** ***⇒ page 8*** ***.***



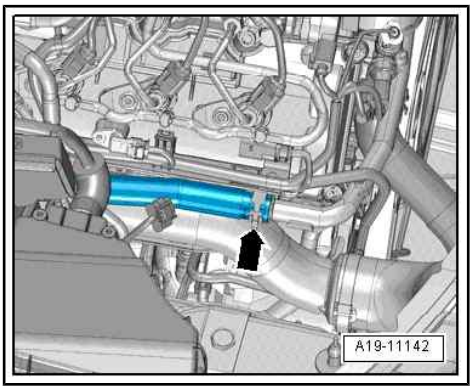
– Release hose clips and detach fuel hoses:

1 - Fuel hose (yellow)

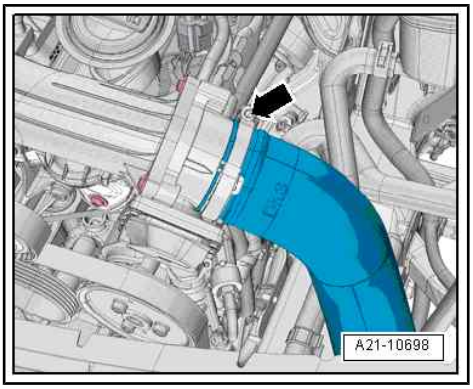
2 - Fuel hose (blue)

3 - Fuel hose (white)

– Release hose clip -arrow- and disconnect coolant hose from coolant pipe (front).



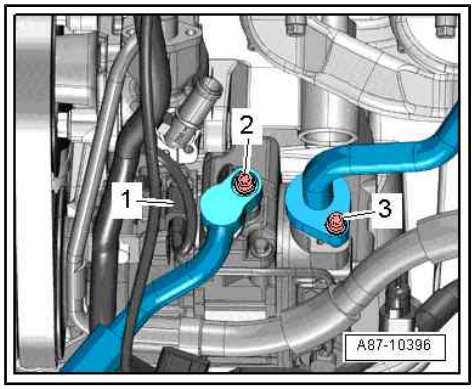
– Release hose clip -arrow- and detach air hose.



Caution

Risk of damage to refrigerant lines and hoses

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

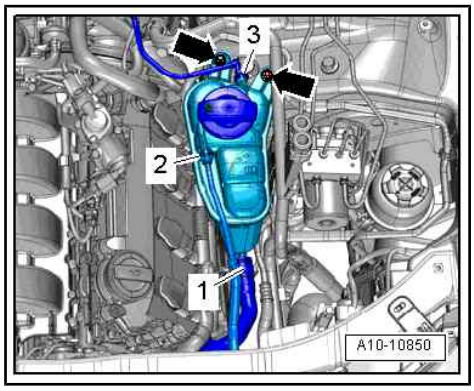


– Remove bolt -2-, disconnect refrigerant line from air conditioner compressor and move to one side.
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .

Note

Disregard items -1 and 3-.

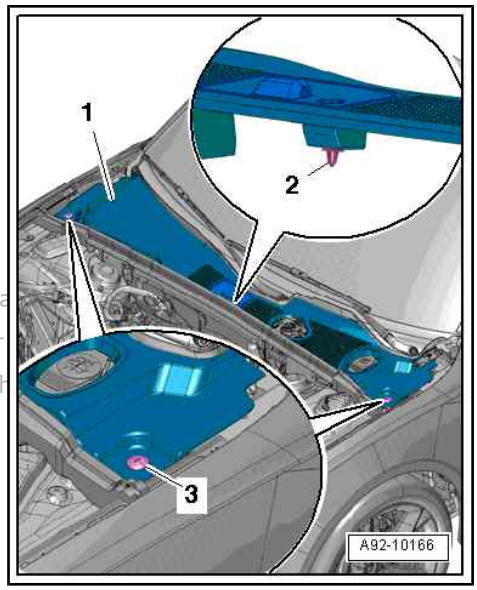
– Disconnect coolant hose -3- from coolant expansion tank.



Note

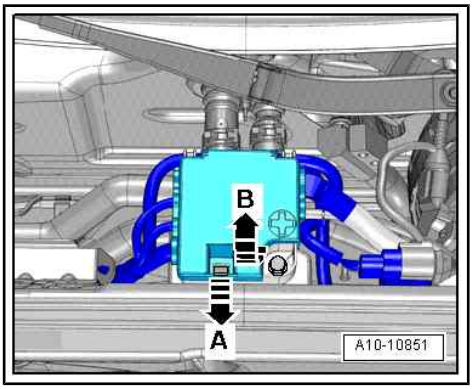
Disregard items marked -1, 2- and -arrows-.

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

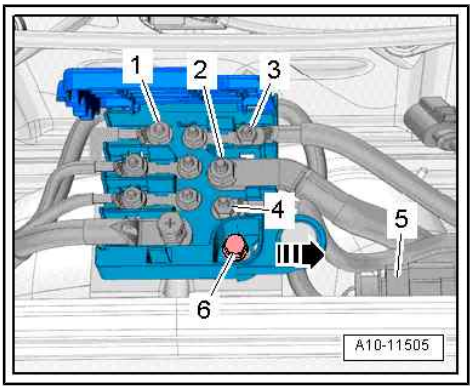


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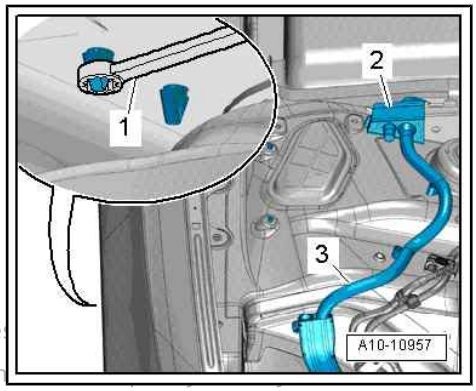
– Release retainer -arrow A- and open cover -arrow B-.



– Remove nuts -1 ... 4- for electrical wiring.
– Detach electrical connector -5- from bracket and unplug.
– Remove bolt -6- and detach terminal 30 wiring junction 2 - TV22- from body brace -arrow-.

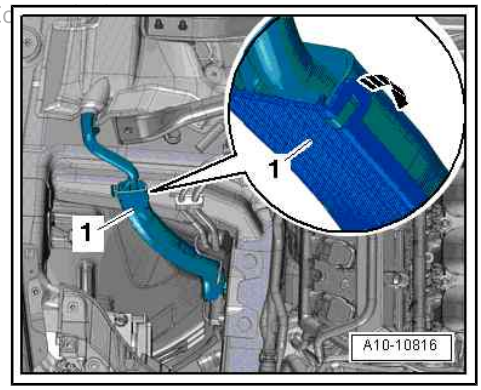


– Working from wheel housing, release catches using a 5.5 mm ring spanner -item 1- and remove wiring protector -2- from above.
– Release wiring harness -3- leading to alternator and starter using removal lever - 80 - 200- and move clear.

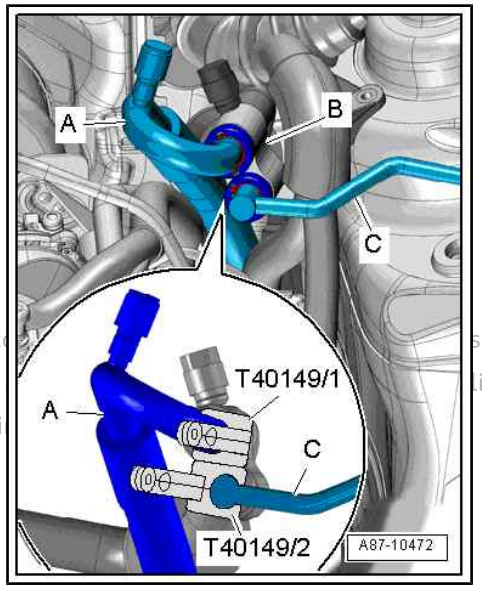


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– Release catch -arrow- to open wiring duct -1- and move wiring harness clear.

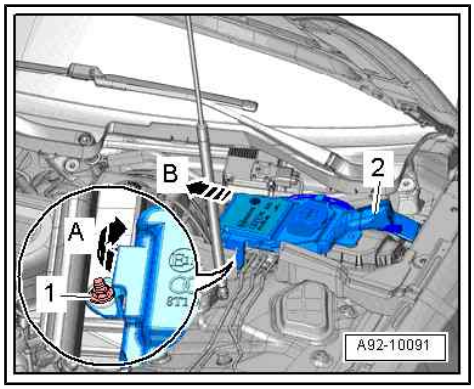


– Detach refrigerant lines -A- and -C- from inner heat exchanger ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit .

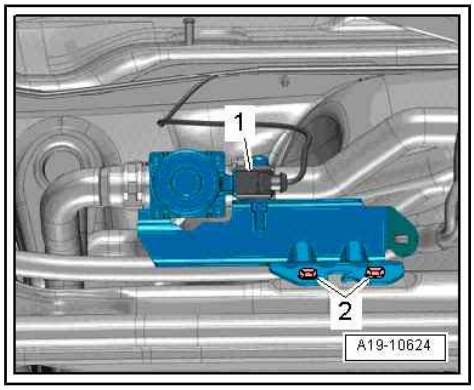


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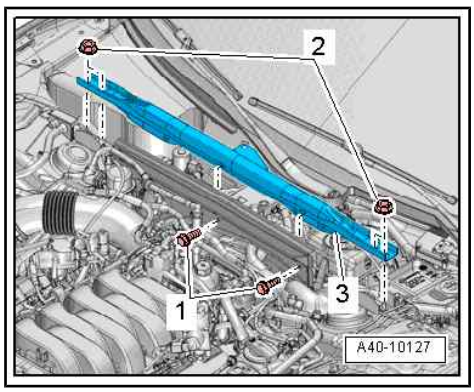
– Remove nut -1- and swivel filler neck for washer fluid reservoir slightly upwards -arrow A-.
– Pull filler neck -2- with filler pipe out of washer fluid reservoir and through opening in body -arrow B-.



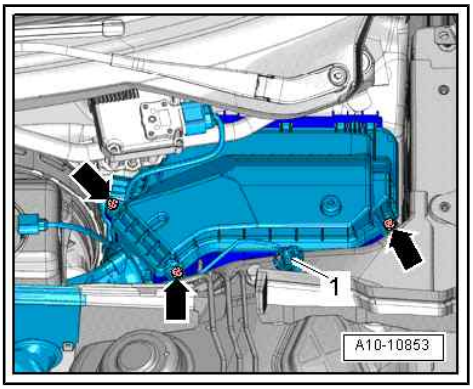
– On vehicles with auxiliary heater: remove bolts -2- and move pump unit -1- clear to one side.



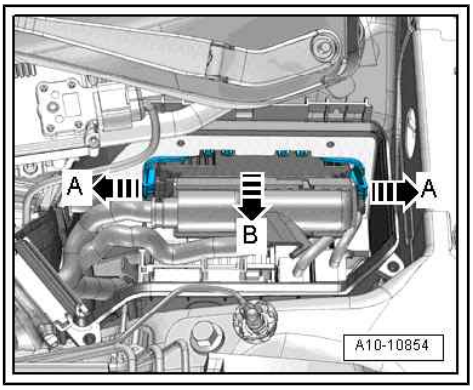
– Remove bolts -1- and nuts -2- and detach body brace -3-.



– Remove bolts -arrows- and detach cover for electronics box in engine compartment.
– Remove nut -1- and move electrical wiring clear.

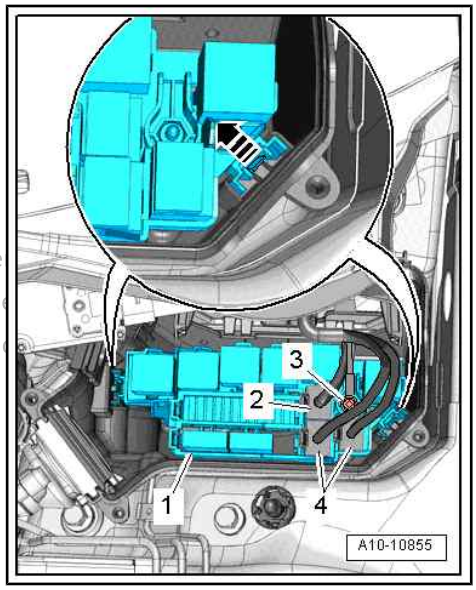


– Release catches -arrows A- and take out engine control unit -arrow B-.

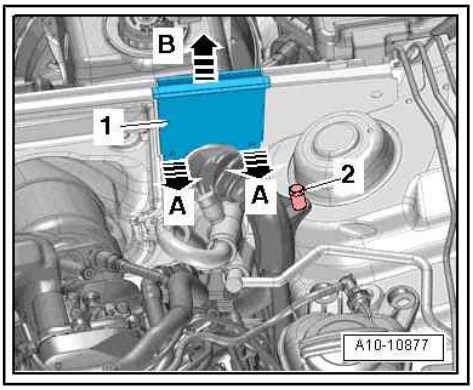


– If fitted, unplug electrical connector -2-.
– Unplug electrical connectors -4- and unscrew nut -3- for wiring.
– Release catches -arrow- and detach relay carrier with fuse holder -1-.
– Disengage engine wiring harness at electronics box in engine compartment and move clear.

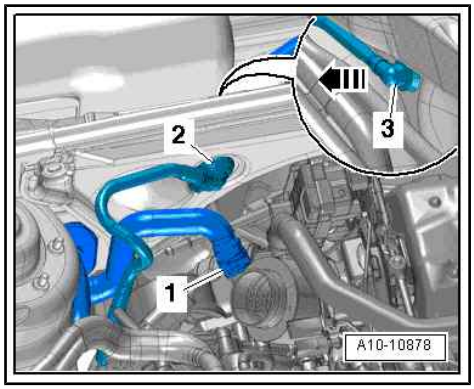
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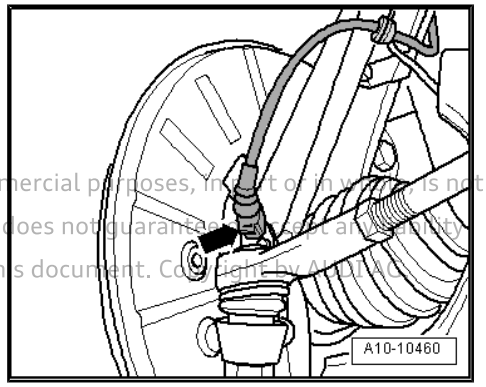
– Release catches -arrows A- and lift off wiring protector -1- -arrow B-.
– Unscrew earth stud -2- and move wiring harness clear.
– Place wiring harness on engine and secure engine control unit to prevent it from dropping.



– Release hose clip -1- and detach coolant hose.
– Disconnect vacuum hose -3- on rear of plenum chamber partition panel -arrow- and detach vacuum connection -2- from plenum chamber partition panel.

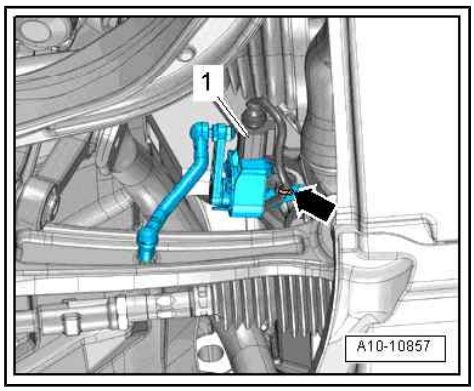


– Unplug electrical connectors -arrow- at front wheel speed sensors on both sides.

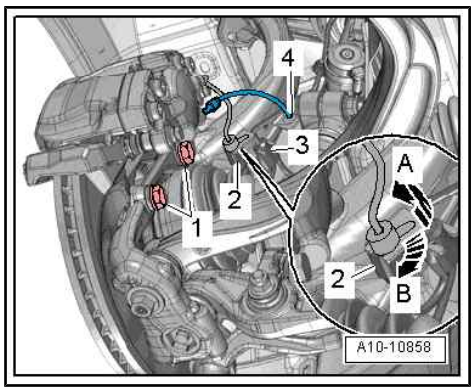


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– If fitted, unplug electrical connector -1- from front left vehicle level sender - G78- and front right vehicle level sender - G289- and move wiring clear -arrow-.



– Release electrical connector -2- at bracket by pulling retainer catch to the rear -arrow A- and turning connector approx. 90° clockwise -arrow B-.
– Move clear electrical wire -3- and brake hose -4- at bracket.
– Remove bolts -1- and tie up brake caliper with attached brake hose in wheel housing.

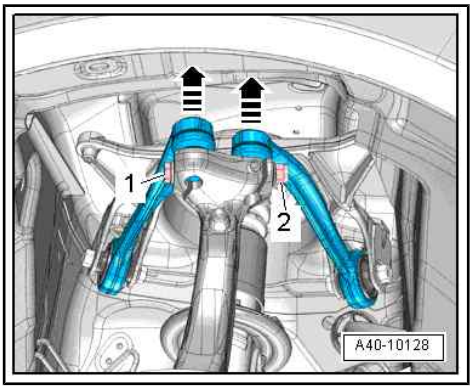


Caution

Risk of damage to brake pistons.

- *Do not operate brake pedal with brake caliper removed.*

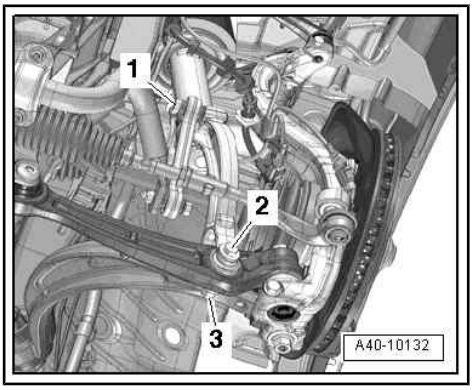
– Remove nut -2- and pull out bolt -1-.
– Pull upper suspension links upwards out of wheel bearing housing -arrows-.
– Repeat procedure on opposite side of vehicle.



– Remove bolt -1- for anti-roll bar on both sides.
– Remove nut -3- on both sides.

Note

The bolts -2- are removed at a later stage.

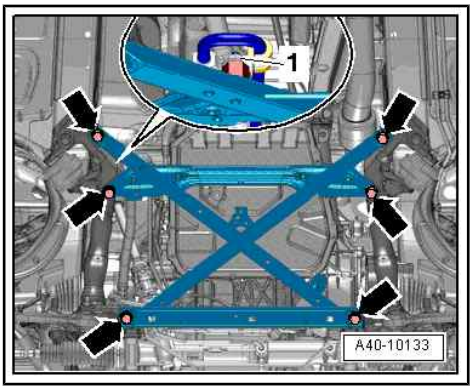


– Remove subframe cross brace ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Removing and installing subframe cross brace .

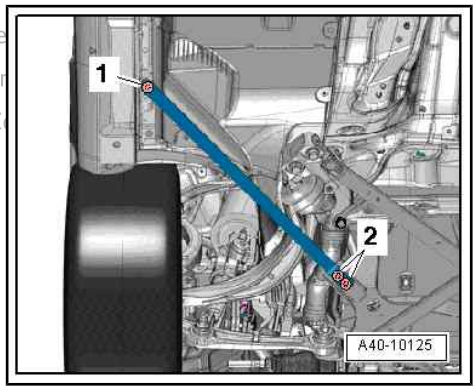
Caution

Risk of damage to running gear components.

- ***The vehicle must NOT be lowered onto its wheels if the engine/gearbox mountings, steering rack or subframe cross brace are not properly installed.***

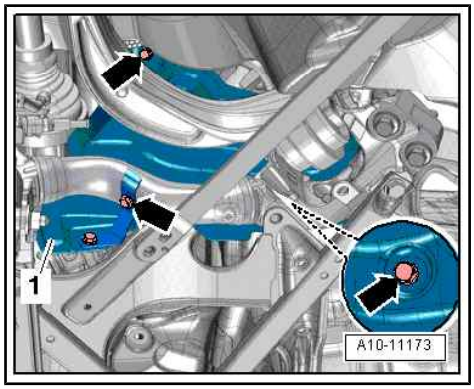


– Audi A5 Cabriolet/Sportback: Remove diagonal struts ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Exploded view - subframe.

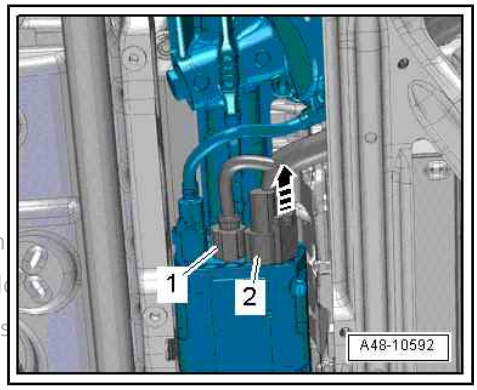


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– Remove bolts -arrows- on both sides and detach heat shield -1-.

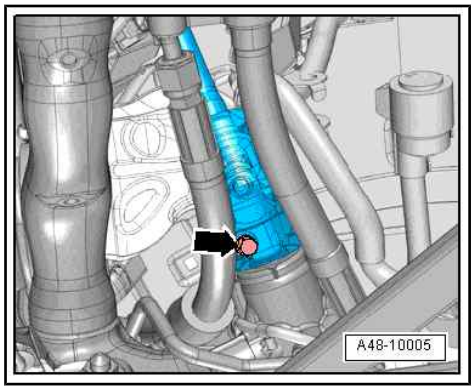


– Unplug electrical connector -2- at power steering control unit - J500- (release retainer -arrow- and press down release catch).
– Unplug electrical connector -1- at power steering control unit - J500- .
– Move electrical wiring harness clear.



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– Detach intermediate steering shaft from steering rack and slide splines together ⇒ Running gear, axles, steering; Rep. gr. 48 ; Steering column; Exploded view - steering column .



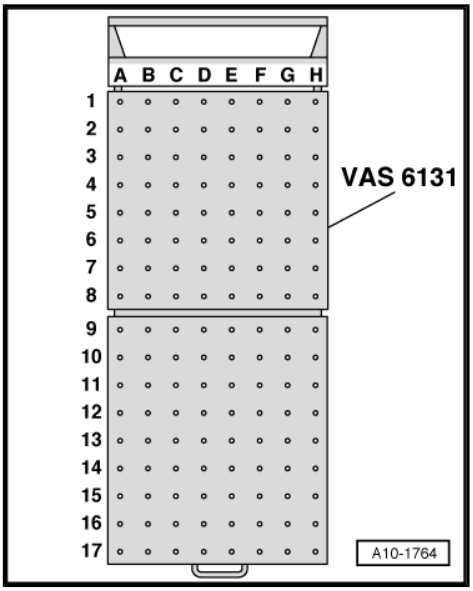
Note

If separating the engine from the gearbox for subsequent work, unscrew the bolted connection securing the drive plate to the fly-wheel/torque converter ⇒ page 78 .

Set up the scissor-type assembly platform as follows:

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

Platform coordinates	Parts of support set for Audi - VAS 6131/10- , support set -VAS 6131/11- and supplementary set - VAS 6131/13-			
B4	/13-4	/10-4	/10-5	/13-1
G4	/13-4	/10-4	/10-5	/13-1
B6	/10-1	/10-2	/10-5	/11-2
G6	/10-1	/10-2	/10-5	/11-2
A8+C8	/13-6	–	–	/13-2
F8+H8	/13-5	–	–	/13-2
C13	/10-1	/10-4	/10-5	/10-7
F13	/10-1	/10-4	/10-5	/11-1
F17	/10-1	/10-4	/10-5	/13-2



– Initially hand-tighten the support elements on the scissor-type assembly platform.

– Position scissor-type assembly platform - VAS 6131 A- horizontally.

• Take note of spirit level (bubble gauge).

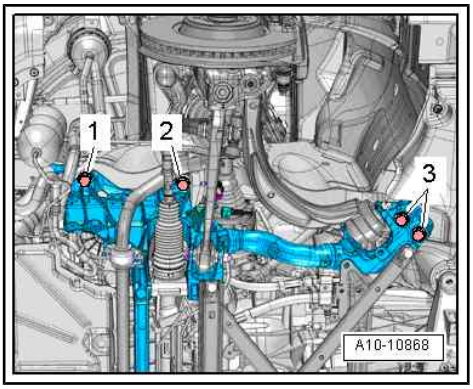
– Position scissor-type assembly platform - VAS 6131 A- below engine/gearbox assembly.

WARNING

Accident risk if subframe mountings are detached.

- ***Subframe bolts -2- and -3- must not be loosened.***

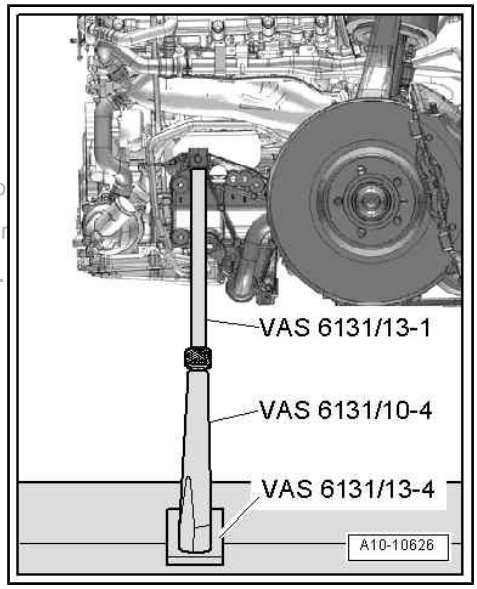
– Remove subframe bolts -1- on both sides.



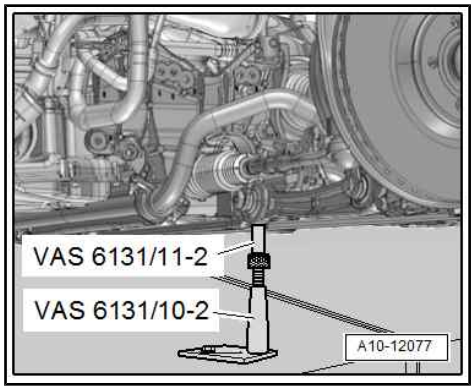
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– Position support elements from -VAS 6131/10- and -VAS 6131/13- at front left and right of subframe as shown.
– Make sure that threaded spindles are screwed in completely.

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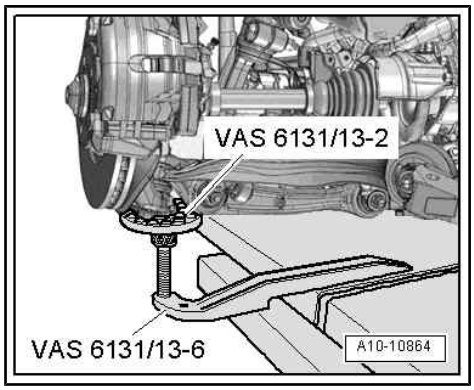
– Position support elements from -VAS 6131/10- and -VAS 6131/11- (rear left and right) at front attachment points of subframe cross brace as shown.



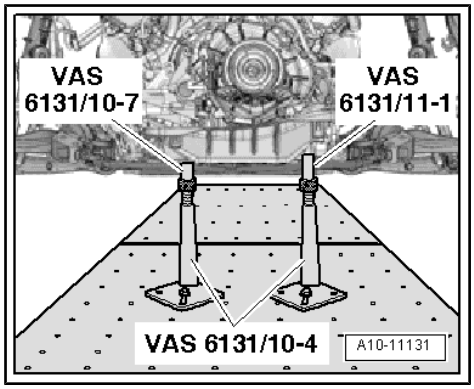
– Position support elements from -VAS 6131/13- under left and right wheel bearing housings as shown.

Note

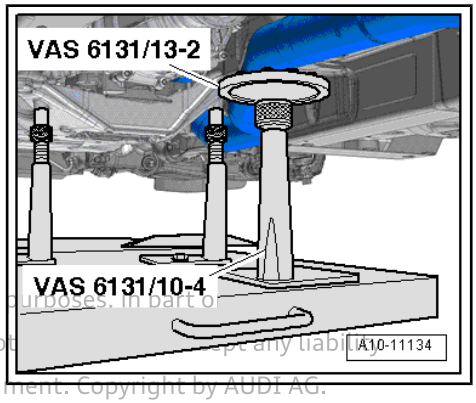
The illustration shows the left side of the vehicle; use -VAS 6131/13-5- for the right side.



– Position support elements from -VAS 6131/10- at rear of cross member on both sides, as shown in illustration.

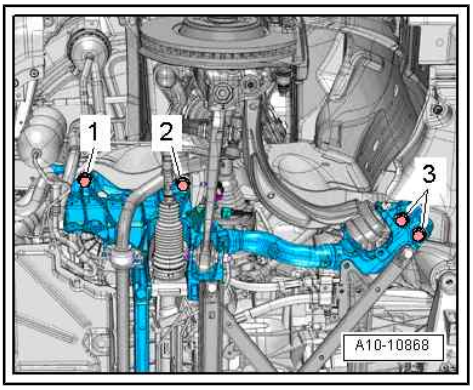


– Position support elements from -VAS 6131/10- and -VAS 6131/13- underneath front exhaust pipe, as shown in illustration.
– Turn all spindles for support elements upwards until all locating lugs make contact with mounting points.
– Tighten base plates for support elements to 20 Nm on scissor-type assembly platform - VAS 6131 A- .

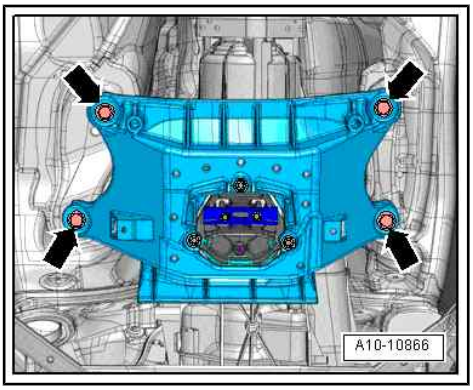


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– Mark installation position of subframe and tunnel cross member on longitudinal members with felt-tip pen.
– Unscrew subframe bolts -2- and -3- on both sides in several stages and in diagonal sequence.



– Remove bolts -arrows- for tunnel cross member.

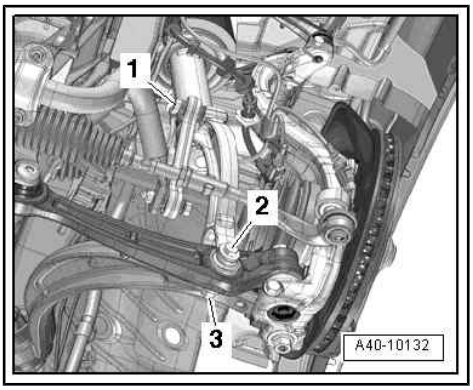


– Remove bolt -2- on both sides.

Caution

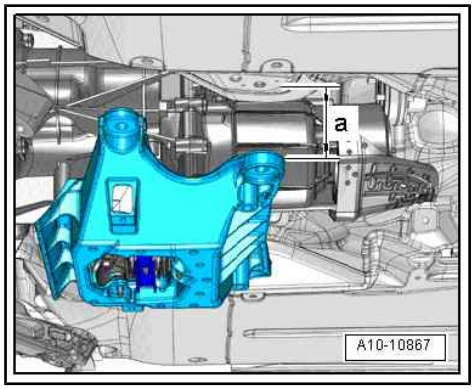
Danger of damage to hoses, pipes and wiring connections and to engine compartment.

- *Check that all hoses and wiring connections between engine, gearbox, subframe and body have been detached.*
- *Carefully guide out engine/gearbox assembly with subframe from engine compartment when lowering.*
- *Carefully guide suspension struts past longitudinal members.*



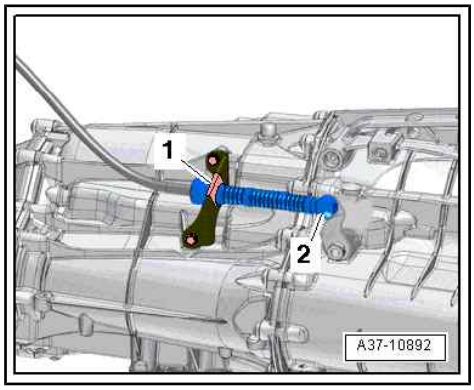
– Lower engine/gearbox assembly using scissor-type assembly platform - VAS 6131 A- initially only as far as distance -a-.

• Dimension -a- = 100 mm (maximum).



– Pry ball socket -2- of selector lever cable off gearbox selector lever using removal lever - 80 - 200- .

– Press off securing clip -1- and remove selector lever cable from gearbox.



Note

Take care not to bend or kink selector lever cable.

– Lower engine/gearbox assembly further.

– Pull out scissor-type assembly platform - VAS 6131 A- with engine/gearbox assembly from underneath vehicle.

1.2 Separating engine and gearbox

⇒ “1.2.1 Separating engine and gearbox - vehicles with manual gearbox”, page 64

⇒ “1.2.2 Separating engine and gearbox - vehicles with multitronic gearbox 0AW”, page 69

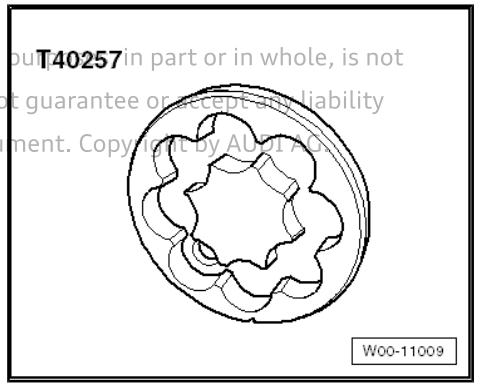
⇒ “1.2.3 Separating engine and gearbox - vehicles with dual clutch gearbox 0B5”, page 75

1.2.1 Separating engine and gearbox - vehicles with manual gearbox

Special tools and workshop equipment required

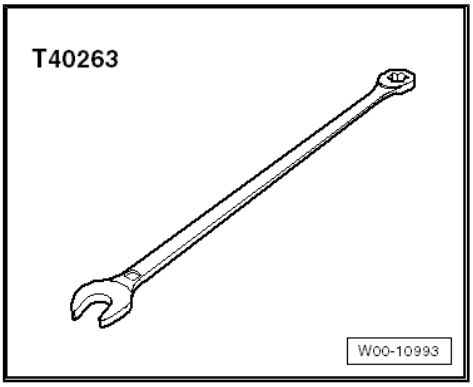
♦ Support set for Audi - VAS 6131/10- , support -VAS 6131/13-7- and gearbox support - VAS 6131/14-

♦ Turning-over tool - T40257-



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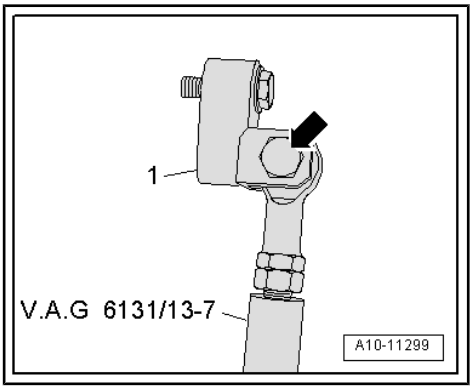
♦ Wrench, 21 mm - T40263-



♦ Adapter -T40314-

Setting up support -VAS 6131/13-7- :

– Remove bolt -arrow- from support -VAS 6131/13-7- and detach support -1-.



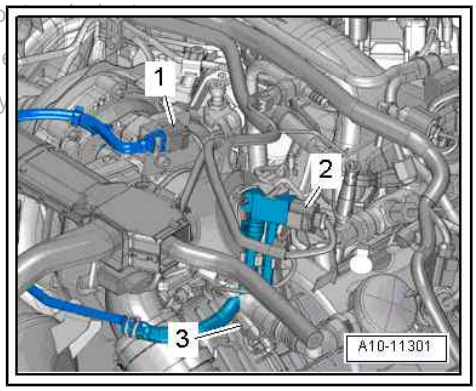
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Procedure

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

– Take electrical connector -3- out of bracket, unplug it and move electrical wiring clear.

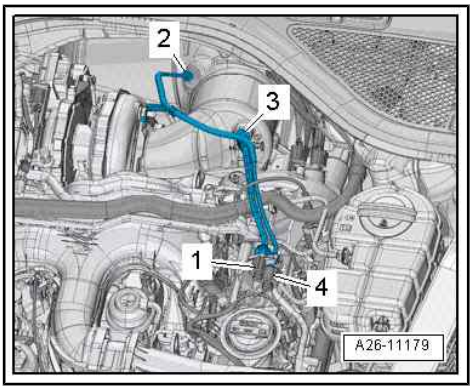
– Unplug electrical connector -2-, unclip pressure differential sender - G505- from bracket and move clear.



Note

Ignore item marked -1-.

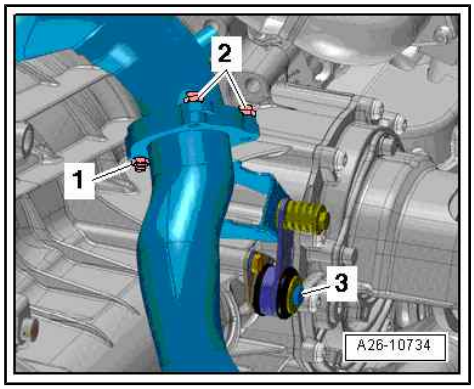
– Detach electrical connectors -1 and 4- from bracket and unplug.



Note

Disregard items -2 and 3-.

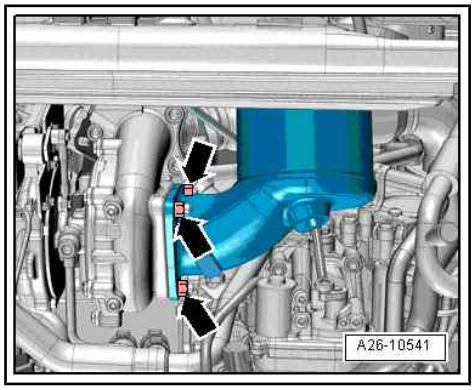
– Remove bolt -3-.



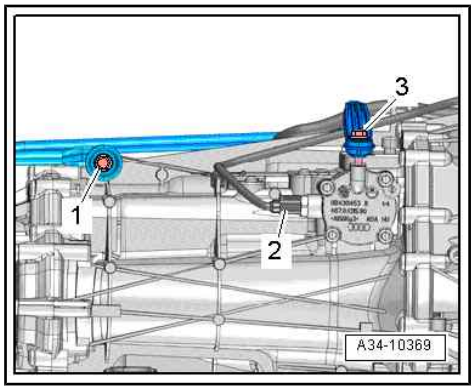
Note

Disregard items -1 and 2-.

– Remove nuts -arrows- for particulate filter and turbocharger.
– Detach particulate filter with front exhaust pipe.



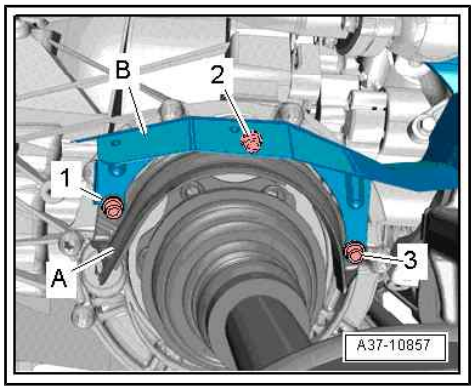
– Unplug electrical connector -2- at gear detection sensor - G604- and move electrical wiring clear.



Note

Disregard items -1 and 3-.

– Remove bolts -1- and -3-.
– Loosen bolt -2- and move heat shield -B- clear to one side.

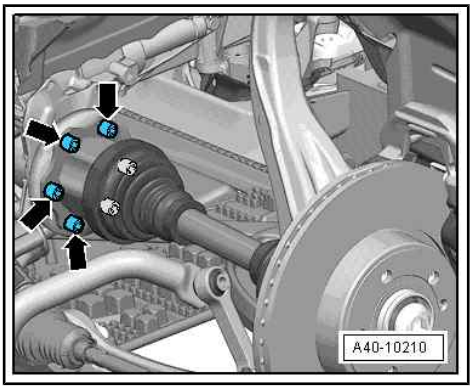


Note

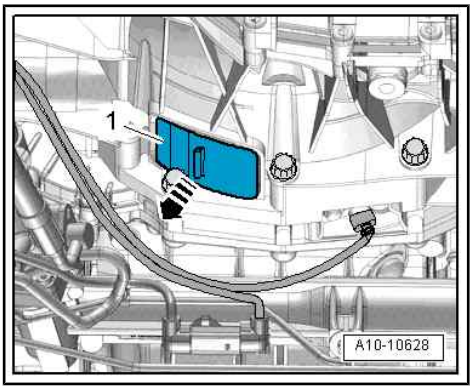
Disregard -item A-.

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– Unbolt drive shafts (left and right) from gearbox flange shafts ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .
– Move electrical wiring for engine speed sender - G28- clear on gearbox.

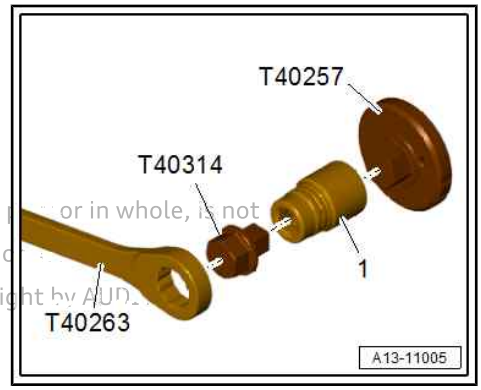


– Detach bottom cover -1- from gearbox -arrow-.



– Assemble tools as shown in illustration.

1 - Socket (21 mm) for 1/2" drive



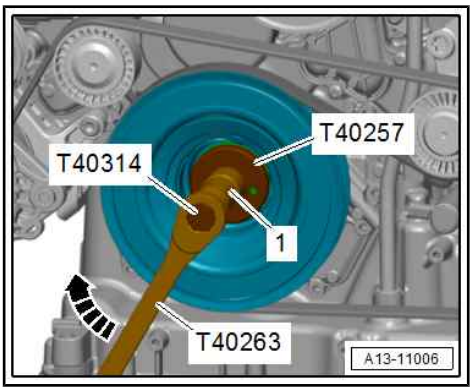
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Caution

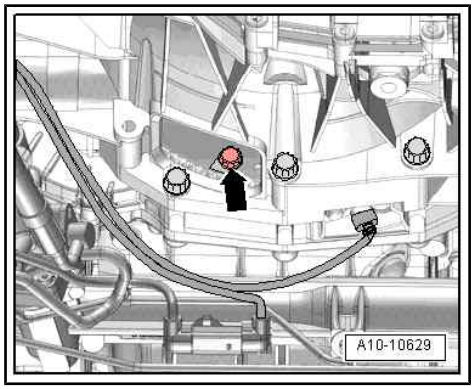
Irreparable damage can be caused if the camshaft timing chain slips.

- ***Turn crankshaft only in direction of engine rotation -arrow-.***

– Turn crankshaft by 180° in direction of engine rotation.



– Remove 6 bolts -arrow- for clutch module, turning crankshaft 60° in normal direction of rotation each time.

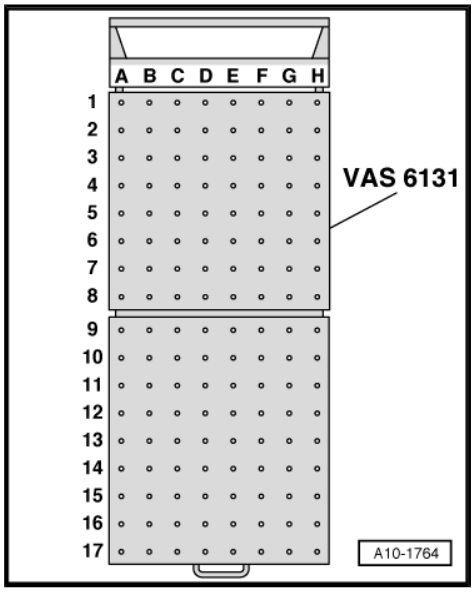


– Set up scissor-type assembly platform - VAS 6131 A- with support set for Audi - VAS 6131/10- , support -VAS 6131/13-7- and gearbox support - VAS 6131/14- as follows.

Note

The other support elements remain unchanged.

Platform coordinates	Parts from support set for Audi - VAS 6131/10- , support -VAS 6131/13-7- and gearbox support - VAS 6131/14-			
H2	/13-7			
B10	/10-1	/10-2	/10-5	/14
G10	/10-1	/10-2	/10-5	

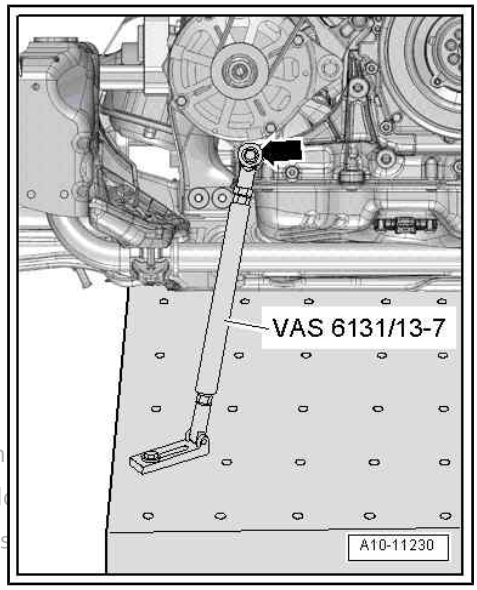


– Secure support -VAS 6131/13-7- in threaded hole at front of engine (right-side) with bolt (M12x35) -arrow- as shown.

Note

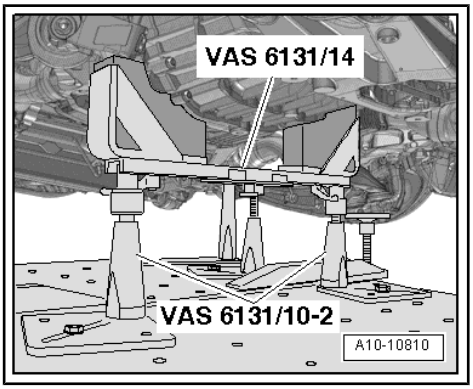
If bore has no thread, tap hole.

– Secure support to scissor-type assembly platform - VAS 6131 A- and tighten to 20 Nm.



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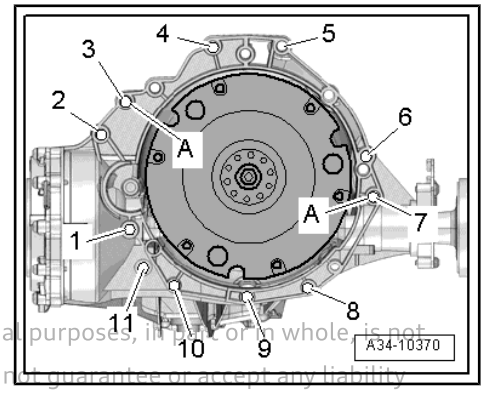
– Position support elements from -VAS 6131/10- and gearbox support - VAS 6131/14- at front of gearbox, as illustrated.
– Screw spindles on both sides upwards until gearbox support - VAS 6131/14- makes full contact with gearbox.
– Tighten base plates for support elements to 20 Nm on scissor-type assembly platform - VAS 6131 A- .



– Remove bolts -1- and -2- for starter.
– Separate starter from gearbox and leave in position.
– Unscrew remaining bolts -3 ... 11- securing engine to gearbox.

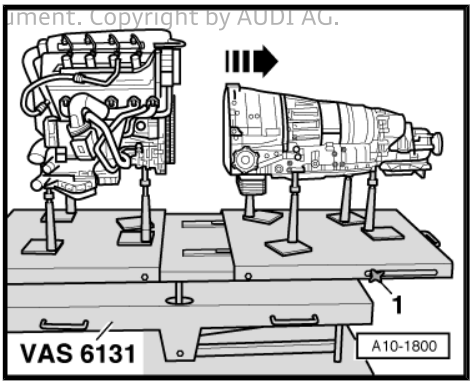
Note

Disregard -item A-.



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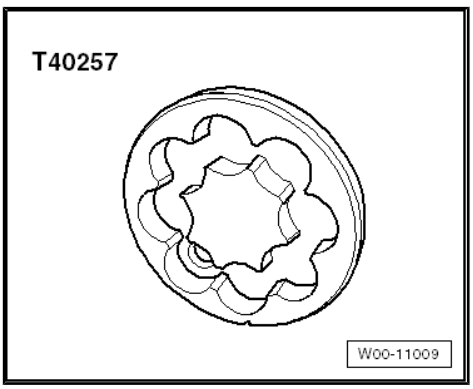
– Loosen clamping bolts -1- on sides of scissor-type assembly platform - VAS 6131 A- and pull rear section of platform together with gearbox towards rear -arrow-.



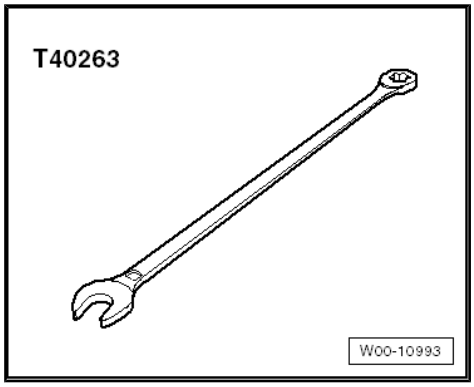
1.2.2 Separating engine and gearbox - vehicles with multitronic gearbox 0AW

Special tools and workshop equipment required

- Support set for Audi - VAS 6131/10- , support -VAS 6131/13-7- and gearbox support - VAS 6131/14-
- Turning-over tool - T40257-



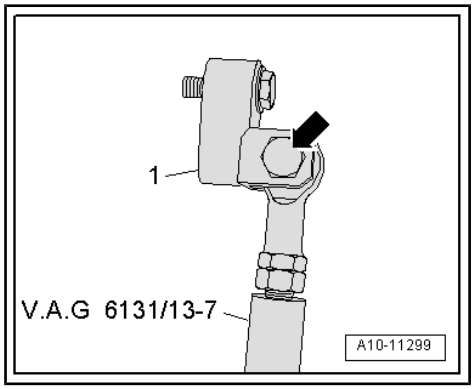
♦ Wrench, 21 mm - T40263-



♦ Adapter -T40314-

Setting up support -VAS 6131/13-7- :

– Remove bolt -arrow- from support -VAS 6131/13-7- and detach support -1-.

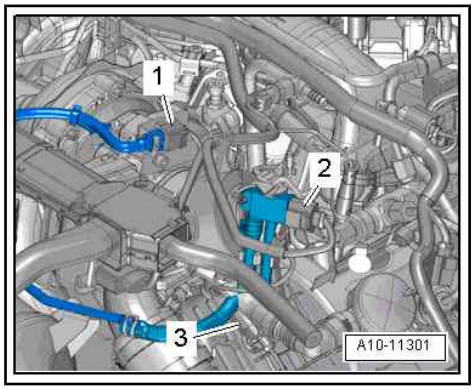


Procedure

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

– Take electrical connector -3- out of bracket, unplug it and move electrical wiring clear.

– Unplug electrical connector -2-, unclip pressure differential sender - G505- from bracket and move clear.



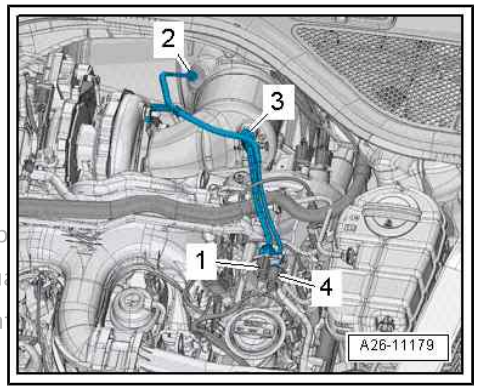
Note

Ignore item marked -1-.

– Detach electrical connectors -1 and 4- from bracket and unplug.

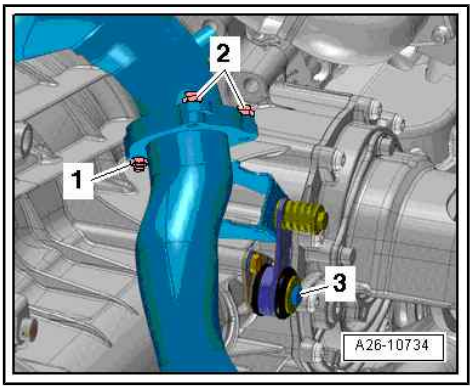
Note

Disregard items -2 and 3-.



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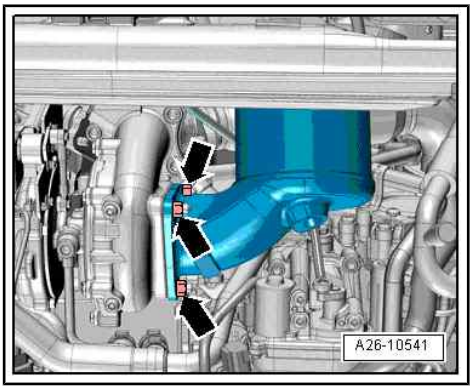
– Remove bolt -3-.



Note

Disregard items -1 and 2-.

– Remove nuts -arrows- for particulate filter and turbocharger.
– Detach particulate filter with front exhaust pipe.

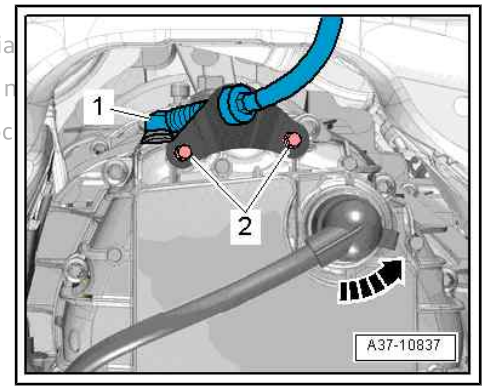


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Caution

Risk of irreparable damage to gearbox control unit (mechatronic unit) because of static discharge.

- ***Before unplugging or plugging in electrical connector, mechanic must discharge static electricity. To do so, touch vehicle earth, heater radiator, or lifting platform, with your hand.***
- ***Do NOT touch connector contacts in gearbox connector with your hands.***

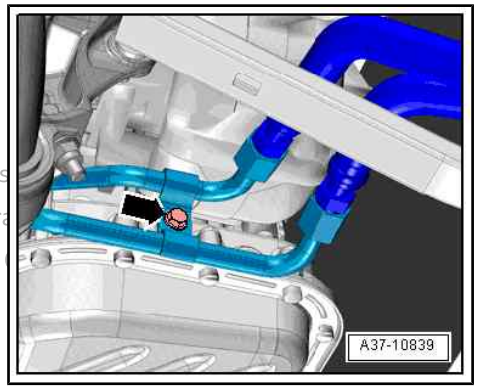


– Turn retainer catch anti-clockwise -arrow- and unplug electrical connector at gearbox.
– Move electrical wiring clear.

Note

Disregard items -1 and 2-.

– Remove bolt -arrow- for ATF lines.

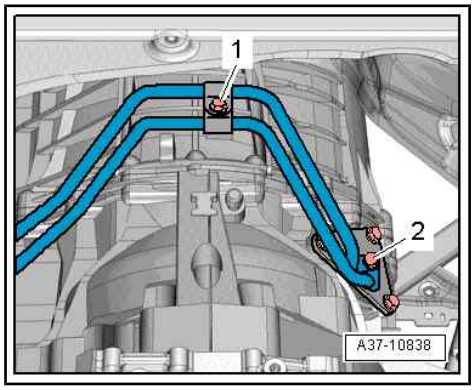


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Note

Lay a cloth under the separating point to catch escaping ATF.

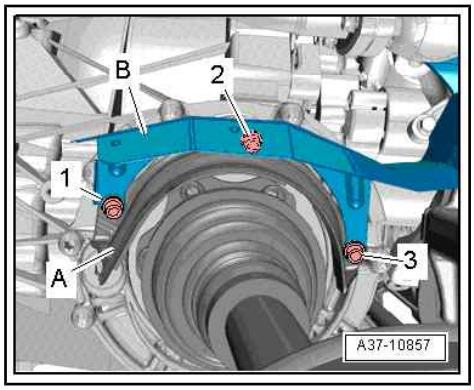
– Unscrew bolts -1- and -2-, detach ATF lines from gearbox and tie up ATF lines.
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .



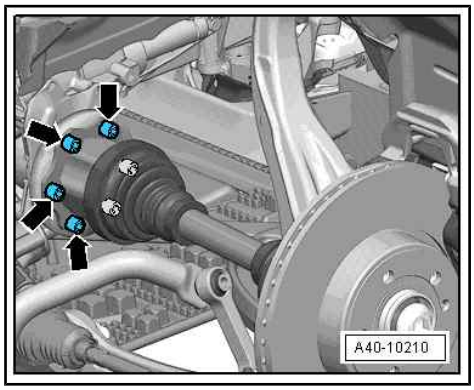
– Remove bolts -1- and -3-.
– Loosen bolt -2- and move heat shield -B- clear to one side.

Note

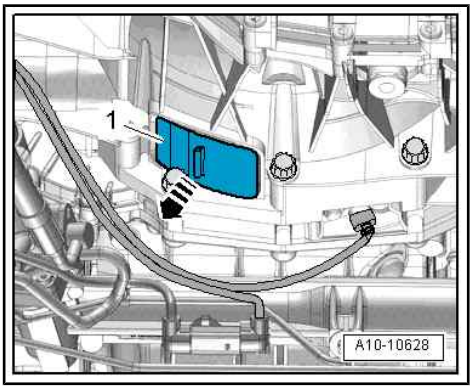
Disregard -item A-.



– Unbolt drive shafts (left and right) from gearbox flange shafts ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .
– Move electrical wiring for engine speed sender - G28- clear on gearbox.

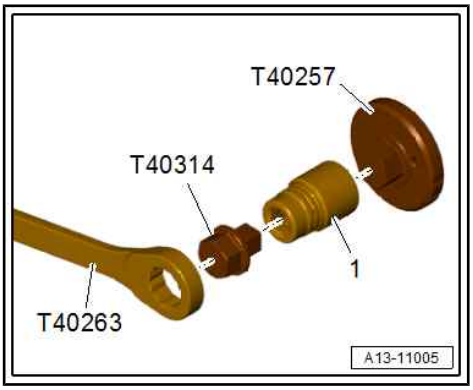


– Detach bottom cover -1- from gearbox -arrow-.

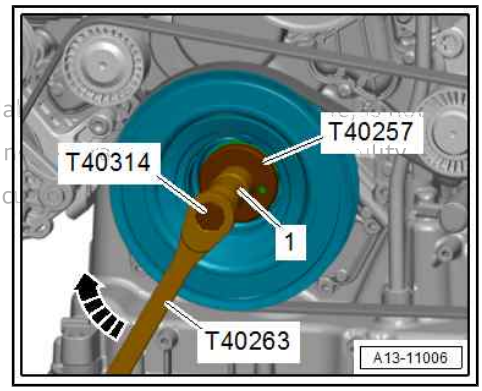


– Assemble tools as shown in illustration.

1 - Socket (21 mm) for 1/2" drive



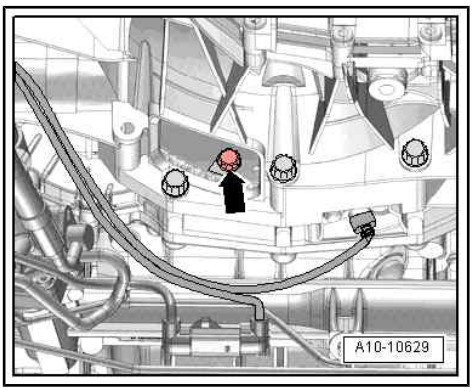
– Counterhold crankshaft to slacken bolts for dual-mass flywheel.



Note

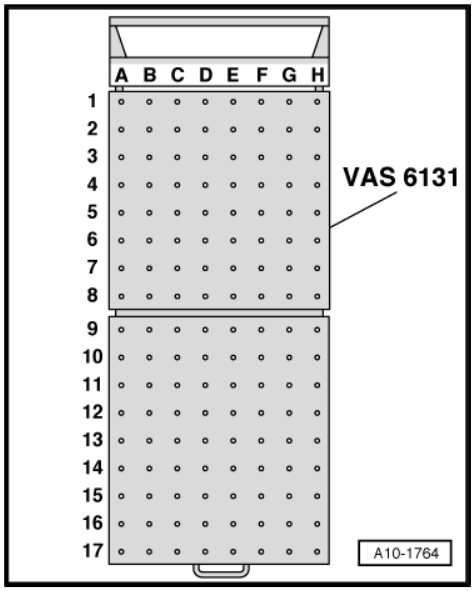
When performing the next step, turn the crankshaft only in the normal direction of rotation -arrow-.

– Remove 6 bolts -arrow- for dual-mass flywheel, turning crankshaft 60° in normal direction of rotation each time.



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– Set up scissor-type assembly platform - VAS 6131 A- with support set for Audi - VAS 6131/10- , support -VAS 6131/13-7- and gearbox support - VAS 6131/14- as follows.

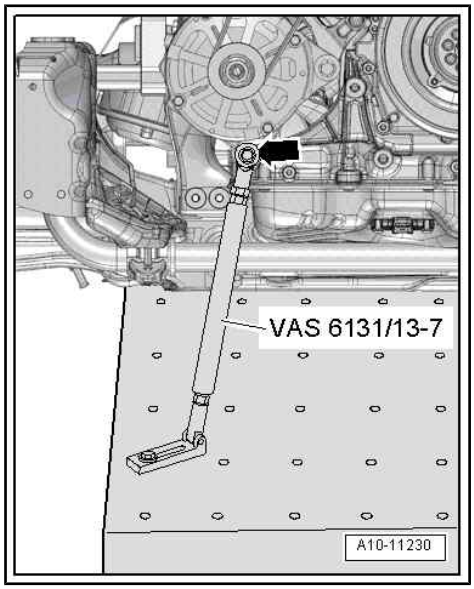


Note

The other support elements remain unchanged.

Platform coordinates	Parts from support set for Audi - VAS 6131/10- , support -VAS 6131/13-7- and gearbox support - VAS 6131/14-			
H2	/13-7			
B10	/10-1	/10-2	/10-5	/14
G10	/10-1	/10-2	/10-5	

– Secure support -VAS 6131/13-7- in threaded hole at front of engine (right-side) with bolt (M12x35) -arrow- as shown.



Note

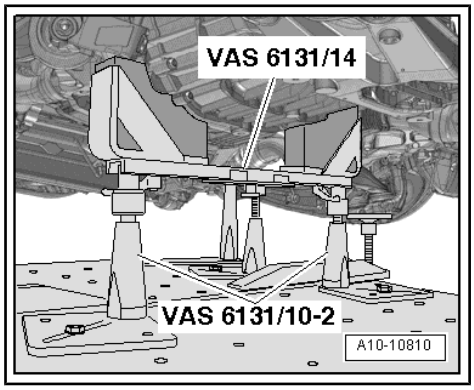
If bore has no thread, tap hole.

– Secure support to scissor-type assembly platform - VAS 6131 A- and tighten to 20 Nm.

– Position support elements from -VAS 6131/10- and gearbox support - VAS 6131/14- at front of gearbox, as illustrated.

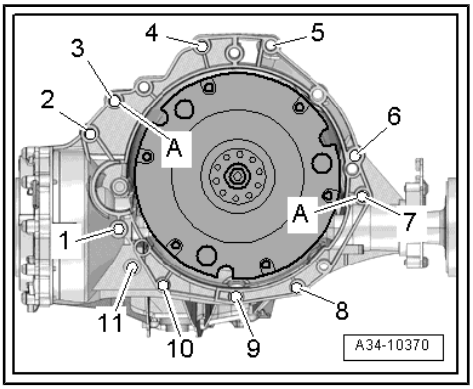
– Screw spindles on both sides upwards until gearbox support - VAS 6131/14- makes full contact with gearbox.

– Tighten base plates for support elements to 20 Nm on scissor-type assembly platform - VAS 6131 A- .



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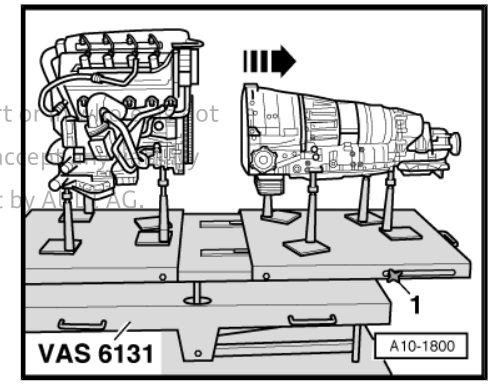
– Remove bolts -1- and -2- for starter.
– Separate starter from gearbox and leave in position.
– Unscrew remaining bolts -3 ... 11- securing engine to gearbox.



Note

Disregard -item A-.

– Loosen clamping bolts -1- on sides of scissor-type assembly platform - VAS 6131 A- and pull rear section of platform together with gearbox towards rear -arrow-.

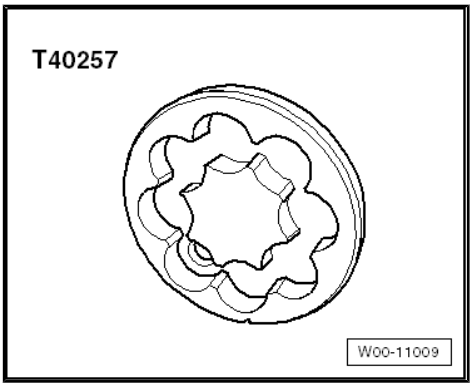


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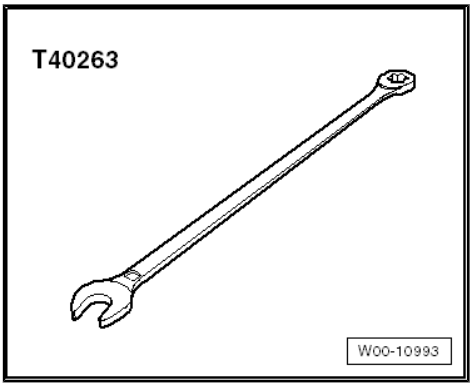
1.2.3 Separating engine and gearbox - vehicles with dual clutch gearbox 0B5

Special tools and workshop equipment required

- Support set for Audi - VAS 6131/10- , support -VAS 6131/13-7- and gearbox support - VAS 6131/14-
- Turning-over tool - T40257-



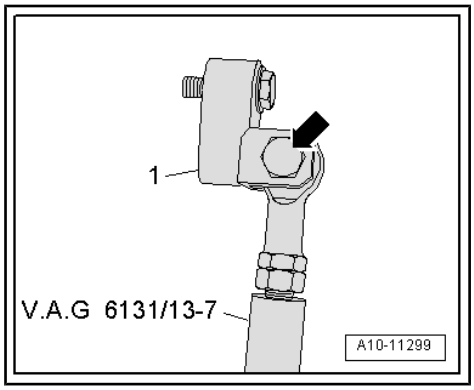
- Wrench, 21 mm - T40263-



♦ Adapter -T40314-

Setting up support -VAS 6131/13-7- :

– Remove bolt -arrow- from support -VAS 6131/13-7- and detach support -1-.

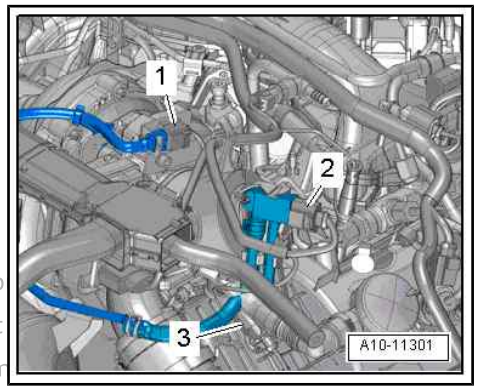


Procedure

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

– Take electrical connector -3- out of bracket, unplug it and move electrical wiring clear.

– Unplug electrical connector -2-, unclip pressure differential sender - G505- from bracket and move clear.

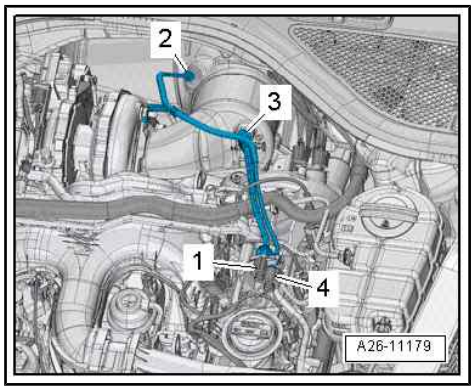


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Note

Ignore item marked -1-.

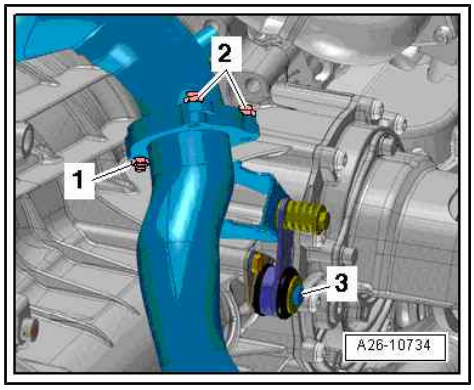
– Detach electrical connectors -1 and 4- from bracket and unplug.



Note

Disregard items -2 and 3-.

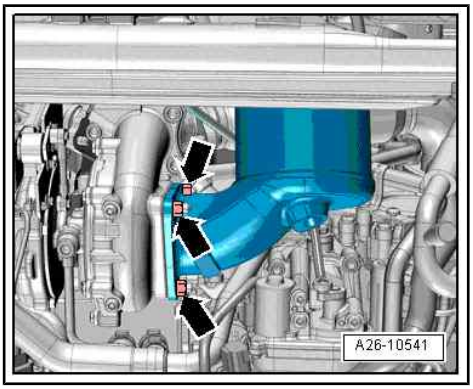
– Remove bolt -3-.



Note

Disregard items -1 and 2-.

– Remove nuts -arrows- for particulate filter and turbocharger.
– Detach particulate filter with front exhaust pipe.

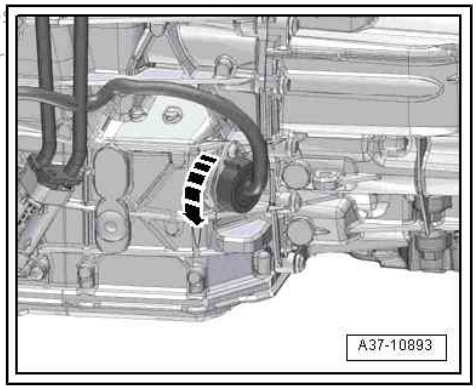


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Caution

Risk of irreparable damage to gearbox control unit (mechatronic unit) because of static discharge.

- ***Before unplugging or plugging in electrical connector, mechanic must discharge static electricity. To do so, touch vehicle earth, heater radiator, or lifting platform, with your hand.***
- ***Do NOT touch connector contacts in gearbox connector with your hands.***

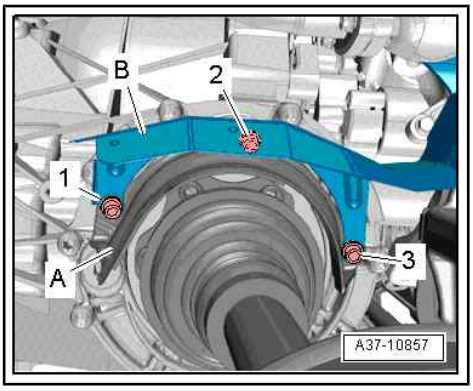


– Turn retainer catch anti-clockwise -arrow- and unplug electrical connector at gearbox.

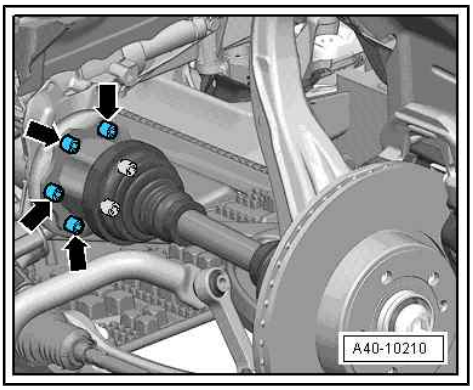
– Remove bolts -1- and -3-.
– Loosen bolt -2- and move heat shield -B- clear to one side.

Note

Disregard -item A-.

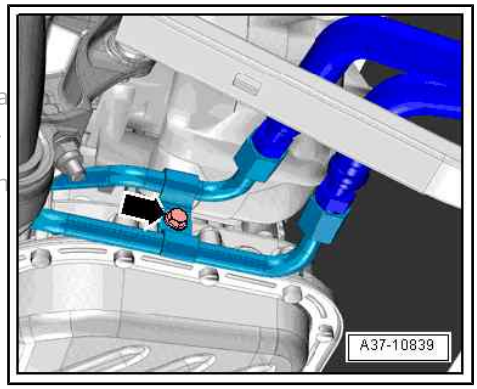


– Unbolt drive shafts (left and right) from gearbox flange shafts ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .
– Move electrical wiring for engine speed sender - G28- clear on gearbox.



– Remove bolt -arrow- for ATF lines.

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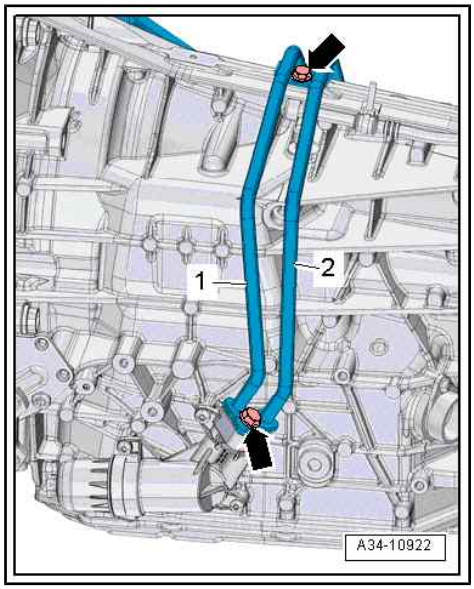


Note

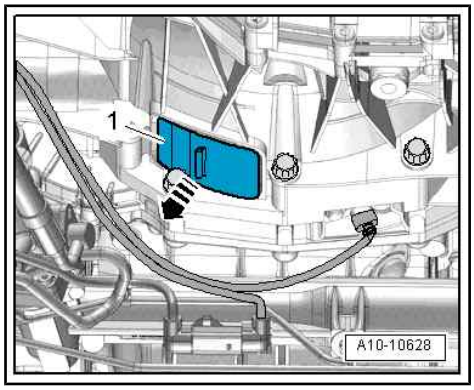
Lay a cloth under the separating point to catch escaping ATF.

– Unscrew bolts -arrows -, detach ATF lines -1, 2- from ATF-filter housing and tie up ATF lines.

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

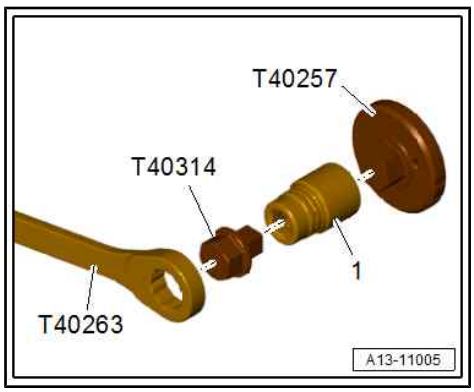


– Detach bottom cover -1- from gearbox -arrow-.

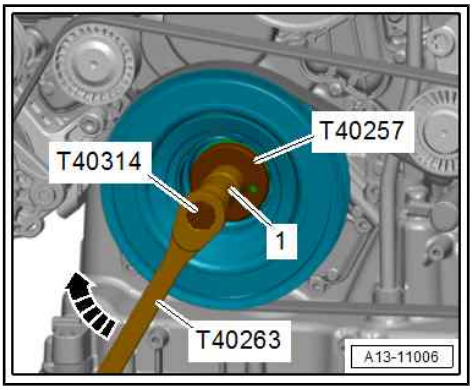


– Assemble tools as shown in illustration.

1 - Socket (21 mm) for $^{1}/_{2}$" drive



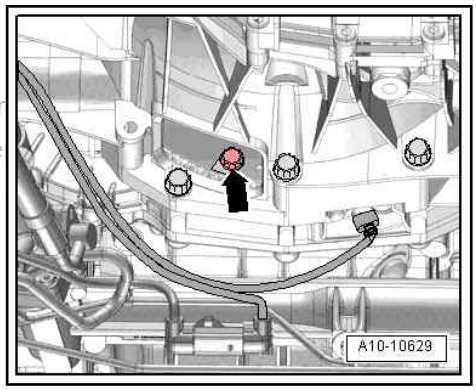
– Counterhold crankshaft to slacken bolts for dual-mass flywheel.



Note

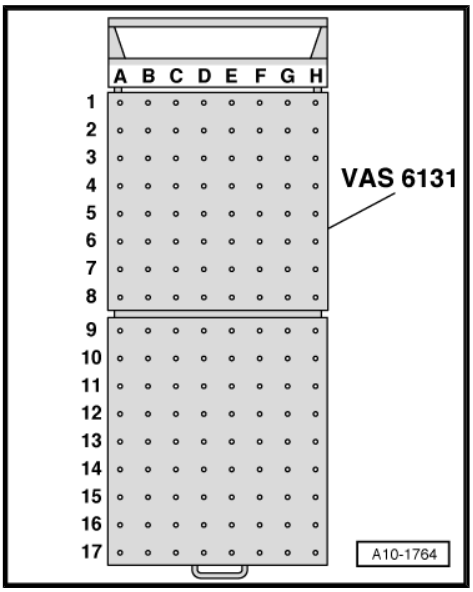
When performing the next step, turn the crankshaft only in the normal direction of rotation -arrow-.

– Remove 6 bolts -arrow- for dual-mass flywheel, turning crankshaft 60° in normal direction of rotation each time.



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– Set up scissor-type assembly platform - VAS 6131 A- with support set for Audi - VAS 6131/10- , support -VAS 6131/13-7- and gearbox support - VAS 6131/14- as follows.

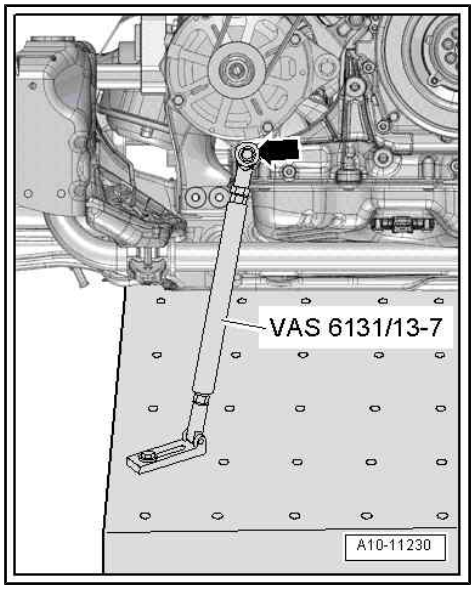


Note

The other support elements remain unchanged.

Platform coordinates	Parts from support set for Audi - VAS 6131/10- , support -VAS 6131/13-7- and gearbox support - VAS 6131/14-			
H2	/13-7			
B10	/10-1	/10-2	/10-5	/14
G10	/10-1	/10-2	/10-5	

– Secure support -VAS 6131/13-7- in threaded hole at front of engine (right-side) with bolt (M12x35) -arrow- as shown.



Note

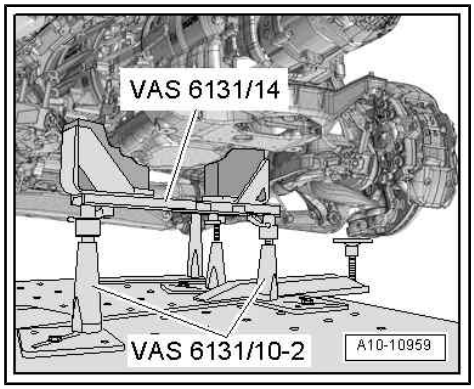
If bore has no thread, tap hole.

– Secure support to scissor-type assembly platform - VAS 6131 A- and tighten to 20 Nm.

Caution

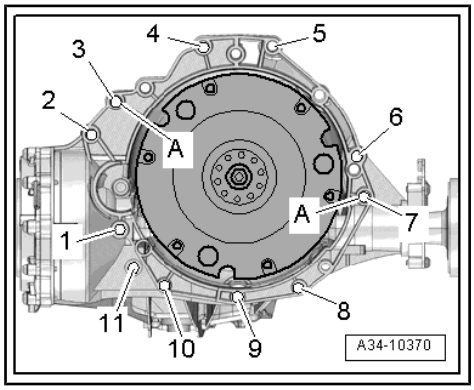
Risk of leaks at ATF sump.

- ***Do not apply gearbox support - VAS 6131/14- at ATF oil pan.***



– Position support elements from -VAS 6131/10- and gearbox support - VAS 6131/14- at front of gearbox, as illustrated.
– Screw spindles on both sides upwards until gearbox support - VAS 6131/14- makes full contact with gearbox.
– Tighten base plates for support elements to 20 Nm on scissor-type assembly platform - VAS 6131 A- .

– Remove bolts -1- and -2- for starter.
– Separate starter from gearbox and leave in position.
– Unscrew remaining bolts -3 ... 11- securing engine to gearbox.

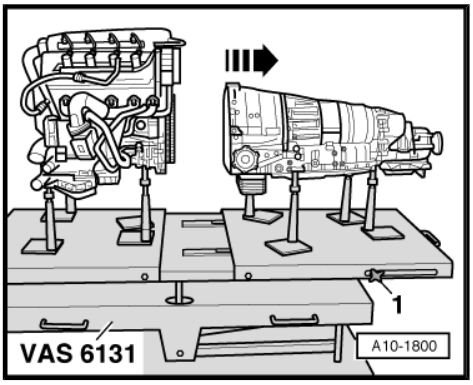


Note

Disregard -item A-.

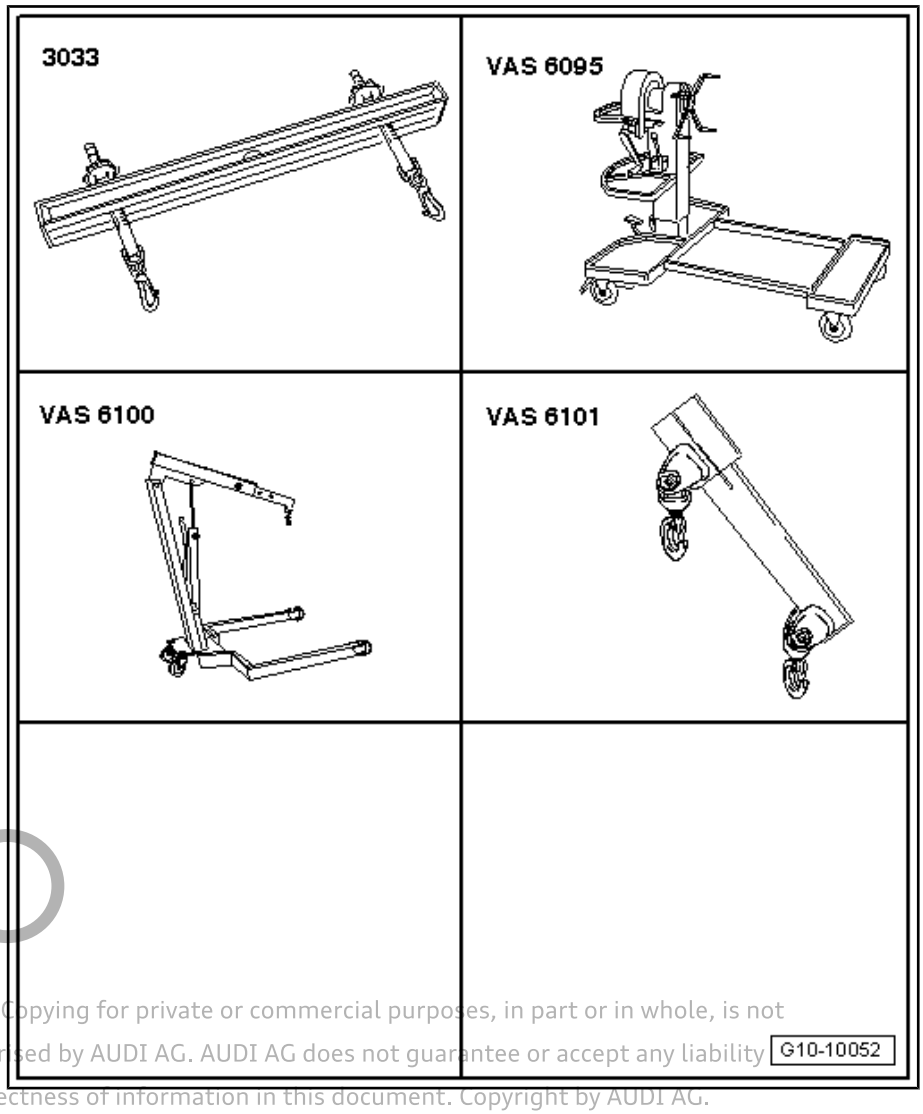
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– Loosen clamping bolts -1- on sides of scissor-type assembly platform - VAS 6131 A- and pull rear section of platform together with gearbox towards rear -arrow-.



1.3 Securing engine to engine and gearbox support

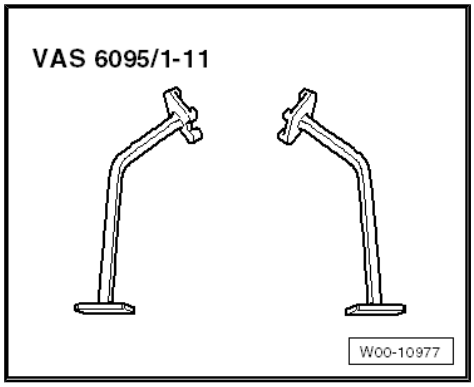
Special tools and workshop equipment required



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- Lifting tackle - 3033-
- Engine and gearbox support - VAS 6095-
- Workshop hoist - VAS 6100-
- Lift arm extension/workshop hoist - VAS 6101-

♦ Bracket for V6 TDI engine - VAS 6095/1-11-



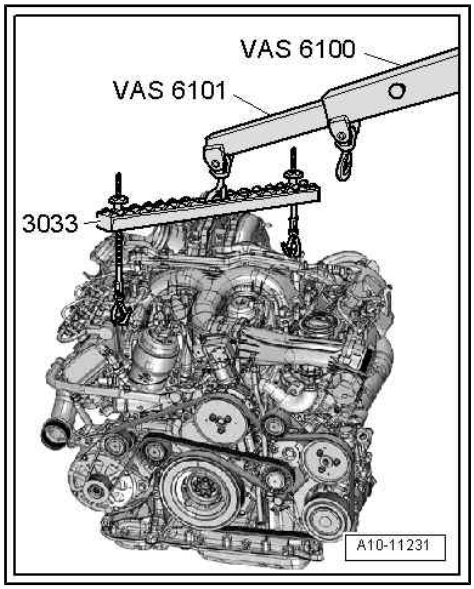
Procedure

- Engine/gearbox assembly removed and secured to scissor-type assembly platform - VAS 6131- (with engine detached from gearbox)
- Engine secured with support -VAS 6131/13-7- .

– Attach lift arm extension - VAS 6101- to workshop hoist - VAS 6100- .

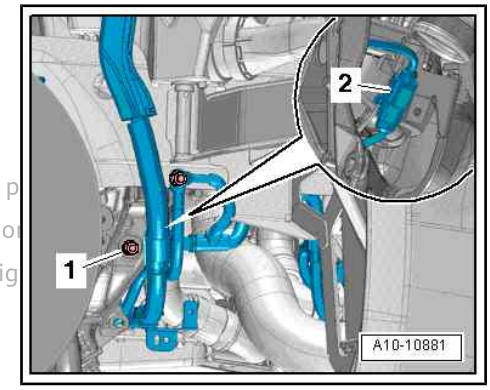
– Attach lifting tackle - 3033- to engine lifting eyes and workshop hoist as shown in illustration.

– Take up weight of engine with workshop hoist, but do not lift.



– Take electrical connectors -2- for electrohydraulic engine mounting solenoid valves -N144- / -N145- out of brackets and unplug (both sides).

– Unscrew nut -1- and detach bracket with electrical wiring from subframe.

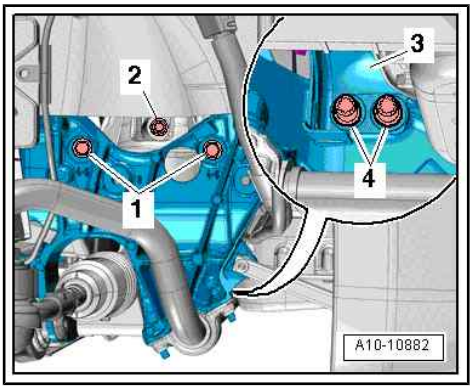


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Note

The illustration shows the installation position with the engine installed.

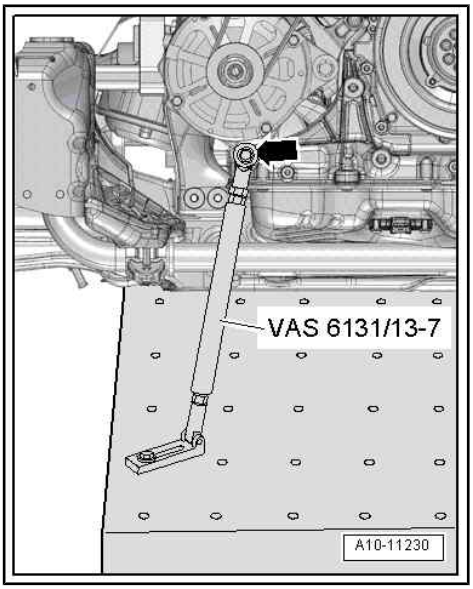
– Remove bolt -2- for engine mounting on both sides.



Note

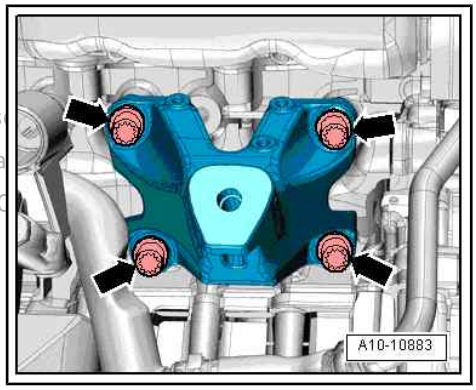
Disregard -items 1, 3, 4-.

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

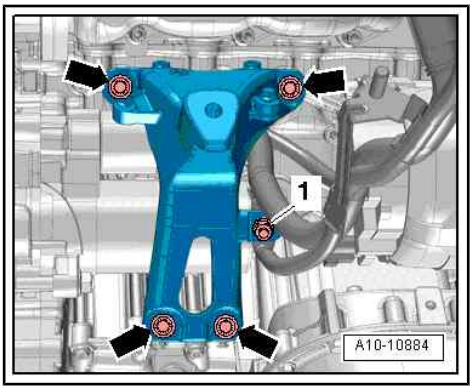


– Unscrew bolts -arrows- and remove engine support (left-side).

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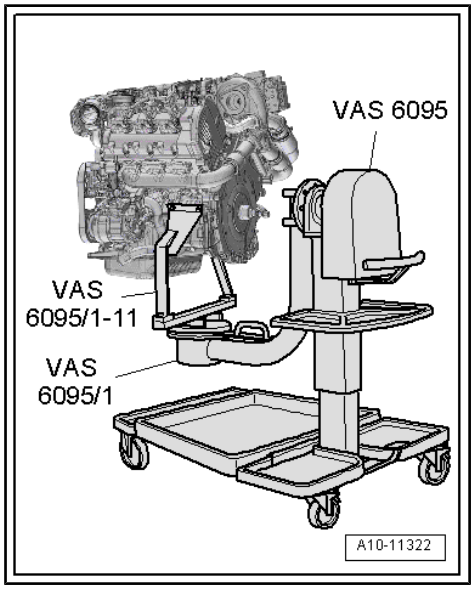
– Unscrew bolts -arrows- and remove engine support (right-side).
– Tie up starter on engine.



Note

Disregard -item 1-.

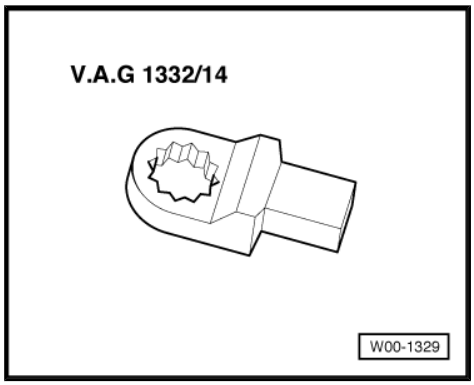
– Using universal mounting - VAS 6095/1- and bracket for V6 TDI engine - VAS 6095/1-11- , secure engine to engine and gearbox support - VAS 6095- (40 Nm) as shown in illustration.



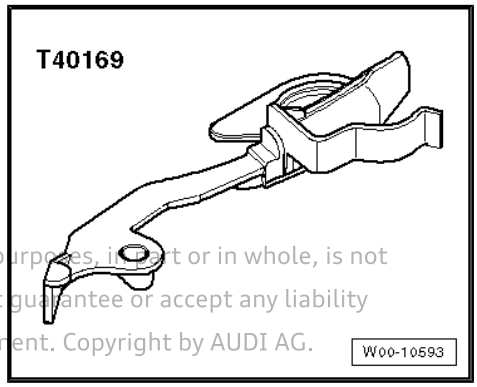
1.4 Installing engine

Special tools and workshop equipment required

♦ Ring spanner insert AF 16 - V.A.G 1332/14-

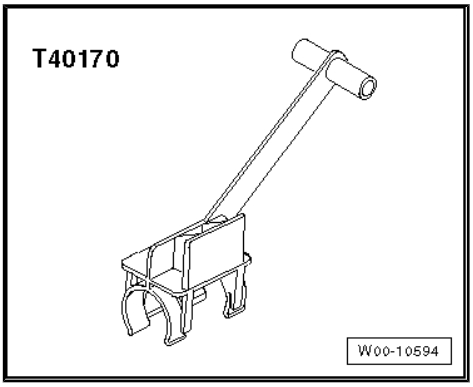


♦ Assembly aid - T40169-

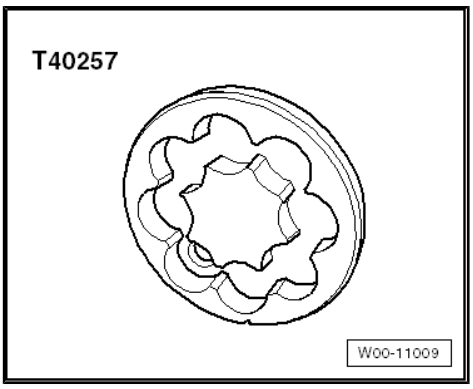


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- Transportation lock - T40170-



- Turning-over tool - T40257-



- Wrench, 21 mm - T40263-



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- Adapter -T40314-

Tightening torques

Note

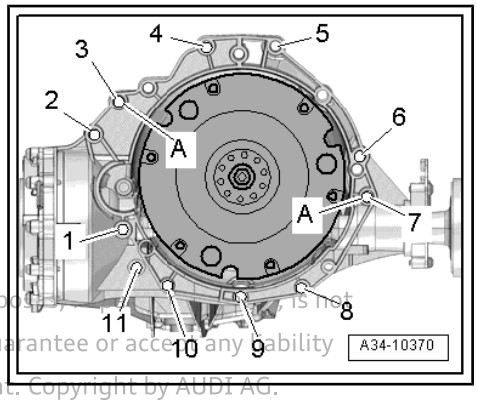
- *Tightening torques apply only to lightly greased, oiled, phosphated or black-finished nuts and bolts.*
- *Additional lubricant such as engine oil or gearbox oil may be used, but do not use lubricant containing graphite.*
- *Do not use degreased parts.*
- *Tolerance for tightening torques: ± 15 %.*

Component		Nm
Bolts/nuts	M6	9
	M7	15
	M8	20
	M10	40

Component	Nm
M12	65

Assembly mountings
⇒ “2.1 Exploded view - assembly mountings”, page 93

Engine to manual gearbox/multitronic gearbox 0AW/dual clutch gearbox 0B5

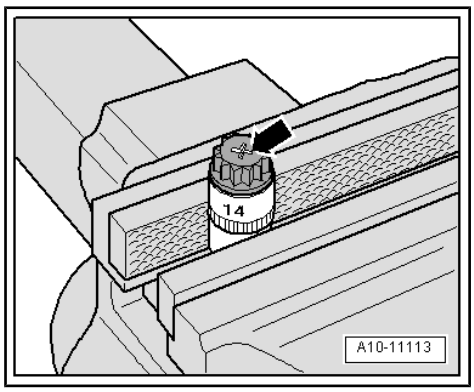


Item	Bolt	Nm
1 [1]	M10x50 [2]	65
2 [1] … 6	M12x100 [3]	30 + 90°
7	M12x125 [3]	30 + 90°
8, 11	M10x60 [3]	15 + 90°
9, 10	M10x95 [3]	15 + 90°
A	Dowel sleeves for centralising	

- [1] Also secures starter
- [2] Property class 10.9. The steel bolt may be re-used as often as necessary.
- [3] Aluminium bolts must not be used more often than twice ⇒ page 86 .

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The aluminium bolts -2 … 11- may only be used twice. After first use, bolts must therefore be identified with an “X” made by two chisel marks -arrow-.



To avoid damaging the bolts when making this mark, do not clamp them directly in a vice. Clamp a 14 mm socket with $^1/_2$" drive in a vice and insert the bolt as shown.

Bolts already marked with an “X” must not be used again.

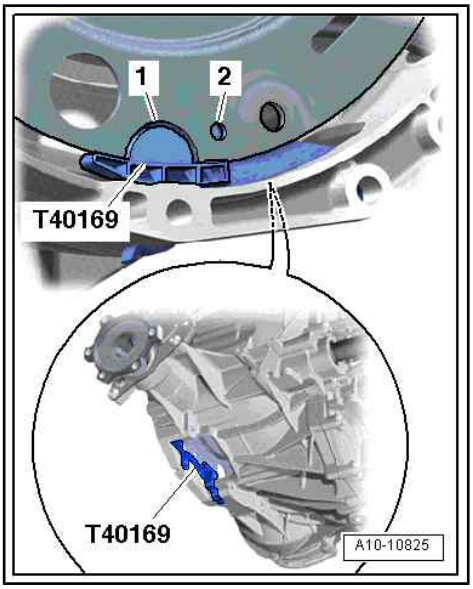
Procedure

Note

- *Renew the bolts tightened with specified tightening angle.*
- *Renew self-locking nuts and bolts as well as seals, gaskets and O-rings.*
- *Do not remove plugs or protective caps until you are ready to fit the relevant line.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *Fit all cable ties in the original positions when installing.*

– Before installing gearbox, remove residue from threaded holes for engine/gearbox bolts in cylinder block using a thread tap.

– The following preparations are required before joining engine and gearbox:
– Insert assembly aid - T40169- into gearbox housing between clutch module and gearbox housing from below, as illustrated.
• The assembly aid - T40169- must engage in the semi-circular recess -1- and in the inspection hole -2-.

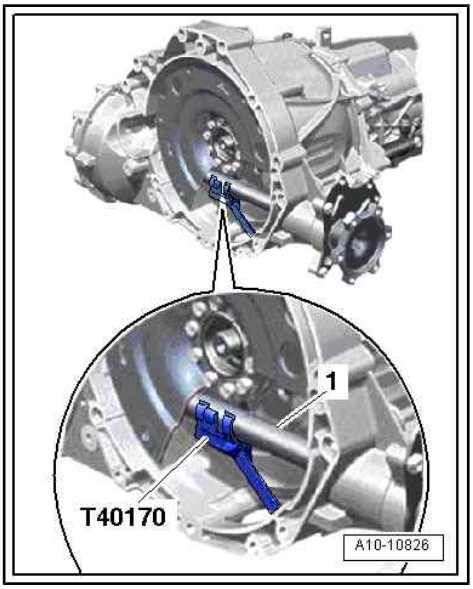


Note

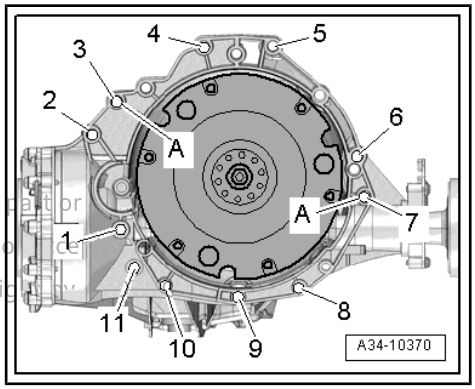
There is only one inspection hole on the circumference; turn the clutch module/dual-mass flywheel accordingly.

– Insert pin of assembly aid into hole on gearbox housing.

– Insert transportation lock - T40170- into gearbox housing from below and clamp onto flange shaft -1-.



– Check whether dowel sleeves -A- for centring engine and gearbox are fitted in cylinder block; install missing dowel sleeves.
– Check whether aluminium bolts securing engine to gearbox can be reused; if so, apply marking ⇒ page 86 .
– Bring gearbox into position on engine and tighten bolts -1 … 11-.
– Remove transport lock - T40170- and assembly aid - T40169- .



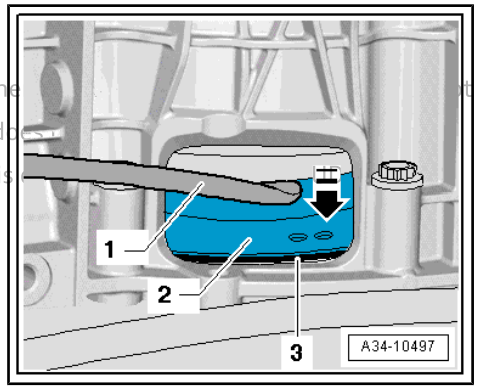
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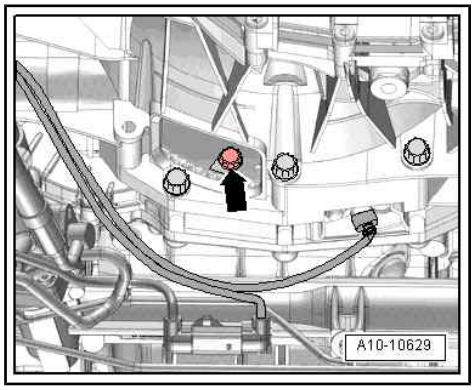
Note

The following step is necessary to ensure that the clutch module/dual-mass flywheel is straight and that it makes even contact with the drive plate.

– Use assembly lever -1- to press clutch module/dual-mass flywheel -2- slightly against drive plate -3- in direction of -arrow-.



– Bolt clutch module/dual-mass flywheel onto drive plate as follows:



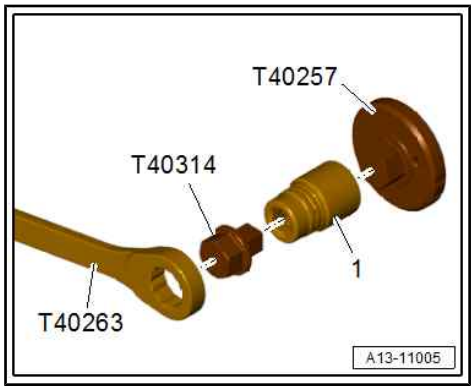
Note

Use ring spanner insert AF 16 - V.A.G 1332/14- to tighten bolts.

– Screw in first bolt -arrow- hand-tight (2 Nm).

– Assemble tools as shown in illustration.

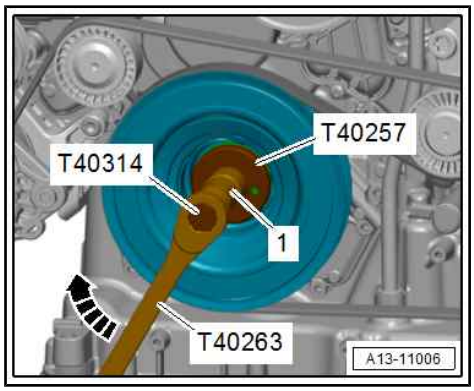
1 - Socket (21 mm) for $^1/_2$" drive



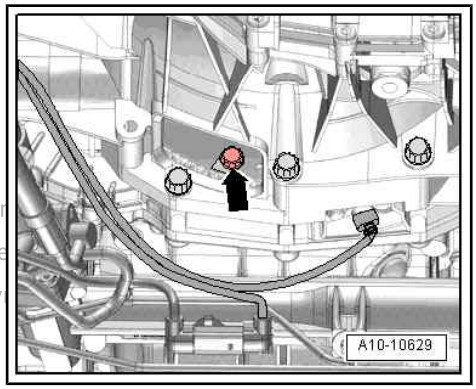
Caution

Irreparable damage can be caused if the camshaft timing chain slips.

- ***Turn crankshaft only in direction of engine rotation -arrow-.***



– Turn crankshaft by 180° in direction of engine rotation.

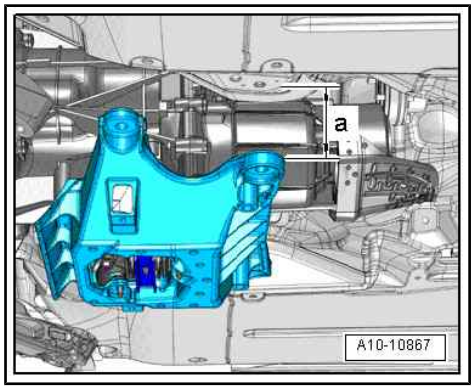


– Tighten bolt -arrow- accessible in this crankshaft position to specified torque ⇒ Rep. gr. 34 ; Removing and installing gearbox; Tightening torques for gearbox or ⇒ Rep. gr. 37 ; Removing and installing gearbox; Tightening torques for gearbox .
– Turn crankshaft by 60° each time and tighten remaining 5 bolts to specified torque ⇒ Rep. gr. 34 ; Removing and installing gearbox; Tightening torques for gearbox or ⇒ Rep. gr. 37 ; Removing and installing gearbox; Tightening torques for gearbox .
– Hold ATF lines in installation position when joining engine and subframe.
– Install engine support and engine mounting ⇒ page 93 .
– Secure drive shafts (left and right) to gearbox flange shafts ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .
– Vehicles with multitronic gearbox 0AW: Install ATF lines ⇒ Rep. gr. 34 ; ATF circuit; Removing and installing ATF lines .
– Vehicles with dual clutch gearbox 0B5: Install ATF lines ⇒ Rep. gr. 37 ; ATF circuit; Removing and installing ATF lines .
– Install particulate filter:

♦ Vehicles with manual gearbox/multitronic gearbox 0AW ⇒ page 411
♦ Vehicles with dual clutch gearbox 0B5 ⇒ page 412 .

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Vehicles with manual gearbox or dual clutch gearbox 0B5:



– Raise engine/gearbox assembly using scissor-type assembly platform - VAS 6131 A- only until distance between tunnel cross member and body is -a-.

• Dimension -a- = min. 100 mm.

– Vehicles with manual gearbox: Install selector rod and push rod ⇒ Rep. gr. 34 ; Selector mechanism; Exploded view - selector mechanism .

– Vehicles with dual clutch gearbox 0B5: Install selector lever cable ⇒ Rep. gr. 34 ; Selector mechanism; Removing and installing selector lever cable .

All vehicles (continued):

– Raise engine/gearbox assembly using scissor-type assembly platform - VAS 6131 A- .

– Align subframe and tunnel cross member on longitudinal members according to markings made before removal.

– Tighten subframe bolts only to specified torque (do not turn further); the bolts should only be fully tightened after performing the wheel alignment check ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Exploded view - subframe .

WARNING

Risk of accident if bolted connections are loose.

- ***Do NOT drive the vehicle unless the subframe bolts have been tightened to their final torque.***

– Tighten bolts for tunnel cross-piece ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings ; or ⇒ Rep. gr. 37 ; Assembly mountings; Exploded view - assembly mountings .

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

– Vehicles with four-wheel drive: Install propshaft ⇒ Rear final drive; Rep. gr. 39 ; Propshaft; Removing and installing propshaft .

– Vehicles with manual gearbox: Install clutch slave cylinder ⇒ Rep. gr. 30 ; Clutch mechanism; Removing and installing clutch slave cylinder .

– Install front cross member ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim panels .

– Vehicles with multitronic gearbox 0AW: Install selector lever cable ⇒ Rep. gr. 37 ; Selector mechanism; Removing and installing selector lever cable .

– Secure intermediate steering shaft to steering rack ⇒ Running gear, axles, steering; Rep. gr. 48 ; Steering column; Exploded view - steering column .

– Install subframe cross brace, anti-roll bar and (if originally fitted) diagonal struts ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Exploded view - subframe .

– Install upper suspension links and secure suspension strut to track control link ⇒ Running gear, axles, steering; Rep. gr. 40 ; Suspension strut, upper links; Exploded view - suspension strut, upper links .

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– Install brake calipers ⇒ Brake system; Rep. gr. 46 ; Front brakes; Removing and installing brake caliper .
– Install engine control unit ⇒ page 398 .
– 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 ⇒ 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 refrigerant lines ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit .
– Observe steps required after re-connecting battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .

Caution

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

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

– Install air cleaner housing ⇒ page 340 .
– Install lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .
– Install plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .
– Install lock carrier brace ⇒ General body repairs, exterior; Rep. gr. 50 ; Lock carrier .
– Fill up with engine oil and check oil level ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .
– Connect coolant hoses with plug-in connector ⇒ page 282 .
– Fill up with coolant ⇒ page 259 .

Note

- *Drained-off coolant may only be used again if the original cylinder head and cylinder block are re-installed.*
- *Contaminated or dirty coolant must not be used again.*

– Bleed fuel system ⇒ page 332 .
– Charge refrigerant circuit ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit .
– Install wheel housing liners ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front) .
– Fit front wheels ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres; Tightening torque for wheel bolts .

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– Check wheel alignment ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheel alignment check; Wheel alignment procedure .

WARNING

Risk of accident if bolted connections are loose.

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

– Fill up ATF ⇒ Rep. gr. 34 ; ATF; Draining and filling ATF or ⇒ Rep. gr. 37 ; ATF; Draining and filling ATF .

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

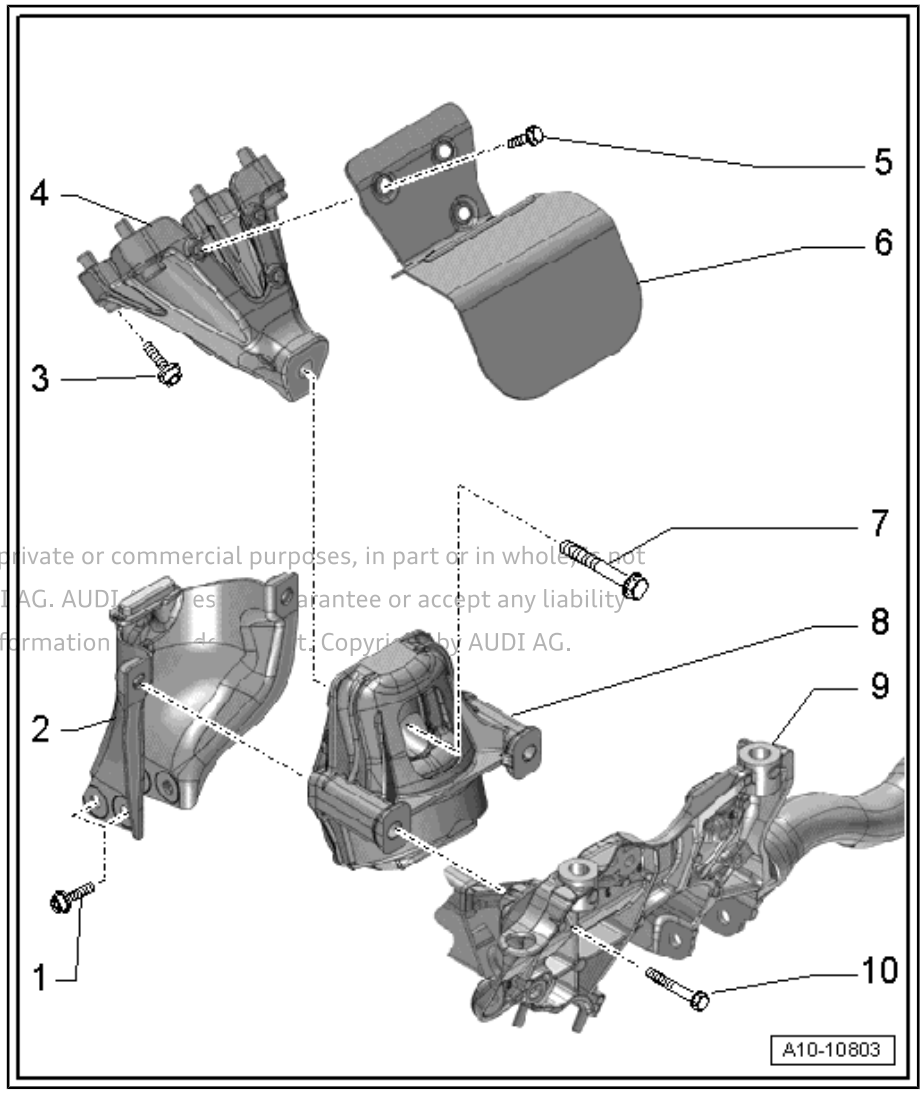
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2 Assembly mountings

⇒ "2.1 Exploded view - assembly mountings", page 93

⇒ "2.2 Removing and installing engine mountings", page 94

2.1 Exploded view - assembly mountings



1 - Bolt

- ❑ 20 Nm

2 - Bracket

- ❑ For engine mounting
- ❑ Renew retaining plate if engine mounting is defective
- ❑ Check retaining plate on opposite side; renew if necessary

3 - Bolt

- ❑ 40 Nm

4 - Engine support

5 - Bolt

- ❑ 10 Nm

6 - Heat shield

7 - Bolt

- ❑ Renew
- ❑ 90 Nm +90°

8 - Engine mounting

- ❑ With electrohydraulic engine mounting solenoid valve
- ❑ Left side: left electrohydraulic engine mounting solenoid valve - N144-
- ❑ Right side: right electrohydraulic engine mounting solenoid valve - N145-
- ❑ 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 94

9 - Subframe

10 - Bolt

- ❑ 55 Nm

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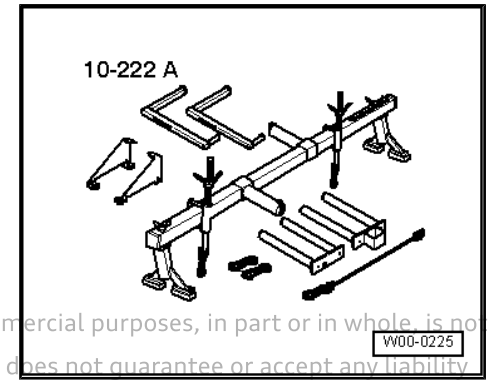
2.2 Removing and installing engine mountings

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 .*

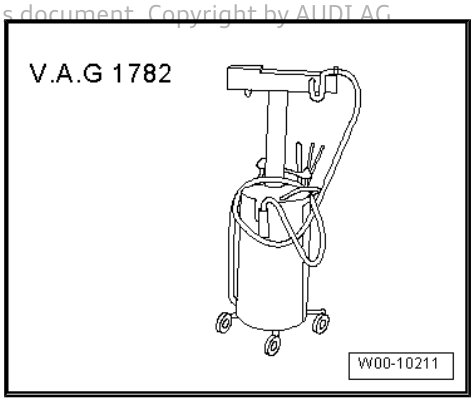
Special tools and workshop equipment required

- Support bracket - 10 - 222 A-



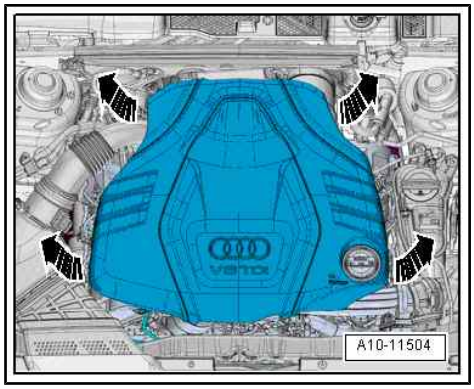
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- Used oil collection and extraction unit - V.A.G 1782-

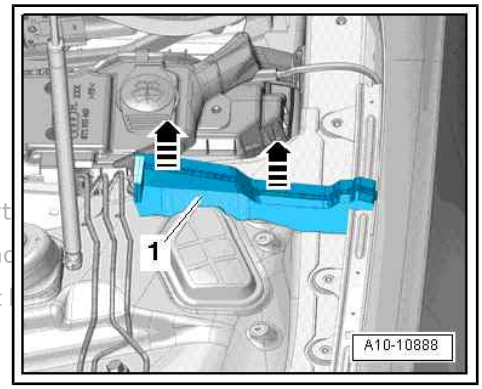


Removing

– Remove engine cover panel -arrows-.

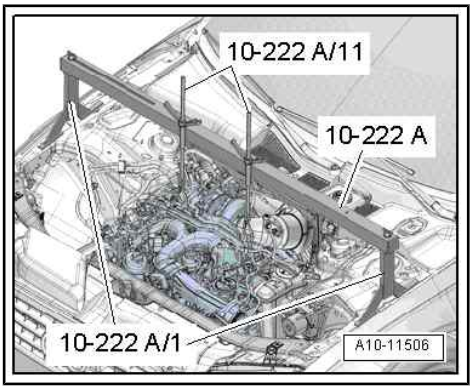


– Pull off foam wedge -1- on both sides of vehicle -arrows-.

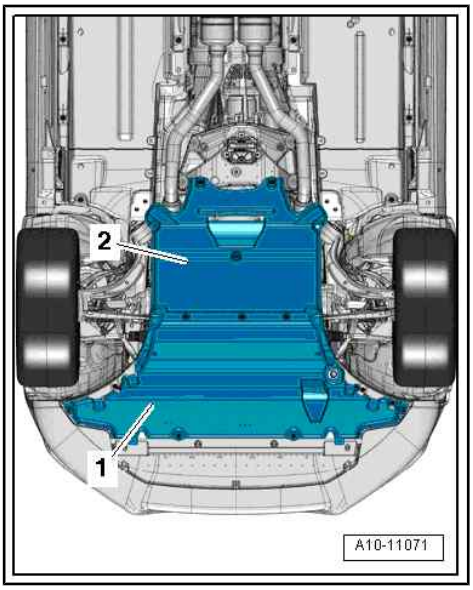


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– Set up support bracket - 10 - 222 A- top edges of body flanges (left and right) as illustrated.
– Engage spindles -10 - 222 A /11- at engine lifting eyes (left and right).
– Partly take up weight of engine with spindles.



– Remove noise insulation -1- and -2- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .
– Remove relevant front wheel housing liner ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front) .



Engine mounting (left-side):

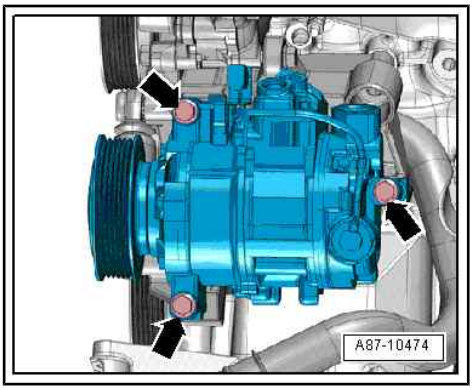
– Remove poly V-belt ⇒ page 106 .

Caution

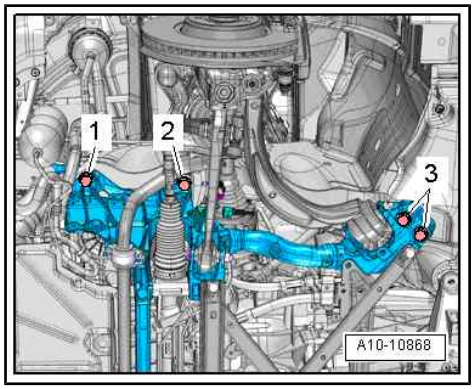
Risk of damage to refrigerant lines and hoses

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

– Remove bolts -arrows-, detach air conditioner compressor from bracket and tie up.



– Remove bolt -2- for subframe (left-side).



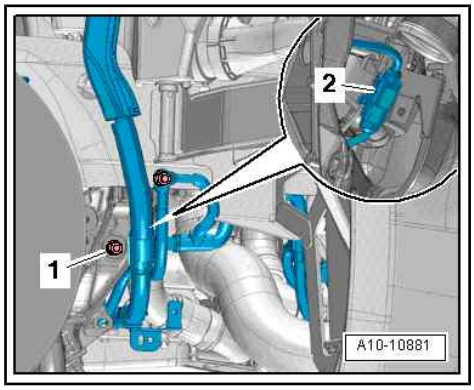
Note

Bolts -1- and -3- on left side and all bolts for subframe on right side remain fitted.

Engine mounting (right-side):

– Unscrew nut -1- and detach bracket with electrical connector from subframe.

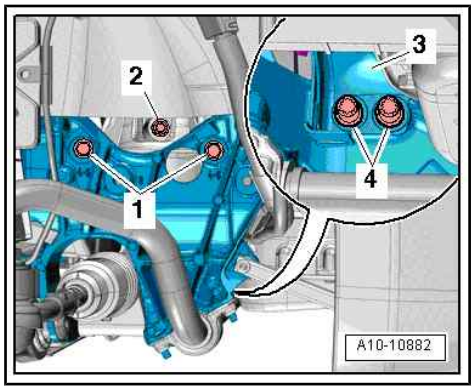
– Remove alternator ⇒ Electrical system; Rep. gr. 27 ; Alternator; Removing and installing alternator .



Both sides (continued):

– Unplug electrical connectors -2- for electrohydraulic engine mounting solenoid valves -N144- / -N145- on both sides and move wiring clear.

– Remove bolts (left and right) -1, 2, 4- and place retaining plate -3- to one side.

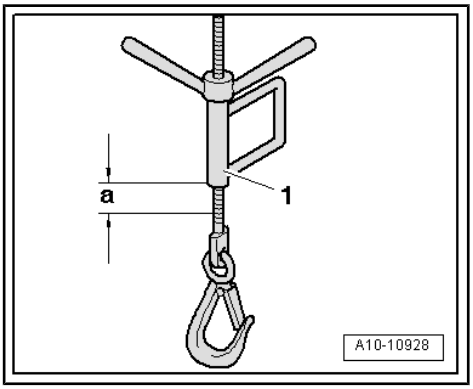


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– Using spindle - 10 - 222 A /11- -item 1-, raise engine through distance -a- on corresponding side.

• Distance -a- = approx. 20 mm.

– Detach engine mounting on relevant side.



Installing

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

• Tightening torques
⇒ “2.1 Exploded view - assembly mountings”, page 93

Note

Renew the bolts tightened with specified tightening angle.

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

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

– Install air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Removing and installing air conditioner compressor .

– Install alternator ⇒ Electrical system; Rep. gr. 27 ; Alternator; Removing and installing alternator .

– Install poly V-belt ⇒ page 106 .

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

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

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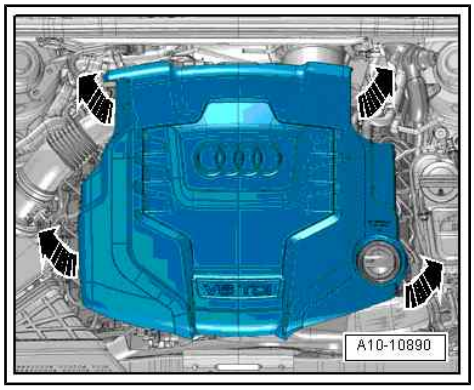
3 Engine cover panel

⇒ “3.1 Removing and installing engine cover panel”, page 98

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.

– When fitting engine cover panel, take care not to damage oil filler neck.

– First press engine cover panel onto rear retaining pins and then onto front retaining pins with both hands.

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13 – Crankshaft group

1 Cylinder block (pulley end)

⇒ "1.1 Exploded view - poly V-belt drive", page 99

⇒ "1.2 Exploded view - sealing flange (pulley end)", page 101

⇒ "1.3 Removing and installing poly V-belt", page 106

⇒ "1.4 Removing and installing tensioner for poly V-belt", page 108

⇒ "1.5 Removing and installing vibration damper", page 109

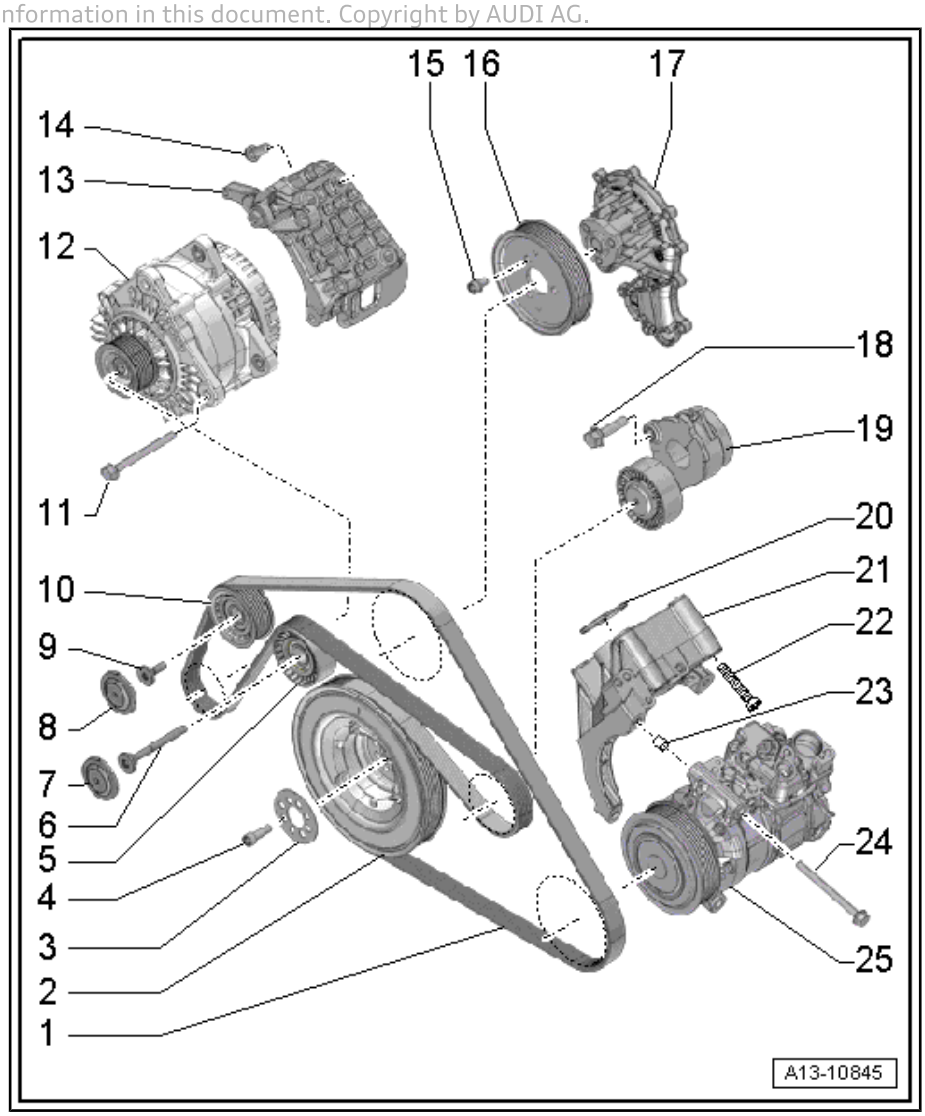
⇒ "1.6 Removing and installing bracket for ancillaries", page 110

⇒ "1.7 Renewing crankshaft oil seal (pulley end)", page 110

⇒ "1.8 Removing and installing sealing flange (pulley end)", page 112

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1.1 Exploded view - poly V-belt drive



1 - Poly V-belt
- ❑ Check for wear
- ❑ Before removing, mark direction of rotation with chalk or felt-tip pen
- ❑ Removing and installing ⇒ page 106
- ❑ Do not kink
- ❑ When installing, make sure it is properly seated on pulleys

2 - Vibration damper
- ❑ With poly V-belt pulley
- ❑ Removing and installing ⇒ page 109

3 - Washer
- ❑ Renew

4 - Bolt
- ❑ Renew
- ❑ 20 Nm +90°

5 - Idler roller
- ❑ For poly V-belt

6 - Bolt
- ❑ 23 Nm

7 - Cover
- ❑ For idler roller

8 - Cover
- ❑ For idler roller

9 - Bolt
- ❑ 23 Nm

10 - Idler roller

- ❑ For poly V-belt

11 - Bolt

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

12 - Alternator

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

13 - Bracket

- ❑ For alternator

14 - Bolt

- ❑ Tighten in two stages:

- ♦ 5 Nm in diagonal sequence
- ♦ 40 Nm in diagonal sequence

15 - Bolt

- ❑ Tightening torque ⇒ Item 3 (page 263)

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16 - Poly V-belt pulley

- ❑ For coolant pump

17 - Coolant pump

- ❑ Removing and installing ⇒ page 265

18 - Bolt

- ❑ Renew
- ❑ 50 Nm +90°

19 - Tensioner

- ❑ For poly V-belt
- ❑ Different versions (with or without washer for tensioner) ⇒ page 101
- ❑ Removing and installing ⇒ page 108

20 - Gasket

- ❑ Renew

21 - Bracket

- ❑ For air conditioner compressor
- ❑ Removing and installing ⇒ page 110

22 - Bolt

- ❑ Tighten in two stages:

- ♦ 5 Nm in diagonal sequence
- ♦ 40 Nm in diagonal sequence

23 - Dowel sleeve

- ❑ 2x

24 - Bolt

- ❑ Tightening torque ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Removing and installing air conditioner compressor

25 - Air conditioner compressor

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

Allocation of washer for tensioner

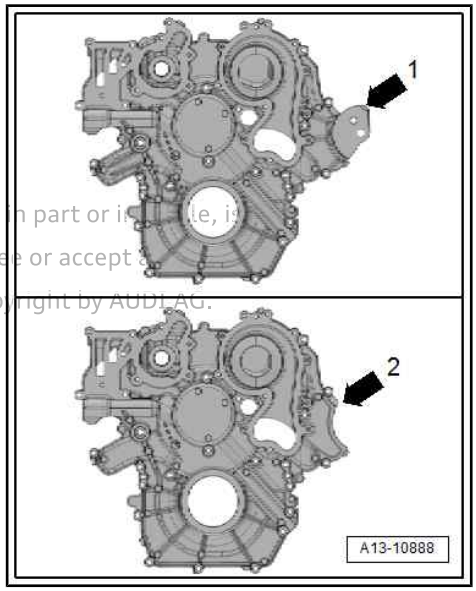
1 - Sealing flange WITH support for tensioner

– Install tensioner WITHOUT washer.

2 - Sealing flange WITHOUT support for tensioner

– Install tensioner WITH washer.

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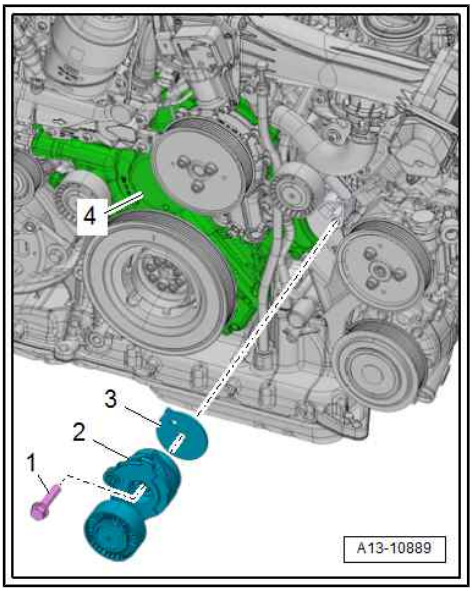
Tensioner with washer for sealing flange without support

1 - Bolt - tightening torque ⇒ Item 18 (page 100)

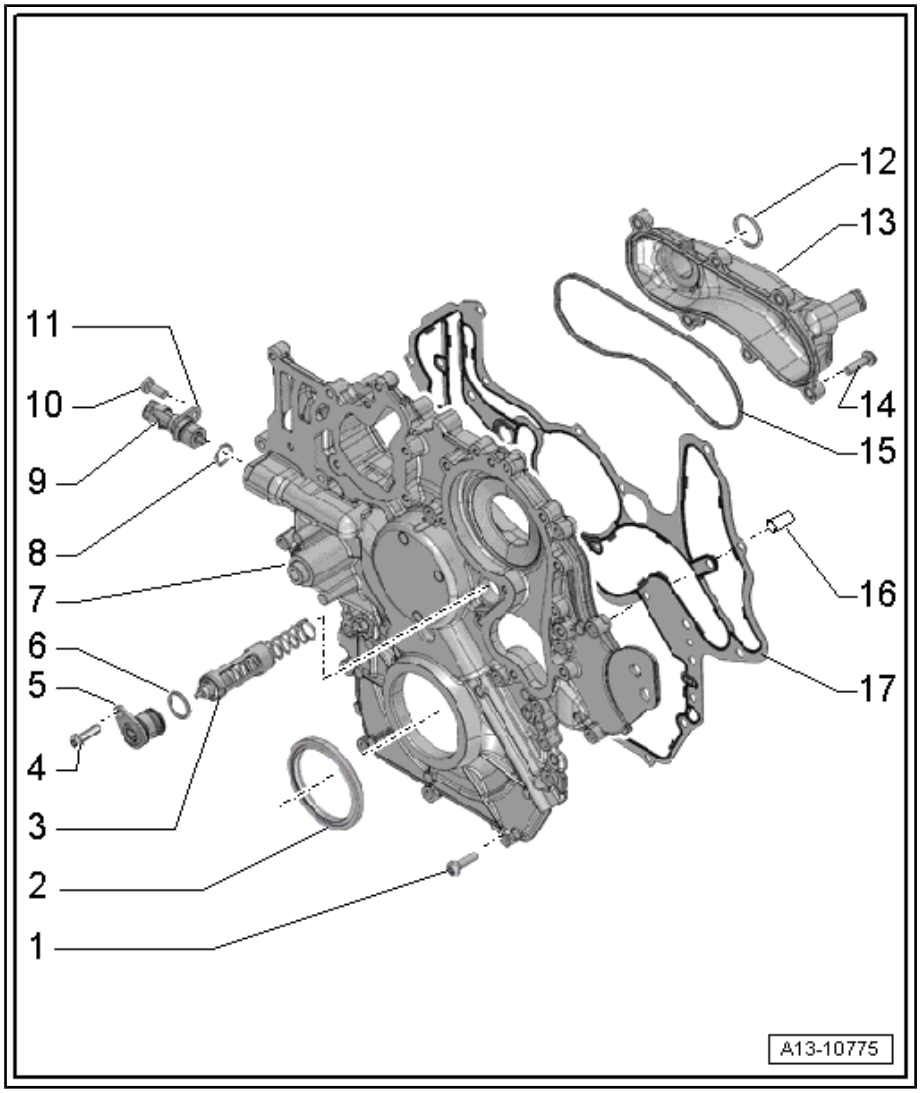
2 - Tensioner

3 - Washer - only for sealing flange without support

4 - Sealing flange - without support



1.2 Exploded view - sealing flange (pulley end)



1 - Bolt

- ❑ Renew
- ❑ Steel bolts: tightening torque and sequence ⇒ page 103
- ❑ Aluminium bolts: tightening torque and sequence ⇒ page 105

2 - Oil seal

- ❑ For crankshaft (pulley end)
- ❑ Renewing ⇒ page 110

3 - Temperature regulator

- ❑ For engine oil cooler
- ❑ Removing and installing ⇒ page 240

4 - Bolt

- ❑ Tightening torque and sequence ⇒ page 105

5 - Cover

- ❑ For temperature regulator for engine oil cooler
- ❑ Removing and installing ⇒ “2.4 Removing and installing temperature regulator for engine oil cooler”, page 240

6 - O-ring

- ❑ Renew

7 - Sealing flange

- ❑ Pulley end

> **Caution**
>
> *Different versions possible; see ⇒ Electronic parts catalogue*
>
> *The sealing flange version is matched to the gasket version (with or without metal carrier).*
>
> *Different versions (with or without washer for tensioner) ⇒ page 101*

- ❑ Removing and installing ⇒ page 112

8 - O-ring

- ❑ Renew

9 - Oil temperature sender 2 - G664-

- ❑ Removing and installing ⇒ page 245

10 - Bolt

- ❑ 9 Nm

11 - Bracket

- ❑ For oil temperature sender 2 - G664-

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12 - O-ring

- ❑ Renew

13 - Cover

14 - Bolt

- ❑ 9 Nm

15 - Seal

- ❑ Renew

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16 - Dowel pins

- ❑ 2x

17 - Gasket

- ❑ Renew

Caution

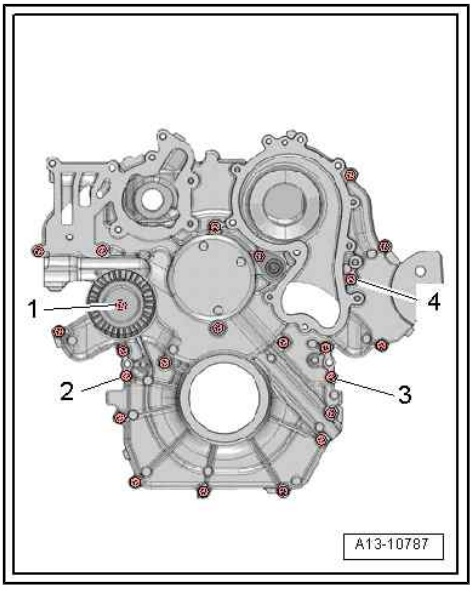
Different versions possible; see ⇒ Electronic parts catalogue
The sealing flange version is matched to the gasket version (with or without metal carrier).

Steel bolts: sealing flange (pulley end) - tightening torque and sequence

– Tighten bolts in 7 stages in the sequence shown.

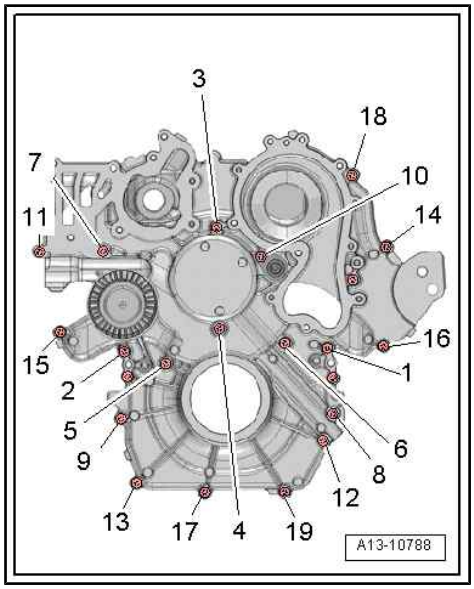
Stages 1 ... 3:

Stage	Bolts	Tightening torque
1.		Fit sealing flange with gasket on cylinder block
2.	-1-	Tighten for idler roller ⇒ Item 6 (page 99)
3.	-2, 3, 4-	9 Nm



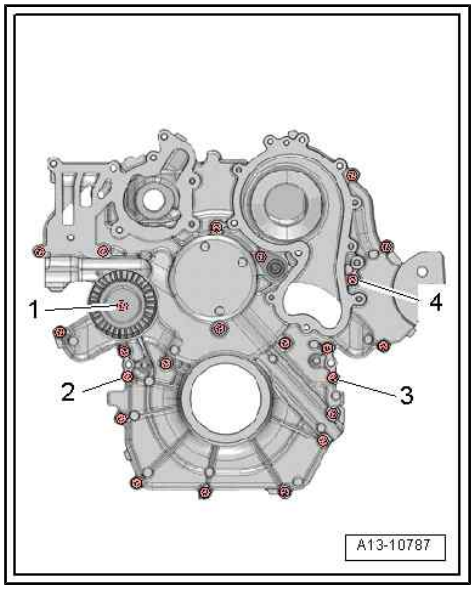
Stages 4 ... 6:

Stage	Bolts	Tightening torque/angle specification
4.		Insert temperature regulator for engine oil cooler with cover
5.	-10-	Screw in by hand until contact is made
6.	-1 … 19-	9 Nm



Stage 7:

Stage	Bolts	Tightening torque/angle specification
7.	-2, 3, 4-	9 Nm



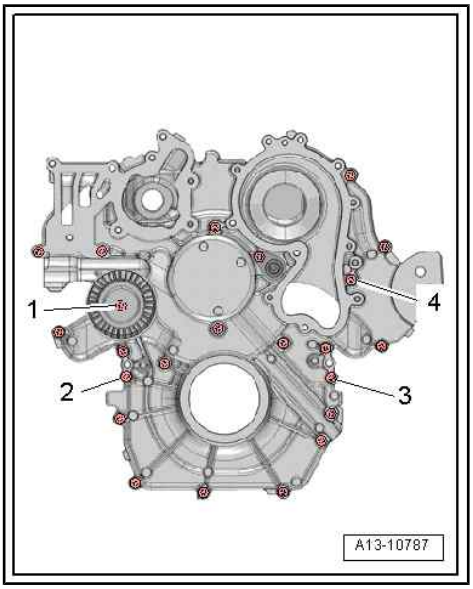
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Aluminium bolts: sealing flange (pulley end) - tightening torque and sequence

Caution

Risk of damage to aluminium bolts when installing sealing flange (pulley end).

- *Do not use aluminium bolts to pull sealing flange (pulley end) onto cylinder block.*
- *Use three steel bolts M6x20 to secure sealing flange (pulley end); refer to the following description.*



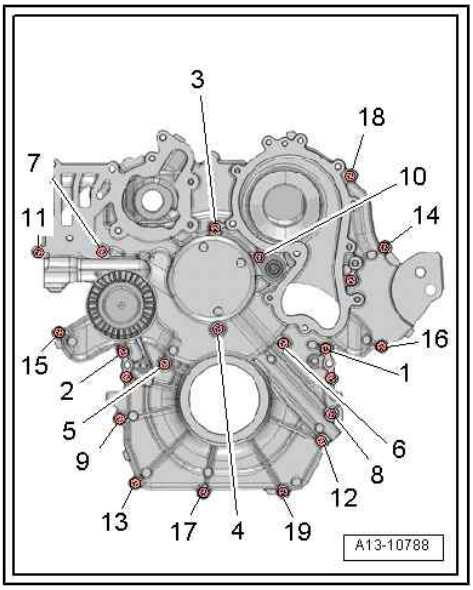
– Tighten bolts in 11 stages as follows:

Stages 1 ... 3:

Stage	Bolts	Tightening torque
1.		Fit sealing flange with gasket on cylinder block
2.	-1-	Tighten for idler roller ⇒ Item 6 (page 99)
3.	-2, 3, 4-	Tighten steel bolts M6x20 to 9 Nm

Stages 4 ... 8:

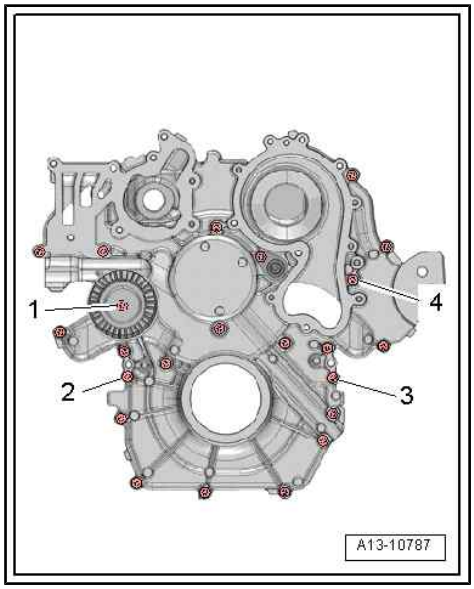
Stage	Bolts	Tightening torque/angle specification
4.		Insert temperature regulator for engine oil cooler with cover
5.	-10-	Screw in by hand until contact is made
6.	-1 … 19-	3 Nm
7.	-1 … 19-	3 Nm; this step is performed to allow for settling of sealing flange (pulley end)
8.	-1 … 19-	Turn 90° further



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Stages 9 ... 11:

Stage	Bolts	Tightening torque/angle specification
9.	-2, 3, 4-	Unscrew steel bolts M6x20
10.	-2, 3, 4-	Insert aluminium bolts and tighten to 3 Nm
11.	-2, 3, 4-	Turn aluminium bolts 90° further

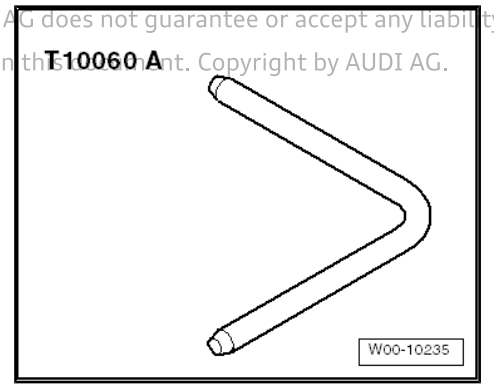


1.3 Removing and installing poly V-belt

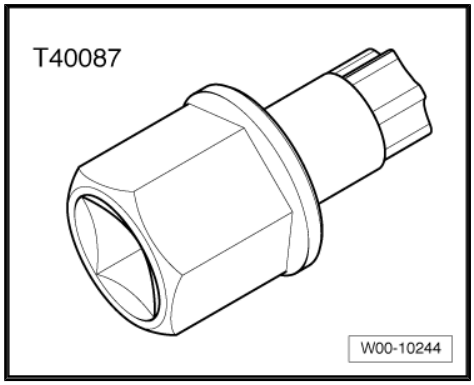
Special tools and workshop equipment required

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- Locking pin - T10060 A-

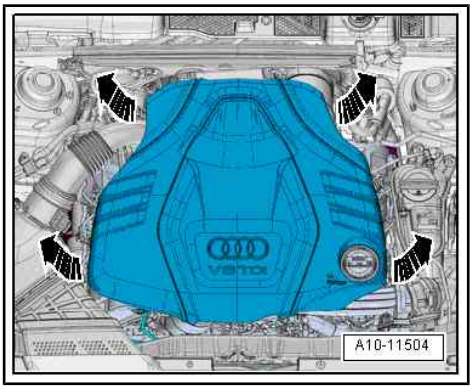


- Socket Torx T60 - T40087-

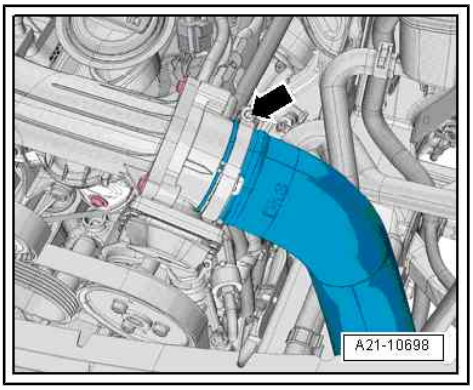


Removing

– Remove engine cover panel -arrows-.



– Release hose clip -arrow- and remove air hose.



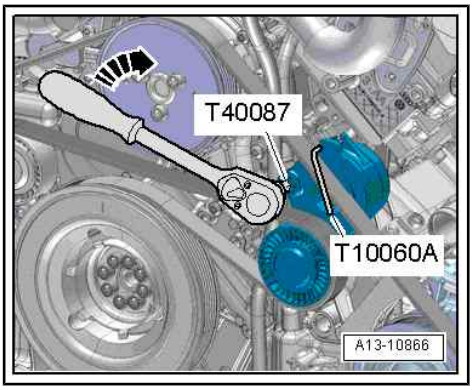
Caution

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.*

– Slacken poly V-belt by turning tensioner in clockwise direction -arrow- using socket Torx T 60 - T40087- .

– Detach poly V-belt and lock tensioner with locking pin - T10060 A- .



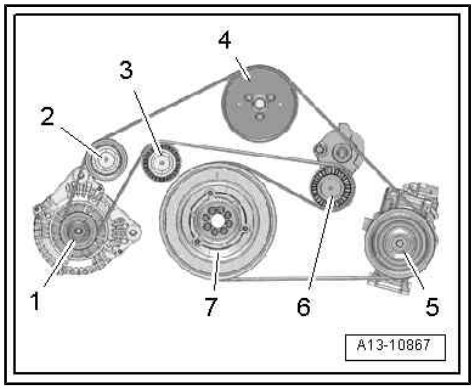
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Installing

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

– Fit poly V-belt onto poly V-belt pulleys.

1 - Alternator
2 - Idler roller
3 - Idler roller
4 - Coolant pump
5 - Air conditioner compressor
6 - Poly V-belt tensioner
7 - Vibration damper



Note

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

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

1.4 Removing and installing tensioner for poly V-belt

Removing

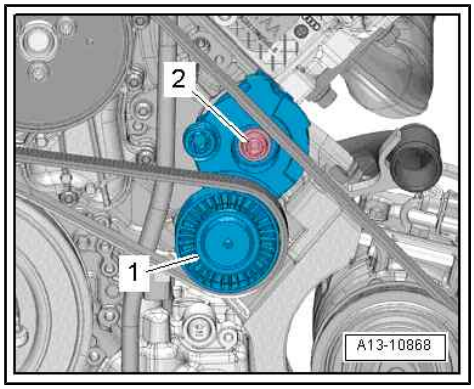
– Detach poly V-belt from tensioner ⇒ “1.3 Removing and installing poly V-belt”, page 106 .

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

Installing

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

• Tightening torque ⇒ “1.1 Exploded view - poly V-belt drive”, page 99



Note

Depending on version, install tensioner with or without washer ⇒ page 101 .

– Install poly V-belt ⇒ page 106 .

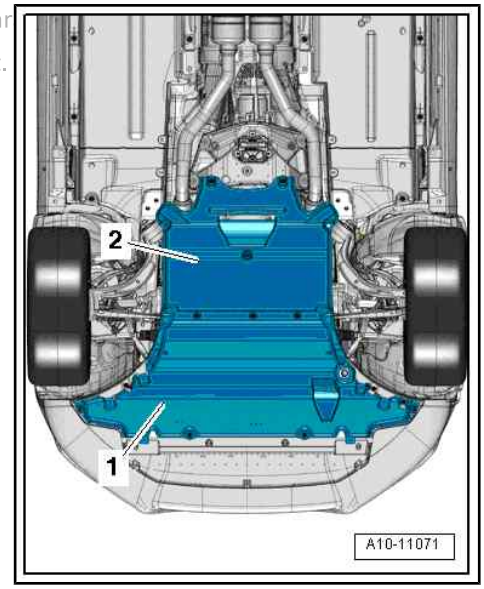
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1.5 Removing and installing vibration damper

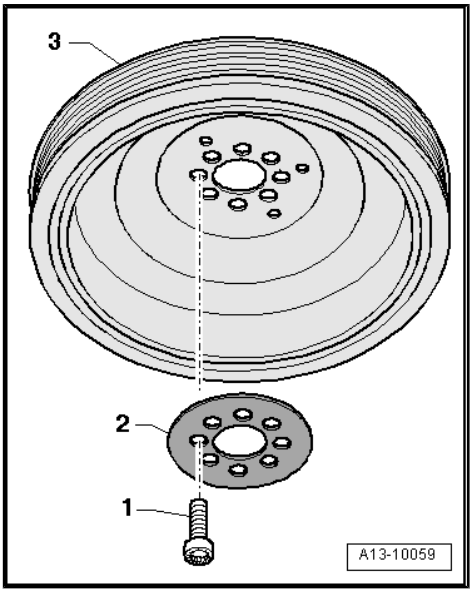
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Removing

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



– Loosen bolts -1- on vibration damper (counterhold with ring spanner at nut for alternator pulley).
– Slacken poly V-belt from below and remove ⇒ page 106 ; release tensioner.
– Remove bolts and detach shim -2- and vibration damper -3-.



Installing

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

- Tightening torque
⇒ “1.1 Exploded view - poly V-belt drive”, page 99

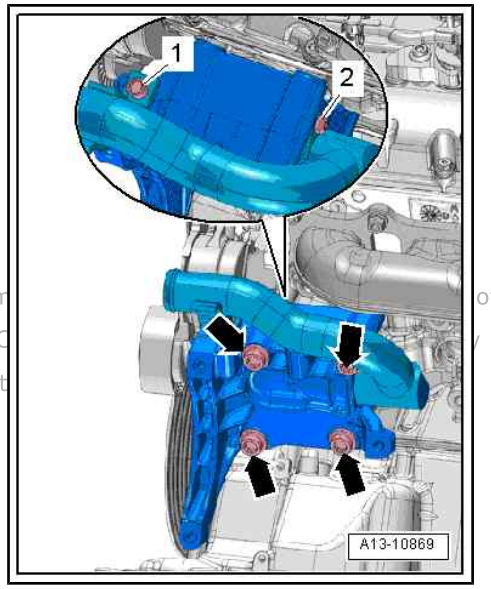
Note

- *Renew the bolts tightened with specified tightening angle.*
- *Renew the shim.*

– Install poly V-belt ⇒ page 106 .
– Install noise insulation (front) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .

1.6 Removing and installing bracket for ancillaries

Removing



– Drain coolant ⇒ page 253 .
– Remove air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Removing and installing air conditioner compressor .
– Unscrew bolts -arrows- and detach bracket for air conditioner compressor.

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Note

Disregard items -1 and 2-.

Installing

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

- Tightening torque
  ⇒ “1.1 Exploded view - poly V-belt drive”, page 99

Note

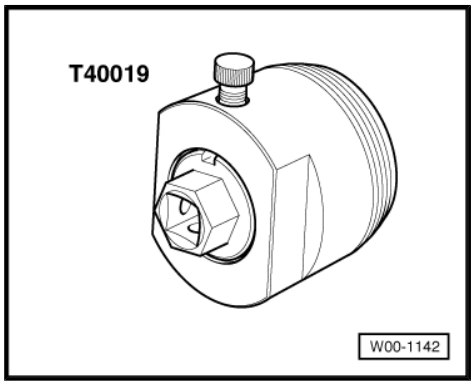
Renew seal.

– Install air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Removing and installing air conditioner compressor .
– Fill up with coolant ⇒ page 254 .

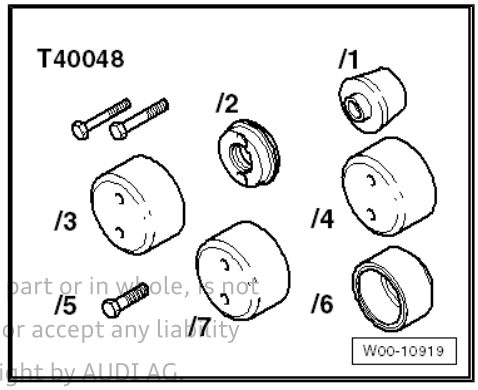
1.7 Renewing crankshaft oil seal (pulley end)

Special tools and workshop equipment required

♦ Oil seal extractor - T40019-



♦ Assembly appliance - T40048- with -T40048/7-



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♦ Bolts M8x55 mm (2x)

Procedure

– Remove vibration damper ⇒ page 109 .

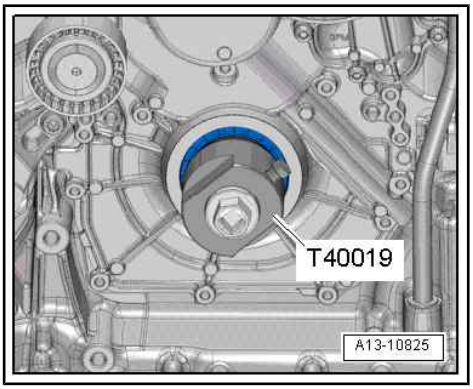
– Adjust inner part of oil seal extractor -T40019- so it is flush with the outer part and lock in position with knurled screw.

– Lubricate threaded head of oil seal extractor, place it in position and screw it into oil seal as far as possible (applying firm pressure).

– Loosen knurled screw and turn inner part against crankshaft until the oil seal is pulled out.

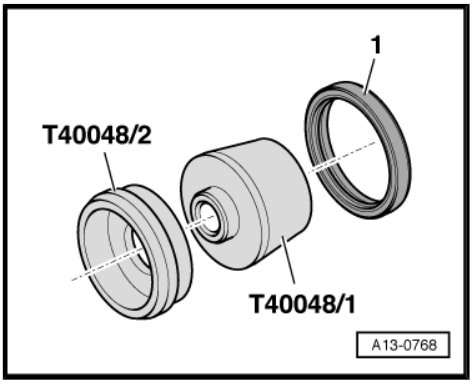
– Clamp flats of oil seal extractor in vice and use pliers to remove oil seal.

– Clean contact surface and sealing surface.



– Fit assembly aid -T40048/1- onto assembly sleeve -T40048/2- and slide oil seal -1- onto assembly sleeve.

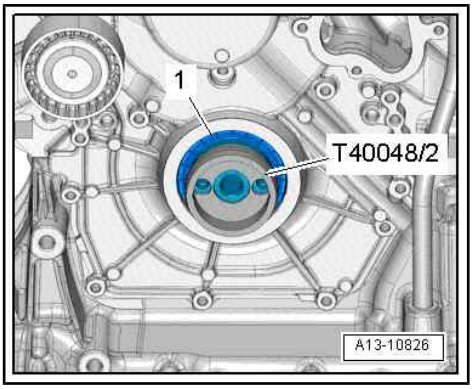
– Detach assembly aid.



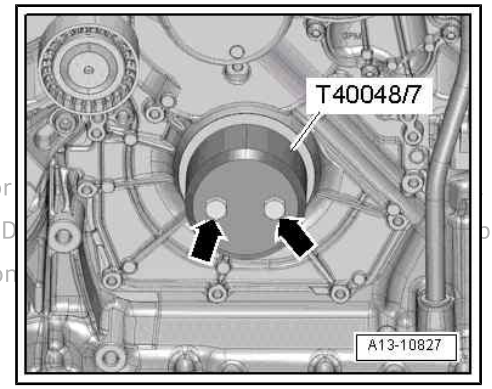
– Fit assembly sleeve -T40048/2- on crankshaft and slide oil seal -1- into sealing flange (pulley end).

Note

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



– Apply press sleeve -T40048/7- to crankshaft using M8×55 mm bolts -arrows-.
– Screw in bolts hand-tight at first.
– Tighten bolts alternately, $^1/_2$ turn at a time, to press in oil seal onto stop.



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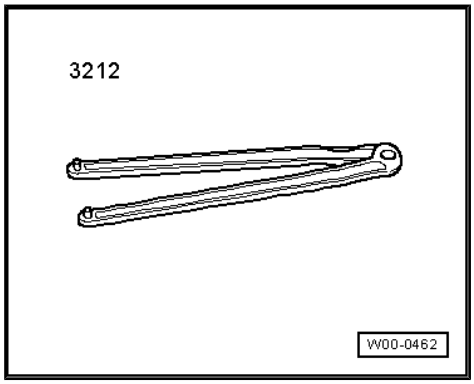
Remaining installation steps are carried out in reverse sequence; note the following:

– Install vibration damper ⇒ page 109 .

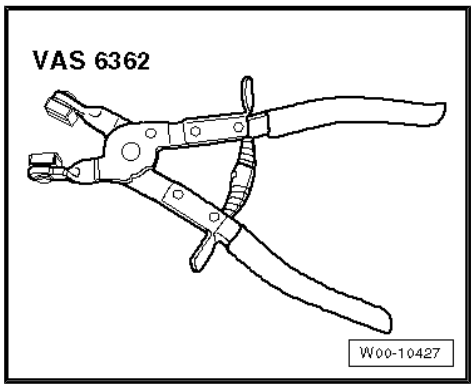
1.8 Removing and installing sealing flange (pulley end)

Special tools and workshop equipment required

♦ Pin wrench - 3212-

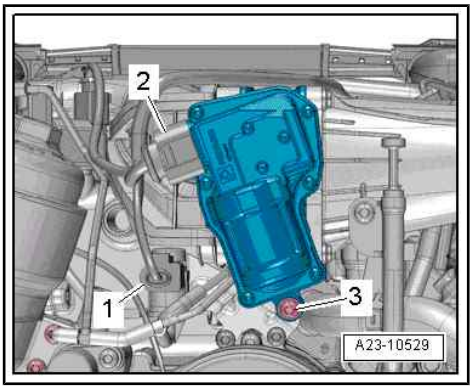


♦ Hose clip pliers - VAS 6362-

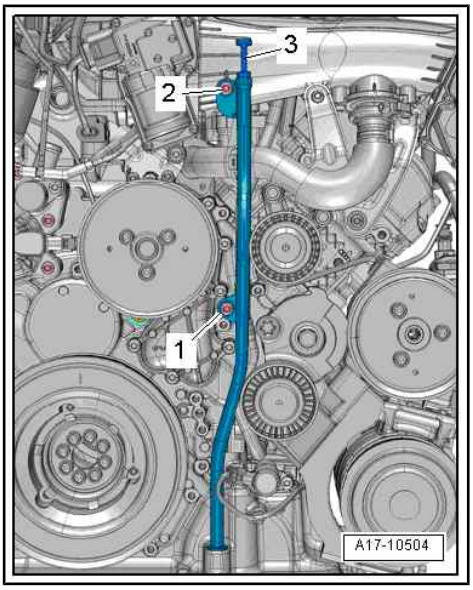


♦ Steel bolt M6x20 (3x)

Removing



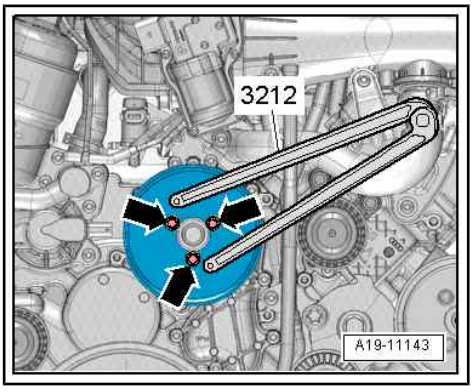
- Drain coolant ⇒ page 253 .
- Remove vibration damper ⇒ page 109 .
- Unplug electrical connector -1- and unclip change-over valve from bracket.
- Unplug electrical connector -2-.
- Remove bolt -3-.
- Remove exhaust gas recirculation cooler ⇒ page 461 .
- Remove poly V-belt tensioner ⇒ page 108 .
- Remove coolant pipe (front) ⇒ page 276 .
- Remove oil filter element ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .



- Remove bolt -1- and pull out guide tube for oil dipstick.

Note

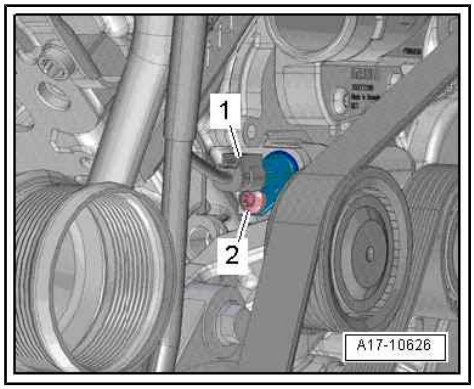
Disregard items -2 and 3-.



- Loosen bolts -arrows- for coolant pump pulley (counterhold with pin wrench - 3212-).
- Remove bolts and take off poly V-belt pulley.

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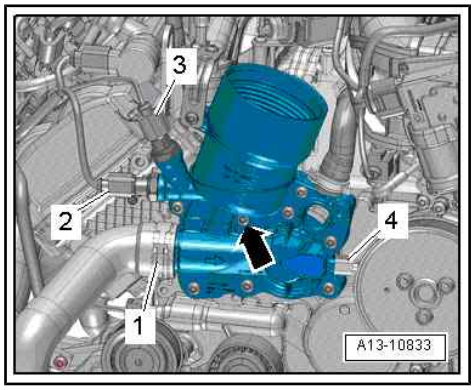
– Unplug electrical connector -1- at oil temperature sender 2 - G664- .



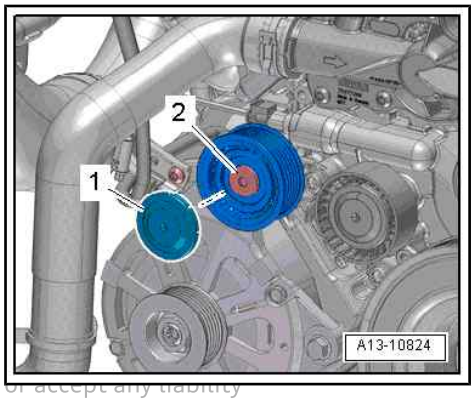
Note

Disregard -item 2-.

– Unplug electrical connectors -2, 3, 4-.
– Remove bolt -arrow-.
– Release hose clip -1- and detach coolant hose.



– Unclip cover -1-.
– Unscrew bolt -2- and remove idler roller.



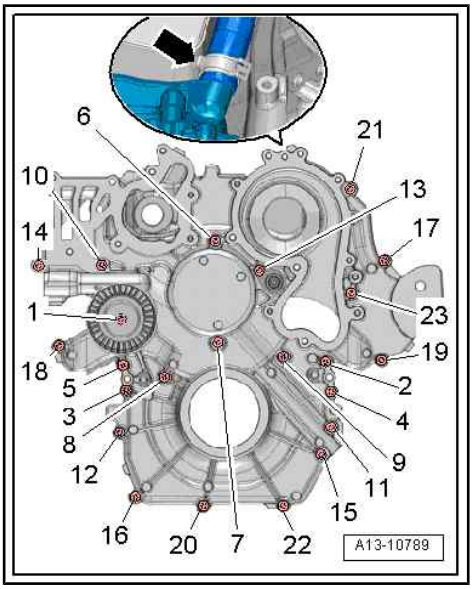
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– Slacken and remove bolts in the sequence: -23 ... 1-.

– Remove temperature regulator for engine oil cooler ⇒ page 240 .

– Disconnect coolant hose (top) -arrow- from sealing flange (pulley end) and detach.

– Drive crankshaft oil seal out of sealing flange after removing sealing flange.



Installing

Tightening torques:

- ⇒ “1.2 Exploded view - sealing flange (pulley end)”, page 101
- ⇒ Fig. ““Aluminium bolts: sealing flange (pulley end) - tightening torque and sequence”“ , page 105
- ⇒ “1.1 Exploded view - poly V-belt drive”, page 99
- ⇒ “1.1.2 Exploded view - sump (top section)”, page 228
- ⇒ “3.1 Exploded view - oil filter housing/oil pressure switch”, page 242
- ⇒ “2.1 Exploded view - coolant pump”, page 262

Note

- *Renew gasket, O-ring for temperature regulator and crankshaft oil seal.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

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

– Tighten sealing flange bolts (pulley end) ⇒ page 105 .

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

– Install crankshaft oil seal (pulley end) ⇒ page 110 .

– Install oil filter element ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .

– Install coolant pipe (front) ⇒ page 276 .

– Install poly V-belt tensioner ⇒ page 108 .

– Install exhaust gas recirculation cooler ⇒ page 461 .

– Install vibration damper ⇒ page 109 .

– Fill up with coolant ⇒ page 254 .

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2 Cylinder block (gearbox end)

⇒ “2.1 Exploded view - drive plate”, page 116

⇒ “2.2 Removing and installing drive plate”, page 117

⇒ “2.3 Removing and installing sender wheel”, page 119

⇒ “2.4 Checking sender wheel”, page 119

⇒ “2.5 Renewing crankshaft oil seal (gearbox end)”, page 120

2.1 Exploded view - drive plate

Note

When performing assembly work, secure engine to engine and gearbox support - VAS 6095- ⇒ page 81 .

1 - Bolt
- ❑ Renew
- ❑ 60 Nm +90°

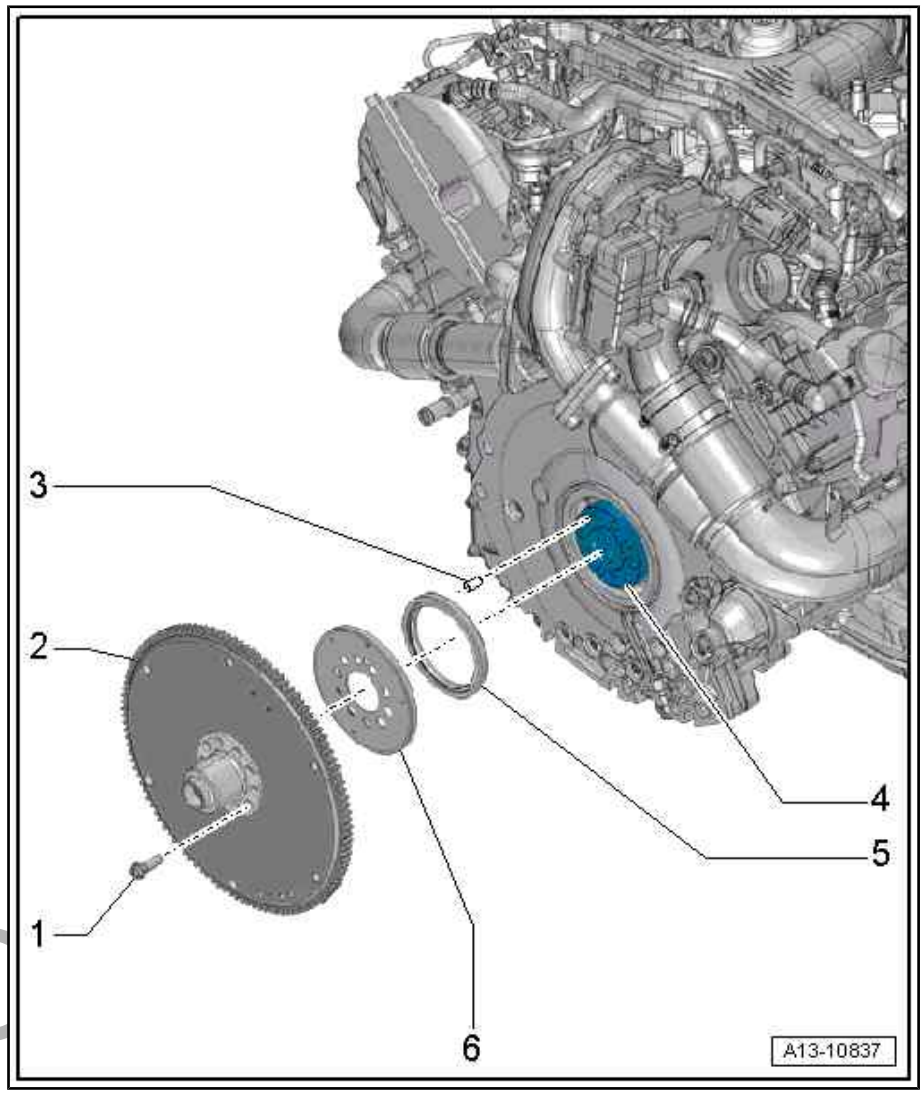
2 - Drive plate
- ❑ Check holes for cracks and scoring
- ❑ Removing and installing ⇒ page 117

3 - Dowel pin

4 - Crankshaft

5 - Oil seal
- ❑ For crankshaft (gearbox end)
- ❑ Renewing ⇒ page 120

6 - Sender wheel
- ❑ For engine speed sender - G28-
- ❑ Removing and installing sender wheel ⇒ page 119
- ❑ Checking sender wheel ⇒ page 119



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Caution

Risk of magnetic fields causing irreparable damage to sender wheel.

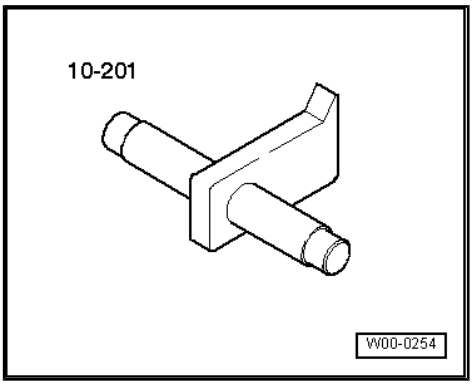
The sender wheel must be kept away from magnets (e.g. base of torch, loudspeaker).

If the drive plate/flywheel or the sender wheel itself has been removed or renewed, check that the sender wheel is operating correctly before installation *⇒ page 119* *.*

2.2 Removing and installing drive plate

Special tools and workshop equipment required

- Counterhold tool - 10 - 201-



Removing

Caution

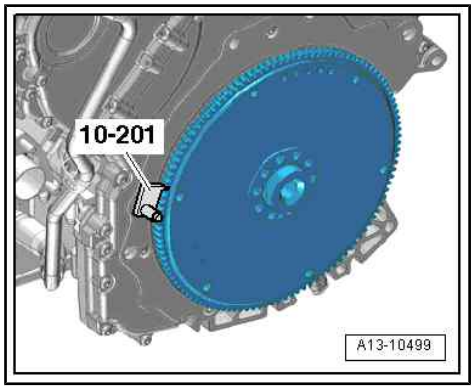
Risk of magnetic fields causing irreparable damage to sender wheel.

- *The sender wheel must be kept away from magnets (e.g. base of torch, loudspeaker).*
- *If the drive plate/flywheel or the sender wheel itself has been removed or renewed, check that the sender wheel is operating correctly before installation* *⇒ page 119* *.*

- Gearbox removed

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– Insert counterhold tool - 10 - 201- to 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.*

– Unscrew bolts for drive plate in diagonal sequence and remove.

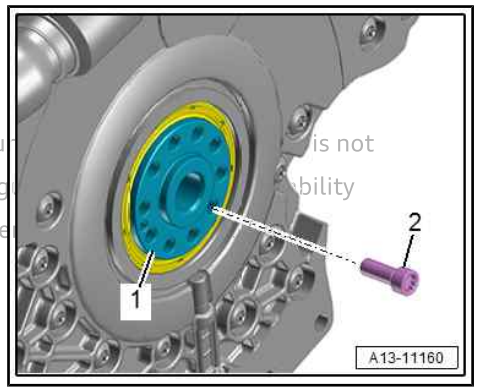
– Detach drive plate and sender wheel.

Installing

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

Note

After removing, renew bolts tightened with specified tightening angle.



Threads in crankshaft must be cleaned before any further assembly work is performed.

– Clean crankshaft flange until all residual adhesive has been removed completely.

- Ensure you do not damage oil seal when cleaning flange.
- Use a vacuum cleaner to hoover up residual adhesive; do NOT use compressed air.

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– Remove residual adhesive from one of the old bolts -2- for drive plate using wire brush and remove oil residue using brake cleaner.

– Screw cleaned bolt into a thread on crankshaft -1- and out again; repeat this action until no further residual adhesive appears.

- Do not screw bolt in too far; otherwise, the camshaft timing chain located behind it may be damaged.

– When no further residual adhesive appears, repeat the procedure for the other crankshaft threads.

- Finally, use a vacuum cleaner to hoover up residual adhesive; do NOT use compressed air.

– Clean crankshaft flange with a cloth.

- Thread in crankshaft must be free of oil and grease.

– Install drive plate with sender wheel (pay attention to dowel pin).

– Fit counterhold tool - 10 - 201- the other way round to tighten bolts for drive plate.

Tightening torques

◆ ⇒ “2.1 Exploded view - drive plate”, page 116

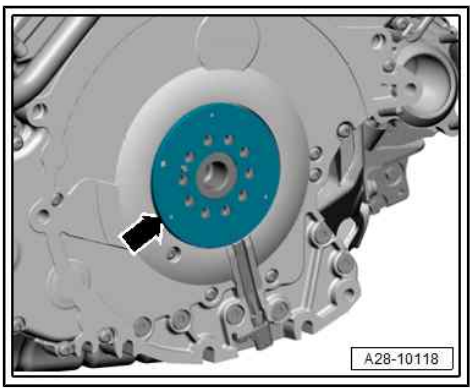
2.3 Removing and installing sender wheel

Removing

- Gearbox removed ⇒ Rep. gr. 37 ; Removing and installing gearbox; Removing gearbox

– Remove drive plate ⇒ page 117 .

– Detach sender wheel -arrow-.



Installing

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

Caution

Risk of magnetic fields causing irreparable damage to sender wheel.

- ***The sender wheel must be kept away from magnets (e.g. base of torch, loudspeaker).***
- ***If the drive plate/flywheel or the sender wheel itself has been removed or renewed, check that the sender wheel is operating correctly before installation ⇒ page 119 .***

– Install drive plate ⇒ page 117 .

2.4 Checking sender wheel

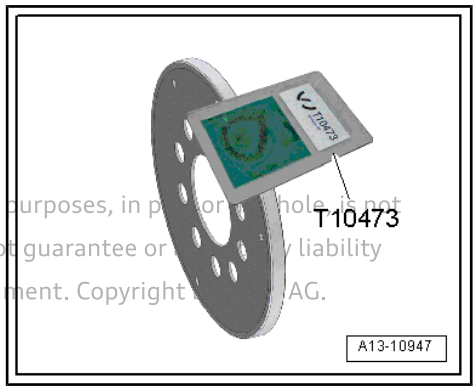
Special tools and workshop equipment required

- Sensor gauge - T10473-

Procedure

- Sender wheel removed

– Check entire circumference of sender wheel using sensor gauge - T10473- , as shown in illustration.

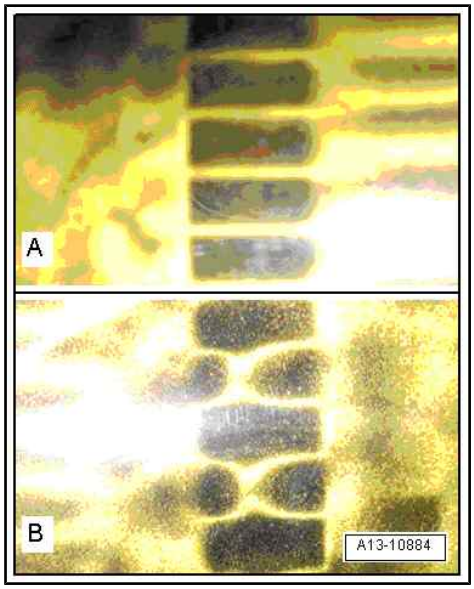


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Inspection image of sender wheel

A - Sender wheel OK

B - Sender wheel defective

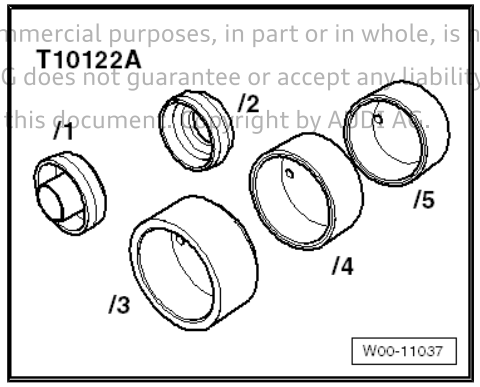


2.5 Renewing crankshaft oil seal (gearbox end)

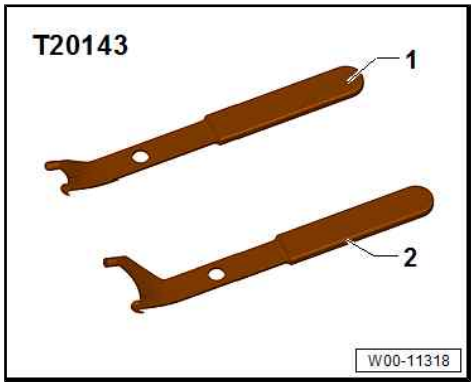
Special tools and workshop equipment required

- Fitting tool - T10122 A-

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- Guide piece - T10122/6-
- Extractor tool - T20143/2-



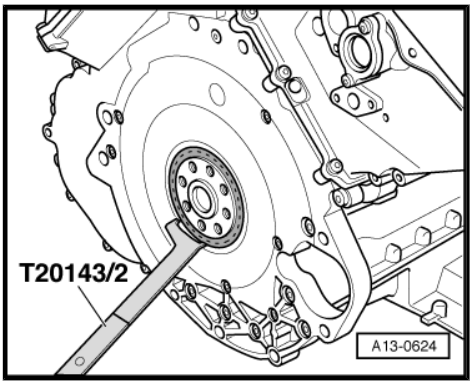
Note

Procedure

– Pry out oil seal using extractor tool - T20143/2- .

• Gearbox removed ⇒ Rep. gr. 34 ; Removing and installing gearbox; Removing gearbox or ⇒ Rep. gr. 37 ; Removing and installing gearbox; Removing gearbox .

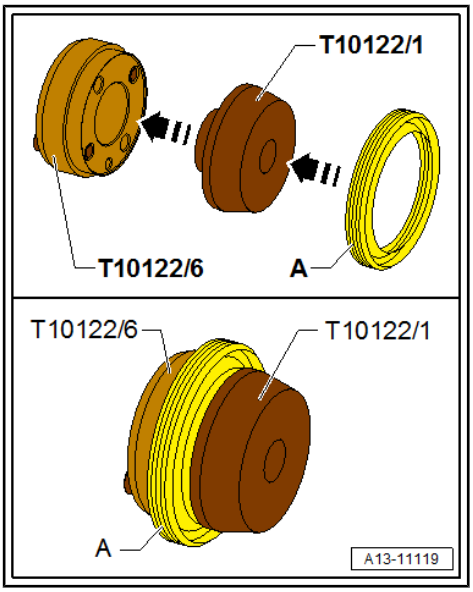
– Remove drive plate
⇒ “2.2 Removing and installing drive plate”, page 117 .



– Clean contact surface and sealing surface.

– Fit assembly aid -T10122/1- onto guide piece - T10122/6- and slide oil seal -A- onto guide piece.

– Detach assembly aid -T10122/1- .



– Fit guide piece - T10122/6- onto crankshaft.

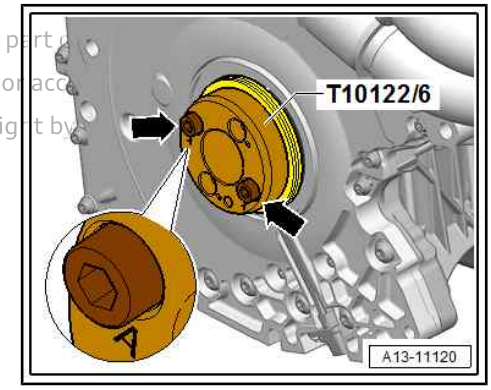
– Bolt guide piece - T10122/6- to crankshaft through securing points -A- using bolts -arrows-.

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Caution

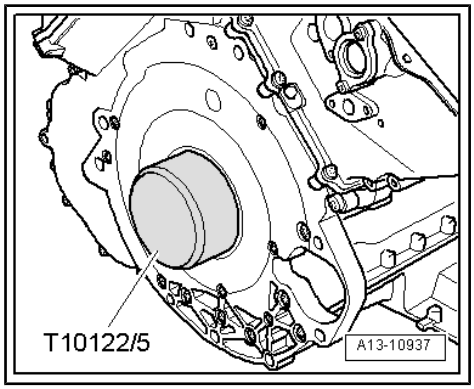
Risk of leaks if installed incorrectly.

- ***Slide oil seal onto crankshaft by hand to prevent sealing lip on oil seal from folding over.***



– Slide oil seal over guide piece - T10122/6- onto crankshaft by hand.

– Press in oil seal uniformly until flush all round using press sleeve -T10122/5- .
– Remove guide piece - T10122/6- .
– Check that oil seal and its sealing lip are correctly seated. If sealing lip is partially folded over, repeat procedure with a new oil seal.
– Install drive plate
⇒ “2.2 Removing and installing drive plate”, page 117 .



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3 Crankshaft

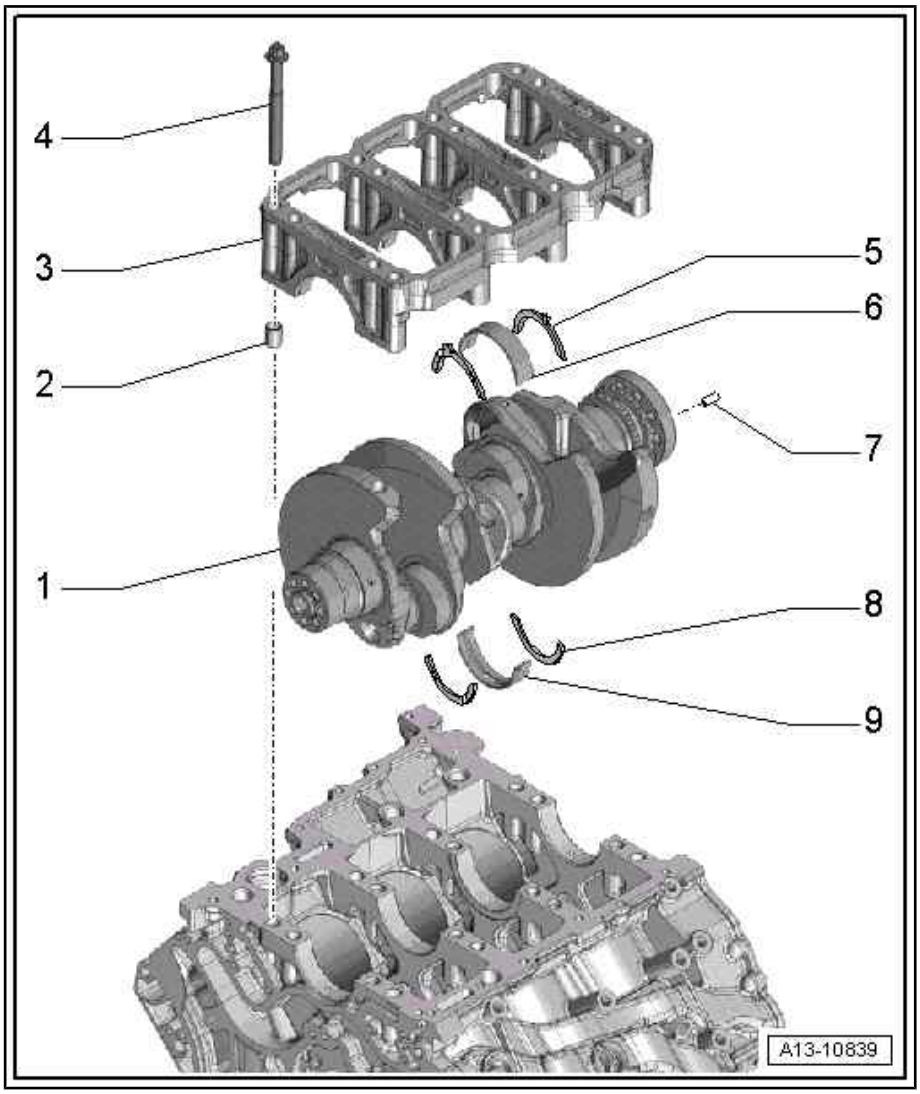
⇒ "3.1 Exploded view - crankshaft", page 123
⇒ "3.2 Crankshaft dimensions", page 125
⇒ "3.3 Measuring axial clearance of crankshaft", page 125
⇒ "3.4 Measuring radial clearance of crankshaft", page 126

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3.1 Exploded view - crankshaft

Note

When performing assembly work, secure engine to engine and gearbox support - VAS 6095- ⇒ page 81 .



1 - Crankshaft
- ❑ Measuring axial clearance ⇒ page 125
- ❑ Measuring radial clearance ⇒ page 126
- ❑ Crankshaft dimensions ⇒ page 125

2 - Dowel sleeve
- ❑ 4x
- ❑ Insert in cylinder block

3 - Retaining frame

4 - Bolt
- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 124

5 - Thrust washer
- ❑ Only fitted on 3rd crankshaft bearing
- ❑ Installation position: oil grooves face outwards
- ❑ Note location

6 - Bearing shell
- ❑ For retaining frame (without oil groove)
- ❑ Renew used bearing shells
- ❑ Install new bearing shells for retaining frame with correct coloured markings ⇒ page 125

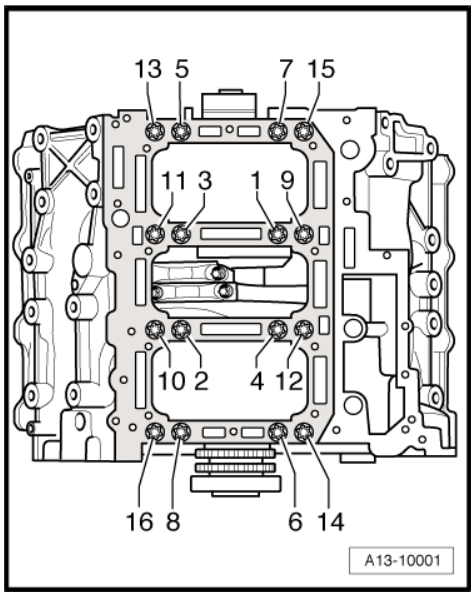
7 - Dowel pin
- ❑ Check that pin is firmly seated in crankshaft

8 - Thrust washer
- ❑ Only fitted on 3rd crankshaft bearing
- ❑ Installation position: oil grooves face outwards

9 - Bearing shell

- ❑ For cylinder block (with oil groove)
- ❑ Renew used bearing shells
- ❑ Install new bearing shells for the cylinder block with the correct coloured markings ⇒ page 124

Retaining frame - tightening torque and sequence



Note

Renew the bolts tightened with specified tightening angle.

– Insert two dowel sleeves in cylinder block.

– Tighten bolts in 3 stages in the sequence shown:

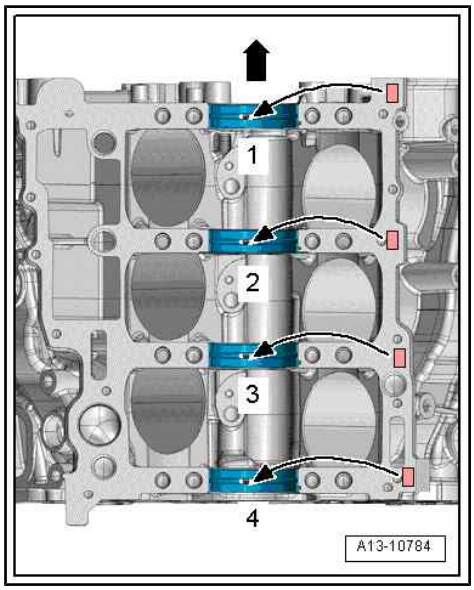
Stage	Bolts	Tightening torque/angle specification
1.	-1 … 16-	30 Nm
2.	-1 … 16-	50 Nm
3.	-1 … 16-	Turn 180° further

Allocation of crankshaft bearing shells for cylinder block

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

- -Arrow-: Pulley end.

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



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

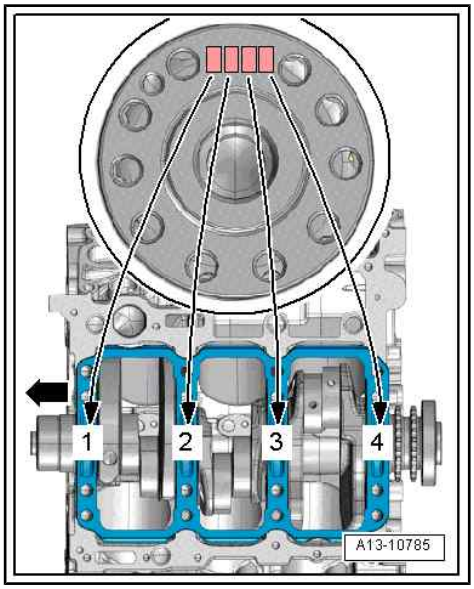
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Allocation of crankshaft bearing shells for retaining frame

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

The allocation of the bearing shells to the bearing positions in the retaining frame is indicated by a sequence of letters on the flywheel flange on the crankshaft. The first letter in the sequence stands for bearing “1”, the second letter for bearing “2”, etc.

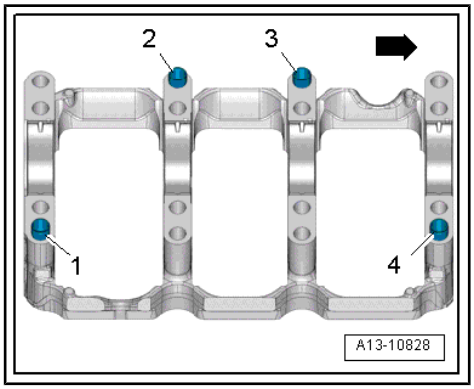
Letter on crankshaft	Colour coding of bearing
R =	Red
G =	Yellow
B =	Blue



Position of dowel sleeves

– Check that dowel sleeves -1 ... 4- are inserted in retaining frame at positions shown in illustration.

• -Arrow-: Pulley end.



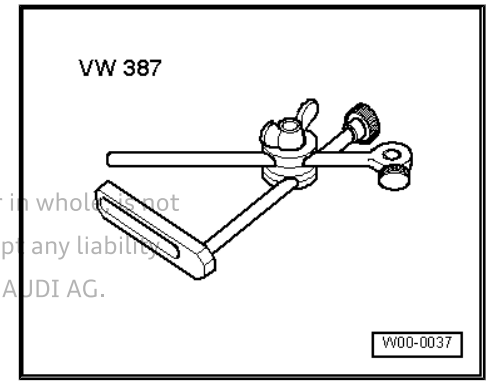
3.2 Crankshaft dimensions

Honing dimension	Main bearing journal Ø mm	Conrod journal Ø mm
Basic dimension	65.000 – 0.022 – 0.042	60.000 – 0.022 – 0.042

3.3 Measuring axial clearance of crankshaft

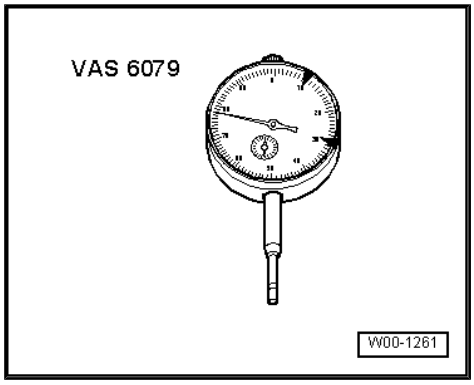
Special tools and workshop equipment required

♦ Universal dial gauge bracket - VW 387-



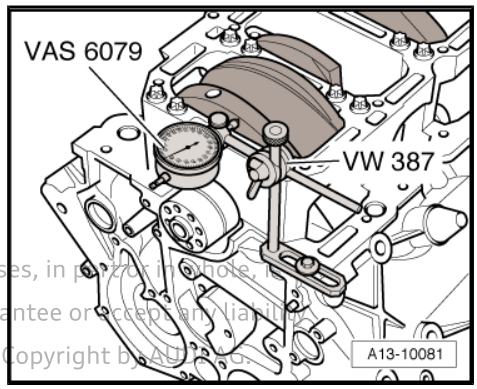
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♦ Dial gauge - VAS 6079-



Procedure

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



– Apply dial gauge to crank web.

– Press crankshaft against dial gauge by hand and set gauge to “0”.

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

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Axial clearance:

• New: 0.090 ... 0.251 mm.

3.4 Measuring radial clearance of crankshaft

Special tools and workshop equipment required

♦ Plastigauge

Procedure

– Remove retaining frame and clean bearing journals.

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

• The Plastigauge must be positioned in the centre of the bearing shell

– Fit retaining frame and secure with old bolts ⇒ page 124 without rotating crankshaft.

– Remove retaining frame again.

– Compare width of Plastigauge with measurement scale.

Radial clearance:

• New: 0.02 ... 0.05 mm.

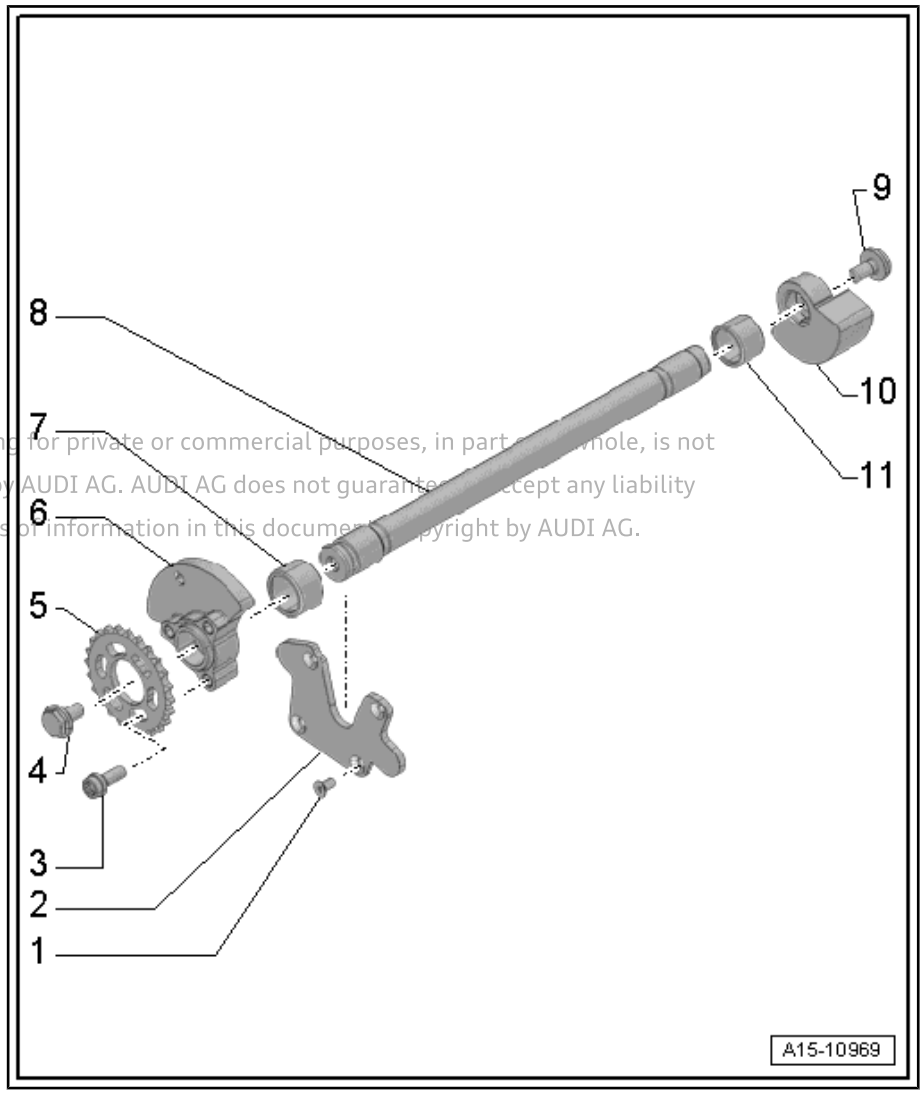
4 Balance shaft

⇒ “4.1 Exploded view - balance shaft”, page 127

⇒ “4.2 Renewing roller bearing for balance shaft”, page 127

⇒ “4.3 Removing and installing balance shaft”, page 128

4.1 Exploded view - balance shaft



1 - Bolt

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

2 - Bearing plate

3 - Bolt

- ❑ 23 Nm

4 - Bolt

- ❑ 60 Nm
- ❑ Counterhold with diesel injection pump locking pin - 3359- when loosening and tightening

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5 - Drive chain sprocket

- ❑ For balance shaft

6 - Balance weight

- ❑ Gearbox end

7 - Roller bearing

- ❑ Renewing ⇒ page 127

8 - Balance shaft

- ❑ Removing and installing ⇒ page 128

9 - Bolt

- ❑ 60 Nm
- ❑ Counterhold with diesel injection pump locking pin - 3359- when loosening and tightening

10 - Balance weight

- ❑ Pulley end

11 - Roller bearing

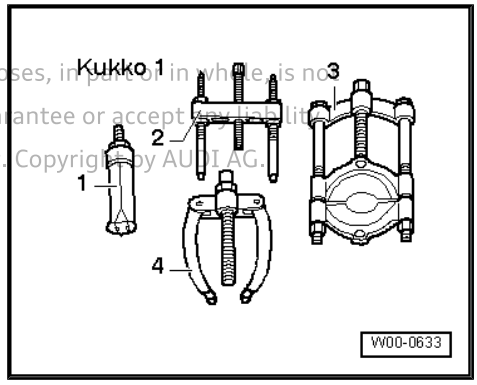
- ❑ Renewing ⇒ page 127

4.2 Renewing roller bearing for balance shaft

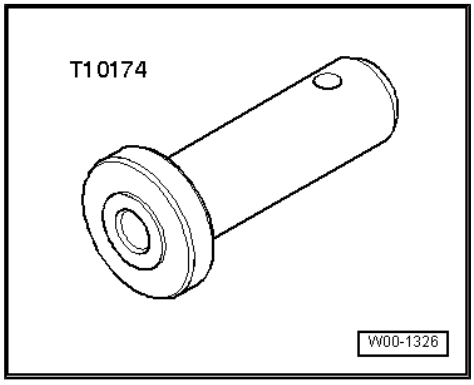
Special tools and workshop equipment required

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- -1- Internal puller -Kukko 21/4-



- -4- Counter-support -Kukko 22/2-
- Thrust piece - T10174-

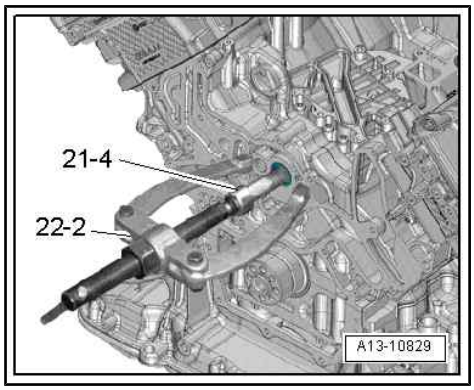


Procedure

– Remove radiator ⇒ page 282 .

– Remove balance shaft ⇒ page 128 .

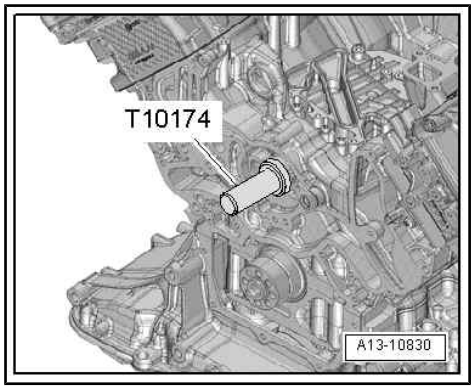
– Remove roller bearing using internal puller -Kukko 21/4- and counter-support -Kukko 22/2- .



– Fit roller bearing and drive it into cylinder head carefully so it is flush; use thrust piece - T10174- to do so.

– Install balance shaft ⇒ page 128 .

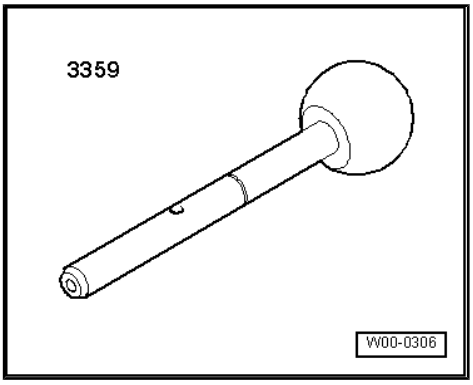
– Install radiator ⇒ page 282 .



4.3 Removing and installing balance shaft

Special tools and workshop equipment required

♦ Diesel injection pump locking pin - 3359-



Removing

- Gearbox removed

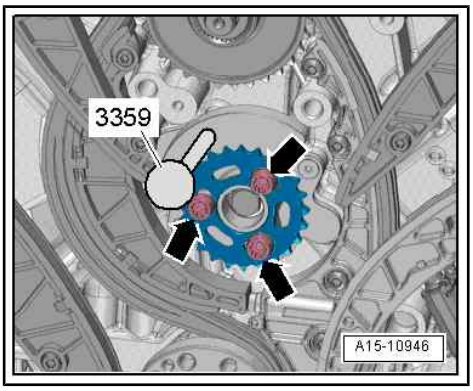
– Remove sealing flange (pulley end) ⇒ page 112 .

– Remove timing chain cover (bottom) ⇒ page 163 .

– Remove camshaft timing chain ⇒ page 169 .

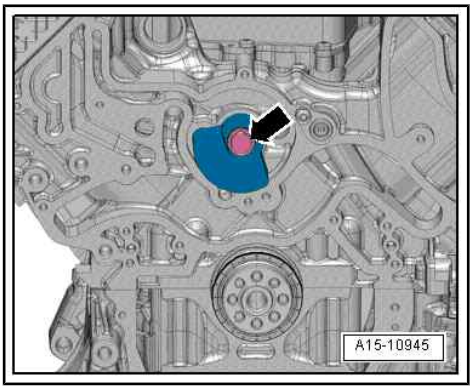
– Lock balance shaft at rear of engine with diesel injection pump locking pin - 3359- .

– Remove bolts -arrows- at rear of engine and detach drive chain sprocket from balance weight.

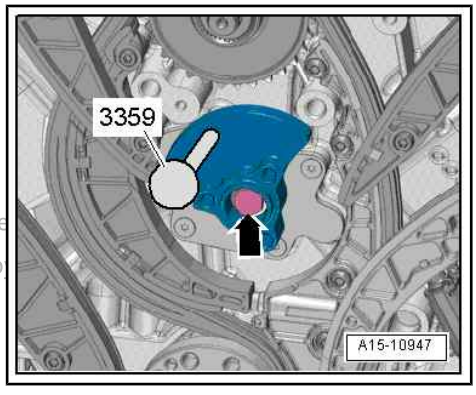


– Loosen bolt -arrow- at front of engine.

– Remove bolt and detach balance weight from balance shaft.

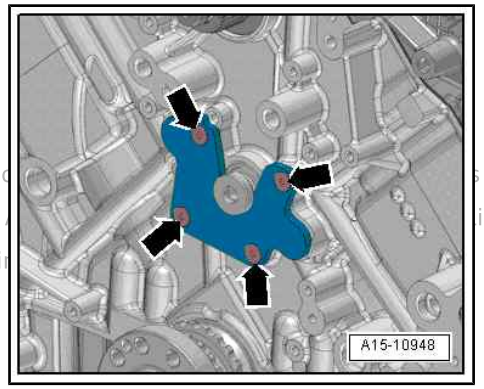


– Remove bolt -arrow- at rear of engine and detach balance weight from balance shaft.



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– Remove bolts -arrows- and detach bearing plate for balance shaft.
– Pull balance shaft to rear out of cylinder block.



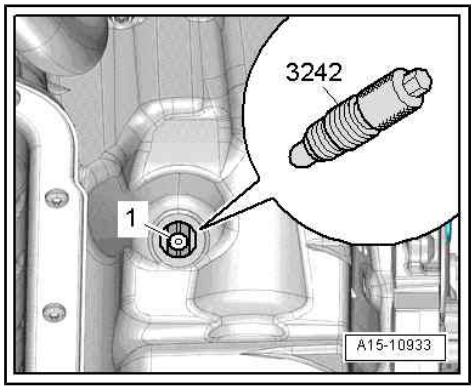
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Installing

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

- Tightening torques
  ⇒ “4.1 Exploded view - balance shaft”, page 127
- Crankshaft -1- locked in “TDC” position with locking pin -3242- .

– Install camshaft timing chain ⇒ page 169 .
– Install timing chain cover (bottom) ⇒ page 163 .
– Install sealing flange (pulley end) ⇒ page 112 .



5 Pistons and conrods

⇒ “5.1 Exploded view - pistons and conrods”, page 131

⇒ “5.2 Removing and installing pistons”, page 133

⇒ “5.3 Measuring piston projection at TDC”, page 134

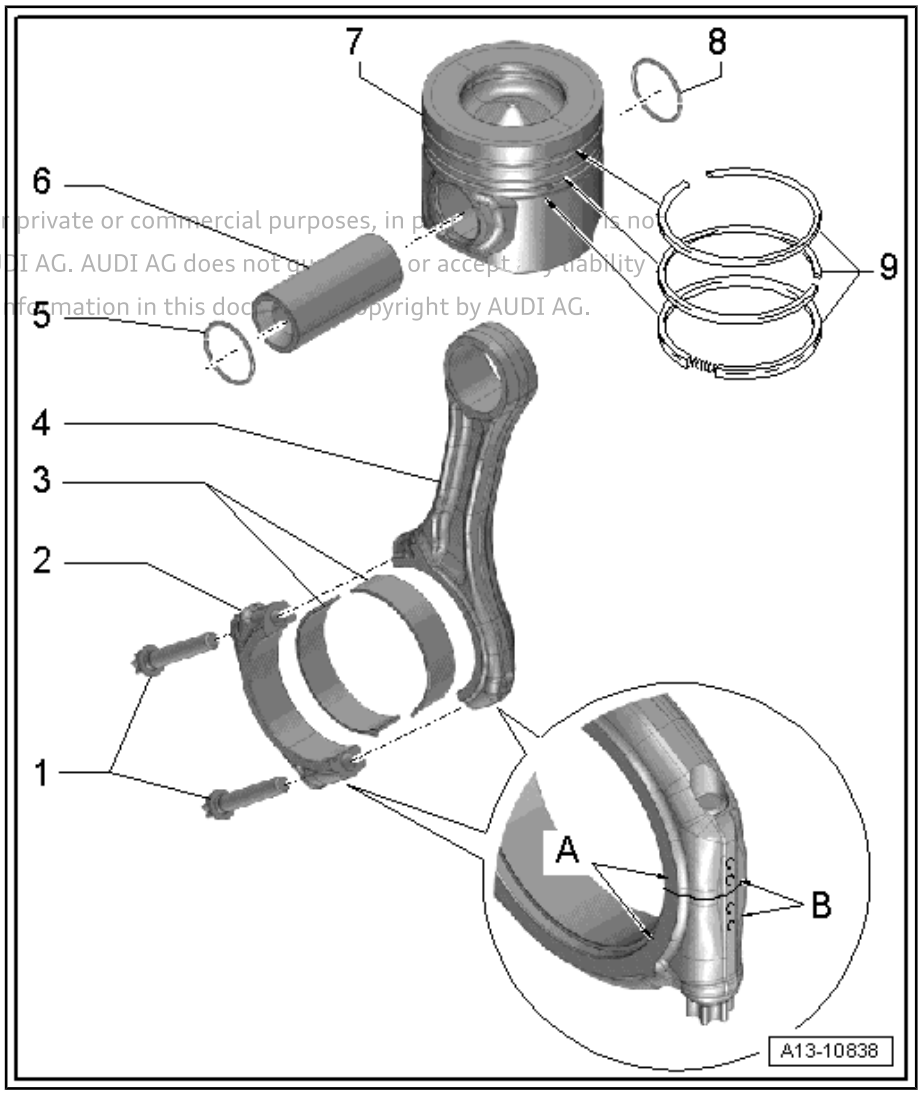
⇒ “5.4 Checking pistons and cylinder bores”, page 137

⇒ “5.5 Checking radial clearance of conrod bearings”, page 138

5.1 Exploded view - pistons and conrods

Note

- *All bearing and running surfaces must be oiled before assembling.*
- *Oil spray jet for piston cooling ⇒ page 132 .*



1 - Bolts

- ❑ Renew
- ❑ Lubricate threads and contact surface
- ❑ 35 Nm +90°

2 - Conrod bearing cap

- ❑ Due to the cracking method used to separate the bearing cap from the conrod in manufacture, the caps only fit in one position and only on the appropriate conrod
- ❑ Mark installation position for re-installation
- ❑ Mark cylinder allocation in colour -B- ⇒ page 133
- ❑ Note when fitting: the wide contact shoulder -A- must point towards same side on conrod and conrod bearing cap

3 - Bearing shells

- ❑ Note installation position
- ❑ 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
- ❑ Ensure that retaining lugs are securely seated.

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4 - Conrod

- ❑ With industrially cracked conrod bearing cap
- ❑ Mark cylinder allocation in colour -B- ⇒ page 133
- ❑ Axial clearance for each conrod pair (when new): 0.20 … 0.44 mm
- ❑ Measuring radial clearance ⇒ page 138
- ❑ Installation position ⇒ page 133
- ❑ Only renew as a complete set
- ❑ Note when fitting: the wide contact shoulder -A- must point towards same side on conrod and conrod bearing cap

5 - Circlip

- ❑ Renew

6 - Piston pin

- ❑ Removing and installing ⇒ “5.2 Removing and installing pistons”, page 133

7 - Piston

- ❑ Measuring piston projection at “TDC” ⇒ page 134
- ❑ Mark installation position and cylinder number ⇒ page 133
- ❑ Renew piston if cracking is visible on piston crown or piston skirt
- ❑ Removing and installing ⇒ page 133
- ❑ Checking pistons and cylinder bores ⇒ page 137

8 - Circlip

- ❑ Renew

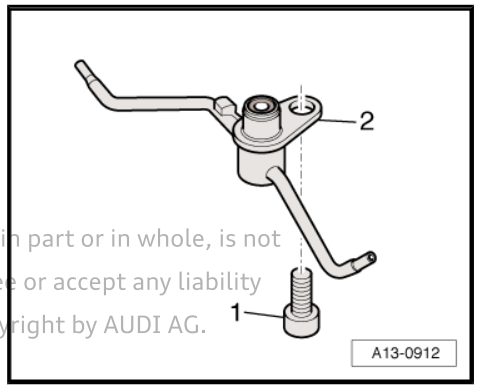
9 - Piston rings

- ❑ Measuring ring gap ⇒ page 137
- ❑ Measuring ring-to-groove clearance ⇒ page 138
- ❑ 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°

Oil spray jet for piston cooling

1 - Bolt, 9 Nm

2 - Oil spray jet with spray nozzle valve for piston cooling



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.***

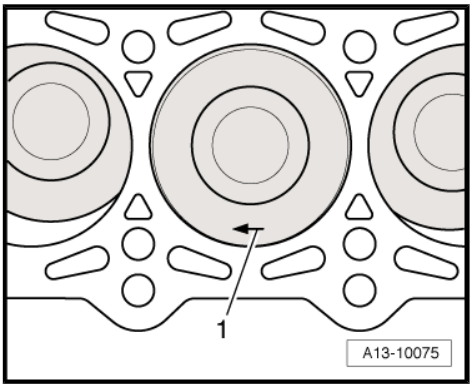
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Installation position of pistons

Caution

Risk of damage to piston crown.

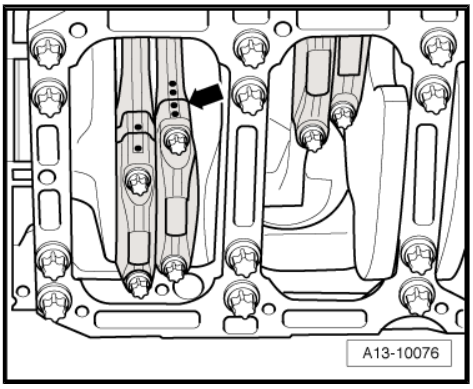
- *If you intend to re-install used pistons, mark the cylinder number on the piston crown using paint. Do not attempt to mark the piston crown with a centre punch or by making a scratch, notch or similar.*



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

Marking conrods

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

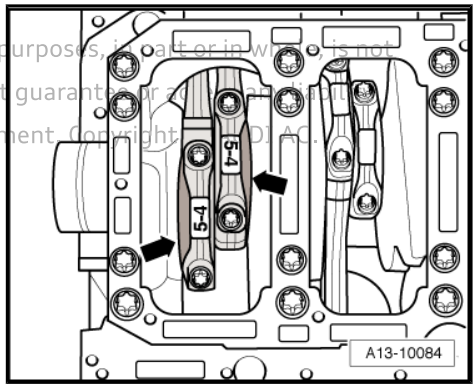


Note

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

Conrod installation position

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



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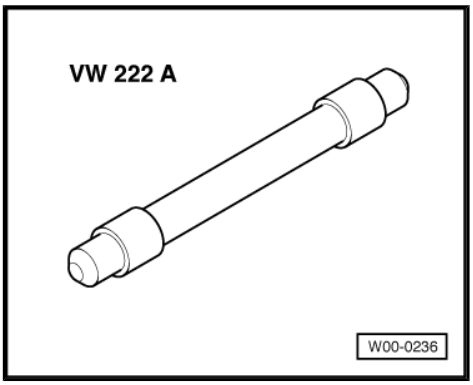
Note

Illustration shows first conrod pair.

5.2 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 - VAS 6095- ⇒ page 81

– Remove cylinder head ⇒ page 143 .

– Remove sump (top section) ⇒ page 231 .

– Mark installation position and matching of conrod bearing caps to cylinder and to conrods for re-installation ⇒ page 133 .

– Unbolt conrod bearing caps.

– Pull out pistons upwards with conrods.

Note

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

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– 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:

- Tightening torques ⇒ “5.1 Exploded view - pistons and conrods”, page 131

Note

Renew the bolts tightened with specified tightening angle.

– Oil running surfaces of bearing shells.

– Install pistons using commercially available piston ring clamp.

Installation position:

- Pistons ⇒ page 133
- Conrods ⇒ page 133

– Install conrod bearing caps according to markings.

– Install sump (upper section) ⇒ page 231 .

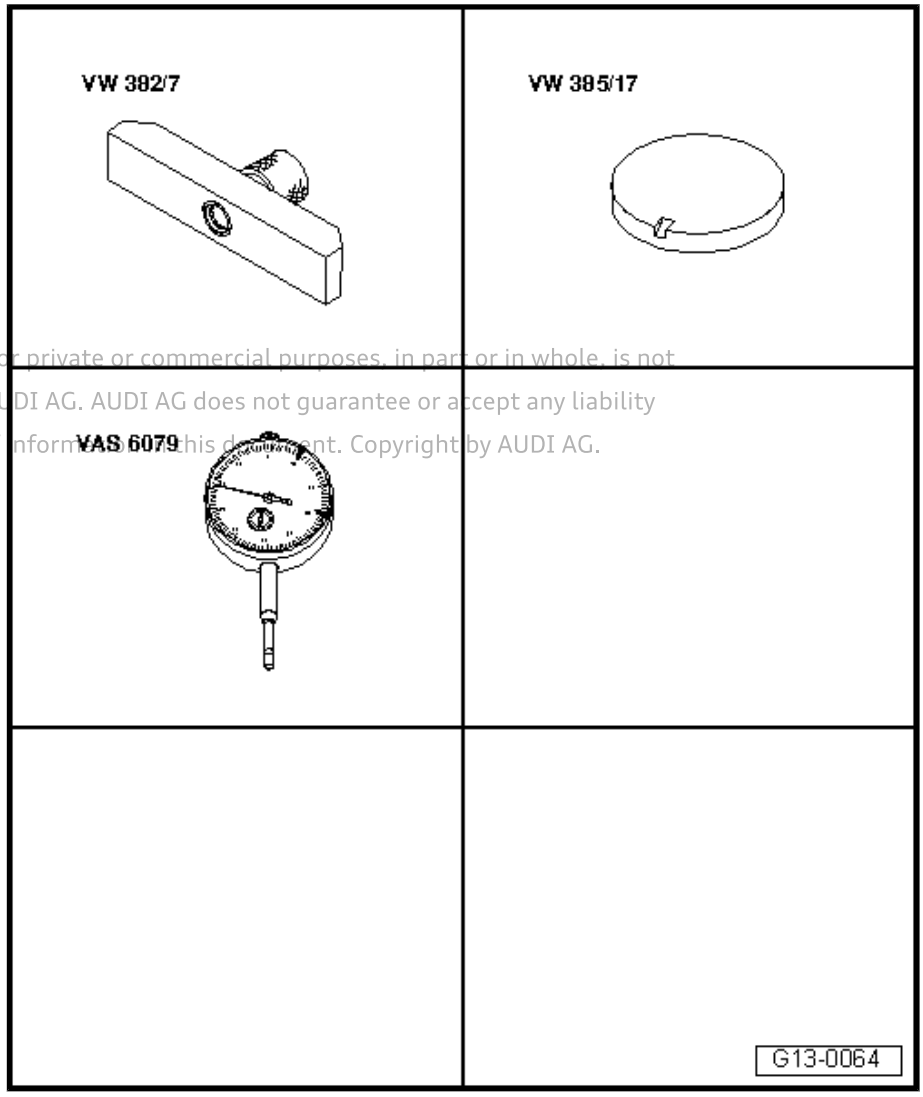
– Install cylinder head ⇒ page 143 .

5.3 Measuring piston projection at TDC

Note

Piston projection at “TDC” must be measured when installing new pistons or a short engine.

Special tools and workshop equipment required



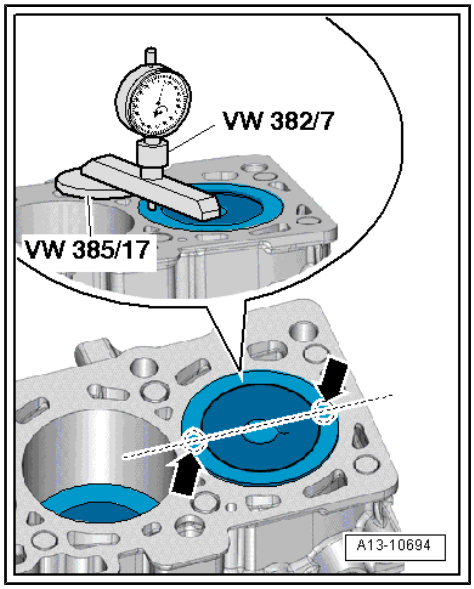
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- Measuring bridge -VW 382/7- from measuring tool - VW 382-
- Measuring plate -VW 385/17- from universal measuring tool - VW 385-
- Dial gauge - VAS 6079-

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).



Note

- *If the measured values for piston projection are not the same for all pistons, use the highest value to determine the correct gasket size.*
- *The cylinder head gasket size must be determined separately for each cylinder bank.*

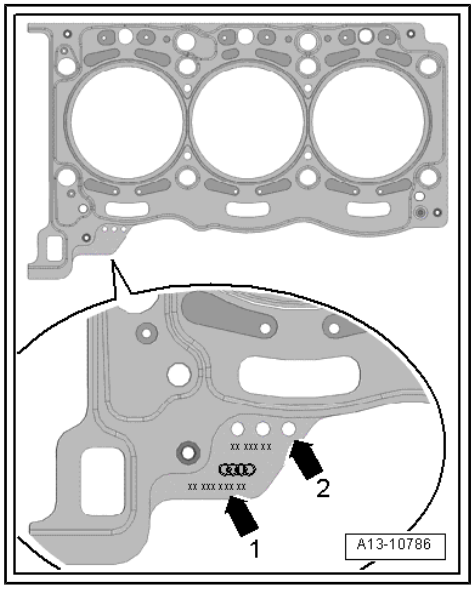
– Depending on piston projection, install corresponding cylinder head gasket according to following table:

Piston projection above top surface of cylinder block	Identification (no. of holes)
0.82…0.92 mm	1
0.92…0.97 mm	2
0.97…1.08 mm	3

Identification of cylinder head gasket

1 - Part number

2 - Holes

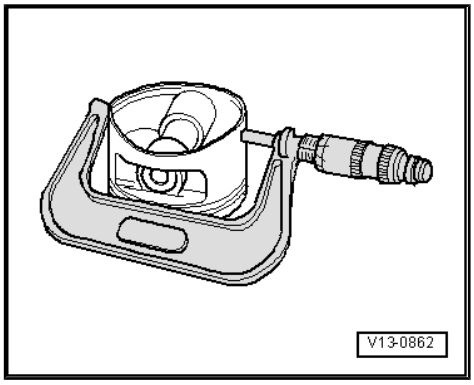


Note

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

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5.4 Checking pistons and cylinder bores



Checking piston

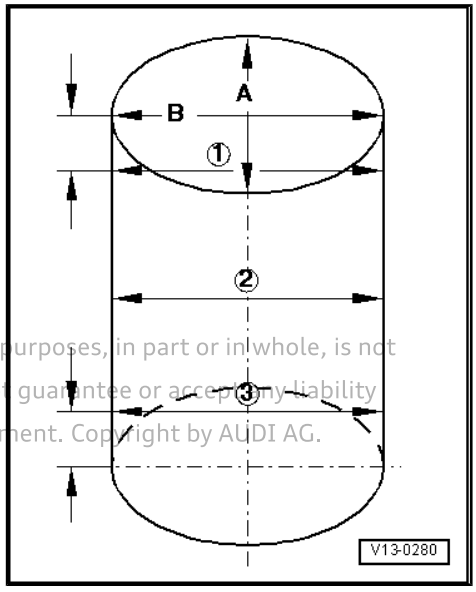
– Using a micrometer (75 ... 100 mm), measure approx. 10 mm from the lower edge, perpendicular to the piston pin axis.

• Maximum deviation from nominal dimension: 0.05 mm.

There are different piston sizes specifically matched to the different dimensions of the cylinder block.

Piston Ø mm	
Nominal dimension	82.924 … 82.936 1)
Repair oversize	82.964 … 82.976 1)

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



Measuring cylinder bore

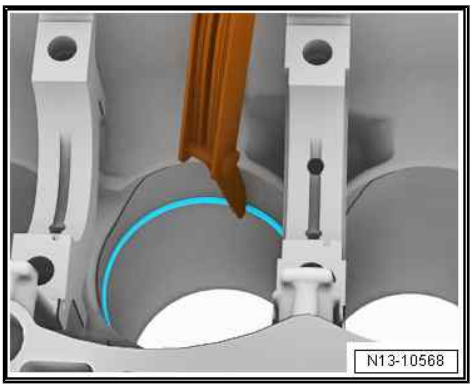
– Use a cylinder gauge - VAS 6078- to take measurements at 3 points in transverse direction -A- and in longitudinal direction -B-.

• Maximum deviation from nominal dimension: 0.08 mm.

Cylinder bore Ø mm	
Nominal dimension	83.006 … 83.014 1)
Repair oversize	83.046 … 83.054 1)

• 1) Measure at 50 mm into cylinder bore.

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Measuring piston ring gap

– Insert ring at right angle to cylinder wall from above and push down into lower cylinder opening approx. 50 mm from bottom of cylinder.

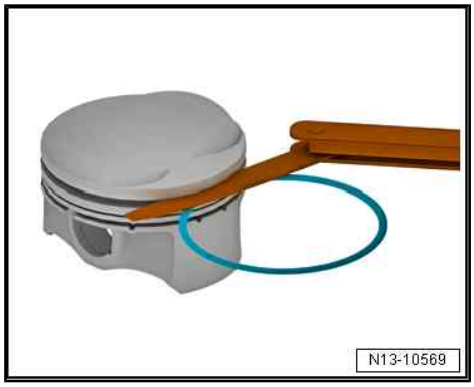
– To do so, use a piston without rings.

Piston ring	new mm	Wear limit mm
1st compression ring	0.25 … 0.40	0.60
2nd compression ring	0.70 … 0.90	1.20
Oil scraper ring	0.25 … 0.50	0.70

Measuring ring-to-groove clearance

– Clean groove in piston before checking clearance.

Piston ring	new mm	Wear limit mm
1st compression ring	0.09 … 0.130	0.160
2nd compression ring	0.05 … 0.09	0.11
Oil scraper ring	0.03 … 0.07	0.10



5.5 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 131) without rotating crankshaft.

– Remove conrod bearing cap again.

– Compare width of Plastigauge with measurement scale.

Radial clearance:

• New: 0.02 ... 0.07 mm.

– Renew conrod bolts.

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15 – Cylinder head, valve gear

1 Cylinder head

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⇒ “1.1 Exploded view - cylinder head”, page 139
⇒ “1.2 Exploded view - cylinder head cover”, page 141
⇒ “1.3 Removing and installing cylinder head”, page 143
⇒ “1.4 Removing and installing cylinder head cover”, page 149
⇒ “1.5 Removing and installing seals for injectors”, page 154
⇒ “1.6 Checking compression”, page 156

1.1 Exploded view - cylinder head

Note

Illustration shows the cylinder head for cylinder bank 2 (left-side).

1 - Cylinder head gasket
- ❑ Renewing ⇒ page 143
- ❑ Identification ⇒ page 140
- ❑ Installation position: part number must face cylinder head
- ❑ If renewed, change coolant and engine oil

2 - Cylinder head
- ❑ To prevent damage to glow plugs, always place cylinder head on a soft foam surface after removal.
- ❑ Removing and installing ⇒ page 143
- ❑ Checking for distortion ⇒ page 140
- ❑ Cylinder heads must not be reworked on TDI engines
- ❑ If renewed, change coolant and engine oil

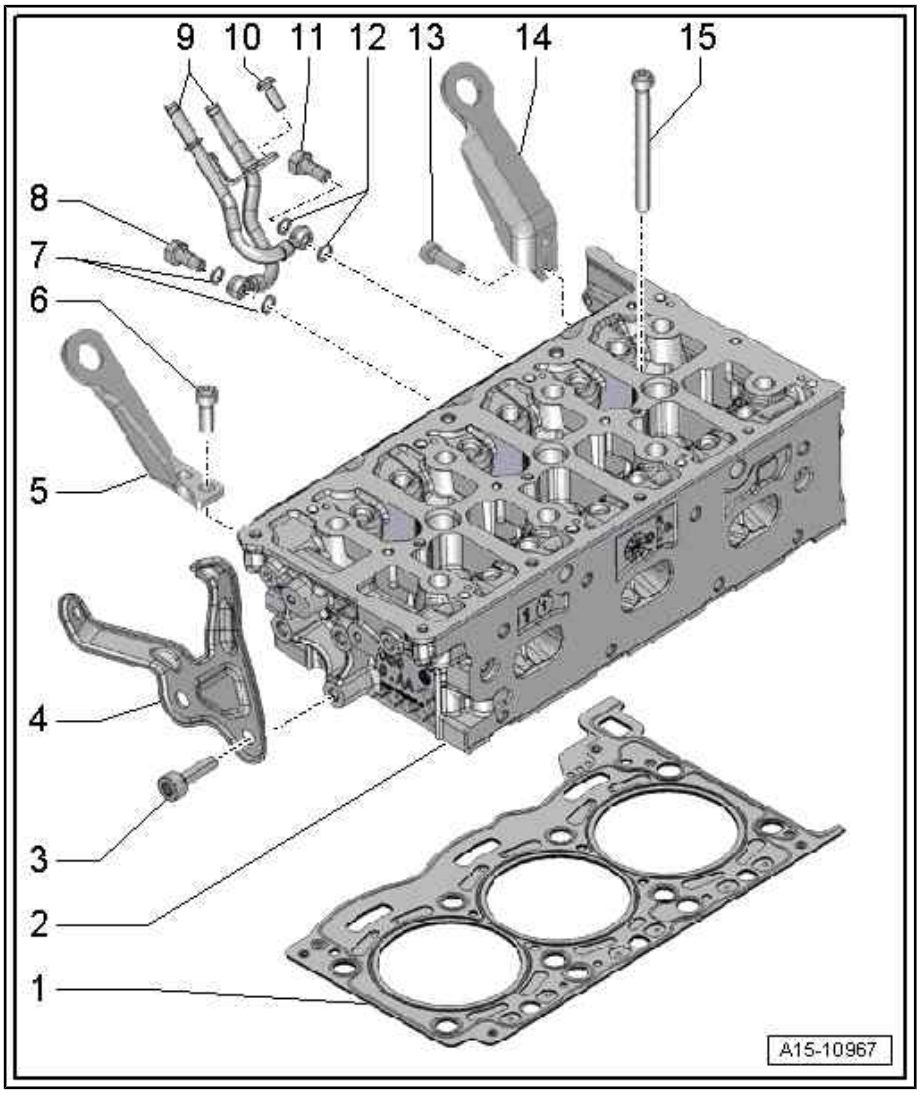
3 - Bolt
- ❑ 23 Nm

4 - Bracket

5 - Engine lifting eye

6 - Bolt
- ❑ 23 Nm

7 - Seals
- ❑ Renew



8 - Banjo bolt

- ❑ Tightening torque ⇒ Item 13 (page 274)

9 - Coolant lines

10 - Bolt

- ❑ Tightening torque ⇒ Item 15 (page 274)

11 - Banjo bolt

- ❑ Tightening torque ⇒ Item 16 (page 275)

12 - Seals

- ❑ Renew

13 - Bolt

- ❑ 23 Nm

14 - Engine lifting eye

15 - Bolt

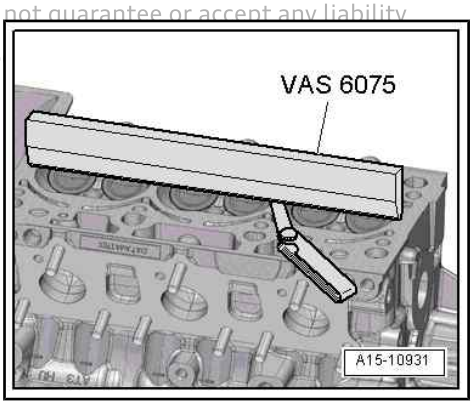
- ❑ Correct sequence when slackening ⇒ page 146
- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 141

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Checking cylinder head for distortion

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

- Max. permissible distortion: 0.1 mm.



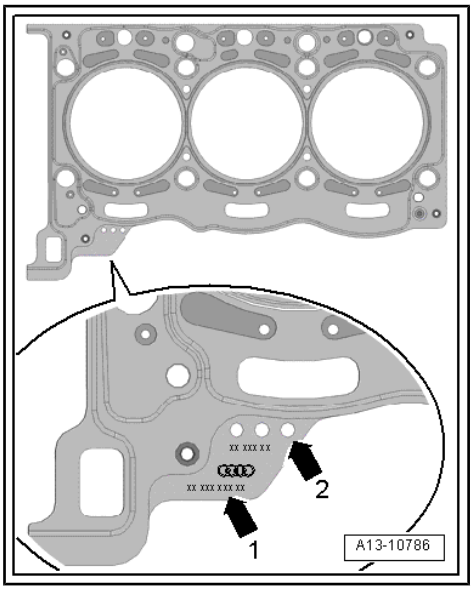
Note

Cylinder heads must not be reworked on TDI engines.

Identification of cylinder head gasket

1 - Part number

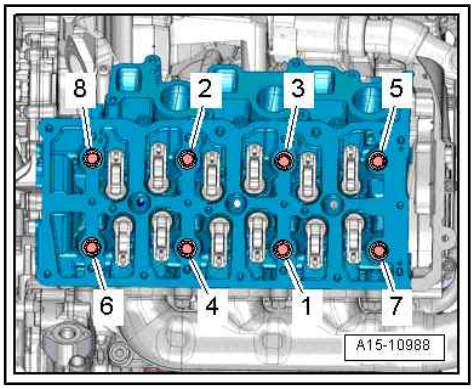
2 - Holes



Note

- ♦ *Cylinder head gaskets of different thicknesses are fitted depending on the amount of piston projection ⇒ page 134 . When renewing only the cylinder head gasket, the new gasket should have the same identification as the old one.*
- ♦ *The gaskets for the left and right cylinder heads have different shapes and cannot be interchanged.*

Cylinder head - tightening torque and sequence



Note

Renew the bolts tightened with specified tightening angle.

– Tighten bolts in 5 stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1.	-1 … 8-	Screw in by hand until contact is made
2.	-1 … 8-	35 Nm
3.	-1 … 8-	70 Nm
4.	-1 … 8-	Turn 90° further
5.	-1 … 8-	Turn 90° further

1.2 Exploded view - cylinder head cover

Note

The illustration shows the cylinder head cover for cylinder bank 2 (left-side).

1 - Gasket
- ❑ For cylinder head cover
- ❑ Renew if damaged or leaking

2 - Cylinder head cover
- ❑ Removing and installing: left-side ⇒ page 149 , right-side ⇒ page 152

3 - Grommet
- ❑ Renew if damaged or leaking

4 - Seal
- ❑ For injector
- ❑ Renewing ⇒ page 154

5 - Grommet

6 - Seal
- ❑ For sealing cap
- ❑ Renew if damaged or leaking

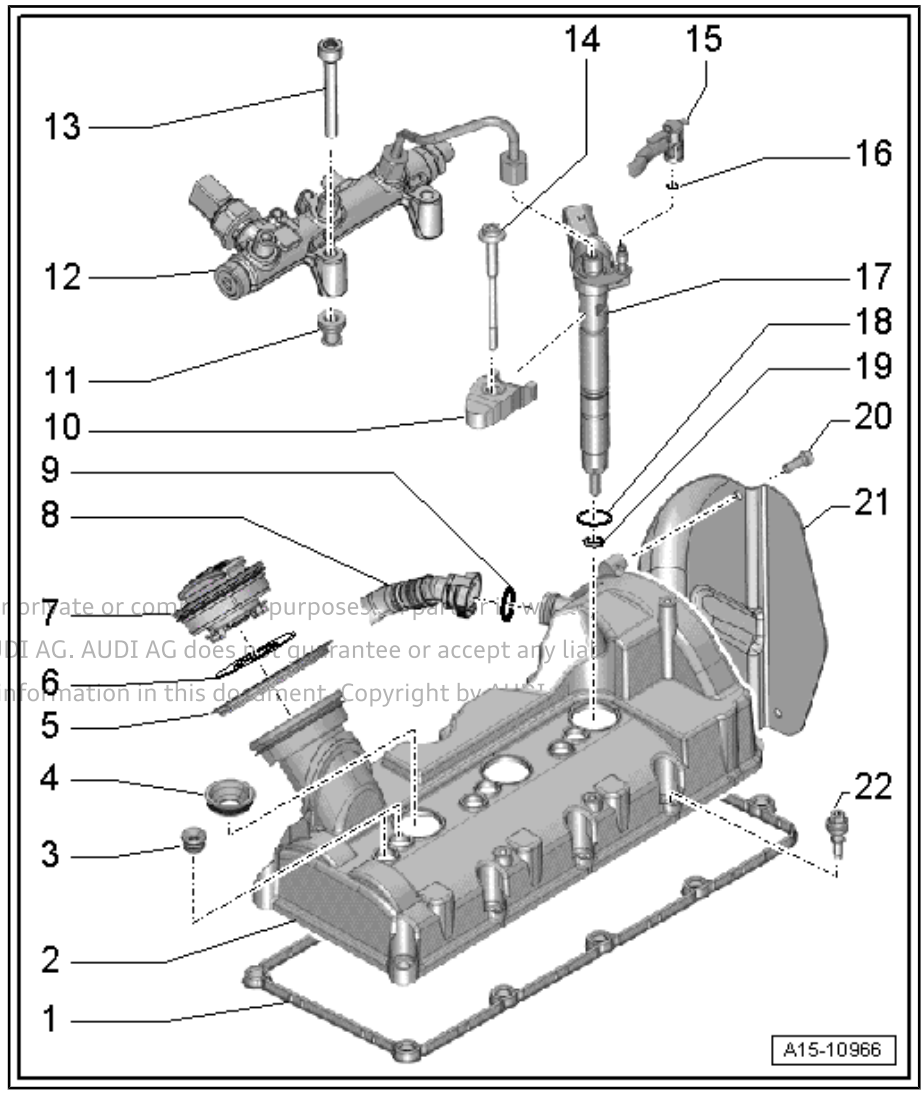
7 - Filler cap

8 - Hose
- ❑ For crankcase breather

9 - O-ring

10 - Clamping piece
- ❑ Removing and installing ⇒ page 363

11 - Sealing bush
- ❑ For fuel rail



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12 - Fuel rail

- ❑ Observe rules for cleanliness ⇒ page 8
- ❑ Do not attempt to bend high-pressure pipes to a different shape
- ❑ Installing high-pressure pipes ⇒ page 369

13 - Bolt

- ❑ Tightening torque ⇒ Item 17 (page 353)

14 - Bolt

- ❑ Tightening torque ⇒ Item 3 (page 352)

15 - Fuel return hose

- ❑ Observe rules for cleanliness ⇒ page 8

16 - O-ring

- ❑ Renew

17 - Injector

- ❑ Observe rules for cleanliness ⇒ page 8
- ❑ Removing and installing ⇒ page 363

18 - O-ring

- ❑ Renew

19 - Copper seal

- ❑ Renew

20 - Bolt

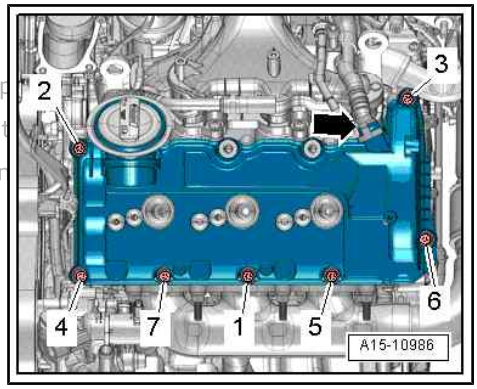
- ❑ 9 Nm

21 - Heat shield

22 - Bolt

- ❑ With seal
- ❑ Renew
- ❑ Tightening torque and tightening sequence: left-side ⇒ page 142 ; right-side ⇒ page 143

Cylinder head cover (left-side) - tightening torque and sequence



Note

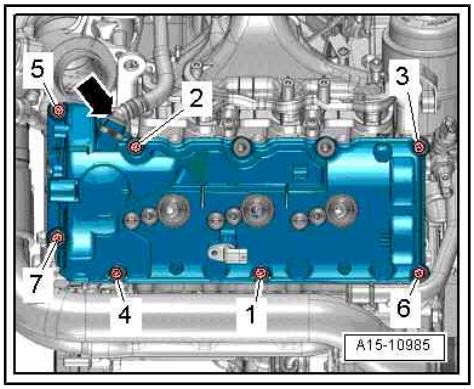
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Renew the bolts tightened with specified tightening angle.

– Tighten bolts in 3 stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1.	-1 … 7-	Screw in by hand until contact is made
2.	-1 … 7-	8 Nm
3.	-1 … 7-	Turn 90° further

Cylinder head cover (right-side) - tightening torque and sequence



Note

Renew the bolts tightened with specified tightening angle.

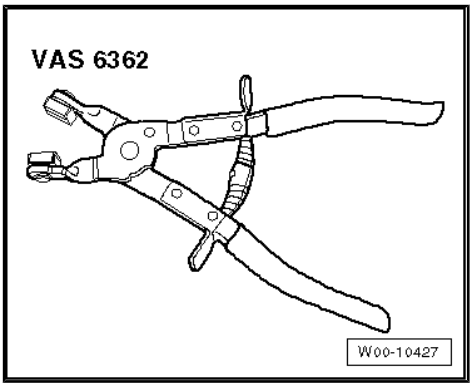
– Tighten bolts in 3 stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1.	-1 … 7-	Screw in by hand until contact is made
2.	-1 … 7-	8 Nm
3.	-1 … 7-	Turn 90° further

1.3 Removing and installing cylinder head

Special tools and workshop equipment required

♦ Hose clip pliers - VAS 6362-

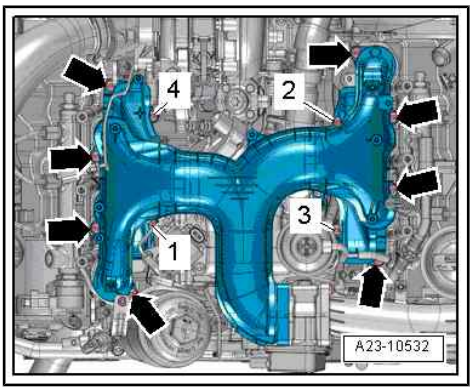


Removing

– Drain coolant ⇒ page 253 .
– Remove turbocharger ⇒ page 297 .
– Remove intake manifold ⇒ page 343 .
– Remove corresponding camshafts:

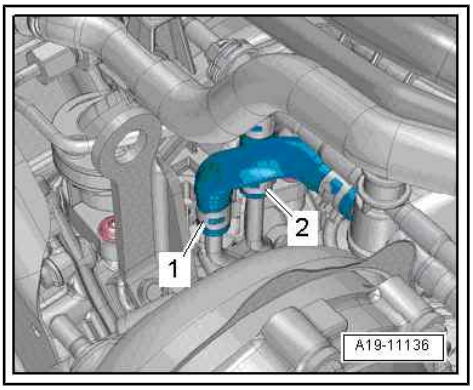
♦ ⇒ “4.4.1 Removing camshafts and re-installing used camshafts - cylinder bank 1 (right-side)”, page 194

♦ ⇒ “4.4.3 Removing camshafts and re-installing used camshafts - cylinder bank 2 (left-side)”, page 206



Cylinder head (left-side):

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

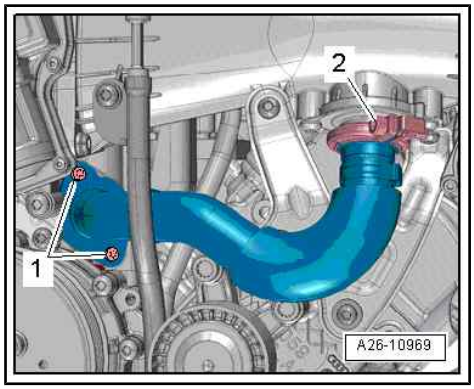


Note

Disregard -item 2-.

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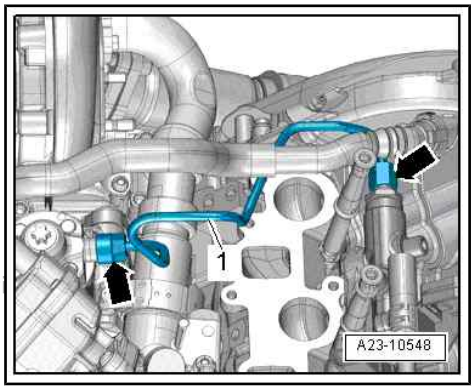
– Remove bolts -1- and detach exhaust gas recirculation pipe.



Note

Disregard -item 2-.

– Unscrew union nut -left arrow- and detach high-pressure pipe -1-.



Note

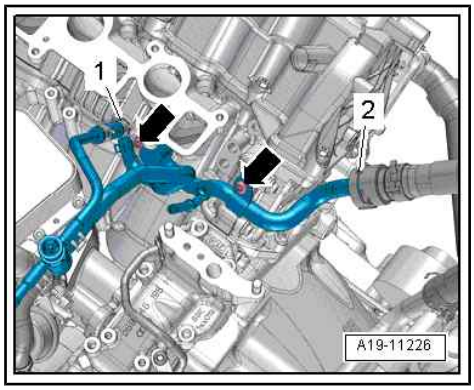
Disregard -arrow- on right-side of illustration.

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Cylinder head (right-side):

– Remove coolant pipe (front) ⇒ page 276 .

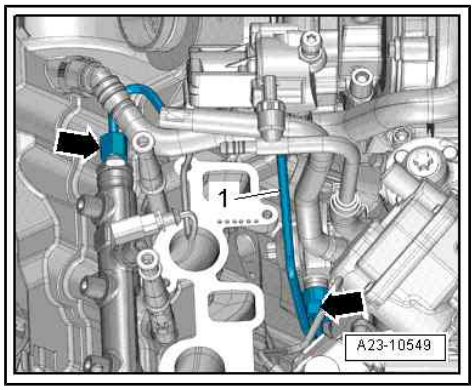
– Release hose clip -1-, lift retaining clip -2- and detach coolant hoses.



Note

Disregard -arrows-.

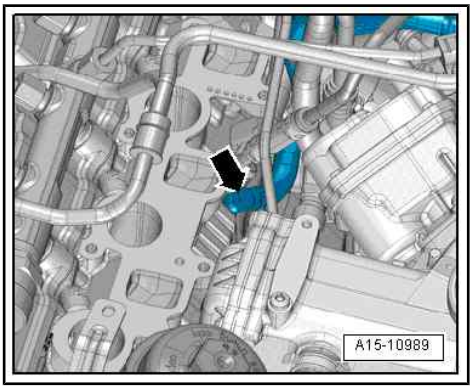
– Unscrew union nut -right arrow- and detach high-pressure pipe -1-.



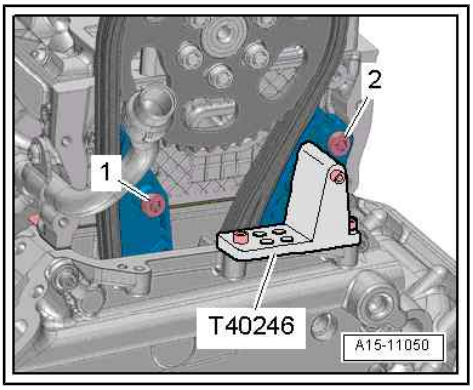
Note

Ignore -arrow on left side of illustration-.

– Remove banjo bolt -arrow-.



– Remove guide pin -1- for guide rail and -2- for tensioning rail.



Note

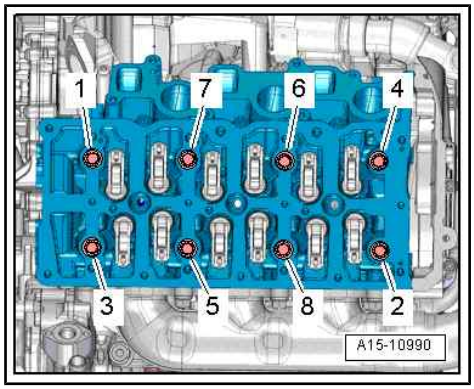
Ignore -T40246- .

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Both sides (continued):

– Slacken cylinder head bolts in the sequence -1 ... 8-.

– Remove bolts and carefully take off cylinder head.



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.*

Installing

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

Tightening torques

- ⇒ “1.1 Exploded view - cylinder head”, page 139
- ⇒ Fig. ““Cylinder head - tightening torque and sequence”“ , page 141
- ⇒ Fig. ““Installing air hoses with screw-type clips”“ , page 313
- ⇒ “5.1 Exploded view - exhaust gas recirculation system”, page 458

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Caution

Risk of damage to sealing surfaces.

- *Carefully remove sealant residue from cylinder head and cylinder block.*
- *Ensure that no long scores or scratches are made on the surfaces.*

Risk of damage to cylinder block.

- *No oil or coolant must be allowed to remain in the blind holes for the cylinder head bolts in the cylinder block.*

Risk of leaks at cylinder head gasket.

- *Carefully remove any remaining emery and abrasive material.*
- *Do not remove new cylinder head gasket from packaging until it is ready to be fitted.*
- *Handle the cylinder head gasket very carefully to prevent damage to the silicone coating or the indented area of the gasket.*

Risk of damage to open valves.

- *When installing an exchange cylinder head, the plastic protectors fitted to protect the open valves should not be removed until the cylinder head is ready to be fitted.*

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

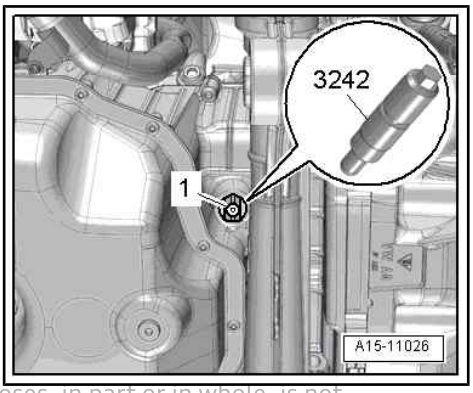
- *Turn the engine carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.*

Note

- *Renew the bolts tightened with specified tightening angle.*
- *Renew self-locking nuts as well as seals, gaskets and O-rings.*
- *Cylinder heads must not be reworked on TDI engines.*
- *When installing an exchange cylinder head, the contact surfaces between roller rocker fingers and cams must be oiled before installing the cylinder head cover.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *After fitting a new cylinder head or cylinder head gasket, change the engine oil and the coolant in the entire cooling system.*

– Before installing cylinder head, set crankshaft and camshafts to “TDC”:

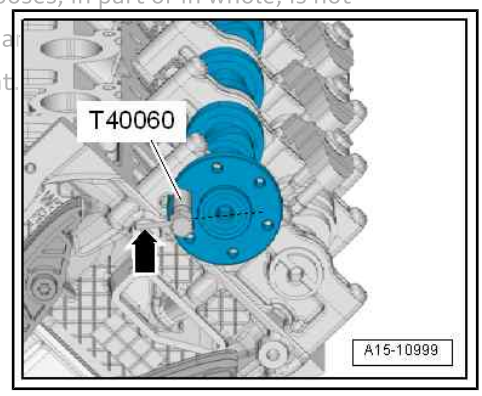
• Crankshaft -1- locked in “TDC” position with locking pin - 3242- .



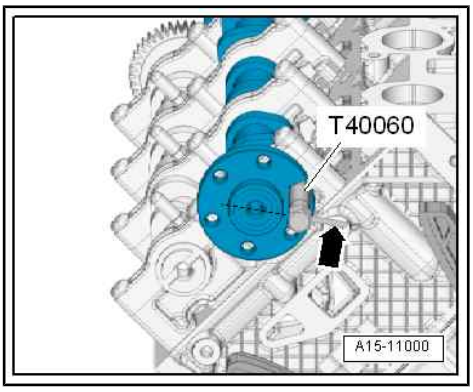
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• Camshafts locked with adjustment pin - T40060- .

• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft on cylinder bank 1 (right-side).



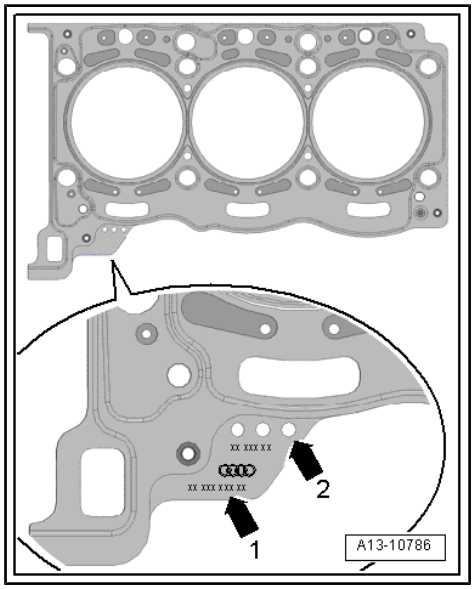
• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft on cylinder bank 2 (left-side).



– Note cylinder head gasket identification:

1 - Part number

2 - Holes



Note

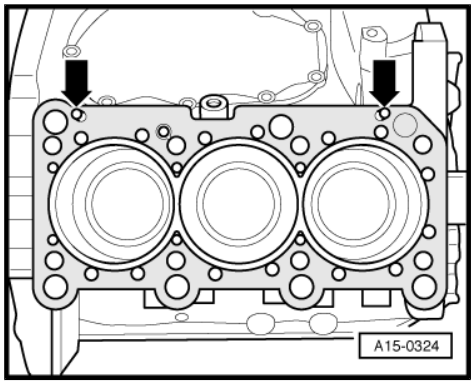
- *If the cylinder head gasket or cylinder head have been replaced, select the new cylinder head gasket according to the number of holes on the old gasket.*
- *If parts of the crankshaft drive have been renewed, the new cylinder head gasket must be selected by measuring the piston projection at "TDC" ⇒ page 134 .*
- *The gaskets for the left and right cylinder heads have different shapes and cannot be interchanged.*

– Place cylinder head gasket in position.

- Pay attention to 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.

– Fit cylinder head.

– Tighten cylinder head bolts ⇒ page 141 .



Note

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

– Install coolant pipe (front) ⇒ page 276 .

– Install high-pressure pipes ⇒ page 369 .

– Install camshafts:

- ⇒ "4.4.1 Removing camshafts and re-installing used camshafts - cylinder bank 1 (right-side)", page 194
- ⇒ "4.4.3 Removing camshafts and re-installing used camshafts - cylinder bank 2 (left-side)", page 206

– Install intake manifold ⇒ page 343 .

– Install turbocharger ⇒ page 297 .

– Change engine oil ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .

– Connect coolant hose with plug-in connector ⇒ page 282 .

– Fill cooling system with fresh coolant ⇒ page 254 .

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1.4 Removing and installing cylinder head cover

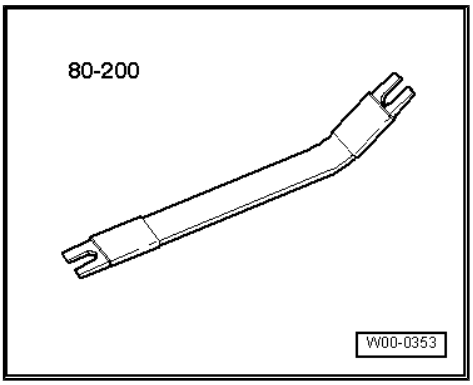
⇒ "1.4.1 Removing and installing cylinder head cover (left-side)", page 149

⇒ "1.4.2 Removing and installing cylinder head cover (right-side)", page 152

1.4.1 Removing and installing cylinder head cover (left-side)

Special tools and workshop equipment required

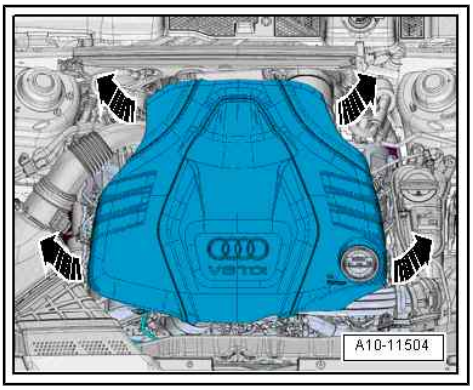
- Removal lever - 80 - 200-



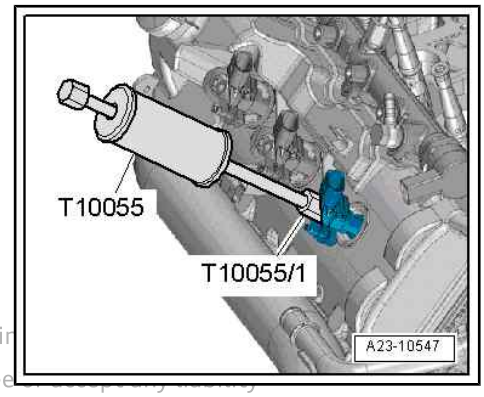
- Sealant ⇒ Electronic parts catalogue

Removing

– Remove engine cover panel -arrows-.

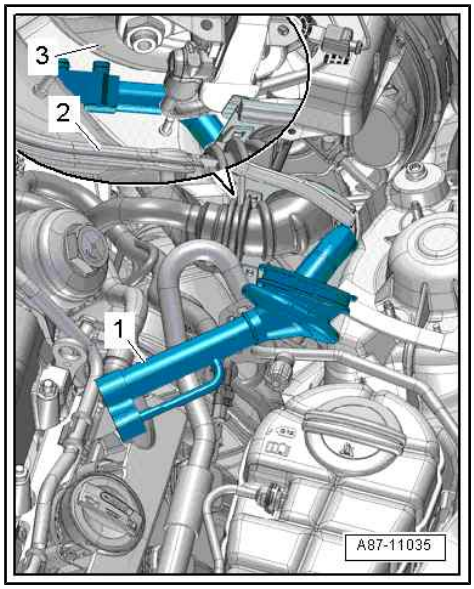


– Remove injectors (left-side) ⇒ page 363 .

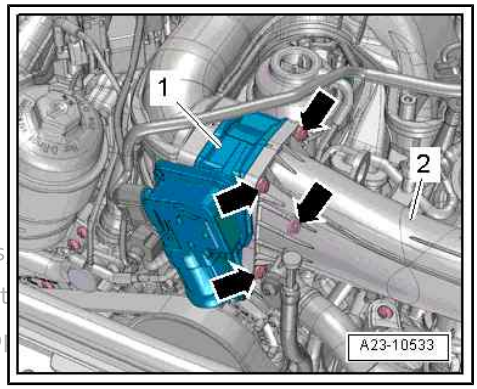


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– Remove refrigerant line -1- with internal heat exchanger ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit; Removing and installing refrigerant lines with internal heat exchanger .

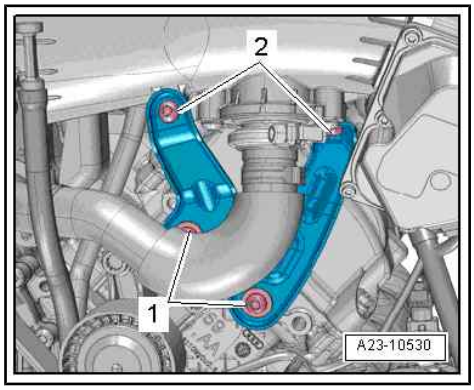


– Remove intake manifold flap motor - V157- ⇒ page 343 .



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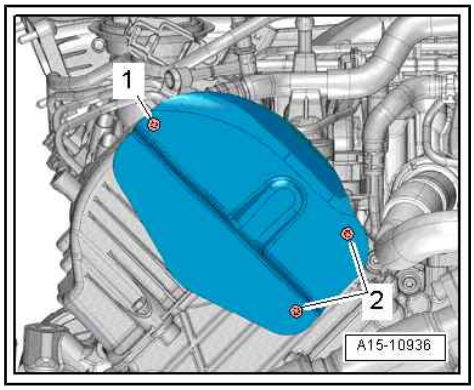
– Remove bolts -1- and detach bracket for intake manifold.



Note

Disregard -item 2-.

– If fitted, unscrew bolt -1- for heat shield.



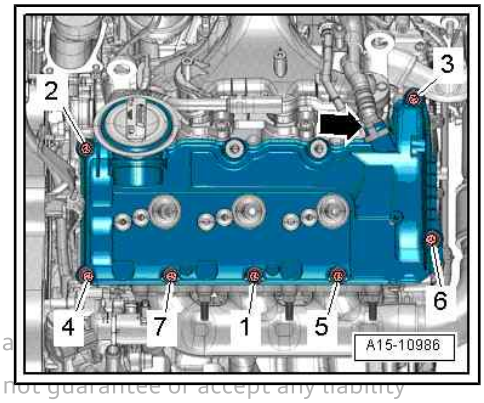
Note

Disregard -item 2-.

– Using removal lever - 80 - 200- , move clear electrical wiring harness at cylinder head cover.

Caution

Depending on the vehicle version and country version, a crankcase breather hose may be fitted which cannot be detached from the cylinder head cover without being damaged irreparably. For these versions, the hose on the cylinder head cover will be damaged irreparably and must then be renewed.



– Remove crankcase breather hose -arrow-; to do so, press release tabs (if present) or break hose connection at cylinder head cover as necessary.
– Loosen bolts in the sequence -7 ... 1-.
– Remove bolts and take off cylinder head cover.

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Installing

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

- Tightening torque
  ⇒ Fig. ""Cylinder head cover (left-side) - tightening torque and sequence"" , page 142

Note

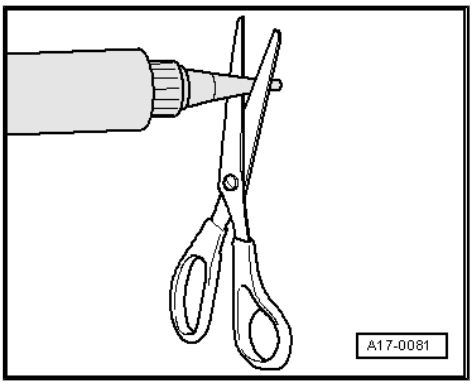
- ♦ *Renew the bolts tightened with specified tightening angle.*
- ♦ *Renew gasket for cylinder head cover if damaged.*

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

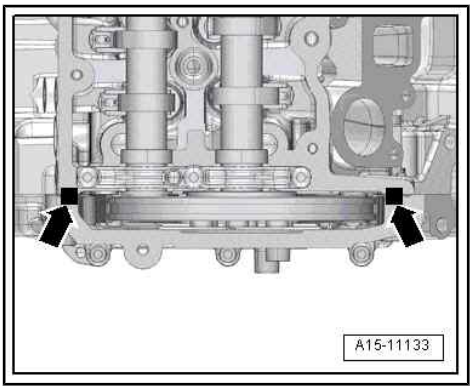
Note

Note the use-by date of the sealant.

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



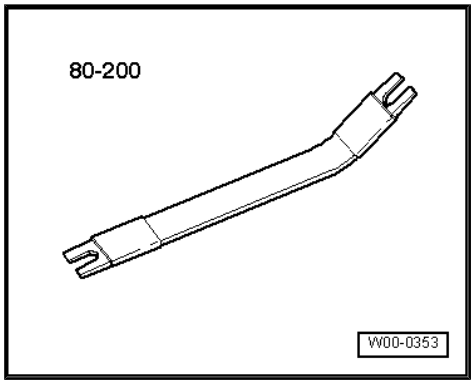
– Apply sealant bead -arrows- at each joint between cylinder head and timing chain cover (bottom).
- Width of sealant beads: approx. 2 mm.
– Tighten cylinder head cover bolts ⇒ page 142 .
– Install intake manifold flap motor - V157- and injectors ⇒ page 363 .
– Check fuel system for leaks ⇒ page 333 .



1.4.2 Removing and installing cylinder head cover (right-side)

Special tools and workshop equipment required

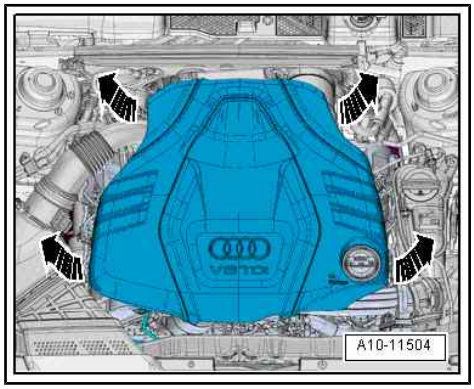
- Removal lever - 80 - 200-



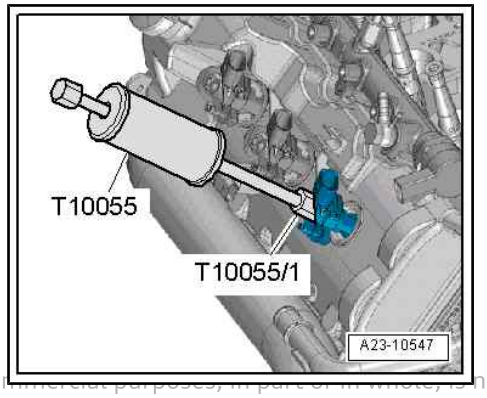
- Sealant ⇒ Electronic parts catalogue

Removing

– Remove engine cover panel -arrows-.



– Remove injectors (right-side) ⇒ page 363 .

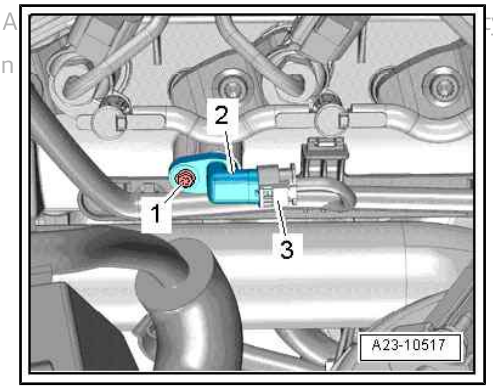


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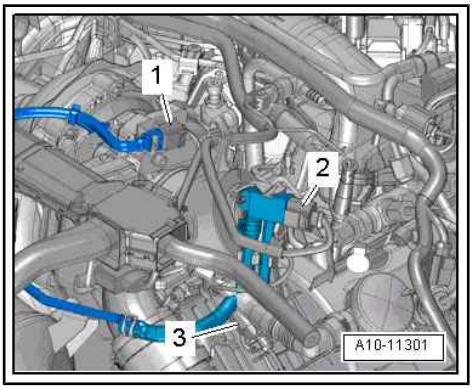
– Unplug electrical connector -3- at Hall sender G40 - item 2- and move clear wiring harness at cylinder head cover using removal lever - 80 - 200- .

Note

Disregard -item 1-.



– Take electrical connector -3- and pressure differential sender - G505- -item 2- out of bracket.



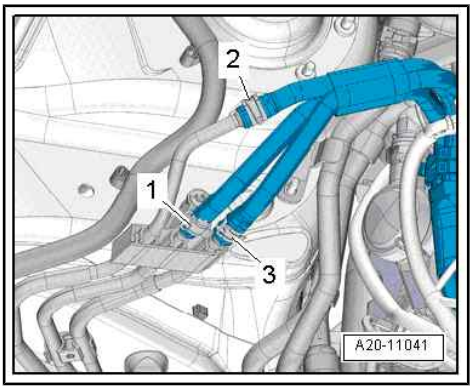
Note

Disregard -item 1-.

Caution

Take care to keep components clean.

- ***Observe rules for cleanliness when working on the fuel supply system ⇒ page 8 .***



– Detach fuel hoses and move clear; to do so, release hose clips:

1 - Fuel hose (blue)

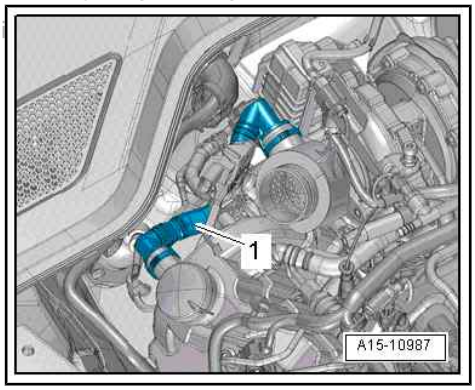
2 - Fuel hose (blue)

3 - Fuel hose (white)

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Caution

Depending on the vehicle version and country version, a crankcase breather hose may be fitted which cannot be detached from the cylinder head cover without being damaged irreparably. For these versions, only detach the crankcase breather hose at the connection piece for the air intake hose.

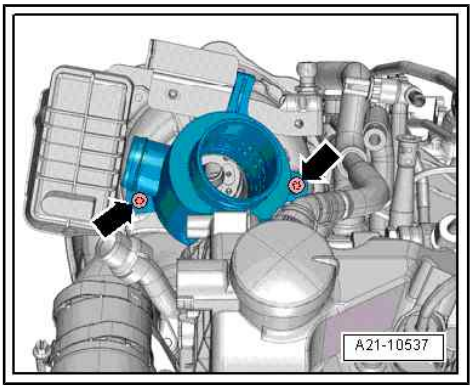


– Press release tabs and remove crankcase breather hose -1-.

Note

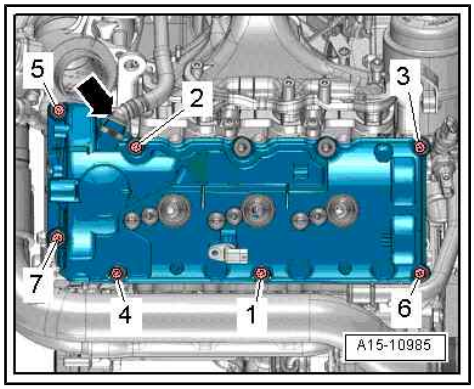
If the crankcase breather hose cannot be detached from the cylinder head cover without being damaged irreparably, detach it from the connection for the turbocharger only.

– Remove bolts -arrows- and detach connection for turbocharger.



Caution

Depending on the vehicle version and country version, a crankcase breather hose may be fitted which cannot be detached from the cylinder head cover without being damaged irreparably. For these versions, the hose on the cylinder head cover will be damaged irreparably and must then be renewed.



– Remove crankcase breather hose -arrow-; to do so, press release tabs (if present) or break hose connection at cylinder head cover as necessary.

– Loosen bolts in the sequence -7 ... 1-.

– Remove bolts and take off cylinder head cover.

Installing

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

Tightening torques:

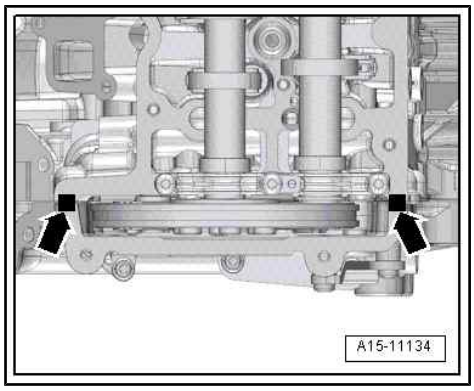
- ⇒ Fig. ""Cylinder head cover (left-side) - tightening torque and sequence"" , page 142
- ⇒ "1.1 Exploded view - turbocharger", page 295

Note

- *Renew the bolts tightened with specified tightening angle.*
- *Fit new O-rings.*
- *Renew gasket for cylinder head cover if damaged.*

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

– Apply sealant bead -arrows- at each joint between cylinder head and timing chain cover (bottom).



- Width of sealant beads: approx. 2 mm.

– Tighten cylinder head cover bolts ⇒ page 142 .

– Install injectors ⇒ page 363 .

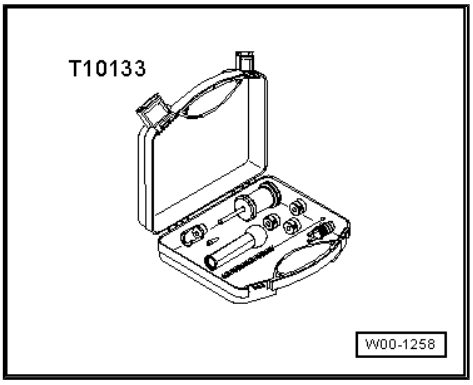
– Check fuel system for leaks ⇒ page 333 .

1.5 Removing and installing seals for injectors

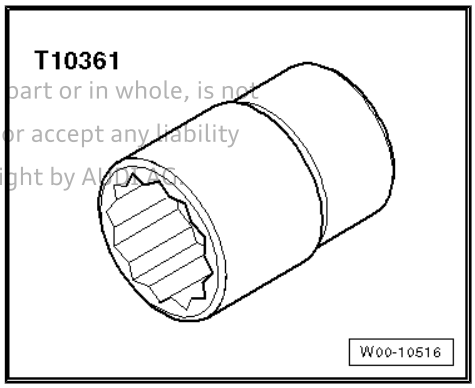
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Special tools and workshop equipment required

- Tool set for FSI engines - T10133-

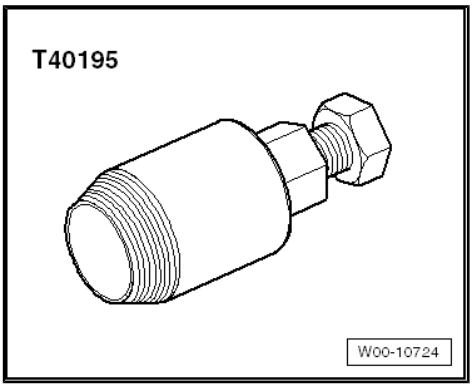


- Socket, 24 mm - T10361-



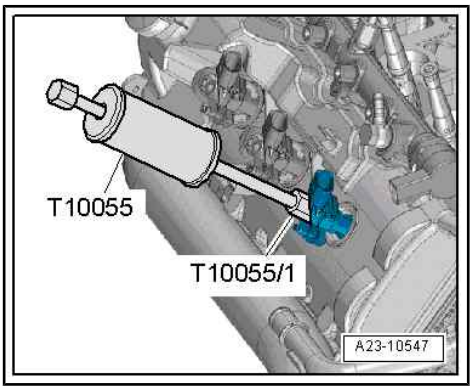
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- Oil seal extractor - T40195-

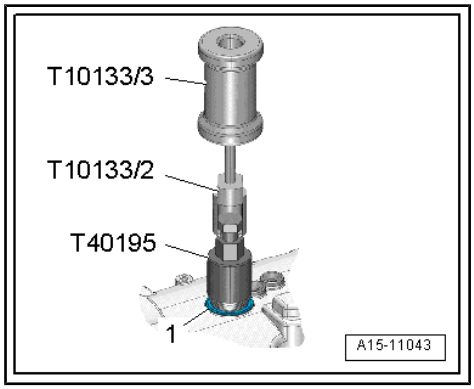


Procedure

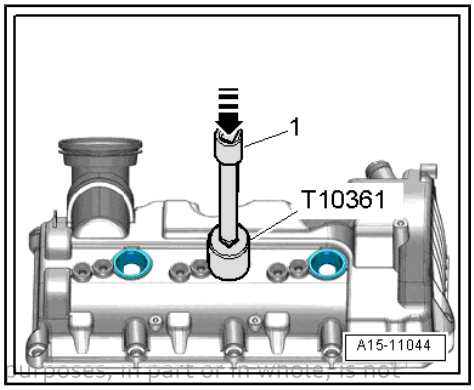
– Remove corresponding injector ⇒ page 363 .



– Screw oil seal extractor - T40195- into seal -1-.
– Fit striker -T10133/3- with adapter -T10133/2- on oil seal extractor, as shown in illustration, and pull out seal upwards by tapping gently.



– Drive in new injector seal as far as stop using socket, AF 24 - T10361- and short extension -1-.

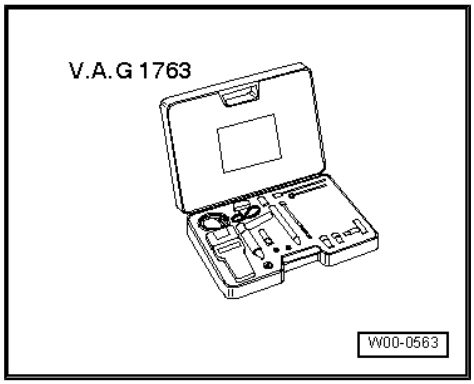


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1.6 Checking compression

Special tools and workshop equipment required

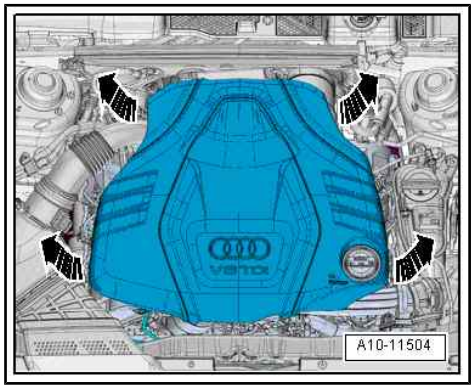
♦ Compression tester - V.A.G 1763- with adapter - V.A.G 1763/8-



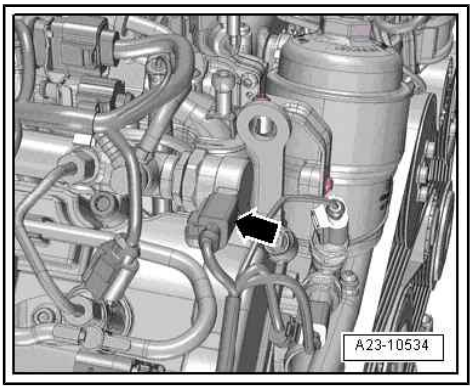
Procedure

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

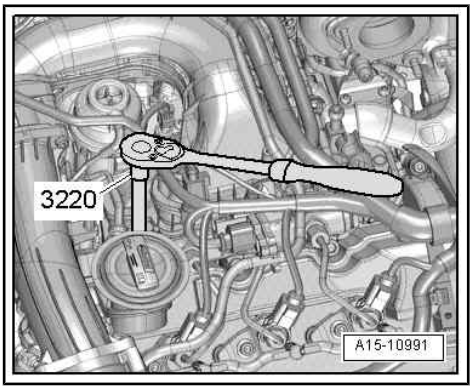
– Carefully pull engine cover panel off the 4 retaining pins one after another -arrows-.
– Unplug electrical connectors on all glow plugs.



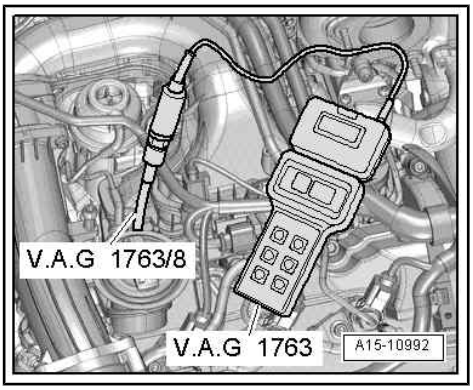
– Unplug electrical connector -arrow- at fuel pressure regulating valve - N276- on fuel rail (cylinder bank 1, right-side).
– Briefly start engine to relieve fuel pressure in fuel rail.



– Remove all glow plugs ⇒ page 472 .



– Screw in adapter - V.A.G 1763/8- in place of the glow plugs 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	28 … 33
Wear limit	21
Maximum difference between cylinders	5

Attaching

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

– Install glow plugs ⇒ page 472 .
– Entries are stored in event memory of engine control unit because electrical connectors were unplugged and the engine was started: `Interrogate event memory` in `Vehicle self-diagnosis` ⇒ Vehicle diagnostic tester.

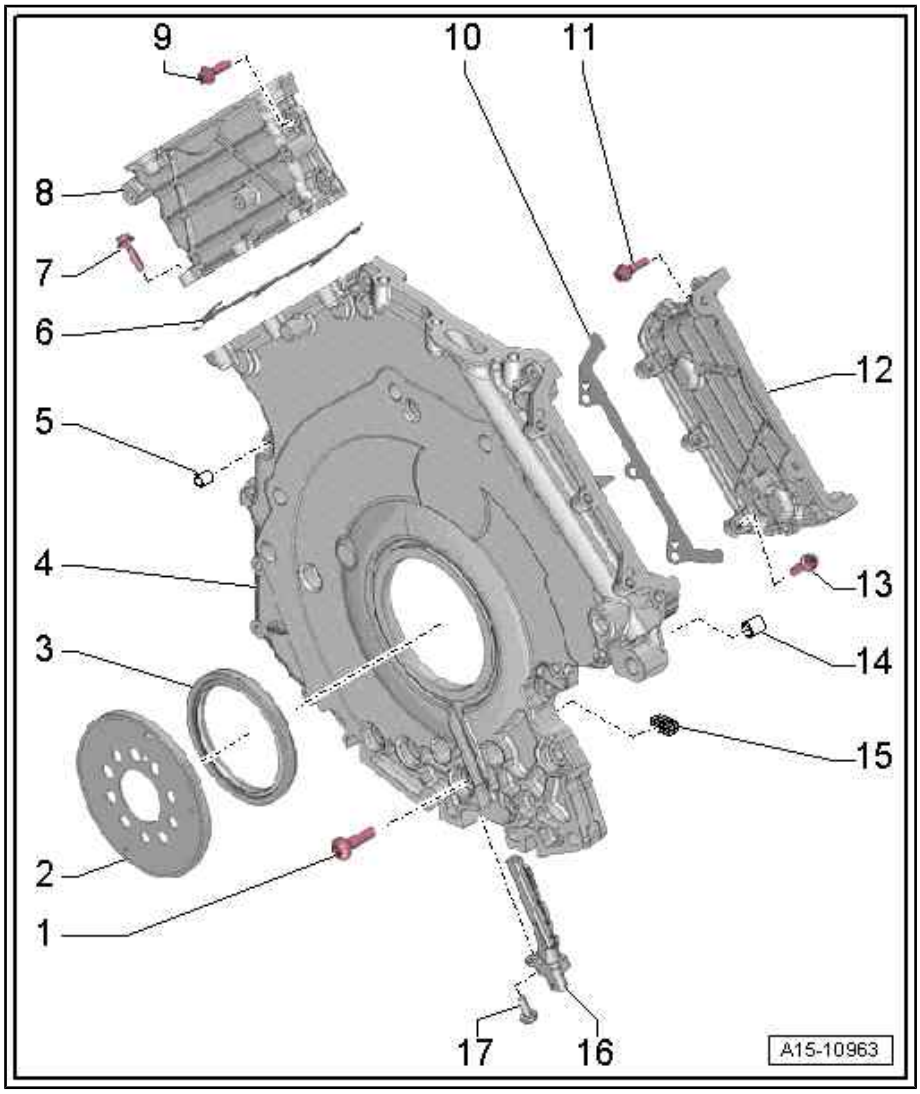
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2 Timing chain cover

⇒ “2.1 Exploded view - timing chain cover”, page 158

⇒ “2.2 Removing and installing timing chain cover”, page 160

2.1 Exploded view - timing chain cover



1 - Bolt
- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 159

2 - Sender wheel
- ❑ For engine speed sender - G28-

3 - Oil seal
- ❑ For crankshaft (gearbox end)
- ❑ Removing and installing ⇒ page 120

4 - Timing chain cover (bottom)
- ❑ Removing and installing ⇒ page 163

5 - Dowel sleeve

6 - Gasket
- ❑ Renew

7 - Bolt
- ❑ Renew
- ❑ Tightening torque and sequence ⇒ Fig. ““Timing chain covers (top) - tightening torque and tightening sequence”“ , page 159

8 - Timing chain cover (left-side)
- ❑ Removing and installing ⇒ page 160

9 - Bolt
- ❑ Renew
- ❑ Tightening torque and sequence ⇒ Fig. ““Timing chain covers (top) - tightening torque and tightening sequence”“ , page 159

10 - Gasket
- ❑ Renew

11 - Bolt
- ❑ Renew
- ❑ Tightening torque and sequence ⇒ Fig. ““Timing chain covers (top) - tightening torque and tightening sequence”“ , page 159

12 - Timing chain cover (right-side)
- ❑ Removing and installing ⇒ page 160

13 - Bolt
- ❑ Renew

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❑ Tightening torque and sequence
⇒ Fig. ""Timing chain covers (top) - tightening torque and tightening sequence"" , page 159

14 - Dowel sleeve

15 - Sealing element

❑ 2x

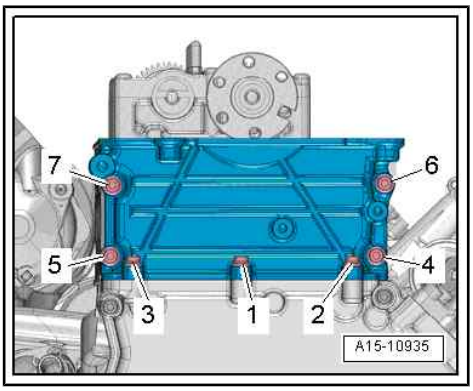
16 - Engine speed sender - G28-

❑ Removing and installing ⇒ page 475

17 - Bolt

❑ Tightening torque ⇒ page 471

Timing chain covers (top) - tightening torque and tightening sequence



Note

Renew the bolts tightened with specified tightening angle.

– Tighten bolts in 4 stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1.	-1, 2, 3-	Screw in by hand until contact is made
2.	-4 … 7-	Screw in by hand until contact is made
3.	-1 … 7-	8 Nm
4.	-1 … 7-	8 Nm + turn 90° further

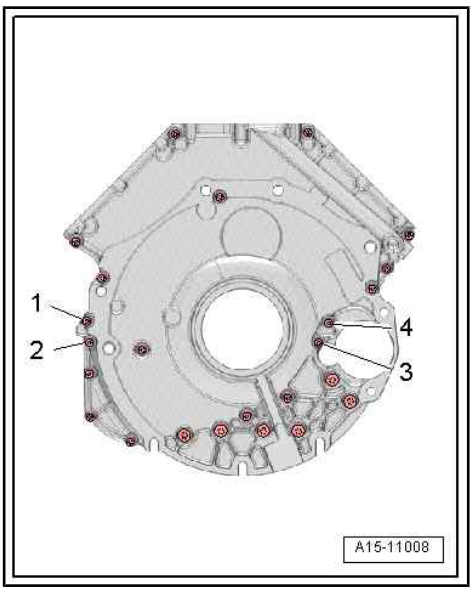
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Timing chain cover (bottom) - tightening torque and tightening sequence:

– Tighten bolts in 7 stages as follows:

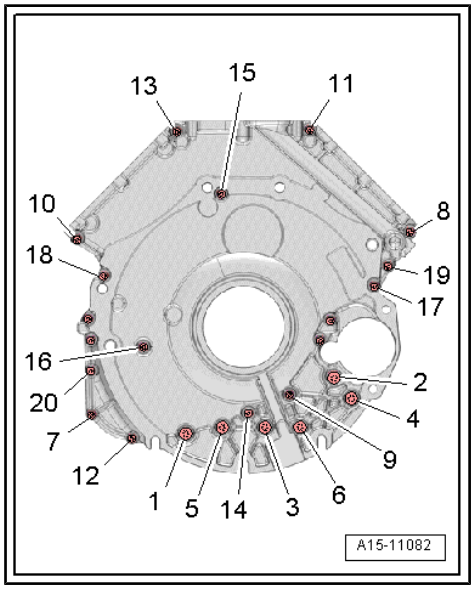
Stages 1 and 2:

Stage	Bolts	Tightening torque
1.		Fit timing chain cover (bottom) on cylinder block with sealant and sealing elements.
2.	-1, 2, 3, 4-	9 Nm



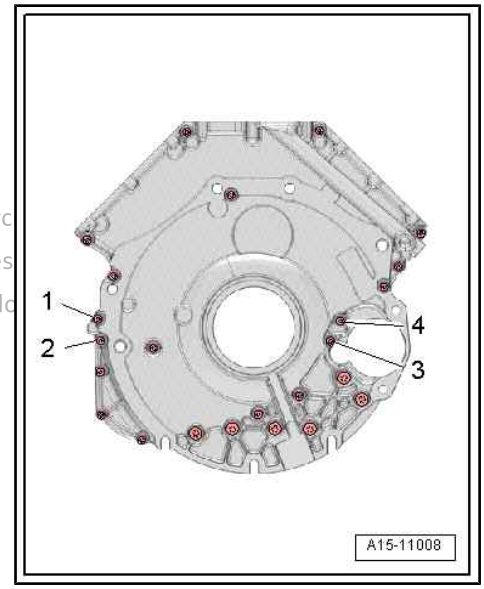
Stages 3 ... 6:

Stage	Bolts	Tightening torque/angle specification
3.	-1 … 20-	3 Nm
4.	-1 … 6-	8 Nm
5.	-1 … 6-	Turn 90° further
6.	-7 … 20-	9 Nm



Stage 7:

Stage	Bolts	Tightening torque
7.	-1, 2, 3, 4-	9 Nm



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2.2 Removing and installing timing chain cover

⇒ “2.2.1 Removing and installing timing chain covers (top)”, page 160

⇒ “2.2.2 Removing and installing timing chain cover (bottom)”, page 163

2.2.1 Removing and installing timing chain covers (top)

Special tools and workshop equipment required

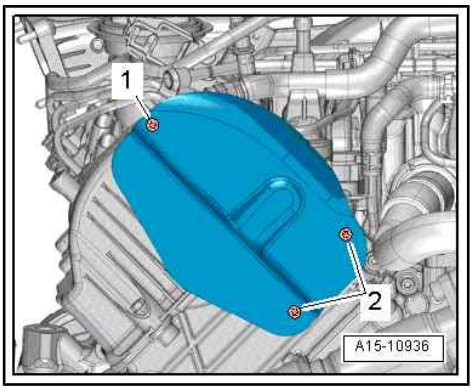
- Electric drill with plastic brush
- Safety goggles
- Sealant ⇒ Electronic parts catalogue

Removing

Timing chain cover (top left):

– Remove particulate filter:

- ♦ Vehicles with multitronic gearbox 0AW (front-wheel drive) ⇒ page 411 .
- ♦ Vehicles with dual clutch gearbox 0B5 ⇒ page 412 .
- – Remove cylinder head cover (left-side) ⇒ page 149 .
- – If fitted, unscrew bolts -2- and remove heat shield.

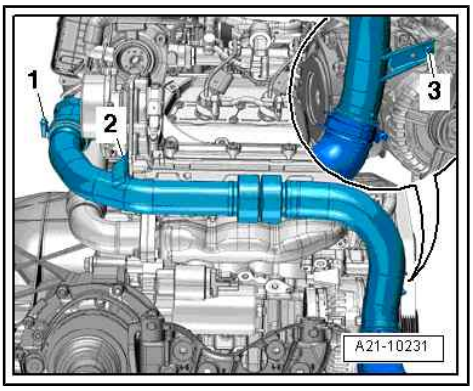


Note

Disregard -item 1-.

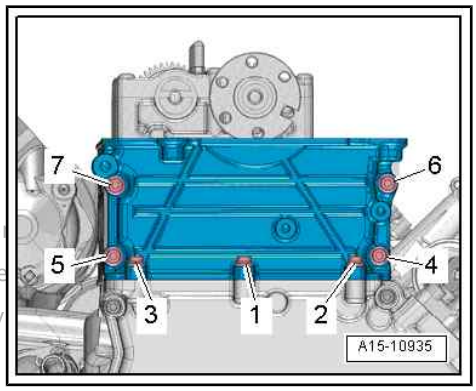
Timing chain cover (top right):

- – Remove plenum chamber partition panel ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Exploded view - plenum chamber partition panel .
- – Remove cylinder head cover (right-side) ⇒ page 152 .
- – Remove bolts -2, 3-.
- – Release hose clip -1- and detach air pipe.
- – Press air pipe to rear.



Both sides (continued):

- – Loosen bolts in the sequence -7 ... 1-.
- – Carefully release timing chain cover (top) from bonded joint and remove cover.



Installing

- Tightening torques ⇒ Fig. ""Timing chain covers (top) - tightening torque and tightening sequence"" , page 159
- – Remove old sealant from sealing surfaces on timing chain cover.

Caution

Protect lubrication system against contamination.

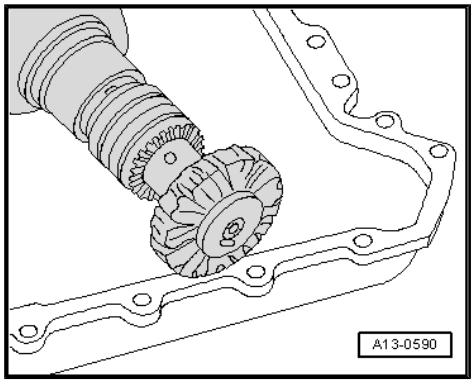
- ♦ *Cover exposed parts of the engine.*

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WARNING

Risk of eye injury.

- *Put on safety goggles.*



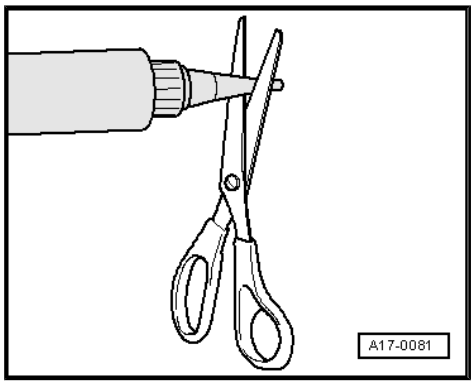
– Remove remaining sealant on timing chain cover and cylinder head using rotating plastic brush or similar.

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

Note

Note the use-by date of the sealant.

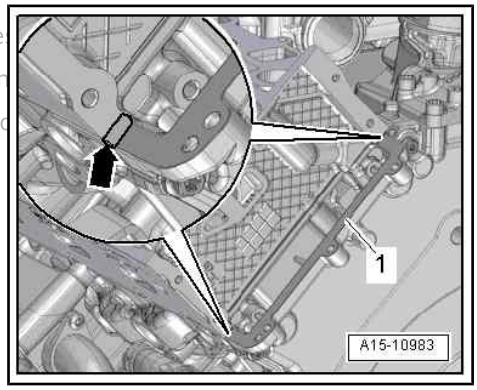
– Cut off nozzle of tube at front marking (nozzle ∅ approx. 1.5 mm).



– Fit gasket -1-.

– Apply sealant at joints between cylinder head and timing chain cover (bottom) -arrow-, as shown in illustration.

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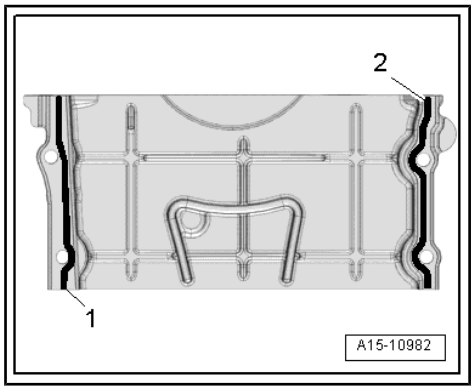
Caution

Make sure lubrication system is not clogged by excess sealant.

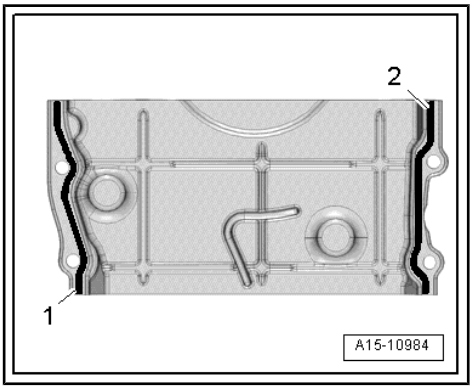
- *The sealant bead must not be thicker than specified.*

• The bead of sealant must project 1.5 … 2.0 mm above the sealing surface.

– Apply sealant beads -1 and 2- onto clean sealing surface of timing chain cover (left-side), as illustrated.



– Apply sealant beads -1 and 2- onto clean sealing surface of timing chain cover (right-side), as illustrated.



Note

The timing chain covers must be installed within 5 minutes after applying the sealant.

– Fit timing chain cover and tighten bolts ⇒ page 159 .

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

Timing chain cover (top left):

– Install cylinder head cover (left-side) ⇒ page 149 .

– Install particulate filter:

♦ Vehicles with multitronic gearbox 0AW (front-wheel drive) ⇒ page 411 .

♦ Vehicles with dual clutch gearbox 0B5 ⇒ page 412 .

Timing chain cover (top right):

– Install air pipe ⇒ page 312 .

– Install cylinder head cover (right-side) ⇒ page 152 .

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

2.2.2 Removing and installing timing chain cover (bottom)

Special tools and workshop equipment required

♦ Electric drill with plastic brush

♦ Safety goggles

♦ Sealant ⇒ Electronic parts catalogue

♦ Steel bolt M6x20 (4x)

Removing

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• Gearbox removed

– Remove drive plate ⇒ page 117 .

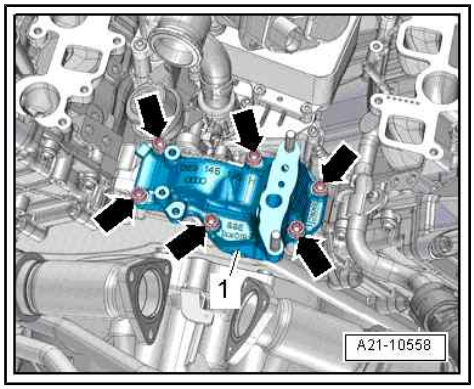
– Remove turbocharger ⇒ page 297 .

– Remove exhaust manifold (left-side) ⇒ page 466 .

– Remove exhaust manifold (right-side) ⇒ page 468 .

– Remove timing chain covers (top) ⇒ page 160 .

– Unscrew bolts -arrows- and swivel bracket -1- for turbocharger to side.

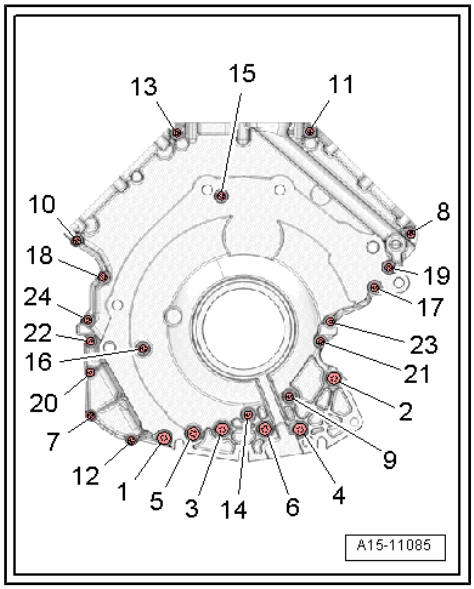


– Slacken and remove bolts in the sequence: -24 ... 1-.
– Carefully release timing chain cover (bottom) from bonded joint and remove cover.
– Press crankshaft oil seal (gearbox end) out of timing chain cover (bottom).

Installing

- Tightening torques ⇒ page 159

– Remove old sealant from grooves on timing chain cover and from sealing surfaces.



Caution

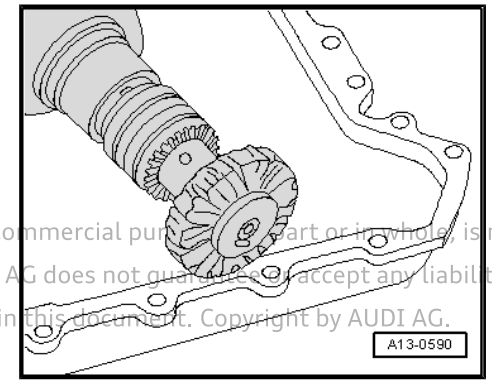
Protect lubrication system against contamination.

- *Cover exposed parts of the engine.*

WARNING

Risk of eye injury.

- *Put on safety goggles.*



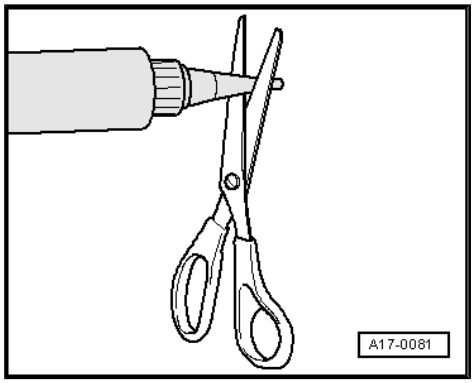
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– Remove remaining sealant on timing chain cover (bottom) and on cylinder block using rotating plastic brush or similar.
– Clean surfaces; they must be free of oil and grease.
– Before installing gearbox, remove residue from threaded holes for engine/gearbox bolts in cylinder block using a thread tap.

Note

Note the use-by date of the sealant.

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

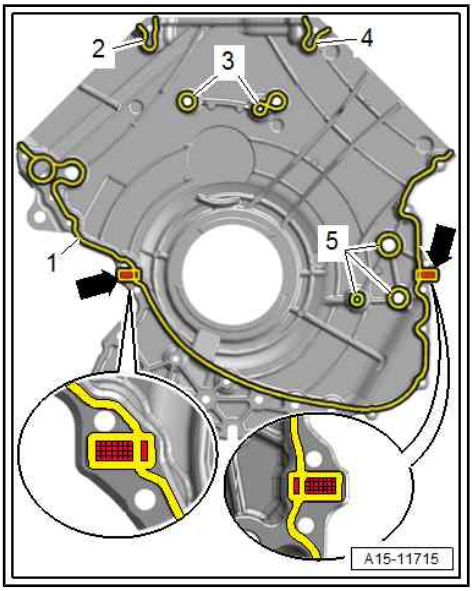


– Fit sealing elements -arrows- (without sealant).

Caution

Make sure lubrication system is not clogged by excess sealant.

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



– Apply beads of sealant onto clean sealing surface of timing chain cover (bottom) as illustrated.

- The beads of sealant -1, 2, 4- must be 1.5 ... 2.0 mm thick.
- The beads of sealant around drillings -3- and -5- must be 1.5 … 2.0 mm thick.

Note

The timing chain cover must be installed within 5 minutes after applying the sealant.

– Check whether the two dowel sleeves are fitted in the cylinder block; install if necessary.

– Install timing chain cover (bottom) and tighten bolts ⇒ page 159 .

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

– Install crankshaft oil seal (gearbox end) ⇒ page 120 .

– Install timing chain covers (top) ⇒ page 160 .

– Install bracket for turbocharger ⇒ page 295 .

– Install exhaust manifold (left-side) ⇒ page 466 .

– Install exhaust manifold (right-side) ⇒ page 468 .

– Install turbocharger ⇒ page 297 .

– Install drive plate ⇒ page 117 .

– Before installing gearbox, remove residue from threaded holes for engine/gearbox bolts in cylinder block using a thread tap.

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3 Chain drive

⇒ “3.1 Exploded view - camshaft timing chains”, page 166

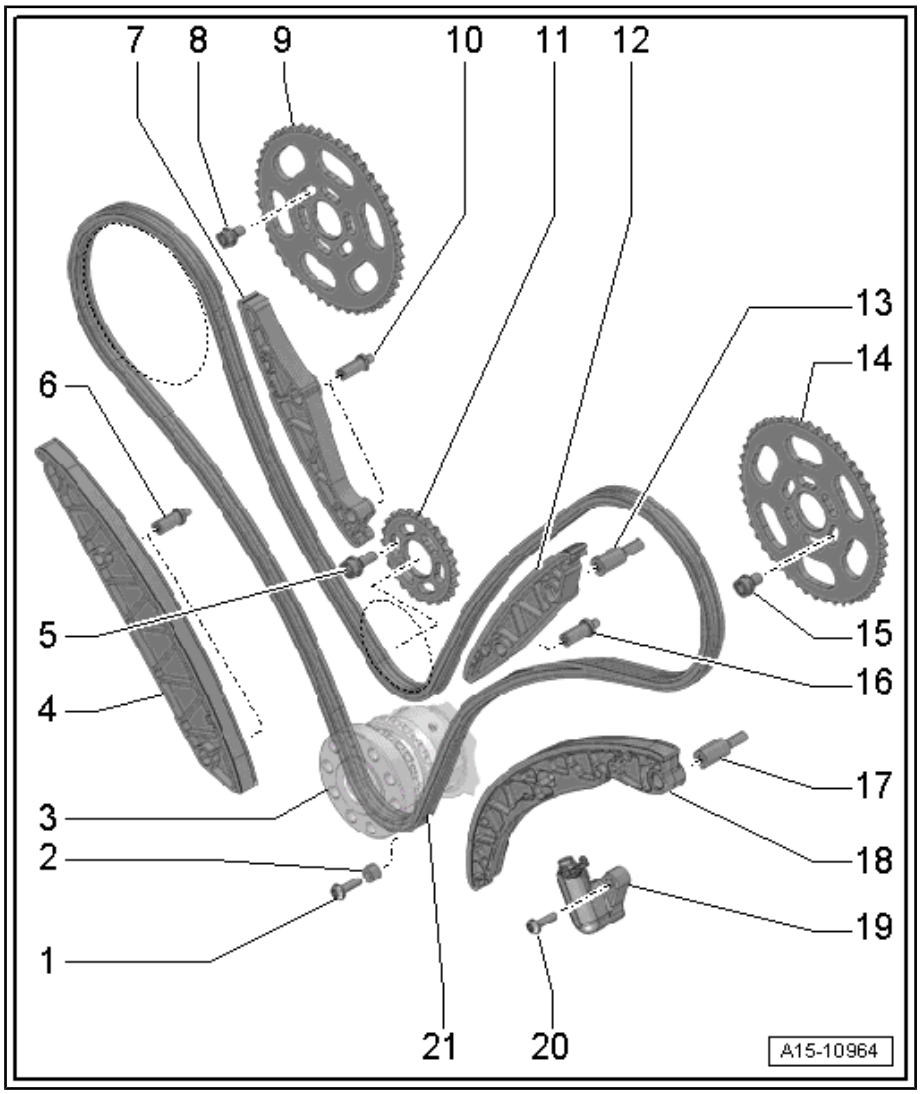
⇒ “3.2 Exploded view - drive chain for oil pump and high-pressure pump”, page 168

⇒ “3.3 Removing and installing camshaft timing chain”, page 169

⇒ “3.4 Removing camshaft timing chain from camshafts”, page 178

⇒ “3.5 Removing and installing drive chain for oil pump and high-pressure pump”, page 186

3.1 Exploded view - camshaft timing chains



1 - Bolt
- ❑ 9 Nm

2 - Chain slip preventer

3 - Crankshaft
- ❑ With sprocket for camshaft timing chain

4 - Guide rail
- ❑ Note installation position

5 - Bolt
- ❑ Tightening torque ⇒ Item 3 (page 127)

6 - Guide pin
- ❑ For guide rail
- ❑ Renew
- ❑ 5 Nm +90°

7 - Guide rail
- ❑ Note installation position

8 - Bolt
- ❑ 23 Nm

9 - Camshaft chain sprocket
- ❑ For inlet camshaft
- ❑ Installation position: Side with lettering legible from rear

10 - Guide pin
- ❑ For guide rail
- ❑ Renew
- ❑ 5 Nm +90°

11 - Chain sprocket
- ❑ For balance shaft

12 - Guide rail
- ❑ Note installation position

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13 - Guide pin

- ❑ For guide rail
- ❑ 23 Nm

14 - Camshaft chain sprocket

- ❑ For inlet camshaft
- ❑ Installation position: Side with lettering legible from rear

15 - Bolt

- ❑ 23 Nm

16 - Guide pin

- ❑ For guide rail
- ❑ Renew
- ❑ 5 Nm +90°

17 - Guide pin

- ❑ For tensioning rail
- ❑ 23 Nm

18 - Tensioning rail

19 - Chain tensioner

- ❑ For camshaft timing chain

20 - Bolt

- ❑ Renew
- ❑ 5 Nm +90°

21 - Camshaft timing chain

- ❑ Removing from camshafts ⇒ page 178
- ❑ Before removing, mark running direction with paint
- ❑ Removing and installing ⇒ page 169

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3.2 Exploded view - drive chain for oil pump and high-pressure pump

1 - Drive chain for oil pump and high-pressure pump

- ❑ Removing and installing ⇒ page 186

2 - Bolt

- ❑ Renew
- ❑ 30 Nm +45°

3 - Drive chain sprocket

- ❑ For oil pump
- ❑ Installation position: Side with lettering faces engine

4 - Compression spring

5 - Crankshaft

- ❑ With sprocket for drive chain for oil pump and high-pressure pump

6 - Drive chain sprocket

- ❑ For high-pressure pump
- ❑ Installation position: Side with lettering legible from rear

7 - Guide rail

8 - Guide pin

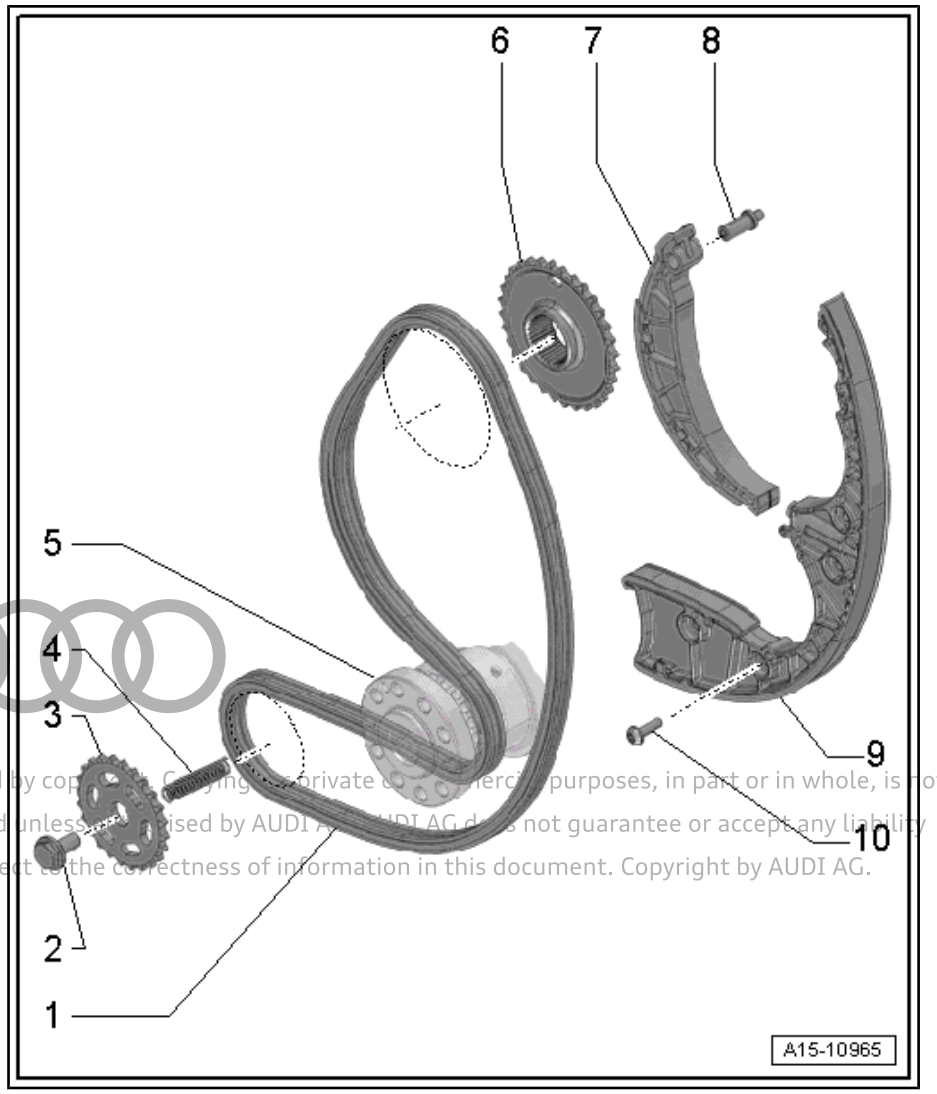
- ❑ For guide rail
- ❑ Renew
- ❑ 5 Nm +90°

9 - Chain tensioner

- ❑ With guide rail

10 - Bolt

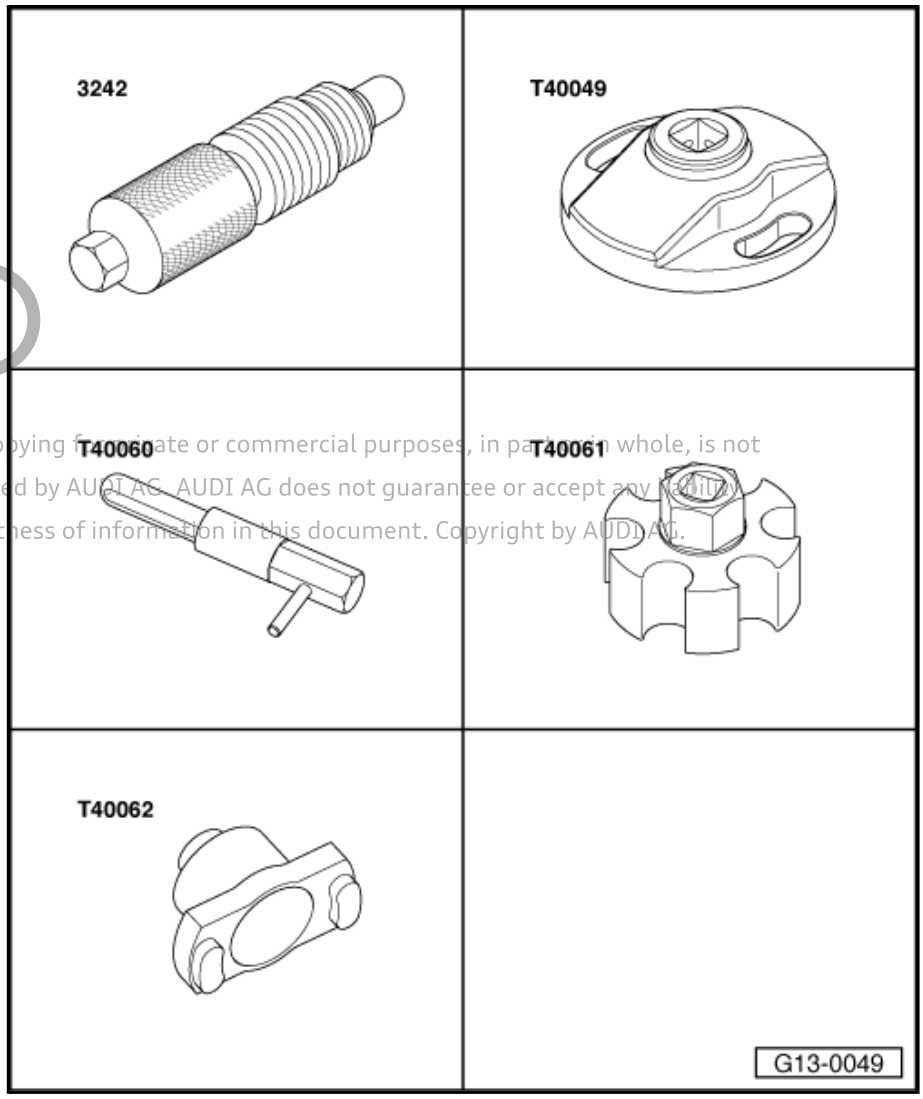
- ❑ Renew
- ❑ 5 Nm +90°



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3.3 Removing and installing camshaft timing chain

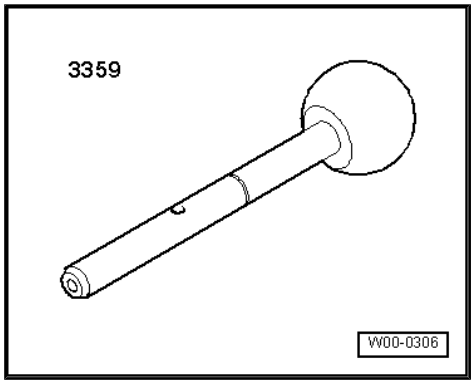
Special tools and workshop equipment required



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- Locking pin - 3242-
- Key - T40049-
- Adjustment pin - T40060- (2x)
- Adapter - T40061-
- Adapter - T40062-

- Diesel injection pump locking pin - 3359-



- Locking pin - T40316-
- Nuts M12 (2x)

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Removing

- Gearbox removed

Caution

Risk of damage to valves and piston crowns.

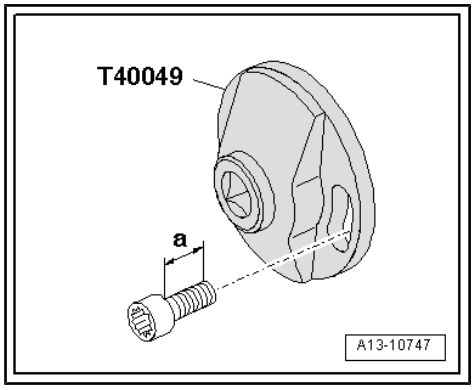
- *The crankshaft and camshafts must only be turned with the chain drive mechanism fully installed.*

– Remove timing chain cover (bottom) ⇒ page 163 .

Caution

Risk of damage to drive chain if thread of bolt exceeds specified length.

- *Use bolts with a maximum thread length -a- of 22 mm to attach key -T40049- .*
- *If no suitable bolts are available, position suitable washer (s) under bolt head so that remaining thread length does not exceed 22 mm.*

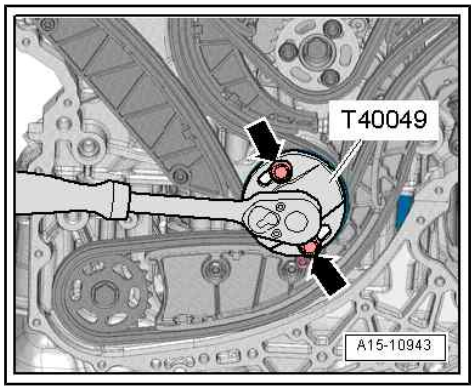


– Secure special wrench - T40049- onto rear of crankshaft.

Caution

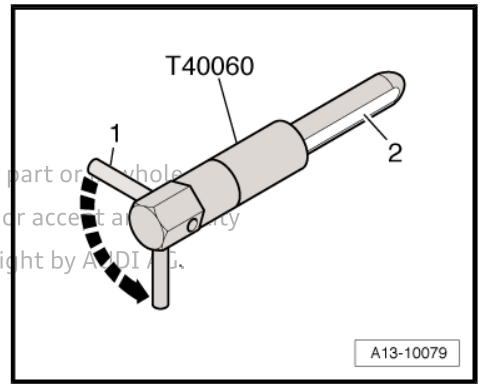
Irreparable damage can be caused if the camshaft timing chain slips.

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



Note

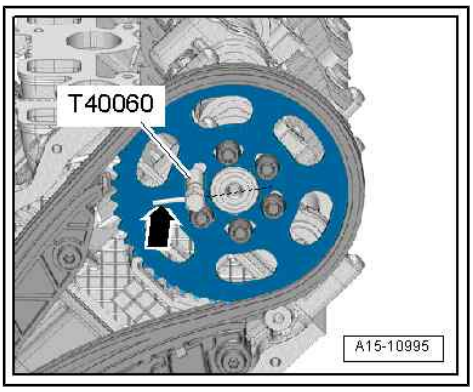
- *The adjustment pin - T40060- has a flat -2- which makes it easier to insert when the locating bores in the camshaft and cylinder head are not exactly in line.*
- *The adjustment pin is inserted initially so that the side pin -1- is perpendicular to the imaginary line between the adjustment pin and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



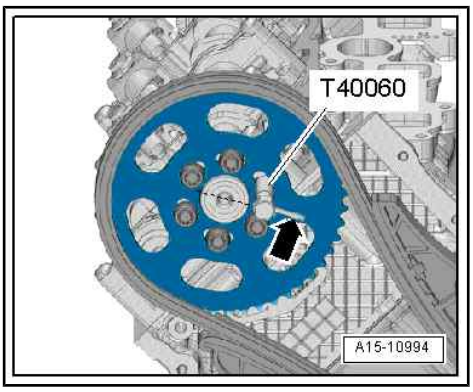
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– Rotate crankshaft to "TDC":

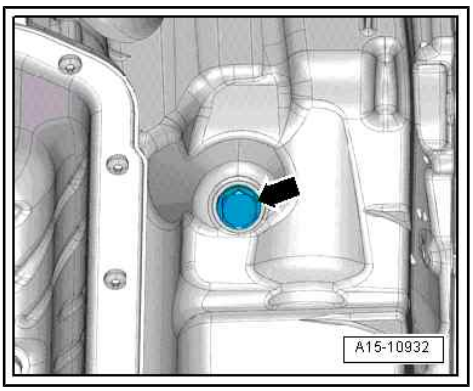
- It should be possible to lock the camshafts with the adjustment pins - T40060- .
- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft on cylinder bank 1 (right-side).



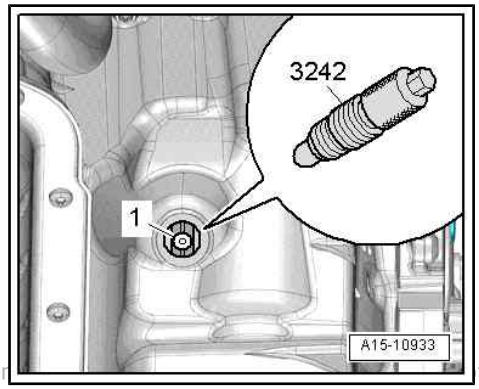
- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft on cylinder bank 2 (left-side).



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



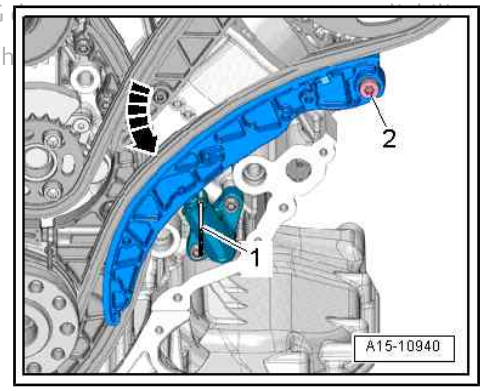
– Screw locking pin - 3242- into hole (20 Nm); if necessary, turn crankshaft backwards and forwards slightly to fully centralise locking pin.



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– Press tensioning rail of camshaft timing chain tensioner in direction of -arrow- and lock chain tensioner by inserting locking pin - T40316- -item 1-.- -

– Remove guide pin -2- and detach tensioning rail.

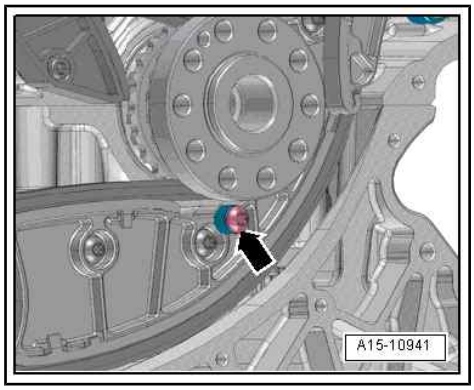


Caution

If a used timing chain rotates in the opposite direction when it is refitted, this can cause breakage.

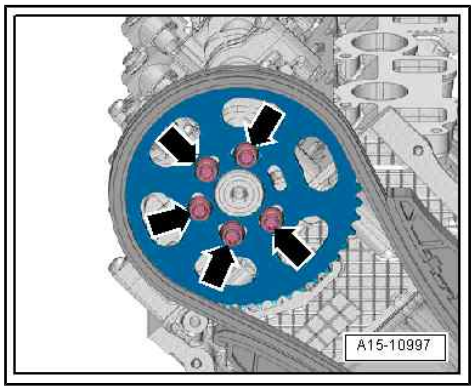
- ***Mark running direction of timing chain with coloured arrows for re-installation.***

– Remove bolt -arrow- for chain slip preventer.



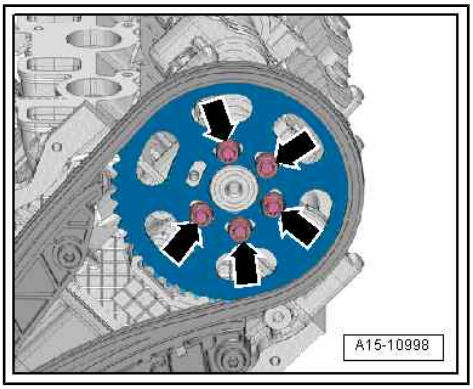
– Remove adjustment pin - T40060- from both camshafts.

– Remove bolts -arrows-.



– Remove bolts -arrows-.

– Remove camshaft sprockets and camshaft timing chain.



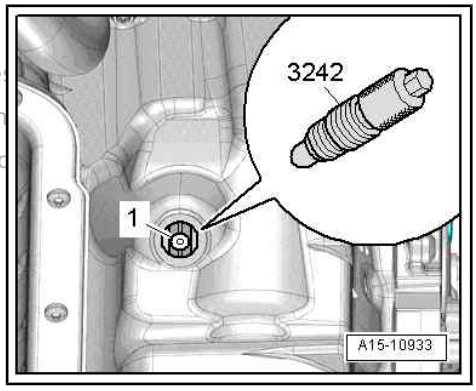
Installing

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

Tightening torques:

- ⇒ “3.1 Exploded view - camshaft timing chains”, page 166
- ⇒ “1.1.2 Exploded view - sump (top section)”, page 228

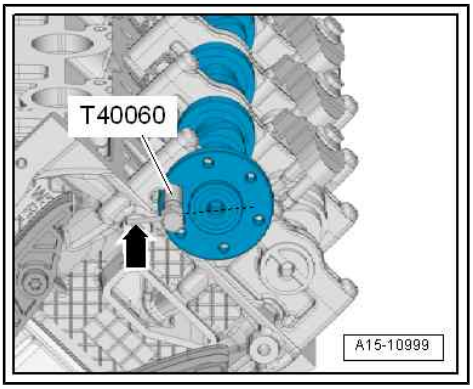


Note

- *Renew the seal on the screw plug for the “TDC” mark.*
- *Renew the bolts tightened with specified tightening angle.*

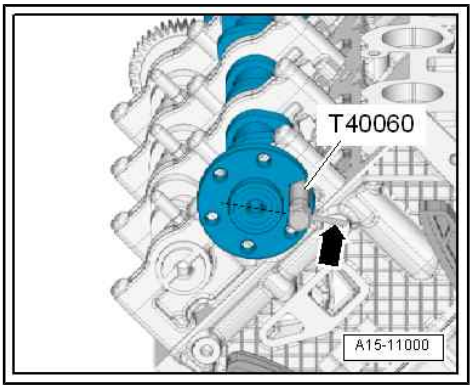
– Check that camshafts on both cylinder heads are positioned at “TDC”.

- It should be possible to lock the camshafts with the adjustment pins - T40060- .
- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft on cylinder bank 1 (right-side).



- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft on cylinder bank 2 (left-side).

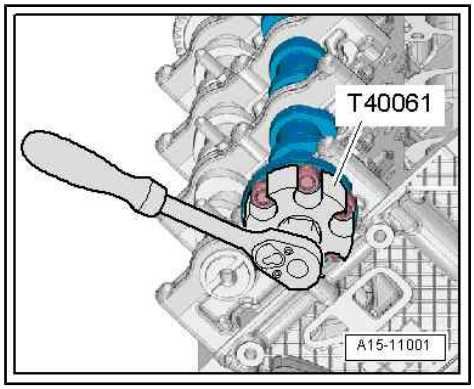
– Remove adjustment pin - T40060- from both camshafts.



Caution

Risk of damage to valves and piston crowns.

- ***The crankshaft must not be at "TDC" at any cylinder when the camshafts are to be turned.***



Note

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

– Fit camshaft sprocket (left-side) with camshaft timing chain.

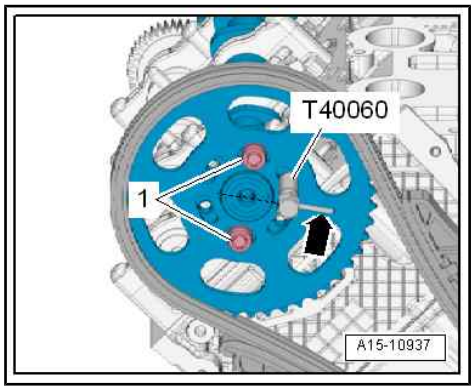
• The elongated holes in the camshaft chain sprocket must be aligned centrally over the threaded holes in the camshaft.

– First screw in two bolts -1- loosely for camshaft chain sprocket.

• It should just be possible to turn the sprocket on the camshaft without axial movement.

– Use adjustment pin - T40060- to lock camshaft (left-side).

• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.



– Fit camshaft sprocket (right-side) with camshaft timing chain.

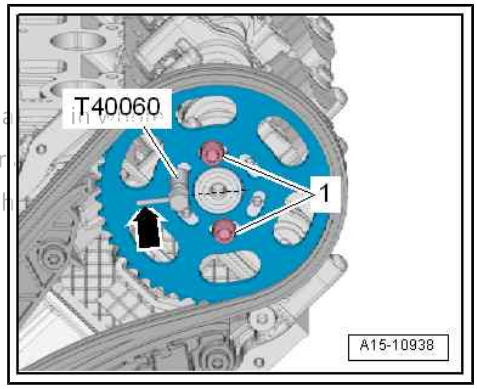
• The elongated holes in the camshaft chain sprocket must be aligned centrally over the threaded holes in the camshaft.

– First screw in two bolts -1- loosely for camshaft chain sprocket.

• It should just be possible to turn the sprocket on the camshaft without axial movement.

– Use adjustment pin - T40060- to lock camshaft (right-side).

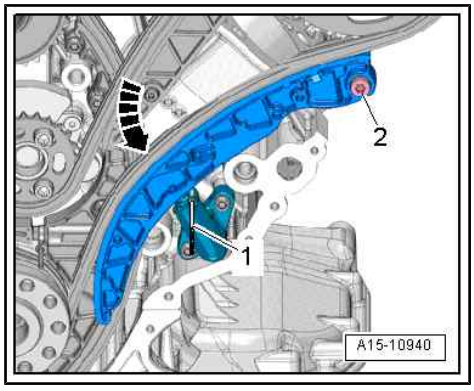
• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.



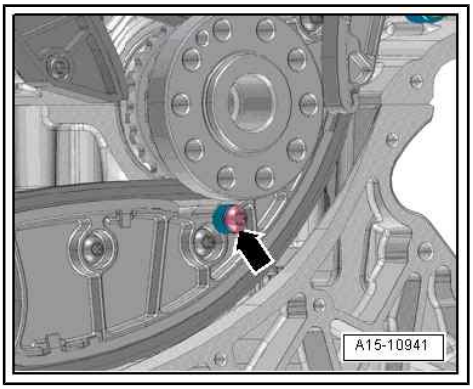
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– Secure tensioning rail with guide pin -2-.

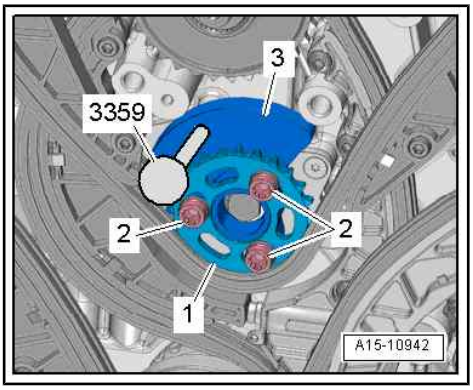
– Pull locking pin - T40316- -item 1- out of locating hole, this releases the chain tensioner (right-side).



– Screw in bolt -arrow- for chain slip preventer.



– Loosen bolts -2-.
– Lock balance shaft -3- with diesel injection pump locking pin -3359- , as shown in illustration.

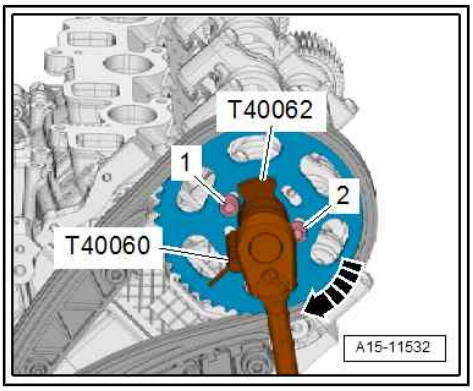


Note

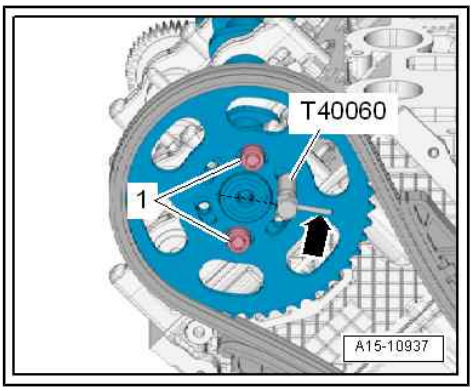
If necessary, remove bolts and bring balance shaft into position.

– Loosely screw in bolts -2-.
• It should just be possible to turn the sprocket -1- on the balance shaft without axial movement.

– With the help of a second mechanic, apply a torque of 20 Nm to camshaft chain sprocket (right-side) in clockwise direction -arrow- using a torque wrench and adapter - T40062- and maintain this torque.
– Tighten bolts -1- and -2- for camshaft chain sprocket (right-side).

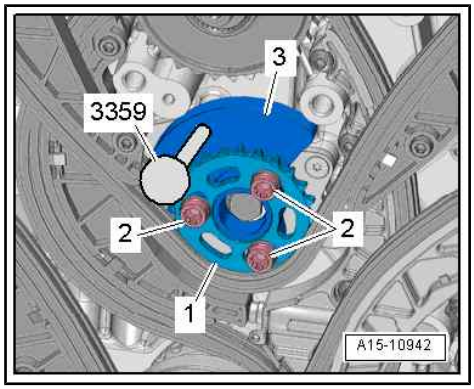


– Tighten bolts -1- for camshaft chain sprocket (left-side); while doing so, second mechanic must keep maintaining torque.

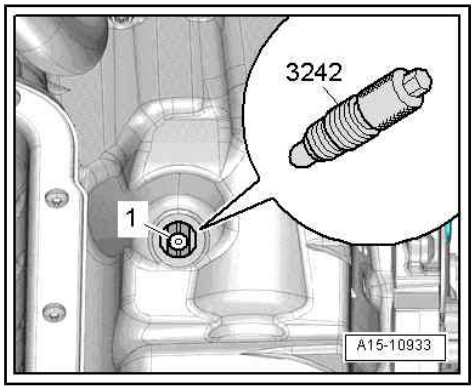


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– Tighten bolts -2- at chain sprocket -1- for balance shaft -3-.
– Remove diesel injection pump locking pin - 3359- , adapter - T40062- and adjustment pins -T40060- .
– Tighten remaining bolts for camshaft chain sprockets (both sides).



– Remove locking pin - 3242- .

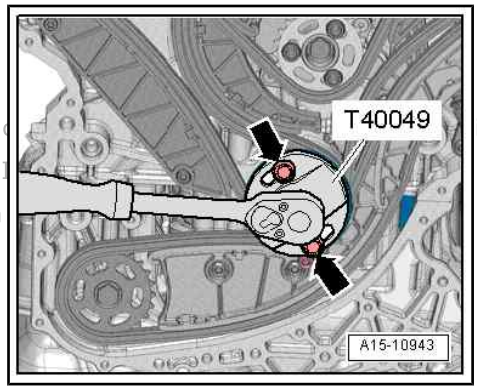


Checking valve timing

Caution

Irreparable damage can be caused if the camshaft timing chain slips.

- ***Turn crankshaft only in direction of engine rotation -arrow-.***



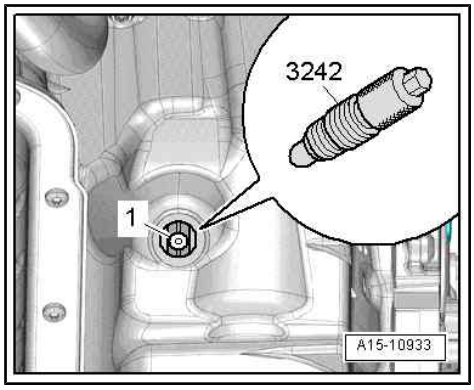
– Turn crankshaft two rotations until it is again positioned just before “TDC”.

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

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 locking pin - 3242- .***

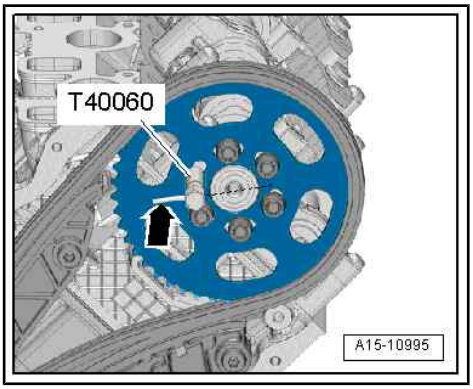


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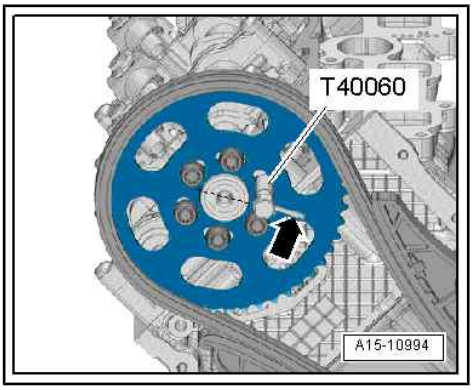
– Check that camshafts on both cylinder heads are positioned at “TDC”.

• It should be possible to lock the camshafts with the adjustment pins - T40060- .

• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft on cylinder bank 1 (right-side).

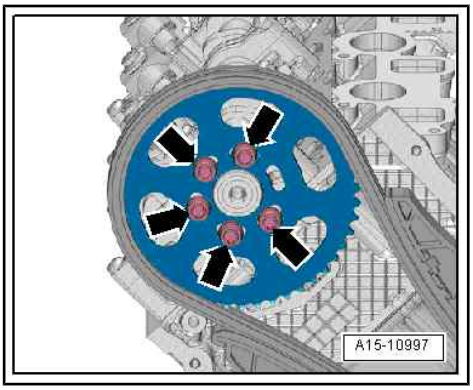


• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft on cylinder bank 2 (left-side).



Adjusting valve timing

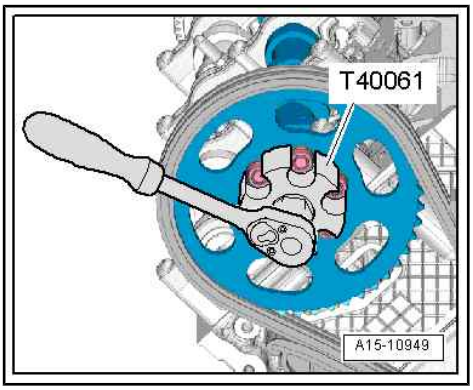
– If the pin cannot be inserted in one of the camshafts, loosen all bolts -arrows- of relevant camshaft chain sprocket approx. 1 turn.



– Apply adapter - T40061- to the heads of the loosened bolts.

– Turn camshaft slightly backwards and forwards with adapter - T40061- until adjustment pin - T40060- can be inserted.

• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.



– With adapter - T40061- and adjustment pin - T40060- still in position, tighten bolts on camshaft sprocket to approx. 5 Nm.

– Remove adjustment pin - T40060- and adapter - T40061- .

– Tighten bolts for camshaft chain sprocket to final torque.

– Repeat procedure on other cylinder bank if necessary.

– Remove locking pin - 3242- .

– Check valve timing once again ⇒ page 176 .

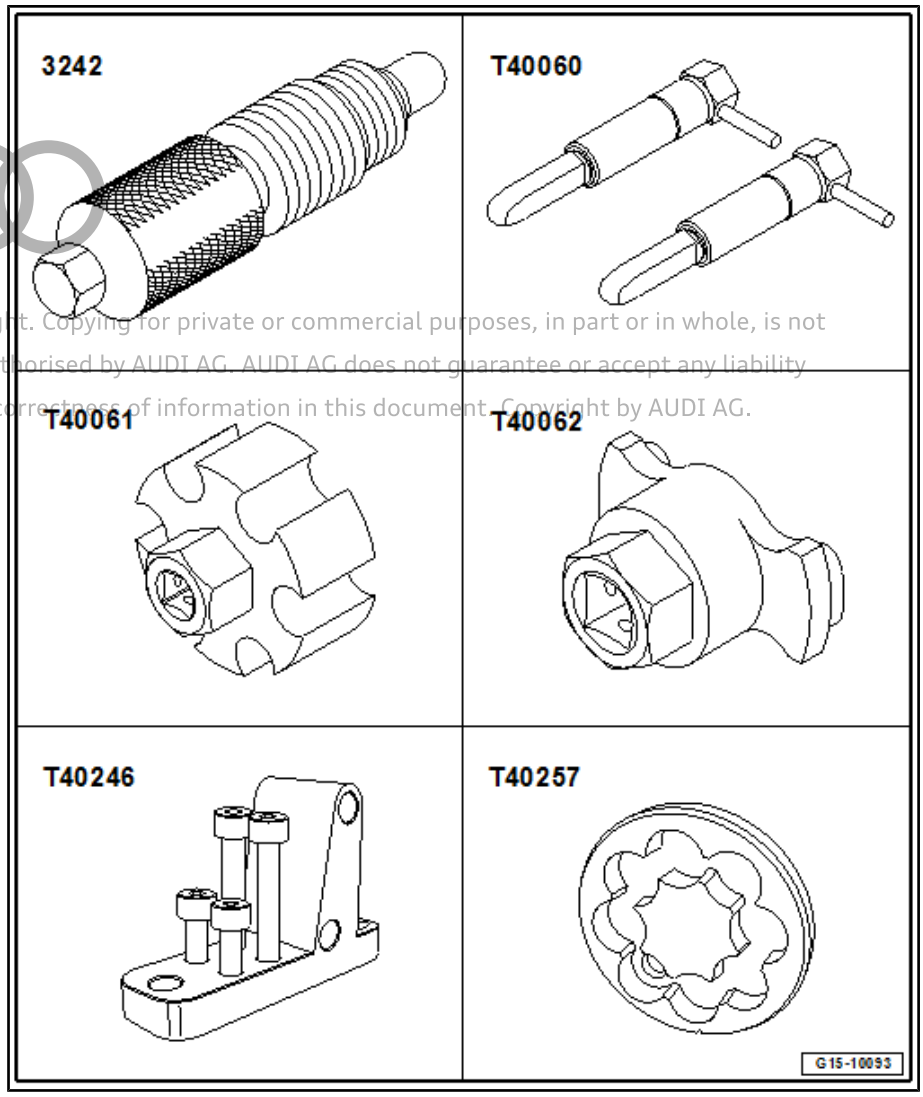
Remaining installation steps are carried out in reverse sequence; note the following:

– Install timing chain cover (bottom) ⇒ page 163 .

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3.4 Removing camshaft timing chain from camshafts

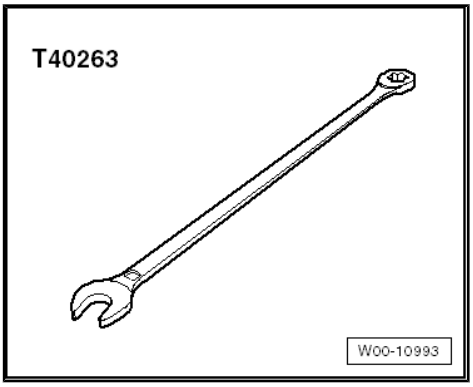
Special tools and workshop equipment required



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- Locking pin - 3242-
- Adjustment pin - T40060- (2x)
- Adapter - T40061-
- Adapter - T40062-
- Bracket - T40246-
- Turning-over tool - T40257-

♦ Wrench, 21 mm - T40263-



♦ Adapter -T40314-

♦ Bolt, M6x20 (2x)

♦ Bolt, M6x40 (2x)

Removing

• Engine and gearbox in vehicle

Note

When working on the bank 1 cylinder head (right-side) only, it is not necessary to remove the timing chain cover on the bank 2 cylinder head (left-side).

– Remove timing chain covers (top) ⇒ page 160 .

– Assemble tools as shown in illustration.

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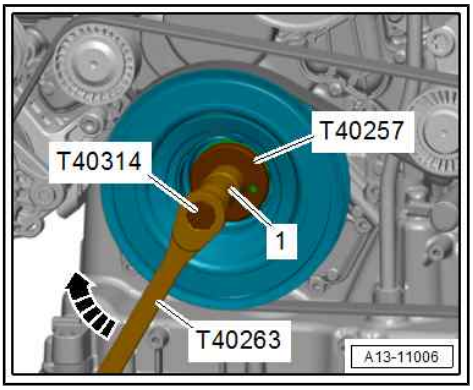
1 - Socket (21 mm) for 1/2" drive



Caution

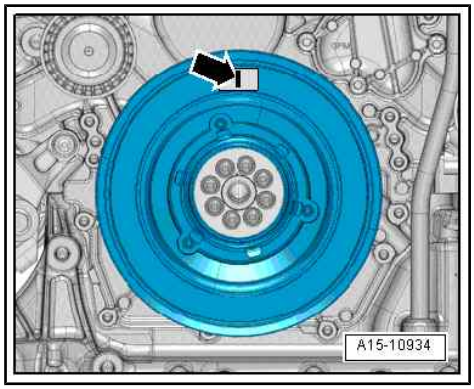
Irreparable damage can be caused if the camshaft timing chain slips.

- ***Turn crankshaft only in direction of engine rotation -arrow-.***



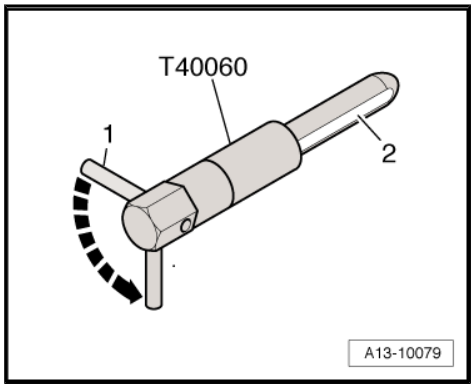
– Turn crankshaft until vibration damper is at “TDC” position.

• Mark (stuck on) -arrow- must be vertical.



Note

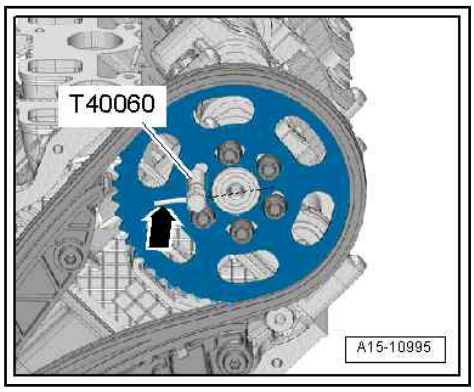
- *The adjustment pin - T40060- has a flat -2- which makes it easier to insert when the locating bores in the camshaft and cylinder head are not exactly in line.*
- *The adjustment pin is inserted initially so that the side pin -1- is perpendicular to the imaginary line between the adjustment pin and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



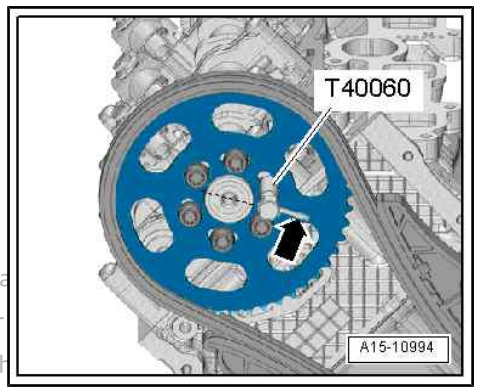
– Check that camshafts on both cylinder heads are positioned at “TDC”.

• It should be possible to lock the camshafts with the adjustment pins - T40060- .

• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft on cylinder bank 1 (right-side).



• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft on cylinder bank 2 (left-side).

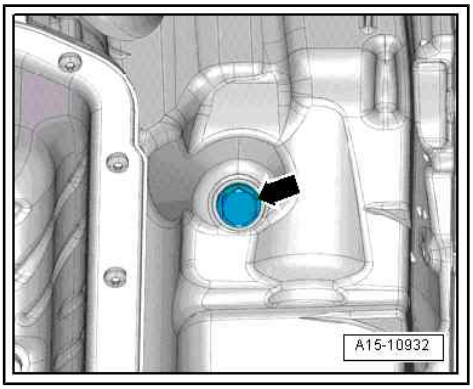


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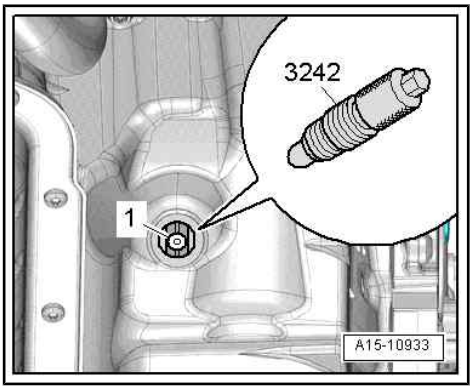
Note

Place a cloth beneath the sump (top section) to catch escaping oil.

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

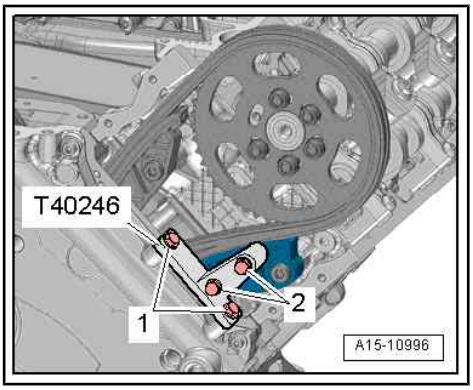


– Screw locking pin - 3242- into hole (20 Nm); if necessary, turn crankshaft backwards and forwards slightly to fully centralise locking pin.



– Secure bracket - T40246- as shown in illustration.

Stage	Bolts	Tightening torque
1.	-1- M6x40	Screw in by hand until contact is made
2.	-2, 3- M6x20	Screw in by hand until contact is made
3.	-2- M6x40	8 Nm
4.	-1, 3- M6x20	8 Nm



Caution

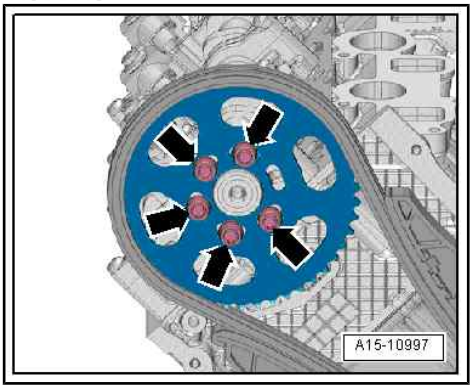
Risk of irreparable damage to engine.

- ***Block off the opening in the valve timing housing with a clean cloth to prevent small items from dropping into the engine.***

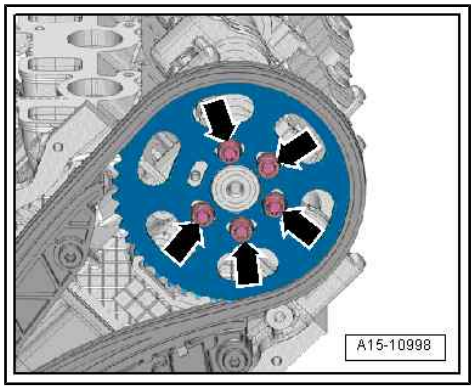
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– Remove adjustment pin - T40060- from both camshafts.

– Remove bolts -arrows-.



– Remove bolts -arrows-.
– Remove camshaft sprockets and camshaft timing chain.

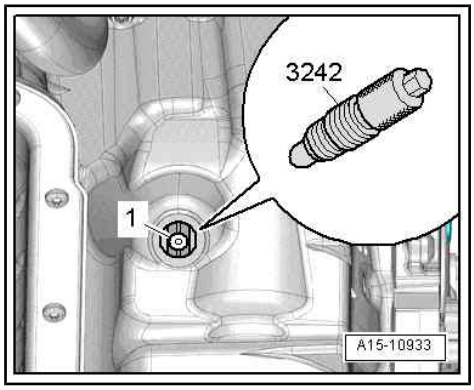


Installing

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

Tightening torques:

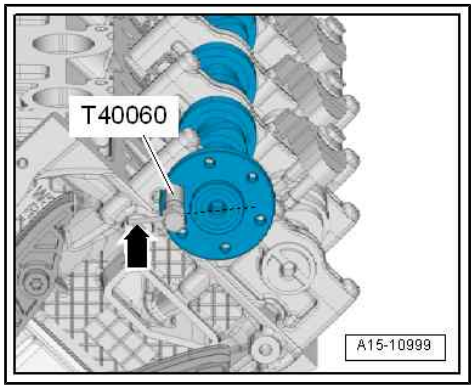
- ⇒ “3.1 Exploded view - camshaft timing chains”, page 166
- ⇒ “1.1.2 Exploded view - sump (top section)”, page 228



Note

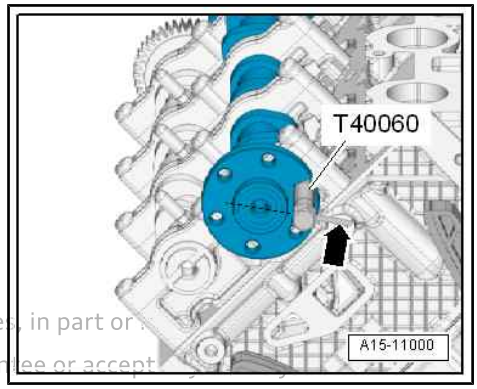
- *Renew the bolts tightened with specified tightening angle.*
- *Renew the seal on the screw plug for the “TDC” mark.*

– Check that camshafts on both cylinder heads are positioned at “TDC”.
- It should be possible to lock the camshafts with the adjustment pins - T40060- .
- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft on cylinder bank 1 (right-side).



- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft on cylinder bank 2 (left-side).

– Remove adjustment pin - T40060- from both camshafts.



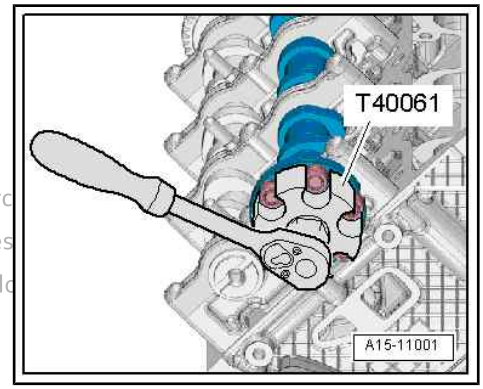
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Caution

Risk of damage to valves and piston crowns.

- ***The crankshaft must not be at "TDC" at any cylinder when the camshafts are to be turned.***

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Note

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

– Fit camshaft sprocket (left-side) with camshaft timing chain.

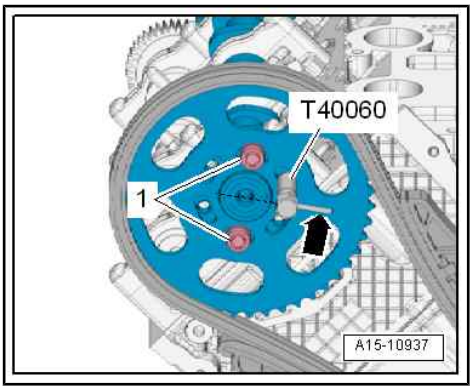
• The elongated holes in the camshaft chain sprocket must be aligned centrally over the threaded holes in the camshaft.

– First screw in two bolts -1- loosely for camshaft chain sprocket.

• It should just be possible to turn the sprocket on the camshaft without axial movement.

– Use adjustment pin - T40060- to lock camshaft (left-side).

• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.



– Fit camshaft sprocket (right-side) with camshaft timing chain.

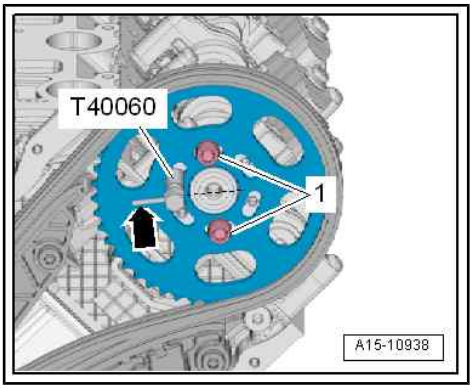
• The elongated holes in the camshaft chain sprocket must be aligned centrally over the threaded holes in the camshaft.

– First screw in two bolts -1- loosely for camshaft chain sprocket.

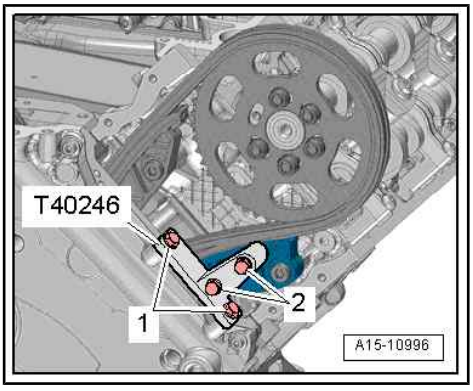
• It should just be possible to turn the sprocket on the camshaft without axial movement.

– Use adjustment pin - T40060- to lock camshaft (right-side).

• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.

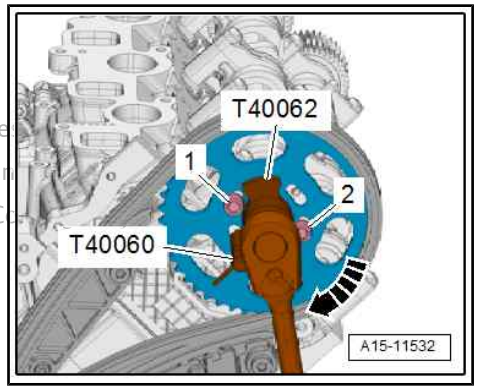


– Remove bracket - T40246- .

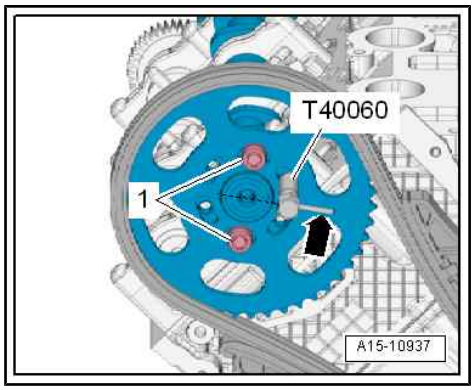


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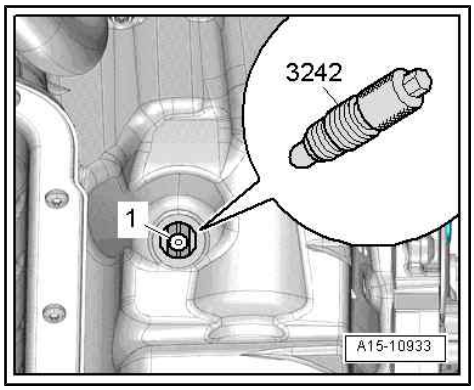
– With the help of a second mechanic, apply a torque of 20 Nm to camshaft chain sprocket (right-side) in clockwise direction -arrow- using a torque wrench and adapter - T40062- and maintain this torque.
– Tighten bolts -1- and -2- for camshaft chain sprocket (right-side).



– Tighten bolts -1- for camshaft chain sprocket (left-side); while doing so, second mechanic must keep maintaining torque.
– Remove adapter - T40062- and adjustment pins -T40060- .
– Tighten remaining bolts for camshaft chain sprockets (both sides).



– Remove locking pin - 3242- .

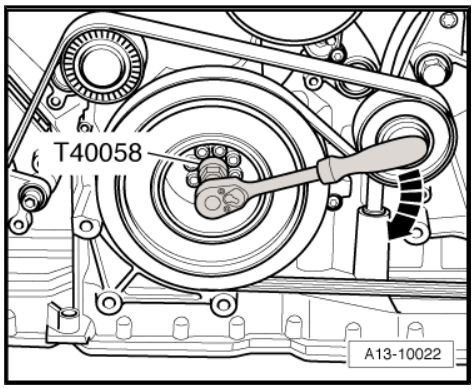


Checking valve timing

Caution

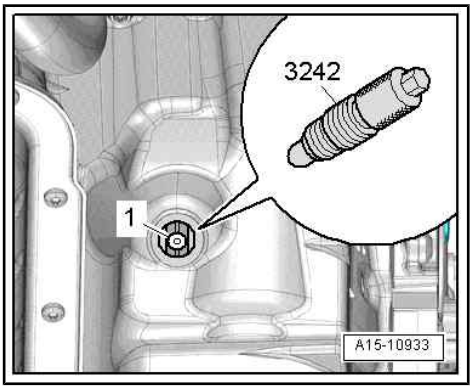
Irreparable damage can be caused if the camshaft timing chain slips.

- ***Turn crankshaft only in direction of engine rotation -arrow-.***



– Turn crankshaft two rotations until it is again positioned just before “TDC”.

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

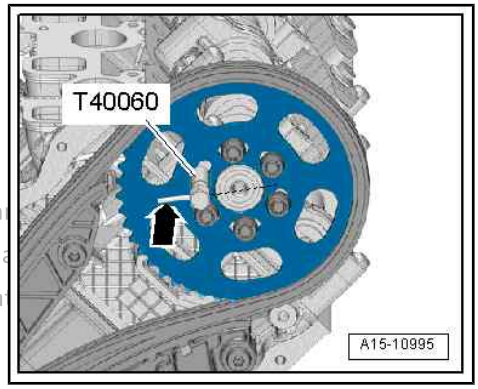


Caution

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 locking pin - 3242- .***

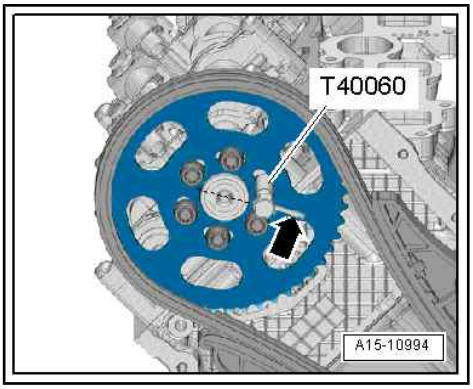
– Check that camshafts on both cylinder heads are positioned at "TDC".



- It should be possible to lock the camshafts with the adjustment pins - T40060- .
- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft on cylinder bank 1 (right-side).

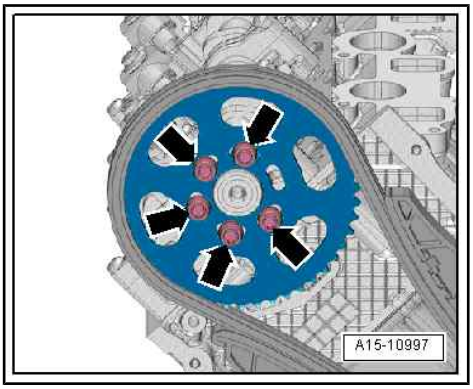
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- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft on cylinder bank 2 (left-side).

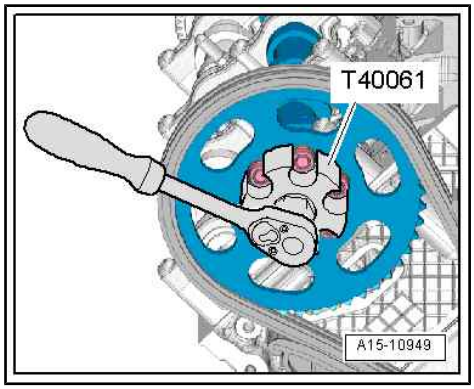


Adjusting valve timing

– If the pin cannot be inserted in one of the camshafts, loosen all bolts -arrows- of relevant camshaft chain sprocket approx. 1 turn.



– Apply adapter - T40061- to the heads of the loosened bolts.
– Turn camshaft slightly backwards and forwards with adapter - T40061- until adjustment pin - T40060- can be inserted.
• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.
– With adapter - T40061- and adjustment pin - T40060- still in position, tighten bolts on camshaft sprocket to approx. 5 Nm.
– Remove adjustment pin - T40060- and adapter - T40061- .
– Tighten bolts for camshaft chain sprocket to final torque.
– Repeat procedure on other cylinder bank if necessary.
– Remove locking pin - 3242- .
– Check valve timing once again ⇒ page 184 .



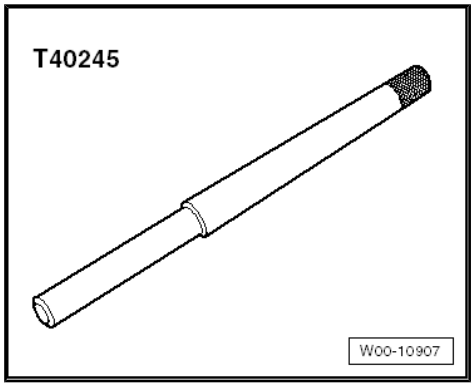
Remaining installation steps are carried out in reverse sequence; note the following:

– Install timing chain covers (top) ⇒ page 160 .

3.5 Removing and installing drive chain for oil pump and high-pressure pump

Special tools and workshop equipment required

♦ Locking pin - T40245-



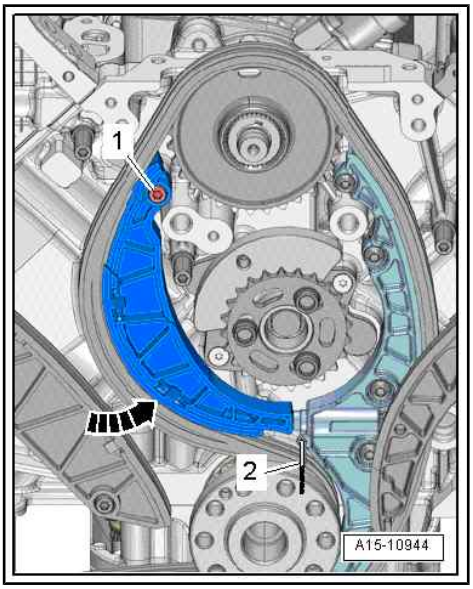
♦ Locking pin -T40316-

Removing

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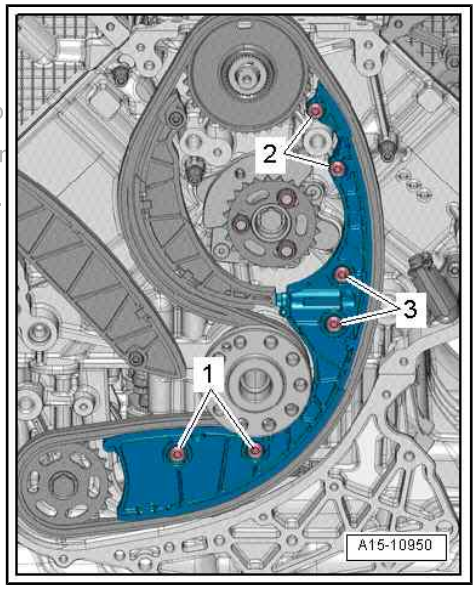
– Remove timing chain cover (bottom) ⇒ page 163 .
– Remove camshaft timing chain ⇒ page 169 .
– Remove both guide rails (top) for camshaft timing chain.

– Press tensioning rail of chain tensioner in direction of -arrow- and lock chain tensioner by inserting locking pin -T40316- -item 2-.
– Unscrew bolt -1- and remove tensioning rail.



– Remove bolts -1, 2, 3- and take off chain tensioner for drive chain for oil pump and high-pressure pump.
– Detach drive chain for oil pump and high-pressure pump.

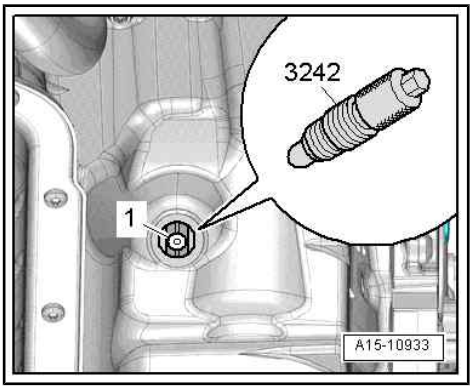
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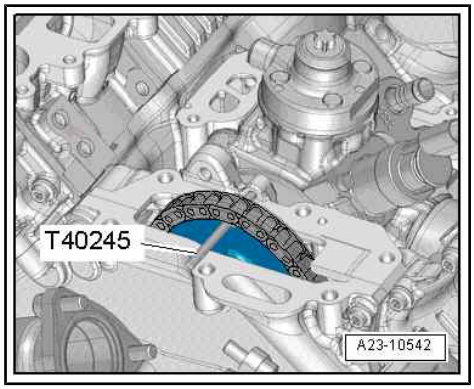
Installing

• Crankshaft -1- locked in “TDC” position with locking pin -3242- .

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



– Lock chain sprocket for high-pressure pump in position using locking pin - T40245- .



Note

The illustration shows the chain sprocket with the timing chain cover (bottom) installed.

– Install camshaft timing chain ⇒ page 169 .
– Remove locking pin - T40245- for chain sprocket for high-pressure pump.
– Install timing chain cover (bottom) ⇒ page 163 .

Tightening torques

◆ ⇒ “3.2 Exploded view - drive chain for oil pump and high-pressure pump”, page 168

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4 Valve gear

⇒ “4.1 Exploded view - valve gear”, page 189

⇒ “4.2 Measuring axial clearance of camshaft”, page 192

⇒ “4.3 Measuring radial clearance of camshaft”, page 193

⇒ “4.4 Removing and installing camshaft”, page 194

⇒ “4.5 Removing and installing valve stem oil seals”, page 215

4.1 Exploded view - valve gear

Caution

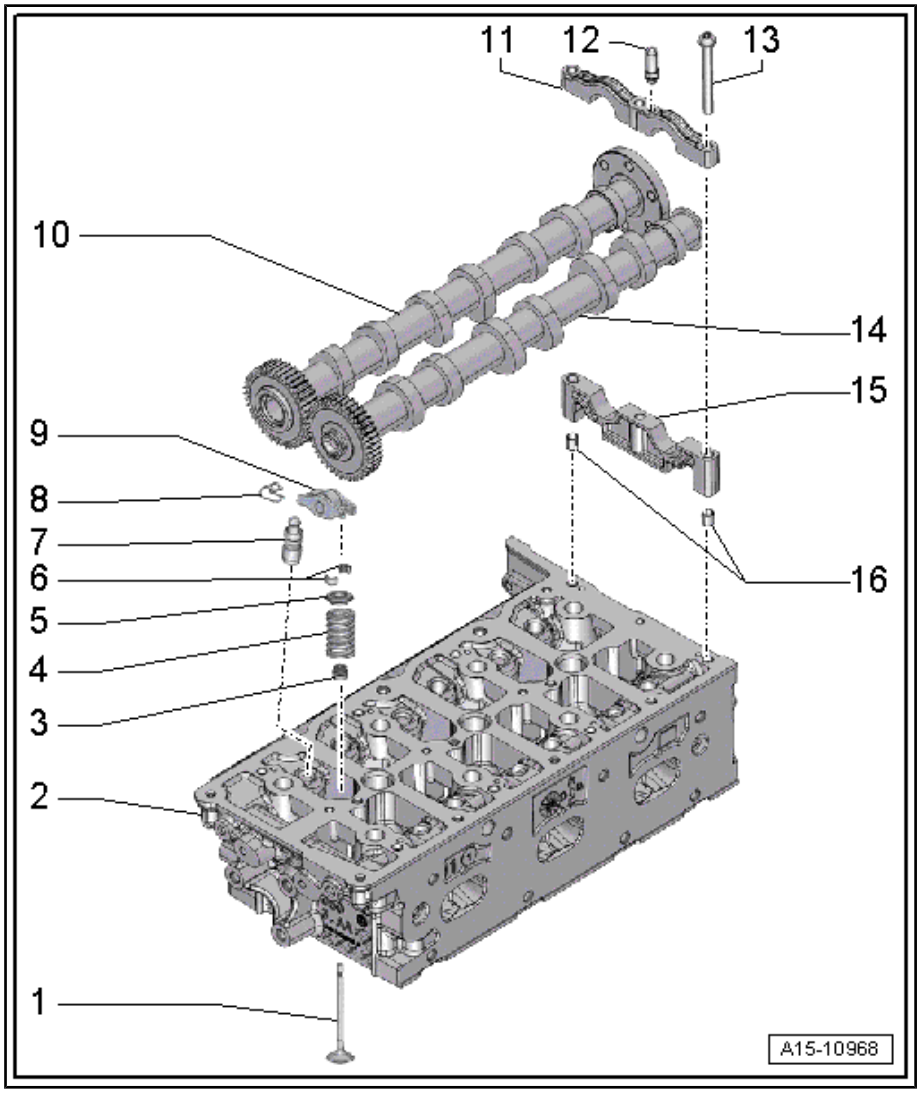
Risk of damage to valves and piston crowns after working on valve gear.

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

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Note

Illustration shows the cylinder head for cylinder bank 2 (left-side).



1 - Valve

- ❑ Do not machine, only grinding-in is permitted
- ❑ Mark installation position for re-installation
- ❑ Checking ⇒ page 223
- ❑ Valve dimensions ⇒ page 224
- ❑ Checking valve guides ⇒ page 222

2 - Cylinder head

- ❑ Checking valve guides ⇒ page 222
- ❑ Machining valve seats ⇒ page 222

3 - Valve stem oil seal

- ❑ Renewing with cylinder head installed ⇒ page 215
- ❑ Renewing with cylinder head removed ⇒ page 219

4 - Valve spring

5 - Valve spring plate

6 - Valve cotters

7 - Hydraulic compensation element

- ❑ Clipped into roller rocker finger -item 9-
- ❑ Mark installation position for re-installation
- ❑ Lubricate contact surfaces before installing

8 - Securing clip

- ❑ Not supplied separately
- ❑ Check for firm attachment

9 - Roller rocker finger

- ❑ Mark installation position for re-installation
- ❑ Check roller bearings for ease of movement
- ❑ Lubricate contact surfaces before installing
- ❑ Assembly: attach to hydraulic compensation element -item 7- using securing clip -item 8-

10 - Inlet camshaft

- ❑ Removing and installing:

◆ ⇒ “4.4.1 Removing camshafts and re-installing used camshafts - cylinder bank 1 (right-side)”, page 194

◆ ⇒ “4.4.2 Removing and renewing camshafts or camshaft bearings - cylinder bank 1 (right-side)”, page 200

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◆ ⇒ “4.4.3 Removing camshafts and re-installing used camshafts - cylinder bank 2 (left-side)”, page 206

◆ ⇒ “4.4.4 Removing and renewing camshafts or camshaft bearings - cylinder bank 2 (left-side)”, page 210

- ❑ Measuring axial clearance ⇒ page 192
- ❑ Measuring radial clearance ⇒ page 193
- ❑ Runout: max. 0.01 mm

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11 - Bearing cap

- ❑ Removing and installing ⇒ “4.4.1 Removing camshafts and re-installing used camshafts - cylinder bank 1 (right-side)”, page 194
- ❑ Note installation position

12 - Support bracket

- ❑ For clamping piece
- ❑ Tightening torque ⇒ page 351

13 - Bolt

- ❑ Tightening torque and tightening sequence: cylinder bank 1 (right-side) ⇒ page 191 , cylinder bank 2 (left-side) ⇒ page 192

14 - Exhaust camshaft

- ❑ Removing and installing:

- ◆ ⇒ “4.4.1 Removing camshafts and re-installing used camshafts - cylinder bank 1 (right-side)”, page 194
- ◆ ⇒ “4.4.2 Removing and renewing camshafts or camshaft bearings - cylinder bank 1 (right-side)”, page 200
- ◆ ⇒ “4.4.3 Removing camshafts and re-installing used camshafts - cylinder bank 2 (left-side)”, page 206
- ◆ ⇒ “4.4.4 Removing and renewing camshafts or camshaft bearings - cylinder bank 2 (left-side)”, page 210

- ❑ Measuring axial clearance ⇒ page 192
- ❑ Measuring radial clearance ⇒ page 193
- ❑ Runout: max. 0.01 mm

15 - Bearing pedestal

- ❑ Removing and installing:

- ◆ ⇒ “4.4.1 Removing camshafts and re-installing used camshafts - cylinder bank 1 (right-side)”, page 194
- ◆ ⇒ “4.4.3 Removing camshafts and re-installing used camshafts - cylinder bank 2 (left-side)”, page 206

- ❑ Note installation position

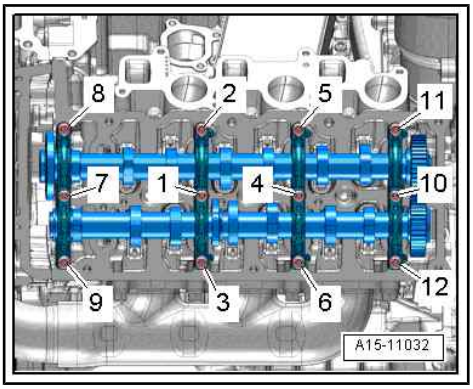
16 - Spring pins

- ❑ Only for bearing pedestal (rear) with camshaft axial bearing

Bearing cap, cylinder bank 1 (right-side) - tightening torque and sequence

– Tighten bolts in 2 stages in the sequence shown:

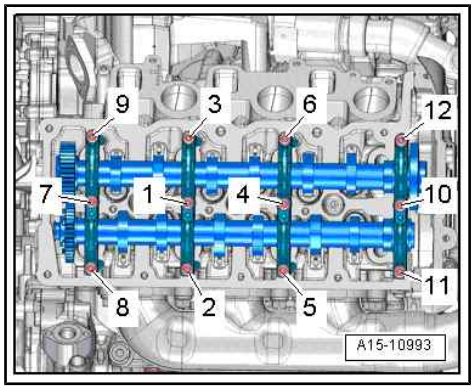
Stage	Bolts	Tightening torque
1.	-1 … 12-	Screw in by hand until contact is made
2.	-1 … 12-	9 Nm



Bearing cap, cylinder bank 2 (left-side) - tightening torque and sequence

– Tighten bolts in 2 stages in the sequence shown:

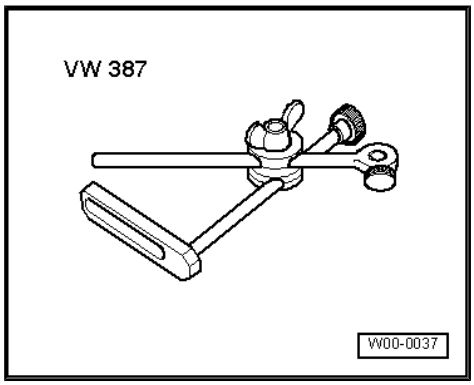
Stage	Bolts	Tightening torque
1.	-1 … 12-	Screw in by hand until contact is made
2.	-1 … 12-	9 Nm



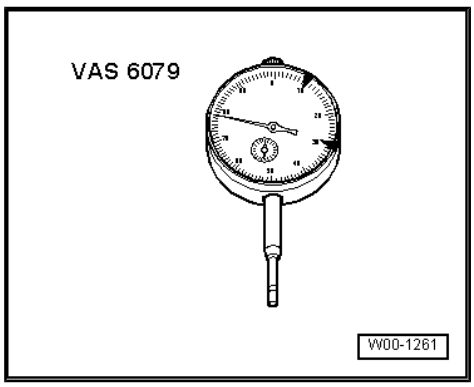
4.2 Measuring axial clearance of camshaft

Special tools and workshop equipment required

♦ Universal dial gauge bracket - VW 387-



♦ Dial gauge - VAS 6079-



Procedure

– Remove camshafts ⇒ page 194 .

– Mark allocation of roller rocker fingers for re-installation.

– Carefully remove roller rocker fingers and place them on a clean surface.

– Re-install camshafts with outer bearing caps ⇒ page 192 .

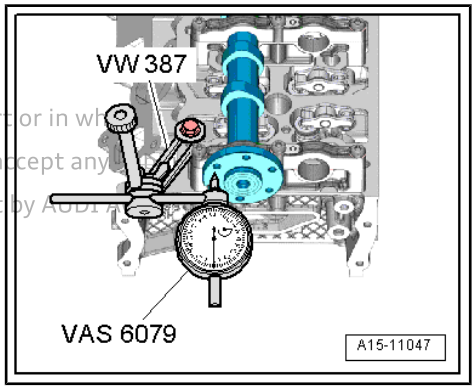
– Secure dial gauge - VAS 6079- with universal dial gauge bracket - VW 387- to cylinder head as shown in illustrations.

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Axial clearance (inlet camshaft)

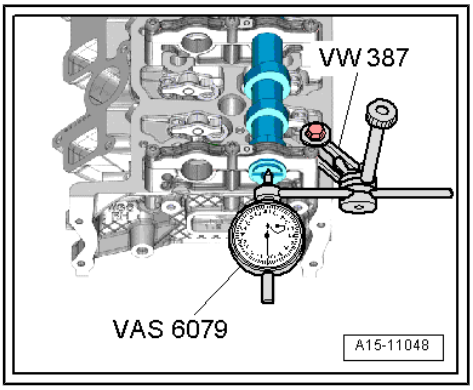
- Specification: 0.0682 … 0.0750 mm.

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Axial clearance (exhaust camshaft)

- Specification: 0.0682 … 0.0750 mm.



4.3 Measuring radial clearance of camshaft

Special tools and workshop equipment required

♦ Plastigauge

Procedure

– Remove camshafts ⇒ page 194 .

– Mark allocation of roller rocker fingers for re-installation.

– Carefully remove roller rocker fingers and place them on a clean surface.

– Clean bearings and bearing journals.

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

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

– Re-insert camshafts, fit bearing cap and secure with old bolts without rotating camshafts.

♦ Bearing cap, cylinder bank 1 (right-side) - tightening torque and sequence ⇒ page 191

♦ Bearing cap, cylinder bank 2 (left-side) - tightening torque and sequence ⇒ page 192

– Remove camshafts with bearing caps again.

– Compare width of Plastigauge with measurement scale.

Radial clearance:

• New: 0.037 ... 0.063 mm.

4.4 Removing and installing camshaft

⇒ “4.4.1 Removing camshafts and re-installing used camshafts - cylinder bank 1 (right-side)”, page 194

⇒ “4.4.2 Removing and renewing camshafts or camshaft bearings - cylinder bank 1 (right-side)”, page 200

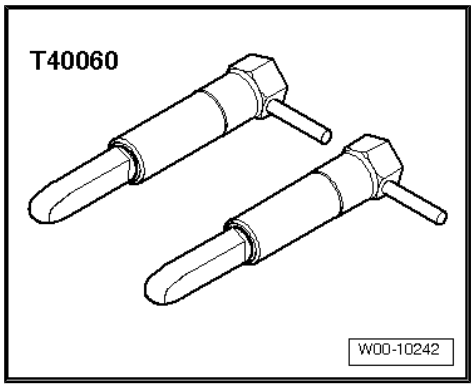
⇒ “4.4.3 Removing camshafts and re-installing used camshafts - cylinder bank 2 (left-side)”, page 206

⇒ “4.4.4 Removing and renewing camshafts or camshaft bearings - cylinder bank 2 (left-side)”, page 210

4.4.1 Removing camshafts and re-installing used camshafts - cylinder bank 1 (right-side)

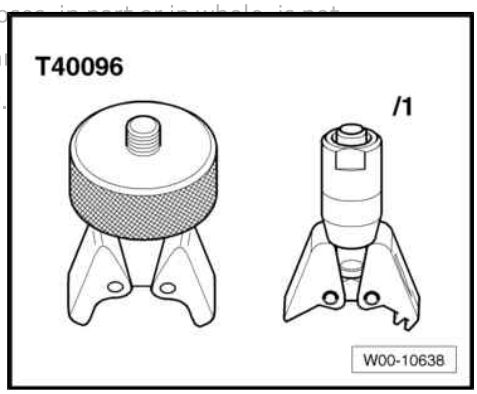
Special tools and workshop equipment required

- Adjustment pin - T40060-



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- Camshaft fitting tool - T40096-

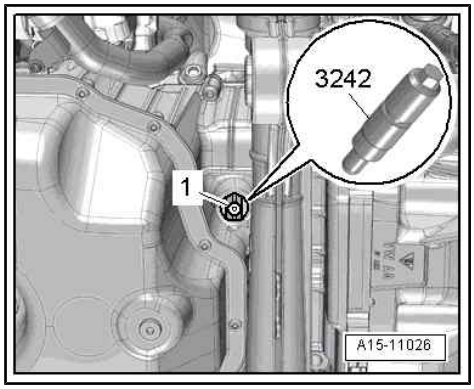


- Gauge -T40311-
- Locking pin - 3242-

Removing

– Remove timing chain from inlet camshaft ⇒ page 178 .

• Crankshaft -1- locked in “TDC” position with locking pin - 3242- .

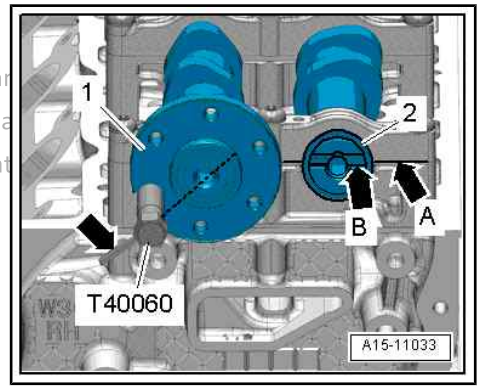


– Check “TDC” position of camshafts:

• It should be possible to lock the inlet camshaft -1- with the adjustment pin - T40060- .

• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.

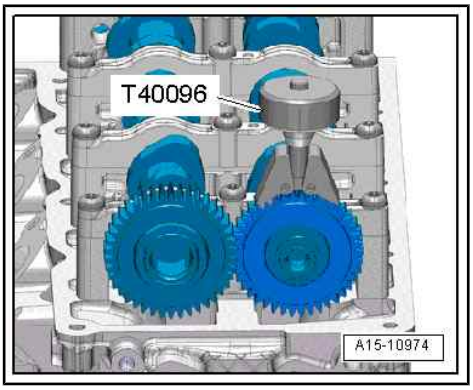
• Exhaust camshaft -2- must be set so that groove -arrow B- is parallel above joint -arrow A- between bearing pedestal and bearing cap.



– Place camshaft fitting tool - T40096- on teeth of inlet camshaft so that the two arms of the tool engage on the two halves of the gear (one in each half, as shown in illustration).

• The wider arm must engage in the wider half of the gear.

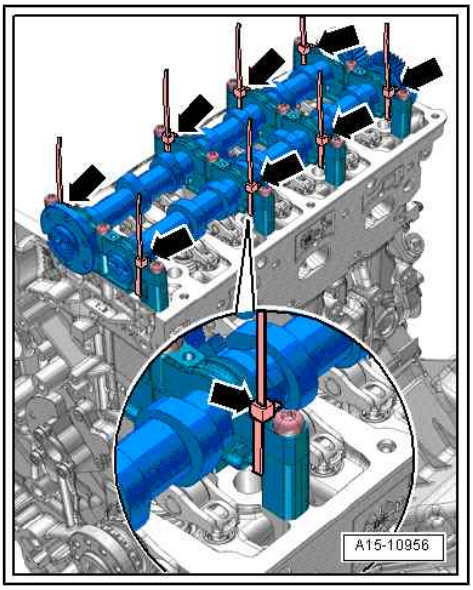
– Tighten the clamping tool using the knurled wheel so that the faces of the gear teeth are in alignment.



– Wrap one cable tie -arrows- on each side around bearing pedestal and bearing cap and secure.

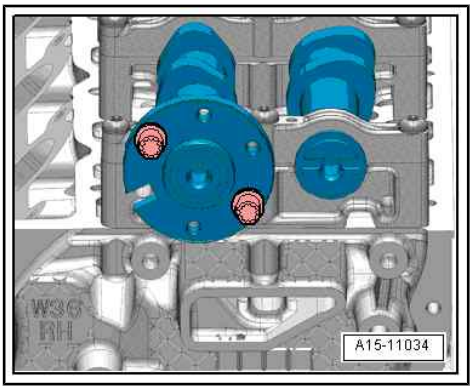
Note

With the cable ties it is possible to detach the camshafts together with the camshaft bearings. This prevents components from being interchanged.



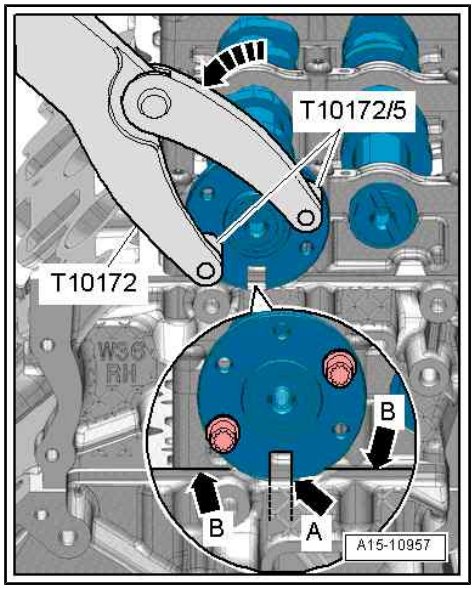
– Pull off adjustment pin - T40060- .

– Screw two bolts for camshaft chain sprocket five turns into threaded holes in camshaft, as shown in illustration.



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– Fit counterhold tool - T10172- with adapters -T10172/5- on both bolts and turn camshafts approx. 30° in anti-clockwise direction -arrow- until groove -arrow A- in camshaft points vertically to sealing surface -arrows B- of cylinder head.

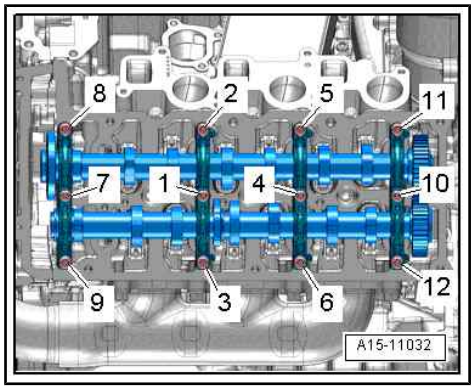


Caution

Risk of damage to valves.

- *Do not turn camshafts any further than specified.*

– Loosen bearing cap bolts in the sequence -12 ... 1-.



Note

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

– Carefully detach bearing caps together with camshafts.

Caution

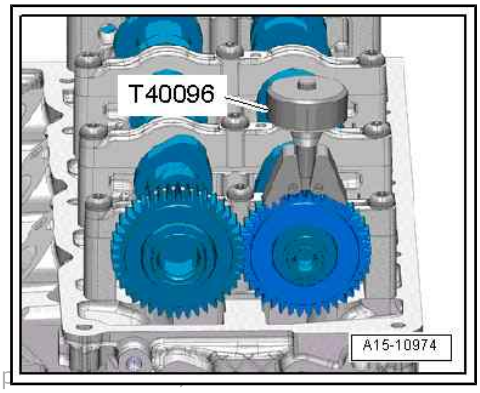
Do NOT interchange components!

- *Do not release cable ties until after re-installation.*

Installing

- Tightening torques
  ⇒ “4.1 Exploded view - valve gear”, page 189
- Crankshaft locked in “TDC” position with locking pin - 3242- .

– Place camshaft fitting tool - T40096- on teeth of inlet camshaft so that the two arms of the tool engage on the two halves of the gear (one in each half, as shown in illustration).

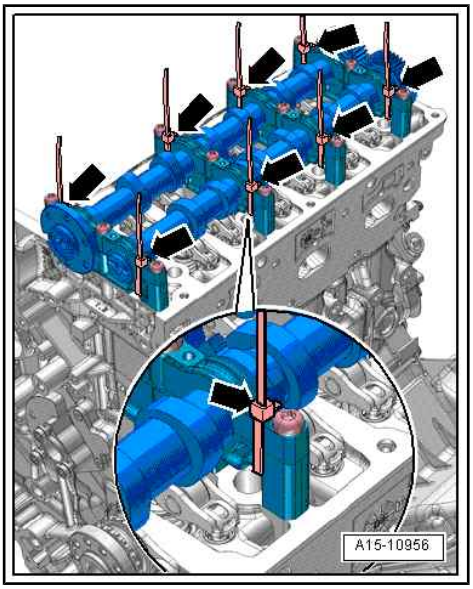


- The wider arm must engage in the wider half of the gear.

– Tighten the clamping tool using the knurled wheel so that the faces of the gear teeth are in alignment.

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– Fit camshafts and camshaft bearings (secured with cable ties -arrows-) on cylinder head.

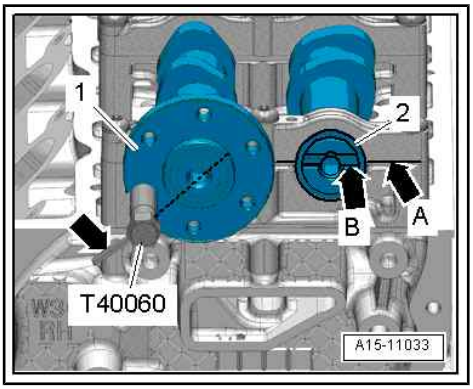


Note

The cable ties help to keep the camshafts and camshaft bearings straight when they are tightened.

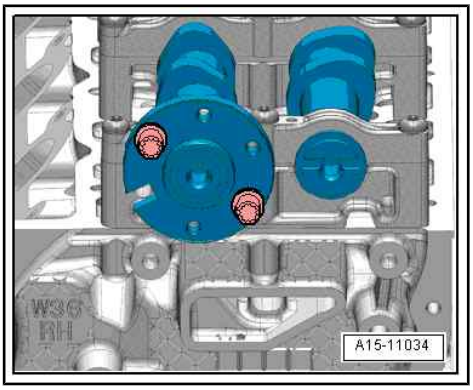
– Check “TDC” position of camshafts:

- It should be possible to lock the inlet camshaft -1- with the adjustment pin - T40060- .
- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.
- Exhaust camshaft -2- must be set so that groove -arrow A- is parallel above joint -arrow B- between bearing pedestal and bearing cap.



– Pull off adjustment pin - T40060- .

– Screw two bolts for camshaft chain sprocket five turns into threaded holes in camshaft, as shown in illustration.



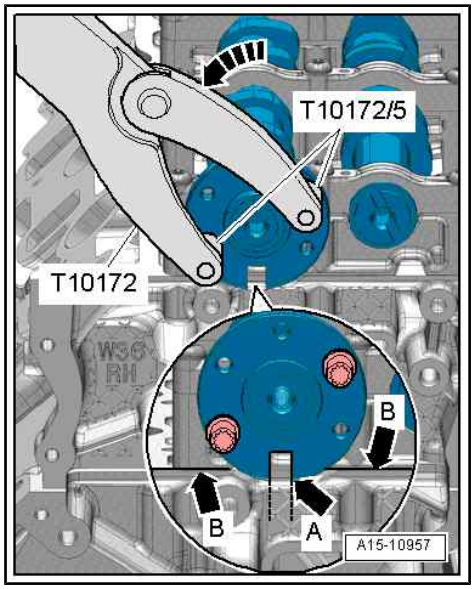
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– Fit counterhold tool - T10172- with adapters -T10172/5- on both bolts and turn camshafts approx. 30° in anti-clockwise direction -arrow- until groove -arrow A- in camshaft points vertically to sealing surface -arrows B- of cylinder head.

Caution

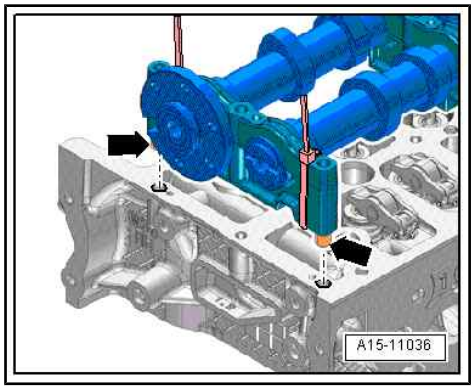
Risk of damage to valves.

- *Do not turn camshafts any further than specified.*

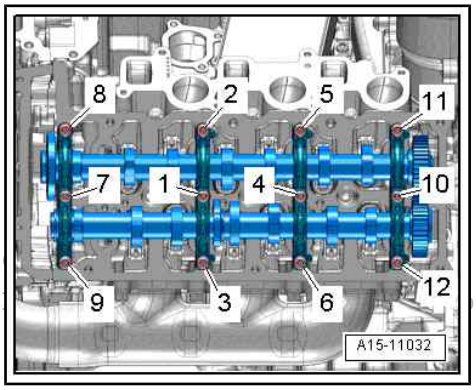


– Check installation position of dowel sleeves:

- Both dowel sleeves -arrows- must be inserted in holes in bearing pedestal “IV”.
- Dowel sleeves must engage in holes in cylinder head.

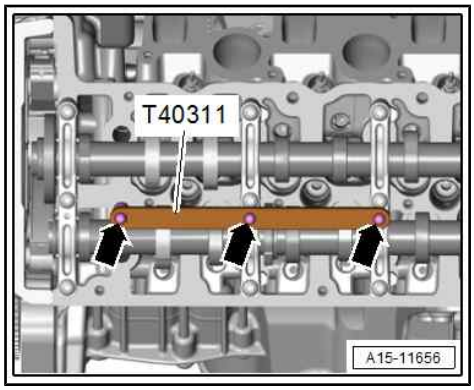


– Fit bolts -1 … 12- in bearing caps.

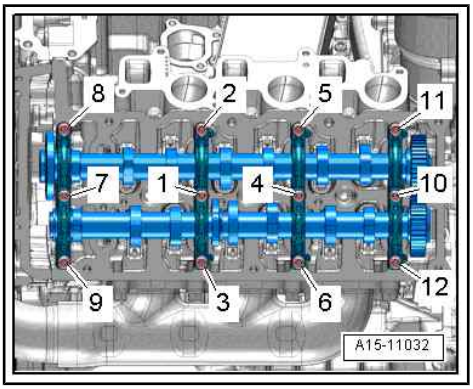


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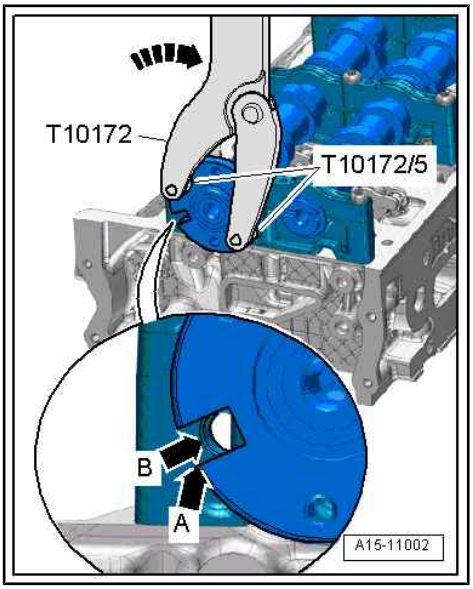
– Fit gauge -T40311- onto support brackets -arrows- for clamping pieces, as shown in illustration.



– Tighten bearing cap bolts ⇒ page 191 .



– Fit counterhold tool - T10172- with adapters -T10172/5- on both bolts and turn camshafts approx. 30° in clockwise direction -arrow- until groove -arrow A- in camshaft is aligned with hole -arrow B- for adjustment pin - T40060- .

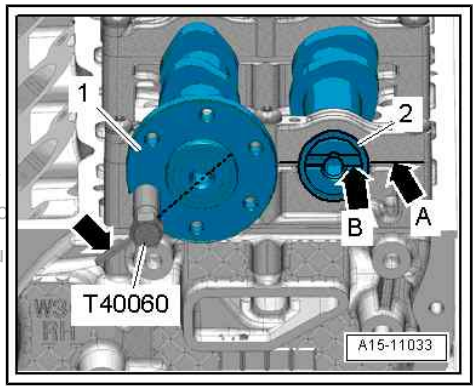


– Check “TDC” position of camshafts:

• It should be possible to lock the inlet camshaft -1- with the adjustment pin - T40060- .

• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.

• Exhaust camshaft -2- must be set so that groove -arrow A- is parallel above joint -arrow B- between bearing pedestal and bearing cap.



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

– Remove camshaft fitting tool - T40096- .

– Install camshaft timing chains ⇒ page 178 .

Caution

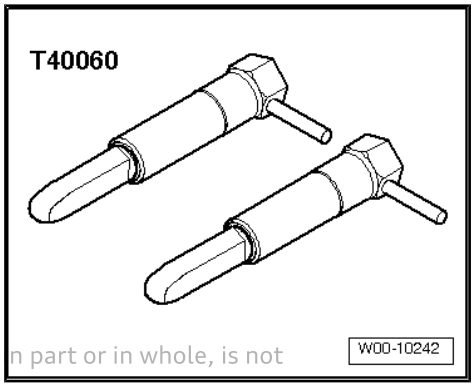
Risk of damage to valves and piston crowns after working on valve gear.

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

4.4.2 Removing and renewing camshafts or camshaft bearings - cylinder bank 1 (right-side)

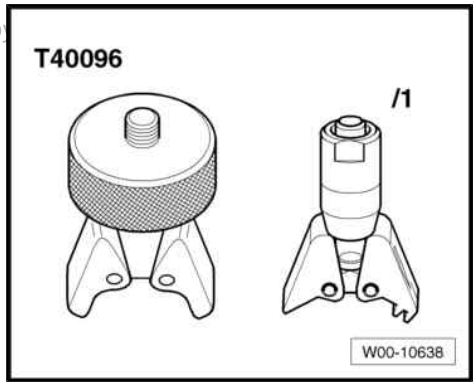
Special tools and workshop equipment required

- Adjustment pin - T40060-



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- Camshaft fitting tool - T40096-

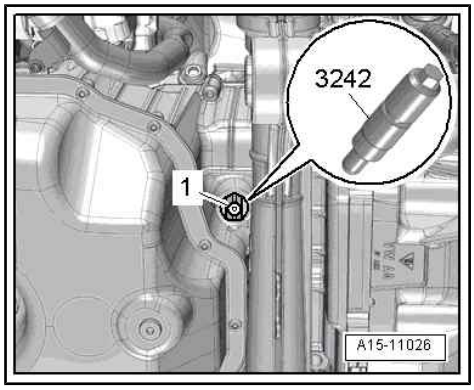


- Gauge -T40311-
- Locking pin - 3242-

Removing

– Remove timing chain from inlet camshaft ⇒ page 178 .

• Crankshaft -1- locked in “TDC” position with locking pin - 3242- .

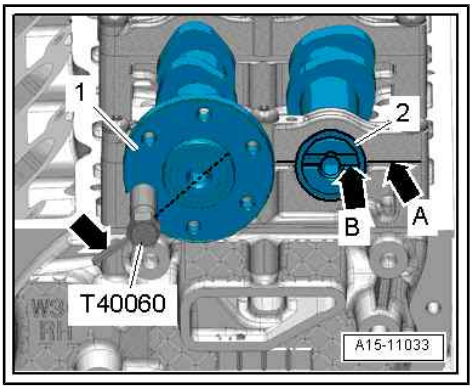


– Check “TDC” position of camshafts:

• It should be possible to lock the inlet camshaft -1- with the adjustment pin - T40060- .

• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.

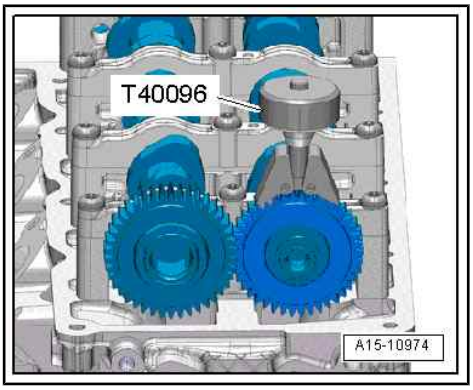
• Exhaust camshaft -2- must be set so that groove -arrow B- is parallel above joint -arrow A- between bearing pedestal and bearing cap.



– Place camshaft fitting tool - T40096- on teeth of inlet camshaft so that the two arms of the tool engage on the two halves of the gear (one in each half, as shown in illustration).

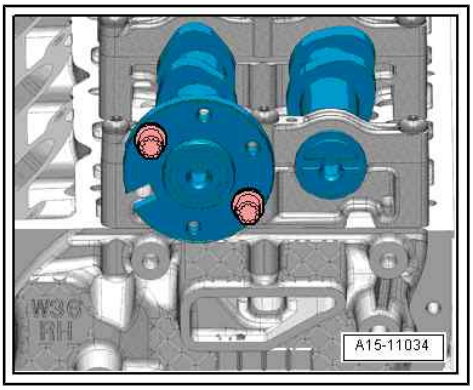
• The wider arm must engage in the wider half of the gear.

– Tighten the clamping tool using the knurled wheel so that the faces of the gear teeth are in alignment.



– Pull off adjustment pin - T40060- .

– Screw two bolts for camshaft chain sprocket five turns into threaded holes in camshaft, as shown in illustration.

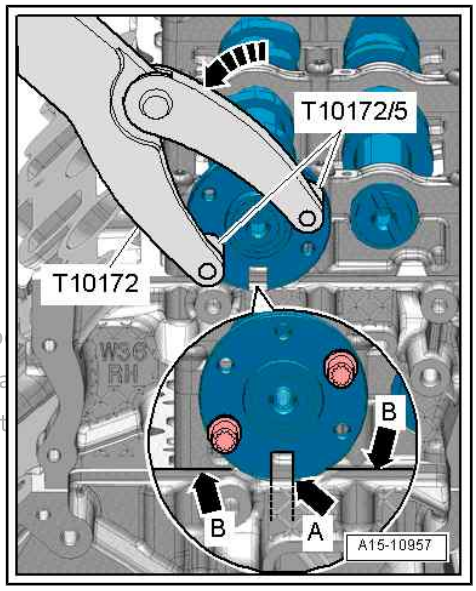


– Fit counterhold tool - T10172- with adapters -T10172/5- on both bolts and turn camshafts approx. 30° in anti-clockwise direction -arrow- until groove -arrow A- in camshaft points vertically to sealing surface -arrows B- of cylinder head.

Caution

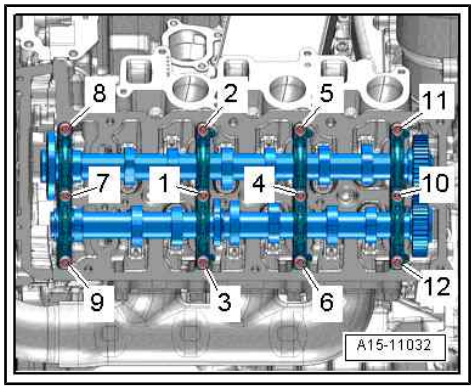
Risk of damage to valves.

- ***Do not turn camshafts any further than specified.***



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– Loosen bearing cap bolts in the sequence -12 ... 1-.



Note

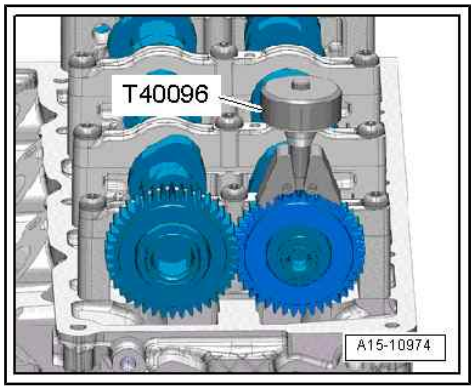
Make sure you do not damage the roller rocker fingers and hydraulic compensation elements when removing the camshafts.

– Carefully detach bearing caps and camshafts.

Installing

- Tightening torques
⇒ “4.1 Exploded view - valve gear”, page 189
- Crankshaft locked in “TDC” position with locking pin - 3242- .

– Place camshaft fitting tool - T40096- on teeth of inlet camshaft so that the two arms of the tool engage on the two halves of the gear (one in each half, as shown in illustration).

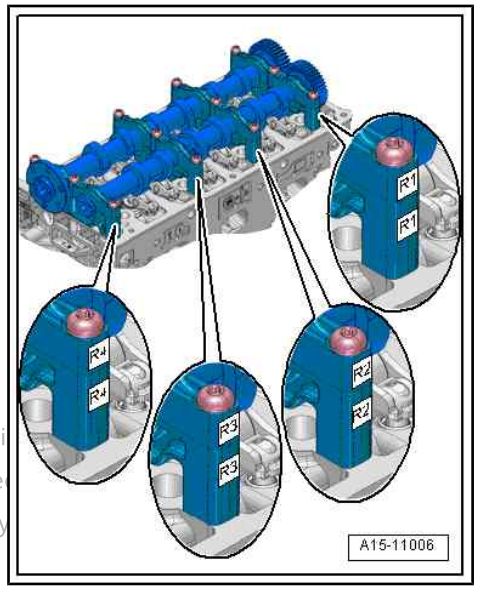


- The wider arm must engage in the wider half of the gear.

– Tighten the clamping tool using the knurled wheel so that the faces of the gear teeth are in alignment.

To prevent installation at the wrong locations, the camshaft bearing pedestals and bearing caps for cylinder bank 1 are marked at the factory on the exhaust side:

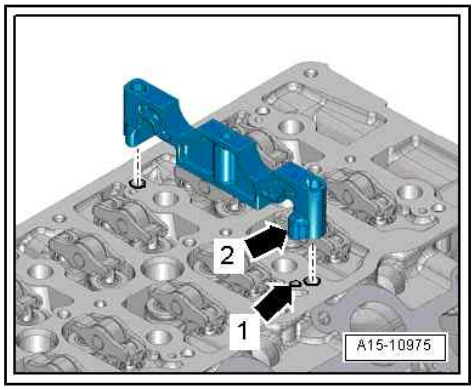
Cylinder bank 1 (right-side)	
R1/R1	Front
R2/R2	Front centre
R3/R3	Rear centre
R4/R4	Rear



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– Fit camshaft bearing pedestals “I, II and III” on cylinder head.

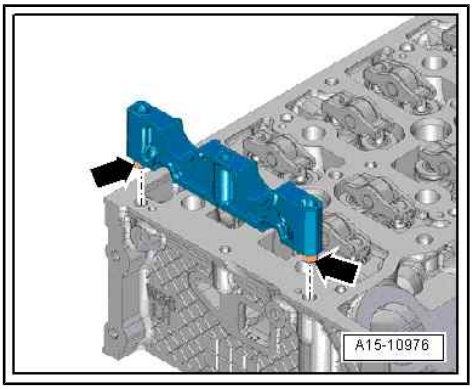
- The oil drillings -arrow 1- in the cylinder head must be in line with the oil passages -arrow 2- in the bearing pedestals.



– Fit camshaft bearing pedestal “IV” on cylinder head.

• Both dowel sleeves -arrows- must be inserted in holes in bearing pedestal.

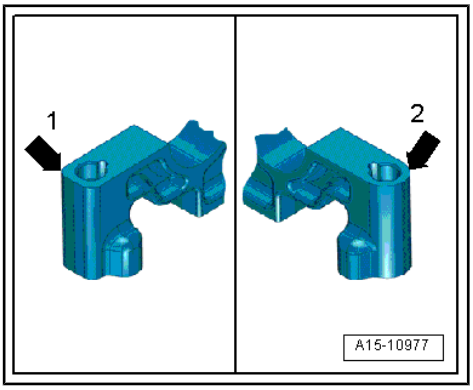
• Dowel sleeves must engage in holes in cylinder head.



– Check that bearing pedestals are positioned correctly:

• The round side -arrow 2- faces the inlet side.

• The square side -arrow 1- faces the exhaust side.



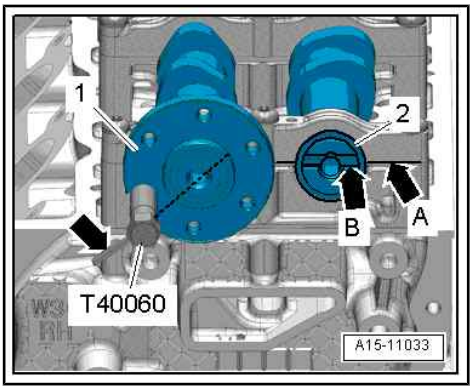
– Insert camshafts in bearing pedestals in “TDC” position.

• It should be possible to lock the inlet camshaft -1- with the adjustment pin - T40060- .

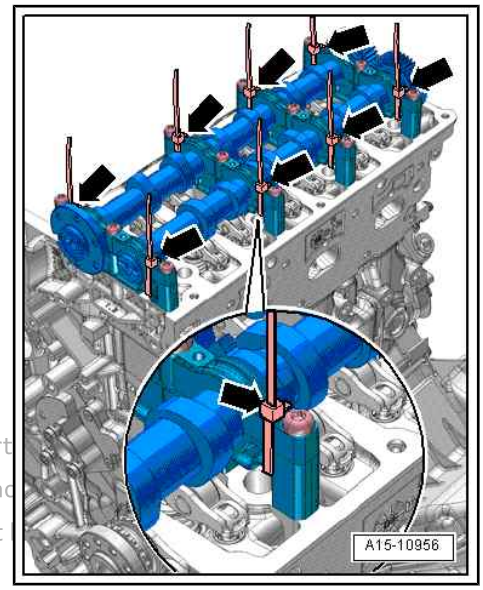
• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.

• Exhaust camshaft -2- must be set so that groove -arrow A- is parallel above joint -arrow B- between bearing pedestal and bearing cap.

– Fit matching bearing caps on bearing pedestals.



– Wrap one cable tie -arrows- on each side around bearing pedestal and bearing cap and secure.



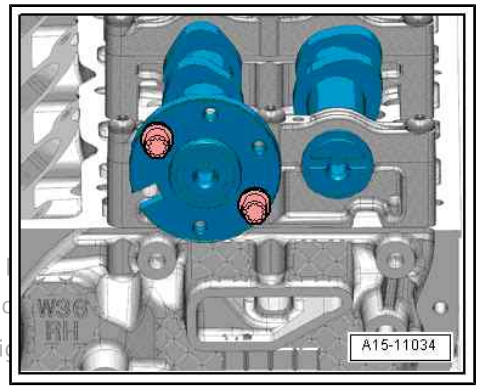
Note

The cable ties help to keep the camshafts and camshaft bearings straight when they are tightened.

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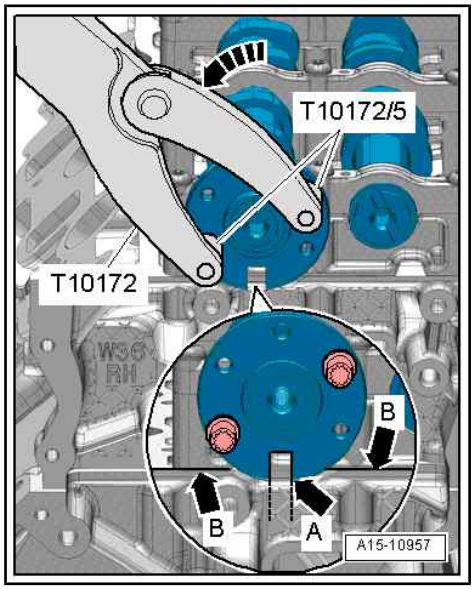
– Pull off adjustment pin - T40060- .

– Screw two bolts for camshaft chain sprocket five turns into threaded holes in camshaft, as shown in illustration.



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– Fit counterhold tool - T10172- with adapters -T10172/5- on both bolts and turn camshafts approx. 30° in anti-clockwise direction -arrow- until groove -arrow A- in camshaft points vertically to sealing surface -arrows B- of cylinder head.

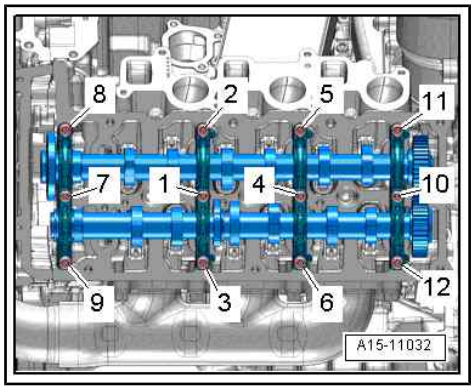


Caution

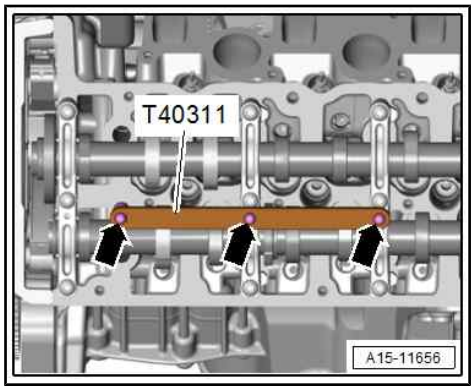
Risk of damage to valves.

- *Do not turn camshafts any further than specified.*

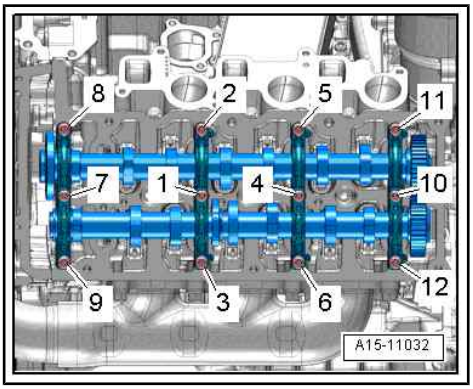
– Fit bolts -1 … 12- in bearing caps.



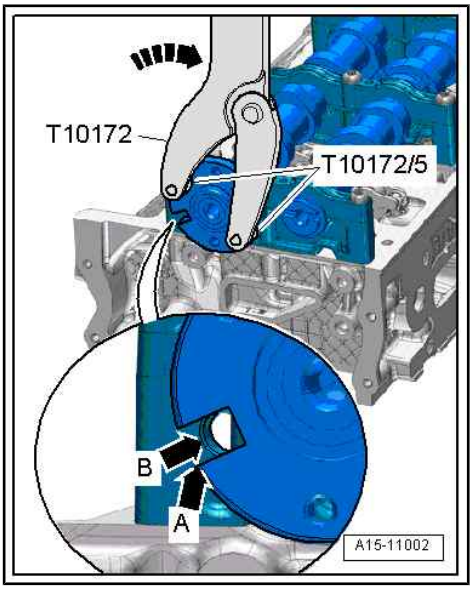
– Fit gauge -T40311- onto support brackets -arrows- for clamping pieces, as shown in illustration.



– Tighten bearing cap bolts ⇒ page 191 .

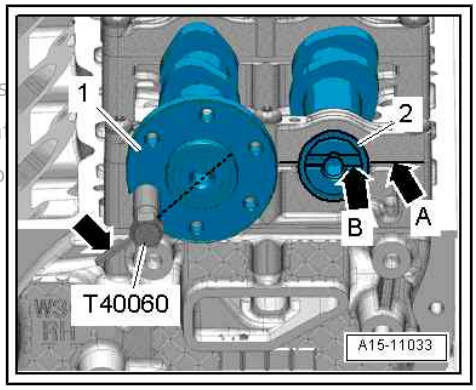


– Fit counterhold tool - T10172- with adapters -T10172/5- on both bolts and turn camshafts approx. 30° in clockwise direction -arrow- until groove -arrow A- in camshaft is aligned with hole -arrow B- for adjustment pin - T40060- .



– Check “TDC” position of camshafts:

- It should be possible to lock the inlet camshaft -1- with the adjustment pin - T40060- .
- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.
- Exhaust camshaft -2- must be set so that groove -arrow A- is parallel above joint -arrow B- between bearing pedestal and bearing cap.



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

– Remove camshaft fitting tool - T40096- .

– Install camshaft timing chains ⇒ page 178 .

Caution

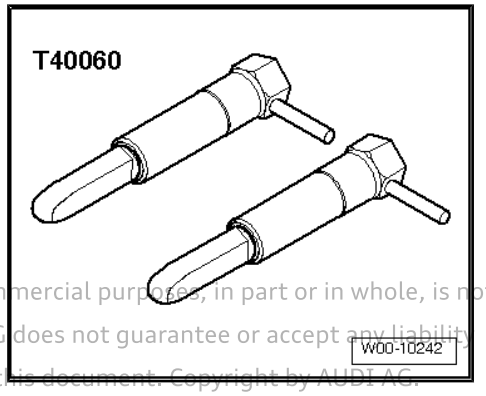
Risk of damage to valves and piston crowns after working on valve gear.

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

4.4.3 Removing camshafts and re-installing used camshafts - cylinder bank 2 (left-side)

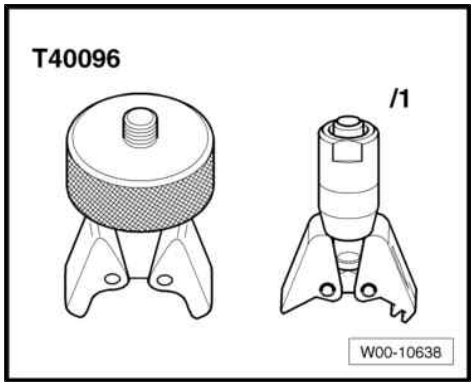
Special tools and workshop equipment required

- Adjustment pin - T40060-



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- Camshaft fitting tool - T40096-

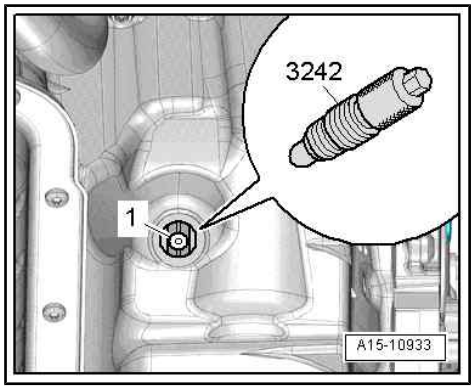


- Gauge -T40311-
- Locking pin - 3242-

Removing

– Remove timing chain from inlet camshaft ⇒ page 178 .

• Crankshaft -1- locked in “TDC” position with locking pin - 3242- .

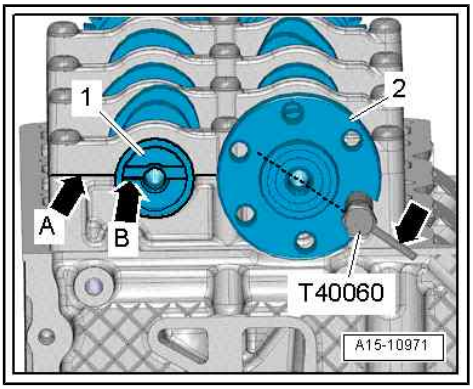


– Check “TDC” position of camshafts:

• It should be possible to lock the inlet camshaft -2- with the adjustment pin - T40060- .

• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.

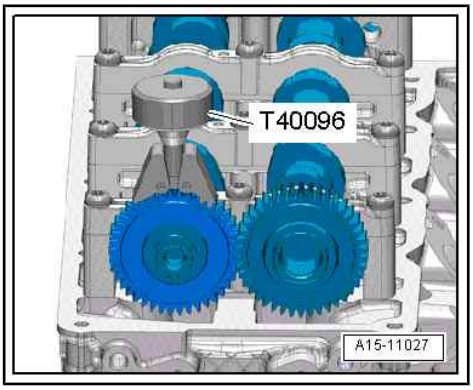
• Exhaust camshaft -1- must be set so that groove -arrow B- is parallel above joint -arrow A- between bearing pedestal and bearing cap.



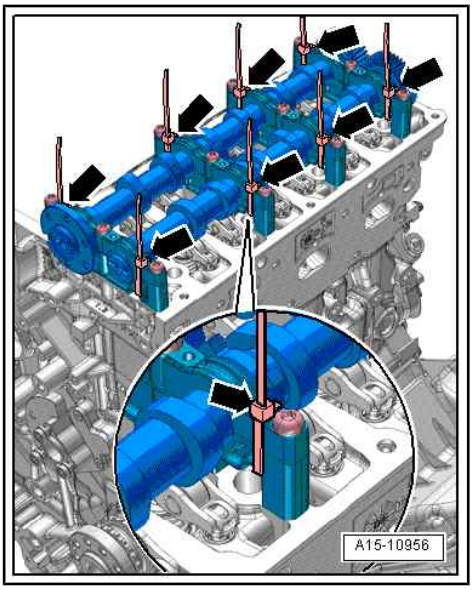
– Place camshaft fitting tool - T40096- on teeth of inlet camshaft so that the two arms of the tool engage on the two halves of the gear (one in each half, as shown in illustration).

• The wider arm must engage in the wider half of the gear.

– Tighten the clamping tool using the knurled wheel so that the faces of the gear teeth are in alignment.



– Wrap one cable tie -arrows- on each side around bearing pedestal and bearing cap and secure.

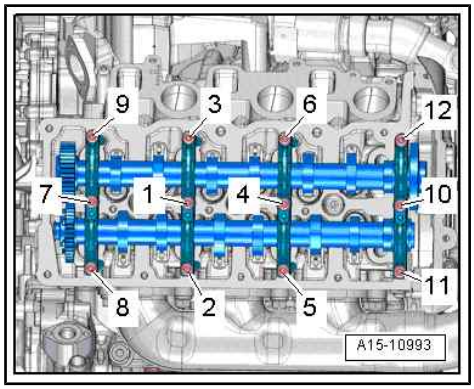


Note

With the cable ties it is possible to detach the camshafts together with the camshaft bearings. This prevents components from being interchanged.

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– Loosen bearing cap bolts in the sequence -12 ... 1-.



Note

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

– Carefully detach bearing caps together with camshafts.

Caution

Do NOT interchange components!

- ***Do not release cable ties until after re-installation.***

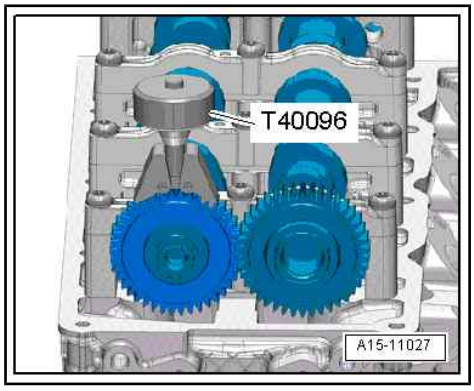
Installing

- Tightening torques
  ⇒ “4.1 Exploded view - valve gear”, page 189
- Crankshaft locked in “TDC” position with locking pin - 3242- .

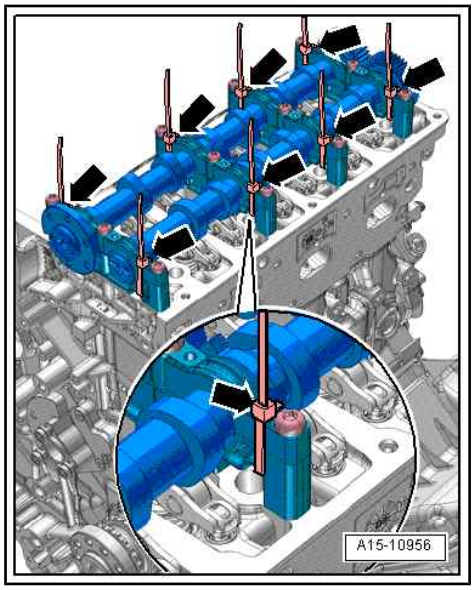
– Place camshaft fitting tool - T40096- on teeth of inlet camshaft so that the two arms of the tool engage on the two halves of the gear (one in each half, as shown in illustration).

- The wider arm must engage in the wider half of the gear.

– Tighten the clamping tool using the knurled wheel so that the faces of the gear teeth are in alignment.



– Fit camshafts and camshaft bearings (secured with cable ties -arrows-) on cylinder head.



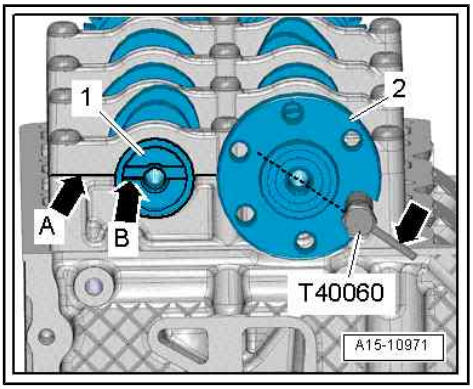
Note

The cable ties help to keep the camshafts and camshaft bearings straight when they are tightened.

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– Check “TDC” position of camshafts:

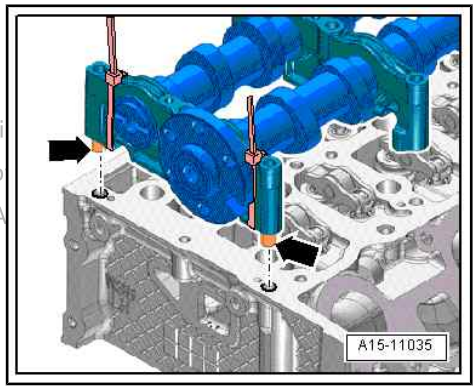
- It should be possible to lock the inlet camshaft -2- with the adjustment pin - T40060- .
- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.
- Exhaust camshaft -1- must be set so that groove -arrow A- is parallel above joint -arrow B- between bearing pedestal and bearing cap.



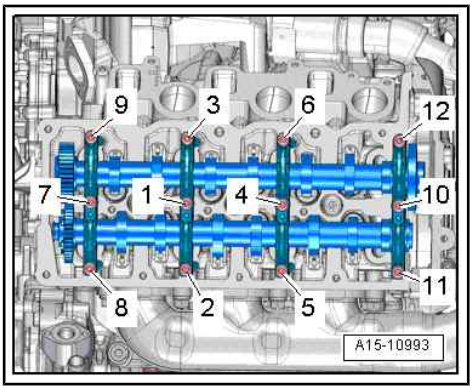
– Check installation position of dowel sleeves:

- Both dowel sleeves -arrows- must be inserted in holes in bearing pedestal “IV”.
- Dowel sleeves must engage in holes in cylinder head.

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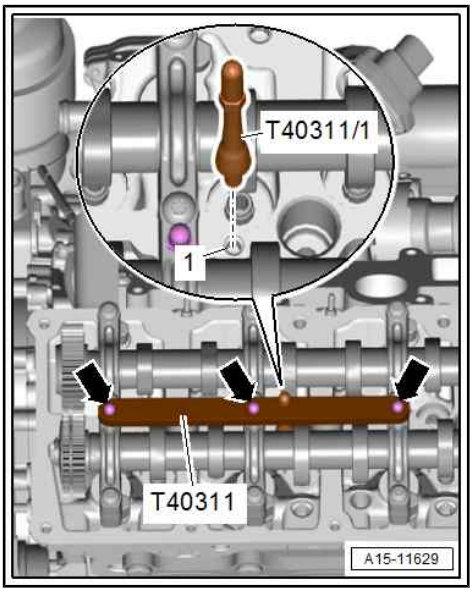


– Fit bolts -1 … 12- in bearing caps.

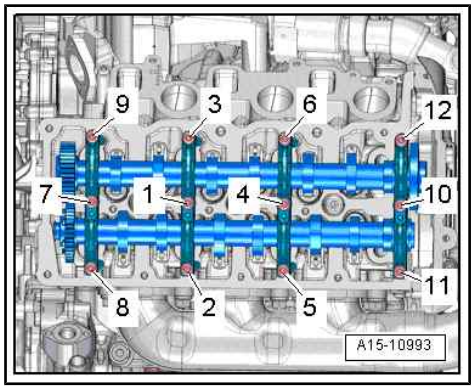


– Screw locating pin -T40311/1- into threaded hole -1- in line with cylinder 5, as shown in illustration.

– Place gauge -T40311- onto support brackets for clamping pieces -arrows-, as shown in illustration.

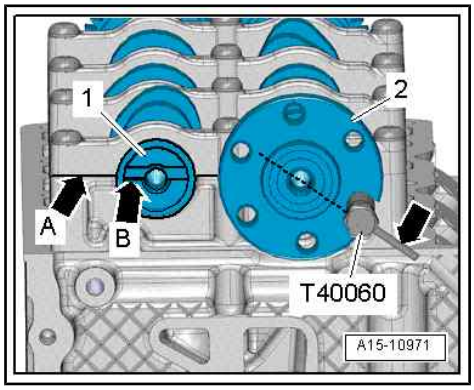


– Tighten bearing cap bolts ⇒ page 192 .



– Check “TDC” position of camshafts:

- It should be possible to lock the inlet camshaft -2- with the adjustment pin - T40060- .
- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.
- Exhaust camshaft -1- must be set so that groove -arrow A- is parallel above joint -arrow B- between bearing pedestal and bearing cap.



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

– Remove camshaft fitting tool - T40096- .

– Install camshaft timing chains ⇒ page 178 .

Caution

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

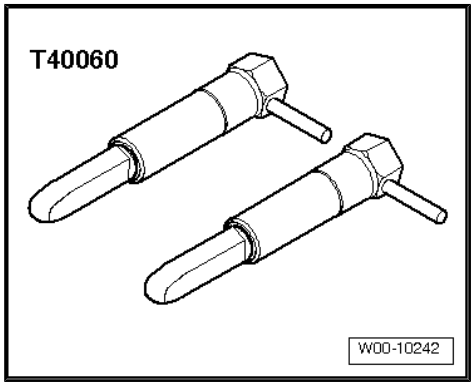
- ***The hydraulic tappets have to settle; wait for approx. 30 minutes after installing camshafts before starting engine.***
- ***Turn the engine carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.***

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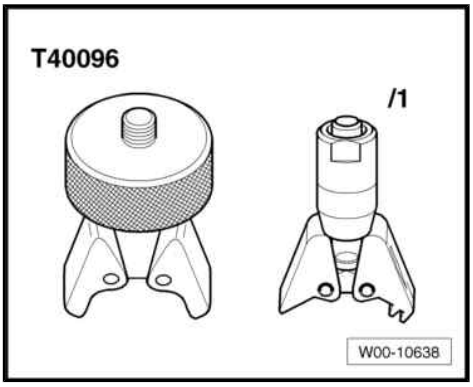
4.4.4 Removing and renewing camshafts or camshaft bearings - cylinder bank 2 (left-side)

Special tools and workshop equipment required

- Adjustment pin - T40060-



♦ Camshaft fitting tool - T40096-



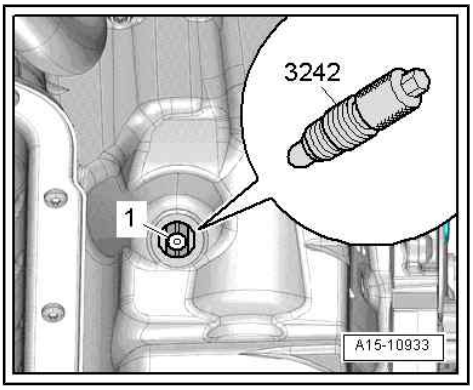
♦ Gauge -T40311-

♦ Locking pin - 3242-

Removing

– Remove timing chain from inlet camshaft ⇒ page 178 .

• Crankshaft -1- locked in “TDC” position with locking pin - 3242- .

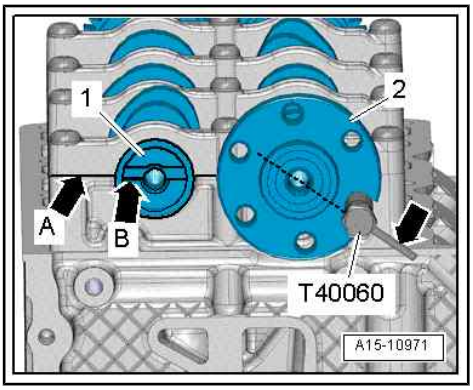


– Check “TDC” position of camshafts:

• It should be possible to lock the inlet camshaft -2- with the adjustment pin - T40060- .

• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.

• Exhaust camshaft -1- must be set so that groove -arrow B- is parallel above joint -arrow A- between bearing pedestal and bearing cap.

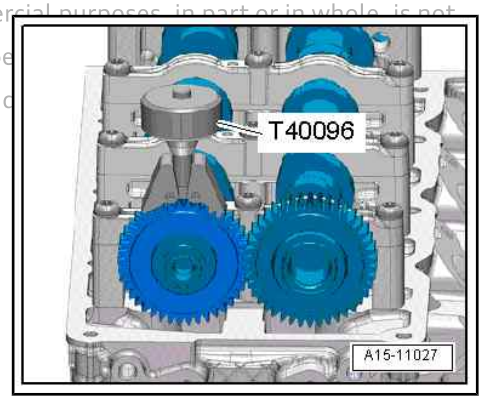


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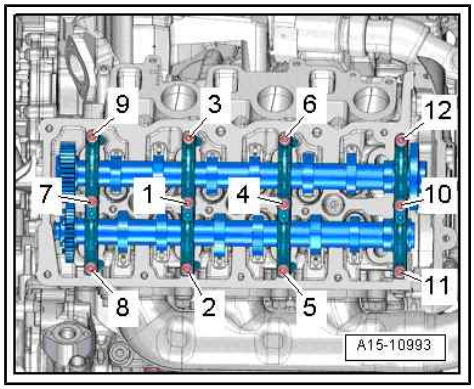
– Place camshaft fitting tool - T40096- on teeth of inlet camshaft so that the two arms of the tool engage on the two halves of the gear (one in each half, as shown in illustration).

• The wider arm must engage in the wider half of the gear.

– Tighten the clamping tool using the knurled wheel so that the faces of the gear teeth are in alignment.



– Loosen bearing cap bolts in the sequence -12 ... 1-.



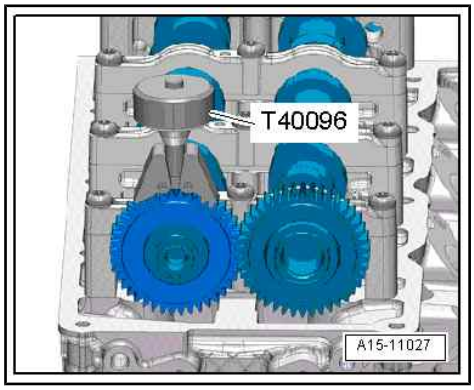
Note

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

– Carefully detach bearing caps and camshafts.

Installing

- Tightening torques
  ⇒ “4.1 Exploded view - valve gear”, page 189
- Crankshaft locked in “TDC” position with locking pin - 3242- .

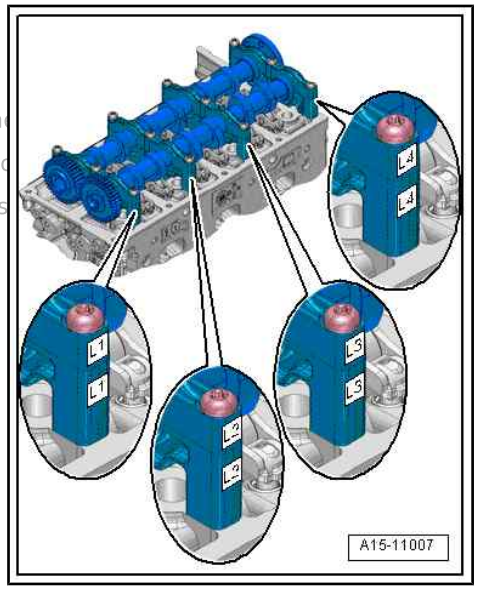


– Place camshaft fitting tool - T40096- on teeth of inlet camshaft so that the two arms of the tool engage on the two halves of the gear (one in each half, as shown in illustration).
- The wider arm must engage in the wider half of the gear.
– Tighten the clamping tool using the knurled wheel so that the faces of the gear teeth are in alignment.

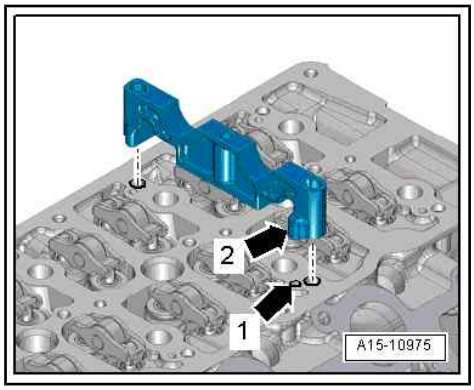
To prevent installation at the wrong locations, the camshaft bearing pedestals and bearing caps for cylinder bank 2 are marked at the factory on the exhaust side:

Cylinder bank 2 (left-side)	
L1/L1	Front
L2/L2	Front centre
L3/L3	Rear centre
L4/L4	Rear

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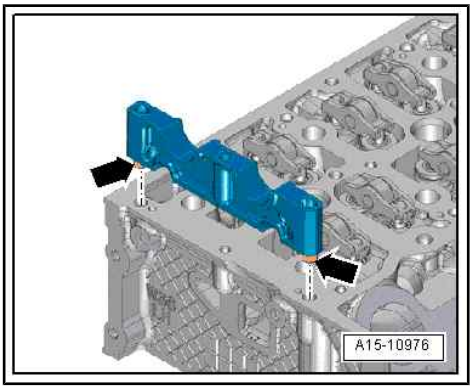
– Fit camshaft bearing pedestals “I, II and III” on cylinder head.
- The oil drillings -arrow 1- in the cylinder head must be in line with the oil passages -arrow 2- in the bearing pedestals.



– Fit camshaft bearing pedestal “IV” on cylinder head.

• Both dowel sleeves -arrows- must be inserted in holes in bearing pedestal.

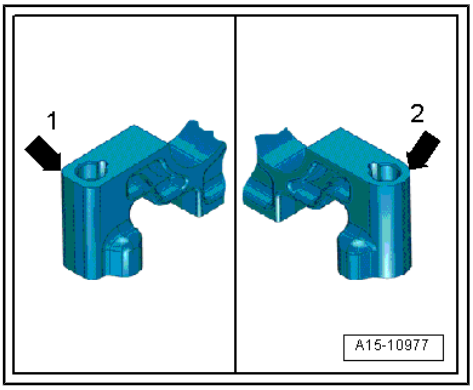
• Dowel sleeves must engage in holes in cylinder head.



– Check that bearing pedestals are positioned correctly:

• The round side -arrow 2- faces the inlet side.

• The square side -arrow 1- faces the exhaust side.



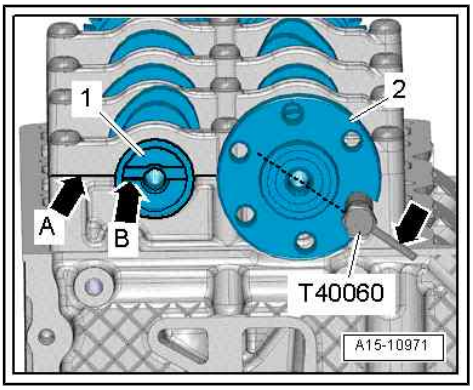
– Insert camshafts in bearing pedestals in “TDC” position.

• It should be possible to lock the inlet camshaft -2- with the adjustment pin - T40060- .

• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.

• Exhaust camshaft -1- must be set so that groove -arrow A- is parallel above joint -arrow B- between bearing pedestal and bearing cap.

– Fit matching bearing caps on bearing pedestals.

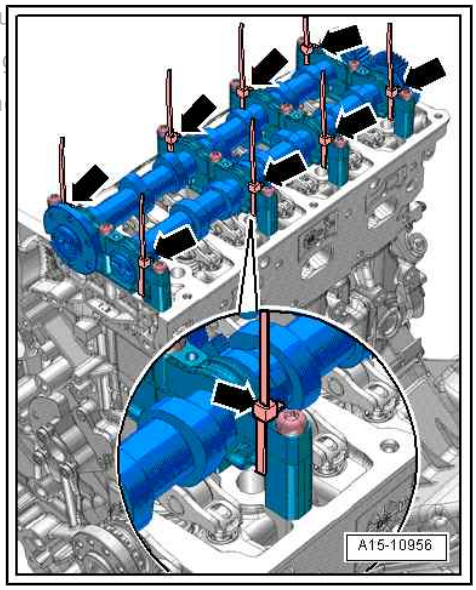


– Wrap one cable tie -arrows- on each side around bearing pedestal and bearing cap and secure.

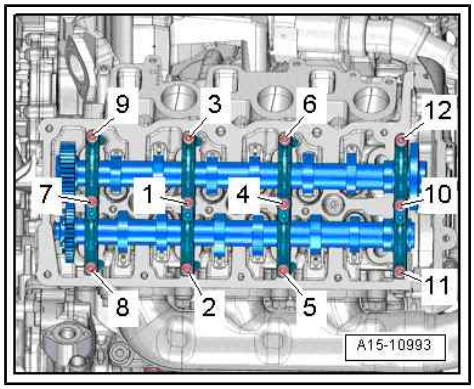
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Note

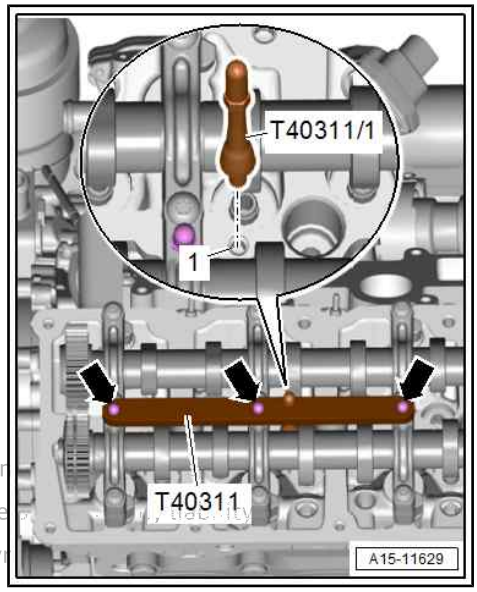
The cable ties help to keep the camshafts and camshaft bearings straight when they are tightened.



– Fit bolts -1 … 12- in bearing caps.

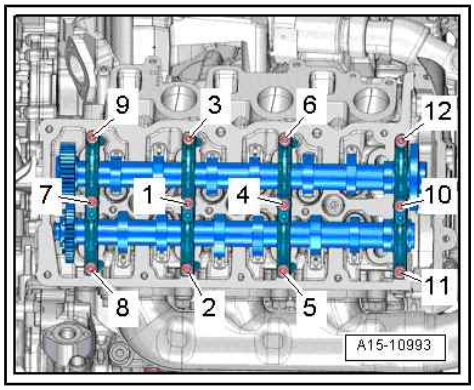


– Screw locating pin -T40311/1- into threaded hole -1- in line with cylinder 5, as shown in illustration.
– Fit gauge -T40311- onto support brackets -arrows- for clamping pieces, as shown in illustration.



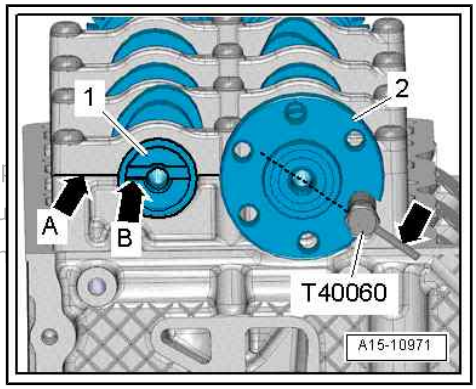
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– Tighten bearing cap bolts ⇒ page 192 .



– Check “TDC” position of camshafts:

- It should be possible to lock the inlet camshaft -2- with the adjustment pin - T40060- .
- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.
- Exhaust camshaft -1- must be set so that groove -arrow A- is parallel above joint -arrow B- between bearing pedestal and bearing cap.



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

– Remove camshaft fitting tool - T40096- .

– Install camshaft timing chains ⇒ page 178 .

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 engine carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.*

4.5 Removing and installing valve stem oil seals

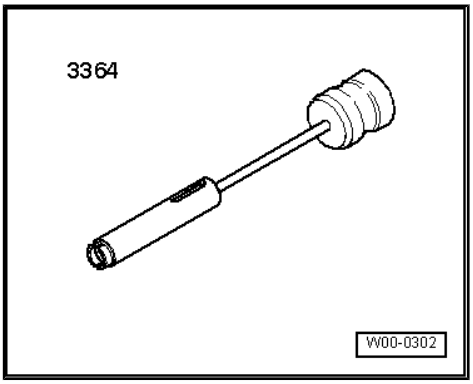
⇒ “4.5.1 Renewing valve stem oil seals with cylinder head installed”, page 215

⇒ “4.5.2 Renewing valve stem oil seals with cylinder head removed”, page 219

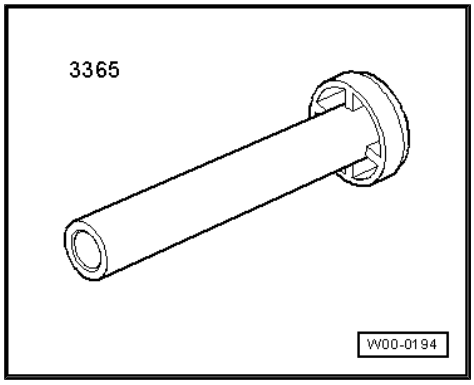
4.5.1 Renewing valve stem oil seals with cylinder head installed

Special tools and workshop equipment required

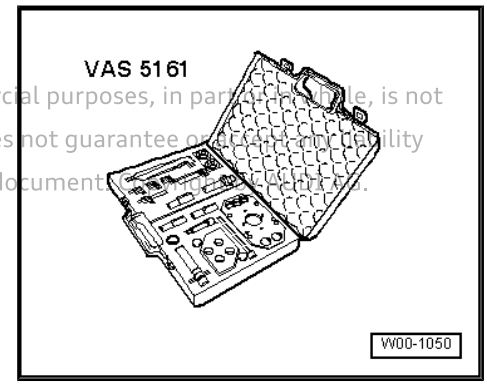
- Valve stem seal puller - 3364-



- Valve stem seal fitting tool - 3365-



- Removal and installation device for valve cotters - VAS 5161- with drift -VAS 5161/3 A- , assembly cartridge -VAS 5161/8 A- , guide plate -VAS 5161/29- and sealing pin -VAS 5161/29-1-



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Procedure

– Remove all glow plugs ⇒ page 472 .

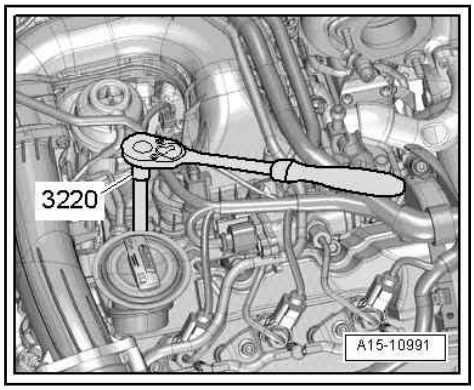
– Remove camshafts:

- ⇒ “4.4.1 Removing camshafts and re-installing used camshafts - cylinder bank 1 (right-side)”, page 194
- ⇒ “4.4.3 Removing camshafts and re-installing used camshafts - cylinder bank 2 (left-side)”, page 206

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

– Remove roller rocker fingers together with hydraulic compensation elements and put down on a clean surface.

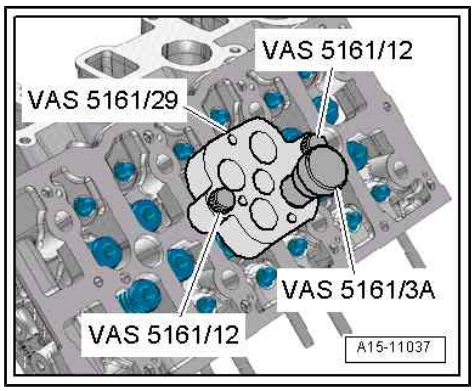
– Set piston of appropriate cylinder to “bottom dead centre”.



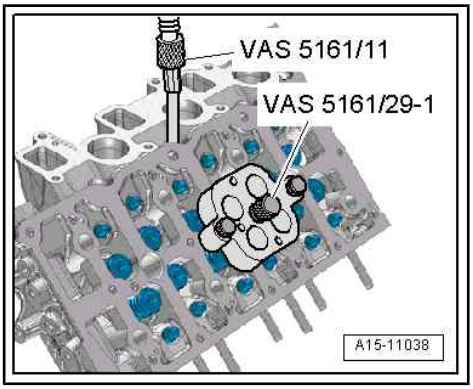
– Fit guide plate -VAS 5161/29- onto cylinder head.

– Secure guide plate with knurled screws -VAS 5161/12- .

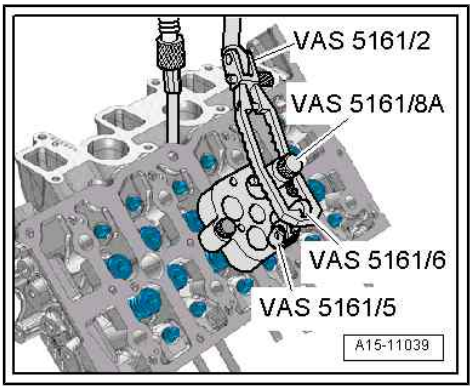
– Insert drift -VAS 5161/3 A- into guide plate and use plastic-headed hammer to release sticking valve cotters.



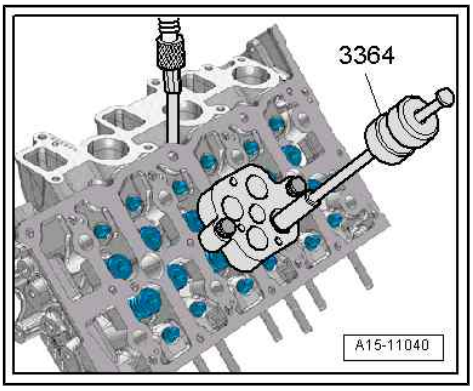
– Screw sealing pin -VAS 5161/29-1- into guide plate.
– Screw adapter -VAS 5161/11- hand-tight into corresponding glow plug thread.



– Screw snap-in device -VAS 5161/6- with engaging fork -VAS 5161/5- into guide plate.
– Insert assembly cartridge -VAS 5161/8 A- in hole above valve spring that is to be removed.
– 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 knurled spacer ring.
– Detach valve spring with valve spring plate.

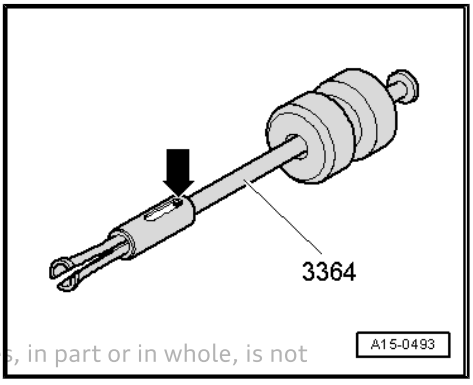


– Pull off valve stem oil seal with valve stem seal puller - 3364- .



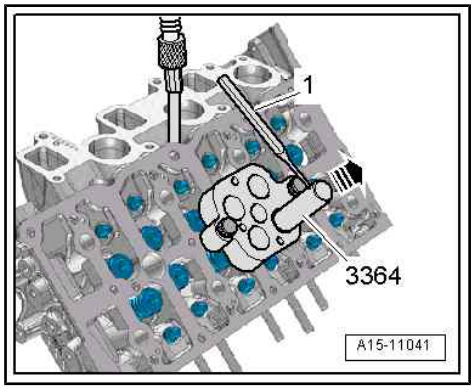
If the puller cannot be used on some of the valve stem oil seals due to the confined space, proceed as follows:

– Knock out pin -arrow- of puller using a drift and remove impact extractor attachment.



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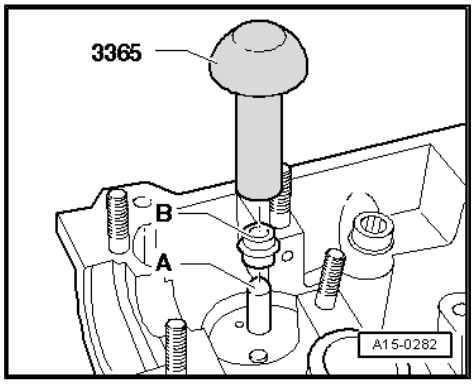
– Apply bottom section of puller -3364- to valve stem oil seal.
– Secure puller with a punch or roll-pin drift -1-, as shown in illustration.
– Apply assembly lever to puller and pull out valve stem oil seal -arrow-.



Caution

Make sure valve stem oil seals are not damaged when installing.

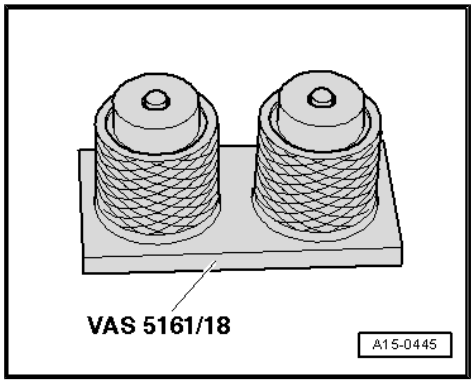
- *New valve stem oil seals -B- are supplied with plastic sleeve; fit plastic sleeve -A- onto valve stem.*



– 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.

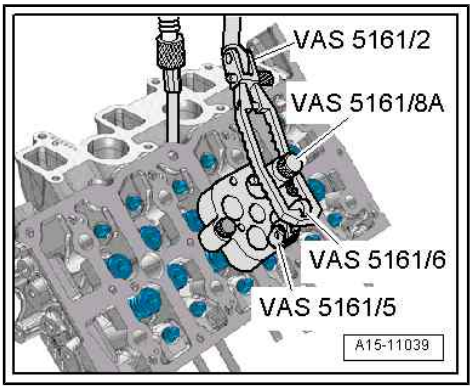
If valve cotters have been removed from assembly cartridge, they must first be inserted in insertion device -VAS 5161/18- .

• Larger diameter of valve cotters faces upwards.
– Insert valve spring and valve spring plate.
– Press assembly cartridge onto insertion device from above and pick up valve cotters.



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– Insert assembly cartridge in guide plate -VAS 5161/29- 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

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

– Install camshafts:

♦ ⇒ “4.4.1 Removing camshafts and re-installing used camshafts - cylinder bank 1 (right-side)”, page 194

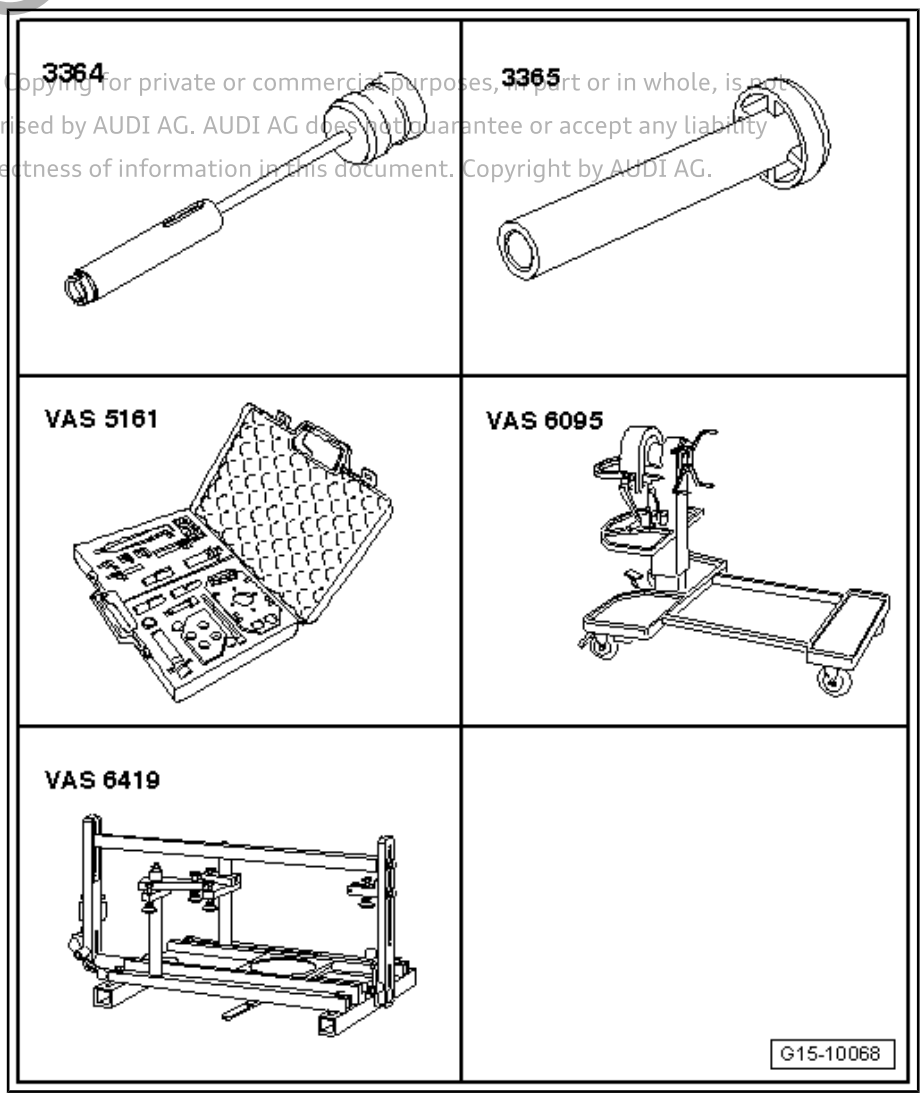
♦ ⇒ “4.4.3 Removing camshafts and re-installing used camshafts - cylinder bank 2 (left-side)”, page 206

– Install glow plugs ⇒ page 472 .

4.5.2 Renewing valve stem oil seals with cylinder head removed

Special tools and workshop equipment required

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♦ Valve stem seal puller - 3364-

- Valve stem seal fitting tool - 3365-
- Removal and installation device for valve cotters - VAS 5161- with drift -VAS 5161/3 A- , assembly cartridge -VAS 5161/8 A- and guide plate -VAS 5161/29-
- Engine and gearbox support - VAS 6095-
- Cylinder head tensioning device - VAS 6419-

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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.

– Insert cylinder head tensioning device - VAS 6419- into engine and gearbox support - VAS 6095- .

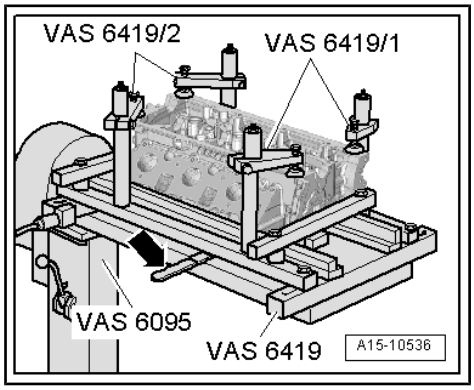
– Secure cylinder head in cylinder head tensioning device, as shown in illustration.

– 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.

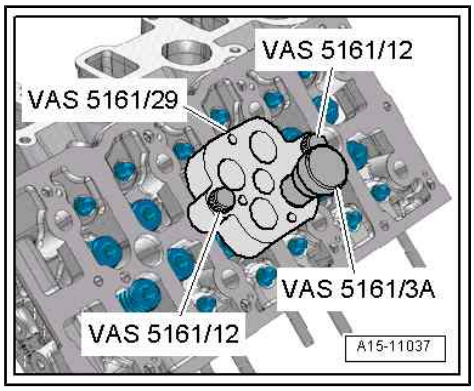
– Mark fitting location of roller rocker fingers for re-installation and remove.



– Fit guide plate -VAS 5161/29- onto cylinder head.

– Secure guide plate with knurled screws -VAS 5161/12- .

– Insert drift -VAS 5161/3 A- 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 5161/8 A- in hole above valve spring that is to be removed.

– Attach pressure fork -VAS 5161/2- to snap-in device and push assembly cartridge down.

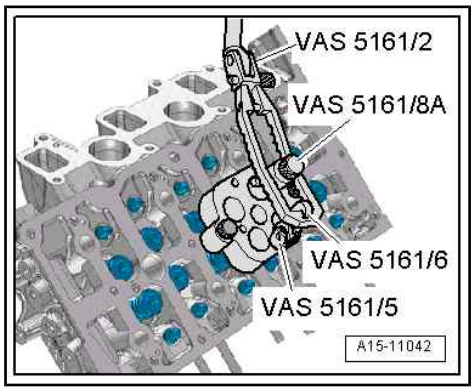
– At the same time, turn knurled screw of assembly cartridge clockwise until tips engage in valve cotters.

– Move knurled screw back and forth slightly; the valve cotters are thus forced apart and taken up by the assembly cartridge.

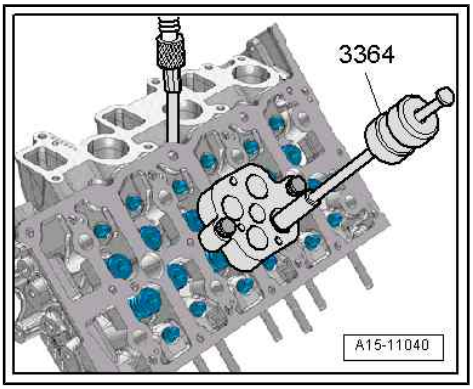
– Release pressure fork.

– Take off assembly cartridge with knurled spacer ring.

– Detach valve spring with valve spring plate.



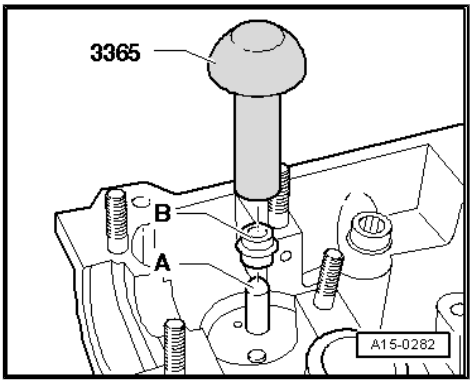
– Pull off valve stem oil seal with valve stem seal puller - 3364- .



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.

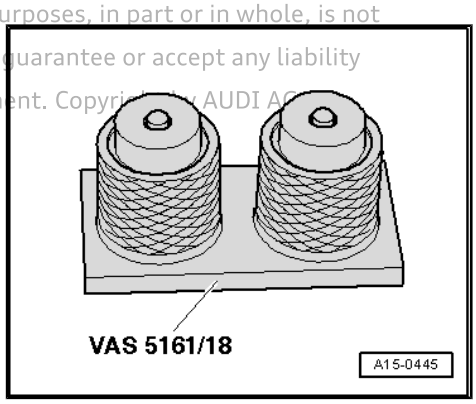
– Slide valve stem oil seal onto plastic sleeve.

– Carefully press valve stem oil seal onto valve guide using valve stem seal fitting tool - 3365- .

– Take off plastic sleeve.

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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.

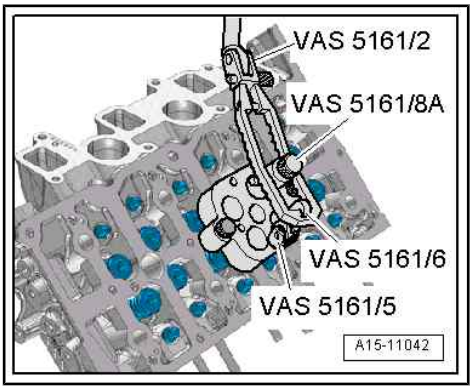
– Press assembly cartridge onto insertion device from above and pick up valve cotters.

– Insert assembly cartridge in guide plate -VAS 5161/29- 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

Assemble in reverse order.

5 Inlet and exhaust valves

⇒ “5.1 Machining valve seats”, page 222
⇒ “5.2 Checking valve guides”, page 222
⇒ “5.3 Checking valves”, page 223
⇒ “5.4 Valve dimensions”, page 224

5.1 Machining valve seats

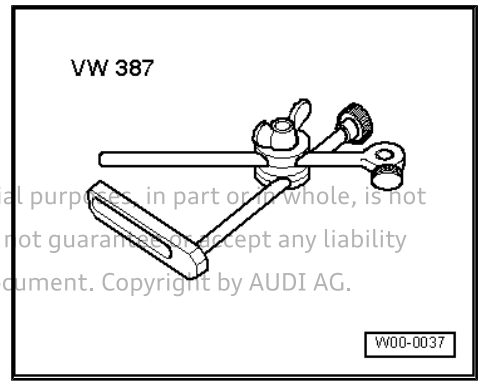
Note

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

5.2 Checking valve guides

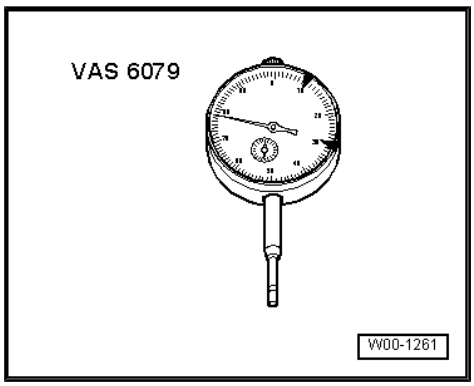
Special tools and workshop equipment required

- Universal dial gauge bracket - VW 387-

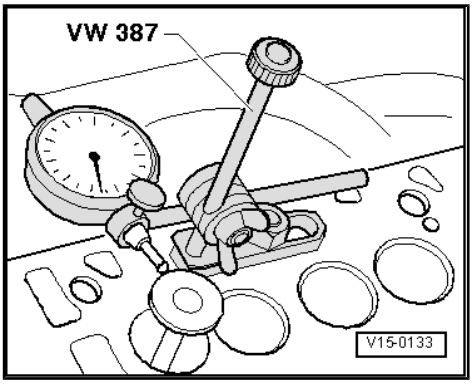


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- Dial gauge - VAS 6079-



Procedure



Note

- *If the valve has to be renewed as part of a repair, use a new valve for the measurement.*
- *Only insert inlet valve into inlet valve guide and exhaust valve into exhaust valve guide, as the stem diameters are different.*

– Insert valve into guide.

• End of valve stem must be flush with valve 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.

5.3 Checking valves

– Visually inspect for scoring on valve stems and valve seat surfaces.

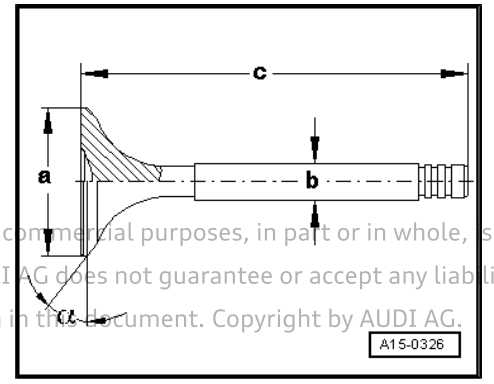
– Renew valve if scoring is clearly visible.

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5.4 Valve dimensions

Note

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



Dimension		Inlet valve	Exhaust valve
∅ a	mm	28.5 … 28.7	25.9 … 26.1
∅ b	mm	5.968 … 5.982	5.958 … 5.972
c	mm	97.2 … 97.4	99.0 … 99.2
α	∠°	45° 10'	45° 10'

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WARNING

Care must be taken when disposing of old sodium-cooled exhaust valves - risk of injury.

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

17 – Lubrication

1 Sump/oil pump

⇒ “1.1 Exploded view - sump/oil pump”, page 225

⇒ “1.2 Engine oil”, page 229

⇒ “1.3 Checking oil level”, page 229

⇒ “1.4 Removing and installing sump (bottom section)”, page 229

⇒ “1.5 Removing and installing sump (top section)”, page 231

⇒ “1.6 Removing and installing oil pump”, page 236

⇒ “1.7 Removing and installing oil level and oil temperature sender G266 ”, page 237

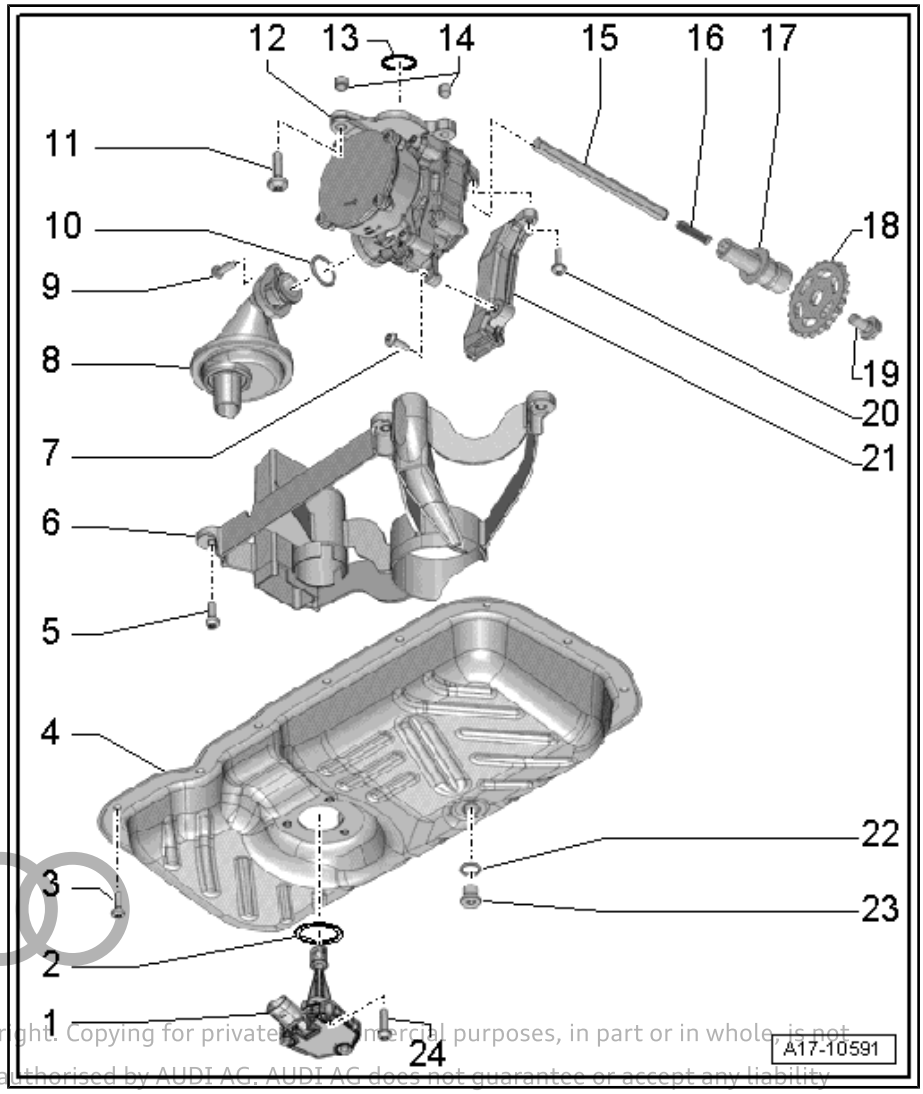
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1.1 Exploded view - sump/oil pump

⇒ “1.1.1 Exploded view - sump (bottom section) and oil pump”, page 225

⇒ “1.1.2 Exploded view - sump (top section)”, page 228

1.1.1 Exploded view - sump (bottom section) and oil pump



1 - Oil level and oil temperature sender - G266-

- ❑ Removing and installing ⇒ page 237

2 - Seal

- ❑ Renew

3 - Bolt

- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 227

4 - Sump (bottom section)

- ❑ Removing and installing ⇒ page 229

5 - Bolt

- ❑ Renew
- ❑ 3 Nm +90°

6 - Baffle plate

7 - Bolt

- ❑ Aluminium or steel bolts, depending on version
- ❑ Renew aluminium bolts
- ❑ Aluminium bolts: 3 Nm + 90°
- ❑ Steel bolts: 9 Nm

8 - Suction pipe

9 - Bolt

- ❑ 9 Nm

10 - O-ring

- ❑ Renew

11 - Bolt

- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 227

12 - Oil pump

- ❑ With vacuum pump for brake servo
- ❑ Do not dismantle
- ❑ Removing and installing ⇒ page 236

13 - O-ring

- ❑ Renew

14 - Dowel sleeves

- ❑ 2x

15 - Drive shaft

- ❑ For oil pump

16 - Compression spring

17 - Coupling

18 - Chain sprocket

- ❑ For oil pump
- ❑ Installation position: Side with lettering faces engine

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19 - Bolt

- ❑ To loosen, use pin wrench - 3212- to counterhold chain sprocket
- ❑ Renew
- ❑ 30 Nm +45°
- ❑ If bolt cannot be tightened to torque, remove sump (bottom section) with baffle plate and counterhold oil pump drive shaft using an open-end spanner.

20 - Bolt

- ❑ Aluminium or steel bolts, depending on version
- ❑ Renew aluminium bolts
- ❑ Aluminium bolts: 3 Nm + 90°
- ❑ Steel bolts: 9 Nm

21 - Oil return pipe

22 - Seal

- ❑ Renew

23 - Oil drain plug

- ❑ 30 Nm

24 - Bolt

- ❑ 9 Nm

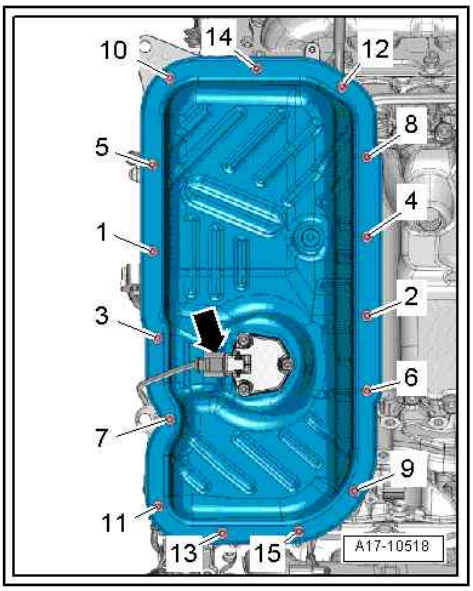
Sump (bottom section) - tightening torque and sequence

Note

Renew the bolts tightened with specified tightening angle.

– Tighten bolts in 3 stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1.	-1 … 15-	2 Nm
2.	-1 … 15-	3 Nm
3.	-1 … 15-	Turn 45° further



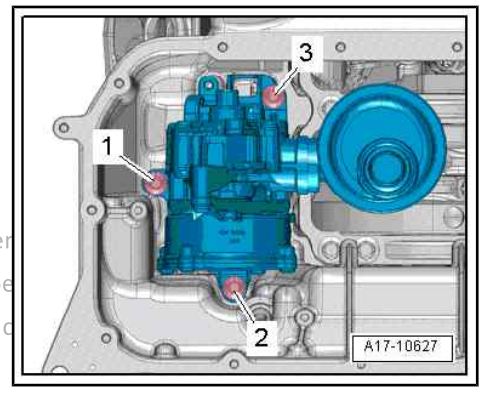
Oil pump with vacuum pump - tightening torque and sequence

Note

Renew the bolts tightened with specified tightening angle.

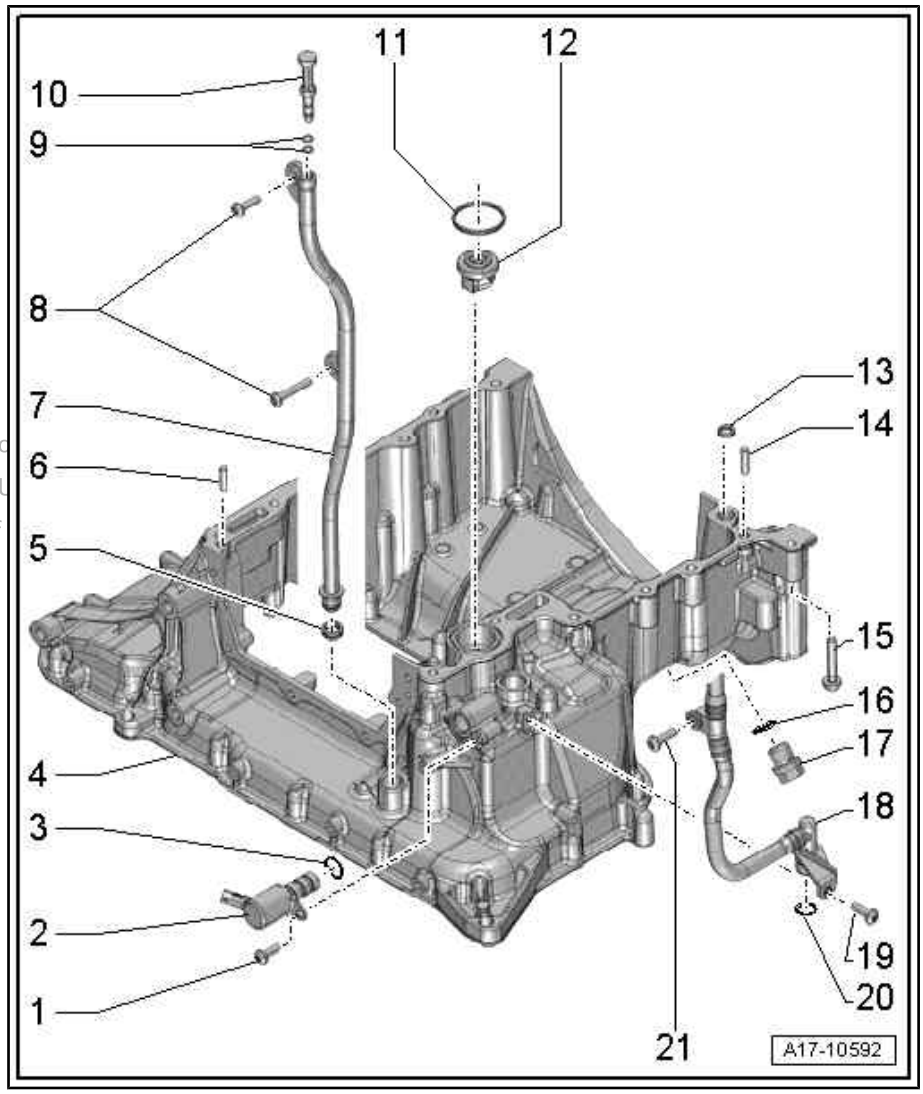
– Tighten bolts in 3 stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1.	-1 … 3-	Screw in by hand until contact is made
2.	-1 … 3-	8 Nm
3.	-1 … 3-	Turn 90° further



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1.1.2 Exploded view - sump (top section)



1 - Bolt
- ❑ 9 Nm

2 - Valve for oil pressure control - N428-
- ❑ Removing and installing ⇒ page 246

3 - O-ring
- ❑ Renew

4 - Sump (top section)
- ❑ Removing and installing ⇒ page 231

5 - Seal
- ❑ Renew

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6 - Dowel sleeve

7 - Guide tube
- ❑ For oil dipstick

8 - Bolts
- ❑ 9 Nm

9 - O-rings
- ❑ Renew

10 - Sealing plug

11 - Seal
- ❑ Renew

12 - Oil return valve
- ❑ For engine oil cooler

13 - Seal
- ❑ Renew

14 - Dowel sleeve

15 - Bolt
- ❑ Tightening torque and sequence ⇒ page 229

16 - Seal
- ❑ Renew

17 - Plug
- ❑ For “TDC” marking
- ❑ 25 Nm

18 - Vacuum line
- ❑ From vacuum pump

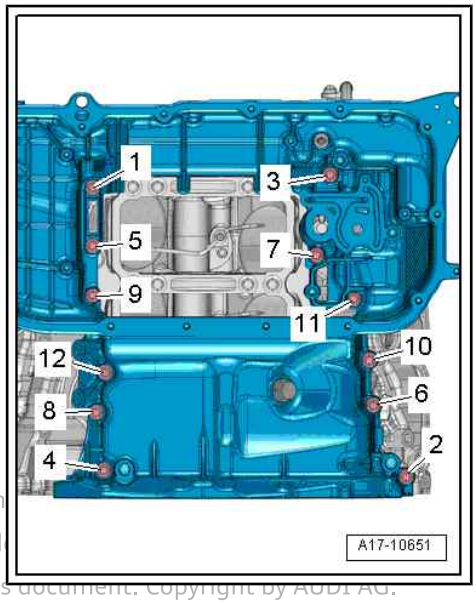
19 - Bolt
- ❑ Renew
- ❑ 3 Nm +45°

20 - O-ring
- ❑ Renew

21 - Bolt

❑ 9 Nm

Sump (top section) - tightening torque and sequence



Note

Renew the bolts tightened with specified tightening angle.

– Tighten bolts in 3 stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1.	-1 … 12-	2 Nm
2.	-1 … 12-	5 Nm
3.	-1 … 12-	Turn 90° further

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1.2 Engine oil

Note

- *If large quantities of metal shavings or particles are found in the engine oil when repairing the engine, the oil passages must be cleaned carefully, and the engine oil cooler must be renewed in order to prevent further damage occurring later.*
- *The oil level must not be above max. mark on dipstick – danger of damage to catalytic converter.*
- *Oil capacities, oil specifications and viscosity grades ⇒ Maintenance tables .*
- *Oil spray jet for piston cooling ⇒ page 132 .*

Check oil level ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .

1.3 Checking oil level

Caution

Risk of damage to catalytic converter.

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

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

1.4 Removing and installing sump (bottom section)

Special tools and workshop equipment required

- Electric drill with plastic brush

- Safety goggles
- Sealant ⇒ Electronic parts catalogue

Removing

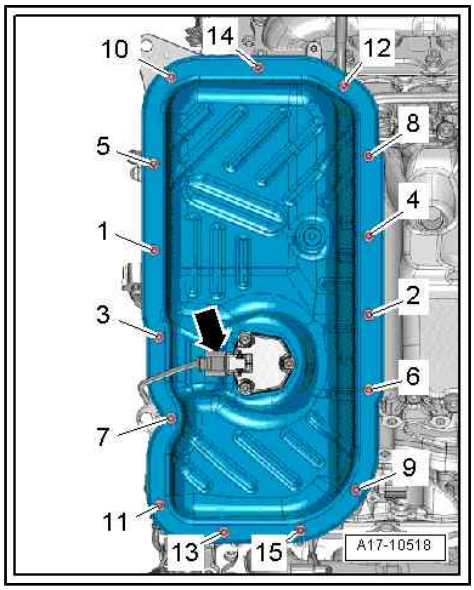
- Engine oil drained ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .

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

Caution

Take care to keep components clean.

- *There will still be some oil in the sump (bottom section).*



– Slacken and remove bolts in the sequence: -15 ... 1-.

– Carefully release sump (bottom section) from bonded joint and detach.

Installing

- Tightening torques
⇒ Fig. ""Sump (bottom section) - tightening torque and sequence"" , page 227

Caution

Protect lubrication system and bearings against contamination.

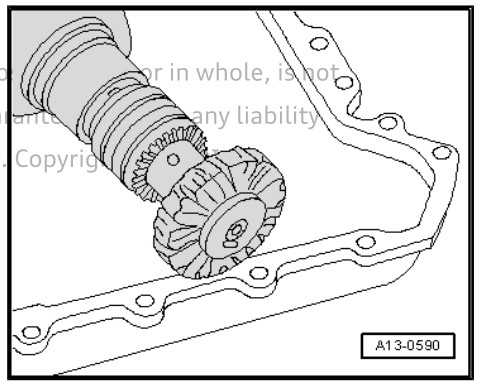
- *Cover exposed parts of the engine.*

WARNING

Risk of eye injury.

- *Put on safety goggles.*

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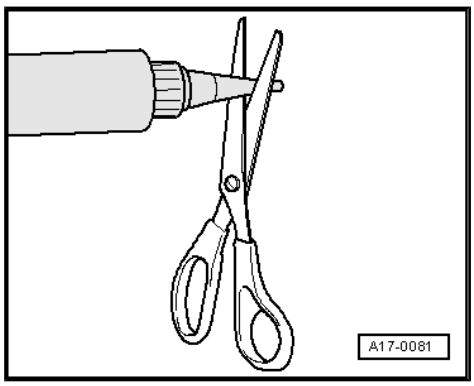
– Remove remaining sealant on bottom and top sections of sump with a rotating plastic brush or similar.

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

Note

Note the use-by date of the sealant.

– Cut off nozzle of tube at front marking (nozzle ∅ approx. 3 mm).

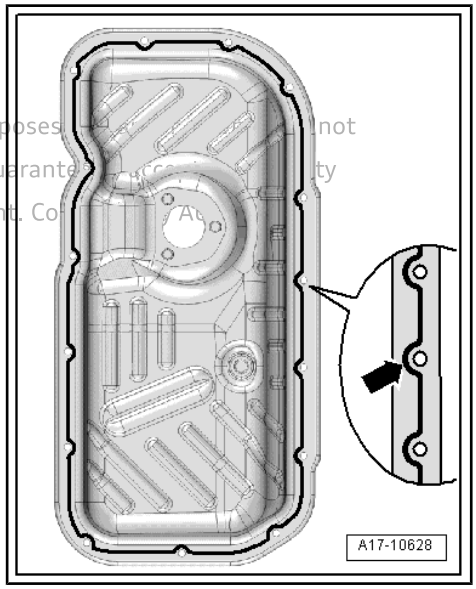


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Caution

Make sure lubrication system is not clogged by excess sealant.

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



– Apply sealant bead -arrow- onto clean sealing surface of sump (bottom section) as shown in illustration.

• Width of sealant bead: 3.5 mm.

Note

The sump (bottom section) must be installed within 5 minutes after applying the sealant.

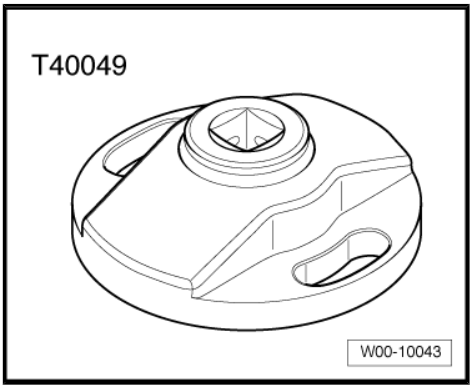
– Fit sump (bottom section) and tighten bolts ⇒ page 227 .

– Fill up with engine oil and check oil level ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .

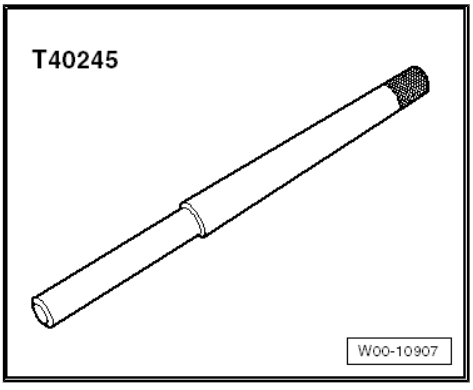
1.5 Removing and installing sump (top section)

Special tools and workshop equipment required

♦ Key - T40049-



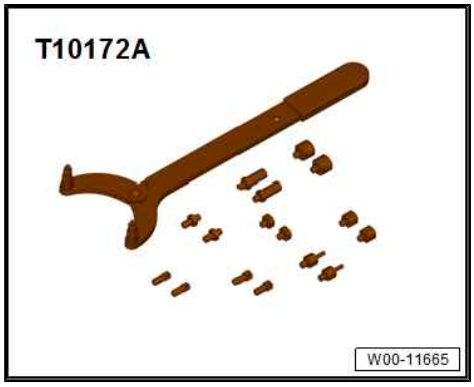
♦ Locking pin - T40245-



♦ Locking pin - T40316-



♦ Counterhold tool - T10172A-



♦ Safety goggles

♦ Electric drill with plastic brush

♦ Sealant ⇒ Electronic parts catalogue

Removing

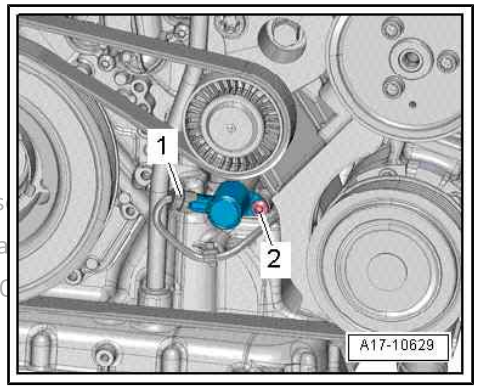
- Engine removed and secured to engine and gearbox support ⇒ page 81
- Engine oil drained ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .

– Remove timing chain cover (bottom) ⇒ page 163 .

– Remove sealing flange (pulley end) ⇒ page 112 .

– Remove oil pump ⇒ page 236 .

– Unplug electrical connector -1- at valve for oil pressure control - N428- .

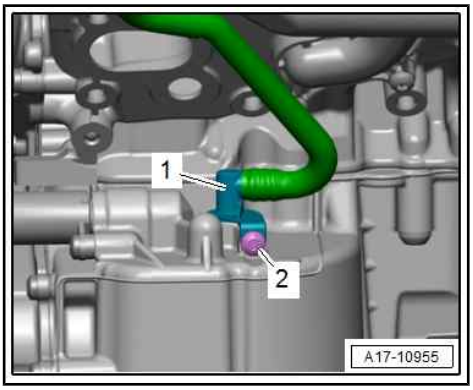


Note

Disregard -item 2-.

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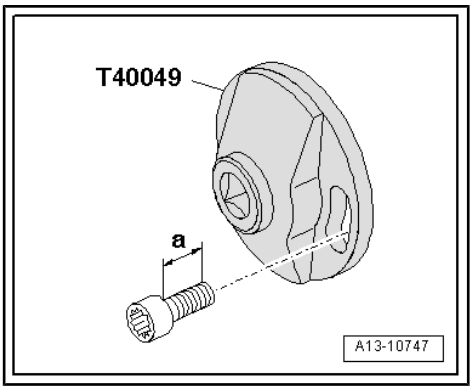
– Remove bolt -item 2- and disconnect vacuum hose -item 1-.



Caution

Risk of damage to drive chain if thread of bolt exceeds specified length.

- *Use bolts with a maximum thread length -a- of 22 mm to attach key -T40049- .*
- *If no suitable bolts are available, position suitable washer (s) under bolt head so that remaining thread length does not exceed 22 mm.*

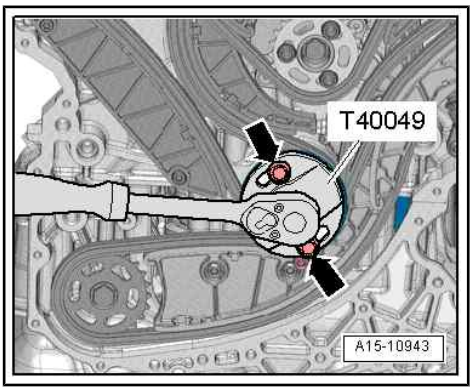


– Secure special wrench - T40049- onto rear of crankshaft -arrows-.

Caution

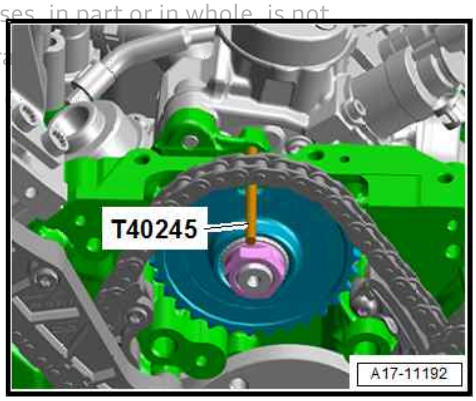
Irreparable damage can be caused if the camshaft timing chain slips.

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

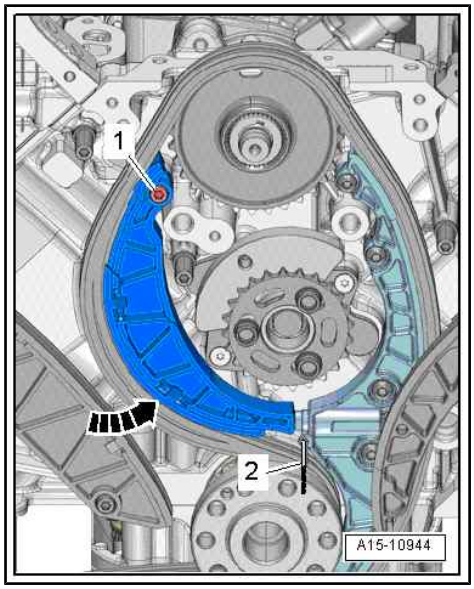


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– Turn crankshaft in direction of engine rotation until high-pressure pump sprocket can be locked in position with locking pin - T40245- , as shown in illustration.



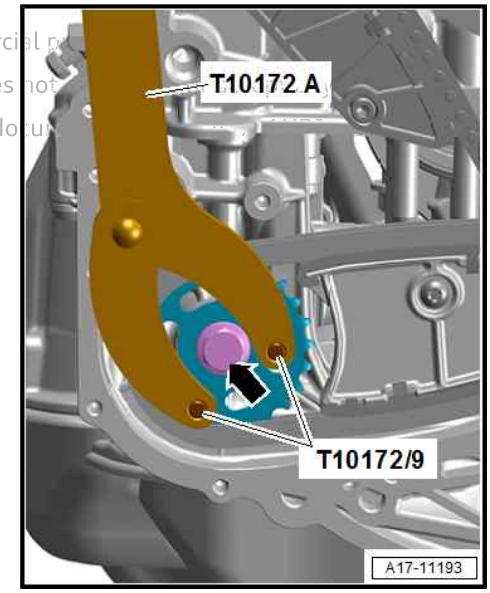
– Press tensioning rail of chain tensioner in direction of -arrow- and lock chain tensioner by inserting locking pin -T40316- -item 2-.



– Using counterhold tool - T10172A- , release and remove bolt -1-.

– Pull off drive chain with chain sprocket (leave in installation position).

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– Slacken and remove bolts in the sequence: -12 ... 1-.

– Carefully release sump (top section) from bonded joint, pry sump off dowel sleeves and detach.

Installing

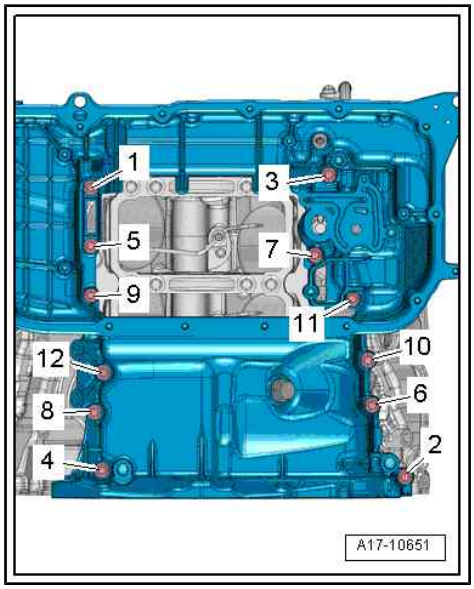
Note

Renew gaskets, seals and O-rings.

Caution

Protect lubrication system against contamination.

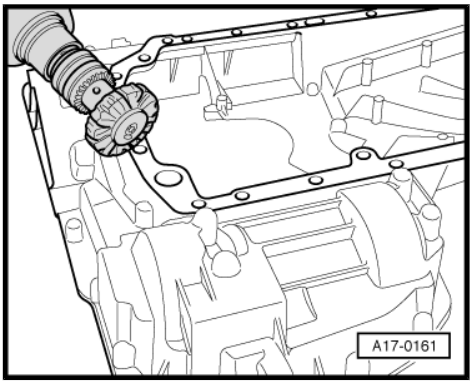
- ***Cover exposed parts of the engine.***



WARNING

Risk of eye injury.

- *Put on safety goggles.*



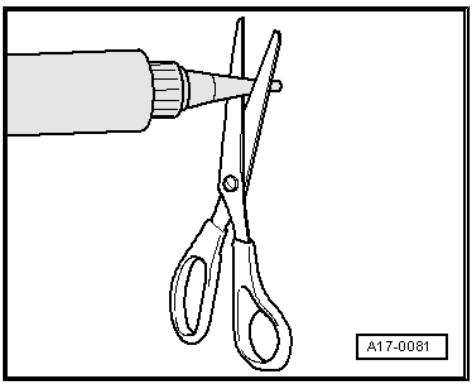
– Remove remaining sealant from sump (top section) and cylinder block using rotating plastic brush or similar.

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

Note

Note the use-by date of the sealant.

– Cut off nozzle of tube at front marking (nozzle ∅ approx. 3 mm).

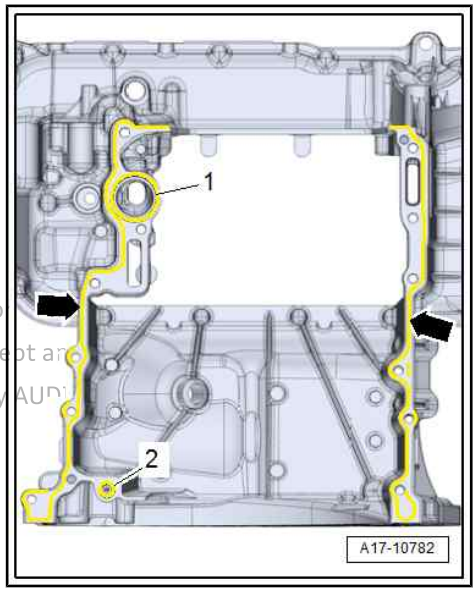


– Fit seals -1 and 2- in sump (top section).

Caution

Make sure lubrication system is not clogged by excess sealant.

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



– Apply beads of sealant -arrows- onto clean sealing surface of sump (top section) as shown in illustration.

- The grooves on the sealing surfaces must be completely filled with sealant.
- The beads of sealant must project 3.5 mm above the sealing surface.

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Note

The sump (top section) must be installed within 5 minutes after applying the sealant.

– Fit sump (top section) and tighten bolts ⇒ page 229 .

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

– Install oil pump ⇒ page 236 .

– Install sealing flange (pulley end) ⇒ page 112 .

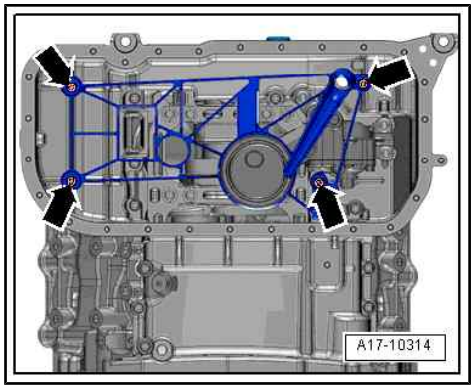
– Install timing chain cover (bottom) ⇒ page 163 .

1.6 Removing and installing oil pump

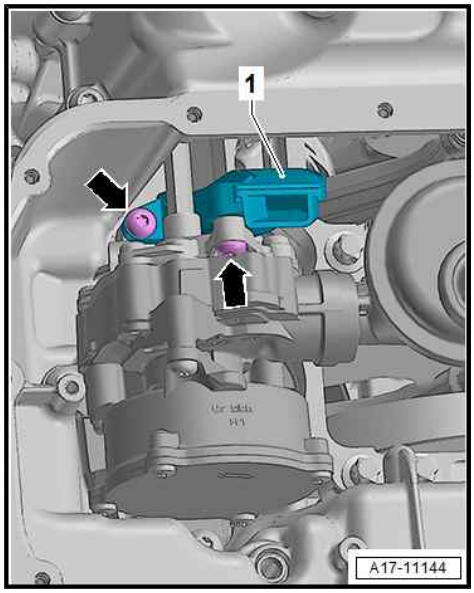
Removing

– Remove sump (bottom section) ⇒ page 229 .

– Remove bolts -arrows- and detach baffle plate.

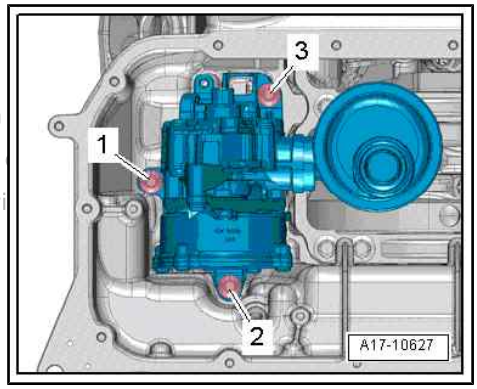


– Remove bolts -arrows- and detach oil return pipe -1-.



– Remove bolts -1, 2, 3-.

– Press oil pump drive shaft back against spring pressure and detach oil pump.



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Note

Oil pump drive shaft remains in position.

Installing

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

- Tightening torque ⇒ “1.1.1 Exploded view - sump (bottom section) and oil pump”, page 225

– Check that the two dowel sleeves are fitted in the oil pump. Install missing dowel sleeves.

– Install sump (bottom section) ⇒ page 229 .

– Fill up with engine oil and check oil level ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .

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

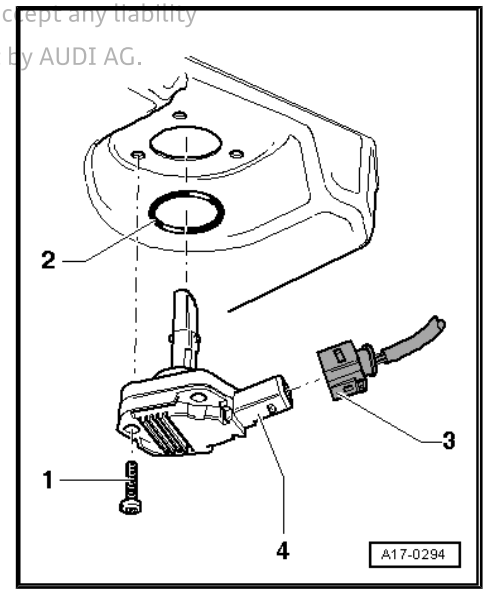
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Removing

- Engine oil drained ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .

– Unplug electrical connector -3-.

– Remove bolts -1- and detach oil level and oil temperature sender - G266- -item 4-.



Installing

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

- Tightening torque
⇒ “1.1.1 Exploded view - sump (bottom section) and oil pump”, page 225

Note

Renew seal -2-.

– Fill up with engine oil and check oil level ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .

2 Engine oil cooler

⇒ “2.1 Exploded view - engine oil cooler”, page 238

⇒ “2.2 Removing and installing engine oil cooler”, page 239

⇒ “2.3 Removing and installing mounting plate for engine oil cooler/coolant shut-off valve”, page 240

⇒ “2.4 Removing and installing temperature regulator for engine oil cooler”, page 240

2.1 Exploded view - engine oil cooler

Engine oil cooler, coolant shut-off valve

1 - Gaskets
- ❑ For mounting plate

2 - Mounting plate
- ❑ For engine oil cooler

3 - Bolt
- ❑ 9 Nm

4 - Gasket
- ❑ For engine oil cooler
- ❑ Renew

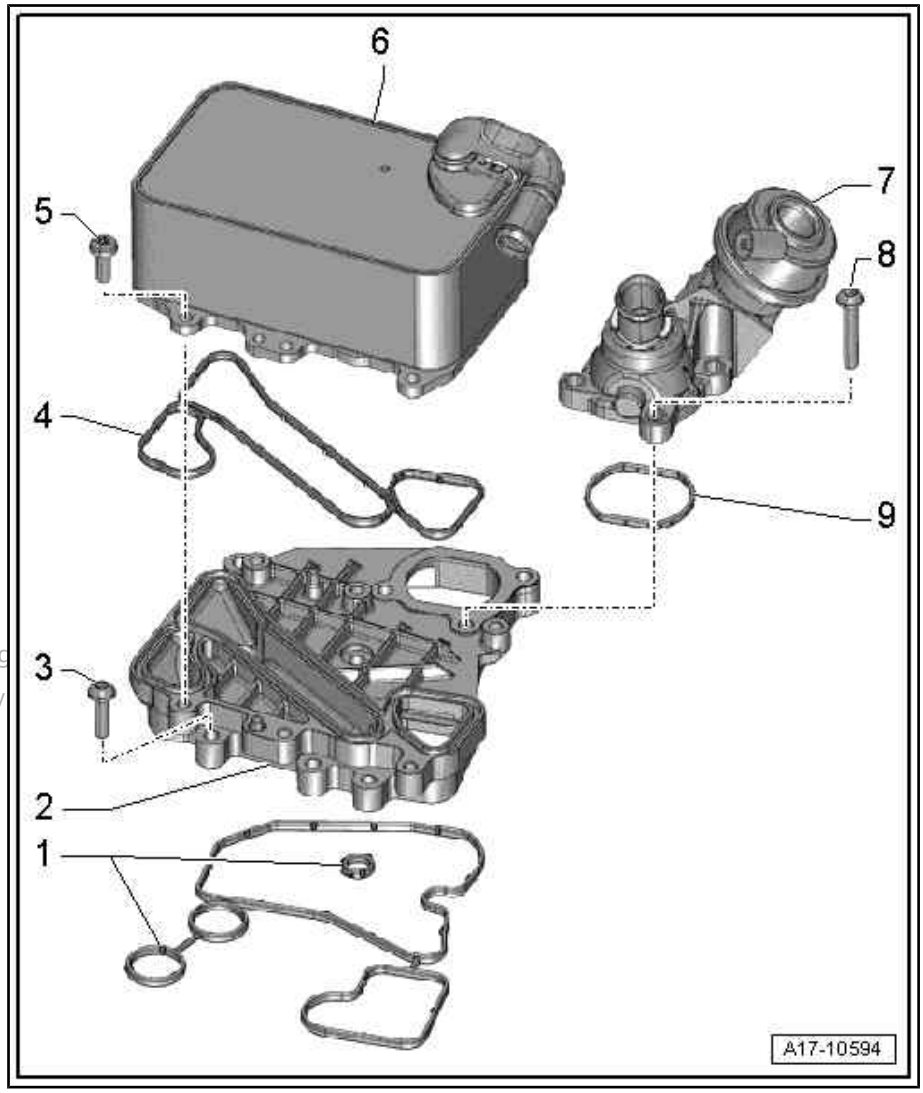
5 - Bolt
- ❑ 9 Nm

6 - Engine oil cooler
- ❑ See note ⇒ page 225
- ❑ Removing and installing ⇒ page 239

7 - Coolant shut-off valve
- ❑ Removing and installing ⇒ page 269

8 - Bolt
- ❑ Tightening torque ⇒ Item 3 (page 265)

9 - Gasket
- ❑ For shut-off valve
- ❑ Renew



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Temperature regulator for engine oil cooler

1 - Cover

- ❑ For temperature regulator for engine oil cooler
- ❑ Removing and installing ⇒ “1.8 Removing and installing sealing flange (pulley end)”, page 112

2 - Bolt

- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 105

3 - O-ring

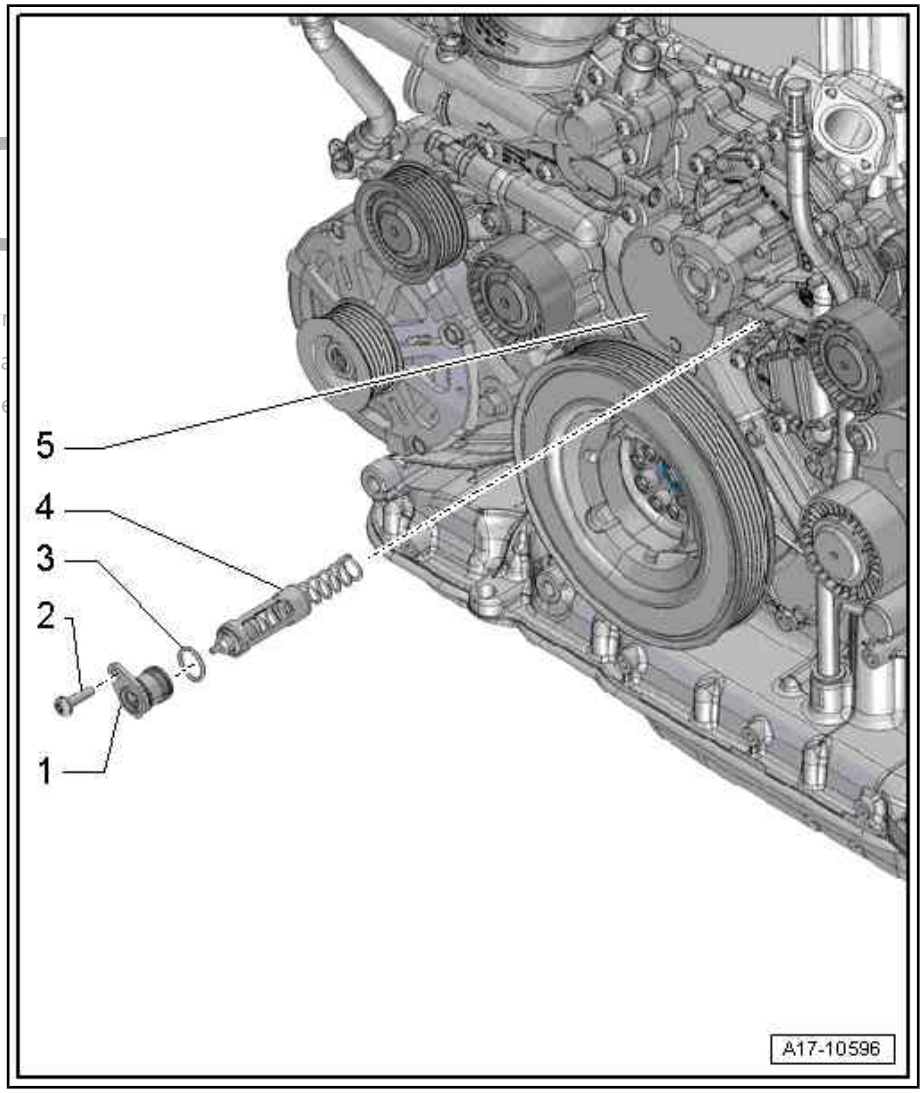
- ❑ Renew

4 - Temperature regulator for engine oil cooler

- ❑ Removing and installing ⇒ page 240

5 - Sealing flange

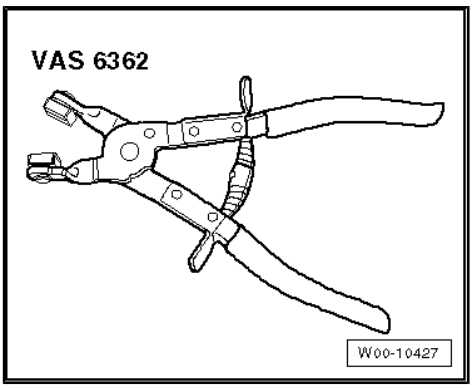
- ❑ Pulley end
- ❑ Removing and installing ⇒ page 112



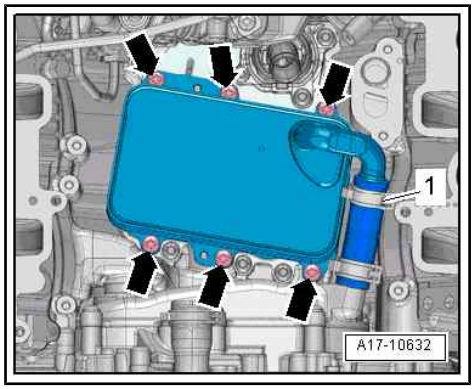
2.2 Removing and installing engine oil cooler

Special tools and workshop equipment required

- ♦ Hose clip pliers - VAS 6362-



Removing



– Remove exhaust gas recirculation cooler ⇒ page 461 .
– Remove bolts -arrows-.
– Open hose clip -1- and disconnect coolant hose from engine oil cooler.
– Detach engine oil cooler.

Installing

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

- Tightening torque
  ⇒ “2.1 Exploded view - engine oil cooler”, page 238

Note

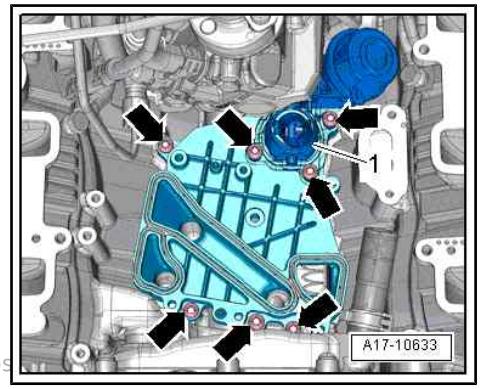
♦ *Renew seal.*

♦ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

– Install exhaust gas recirculation cooler ⇒ page 461 .

2.3 Removing and installing mounting plate for engine oil cooler/coolant shut-off valve

Removing



– Remove engine oil cooler ⇒ page 239 .
– Remove bolts -arrows-.
– Move coolant shut-off valve -1- to one side and detach mounting plate for engine oil cooler and shut-off valve.
– Unplug electrical connector -arrow- on oil pressure switch.
– Remove bolts -arrows-.
– Detach mounting plate for engine oil cooler and coolant shut-off valve

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Installing

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

- Tightening torque
  ⇒ “2.1 Exploded view - engine oil cooler”, page 238

Note

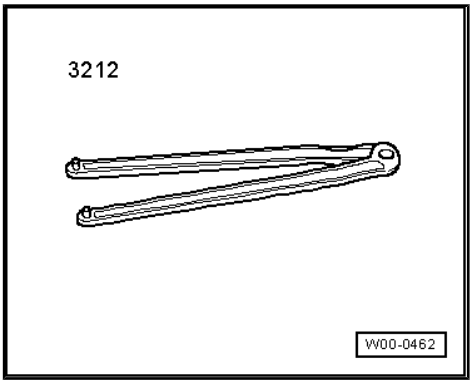
Renew seals and/or gaskets.

– Install engine oil cooler ⇒ page 239 .

2.4 Removing and installing temperature regulator for engine oil cooler

Special tools and workshop equipment required

♦ Pin wrench - 3212-

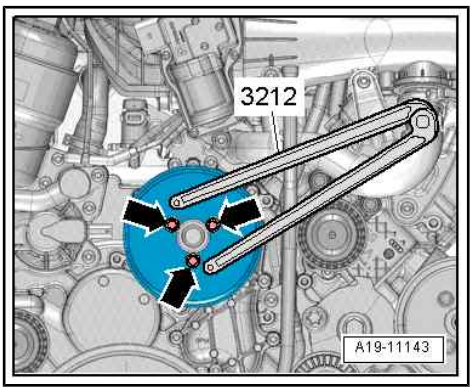


♦ M6 bolt

Removing

– Remove poly V-belt ⇒ page 106 .

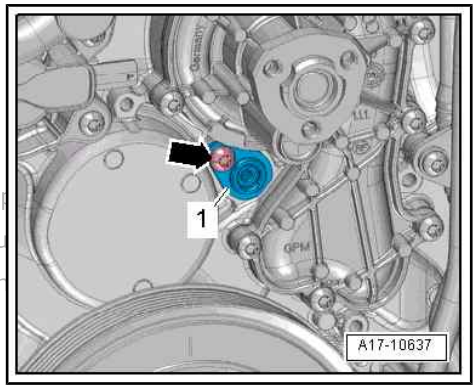
– Remove bolts for coolant pump pulley -arrows- (counterhold with pin wrench - 3212-).



Note

Place a cloth underneath to catch escaping engine oil.

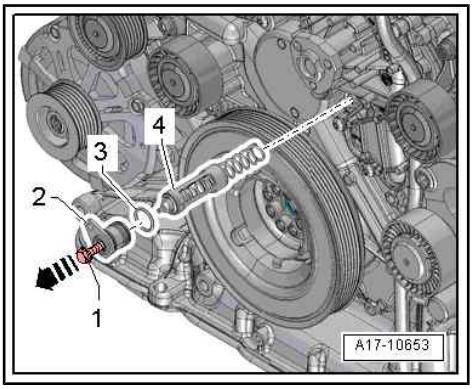
– Remove bolt -arrow- for cover -1-.



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– To remove cover -2-, screw M6 bolt -item 1- into thread in cover and pull out cover by lifting bolt.

– Pull out temperature regulator -4- for engine oil cooler.



Installing

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

- Tightening torque
  ⇒ “2.1 Exploded view - engine oil cooler”, page 238

Note

Fit new O-ring -3-.

– Install poly V-belt pulley for coolant pump ⇒ page 262 .

– Install poly V-belt ⇒ page 106 .

3 Oil filter/oil pressure switches

⇒ “3.1 Exploded view - oil filter housing/oil pressure switch”, page 242

⇒ “3.2 Checking oil pressure switch F22 / oil pressure switch for reduced oil pressure F378 ”, page 243

⇒ “3.3 Removing and installing oil pressure switch F22 / oil pressure switch for reduced oil pressure F378 ”, page 243

⇒ “3.4 Removing and installing oil temperature sender 2 G664 ”, page 245

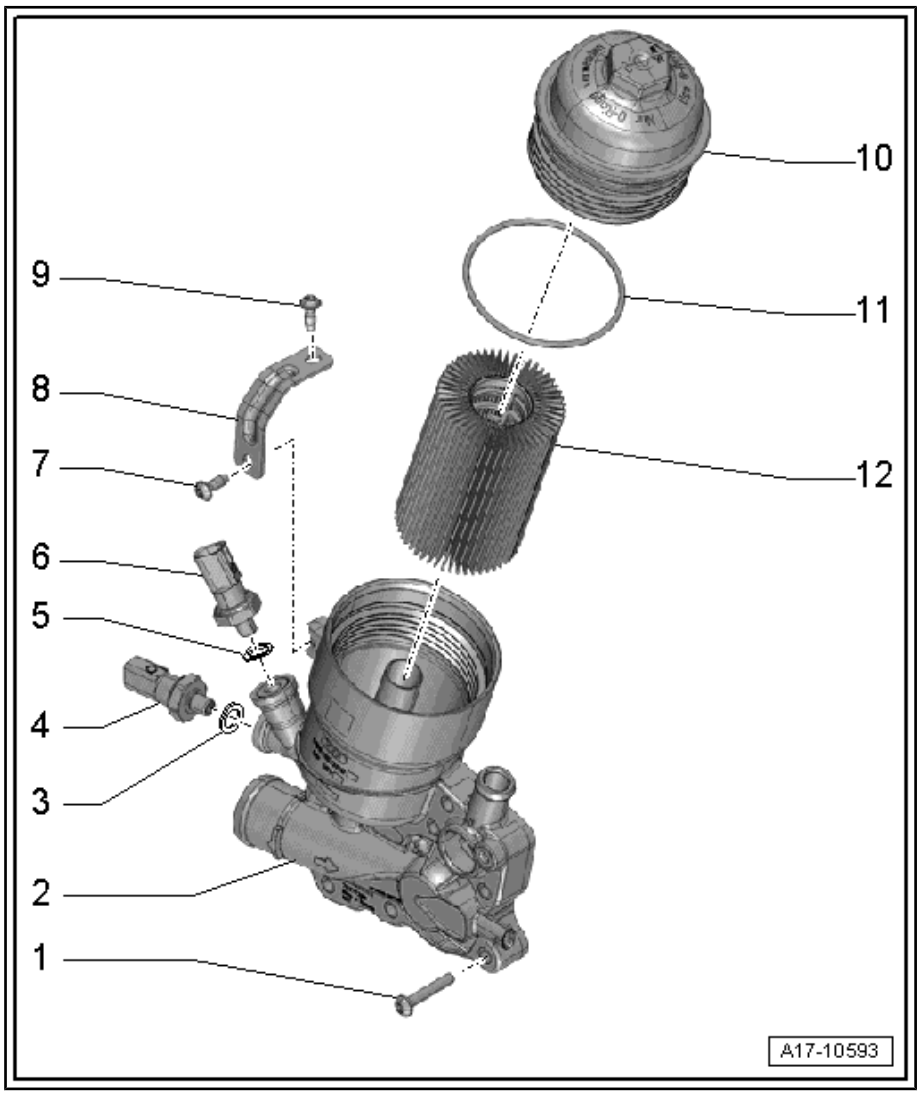
⇒ “3.5 Removing and installing valve for oil pressure control N428 ”, page 246

⇒ “3.6 Checking oil pressure”, page 246

⇒ “3.7 Removing and installing oil filter housing”, page 247

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3.1 Exploded view - oil filter housing/oil pressure switch



1 - Bolt

- ❑ 9 Nm

2 - Oil filter housing

- ❑ With map-controlled engine cooling system thermostat - F265-
- ❑ Removing and installing ⇒ page 247
- ❑ Renew after removing

3 - Seal

- ❑ Permanently attached to oil pressure switch; not available as a replacement part

4 - Oil pressure switch - F22-

- ❑ Opening/closing pressure 2.0 ... 2.5 bar
- ❑ Green insulation
- ❑ Check in `Guided Fault Finding` ⇒ Vehicle diagnostic tester
- ❑ Removing and installing ⇒ page 243
- ❑ 20 Nm

5 - Seal

- ❑ Permanently attached to oil pressure switch; not available as a replacement part

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

- ❑ Opening/closing pressure 0.75 ... 1.05 bar
- ❑ Grey insulation
- ❑ Check in `Guided Fault Finding` ⇒ Vehicle diagnostic tester
- ❑ Removing and installing ⇒ page 243

- ❑ 20 Nm

7 - Bolt

- ❑ Not installed in all vehicles
- ❑ 4 Nm

8 - Retaining bracket

- ❑ For oil filter housing
- ❑ Not installed in all vehicles

9 - Bolt

- ❑ Not installed in all vehicles
- ❑ 4 Nm

10 - Sealing cap

- ❑ With oil filter bypass valve
- ❑ 35 Nm

11 - O-ring

- ❑ Renew

12 - Oil filter element

- ❑ Removing and installing ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818

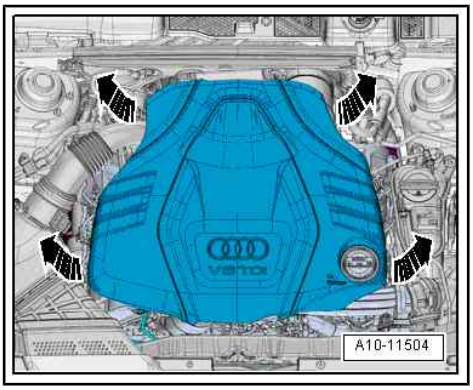
3.2 Checking oil pressure switch - F22- / oil pressure switch for reduced oil pressure - F378-

Checking oil pressure switch - F22- / oil pressure switch for reduced oil pressure - F378- in `Guided Fault Finding` ⇒ Vehicle diagnostic tester.

3.3 Removing and installing oil pressure switch - F22- / oil pressure switch for reduced oil pressure - F378-

Removing

– Remove engine cover panel -arrows-.

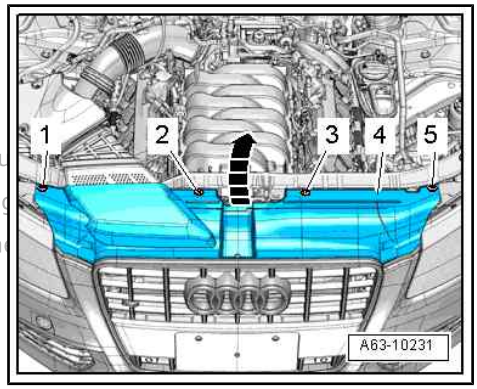


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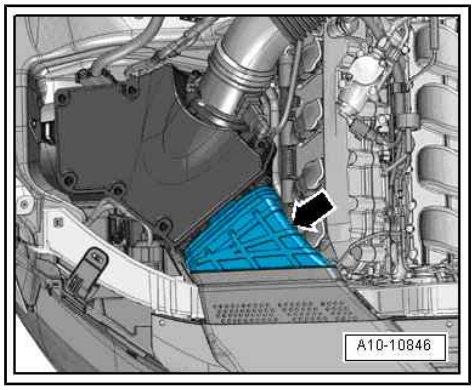
Oil pressure switch - F22- :

– Remove lock carrier cover -4- ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .

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– Remove air duct -arrow-.

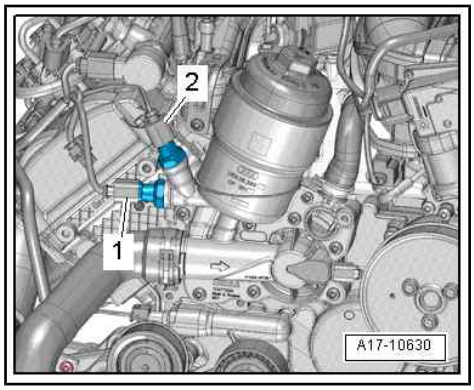


Continuation for both oil pressure switches:

– Unplug electrical connectors:

1 - For oil pressure switch - F22-

2 - For oil pressure switch for reduced oil pressure - F378-



Note

Place a cloth underneath to catch escaping engine oil.

– Unscrew relevant oil pressure switch.

Installing

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

- Tightening torques ⇒ page 242

Note

Renew seal.

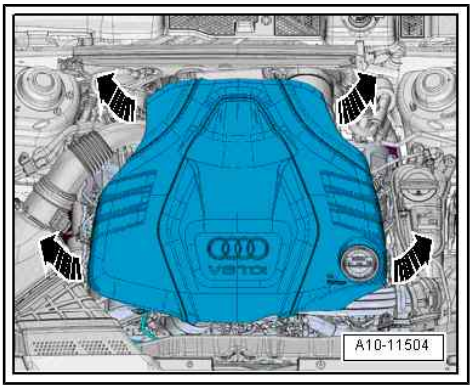
– Install air duct ⇒ page 336 .

– Install lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .

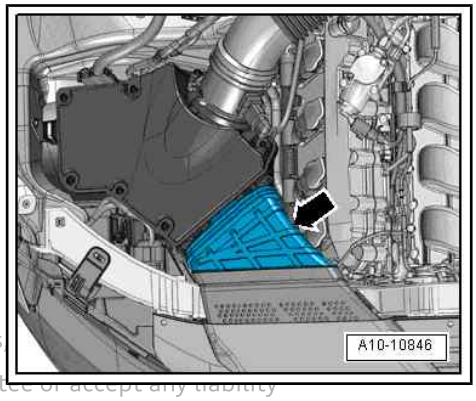
3.4 Removing and installing oil temperature sender 2 - G664-

Removing

– Remove engine cover panel -arrows-.



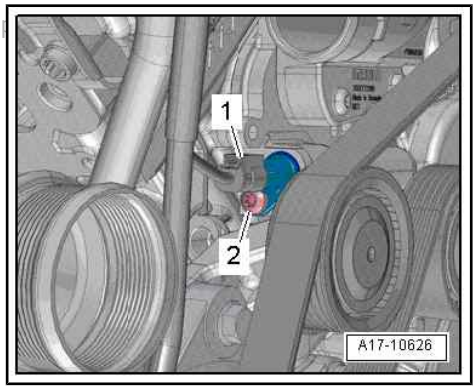
– Remove air duct -arrow-.



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– Unplug electrical connector -1-.

– Unscrew bolt -2- and remove oil temperature sender 2 - G664- .



Installing

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

- Tightening torque
  ⇒ “1.2 Exploded view - sealing flange (pulley end)”, page 101

Note

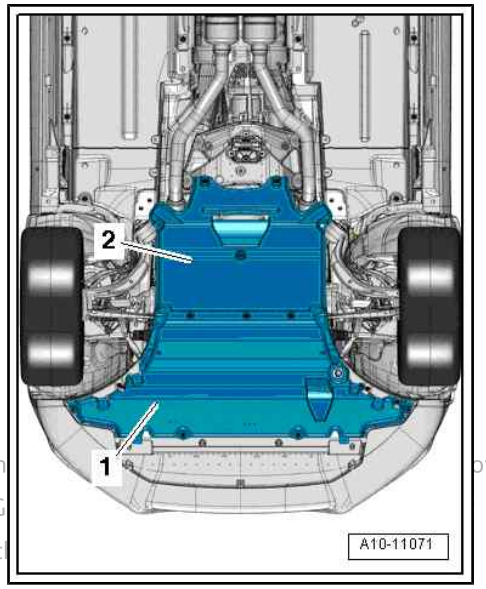
Fit new O-ring.

– Install air duct ⇒ page 336 .

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

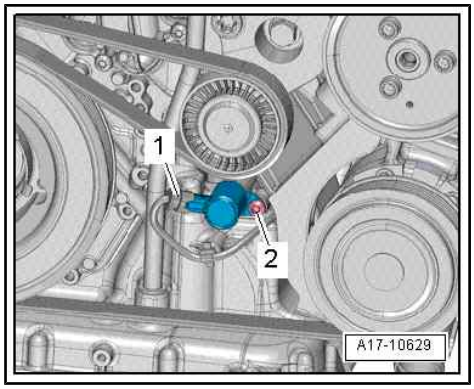
Removing

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



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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:

- Tightening torque
⇒ “1.1.2 Exploded view - sump (top section)”, page 228

Note

Fit new O-ring.

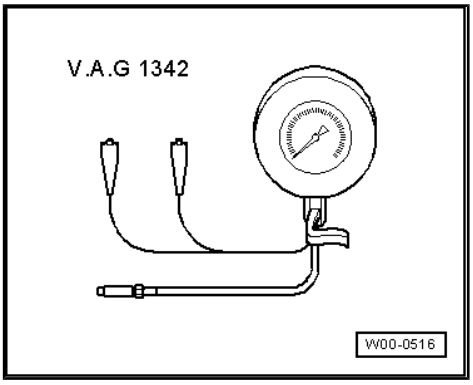
– Check oil level ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .

– Install noise insulation (front) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .

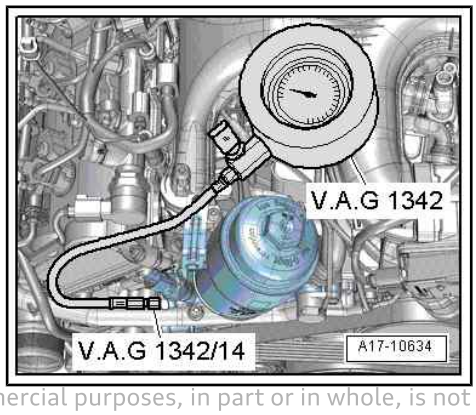
3.6 Checking oil pressure

Special tools and workshop equipment required

♦ Oil pressure tester - V.A.G 1342- with adapter -V.A.G 1342/14-



Procedure



- Oil level OK

– Remove oil pressure switch - F22- ⇒ page 243 .

– Connect oil pressure tester - V.A.G 1342- with adapter -V.A.G 1342/14- , as shown in illustration.

– Screw oil pressure switch - F22- into hole in -V.A.G 1342- to seal hole.

– Start engine.

- Oil pressure when starting and then at idling speed: at least 0.8 bar.

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If specification is not obtained, switch off engine immediately and check oil pump drive, renew oil pump if necessary ⇒ “1.6 Removing and installing oil pump”, page 236 .

If specification is obtained, allow engine to warm up.

- Oil pressure specification at operating temperature and 2000 rpm: at least 1.5 bar.

Attaching

Assemble in reverse order.

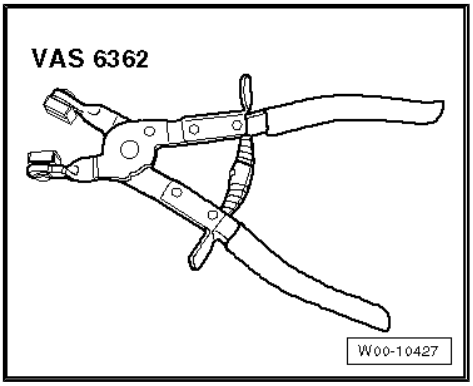
3.7 Removing and installing oil filter housing

Note

The seals on the oil filter housing can only be used once and cannot be supplied as replacement parts. After removing the oil filter housing, it must always be renewed.

Special tools and workshop equipment required

♦ Hose clip pliers - VAS 6362-



Removing

– Remove coolant pipe (front) ⇒ page 276 .

– Remove oil filter element ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .

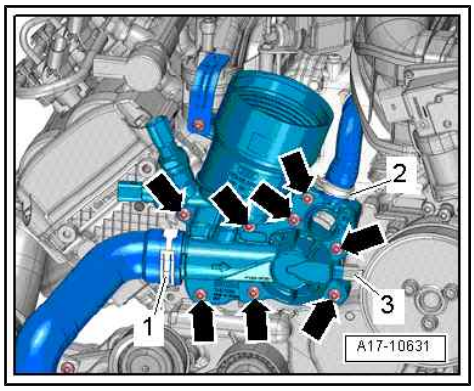
– Remove poly V-belt ⇒ page 106 .

– Remove oil pressure switch - F22- and oil pressure switch for reduced oil pressure - F378- ⇒ page 243 .

– Open hose clips -1 and 2- and disconnect coolant hoses from oil filter housing.

– Remove bolts -arrows-.

– Detach oil filter housing and unplug electrical connector -3-.



Installing

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

- Tightening torque ⇒ "3.1 Exploded view - oil filter housing/oil pressure switch", page 242

Note

♦ *Renew oil filter housing.*

♦ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

– Install oil pressure switch - F22- and oil pressure switch for reduced oil pressure - F378- ⇒ page 243 .

– Install poly V-belt ⇒ page 106 .

– Install oil filter element ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .

– Install coolant pipe (front) ⇒ page 276 .

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19 – Cooling

1 Cooling system/coolant

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⇒ “1.1 Connection diagram - coolant hoses”, page 249

⇒ “1.2 Draining and filling cooling system”, page 253

⇒ “1.3 Checking cooling system for leaks”, page 259

1.1 Connection diagram - coolant hoses

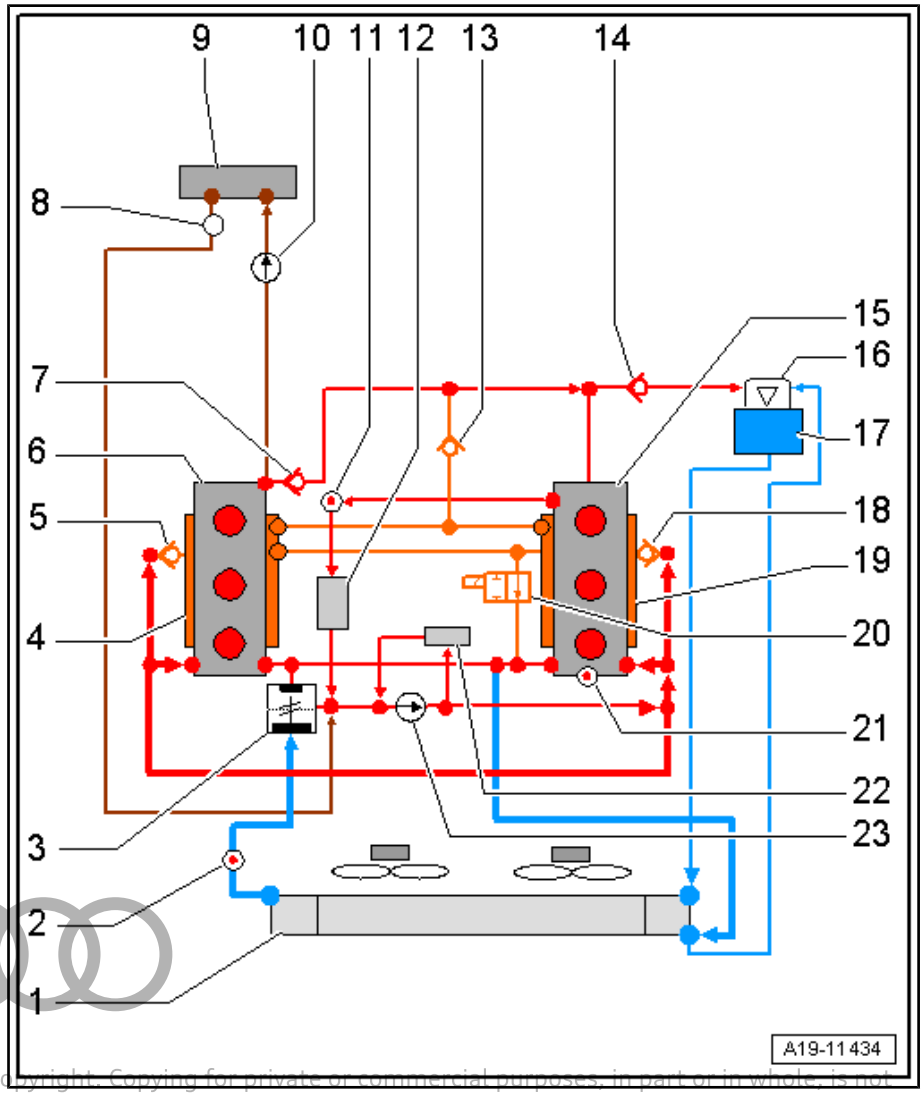
⇒ “1.1.1 Connection diagram - coolant hoses, vehicles without auxiliary heater”, page 249

⇒ “1.1.2 Connection diagram - coolant hoses, vehicles with auxiliary heater”, page 251

1.1.1 Connection diagram - coolant hoses, vehicles without auxiliary heater

Note

- *Blue = Large coolant circuit*
- *Red = Small coolant circuit*
- *Orange = Coolant circuit for cylinder block.*
- *Brown = Heating circuit*
- *Arrows show direction of coolant flow.*



1 - Radiator

- ❑ Vehicles with multitronic gearbox 0AW or dual clutch gearbox 0B5: with ATF cooler
- ❑ If renewed, refill system with fresh coolant

2 - Radiator outlet coolant temperature sender - G83-

3 - Map-controlled engine cooling system thermostat - F265-

4 - Cylinder block

- ❑ Cylinder bank 1 (right-side)
- ❑ If renewed, refill system with fresh coolant

5 - Non-return valve

6 - Cylinder head

- ❑ Cylinder bank 1 (right-side)
- ❑ If renewed, refill system with fresh coolant

7 - Non-return valve

8 - Bleeder screw

9 - Heat exchanger for heater

- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Front air conditioning unit; Removing and installing heat exchanger
- ❑ If renewed, refill system with fresh coolant

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10 - Coolant circulation pump - V50-

- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Coolant circuit

11 - Coolant temperature sender - G62-

12 - Exhaust gas recirculation cooler

- ❑ If renewed, refill system with fresh coolant

13 - Non-return valve

14 - Non-return valve

15 - Cylinder head

- ❑ Cylinder bank 2 (left-side)
- ❑ If renewed, refill system with fresh coolant

16 - Filler cap

- ❑ Checking pressure relief valve ⇒ page 261

17 - Coolant expansion tank

18 - Non-return valve

19 - Cylinder block

- ❑ Cylinder bank 2 (left-side)
- ❑ If renewed, refill system with fresh coolant

20 - Coolant shut-off valve

21 - Temperature sender for engine temperature regulation - G694-

22 - Engine oil cooler

- ❑ If renewed, refill system with fresh coolant

23 - Coolant pump

1.1.2 Connection diagram - coolant hoses, vehicles with auxiliary heater

Note

- ♦ *Blue = Large coolant circuit*
- ♦ *Red = Small coolant circuit*
- ♦ *Orange = Coolant circuit for cylinder block.*
- ♦ *Brown = Heating circuit*
- ♦ *Arrows show direction of coolant flow.*

1 - Radiator

- ❑ Vehicles with multitronic gearbox 0AW or dual clutch gearbox 0B5: with ATF cooler
- ❑ If renewed, refill system with fresh coolant

2 - Radiator outlet coolant temperature sender - G83-

3 - Map-controlled engine cooling system thermostat - F265-

4 - Auxiliary heater

- ❑ With circulation pump - V55-
- ❑ Removing and installing ⇒ Auxiliary/supplementary heater; Rep. gr. 82 ; Auxiliary/supplementary heater; Removing and installing auxiliary/supplementary heater

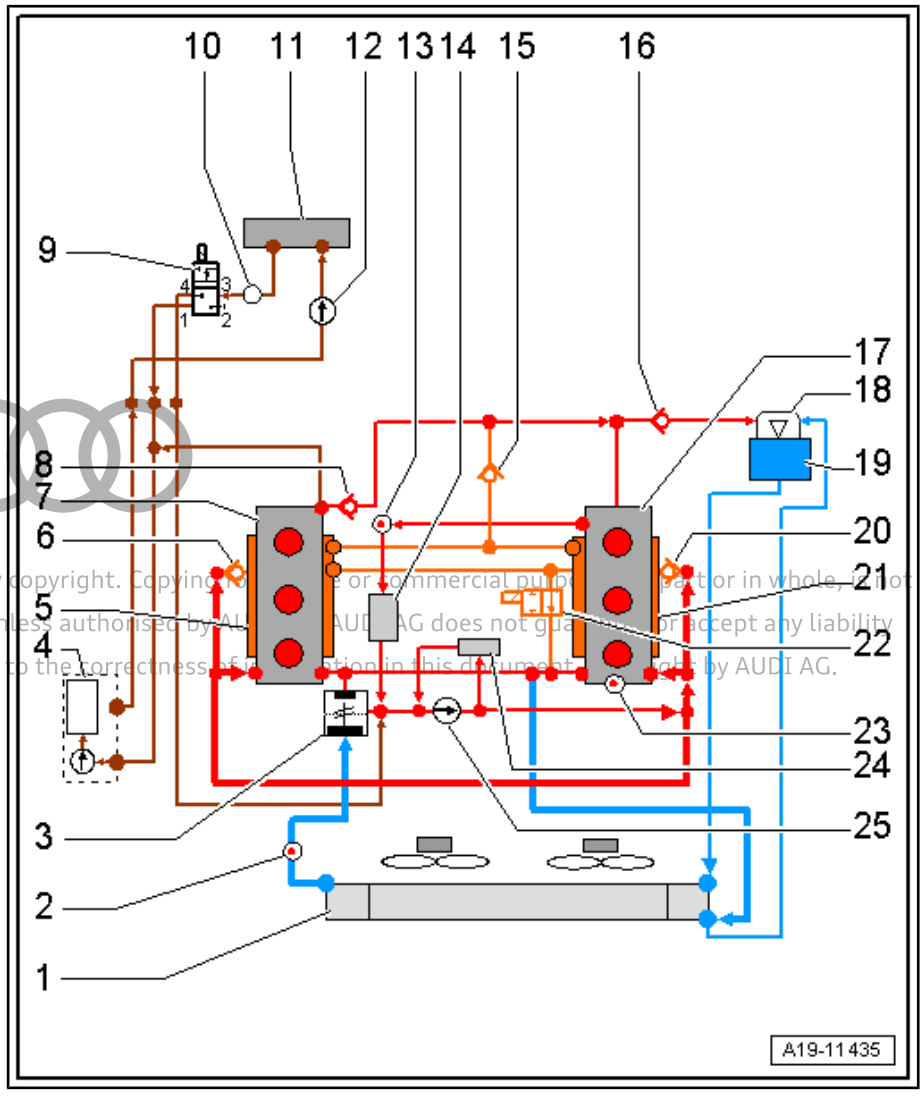
5 - Cylinder block

- ❑ Cylinder bank 1 (right-side)
- ❑ If renewed, refill system with fresh coolant

6 - Non-return valve

7 - Cylinder head

- ❑ Cylinder bank 1 (right-side)
- ❑ If renewed, refill system with fresh coolant



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8 - Non-return valve

9 - Heater coolant shut-off valve - N279-

- ❑ Removing and installing ⇒ Auxiliary/supplementary heater; Rep. gr. 82 ; Coolant circuit with auxiliary/ supplementary heater; Removing and installing heater coolant shut-off valve

10 - Bleeder screw

11 - Heat exchanger for heater

- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Front air conditioning unit; Removing and installing heat exchanger
- ❑ If renewed, refill system with fresh coolant

12 - Coolant circulation pump - V50-

- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Coolant circuit

13 - Coolant temperature sender - G62-

14 - Exhaust gas recirculation cooler

- ❑ If renewed, refill system with fresh coolant

15 - Non-return valve

16 - Non-return valve

17 - Cylinder head

- ❑ Cylinder bank 2 (left-side)
- ❑ If renewed, refill system with fresh coolant

18 - Filler cap

- ❑ Checking pressure relief valve ⇒ page 261

19 - Coolant expansion tank

20 - Non-return valve

21 - Cylinder block

- ❑ Cylinder bank 2 (left-side)
- ❑ If renewed, refill system with fresh coolant

22 - Coolant shut-off valve

23 - Temperature sender for engine temperature regulation - G694-

24 - Engine oil cooler

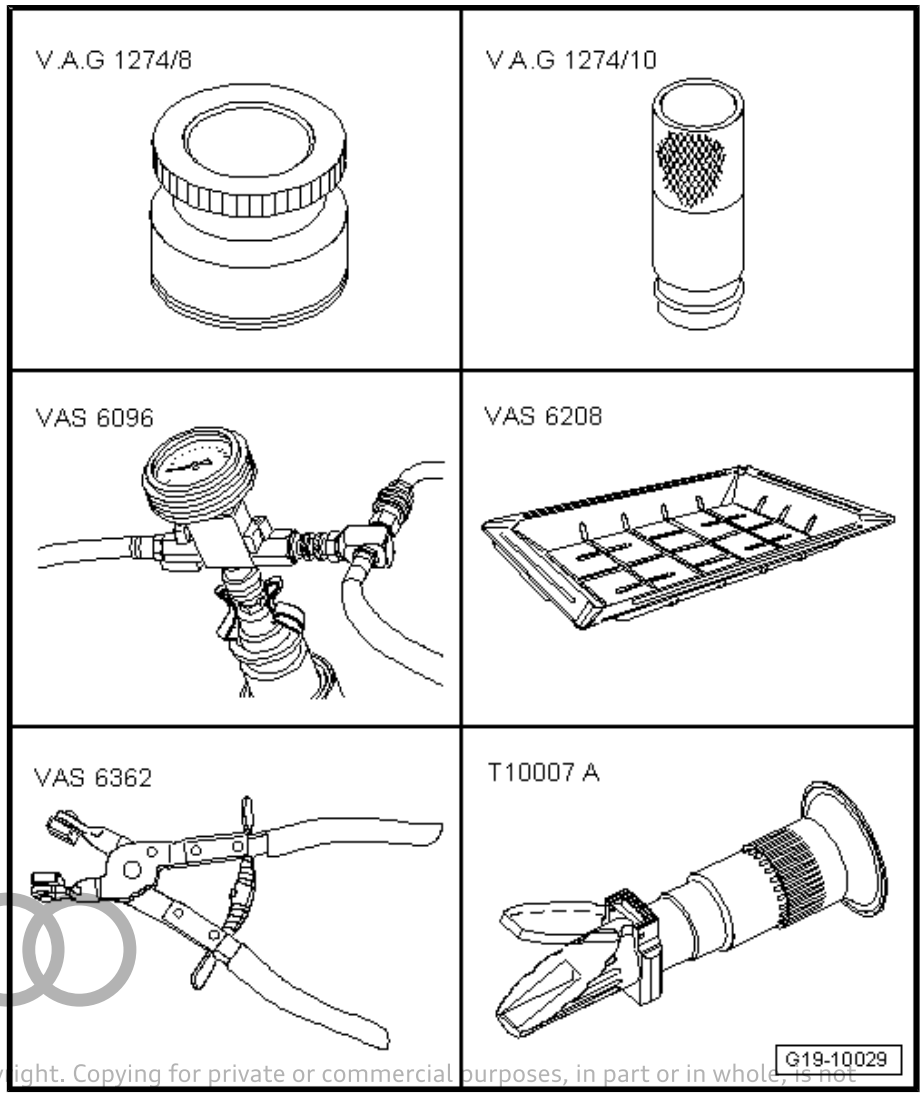
- ❑ If renewed, refill system with fresh coolant

25 - Coolant pump

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1.2 Draining and filling cooling system

Special tools and workshop equipment required



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- 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-
- Drip tray for workshop hoist - VAS 6208-
- Hose clip pliers - VAS 6362-
- Refractometer - T10007 A-

Draining

WARNING

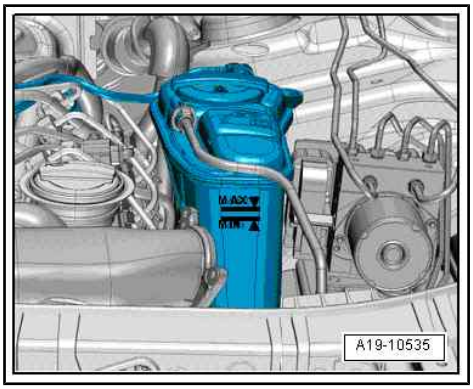
Risk of injury as the radiator fans may start up automatically.

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

WARNING

Risk of scalding due to hot steam and hot coolant.

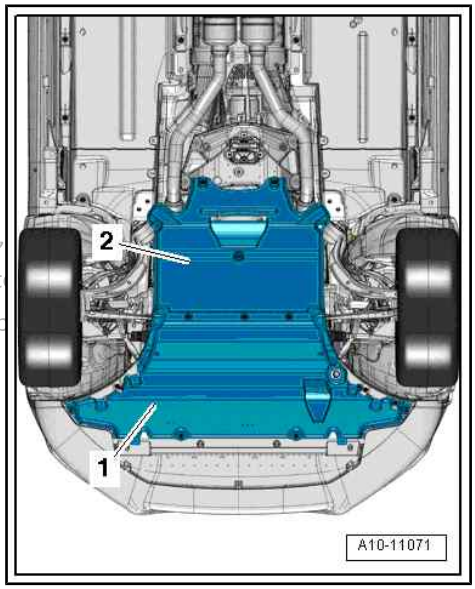
- *The cooling system is under pressure when the engine is hot.*
- *To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.*



– Open filler cap on coolant expansion tank.

– Remove noise insulation -1- and -2- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .

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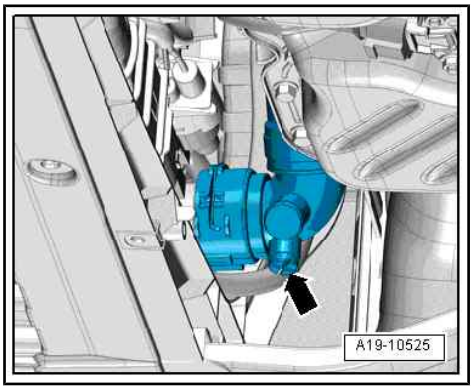


Note

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

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

– Remove drain plug -arrow- at connection and drain off coolant.



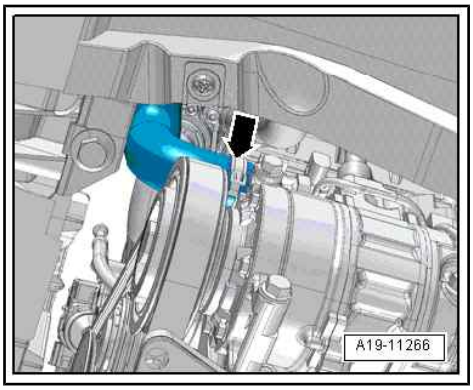
– Release hose clip -arrow-, disconnect coolant hose from coolant pipe (front left) and drain off coolant.

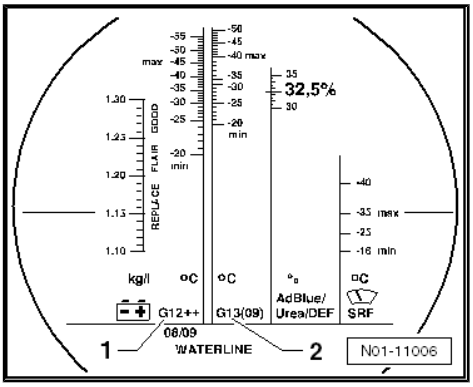
Filling

- Ignition switched off.

Caution

To ensure optimal corrosion protection, only distilled water may be mixed with coolant additives.





Note

- *The effectiveness of the coolant is greatly influenced by the quality of the water with which it is mixed. Because water may contain different substances depending on the country or even the region, the water quality to be used for cooling systems has been specified. Distilled water meets all the requirements and is therefore recommended for use when topping up or filling up with coolant.*
- *Use only coolant additives listed in the ⇒ Electronic parts catalogue (ETKA) . If you use other coolant additives, this can significantly impair in particular the corrosion protection effect. The resulting damage could lead to loss of coolant and consequently to serious engine damage.*
- *Coolant with the recommended mixture ratio prevents frost and corrosion damage and stops scaling. At the same time it raises the boiling point of the fluid in the system. For this reason the cooling system must be filled all year round with the correct coolant additive.*
- *Because of its high boiling point, the coolant improves engine reliability under heavy loads, particularly in countries with tropical climates.*
- *The refractometer - T10007A- MUST be used to determine the current level of frost protection.*
- *The mixture must guarantee frost protection down to at least -25 °C (in countries with arctic climate: down to -36 °C). The amount of antifreeze should only be increased if greater frost protection is required in very cold climates. This must only be down to -48 °C, however, as otherwise the cooling efficiency of the coolant is impaired.*
- *The coolant concentration must not be reduced by adding water even in warmer seasons and in warmer countries. Frost protection must be provided to at least -25 °C.*
- *Read off the level of frost protection on the scale for the relevant coolant additive.*
- *The temperature indicated on the refractometer - T10007A- corresponds to the temperature at which the first ice crystals can form in the coolant.*
- *Do not reuse coolant.*
- *Only use water/coolant additive as a lubricant for coolant hoses.*

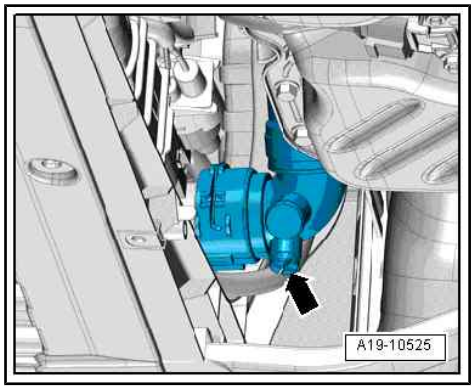
Recommended mixture ratio for coolant

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

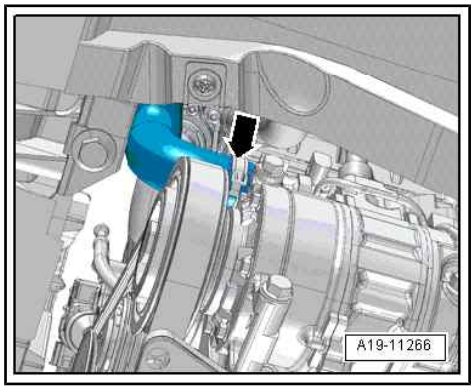
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Procedure

– Close drain plug -arrow-.



– Connect coolant hose to coolant pipe (front left) with hose clip -arrow-.

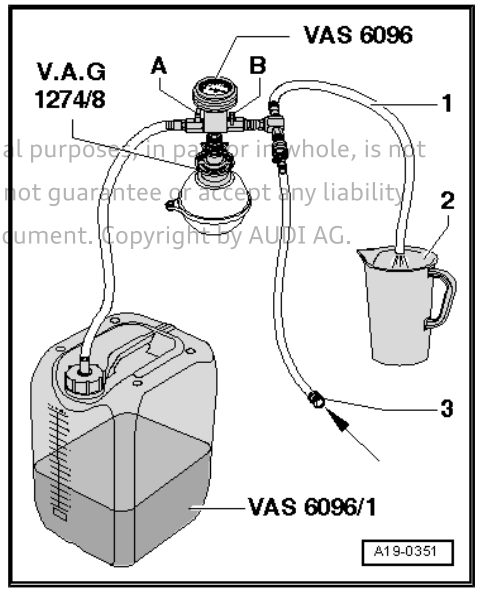


– Fill reservoir of cooling system charge unit -VAS 6096- with at least 12 litres of premixed coolant (according to recommended ratio):

– Fit adapter for cooling system tester - V.A.G 1274/8- onto coolant expansion tank.

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

– Run vent hose -1- into a small container -2-.



Note

The vented air draws along a small amount of coolant, which should be collected.

– Close both valves -A- and -B- (turn lever at right angles to direction of flow).

– Connect hose -3- to compressed air supply.

• Pressure: 7 ... 10 bar.

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

• The suction jet pump generates a partial vacuum in the cooling system; the needle on the gauge should move into the green zone.

– Also briefly open valve -A- (turn lever in direction of flow) so that hose on reservoir of -VAS 6096- can fill with coolant.

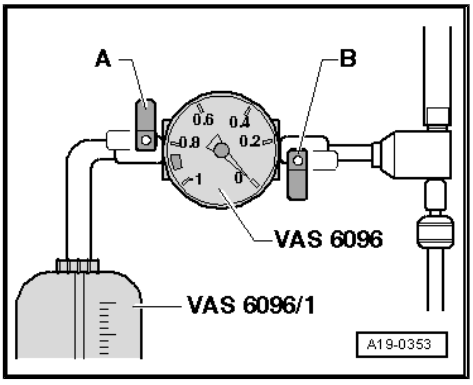
– Close valve -A- again.

– Leave valve -B- open for another 2 minutes.

• The suction jet pump continues to generate a partial vacuum in the cooling system; the needle on the gauge should remain in the green zone.

– Close valve -B-.

• The needle on the gauge should stop in the green zone. The vacuum level in the cooling system is then sufficient for subsequent filling.



Note

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

♦ *Check cooling system for leaks if the vacuum is not maintained.*

– Detach compressed air hose.

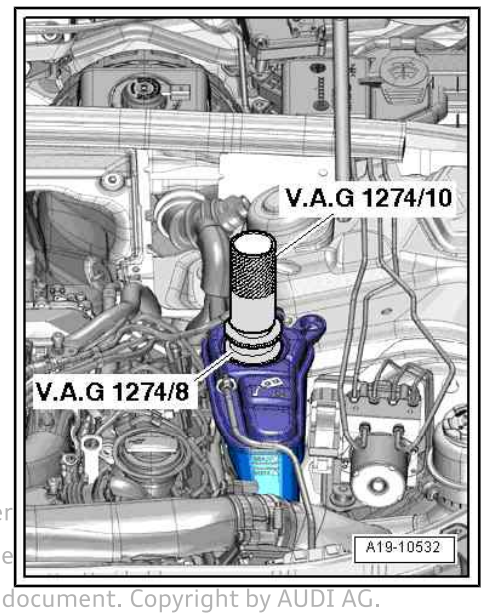
– Open valve -A-.

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

– Detach cooling system charge unit - VAS 6096- from adapter -V.A.G 1274/8- on coolant expansion tank.

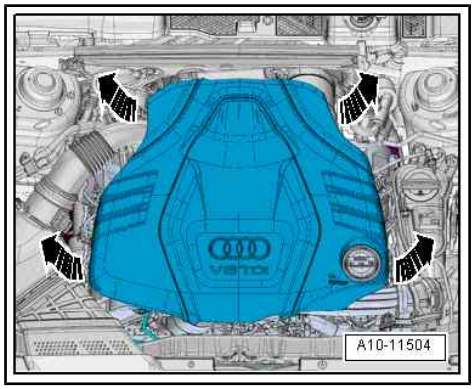
– Attach pipe -V.A.G 1274/10- onto adapter -V.A.G 1274/8- .

– Fill up with coolant until pipe for cooling system tester is filled. If required, add further coolant when performing bleeding procedure.

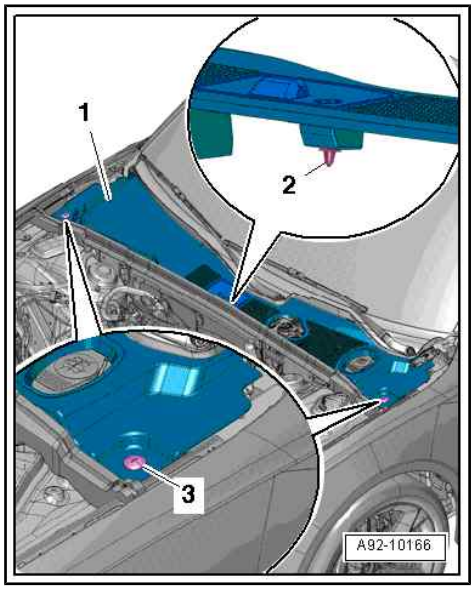


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– Remove engine cover panel -arrows-.

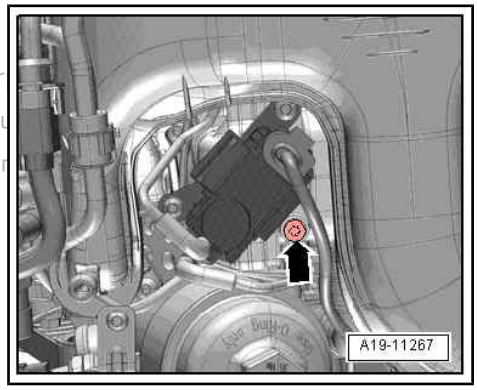


– Pull seal off plenum chamber partition panel.
– Remove plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .

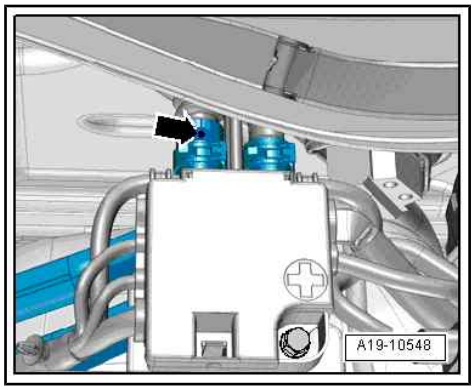


– Open bleeder screw -arrow- at coolant pipe (front) until coolant flows out.
– Close bleeder screw.

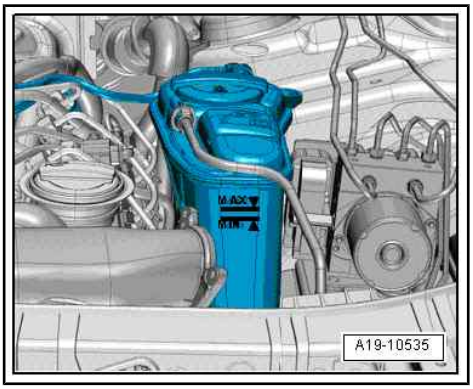
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– Release coolant hose going to heat exchanger and pull back hose until coolant flows out at bleeder hole -arrow- in coolant hose.
– Push coolant hose back onto connection and secure with hose clip.
– On vehicles with auxiliary heater, switch heater on (for about 30 seconds) and then off again.



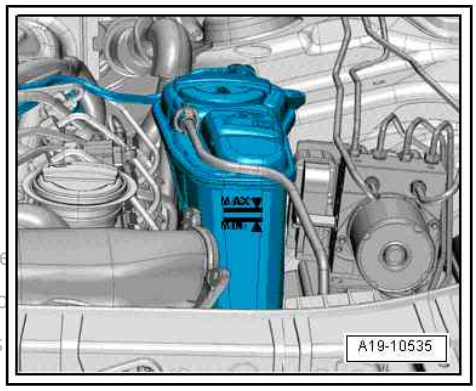
– Close filler cap on coolant expansion tank (make sure it engages).
– Start engine.



Time period	Engine speed	Air conditioner/heater setting
3 minutes	2000 rpm	• Air conditioning system “OFF”, LED in AC button not lit • Heating at “HI”, select lowest possible blower speed (= 0)
Until both large coolant hoses at radiator become warm	Idling	• Air conditioning system “OFF” • Heating at “HI”
2 minutes	2000 rpm	• Air conditioning system “OFF” • Heating at “HI”

– Switch off ignition and allow engine to cool down.
– Install noise insulation panels ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .
– Check coolant level.

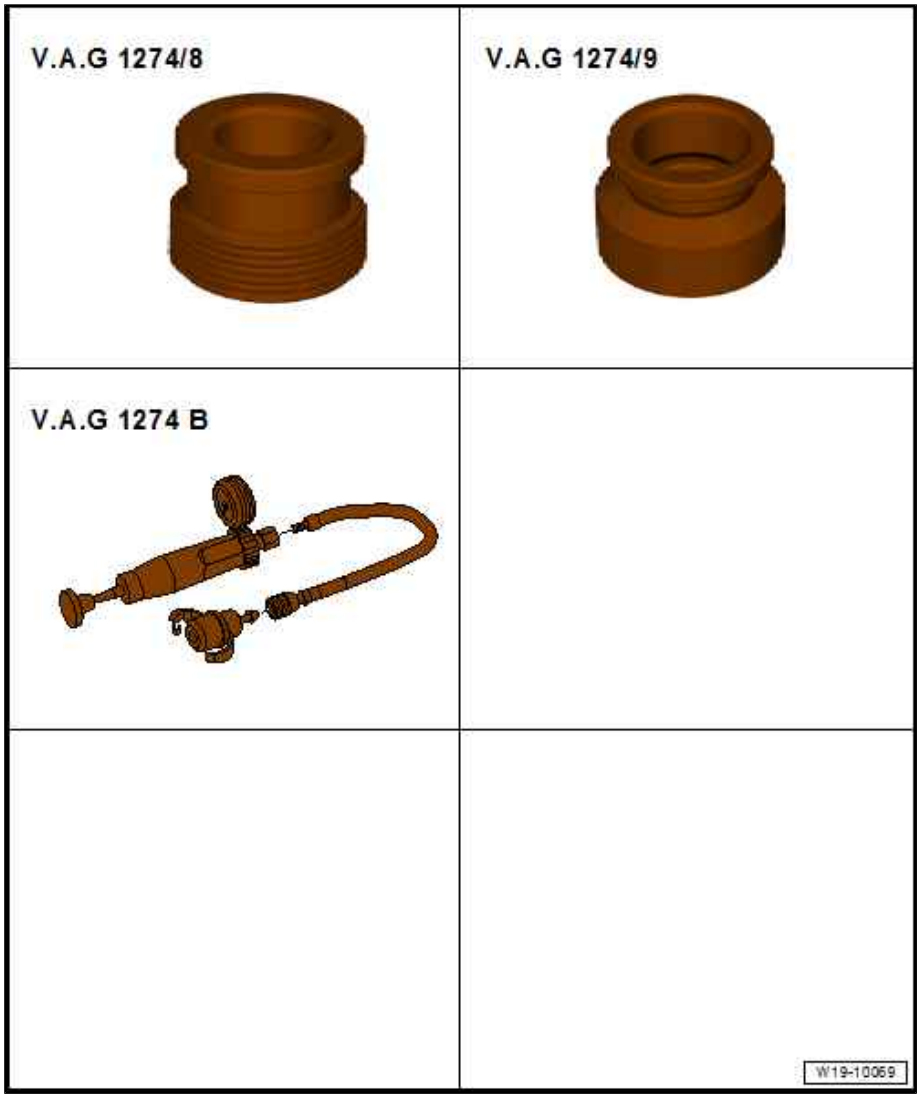
• The coolant level must be at the -MAX- marking when the engine is cold.
• The coolant level can be above the -MAX- marking when the engine is warm.



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1.3 Checking cooling system for leaks

Special tools and workshop equipment required



- Adapter for cooling system tester - V.A.G 1274/8-
- Adapter for cooling system tester - V.A.G 1274/9-
- Cooling system tester - V.A.G 1274 B-

Procedure

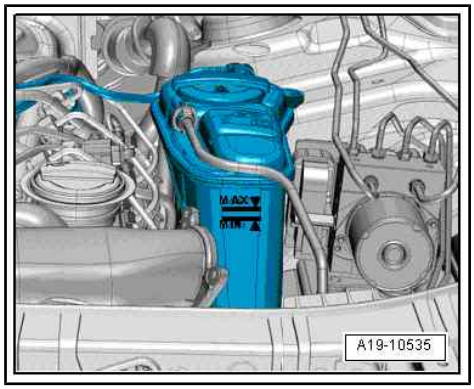
- Engine must be warm.

WARNING

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

Danger of scalding skin and other parts of the body.

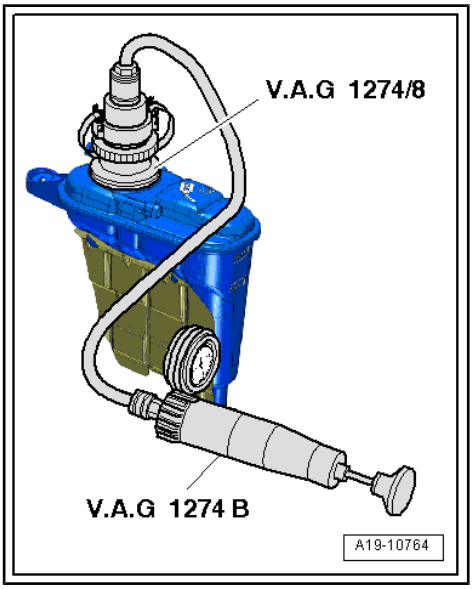
- ***Put on protective gloves.***
- ***Put on safety goggles.***
- ***Cover filler cap on expansion tank with a cloth and open carefully to release pressure.***



– Open filler cap on coolant expansion tank.

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– Fit cooling system tester - V.A.G 1274 B- with adapter - V.A.G 1274/8- onto coolant expansion tank.
– Using hand pump on cooling system tester, build up a pressure of approx. 1.5 bar.
• The pressure should not drop more than 0.2 bar within 10 minutes.
– If the pressure drops more than 0.2 bar, locate leak and eliminate fault.

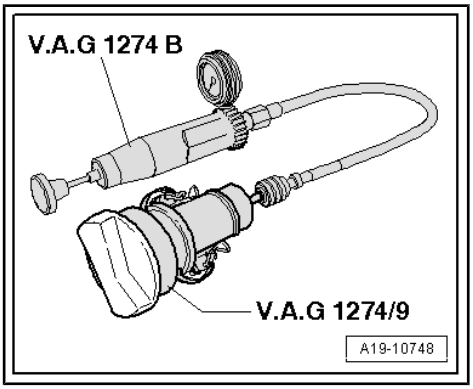


Note

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.

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”, page 262

⇒ “2.2 Exploded view - coolant temperature senders”, page 264

⇒ “2.3 Exploded view - coolant shut-off valve”, page 265

⇒ “2.4 Removing and installing coolant pump”, page 265

⇒ “2.5 Removing and installing map-controlled engine cooling system thermostat F265 ”, page 267

⇒ “2.6 Removing and installing coolant valves”, page 267

⇒ “2.7 Removing and installing coolant shut-off valve”, page 269

⇒ “2.9 Removing and installing temperature sender for engine temperature regulation G694 ”, page 271

⇒ “2.8 Removing and installing coolant temperature sender G62 ”, page 270

⇒ “2.10 Removing and installing radiator outlet coolant temperature sender G83 ”, page 272

2.1 Exploded view - coolant pump

Coolant pump

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1 - Bolt

- ❑ Aluminium or steel bolts, depending on version
- ❑ Renew aluminium bolts
- ❑ Tighten in stages and in diagonal sequence
- ❑ Aluminium bolts: 3 Nm + 90°
- ❑ Steel bolts: 9 Nm

2 - Poly V-belt pulley for coolant pump

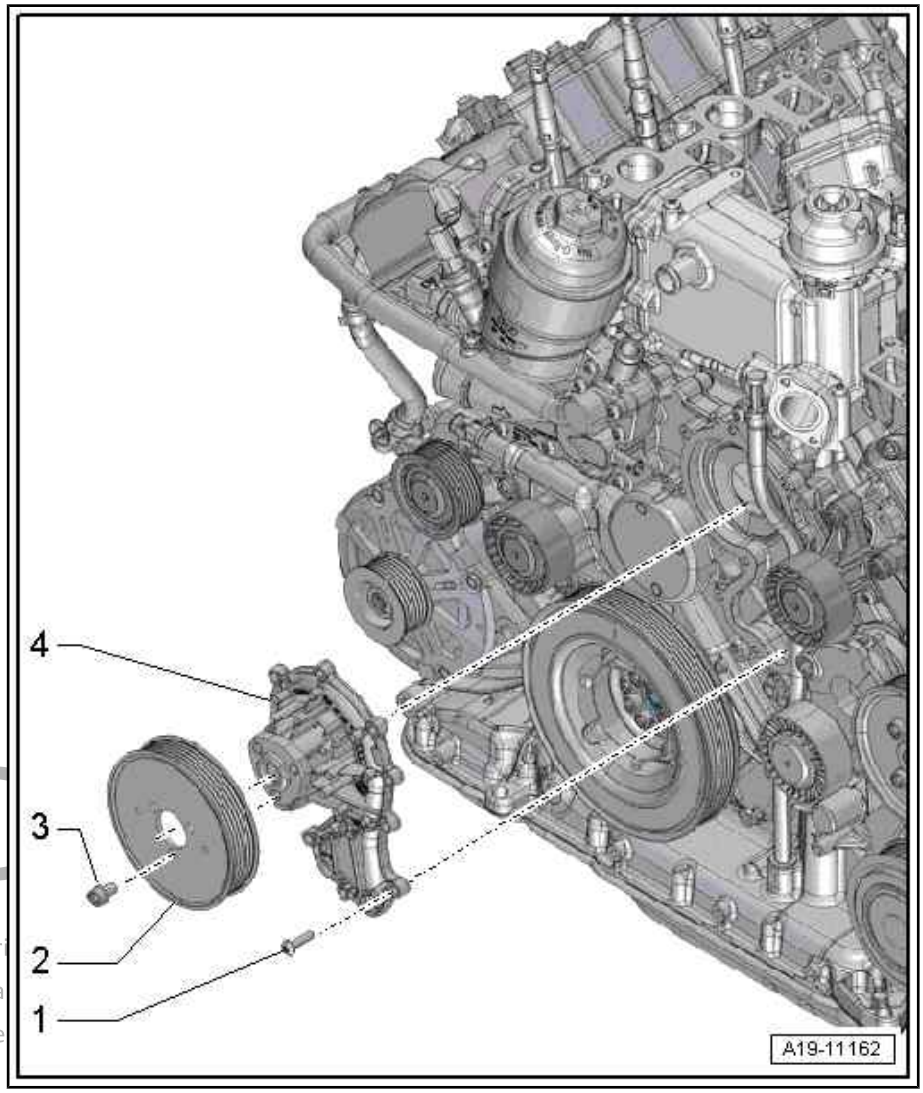
- ❑ Installation position: marking “vorne” (front) faces in direction of travel

3 - Bolt

- ❑ 23 Nm

4 - Coolant pump

- ❑ Removing and installing ⇒ page 265
- ❑ Renew coolant pump if seal is damaged



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2.2 Exploded view - coolant temperature senders

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1 - Radiator outlet coolant temperature sender - G83-

- ❑ Removing and installing ⇒ page 272

2 - Retaining clip

- ❑ Check that it is securely seated

3 - O-ring

- ❑ Renew

4 - O-rings

- ❑ Renew

5 - Coolant temperature sender - G62-

- ❑ Removing and installing ⇒ page 271

6 - Bolt

- ❑ 9 Nm

7 - O-rings

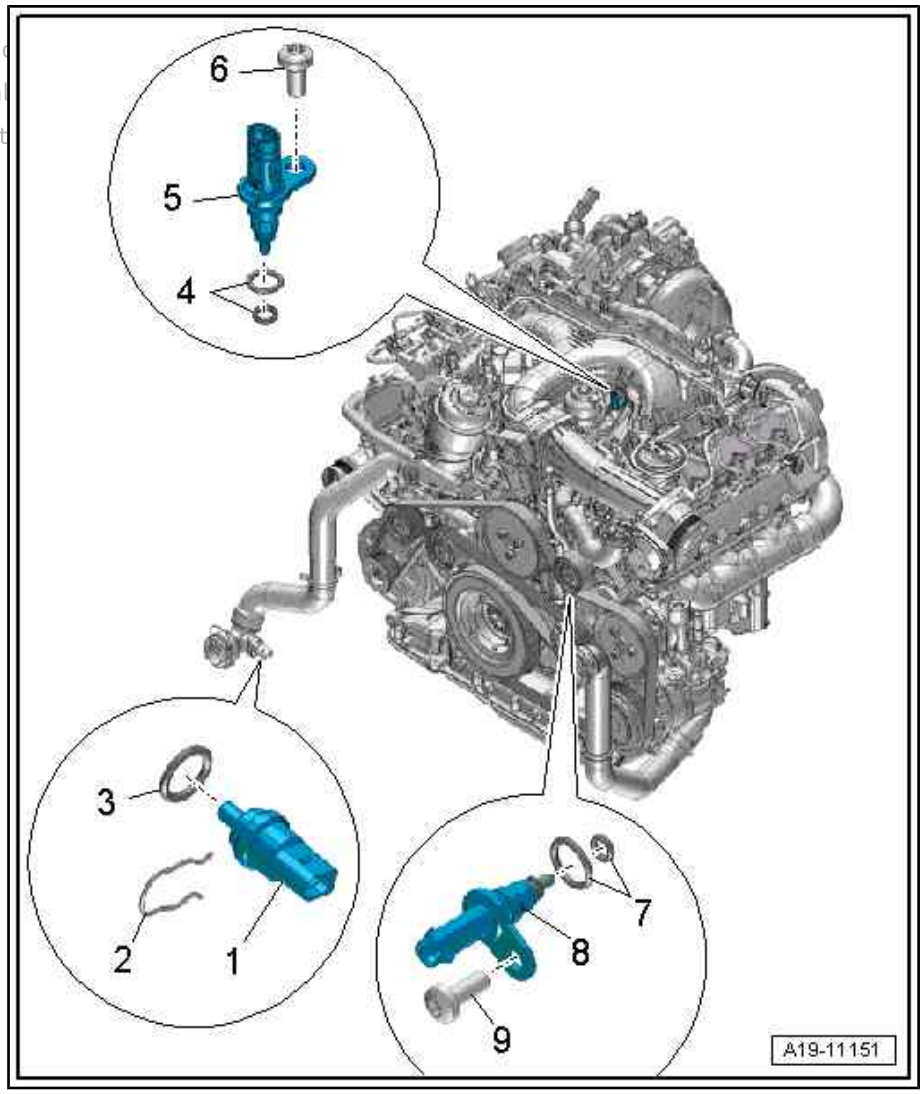
- ❑ Renew

8 - Temperature sender for engine temperature regulation - G694-

- ❑ Removing and installing ⇒ page 270

9 - Bolt

- ❑ 9 Nm



2.3 Exploded view - coolant shut-off valve

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1 - Mounting plate
- ❑ For engine oil cooler and coolant shut-off valve

2 - Gasket
- ❑ Renew

3 - Bolt
- ❑ 9 Nm

4 - Coolant hose

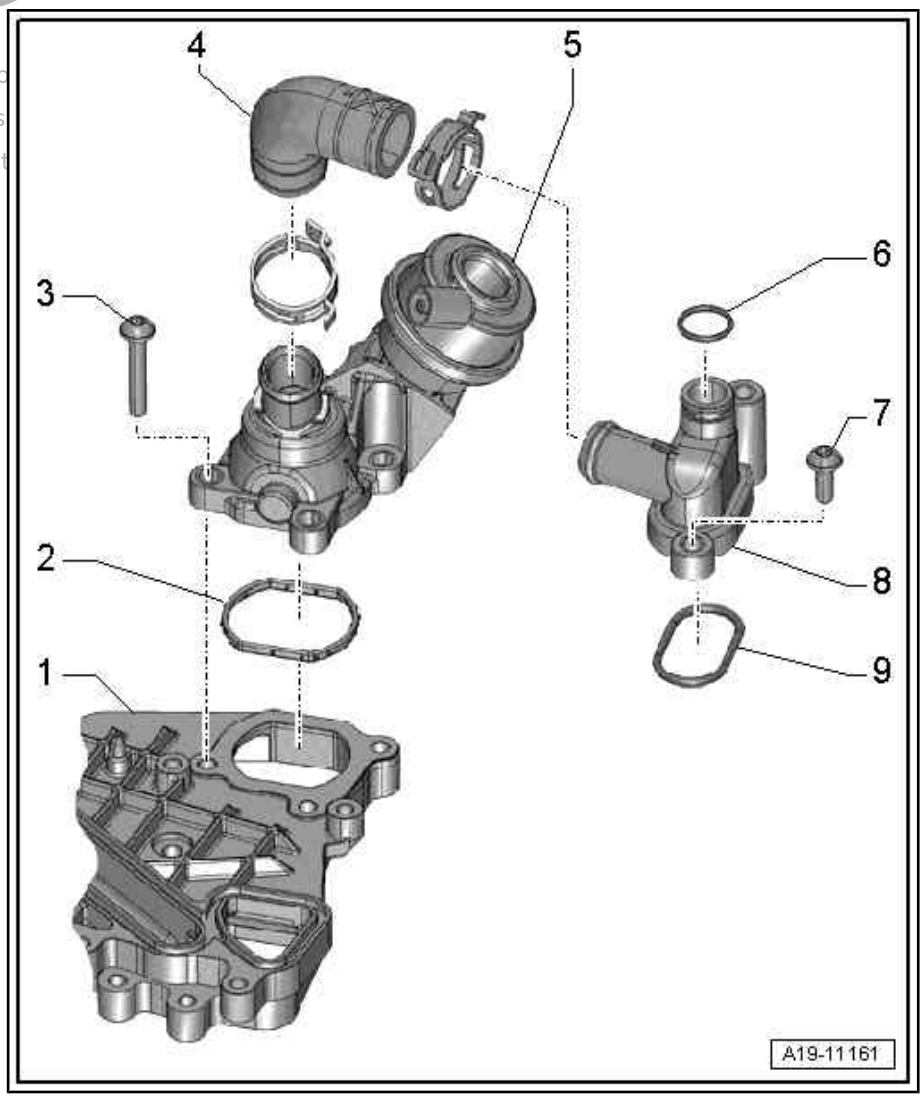
5 - Coolant shut-off valve
- ❑ Removing and installing ⇒ page 269

6 - O-ring
- ❑ Renew

7 - Bolt
- ❑ 9 Nm

8 - Coolant connection

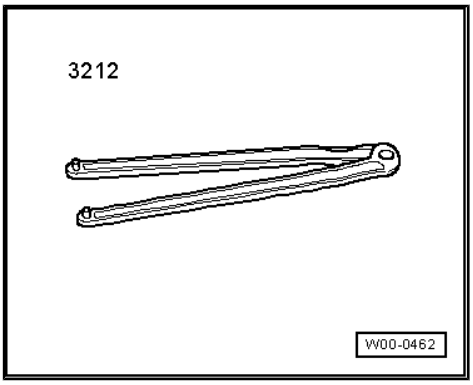
9 - Gasket
- ❑ Renew



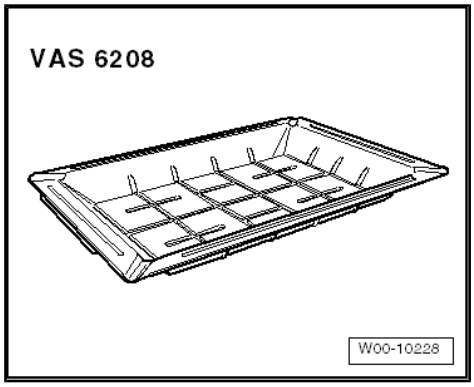
2.4 Removing and installing coolant pump

Special tools and workshop equipment required

- ♦ Pin wrench - 3212-



♦ Drip tray for workshop hoist - VAS 6208-

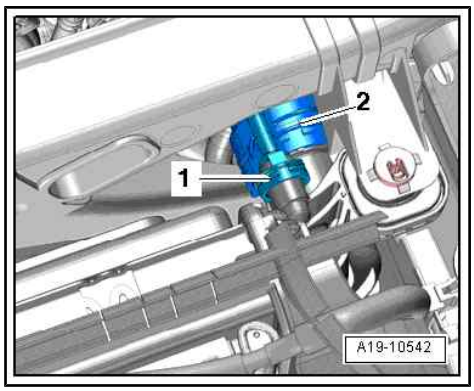


Removing

– Drain coolant ⇒ page 253 .

– Remove poly V-belt ⇒ page 106 .

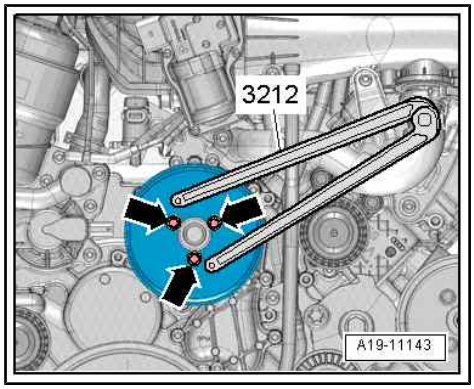
– Release retaining clip -2- and detach connection from radiator.



Note

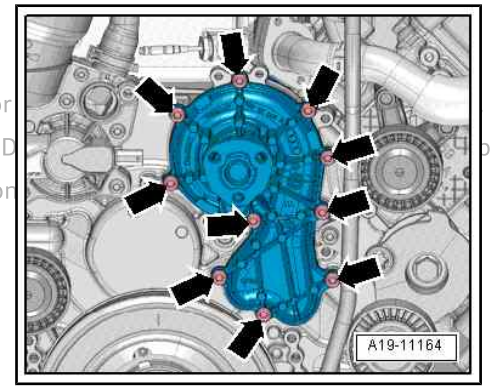
Disregard -item 1-.

– Remove bolts for coolant pump pulley -arrows- (counterhold with pin wrench - 3212-).



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

– Remove bolts -arrows- and detach coolant pump.



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Installing

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

- Tightening torques
  ⇒ “2.1 Exploded view - coolant pump”, page 262

– Clean sealing surface.

– Install poly V-belt ⇒ page 106 .

– Fill up with coolant ⇒ page 254 .

2.5 Removing and installing map-controlled engine cooling system thermostat - F265-

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Note

- *The map-controlled engine cooling system thermostat - F265- is integrated in the oil filter housing and cannot be renewed separately.*
- *The seals on the oil filter housing can only be used once and cannot be supplied as replacement parts. After removing the oil filter housing, it must always be renewed.*

– Oil filter housing must be removed and installed ⇒ page 247 .

2.6 Removing and installing coolant valves

⇒ “2.6.1 Removing and installing non-return valve - cylinder bank 1”, page 267

⇒ “2.6.2 Removing and installing non-return valve - cylinder bank 2”, page 268

2.6.1 Removing and installing non-return valve - cylinder bank 1

Note

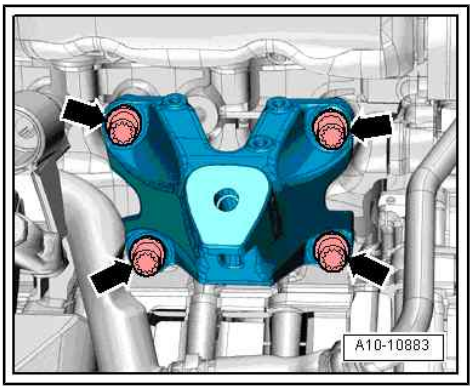
The removal and installation procedures are described for the version without a connection for a coolant hose.

Removing

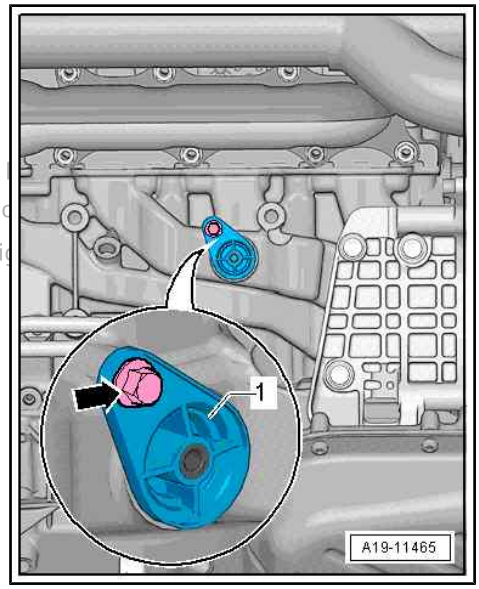
– Drain coolant ⇒ page 253 .

– Remove engine mounting (right-side) ⇒ page 94 .

– Unscrew bolts -arrows- and remove engine support (right-side).



– Remove bolt -arrow-.
– Detach non-return valve -1-.



Installing

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

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- Tightening torques
  ⇒ "3.1 Exploded view - coolant pipes", page 274
– Install engine support and engine mounting ⇒ page 93 .
– Fill up with coolant ⇒ page 254 .

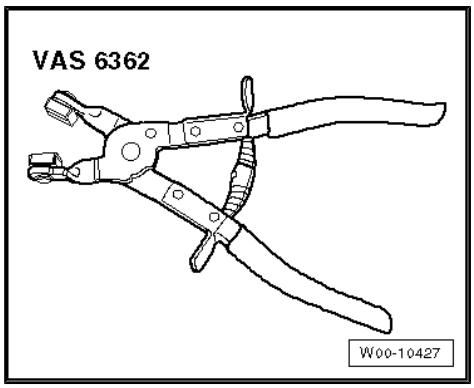
2.6.2 Removing and installing non-return valve - cylinder bank 2

Note

The removal and installation procedures are described for the version with a connection for a coolant hose.

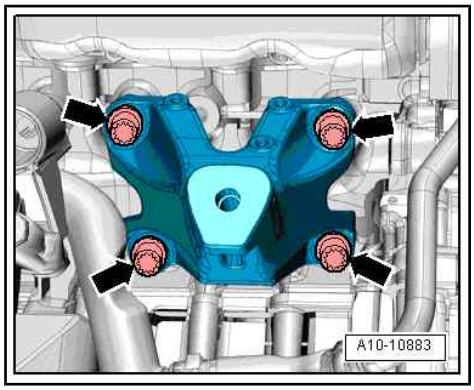
Special tools and workshop equipment required

♦ Hose clip pliers - VAS 6362-

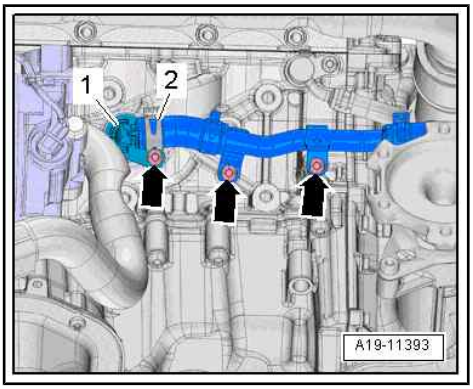


Removing

– Drain coolant ⇒ page 253 .
– Remove engine mounting (left-side) ⇒ page 94 .
– Unscrew bolts -arrows- and remove engine support (left-side).



– Remove bolts -arrows-.
– Release hose clip -2- and detach coolant hose.
– Detach non-return valve -1-.



Installing

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

- Tightening torques
  ⇒ “3.1 Exploded view - coolant pipes”, page 274

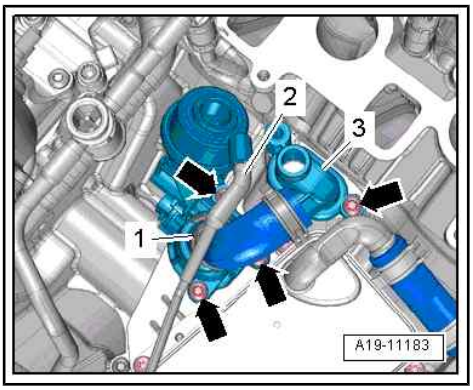
Note

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

– Install engine support and engine mounting ⇒ page 93 .
– Fill up with coolant ⇒ page 254 .

2.7 Removing and installing coolant shut-off valve

Removing



– Remove exhaust gas recirculation cooler ⇒ page 461 .
– Remove engine oil cooler ⇒ page 239 .
– Unscrew bolts -arrows- and detach shut-off valve with coolant connection -3-.
– Disconnect vacuum hose -2-.
– Release hose clip -1- and detach coolant connection.

Installing

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

- Tightening torques
  ⇒ “2.3 Exploded view - coolant shut-off valve”, page 265

Note

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

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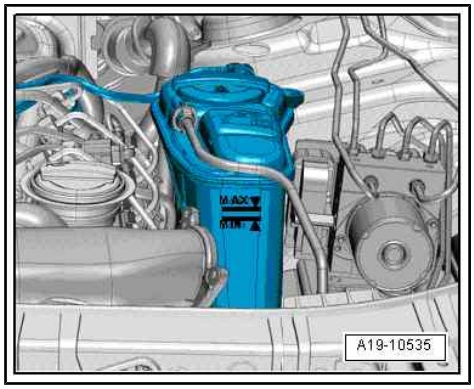
– Install engine oil cooler ⇒ page 239 .
– Install exhaust gas recirculation cooler ⇒ page 461 .

2.8 Removing and installing coolant temperature sender - G62-

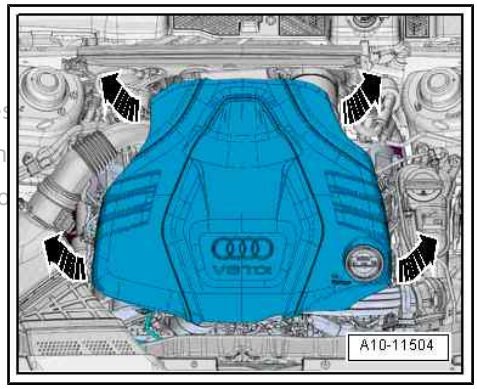
Removing

- Engine cold.

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



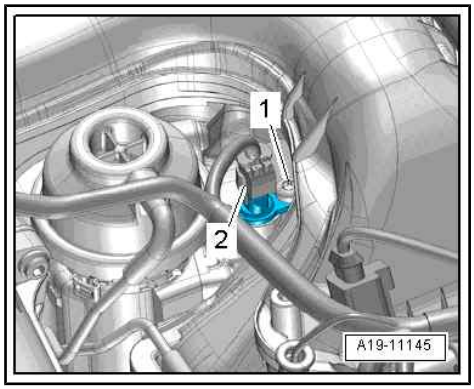
– Remove engine cover panel -arrows-.



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– Unplug electrical connector -2-.

– Unscrew bolt -1- and pull off coolant temperature sender - G62- .



Installing

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

- Tightening torque
⇒ “2.2 Exploded view - coolant temperature senders”, page 264

Note

- *Fit new O-rings.*
- *To avoid loss of coolant, insert new coolant temperature sender - G62- immediately.*

– Check coolant level ⇒ page 259 .

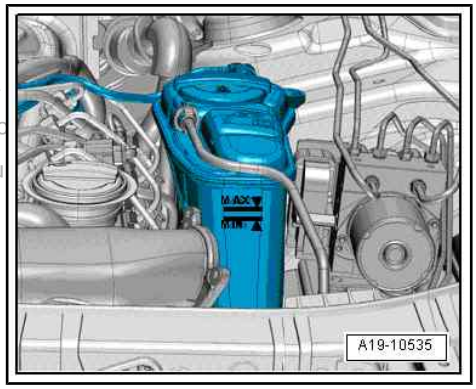
2.9 Removing and installing temperature sender for engine temperature regulation - G694-

Removing

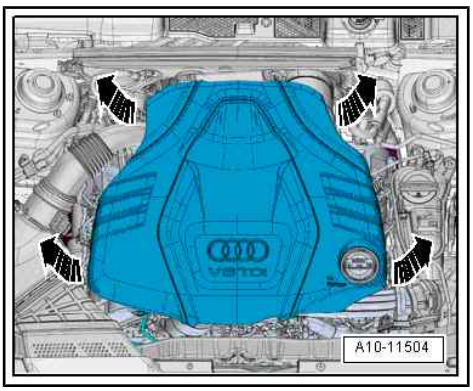
- Engine cold.

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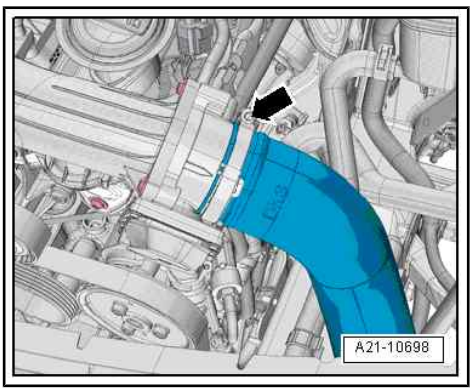
– Open filler cap on coolant expansion tank briefly and allow residual pressure in cooling system to dissipate.



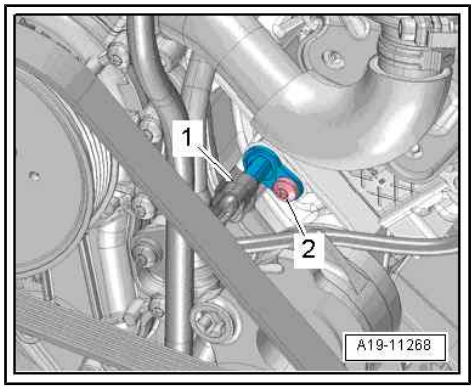
– Remove engine cover panel -arrows-.



– Release hose clip -arrow- and remove air hose.



– Unplug electrical connector -1-.



Note

Place a cloth underneath to catch escaping coolant.

– Unscrew bolt -2- and detach temperature sender for engine temperature regulation - G694- .

Installing

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

- Tightening torque
⇒ “2.2 Exploded view - coolant temperature senders”, page 264

Note

- *Fit new O-rings.*
- *To avoid loss of coolant, insert new temperature sender for engine temperature regulation - G694- immediately.*

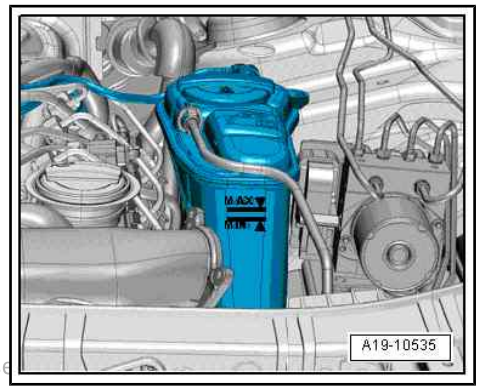
– Check coolant level ⇒ page 259 .

2.10 Removing and installing radiator outlet coolant temperature sender - G83-

Removing

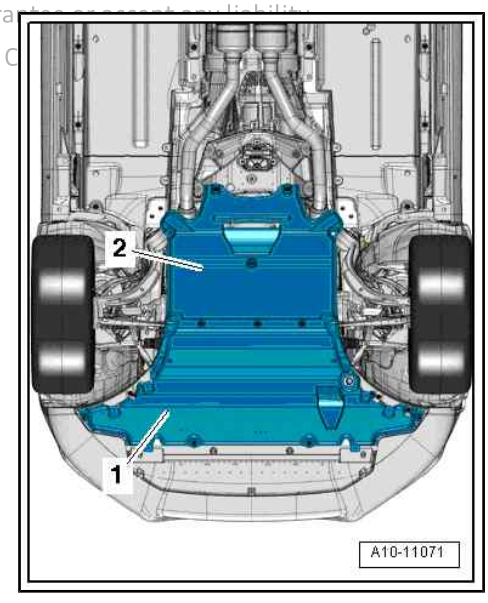
- Engine cold.

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

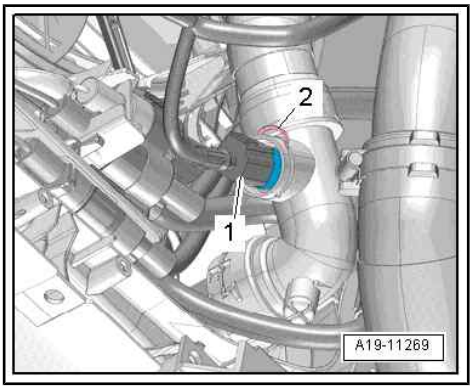


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– Remove front noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .



– Unplug electrical connector -1-.



Note

Place a cloth underneath to catch escaping coolant.

– Pull off retaining clip -2- and detach radiator outlet coolant temperature sender - G83- .

Installing

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

Note

- *Fit new O-rings.*
- *To avoid loss of coolant, insert new radiator outlet coolant temperature sender - G83- immediately.*

– Install noise insulation (front) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .

– Check coolant level ⇒ page 259 .

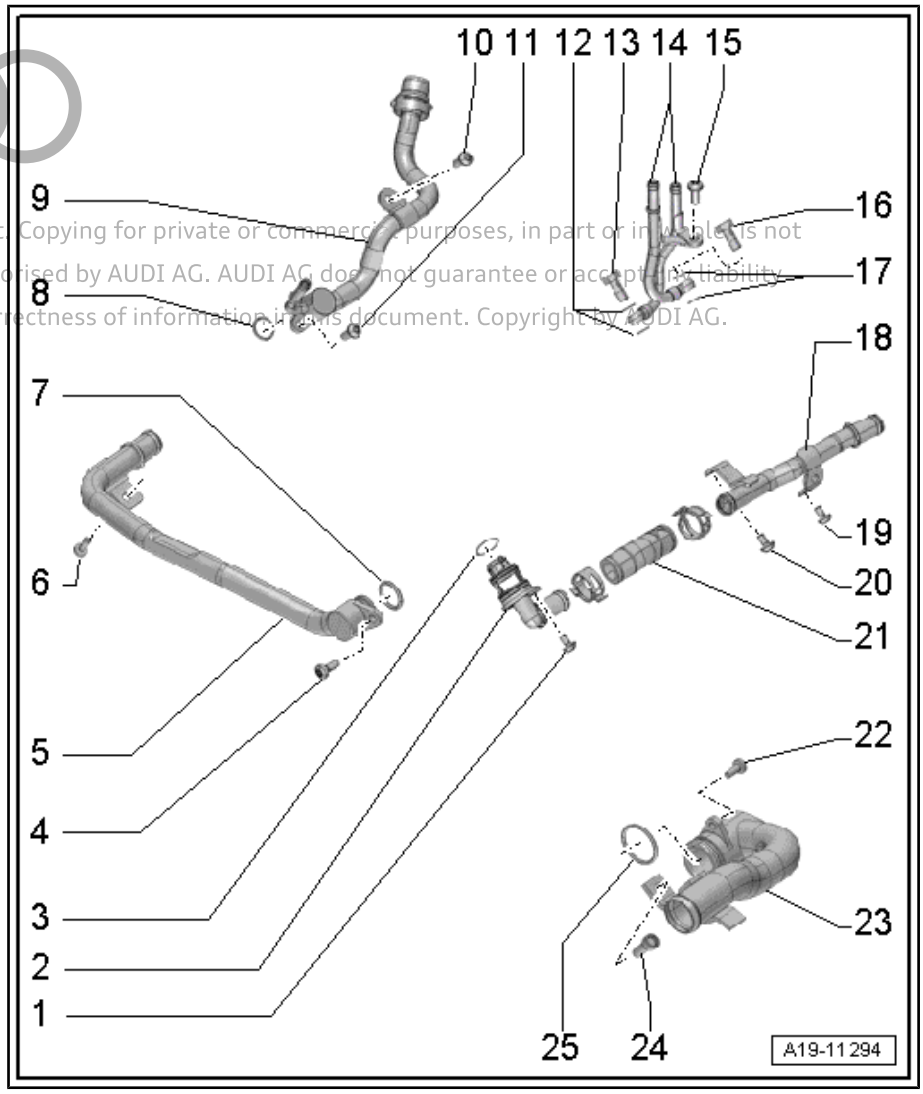
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3 Coolant pipes

⇒ “3.1 Exploded view - coolant pipes”, page 274

⇒ “3.2 Removing and installing coolant pipes”, page 275

3.1 Exploded view - coolant pipes



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1 - Bolt
- ❑ 9 Nm

2 - Non-return valve
- ❑ With connection for coolant hose (depending on equipment)
- ❑ Removing and installing:

◆ Cylinder bank 1 ⇒ page 267

◆ Cylinder bank 2 ⇒ page 268

3 - O-ring
- ❑ Renew

4 - Bolt
- ❑ 9 Nm

5 - Coolant pipe (front)
- ❑ Removing and installing ⇒ page 276

6 - Bolt
- ❑ 9 Nm

7 - O-ring
- ❑ Renew

8 - O-ring
- ❑ Renew

9 - Coolant pipe (top)
- ❑ With non-return valve
- ❑ Removing and installing ⇒ page 275

10 - Bolt
- ❑ 9 Nm

11 - Bolt
- ❑ 9 Nm

12 - Seals
- ❑ Renew

13 - Banjo bolt
- ❑ 12 Nm

14 - Coolant lines
- ❑ For cylinder head, bank 2 (left-side)

15 - Bolt
- ❑ 9 Nm

16 - Banjo bolt
- ❑ 12 Nm

17 - Seals
- ❑ Renew

18 - Coolant pipe (rear left)
- ❑ Only for vehicles with multitronic gearbox 0AW or dual clutch gearbox 0B5
- ❑ Removing and installing ⇒ page 277

19 - Bolt
- ❑ Only for vehicles with multitronic gearbox 0AW or dual clutch gearbox 0B5
- ❑ 9 Nm

20 - Bolt
- ❑ Only for vehicles with multitronic gearbox 0AW or dual clutch gearbox 0B5
- ❑ 9 Nm

21 - Coolant hose
- ❑ Only for vehicles with multitronic gearbox 0AW or dual clutch gearbox 0B5

22 - Bolt
- ❑ 9 Nm

23 - Coolant pipe (front left)
- ❑ Removing and installing ⇒ “3.2.4 Removing and installing coolant pipe (front left)”, page 279

24 - Bolt
- ❑ 20 Nm

25 - O-ring
- ❑ Renew

3.2 Removing and installing coolant pipes

⇒ “3.2.1 Removing and installing coolant pipe (top)”, page 275

⇒ “3.2.2 Removing and installing coolant pipe (front)”, page 276

⇒ “3.2.3 Removing and installing coolant pipe (rear left)”, page 277

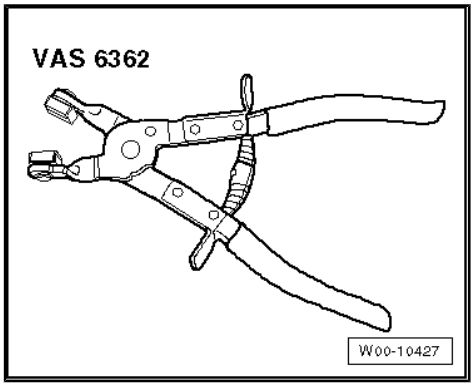
⇒ “3.2.4 Removing and installing coolant pipe (front left)”, page 279

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3.2.1 Removing and installing coolant pipe (top)

Special tools and workshop equipment required

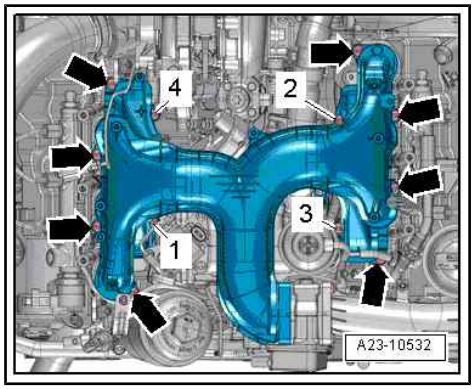
- ♦ Hose clip pliers - VAS 6362-



Removing

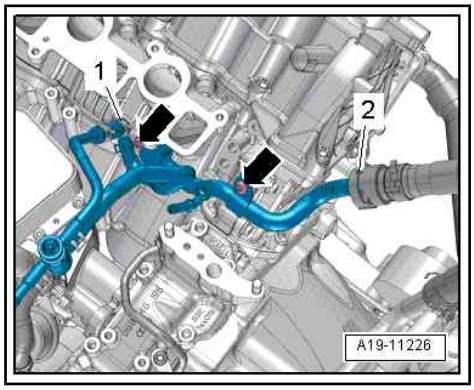
– Remove turbocharger ⇒ page 297 .

– Remove intake manifold ⇒ page 343 .



– Release hose clips -1 and 2-, lift retaining clip -3- and detach coolant hoses.

– Remove bolts -arrows- and detach coolant pipe (top) from cylinder head.



Installing

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

- Tightening torques
  ⇒ “3.1 Exploded view - coolant pipes”, page 274

Note

- *Fit new O-ring.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

– Clean and smoothen sealing surface for O-ring.

– Lubricate O-ring with coolant and slide onto coolant pipe.

– Install intake manifold ⇒ page 343 .

– Install turbocharger ⇒ page 297 .

– Connect coolant hose with plug-in connector ⇒ page 282 .

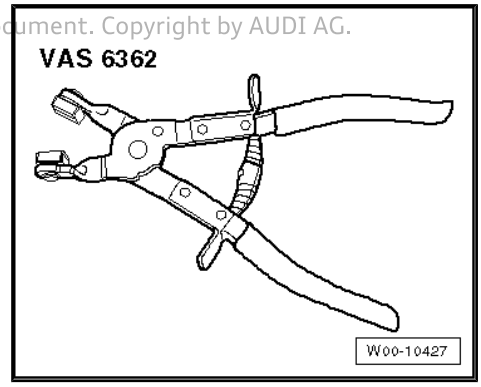
– Fill up with coolant ⇒ page 254 .

3.2.2 Removing and installing coolant pipe (front)

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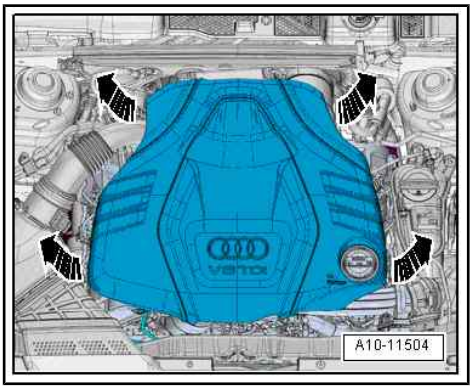
Special tools and workshop equipment required

- Hose clip pliers - VAS 6362-



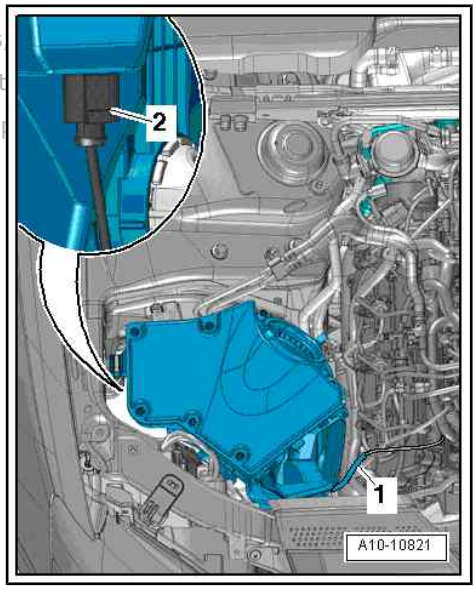
Removing

– Remove engine cover panel -arrows-.

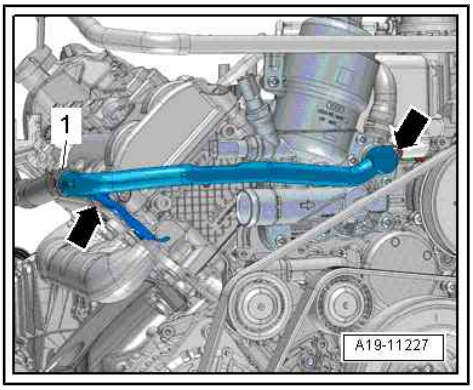


– Remove air cleaner housing ⇒ page 340 .
– Drain coolant ⇒ page 253 .

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– Release hose clip -1- and detach coolant hose.
– Remove bolts -arrows- and detach coolant pipe (front) from oil filter housing.



Installing

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

- Tightening torques
  ⇒ “3.1 Exploded view - coolant pipes”, page 274

Note

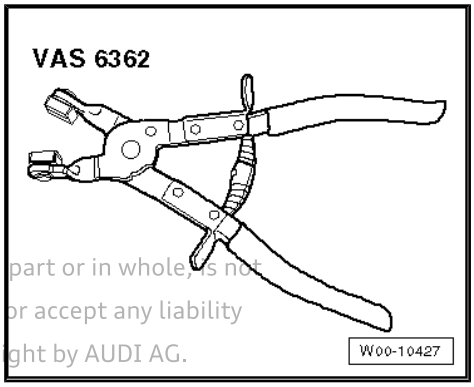
- *Fit new O-ring.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

– Clean and smoothen sealing surface for O-ring.
– Lubricate O-ring with coolant and slide onto coolant pipe.
– Install air cleaner housing ⇒ page 340 .
– Fill up with coolant ⇒ page 254 .

3.2.3 Removing and installing coolant pipe (rear left)

Special tools and workshop equipment required

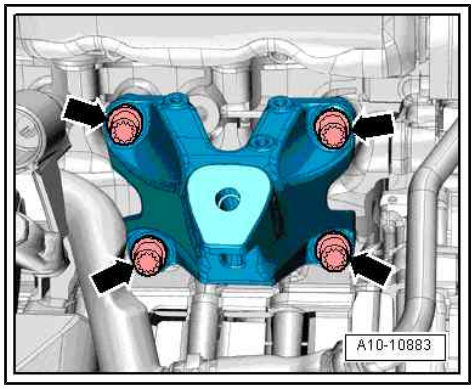
♦ Hose clip pliers - VAS 6362-



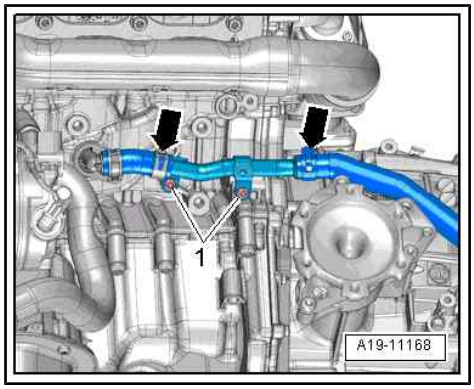
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Removing

– Drain coolant ⇒ page 253 .
– Remove engine mounting (left-side) ⇒ page 94 .
– Unscrew bolts -arrows- and remove engine support (left-side).



– Remove bolts -1-.
– Release hose clips -arrows- and detach coolant hoses from coolant pipe.
– Detach coolant pipe (rear left).



Installing

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

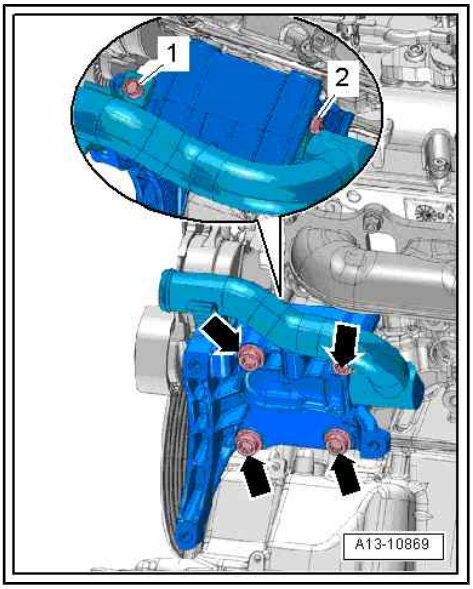
- Tightening torques
  ⇒ “3.1 Exploded view - coolant pipes”, page 274

Note

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

– Install engine support and engine mounting ⇒ page 93 .
– Fill up with coolant ⇒ page 254 .

3.2.4 Removing and installing coolant pipe (front left)



Removing

– Remove bracket for air conditioner compressor ⇒ page 110 .

– Remove bolts -1 and 2- and detach coolant pipe (front left).

Note

Disregard -arrows-.

Installing

- Tightening torques
⇒ “3.1 Exploded view - coolant pipes”, page 274

Note

- *Fit new O-ring.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

– Clean and smoothen sealing surface for O-ring.

– Lubricate O-ring with coolant and slide onto coolant pipe.

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

– Install bracket for air conditioner compressor ⇒ page 110 .

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4 Radiator/radiator fans

⇒ “4.1 Exploded view - radiator/radiator fans”, page 280

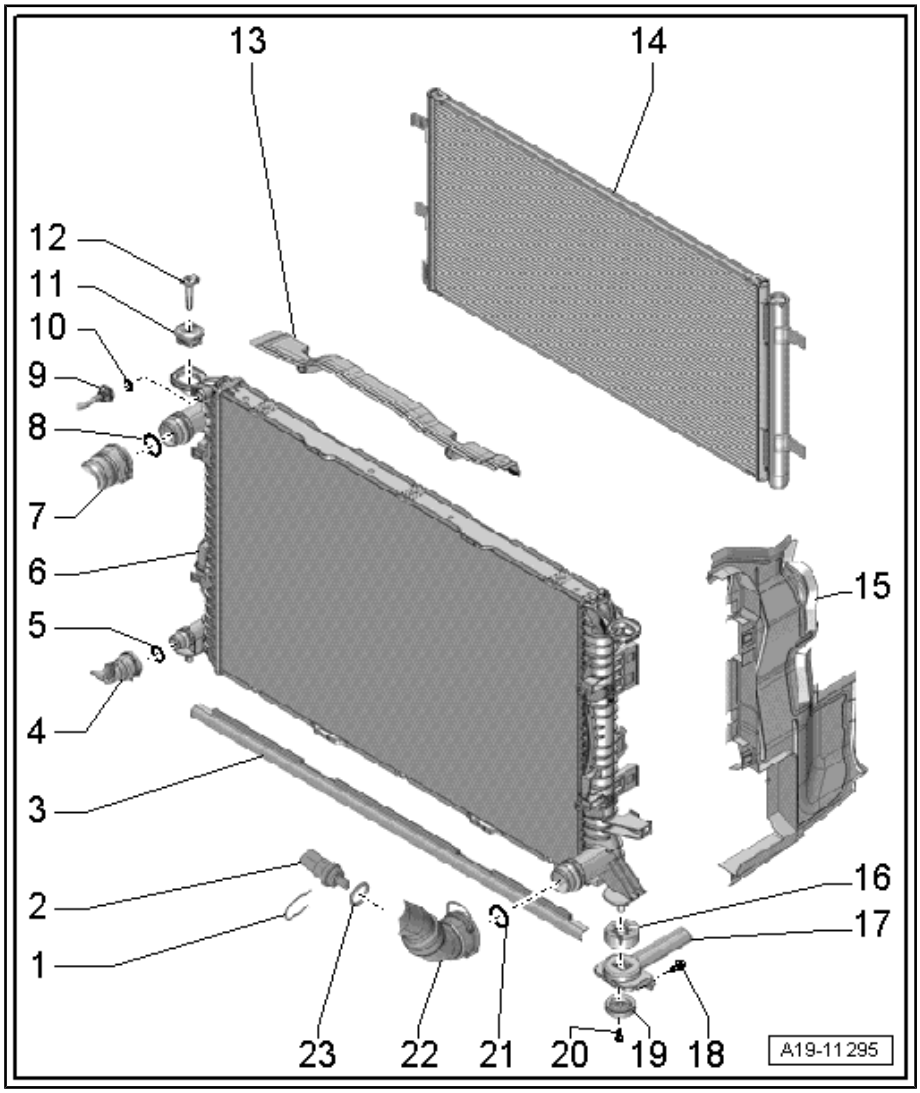
⇒ “4.2 Exploded view - radiator cowl and radiator fans”, page 282

⇒ “4.3 Removing and installing radiator”, page 282

⇒ “4.4 Removing and installing radiator cowl”, page 288

⇒ “4.5 Removing and installing radiator fans”, page 294

4.1 Exploded view - radiator/radiator fans



1 - Retaining clip

2 - Radiator outlet coolant temperature sender - G83-

- ❑ Removing and installing ⇒ page 272

3 - Air duct

4 - Coolant hose

- ❑ Lift retaining clip to detach
- ❑ Connecting ⇒ page 282

5 - O-ring

- ❑ Renew

6 - Radiator

- ❑ Removing and installing ⇒ page 282
- ❑ If renewed, change coolant in entire system

7 - Coolant hose

- ❑ Lift retaining clip to detach
- ❑ Connecting ⇒ page 282

8 - O-ring

- ❑ Renew

9 - Coolant pipe

- ❑ To coolant expansion tank
- ❑ Press release ring to detach
- ❑ Connecting ⇒ page 282

10 - O-ring

- ❑ Renew

11 - Rubber bush

- ❑ For radiator

12 - Retaining pin

- ❑ Use screwdriver to release and pull off

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13 - Air duct

14 - Condenser

- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit; Removing and installing condenser

15 - Air duct

16 - Rubber bush

- ❑ For radiator

17 - Radiator bracket

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18 - Bolt

- ❑ 5 Nm

19 - Washer

20 - Bolt

- ❑ 4.5 Nm

21 - O-ring

- ❑ Renew

22 - Coolant hose

- ❑ Lift retaining clip to detach
- ❑ Connecting to radiator ⇒ page 282

23 - O-ring

- ❑ Renew

– Press coolant hose in again and then pull to check that plug-in connector is correctly engaged.

4.2 Exploded view - radiator cowl and radiator fans

1 - Radiator fan 2 - V177-
- ❑ With radiator fan control unit 2 - J671-
- ❑ Removing and installing ⇒ page 294

2 - Radiator fan - V7-
- ❑ With radiator fan control unit - J293-
- ❑ Removing and installing ⇒ page 294

3 - Radiator cowl
- ❑ Removing and installing ⇒ page 288

4 - Bolt
- ❑ 3.5 Nm

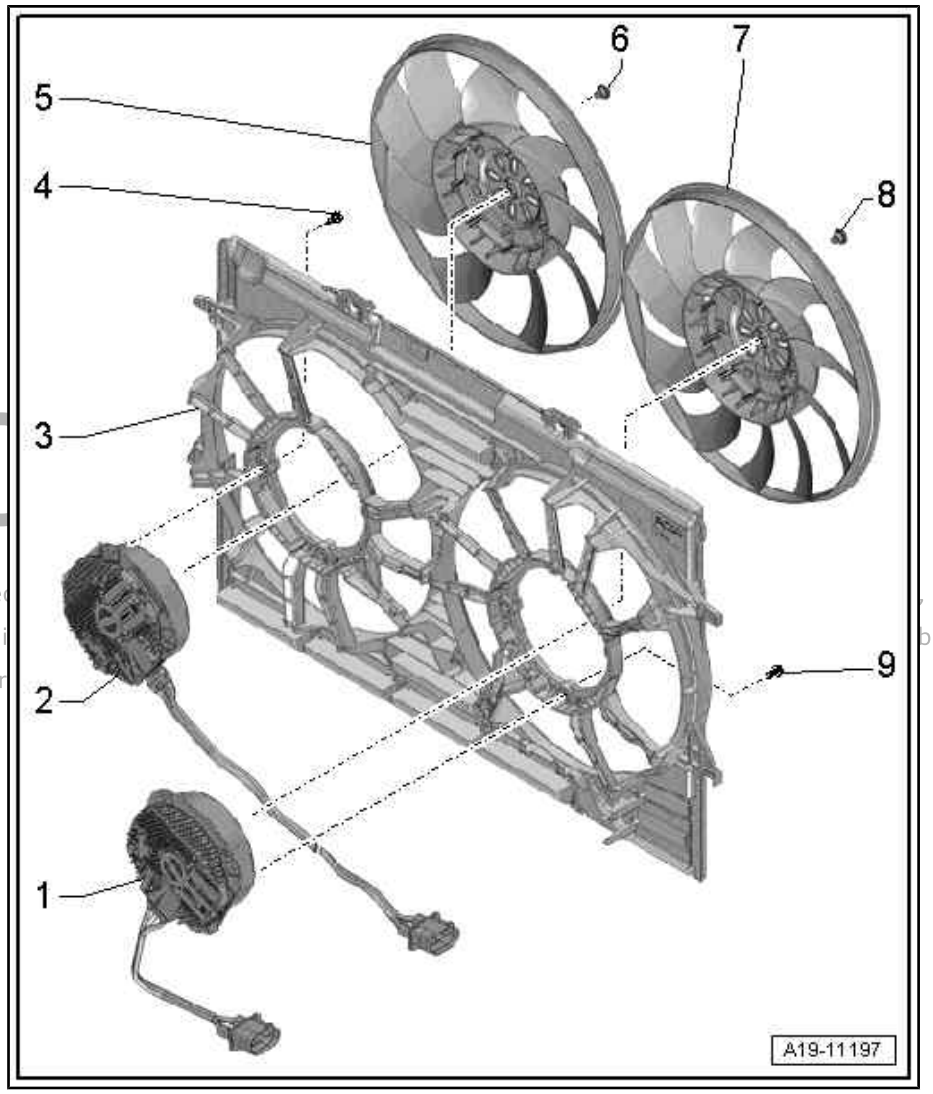
5 - Fan wheel
- ❑ Pin must engage in hole

6 - Bolt
- ❑ 5 Nm

7 - Fan wheel
- ❑ Pin must engage in hole

8 - Bolt
- ❑ 5 Nm

9 - Bolt
- ❑ 3.5 Nm

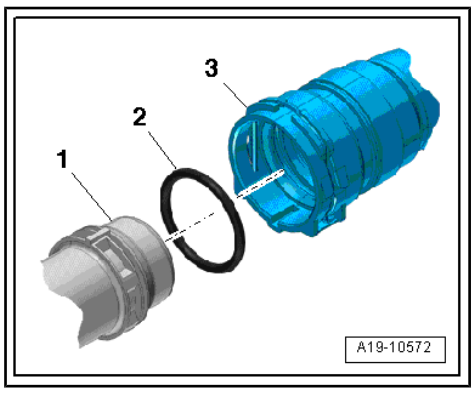


Connecting coolant hose with plug-in connector

– Remove old O-ring -2- from coolant hose -3-.

– Lightly lubricate new O-ring with coolant and fit O-ring in coolant hose.

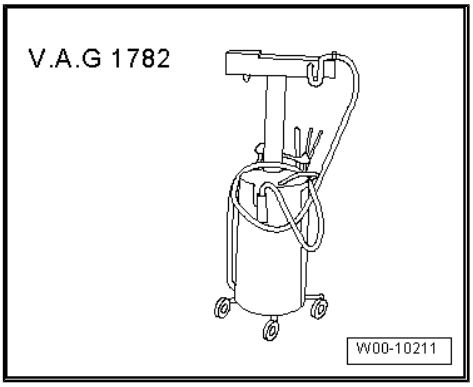
– Press coolant hose onto connection -1- until it engages audibly.



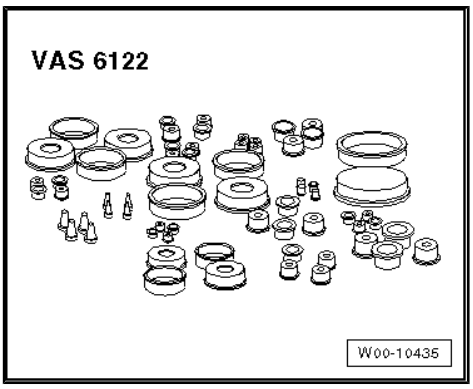
4.3 Removing and installing radiator

Special tools and workshop equipment required

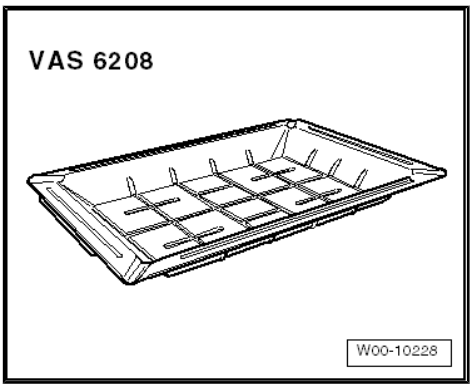
- Used oil collection and extraction unit - V.A.G 1782- for vehicles with multitronic gearbox 0AW/dual clutch gearbox 0B5



- Engine bung set - VAS 6122- for vehicles with multitronic gearbox 0AW/dual clutch gearbox 0B5



- Drip tray for workshop hoist - VAS 6208-



WARNING

Risk of scalding due to hot steam and hot coolant.

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

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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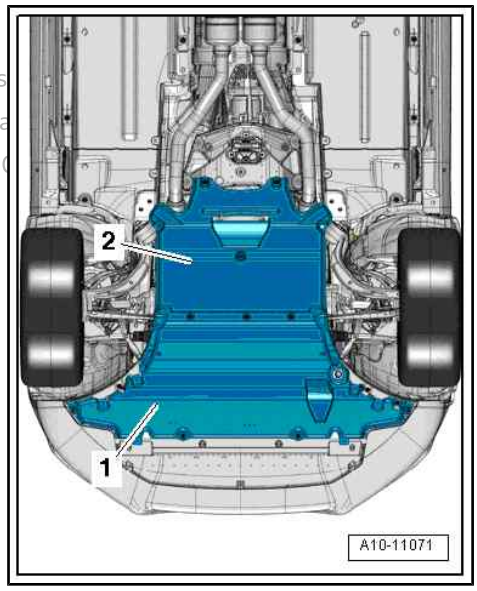
Note

- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *The arrow markings on coolant pipes and on ends of hoses must align.*
- *Radiator and radiator cowl can only be removed and installed together as one unit.*

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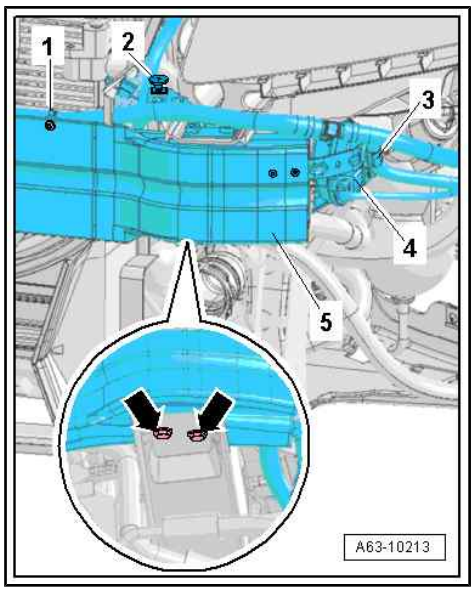
Removing

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

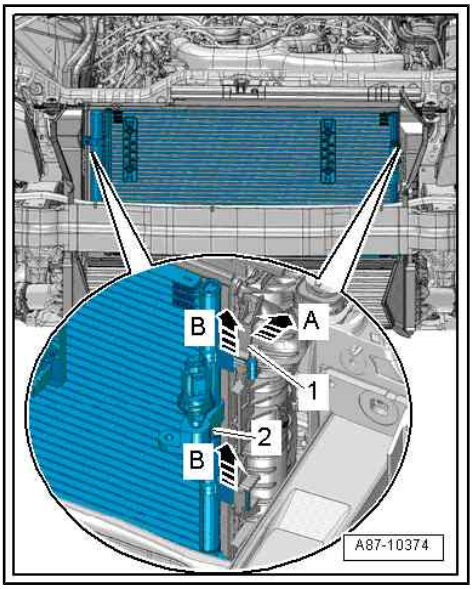


– Remove impact bar -5- ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing impact bar .

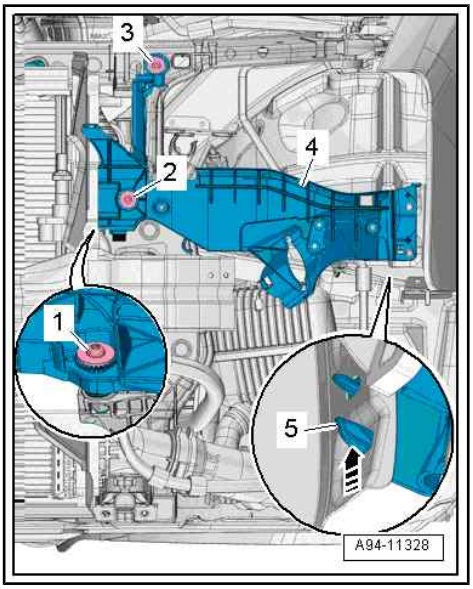
– Remove charge air cooler ⇒ page 314 .



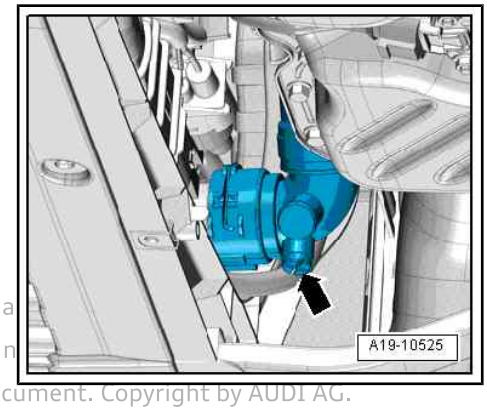
– Remove condenser ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit; Removing and installing condenser .



– Audi A4: Remove brackets for mountings for headlight housings ⇒ General body repairs, exterior; Rep. gr. 50 ; Lock carrier .

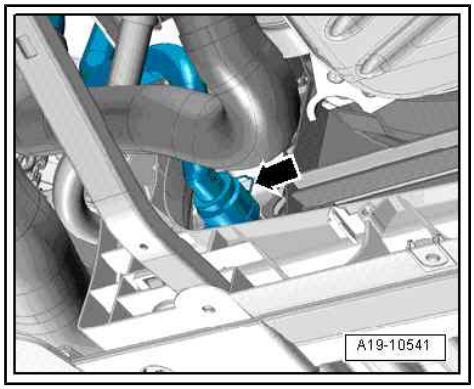


– Place drip tray for workshop hoist - VAS 6208- beneath engine.
– Remove drain plug -arrow- at connection and drain off coolant.
– Then detach connection from radiator (lift retaining clip).

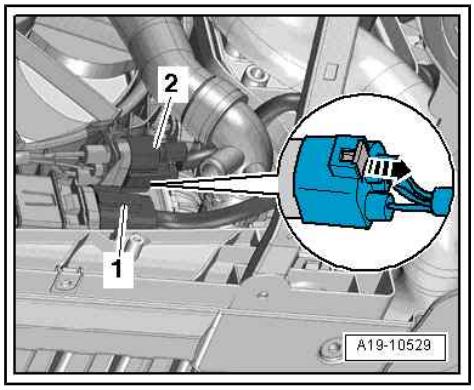


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– Detach connection from radiator (lift retaining clip -arrow-).



– Unplug electrical connector -1- and, if fitted, -2- for radiator fan (push retainer to the rear -arrow- and press down release catch).



Vehicles with multitronic gearbox 0AW/dual clutch gearbox 0B5:

– Position used oil collection and extraction unit - V.A.G 1782- below connection point.

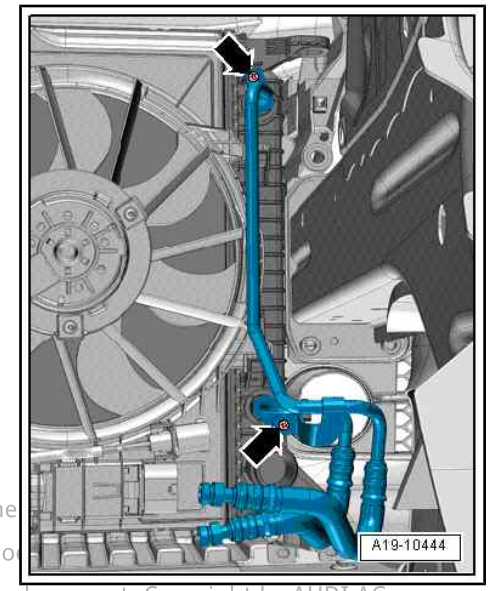
Note

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.

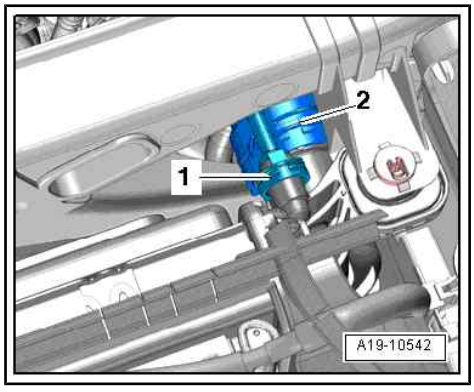


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– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122-.

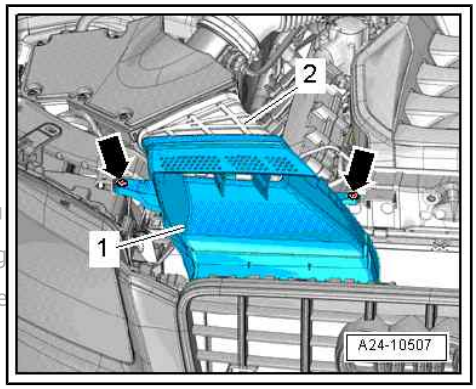
All vehicles (continued):

– Lift retaining clips -1- and -2- and detach connection from radiator.

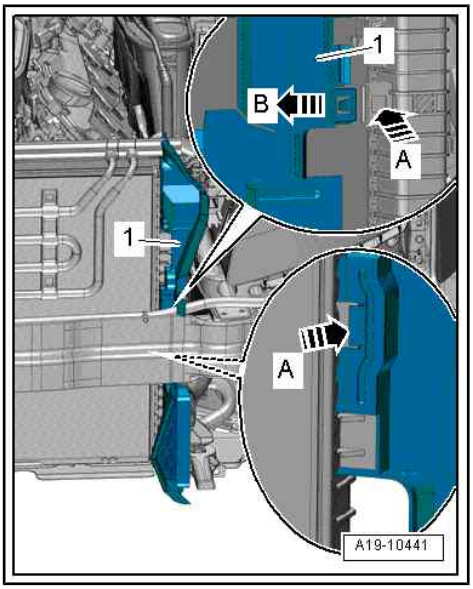


– Remove bolts -arrows-.
– Detach air duct -1- from intermediate flange -2- for air cleaner housing.

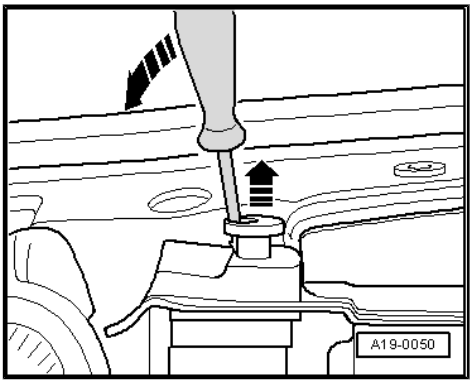
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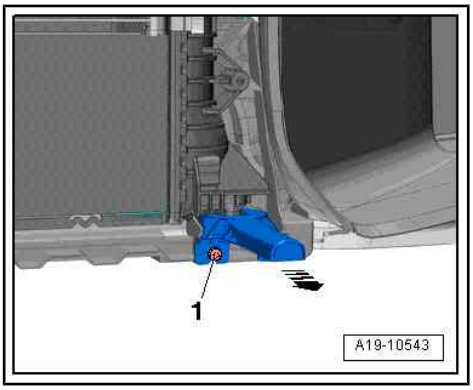
– Release catches -arrows A- and detach air duct -1- on left and right -arrow B-.



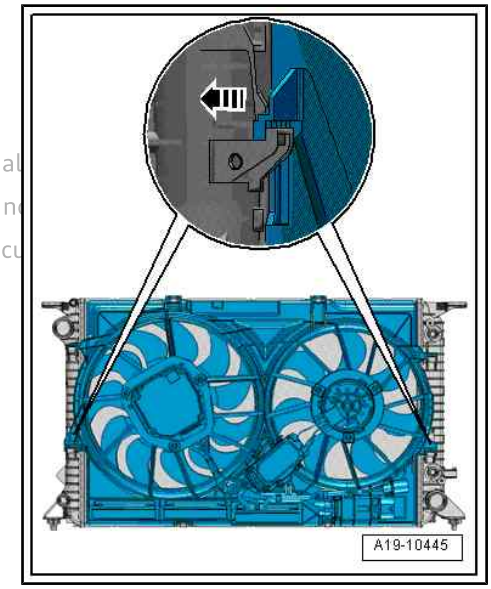
– Release retaining pins for radiator on both sides and pull out upwards -arrows-.



– Remove bolts -1- on both sides and detach radiator bracket with radiator from lock carrier -arrow-.
– Slightly lower radiator and detach.



– 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:

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- Tightening torque
  ⇒ “4.1 Exploded view - radiator/radiator fans”, page 280

Note

If there are slight impressions on the fins, refer to ⇒ page 10 .

– Attach air duct to intermediate flange for air cleaner housing ⇒ page 336 .
– Vehicles with multitronic gearbox 0AW: Secure ATF lines ⇒ Rep. gr. 37 ; ATF circuit; Removing and installing ATF lines .
– Vehicles with dual clutch gearbox 0B5: Secure ATF lines ⇒ Rep. gr. 34 ; ATF circuit; Removing and installing ATF lines .
– Install charge air cooler ⇒ page 314 .
– Audi A4: Install brackets for mountings for headlight housings ⇒ General body repairs, exterior; Rep. gr. 50 ; Lock carrier .
– Install condenser ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit; Removing and installing condenser .
– Install impact bar ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing impact bar .
– Connect coolant hose with plug-in connector ⇒ page 282 .
– Fill up with coolant ⇒ page 254 .

Note

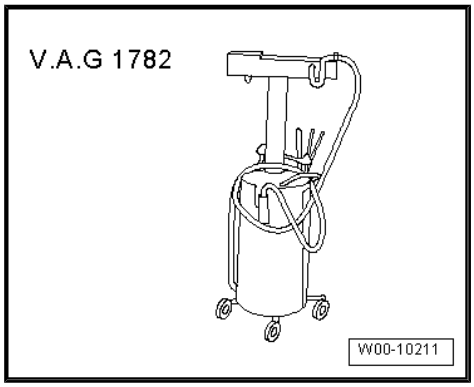
The coolant in the entire system must be changed if the radiator is renewed.

– Vehicles with multitronic gearbox 0AW: Check ATF level ⇒ Rep. gr. 37 ; ATF; Checking ATF level .
– Vehicles with dual clutch gearbox 0B5: Check ATF level ⇒ Rep. gr. 34 ; ATF; Checking ATF level .

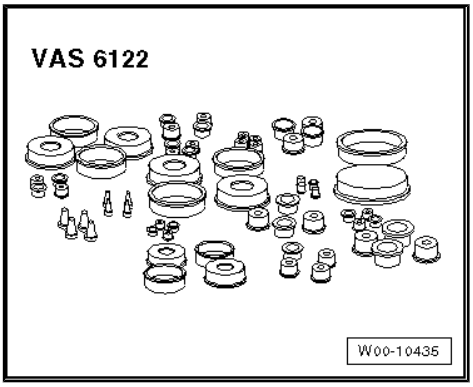
4.4 Removing and installing radiator cowl

Special tools and workshop equipment required

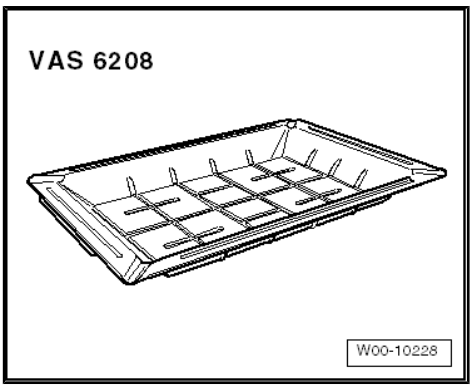
◆ Used oil collection and extraction unit - V.A.G 1782- for vehicles with multitronic gearbox 0AW/dual clutch gearbox 0B5



- Engine bung set - VAS 6122- for vehicles with multitronic gearbox 0AW/dual clutch gearbox 0B5

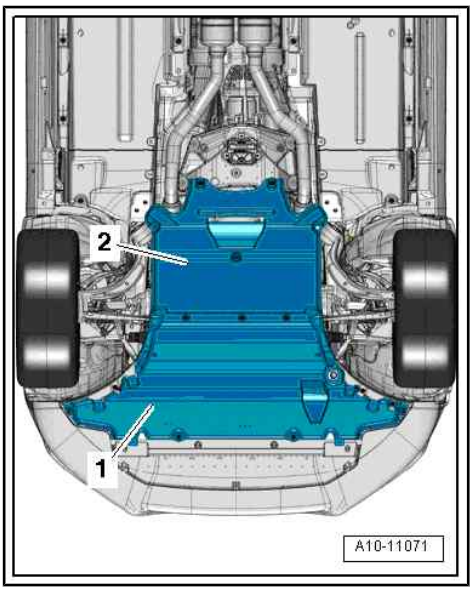


- Drip tray for workshop hoist - VAS 6208-



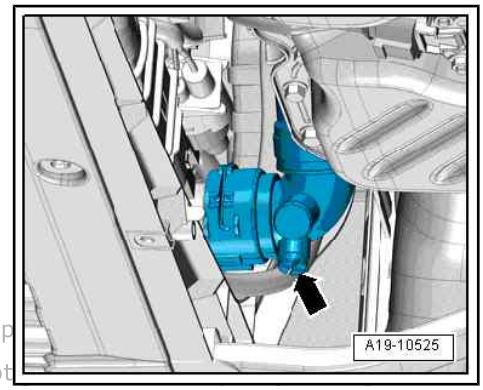
Removing

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



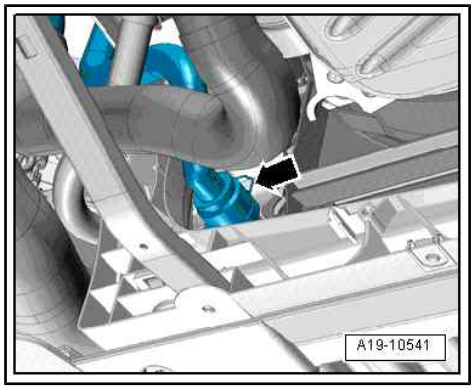
– Place drip tray for workshop hoist - VAS 6208- beneath engine.

– Remove drain plug -arrow- at connection and drain off coolant.



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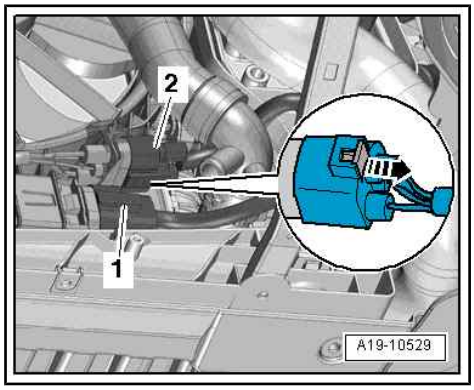
– Detach connection from radiator (lift retaining clip -arrow-).



WARNING

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

- ***Unplug electrical connectors before working in vicinity of radiator cowl.***



– Unplug electrical connector -1- and, if fitted, -2- for radiator fan (push retainer to the rear -arrow- and press down release catch).

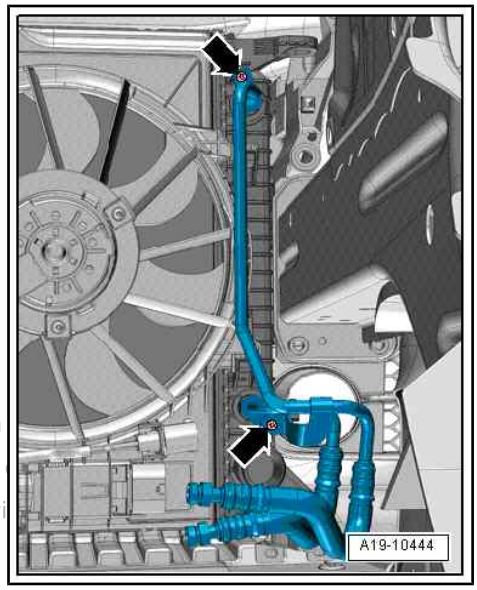
Vehicles with multitronic gearbox 0AW or dual clutch gearbox 0B5:

– Position used oil collection and extraction unit - V.A.G 1782- 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

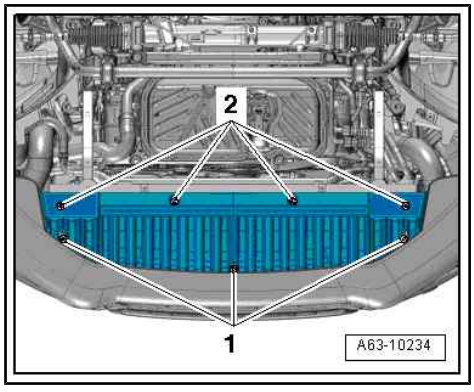
Tie ATF lines up onto longitudinal member to prevent fluid escaping.

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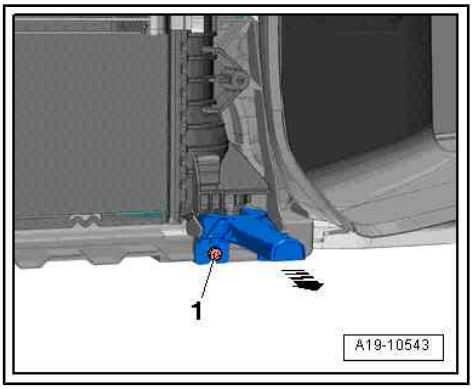
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .

All vehicles (continued):

– Remove closure plate at bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .



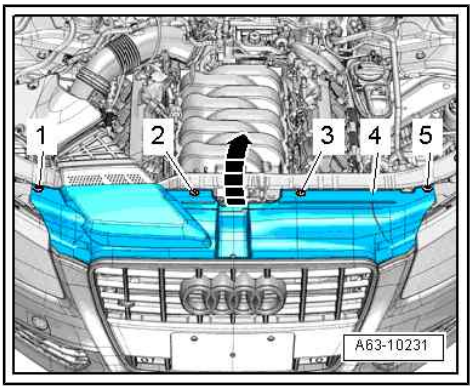
– Remove bolts -1- on both sides.



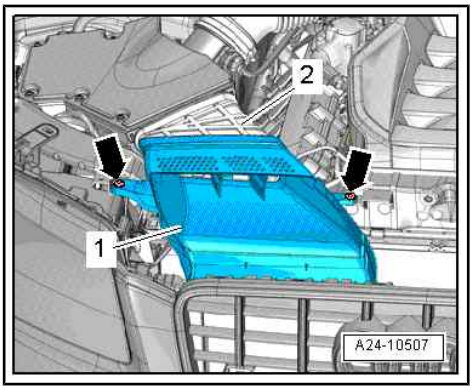
Note

Disregard -arrow-.

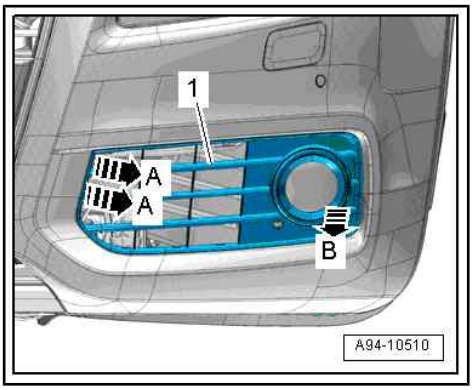
– Remove lock carrier cover -4- ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .
– Remove brackets for mountings for headlight housings ⇒ General body repairs, exterior; Rep. gr. 50 ; Lock carrier .



– Remove bolts -arrows-.
– Detach air duct -1- from intermediate flange -2- for air cleaner housing.

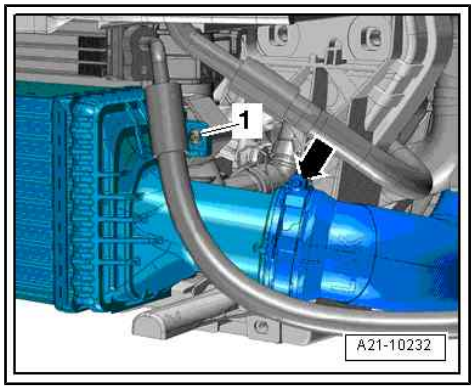


– Remove air intake grille -1- on both sides ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .



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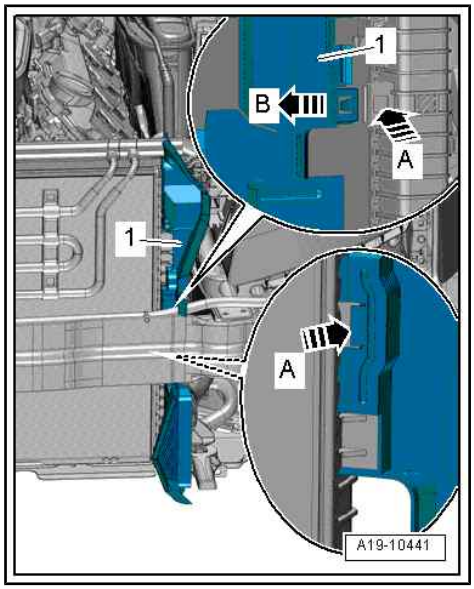
– Release hose clip -arrow- and detach air hose from charge air cooler.



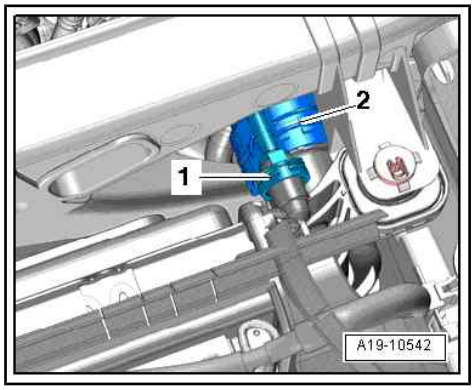
Note

Disregard -item 1-.

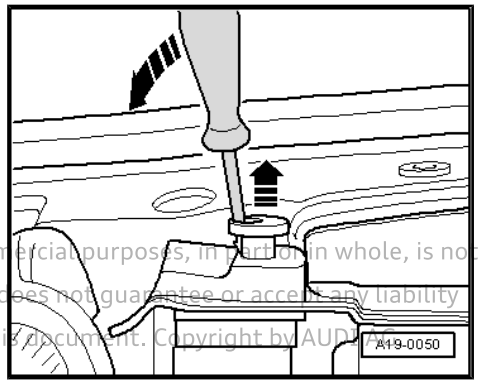
– Release catches -arrows A- and swivel air duct -1- on left and right to centre of vehicle -arrow B-.



– Lift retaining clips -1- and -2- and detach connection from radiator.

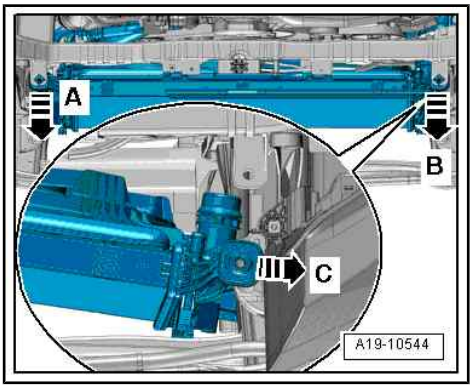


– Release retaining pins for radiator on both sides and pull out upwards -arrows-.

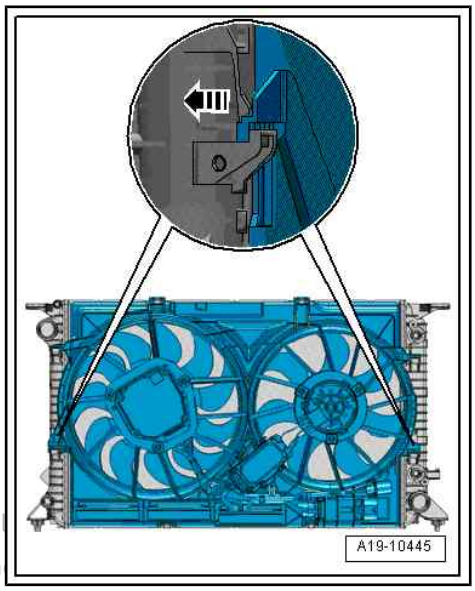


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– Move left side of radiator to front -arrow B-, then press to left -arrow C- and then move forward on right side -arrow A-.



– 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:

Tightening torques:

- ⇒ “4.1 Exploded view - radiator/radiator fans”, page 280
- ⇒ Fig. ““Installing air hoses with screw-type clips”“ , page 313

Note

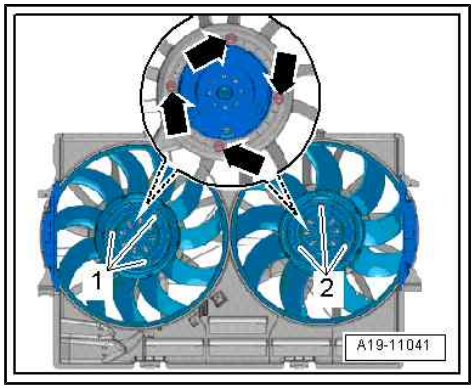
Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .

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– Vehicles with multitronic gearbox 0AW: Secure ATF lines ⇒ Rep. gr. 37 ; ATF circuit; Removing and installing ATF lines .
– Vehicles with dual clutch gearbox 0B5: Secure ATF lines ⇒ Rep. gr. 34 ; ATF circuit; Removing and installing ATF lines .
– Attach air duct to intermediate flange for air cleaner housing ⇒ page 336 .
– Install brackets for mountings for headlight housings ⇒ General body repairs, exterior; Rep. gr. 50 ; Lock carrier .
– Install lock carrier cover and closure plate at bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .
– Attach connection with plug-in connector ⇒ page 282 .
– Fill up with coolant ⇒ page 254 .
– Vehicles with multitronic gearbox 0AW: Check ATF level ⇒ Rep. gr. 37 ; ATF; Checking ATF level .
– Vehicles with dual clutch gearbox 0B5: Check ATF level ⇒ Rep. gr. 34 ; ATF; Checking ATF level .

4.5 Removing and installing radiator fans

Removing



Note

Fit all cable ties in the original positions when installing.

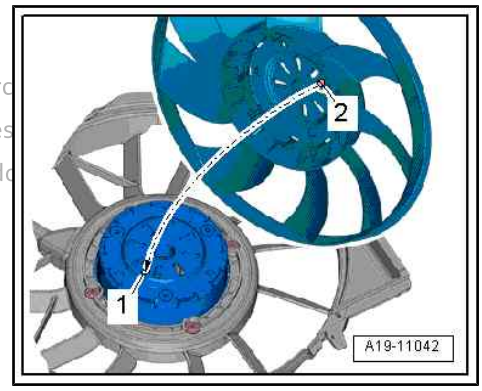
– Remove radiator cowl ⇒ page 288 .
– Remove bolts -1- or -2- and detach corresponding fan wheel.
– Remove bolts -arrows- on radiator fan.
– Move electrical wiring harness clear and detach radiator fan.

Installing

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

• Tightening torques
⇒ “4.1 Exploded view - radiator/radiator fans”, page 280

– Note installation position of fan wheel:



• Pin -2- must engage in hole -1-.
– Install radiator cowl ⇒ page 288 .

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21 – Turbocharging/supercharging

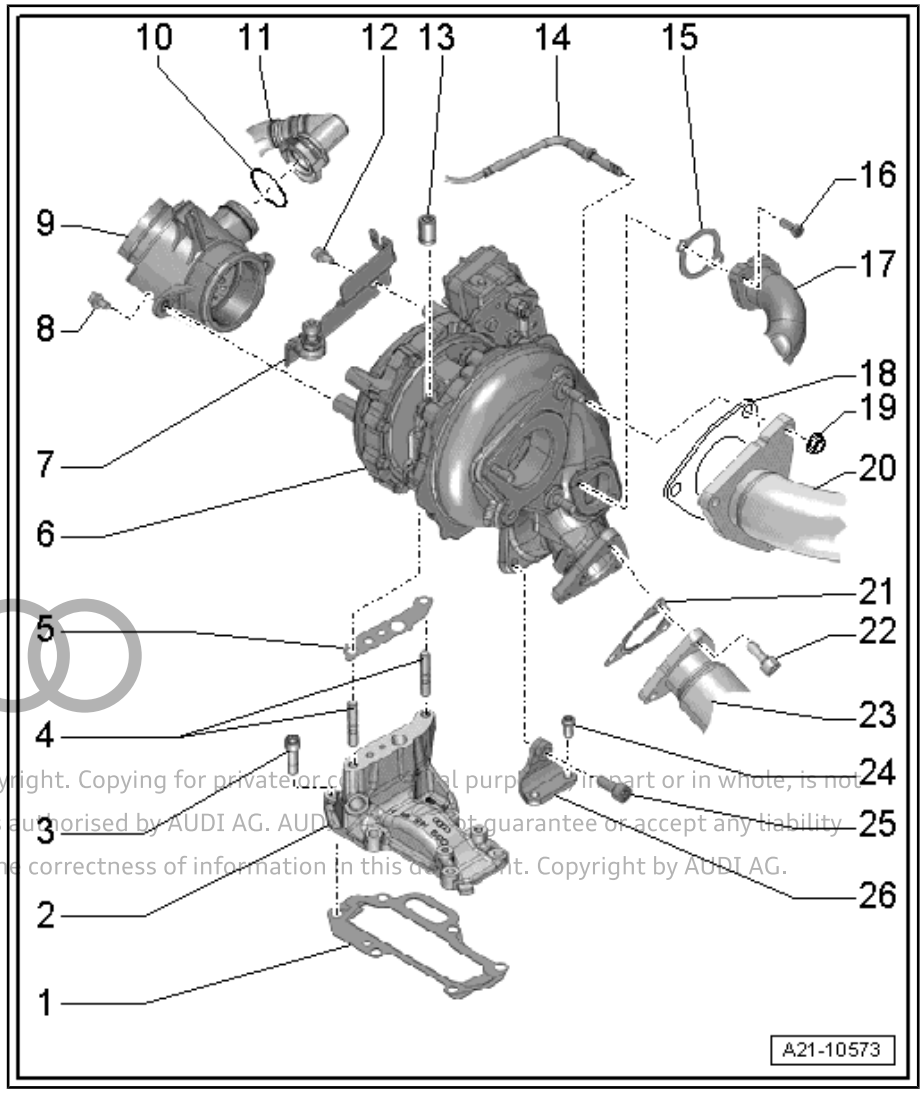
1 Turbocharger

⇒ "1.1 Exploded view - turbocharger", page 295

⇒ "1.2 Removing and installing turbocharger", page 297

⇒ "1.3 Removing and installing turbocharger 1 control unit J724 ", page 300

1.1 Exploded view - turbocharger



1 - Gasket
- ❑ Renew

2 - Bracket
- ❑ For turbocharger

3 - Bolt
- ❑ Tighten in stages and in diagonal sequence; final torque 23 Nm.

4 - Studs
- ❑ Must always be renewed if nuts are loosened
- ❑ 10 Nm

5 - Gasket
- ❑ Renew

6 - Turbocharger
- ❑ With turbocharger 1 control unit - J724-
- ❑ Removing and installing turbocharger ⇒ page 297
- ❑ Removing and installing turbocharger 1 control unit - J724- ⇒ page 300

7 - Bracket
- ❑ For electrical connector and engine cover panel

8 - Bolt
- ❑ 9 Nm

9 - Connection
- ❑ For air hose
- ❑ From air mass meter - G70- to turbocharger
- ❑ Must be free of oil and grease when installing

10 - O-ring
- ❑ Renew

11 - Hose
- ❑ For crankcase breather

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12 - Bolt
- ❑ 9 Nm

13 - Nut
- ❑ Renew
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ Tightening torque and sequence ⇒ page 297

14 - Exhaust gas temperature sender 1 - G235-
- ❑ Removing and installing ⇒ page 448

15 - Gasket
- ❑ Renew

16 - Bolt
- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 461

17 - Pipe
- ❑ To exhaust gas recirculation cooler

18 - Gasket
- ❑ Renew

19 - Nut
- ❑ Renew
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ Tightening torque and sequence ⇒ page 461

20 - Exhaust pipe

21 - Gasket
- ❑ Renew

22 - Bolt
- ❑ Renew
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ Tightening torque ⇒ Item 5 (page 465)

23 - Exhaust manifold
- ❑ Removing and installing: left-side ⇒ page 466 , right-side ⇒ page 468

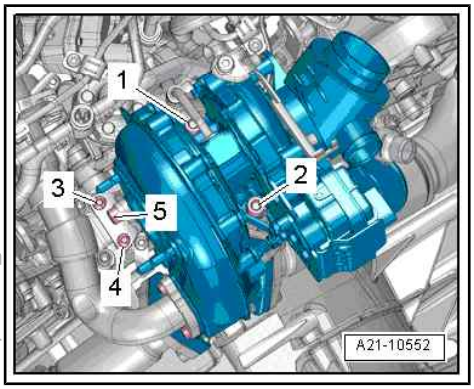
24 - Bolt
- ❑ Tightening torque and sequence ⇒ page 297

25 - Bolt
- ❑ Tightening torque and sequence ⇒ page 297

26 - Bracket
- ❑ For turbocharger

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Turbocharger - tightening torque and sequence



Note

Renew studs and nuts.

– Tighten bolts and nuts in 7 stages in the sequence shown:

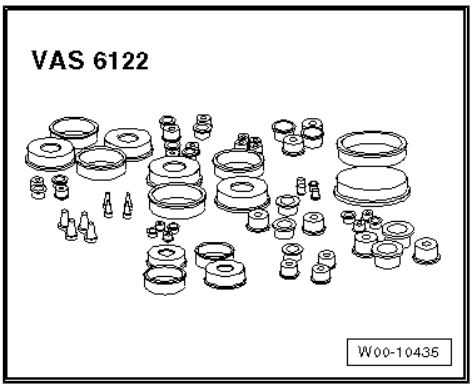
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Stage	Bolts/nuts	Torque for tightening/tightening further
1.	Studs for nuts -1, 2-	10 Nm
2.	-1, 2-	Screw in by hand until contact is made
3.	-1, 2-	9 Nm
4.	-1, 2-	Turn 90° further
5.	-3, 4, 5-	Screw in by hand until contact is made
6.	-3, 4-	9 Nm
7.	-5-	23 Nm

1.2 Removing and installing turbocharger

Special tools and workshop equipment required

- Engine bung set - VAS 6122-



Removing

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.*
- *Mechanical faults on the turbocharger can be caused by foreign matter from the exhaust manifold.*
- *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.*

Note

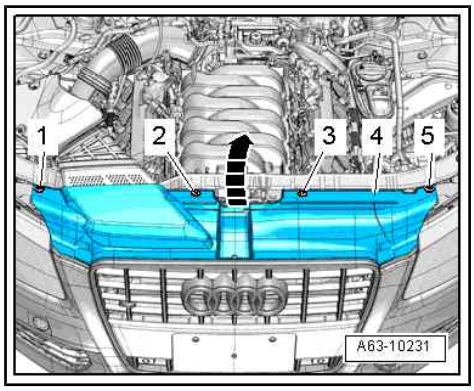
Observe rules for cleanliness ⇒ page 8 .

– Remove lock carrier cover -4- ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .

– Remove particulate filter:

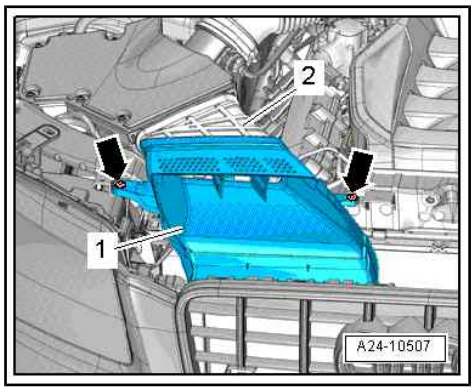
♦ Vehicles with manual gearbox/multitronic gearbox 0AW ⇒ page 411

♦ Vehicles with dual clutch gearbox 0B5 ⇒ page 412 .



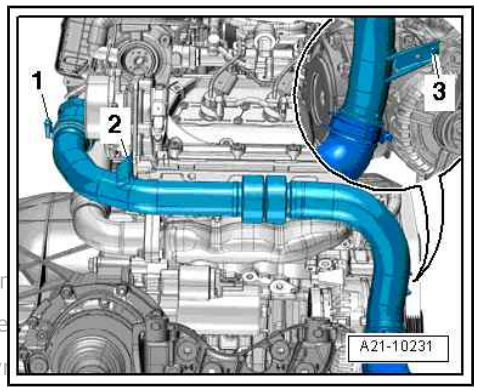
– Remove bolts -arrows-.

– Detach air duct -1- from intermediate flange -2- for air cleaner housing.



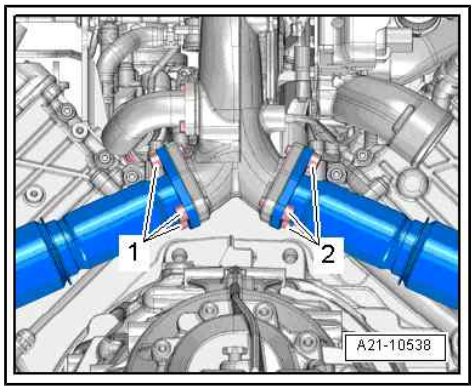
– Remove bolts -2, 3-.

– Release hose clip -1- and detach air pipe.



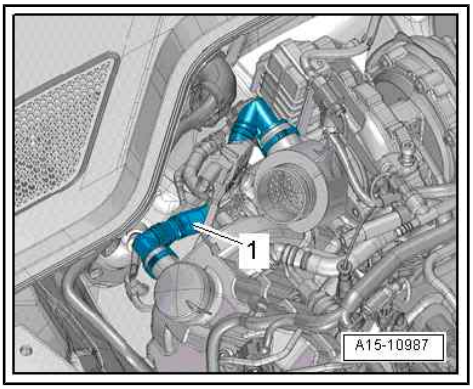
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– Remove bolts -1, 2-.



Caution

Depending on the vehicle version and country version, a crankcase breather hose may be fitted which cannot be detached from the cylinder head cover without being damaged irreparably. For these versions, the hose on the cylinder head cover will be damaged irreparably and must then be renewed.

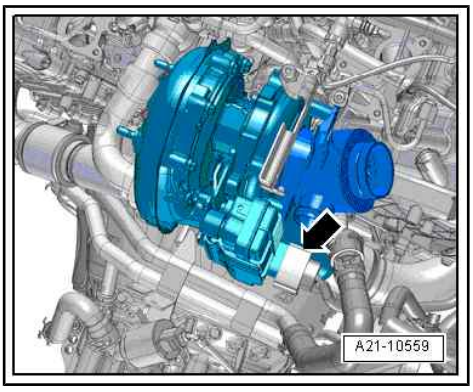


– Remove crankcase breather hose -arrow-; to do so, press release tabs (if present) or break hose connection at cylinder head cover as necessary.

Note

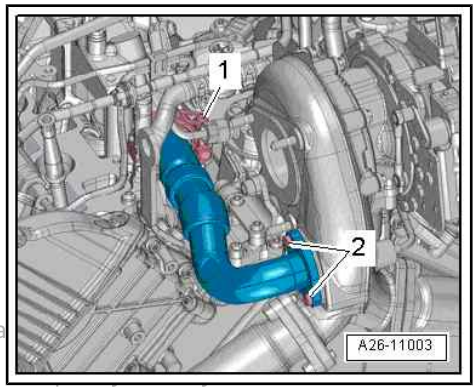
If the crankcase breather hose cannot be detached from the cylinder head cover without being damaged irreparably, detach it from the connection for the turbocharger only.

– Unplug electrical connector -arrow-.



– Remove bolts -2-.

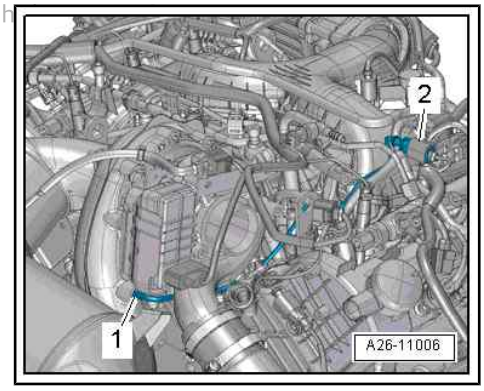
– Release screw-type clip -1- and detach exhaust gas recirculation pipe.



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– Detach electrical connector -2- from bracket and unplug.

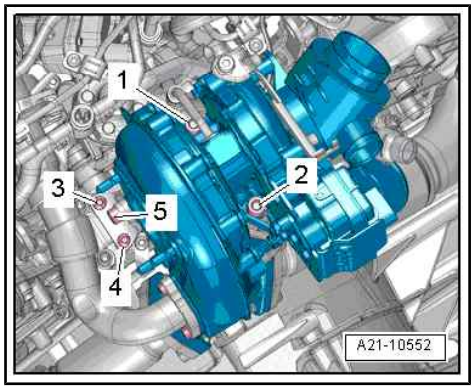
– Move clear electrical wiring.



Note

Disregard -item 1-.

– Loosen bolt -5-.
– Remove nuts -1, 2- and bolts -3, 4-.
– Remove turbocharger.



Installing

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

Tightening torques:

- ⇒ “1.1 Exploded view - turbocharger”, page 295
- ⇒ Fig. ““Turbocharger - tightening torque and sequence”“ , page 297
- ⇒ Fig. ““Exhaust gas recirculation pipe to turbocharger - tightening torque and sequence”“ , page 461
- ⇒ “2.1 Exploded view - charge air system”, page 312
- ⇒ Fig. ““Installing air hoses with screw-type clips”“ , page 313

Note

- *Renew seals and O-rings.*
- *Fill turbocharger with engine oil at connection for oil supply line.*
- *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 ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
– Install air duct ⇒ page 336 .
– Install particulate filter:
- Vehicles with manual gearbox/multitronic gearbox 0AW ⇒ page 411
- Vehicles with dual clutch gearbox 0B5 ⇒ page 412 .

– Install lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .
– Fill up with coolant ⇒ page 259 .

1.3 Removing and installing turbocharger 1 control unit - J724-

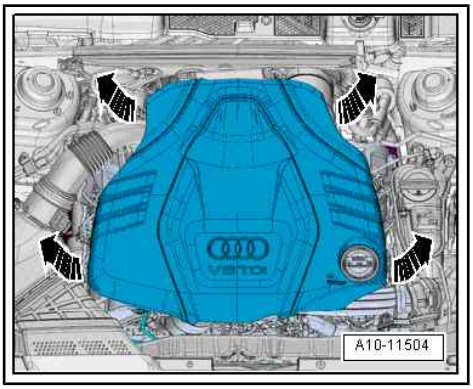
Special tools and workshop equipment required

- Tester for E-positioner - VAS 6395- or -VAS 6395A-
- Bracket - VAS 6395 /6-

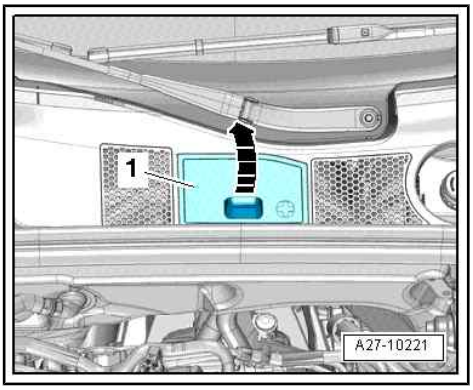
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Removing

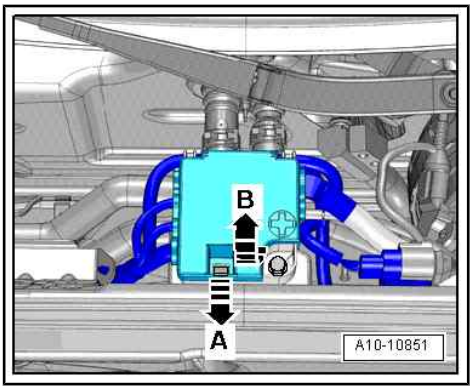
– Remove engine cover panel -arrows-.



– Lift off cover -1- by its handle.

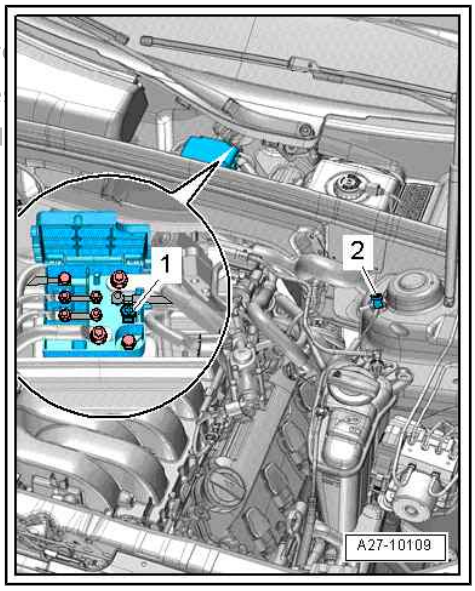


– Release retainer -arrow A- and open cover -arrow B-.



– Connect tester - VAS 6395 A/1- with connection lead - VAS 6395/2- to positive terminal -1- and negative terminal -2-.

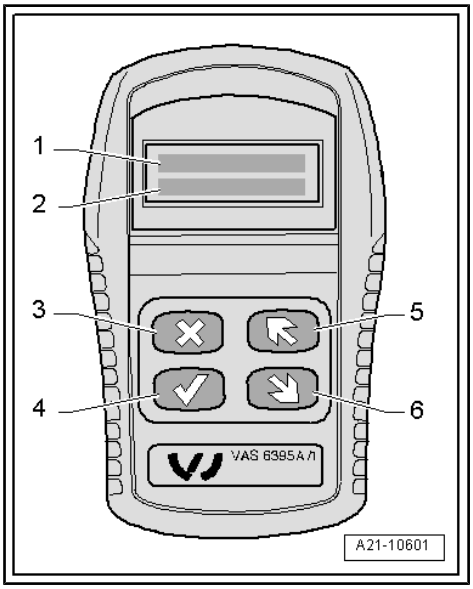
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Procedure for tester for E-positioner - VAS 6395 A/1- :

– Select software version with buttons [↑] -item 5- and [↓] -item 6-.

– To confirm software version, press [V] button -item 4-.



Note

In this example, software version Hella -item 1- is selected.

Procedure for tester for E-positioner - VAS 6395 /1- :

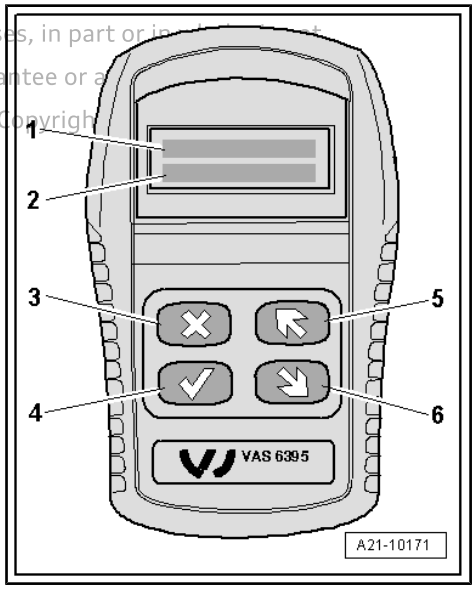
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Checking software version of tester - VAS 6395 /1- :

Caution

Risk of damage to turbocharger 1 control unit - J724- .

- ***Before continuing, check whether the correct software version is loaded in the tester - VAS 6395 /1- . To do so, proceed as follows:***



Display on -VAS 6395 /1- (2 seconds after connecting to power supply) if correct software version is loaded:

1 - > 1. START

2 - 2. NEXT [>]

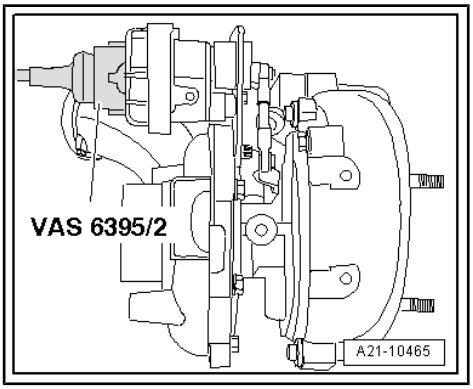
Note

- *If the following appears on the display, an incorrect software version has been loaded:*
- *1. >TEST*
- *2. LEARN*
- *German market: If this is the case, download the correct software version from the "Audi Partner Portal (under Service)" in the section "Workshop Equipment".*
- *Rest of the world: If this is the case, download the correct software version from your Importer's information platform.*

Continuation for both testers:

– Unplug electrical connector for turbocharger 1 control unit - J724- .

– Connect connecting wire - VAS 6395/2- to turbocharger 1 control unit - J724- and to tester - VAS 6395 A/1- .



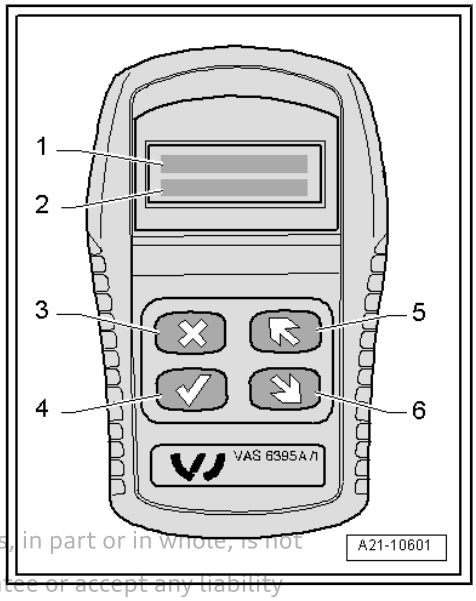
Display on -VAS 6395 A/1- :

1 - > 1. START

2 - 2. NEXT [>]

– To continue, press V button -item 4-.

• The tester - VAS 6395 A/1- runs through the adjustment range of the turbocharger 1 control unit - J724- and checks that the end positions are reached; display indicates “CHECK”.



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Display on -VAS 6395 A/1- :

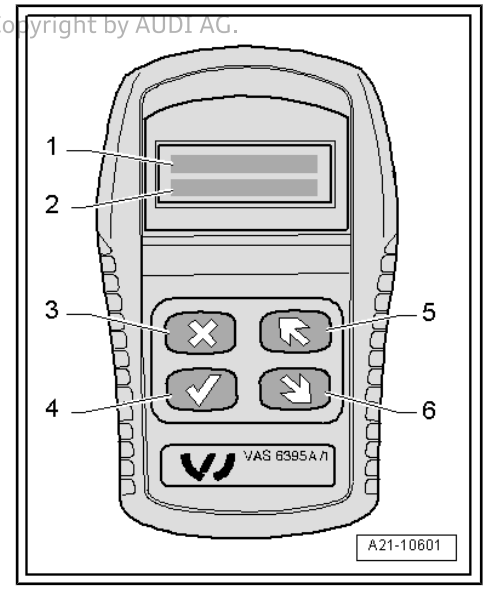
1 -

2 - [OK]

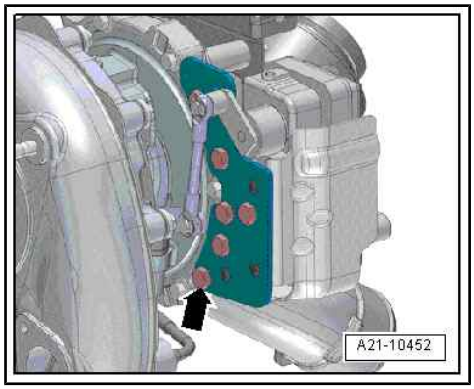
Note

♦ *If the display indicates “[OK]”, the adjustment range of the turbocharger 1 control unit - J724- is OK.*

♦ *If the display shows “FAULT [OK]”, tap gently several times on the housing of turbocharger 1 control unit - J724- with the handle of a screwdriver and repeat the check by pressing V button -item 4-.*



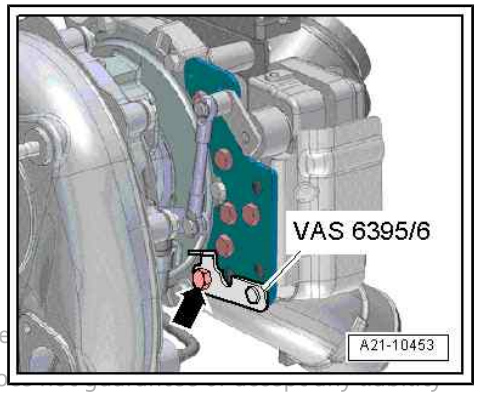
– Remove bolt -arrow-.



Note

Do NOT unscrew any of the other bolts visible in the illustration.

– Fit bracket - VAS 6395 /6- on centring hole of bracket for turbocharger 1 control unit - J724- and tighten bolt to 8 Nm.

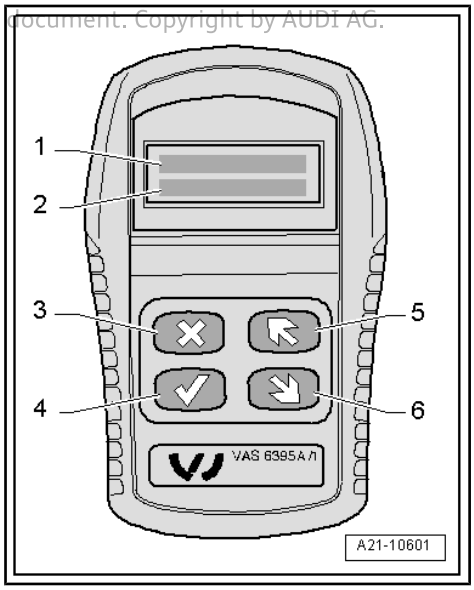


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– To continue, press button -item 4-.

- The turbocharger 1 control unit - J724- moves back and forth between the stops several times to determine the voltage value.
- Then the turbocharger 1 control unit - J724- moves into installation position.

– While the voltage value is being determined, keep tapping gently on the housing of turbocharger 1 control unit - J724- until the display indicates the following:



Display on -VAS 6395 A/1- :

1 - X.XXX V

2 - [↑][↓][OK]

– Note voltage value.

- Specification: 3.3 ... 3.7 V

Note

If the display indicates "FAULT [OK]" or the voltage is less than 3.3 V or greater than 3.7 V, unplug tester - VAS 6395 A/1- and repeat the complete procedure ⇒ page 303 .

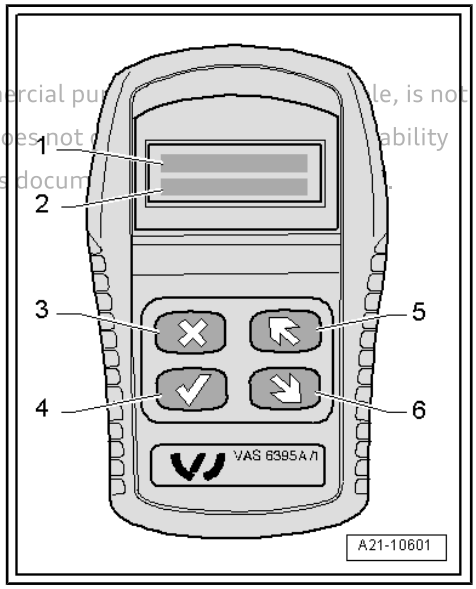
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Display on -VAS 6395 A/1- :

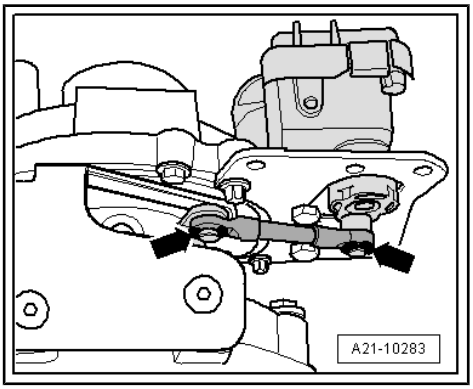
1 - X.XXX V

2 - [↑][↓][OK]

– By pressing buttons [↑] -item 5- and [↓] -item 6-, adjust turbocharger 1 control unit - J724- so that coupling rod can be accessed easily for removal.



– Unclip circlips -arrows- and dispose of them, detach coupling rod.

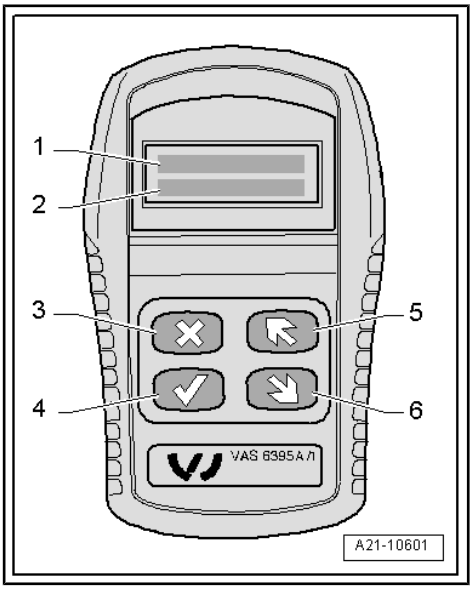


Display on -VAS 6395 A/1- :

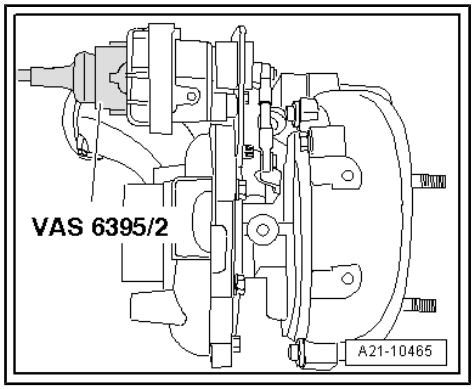
1 - X.XXX V

2 - [↑][↓][OK]

– By pressing buttons [↑] -item 5- and [↓] -item 6-, adjust turbocharger 1 control unit - J724- so that bolts for -J724- can be accessed easily.



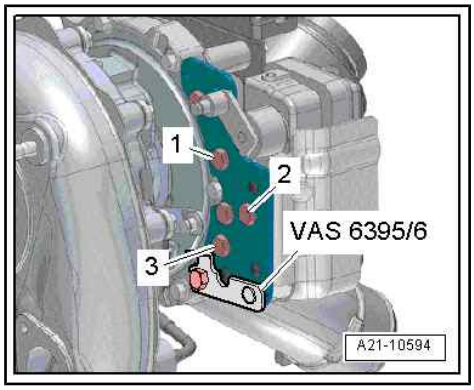
– Disconnect connecting wire - VAS 6395/2- from turbocharger 1 control unit - J724- .



Caution

Power supply for tester - VAS 6395 /1A- must remain connected.

– Remove bolts -1, 2, 3- and dispose of them.



Note

Do NOT unscrew any of the other bolts visible in the illustration.

– Remove old turbocharger 1 control unit - J724- and dispose of it.

Caution

Check that the three insulating washers are fitted between turbocharger 1 control unit - J724- and the bracket.

– Install new turbocharger 1 control unit - J724- in reverse sequence of removal.

– Fit new bolts as follows:

1 - M6x15 with tapered shank

2 - M6x15 with tapered shank

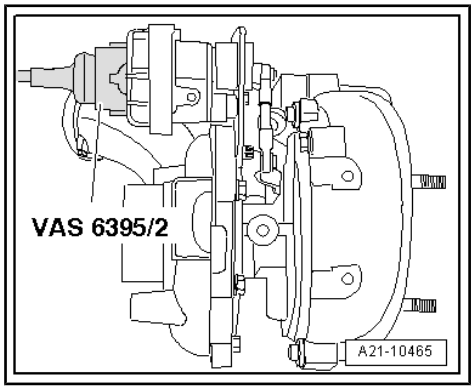
3 - M6x15

– Initially hand-tighten bolts.

• Turbocharger 1 control unit - J724- must rest on retaining plate so there is no play; it must still be possible to move control unit by hand.

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– Connect connecting wire - VAS 6395/2- to new turbocharger 1 control unit - J724- .



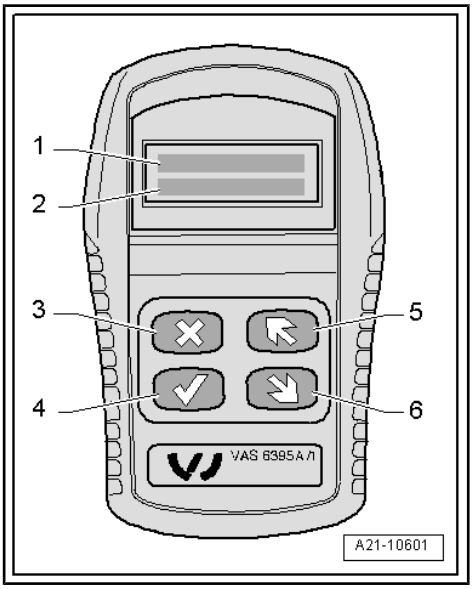
– To continue, press [v] button -item 4-.

Display on -VAS 6395 A/1- :

1 - > 1. START

2 - 2. NEXT [>]

– Select menu item “NEXT” with [↓] button -item 6-.



– To continue, press [v] button -item 4-.

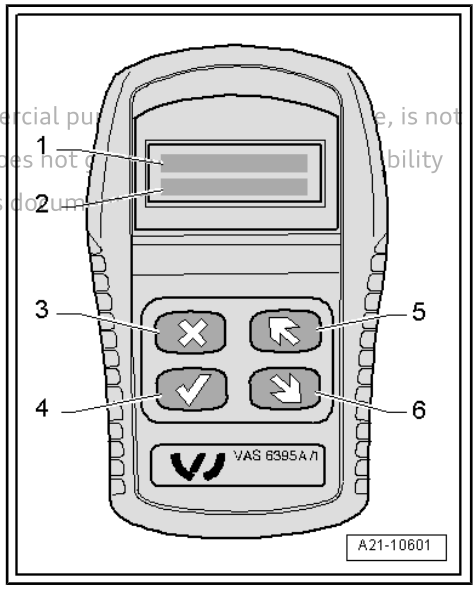
- The tester - VAS 6395 A/1- runs through the adjustment range of the turbocharger 1 control unit - J724- and checks that the end positions are reached; display indicates “CHECK”.

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Display on -VAS 6395 A/1- :

1 - X.XXX V

2 - [OK]



Note

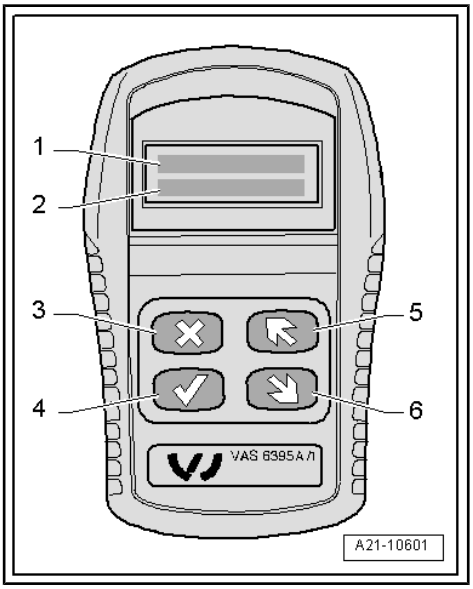
If the display indicates “FAULT”, the new turbocharger 1 control unit - J724- must be renewed for a second time.

– To continue, press [v] button -item 4-.

Display on -VAS 6395 A/1- :

1 -

2 - [OK]



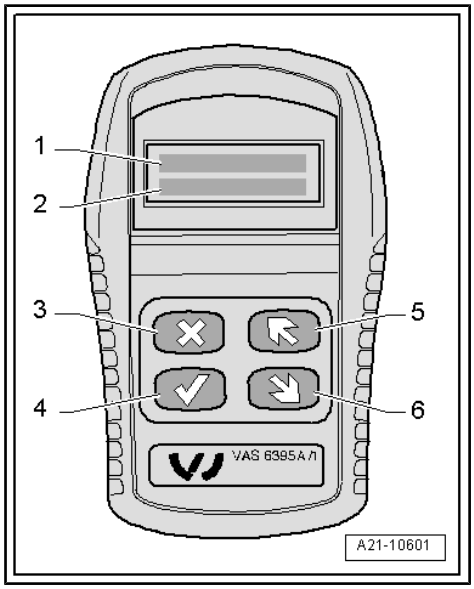
– To continue, press V button -item 4-.

Display on -VAS 6395 A/1- :

1 - X.XXX V (voltage determined with first measurement)

2 - [OK]

• Turbocharger 1 control unit - J724- moves into installation position.

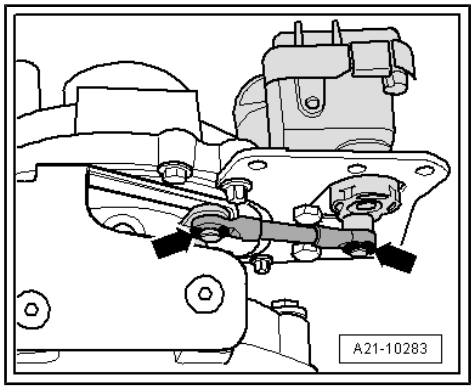


– Insert coupling rod.

• Installation position: The thicker eyelet is fitted onto the shaft of turbocharger 1 control unit - J724- .

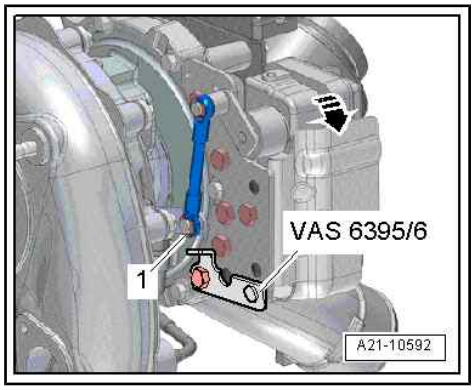
– Fit circlips -arrows-.

• The circlips must engage audibly.

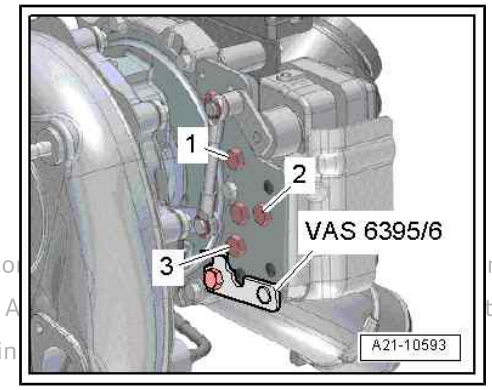


– Press turbocharger 1 control unit - J724- towards the rear without applying force -arrow- until lever -1- rests lightly on bracket -VAS 6395/6- .

– Hold -J724- in this position.



– Tighten bolts -1, 2, 3- to 5 Nm.



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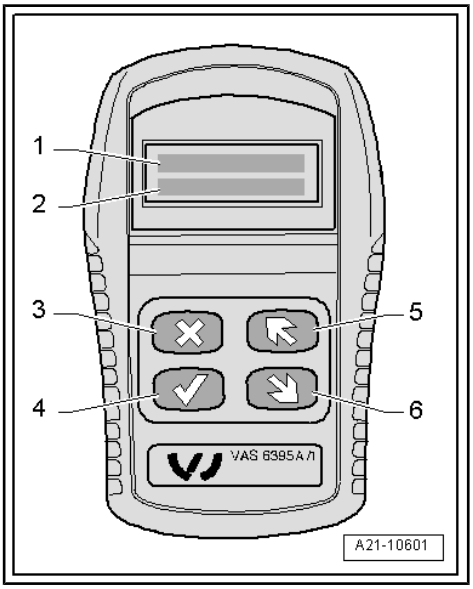
– To continue, press V button -item 4-.

• Turbocharger 1 control unit - J724- moves back and forth between the stops several times and is adjusted to the voltage value determined with the first measurement.

Display on -VAS 6395 A/1- :

1 - X.XXX V (voltage determined with first measurement)

2 - [OK]



Note

◆ *If [OK] is indicated on display, terminate adjustment* *⇒ page 310* *.*

◆ *If "CHECK" is indicated on display, proceed as follows.*

Procedure if display indicates "CHECK":

Display on -VAS 6395 A/1- :

1 - [<<<]

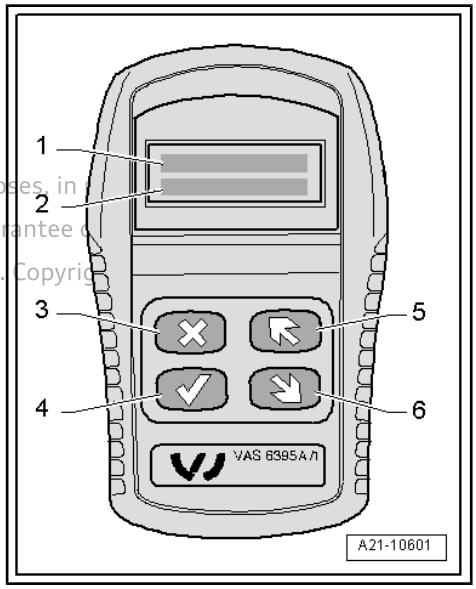
2 - CHECK

Or

1 - [>>>]

2 - CHECK

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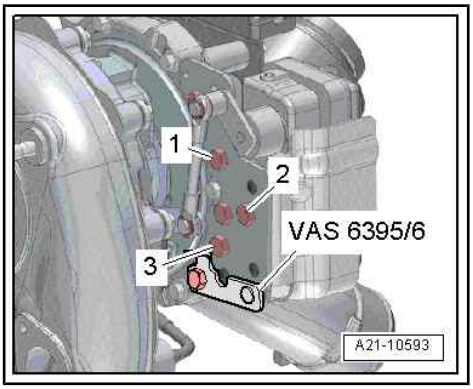


– Loosen bolts -1, 2, 3- until turbocharger 1 control unit - J724- can just be moved by applying light force in the direction stated:

• If display indicates [<<<], move -J724- slightly in direction of travel.

• If display indicates [>>>], move -J724- slightly towards rear of vehicle.

– Tighten bolts -1, 2, 3- to 5 Nm.



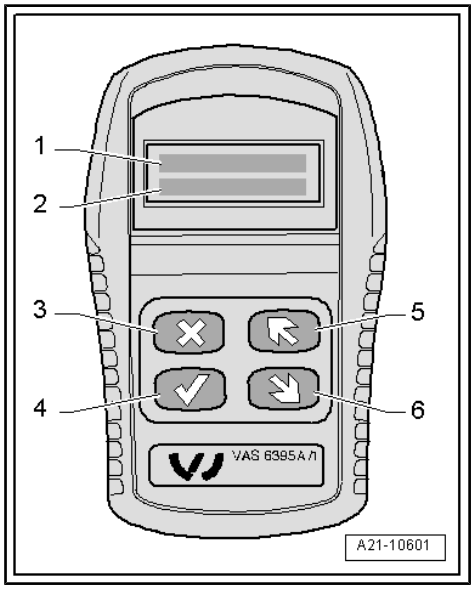
– To continue, press V button -item 4-.

- Turbocharger 1 control unit - J724- again moves back and forth between the stops several times and is adjusted to the voltage value determined with the first measurement.

Display on -VAS 6395 A/1- :

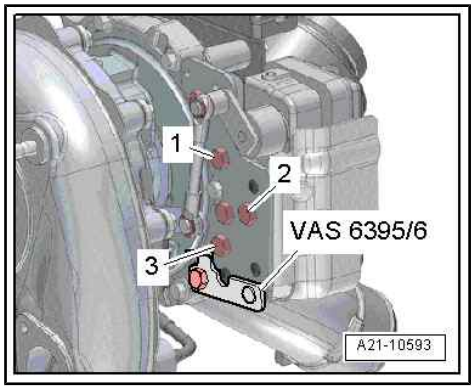
1 - X.XXX V

2 - [OK]



Terminating adjustment:

– Tighten bolts -1, 2, 3- to 10 Nm.

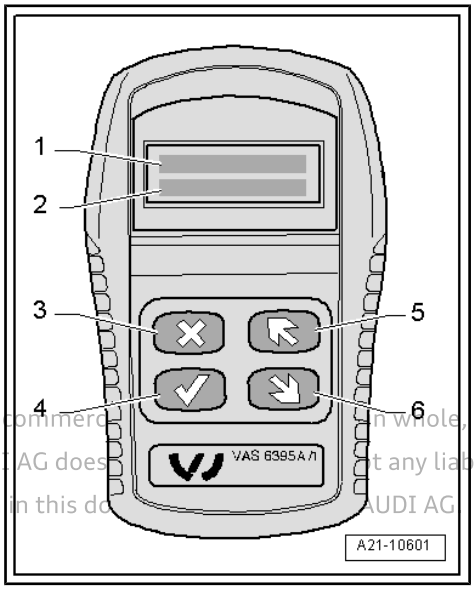


– To continue, press V button -item 4-.

Display on -VAS 6395 A/1- :

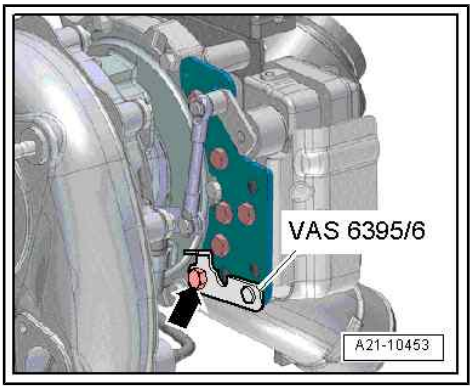
1 - X.XXX V

2 - [OK]



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– Unbolt bracket -VAS 6395/6- -arrow-.

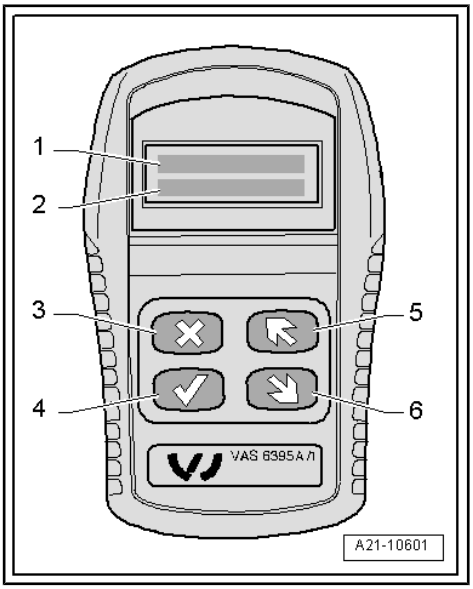


– To continue, press [V] button -item 4-.

• Turbocharger 1 control unit - J724- moves to end positions.

Note

If the display indicates "FAULT", the new turbocharger 1 control unit - J724- must be renewed ⇒ page 306 .



Display on -VAS 6395 A/1- :

1 -

2 - [OK]

• Adjustment is completed.

– Unplug electrical connectors for tester - VAS 6395 A/1- .

Assemble in reverse order.

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2 Charge air system

⇒ “2.1 Exploded view - charge air system”, page 312

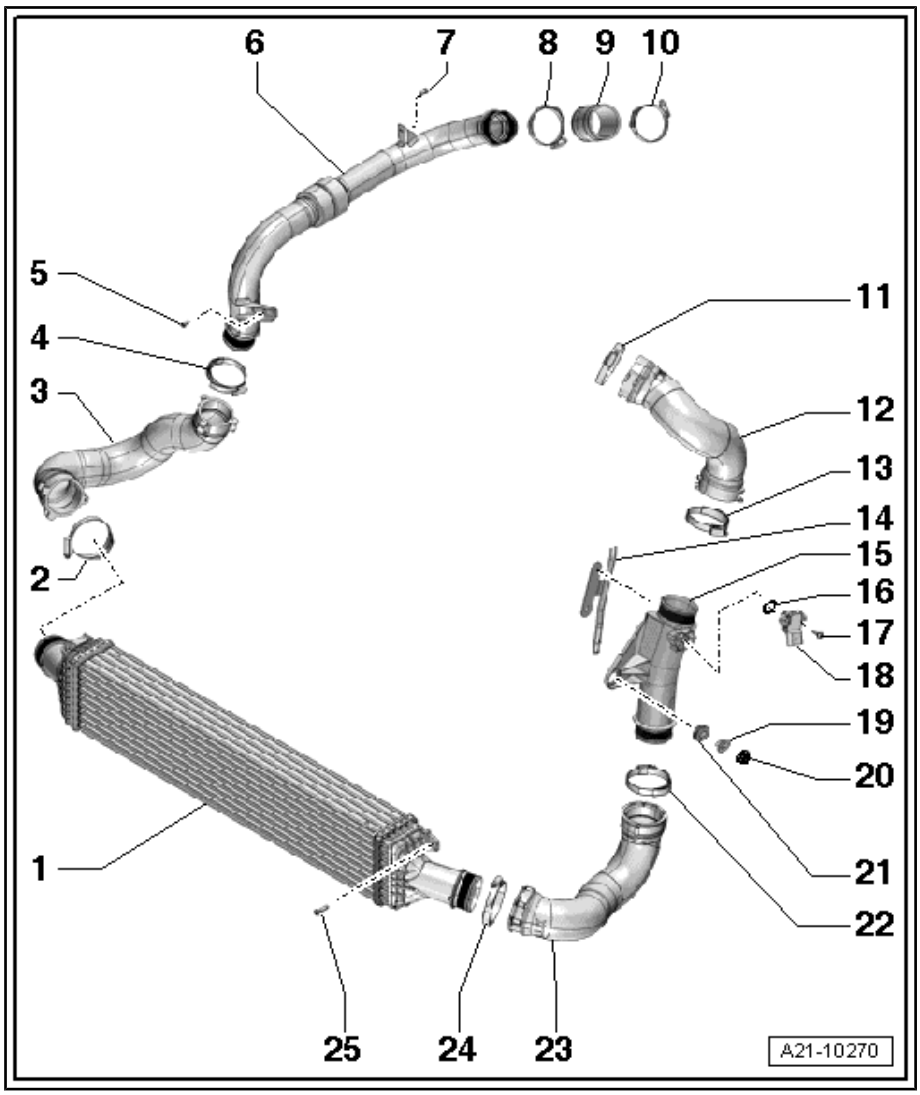
⇒ “2.2 Removing and installing charge air cooler”, page 314

⇒ “2.3 Removing and installing charge pressure sender G31 / intake air temperature sender G42 ”, page 316

⇒ “2.4 Checking charge air system for leaks”, page 317

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2.1 Exploded view - charge air system



1 - Charge air cooler
- ❑ Removing and installing ⇒ page 314

2 - Hose clip
- ❑ Tightening torque ⇒ page 313

3 - Air hose
- ❑ To charge air cooler
- ❑ Must be free of oil and grease when installing

4 - Hose clip
- ❑ Tightening torque ⇒ page 313

5 - Bolt
- ❑ 9 Nm

6 - Air pipe (right-side)

7 - Bolt
- ❑ 9 Nm

8 - Hose clip
- ❑ Tightening torque ⇒ page 313

9 - Air hose
- ❑ To turbocharger
- ❑ Must be free of oil and grease when installing

10 - Hose clip
- ❑ Tightening torque ⇒ page 313

11 - Hose clip
- ❑ Tightening torque ⇒ page 313

12 - Air hose
- ❑ To intake manifold
- ❑ Must be free of oil and grease when installing

13 - Hose clip
- ❑ Tightening torque ⇒ page 313

14 - Not fitted

15 - Air pipe (left-side)

16 - O-ring

- ❑ Renew

17 - Bolt

- ❑ 5 Nm

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18 - Charge pressure sender - G31- / intake air temperature sender - G42-

- ❑ Removing and installing ⇒ page 316

19 - Bush

20 - Nut

- ❑ 9 Nm

21 - Rubber grommet

22 - Hose clip

- ❑ Tightening torque ⇒ page 313

23 - Air hose

- ❑ From charge air cooler
- ❑ Must be free of oil and grease when installing

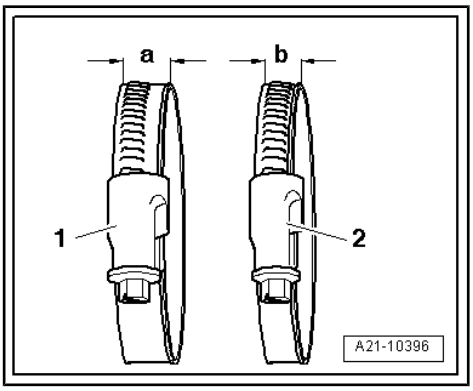
24 - Hose clip

- ❑ Tightening torque ⇒ page 313

25 - Bolt

- ❑ 7 Nm

Installing air hoses with screw-type clips



Note

- ♦ *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- ♦ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- ♦ *The screw sections of used screw-type clips must be sprayed with rust remover prior to fitting so that the air hoses can be attached securely to the hose connections.*

Tightening torque for

1 - Hose clip with width -a- = 13 mm: 5.5 Nm

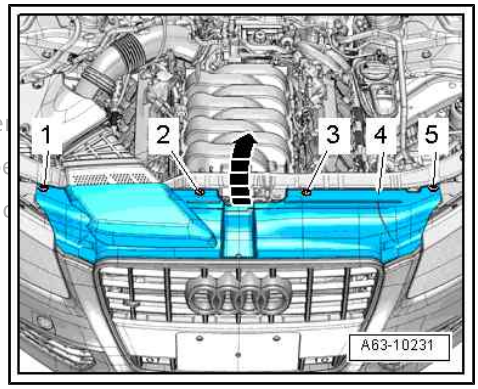
2 - Hose clip with width -b- = 9 mm: 3.4 Nm

2.2 Removing and installing charge air cooler

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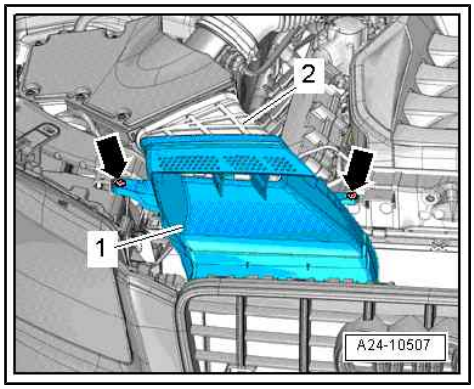
Removing

– Remove lock carrier cover -4- ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .



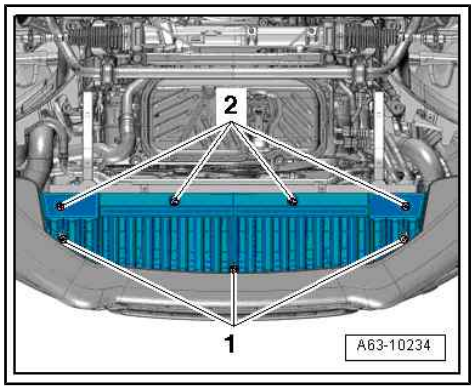
– Remove bolts -arrows-.

– Detach air duct -1- from intermediate flange -2- for air cleaner housing.

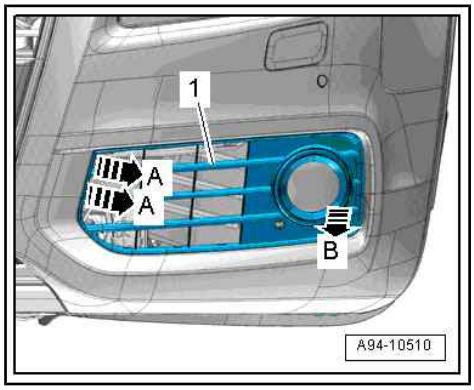


– Remove closure plate at bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .

– A4 Allroad:Remove bumper cover (front) ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing bumper cover .



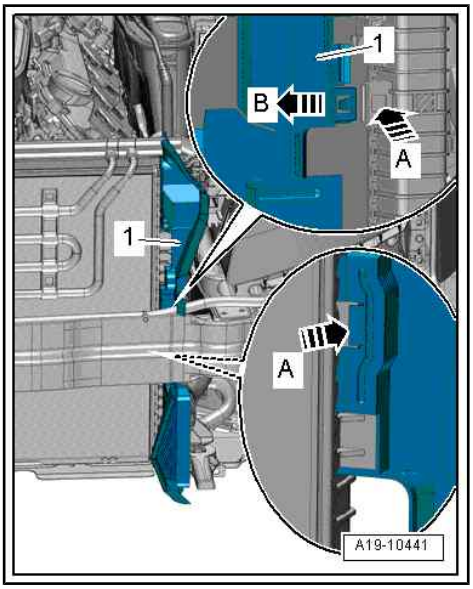
– Remove air intake grille -1- on both sides ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .



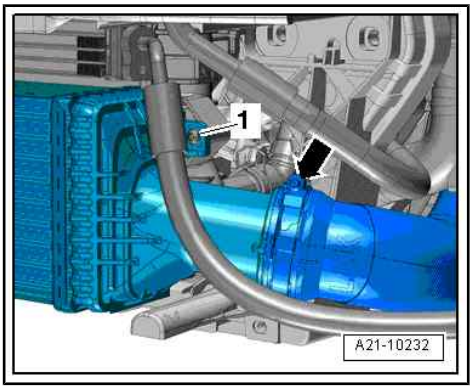
Note

For illustration purposes, the installation position is shown in the following illustrations with the bumper removed.

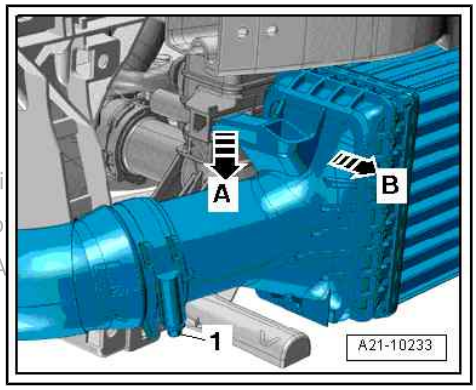
– Release catches -arrows A- and swivel air duct -1- on left and right to centre of vehicle -arrow B-.



– Release hose clip -arrow- and detach air hose from charge air cooler.
– Remove bolt -1-.

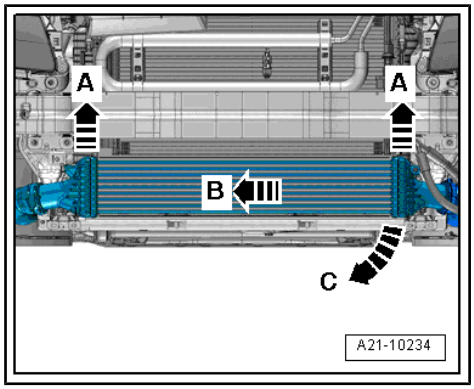


– Release hose clip -1- and detach air hose from charge air cooler.
– Push catch down -arrow A- and move top of charge air cooler slightly in direction of -arrow B-.



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– Lift charge air cooler off radiator -arrows A- and press in direction of -arrow B-.
– Pull left side of charge air cooler downwards -arrow C- and detach charge air cooler.



Installing

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

Tightening torques:

- ⇒ “2.1 Exploded view - charge air system”, page 312
- ⇒ Fig. ““Installing air hoses with screw-type clips”“ , page 313

Note

- *If there are slight impressions on the fins, refer to ⇒ page 10 .*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

– Install bumper and closure plate at bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .
– Attach air duct to intermediate flange for air cleaner housing ⇒ page 336 .
– Install lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .

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2.3 Removing and installing charge pressure sender - G31- / intake air temperature sender - G42-

Removing

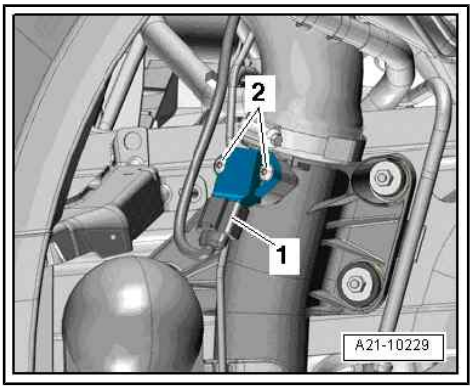
Note

Observe rules for cleanliness ⇒ page 8 .

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

– Unplug electrical connector -1-.

– Remove bolts -2- and pull charge pressure sender - G31- / intake air temperature sender - G42- out of air pipe.



Installing

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

- Tightening torque
  ⇒ "2.1 Exploded view - charge air system", page 312

Note

Fit new O-ring.

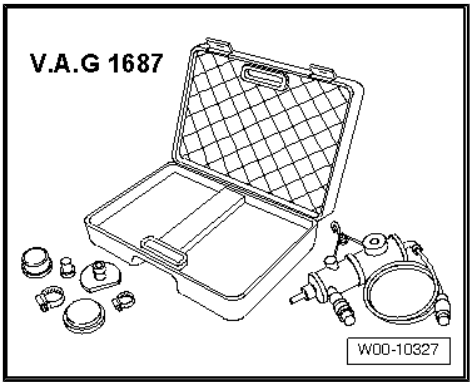
– Install front wheel housing liner (left-side) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front) .

– Fit front left wheel ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres; Tightening torque for wheel bolts .

2.4 Checking charge air system for leaks

Special tools and workshop equipment required

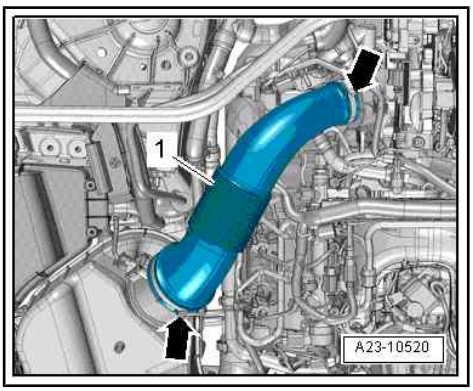
♦ Charge air system tester - V.A.G 1687- with adapter - V.A.G 1687/11- and adapter - V.A.G 1687/13-



Procedure

– Remove engine cover panel ⇒ page 98 .

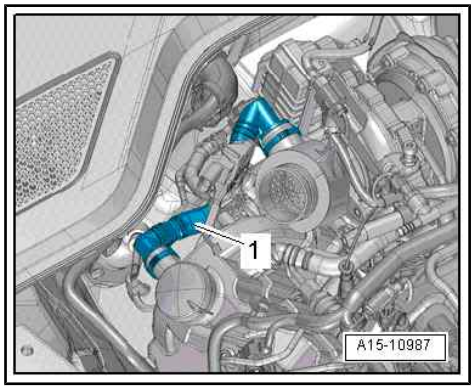
– Release hose clips -arrows- and detach air pipe -1-.



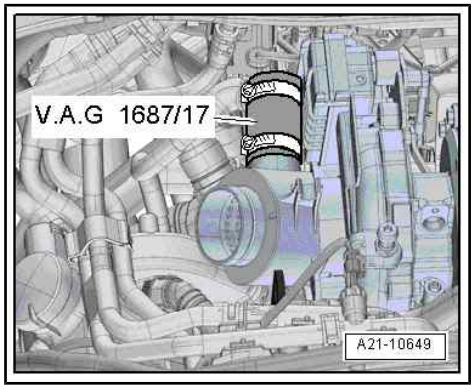
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Caution

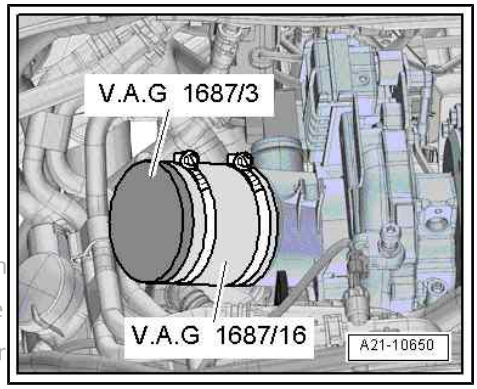
Depending on the vehicle version and country version, a crankcase breather hose may be fitted which cannot be detached from the cylinder head cover without being damaged irreparably. For these versions, the hose on the cylinder head cover will be damaged irreparably and must then be renewed.



– Remove crankcase breather hose -arrow-; to do so, press release tabs (if present) or break hose connection at cylinder head cover as necessary.

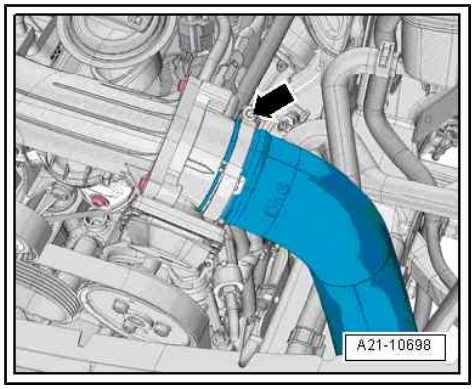


– Seal connection for crankcase breather on turbocharger with adapter -1687/17- .



– Connect end seal -V.A.G 1687/3- to turbocharger with adapter -1687/16- .

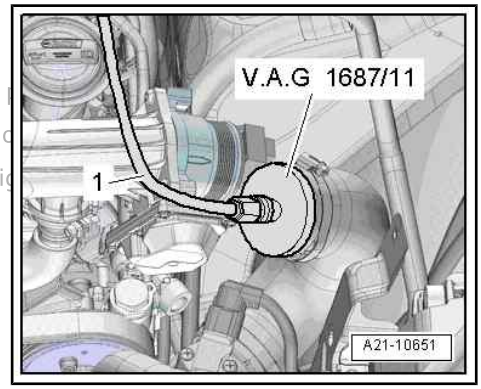
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– Release hose clip -arrow- and detach air hose.

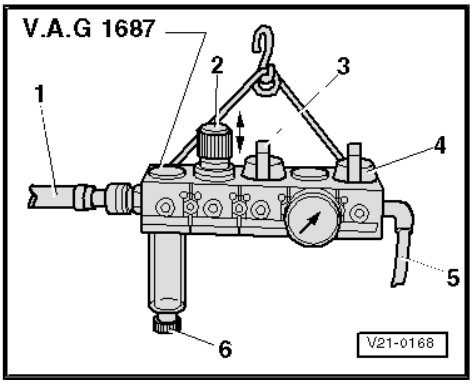
– Connect adapter - 1687/11- to air hose going to throttle valve module - J338- .
– Connect hose -1- of charge air system tester - V.A.G 1687- to adapter.

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Prepare charge air system tester - V.A.G 1687- as follows:

– Unscrew pressure control valve -2- completely and close valves -3- and -4-.
• Make sure knob is pulled out before turning pressure control valve -2-.
– Using a commercially available connection piece, connect charge air system tester - V.A.G 1687- to compressed air -1-.



Note

If there is water in sight glass, remove drain plug -6- and drain water.

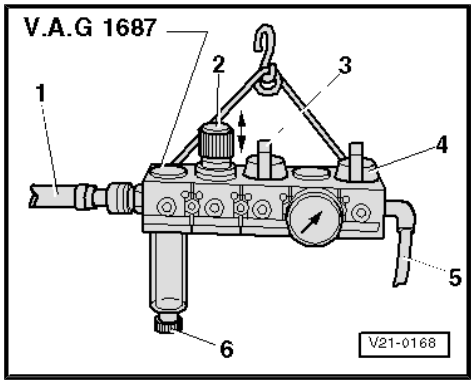
– Open valve -3-.

Caution

Risk of damage if pressure is set too high.

- ***The pressure must not exceed 0.5 bar.***

– Adjust pressure to 0.5 bar via pressure control valve -2-.
– Open valve -4- and wait until test system is pressurised. If necessary, adjust pressure to 0.5 bar again.
– Check charge air system for audible leaks or leaks that can be felt with the hand; apply commercially available leak detection spray or use ultrasonic tester - V.A.G 1842- .



Note

- *A small amount of air escapes through the valves and enters the engine. Therefore it is not possible to perform a pressure retention test.*
- *For operation of ultrasonic tester -V.A.G 1842- , refer to ⇒ Operating instructions .*
- *Release pressure in test circuit by detaching hose coupling from adapter before removing adapter.*

Attaching

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

- Tightening torque ⇒ , page 313

Note

Renew gasket and O-rings.

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23 – Mixture preparation - injection

1 Injection system

⇒ “1.1 Overview of fitting locations - injection system”, page 321

⇒ “1.2 Overview - fuel system”, page 330

⇒ “1.3 Filling and bleeding fuel system”, page 332

⇒ “1.4 Checking fuel system for leaks”, page 333

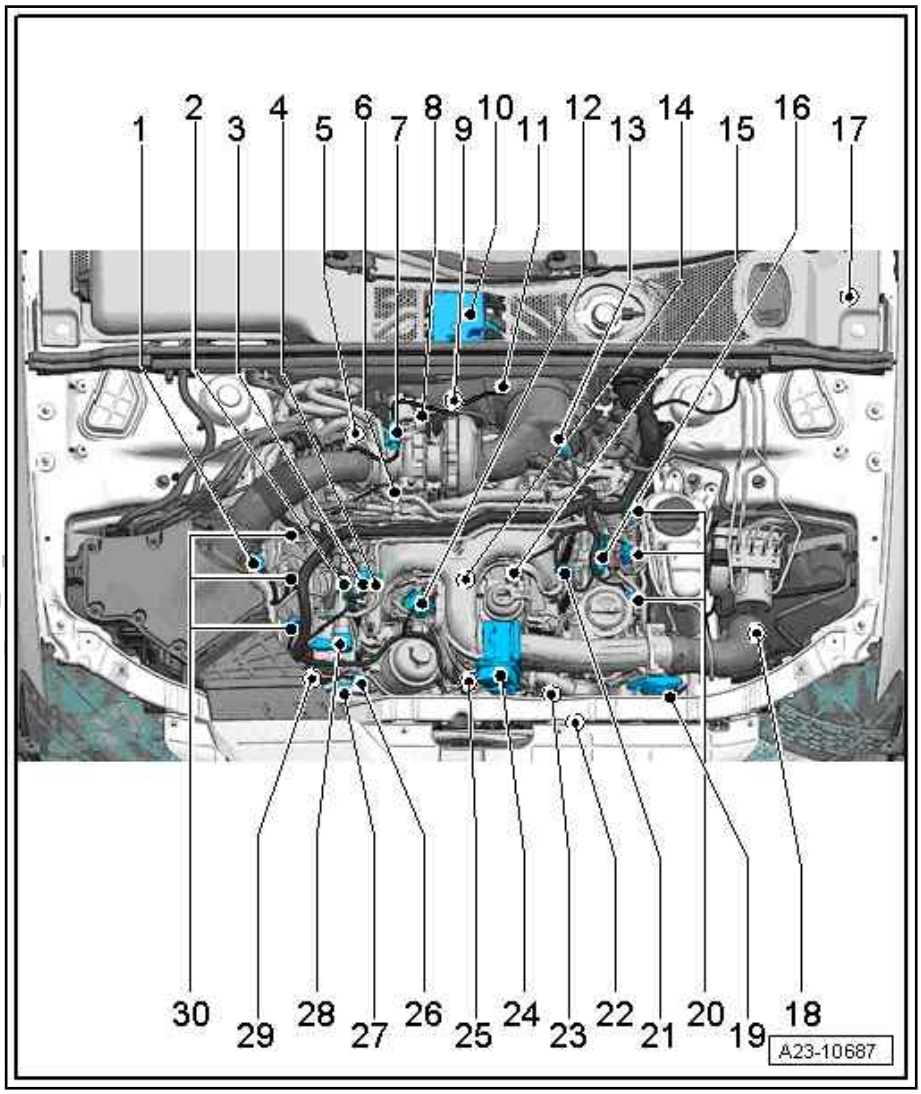
1.1 Overview of fitting locations - injection system

Engine compartment ⇒ page 321

Engine (top view) ⇒ page 323

Engine (front view) ⇒ page 324

Engine compartment



1 - Air mass meter - G70-

- ❑ Removing and installing ⇒ page 390

2 - Electrical connector for exhaust gas recirculation temperature sensor - G98-

- ❑ Removing and installing ⇒ page 447

3 - Electrical connector

- ❑ For map-controlled engine cooling system thermostat - F265- , fuel metering valve - N290- and exhaust gas recirculation control motor - V338-

4 - Restrictor

- ❑ In fuel return line

5 - Pressure differential sender - G505-

- ❑ Fitting location ⇒ page 327
- ❑ Exploded view ⇒ page 393
- ❑ Removing and installing ⇒ page 391

6 - Fuel temperature sender - G81-

7 - Electrical connector for exhaust gas temperature sender 3 - G495-

- ❑ Fitting location ⇒ page 329 or ⇒ page 329
- ❑ Exploded view ⇒ page 393

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8 - Control unit for turbocharger 1 - J724-

- On turbocharger (left-side)
- Removing and installing ⇒ page 300

9 - Exhaust gas temperature sender 1 - G235-

- Fitting location ⇒ page 328
- Removing and installing ⇒ page 448

10 - Jump start box

11 - Exhaust gas temperature sender 3 - G495-

- Fitting location ⇒ page 329 or ⇒ page 329
- Removing and installing ⇒ page 448

12 - Coolant valve for cylinder head - N489-

13 - Lambda probe - G39- with Lambda probe heater - Z19-

- Exploded view ⇒ page 393
- Removing and installing ⇒ page 394

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14 - Exhaust gas recirculation control motor - V338-

- Removing and installing ⇒ page 462

15 - Coolant temperature sender - G62-

16 - Electrical connector for Lambda probe - G39-

- Exploded view ⇒ page 393

17 - Engine control unit - J623-

- Fitting location ⇒ page 326
- Removing and installing ⇒ page 398

18 - Charge pressure sender - G31- / intake air temperature sender - G42-

- Fitting location ⇒ page 328
- Removing and installing ⇒ page 316
- 5 Nm

19 - Throttle valve module - J338-

- Exploded view ⇒ page 342

20 - Injectors

- Cylinder bank 2
- Removing and installing ⇒ page 363

21 - Fuel pressure sender - G247-

- With deformable sealing lip
- Cannot be re-installed
- Removing and installing ⇒ page 387
- Tightening torque ⇒ Fig. “” Fuel pressure sender -G247- - tightening torque”“ , page 332

22 - Valve for oil pressure control - N428-

- Removing and installing ⇒ page 246

23 - Temperature sender for engine temperature regulation - G694-

- Fitting location ⇒ page 328

24 - Intake manifold flap motor - V157-

- Exploded view ⇒ page 342

25 - Exhaust gas recirculation cooler change-over valve - N345-

- Removing and installing ⇒ page 458

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

- Removing and installing ⇒ page 243

27 - Oil pressure switch - F22-

- ❑ Removing and installing ⇒ page 243

28 - Fuel pressure regulating valve - N276-

- ❑ With deformable sealing lip
- ❑ Cannot be re-installed
- ❑ After renewing, perform adaption ⇒ Vehicle diagnostic tester using `Guided Functions`
- ❑ Removing and installing ⇒ page 385
- ❑ Tightening torque ⇒ Fig. "" Fuel pressure regulating valve -N276- - tightening torque"" , page 332

29 - Radiator outlet coolant temperature sender - G83-

- ❑ Fitting location ⇒ page 328

30 - Injectors

- ❑ Cylinder bank 1
- ❑ Removing and installing ⇒ page 363

Engine (top view)

1 - Fuel pressure regulating valve - N276-

- ❑ Exploded view ⇒ page 375

2 - Injector, cylinder 1 - N30-

- ❑ Exploded view ⇒ page 351

3 - Glow plug 1 - Q10-

- ❑ Exploded view ⇒ page 471

4 - Injector, cylinder 2 - N31-

- ❑ Exploded view ⇒ page 351

5 - Hall sender - G40-

- ❑ Fitting location ⇒ page 327
- ❑ Exploded view ⇒ page 471

6 - Glow plug 2 - Q11-

- ❑ Exploded view ⇒ page 471

7 - Injector, cylinder 3 - N32-

- ❑ Exploded view ⇒ page 351

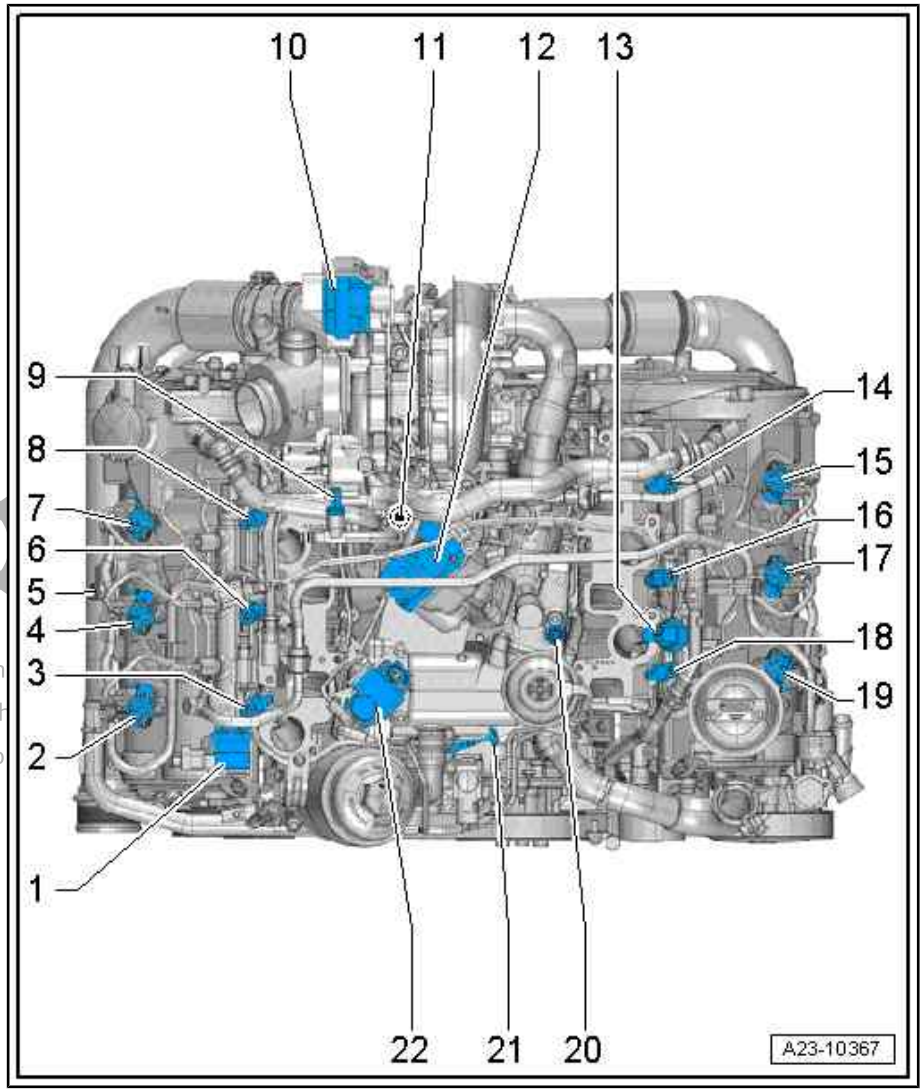
8 - Glow plug 3 - Q12-

- ❑ Exploded view ⇒ page 471

9 - Fuel temperature sender - G81-

10 - Control unit for turbo-charger 1 - J724-

- ❑ On turbocharger
- ❑ Removing and installing ⇒ page 300



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11 - Fuel metering valve - N290-

- ❑ Fitting location ⇒ page 327

12 - Exhaust gas recirculation control motor - V338-

- ❑ Removing and installing ⇒ page 462

13 - Fuel pressure sender - G247-

- ❑ Removing and installing ⇒ page 387

14 - Glow plug 6 - Q15-

- ❑ Exploded view ⇒ page 471

15 - Injector, cylinder 6 - N84-

- ❑ Exploded view ⇒ page 351

16 - Glow plug 5 - Q14-

- ❑ Exploded view ⇒ page 471

17 - Injector, cylinder 5 - N83-

- ❑ Exploded view ⇒ page 351

18 - Glow plug 4 - Q13-

- ❑ Exploded view ⇒ page 471

19 - Injector, cylinder 4 - N33-

- ❑ Exploded view ⇒ page 351

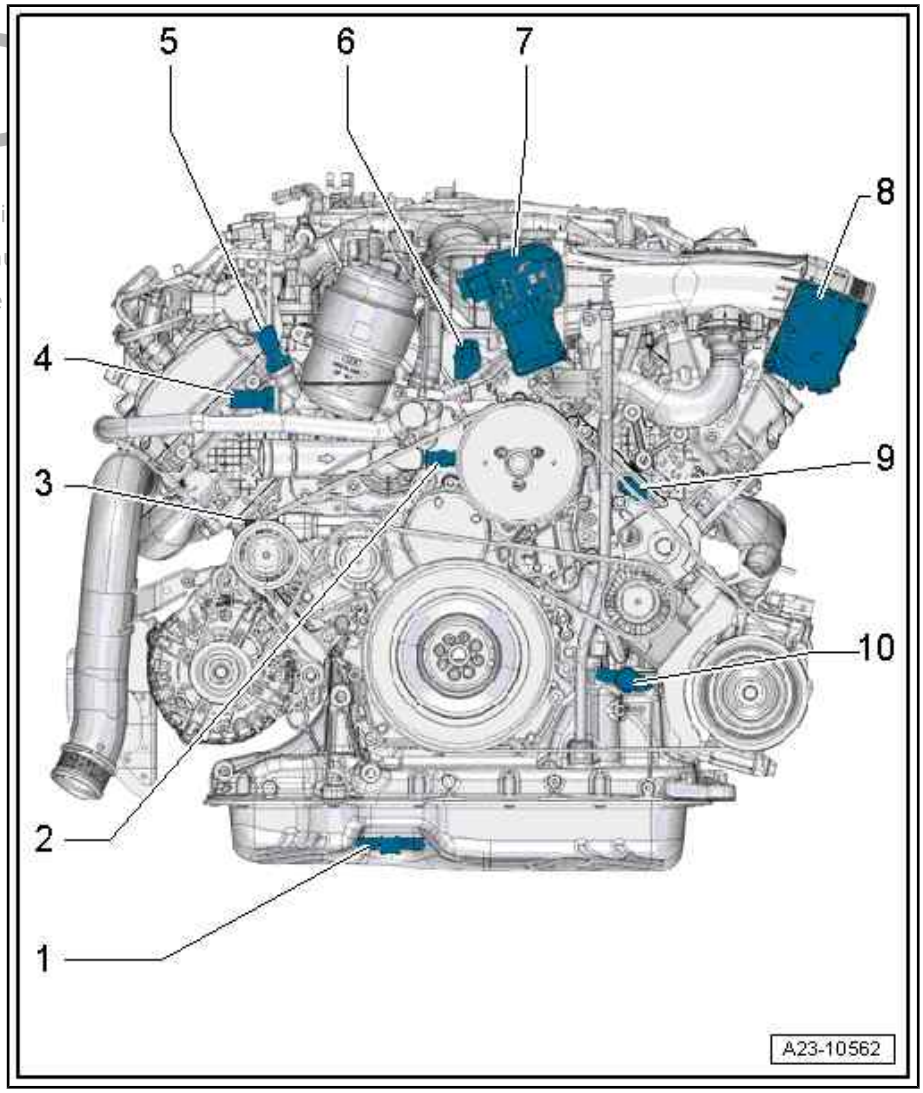
20 - Coolant temperature sender - G62-

21 - Coolant valve for cylinder head - N489-

Engine (front view)



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1 - Oil level and oil temperature sender - G266-

- ❑ Removing and installing ⇒ page 237

2 - Map-controlled engine cooling system thermostat - F265-

- ❑ Removing and installing ⇒ page 267

3 - Oil temperature sender 2 - G664-

- ❑ Removing and installing ⇒ page 245

4 - Oil pressure switch - F22-

- ❑ Removing and installing ⇒ page 243

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

- ❑ Removing and installing ⇒ page 243

6 - Exhaust gas recirculation cooler change-over valve - N345-

- ❑ Removing and installing ⇒ page 458

7 - Intake manifold flap motor - V157-

- ❑ Exploded view ⇒ page 342

8 - Throttle valve module - J338-

- ❑ Exploded view ⇒ page 342

9 - Temperature sender for engine temperature regulation - G694-

- ❑ Fitting location ⇒ page 328

10 - Valve for oil pressure control - N428-

- ❑ Removing and installing ⇒ page 246

A - Exhaust gas temperature sender 4 - G648-

- ❑ Only fitted on vehicles with SCR catalytic converter
- ❑ Fitting location ⇒ page 329
- ❑ Removing and installing ⇒ page 448

B - Control unit for NOx sender 2 - J881- with NOx sender 2 - G687-

- ❑ Only fitted on vehicles with engine codes CKVB and CKVC
- ❑ Fitting location ⇒ page 330
- ❑ Removing and installing ⇒ page 456

C - Particulate sensor - G784-

- ❑ Only installed on vehicles with engine code CKVC
- ❑ Fitting location ⇒ page 330
- ❑ Removing and installing ⇒ page 454

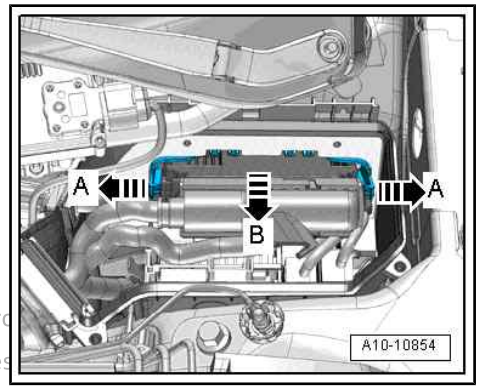
D - Exhaust gas temperature sender 2 - G448-

- ❑ Only installed on vehicles with engine code CKVC
- ❑ Fitting location ⇒ page 329

❑ Removing and installing ⇒ page 448

Fitting location of engine control unit - J623-

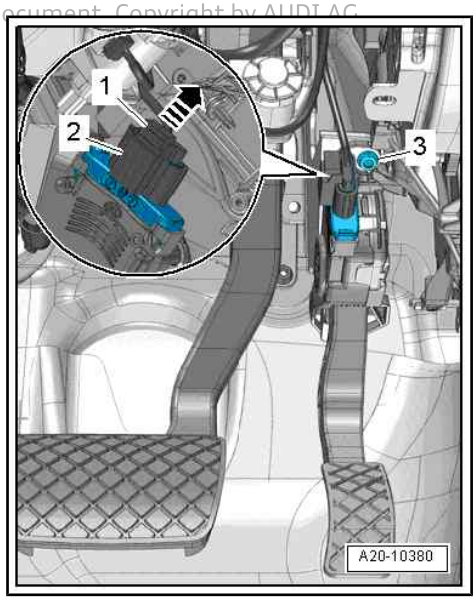
♦ In left electronics box in engine compartment



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Fitting location of accelerator position sender - G79- / accelerator position sender 2 - G185-

♦ In accelerator pedal module

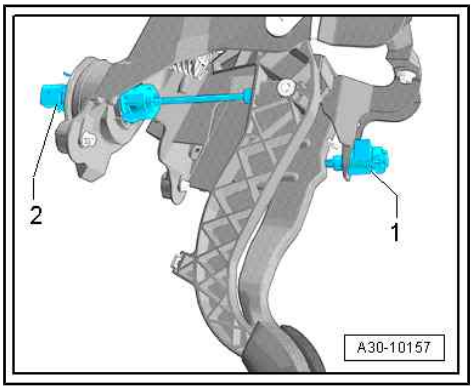


Note

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; Removing and installing accelerator pedal module with accelerator position sender -G79- / -G185-

Fitting locations on pedal bracket



1 - Brake light switch - F- and brake pedal switch - F47-

2 - Clutch position sender - G476-

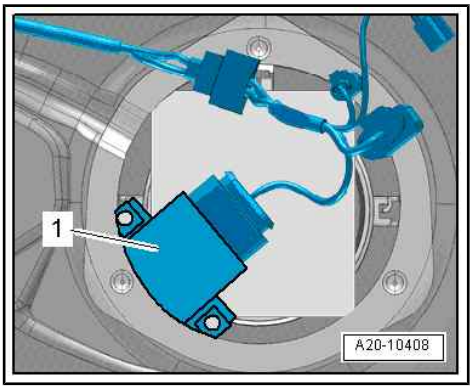
Integrated functions: clutch pedal switch for engine start - F194- and clutch pedal switch - F36- (manual gearbox only)

Removing and installing brake light switch - F- ⇒ Brake system; Rep. gr. 45 ; Sensors; Removing and installing brake light sensor

Fitting location of fuel pump control unit - J538-

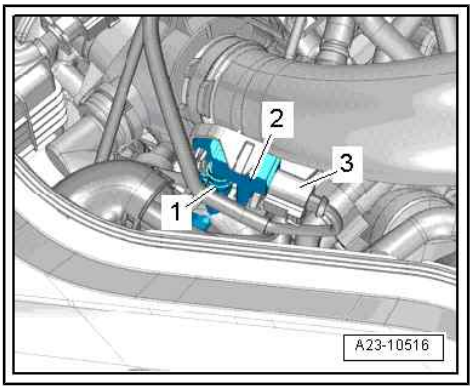
- Fuel pump control unit - J538- -arrow- is located between floor panel and fuel tank level with rear seat bench (right-side).

Removing and installing ⇒ Fuel supply system; Rep. gr. 20 ; Fuel pump; Removing and installing fuel pump control unit - J538-



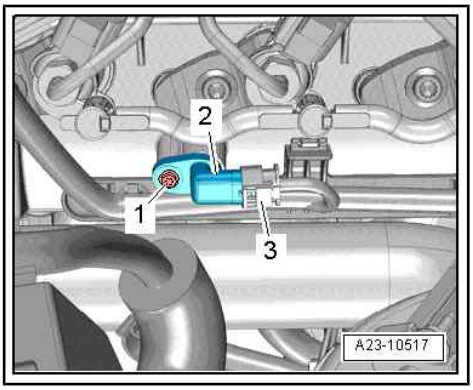
Fitting location of pressure differential sender - G505-

- -Item 2- at rear right of engine



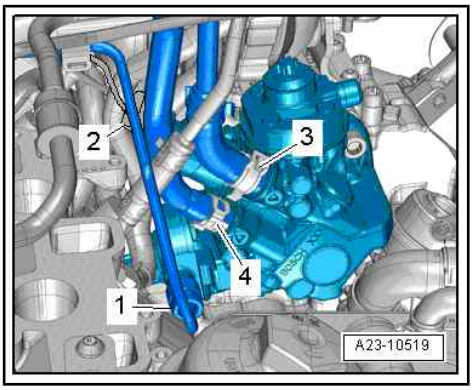
Fitting location of Hall sender - G40-

- -Item 2- on cylinder head cover, cylinder bank 1 (right-side)



Fitting location of fuel metering valve - N290-

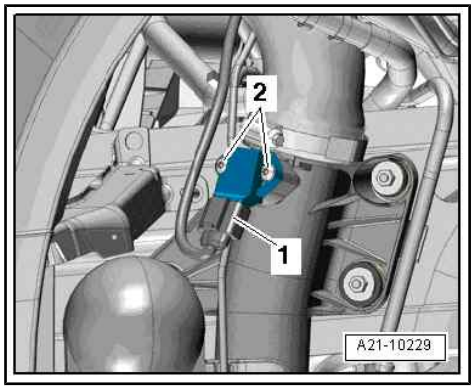
- -Item 2- in high-pressure pump



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Fitting location of charge pressure sender - G31- / intake air temperature sender - G42-

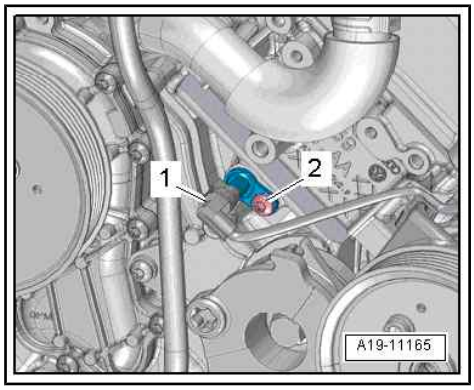
Removing and installing ⇒ page 316



Fitting location of temperature sender for engine temperature regulation - G694-

- -Item 1- at front left of cylinder block

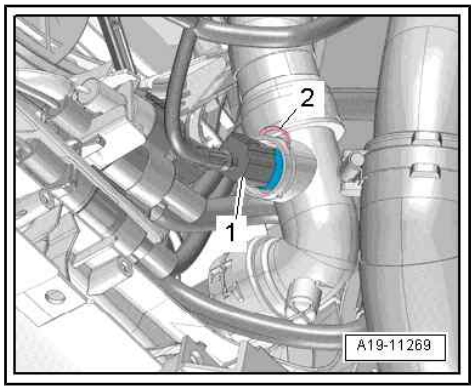
Removing and installing ⇒ page 271



Fitting location of radiator outlet coolant temperature sender - G83-

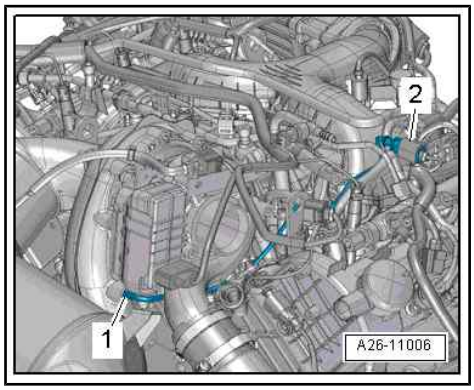
- -Item 2- in coolant hose (front right)

Removing and installing ⇒ page 272



Temperature sender in turbocharger

1 - Exhaust gas temperature sender 1 - G235-

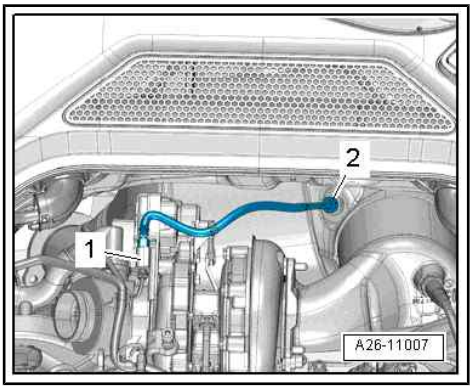


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Exhaust temperature sender 3 - G495- (version 1)

1 - Electrical connector for exhaust gas temperature sender 3 - G495-

2 - Exhaust gas temperature sender 3 - G495-

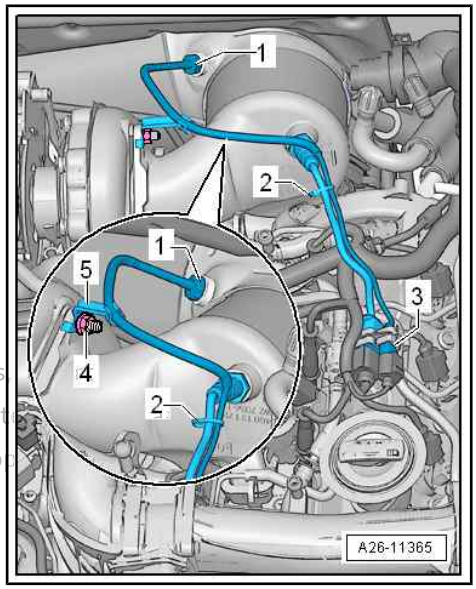


Exhaust temperature sender 3 - G495- (version 2)

1 - Exhaust gas temperature sender 3 - G495-

3 - Electrical connector for exhaust gas temperature sender 3 - G495-

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Fitting locations of exhaust gas temperature sensors (engine code CKVC only)

1 - Exhaust gas temperature sender 3 - G495-

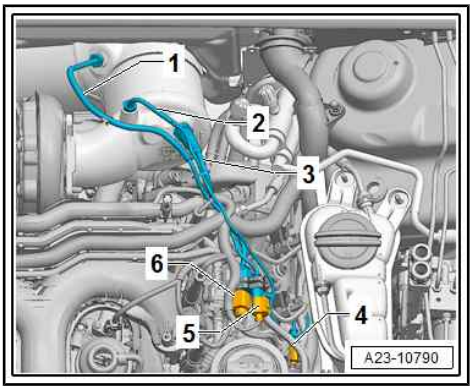
2 - Exhaust gas temperature sender 2 - G448-

3 - Lambda probe - G39-

4 - Electrical connector for exhaust gas temperature sender 2 - G448-

5 - Electrical connector for exhaust gas temperature sender 3 - G495-

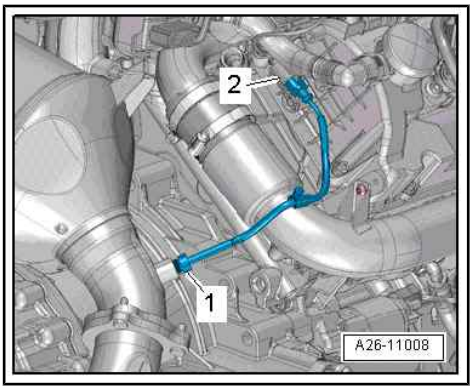
6 - Electrical connector for Lambda probe - G39-



Exhaust gas temperature sender

1 - Exhaust gas temperature sender 4 - G648-

2 - Electrical connector for exhaust gas temperature sender 4 - G648-

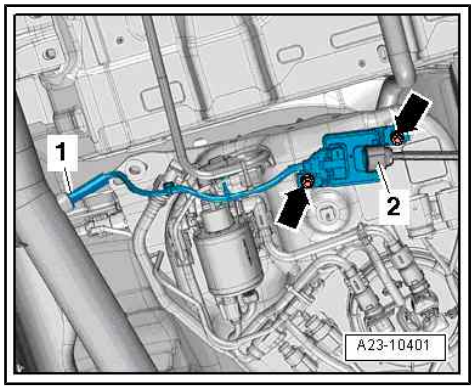


Control unit for NOx sender 2 - J881- with NOx sender 2 - G687- (engine codes CKVB and CKVC only)

1 - NOx sender 2 - G687-

2 - Control unit for NOx sender 2 - J881- on active tank for reducing agent

Removing and installing ⇒ page 456



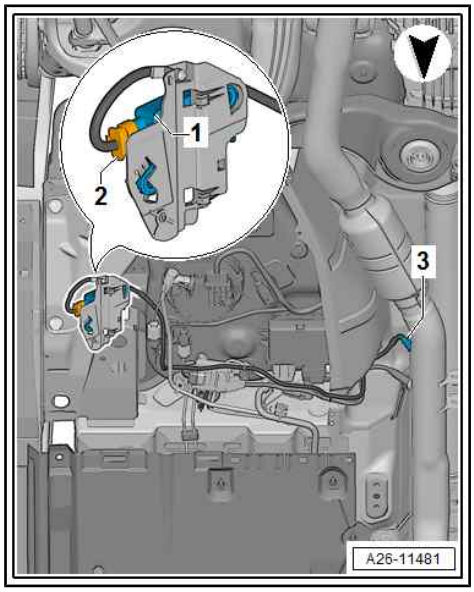
Particulate sensor - G784- (engine code CKVC only)

1 - Control unit for particulate sensor - G784-

2 - Electrical connector from control unit

3 - Particulate sensor - G784-

Removing and installing ⇒ page 454



1.2 Overview - fuel system

Caution

Risk of malfunctions caused by dirt.

- *Observe ⇒ "2.1 Safety precautions when working on the fuel supply system", page 2 .*

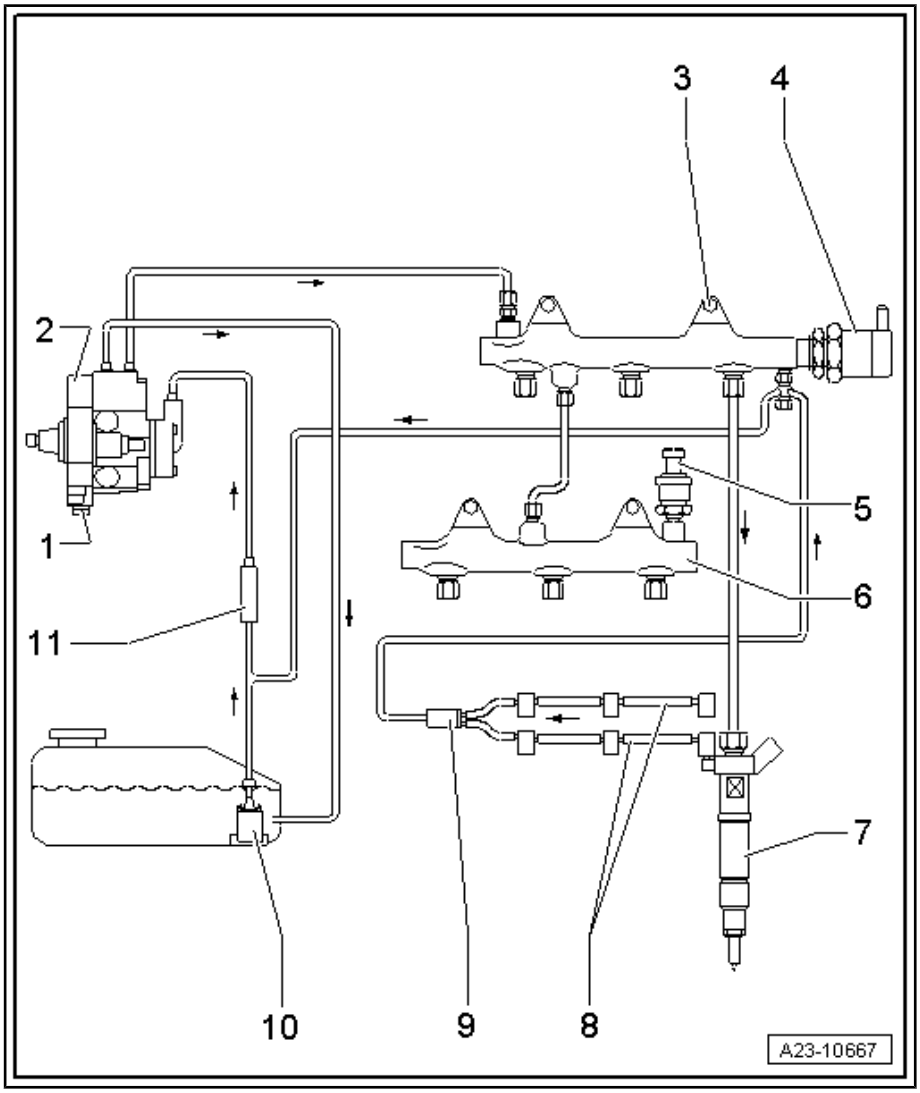
The high-pressure fuel pump has very close tolerances and must not be allowed to run without fuel. To prevent this and to enable the engine to start quickly after parts have been renewed, it is important to observe the following:

- *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 ⇒ page 332 .*
- *If a fuel pump, fuel line (between fuel tank and high-pressure pump) or fuel filter is removed or renewed, the fuel system must be bled before the engine is started for the first time.*
- *If the high-pressure pump is removed or renewed, the fuel system must be bled before the engine is started for the first time. Procedure for first fuel filling ⇒ page 332*

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Note

The high-pressure pump will be damaged if the first fuel filling operation is not performed.



1 - Fuel metering valve - N290-

- ❑ Do not unscrew

2 - High-pressure fuel pump

- ❑ Exploded view ⇒ page 375

3 - Fuel rail

- ❑ For cylinder bank 1 (right-side)

4 - Fuel pressure regulating valve - N276-

- ❑ With deformable sealing lip
- ❑ Cannot be re-installed
- ❑ Removing and installing ⇒ page 387
- ❑ Tightening torque ⇒ Fig. "" Fuel pressure sender -G247- - tightening torque"" , page 332

5 - Fuel pressure sender - G247-

- ❑ With deformable sealing lip
- ❑ Cannot be re-installed
- ❑ Removing and installing ⇒ page 387
- ❑ Tightening torque ⇒ Fig. "" Fuel pressure sender -G247- - tightening torque"" , page 332

6 - Fuel rail

- ❑ For cylinder bank 2 (left-side)

7 - Injector

- ❑ Removing and installing ⇒ page 363

8 - Fuel return hoses

- ❑ Do not dismantle
- ❑ Renew together with restrictor

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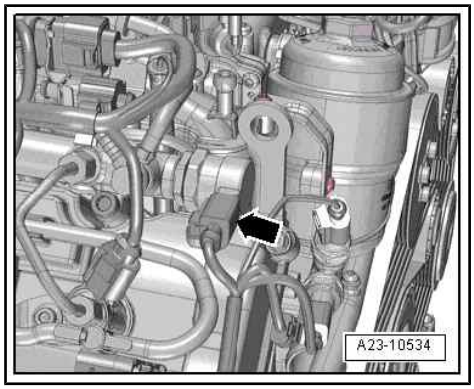
9 - Restrictor

- ❑ Maintains a residual pressure in fuel return hoses
- ❑ Cannot be renewed separately; if defective, renew fuel return hoses

10 - Fuel system pressurisation pump - G6-

11 - Fuel filter

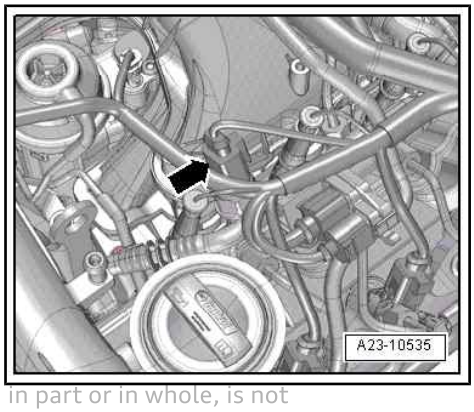
Fuel pressure regulating valve - N276- - tightening torque



– Position fuel pressure regulating valve - N276- so that electrical wiring is not under tension when connector -arrow- is plugged in.
– Tighten union nut on regulating valve in 4 stages as follows (counterhold hexagon flats on housing):

Stage	Tightening torque
1.	Screw in by hand until contact is made
2.	60 Nm
3.	Turn back by 90°
4.	85 Nm

Fuel pressure sender - G247- - tightening torque



– Tighten fuel pressure sender - G247- in 4 stages as follows:

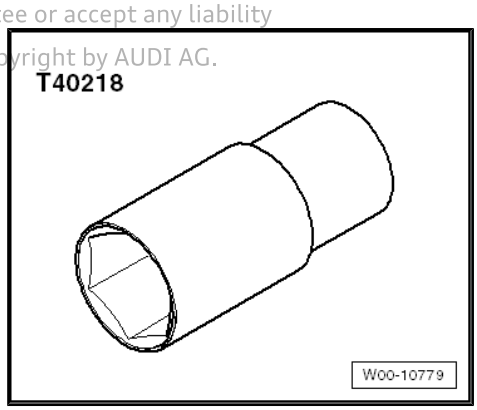
Note

An open-end spanner must not be used for loosening or tightening.

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Special tools and workshop equipment required

♦ Socket, 27 mm - T40218-



♦ Torque wrench

Stage	Tightening torque
1.	Screw in by hand until contact is made
2.	60 Nm
3.	Turn back by 180°
4.	85 Nm

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.

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– 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 inspect high-pressure section again for leaks.

1.4 Checking fuel system for leaks

Procedure

– Allow engine to run for several minutes at moderate rpm.

– Switch off ignition.

– 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.

– Road-test vehicle and accelerate with full throttle at least once.

– Then inspect high-pressure section of fuel system again for leaks.

2 Vacuum system

⇒ “2.1 Connection diagram - vacuum system”, page 334

⇒ “2.2 Checking vacuum system”, page 334

2.1 Connection diagram - vacuum system

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1 - Exhaust gas recirculation cooler change-over valve - N345-

2 - Coolant valve for cylinder head - N489-

3 - Vacuum unit

- ❑ For exhaust gas recirculation cooler

4 - Non-return valve

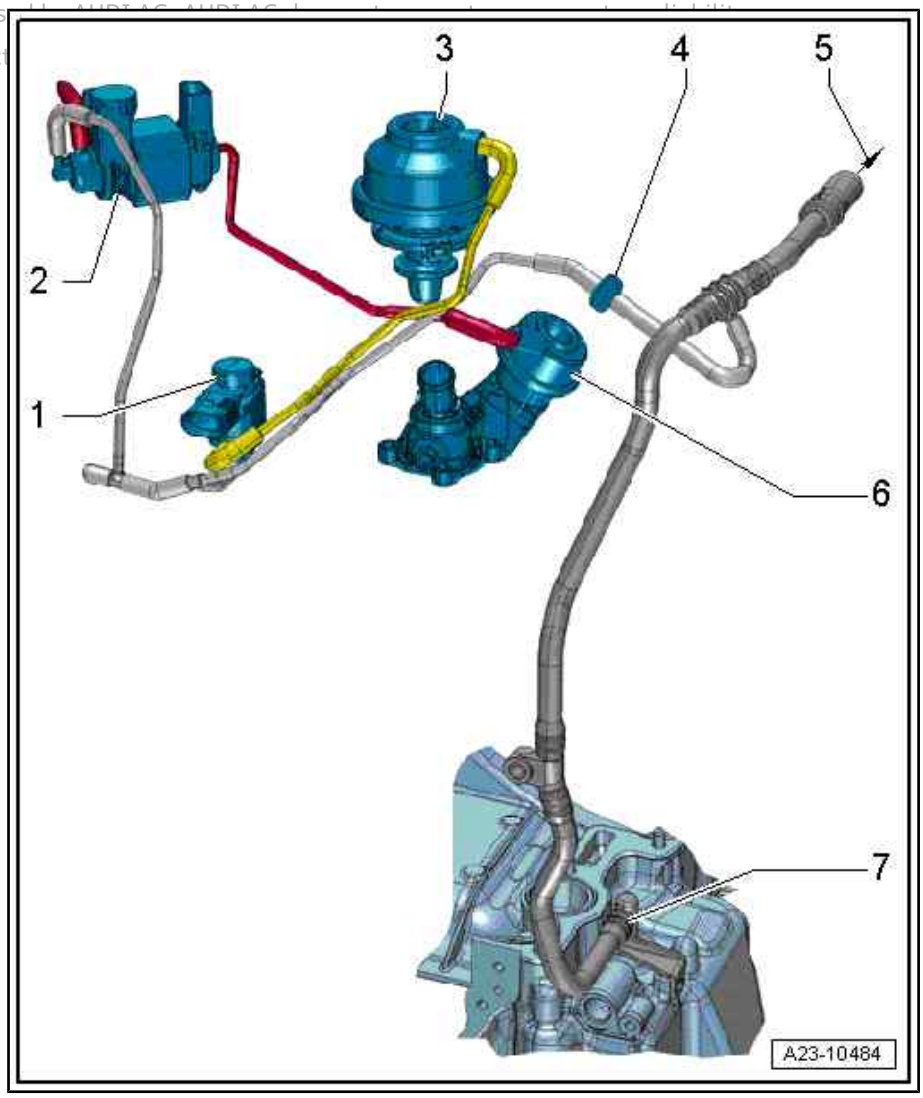
5 - To brake servo

6 - Shut-off valve

- ❑ For coolant

7 - Vacuum connection

- ❑ On sump (top section)
- ❑ To vacuum pump

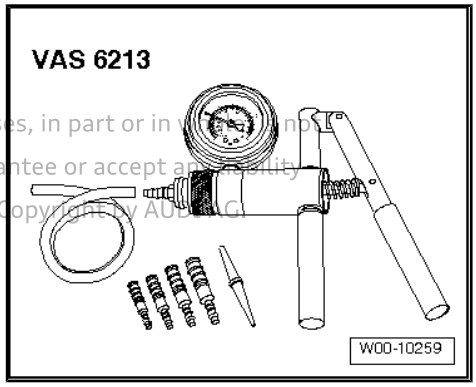


2.2 Checking vacuum system

Special tools and workshop equipment required

- Hand vacuum pump - VAS 6213-

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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 the 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.

3 Air cleaner

⇒ “3.1 Exploded view - air cleaner housing”, page 336

⇒ “3.2 Removing and installing air filter element”, page 338

⇒ “3.3 Removing and installing air cleaner housing”, page 340

3.1 Exploded view - air cleaner housing

1 - Hose clip

2 - Air hose

- ❑ To throttle valve module - J338-
- ❑ When installing, pay attention to marking ⇒ page 337

3 - Hose clip

4 - Air mass meter

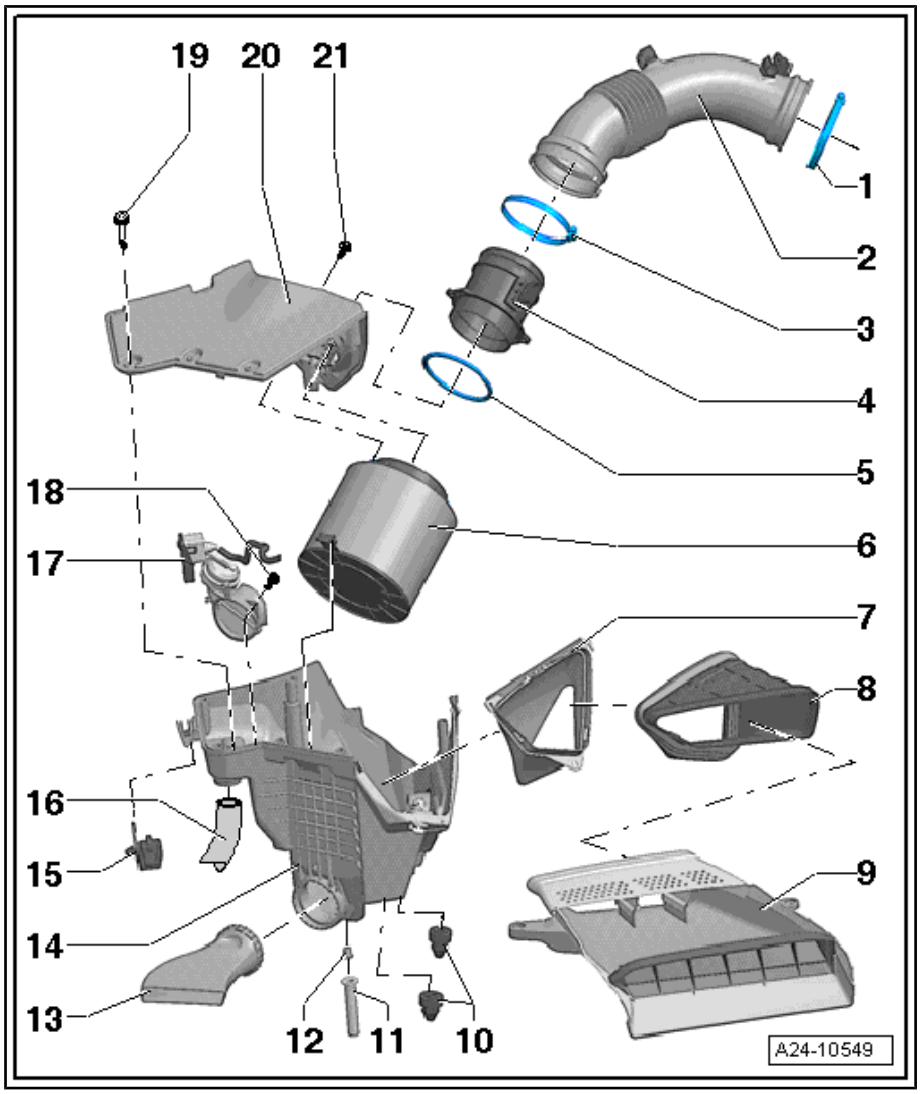
- ❑ Removing and installing air mass meter - G70- with intake air temperature sender - G42- ⇒ page 390
- ❑ 5 Nm

5 - O-ring

- ❑ Renew if damaged

6 - Air filter element

- ❑ Always use a genuine Audi air filter element
- ❑ For maintenance intervals refer to ⇒ Maintenance ; Booklet 811 (for A5 Coupé); ⇒ Maintenance ; Booklet 812 (for A4); or ⇒ Maintenance ; Booklet 818 (for A5 Cabriolet)
- ❑ Removing and installing ⇒ page 338
- ❑ Also clean snow screen



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(if fitted)

7 - Air duct

- ❑ Clipped into air cleaner (top section)
- ❑ Clean dirt and leaves out of air duct

8 - Air duct

- ❑ Clean dirt and leaves out of air duct

9 - Air duct

- ❑ To lock carrier
- ❑ Clean dirt and leaves out of air duct

10 - Rubber grommet

11 - Water drain hose

- ❑ Clean any leaves and dirt out of water drain hose (important)

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12 - Guide for water drain hose

13 - Hot air intake (countries with cold climates only)

- ❑ Slide hot air intake into air cleaner as far as stop; then turn clockwise until it engages noticeably

14 - Air cleaner (bottom section)

- ❑ Clean any salt residue, leaves and dirt out of air cleaner (bottom section)
- ❑ Check for dirt in water drain and clean as required (important)

15 - Retainer for air cleaner (bottom section)

16 - Intake hose for secondary air pump

- ❑ Installed on petrol engines only

17 - Air filter bypass flap valve - N275-

- ❑ With flap for variable intake manifold change-over

18 - Bolt

- ❑ For air filter bypass flap valve - N275-

19 - Bolt

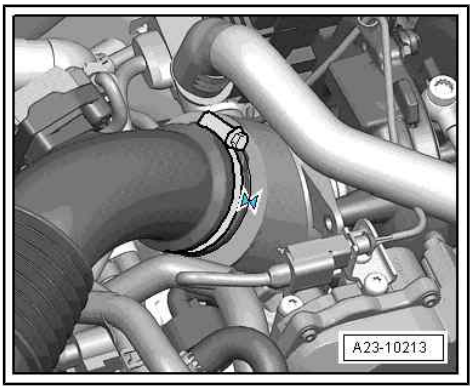
20 - Air cleaner (top section)

- ❑ Clean any salt residue, leaves and dirt out of air cleaner (top section)

21 - Bolt

- ❑ For securing air filter element

Pay attention to arrows when installing intake hose.

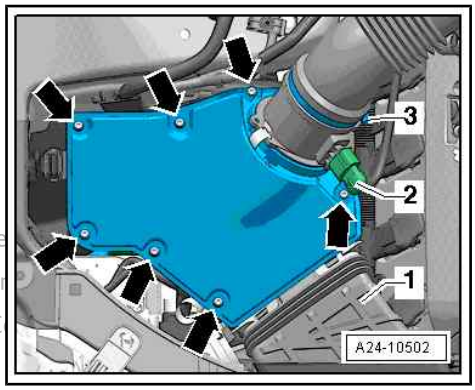


3.2 Removing and installing air filter element

Removing

– Remove air duct -1-.

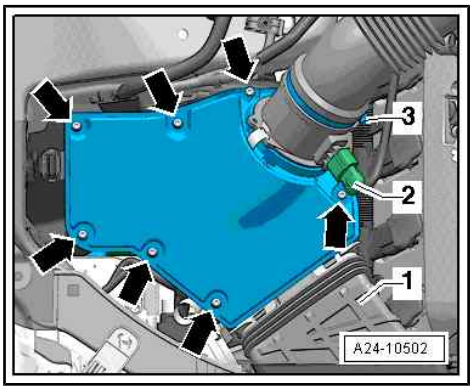
– Unplug electrical connector -2- at air mass meter - G70- .



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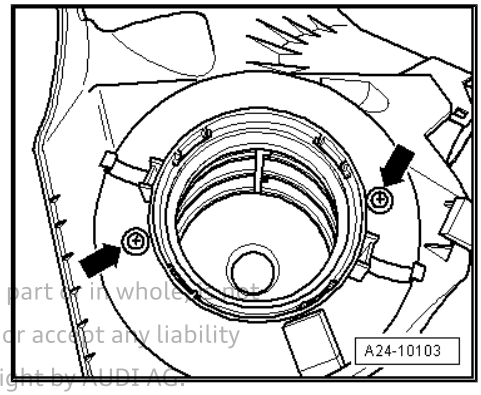
– Release hose clip -3- and detach air hose from air mass meter - G70- .

– Remove bolts -arrows- from air cleaner (top section) and pull out air cleaner (top section) upwards.



– Remove the two bolts -arrows- securing the air filter element.

– Take out air filter element.



Installing

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

- Tightening torques
  ⇒ "3.1 Exploded view - air cleaner housing", page 336

To ensure the proper function of the air mass meter - G70- it is important to observe the following instructions.

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Note

- *If the air filter element is very dirty or wet, dirt particles or water can reach the air mass meter - G70- and falsify the detected air mass values. This will cause a loss of power as the calculated injection quantities will be too low.*
- *Always use genuine air filter elements (same as original equipment).*
- *The air cleaner housing must always be clean.*
- *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- *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.*
- *Use a lubricant (silicone-free) when installing air hoses.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *To ensure that the air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.*
- *Observe environmental requirements for disposal.*

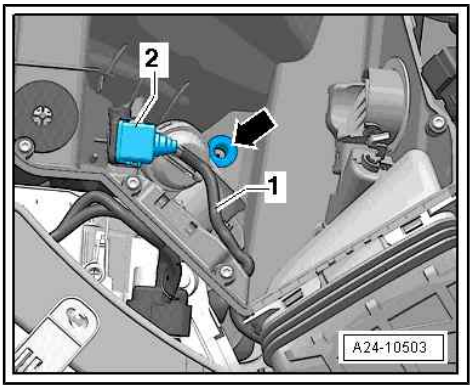
– Check whether water drain hose -arrow- in air cleaner (bottom section) is dirty or blocked (clean if necessary).

– Clean salt residue, dirt and leaves out of air cleaner housing (top and bottom sections); use a vacuum cleaner if necessary.

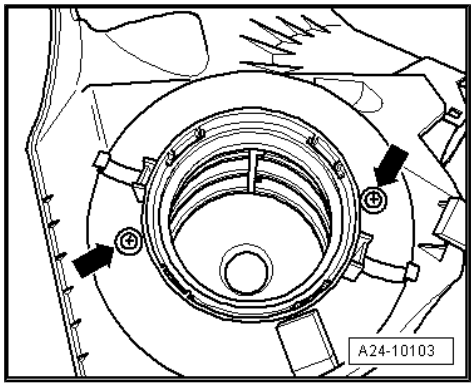
– Check air mass meter and air hose (engine intake side) for salt residue, dirt and leaves.

– Check intake duct as far as air filter element for dirt.

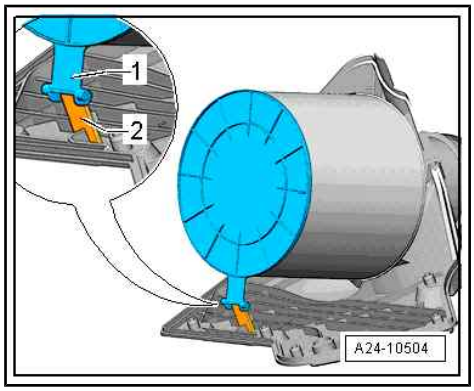
– When installing air filter element, check that it is properly centred in retainer in air cleaner (top section).



– Screw air cleaner (top section) onto new air filter element.



– Tab of air filter element -1- must rest against tab of air cleaner housing -2-.
– Carefully fit air cleaner (top section) on air cleaner (bottom section) without applying any force.



Note

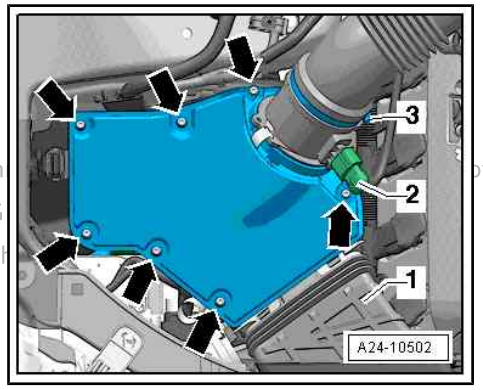
Before tightening bolts, make sure that top section of air cleaner is inserted into groove on bottom section of air cleaner (to prevent air leaks).

– Then secure top section of air cleaner to bottom section.
– Make sure that air hose is correctly seated at air mass meter - G70- .
– Re-attach electrical connector to air mass meter - G70- .
– The remaining installation steps are carried out in the reverse sequence.

3.3 Removing and installing air cleaner housing

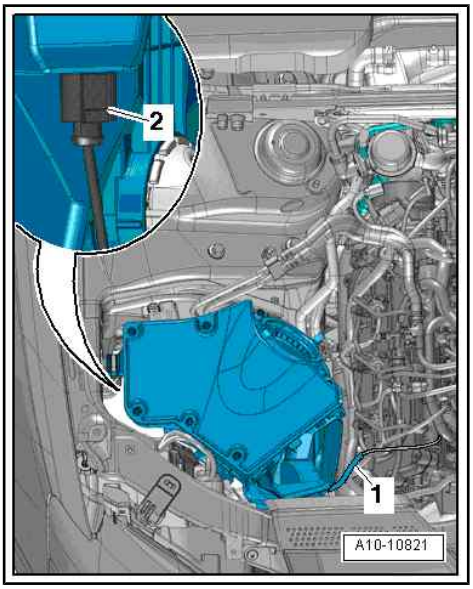
Removing

– Remove cover above radiator grille (4 bolts).
– Remove air duct -1-.
– Unplug electrical connector -2- at air mass meter - G70- .
– Release hose clip -3- and detach air hose from air mass meter - G70- .



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– Detach vacuum hose -1-.
– Release fastener for air cleaner (bottom section) by pressing rubber in on both sides and pulling upwards.
– Unplug electrical connector at air filter bypass flap valve - N275- -2-.
– Carefully take out air cleaner (bottom section).



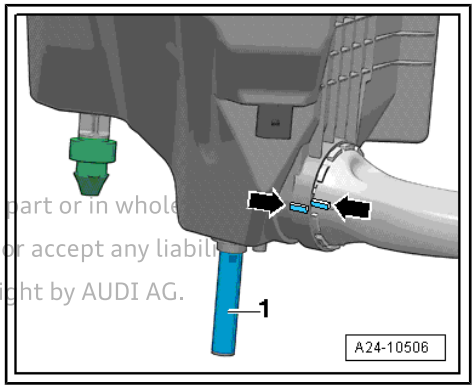
Installing

To ensure the proper function of the air mass meter - G70- it is important to observe the following instructions.

Note

- *If the air filter element is very dirty or wet, dirt particles or water can reach the air mass meter - G70- and falsify the detected air mass values. This will cause a loss of power as the calculated injection quantities will be too low.*
- *Always use genuine air filter elements (same as original equipment).*
- *Use a silicone-free lubricant when installing the intake hose.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue .*
- *Do not use lubricants when installing retainer.*

– 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).
– Check water drain hose -1- in air cleaner (bottom section) for dirt and other obstructions (clean if necessary).
– Check air mass meter and air hose (engine intake side) for salt residue, dirt and leaves.
– Check intake duct as far as air filter element for dirt.
– Plug in electrical connector at air filter bypass flap valve - N275- again.
– Re-install air cleaner (bottom section).



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Note

The water drain hose must be routed straight downwards; make sure it is not kinked or twisted.

– Slide vacuum hose for air filter bypass flap valve - N275- back on.

4 Intake manifold

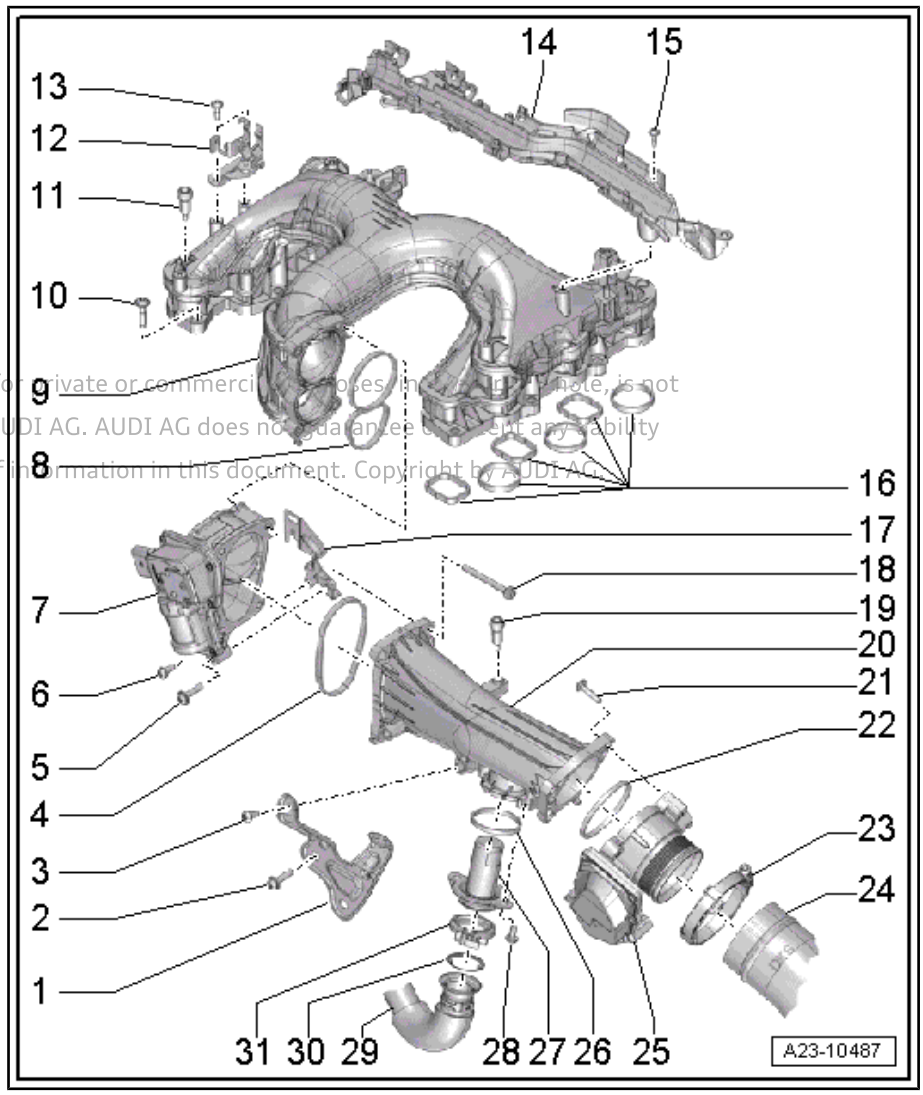
⇒ “4.1 Exploded view - intake manifold”, page 342

⇒ “4.2 Removing and installing intake manifold”, page 343

⇒ “4.3 Removing and installing intake manifold flap motor V157 ”, page 348

⇒ “4.4 Removing and installing throttle valve module J338 ”, page 350

4.1 Exploded view - intake manifold



1 - Bracket
- ❑ For air pipe

2 - Bolt
- ❑ 9 Nm

3 - Bolt
- ❑ 9 Nm

4 - Gasket
- ❑ Renew

5 - Bolt
- ❑ 9 Nm

6 - Bolt
- ❑ 9 Nm

7 - Intake manifold flap motor - V157-
- ❑ Removing and installing ⇒ page 348

8 - Gasket
- ❑ Renew

9 - Intake manifold
- ❑ Removing and installing ⇒ page 343

10 - Bolt
- ❑ Tightening torque and sequence ⇒ page 343

11 - Mounting pin
- ❑ For engine cover panel
- ❑ 5 Nm

12 - Bracket
- ❑ For electrical connector

13 - Bolt
- ❑ 4 Nm

14 - Cable guide

15 - Bolt
- ❑ 4 Nm

16 - Gaskets
- ❑ Renew

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17 - Bracket

- ❑ For exhaust gas recirculation cooler change-over valve - N345-

18 - Bolt

- ❑ 9 Nm

19 - Mounting pin

- ❑ For engine cover panel
- ❑ 5 Nm

20 - Air pipe

21 - Bolt

- ❑ 9 Nm

22 - Seal

- ❑ Renew

23 - Screw-type clip

- ❑ Tightening torque ⇒ page 313

24 - Air hose

25 - Throttle valve module - J338-

- ❑ Removing and installing ⇒ page 350

26 - Seal

- ❑ Renew

27 - Pipe

- ❑ For exhaust gas recirculation

28 - Bolt

- ❑ 9 Nm

29 - Pipe

- ❑ For exhaust gas recirculation

30 - Gasket

- ❑ Renew

31 - Screw-type clip

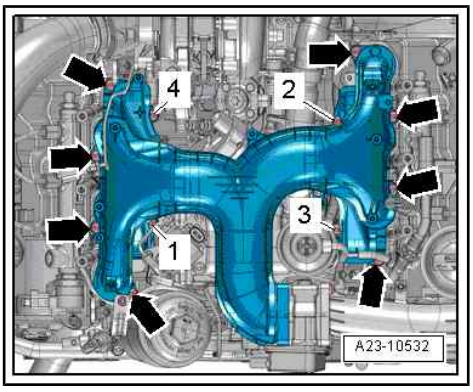
- ❑ Tightening torque ⇒ page 313

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Intake manifold - tightening torque and sequence

– Tighten bolts in 3 stages as follows:

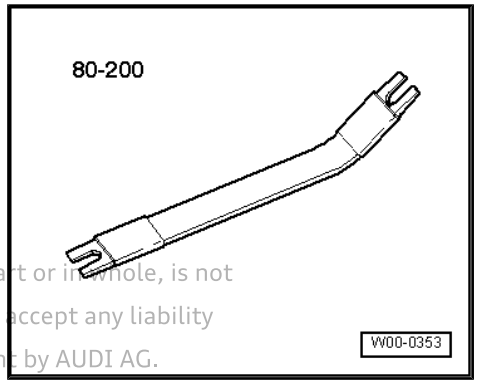
Stage	Bolts	Tightening torque
1.	-1 to 4-, -arrows-	Screw in by hand until contact is made
2.	-1 to 4-	5 Nm, in sequence indicated
3.	-1 to 4- -arrows-	9 Nm, in any sequence



4.2 Removing and installing intake manifold

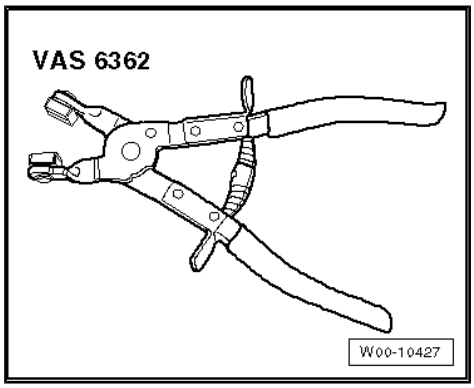
Special tools and workshop equipment required

♦ Removal lever - 80 - 200-



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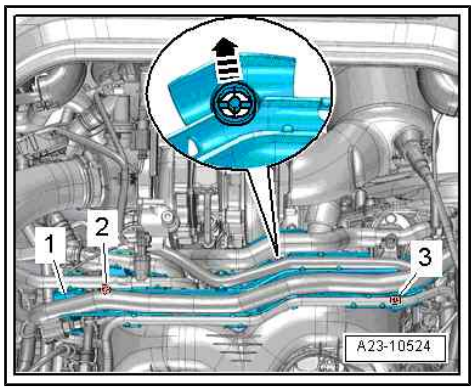
♦ Hose clip pliers - VAS 6362-



Removing

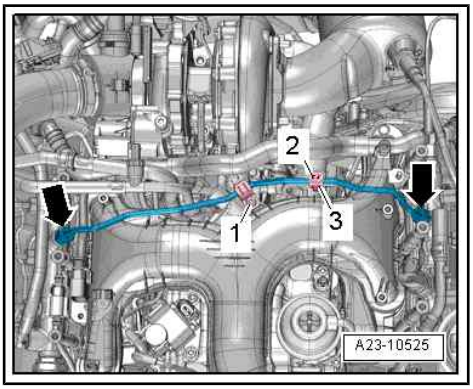
Caution

- *Use an absorbent cloth to catch escaping fuel.*
- *No fuel must be allowed to spill onto components or seals in the vicinity of the engine; this can ultimately lead to damage caused by leaking seals.*
- *Risk of malfunctions caused by dirt.*
- *Observe ⇒ "2.1 Safety precautions when working on the fuel supply system", page 2 .*

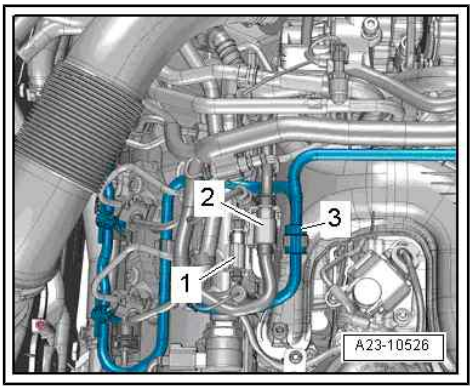


– Remove engine cover panel ⇒ page 98 .
– Use removal lever - 80 - 200- to move electrical wiring harness and hoses clear at cable guide -1-.
– Pull coolant hose off to rear -arrow-.
– Unscrew bolts -2 and 3- and remove cable guide -1-.

– Unscrew bolts -1, 2- and detach retaining clamp -3-.
– Unscrew union nuts -arrows- and detach high-pressure pipe (top).



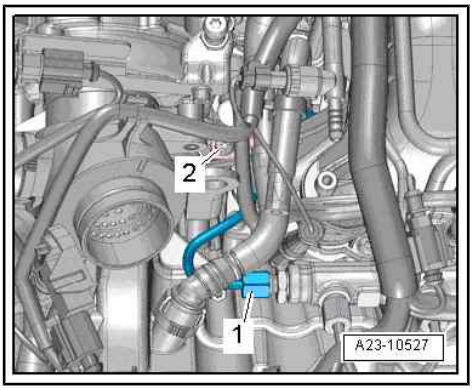
– Detach electrical connectors -1 and 2- and remove non-return valve -3- from bracket.



– If fitted, remove bolt -2- at retaining clamp for high-pressure pipe.

Note

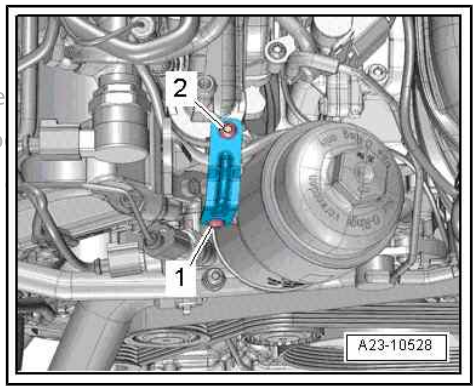
Disregard -item 1-.



– Remove bolt -1- from bracket (right-side) for intake manifold.

Note

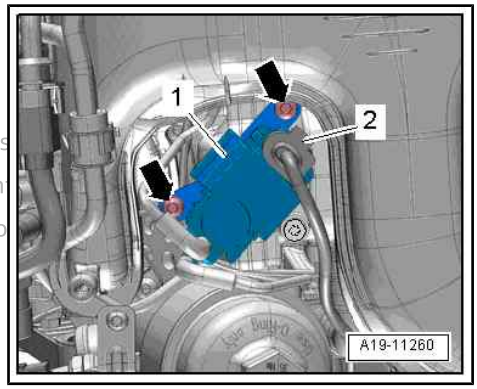
Disregard -item 2-.



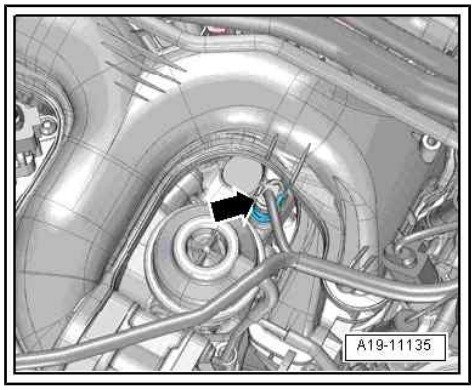
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– Unplug electrical connector -2- at coolant valve for cylinder head - N489- -item 1-.
– Unscrew bolts -arrows- and place bracket with coolant valve for cylinder head - N489- to the side.

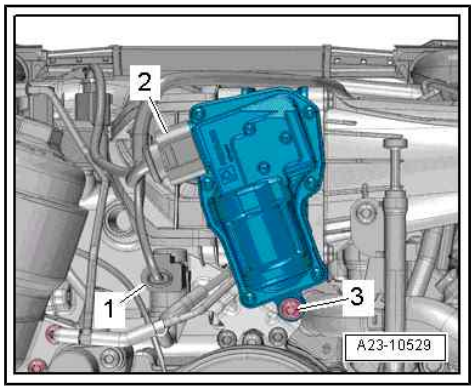
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– Unplug electrical connector -arrow- at coolant temperature sender - G62- .



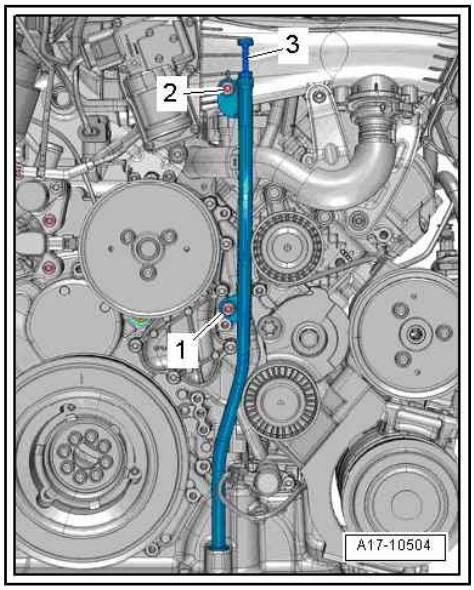
– Unplug electrical connectors -1 and 2- and move wiring harness clear to left side.
– Remove bolt -3- from bracket (centre) for intake manifold.



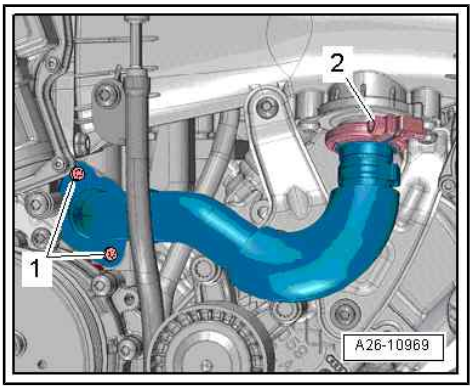
– Pull out plug -3-.
– Remove bolt -2- for dipstick guide tube.

Note

Disregard -item 1-.



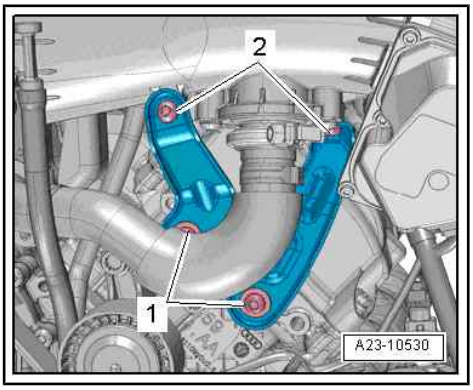
– Release screw-type clip -2- on exhaust gas recirculation pipe.



Note

Disregard -item 1-.

– Remove bolts -2- from bracket (left-side) for air pipe.

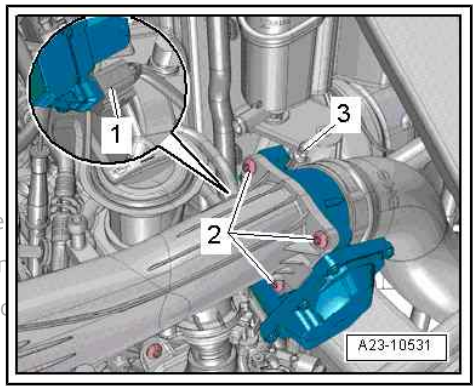


Note

Disregard -item 1-.

– Unplug electrical connector -1- at throttle valve module - J338- .

– Release screw-type clip -3- and detach air hose.



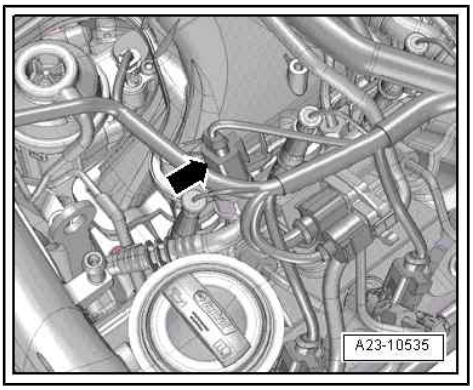
Note

Disregard -item 2-.

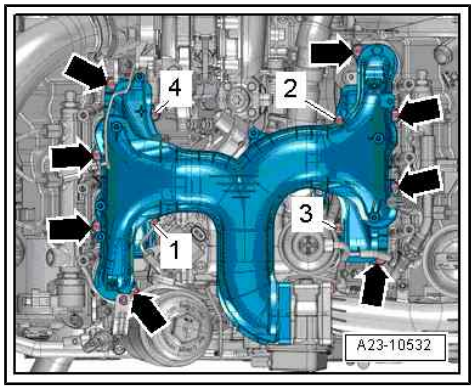
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– Unplug electrical connectors on glow plugs.

– Remove fuel pressure sender - G247- -arrow- ⇒ page 387 .



– Remove bolts -1 ... 4- and -arrows- and detach intake manifold.



Installing

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

- Tightening torques
  ⇒ Fig. ""Intake manifold - tightening torque and sequence"" , page 343

Note

- *Renew seals and/or gaskets.*
- *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 .*
- *To ensure that the air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.*

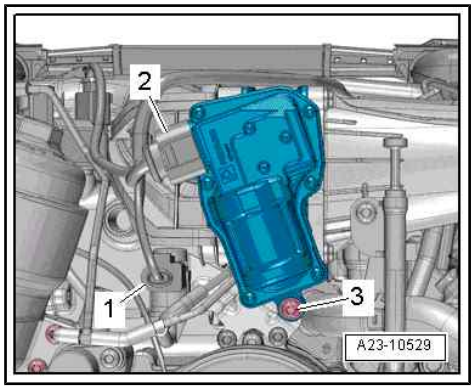
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– Tighten bolts for intake manifold ⇒ page 343 .
– Install high-pressure pipe ⇒ page 369 .
– Install dipstick guide tube ⇒ page 228 .
– Install exhaust gas recirculation pipe ⇒ page 461 .

4.3 Removing and installing intake manifold flap motor - V157-

Removing

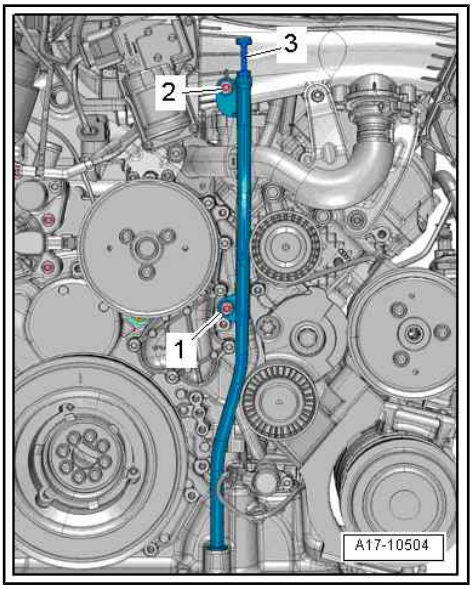
– Remove engine cover panel ⇒ page 98 .
– Unplug electrical connector -2-.
– Remove bolt -3- from bracket (centre) for intake manifold.



Note

Disregard -item 1-.

– Remove bolt -2- for dipstick guide tube.

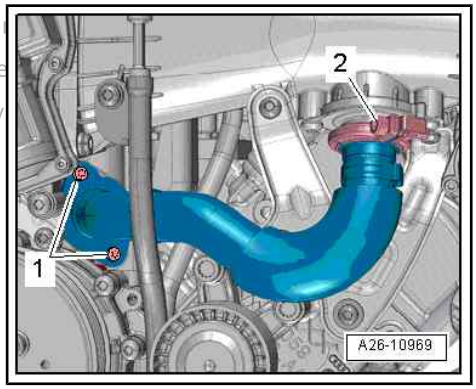


Note

Disregard items -1 and 3-.

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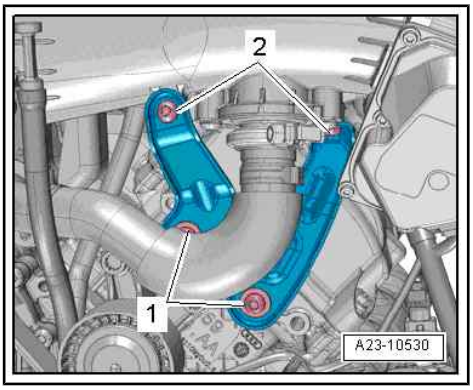
– Release screw-type clip -2- on exhaust gas recirculation pipe.



Note

Disregard -item 1-.

– Remove bolts -2- from bracket (left-side) for air pipe.

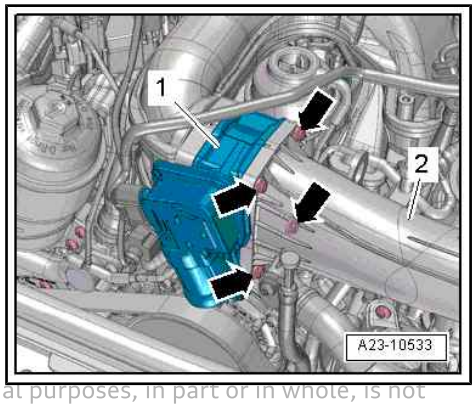


Note

Disregard -item 1-.

– Remove bolts -arrows-.

– Press air pipe -2- to left side and detach intake manifold flap motor - V157- -item 1-.



Installing

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

- Tightening torques
⇒ “4.1 Exploded view - intake manifold”, page 342

Note

♦ *Renew seals and/or gaskets.*

♦ *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*

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– Install dipstick guide tube ⇒ page 228 .

– Install exhaust gas recirculation pipe ⇒ page 461 .

4.4 Removing and installing throttle valve module - J338-

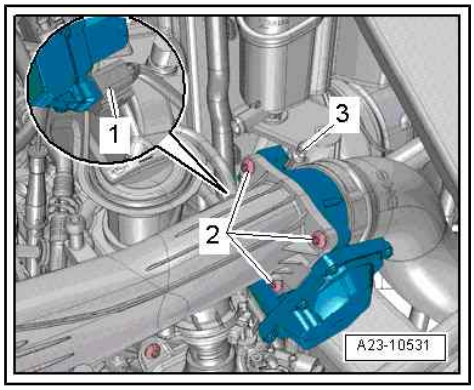
Removing

– Remove engine cover panel ⇒ page 98 .

– Release hose clip -3- and detach air hose.

– Unplug electrical connector -1-.

– Remove bolts -2- and detach throttle valve module - J338- .



Installing

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

- Tightening torques
⇒ “4.1 Exploded view - intake manifold”, page 342

Note

♦ *Renew seal.*

♦ *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 .*

♦ *To ensure that the air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.*

5 Injectors/high-pressure reservoir (rail)

⇒ “5.1 Exploded view - injectors”, page 351

⇒ “5.2 Checking injectors”, page 354

⇒ “5.3 Performing adaption of correction values for injectors”, page 355

⇒ “5.4 Checking for injectors sticking open”, page 355

⇒ “5.5 Checking return flow rate of injectors with engine running”, page 357

⇒ “5.6 Checking return flow rate of injectors at starter cranking speed”, page 360

⇒ “5.7 Checking restrictor in fuel return line”, page 362

⇒ “5.8 Removing and installing injectors”, page 363

⇒ “5.9 Removing and installing high-pressure pipes”, page 369

⇒ “5.10 Removing and installing high-pressure reservoir (rail)”, page 370

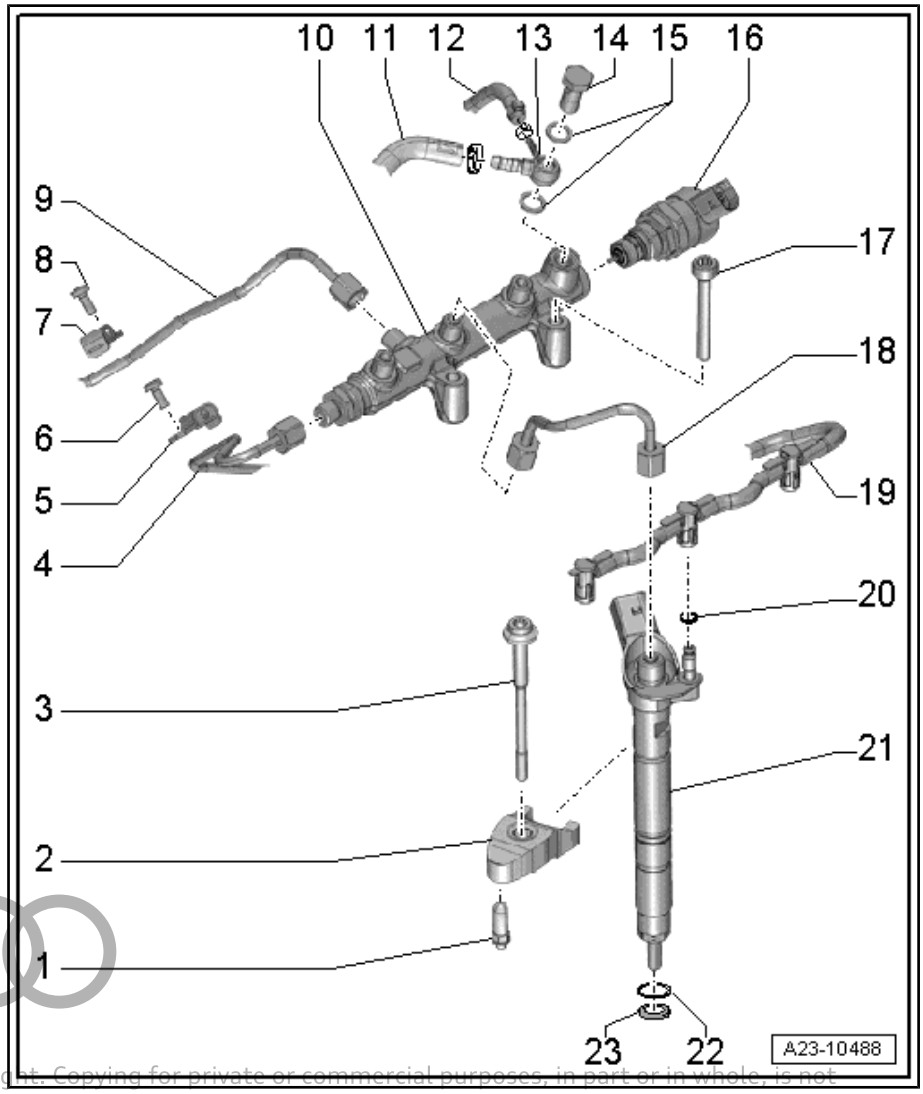
5.1 Exploded view - injectors

Caution

Risk of malfunctions caused by dirt.

- *Observe ⇒ “2.1 Safety precautions when working on the fuel supply system”, page 2 .*

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1 - Support bracket

- ❑ For clamping piece
- ❑ Different tightening torques:

- ◆ To camshaft bearing: 2.5 Nm
- ◆ To cylinder head: 9 Nm

2 - Clamping piece

- ❑ Use a coloured pen to mark injectors and corresponding clamping piece and cylinder for re-installation; pay attention to markings when installing
- ❑ If the injector is installed on another cylinder for testing purposes, the clamping piece must also be moved
- ❑ After looking for the fault, the injector and the clamping piece must be re-installed on their original cylinder
- ❑ The clamping pieces can be re-used when installing new injectors

3 - Bolt

- ❑ Renew
- ❑ Tighten initially to 6 Nm
- ❑ Then tighten 90° further

4 - High-pressure pipe

- ❑ From high-pressure pump to fuel rail
- ❑ Do not alter shape
- ❑ Check for damage before re-installing
- ❑ Installing ⇒ page 369
- ❑ Lubricate threads of union nuts with clean engine oil
- ❑ 25 Nm

5 - Retaining clamp

- ❑ For high-pressure pipe

6 - Bolt

- ❑ 9 Nm

7 - Retaining clamp

- ❑ For high-pressure pipe

8 - Bolt

- ❑ 9 Nm

9 - High-pressure pipe

- ❑ From fuel rail on opposite side
- ❑ Do not alter shape
- ❑ Check for damage before re-installing
- ❑ Installing ⇒ page 369

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- ❑ Lubricate threads of union nuts with clean engine oil
- ❑ 25 Nm

10 - Fuel rail

- ❑ Removing and installing ⇒ page 370

11 - Fuel return hose

- ❑ To fuel tank

12 - Fuel return hose

- ❑ From injectors
- ❑ Do not dismantle
- ❑ Renew together with restrictor
- ❑ After renewing, engine must be run at idling speed for approx. 2 minutes to bleed fuel system
- ❑ Then check fuel return hoses for leaks

13 - Ring connection for hose

14 - Banjo bolt

- ❑ 25 Nm

15 - Seals

- ❑ Renew

16 - Fuel pressure regulating valve - N276-

- ❑ With deformable sealing lip
- ❑ Cannot be re-installed
- ❑ After renewing high-pressure pump and/or fuel pressure regulating valve - N276- , adaption must be performed. Use ⇒ Vehicle diagnostic tester
- ❑ Removing and installing ⇒ page 385
- ❑ Tightening torque ⇒ Fig. “” Fuel pressure regulating valve -N276- - tightening torque”“ , page 332

17 - Bolt

- ❑ 22 Nm

18 - High-pressure pipe

- ❑ From fuel rail to injector
- ❑ Do not alter shape
- ❑ Mark allocation for re-installation; pay attention to marking when installing
- ❑ Check for damage before re-installing
- ❑ Installing ⇒ page 369
- ❑ Lubricate threads of union nuts with clean engine oil
- ❑ 25 Nm

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19 - Fuel return hose

- ❑ From injectors
- ❑ Do not dismantle
- ❑ Renew together with restrictor
- ❑ After renewing, engine must be run at idling speed for approx. 2 minutes to bleed fuel system
- ❑ Then check fuel return hoses for leaks

20 - O-ring

- ❑ Renew

21 - 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
- ❑ If the injector is installed on another cylinder for testing purposes, the clamping piece must also be moved
- ❑ Always renew copper seal when removing and installing

- ❑ After looking for the fault (switching the injectors around), the injector and the clamping piece must be re-installed on their original cylinder
- ❑ 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 363

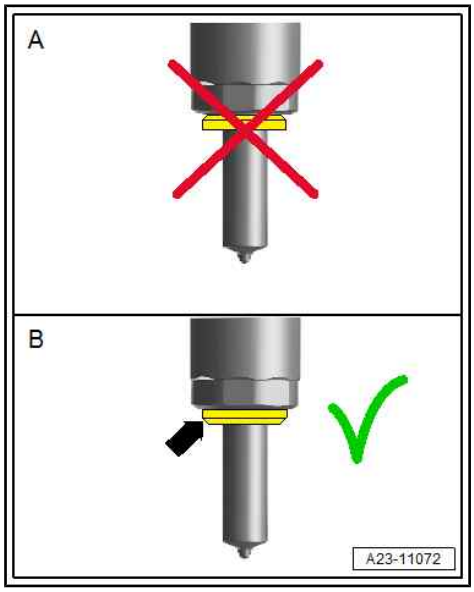
22 - O-ring

- ❑ Renew

23 - Copper seal

- ❑ Always renew copper seal when removing and installing
- ❑ Copper seal without chamfer: has no specified installation position
- ❑ Copper seal with chamfer: note installation position ⇒ page 354

Note installation position for copper seal with chamfer:



5.2 Checking injectors

There are four different tests for checking the operation of the injectors.

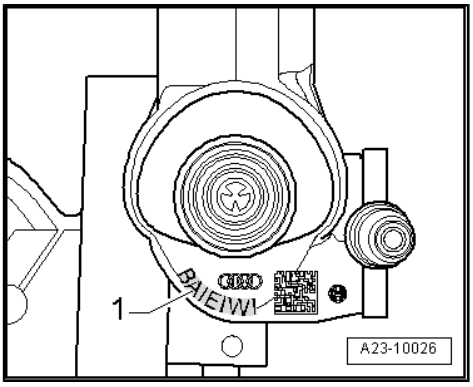
- ⇒ “5.3 Performing adaption of correction values for injectors”, page 355
- ⇒ “5.4 Checking for injectors sticking open”, page 355
- ⇒ “5.5 Checking return flow rate of injectors with engine running”, page 357
- ⇒ “5.6 Checking return flow rate of injectors at starter cranking speed”, page 360

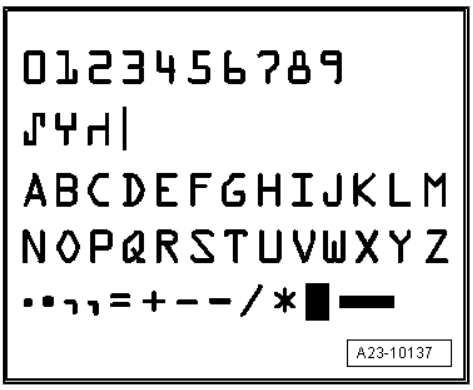
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Perform the following tests first if the engine does not start at all:

- ◆ ⇒ “5.4 Checking for injectors sticking open”, page 355
- ◆ ⇒ “5.6 Checking return flow rate of injectors at starter cranking speed”, page 360
- ◆ ⇒ “7.1 Checking fuel pressure regulating valve N276 ”, page 382

5.3 Performing adaption of correction values for injectors





- The “Injector delivery calibration” and “Injector voltage calibration” serve to correct the injection rates for each cylinder of a common rail system individually across the entire operating range.
- The 7-digit adaption value -1- (example) is marked separately on each injector. It may consist of letters and/or numbers (ASCII code).
- Reference table for reading out letters and/or numbers on each injector

Special tools and workshop equipment required

- Vehicle diagnostic tester

The adaption procedure is described in the “Guided Fault Finding”. (The procedure is also described under “Guided Functions”.) Use ⇒ Vehicle diagnostic tester

When a new injector is installed, the adaption value must be written into the engine control unit.

– Additionally, check that the “Injector delivery calibration values” with “Injector voltage calibration values” are correctly entered for all the other injectors. Do NOT attempt to re-enter these adaption values if the correct values are already stored in the engine control unit.

– When the engine control unit is renewed, the appropriate “Injector delivery calibration values” with “Injector voltage calibration” values must be written into the new engine control unit.

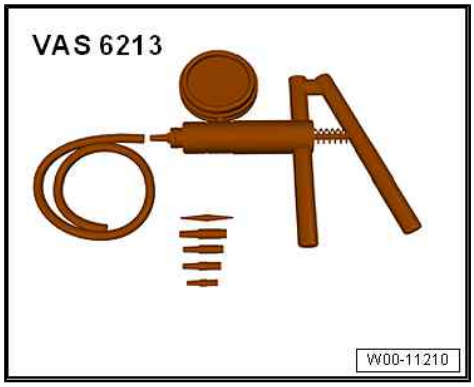
5.4 Checking for injectors sticking open

If one of the injectors is sticking open, this means that the injector needle is not closing fully and fuel escapes into the cylinder.

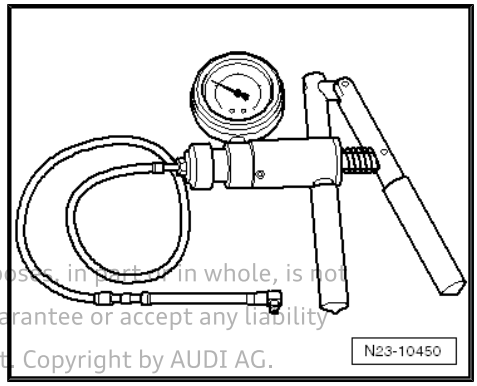
Special tools and workshop equipment required

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- Hand vacuum pump - VAS 6213-



- Use a return line to make an -adapter-.



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Procedure

– Remove engine cover panel ⇒ page 98 .

– Clean all fuel rail connections with engine cleaner or brake cleaner and dry.

Caution

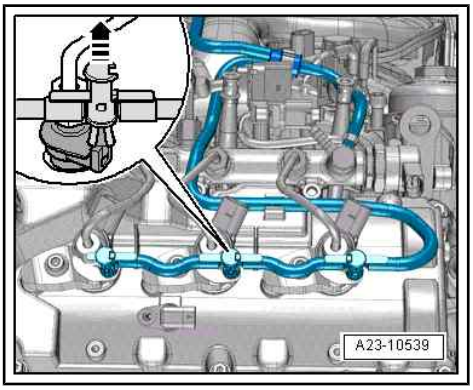
Risk of malfunctions caused by dirt.

- ***Observe***
  ⇒ "2.1 Safety precautions when working on the fuel supply system", page 2 .

Check all cylinders in turn.

Start with cylinder No. 1.

– Disconnect fuel return hoses from injectors; to do so, press down both tabs and at the same time pull centre piece up to release connection -arrow-.
– Connect adapter 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 363 .

Attaching

– 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 O-rings with engine oil or assembly oil before installing.

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– Push return line connections carefully over seals and onto injectors. The catch should engage audibly. Then press release pin down carefully.

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.

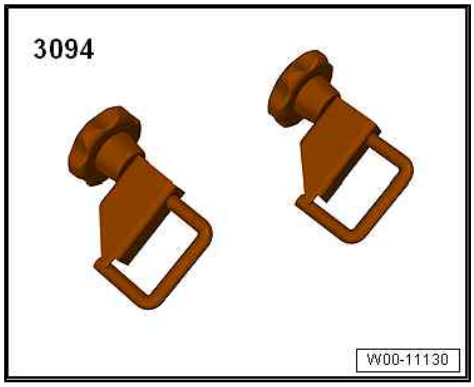
– After completing the repair, road-test the vehicle. Accelerate with full throttle at least once. Then check the high-pressure section of the fuel system again for leaks.
– Install engine cover panel ⇒ page 98 .

5.5 Checking return flow rate of injectors with engine running

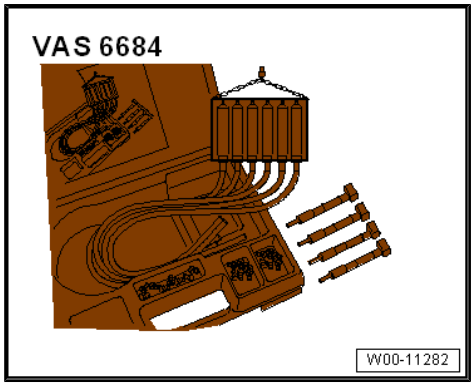
Checking return flow rate if engine does not start ⇒ page 360

Special tools and workshop equipment required

- Hose clamps, up to 25 mm - 3094-



- Return flow meter - VAS 6684-



- Fuel-resistant measuring container

Caution

Risk of malfunctions caused by dirt.

- ***Observe***
  ⇒ "2.1 Safety precautions when working on the fuel supply system", page 2 .

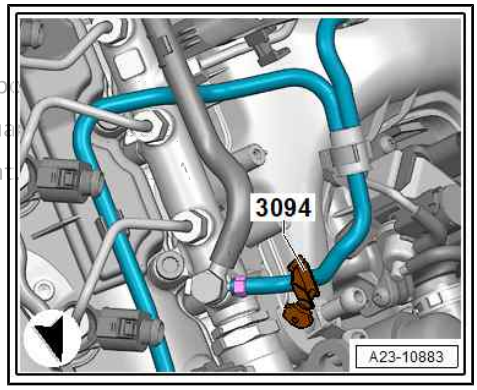
– Remove engine cover panel ⇒ page 98 .

Measuring return flow rate of individual injectors:

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.

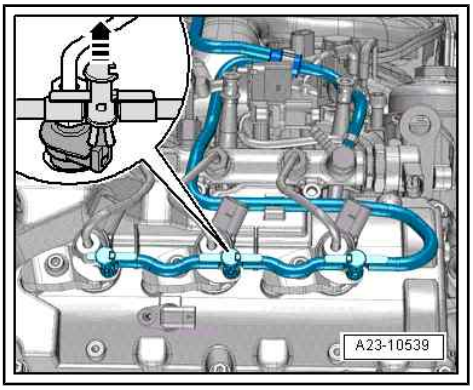
– Clean all return line connections with engine cleaner or brake cleaner and dry.

– Clamp off fuel return line downstream of restrictor using hose clamp up to 25 mm - 3094- .



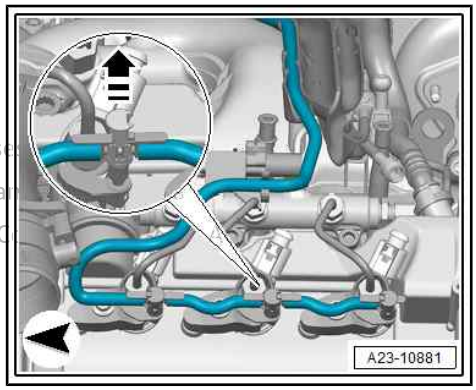
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– Disconnect fuel return hoses from injectors on cylinder bank 1; to do so, press down both tabs and at the same time pull centre piece up to release connection -arrow-.



– Disconnect fuel return hoses from injectors on cylinder bank 2; to do so, press down both tabs and at the same time pull centre piece up to release connection -arrow-.

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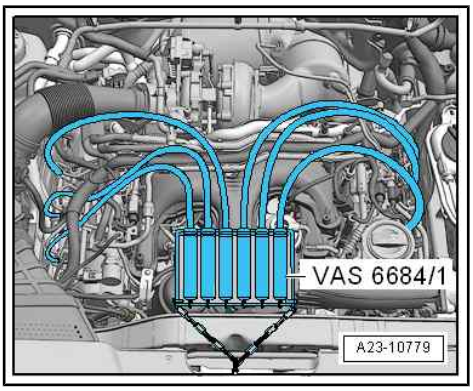
– Connect hoses of return flow meter - VAS 6684- to all return line connections of the six injectors.

– Start engine and run at idling speed for several minutes:

Caution

Risk of damage to injectors due to increased engine speed.

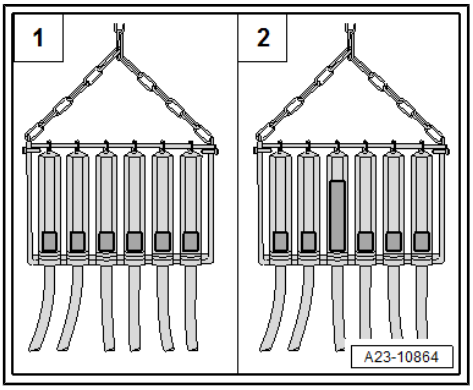
- *Do NOT press the accelerator during this test; the engine must only run at idling speed.*



– When the engine is warm and running at idling speed, the return flow rates at each of the 6 injectors must not differ by more than a small amount.

Evaluating return flow rate:

- 1 = injectors OK; return flow rate approx. identical on all injectors.
- 2 = injector for cylinder 3 not OK; return flow rate surpasses value three times the volume of smallest measured return flow rate.

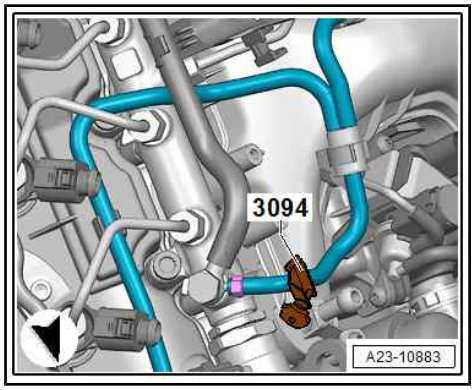


Note

There is a mechanical fault at the injector if the return flow rate is greater than three times the volume of the smallest measured return flow rate.

– If one injector has a significantly higher return flow rate than the others it must be renewed ⇒ page 363 .

– Remove hose clamp up to 25 mm - 3094- from fuel return line.



Attaching

– 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 O-rings 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.

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.

– After completing the repair, road-test the vehicle. Accelerate with full throttle at least once. Then check the high-pressure section of the fuel system again for leaks.

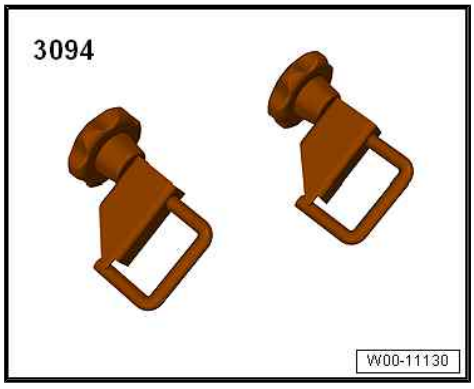
– Install engine cover panel ⇒ page 98 .

5.6 Checking return flow rate of injectors at starter cranking speed

Only perform this test if the engine does not start at all.

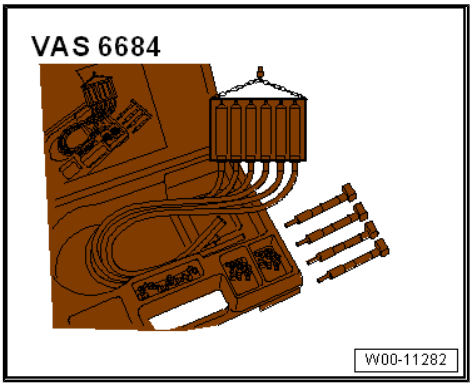
Special tools and workshop equipment required

♦ Hose clamps, up to 25 mm - 3094-



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- Return flow meter - VAS 6684-



Caution

Risk of malfunctions caused by dirt.

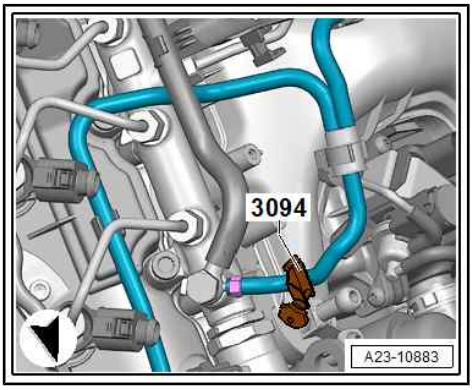
- *Observe*
  ⇒ "2.1 Safety precautions when working on the fuel supply system", page 2 .

Measuring return flow rate of individual injectors

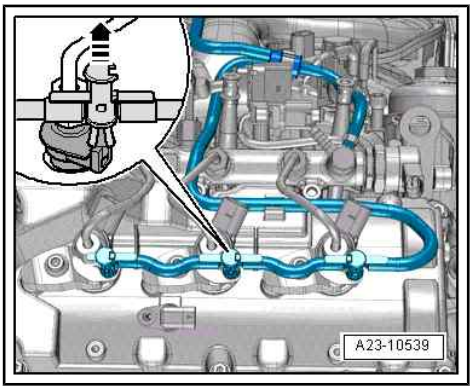
Each injector normally has a relatively low fuel return flow rate. If the return flow rate at one injector is relatively high compared to the other injectors, that injector is probably defective.

– Remove engine cover panel ⇒ page 98 .

– Clamp off fuel return line downstream of restrictor using hose clamp up to 25 mm - 3094- .

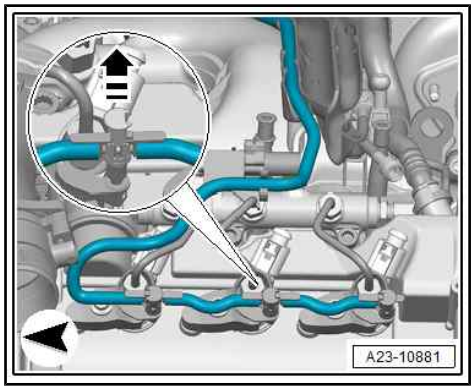


– Disconnect fuel return hoses from injectors on cylinder bank 1; to do so, press down both tabs and at the same time pull centre piece up to release connection -arrow-.

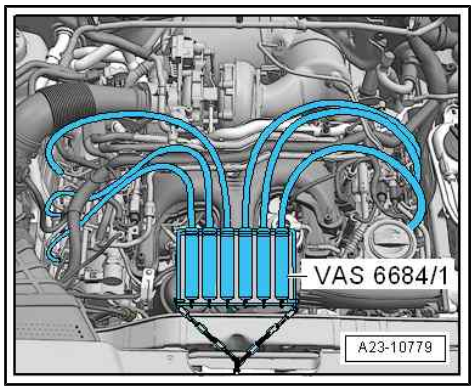


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– Disconnect fuel return hoses from injectors on cylinder bank 2; to do so, press down both tabs and at the same time pull centre piece up to release connection -arrow-.



– Connect hoses of return flow meter - VAS 6684- to all return line connections of the six 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 one injector, that injector must be renewed ⇒ page 363 .

Attaching

– 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 O-rings 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.

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.

– After completing the repair, road-test the vehicle. Accelerate with full throttle at least once. Then check the high-pressure section of the fuel system again for leaks.

– Install engine cover panel ⇒ page 98 .

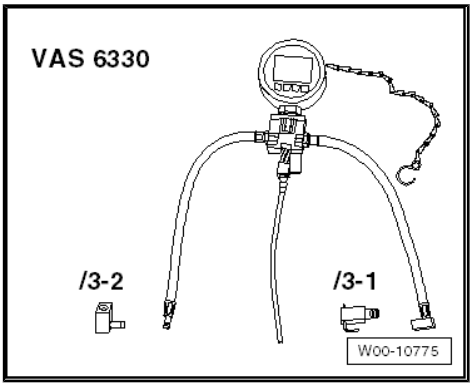
5.7 Checking restrictor in fuel return line

On vehicles with fuel systems with 6 bar, the restrictor maintains a constant residual pressure in the fuel return line. This residual pressure is required for the control function of the injectors.

Special tools and workshop equipment required

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♦ Tester for fuel return system - VAS 6330-



Caution

Risk of malfunctions caused by dirt.

♦ *Observe*
⇒ "2.1 Safety precautions when working on the fuel supply system", page 2 .

– Remove engine cover panel ⇒ page 98 .
– Clean return line connection on cylinder 1 (with commercial cleaning solution or similar) before removing.
– Dry return line connection on cylinder 1.
– Cover return line connection on cylinder 1 with a cloth.
– Detach return line connection from cylinder 1. To do so, press tabs down and pull centre piece up to release connection.

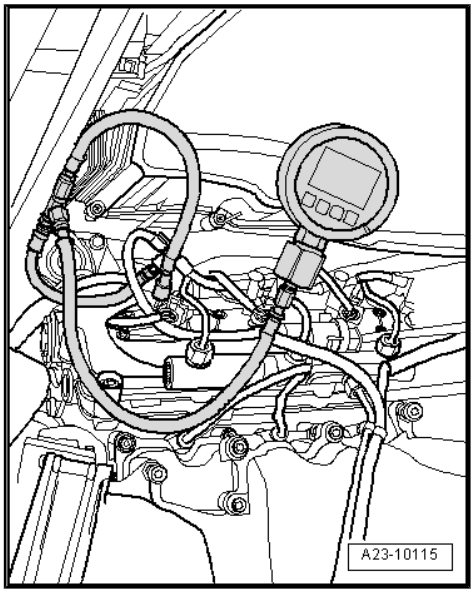
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Note

No dirt must be allowed to get into the disconnected return line or the open connection on the injector.

– Connect tester for fuel return system - VAS 6330- between return line connection on injector and return line.
– Start engine.
– Check pressure indicated on tester.

♦ Specification: approx. 4 bar



If specification is not attained, renew fuel return line with restrictor and ring/hose connector.

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.

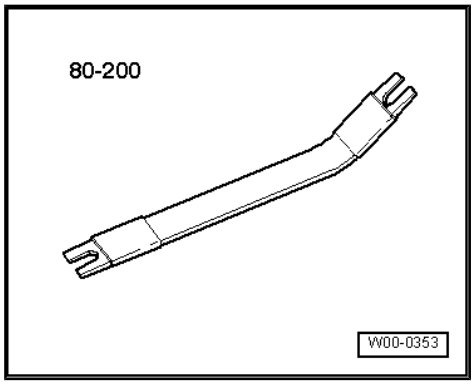
Renew the affected component if leakage occurs.

– Install engine cover panel ⇒ page 98 .

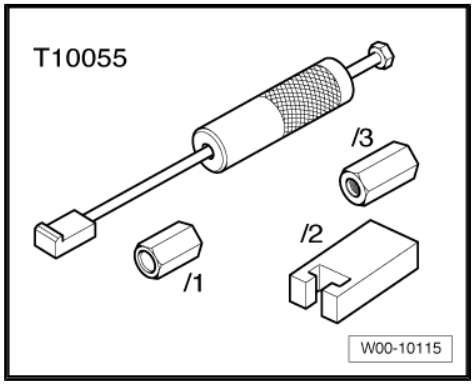
5.8 Removing and installing injectors

Special tools and workshop equipment required

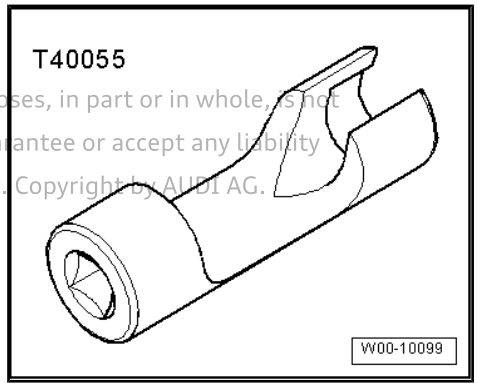
- Cleaning kit - VAS 6811-
- Removal lever - 80 - 200-



- Puller - T10055- with adapter - T10055/1- and -T10055/3-

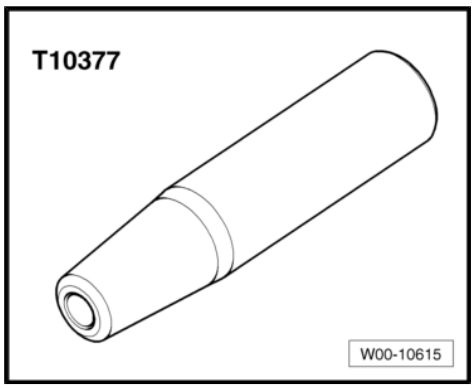


- Socket - T40055-



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- Assembly sleeve - T10377-



Removing

Note

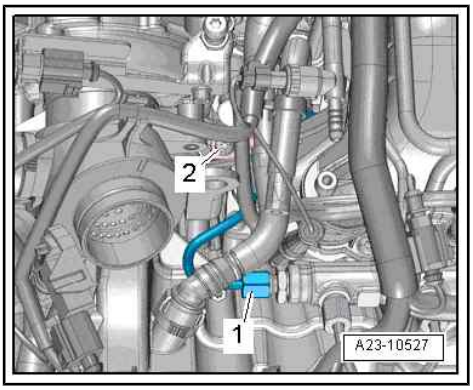
- *The following description shows the removal and installation of the injectors on cylinder bank 2 (left-side).*
- *Step required for cylinder bank 1 only: Remove top section of air cleaner with air mass meter ⇒ page 340 .*
- *Step required for cylinder bank 2 only: Detach coolant expansion tank; coolant hoses remain connected.*

– Remove engine cover panel ⇒ page 98 .

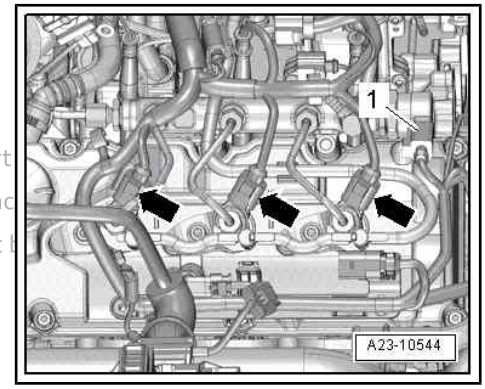
Caution

Risk of malfunctions caused by dirt.

- ***Observe ⇒ "2.1 Safety precautions when working on the fuel supply system", page 2 .***



– Unplug electrical connectors at injectors -arrows- and at fuel pressure regulating valve - N276- -item 1-.
– Move clear electrical wiring harness at cylinder head cover and fuel rail.



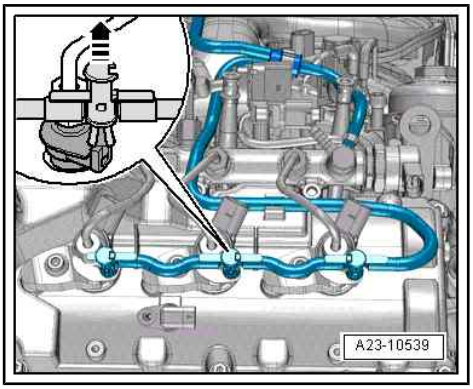
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– Disconnect fuel return hoses from injectors; to do so, press down both tabs and at the same time pull centre piece up to release connection -arrow-.

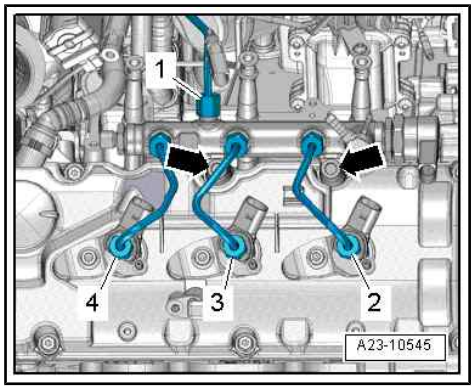
Caution

Used injectors must always be re-installed on the same cylinder.

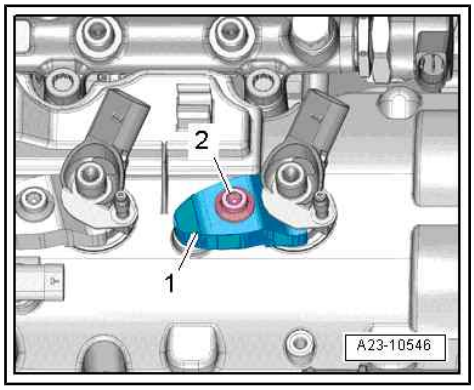
- ***Mark injectors to ensure that they are re-installed at the correct cylinders.***



– Loosen union nuts -2, 3 and 4- using socket - T40055- and remove high-pressure pipes.
– Seal off open lines and connections with clean plugs.

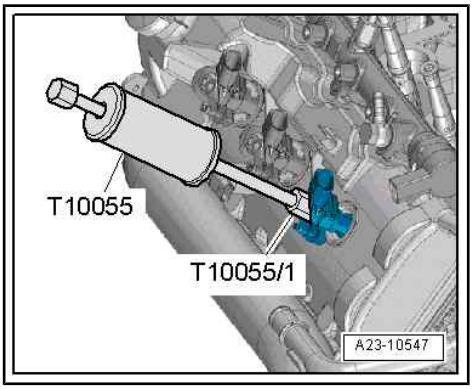


– Mark position of clamping piece -1- in relation to injector with paint for re-installation.
– Unscrew bolt -2- and detach clamping piece.
– Repeat work steps on remaining injectors.



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– Apply puller - T10055- with adapter -T10055/1- to injector, as shown in illustration. Pull off injector by tapping gently.



– Place removed injectors on a clean cloth.

Installing

Installing new injectors

When installing a new injector, the following components must be renewed:

- Bolt for clamping piece
- Copper seal
- O-ring for injector bore
- O-ring for fuel return line connection

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Installing used injectors

When re-installing a used injector in the same cylinder, 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-solvent 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.

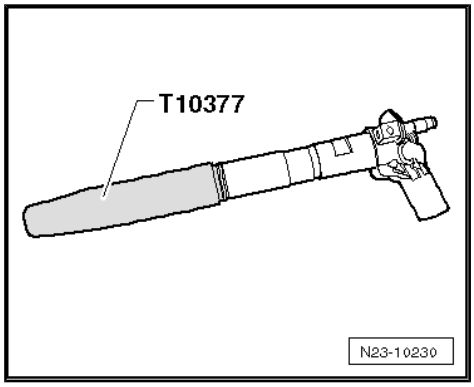
– Clean off deposits under the copper seal using a suitable scraper.

Continued (same procedure for used and new injectors):

– Fit new copper seal.

– Lubricate all O-rings with engine oil or assembly oil before installing.

– Renew O-ring for injector bore using assembly sleeve - T10377- .



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.

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

Tightening torques

- ⇒ “5.1 Exploded view - injectors”, page 351

– Install high-pressure pipes ⇒ “5.9 Removing and installing high-pressure pipes”, page 369 .

Note

Lubricate all O-rings with engine oil or assembly oil before installing.

– 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.

After renewing one or more injectors, the “injector delivery calibration values” and “injector voltage calibration values” for the new injectors must be written into the engine control unit ⇒ page 355 .

Bleeding fuel system and checking for leaks

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Note

The fuel system is self-bleeding; do not open the high-pressure connections.

– Run engine at idling speed for several minutes (do not press accelerator) and then switch off.

– Switch off ignition.

– Carefully check the complete fuel system including all 6 return line connections for leaks.

Renew affected component if leakage still occurs after tightening to correct torque.

– After completing the repair, road-test the vehicle. Accelerate with full throttle at least once. Then inspect high-pressure section of fuel system again for leaks.

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.

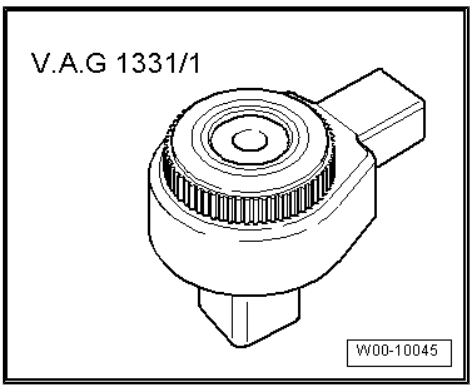
– Interrogate the event memory again after road-testing.

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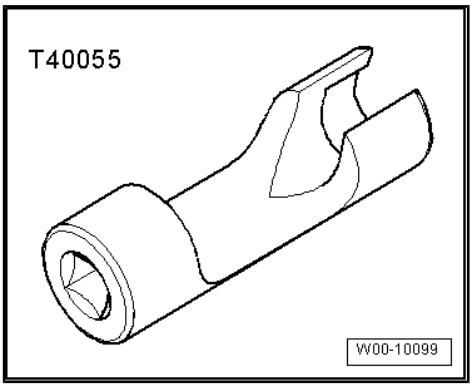
5.9 Removing and installing high-pressure pipes

Special tools and workshop equipment required

♦ Ratchet - V.A.G 1331/1-



♦ Socket - T40055-



Procedure

• Tightening torques ⇒ page 351

Note

♦ *Before re-installation, check taper seats for deformation, cracks, damage, scores and corrosion. Renew high-pressure pipes if they are damaged or corroded.*

♦ *Check that bore in pipe is not distorted, restricted or damaged in any other way.*

♦ *When re-installing "old" high-pressure pipe, observe marking for installation position.*

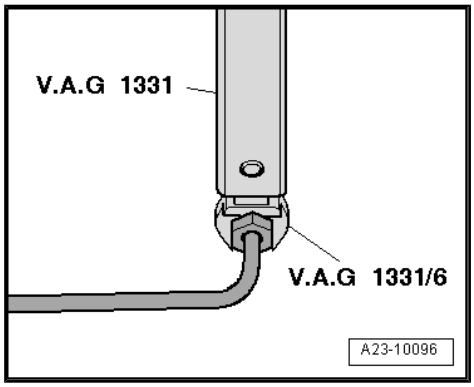
– Use vacuum cleaner to remove dirt from taper seat at fuel rail.

– Clean fuel pipe and end of pipe with engine cleaner or brake cleaner and dry.

– Lubricate threads of union nuts with clean engine oil.
– Hand-tighten union nuts on high-pressure pipes until they make contact (ensure that pipes are not under tension).

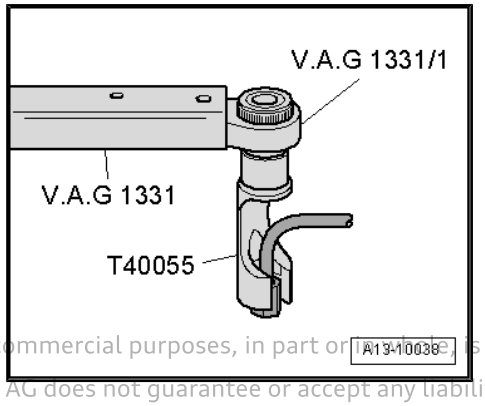
Union nuts (AF 17):

– To secure high-pressure pipes, use torque wrench - V.A.G 1331- with tool insert, AF 17 - V.A.G 1331/6- .



Union nuts (AF 17) on injectors:

– To tighten unions of injectors, use torque wrench - V.A.G 1331- with ratchet - V.A.G 1331/1- and socket - T40055- .



Bleeding fuel system and checking for leaks:

– Run engine at idling speed for several minutes (do not press accelerator) and then switch off.

Note

The fuel system is self-bleeding; do not open the high-pressure connections.

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– Switch off ignition.
– Carefully check the complete fuel system including all 6 return line connections for leaks.

Renew affected component if leakage still occurs after tightening to correct torque.

– After completing the repair, road-test the vehicle. Accelerate with full throttle at least once. Then inspect high-pressure section of fuel system again for leaks.

Note

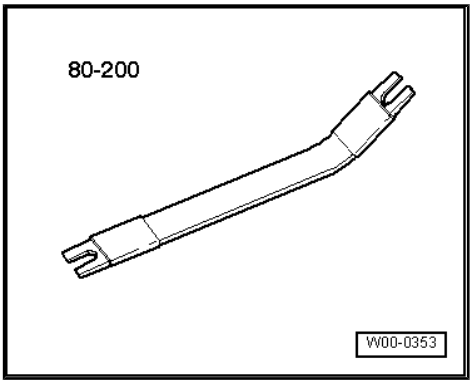
If there is any air left in the fuel system, the engine may switch to the backup mode ('emergency running' mode) during the road test. Switch off the engine and erase the event memory. Then continue the road test.

– Interrogate the event memory again after road-testing.

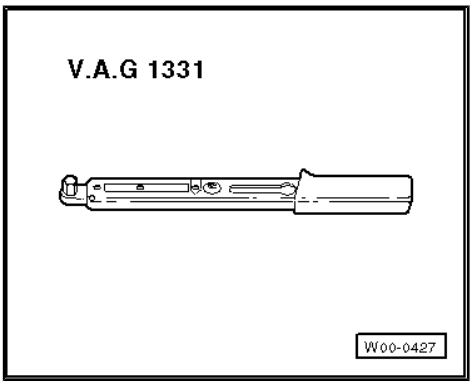
5.10 Removing and installing high-pressure reservoir (rail)

Special tools and workshop equipment required

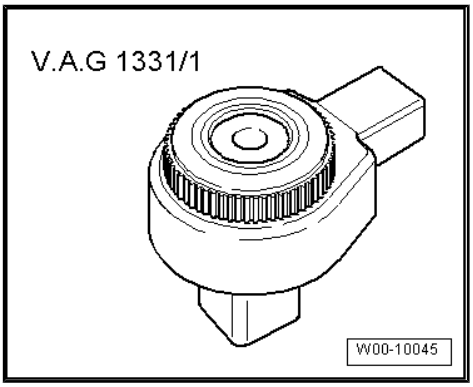
- Removal lever - 80 - 200-



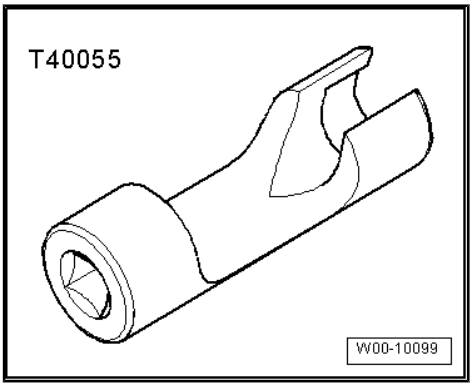
- Torque wrench - V.A.G 1331-



- Ratchet - V.A.G 1331/1-

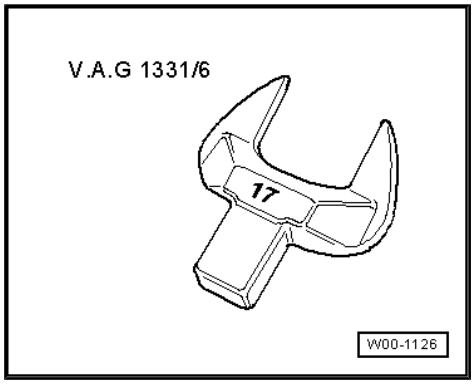


- Socket - T40055-

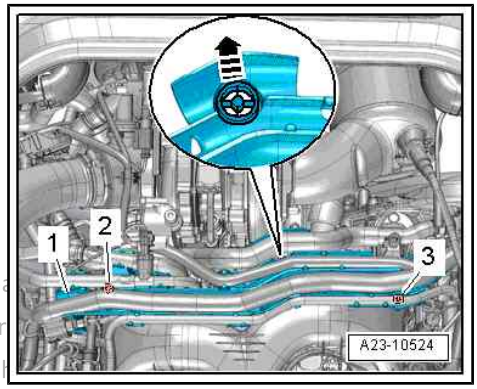


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♦ Open end spanner insert, AF 17 - V.A.G 1331/6-

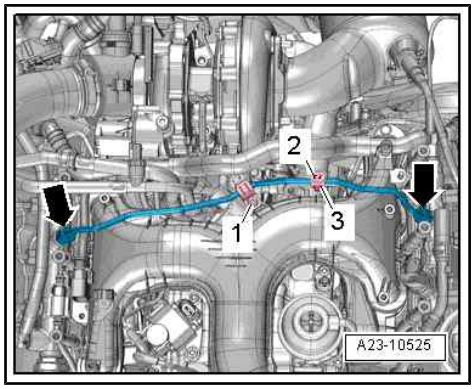


– Remove engine cover panel ⇒ page 98 .
– Use removal lever - 80 - 200- to move electrical wiring harness and hoses clear at cable guide -1-.
– Pull coolant hose off to rear -arrow-.
– Remove bolts -2, 3- and move cable guide to rear.



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– Unscrew union nut on fuel rail to be removed.

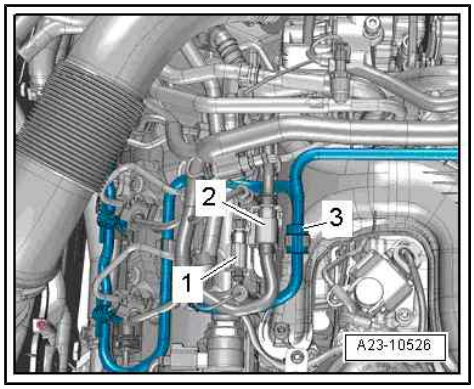


Note

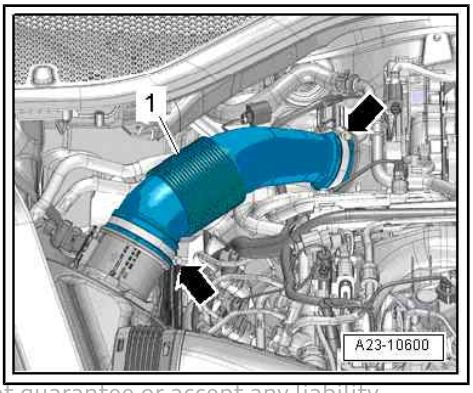
♦ *-Left arrow- for fuel rail on cylinder bank 1*
♦ *-Right arrow- for fuel rail on cylinder bank 2*

Fuel rail on cylinder bank 1

– Detach electrical connectors -1 and 2- and remove non-return valve -3- from bracket.

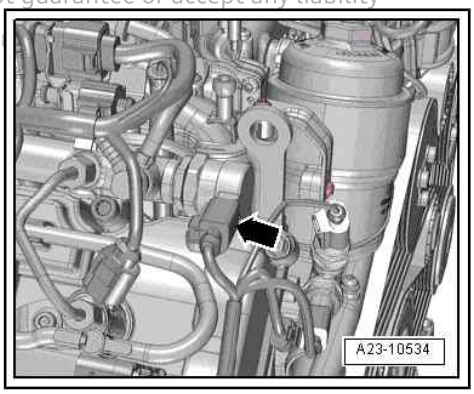


– Release hose clips -arrows- and detach air pipe -1-.

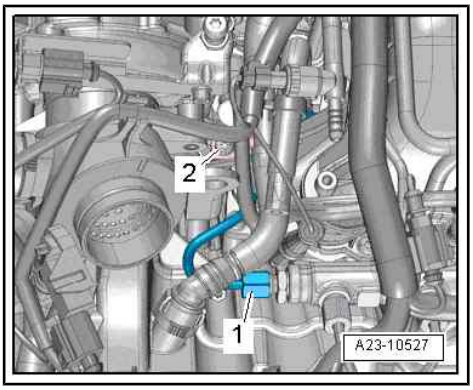


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– Unplug electrical connector -arrow- at fuel pressure regulating valve - N276- .

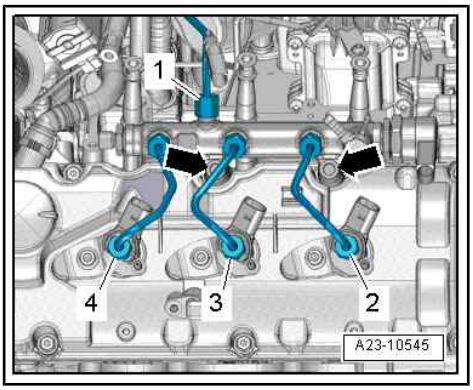


– Remove union nut -1- on fuel rail.
– Remove banjo bolt ⇒ Item 14 (page 353) for fuel return lines from fuel rail.

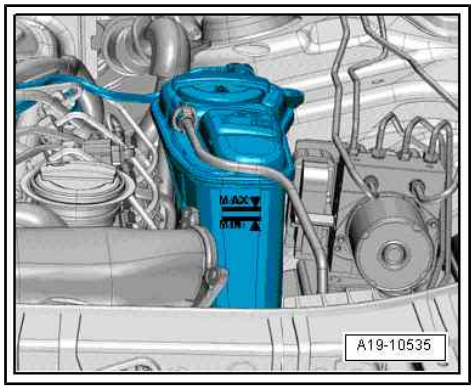


– Loosen union nuts of high-pressure pipes -2, 3 and 4-.
– Remove bolts -arrows- from fuel rail and place them down carefully on a clean surface.
– Seal off open lines and connections with clean plugs.

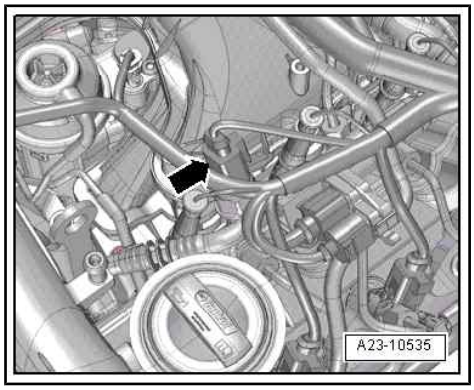
Fuel rail on cylinder bank 2



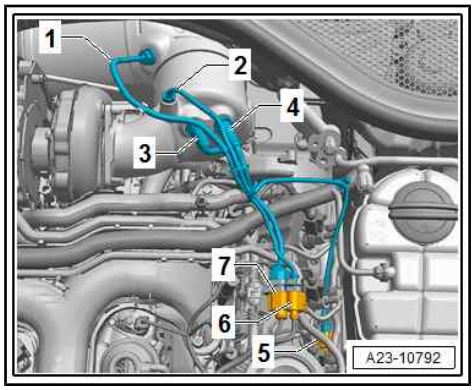
– Unbolt coolant expansion tank and place to one side.
– Seal off open lines and connections with clean plugs.



– Unplug electrical connector at fuel pressure sender - G247- -arrow-.



– Unclip bracket for electrical connectors -6 and 7-.
– Move electrical wiring harness clear.
– Remove union nut of rear fuel supply line on fuel rail.
– Unscrew union nuts for high-pressure pipes between injectors and fuel rail.
– Remove bolts from fuel rail and place them down carefully on a clean surface.
– Seal off open lines and connections with clean plugs.



Installing

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

– Install high-pressure pipes ⇒ page 369 .

Tightening torques

◆ Exploded view - injectors
⇒ “5.1 Exploded view - injectors”, page 351

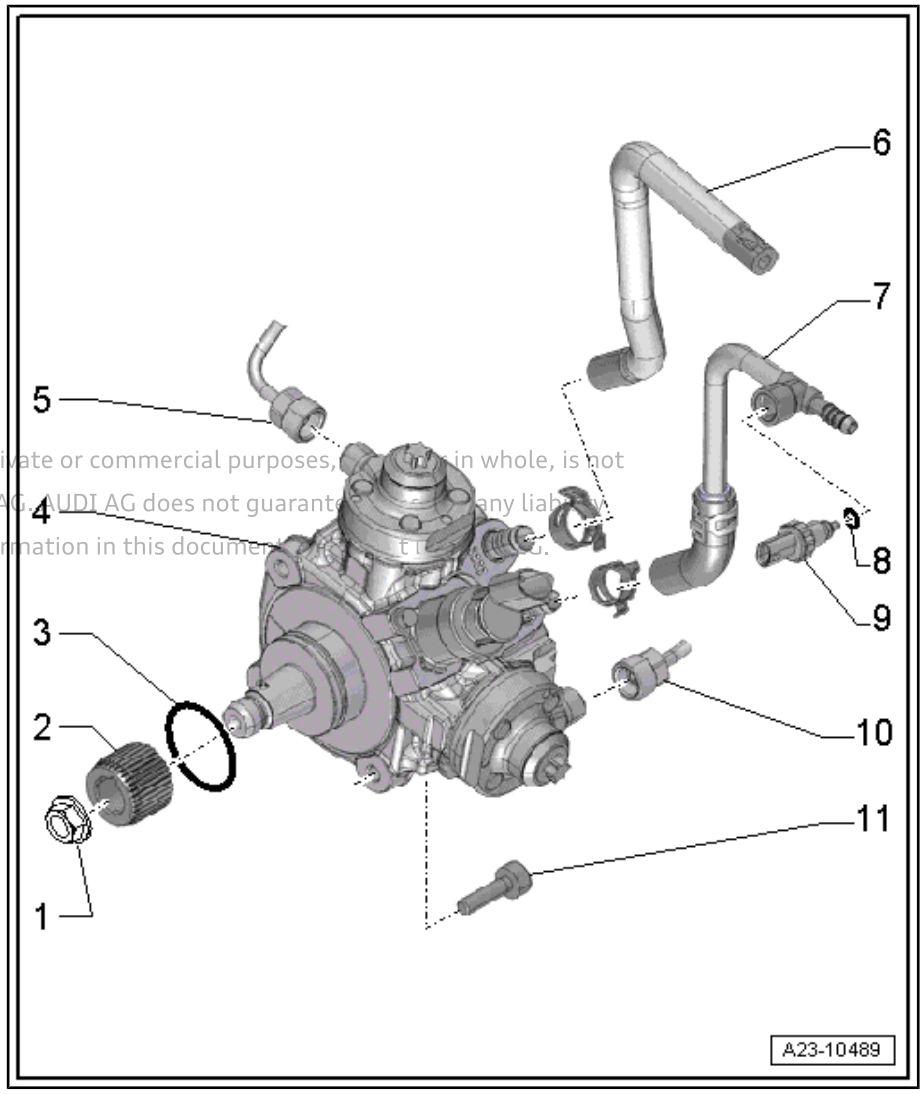
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6 High-pressure pump

⇒ "6.1 Exploded view - high-pressure pump", page 375

⇒ "6.2 Removing and installing high-pressure pump", page 376

6.1 Exploded view - high-pressure pump



1 - Nut

- ❑ Different types of adapters are fitted depending on version
- ❑ To loosen, counterhold adapter -item 2- using counterhold tool - T40248- or counterhold tool - T40292-
- ❑ 70 Nm

2 - Adapter

- ❑ For chain sprocket for high-pressure pump
- ❑ Different types of adapters are fitted depending on version
- ❑ To loosen nut -item 1-, use counterhold tool - T40248- or counterhold tool - T40292-
- ❑ Install on new high-pressure pump when renewing high-pressure pump

3 - O-ring

- ❑ Renew

4 - High-pressure pump

> **Caution**
>
> *Risk of malfunctions caused by dirt.*
> *Observe ⇒ "2.1 Safety precautions when working on the fuel supply system", page 2 .*
>
> *Running when dry causes irreparable damage to high-pressure pump.*
> *After installing the high-pressure pump, the pump must first be filled with fuel before the engine is started for the first time ⇒ page 332 .*

- ❑ After renewing high-pressure pump and/or fuel pressure regulating valve - N276- , adaption must be performed. Use ⇒ Vehicle diagnostic tester
- ❑ Removing and installing ⇒ page 376

5 - High-pressure pipe

- ❑ Do not alter shape

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- ❑ Check for damage before re-installing
- ❑ Always renew high-pressure pipe when renewing high-pressure pump
- ❑ Installing ⇒ page 369
- ❑ Lubricate threads of union nuts with clean engine oil
- ❑ 25 Nm

6 - Fuel return hose

7 - Fuel supply hose

8 - O-ring

- ❑ Renew

9 - Fuel temperature sender - G81-

- ❑ 2 Nm

10 - High-pressure pipe

- ❑ Do not alter shape
- ❑ Check for damage before re-installing
- ❑ Always renew high-pressure pipe when renewing high-pressure pump
- ❑ Installing ⇒ page 369
- ❑ Lubricate threads of union nuts with clean engine oil
- ❑ 25 Nm

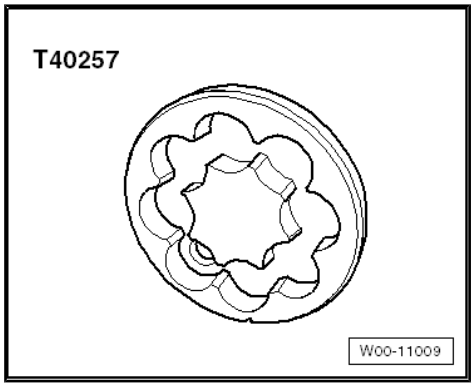
11 - Bolt

- ❑ Renew
- ❑ 22 Nm

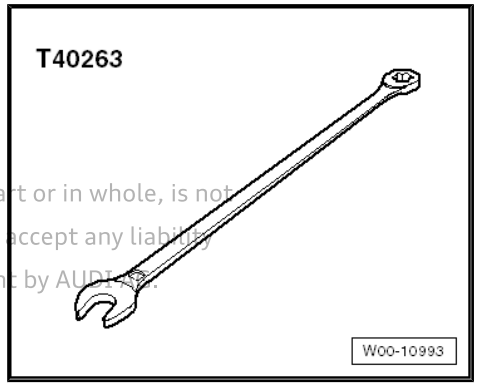
6.2 Removing and installing high-pressure pump

Special tools and workshop equipment required

- ♦ Turning-over tool - T40257-

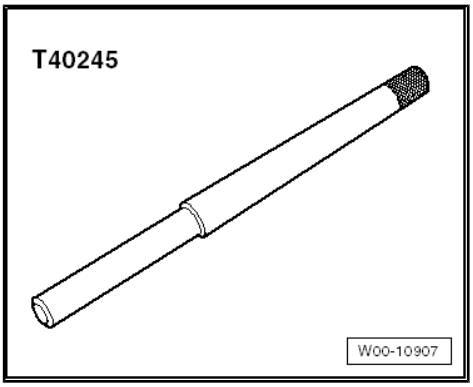


- ♦ Wrench, 21 mm - T40263-

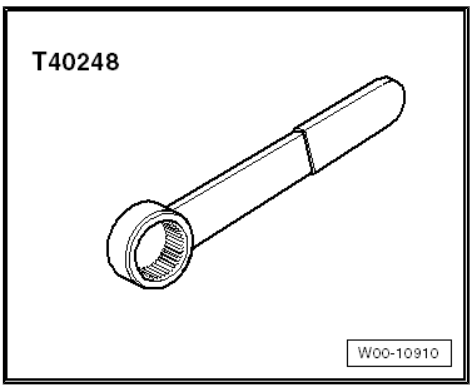


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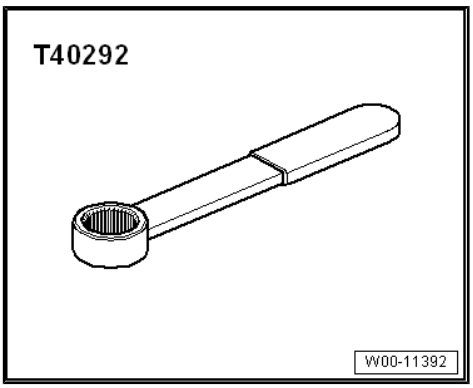
- Adapter -T40314-
- Locking pin -T40245-



- Use counterhold tool - T40248- or counterhold tool - T40292- (different types of adapters are fitted depending on version)



- Counterhold tool - T40292-

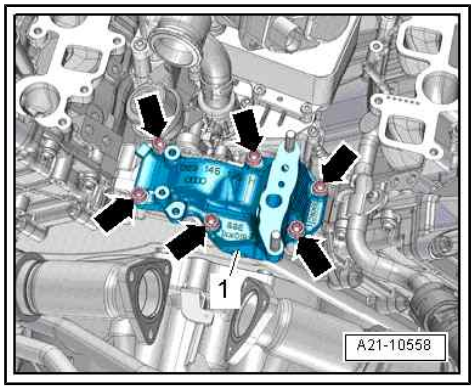


Removing

– Remove intake manifold ⇒ page 343 .
– Remove turbocharger ⇒ page 297 .
– Remove engine oil cooler ⇒ page 239 .
– Remove coolant shut-off valve ⇒ page 269 .

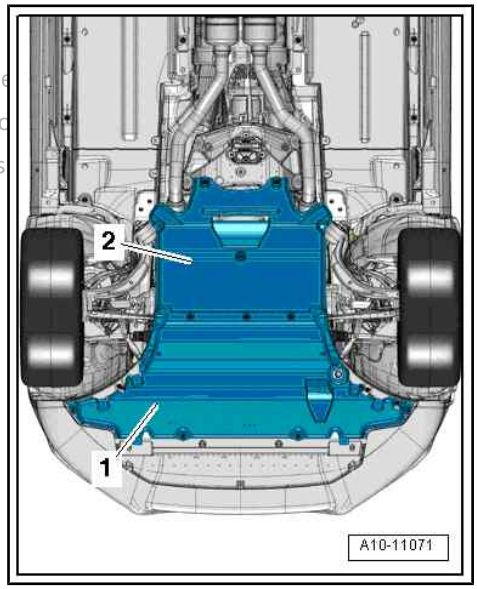
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– Unscrew bolts -arrows- and swivel bracket -1- for turbocharger to side.



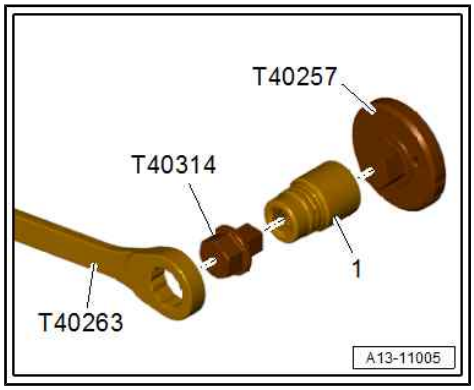
– Remove rear noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .

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– Assemble tools as shown in illustration.

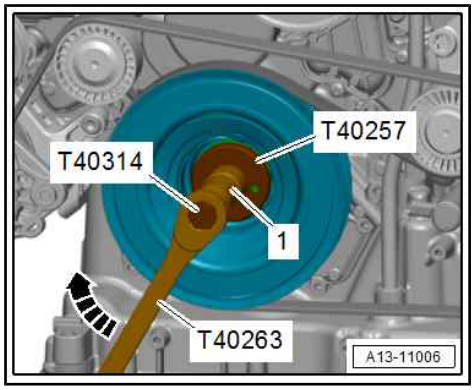
1 - Socket (21 mm) for $^1/_2$" drive



Caution

Irreparable damage can be caused if the camshaft timing chain slips.

- ***Turn crankshaft only in direction of engine rotation -arrow-.***



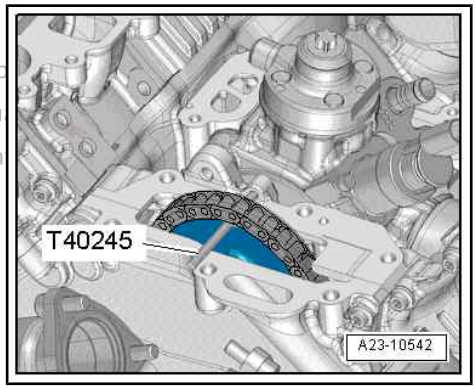
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– Turn crankshaft and lock chain sprocket for high-pressure pump in position using locking pin -T40245- .

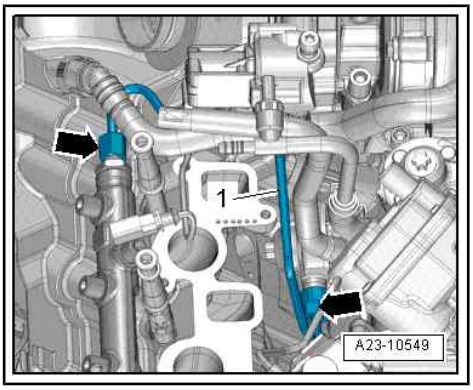
Caution

Risk of malfunctions caused by dirt.

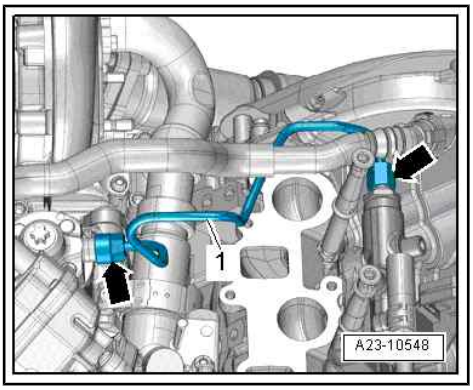
- *Observe*
  ⇒ "2.1 Safety precautions when working on the fuel supply system", page 2 .



– Unscrew union nuts -arrows- and detach high-pressure pipe (right-side) -1-.



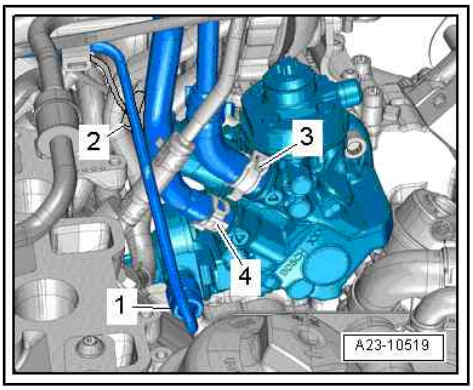
– Unscrew union nuts -arrows- and detach high-pressure pipe (left-side) -1-.
– Seal off open lines and connections with clean plugs.



– Unplug electrical connector -2-.
– Release hose clips -3 and 4- and detach fuel hoses.

Note

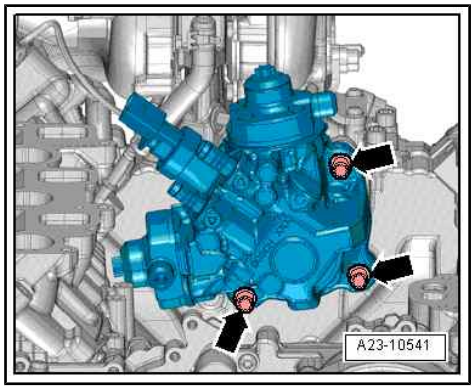
Lay a cloth under the connection to catch escaping fuel.



Note

Disregard -item 1-.

– Unscrew bolts -arrows- and detach high-pressure pump.



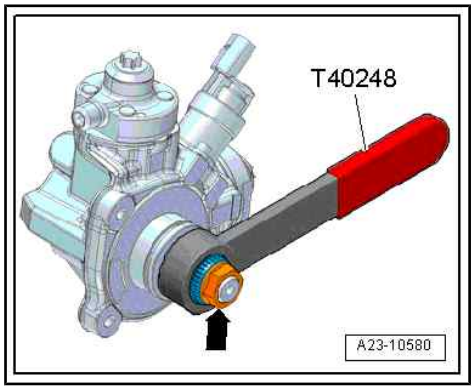
Installing

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

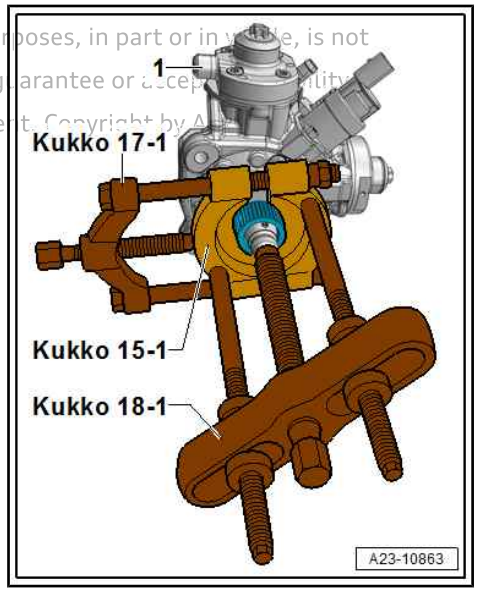
- Tightening torques
⇒ “6.1 Exploded view - high-pressure pump”, page 375

– When renewing high-pressure pump, install adapter from old high-pressure pump on new pump.

– Use counterhold tool - T40248- or counterhold tool - T40292- to loosen and tighten nut -arrow-.



– Detach adapter from high-pressure pump -1-, as shown in illustration. Use commercially available puller, e.g. Kukko 15-1/, 17-1/ and 18-1.



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Note

- *Different types of adapters are fitted depending on version.*
- *Always renew high-pressure pipes when renewing high-pressure pump.*

– Insert high-pressure pump into chain sprocket.

• The dual toothing -arrow A- on the chain sprocket must align with the groove -arrow B- in the adapter on the high-pressure pump shaft.

– Remove locking pin -T40245- .

– Install high-pressure pipes ⇒ page 369 .

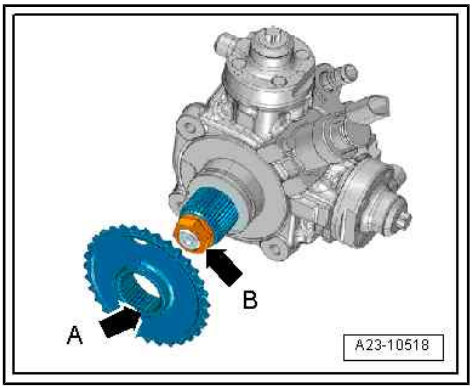
– Install coolant shut-off valve ⇒ page 461 .

– Install engine oil cooler ⇒ page 239 .

– Install turbocharger ⇒ page 297 .

– Install intake manifold ⇒ page 343 .

– Install noise insulation (rear) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .



Caution

Running when dry causes irreparable damage to high-pressure pump.

- ***After installing the high-pressure pump, the pump must first be filled with fuel before the engine is started for the first time ⇒ page 332 .***

After renewing high-pressure pump and/or fuel pressure regulating valve - N276- , adaption must be performed. Use ⇒ Vehicle diagnostic tester.

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7 Senders and sensors

⇒ "7.1 Checking fuel pressure regulating valve N276 ", page 382

⇒ "7.2 Removing and installing fuel pressure regulating valve N276 ", page 385

⇒ "7.3 Removing and installing fuel pressure sender G247 ", page 387

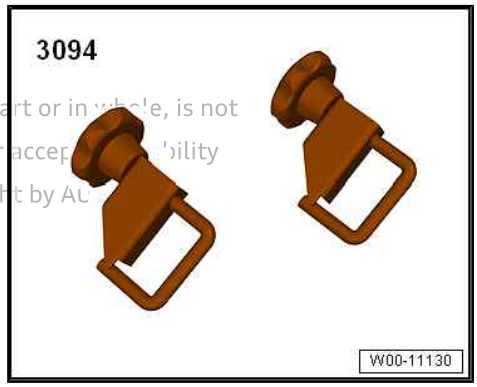
⇒ "7.4 Removing and installing air mass meter G70 ", page 390

⇒ "7.5 Removing and installing pressure differential sender G505 ", page 391

7.1 Checking fuel pressure regulating valve - N276-

Special tools and workshop equipment required

- Hose clamps, up to 25 mm - 3094-



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- Fuel-resistant measuring container
- Test hose for return line connection

Procedure

WARNING

Risk of malfunctions caused by dirt.

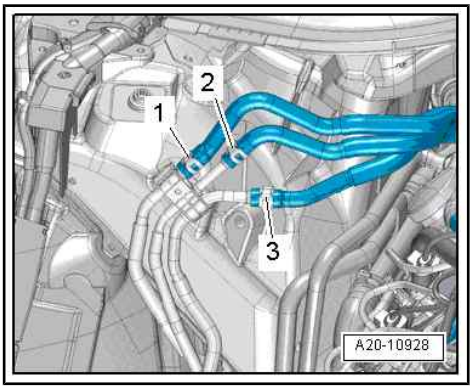
- *Observe ⇒ "2.1 Safety precautions when working on the fuel supply system", page 2 .*

– Remove engine cover panel ⇒ page 98 .

Note

Fuel temperature above 15 °C.

– Detach fuel return hose -2-.

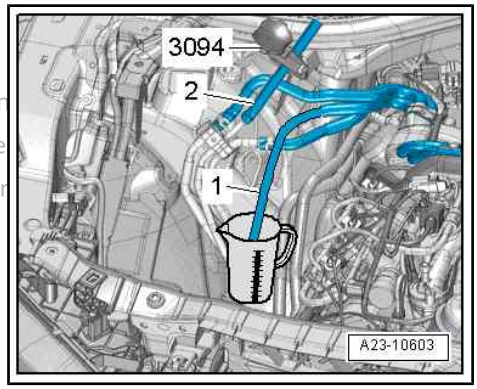


Note

Disregard items -1 and 3-.

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– Seal off open return line connection with a test hose -2- and a hose clamp up to 25 mm - 3094- .
– Hold end of fuel return hose -1- in measuring container.
– Start engine and run at idling speed for one minute.
• Return flow rate (engine start): 0 ml
– Leave engine running at idling speed.
– While engine is running, empty measuring container, or exchange it for an empty container and begin measurement.
– Leave engine running at idling speed for two minutes and measure return flow rate.
• Return flow rate after 2 minutes: 0 ... 60 ml

Note

If specified values are obtained, fuel pressure regulating valve - N276- is OK.

If values do not match specifications:

Note

- *The fuel pressure regulating valve - N276- and injectors were checked during the preceding measuring process.*
- *To determine which component is defective, you must check the return flow rate of the injectors.*

– Measure return flow rate of injectors with engine running ⇒ page 357 .
– If return flow rate of injectors is OK, renew fuel pressure regulating valve - N276- ⇒ page 385 .
– If return flow rate of injectors is not OK, renew defective injector ⇒ page 363 .

Bleeding fuel system and checking 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.

– After completing the repair, road-test the vehicle. Accelerate with full throttle at least once. Then check the high-pressure section of the fuel system again for leaks.
– Install engine cover panel ⇒ page 98 .

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.

7.2 Removing and installing fuel pressure regulating valve - N276-

Special tools and workshop equipment required

- Open-end spanner insert, 30 mm - T10553-



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- Torque wrench - V.A.G 1332-



- Pliers (e.g. water pump pliers)

Note

- *The fuel pressure regulating valve - N276- maintains a constant pressure in the fuel rail and the injector pipes (high-pressure fuel circuit).*
- *It is not possible to start engine if fuel pressure regulating valve - N276- is defective.*
- *If the pressure in the high-pressure fuel circuit is too high, the regulating valve opens to allow some of the fuel to flow back from the fuel rail to the fuel tank via a return hose.*
- *If the pressure in the high-pressure fuel circuit is too low, the valve closes and seals off the high-pressure section of the system from the low-pressure section.*
- *The fuel pressure regulating valve - N276- has a deformable sealing lip and can only be used once. Do not install it for test purposes.*

Removing

– Remove engine cover panel ⇒ page 98 .

WARNING

Risk of malfunctions caused by dirt.

- *Observe*
  ⇒ "2.1 Safety precautions when working on the fuel supply system", page 2 .

– Clean thread and area all around fuel pressure regulating valve with engine cleaner or brake cleaner and dry.

Note

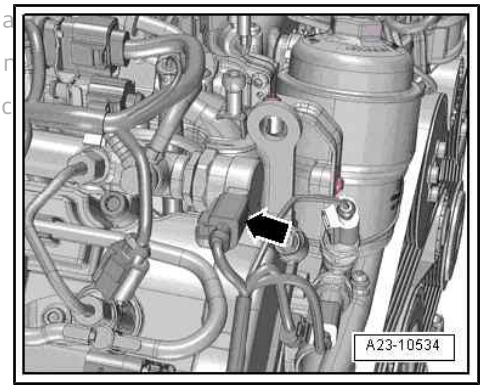
- *Clean carefully; cleaning solution must not enter the electrical connector.*
- *Make sure no dirt gets into opening in fuel rail.*

– Remove banjo bolt for fuel return hoses.

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

– Loosen union nut using open-end spanner insert, 30 mm - T10553- (at the same time, counterhold at hexagon flats on housing). Then unscrew and remove by hand.

– Remove dirt from thread and sealing surface of fuel rail using a vacuum cleaner. Do not use metal tools, etc.



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Note

Seal off opening in fuel rail immediately with a suitable plug to prevent dirt from entering.

Installing

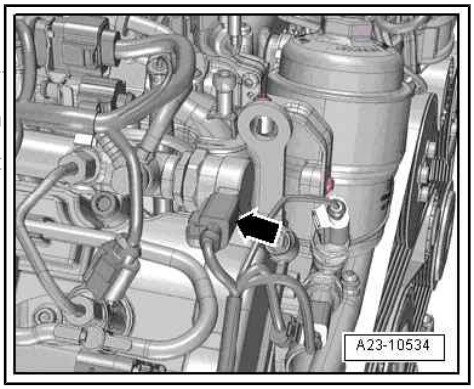
Installation is carried out in reverse order; note the following:

Note

- *The fuel pressure regulating valve - N276- has a deformable sealing lip and no separate seal; it can therefore be used only once.*
- *Check that deformable sealing lip and thread on new fuel pressure regulating valve - N276- are not damaged.*
- *Check sealing surface at opening in fuel rail.*
- *The beginning of the thread and the deformable sealing lip of the fuel pressure regulating valve - N276- must be coated with diesel fuel.*

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– Position fuel pressure regulating valve - N276- so that electrical wiring is not under tension when connector -arrow- is plugged in.



– Tighten union nut using open-end spanner insert, 30 mm - T10553- (at the same time, counterhold at hexagon flats on housing).
– Tighten banjo bolt for fuel return lines with new seals to 25 Nm.
– Install engine cover panel ⇒ page 98 .
– Check fuel system for leaks ⇒ page 333 .

After renewing high-pressure pump and/or fuel pressure regulating valve - N276- , adaption must be performed. Use ⇒ Vehicle diagnostic tester.

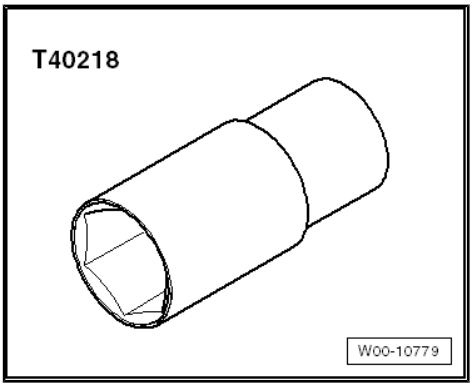
Tightening torques

♦ ⇒ Fig. “” Fuel pressure regulating valve -N276- - tightening torque”” , page 332

7.3 Removing and installing fuel pressure sender - G247-

Special tools and workshop equipment required

♦ Bit (27 mm) - T40218- or commercially available socket (27 mm)



♦ Torque wrench

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- has a deformable sealing lip.*

Removing

Caution

Risk of malfunctions caused by dirt.

♦ *Observe*
⇒ “2.1 Safety precautions when working on the fuel supply system”, page 2 .

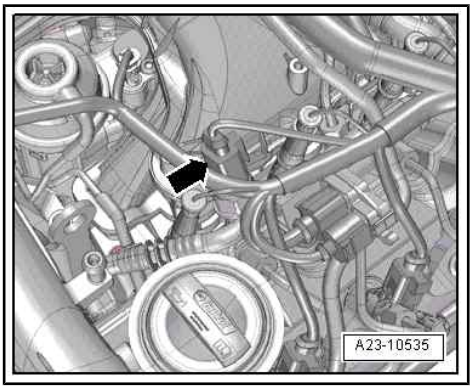
– Remove engine cover panel ⇒ page 98 .
– Clean thread and area all around fuel pressure sender with engine cleaner or brake cleaner and dry.

Note

Clean carefully; cleaning solution must not enter the electrical connector.

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– Unplug electrical connector at fuel pressure sender - G247- -arrow-.
– Unscrew fuel pressure sender - G247- using socket, 27 mm - T40218- .



Note

An open-end spanner must not be used for loosening or tightening.

– Remove dirt from opening in fuel rail using a vacuum cleaner. Do not use metal tools, etc.

Seal off opening in fuel rail immediately with a suitable plug to prevent dirt from entering.

Installing

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

Note

- *The fuel pressure sender - G247- has a deformable sealing lip and no separate seal; it can therefore be used only once.*
- *Check that the deformable sealing lip and the thread on the new fuel pressure sender - G247- are not damaged.*
- *Check sealing surface at opening in fuel rail.*
- *The beginning of the thread and the deformable sealing lip of the fuel pressure sender - G247- must be coated with diesel fuel.*

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– Screw in fuel pressure sender - G247- by hand.
– Then tighten fuel pressure sender - G247- to specified torque.
• Note tightening sequence and tightening torque ⇒ Fig. “” Fuel pressure sender -G247- - tightening torque”“ , page 332 .

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.

– 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.

– After completing the repair, road-test the vehicle. Accelerate with full throttle at least once. Then check the high-pressure section of the fuel system again for leaks.

Note

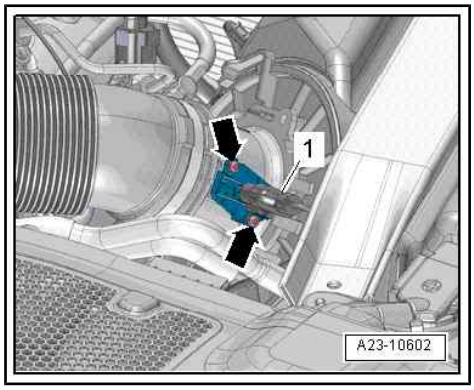
If there is any air left in the fuel system, the engine may switch to the backup mode ('emergency running' mode) during the road test. Switch off the engine and erase the event memory. Then continue the road test.

– After road test, interrogate event memory again.

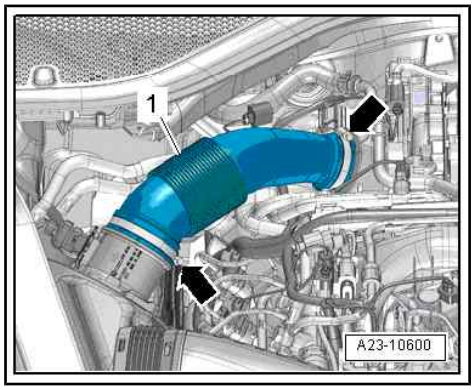
7.4 Removing and installing air mass meter - G70-

Removing

– Unplug electrical connector -1-.



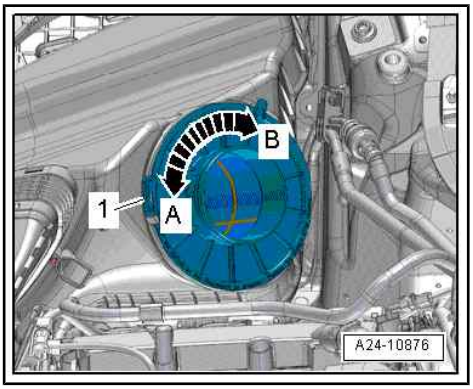
– Release hose clips -arrows- and detach air pipe -1-.



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– Release catch -1-, turn cover for air cleaner housing with air mass meter - G70- in anti-clockwise direction -arrow A- and detach.

– Release catches and detach air mass meter - G70- from cover.



Installing

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

- Tightening torques
  ⇒ “3.1 Exploded view - air cleaner housing”, page 336

To ensure that the air mass meter - G70- functions correctly, it is important to observe the following notes and procedures.

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.*
- *Always renew seal for air mass meter if damaged (air leaks in intake system).*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

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7.5 Removing and installing pressure differential sender - G505-

Note

The pressure differential sender - G505- detects the amount of deposits in the particulate filter.

Special tools and workshop equipment required

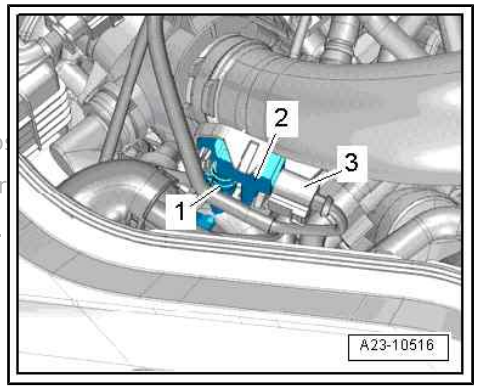
- Vehicle diagnostic tester

Removing

– Remove engine cover panel ⇒ page 98 .

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– Unplug electrical connector -3-.
– Unclip pressure differential sender - G505- -2- from bracket and detach.
– If hose is to be disconnected from pressure sender, release hose clips (if fitted) and spray hose with silicone-free lubricant.
– To prevent hose connection from breaking off, carefully disconnect hose and keep it straight when pulling it off.



Note

The short measuring line can be pulled off with the pressure differential sender - G505- removed.

Installing

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

Note

- *Blow through hose (towards particulate filter) with compressed air to remove dirt or ice (frozen condensation).*
- *Make sure that hoses are securely fitted and that there are no leaks.*
- *If pressure pipes have been detached from particulate filter, tighten connections to specified torque.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

Adaption must be performed after renewing pressure differential sender - G505- and/or particulate filter. Use ⇒ Vehicle diagnostic tester.

8 Lambda probe

⇒ "8.1 Exploded view - Lambda probe, exhaust gas temperature senders and pressure sender", page 393

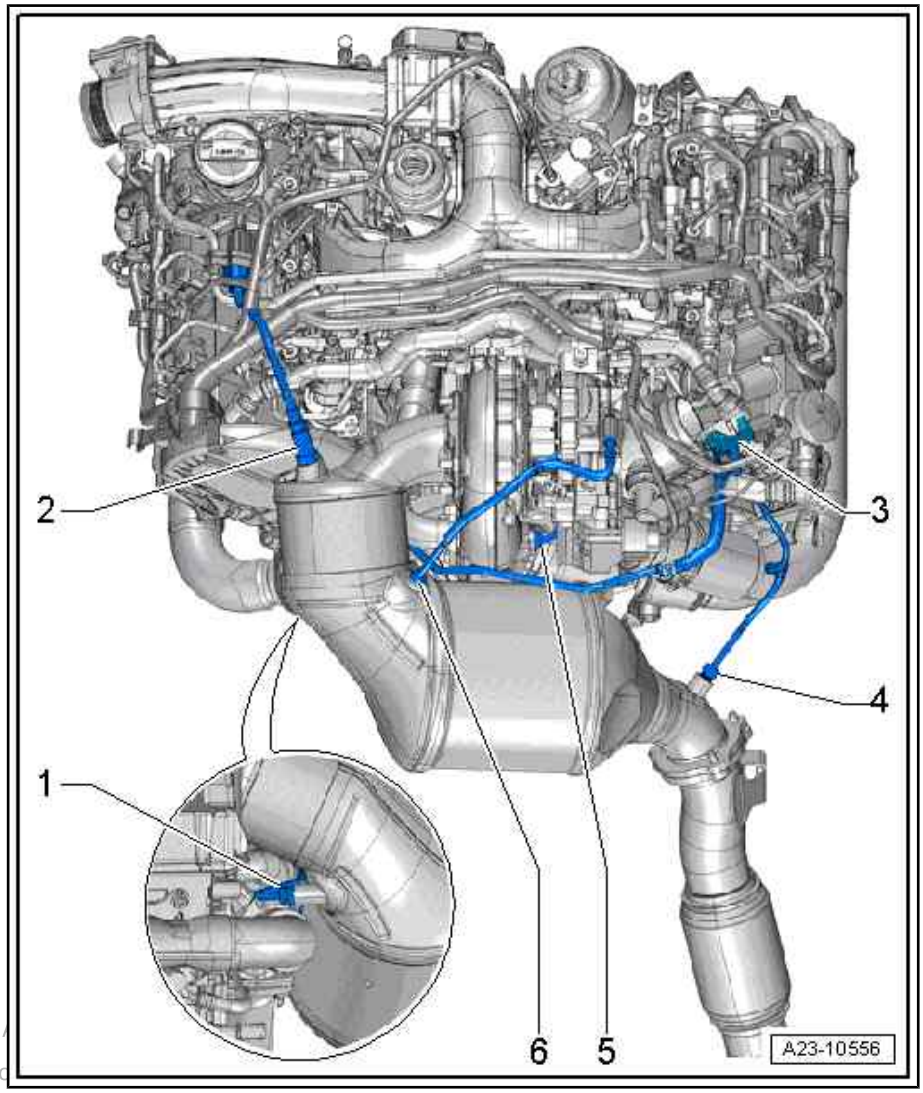
⇒ "8.2 Removing and installing Lambda probe", page 394

8.1 Exploded view - Lambda probe, exhaust gas temperature senders and pressure sender

WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system ⇒ page 6 .*



1 - Pressure pipe

- ❑ For pressure differential sender - G505-
- ❑ Tightening torque ⇒ page 447

2 - Lambda probe - G39- with Lambda probe heater - Z19-

- ❑ Removing and installing ⇒ page 394
- ❑ After renewing, learnt values must be re-adapted; see ⇒ Vehicle diagnostic tester
- ❑ New Lambda probes are coated with an assembly paste
- ❑ If you are re-using Lambda probe, coat only thread with high-temperature paste; refer to ⇒ Electronic parts catalogue for high-temperature paste
- ❑ The assembly paste/ high-temperature paste must not get into the slots on the Lambda probe body
- ❑ 55 Nm

3 - Pressure differential sender - G505-

- ❑ Removing and installing ⇒ page 391

4 - Exhaust gas temperature sender 4 - G648-

- ❑ Removing and installing ⇒ page 448

5 - Exhaust gas temperature sender 1 - G235-

- ❑ Removing and installing ⇒ page 448

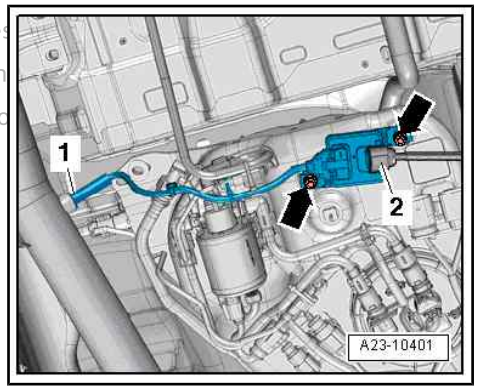
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6 - Exhaust gas temperature sender 3 - G495-

❑ Removing and installing ⇒ page 448

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Control unit for NOx sender 2 - J881- with NOx sender 2 - G687- (engine codes CKVB and CKVC only)

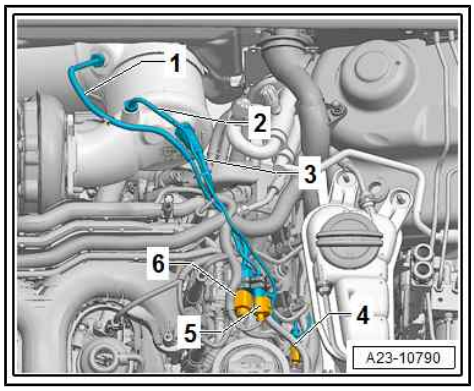


1 - NOx sender 2 - G687-

2 - Control unit for NOx sender 2 - J881- on active tank for reducing agent

Removing and installing ⇒ page 456

Fitting locations of exhaust gas temperature sensors (engine code CKVC only)



1 - Exhaust gas temperature sender 3 - G495-

2 - Exhaust gas temperature sender 2 - G448-

3 - Lambda probe - G39-

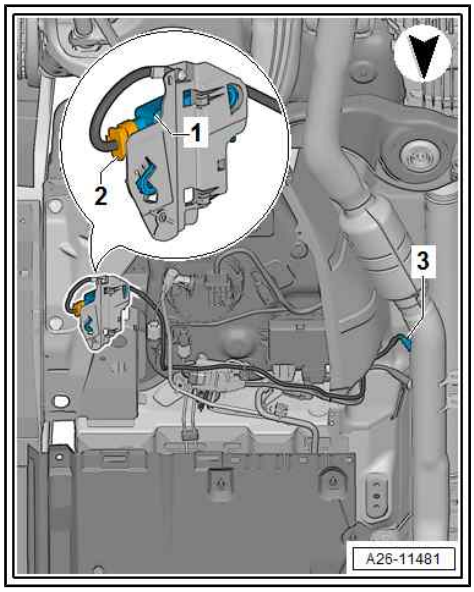
4 - Electrical connector for exhaust gas temperature sender 2 - G448-

5 - Electrical connector for exhaust gas temperature sender 3 - G495-

6 - Electrical connector for Lambda probe - G39-

Removing and installing ⇒ page 448

Particulate sensor - G784- (engine code CKVC only)



1 - Control unit for particulate sensor - G784-

2 - Electrical connector from control unit

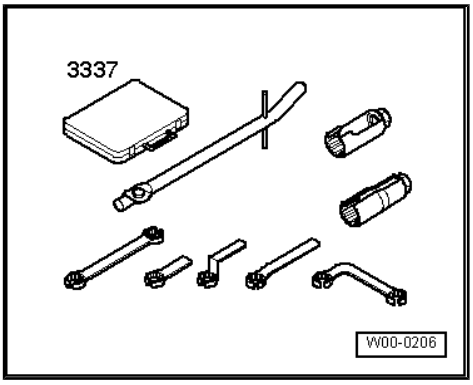
3 - Particulate sensor - G784-

Removing and installing ⇒ page 454

8.2 Removing and installing Lambda probe

Special tools and workshop equipment required

- Lambda probe open ring spanner set - 3337-



Removing

– Remove engine cover panel ⇒ page 98 .

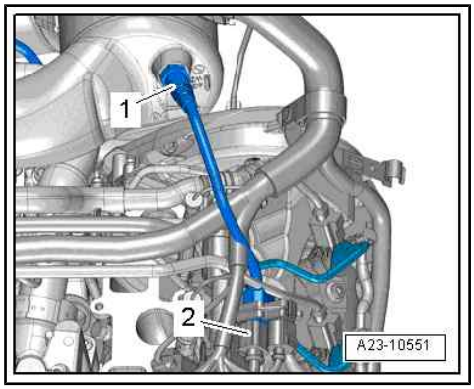
WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system ⇒ page 6 .*

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– Unplug electrical connector -2- for Lambda probe - G39- .



Note

Fit all cable ties in the original positions when installing.

– Unscrew Lambda probe - G39- -1- using tool from Lambda probe open ring spanner set - 3337- .

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 ⇒ 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.*

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- Tightening torque
⇒ "8.1 Exploded view - Lambda probe, exhaust gas temperature senders and pressure sender", page 393

Adapting learnt values if Lambda probe was renewed

– Connect ⇒ Vehicle diagnostic tester.

– Switch on ignition.

– 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 J623`
- `01 - Engine electronics, functions`
- `01 - Lambda probe - Adapt learnt values`

9 Engine control unit

⇒ "9.1 Wiring and component check with isolator box VAS 6606 ", page 397

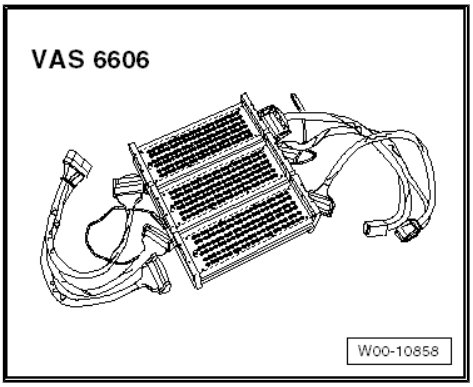
⇒ "9.2 Removing and installing engine/motor control unit J623 ", page 398

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9.1 Wiring and component check with isolator box -VAS 6606-

Special tools and workshop equipment required

- Isolator box, 198-pin - VAS 6606/1-1-
- Isolator box, 198-pin - VAS 6606/1-2-
- Isolator box, 198-pin - VAS 6606/1-3-
- Sheets -VAS 6606/1-1-
- Sheets -VAS 6606/2-1-
- Sheets -VAS 6606/3-1-
- Set of cables -VAS 6606/7-1- and -VAS 6606/7-2-



Note

- *Always make sure that the cables are properly connected.*
- *Do not use damaged or worn tools and accessories.*
- *Observe operating instructions.*

– Connect both cable sets -VAS 6606/7-1- and -VAS 6606/7-2- to the three isolator boxes -VAS 6606- .

– Use the following sheets:

- -VAS 6606/1-1- for isolator box, 198-pin - VAS 6606/1-1-
- -VAS 6606/2-1- for isolator box, 198-pin - VAS 6606/1-2-
- -VAS 6606/3-1- for isolator box, 198-pin - VAS 6606/1-3-

Note

Make sure that all plug-in bridges are inserted completely in all isolator boxes.

– Connect earth strap to an isolator box and to an earth point on the vehicle.

– Remove engine control unit ⇒ page 398 .

– Connect engine control unit to cable set -VAS 6606/7-1- .

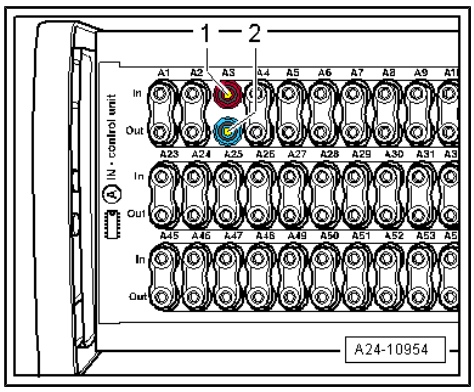
– Connect vehicle wiring harness to cable set -VAS 6606/7-2- .

The connection on the engine control unit consists of a large and a small connector.

The large connector has 105 pins and is assigned to the sheets for the isolator box marked “A 1 to A 105”.

The small connector has 91 pins and is assigned to the sheets for the isolator box marked “B 1 to B 91”.

When a push-in bridge is pulled out, the corresponding wiring connection is disconnected.



Note

- *The “In” contact -1- (red socket) leads to the engine control unit.*
- *The “Out” contact -2- (blue socket) leads to the wiring harness.*

– Carry out test as described in appropriate repair procedures.

Installing engine control unit

Installation is performed in the reverse sequence.

The procedure required after connecting the new engine control unit is described in the Guided Fault Finding or Guided Functions. Use ⇒ Vehicle diagnostic tester.

Note

After completion of the Guided Fault Finding routine, the tester will attempt to erase the event memories of all control units. If this is not successful, the remaining events saved in the memories must be dealt with so that all event memory entries can be erased.

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9.2 Removing and installing engine/motor control unit - J623-

Removing

– Before removing the engine control unit - J623- , the adaption values of the injectors and the ash deposit mass must be read out. Use ⇒ Vehicle diagnostic tester.

The adaption values for the injectors in the old (defective) engine control unit can be read out via the Guided Fault Finding or Guided Functions mode and can be stored as an electronic file in the ⇒ Vehicle diagnostic tester.

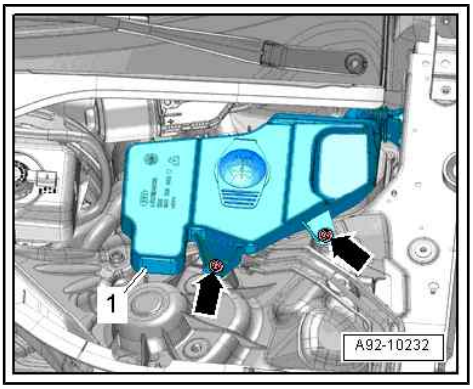
– Switch off ignition and remove ignition key after storing electronic file containing adaption values.

Note

If the adaption values of the injectors cannot be read out of the old (defective) engine control unit, they must be entered into the new engine control unit manually and the adaption procedure must be performed accordingly.

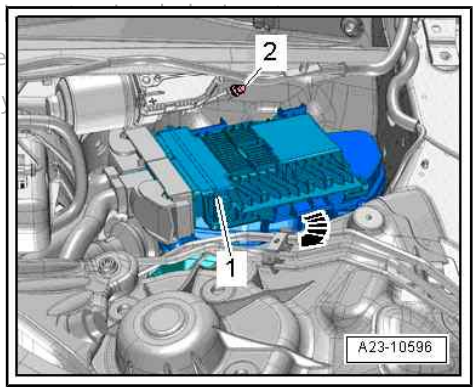
– Remove plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .

– Unscrew bolts -arrows- and pull filler neck out of washer fluid reservoir and through opening in body to right side.



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– Release catch -arrow- and detach engine control unit - J623- -item 1-.



Note

Disregard -item 2-.

Installing

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

– After the engine control unit - J623- has been renewed, the “Injector delivery calibration” and the “Injector voltage calibration” must also be re-adapted in the engine control unit (these functions influence engine power and exhaust emissions).

– On vehicles with particulate filter the current mileage (km) reading must be stored in the engine control unit - J623- via an adaption procedure.

The procedure required after connecting the new engine control unit is described in the Guided Fault Finding or Guided Functions. Use ⇒ Vehicle diagnostic tester.

26 – Exhaust system

1 Exhaust pipes/silencers

⇒ “1.1 Exploded view - silencers”, page 400
⇒ “1.2 Removing and installing front exhaust pipe”, page 404
⇒ “1.3 Separating exhaust pipes/silencers”, page 407
⇒ “1.4 Renewing tailpipes”, page 408
⇒ “1.5 Stress-free alignment of exhaust system”, page 409
⇒ “1.6 Checking exhaust system for leaks”, page 410

1.1 Exploded view - silencers

WARNING

When working on all parts of the exhaust system:

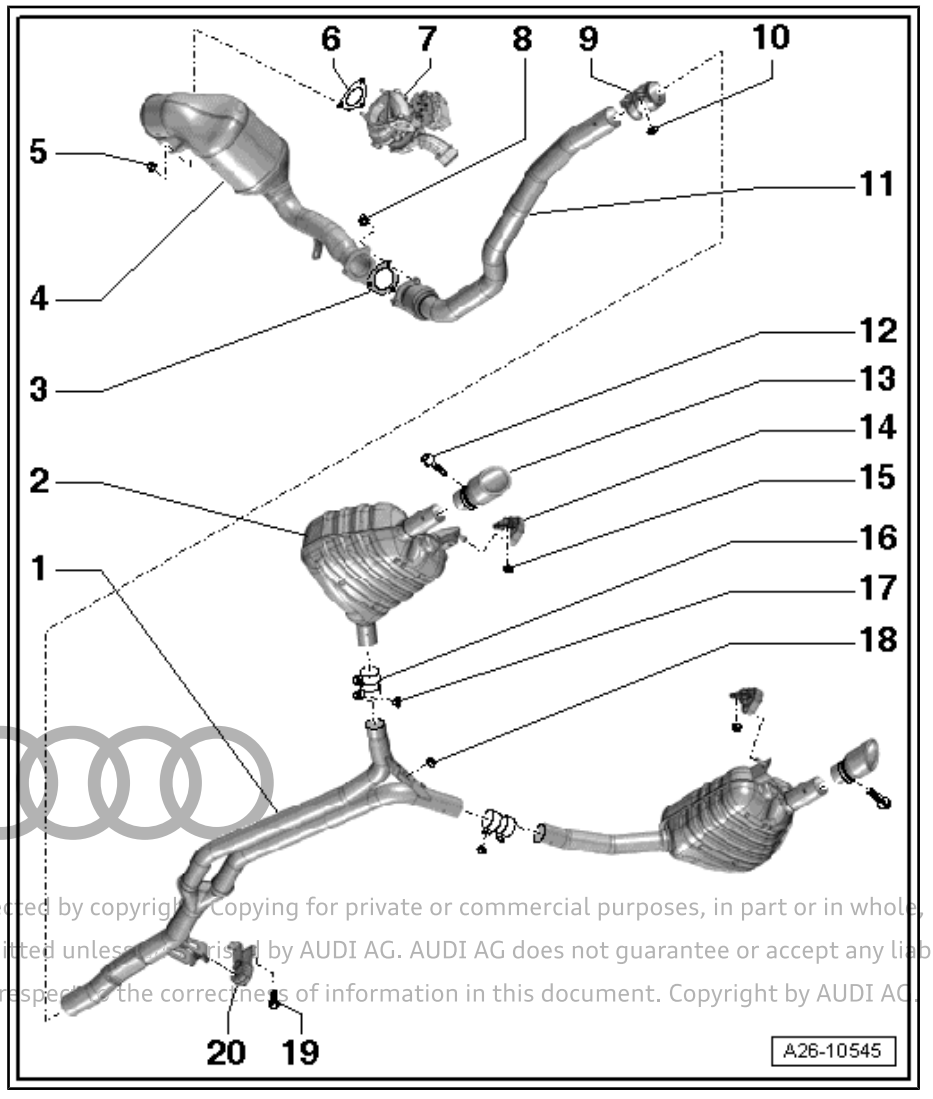
- *Observe safety precautions when working on the exhaust system ⇒ page 6 .*

1 - Y-pipe

- ❑ Combined in one unit with rear silencers as original equipment
- ❑ Y-pipe, rear silencer and tailpipe can be renewed separately as required
- ❑ For removal on A5 Cabriolet/Sportback: Remove diagonal struts ⇒ page 403
- ❑ Cutting point: Y-pipe / rear silencer ⇒ page 407
- ❑ Align exhaust system so it is free of stress ⇒ page 409

2 - Rear silencer

- ❑ Combined with Y-pipe in one unit as original equipment
- ❑ Y-pipe, rear silencer and tailpipe can be renewed separately as required
- ❑ For removal on A5 Cabriolet/Sportback: Remove diagonal struts ⇒ page 403
- ❑ Cutting point: Y-pipe / rear silencer ⇒ page 407
- ❑ Cutting point between rear silencer and tailpipe ⇒ page 408



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- ❑ Align exhaust system so it is free of stress ⇒ page 409

3 - Gasket

- ❑ Renew

4 - Particulate filter

- ❑ With catalytic converter
- ❑ Removing and installing ⇒ page 411
- ❑ After renewing, perform `Adaption` in `Guided Functions` ⇒ Vehicle diagnostic tester

5 - Nut

- ❑ Renew
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 23 Nm

6 - Gasket

- ❑ Renew

7 - Turbocharger

8 - Nut

- ❑ Renew
- ❑ 23 Nm

9 - Clamp (front)

- ❑ Before tightening, align exhaust system so it is free of stress ⇒ page 409
- ❑ Installation position ⇒ page 402
- ❑ Tighten bolted connections evenly

10 - Nut

- ❑ 23 Nm

11 - Front exhaust pipe

- ❑ With flexible joint; do not bend flexible joint more than 10° – otherwise it can be damaged
- ❑ Protect against knocks and impact
- ❑ Removing and installing ⇒ page 405
- ❑ Stress-free alignment of exhaust system with cutting point ⇒ page 409

12 - Bolt

- ❑ 23 Nm

13 - Tailpipe

- ❑ Renewing ⇒ page 408

14 - Mounting

- ❑ Renew if damaged
- ❑ Check preload ⇒ “1.5 Stress-free alignment of exhaust system”, page 409

15 - Nut

- ❑ 20 Nm

16 - Clamp (rear)

- ❑ For separate replacement of Y-pipe and rear silencers
- ❑ Before tightening, align exhaust system so it is free of stress ⇒ page 409
- ❑ Installation position ⇒ page 402
- ❑ Tighten bolted connections evenly

17 - Nut

- ❑ 23 Nm

18 - Nut

- ❑ Renew

- ❑ 23 Nm

19 - Bolt

- ❑ Tightening torque ⇒ page 403

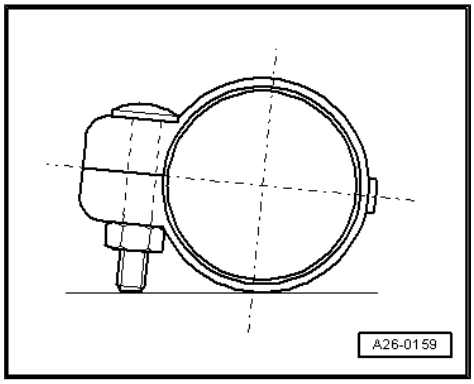
20 - Mounting

- ❑ Renew if damaged
- ❑ Components ⇒ page 403
- ❑ Check preload ⇒ “1.5 Stress-free alignment of exhaust system”, page 409

Installation position of front clamp

– Install clamp so that ends of bolts do not protrude beyond bottom of clamp.

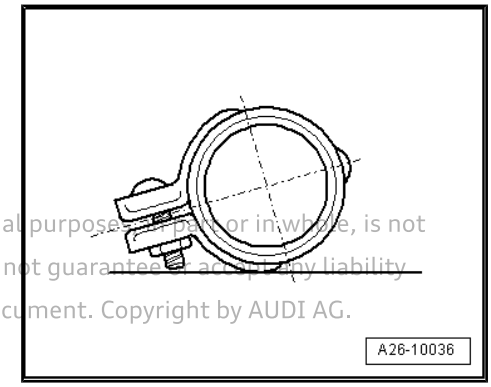
• Bolted connection faces to left.



Installation position of rear clamps

– Install clamps so that the bolt ends do not protrude beyond bottom of clamp.

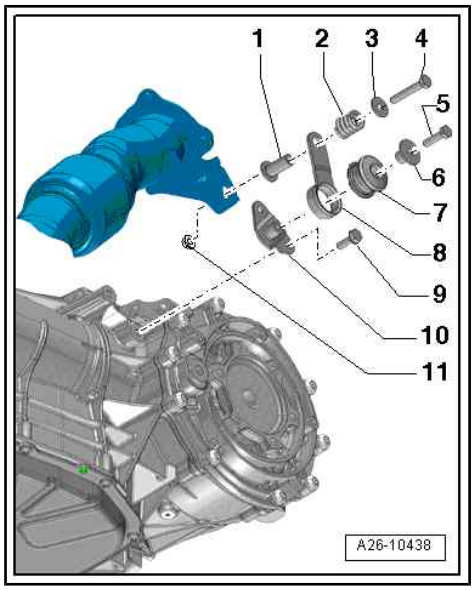
• Installation position: bolted connections face forwards.



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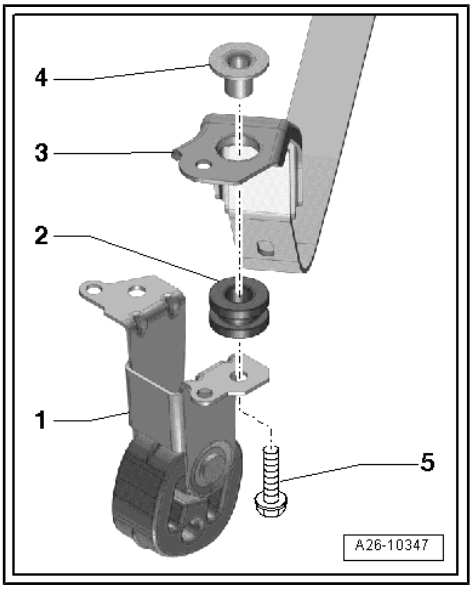
Components of mountings for front exhaust pipe

1 - Spacer sleeve
2 - Compression spring
3 - Washer
4 - Bolt, 23 Nm
5 - Bolt, 23 Nm
6 - Spacer sleeve
7 - Buffer
8 - Bracket
9 - Bolt, 23 Nm
10 - Bracket
11 - Nut



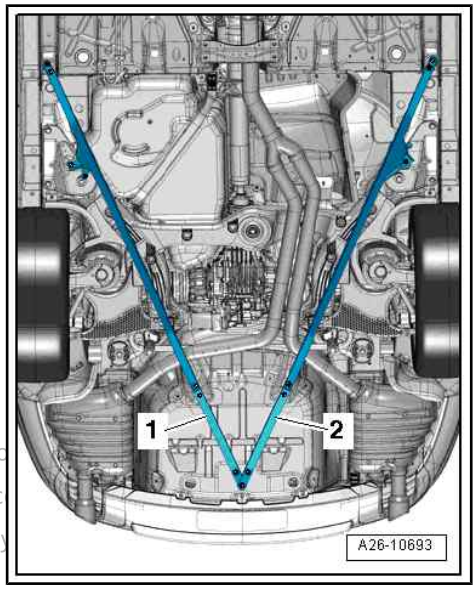
Front mounting components for exhaust system

1 - Mounting
2 - Buffer
3 - Securing strap
4 - Spacer sleeve
5 - Bolt, 20 Nm



Diagonal struts (Audi A5 Cabriolet/Sportback)

– Remove diagonal struts -1- and -2- before removing Y-pipe and rear silencer unit.
– Install diagonal struts ⇒ Running gear, axles, steering; Rep. gr. 42 ; Subframe; Exploded view - subframe .



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1.2 Removing and installing front exhaust pipe

⇒ "1.2.2 Removing and installing front exhaust pipe - vehicles with manual gearbox/multitronic gearbox 0AW", page 405

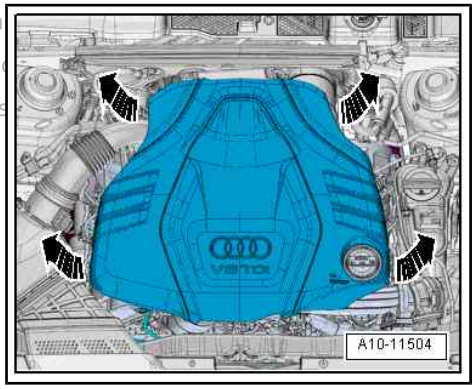
⇒ "1.2.1 Removing and installing front exhaust pipe - vehicles with dual clutch gearbox 0B5", page 404

1.2.1 Removing and installing front exhaust pipe - vehicles with dual clutch gearbox 0B5

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Removing

– Remove engine cover panel -arrows-.

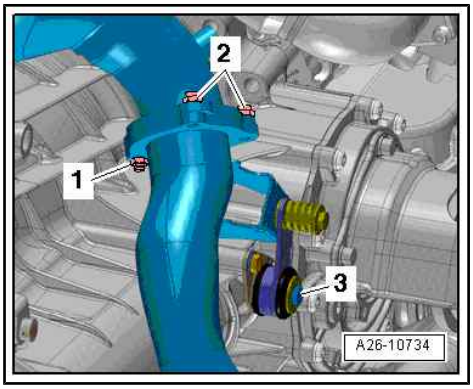


WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system ⇒ page 6 .*

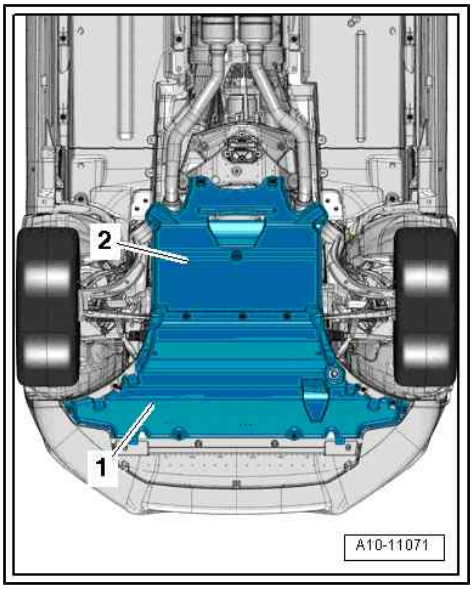
– Remove nuts -2- (accessible from above) for front exhaust pipe.



Note

The nut -1- and bolt -3- are removed at a later stage.

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

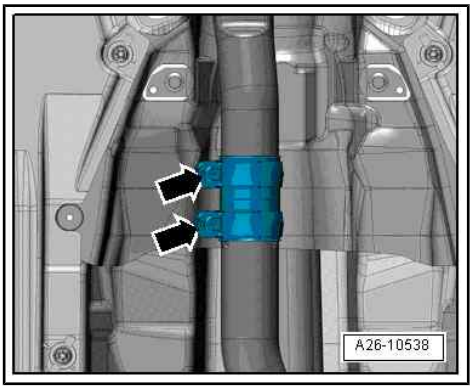


Caution

Risk of damage to flexible joint in front exhaust pipe.

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

– Loosen bolt connections -arrows- on clamp.
– Push clamp back and lower front exhaust pipe slightly.



– Remove nut -1- and bolt -3- and detach front exhaust pipe.

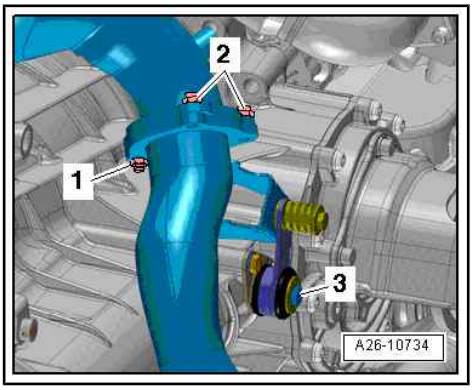
Installing

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

- Tightening torques
  ⇒ “1.1 Exploded view - silencers”, page 400

Note

Renew gaskets and self-locking nuts.



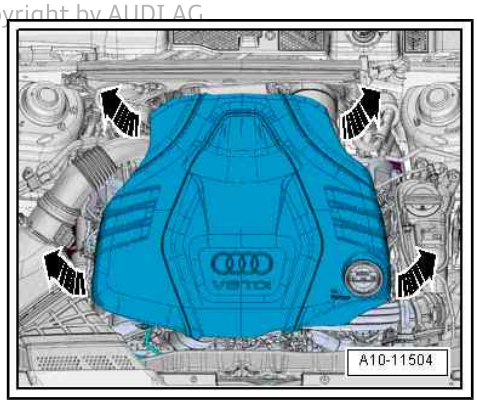
– Align the exhaust system so it is free of stress ⇒ page 409 .
– Install noise insulation (rear) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .

1.2.2 Removing and installing front exhaust pipe - vehicles with manual gearbox/ multitronic gearbox 0AW

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Removing

– Remove engine cover panel -arrows-.

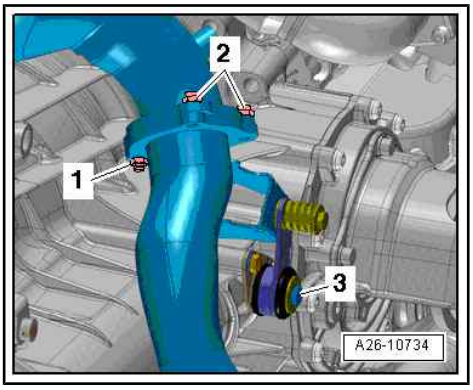


WARNING

When working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system ⇒ page 6 .***

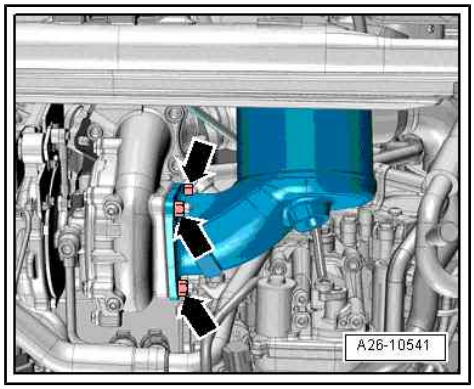
– Remove nuts -2- (accessible from above) for front exhaust pipe.



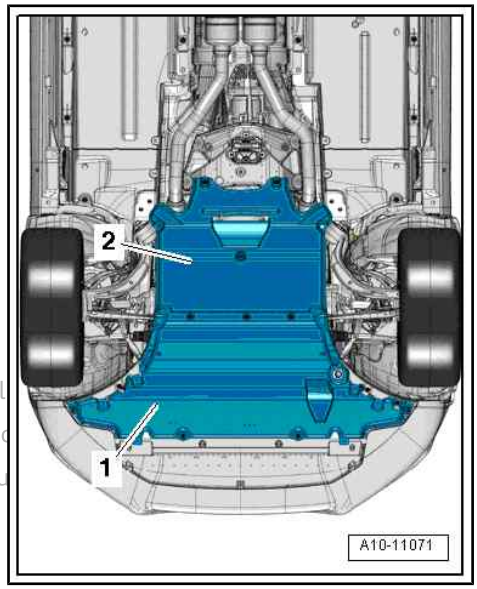
Note

The nut -1- and bolt -3- are removed at a later stage.

– Remove nuts -arrows-.



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

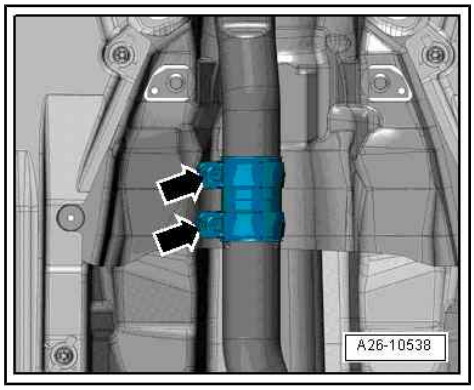


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Caution

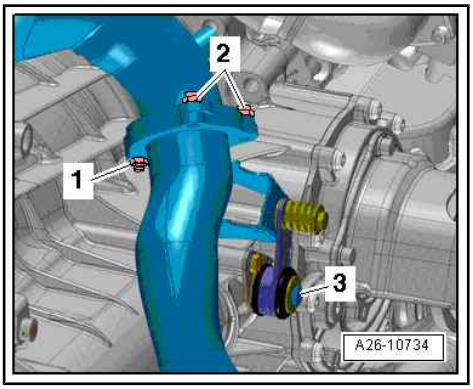
Risk of damage to flexible joint in front exhaust pipe.

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



– Loosen bolt connections -arrows- on clamp.
– Push clamp back and lower front exhaust pipe slightly.

– Remove bolt -3-.
– Press front exhaust pipe with particulate filter up slightly and unscrew nut -1-.
– Detach front exhaust pipe.



Installing

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

- Tightening torques
  ⇒ "1.1 Exploded view - silencers", page 400

Note

Renew gaskets and self-locking nuts.

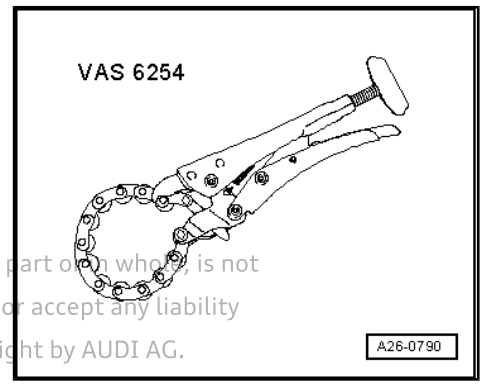
– Install particulate filter ⇒ page 411 .
– Align the exhaust system so it is free of stress ⇒ page 409 .
– Install noise insulation (rear) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .

1.3 Separating exhaust pipes/silencers

- The connecting pipe can be cut through at the point marked in order to renew the Y-pipe or rear silencer(s) 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-



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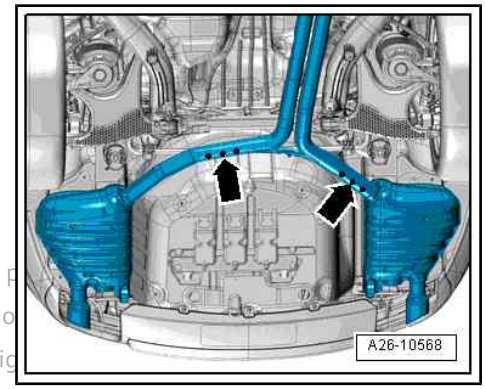
Procedure

WARNING

When working on all parts of the exhaust system:

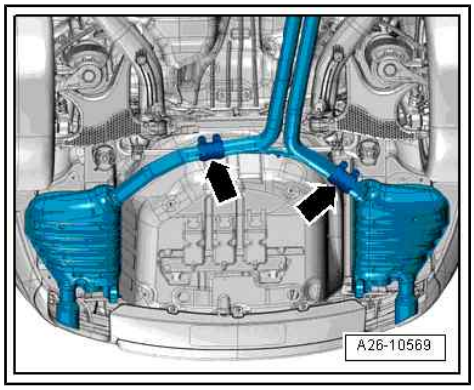
- ***Observe safety precautions when working on the exhaust system*** ⇒ page 6 .

– Cut through exhaust pipes at right angles at the positions marked -arrows- using chain pipe cutter - VAS 6254- .

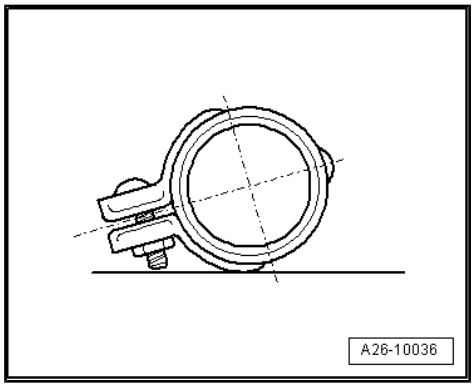


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– Position centre of clamps -arrows- over cutting location.



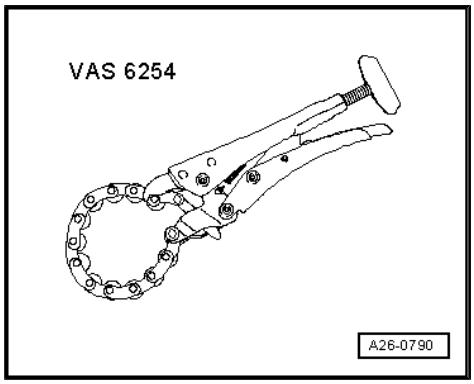
– Install clamps so that the bolt ends do not protrude beyond bottom of clamp.
• Installation position: bolted connections face forwards.
– Align the exhaust system so it is free of stress ⇒ page 409 .



1.4 Renewing tailpipes

Special tools and workshop equipment required

♦ Chain pipe cutter - VAS 6254-



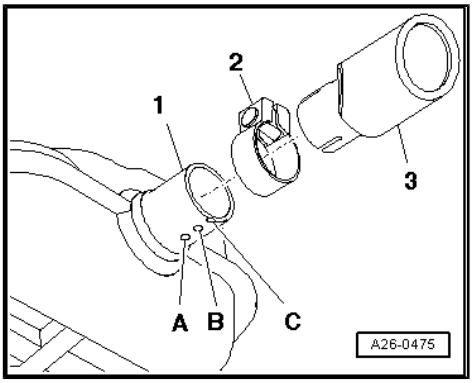
Procedure

- Tightening torque
  ⇒ “1.1 Exploded view - silencers”, page 400

– Cut through tailpipe -1- with chain pipe cutter - VAS 6254- at the position marked -C-.

– Push new tailpipe -3- onto tailpipe as far as marking -A-. Slot on tailpipe should align with marking -B-.

– Tighten nut for clamp -2-.



1.5 Stress-free alignment of exhaust system

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Procedure

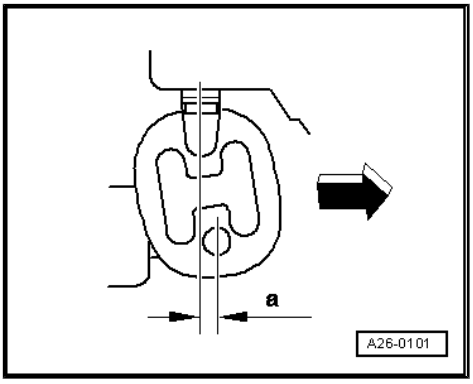
- The exhaust system must be aligned when it is cool.
- Tightening torques
  ⇒ “1.1 Exploded view - silencers”, page 400

Vehicles without clamps between Y-pipe and rear silencer

– Loosen bolted connections on front clamp.

– Push exhaust system towards front of vehicle -arrow- so that rear mountings for rear silencers are preloaded by -a- = 5 ... 9 mm.

– Tighten bolt connections on clamp evenly.



Vehicles with clamps between Y-pipe and rear silencer

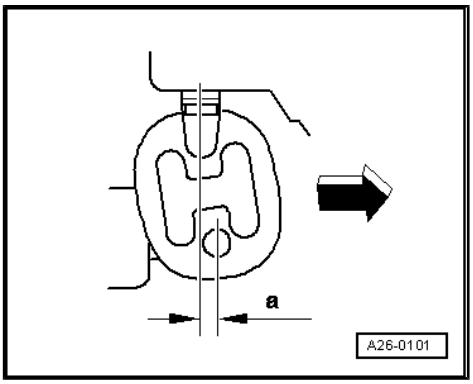
Note

On a vehicle with clamps fitted between Y-pipe and rear silencer, it is also necessary to align the Y-pipe.

– Loosen bolted connections on front and rear clamps.

– Push front section of exhaust system towards front of vehicle -arrow-, so that mountings for Y-pipe are preloaded by -a- = 5 ... 9 mm.

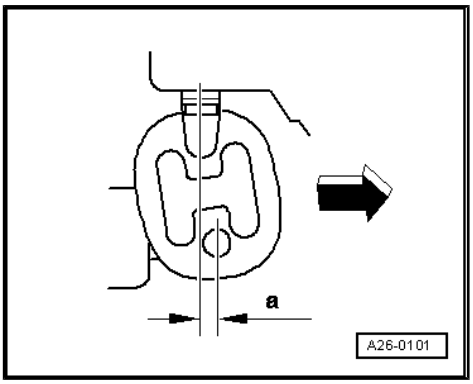
– Tighten bolt connections on front clamp evenly.



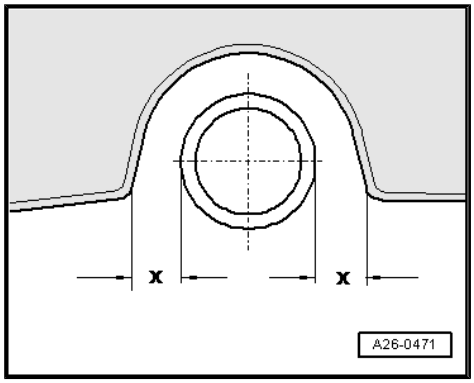
– Push rear section of exhaust system towards front of vehicle -arrow-, so that mountings (rear) for rear silencers are preloaded by -a- = 5 ... 9 mm.

– Align rear silencers so they are horizontal.

– Tighten bolted connections on rear clamps evenly.

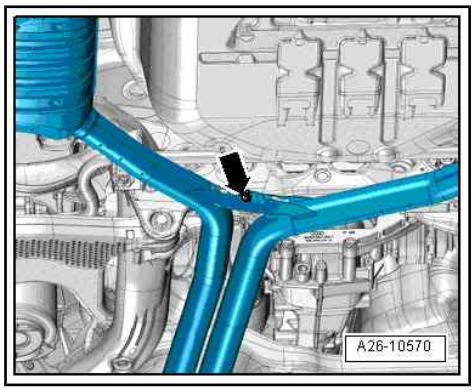


– Check clearance between tailpipes and bumper on both sides:
• Dimension -x- (left-side) = dimension -x- (right-side)



If necessary, correct dimension -x- as follows:

– Loosen connection -arrow- on strut between exhaust pipes.
– Adjust the distance between the rear silencers.



1.6 Checking exhaust system for leaks

Procedure

– Start the engine and run at idling speed.
– Plug tailpipes during leak test (e.g. with cloth or plug).
– Listen for leaks at connection points between cylinder head/ exhaust manifold, exhaust manifold/intermediate pipe and turbocharger/intermediate flange etc.
– Rectify any leaks that are found.

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2 Emission control system

⇒ “2.1 Removing and installing particulate filter”, page 411

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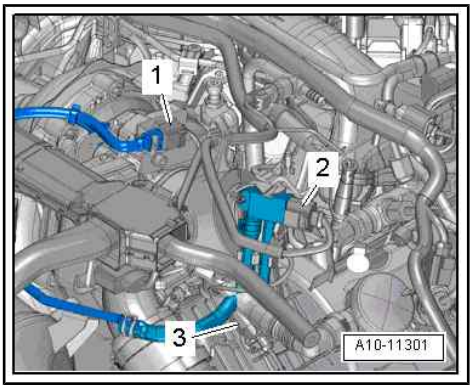
2.1 Removing and installing particulate filter

⇒ “2.1.1 Removing and installing particulate filter - vehicles with manual gearbox/multitronic gearbox 0AW”, page 411

⇒ “2.1.2 Removing and installing particulate filter - vehicles with dual clutch gearbox 0B5”, page 412

2.1.1 Removing and installing particulate filter - vehicles with manual gearbox/multitronic gearbox 0AW

Removing

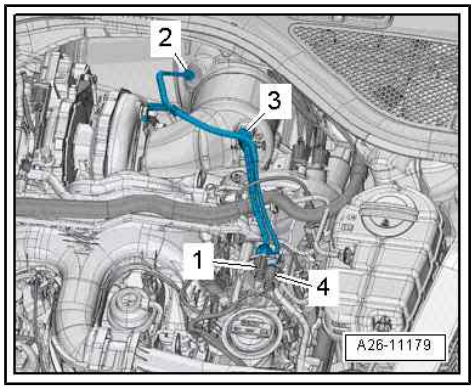


– Remove plenum chamber partition panel ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Exploded view - plenum chamber partition panel .
– Remove front exhaust pipe ⇒ page 405 .
– Take electrical connector -3- out of bracket, unplug it and move electrical wiring clear.
– Unplug electrical connector -2-, unclip pressure differential sender - G505- from bracket and move clear.

Note

Ignore item marked -1-.

– Detach electrical connectors -1 and 4- from bracket and unplug.



Note

Disregard items -2 and 3-.

– Detach particulate filter.

Installing

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

- Tightening torques
⇒ “1.1 Exploded view - silencers”, page 400

Note

Renew seals, gaskets and self-locking nuts.

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

– Install front exhaust pipe ⇒ page 405 .

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

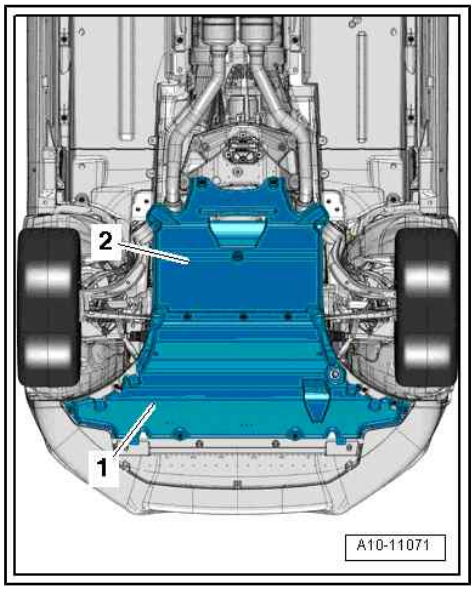
– After renewing particulate filter, perform `Adaption` in `Guided Functions` ⇒ Vehicle diagnostic tester.

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2.1.2 Removing and installing particulate filter - vehicles with dual clutch gearbox 0B5

Removing

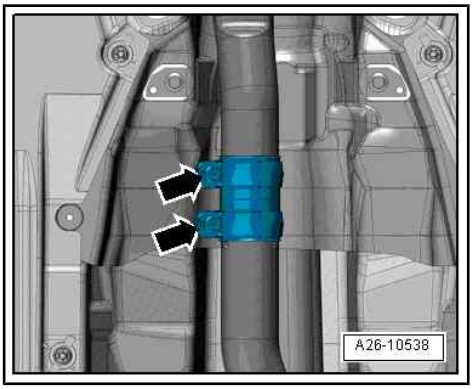
– Remove rear noise insulation -2- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .



Caution

Risk of damage to flexible joint in front exhaust pipe.

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



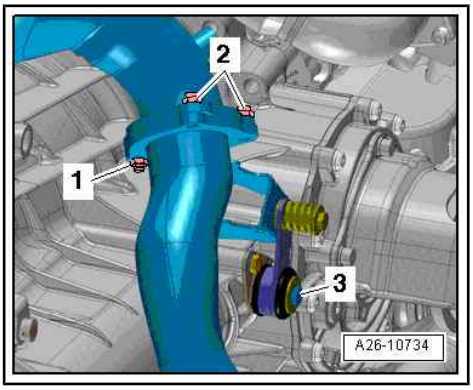
– Loosen bolt connections -arrows- on clamp.

– Push clamp back and lower front exhaust pipe slightly.

– Unscrew nut -1-.

Note

- *The nuts -2- are removed at a later stage.*
- *Disregard -item 3-.*



– Secure front exhaust pipe with clamp.

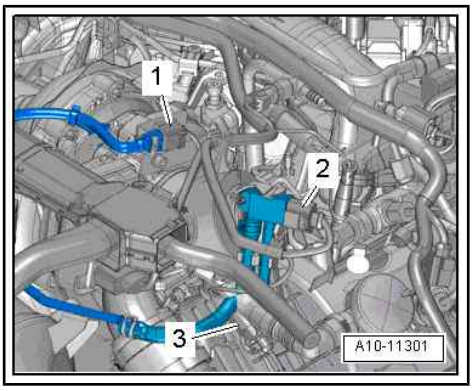
– Remove plenum chamber partition panel ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Exploded view - plenum chamber partition panel .

– Take electrical connector -3- out of bracket, unplug it and move electrical wiring clear.

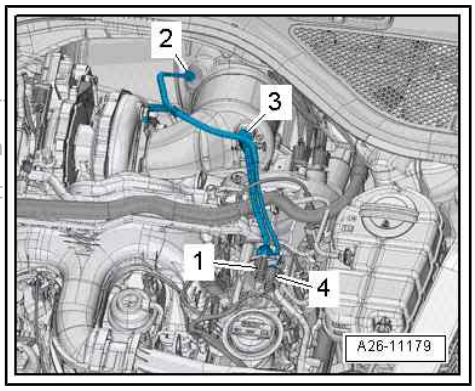
– Unplug electrical connector -2-, unclip pressure differential sender - G505- from bracket and move clear.

Note

Ignore item marked -1-.



– Detach electrical connectors -1 and 4- from bracket and unplug.

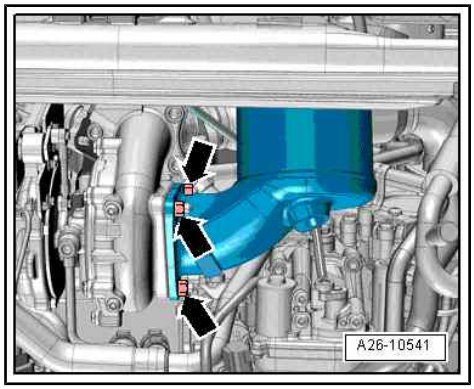


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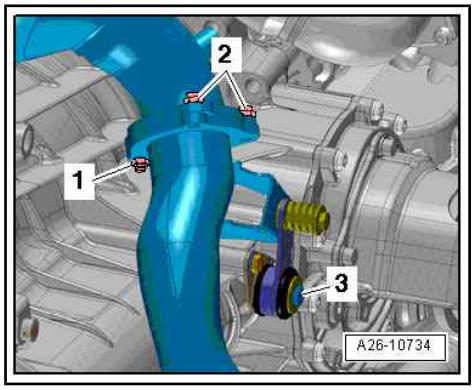
Note

Disregard items -2 and 3-.

– Remove nuts -arrows- and detach particulate filter from turbocharger.



– Remove nuts -2- (accessible from above) and detach particulate filter.



Note

Disregard -item 3-.

Installing

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

- Tightening torques
⇒ “1.1 Exploded view - silencers”, page 400

Note

Renew seals, gaskets and self-locking nuts.

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

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

– Align the exhaust system so it is free of stress ⇒ page 409 .

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

– After renewing particulate filter, perform `Adaption` in `Guided Functions` ⇒ Vehicle diagnostic tester.

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3 SCR (selective catalytic reduction) system

⇒ “3.1 Exploded view - reducing agent tank”, page 415

⇒ “3.2 Exploded view - pump for reducing agent V437 ”, page 418

⇒ “3.3 Exploded view - delivery unit for reducing agent”, page 420

⇒ “3.4 Exploded view - injector for reducing agent N474 ”, page 422

⇒ “3.5 Exploded view - control unit for reducing agent metering system”, page 423

⇒ “3.6 Removing and installing reducing agent supply line”, page 423

⇒ “3.7 Removing and installing delivery unit for reducing agent”, page 425

⇒ “3.8 Removing and installing injector for reducing agent N474 ”, page 430

⇒ “3.9 Draining active tank for reducing agent”, page 431

⇒ “3.10 Removing and installing active tank for reducing agent”, page 433

⇒ “3.11 Draining passive tank for reducing agent”, page 436

⇒ “3.12 Removing and installing passive tank for reducing agent”, page 437

⇒ “3.13 Removing and installing pressure sender for reducing agent metering system G686 ”, page 440

⇒ “3.14 Removing and installing pump for reducing agent V437 ”, page 441

⇒ “3.15 Checking control unit for reducing agent metering system J880 ”, page 442

⇒ “3.16 Removing and installing control unit for reducing agent metering system J880 ”, page 442

⇒ “3.17 Removing and installing transfer pump for reducing agent V436 ”, page 444

3.1 Exploded view - reducing agent tank

⇒ “3.1.1 Exploded view - active tank for reducing agent with attached components”, page 415

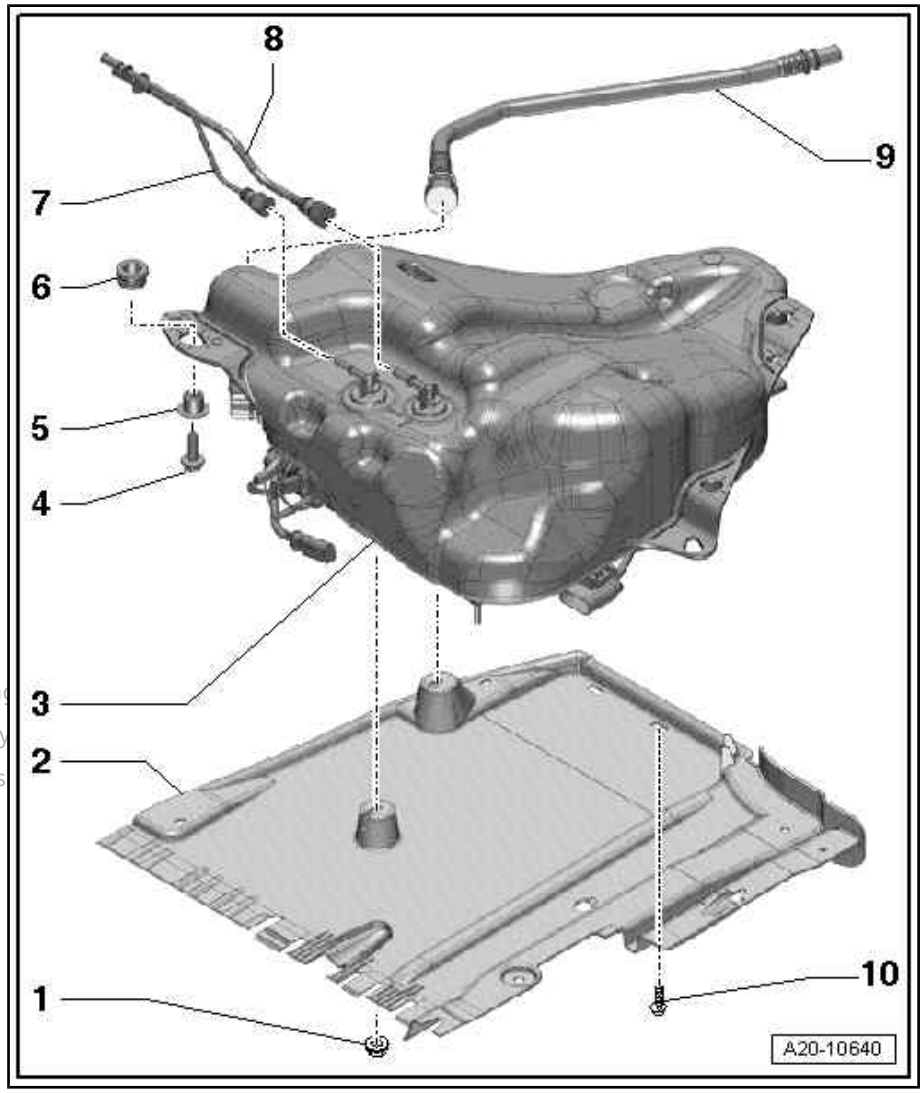
⇒ “3.1.2 Exploded view - passive tank for reducing agent with attached components”, page 417

3.1.1 Exploded view - active tank for reducing agent with attached components

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Note

Fitting location: Beneath left rear seat on underside of vehicle.



1 - Nut

- ❑ 2 Nm

2 - Cover

- ❑ For active tank for reducing agent

3 - Active tank

- ❑ For reducing agent
- ❑ Removing and installing ⇒ page 433

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 .*

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

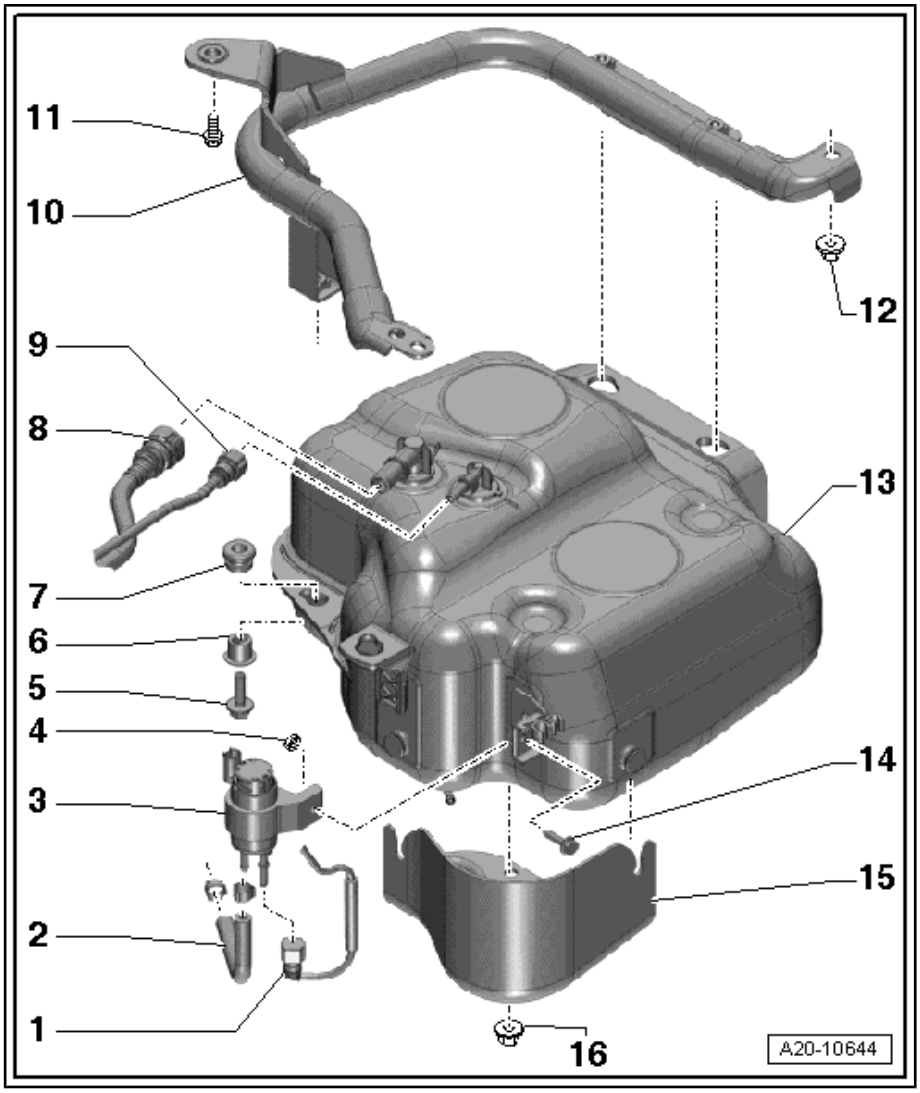
- ❑ 4.2 Nm

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3.1.2 Exploded view - passive tank for reducing agent with attached components

Note

Fitting location: on underbody (rear right).



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 444

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

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13 - Passive tank

- ❑ For reducing agent
- ❑ Removing and installing ⇒ page 437

14 - Bolt

- ❑ 1.8 Nm

15 - Cover

- ❑ For transfer pump for reducing agent - V436-

16 - Nut

- ❑ 2.1 Nm

3.2 Exploded view - pump for reducing agent - V437-

1 - Active tank

- ❑ For reducing agent

2 - Return line

- ❑ With heater

> **WARNING**
> *Safety risk due to escaping reducing agent. Observe safety measures for handling reducing agent ⇒ page 4 .*

3 - Bolt

- ❑ 2 Nm

4 - Electrical wire

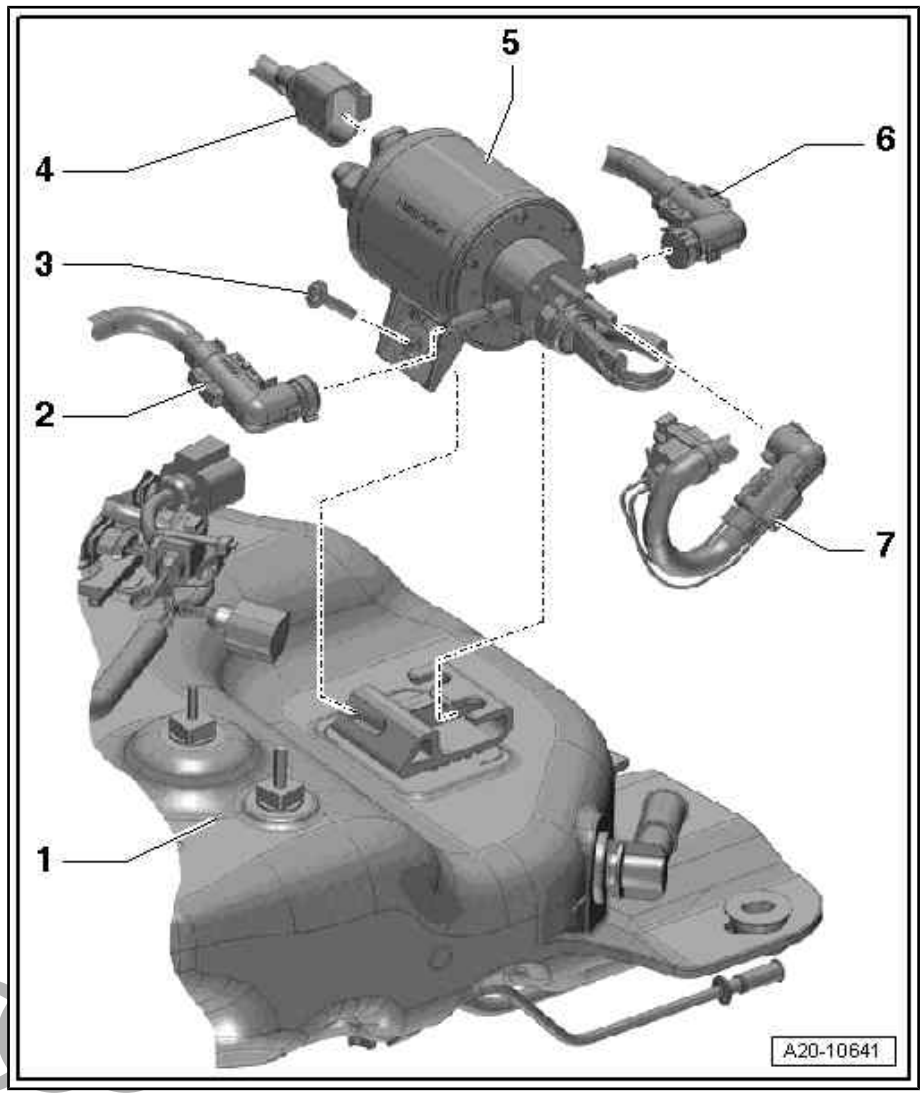
- ❑ Version depends on country

5 - Pump for reducing agent - V437-

- ❑ With heater for reducing-agent pump - Z103-
- ❑ With pressure sender for reducing agent metering system - G686-
- ❑ Removing and installing pump for reducing agent - V437- ⇒ page 441
- ❑ Removing and installing pressure sender for reducing agent metering system - G686- ⇒ page 440
- ❑ Tightening torque for pressure sender for reducing agent metering system - G686- , version 1 ⇒ page 419
- ❑ Tightening torque for pressure sender for reducing agent metering system - G686- , version 2 ⇒ page 419

6 - Supply line

- ❑ With heater



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WARNING

Safety risk due to escaping reducing agent.
Observe safety measures for handling reducing agent ⇒ page 4 .

7 - Metering line

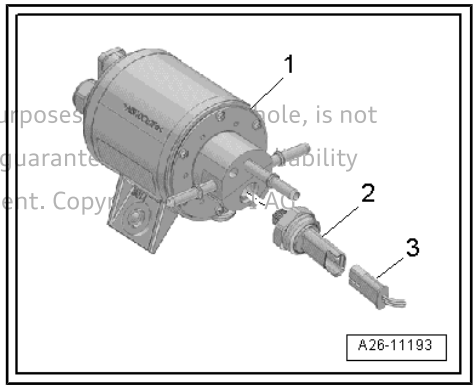
- ❑ From pump for reducing agent - V437- to injector for reducing agent - N474-
- ❑ With heater
- ❑ Clip onto fuel tank

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 .

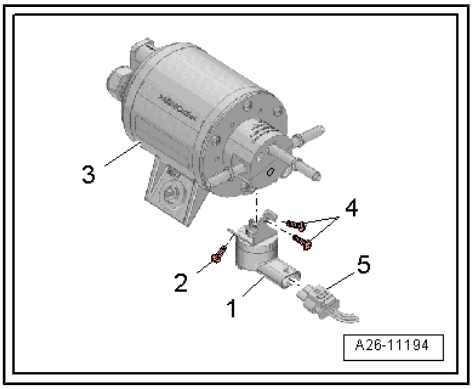
Pressure sender for reducing agent metering system - G686- version 1 - tightening torque

– Tighten pressure sender for reducing agent metering system - G686- -item 2- to 8 Nm.



Pressure sender for reducing agent metering system - G686- version 2 - tightening torque

– Tighten bolts -2, 4- to 1.5 Nm.



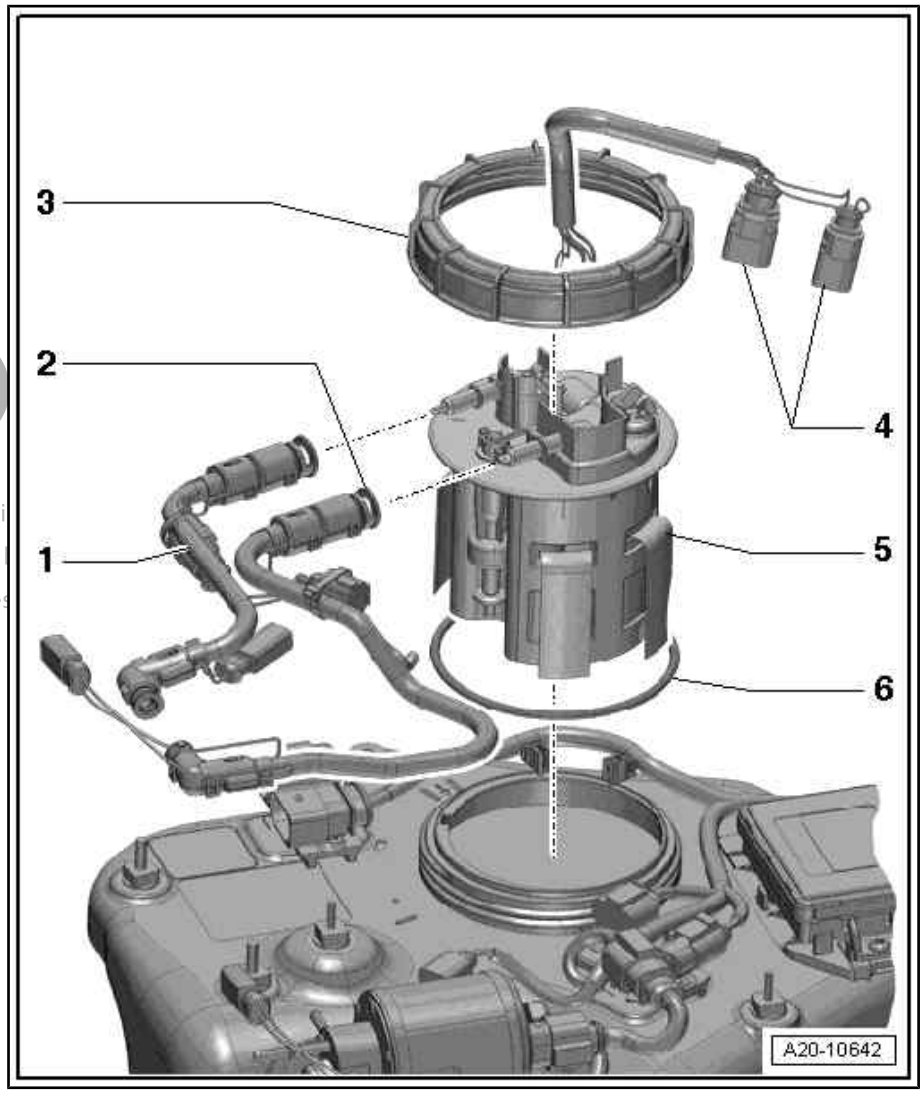
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3.3 Exploded view - delivery unit for reducing agent

⇒ "3.3.1 Exploded view - delivery unit for reducing agent, vehicles with external pump for reducing agent ", page 420

⇒ "3.3.2 Exploded view - delivery unit for reducing agent, vehicles with internal pump for reducing agent ", page 421

3.3.1 Exploded view - delivery unit for reducing agent, vehicles with external pump for reducing agent



1 - Return line

- ❑ With heater

> **WARNING**
> *Safety risk due to escaping reducing agent. Observe safety measures for handling reducing agent ⇒ page 4 .*

2 - Supply line

- ❑ With heater

> **WARNING**
> *Safety risk due to escaping reducing agent. Observe safety measures for handling reducing agent ⇒ page 4 .*

3 - Union nut

- ❑ Renew
- ❑ Remove and install using key - T50014-
- ❑ Tightening ⇒ page 427

4 - Electrical connectors

- ❑ For tank sender for reducing agent - G684-
- ❑ For temperature sender for reducing agent - G685-
- ❑ For heater for reducing-agent tank - Z102-

5 - Reservoir

- ❑ With tank sender for reducing agent - G684-
- ❑ With temperature sender for reducing agent - G685-
- ❑ With heater for reducing-agent tank - Z102-
- ❑ With filter
- ❑ Do not kink heating mats when installing
- ❑ Removing and installing ⇒ page 425

6 - Seal

- ❑ Renew

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❑ Install dry

3.3.2 Exploded view - delivery unit for reducing agent, vehicles with internal pump for reducing agent

1 - Bolt
- ❑ 20 Nm

2 - Reducing agent tank

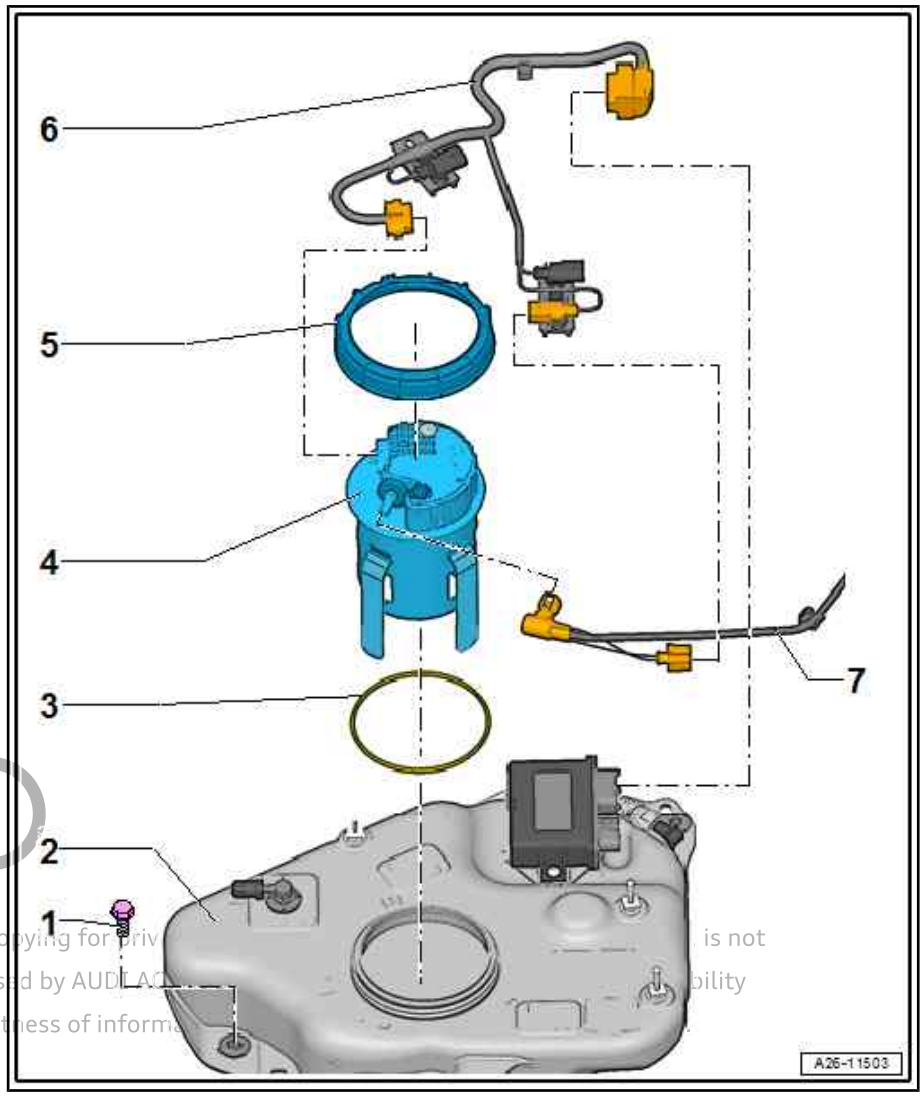
3 - Seal
- ❑ Renew
- ❑ Install dry

4 - Delivery unit
- ❑ With pump for reducing agent - V437-
- ❑ With tank sender for reducing agent - G684-
- ❑ With temperature sender for reducing agent - G685-
- ❑ With pressure sender for reducing agent metering system - G686-
- ❑ With heater for reducing-agent tank - Z102-
- ❑ With filter
- ❑ Removing and installing ⇒ page 428

5 - Union nut
- ❑ Remove and install using key - T40283-
- ❑ Tightening ⇒ page 429

6 - Electrical wiring harness

7 - Reducing agent line
- ❑ To injector for reducing agent - N474-
- ❑ Disconnecting reducing agent lines ⇒ page 423



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3.4 Exploded view - injector for reducing agent - N474-

1 - Bolt
- ❑ 5 Nm

2 - Retaining clamp

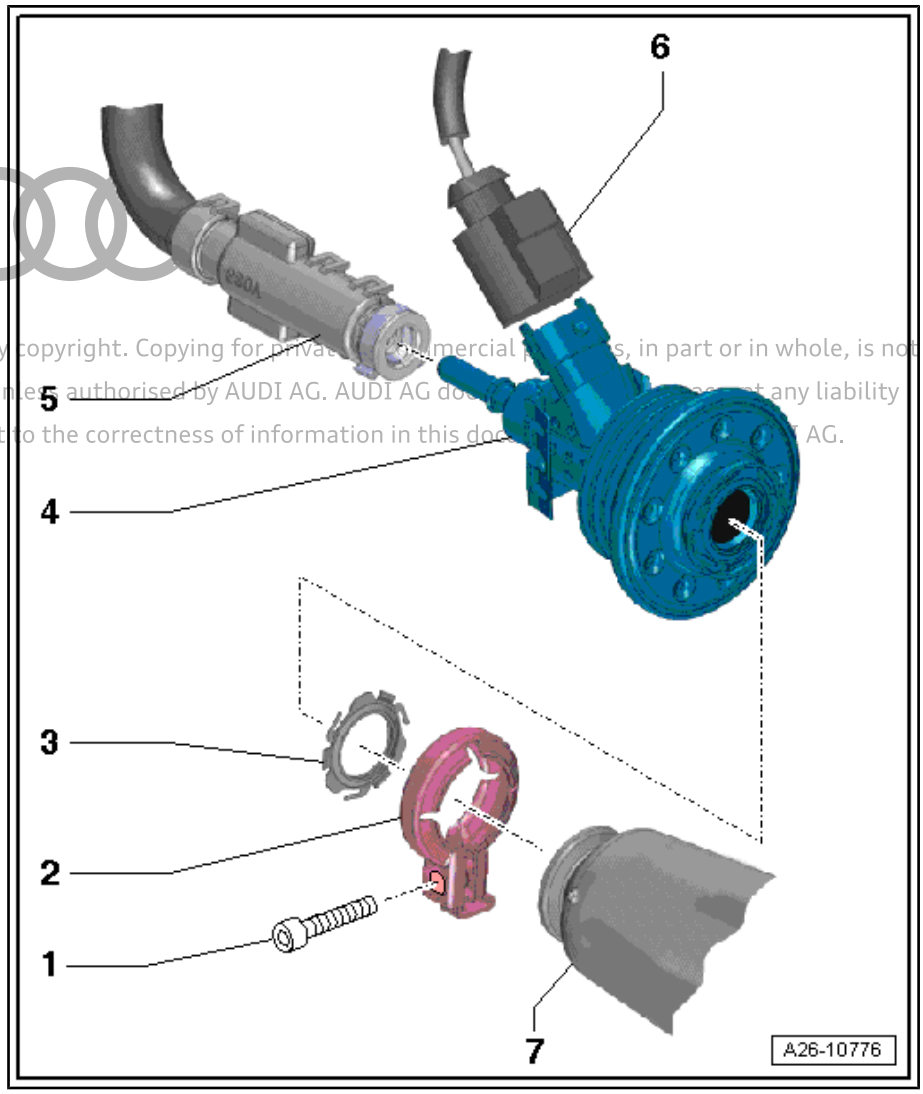
3 - Gasket
- ❑ Renew

4 - Injector for reducing agent - N474-
- ❑ Removing and installing ⇒ page 430

5 - Hose
- ❑ For reducing agent
- ❑ Press release catches to remove ⇒ page 423

6 - Electrical connector

7 - Front exhaust pipe



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3.5 Exploded view - control unit for reducing agent metering system

Note

Fitting location: control unit for reducing agent metering system - J880- is underneath active tank.

1 - Base plate

- For control unit for reducing agent metering system - J880-
- Part of active tank

2 - Clip nut

3 - Bolt

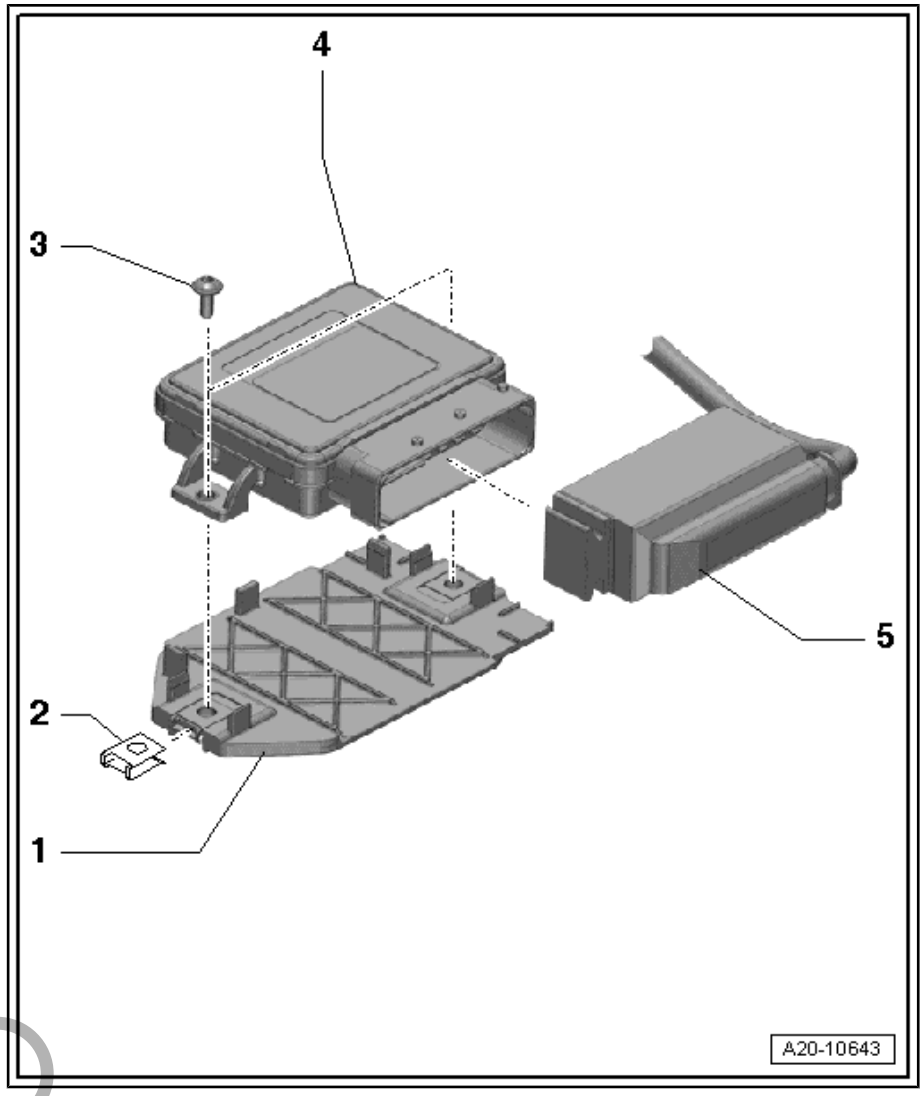
- 4.5 Nm

4 - 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
- Removing and installing ⇒ page 442

5 - Electrical connector

- For control unit for reducing agent metering system - J880-
- Depending on vehicle version, electrical connector may have two parts

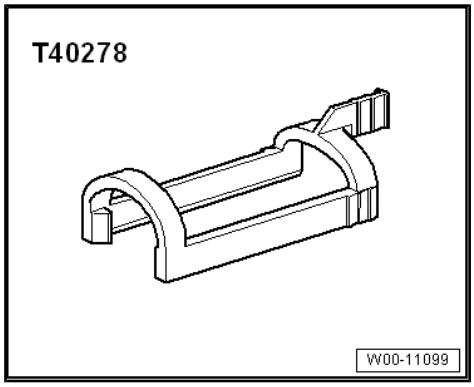


3.6 Removing and installing reducing agent supply line

Special tools and workshop equipment required

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- Release tool - T40278-



WARNING

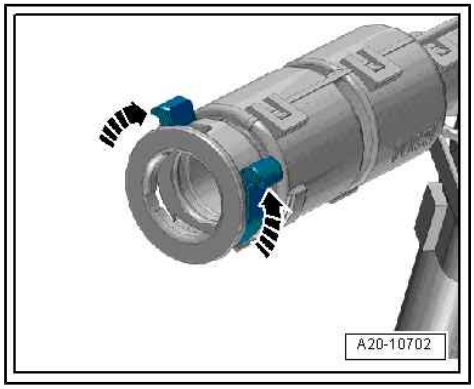
Safety risk due to escaping reducing agent.

- *Observe safety measures for handling reducing agent* *⇒ page 4* *.*

Different connectors may be installed, depending on vehicle version.

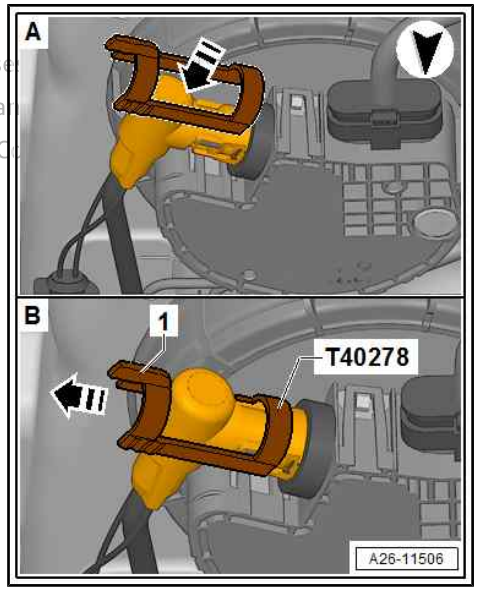
Version 1

– Press release catches in direction of -arrows- and detach reducing agent line.



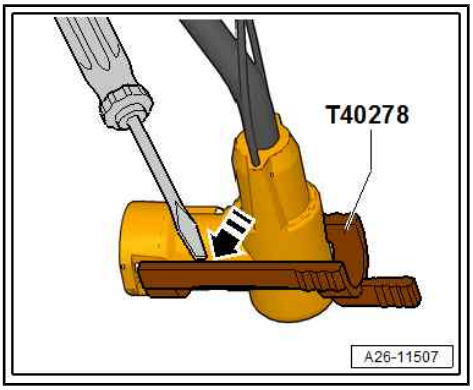
Version 2

– Push release tool - T40278- onto connector in direction of -arrow-, as shown in illustration A.
– Pull release tool - T40278- by retainer -1- in direction of -arrow-, as shown in illustration B.



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– Use a small screwdriver to detach release tool - T40278- , as shown in illustration.



3.7 Removing and installing delivery unit for reducing agent

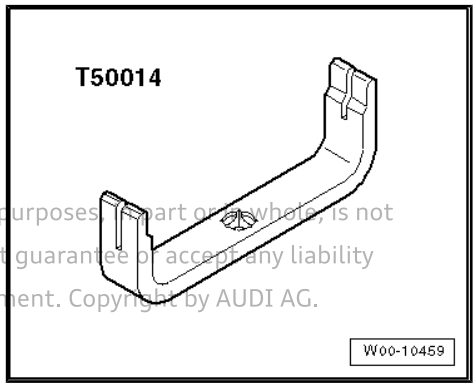
⇒ “3.7.1 Removing and installing delivery unit for reducing agent - vehicles with external pump for reducing agent ”, page 425

⇒ “3.7.2 Removing and installing delivery unit for reducing agent - vehicles with internal pump for reducing agent ”, page 428

3.7.1 Removing and installing delivery unit for reducing agent - vehicles with external pump for reducing agent

Special tools and workshop equipment required

♦ Special wrench - T50014-



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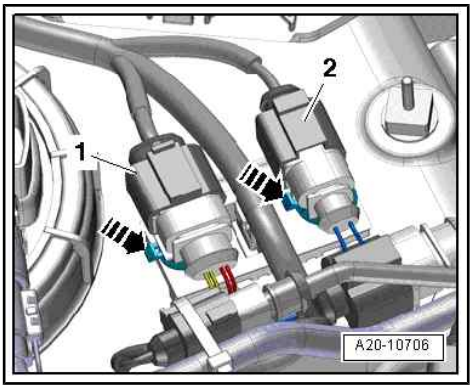
Removing

Observe safety precautions ⇒ page 4 .

Observe rules for cleanliness ⇒ page 8 .

– Remove active tank for reducing agent ⇒ page 433 .

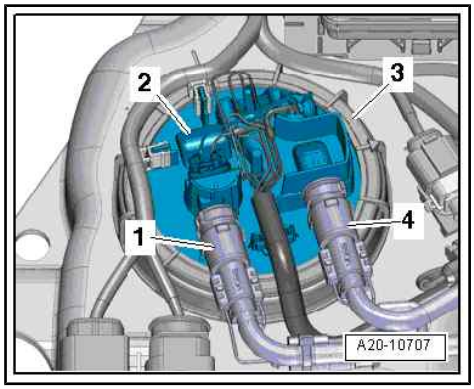
– Press release tabs -arrows-, unplug electrical connectors -1- and -2- and unclip from bracket.



WARNING

Safety risk due to escaping reducing agent.

- ***Observe safety measures for handling reducing agent ⇒ page 4 .***



Note

Hold a clean cloth under the separating point to catch escaping reducing agent.

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– Press release catches ⇒ page 423 and disconnect return line -1- and supply line -4-.
– Move electrical wiring clear.
– Unscrew union nut -3- using special wrench - T50014- and carefully lift off reservoir -2-.

WARNING

Safety risk due to escaping reducing agent.

- ***Keep in mind that the active tank and the reservoir still contain a small amount of reducing agent.***

Installing

- Tightening torques
  ⇒ "3.3.1 Exploded view - delivery unit for reducing agent, vehicles with external pump for reducing agent ", page 420

Note

- *Renew seal.*
- *Thoroughly clean sealing surfaces for seal.*

Caution

Risk of malfunctions.

- ***The seal must not be twisted.***
- ***Do not kink heating mats when installing.***

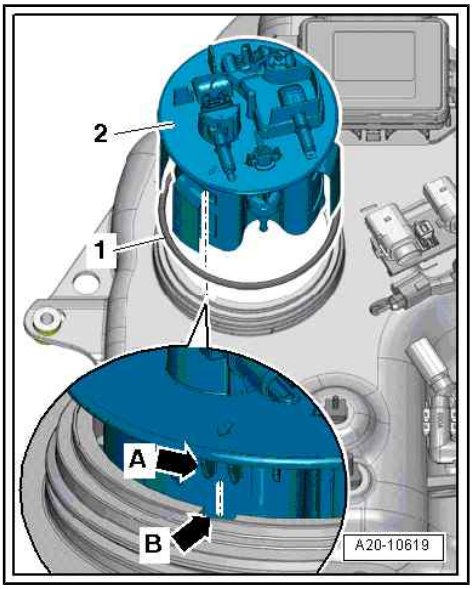
– Insert reservoir -2- in active tank; while doing so, carefully slide heating mats into active tank through gap between reservoir and installation opening.

– Slip new seal -1- onto reservoir and press it until it makes contact at installation opening.

• The seal must not be twisted.

– Move reservoir into installation position:

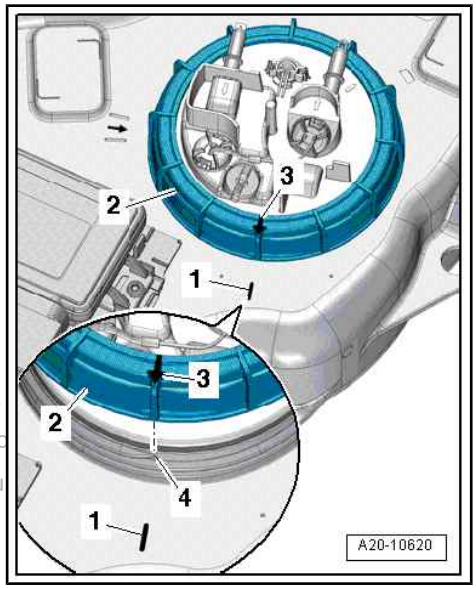
• Lug -arrow A- on reservoir must engage in groove -arrow B- on edge of installation opening of active tank.



– 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 new union nut by hand and then use special wrench - T50014- to tighten it a total of $^{5}/_{4}$ turns (450°).

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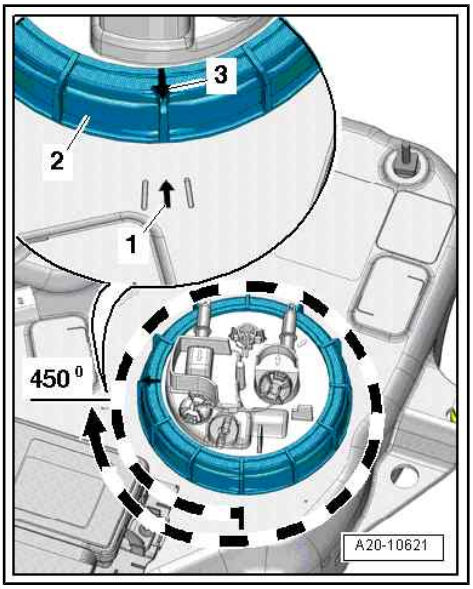


• Mark -3- on new union nut -2- and mark -1- (arrow with a line on each side) must be aligned.

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

– Install active tank for reducing agent ⇒ page 433 .

– Adapt learnt value after draining reducing agent or renewing components ⇒ page 5 .

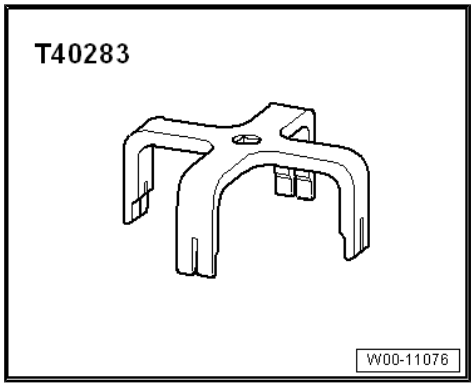


3.7.2 Removing and installing delivery unit for reducing agent - vehicles with internal pump for reducing agent

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Special tools and workshop equipment required

- Special wrench - T40283-



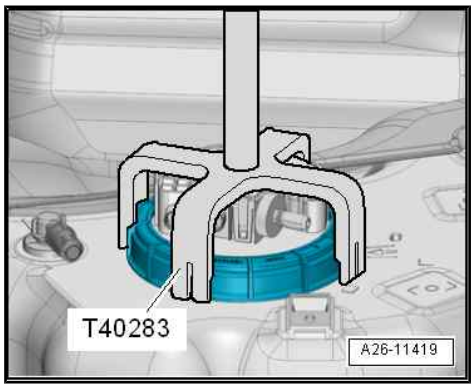
Removing

Observe safety precautions ⇒ page 4 .

Observe rules for cleanliness ⇒ page 8 .

– Remove reducing agent tank ⇒ page 433 .

– Unscrew union nut -2- using special wrench - T40283- and carefully lift off delivery unit -1-.



WARNING

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

- Tightening torques ⇒ page 420

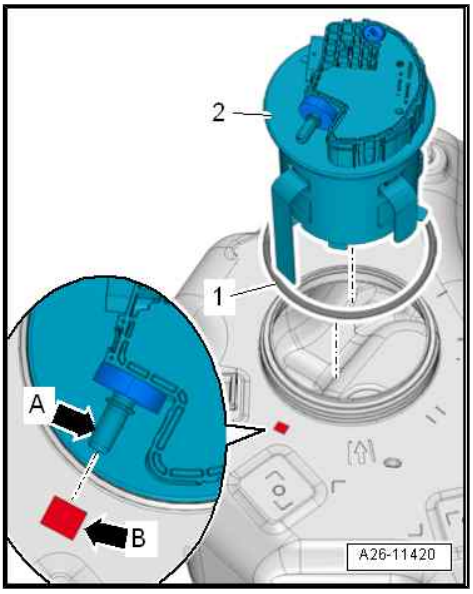
Note

- *Renew seal.*
- *Thoroughly clean sealing surfaces for seal.*

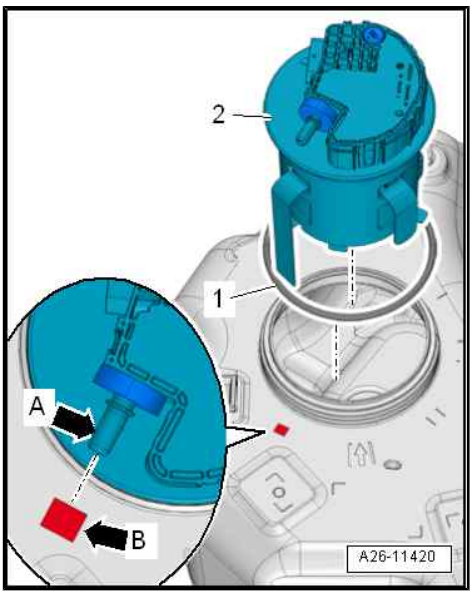
– Insert delivery unit -2- in tank; while doing so, carefully slide heating element into tank through gap between delivery unit and installation opening.
– Slip new seal -1- onto delivery unit and press it until it makes contact at installation opening.

• The seal must not be twisted.

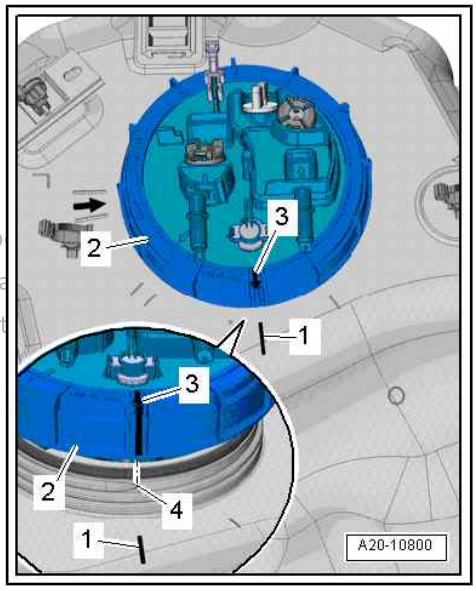
– Move delivery unit into installation position:



• Connection for reducing agent line -arrow A- must align with installation marking (square recess) -arrow B- on reducing agent 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 tank.
– First tighten union nut by hand and then use special wrench -T40283- to tighten it a total of $^{5}/_{4}$ turns (450°).



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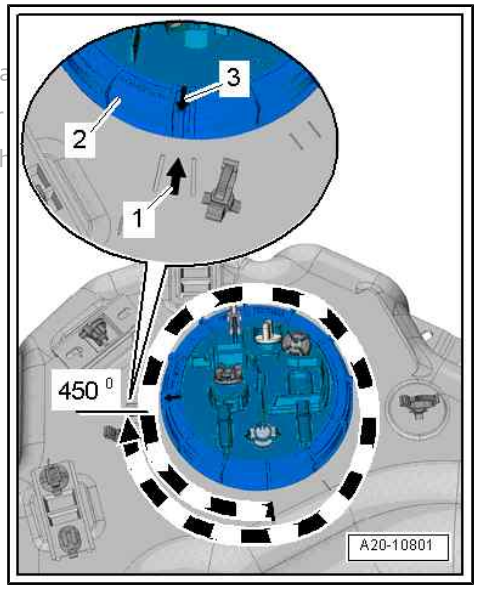
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- Mark -3- on union nut -2- and mark -1- (arrow with a line on each side) must be aligned.

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

– Install reducing agent tank ⇒ page 433 .

– Adapt learnt value after draining reducing agent or renewing components ⇒ page 5 .



3.8 Removing and installing injector for reducing agent - N474-

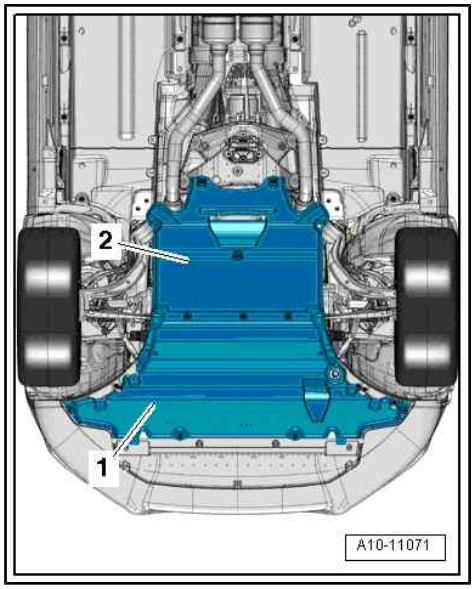
Removing

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

WARNING

Reducing agent can cause skin irritation.

- *Observe safety measures when handling reducing agent ⇒ page 4 .*
- *Put on safety goggles.*



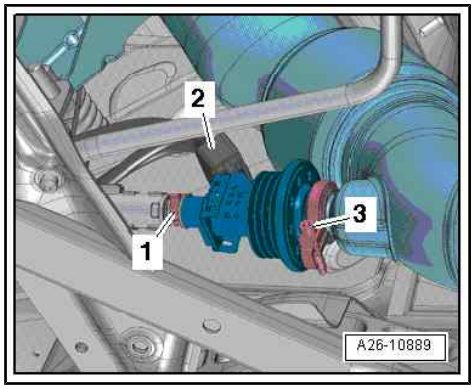
Note

Hold a clean cloth under the separating point to catch escaping reducing agent.

– Press release catches ⇒ page 423 and disconnect hose -1- from injector for reducing agent - N474- .

– Unplug electrical connector -2-.

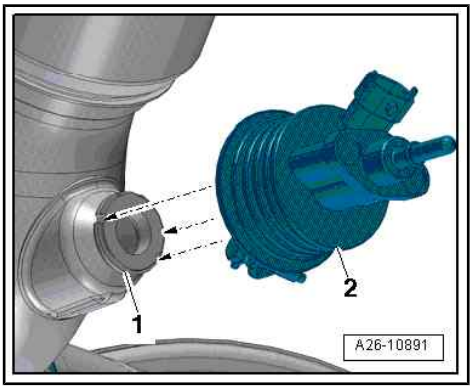
– Release retaining clip -3- and detach injector for reducing agent - N474- .



Installing

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

- Tightening torque
  ⇒ "3.4 Exploded view - injector for reducing agent N474 ", page 422



Note

Renew seal.

- Installation position: lugs in injector for reducing agent - N474- -item 2- must be inserted in corresponding mountings in front exhaust pipe -1-.

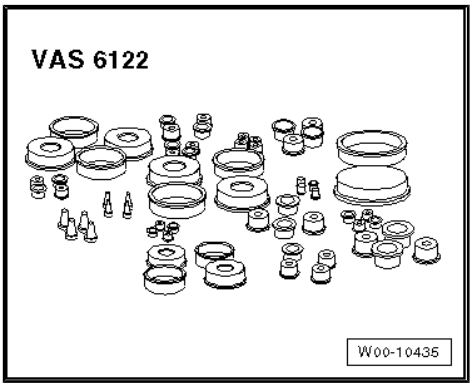
– Install noise insulation (rear) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .

– Adapt learnt value after draining reducing agent or renewing components ⇒ page 5 .

3.9 Draining active tank for reducing agent

Special tools and workshop equipment required

♦ Engine bung set - VAS 6122-



♦ Drip tray

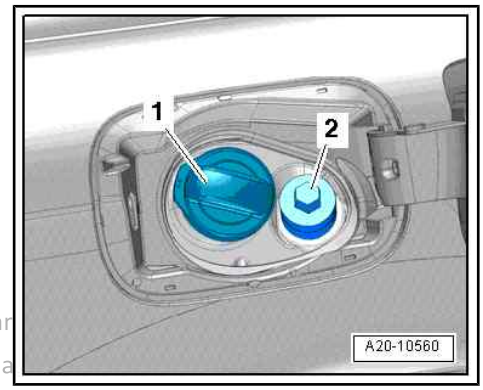
Procedure

Observe safety precautions ⇒ page 4 .

Observe rules for cleanliness ⇒ page 8 .

– Open tank flap.

– Unscrew filler cap -2- from filler neck for reducing agent.

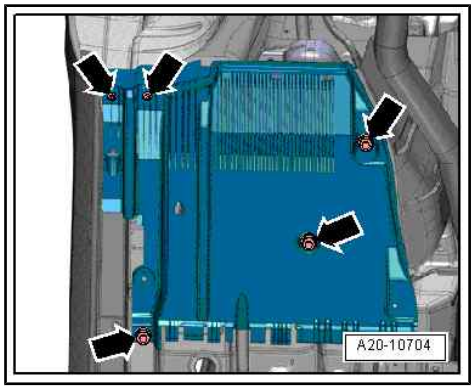


Note

Disregard -item 1-.

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– Remove bolt and nuts -arrows- and detach cover for active tank.



WARNING

Reducing agent can cause skin irritation.

- ***Avoid contact with the skin and eyes. Wear gloves and safety goggles.***
- ***If your skin has come into contact with reducing agent, rinse it off with soap and water.***
- ***If reducing agent gets into your eyes, rinse them out with water for several minutes.***
- ***Do not breathe in or swallow reducing agent.***
- ***If you have swallowed reducing agent, rinse your mouth, drink lots of water and consult a paramedic or doctor immediately.***

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– Place drip tray underneath.

Different types may be installed, depending on vehicle version.

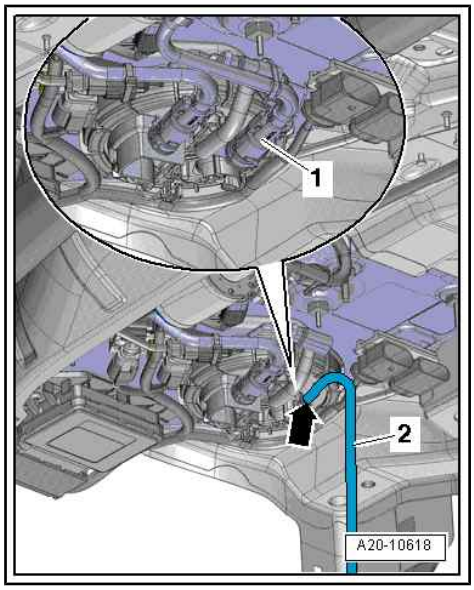
Type A:

Note

Hold a clean cloth under the separating point to catch escaping reducing agent.

– Press release catches ⇒ page 423 and disconnect return line -1- from reservoir.

– Attach auxiliary hose -2- to connection -arrow- on reservoir and drain off reducing agent into drip tray.



Type B:

– Remove sealing cap -1- on reducing agent tank.

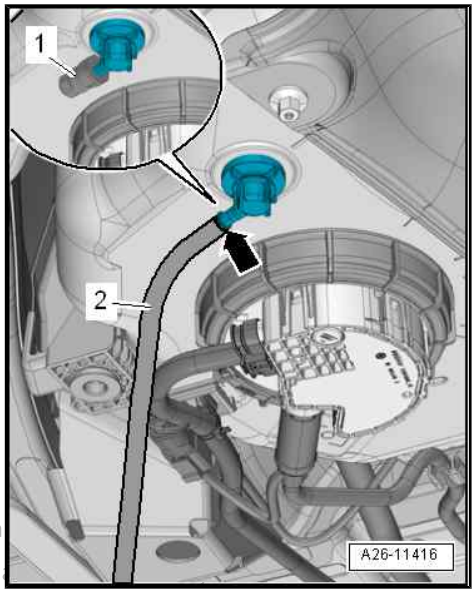
– Attach auxiliary hose -2- to connection and drain off reducing agent into drip tray.

Both types:

– Seal off open pipes/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 ⇒ page 5 .

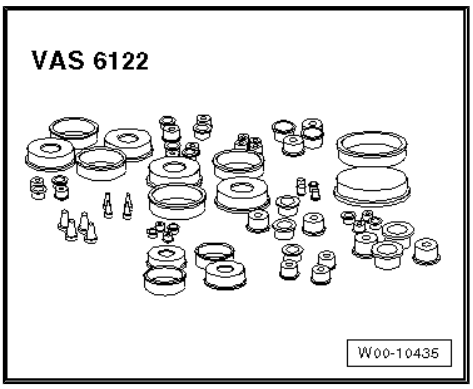


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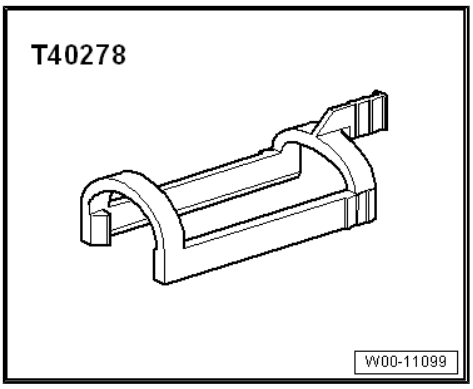
3.10 Removing and installing active tank for reducing agent

Special tools and workshop equipment required

♦ Engine bung set - VAS 6122-



♦ Release tool - T40278-



Removing

Observe safety precautions ⇒ page 4 .

Observe rules for cleanliness ⇒ page 8 .

WARNING

Safety risk due to escaping reducing agent.

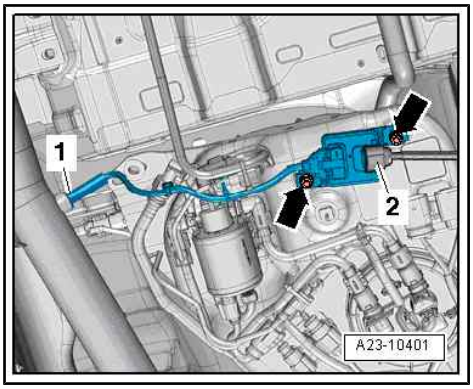
- ***To prevent large amounts of reducing agent from escaping when the metering line is opened, wait until the reducing agent has been drawn back automatically ⇒ page 4 .***

– Drain active tank for reducing agent ⇒ page 431 .

– Unplug electrical connector -2-.

– Remove nuts/clips -arrows- for control unit for NOx sender 2 - J881- .

– Move electrical wiring clear.

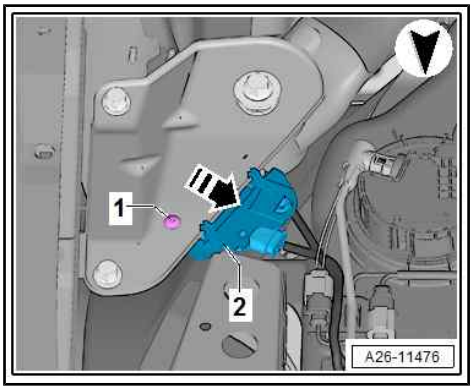


Note

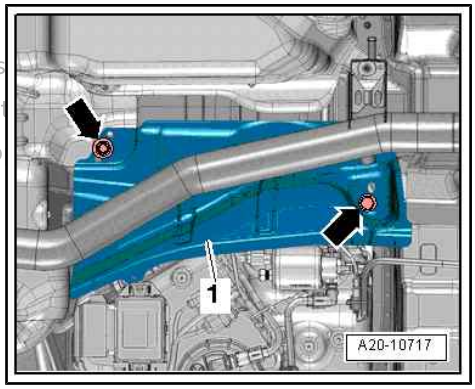
Disregard -item 1-.

– If fitted, remove bolt -1- and detach bracket with particulate sensor -2- in direction of -arrow-.

– Move electrical wiring clear.



– Remove bolts -arrows- and detach heat shield -1-.



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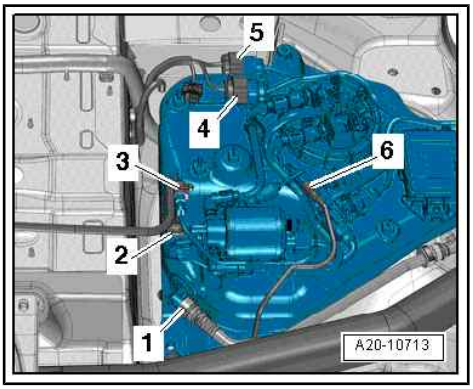
WARNING

Reducing agent can cause skin irritation.

- ***Avoid contact with the skin and eyes. Wear gloves and safety goggles.***
- ***If your skin has come into contact with reducing agent, rinse it off with soap and water.***
- ***If reducing agent gets into your eyes, rinse them out with water for several minutes.***
- ***Do not breathe in or swallow reducing agent.***
- ***If you have swallowed reducing agent, rinse your mouth, drink lots of water and consult a paramedic or doctor immediately.***

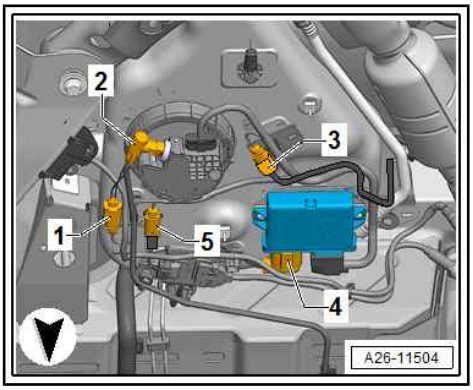
Vehicles with external pump for reducing agent - V437-

– Press release catches ⇒ page 423 and disconnect filler line -1- and metering line -2-.
– Unplug electrical connectors -3 ... 6- and move electrical wiring harness clear.



Vehicles with internal pump for reducing agent - V437-

– Unplug electrical connectors -1- and -3 … 5- and move electrical wiring clear.
– Disconnect line for reducing agent -2- ⇒ page 423 .



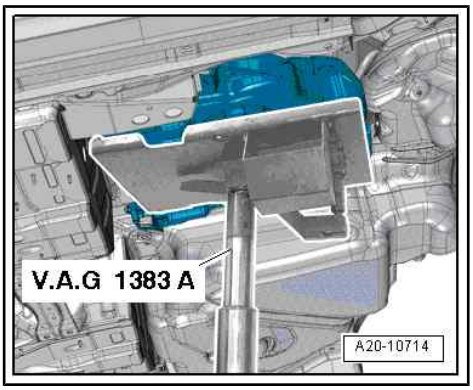
All vehicles:

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.



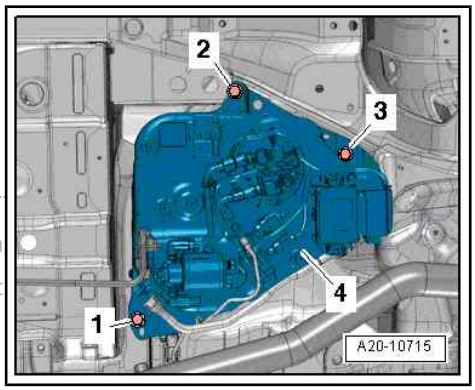
– Remove bolts -2- and -3- (have a second mechanic support the active tank -4- by hand).

Note

- *For greater clarity the active tank is shown without the engine and gearbox jack.*
- *Disregard -item 1-.*

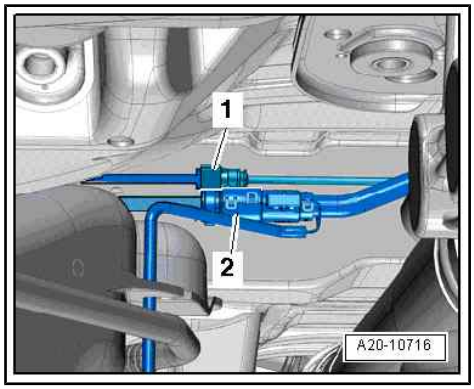
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– Then lower active tank about 100 mm using engine and gearbox jack - V.A.G 1383 A- (guide tank down by hand).



Note

Hold a clean cloth under the separating point to catch escaping reducing agent.



- Press release tab and disconnect transfer line -1-.
- Press release catches ⇒ page 423 and disconnect breather line -2-.
- Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .
- Continue lowering active 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:

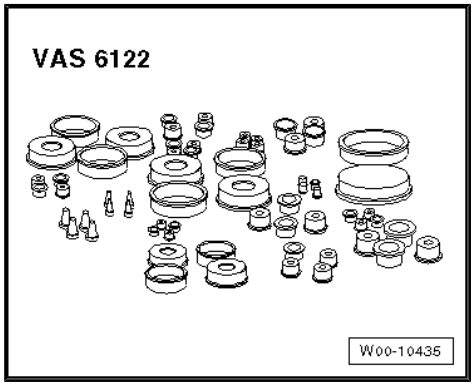
- Tightening torques ⇒ "3.11 Exploded view - active tank for reducing agent with attached components", page 415
- Check that lines are clipped onto active tank.
- Adapt learnt value after draining reducing agent or renewing components ⇒ page 5 .

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3.11 Draining passive tank for reducing agent

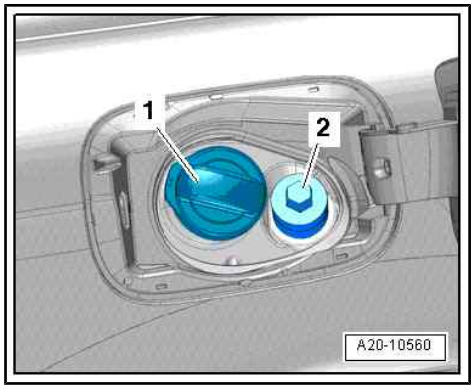
Special tools and workshop equipment required

- Engine bung set - VAS 6122-



- Drip tray

Procedure



Observe safety precautions ⇒ page 4 .

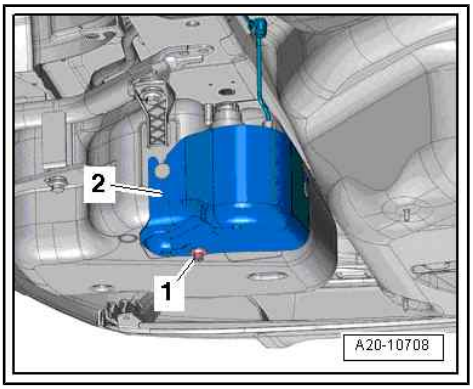
Observe rules for cleanliness ⇒ page 8 .

- 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- .

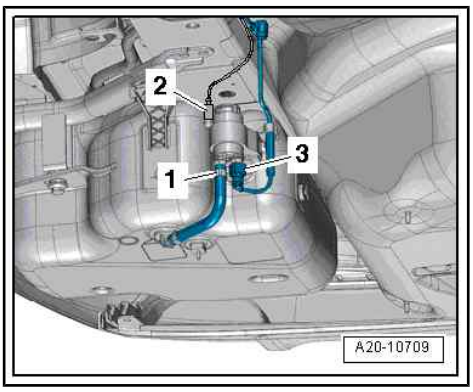


WARNING

Reducing agent can cause skin irritation.

- *Avoid contact with the skin and eyes. Wear gloves and safety goggles.*
- *If your skin has come into contact with reducing agent, rinse it off with soap and water.*
- *If reducing agent gets into your eyes, rinse them out with water for several minutes.*
- *Do not breathe in or swallow reducing agent.*
- *If you have swallowed reducing agent, rinse your mouth, drink lots of water and consult a paramedic or doctor immediately.*

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

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Note

Disregard items -2 and 3-.

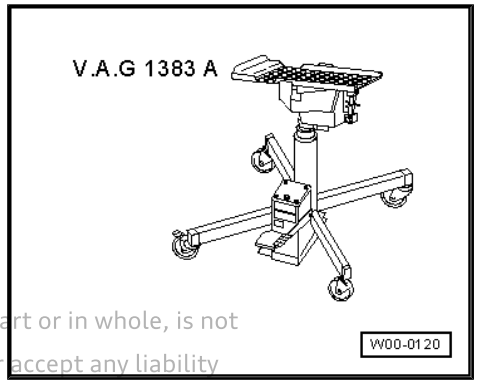
After re-filling, the following step must be carried out:

– Adapt learnt value after draining reducing agent or renewing components ⇒ page 5 .

3.12 Removing and installing passive tank for reducing agent

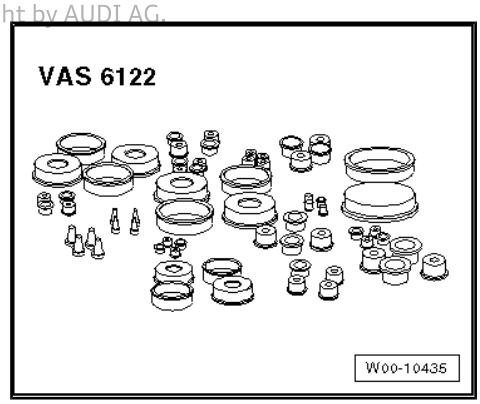
Special tools and workshop equipment required

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



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- Engine bung set - VAS 6122-



Removing

Observe safety precautions ⇒ page 4 .

Observe rules for cleanliness ⇒ page 8 .

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 .*

– Drain passive tank for reducing agent ⇒ page 436 .

WARNING

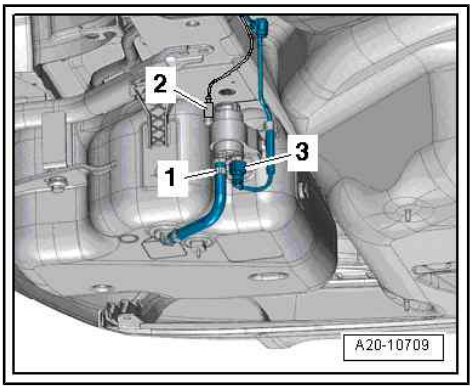
Reducing agent can cause skin irritation.

- *Avoid contact with the skin and eyes. Wear gloves and safety goggles.*
- *If your skin has come into contact with reducing agent, rinse it off with soap and water.*
- *If reducing agent gets into your eyes, rinse them out with water for several minutes.*
- *Do not breathe in or swallow reducing agent.*
- *If you have swallowed reducing agent, rinse your mouth, drink lots of water and consult a paramedic or doctor immediately.*

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 pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .
– Unplug electrical connector -2- and move electrical wire clear.



Note

Disregard -item 1-.

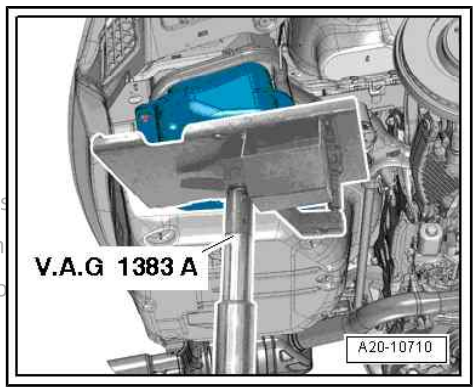
WARNING

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-.***

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– Position engine and gearbox jack - V.A.G 1383 A- below vehicle to support passive tank.

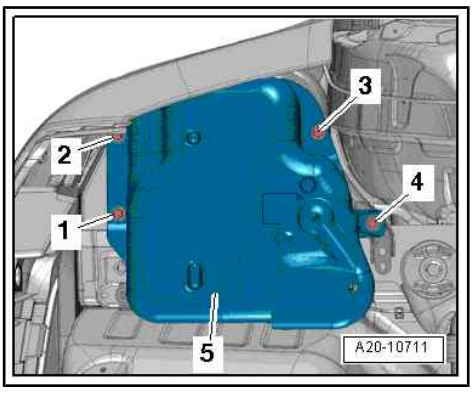


– Remove bolts -1 ... 4-.

Note

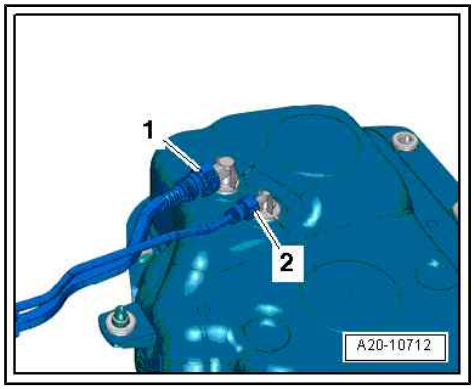
For greater clarity the passive tank is shown without the engine and gearbox jack.

– 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 pipes/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:

- Tightening torques
  ⇒ "3.1.2 Exploded view - passive tank for reducing agent with attached components", page 417
- Check that lines are clipped onto passive tank.
- Adapt learnt value after draining reducing agent or renewing components ⇒ page 5 .

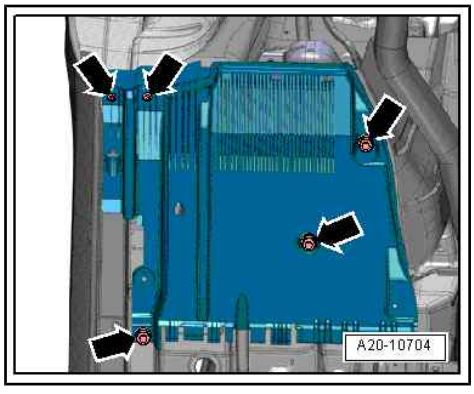
3.13 Removing and installing pressure sender for reducing agent metering system - G686-

Removing

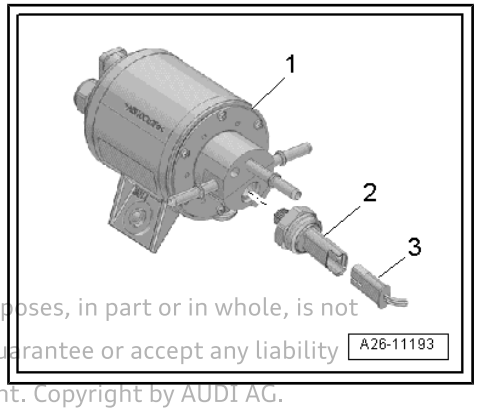
Observe safety precautions ⇒ page 4 .

Observe rules for cleanliness ⇒ page 8 .

- Switch off ignition and remove ignition key.
- Remove bolt and nuts -arrows- and detach cover for active tank.



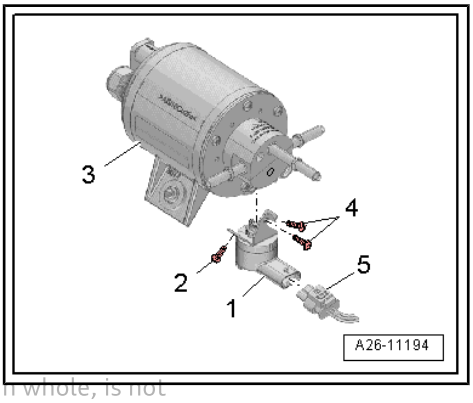
Pressure sender for reducing agent metering system - G686- version 1:



- Unplug electrical connector -3-.
- Unscrew pressure sender -2- from pump for reducing agent - V437- -item 1-.

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Pressure sender for reducing agent metering system - G686- version 2:



– Unplug electrical connector -5-.

– Unscrew bolts -2, 4- and detach pressure sender -1- from pump for reducing agent - V437- -item 3-.

Installing

Installation is carried out in reverse sequence.

Tightening torques:

- ⇒ “3.1.1 Exploded view - active tank for reducing agent with attached components”, page 415
- ⇒ Fig. “” Pressure sender for reducing agent metering system -G686- version 1 - tightening torque”“ , page 419
- ⇒ Fig. “” Pressure sender for reducing agent metering system -G686- version 2 - tightening torque”“ , page 419

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3.14 Removing and installing pump for reducing agent - V437-

Removing

Observe safety precautions ⇒ page 4 .

Observe rules for cleanliness ⇒ page 8 .

– Switch off ignition and remove ignition key.

WARNING

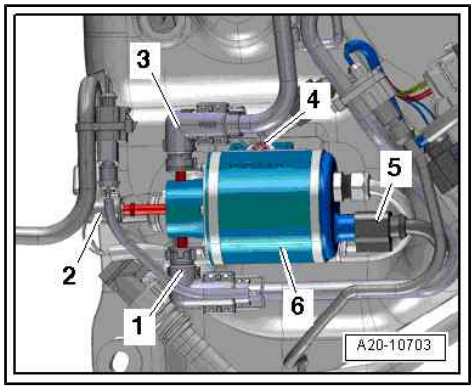
Safety risk due to escaping reducing agent.

- *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 .*

– Drain active tank for reducing agent ⇒ page 431 .

– Unplug electrical connector -5-.

– Unscrew bolt -4- and detach pump for reducing agent - V437- -item 6- from active tank.



WARNING

Reducing agent can cause skin irritation.

- ***Avoid contact with the skin and eyes. Wear gloves and safety goggles.***
- ***If your skin has come into contact with reducing agent, rinse it off with soap and water.***
- ***If reducing agent gets into your eyes, rinse them out with water for several minutes.***
- ***Do not breathe in or swallow reducing agent.***
- ***If you have swallowed reducing agent, rinse your mouth, drink lots of water and consult a paramedic or doctor immediately.***

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Note

Hold a clean cloth under the separating point to catch escaping reducing agent.

– Press release catches ⇒ page 423 and disconnect return line -1-, metering line -2- and supply line -3-.

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

Installing

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

- Tightening torque
  ⇒ “3.2 Exploded view - pump for reducing agent V437 ”, page 418

– Adapt learnt value after draining reducing agent or renewing components ⇒ page 5 .

3.15 Checking control unit for reducing agent metering system - J880-

- The control unit for reducing agent metering system - J880- actuates the transfer pump for reducing agent - V436- and the reducing agent heaters and processes the signals from the tank sender for reducing agent - G684- .
- You can check the control unit for reducing agent metering system -J880- via the `Guided Fault Finding` function ⇒ Vehicle diagnostic tester.

3.16 Removing and installing control unit for reducing agent metering system - J880-

Special tools and workshop equipment required

- Vehicle diagnostic tester

Note

Fitting location: control unit for reducing agent metering system - J880- is underneath active tank.

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Removing

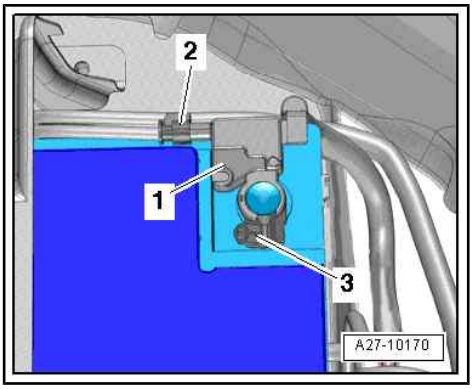
Observe safety precautions ⇒ page 4 .

Observe rules for cleanliness ⇒ page 8 .

Caution

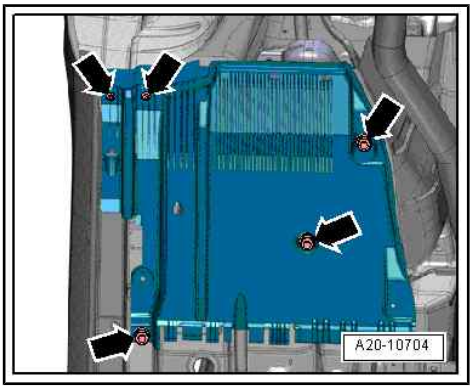
When disconnecting the battery there is a risk of irreparable damage to electronic components.

- ***Observe notes on procedure for disconnecting the battery.***
- ***Observe necessary waiting time before disconnecting the battery ⇒ page 4 .***
- ***Always switch off the ignition before disconnecting the battery.***

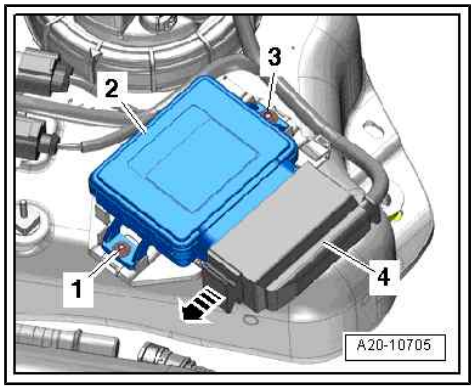


– Disconnect battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .

– Remove bolt and nuts -arrows- and detach cover for active tank.



– Release electrical connector -4- -arrow- and unplug.



Note

Depending on vehicle version, electrical connector may have two parts.

– Remove bolts -1- and -3- and detach control unit for reducing agent metering system - J880- -item 2-.

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.

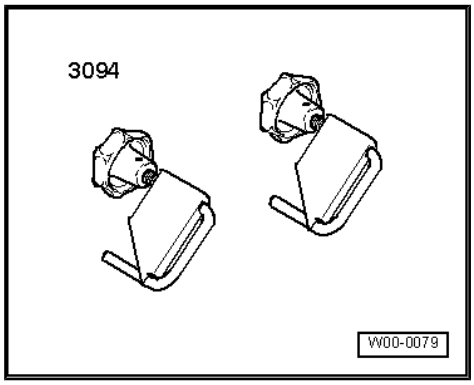
- Tightening torque
⇒ "3.5 Exploded view - control unit for reducing agent metering system", page 423

– Connect battery and perform steps required after re-connecting battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .

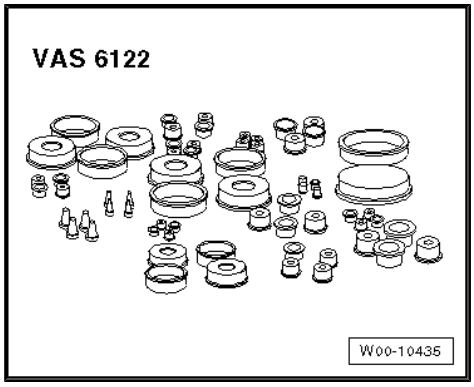
3.17 Removing and installing transfer pump for reducing agent - V436-

Special tools and workshop equipment required

♦ Hose clamps, up to 25 mm - 3094-



♦ Engine bung set - VAS 6122-



Removing

Observe safety precautions ⇒ page 4 .

Observe rules for cleanliness ⇒ page 8 .

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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 .*

Note

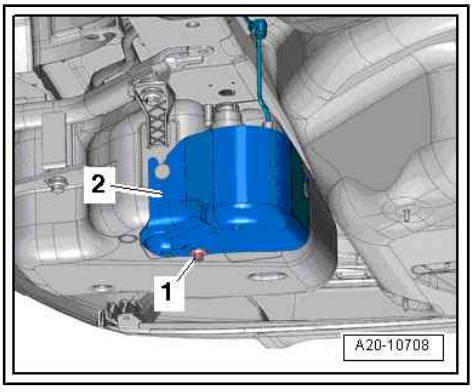
Hold a clean cloth under the separating point to catch escaping reducing agent.

WARNING

Reducing agent can cause skin irritation.

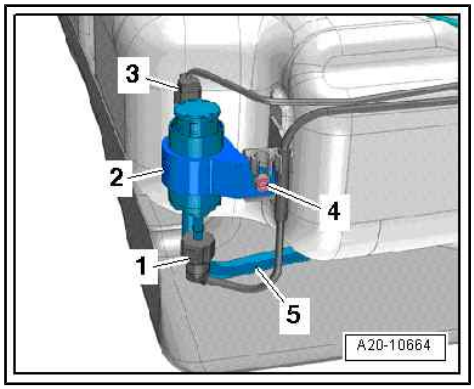
- *Avoid contact with the skin and eyes. Wear gloves and safety goggles.*
- *If your skin has come into contact with reducing agent, rinse it off with soap and water.*
- *If reducing agent gets into your eyes, rinse them out with water for several minutes.*
- *Do not breathe in or swallow reducing agent.*
- *If you have swallowed reducing agent, rinse your mouth, drink lots of water and consult a paramedic or doctor immediately.*

– Unscrew bolt -1- and remove cover -2- for transfer pump.



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– 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 pipes/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.



Installing

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

- Tightening torques
⇒ “3.1.1 Exploded view - active tank for reducing agent with attached components”, page 415

Note

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

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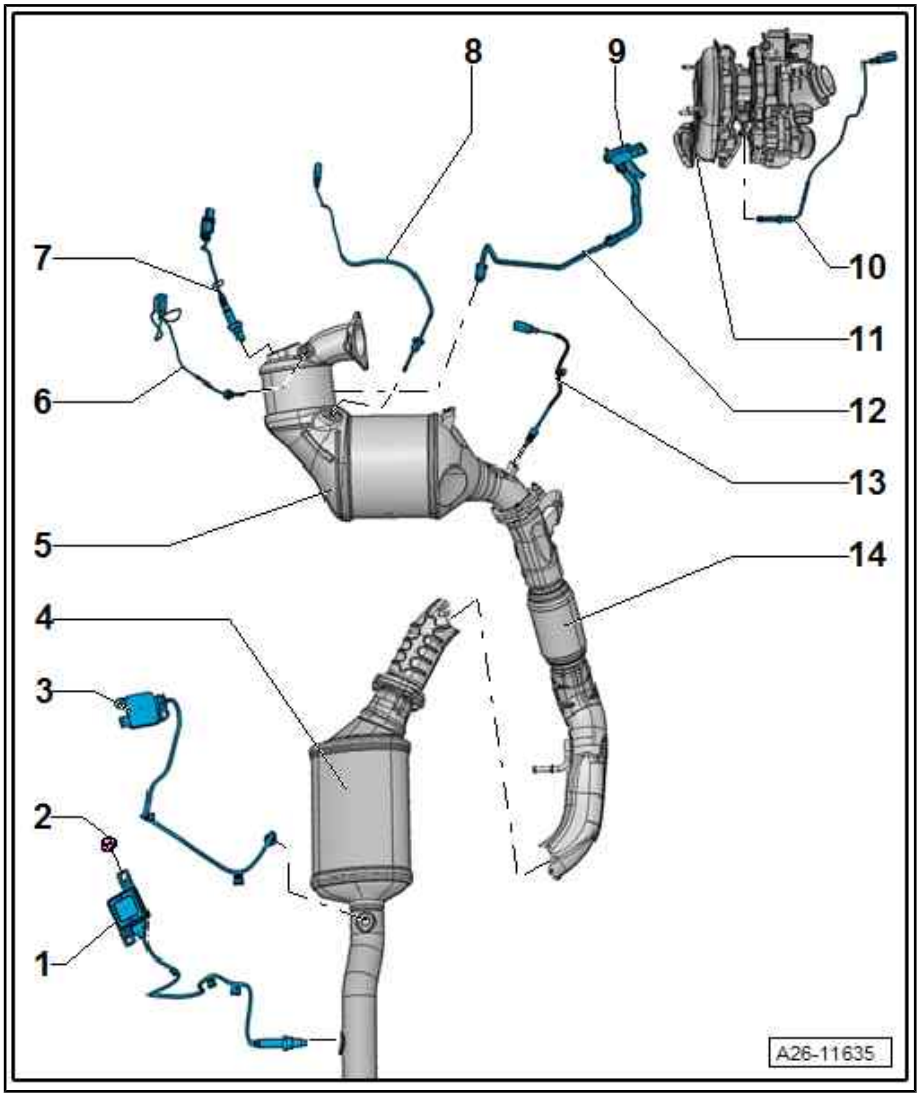
– Adapt learnt value after draining reducing agent or renewing components ⇒ page 5 .

4 Exhaust gas temperature control

⇒ "4.1 Exploded view - exhaust gas temperature control", page 447

⇒ "4.2 Removing and installing exhaust gas temperature sender", page 448

4.1 Exploded view - exhaust gas temperature control



1 - Control unit for NOx sender 2 - J881- with NOx sender 2 - G687-

- ❑ Removing and installing ⇒ page 456
- ❑ Installed on certain country-specific/vehicle versions ⇒ Electronic parts catalogue
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 50 Nm

2 - Nut

3 - Particulate sensor - G784-

- ❑ Removing and installing ⇒ page 454
- ❑ Installed on certain country-specific/vehicle versions ⇒ Electronic parts catalogue
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 50 Nm

4 - SCR catalytic converter

- ❑ Installed on certain country-specific/vehicle versions ⇒ Electronic parts catalogue
- ❑ After renewing, perform `Adaption` in `Guided Functions` ⇒ Vehicle diagnostic tester

5 - Particulate filter

6 - Exhaust gas temperature sender 2 - G448-

- ❑ Removing and installing ⇒ page 450
- ❑ Installed on certain country-specific/vehicle versions ⇒ Electronic parts catalogue
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 45 Nm

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7 - Lambda probe - G39- with Lambda probe heater - Z19-

- ❑ Removing and installing ⇒ page 394

8 - Exhaust gas temperature sender 3 - G495-

- ❑ Removing and installing ⇒ page 451

- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 45 Nm

9 - Pressure differential sender - G505-

- ❑ Removing and installing ⇒ page 391

10 - Exhaust gas temperature sender 1 - G235-

- ❑ Removing and installing ⇒ page 448
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 45 Nm

11 - Turbocharger

12 - Pressure line for exhaust gas pressure sensor 1 - G450-

- ❑ Fit into particulate filter, clip into bracket and tighten.
- ❑ 45 Nm

13 - Exhaust gas temperature sender 4 - G648-

- ❑ Removing and installing ⇒ page 453
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 45 Nm

14 - Front exhaust pipe

4.2 Removing and installing exhaust gas temperature sender

⇒ “4.2.1 Removing and installing exhaust gas temperature sender 1 G235 ”, page 448

⇒ “4.2.2 Removing and installing exhaust gas temperature sender 2 G448 ”, page 450

⇒ “4.2.3 Removing and installing exhaust gas temperature sender 3 G495 ”, page 451

⇒ “4.2.4 Removing and installing exhaust gas temperature sender 4 G648 ”, page 453

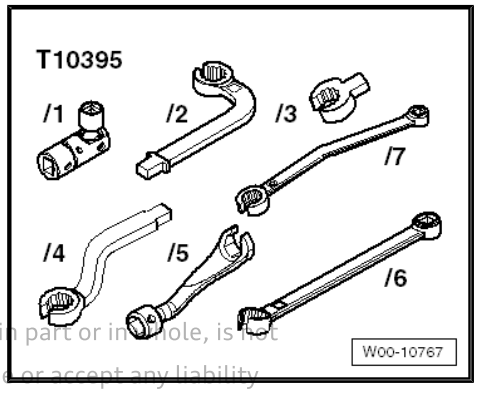
⇒ “4.2.5 Removing and installing particulate sensor G784 ”, page 454

⇒ “4.2.6 Removing and installing control unit for NOx sender 2 J881 with NOx sender 2 G687 ”, page 456

4.2.1 Removing and installing exhaust gas temperature sender 1 - G235-

Special tools and workshop equipment required

- ◆ Tool set, 17 mm - T10395-



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Removing

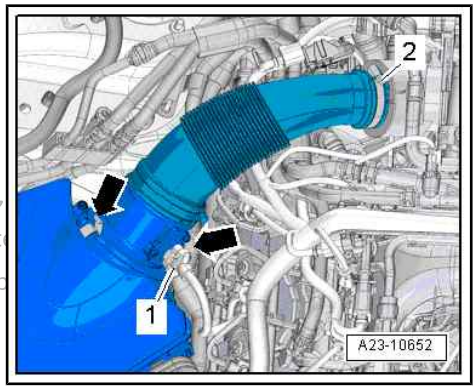
Note

- *Fit all cable ties in the original positions when installing.*
- *When removing, the electrical wiring must not be cut, otherwise a fault diagnosis would no longer be possible.*

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

– Unplug electrical connector -1-.

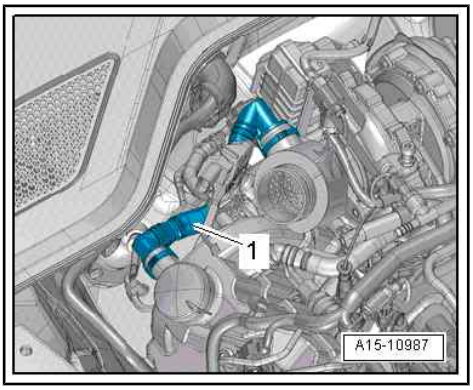
– Remove air hose and air mass meter - G70- . To do so, release hose clip -2- and clamps -arrows-.



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Caution

Depending on the vehicle version and country version, a crankcase breather hose may be fitted which cannot be detached from the cylinder head cover without being damaged irreparably. For these versions, the hose on the cylinder head cover will be damaged irreparably and must then be renewed.



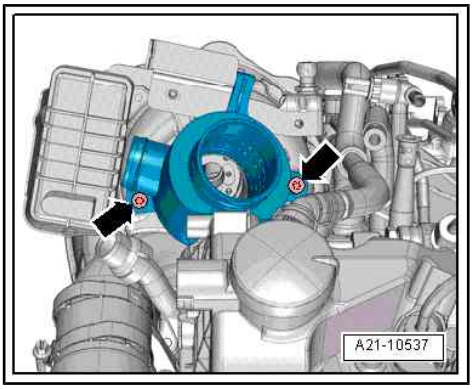
– Remove crankcase breather hose -arrow-; to do so, press release tabs (if present) or break hose connection at cylinder head cover as necessary.

– Remove bolts -arrows- and detach connection for turbocharger.

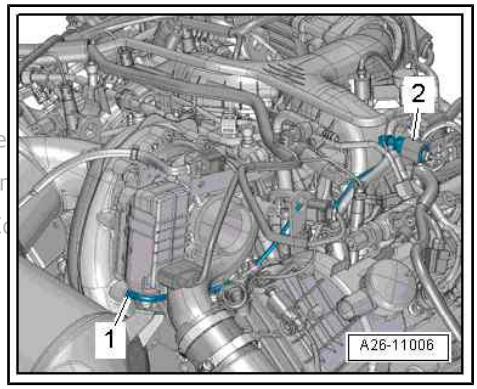
WARNING

When working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system ⇒ page 6 .***



– Detach electrical connector -2- from bracket and unplug.
– Unscrew exhaust gas temperature sender 1 - G235- -item 1- using a tool from tool set, 17 mm - T10395- .



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Installing

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

Tightening torques:

- ⇒ “4.1 Exploded view - exhaust gas temperature control”, page 447
- ⇒ “1.1 Exploded view - turbocharger”, page 295
- ⇒ “2.1 Exploded view - charge air system”, page 312

Note

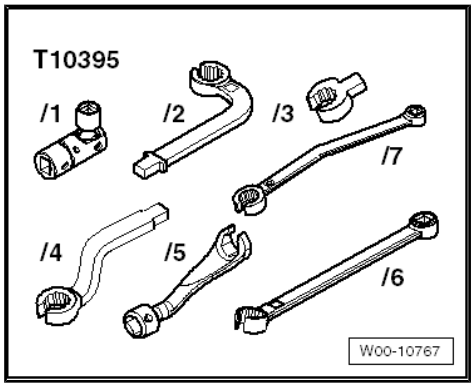
- *Fit new O-rings.*
- *Take care to protect exhaust gas temperature sender from knocks and impact; if dropped, the exhaust gas temperature sender can no longer be used.*
- *Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue*

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

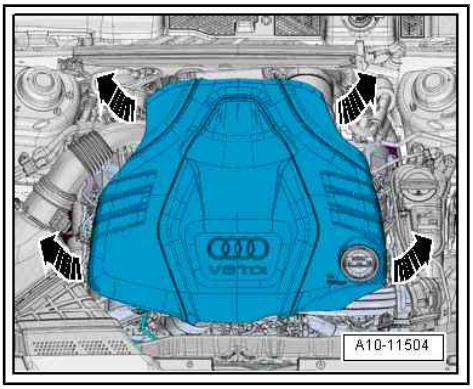
4.2.2 Removing and installing exhaust gas temperature sender 2 - G448-

Special tools and workshop equipment required

- Tool set, 17 mm - T10395-



Removing



Note

- *Fit all cable ties in the original positions when installing.*
- *When removing, the electrical wiring must not be cut, otherwise a fault diagnosis would no longer be possible.*

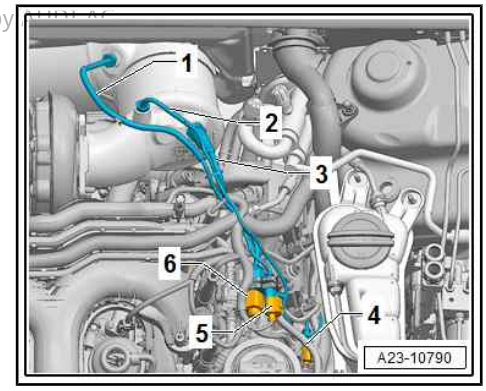
– Remove engine cover panel -arrows-.

WARNING

When working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system ⇒ page 6 .***

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

– Unscrew exhaust gas temperature sender 2 - G448- -item 2- using a tool from tool set, 17 mm - T10395- .

Installing

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

- Tightening torque
⇒ "4.1 Exploded view - exhaust gas temperature control", page 447

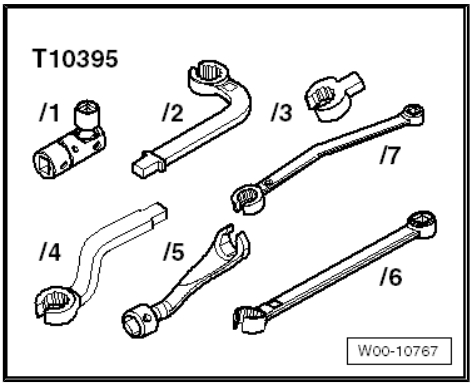
Note

- *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*

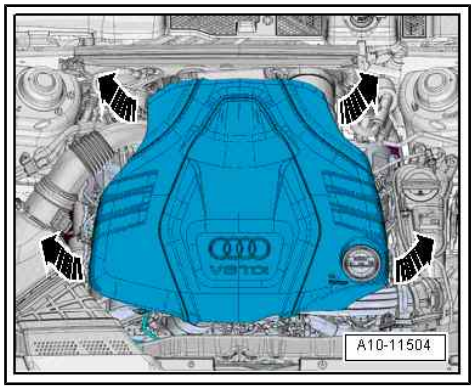
4.2.3 Removing and installing exhaust gas temperature sender 3 - G495-

Special tools and workshop equipment required

- Tool set, 17 mm - T10395-



Removing



Note

- *Fit all cable ties in the original positions when installing.*
- *When removing, the electrical wiring must not be cut, otherwise a fault diagnosis would no longer be possible.*

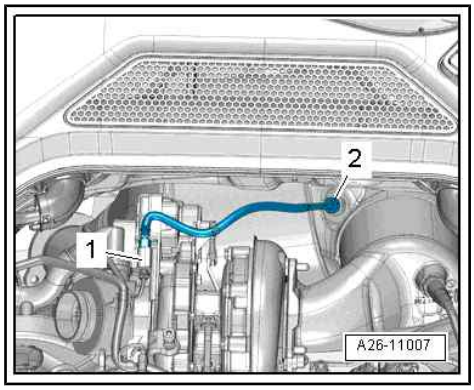
– Remove engine cover panel -arrows-.

WARNING

When working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system ⇒ page 6 .***

Exhaust temperature sender 3 - G495- - version 1:

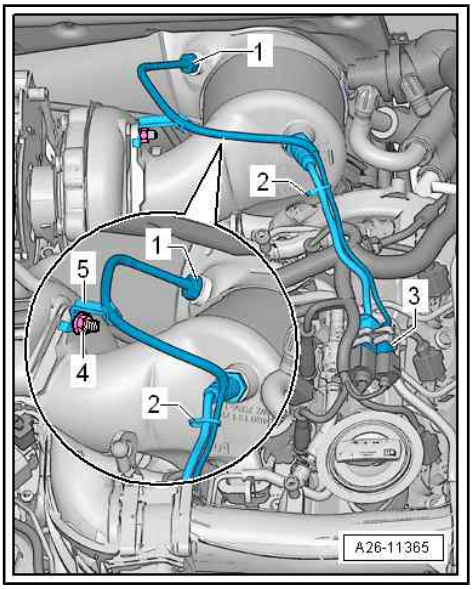


– Detach electrical connector -1- from bracket and unplug.

– Remove exhaust gas temperature sender 3 - G495- -item 2-.

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Exhaust temperature sender 3 - G495- - version 2:



– Detach electrical connector -3- from bracket and unplug.

– Unscrew exhaust gas temperature sender 3 - G495- -item 1- using a tool from tool set, 17 mm - T10395- .

Note

- *On vehicles without bracket -5-, remove nut -4- and install bracket.*
- *Route electrical wiring as shown in illustration.*
- *Attach cable tie -2- as shown in illustration.*

Installing

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

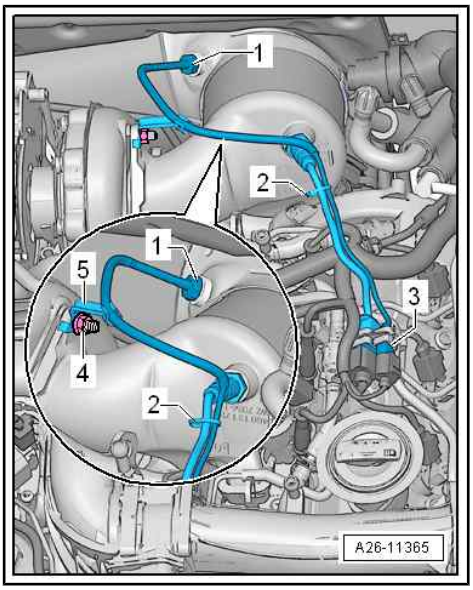
- Tightening torque
⇒ “4.1 Exploded view - exhaust gas temperature control”, page 447

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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*

Exhaust temperature sender 3 - G495- - version 2:



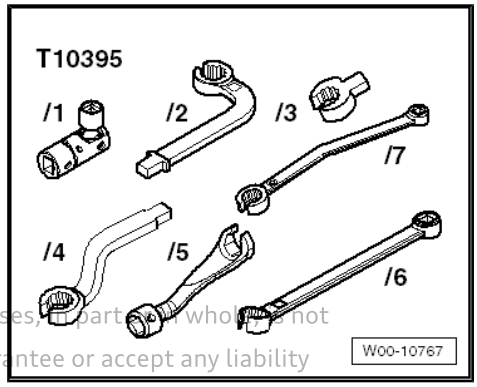
Note

- *On vehicles without bracket -5-, remove nut -4- and install bracket.*
- *Route electrical wiring as shown in illustration.*
- *Attach cable tie -2- as shown in illustration.*

4.2.4 Removing and installing exhaust gas temperature sender 4 - G648-

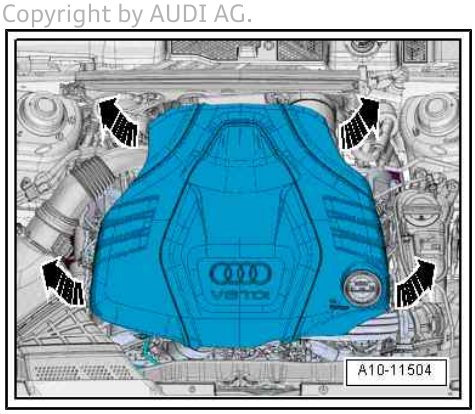
Special tools and workshop equipment required

- Tool set, 17 mm - T10395-



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Removing



Note

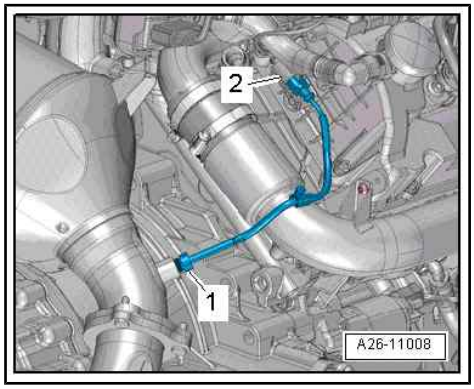
When removing, the electrical wiring must not be cut, otherwise a fault diagnosis would no longer be possible.

– Remove engine cover panel -arrows-.

WARNING

When working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system ⇒ page 6 .***



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

– Unscrew exhaust gas temperature sender 4 - G648- -item 1- using a tool from tool set, 17 mm - T10395- .

Installing

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

- Tightening torque
  ⇒ “4.1 Exploded view - exhaust gas temperature control”, page 447

Note

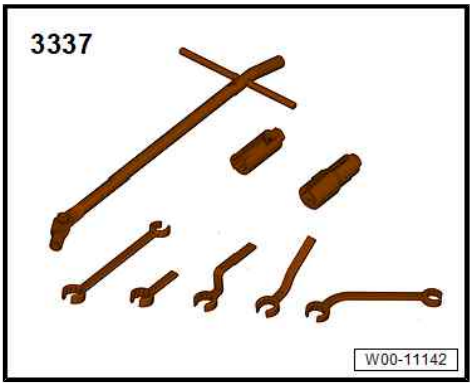
- *Take care to protect exhaust gas temperature sender from knocks and impact; if dropped, the exhaust gas temperature sender can no longer be used.*
- *Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue*

– Install air hoses with screw-type clips ⇒ page 313 .

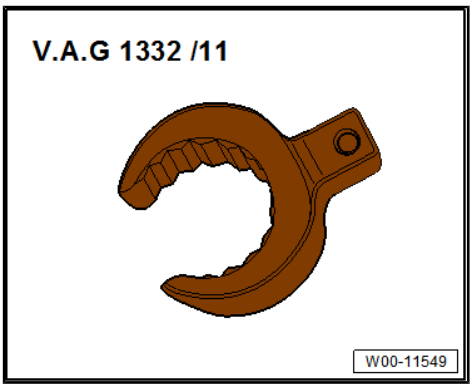
4.2.5 Removing and installing particulate sensor - G784-

Special tools and workshop equipment required

♦ Lambda probe open ring spanner set - 3337-



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



Removing

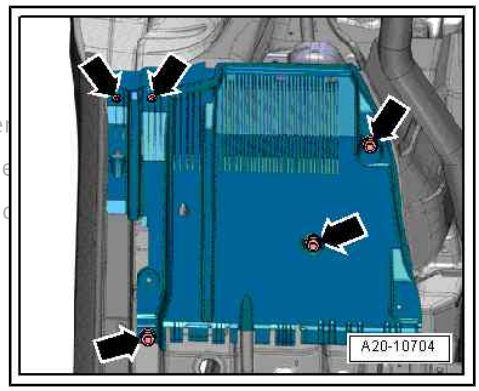
WARNING

When working on all parts of the exhaust system:

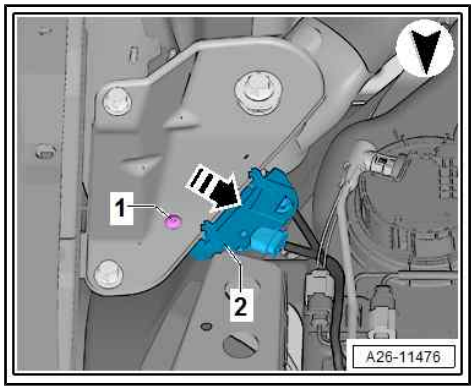
- ***Observe safety precautions when working on the exhaust system*** ***⇒ page 6*** ***.***

– Remove bolt and nuts -arrows- and detach cover for active tank.

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– Remove bolt -1- and detach bracket with particulate sensor - G784- -2- in direction of -arrow-.



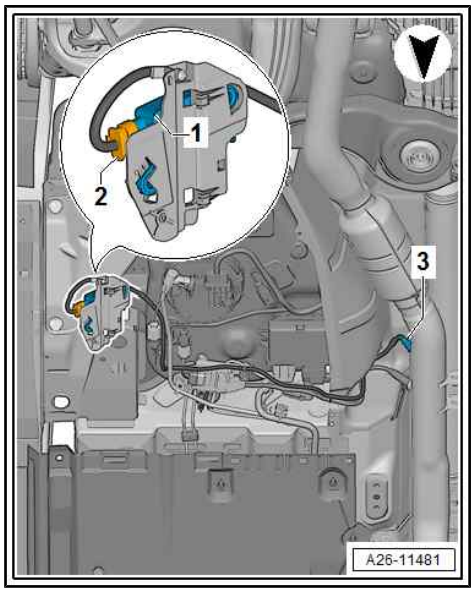
– Unclip control unit for particulate sensor - G784- -1- from bracket and unplug electrical connector -2-.

– Move electrical wiring clear.

Note

Different spanner sizes are required depending on the particulate sensors fitted.

– Unscrew particulate sensor - G784- -3- with appropriate size tool.



Installing

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

Note

- *New particulate sensors are coated with an assembly paste.*
- *When re-installing, coat thread of particulate sensor with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue.*

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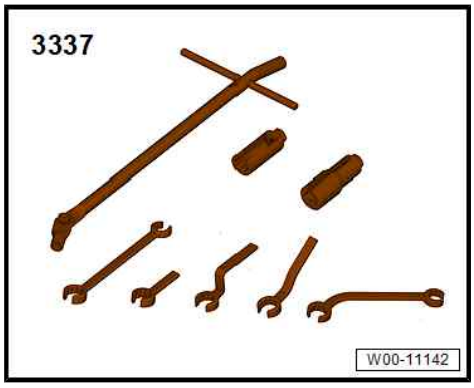
Tightening torques

- ⇒ “4.1 Exploded view - exhaust gas temperature control”, page 447

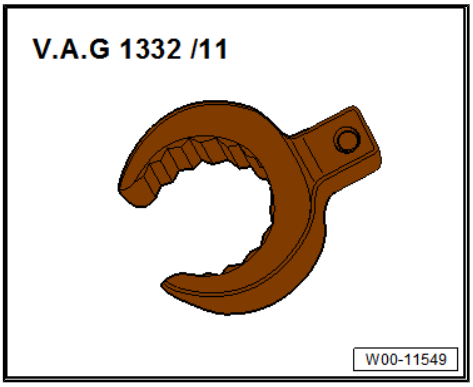
4.2.6 Removing and installing control unit for NOx sender 2 - J881- with NOx sender 2 - G687-

Special tools and workshop equipment required

- Lambda probe open ring spanner set - 3337-



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



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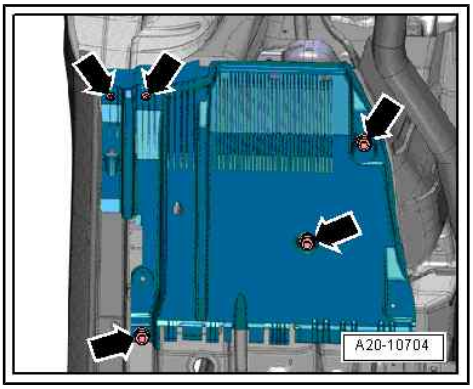
Removing

WARNING

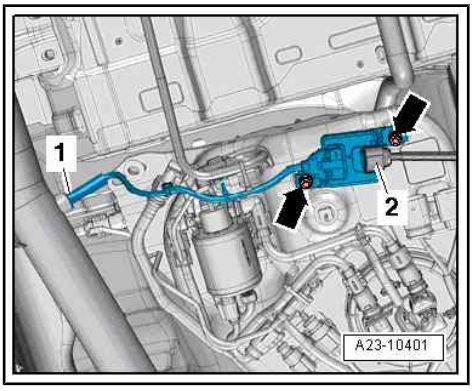
When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system ⇒ page 6 .*

– Remove bolt and nuts -arrows- and detach cover for active tank.



– Unplug electrical connector -2-.
– Unscrew nuts -arrows- for control unit for NOx sender 2 - J881- .
– Move electrical wiring clear.



Note

Different spanner sizes are required depending on the NOx sender 2 - G687- fitted.

– Unscrew NOx sender 2 - G687- -1- with appropriate size tool.

Installing

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

Tightening torques

- ⇒ “4.1 Exploded view - exhaust gas temperature control”, page 447

5 Exhaust gas recirculation

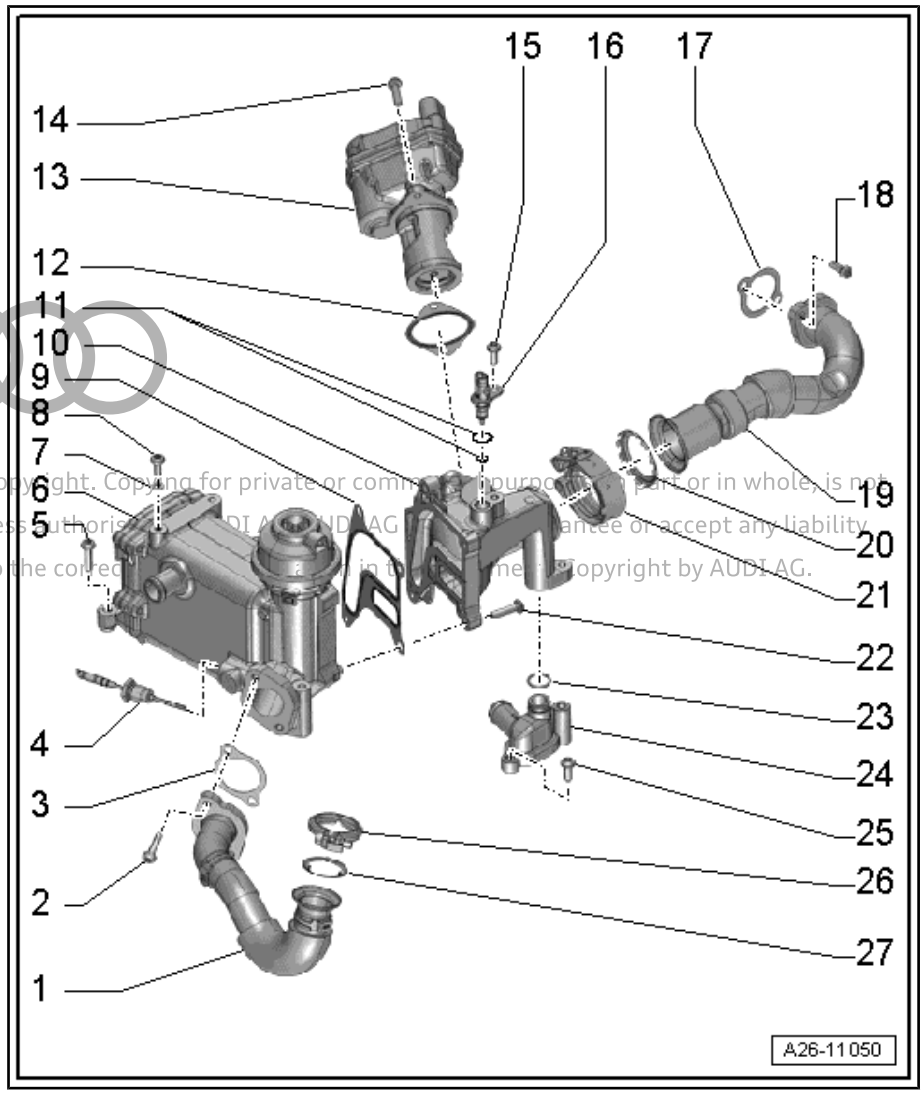
⇒ “5.1 Exploded view - exhaust gas recirculation system”, page 458

⇒ “5.2 Removing and installing exhaust gas recirculation cooler”, page 461

⇒ “5.3 Removing and installing exhaust gas recirculation control motor V338 ”, page 462

⇒ “5.4 Removing and installing exhaust gas recirculation temperature sensor G98 ”, page 463

5.1 Exploded view - exhaust gas recirculation system



1 - Exhaust gas recirculation pipe

- ❑ To intake manifold
- ❑ Tightening torque and sequence ⇒ page 460

2 - Bolt

- ❑ Tightening torque and sequence ⇒ page 460

3 - Gasket

- ❑ Renew

4 - Exhaust gas recirculation temperature sensor - G98-

- ❑ 35 Nm for aluminium exhaust gas recirculation cooler
- ❑ 45 Nm for steel exhaust gas recirculation cooler
- ❑ Removing and installing ⇒ page 463

5 - Bolt

- ❑ 9 Nm

6 - Exhaust gas recirculation cooler

- ❑ Removing and installing ⇒ page 461
- ❑ Before fitting, grease exhaust gas recirculation pipe at exhaust gas recirculation cooler ⇒ page 460

7 - Seal

- ❑ Renew

8 - Bleeder screw

9 - Seal

- ❑ Renew

10 - Connection

11 - O-rings

- ❑ Renew

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12 - Gasket
- ❑ Renew

13 - Exhaust gas recirculation control motor - V338-
- ❑ Note installation position
- ❑ With exhaust gas recirculation potentiometer - G212-
- ❑ Removing and installing ⇒ page 462

14 - Bolt
- ❑ 9 Nm

15 - Bolt
- ❑ 9 Nm

16 - Coolant temperature sender - G62-
- ❑ Removing and installing ⇒ page 270

17 - Gasket
- ❑ Renew

18 - Bolt
- ❑ Tightening torque and sequence ⇒ page 461

19 - Exhaust gas recirculation pipe
- ❑ From turbocharger
- ❑ Exhaust gas recirculation pipe and screw-type clip must always be renewed if screw-type clip -item 21- has been loosened
- ❑ Before fitting, grease exhaust gas recirculation pipe at exhaust gas recirculation cooler ⇒ page 460
- ❑ Tightening torque and sequence ⇒ page 461

20 - Gasket
- ❑ Renew

21 - Screw-type clip
- ❑ Renew
- ❑ If screw-type clip has been unfastened, exhaust gas recirculation pipe -item 19- and screw-type clip must always be renewed
- ❑ Tightening torque and sequence ⇒ page 461

22 - Bolt
- ❑ 9 Nm

23 - O-ring
- ❑ Renew

24 - Coolant connection

25 - Bolt
- ❑ Tightening torque ⇒ Item 7 (page 265)

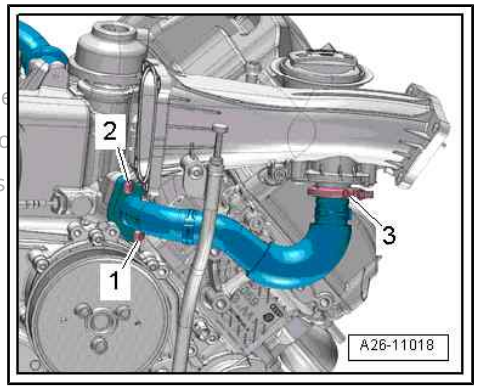
26 - Screw-type clip
- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 460

27 - Gasket
- ❑ Renew

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Exhaust gas recirculation pipe to intake manifold - tightening torque and sequence



- Collar of exhaust gas recirculation pipe must not be distorted or bent.

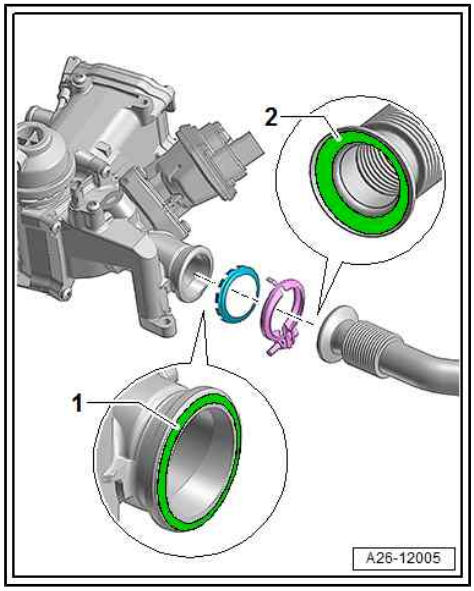
– Fit exhaust gas recirculation pipe with gaskets and screw-type clip.

Note

Coat threads of bolts with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .

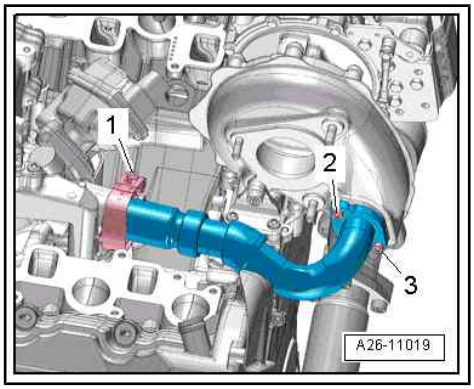
Stage	Bolts/screw-type clip	Tightening torque
1.	-1, 2-	Screw in by hand until bolt heads make contact
2.	-3-	Position as illustrated 2.5 Nm
3.	-1, 2-	9 Nm

Greasing exhaust gas recirculation pipe at exhaust gas recirculation cooler before fitting



– Before fitting, grease illustrated areas -1- and -2- lightly with commercially available grease.

Exhaust gas recirculation pipe to turbocharger - tightening torque and sequence



Note

- *Renew exhaust gas recirculation pipe and screw-type clip if screw-type clip has been unfastened*
- *Renew the bolts tightened with specified tightening angle.*

– Fit exhaust gas recirculation pipe with gaskets and screw-type clip.

Note

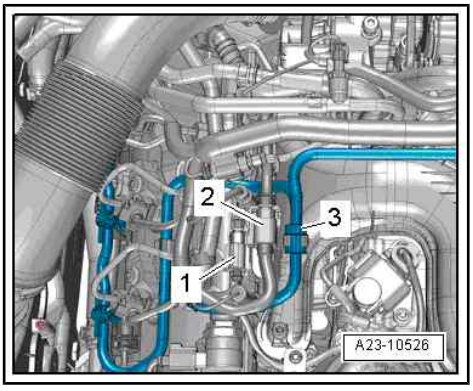
Coat threads of bolts with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .

Stage	Bolts/screw-type clip	Tightening torque
1.	-2, 3-	Screw in by hand until bolt heads make contact
2.	-1-	Position according to tab on exhaust gas recirculation pipe Tightening torque: ♦ Part number 059 131 548 C: 5 Nm ♦ Part number 059 131 548 D: 3.5 Nm
3.	-2, 3-	5 Nm
4.	-2, 3-	Turn 90° further

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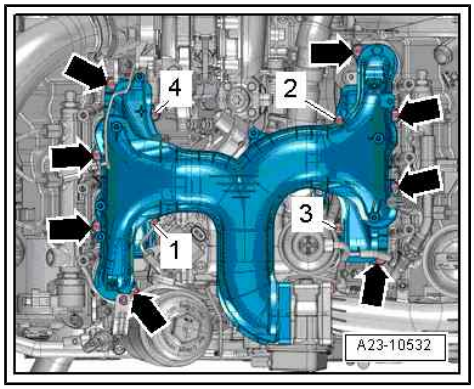
5.2 Removing and installing exhaust gas recirculation cooler

Removing

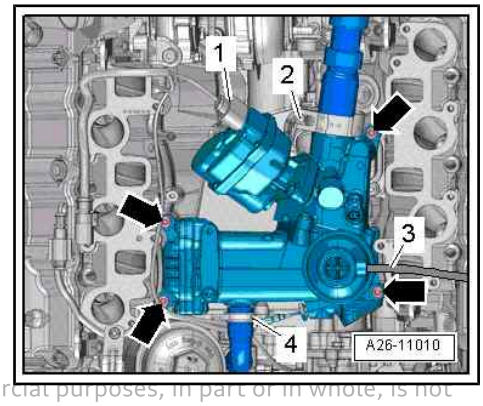


– Drain coolant ⇒ page 253 .
– Detach electrical connector -1- from bracket and unplug.
– Take electrical connector -2- and retention valve -3- out of bracket.

– Remove intake manifold ⇒ page 343 .



– Disconnect vacuum hose -3-.
– Unplug electrical connector -1-.
– Loosen clamp -2- and push to rear.
– Release hose clip -4- and detach coolant hose.
– Remove bolts -arrows- and lift exhaust gas recirculation cooler off connection.



Installing

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

- Tightening torque ⇒ "5.1 Exploded view - exhaust gas recirculation system", page 458

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Note

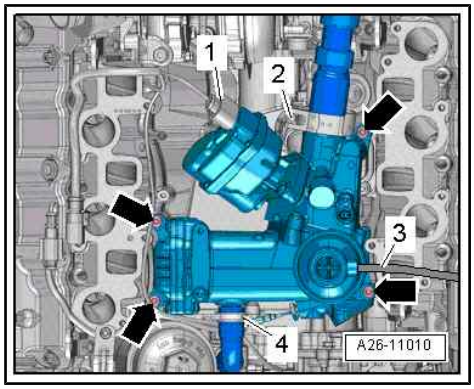
- *Renew gaskets, seals and O-rings.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

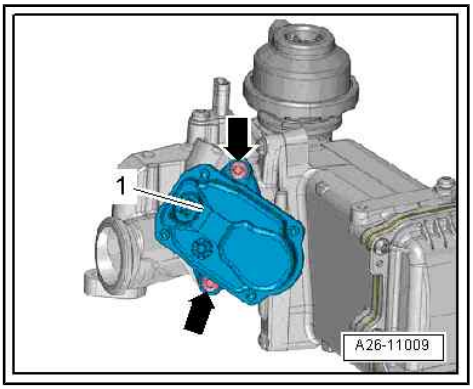
– Install intake manifold ⇒ page 343 .
– Fill up with coolant ⇒ page 254 .

5.3 Removing and installing exhaust gas recirculation control motor - V338-

Removing

– Remove intake manifold ⇒ page 343 .
– Unplug electrical connector -1-.





Note

Note installation position of exhaust gas recirculation control motor .

– Remove bolts -arrows-.
– Move coolant line and fuel line clear.
– Press coolant line and fuel line back and pull exhaust gas recirculation control motor - V338- out of exhaust gas recirculation cooler.

Installing

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

- Tightening torques
⇒ "5.1 Exploded view - exhaust gas recirculation system", page 458

Note

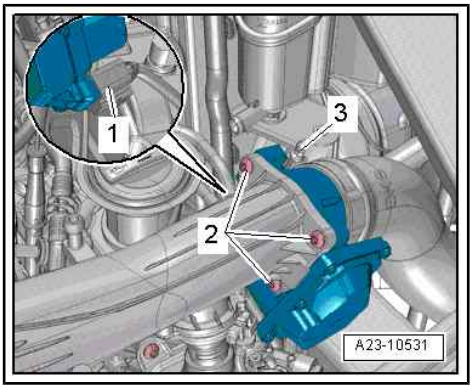
Note installation position of exhaust gas recirculation control motor .

– Install intake manifold ⇒ page 343 .

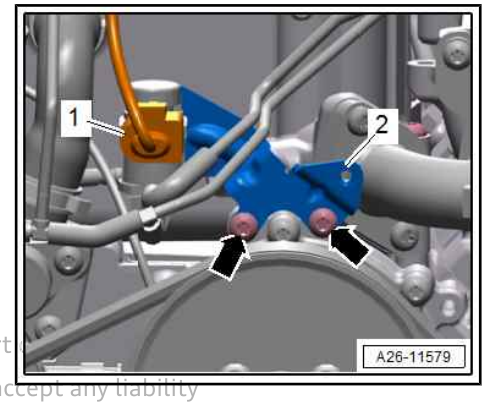
5.4 Removing and installing exhaust gas recirculation temperature sensor - G98-

Removing

– Remove engine cover panel ⇒ page 98 .
– Remove intake manifold flap motor - V157- ⇒ page 348 .
– Unplug electrical connector -1-.
– Release hose clip -3- and detach throttle valve module - J338- with air pipe.

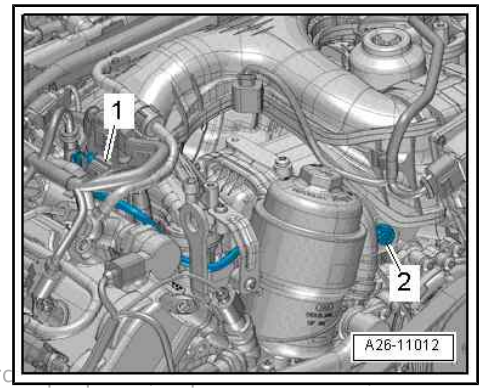


– Unscrew bolts -arrows- and push bracket -2- with exhaust gas recirculation cooler change-over valve - N345- to one side.



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– Take electrical connector -1- out of bracket, unplug it and move electrical wiring clear.
– Unscrew exhaust gas recirculation temperature sensor - G98- -item 2-.



Installing

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

- Tightening torque
⇒ “5.1 Exploded view - exhaust gas recirculation system”, page 458

– Install engine cover panel ⇒ page 98 .

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6 Exhaust manifolds

⇒ "6.1 Exploded view - exhaust manifold", page 465
⇒ "6.2 Removing and installing exhaust manifold", page 466

6.1 Exploded view - exhaust manifold

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Note

The illustration shows the exhaust manifold for cylinder bank 2 (left-side).

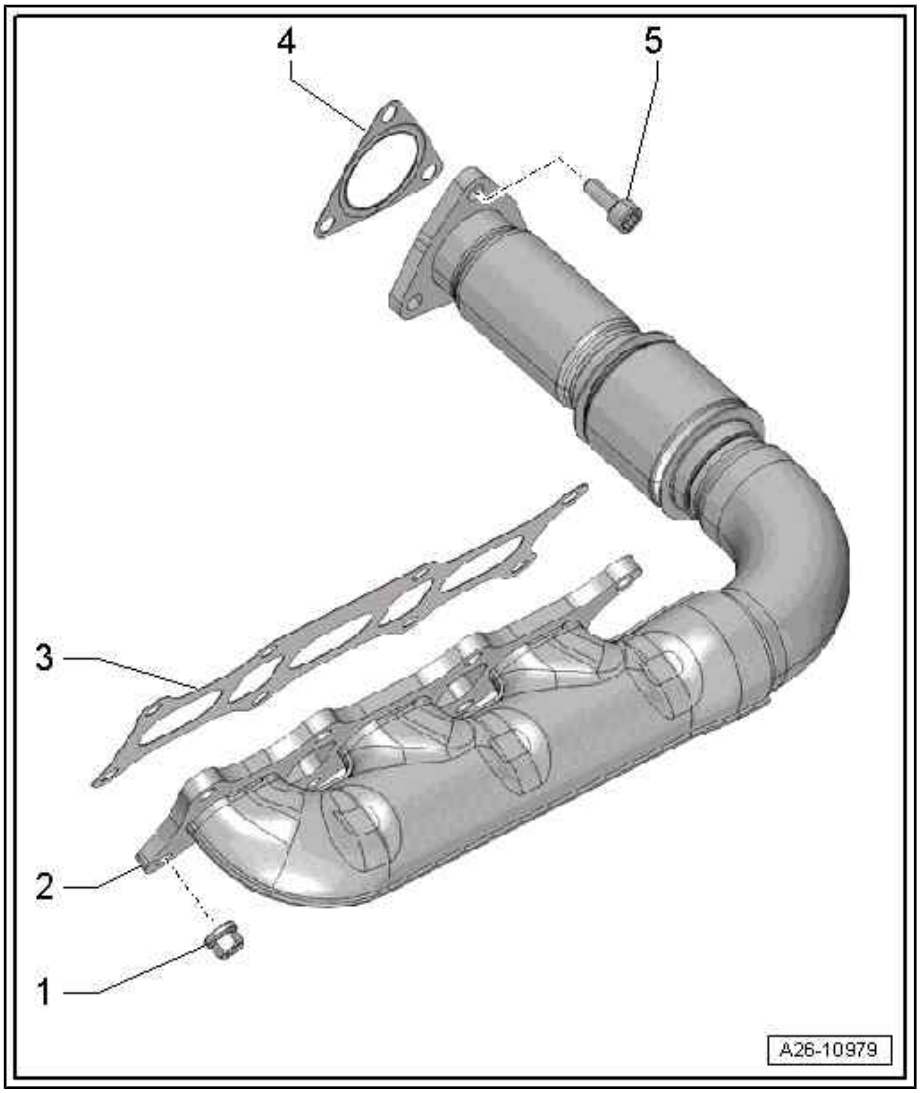
1 - Nut
- ❑ Renew
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 25 Nm

2 - Exhaust manifold
- ❑ Removing and installing: left-side ⇒ page 466 , right-side ⇒ page 468

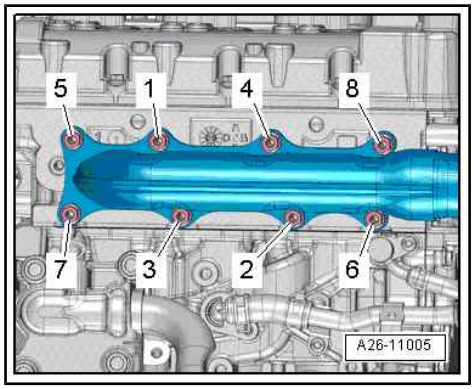
3 - Gasket
- ❑ Renew

4 - Gasket
- ❑ Renew

5 - Bolt
- ❑ Renew
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 30 Nm +90°



Exhaust manifold - tightening torque and sequence



Note

- *Renew nuts.*
- *Coat threads of nuts with high-temperature paste; for high temperature paste refer to ⇒ Electronic parts catalogue .*

– Tighten nuts in 3 stages in the sequence shown:

Stage	Nuts	Tightening torque
1.	-1 … 9-	Screw in by hand until contact is made
2.	-1 … 9-	15 Nm
3.	-1 … 9-	25 Nm

6.2 Removing and installing exhaust manifold

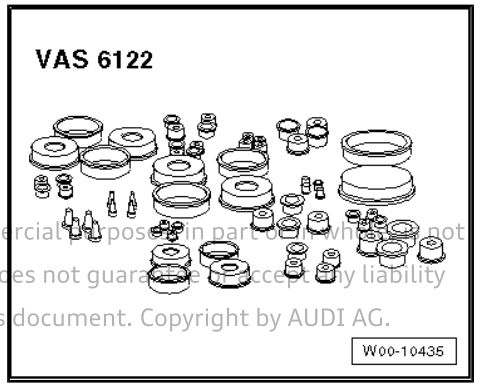
⇒ "6.2.1 Removing and installing exhaust manifold (left-side)", page 466

⇒ "6.2.2 Removing and installing exhaust manifold (right-side)", page 468

6.2.1 Removing and installing exhaust manifold (left-side)

Special tools and workshop equipment required

- Engine bung set - VAS 6122-



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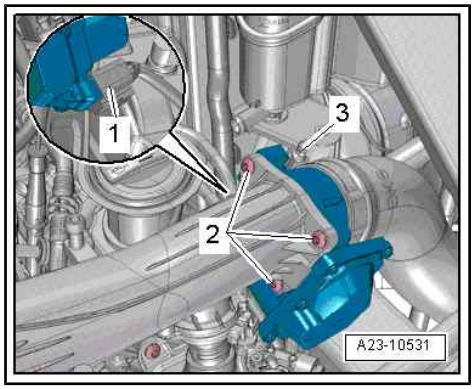
Removing

– Remove particulate filter:

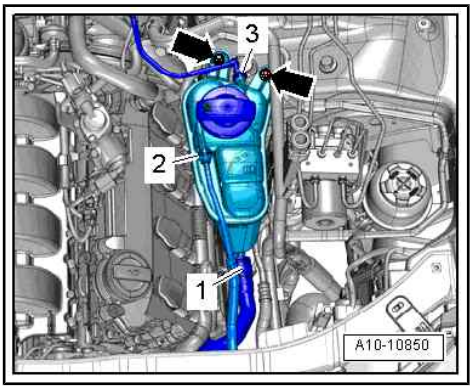
- Vehicles with manual gearbox/multitronic gearbox 0AW ⇒ page 411
- Vehicles with dual clutch gearbox 0B5 ⇒ page 412 .

– Remove throttle valve module - J338- ⇒ page 350 .

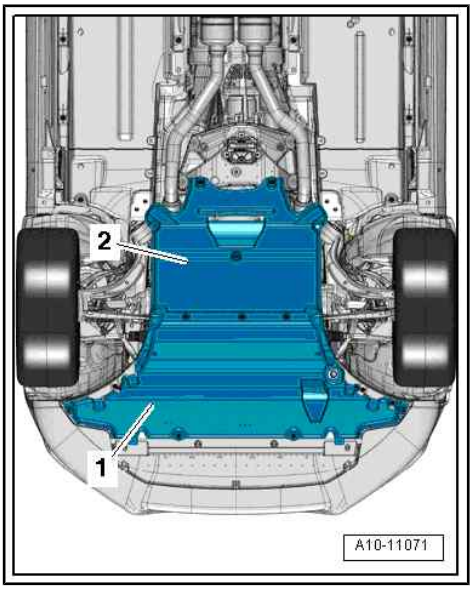
– Remove poly V-belt ⇒ page 106 .



– Disconnect coolant hose -3- from coolant expansion tank.
– Remove bolts -arrows- and move coolant expansion tank to side with coolant hoses -1, 2- attached.



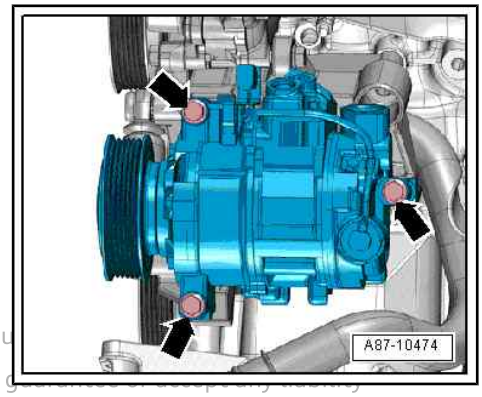
– Remove front noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .



Caution

Risk of damage to refrigerant lines and hoses

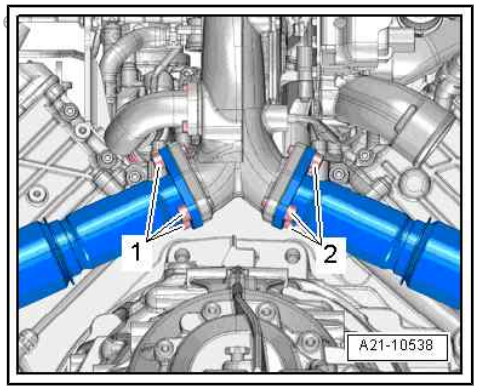
- *Do NOT stretch, kink or bend refrigerant lines and hoses.*



– Remove bolts -arrows- and push air conditioner compressor to the side.

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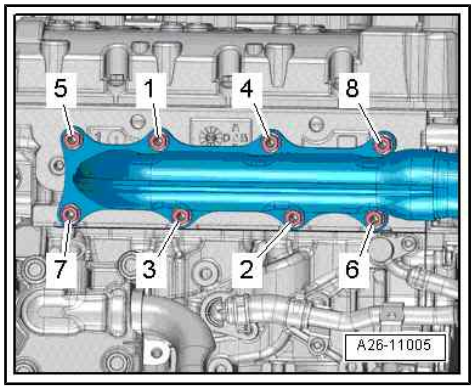
– Remove bolts -1-.



Note

Disregard -item 2-.

– Loosen and remove nuts in the sequence: -8 ... 1- and detach exhaust manifold.



Installing

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

Tightening torques

- ⇒ “6.1 Exploded view - exhaust manifold”, page 465
- ⇒ Fig. ““Exhaust manifold - tightening torque and sequence”“ , page 466
- ⇒ Fig. ““Installing air hoses with screw-type clips”“ , page 313

Note

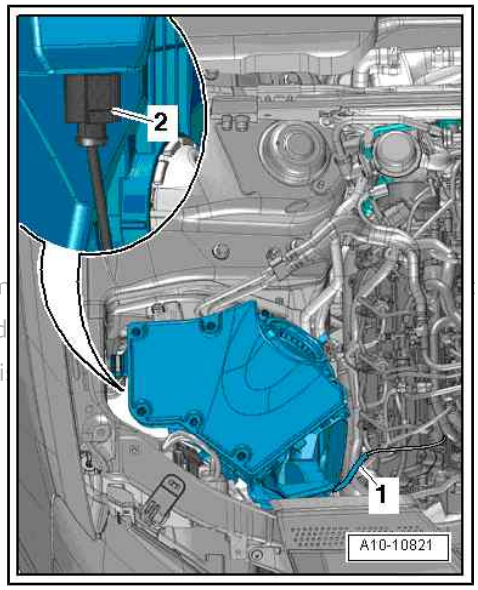
Renew gaskets and self-locking nuts.

– Tighten nuts for exhaust manifold ⇒ page 466 .
– Install air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Removing and installing air conditioner compressor .
– Install poly V-belt ⇒ page 106 .
– Install noise insulation (front) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .
– Connect coolant line with plug-in connector ⇒ page 282 .
– Install throttle valve module - J338- ⇒ page 350 .
– Install particulate filter:
◆ Vehicles with manual gearbox/multitronic gearbox 0AW ⇒ page 411
◆ Vehicles with dual clutch gearbox 0B5 ⇒ page 412 .

6.2.2 Removing and installing exhaust manifold (right-side)

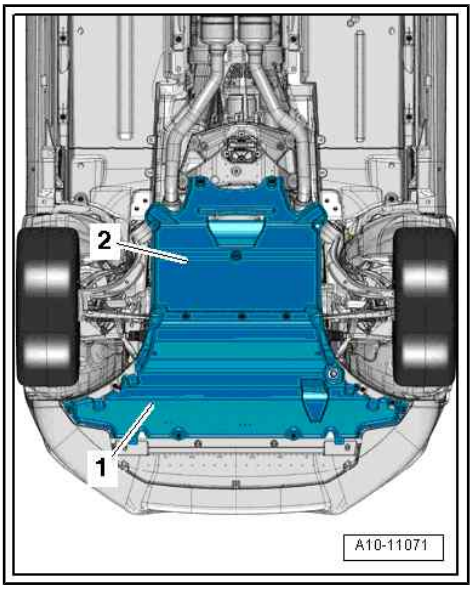
Removing

– Remove particulate filter:
◆ Vehicles with manual gearbox/multitronic gearbox 0AW ⇒ page 411
◆ Vehicles with dual clutch gearbox 0B5 ⇒ page 412 .
– Remove air cleaner housing ⇒ page 340 .

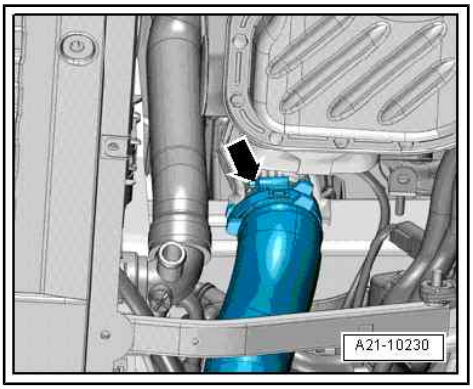


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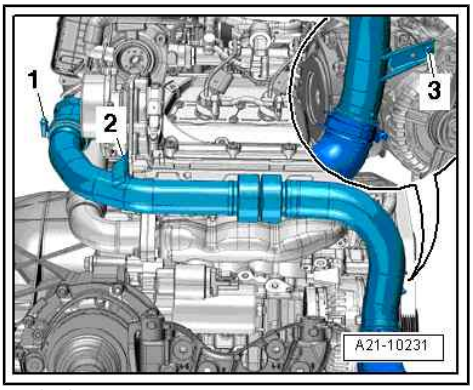
– Remove front noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .



– Release hose clip -arrow- and detach air hose from air pipe.



– Remove bolts -2, 3-.
– Release hose clip -1- and detach air hose.
– Press air pipe to the side.

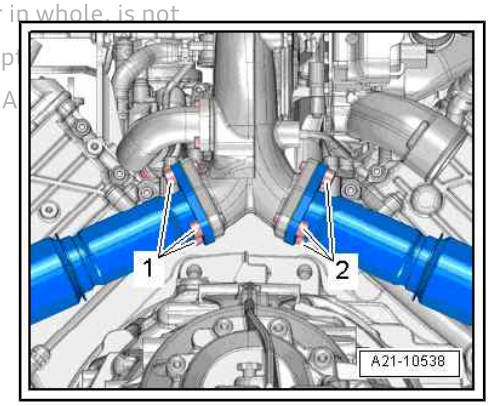


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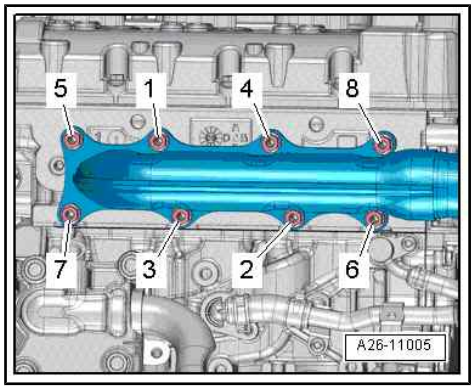
– Remove bolts -2-.

Note

Disregard -item 1-.



– Loosen and remove nuts in the sequence: -8 ... 1- and detach exhaust manifold.



Installing

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

Tightening torques

- ⇒ “6.1 Exploded view - exhaust manifold”, page 465
- ⇒ Fig. ““Exhaust manifold - tightening torque and sequence”“ , page 466

Note

Renew gaskets and self-locking nuts.

– Tighten nuts for exhaust manifold ⇒ page 466 .
– Install air pipe ⇒ page 312 .
– Install air hoses with screw-type clips ⇒ page 313 .
– Install noise insulation (front) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .
– Install air cleaner housing ⇒ page 340 .
– Install particulate filter:

♦ Vehicles with manual gearbox/multitronic gearbox 0AW ⇒ page 411
♦ Vehicles with dual clutch gearbox 0B5 ⇒ page 412 .

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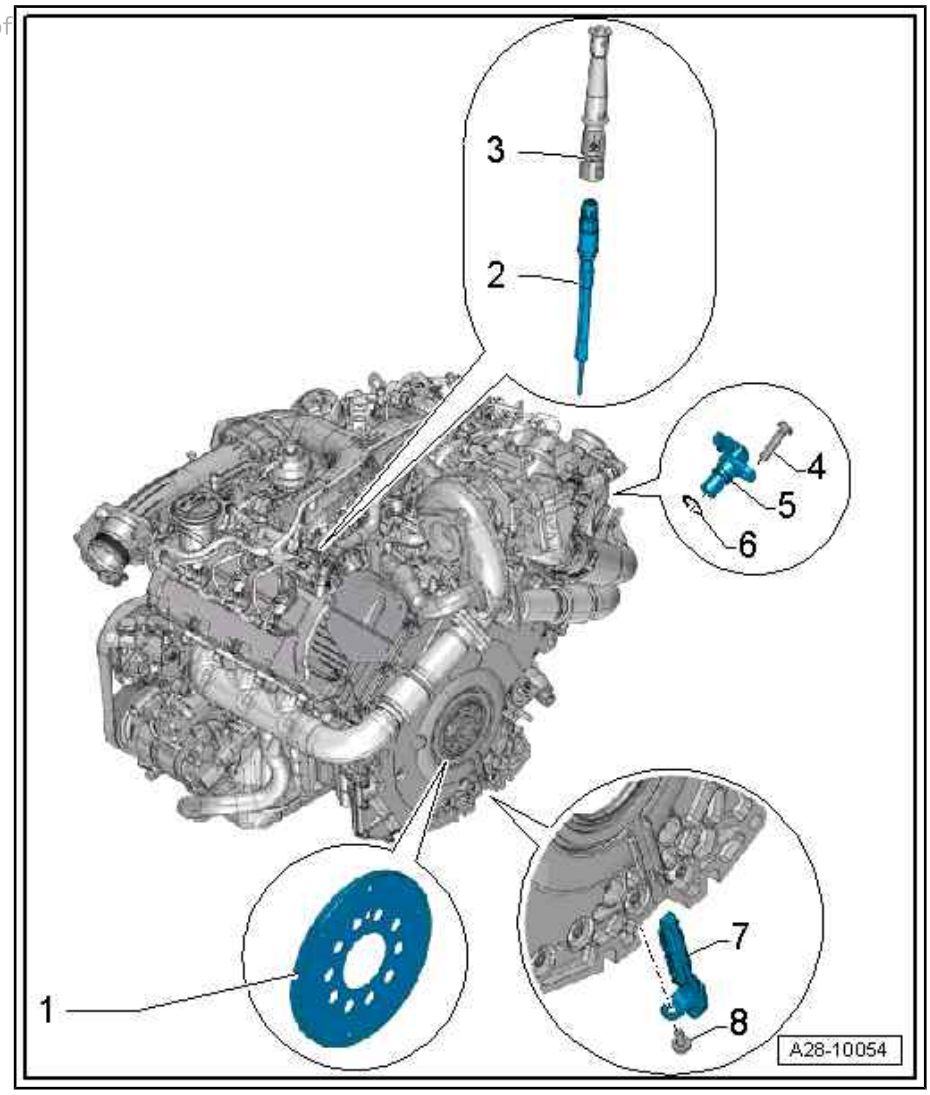
28 – Glow plug system

1 Glow plug system

⇒ “1.1 Exploded view - glow plug system”, page 471
⇒ “1.2 Removing and installing glow plug”, page 472
⇒ “1.3 Checking glow plug”, page 473
⇒ “1.4 Removing and installing Hall sender G40 ”, page 474
⇒ “1.5 Removing and installing engine speed sender G28 ”, page 475

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1.1 Exploded view - glow plug system



1 - Sender wheel

- For engine speed sender - G28-
- Removing and installing ⇒ page 117

2 - Glow plug

Cylinder bank 1 (right-side):

- Glow plug 1 - Q10- , glow plug 2 - Q11- , glow plug 3 - Q12-
- Depending on emission standard, cylinder 2 combustion chamber pressure sender - G678- may be fitted on cylinder 2 ⇒ page 472

Cylinder bank 2 (left-side):

- Glow plug 4 - Q13- , glow plug 5 - Q14- , glow plug 6 - Q15-
- Removing and installing ⇒ page 472
- 12 Nm

3 - Electrical connector

4 - Bolt

- 9 Nm

5 - Hall sender - G40-

- Removing and installing ⇒ page 474

6 - O-ring

- Renew

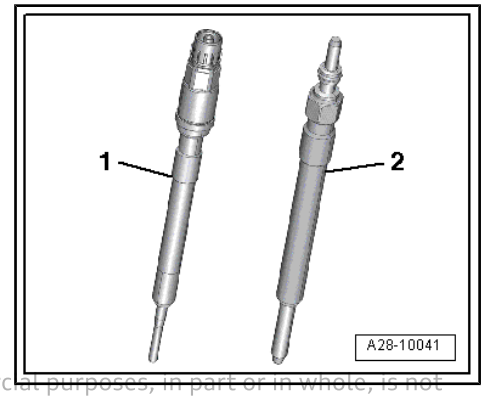
7 - Engine speed sender - G28-

- Removing and installing ⇒ page 475

8 - Bolt

- 9 Nm

Glow plug versions (depends on emission standard)



1 - Glow plug with combustion chamber pressure sender (only installed on cylinder 2)

2 - Glow plug without combustion chamber pressure sender

Note

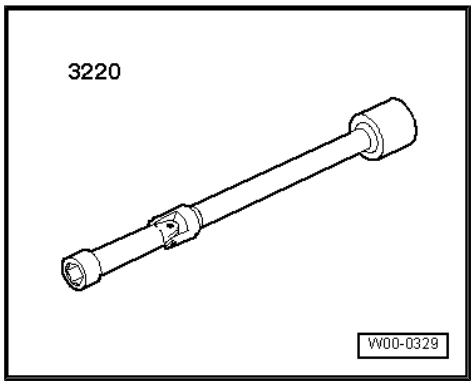
- *Depending on the emission standard, a combustion chamber pressure sender is integrated in the glow plug on cylinder 2.*
- *Designation: glow plug 2 - Q11- with cylinder 2 combustion chamber pressure sender - G678-*

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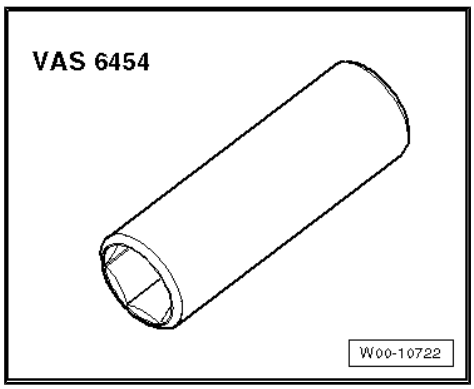
1.2 Removing and installing glow plug

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 glow plug for cylinder 2, depends on emission standard)



Removing

– Switch off ignition.

– Remove engine cover panel ⇒ page 98 .

– Detach glow plug connectors from glow plugs.

– Clean glow plug opening to make sure no dirt gets into cylinders.

– Clean glow plug openings in cylinder head; make sure no dirt gets into cylinder.

Note

- *Cleaning procedure:*
- *Use a vacuum cleaner to remove coarse dirt.*
- *Spray brake cleaner or suitable cleaning agent into glow plug apertures, let it work in briefly, and blow out with compressed air.*
- *Then clean the glow plug openings using a cloth moistened with oil.*

WARNING

Risk of eye injury.

- *Put on safety goggles.*

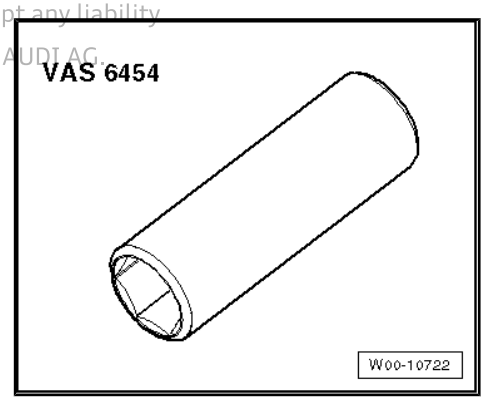
– Loosen glow plugs using tool and unscrew by hand:

Use U/J extension and socket, 10 mm - 3220- for cylinders 1, 3, 4, 5 and 6.



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Use socket insert AF 12 for glow plugs 4-cyl.TDI CR diesel - VAS 6454- for cylinder 2.



– Then unscrew glow plugs carefully by hand or using a suitable hose. Keep the glow plugs straight while unscrewing.

Installing

– Fit glow plugs carefully by hand or using a suitable hose. Keep the glow plugs straight while screwing them back in.

– To tighten glow plugs, use U/J extension and socket, 10 mm - 3220- / socket insert AF 12 for glow plugs 4-cyl.TDI CR diesel - VAS 6454- and a suitable torque wrench.

Tightening torques

- ⇒ “1.1 Exploded view - glow plug system”, page 471

– Attach glow plug connectors correctly and make sure connectors are securely fitted.

The remaining installation steps are carried out in the reverse sequence.

1.3 Checking glow plug

- The glow plug system is activated via the automatic glow period control unit - J179- . The control unit is self-diagnosis compatible.

- A fault is stored in the event memory of the engine control unit - J623- if a fault occurs in the glow plug system.
- The procedure for checking the glow plug system is described in the “Guided Fault Finding”.
- For faster starting, the vehicle is equipped with electronically controlled glow plugs and a separate glow period control unit.
- Each glow plug is activated and diagnosed separately.

Note

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- *Wait for 60 seconds each time after performing final control diagnosis of the glow period control unit. The ignition must remain switched on.*
- *If you do not wait for 60 seconds (if ignition is switched off and immediately switched on again), the glow plugs can be damaged (due to repeated pre-heating).*
- *The activation of the glow plugs is controlled according to coolant temperature.*

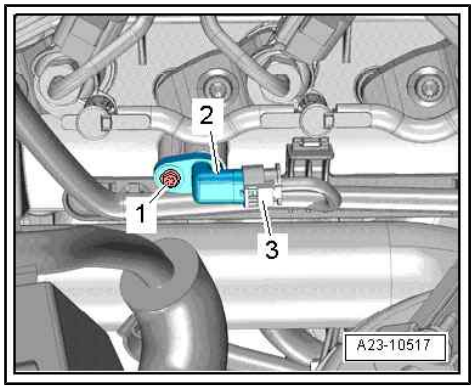
1.4 Removing and installing Hall sender - G40-

Removing

– Remove engine cover panel ⇒ page 98 .

– Unplug electrical connector -3-.

– Unscrew bolt -1- and remove Hall sender - G40- -item 2-.



Installing

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

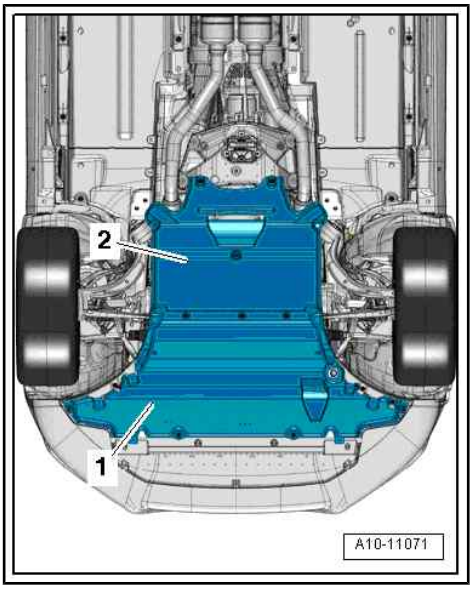
Note

Fit new O-ring.

- Tightening torque
  ⇒ “1.1 Exploded view - glow plug system”, page 471

1.5 Removing and installing engine speed sender - G28-

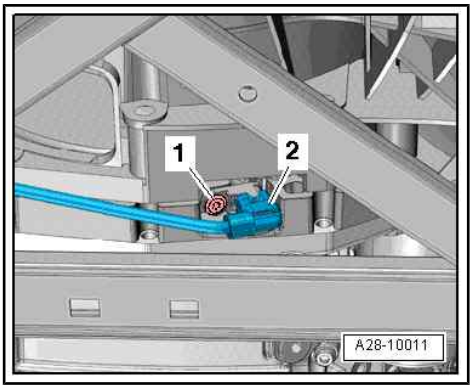
Removing



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

– Unplug electrical connector -2-.

– Unscrew bolt -1- and detach engine speed sender - G28- downwards.



Installing

Installation is carried out in reverse sequence.

- Tightening torque
  ⇒ “1.1 Exploded view - glow plug system”, page 471

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

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