Workshop Manual

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

6-cylinder TDI engine (2.7 ltr.; 3.0 ltr. 4-valve common rail)									
Engine ID	CAM A	CAP A	CAM B	CCW A	CCW B	CGK A	CGK B	CCL A	

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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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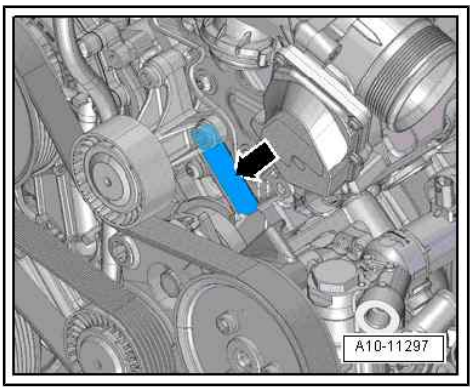
00 – Technical data

1 Identification

(ARL005954; Edition 08.2018)

⇒ "1.1 Engine number/engine data", page 1

1.1 Engine number/engine data



- The engine number ("engine code" and "serial number") is located on the front left side underneath the toothed belt for the high-pressure pump -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.

Note

- *On some versions the engine number is concealed by an idler roller for the poly V-belt. Removing idler roller (left-side) for poly V-belt ⇒ page 170 .*
- *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 .*

Code letters		CAMA	CAMB	CAPA
Capacity	ltr.	2.698	2.698	2.967
Power output	kW at rpm	140/3300	120/3300	176/4000 … 4500
Torque	Nm at rpm	400/1400	400/1400	500/1500 … 3000
Bore	∅ mm	83.0	83.0	83.0
Stroke	mm	83.1	83.1	91.4
Compression ratio		16.4	16.4	16.4
CN	at least	51	51	51
Firing order		1-4-3-6-2-5	1-4-3-6-2-5	1-4-3-6-2-5
Exhaust gas recirculation		yes	yes	yes
Turbocharging/supercharging		Turbocharger	Turbocharger	Turbocharger
Charge air cooling		yes	yes	yes
Lambda control		1 Lambda probe	1 Lambda probe	1 Lambda probe
Particulate filter		yes	yes	yes
SCR catalytic converter		no	no	no
Valves per cylinder		4	4	4

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Code letters		CCLA	CCWA	CCWB
Capacity	ltr.	2.967	2.967	2.967
Power output	kW at rpm	155/4000 … 4500	176/4000 … 4500	155/4000 … 4500
Torque	Nm at rpm	500/1500 … 3000	500/1500 … 3000	500/1500 … 3000
Bore	∅ mm	83.0	83.0	83.0
Stroke	mm	91.4	91.4	91.4
Compression ratio		16.4	16.4	16.4
CN	at least	51	51	51
Firing order		1-4-3-6-2-5	1-4-3-6-2-5	1-4-3-6-2-5
Exhaust gas recirculation		yes	yes	yes
Turbocharging/supercharging		Turbocharger	Turbocharger	Turbocharger
Charge air cooling		yes	yes	yes
Lambda control		1 Lambda probe	1 Lambda probe	1 Lambda probe
Particulate filter		yes	yes	yes
SCR catalytic converter		yes	no	no
Valves per cylinder		4	4	4

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Code letters		CGKA	CGKB	
Capacity	ltr.	2.698	2.698	
Power output	kW at rpm	140/3300	120/3300	
Torque	Nm at rpm	400/1400	400/1400	
Bore	∅ mm	83.0	83.0	
Stroke	mm	83.1	83.1	
Compression ratio		16.4	16.4	
CN	at least	51	51	
Firing order		1-4-3-6-2-5	1-4-3-6-2-5	
Exhaust gas recirculation		yes	yes	
Turbocharging/supercharging		Turbocharger	Turbocharger	
Charge air cooling		yes	yes	
Lambda control		1 Lambda probe	1 Lambda probe	
Particulate filter		yes	yes	
SCR catalytic converter		no	no	
Valves per cylinder		4	4	

2 Safety precautions

⇒ “2.1 Safety precautions when working on the fuel supply system”, page 3

⇒ “2.2 Working on the reducing agent metering system - vehicles with SCR catalytic converter”, page 5

⇒ “2.3 Adapting learnt value after draining reducing agent or renewing components”, page 6

⇒ “2.4 Safety precautions when working on vehicles with start/stop system”, page 6

⇒ “2.5 Safety precautions when using testers and measuring instruments during a road test”, page 6

⇒ “2.6 Safety precautions when working on the cooling system”, page 7

⇒ “2.7 Safety precautions when working on the subframe”, page 7

⇒ “2.8 Safety precautions when working on the exhaust system”, page 7

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 474 .*
- *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 474 .*

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 596 ; procedure for passive tank ⇒ page 600 .

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 596 ; procedure for passive tank ⇒ page 600 .

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 .

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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 5 .*

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.

- 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).*

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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

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.*

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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 9

⇒ “3.2 General notes”, page 9

⇒ “3.3 General repair instructions”, page 10

⇒ “3.4 Foreign particles in engine”, page 11

⇒ “3.5 Contact corrosion”, page 11

⇒ “3.6 Routing and attachment of pipes, hoses and wiring”, page 11

⇒ “3.7 Installing radiators and condensers”, page 11

⇒ “3.8 Checking vacuum system”, page 11

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3.1 Rules for cleanliness

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

- Clean connections and surrounding area thoroughly with engine cleaner or brake cleaner and dry cleaned area before loosening.
- 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.

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 3 .

3.3 General repair instructions

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 474 .***

- 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.

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- 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.

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

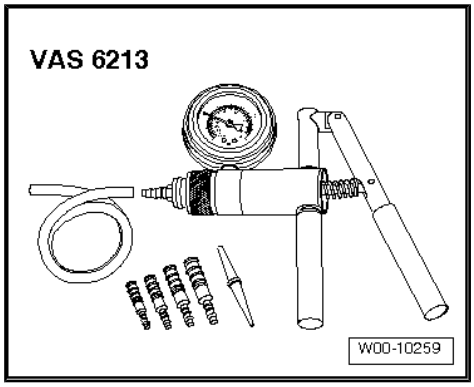
Even when the radiator, condenser and charge air cooler are correctly installed, slight impressions may be visible on the fins of these components. This does not mean that the components are damaged. If the fins are only very slightly distorted, this does not justify renewal of the radiator, condenser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

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3.8 Checking vacuum system

Special tools and workshop equipment required

- Hand vacuum pump - VAS 6213-



Procedure

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

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

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

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

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

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10 – Removing and installing engine

1 Removing and installing engine

⇒ “1.1 Removing engine”, page 13

⇒ “1.2 Separating engine and gearbox”, page 96

⇒ “1.3 Securing engine to engine and gearbox support”, page 122

⇒ “1.4 Installing engine”, page 126

1.1 Removing engine

⇒ “1.1.1 Removing engine - vehicles with manual gearbox”, page 13

⇒ “1.1.2 Removing engine - vehicles with multitronic gearbox 0AW”, page 35

⇒ “1.1.3 Removing engine - vehicles with dual clutch gearbox 0B5”, page 54

⇒ “1.1.4 Removing engine - vehicles with automatic gearbox 0B6”, page 74

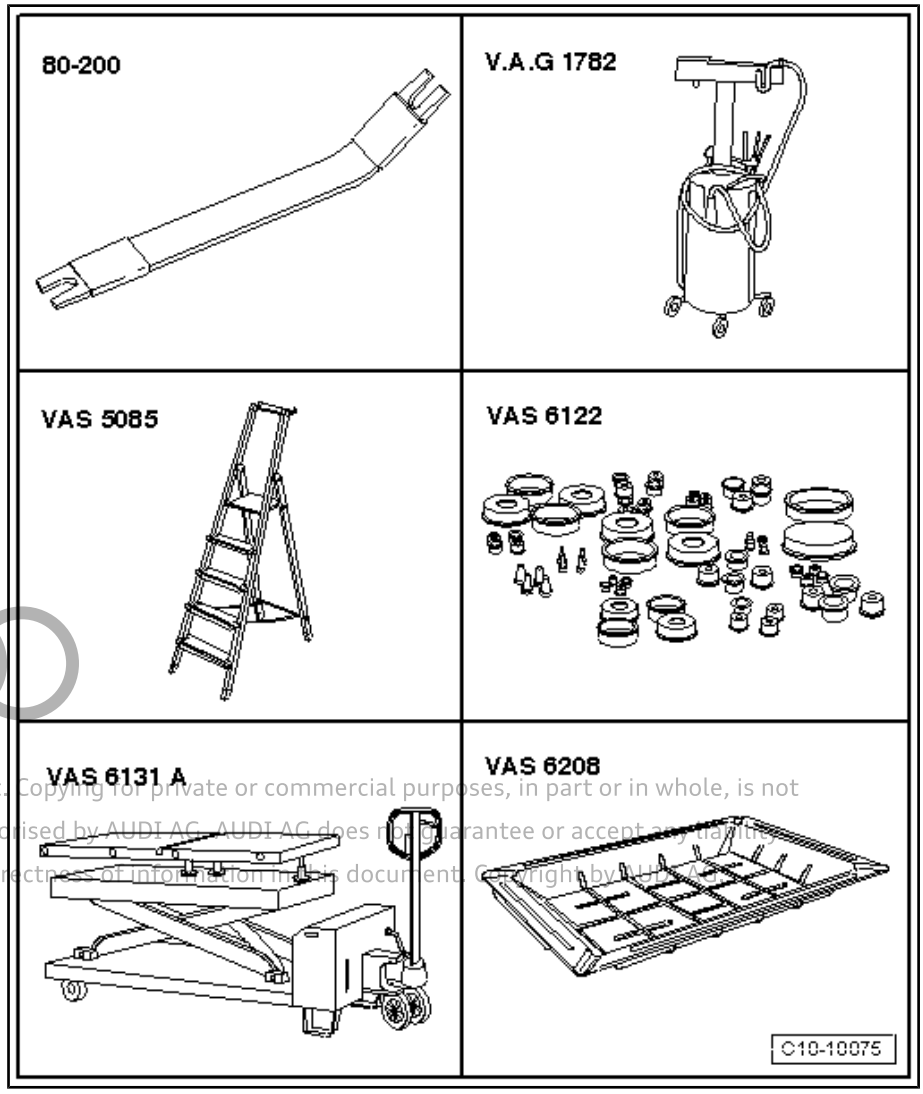
1.1.1 Removing engine - vehicles with manual gearbox

Note

- *The engine is removed from underneath together with the gearbox and subframe (with lock carrier installed).*
- *Collect drained coolant in a clean container for re-use or disposal.*
- *Fit all cable ties in the original positions when installing.*

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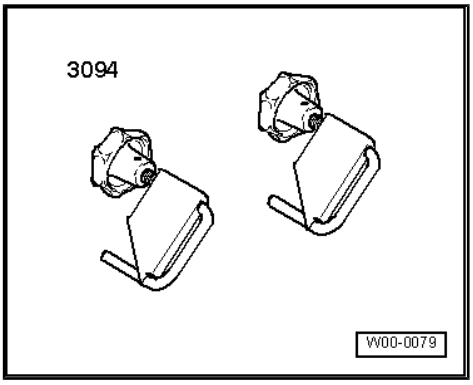
Special tools and workshop equipment required



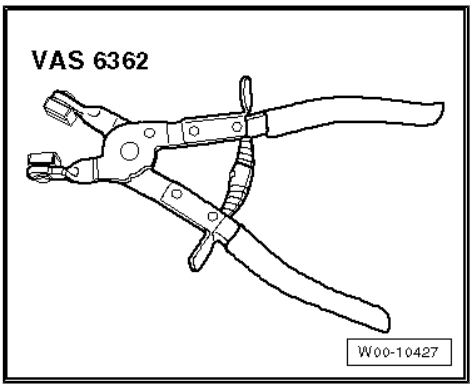
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- Removal lever - 80 - 200-
- Used oil collection and extraction unit - V.A.G 1782-
- Stepladder - VAS 5085-
- Engine bung set - VAS 6122-
- Scissor-type assembly platform - VAS 6131 A- with support set for Audi - VAS 6131/10- and supplementary set - VAS 6131/13-
- Drip tray for workshop hoist - VAS 6208-

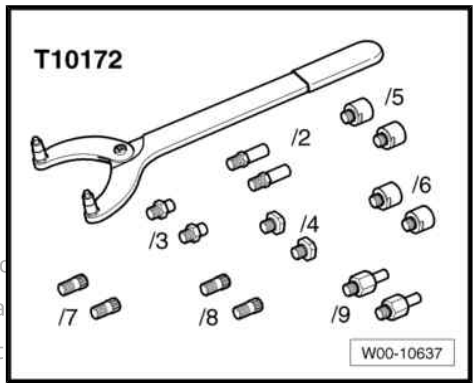
- Hose clamps, up to 25 mm - 3094-



- Hose clip pliers - VAS 6362-

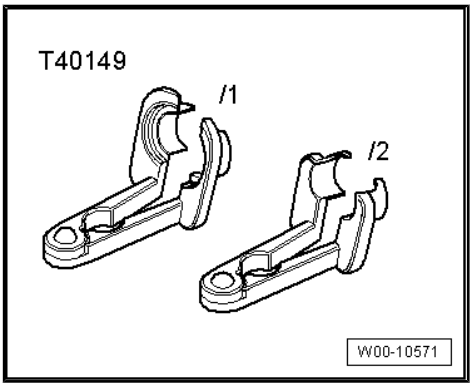


- Counterhold tool - T10172- with -T10172/5- for vehicles with four-wheel drive

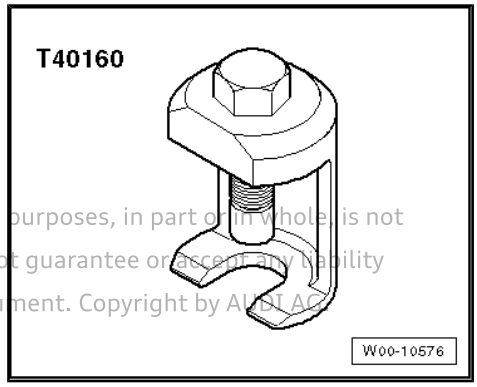


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- Release tool - T40149-



- Puller - T40160-



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Procedure

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.***

– Bring front wheels into straight-ahead position.

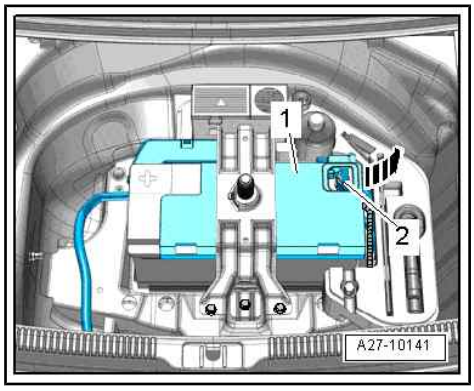
Note

On four-wheel drive vehicles the electromechanical parking brake must be released before disconnecting the battery, so that the propshaft can be turned during removal.

Caution

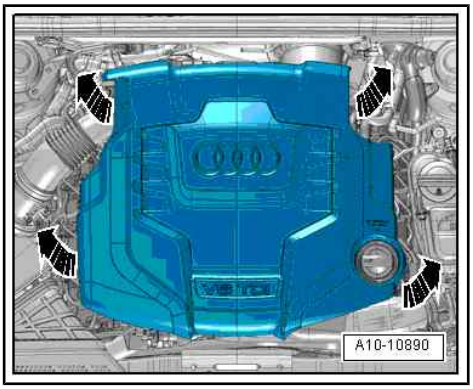
Risk of irreparable damage to electronic components.

- ***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 .
– Discharge refrigerant circuit ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit .
– Extract hydraulic fluid for power steering from reservoir using used oil collection and extraction unit - V.A.G 1782- .

– Remove engine cover panel -arrows-.



WARNING

Risk of scalding due to hot steam and hot coolant.

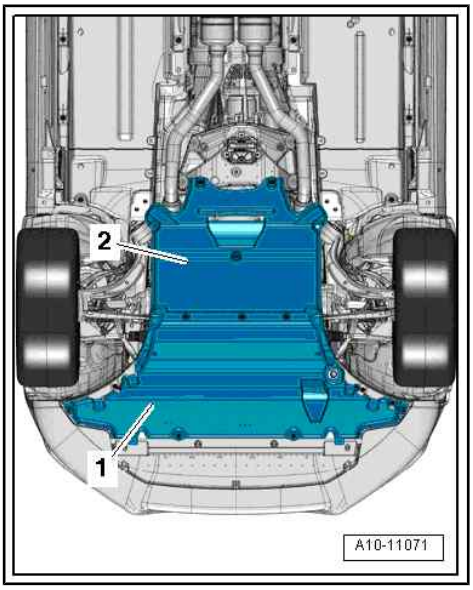
- *The cooling system is under pressure when the engine is hot.*
- *To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.*

– Open filler cap on coolant expansion tank.

– Remove both front wheels.

– Remove wheel spoilers (front) on both sides ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front) .

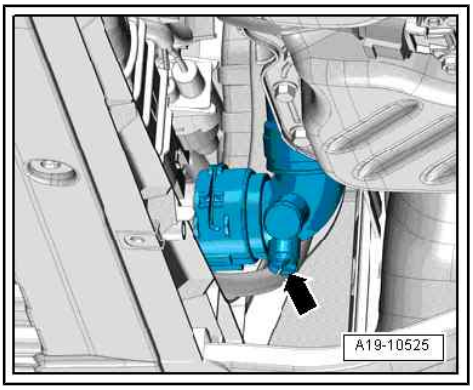
– Remove noise insulation -1- and -2- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .



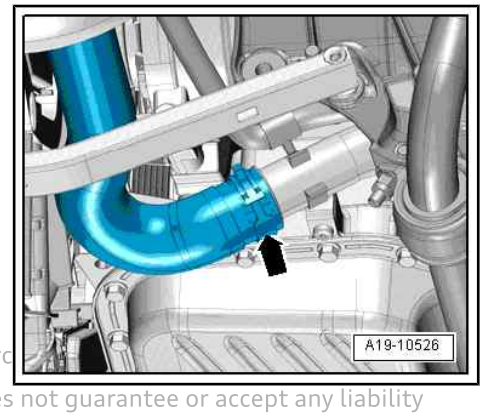
– Place drip tray for workshop hoist - VAS 6208- beneath engine.

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

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

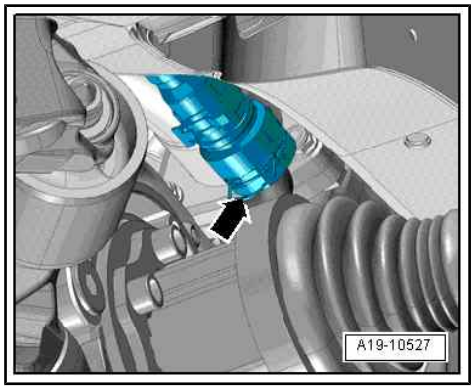


– Release hose clip -arrow-, disconnect coolant hose from coolant pipe (left-side) and drain off coolant.

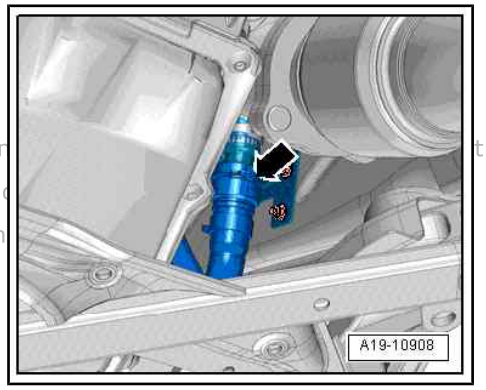


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– Vehicles with plug-in connector at coolant pipe (bottom right): Lift retaining clip -arrow-, disconnect coolant hose and drain off coolant.

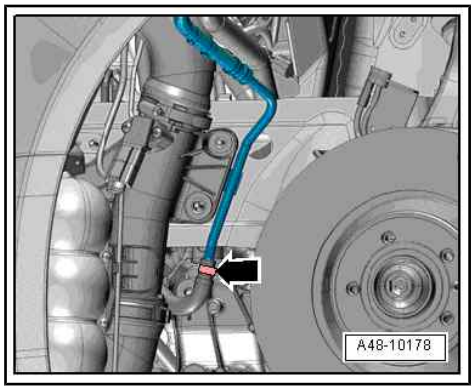


– Vehicles with plug-in connector at longitudinal member: Lift retaining clip -arrow-, disconnect coolant hose and drain off coolant.

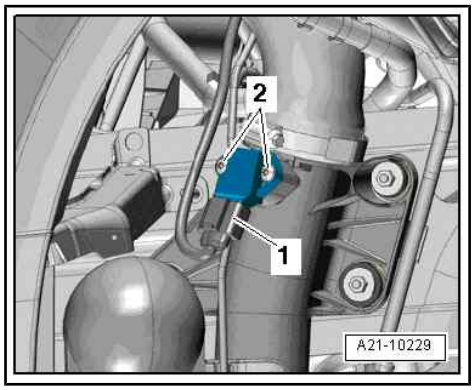


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– Position used oil collection and extraction unit - V.A.G 1782- below connection point.
– Disconnect hydraulic fluid return line -arrow- for power steering.
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .



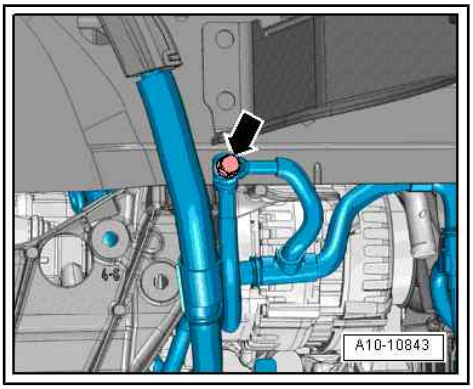
– Unplug electrical connector -1- at charge pressure sender - G31- and move electrical wiring clear.



Note

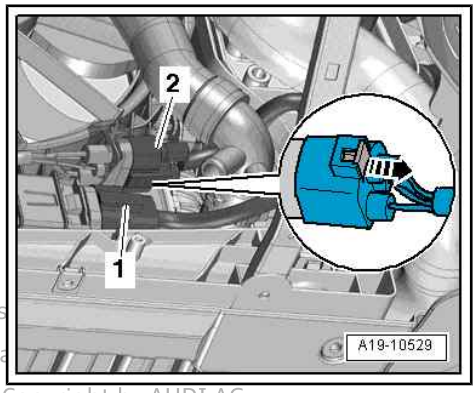
Disregard -item 2-.

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



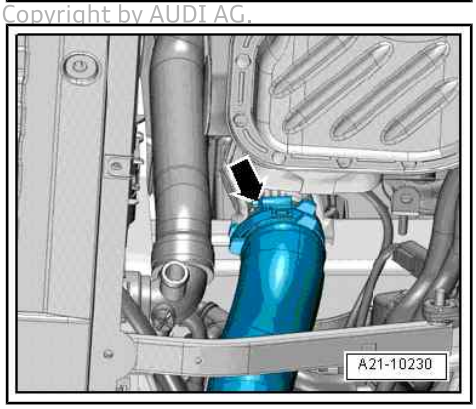
– Unplug electrical connector -1- and, if fitted, -2- for radiator fan (push retainer to the rear -arrow- and press down release catch).

– Move electrical wiring harness clear.

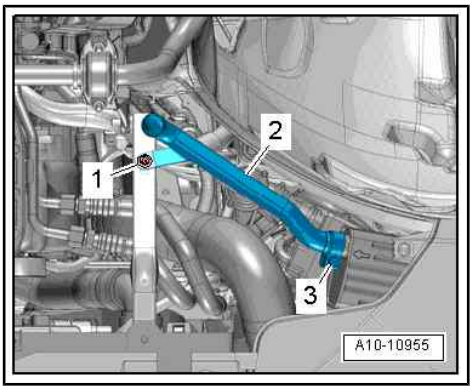


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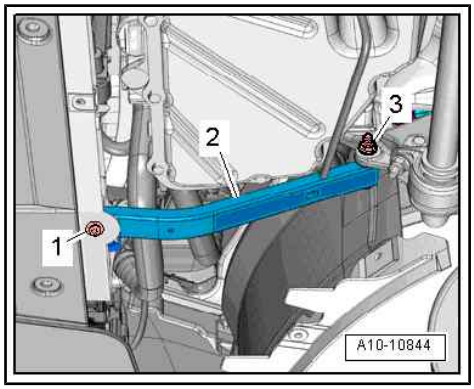
– Release hose clip -arrow-, disconnect air hose from air pipe and move to one side.



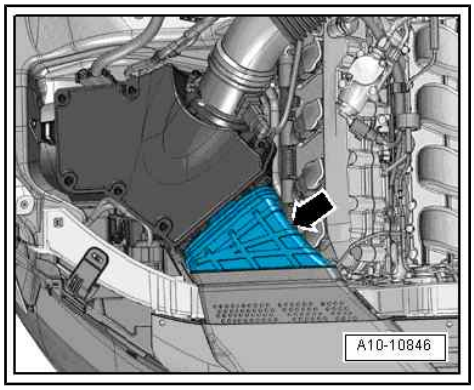
– On vehicles with auxiliary heater: remove nut -1-, loosen clamp -3- and detach exhaust pipe -2- for auxiliary heater



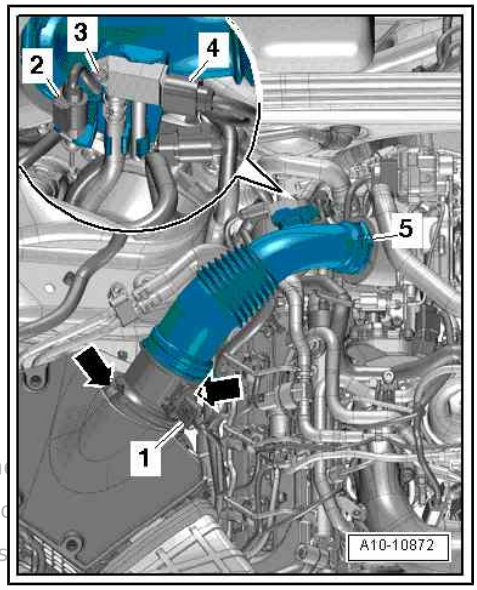
– Remove bolt -1- and nut -3- on both sides and detach strut -2- for lock carrier.



– Remove air duct -arrow-.

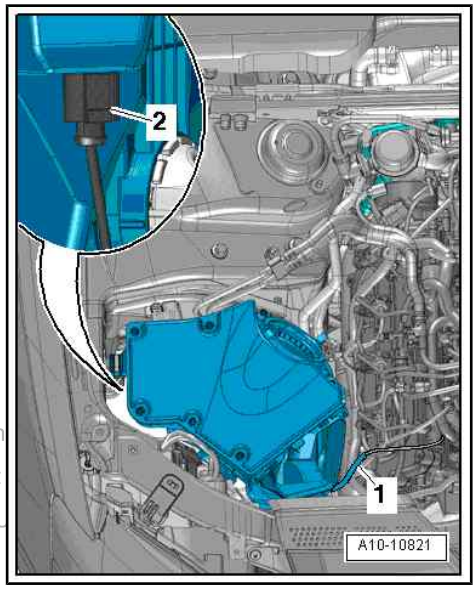


– Unplug electrical connector -1- at air mass meter - G70- .
– Unscrew bolt -3- and move clear exhaust gas pressure sensor 1 - G450- -item 4- at air pipe.
– Move electrical connector -2- clear at air pipe.
– Remove air hose and air mass meter - G70- . To do so, release hose clip -5- and clamps -arrows-.



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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.

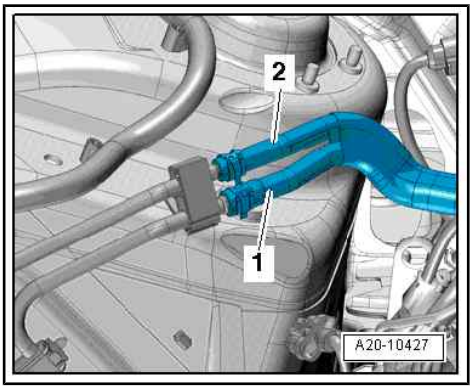


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Caution

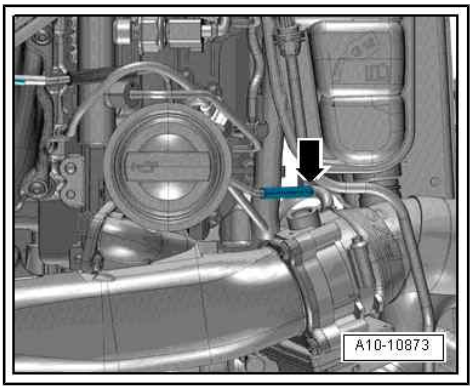
Take care to keep components clean.

- *Observe rules for cleanliness when working on the fuel supply system ⇒ page 9 .*

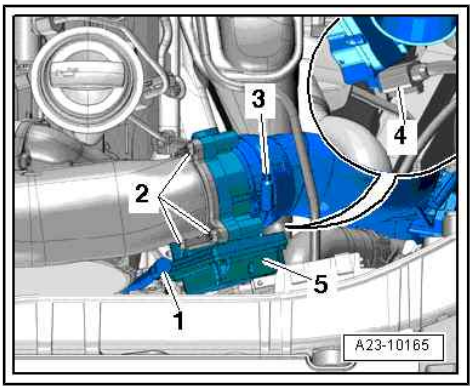


– Disconnect fuel supply hose -1- and fuel return hose -2-.

– If fitted, disconnect vacuum line -arrow-.

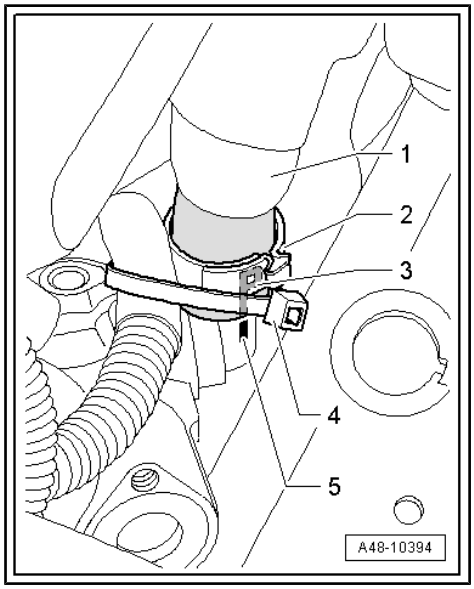


– If fitted, pull out oil dipstick -1-.
– Release hose clip -3- and detach air hose.
– Unplug electrical connector -4-.
– Remove bolts -2- and detach throttle valve module - J338- -item 5-.



Note

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

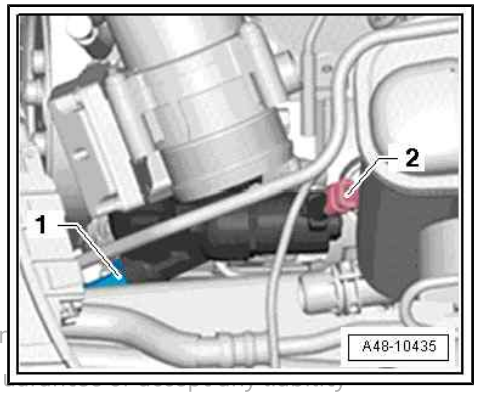


- Cut open cable tie -4-.
- Clamp off hydraulic hose -1- using hose clamp -3094- , release hose clip -2- and disconnect hose from power steering pump.
- Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .

Note

Disregard items -3 and 5-.

- If fitted, unplug electrical connector -2-.



Note

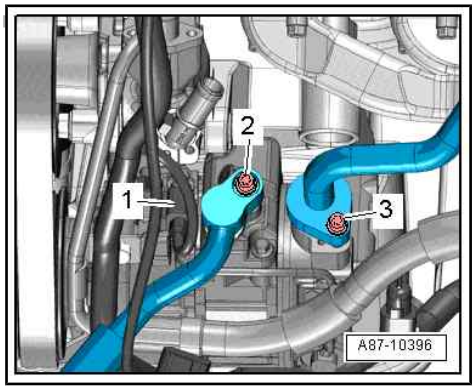
Disregard -item 1-.

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Caution

Risk of damage to refrigerant lines and hoses

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

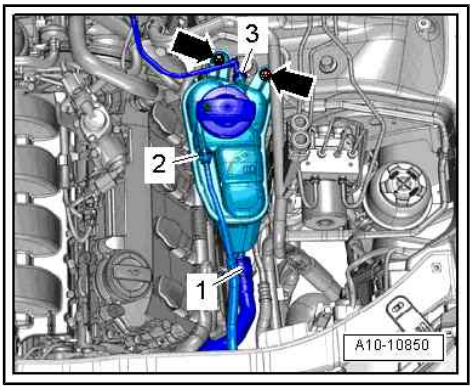


- Remove bolt -2-, disconnect refrigerant line from air conditioner compressor and move to one side.
- Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .

Note

Disregard items -1 and 3-.

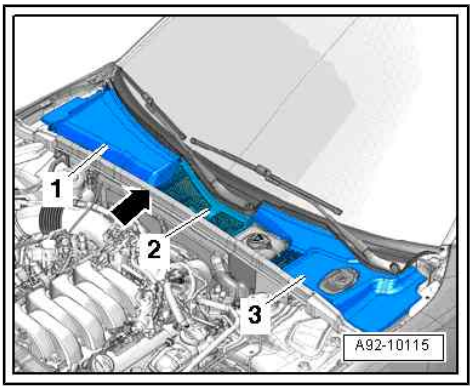
– Disconnect coolant hose -3- from coolant expansion tank.



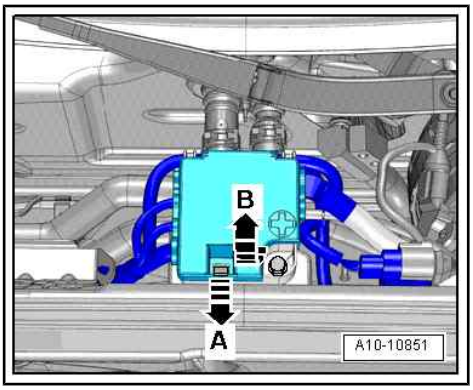
Note

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

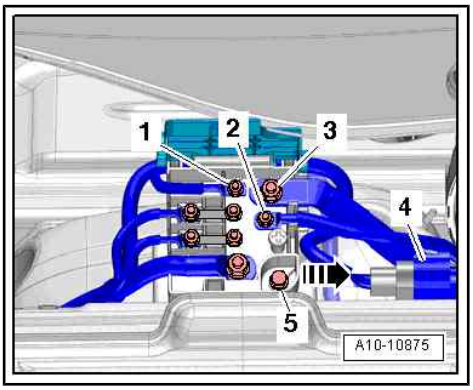
– Remove seal -arrow-.
– Remove plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .



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

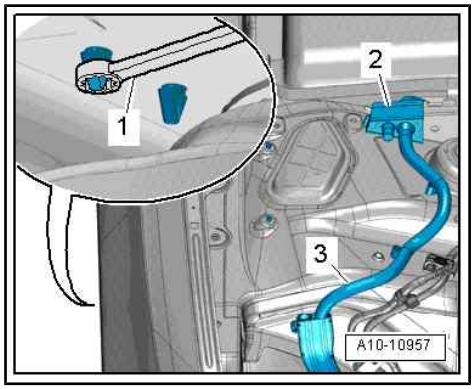


– Remove nuts -1 ... 3- for electrical wiring.
– Detach electrical connector -4- from bracket and unplug.
– Remove bolt -5- and detach terminal 30 wiring junction 2 - TV22- from body brace -arrow-.

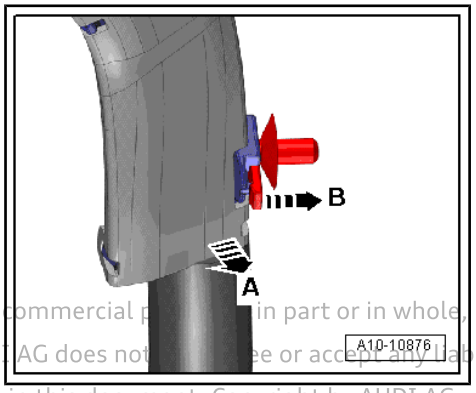


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– Working from wheel housing, release catches using a 5.5 mm ring spanner -item 1- and remove wiring protector -2- from above.
– Release wiring harness -3- leading to alternator and starter using removal lever - 80 - 200- and move clear.

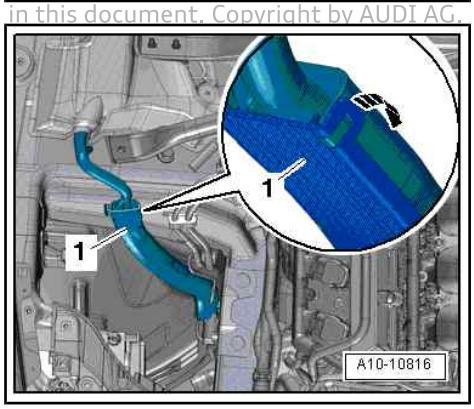


– Wiring duct (version 1): release catch -arrow B- and move wiring duct clear by pulling it towards front -arrow A-.

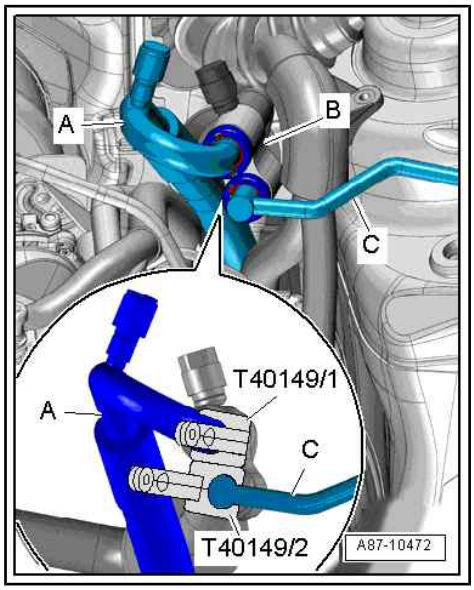


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– Wiring duct (version 2): release catch -arrow- to open wiring duct -1- and move wiring harness clear.

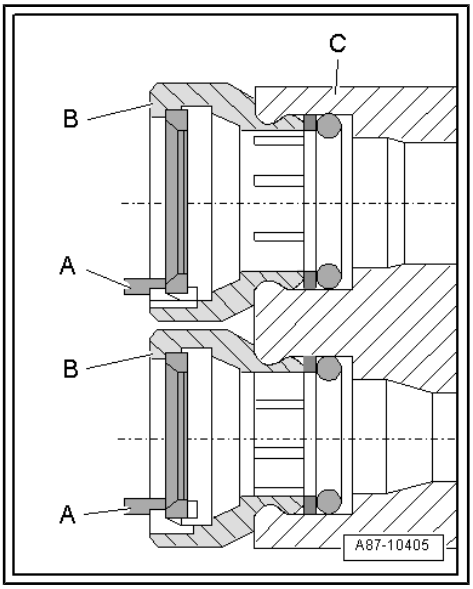


– Press refrigerant lines -A- and -C- by hand as far as stop into connection piece -B- for refrigerant line with internal heat exchanger.
– Spray area around refrigerant lines with silicone-free lubricant.
– Fit release tool - T40149/1- for air conditioner line onto refrigerant line -A- and release tool - T40149/2- for air conditioner line onto refrigerant line -C- so that both tools engage audibly. This releases the retaining lugs.
– Using release tools for air conditioner line, pull refrigerant lines -A- and -C- out of connection piece -B- for refrigerant line with internal heat exchanger.

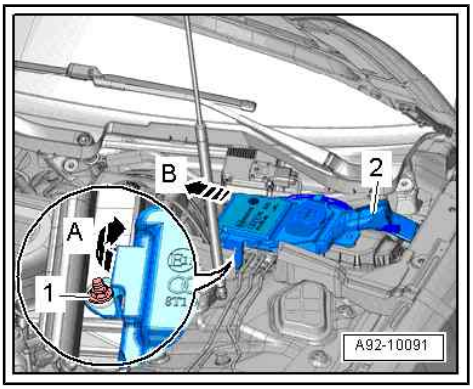


Note

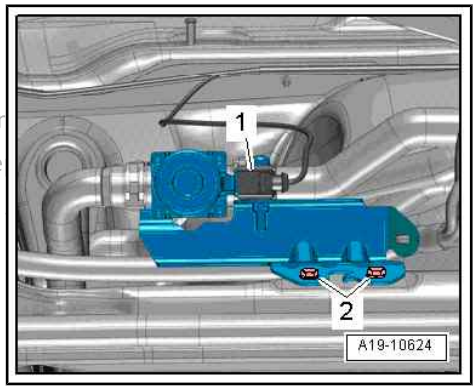
- *If it is not possible to pull out the refrigerant lines, do NOT attempt to turn the refrigerant lines in connection piece -C-.*
- *In this case you will have to cut open the connectors -B- and take out the retaining rings -A-.*
- *When cutting open the connectors, take care not to damage the connection piece -C- for the refrigerant line with internal heat exchanger.*



– 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-.

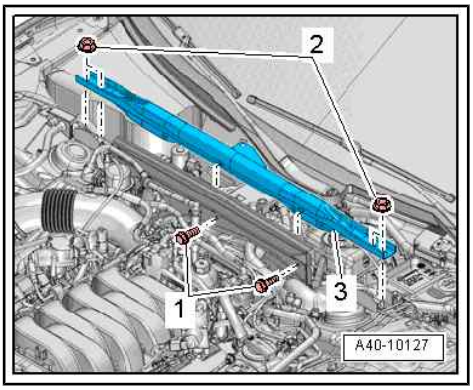


– On vehicles with auxiliary heater: remove bolts -2- and move pump unit -1- clear to one side.

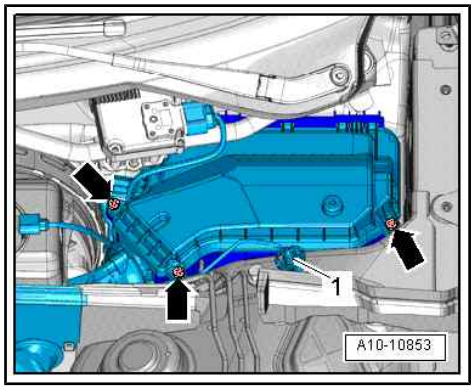


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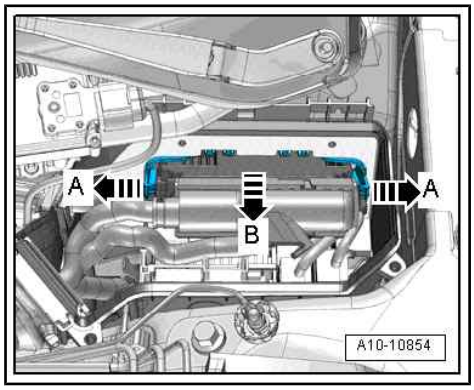
– Remove bolts -1- and nuts -2- and detach body brace -3-.



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

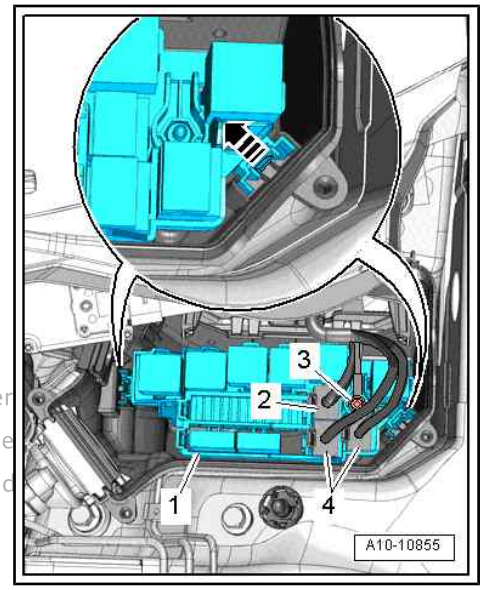


– Release catches -arrows A- and take out engine control unit -arrow B-.

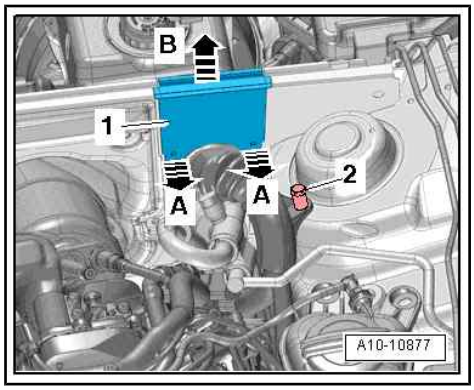


– If fitted, unplug electrical connector -2-.
– Unplug electrical connectors -4- and unscrew nut -3- for wiring.
– Release catches -arrow- and detach relay carrier with fuse holder -1-.
– Disengage engine wiring harness at electronics box in engine compartment and move clear.

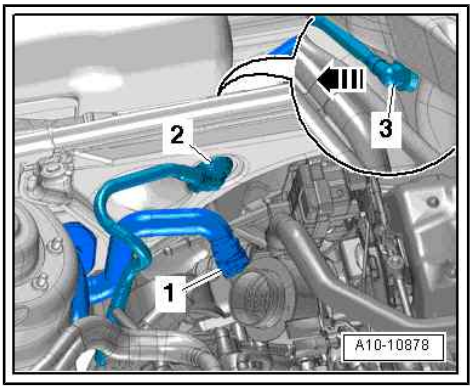
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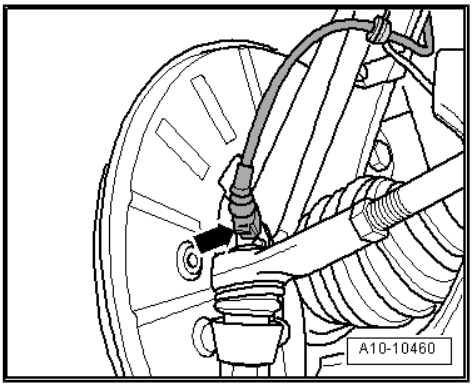
– Release catches -arrows A- and lift off wiring protector -1- -arrow B-.
– Unscrew earth stud -2- and move wiring harness clear.
– Place wiring harness on engine and secure engine control unit to prevent it from dropping.



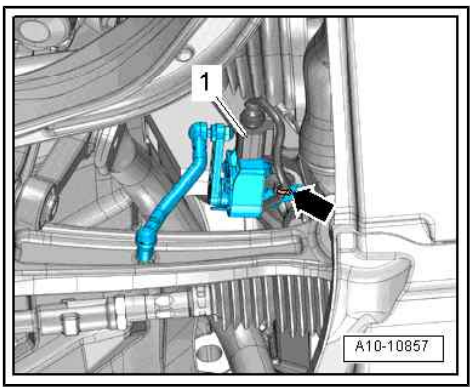
– Release hose clip -1- and detach coolant hose.
– Disconnect vacuum hose -3- on rear of plenum chamber partition panel -arrow- and detach vacuum connection -2- from plenum chamber partition panel.



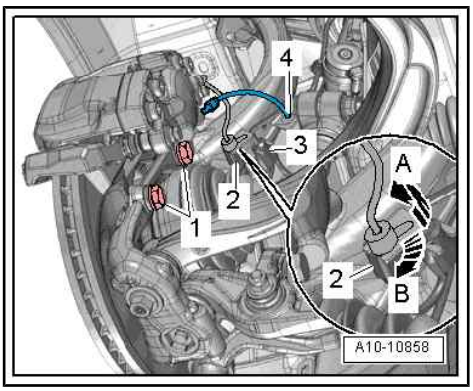
– Unplug electrical connectors -arrow- at front wheel speed sensors on both sides.



– 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

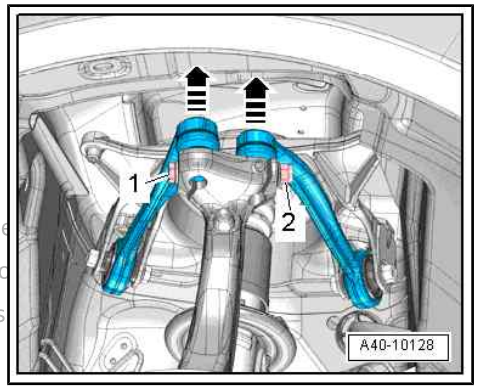
Risk of damage to brake pistons.

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

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– 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.

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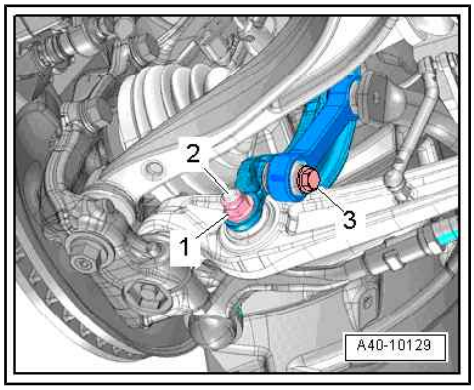


A5 up to vehicle identification no. 8T-8-011200:

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

Note

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

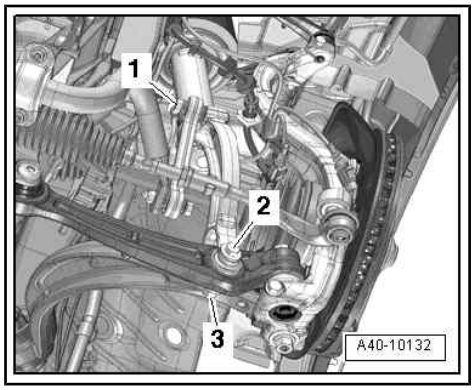


A4 (all), A5 from vehicle identification no. 8T-8-011201 onwards:

– 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.



All vehicles (continued):

Caution

Risk of damage to running gear components.

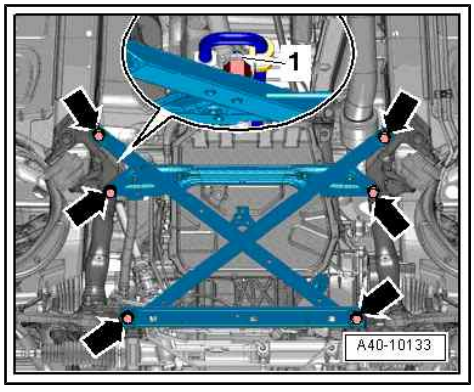
- ***The vehicle must NOT be lowered onto its wheels if the engine/gearbox mountings, steering rack or subframe cross brace are not properly installed.***

A4 (all), A5 Coupé:

– Remove nut -1- for power steering hydraulic line.
– Remove bolts -arrows- and detach subframe cross brace.

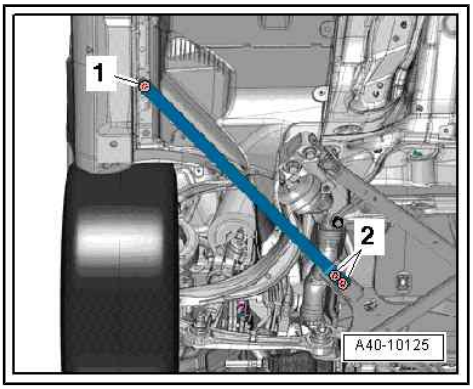
Note

Illustration shows the installation position on a vehicle with dynamic steering.



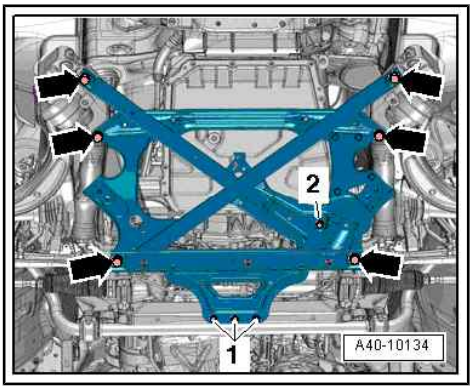
A5 Cabriolet:

– Remove bolts -1- and -2- on both sides and detach strut.



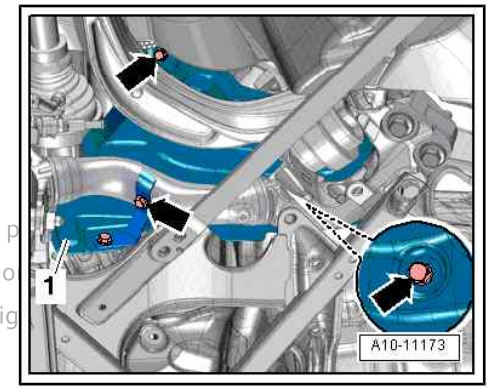
– Remove bolt -2- for power steering hydraulic line.

– Remove bolts -1- and -arrows- and detach subframe cross brace.



All vehicles (continued):

– If fitted, remove bolts -arrows- on both sides and detach heat shield -1-.

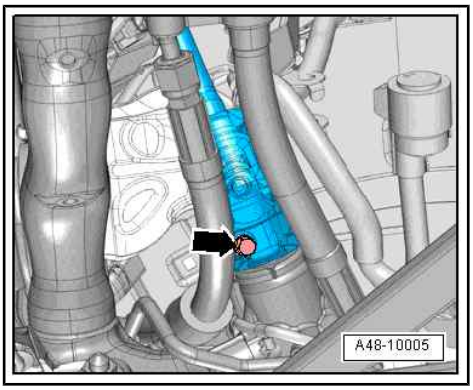


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Caution

Risk of damage to coil connector for airbag.

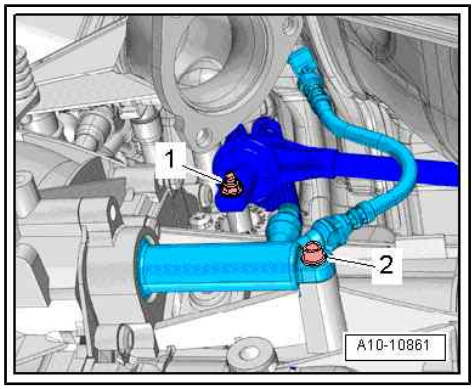
- ***Make sure that front wheels are in straight-ahead position before removing universal joint from steering rack.***
- ***Do not alter the position of the steering wheel or the steering rack from this point onwards.***



– Remove bolt -arrow- for universal joint ⇒ Running gear, axles, steering; Rep. gr. 48 ; Steering column; Exploded view - steering column .

– Separate universal joint from steering rack and move clear to the top as far as possible.

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



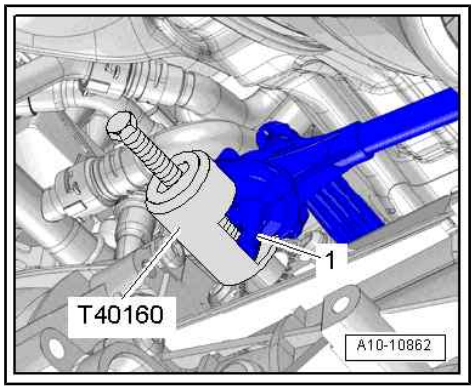
Caution

Risk of damage to clutch slave cylinder.

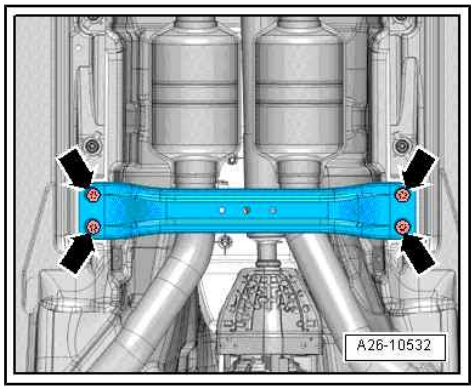
- *Do not press clutch pedal after removing slave cylinder.*

– Remove nut -1- for selector rod.

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



– Remove bolts -arrows- and detach front cross member.



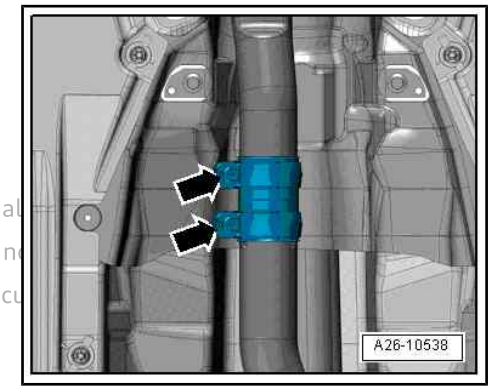
Caution

Risk of damage to flexible joint in front exhaust pipe.

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

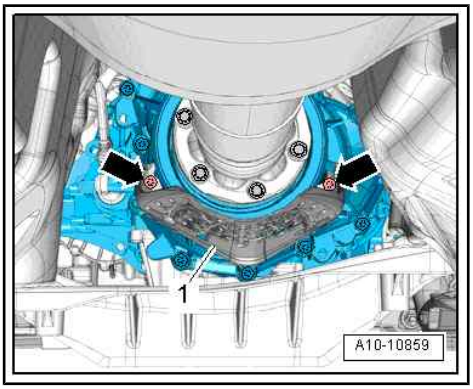
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– Loosen bolted connections -arrows- and push clamp towards rear.



Vehicles with four-wheel drive:

– If fitted, remove bolts -arrows- and detach heat shield -1- for propshaft.

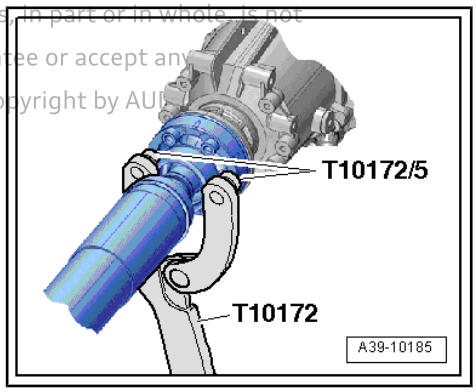


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– Remove bolts connecting propshaft to gearbox (use counter-hold tool - T10172- with -T10172/5-).

– Slide propshaft towards rear final drive; the constant velocity joints can be moved axially.

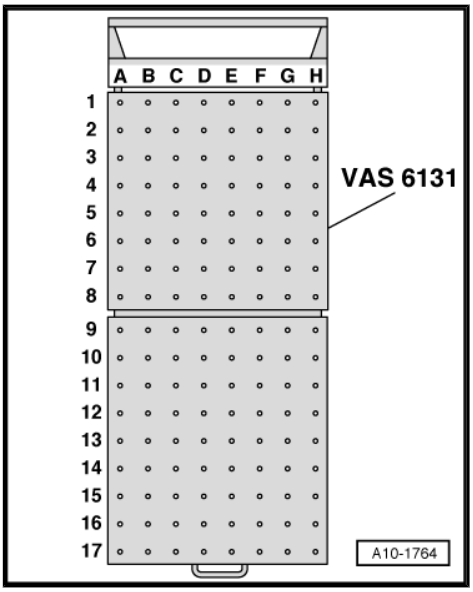
– Tie up propshaft on one side.



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- and supplementary set - VAS 6131/13- as follows:

Platform coordinates	Parts of support set for Audi - VAS 6131/10- 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	/10-11
G6	/10-1	/10-2	/10-5	/10-11
A8+C8	/13-6	–	–	/13-2
F8+H8	/13-6	–	–	/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



– Bolt the support elements onto the scissor-type assembly platform hand-tight to start with.

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

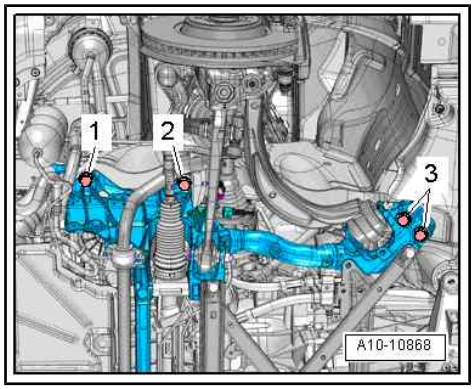
• Take note of spirit level (bubble gauge).

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

WARNING

Accident risk if subframe mountings are detached.

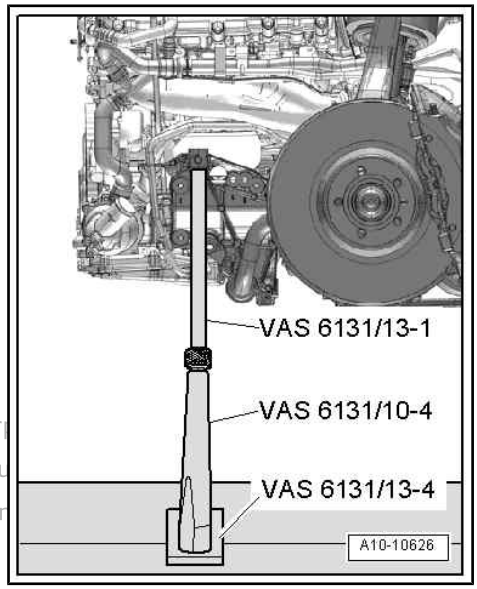
- *Subframe bolts -2- and -3- must not be loosened.*



– Remove subframe bolts -1- on both sides.

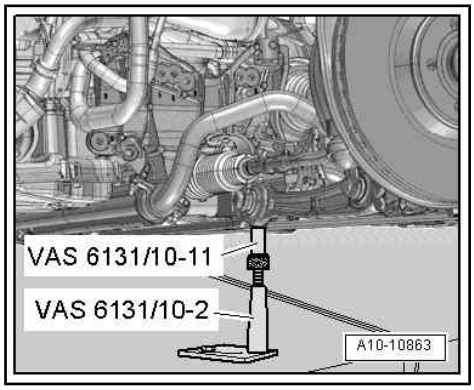
– Position support elements from -VAS 6131/10- and -VAS 6131/13- at front left and right of subframe as shown.

– Make sure that threaded spindles are screwed in completely.

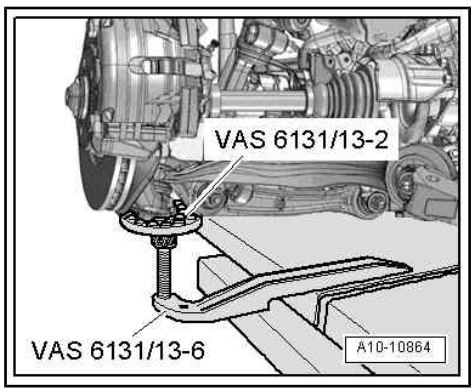


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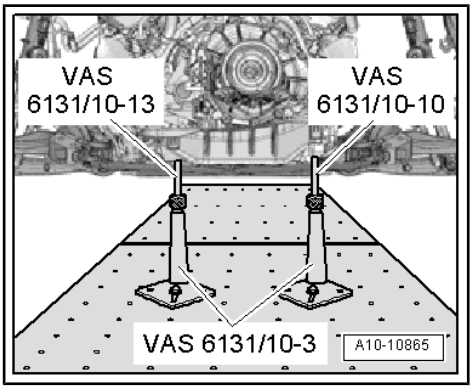
– Position support elements from -VAS 6131/10- (rear left and right) at front attachment points of subframe cross brace as shown.



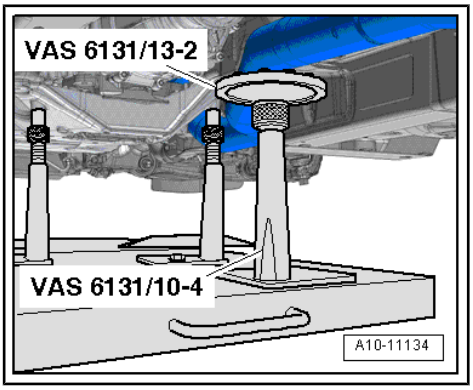
– Position support elements from -VAS 6131/13- under left and right wheel bearing housings as shown.



– 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.
– Turn all spindles for support elements upwards until all locating lugs make contact with mounting points.



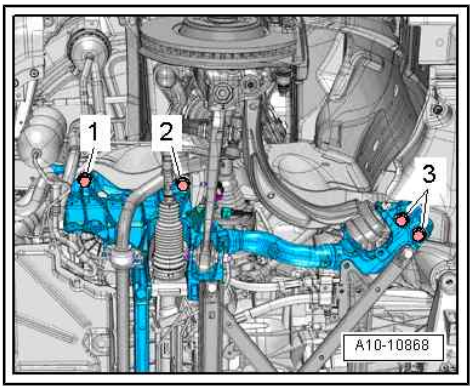
– Position support elements from -VAS 6131/10- and -VAS 6131/13- underneath front exhaust pipe, as shown in illustration.
– Tighten base plates for support elements to 20 Nm on scissor-type assembly platform - VAS 6131 A- .



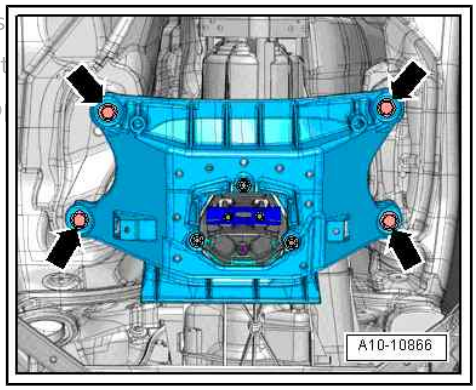
– Mark installation position of subframe on longitudinal members with felt-tip pen.
– Unscrew subframe bolts -2- and -3- on both sides in several stages and in diagonal sequence.

Note

Disregard -item 1-.



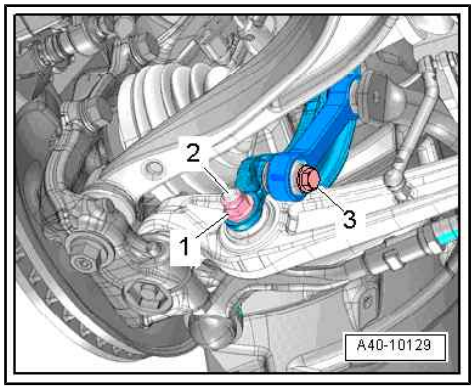
– Remove bolts -arrows- for tunnel cross member.



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A5 up to vehicle identification no. 8T-8-011200:

– Remove bolt -2- on both sides.



A4 (all), A5 from vehicle identification no. 8T-8-011201 onwards:

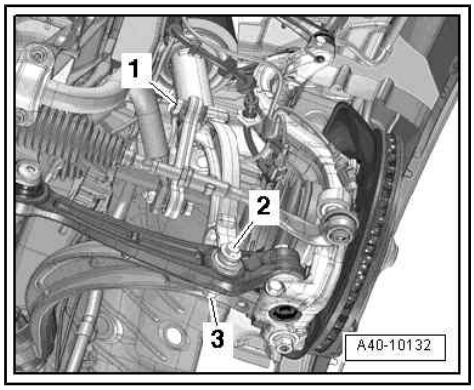
– Remove bolt -2- on both sides.

All vehicles (continued):

Caution

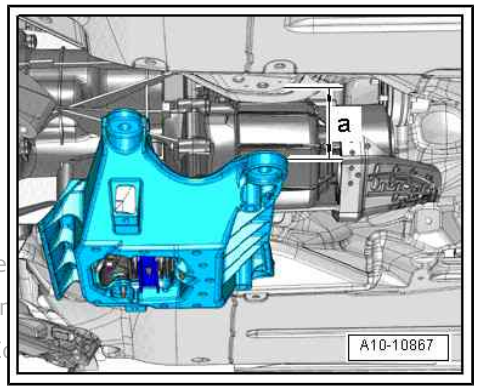
Danger of damage to hoses, pipes and wiring connections and to engine compartment.

- ***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.***



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

• Dimension -a- = 100 mm (maximum).



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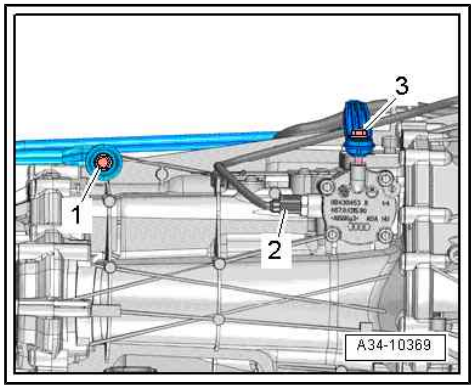
– Remove bolts -1- and -3- for selector rod and push rod.

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.

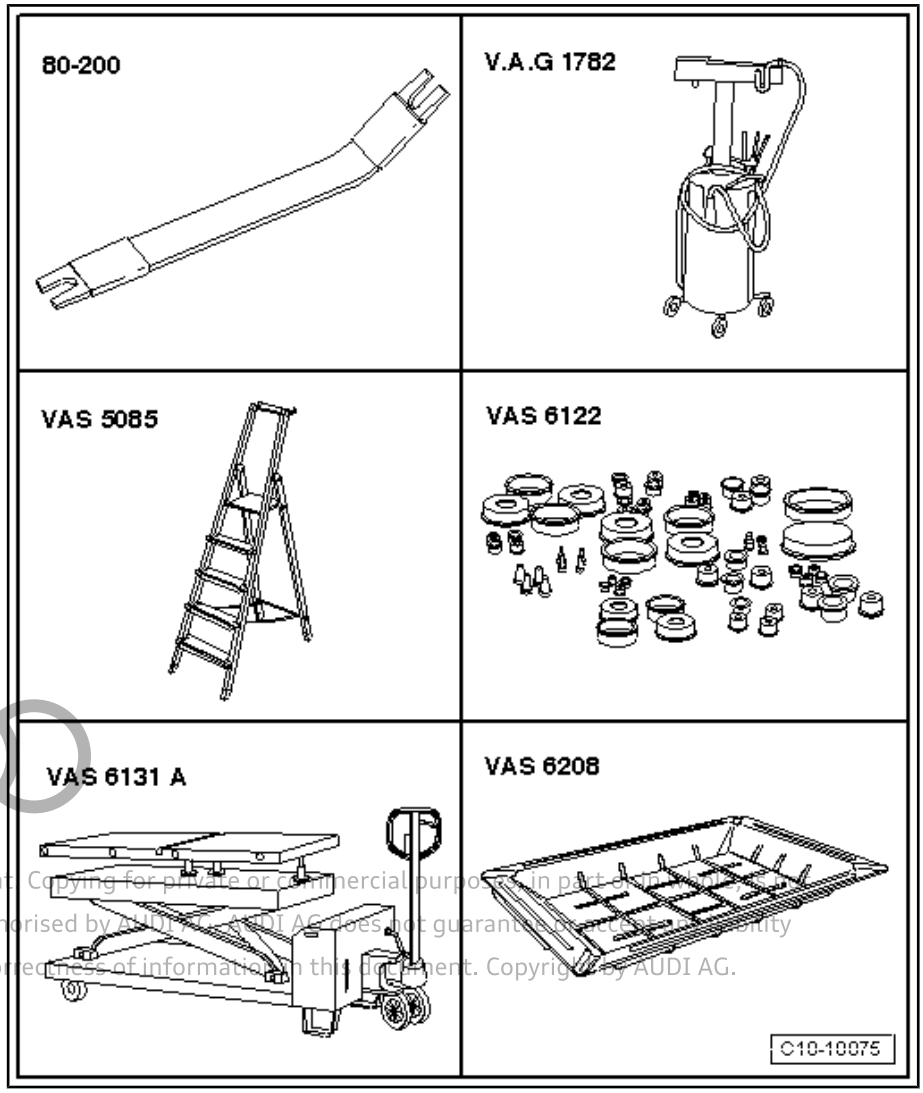


1.1.2 Removing engine - vehicles with multitronic gearbox 0AW

Note

- *The engine is removed from underneath together with the gearbox and subframe (with lock carrier installed).*
- *Collect drained coolant in a clean container for re-use or disposal.*
- *Fit cable ties in the original positions when installing.*

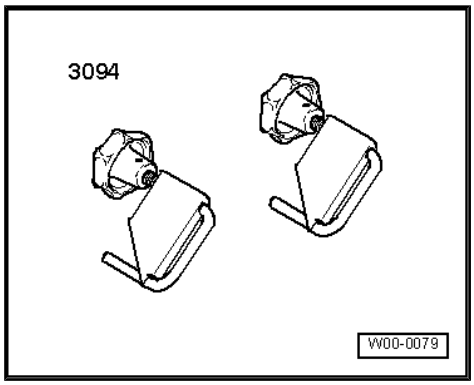
Special tools and workshop equipment required



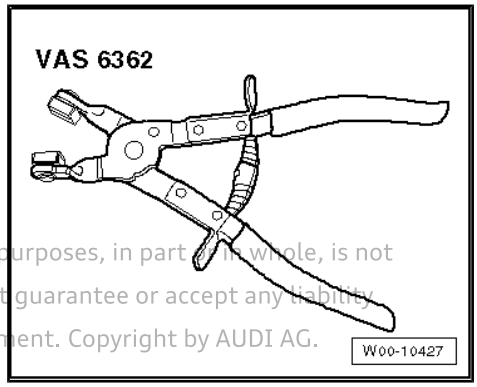
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- Removal lever - 80 - 200-
- Used oil collection and extraction unit - V.A.G 1782-
- Stepladder - VAS 5085-
- Engine bung set - VAS 6122-
- Scissor-type assembly platform - VAS 6131 A- with support set for Audi - VAS 6131/10- and supplementary set - VAS 6131/13-

- Drip tray for workshop hoist - VAS 6208-
- Hose clamps, up to 25 mm - 3094-

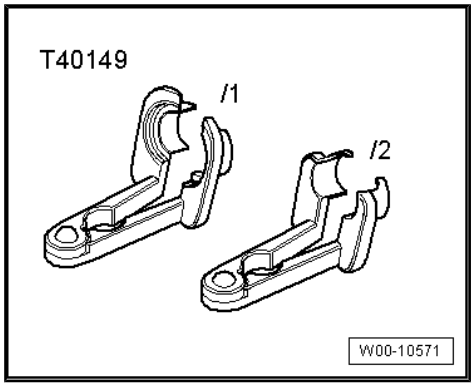


- Hose clip pliers - VAS 6362-



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- Release tool - T40149-



Procedure

WARNING

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

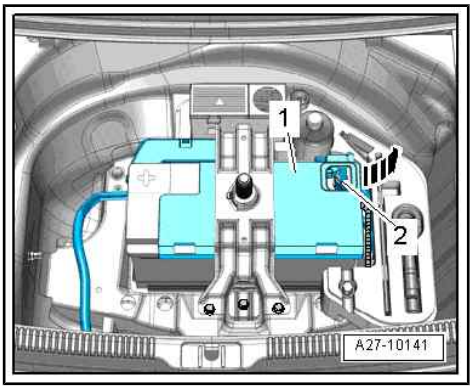
- ***Secure the vehicle, to do so, the luggage compartment must be empty.***

– Bring front wheels into straight-ahead position.

Caution

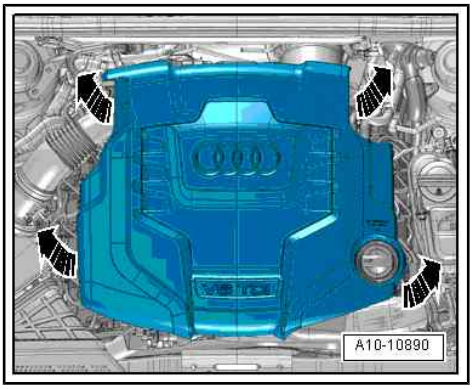
Risk of irreparable damage to electronic components.

- *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 .
– Discharge refrigerant circuit ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit .
– Extract hydraulic fluid for power steering from reservoir using used oil collection and extraction unit - V.A.G 1782- .

– Remove engine cover panel -arrows-.



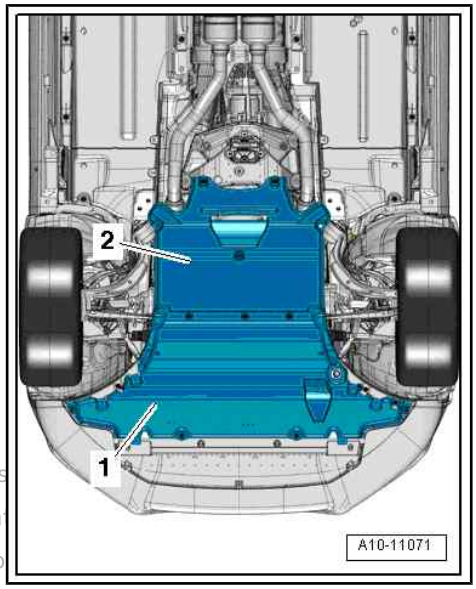
WARNING

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.*

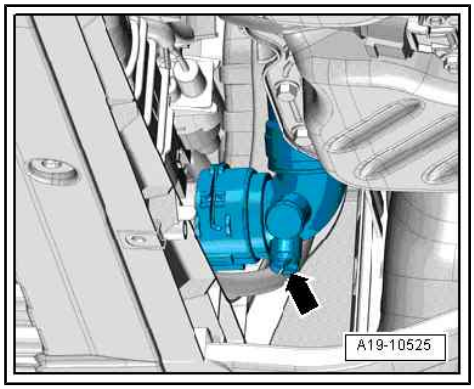
– Open filler cap on coolant expansion tank.

– Remove both front wheels.
– Remove wheel spoilers (front) on both sides ⇒ 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 .



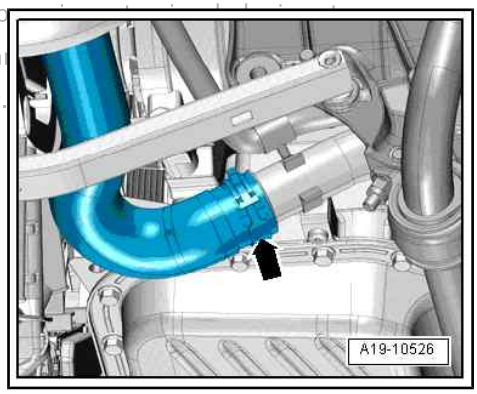
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– Place drip tray for workshop hoist - VAS 6208- beneath engine.
– Remove drain plug -arrow- at connection and drain off coolant.
– Then detach connection from radiator (lift retaining clip).

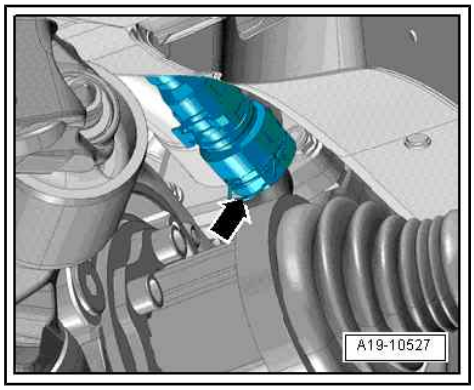


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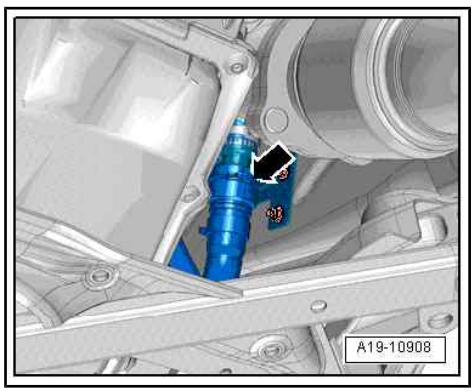
– Release hose clip -arrow-, disconnect coolant hose from coolant pipe (left-side) and drain off coolant.



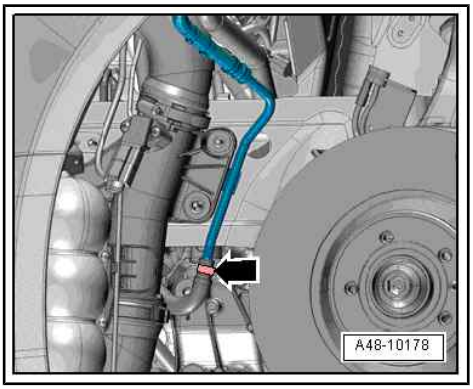
– Vehicles with plug-in connector at coolant pipe (bottom right): Lift retaining clip -arrow-, disconnect coolant hose and drain off coolant.



– Vehicles with plug-in connector at longitudinal member: Lift retaining clip -arrow-, disconnect coolant hose and drain off coolant.



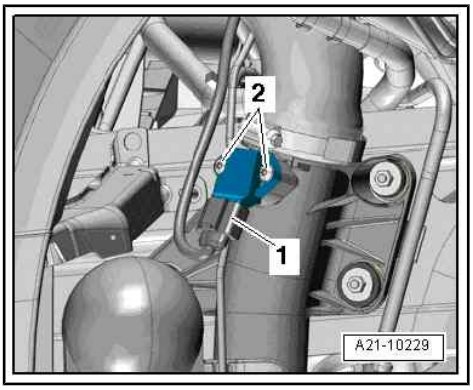
– Position used oil collection and extraction unit - V.A.G 1782- below connection point.
– Disconnect hydraulic fluid return line -arrow- for power steering.
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .



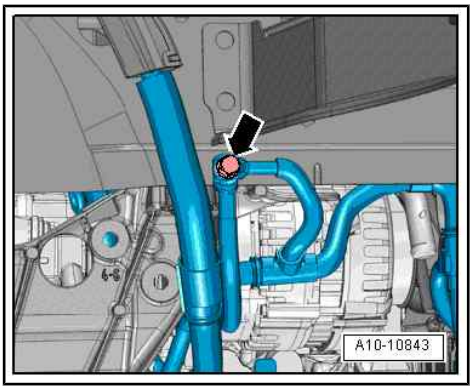
– Unplug electrical connector -1- at charge pressure sender - G31- and move electrical wiring clear.

Note

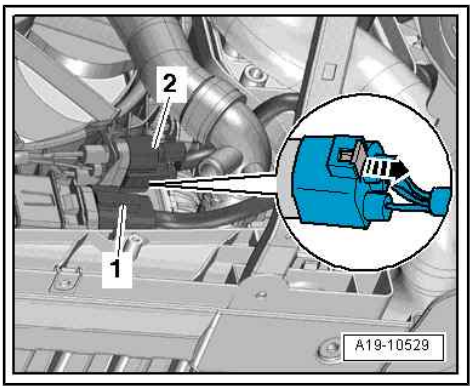
Disregard -item 2-.



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

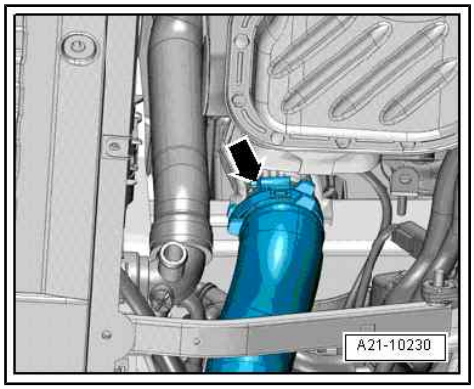


– Unplug electrical connector -1- and, if fitted, -2- for radiator fan (push retainer to the rear -arrow- and press down release catch).
– Move electrical wiring harness clear.

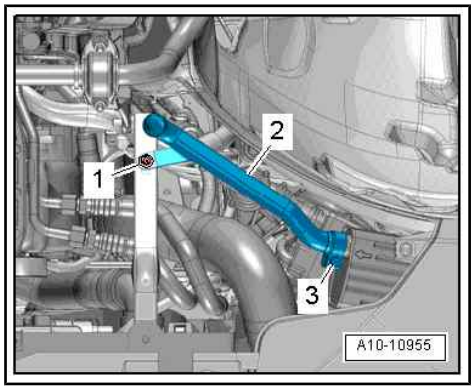


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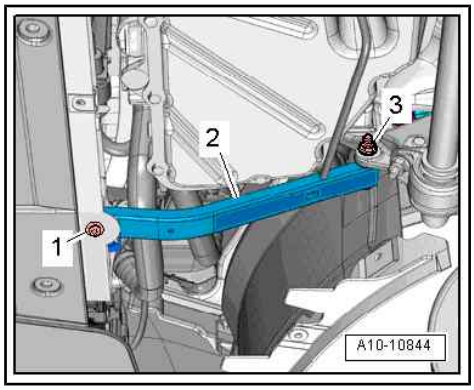
– Release hose clip -arrow-, disconnect air hose from air pipe and move to one side.



– 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.

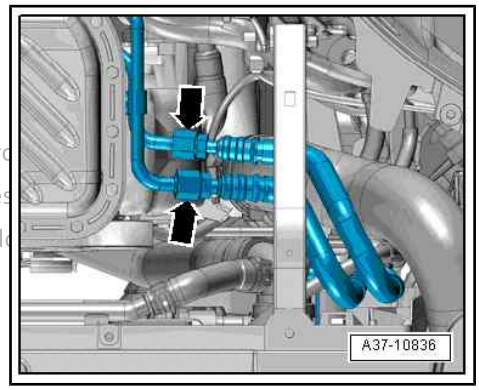


Note

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

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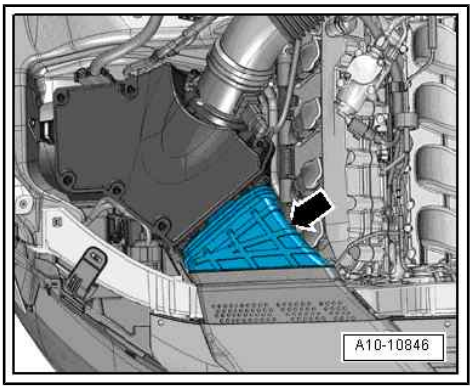
– Position used oil collection and extraction unit - V.A.G 1782- below connection points.



– Disconnect ATF lines -arrows- at connections on right side of engine.

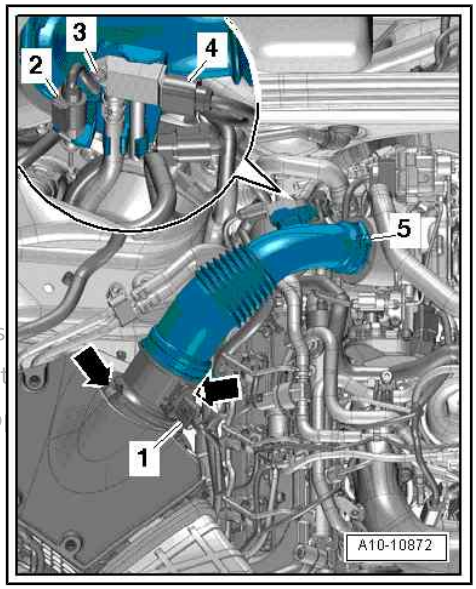
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .

– Remove air duct -arrow-.

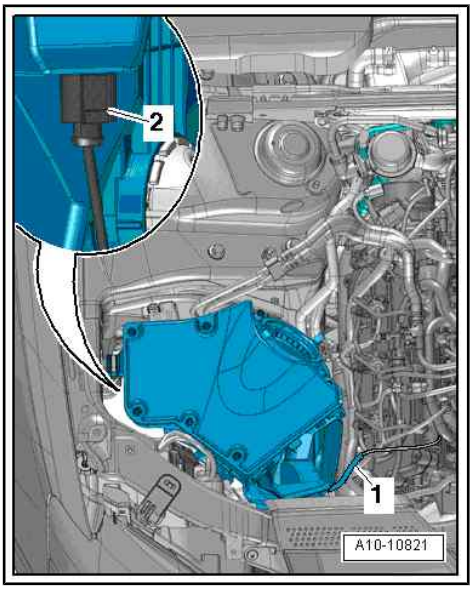


– Unplug electrical connector -1- at air mass meter - G70- .
– Unscrew bolt -3- and move clear exhaust gas pressure sensor 1 - G450- -item 4- at air pipe.
– Move electrical connector -2- clear at air pipe.
– Remove air hose and air mass meter - G70- . To do so, release hose clip -5- and clamps -arrows-.

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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.

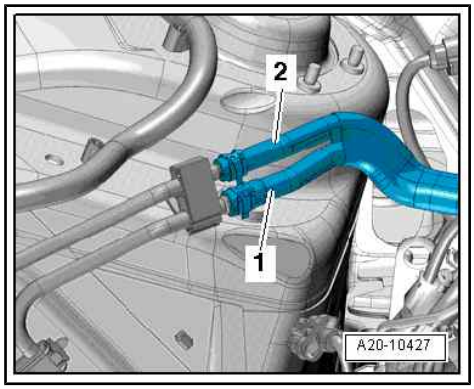


Caution

Take care to keep components clean.

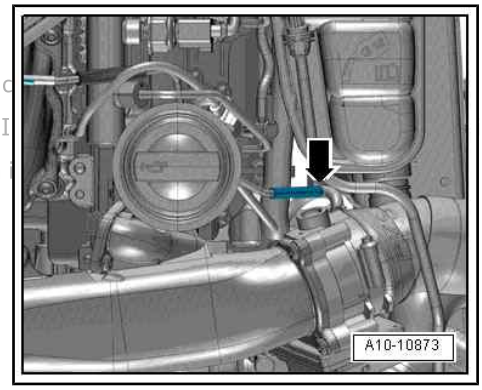
- *Observe rules for cleanliness when working on the fuel supply system ⇒ page 9 .*

– Disconnect fuel supply hose -1- and fuel return hose -2-.

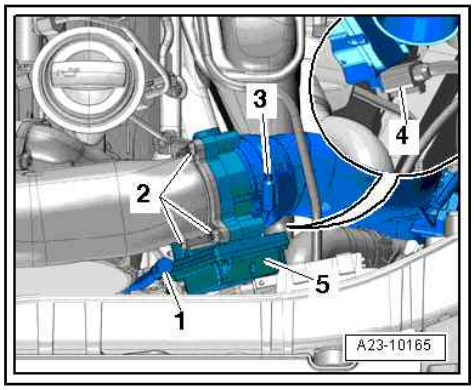


– If fitted, disconnect vacuum line -arrow-.

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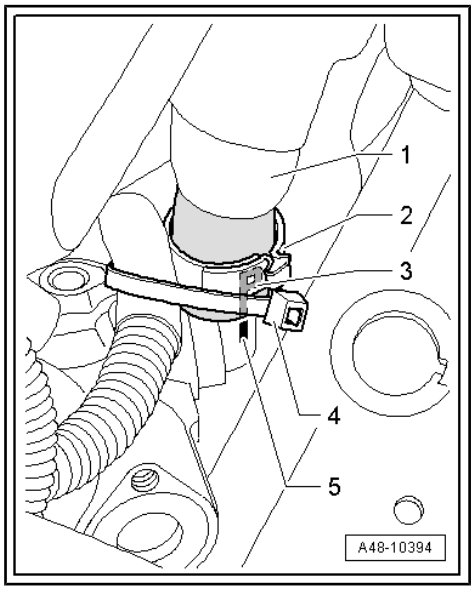
– If fitted, pull out oil dipstick -1-.
– Release hose clip -3- and detach air hose.
– Unplug electrical connector -4-.
– Remove bolts -2- and detach throttle valve module - J338- -item 5-.



Note

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

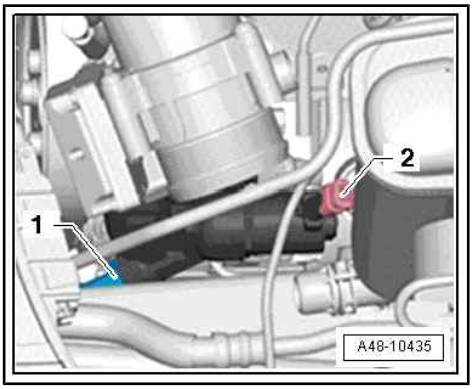
– Cut open cable tie -4-.
– Clamp off hydraulic hose -1- using hose clamp -3094- , release hose clip -2- and disconnect hose from power steering pump.
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .



Note

Disregard items -3 and 5-.

– If fitted, unplug electrical connector -2-.



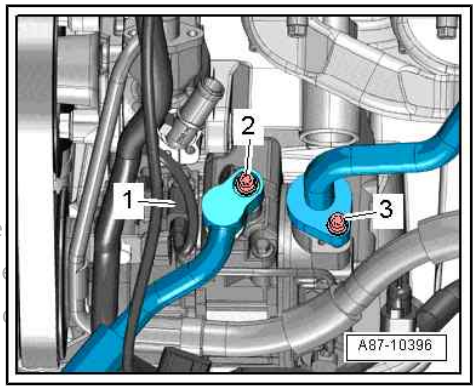
Note

Disregard -item 1-.

Caution

Risk of damage to refrigerant lines and hoses

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



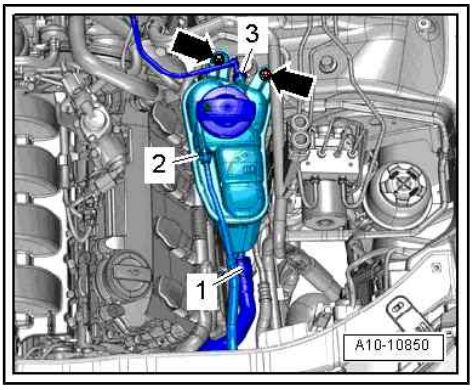
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– Remove bolt -2-, disconnect refrigerant line from air conditioner compressor and move to one side.
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .

Note

Disregard items -1 and 3-.

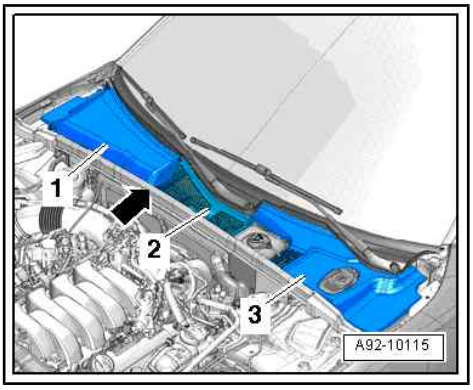
– Disconnect coolant hose -3- from coolant expansion tank.



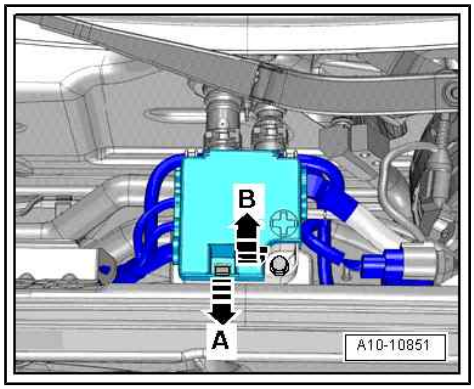
Note

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

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

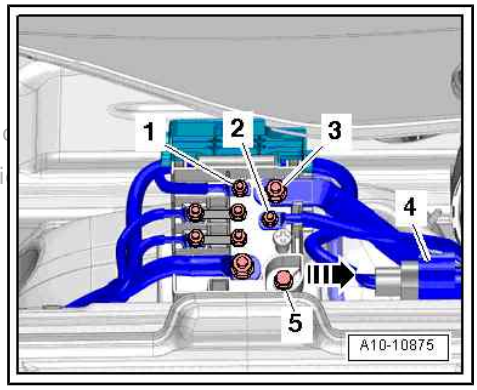


– Release retainer -arrow A- and open cover -arrow B-.

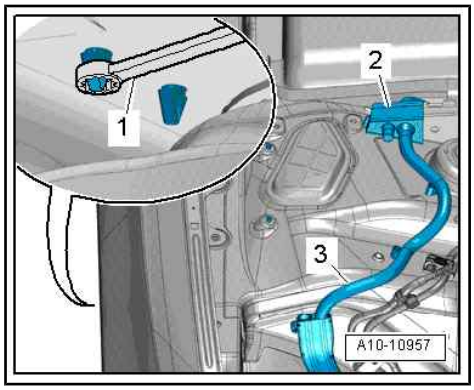


– Remove nuts -1 ... 3- for electrical wiring.
– Detach electrical connector -4- from bracket and unplug.
– Remove bolt -5- and detach terminal 30 wiring junction 2 - TV22- from body brace -arrow-.

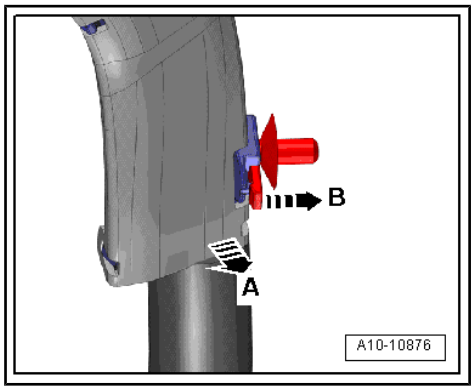
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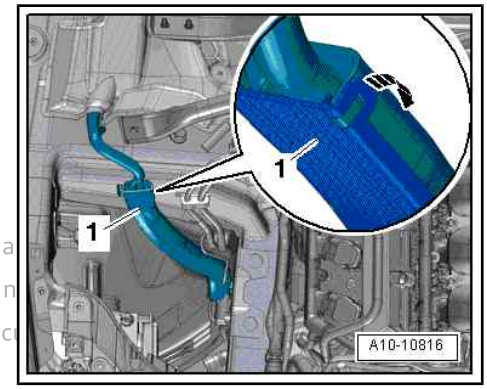
– Working from wheel housing, release catches using a 5.5 mm ring spanner -item 1- and remove wiring protector -2- from above.
– Release wiring harness -3- leading to alternator and starter using removal lever - 80 - 200- and move clear.



– Wiring duct (version 1): release catch -arrow B- and move wiring duct clear by pulling it towards front -arrow A-.

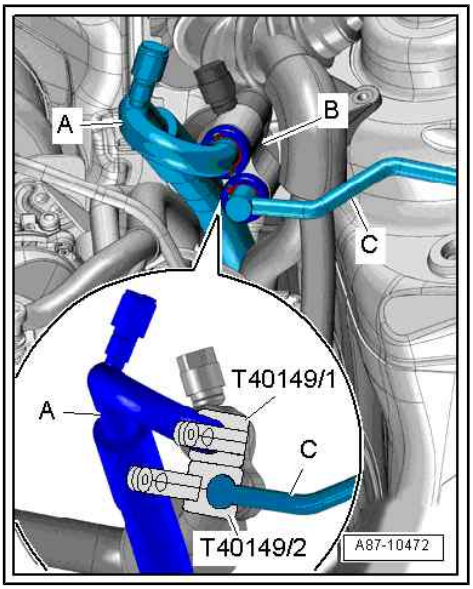


– Wiring duct (version 2): release catch -arrow- to open wiring duct -1- and move wiring harness clear.



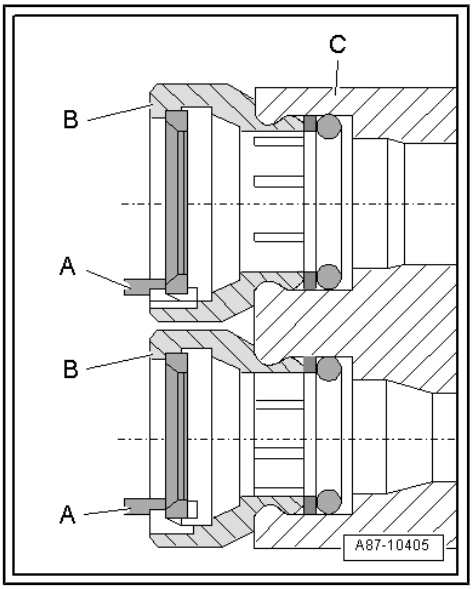
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– Press refrigerant lines -A- and -C- by hand as far as stop into connection piece -B- for refrigerant line with internal heat exchanger.
– Spray area around refrigerant lines with silicone-free lubricant.
– Fit release tool - T40149/1- for air conditioner line onto refrigerant line -A- and release tool - T40149/2- for air conditioner line onto refrigerant line -C- so that both tools engage audibly. This releases the retaining lugs.
– Using release tools for air conditioner line, pull refrigerant lines -A- and -C- out of connection piece -B- for refrigerant line with internal heat exchanger.

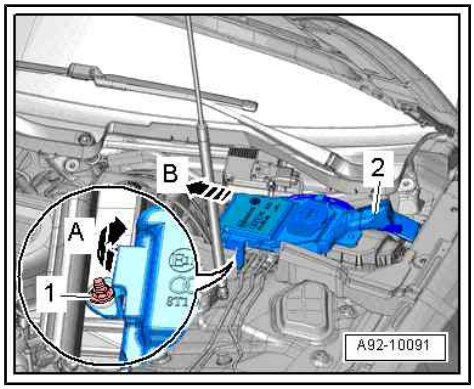


Note

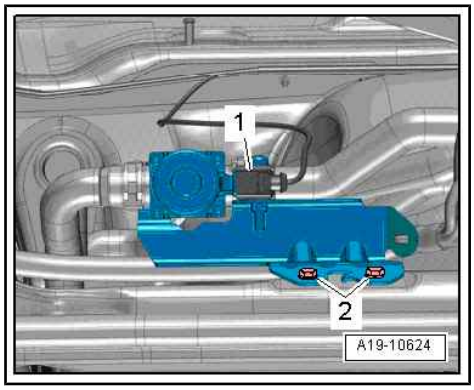
- *If it is not possible to pull out the refrigerant lines, do NOT attempt to turn the refrigerant lines in connection piece -C-.*
- *In this case you will have to cut open the connectors -B- and take out the retaining rings -A-.*
- *When cutting open the connectors, take care not to damage the connection piece -C- for the refrigerant line with internal heat exchanger.*



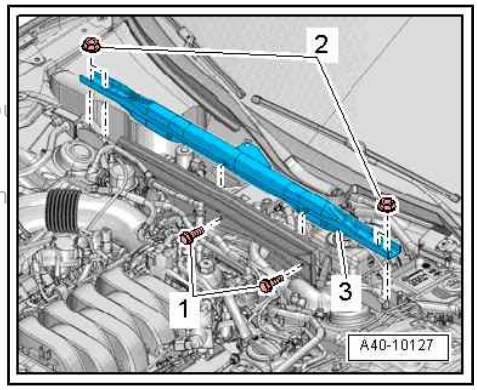
– Remove nut -1- and swivel filler neck for washer fluid reservoir slightly upwards -arrow A-.
– Pull filler neck -2- with filler pipe out of washer fluid reservoir and through opening in body -arrow B-.



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

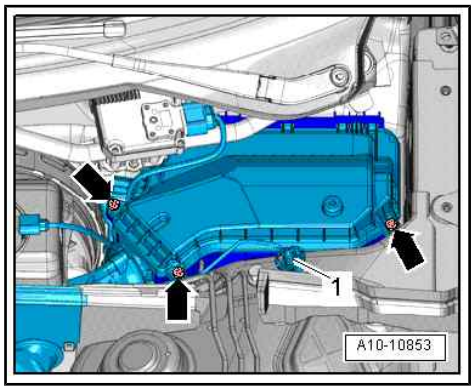


– Remove bolts -1- and nuts -2- and detach body brace -3-.

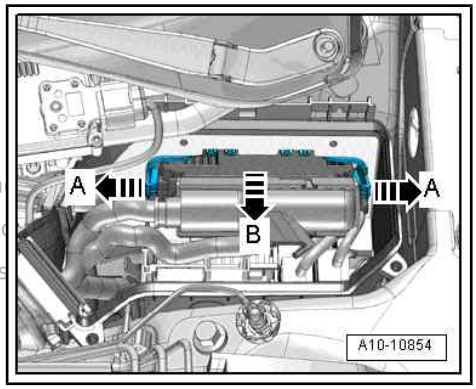


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– Remove bolts -arrows- and detach cover for electronics box in engine compartment.
– Remove nut -1- and move electrical wiring clear.

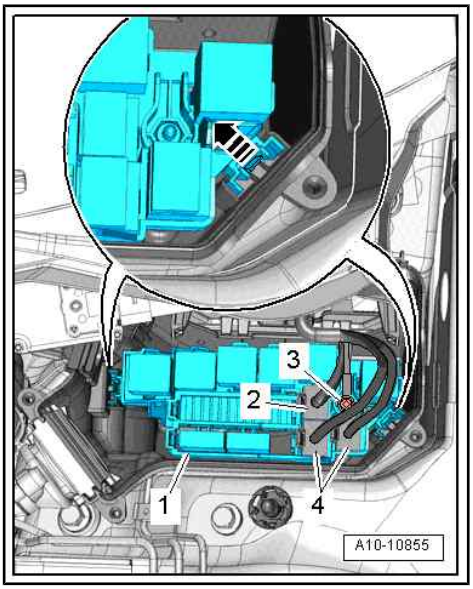


– Release catches -arrows A- and take out engine control unit -arrow B-.

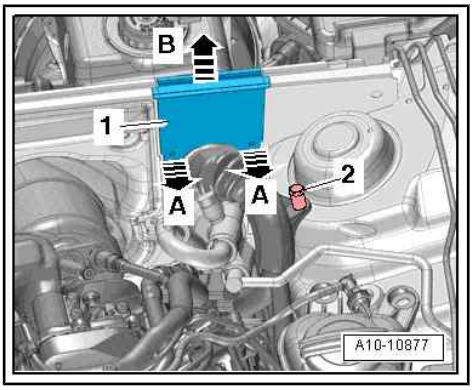


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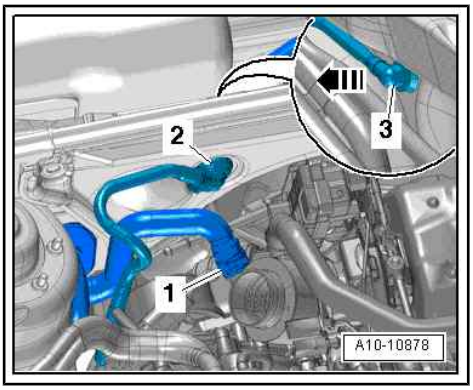
– If fitted, unplug electrical connector -2-.
– Unplug electrical connectors -4- and unscrew nut -3- for wiring.
– Release catches -arrow- and detach relay carrier with fuse holder -1-.
– Disengage engine wiring harness at electronics box in engine compartment and move clear.



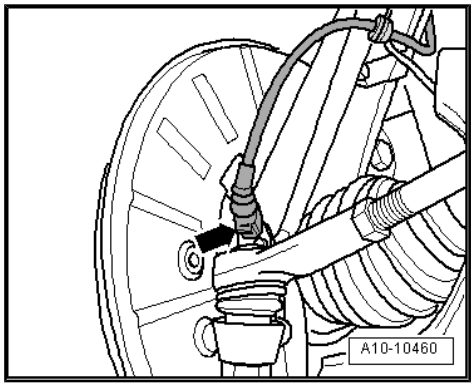
– Release catches -arrows A- and lift off wiring protector -1- -arrow B-.
– Unscrew earth stud -2- and move wiring harness clear.
– Place wiring harness on engine and secure engine control unit to prevent it from dropping.



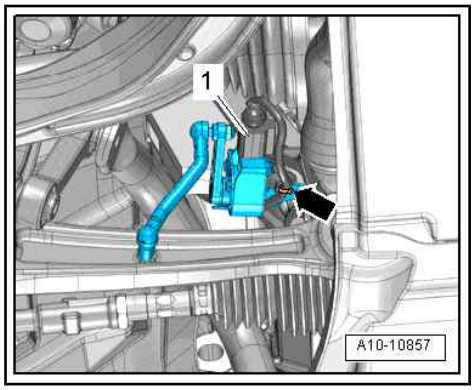
– Release hose clip -1- and detach coolant hose.
– Disconnect vacuum hose -3- on rear of plenum chamber partition panel -arrow- and detach vacuum connection -2- from plenum chamber partition panel.



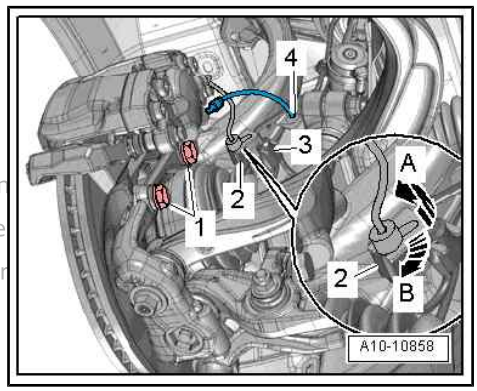
– Unplug electrical connectors -arrow- at front wheel speed sensors on both sides.



– 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-.



– 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.



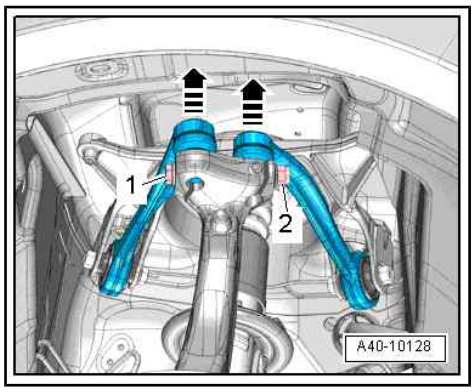
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Caution

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.



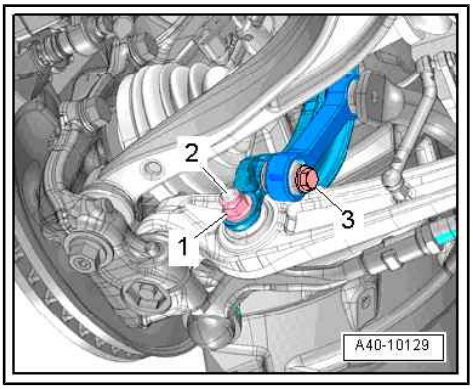
A5 up to vehicle identification no. 8T-8-011200:

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

– Remove nut -1- on both sides.

Note

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



A4 (all), A5 from vehicle identification no. 8T-8-011201 onwards:

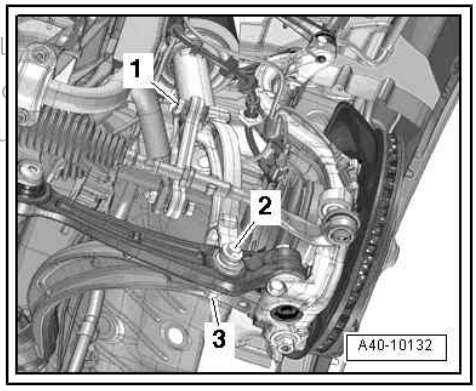
– Remove bolt -1- for anti-roll bar on both sides.

– Remove nut -3- on both sides.

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Note

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



All vehicles (continued):

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.***

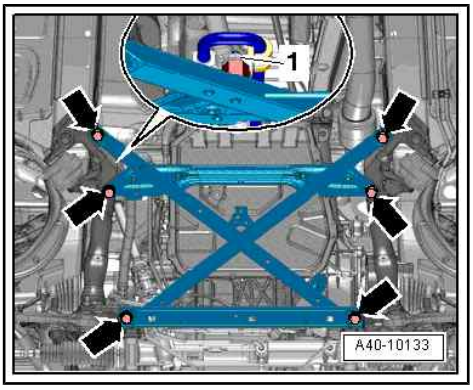
A4 (all), A5 Coupé:

– Remove nut -1- for power steering hydraulic line.

– Remove bolts -arrows- and detach subframe cross brace.

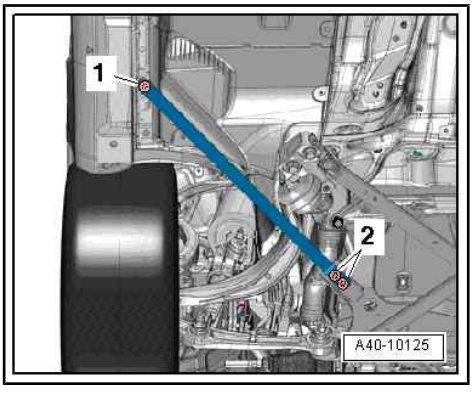
Note

Illustration shows the installation position on a vehicle with dynamic steering.

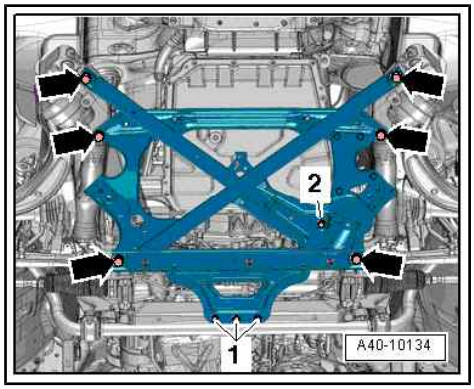


A5 Cabriolet:

– Remove bolts -1- and -2- on both sides and detach strut.

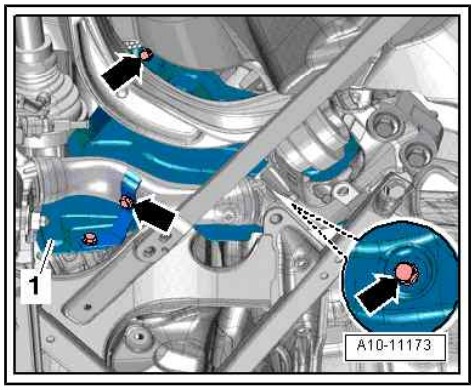


– Remove bolt -2- for power steering hydraulic line.
– Remove bolts -1- and -arrows- and detach subframe cross brace.



All vehicles (continued):

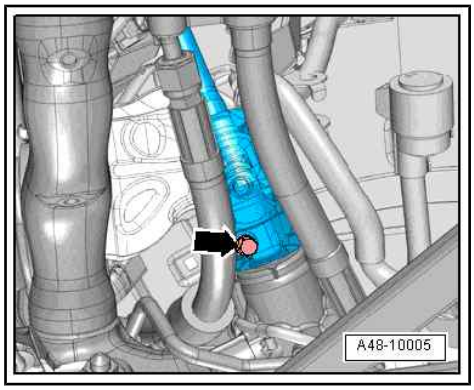
– If fitted, remove bolts -arrows- on both sides and detach heat shield -1-.



Caution

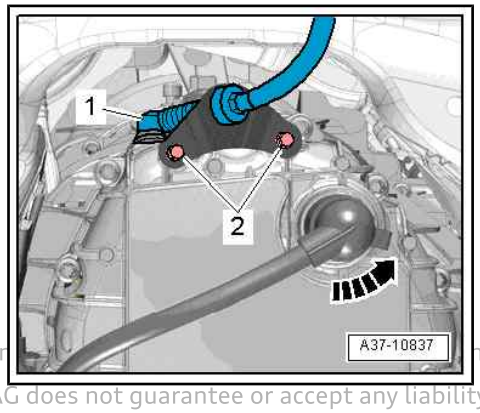
Risk of damage to coil connector for airbag.

- *Make sure that front wheels are in straight-ahead position before removing universal joint from steering rack.*
- *Do not alter the position of the steering wheel or the steering rack from this point onwards.*



– Remove bolt -arrow- for universal joint ⇒ Running gear, axles, steering; Rep. gr. 48 ; Steering column; Exploded view - steering column .
– Separate universal joint from steering rack and move clear to the top as far as possible.

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



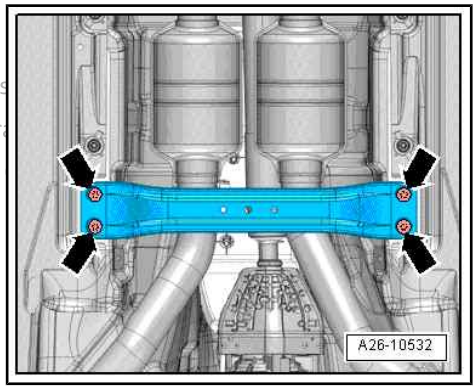
Note

- *Take care not to bend or kink selector lever cable.*
- *Disregard -arrow-.*

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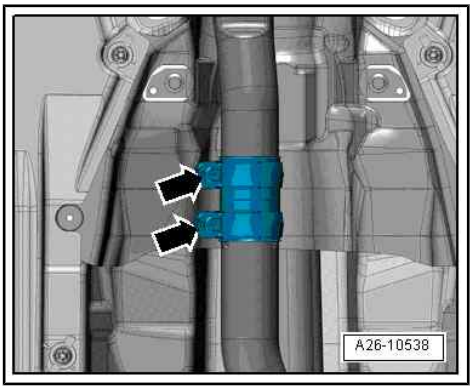
– Remove bolts -arrows- and detach front cross member.



Caution

Risk of damage to flexible joint in front exhaust pipe.

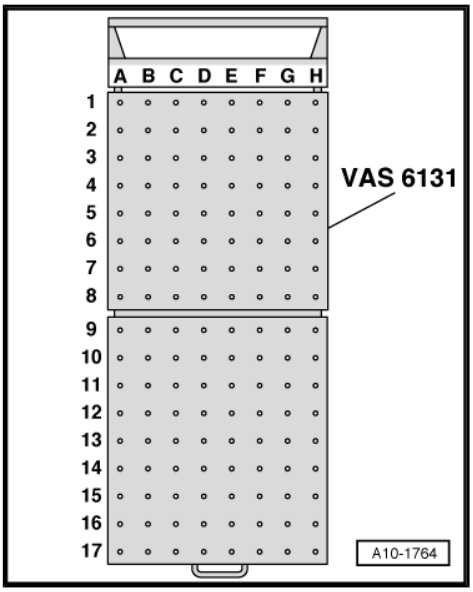
- *Do NOT bend flexible joint in front exhaust pipe more than 10°.*



– Loosen bolts -arrows-, push back clamp and detach front exhaust pipe.

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- and supplementary set - VAS 6131/13- as follows:



Platform coordinates	Parts of support set for Audi - VAS 6131/10- 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	/10-11
G6	/10-1	/10-2	/10-5	/10-11
A8+C8	/13-6	–	–	/13-2
F8+H8	/13-6	–	–	/13-2
C13	/10-1	/10-3	/10-5	/10-13
F13	/10-1	/10-3	/10-5	/10-10
F17	/10-1	/10-4	/10-5	/13-2

– Bolt the support elements onto the scissor-type assembly platform hand-tight to start with.

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

• Take note of spirit level (bubble gauge).

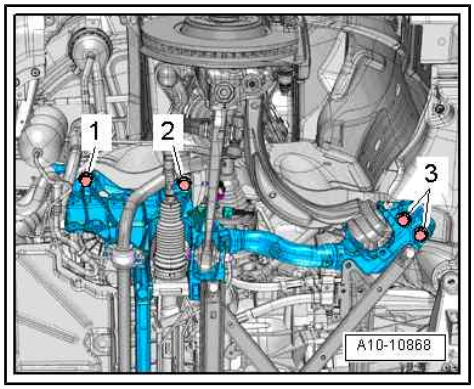
– Position scissor-type assembly platform - VAS 6131 A- below engine/gearbox assembly.

WARNING

Accident risk if subframe mountings are detached.

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

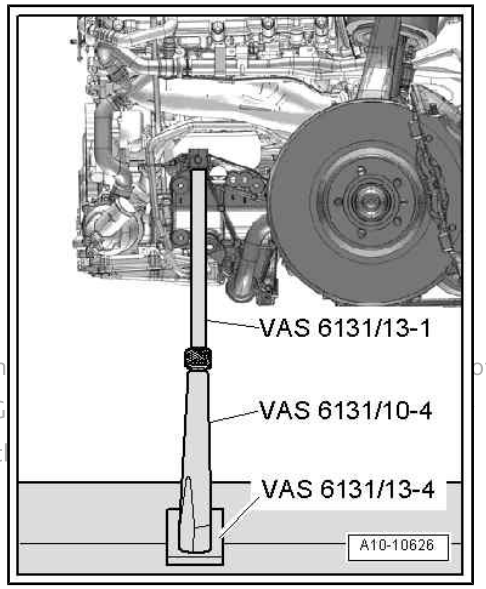
– Remove subframe bolts -1- on both sides.



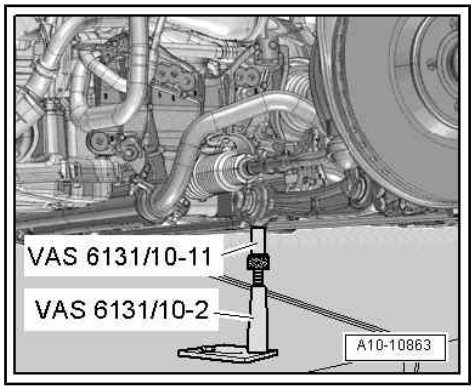
– Position support elements from -VAS 6131/10- and -VAS 6131/13- at front left and right of subframe as shown.

– Make sure that threaded spindles are screwed in completely.

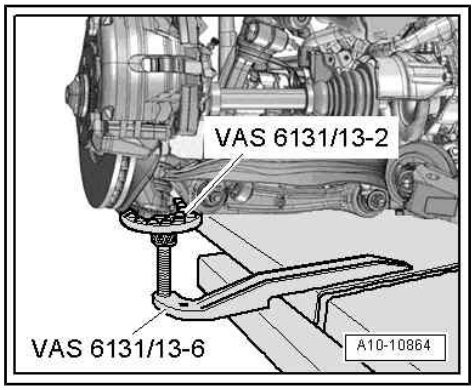
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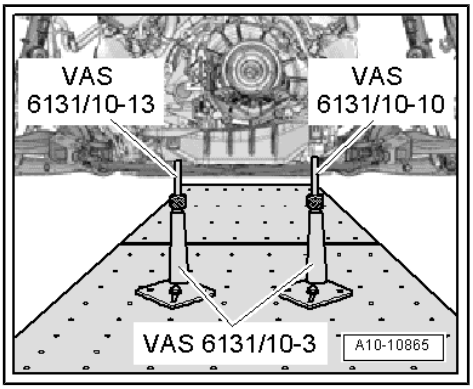
– Position support elements from -VAS 6131/10- (rear left and right) at front attachment points of subframe cross brace as shown.



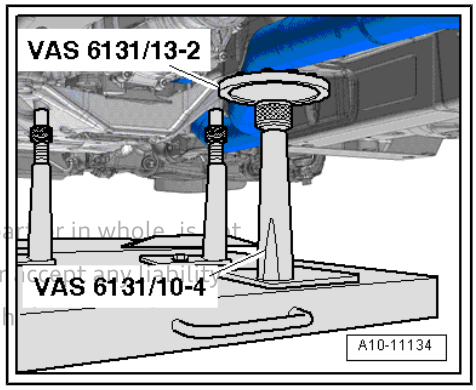
– Position support elements from -VAS 6131/13- under left and right wheel bearing housings as shown.



– Detach retaining clips for noise insulation from cross member.
– Position support elements from -VAS 6131/10- at rear of cross member on both sides, as shown in illustration.
– Turn all spindles for support elements upwards until all locating lugs make contact with mounting points.



– Position support elements from -VAS 6131/10- and -VAS 6131/13- underneath front exhaust pipe, as shown in illustration.
– Tighten base plates for support elements to 20 Nm on scissor-type assembly platform - VAS 6131 A- .

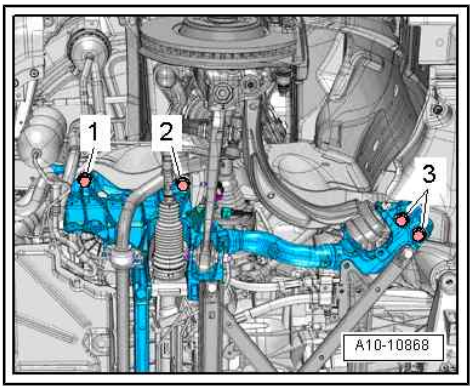


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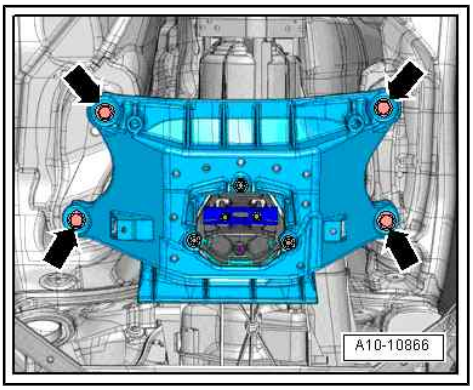
– Mark installation position of subframe on longitudinal members with felt-tip pen.
– Unscrew subframe bolts -2- and -3- on both sides in several stages and in diagonal sequence.

Note

Disregard -item 1-.

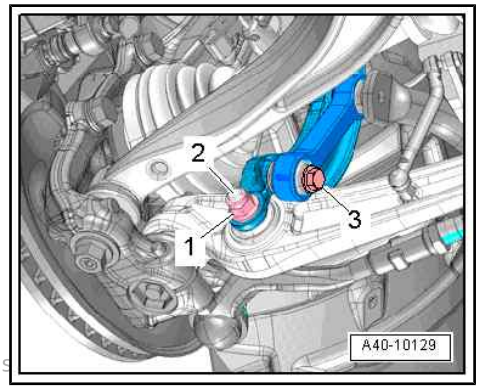


– Remove bolts -arrows- for tunnel cross member.



A5 up to vehicle identification no. 8T-8-011200:

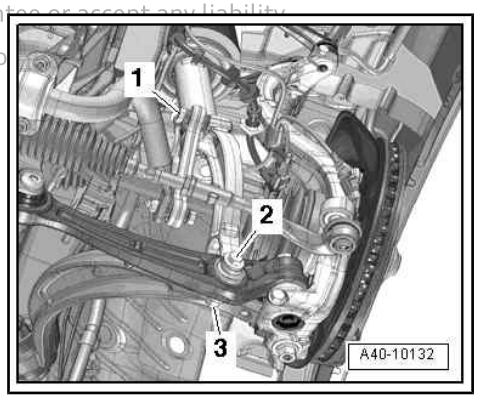
– Remove bolt -2- on both sides.



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A4 (all), A5 from vehicle identification no. 8T-8-011201 onwards:

– Remove bolt -2- on both sides.



All vehicles (continued):

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.***

– Lower engine/gearbox assembly.

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

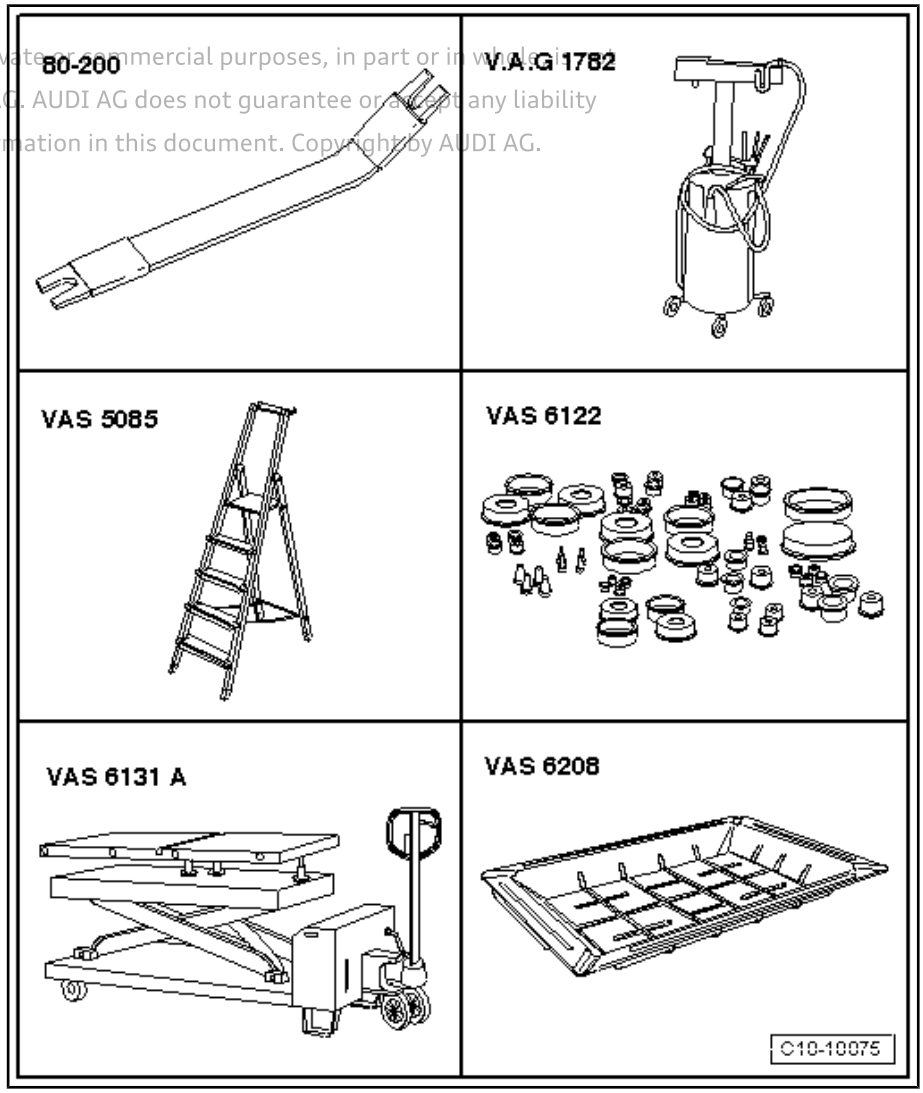
1.1.3 Removing engine - vehicles with dual clutch gearbox 0B5

Note

- *The engine is removed from underneath together with the gearbox and subframe (with lock carrier installed).*
- *Collect drained coolant in a clean container for re-use or disposal.*
- *Fit cable ties in the original positions when installing.*

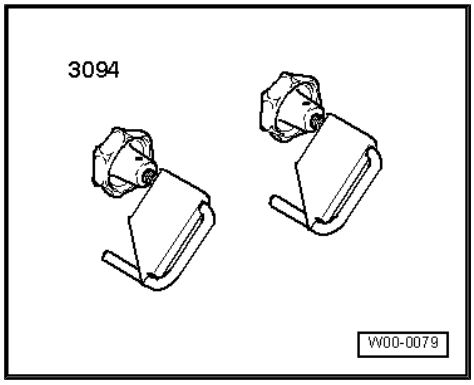
Special tools and workshop equipment required

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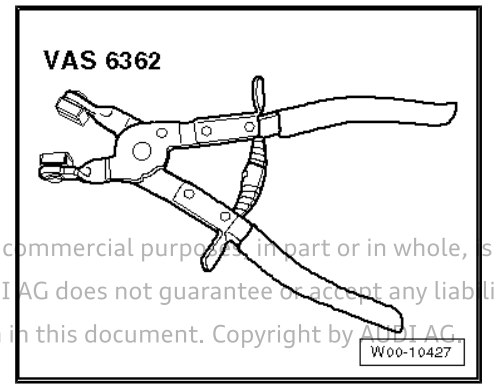


- Removal lever - 80 - 200-
- Used oil collection and extraction unit - V.A.G 1782-
- Stepladder - VAS 5085-
- Engine bung set - VAS 6122-
- Scissor-type assembly platform - VAS 6131 A- with support set for Audi - VAS 6131/10- and supplementary set - VAS 6131/13-
- Drip tray for workshop hoist - VAS 6208-

- Hose clamps, up to 25 mm - 3094-

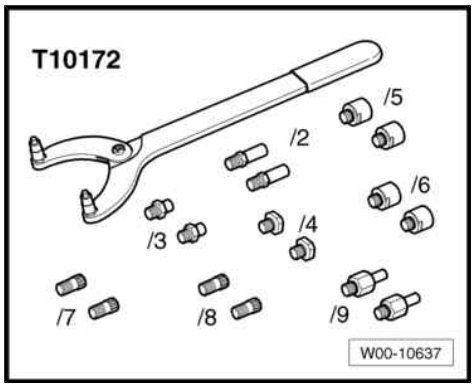


- Hose clip pliers - VAS 6362-

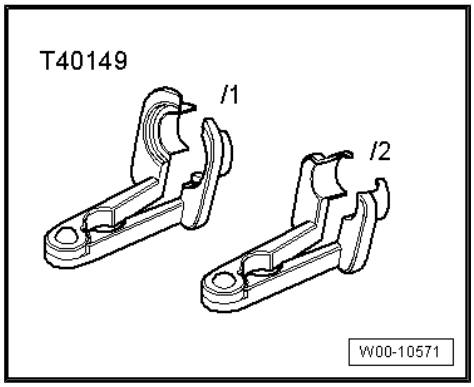


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- Counterhold tool - T10172- with -T10172/5-



- Release tool - T40149-



Procedure

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.***

– Bring front wheels into straight-ahead position.

Note

The electromechanical parking brake must be released before disconnecting the battery, so that the propshaft can be turned during removal.

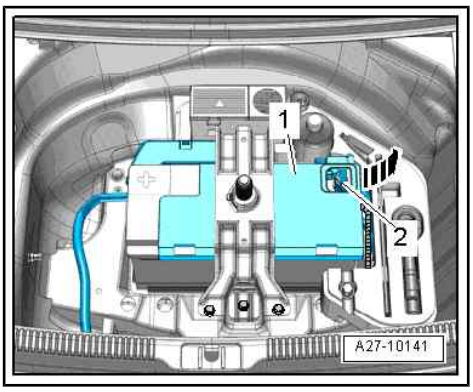
Caution

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 .



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

– Extract hydraulic fluid for power steering from reservoir using used oil collection and extraction unit - V.A.G 1782- .

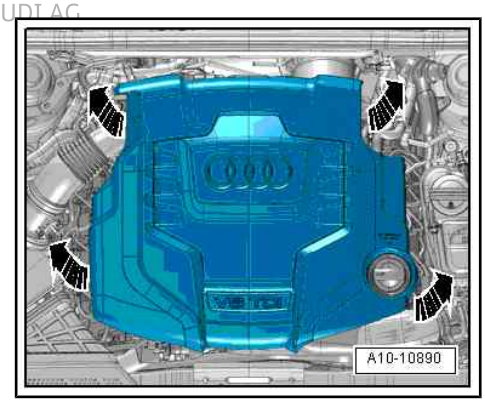
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– Remove engine cover panel -arrows-.

WARNING

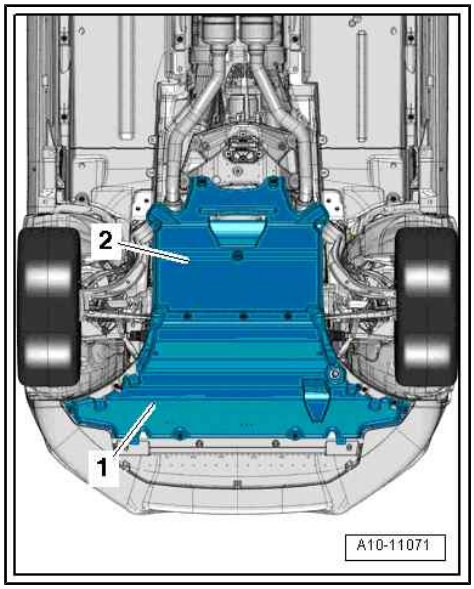
Risk of scalding due to hot steam and hot coolant.

- ***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.***

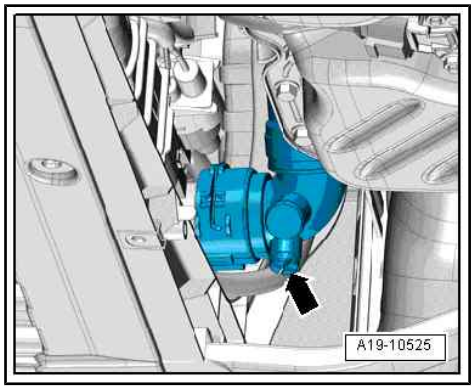


– Open filler cap on coolant expansion tank.

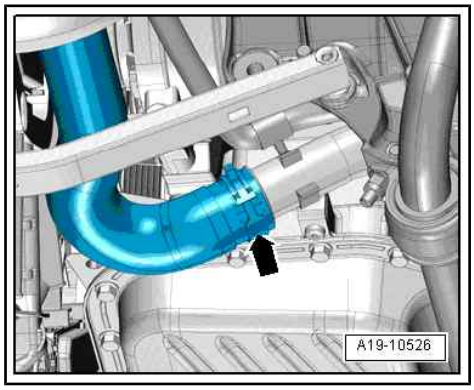
– Remove both front wheels.
– Remove wheel spoilers (front) on both sides ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front) .
– Remove noise insulation -1- and -2- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded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



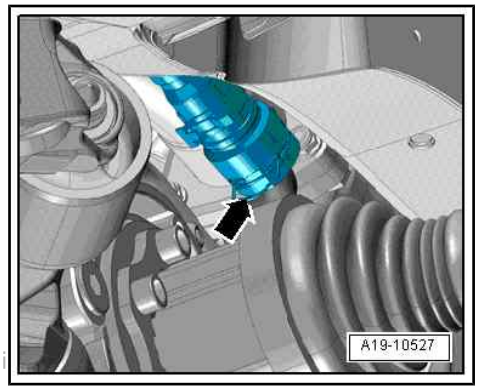
– Place drip tray for workshop hoist - VAS 6208- beneath engine.
– Remove drain plug -arrow- at connection and drain off coolant.
– Then detach connection from radiator (lift retaining clip).



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

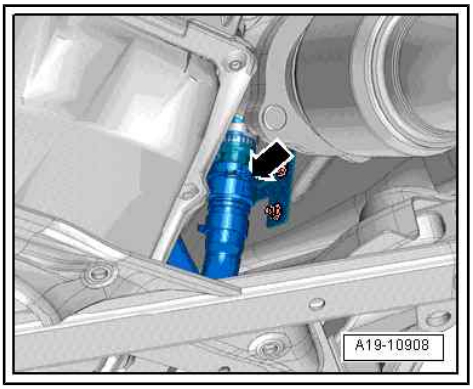


– Vehicles with plug-in connector at coolant pipe (bottom right): Lift retaining clip -arrow-, disconnect coolant hose and drain off coolant.

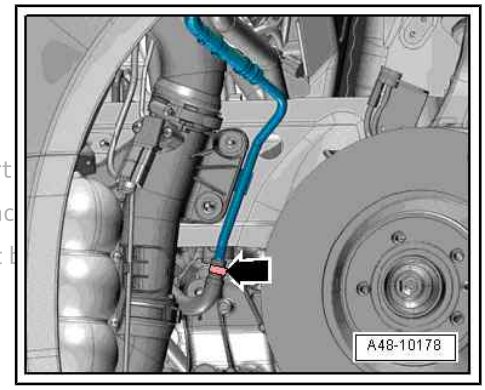


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– Vehicles with plug-in connector at longitudinal member: Lift retaining clip -arrow-, disconnect coolant hose and drain off coolant.



– Position used oil collection and extraction unit - V.A.G 1782- below connection point.
– Disconnect hydraulic fluid return line -arrow- for power steering.
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .

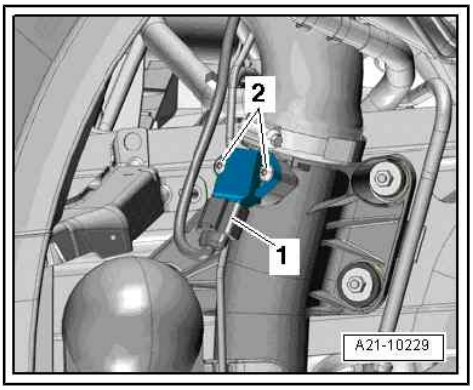


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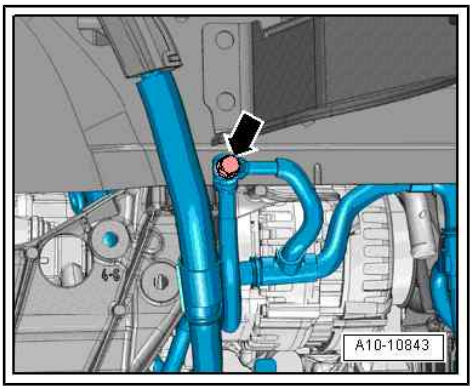
– Unplug electrical connector -1- at charge pressure sender - G31- and move electrical wiring clear.

Note

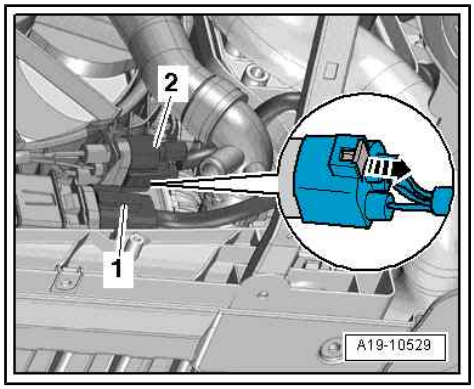
Disregard -item 2-.



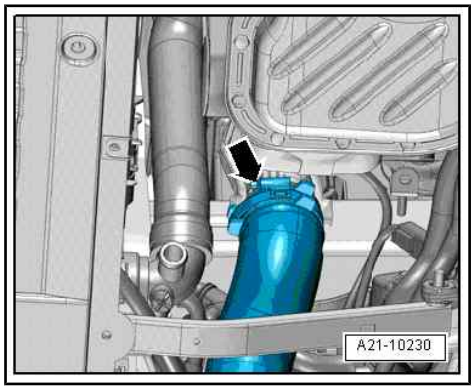
– Unscrew nut -arrow- on longitudinal member (right-side) and move earth cables clear.



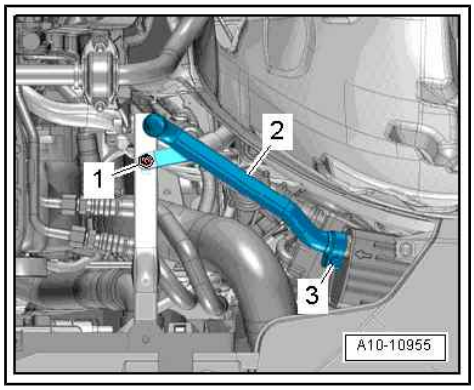
– Unplug electrical connectors -1- and, if fitted, -2- for radiator fan (push retainer to the rear -arrow- and press down release catch).
– Move electrical wiring harness clear.



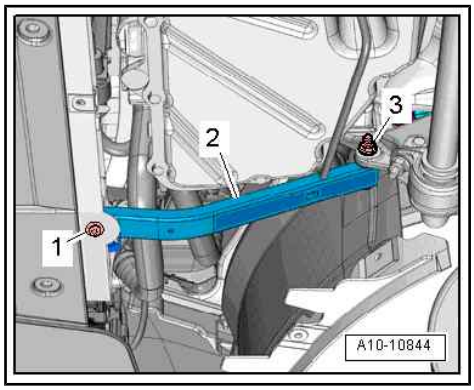
– Release hose clip -arrow-, disconnect air hose from air pipe and move to one side.



– 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.



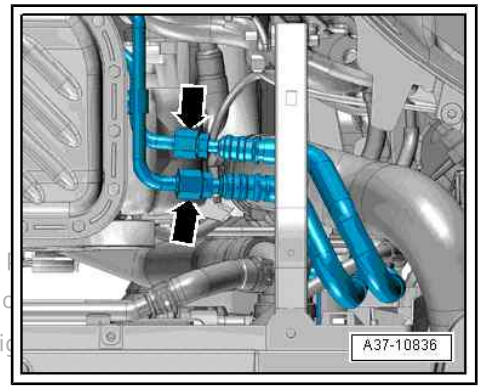
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Note

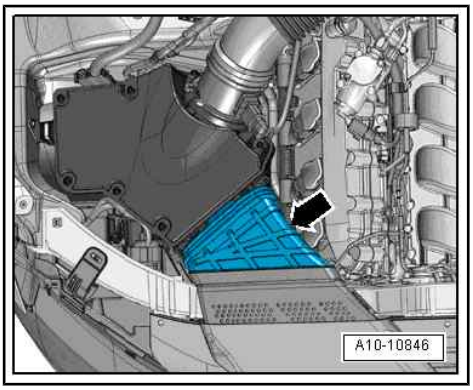
Observe rules for cleanliness when working on gearbox ⇒ Rep. gr. 00 ; Repair instructions; Rules for cleanliness .

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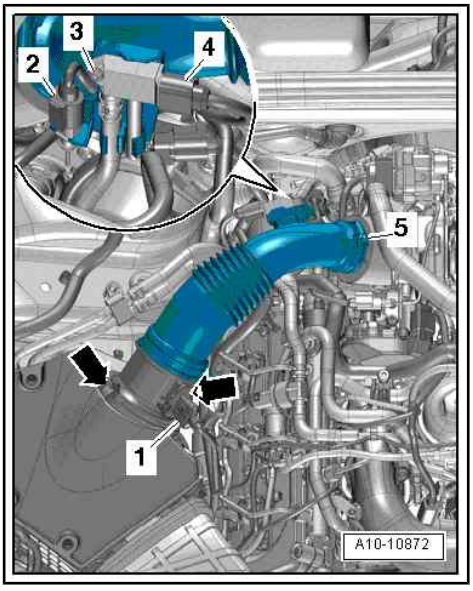
– Position used oil collection and extraction unit - V.A.G 1782- below connection points.
– Disconnect ATF lines -arrows- at connections on right side of engine.
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .



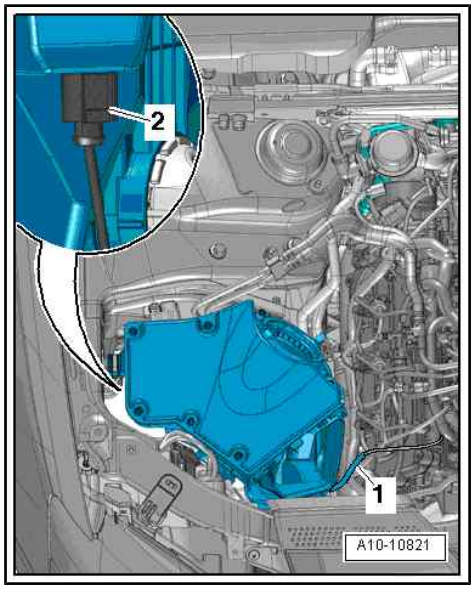
– Remove air duct -arrow-.



– Unplug electrical connector -1- at air mass meter - G70- .
– Unscrew bolt -3- and move clear exhaust gas pressure sensor 1 - G450- -item 4- at air pipe.
– Move electrical connector -2- clear at air pipe.
– Remove air hose and air mass meter - G70- . To do so, release hose clip -5- and clamps -arrows-.



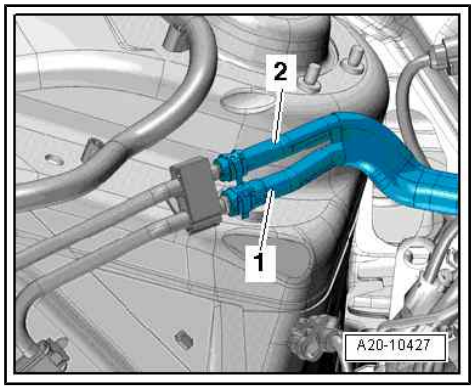
– Disconnect vacuum line -1-.
– Detach air cleaner housing, unplug electrical connector -2- at air filter bypass flap valve - N275- on reverse side of air cleaner and move electrical wiring clear.



Caution

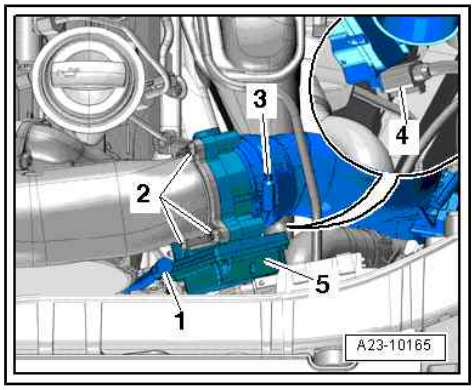
Take care to keep components clean.

- *Observe rules for cleanliness when working on the fuel supply system ⇒ page 9 .*



– Disconnect fuel supply hose -1- and fuel return hose -2-.

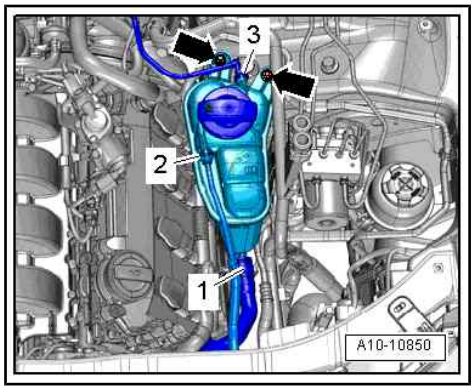
– Release hose clip -3- and detach air hose.
– Unplug electrical connector -4-.
– Remove bolts -2- and detach throttle valve module - J338- -item 5-.



Note

Disregard -item 1-.

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



Note

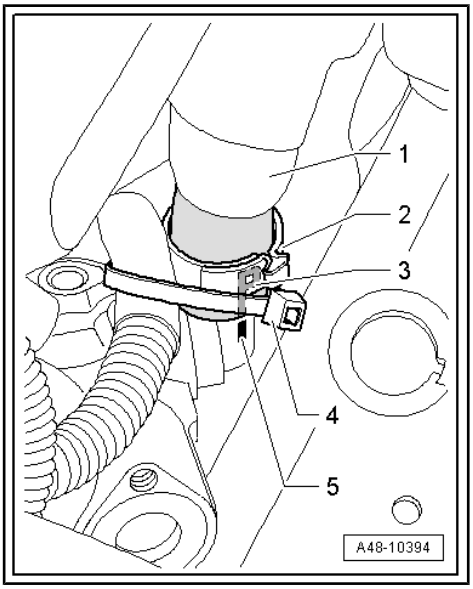
Disregard items marked -1, 2- and -arrows-.

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Note

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

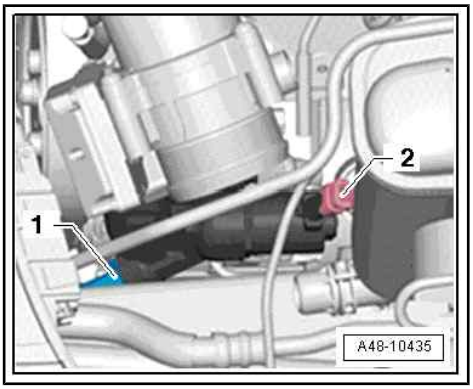
– Cut open cable tie -4-.
– Clamp off hydraulic hose -1- using hose clamp -3094- , release hose clip -2- and disconnect hose from power steering pump.
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .



Note

Disregard items -3 and 5-.

– If fitted, unplug electrical connector -2-.



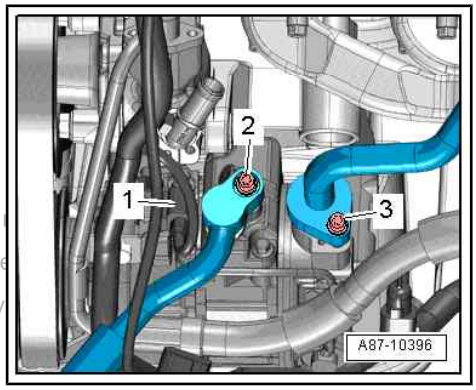
Note

Disregard -item 1-.

Caution

Risk of damage to refrigerant lines and hoses

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



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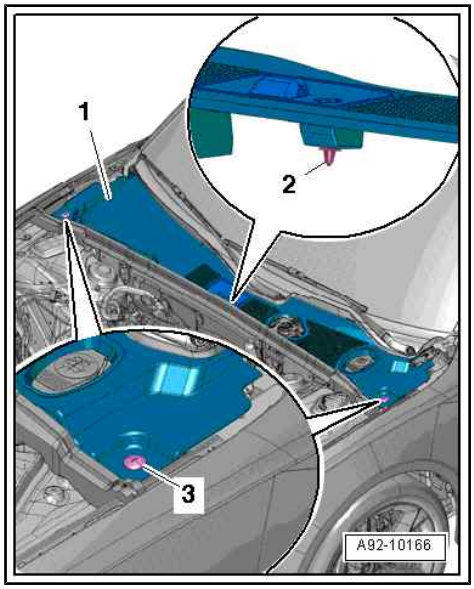
– Remove bolt -2-, disconnect refrigerant line from air conditioner compressor and move to one side.
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .

Note

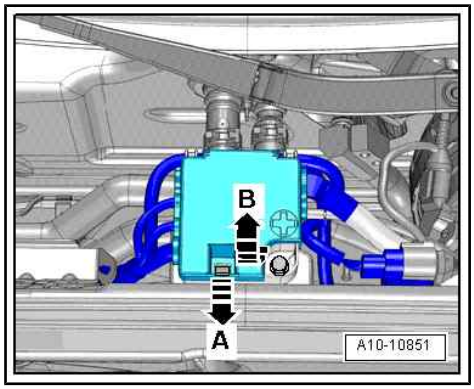
Disregard items -1 and 3-.

– Remove gasket.

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



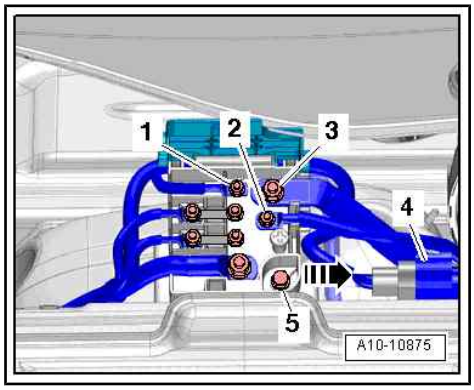
– Release retainer -arrow A- and open cover -arrow B-.



– Remove nuts -1 ... 3- for electrical wiring.

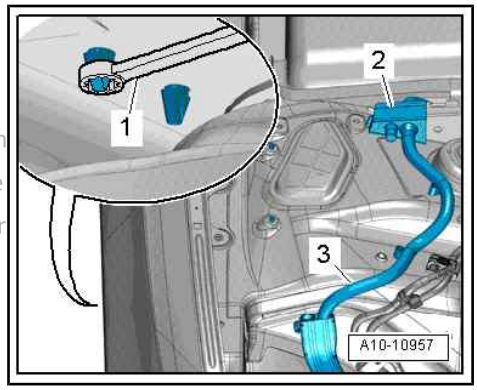
– Detach electrical connector -4- from bracket and unplug.

– Remove bolt -5- and detach terminal 30 wiring junction 2 - TV22- from body brace -arrow-.



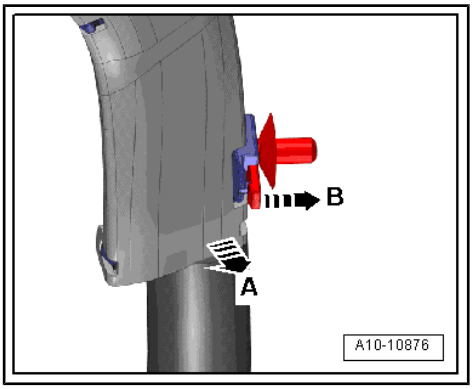
– Working from wheel housing, release catches using a 5.5 mm ring spanner -item 1- and remove wiring protector -2- from above.

– Release wiring harness -3- leading to alternator and starter using removal lever - 80 - 200- and move clear.

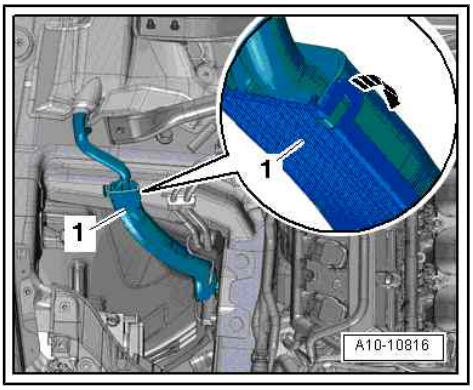


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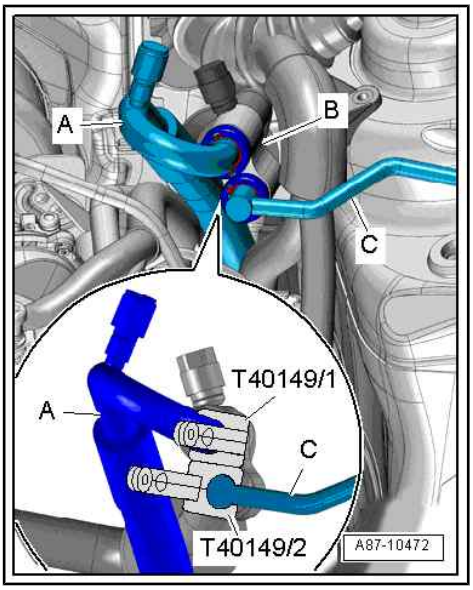
– Wiring duct (version 1): release catch -arrow B- and move wiring duct clear by pulling it towards front -arrow A-.



– Wiring duct (version 2): release catch -arrow- to open wiring duct -1- and move wiring harness clear.



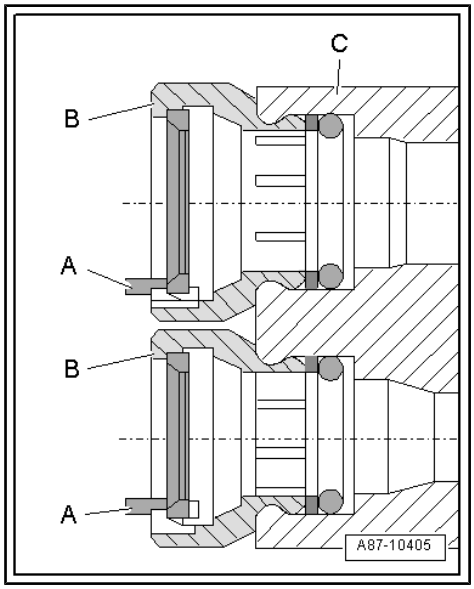
– Press refrigerant lines -A- and -C- by hand as far as stop into connection piece -B- for refrigerant line with internal heat exchanger.
– Spray area around refrigerant lines with silicone-free lubricant.
– Fit release tool - T40149/1- for air conditioner line onto refrigerant line -A- and release tool - T40149/2- for air conditioner line onto refrigerant line -C- so that both tools engage audibly. This releases the retaining lugs.
– Using release tools for air conditioner line, pull refrigerant lines -A- and -C- out of connection piece -B- for refrigerant line with internal heat exchanger.



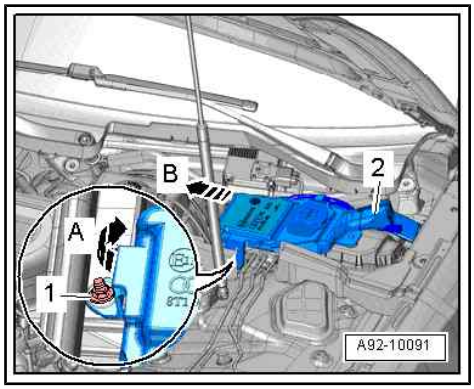
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Note

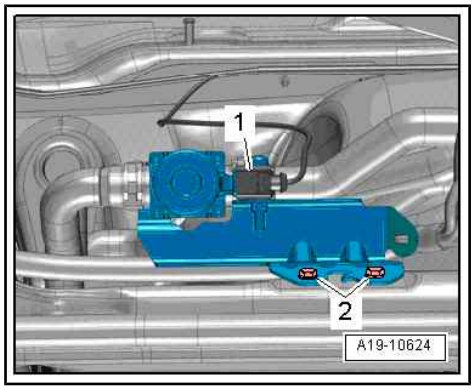
- *If it is not possible to pull out the refrigerant lines, do NOT attempt to turn the refrigerant lines in connection piece -C-.*
- *In this case you will have to cut open the connectors -B- and take out the retaining rings -A-.*
- *When cutting open the connectors, take care not to damage the connection piece -C- for the refrigerant line with internal heat exchanger.*



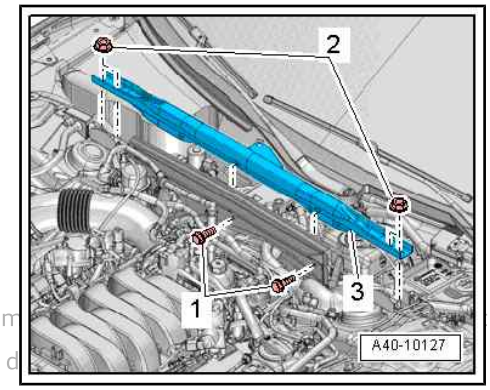
– Remove nut -1- and swivel filler neck for washer fluid reservoir slightly upwards -arrow A-.
– Pull filler neck -2- with filler pipe out of washer fluid reservoir and through opening in body -arrow B-.



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

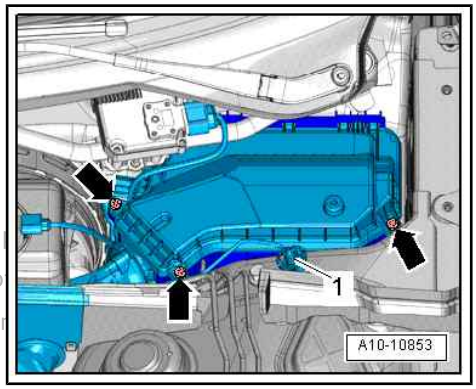


– Remove bolts -1- and nuts -2- and detach body brace -3-.



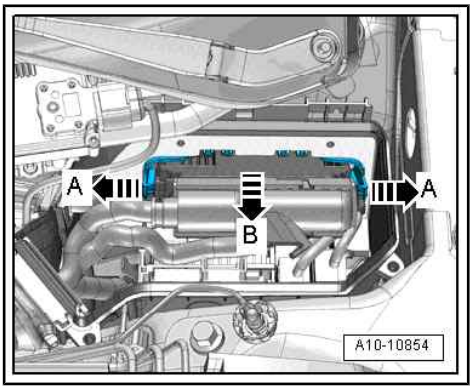
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– Remove bolts -arrows- and detach cover for electronics box in engine compartment.
– Remove nut -1- and move electrical wiring clear.

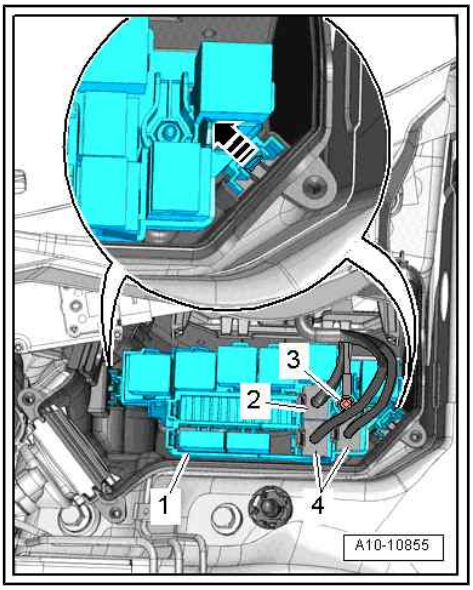


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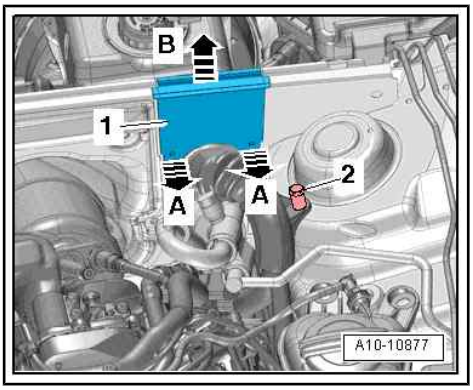
– Release catches -arrows A- and take out engine control unit -arrow B-.



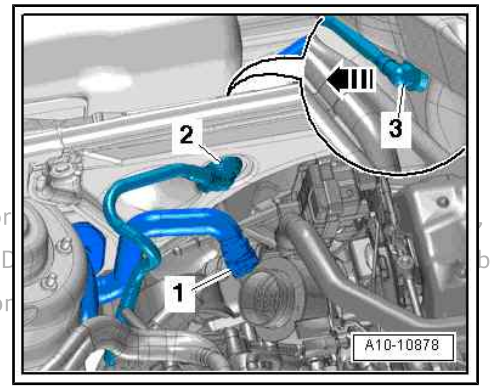
– If fitted, unplug electrical connector -2-.
– Unplug electrical connectors -4- and unscrew nut -3- for wiring.
– Release catches -arrow- and detach relay carrier with fuse holder -1-.
– Disengage engine wiring harness at electronics box in engine compartment and move clear.



– 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.

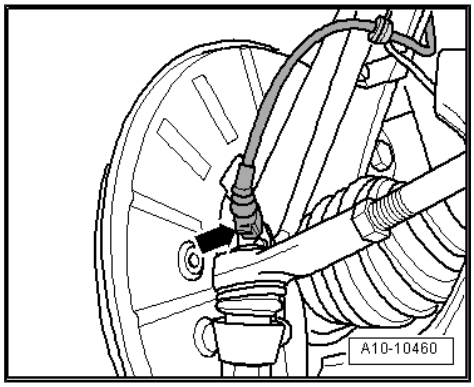


– Release hose clip -1- and detach coolant hose.
– Disconnect vacuum hose -3- on rear of plenum chamber partition panel -arrow- and detach vacuum connection -2- from plenum chamber partition panel.

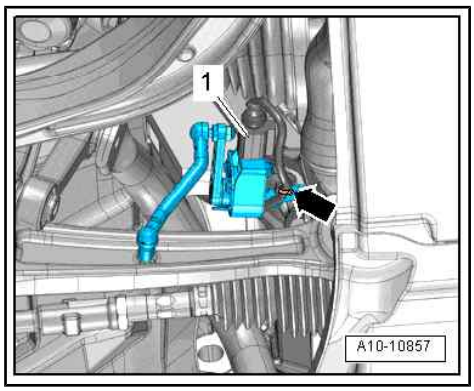


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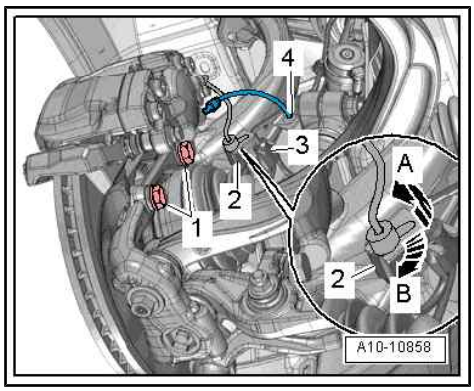
– Unplug electrical connectors -arrow- at front wheel speed sensors on both sides.



– 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-.



– 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.

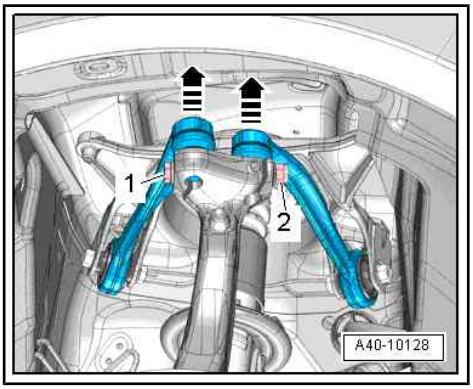


Caution

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.

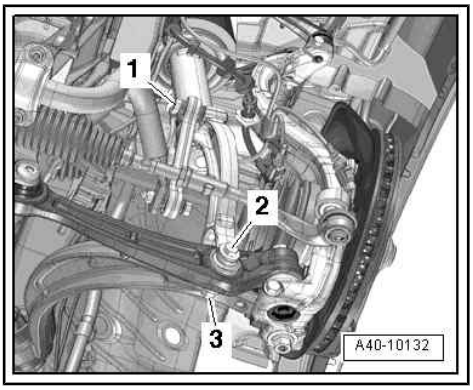
Note

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

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.***



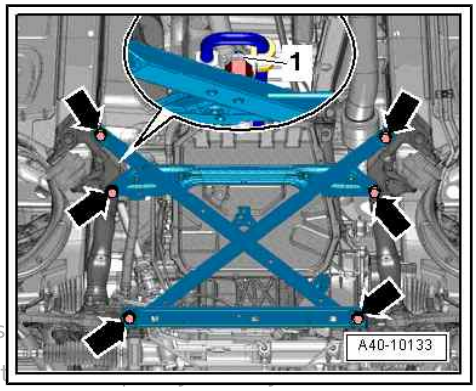
A4 (all), A5 Coupé:

– Remove nut -1- for power steering hydraulic line.
– Remove bolts -arrows- and detach subframe cross brace.

Note

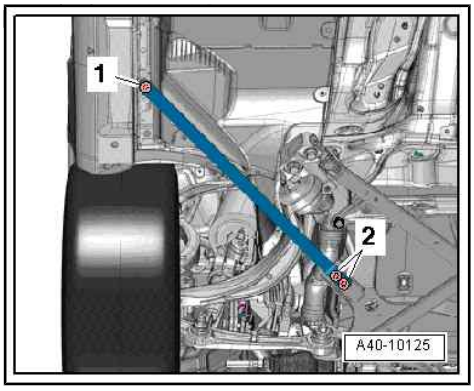
Illustration shows the installation position on a vehicle with dynamic steering.

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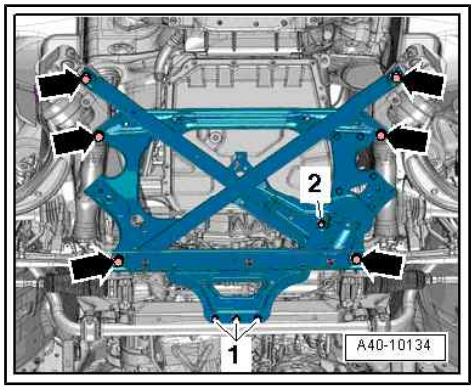


A5 Cabriolet:

– Remove bolts -1- and -2- on both sides and detach strut.

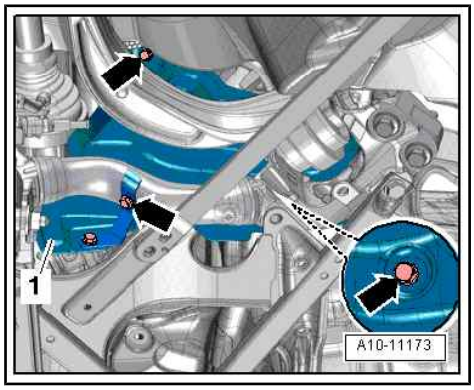


– Remove bolt -2- for power steering hydraulic line.
– Remove bolts -1- and -arrows- and detach subframe cross brace.



All vehicles (continued):

– If fitted, remove bolts -arrows- on both sides and detach heat shield -1-.

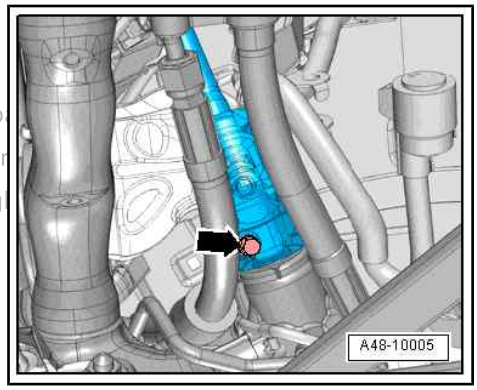


Caution

Risk of damage to coil connector for airbag.

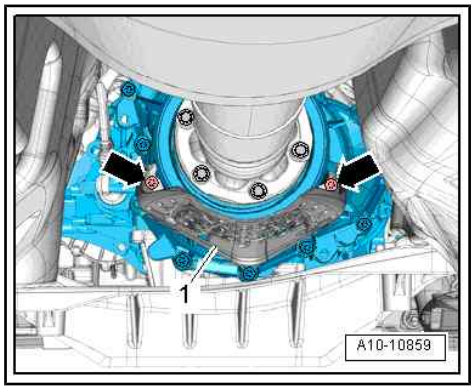
- ***Make sure that front wheels are in straight-ahead position before removing universal joint from steering rack.***
- ***Do not alter the position of the steering wheel or the steering rack from this point onwards.***

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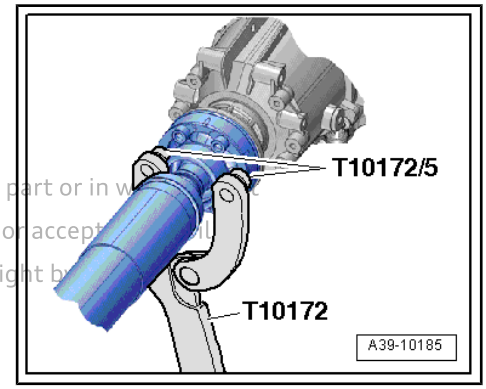
– Remove bolt -arrow- for universal joint ⇒ Running gear, axles, steering; Rep. gr. 48 ; Steering column; Exploded view - steering column .
– Separate universal joint from steering rack and move clear to the top as far as possible.

– Remove bolts -arrows- and detach heat shield for propshaft.



– Remove bolts connecting propshaft to gearbox (use counter-hold tool - T10172- with -T10172/5-).
– Slide propshaft towards rear final drive; the constant velocity joints can be moved axially.
– Tie up propshaft on one side.

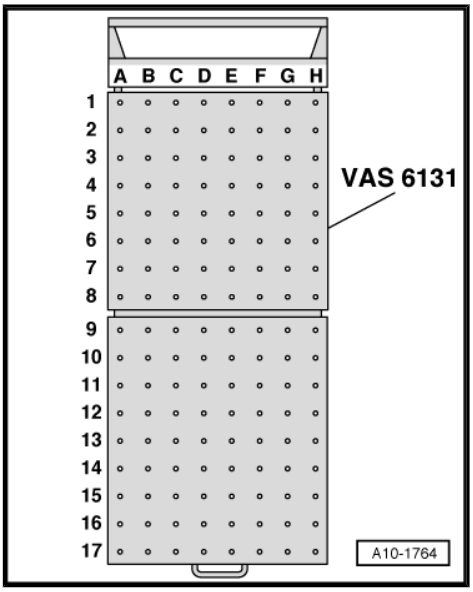
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Set up the scissor-type assembly platform as follows:

– 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	/10-11
G6	/10-1	/10-2	/10-5	/10-11
A8+C8	/13-6	–	–	/13-2
F8+H8	/13-6	–	–	/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



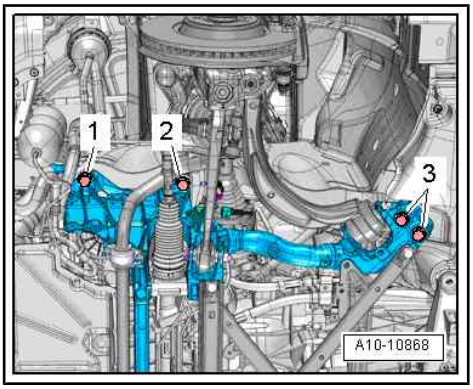
– Bolt the support elements onto the scissor-type assembly platform hand-tight to start with.
– Position scissor-type assembly platform - VAS 6131 A- horizontally.
• Take note of spirit level (bubble gauge).
– Position scissor-type assembly platform - VAS 6131 A- below engine/gearbox assembly.

WARNING

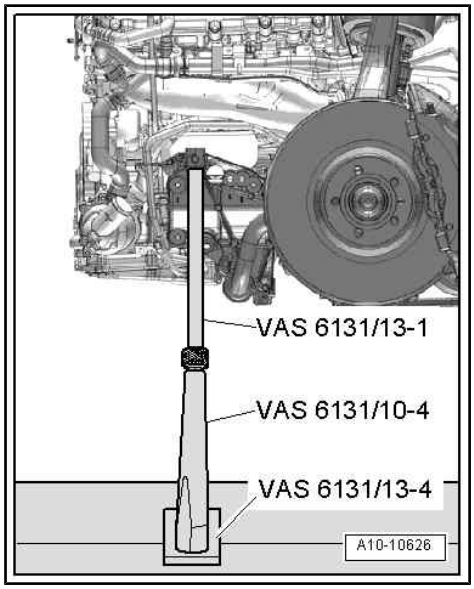
Accident risk if subframe mountings are detached.

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

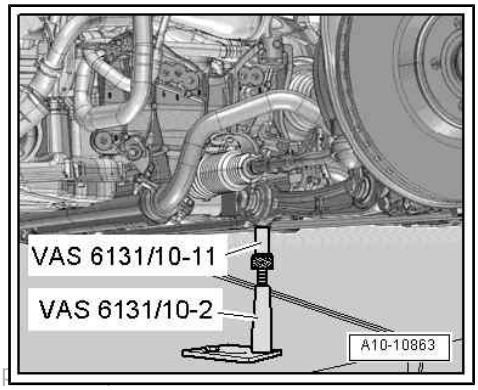
– Remove subframe bolts -1- on both sides.



– 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.

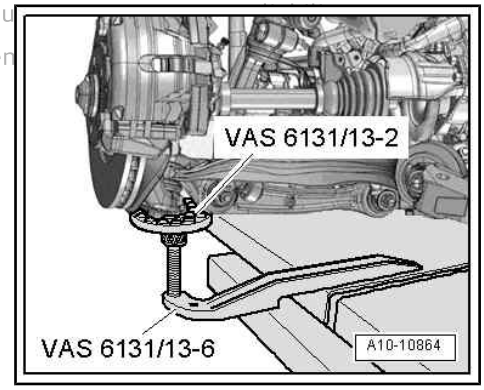


– Position support elements from -VAS 6131/10- (rear left and right) at front attachment points of subframe cross brace as shown.

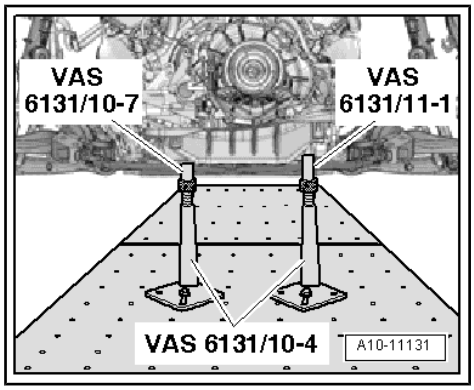


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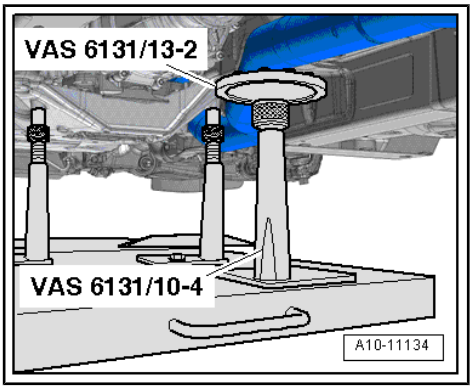
– Position support elements from -VAS 6131/13- under left and right wheel bearing housings as shown.



– Position support elements from -VAS 6131/10- at rear of cross member on both sides, as shown in illustration.
– Turn all spindles for support elements upwards until all locating lugs make contact with mounting points.



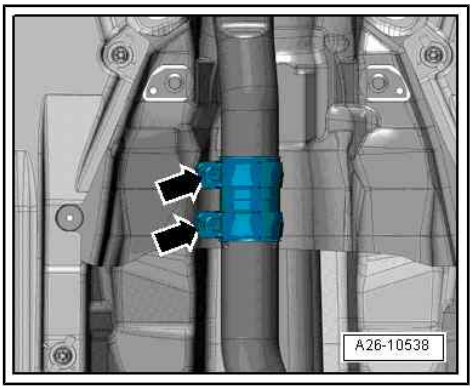
– Position support elements from -VAS 6131/10- and -VAS 6131/13- underneath front exhaust pipe, as shown in illustration.
– Tighten base plates for support elements to 20 Nm on scissor-type assembly platform - VAS 6131 A- .



Caution

Risk of damage to flexible joint in front exhaust pipe.

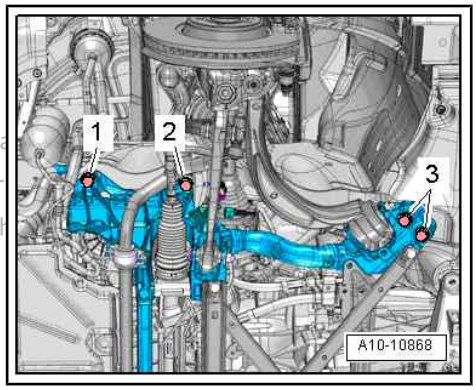
- *Do NOT bend flexible joint in front exhaust pipe more than 10°.*



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

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

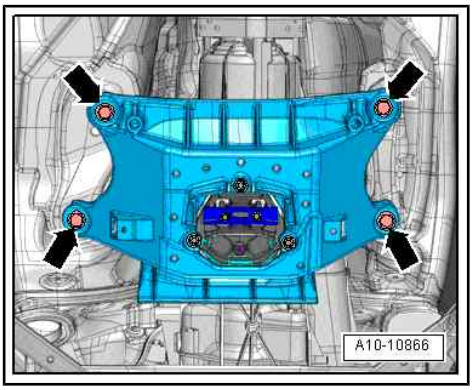
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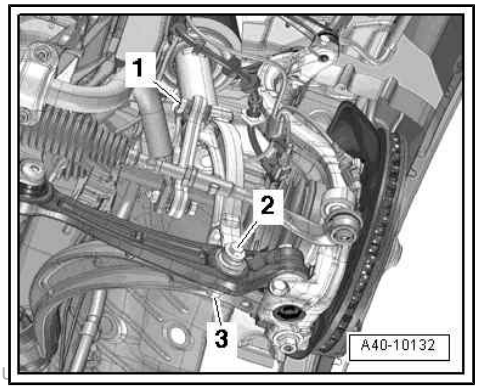
Note

Disregard -item 1-.

– Remove bolts -arrows- for tunnel cross member.



– Remove bolt -2- on both sides.



Caution

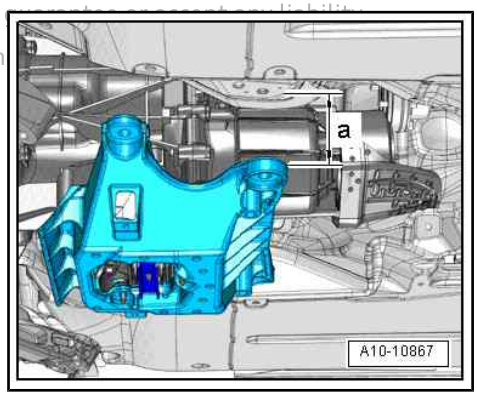
Danger of damage to hoses, pipes and wiring connections and to engine compartment.

- ***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.***

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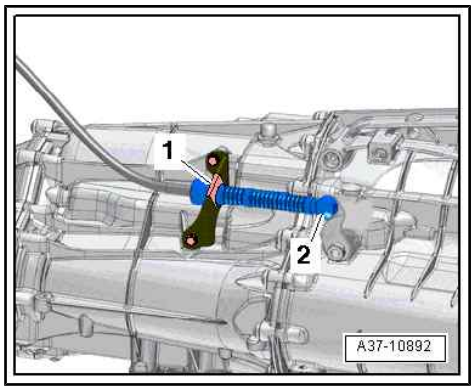
– Lower engine/gearbox assembly using scissor-type assembly platform - VAS 6131 A- initially only as far as distance -a-.

• Dimension -a- = 100 mm (maximum).



– Pry ball socket -2- of selector lever cable off selector shaft 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.

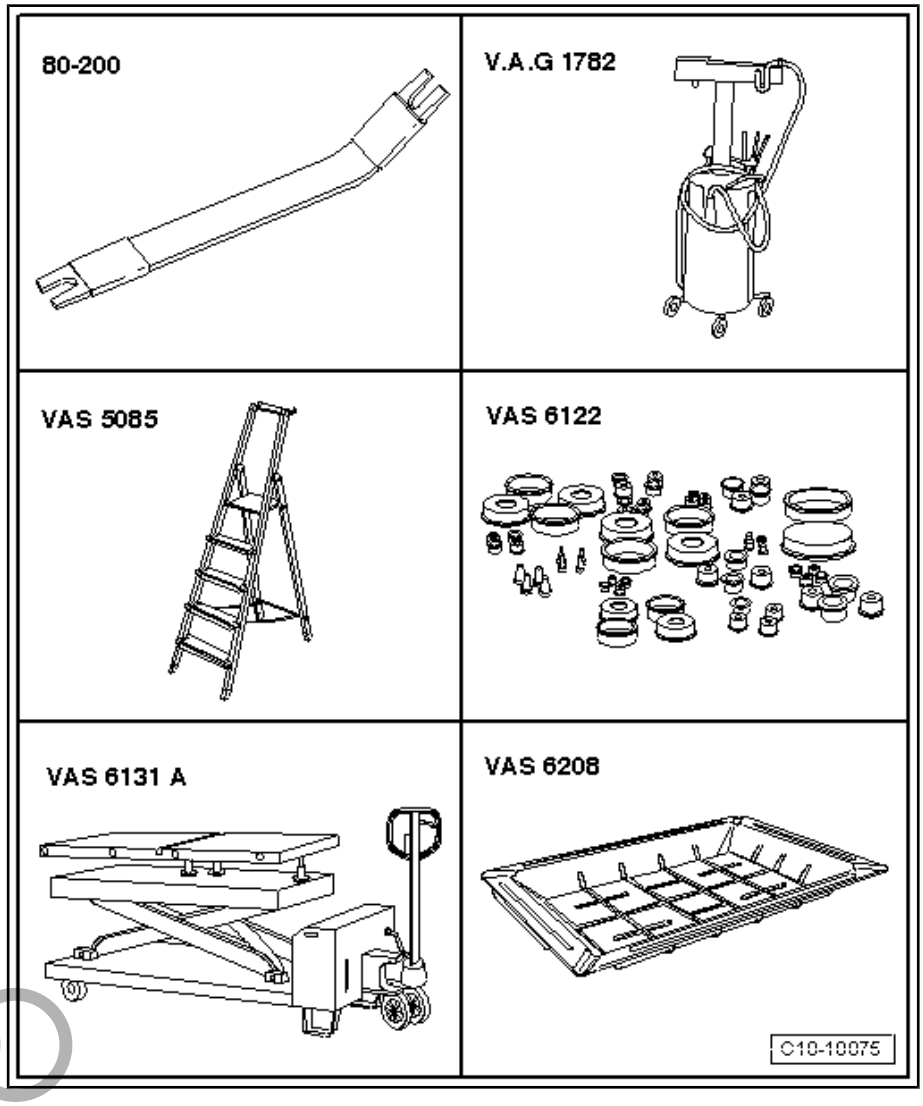
– Pull out scissor-type assembly platform - VAS 6131 A- with engine/gearbox assembly from underneath vehicle.

1.1.4 Removing engine - vehicles with automatic gearbox 0B6

Note

- *The engine is removed from underneath together with the gearbox and subframe (with lock carrier installed).*
- *Collect drained coolant in a clean container for re-use or disposal.*
- *Fit cable ties in the original positions when installing.*

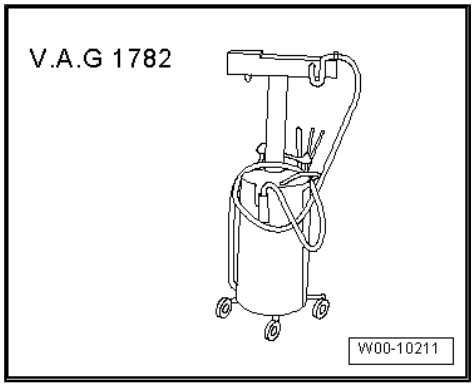
Special tools and workshop equipment required



- Removal lever - 80 - 200-
- Used oil collection and extraction unit - V.A.G 1782-
- 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 6131/13-
- Drip tray for workshop hoist - VAS 6208-

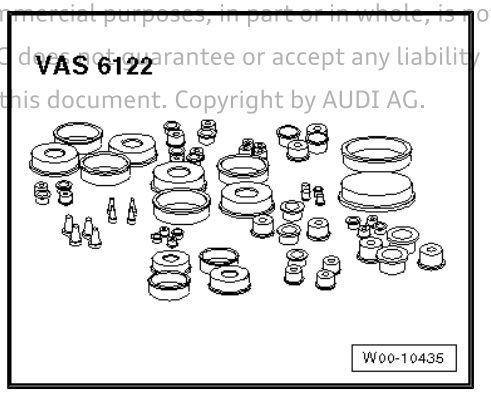
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- Used oil collection and extraction unit - V.A.G 1782-

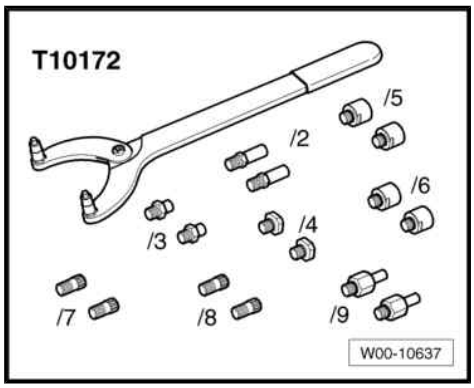


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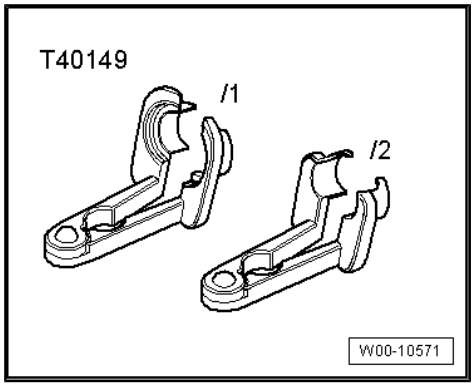
- Engine bung set - VAS 6122-



- Counterhold tool - T10172- with -T10172/5-



- Release tool - T40149-



Procedure

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.*

– Bring front wheels into straight-ahead position.

Note

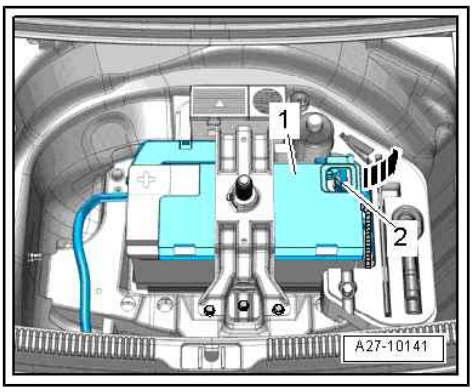
The electromechanical parking brake must be released before disconnecting the battery, so that the propshaft can be turned during removal.

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Caution

Risk of irreparable damage to electronic components.

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



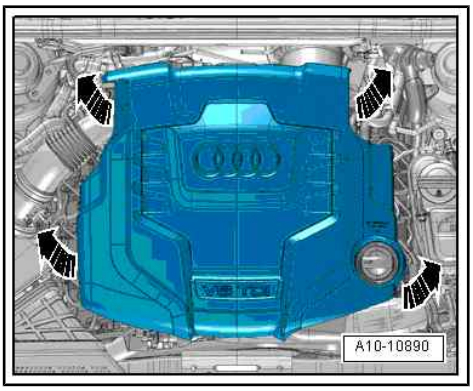
– Switch off ignition and remove ignition key.

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

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

– Extract hydraulic fluid for power steering from reservoir using used oil collection and extraction unit - V.A.G 1782- .

– Remove engine cover panel -arrows-.



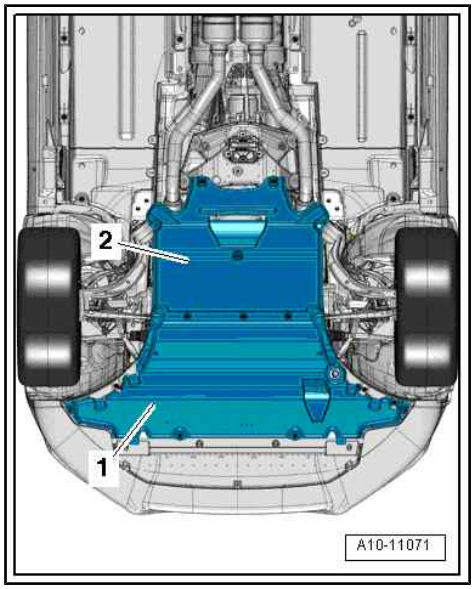
WARNING

Risk of scalding due to hot steam and hot coolant.

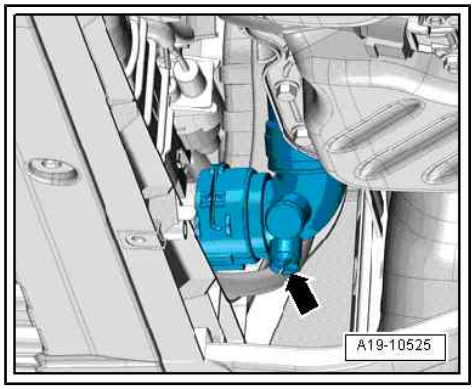
- *The cooling system is under pressure when the engine is hot.*
- *To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.*

– Open filler cap on coolant expansion tank.

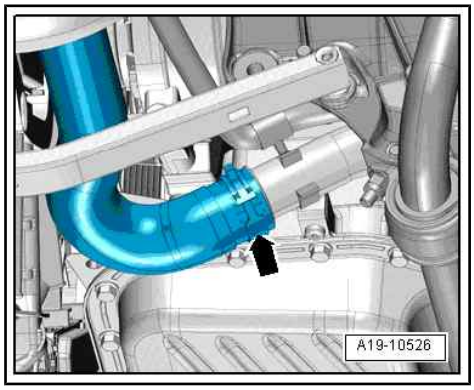
– Remove both front wheels.
– Remove wheel spoilers (front) on both sides ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front) .
– Remove noise insulation -1- and -2- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded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



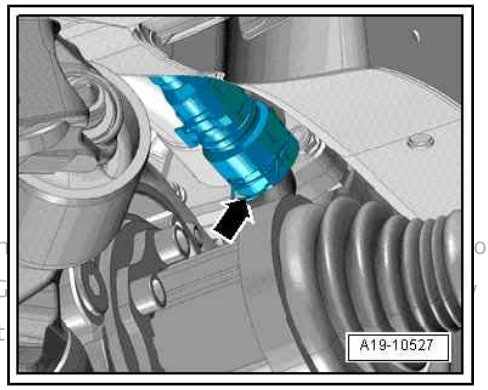
– Place drip tray for workshop hoist - VAS 6208- beneath engine.
– Remove drain plug -arrow- at connection and drain off coolant.
– Then detach connection from radiator (lift retaining clip).



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

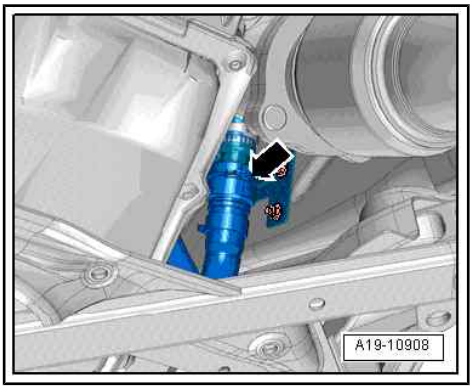


– Vehicles with plug-in connector at coolant pipe (bottom right): Lift retaining clip -arrow-, disconnect coolant hose and drain off coolant.

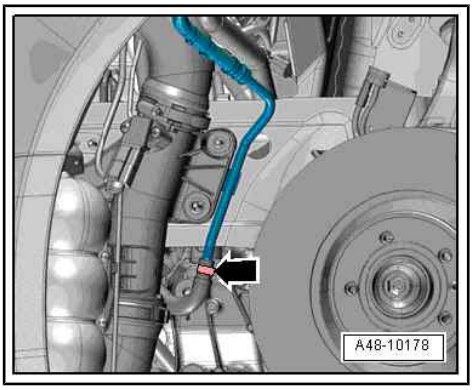


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– Vehicles with plug-in connector at longitudinal member: Lift retaining clip -arrow-, disconnect coolant hose and drain off coolant.



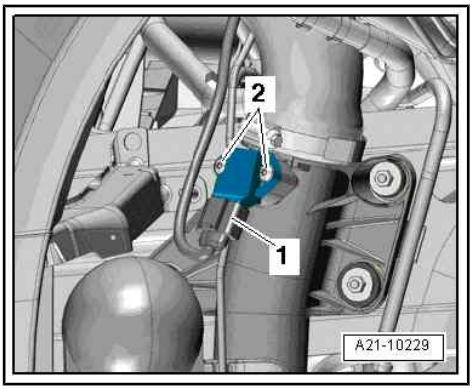
– Position used oil collection and extraction unit - V.A.G 1782- below connection point.
– Disconnect hydraulic fluid return line -arrow- for power steering.
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .



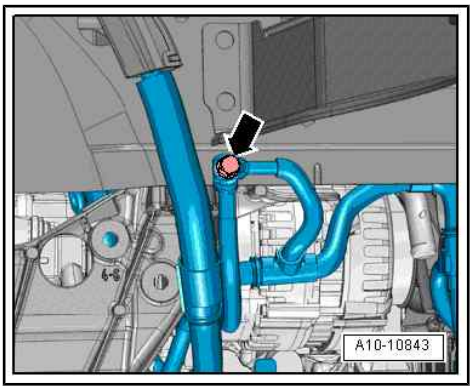
– Unplug electrical connector -1- at charge pressure sender - G31- and move electrical wiring clear.

Note

Disregard -item 2-.

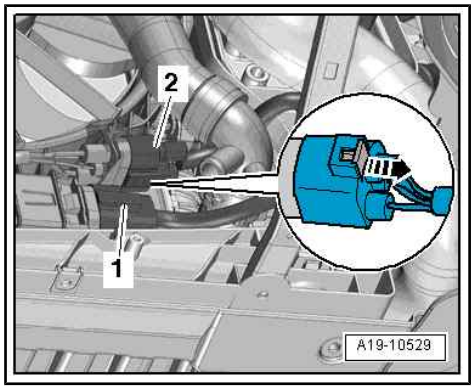


– Unscrew nut -arrow- on longitudinal member (right-side) and move earth cables clear.

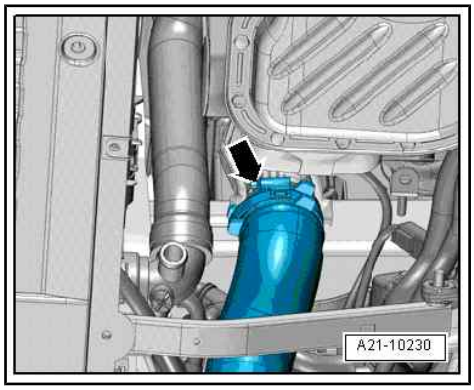


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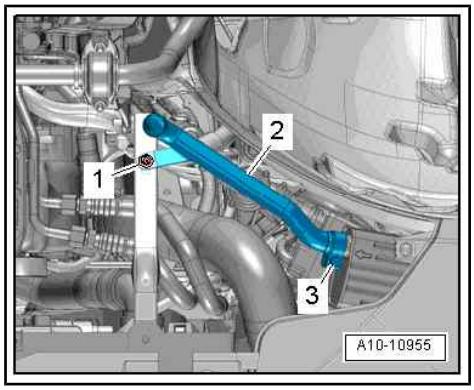
– Unplug electrical connectors -1- and, if fitted, -2- for radiator fan (push retainer to the rear -arrow- and press down release catch).
– Move electrical wiring harness clear.



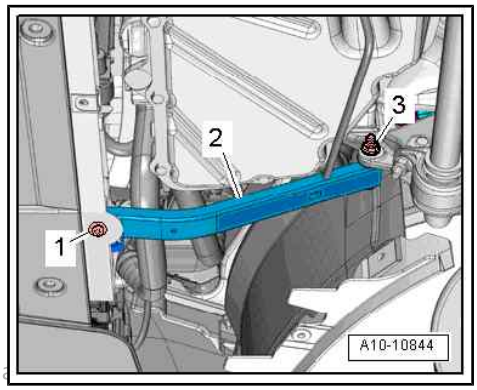
– Release hose clip -arrow-, disconnect air hose from air pipe and move to one side.



– 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.

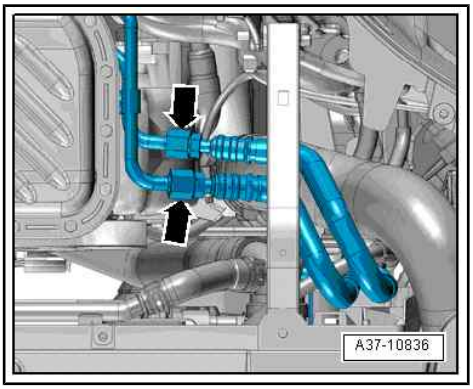


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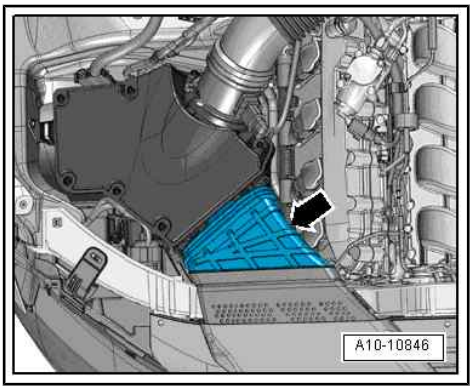
Note

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

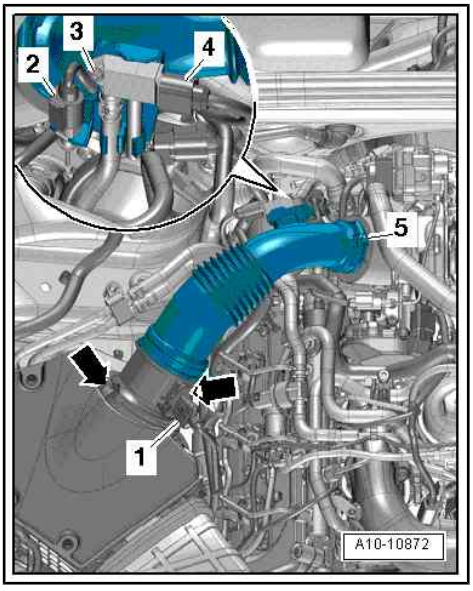
– Position used oil collection and extraction unit - V.A.G 1782- below connection points.
– Disconnect ATF lines -arrows- at connections on right side of engine.
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .



– Remove air duct -arrow-.



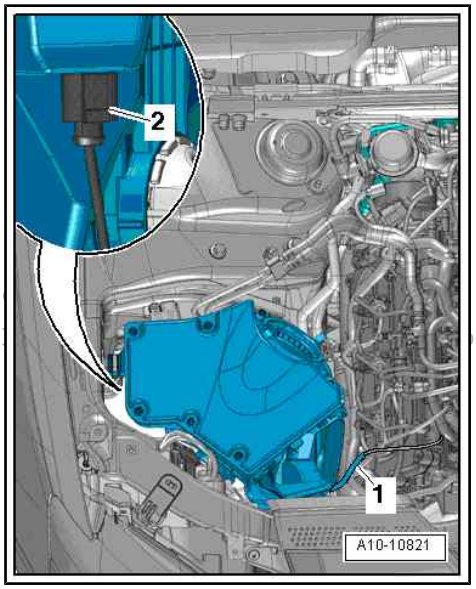
– Unplug electrical connector -1- at air mass meter - G70- .
– Unscrew bolt -3- and move clear exhaust gas pressure sensor 1 - G450- -item 4- at air pipe.
– Move electrical connector -2- clear at air pipe.
– Remove air hose and air mass meter - G70- . To do so, release hose clip -5- and clamps -arrows-.



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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.



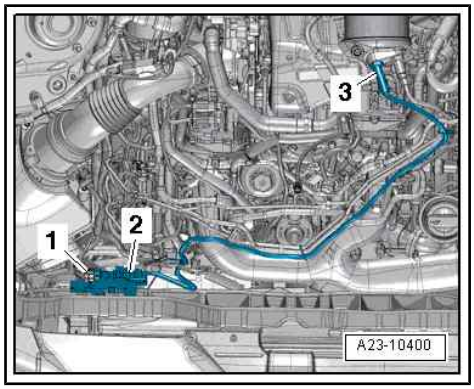
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Vehicles with SCR catalytic converter:

– Unclip NOx sensor control unit - J583- -item 2- from bracket and tie to engine.

Note

Disregard items -1 and 3-.



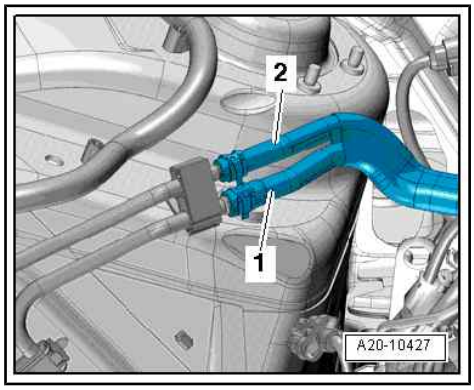
All vehicles (continued):

Caution

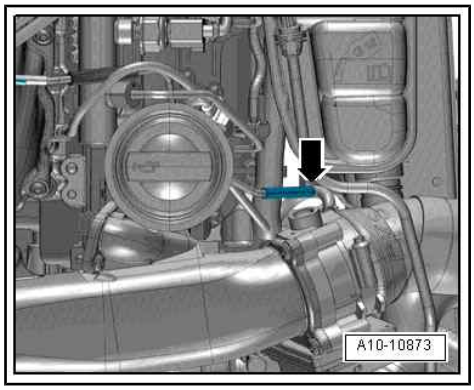
Take care to keep components clean.

- ***Observe rules for cleanliness when working on the fuel supply system*** ***⇒ page 9*** ***.***

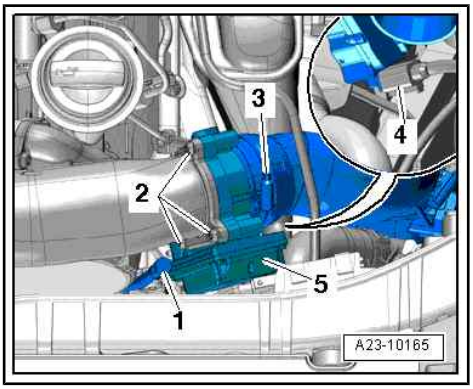
– Disconnect fuel supply hose -1- and fuel return hose -2-.



– If fitted, disconnect vacuum line -arrow-.



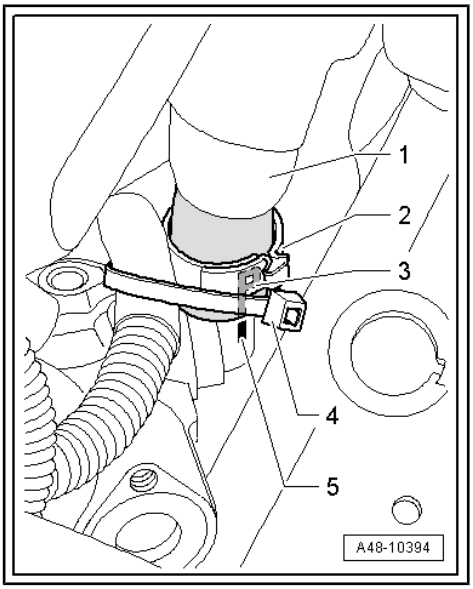
– If fitted, pull out oil dipstick -1-.
– Release hose clip -3- and detach air hose.
– Unplug electrical connector -4-.
– Remove bolts -2- and detach throttle valve module - J338- -item 5-.



Note

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

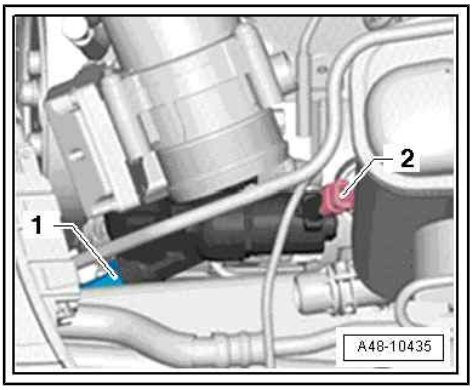
– Cut open cable tie -4-.
– Clamp off hydraulic hose -1- using hose clamp -3094- , release hose clip -2- and disconnect hose from power steering pump.
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .



Note

Disregard items -3 and 5-.

– If fitted, unplug electrical connector -2-.



Note

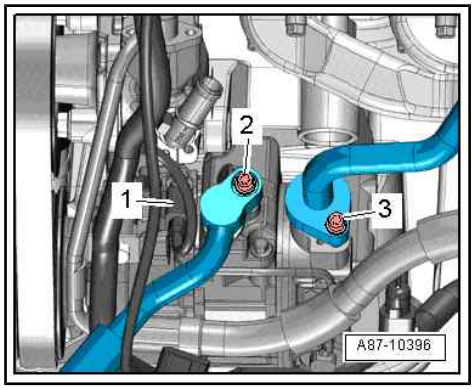
Disregard -item 1-.

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Caution

Risk of damage to refrigerant lines and hoses

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



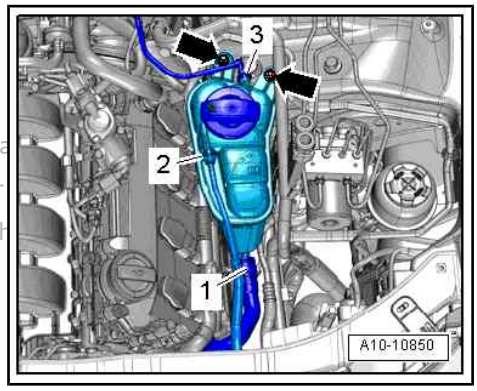
– Remove bolt -2-, disconnect refrigerant line from air conditioner compressor and move to one side.

– 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.



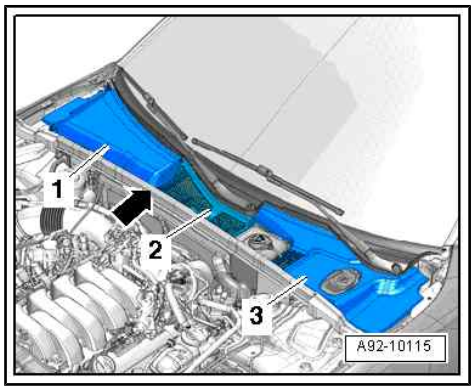
Note

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

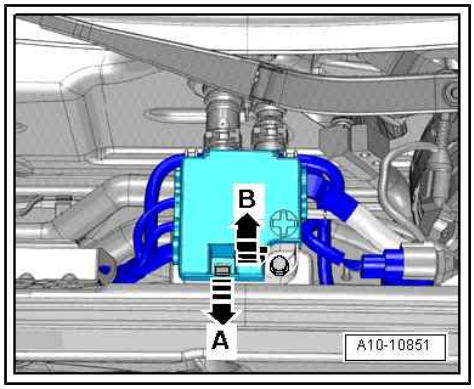
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– Remove seal -arrow-.

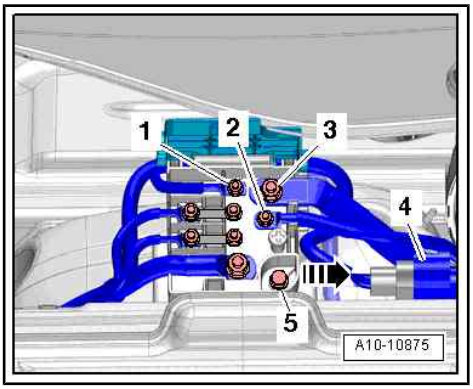
– Remove plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .



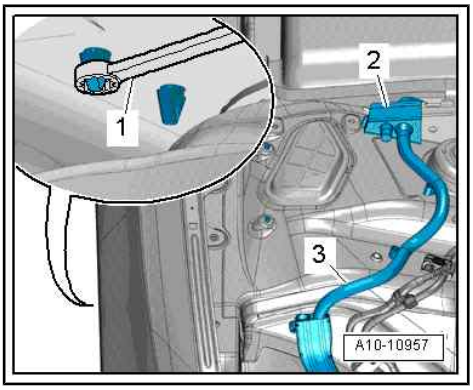
– Release retainer -arrow A- and open cover -arrow B-.



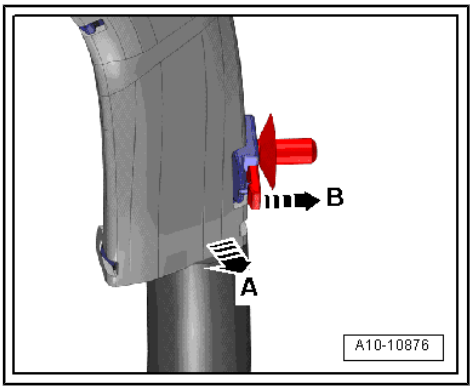
– Remove nuts -1 ... 3- for electrical wiring.
– Detach electrical connector -4- from bracket and unplug.
– Remove bolt -5- and detach terminal 30 wiring junction 2 - TV22- from body brace -arrow-.



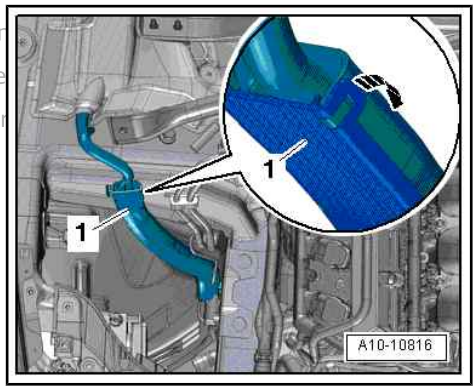
– Working from wheel housing, release catches using a 5.5 mm ring spanner -item 1- and remove wiring protector -2- from above.
– Release wiring harness -3- leading to alternator and starter using removal lever - 80 - 200- and move clear.



– Wiring duct (version 1): release catch -arrow B- and move wiring duct clear by pulling it towards front -arrow A-.

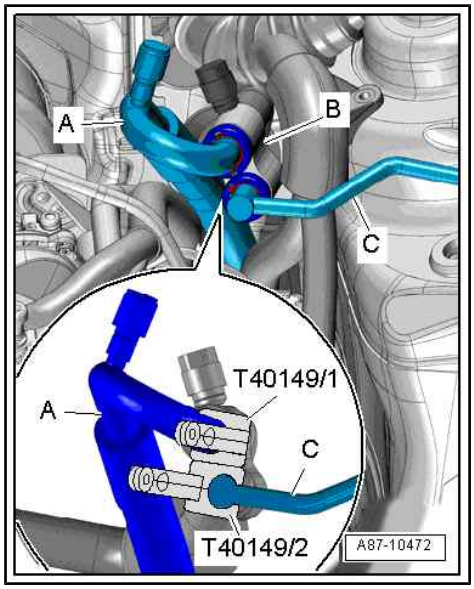


– Wiring duct (version 2): release catch -arrow- to open wiring duct -1- and move wiring harness clear.



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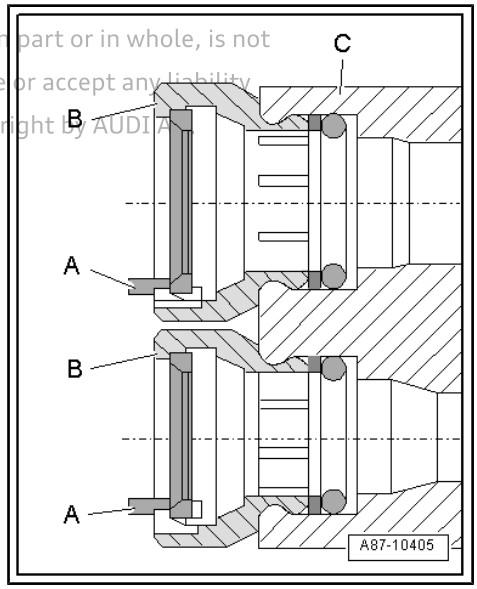
– Press refrigerant lines -A- and -C- by hand as far as stop into connection piece -B- for refrigerant line with internal heat exchanger.
– Spray area around refrigerant lines with silicone-free lubricant.
– Fit release tool - T40149/1- for air conditioner line onto refrigerant line -A- and release tool - T40149/2- for air conditioner line onto refrigerant line -C- so that both tools engage audibly. This releases the retaining lugs.
– Using release tools for air conditioner line, pull refrigerant lines -A- and -C- out of connection piece -B- for refrigerant line with internal heat exchanger.



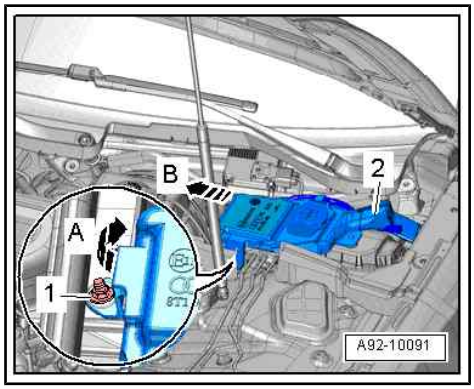
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Note

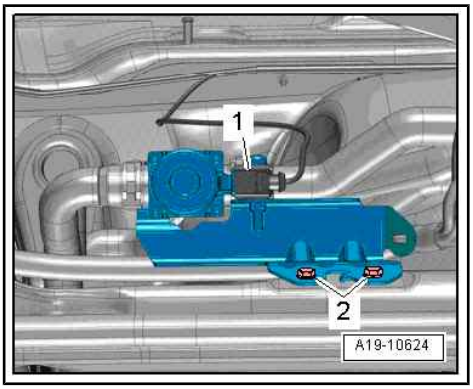
- *If it is not possible to pull out the refrigerant lines, do NOT attempt to turn the refrigerant lines in connection piece -C-.*
- *In this case you will have to cut open the connectors -B- and take out the retaining rings -A-.*
- *When cutting open the connectors, take care not to damage the connection piece -C- for the refrigerant line with internal heat exchanger.*



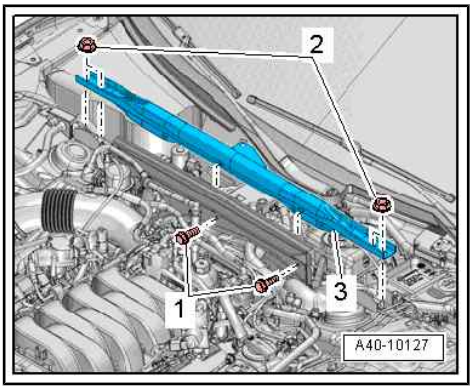
– Remove nut -1- and swivel filler neck for washer fluid reservoir slightly upwards -arrow A-.
– Pull filler neck -2- with filler pipe out of washer fluid reservoir and through opening in body -arrow B-.



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

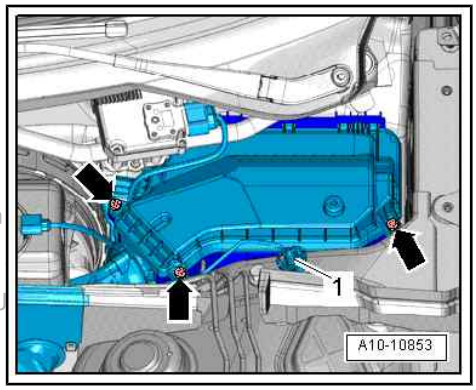


– Remove bolts -1- and nuts -2- and detach body brace -3-.



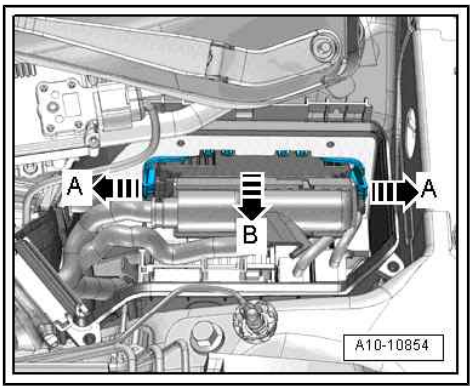
– Remove bolts -arrows- and detach cover for electronics box in engine compartment.

– Remove nut -1- and move electrical wiring clear.

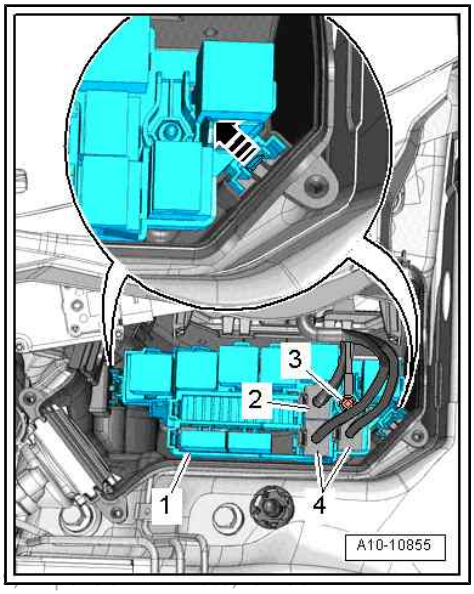


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– Release catches -arrows A- and take out engine control unit -arrow B-.

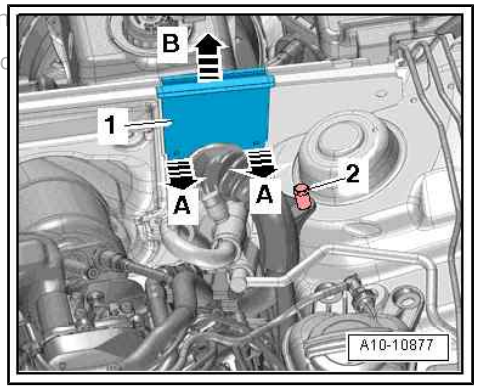


– If fitted, unplug electrical connector -2-.
– Unplug electrical connectors -4- and unscrew nut -3- for wiring.
– Release catches -arrow- and detach relay carrier with fuse holder -1-.
– Disengage engine wiring harness at electronics box in engine compartment and move clear.

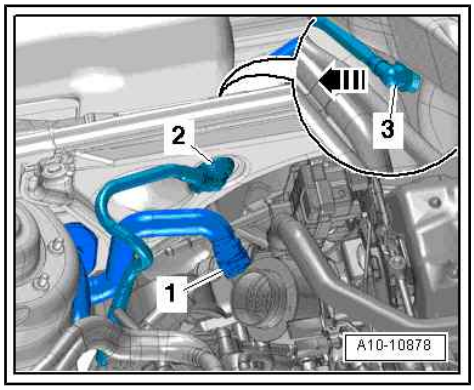


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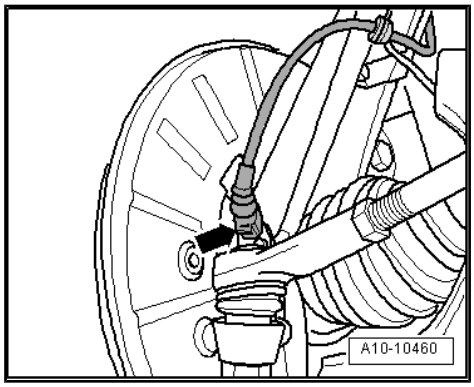
– Release catches -arrows A- and lift off wiring protector -1- -arrow B-.
– Unscrew earth stud -2- and move wiring harness clear.
– Place wiring harness on engine and secure engine control unit to prevent it from dropping.



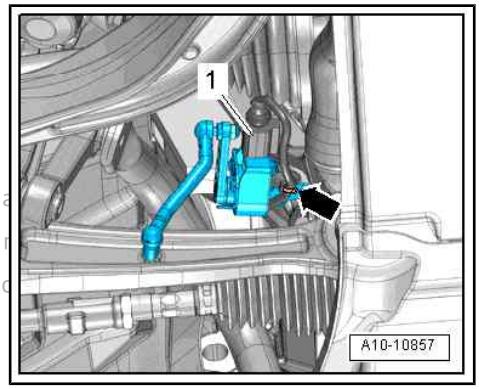
– Release hose clip -1- and detach coolant hose.
– Disconnect vacuum hose -3- on rear of plenum chamber partition panel -arrow- and detach vacuum connection -2- from plenum chamber partition panel.



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

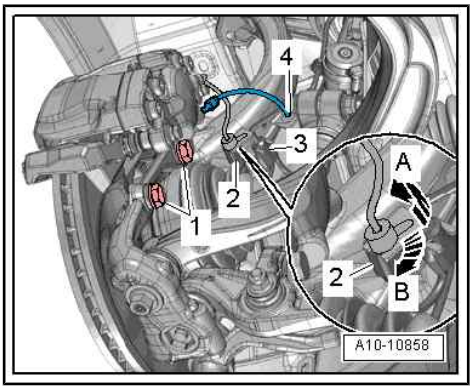


– If fitted, unplug electrical connector -1- from front left vehicle level sender - G78- and front right vehicle level sender - G289- and move wiring clear -arrow-.



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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.

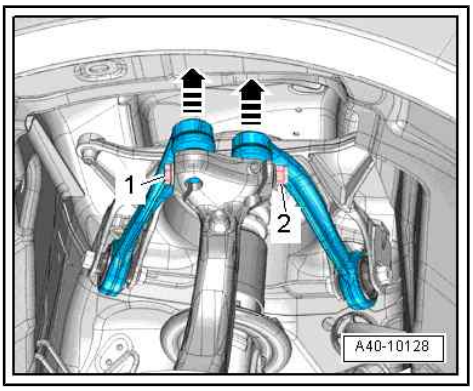


Caution

Risk of damage to brake pistons.

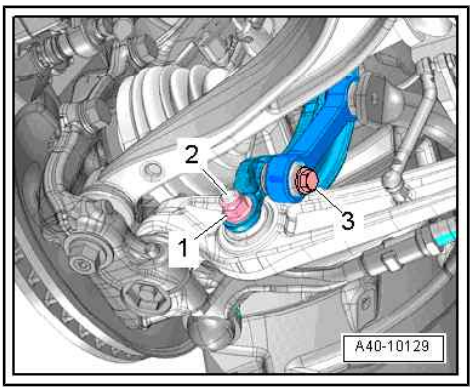
- *Do not operate brake pedal with brake caliper removed.*

– 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.



A5 up to vehicle identification no. 8T-8-011200:

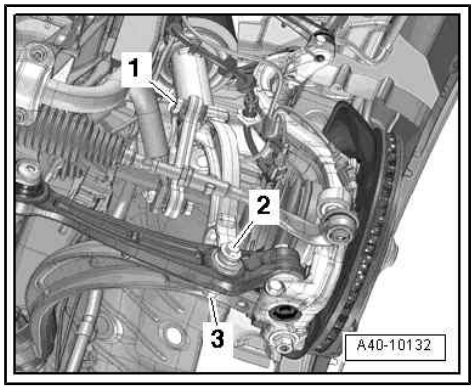
– Remove bolt -3- for anti-roll bar on both sides.
– Remove nut -1- on both sides.



Note

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

A4 (all), A5 from vehicle identification no. 8T-8-011201 onwards:



– 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.

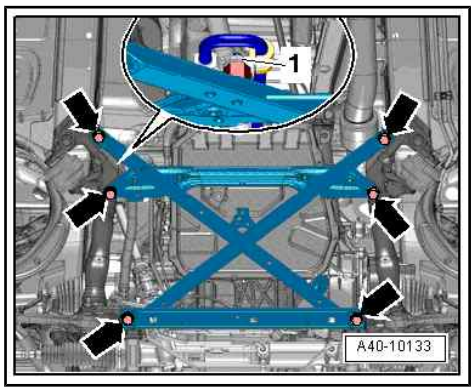
All vehicles (continued):

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.***

A4 (all), A5 Coupé:

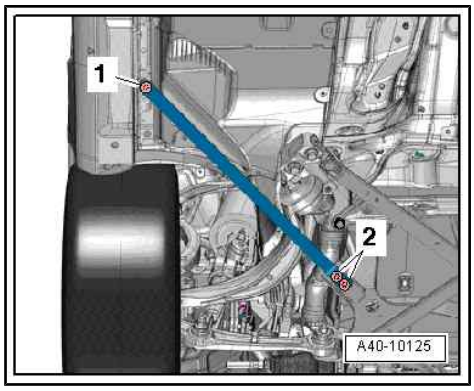


– Remove nut -1- for power steering hydraulic line.
– Remove bolts -arrows- and detach subframe cross brace.

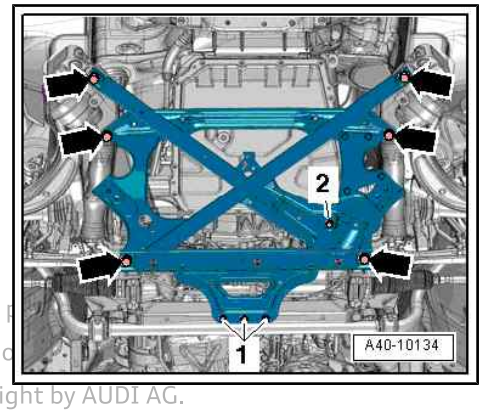
Note

Illustration shows the installation position on a vehicle with dynamic steering.

A5 Cabriolet:



– Remove bolts -1- and -2- on both sides and detach strut.



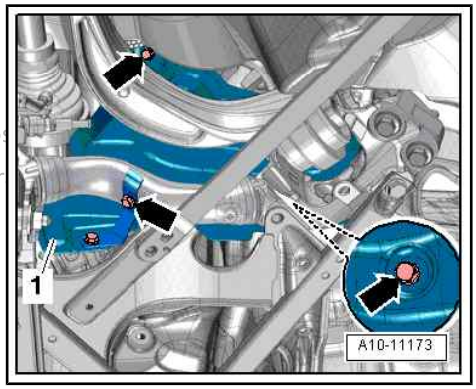
– Remove bolt -2- for power steering hydraulic line.
– Remove bolts -1- and -arrows- and detach subframe cross brace.

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All vehicles (continued):

– If fitted, remove bolts -arrows- on both sides and detach heat shield -1-.

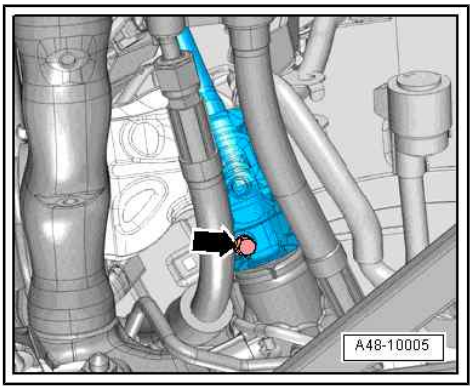
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Caution

Risk of damage to coil connector for airbag.

- *Make sure that front wheels are in straight-ahead position before removing universal joint from steering rack.*
- *Do not alter the position of the steering wheel or the steering rack from this point onwards.*

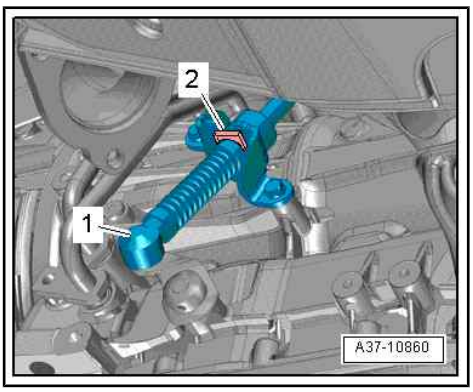


– Remove bolt -arrow- for universal joint ⇒ Running gear, axles, steering; Rep. gr. 48 ; Steering column; Exploded view - steering column .

– Separate universal joint from steering rack and move clear to the top as far as possible.

– Pry ball socket -1- of selector lever cable off selector shaft lever using removal lever - 80 - 200- .

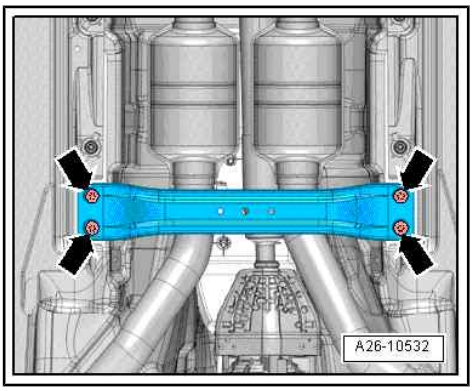
– Press off securing clip -2- and remove selector lever cable from gearbox.



Note

Take care not to bend or kink selector lever cable.

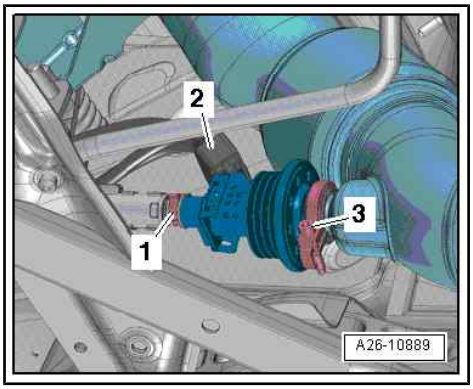
– Remove bolts -arrows- and detach front cross member.



Vehicles with SCR catalytic converter:

– Unplug electrical connector -2- and move electrical wire clear.

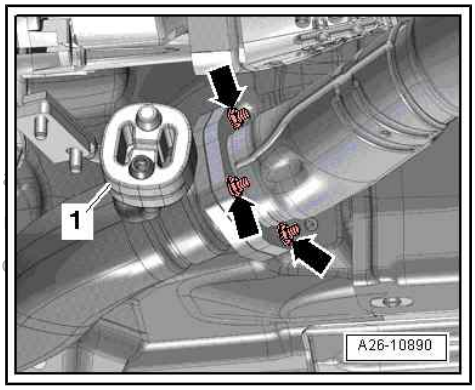
– Release retaining clip -3-, move clear injector for reducing agent - N474- with electrical wire and tie up to underbody.



Note

Disregard -item 1-.

– Remove nuts -arrows- and disconnect exhaust system.

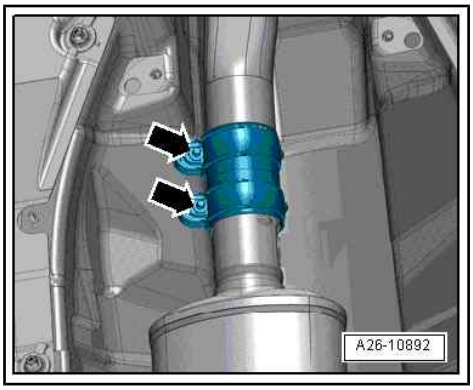


Note

Disregard -item 1-.

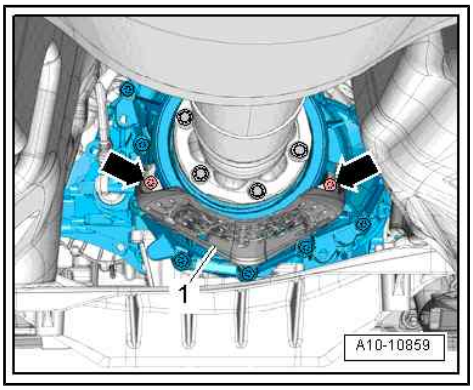
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– Unfasten connections -arrows-, push clamp towards rear and detach SCR catalytic converter.

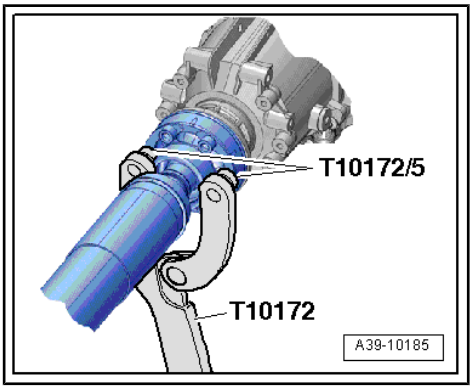


All vehicles (continued):

– Remove bolts -arrows- and detach heat shield for propshaft.



– Remove bolts connecting propshaft to gearbox (use counter-hold tool - T10172- with -T10172/5-).
– Slide propshaft towards rear final drive; the constant velocity joints can be moved axially.
– Tie up propshaft on one side.



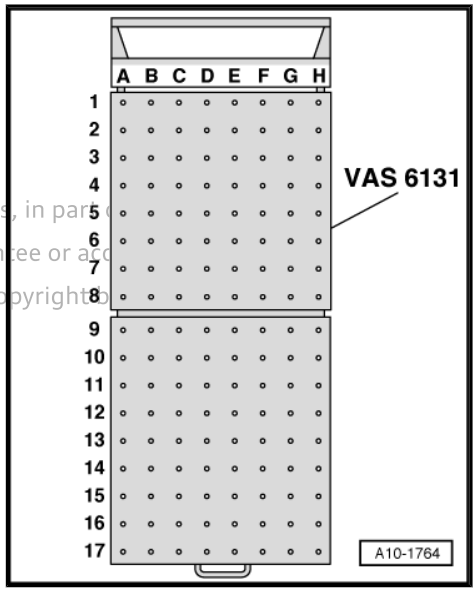
Set up the scissor-type assembly platform as follows:

– 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	/10-11
G6	/10-1	/10-2	/10-5	/10-11
A8+C8	/13-6	–	–	/13-2
F8+H8	/13-6	–	–	/13-2
C13	/10-1	/10-4	/10-5	/10-7
F13	/10-1	/10-4	/10-5	/11-1
F17 1)	/10-1	/10-4	/10-5	/13-2

• 1) No support elements are required in this position for vehicles with SCR catalytic converter.

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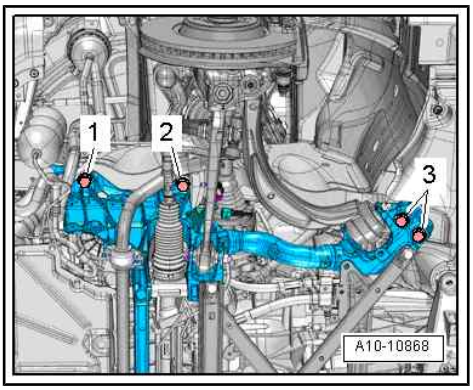
– Bolt the support elements onto the scissor-type assembly platform hand-tight to start with.
– Position scissor-type assembly platform - VAS 6131 A- horizontally.
• Take note of spirit level (bubble gauge).
– Position scissor-type assembly platform - VAS 6131 A- below engine/gearbox assembly.

WARNING

Accident risk if subframe mountings are detached.

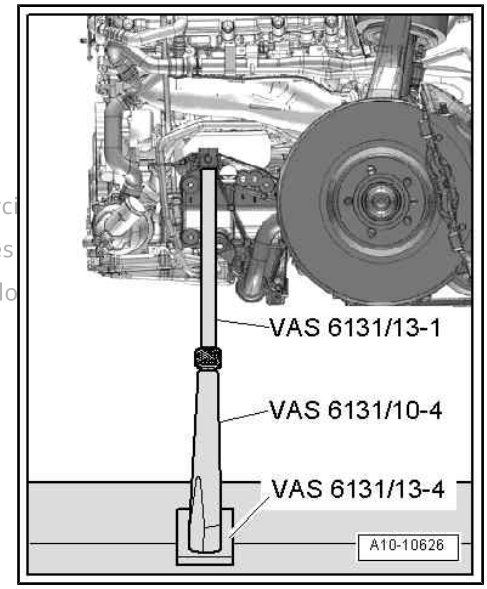
- ***Subframe bolts -2- and -3- must not be loosened.***

– Remove subframe bolts -1- on both sides.

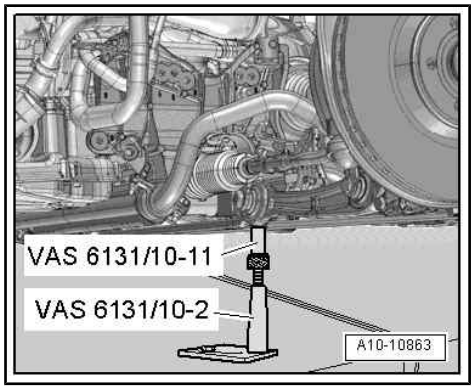


– Position support elements from -VAS 6131/10- and -VAS 6131/13- at front left and right of subframe as shown.
– Make sure that threaded spindles are screwed in completely.

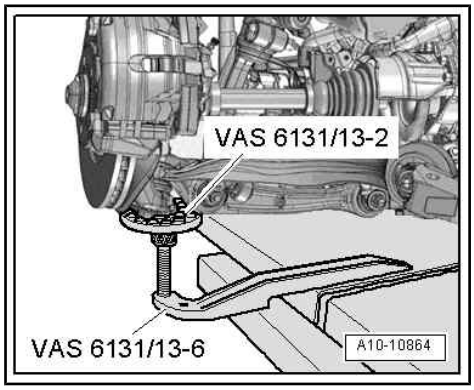
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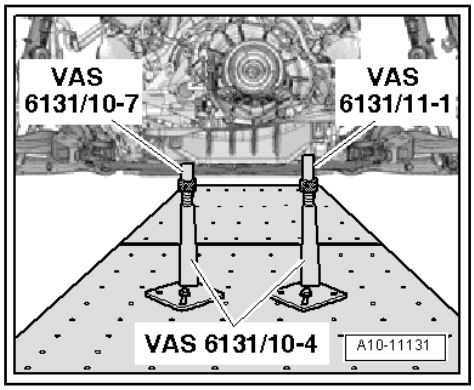
– Position support elements from -VAS 6131/10- (rear left and right) at front attachment points of subframe cross brace as shown.



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



– Position support elements from -VAS 6131/10- at rear of cross member on both sides, as shown in illustration.
– Turn all spindles for support elements upwards until all locating lugs make contact with mounting points.

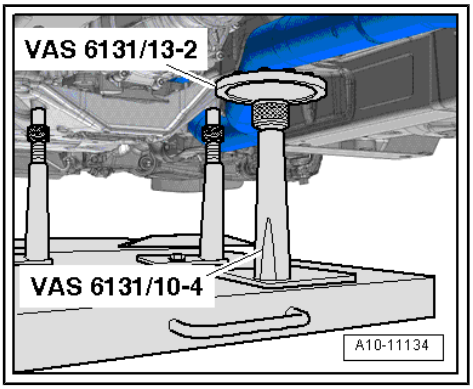


Vehicles without SCR catalytic converter:

– Position support elements from -VAS 6131/10- and -VAS 6131/13- underneath front exhaust pipe, as shown in illustration.

All vehicles (continued):

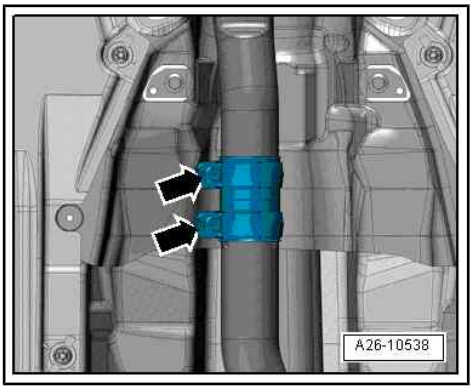
– Tighten base plates for support elements to 20 Nm on scissor-type assembly platform - VAS 6131 A- .



Caution

Risk of damage to flexible joint in front exhaust pipe.

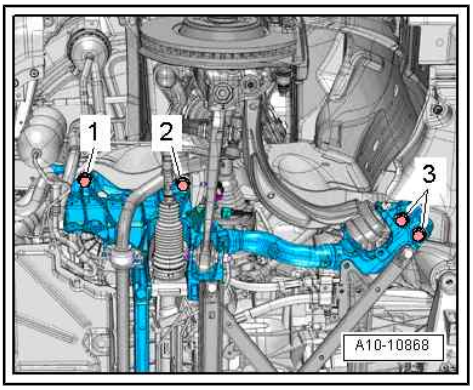
- *Do NOT bend flexible joint in front exhaust pipe more than 10°.*



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

– Mark installation position of subframe on longitudinal members with felt-tip pen.

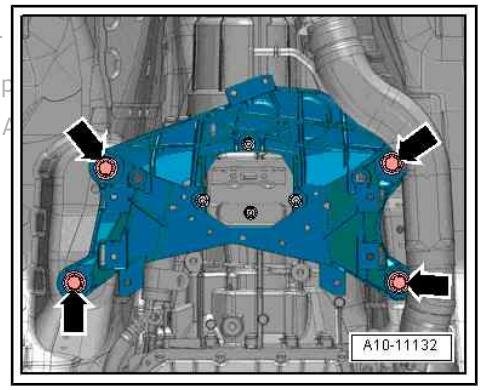
– Unscrew subframe bolts -2- and -3- on both sides in several stages and in diagonal sequence.



Note

Disregard -item 1-.

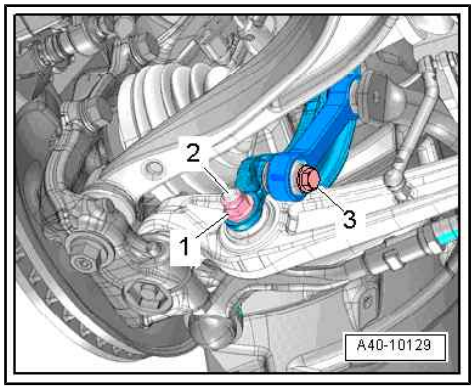
– Remove bolts -arrows- for tunnel cross member.



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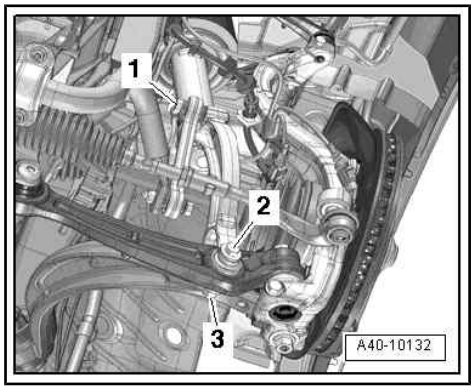
A5 up to vehicle identification no. 8T-8-011200:

– Remove bolt -2- on both sides.



A4 (all), A5 from vehicle identification no. 8T-8-011201 onwards:

– Remove bolt -2- on both sides.



All vehicles (continued):

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.***

– Lower engine/gearbox assembly.

– 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 96

⇒ “1.2.2 Separating engine and gearbox - vehicles with multitronic gearbox 0AW”, page 102

⇒ “1.2.3 Separating engine and gearbox - vehicles with dual clutch gearbox 0B5”, page 108

⇒ “1.2.4 Separating engine and automatic gearbox 0B6”, page 115

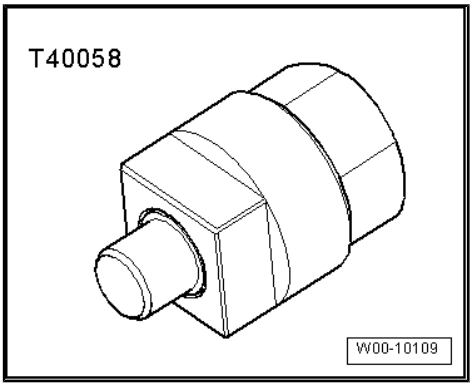
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1.2.1 Separating engine and gearbox - vehicles with manual gearbox

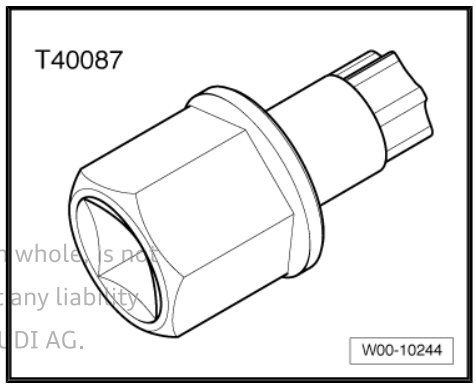
Special tools and workshop equipment required

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

♦ Adapter - T40058-



♦ Socket Torx T60 - T40087-



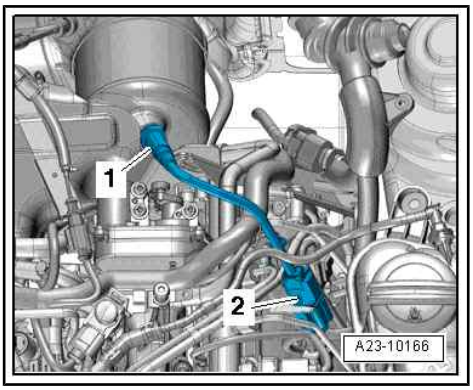
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♦ Bolt M8x35 with washer (outer diameter 25 mm)

Procedure

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

– Detach electrical connector -2- from bracket and unplug.



Note

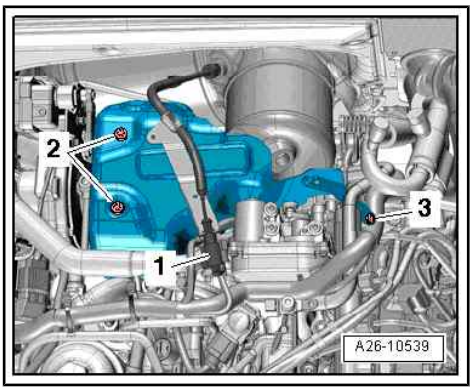
♦ *The illustration shows the installation position with the engine installed.*

♦ *Disregard -item 1-.*

– Move electrical connector -1- clear and disconnect.

– Remove bolts -2- and -3-.

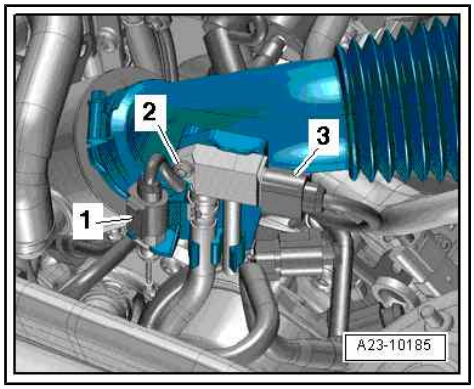
– Detach heat shield for turbocharger.



Note

The illustration shows the installation position with the engine installed.

– Unplug electrical connectors -1- and -3-.



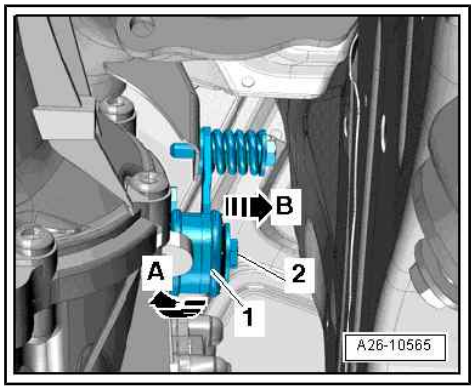
Note

- *The illustration shows the installation position with the engine installed.*
- *Disregard -item 2-.*

A5 up to vehicle identification no. 8T-8-009 998:

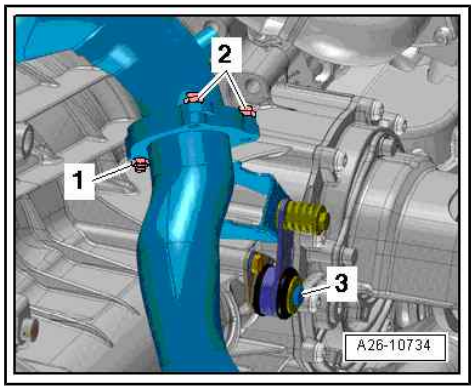
– Remove bolt -2-.

– Press retainer -1- in direction of -arrow B- and pivot to the rear -arrow A-.



A4 (all), A5 from vehicle identification no. 8T-8-009 999 onwards:

– Remove bolt -3-.



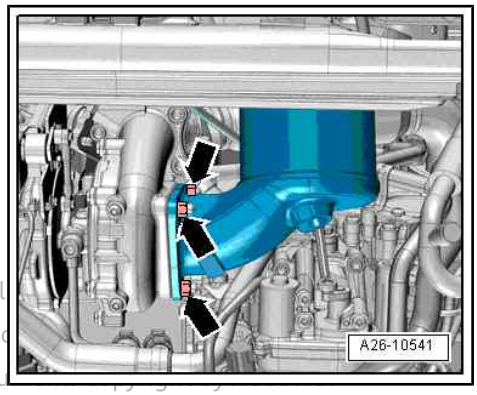
Note

Disregard items -1 and 2-.

All vehicles (continued):

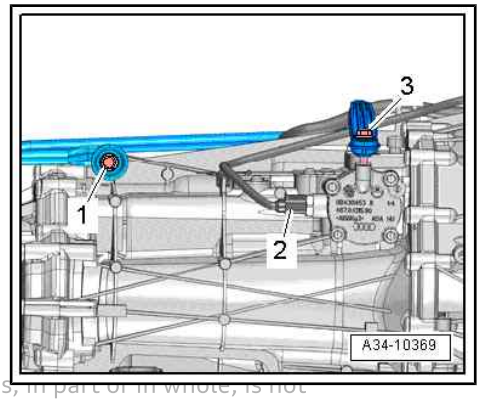
– Remove nuts -arrows- for particulate filter and turbocharger.

– Detach particulate filter with front exhaust pipe.



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– Unplug electrical connector -2- for reversing light switch - F4- and move electrical wiring clear.

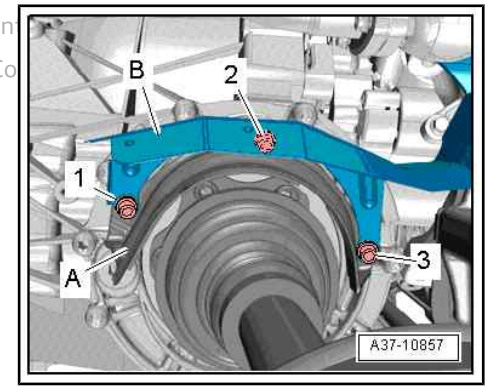


Note

Disregard items -1 and 3-.

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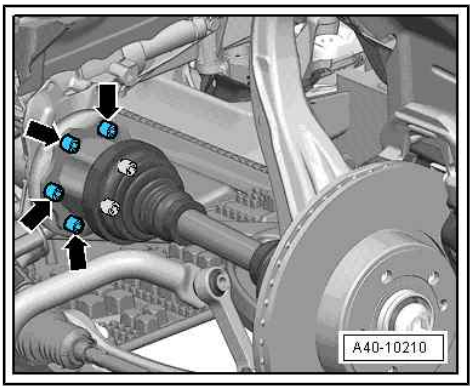
– Remove bolts -1- and -3-.
– Loosen bolt -2- and move heat shield -B- clear to one side.



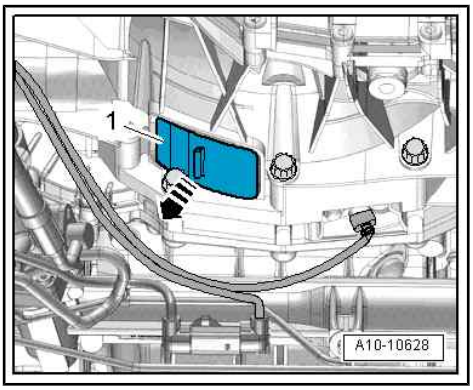
Note

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.

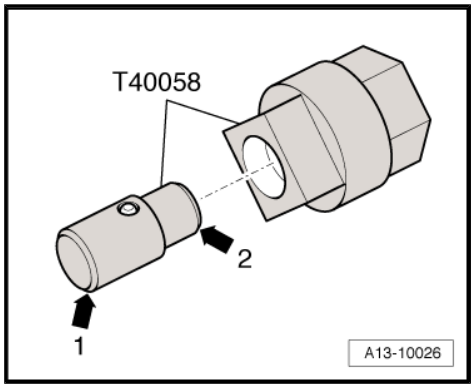


– Detach bottom cover -1- from gearbox -arrow-.

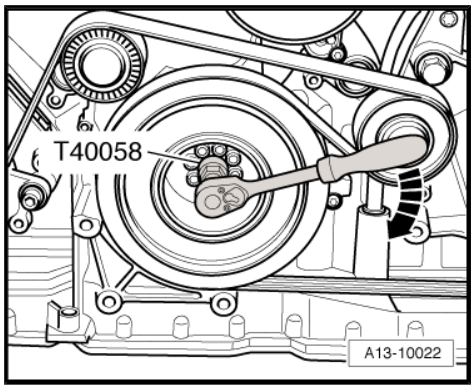


– Insert guide pin of adapter -T40058- as follows:

- The larger-diameter section -arrow 1- faces towards the engine.
- The smaller-diameter section -arrow 2- faces the adapter.



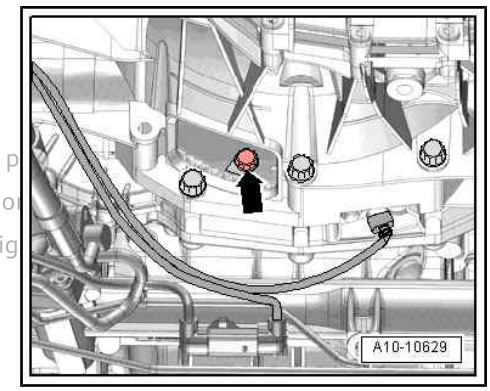
– Counterhold crankshaft using adapter - T40058- when slackening bolts for clutch module.



Note

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

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

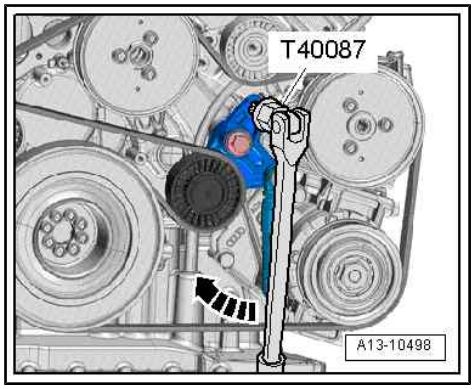


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Caution

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

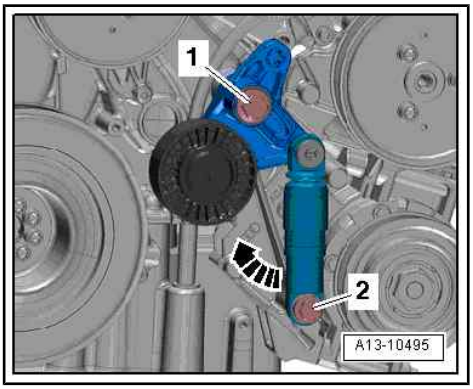
- ***Before removing the poly V-belt, mark the direction of rotation with chalk or a felt-tip pen for re-installation.***



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

– Remove poly V-belt from tensioner and release tensioner.

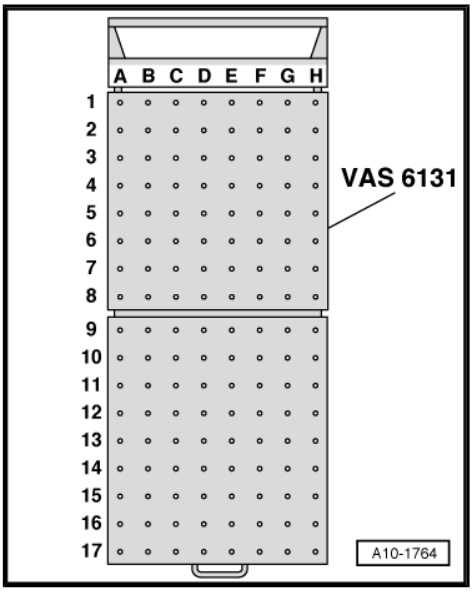
– Remove bolt -2- and pivot tensioner in clockwise direction -arrow-.



Note

Disregard -item 1-.

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



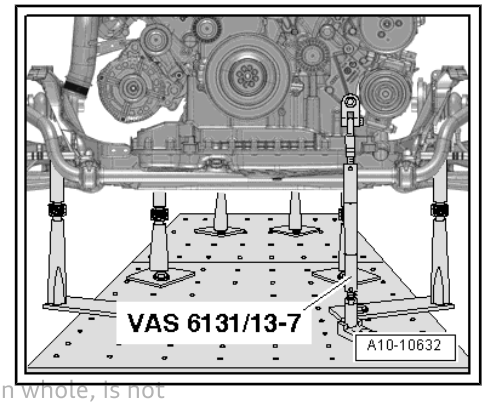
Note

The other support elements remain unchanged.

Platform coordinates	Parts of support set for Audi - VAS 6131/10- , supplementary set -VAS 6131/13- and gearbox support - VAS 6131/14-			
D2	/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 for poly V-belt tensioner at front left of engine with M8x35 bolt and washer (outside diameter 25 mm), as illustrated.

– Secure support -VAS 6131/13-7- to scissor-type assembly platform and tighten to 20 Nm.

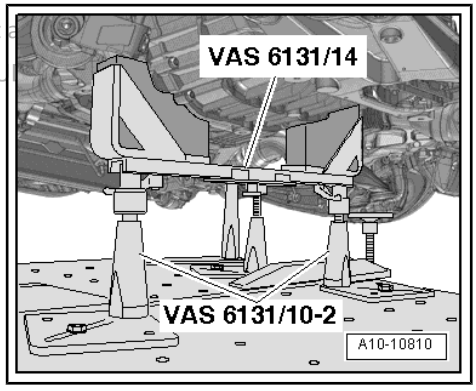


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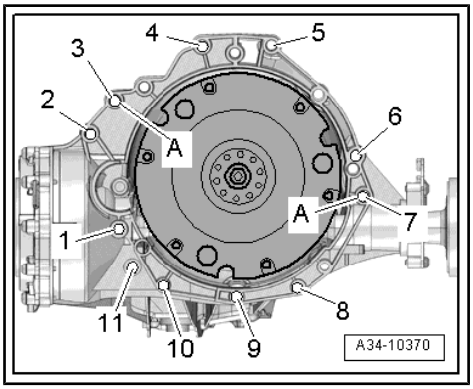
– Position support elements from -VAS 6131/10- and gearbox support - VAS 6131/14- at front of gearbox, as illustrated.

– 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- .



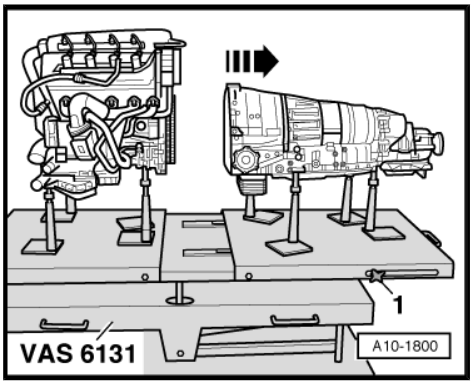
– Remove bolts -1- and -2- for starter.
– Separate starter from gearbox and leave in position.
– Unscrew remaining bolts -3 ... 11- securing engine to gearbox.



Note

Disregard -item A-.

– 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-.

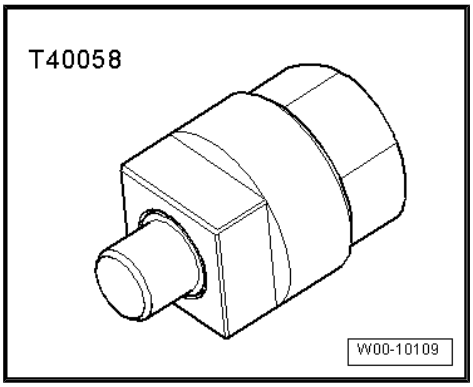


1.2.2 Separating engine and gearbox - vehicles with multitronic gearbox 0AW

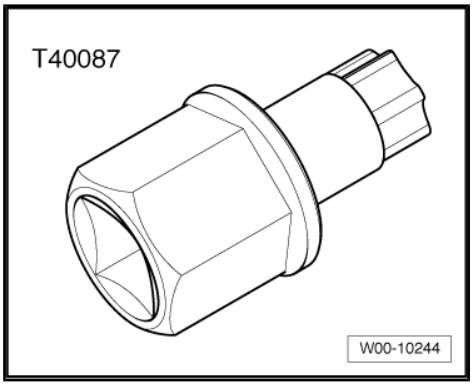
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Special tools and workshop equipment required

- Support set for Audi - VAS 6131/10- , supplementary set - VAS 6131/13- and gearbox support - VAS 6131/14-
- Adapter - T40058-



- Socket Torx T60 - T40087-

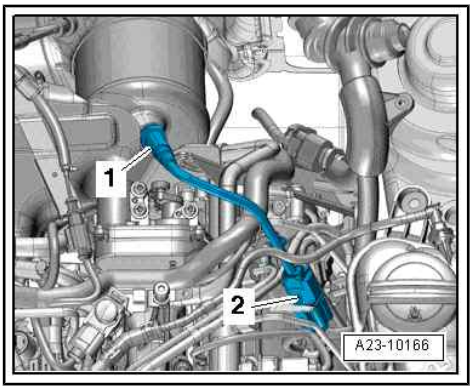


♦ Bolt M8x35 with washer (outer diameter 25 mm)

Procedure

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

– Detach electrical connector -2- from bracket and unplug.



Note

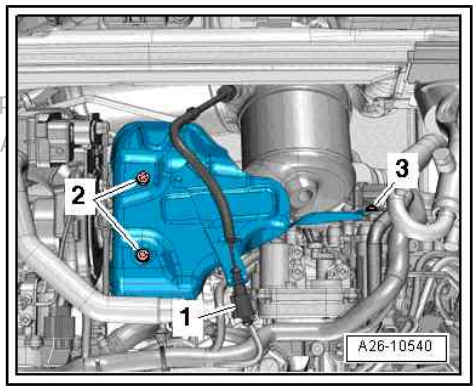
♦ *The illustration shows the installation position with the engine installed.*

♦ *Disregard -item 1-.*

– Unplug electrical connector -1- for exhaust gas temperature sender and move wiring clear.

– Remove bolts -2- and -3-.

– Detach heat shield for turbocharger.

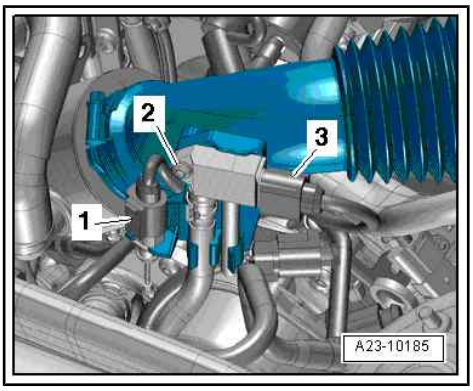


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Note

The illustration shows the installation position with the engine installed.

– Unplug electrical connectors -1- and -3-.



Note

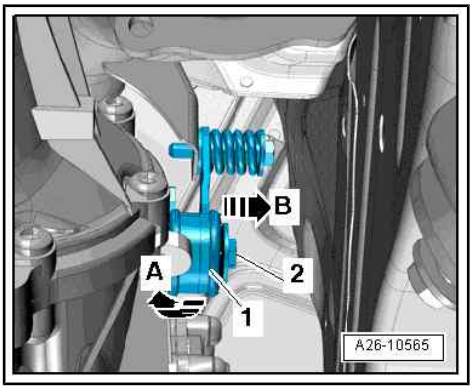
♦ *The illustration shows the installation position with the engine installed.*

♦ *Disregard -item 2-.*

A5 up to vehicle identification no. 8T-8-009 998:

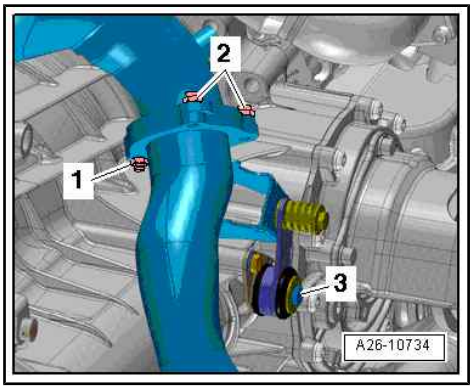
– Remove bolt -2-.

– Press retainer -1- in direction of -arrow B- and pivot to the rear -arrow A-.



A4 (all), A5 from vehicle identification no. 8T-8-009 999 onwards:

– Remove bolt -3-.



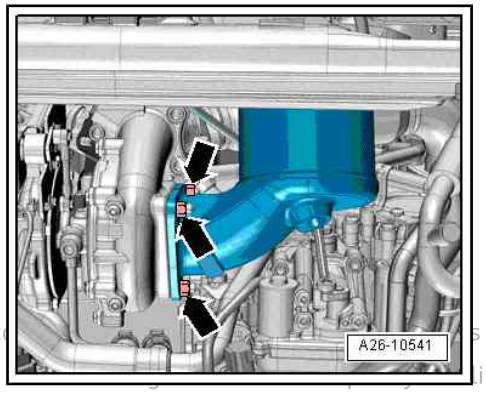
Note

Disregard items -1 and 2-.

All vehicles (continued):

– Remove nuts -arrows- for particulate filter and turbocharger.

– Detach particulate filter with front exhaust pipe.

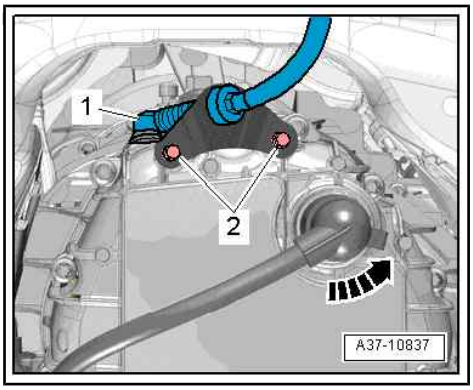


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Caution

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.***



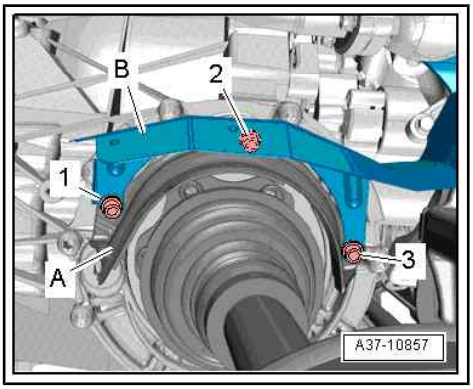
– Turn retainer catch anti-clockwise -arrow- and unplug electrical connector at gearbox.

– Move electrical wiring clear.

Note

Disregard items -1 and 2-.

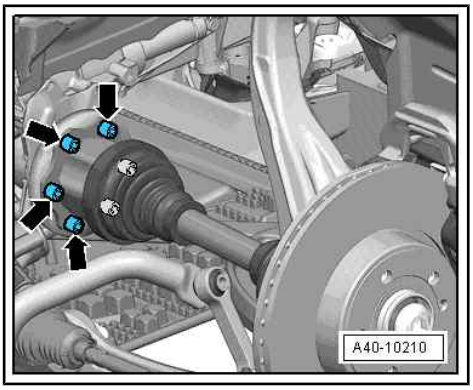
– Remove bolts -1- and -3-.
– Loosen bolt -2- and move heat shield -B- clear to one side.



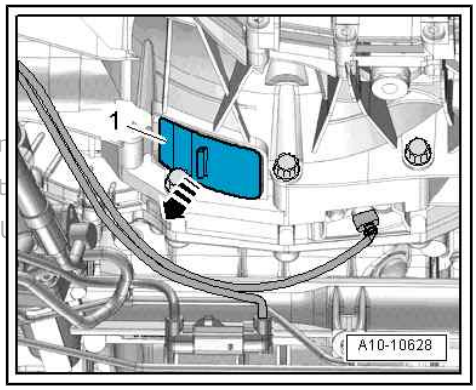
Note

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.



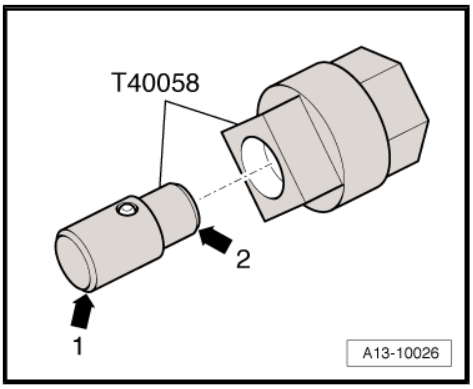
– Detach bottom cover -1- from gearbox -arrow-.



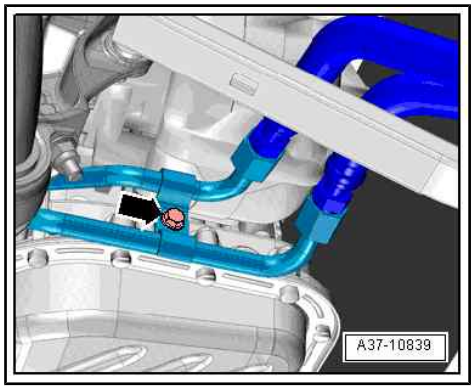
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– Insert guide pin of adapter -T40058- as follows:

- The larger-diameter section -arrow 1- faces towards the engine.
- The smaller-diameter section -arrow 2- faces the adapter.



– Remove bolt -arrow- for ATF lines.

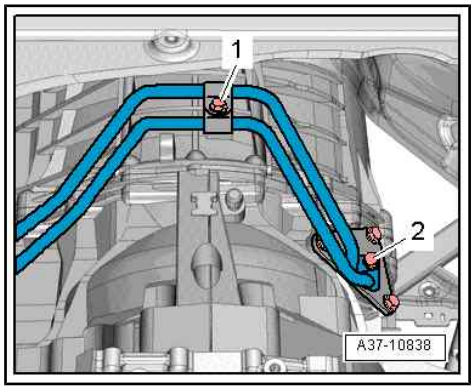


Note

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.

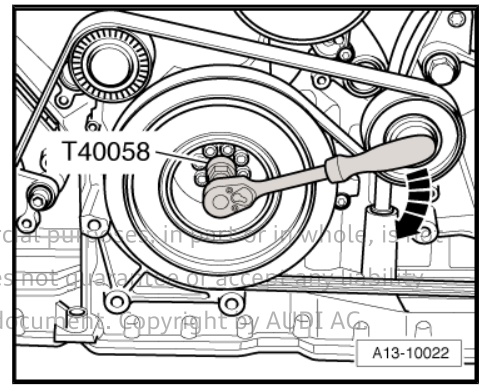
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .



– Counterhold crankshaft using adapter - T40058- when slackening bolts for dual-mass flywheel.

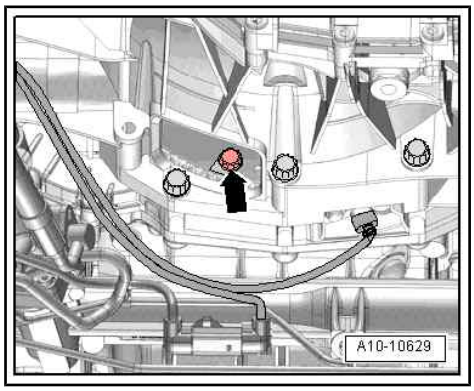
Note

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



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

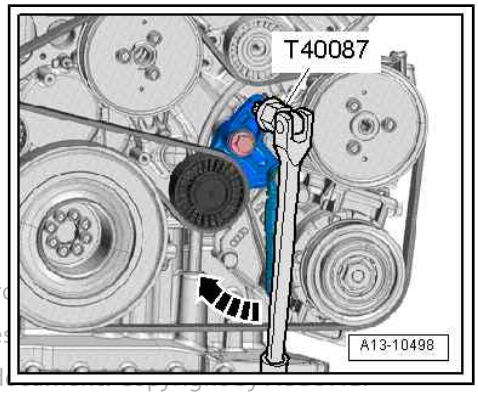


Caution

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.*

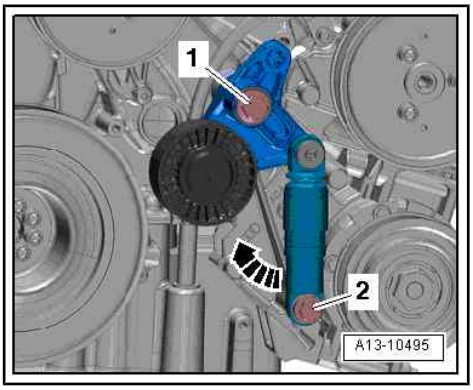
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– Slacken poly V-belt by turning tensioner in clockwise direction -arrow- using socket Torx T60 - T40087- .

– Remove poly V-belt from tensioner and release tensioner.

– Remove bolt -2- and pivot tensioner in clockwise direction -arrow-.



Note

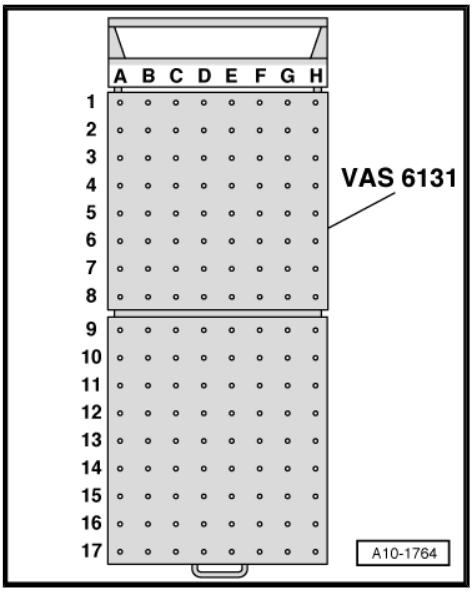
Disregard -item 1-.

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

Note

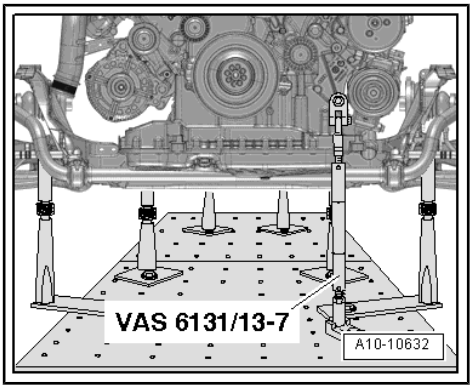
The other support elements remain unchanged.

Platform coordinates	Parts of support set for Audi - VAS 6131/10- , supplementary set -VAS 6131/13- and gearbox support - VAS 6131/14-			
D2	/13-7			
B10	/10-1	/10-2	/10-5	/14
G10	/10-1	/10-2	/10-5	

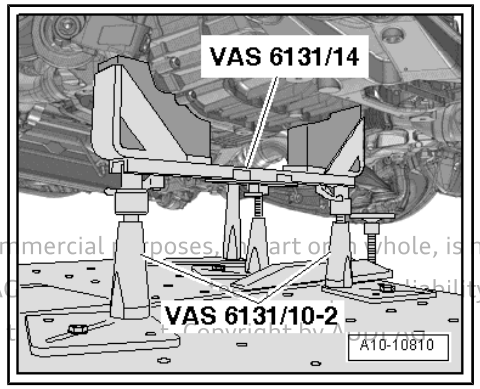


– Secure support -VAS 6131/13-7- in threaded hole for poly V-belt tensioner at front left of engine with M8x35 bolt and washer (outside diameter 25 mm), as illustrated.

– Secure support -VAS 6131/13-7- to scissor-type assembly platform.

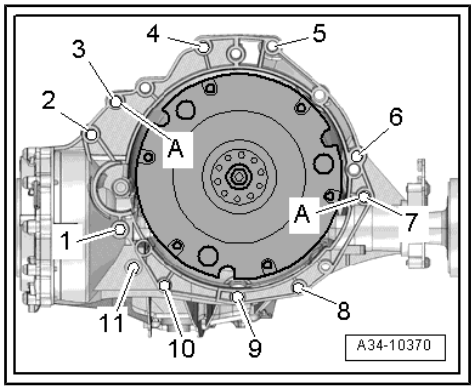


– Position support elements from -VAS 6131/10- and gearbox support - VAS 6131/14- at front of gearbox, as illustrated.
– Screw spindles on both sides upwards until gearbox support - VAS 6131/14- makes full contact with gearbox.
– Tighten base plates for support elements to 20 Nm on scissor-type assembly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



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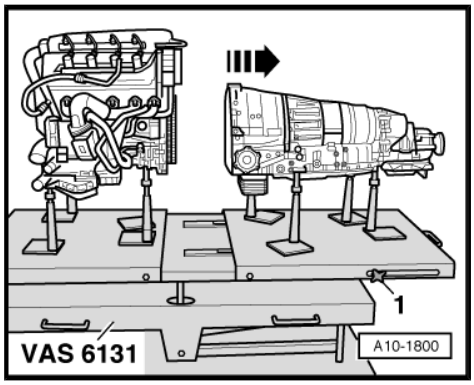
– Remove bolts -1- and -2- for starter.
– Separate starter from gearbox and leave in position.
– Unscrew remaining bolts -3 ... 11- securing engine to gearbox.



Note

Disregard -item A-.

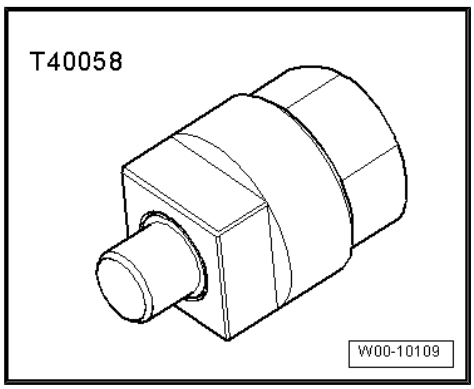
– Loosen clamping bolts -1- on sides of scissor-type assembly platform - VAS 6131 A- and pull rear section of platform together with gearbox towards rear -arrow-.



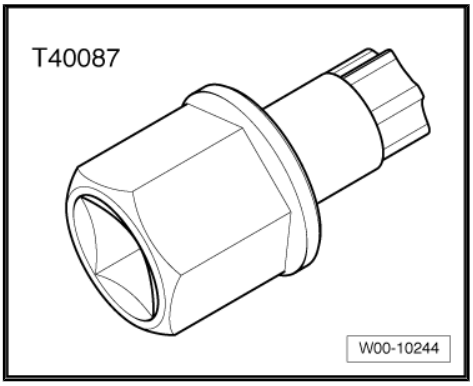
1.2.3 Separating engine and gearbox - vehicles with dual clutch gearbox 0B5

Special tools and workshop equipment required

- Support set for Audi - VAS 6131/10- , supplementary set - VAS 6131/13- and gearbox support - VAS 6131/14-
- Adapter - T40058-



♦ Socket Torx T60 - T40087-

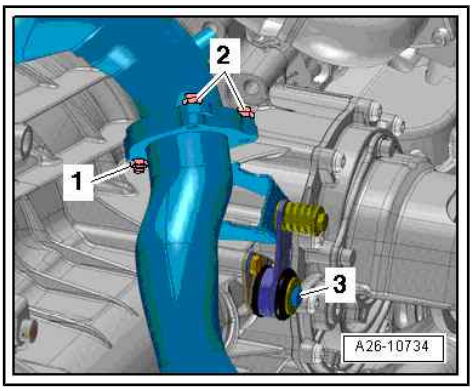


♦ Bolt M8x35 with washer (outer diameter 25 mm)

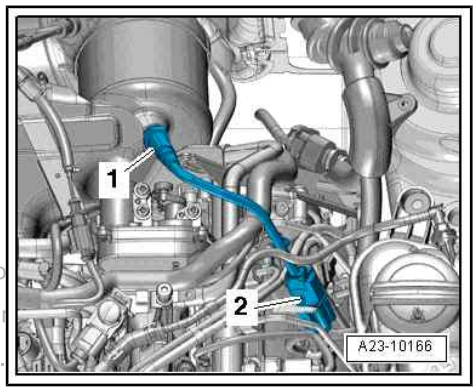
Procedure

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

– Remove nuts -1, 2- and bolt -3- and detach front exhaust pipe.



– Detach electrical connector -2- from bracket and unplug.



Note

♦ *The illustration shows the installation position with the engine installed.*

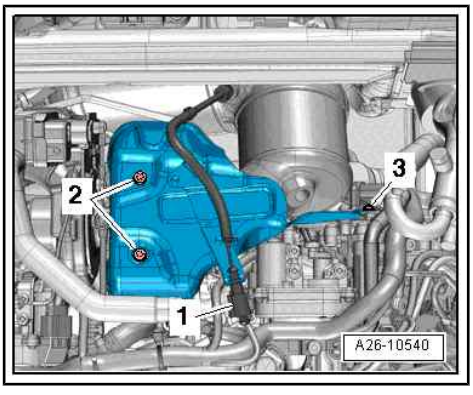
♦ *Disregard -item 1-.*

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– Unplug electrical connector -1- for exhaust gas temperature sender and move wiring clear.

– Remove bolts -2- and -3-.

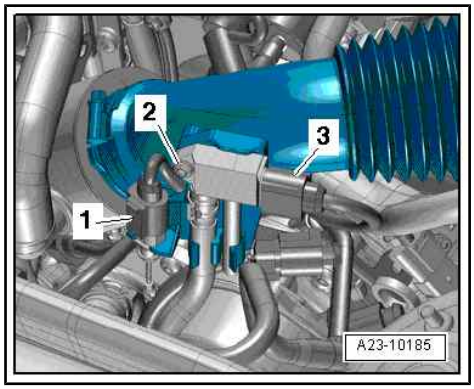
– Detach heat shield for turbocharger.



Note

The illustration shows the installation position with the engine installed.

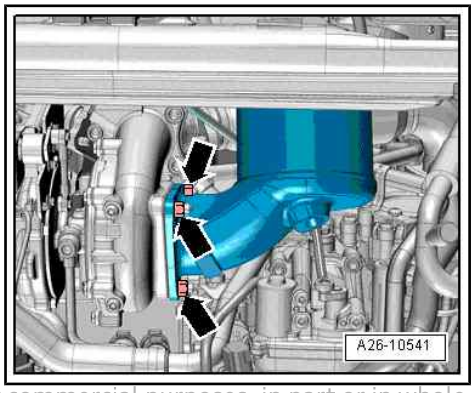
– Unplug electrical connectors -1- and -3-.



Note

- *The illustration shows the installation position with the engine installed.*
- *Disregard -item 2-.*

– Remove nuts -arrows- for particulate filter and turbocharger.
– Detach particulate filter.

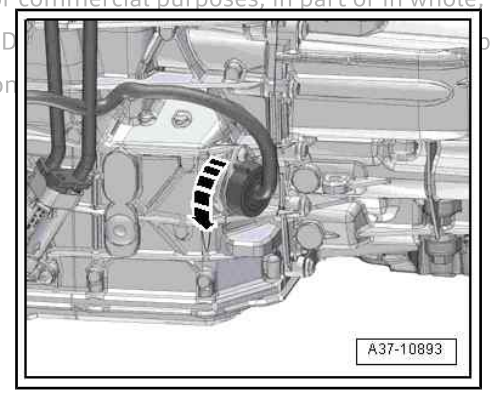


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Caution

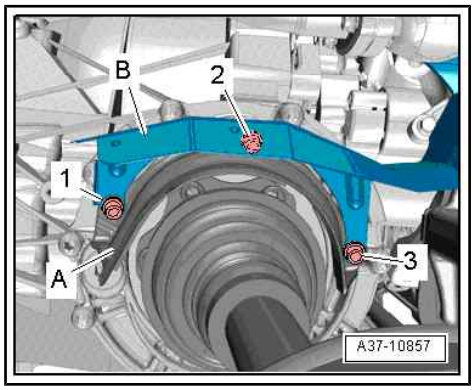
Risk of irreparable damage to gearbox control unit (mechatronic unit) because of static discharge.

- ***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.

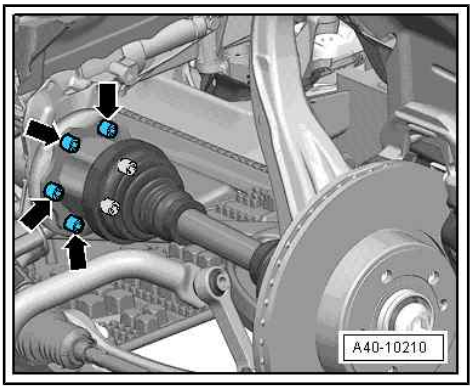
– Remove bolts -1- and -3-.
– Loosen bolt -2- and move heat shield -B- clear to one side.



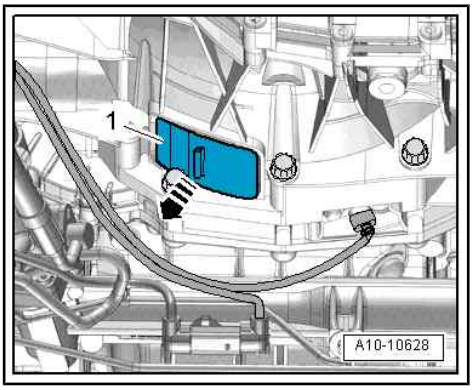
Note

Disregard -item A-.

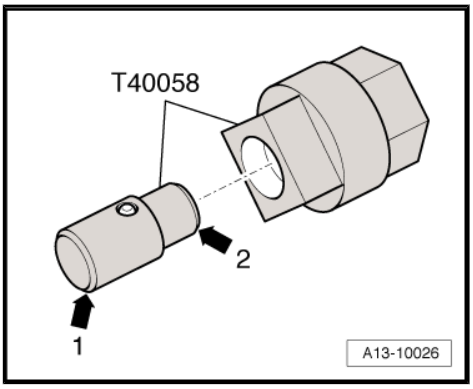
– Unbolt drive shafts (left and right) from gearbox flange shafts ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .
– Move electrical wiring for engine speed sender - G28- clear on gearbox.



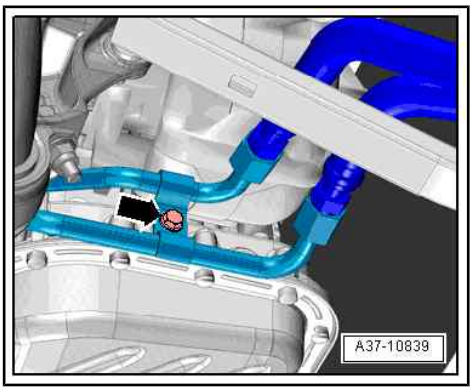
– Detach bottom cover -1- from gearbox -arrow-.



– Insert guide pin of adapter -T40058- as follows:
• The larger-diameter section -arrow 1- faces towards the engine.
• The smaller-diameter section -arrow 2- faces the adapter.



– Remove bolt -arrow- for ATF lines.

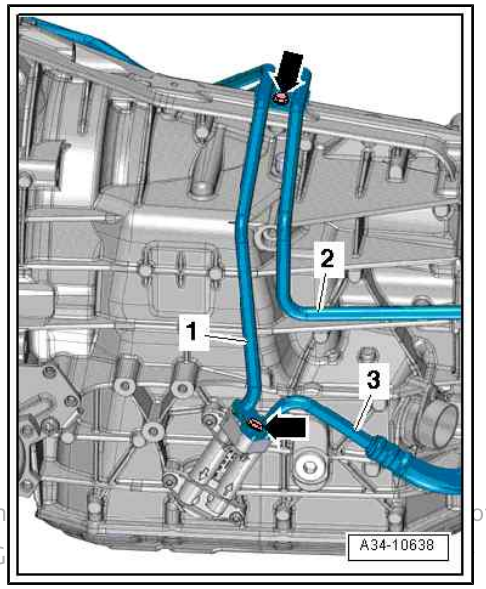


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Note

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

– Remove bolts -arrows- and detach ATF line -1- from gearbox.



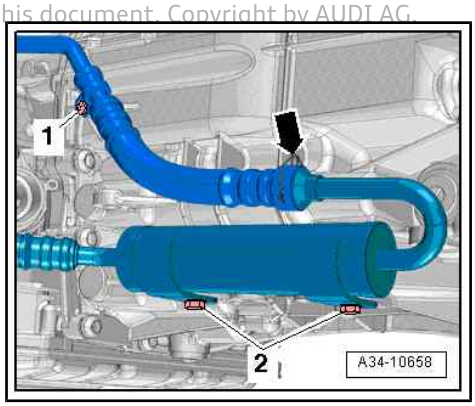
Note

Disregard items -2 and 3-.

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– Remove bolt -1-.

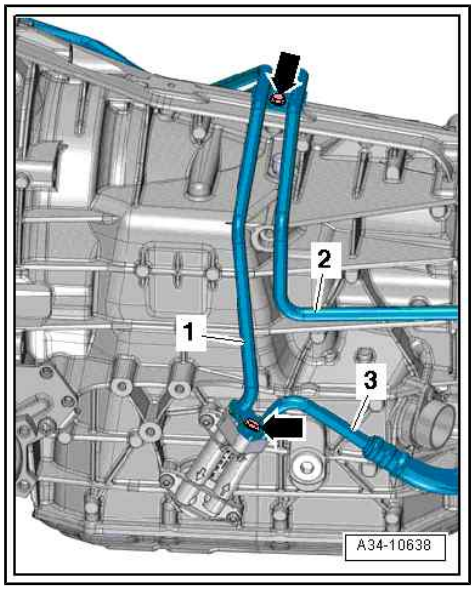
– Pull out securing clip -arrow- and disconnect ATF line from ATF filter.



Note

Disregard -item 2-.

– Tie up ATF lines -1- and -2-.

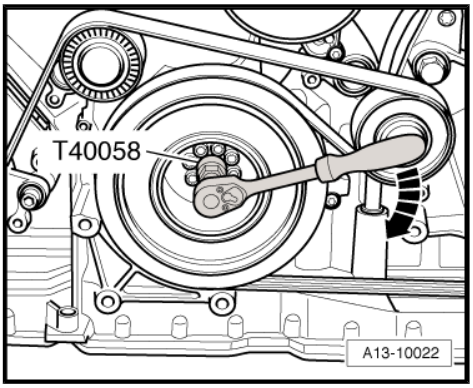


Note

Disregard -item 3-.

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

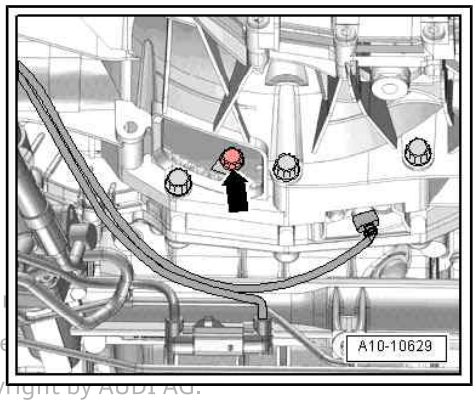
– Counterhold crankshaft using adapter - T40058- when slackening bolts for dual-mass flywheel.



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.

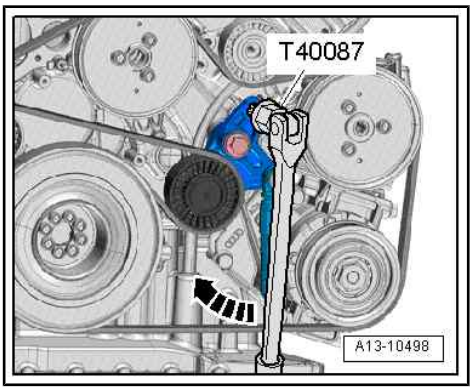


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Caution

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

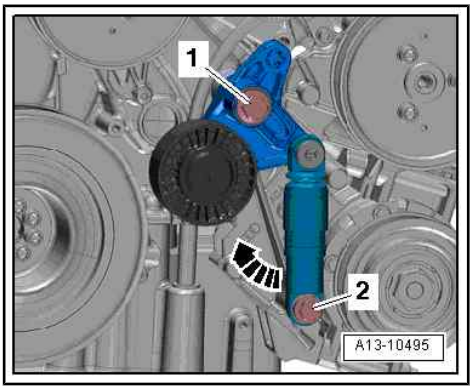
- ***Before removing the poly V-belt, mark the direction of rotation with chalk or a felt-tip pen for re-installation.***



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

– Remove poly V-belt from tensioner and release tensioner.

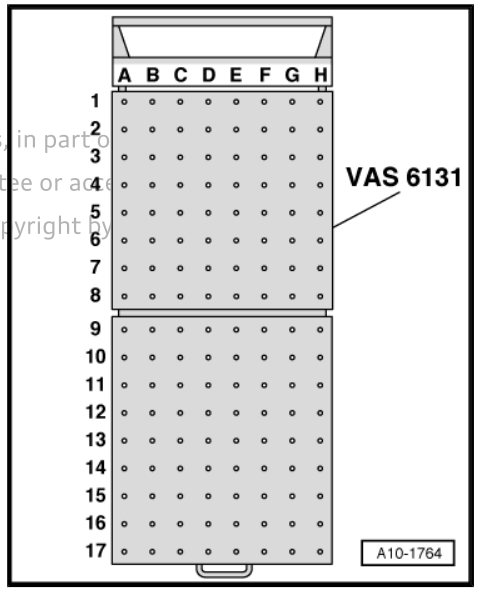
– Remove bolt -2- and pivot tensioner in clockwise direction -arrow-.



Note

Disregard -item 1-.

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



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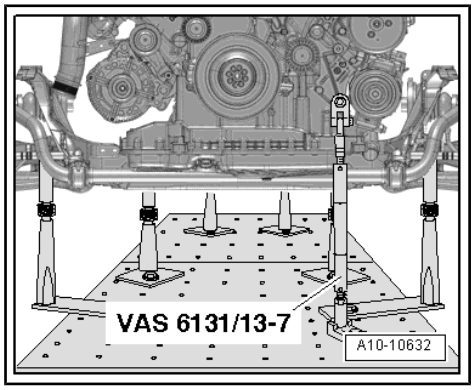
Note

The other support elements remain unchanged.

Platform coordinates	Parts of support set for Audi - VAS 6131/10- , supplementary set -VAS 6131/13- and gearbox support - VAS 6131/14-			
D2	/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 for poly V-belt tensioner at front left of engine with M8x35 bolt and washer (outside diameter 25 mm), as illustrated.

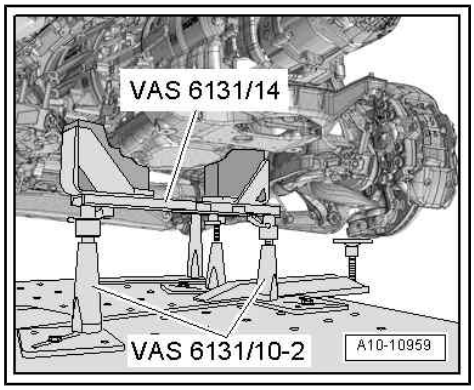
– Secure support -VAS 6131/13-7- to scissor-type assembly platform.



Caution

Risk of leaks at ATF sump.

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

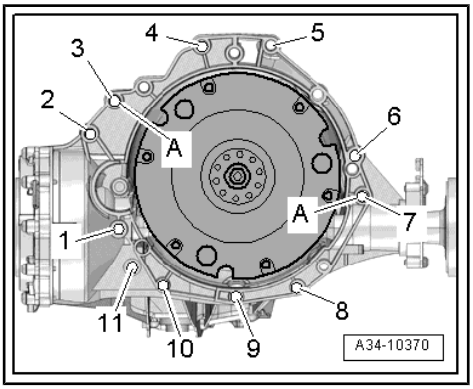


– Position support elements from -VAS 6131/10- and gearbox support - VAS 6131/14- at front of gearbox, as illustrated.

– 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- .

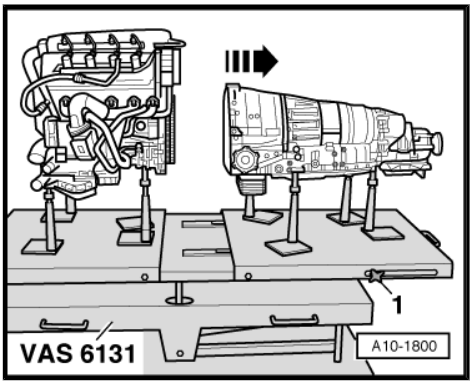
– Remove bolts -1- and -2- for starter.
– Separate starter from gearbox and leave in position.
– Unscrew remaining bolts -3 ... 11- securing engine to gearbox.



Note

Disregard -item A-.

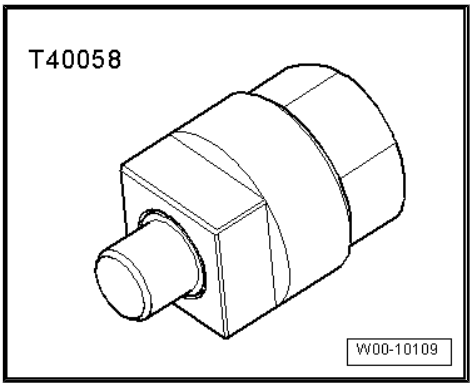
– Loosen clamping bolts -1- on sides of scissor-type assembly platform - VAS 6131 A- and pull rear section of platform together with gearbox towards rear -arrow-.



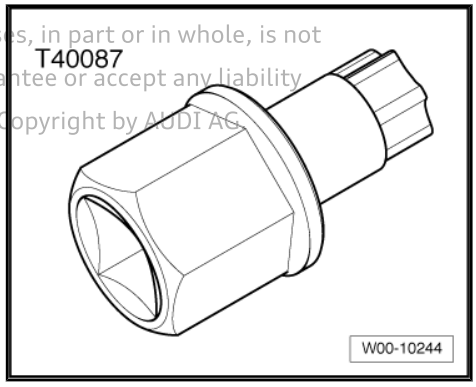
1.2.4 Separating engine and automatic gearbox 0B6

Special tools and workshop equipment required

- Support set for Audi - VAS 6131/10- , supplementary set - VAS 6131/13- and gearbox support - VAS 6131/14-
- Adapter - T40058-



- Socket Torx T60 - T40087-



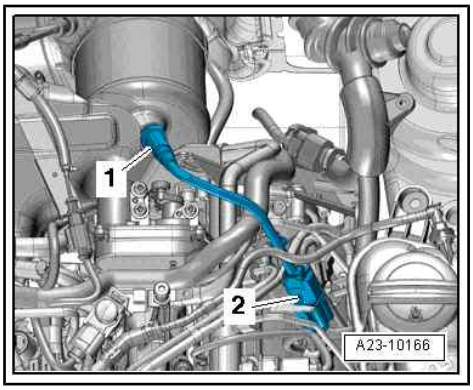
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♦ Bolt M8x35 with washer (outer diameter 25 mm)

Procedure

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

– Detach electrical connector -2- from bracket and unplug.



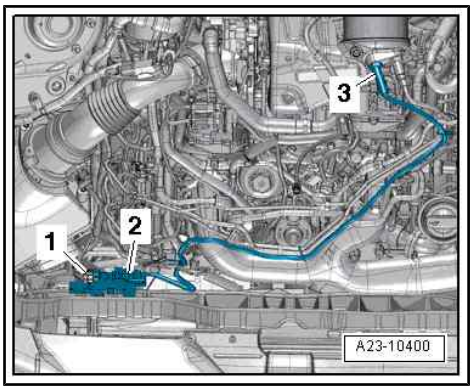
Note

♦ *The illustration shows the installation position with the engine installed.*

♦ *Disregard -item 1-.*

Vehicles with SCR catalytic converter:

– Move clear electrical wire for NOx sender - G295- -item 3-.



Note

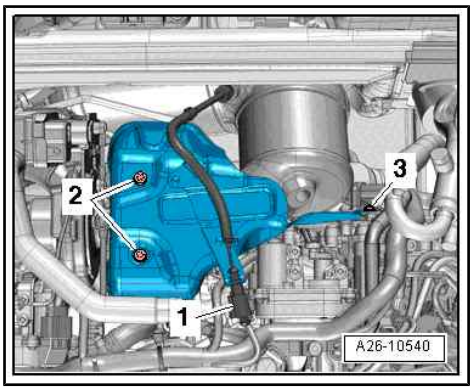
Disregard items -1 and 2-.

All vehicles (continued):

– Unplug electrical connector -1- for exhaust gas temperature sender and move wiring clear.

– Remove bolts -2- and -3-.

– Detach heat shield for turbocharger.

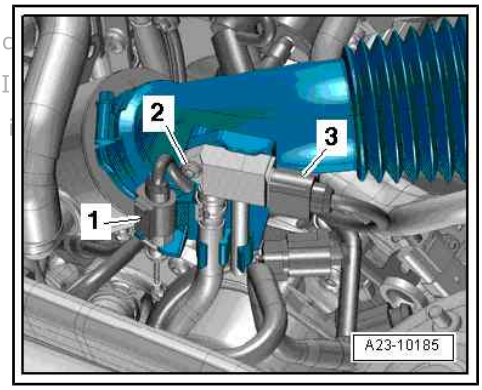


Note

The illustration shows the installation position with the engine installed.

– Unplug electrical connector -1- and move electrical wire clear.

– Unplug electrical connector -3-.



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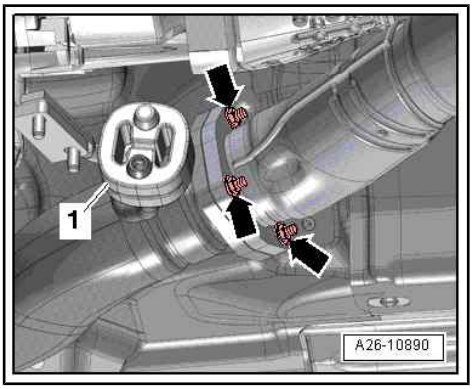
Note

♦ *The illustration shows the installation position with the engine installed.*

♦ *Disregard -item 2-.*

Vehicles with SCR catalytic converter:

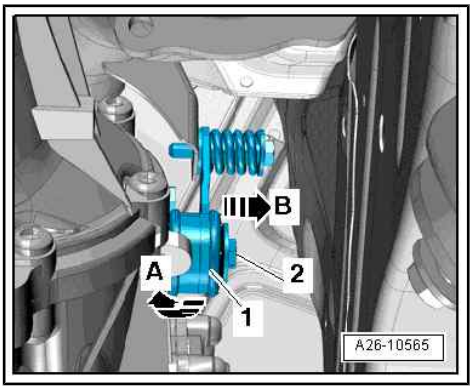
– Move front exhaust pipe clear of mounting -1- and detach.



A5 up to vehicle identification no. 8T-8-009 998:

– Remove bolt -2-.

– Press retainer -1- in direction of -arrow B- and pivot to the rear -arrow A-.

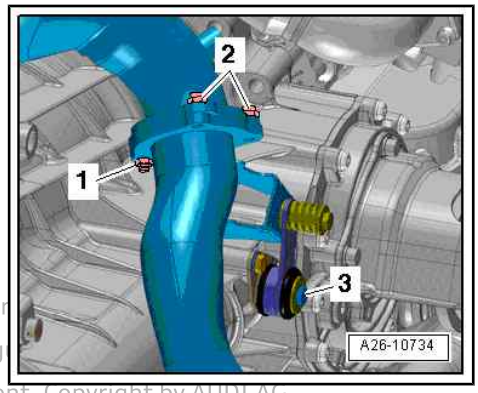


A4 (all), A5 from vehicle identification no. 8T-8-009 999 onwards:

– Remove bolt -3-.

Note

Disregard items -1 and 2-.

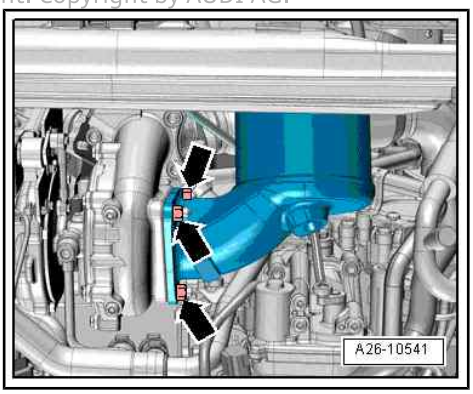


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All vehicles (continued):

– Remove nuts -arrows- for particulate filter and turbocharger.

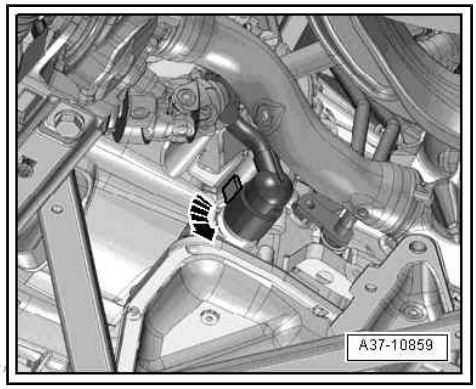
– Detach particulate filter with front exhaust pipe.



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.***



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

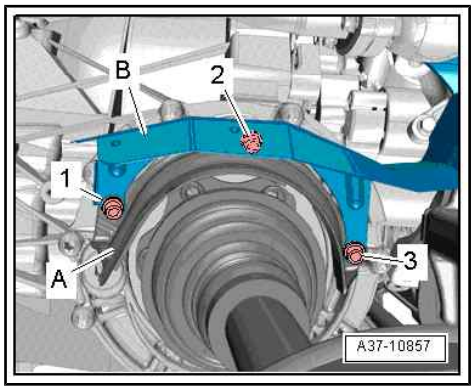
– Move electrical wiring clear.

Note

Disregard items -1 and 2-.

– Remove bolts -1- and -3-.

– Loosen bolt -2- and move heat shield -B- clear to one side.

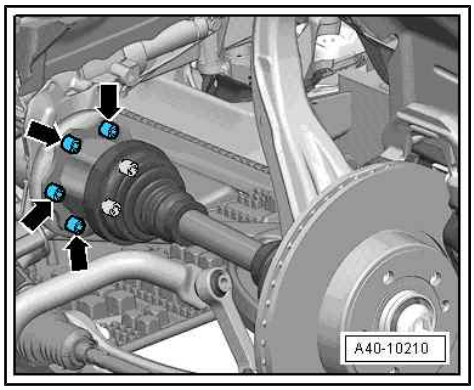


Note

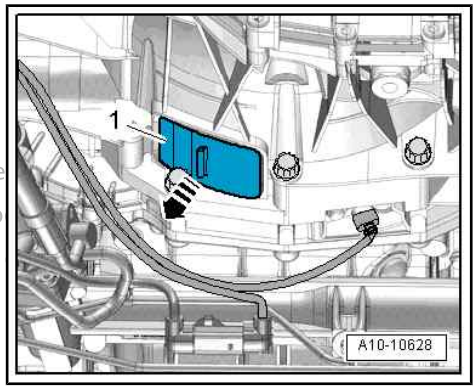
Disregard -item A-.

– 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.



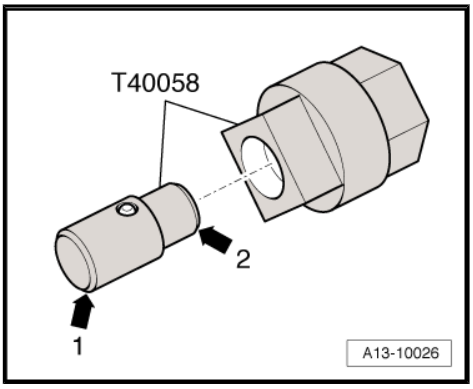
– Detach bottom cover -1- from gearbox -arrow-.



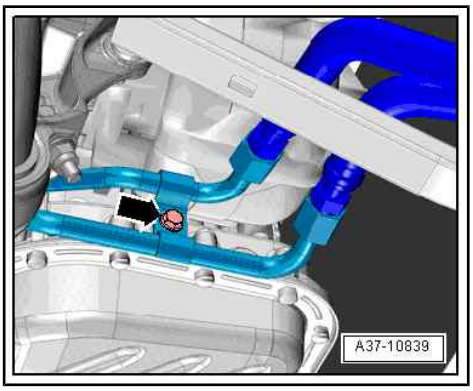
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with respect to the correctness of information in this

– Insert guide pin of adapter -T40058- as follows:

- The larger-diameter section -arrow 1- faces towards the engine.
- The smaller-diameter section -arrow 2- faces the adapter.



– Remove bolt -arrow- for ATF lines.

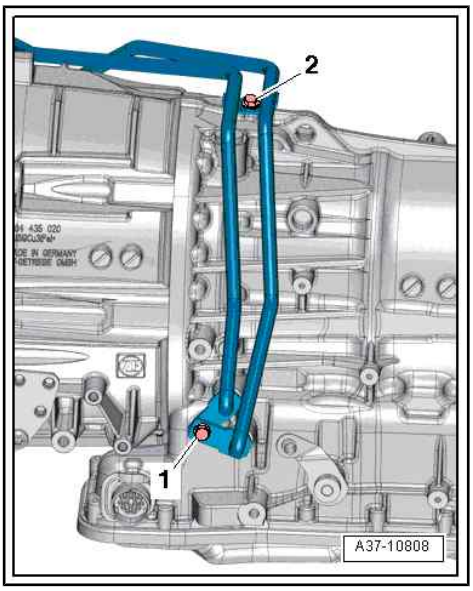


Note

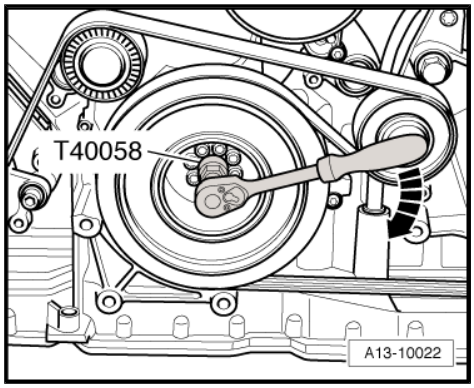
- *Observe rules for cleanliness when working on gearbox ⇒ Rep. gr. 00 ; Repair instructions; Rules for cleanliness .*
- *Lay a cloth under the separating point to catch escaping ATF.*

– 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- .



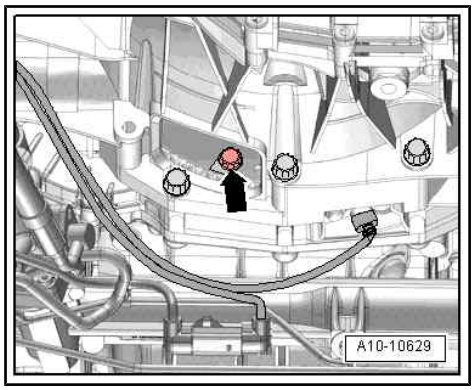
– Counterhold crankshaft using adapter - T40058- when slackening bolts for dual-mass flywheel.



Note

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

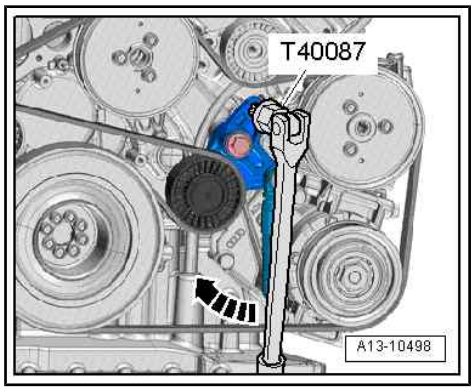
– Remove 6 bolts -arrow- for dual-mass flywheel, turning crankshaft 60° in normal direction of rotation each time.



Caution

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

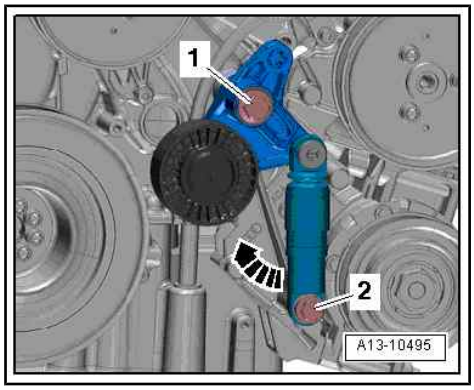
- ***Before removing the poly V-belt, mark the direction of rotation with chalk or a felt-tip pen for re-installation.***



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

– Remove poly V-belt from tensioner and release tensioner.

– Remove bolt -2- and pivot tensioner in clockwise direction -arrow-.

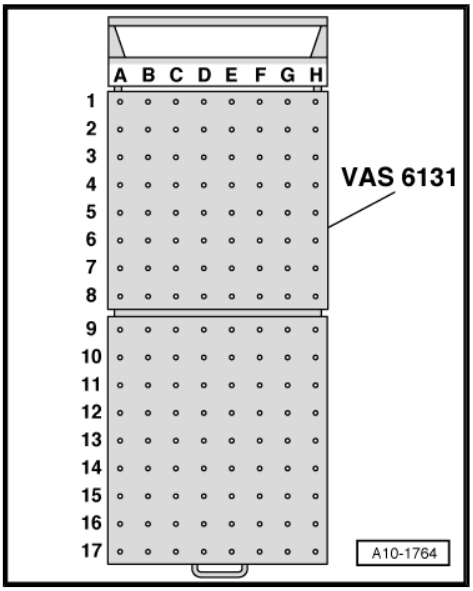


Note

Disregard -item 1-.

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



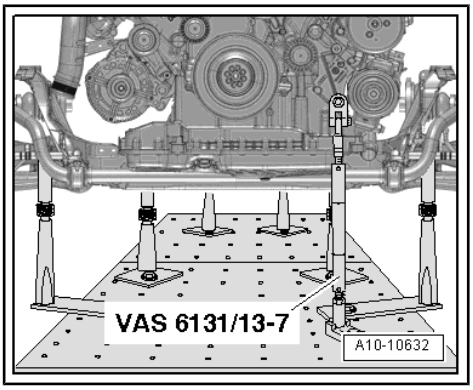
Note

The other support elements remain unchanged.

Platform coordinates	Parts of support set for Audi - VAS 6131/10- , supplementary set -VAS 6131/13- and gearbox support - VAS 6131/14-			
D2	/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 for poly V-belt tensioner at front left of engine with M8x35 bolt and washer (outside diameter 25 mm), as illustrated.

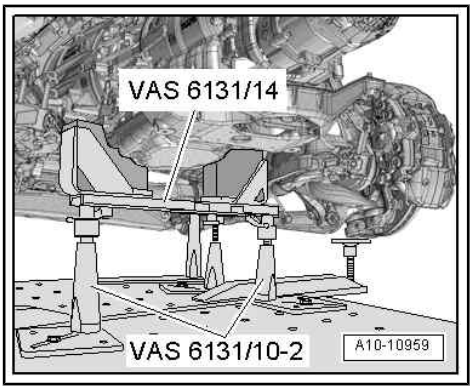
– Secure support -VAS 6131/13-7- to scissor-type assembly platform.



– 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.

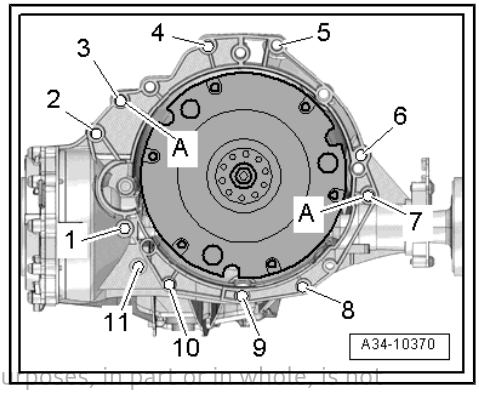
– Tighten base plates for support elements to 20 Nm on scissor-type assembly platform - VAS 6131 A- .



– Remove bolts -1- and -2- for starter.

– Separate starter from gearbox and leave in position.

– Unscrew remaining bolts -3 ... 11- securing engine to gearbox.

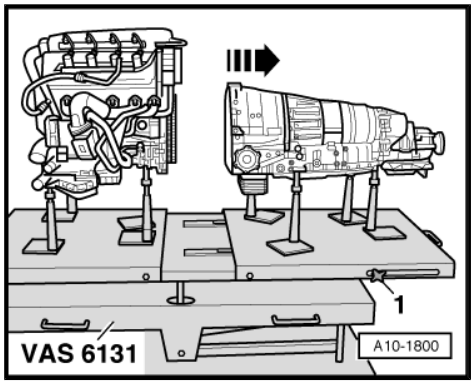


Note

Disregard -item A-.

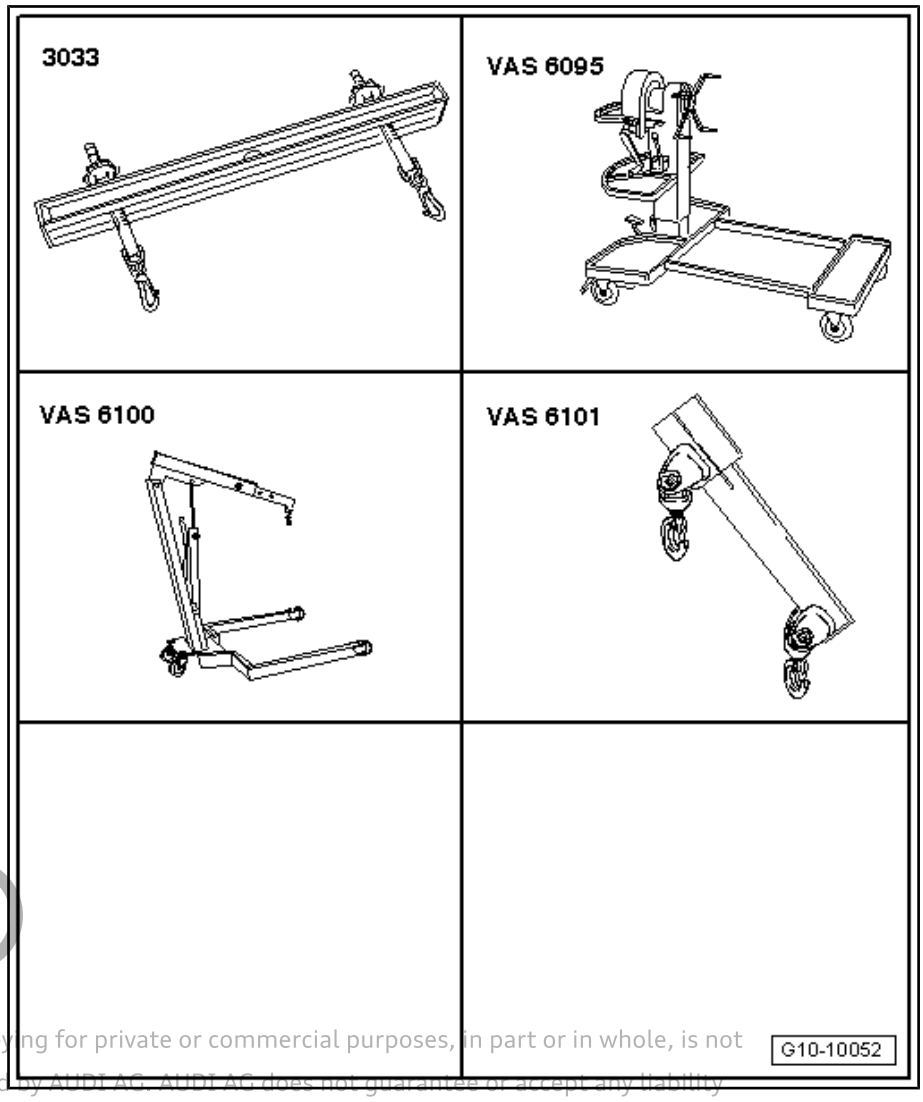
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– Loosen clamping bolts -1- on sides of scissor-type assembly platform - VAS 6131 A- and pull rear section of platform together with gearbox towards rear -arrow-.



1.3 Securing engine to engine and gearbox support

Special tools and workshop equipment required



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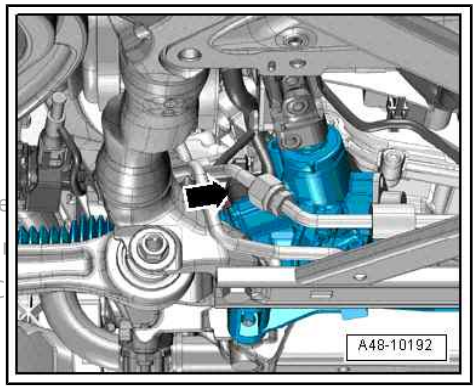
- Lifting tackle - 3033-
- Engine and gearbox support - VAS 6095- with bracket for V6 TDI engine -VAS 6095/1-4-
- Workshop hoist - VAS 6100-
- Lift arm extension/workshop hoist - VAS 6101-

Procedure

- Engine/gearbox assembly removed and secured to scissor-type assembly platform - VAS 6131- (with engine detached from gearbox) ⇒ page 96 .
- Engine secured with support -VAS 6131/13-7- .

– Unplug electrical connector -arrow- on steering rack.

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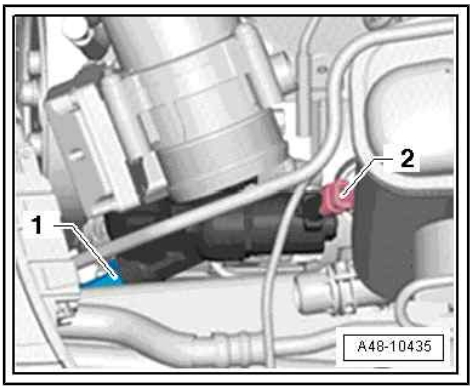


Note

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

– Unscrew bolted connection -1- and move power steering hydraulic line to one side.

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



Note

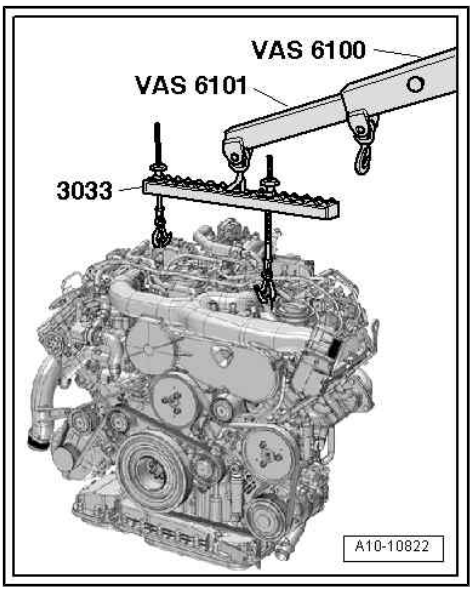
♦ *Illustration shows the installation position on a vehicle with dynamic steering.*

♦ *Disregard -item 2-.*

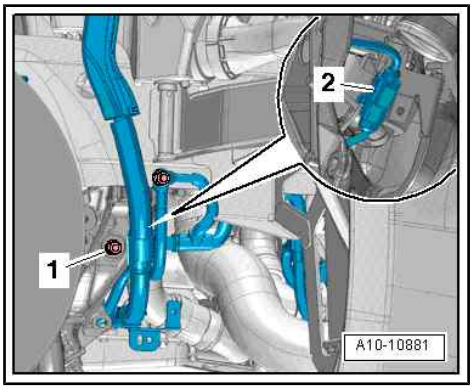
– Attach lift arm extension - VAS 6101- to workshop hoist - VAS 6100- .

– 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.



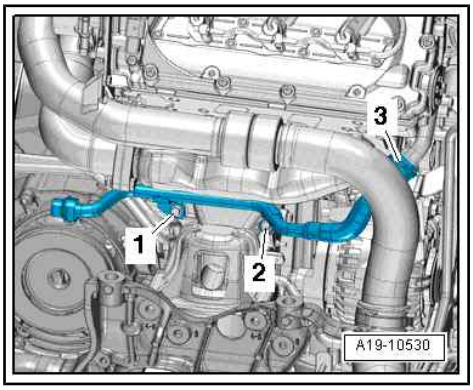
– Detach electrical connector -2- on solenoid valve (right-side) for electro-hydraulic engine mounting - N145- from bracket and unplug connector.
– Unscrew nut -1- and detach bracket with electrical wiring from subframe.



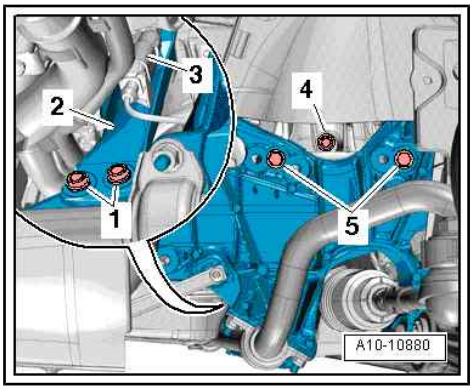
Note

The illustration shows the installation position with the engine installed.

– Remove bolts -1- and -2-.
– Lift retaining clip and detach coolant hose -3- from coolant pipe (front).
– Detach coolant pipe (bottom right) together with coolant hose.



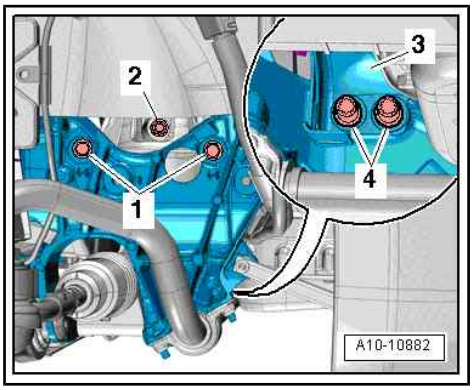
– Unplug electrical connector -3- on left electrohydraulic engine mounting solenoid valve - N144- .
– Remove bolt -4- for engine mounting (left-side).



Note

Disregard -items 1, 2, 5-.

– Remove bolt -2- for engine mounting (right-side).

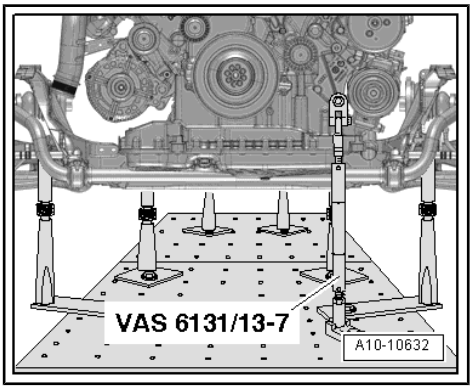


Note

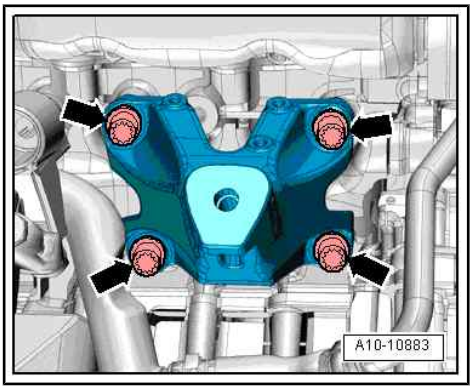
Disregard -items 1, 3, 4-.

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

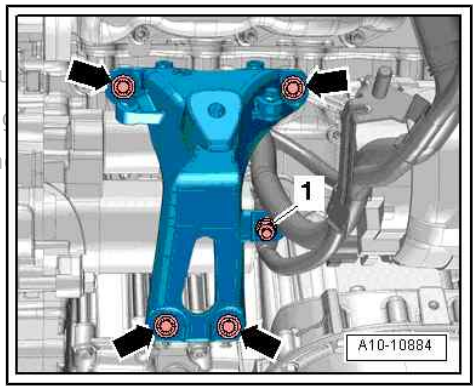


– Unscrew bolts -arrows- and remove engine support (left-side).

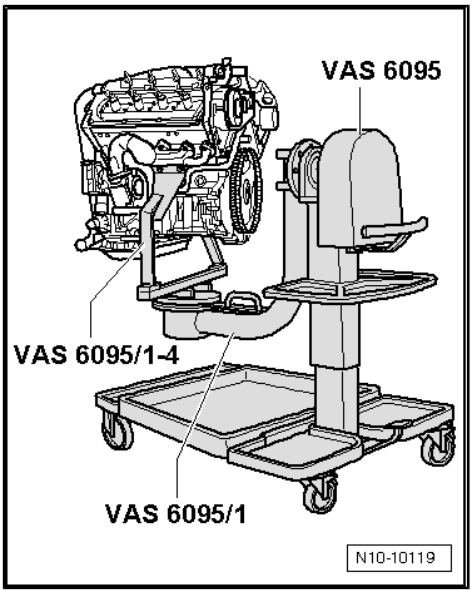


– Remove nut -1- and move earth wire clear at engine support.
– Unscrew bolts -arrows- and remove engine support (right-side).
– Tie up starter on engine.

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– Using support bracket for V6 TDI engine -VAS 6095/1-4- , secure engine to engine and gearbox support - VAS 6095- (40 Nm), as shown in illustration.



1.4 Installing engine

⇒ “1.4.1 Installing engine - vehicles with manual gearbox”, page 126

⇒ “1.4.2 Installing engine - vehicles with multitronic gearbox 0AW”, page 134

⇒ “1.4.3 Installing engine - vehicles with dual clutch gearbox 0B5”, page 141

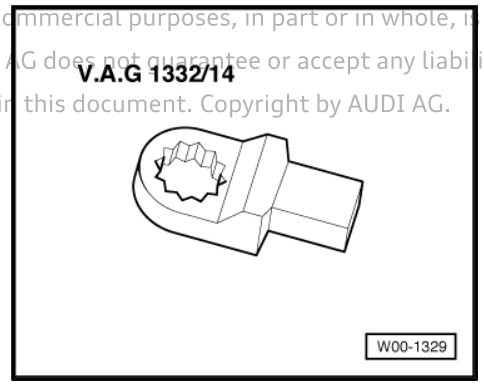
⇒ “1.4.4 Installing engine - vehicles with automatic gearbox 0B6”, page 148

1.4.1 Installing engine - vehicles with manual gearbox

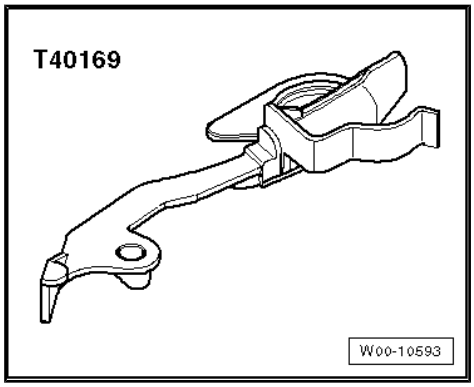
Special tools and workshop equipment required

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

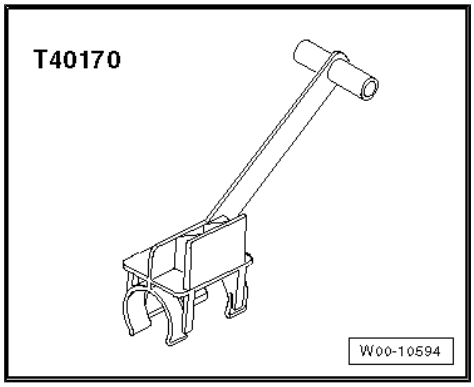
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- Assembly aid - T40169-



- Transportation lock - T40170-



Tightening torques

Note

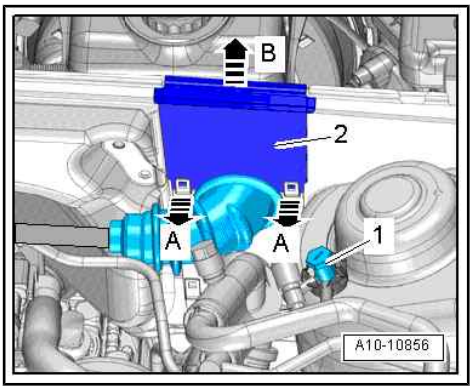
- *Tightening torques apply only to lightly greased, oiled, phosphated or black-finished nuts and bolts.*
- *Additional lubricants such as engine or gearbox oil may be used, but do not use lubricants containing graphite.*
- *Do not use de-greased parts.*
- *Tolerance for tightening torques: ± 15 %.*

Component		Nm
Bolts/nuts	M6	9
	M7	15
	M8	20
	M10	40
	M12	65

Assembly mountings ⇒ page 156

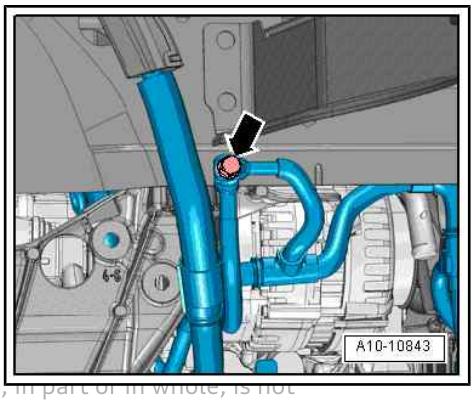
Earth stud at suspension turret - tightening torque

– Tighten earth stud -1- to 9 Nm.



Earth wiring at longitudinal member - tightening torque

– Tighten nut -arrow- to 9 Nm.

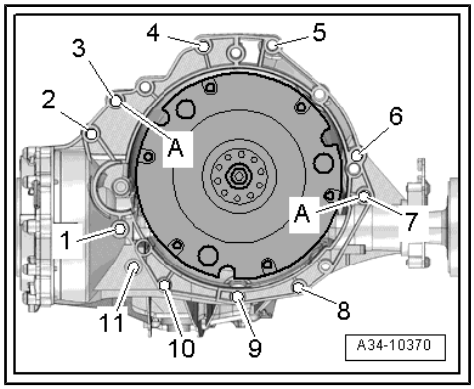


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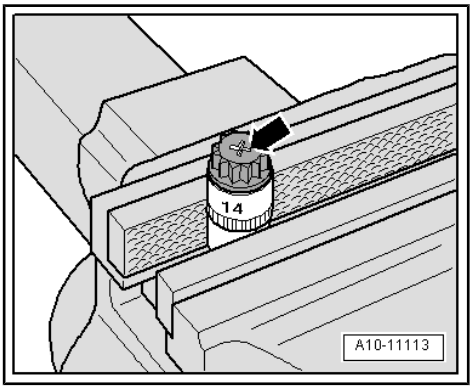
Engine to manual gearbox

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

- 1) Property class 10.9. The steel bolt may be re-used as often as necessary.
- 2) Audi A4 up to vehicle identification no. 8K-9-066499, Audi A5 up to vehicle identification no. 8T-9-007999: renew aluminium bolts.
- 3) Audi A4 from vehicle identification no. 8K-9-066500 onwards, Audi A5 from vehicle identification no. 8T-9-008000 onwards: aluminium bolts must not be used more often than twice ⇒ page 129 .



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- Audi A4 from vehicle identification no. 8K-9-066500 onwards, Audi A5 from vehicle identification no. 8T-9-008000 onwards: aluminium bolts -2 ... 11- must not be used more often than 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.

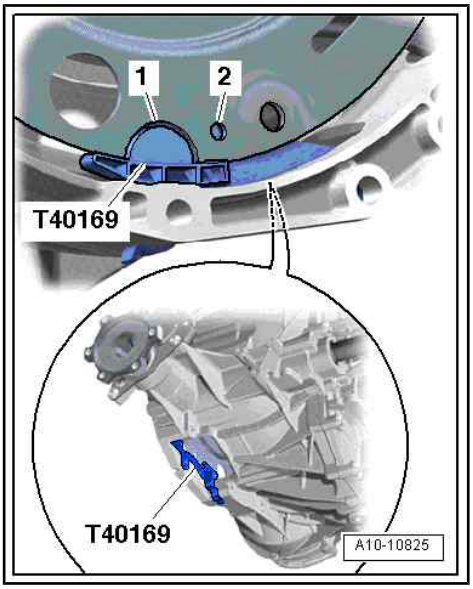
Procedure

Note

- *Renew the bolts tightened with specified tightening angle.*
- *Renew self-locking nuts and bolts as well as seals, gaskets and O-rings.*
- *On vehicles with manual gearbox, a needle bearing is fitted in the drive plate. Before installing, check that the needle bearing is fitted. Removing and installing needle bearing in drive plate (pressing in and out)* ⇒ page 181 .
- *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.*
- *Fit all cable ties in the original positions when installing.*

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– Install engine supports and engine mountings ⇒ page 156 .
– Install coolant pipe (bottom right) ⇒ page 396 .
– Before installing gearbox, remove residue from threaded holes for engine/gearbox bolts in cylinder block using a thread tap.



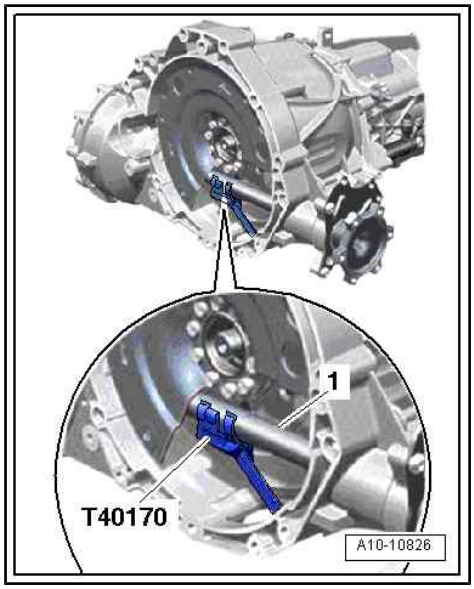
– The following preparations are required before joining engine and gearbox:
– Insert assembly aid - T40169- into gearbox housing between clutch module and gearbox housing from below, as illustrated.
• The assembly aid must engage in the semi-circular recess -1- and in the inspection hole -2-.

Note

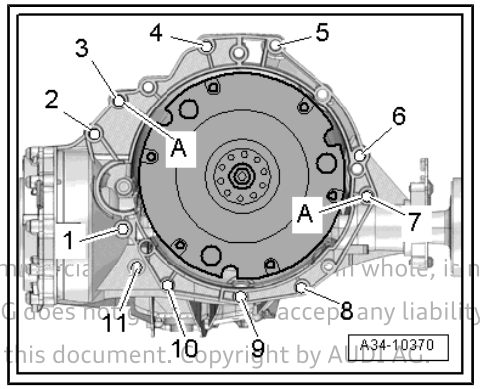
There is only one inspection hole on the circumference; turn the clutch module accordingly.

– 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 129 .
– Bring gearbox into position on engine and tighten bolts -1 … 11-.
– Remove transport lock - T40170- and assembly aid - T40169- .

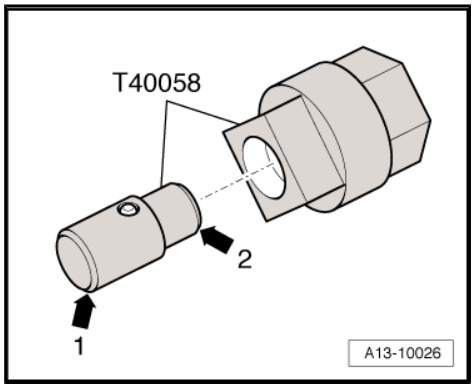


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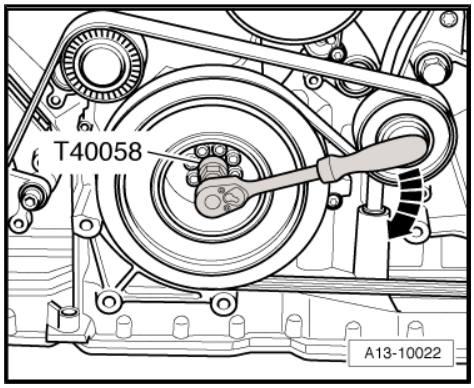
Note

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

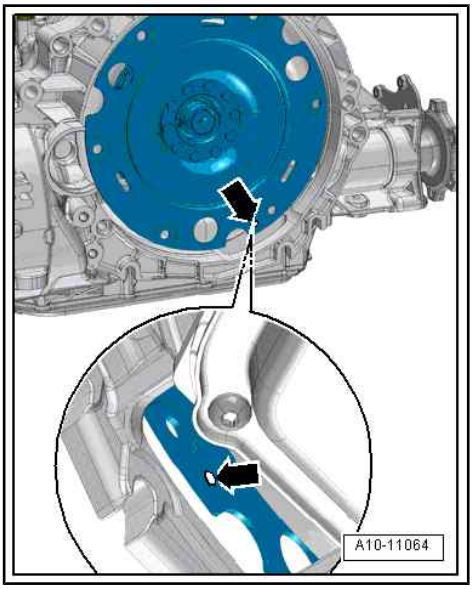
– Insert guide pin of adapter -T40058- as follows:
- The larger-diameter section -arrow 1- faces towards the engine.
- The smaller-diameter section -arrow 2- faces the adapter.



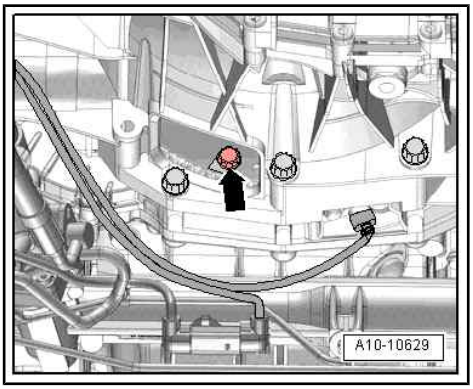
– Use adapter - T40058- to turn crankshaft one full turn (360°) in direction of engine rotation -arrow-.



- The inspection hole -arrow- should be visible again in the recess on the gearbox housing.



– Bolt clutch module 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).
– Turn crankshaft 180° further in normal direction of engine rotation -arrow- with adapter - T40058- .
– Tighten bolt accessible in this position to specified torque ⇒ Rep. gr. 34 ; 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 .
– Install power steering hydraulic lines ⇒ Running gear, axles, steering; Rep. gr. 48 ; Hydraulic power steering; Exploded view - hydraulic lines, reservoir .
– Install particulate filter: A5 up to vehicle identification no. 8T-8-009 998 ⇒ page 578 ; A4 (all), A5 from vehicle identification no. 8T-8-009 999 onwards ⇒ page 580 .
– Install poly V-belt tensioner ⇒ page 170 .
– Secure drive shafts (left and right) to gearbox flange shafts ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .

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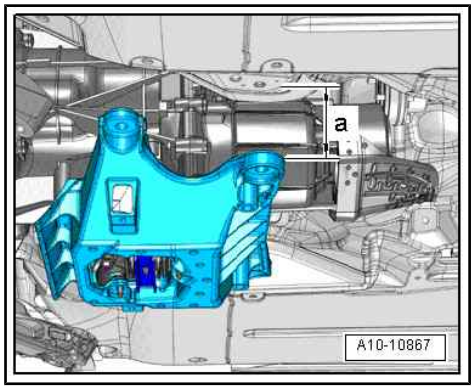
– Raise engine/gearbox assembly using scissor-type assembly platform - VAS 6131 A- only until distance between tunnel cross member and body is -a-.

• Dimension -a- = min. 100 mm.

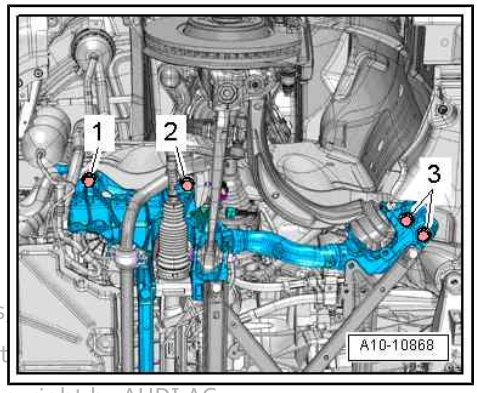
– Install selector rod and push rod ⇒ Rep. gr. 34 ; Selector mechanism; Removing and installing selector mechanism .

– Raise engine/gearbox assembly further 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 .

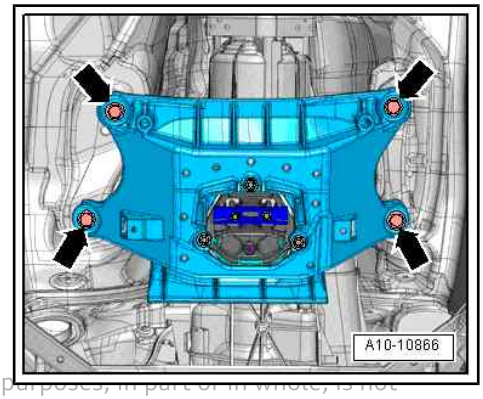


WARNING

Risk of accident if bolted connections are loose.

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

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

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

– Install heat shield for turbocharger ⇒ page 420 .
– Vehicles with four-wheel drive: Install propshaft ⇒ Rear final drive; Rep. gr. 39 ; Propshaft; Removing and installing propshaft .
– Install front exhaust pipe: A5 up to vehicle identification no. 8T-8-009 998 ⇒ page 567 ; A4 (all), A5 from vehicle identification no. 8T-8-009 999 onwards ⇒ page 568 .
– Align the exhaust system so it is free of stress ⇒ page 574 .
– Install front cross member ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim panels .
– Install clutch slave cylinder ⇒ Rep. gr. 30 ; Clutch mechanism; Removing and installing clutch slave cylinder .
– Secure universal joint to steering rack ⇒ Running gear, axles, steering; Rep. gr. 48 ; Steering column; Exploded view - steering column .
– Install subframe cross brace and anti-roll bar ⇒ 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 .
– Install brake calipers ⇒ Brake system; Rep. gr. 46 ; Front brakes; Removing and installing brake caliper .
– Install lock carrier braces ⇒ General body repairs, exterior; Rep. gr. 50 ; Lock carrier .
– Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
– Plug in electrical connectors for exhaust gas temperature senders ⇒ page 609 .
– Install engine control unit ⇒ page 557 .
– Install electrical wiring, terminal 30 wiring junction 2 - TV22- and cover for electronics box in engine compartment ⇒ page 127 , ⇒ page 127 , and ⇒ Electrical system; Rep. gr. 97 ; Relay carriers, fuse carriers, electronics boxes .
– Install body brace ⇒ Running gear, axles, steering; Rep. gr. 40 ; Suspension strut, upper links; Removing and installing body brace .
– Install filler neck for washer fluid reservoir ⇒ Electrical system; Rep. gr. 92 ; Windscreen washer system; Removing and installing washer fluid reservoir .
– 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 .

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Caution

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

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

– Install throttle valve module - J338- , exhaust gas pressure sensor 1 - G450- and air cleaner housing ⇒ page 483 .

– Fill up with engine oil and check oil level ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .

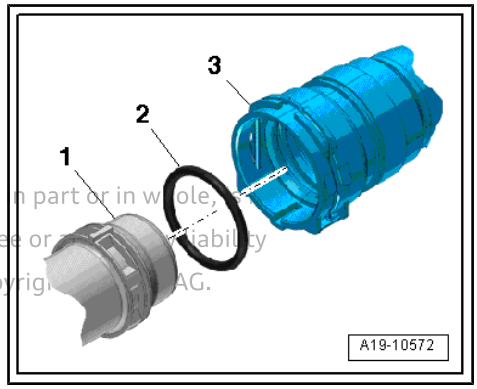
– Before starting engine, top up hydraulic fluid in power steering reservoir ⇒ Running gear, axles, steering; Rep. gr. 48 ; Hydraulic power steering; Checking power steering fluid level .

Note

The power steering pump must not be run when dry.

– Connect coolant hose and connection with plug-in connector ⇒ page 404 .

– Fill up with coolant ⇒ page 361 .



Note

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- *Do not use drained coolant again if:*
- *the cylinder head or cylinder block have been renewed.*
- *the coolant is contaminated or dirty.*

– 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 and perform wheel alignment ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheel alignment .

WARNING

Risk of accident if bolted connections are loose.

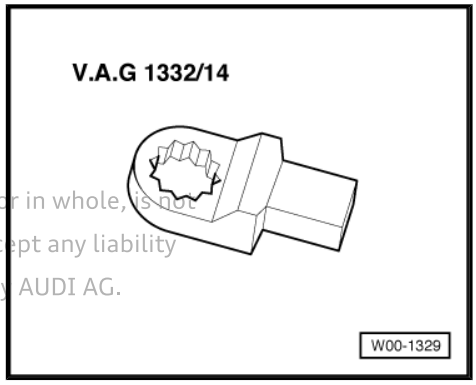
- ***Tighten subframe bolts to final setting after performing wheel alignment check.***

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

1.4.2 Installing engine - vehicles with multitronic gearbox 0AW

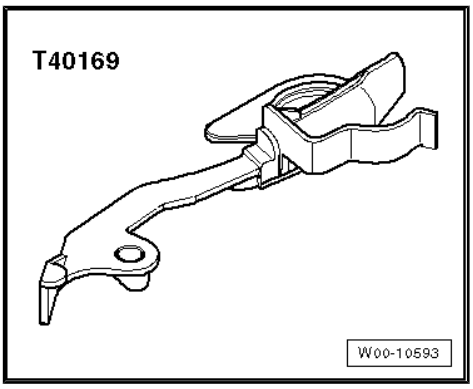
Special tools and workshop equipment required

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

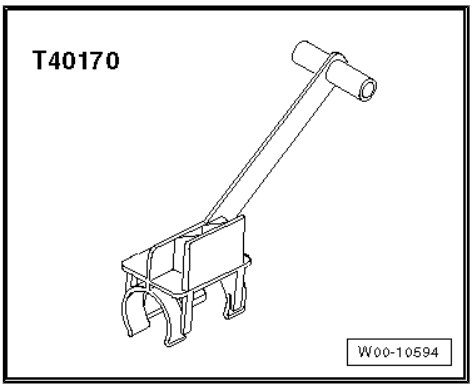


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- Assembly aid - T40169-



- Transportation lock - T40170-



Tightening torques

Note

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

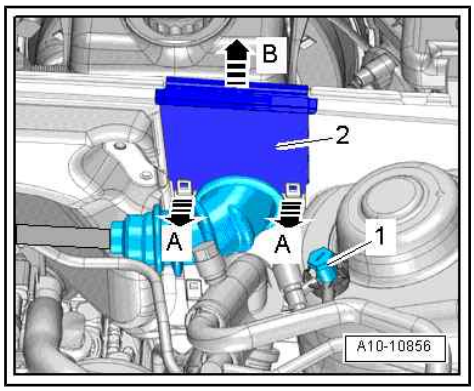
Component		Nm
Bolts/nuts	M6	9
	M7	15
	M8	20
	M10	40

Component	Nm
M12	65

Assembly mountings ⇒ page 156

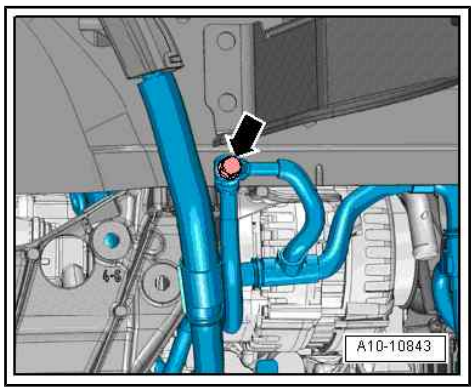
Earth stud at suspension turret - tightening torque

– Tighten earth stud -1- to 9 Nm.



Earth wiring at longitudinal member - tightening torque

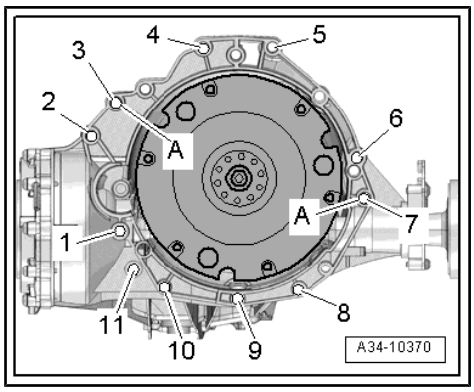
– Tighten nut -arrow- to 9 Nm.



Engine to multitronic gearbox 0AW

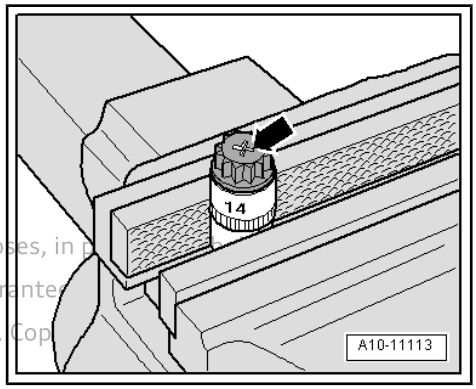
Item	Bolt	Nm
1	M10x50 1)	65
2 … 6	M12x100 2)3)	30 + 90°
7	M12x125 2)3)	30 + 90°
8, 11	M10x60 2)3)	15 + 90°
9, 10	M10x95 2)3)	15 + 90°
A	Dowel sleeves for centralising	

- 1) Property class 10.9. The steel bolt may be re-used as often as necessary.
- 2) Audi A4 up to vehicle identification no. 8K-9-066499, Audi A5 up to vehicle identification no. 8T-9-007999: renew aluminium bolts.
- 3) Audi A4 from vehicle identification no. 8K-9-066500 onwards, Audi A5 from vehicle identification no. 8T-9-008000 onwards: aluminium bolts must not be used more often than twice ⇒ page 137 .



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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.



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Procedure

Note

- *Renew the bolts tightened with specified tightening angle.*
- *Renew self-locking nuts and bolts as well as seals, gaskets and O-rings.*
- *On vehicles with multitronic gearbox 0AW, a needle bearing is fitted in the drive plate. Before installing, check that the needle bearing is fitted. Removing and installing needle bearing in drive plate (pressing in and out)* ⇒ page 181 .
- *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.*
- *Fit all cable ties in the original positions when installing.*

– Install engine supports and engine mountings ⇒ page 156 .

– Install coolant pipe (bottom right) ⇒ page 396 .

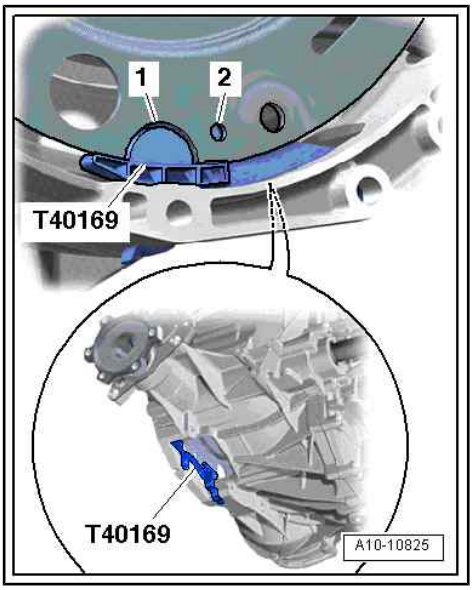
– Hold ATF lines in installation position when joining engine and subframe.

– 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 flywheel/torque converter 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-.

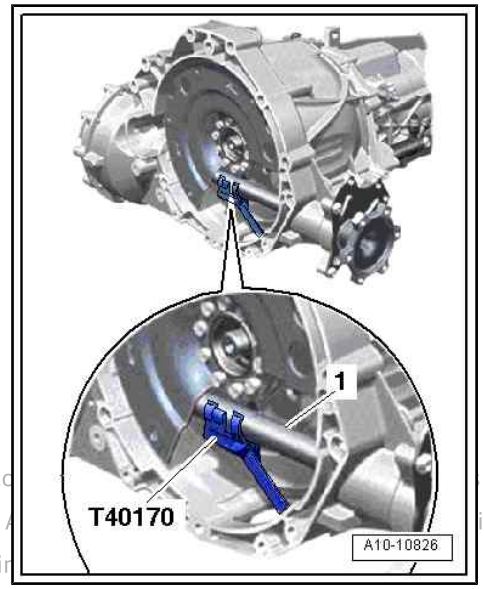


Note

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

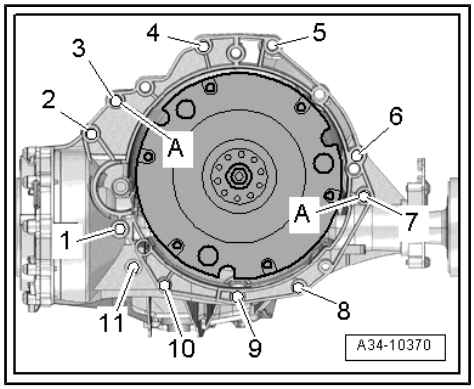
– Insert pin of assembly aid into hole on gearbox housing.

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



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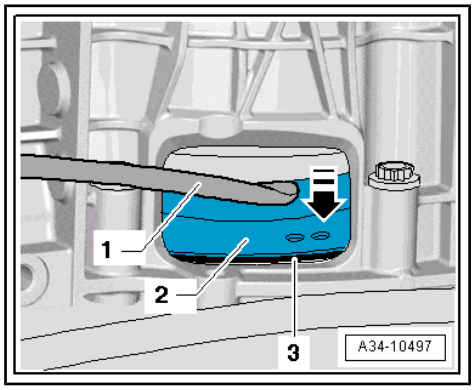
– Check whether dowel sleeves -A- for centring engine and gearbox are fitted in cylinder block; install missing dowel sleeves.
– Check whether aluminium bolts securing engine to gearbox can be reused; if so, apply marking ⇒ page 129 .
– Bring gearbox into position on engine and tighten bolts -1 … 11-.
– Remove transport lock - T40170- and assembly aid - T40169- .



Note

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

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

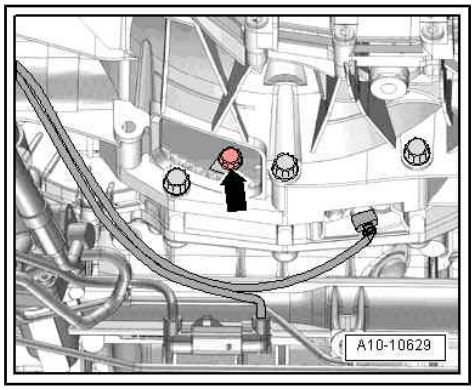


– Bolt dual-mass flywheel onto drive plate as follows:

Note

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

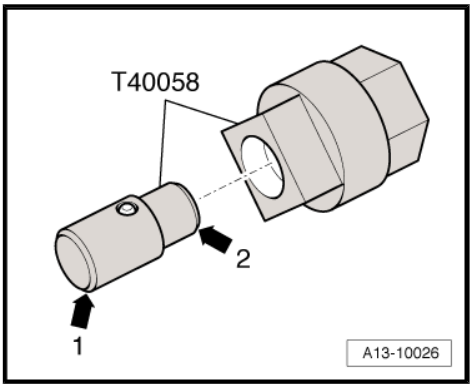
– Screw in first bolt -arrow- hand-tight (2 Nm).



– Insert guide pin of adapter -T40058- as follows:

• The larger-diameter section -arrow 1- faces towards the engine.

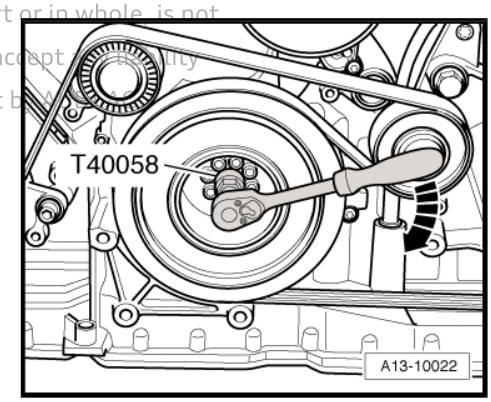
• The smaller-diameter section -arrow 2- faces the adapter.



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– Turn crankshaft 180° further in normal direction of engine rotation -arrow- with adapter -T40058-.

– Tighten bolt accessible in this crankshaft position to specified torque ⇒ 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. 37 ; Removing and installing gearbox; Tightening torques for gearbox .

– Install power steering hydraulic lines ⇒ Running gear, axles, steering; Rep. gr. 48 ; Hydraulic power steering; Exploded view - hydraulic lines, reservoir .

– Install poly V-belt tensioner ⇒ page 170 .

– Secure drive shafts (left and right) to gearbox flange shafts ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .

– Install ATF lines ⇒ Rep. gr. 37 ; ATF circuit; Removing and installing ATF lines .

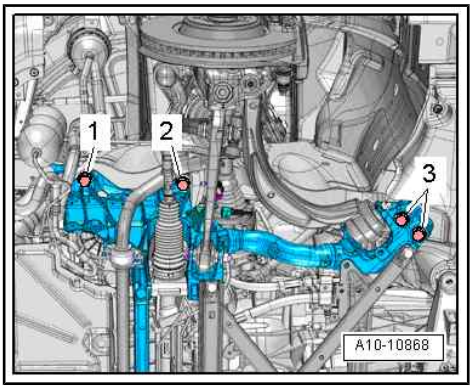
– Install particulate filter: A5 up to vehicle identification no. 8T-8-009 998 ⇒ page 578 ; A4 (all), A5 from vehicle identification no. 8T-8-009 999 onwards ⇒ page 580 .

– Install heat shield for turbocharger ⇒ page 420 .

– 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.

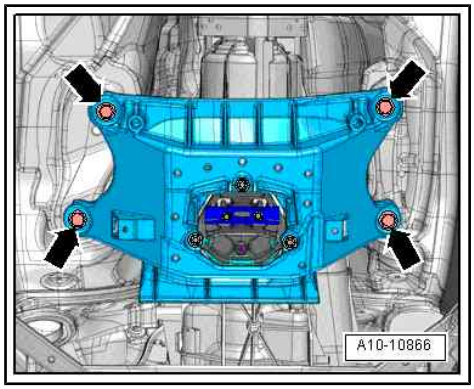
– Tighten subframe bolts only to specified torque (do not turn further); the bolts should only be fully tightened after performing the wheel alignment check ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Exploded view - subframe .



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. 37 ; Assembly mountings; Exploded view - assembly mountings .

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

– Install front exhaust pipe: A5 up to vehicle identification no. 8T-8-009 998 ⇒ page 567 ; A4 (all), A5 from vehicle identification no. 8T-8-009 999 onwards ⇒ page 568 .
– Align the exhaust system so it is free of stress ⇒ page 574 .
– Install front cross member ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim panels .
– Install selector lever cable ⇒ Rep. gr. 37 ; Selector mechanism; Removing and installing selector lever cable .
– Secure universal joint to steering rack ⇒ Running gear, axles, steering; Rep. gr. 48 ; Steering column; Exploded view - steering column .
– Install subframe cross brace and anti-roll bar ⇒ 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 .
– Install brake calipers ⇒ Brake system; Rep. gr. 46 ; Front brakes; Removing and installing brake caliper .
– Install lock carrier braces ⇒ General body repairs, exterior; Rep. gr. 50 ; Lock carrier .
– Install engine control unit ⇒ page 557 .
– 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 ⇒ page 136 , ⇒ page 136 , and ⇒ Electrical system; Rep. gr. 97 ; Relay carriers, fuse carriers, electronics boxes .
– Plug in electrical connectors for exhaust gas temperature senders ⇒ page 609 .
– Install body brace ⇒ Running gear, axles, steering; Rep. gr. 40 ; Suspension strut, upper links; Removing and installing body brace .
– Install filler neck for washer fluid reservoir ⇒ Electrical system; Rep. gr. 92 ; Windscreen washer system; Removing and installing washer fluid reservoir .
– 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.***

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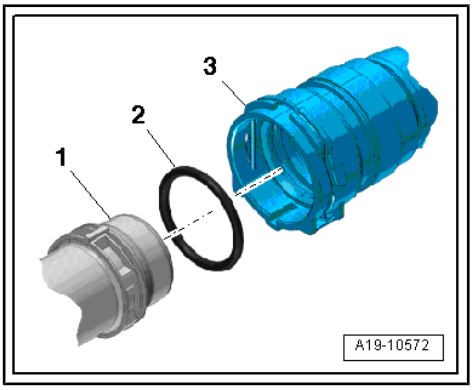
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– Install throttle valve module - J338- , exhaust gas pressure sensor 1 - G450- and air cleaner housing ⇒ page 483 .
– Fill up with engine oil and check oil level ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .
– Before starting engine, top up hydraulic fluid in power steering reservoir ⇒ Running gear, axles, steering; Rep. gr. 48 ; Hydraulic power steering; Checking power steering fluid level .

Note

The power steering pump must not be run when dry.

– Connect coolant hose and connection with plug-in connector ⇒ page 404 .
– Fill up with coolant ⇒ page 361 .



Note

- *Do not use drained coolant again if:*
- *the cylinder head or cylinder block have been renewed.*
- *the coolant is contaminated or dirty.*

– 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 and perform wheel alignment ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheel alignment .

WARNING

Risk of accident if bolted connections are loose.

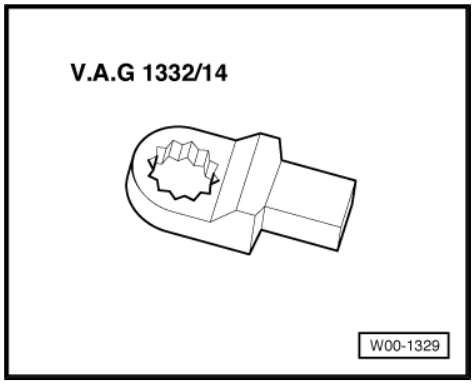
- ***Tighten subframe bolts to final setting after performing wheel alignment check.***

– Fill up ATF ⇒ Rep. gr. 37 ; ATF; Draining and filling ATF .
– Install noise insulation panels ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .

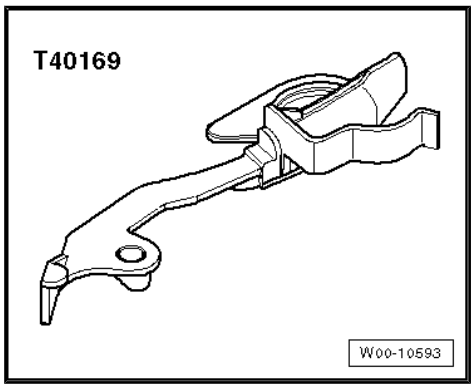
1.4.3 Installing engine - vehicles with dual clutch gearbox 0B5

Special tools and workshop equipment required

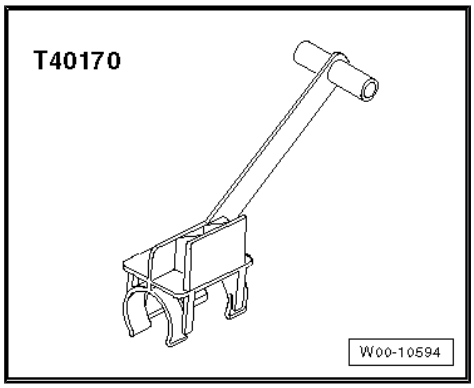
- Ring spanner insert AF 16 - V.A.G 1332/14-



- Assembly aid - T40169-



- Transportation lock - T40170-



Tightening torques

Note

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

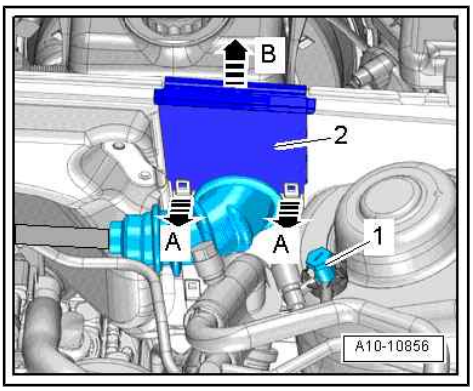
Component		Nm
Bolts/nuts	M6	9
	M7	15
	M8	20
	M10	40

Component	Nm
M12	65

Assembly mountings ⇒ page 156

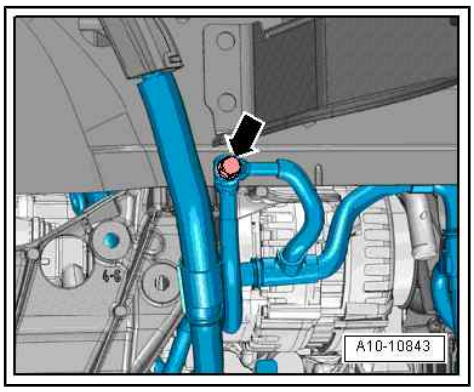
Earth stud at suspension turret - tightening torque

– Tighten earth stud -1- to 9 Nm.



Earth wiring at longitudinal member - tightening torque

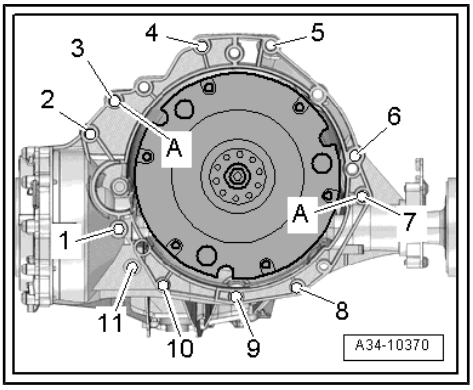
– Tighten nut -arrow- to 9 Nm.



Engine to dual clutch gearbox 0B5

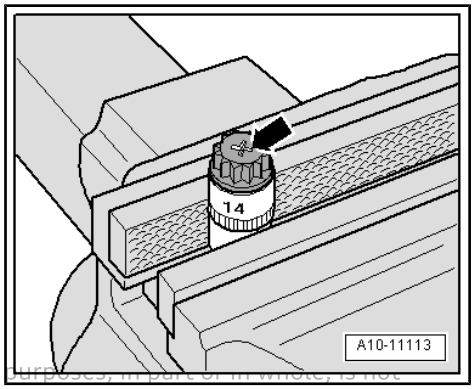
Item	Bolt	Nm
1	M10x50 1)	65
2 … 6	M12x100 2)	30 + 90°
7	M12x125 2)	30 + 90°
8, 11	M10x60 2)	15 + 90°
9, 10	M10x95 2)	15 + 90°
A	Dowel sleeves for centralising	

- 1) Property class 10.9. The steel bolt may be re-used as often as necessary.
- 2) Aluminium bolts must not be used more often than twice ⇒ page 144 .



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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.



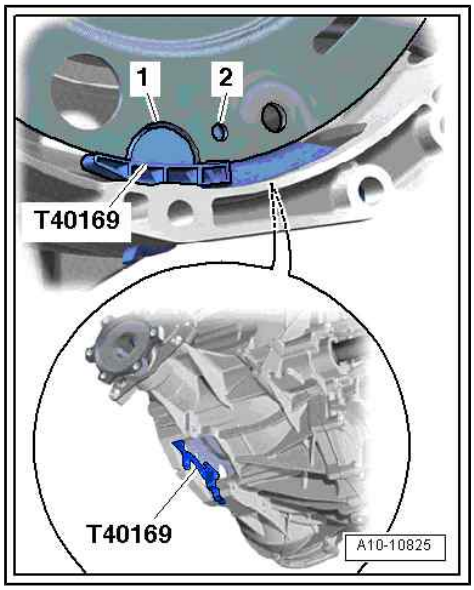
Procedure

Note

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- *Renew the bolts tightened with specified tightening angle.*
- *Renew self-locking nuts and bolts as well as seals, gaskets and O-rings.*
- *On vehicles with dual clutch gearbox 0B5, a needle bearing is fitted in the drive plate. Before installing, check that the needle bearing is fitted. Removing and installing needle bearing in drive plate (pressing in and out)* ⇒ page 181 .
- *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.*
- *Fit all cable ties in the original positions when installing.*

– Install engine supports and engine mountings ⇒ page 156 .
– Install coolant pipe (bottom right) ⇒ page 396 .
– Hold ATF lines in installation position when joining engine and subframe.
– 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 flywheel/torque converter and gearbox housing from below, as illustrated.



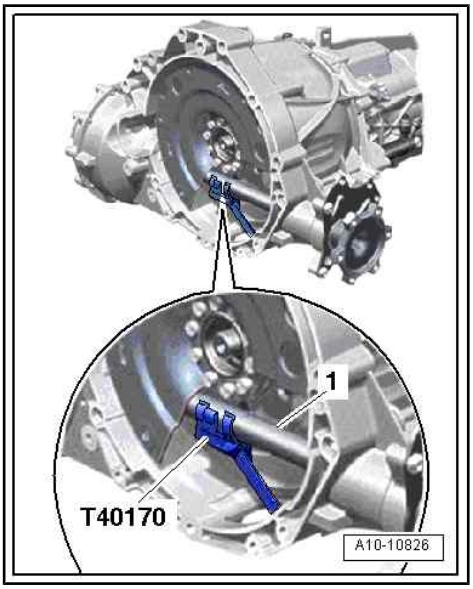
- The assembly aid - T40169- must engage in the semi-circular recess -1- and in the inspection hole -2-.

Note

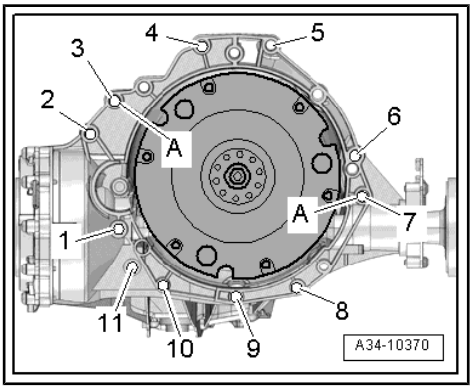
There is only one inspection hole on the circumference; turn the dual-mass flywheel accordingly.

– 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-.



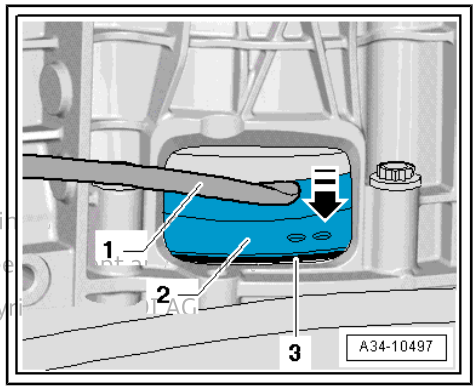
– Check whether dowel sleeves -A- for centring engine and gearbox are fitted in cylinder block; install missing dowel sleeves.
– Check whether aluminium bolts securing engine to gearbox can be reused; if so, apply marking ⇒ page 144 .
– Bring gearbox into position on engine and tighten bolts -1 … 11-.
– Remove transport lock - T40170- and assembly aid - T40169- .



Note

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

– Using assembly lever -1-, press clutch module -2- slightly against drive plate -3- -arrow-.



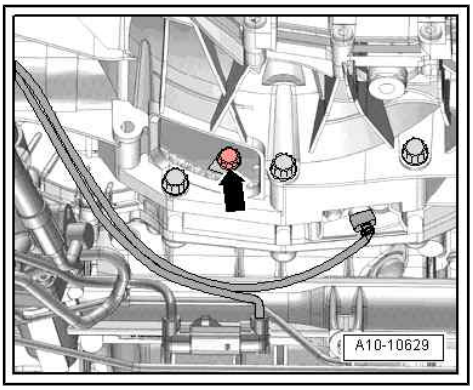
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– Bolt clutch module onto drive plate as follows:

Note

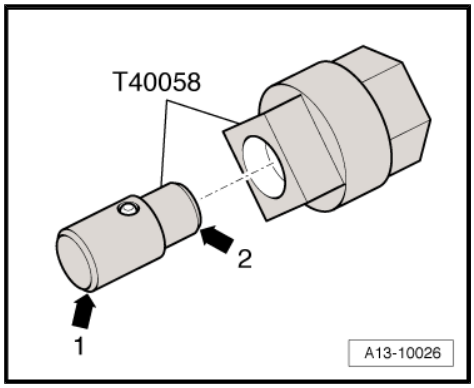
Use ring spanner insert AF 16 - V.A.G 1332/14- to tighten bolts.

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



– Insert guide pin of adapter -T40058- as follows:

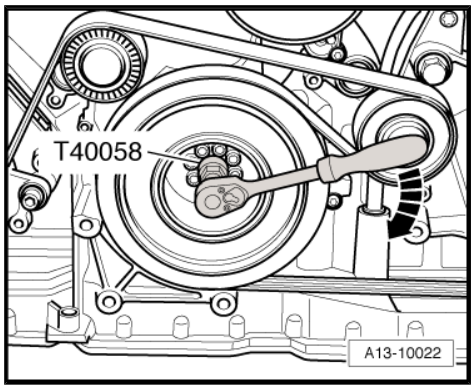
- The larger-diameter section -arrow 1- faces towards the engine.
- The smaller-diameter section -arrow 2- faces the adapter.



– Turn crankshaft 180° further in normal direction of engine rotation -arrow- with adapter - T40058- .

– Tighten bolt accessible in this crankshaft position to specified torque ⇒ Rep. gr. 34 ; 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 .



– Install power steering hydraulic lines ⇒ Running gear, axles, steering; Rep. gr. 48 ; Hydraulic power steering; Exploded view - hydraulic lines, reservoir .

– Install poly V-belt tensioner ⇒ page 170 .

– Secure drive shafts (left and right) to gearbox flange shafts ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .

– Install ATF lines ⇒ Rep. gr. 34 ; ATF circuit; Removing and installing ATF lines .

– Install particulate filter ⇒ page 580 .

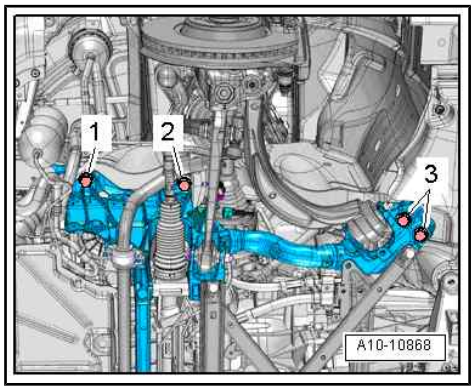
– Install heat shield for turbocharger ⇒ page 420 .

– 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.

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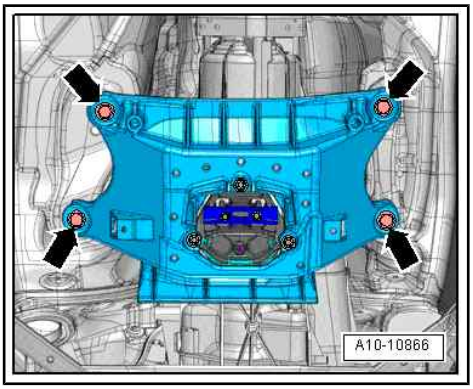
– Tighten subframe bolts only to specified torque (do not turn further); the bolts should only be fully tightened after performing the wheel alignment check ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Exploded view - subframe .



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 .

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

– Install propshaft ⇒ Rear final drive; Rep. gr. 39 ; Propshaft; Removing and installing propshaft .
– Install front exhaust pipe ⇒ page 568 .
– Align the exhaust system so it is free of stress ⇒ page 574 .
– Install front cross member ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim panels .
– Install selector lever cable ⇒ Rep. gr. 34 ; Selector mechanism; Removing and installing selector lever cable .
– Secure universal joint to steering rack ⇒ Running gear, axles, steering; Rep. gr. 48 ; Steering column; Exploded view - steering column .
– Install subframe cross brace and anti-roll bar ⇒ 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 .
– Install brake calipers ⇒ Brake system; Rep. gr. 46 ; Front brakes; Removing and installing brake caliper .
– Install lock carrier braces ⇒ General body repairs, exterior; Rep. gr. 50 ; Lock carrier .
– Install engine control unit ⇒ page 557 .
– 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 ⇒ page 143 , ⇒ page 143 , and ⇒ Electrical system; Rep. gr. 97 ; Relay carriers, fuse carriers, electronics boxes .
– Plug in electrical connectors for exhaust gas temperature senders ⇒ page 609 .
– Install body brace ⇒ Running gear, axles, steering; Rep. gr. 40 ; Suspension strut, upper links; Removing and installing body brace .
– Install filler neck for washer fluid reservoir ⇒ Electrical system; Rep. gr. 92 ; Windscreen washer system; Removing and installing washer fluid reservoir .
– 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.***

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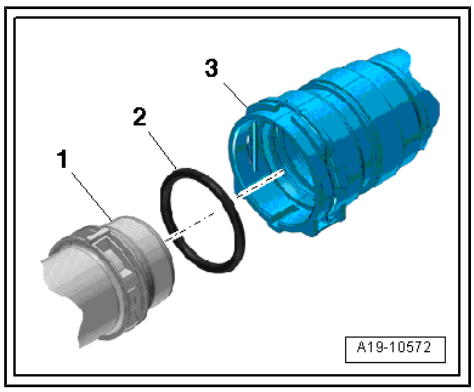
– Install throttle valve module - J338- , exhaust gas pressure sensor 1 - G450- and air cleaner housing ⇒ page 483 .
– Fill up with engine oil and check oil level ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .
– Before starting engine, top up hydraulic fluid in power steering reservoir ⇒ Running gear, axles, steering; Rep. gr. 48 ; Hydraulic power steering; Checking power steering fluid level .

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Note

The power steering pump must not be run when dry.

– Connect coolant hose and connection with plug-in connector ⇒ page 404 .
– Fill up with coolant ⇒ page 361 .



Note

- *Do not use drained coolant again if:*
- *the cylinder head or cylinder block have been renewed.*
- *the coolant is contaminated or dirty.*

– 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 and perform wheel alignment ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheel alignment .

WARNING

Risk of accident if bolted connections are loose.

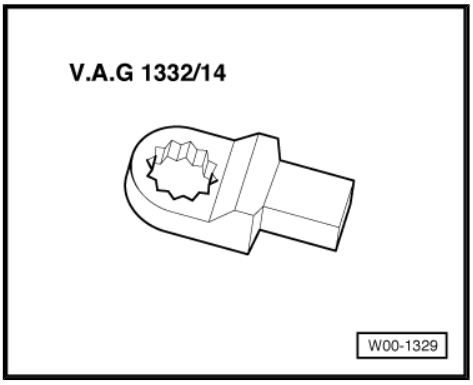
- ***Tighten subframe bolts to final setting after performing wheel alignment check.***

– Fill up ATF ⇒ Rep. gr. 34 ; ATF; Draining and filling ATF .
– Install noise insulation panels ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .

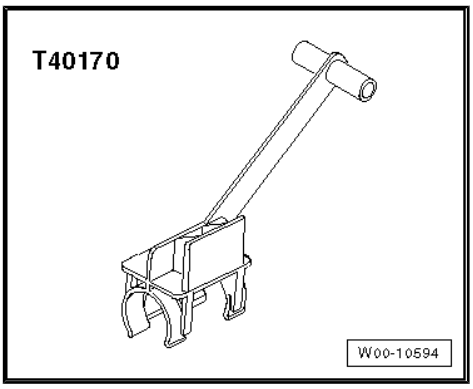
1.4.4 Installing engine - vehicles with automatic gearbox 0B6

Special tools and workshop equipment required

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



- Transportation lock - T40170-



Tightening torques

Note

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

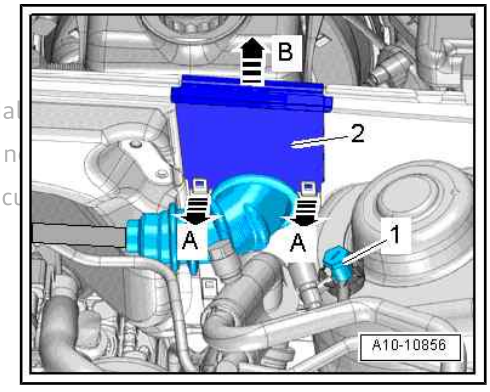
Component		Nm
Bolts/nuts	M6	9
	M7	15
	M8	20
	M10	40
	M12	65

Assembly mountings ⇒ page 156

Earth stud at suspension turret - tightening torque

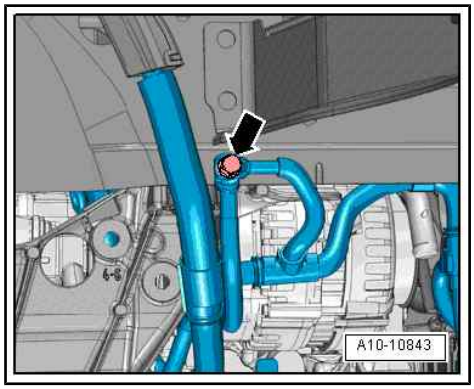
– Tighten earth stud -1- to 9 Nm.

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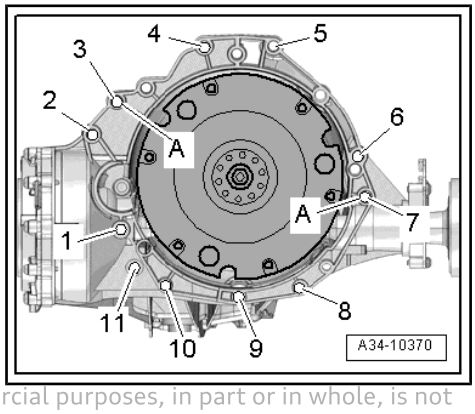
Earth wiring at longitudinal member - tightening torque

– Tighten nut -arrow- to 9 Nm.



Engine to automatic gearbox 0B6

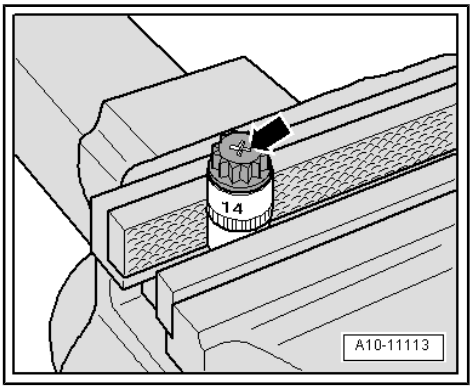
Item	Bolt	Nm
1	M10x50 1)	65
2 … 6	M12x100 2)3)	30 + 90°
7	M12x125 2)3)	30 + 90°
8, 11	M10x60 2)3)	15 + 90°
9, 10	M10x95 2)3)	15 + 90°
A	Dowel sleeves for centralising	



- 1) Property class 10.9. The steel bolt may be re-used as often as necessary.
- 2) Audi A4 up to vehicle identification no. 8K-9-066499, Audi A5 up to vehicle identification no. 8T-9-007999: renew aluminium bolts.
- 3) Audi A4 from vehicle identification no. 8K-9-066500 onwards, Audi A5 from vehicle identification no. 8T-9-008000 onwards: aluminium bolts must not be used more often than twice ⇒ page 151 .

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- Audi A4 from vehicle identification no. 8K-9-066500 onwards, Audi A5 from vehicle identification no. 8T-9-008000 onwards: aluminium bolts -2 ... 11- must not be used more often than 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.

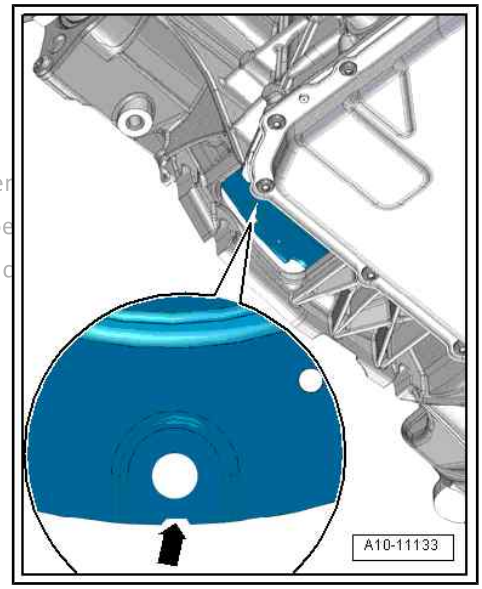


Procedure

Note

- *Renew the bolts tightened with specified tightening angle.*
- *Renew self-locking nuts and bolts as well as seals, gaskets and O-rings.*
- *On vehicles with automatic gearbox 0B6, no needle bearing should be fitted in the drive plate. Before installing, check whether a needle bearing is fitted. Press needle bearing out of drive plate ⇒ page 181 .*
- *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.*
- *Fit all cable ties in the original positions when installing.*

– Install engine supports and engine mountings ⇒ page 156 .
– Install coolant pipe (bottom right) ⇒ page 396 .
– Hold ATF lines in installation position when joining engine and subframe.
– 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:
– Turn torque converter until hole is visible next to notch -arrow- in recess in bottom of gearbox housing, as shown in illustration.

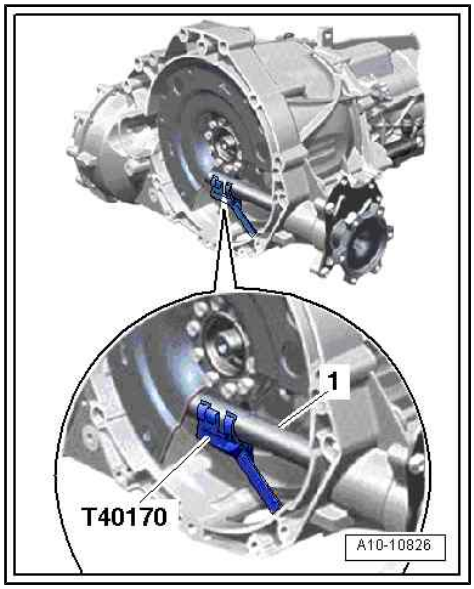


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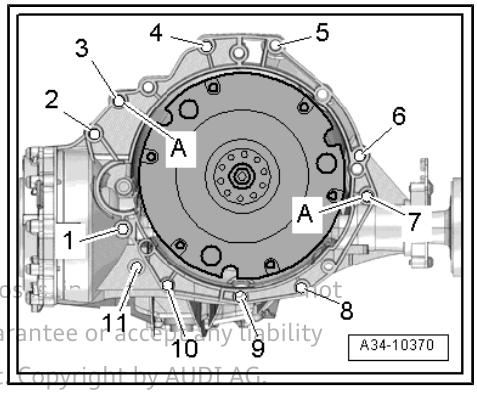
Note

There is only one notch on the circumference; turn the torque converter accordingly.

– 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 151 .
– Bring gearbox into position on engine and tighten bolts -1 … 11-.
– Remove transport lock - T40170- .

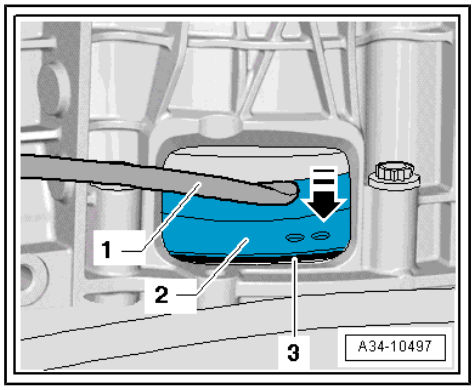


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Note

The following step is necessary to ensure that the torque converter is straight and that it makes even contact with the drive plate.

– Use assembly lever -1- to press torque converter -2- slightly against drive plate -3- in direction of -arrow-.

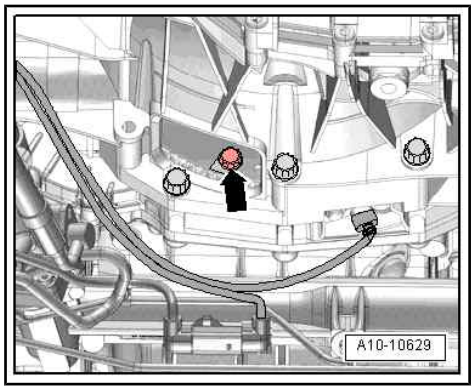


– Bolt torque converter onto drive plate as follows:

Note

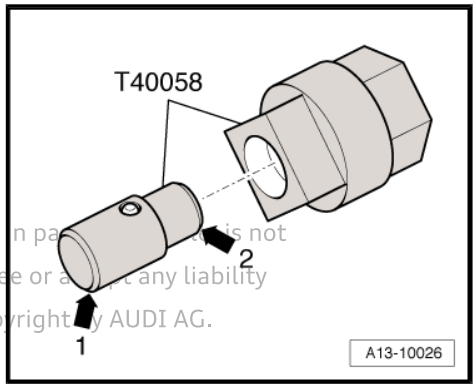
Use ring spanner insert AF 16 - V.A.G 1332/14- to tighten bolts.

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



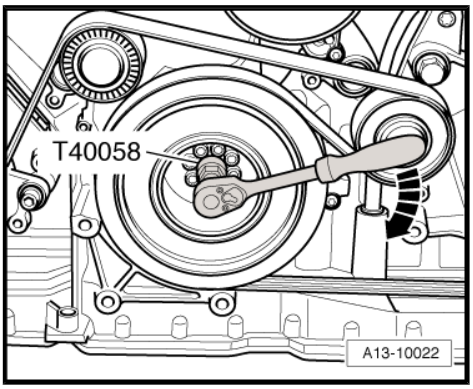
– Insert guide pin of adapter -T40058- as follows:

- The larger-diameter section -arrow 1- faces towards the engine.
- The smaller-diameter section -arrow 2- faces the adapter.



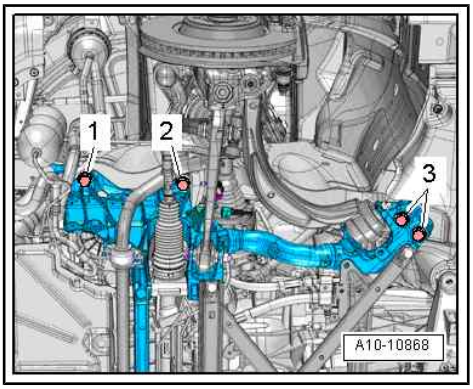
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– Turn crankshaft 180° further in normal direction of engine rotation -arrow- with adapter - T40058- .



– Tighten bolt accessible in this crankshaft position to specified torque ⇒ 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. 37 ; Removing and installing gearbox; Tightening torques for gearbox .
– Install power steering hydraulic lines ⇒ Running gear, axles, steering; Rep. gr. 48 ; Hydraulic power steering; Exploded view - hydraulic lines, reservoir .
– Install poly V-belt tensioner ⇒ page 170 .
– Secure drive shafts (left and right) to gearbox flange shafts ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .
– Install ATF lines ⇒ Rep. gr. 37 ; ATF circuit; Removing and installing ATF lines .
– Install particulate filter: A5 up to vehicle identification no. 8T-8-009 998 ⇒ page 578 ; A4 (all), A5 from vehicle identification no. 8T-8-009 999 onwards ⇒ page 580 .
– Install heat shield for turbocharger ⇒ page 420 .
– 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.

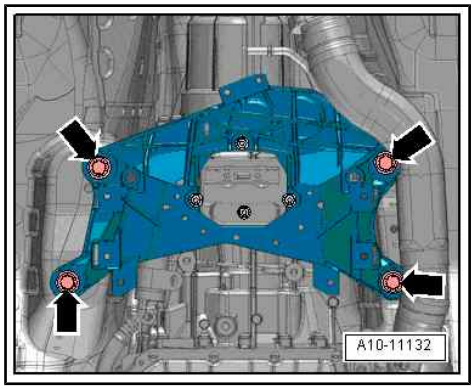
– Tighten subframe bolts only to specified torque (do not turn further); the bolts should only be fully tightened after performing the wheel alignment check ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Exploded view - subframe .



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. 37 ; Assembly mountings; Exploded view - assembly mountings .

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

– Install propshaft ⇒ Rear final drive; Rep. gr. 39 ; Propshaft; Removing and installing propshaft .
– Install front exhaust pipe: A5 up to vehicle identification no. 8T-8-009 998 ⇒ page 567 ; A4 (all), A5 from vehicle identification no. 8T-8-009 999 onwards ⇒ page 568 .
– Align exhaust system so it is free of stress: vehicles without SCR catalytic converter ⇒ page 574 , vehicles with SCR catalytic converter ⇒ page 576 .
– Install front cross member ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim panels .
– Install selector lever cable ⇒ Rep. gr. 37 ; Selector mechanism; Removing and installing selector lever cable .
– Secure universal joint to steering rack ⇒ Running gear, axles, steering; Rep. gr. 48 ; Steering column; Exploded view - steering column .
– Install subframe cross brace and anti-roll bar ⇒ 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 .
– Install brake calipers ⇒ Brake system; Rep. gr. 46 ; Front brakes; Removing and installing brake caliper .
– Install lock carrier braces ⇒ General body repairs, exterior; Rep. gr. 50 ; Lock carrier .
– Install engine control unit ⇒ page 557 .
– 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 ⇒ page 149 , ⇒ page 150 , and ⇒ Electrical system; Rep. gr. 97 ; Relay carriers, fuse carriers, electronics boxes .
– Plug in electrical connectors for exhaust gas temperature senders ⇒ page 609 .
– Install body brace ⇒ Running gear, axles, steering; Rep. gr. 40 ; Suspension strut, upper links; Removing and installing body brace .
– Install filler neck for washer fluid reservoir ⇒ Electrical system; Rep. gr. 92 ; Windscreen washer system; Removing and installing washer fluid reservoir .
– 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 .

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Caution

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

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

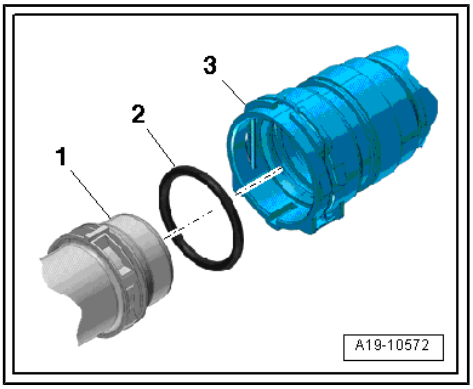
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- Install throttle valve module - J338- , exhaust gas pressure sensor 1 - G450- and air cleaner housing ⇒ page 483 .
- Fill up with engine oil and check oil level ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .
- Before starting engine, top up hydraulic fluid in power steering reservoir ⇒ Running gear, axles, steering; Rep. gr. 48 ; Hydraulic power steering; Checking power steering fluid level .

Note

The power steering pump must not be run when dry.

- Connect coolant hose and connection with plug-in connector ⇒ page 404 .
- Fill up with coolant ⇒ page 361 .



Note

- *Do not use drained coolant again if:*
- *the cylinder head or cylinder block have been renewed.*
- *the coolant is contaminated or dirty.*

- 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 and perform wheel alignment ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheel alignment .

WARNING

Risk of accident if bolted connections are loose.

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

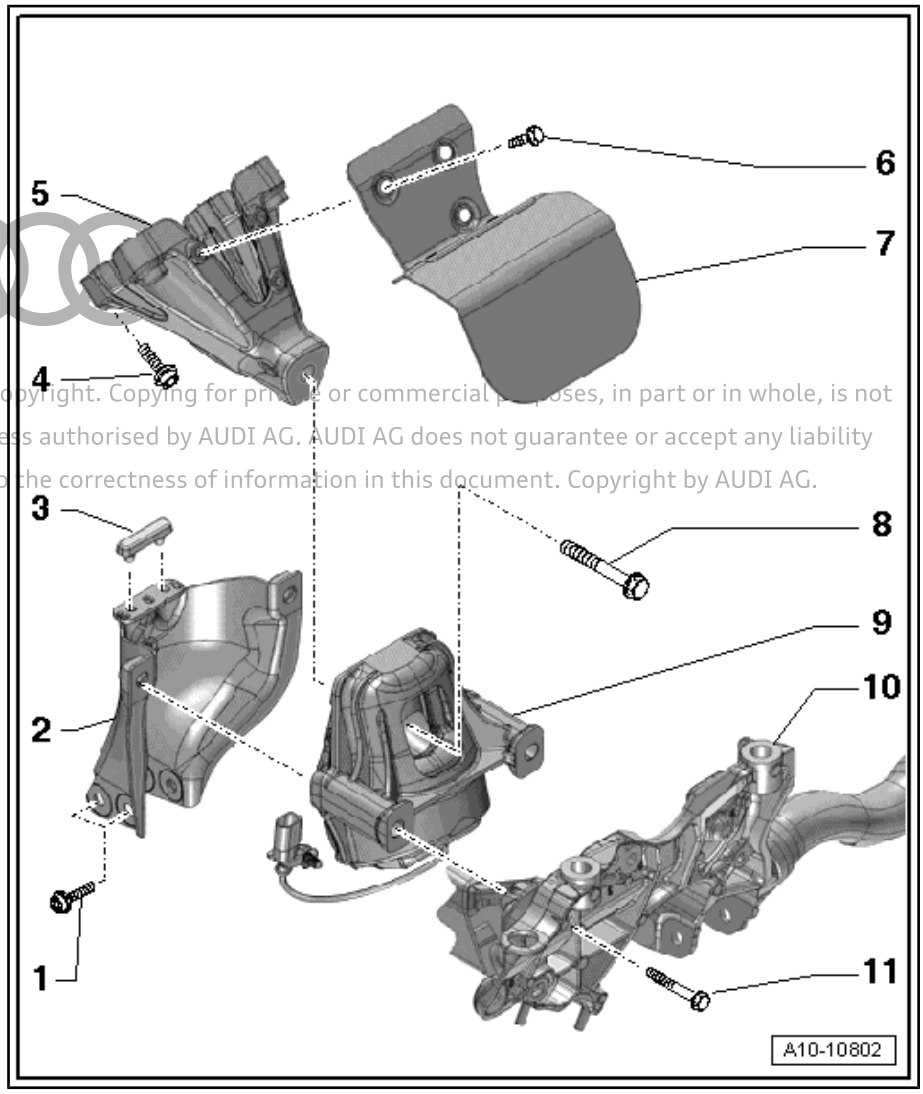
- Fill up ATF ⇒ Rep. gr. 37 ; ATF; Draining and filling ATF .
- Install noise insulation panels ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .

2 Assembly mountings

⇒ “2.1 Exploded view - assembly mountings”, page 156

⇒ “2.2 Removing and installing engine mountings”, page 157

2.1 Exploded view - assembly mountings



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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 - Stop buffer

- ❑ For engine mounting
- ❑ Not supplied separately

4 - Bolt

- ❑ 40 Nm

5 - Engine support

6 - Bolt

- ❑ 10 Nm

7 - Heat shield

8 - Bolt

- ❑ Renew
- ❑ 90 Nm + turn 90° further

9 - 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: left-side ⇒ page 157 , right-side ⇒ page 159

10 - Subframe

11 - Bolt

- ❑ 55 Nm

2.2 Removing and installing engine mountings

⇒ "2.2.1 Removing and installing engine mounting (left-side)", page 157

⇒ "2.2.2 Removing and installing engine mounting (right-side)", page 159

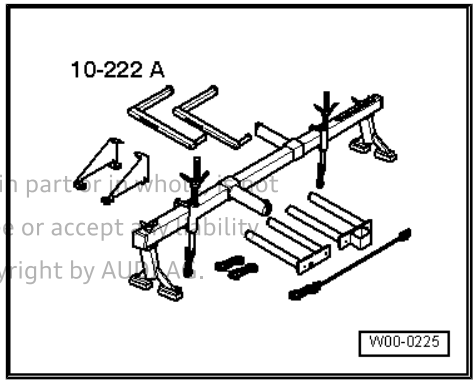
2.2.1 Removing and installing engine mounting (left-side)

Note

- *To avoid repeat repairs, proceed as follows if an engine mounting is defective:*
- *Renew engine mounting and corresponding bracket.*
- *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-



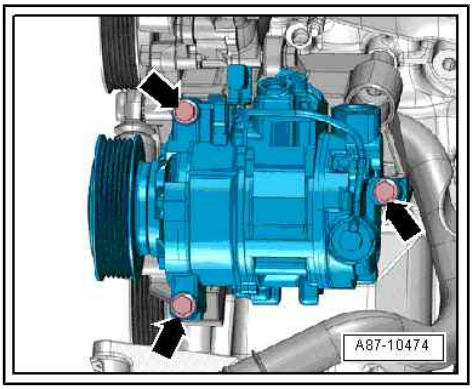
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Removing

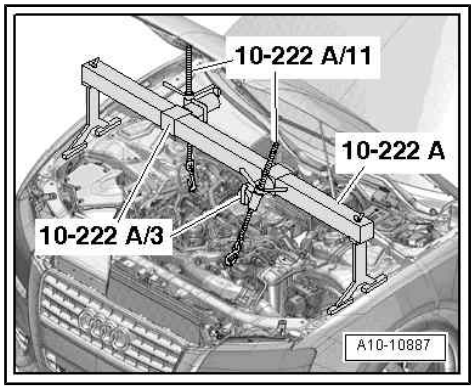
Note

Fit all cable ties in the original positions when installing.

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



– Set up support bracket - 10 - 222 A- with adapters -10 - 222 A /3- on suspension turrets (left and right) as illustrated.
– Attach spindles -10 - 222 A /11- to engine lifting eyes.
– Partly take up weight of engine with spindles.

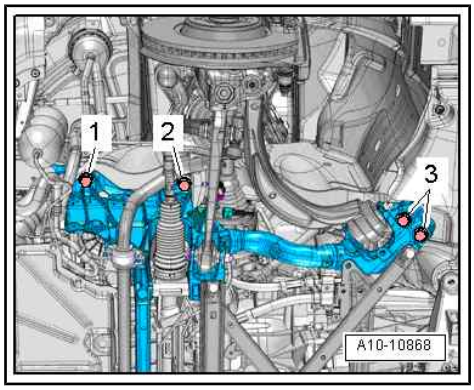


WARNING

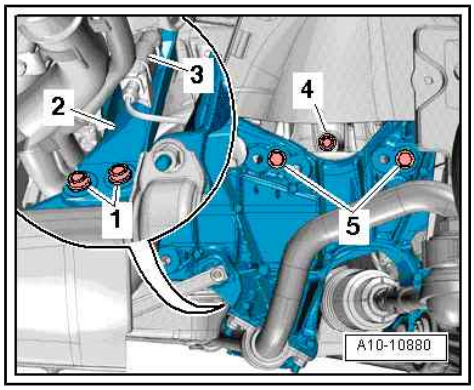
Accident risk if subframe mountings are detached.

- *Subframe bolts -1- and -3- must not be loosened.*

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



– Release and unplug electrical connector -3- on left electrohydraulic engine mounting solenoid valve - N144- .
– Remove bolts -1, 4, 5- for engine mounting (left-side).
– Move retaining plate -2- for engine mounting (left-side) clear to the side.

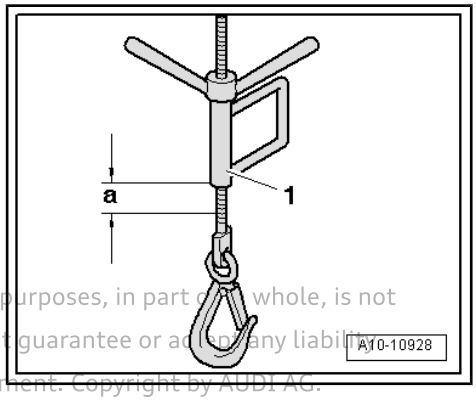


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– Using spindle - 10 - 222 A /11- -item 1-, raise engine through distance -a- on left side.

• Dimension -a- = 25 mm

– Detach engine mounting (left-side).



Installing

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

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Note

Renew the bolts tightened with specified tightening angle.

Tightening torques

♦ ⇒ “2.1 Exploded view - assembly mountings”, page 156

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

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

– Install front wheel housing liner (left-side) ⇒ 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 .

– Fit front wheel ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres; Tightening torque for wheel bolts .

2.2.2 Removing and installing engine mounting (right-side)

Note

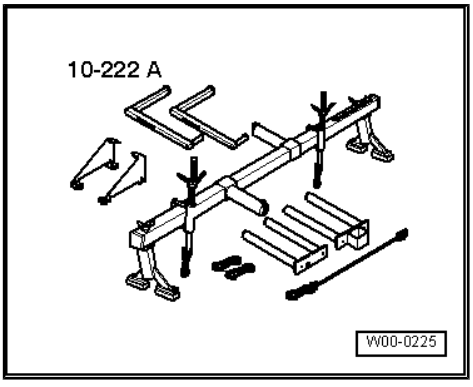
♦ *To avoid repeat repairs, proceed as follows if an engine mounting is defective:*

♦ *Renew engine mounting and corresponding bracket.*

♦ *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 .*

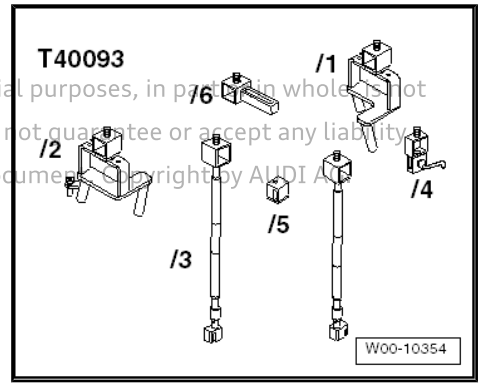
Special tools and workshop equipment required

♦ Support bracket - 10 - 222 A-



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- Engine support bracket (supplementary set) - T40093-

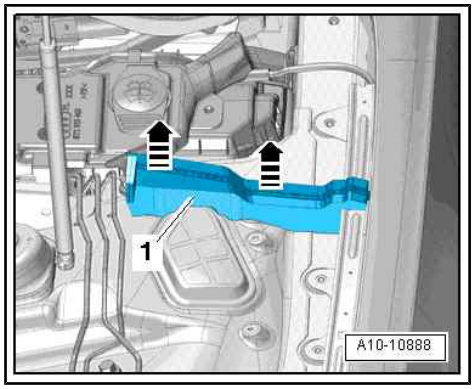


Removing

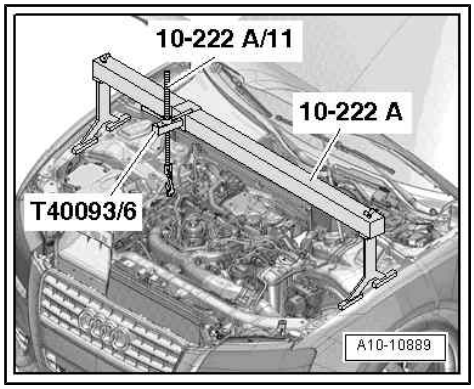
Note

Fit all cable ties in the original positions when installing.

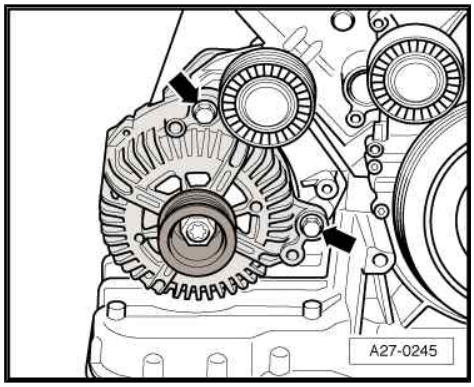
– Lift off foam plastic block -1- on both sides of vehicle -arrows-.



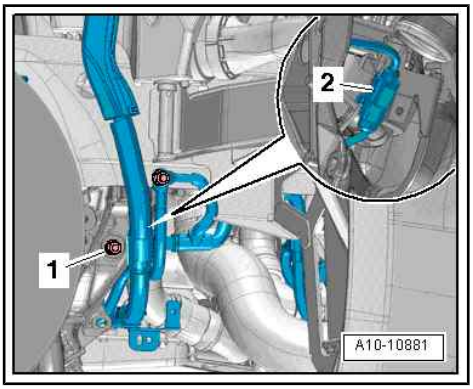
– Set up support bracket - 10 - 222 A- with adapters -T40093/6- on suspension turrets (left and right) as illustrated.
– Attach spindle -10 - 222 A /11- to engine lifting eye (right-side).
– Partly take up weight of engine with spindle.



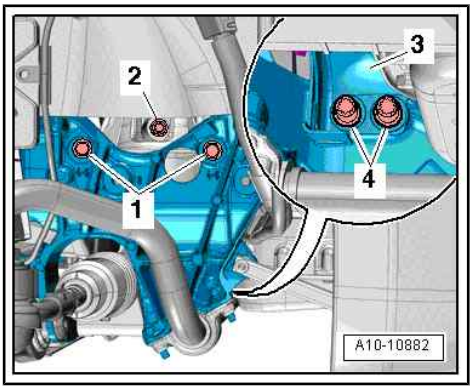
– Remove alternator ⇒ Electrical system; Rep. gr. 27 ; Alternator; Removing and installing alternator .
– Remove wheel housing liner (front right) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front) .



– Detach electrical connector -2- on solenoid valve (right-side) for electro-hydraulic engine mounting - N145- from bracket and unplug connector.
– Unscrew nut -1- and detach bracket with electrical wiring from subframe.



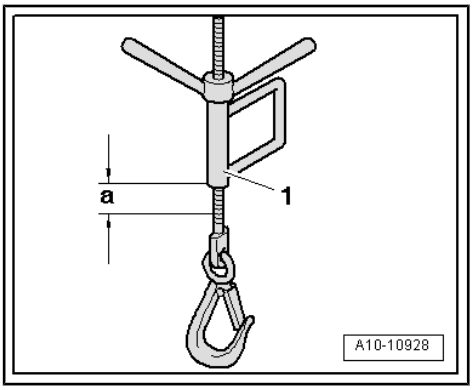
– Remove bolts -1, 2, 4- and move clear retaining plate -3- for engine mounting (right-side).



– Using spindle - 10 - 222 A /11- , raise engine through distance -a-.

• Distance -a- = approx. 70 mm.

– Detach engine mounting (right-side).



Installing

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

Tightening torques

◆ ⇒ “2.1 Exploded view - assembly mountings”, page 156

– Install alternator ⇒ Electrical system; Rep. gr. 27 ; Alternator; Removing and installing alternator .
– Install front right wheel housing liner ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front) .

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3 Engine cover panel

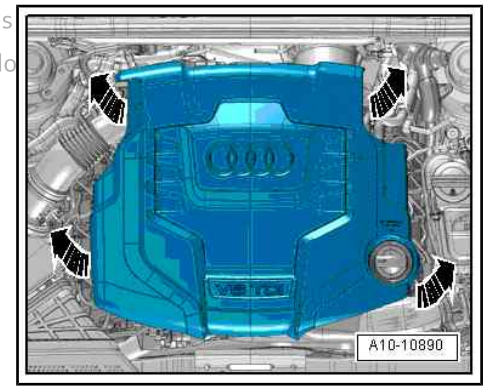
⇒ “3.1 Removing and installing engine cover panel”, page 162

3.1 Removing and installing engine cover panel

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Removing

– Carefully pull engine cover panel off four retaining pins one after the other “arrows”. Do not jerk the cover panel away, and do not try to pull on one side only.



Installing

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

– Position engine cover panel on engine (note locations of oil filler neck and oil dipstick).

– First press engine cover panel into rear rubber grommets and then into front rubber grommets with both hands.

13 – Crankshaft group

1 Cylinder block (pulley end)

⇒ “1.1 Exploded view - poly V-belt drive”, page 163

⇒ “1.2 Exploded view - sealing flange (pulley end)”, page 167

⇒ “1.3 Removing and installing poly V-belt”, page 168

⇒ “1.4 Removing and installing tensioner for poly V-belt”, page 170

⇒ “1.5 Removing and installing idler roller (left-side) for poly V-belt”, page 170

⇒ “1.6 Removing and installing vibration damper”, page 171

⇒ “1.7 Removing and installing bracket for ancillaries”, page 171

⇒ “1.8 Renewing crankshaft oil seal (pulley end)”, page 171

⇒ “1.9 Removing and installing sealing flange (pulley end)”, page 173

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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 168
- ❑ Do not kink
- ❑ When installing, make sure it is properly seated on pulleys

2 - Bolt

- ❑ Renew
- ❑ 20 Nm + turn 90° further

3 - Shim

- ❑ Renew

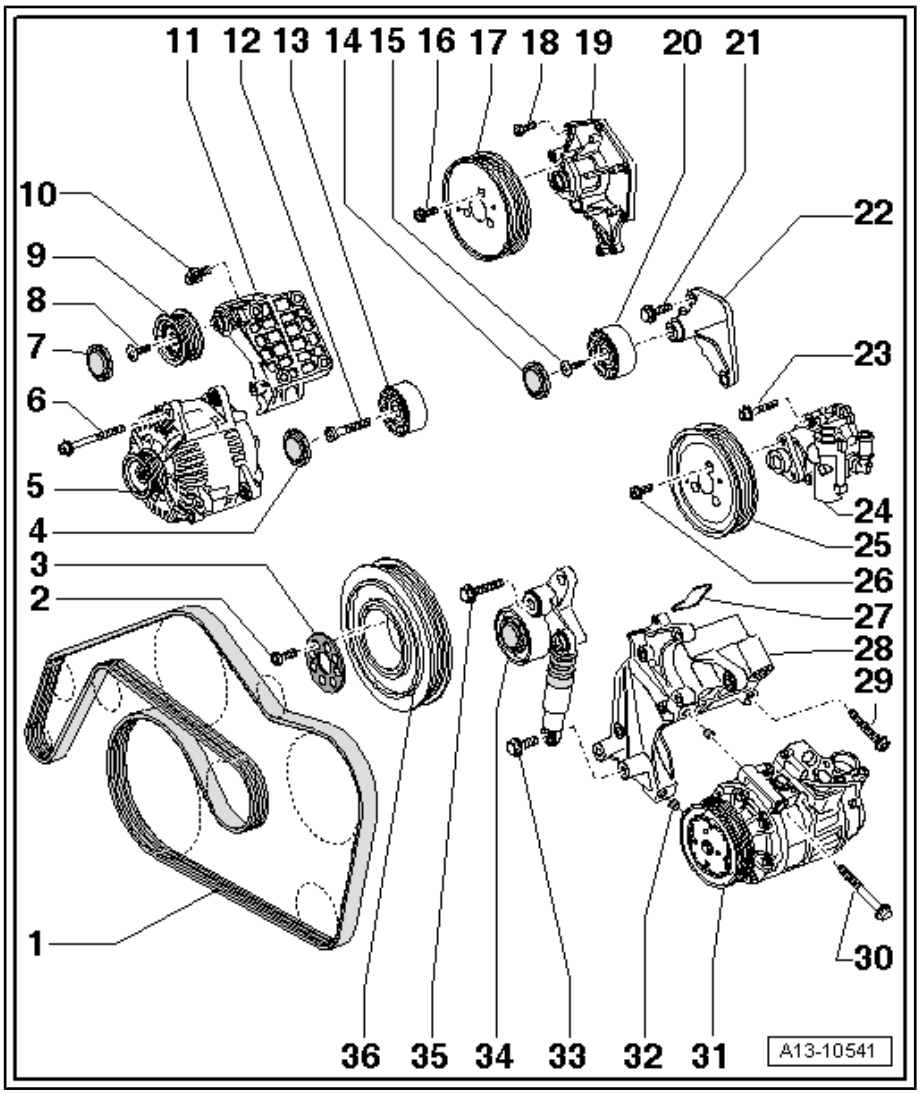
4 - Cover for idler roller (right-side)

5 - Alternator

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

6 - Bolt

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



7 - Cover for idler roller

8 - Bolt

- ❑ 23 Nm

9 - Idler roller for poly V-belt

- ❑ On bracket for alternator
- ❑ Note installation position

10 - Bolt

- ❑ Tightening torque and sequence ⇒ page 166

11 - Bracket for alternator and idler roller

12 - Bolt

- ❑ 23 Nm

13 - Idler roller (right-side) for poly V-belt

- ❑ Note installation position

14 - Cover for idler roller (left-side)

- ❑ Depending on version ⇒ Electronic parts catalogue

15 - Bolt

- ❑ Depending on version ⇒ Electronic parts catalogue
- ❑ 23 Nm

16 - Bolt

- ❑ Tightening torque ⇒ Item 1 (page 363)

17 - Poly V-belt pulley for coolant pump

- ❑ Removing and installing ⇒ “2.4 Removing and installing coolant pump”, page 367
- ❑ Installation position: marking “vorne” (front) faces in direction of travel

18 - Bolt

- ❑ Tightening torque and sequence ⇒ page 365

19 - Coolant pump

- ❑ Removing and installing ⇒ page 367

20 - Idler roller (left-side) for poly V-belt

- ❑ Depending on version ⇒ Electronic parts catalogue
- ❑ Removing and installing ⇒ page 170

21 - Bolt

- ❑ Depending on version ⇒ Electronic parts catalogue
- ❑ 23 Nm

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22 - Bracket for idler roller

- ❑ Depending on version ⇒ Electronic parts catalogue

23 - Bolt

- ❑ Tightening torque ⇒ Running gear, axles, steering; Rep. gr. 48 ; Hydraulic power steering; Exploded view - power steering pump

24 - Power steering pump

- ❑ Removing and installing ⇒ Running gear, axles, steering; Rep. gr. 48 ; Hydraulic power steering; Removing and installing power steering pump

25 - Poly V-belt pulley for power steering pump

- ❑ Removing and installing ⇒ Running gear, axles, steering; Rep. gr. 48 ; Hydraulic power steering; Removing and installing power steering pump
- ❑ Installation position: marking “vorne” (front) faces in direction of travel

26 - Bolt

- ❑ Tightening torque ⇒ Running gear, axles, steering; Rep. gr. 48 ; Hydraulic power steering; Exploded view - power steering pump

27 - Gasket

- ❑ Renew

28 - Bracket for ancillaries

- ❑ Removing and installing ⇒ page 171

29 - Bolt

- ❑ Tighten in two stages:

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

30 - Bolt

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

31 - Air conditioner compressor

- ❑ Do not unscrew or disconnect refrigerant hoses or pipes
- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Removing and installing air conditioner compressor
- ❑ When installing check dowel sleeves -item 32-

32 - Dowel sleeve

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

33 - Bolt

- ❑ 23 Nm

34 - Poly V-belt tensioner

> **Caution**
>
> *Depending on the vehicle version, an M10 or an M11 thread may have been used for the securing thread in the crankcase for the tensioner. It is very important that the correct bolt and tensioner to the crankcase is used. ⇒ Electronic parts catalogue*

- ❑ Removing and installing ⇒ page 170

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35 - Bolt

> **Caution**
> *Different threads in crankcase.*
>
> *Before installation, check whether thread is M10 or M11 version.*
>
> *Use appropriate bolt size. Risk of damage to engine.*
>
> *It is very important that the correct bolt and tensioner to the crankcase is used. ⇒ Electronic parts catalogue*

- ❑ Bolt with M10 thread: 50 Nm + turn 90° further
- ❑ Bolt with M11 thread: 60 Nm + turn 90° further
- ❑ Renew

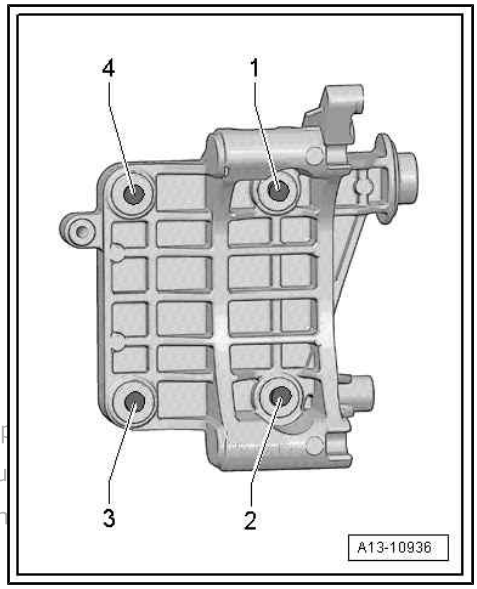
36 - Vibration damper with poly V-belt pulley

- ❑ Removing and installing ⇒ page 171

Bracket for alternator and idler roller - tightening torque and sequence

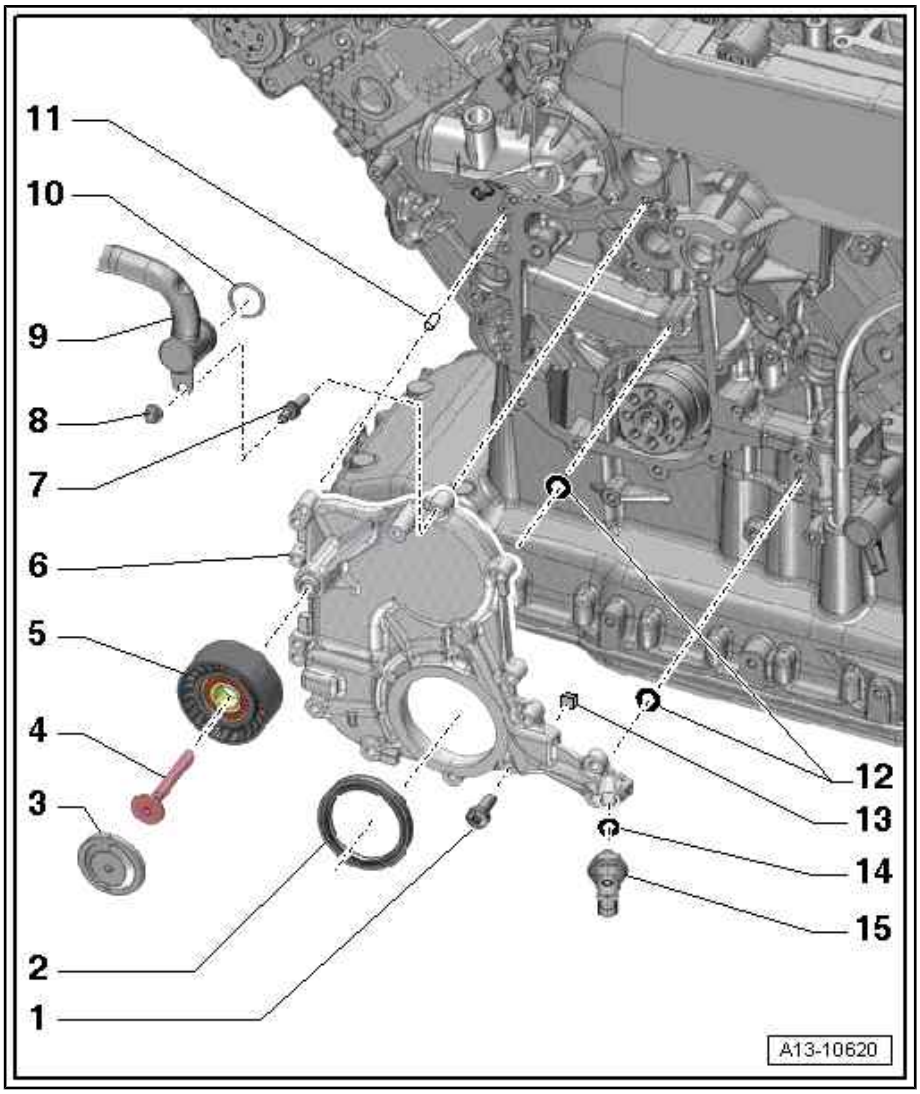
– Fit bolts in the sequence -1 to 4-.

– Tighten bolts in the sequence -1 ... 4- to 40 Nm.



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1.2 Exploded view - sealing flange (pulley end)



1 - Bolt
- ❑ Tightening torque and sequence ⇒ page 168

2 - Oil seal for crankshaft (pulley end)
- ❑ Renewing ⇒ page 171

3 - Cover for idler roller (right-side)

4 - Bolt
- ❑ Tightening torque ⇒ Item 15 (page 164)

5 - Idler roller (right-side) for poly V-belt
- ❑ Note installation position

6 - Sealing flange (pulley end)
- ❑ Removing and installing ⇒ page 173

7 - Centre hex stud
- ❑ 9 Nm

8 - Nut
- ❑ Tightening torque ⇒ Item 4 (page 374)

9 - Coolant pipe (front)
- ❑ Removing and installing: engine codes CAMA, CAMB, CCLA, CCWA, CCWB, CGKA, CGKB ⇒ page 381 , engine code CAPA ⇒ page 383

10 - O-ring
- ❑ Renew

11 - Dowel pins
- ❑ 2x

12 - O-rings
- ❑ Renew

13 - Sealing element
- ❑ 2x
- ❑ Renew

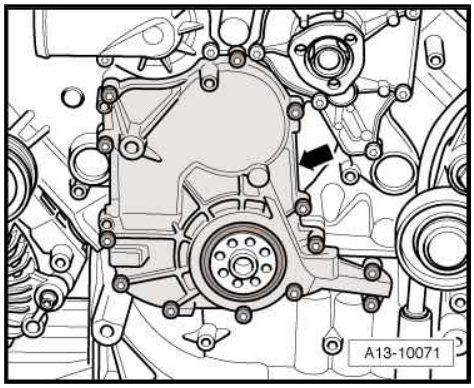
14 - Seal
- ❑ Renew

15 - Oil pressure switch - F22-
- ❑ Engine codes CCLA, CCWA, CCWB, CGKA, CGKB
- ❑ Removing and installing ⇒ page 341
- ❑ Tightening torque ⇒ Item 17 (page 324)

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Sealing flange (pulley end) - tightening torque and sequence

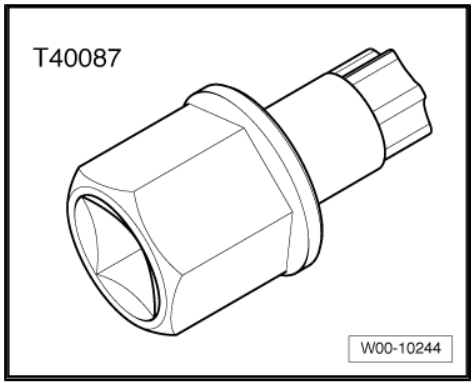
– Tighten bolts for sealing flange (pulley end) -arrow- in diagonal sequence and in stages to 9 Nm.



1.3 Removing and installing poly V-belt

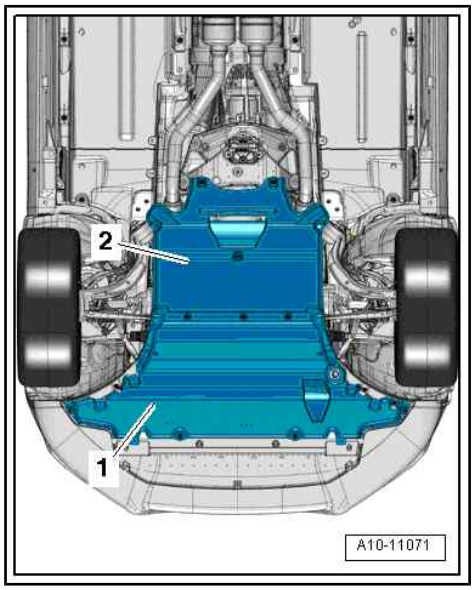
Special tools and workshop equipment required

♦ Socket Torx T60 - T40087-



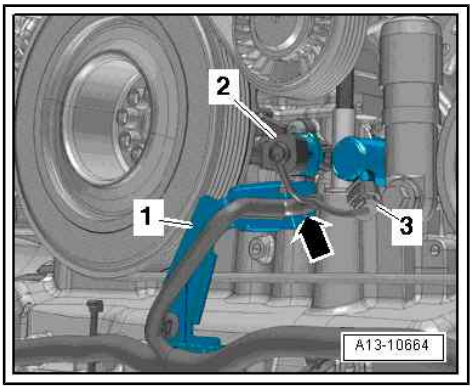
Removing

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



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– Vehicles with bracket for wiring harness: Unplug electrical connectors -2- and -3-.
– Remove bracket -1- and move to one side together with wiring harness.



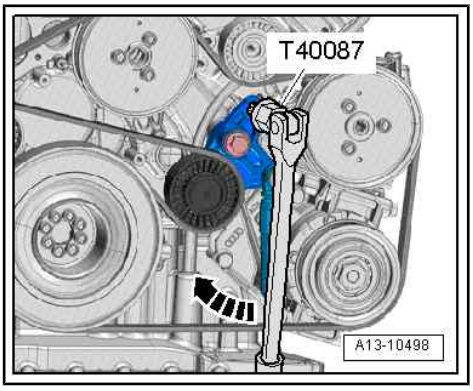
Note

Disregard -arrow-.

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.***

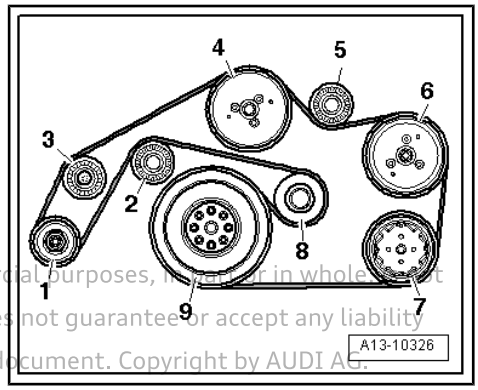


– Slacken poly V-belt by turning tensioner in clockwise direction -arrow- using socket Torx T 60 - T40087- .
– Remove poly V-belt and release tensioner.

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 (right-side)
3 - Idler roller on bracket for alternator
4 - Coolant pump
5 - Idler roller (left-side) - depending on version, refer to ⇒ Electronic parts catalogue
6 - Power steering pump
7 - Air conditioner compressor
8 - Poly V-belt tensioner
9 - Vibration damper

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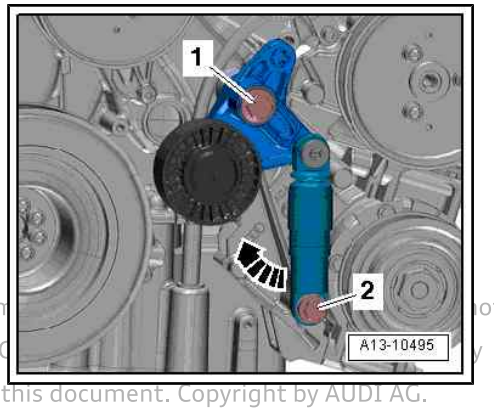
Note

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

– Start engine and check that poly V-belt(s) run properly.
– Install noise insulation (front) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .

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 168 .
– Remove bolts -1- and -2- and detach tensioner for poly V-belt.

Note

Disregard -arrow-.

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Installing

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

- Tightening torque
⇒ “1.1 Exploded view - poly V-belt drive”, page 163

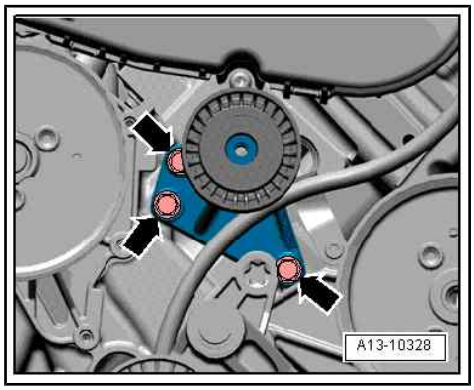
– Install poly V-belt ⇒ page 168 .

1.5 Removing and installing idler roller (left-side) for poly V-belt

Note

The idler roller (left-side) for the poly V-belt is not fitted on all versions; refer to ⇒ Electronic parts catalogue .

Removing



– Remove poly V-belt tensioner ⇒ page 170 .
– Remove bolts -arrows- and take off idler roller for poly-V-belt.

Installing

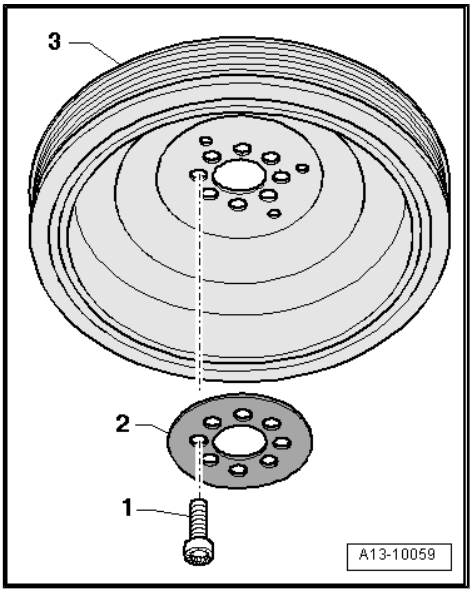
Installation is carried out in reverse order; note the following:

- Tightening torque
⇒ “1.1 Exploded view - poly V-belt drive”, page 163

– Install poly V-belt tensioner ⇒ page 170 .

1.6 Removing and installing vibration damper

Removing



– Slacken off bolts -1- on vibration damper (counterhold with ring spanner on nut for poly V-belt pulley for alternator).
– Remove poly V-belt ⇒ page 168 .
– Remove bolts and detach shim -2- and vibration damper -3- with poly V-belt pulley.

Installing

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

- Tightening torque
⇒ “1.1 Exploded view - poly V-belt drive”, page 163

Note

Renew shim -2- and bolts -1- for vibration damper.

– Install poly V-belt ⇒ page 168 .

1.7 Removing and installing bracket for ancillaries

Removing

– Remove coolant pipe (left-side) ⇒ page 387 .
– Remove bolts for power steering pump on bracket for ancillaries and detach power steering pump.

Installing

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

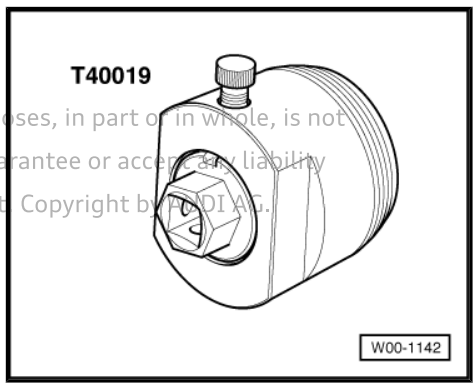
- Tightening torque
⇒ “1.1 Exploded view - poly V-belt drive”, page 163

– Install power steering pump ⇒ Running gear, axles, steering; Rep. gr. 48 ; Hydraulic power steering; Removing and installing power steering pump .
– Install coolant pipe (left-side) ⇒ page 387 .

1.8 Renewing crankshaft oil seal (pulley end)

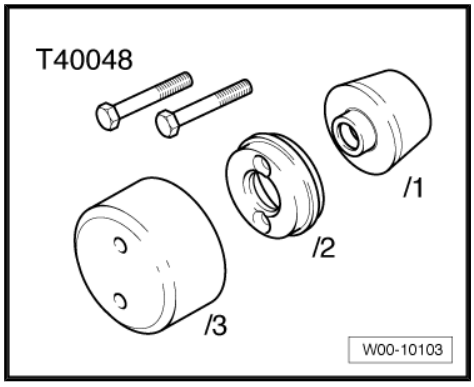
Special tools and workshop equipment required

♦ Oil seal extractor - T40019-



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♦ Assembly appliance - T40048- with -T40048/4-



♦ Bolts M8x55 mm (2x)

Procedure

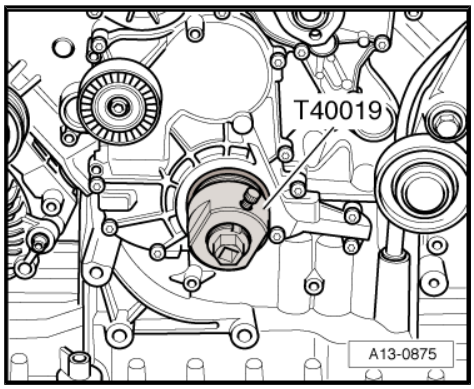
– Remove vibration damper with poly V-belt pulley ⇒ page 171 .

– 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.

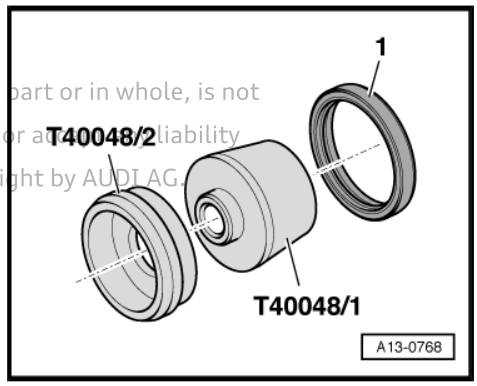


– Clean contact surface and sealing surface.

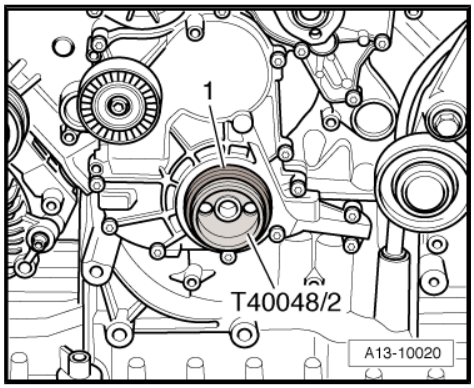
– Fit assembly aid -T40048/1- onto assembly sleeve -T40048/2- and slide oil seal -1- onto assembly sleeve.

– Detach assembly aid.

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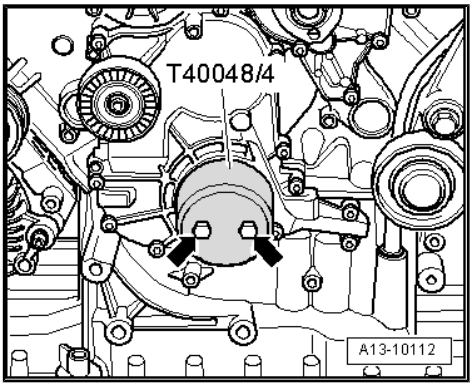
– Fit assembly sleeve -T40048/2- on crankshaft and slide oil seal -1- into sealing flange (pulley end).



Note

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

– Apply press sleeve -T40048/4- 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.



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

– Install vibration damper with poly V-belt pulley ⇒ page 171 .

1.9 Removing and installing sealing flange (pulley end)

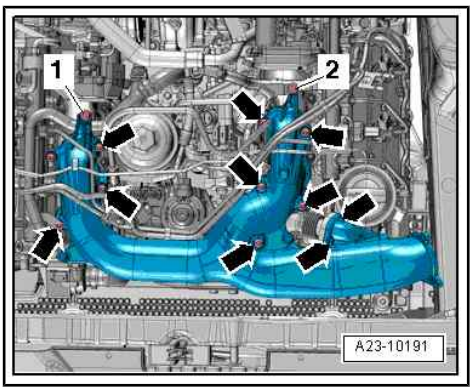
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Special tools and workshop equipment required

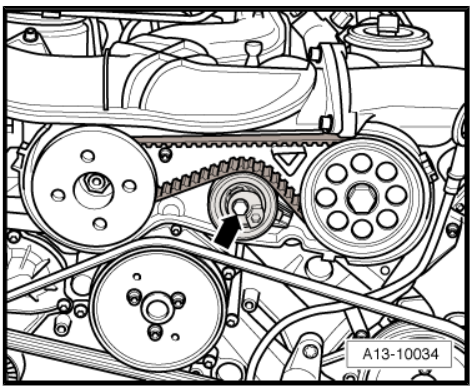
- Electric drill with plastic brush
- Safety goggles
- Sealant ⇒ Electronic parts catalogue

Removing

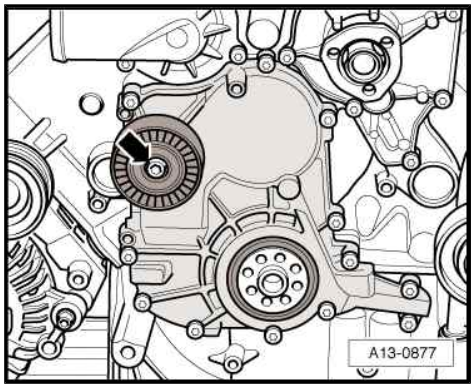
– Drain coolant ⇒ page 353 .
– Remove vibration damper with poly V-belt pulley ⇒ page 171 .
– Remove intake manifold (top section) ⇒ page 483 .



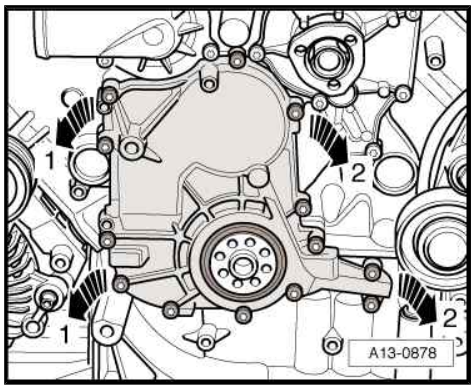
– Engine code CAPA: Remove toothed belt for high-pressure pump ⇒ page 521 .
– Remove coolant pipe (front): engine codes CAMA, CAMB, CCLA, CCWA, CCWB, CGKA, CGKB ⇒ page 381 , engine code CAPA ⇒ page 383 .



– If fitted, pry cover off idler roller for poly V-belt.
– Remove bolt -arrow- and detach idler roller from sealing flange (pulley end).



– Remove bolts.
– Pull off sealing flange (pulley end): right-side first -arrows 1-, then left-side -arrows 2-.
– Drive crankshaft oil seal out of sealing flange after removing sealing flange.



Installing

- Tightening torque
⇒ “1.2 Exploded view - sealing flange (pulley end)”, page 167

Note

Renew sealing elements, O-rings and crankshaft oil seal.

– Remove old sealant from grooves on sealing flange and from sealing surfaces.

Caution

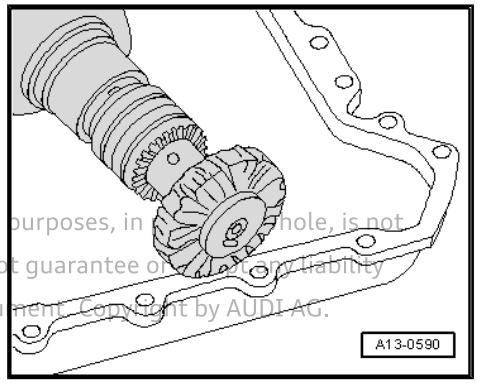
Protect lubrication system against contamination.

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

WARNING

Risk of eye injury.

- ***Put on safety goggles.***



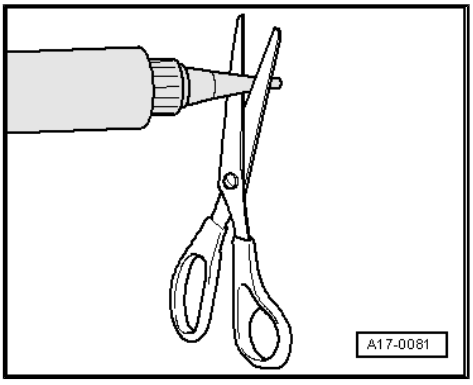
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– Remove remaining sealant on sealing flange and cylinder block/top section of sump using rotating plastic brush or similar.
– Clean sealing surfaces; they must be free of oil and grease.

Note

Note the use-by date of the sealant.

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



– Install sealing elements -2- and -4- and O-rings -1- and -3-.

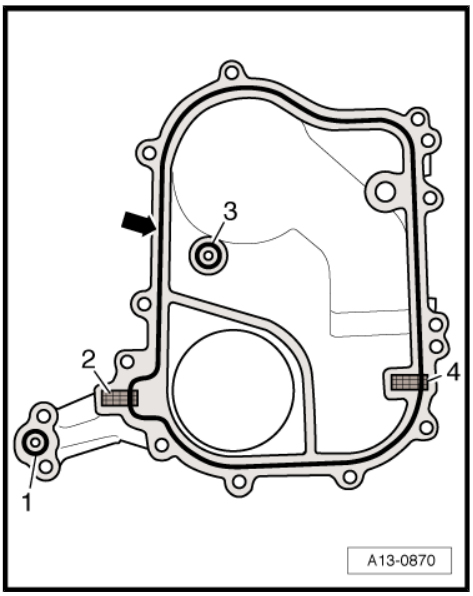
Caution

Make sure lubrication system is not clogged by excess sealant.

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

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

- The bead of sealant must project 1.5 … 2.0 mm above the sealing surface.



Note

The sealing flange (pulley end) must be installed within 5 minutes after applying the sealant.

– Tighten sealing flange bolts (pulley end) ⇒ page 168 .

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

– Install crankshaft oil seal (pulley end) ⇒ page 171 .

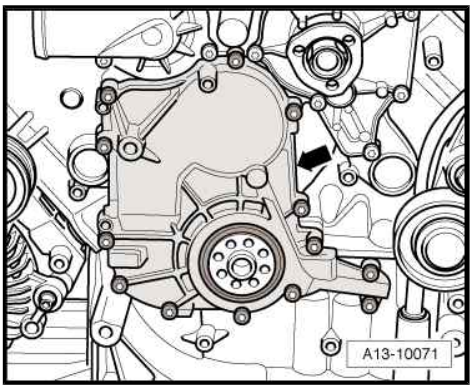
– Install coolant pipe (front): engine codes CAMA, CAMB, CCLA, CCWA, CCWB, CGKA, CGKB ⇒ page 381 , engine code CAPA ⇒ page 383 .

– Engine code CAPA: Install toothed belt for high-pressure pump ⇒ page 533 .

– Install intake manifold (top section) ⇒ page 483 .

– Install vibration damper with poly V-belt pulley ⇒ page 171 .

– Fill up with coolant ⇒ page 357 .



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2 Cylinder block (gearbox end)

⇒ "2.1 Exploded view - drive plate", page 176
⇒ "2.2 Removing and installing drive plate", page 177
⇒ "2.3 Removing and installing sender wheel", page 178
⇒ "2.4 Checking sender wheel", page 179
⇒ "2.5 Renewing crankshaft oil seal (gearbox end)", page 180
⇒ "2.6 Renewing needle bearing in drive plate", page 181

2.1 Exploded view - drive plate

Note

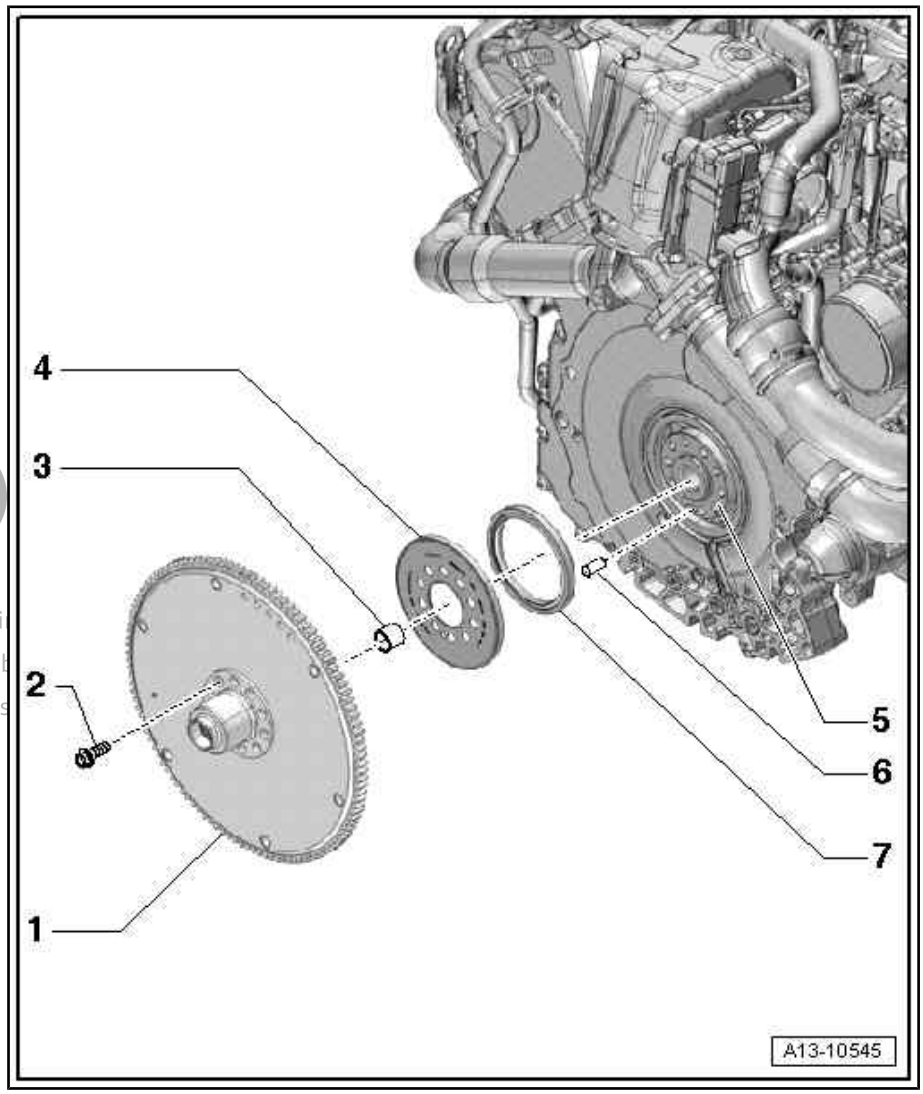
When carrying out repairs, secure engine to engine and gearbox support - VAS 6095- using bracket for V6 TDI engine -VAS 6095/1-4- ⇒ page 122 .

1 - Drive plate
- ❑ With bearing flange
- ❑ Check running surface on bearing flange and holes for clutch module or dual-mass flywheel for cracks and scoring.
- ❑ Removing and installing ⇒ page 177

2 - Bolt
- ❑ Renew
- ❑ 60 Nm + turn 90° further

3 - Needle bearing
- ❑ Not for vehicles with automatic gearbox 0B6
- ❑ Installation position: closed side towards engine
- ❑ Removing and installing ⇒ page 181

4 - Sender wheel
- ❑ For engine speed sender - G28-
- ❑ Removing and installing sender wheel ⇒ page 178
- ❑ Checking sender wheel ⇒ page 179



permitted unless authorised

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 179 .*

5 - Crankshaft

6 - Dowel pin

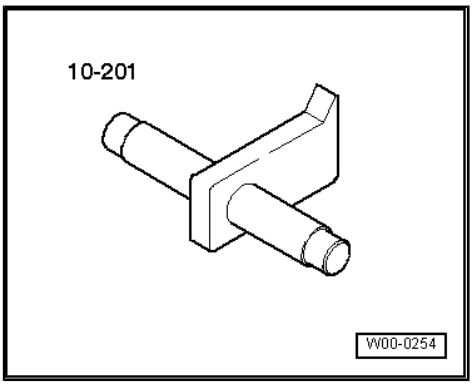
7 - Crankshaft oil seal (gearbox end)

- ❑ Renewing ⇒ page 180

2.2 Removing and installing drive plate

Special tools and workshop equipment required

- ♦ Counterhold tool - 10 - 201-

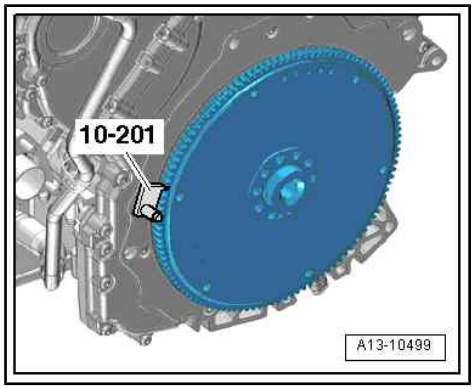


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Removing

- Gearbox removed

– Insert counterhold tool - 10 - 201- to slacken bolts.



Caution

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

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

– Remove bolts and take off drive plate and sender wheel.

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 179 .

- Tightening torque
⇒ “2.1 Exploded view - drive plate”, page 176

Note

- *Renew bolts for drive plate.*
- *On vehicles with manual gearbox/dual clutch gearbox 0B5, a needle bearing is fitted in the drive plate. On vehicles with automatic gearbox 0B6, no needle bearing should be fitted. Before installing, check that the needle bearing is fitted. Removing and installing needle bearing in drive plate (pressing in and out)* ⇒ page 181 .

– Pay attention to dowel pin when installing drive plate.

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

2.3 Removing and installing sender wheel

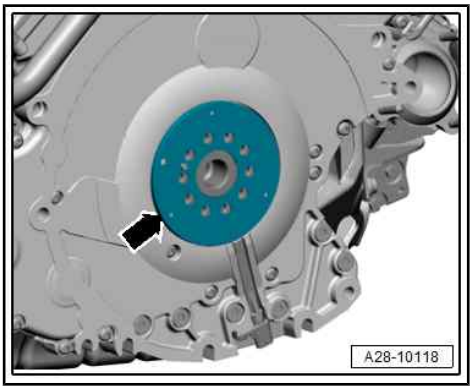
Removing

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

– Remove drive plate ⇒ page 177 .

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– 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 179 .***

– Install drive plate ⇒ page 177 .

2.4 Checking sender wheel

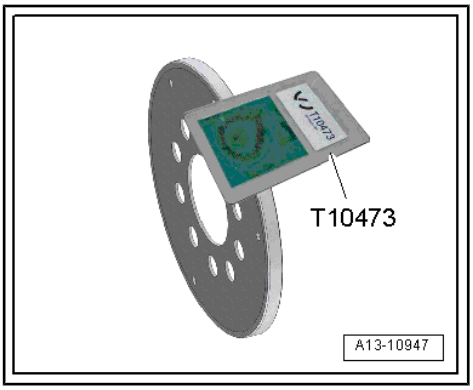
Special tools and workshop equipment required

- Sensor gauge - T10473-

Procedure

- Sender wheel removed

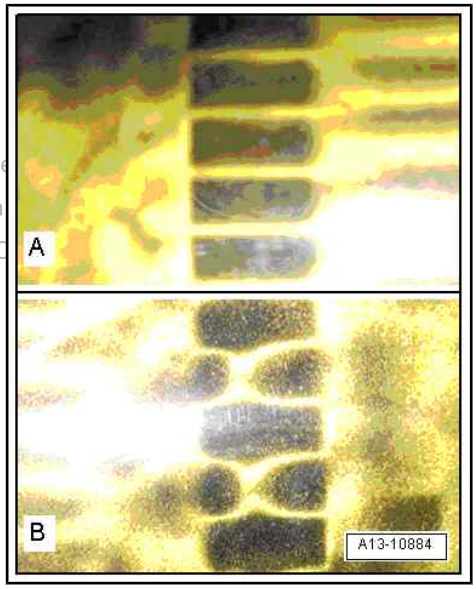
– Check entire circumference of sender wheel using sensor gauge - T10473- , as shown in illustration.



Inspection image of sender wheel

A - Sender wheel OK

B - Sender wheel defective

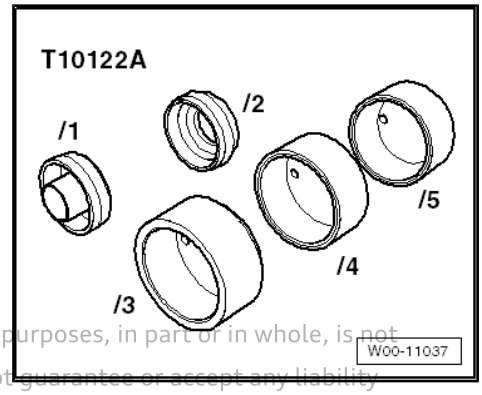


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2.5 Renewing crankshaft oil seal (gearbox end)

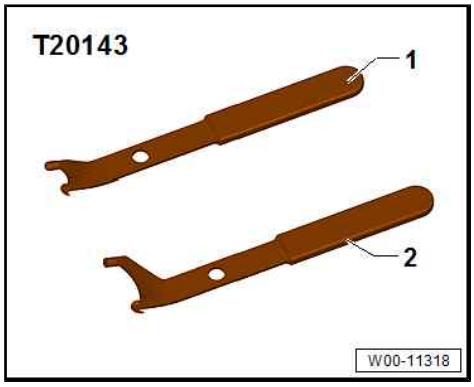
Special tools and workshop equipment required

- Fitting tool - T10122 A-



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

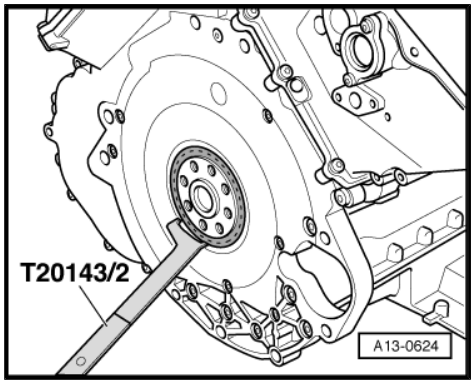


Procedure

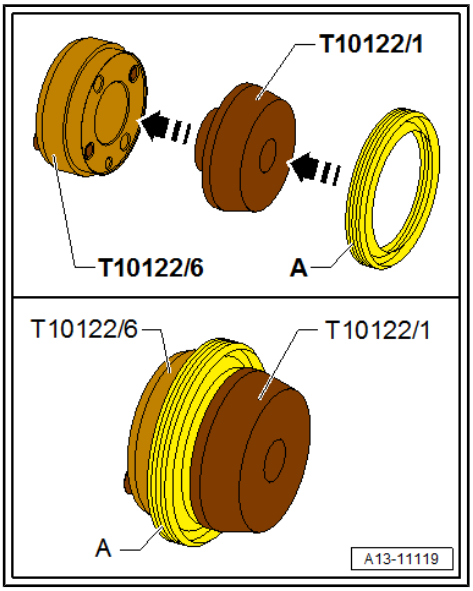
- Gearbox removed ⇒ Rep. gr. 34 ; Removing and installing gearbox; Removing gearbox or ⇒ Rep. gr. 37 ; Removing and installing gearbox; Removing gearbox .

– Remove drive plate ⇒ page 177 .

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



– 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- .



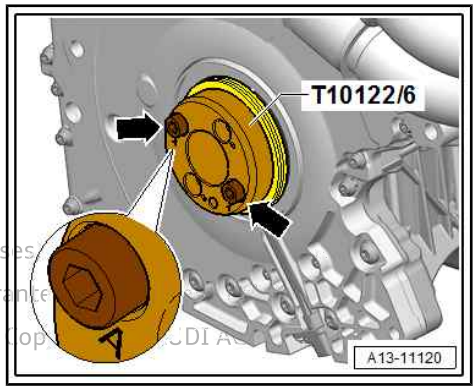
– Fit guide piece - T10122/6- onto crankshaft.
– Bolt guide piece - T10122/6- to crankshaft through securing points -A- using bolts -arrows-.

Caution

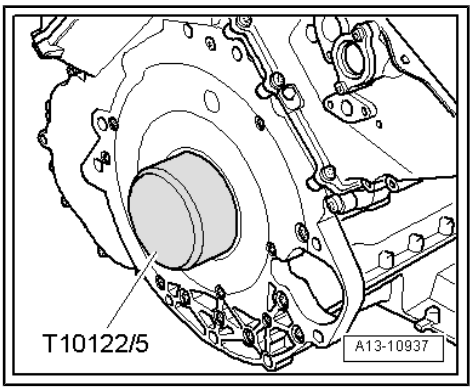
Risk of leaks if installed incorrectly.

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

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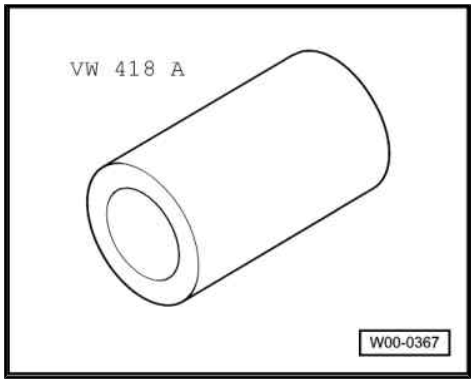
– Slide oil seal over guide piece - T10122/6- onto crankshaft by hand.
– Press in oil seal uniformly until flush all round using press sleeve -T10122/5- .
– Remove guide piece - T10122/6- .
– Check that oil seal and its sealing lip are correctly seated. If sealing lip is partially folded over, repeat procedure with a new oil seal.
– Install drive plate ⇒ page 177 .



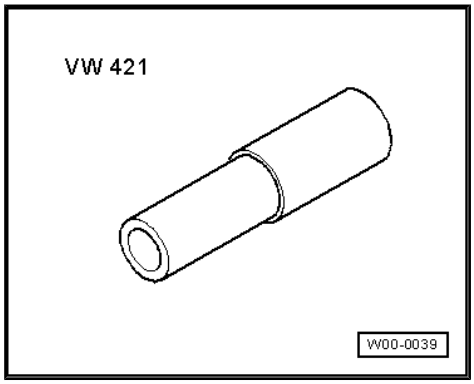
2.6 Renewing needle bearing in drive plate

Special tools and workshop equipment required

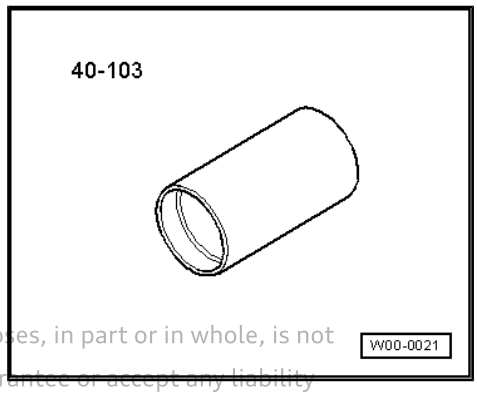
- Tube - VW 418 A-



- Tube - VW 421-



- Support - 40 - 103-



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Procedure

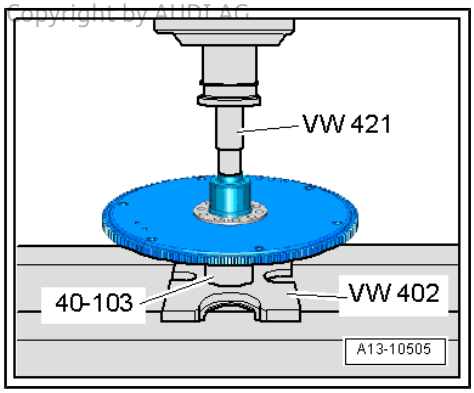
- Gearbox removed

– Remove drive plate ⇒ page 177 .

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

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

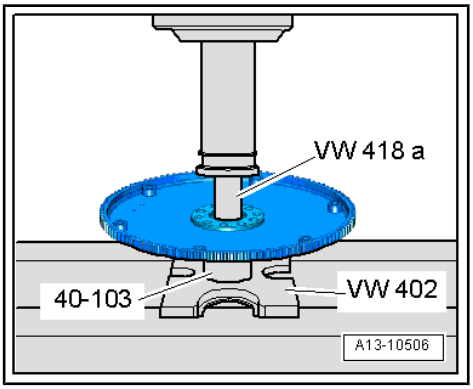
- Smaller diameter of tube -VW 421- faces drive plate.



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

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

– Install drive plate ⇒ page 177 .



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3 Crankshaft

⇒ “3.1 Exploded view - crankshaft”, page 184

⇒ “3.2 Crankshaft dimensions”, page 186

⇒ “3.3 Measuring axial clearance of crankshaft”, page 186

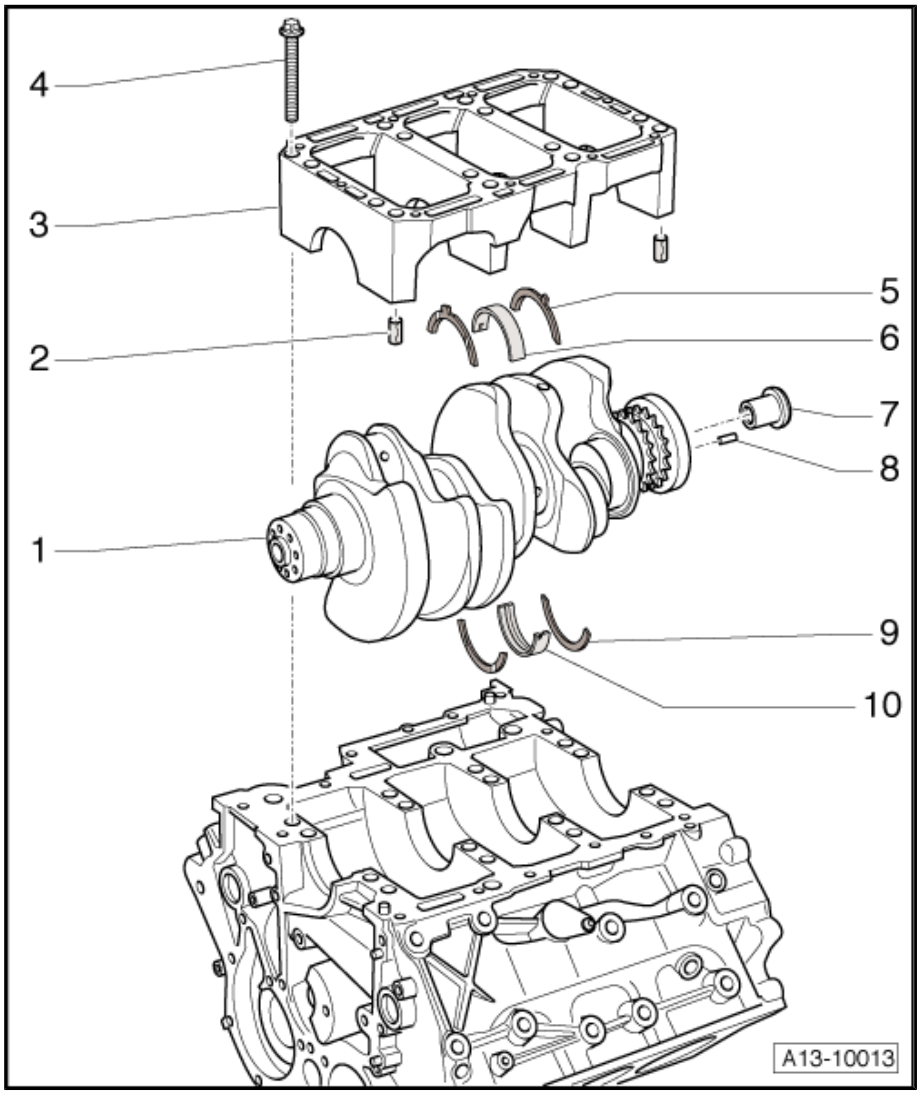
⇒ “3.4 Measuring radial clearance of crankshaft”, page 187

3.1 Exploded view - crankshaft

Note

When carrying out repairs, secure engine to engine and gearbox support - VAS 6095- using bracket for V6 TDI engine -VAS 6095/1-4- ⇒ page 122 .

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1 - Crankshaft

- ❑ Measuring axial clearance ⇒ page 186
- ❑ Measuring radial clearance ⇒ page 187
- ❑ Crankshaft dimensions ⇒ page 186

2 - Dowel sleeve

- ❑ 2x
- ❑ Insert in cylinder block

3 - Retaining frame

4 - Bolt

- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 185

5 - Thrust washer

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

6 - Bearing shell

- ❑ For retaining frame
- ❑ Renew used bearing shells
- ❑ Install new bearing shells for retaining frame with correct coloured markings ⇒ page 186

7 - Not fitted

8 - Dowel pin

- ❑ Check that pin is firmly seated in crankshaft

9 - Thrust washer

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

❑ Note location

10 - 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 185

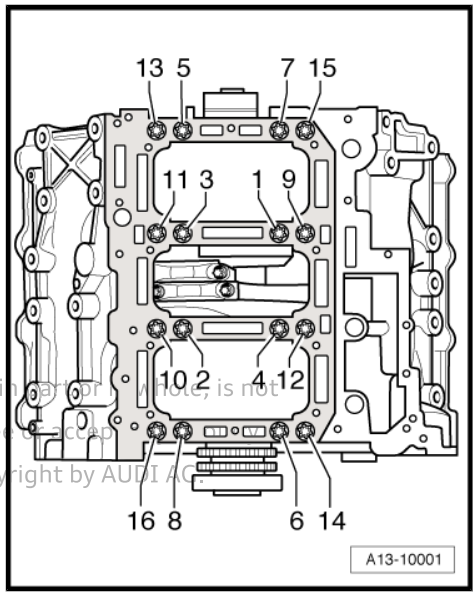
Retaining frame - tightening torque and sequence

– Renew bolts for retaining frame.

– Insert two dowel sleeves in cylinder block.

– Tighten bolts in the sequence -1 ... 16- in 3 stages as follows:

1. Tighten to 30 Nm.
2. Tighten to 50 Nm.
3. Turn 90° further.



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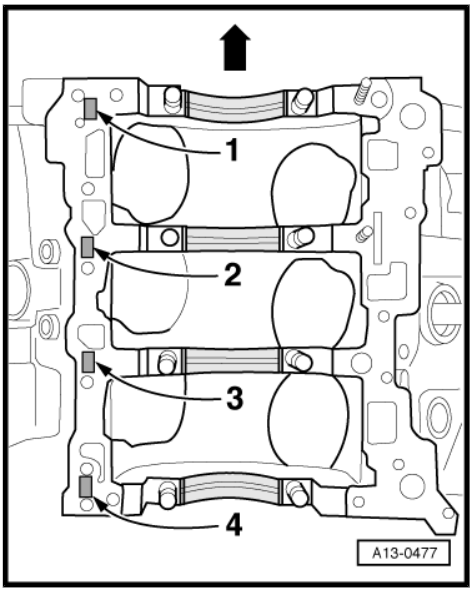
Allocation of crankshaft bearing shells for cylinder block

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.

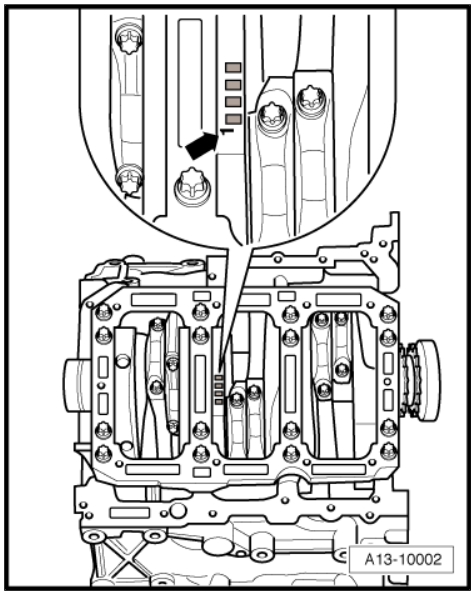
Letter on cylinder block	Colour coding of bearing
R =	Red
G =	Yellow
B =	Blue



Allocation of crankshaft bearing shells for retaining frame

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

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



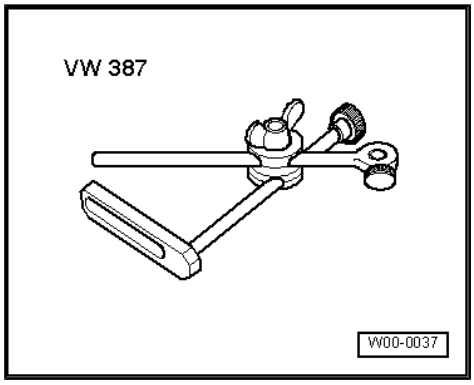
3.2 Crankshaft dimensions

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

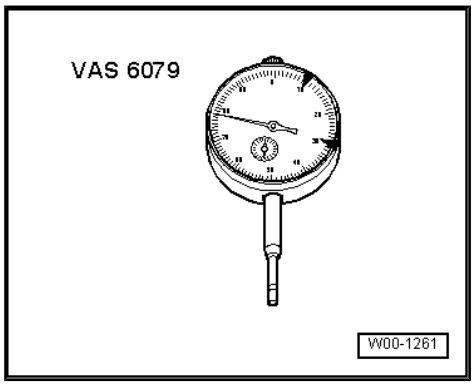
3.3 Measuring axial clearance of crankshaft

Special tools and workshop equipment required

- Universal dial gauge bracket - VW 387-

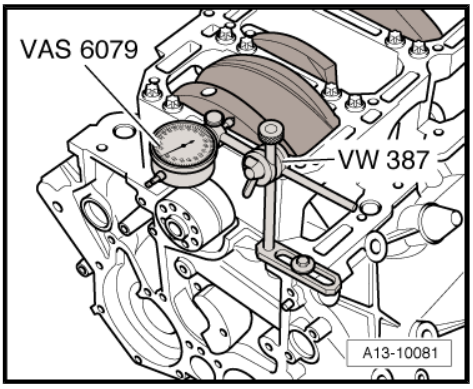


- Dial gauge - VAS 6079-



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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.

Axial clearance:

- New: 0.090 ... 0.215 mm.
- Wear limit: 0.280 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 185 without rotating crankshaft.
– Remove retaining frame again.
– Compare width of Plastigauge with measurement scale.

Radial clearance:

- New: 0.018 ... 0.045 mm.
- Wear limit: 0.100 mm.

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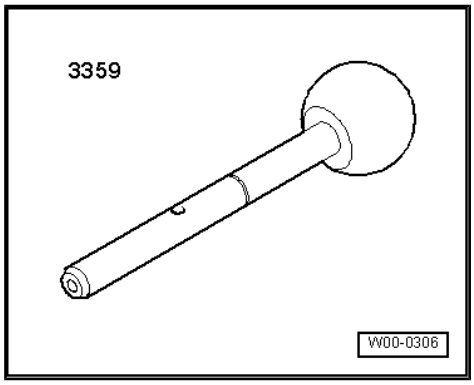
4 Balance shaft

⇒ “4.1 Removing and installing balance shaft”, page 188

4.1 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 173 .

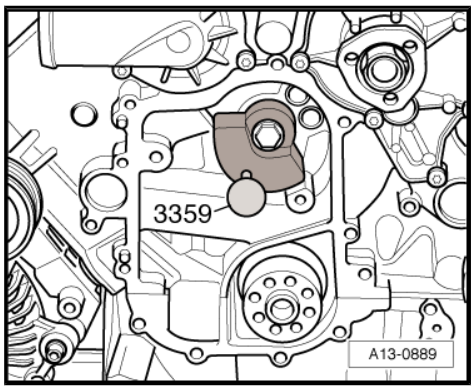
– Remove drive plate ⇒ page 177 .

– Remove timing chain covers: left-side ⇒ page 230 , right-side ⇒ page 232 , bottom ⇒ page 234 .

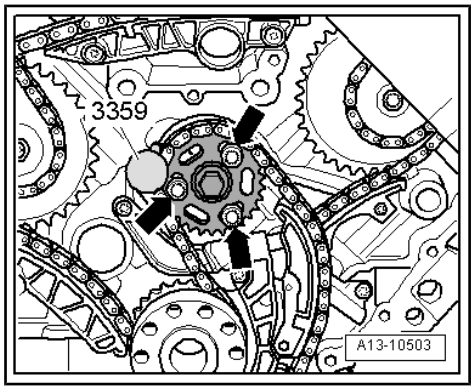
– Remove chain for auxiliary drives ⇒ page 285 .

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

– Remove bolt and detach balance weight from balance shaft.

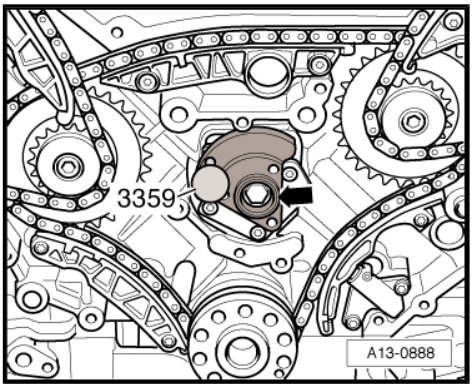


– Remove bolts -arrows- at rear of engine and detach chain sprocket from balance shaft.

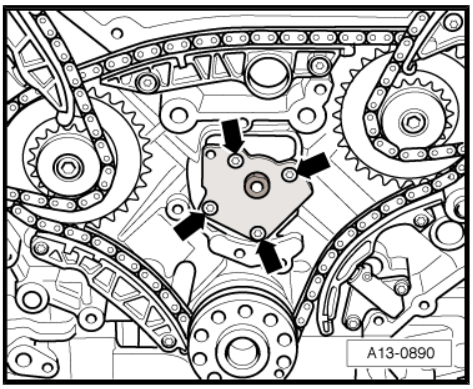


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– Remove bolt -arrow- at rear of engine and detach balance weight from balance shaft.



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



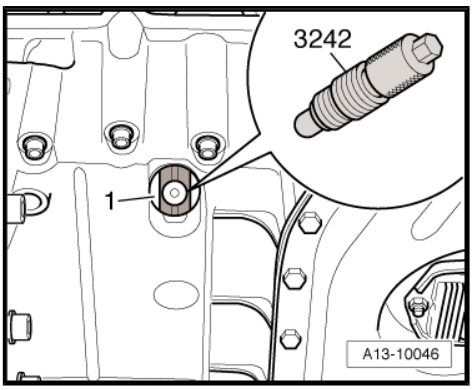
Installing

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

Tightening torques

◆ ⇒ “3.4 Exploded view - drive chain for balance shaft”, page 246

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



– Install chain for auxiliary drives ⇒ page 285 .
– Install timing chain covers: left-side ⇒ page 230 , right-side ⇒ page 232 , bottom ⇒ page 234 .
– Install drive plate ⇒ page 177 .
– Install sealing flange (pulley end) ⇒ page 173 .
– Fill up with engine oil and check oil level ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .

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5 Pistons and conrods

⇒ “5.1 Exploded view - pistons and conrods”, page 190

⇒ “5.2 Measuring piston projection at TDC”, page 193

⇒ “5.3 Checking pistons and cylinder bores”, page 195

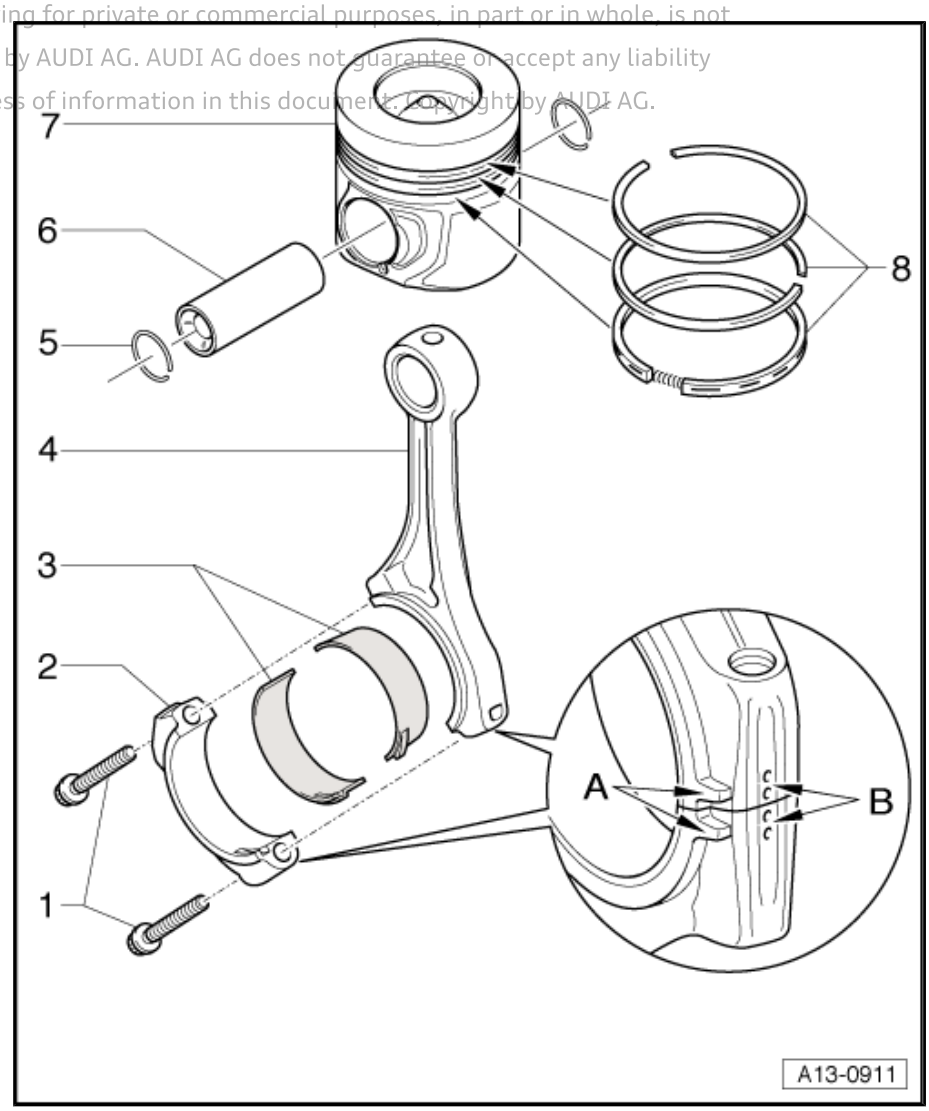
⇒ “5.4 Checking radial clearance of conrod bearings”, page 195

5.1 Exploded view - pistons and conrods

Note

Oil spray jet for piston cooling ⇒ page 191 .

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1 - Bolts

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

2 - Conrod bearing cap

- ❑ Mark installation position for re-installation
- ❑ Mark cylinder allocation in colour -B- ⇒ page 192
- ❑ Installation position: Note position of lugs on casting -A-

3 - Bearing shells

- ❑ Note installation position
- ❑ Renew used bearing shells
- ❑ Measuring radial clearance ⇒ page 195

4 - Conrod

- ❑ Only renew as a complete set
- ❑ Mark cylinder allocation in colour -B- ⇒ page 192
- ❑ Installation position: Note position of lugs on casting -A- and ⇒ page 193
- ❑ Axial clearance for each conrod pair (when new): 0.20 … 0.44 mm
- ❑ Measuring radial clearance ⇒ page 195

5 - Circlip

- ❑ Renew

6 - Piston pin

- ❑ If difficult to remove, heat piston to approx. 60 °C

❑ Remove and install using drift - VW 222 A-

7 - Piston

❑ Mark installation position and cylinder number ⇒ page 192
❑ Renew piston if cracking is visible on piston crown or piston skirt
❑ Checking ⇒ page 192
❑ Measuring cylinder bore ⇒ page 192
❑ Piston and cylinder dimensions ⇒ page 195
❑ Install using piston ring clamp
❑ Measuring piston projection at “TDC” ⇒ page 193

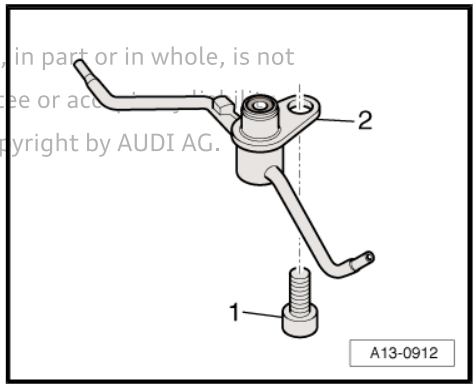
8 - Piston rings

❑ Offset gaps by 120°
❑ Use piston ring pliers to remove and install
❑ Inscription “TOP” faces towards piston crown
❑ Measuring ring gap ⇒ page 191
❑ Measuring ring-to-groove clearance ⇒ page 191

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Oil spray jet for piston cooling

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

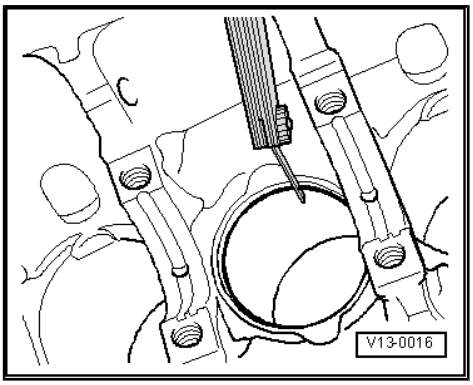


Note

- *Take care not to bend oil spray jets.*
- *Always renew bent oil spray jets.*

Measuring piston ring gap

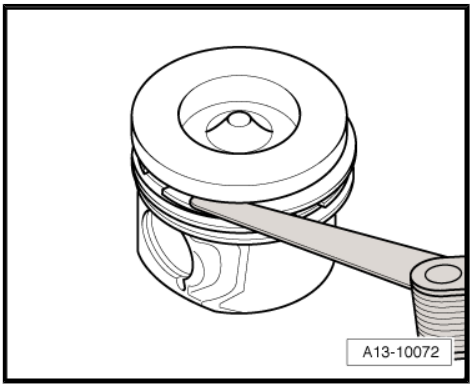
– Insert ring at right angle to cylinder wall from above and push down into lower cylinder opening approx. 15 mm from bottom of cylinder.
– To do so, use a piston without rings.



Piston ring	new mm	Wear limit mm
1. Compression ring	0.25 … 0.38	0.80
2. Compression ring	0.70 … 0.90	1.30
Oil scraper ring	Max. 0.40	0.70

Measuring ring-to-groove clearance

– Clean groove in piston before checking clearance.



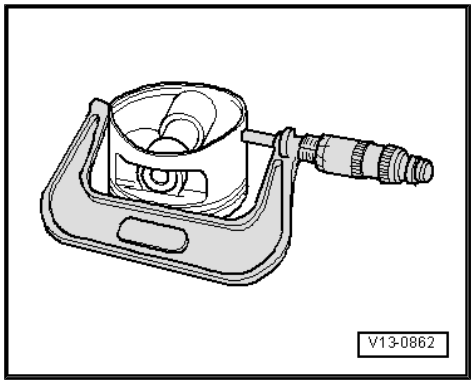
Piston ring	new mm	Wear limit mm
1. Compression ring	0.120 … 0.160	0.175
2. Compression ring	0.020 … 0.090	0.115
Oil scraper ring	0.020 … 0.090	0.115

Checking piston

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

• Maximum deviation from nominal dimension: 0.05 mm.

Nominal dimension
⇒ “5.3 Checking pistons and cylinder bores”, page 195 .

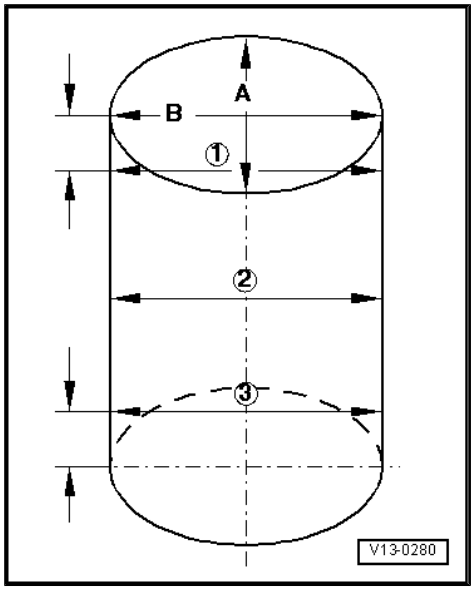


Measuring cylinder bore

– 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.

Nominal dimension
⇒ “5.3 Checking pistons and cylinder bores”, page 195 .



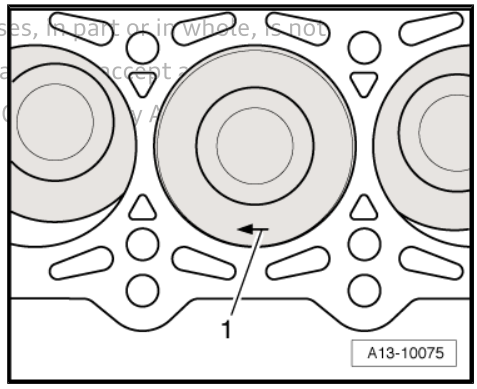
Installation position of pistons

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Caution

Do not damage the coating of the piston crown.

- *If you intend to re-install used pistons, mark the cylinder number on the piston crown using paint. Do not mark piston crown by means of centre punch, notch or the like.*



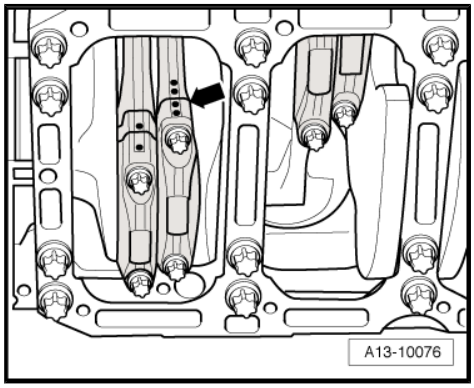
• Installation position: Arrow -item 1- on piston crown points to pulley end.

Marking conrods

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

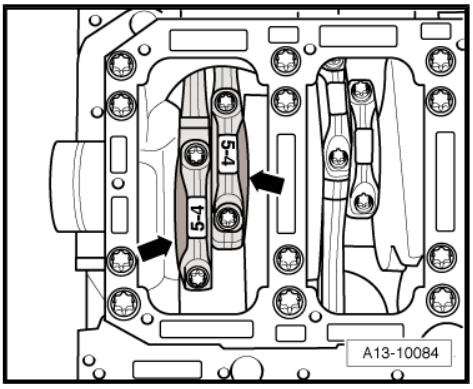
Note

- *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.



Note

Illustration shows front pair of conrods.

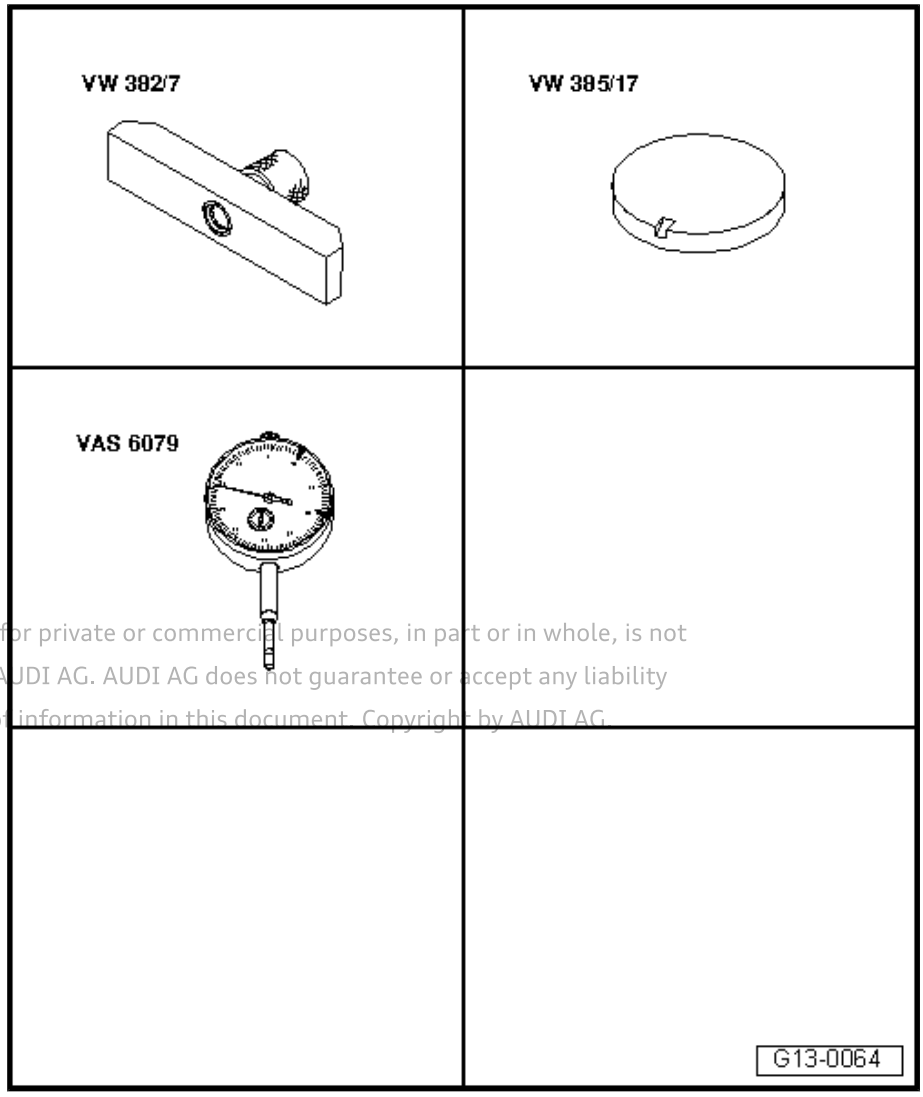
5.2 Measuring piston projection at TDC

Note

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

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Special tools and workshop equipment required



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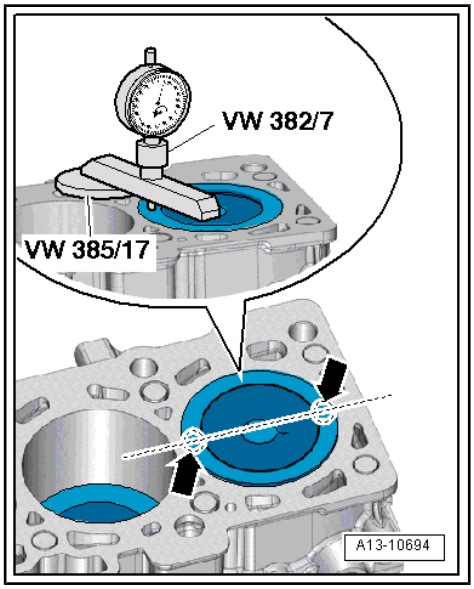
- Measuring bridge -VW 382/7- from measuring tool - VW 382-
- Measuring plate -VW 385/17- from universal measuring tool - VW 385-
- Dial gauge - VAS 6079-

Procedure

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

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

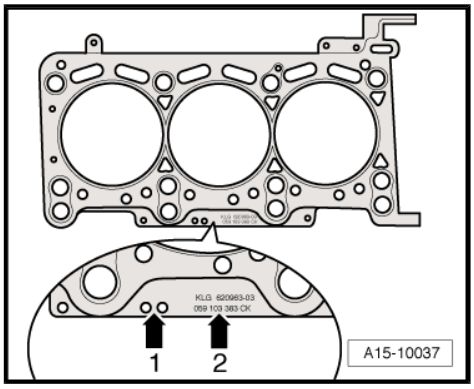
Piston projection above top surface of cylinder block	Identification (no. of holes)
0.39…0.49 mm	1
0.49…0.54 mm	2
0.54…0.65 mm	3



Identification of cylinder head gasket

1 - Holes

2 - Part number



Note

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

5.3 Checking pistons and cylinder bores

Honing dimension	Piston Ø mm	Cylinder bore Ø mm
Basic dimension	82.939 … 82.951 1)	83.006 … 83.014
Repair oversize	82.979 … 82.991 1)	83.046 … 83.054

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

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5.4 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 190) without rotating crankshaft.

– Remove conrod bearing cap again.

– Compare width of Plastigauge with measurement scale.

Radial clearance:

- New: 0.015 ... 0.062 mm.
- Wear limit: 0.12 mm.

– Renew conrod bolts.

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15 – Cylinder head, valve gear

1 Cylinder head

⇒ “1.1 Exploded view - cylinder head”, page 197

⇒ “1.2 Exploded view - cylinder head cover”, page 199

⇒ “1.3 Removing and installing cylinder head”, page 200

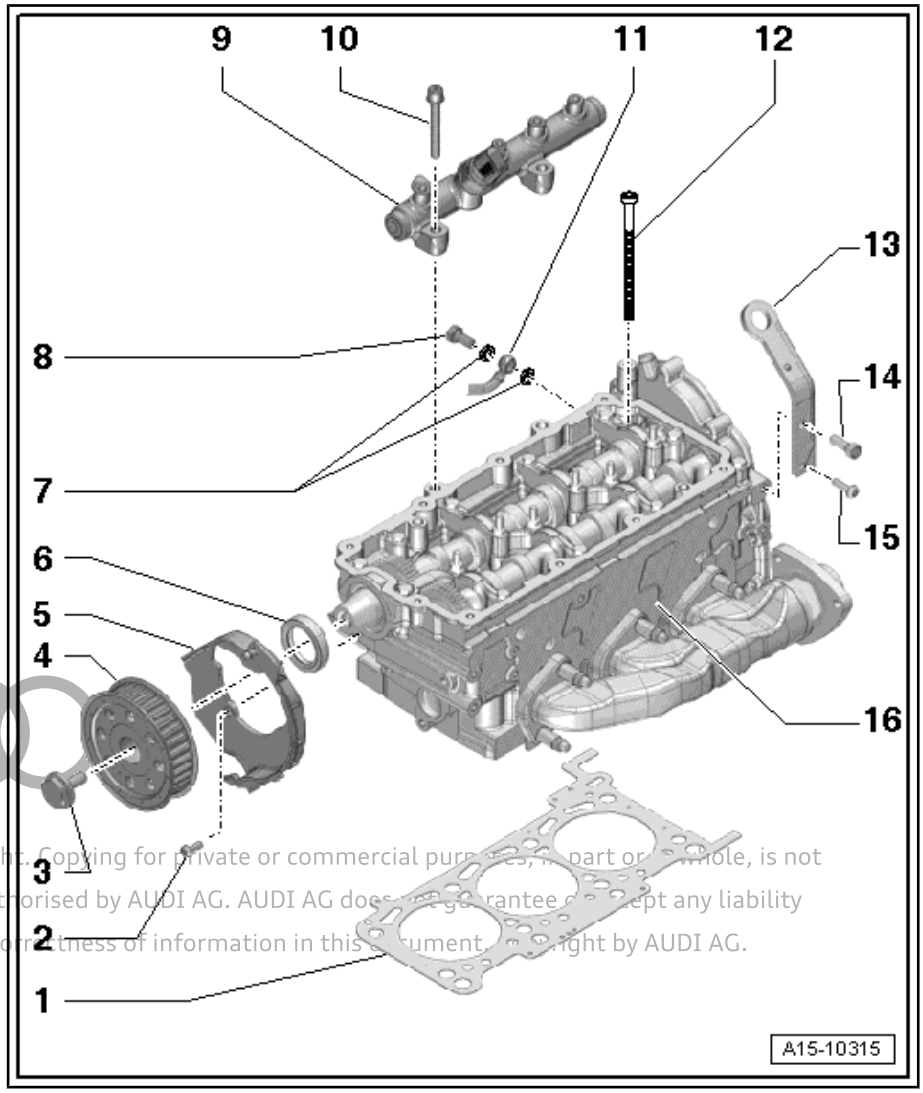
⇒ “1.4 Removing and installing cylinder head cover”, page 216

⇒ “1.5 Checking compression”, page 225

1.1 Exploded view - cylinder head

Note

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



1 - Cylinder head gasket

- ❑ Renewing: engine codes CAMA, CAMB, CCLA, CCWA, CCWB, CGKA, CGKB ⇒ page 200 , engine code CAPA ⇒ page 205
- ❑ Identification ⇒ page 198
- ❑ Installation position: part number must face cylinder head
- ❑ If renewed, change engine oil and coolant

2 - Bolt

- ❑ Tightening torque ⇒ page 510

3 - Bolt

- ❑ 70 Nm

4 - Toothed belt drive sprocket for high-pressure pump

- ❑ Removing and installing ⇒ page 510

5 - Toothed belt cover (rear)

6 - Camshaft oil seal

- ❑ Renewing ⇒ page 294

7 - Seals

- ❑ Renew

8 - Banjo bolt

- ❑ Tightening torque ⇒ Item 20 (page 375)

9 - Fuel rail

- ❑ Observe rules for cleanliness ⇒ page 9

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- ❑ Do not attempt to bend high-pressure pipes to a different shape
- ❑ Installing high-pressure pipes ⇒ page 507

10 - Bolt

- ❑ 23 Nm

11 - Coolant pipe

12 - Bolt

- ❑ Loosening sequence: engine codes CAMA, CAMB, CCLA, CCWA, CCWB, CGKA, CGKB ⇒ page 205 , engine code CAPA ⇒ page 211
- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 199

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13 - Engine lifting eye

14 - M8 bolt

- ❑ 23 Nm

15 - M6 bolt

- ❑ 9 Nm

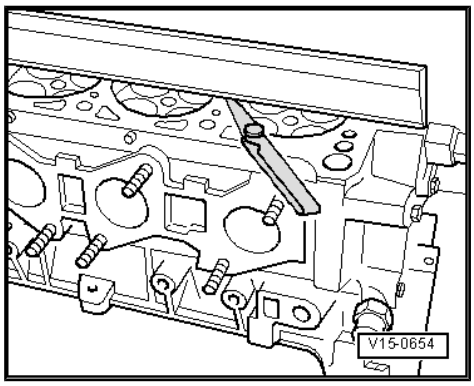
16 - Cylinder head

- ❑ To prevent damage to glow plugs, always place cylinder head on a soft foam surface after removal.
- ❑ Removing: engine codes CAMA, CAMB, CCLA, CCWA, CCWB, CGKA, CGKB ⇒ page 200 , engine code CAPA ⇒ page 205
- ❑ Checking for distortion ⇒ page 198
- ❑ Cylinder heads must not be reworked on TDI engines
- ❑ Installing ⇒ page 211
- ❑ If renewed, change coolant and engine oil

Checking cylinder head for distortion

– Use straight edge and feeler gauge to measure cylinder head for distortion at several points.

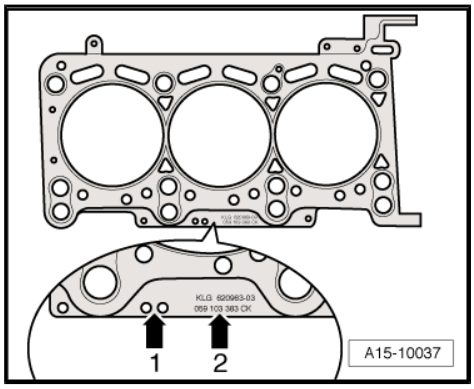
• Max. permissible distortion: 0.1 mm.



Identification of cylinder head gasket

1 - Holes

2 - Part number



Note

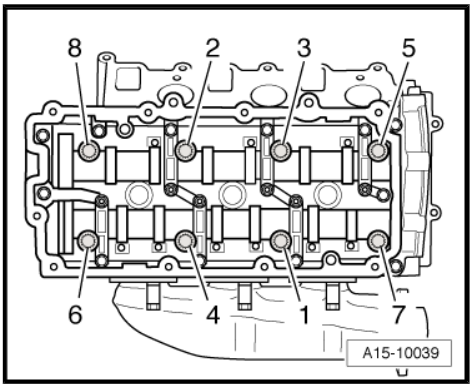
The gaskets for the left and right cylinder heads have different shapes and cannot be interchanged.

Cylinder head - tightening torque and sequence

– Renew cylinder head bolts.

– Tighten bolts in the sequence -1 ... 8- in 5 stages as follows:

1. Screw in by hand until contact is made.
2. Tighten to 35 Nm.
3. Tighten to 60 Nm.
4. Turn 90° further.
5. Turn 90° further.



1.2 Exploded view - cylinder head cover

Note

The diagram shows the cylinder head cover on 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 216 , right-side ⇒ page 221

3 - O-ring

- ❑ Renew

4 - Oil filler neck

- ❑ To remove: Lift tab, turn oil filler neck anti-clockwise and take out

5 - Seal

6 - Seal

- ❑ Renew if damaged or leaking

7 - Filler cap

8 - Nut

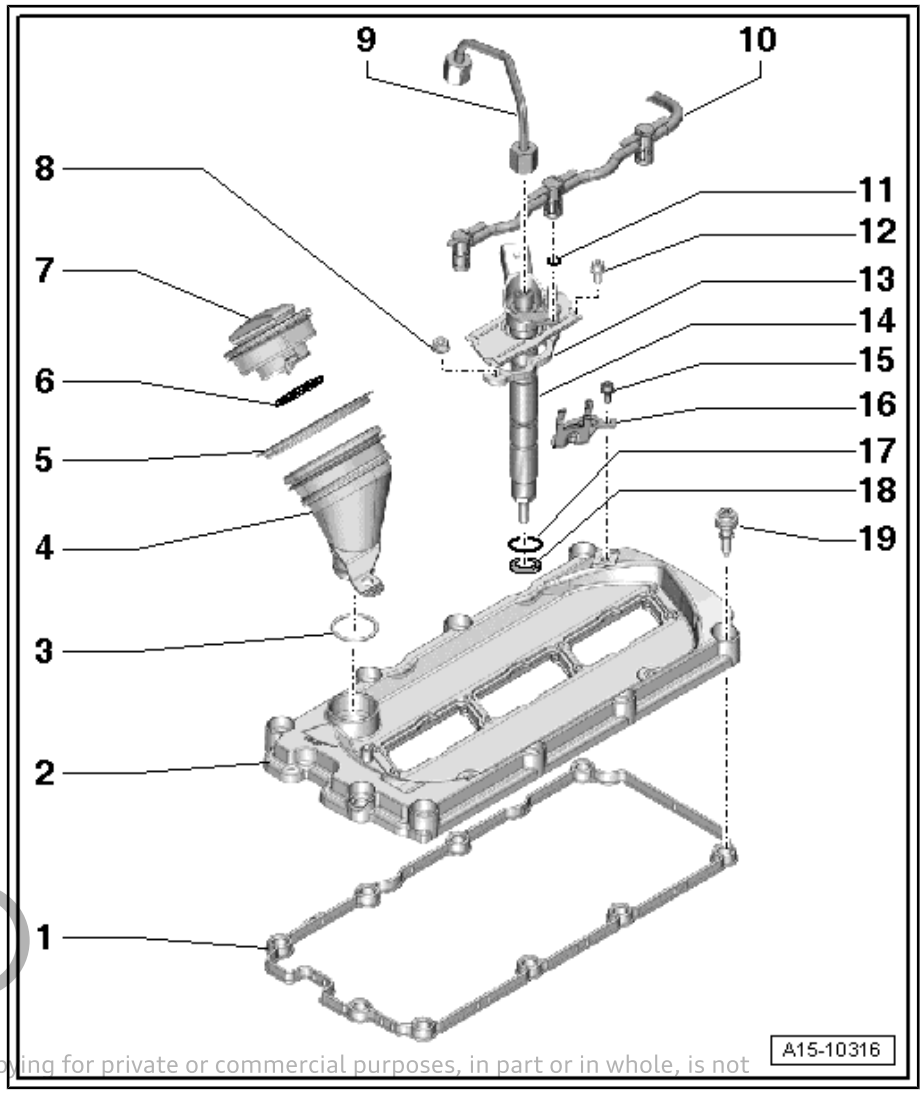
- ❑ Tightening torque ⇒ page 468

9 - High-pressure pipe

- ❑ Observe rules for cleanliness ⇒ page 9
- ❑ Mark allocation to injectors
- ❑ Do not alter shape
- ❑ Installing ⇒ page 507

10 - Fuel return line

- ❑ Observe rules for cleanliness ⇒ page 9



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11 - O-ring

- ❑ Renew

12 - Bolt

- ❑ Tightening torque ⇒ page 468

13 - Clamping piece

- ❑ Removing and installing ⇒ page 501

14 - Injector

- ❑ Observe rules for cleanliness ⇒ page 9
- ❑ Removing and installing ⇒ page 501

15 - Bolt

- ❑ 5 Nm

16 - Bracket

- ❑ For electrical connector for Lambda probe - G39-

17 - O-ring

- ❑ Renew

18 - Copper seal

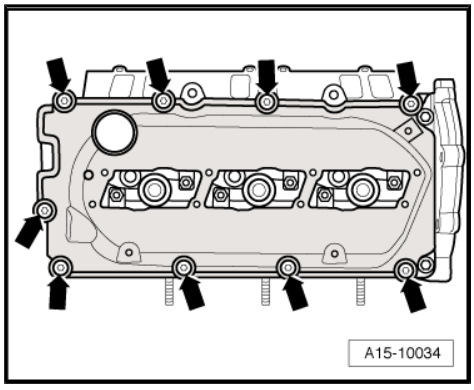
- ❑ Renew

19 - Bolt

- ❑ With seal
- ❑ Renew bolt if seal is damaged or leaking
- ❑ Tightening torque and sequence ⇒ page 200

Cylinder head cover - tightening torque and sequence

– Tighten bolts -arrows- for cylinder head cover in diagonal sequence and in stages to 9 Nm.



1.3 Removing and installing cylinder head

⇒ “1.3.1 Removing cylinder head - engine codes CAMA, CAMB, CCLA, CCWA, CCWB, CGKA, CGKB”, page 200

⇒ “1.3.2 Removing cylinder head - engine code CAPA”, page 205

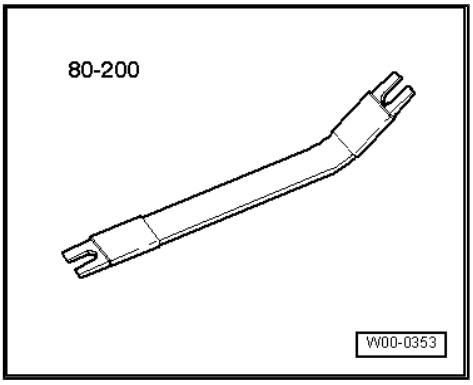
⇒ “1.3.3 Installing cylinder head”, page 211

1.3.1 Removing cylinder head - engine codes CAMA, CAMB, CCLA, CCWA, CCWB, CGKA, CGKB

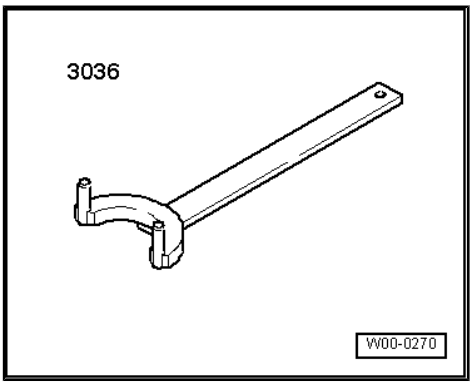
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Special tools and workshop equipment required

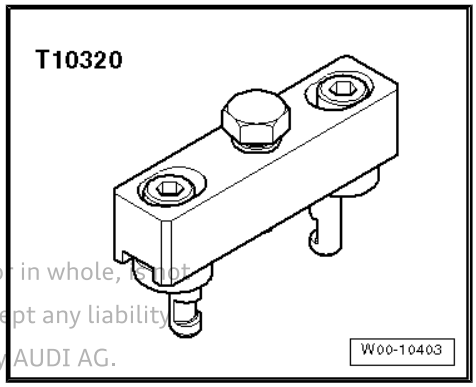
♦ Removal lever - 80 - 200-



♦ Counterhold tool - 3036-



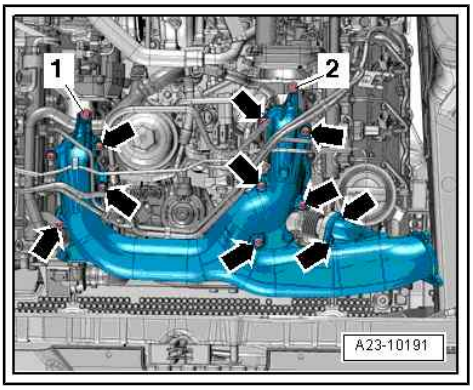
♦ Puller - T10320-



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Removing

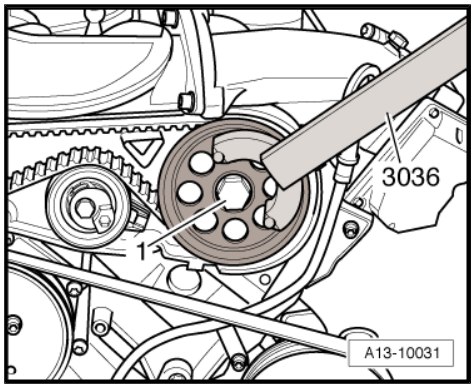
– Drain coolant ⇒ page 353 .
– Remove timing chain from camshaft on relevant side ⇒ page 264 .
– Remove intake manifold (top section) ⇒ page 483 .
– Remove relevant cylinder head cover: left-side ⇒ page 216 ; right-side ⇒ page 221 .



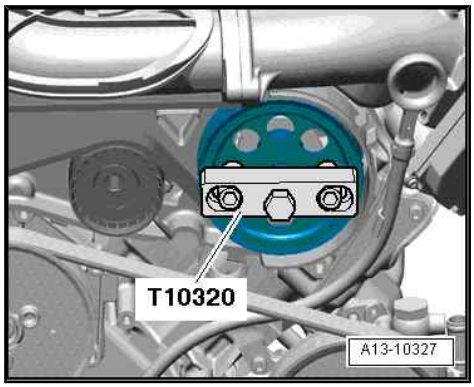
Cylinder head (left-side):

– Remove toothed belt for high-pressure pump and toothed belt tensioner ⇒ page 524 .

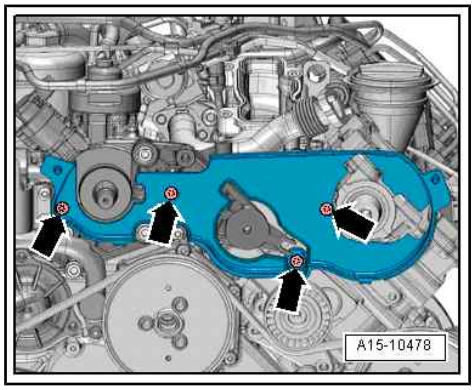
– Loosen bolt -1- for toothed belt drive sprocket approx. 2 turns using counterhold tool - 3036- .



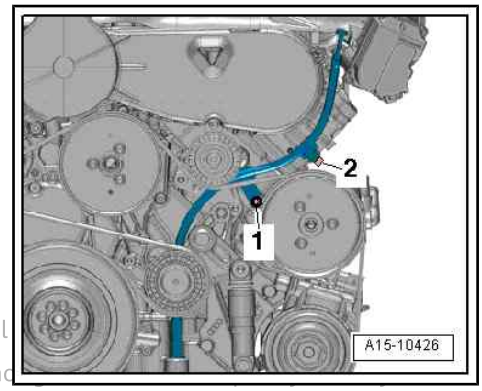
– Remove toothed belt drive sprocket using puller - T10320- .



– Remove bolts -arrows-; toothed belt cover (rear) remains in installation position.



– Remove bolt -2- for dipstick guide tube.

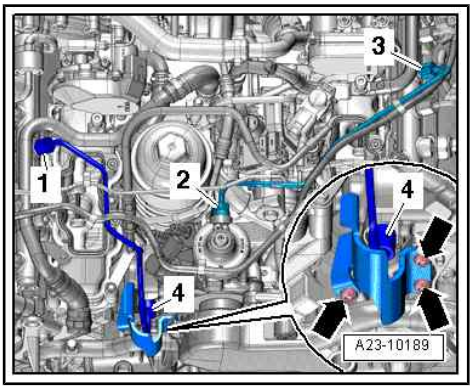


Note

Disregard -item 1-.

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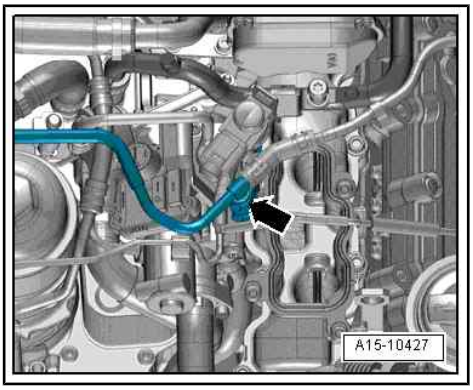
– Remove union nuts -2- and -3-, move high-pressure pipe clear and remove.



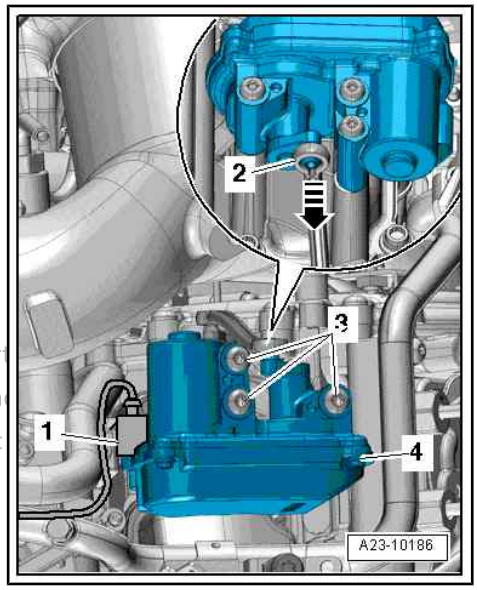
Note

Disregard items marked -1, 4- and -arrows-.

– Detach T-piece from coolant bleeder hose -arrow-.



– Unplug electrical connector -1- at intake manifold flap motor 2 - V275- -item 4-.

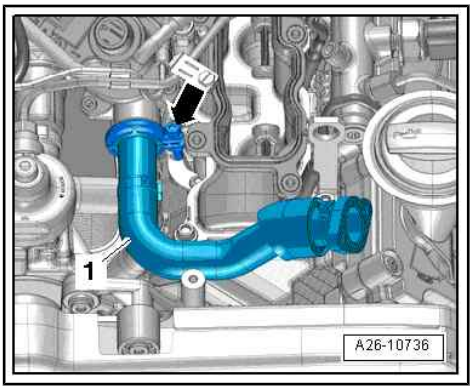


Note

Disregard -items 2, 3- and -arrow-.

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– Release clamp -arrow- and detach connecting pipe -1- for exhaust gas recirculation.



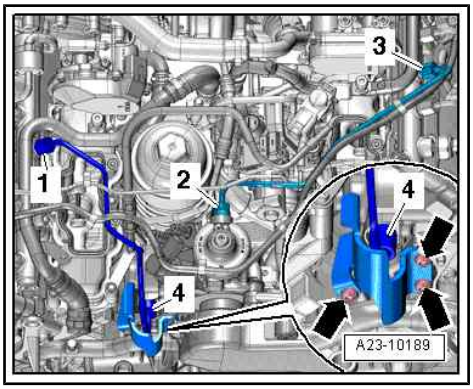
Cylinder head (right-side):

– Remove intermediate pipe (right-side) ⇒ page 633 .

– Remove coolant pipe (top right) ⇒ page 395 .

– Unscrew bolts -arrows- and remove protective plate for high-pressure pipe.

– Remove union nuts -1- and -4-, move high-pressure pipe clear and remove.

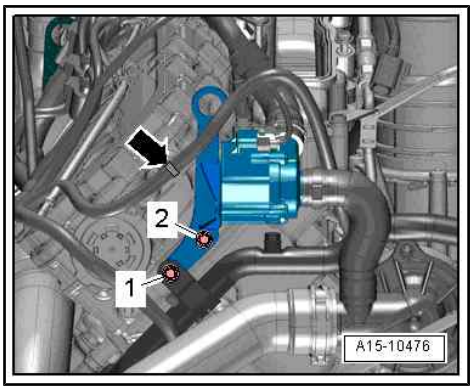


Note

Disregard items -2 and 3-.

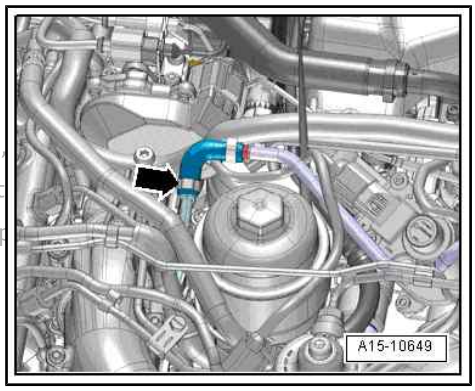
– Remove bolts -1- and -2- for engine lifting eye and pump for exhaust gas recirculation cooler - V400- .

– Use removal lever - 80 - 200- and move wiring harness clear -arrow-.



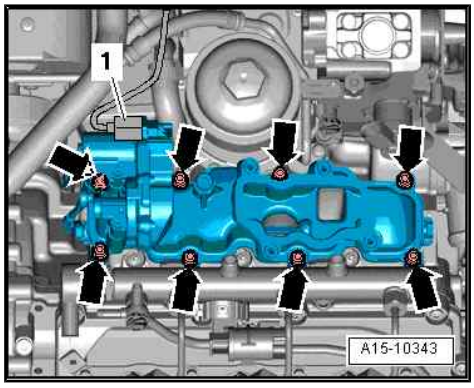
– Disconnect coolant pipe -arrow-.

– Unplug electrical connectors at glow plugs for cylinders 2 and 3.



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– Unplug electrical connector -1- at intake manifold flap motor - V157- .

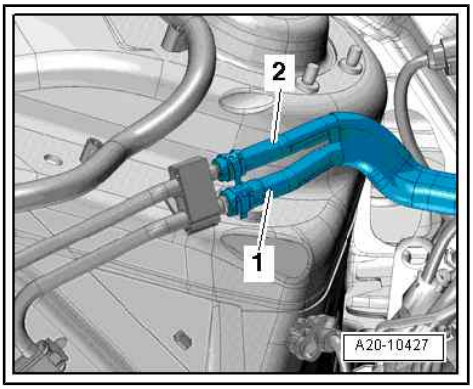


Note

Disregard -arrows-.

Note

Lay a cloth under the connection to catch escaping fuel.



Caution

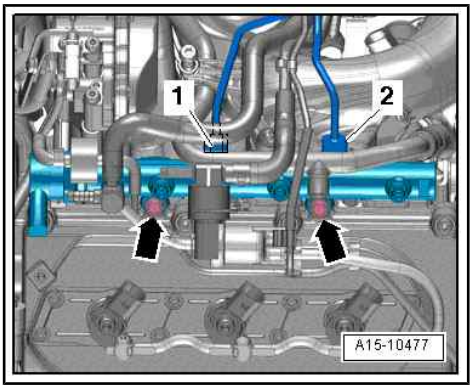
Protect fuel system against contamination.

- ***Rules for cleanliness when working on the injection system*** ***⇒ page 9*** ***.***

– Disconnect fuel supply hose -1- and fuel return hose -2-.

– Loosen union nuts -1- and -2-.

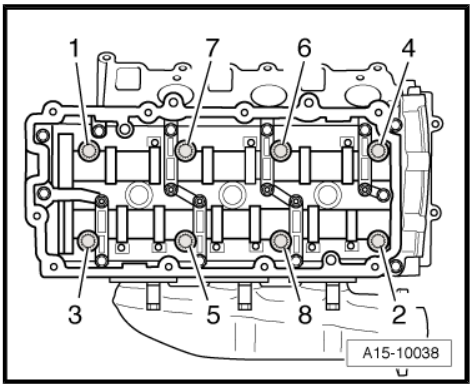
– Remove bolts -arrows- and move fuel rail to one side (fuel hoses remain connected).



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.

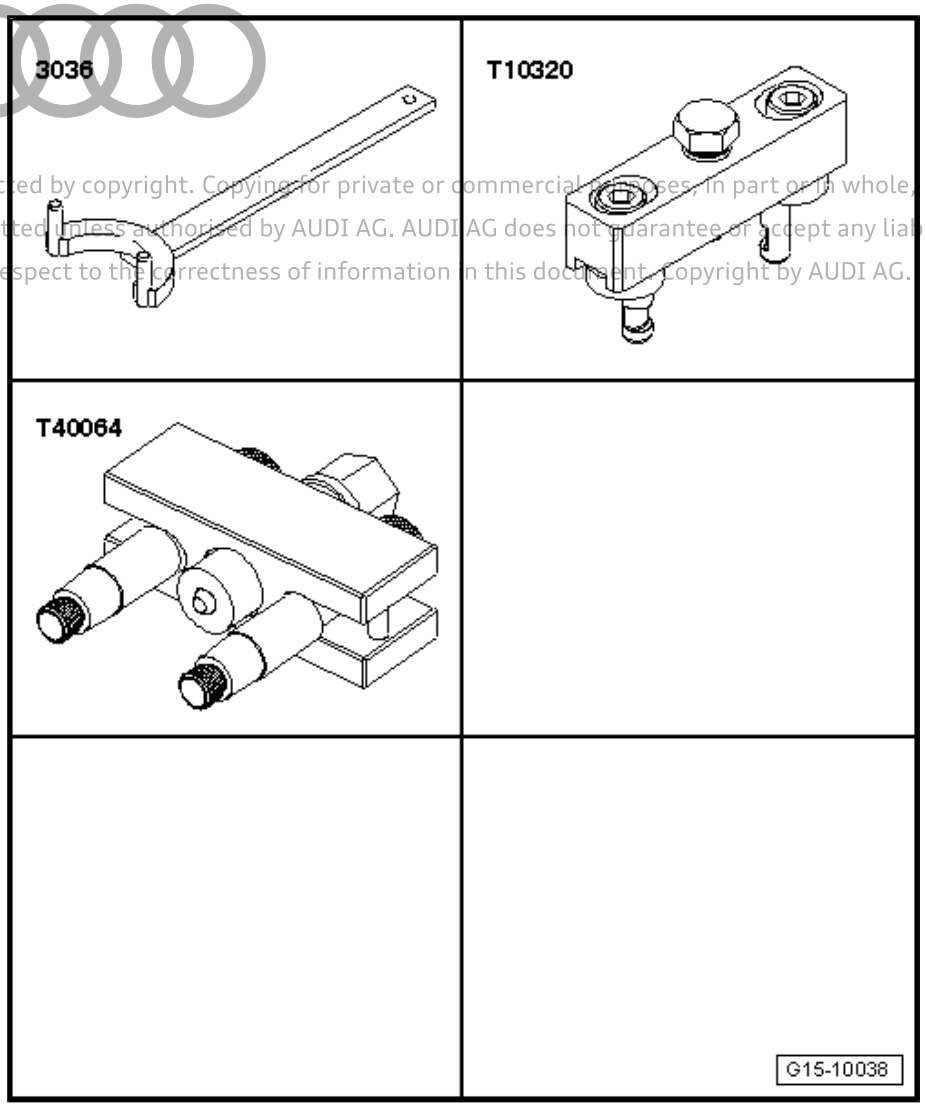
- ***After removal, the cylinder head must not be put down on the gasket side with the glow plugs still installed, because the glow plugs project slightly beyond the gasket surface.***

1.3.2 Removing cylinder head - engine code CAPA

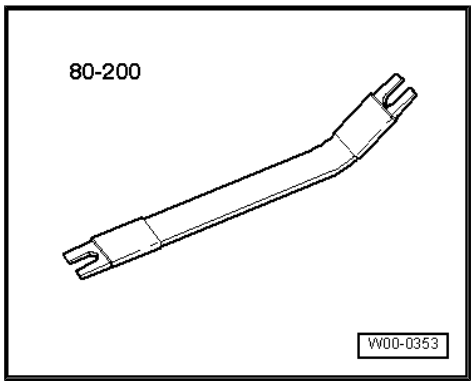
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Special tools and workshop equipment required

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- Counterhold tool - 3036-
- Puller - T10320-
- Puller - T40064-
- Removal lever - 80 - 200-



Removing

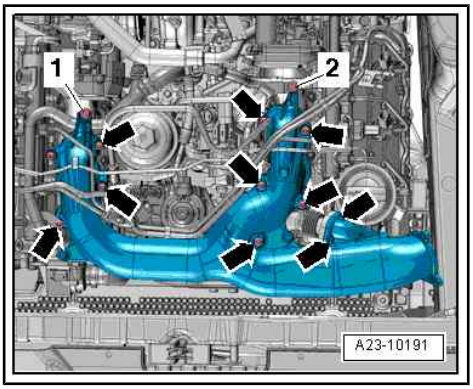
– Drain coolant ⇒ page 353 .

– Remove timing chain from camshaft on relevant side ⇒ page 264 .

– Remove relevant intermediate pipe: left-side ⇒ page 631 ; right-side ⇒ page 633 .

– Remove intake manifold (top section) ⇒ page 483 .

– Remove relevant cylinder head cover: left-side ⇒ page 216 ; right-side ⇒ page 221 .



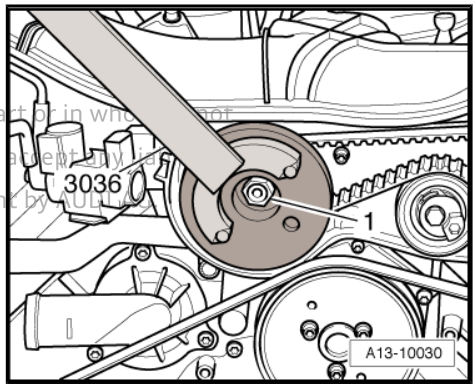
Cylinder head (left-side):

– Remove toothed belt for high-pressure pump ⇒ page 533 .

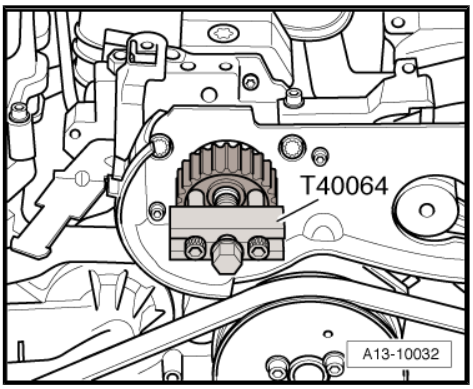
– Unscrew nut -1- for high-pressure pump shaft using counter-hold tool - 3036- .

– Remove damper weight.

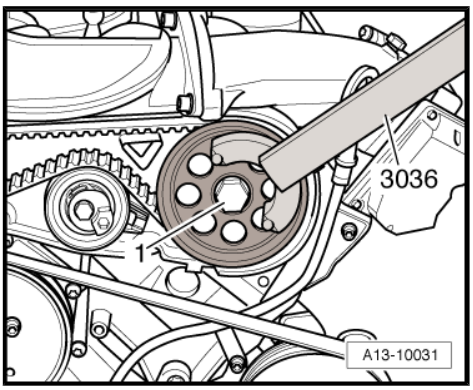
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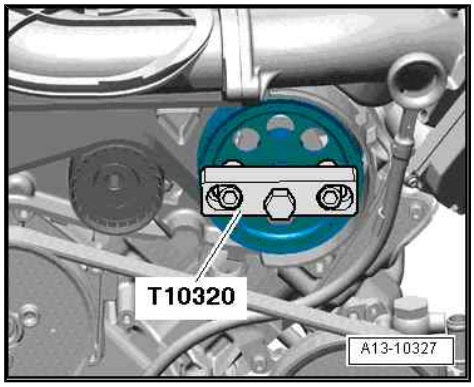
– Remove toothed belt sprocket for high-pressure pump using puller - T40064- .



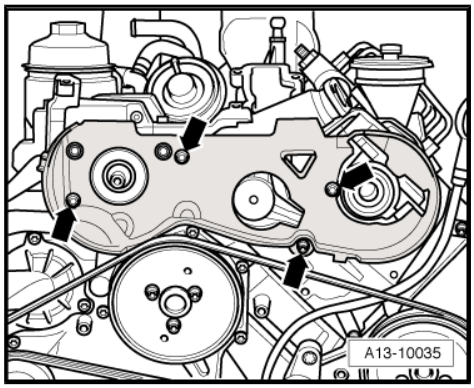
– Loosen bolt -1- for toothed belt drive sprocket approx. 2 turns using counterhold tool - 3036- .



– Remove toothed belt drive sprocket using puller - T10320- .



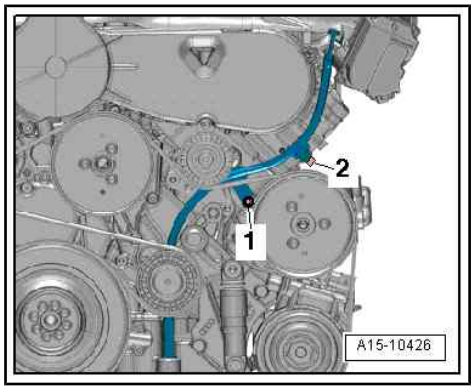
– Unscrew bolts -arrows- and remove toothed belt cover (rear).



– Remove bolt -2- for dipstick guide tube.

Note

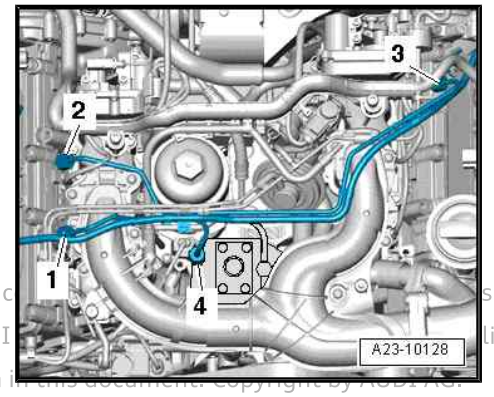
Disregard -item 1-.



– Remove union nuts -2- and -3-, move high-pressure pipe clear and remove.

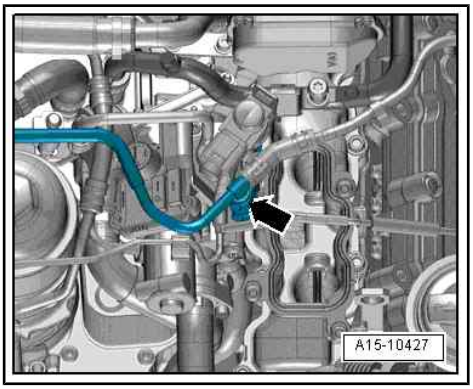
Note

Disregard items -1 and 4-.



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– Detach T-piece from coolant bleeder hose -arrow-.

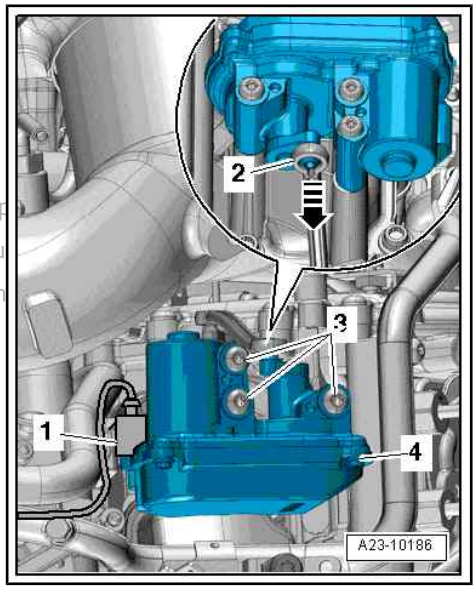


– Unplug electrical connector -1- at intake manifold flap motor 2 - V275- -item 4-.

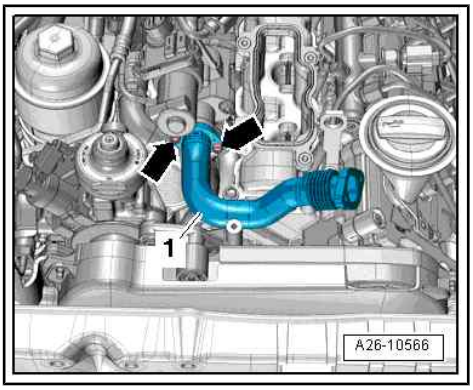
Note

Disregard -items 2, 3- and -arrow-.

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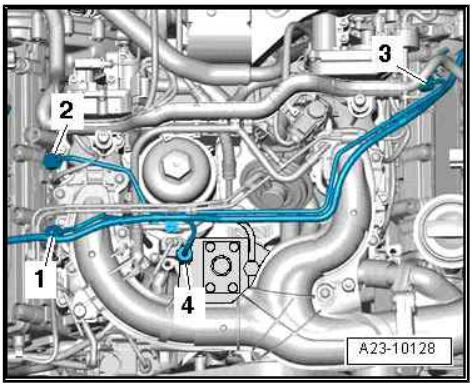
– Unscrew bolts -arrows- and remove connecting pipe -1- for exhaust gas recirculation.



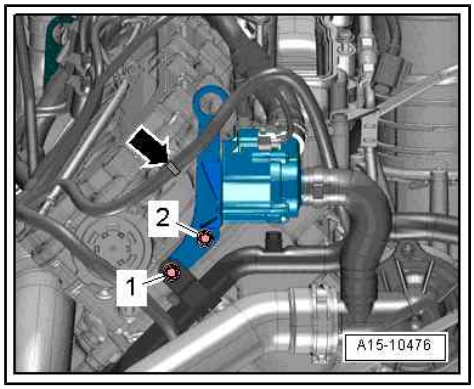
Cylinder head (right-side):

– Remove coolant pipe (top right) ⇒ page 395 .

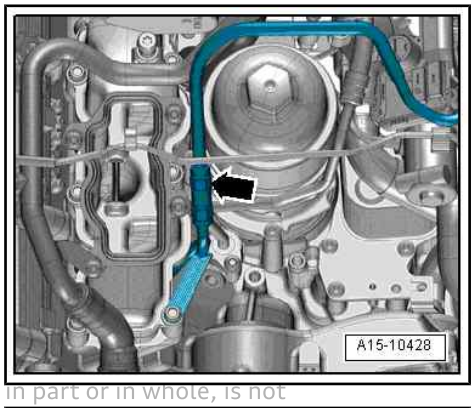
– Unscrew union nuts -1 ... 4- and detach high-pressure pipes.



– Remove bolts -1- and -2- for engine lifting eye and pump for exhaust gas recirculation cooler - V400- .
– Use removal lever - 80 - 200- and move wiring harness clear -arrow-.

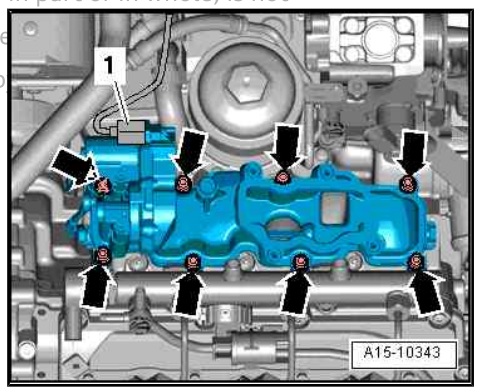


– Disconnect coolant bleeder line -arrow-.
– Unplug electrical connectors at glow plugs for cylinders 2 and 3.



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– Unplug electrical connector -1- at intake manifold flap motor - V157- .



Note

Disregard -arrows-.

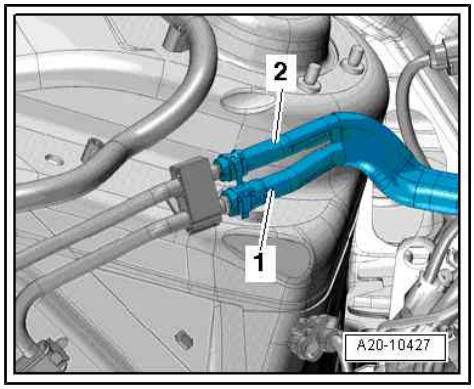
Note

Lay a cloth under the connection to catch escaping fuel.

Caution

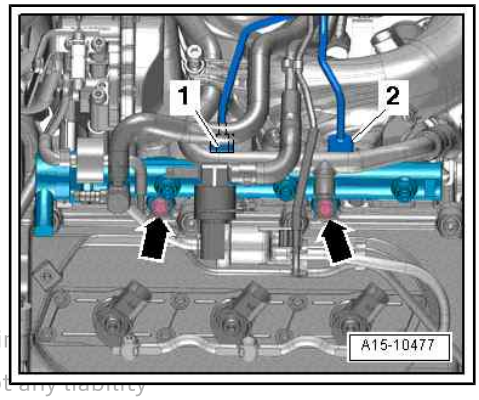
Protect fuel system against contamination.

- ***Rules for cleanliness when working on the injection system*** ⇒ page 9 .



– Disconnect fuel supply hose -1- and fuel return hose -2-.

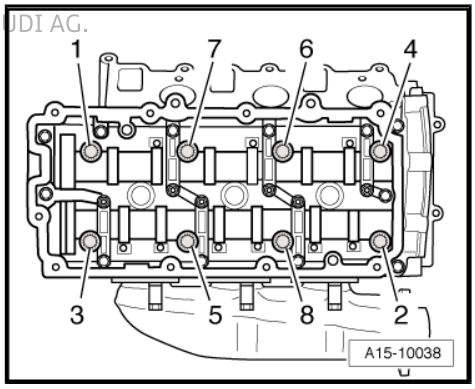
– Loosen union nuts -1- and -2-.
– Remove bolts -arrows- and move fuel rail to one side (fuel hoses remain connected).



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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.***

1.3.3 Installing cylinder head

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

- Tightening torques
⇒ “1.1 Exploded view - cylinder head”, page 197

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

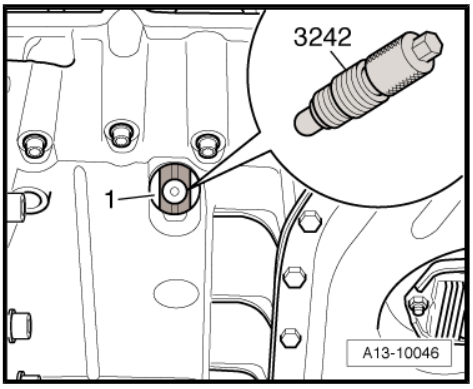
Note

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

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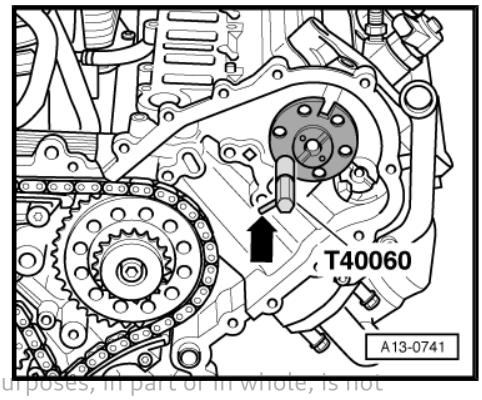
– Before installing cylinder head, set crankshaft and camshafts to “TDC”:

• Locking pin - 3242- must be screwed in with crankshaft at “TDC” position -1-.



• The camshafts on both cylinder heads must be locked with 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.

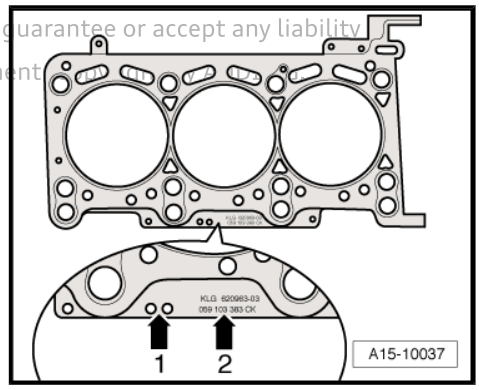


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– Note cylinder head gasket identification:

1 - Holes

2 - Part number



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 193 .*

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

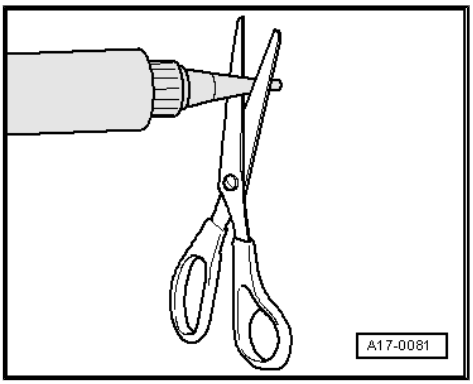
– Clean surfaces; they must be free of oil and grease.

Note

♦ *Note the use-by date of the sealant.*

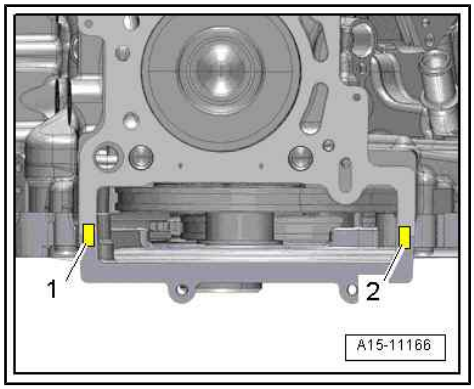
♦ *Cut off nozzle of tube at front marking (nozzle ∅ approx. 5 mm).*

♦ *After applying sealant, components must be installed and secured within 15 minutes.*



Cylinder head (left-side):

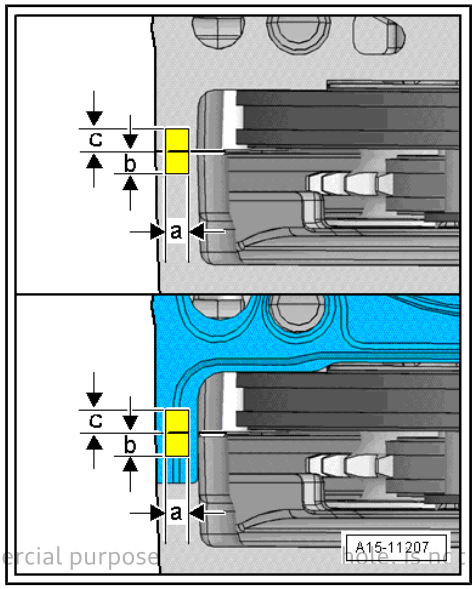
– Apply sealant beads -1- and -2- onto clean sealing surface of cylinder block and timing chain cover (bottom) as illustrated.



– Apply sealant according to dimensions given.

- a = 7 mm
- b = 7 mm
- c = 7 mm

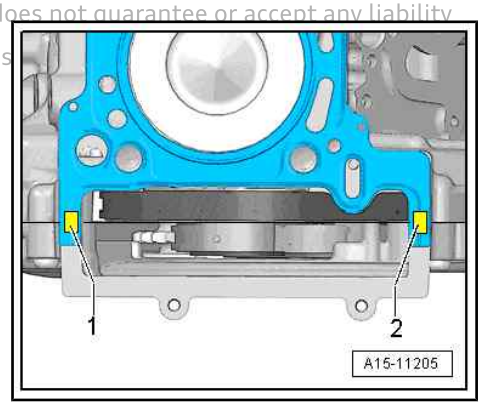
– Place cylinder head gasket in position.



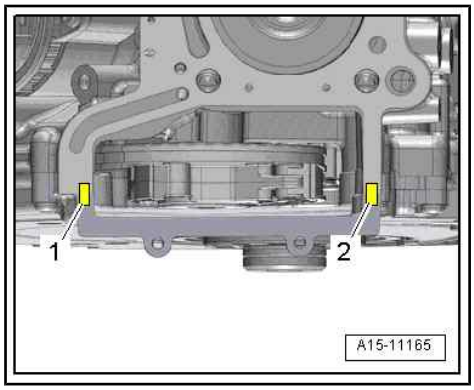
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– Apply sealant beads -1- and -2- onto cylinder head gasket as shown in illustration.

Cylinder head (right-side):



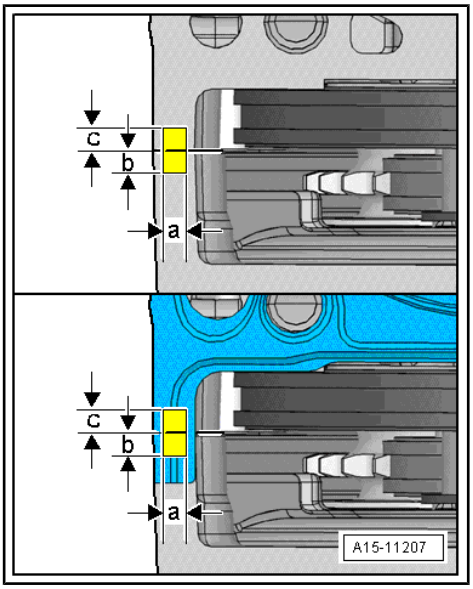
– Apply sealant beads -1- and -2- onto clean sealing surface of cylinder block and timing chain cover (bottom) as illustrated.



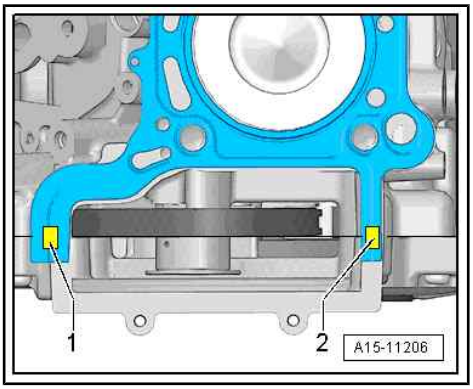
– Apply sealant according to dimensions given.

- a = 7 mm
- b = 7 mm
- c = 7 mm

– Place cylinder head gasket in position.



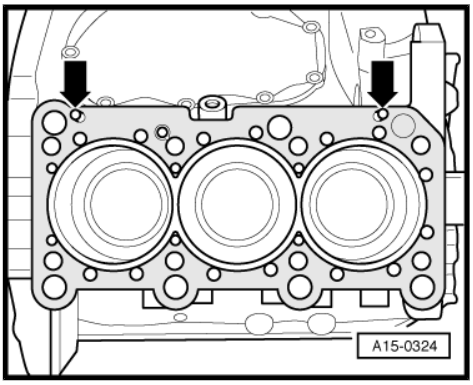
– Apply sealant beads -1- and -2- onto cylinder head gasket as shown in illustration.



Both sides (continued):

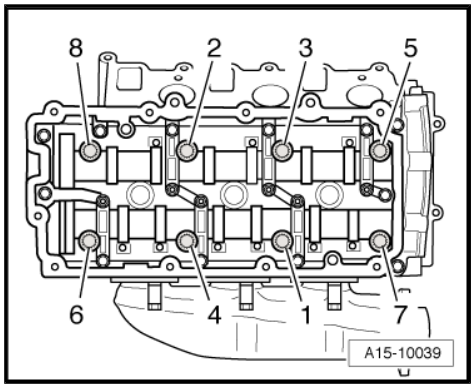
- Pay attention to dowel sleeves -arrows- in cylinder block.
- Installation position of cylinder head gasket: the word “oben” (top) or the part number should face towards the cylinder head.

– Fit cylinder head.



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– Tighten cylinder head bolts ⇒ page 199 .



Note

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

Cylinder head (left-side):

– Engine codes CAMA, CAMB, CCLA, CCWA, CCWB, CGKA, CGKB: Install toothed belt tensioning roller and toothed belt for high-pressure pump ⇒ page 524 .

– Engine code CAPA: Install toothed belt for high-pressure pump ⇒ page 533 .

– Install connecting pipe for exhaust gas recirculation ⇒ page 616 .

– Install dipstick guide tube ⇒ page 323 .

Cylinder head (right-side):

– Install coolant pipe (top right) ⇒ page 395 .

– Install intermediate pipe (right-side) ⇒ page 633 .

Both sides (continued):

– Install high-pressure pipes ⇒ page 507 .

– Install cylinder head cover: left-side ⇒ page 216 ; right-side ⇒ page 221 .

– Install intake manifold (top section) ⇒ page 483 .

– Install camshaft timing chains: engine codes CAMA, CAMB, CCLA, CCWA, CCWB, CGKA, CGKB ⇒ page 269 , engine code CAPA ⇒ page 278 .

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

– Fill cooling system with fresh coolant ⇒ page 357 .

– Check fuel system for leaks ⇒ page 475 .

1.4 Removing and installing cylinder head cover

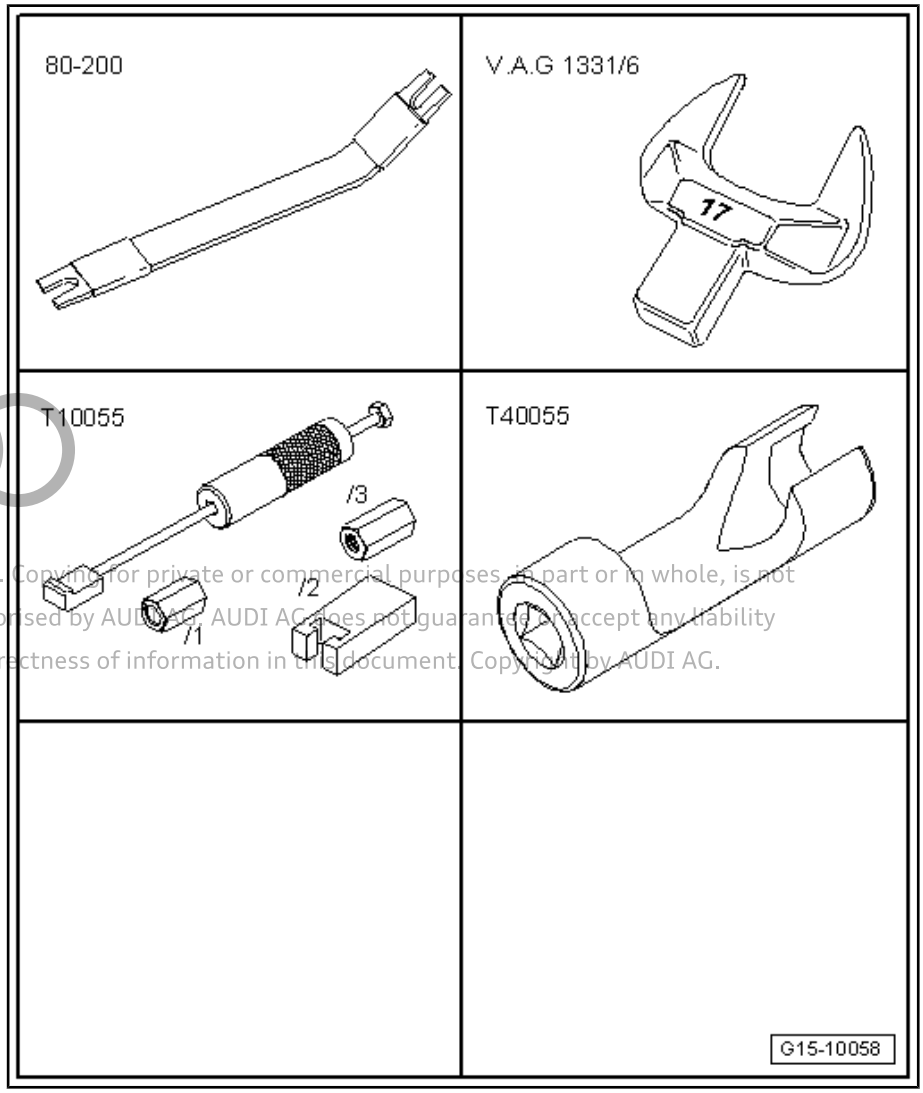
⇒ "1.4.1 Removing and installing cylinder head cover (left-side)", page 216

⇒ "1.4.2 Removing and installing cylinder head cover (right-side)", page 221

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

Special tools and workshop equipment required

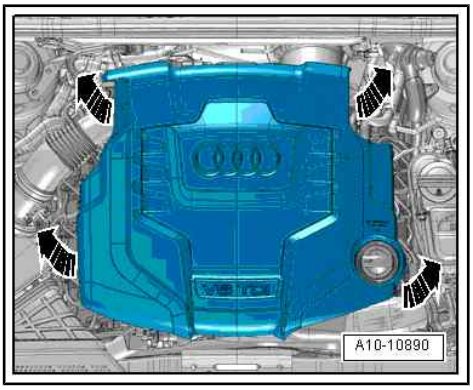


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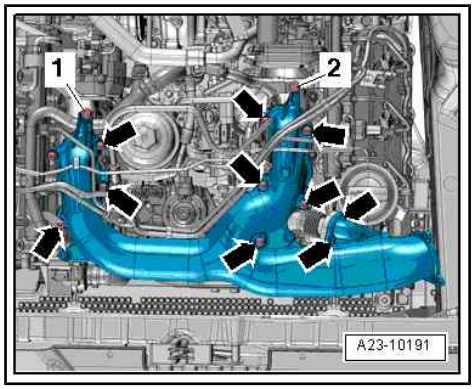
- Removal lever - 80 - 200-
- Open end spanner insert, AF 17 - V.A.G 1331/6-
- Puller - T10055- with -T10055/1-
- Socket - T40055-

Removing

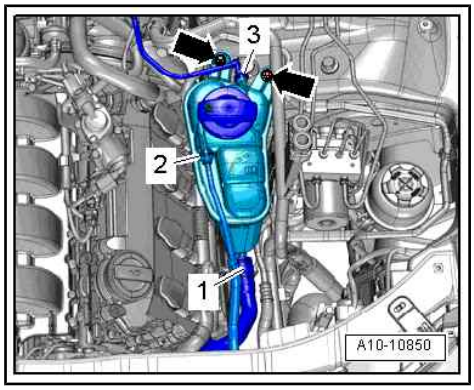
– Remove engine cover panel -arrows-.



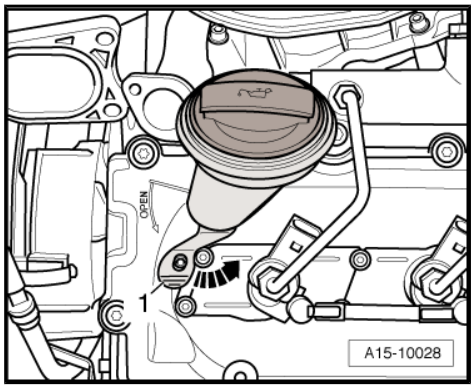
– Remove intake manifold (top section) ⇒ page 483 .



– Disconnect coolant hose -3- from coolant expansion tank.
– Remove bolts -arrows- and move coolant expansion tank to side with coolant hoses -1- and -2- attached.



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

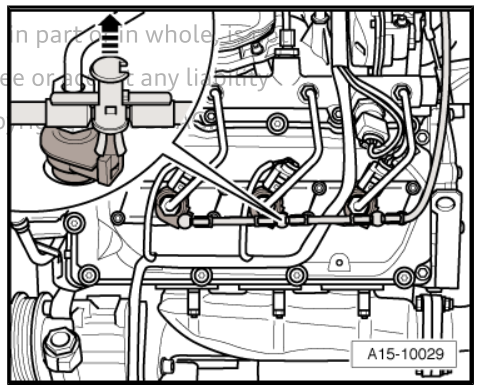


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Caution

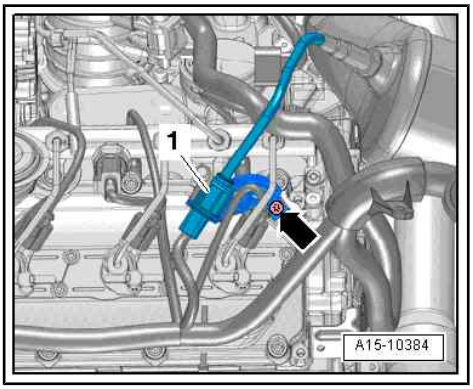
Protect fuel system against contamination.

- ***Rules for cleanliness when working on the injection system ⇒ page 9 .***

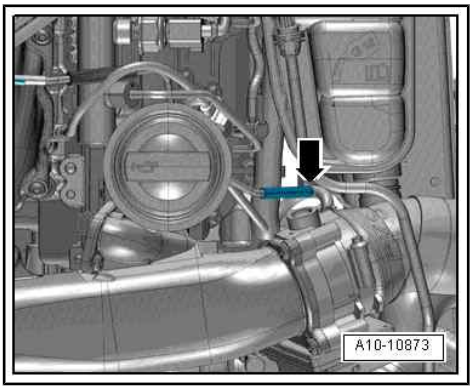


– Pull release pins upwards -arrow- and pull return line connections off injectors.

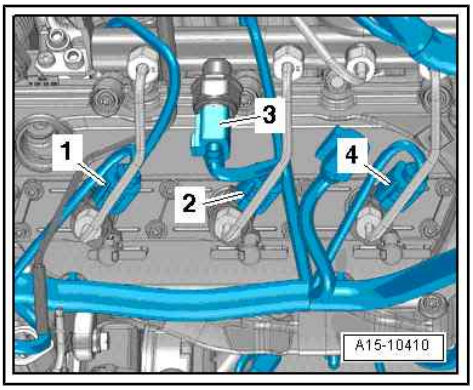
– Remove electrical connector -1- for Lambda probe - G39- from bracket and unplug connector.
– Move electrical wiring clear.
– Remove bolt -arrow- and detach bracket for connector for Lambda probe - G39- .



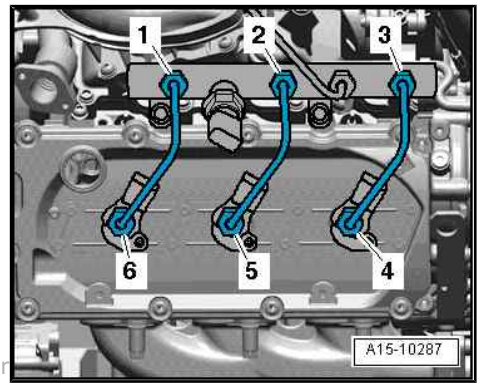
– If fitted, disconnect vacuum line -arrow-.



– Unplug electrical connectors at glow plugs for cylinders 4 and 5.
– Unplug electrical connectors -1 ... 4-.
– Use removal lever - 80 - 200- and move wiring harness clear.

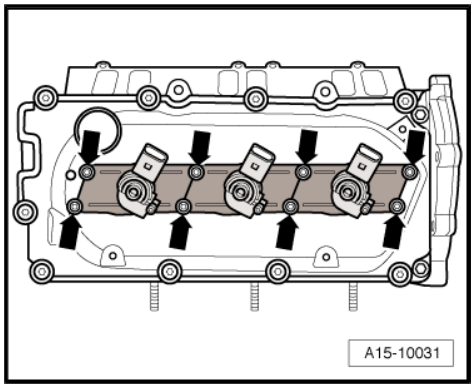


– Mark high-pressure pipes to ensure they are re-connected to the same injectors.
– Loosen union nuts for high-pressure pipes -1 ... 6- using tool insert, AF 17 - V.A.G 1331/6- and socket - T40055- and detach high-pressure pipes.

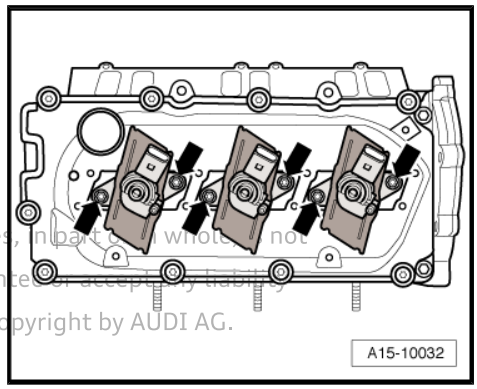


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– Remove bolts -arrows- for cover plates for injectors.
– Pull cover plates upwards and turn through 90°.



– Remove bolts -arrows- for injectors.

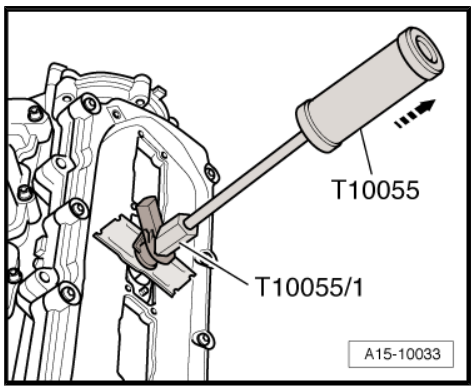


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Caution

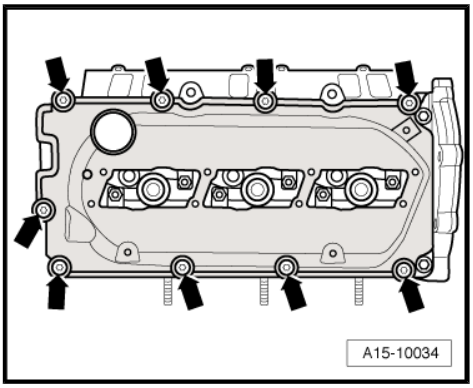
Used injectors must always be re-installed on the same cylinder.

- ***Identify cylinder numbers on corresponding injectors.***



– Pull out injectors using puller - T10055- with adapter - T10055/1- .

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



Installing

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

- Tightening torque
  ⇒ “1.2 Exploded view - cylinder head cover”, page 199

Note

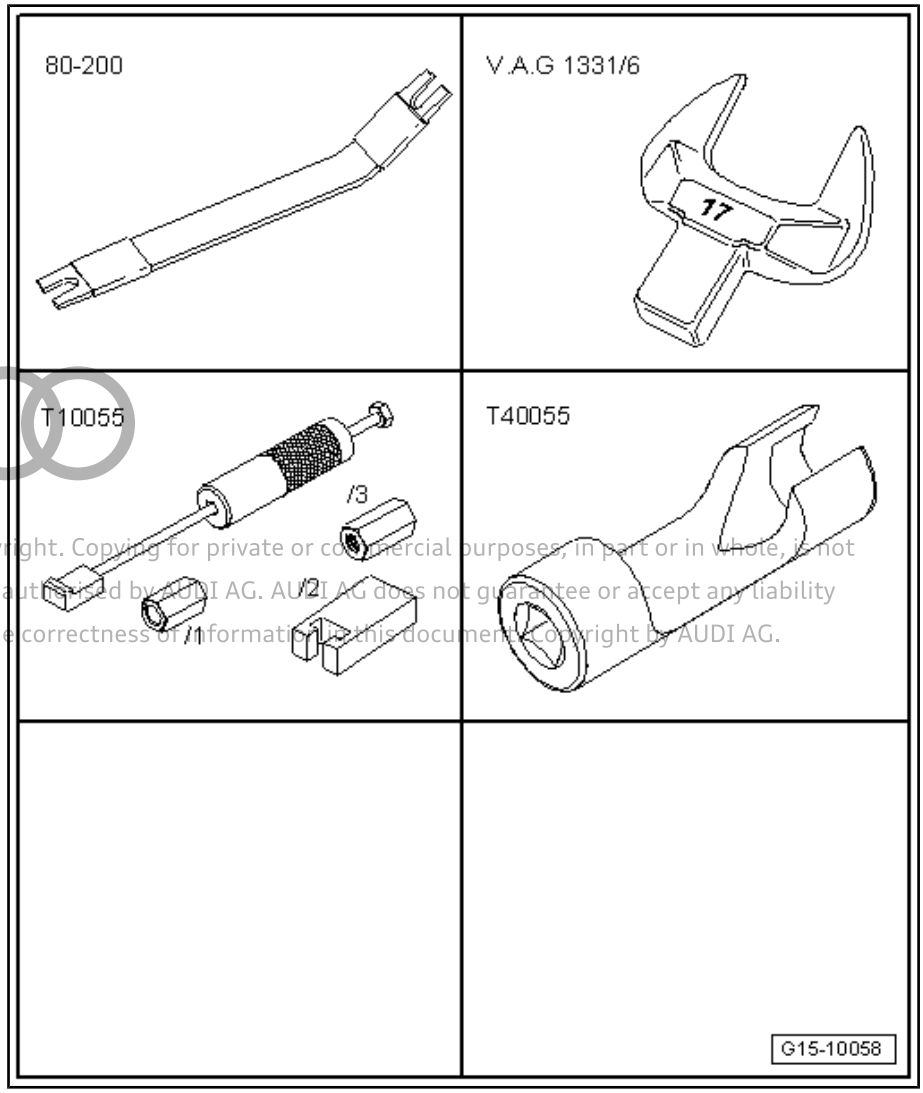
♦ *Renew gasket for cylinder head cover if damaged.*
♦ *Renew bolts for cylinder head cover if seals on bolts are damaged.*

– Clean sealing surfaces; they must be free of oil and grease.
– Tighten cylinder head cover bolts ⇒ page 200 .
– Install injectors and high-pressure pipes ⇒ page 501 .
– Install intake manifold (top section) ⇒ page 483 .
– Check fuel system for leaks ⇒ page 475 .

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

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Special tools and workshop equipment required



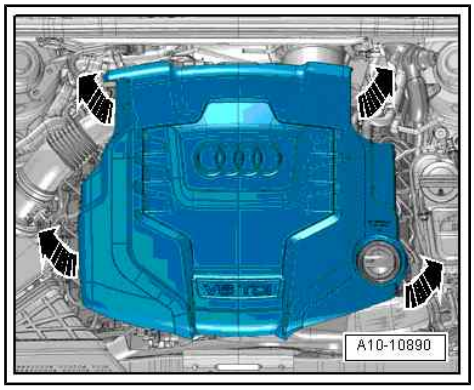
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- Removal lever - 80 - 200-
- Open end spanner insert, AF 17 - V.A.G 1331/6-
- Puller - T10055- with -T10055/1-
- Socket - T40055-

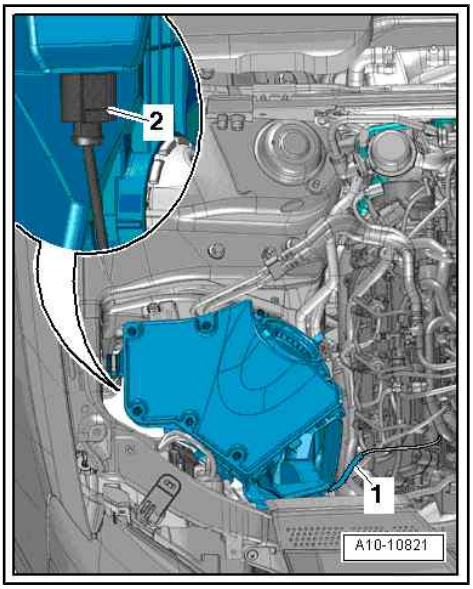
Removing

– Remove engine cover panel -arrows-.

– Disconnect vacuum line -1-.

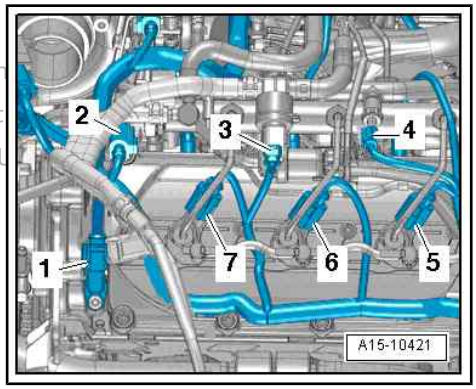


– Remove air cleaner housing ⇒ page 479 .
– Unplug electrical connector at glow plug for cylinder 1.

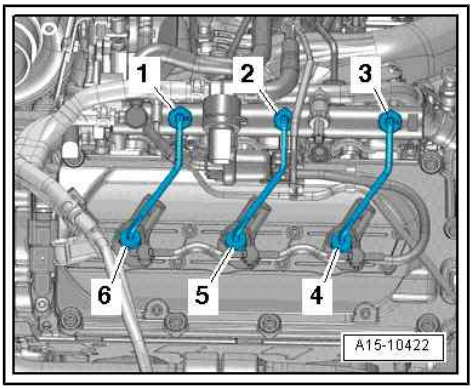


– Unplug electrical connectors -1 ... 7- and use removal lever - 80 - 200- to move electrical wiring clear.

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– Mark high-pressure pipes to ensure they are re-connected to the same injectors.



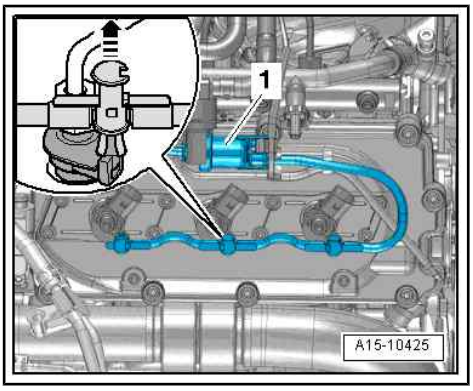
Caution

Protect fuel system against contamination.

- ***Rules for cleanliness when working on the injection system ⇒ page 9 .***

– Loosen union nuts for high-pressure pipes -1 ... 6- using tool insert, AF 17 - V.A.G 1331/6- and socket - T40055- and detach high-pressure pipes.

– Pull release pins upwards -arrow- and pull return line connections off injectors.
– Remove pressure retention valve -1- from retainer and move clear to one side with fuel hoses connected.



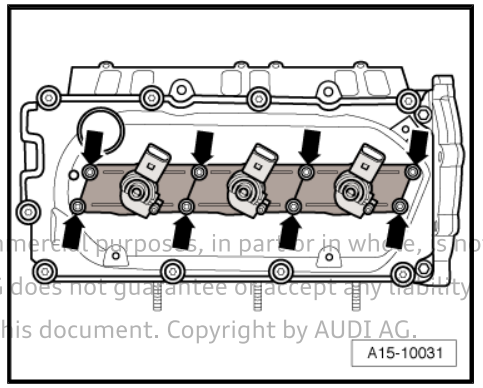
Note

The next illustrations show the left-side cylinder head cover.

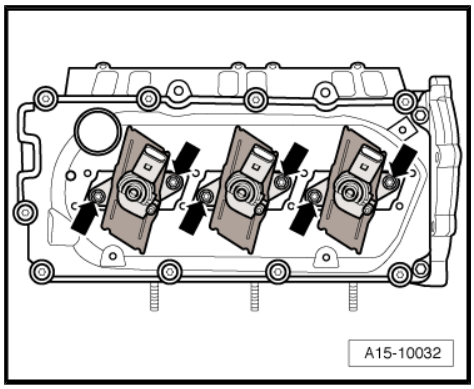
– Remove bolts -arrows- for cover plates for injectors.

– Pull cover plates upwards and turn through 90°.

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– Remove bolts -arrows- for injectors.

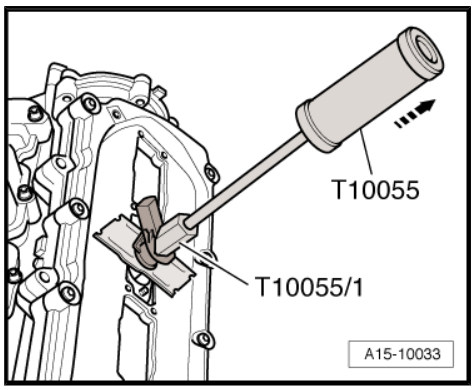


Caution

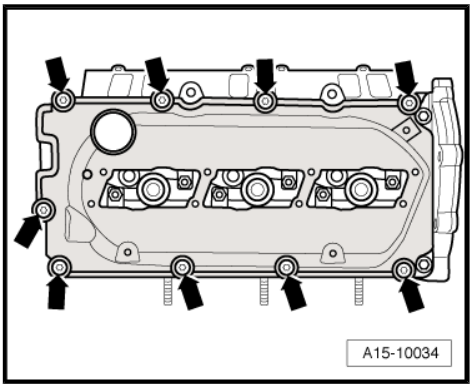
Used injectors must always be re-installed on the same cylinder.

- ***Identify cylinder numbers on corresponding injectors.***

– Pull out injectors using puller - T10055- with adapter - T10055/1- .



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



Installing

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

- Tightening torque
⇒ “1.2 Exploded view - cylinder head cover”, page 199

Note

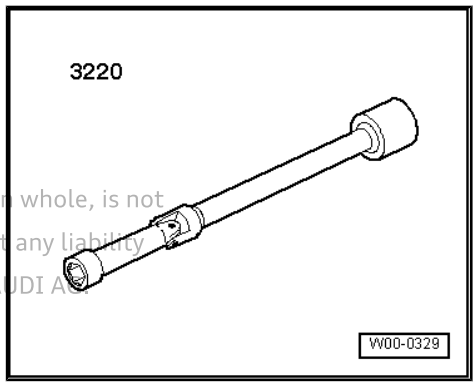
- *Renew gasket for cylinder head cover if damaged.*
- *Renew bolts for cylinder head cover if seals on bolts are damaged.*
- *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ 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.*

– Clean sealing surfaces; they must be free of oil and grease.
– Tighten bolts for cylinder head cover in diagonal sequence and in stages.
– Install injectors, high-pressure pipes, air cleaner housing and exhaust gas pressure sensor 1 - G450- ⇒ page 546 .
– Check fuel system for leaks ⇒ page 475 .

1.5 Checking compression

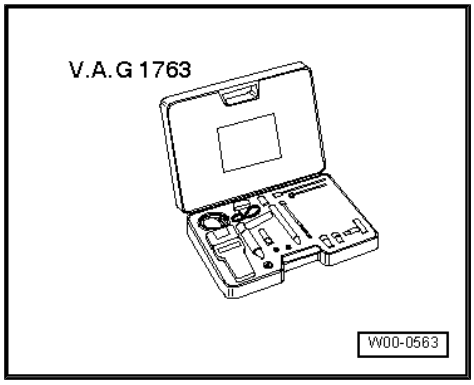
Special tools and workshop equipment required

- Articulated wrench, 10 mm - 3220-



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

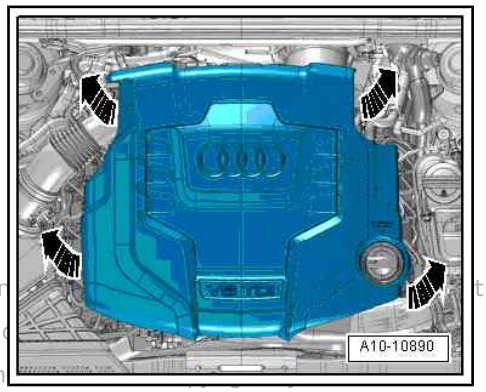


Procedure

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

– Remove engine cover panel -arrows-.

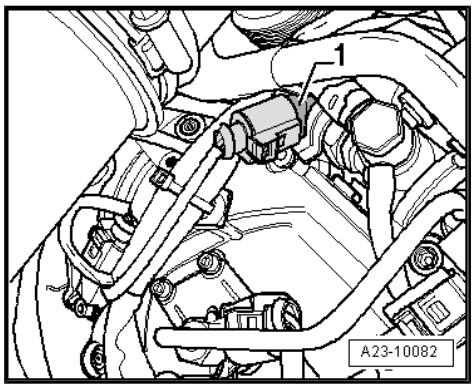
– Unplug electrical connectors on all glow plugs.



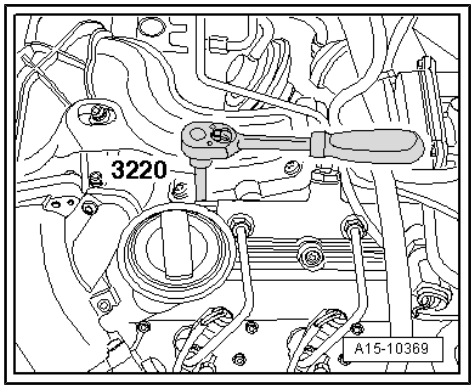
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– Unplug electrical connector at fuel pressure regulating valve - N276- -item 1- at fuel rail (cylinder bank 1, right-side).

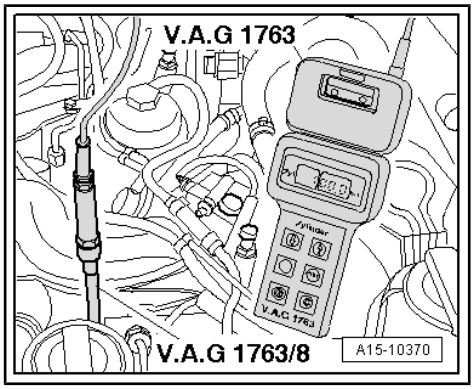
– Briefly start engine to relieve fuel pressure in fuel rail.



– Remove all glow plugs ⇒ page 634 .



– 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

Assembling

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

– Install glow plugs ⇒ page 634 .
– Faults are stored in the engine control unit due to electrical connectors being unplugged and the engine being started: “Interrogate event memory” in “Vehicle self-diagnosis” ⇒ Vehicle diagnostic tester.

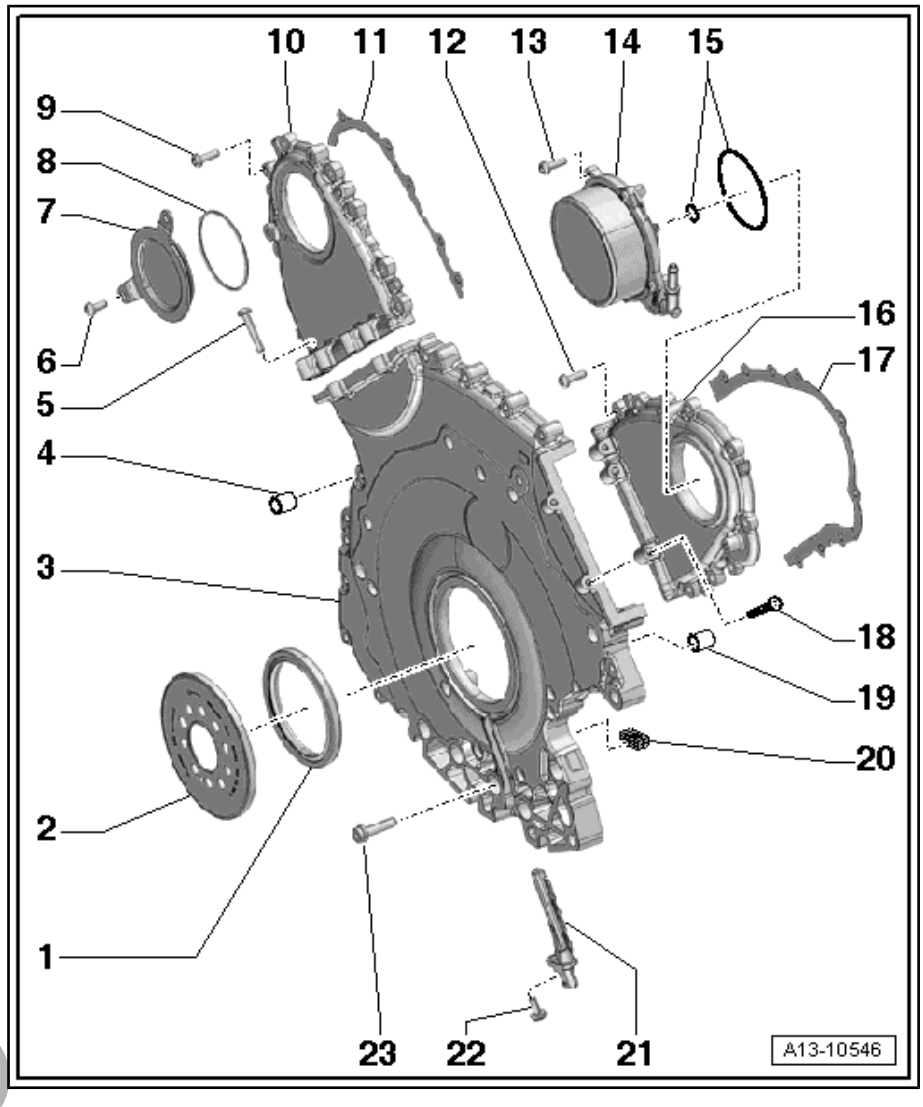
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2 Timing chain cover

⇒ “2.1 Exploded view - timing chain cover”, page 228

⇒ “2.2 Removing and installing timing chain cover”, page 230

2.1 Exploded view - timing chain cover



1 - Crankshaft oil seal (gearbox end)

- ❑ Removing and installing ⇒ page 180

2 - Sender wheel

- ❑ For engine speed sender - G28-

3 - Timing chain cover (bottom)

- ❑ Removing and installing ⇒ page 234

4 - Dowel sleeve

- ❑ 2x

5 - Bolt

- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 229

6 - Bolt

- ❑ 9 Nm

7 - Sealing cap

8 - O-ring

- ❑ Renew

9 - Bolt

- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 229

10 - Timing chain cover (left-side)

- ❑ Removing and installing ⇒ page 230

11 - Gasket

- ❑ Renew

12 - Bolt

- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 229

13 - Bolt

- ❑ 9 Nm

14 - Vacuum pump

- ❑ Removing and installing ⇒ Brake system; Rep. gr. 47 ; Vacuum system; Removing and installing vacuum pump

15 - O-rings

- ❑ Renew

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16 - Timing chain cover (right-side)

- ❑ Removing and installing ⇒ page 232

17 - Gasket

- ❑ Renew

18 - Bolt

- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 229

19 - Dowel sleeve

- ❑ 2x

20 - Sealing element

- ❑ 2x

21 - Engine speed sender - G28-

- ❑ Removing and installing ⇒ page 637

22 - Bolt

- ❑ Tightening torque ⇒ page 637

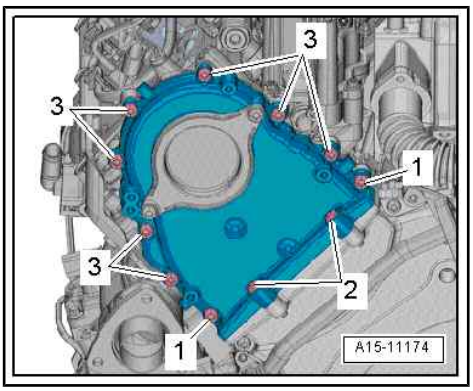
23 - Bolt

- ❑ Tightening torque and sequence ⇒ page 230

Timing chain cover (left-side) - tightening torque and sequence

– Tighten bolts in 4 stages as follows:

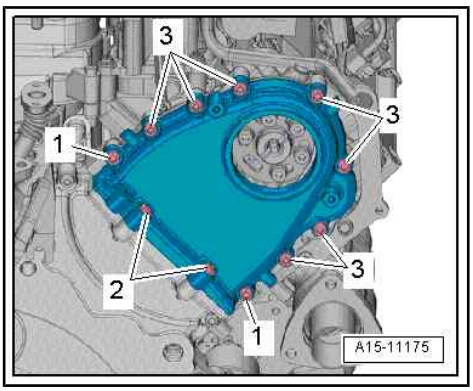
Stage	Bolts	Tightening torque/angle specification
1.	-1-	3 Nm
2.	-2-	9 Nm
3.	-1-	9 Nm
4.	-3-	9 Nm in diagonal sequence



Timing chain cover (right-side) - tightening torque and sequence

– Tighten bolts in 4 stages as follows:

Stage	Bolts	Tightening torque/angle specification
1.	-1-	3 Nm
2.	-2-	9 Nm
3.	-1-	9 Nm
4.	-3-	9 Nm in diagonal sequence

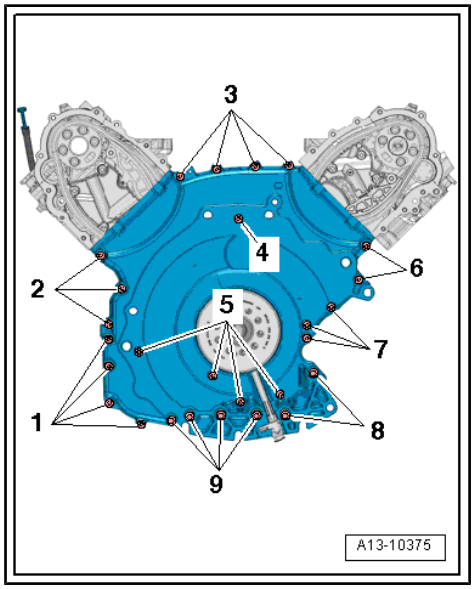


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Timing chain cover (bottom) - tightening torque and sequence

– Tighten bolts for timing chain cover (bottom) in 3 stages as follows:

1. Pre-tighten bolts -1 … 9- to 5 Nm in diagonal sequence starting from inside and working outwards.
2. Tighten bolts -1 … 7- to 9 Nm in diagonal sequence starting from inside and working outwards.
3. Tighten bolts -8- and -9- to 23 Nm.



2.2 Removing and installing timing chain cover

⇒ “2.2.1 Removing and installing timing chain cover (left-side)”, page 230
⇒ “2.2.2 Removing and installing timing chain cover (right-side)”, page 232
⇒ “2.2.3 Removing and installing timing chain cover (bottom)”, page 234

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2.2.1 Removing and installing timing chain cover (left-side)

Special tools and workshop equipment required

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

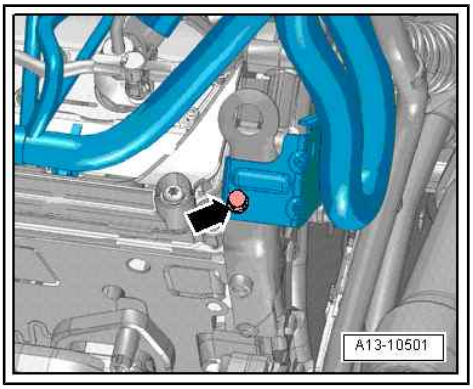
Removing

– Remove particulate filter: A5 up to vehicle identification no. 8T-8-009 998 ⇒ page 578 ; A4 (all), A5 from vehicle identification no. 8T-8-009 999 onwards ⇒ page 580 .

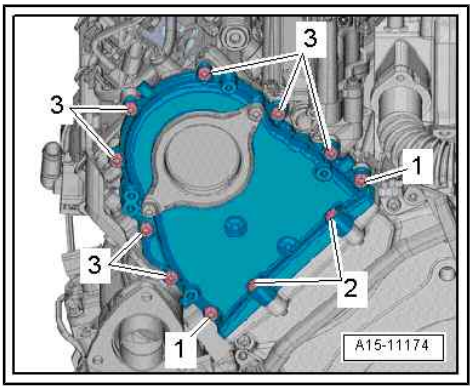
– Remove intermediate pipe (left-side) ⇒ page 631

– Remove coolant pipe (rear left): engine codes CAMA, CAMB, CAPA ⇒ page 390 ; engine codes CCLA, CCWA, CCWB, CGKA, CGKB ⇒ page 391 .

– Remove bolt -arrow- and move bracket with wiring harness to one side.



– Loosen bolts in the sequence -3 ... 1-.
– Carefully release timing chain cover (left-side) from bonded joint and detach.



Installing

– Remove old sealant from grooves on timing chain cover and from sealing surfaces.

Caution

Protect lubrication system against contamination.

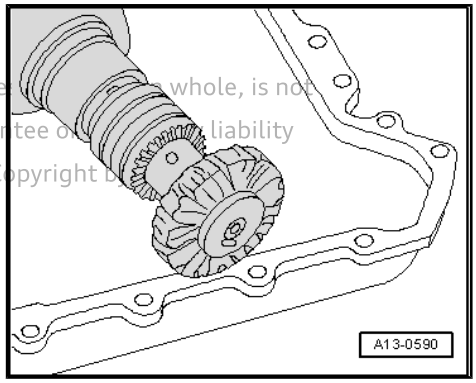
- *Cover exposed parts of the engine.*

WARNING

Risk of eye injury.

- *Put on safety goggles.*

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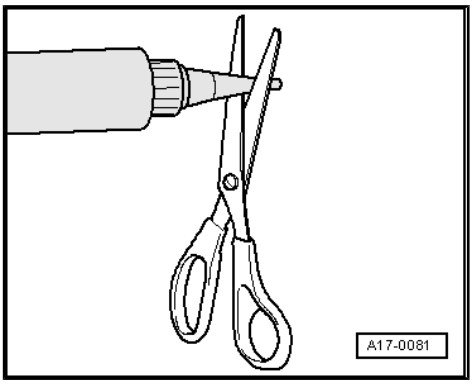


– Remove remaining sealant on timing chain cover and cylinder head using rotating plastic brush or similar.
– Clean sealing surfaces; they must be free of oil and grease.

Note

Note the use-by date of the sealant.

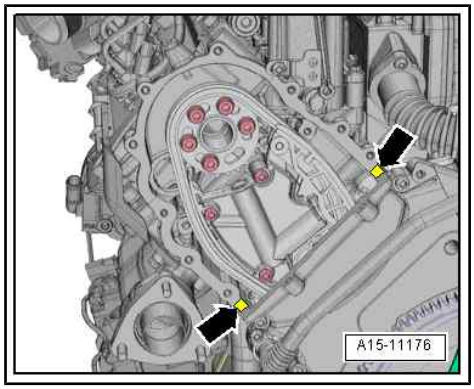
– Cut off nozzle of tube at front marking (nozzle ∅ approx. 1.5 mm).



Caution

Make sure lubrication system is not clogged by excess sealant.

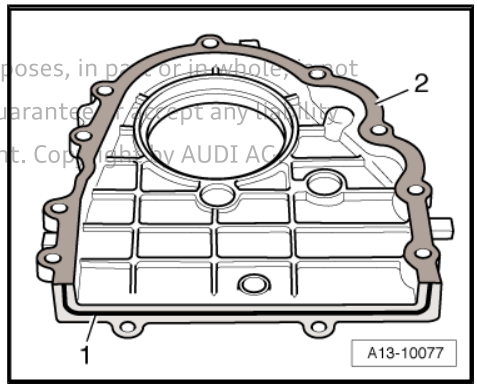
- ***The sealant bead must not be thicker than specified.***



– Apply a bead of sealant (∅ 3 mm) at each joint between cylinder head and timing chain cover (bottom) -arrow-, as shown in illustration.

– Apply bead of sealant onto clean sealing surface of timing chain cover (left-side) as illustrated.

- The groove -1- on the sealing surface must be completely filled with sealant.
- The bead of sealant must project 1.5 … 2.0 mm above the sealing surface.

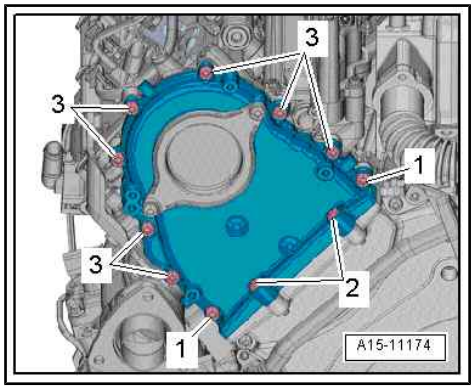


– Fit gasket -2-.

Note

The timing chain cover must be installed within 5 minutes after applying the sealant.

– Install timing chain cover (left-side) and tighten bolts ⇒ page 229 .



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

– Install coolant pipe (rear left): engine codes CAMA, CAMB, CAPA ⇒ page 390 ; engine codes CCLA, CCWA, CCWB, CGKA, CGKB ⇒ page 391 .

– Install intermediate pipe (left-side) ⇒ page 631 .

– Install particulate filter: A5 up to vehicle identification no. 8T-8-009 998 ⇒ page 578 ; A4 (all), A5 from vehicle identification no. 8T-8-009 999 onwards ⇒ page 580 .

2.2.2 Removing and installing timing chain cover (right-side)

Special tools and workshop equipment required

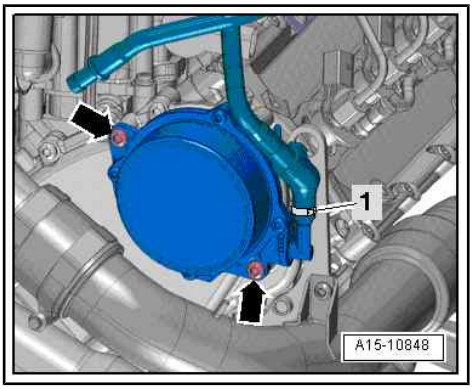
- Electric drill with plastic brush
- Safety goggles
- Sealant ⇒ Electronic parts catalogue

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Removing

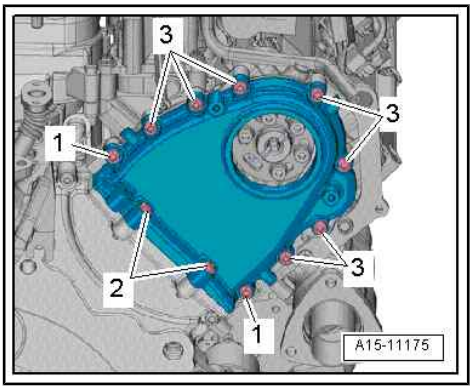
– Remove vacuum pump ⇒ Brake system; Rep. gr. 47 ; Vacuum system; Removing and installing vacuum pump .

– Remove coolant pipe (rear right): engine codes CAMA, CAMB, CAPA ⇒ page 399 ; engine codes CCLA, CCWA, CCWB, CGKA, CGKB ⇒ page 401 .



– Loosen bolts in the sequence -3 ... 1-.

– Carefully release timing chain cover (right-side) from bonded joint and detach.



Installing

– Remove old sealant from grooves on timing chain cover and from sealing surfaces.

Caution

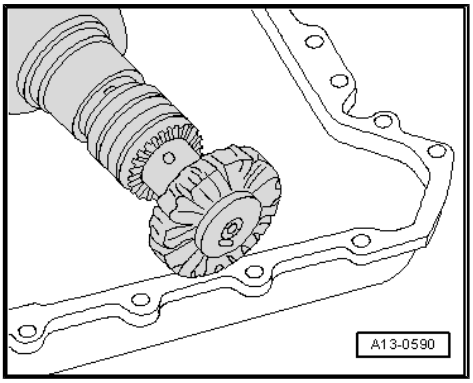
Protect lubrication system against contamination.

- *Cover exposed parts of the engine.*

WARNING

Risk of eye injury.

- *Put on safety goggles.*



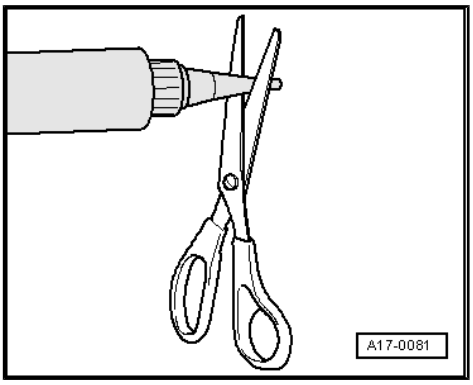
– Remove remaining sealant on timing chain cover and cylinder head using rotating plastic brush or similar.

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

Note

Note the use-by date of the sealant.

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

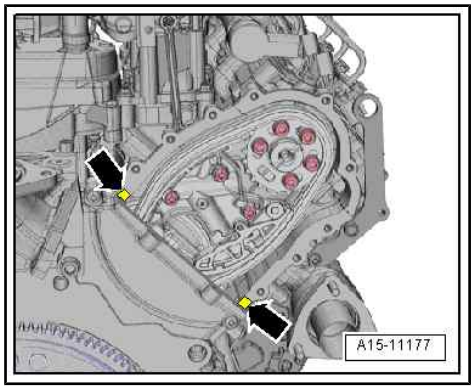


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Caution

Make sure lubrication system is not clogged by excess sealant.

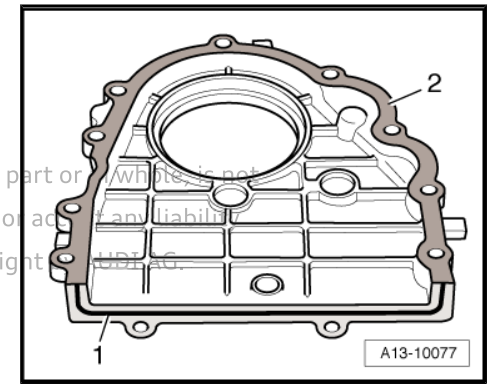
- ***The sealant bead must not be thicker than specified.***



– Apply a bead of sealant (∅ 3 mm) at each joint between cylinder head and timing chain cover (bottom) -arrow-, as shown in illustration.

– Apply bead of sealant onto clean sealing surface of timing chain cover (right-side) as illustrated.

- The groove -1- on the sealing surface must be completely filled with sealant.
- The bead of sealant must project 1.5 ... 2.0 mm above the sealing surface.



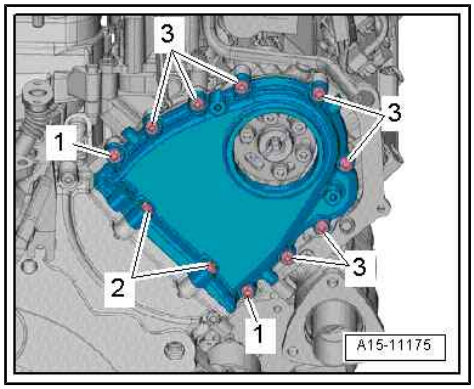
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– Fit gasket -2-.

Note

The timing chain cover must be installed within 5 minutes after applying the sealant.

– Install timing chain cover (right-side) and tighten bolts ⇒ page 229 .



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

– Install coolant pipe (rear right): engine codes CAMA, CAMB, CAPA ⇒ page 399 ; engine codes CCLA, CCWA, CCWB, CGKA, CGKB ⇒ page 401 .

– Install vacuum pump ⇒ Brake system; Rep. gr. 47 ; Vacuum system; Removing and installing vacuum pump .

2.2.3 Removing and installing timing chain cover (bottom)

Special tools and workshop equipment required

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

Removing

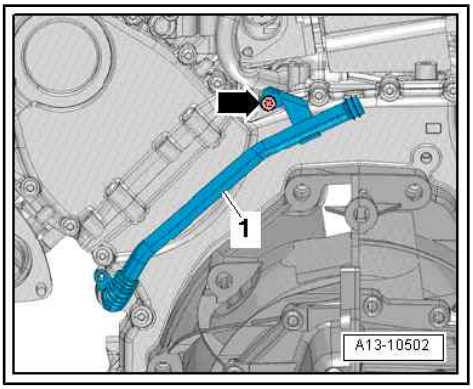
- Gearbox removed

– Remove drive plate ⇒ page 177 .

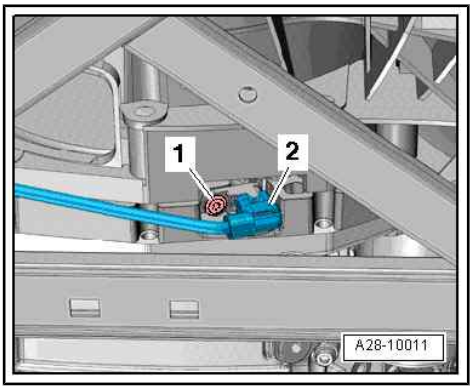
– Remove intermediate pipe with intermediate flange: left-side ⇒ page 631 ; right-side ⇒ page 633 .

– Remove timing chain covers: left-side ⇒ page 230 , right-side ⇒ page 232 .

– Remove bolt -arrow- and detach bottom section of oil return line -1- from cylinder block.



– Unplug electrical connector -2- for engine speed sender - G28- .

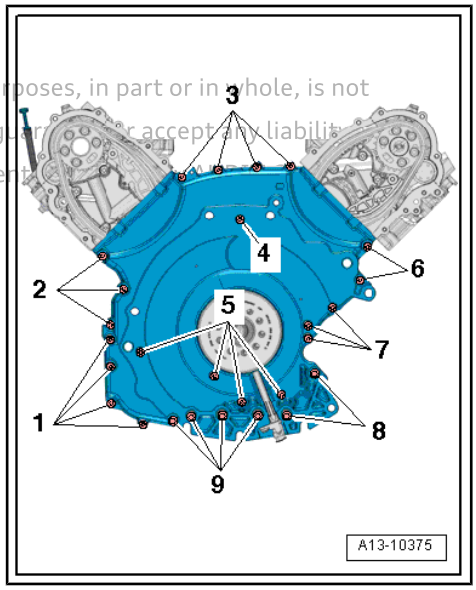


Note

Disregard -item 1-.

– Unscrew bolts -1 ... 9- and remove timing chain cover (bottom).

– Press crankshaft oil seal (gearbox end) out of timing chain cover (bottom).



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Installing

– Remove old sealant from grooves on timing chain cover and from sealing surfaces.

Caution

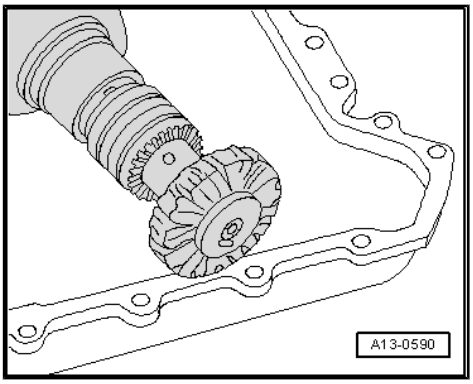
Protect lubrication system against contamination.

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

WARNING

Risk of eye injury.

- ***Put on safety goggles.***



– Remove remaining sealant on timing chain cover (bottom) and on cylinder block using rotating plastic brush or similar.

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

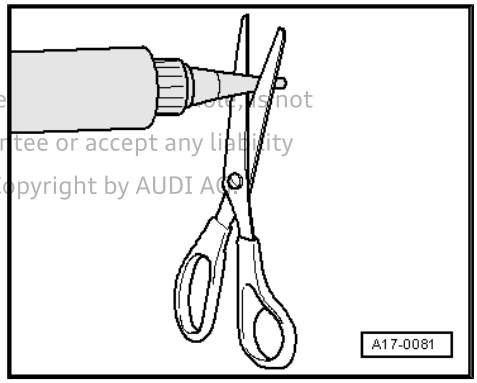
– Before installing gearbox, remove residue from threaded holes for engine/gearbox bolts in cylinder block using a thread tap.

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Note

Note the use-by date of the sealant.

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



– Fit sealing elements -2- and -5-.

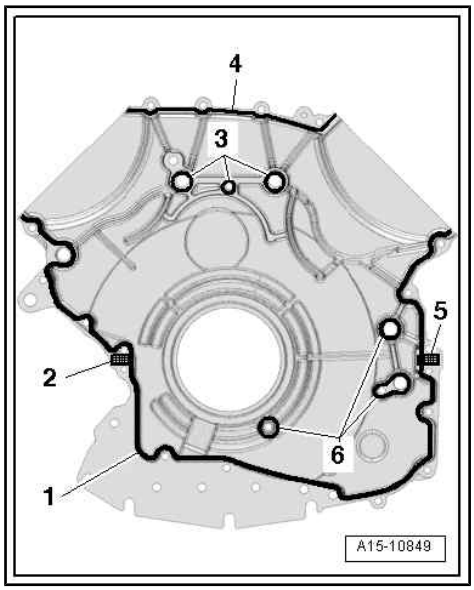
Caution

Make sure lubrication system is not clogged by excess sealant.

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

– Apply sealant beads -1- and -4- onto clean sealing surface of timing chain cover (bottom) as illustrated.

- The grooves on the sealing surfaces must be completely filled with sealant.
- The bead of sealant must project 1.5 … 2.0 mm above the sealing surface.
- The beads of sealant around drillings -3- and -6- 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 230 .

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

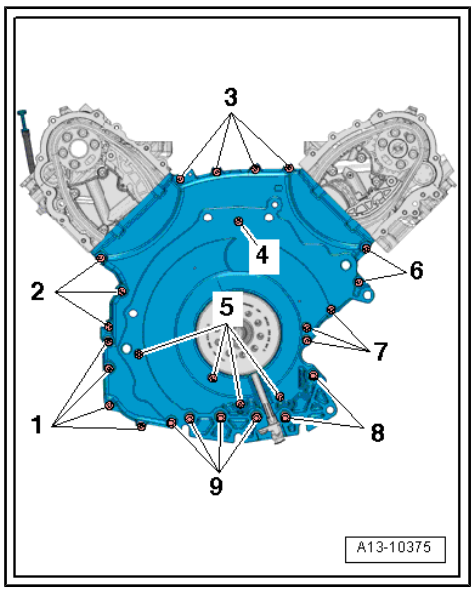
– Install timing chain covers: left-side ⇒ page 230 , right-side ⇒ page 232 .

– Install bottom section of oil return line ⇒ page 420 .

– Install intermediate pipe with intermediate flange: left-side ⇒ page 631 ; right-side ⇒ page 633 .

– Install drive plate ⇒ page 177 .

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



3 Chain drive

⇒ “3.1 Exploded view - camshaft timing chains”, page 237

⇒ “3.2 Exploded view - drive chain for valve gear”, page 242

⇒ “3.3 Exploded view - drive chain for balance shaft and oil pump”, page 245

⇒ “3.4 Exploded view - drive chain for balance shaft”, page 246

⇒ “3.5 Removing and installing camshaft timing chain”, page 247

⇒ “3.6 Removing camshaft timing chain from camshafts”, page 264

⇒ “3.7 Removing and installing drive chain for valve gear”, page 282

⇒ “3.8 Removing and installing drive chain for auxiliary drive”, page 285

3.1 Exploded view - camshaft timing chains

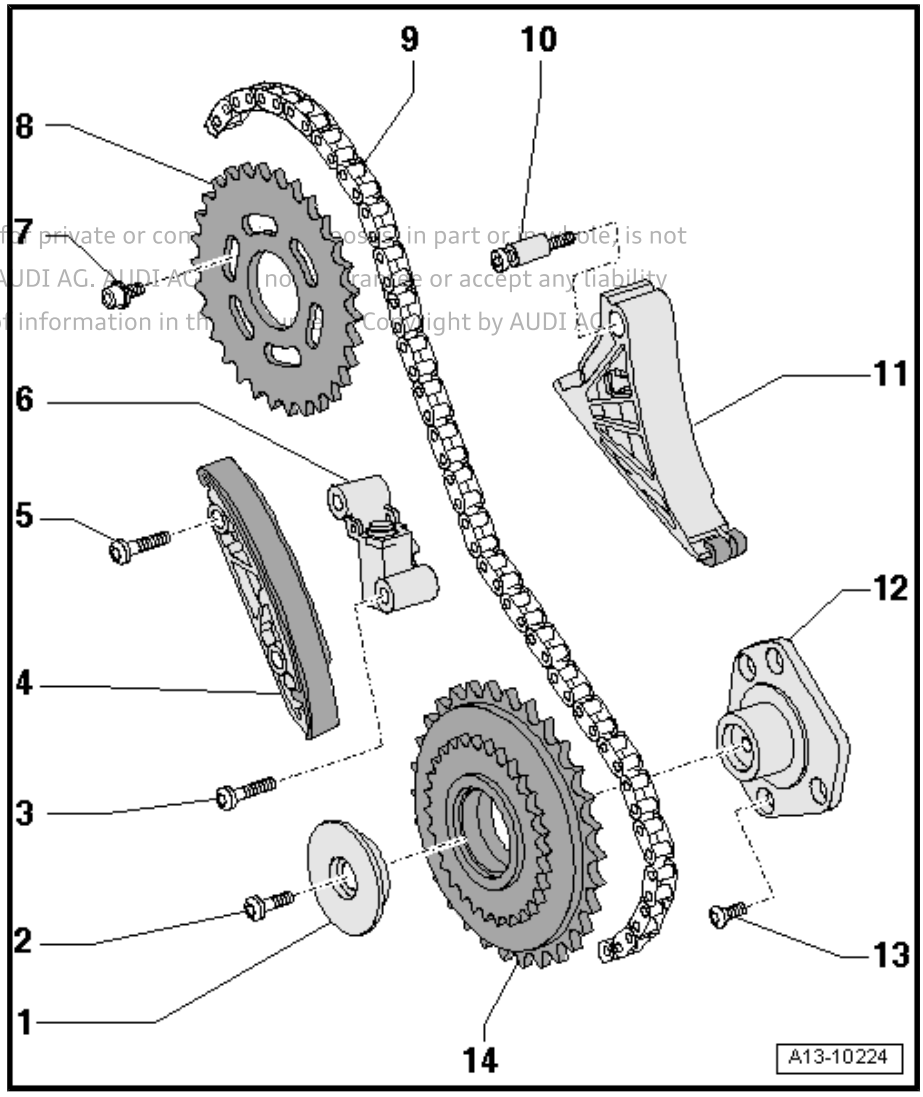
⇒ “3.1.1 Exploded view - camshaft timing chains, engine codes CAMA, CAMB, CCLA, CCWA, CCWB, CGKA, CGKB”, page 237

⇒ “3.1.2 Exploded view - camshaft timing chains, engine code CAPA”, page 240

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3.1.1 Exploded view - camshaft timing chains, engine codes CAMA, CAMB, CCLA, CCWA, CCWB, CGKA, CGKB

Camshaft timing chain (left-side)



1 - Thrust washer
- ❑ For drive chain sprocket

2 - Bolt
- ❑ Tightening torque ⇒ Item 4 (page 242)

3 - Bolt
- ❑ Renew
- ❑ 5 Nm + turn 90° further

4 - Guide rail
- ❑ Note installation position

5 - Bolt
- ❑ Renew
- ❑ 5 Nm + turn 90° further

6 - Chain tensioner
- ❑ For camshaft timing chain (left-side)

7 - Bolt
- ❑ 23 Nm

8 - Camshaft chain sprocket
- ❑ For inlet camshaft
- ❑ Installation position: Side with lettering faces front

9 - Camshaft timing chain (left-side)
- ❑ Removing from camshafts ⇒ page 264
- ❑ Before removing, mark running direction with paint
- ❑ Removing and installing ⇒ page 247

10 - Bolt
- ❑ With sleeve
- ❑ Renew
- ❑ 5 Nm + turn 90° further

11 - Tensioning rail

12 - Mounting bracket
- ❑ For drive chain sprocket

13 - Bolt
- ❑ Tightening torque ⇒ Item 10 (page 242)

14 - Drive chain sprocket
- ❑ For camshaft timing chain (left-side)

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Camshaft timing chain (right-side)

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1 - Bolt

- ❑ Tightening torque ⇒ Item 2 (page 242)

2 - Bearing mounting

- ❑ For drive chain sprocket

3 - Camshaft timing chain (right-side)

- ❑ Removing from camshafts ⇒ page 264
- ❑ Before removing, mark running direction with paint
- ❑ Removing and installing ⇒ page 247

4 - Camshaft chain sprocket

- ❑ For inlet camshaft
- ❑ Installation position: Side with lettering faces front

5 - Bolt

- ❑ 23 Nm

6 - Chain tensioner

- ❑ For camshaft timing chain (right-side)

7 - Bolt

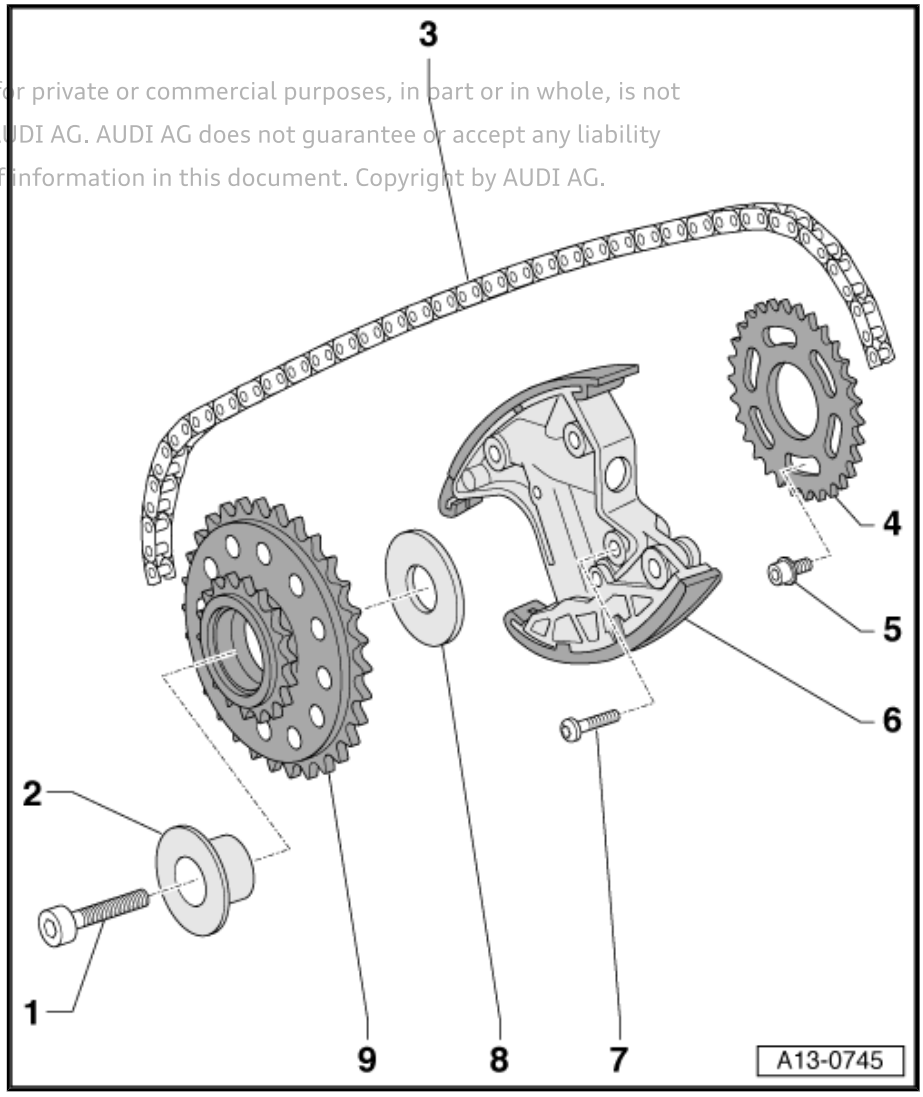
- ❑ Renew
- ❑ 5 Nm + turn 90° further

8 - Thrust washer

- ❑ For drive chain sprocket

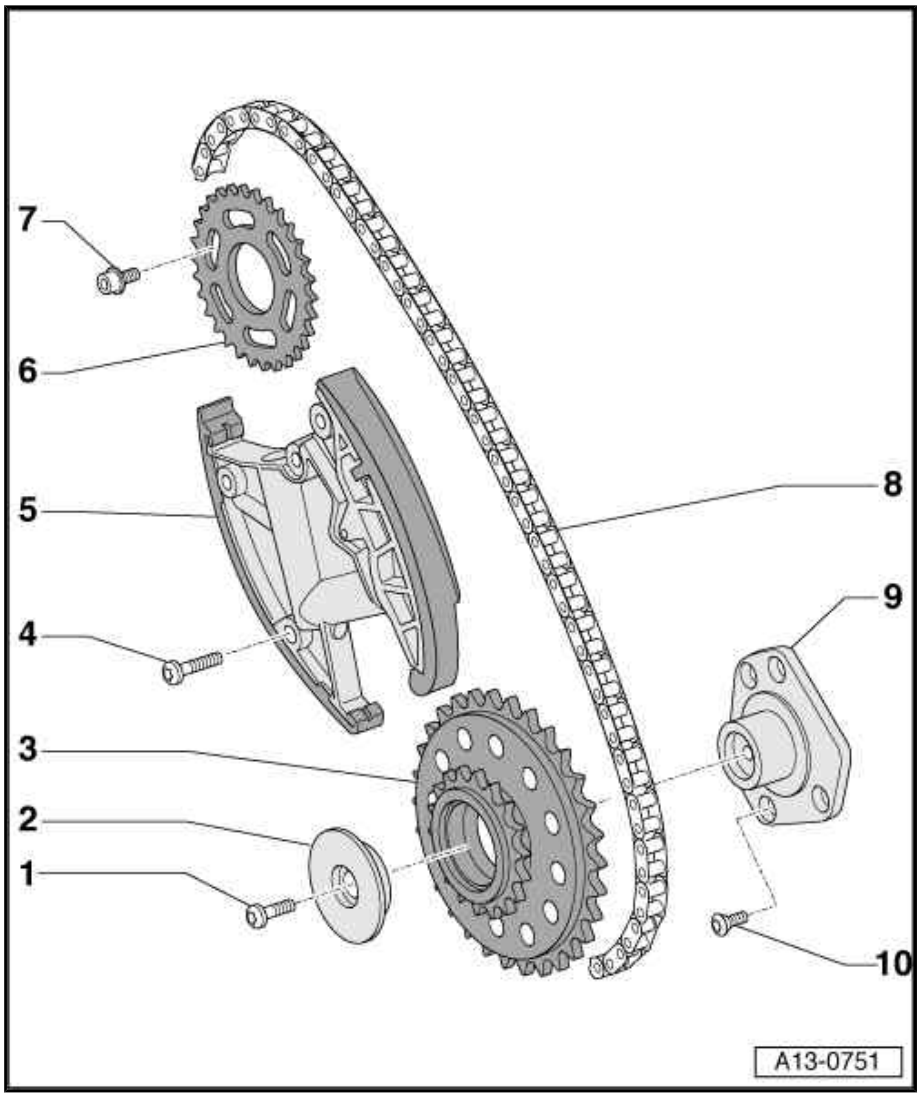
9 - Drive chain sprocket

- ❑ For camshaft timing chain (right-side)



3.1.2 Exploded view - camshaft timing chains, engine code CAPA

Camshaft timing chain (left-side)



1 - Bolt
- ❑ Tightening torque ⇒ Item 4 (page 243)

2 - Thrust washer
- ❑ For drive chain sprocket

3 - Drive chain sprocket
- ❑ For camshaft timing chain (left-side)

4 - Bolt
- ❑ Renew
- ❑ 5 Nm + turn 90° further

5 - Chain tensioner
- ❑ For camshaft timing chain (left-side)

6 - Camshaft chain sprocket
- ❑ For inlet camshaft
- ❑ Installation position: Side with lettering faces gearbox

7 - Bolt
- ❑ 23 Nm

8 - Camshaft timing chain (left-side)
- ❑ Removing from cam-shafts ⇒ page 273
- ❑ Before removing, mark running direction with paint
- ❑ Removing and installing ⇒ page 255

9 - Mounting bracket
- ❑ For drive chain sprocket

10 - Bolt
- ❑ Tightening torque ⇒ Item 11 (page 243)

Camshaft timing chain (right-side)

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1 - Bolt

- ❑ Tightening torque ⇒ Item 2 (page 243)

2 - Bearing mounting

- ❑ For drive chain sprocket

3 - Camshaft timing chain (right-side)

- ❑ Removing from camshafts ⇒ page 273
- ❑ Before removing, mark running direction with paint
- ❑ Removing and installing ⇒ page 255

4 - Camshaft chain sprocket

- ❑ For inlet camshaft
- ❑ Installation position: Side with lettering faces gearbox

5 - Bolt

- ❑ 23 Nm

6 - Chain tensioner

- ❑ For camshaft timing chain (right-side)

7 - Bolt

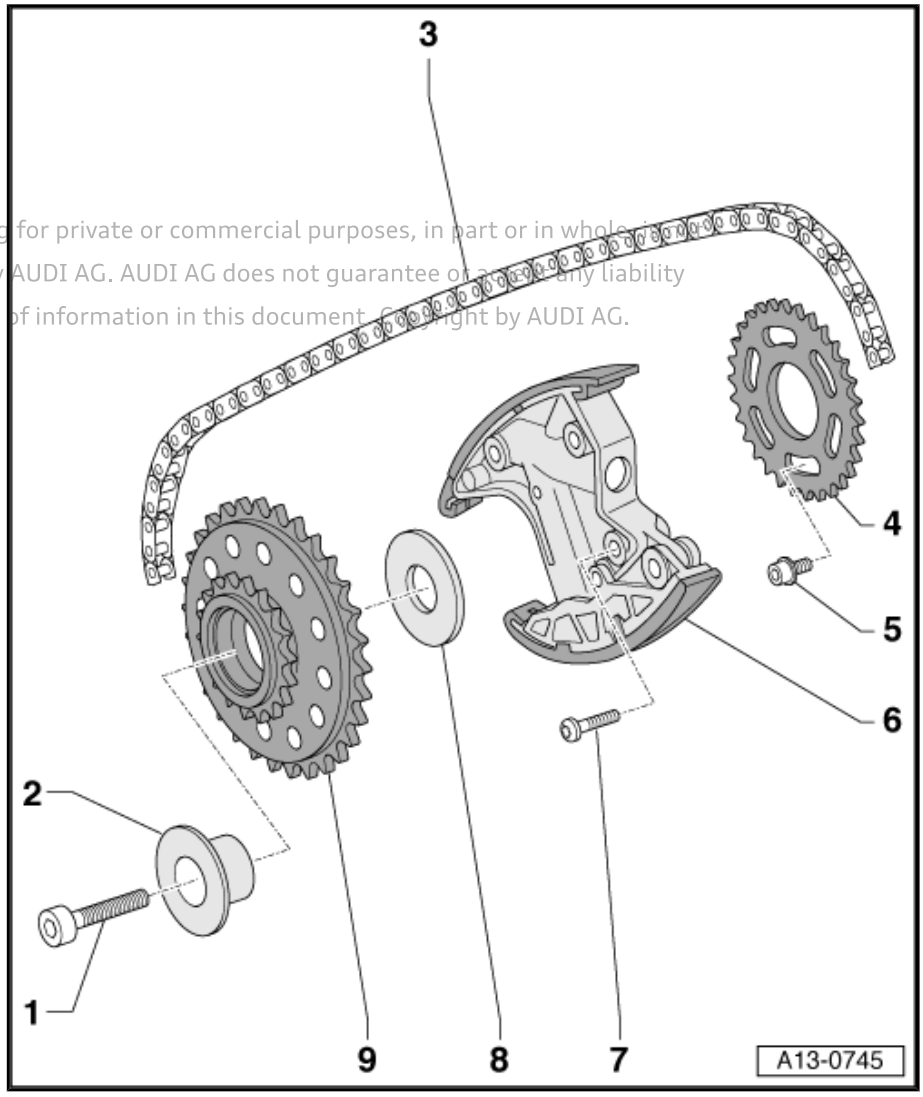
- ❑ Renew
- ❑ 5 Nm + turn 90° further

8 - Thrust washer

- ❑ For drive chain sprocket

9 - Drive chain sprocket

- ❑ For camshaft timing chain (right-side)



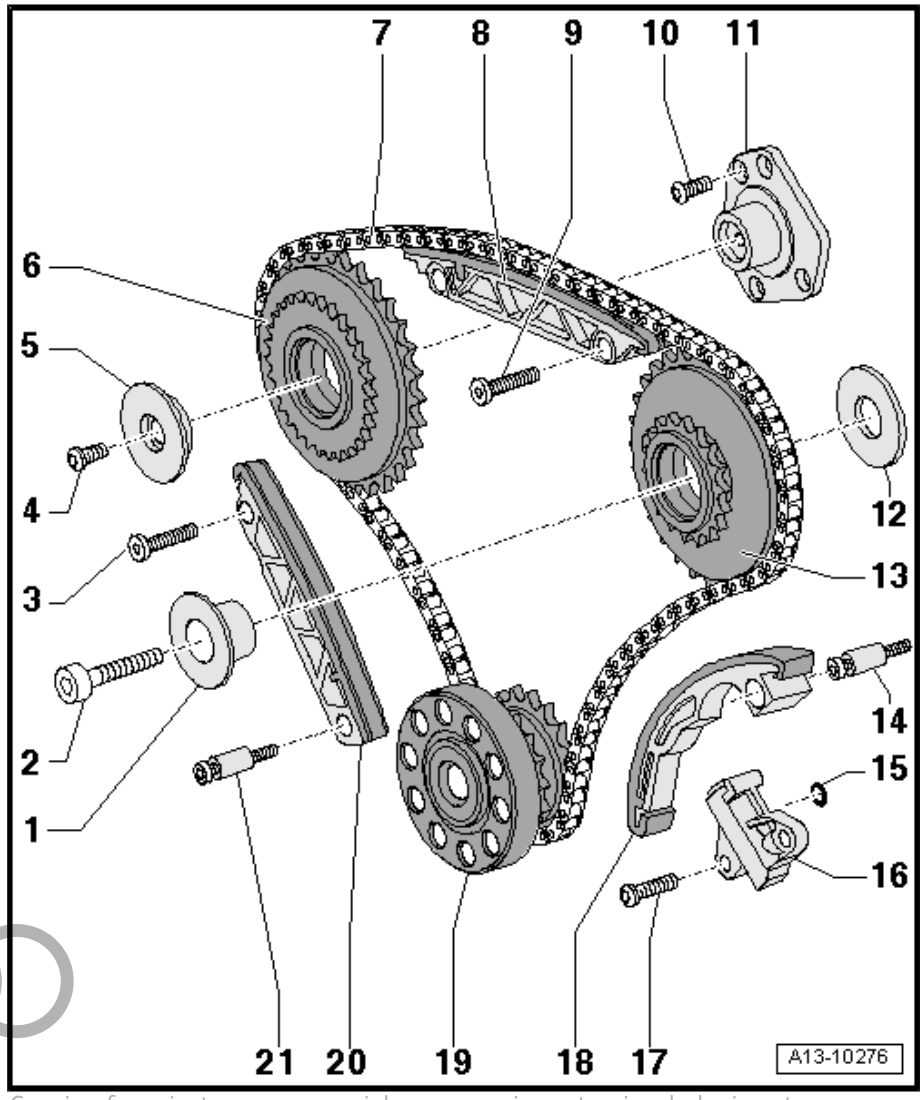
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3.2 Exploded view - drive chain for valve gear

⇒ “3.2.1 Exploded view - drive chain for valve gear, engine codes CAMA, CAMB, CCLA, CCWA, CCWB, CGKA, CGKB”, page 242

⇒ “3.2.2 Exploded view - drive chain for valve gear, engine code CAPA”, page 243

3.2.1 Exploded view - drive chain for valve gear, engine codes CAMA, CAMB, CCLA, CCWA, CCWB, CGKA, CGKB



1 - Bearing mounting for drive sprocket

2 - Bolt
- ❑ 45 Nm

3 - Bolt
- ❑ Renew
- ❑ 5 Nm + turn 90° further

4 - Bolt
- ❑ Renew
- ❑ 5 Nm + turn 90° further

5 - Thrust washer for drive sprocket

6 - Drive sprocket for timing chain (left-side)

7 - Drive chain for valve gear
- ❑ Before removing, mark running direction with paint
- ❑ Removing and installing ⇒ page 282

8 - Guide rail
- ❑ Note installation position

9 - Bolt
- ❑ Renew
- ❑ 5 Nm + turn 90° further

10 - Bolt
- ❑ Renew
- ❑ 5 Nm + turn 90° further

11 - Bearing bracket for drive sprocket

12 - Thrust washer

13 - Drive sprocket for timing chain (right-side)

14 - Pivot pin
- ❑ Apply locking fluid when installing; refer to ⇒ Electronic parts catalogue
- ❑ 12 Nm

15 - O-ring
- ❑ Renew

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16 - Chain tensioner

17 - Bolt
- ❑ 12 Nm

18 - Tensioning rail

19 - Crankshaft
- ❑ With chain sprockets

20 - Guide rail

21 - Pivot pin
- ❑ Apply locking fluid when installing; refer to ⇒ Electronic parts catalogue
- ❑ 12 Nm

3.2.2 Exploded view - drive chain for valve gear, engine code CAPA

1 - Bearing mounting for drive sprocket

2 - Bolt
- ❑ 45 Nm

3 - Bearing mounting
- ❑ Apply locking fluid when installing; refer to ⇒ Electronic parts catalogue
- ❑ 12 Nm

4 - Bolt
- ❑ Renew
- ❑ 5 Nm + turn 90° further

5 - Thrust washer for drive sprocket

6 - Drive chain sprocket
- ❑ For camshaft timing chain (left-side)

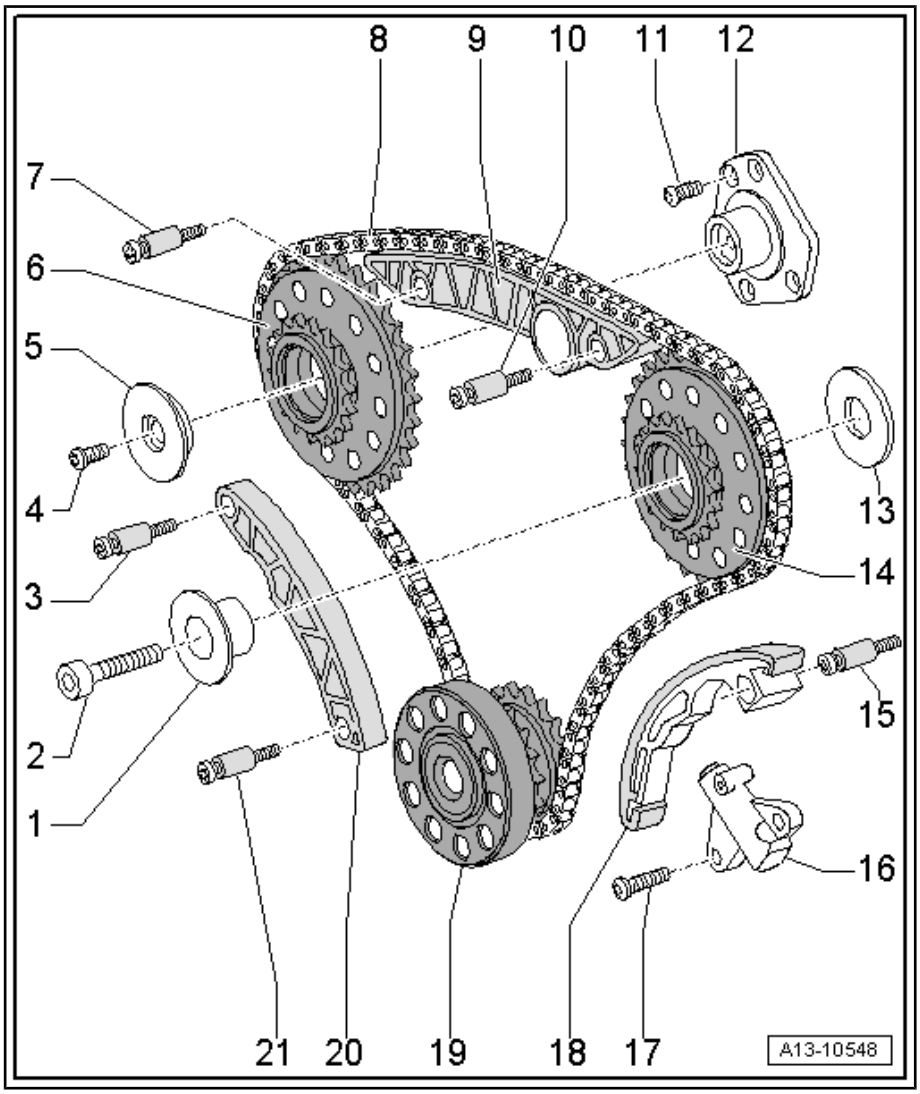
7 - Bearing mounting
- ❑ Apply locking fluid when installing; refer to ⇒ Electronic parts catalogue
- ❑ 12 Nm

8 - Drive chain for valve gear
- ❑ Before removing, mark running direction with paint
- ❑ Removing and installing ⇒ page 284

9 - Guide rail

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

11 - Bolt
- ❑ 9 Nm



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12 - Bearing bracket for drive sprocket

13 - Thrust washer

14 - Drive chain sprocket

- ❑ For camshaft timing chain (right-side)

15 - Bearing mounting

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

16 - Chain tensioner

17 - Bolt

- ❑ 12 Nm

18 - Guide rail for chain tensioner

19 - Crankshaft

20 - Guide rail

- ❑ Note installation position

21 - Pivot pin

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

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3.3 Exploded view - drive chain for balance shaft and oil pump

1 - Drive chain for auxiliary drives

- ❑ Removing and installing ⇒ page 285

2 - Drive chain sprocket for oil pump

- ❑ Installation position: Side with lettering faces engine

3 - Bolt

- ❑ Tightening torque ⇒ Item 13 (page 322)

4 - Thrust washer

5 - Compression spring

6 - Crankshaft

7 - Bolt

- ❑ 23 Nm

8 - Chain sprocket for balance shaft

- ❑ Installation position: Side with lettering faces gearbox

9 - Bolt

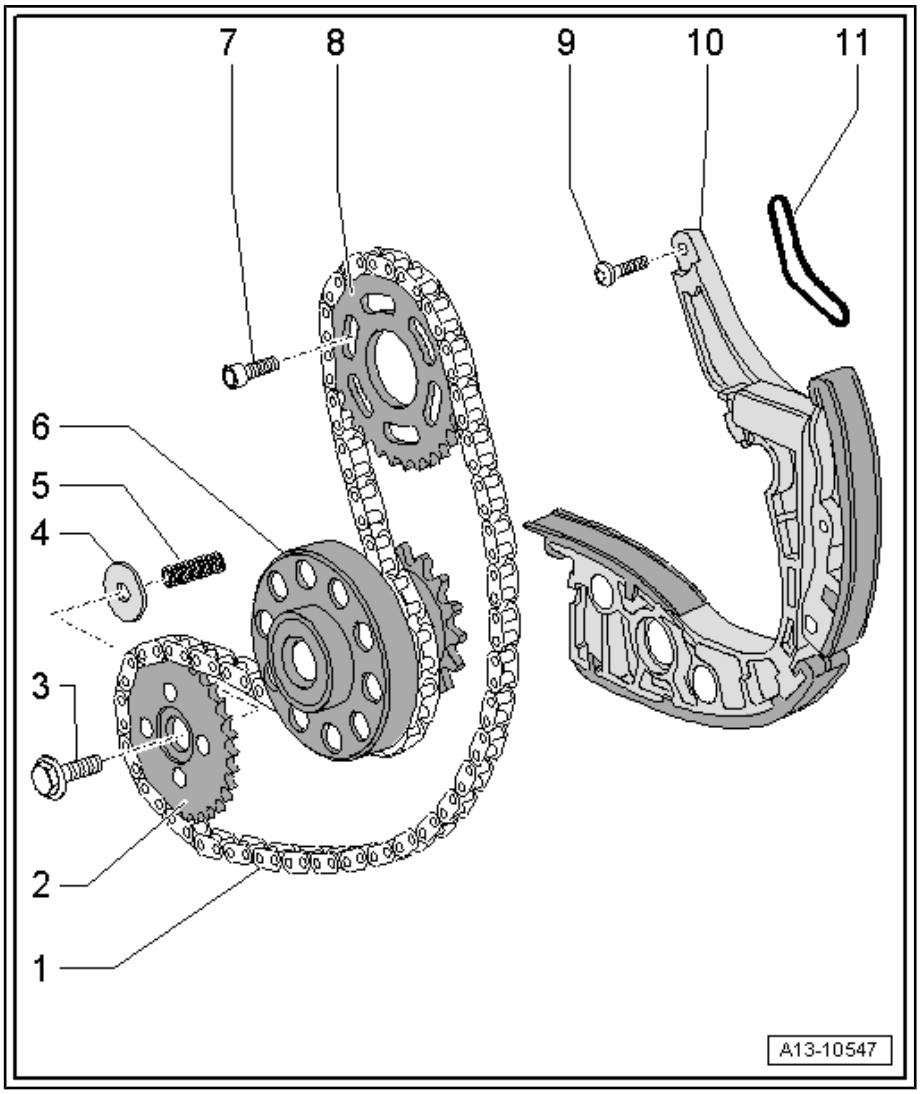
- ❑ 9 Nm

10 - Chain tensioner

- ❑ With guide rail

11 - Gasket

- ❑ Renew



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3.4 Exploded view - drive chain for balance shaft

1 - Sleeve bearing

2 - Bolt

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

3 - Balance weight (gearbox end)

4 - Bolt

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

5 - Bearing plate

6 - Balance weight (pulley end)

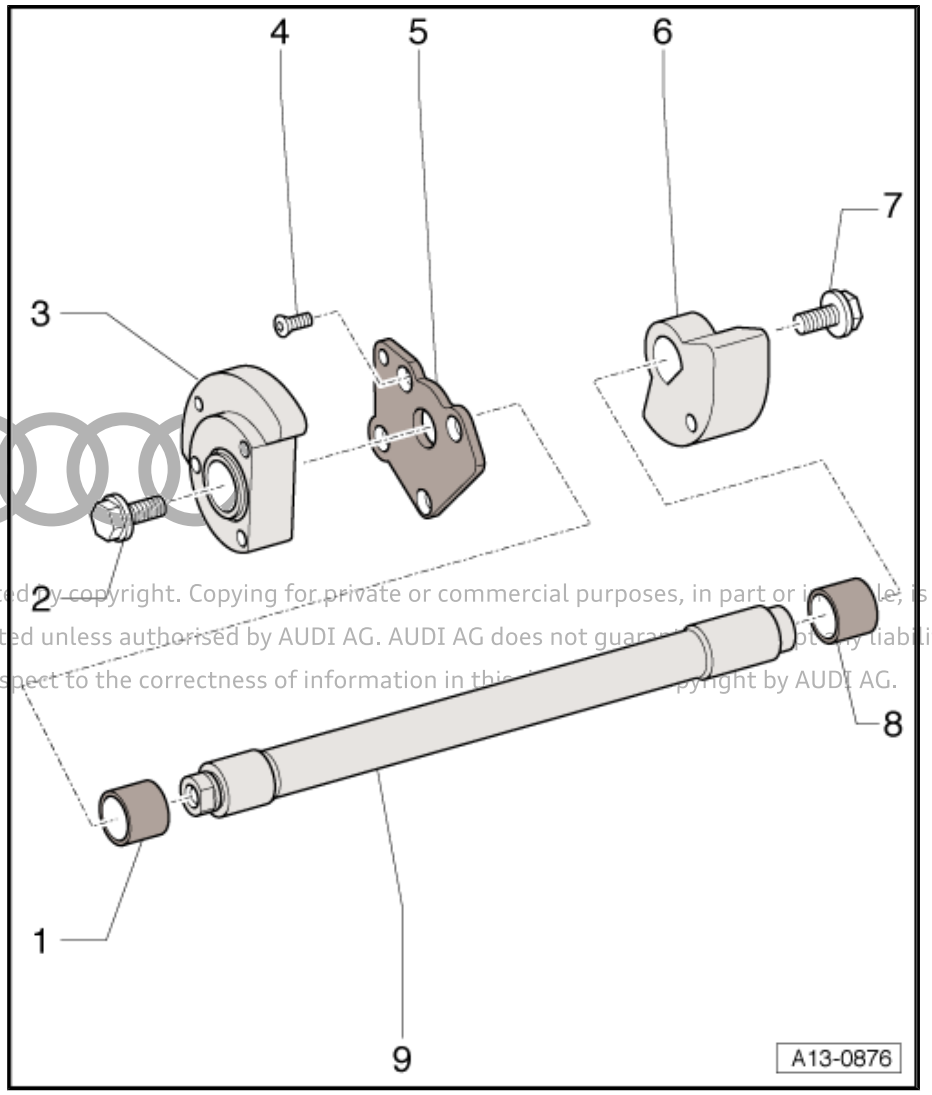
7 - Bolt

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

8 - Sleeve bearing

9 - Balance shaft

- ❑ Removing and installing ⇒ page 188



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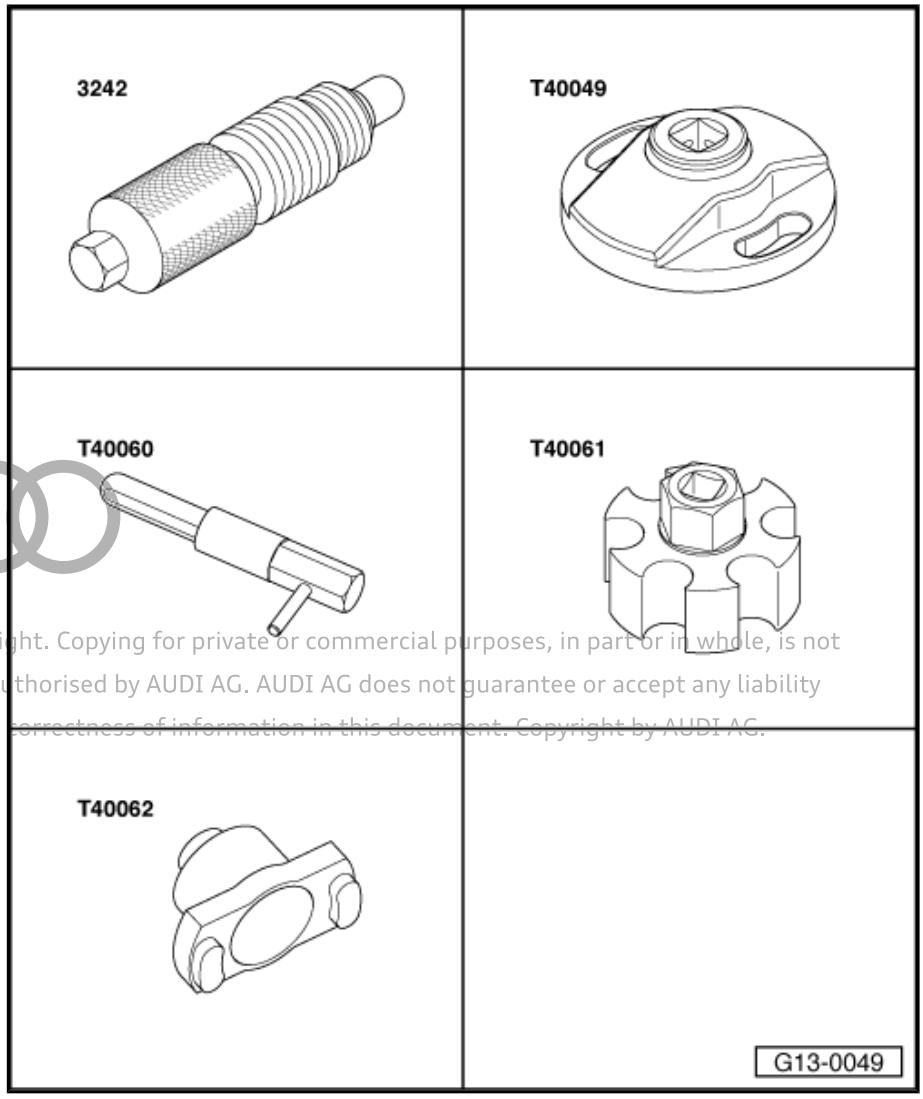
3.5 Removing and installing camshaft timing chain

⇒ “3.5.1 Removing and installing camshaft timing chain - engine codes CAMA, CAMB, CCLA, CCWA, CCWB, CGKA, CGKB”, page 247

⇒ “3.5.2 Removing and installing camshaft timing chain - engine code CAPA”, page 255

3.5.1 Removing and installing camshaft timing chain - engine codes CAMA, CAMB, CCLA, CCWA, CCWB, CGKA, CGKB

Special tools and workshop equipment required



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- Locking pin - 3242- or locking pin - T40237-
- Key - T40049-
- 2x adjustment pin - T40060-
- Adapter - T40061-
- Adapter - T40062-
- Nuts M12 (2x)
- Drill bit 3.3 mm ∅ (2x)

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.***

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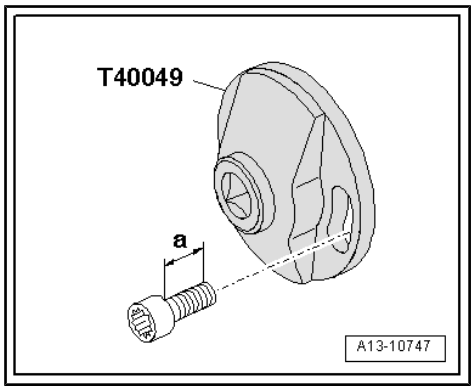
– Remove drive plate ⇒ page 177 .

– Remove timing chain covers: left-side ⇒ page 230 , right-side ⇒ page 232 , bottom ⇒ page 234 .

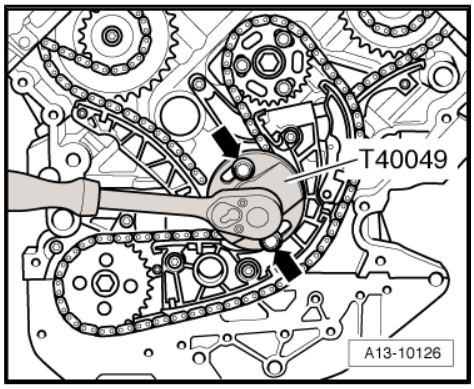
Caution

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.***

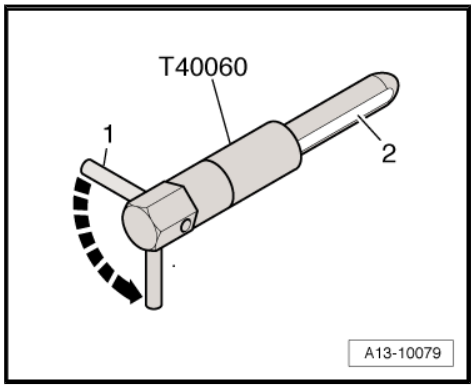


– Attach key - T40049- at rear end of crankshaft using 2 bolts -arrows-.



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.*



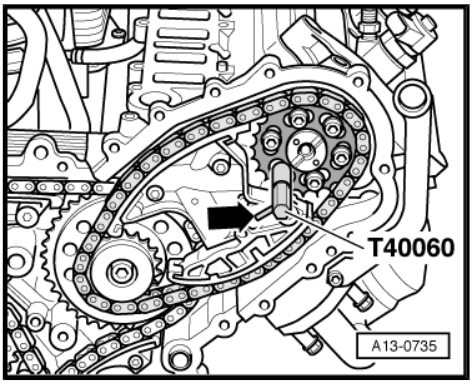
Caution

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

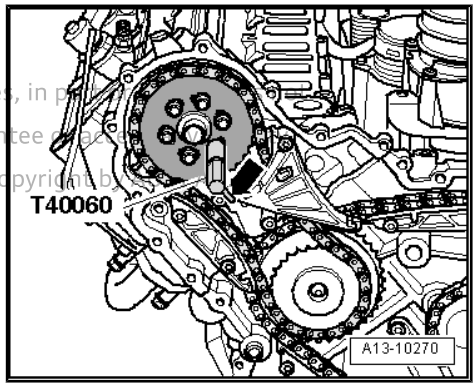
- *Only turn crankshaft in direction of engine rotation.*

– 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).

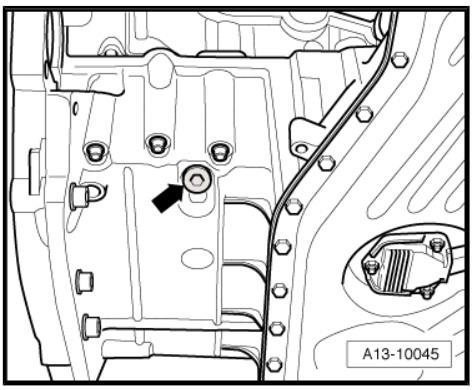


- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft on cylinder bank 2 (left-side).

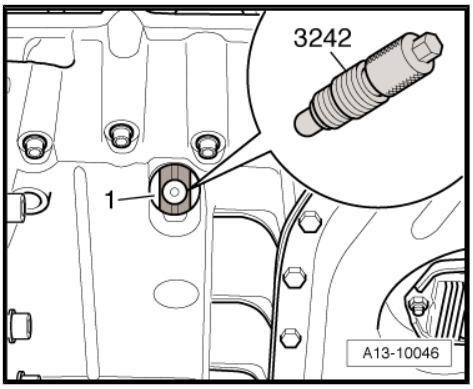


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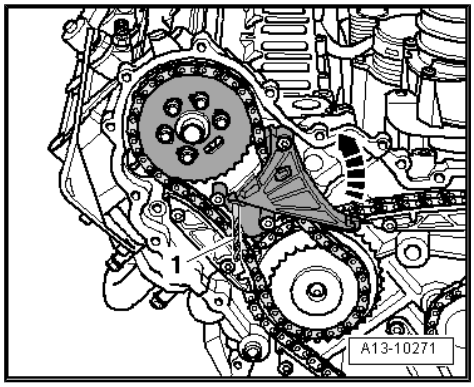
– Use extended hexagon socket wrench with ball head and unscrew plug -arrow- from sump (top section).



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



– Wrap insulating tape around tip and shaft of 3.3 mm ∅ drill bit to avoid cuts.
– Press tensioning rail of camshaft timing chain tensioner (left-side) in direction of -arrow- and lock chain tensioner by inserting 3.3 mm ∅ drill bit -item 1-.

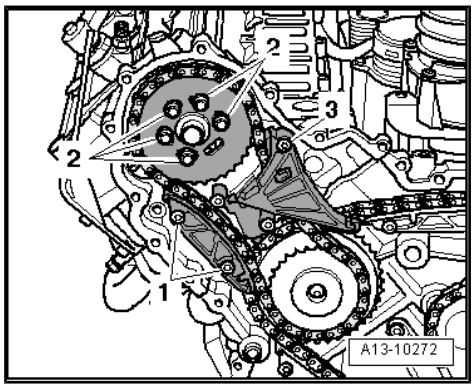


Caution

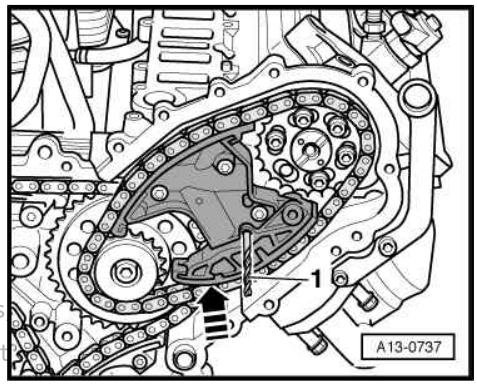
If a used timing chain rotates in the opposite direction when it is refitted, this can cause breakage.

- *Mark running direction of timing chain with coloured arrows for re-installation.*

– Remove adjustment pin - T40060- from both camshafts.
– Unscrew bolt -3- and remove tensioning rail.
– Remove bolts -1- for guide rail and -2- for camshaft chain sprocket.
– Detach camshaft chain sprocket, guide rail and camshaft timing chain (left-side).



– Wrap insulating tape around tip and shaft of 3.3 mm ∅ drill bit to avoid cuts.
– Press guide rail of camshaft timing chain tensioner (right-side) in direction of -arrow- and lock chain tensioner by inserting 3.3 mm ∅ drill bit -item 1-.

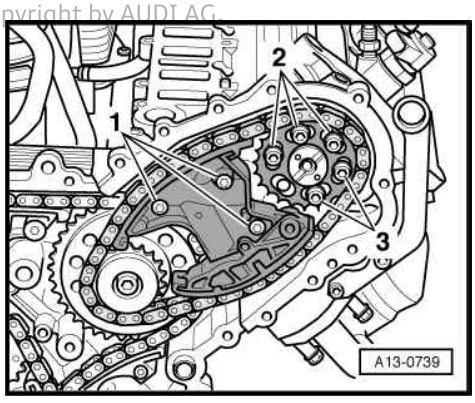


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Caution

If a used timing chain rotates in the opposite direction when it is refitted, this can cause breakage.

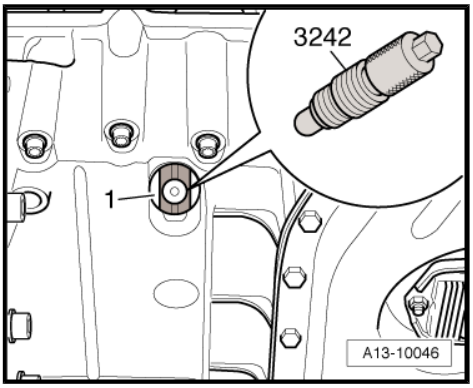
- *Mark running direction of timing chain with coloured arrows for re-installation.*



– Remove bolts -1- for chain tensioner and bolts -2- and -3- for camshaft chain sprocket.
– Detach camshaft chain sprocket, chain tensioner and camshaft timing chain (right-side).

Installing

- Tightening torques
  ⇒ “3.1.1 Exploded view - camshaft timing chains, engine codes CAMA, CAMB, CCLA, CCWA, CCWB, CGKA, CGKB”, page 237
- Crankshaft -1- locked in “TDC” position with locking pin - 3242- .
- Drive chain for valve gear installed ⇒ page 282



Note

- *Renew the seal on the screw plug for the “TDC” mark.*
- *Renew the bolts tightened with specified tightening angle.*

Caution

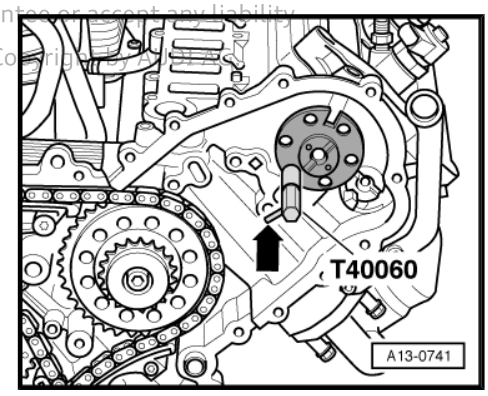
Risk of damage to valves and piston crowns.

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

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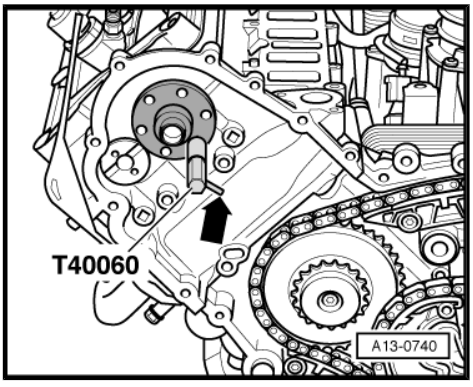
– Check that camshafts on both cylinder heads are positioned at “TDC”.

- 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).

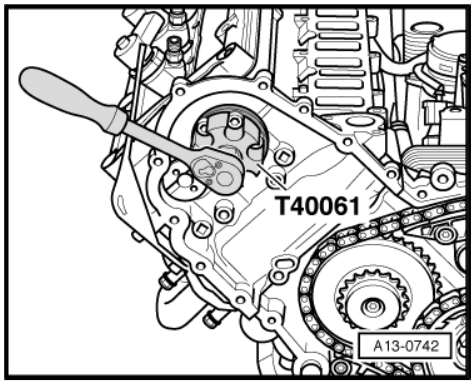
– Remove adjustment pin - T40060- from both camshafts.



Caution

Risk of damage to valves and piston crowns.

- *The crankshaft must not be at "TDC" at any cylinder when the camshafts are 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.

– Install camshaft timing chain (left-side) with camshaft chain sprocket, guide rail and tensioning rail.

• The elongated holes in the camshaft chain sprocket must be aligned centrally over the threaded holes in the camshaft.

– Tighten bolts -1- and -3- for guide rail and tensioning rail.

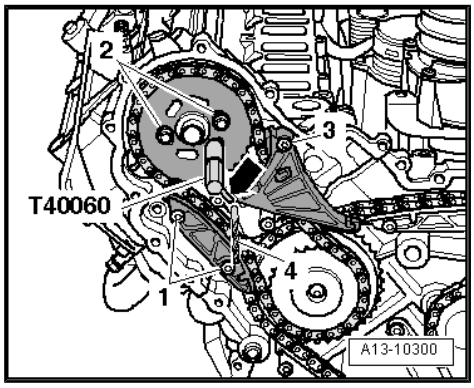
– Fit both bolts -2- for camshaft chain sprocket without tightening.

• 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.

– Pull drill bit -4- out of locating hole, this releases the chain tensioner (left-side).



– Install camshaft timing chain (right-side) with camshaft chain sprocket and chain tensioner.

• The elongated holes in the camshaft chain sprocket must be aligned centrally over the threaded holes in the camshaft.

– Tighten bolts -1- for chain tensioner.

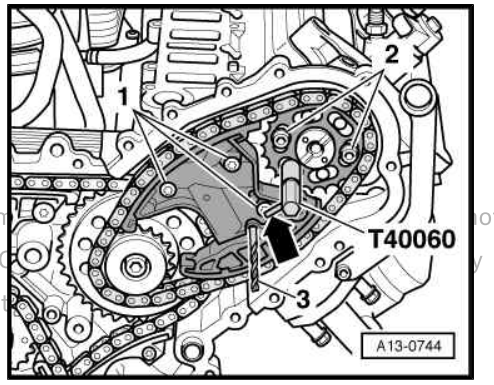
– Fit both bolts -2- for camshaft chain sprocket without tightening.

• It should just be possible to turn the sprocket on the camshaft without axial movement.

– Use adjustment pin - T40060- to lock camshaft (right-side).

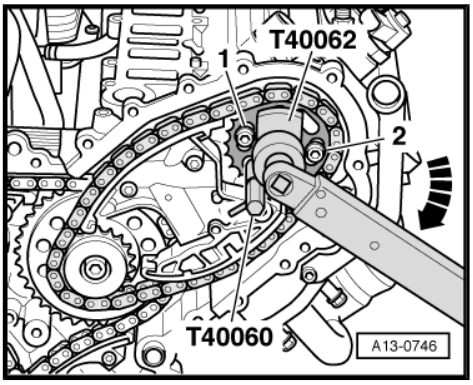
• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.

– Pull drill bit -3- out of locating hole, this releases the chain tensioner (right-side).

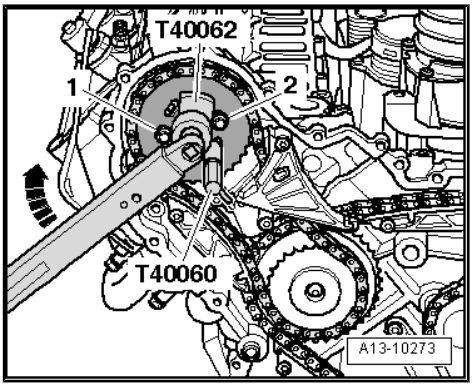


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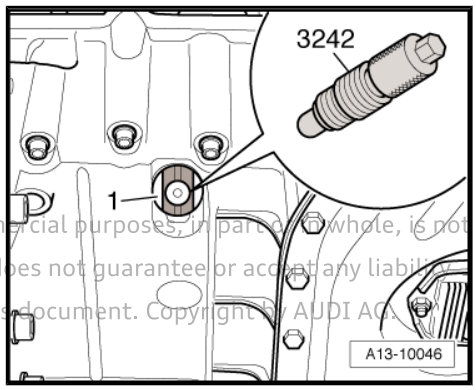
– Apply a torque of 20 Nm to camshaft sprocket (right-side) in clockwise direction -arrow- using a torque wrench and adapter - T40062- and maintain this torque.
– Tighten bolts -1- and -2-.
– Remove adapter - T40062- and adjustment pin - T40060- .
– Tighten remaining bolts for camshaft sprocket (right-side).



– Apply a torque of 15 Nm to camshaft sprocket (left-side) in clockwise direction -arrow- using a torque wrench and adapter - T40062- and maintain this torque.
– Tighten bolts -1- and -2-.
– Remove adapter - T40062- and adjustment pin - T40060- .
– Tighten remaining bolts for camshaft sprocket (left-side).



– Remove locking pin - 3242- .



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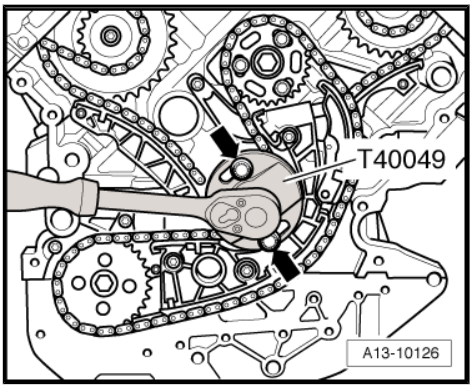
Checking valve timing

Caution

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

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

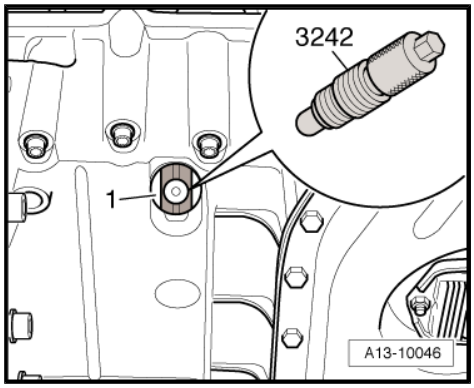
– Turn crankshaft two rotations using key - T40049- until it is again positioned just before “TDC”.



Note

Disregard -arrows-.

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

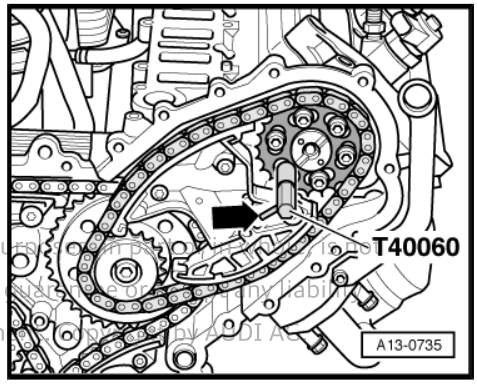


Caution

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- .*

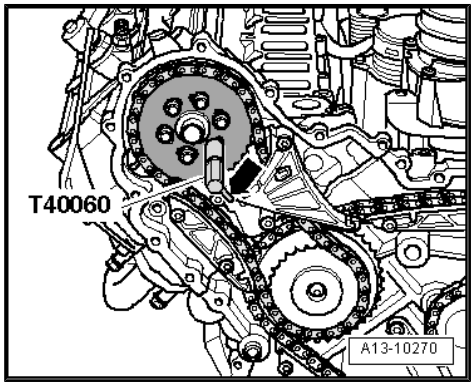
– Check that camshafts on both cylinder heads are positioned at "TDC".



- 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).

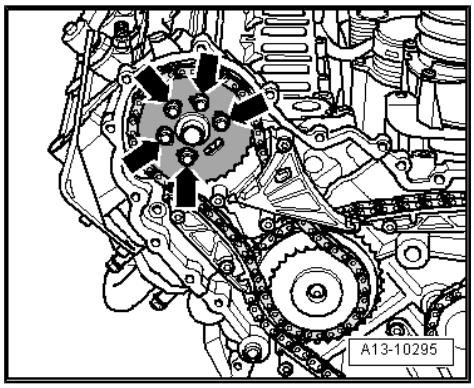
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- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft on cylinder bank 2 (left-side).



Adjusting valve timing

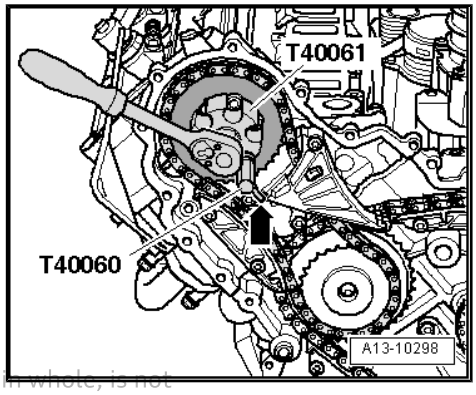
– If the pin cannot be inserted in one of the camshafts, loosen all bolts -arrows- of relevant camshaft chain sprocket approx. 1 turn.



– 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.

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– Remove locking pin - 3242- .

– Check valve timing once again ⇒ page 253 .

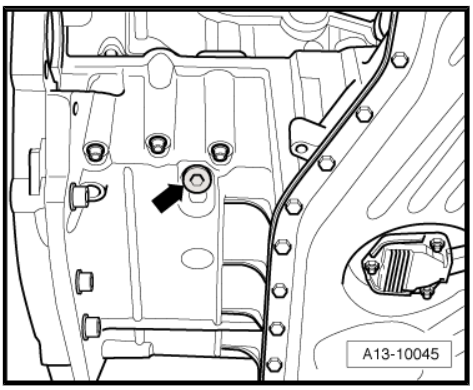
Remaining installation steps are carried out in reverse sequence; note the following:

– Tighten plug for “TDC” drilling in sump (top section) ⇒ page 253 .

– Install timing chain covers: left-side ⇒ page 230 , right-side ⇒ page 232 , bottom ⇒ page 234 .

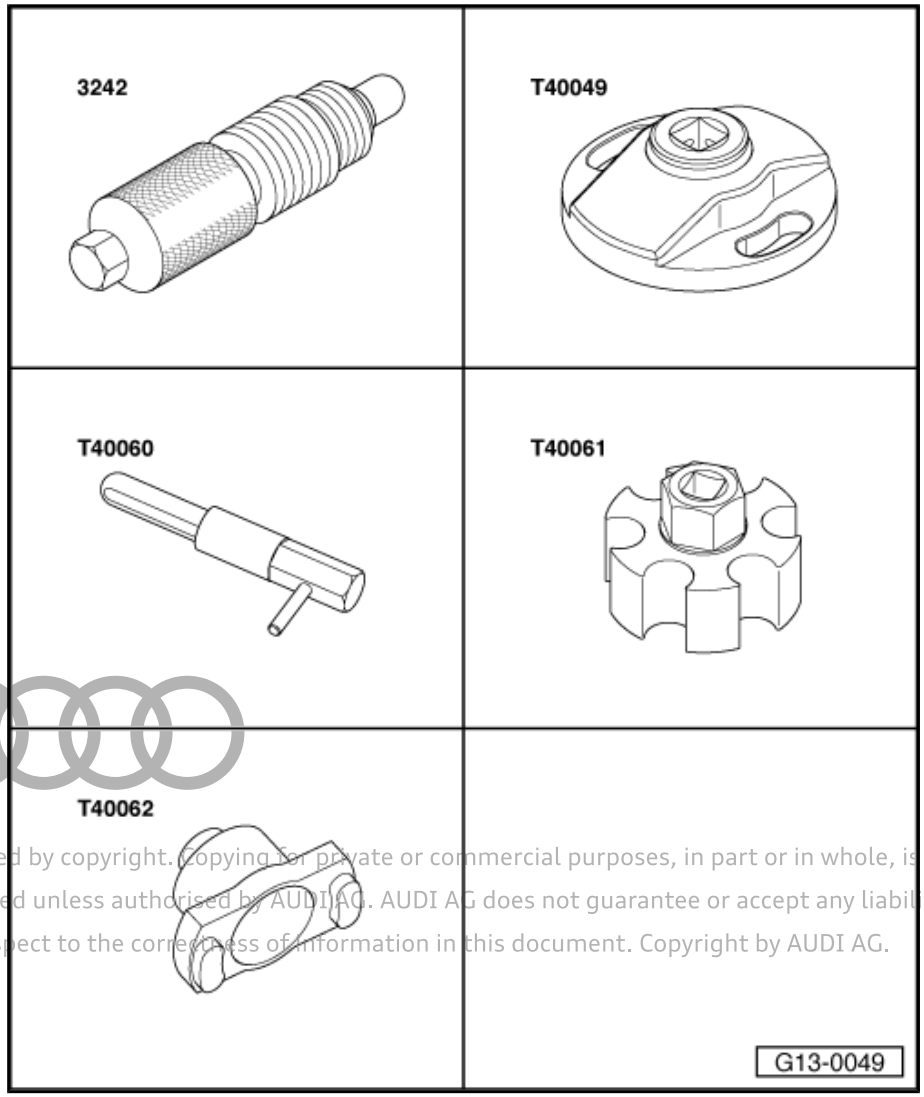
– Install drive plate ⇒ page 177 .

– Fill up with engine oil and check oil level ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .



3.5.2 Removing and installing camshaft timing chain - engine code CAPA

Special tools and workshop equipment required



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- Locking pin - 3242- or locking pin - T40237-
- Key - T40049-
- 2x adjustment pin - T40060-
- Adapter - T40061-
- Adapter - T40062-
- Nuts M12 (2x)
- Drill bit 3.3 mm ∅ (2x)

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.*

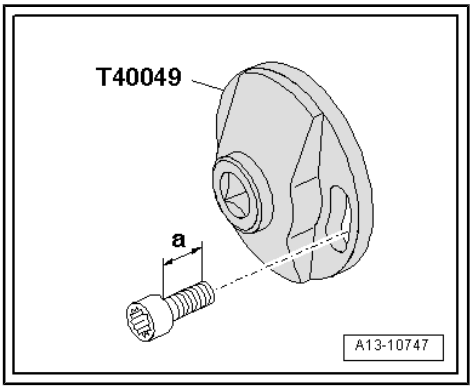
– Remove drive plate ⇒ page 177 .

– Remove timing chain covers: left-side ⇒ page 230 , right-side ⇒ page 232 , bottom ⇒ page 234 .

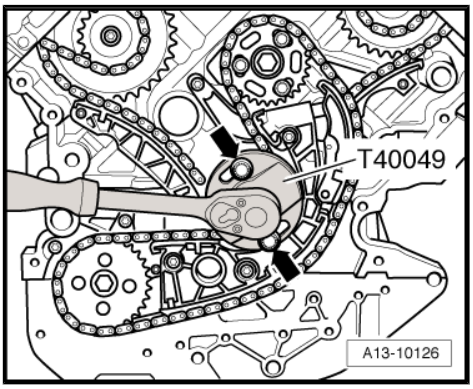
Caution

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.***

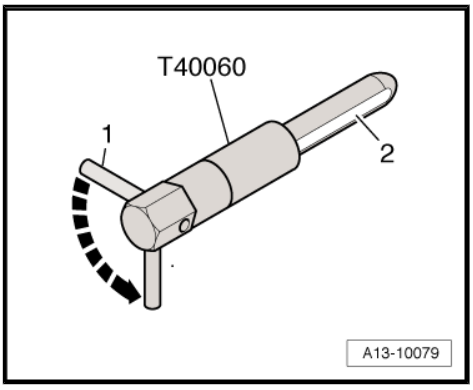


– Attach key - T40049- at rear end of crankshaft using 2 bolts -arrows-.



Note

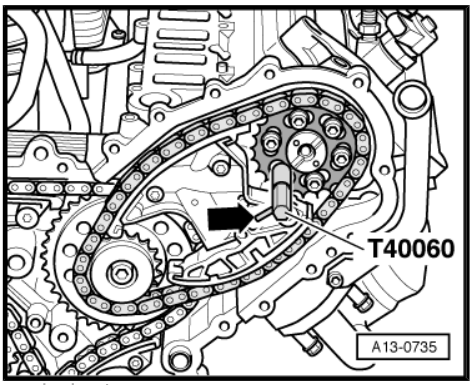
- *The adjustment pin - T40060- has a flat -2- which makes it easier to insert when the locating bores in the camshaft and cylinder head are not exactly in line.*
- *The adjustment pin is inserted initially so that the side pin -1- is perpendicular to the imaginary line between the adjustment pin and 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.*



Caution

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

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

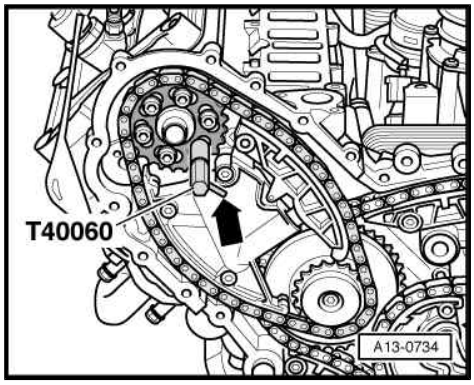


– Rotate crankshaft to "TDC":

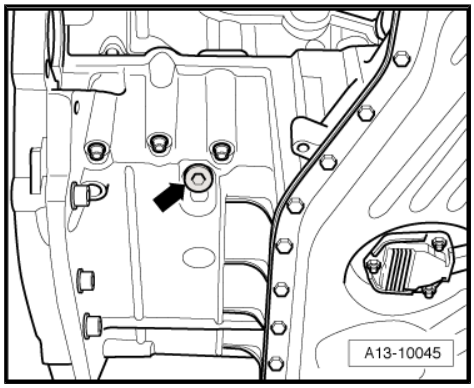
- It should be possible to lock the camshafts with the adjustment pins - T40060- .
- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft on cylinder bank 1 (right-side).

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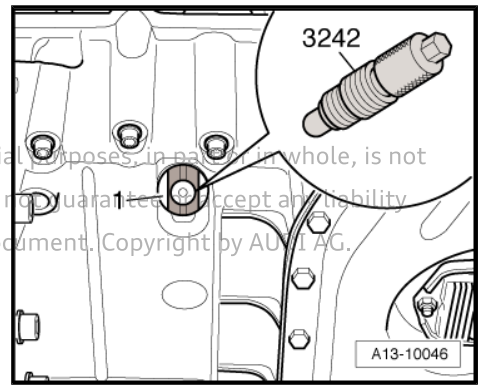
- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft on cylinder bank 2 (left-side).



– Use extended hexagon socket wrench with ball head and unscrew plug -arrow- from sump (top section).

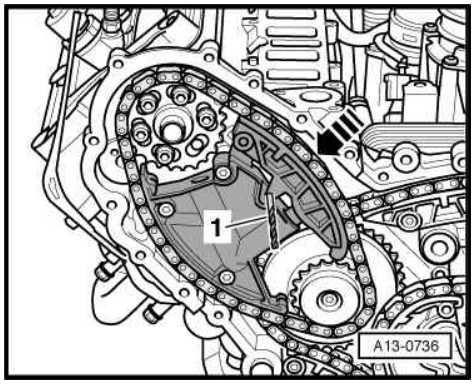


– Screw locking pin - 3242- into hole (20 Nm); if necessary, turn crankshaft backwards and forwards slightly to fully centralise locking pin.



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– Wrap insulating tape around tip and shaft of 3.3 mm ∅ drill bit to avoid cuts.
– Press guide rail of camshaft timing chain tensioner (left-side) in direction of -arrow- and lock chain tensioner by inserting 3.3 mm ∅ drill bit -item 1-.



Caution

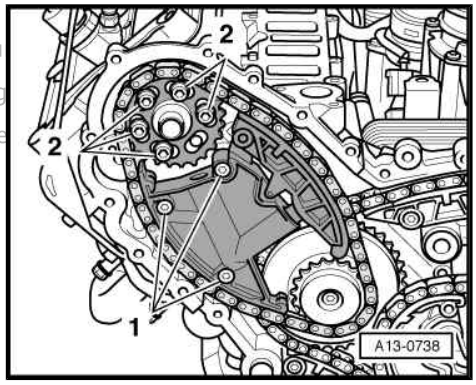
If a used timing chain rotates in the opposite direction when it is refitted, this can cause breakage.

- ***Mark running direction of timing chain with coloured arrows for re-installation.***

– Remove adjustment pin - T40060- from both camshafts.

– Remove bolts -1- for chain tensioner and -2- for camshaft chain sprocket.
– Detach camshaft chain sprocket, guide rail and camshaft timing chain (left-side).

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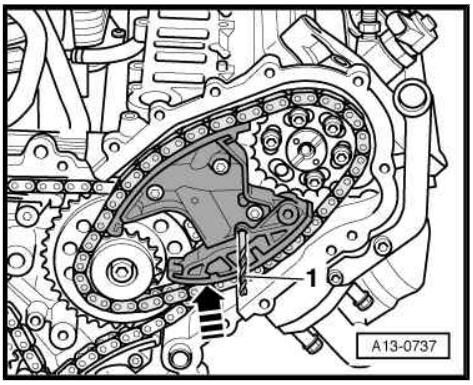


– Wrap insulating tape around tip and shaft of 3.3 mm ∅ drill bit to avoid cuts.
– Press guide rail of camshaft timing chain tensioner (right-side) in direction of -arrow- and lock chain tensioner by inserting 3.3 mm ∅ drill bit -item 1-.

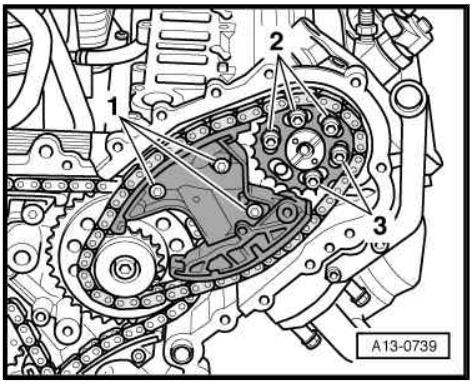
Caution

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.***

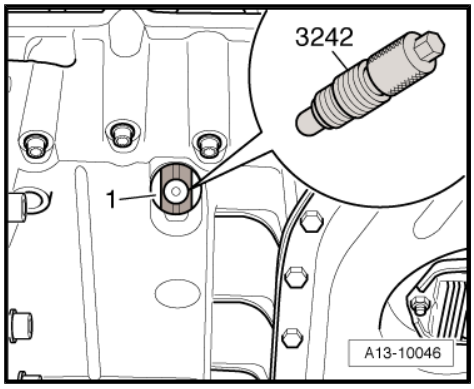


– Remove bolts -1- for chain tensioner and bolts -2- and -3- for camshaft chain sprocket.
– Detach camshaft chain sprocket, chain tensioner and camshaft timing chain (right-side).



Installing

- Tightening torques
  ⇒ “3.1.2 Exploded view - camshaft timing chains, engine code CAPA”, page 240
- Crankshaft -1- locked in “TDC” position with locking pin - 3242- .
- Drive chain for valve gear installed ⇒ page 282



Note

- *Renew the seal on the screw plug for the “TDC” mark.*
- *Renew the bolts tightened with specified tightening angle.*

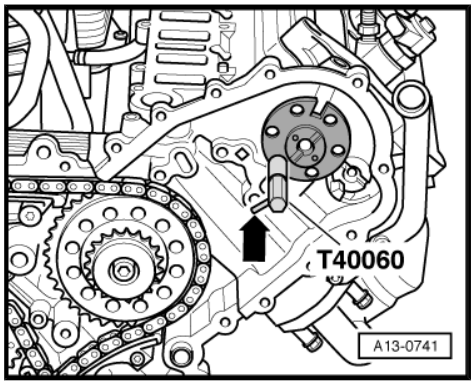
Caution

Risk of damage to valves and piston crowns.

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

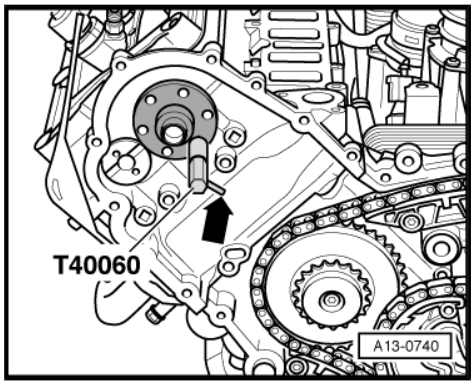
– Check that camshafts on both cylinder heads are positioned at “TDC”.

- 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.

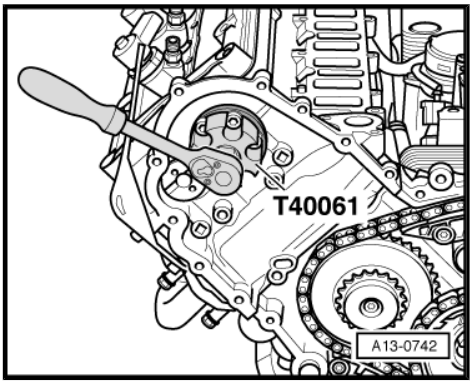


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Caution

Risk of damage to valves and piston crowns.

- *The crankshaft must not be at "TDC" at any cylinder when the camshafts are 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.

– Install camshaft timing chain (left-side) with camshaft chain sprocket and chain tensioner.

• The elongated holes in the camshaft chain sprocket must be aligned centrally over the threaded holes in the camshaft.

– Tighten bolts -1- for chain tensioner.

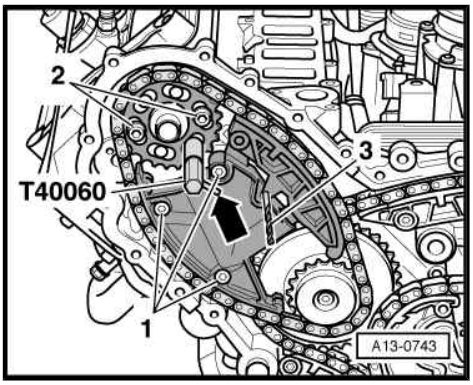
– Fit both bolts -2- for camshaft chain sprocket without tightening.

• 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.

– Pull drill bit -3- out of locating hole, this releases the chain tensioner (left-side).



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– Install camshaft timing chain (right-side) with camshaft chain sprocket and chain tensioner.

• The elongated holes in the camshaft chain sprocket must be aligned centrally over the threaded holes in the camshaft.

– Tighten bolts -1- for chain tensioner.

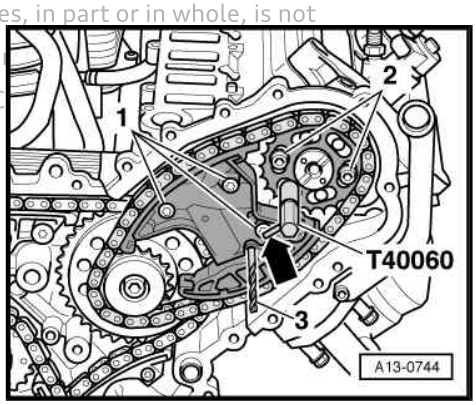
– Fit both bolts -2- for camshaft chain sprocket without tightening.

• It should just be possible to turn the sprocket on the camshaft without axial movement.

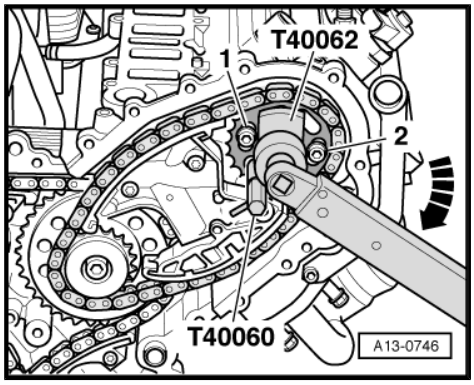
– Use adjustment pin - T40060- to lock camshaft (right-side).

• 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.

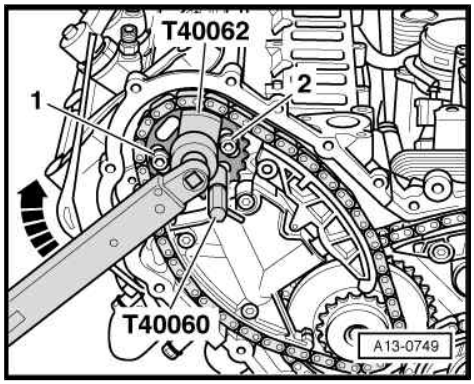
– Pull drill bit -3- out of locating hole, this releases the chain tensioner (right-side).



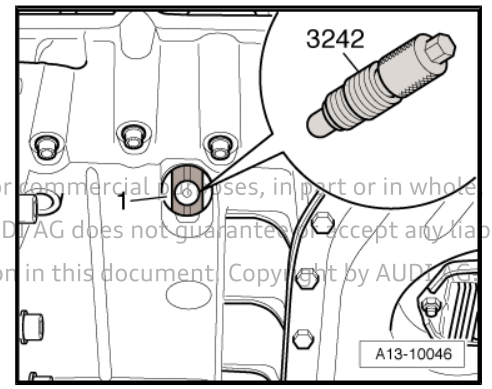
– Apply a torque of 20 Nm to camshaft sprocket (right-side) in clockwise direction -arrow- using a torque wrench and adapter - T40062- and maintain this torque.
– Tighten bolts -1- and -2-.
– Remove adapter - T40062- and adjustment pin - T40060- .
– Tighten remaining bolts for camshaft sprocket (right-side).



– Apply a torque of 15 Nm to camshaft sprocket (left-side) in clockwise direction -arrow- using a torque wrench and adapter - T40062- and maintain this torque.
– Tighten bolts -1- and -2-.
– Remove adapter - T40062- and adjustment pin - T40060- .
– Tighten remaining bolts for camshaft sprocket (left-side).



– Remove locking pin - 3242- .



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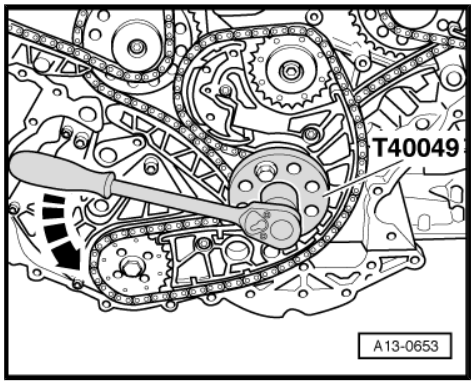
Checking valve timing

Caution

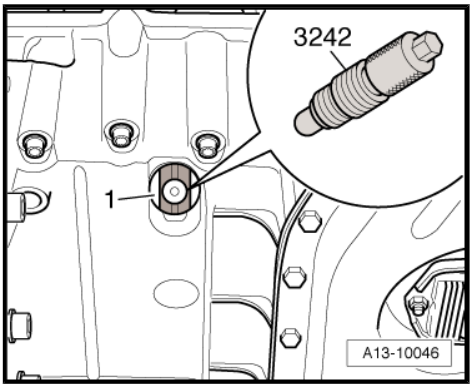
Irreparable damage can be caused if the camshaft timing chain slips.

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

– Turn crankshaft two rotations using key - T40049- 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.



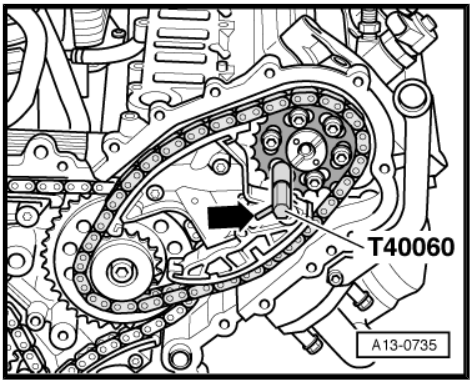
Caution

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

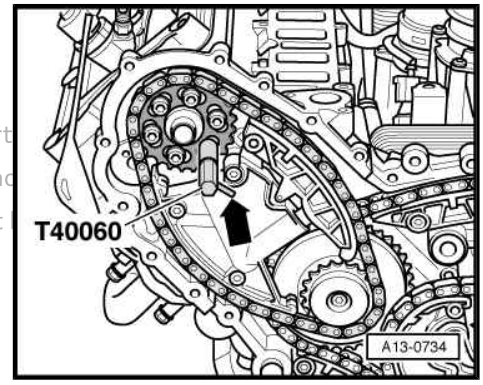
- *If crankshaft has been turned past "TDC" position, turn crankshaft two further rotations until it is again positioned just before "TDC". Then turn further in the same direction and lock crankshaft with locking pin - 3242- .*

– 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).



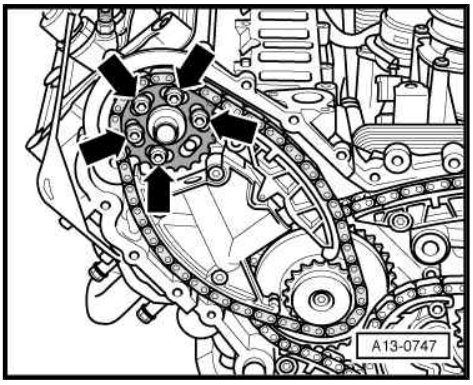
- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft on cylinder bank 2 (left-side).



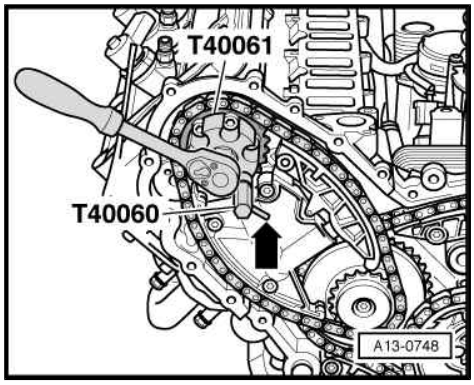
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Adjusting valve timing

– If the pin cannot be inserted in one of the camshafts, loosen all bolts -arrows- of relevant camshaft chain sprocket approx. 1 turn.

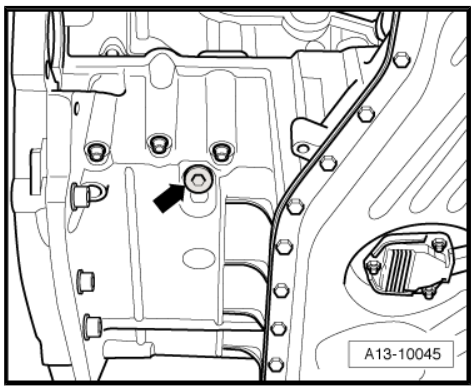


– Apply adapter - T40061- to the heads of the loosened bolts.
– Turn camshaft slightly backwards and forwards with adapter - T40061- until adjustment pin - T40060- can be inserted.
• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin 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 262 .



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

– Tighten plug for “TDC” drilling in sump (top section) ⇒ page 253 .
– Install timing chain covers: left-side ⇒ page 230 , right-side ⇒ page 232 , bottom ⇒ page 234 .
– Install drive plate ⇒ page 177 .
– Fill up with engine oil and check oil level ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .



3.6 Removing camshaft timing chain from camshafts

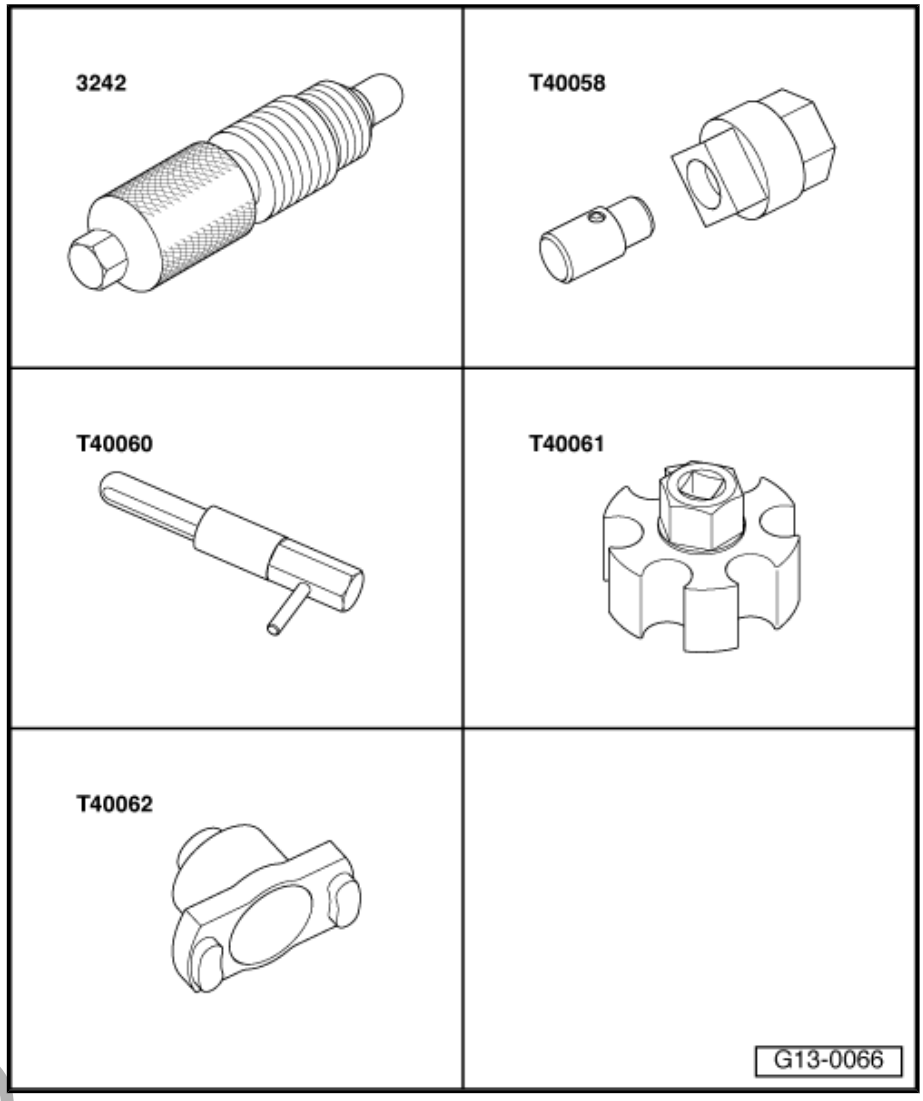
⇒ “3.6.1 Removing camshaft timing chain from camshafts - engine codes CAMA, CAMB, CCLA, CCWA, CCWB, CGKA, CGKB”, page 264

⇒ “3.6.2 Removing camshaft timing chain from camshafts - engine code CAPA”, page 273

3.6.1 Removing camshaft timing chain from camshafts - engine codes CAMA, CAMB, CCLA, CCWA, CCWB, CGKA, CGKB

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Special tools and workshop equipment required



- Locking pin - 3242- or locking pin - T40237-
- Adapter - T40058-
- 2x adjustment pin - T40060-
- Adapter - T40061-
- Adapter - T40062-
- Drill bit 3.3 mm ∅ (2x)

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Removing

- Engine and gearbox in vehicle

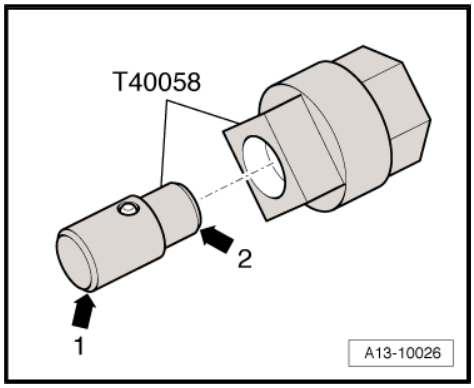
Note

When working on one cylinder head only, it is not necessary to remove the timing chain cover on the opposite cylinder head as well.

– Remove timing chain cover: left-side ⇒ page 230 , right-side ⇒ page 232 .

– Insert guide pin of adapter -T40058- as follows:

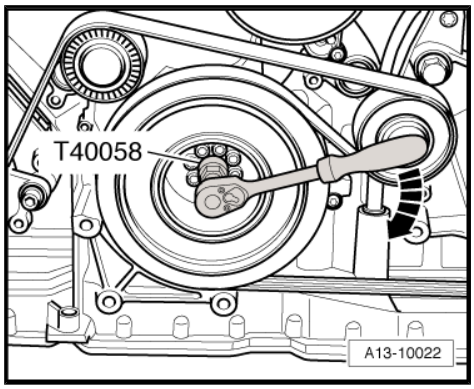
- The larger-diameter section -arrow 1- faces towards the engine.
- The smaller-diameter section -arrow 2- faces the adapter.



Caution

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

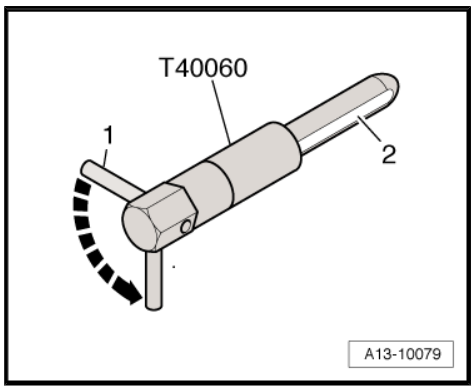
- ***Turn crankshaft only in direction of engine rotation -arrow-.***



– Use adapter - T40058- to turn crankshaft to “TDC” position.

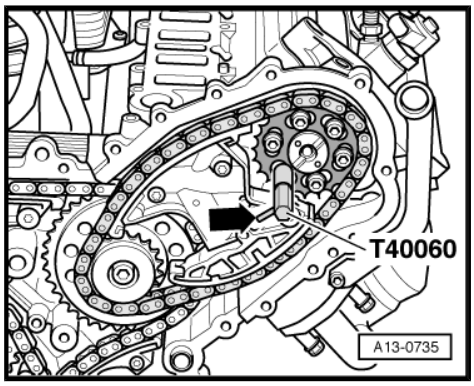
Note

- *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.*



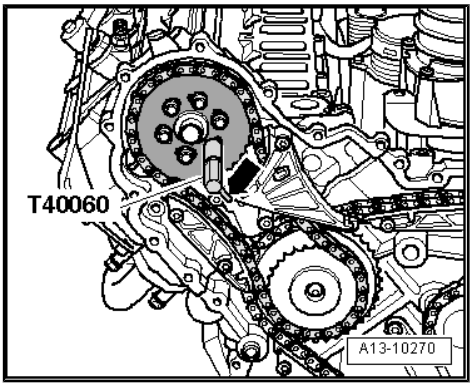
– Check that camshafts on both cylinder heads are positioned at “TDC”.

- 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).



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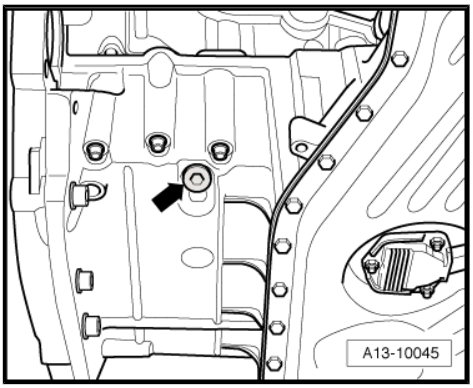
- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft on cylinder bank 2 (left-side).



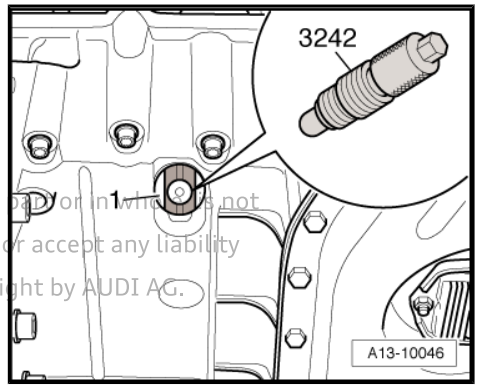
Note

Place a cloth beneath the sump (top section) to catch escaping oil.

– Use extended hexagon socket wrench with ball head and unscrew plug -arrow- from sump (top section).

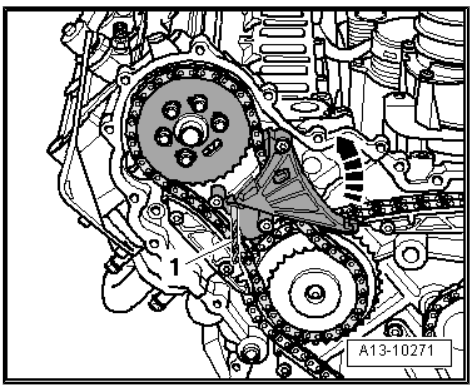


– Screw locking pin - 3242- into hole (20 Nm); if necessary, turn crankshaft backwards and forwards slightly to fully centralise locking pin.



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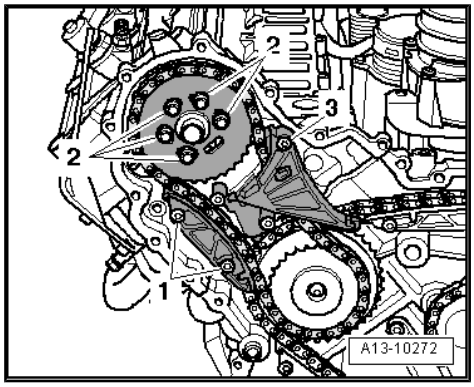
– Wrap insulating tape around tip and shaft of 3.3 mm ∅ drill bit to avoid cuts.
– Press tensioning rail of camshaft timing chain tensioner (left-side) in direction of -arrow- and lock chain tensioner by inserting 3.3 mm ∅ drill bit -item 1-.



Caution

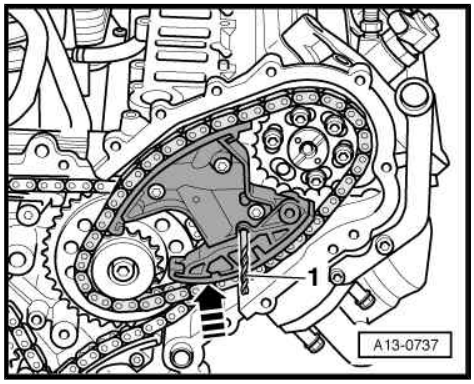
Risk of irreparable damage to engine.

- *Block off the opening in the valve timing housing with a clean cloth to prevent small items from dropping into the engine.*



– Unscrew bolt -3- and remove tensioning rail.
– Remove bolts -1- for guide rail and -2- for camshaft chain sprocket.
– Detach camshaft chain sprocket and guide rail.

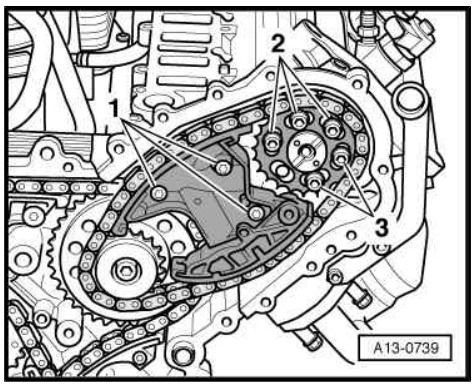
– Wrap insulating tape around tip and shaft of 3.3 mm ∅ drill bit to avoid cuts.
– Press guide rail of camshaft timing chain tensioner (right-side) in direction of -arrow- and lock chain tensioner by inserting 3.3 mm ∅ drill bit -item 1-.



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.*

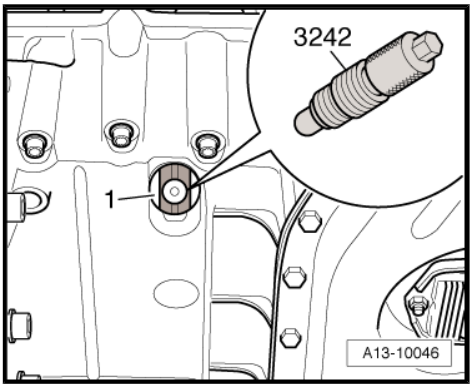


– Remove bolts -1- for chain tensioner and bolts -2- and -3- for camshaft chain sprocket.
– Detach camshaft chain sprocket and chain tensioner (right-side).

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Installing

- Tightening torques
  ⇒ “3.1.1 Exploded view - camshaft timing chains, engine codes CAMA, CAMB, CCLA, CCWA, CCWB, CGKA, CGKB”, page 237
- Crankshaft -1- locked in “TDC” position with locking pin - 3242- .



Note

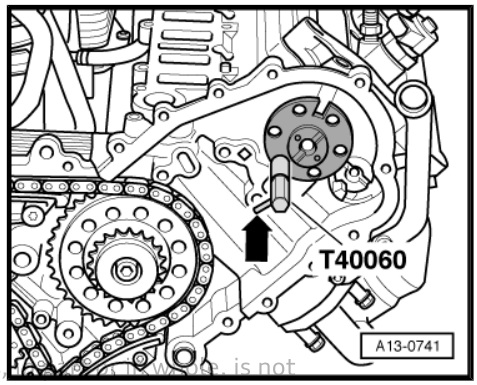
- *Renew the bolts tightened with specified tightening angle.*
- *Renew the seal on the screw plug for the “TDC” mark.*

Caution

Risk of damage to valves and piston crowns.

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

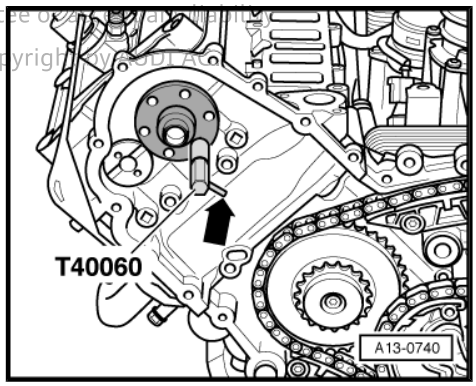
– Check that camshafts on both cylinder heads are positioned at “TDC”.
- It should be possible to lock the camshafts with the adjustment pins - T40060- .
- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft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

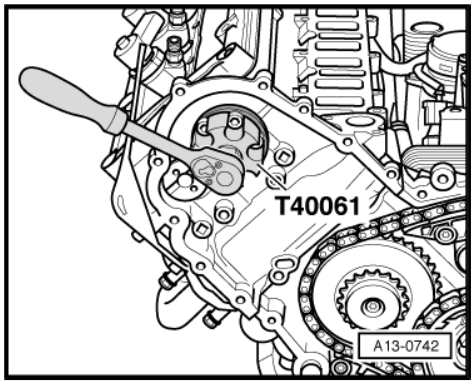
– Remove adjustment pin - T40060- from both camshafts.



Caution

Risk of damage to valves and piston crowns.

- *The crankshaft must not be at "TDC" at any cylinder when the camshafts are 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.

– Install camshaft timing chain (left-side) with camshaft chain sprocket, guide rail and tensioning rail.

• The elongated holes in the camshaft chain sprocket must be aligned centrally over the threaded holes in the camshaft.

– Tighten bolts -1- and -3- for guide rail and tensioning rail.

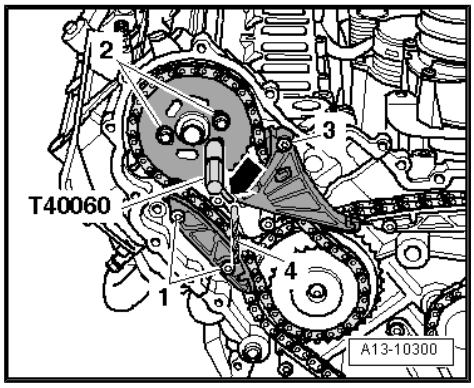
– Fit both bolts -2- for camshaft chain sprocket without tightening.

• 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.

– Pull drill bit -4- out of locating hole, this releases the chain tensioner (left-side).



– Install camshaft timing chain (right-side) with camshaft chain sprocket and chain tensioner.

• The elongated holes in the camshaft chain sprocket must be aligned centrally over the threaded holes in the camshaft.

– Tighten bolts -1- for chain tensioner.

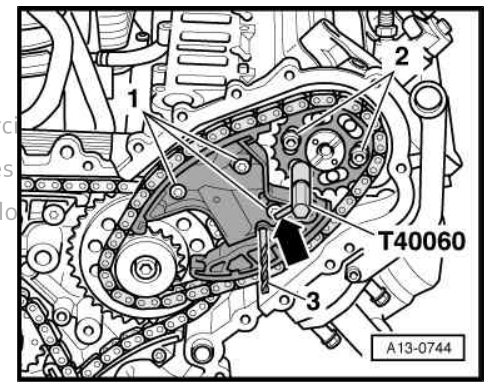
– Fit both bolts -2- for camshaft chain sprocket without tightening.

• It should just be possible to turn the sprocket on the camshaft without axial movement.

– Use adjustment pin - T40060- to lock camshaft (right-side).

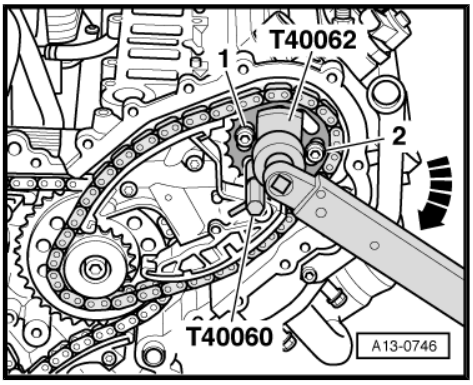
• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.

– Pull drill bit -3- out of locating hole, this releases the chain tensioner (right-side).

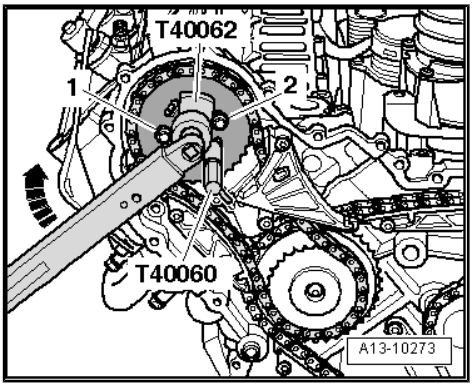


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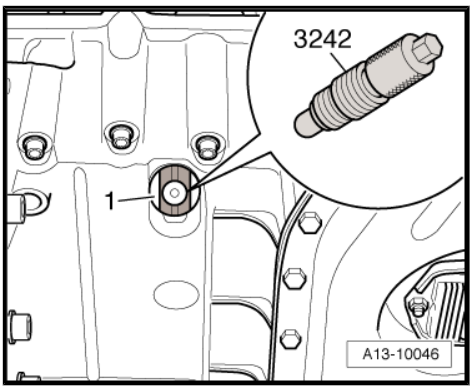
– Apply a torque of 20 Nm to camshaft sprocket (right-side) in clockwise direction -arrow- using a torque wrench and adapter - T40062- and maintain this torque.
– Tighten bolts -1- and -2-.
– Remove adapter - T40062- and adjustment pin - T40060- .
– Tighten remaining bolts for camshaft sprocket (right-side).



– Apply a torque of 15 Nm to camshaft sprocket (left-side) in clockwise direction -arrow- using a torque wrench and adapter - T40062- and maintain this torque.
– Tighten bolts -1- and -2-.
– Remove adapter - T40062- and adjustment pin - T40060- .
– Tighten remaining bolts for camshaft sprocket (left-side).



– Remove locking pin - 3242- .



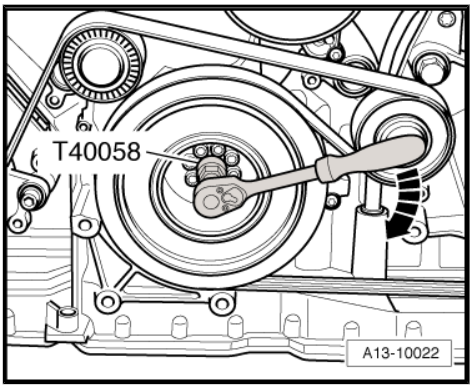
Checking valve timing

Caution

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

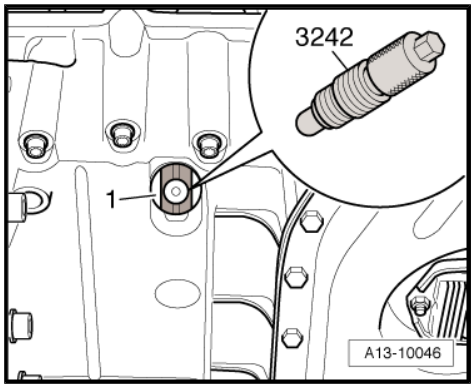
- ***Turn crankshaft only in direction of engine rotation -arrow-.***

– Turn crankshaft two rotations until it is again positioned just before “TDC”.



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

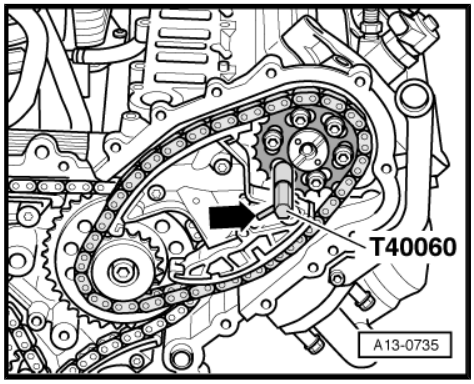


Caution

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

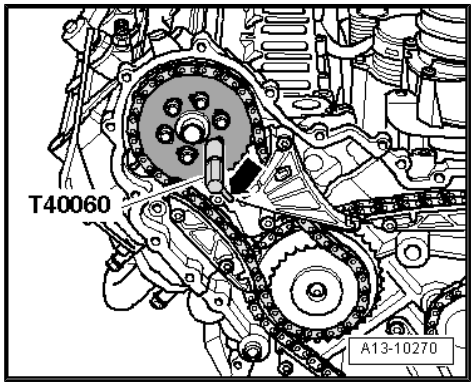
- *If crankshaft has been turned past "TDC" position, turn crankshaft two further rotations until it is again positioned just before "TDC". Then turn further in the same direction and lock crankshaft with locking pin - 3242- .*

– Check that camshafts on both cylinder heads are positioned at "TDC".



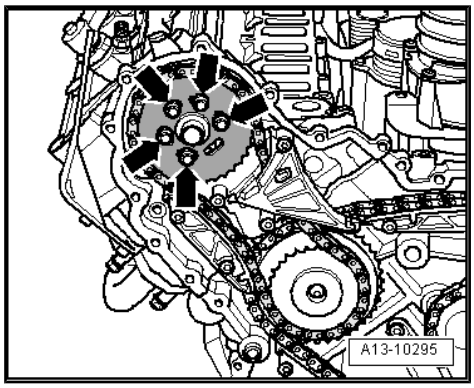
- It should be possible to lock the camshafts with the adjustment pins - T40060- .
- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft on cylinder bank 1 (right-side).

- 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).



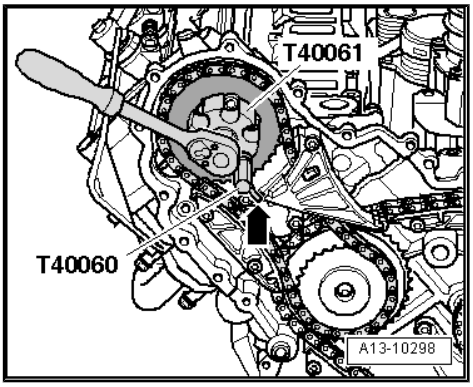
Adjusting valve timing

– If the pin cannot be inserted in one of the camshafts, loosen all bolts -arrows- of relevant camshaft chain sprocket approx. 1 turn.



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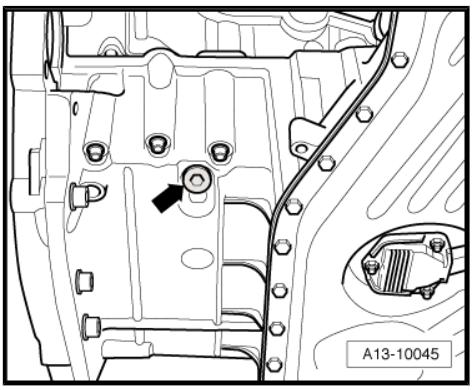
– Apply adapter - T40061- to the heads of the loosened bolts.
– Turn camshaft slightly backwards and forwards with adapter - T40061- until adjustment pin - T40060- can be inserted.
• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin 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 271 .



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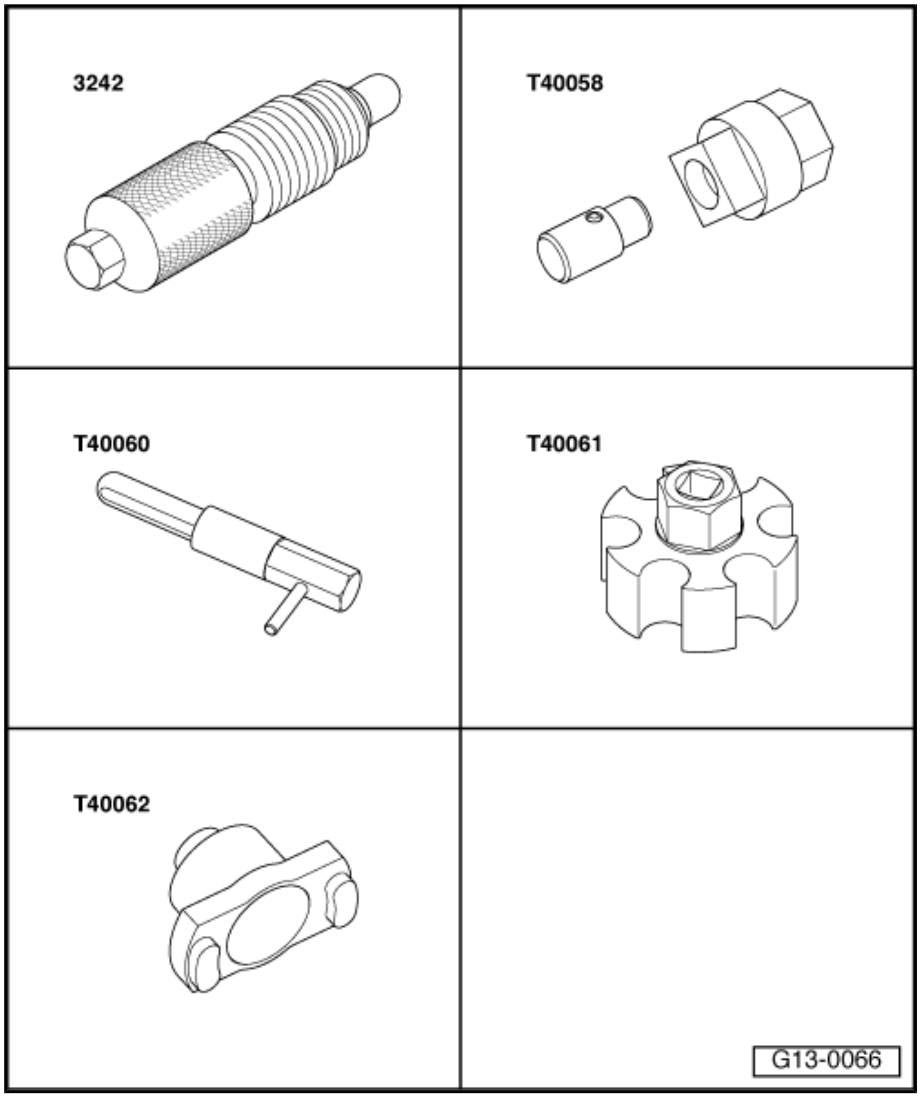
Remaining installation steps are carried out in reverse sequence; note the following:

– Tighten plug for “TDC” drilling in sump (top section) ⇒ page 253 .
– Install timing chain cover: left-side ⇒ page 230 , right-side ⇒ page 232 .



3.6.2 Removing camshaft timing chain from camshafts - engine code CAPA

Special tools and workshop equipment required



- Locking pin - 3242- or locking pin - T40237-
- Adapter - T40058-
- 2x adjustment pin - T40060-
- Adapter - T40061-
- Adapter - T40062-
- Drill bit 3.3 mm ∅ (2x)

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Removing

Note

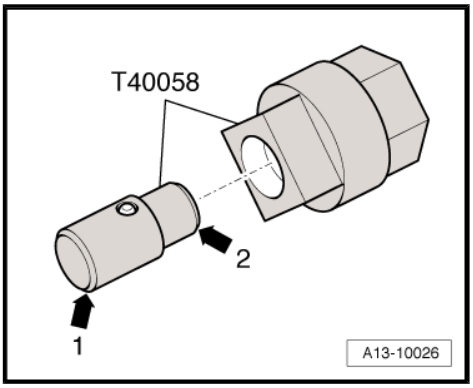
When working on one cylinder head only, it is not necessary to remove the timing chain cover on the opposite cylinder head as well.

- Engine and gearbox in vehicle

– Remove timing chain cover: left-side ⇒ page 230 , right-side ⇒ page 232 .

– Insert guide pin of adapter -T40058- as follows:

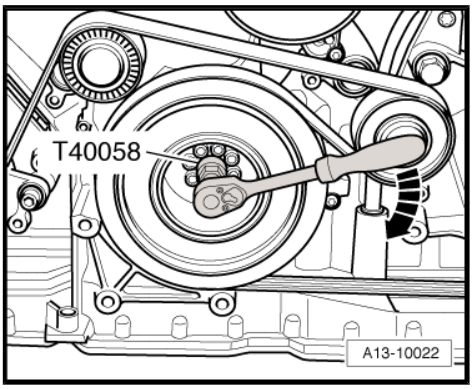
- The larger-diameter section -arrow 1- faces towards the engine.
- The smaller-diameter section -arrow 2- faces the adapter.



Caution

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

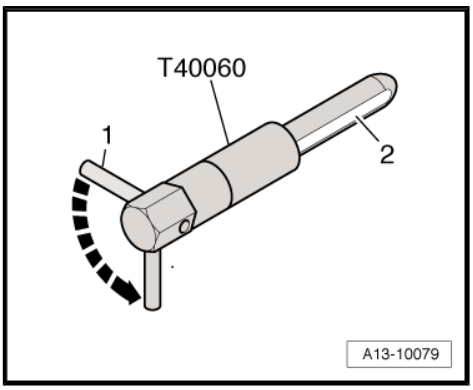
- ***Turn crankshaft only in direction of engine rotation -arrow-.***



– Use adapter - T40058- to turn crankshaft to “TDC” position.

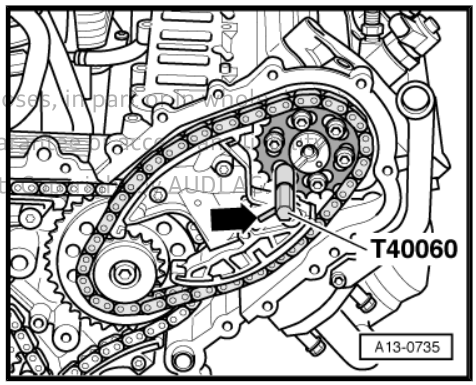
Note

- *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.*



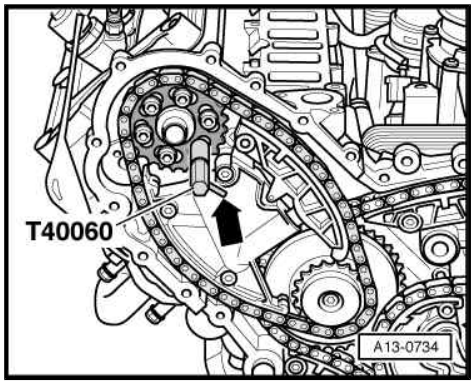
– Check that camshafts on both cylinder heads are positioned at “TDC”.

- 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).



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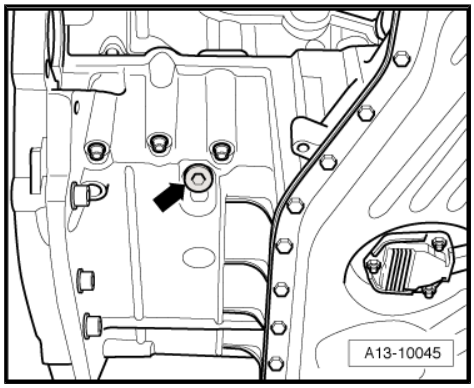
- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft on cylinder bank 2 (left-side).



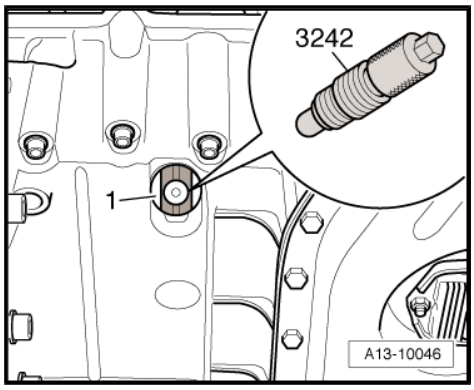
Note

Place a cloth beneath the sump (top section) to catch escaping oil.

– Use extended hexagon socket wrench with ball head and unscrew plug -arrow- from sump (top section).

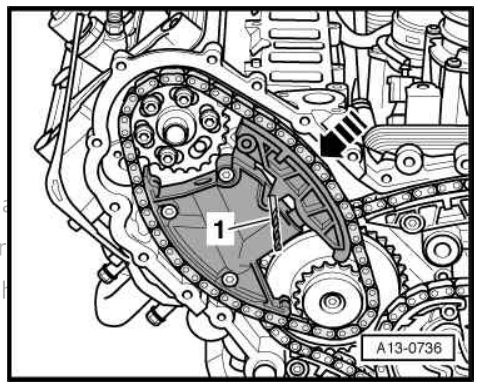


– Screw locking pin - 3242- into hole (20 Nm); if necessary, turn crankshaft backwards and forwards slightly to fully centralise locking pin.



– Wrap insulating tape around tip and shaft of 3.3 mm ∅ drill bit to avoid cuts.

– Press guide rail of camshaft timing chain tensioner (left-side) in direction of -arrow- and lock chain tensioner by inserting 3.3 mm ∅ drill bit -item 1-.



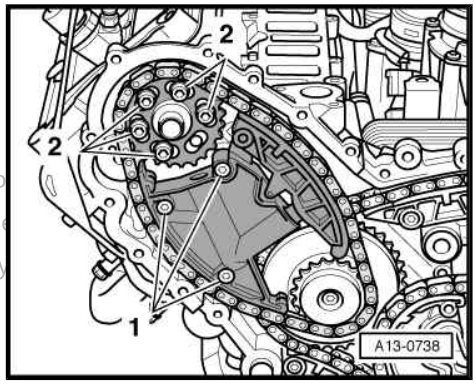
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Caution

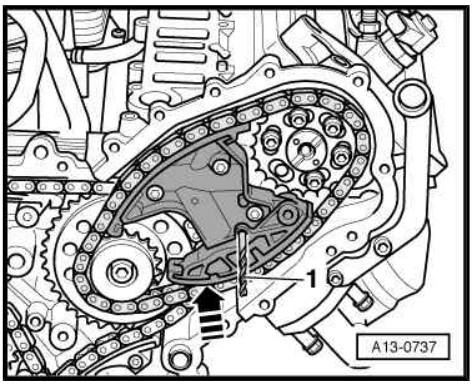
Risk of irreparable damage to engine.

- *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 bolts -1- for chain tensioner and -2- for camshaft chain sprocket.
– Detach camshaft chain sprocket and chain tensioner (left-side).

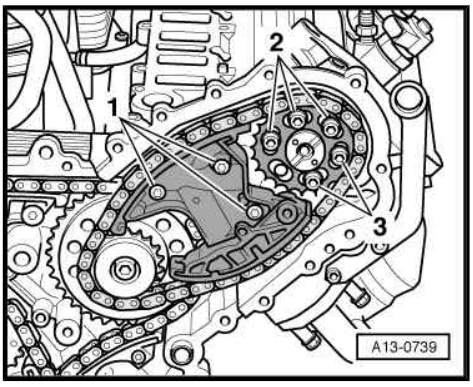


– Wrap insulating tape around tip and shaft of 3.3 mm ∅ drill bit to avoid cuts.
– Press guide rail of camshaft timing chain tensioner (right-side) in direction of -arrow- and lock chain tensioner by inserting 3.3 mm ∅ drill bit -item 1-.

Caution

Risk of irreparable damage to engine.

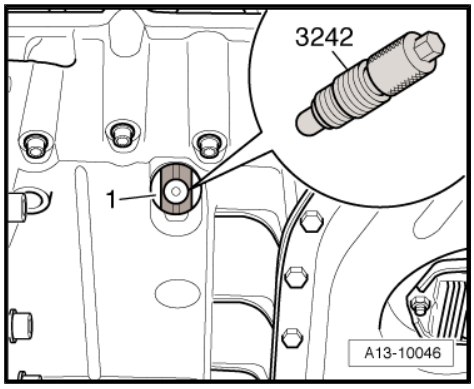
- *Block off the opening in the valve timing housing with a clean cloth to prevent small items from dropping into the engine.*



– Remove bolts -1- for chain tensioner and bolts -2- and -3- for camshaft chain sprocket.
– Detach camshaft chain sprocket and chain tensioner (right-side).

Installing

- Tightening torques
  ⇒ “3.1.2 Exploded view - camshaft timing chains, engine code CAPA”, page 240
- Crankshaft -1- locked in “TDC” position with locking pin - 3242- .



Note

- *Renew the seal on the screw plug for the “TDC” mark.*
- *Renew the bolts tightened with specified tightening angle.*

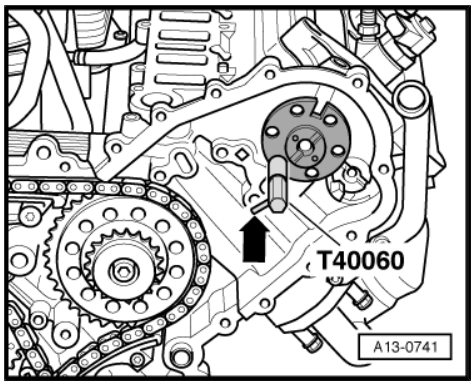
Caution

Risk of damage to valves and piston crowns.

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

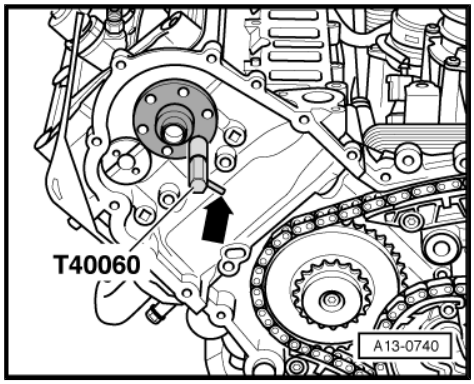
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– Check that camshafts on both cylinder heads are positioned at “TDC”.
- It should be possible to lock the camshafts with the adjustment pins - T40060- .
- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line 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).

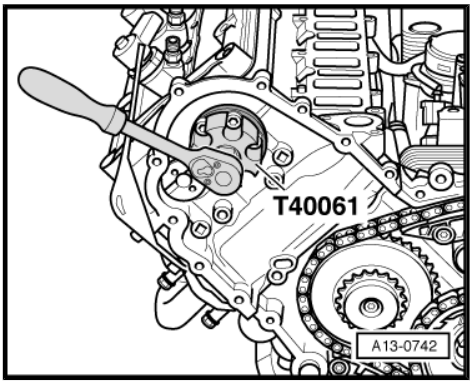
– Remove adjustment pin - T40060- from both camshafts.



Caution

Risk of damage to valves and piston crowns.

- *The crankshaft must not be at "TDC" at any cylinder when the camshafts are 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.

– Install camshaft timing chain (left-side) with camshaft chain sprocket and chain tensioner.

• The elongated holes in the camshaft chain sprocket must be aligned centrally over the threaded holes in the camshaft.

– Tighten bolts -1- for chain tensioner.

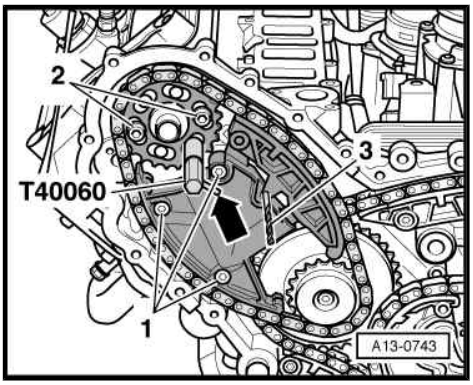
– Fit both bolts -2- for camshaft chain sprocket without tightening.

• 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.

– Pull drill bit -3- out of locating hole, this releases the chain tensioner (left-side).



– Install camshaft timing chain (right-side) with camshaft chain sprocket and chain tensioner.

• The elongated holes in the camshaft chain sprocket must be aligned centrally over the threaded holes in the camshaft.

– Tighten bolts -1- for chain tensioner.

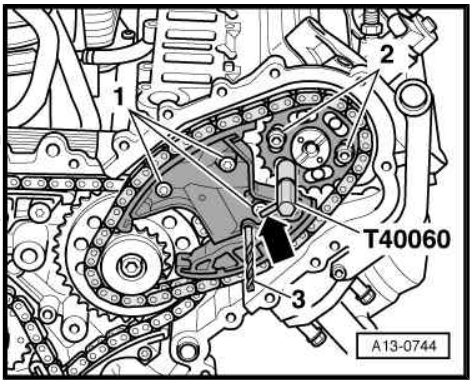
– Fit both bolts -2- for camshaft chain sprocket without tightening.

• It should just be possible to turn the sprocket on the camshaft without axial movement.

– Use adjustment pin - T40060- to lock camshaft (right-side).

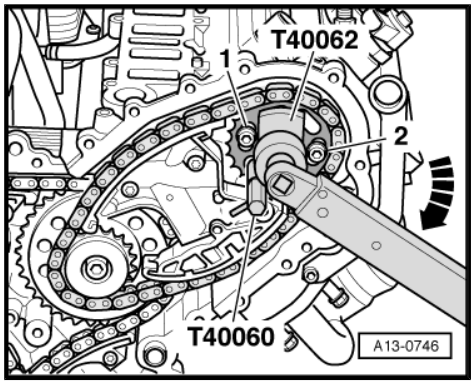
• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.

– Pull drill bit -3- out of locating hole, this releases the chain tensioner (right-side).

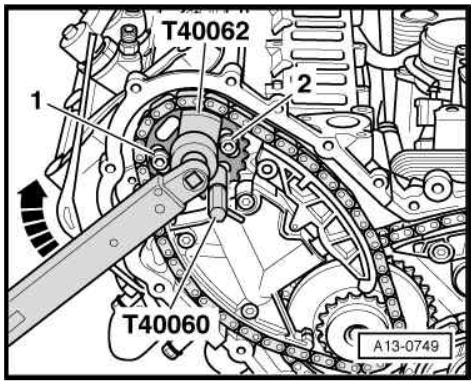


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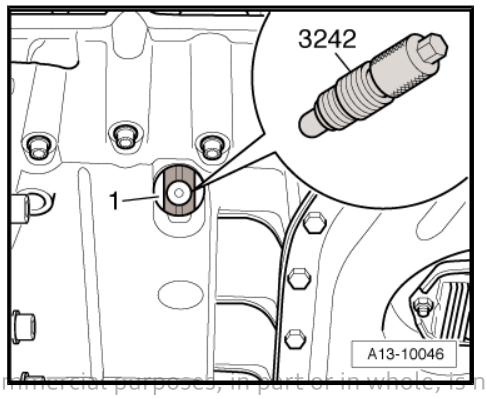
– Apply a torque of 20 Nm to camshaft sprocket (right-side) in clockwise direction -arrow- using a torque wrench and adapter - T40062- and maintain this torque.
– Tighten bolts -1- and -2-.
– Remove adapter - T40062- and adjustment pin - T40060- .
– Tighten remaining bolts for camshaft sprocket (right-side).



– Apply a torque of 15 Nm to camshaft sprocket (left-side) in clockwise direction -arrow- using a torque wrench and adapter - T40062- and maintain this torque.
– Tighten bolts -1- and -2-.
– Remove adapter - T40062- and adjustment pin - T40060- .
– Tighten remaining bolts for camshaft sprocket (left-side).



– Remove locking pin - 3242- .



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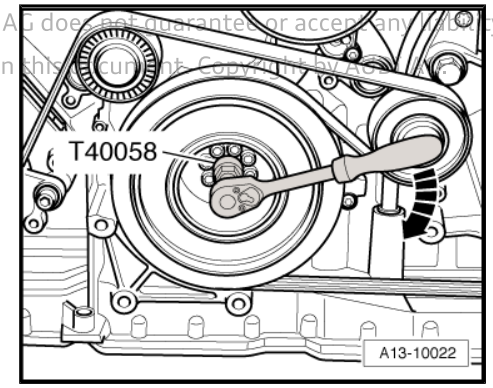
Checking valve timing

Caution

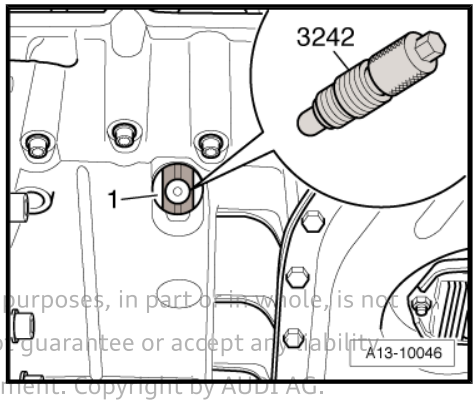
Irreparable damage can be caused if the camshaft timing chain slips.

- ***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

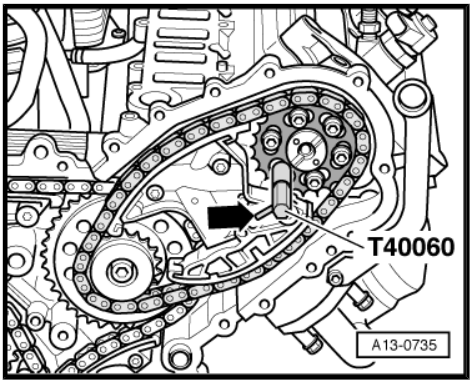
The crankshaft must be exactly in "TDC" position to ensure accurate valve timing adjustment.

- *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- .*

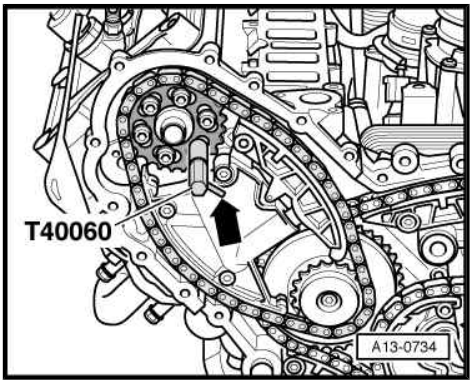
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– Check that camshafts on both cylinder heads are positioned at "TDC".

- 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).

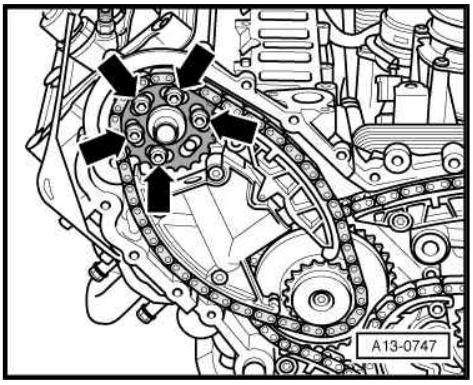


- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft on cylinder bank 2 (left-side).

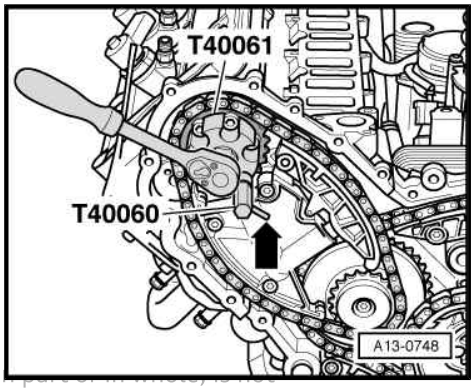


Adjusting valve timing

– If the pin cannot be inserted in one of the camshafts, loosen all bolts -arrows- of relevant camshaft chain sprocket approx. 1 turn.



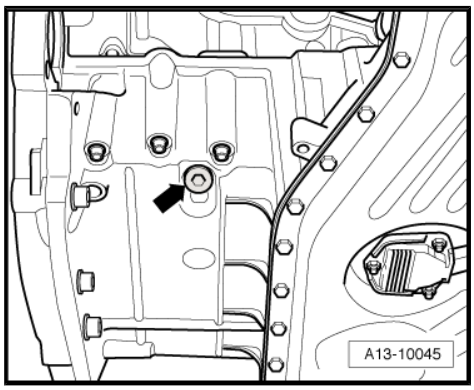
– Apply adapter - T40061- to the heads of the loosened bolts.
– Turn camshaft slightly backwards and forwards with adapter - T40061- until adjustment pin - T40060- can be inserted.
• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin 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 280 .



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

– Tighten plug -arrow- for “TDC” marking in sump (top section) ⇒ page 253 .
– Install timing chain cover: left-side ⇒ page 230 , right-side ⇒ page 232 .



3.7 Removing and installing drive chain for valve gear

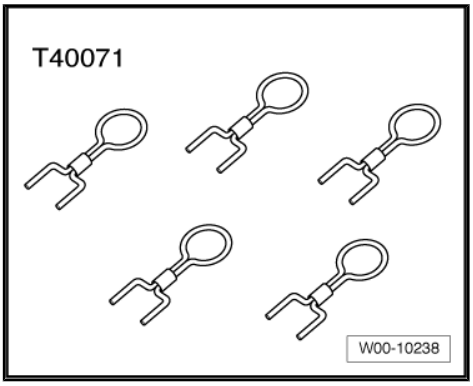
⇒ “3.7.1 Removing and installing drive chain for valve gear - engine codes CAMA, CAMB, CCLA, CCWA, CCWB, CGKA, CGKB”, page 282

⇒ “3.7.2 Removing and installing drive chain for valve gear - engine code CAPA”, page 284

3.7.1 Removing and installing drive chain for valve gear - engine codes CAMA, CAMB, CCLA, CCWA, CCWB, CGKA, CGKB

Special tools and workshop equipment required

♦ Locking pin - T40071-



♦ Drill bit, ∅ 3.3 mm

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Removing

- Gearbox removed

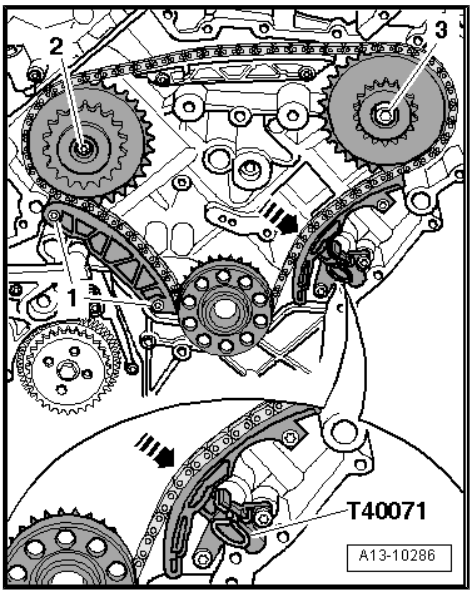
– Remove drive plate ⇒ page 177 .

– Remove timing chain covers: left-side ⇒ page 230 , right-side ⇒ page 232 , bottom ⇒ page 234 .

– Remove timing chains ⇒ page 247 .

– Remove chain for auxiliary drives ⇒ page 285 .

– Press tensioning rail of drive chain tensioner in direction of -arrow- and lock chain tensioner by inserting locking pin - T40071- .



> **Caution**
>
> ***If a used drive chain rotates in the opposite direction when it is refitted, this can cause breakage.***
>
> ♦ ***Mark running direction of drive chain with coloured arrows for re-installation.***

– Unscrew bolts -1- and remove guide rail.

– Remove bolts -2- and -3- and detach chain sprockets with drive chain.

Installing

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

Tightening torques

♦ ⇒ “3.2.1 Exploded view - drive chain for valve gear, engine codes CAMA, CAMB, CCLA, CCWA, CCWB, CGKA, CGKB”, page 242

– Install chain for auxiliary drives ⇒ page 285 .

– Install camshaft timing chains ⇒ page 247 .

– Install timing chain covers: left-side ⇒ page 230 , right-side ⇒ page 232 , bottom ⇒ page 234 .

– Install drive plate ⇒ page 177 .

– Fill up with engine oil and check oil level ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .

3.7.2 Removing and installing drive chain for valve gear - engine code CAPA

Special tools and workshop equipment required

- Drill bit, ∅ 3.3 mm

Removing

- Gearbox removed

– Remove drive plate ⇒ page 177 .

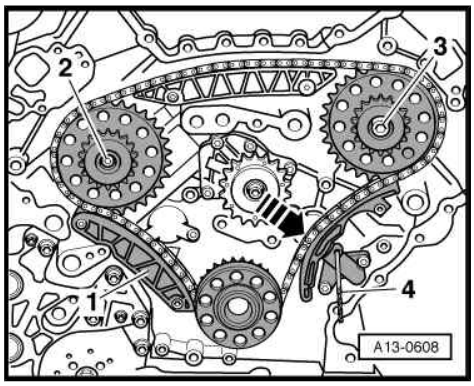
– Remove timing chain covers: left-side ⇒ page 230 , right-side ⇒ page 232 , bottom ⇒ page 234 .

– Remove timing chains ⇒ page 255 .

– Remove chain for auxiliary drives ⇒ page 285 .

– Wrap insulating tape around tip and shaft of 3.3 mm ∅ drill bit to avoid cuts.

– Press guide rail of drive chain tensioner in direction of -arrow- and lock chain tensioner by inserting 3.3 mm ∅ drill bit -item 4-.



Caution

If a used drive chain rotates in the opposite direction when it is refitted, this can cause breakage.

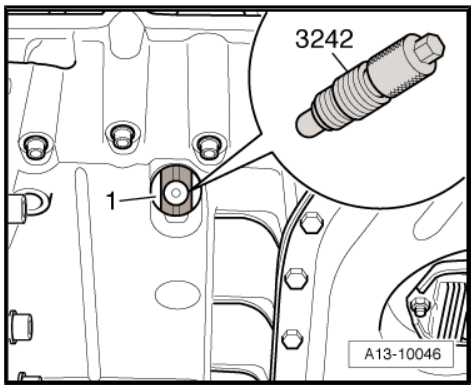
- *Mark running direction of drive chain with coloured arrows for re-installation.*

– Remove bolts -2- and -3- and detach chain sprockets with drive chain and guide rail -1-.

Installing

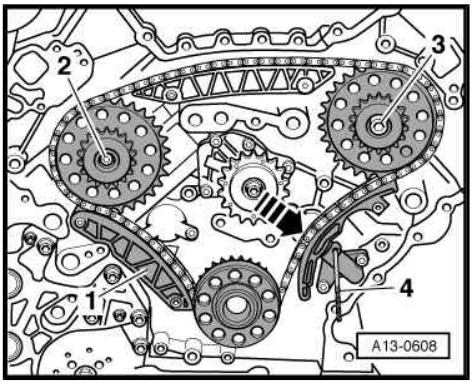
Installation is carried out in reverse order; note the following:

- Tightening torque ⇒ “3.2.2 Exploded view - drive chain for valve gear, engine code CAPA”, page 243
- Crankshaft -1- locked in TDC position with locking pin - 3242- .



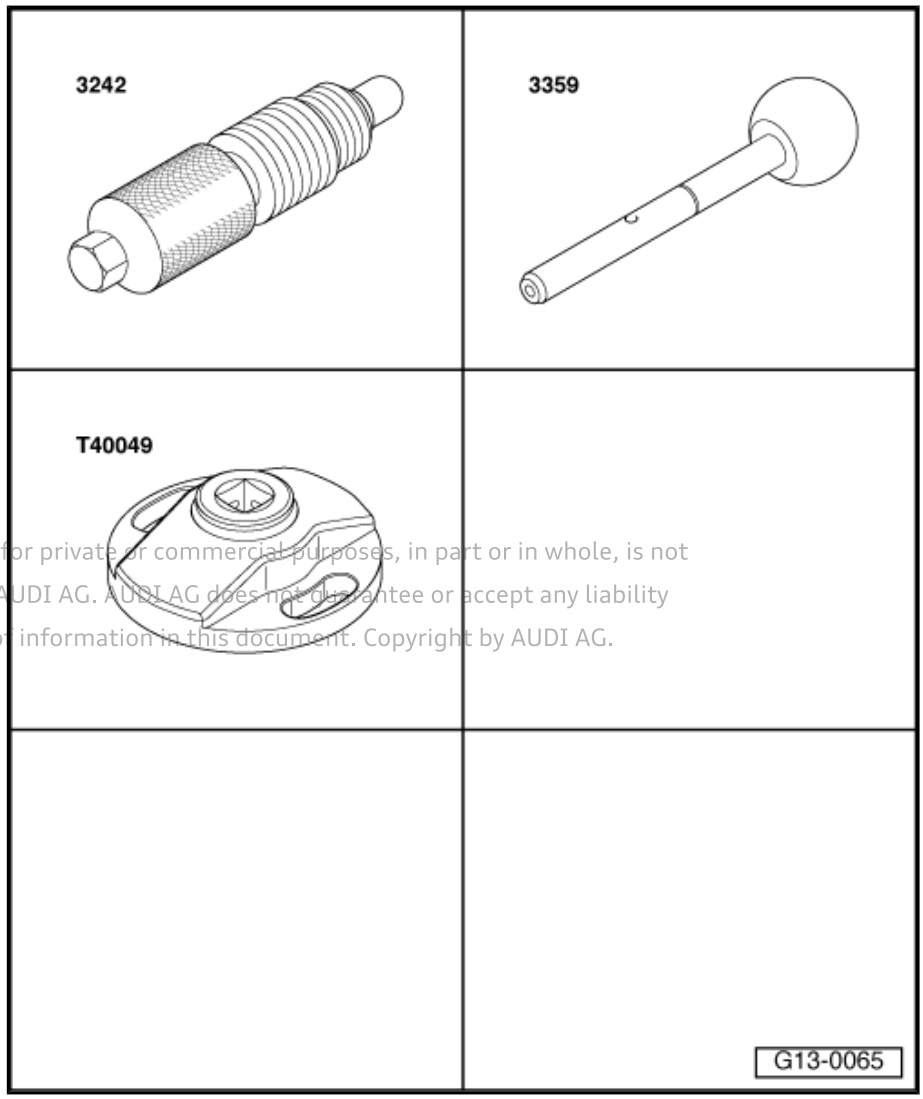
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– First install camshaft chain sprocket -2- for camshaft timing chain (left-side).
– Install guide rail -1- with drive chain fitted.
– Install camshaft chain sprocket for camshaft timing chain (right-side) -3-.
– Press guide rail of drive chain tensioner in direction of -arrow- and pull drill bit -4- out of chain tensioner.
– Install chain for auxiliary drives ⇒ page 285 .
– Install timing chain covers: left-side ⇒ page 230 , right-side ⇒ page 232 , bottom ⇒ page 234 .
– Install drive plate ⇒ page 177 .
– Fill up with engine oil and check oil level ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .



3.8 Removing and installing drive chain for auxiliary drive

Special tools and workshop equipment required



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♦ Locking pin - 3242- or locking pin - T40237-
♦ Diesel injection pump locking pin - 3359-

- Key - T40049-
- Nuts M12 (2x)
- Drill bit, ∅ 3.3 mm

Removing

- Gearbox removed

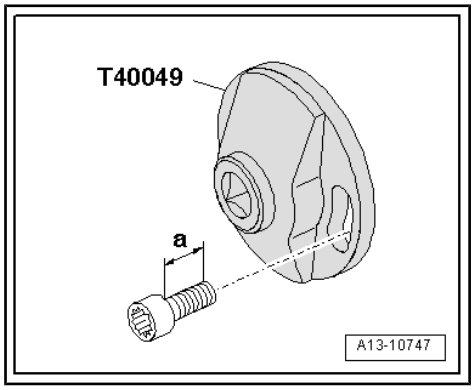
– Remove drive plate ⇒ page 177 .

– Remove timing chain covers: left-side ⇒ page 230 , right-side ⇒ page 232 , bottom ⇒ page 234 .

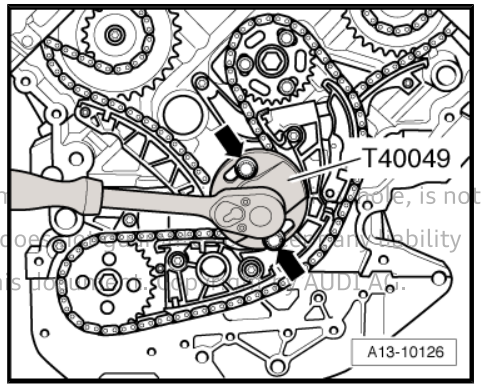
Caution

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.***

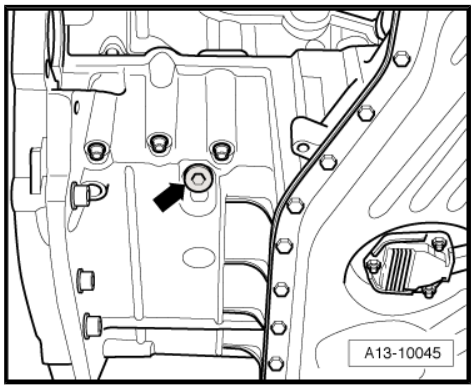


– Attach key - T40049- at rear end of crankshaft using 2 bolts -arrows-.

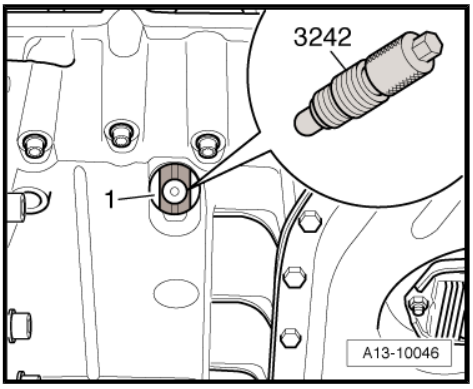


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– Use extended hexagon socket wrench with ball head and unscrew plug -arrow- from sump (top section).



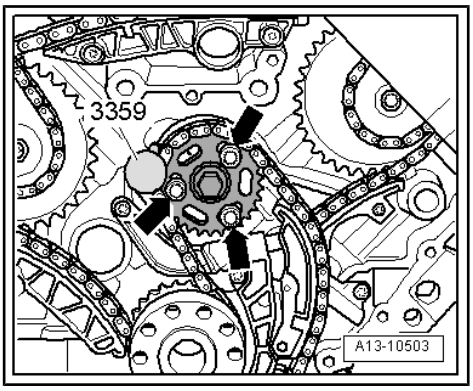
– Screw locking pin - 3242- into hole (20 Nm); if necessary, turn crankshaft backwards and forwards slightly to fully centralise locking pin.



Caution

If a used chain for auxiliary drives rotates in the opposite direction when it is refitted, this can cause breakage.

- *Mark running direction of chain for auxiliary drives with coloured arrows for re-installation.*

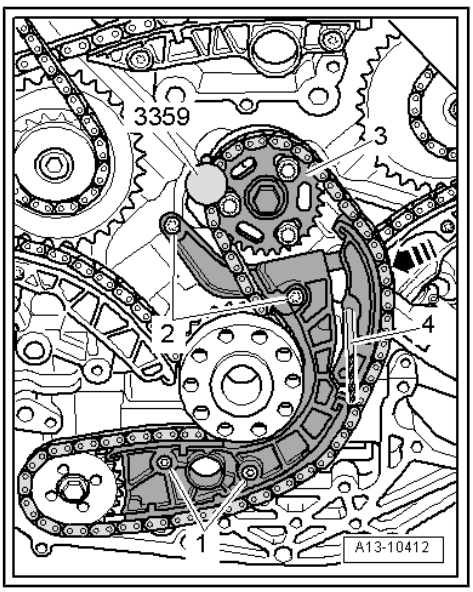


– Lock balance shaft at rear of engine with diesel injection pump locking pin - 3359- and loosen bolts -arrows- for balance shaft sprocket.

– Wrap insulating tape around tip and shaft of 3.3 mm ∅ drill bit to avoid cuts.

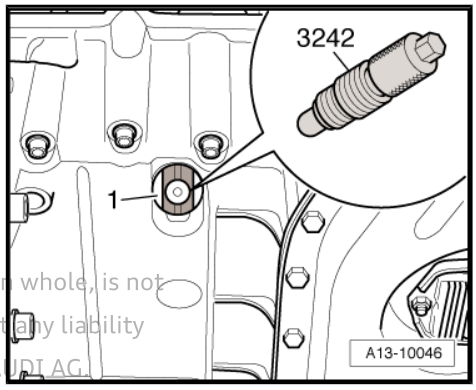
– Press guide rail of chain tensioner in direction of -arrow- and lock chain tensioner by inserting 3.3 mm ∅ drill bit -item 4-.

– Remove bolts -1- and -2- and take out chain tensioner, balance shaft sprocket -3- and chain.



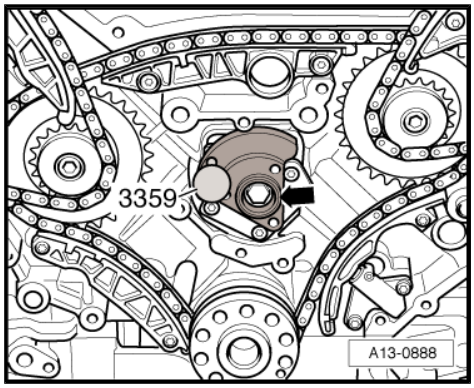
Installing

- Tightening torques
  ⇒ “3.3 Exploded view - drive chain for balance shaft and oil pump”, page 245
- Crankshaft -1- locked in “TDC” position with locking pin - 3242- .



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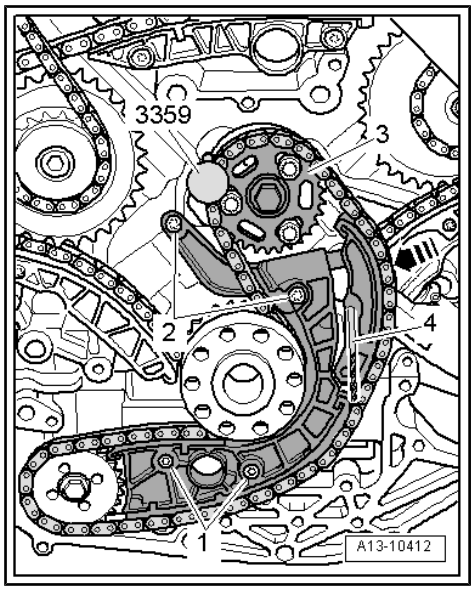
– Lock balance shaft -arrow- at rear of engine with diesel injection pump locking pin - 3359-



– Install chain tensioner with chain and balance shaft sprocket.

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

– Tighten bolts -1- and -2- for chain tensioner.

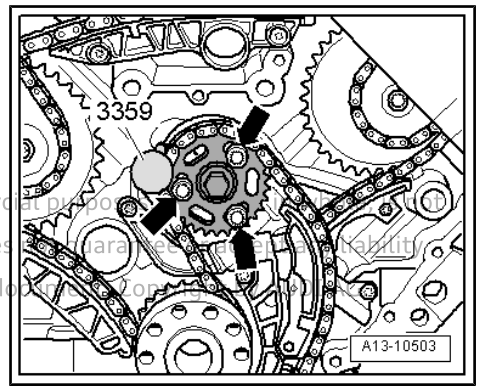


Note

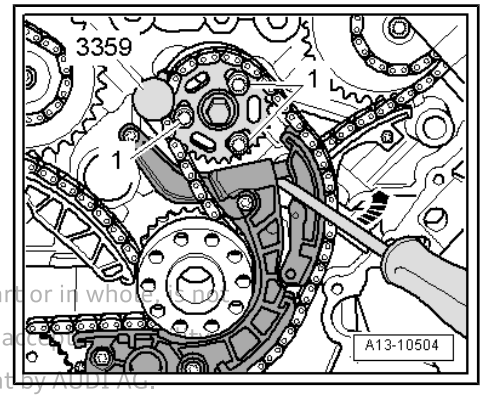
Disregard -item 4- and -arrow-.

– Fit bolts -arrows- for chain sprocket without tightening.

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



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– Pull drill bit out of locating hole, this releases the chain tensioner.
– Press against guide rail of chain tensioner in direction of -arrow- using a screwdriver, and at the same time tighten bolts -1- securing chain sprocket.
– Pull diesel injection pump locking pin - 3359- out of balance shaft.

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

– Install timing chain covers: left-side ⇒ page 230 , right-side ⇒ page 232 , bottom ⇒ page 234 .
– Install drive plate ⇒ page 177 .
– Fill up with engine oil and check oil level ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .

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4 Valve gear

⇒ “4.1 Exploded view - valve gear”, page 290
⇒ “4.2 Measuring axial clearance of camshaft”, page 292
⇒ “4.3 Measuring radial clearance of camshaft”, page 293
⇒ “4.4 Removing and installing camshaft oil seal”, page 294
⇒ “4.5 Removing and installing camshaft”, page 296
⇒ “4.6 Removing and installing valve stem oil seals”, page 311

4.1 Exploded view - valve gear

Caution

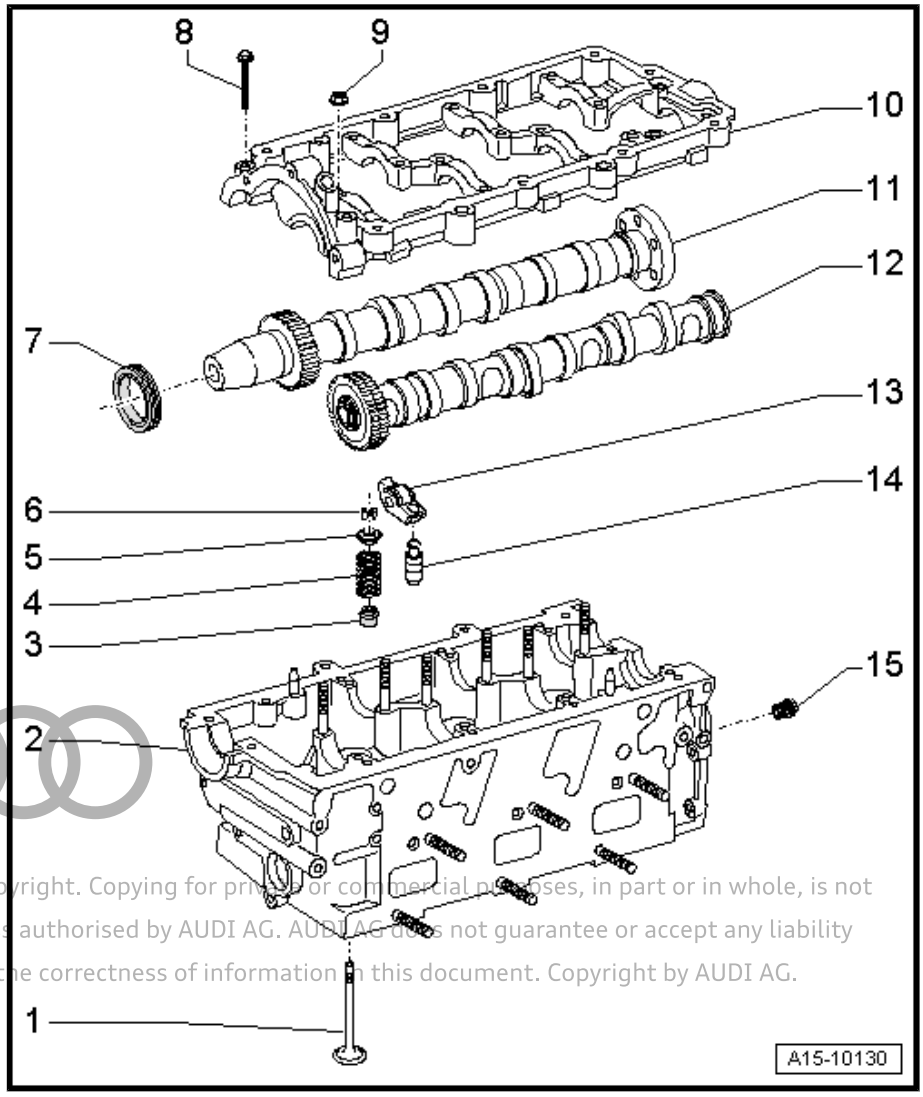
Risk of damage to valves and piston crowns after working on valve gear.

- *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

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



1 - Valve

- ❑ Do not machine, only grinding-in is permitted
- ❑ Mark installation position for re-installation
- ❑ Checking ⇒ page 319
- ❑ Valve dimensions ⇒ page 320
- ❑ Checking valve guides ⇒ page 318

2 - Cylinder head

- ❑ Checking valve guides ⇒ page 318
- ❑ Machining valve seats ⇒ page 318

3 - Valve stem oil seal

- ❑ Renewing with cylinder head installed ⇒ page 311
- ❑ Renewing with cylinder head removed ⇒ page 315

4 - Valve spring

5 - Valve spring plate

6 - Valve cotters

7 - Camshaft oil seal

- ❑ Renewing ⇒ page 294

8 - Bolt

- ❑ Tightening torque and tightening sequence: cylinder head (left-side) ⇒ page 292 , cylinder head (right-side) ⇒ page 292

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9 - Nut

- ❑ Tightening torque and tightening sequence: cylinder head (left-side) ⇒ page 292 , cylinder head (right-side) ⇒ page 292

10 - Retaining frame

- ❑ With integrated camshaft bearings
- ❑ Removing and installing ⇒ “4.5.1 Removing and installing camshaft - cylinder head (left-side)”, page 296

11 - Inlet camshaft

- ❑ Removing and installing: cylinder head (left-side) ⇒ page 296 , cylinder head (right-side) ⇒ page 304
- ❑ Measuring axial clearance ⇒ page 292
- ❑ Measuring radial clearance ⇒ page 293
- ❑ Runout: max. 0.01 mm

12 - Exhaust camshaft

- ❑ Removing and installing: cylinder head (left-side) ⇒ page 296 , cylinder head (right-side) ⇒ page 304
- ❑ Measuring axial clearance ⇒ page 292
- ❑ Measuring radial clearance ⇒ page 293
- ❑ Runout: max. 0.01 mm

13 - Roller rocker finger

- ❑ Mark installation position for re-installation

- ❑ Check roller bearings for ease of movement
- ❑ Lubricate contact surfaces before installing

14 - Hydraulic compensation element

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

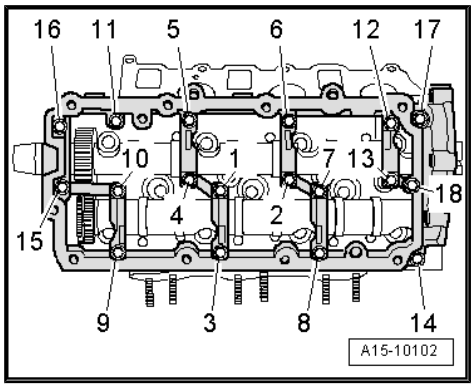
15 - Pressure limiting valve 1.0 bar

- ❑ For lubricating points in cylinder head
- ❑ Not applicable to more recent versions
- ❑ 25 Nm

Retaining frame on cylinder head (left-side) - tightening torque and sequence

– Tighten bolts and nuts in 2 stages in the sequence shown:

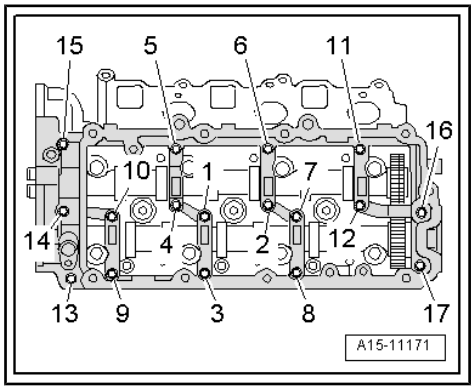
Stage	Bolts/nuts	Tightening torque
1.	-1 … 18-	Screw in by hand until contact is made • The retaining frame should make contact with the cylinder head over the full surface
2.	-1 … 18-	9 Nm



Retaining frame on cylinder head (right-side) - tightening torque and sequence

– Tighten bolts and nuts in 2 stages in the sequence shown:

Stage	Bolts/nuts	Tightening torque
1.	-1 … 17-	Screw in by hand until contact is made • The retaining frame should make contact with the cylinder head over the full surface
2.	-1 … 17-	9 Nm

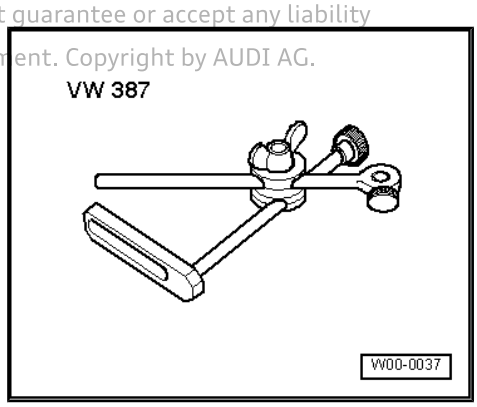


4.2 Measuring axial clearance of camshaft

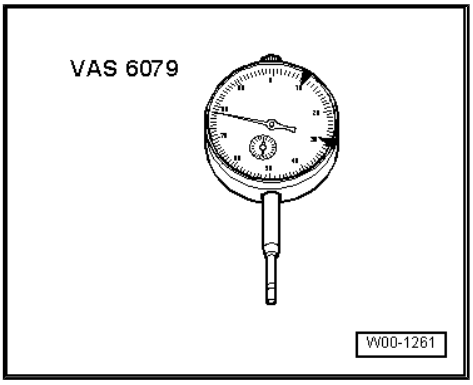
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Special tools and workshop equipment required

♦ Universal dial gauge bracket - VW 387-



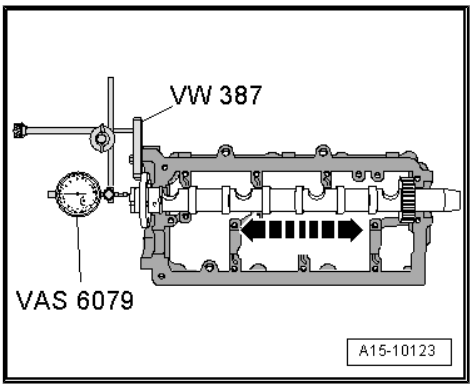
♦ Dial gauge - VAS 6079-



Procedure

– Remove retaining frame: cylinder head (left-side) ⇒ page 296 , cylinder head (right-side) ⇒ page 304 .

– Secure dial gauge - VAS 6079- with universal dial gauge bracket - VW 387- to retaining frame as shown in illustrations.

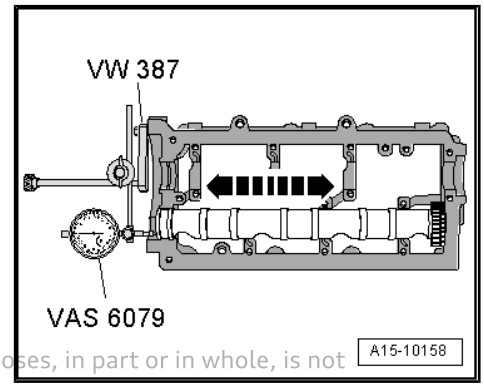


Axial clearance (inlet camshaft)

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

Axial clearance (exhaust camshaft)

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



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4.3 Measuring radial clearance of camshaft

Special tools and workshop equipment required

♦ Plastigauge

Procedure

– Remove camshafts: cylinder head (left-side) ⇒ page 296 , cylinder head (right-side) ⇒ page 304 .

– 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 retaining frame and secure with old bolts and nuts without rotating camshafts.

- Retaining frame on cylinder head (left-side) - tightening torque and sequence ⇒ page 292
- Retaining frame on cylinder head (right-side) - tightening torque and sequence ⇒ page 292

– Remove retaining frame and camshafts again.

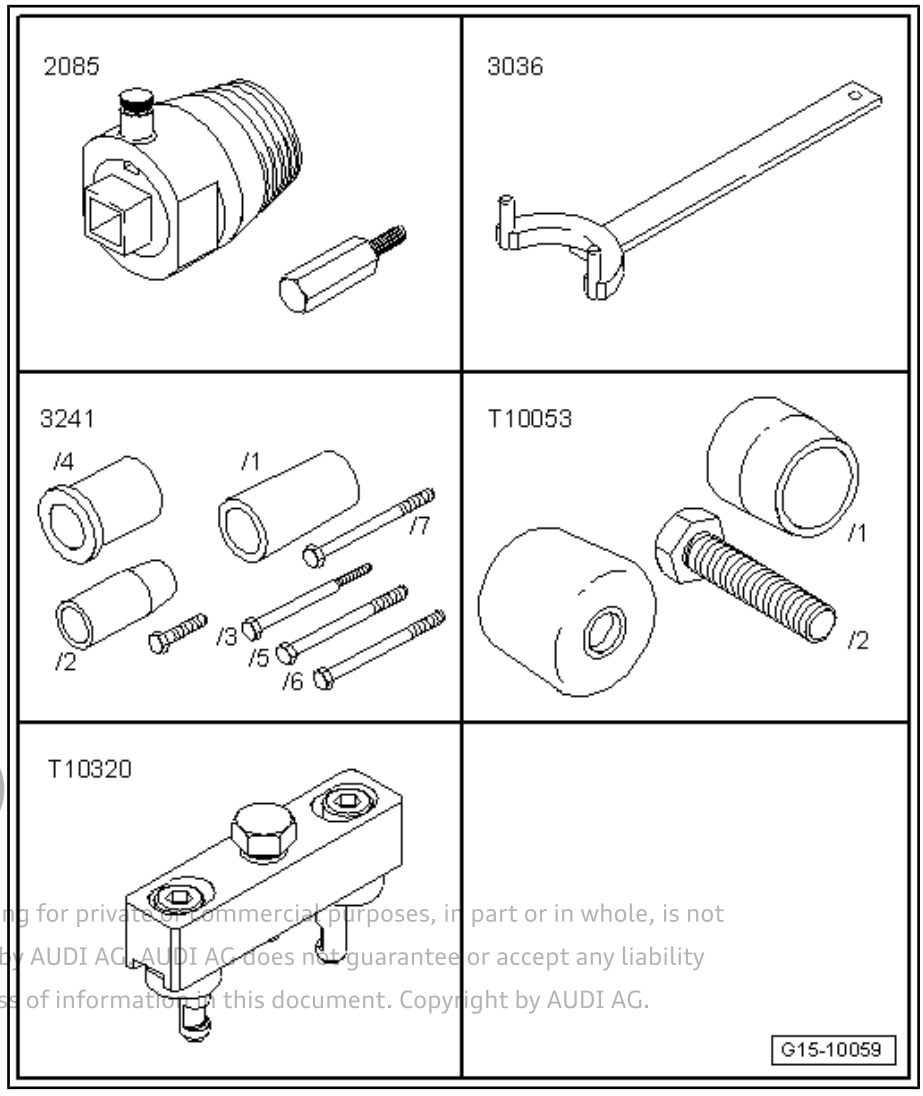
– Compare width of Plastigauge with measurement scale.

Radial clearance:

- New: 0.035 ... 0.085 mm.
- Wear limit: 0.1 mm.

4.4 Removing and installing camshaft oil seal

Special tools and workshop equipment required



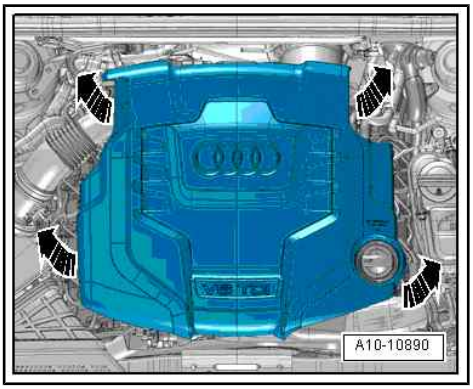
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- Oil seal extractor - 2085-
- Counterhold tool - 3036-
- Hexagon bolt M10 x 1.25 x 40, (from fitting sleeves - 3241-)
- Assembly tool - T10053-
- Puller - T10320-

Procedure

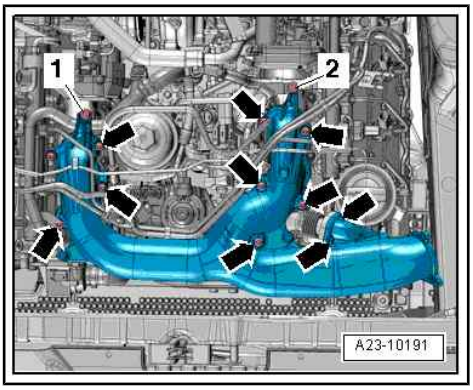
- Tightening torque ⇒ page 197

– Remove engine cover panel -arrows-.

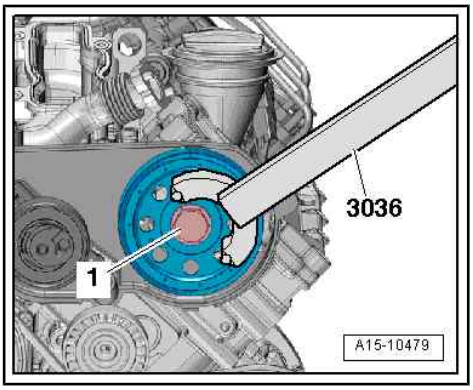


– Remove intake manifold (top section) ⇒ page 483 .

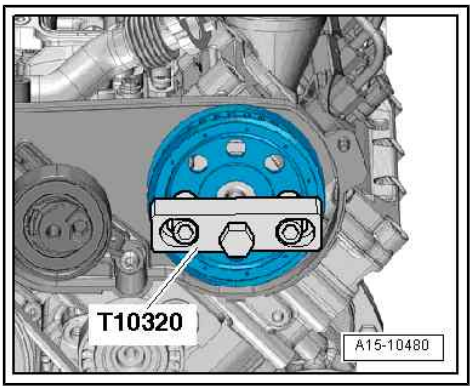
– Remove toothed belt for high-pressure pump ⇒ page 519 .



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

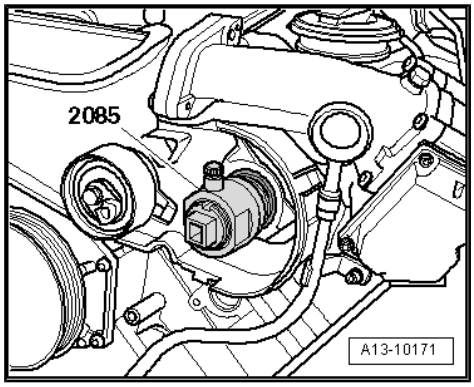


– Remove toothed belt drive sprocket using puller - T10320- .

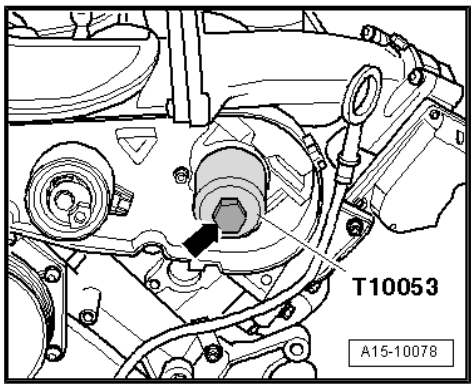


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– Unscrew inner section of oil seal extractor -2085- 3 turns out of outer section and lock inner section with knurled screw.
– Lubricate threaded head of oil seal extractor, place it in position and screw it into oil seal as far as possible (applying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



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



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

– Install toothed belt for high-pressure pump ⇒ page 519 .
– Install intake manifold (top section) ⇒ page 483 .

4.5 Removing and installing camshaft

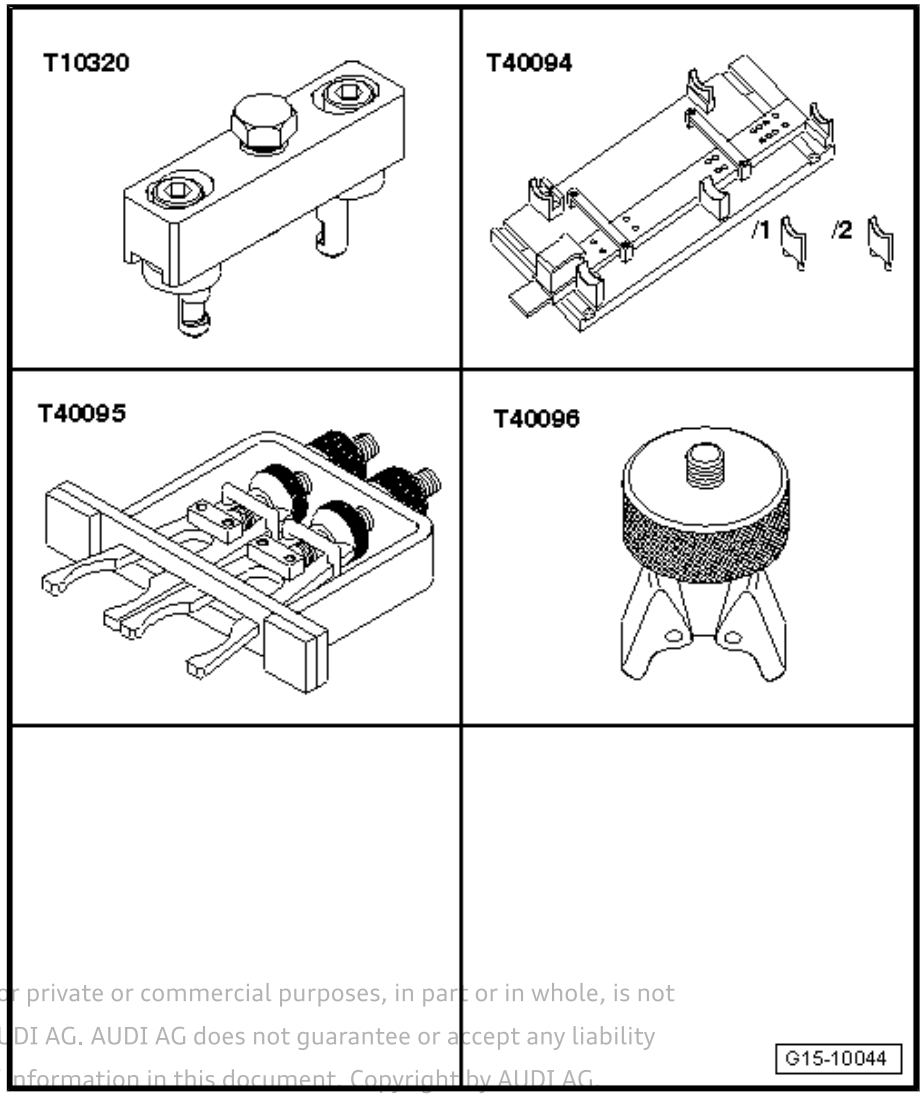
⇒ “4.5.1 Removing and installing camshaft - cylinder head (left-side)”, page 296

⇒ “4.5.2 Removing and installing camshaft - cylinder head (right-side)”, page 304

4.5.1 Removing and installing camshaft - cylinder head (left-side)

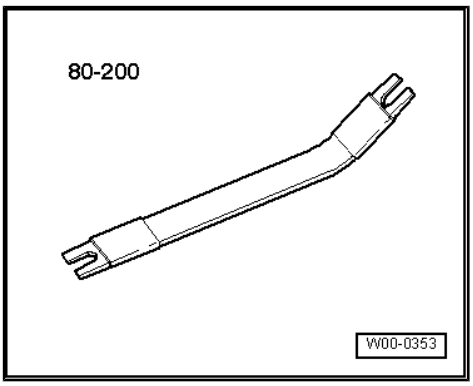
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Special tools and workshop equipment required

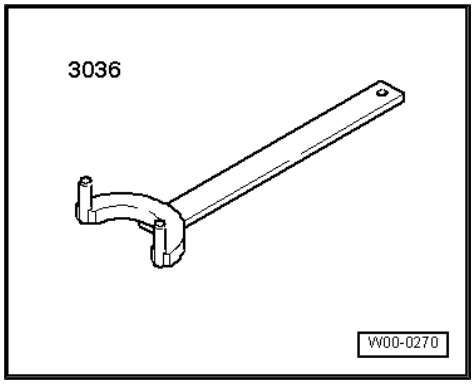


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- Puller - T10320-
- Camshaft fitting tool - T40094-
- Camshaft fitting tool - T40095-
- Camshaft fitting tool - T40096-
- Removal lever - 80 - 200-



- Counterhold tool - 3036-



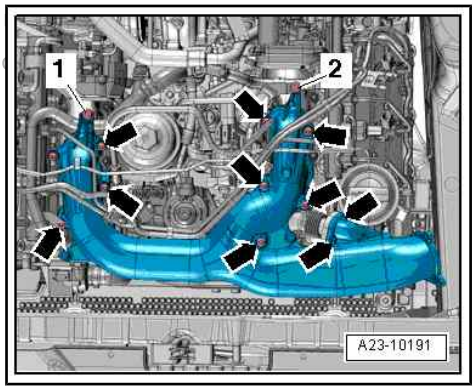
- Electric drill with plastic brush
- Safety goggles
- Sealant ⇒ Electronic parts catalogue

Removing

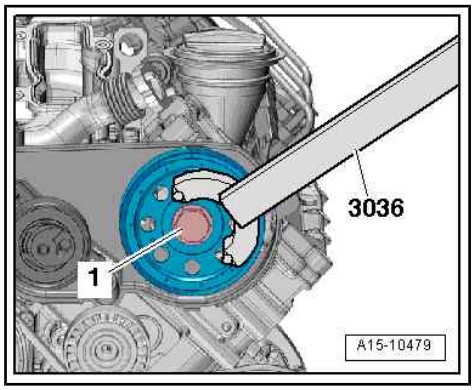
– Remove timing chain (left-side) from camshaft: engine codes CAMA, CAMB, CCLA, CCWA, CCWB, CGKA, CGKB ⇒ page 264 , engine code CAPA ⇒ page 273 .

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– Remove intake manifold (top section) ⇒ page 483 .

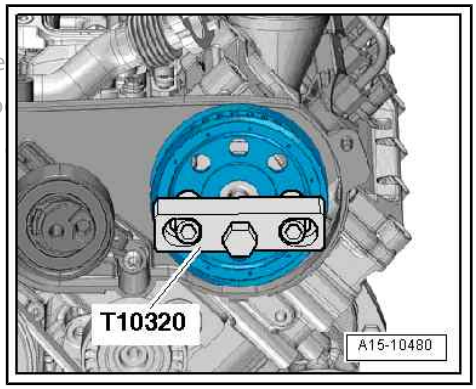


– Remove toothed belt for high-pressure pump ⇒ page 519 .
– Loosen bolt -1- for toothed belt drive sprocket approx. 2 turns using counterhold tool - 3036- .

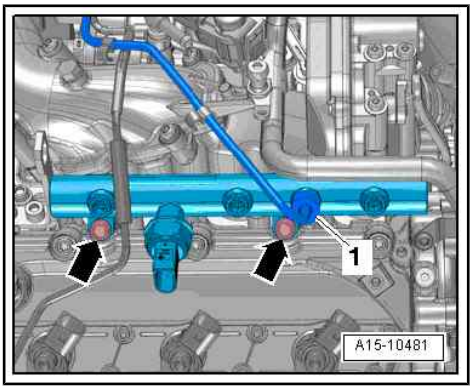


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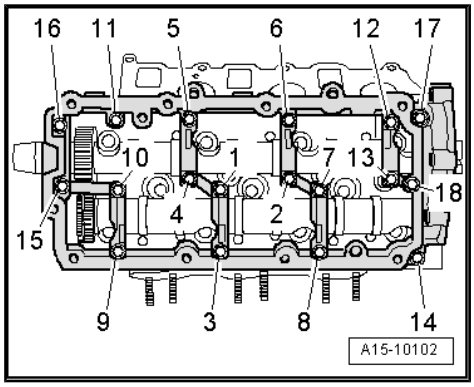
– Remove toothed belt drive sprocket using puller - T10320- .
– Remove cylinder head cover (left-side) ⇒ page 216 .



– Remove union nut -1- for high-pressure pipe.
– Remove bolts -arrows- and remove fuel rail from cylinder head (left-side).



– Slacken retaining frame bolts and nuts in the sequence -18 ... 1-.



Note

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

– Carefully detach retaining frame and camshafts.

Installing

Note

Renew sealing cap (front) on cylinder head (right-side).

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Tightening torques

◆ ⇒ “1.1 Exploded view - cylinder head”, page 197

Caution

Make sure axial bearings in retaining frame are not damaged.

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

Protect lubrication system against contamination.

- *Cover exposed parts of the cylinder head.*

WARNING

Risk of eye injury.

- *Put on safety goggles.*

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

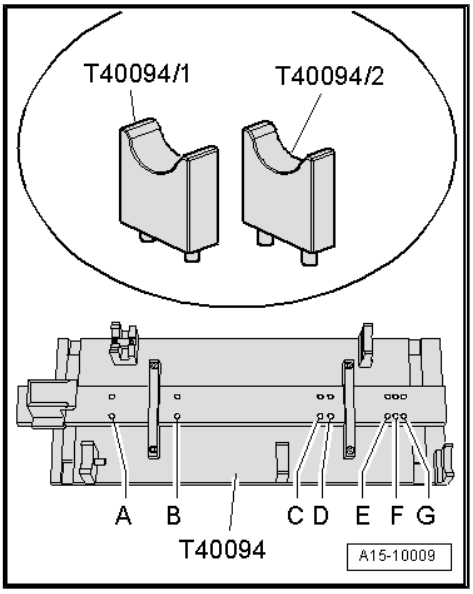
– Clean sealing surfaces; they must be free of oil and grease.

– Oil running surfaces of both camshafts.

Set up camshaft fitting tool - T40094- as follows:

– Insert support -T40094/2- in position -A-.

– Insert support -T40094/1- in position -D-.

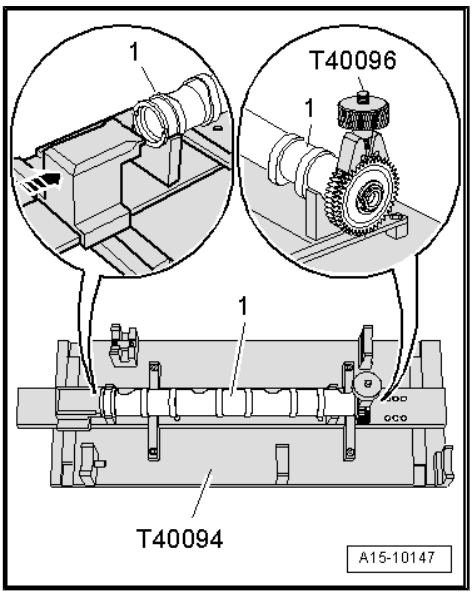


– Place exhaust camshaft -1- in supports -T40094/1- and -T40094/2- .

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

– Place camshaft fitting tool - T40096- on teeth of exhaust camshaft in such a way that the two arms of the tool engage on the two halves of the gear (one in each half, as shown in illustration).

– Tighten the clamping tool using the knurled wheel so that the faces of the gear teeth are in alignment.

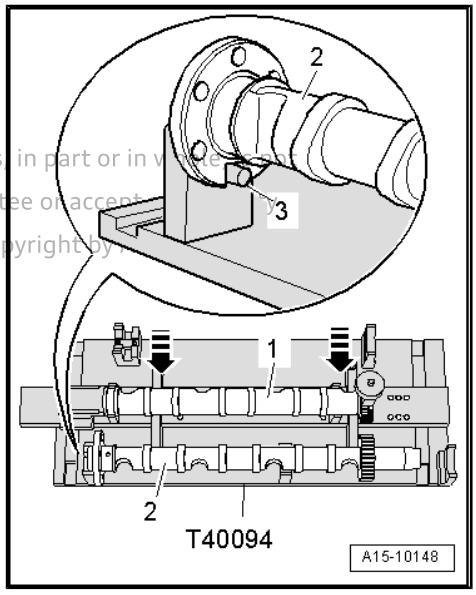


– Place inlet camshaft -2- in camshaft fitting tool - T40094- .

• The locating pin -3- must engage in the slot on the inlet camshaft.

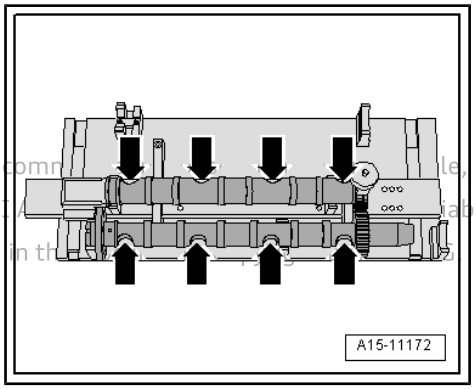
– Slide exhaust camshaft -1- towards inlet camshaft -arrows- until gear teeth engage.

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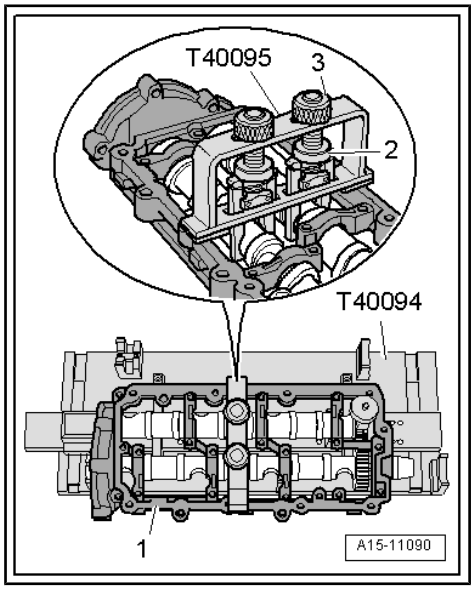


– Check that camshafts are in correct position:
• Recesses -arrows- on both camshafts must point outwards.

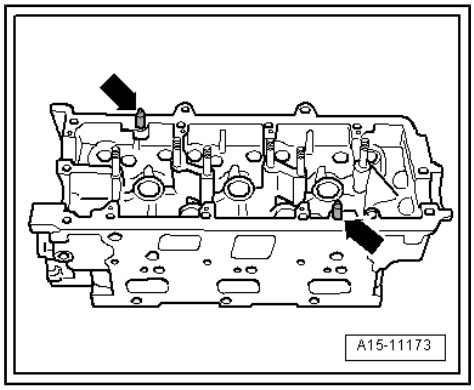
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– Fit retaining frame -1- on both camshafts.
• All camshaft bearings must be seated on the camshafts.
– Attach camshaft fitting tool - T40095- to camshafts (align arms of bracket as required and tighten knurled nuts -2-).
– Apply tension to camshafts by tightening the knurled nuts -3- upwards.



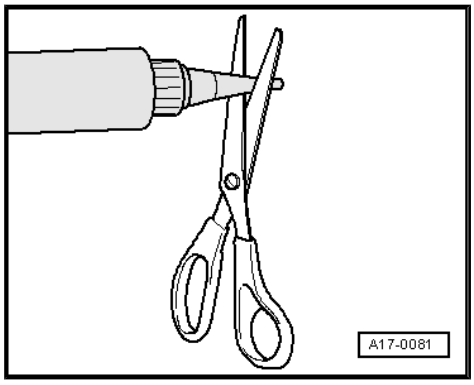
– Check if dowel pins -arrows- are fitted in cylinder head. Install missing dowel pins.

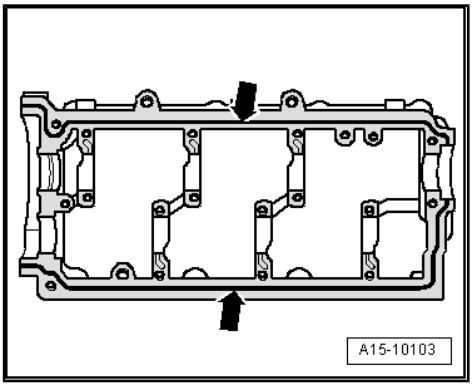


Note

Note the use-by date of the sealant.

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





Note

For illustration purposes, the retaining frame is shown without the camshafts.

– Turn retaining frame upside down.

Caution

Make sure lubrication system is not clogged by excess sealant.

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

– Apply sealant beads -arrows- onto clean sealing surfaces of retaining frame as shown in illustration.

- The grooves on the sealing surface must be completely filled with sealant.
- The beads of sealant must project 1.5 … 2.0 mm above the sealing surface.

Note

The retaining frame must be installed within 5 minutes after applying the sealant.

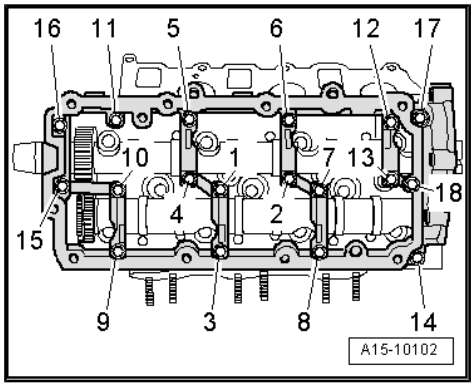
Caution

Risk of damage to engine.

- ***Ensure that all roller rocker fingers contact the valve ends and compensation elements correctly.***

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– Fit retaining frame together with both camshafts and camshaft fitting tool - T40095- onto cylinder head.
– Tighten bolts for retaining frame ⇒ page 292 .
– Remove camshaft fitting tool - T40095- and -T40096- .



Note

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

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

– Install cylinder head cover (left-side) ⇒ page 216 .
– Renew camshaft oil seal ⇒ page 294 .
– Install toothed belt for high-pressure pump ⇒ page 519 .
– Install intake manifold (top section) ⇒ page 483 .
– Install camshaft timing chain: engine codes CAMA, CAMB, CCLA, CCWA, CCWB, CGKA, CGKB ⇒ page 269 , engine code CAPA ⇒ page 278 .

Caution

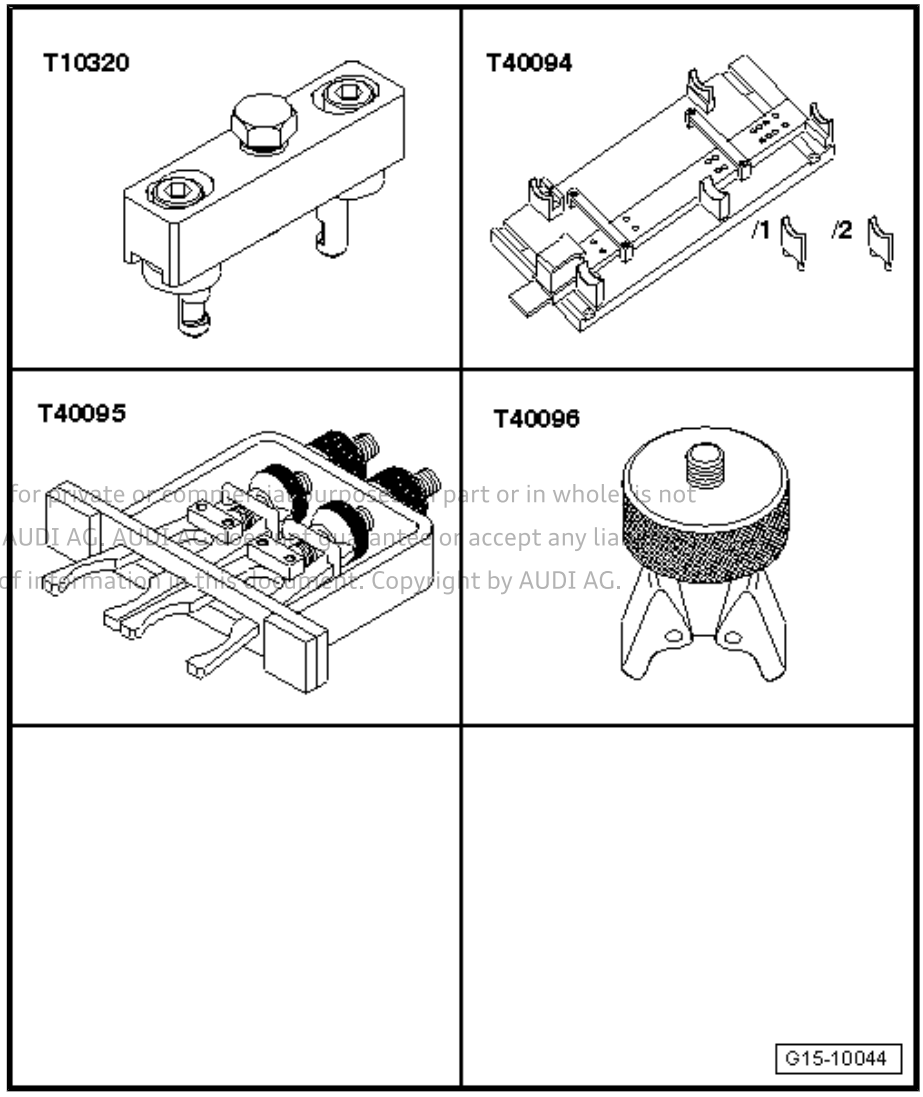
Risk of damage to valves and piston crowns after working on valve gear.

- ***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.***

4.5.2 Removing and installing camshaft - cylinder head (right-side)

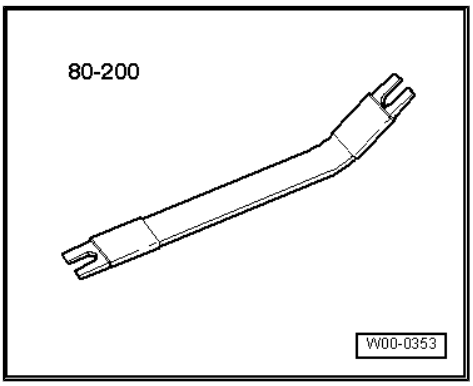
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Special tools and workshop equipment required

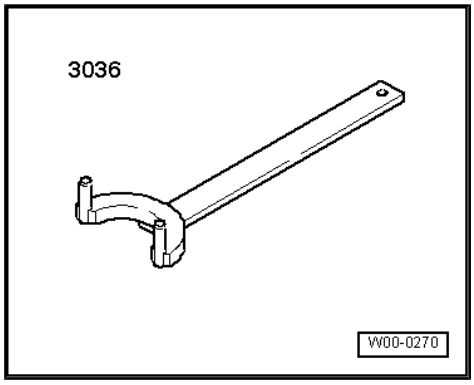


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- Puller - T10320-
- Camshaft fitting tool - T40094-
- Camshaft fitting tool - T40095-
- Camshaft fitting tool - T40096-
- Removal lever - 80 - 200-



- Counterhold tool - 3036-



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

Removing

– Remove timing chain (right-side) from camshaft: engine codes CAMA, CAMB, CCLA, CCWA, CCWB, CGKA, CGKB ⇒ page 264 , engine code CAPA ⇒ page 273 .

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– Remove cylinder head cover (right-side) ⇒ page 221 .

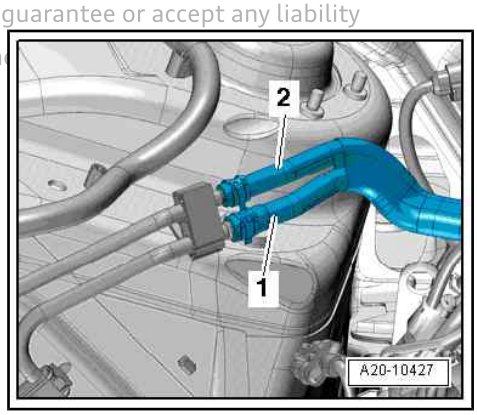
Note

Lay a cloth under the connection to catch escaping fuel.

Caution

Protect fuel system against contamination.

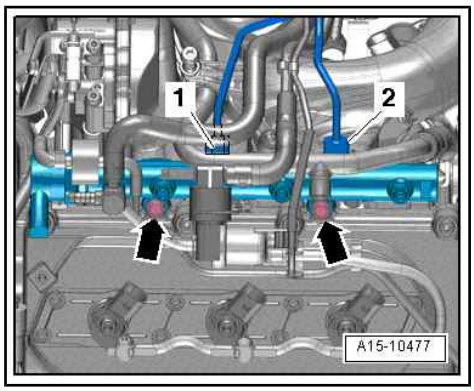
- ***Rules for cleanliness when working on the injection system ⇒ page 9 .***



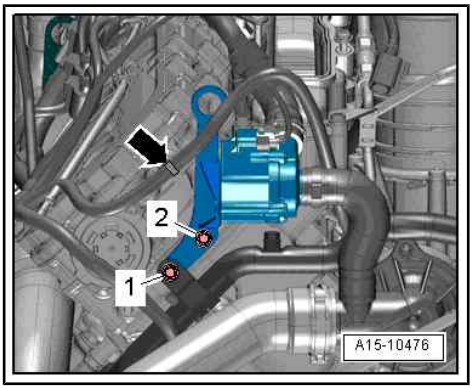
– Disconnect fuel supply hose -1- and fuel return hose -2-.

– Unscrew union nuts -1- and -2-.

– Remove bolts -arrows- and move fuel rail to one side (fuel hoses remain connected).



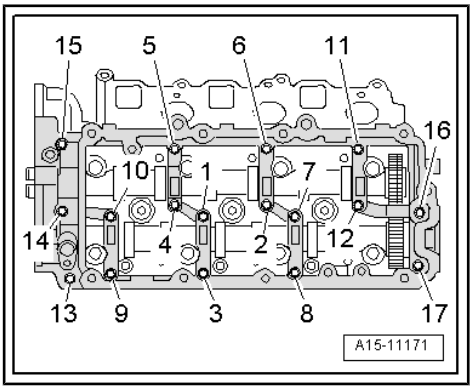
– Use removal lever - 80 - 200- to move electrical wiring harness clear -arrow-.



Note

Disregard items -1 and 2-.

– Slacken retaining frame bolts and nuts in the sequence -17 ... 1-.



Note

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

– Carefully detach retaining frame and camshafts.

Installing

Tightening torques

⇒ “1.1 Exploded view - cylinder head”, page 197

Caution

Make sure axial bearings in retaining frame are not damaged.

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

Protect lubrication system against contamination.

- ***Cover exposed parts of the cylinder head.***

WARNING

Risk of eye injury.

- ***Put on safety goggles.***

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

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

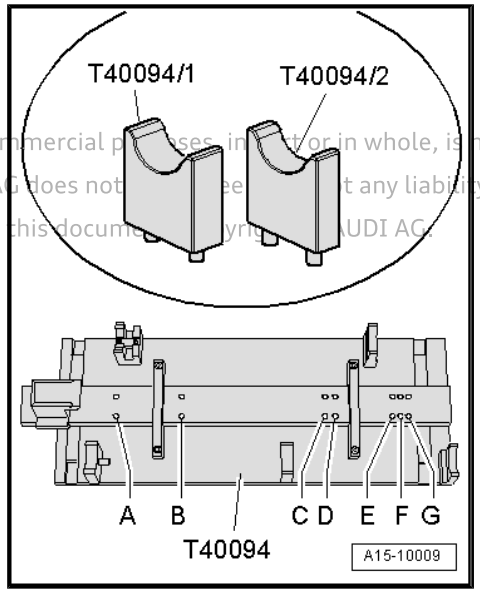
– Oil running surfaces of both camshafts.

Set up camshaft fitting tool - T40094- as follows:

– Insert support -T40094/2- in position -B-.

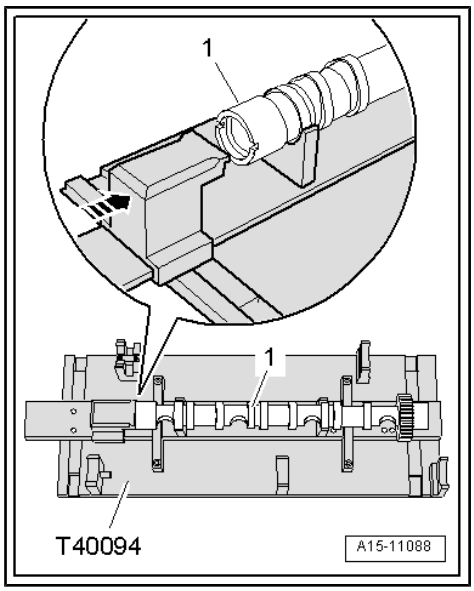
– Insert support -T40094/1- in position -C-.

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

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



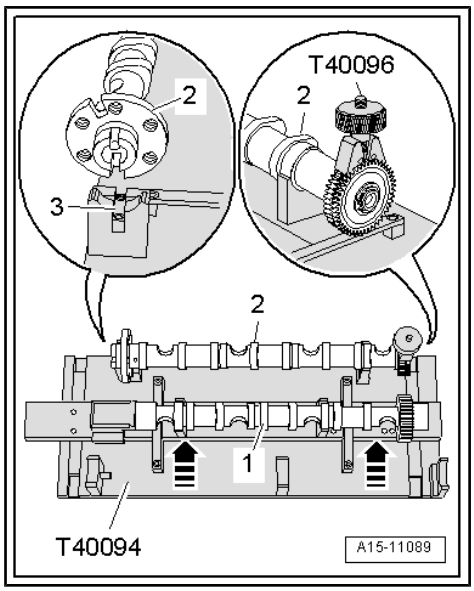
– Place inlet camshaft -2- in camshaft fitting tool - T40094- .

• The locating bar -3- must engage in the groove on the inlet camshaft.

– Place camshaft fitting tool - T40096- on teeth of inlet camshaft in such a way that the two arms of the tool engage on the two halves of the gear (one in each half, as shown in illustration).

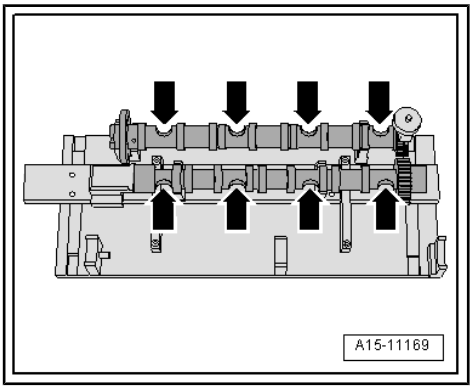
– Tighten the clamping tool using the knurled wheel so that the faces of the gear teeth are in alignment.

– Slide exhaust camshaft -1- towards inlet camshaft -arrows- until gear teeth engage.



– Check that camshafts are in correct position:

• Recesses -arrows- on both camshafts must point outwards.

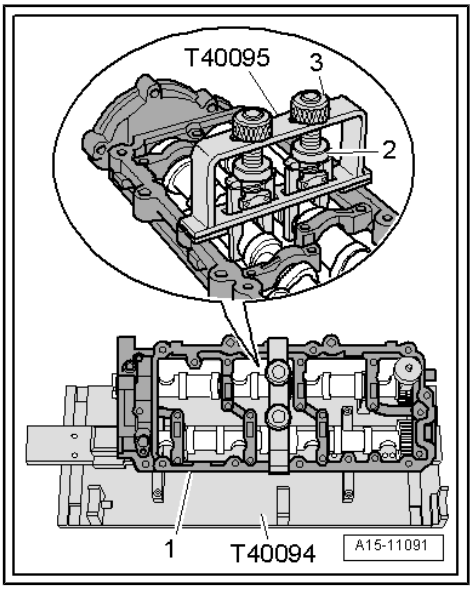


– Fit retaining frame -1- on both camshafts.

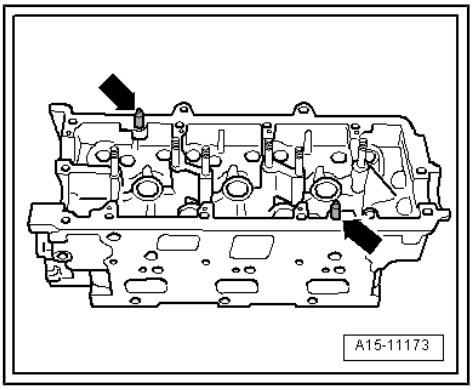
• All camshaft bearings must be seated on the camshafts.

– Attach camshaft fitting tool - T40095- to camshafts (align arms of bracket as required and tighten knurled nuts -2-).

– Apply tension to camshafts by tightening the knurled nuts -3- upwards.



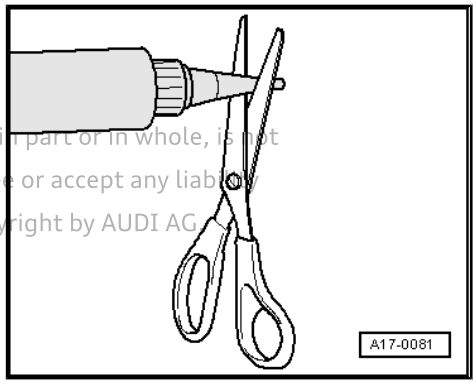
– Check if dowel pins -arrows- are fitted in cylinder head. Install missing dowel pins.



Note

Note the use-by date of the sealant.

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



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Note

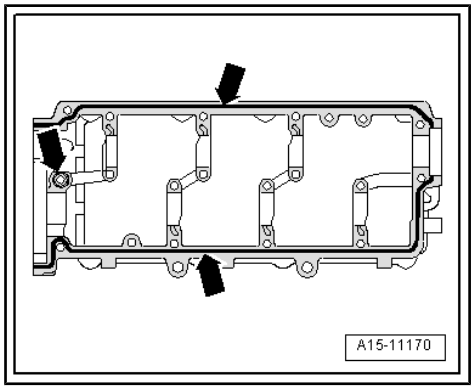
For illustration purposes, the retaining frame is shown without the camshafts.

– Turn retaining frame upside down.

Caution

Make sure lubrication system is not clogged by excess sealant.

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



– Apply sealant beads -arrows- onto clean sealing surfaces of retaining frame as shown in illustration.

- The grooves on the sealing surface must be completely filled with sealant.
- The beads of sealant must project 1.5 … 2.0 mm above the sealing surface.

Note

The retaining frame must be installed within 5 minutes after applying the sealant.

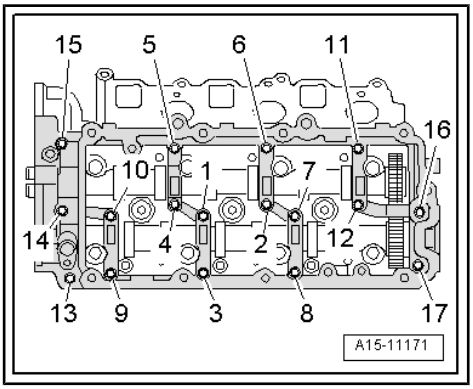
Caution

Risk of damage to engine.

- ***Ensure that all roller rocker fingers contact the valve ends and compensation elements correctly.***

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– Fit retaining frame together with both camshafts and camshaft fitting tool - T40095- onto cylinder head.
– Tighten bolts for retaining frame ⇒ page 292 .
– Remove camshaft fitting tool - T40095- and -T40096- .



Note

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

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

– Install cylinder head cover (right-side) ⇒ page 221 .
– Use suitable drift to drive in new sealing cap until flush.
– Install camshaft timing chain: engine codes CAMA, CAMB, CCLA, CCWA, CCWB, CGKA, CGKB ⇒ page 269 , engine code CAPA ⇒ page 278 .

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Caution

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

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

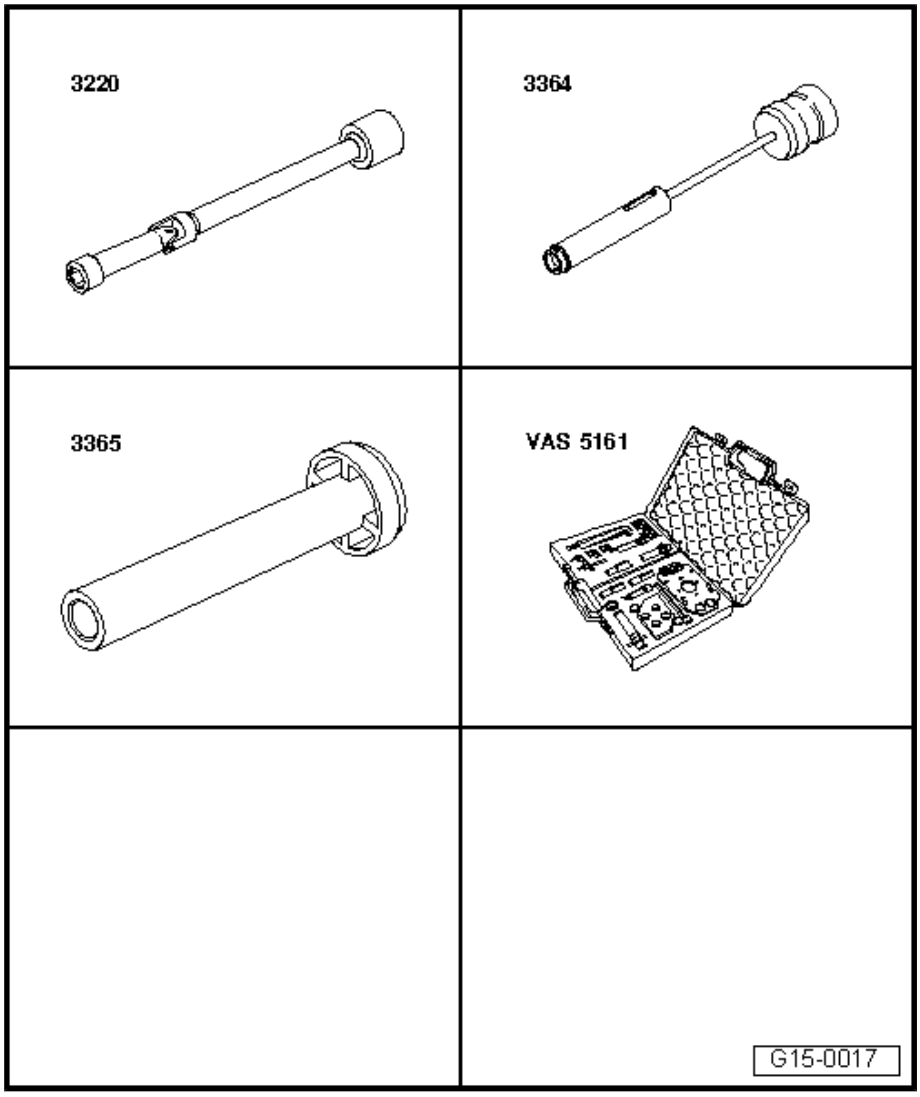
4.6 Removing and installing valve stem oil seals

⇒ "4.6.1 Removing and installing valve stem oil seals with cylinder head installed", page 311

⇒ "4.6.2 Removing and installing valve stem oil seals with cylinder head removed", page 315

4.6.1 Removing and installing valve stem oil seals with cylinder head installed

Special tools and workshop equipment required

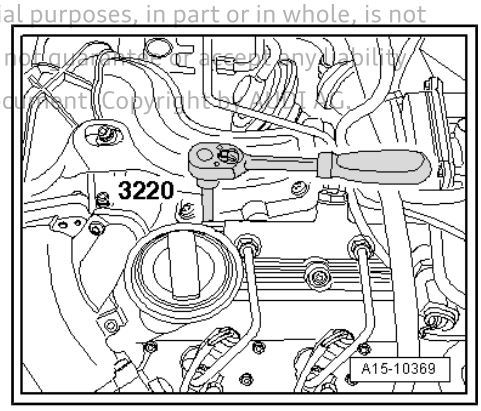


- Articulated wrench, 10 mm - 3220-
- Valve stem seal puller - 3364-
- Valve stem seal fitting tool - 3365-
- Removal and installation device for valve cotters - VAS 5161- with knurled spacer ring -VAS 5161/23-1- and guide plate for 3.0 ltr. TDI engine - VAS 5161/23-

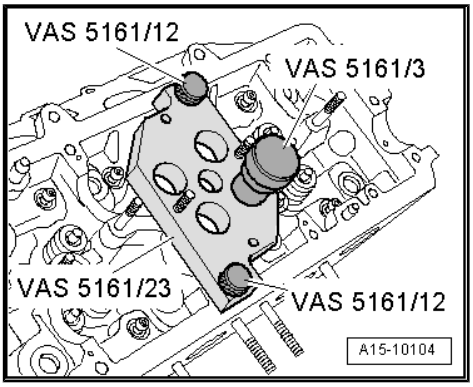
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Procedure

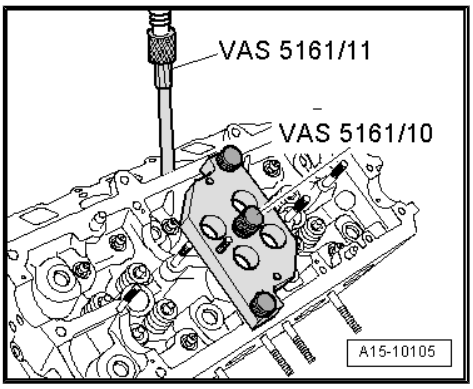
– Remove all glow plugs ⇒ page 634 .
– Remove camshafts: cylinder head (left-side) ⇒ page 296 , cylinder head (right-side) ⇒ page 304 .
– Mark original positions of roller rocker fingers and hydraulic compensation elements for re-installation.
– Remove roller rocker fingers together with hydraulic compensation elements and put down on a clean surface.
– Set piston of appropriate cylinder to “bottom dead centre”.



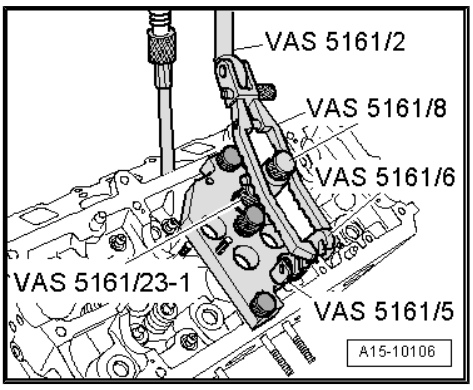
– Fit guide plate -VAS 5161/23- onto cylinder head.
– Secure guide plate with knurled screws -VAS 5161/12- .
– Insert drift -VAS 5161/3- into guide plate and use plastic-headed hammer to release sticking valve cotters.



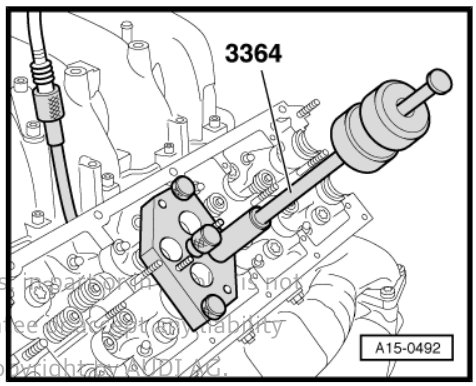
– Screw sealing pin -VAS 5161/10- into guide plate.
– Screw adapter -VAS 5161/11- hand-tight into corresponding glow plug thread.



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



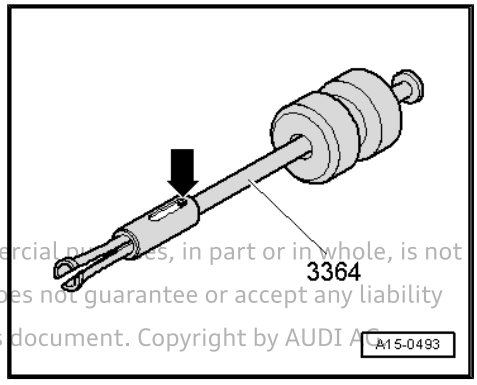
– Pull off valve stem oil seal with valve stem seal puller - 3364- .



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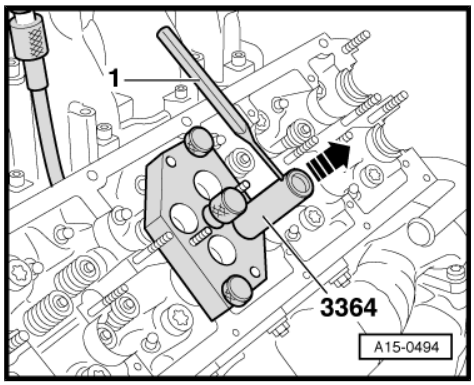
If the puller cannot be used on some of the valve stem oil seals due to the confined space, proceed as follows:

– Knock out pin -arrow- of puller using a drift and remove impact extractor attachment.



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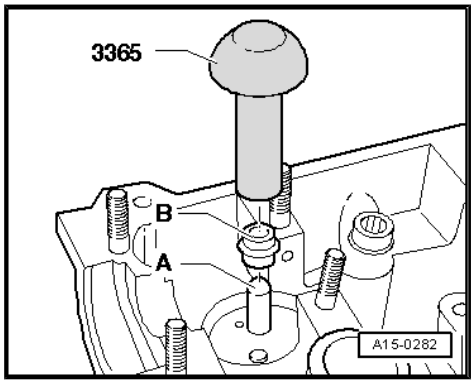
– Apply bottom section of puller -3364- to valve stem oil seal.
– Secure puller with a punch or roll-pin drift -1-, as shown in illustration.
– Apply assembly lever to puller and pull out valve stem oil seal -arrow-.



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.***

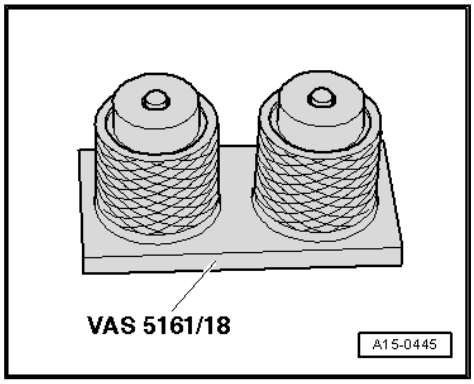


– Lightly oil sealing lip of valve stem oil seal.
– Slide valve stem oil seal onto plastic sleeve.
– Carefully press valve stem oil seal onto valve guide using valve stem seal fitting tool - 3365- .
– Take off plastic sleeve.

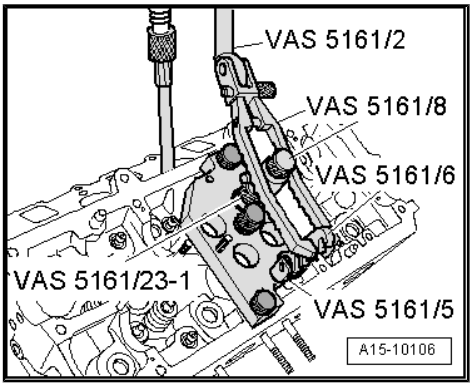
If valve cotters have been removed from assembly cartridge, they must first be inserted in insertion device -VAS 5161/18- .

- Larger diameter of valve cotters faces upwards.

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



– Insert assembly cartridge in guide plate -VAS 5161/23- again.
– Press down pressure fork and pull knurled screw upwards while turning screw in both directions - this will insert the valve cotters.
– Release pressure fork with knurled screw still in pulled position.
– Repeat procedure for each valve.



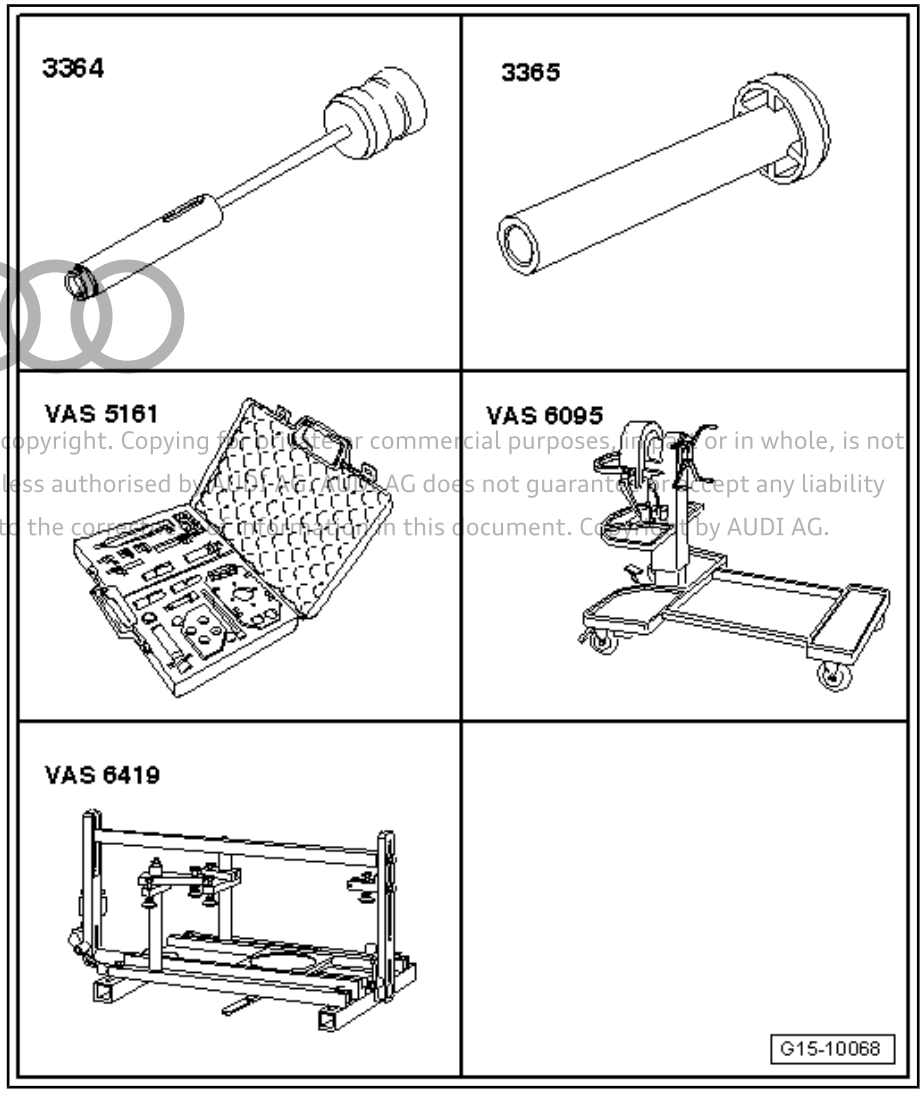
Assembling

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

– Install camshafts: cylinder head (left-side) ⇒ page 296 , cylinder head (right-side) ⇒ page 304 .
– Install glow plugs ⇒ page 634 .

4.6.2 Removing and installing 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-

- Engine and gearbox support - VAS 6095-
- Cylinder head tensioning device - VAS 6419-

Procedure

– Remove camshafts: cylinder head (left-side) ⇒ page 296 , cylinder head (right-side) ⇒ page 304 .

– 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- .

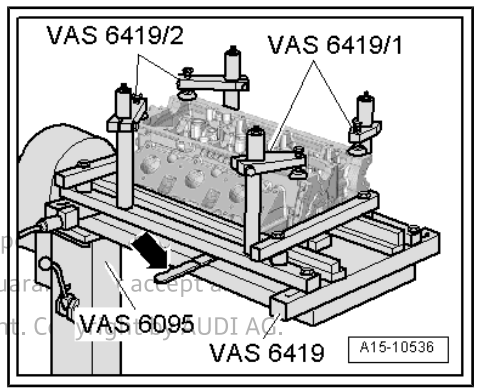
– Secure cylinder head in cylinder head tensioning device, as shown in illustration.

– 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.

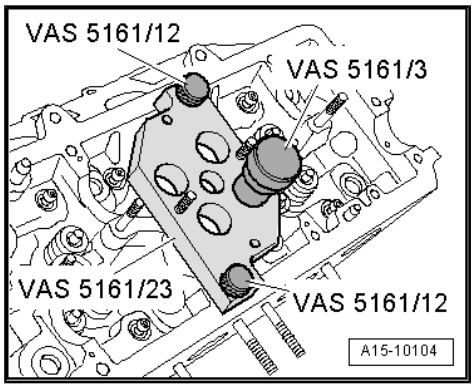


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– Fit guide plate -VAS 5161/23- onto cylinder head.

– Secure guide plate with knurled screws -VAS 5161/12- .

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



– Screw snap-in device -VAS 5161/6- with engaging fork -VAS 5161/5- into guide plate.

– Slide knurled spacer ring -VAS 5161/23-1- onto assembly cartridge -VAS 5161/8- .

– Attach pressure fork -VAS 5161/2- to snap-in device and push assembly cartridge down.

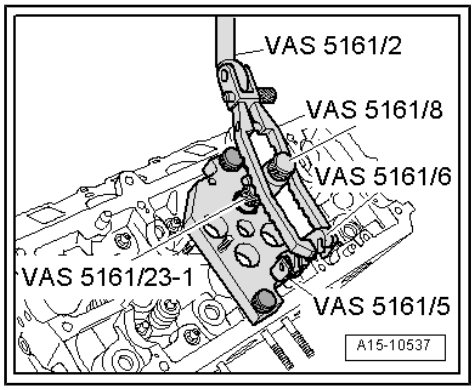
– At the same time, turn knurled screw of assembly cartridge clockwise until tips engage in valve cotters.

– Move knurled screw back and forth slightly; the valve cotters are thus forced apart and taken up by the assembly cartridge.

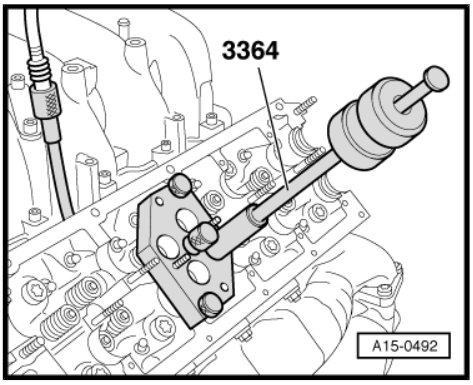
– Release pressure fork.

– Take off assembly cartridge with knurled spacer ring.

– Detach valve spring with valve spring plate.



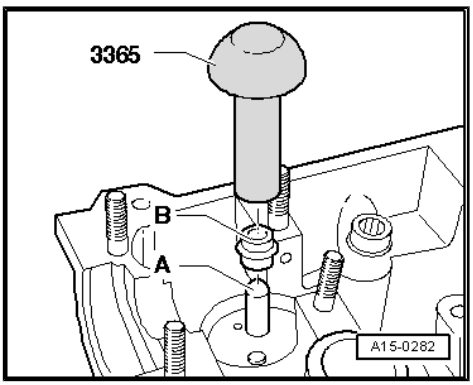
– Pull off valve stem oil seal with valve stem seal puller - 3364- .



Caution

Make sure valve stem oil seals are not damaged when installing.

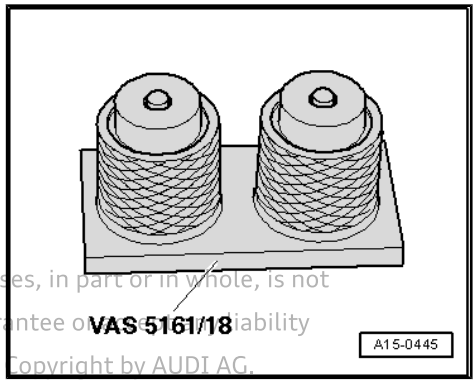
- ***New valve stem oil seals -B- are supplied with plastic sleeve; fit plastic sleeve -A- onto valve stem.***



– 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.

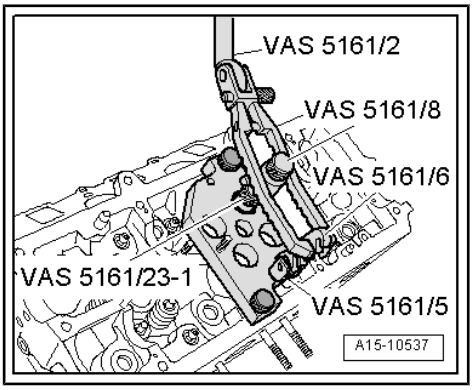
If valve cotters have been removed from assembly cartridge, they must first be inserted in insertion device -VAS 5161/18- .

• Larger diameter of valve cotters faces upwards.
– Insert valve spring and valve spring plate.
– Press assembly cartridge onto insertion device from above and take up valve cotters.



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– Insert assembly cartridge in guide plate -VAS 5161/23- again.
– Press down pressure fork and pull knurled screw upwards while turning screw in both directions - this will insert the valve cotters.
– Release pressure fork with knurled screw still in pulled position.
– Repeat procedure for each valve.



Assembling

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

– Install camshafts: cylinder head (left-side) ⇒ page 296 , cylinder head (right-side) ⇒ page 304 .

5 Inlet and exhaust valves

⇒ “5.1 Machining valve seats”, page 318

⇒ “5.2 Checking valve guides”, page 318

⇒ “5.3 Checking valves”, page 319

⇒ “5.4 Valve dimensions”, page 320

5.1 Machining valve seats

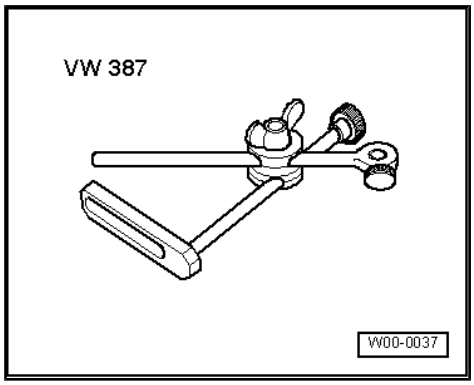
Note

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

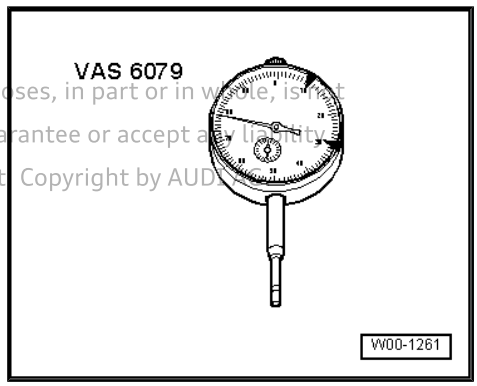
5.2 Checking valve guides

Special tools and workshop equipment required

- Universal dial gauge bracket - VW 387-

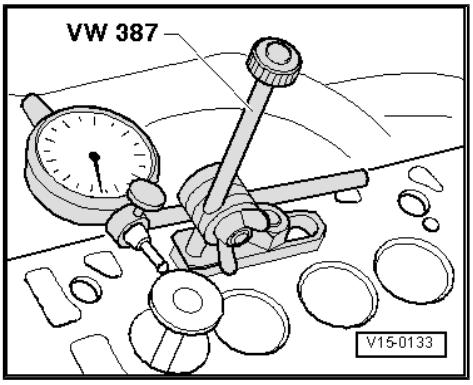


- Dial gauge - VAS 6079-



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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.

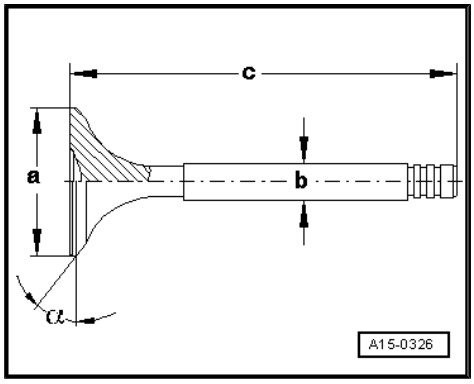
5.3 Checking valves

– 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	28.60 … 28.80	26.70 … 26.90
∅ b	mm	5.968 … 5.982	5.958 … 5.972
c	mm	97.25 … 97.45	97.35 … 97.55
α	∠°	45° 10'	45° 10'

WARNING

Care must be taken when disposing of old sodium-cooled exhaust valves - 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.***

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17 – Lubrication

1 Sump/oil pump

⇒ “1.1 Exploded view - sump/oil pump”, page 321

⇒ “1.2 Engine oil”, page 325

⇒ “1.3 Checking oil level”, page 326

⇒ “1.4 Removing and installing sump (bottom section)”, page 326

⇒ “1.5 Removing and installing sump (top section)”, page 328

⇒ “1.6 Removing and installing oil pump”, page 331

⇒ “1.7 Removing and installing oil level and oil temperature sender G266 ”, page 333

1.1 Exploded view - sump/oil pump

Exploded view - oil pump and sump (bottom section) ⇒ page 321

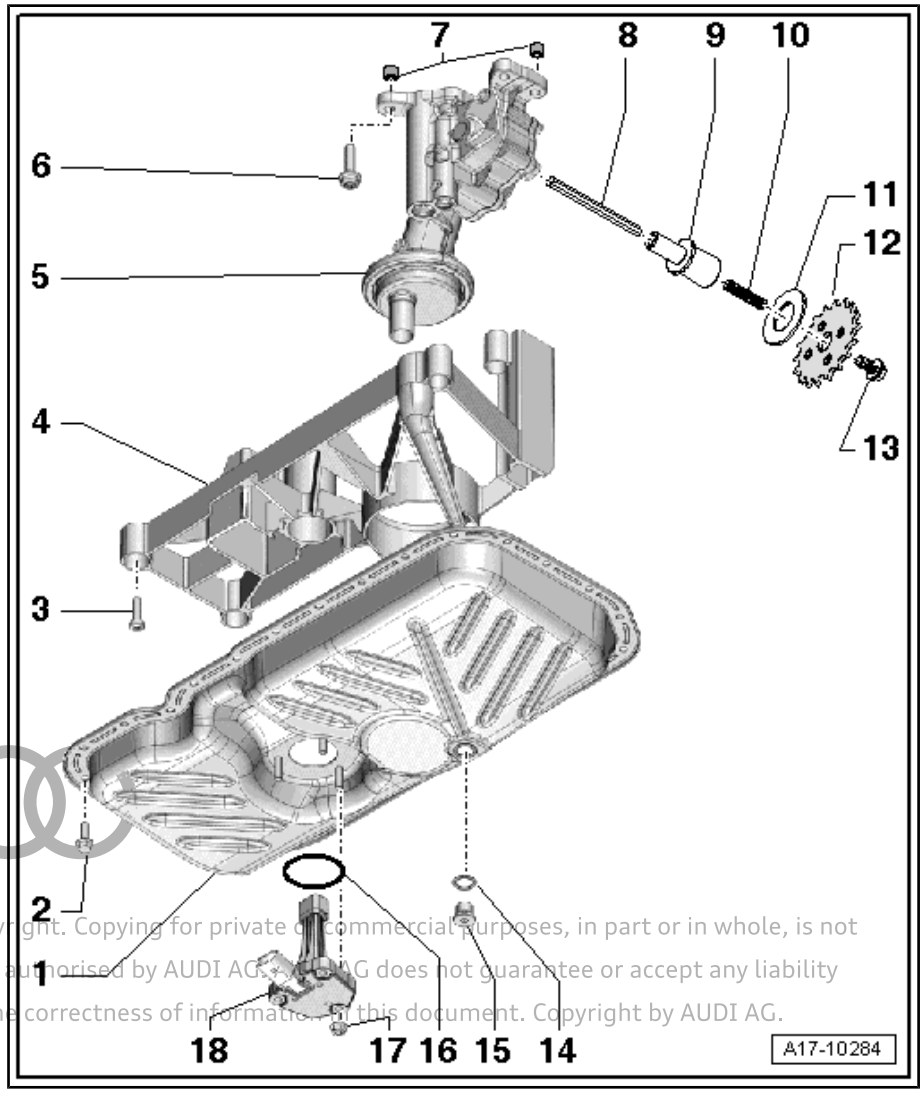
Exploded view - sump (top section) ⇒ page 323

Note

Oil spray jet for piston cooling ⇒ page 323 .

Exploded view - oil pump and sump (bottom section)

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1 - Sump (bottom section)
- ❑ Removing and installing ⇒ page 326

2 - Bolt
- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 323

3 - Bolt
- ❑ Self-locking
- ❑ Renew
- ❑ 8 Nm + turn 90° further

4 - Baffle plate

5 - Oil pump
- ❑ Do not dismantle
- ❑ With pressure relief valve for cold condition (11 bar) and pressure control valve (3.5 bar)
- ❑ Removing and installing ⇒ page 331

6 - Bolt
- ❑ 23 Nm

7 - Dowel sleeves

8 - Oil pump drive shaft

9 - Coupling

10 - Compression spring

11 - Thrust washer

12 - Chain sprocket for oil pump
- ❑ Installation position: Side with lettering faces engine

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

14 - Seal
- ❑ Renew

15 - Oil drain plug
- ❑ 30 Nm

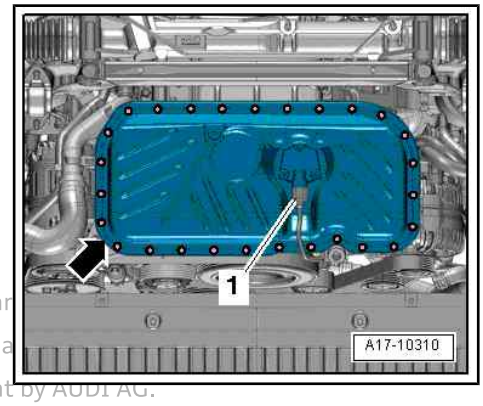
16 - Seal
- ❑ Renew

17 - Nut
- ❑ 9 Nm

18 - Oil level and oil temperature sender - G266-
- ❑ Removing and installing ⇒ page 333

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Sump (bottom section) - tightening torque and sequence



– Renew bolts for sump (bottom section) -arrow-.
– Tighten bolts in 3 stages and in diagonal sequence as follows:

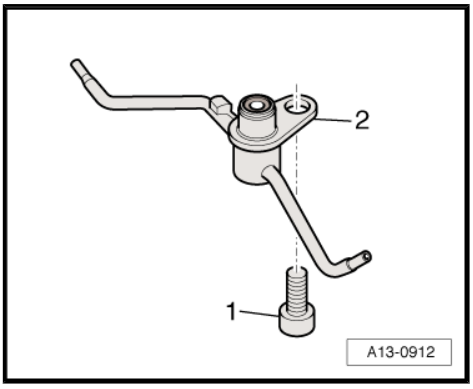
1. Initially tighten to 5 Nm.
2. Tighten to 8 Nm.
3. Turn 90° further.

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Note

Disregard -item 1-.

Oil spray jet for piston cooling

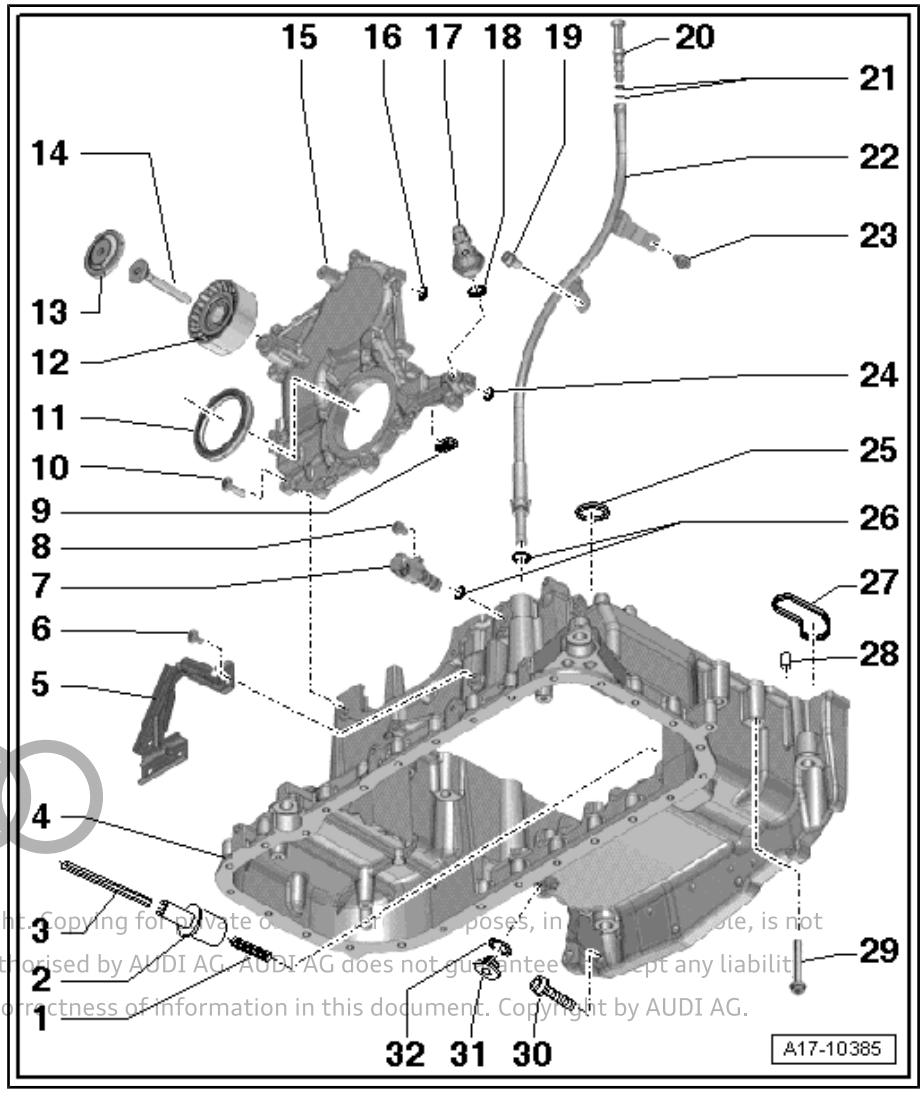


1 - Bolt, 9 Nm
2 - Oil spray jet with spray nozzle valve for piston cooling

Note

- *Take care not to bend oil spray jets.*
- *Always renew bent oil spray jets.*

Exploded view - sump (top section)



1 - Compression spring

2 - Coupling

3 - Oil pump drive shaft

4 - Sump (top section)

- ❑ Removing and installing ⇒ page 328

5 - Bracket

- ❑ For electrical wiring harness
- ❑ Depending on version ⇒ Electronic parts catalogue

6 - Bolt

- ❑ 9 Nm

7 - Valve for oil pressure control - N428-

- ❑ Engine codes CCLA, CCWA, CCWB, CGKA, CGKB
- ❑ Removing and installing ⇒ page 347

8 - Bolt

- ❑ 9 Nm

9 - Sealing element

- ❑ 2x
- ❑ Renew

10 - Bolt

- ❑ Tightening torque and sequence ⇒ page 325

11 - Oil seal for crankshaft (pulley end)

- ❑ Renewing ⇒ page 171

12 - Idler roller (right-side) for poly V-belt

- ❑ Note installation position

13 - Cover for idler roller

14 - Bolt

- ❑ Tightening torque ⇒ Item 15 (page 164)

15 - Sealing flange (pulley end)

- ❑ Removing and installing ⇒ page 173

16 - O-ring

- ❑ Renew

17 - Oil pressure switch - F22-

- ❑ Engine codes CCLA, CCWA, CCWB, CGKA, CGKB
- ❑ Opening/closing pressure 2.0 ... 2.5 bar
- ❑ Green insulation
- ❑ Check in “Guided Fault Finding” ⇒ Vehicle diagnostic tester
- ❑ Removing and installing ⇒ page 341
- ❑ 20 Nm

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18 - Seal
- ❑ Renew

19 - Bolt
- ❑ 9 Nm

20 - Plug

21 - O-rings
- ❑ Renew

22 - Dipstick guide tube

23 - Bolt
- ❑ 9 Nm

24 - O-ring
- ❑ Renew

25 - Seal
- ❑ Renew

26 - O-rings
- ❑ Renew

27 - Seal
- ❑ Renew

28 - Dowel sleeve
- ❑ 2x

29 - Bolt
- ❑ Tightening torque and sequence ⇒ page 325

30 - Bolt
- ❑ Tightening torque for vehicles with manual gearbox ⇒ page 129 , with multitronic gearbox 0AW ⇒ page 136 , with dual clutch gearbox 0B5 ⇒ page 143 , with automatic gearbox 0B6 ⇒ page 150

31 - Plug for “TDC” marking
- ❑ 35 Nm
- ❑ Use extended hexagon socket wrench with ball head to unscrew or tighten plug

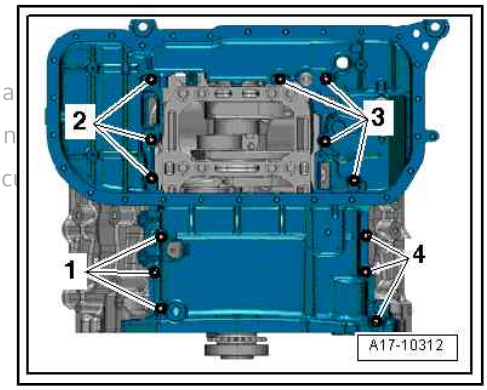
32 - Seal
- ❑ Renew

Sump (top section) - tightening torque and sequence

– Tighten bolts -1 ... 4- for sump (top section) in 2 stages and in diagonal sequence as follows:

1. Initially tighten to 5 Nm.
2. Tighten to 15 Nm.

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1.2 Engine oil

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

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.***

Note

- *If large quantities of metal shavings or abrasion are found when performing engine repairs, this may be an indication of damage to the crankshaft or conrod bearings. To prevent further damage, the following steps are required after completion of repair work: clean the oil passages carefully and renew the oil spray jets, engine oil cooler and oil filter.*
- *Oil capacities, oil specifications and viscosity grades ⇒ Maintenance tables .*
- A4: Depending on the equipment version, the oil level is displayed on the MMI or the sound system. Procedure ⇒ Owner's Manual .
- A5: Depending on the version and the equipment fitted, the oil level can be checked at the oil dipstick, on the MMI or on the sound system. Procedure ⇒ Owner's Manual .
- Checking oil level using oil dipstick or oil gauge tester - T40178- ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .

1.4 Removing and installing sump (bottom section)

Special tools and workshop equipment required

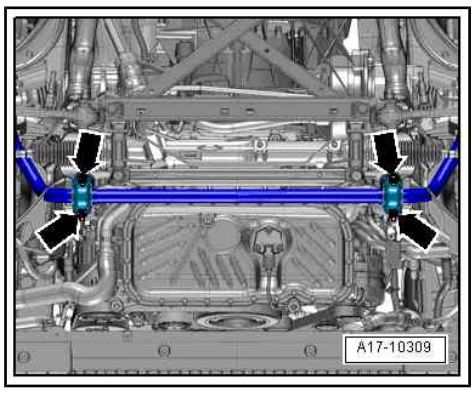
- Electric drill with plastic brush
- Safety goggles
- Sealant ⇒ Electronic parts catalogue

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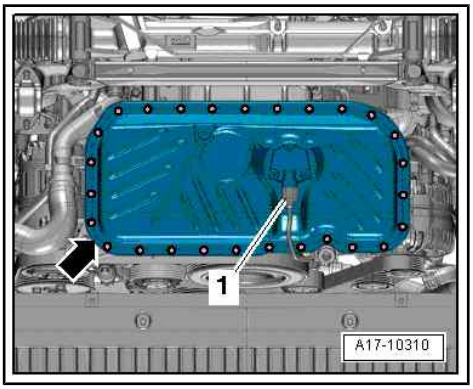
Removing

– Draining engine oil, filling up with engine oil and checking oil level ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .

– Remove nuts -arrows- and lower anti-roll bar.



– Unplug electrical connector at oil level and oil temperature sender - G266- -item 1-.
– Remove bolts and pry off sump (bottom section) -arrow- carefully.

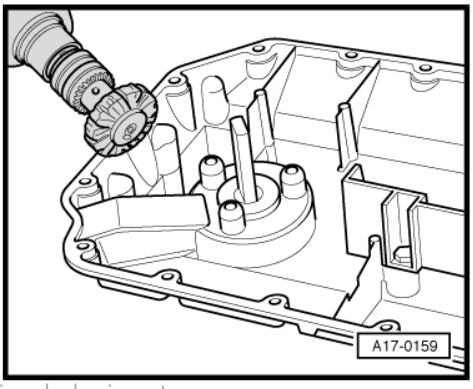


Installing

Caution

Protect lubrication system and bearings against contamination.

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

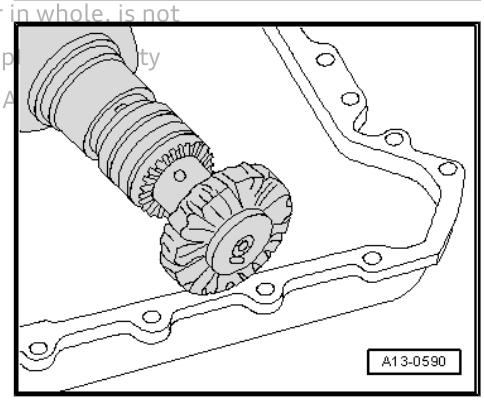


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WARNING

Risk of eye injury.

- ***Put on safety goggles.***

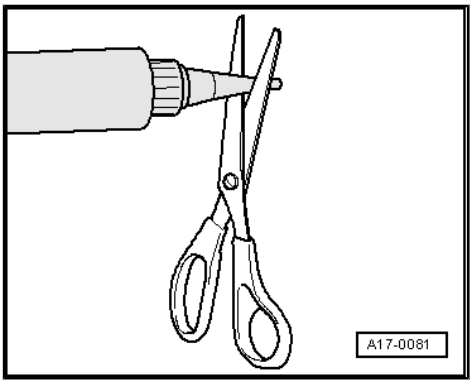


– Remove remaining sealant on bottom and top sections of sump with a rotating plastic brush or similar.
– Clean sealing surfaces; they must be free of oil and grease.

Note

Note the use-by date of the sealant.

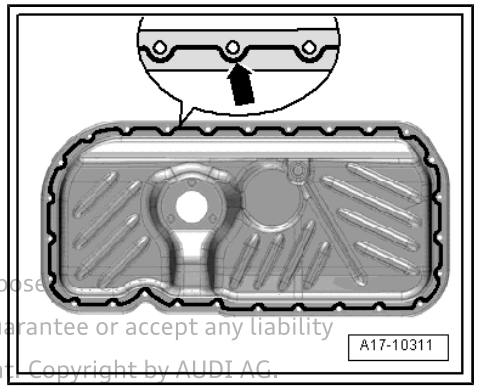
– Cut off nozzle of tube at front marking (nozzle ∅ approx. 1.5 mm).



Caution

Make sure lubrication system is not clogged by excess sealant.

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



– Apply sealant bead -arrow- onto clean sealing surface of sump (bottom section) as shown in illustration.

- Width of sealant bead: 2 mm.

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Note

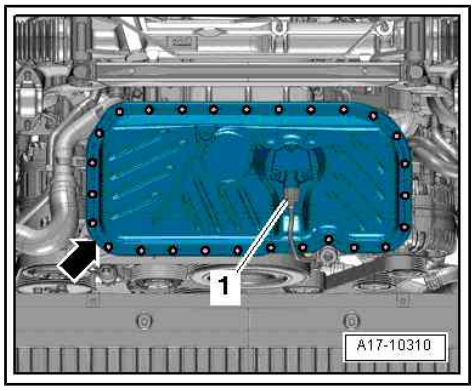
The sump (bottom section) must be installed within 5 minutes after applying the sealant.

– Fit sump (bottom section) and tighten bolts ⇒ page 323 .

– Install anti-roll bar ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Removing and installing anti-roll bar .

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

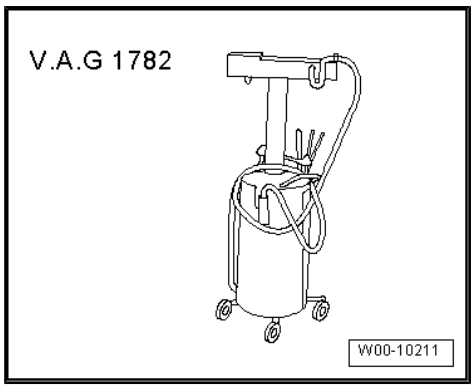
– Fill up with engine oil and check oil level ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .



1.5 Removing and installing sump (top section)

Special tools and workshop equipment required

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

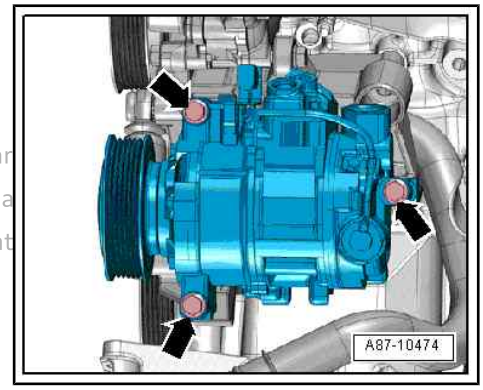


- Safety goggles
- Electric drill with plastic brush
- Sealant ⇒ Electronic parts catalogue

Removing

- Engine removed and secured to engine and gearbox support ⇒ page 122
- Engine oil drained ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .

– Remove drive plate ⇒ page 177 .
– Remove timing chain covers: left-side ⇒ page 230 , right-side ⇒ page 232 , bottom ⇒ page 234 .
– Remove chain for auxiliary drives ⇒ page 285 .
– Remove sealing flange (pulley end) ⇒ page 173 .
– Remove air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Removing and installing air conditioner compressor .
– Remove sump (bottom section) ⇒ page 326 .
– Remove oil pump ⇒ page 331 .



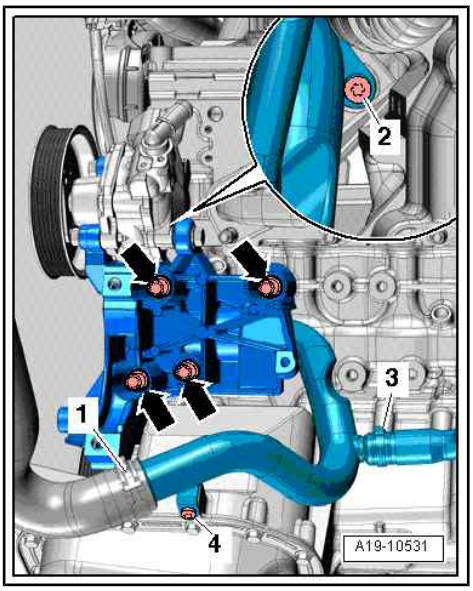
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– Remove bolts -2- and -4- and detach coolant pipe (left-side) from subframe.

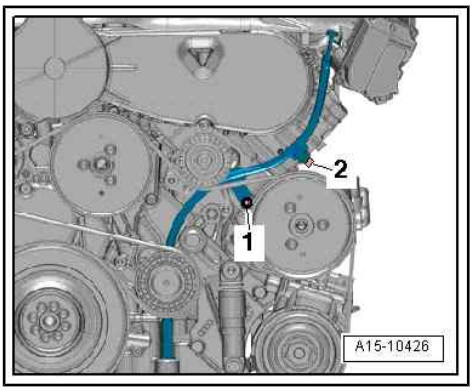
Note

Disregard items marked -1, 3- and -arrows-.

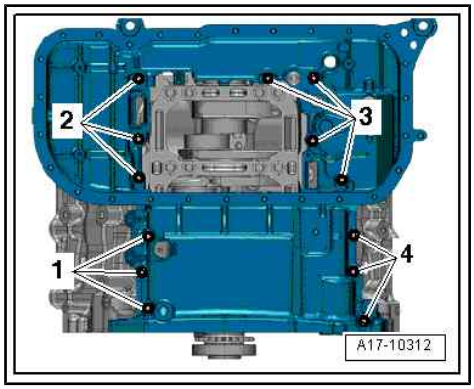
– Removing idler roller for poly V-belt ⇒ page 170 .



– Remove bolts -1- and -2- and detach guide tube for oil dipstick.



– Remove bolts -1 ... 4- for sump (top section).
– Press sump (top section) off dowel pins on cylinder block.



Installing

Note

Renew gaskets, seals and O-rings.

Caution

Protect lubrication system against contamination.

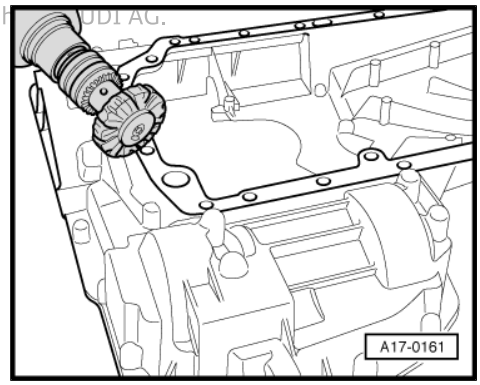
- ***Cover exposed parts of the engine.***

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WARNING

Risk of eye injury.

- ***Put on safety goggles.***

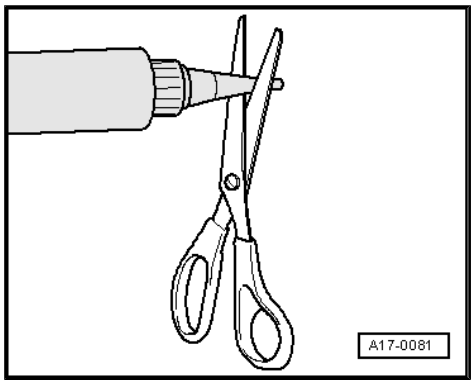


– Remove remaining sealant from sump (top section) and cylinder block using rotating plastic brush or similar.
– Clean sealing surfaces; they must be free of oil and grease.

Note

Note the use-by date of the sealant.

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



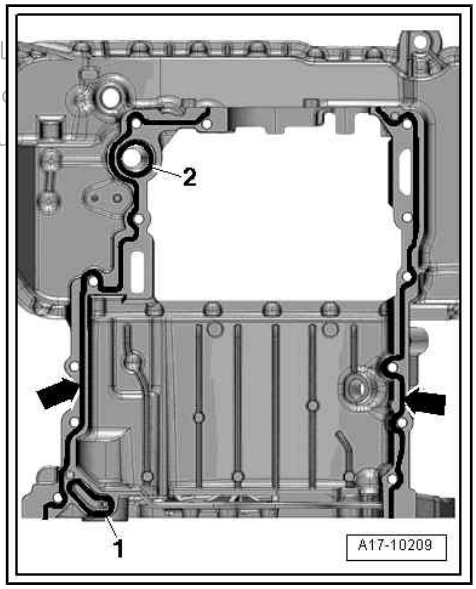
– Fit seals -1- and -2- in sump (top section).

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Caution

Make sure lubrication system is not clogged by excess sealant.

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



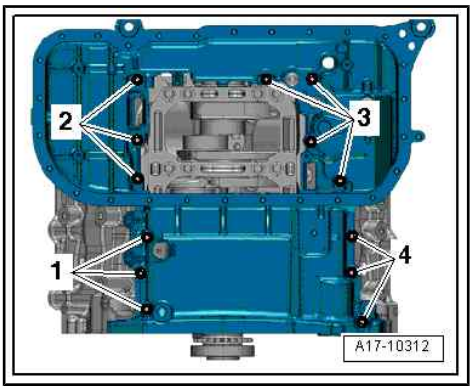
– Apply beads of sealant -arrows- onto clean sealing surface of sump (top section) as shown in illustration.

- The grooves on the sealing surfaces must be completely filled with sealant.
- The beads of sealant must project 1.5 … 2.0 mm above the sealing surface.

Note

The sump (top section) must be installed within 5 minutes after applying the sealant.

– Fit sump (top section) and tighten bolts ⇒ page 325 .



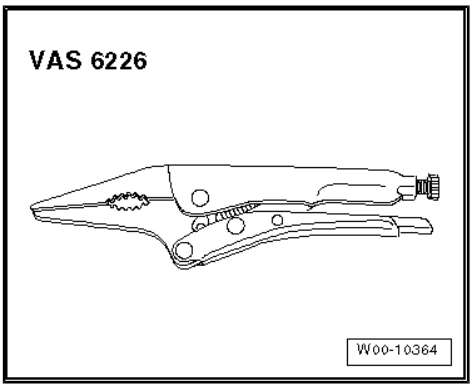
Remaining installation steps are carried out in reverse sequence; note the following:

– Install idler roller for poly V-belt ⇒ page 170 .
– Install coolant pipe (left-side) ⇒ page 387 .
– Install oil pump ⇒ page 331 .
– Install sump (bottom section) ⇒ page 326 .
– Install air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Removing and installing air conditioner compressor .
– Install sealing flange (pulley end) ⇒ page 173 .
– Install chain for auxiliary drives ⇒ page 285 .
– Install timing chain covers: left-side ⇒ page 230 , right-side ⇒ page 232 , bottom ⇒ page 234 .
– Install drive plate ⇒ page 177 .

1.6 Removing and installing oil pump

Special tools and workshop equipment required

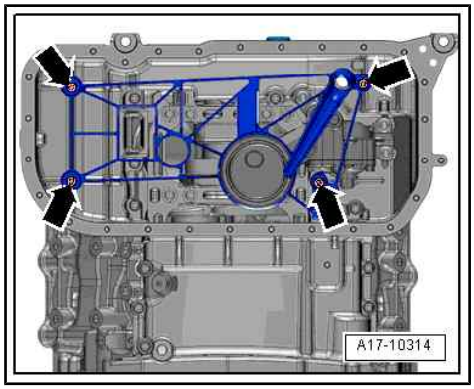
♦ Long-nose grip pliers - VAS 6226-



Removing

– Remove sump (bottom section) ⇒ page 326 .

– Remove bolts -arrows- and detach baffle plate.

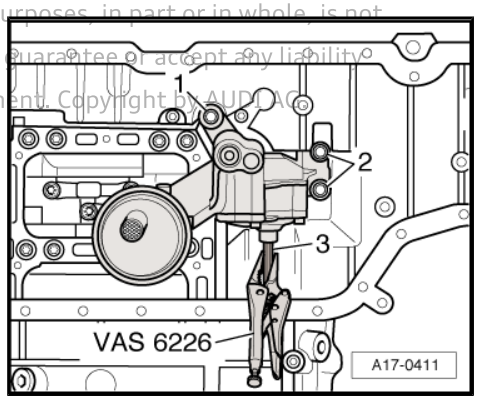


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– Remove bolts -1- and -2-.

– Hold oil pump drive shaft -3- firmly with long-nose grip pliers - VAS 6226- and push shaft back against spring pressure.

– Remove oil pump.



Note

Oil pump drive shaft remains in position.

Installing

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

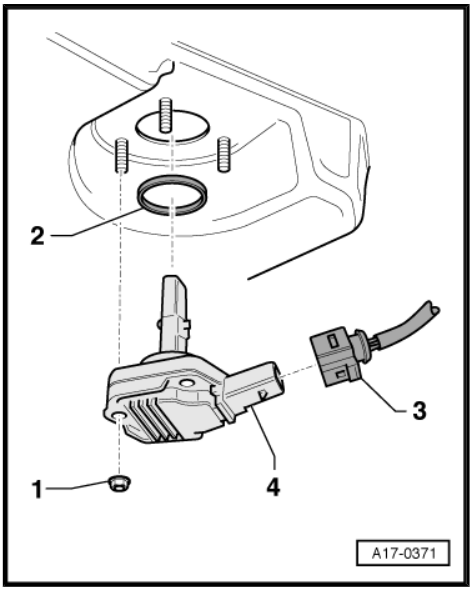
- Tightening torque
  ⇒ “1.1 Exploded view - sump/oil pump”, page 321

– Check that the two dowel sleeves are fitted in the oil pump. Install missing dowel sleeves.

– Install sump (bottom section) ⇒ page 327 .

– 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-



Removing

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

– Unplug electrical connector -3-.

– Remove nuts -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 Exploded view - sump/oil pump”, page 321

Note

Renew seal -2-.

– Fill up with engine oil and check oil level ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .

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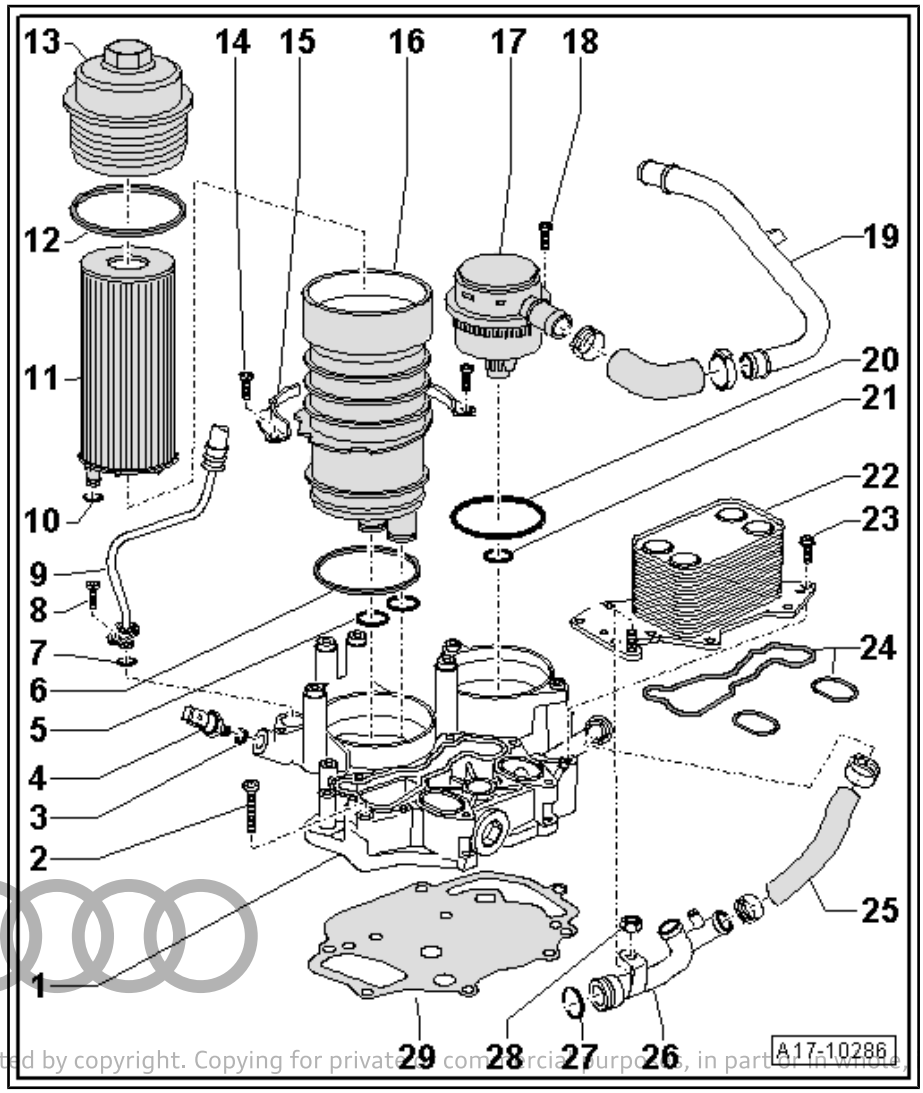
2 Engine oil cooler

⇒ “2.1 Exploded view - engine oil cooler”, page 334

⇒ “2.2 Removing and installing engine oil cooler”, page 336

⇒ “2.3 Removing and installing mounting plate for engine oil cooler, pressure control valve and oil filter housing”, page 338

2.1 Exploded view - engine oil cooler



1 - Mounting plate

- For engine oil cooler, pressure control valve for crankcase breather system, oil filter housing
- Removing and installing ⇒ page 338

2 - Bolt

- 9 Nm

3 - Seal

- Renew

4 - Oil pressure switch

- Engine codes CAMA, CAMB, CAPA: oil pressure switch - F1- ; engine codes CCLA, CCWA, CCWB, CGKA, CGKB: 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 oil pressure switch - F1- - engine code CAPA ⇒ page 342
- Removing and installing oil pressure switch - F1- / oil pressure switch for reduced oil pressure - F378- - engine codes CAMA, CAMB, CCLA, CCWA, CCWB, CGKA, CGKB ⇒ page 343
- 20 Nm

5 - O-rings

- Renew

6 - Seal

- Renew

7 - O-ring

- Renew

8 - Bolt

- 9 Nm

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9 - Oil supply line

- ❑ To turbocharger

10 - O-ring

- ❑ Renew

11 - Oil filter element

- ❑ Removing and installing ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818

12 - Seal

- ❑ Renew

13 - Filler cap

- ❑ 35 Nm

14 - Bolt

- ❑ 9 Nm

15 - Retaining clip

- ❑ For oil filter housing

16 - Oil filter housing

- ❑ Removing and installing ⇒ page 345
- ❑ With oil filter bypass valve, 2.0 … 3.0 bar (pressure differential upstream/downstream of filter)

17 - Pressure control valve for crankcase breather system

- ❑ Removing and installing ⇒ page 340

18 - Bolt

- ❑ 9 Nm

19 - Crankcase breather pipe

20 - O-ring

- ❑ Renew

21 - O-ring

- ❑ Renew

22 - Engine oil cooler

- ❑ See note ⇒ page 321
- ❑ Removing and installing ⇒ page 336
- ❑ With oil cooler bypass valve, 2.0 … 3.0 bar (pressure differential upstream/downstream of engine oil cooler)

23 - Bolt

- ❑ 9 Nm

24 - Gaskets

- ❑ Renew

25 - Coolant hose

26 - Coolant pipe (top)

27 - O-ring

- ❑ Renew

28 - Nut

- ❑ 9 Nm

29 - Gasket

- ❑ Renew

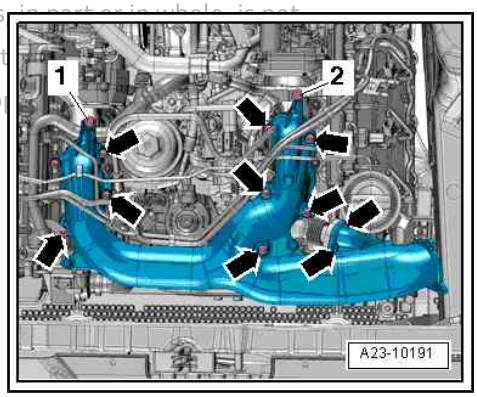
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2.2 Removing and installing engine oil cooler

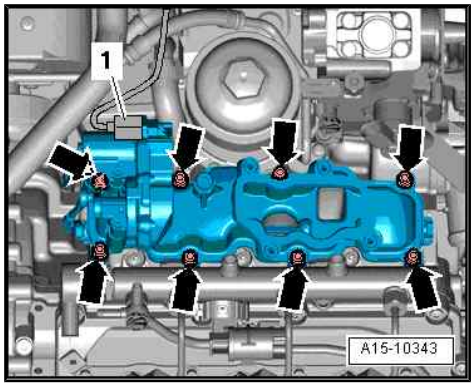
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Removing

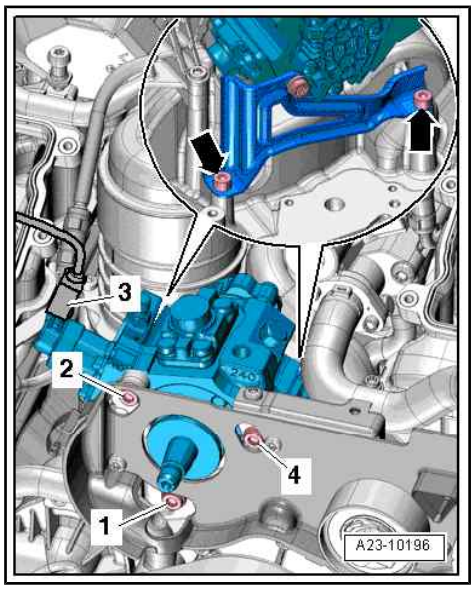
– Drain coolant ⇒ page 353 .
– Remove intake manifold (top section) ⇒ page 483 .



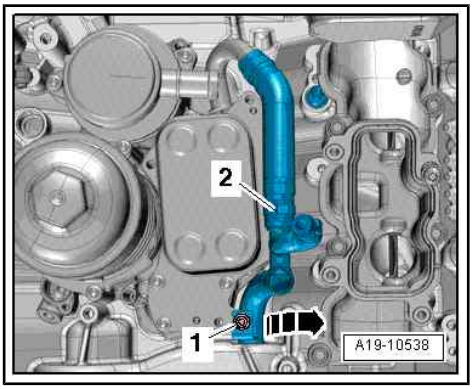
– Remove intake manifold (bottom section, right-side) ⇒ page 485 .
– Remove oil filter housing ⇒ page 345 .
– Remove exhaust gas recirculation control motor - V338- ⇒ page 619 .
– Remove particulate filter: A5 up to vehicle identification no. 8T-8-009 998 ⇒ page 578 ; A4 (all), A5 from vehicle identification no. 8T-8-009 999 onwards ⇒ page 580 .



– Engine code CAPA: Remove high-pressure pump ⇒ page 519 .
– Remove exhaust gas recirculation cooler ⇒ page 623 .



– Remove nut -1- and turn coolant pipe (top) slightly in direction of -arrow-.



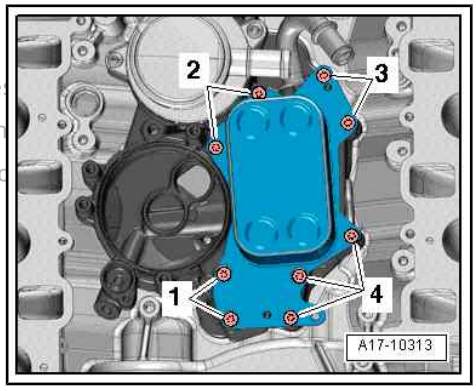
Note

Disregard -item 2-.

Note

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Spread out rags round engine oil cooler to catch escaping engine oil.



– Unscrew bolts -1 ... 4- and 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 334

Note

To ensure top coolant pipe is free of leaks, remove top coolant pipe and renew O-ring ⇒ page 380 .

– Install exhaust gas recirculation cooler ⇒ page 623 .
– Engine code CAPA: Install high-pressure pump ⇒ page 519 .
– Install particulate filter: A5 up to vehicle identification no. 8T-8-009 998 ⇒ page 578 ; A4 (all), A5 from vehicle identification no. 8T-8-009 999 onwards ⇒ page 580 .
– Install exhaust gas recirculation control motor - V338- ⇒ page 619 .
– Install oil filter housing ⇒ page 345 .
– Install bottom section of intake manifold (right-side) and top section of intake manifold ⇒ page 483 .
– Change engine oil ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .
– Fill up with coolant ⇒ page 357 .

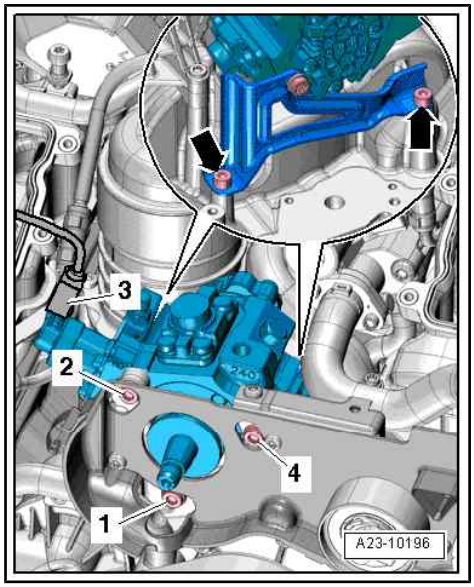
2.3 Removing and installing mounting plate for engine oil cooler, pressure control valve and oil filter housing

Removing

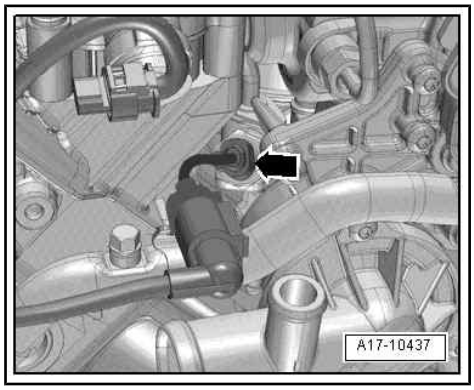
– Engine code CAPA: Remove high-pressure pump ⇒ page 519 .

– Remove coolant pipe (top) ⇒ page 380 .

– Remove pressure control valve for crankcase breather system ⇒ page 340 .



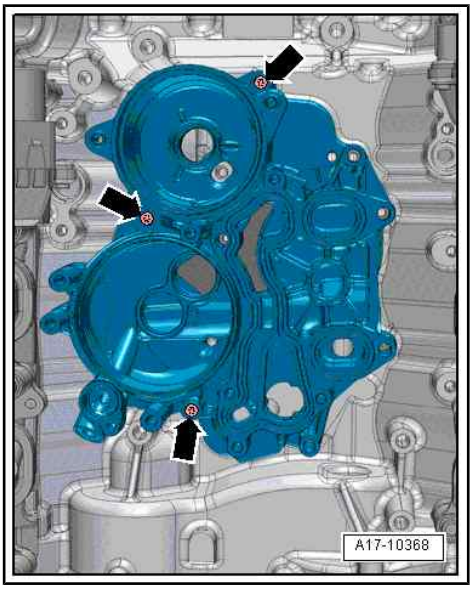
– Unplug electrical connector -arrow- on oil pressure switch.



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– Remove bolts -arrows-.

– Remove mounting plate for engine oil cooler, pressure control valve for crankcase breather system and oil filter housing.



Installing

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

- Tightening torque
  ⇒ "2.1 Exploded view - engine oil cooler", page 334

Note

- *Renew gaskets, seals and O-rings.*
- *To ensure top coolant pipe is free of leaks, remove top coolant pipe and renew O-ring ⇒ page 380 .*

– Tighten securing bolts for mounting plate, working from inside to outside.

– Install pressure control valve for crankcase breather system ⇒ page 340 .

– Install coolant pipe (top) ⇒ page 380 .

– Engine code CAPA: Install high-pressure pump ⇒ page 519 .

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

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3 Crankcase breather

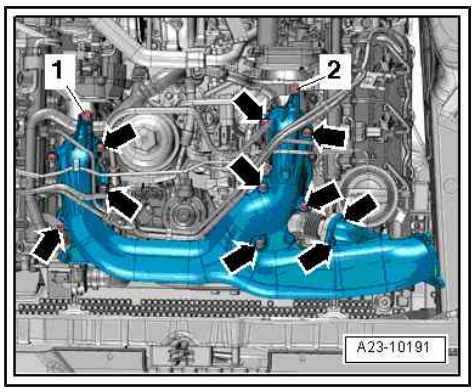
⇒ “3.1 Removing and installing pressure control valve for crankcase breather system”, page 340

3.1 Removing and installing pressure control valve for crankcase breather system

Removing

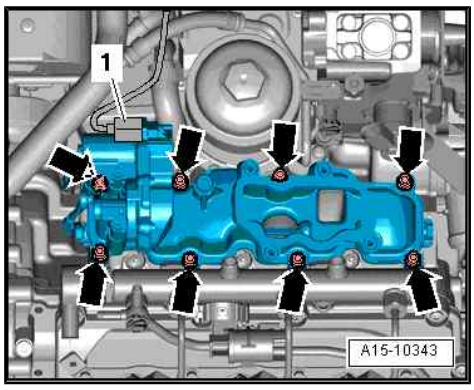
– Drain coolant ⇒ page 353 .

– Remove intake manifold (top section) ⇒ page 483 .



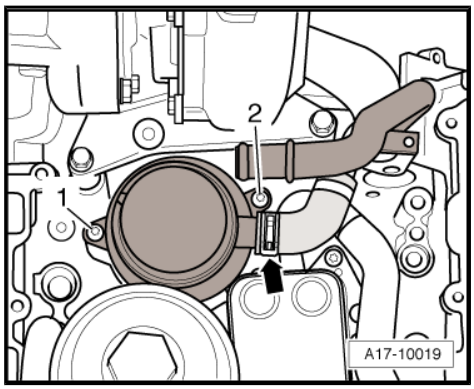
– Remove intake manifold (bottom section, right-side) ⇒ page 485 .

– Remove exhaust gas recirculation cooler ⇒ page 623 .



– Detach hose -arrow- from pressure control valve for crankcase breather system.

– Unscrew bolts -1- and -2- and remove pressure control valve for crankcase breather system.



Installing

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

- Tightening torque ⇒ “2.1 Exploded view - engine oil cooler”, page 334

Note

♦ *Fit new O-rings.*

♦ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

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– Install exhaust gas recirculation cooler ⇒ page 623 .

– Install bottom section of intake manifold (right-side) and top section of intake manifold ⇒ page 483 .

– Fill up with coolant ⇒ page 357 .

4 Oil filter/oil pressure switches

⇒ “4.1 Removing and installing oil pressure switch F22 ”, page 341

⇒ “4.2 Removing and installing oil pressure switch F1 ”, page 342

⇒ “4.3 Removing and installing oil pressure switch F1 / oil pressure switch for reduced oil pressure F378 ”, page 343

⇒ “4.4 Checking oil pressure”, page 344

⇒ “4.5 Removing and installing oil filter housing”, page 345

⇒ “4.6 Removing and installing valve for oil pressure control N428 ”, page 347

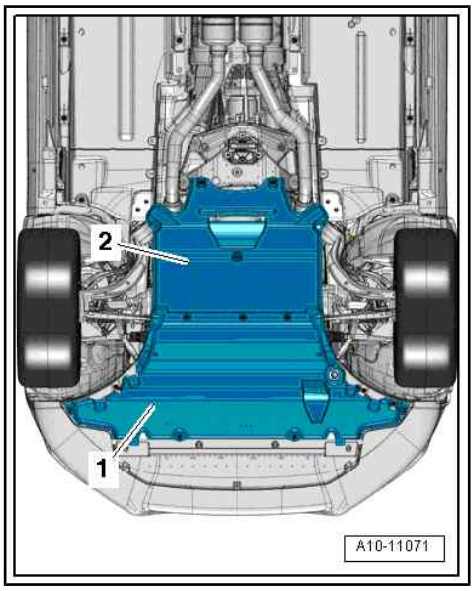
⇒ “4.7 Checking oil pressure switch F1 / oil pressure switch F22 / oil pressure switch for reduced oil pressure F378 ”, page 348

4.1 Removing and installing oil pressure switch - F22-

Engine codes CCLA, CCWA, CCWB, CGKA, CGKB

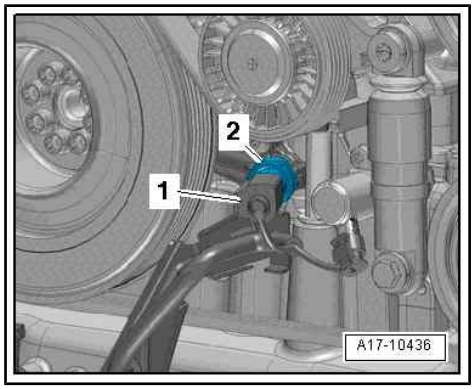
Removing

– 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.

– Remove oil pressure switch - F22- -item 2-.

Installing

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

- Tightening torque
  ⇒ “1.2 Exploded view - sealing flange (pulley end)”, page 167

Note

Renew seal.

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

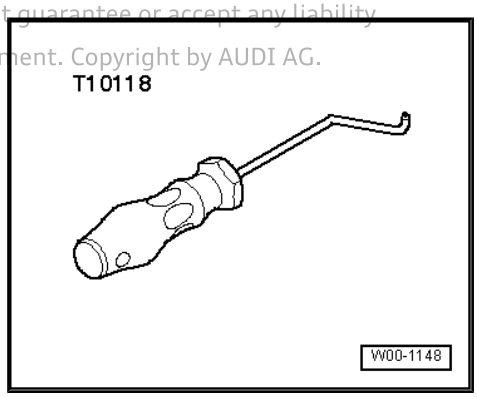
4.2 Removing and installing oil pressure switch - F1-

Engine code CAPA

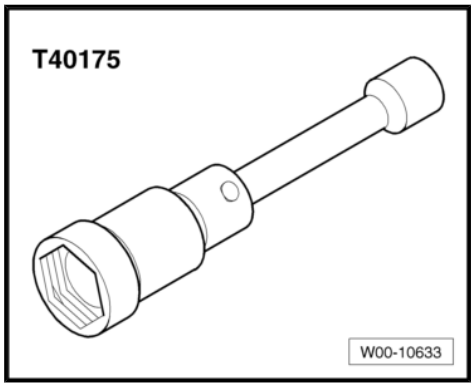
Special tools and workshop equipment required

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♦ Assembly tool - T10118-

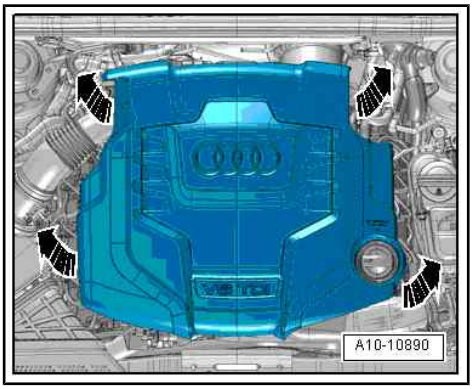


♦ Articulated wrench, 24 mm - T40175-



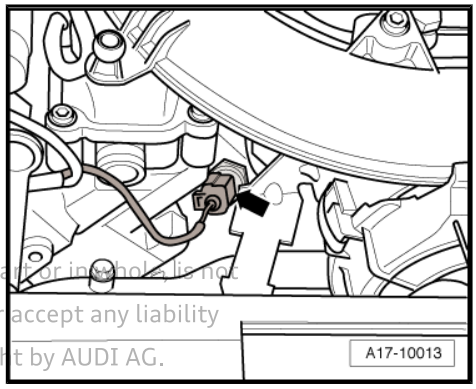
Removing

– Remove engine cover panel -arrows-.



– Use assembly tool - T10118- to unplug electrical connector -arrow-.

– Use U/J extension socket, 24 mm - F1- to unscrew oil pressure switch - T40175- .



Installing

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

- Tightening torque
  ⇒ "2.1 Exploded view - engine oil cooler", page 334

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Note

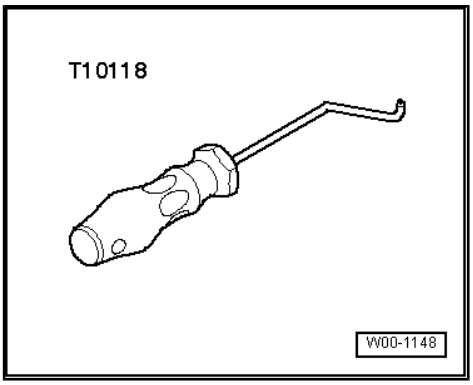
Renew seal.

4.3 Removing and installing oil pressure switch - F1- / oil pressure switch for reduced oil pressure - F378-

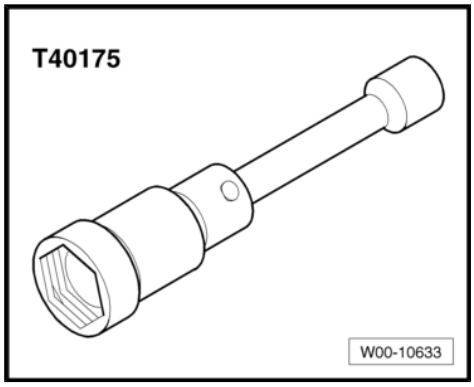
Engine codes CAMA, CAMB, CCLA, CCWA, CCWB, CGKA, CGKB

Special tools and workshop equipment required

♦ Assembly tool - T10118-



♦ Articulated wrench, 24 mm - T40175-

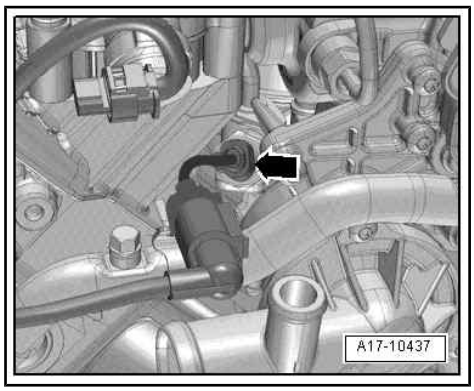


Removing

– Remove pump for exhaust gas recirculation cooler - V400- ⇒ page 365 .

– Use assembly tool - T10118- to unplug electrical connector -arrow-.

– Use articulated wrench, 24 mm - T40175- to remove oil pressure switch for reduced oil pressure - F378- .



Installing

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

- Tightening torque
⇒ “2.1 Exploded view - engine oil cooler”, page 334

Note

Renew seal.

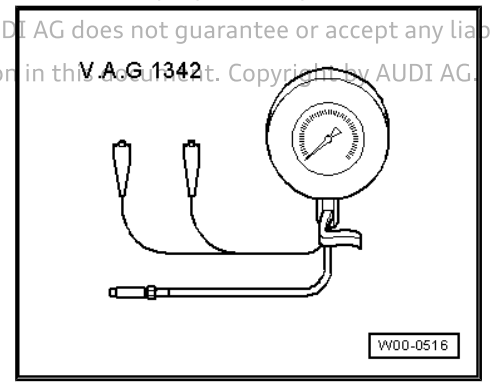
– Install pump for exhaust gas recirculation cooler - V400- ⇒ page 365 .

4.4 Checking oil pressure

Special tools and workshop equipment required

♦ Oil pressure tester - V.A.G 1342- with adapter -V.A.G 1342/21-

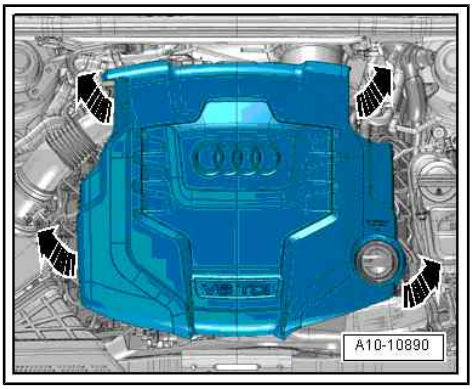
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Procedure

- Oil level OK

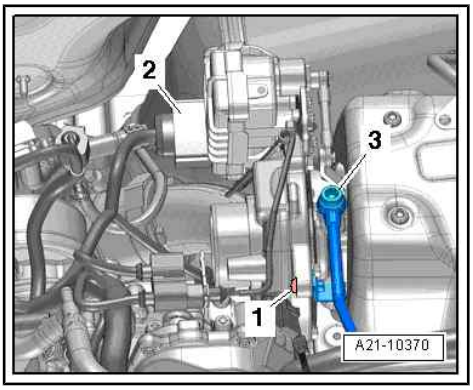
– Remove engine cover panel -arrows-.



– Remove bolt -1- and banjo bolt -3- for oil supply line at turbocharger.

Note

Disregard -item 2-.



– Fit adapter -V.A.G 1342/21- with new seals to turbocharger as shown in illustration.

– Connect oil pressure tester - V.A.G 1342- to -V.A.G 1342/21- .

– Screw a used oil pressure switch into threaded hole on oil pressure tester - V.A.G 1342- to seal hole.

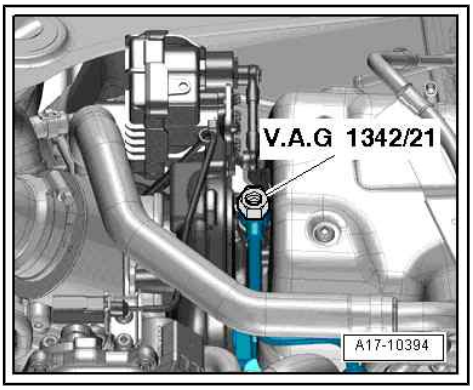
– Start engine.

- Oil pressure when starting and then at idling speed: at least 0.8 bar.

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 331 .

If specification is obtained, let engine warm up.

- Oil pressure specification at operating temperature and 2000 rpm: at least 1.5 bar.



Attaching

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

– Remove adapter -V.A.G 1342/21- and install oil supply line for turbocharger ⇒ page 420 .

4.5 Removing and installing oil filter housing

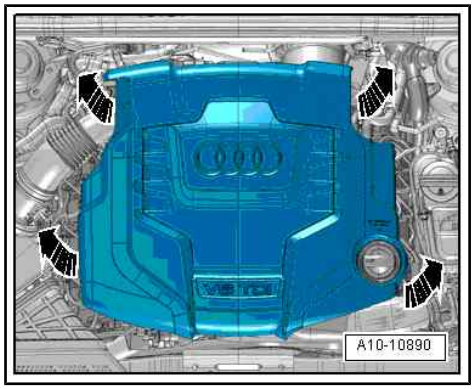
Special tools and workshop equipment required

♦ Magnetic fitting tool

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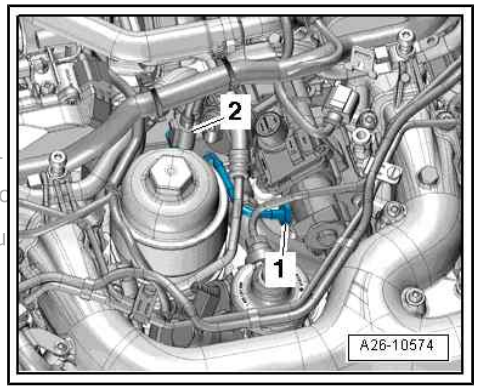
Removing

– Remove engine cover panel -arrows-.



Engine codes CAMA, CAMB, CAPA:

– Detach electrical connector -2- from bracket and move clear to side.



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Note

Disregard -item 1-.

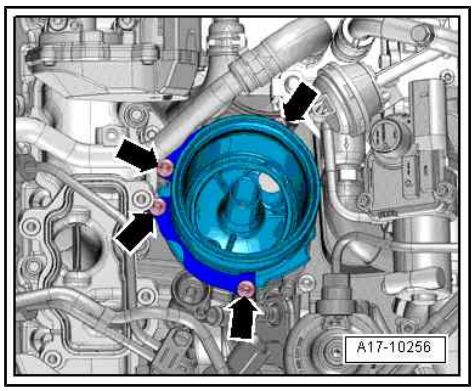
Engine codes CCLA, CCWA, CCWB, CGKA, CGKB:

– Remove exhaust gas recirculation control motor - V338- ⇒ page 621 .

All vehicles (continued):

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

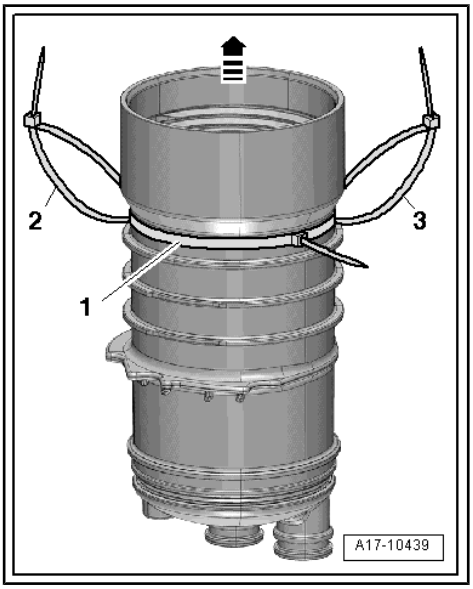
– Remove bolts -arrows- for retaining clip.



Note

Use magnetic fitting tool to remove bolts and retaining clip for oil filter housing.

– Tie two cable ties -2- and -3- into loops and secure them in upper groove on oil filter housing with a third cable tie -1-.
– Lift off oil filter housing with cable ties -arrow-.



Installing

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

- Tightening torque
⇒ "2.1 Exploded view - engine oil cooler", page 334

Note

♦ *Fit new O-rings.*

♦ *Use magnetic fitting tool to insert bolts securing retaining clip for oil filter housing.*

Engine codes CCLA, CCWA, CCWB, CGKA, CGKB:

– Install exhaust gas recirculation control motor - V338-
⇒ page 621 .

All vehicles (continued):

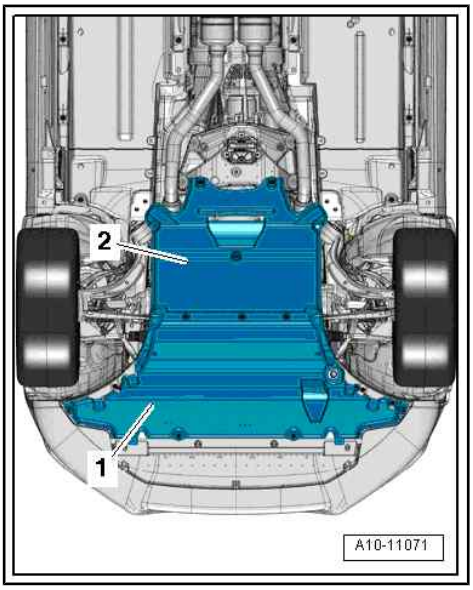
– Change engine oil ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .

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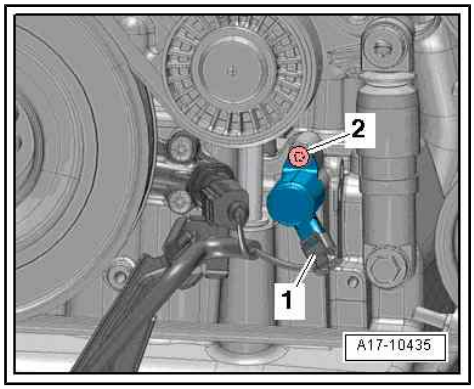
4.6 Removing and installing valve for oil pressure control - N428-

Removing

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



– Unplug electrical connector -1-.
– Unscrew bolt -2- and remove valve for oil pressure control - N428- .



Installing

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

- Tightening torque ⇒ page 323

Note

Fit new O-ring.

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

4.7 Checking oil pressure switch - F1- / oil pressure switch - F22- / oil pressure switch for reduced oil pressure - F378-

Check oil pressure switch - F1- / oil pressure switch - F22- / oil pressure switch for reduced oil pressure - F378- in Guided Fault Finding.

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19 – Cooling

1 Cooling system/coolant

⇒ “1.1 Connection diagram - coolant hoses”, page 349

⇒ “1.2 Checking cooling system for leaks”, page 352

⇒ “1.3 Draining and filling cooling system”, page 353

1.1 Connection diagram - coolant hoses

⇒ “1.1.1 Connection diagram - coolant hoses, vehicles without auxiliary heater”, page 349

⇒ “1.1.2 Connection diagram - coolant hoses, vehicles with auxiliary heater”, page 350

1.1.1 Connection diagram - coolant hoses, vehicles without auxiliary heater

Note

Arrows show direction of coolant flow.

1 - Radiator

- ❑ If renewed, refill system with fresh coolant

2 - Pump for exhaust gas recirculation cooler - V400-

3 - Bleeder screw

4 - Radiator outlet coolant temperature sender - G83-

5 - Thermostat

6 - Engine oil cooler

- ❑ If renewed, refill system with fresh coolant

7 - Exhaust gas recirculation cooler

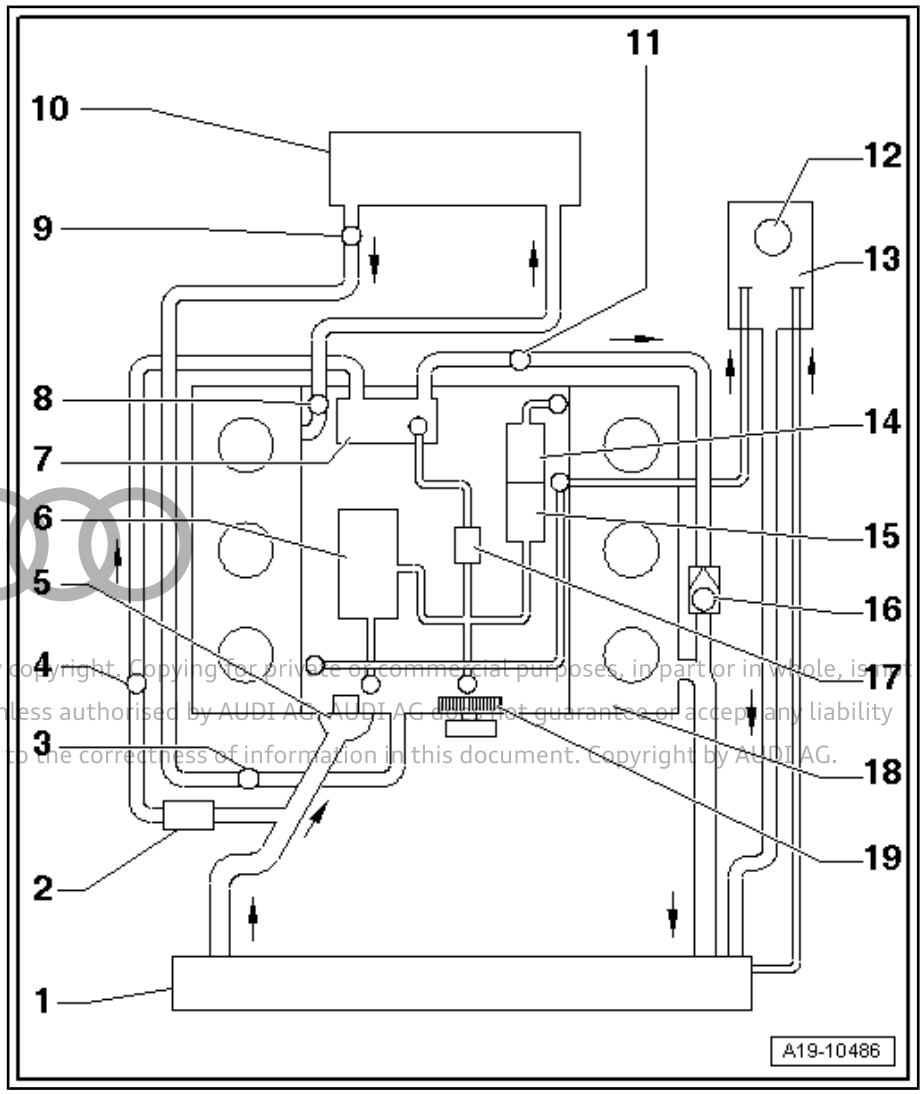
- ❑ If renewed, refill system with fresh coolant

8 - Coolant temperature sender - G62-

9 - Bleeder hole

10 - 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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11 - Bleeder screw

12 - Filler cap for expansion tank

- ❑ Checking pressure relief valve ⇒ page 353

13 - Coolant expansion tank

14 - Changeover flap for exhaust gas recirculation

15 - Exhaust gas recirculation control motor - V338-

- ❑ With exhaust gas recirculation potentiometer - G212-

16 - Non-return valve

- ❑ Arrow indicates direction of flow

17 - Thermostat housing for exhaust gas recirculation

18 - Cylinder head and cylinder block

- ❑ If renewed, refill system with fresh coolant

19 - Coolant pump

1.1.2 Connection diagram - coolant hoses, vehicles with auxiliary heater

1 - Radiator

- ❑ If renewed, refill system with fresh coolant

2 - Pump for exhaust gas recirculation cooler - V400-

3 - Bleeder screw

4 - Radiator outlet coolant temperature sender - G83-

5 - Auxiliary heater

- ❑ With circulation pump - V55-
- ❑ Removing and installing ⇒ Auxiliary/supplementary heater; Rep. gr. 82 ; Auxiliary/supplementary heater; Removing and installing auxiliary/supplementary heater

6 - Engine oil cooler

- ❑ If renewed, refill system with fresh coolant

7 - Exhaust gas recirculation cooler

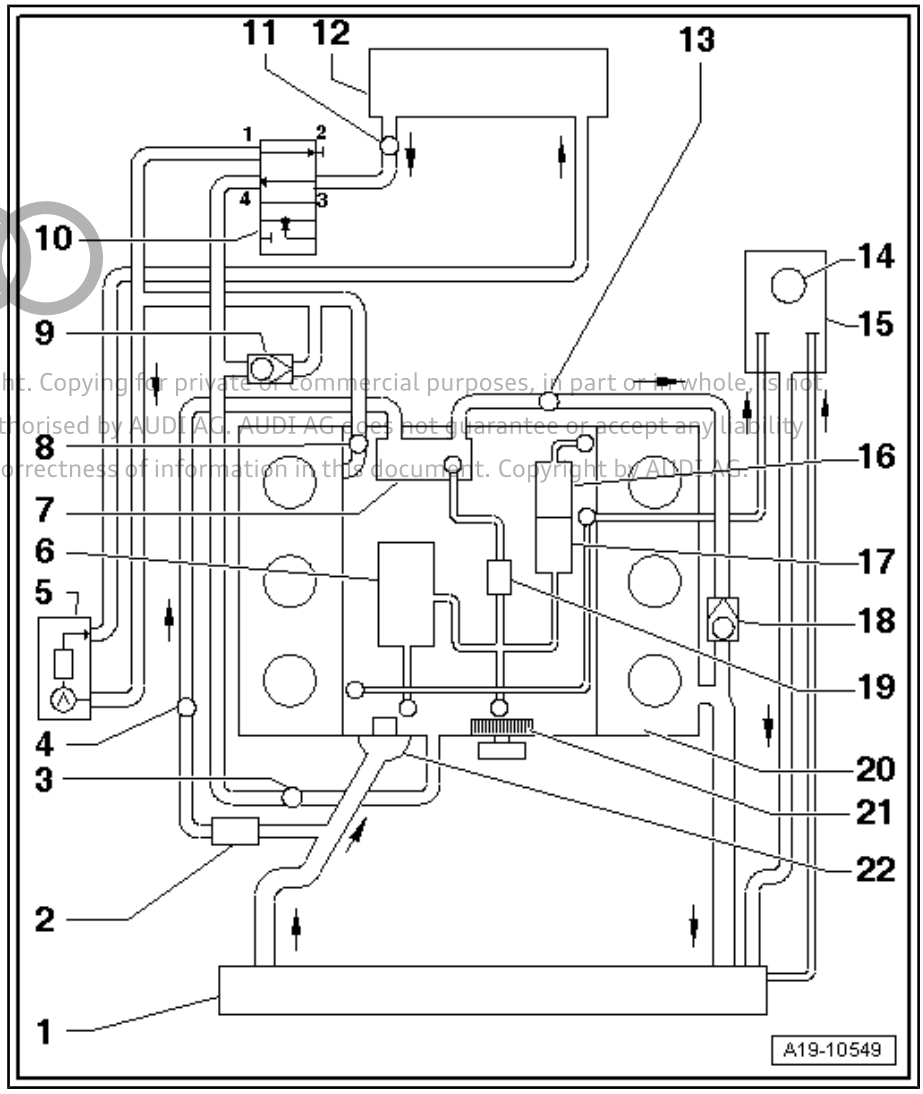
- ❑ If renewed, refill system with fresh coolant

8 - Coolant temperature sender - G62-

9 - Non-return valve

10 - Heater coolant shut-off valve - N279-

- ❑ Removing and installing ⇒ Auxiliary/supplemen-



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tary heater; Rep. gr. 82 ;
Coolant circuit with auxiliary/supplementary heater; Removing and installing heater coolant shut-off valve

11 - Bleeder hole

12 - 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

13 - Bleeder screw

14 - Filler cap for expansion tank

- ❑ Checking pressure relief valve in filler cap ⇒ page 353

15 - Coolant expansion tank

16 - Changeover flap for exhaust gas recirculation

17 - Exhaust gas recirculation control motor - V338-

- ❑ With exhaust gas recirculation potentiometer - G212-

18 - Non-return valve

19 - Thermostat housing for exhaust gas recirculation

20 - Cylinder head and cylinder block

- ❑ If renewed, refill system with fresh coolant

21 - Coolant pump

22 - Thermostat

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1.2 Checking cooling system for leaks

Special tools and workshop equipment required



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- 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.

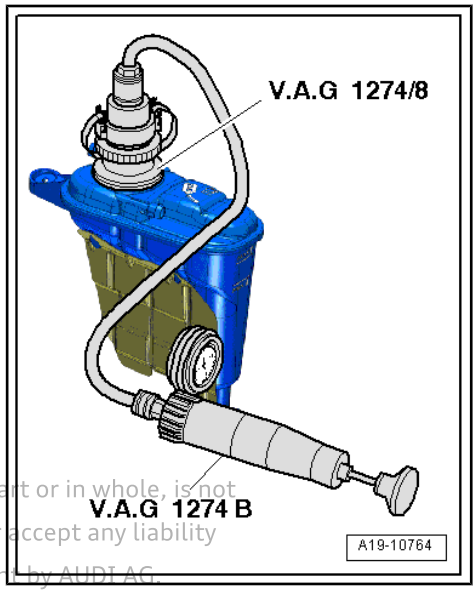
WARNING

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.
– 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.



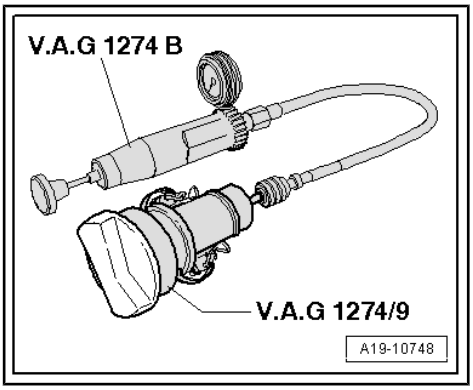
Note

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.

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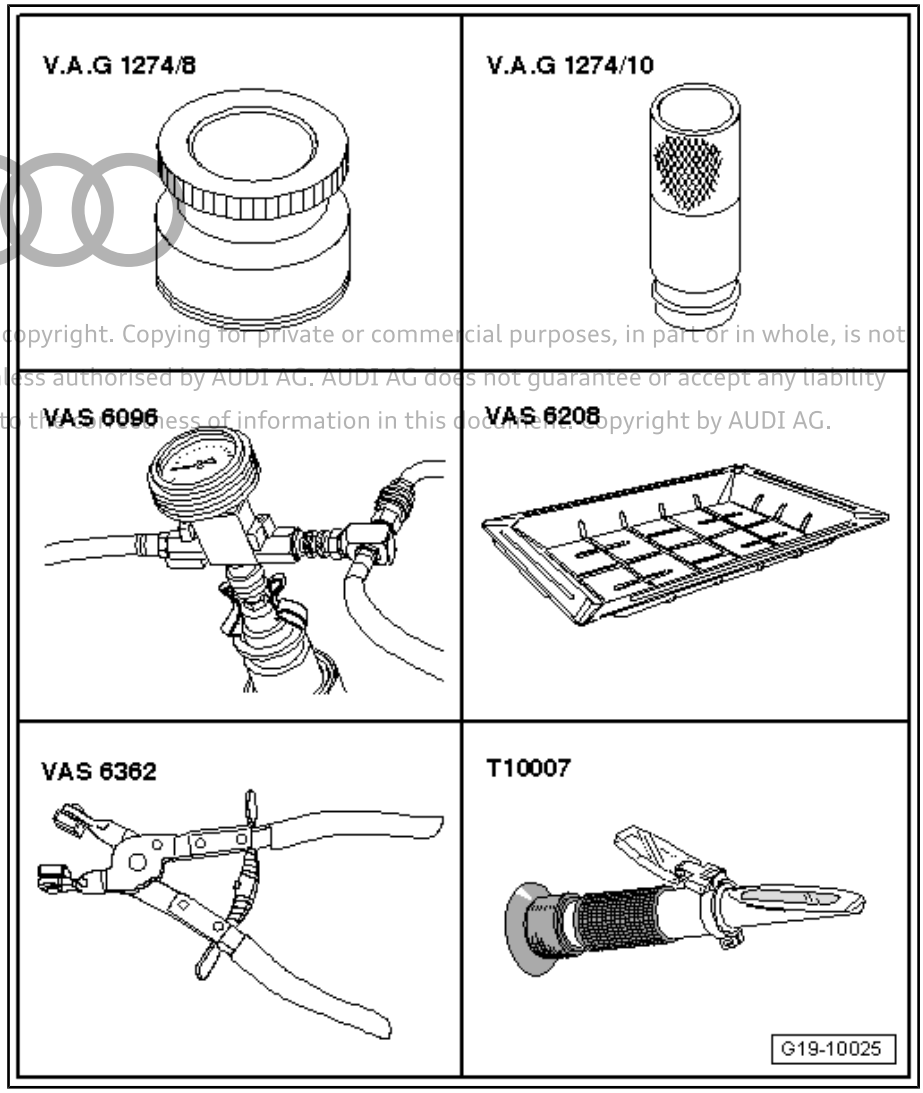
Checking pressure relief valve in filler cap

– 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.



1.3 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-
- Hose clip pliers - VAS 6362-
- Cooling system charge unit - VAS 6096-
- Drip tray for workshop hoist - VAS 6208-
- Refractometer - T10007-

Draining

Note

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

WARNING

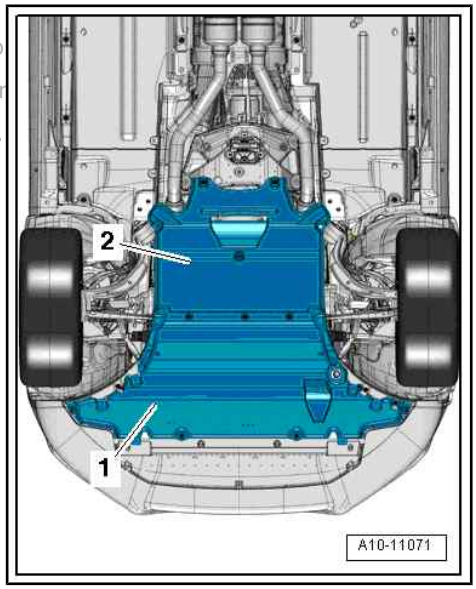
Risk of scalding due to hot steam and hot coolant.

- *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.*

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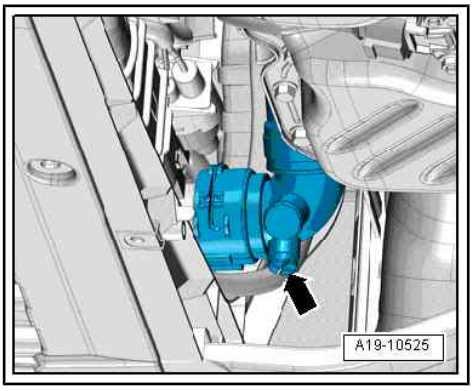
– Open filler cap on coolant expansion tank.

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

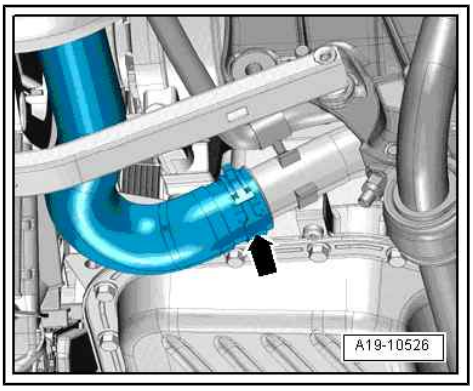


– Place drip tray for workshop hoist - VAS 6208- beneath engine.

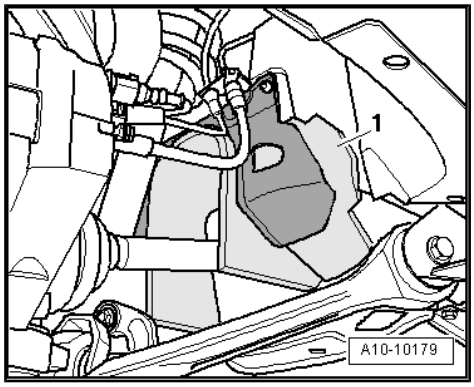
– Remove drain plug -arrow- at connection and drain off coolant.



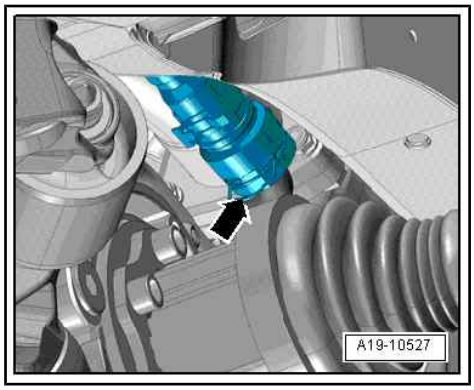
– Release hose clip -arrow-, disconnect coolant hose from coolant pipe (left-side) and drain off coolant.



– Remove cover -1- for drive shaft in wheel housing (right-side).

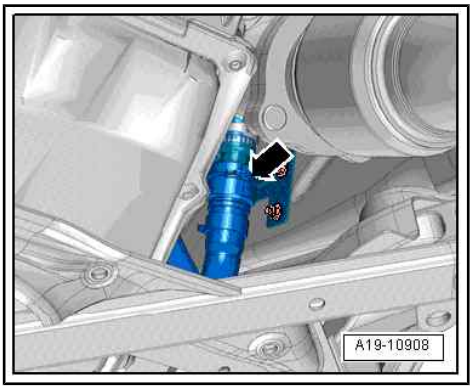


– Vehicles with plug-in connector at coolant pipe (bottom right): Lift retaining clip, disconnect coolant hose -arrow- and drain off coolant.



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– Vehicles with plug-in connector at longitudinal member: Lift retaining clip -arrow-, disconnect coolant hose and drain off coolant.



Filling

- Ignition switched off.

Note

- *The cooling system is filled all year round with a mixture of water and coolant additive. Mixture ratio ⇒ page 357*
- *Use only the coolant additive listed in the ⇒ Electronic parts catalogue . 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.*
- *The specified coolant (based on recommended mixture ratio) ⇒ page 357 prevents frost and corrosion damage and stops scaling. Such additives also raise the boiling point of the coolant. It is therefore essential to use the correct coolant additive in the cooling system all year round.*
- *Because of its high boiling point, the coolant improves engine reliability under heavy loads, particularly in countries with tropical climates.*
- *Frost protection is required down to about –25 °C (in countries with arctic climate: down to about –35 °C).*
- *The coolant concentration must not be reduced by adding water even in warmer seasons and in warmer countries. The coolant concentration must be at least 40 %.*
- *If greater frost protection is required for reasons of climate, the coolant concentration can be increased up to a maximum of 60% (this gives frost protection down to about –40 °C). Otherwise frost protection decreases again and cooling efficiency also becomes worse.*
- *Use only clean tap water for mixing coolant.*
- *If radiator, heat exchanger, cylinder head, cylinder head gasket or cylinder block have been renewed, do not re-use old coolant.*
- *Contaminated or dirty coolant must not be used again.*
- *To check anti-freeze protection in cooling system, use refractometer - T10007- .*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

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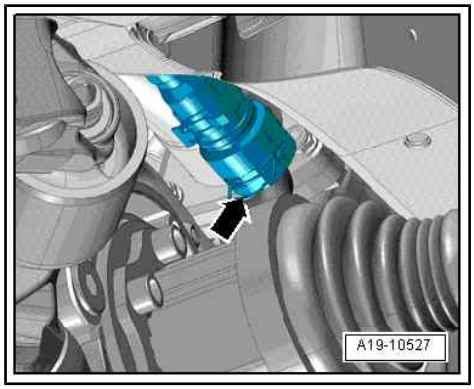
Recommended mixture ratio for coolant

- Coolant (40 %) and water (60 %) for frost protection to -25 °C
- Coolant (50 %) and water (50 %) for frost protection to –35 °C
- Coolant (60 %) and water (40 %) for frost protection to -40 °C

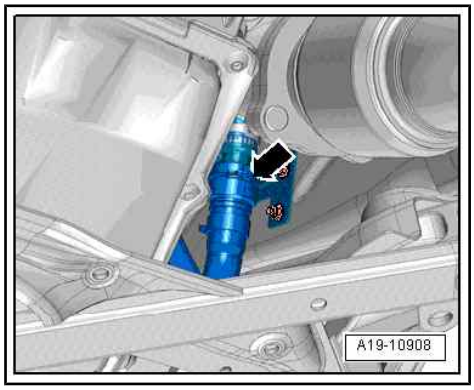
- Coolant additive ⇒ Electronic parts catalogue

Procedure

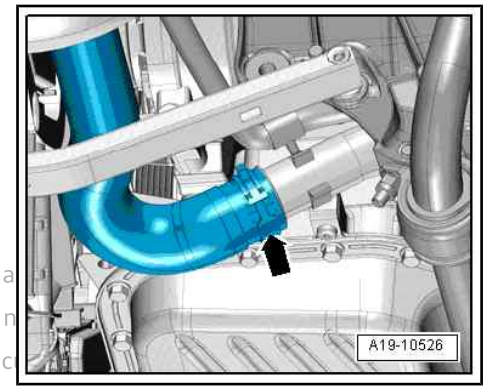
– Vehicles with plug-in connector at coolant pipe (bottom right): Connect coolant hose ⇒ page 404 .



– Vehicles with plug-in connector at longitudinal member: Connect coolant hose ⇒ page 404 .

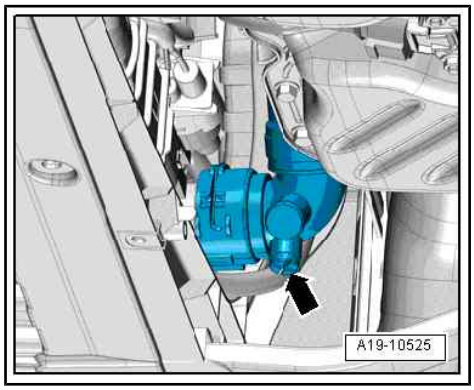


– Connect coolant hose to coolant pipe (left-side) -arrow-.

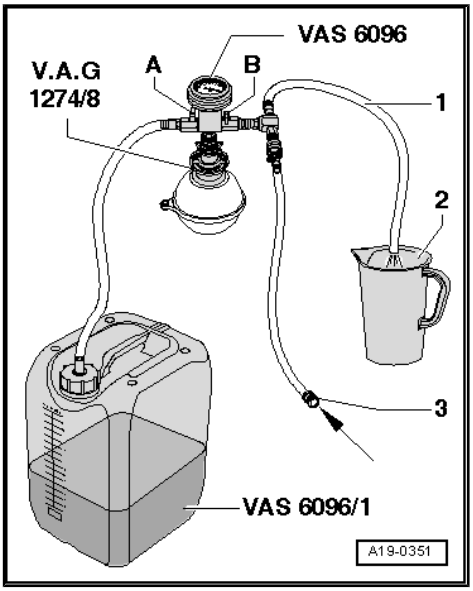


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– Fit drain plug -arrow- with new O-ring into connection.



– 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-.

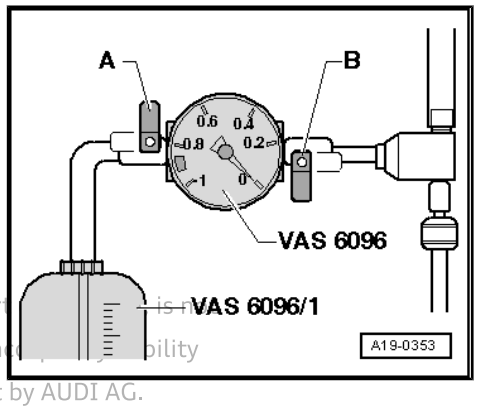


Note

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.

– 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.



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– 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.

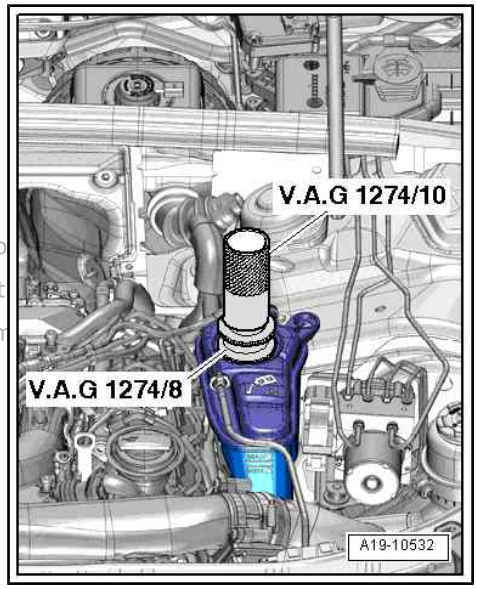
Note

♦ *If the needle does not reach the green zone, repeat the process.*
♦ *Check cooling system for leaks if the vacuum is not maintained.*

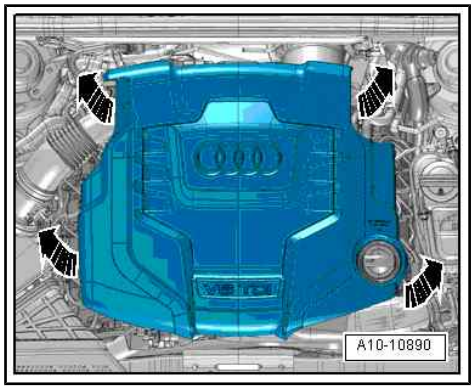
– Detach compressed air hose.
– Open valve -A-.
• The vacuum in the cooling system causes the coolant to be drawn out of the reservoir of -VAS 6096- ; the cooling system is then filled.
– Detach cooling system charge unit - VAS 6096- from adapter -V.A.G 1274/8- on coolant expansion tank.

– 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.

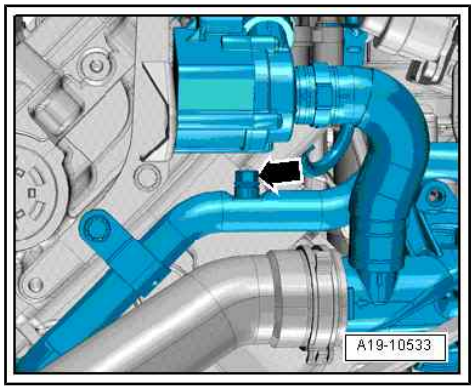
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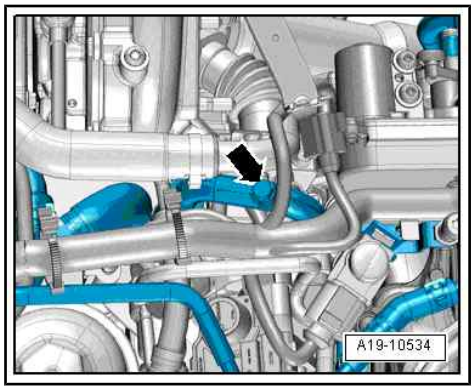
– Remove engine cover panel -arrows-.



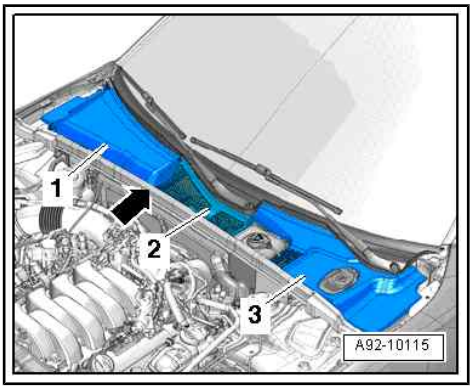
– Open bleeder screw -arrow- at coolant pipe (front) until coolant flows out.
– Close bleeder screw.



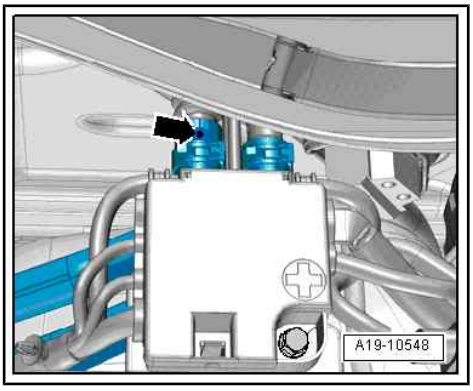
– Open bleeder screw -arrow- at coolant pipe (rear) until coolant flows out.
– Close bleeder screw.



– Depending on version, remove centre part of plenum chamber cover -2- or entire plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .

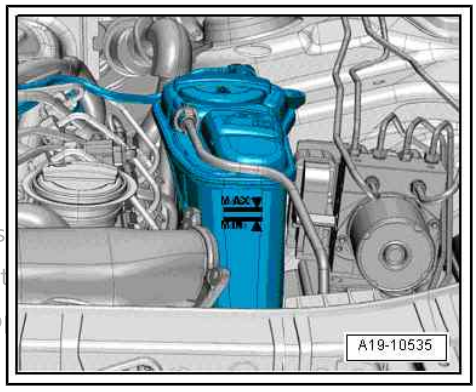


– Release coolant hose going to heat exchanger and pull back hose until coolant flows out at bleeder hole -arrow- in coolant hose.



– Push coolant hose back onto connection and secure with spring-type 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.
– Set temperature to “HI” for all zones and select lowest possible blower speed (= 0).
– Switch off air conditioner compressor (press AC button).
• LED in button should not light up.
– Run engine for 3 minutes at 2000 rpm.
– Allow engine to run at idling speed until both large coolant hoses at radiator become warm.
– Run engine for 2 minutes at 2000 rpm.
– 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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2 Coolant pump/thermostat assembly

⇒ “2.1 Exploded view - coolant pump/thermostat”, page 362

⇒ “2.2 Exploded view - electric coolant pump”, page 365

⇒ “2.3 Removing and installing electric coolant pump”, page 365

⇒ “2.4 Removing and installing coolant pump”, page 367

⇒ “2.5 Removing and installing thermostat”, page 368

⇒ “2.6 Removing and installing coolant temperature sender G62 ”, page 371

⇒ “2.7 Removing and installing radiator outlet coolant temperature sender G83 ”, page 373

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2.1 Exploded view - coolant pump/thermostat

⇒ “2.1.1 Exploded view - coolant pump/thermostat, vehicles without SCR catalytic converter”, page 362

⇒ “2.1.2 Exploded view - coolant pump/thermostat, vehicles with SCR catalytic converter”, page 364

2.1.1 Exploded view - coolant pump/thermostat, vehicles without SCR catalytic converter

1 - Bolt

- ❑ 23 Nm

2 - Bolt

- ❑ 9 Nm

3 - Coolant hose

- ❑ To radiator (bottom right)

4 - Hose connection with thermostat

- ❑ Removing and installing ⇒ page 368

5 - Seal

- ❑ Renew

6 - Coolant pump

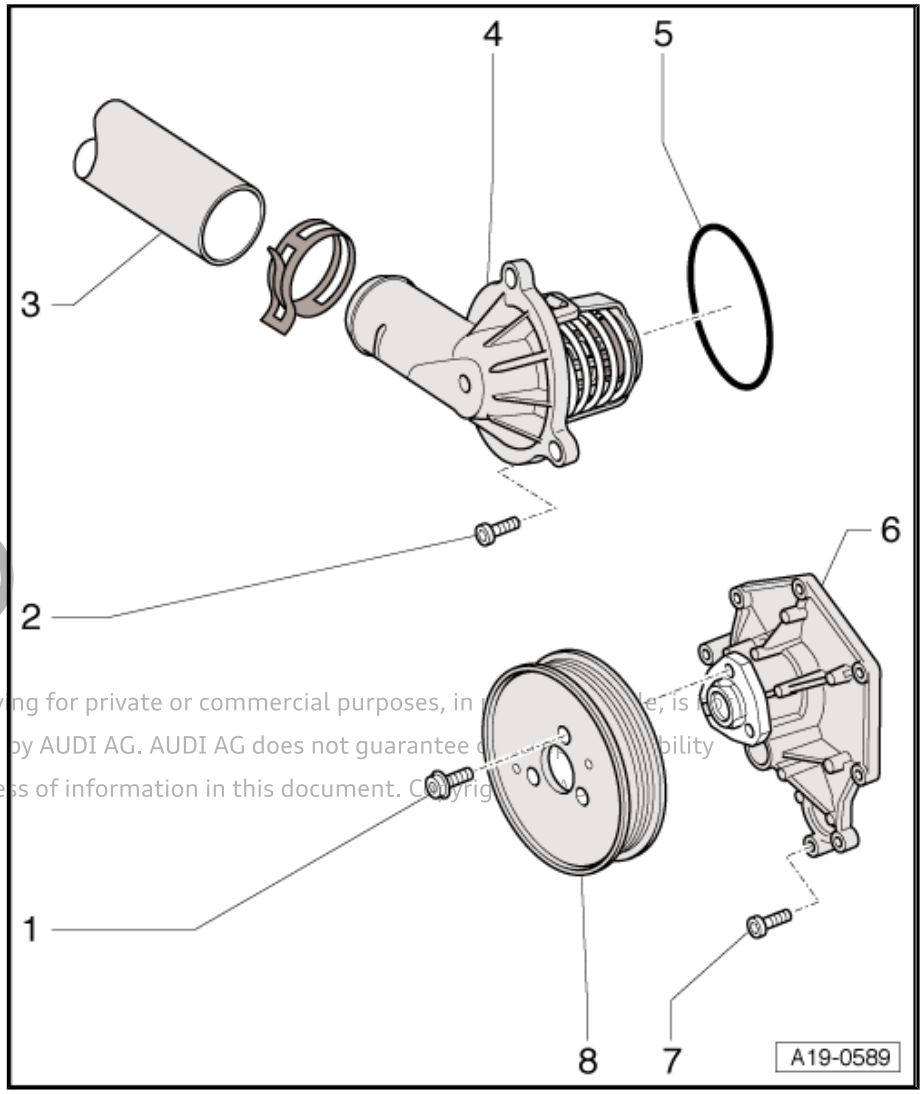
- ❑ Removing and installing ⇒ page 367

7 - Bolt

- ❑ Tightening torque and sequence ⇒ page 365

8 - Poly V-belt pulley for coolant pump

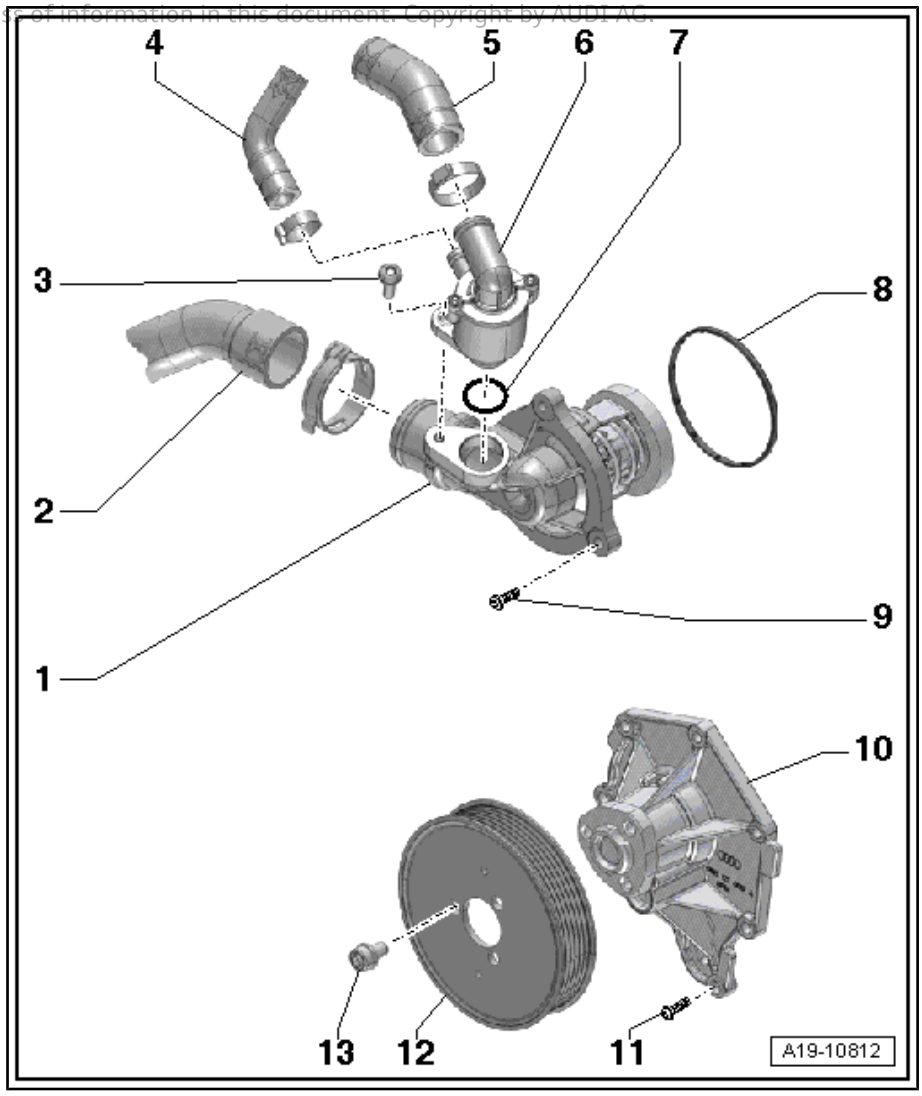
- ❑ Installation position: marking “vorne” (front) faces in direction of travel



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2.1.2 Exploded view - coolant pump/thermostat, vehicles with SCR catalytic converter

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1 - Hose connection with thermostat

- ❑ Removing and installing ⇒ page 369

2 - Coolant hose

- ❑ From radiator (bottom right)

3 - Bolt

- ❑ 9 Nm

4 - Coolant hose

- ❑ To coolant pipe (top left)

5 - Coolant hose

- ❑ From pump for exhaust gas recirculation cooler - V400-

6 - Connection with thermostat for exhaust gas recirculation

- ❑ Removing and installing ⇒ page 370

7 - O-ring

- ❑ Renew

8 - Seal

- ❑ Renew

9 - Bolt

- ❑ 9 Nm

10 - Coolant pump

- ❑ Removing and installing ⇒ page 367

11 - Bolt

- ❑ Tightening torque and sequence ⇒ page 365

12 - Poly V-belt pulley for coolant pump

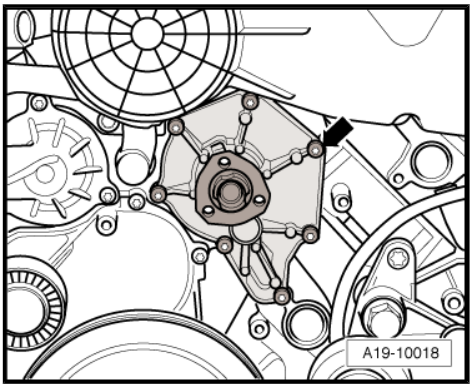
- ❑ Installation position: marking “vorne” (front) faces in direction of travel

13 - Bolt

- ❑ 23 Nm

Coolant pump - tightening torque and sequence

– Tighten bolts -arrow- for coolant pump in diagonal sequence and in stages to 9 Nm.



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2.2 Exploded view - electric coolant pump

1 - Coolant hose

- ❑ To thermostat

2 - Pump for exhaust gas re-circulation cooler - V400-

- ❑ Removing and installing ⇒ page 365

3 - Bolt

- ❑ Tightening torque ⇒ Item 14 (page 198)

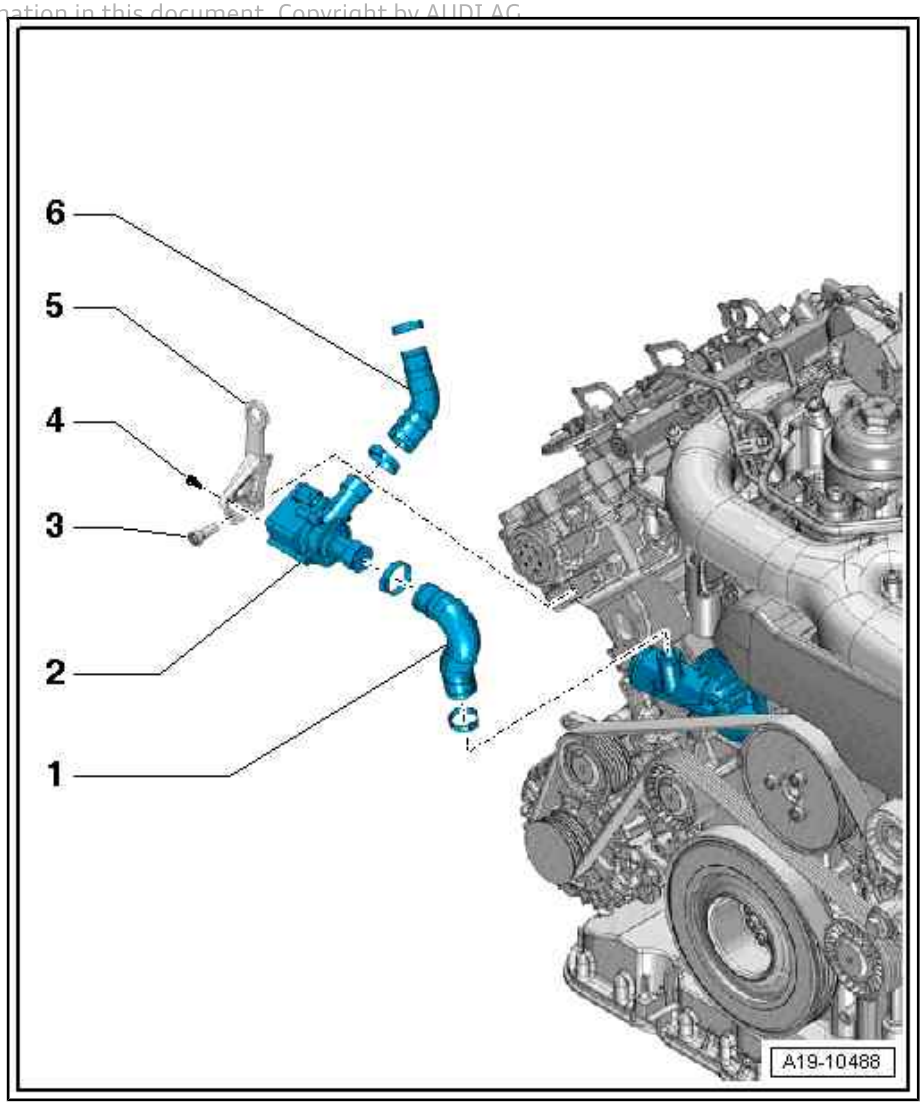
4 - Bolt

- ❑ 2.7 Nm

5 - Engine lifting eye

6 - Coolant hose

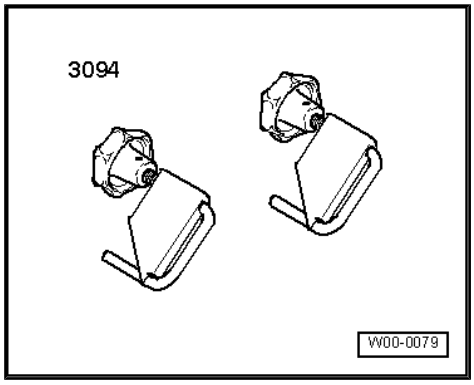
- ❑ To exhaust gas recirculation cooler



2.3 Removing and installing electric coolant pump

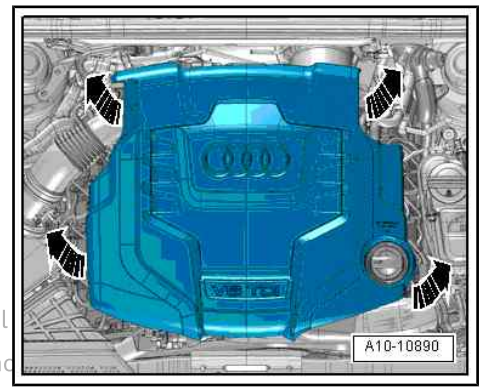
Special tools and workshop equipment required

♦ Hose clamps, up to 25 mm - 3094-



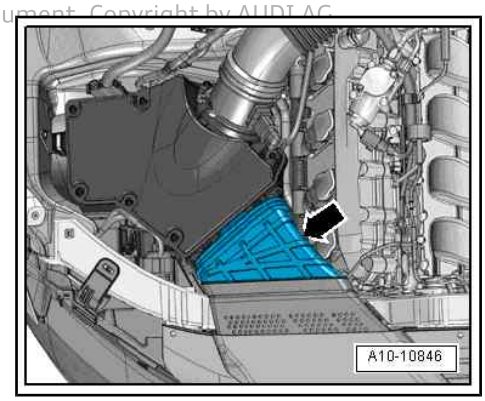
Removing

– Remove engine cover panel -arrows-.

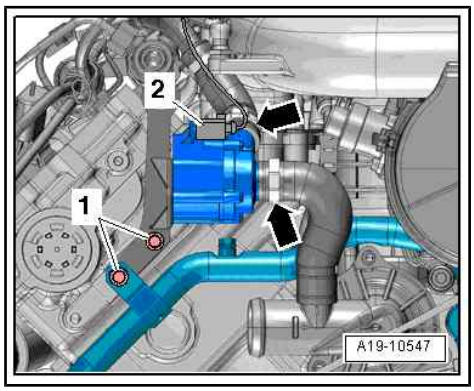


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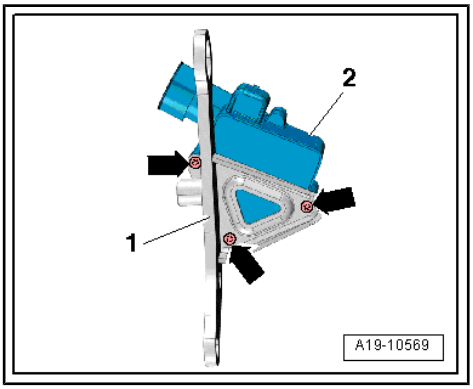
– Remove air duct -arrow-.



– Unplug electrical connector -2-.
– Remove bolts -1-.
– Clamp off coolant hoses -arrows- with hose clamps -3094- and detach from pump for exhaust gas recirculation cooler - V400- .
– Detach pump for exhaust gas recirculation cooler - V400- - together with engine lifting eye.



– Unscrew bolts -arrows- and remove pump for exhaust gas recirculation cooler - V400- -item 2- from engine lifting eye -1-.



Installing

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

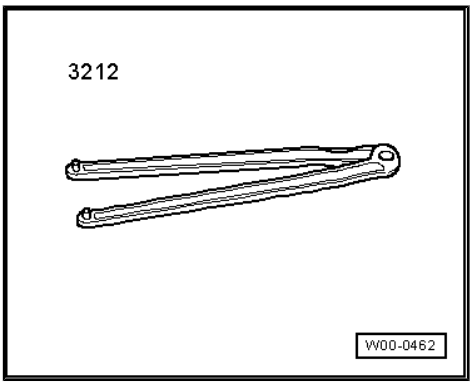
- Tightening torque
  ⇒ “2.2 Exploded view - electric coolant pump”, page 365

– Check coolant level ⇒ page 361 .

2.4 Removing and installing coolant pump

Special tools and workshop equipment required

♦ Pin wrench - 3212-



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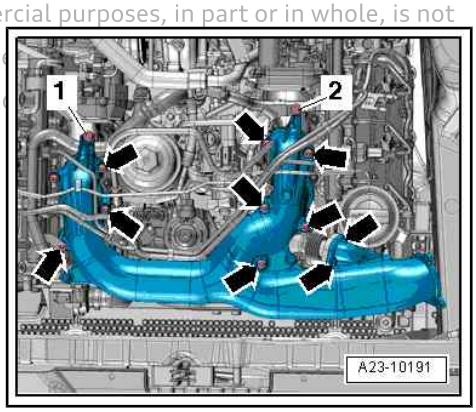
Removing

– Drain coolant ⇒ page 353 .

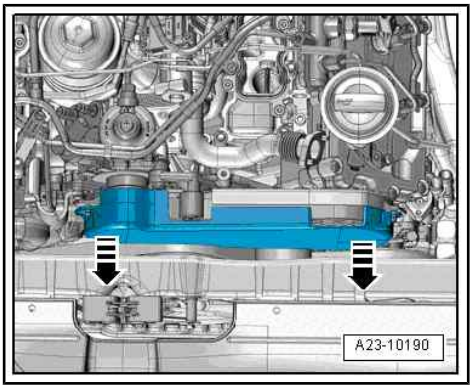
– Remove intake manifold (top section) ⇒ page 483 .

– Remove pump for exhaust gas recirculation cooler - V400- with bracket ⇒ page 365 .

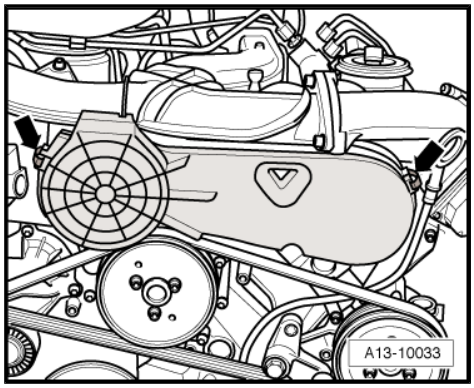
– Remove poly V-belt ⇒ page 168 .



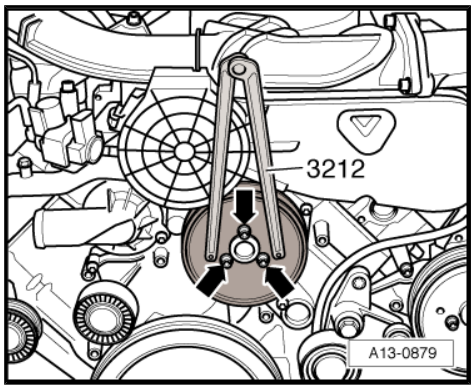
– Engine codes CAMA, CAMB, CCLA, CCWA, CCWB, CGKA, CGKB: pivot toothed belt cover forwards -arrows- and disengage retaining pegs on underside of toothed belt cover.



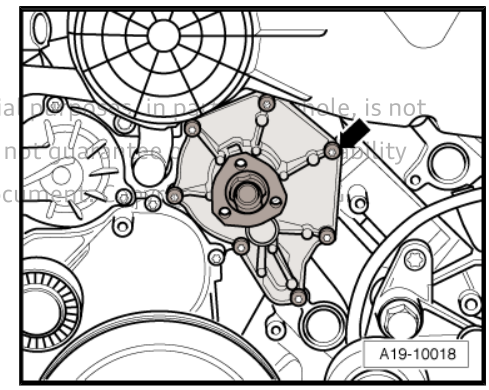
– Engine code CAPA: release clamps -arrows-, pivot toothed belt cover forwards and disengage retaining pegs on underside of toothed belt cover.



– Remove bolts for coolant pump pulley -arrows- (counterhold with pin wrench - 3212-).



– Remove bolts and detach coolant pump -arrow-.



Installing

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

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– Clean sealing surface.
– Tighten coolant pump bolts ⇒ page 365 .
– Install poly V-belt ⇒ page 168 .
– Install pump for exhaust gas recirculation cooler - V400- with bracket ⇒ page 365 .
– Install intake manifold (top section) ⇒ page 483 .
– Fill up with coolant ⇒ page 357 .

2.5 Removing and installing thermostat

⇒ “2.5.1 Removing and installing thermostat - vehicles without SCR catalytic converter”, page 368

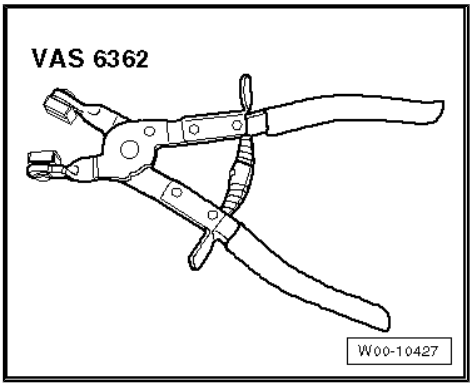
⇒ “2.5.2 Removing and installing thermostat - vehicles with SCR catalytic converter”, page 369

⇒ “2.5.3 Removing and installing thermostat for exhaust gas recirculation - vehicles with SCR catalytic converter”, page 370

2.5.1 Removing and installing thermostat - vehicles without SCR catalytic converter

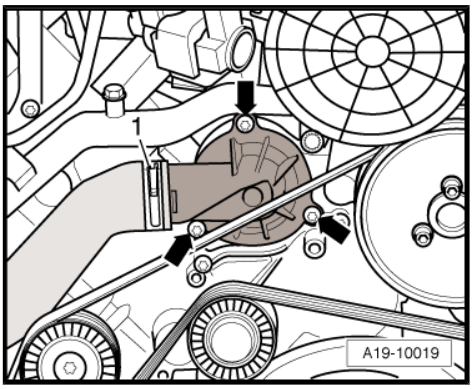
Special tools and workshop equipment required

♦ Hose clip pliers - VAS 6362-



Removing

– Drain coolant ⇒ page 353 .
– Remove poly V-belt ⇒ page 168 .
– Remove pump for exhaust gas recirculation cooler - V400- ⇒ page 365 .
– Detach coolant hose -1-.
– Unscrew bolts -arrows- and remove connection with thermostat.



Installing

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

• Tightening torque ⇒ “2.1 Exploded view - coolant pump/thermostat”, page 362

Note

Fit new O-ring.

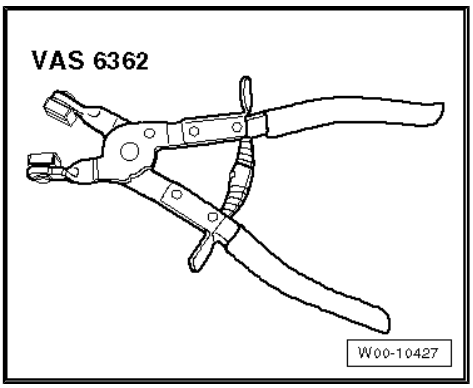
– Clean sealing surface.
– Install poly V-belt ⇒ page 168 .
– Fill up with coolant ⇒ page 357 .

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2.5.2 Removing and installing thermostat - vehicles with SCR catalytic converter

Special tools and workshop equipment required

♦ Hose clip pliers - VAS 6362-



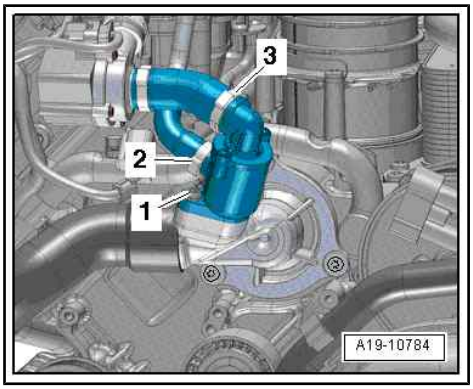
Removing

– Drain coolant ⇒ page 353 .

– Remove poly V-belt ⇒ page 168 .

– Remove pump for exhaust gas recirculation cooler - V400- ⇒ page 365 .

– Remove bolt -1- and detach thermostat for exhaust gas recirculation with connection from connection.

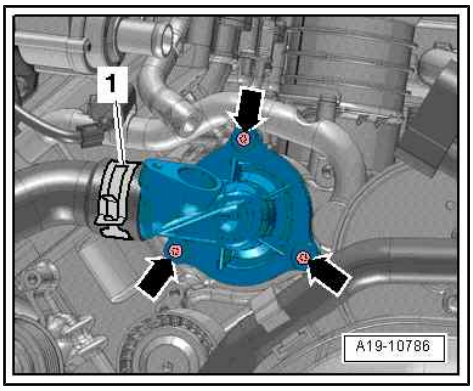


Note

Disregard items -2 and 3-.

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

– Unscrew bolts -arrows- and remove thermostat with connection.



Installing

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

Tightening torques

♦ ⇒ “2.1 Exploded view - coolant pump/thermostat”, page 362

Note

♦ *Fit new O-rings.*

♦ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

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– Clean sealing surface.

– Install poly V-belt ⇒ page 168 .

– Install pump for exhaust gas recirculation cooler - V400- ⇒ page 365 .

– Fill up with coolant ⇒ page 357 .

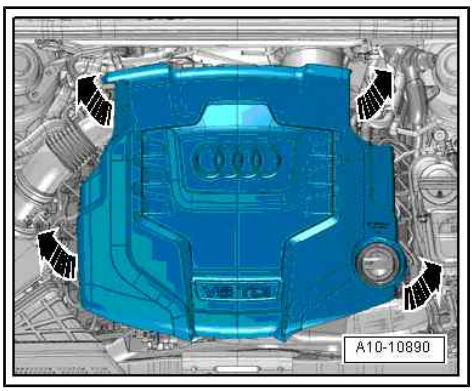
2.5.3 Removing and installing thermostat for exhaust gas recirculation - vehicles with SCR catalytic converter

Removing

– Remove engine cover panel -arrows-.

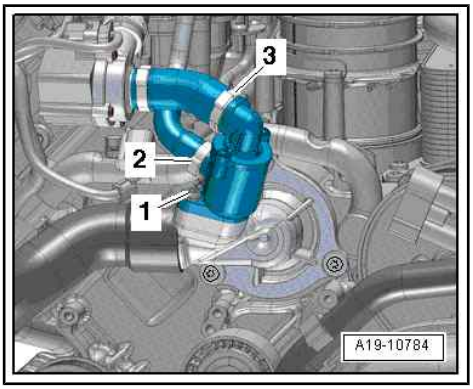
– Drain coolant ⇒ page 353 .

– Remove pump for exhaust gas recirculation cooler - V400- ⇒ page 365 .



– Remove bolt -1-.

– Release hose clip -2-, detach connection with thermostat for exhaust gas recirculation from connection and disconnect from coolant hose.



Note

Disregard -item 3-.

Installing

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

- Tightening torque
⇒ “2.1 Exploded view - coolant pump/thermostat”, page 362

Note

- *Fit new O-ring.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

– Clean sealing surface.

– Install pump for exhaust gas recirculation cooler - V400-
⇒ page 365 .

– Fill up with coolant ⇒ page 357 .

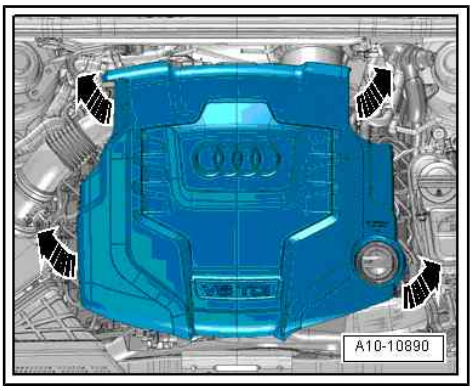
2.6 Removing and installing coolant temperature sender - G62-

Removing

- Engine cold.

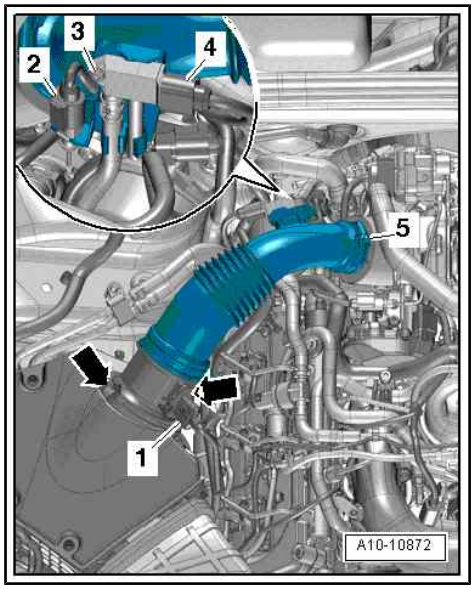
– Open filler cap on coolant expansion tank briefly and allow residual pressure in cooling system to dissipate.

– Remove engine cover panel -arrows-.

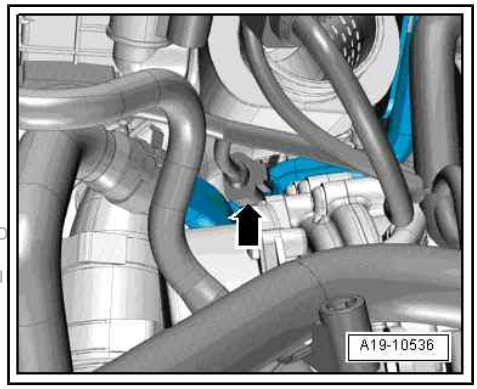


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– Unplug electrical connector -1- at air mass meter - G70- .
– Unscrew bolt -3- and move clear exhaust gas pressure sensor 1 - G450- -item 4- at air pipe.
– Move electrical connector -2- clear at air pipe.
– Remove air hose and air mass meter - G70- . To do so, release hose clip -5- and clamps -arrows-.



– Unplug electrical connector -arrow- at coolant temperature sender - G62- .
– Remove coolant temperature sender - G62- .



Installing

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

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- Tightening torque
⇒ “3.1 Exploded view - coolant pipes”, page 374

Note

- *Fit new O-rings.*
- *To avoid loss of coolant, screw new coolant temperature sender - G62- into connection immediately.*
- *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.*

– Install exhaust gas pressure sensor 1 - G450- ⇒ page 546 .
– Check coolant level ⇒ page 361 .

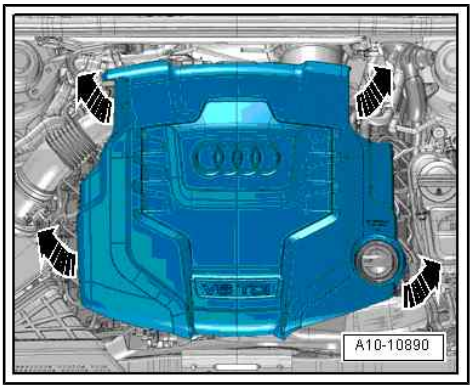
2.7 Removing and installing radiator outlet coolant temperature sender - G83-

Removing

- Engine cold.

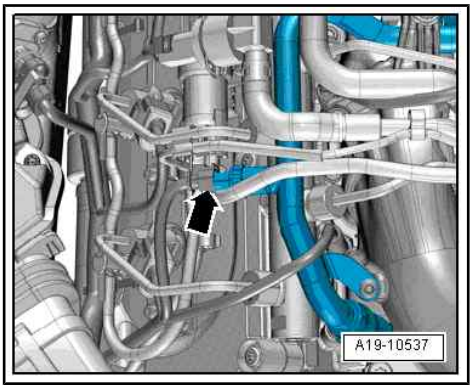
– Open filler cap on coolant expansion tank briefly and allow residual pressure in cooling system to dissipate.

– Remove engine cover panel -arrows-.



– Unplug electrical connector -arrow- at radiator outlet coolant temperature sender - G83- .

– Unscrew radiator outlet coolant temperature sender - G83- .



Installing

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

- Tightening torque
⇒ “3.1 Exploded view - coolant pipes”, page 374

Note

- *Fit new O-rings.*
- *To avoid loss of coolant, screw new radiator outlet coolant temperature sender - G83- into connection immediately.*

– Check coolant level ⇒ page 361 .

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3 Coolant pipes

⇒ “3.1 Exploded view - coolant pipes”, page 374

⇒ “3.2 Removing and installing coolant pipes”, page 380

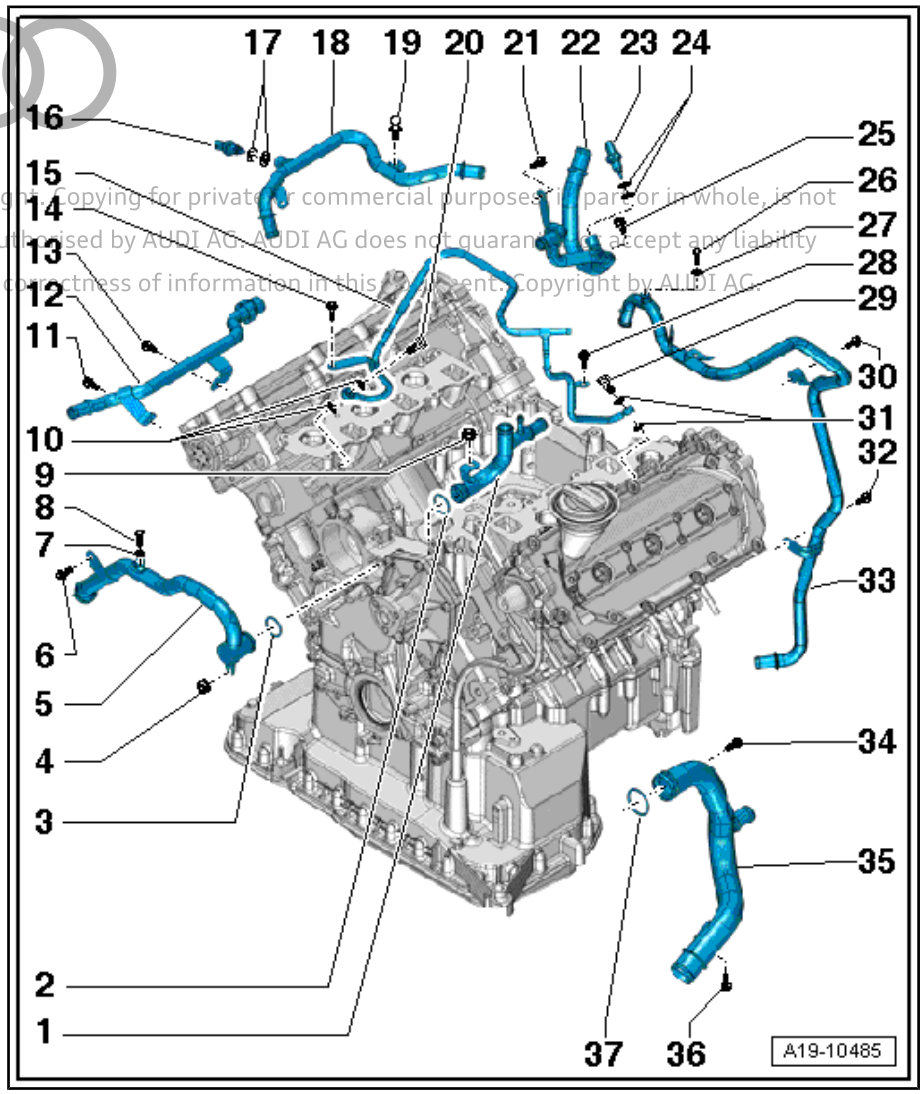
3.1 Exploded view - coolant pipes

⇒ “3.1.1 Exploded view - coolant pipes, engine codes CAMA, CAMB, CAPA”, page 374

⇒ “3.1.2 Exploded view - coolant pipes, engine codes CCLA, CCWA, CCWB, CGKA, CGKB (part 1)”, page 376

⇒ “3.1.3 Exploded view - coolant pipes, engine codes CCLA, CCWA, CCWB, CGKA, CGKB (part 2)”, page 378

3.1.1 Exploded view - coolant pipes, engine codes CAMA, CAMB, CAPA



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1 - Coolant pipe (top)
- ❑ Removing and installing ⇒ page 380

2 - O-ring
- ❑ Renew

3 - O-ring
- ❑ Renew

4 - Nut
- ❑ 9 Nm

5 - Coolant pipe (front)
- ❑ Removing and installing: engine codes CAMA, CAMB ⇒ page 381 , engine code CAPA ⇒ page 383
- ❑ Connect coolant hose with plug-in connector to coolant pipe ⇒ page 404

6 - Bolt
- ❑ 9 Nm

7 - Seal
- ❑ Renew

8 - Bleeder screw

9 - Nut
- ❑ 9 Nm

10 - Seals
- ❑ Renew

11 - Bolt
- ❑ 9 Nm

12 - Coolant pipe (bottom right)
- ❑ Removing and installing ⇒ page 396
- ❑ Connect coolant hose with plug-in connector to coolant pipe ⇒ page 404

13 - Bolt
- ❑ 9 Nm

14 - Bolt
- ❑ 9 Nm

15 - Breather line
- ❑ To cylinder heads

16 - Radiator outlet coolant temperature sender - G83-
- ❑ Removing and installing ⇒ page 373
- ❑ 2 Nm

17 - O-rings
- ❑ Renew
- ❑ Note different diameters

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18 - Coolant pipe (top right)
- ❑ Removing and installing ⇒ page 395

19 - Mounting pin for engine cover panel
- ❑ Tightening torque ⇒ page 482

20 - Banjo bolt
- ❑ 15.5 Nm

21 - Bolt
- ❑ 9 Nm

22 - Coolant pipe (rear right)
- ❑ Removing and installing ⇒ page 399

23 - Coolant temperature sender - G62-
- ❑ Removing and installing ⇒ page 371
- ❑ 2 Nm

24 - O-rings
- ❑ Renew
- ❑ Note different diameters

25 - Bolt
- ❑ 9 Nm

26 - Bleeder screw

27 - Seal
- ❑ Renew

28 - Bolt
- ❑ 9 Nm

29 - Banjo bolt
- ❑ 15.5 Nm

30 - Bolt
- ❑ 9 Nm

31 - Seals
- ❑ Renew

32 - Bolt
- ❑ 9 Nm

33 - Coolant pipe (rear left)
- ❑ Removing and installing ⇒ page 390

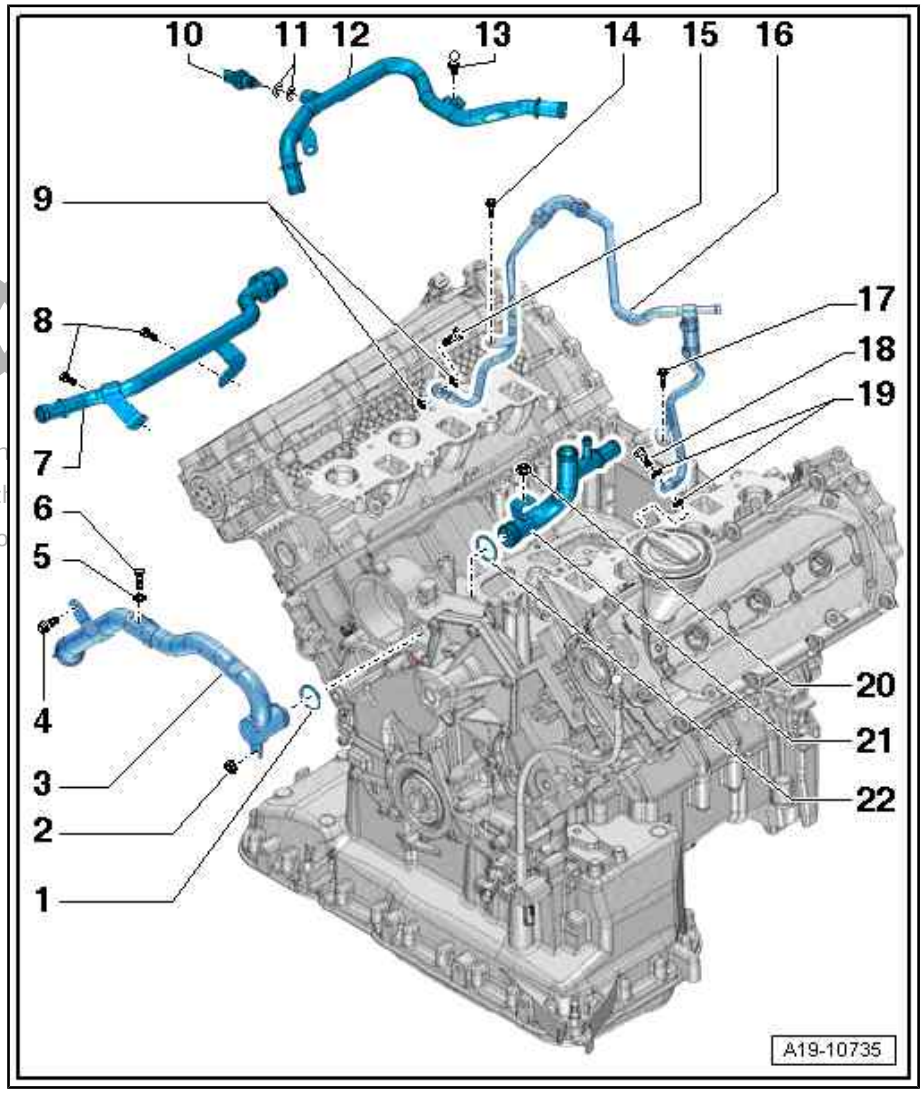
34 - Bolt
- ❑ 9 Nm

35 - Coolant pipe (left-side)
- ❑ Removing and installing ⇒ page 387

36 - Bolt
- ❑ 9 Nm

37 - O-ring
- ❑ Renew

3.1.2 Exploded view - coolant pipes, engine codes CCLA, CCWA, CCWB, CGKA, CGKB (part 1)



1 - O-ring
- ❑ Renew

2 - Nut
- ❑ Tightening torque ⇒ Item 4 (page 374)

3 - Coolant pipe (front)
- ❑ Removing and installing ⇒ page 381
- ❑ Connecting coolant hose with plug-in connector ⇒ page 404

4 - Bolt
- ❑ 9 Nm

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5 - Seal
- ❑ Renew

6 - Bleeder screw

7 - Coolant pipe (bottom right)
- ❑ Removing and installing ⇒ page 396
- ❑ Connecting coolant hose with plug-in connector ⇒ page 404

8 - Bolts
- ❑ 9 Nm

9 - Seals
- ❑ Renew

10 - Radiator outlet coolant temperature sender - G83-
- ❑ Removing and installing ⇒ page 373
- ❑ 2 Nm

11 - O-rings
- ❑ Renew
- ❑ Note different diameters

12 - Coolant pipe (top right)
- ❑ Removing and installing ⇒ page 395

13 - Mounting pin for engine cover panel

- ❑ Tightening torque ⇒ page 482

14 - Bolt

- ❑ 9 Nm

15 - Banjo bolt

- ❑ Tightening torque ⇒ Item 20 (page 375)

16 - Coolant pipe

- ❑ To cylinder heads

17 - Bolt

- ❑ 9 Nm

18 - Banjo bolt

- ❑ 15.5 Nm

19 - Seals

- ❑ Renew

20 - Nut

- ❑ 9 Nm

21 - Coolant pipe (top)

- ❑ Removing and installing ⇒ page 380

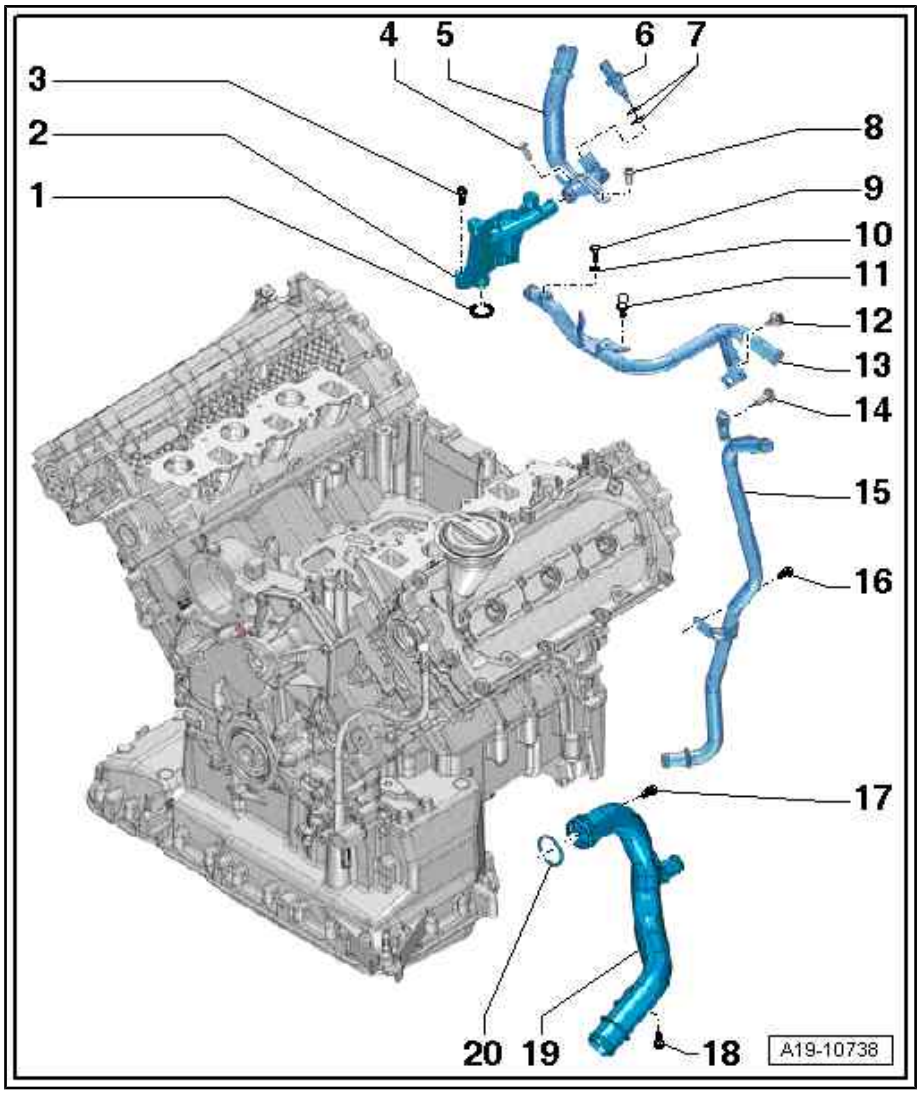
22 - O-ring

- ❑ Renew



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3.1.3 Exploded view - coolant pipes, engine codes CCLA, CCWA, CCWB, CGKA, CGKB (part 2)



1 - O-ring
- ❑ Renew

2 - Connection

3 - Bolt
- ❑ 9 Nm

4 - Bolt
- ❑ 9 Nm

5 - Coolant pipe (rear right)
- ❑ Removing and installing ⇒ page 401

6 - Coolant temperature sender - G62-
- ❑ Removing and installing ⇒ page 371
- ❑ 2 Nm

7 - O-rings
- ❑ Renew
- ❑ Note different diameters

8 - Bolt
- ❑ 9 Nm

9 - Bleeder screw

10 - Seal
- ❑ Renew

11 - Mounting pin for engine cover panel
- ❑ Tightening torque ⇒ page 482

12 - Bolt
- ❑ 9 Nm

13 - Coolant pipe (top left)
- ❑ Removing and installing - engine codes CCWA, CCWB, CGKA, CGKB ⇒ page 393
- ❑ Removing and installing - vehicles with SCR catalytic converter ⇒ page 395

14 - Bolt
- ❑ 9 Nm

15 - Coolant pipe (rear left)
- ❑ Removing and installing ⇒ page 391

16 - Bolt
- ❑ 9 Nm

17 - Bolt
- ❑ 9 Nm

18 - Bolt
- ❑ 9 Nm

19 - Coolant pipe (left-side)
- ❑ Removing and installing ⇒ page 387

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20 - O-ring

- ❑ Renew

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3.2 Removing and installing coolant pipes

⇒ “3.2.1 Removing and installing coolant pipe (top)”, page 380

⇒ “3.2.2 Removing and installing coolant pipe (front) - engine codes CAMA, CAMB, CCLA, CCWA, CCWB, CGKA, CGKB”, page 381

⇒ “3.2.3 Removing and installing coolant pipe (front) - engine code CAPA”, page 383

⇒ “3.2.4 Removing and installing coolant pipe (left-side)”, page 387

⇒ “3.2.5 Removing and installing coolant pipe (rear left) - engine codes CAMA, CAMB, CAPA”, page 390

⇒ “3.2.6 Removing and installing coolant pipe (rear left) - engine codes CCLA, CCWA, CCWB, CGKA, CGKB”, page 391

⇒ “3.2.7 Removing and installing coolant pipe (top left) - engine codes CCWA, CCWB, CGKA, CGKB”, page 393

⇒ “3.2.8 Removing and installing coolant pipe (top left) - vehicles with SCR catalytic converter”, page 395

⇒ “3.2.9 Removing and installing coolant pipe (top right)”, page 395

⇒ “3.2.10 Removing and installing coolant pipe (bottom right)”, page 396

⇒ “3.2.11 Removing and installing coolant pipe (rear right) - engine codes CAMA, CAMB, CAPA”, page 399

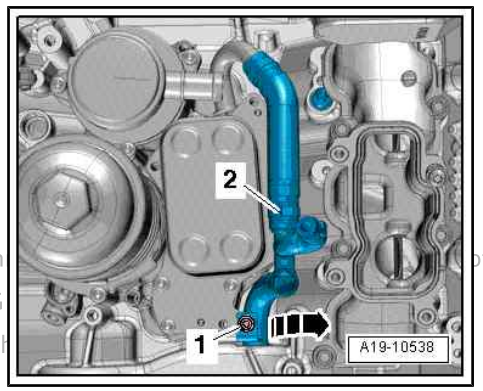
⇒ “3.2.12 Removing and installing coolant pipe (rear right) - engine codes CCLA, CCWA, CCWB, CGKA, CGKB”, page 401

3.2.1 Removing and installing coolant pipe (top)

Removing

– Remove engine oil cooler ⇒ page 336 .

– Release hose clip -2- and detach coolant hose.



Note

Disregard -item 1- and -arrow-.

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– Pull top coolant pipe out of cylinder block.

Installing

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

- Tightening torque
  ⇒ “3.1 Exploded view - coolant pipes”, page 374

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.

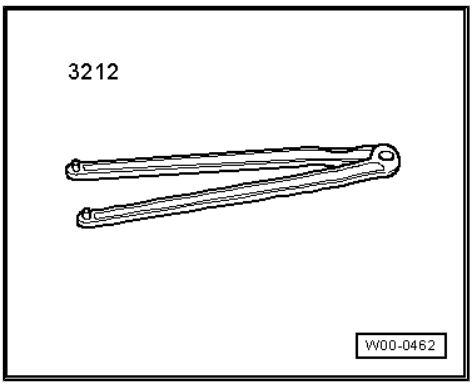
– Lubricate O-ring with coolant and slide onto coolant pipe.

– Install engine oil cooler ⇒ page 336 .
– Fill up with coolant ⇒ page 357 .

3.2.2 Removing and installing coolant pipe (front) - engine codes CAMA, CAMB, CCLA, CCWA, CCWB, CGKA, CGKB

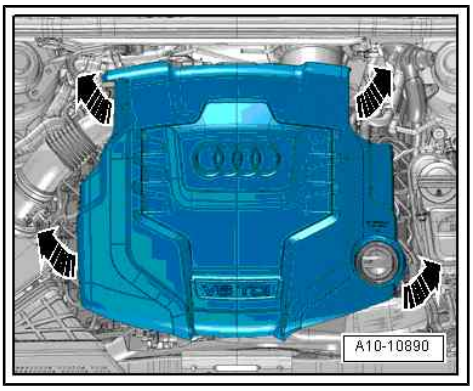
Special tools and workshop equipment required

♦ Pin wrench - 3212-

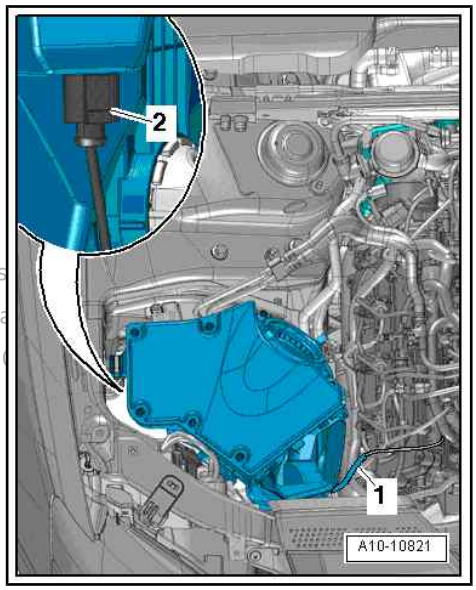


Removing

– Remove engine cover panel -arrows-.

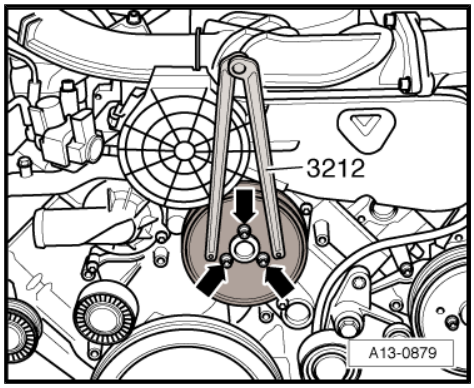


– Remove air cleaner housing ⇒ page 479 .
– Drain coolant ⇒ page 353 .
– Remove poly V-belt ⇒ page 168 .
– Remove pump for exhaust gas recirculation cooler - V400- ⇒ page 365 .

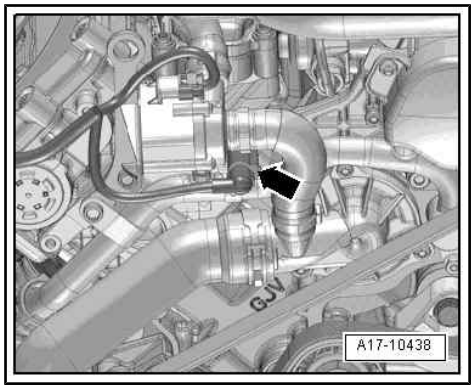


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– Remove bolts -arrows- and detach poly V-belt pulley for coolant pump (counterhold with pin wrench - 3212-).



– Take electrical connector -arrow- for oil pressure switch for reduced oil pressure - F378- out of bracket.

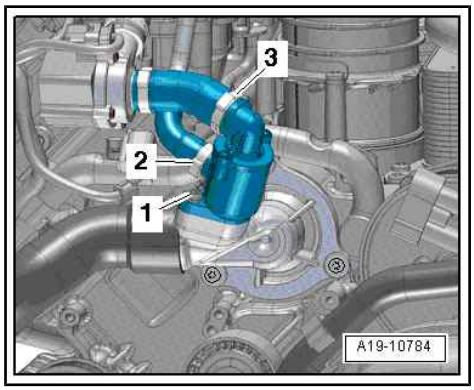


Vehicles with SCR catalytic converter:

– Remove bolt -1- and detach thermostat for exhaust gas recirculation with connection from connection.

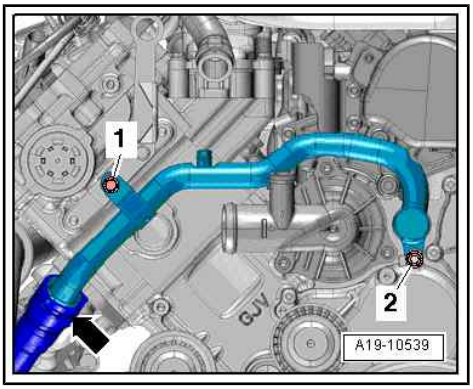
Note

Disregard items -2 and 3-.



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All vehicles (continued):



– Detach coolant hose -arrow- (lift retaining clip).
– Unscrew nut -2-.
– Move electrical wiring on front coolant pipe clear.
– Pull front coolant pipe forwards out of cylinder block.

Note

Disregard -item 1-.

Installing

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

- Tightening torque
⇒ “3.1 Exploded view - coolant pipes”, page 374

Note

- *Fit new O-rings.*
- *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *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.*
- *Fit all cable ties in the original positions when installing.*

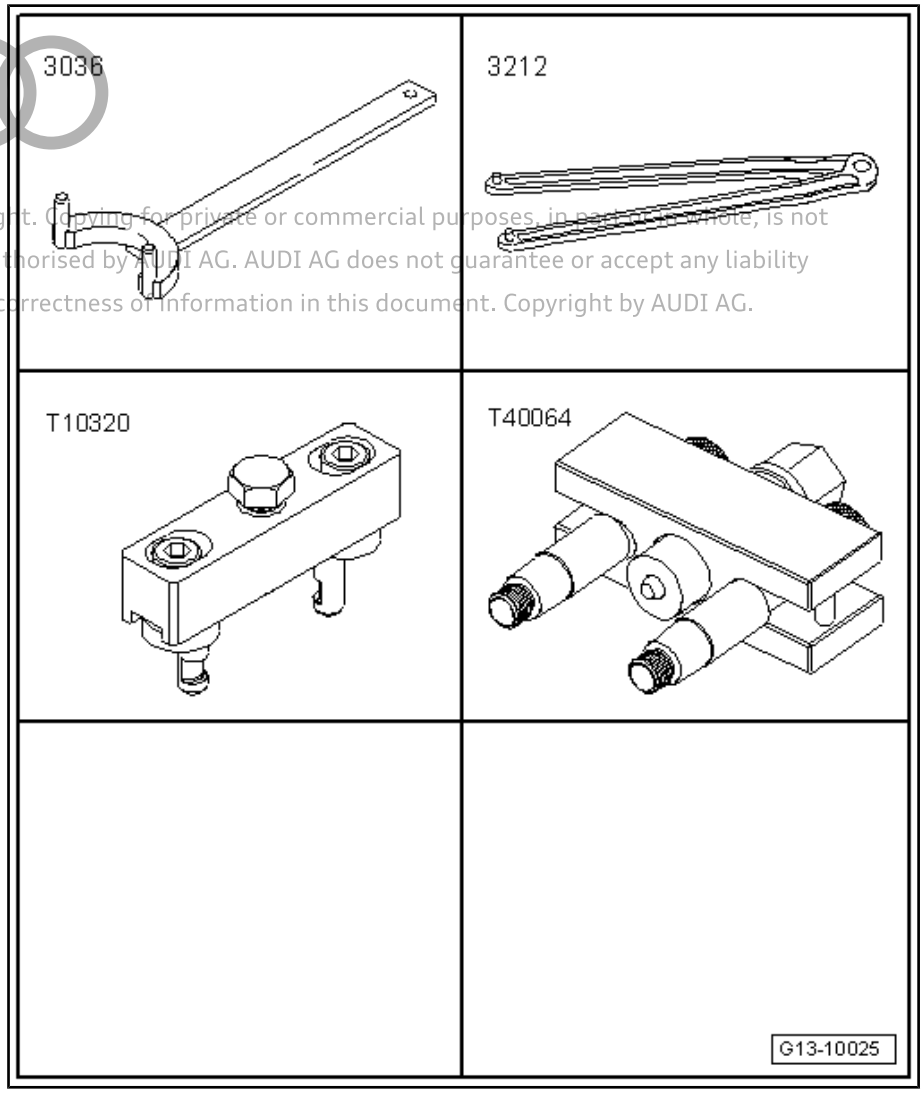
– Clean and smoothen sealing surface for O-ring.
– Lubricate O-ring with coolant and slide onto coolant pipe.
– Connect coolant hose with plug-in connector to coolant pipe ⇒ page 404 .
– Install poly V-belt pulley for coolant pump ⇒ page 362 .
– Install pump for exhaust gas recirculation cooler - V400- ⇒ page 365 .
– Install poly V-belt ⇒ page 168 .
– Install air cleaner housing and exhaust gas pressure sensor 1 - G450- ⇒ page 479 .
– Fill up with coolant ⇒ page 357 .

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3.2.3 Removing and installing coolant pipe (front) - engine code CAPA

Special tools and workshop equipment required

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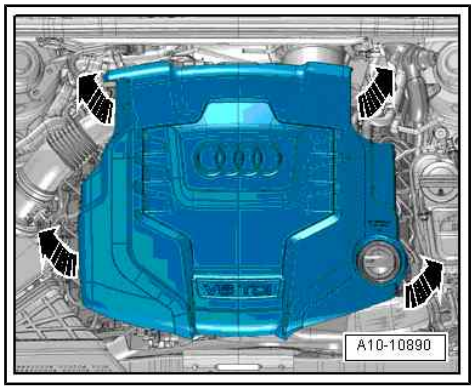
- Counterhold tool - 3036-
- Pin wrench - 3212-
- Puller - T10320-
- Puller - T40064-

Removing

Note

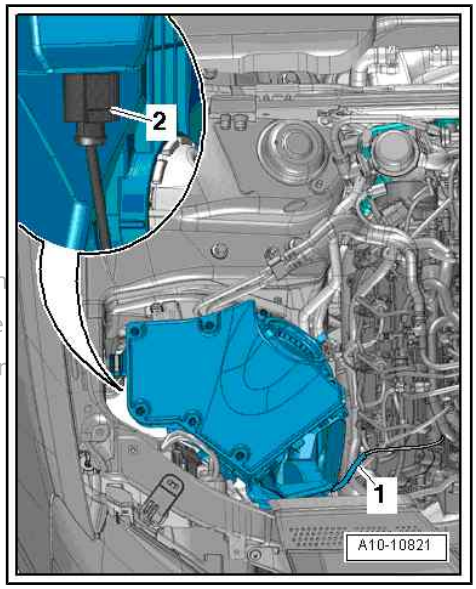
Fit all cable ties in the original positions when installing.

– Remove engine cover panel -arrows-.

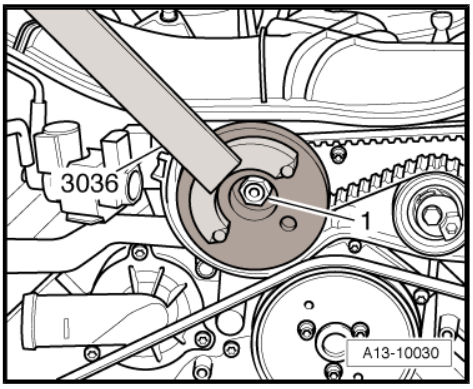


– Remove air cleaner housing ⇒ page 479 .
– Drain coolant ⇒ page 353 .
– Remove poly V-belt ⇒ page 168 .
– Remove pump for exhaust gas recirculation cooler - V400- ⇒ page 365 .

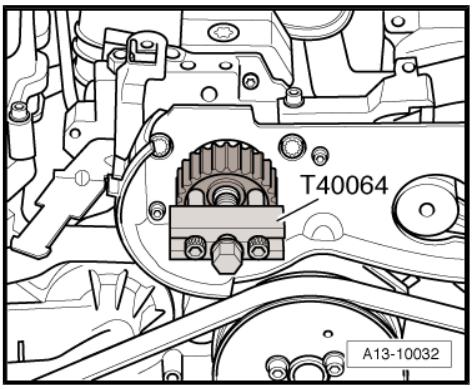
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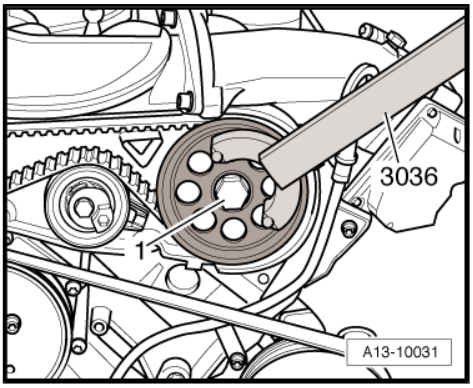
– Remove toothed belt for high-pressure pump ⇒ page 519 .
– Unscrew nut -1- for high-pressure pump shaft using counter-hold tool - 3036- .
– Remove damper weight.



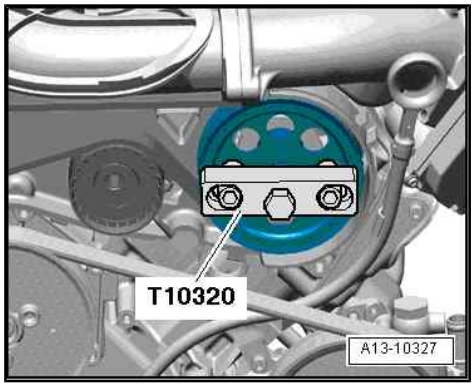
– Remove toothed belt sprocket for high-pressure pump using puller - T40064- .



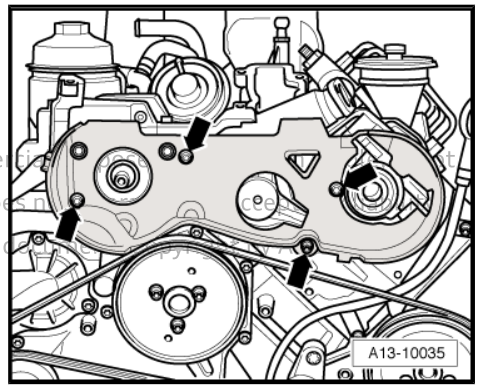
– Loosen bolt -1- for toothed belt drive sprocket approx. 2 turns using counterhold tool - 3036- .



– Remove toothed belt drive sprocket using puller - T10320- .

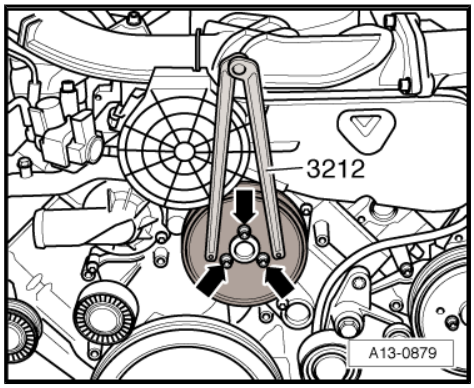


– Unscrew bolts -arrows- and remove toothed belt cover (rear).

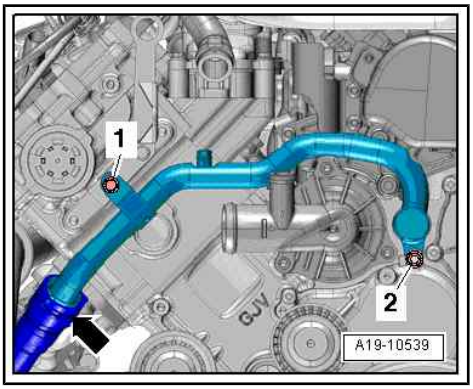


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– Remove bolts for coolant pump pulley -arrows- (counterhold with pin wrench - 3212-).



– Detach coolant hose -arrow- (lift retaining clip).
– Unscrew nut -2-.
– Move electrical wiring on front coolant pipe clear.
– Pull front coolant pipe forwards out of cylinder block.



Note

Disregard -item 1-.

Installing

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

- Tightening torque
⇒ “3.1 Exploded view - coolant pipes”, page 374

Note

- *Fit new O-ring.*
- *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.*

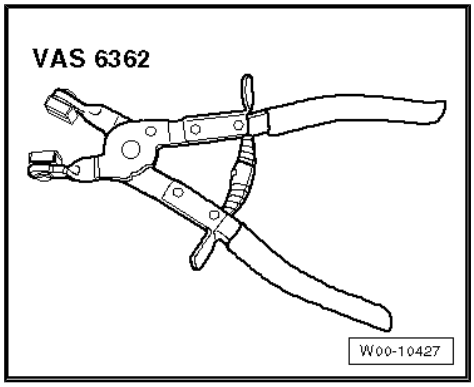
– Clean and smoothen sealing surface for O-ring.
– Lubricate O-ring with coolant and slide onto coolant pipe.
– Connect coolant hose with plug-in connector to coolant pipe ⇒ page 404 .
– Install poly V-belt pulley for coolant pump ⇒ page 362 .
– Install toothed belt drive sprocket ⇒ page 197 .
– Install toothed belt sprocket and toothed belt for high-pressure pump ⇒ page 519 .
– Install pump for exhaust gas recirculation cooler - V400- ⇒ page 365 .
– Install poly V-belt ⇒ page 168 .
– Install air cleaner housing and exhaust gas pressure sensor 1 - G450- ⇒ page 479 .
– Fill up with coolant ⇒ page 357 .

3.2.4 Removing and installing coolant pipe (left-side)

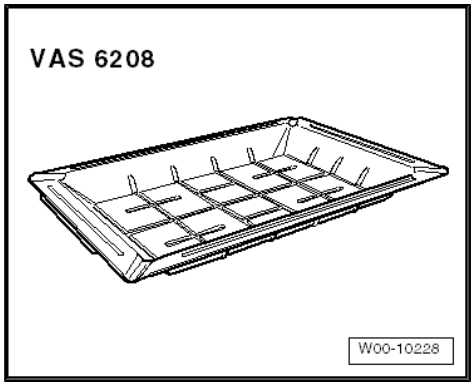
Special tools and workshop equipment required

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- Hose clip pliers - VAS 6362-



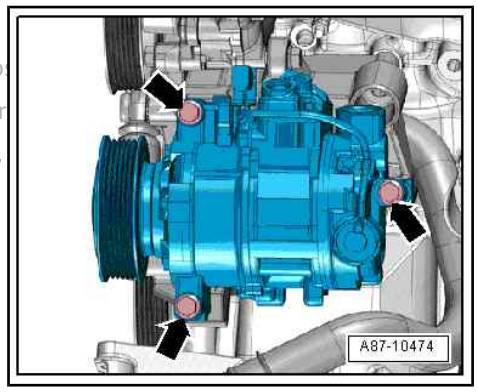
- Drip tray for workshop hoist - VAS 6208-



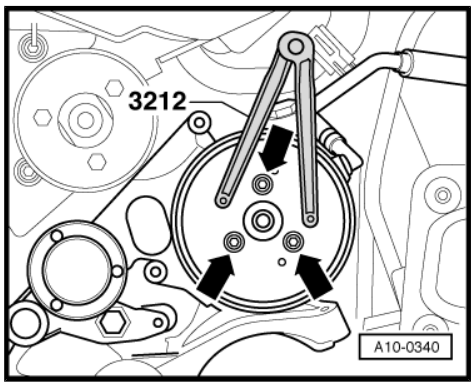
Removing

– Remove poly V-belt ⇒ page 168 .

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

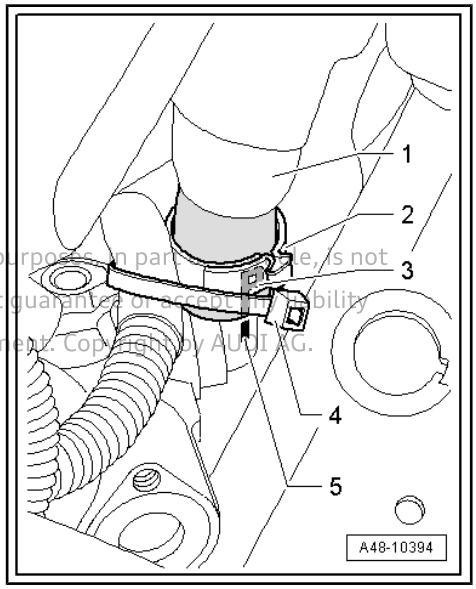


– Remove bolts -arrows- and detach poly V-belt pulley for power-steering pump (counterhold with pin wrench - 3212-).



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– Cut open cable tie -4-.

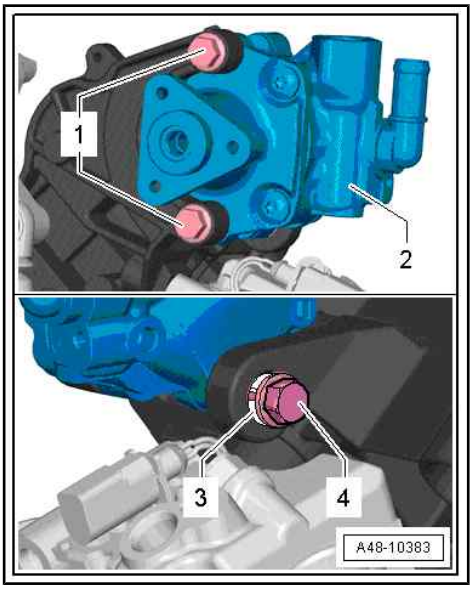


Note

Disregard -items 1, 2, 3, 5-.

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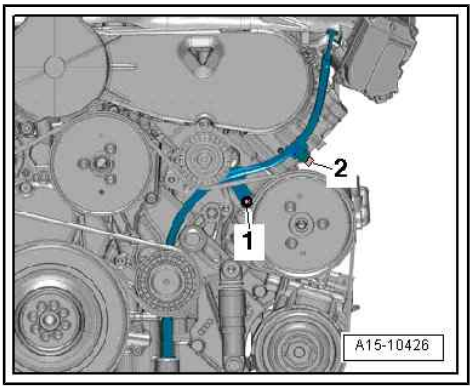
– Remove bolts -1- and -4-.
– Detach power steering pump -2- and tie up.



Note

Disregard -item 3-.

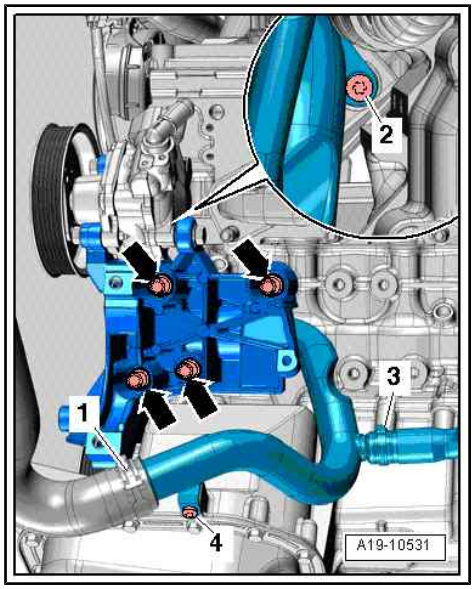
– Remove bolt -1- for dipstick guide tube.



Note

Disregard -item 2-.

– Place drip tray for workshop hoist - VAS 6208- beneath engine.
– Disconnect coolant hose -1- from coolant pipe (left-side) and drain off coolant.
– Remove bolts -4- and -arrows-, detach bracket for ancillaries with power steering pump and simultaneously pull off coolant pipe (left-side) from coolant hose -3-.
– Remove bolt -2- and detach coolant pipe (left-side) from bracket.



Installing

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

- Tightening torque
⇒ “1.1 Exploded view - poly V-belt drive”, page 163 ,
⇒ “3.1 Exploded view - coolant pipes”, page 374

Note

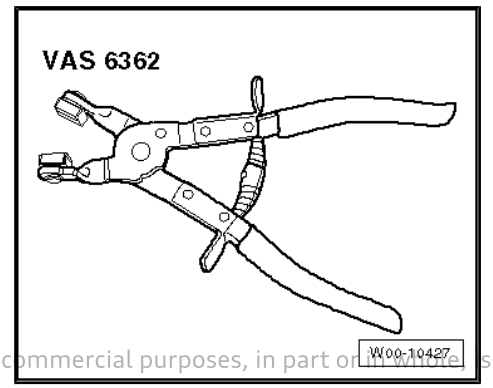
- *Renew seal and O-ring.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

– Clean and smoothen sealing surface for O-ring and seal.
– Lubricate O-ring with coolant and slide onto coolant pipe.
– Install air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Removing and installing air conditioner compressor .
– Install dipstick guide tube ⇒ page 323 .
– Install power steering hydraulic line ⇒ Running gear, axles, steering; Rep. gr. 48 ; Hydraulic power steering; Exploded view - hydraulic lines, reservoir .
– Fill up with coolant ⇒ page 357 .

3.2.5 Removing and installing coolant pipe (rear left) - engine codes CAMA, CAMB, CAPA

Special tools and workshop equipment required

- Hose clip pliers - VAS 6362-



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Removing

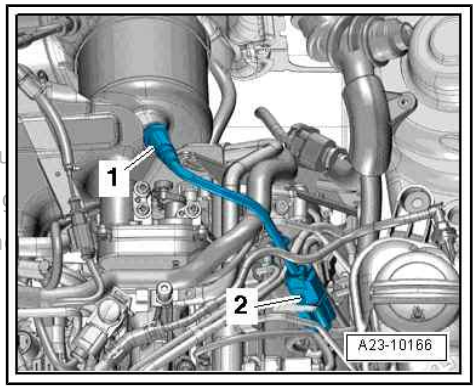
– Drain coolant ⇒ page 353 .

– Detach electrical connector -2- from bracket and unplug.

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Note

Disregard -item 1-.



– Unplug electrical connector at glow plug for cylinder 6.

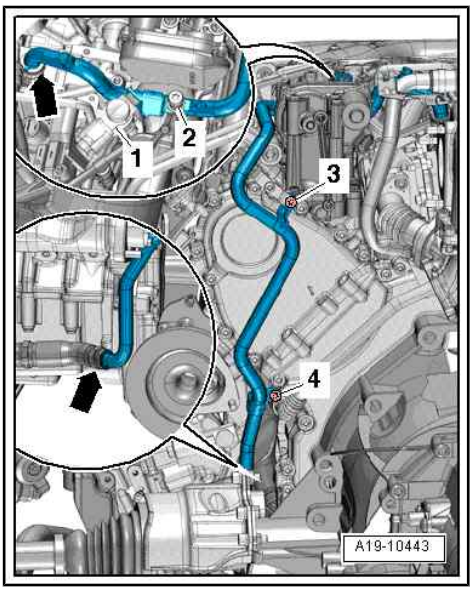
– Remove intermediate pipe (left-side) ⇒ page 631

– Detach change-over valve for exhaust gas recirculation cooler - N345- -item 1- from bracket.

– Remove bolts -3- and -4- and ball stud -2-.

– Move electrical wiring harness clear at coolant pipe (rear left).

– Detach coolant pipe (rear left) from coolant hoses -arrows-.



Installing

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

- Tightening torque
  ⇒ “3.1 Exploded view - coolant pipes”, page 374

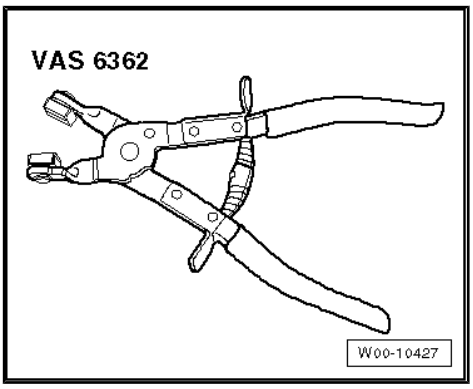
– Install intermediate pipe (left-side) ⇒ page 631 .

– Fill up with coolant ⇒ page 357 .

3.2.6 Removing and installing coolant pipe (rear left) - engine codes CCLA, CCWA, CCWB, CGKA, CGKB

Special tools and workshop equipment required

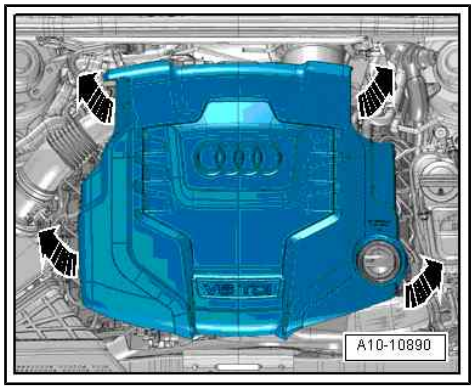
♦ Hose clip pliers - VAS 6362-



Removing

– Drain coolant ⇒ page 353 .

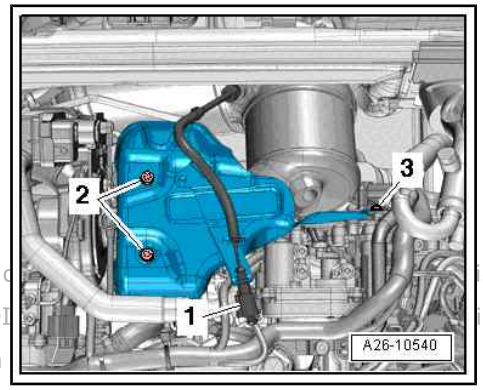
– Remove engine cover panel -arrows-.



– Unplug electrical connector -1- for exhaust gas temperature sender 3 - G495- and move wiring clear.

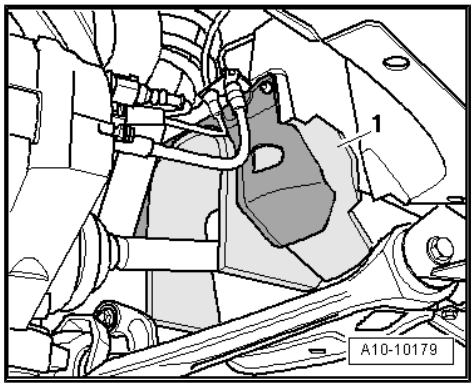
– Remove bolts -2- and -3-.

– Detach heat shield for turbocharger.

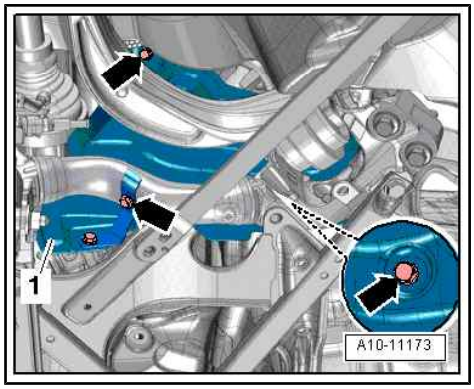


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– Remove cover -1- for drive shaft in wheel housing (left-side).

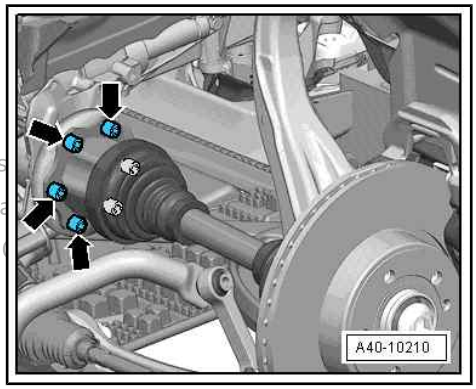


– If fitted, remove bolts -arrows- and detach heat shield -1- (left-side).

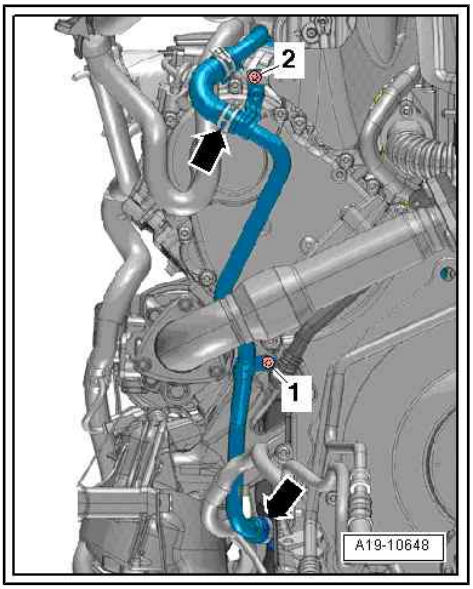


– Unbolt drive shaft (left-side) from gearbox flange shaft ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .

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– Remove bolts -1- and -2-.
– Move electrical wiring harness clear at coolant pipe (rear left).
– Open hose clips -arrows- and detach coolant pipe (rear left) from coolant hoses.



Installing

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

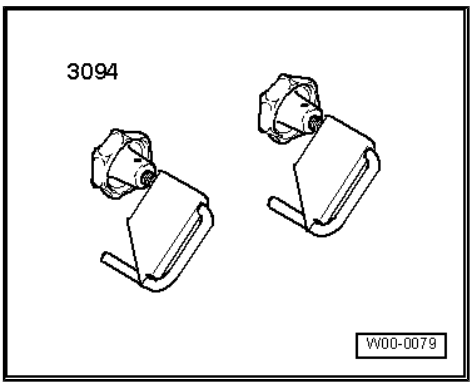
- Tightening torque
  ⇒ “3.1 Exploded view - coolant pipes”, page 374

– Bolt drive shaft (left-side) to gearbox flange shaft ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .
– Install cover for drive shaft ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Exploded view - drive shaft .
– Install heat shield for turbocharger ⇒ page 420 .
– Fill up with coolant ⇒ page 357 .

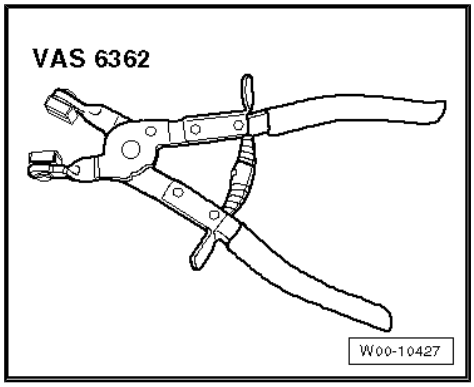
3.2.7 Removing and installing coolant pipe (top left) - engine codes CCWA, CCWB, CGKA, CGKB

Special tools and workshop equipment required

♦ Hose clamps, up to 25 mm - 3094-

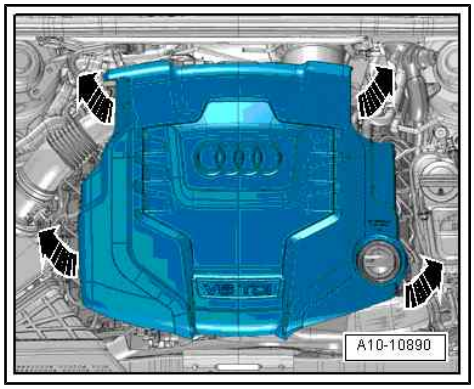


♦ Hose clip pliers - VAS 6362-

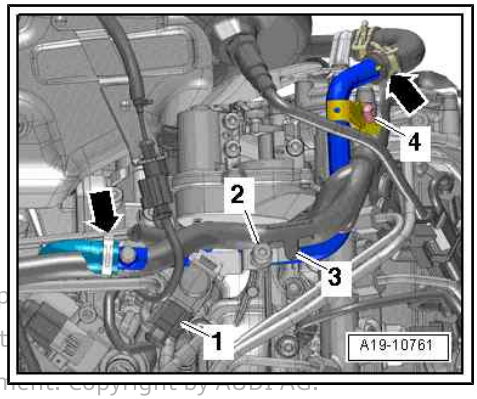


Removing

– Remove engine cover panel -arrows-.



– Detach change-over valve for exhaust gas recirculation cooler - N345- -item 1- from bracket.
– Remove bolt -4- and ball stud -2-.
– Move electrical wiring harness -3- clear at coolant pipe (rear left).
– Clamp off coolant hoses using hose clamps -3094- , release hose clips -arrows- and disconnect hoses.
– Detach coolant pipe (top left).



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Installing

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

Note

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

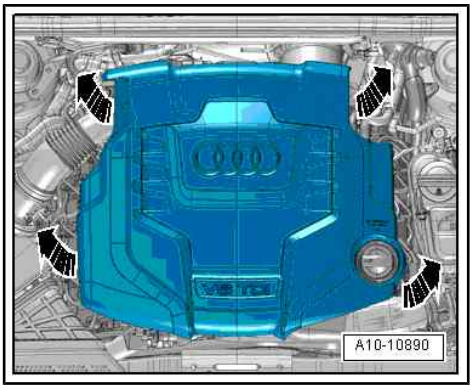
– Fill up with coolant ⇒ page 357 .

3.2.8 Removing and installing coolant pipe (top left) - vehicles with SCR catalytic converter

Removing

– Drain coolant ⇒ page 353 .

– Remove engine cover panel -arrows-.

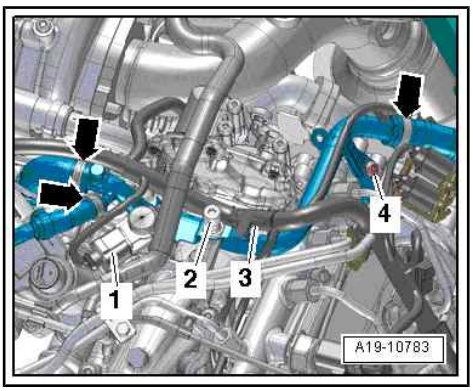


– Detach change-over valve for exhaust gas recirculation cooler - N345- -item 1- from bracket.

– Remove bolt -4- and mounting pin for engine cover panel -2-.

– Move electrical wiring harness -3- clear at coolant pipe (top left).

– Release hose clips -arrows- and detach coolant pipe (top left).



Installing

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

Note

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

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Tightening torques

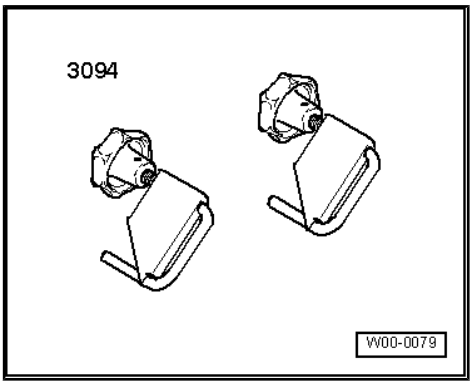
♦ ⇒ “3.1 Exploded view - coolant pipes”, page 374

– Fill up with coolant ⇒ page 357 .

3.2.9 Removing and installing coolant pipe (top right)

Special tools and workshop equipment required

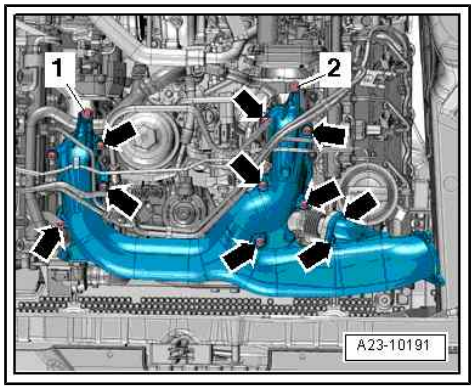
♦ Hose clamps, up to 25 mm - 3094-



Removing

– Remove intake manifold (top section) ⇒ page 483 .

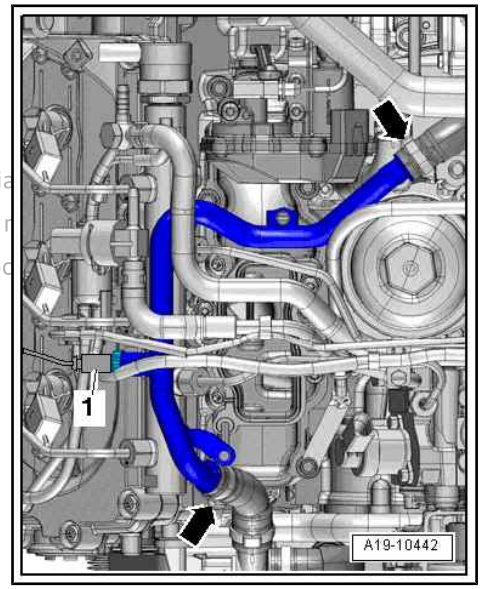
– Move electrical wiring harness on coolant pipe (top right) clear.



– Unplug electrical connector -1- at radiator outlet coolant temperature sender - G83- .

– Clamp off coolant hoses -arrows- with hose clamps -3094- and disconnect hoses from coolant pipe (top right).

– Detach coolant pipe (top right).



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Installing

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

- Tightening torque
  ⇒ “3.1 Exploded view - coolant pipes”, page 374

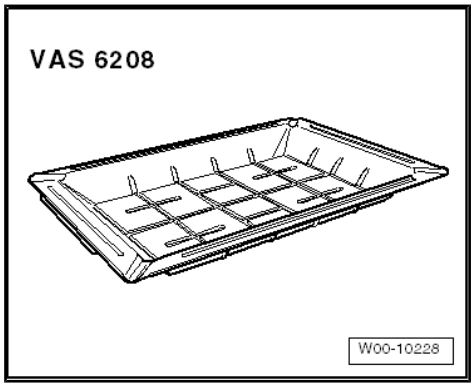
– Install intake manifold (top section) ⇒ page 483 .

– Check coolant level ⇒ page 361 .

3.2.10 Removing and installing coolant pipe (bottom right)

Special tools and workshop equipment required

♦ Drip tray for workshop hoist - VAS 6208- for vehicles with auxiliary heater



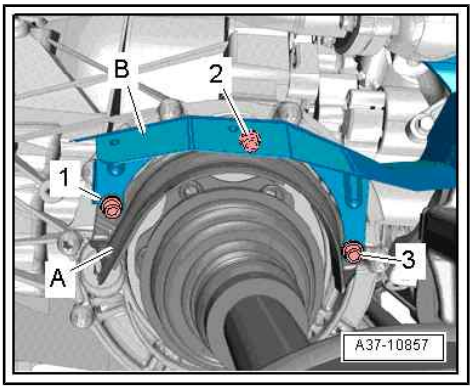
Removing

– Drain coolant ⇒ page 353 .

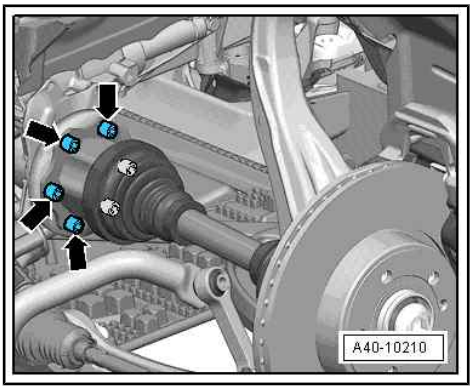
– Remove front right wheel.

– Remove bolts -1, 2, 3- and detach heat shield -A- for drive shaft (right-side).

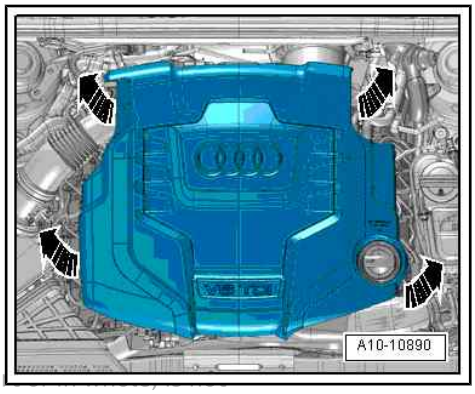
– Move heat shield -B- clear to one side.



– Unbolt drive shaft (right-side) from gearbox flange shaft ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .

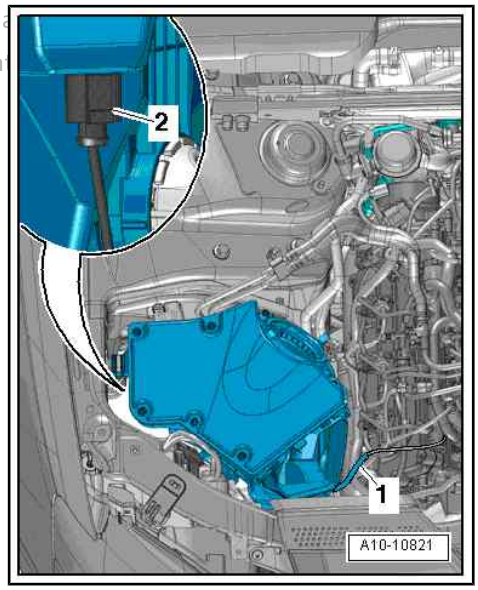


– Remove engine cover panel -arrows-.



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– Remove air cleaner housing ⇒ page 479 .

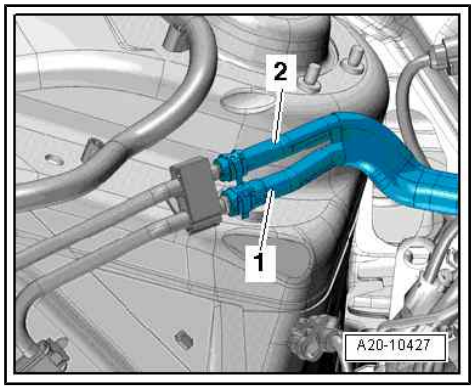


Vehicles with auxiliary heater:

Caution

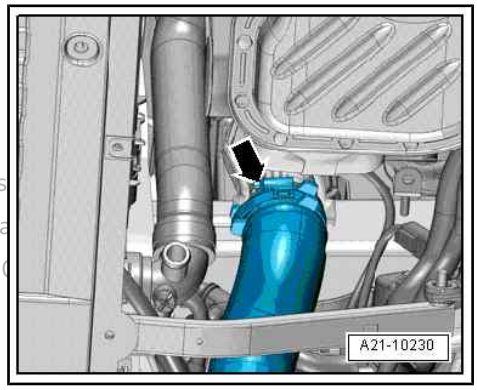
Take care to keep components clean.

- *Observe rules for cleanliness when working on the fuel supply system ⇒ page 9 .*



– Disconnect fuel supply hose -1- and fuel return hose -2-.

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

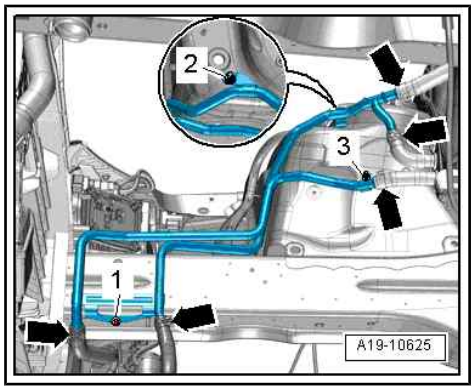


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– Remove bolt -1- and nuts -2- and -3-.

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

– Detach coolant hoses -arrows- and swivel coolant pipes towards the front.

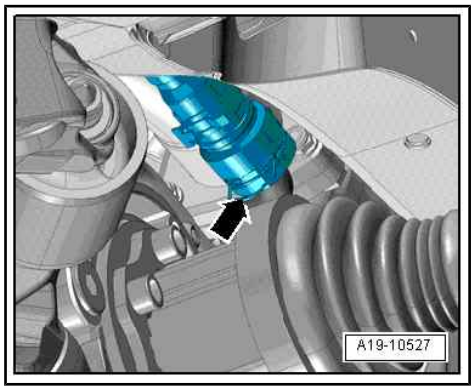


Note

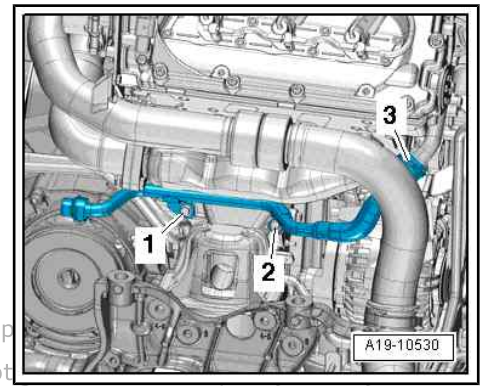
For illustration purposes, the installation position is shown with the engine removed.

Vehicles with plug-in connector on longitudinal member:

– Lift retaining clip -arrow- and detach coolant hose from coolant pipe (bottom right).



All vehicles (continued):



– Remove bolts -1- and -2-.
– Lift retaining clip and detach coolant hose -3- from coolant pipe (front).
– Detach coolant pipe (bottom right).

Installing

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

• Tightening torque ⇒ page 374

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Note

♦ *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*

♦ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

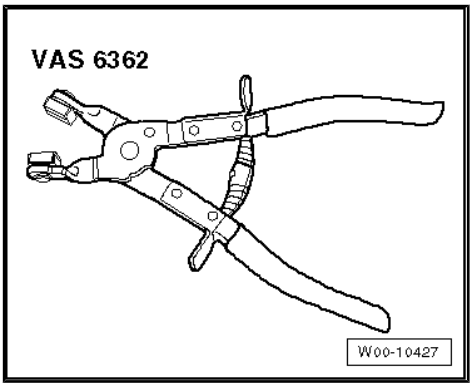
♦ *The screw sections of used screw-type clips must be sprayed with rust remover prior to fitting so that the air hoses can be attached securely to the hose connections.*

– Connect coolant hose with plug-in connector to coolant pipe ⇒ page 404 .
– Install air cleaner housing and exhaust gas pressure sensor 1 - G450- ⇒ page 479 .
– Bolt drive shaft (right-side) to gearbox flange shaft ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .
– Install heat shield for drive shaft ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Exploded view - drive shaft .
– Fit front wheel ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres; Tightening torque for wheel bolts .
– Fill up with coolant ⇒ page 357 .

3.2.11 Removing and installing coolant pipe (rear right) - engine codes CAMA, CAMB, CAPA

Special tools and workshop equipment required

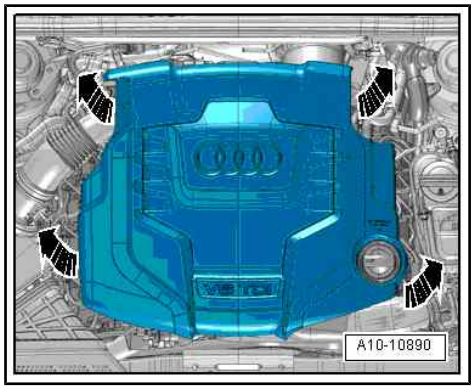
♦ Hose clip pliers - VAS 6362-



Removing

– Drain coolant ⇒ page 353 .

– Remove engine cover panel -arrows-.

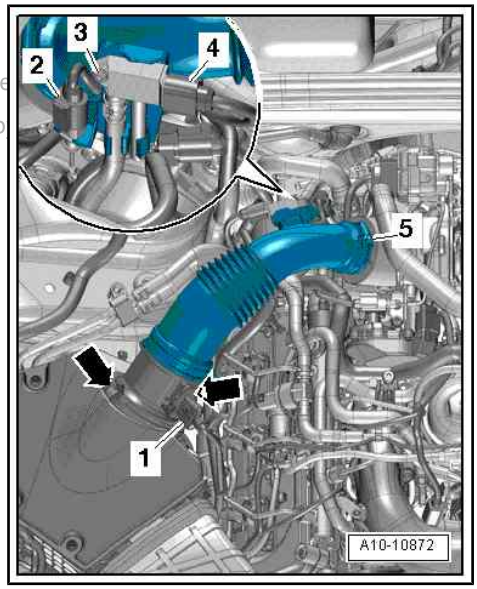


– Unplug electrical connector -1- at air mass meter - G70- .

– Unscrew bolt -3- and move clear exhaust gas pressure sensor 1 - G450- -item 4- at air pipe.

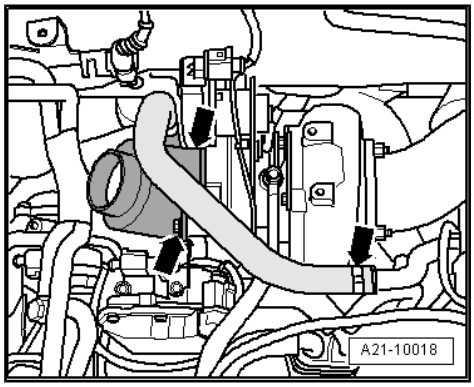
– Move electrical connector -2- clear at air pipe.

– Remove air hose and air mass meter - G70- . To do so, release hose clip -5- and clamps -arrows-.

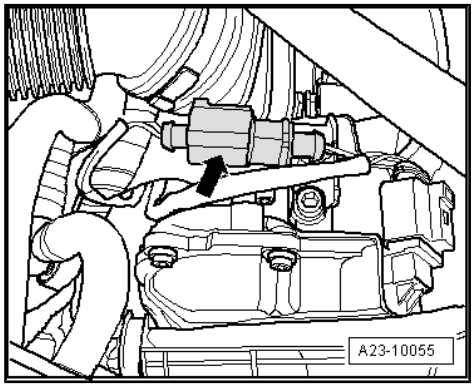


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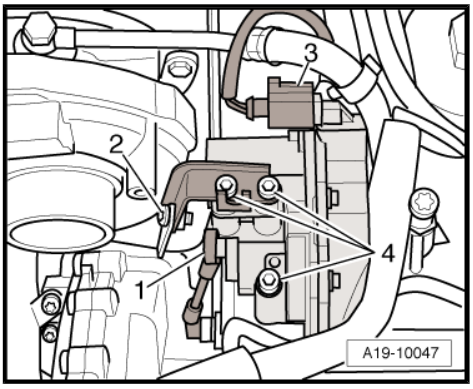
– Unbolt air intake connection -left arrows- and move it aside with air intake hose connected -right arrow-.



– If fitted, take electrical connector -arrow- for exhaust gas temperature sender 1 - G235- out of bracket.



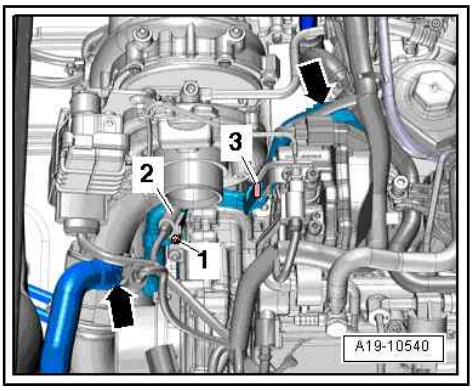
– Unplug electrical connector -3- at intake manifold flap motor - V157- .
– Remove bolts -2- and -4- and move intake manifold flap motor - V157- clear to the side (with connecting rod installed).



Note

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

– Unscrew bolt -1- and unplug electrical connector -2- for coolant temperature sender - G62- .
– Detach coolant pipe (rear right) from coolant hoses -arrows-.



Note

Disregard -item 3-.

Installing

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

- Tightening torque
⇒ “3.1 Exploded view - coolant pipes”, page 374

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.*

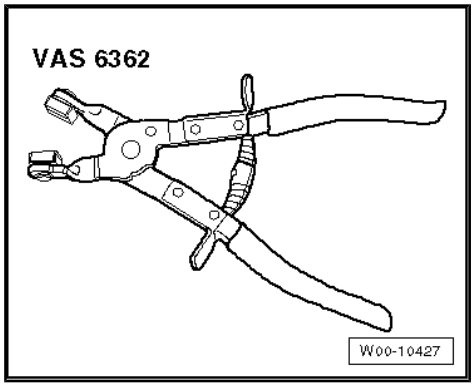
– Install intake manifold flap motor - V157- ⇒ page 482 .
– Install air intake connection ⇒ page 420 .
– Install exhaust gas pressure sensor 1 - G450- ⇒ page 546 .
– Fill up with coolant ⇒ page 357 .

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3.2.12 Removing and installing coolant pipe (rear right) - engine codes CCLA, CCWA, CCWB, CGKA, CGKB

Special tools and workshop equipment required

♦ Hose clip pliers - VAS 6362-



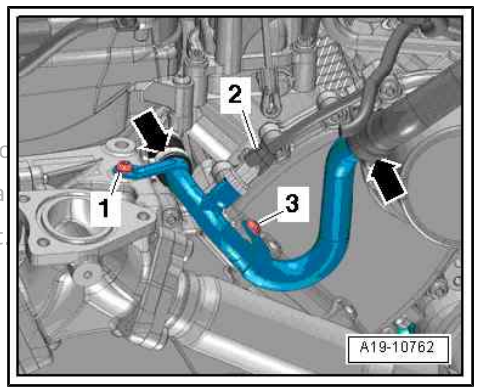
Removing

– Drain coolant ⇒ page 353 .

– Remove turbocharger ⇒ page 422 .

– Remove bolts -1- and -2- and unplug electrical connector -3- for coolant temperature sender - G62- .

– Open hose clips -arrows- and detach coolant pipe (rear right) from coolant hoses.



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Note

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

Installing

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

- Tightening torque
  ⇒ “3.1 Exploded view - coolant pipes”, page 374

Note

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

– Install turbocharger ⇒ page 422 .

– Fill up with coolant ⇒ page 357 .

4 Radiator/radiator fans

⇒ “4.1 Exploded view - radiator cowl and radiator fans”, page 403

⇒ “4.2 Removing and installing radiator”, page 405

⇒ “4.3 Removing and installing radiator cowl”, page 411

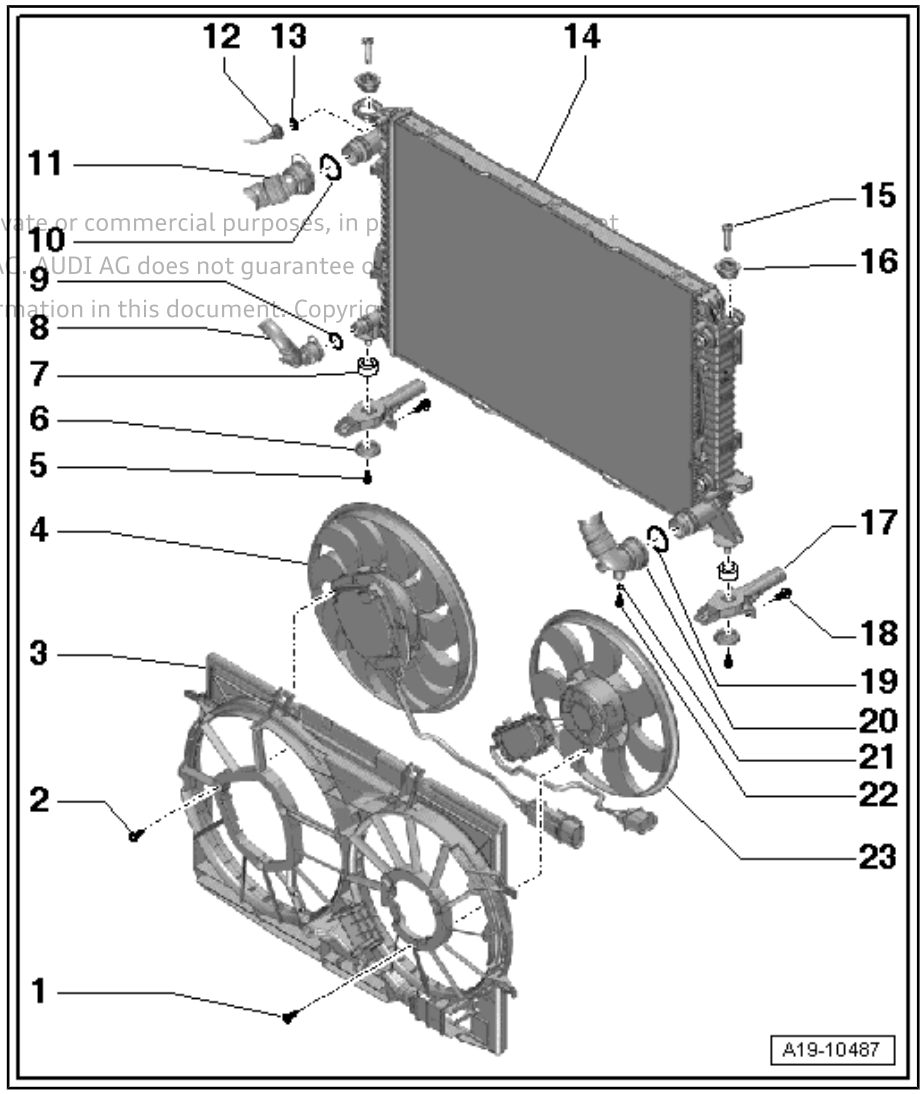
⇒ “4.4 Removing and installing radiator fan control unit”, page 417

⇒ “4.5 Removing and installing radiator fan”, page 418

4.1 Exploded view - radiator cowl and radiator fans

Note

The diagram shows the components fitted with radiator fans running with 1000 W.



1 - Bolt
- ❑ 5 Nm

2 - Bolt
- ❑ 5 Nm

3 - Radiator cowl
- ❑ Removing and installing: on A4, together with radiator ⇒ page 405 , A5 ⇒ page 411

4 - Radiator fan - V7-
- ❑ With separate radiator fan control unit - J293- (depending on equipment version)
- ❑ Removing and installing radiator fan - V7- ⇒ page 418
- ❑ Removing and installing radiator fan control unit - J293- (separate unit) ⇒ page 417

5 - Bolt
- ❑ 3.5 Nm

6 - Washer

7 - Rubber bush
- ❑ For radiator

8 - Coolant hose
- ❑ Lift retaining clip to detach
- ❑ Connecting to radiator ⇒ page 404

9 - O-ring
- ❑ Renew

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10 - O-ring
- ❑ Renew

11 - Coolant hose
- ❑ Lift retaining clip to detach
- ❑ Connecting to radiator ⇒ page 404

12 - Coolant hose
- ❑ To coolant expansion tank

13 - O-ring
- ❑ Renew

14 - Radiator
- ❑ Removing and installing ⇒ page 405
- ❑ If renewed, change coolant in entire system

15 - Retaining pin
- ❑ Use screwdriver to release and pull off

16 - Rubber buffer

17 - Radiator bracket

18 - Bolt

19 - O-ring
- ❑ Renew

20 - Coolant hose
- ❑ Lift retaining clip to detach
- ❑ Connecting to radiator ⇒ page 404

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21 - O-ring
- ❑ Renew

22 - Drain plug

23 - Radiator fan 2 - V177-
- ❑ Not fitted if fan runs with 400 W
- ❑ With integrated radiator fan control unit - J293- (depending on equipment)
- ❑ Removing and installing ⇒ page 418

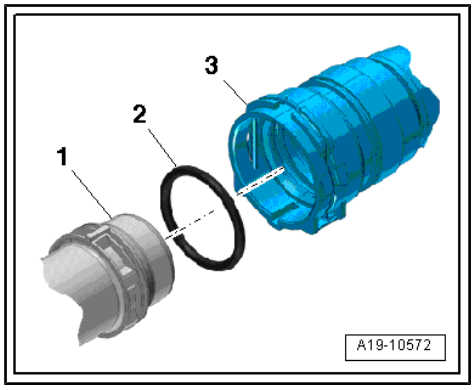
Connecting coolant hose with plug-in connector

– Remove old O-ring -2- from coolant hose -3-.

– Lightly lubricate new O-ring with coolant and fit O-ring in coolant hose.

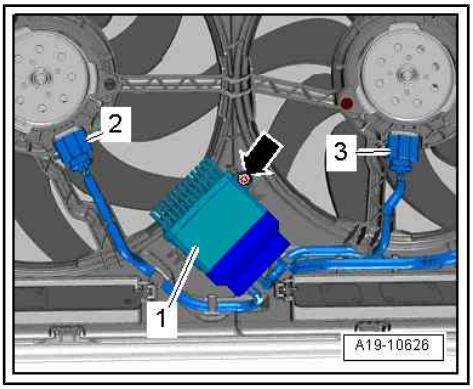
– Press coolant hose onto connection -1- until it engages audibly.

– Press coolant hose in again and then pull to check that plug-in connector is correctly engaged.



Radiator fan control unit - tightening torque

– Tighten bolt -arrow- to 4.5 Nm.



4.2 Removing and installing radiator

WARNING

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

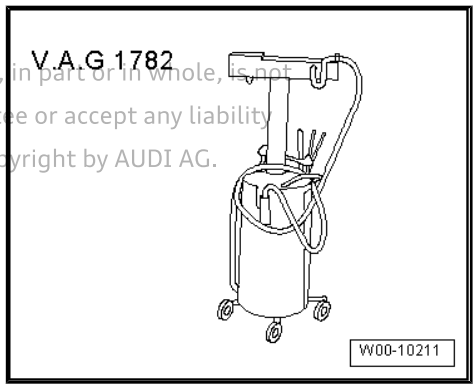
- ***Unplug electrical connectors before working in vicinity of radiator cowl.***

Note

- *Radiator and radiator cowl can only be removed and installed together as one unit.*
- *On more recent versions it is no longer possible to remove the condenser from the radiator with the refrigerant lines attached. This is described below under "version 2".*

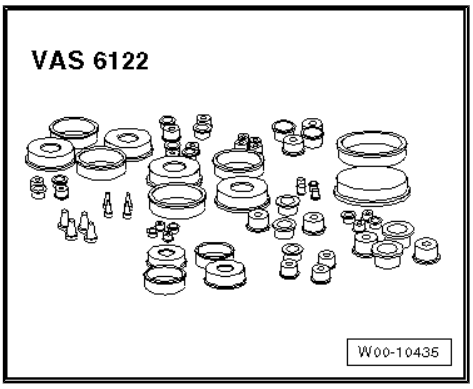
Special tools and workshop equipment required

- Used oil collection and extraction unit - V.A.G 1782- for vehicles with dual clutch gearbox 0B5

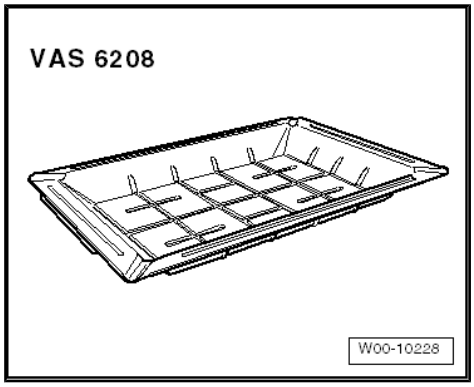


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- Engine bung set - VAS 6122- for vehicles with dual clutch gearbox 0B5

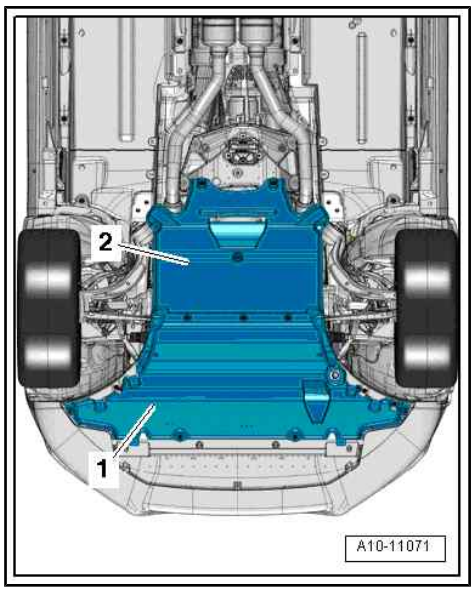


♦ Drip tray for workshop hoist - VAS 6208-



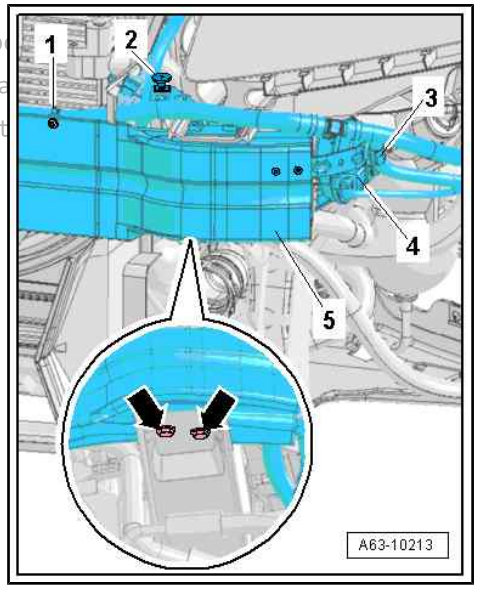
Removing

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



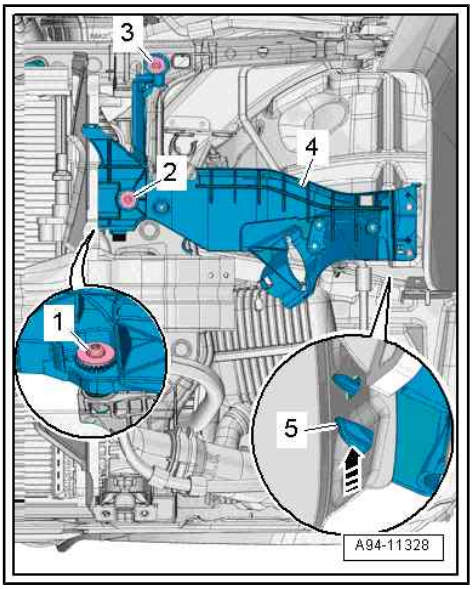
– Remove impact bar -5- ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing impact bar .

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Audi A4:

– Remove brackets for mountings for headlight housings ⇒ General body repairs, exterior; Rep. gr. 50 ; Lock carrier .

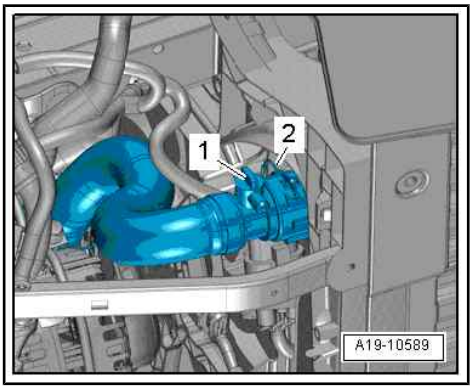


All vehicles (continued):

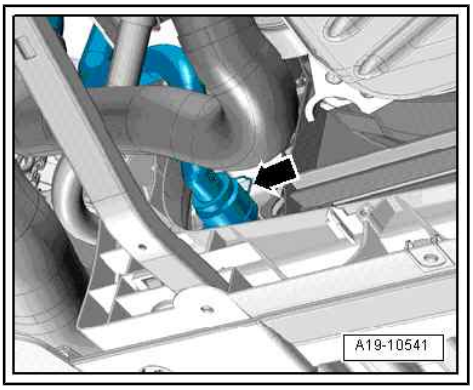
– Place drip tray for workshop hoist - VAS 6208- beneath engine.

– Remove drain plug -1- and drain off coolant.

– Lift retaining clip -2- and disconnect coolant hose from radiator.



– Detach connection from radiator (lift retaining clip -arrow-).



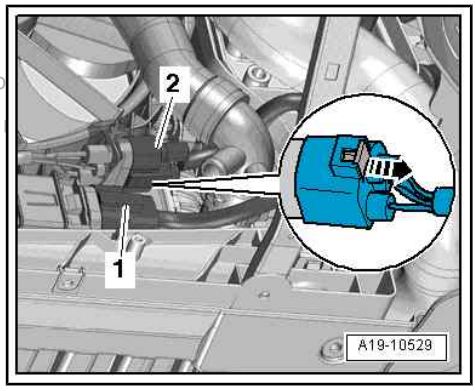
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WARNING

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

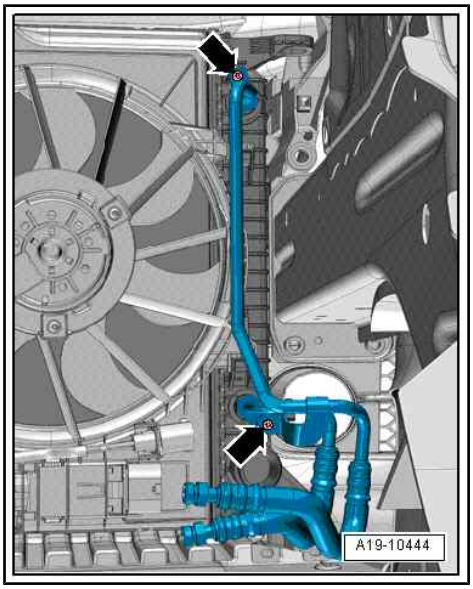
- ***Unplug electrical connectors before working in vicinity of radiator cowl.***

– Unplug electrical connectors -1- and -2- for radiator fan (push retainer to the rear -arrow- and press down release catch).



Vehicles with 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.

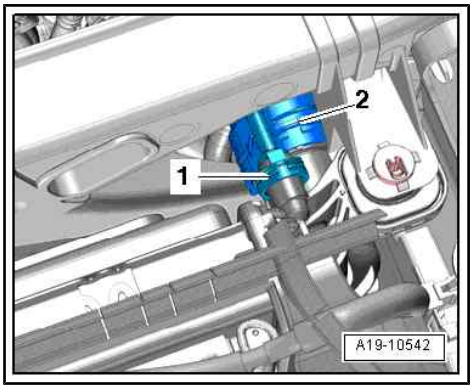
Note

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

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

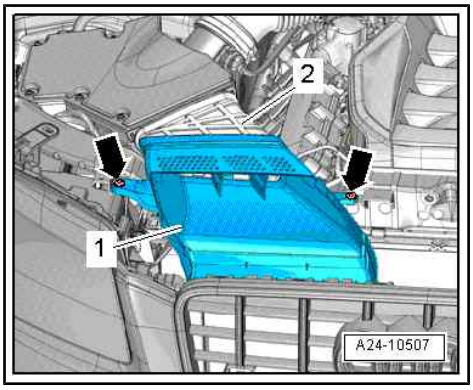
All vehicles (continued):

– 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.

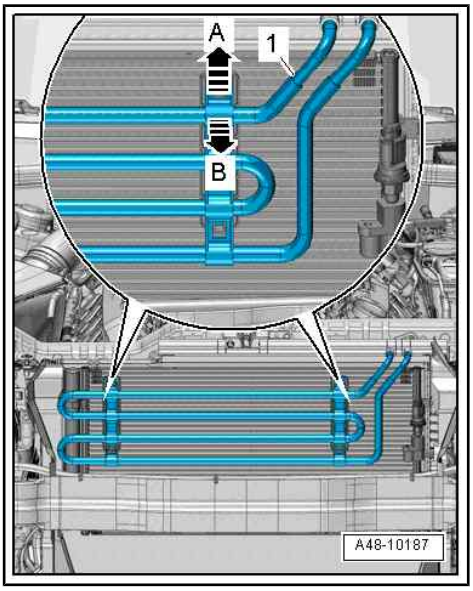


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Vehicles with hydraulic power steering:

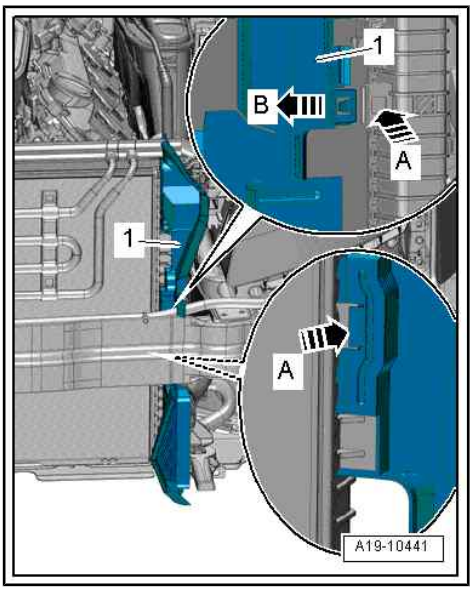
– If fitted, release retaining clips -arrow A- and swivel power steering cooling pipe -1- to front -arrow B-.

– Lift power steering cooling pipe away from condenser and place onto engine.

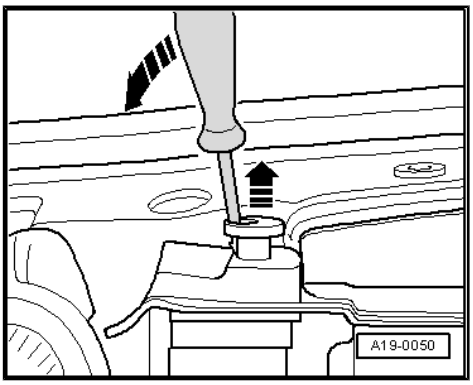


All vehicles (continued):

– Release catches -arrows A- and detach air duct -1- on left and right -arrow B-.

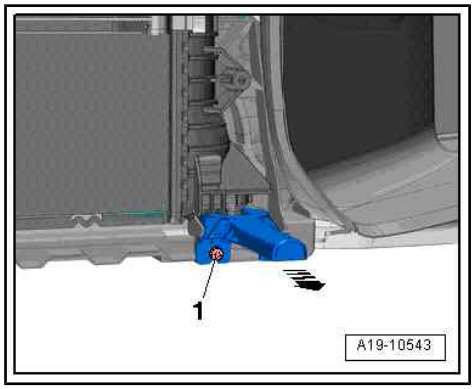


– Release retaining pins for radiator on both sides and pull out upwards -arrows-.



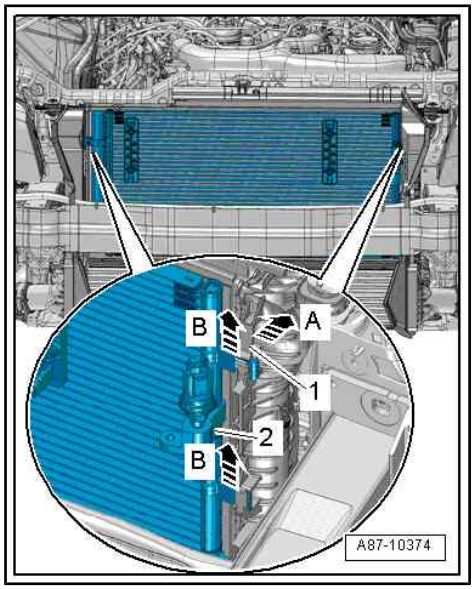
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– Remove bolts -1- on both sides and detach radiator bracket with radiator from lock carrier -arrow-.
– Slightly lower radiator.



Vehicles with refrigerant lines (version 1):

– Have a second mechanic release retaining clips -1- in direction of -arrow A- and lift condenser -2- out of mountings on radiator -arrows B-.
– Pivot condenser forwards with refrigerant lines attached.



Caution

Risk of damage to condenser, refrigerant lines and refrigerant hoses.

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

Note

On more recent versions it is no longer possible to remove the condenser from the radiator with the refrigerant lines attached. This is described below under "version 2".

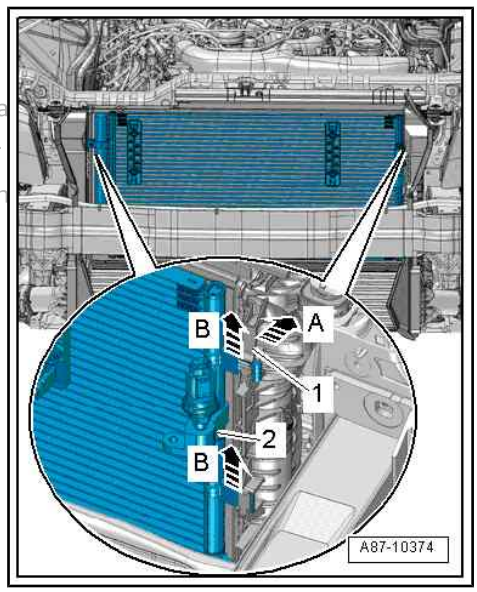
Vehicles with refrigerant lines (version 2):

– Remove condenser ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit; Removing and installing condenser .

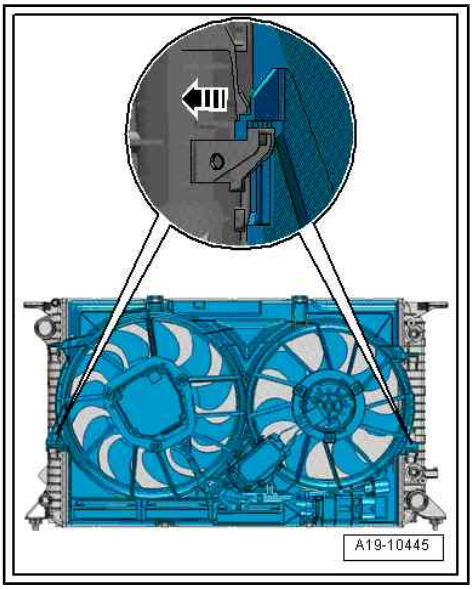
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All vehicles (continued):

– Detach radiator.



– Press locking tabs on left and right sides of radiator cowl together -arrow- and lift radiator cowl off radiator.



Installing

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

Note

If there are slight impressions on the fins, refer to ⇒ page 11 .

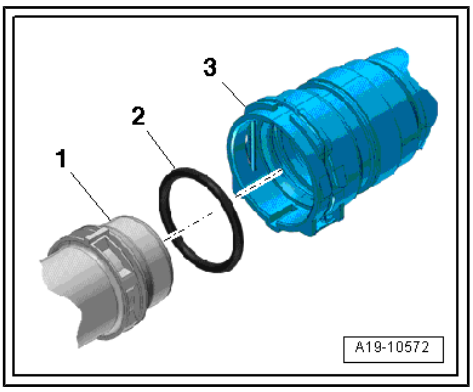
Tightening torques

♦ ⇒ "4.1 Exploded view - radiator cowl and radiator fans", page 403

– Attach air duct to intermediate flange for air cleaner housing ⇒ page 479 .

– Vehicles with dual clutch gearbox 0B5: Secure ATF lines ⇒ Rep. gr. 34 ; ATF circuit; Removing and installing ATF lines .

– Connect coolant hose with plug-in connector ⇒ page 404 .



– 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 .

– Fill up with coolant ⇒ page 361 .

Note

The coolant in the entire system must be changed if the radiator is renewed.

– Vehicles with dual clutch gearbox 0B5: Check ATF level ⇒ Rep. gr. 34 ; ATF; Checking ATF level.

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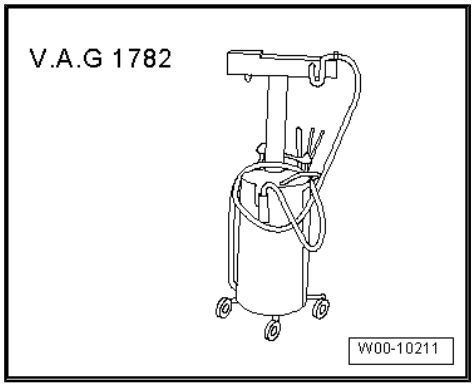
4.3 Removing and installing radiator cowl

Note

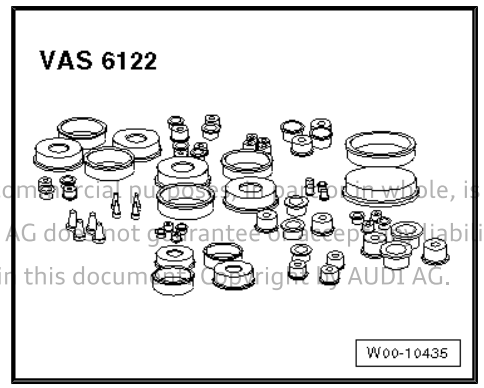
The radiator cowl can be removed separately on the Audi A5. On the Audi A4, the radiator cowl is removed together with the radiator ⇒ page 405 .

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/ automatic gearbox 0B6

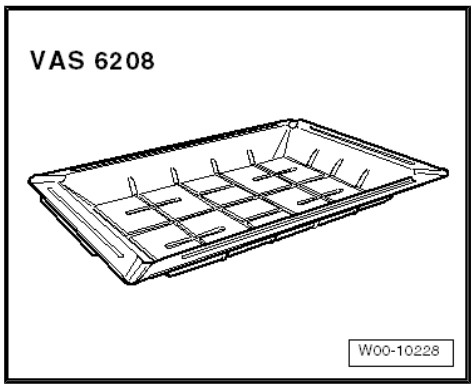


- Engine bung set - VAS 6122- for vehicles with multitronic gearbox 0AW/dual clutch gearbox 0B5/automatic gearbox 0B6



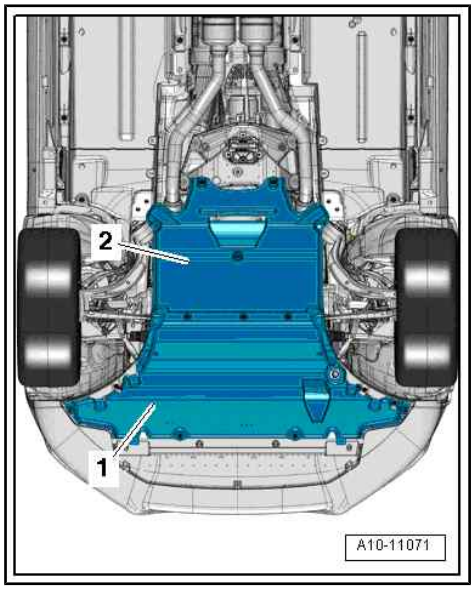
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- Drip tray for workshop hoist - VAS 6208-

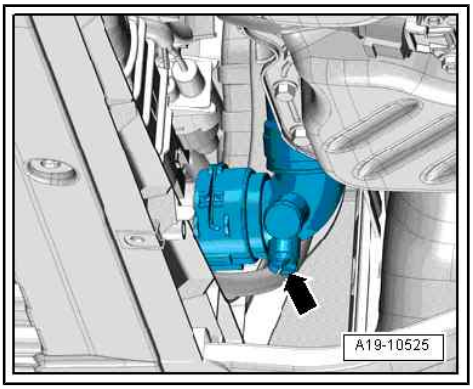


Removing

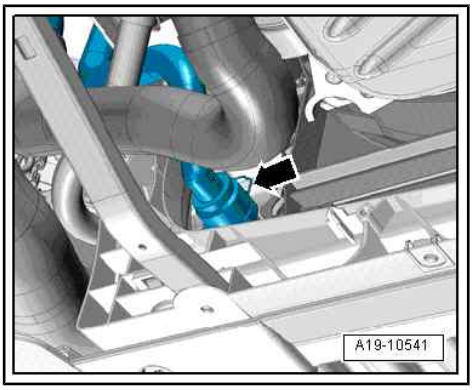
– Remove front noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .



– Place drip tray for workshop hoist - VAS 6208- beneath engine.
– Remove drain plug -arrow- at connection and drain off coolant.



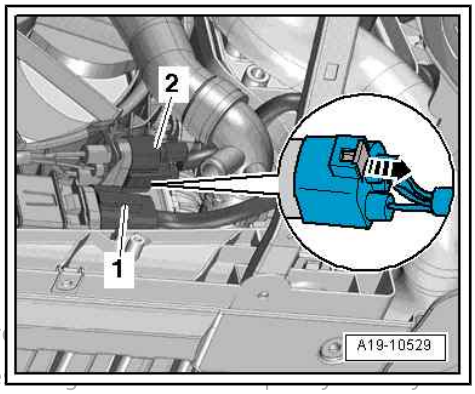
– Detach connection from radiator (lift retaining clip -arrow-).



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).

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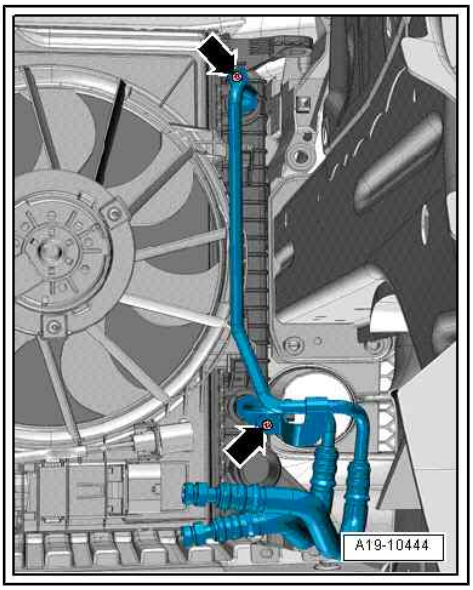
Vehicles with multitronic gearbox 0AW/dual clutch gearbox 0B5/ automatic gearbox 0B6:

– 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.



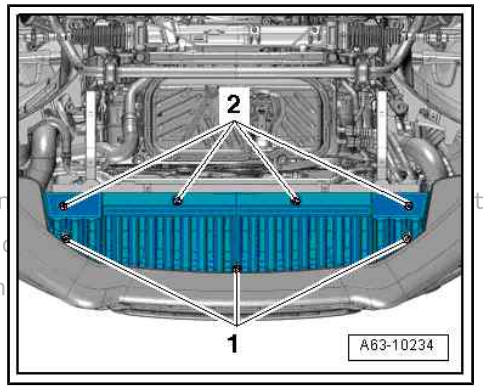
Note

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

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

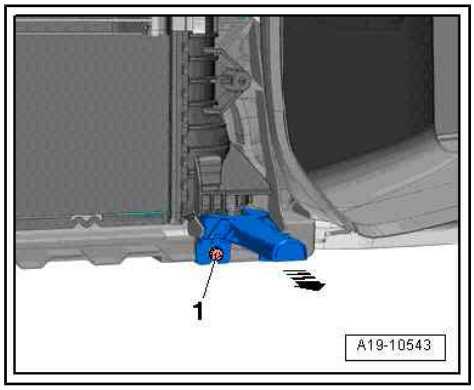
All vehicles (continued):

– Loosen bolts -1- and -2- and detach end plate at bumper cover towards rear.



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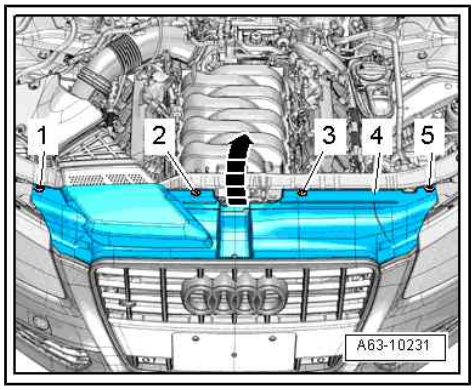
– Remove bolts -1- on both sides.



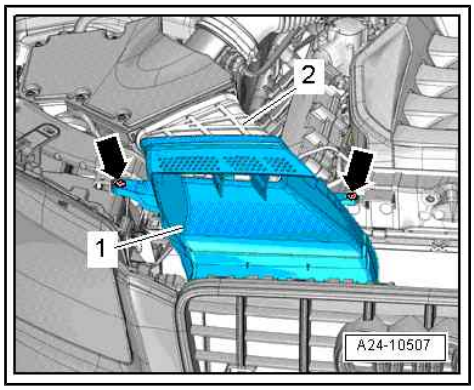
Note

Disregard -arrow-.

– Remove bolts -1, 2, 3, 5-.
– Lift cover -4- above lock carrier and detach from radiator grille -arrow-.

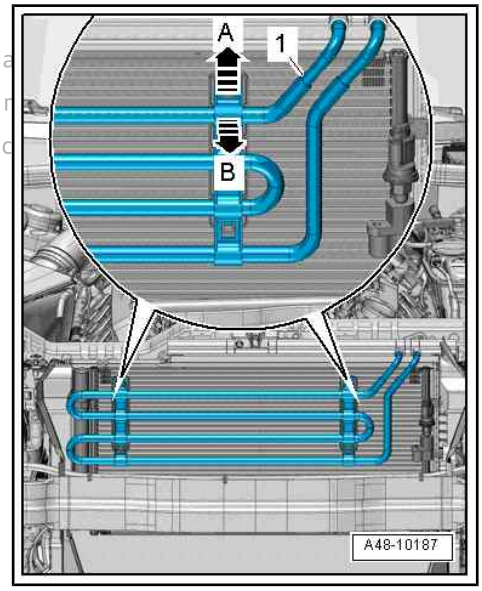


– Remove bolts -arrows-.
– Detach air duct -1- from intermediate flange -2- for air cleaner housing.

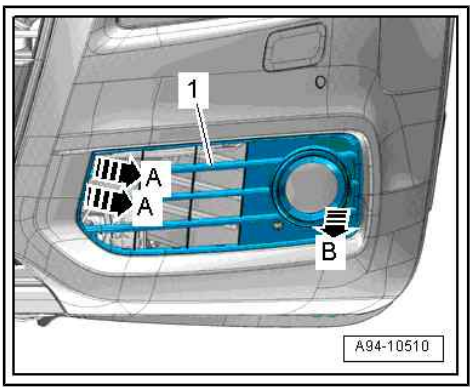


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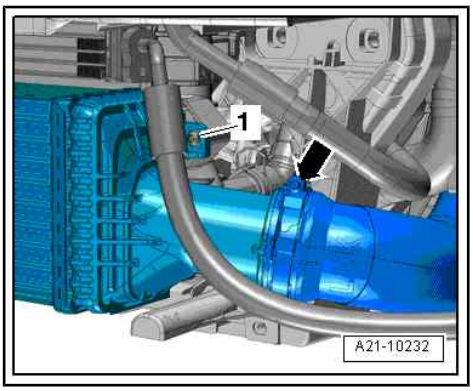
– If fitted, release retaining clips -arrow A- and swivel power steering cooling pipe -1- to front -arrow B-.



– Release retaining clips -arrows A- and detach air intake grille -1- on left and right from bottom section of bumper cover -arrow B-.



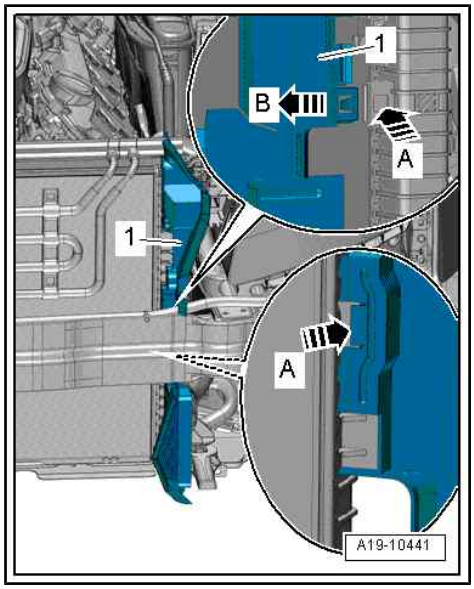
– Release hose clip -arrow- and detach air hose from charge air cooler.



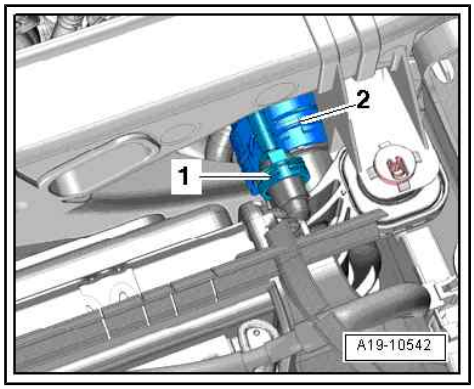
Note

Disregard -item 1-.

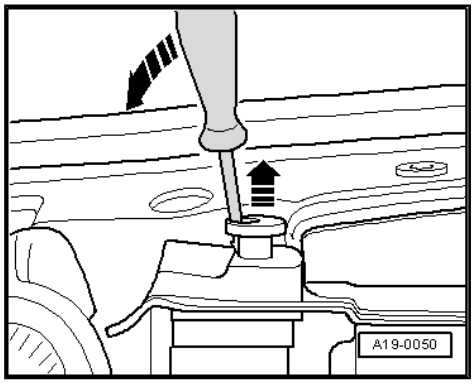
– Release catches -arrows A- and swivel air duct -1- on left and right to centre of vehicle -arrow B-.



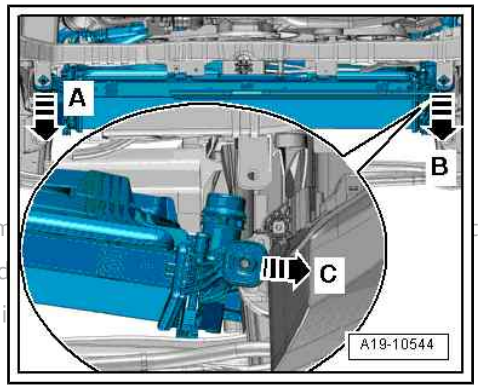
– Lift retaining clips -1- and -2- and detach connection from radiator.



– Release retaining pins for radiator on both sides and pull out upwards -arrows-.



– Move left side of radiator to front -arrow B-, then press to left -arrow C- and then move forward on right side -arrow A-.

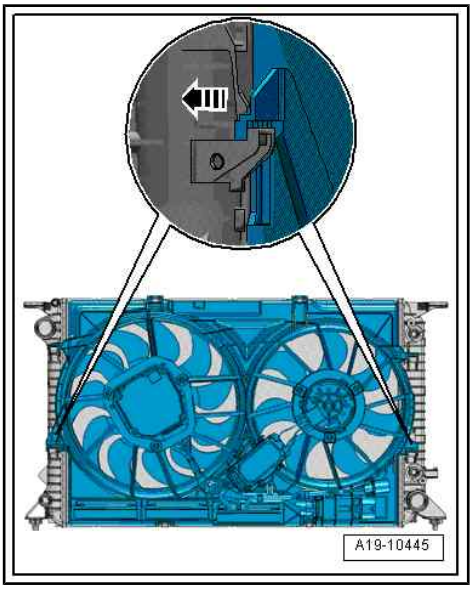


Note

If it is not possible to push radiator in direction of arrow -C-, remove bracket (left-side) for mounting for headlight housing ⇒ General body repairs, exterior; Rep. gr. 50 ; Lock carrier .

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– 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 torque
  ⇒ "4.1 Exploded view - radiator cowl and radiator fans", page 403

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.*

– Vehicles with multitronic gearbox 0AW/dual clutch gearbox 0B5/automatic gearbox 0B6: Secure ATF lines ⇒ Rep. gr. 34 ; ATF circuit; Removing and installing ATF lines , or ⇒ Rep. gr. 37 ; ATF circuit; Removing and installing ATF lines .

– Attach air duct to intermediate flange for air cleaner housing ⇒ page 479 .

– Install lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .

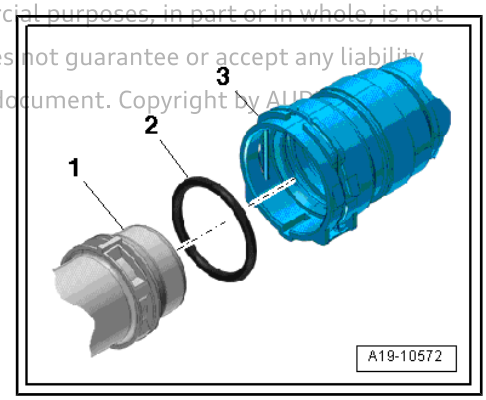
– Install closure plate at bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .

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– Attach connection with plug-in connector ⇒ page 404 .

– Fill up with coolant ⇒ page 357 .

– Vehicles with multitronic gearbox 0AW/dual clutch gearbox 0B5/automatic gearbox 0B6: Check ATF level ⇒ Rep. gr. 34 ; ATF; Checking ATF level , or ⇒ Rep. gr. 37 ; ATF; Checking ATF level .



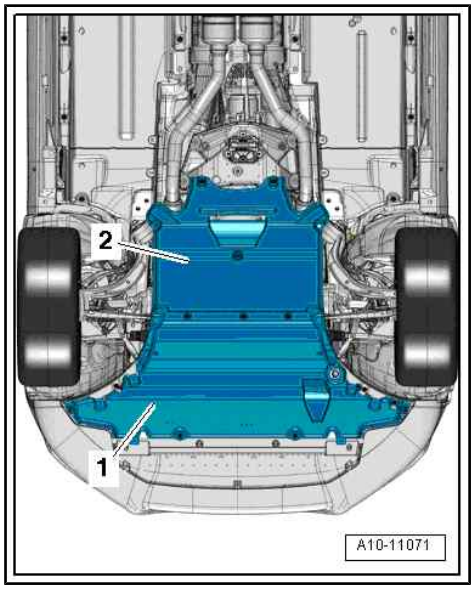
4.4 Removing and installing radiator fan control unit

Note

The following procedure refers to the radiator fan with separate radiator fan control unit.

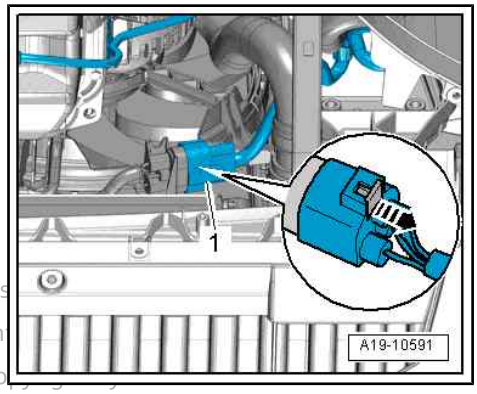
Removing

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



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

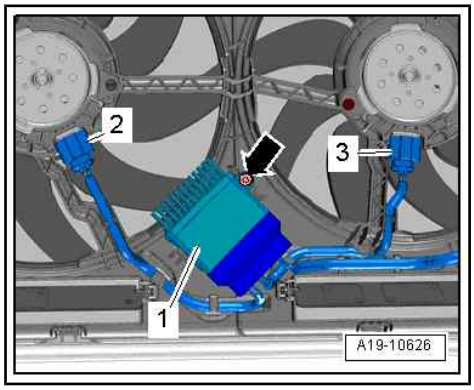
– Move electrical wiring harness going to radiator fan control unit clear.



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– Unplug electrical connectors -2- and -3-.

– Unscrew bolt -arrow- and remove radiator fan control unit -1-.



Installing

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

- Tightening torque
⇒ Fig. ""Radiator fan control unit - tightening torque"" , page 405

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

4.5 Removing and installing radiator fan

Removing

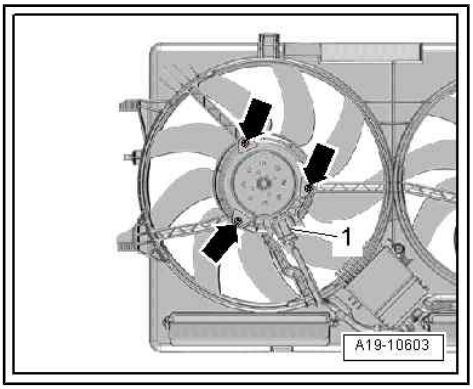
Note

Fit all cable ties in the original positions when installing.

– A4: Remove radiator with radiator cowl ⇒ page 405 .

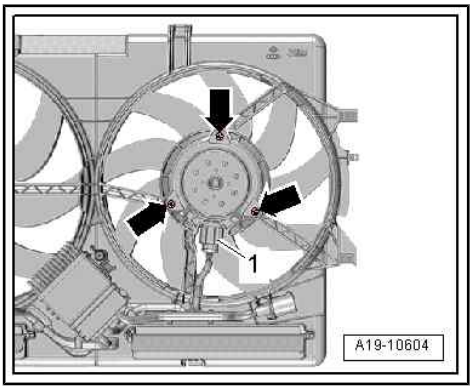
– A5: Remove radiator cowl ⇒ page 411 .

– Unplug electrical connector -1-.
– Remove bolts -arrows- and detach radiator fan - V7- (left-side).



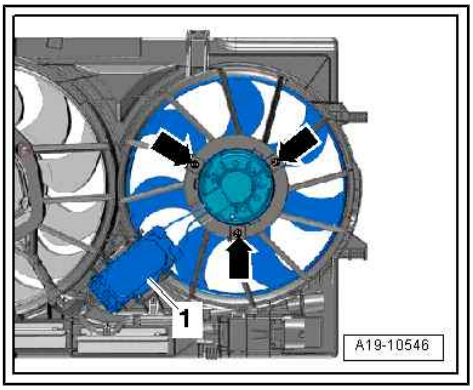
Radiator fan with separate radiator fan control unit

– Unplug electrical connector -1-.
– Remove bolts -arrows- and detach radiator fan 2 - V177- (right-side).



Radiator fan with radiator fan control unit

– Remove bolts -arrows- on radiator fan 2 - V177- (right-side).
– Move electrical wiring harness clear.
– Unclip radiator fan control unit -1- from radiator cowl and detach radiator fan with control unit.



Installing

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

- Tightening torque ⇒ “4.1 Exploded view - radiator cowl and radiator fans”, page 403

– A4: Install radiator with radiator cowl ⇒ page 405 .
– A5: Install radiator cowl ⇒ page 411 .

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21 – Turbocharging/supercharging

1 Turbocharger

⇒ “1.1 Exploded view - turbocharger”, page 420

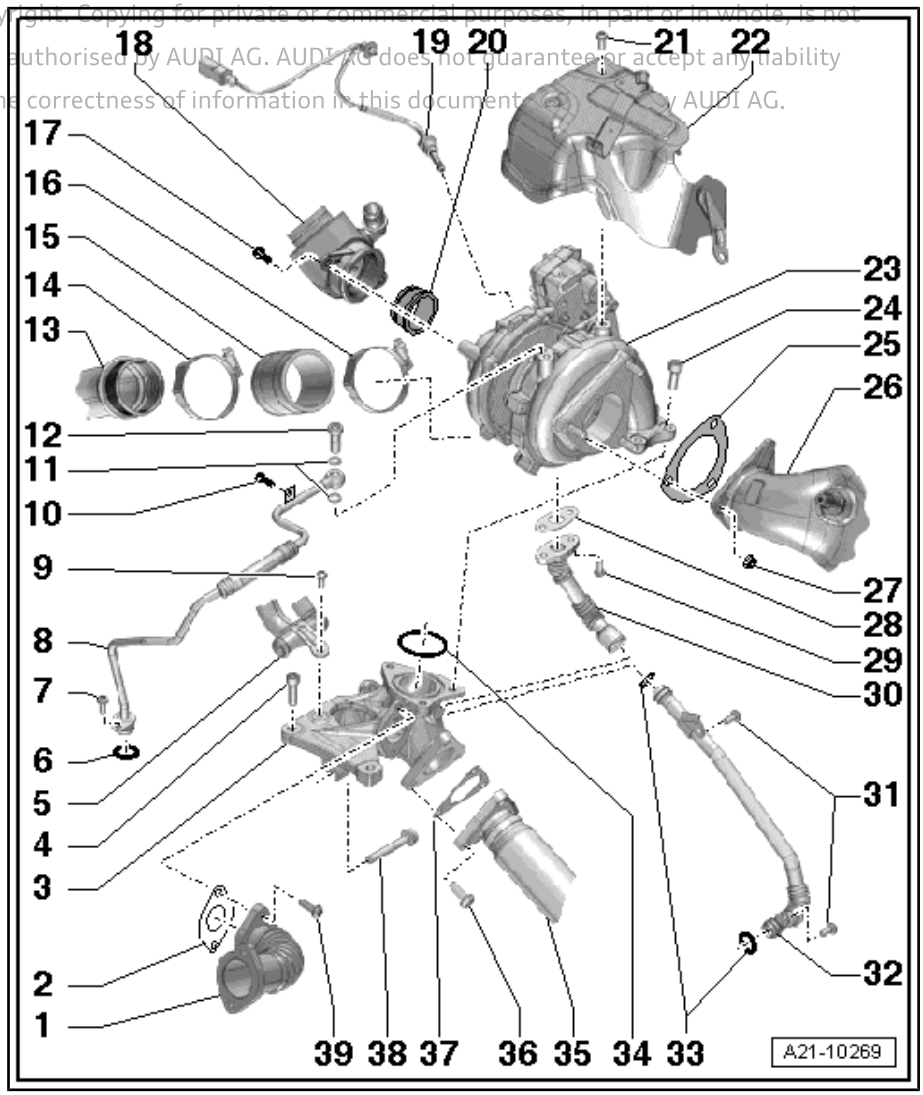
⇒ “1.2 Removing and installing turbocharger”, page 422

⇒ “1.3 Removing and installing turbocharger 1 control unit J724 ”, page 428

⇒ “1.4 Removing and installing intermediate flange”, page 440

1.1 Exploded view - turbocharger

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1 - Connecting pipe
- ❑ To change-over flap for exhaust gas recirculation cooler

2 - Gasket
- ❑ Renew

3 - Intermediate flange
- ❑ Removing and installing ⇒ page 440

4 - Bolt
- ❑ 25 Nm

5 - Coolant pipe (rear right)
- ❑ Exploded view ⇒ page 374

6 - O-ring
- ❑ Renew

7 - Bolt
- ❑ Tightening torque and sequence ⇒ page 422

8 - Oil supply line
- ❑ From cylinder block

9 - Bolt
- ❑ Depending on version
- ❑ 9 Nm

10 - Bolt
- ❑ Depending on version
- ❑ Tightening torque and sequence ⇒ page 422

11 - Seals
- ❑ Renew

12 - Banjo bolt
- ❑ Tightening torque and sequence ⇒ page 422

13 - Air pipe (right-side)

14 - Hose clip
- ❑ Reinforced
- ❑ 5.5 Nm

15 - Air hose

- From turbocharger to air pipe (right-side)

16 - Hose clip

- Reinforced
- 5.5 Nm

17 - Bolt

- 9 Nm

18 - Connecting piece for air intake hose

- From air mass meter - G70- to turbocharger
- Must be free of oil and grease when installing

19 - Exhaust gas temperature sender 1 - G235-

- Removing and installing ⇒ page 612

20 - Seal

- Renew if damaged

21 - Bolt

- 9 Nm

22 - Heat shield for turbocharger

23 - Turbocharger

- With turbocharger 1 control unit - J724-
- Removing and installing turbocharger ⇒ page 422
- Removing and installing turbocharger 1 control unit - J724- ⇒ page 428

24 - Bolt

- Renew
- Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- 30 Nm + turn 90° further

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25 - Gasket

- Renew

26 - Particulate filter

- Removing and installing: A5 up to vehicle identification no. 8T-8-009 998 ⇒ page 578 ; A4 (all), A5 from vehicle identification no. 8T-8-009 999 onwards ⇒ page 580

27 - Nut

- Tightening torque ⇒ Item 5 (page 562)

28 - Gasket

- Renew

29 - Bolt

- Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- Pre-tighten to 7 Nm.
- 9 Nm

30 - Top section of oil return line

- From turbocharger

31 - Bolts

- 9 Nm

32 - Bottom section of oil return line

- To cylinder block

33 - O-rings

- Renew

34 - Seal

- ❑ Renew

35 - Intermediate pipe

- ❑ Removing and installing: left-side ⇒ page 631 , right-side ⇒ page 633

36 - Bolt

- ❑ Tightening torque ⇒ Item 5 (page 629)

37 - Gasket

- ❑ Renew

38 - Bolt

- ❑ 25 Nm

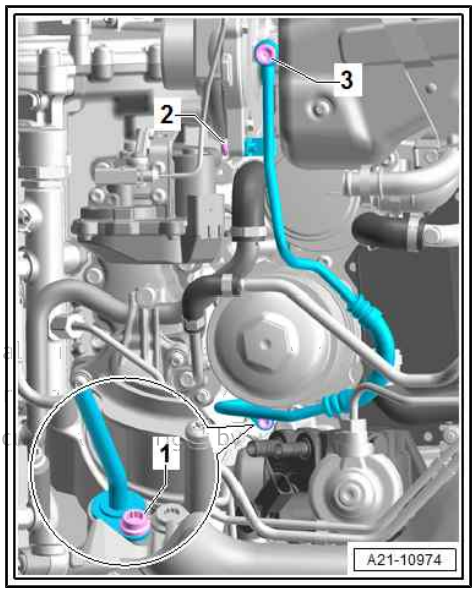
39 - Bolt

- ❑ Tightening torque ⇒ Item 21 (page 619)

Oil supply line - tightening torque and sequence

Note

When tightening bolts -2 and 3-, ensure that the oil supply line and bracket are not subjected to torsional or bending stress.



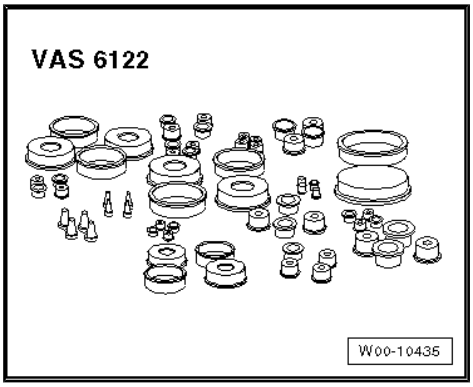
– Fit bolt -1- on mounting plate for engine oil cooler and tighten to 9 Nm.
– Fit bolt -3- on turbocharger.
– Fit bolt -2- for oil supply line bracket and hand-tighten.
– Tighten bolt -3- on turbocharger to 15 Nm.
– Tighten bolt -2- for oil supply line bracket to 9 Nm.

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1.2 Removing and installing turbocharger

Special tools and workshop equipment required

- ♦ Engine bung set - VAS 6122-



Removing

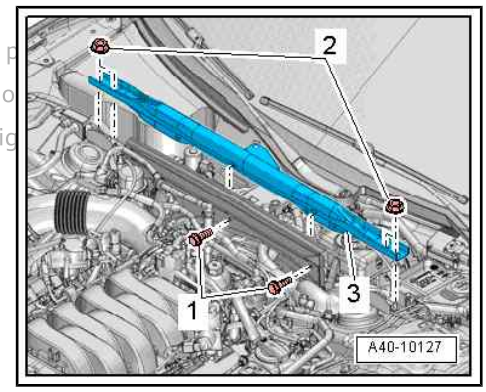
– Observe rules for cleanliness ⇒ page 9 .

Caution

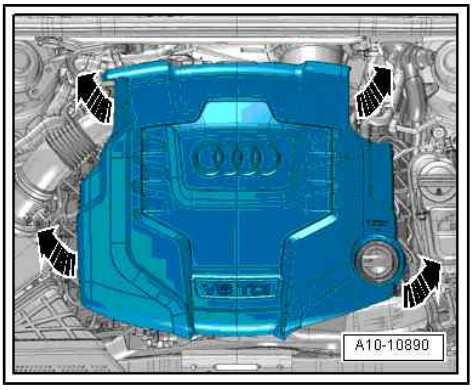
If the turbocharger has suffered mechanical damage (e.g. damaged compressor wheel), it is not sufficient merely to fit a new turbocharger. The following work must be performed in order to avoid further damage:

- ***Check air cleaner housing, air filter element and air hoses for dirt and foreign particles.***
- ***Check the entire charge air system (including the charge air cooler) for foreign matter.***
- ***If foreign matter is found in the charge air system, clean all relevant ducts and hoses and renew charge air cooler if necessary.***

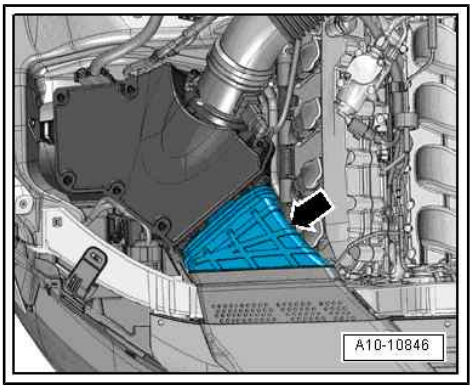
– For vehicles with auxiliary heating: Remove body brace ⇒ Running gear, axles, steering; Rep. gr. 40 ; Suspension strut, upper links; Removing and installing body brace , and ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Exploded view - bulkhead .



– Remove engine cover panel -arrows-.

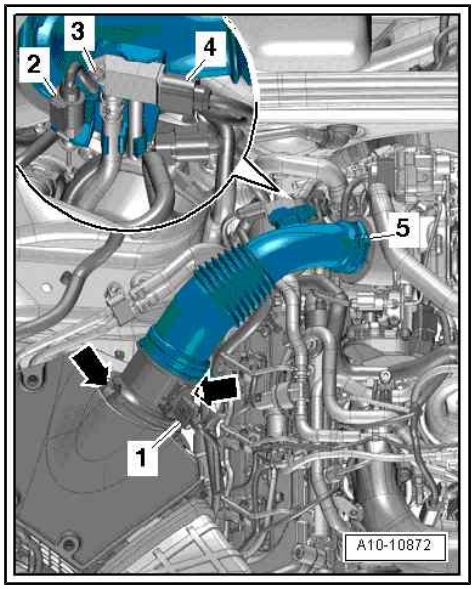


– Remove air duct -arrow-.



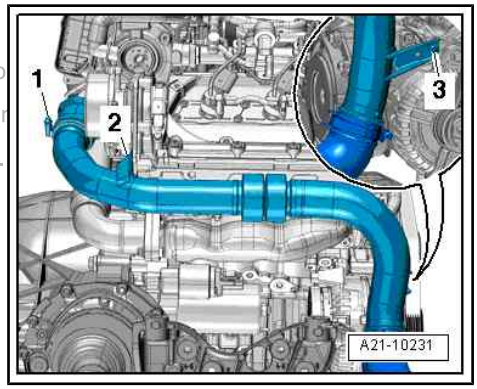
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– Unplug electrical connector -1- at air mass meter - G70- .
– Unscrew bolt -3- and move clear exhaust gas pressure sensor 1 - G450- -item 4- at air pipe.
– Move electrical connector -2- clear at air pipe.
– Remove air hose and air mass meter - G70- . To do so, release hose clip -5- and clamps -arrows-.

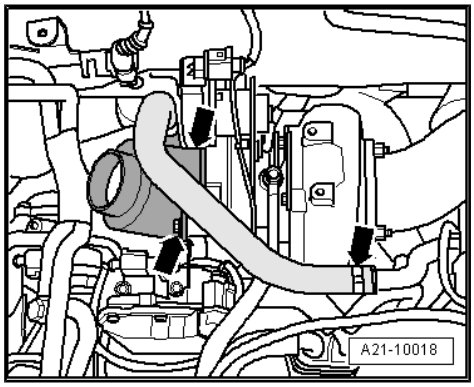


– Remove bolts -2- and -3-.
– Release hose clip -1- and detach air pipe from air hose.

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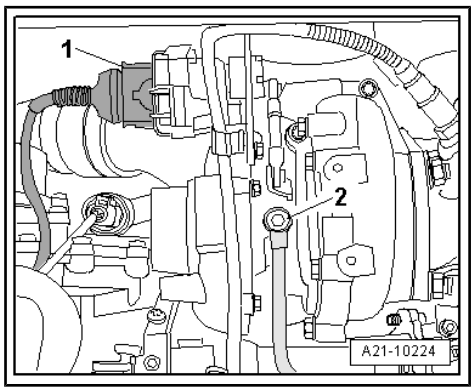


– Unbolt air intake connection -left arrows- and move it aside with air intake hose connected -right arrow-.



Engine codes CAMA, CAMB, CAPA:

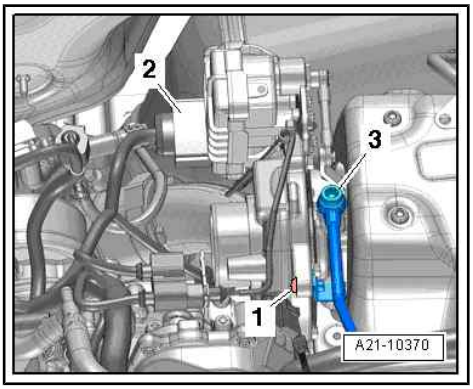
– Unplug electrical connector-1- at turbocharger 1 control motor - V280- .
– Remove banjo bolt -2- for oil supply line at turbocharger.



Engine codes CCLA, CCWA, CCWB, CGKA, CGKB:

– Unplug electrical connector-2- at turbocharger 1 control motor - V280- .

– Remove bolt -1- and banjo bolt -3- for oil supply line at turbocharger.

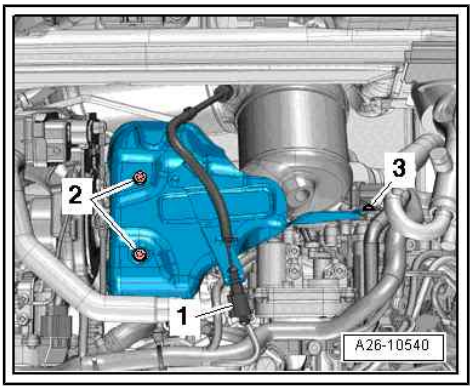


All vehicles (continued):

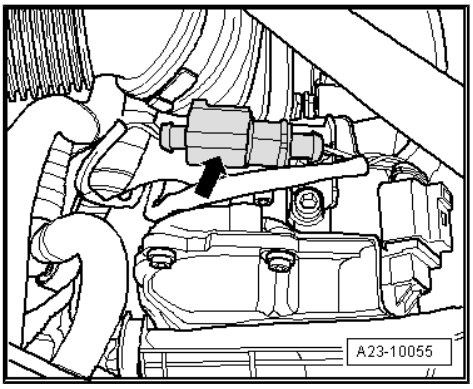
– Unplug electrical connector -1- for exhaust gas temperature sender and move wiring clear.

– Remove bolts -2- and -3-.

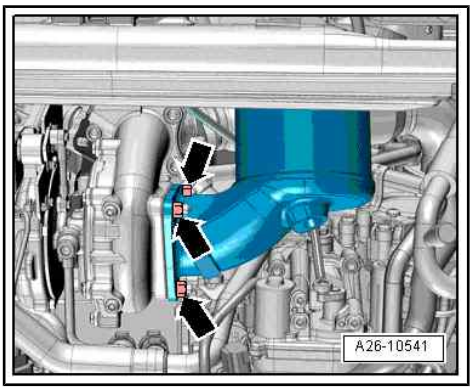
– Detach heat shield for turbocharger.



– If fitted, unplug electrical connector -arrow- for exhaust gas temperature sender 1 - G235- .

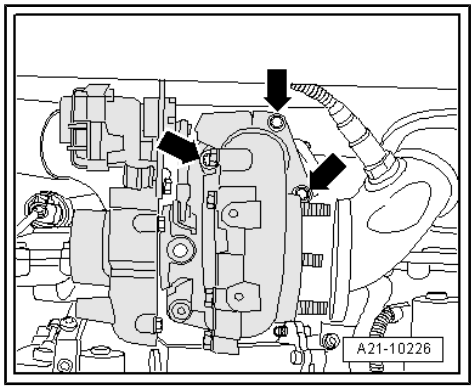


– Remove nuts -arrows- and detach particulate filter from turbocharger.



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– Remove bolts -arrows- for turbocharger.

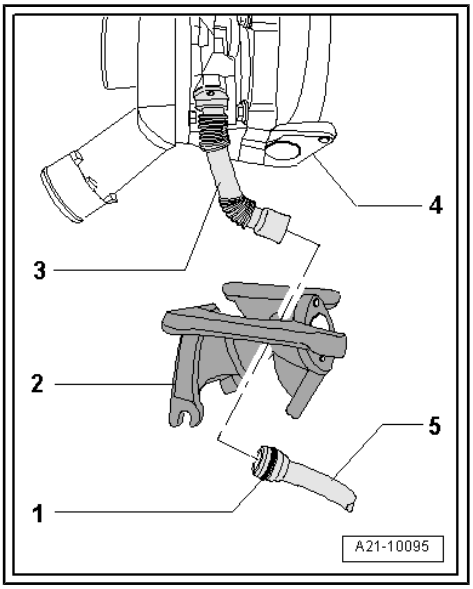


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Caution

Make sure that the two pipes of the oil return line are not damaged/bent.

- ***The top section of the oil return line -3- is secured to the turbocharger and must be detached carefully from the bottom section of the oil return line -5-.***
- ***To avoid bending the two pipes of the oil return line, move the turbocharger -4- slightly backwards and forwards while pulling it off upwards and towards one side.***



1 - O-ring

2 - Intermediate flange

– Remove turbocharger.

– Seal openings on turbocharger and all relevant ducts and hoses of the charge air system with plugs from engine bung set - VAS 6122- .

Note

After removing the turbocharger, do not put it down so it rests on the top section of the oil return line – this could cause damage.

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Installing

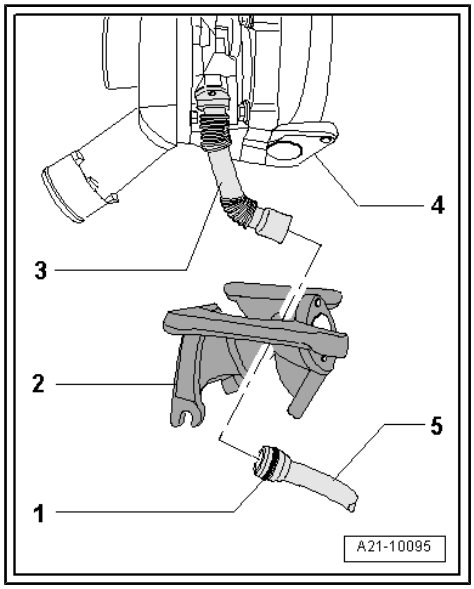
Tightening torques

- ⇒ “1.1 Exploded view - turbocharger”, page 420

Note

- *Renew gaskets, seals and O-rings.*
- *Fit all heat insulation sleeves in the original position when installing.*
- *Fill turbocharger with engine oil at connection for oil supply line.*
- *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *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.*
- *After installing the turbocharger, allow the engine to idle for approx. 1 minute without pressing the accelerator to ensure that the turbocharger is supplied with oil.*

– Fit new O-ring -1- on bottom section of oil return line -5-.
– Lightly lubricate O-ring and internal sealing surface of top section of oil return line -3- with oil.
– When fitting turbocharger -4-, guide top section of oil return line -3- through intermediate flange -2- and towards bottom section of oil return line -5-.

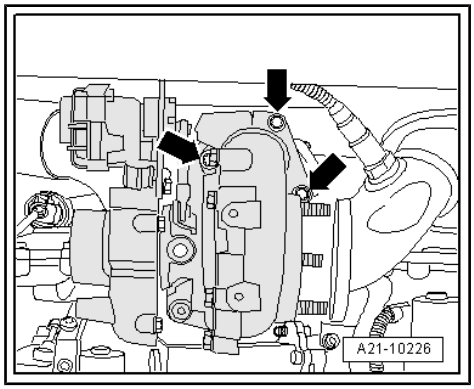


Caution

Make sure O-ring is not damaged.

- *Carefully push top section -3- of oil return line onto bottom section -5- of oil return line.*

– Secure turbocharger -arrows-.



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

– Install particulate filter: A5 up to vehicle identification no. 8T-8-009 998 ⇒ page 578 ; A4 (all), A5 from vehicle identification no. 8T-8-009 999 onwards ⇒ page 580 .
– Install exhaust gas pressure sensor 1 - G450- ⇒ page 546 .
– For vehicles with auxiliary heating: Install plenum chamber partition panel ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Exploded view - bulkhead .

1.3 Removing and installing turbocharger 1 control unit - J724-

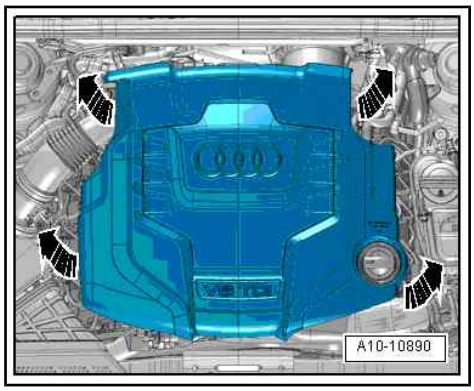
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Special tools and workshop equipment required

- Tester for E-positioner - VAS 6395- or -VAS 6395A-
- Connection lead - VAS 6395 /2-
- Bracket - VAS 6395 /5-

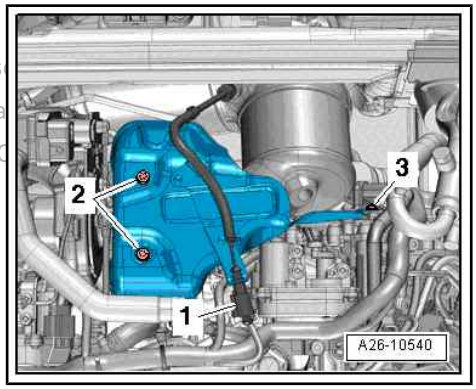
Removing

– Remove engine cover panel -arrows-.



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with respect to the correctness of information in this document.

– Unplug electrical connector -1- for exhaust gas temperature sender and move wiring clear.
– Remove bolts -2- and -3-.

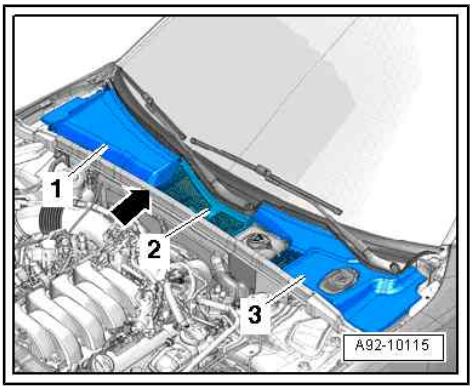


Note

The bottom bolt -3- does not have to be removed completely.

– Detach heat shield for turbocharger.

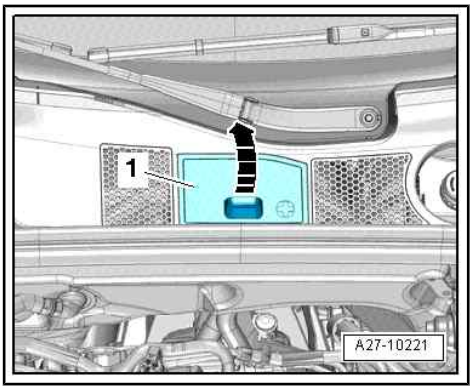
– Vehicles with three-piece plenum chamber cover: Unclip centre part -2- and detach.



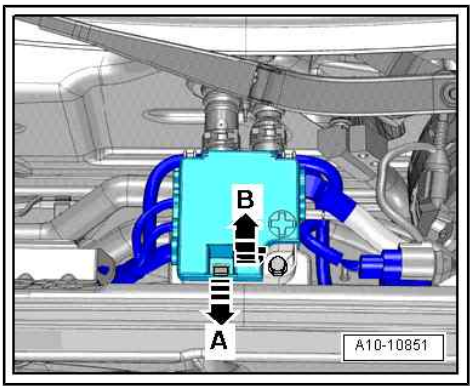
Note

Disregard -items 1, 3- and -arrow-.

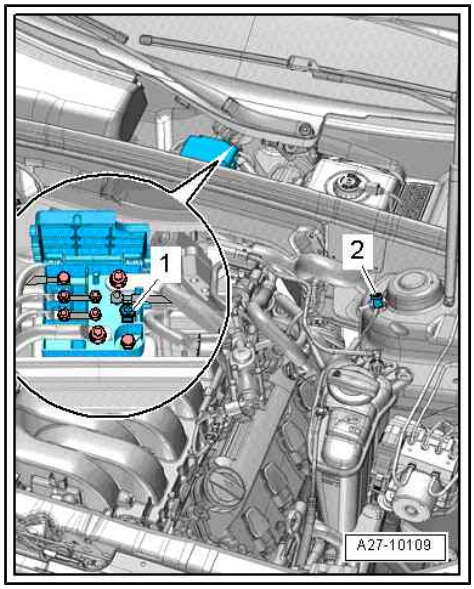
– Vehicles with one-piece plenum chamber cover: Lift cover -1- by its handle.



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



– Connect tester - VAS 6395 /1A- with connection lead - VAS 6395/2- to positive terminal -1- and negative terminal -2-.



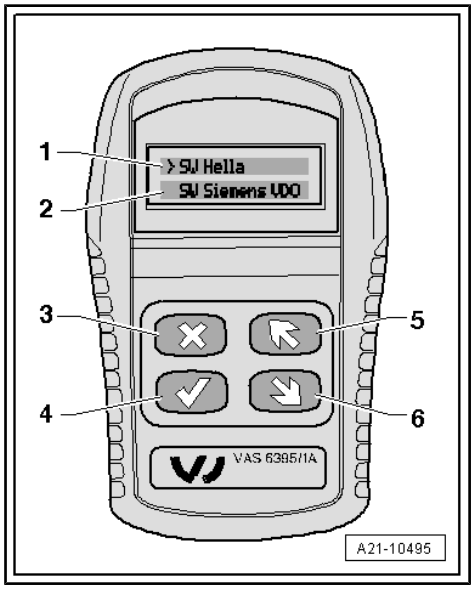
Procedure for tester for E-positioner - VAS 6395 /1A- :

– 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.



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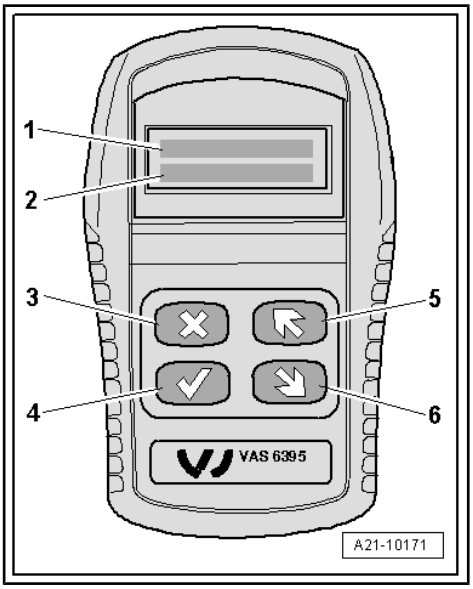
Procedure for tester for E-positioner - VAS 6395 /1- :

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 [>]

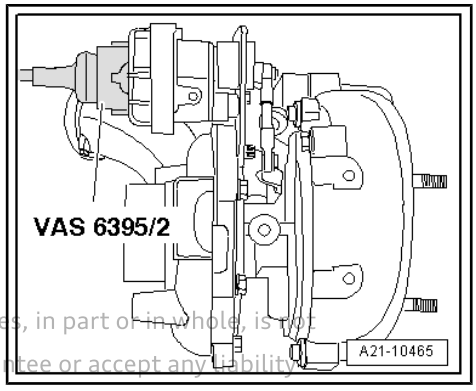
Note

- *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 connection lead - VAS 6395/2- to turbocharger 1 control unit - J724- and to tester - VAS 6395 /1A- .



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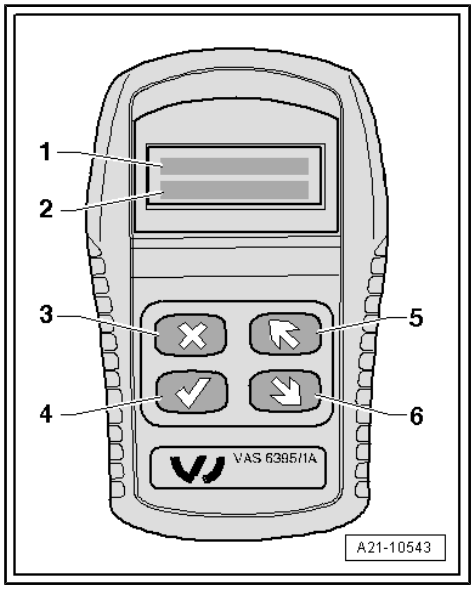
Display on -VAS 6395 /1A- :

1 - > 1. START

2 - 2. NEXT [>]

– To continue, press V button -item 4-.

• The tester - VAS 6395 /1A- runs through the adjustment range of the turbocharger 1 control unit - J724- and checks that the end positions are reached; display indicates “CHECK”.



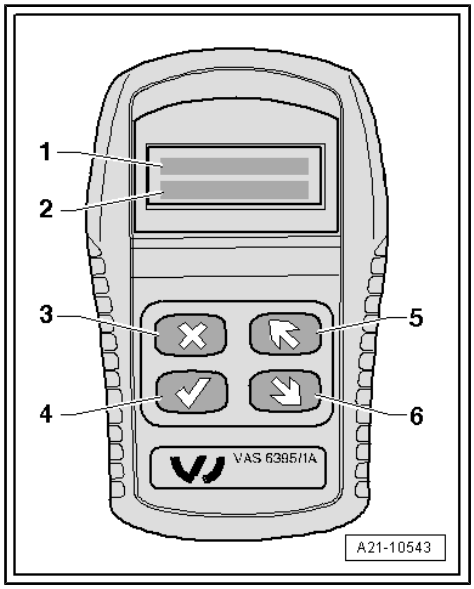
Display on -VAS 6395 /1A- :

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-.*



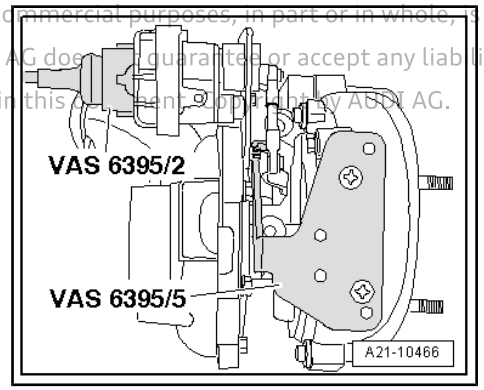
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– Secure bracket - VAS 6395/5- with countersunk bolts supplied with and screwed into bracket (8 Nm).

Caution

Measurement errors due to incorrect attachment of bracket - VAS 6395/5- .

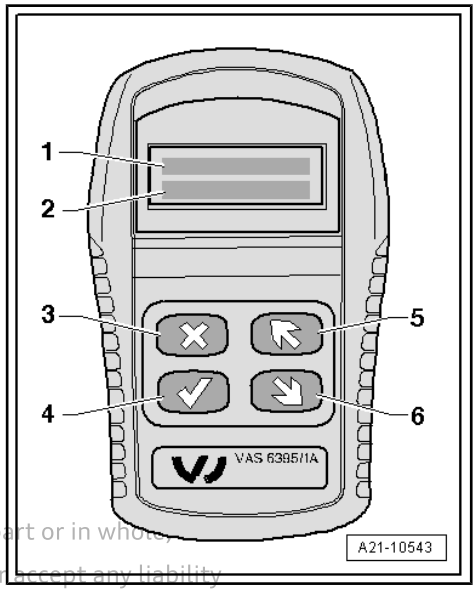
- ***The bracket should only be bolted on using the countersunk bolts supplied with the bracket.***
- ***The bracket must not be loosened until the work sequence has been completed.***



– To continue, press [V] 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 /1A- :

1 - X.XXX V

2 - [↑][↓][OK]

– Note voltage value.

- Specification: 3.3 ... 3.7 V

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Note

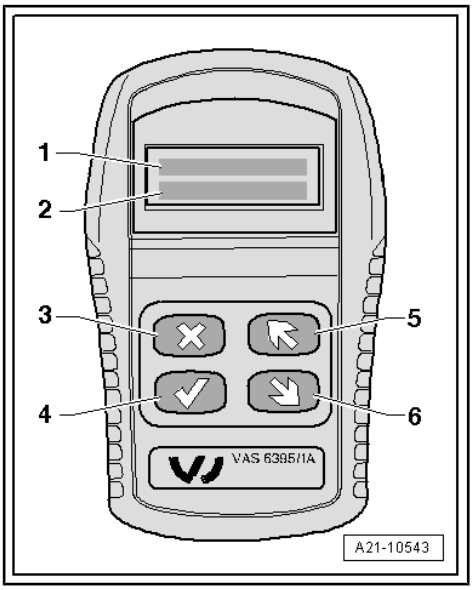
If the display indicates "FAULT [OK]" or the voltage is less than 3.3 V or greater than 3.7 V, unplug tester - VAS 6395 /1A- and repeat the complete procedure ⇒ *page 431* .

Display on -VAS 6395 /1A- :

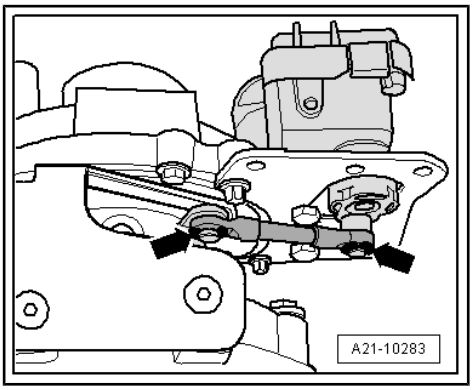
1 - X.XXX V

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.



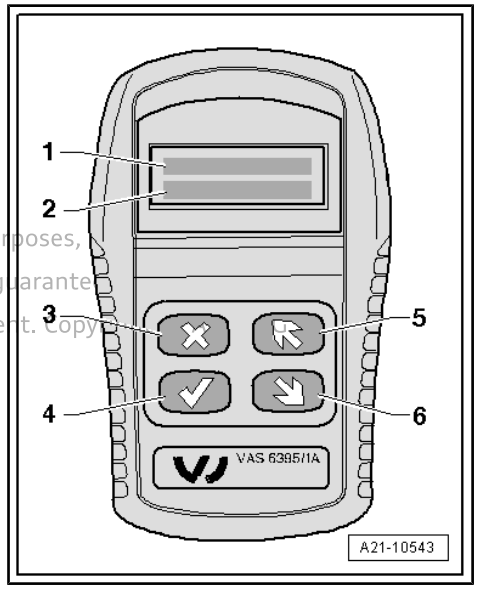
Display on -VAS 6395 /1A- :

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.

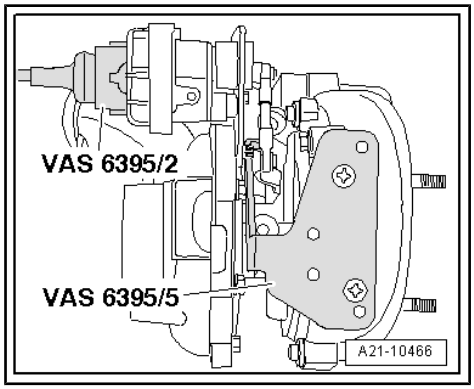
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– Disconnect connection lead - VAS 6395/2- from turbocharger 1 control unit - J724- .

Caution

Power supply for tester - VAS 6395 /1A- must remain connected.

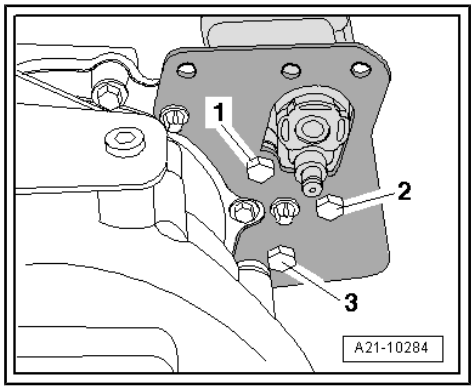


– Remove bolts -1, 2, 3- and dispose of them.

– 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

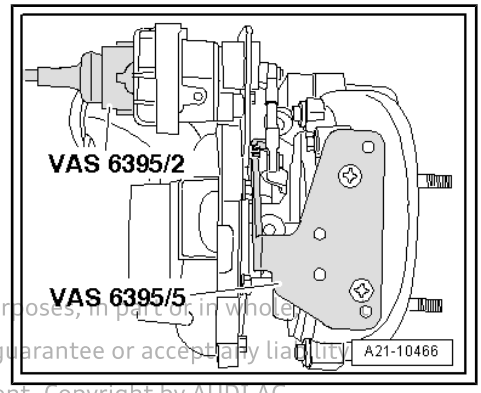
2 - M6x15 with tapered shank

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.

– Connect connection lead - VAS 6395/2- to new turbocharger 1 control unit - J724- .



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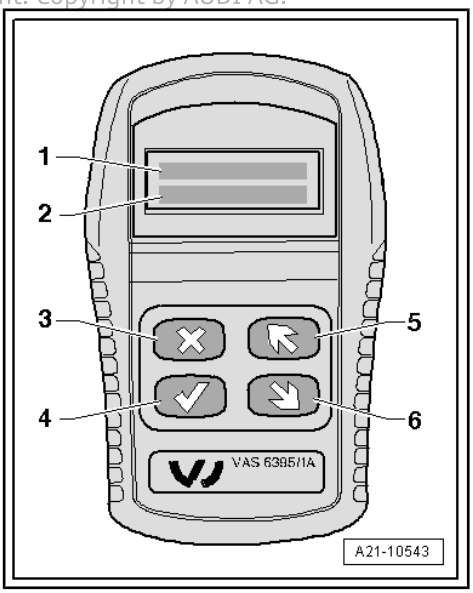
– To continue, press V button -item 4-.

Display on -VAS 6395 /1A- :

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 /1A- runs through the adjustment range of the turbocharger 1 control unit - J724- and checks that the end positions are reached; display indicates “CHECK”.

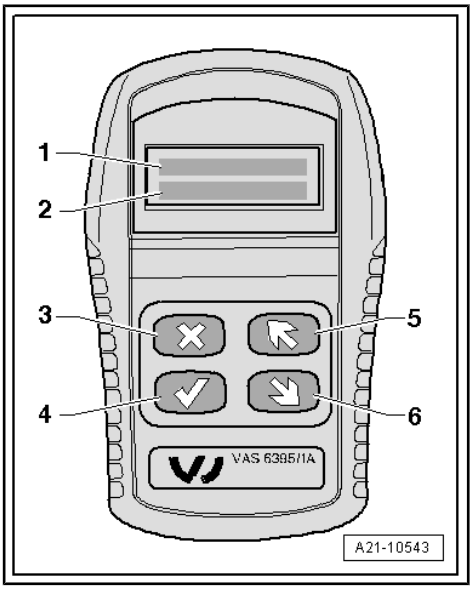
Display on -VAS 6395 /1A- :

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.

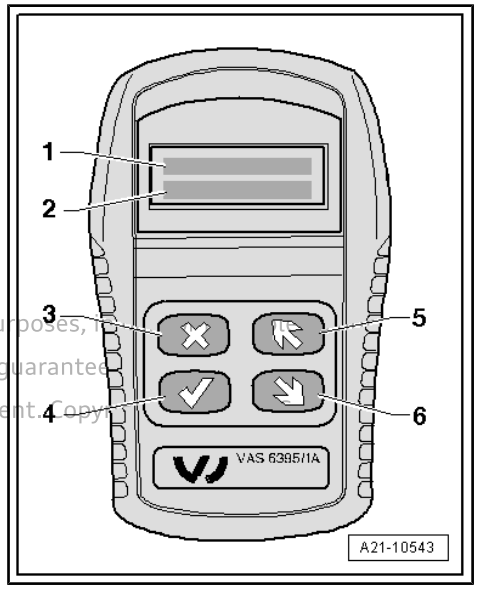


– To continue, press V button -item 4-.

Display on -VAS 6395 /1A- :

1 -

2 - [OK]



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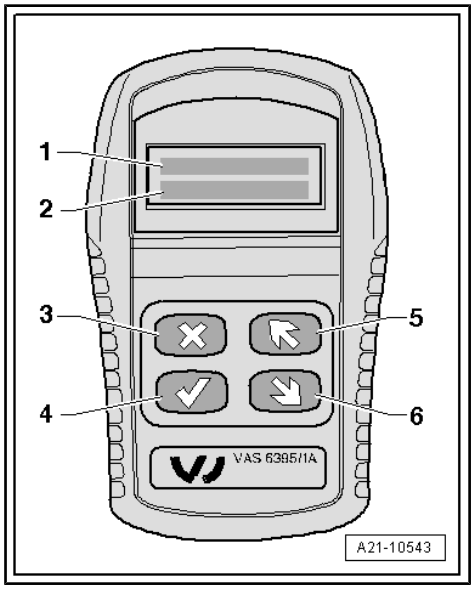
– To continue, press V button -item 4-.

Display on -VAS 6395 /1A- :

1 - X.XXX V (voltage determined with first measurement)

2 - [OK]

• Turbocharger 1 control unit - J724- moves into installation position.

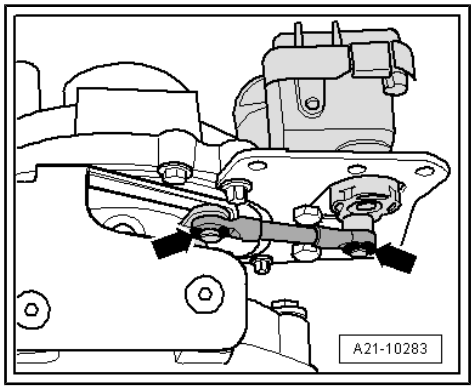


– Insert coupling rod.

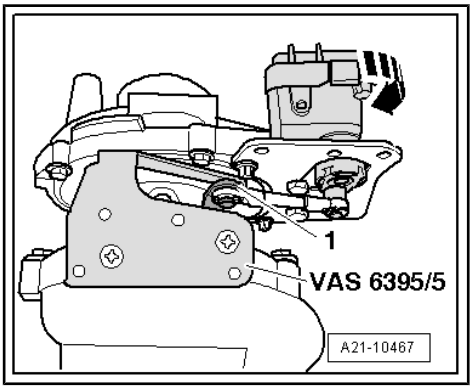
• Installation position: The thicker eyelet is fitted onto the shaft of turbocharger 1 control unit - J724- .

– Fit circlips -arrows-.

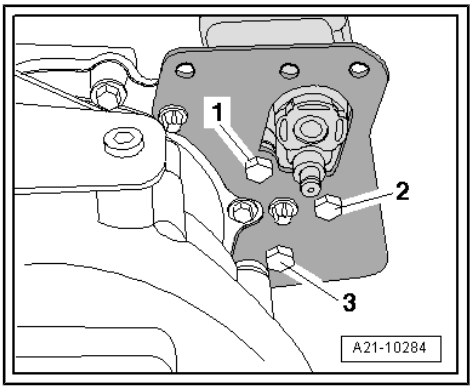
• The circlips must engage audibly.



– Press turbocharger 1 control unit - J724- towards the rear without applying force -arrow- until lever -1- rests lightly on bracket - VAS 6395/5- .
– Hold -J724- in this position.



– Tighten bolts -1, 2, 3- to 5 Nm.

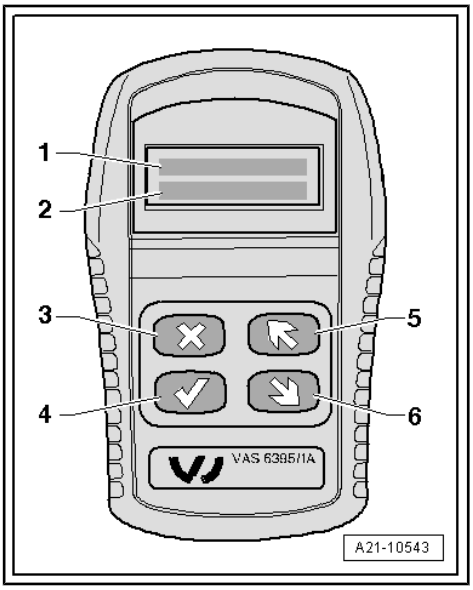


– To continue, press V button -item 4-.
• Turbocharger 1 control unit - J724- moves back and forth between the stops several times and is adjusted to the voltage value determined with the first measurement.

Display on -VAS 6395 /1A- :

1 - X.XXX V (voltage determined with first measurement)

2 - [OK]



Note

♦ *If [OK] is indicated on display, terminate adjustment* *⇒ page 439* *.*

♦ *If "CHECK" is indicated on display, proceed as follows.*

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Procedure if display indicates “CHECK”:

Display on -VAS 6395 /1A- :

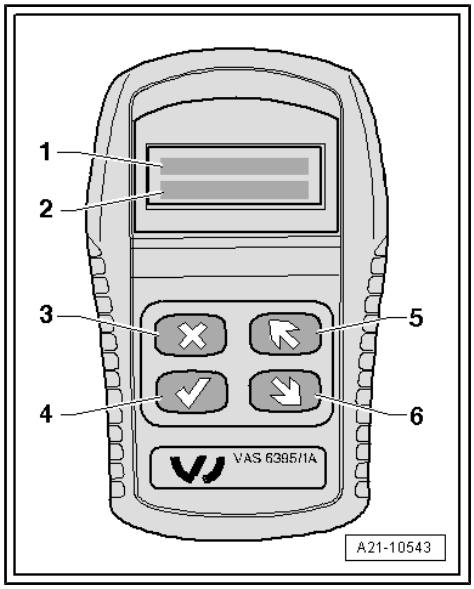
1 - [<<<]

2 - CHECK

Or

1 - [>>>]

2 - CHECK

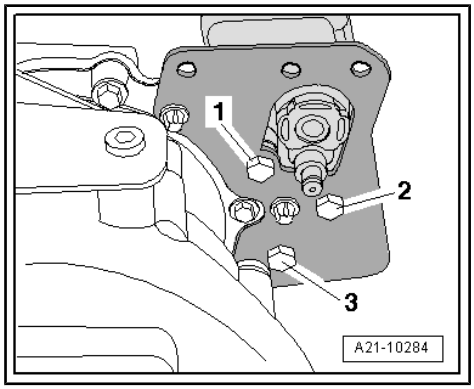


– Loosen bolts -1, 2, 3- until turbocharger 1 control unit - J724- can just be moved by applying light force in the direction stated:

• 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.



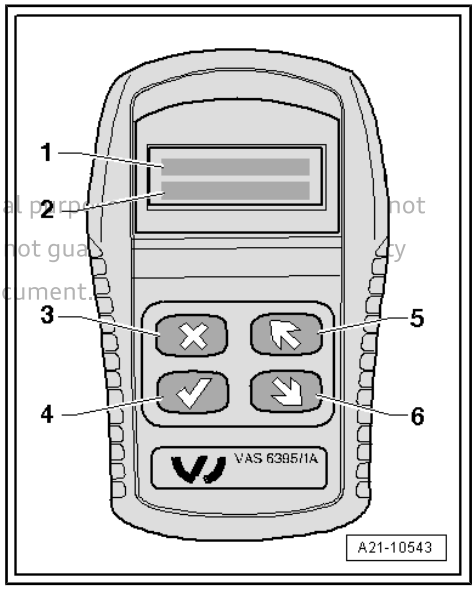
– To continue, press V button -item 4-.

• 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 /1A- :

1 - X.XXX V

2 - [OK]

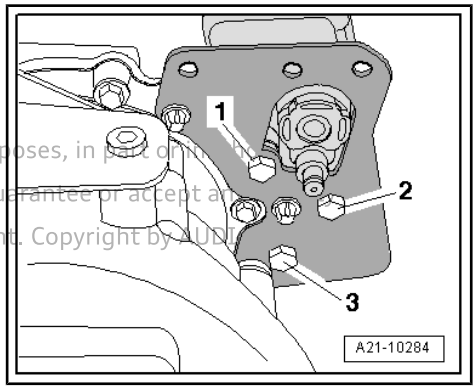


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Terminating adjustment:

– Tighten bolts -1, 2, 3- to 10 Nm.

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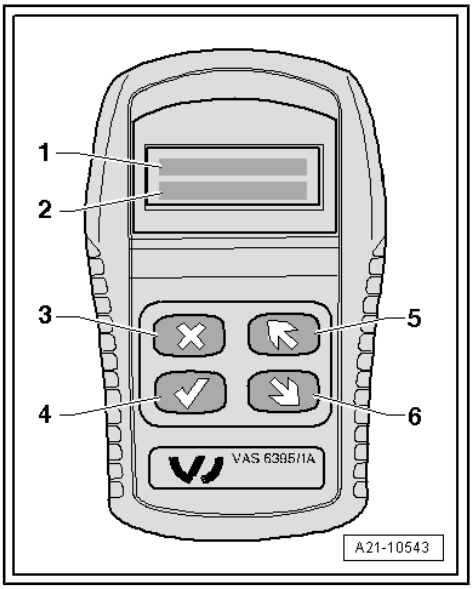


– To continue, press V button -item 4-.

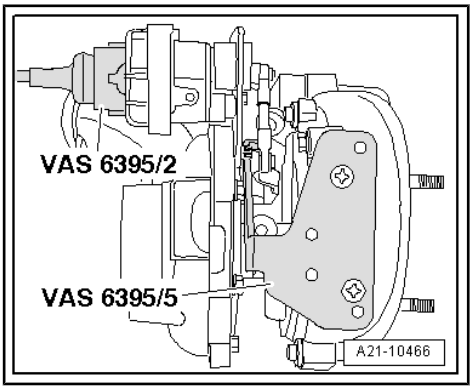
Display on -VAS 6395 /1A- :

1 - X.XXX V

2 - [OK]

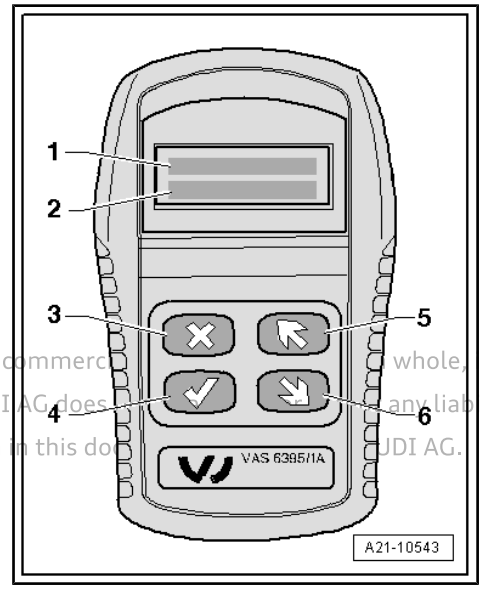


– Unbolt bracket - VAS 6395/5- .



– 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 434 .

Display on -VAS 6395 /1A- :

1 -

2 - [OK]

• Adjustment is completed.

– Unplug electrical connectors for tester - VAS 6395 /1A- .

Assemble in reverse order.

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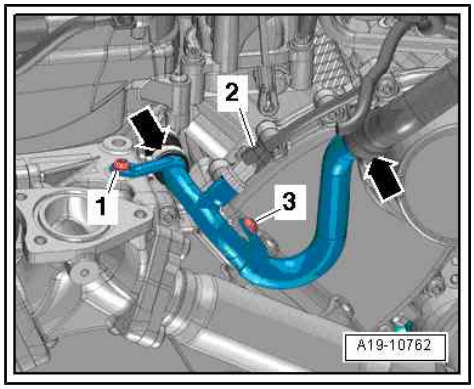
1.4 Removing and installing intermediate flange

Removing

– Remove particulate filter: A5 up to vehicle identification no. 8T-8-009 998 ⇒ page 578 ; A4 (all), A5 from vehicle identification no. 8T-8-009 999 onwards ⇒ page 580 .

– Remove turbocharger ⇒ page 422 .

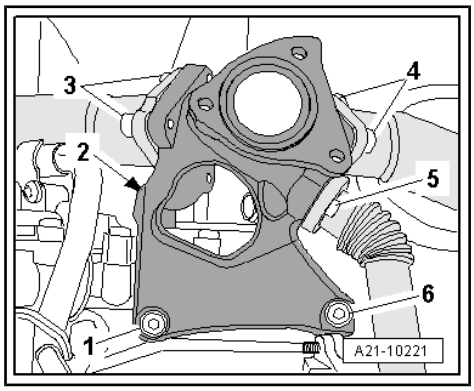
– If fitted, remove bolts -1- and -3-.



Note

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

– Remove bolts -3- (3x), -4- (3x), -5- (2x) and -1, 2 and 6- and take off intermediate flange.



Installing

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

• Tightening torque
⇒ "1.1 Exploded view - turbocharger", page 420

Note

Renew seals and/or gaskets.

– Install turbocharger ⇒ page 422 .

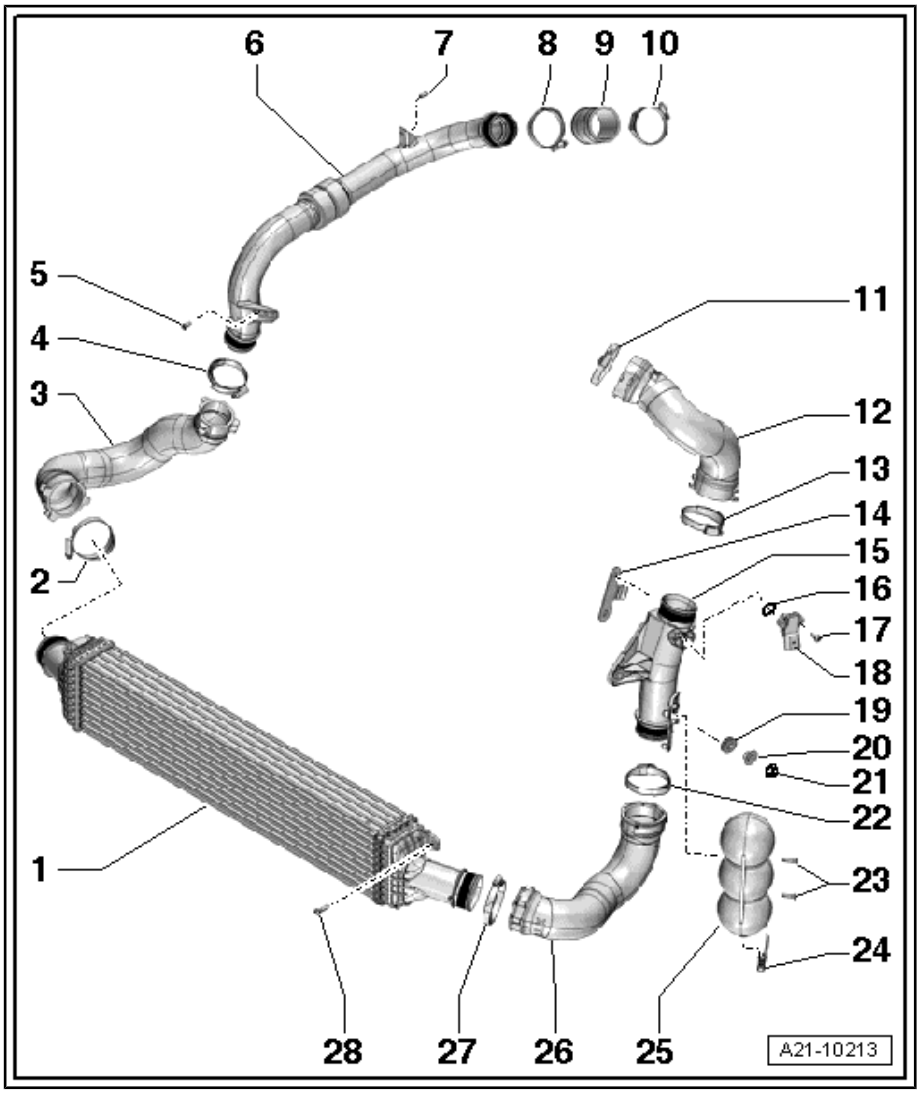
2 Charge air system

⇒ "2.1 Exploded view - charge air system", page 441

⇒ "2.2 Removing and installing charge air cooler", page 442

⇒ "2.3 Removing and installing charge pressure sender G31 ", page 445

2.1 Exploded view - charge air system



1 - Charge air cooler
- ❑ Removing and installing ⇒ page 442

2 - Hose clip
- ❑ Reinforced
- ❑ 5.5 Nm

3 - Air hose
- ❑ To charge air cooler
- ❑ Must be free of oil and grease when installing

4 - Hose clip
- ❑ Reinforced
- ❑ 5.5 Nm

5 - Bolt
- ❑ 9 Nm

6 - Air pipe

7 - Bolt
- ❑ 9 Nm

8 - Hose clip
- ❑ Reinforced
- ❑ 5.5 Nm

9 - Air hose
- ❑ To turbocharger
- ❑ Must be free of oil and grease when installing

10 - Hose clip
- ❑ Reinforced
- ❑ 5.5 Nm

11 - Hose clip
- ❑ Reinforced
- ❑ 5.5 Nm

12 - Air hose
- ❑ To intake manifold
- ❑ Must be free of oil and grease when installing

13 - Hose clip
- ❑ Reinforced
- ❑ 5.5 Nm

14 - Bracket
- ❑ For hydraulic fluid line for power steering

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15 - Air pipe

16 - O-ring
- ❑ Renew

17 - Bolt
- ❑ 5 Nm

18 - Charge pressure sender - G31-
- ❑ Removing and installing ⇒ page 445

19 - Rubber grommet

20 - Bush

21 - Nut
- ❑ 9 Nm

22 - Hose clip
- ❑ Reinforced
- ❑ 5.5 Nm

23 - Bolts
- ❑ 5 Nm

24 - Vacuum hose

25 - Vacuum reservoir

26 - Air hose
- ❑ From charge air cooler
- ❑ Must be free of oil and grease when installing

27 - Hose clip
- ❑ Reinforced
- ❑ 5.5 Nm

28 - Bolt
- ❑ 7 Nm

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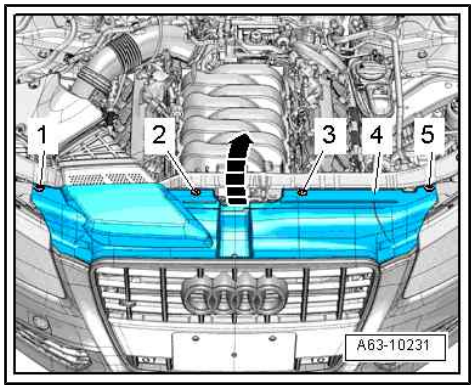
2.2 Removing and installing charge air cooler

– Observe rules for cleanliness ⇒ page 9 .

Removing

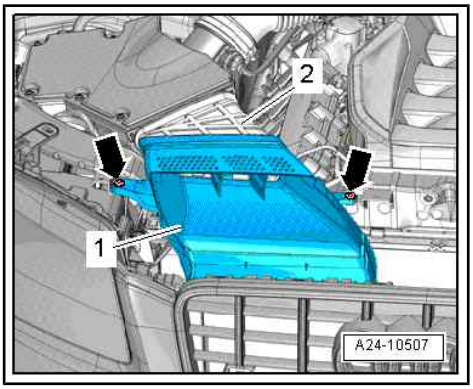
– Remove bolts -1, 2, 3, 5-.

– Lift cover -4- above lock carrier and detach from radiator grille -arrow-.



– Remove bolts -arrows-.

– Detach air duct -1- from intermediate flange -2- for air cleaner housing.

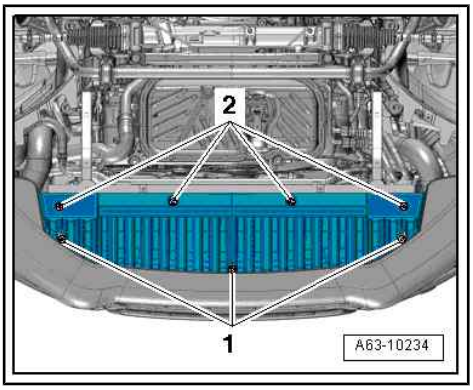


Allroad vehicles only:

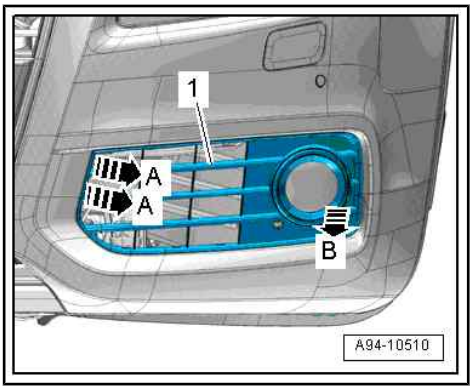
– Remove bumper (front) ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing bumper cover .

All vehicles:

– Loosen bolts -1- and -2- and detach end plate at bumper cover towards rear.



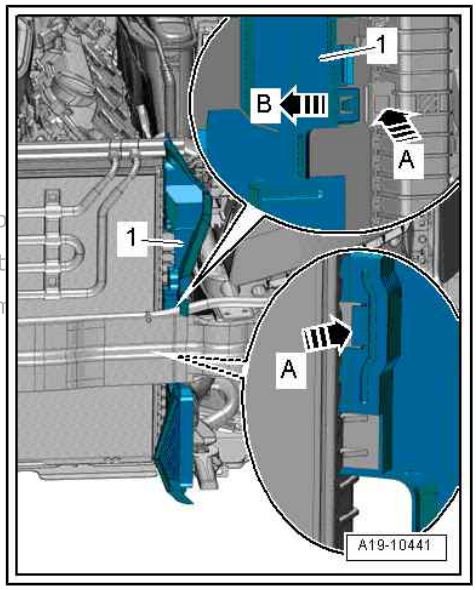
– Release retaining clips -arrows A- and detach air intake grille -1- on left and right from bottom section of bumper cover -arrow B-.



Note

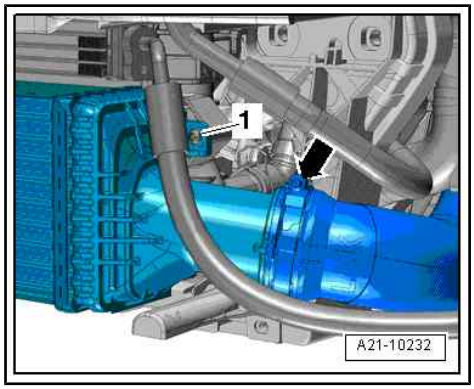
For illustration purposes, the installation position is shown in the following illustrations with the bumper removed.

– Release catches -arrows A- and swivel air duct -1- on left and right to centre of vehicle -arrow B-.



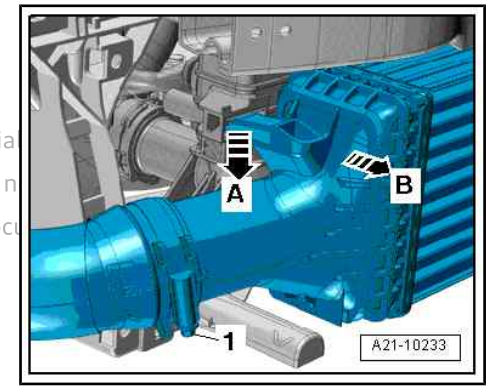
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– Release hose clip -arrow- and detach air hose from charge air cooler.
– Remove bolt -1-.

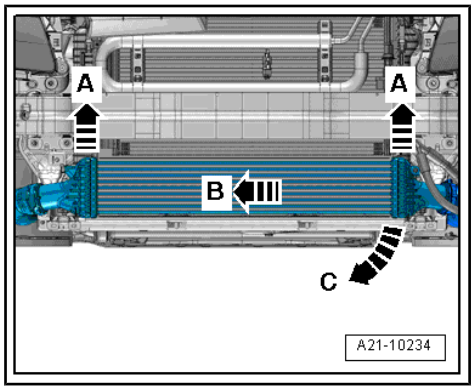


– Release hose clip -1- and detach air hose from charge air cooler.
– Push catch down -arrow A- and move top of charge air cooler slightly in direction of -arrow B-.

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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 torque
  ⇒ “2.1 Exploded view - charge air system”, page 441

Note

- *If there are slight impressions on the fins, refer to ⇒ page 11 .*
- *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.*

– Install bumper cover (front) ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing bumper cover .
– Install noise insulation (front) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .
– Attach air duct to intermediate flange for air cleaner housing ⇒ page 476 .
– Install lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .

2.3 Removing and installing charge pressure sender - G31-

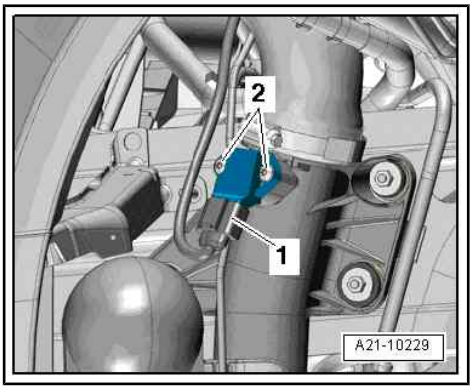
Removing

– 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- from charge pressure sender - G31- .

– Remove bolts -2- and pull charge pressure sender - G31- 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 441

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 wheel ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres; Tightening torque for wheel bolts .

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23 – Mixture preparation - injection

1 Injection system

⇒ “1.1 Overview - fuel system”, page 446

⇒ “1.2 Overview of fitting locations - injection system”, page 449

⇒ “1.3 Exploded view - fuel system”, page 468

⇒ “1.4 Filling and bleeding fuel system”, page 474

⇒ “1.5 Checking fuel system for leaks”, page 475

1.1 Overview - fuel system

WARNING

- *Always read rules for cleanliness and instructions for working on fuel system ⇒ page 9 .*
- *Follow these instructions and rules for cleanliness before starting work and while working on the fuel system.*

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The first fuel filling operation is only required on vehicles with engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB and CCLA.

Caution

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 474 .*
- *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.*

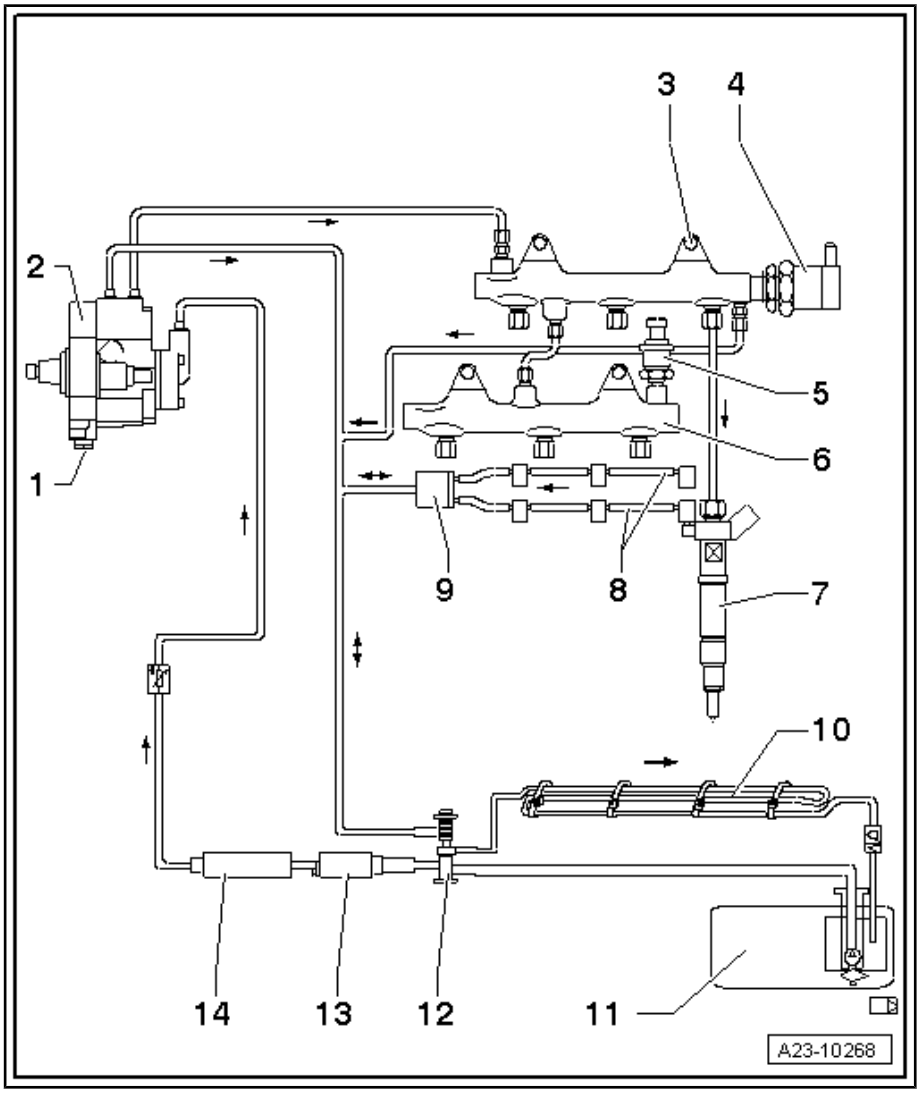
Perform first fuel filling after installing high-pressure pump ⇒ page 474 .

1 - Fuel metering valve - N290-

- ❑ Do not unscrew

2 - High-pressure fuel pump

- ❑ With fuel metering valve - N290-
- ❑ On vehicles with engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB and CCLA, a first fuel filling operation MUST be performed after the high-pressure pump has been renewed (the pump must NOT be allowed to run while it is still empty) ⇒ page 474
- ❑ On vehicles with engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB, and CCLA, the learnt values must be re-adapted after renewing the high-pressure pump or the fuel pressure regulating valve - N276- ; see “Guided Functions” in vehicle diagnostic tester
- ❑ High-pressure pump - exploded view, engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB, CCLA ⇒ page 510
- ❑ Removing and installing, engine codes CA-



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MA, CAMB, CCWA,
CCWB, CGKA, CGKB, CCLA ⇒ page 519

- ❑ High-pressure pump - exploded view, engine code CAPA ⇒ page 513
- ❑ Removing and installing, engine code CAPA ⇒ page 521

3 - Fuel rail

- ❑ Cylinder bank 1

4 - Fuel pressure regulating valve - N276-

- ❑ On cylinder bank 1
- ❑ Cannot be re-installed
- ❑ On vehicles with engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB, and CCLA, the learnt values must be re-adapted after renewing the high-pressure pump or the fuel pressure regulating valve - N276- ; see “Guided Functions” in vehicle diagnostic tester
- ❑ Removing and installing ⇒ page 540

5 - Fuel pressure sender - G247-

- ❑ 30 Nm
- ❑ On cylinder bank 2
- ❑ Removing and installing ⇒ page 542

6 - Fuel rail

- ❑ For cylinder bank 2

7 - Injectors

- ❑ Injectors 1 ... 6
- ❑ Removing and installing ⇒ page 501

8 - Fuel return lines

- ❑ The fuel return lines must not be dismantled; if necessary they must be renewed as a complete unit
- ❑ After replacement, engine must be run at idling speed for approx. 2 minutes to bleed fuel system; then check fuel return line for leaks

9 - Pressure retention valve or restrictor

- ❑ Which component is installed depends on the model year
- ❑ Maintains a residual pressure in fuel return hoses
- ❑ Cannot be renewed separately; if defective, renew fuel return hoses
- ❑ Checking pressure retention valve ⇒ page 499
- ❑ Checking restrictor ⇒ page 500

10 - Fuel cooler

- ❑ Fitted on underbody

11 - Fuel tank

- ❑ With fuel system pressurisation pump - G6-

12 - Preheating valve

13 - Supplementary fuel pump - V393-

- ❑ Only fitted on vehicles with engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB, CCLA

14 - Fuel filter

- ❑ Fuel filter - exploded view ⇒ Fuel supply system; Rep. gr. 20 ; Fuel filter; Exploded view - fuel filter
- ❑ Renewing fuel filter ⇒ Fuel supply system; Rep. gr. 20 ; Fuel filter; Removing and installing fuel filter

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1.2 Overview of fitting locations - injection system

⇒ "1.2.1 Overview of fitting locations - injection system, engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB", page 449

⇒ "1.2.2 Overview of fitting locations - injection system, engine code CAPA", page 458

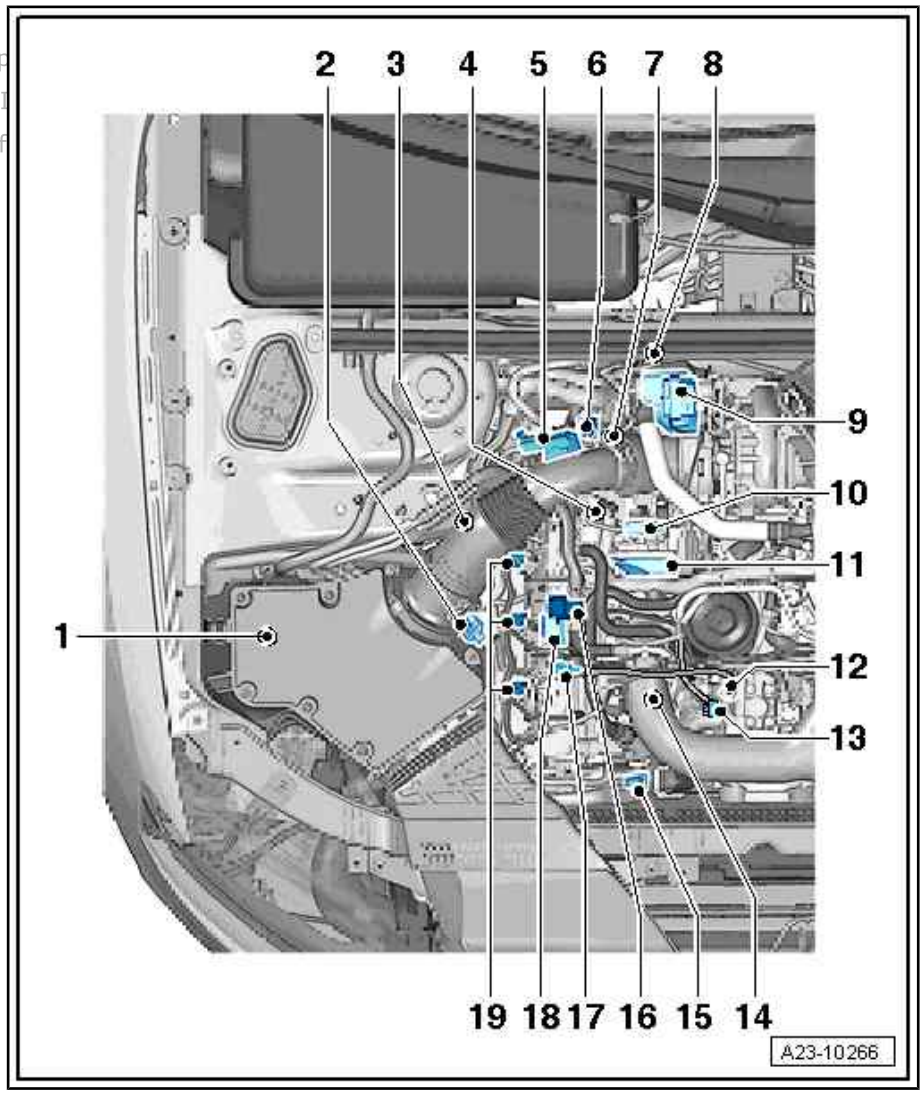
1.2.1 Overview of fitting locations - injection system, engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB

Engine compartment (right-side) ⇒ page 449

Engine compartment (left-side) ⇒ page 451

Engine compartment (right-side)

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1 - Air filter bypass flap valve - N275-

- ❑ These components (bypass flap with air filter bypass flap valve - N275-) are not installed on certain equipment versions or on vehicles for certain export markets
- ❑ If fitted, the bypass flap is located in the air cleaner housing and the air cleaner bypass flap valve - N275- is located on the outside of the air cleaner housing
- ❑ Exploded view - air cleaner ⇒ page 476

2 - Air mass meter - G70-

- ❑ Removing and installing ⇒ page 545

3 - Hall sender - G40- (camshaft position sensor)

- ❑ Fitting location ⇒ page 454

4 - Fuel pressure regulating valve - N276-

- ❑ Fitting location ⇒ page 454
- ❑ After renewing high-pressure pump or fuel pressure regulating valve - N276- , learnt values must be re-adap-

ted; see “Guided Functions” in vehicle diagnostic tester

- ❑ Removing and installing ⇒ page 540

5 - Exhaust gas pressure sensor 1 - G450-

- ❑ Fitting location ⇒ page 457
- ❑ Adaption must be performed after renewing this component
- ❑ Removing and installing ⇒ page 546

6 - Electrical connector

- ❑ For exhaust gas temperature sender 4 - G648- (engine codes CAMA, CAMB, CCWA, CCWB, CGKA and CGKB)
- ❑ For exhaust gas temperature sender 3 for cylinder bank 1 - G496- (engine code CAPA)
- ❑ Fitting location ⇒ page 457
- ❑ Removing and installing ⇒ page 612

7 - Coolant temperature sender - G62-

- ❑ Removing and installing ⇒ page 371

8 - Exhaust gas temperature sender 4 - G648- (engine codes CAMA, CAMB, CCWA, CCWB, CGKA and CGKB)

- ❑ Exhaust gas temperature sender 3 for cylinder bank 1 - G496- (engine code CAPA)
- ❑ Fitting location ⇒ page 457
- ❑ Removing and installing ⇒ page 612

9 - Control unit for turbocharger 1 - J724-

- ❑ Fitting location ⇒ page 457

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10 - Electrical connector for exhaust gas temperature sender 1 - G235-

- ❑ Only fitted on vehicles with engine codes CAPA, CCWA, CCWB
- ❑ Fitting location ⇒ page 457
- ❑ Exhaust gas temperature sender 1 - G235- ⇒ page 457

11 - Intake manifold flap motor - V157-

- ❑ Fitting location ⇒ page 457
- ❑ Cylinder bank 1
- ❑ Exploded view - intake manifold ⇒ page 482

12 - Fuel return line connection

13 - Fuel supply line connection

14 - Oil pressure switch

- ❑ Oil pressure switch - F1- (engine codes CAPA, CAMA, CAMB) - fitting location ⇒ page 455
- ❑ Oil pressure switch for reduced oil pressure - F378- (engine codes CCWA, CCWB, CGKA, CGKB) - fitting location ⇒ page 455
- ❑ Removing, installing and testing ⇒ page 341

15 - Pump for exhaust gas recirculation cooler - V400-

- ❑ Fitting location ⇒ page 455

16 - Fuel temperature sender - G81-

- ❑ Fitting location ⇒ page 454

17 - Radiator outlet coolant temperature sender - G83-

- ❑ Fitting location ⇒ page 454
- ❑ Removing and installing ⇒ page 373

18 - Pressure retention valve or restrictor in fuel return line

- ❑ Fitting location ⇒ page 454
- ❑ Which component is installed depends on the model year
- ❑ In fuel return lines from cylinder banks 1 and 2
- ❑ The pressure retention valve maintains a residual pressure of approx. 10 bar in the return lines
- ❑ The restrictor maintains a residual pressure of approx. 4 bar in the return lines.
- ❑ This residual pressure is required for the control function of the piezo injectors
- ❑ The pressure retention valve/restrictor may only be renewed together with the fuel return lines.
- ❑ Checking pressure retention valve ⇒ page 499
- ❑ Checking restrictor ⇒ page 500

19 - Injectors (piezo injectors)

- ❑ Cylinder bank 1
- ❑ Removing and installing ⇒ page 501

Components A to J are not shown on the exploded view.

Engine compartment (left-side)

1 - Electrical connector

- ❑ For exhaust gas temperature sender 3 - G495- (engine codes CAMA, CAMB, CCWA, CCWB, CGKA and CGKB)
- ❑ For exhaust gas temperature sender 2 - G448- (engine code CAPA)

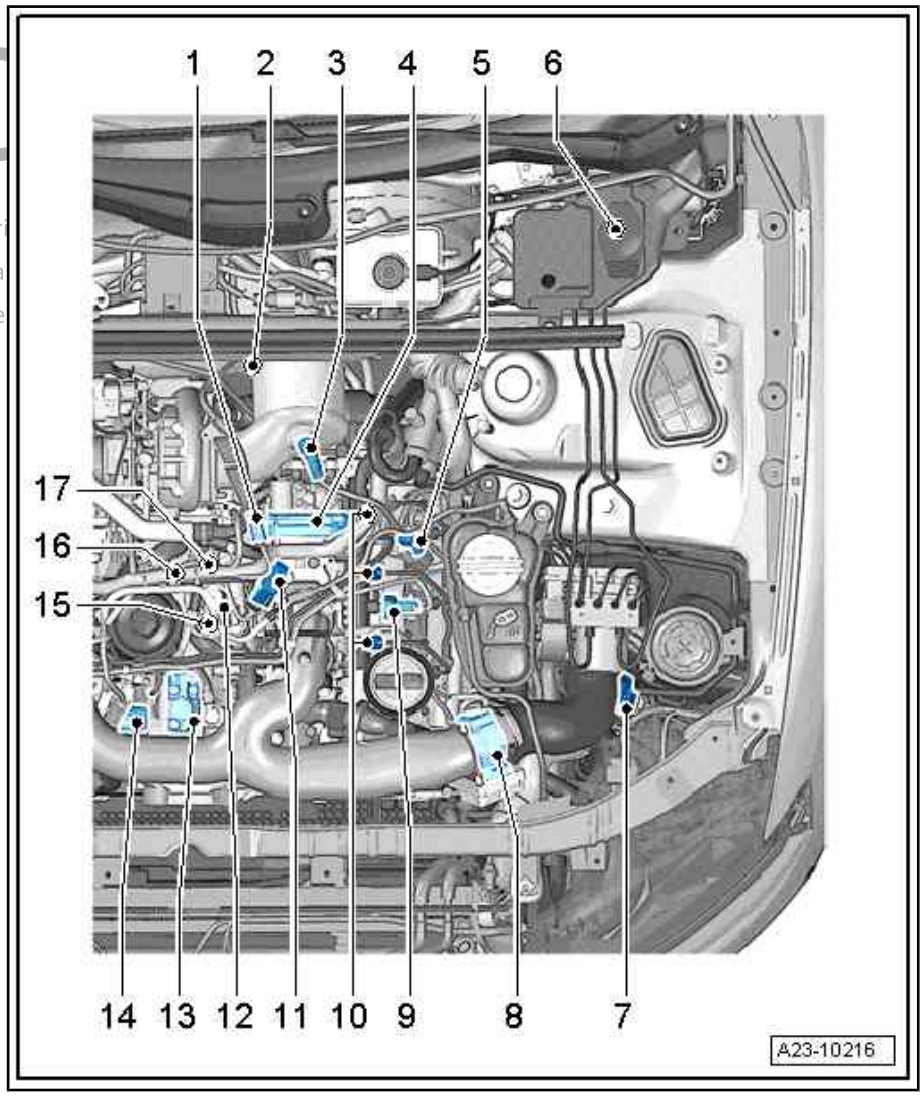
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2 - Exhaust gas temperature sender 3 - G495- (engine codes CAMA, CAMB, CCWA, CCWB, CGKA and CGKB)

- ❑ Exhaust gas temperature sender 2 - G448- (engine code CAPA)
- ❑ Located downstream of starter catalytic converter
- ❑ Removing and installing ⇒ page 612
- ❑ 45 Nm

3 - Lambda probe - G39- with Lambda probe heater - Z19-

- ❑ Fitting location ⇒ page 456
- ❑ Removing and installing



⇒ page 552

- ❑ 50 Nm

4 - Intake manifold flap 2 motor - V275-

- ❑ Cylinder bank 2
- ❑ Exploded view - intake manifold ⇒ page 482

5 - Connector for Lambda probe - G39-

- ❑ Fitting location ⇒ page 456

6 - Engine control unit - J623-

- ❑ Fitting location ⇒ page 453
- ❑ Removing and installing ⇒ page 555

7 - Charge pressure sender - G31-

- ❑ With intake air temperature sender - G42-
- ❑ Fitting location ⇒ page 456
- ❑ Removing and installing ⇒ page 445

8 - Throttle valve module - J338-

- ❑ 9 Nm

9 - Fuel pressure sender - G247-

- ❑ Fitting location ⇒ page 454
- ❑ Removing and installing ⇒ page 542

10 - Injectors (piezo injectors)

- ❑ Cylinder bank 2
- ❑ Removing and installing ⇒ page 501

11 - Exhaust gas recirculation cooler change-over valve - N345-

- ❑ Fitting location ⇒ page 455
- ❑ Overview of exhaust gas recirculation system ⇒ page 465

12 - Exhaust gas recirculation control motor - V338-

13 - High-pressure fuel pump

- ❑ With fuel metering valve - N290-
- ❑ On vehicles with engine codes CAMA, CAMB, CCWA, CCWB, CGKA and CGKB, a first fuel filling operation MUST be performed after the high-pressure pump has been renewed (the pump must NOT be allowed to run while it is still empty) ⇒ page 474
- ❑ After renewing high-pressure pump or fuel pressure regulating valve - N276- , learnt values must be re-adapted; see “Guided Functions” in vehicle diagnostic tester
- ❑ High-pressure pump - exploded view, engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB ⇒ page 510
- ❑ Removing and installing, engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB ⇒ page 519
- ❑ High-pressure pump - exploded view, engine code CAPA ⇒ page 513
- ❑ Removing and installing, engine code CAPA ⇒ page 521

14 - Fuel metering valve - N290-

- ❑ Do not unscrew
- ❑ Screwed directly into high-pressure fuel pump

15 - Exhaust gas recirculation temperature sensor - G98-

- ❑ Fitting location ⇒ page 455
- ❑ Removing and installing ⇒ page 627

16 - Connector for exhaust gas recirculation temperature sensor - G98-

17 - Vacuum unit

- ❑ For change-over flap for exhaust gas recirculation cooler

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A - Relay and fuse holder in electronics box in plenum chamber (left-side)

- ❑ Removing and installing engine control unit - J623- with altitude sensor ⇒ page 557
- ❑ Fitting locations ⇒ Current flow diagrams, Electrical fault finding and Fitting locations

B - Low heat output relay - J359- and high heat output relay - J360-

- ❑ Fitting locations ⇒ Current flow diagrams, Electrical fault finding and Fitting locations

C - Brake light switch - F- and brake pedal switch - F47-

- ❑ In footwell on brake pedal

D - Accelerator position sender - G79- and accelerator position sender 2 - G185-

- ❑ Fitting location ⇒ page 454
- ❑ Removing and installing ⇒ Fuel supply system; Rep. gr. 20 ; Accelerator mechanism; Removing and installing accelerator pedal module with accelerator position sender -G79- / -G185-

E - Exhaust gas temperature sender 1 - G235-

- ❑ Only fitted on vehicles with engine codes CAPA, CCWA, CCWB
- ❑ On turbocharger
- ❑ 45 Nm
- ❑ Removing and installing ⇒ page 612

F - Engine speed sender - G28-

- ❑ Fitting location ⇒ page 457

G - Supplementary fuel pump - V393-

- ❑ Only fitted on vehicles with engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB
- ❑ Fitting location ⇒ page 458
- ❑ Removing and installing ⇒ Fuel supply system; Rep. gr. 20 ; Fuel pump

H - Oil pressure switch - F22-

- ❑ Only fitted on vehicles with engine codes CCWA, CCWB, CGKA, CGKB
- ❑ Fitting location ⇒ page 456
- ❑ Removing and installing ⇒ page 341

I - Valve for oil pressure control - N428-

- ❑ Only fitted on vehicles with engine codes CCWA, CCWB, CGKA, CGKB
- ❑ Fitting location ⇒ page 456
- ❑ Removing and installing ⇒ page 341

J - Particulate filter

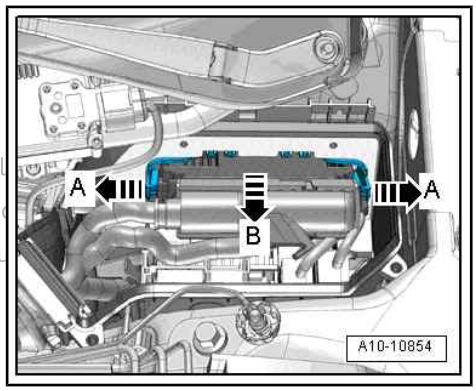
- ❑ Fitted on underbody
- ❑ Combined with a catalytic converter
- ❑ Adaption must be performed after renewing this component
- ❑ Removing and installing ⇒ page 578

After renewing exhaust gas pressure sensor 1 - G450- and/or particulate filter, adaption must be performed in order to reset learnt values. The adaption procedure is described in the Guided Fault Finding or Guided Functions; use a vehicle diagnostic tester .

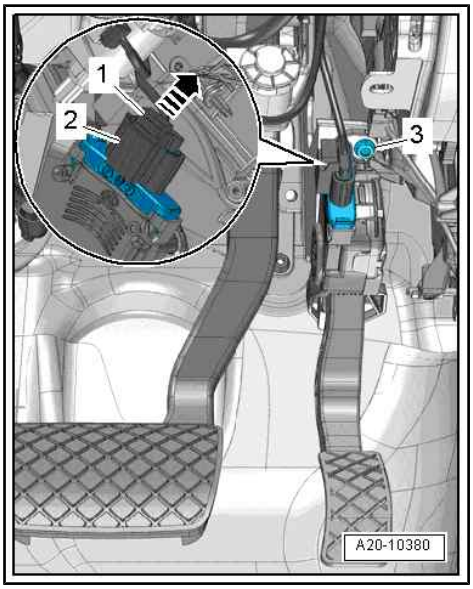
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Fitting location of engine control unit - J623-

- ♦ In left electronics box in engine compartment



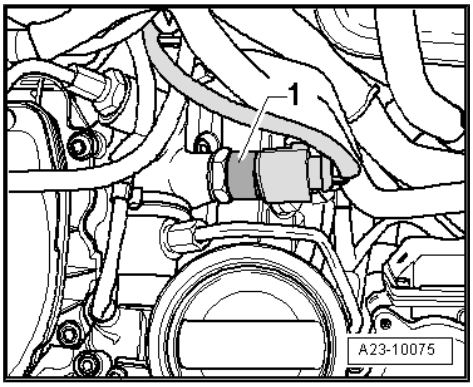
Accelerator position sender - G79- and accelerator position sender 2 - G185-



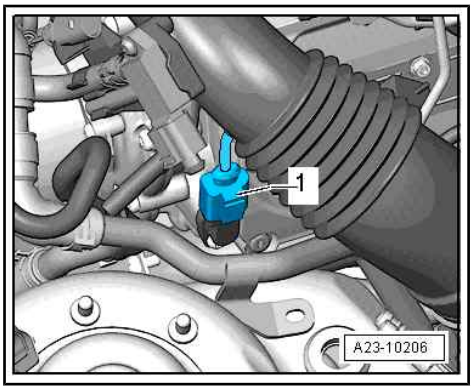
Note

The accelerator position sender - G79- and accelerator position sender 2 - G185- are integrated in the accelerator pedal module and cannot be renewed individually.

Fuel pressure sender - G247- -1- on cylinder bank 2



Hall sender - G40- -1- on cylinder bank 1

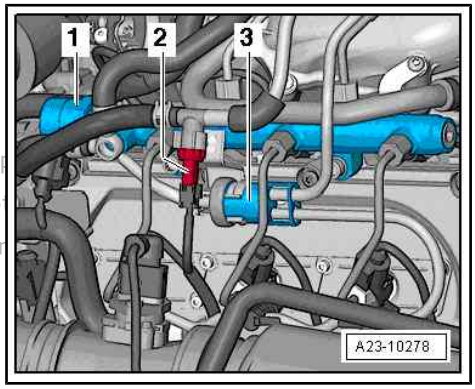


Components on cylinder bank (right-side)

1 - Fuel pressure regulating valve - N276-

2 - Fuel temperature sender - G81-

3 - Pressure retention valve or restrictor in fuel return line



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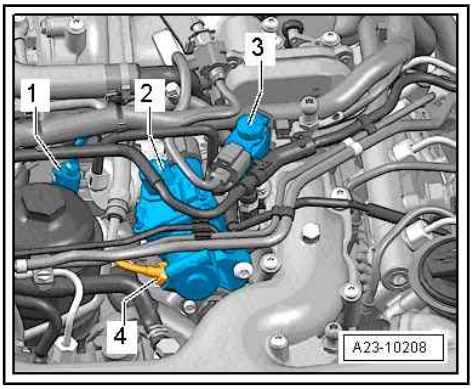
Fitting locations

1 - Electrical connector for exhaust gas recirculation temperature sensor - G98-

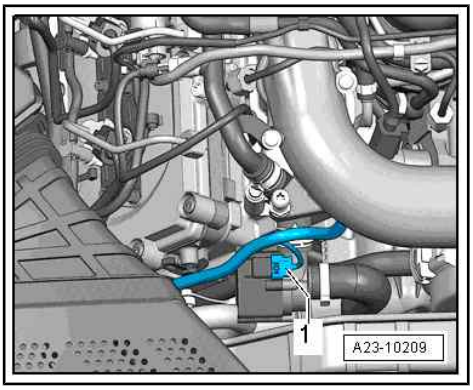
2 - Exhaust gas recirculation control motor - V338-

3 - Exhaust gas recirculation cooler change-over valve - N345-

4 - Exhaust gas recirculation temperature sensor - G98-



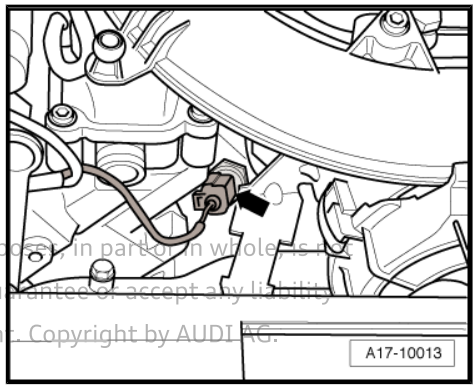
Pump for exhaust gas recirculation cooler - V400- -1-



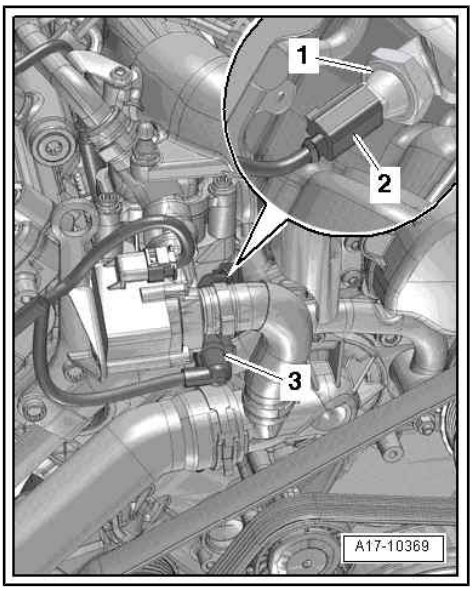
Oil pressure switch - F1- -arrow- (engine codes CAPA, CAMA, CAMB)

♦ Removing, installing and testing ⇒ page 341

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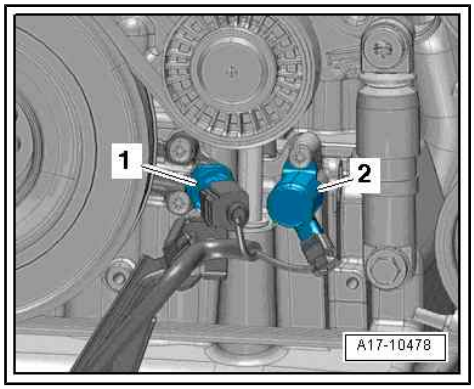
Oil pressure switch for reduced oil pressure - F378- -1- (engine codes CCWA, CCWB, CGKA, CGKB)



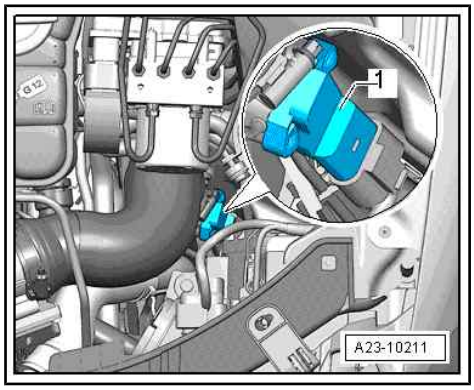
Oil pressure control (engine codes CCWA, CCWB, CGKA, CGKB)

1 - Oil pressure switch - F22-

2 - Valve for oil pressure control - N428-



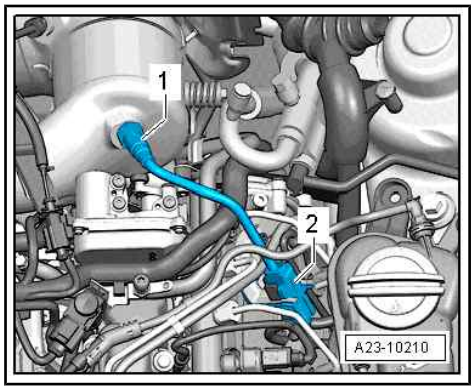
Charge pressure sender - G31- with intake air temperature sender - G42- -1-



Fitting location of Lambda probe - G39-

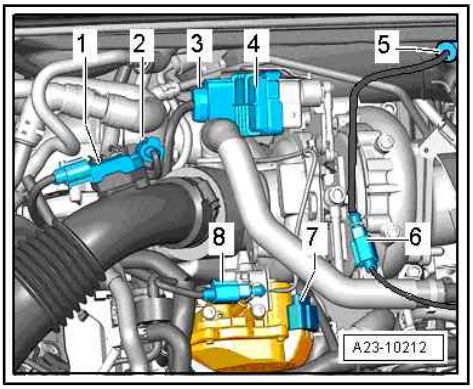
1 - Lambda probe - G39-

2 - Connector for Lambda probe - G39-



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Fitting locations



1 - Exhaust gas pressure sensor 1 - G450-

2 - Electrical connector for exhaust gas temperature sender 3 for cylinder bank 1 - G496- (engine code CAPA)

2 - Electrical connector for exhaust gas temperature sender 4 - G648- (engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB)

3 - Electrical connector for turbocharger 1 control unit - J724-

4 - Control unit for turbocharger 1 - J724-

5 - Exhaust gas temperature sender 2 - G448- (engine code CAPA)

5 - Exhaust gas temperature sender 3 - G495- (engine codes CAMA, CAMB, CCWA, CCWB, CGKA and CGKB)

6 - Electrical connector for exhaust gas temperature sender 2 - G448- (engine code CAPA)

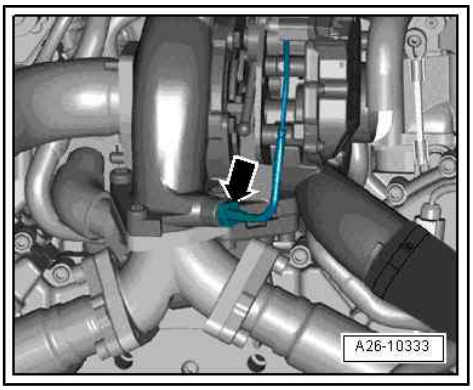
6 - Electrical connector for exhaust gas temperature sender 3 - G495- (engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB)

7 - Intake manifold flap motor - V157-

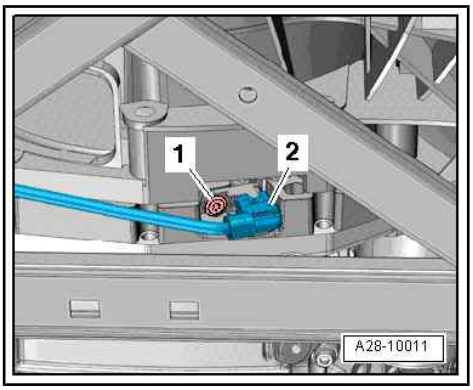
8 - Electrical connector for exhaust gas temperature sender 1 - G235- (only fitted on 3.0 ltr. engines with codes CAPA, CCWA, CCWB)

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Exhaust gas temperature sender 1 - G235- -arrow- (only fitted on 3.0 ltr. engines with codes CAPA, CCWA, CCWB)



Engine speed sender - G28- -2-



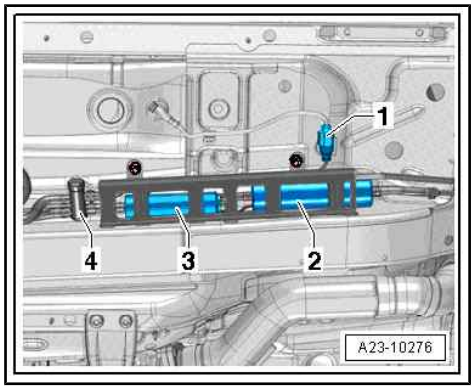
Supplementary fuel pump - V393- -3- (engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB)

1 - Electrical connector for supplementary fuel pump - V393-

2 - Fuel filter

3 - Supplementary fuel pump - V393-

4 - Preheating valve



1.2.2 Overview of fitting locations - injection system, engine code CAPA

⇒ page 458

⇒ page 460

Engine compartment (right-side)

1 - Hall sender - G40-

- ❑ Fitting location ⇒ page 464

2 - Pressure differential sender - G505-

- ❑ Fitting location ⇒ page 466
- ❑ Adaption must be performed after renewing this component
- ❑ Removing and installing ⇒ page 545

3 - Fuel pressure regulating valve - N276-

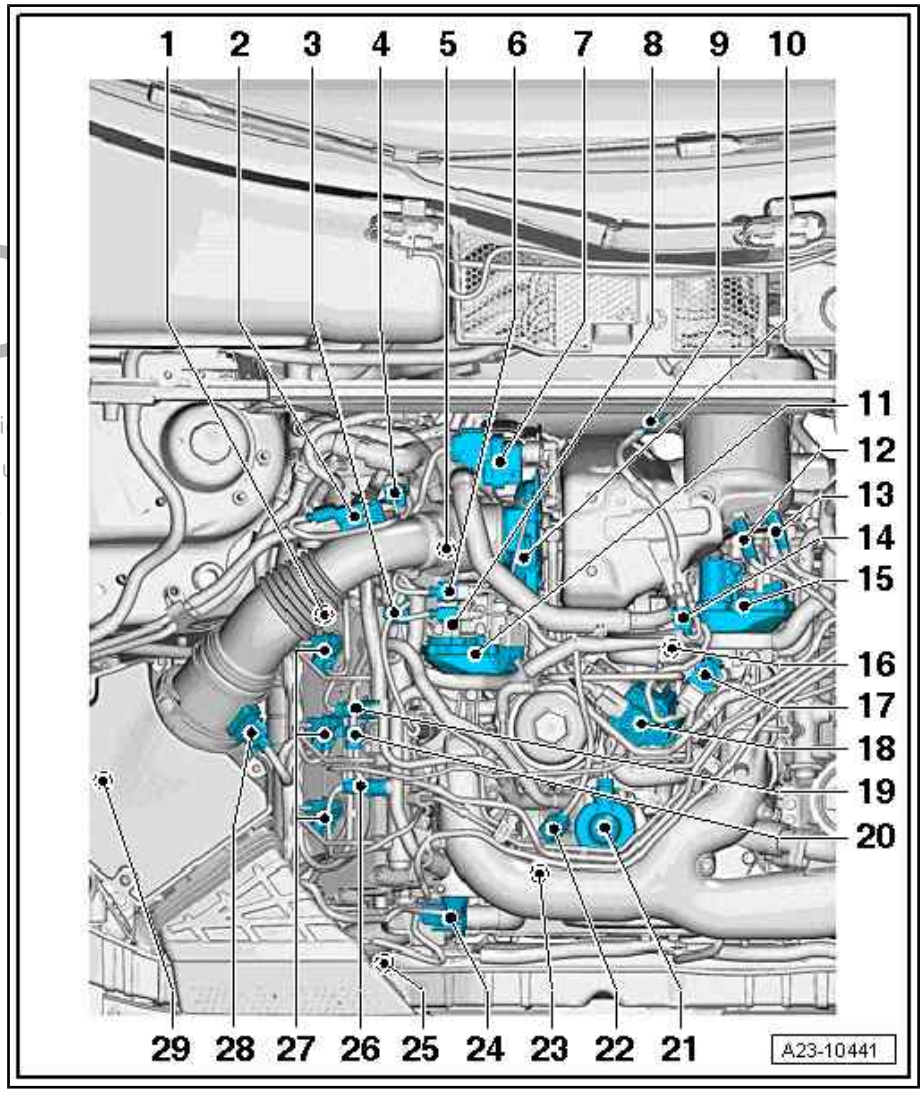
- ❑ Fitting location ⇒ page 464
- ❑ After renewing high-pressure pump or fuel pressure regulating valve - N276- , learnt values must be re-adapted; see “Guided Functions” in vehicle diagnostic tester
- ❑ Removing and installing ⇒ page 540

4 - Electrical connector

- ❑ For exhaust gas temperature sender 4 - G648-

5 - Coolant temperature sender - G62-

- ❑ Removing and installing



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⇒ page 371

6 - Electrical connector for exhaust gas temperature sender 1 - G235-
- ❑ Fitting location ⇒ page 465

7 - Control unit for turbocharger 1 - J724-
- ❑ Fitting location ⇒ page 466

8 - Electrical connector for exhaust gas recirculation temperature sensor - G98-
- ❑ Fitting location ⇒ page 466

9 - Exhaust gas temperature sender 3 - G495-
- ❑ Fitting location ⇒ page 466

10 - Turbocharger
- ❑ Removing and installing ⇒ page 422

11 - Intake manifold flap motor - V157-
- ❑ Fitting location ⇒ page 466
- ❑ Cylinder bank 1
- ❑ Exploded view - intake manifold ⇒ page 482

12 - NOx sender - G295-
- ❑ Fitting location ⇒ page 466

13 - Lambda probe - G39-
- ❑ Fitting location ⇒ page 466

14 - Electrical connector for exhaust gas temperature sender 3 - G495-

15 - Intake manifold flap 2 motor - V275-

16 - Exhaust gas recirculation temperature sensor - G98-
- ❑ Fitting location ⇒ page 465
- ❑ Removing and installing ⇒ page 627

17 - Exhaust gas recirculation cooler change-over valve - N345-
- ❑ Fitting location ⇒ page 465

18 - Exhaust gas recirculation control motor - V338-
- ❑ Fitting location ⇒ page 465

19 - Fuel temperature sender - G81-
- ❑ Fitting location ⇒ page 464

20 - Pressure retention valve or restrictor in fuel return line
- ❑ Fitting location ⇒ page 464
- ❑ Which component is installed depends on the model year
- ❑ In fuel return lines from cylinder banks 1 and 2
- ❑ The pressure retention valve maintains a residual pressure of approx. 10 bar in the return lines
- ❑ The restrictor maintains a residual pressure of approx. 4 bar in the return lines.
- ❑ This residual pressure is required for the control function of the piezo injectors
- ❑ The pressure retention valve/restrictor may only be renewed together with the fuel return lines.
- ❑ Checking pressure retention valve ⇒ page 499
- ❑ Checking restrictor ⇒ page 500

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21 - High-pressure fuel pump

- ❑ With fuel metering valve - N290-
- ❑ After renewing high-pressure pump, first fuel filling operation MUST be performed (it is important not to allow pump to run while it is still empty) ⇒ page 474
- ❑ After renewing high-pressure pump or fuel pressure regulating valve - N276- , learnt values must be re-adapted; see “Guided Functions” in vehicle diagnostic tester
- ❑ Exploded view - high-pressure pump ⇒ page 510
- ❑ Removing and installing ⇒ page 519

22 - Fuel metering valve - N290-

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

- ❑ Fitting location ⇒ page 465
- ❑ Removing, installing and testing ⇒ page 341

24 - Pump for exhaust gas recirculation cooler - V400-

- ❑ Fitting location ⇒ page 465

25 - Control unit for NOx sender - J583-

- ❑ Fitting location ⇒ page 465

26 - Radiator outlet coolant temperature sender - G83-

- ❑ Fitting location ⇒ page 464

27 - Injectors (piezo injectors)

- ❑ Cylinder bank 1
- ❑ Removing and installing ⇒ page 501

28 - Air mass meter - G70-

- ❑ Removing and installing ⇒ page 545

29 - Air filter bypass flap valve - N275-

- ❑ These components (bypass flap with air filter bypass flap valve - N275-) are not installed on certain equipment versions or on vehicles for certain export markets
- ❑ If fitted, the bypass flap is located in the air cleaner housing and the air cleaner bypass flap valve - N275- is located on the outside of the air cleaner housing
- ❑ Exploded view - air cleaner ⇒ page 476

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Components A to K are not shown in the illustration.

Engine compartment (left-side)

1 - Exhaust gas temperature sender 3 - G495-

- ❑ Fitting location ⇒ page 466

2 - NOx sender - G295-

- ❑ Fitting location ⇒ page 466

3 - Lambda probe - G39-

- ❑ Fitting location ⇒ page 466

4 - Engine control unit - J623-

- ❑ Fitting location ⇒ page 463
- ❑ Removing and installing ⇒ page 555

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5 - Charge pressure sender - G31-

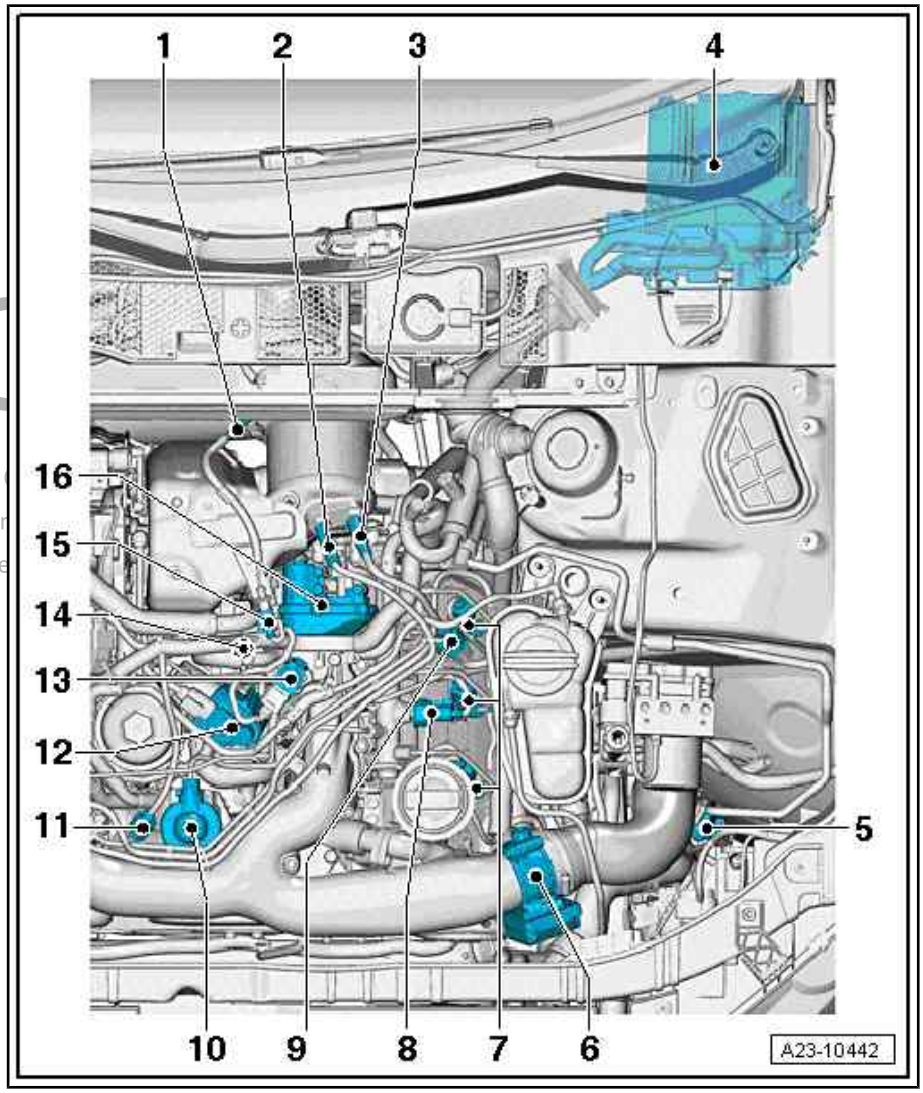
- ❑ With intake air temperature sender - G42-
- ❑ Fitting location ⇒ page 466
- ❑ Removing and installing ⇒ page 445

6 - Throttle valve module - J338-

- ❑ 9 Nm

7 - Injectors (piezo injectors)

- ❑ Cylinder bank 2
- ❑ Removing and installing



⇒ page 501

8 - Fuel pressure sender - G247-

- ❑ Fitting location ⇒ page 464
- ❑ Removing and installing ⇒ page 542

9 - Connector for Lambda probe - G39-

- ❑ Fitting location ⇒ page 466

10 - High-pressure fuel pump

- ❑ With fuel metering valve - N290-
- ❑ After renewing high-pressure pump, first fuel filling operation MUST be performed (it is important not to allow pump to run while it is still empty) ⇒ page 474
- ❑ After renewing high-pressure pump or fuel pressure regulating valve - N276- , learnt values must be re-adapted; see “Guided Functions” in vehicle diagnostic tester
- ❑ Exploded view - high-pressure pump ⇒ page 513
- ❑ Removing and installing ⇒ page 519

11 - Fuel metering valve - N290-

12 - Exhaust gas recirculation control motor - V338-

- ❑ Fitting location ⇒ page 465

13 - Exhaust gas recirculation cooler change-over valve - N345-

- ❑ Fitting location ⇒ page 465

14 - Exhaust gas recirculation temperature sensor - G98-

- ❑ Fitting location ⇒ page 465
- ❑ Removing and installing ⇒ page 627

15 - Electrical connector for exhaust gas temperature sender 3 - G495-

16 - Intake manifold flap 2 motor - V275-

A - Relay and fuse holder in electronics box in plenum chamber (left-side)

- ❑ Removing and installing engine control unit - J623- with altitude sensor ⇒ page 557
- ❑ Fitting locations ⇒ Current flow diagrams, Electrical fault finding and Fitting locations

B - Low heat output relay - J359- and high heat output relay - J360-

- ❑ Fitting locations ⇒ Current flow diagrams, Electrical fault finding and Fitting locations

C - Brake light switch - F- and brake pedal switch - F47-

- ❑ In footwell on brake pedal

D - Accelerator position sender - G79- and accelerator position sender 2 - G185-

- ❑ Fitting location ⇒ page 463
- ❑ Removing and installing ⇒ Fuel supply system; Rep. gr. 20 ; Accelerator mechanism; Removing and installing accelerator pedal module with accelerator position sender -G79- / -G185-

E - Exhaust gas temperature sender 1 - G235-

- ❑ On turbocharger
- ❑ 45 Nm
- ❑ Removing and installing ⇒ page 612

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F - Engine speed sender - G28-

- ❑ Fitting location ⇒ page 467

G - Supplementary fuel pump - V393-

- ❑ Fitting location ⇒ page 467
- ❑ Removing and installing ⇒ Fuel supply system; Rep. gr. 20 ; Fuel pump

H - Oil pressure switch - F22-

- ❑ Fitting location ⇒ page 466
- ❑ Removing and installing ⇒ page 341

I - Valve for oil pressure control - N428-

- ❑ Fitting location ⇒ page 466
- ❑ Removing and installing ⇒ page 341

J - Glow plugs

- ❑ Glow plug 1 - Q10-
- ❑ Glow plug 2 - Q11- with cylinder 2 combustion chamber pressure sender - G678-
- ❑ Glow plug 3 - Q12-
- ❑ Glow plug 4 - Q13-
- ❑ Glow plug 5 - Q14- with cylinder 5 combustion chamber pressure sender - G681-
- ❑ Glow plug 6 - Q15-
- ❑ Removing and installing ⇒ page 635

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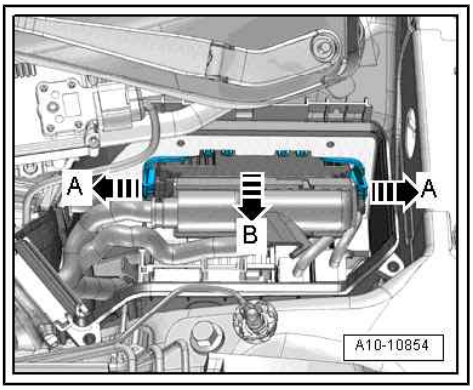
K - Particulate filter

- ❑ Fitted on underbody
- ❑ Combined with a catalytic converter
- ❑ Adaption must be performed after renewing this component
- ❑ Removing and installing ⇒ page 578

After renewing exhaust gas pressure sensor 1 - G450- and/or particulate filter, adaption must be performed in order to reset learnt values. The adaption procedure is described in the Guided Fault Finding or Guided Functions; use a vehicle diagnostic tester .

Fitting location of engine control unit - J623-

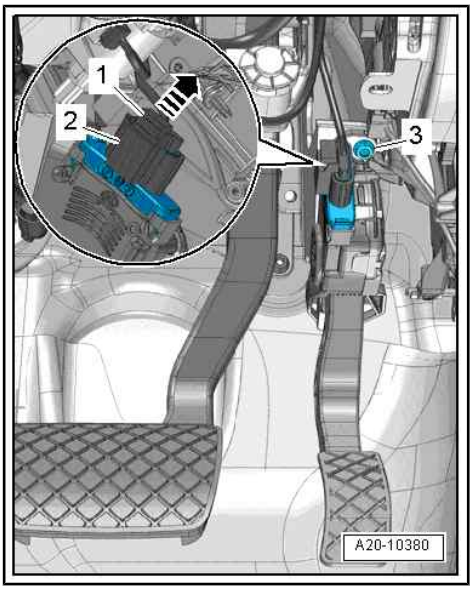
- ♦ In left electronics box in engine compartment



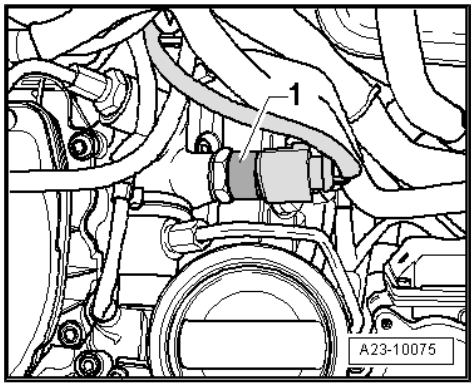
Accelerator position sender - G79- and accelerator position sender 2 - G185-

Note

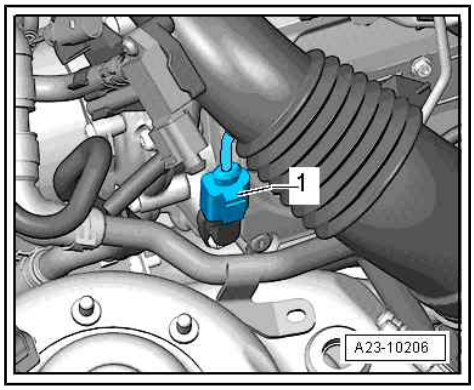
The accelerator position sender - G79- and accelerator position sender 2 - G185- are integrated in the accelerator pedal module and cannot be renewed individually.



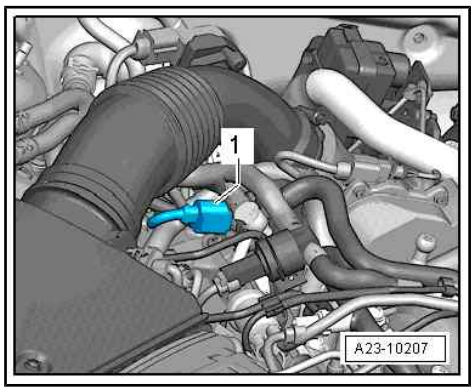
Fuel pressure sender - G247- -1- on cylinder bank 2 (left-side)



Hall sender - G40- -1- on cylinder bank 1 (right-side)



Fuel pressure regulating valve - N276- -1-

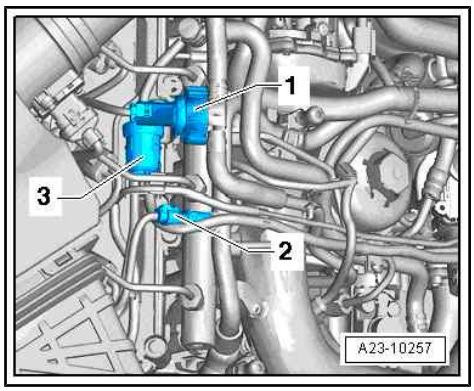


Components on cylinder bank 1 (right-side)

1 - Fuel temperature sender - G81-

2 - Radiator outlet coolant temperature sender - G83-

3 - Pressure retention valve or restrictor in fuel return line



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Fitting locations

1 - Electrical connector for exhaust gas recirculation temperature sensor - G98-

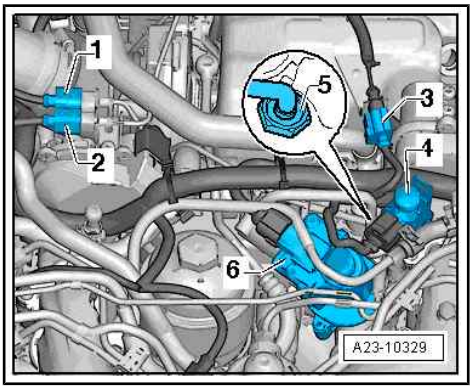
2 - Electrical connector for exhaust gas temperature sender 1 - G235-

3 - Electrical connector for exhaust gas temperature sender 3 - G495-

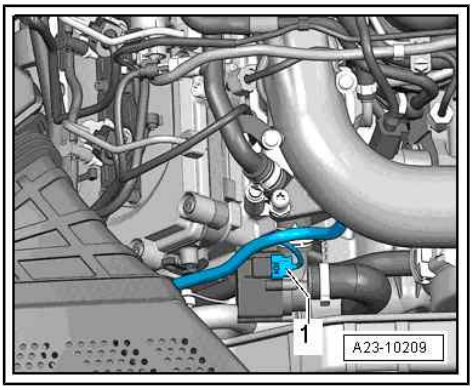
4 - Exhaust gas recirculation cooler change-over valve - N345-

5 - Exhaust gas recirculation temperature sensor - G98-

6 - Exhaust gas recirculation control motor - V338-



Pump for exhaust gas recirculation cooler - V400- -1-

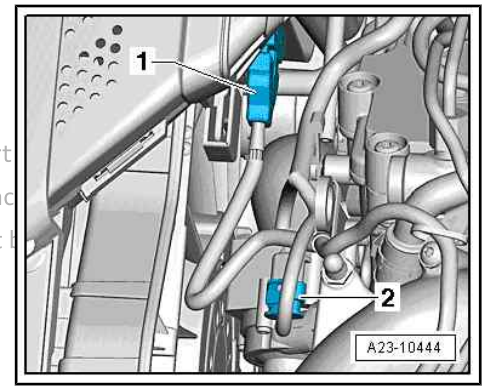


Fitting locations (front right)

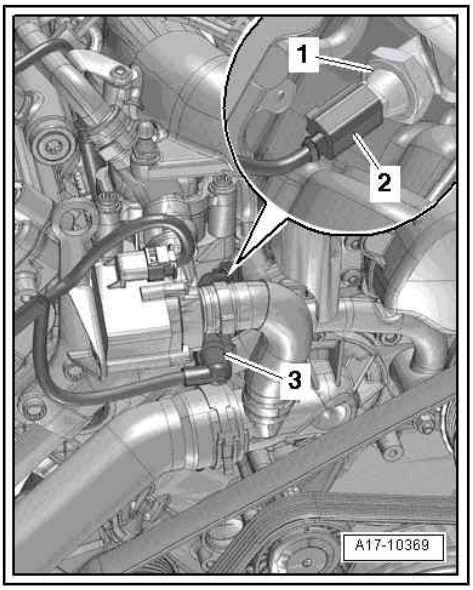
1 - Control unit for NOx sender - J583-

2 - Pump for exhaust gas recirculation cooler - V400-

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Oil pressure switch for reduced oil pressure - F378- -1-

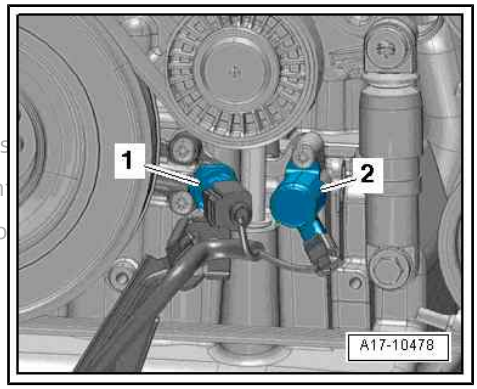


Oil pressure control

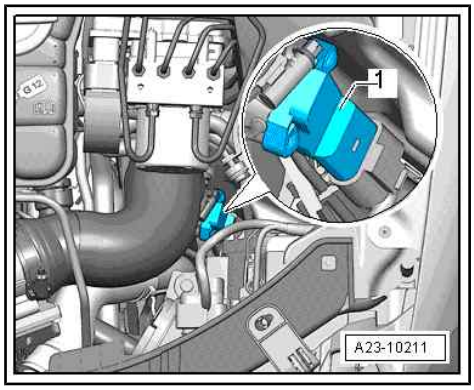
1 - Oil pressure switch - F22-

2 - Valve for oil pressure control - N428-

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Charge pressure sender - G31- with intake air temperature sender - G42- -1-



Fitting locations

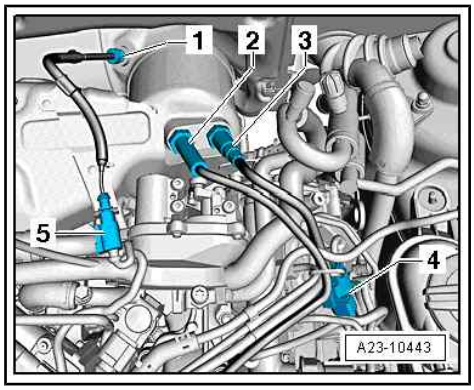
1 - Exhaust gas temperature sender 3 - G495-

2 - NOx sender - G295-

3 - Lambda probe - G39-

4 - Connector for Lambda probe - G39-

5 - Electrical connector for exhaust gas temperature sender 3 - G495-



Fitting locations

1 - Pressure differential sender - G505-

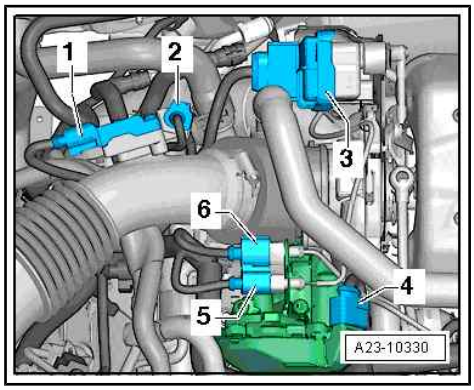
2 - Electrical connector for exhaust gas temperature sender 4 - G648-

3 - Control unit for turbocharger 1 - J724-

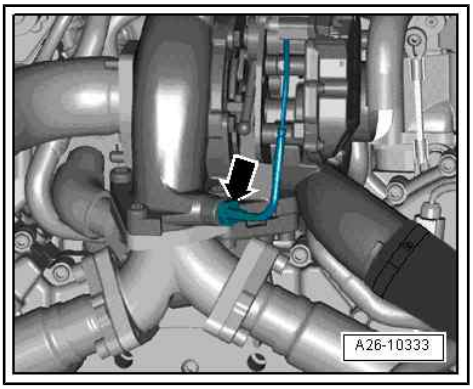
4 - Intake manifold flap motor - V157-

5 - Electrical connector for exhaust gas temperature sender 1 - G235-

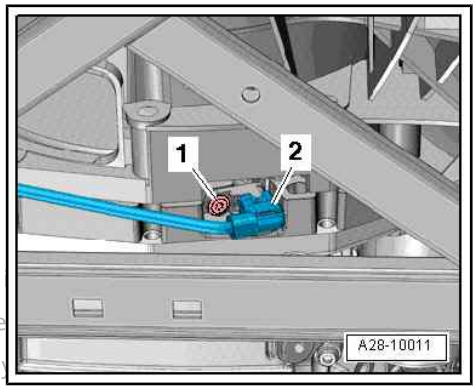
6 - Electrical connector for exhaust gas recirculation temperature sensor - G98-



Exhaust gas temperature sender 1 - G235- -arrow-



Engine speed sender - G28- -2-



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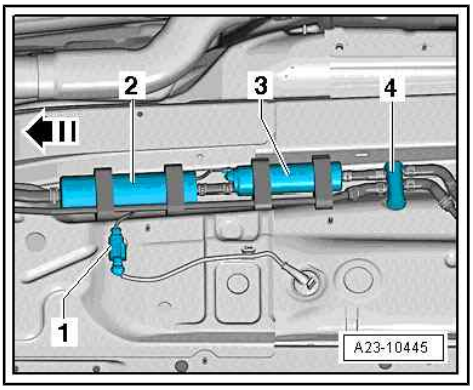
Supplementary fuel pump - V393- -3-

1 - Electrical connector for supplementary fuel pump - V393-

2 - Fuel filter

3 - Supplementary fuel pump - V393-

4 - Preheating valve

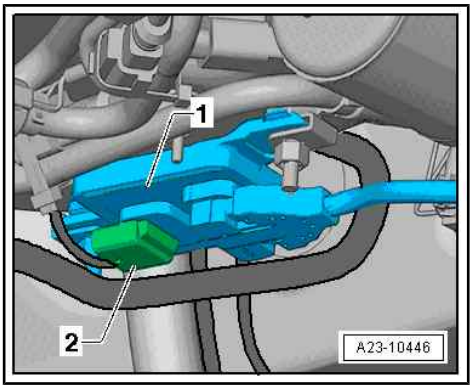


Note

-Arrow- points in direction of travel.

Control unit for NOx sender 2 - J881- -1-

Underneath cover for active tank, in front of rear left wheel



1.3 Exploded view - fuel system

⇒ "1.3.1 Exploded view - fuel system, engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB, CCLA", page 468

⇒ "1.3.2 Exploded view - fuel system, engine code CAPA", page 471

1.3.1 Exploded view - fuel system, engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB, CCLA

WARNING

- *Always read rules for cleanliness and instructions for working on fuel system ⇒ page 9 .*
- *Follow these instructions and rules for cleanliness before starting work and while working on the fuel system.*

Caution

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 474 .*
- *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.*

Perform first fuel filling after installing high-pressure pump ⇒ page 474 .

Note

The high-pressure pump will be damaged if the first fuel filling operation is not performed.

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1 - Fuel return line

- ❑ To fuel tank
- ❑ Fuel return line must not be kinked, damaged or clogged

2 - Fuel supply line

- ❑ From fuel filter

3 - Banjo bolt for fuel return line

4 - Fuel temperature sender - G81-

5 - Bolt

6 - Bracket

7 - Fuel pressure regulating valve - N276-

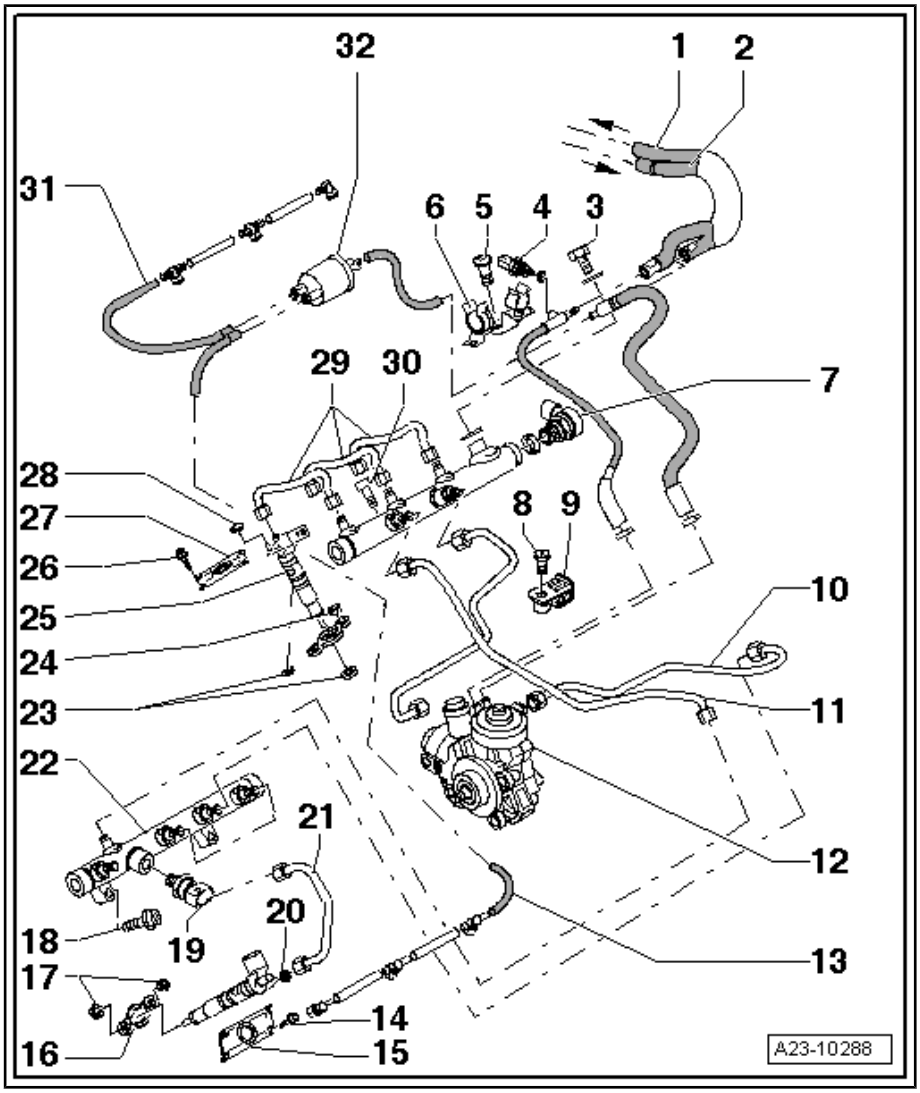
- ❑ Located on cylinder bank 1
- ❑ Cannot be re-installed
- ❑ After renewing high-pressure pump or fuel pressure regulating valve - N276- , learnt values must be re-adapted; see “Guided Functions” in vehicle diagnostic tester
- ❑ Removing and installing ⇒ page 540

8 - Bolt

9 - Bracket

10 - High-pressure fuel pipe

- ❑ Between high-pressure



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pump and fuel rail

11 - High-pressure fuel pipe

- ❑ Between fuel rail on cylinder bank 1 and fuel rail on cylinder bank 2
- ❑ When re-installing high-pressure fuel pipe, check taper seats visually for damage, scores and corrosion (always renew if damaged)
- ❑ If high-pressure pipe is not OK, always renew high-pressure pipe

12 - High-pressure fuel pump

- ❑ With fuel metering valve - N290-
- ❑ After renewing high-pressure pump, first fuel filling MUST be performed (it is important not to allow pump to run while it is still empty) ⇒ page 474
- ❑ After renewing high-pressure pump or fuel pressure regulating valve - N276- , learnt values must be re-adapted; see “Guided Functions” in ⇒ Vehicle diagnostic tester
- ❑ ⇒ “5.1.1 Exploded view - high-pressure pump, engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB, CCLA”, page 510
- ❑ Removing and installing ⇒ page 519

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13 - Fuel return lines

- ❑ The fuel return lines must not be dismantled; if necessary they must be renewed as a complete unit.
- ❑ After replacement, engine must be run at idling speed for approx. 2 minutes to bleed fuel system; then check fuel return line for leaks

14 - Bolt

- ❑ Cover for injector on cylinder head cover
- ❑ 5.5 Nm

15 - Cover for injector

16 - Clamping piece

- ❑ Renew

17 - Hexagon flange nut

- ❑ For clamping piece
- ❑ 10 Nm

18 - Bolt

- ❑ For fuel rail on cylinder bank 2
- ❑ 22 Nm

19 - Fuel pressure sender - G247-

- ❑ 30 Nm
- ❑ Located on cylinder bank 2
- ❑ Removing and installing ⇒ page 542

20 - Seal

- ❑ Renew

21 - High-pressure fuel pipes

- ❑ For cylinder bank 2
- ❑ 25 Nm

22 - Fuel rail

- ❑ For cylinder bank 2

23 - Seals

- ❑ Renew

24 - Hexagon flange nut

- ❑ For clamping piece
- ❑ 10 Nm

25 - Injector

- ❑ Use a coloured pen to mark injectors and corresponding high-pressure pipes and cylinder for re-installation; pay attention to markings when installing
- ❑ Always renew copper seal when removing and installing
- ❑ 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 501

26 - Bolt

- ❑ Cover for injector on cylinder head cover
- ❑ 5.5 Nm

27 - Cover for injector

28 - Seal

- ❑ Renew

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29 - High-pressure pipes

- ❑ For cylinder bank 1

30 - Bolt

- ❑ For fuel rail on cylinder bank 1
- ❑ 22 Nm

31 - Fuel return lines

- ❑ The fuel return lines must not be dismantled; if necessary they must be renewed as a complete unit
- ❑ After replacement, engine must be run at idling speed for approx. 2 minutes to bleed fuel system. Then check fuel return lines for leaks

32 - Pressure retention valve or restrictor

- ❑ Which component is installed depends on the model year
- ❑ Maintains a residual pressure in fuel return hoses
- ❑ Cannot be renewed separately; if defective, renew fuel return hoses
- ❑ Checking pressure retention valve ⇒ page 499
- ❑ Checking restrictor ⇒ page 500

1.3.2 Exploded view - fuel system, engine code CAPA

WARNING

- *Always read rules for cleanliness and instructions for working on fuel system ⇒ page 9 .*
- *Follow these instructions and rules for cleanliness before starting work and while working on the fuel system.*

1 - Fuel supply line

- ❑ From fuel filter

2 - Fuel return line

- ❑ To fuel tank
- ❑ Fuel return line must not be kinked, damaged or clogged

3 - Banjo bolt for fuel return line

4 - Clip

5 - Fuel temperature sender - G81-

6 - Clip

7 - Fuel pressure regulating valve - N276-

- ❑ Located on cylinder bank 1
- ❑ Cannot be re-installed
- ❑ Removing and installing ⇒ page 540

8 - Banjo bolt for fuel return line

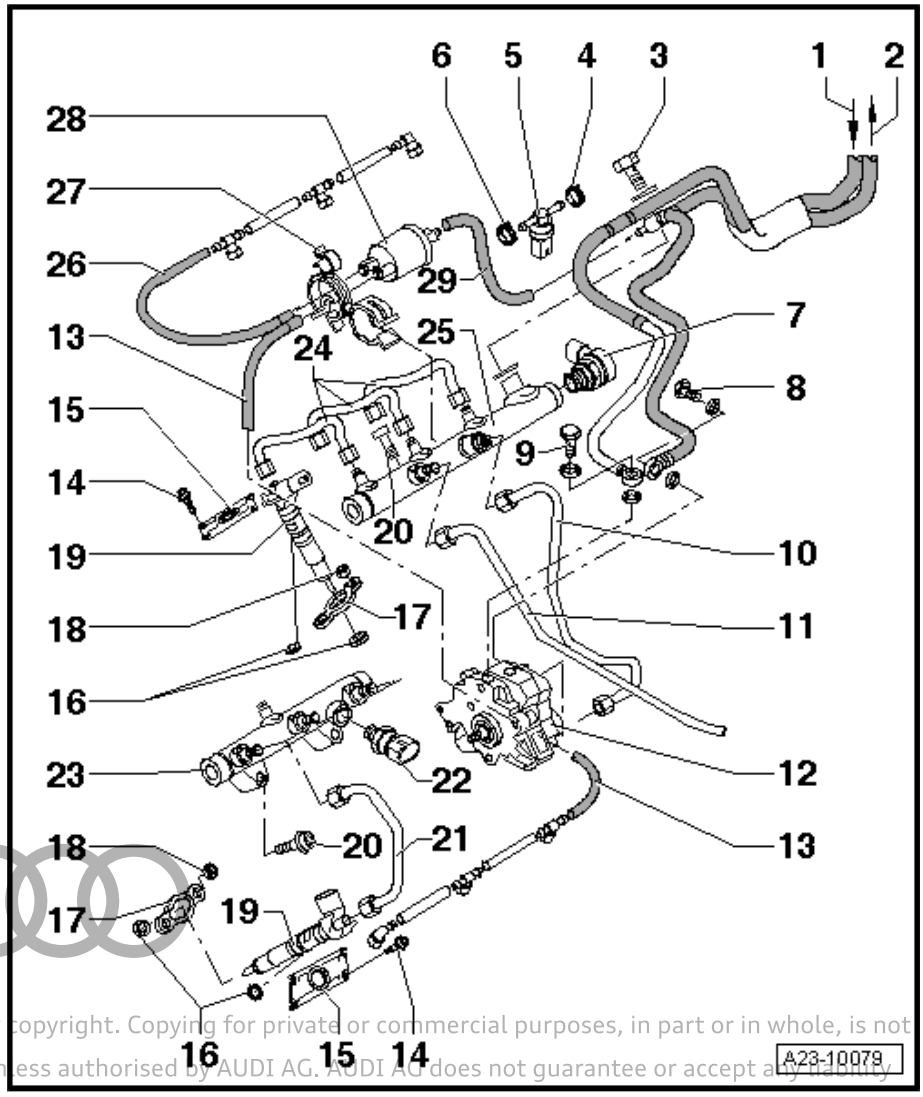
- ❑ 25 Nm

9 - Banjo bolt for fuel supply line

- ❑ 25 Nm

10 - High-pressure fuel pipe

- ❑ Between high-pressure pump and fuel rail on



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cylinder bank 1

11 - High-pressure fuel pipe

- ❑ Between fuel rail on cylinder bank 1 and fuel rail on cylinder bank 2
- ❑ When re-installing high-pressure fuel pipe, check taper seats visually for damage, scores and corrosion (always renew if damaged)
- ❑ If they are to be re-installed, the injectors, high-pressure fuel pipes and clamping pieces must always be re-fitted in their original positions (i.e. on the same cylinder)

12 - High-pressure fuel pump

- ❑ With fuel metering valve - N290-
- ❑ Exploded view - high-pressure pump ⇒ page 513
- ❑ Removing and installing ⇒ page 521

13 - Fuel return line

- ❑ The fuel return lines must not be dismantled; if necessary they must be renewed as a complete unit
- ❑ After replacement, engine must be run at idling speed for approx. 2 minutes to bleed fuel system; then check fuel return line for leaks

14 - Bolt

- ❑ Cover for injector on cylinder head cover
- ❑ 5.5 Nm

15 - Cover for injector

16 - Seal

17 - Clamping piece

- ❑ Renew

18 - Hexagon flange nut

- ❑ For clamping piece
- ❑ 10 Nm

19 - Injector

- ❑ Use a coloured pen to mark injectors and corresponding high-pressure pipes and cylinder for re-installation; pay attention to markings when installing
- ❑ Always renew copper seal when removing and installing
- ❑ 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 501

20 - Bolt

- ❑ 22 Nm

21 - High-pressure pipes

- ❑ For cylinder bank 2
- ❑ 25 Nm

22 - Fuel pressure sender - G247-

- ❑ 30 Nm
- ❑ Located on cylinder bank 2
- ❑ Removing and installing ⇒ page 542

23 - Fuel rail

- ❑ For cylinder bank 2

24 - High-pressure pipes

- ❑ For cylinder bank 1

25 - Fuel rail

- ❑ For cylinder bank 1

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26 - Fuel return line

- ❑ The fuel return lines must not be dismantled; if necessary they must be renewed as a complete unit
- ❑ After replacement, engine must be run at idling speed for approx. 2 minutes to bleed fuel system; then check fuel return line for leaks

27 - Retainer

- ❑ For fuel return line

28 - Pressure retention valve

- ❑ In fuel return lines from cylinder banks 1 and 2
- ❑ The pressure retention valve maintains a residual pressure of approx. 10 bar in the return lines
- ❑ This residual pressure is required for the control function of the piezo injectors
- ❑ The pressure retention valve may only be renewed together with the fuel return lines
- ❑ After replacement, engine must be run at idling speed for approx. 2 minutes to bleed fuel system
- ❑ Checking pressure retention valve ⇒ page 499

29 - Fuel return line

- ❑ Common return line to fuel tank

1.4 Filling and bleeding fuel system

⇒ “1.4.1 Filling and bleeding fuel system - all engine codes except CAPA”, page 474

1.4.1 Filling and bleeding fuel system - all engine codes except CAPA

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.

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Risk of irreparable damage to fuel pump

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

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

– Fill/bleed fuel pump.

Proceed as follows to fill fuel system with fuel:

• Check fuel gauge in instrument cluster; fuel gauge needle must indicate that fuel is above reserve level.

– Connect a vehicle diagnostic tester .

– Switch on ignition.

– Select “Engine electronics” in vehicle self-diagnosis.

– Then select “Basic setting”.

– Select “Checking fuel system pressurisation pump” from the list.

– Press “start” button.

– The fuel pumps start running.

– The fuel pump must run for approx. 3 minutes to ensure that the fuel system is filled sufficiently with fuel.

Note

To repeat basic setting, switch ignition off and on once. Then start basic setting again.

– Start engine after filling fuel system.
– Run engine at moderate speed for several minutes and then switch off.
– Check fuel system for leaks.
– Erase entry in event memory using diagnostic tester.
– 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.

– Interrogate event memory again.

1.5 Checking fuel system for leaks

– 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 check high-pressure system again for leaks.

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2 Air cleaner

⇒ “2.1 Exploded view - air cleaner housing”, page 476

⇒ “2.2 Removing and installing air filter element”, page 478

⇒ “2.3 Removing and installing air cleaner housing”, page 479

2.1 Exploded view - air cleaner housing

1 - Hose clip

2 - Air hose

- ❑ To throttle valve module - J338-
- ❑ When installing, pay attention to marking ⇒ page 477

3 - Hose clip

4 - Air mass meter

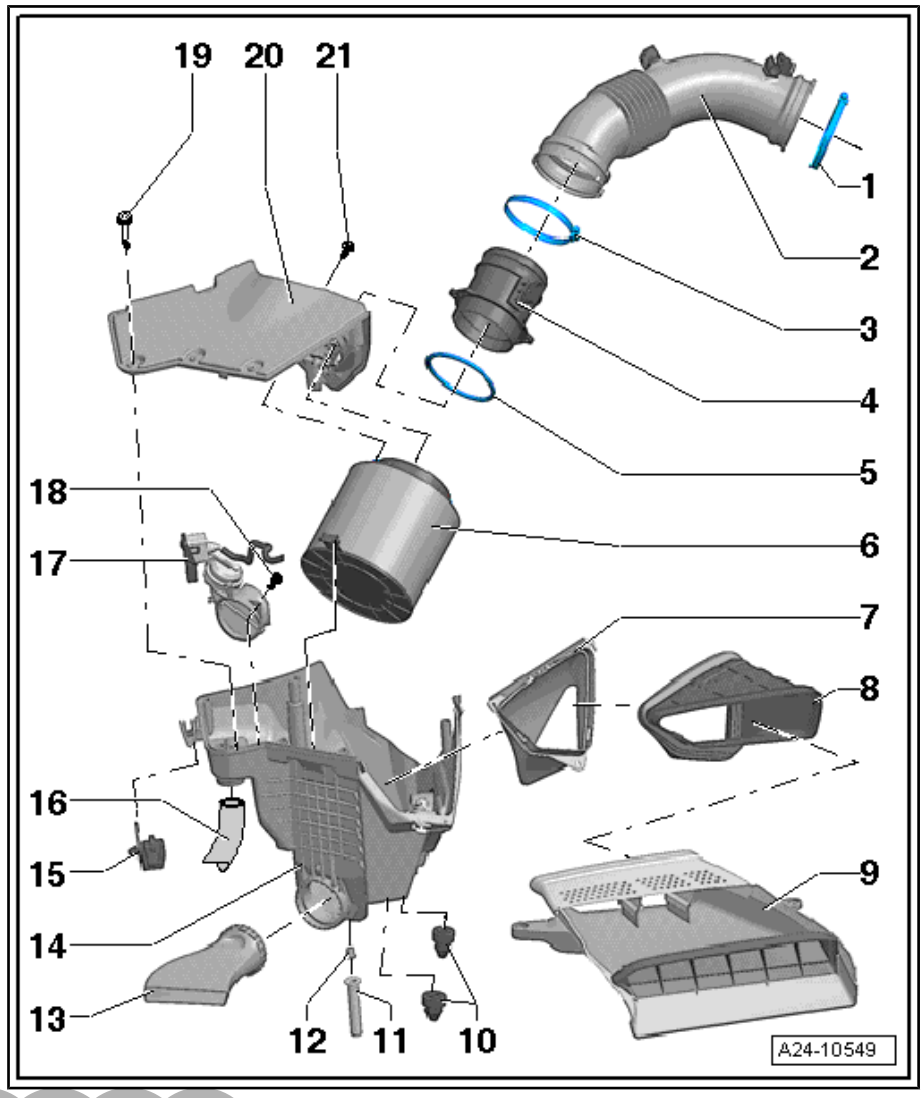
- ❑ Removing and installing air mass meter - G70- with intake air temperature sender - G42- ⇒ page 545
- ❑ 5 Nm

5 - O-ring

- ❑ Renew if damaged

6 - Air filter element

- ❑ Always use genuine part for 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 478
- ❑ 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

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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)

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

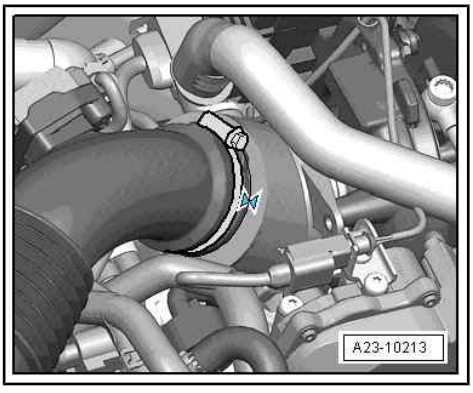
20 - Air cleaner (top section)

- ❑ 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.

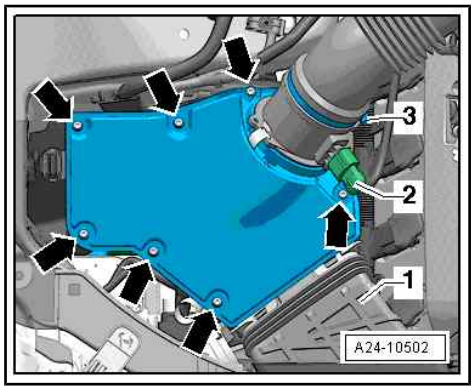


2.2 Removing and installing air filter element

Removing

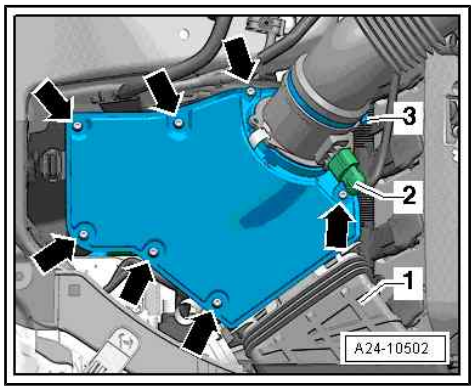
– Remove air duct -1-.

– Unplug electrical connector -2- at air mass meter - G70- .



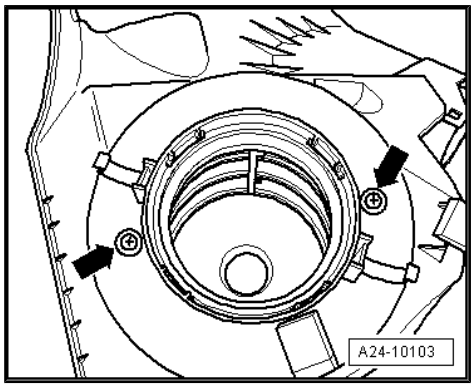
– Release hose clip -3- and detach air hose from air mass meter - G70- .

– 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

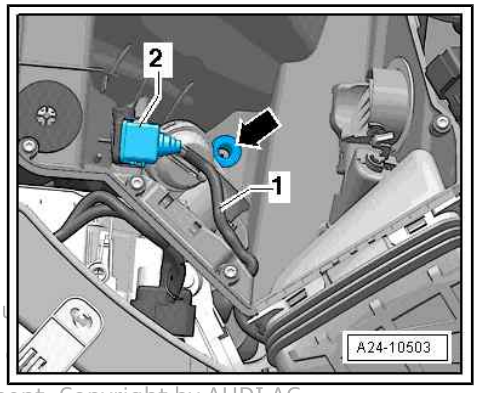
To ensure the proper function of the air mass meter - G70- it is important to observe the following instructions.

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 .*

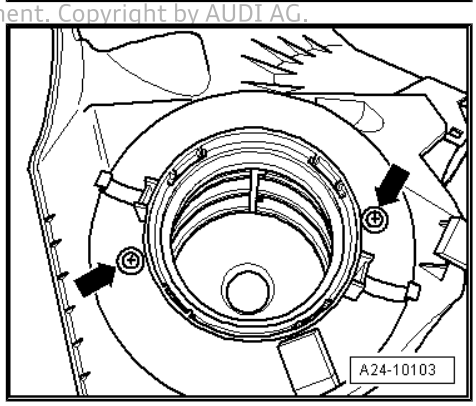
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– Check whether water drain hose -arrow- in air cleaner (bottom section) is dirty or blocked (clean if necessary).
– Clean salt residue, dirt and leaves out of air cleaner housing (top and bottom sections); use a vacuum cleaner if necessary.
– Check 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).

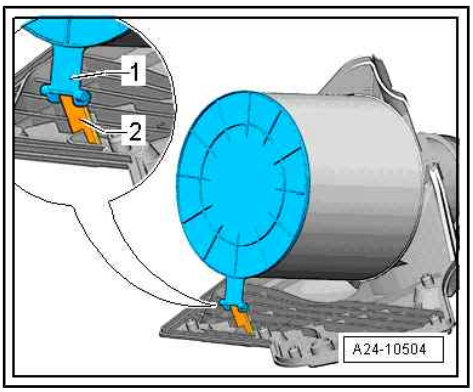


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– Screw air cleaner (top section) onto new air filter element.



– 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).

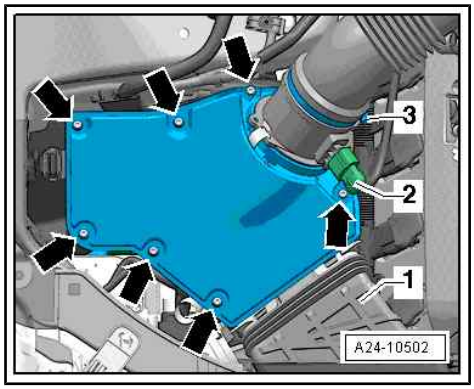
– Then secure top section of air cleaner to bottom section.
– Make sure that air hose is correctly seated at air mass meter - G70- .
– Re-attach electrical connector to air mass meter - G70- .
– The remaining installation steps are carried out in the reverse sequence.

2.3 Removing and installing air cleaner housing

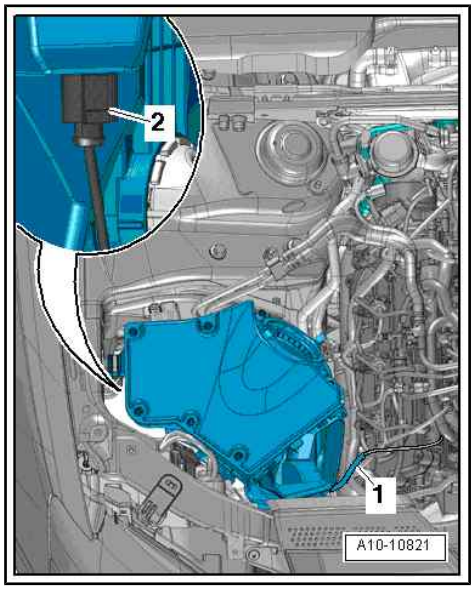
Removing

– 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- .



– 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

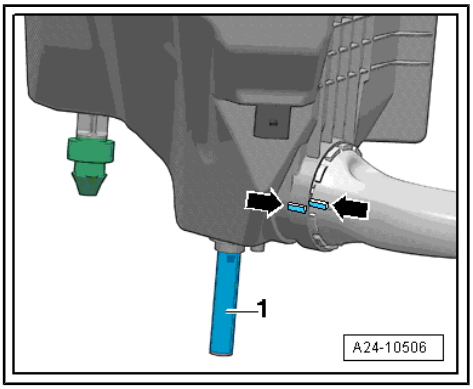
To ensure the proper function of the air mass meter - G70- it is important to observe the following instructions.

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.*

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– If hot air intake is fitted (for countries with cold climates only), make sure that air intake connection has engaged properly -arrows- (pay attention to marking).
– 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).



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.

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3 Intake manifold

⇒ “3.1 Exploded view - intake manifold”, page 482

⇒ “3.2 Removing and installing intake manifold (top section)”, page 483

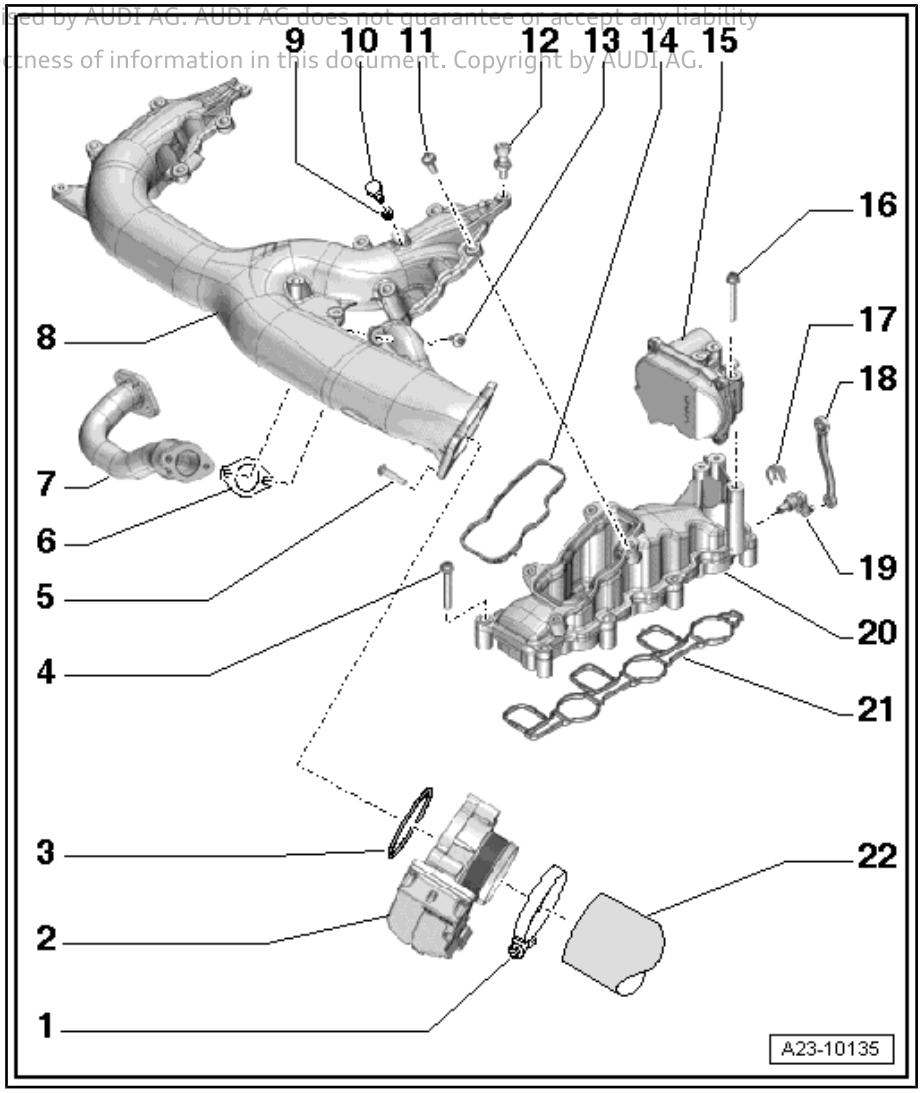
⇒ “3.3 Removing and installing intake manifold (bottom section)”, page 485

3.1 Exploded view - intake manifold

Note

The illustration shows the top section of the intake manifold and the bottom section of the intake manifold (left-side).

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1 - Retaining clamp
- ❑ 5.5 Nm
- ❑ Reinforced

2 - Throttle valve module - J338-
- ❑ 9 Nm

3 - O-ring
- ❑ Renew

4 - Bolt
- ❑ 9 Nm
- ❑ Tighten in stages and in diagonal sequence

5 - Bolt
- ❑ 9 Nm

6 - Gasket
- ❑ Renew

7 - Connecting pipe for exhaust gas recirculation

8 - Intake manifold (top section)
- ❑ Removing and installing ⇒ page 483

9 - Seal
- ❑ Renew

10 - Plug
- ❑ 10 Nm

11 - Bolt
- ❑ 9 Nm

12 - Mounting pin for engine cover panel
- ❑ 5 Nm

13 - Bolt
- ❑ 9 Nm

14 - Gasket

- ❑ Check for damage and renew if necessary

15 - Intake manifold flap motor

- ❑ Cylinder bank 1 (right-side): intake manifold flap motor - V157-
- ❑ Cylinder bank 2 (left-side): intake manifold flap motor - V275-

16 - Bolt

- ❑ 10 Nm

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17 - Retaining clip

18 - Connecting rod

19 - Coupling

20 - Intake manifold (bottom section)

21 - Gasket

- ❑ Check for damage and renew if necessary

22 - Air hose

- ❑ Must be free of oil and grease when installing

3.2 Removing and installing intake manifold (top section)

Removing

WARNING

- *Always read rules for cleanliness and instructions for working on fuel system ⇒ page 9 .*
- *Follow these instructions and rules for cleanliness before starting work and while working on the fuel system.*

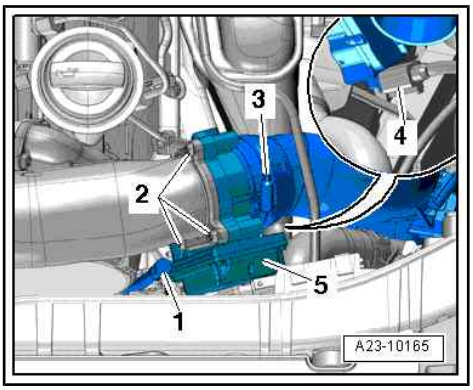
– Remove engine cover panel ⇒ page 162 .

– Pull oil dipstick -1- out of guide tube.

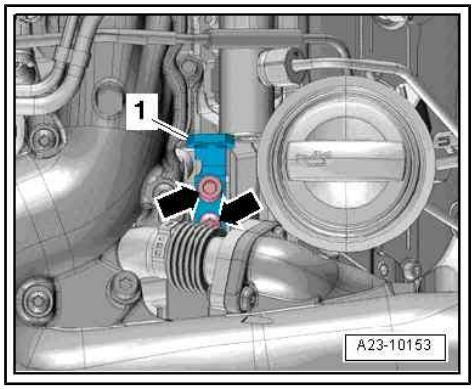
– Loosen hose clip -3- and remove air hose.

– Remove bolt -2- and unplug electrical connector -4-.

– Detach throttle valve module - J338- -item 5-.



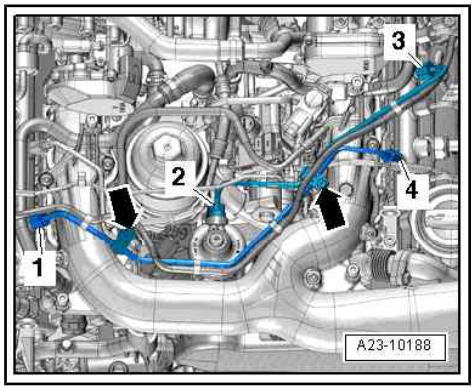
– Unscrew bolts -arrows- and remove engine lifting eye (front left) -1-.



Vehicles with engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB, CCLA:

– Unscrew bolts -arrows- and remove retaining clips.

– Remove union nuts -1- and -4- and detach high-pressure pipe.



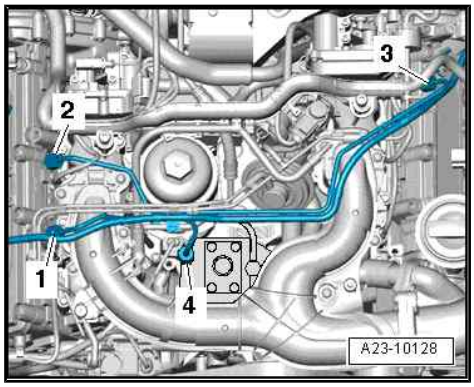
Note

Disregard -items 2 and 3-.

Vehicles with engine code CAPA:

– Unscrew union nuts -1- and -3-.

– Move high-pressure pipes clear and detach.



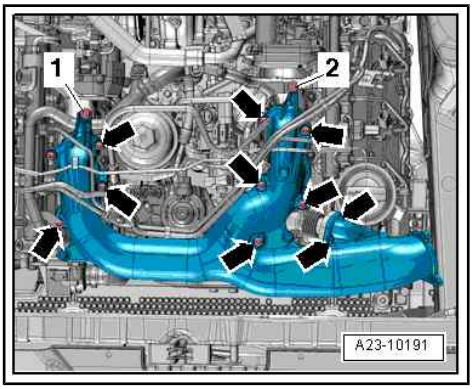
Note

-Item 2- can be disregarded.

All vehicles (continued):

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– Unscrew mounting pins for engine cover panel -1- and -2-.
– Remove bolts -arrows- and detach intake manifold (top section).



Installing

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

Note

- *Renew seals and gaskets.*
- *Hose connections and charge air system 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) ⇒ Parts catalogue .*
- *To ensure that the charge air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.*

Tightening torques

- ⇒ “3.1 Exploded view - intake manifold”, page 482

Vehicles with engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB, CCLA:

– Install high-pressure pipe ⇒ page 507 .

3.3 Removing and installing intake manifold (bottom section)

⇒ “3.3.1 Removing and installing intake manifold (bottom section, left-side)”, page 485

⇒ “3.3.2 Removing and installing intake manifold (bottom section, right-side)”, page 488

3.3.1 Removing and installing intake manifold (bottom section, left-side)

Removing

WARNING

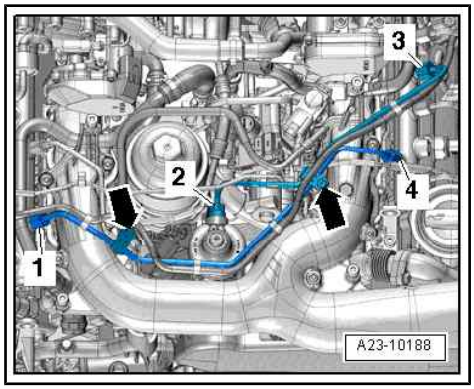
- ***Always read rules for cleanliness and instructions for working on fuel system ⇒ page 9 .***
- ***Follow these instructions and rules for cleanliness before starting work and while working on the fuel system.***

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Vehicles with engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB, CCLA:

– Unscrew bolts -arrows- and remove retaining clips.

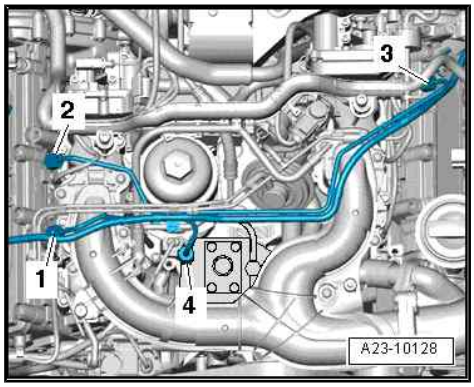
– Unscrew union nuts -1 ... 4- and detach high-pressure pipes.



Vehicles with engine code CAPA:

– Unscrew union nuts -1- and -3-.

– Move high-pressure pipes clear and detach.



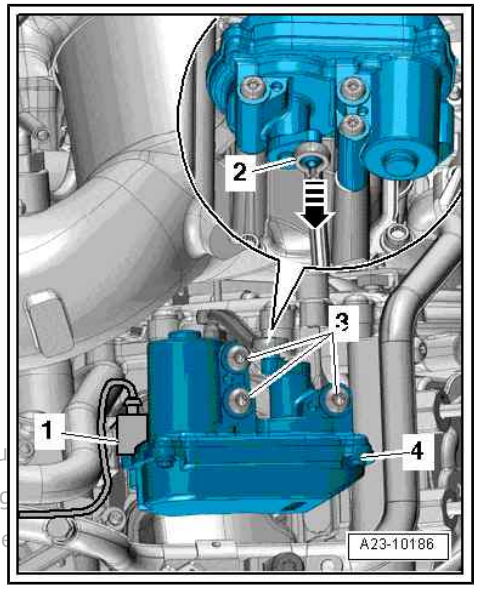
Note

-Item 2- can be disregarded.

All vehicles (continued):

– Remove intake manifold (top section) ⇒ page 483 .

– Carefully press connecting rod -2- off intake manifold flap 2 motor - V275- in direction of -arrow- (observe note).



Note

Proceed carefully when pressing connecting rod off ball stud (risk of breaking).

– Unplug electrical connector -1-.

– Unscrew bolts -3- and detach intake manifold flap motor - V275- -item 4-.

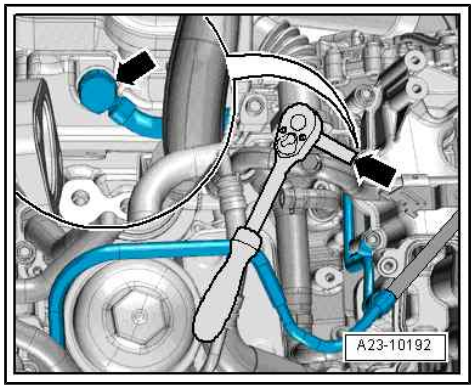
– Unplug electrical connectors for glow plugs on cylinders 4, 5 and 6.

– Take exhaust gas recirculation cooler change-over valve - N345- -item 1- out of bracket.

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ation in this docume

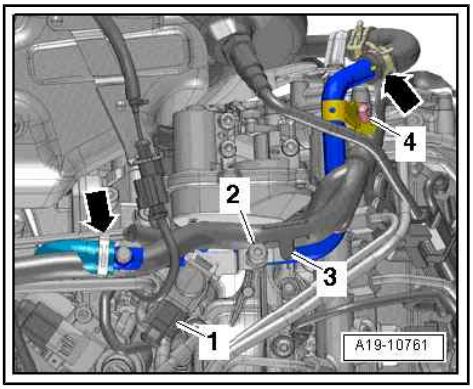
Vehicles with engine codes CAPA, CAMA, CAMB:

– Use jointed wrench to unscrew banjo bolt -arrow- securing coolant bleeder line.



Vehicles with engine codes CCWA, CCWB, CGKA, CGKB, CCLA:

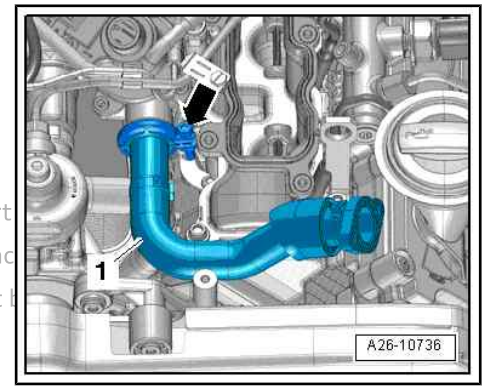
– Remove bolt -4-.



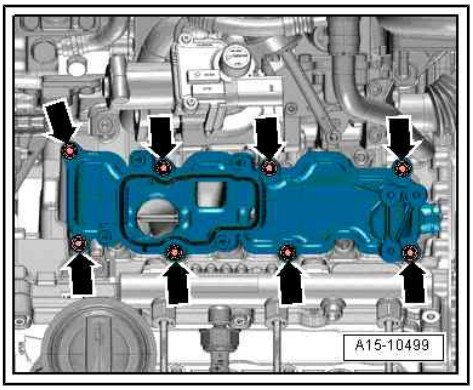
– Release clamp -arrow- and detach exhaust gas recirculation pipe -1-.

All vehicles (continued):

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– Remove bolts -arrows-.
– Press coolant bleeder line to one side and detach bottom section of intake manifold (left-side) to the front.



Note

Block off intake ports in cylinder head with a clean rag.

Installing

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

Note

Renew seals and gaskets.

Tightening torques

◆ ⇒ “3.1 Exploded view - intake manifold”, page 482

– Before installing intake manifold (bottom section), screw in banjo bolt for coolant bleeder pipe 2 to 3 turns with new seals (only for vehicles with engine codes CAPA, CAMA, CAMB).
– Tighten banjo bolt for coolant bleeder line to 15.5 Nm.
– Install intake manifold (top section) ⇒ page 483 .
– Install high-pressure pipes ⇒ page 507 .

3.3.2 Removing and installing intake manifold (bottom section, right-side)

Removing

WARNING

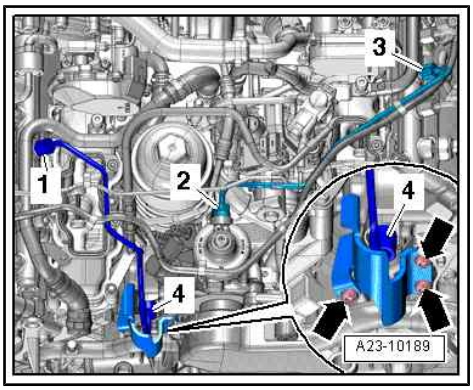
- *Always read rules for cleanliness and instructions for working on fuel system ⇒ page 9 .*
- *Follow these instructions and rules for cleanliness before starting work and while working on the fuel system.*

– Remove engine cover panel ⇒ page 162 .

Vehicles with engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB, CCLA:

– Unscrew bolts -arrows- and remove protective plate for high-pressure pipe.

– Remove union nuts -1- and -4- and detach high-pressure pipe.

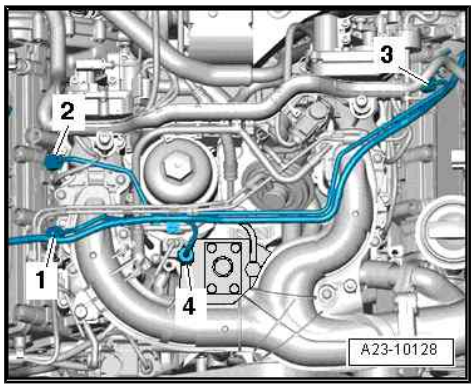


Note

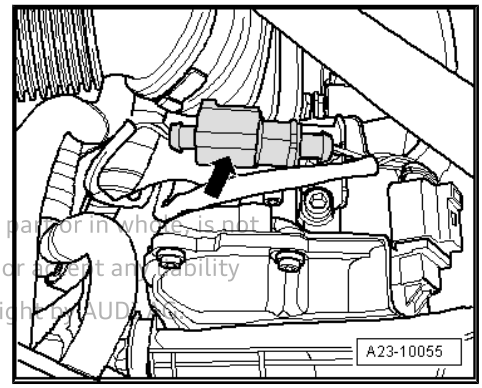
Disregard -items 2, 3-.

Vehicles with engine code CAPA:

– Unscrew union nuts -1 ... 4- and detach high-pressure pipes.



– Take electrical connector -arrow- for exhaust gas temperature sender 2 - G448- out of bracket and unplug.

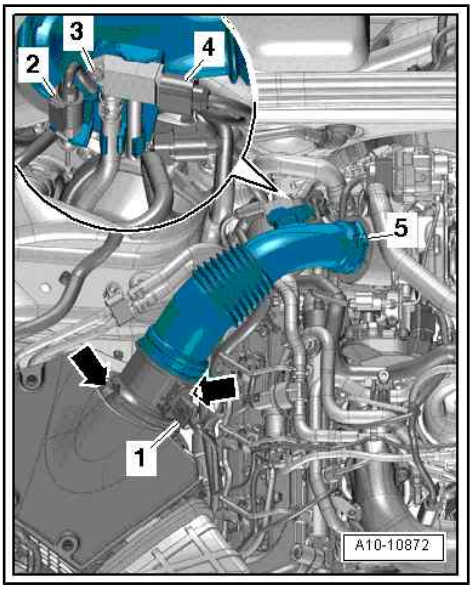


All vehicles (continued):

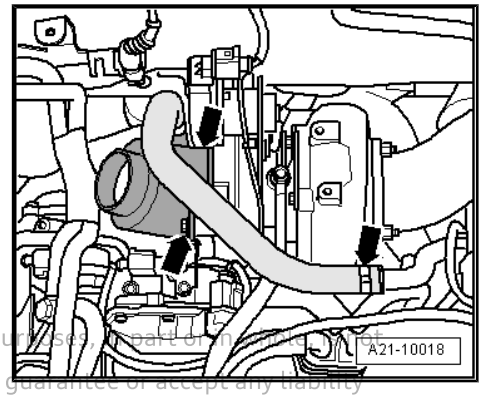
– Remove intake manifold (top section) ⇒ page 483 .

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– Unplug electrical connector -1- at air mass meter - G70- .
– Unscrew bolt -3- and move clear exhaust gas pressure sensor 1 - G450- -item 4- at air pipe.
– Move clear electrical connector -2- for exhaust gas temperature sender 3 for cylinder bank 1 - G496- at air pipe.
– Remove air hose and air mass meter - G70- . To do so, release hose clip -5- and clamps -arrows-.

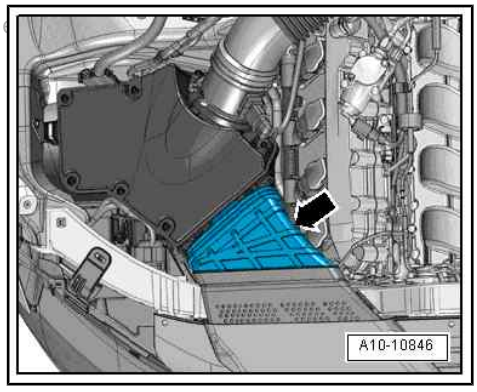


– Unscrew bolts -left arrows-, detach air hose -right arrow- and remove air intake connection with air hose.

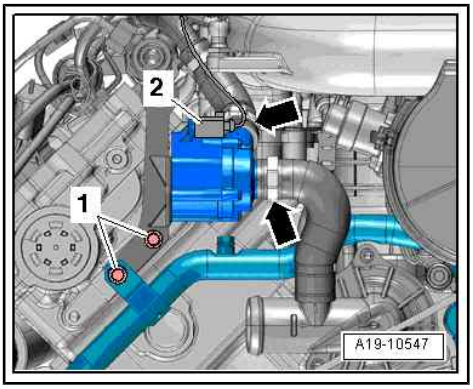


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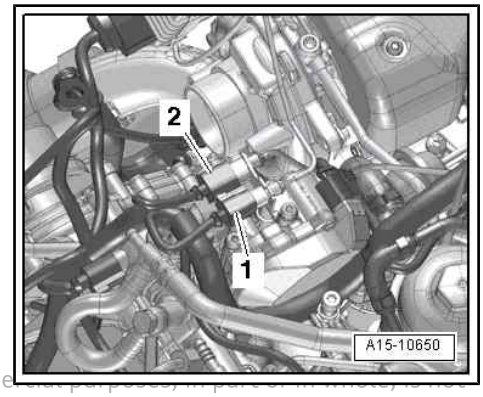
– Remove air duct -arrow-.



– Unplug electrical connector -2-.
– Remove bolts -1-.



– Pull electrical connectors -1 and 2- out of bracket.



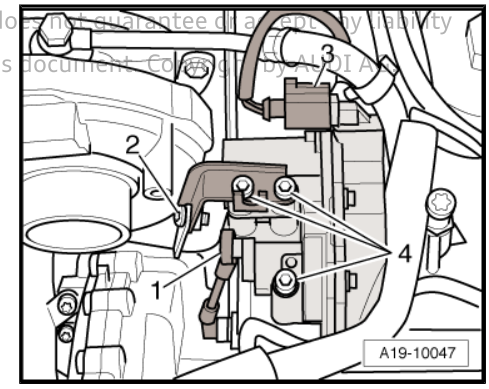
Note

Connector -2- is not fitted in this location on vehicles with engine code CAPA.

– Unplug electrical connector -3- at intake manifold flap motor - V157- .

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– Carefully press connecting rod -1- off intake manifold flap motor - V157- (observe note).



Note

- *Proceed carefully when pressing connecting rod off ball stud (risk of breaking).*
- *Bolt -2- is not fitted.*

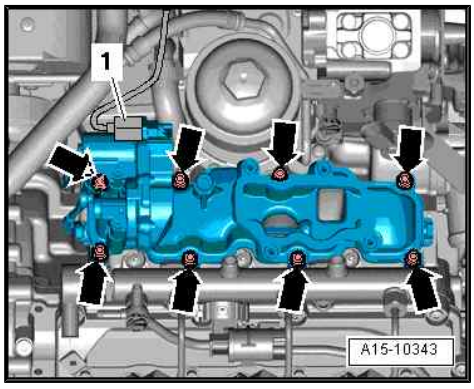
– Remove bolts -4-.

– Unplug electrical connectors at glow plugs for cylinders 1, 2 and 3.

– Move wiring harness clear to the side.

– Remove bolts -arrows-.

– Press coolant pipe to one side and take out intake manifold (bottom section, right-side).



Note

- *Disregard -item 1-.*
- *Block off intake ports in cylinder head with a clean rag.*

Installing

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

Note

Renew seals and/or gaskets.

Tightening torques

- ⇒ “3.1 Exploded view - intake manifold”, page 482
– Install intake manifold (top section) ⇒ page 483 .
– Install high-pressure pipes ⇒ page 507 .
– Check fuel system for leaks ⇒ page 475 .

4 Injectors/high-pressure reservoir (rail)

⇒ “4.2 Performing adaption of correction values for injectors”, page 491

⇒ “4.1 Checking injectors”, page 491

⇒ “4.4 Checking return flow rate of injectors with engine running”, page 494

⇒ “4.5 Checking return flow rate of injectors at starter cranking speed”, page 497

⇒ “4.6 Checking pressure retention valve in fuel return line”, page 499

⇒ “4.7 Checking restrictor in fuel return line”, page 500

⇒ “4.8 Removing and installing injectors”, page 501

⇒ “4.9 Removing and installing high-pressure pipes”, page 507

4.1 Checking injectors

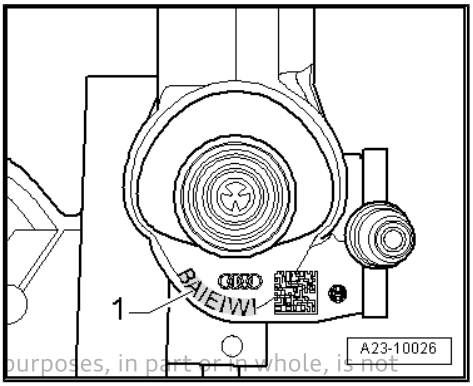
There are four different tests for checking the operation of the injectors.

- ⇒ “4.2 Performing adaption of correction values for injectors”, page 491
- ⇒ “4.3 Checking for injectors sticking open”, page 492
- ⇒ “4.4 Checking return flow rate of injectors with engine running”, page 494
- ⇒ “4.5 Checking return flow rate of injectors at starter cranking speed”, page 497

Perform the following tests first if the engine does not start at all:

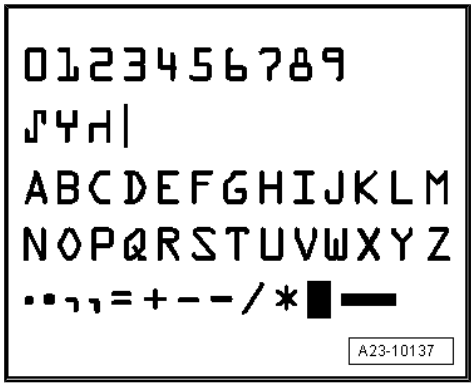
- ⇒ “4.3 Checking for injectors sticking open”, page 492
- ⇒ “4.5 Checking return flow rate of injectors at starter cranking speed”, page 497
- ⇒ “6.1 Checking fuel pressure regulating valve N276 ”, page 538

4.2 Performing adaption of correction values for injectors



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- 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



When a new injector is installed, the adaption value for the new injector must be written into 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 control unit.

The adaption procedure is described in the “Guided Fault Finding”. (The procedure is also described under “Guided Functions”.)

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.

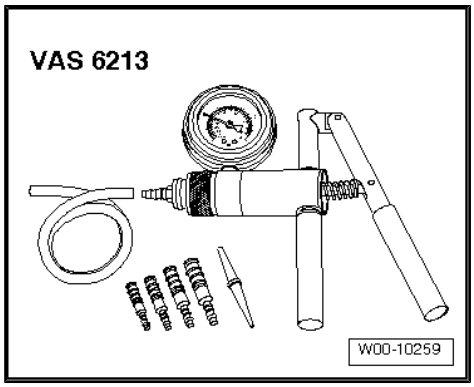
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4.3 Checking for injectors sticking open

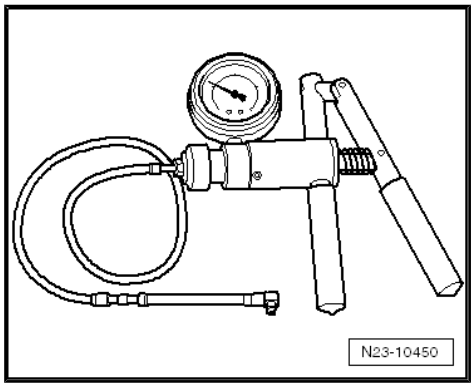
If one of the injectors is sticking open, this means that the injector needle is not closing fully and fuel escapes into the cylinder.

Special tools and workshop equipment required

- Hand vacuum pump - VAS 6213-



- Use a return line to make an -adapter-.



– Remove engine cover panel ⇒ page 162 .

– Clean all fuel rail connections with engine cleaner or brake cleaner and dry.

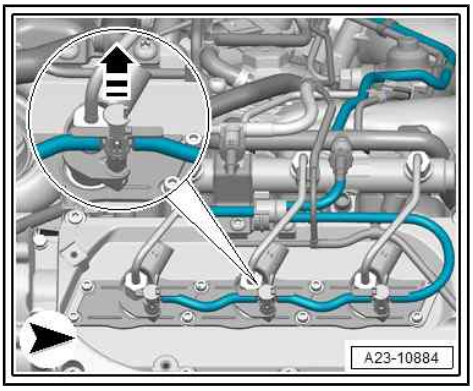
WARNING

- *Always read rules for cleanliness and instructions for working on fuel system ⇒ page 9 .*
- *Follow these instructions and rules for cleanliness before starting work and while working on the fuel system.*

Check all cylinders in turn.

Starting with cylinder 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-.



Note

Illustration shows cylinder bank 1.

– 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.

In the case of a faulty injector, the vacuum 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 501 .

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.

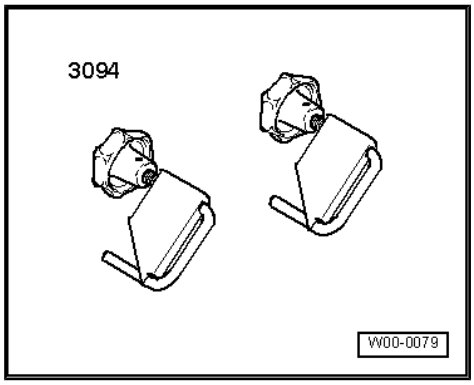
– Install engine cover panel ⇒ page 162 .

4.4 Checking return flow rate of injectors with engine running

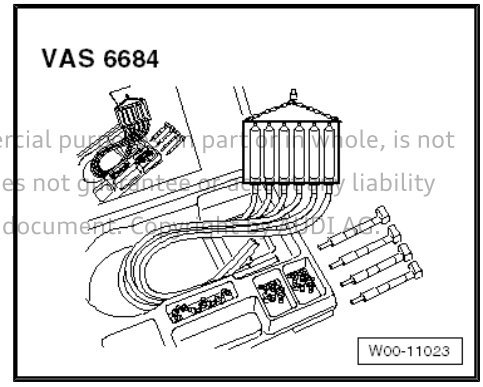
Checking return flow rate if engine does not start ⇒ page 497

Special tools and workshop equipment required

- Hose clamps, up to 25 mm - 3094-



- Return flow meter - VAS 6684-



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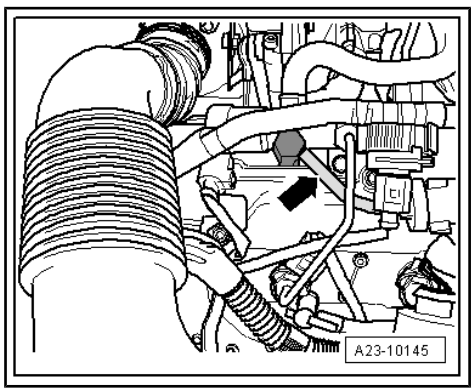
Checking return flow rate of all 6 injectors

– Remove engine cover panel ⇒ page 162 .

WARNING

- *Always read rules for cleanliness and instructions for working on fuel system ⇒ page 9 .*
- *Follow these instructions and rules for cleanliness before starting work and while working on the fuel system.*

– Disconnect hose connection -arrow- at banjo bolt connection.



– Seal off open return line connection with plug -1-.

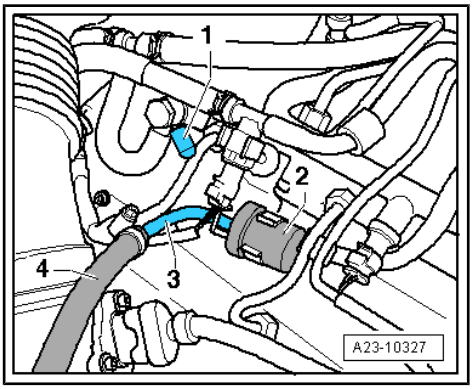
– Hold end of this hose -3- (lengthen with hose -4- if necessary) in a suitable container to measure total return flow rate.

– Start engine and let it idle for 2 minutes.

• Specification for 2 minutes: 0 ml to 50 ml

– If specification is attained, increase engine speed to 2000 ... 2500 rpm for approx. 2 minutes and then check return flow rate again.

• Specification for 2 minutes: less than 250 ml



Note

1000 ml = 1 litre

If specification is exceeded, this indicates that one or more injectors are defective. Check return flow rate from each injector individually.

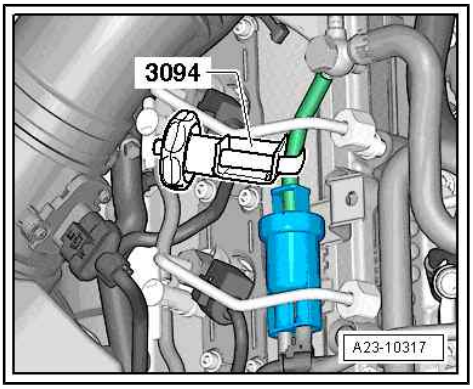
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Checking return flow rate of individual injectors

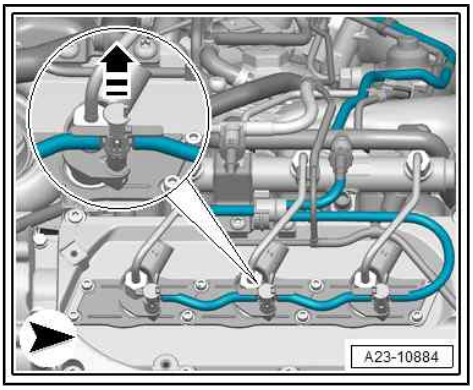
Each injector normally has a relatively low return flow rate. If the return flow rate at one injector is relatively high compared to the other injectors, that injector is probably defective.

– Clean all return line connections with engine cleaner or brake cleaner and dry.

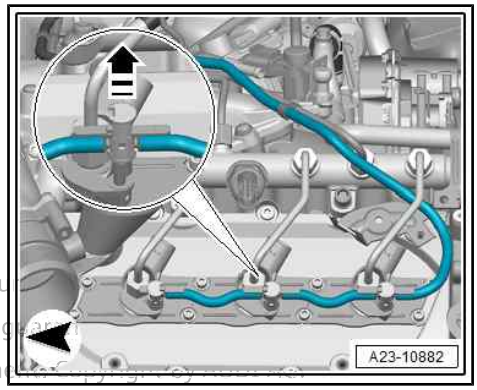
– Clamp off fuel return line downstream of pressure retention valve (restrictor) using hose clamp up to 25 mm - 3094- .



– 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-.

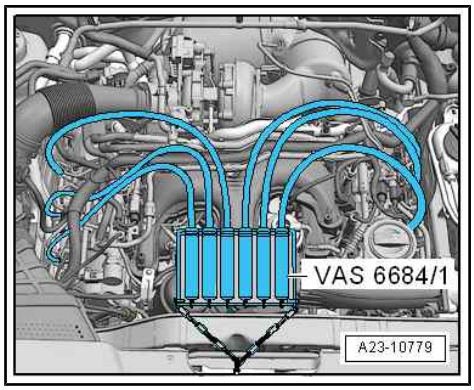


– Disconnect fuel return hoses from injectors on cylinder bank 2; to do so, press down both tabs and at the same time pull centre piece up to release connection -arrow-.



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– Connect hoses of return flow meter - VAS 6684- to return line connections of all six injectors.



– Start engine and let it idle for several minutes.

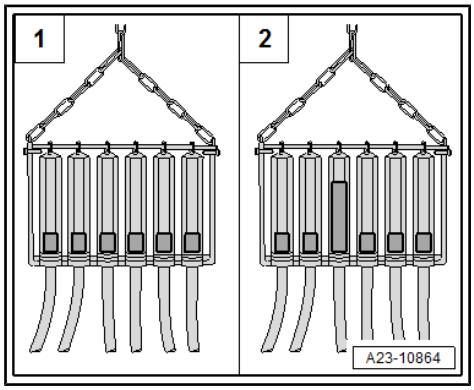
Caution

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 return lines must not differ by more than a small amount.

Evaluating return flow rate:



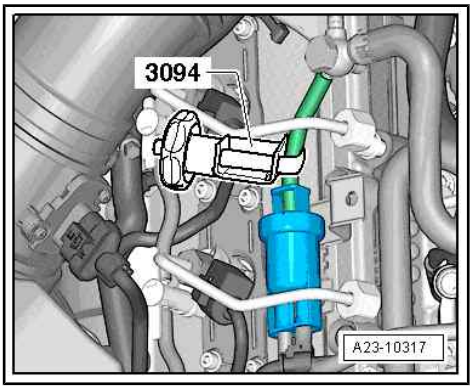
- 1. Injectors OK. Return flow rate approx. identical on all injectors.
- 2. Injector for cylinder 3 not OK. Return flow rate greater than three times the volume of smallest measured return flow rate.

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 501 .

– Remove hose clamp up to 25 mm - 3094- from fuel return line.



Installing fuel return lines

– Check O-ring for fuel return line connection for damage and deformation.

If O-ring is damaged or deformed, renew O-ring.

Note

Lubricate all 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 162 .

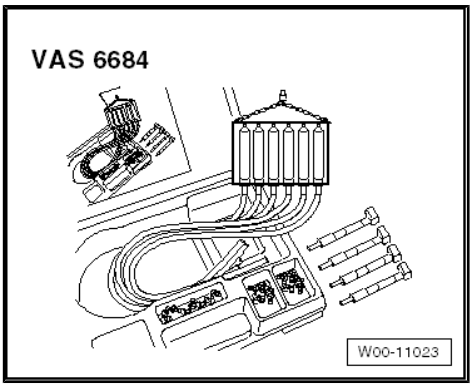
4.5 Checking return flow rate of injectors at starter cranking speed

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Only perform this test if the engine does not start at all.

Special tools and workshop equipment required

- Return flow meter - VAS 6684-
- 6 lengths of hose to fit return line connections on injectors



WARNING

- *Always read instructions on ⇒ page 9 when working on injectors.*
- *Follow these instructions and rules for cleanliness before starting work and while working on the fuel system.*

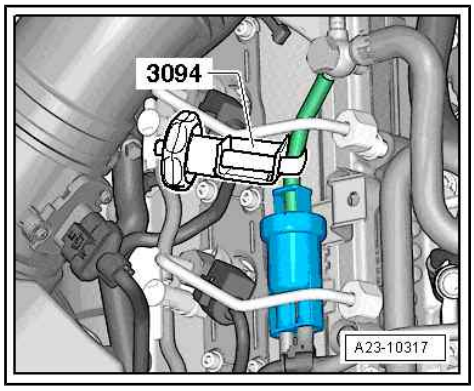
Procedure

Each injector normally has a relatively low return flow rate. If the return flow rate at one injector is relatively high compared to the other injectors, that injector is probably defective.

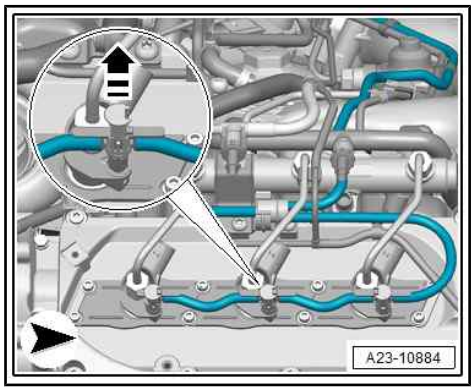
– Remove engine cover panel ⇒ page 162 .

– Clean all return line connections with engine cleaner or brake cleaner and dry.

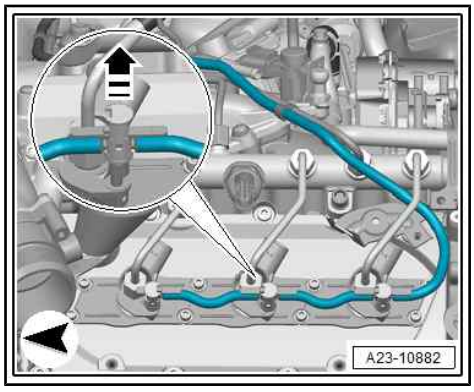
– Clamp off fuel return line downstream of pressure retention valve using hose clamp up to 25 mm - 3094- .



– 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-.



– 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-.

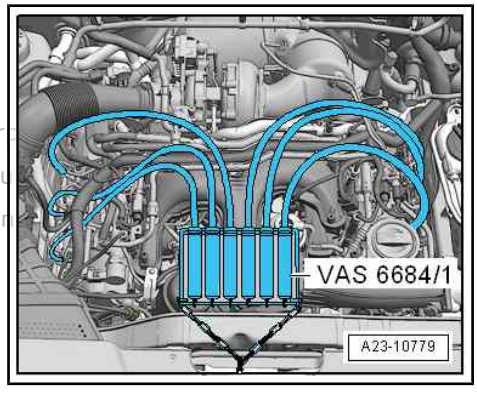


– Connect hoses of return flow meter - VAS 6684- to return line connections of all six injectors.

– Operate starter three times (wait approx. 20 seconds each time after operating starter to prevent it from overheating).

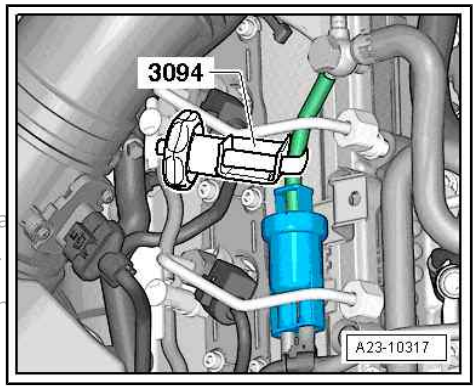
♦ Specification of return flow rate: 0 ml

– If fuel comes out of an injector, that injector must be renewed.



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– Remove hose clamp up to 25 mm - 3094- from fuel return line.



Installing fuel return lines

– Check O-ring for fuel return line connection for damage and deformation.

If O-ring is damaged or deformed, renew O-ring.

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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 162 .

4.6 Checking pressure retention valve in fuel return line

The pressure retention valve maintains a residual pressure of approx. 10 bar in the fuel return line.

This residual pressure is required for the control function of the injectors

Special tools and workshop equipment required

♦ Tester for fuel return system - 6330-

WARNING

- *Always read rules for cleanliness and instructions for working on fuel system ⇒ page 9 .*
- *Follow these instructions and rules for cleanliness before starting work and while working on the fuel system.*

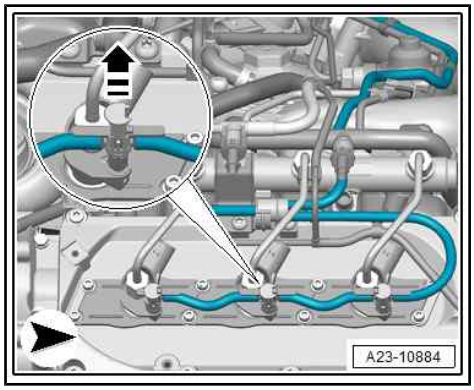
– Remove engine cover panel ⇒ page 162 .

– 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.

– Pull return line connection off cylinder 1; to do so, press both tabs down and at the same time pull centre piece up to release connection -arrow-.

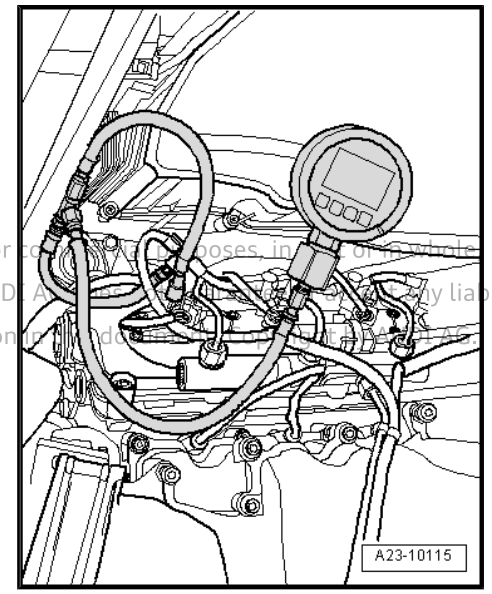


Note

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. 10 bar

If the value does not match the specification, fit a new pressure retention valve.



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4.7 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

♦ Tester for fuel return system - VAS 6330-

WARNING

- ***Always read rules for cleanliness and instructions for working on fuel system*** ***⇒ page 9*** ***.***
- ***Follow these instructions and rules for cleanliness before starting work and while working on the fuel system.***

– Remove engine cover panel.
– 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.

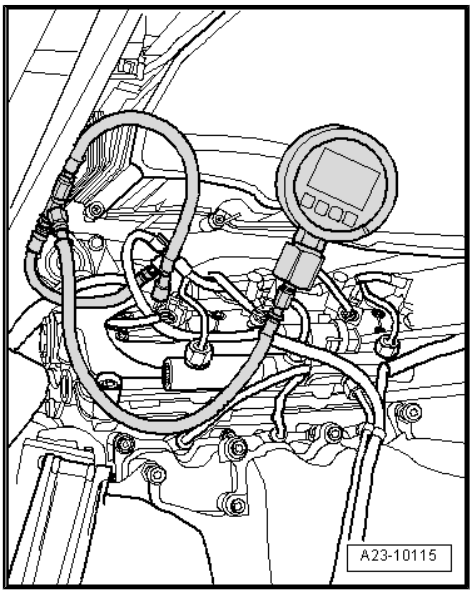
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Note

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

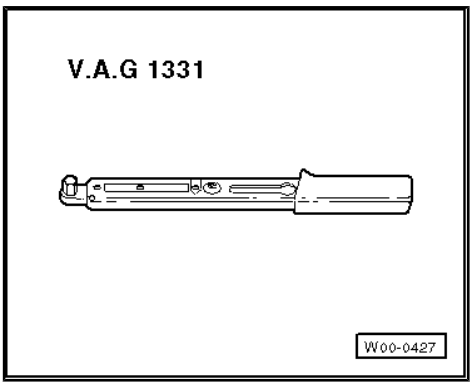
If specification is not attained, renew fuel return line with restrictor.



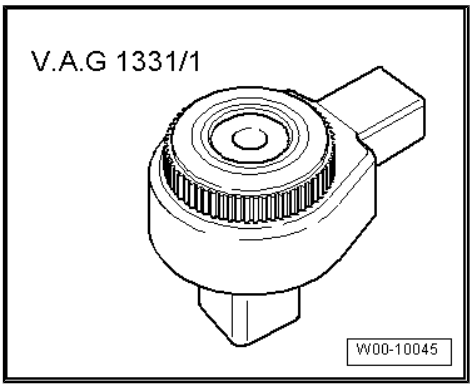
4.8 Removing and installing injectors

Special tools and workshop equipment required

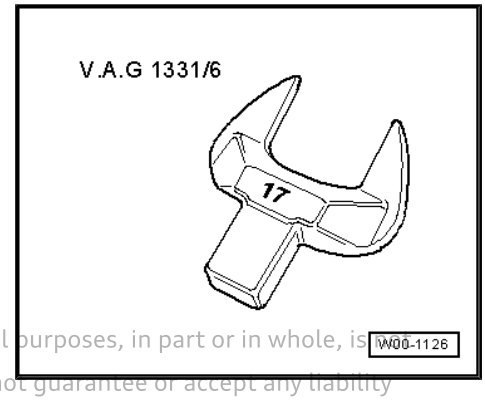
♦ Cleaning kit - VAS 6811-
♦ Torque wrench - V.A.G 1331-



♦ Ratchet - V.A.G 1331/1-

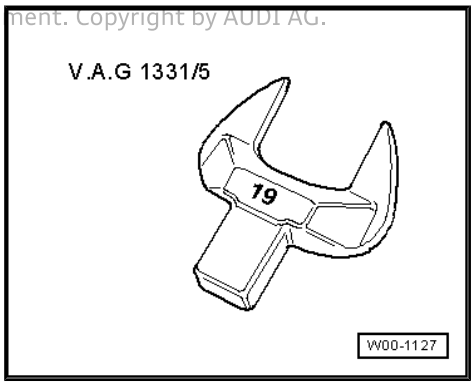


- Open end spanner insert, AF 17 - V.A.G 1331/6-

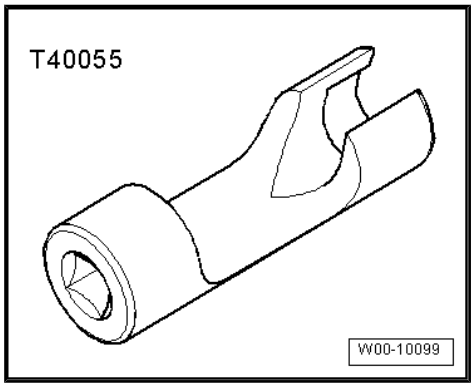


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- Open end spanner insert, AF 19 - V.A.G 1331/5- (engine code CAPA only)



- Socket - T40055-



Removing

WARNING

- *Always read rules for cleanliness and instructions for working on fuel system ⇒ page 9 .*
- *Follow these instructions and rules for cleanliness before starting work and while working on the fuel system.*

Note

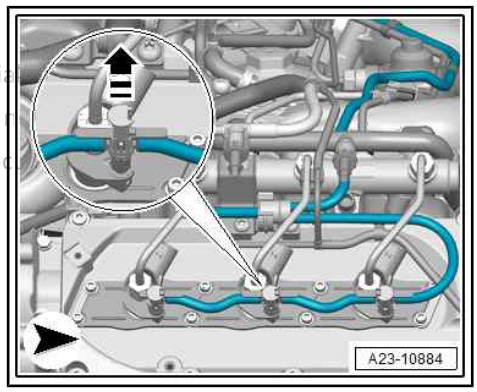
- *The following description shows the removal and installation of the injectors on cylinder bank 2 (left-side).*
- *Step required for cylinder bank 1 only: Remove top section of air cleaner with air mass meter ⇒ page 478 .*
- *On cylinder bank 2 the coolant expansion tank must be detached; coolant hoses remain connected.*

– Remove engine cover panel ⇒ page 162 .

Caution

- ***Mark cylinder numbers on injector units. They must always be re-installed on the same cylinders.***
- ***Observe rules for cleanliness when working on the injection system.***
- ***Plug open connections with suitable sealing caps immediately.***

– Pull return line connections off injectors; to do so, press both tabs down and at the same time pull centre piece up to release connection -arrow-.



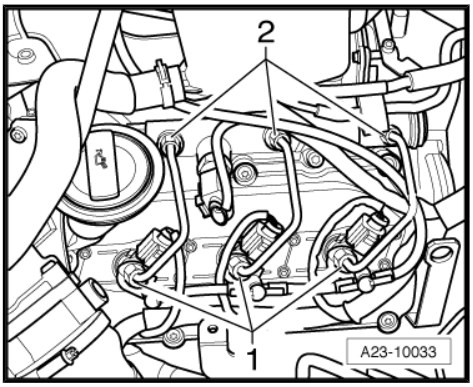
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Note

No dirt must be allowed to get into the disconnected return lines or the open connections on the injectors.

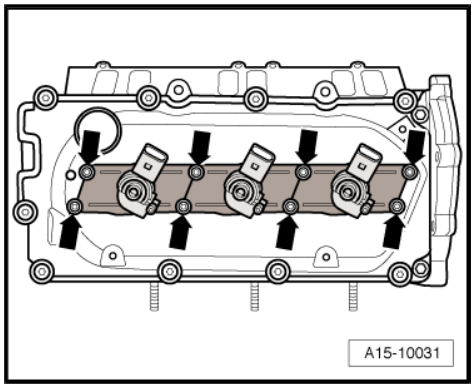
– Detach electrical connectors at injectors which are to be removed.

– Loosen union nuts for high-pressure pipes -1- at injectors using socket - T40055- .
– Loosen union nuts for high-pressure pipes at fuel rail using appropriate socket.
– Remove union nuts, carefully take out high-pressure pipes and put them down on a clean cloth.

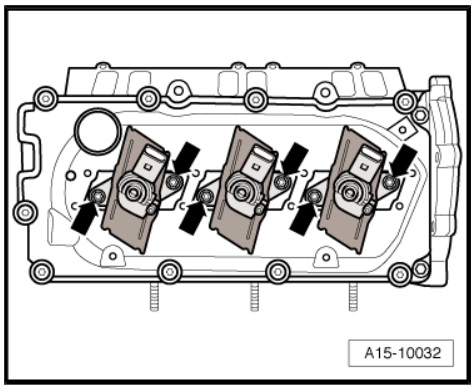


– Unbolt covers for injectors -arrows-.

– Pull covers upwards and turn them $^{1}/_{4}$ turn (90°).



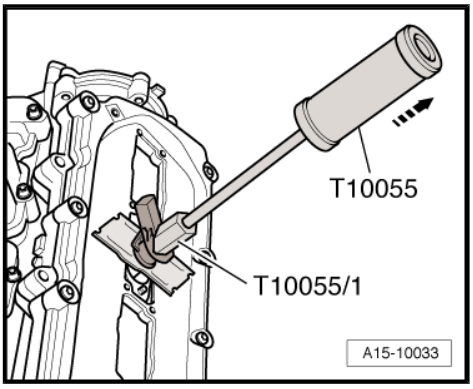
– Unbolt clamping pieces for injectors -arrows-.



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– Pull out injectors using puller - T10055- with adapter - T10055/1- .

– After removal, lay injectors on a clean cloth.



Installing new injectors

When installing new injectors, the following components must be renewed:

- Clamping piece
- Copper seal
- O-ring for injector bore
- O-ring for fuel return line connection

Note

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- *Note identification marks for cylinder allocation when re-installing high-pressure pipes.*
- *The high-pressure pipes can be re-used after performing the following checks:*
- *Check taper seats of high-pressure pipes for deformation and cracks.*
- *The bore of the pipe must not be distorted, restricted or otherwise damaged.*
- *Corroded pipes must not be used again.*

Installing used injectors

When re-installing used injectors, the following components must be renewed:

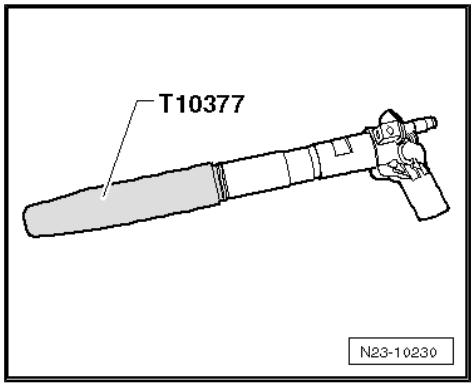
- Clamping piece
- Copper seal
- O-ring for injector bore
- O-ring for fuel return line connection

– Spray tip of injector nozzle with rust-releasing spray. Wait approx. 5 minutes and wipe off soot particles and oil with a cloth.

– To remove the old copper seal from the injector, clamp the seal carefully in a vice so that it is just held between the jaws without turning. Then carefully pull and twist the injector out of the copper seal by hand.

– Remove deposits beneath the copper seal with a scraper.

– Renew seal for injector using assembly sleeve - T10377- .



Continued (same procedure for used and new injectors):

– Fit new O-ring for injector bore.

Note

Lubricate all O-rings with engine oil or assembly oil before installing.

Caution

Risk of damage to injector sealing surface.

- ***To remove carbon deposits from the injector sealing surface, clean the injector bore in the cylinder head with cleaning kit - VAS 6811- .***

– Install injectors.

Tightening torques

- ⇒ “1.3.1 Exploded view - fuel system, engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB, CCLA”, page 468

– Hand-tighten union nuts on high-pressure pipes. Make sure that connections are not under tension.

– Tighten high-pressure pipes ⇒ page 507 .

– Press return line connections carefully over seals and onto injectors (check seal for damage before connecting return line). 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 491 .

Additionally, check that the “injector delivery calibration values” and “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.

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 and then switch off.

– Switch off ignition.

– 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.

Note

The return lines can only be renewed as a complete unit.

– 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

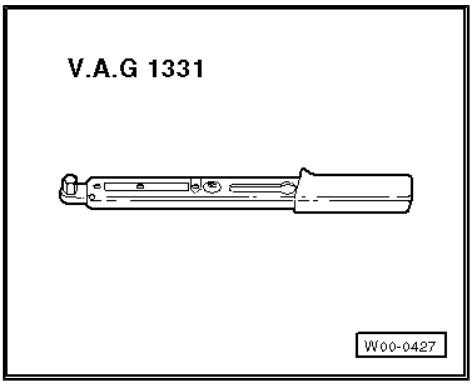
If there is any air left in the fuel system, the engine may switch to the backup mode ('emergency running' mode) during the road test. Switch off the engine and erase the event memory. Then continue the road test.

– Interrogate the event memory again after road-testing.

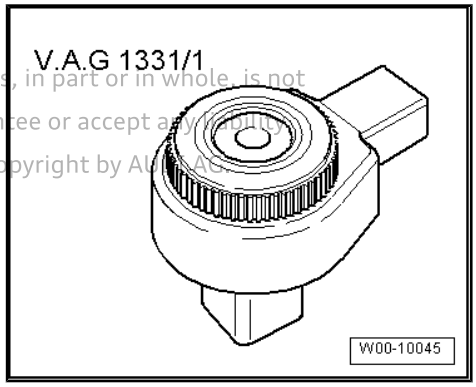
4.9 Removing and installing high-pressure pipes

Special tools and workshop equipment required

♦ Torque wrench - V.A.G 1331-

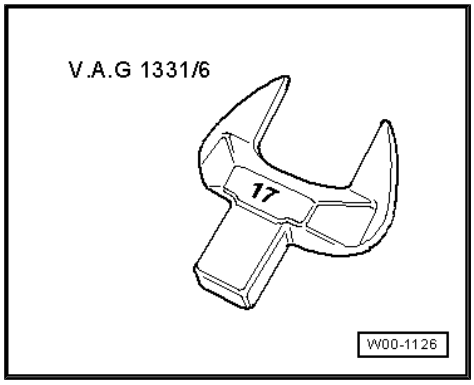


♦ Ratchet - V.A.G 1331/1-

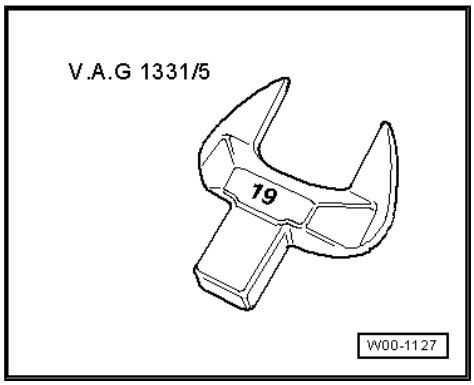


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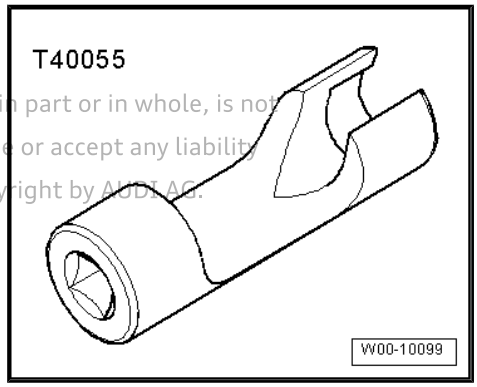
- Open end spanner insert, AF 17 - V.A.G 1331/6-



- Open end spanner insert, AF 19 - V.A.G 1331/5- (engine code CAPA only)



- Socket - T40055-



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Procedure

Note

- *Note identification marks for cylinder allocation when re-installing high-pressure pipes.*
- *The high-pressure pipes can be re-used after performing the following checks:*
- *Check taper seats of high-pressure pipes for deformation and cracks.*
- *The bore of the pipe must not be distorted, restricted or otherwise damaged.*
- *Corroded pipes must not be used again.*

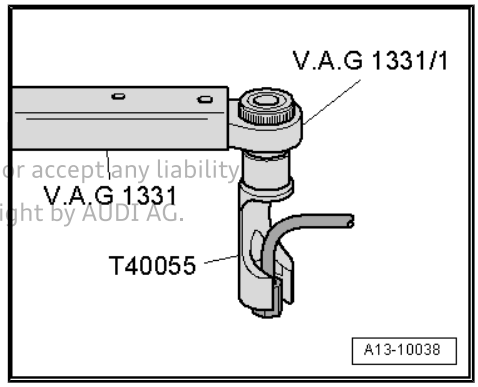
– Lubricate threads of union nuts with fuel.

– Hand-tighten union nuts on high-pressure pipes (ensure that pipes are not under tension).

- Tightening torque: 25 Nm

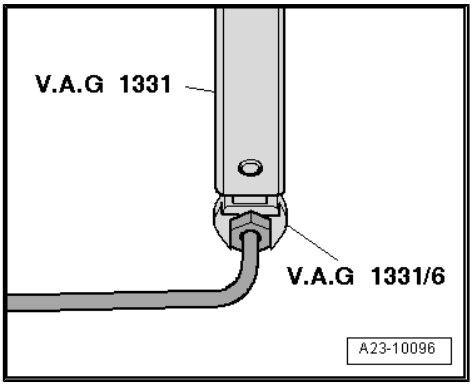
– To tighten unions of high-pressure pipes, use torque wrench - V.A.G 1331- with ratchet - V.A.G 1331/1- and socket, 17 mm - T40055- .

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– To tighten unions of high-pressure pipes, use torque wrench - V.A.G 1331- with tool insert, AF 17 - V.A.G 1331/6- / tool insert, AF 19 - V.A.G 1331/5- .

– Check fuel system for leaks ⇒ page 475 .



5 High-pressure pump

⇒ “5.1 Exploded view - high-pressure pump”, page 510

⇒ “5.2 Removing and installing high-pressure pump”, page 519

5.1 Exploded view - high-pressure pump

⇒ “5.1.1 Exploded view - high-pressure pump, engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB, CCLA”, page 510

⇒ “5.1.2 Exploded view - high-pressure pump, engine code CAPA”, page 513

⇒ “5.1.3 Exploded view - toothed belt for high-pressure pump, engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB, CCLA”, page 515

⇒ “5.1.4 Exploded view - toothed belt for high-pressure pump, engine code CAPA”, page 517

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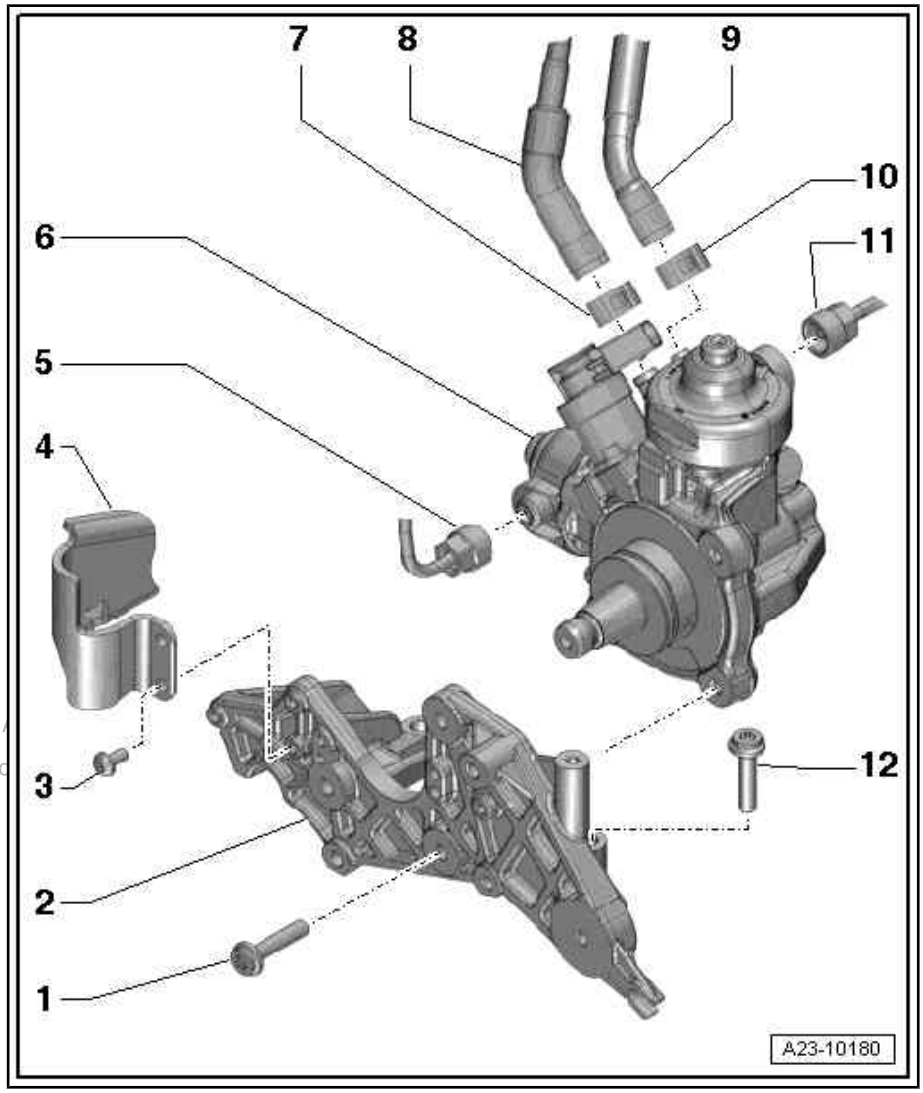
5.1.1 Exploded view - high-pressure pump, engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB, CCLA

Caution

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 first fuel filling operation must be performed.*
- *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.*

Perform first fuel filling after installing high-pressure pump ⇒ page 474 .



1 - Bolt

- ❑ M6: 9 Nm
- ❑ M8: 23 Nm

2 - Front bracket for high-pressure pump

3 - Bolt

- ❑ 9 Nm

4 - Guard plate

5 - Union nut for high-pressure pipe

- ❑ Tightening torque ⇒ page 507

6 - High-pressure pump

Caution

Prerequisites for fitting toothed belt:

TDC of crankshaft ⇒ page 512 and TDC of camshaft ⇒ page 512 must be aligned.

In addition, toothed belt sprocket for high-pressure pump must be locked in position using locking tool - T40135- . This is important to prevent oscillation of toothed belt. ⇒ page 516

The high-pressure pump must first be filled with fuel before the engine is started. The high-pressure pump must not be allowed to run while still empty. First fuel filling ⇒ page 474

Observe rules for cleanliness when working on the injection system ⇒ page 9 .

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- ❑ After renewing high-pressure pump or fuel pressure regulating valve - N276- , learnt values must be re-adapted; see “Guided Functions” in ⇒ Vehicle diagnostic tester
- ❑ Removing toothed belt sprocket for high-pressure pump using puller - T40064- ⇒ page 512
- ❑ Removing and installing ⇒ page 519

7 - Hose clip

- ❑ Use only correct type of hose clips (as original equipment) ⇒ Parts catalogue

8 - Fuel supply hose

9 - Fuel return hose

- ❑ Fuel return line must not be kinked, damaged or clogged

10 - Hose clip

- ❑ Use only correct type of hose clips (as original equipment) ⇒ Parts catalogue

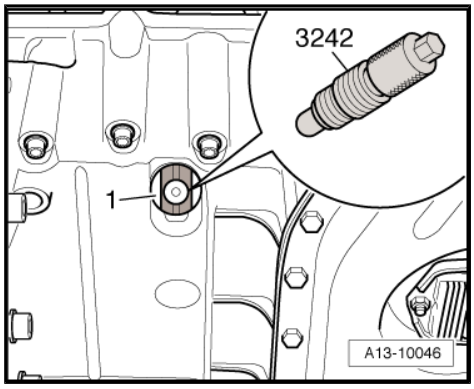
11 - Union nut for high-pressure pipe

- ❑ Tightening torque ⇒ page 507

12 - Bolt

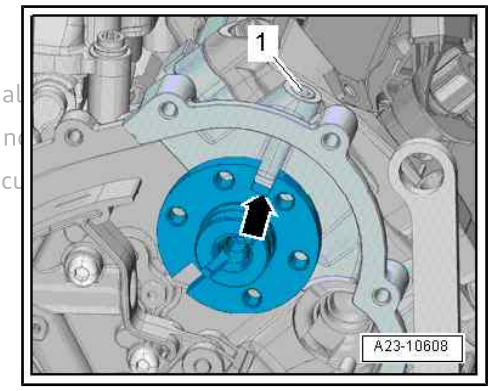
- ❑ 23 Nm

TDC of crankshaft -1-

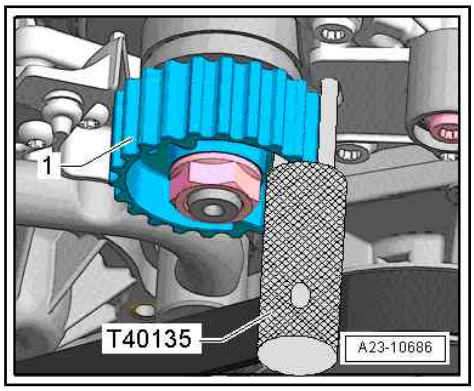


TDC of camshaft -arrow-

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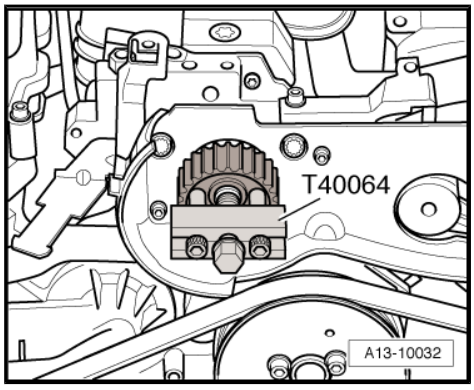


Locking tool - T40135- for toothed belt sprocket for high-pressure pump

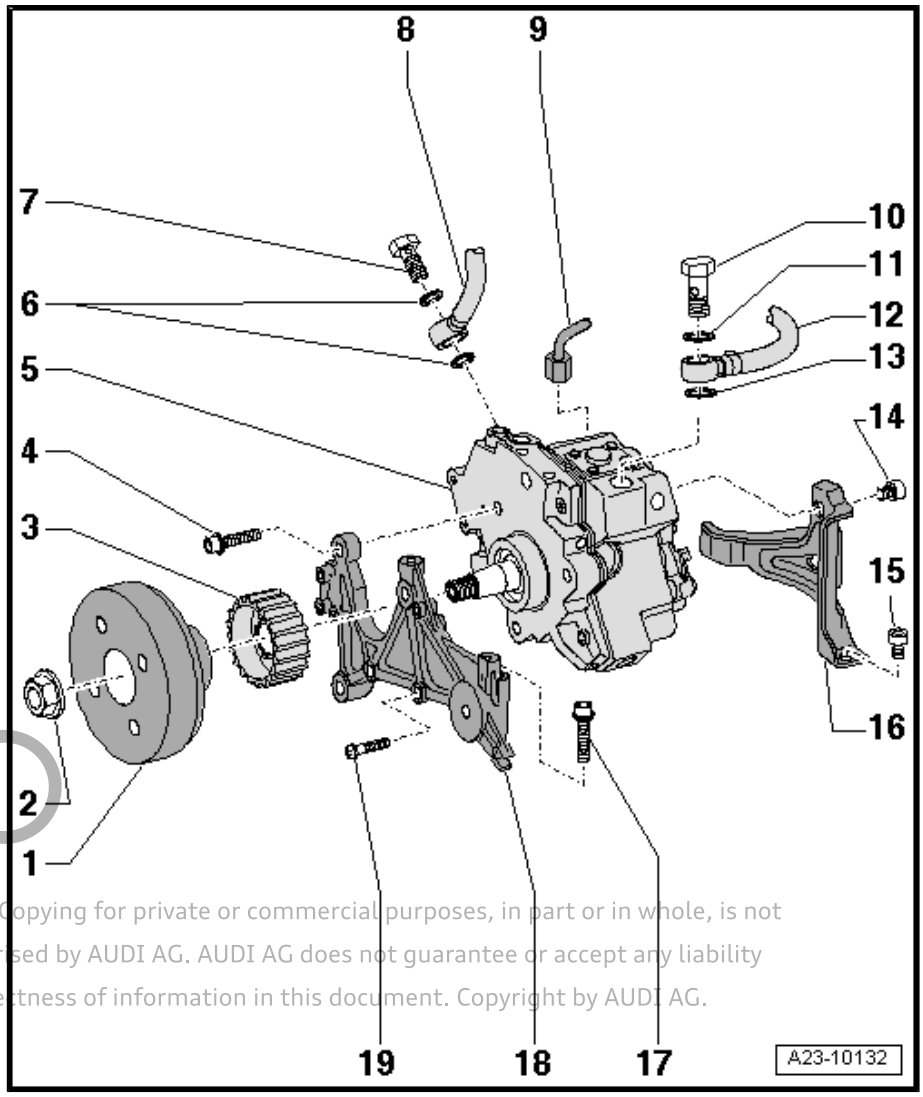


Pulling off toothed belt sprocket for high-pressure pump

- – Use counterhold tool - T10172A- when loosening and tightening central nut.
- – Use puller - T40064- to pull off belt sprocket for high-pressure pump.
- ♦ Tightening torque for nut for toothed belt sprocket: 70 Nm



5.1.2 Exploded view - high-pressure pump, engine code CAPA



1 - Damper weight
- ❑ Use counterhold tool -3036- when loosening and tightening central nut ⇒ page 514

2 - Nut
- ❑ 70 Nm
- ❑ Use counterhold tool -3036- when loosening and tightening ⇒ page 514

3 - Toothed belt sprocket for high-pressure pump
- ❑ Remove using puller -T40064- ⇒ page 514

4 - Bolt
- ❑ 23 Nm

5 - High-pressure pump
- ❑ Removing and installing ⇒ page 521

6 - Seals
- ❑ Renew

7 - Banjo bolt
- ❑ 25 Nm

8 - Fuel supply hose

9 - Union nut for high-pressure pipe
- ❑ Tightening torque ⇒ page 507

10 - Banjo bolt
- ❑ 25 Nm

11 - Seal
- ❑ Renew

12 - Fuel return hose
- ❑ Fuel return line must not be kinked, damaged or clogged

13 - Seal
- ❑ Renew

14 - Bolt
- ❑ 23 Nm

15 - Bolt
- ❑ 23 Nm

16 - Bracket for high-pressure pump

17 - Bolt
- ❑ 23 Nm

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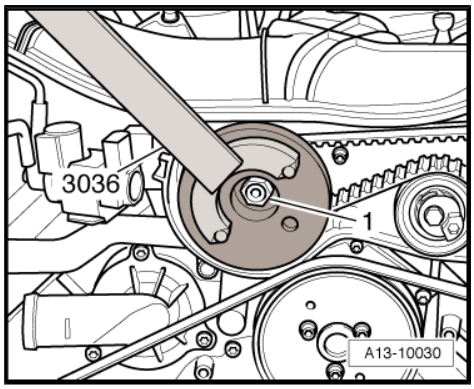
18 - Front bracket for high-pressure pump

19 - Bolt

- ❑ 9 Nm

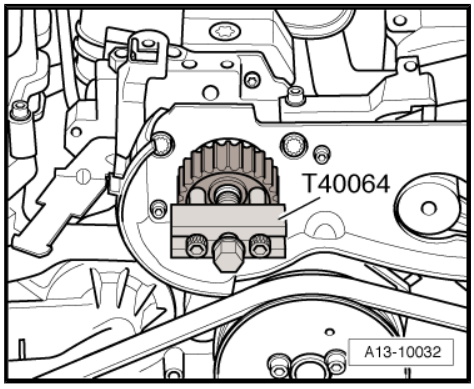
Loosening and tightening central nut for high-pressure pump

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



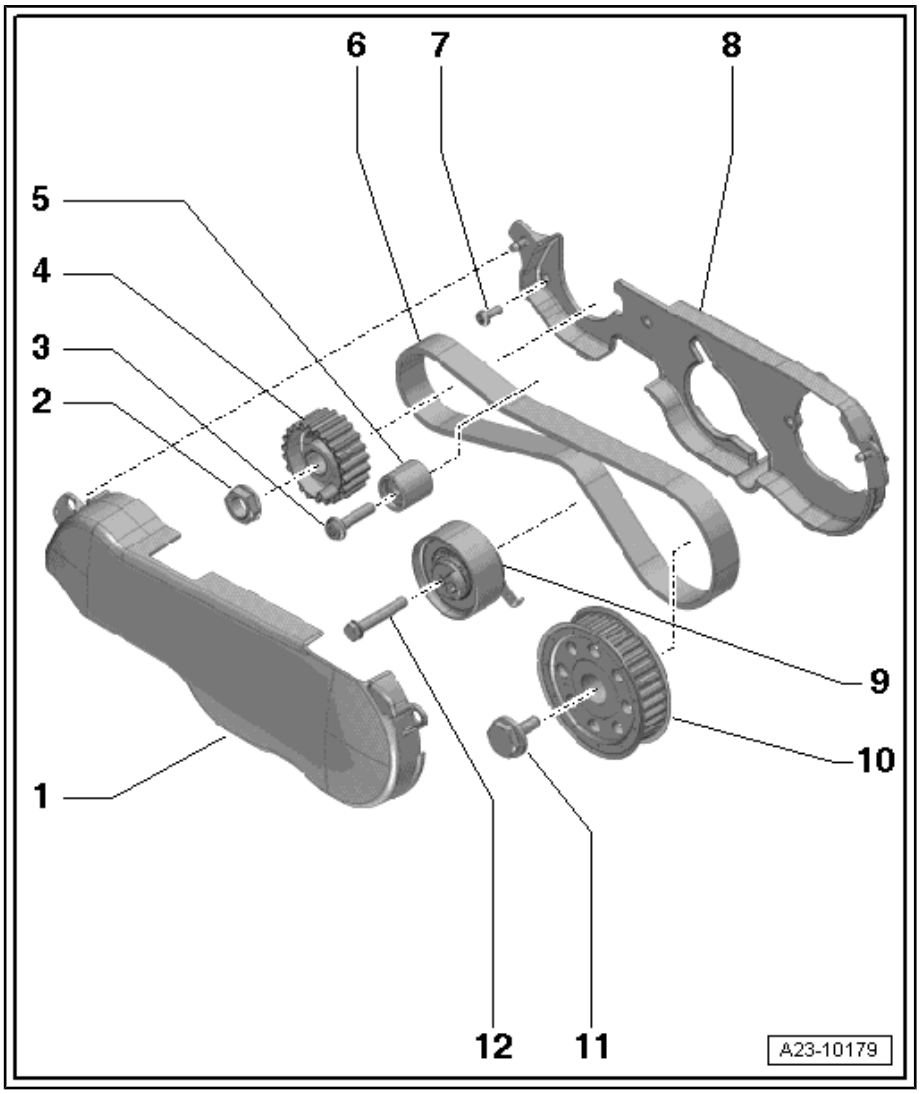
Pulling off toothed belt sprocket for high-pressure pump

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



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5.1.3 Exploded view - toothed belt for high-pressure pump, engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB, CCLA



1 - Toothed belt cover (front)

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

2 - Nut

- ❑ 70 Nm

3 - Bolt

- ❑ 23 Nm

4 - Toothed belt sprocket for high-pressure pump

- ❑ Use counterhold tool - T10172A- when loosening and tightening central nut
- ❑ Remove toothed belt sprocket using puller - T40064- ⇒ page 516

5 - Idler roller

6 - Toothed belt for high-pressure pump

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

Caution

Prerequisites for fitting toothed belt:

TDC of crankshaft ⇒ page 516 and TDC of camshaft ⇒ page 516 must be aligned.

In addition, toothed belt sprocket for high-pressure pump must be locked in position using locking tool - T40135- . This is important to prevent oscillation of toothed belt ⇒ page 516 .

- ❑ Removing and installing ⇒ page 524

7 - Bolt

- ❑ 9 Nm

8 - Toothed belt cover (rear)

9 - Toothed belt tensioning roller

10 - Toothed belt drive sprocket

- ❑ Remove using puller - T10320- ⇒ page 517

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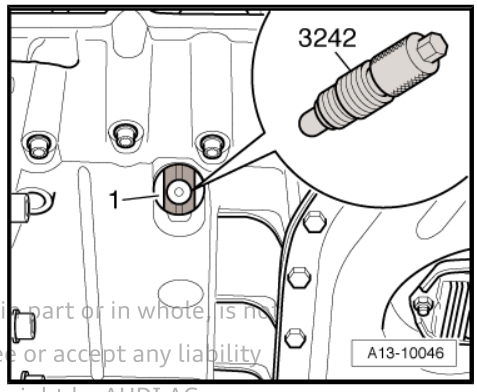
11 - Bolt

- ❑ 75 Nm
- ❑ Use counterhold tool - 3036- when loosening and tightening ⇒ page 517

12 - Bolt

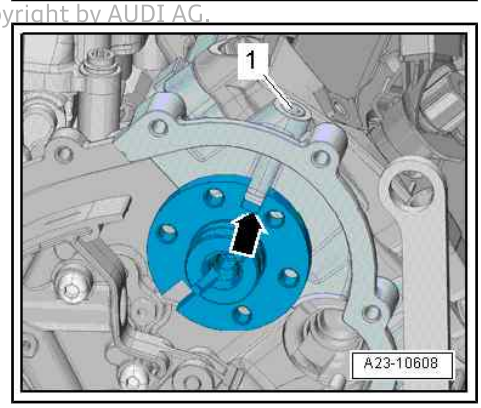
- ❑ 23 Nm

TDC of crankshaft -1-

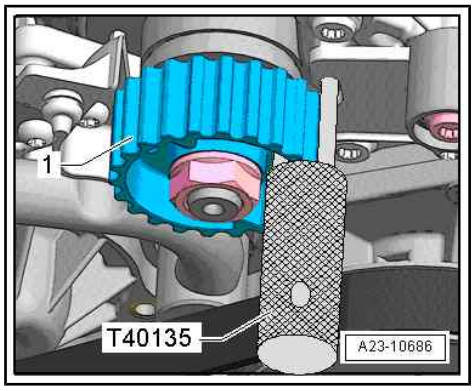


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TDC of camshaft -arrow-



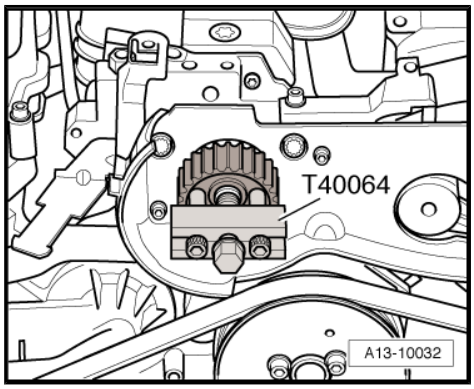
Locking tool - T40135- for toothed belt sprocket for high-pressure pump



Pulling off toothed belt sprocket for high-pressure pump

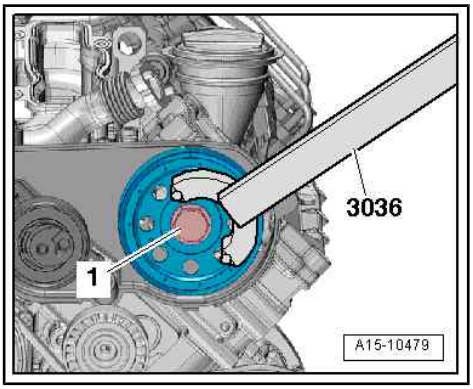
– Use counterhold tool - T10172A- when loosening and tightening central nut.

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



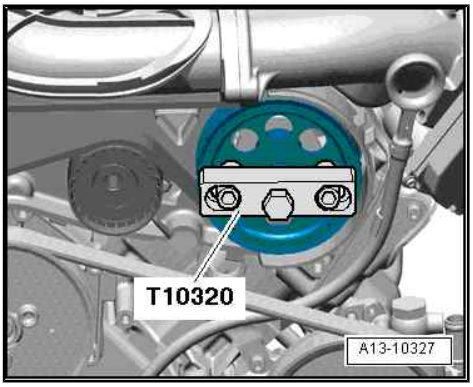
Loosening and tightening central bolt for toothed belt drive sprocket

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



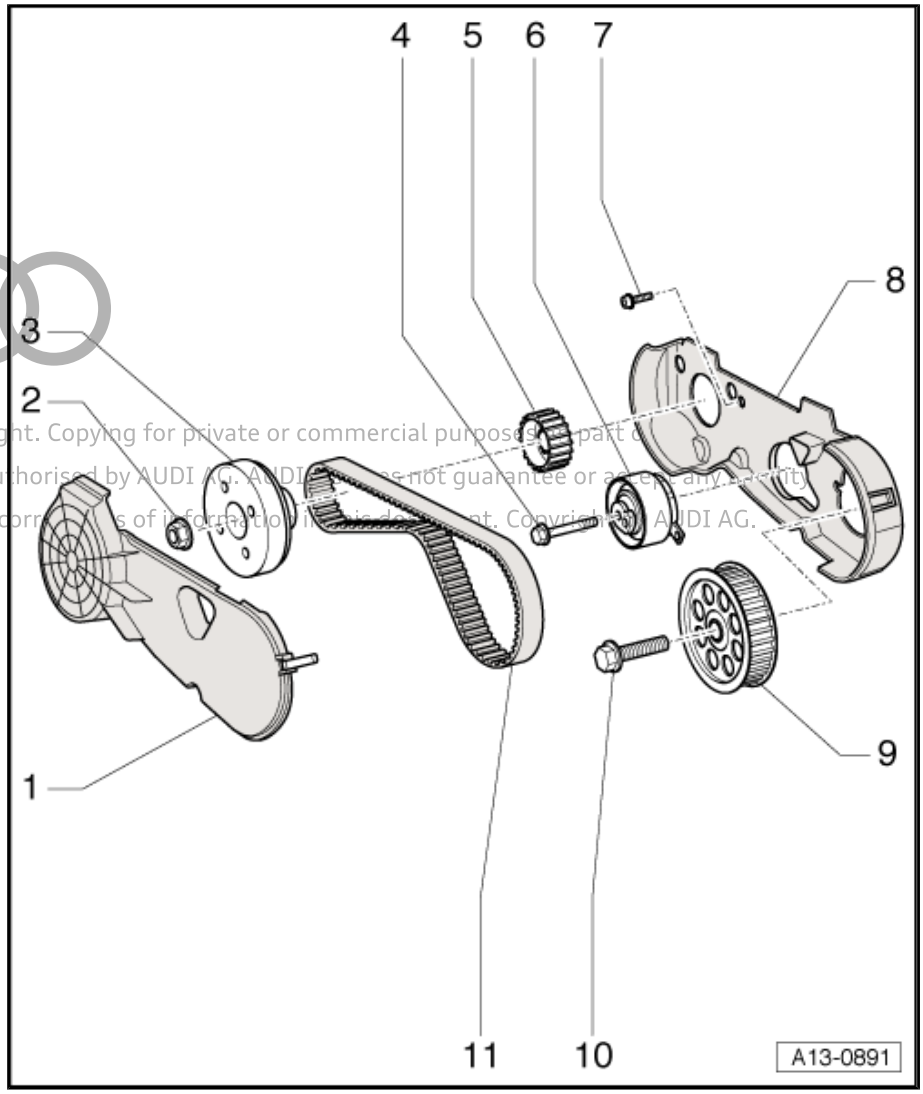
Removing toothed belt drive sprocket

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



5.1.4 Exploded view - toothed belt for high-pressure pump, engine code CAPA

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1 - Toothed belt cover (front)

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

2 - Nut

- ❑ 70 Nm

3 - Damper weight

4 - Bolt

- ❑ 23 Nm

5 - Toothed belt sprocket for high-pressure pump

- ❑ Remove using extracting tool - T40064-

6 - Toothed belt tensioning roller

7 - Bolt

- ❑ 9 Nm

8 - Toothed belt cover (rear)

9 - Toothed belt drive sprocket

10 - Bolt

- ❑ 75 Nm
- ❑ Use counterhold tool - 3036- when loosening and tightening

11 - Toothed belt for high-pressure pump

- ❑ Before removing, mark direction of rotation with chalk or felt-tip pen. If the belt runs in the opposite direction when it is refitted, this can cause breakage
- ❑ Check for wear
- ❑ Removing and installing ⇒ page 533

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5.2 Removing and installing high-pressure pump

⇒ "5.2.1 Removing and installing high-pressure pump - engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB, CCLA", page 519

⇒ "5.2.2 Removing and installing high-pressure pump - engine code CAPA", page 521

⇒ "5.2.3 Removing and installing toothed belt for high-pressure pump - engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB, CCLA", page 524

⇒ "5.2.4 Removing and installing toothed belt for high-pressure pump - engine code CAPA", page 533

5.2.1 Removing and installing high-pressure pump - engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB, CCLA

Caution

- *Observe rules for cleanliness when working on the injection system ⇒ page 9 .*
- *Follow these instructions and rules for cleanliness before starting work and while working on the fuel system.*
- *Before fitting toothed belt, toothed belt sprocket for high-pressure pump must be locked in position using locking tool - T40135- . This is important to prevent oscillation of toothed belt.*
- *The high-pressure pump must first be filled with fuel before the engine is started. The high-pressure pump must not be allowed to run while still empty. First fuel filling ⇒ page 474 .*

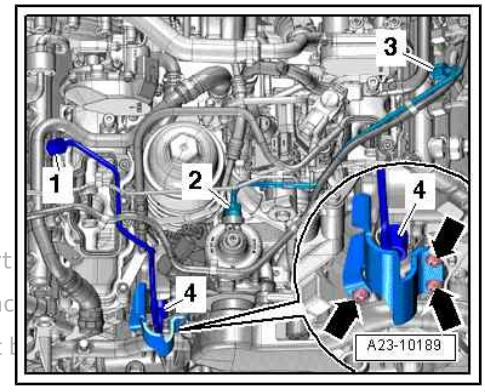
Removing

– Remove intake manifold (top section) ⇒ page 483 .

– Remove toothed belt for high-pressure pump ⇒ page 524 .

– Unscrew bolts -arrows- and remove protective plate for high-pressure pipe.

– Unscrew union nuts -1 ... 4- and move high-pressure pipes clear.

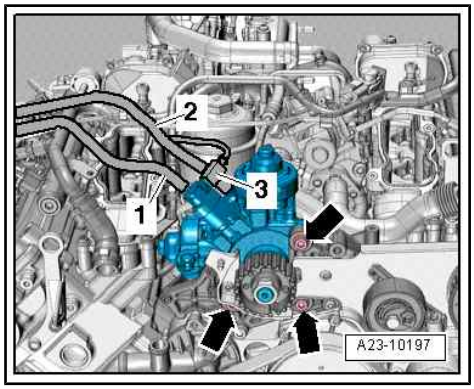


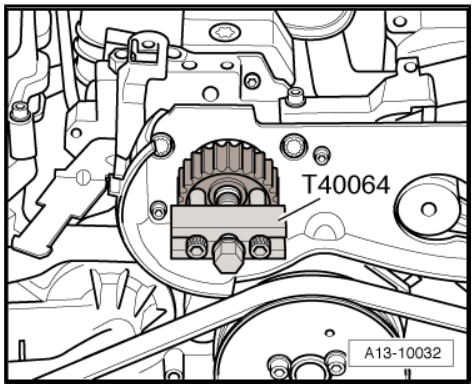
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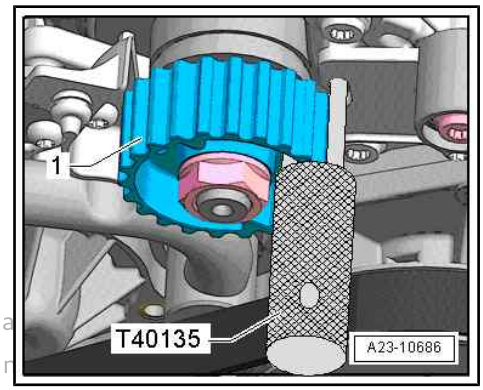
– Unplug electrical connector -3-.
– Remove fuel supply hose -1- and fuel return hose -2-.
– Unscrew bolts -arrows- and detach high-pressure pump.

Installing

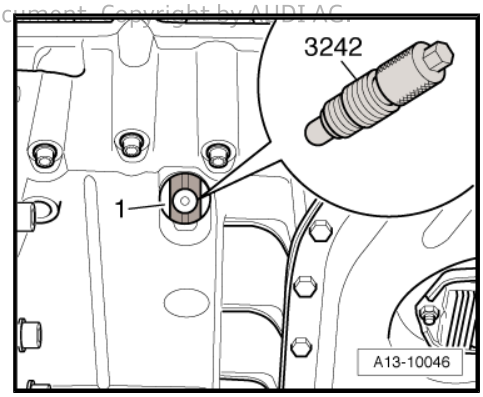
Installation is carried out in reverse order; note the following:

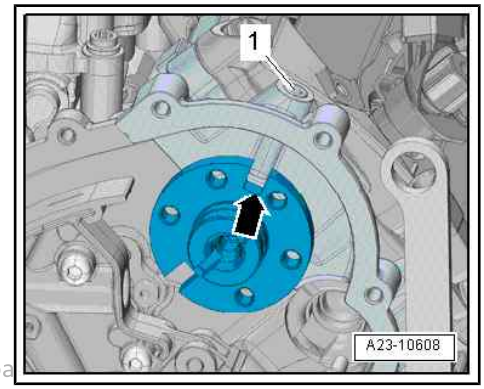






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Note

- *Renew seals and gaskets.*
- *Fuel return lines must not be kinked, damaged or clogged.*
- *If toothed belt sprocket has to be renewed, use counterhold tool - T10172A- when loosening and tightening central nut.*
- *Then use puller - T40064- to pull off toothed belt sprocket.*
- *Before fitting toothed belt, toothed belt sprocket -1- for high-pressure pump must be locked in position using locking tool - T40135- . This is important to prevent oscillation of toothed belt.*
- *Two TDC points must be aligned in order to correctly adjust toothed belt for high pressure pump.*
- *TDC of crankshaft -1-*
- *TDC of camshaft -arrow-*

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- Tightening torques
  ⇒ "5.1.1 Exploded view - high-pressure pump, engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB, CCLA", page 510
- Tightening torque for nut for toothed belt sprocket: 70 Nm

– Install toothed belt for high-pressure pump ⇒ page 524 .

– Install high-pressure pipes ⇒ page 507 .

– Install intake manifold (top section) ⇒ page 483 .

Caution

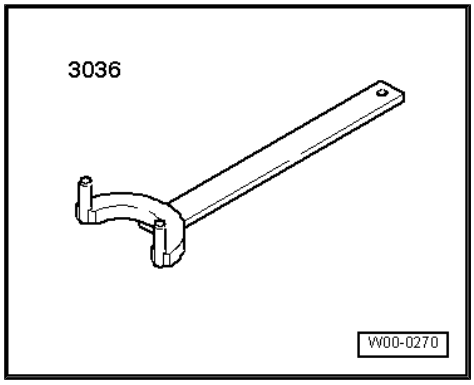
- ***Running when dry causes irreparable damage to high-pressure pump.***
- ***The high-pressure pump must first be filled with fuel before the engine is started. The high-pressure pump must not be allowed to run while still empty. First fuel filling ⇒ page 474***

After renewing high-pressure pump and/or fuel pressure regulating valve - N276- , adaption must be performed. Use ⇒ Vehicle diagnostic tester.

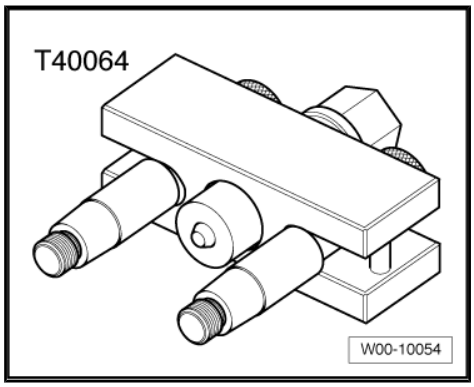
5.2.2 Removing and installing high-pressure pump - engine code CAPA

Special tools and workshop equipment required

- Counterhold tool - 3036-



- Puller - T40064-



WARNING

- *Always read rules for cleanliness and instructions for working on fuel system ⇒ page 9 .*
- *Follow these instructions and rules for cleanliness before starting work and while working on the fuel system.*

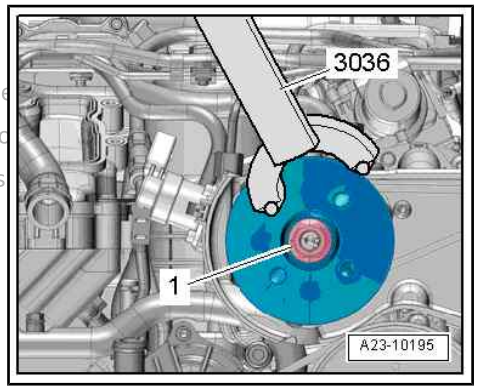
Removing

– Remove intake manifold (top section) ⇒ page 483 .

– Remove toothed belt for high-pressure pump ⇒ page 533 .

– Unscrew nut -1- for high-pressure pump shaft using counterhold tool - 3036- .

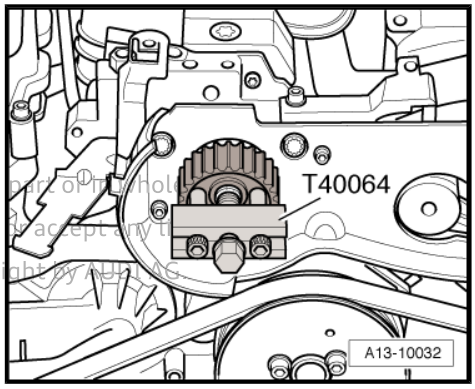
– Remove damper weight.



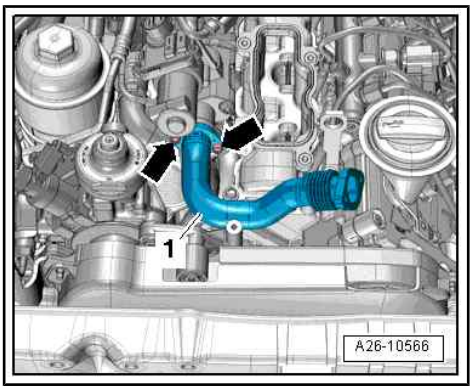
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– Remove toothed belt sprocket for high-pressure pump using puller - T40064- .

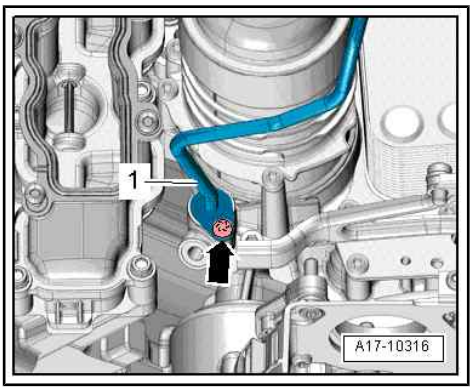
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– Unscrew bolts -arrows- and remove connecting pipe -1- for exhaust gas recirculation.



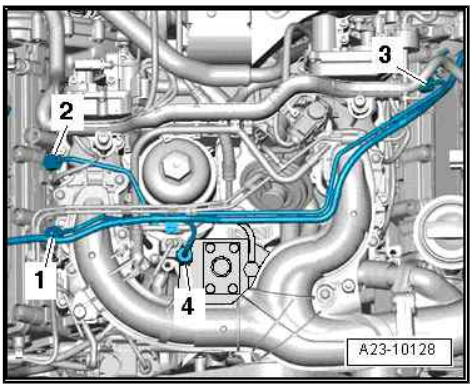
– Unscrew bolt -arrow-, pull off oil supply line for turbocharger and move to one side.



– Remove union nuts -2- and -4-, move high-pressure pipe clear and remove.

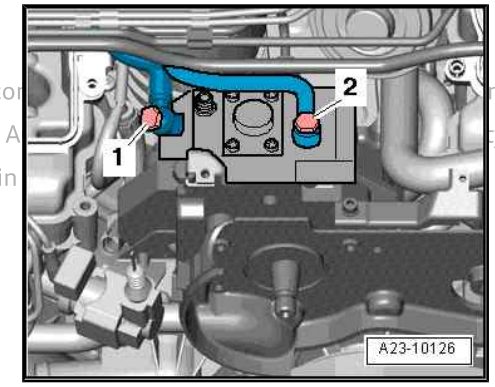
Note

Disregard -items 1, 3-.



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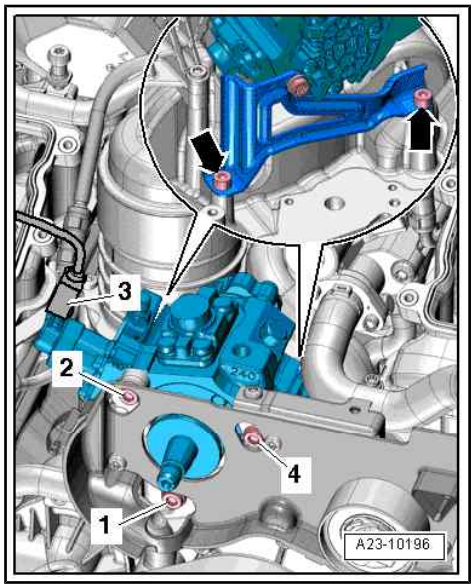
– Unscrew banjo bolt -2- for fuel supply hose and banjo bolt -1- for fuel return hose and move fuel hoses to one side.



Caution

Observe rules for cleanliness when working on the injection system ⇒ page 9 .

– Remove bolts -1, 2, 4- and -arrows-.
– Unplug electrical connector -3-.
– Carefully pull toothed belt cover forward and lift out high-pressure pump.



Installing

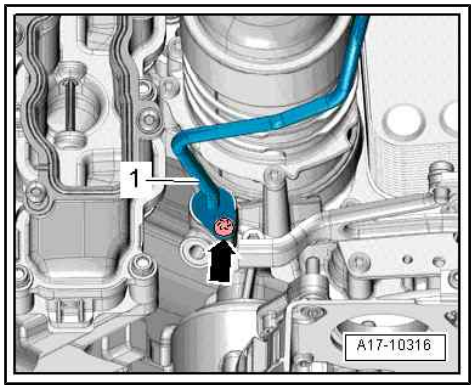
Installation is carried out in reverse order; note the following:

Note

- *Renew seals and gaskets.*
- *Fuel return line must not be kinked, damaged or clogged.*

Tightening torques

- ⇒ “5.1.2 Exploded view - high-pressure pump, engine code CAPA”, page 513



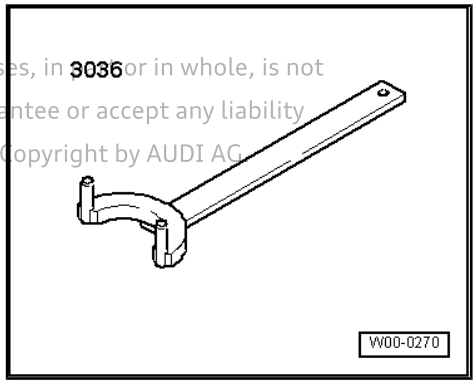
– Secure oil supply line for turbocharger -arrow- ⇒ page 420 .
– Install toothed belt for high-pressure pump ⇒ page 533 .
– Install high-pressure pipes ⇒ page 507 .
– Install intake manifold (top section) ⇒ page 483 .
– Bleed fuel system and check for leaks ⇒ page 475 .

5.2.3 Removing and installing toothed belt for high-pressure pump - engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB, CCLA

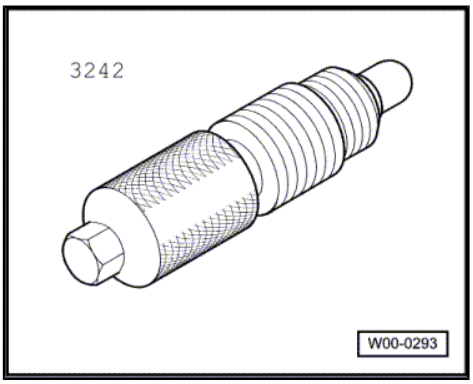
Special tools and workshop equipment required

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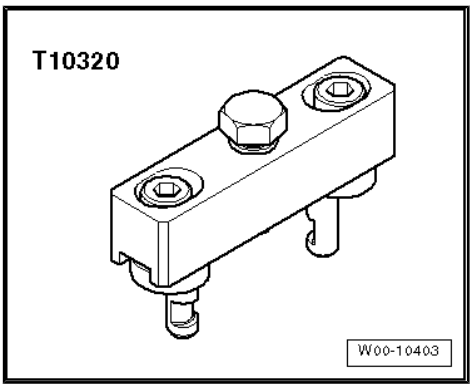
- Counterhold tool - 3036-



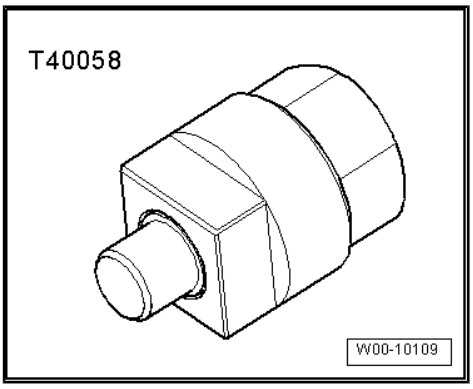
- Locking pin - 3242- or locking pin - T40237-



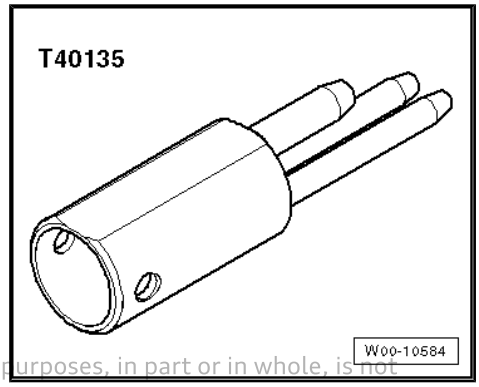
- Puller - T10320-



- Adapter - T40058-

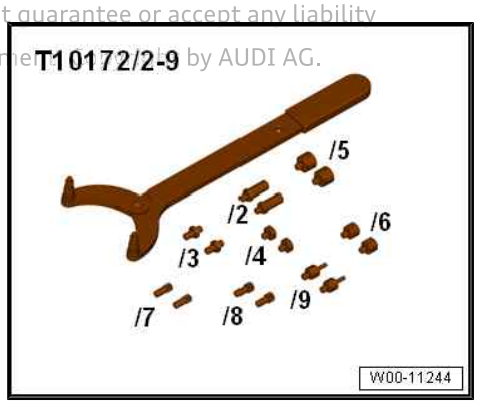


- Locking tool - T40135- for adjusting high-pressure pump



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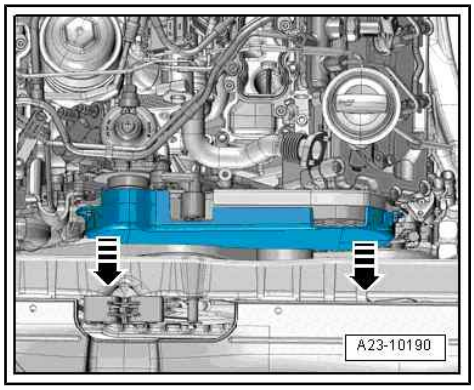
- Counterhold tool - T10172A-



Removing

– Remove intake manifold (top section) ⇒ page 483 .

– Pivot toothed belt cover forwards -arrows- and disengage retaining pegs on bottom side of toothed belt cover.



Note

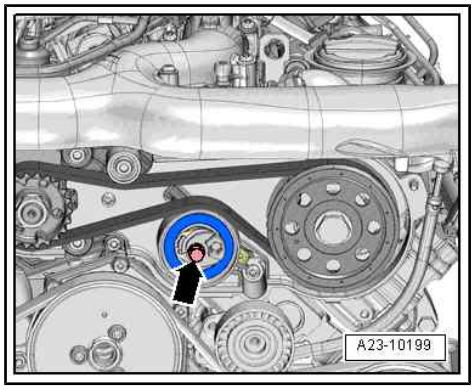
For illustration purposes, the toothed belt cover is shown with the top section of the intake manifold removed.

Caution

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

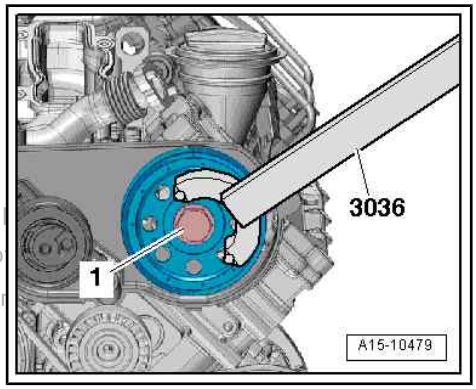
Before removing, mark direction of rotation of toothed belt with chalk or felt-tip pen for re-installation.

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

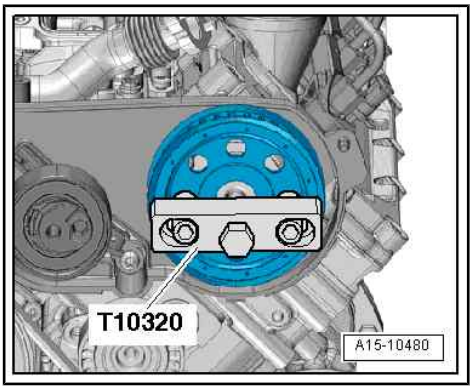


– Loosen bolt -1- for toothed belt drive sprocket approx. 2 turns using counterhold tool - 3036- .

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– Remove toothed belt drive sprocket using puller - T10320- .



Note

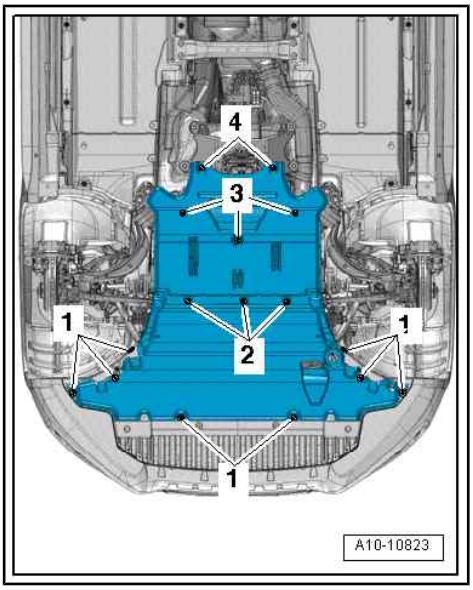
Leave toothed belt drive sprocket on camshaft.

– First detach toothed belt from toothed belt sprocket for high-pressure pump and then from toothed belt drive sprocket.

Installing

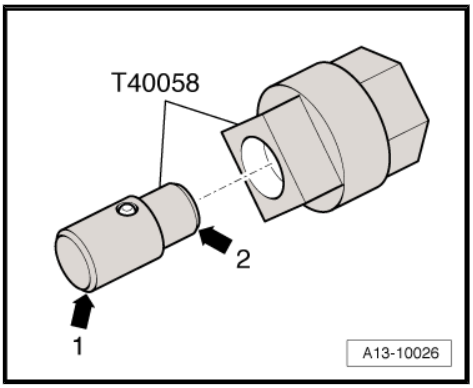
Installation is carried out in reverse order; note the following:

– Release fasteners -1 ... 4- and remove noise insulation panels.



– Insert guide pin of adapter -T40058- as follows:

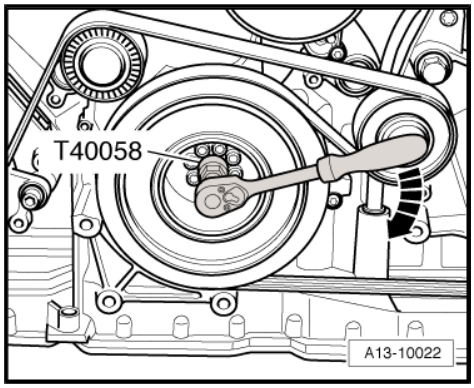
- The larger-diameter section -arrow 1- faces towards the engine.
- The smaller-diameter section -arrow 2- faces the adapter.



Caution

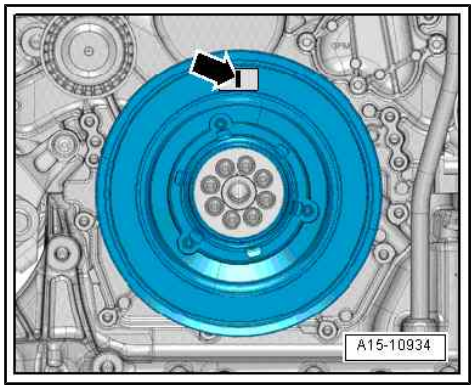
Irreparable damage can be caused if the camshaft timing chain slips.

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



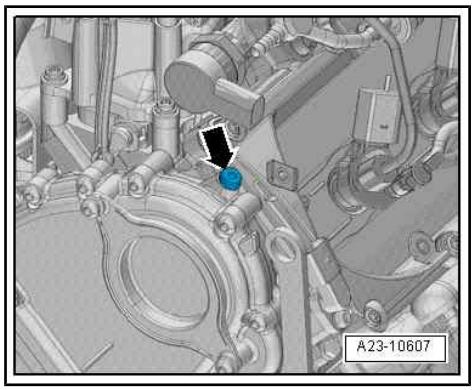
– Use adapter - T40058- to turn crankshaft to “TDC” position.

• Mark -arrow- must be perpendicular to centre of crankshaft, as shown in illustration.



– Remove air intake hoses.

– Remove sealing plug -arrow- at rear of cylinder head (right-side).

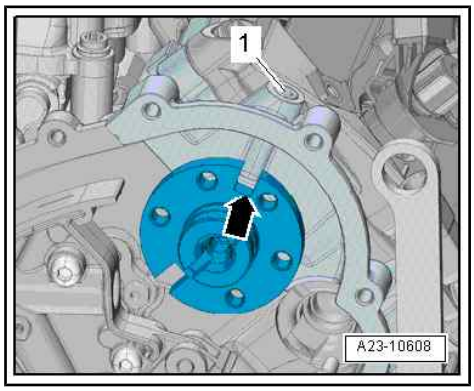


Note

For illustration purposes, the installation position is shown from rear and with engine removed.

– Check whether groove -arrow- in camshaft flange can be seen through bore -1- for sealing plug.

– To do so, shine a small torch into bore for sealing plug.



Note

For illustration purposes, camshaft flange is shown without chain drive and timing chain cover.

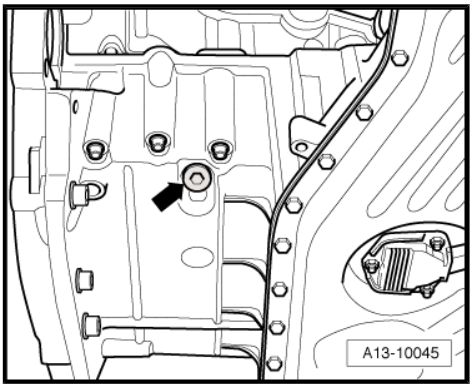
– If groove is not positioned under bore, turn crankshaft 360° further in direction of engine rotation.

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Note

Place a cloth underneath sump (top section) to catch any escaping engine oil.

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

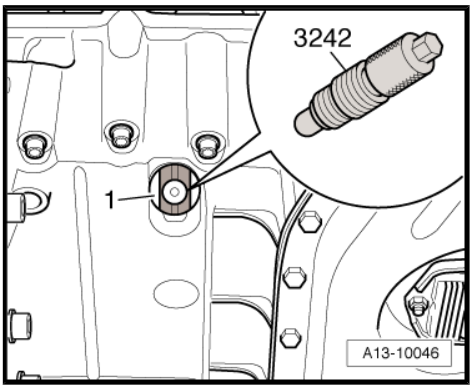


WARNING

Risk of injury while feeling for the "TDC" hole with your finger.

- ***Do NOT turn crankshaft -1-.***

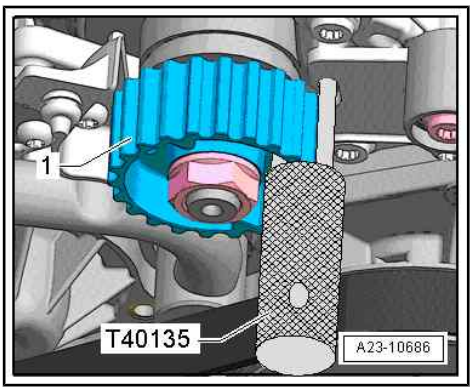
– Screw locking pin - 3242- into hole (20 Nm); if necessary, turn crankshaft backwards and forwards slightly to fully centralise locking pin.

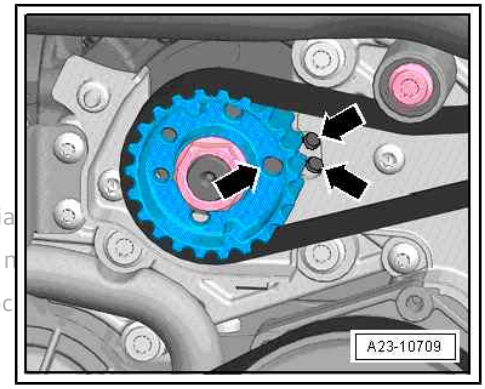


Note

Before installing toothed belt make sure high-pressure pump and toothed belt sprocket for high-pressure pump are firmly in position.

– Lock toothed belt sprocket for high-pressure pump in position using locking tool - T40135- .

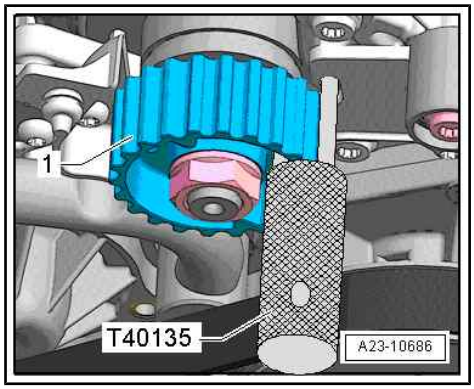




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Note

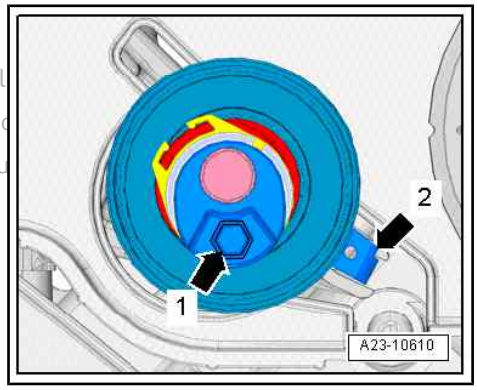
- *Before fitting toothed belt, toothed belt sprocket for high-pressure pump must be locked in position using locking tool -T40135- . This is important to prevent oscillation of toothed belt.*
- *The hole -arrow on toothed belt sprocket- is located at "3 o'clock" position.*
- *Locking tool -T40135- must be inserted all the way.*



– Check installation position of toothed belt tensioning roller:

• Retaining lug -arrow 2- must engage in slot on bracket for high-pressure pump.

• Tensioning roller must be slack and hexagon socket -arrow 1- must face downwards.

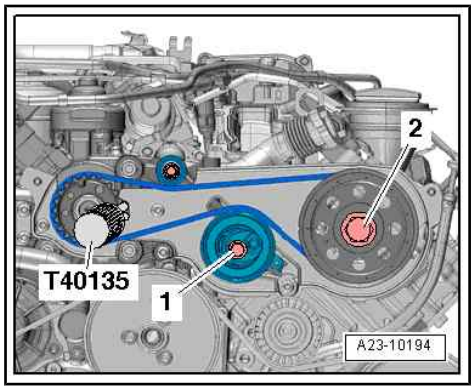


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– Fit toothed belt.

– Screw in bolt -1- for toothed belt tensioning roller without applying force until eccentric adjuster of toothed belt tensioning roller can just still be turned without axial movement.

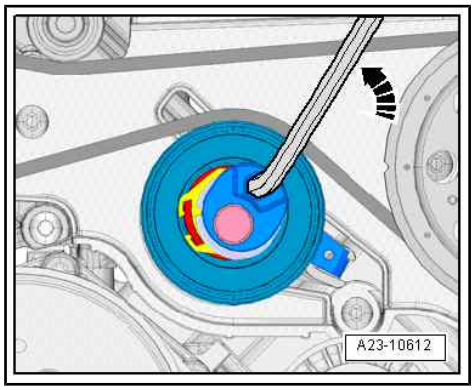
– Screw in bolt -2- for toothed belt drive sprocket until toothed belt drive sprocket can just still be turned without axial movement.



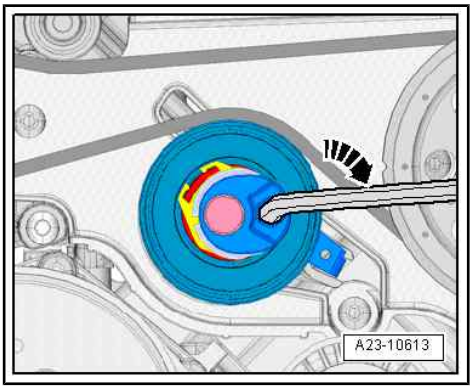
– Tension toothed belt tensioning roller slightly by turning in direction of -arrow- using hexagon key until hexagon socket is in "1 o'clock" position.

Caution

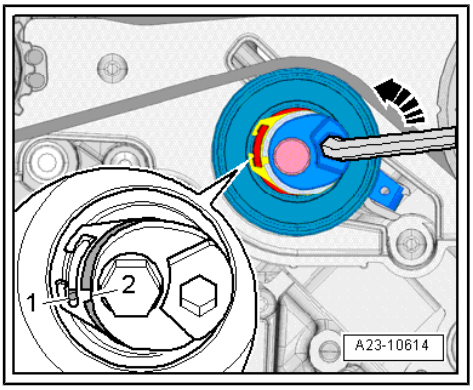
Do NOT turn tensioning roller up to or beyond "12 o'clock" position.



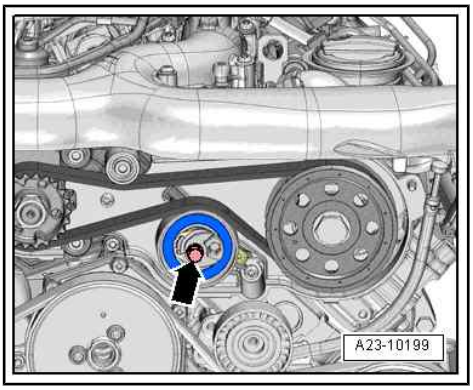
– Now release toothed belt tensioning roller -arrow- to such an extent that hexagon socket moves into "3 o'clock" position.



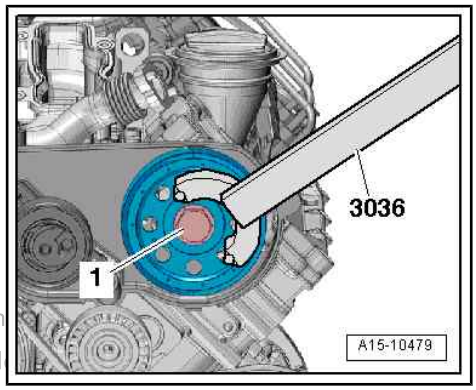
– Tension toothed belt tensioning roller slightly from "3 o'clock" position -arrow- until lug -1- and notch -2- are exactly in line.



– Hold toothed belt tensioning roller in this position and tighten bolt -arrow- ⇒ Item 12 (page 516) .

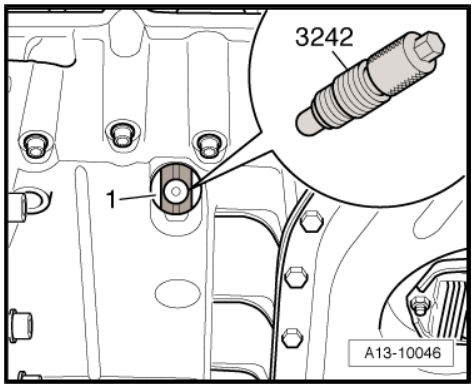


– Tighten bolt -1- for toothed belt drive sprocket using counter-hold tool - 3036- ⇒ Item 11 (page 516) .

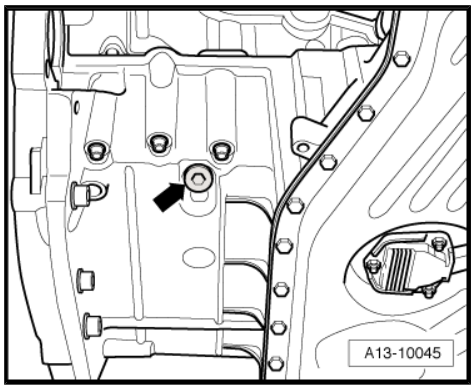


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– Remove locking pin - 3242- .

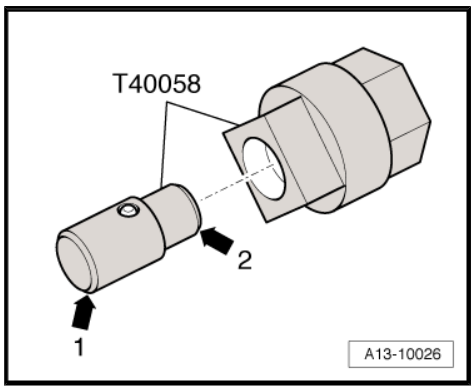


– Screw plug -arrow- for “TDC” marking into sump (top section) ⇒ page 323 .



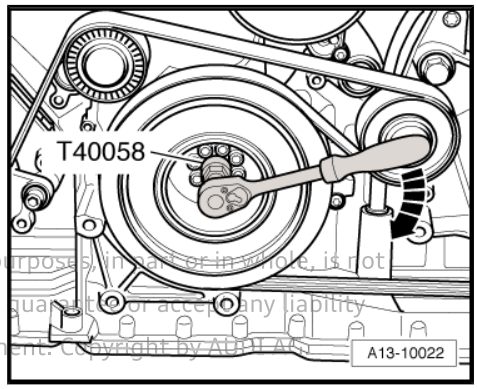
– Insert guide pin of adapter -T40058- as follows:

- The larger-diameter section -arrow 1- faces towards the engine.
- The smaller-diameter section -arrow 2- faces the adapter.



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 1 rotation using adapter - T40058- .

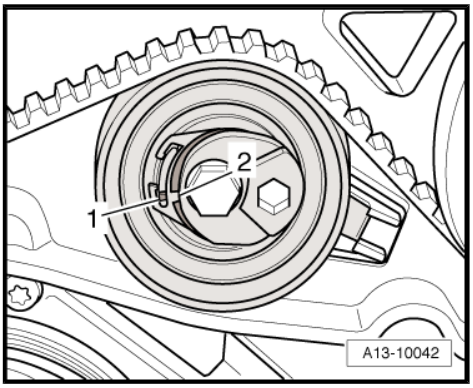
– Check toothed belt tension:

• Lug -1- should align with notch -2-.

– If the specification is not attained, re-adjust toothed belt tension.

The remaining installation steps are carried out in the reverse sequence.

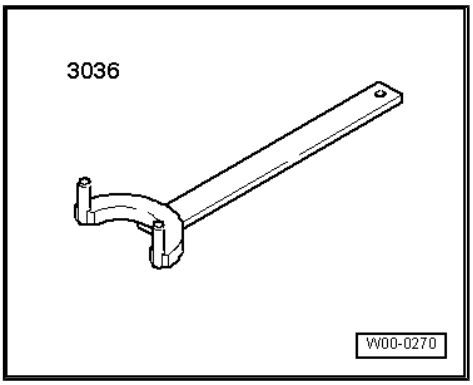
– Install intake manifold (top section) ⇒ page 483 .



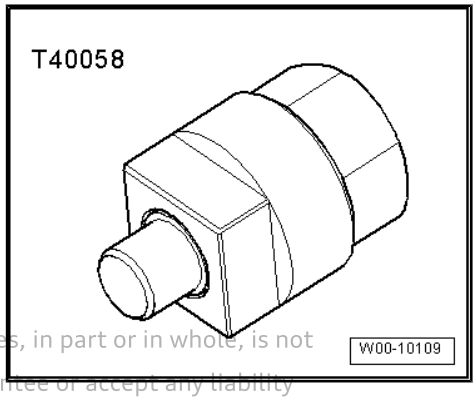
5.2.4 Removing and installing toothed belt for high-pressure pump - engine code CA-PA

Special tools and workshop equipment required

♦ Counterhold tool - 3036-



♦ Adapter - T40058-

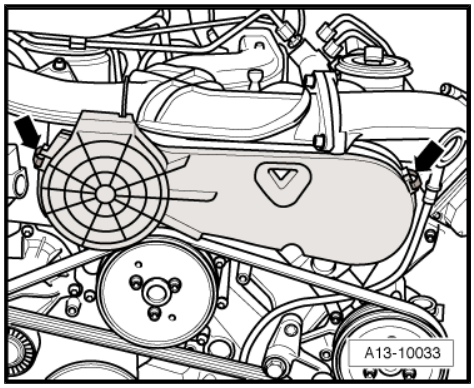


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Removing

– Remove intake manifold (top section) ⇒ page 483 .

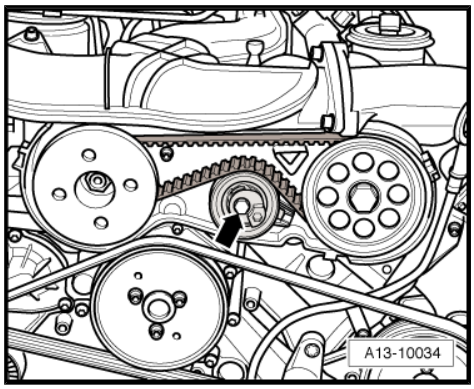
– Release hose clips -arrows-.
– Pivot toothed belt cover forward and disengage retaining pegs on bottom side of toothed belt cover.
– Remove toothed belt cover.



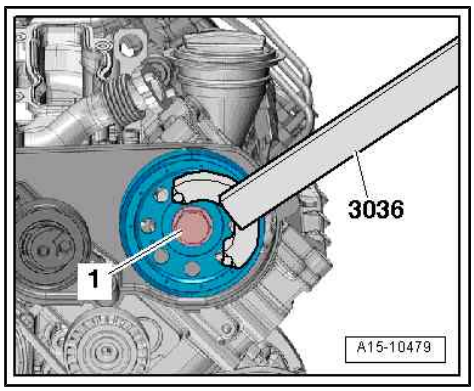
Note

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

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



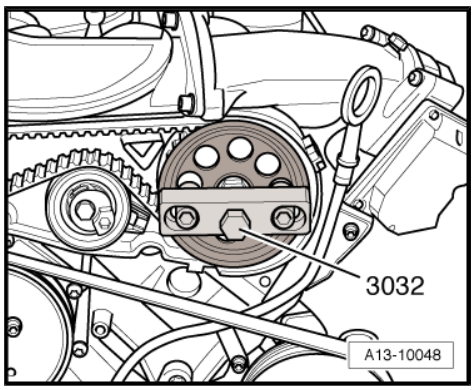
– Loosen central bolt -1- for toothed belt drive sprocket approx. 2 turns using counterhold tool - 3036- .



– Use puller - 3032- to pull off toothed belt drive sprocket.
– Take off drive sprocket together with toothed belt.

Installing

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



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– Check installation position of toothed belt tensioning roller:

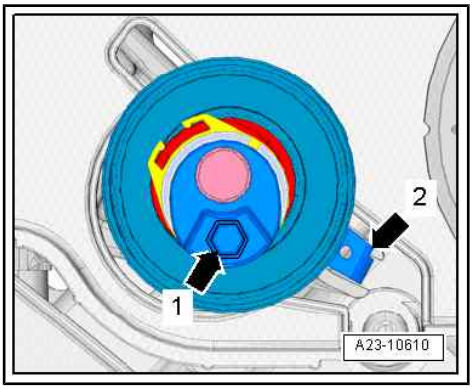
• Retaining lug -arrow 2- must engage in slot on bracket for high-pressure pump.

• Tensioning roller must be slack and hexagon socket -arrow 1- must face downwards.

– Fit toothed belt together with toothed belt drive sprocket.

– Install toothed belt tensioning roller; to do so, screw in bolt for toothed belt tensioning roller without applying force until eccentric adjuster of toothed belt tensioning roller can just still be turned without axial movement.

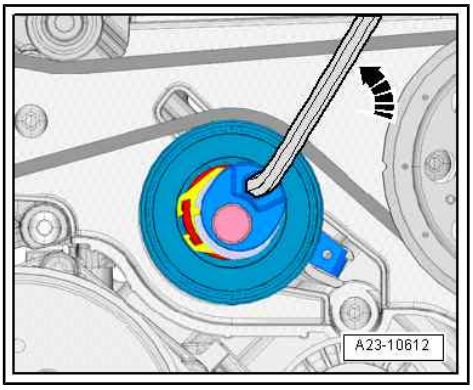
– Screw in bolt for toothed belt drive sprocket until toothed belt drive sprocket can just still be turned without axial movement.



– Tension toothed belt tensioning roller slightly by turning in direction of -arrow- using hexagon key until hexagon socket is in "1 o'clock" position.

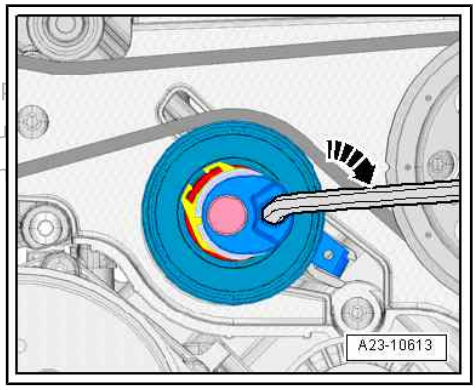
Caution

Do NOT turn tensioning roller up to or beyond "12 o'clock" position.

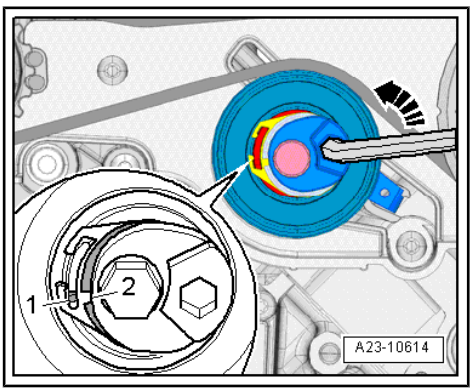


– Now release toothed belt tensioning roller -arrow- to such an extent that hexagon socket moves into "3 o'clock" position.

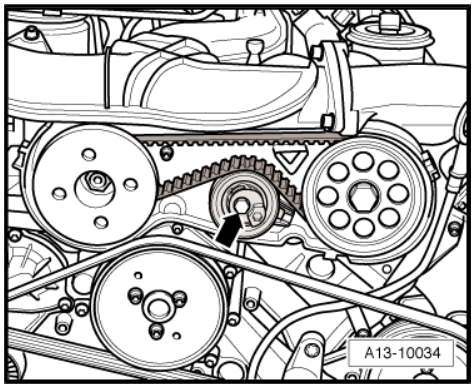
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– Tension toothed belt tensioning roller slightly from "3 o'clock" position -arrow- until lug -1- and notch -2- are exactly in line.

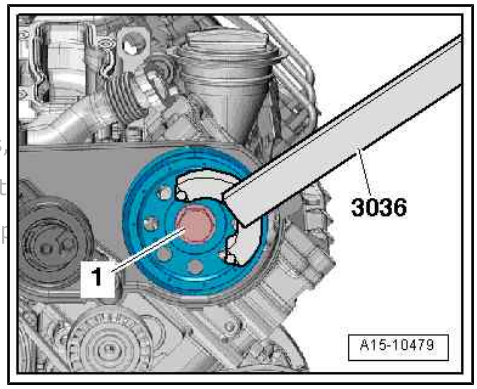


– Hold toothed belt tensioning roller in this position and tighten bolt -arrow- ⇒ Item 4 (page 518) .

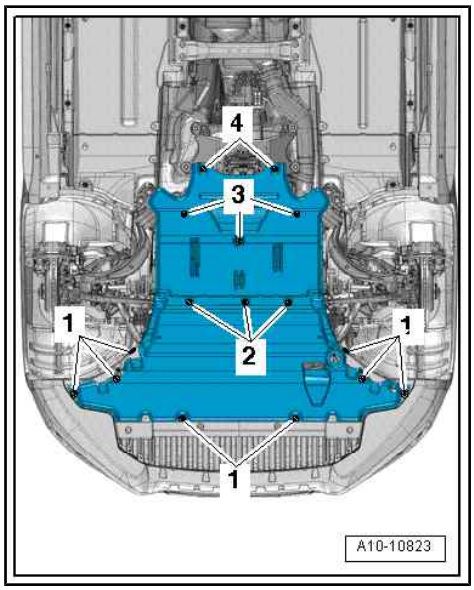


– Tighten bolt -1- for toothed belt drive sprocket using counter-hold tool - 3036- ⇒ Item 10 (page 518) .

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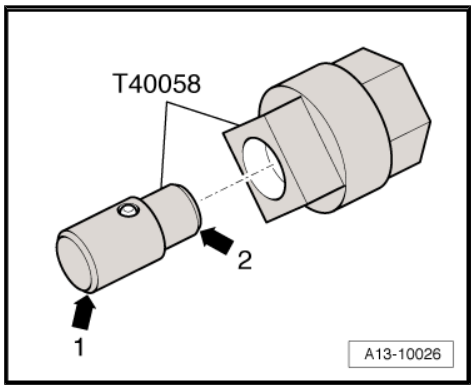


– Release fasteners -1 ... 4- and remove noise insulation panels.



– Insert guide pin of adapter -T40058- as follows:

- The larger-diameter section -arrow 1- faces towards the engine.
- The smaller-diameter section -arrow 2- faces the adapter.

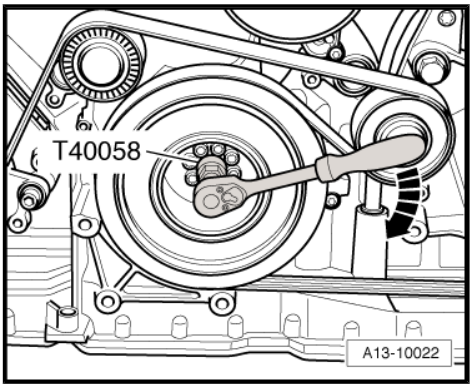


– Turn crankshaft 1 rotation using adapter - T40058- .

Caution

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

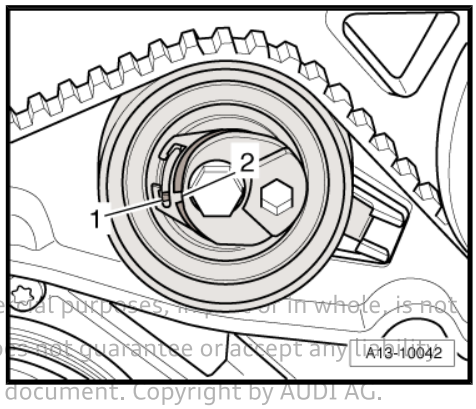
- ***Turn crankshaft only in direction of engine rotation -arrow-.***



– Check toothed belt tension:

• Lug -1- should align with notch -2-.

– If the specification is not attained, re-adjust toothed belt tension.



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

– Install intake manifold (top section) ⇒ page 483 .

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6 Senders and sensors

⇒ “6.1 Checking fuel pressure regulating valve N276 ”, page 538

⇒ “6.2 Removing and installing fuel pressure regulating valve N276 ”, page 540

⇒ “6.3 Removing and installing fuel pressure sender G247 ”, page 542

⇒ “6.4 Removing and installing air mass meter G70 ”, page 545

⇒ “6.5 Removing and installing pressure differential sender G505 ”, page 545

⇒ “6.6 Removing and installing exhaust gas pressure sensor 1 G450 ”, page 546

⇒ “6.7 Removing and installing control unit for NOx sender J583 with NOx sender G295 - engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB, CAPA”, page 547

⇒ “6.8 Removing and installing control unit for NOx sender 2 J881 with NOx sender 2 G687 - engine code CCLA”, page 548

6.1 Checking fuel pressure regulating valve - N276-

WARNING

- *Always read rules for cleanliness and instructions for working on fuel system ⇒ page 9 .*
- *Follow these instructions and rules for cleanliness before starting work and while working on the fuel system.*

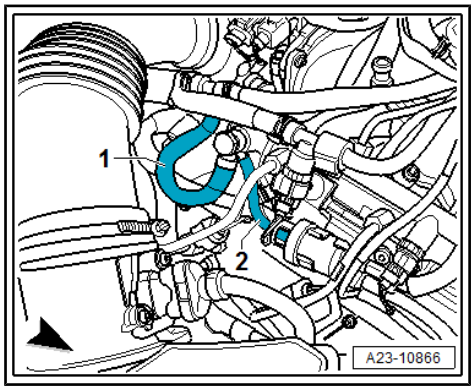
– Remove engine cover panel ⇒ page 162 .

Observe different connections at banjo bolt:

- Checking on vehicles with 2 connections at banjo bolt ⇒ page 538
- Checking on vehicles with 3 connections at banjo bolt ⇒ page 539

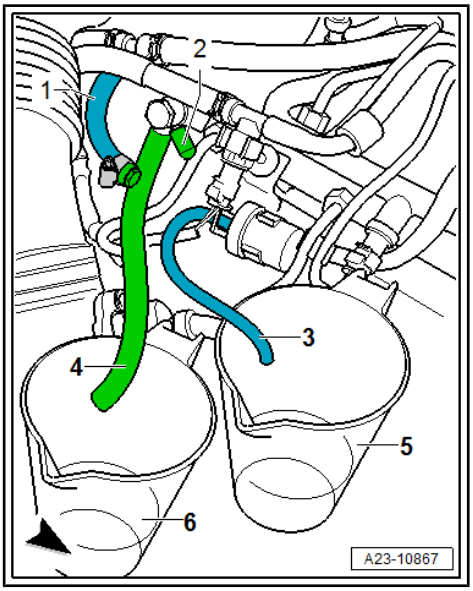
Checking on vehicles with 2 connections at banjo bolt

– Detach fuel return lines -1 and 2- at banjo bolt.



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– Seal off open return line -1- with plug.
– Seal off open connection at banjo bolt with plug -2-.
– Attach hose -4- to open connection at banjo bolt.
– Hold hose -4- into a suitable measuring container.
– Hold return line -3- into a suitable container.
– Measure return flow rate of hose -4- as follows.



Note

- *Fuel return rate of injectors from hose -3- can be disregarded for this test.*
- *Fuel temperature above 10 °C.*

– Start engine and run at idling speed.

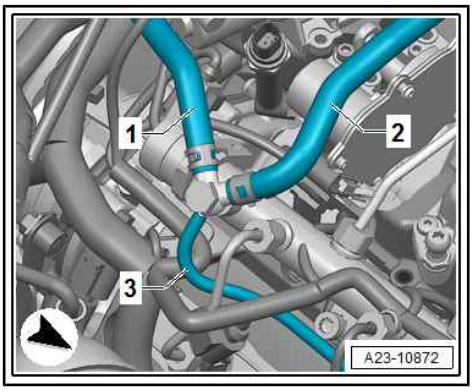
- Return flow rate from hose -4- (engine start): 0 ml
- Return flow rate from hose -4- after 2 minutes: 0 ... 50 ml

If specification is not obtained, fuel pressure regulating valve - N276- is defective.

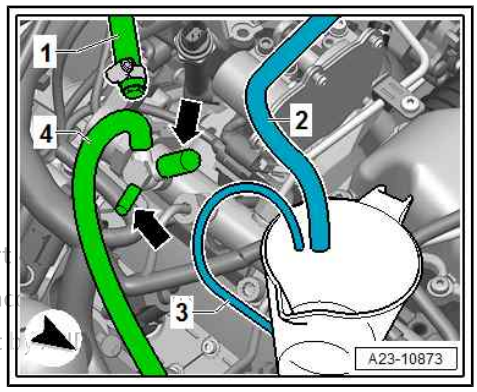
– Renew fuel pressure regulating valve - N276- ⇒ page 540 .

Checking on vehicles with 3 connections at banjo bolt

– Detach fuel return lines -1, 2 and 3- at banjo bolt.



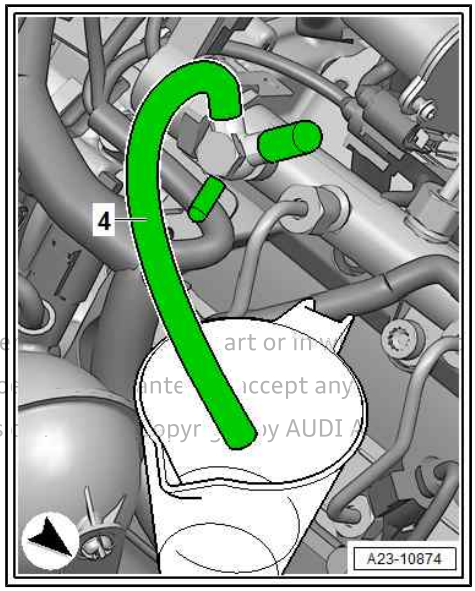
– Seal off open return line connection -1- with plug.
– Seal off open connections at banjo bolt with plugs -arrows-.
– Hold hoses -2 and 3- into a suitable container.
– Attach hose -4- to open connection at banjo bolt.



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– Hold hose -4- into a suitable measuring container.

– Measure return flow rate of hose -4- as follows.



Note

Return flow rate from hoses -2 and 3- can be disregarded for this test.

– Start engine and run at idling speed.

- Return flow rate from hose -4- (engine start): 0 ml
- Return flow rate from hose -4- after 2 minutes: 0 ... 50 ml

If specification is not obtained, fuel pressure regulating valve - N276- is defective.

– Renew fuel pressure regulating valve - N276- ⇒ page 540 .

6.2 Removing and installing fuel pressure regulating valve - N276-

Special tools and workshop equipment required

♦ Open-end spanner insert, 30 mm - T10553-



♦ Torque wrench - V.A.G 1332-



♦ Pliers (e.g. water pump pliers)

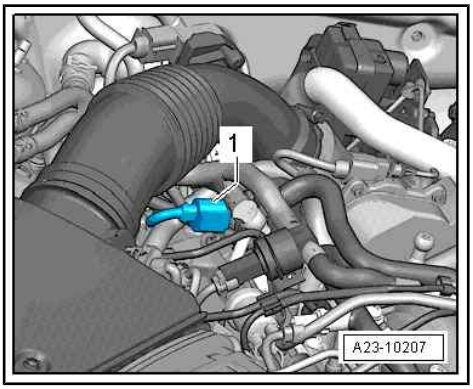
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The fuel pressure regulating valve - N276- -1- is located in the right-side fuel rail (cylinder bank 1). It maintains a constant pressure in the rail and the injector pipes (high-pressure fuel circuit).

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 line.

If the pressure in the high-pressure fuel circuit is too low, the valve (restrictor) closes and seals off the high-pressure section of the system from the low-pressure section.

The fuel pressure regulating valve - N276- cannot be re-used.



Removing

WARNING

- *Always read rules for cleanliness and instructions for working on fuel system ⇒ page 9 .*
- *Follow these instructions and rules for cleanliness before starting work and while working on the fuel system.*

– Remove engine cover panel ⇒ page 162 .
– Remove intake hose between air mass meter - G70- and turbocharger.
– Before removal, clean area around thread for fuel pressure regulating valve using cleaning solution or similar (no dirt must enter opening in fuel rail).

Note

Clean carefully; cleaning solution must not enter the electrical connector.

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– Dry off fuel pressure regulating valve - N276- .
– Remove banjo bolt for fuel return lines (make sure that all parts are clean).
– Open cable tie securing wiring harness located above fuel pressure regulating valve - N276- .
– Detach electrical connector at fuel pressure regulating valve - N276- .
– Slacken union nut (counterhold at hexagon flats on housing). Then unscrew and remove by hand.
– Extract dirt from opening in fuel rail (thread and sealing surface) using a vacuum cleaner. Do not use metal tools, etc.

Note

Seal off opening in fuel rail immediately with a suitable plug to prevent dirt from entering.

Installing

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 sealing surfaces (deformable sealing lip) and threads 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.*

– Screw on union nut by hand.

– Align regulating valve so that connecting wire is free of tension after connector is attached.

– Tighten union nut using open-end spanner insert, 30 mm - T10553- (at the same time, counterhold at hexagon flats on housing).

Tightening torque: Tighten union nut in 2 stages.

Stage 1: 60 +/-5 Nm (counterhold hexagon flats on housing).

Then back off union nut 90° ($^1/_4$ turn; counterhold hexagon flats on housing).

Stage 2: 95 +5 Nm (counterhold hexagon flats on housing).

– Tighten banjo bolt for fuel return lines with new seals to 25 Nm.

– Remove intake hose between air mass meter - G70- and turbocharger.

– The remaining installation steps are carried out in the reverse sequence.

– After installation, run engine at moderate speed for several minutes and then switch off.

– Check fuel system for leaks.

– Interrogate event memory.

After renewing high-pressure pump and/or fuel pressure regulating valve - N276- , adaption must be performed.

– 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.

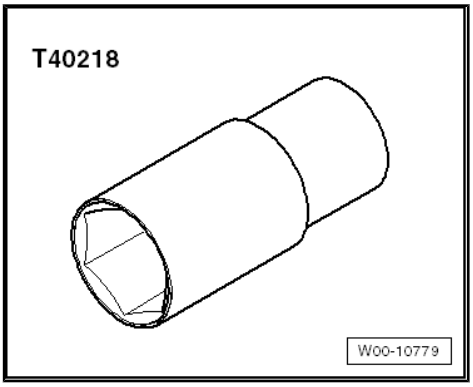
– Interrogate event memory again.

6.3 Removing and installing fuel pressure sender - G247-

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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

WARNING

- ***Always read rules for cleanliness and instructions for working on fuel system ⇒ page 9 .***
- ***Follow these instructions and rules for cleanliness before starting work and while working on the fuel system.***

– Remove engine cover panel ⇒ page 162 .

– Before removal, clean area around thread for fuel pressure sender using commercial cleaning solution or similar (no dirt must enter opening in fuel rail).

Note

Clean carefully; cleaning solution must not enter the electrical connector.

– Dry off fuel pressure sender - G247- .

– Unplug electrical connector at fuel pressure sender - G247- .

– Unscrew fuel pressure sender - G247- using socket, 27 mm - T40218- .

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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

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Note

- *If the deformable sealing lip and the thread of the fuel pressure sender - G247- are not damaged, the sender can be re-used once.*
- *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.*

– Screw in fuel pressure sender - G247- by hand.

– Then tighten fuel pressure sender - G247- to specified torque.

Tightening torques

- ⇒ “1.3.1 Exploded view - fuel system, engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB, CCLA”, page 468

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.

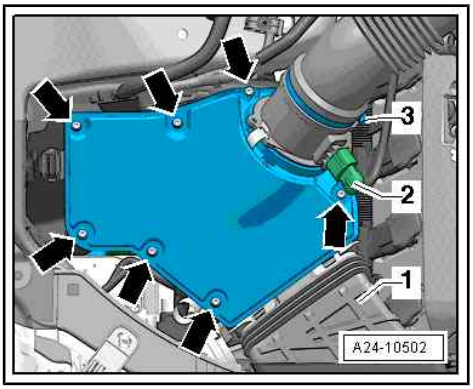
Note

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.

6.4 Removing and installing air mass meter - G70-

Removing



– Unplug electrical connector at air mass meter - G70- -2-.
– Open hose clip -3- at air hose and disconnect air hose from air mass meter - G70- .
– Open both clamps at air mass meter - G70- .
– Carefully pull air mass meter - G70- out of guide on air cleaner housing.

Installing

To ensure the correct function of the air mass meter - G70- , it is important to observe the following notes and instructions.

Note

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

– Check air mass meter - G70- and air hose (engine intake side) for salt residue, dirt and leaves.
– Check intake duct as far as air filter element for dirt. If necessary, clean salt residue, dirt and leaves out of air cleaner housing (top and bottom sections); wash out or use a vacuum cleaner as required. Removing and installing air cleaner ⇒ page 478 .
– If air filter element has been removed, clean water drain hose in air cleaner (bottom section).
– Align O-ring in slot on air cleaner housing and carefully push air mass meter - G70- into air cleaner housing.

Note

- *Use a lubricant (silicone-free) for installation.*
- *Renew O-ring if damaged.*

– Engage the two clamps.
– Fit air hose and tighten hose clamp.
– Plug electrical connector back onto air mass meter - G70- .

6.5 Removing and installing pressure differential sender - G505-

The pressure differential sender - G505- detects the amount of deposits in the particulate filter.

The second measuring line is approx. 7 cm in length and free to atmosphere (relative pressure sensor concept).

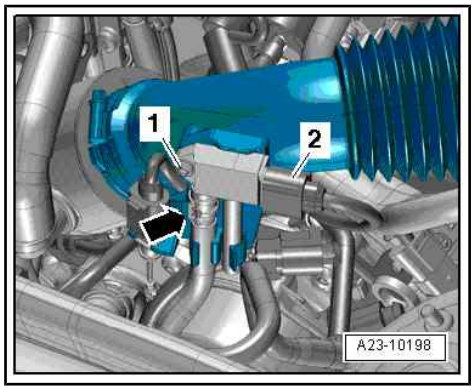
Exhaust gas pressure sensor 1 - G450- detects the amount of deposits in the particulate filter.

Removing

– The pressure differential sender - G505- -3- is mounted at the end face.

– Before disconnecting, spray the hoses for the pressure differential sender - G505- with suitable release agent.

– Carefully disconnect the hoses from their connections (take care to keep the hoses straight: the connections on pressure differential sender - G505- can break off easily).



Note

The short measuring line can also be pulled off with the exhaust gas pressure sensor 1 - G450- removed.

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

– Unscrew bolt -1- and take out pressure differential sender - G505- .

Installing

– When installing, note the following:

Note

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- *Before installing, blow out hose for pressure differential sender - G505- towards particulate filter with compressed air (hose can become obstructed or may ice up due to condensation).*
- *Make sure that hoses are securely fitted and seal properly.*
- *If pressure pipes have been detached from particulate filter, tighten connections to specified torque.*

- Tightening torque: Lambda probe and exhaust gas temperature control - exploded view ⇒ page 551 .

After renewing exhaust gas pressure sensor 1 - G450- and/or particulate filter, adaption must be performed in order to reset learnt values. The adaption procedure is described in the Guided Fault Finding or Guided Functions; use a vehicle diagnostic tester .

6.6 Removing and installing exhaust gas pressure sensor 1 - G450-

The exhaust gas pressure sensor 1 - G450- is connected to a take-off point upstream of the particulate filter via a pipe.

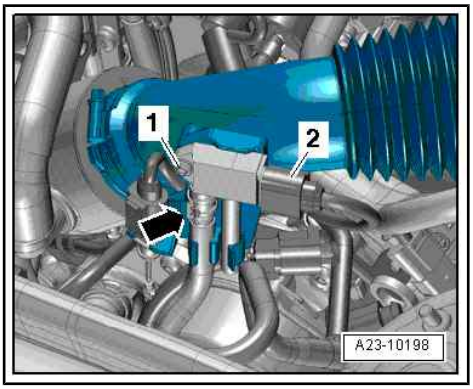
The second measuring line is approx. 7 cm in length and free to atmosphere (relative pressure sensor concept).

Exhaust gas pressure sensor 1 - G450- detects the amount of deposits in the particulate filter.

Removing

– Remove engine cover panel ⇒ page 162 .

– Before disconnecting, spray hoses coming from exhaust gas pressure sensor 1 - G450- with suitable release agent.
– Carefully pull hoses off connections (take care to keep the hoses straight; the connections can easily break off exhaust gas pressure sensor 1 - G450-).



Note

The short measuring line can also be pulled off with the exhaust gas pressure sensor 1 - G450- removed.

– Detach electrical connector -2- from exhaust gas pressure sensor 1 - G450- .
– Unscrew bolt -1- and remove exhaust gas pressure sensor 1 - G450- .

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Installing

– When installing, note the following:

- Tightening torque
  ⇒ “7.1.1 Exploded view - Lambda probe, engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB, CAPA”, page 549

Note

- *Before installing, blow out hose for exhaust gas pressure sensor 1 - G450- to particulate filter towards particulate filter with compressed air (hoses can become obstructed or may ice up due to condensation).*
- *Make sure that hoses are securely fitted and seal properly.*
- *If pressure pipe has been released from particulate filter, tighten to 45 Nm.*

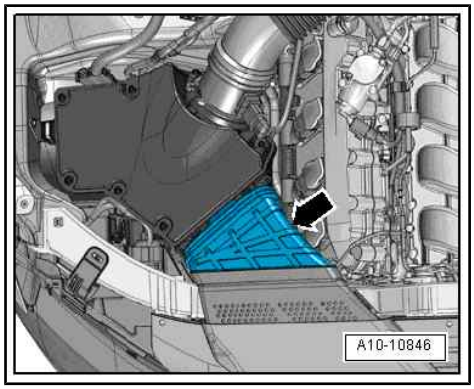
After renewing exhaust gas pressure sensor 1 - G450- and/or particulate filter, adaption must be performed in order to reset learnt values. The adaption procedure is described in the Guided Fault Finding or Guided Functions; use a vehicle diagnostic tester .

6.7 Removing and installing control unit for NOx sender - J583- with NOx sender - G295- - engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB, CAPA

Removing

– Remove engine cover panel ⇒ page 162 .

– Remove air duct -arrow-.

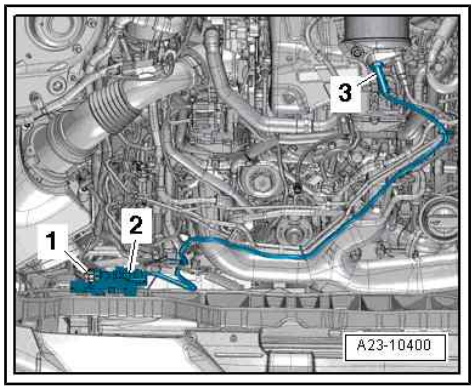


– Unplug electrical connector -2-.
– Unscrew nuts -1- and detach control unit for NOx sender - J583- .
– Move clear electrical wiring harness and unscrew NOx sender - G295- -3-.

Installing

Installation is carried out in reverse sequence.

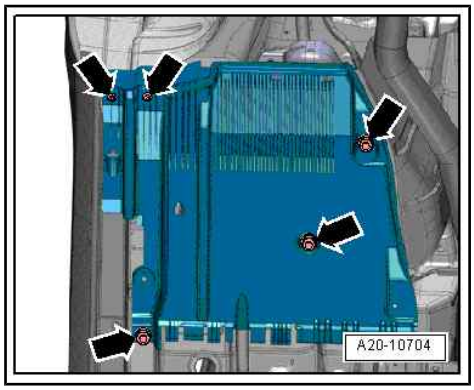
- Tightening torque: Lambda probe and exhaust gas temperature control - exploded view ⇒ page 551 .



6.8 Removing and installing control unit for NOx sender 2 - J881- with NOx sender 2 - G687- - engine code CCLA

Removing

– Remove bolt and nuts -arrows- and detach cover for active tank.



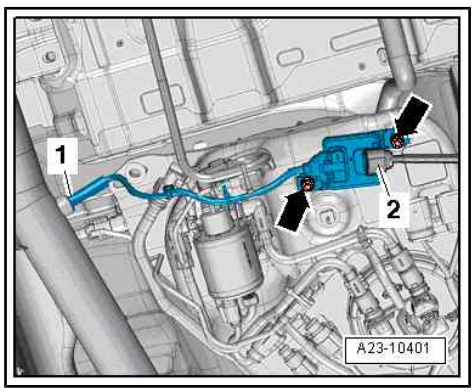
– Unplug electrical connector -2-.
– Unscrew nuts -arrows- for control unit for NOx sender 2 - J881- .
– Unscrew and detach NOx sender 2 - G687- -1-.

Installing

- Tightening torque: Lambda probe and exhaust gas temperature control - exploded view ⇒ page 551 .

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

– Install cover for active tank ⇒ page 584 .



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7 Lambda probe

⇒ “7.1 Exploded view - Lambda probe”, page 549

⇒ “7.2 Removing and installing Lambda probe”, page 552

7.1 Exploded view - Lambda probe

⇒ “7.1.1 Exploded view - Lambda probe, engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB, CAPA”, page 549

⇒ “7.1.2 Exploded view - Lambda probe, engine code CCLA”, page 551

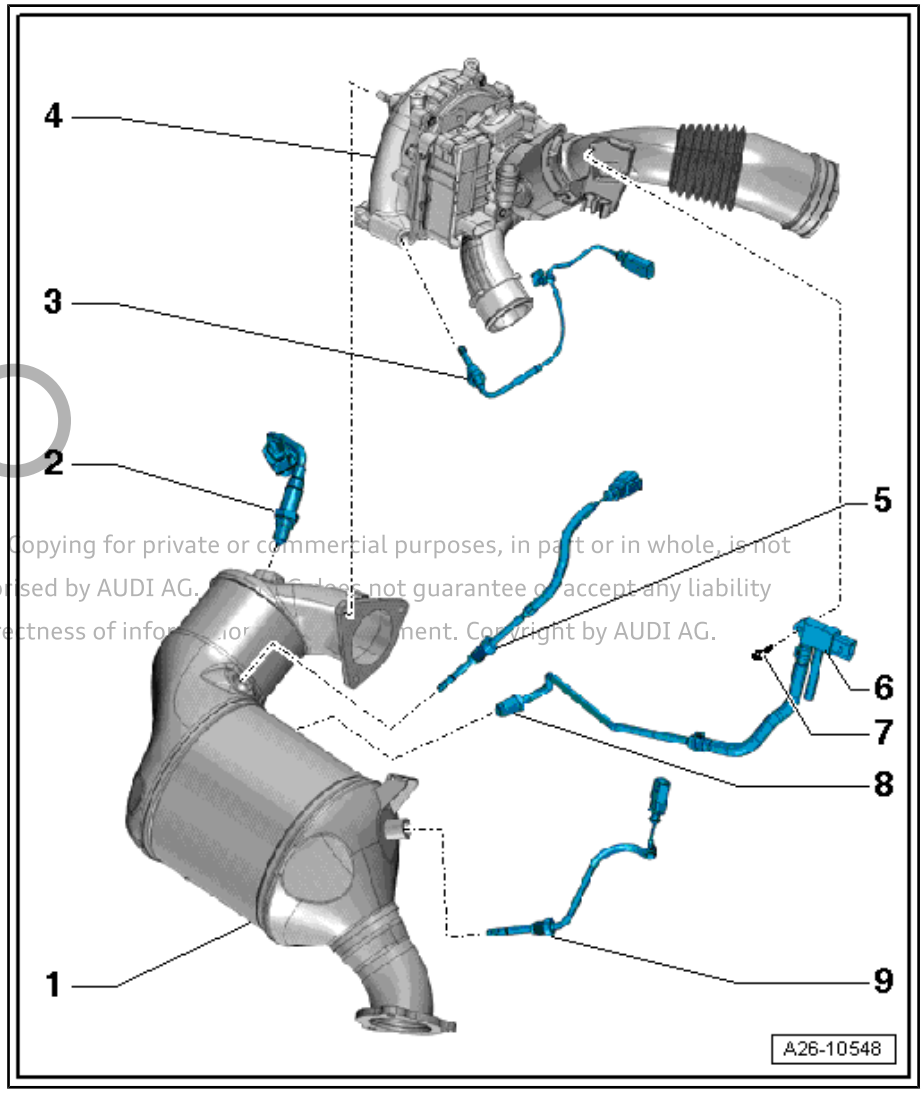
7.1.1 Exploded view - Lambda probe, engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB, CAPA

WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system*
  ⇒ “2.8 Safety precautions when working on the exhaust system”, page 7 .

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1 - Particulate filter

2 - Lambda probe - G39- with Lambda probe heater - Z19-

- ❑ New Lambda probes are coated with an assembly paste
- ❑ In the case of a used Lambda probe, coat only thread with high-temperature paste; refer to ⇒ Parts catalogue for high-temperature paste
- ❑ The assembly paste/high-temperature paste must not make contact with the slots on the Lambda probe body
- ❑ Removing and installing ⇒ page 552
- ❑ 50 Nm

3 - Exhaust gas temperature sender 1 - G235-

- ❑ Only fitted on vehicles with engine codes CAPA, CCWA, CCWB
- ❑ Removing and installing ⇒ page 612
- ❑ 45 Nm

4 - Turbocharger

5 - Exhaust gas temperature sender

- ❑ Exhaust gas temperature sender 3 - G495- (engine codes CAMA, CAMB, CCWA, CCWB, CGKA and CGKB)
- ❑ Exhaust gas temperature sender 2 - G448- (engine code CAPA)
- ❑ Removing and installing ⇒ page 612
- ❑ 45 Nm

6 - Exhaust gas pressure sensor 1 - G450-

- ❑ Removing and installing ⇒ page 546

7 - Bolt

- ❑ 4.5 Nm

8 - Control pipe for exhaust gas pressure sensor 1 - G450-

- ❑ Pressure pipe to particulate filter: 45 Nm
- ❑ Secure to pressure sensor with hose clip
- ❑ Do not attempt to bend pressure pipe to a different shape
- ❑ Install free of stress

9 - Exhaust gas temperature sender

- ❑ Exhaust gas temperature sender 4 - G648- (engine codes CAMA, CAMB, CCWA, CCWB, CGKA and CGKB)
- ❑ Exhaust gas temperature sender 3 for cylinder bank 1 - G496- (engine code CAPA)
- ❑ Removing and installing ⇒ page 612
- ❑ 45 Nm

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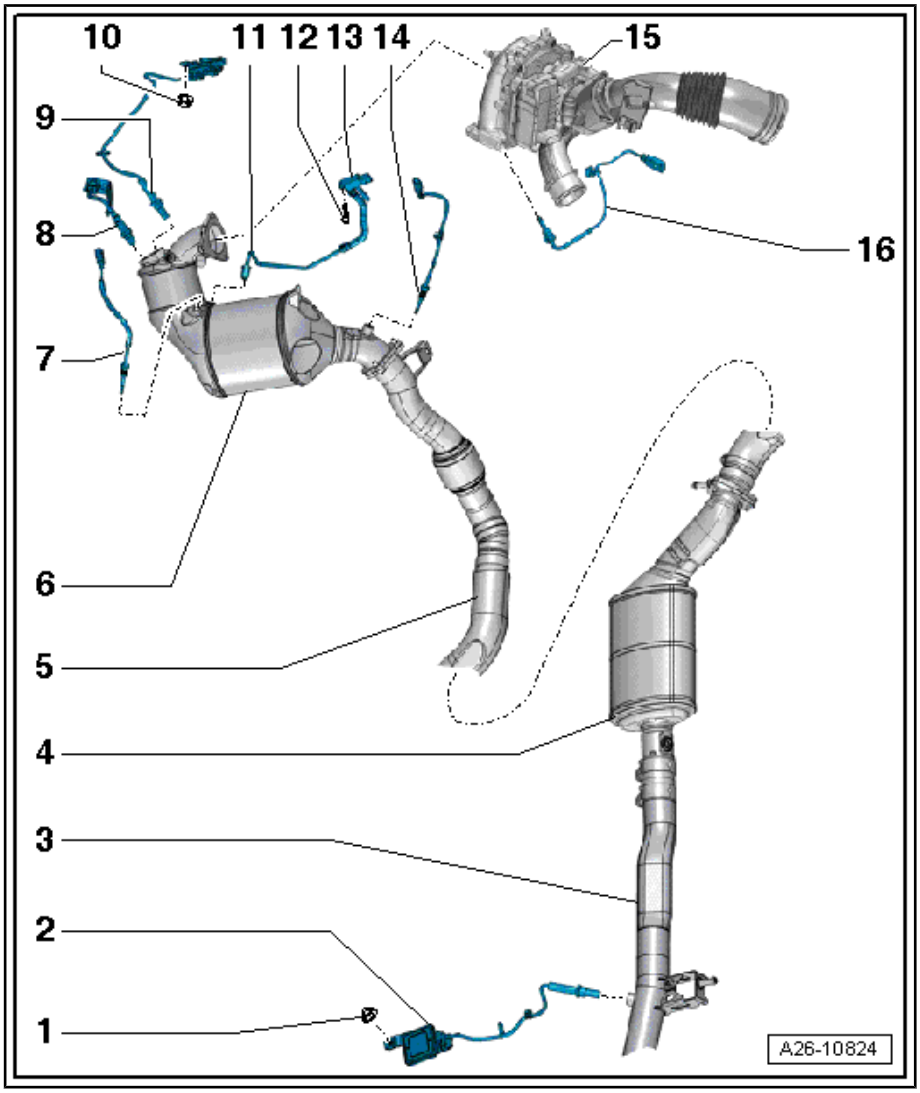
7.1.2 Exploded view - Lambda probe, engine code CCLA

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WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system*
  ⇒ "2.8 Safety precautions when working on the exhaust system", page 7 .



1 - Nut

- ❑ 3.5 Nm

2 - Control unit for NOx sender 2 - J881- with NOx sender 2 - G687-

- ❑ Removing and installing ⇒ page 548
- ❑ Tightening torque for NOx sender 2 - G687- : 50 Nm

3 - Rear silencer

4 - SCR catalytic converter

- ❑ The abbreviation SCR stands for Selective Catalytic Reduction.

5 - Exhaust pipe

6 - Particulate filter

- ❑ Removing and installing ⇒ page 578

7 - Exhaust gas temperature sender 3 - G495-

- ❑ Removing and installing ⇒ page 612
- ❑ Coat thread with high-temperature paste; refer to ⇒ Parts catalogue
- ❑ 45 Nm

8 - Lambda probe - G39- with Lambda probe heater - Z19-

- ❑ New Lambda probes are coated with an assembly paste
- ❑ In the case of a used Lambda probe, coat only thread with high-temperature paste; refer to ⇒ Parts catalogue for high-temperature paste
- ❑ The assembly paste/high-temperature paste must not make contact with the slots on the Lambda probe body
- ❑ Removing and installing ⇒ page 553
- ❑ 50 Nm

9 - Control unit for NOx sender - J583- with NOx sender - G295-

- ❑ Removing and installing ⇒ page 547
- ❑ Tightening torque for NOx sender - G295- : 50 Nm

10 - Nut

- ❑ 3.5 Nm

11 - Control pipe for pressure differential sender - G505-

- ❑ Tighten to 45 Nm at exhaust
- ❑ Secure to pressure sensor with hose clip
- ❑ Do not attempt to bend pressure pipe to a different shape
- ❑ Install free of stress

12 - Bolt

- ❑ 4.5 Nm

13 - Pressure differential sender - G505-

- ❑ Removing and installing ⇒ page 545
- ❑ Adaption must be performed after renewing this component

14 - Exhaust gas temperature sender 4 - G648-

- ❑ Removing and installing ⇒ page 612
- ❑ Coat thread with high-temperature paste; refer to ⇒ Parts catalogue
- ❑ 45 Nm

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15 - Turbocharger

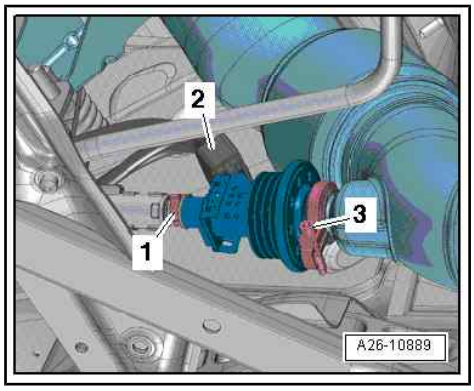
- ❑ Removing and installing ⇒ page 422

16 - Exhaust gas temperature sender 1 - G235-

- ❑ Removing and installing ⇒ page 612
- ❑ Coat thread with high-temperature paste; refer to ⇒ Parts catalogue
- ❑ 45 Nm

Injector for reducing agent - N474-

Removing and installing injector for reducing agent - N474- ⇒ page 595



7.2 Removing and installing Lambda probe

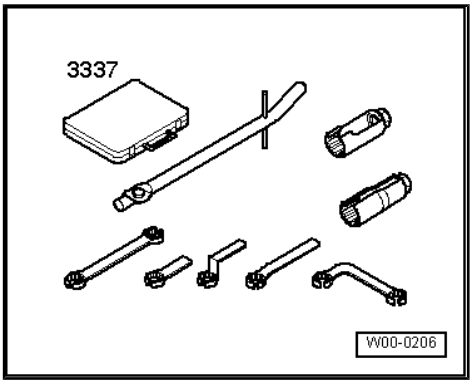
⇒ “7.2.1 Removing and installing Lambda probe - engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB, CAPA”, page 552

⇒ “7.2.2 Removing and installing Lambda probe - engine code CCLA”, page 553

7.2.1 Removing and installing Lambda probe - engine codes CAMA, CAMB, CCWA, CCWB, CGKA, CGKB, CAPA

Special tools and workshop equipment required

- Lambda probe open ring spanner set - 3337-



Removing

– Remove engine cover panel ⇒ page 162 .

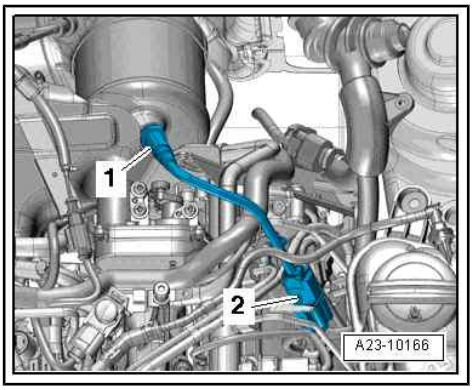
WARNING

When working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system***
  ⇒ "2.8 Safety precautions when working on the exhaust system", page 7 .

– Unplug electrical connector -2- for Lambda probe - G39- .

– Unscrew Lambda probe - G39- -1- using tool from Lambda probe open ring spanner set - 3337- .



Installing

When installing, 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.*

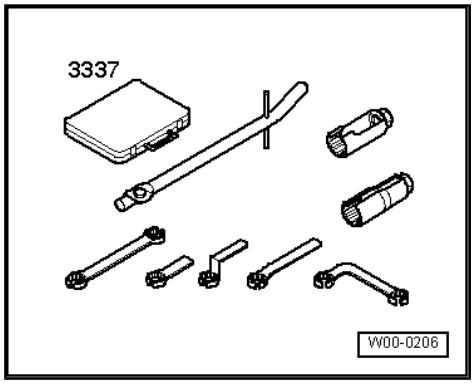
- Tightening torque: Exploded view - Lambda probe ⇒ page 549

7.2.2 Removing and installing Lambda probe - engine code CCLA

Special tools and workshop equipment required

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♦ Lambda probe open ring spanner set - 3337-



Removing

– Remove engine cover panel ⇒ page 162 .

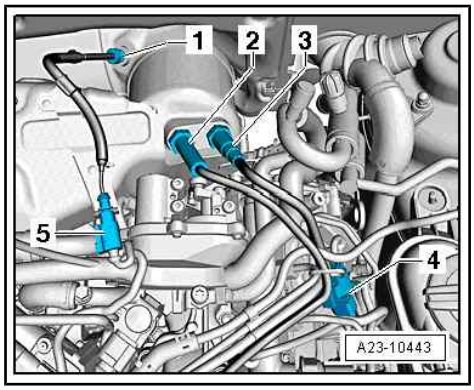
WARNING

When working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system***
  ⇒ "2.8 Safety precautions when working on the exhaust system", page 7 .

– Unplug electrical connector -2- for Lambda probe - G39- .

– Unscrew Lambda probe - G39- -3- using tool from Lambda probe open ring spanner set - 3337- .



Installing

When installing, 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.*

• Tightening torque: Lambda probe and exhaust gas temperature control - exploded view ⇒ page 551 .

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8 Engine control unit

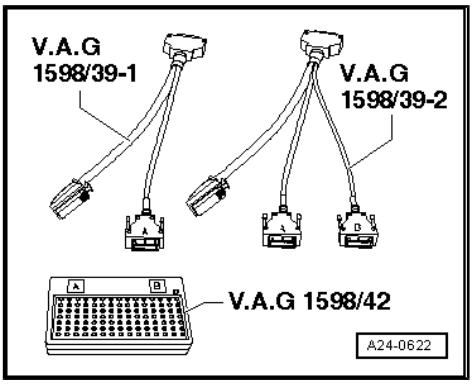
⇒ “8.1 Wiring and component check with test box V.A.G 1598/42 ”, page 555

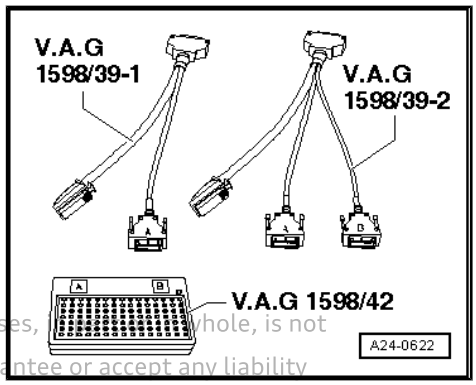
⇒ “8.2 Removing and installing engine/motor control unit J623 ”, page 557

8.1 Wiring and component check with test box - V.A.G 1598/42-

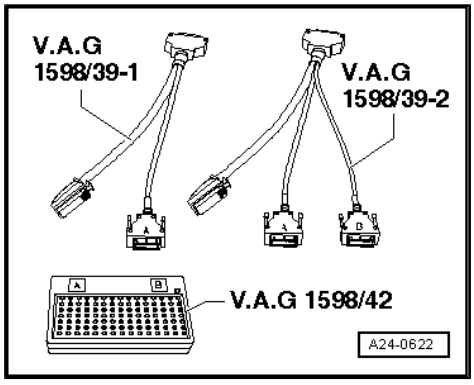
Special tools and workshop equipment required

- Adapter cable - V.A.G 1598/39-1-
- Adapter cable - V.A.G 1598/39-2-
- Test box - V.A.G 1598/42-





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Note

- *The test box has 105 sockets. The connecting cable can be disconnected from the test box. This means that only the cable (and not the test box) has to be purchased for future engine control units with different types of connectors.*
- *The smaller of the two connectors on the engine control unit has the contacts 1 to 60. The larger of the two connectors has the contacts 1 to 94.*
- *To carry out tests on the 60-pin wiring harness connector, the adapter cable -V.A.G 1598/39-1- is connected to connector "A" on the test box. For components connected to 60-pin wiring harness connector ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.*
- *To carry out tests on the 94-pin wiring harness connector, the adapter cable -V.A.G 1598/39-2- must be connected to connectors "A" and "B" on the test box. For components connected to 94-pin wiring harness connector ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.*
- *The test box - V.A.G 1598/42- is designed so it can be connected both to the wiring harness for the engine control unit and to the engine control unit itself at the same time.*
- *The advantage of this is that the electronic engine control system remains fully functional when the test box is connected (for example, for measuring signals when the engine is running).*
- *The relevant test procedure will state whether it is necessary to also connect the engine control unit to the test box.*

WARNING

To prevent irreparable damage to the electronic components, select appropriate measuring range before connecting the measuring cables and observe the test requirements.

– Remove engine control unit ⇒ page 557 .

Note

Not every engine control unit is bolted to locking plates. Whether locking plates are fitted depends on the engine/gearbox combination.

– Connect test box - V.A.G 1598/42- with adapter - V.A.G 1598/39-1- or -V.A.G 1598/39-2- to connector on wiring harness. The earth clip on the test box must be connected to the negative battery terminal. The instructions for performing the individual tests indicate whether or not the engine control unit itself also needs to be connected to the test box.
– Carry out test as described in appropriate repair procedures.

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Installing engine control unit

Installation is performed in the reverse sequence.

– After installation, the locking plates must be re-fitted on the control unit (if locking plates were fitted previously).

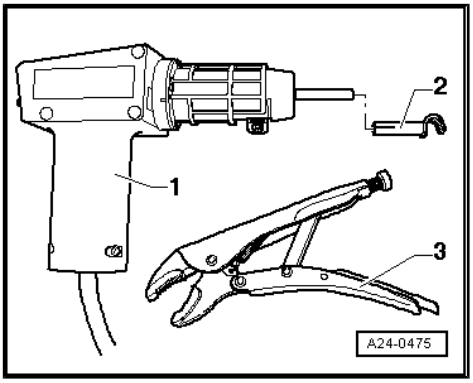
– Clean threaded holes for shear bolts to remove any residue from locking fluid. This can be done using a thread tap.
– Always use new shear bolts.
– Interrogate event memory and erase if necessary.

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8.2 Removing and installing engine/motor control unit - J623-

Special tools and workshop equipment required

- Hot air blower - VAS 1978/14A- -item 1- with nozzle attachment -2- from wiring harness repair set - VAS 1978 B-
- Small, commercially available mole grips -3-



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 .

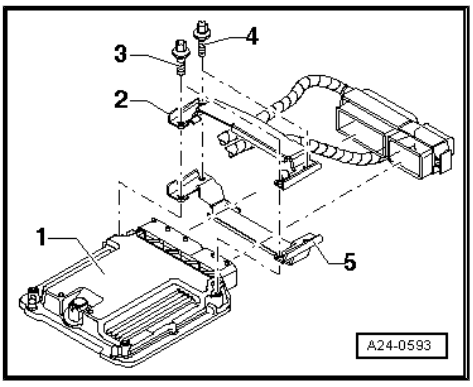
– Switch off ignition and remove ignition key after storing electronic file containing adaption values.

Note

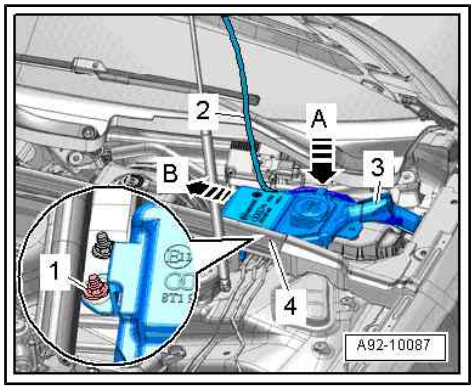
If the adaption values of the injectors cannot be read out of the old (defective) engine control unit, they must be entered into the new engine control unit manually and the adaption procedure must be performed accordingly.

Note

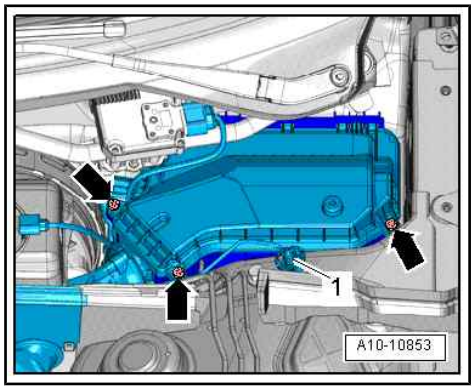
- *Not every engine control unit is bolted to locking plates. Whether locking plates are fitted depends on the engine/gearbox combination.*
- *The engine control unit -1- is bolted to the locking plates -2 and 5-. To make it more difficult to unscrew the shear bolts -4-, the threads have additionally been coated with locking fluid.*



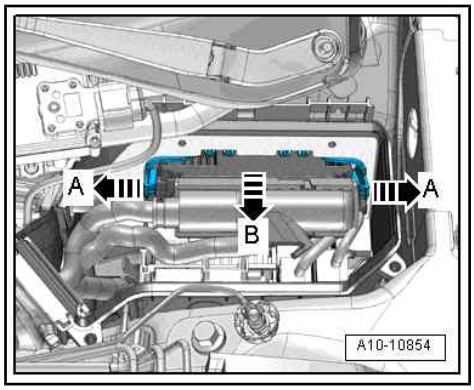
– Slightly pull off rubber seal in front of nut -1- on plenum chamber cover.
– Unscrew nut -1-.
– Unhook wiring harness -2- from retainers -A-.
– Pull filler neck -3- with filler pipe out of washer fluid reservoir and through opening in body.



– Unscrew bolts -arrows- and take off lid for electronics box.

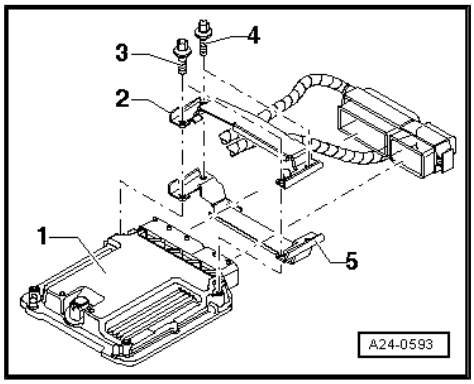


– Release retainers -arrows A- and pull out engine/motor control unit - J623- -arrow B-.



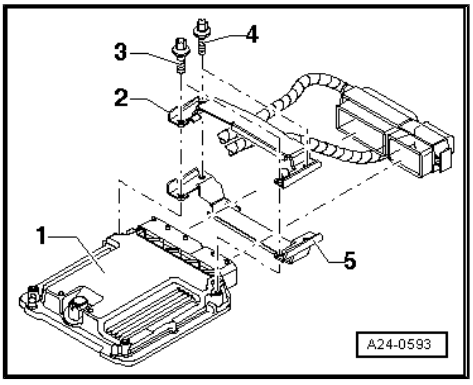
To help prevent unauthorised access to the connectors on the engine control unit, the engine control unit -1- is bolted onto locking plates -2 and 5- with shear bolts -3 and 4-.

The threads of the two shear bolts -4- which are not screwed into the engine control unit are secured with locking fluid. To unscrew these two bolts, the threads must therefore be heated with the hot air blower.

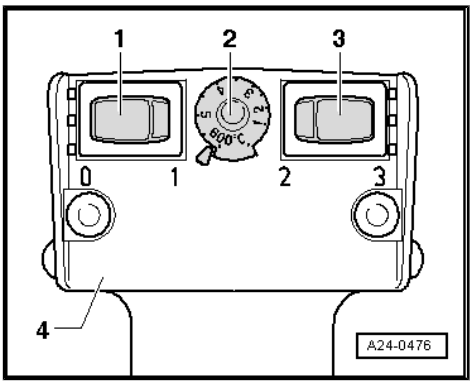


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The threads of the two shear bolts -3- which are screwed into the engine control unit are not secured with locking fluid. Do not apply heat to the threads in the control unit housing; this is not necessary and would cause overheating of the control unit.



– Select settings on hot air blower as shown in illustration, i.e. set temperature potentiometer -2- to maximum heat output and two-stage air flow switch -3- to position 3.



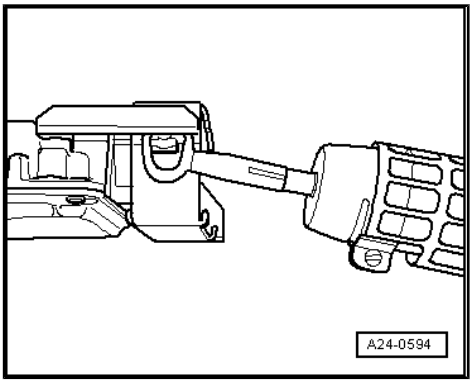
WARNING

Heating the thread of the locking plate also heats up the shear bolts and parts of the metal housing. Take care to avoid burns. It is also important to ensure that only the thread is heated and none of the surrounding components if at all possible. These should be covered if necessary.

Apply heat to the threads of the shear bolts on the connector side as shown in the illustration.

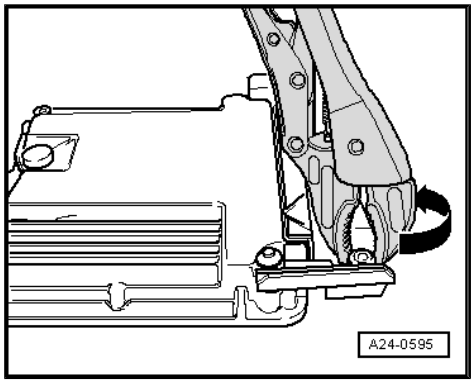
Switch on the hot air blower and heat the bolt for approximately 20 ... 30 seconds.

– Unscrew shear bolts using mole grips (see arrow in illustration).



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– The two shear bolts screwed into the engine control unit do not need to be heated. They should be removed without being heated.
– Detach locking plate from control unit connectors.
– Release connectors on engine control unit and unplug connectors.
– Take out old engine control unit - J623- and install new engine control unit - J623- .



Installing

Installation is performed in the reverse sequence.

– It is important that the locking plates be re-fitted on the control unit (if locking plates were fitted previously).
– Clean threaded holes for shear bolts to remove any residue from locking fluid. This can be done using a thread tap.
– Always use new shear bolts.
• Tightening torque for bolts securing lid of electronics box: 3.5 Nm.
– 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 .

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26 – Exhaust system

1 Exhaust pipes/silencers

⇒ “1.1 Exploded view - silencers”, page 561

⇒ “1.2 Removing and installing front exhaust pipe”, page 567

⇒ “1.3 Separating exhaust pipes/silencers”, page 571

⇒ “1.4 Stress-free alignment of exhaust system”, page 574

⇒ “1.5 Checking exhaust system for leaks”, page 576

1.1 Exploded view - silencers

⇒ “1.1.1 Exploded view - silencers, vehicles without SCR catalytic converter”, page 561

⇒ “1.1.2 Exploded view - silencers, vehicles with SCR catalytic converter”, page 563

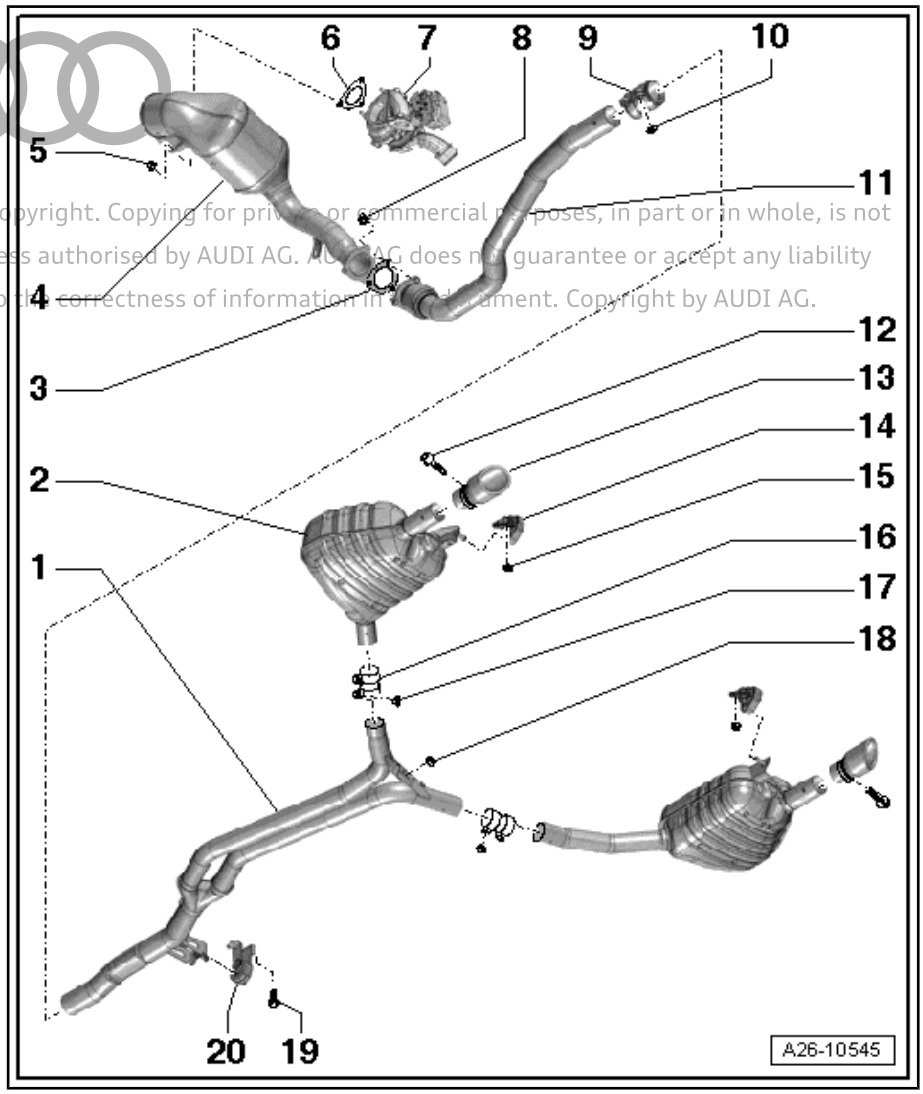
1.1.1 Exploded view - silencers, vehicles without SCR catalytic converter

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: remove diagonal struts ⇒ page 566
- ❑ Cutting point: Y-pipe / rear silencer ⇒ page 571
- ❑ Align exhaust system so it is free of stress ⇒ page 574

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: remove diagonal struts ⇒ page 566
- ❑ Cutting point: Y-pipe / rear silencer ⇒ page 571
- ❑ Cutting point between rear silencer and tailpipe ⇒ page 573
- ❑ Align exhaust system so it is free of stress ⇒ page 574



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3 - Gasket

- ❑ Renew

4 - Particulate filter

- ❑ With catalytic converter
- ❑ With pressure line for exhaust gas pressure sensor 1 - G450- ⇒ Item 8 (page 610)
- ❑ Removing and installing: A5 up to vehicle identification no. 8T-8-009 998 ⇒ page 578 ; A4 (all), A5 from vehicle identification no. 8T-8-009 999 onwards ⇒ page 580
- ❑ After renewing, perform adaption in “Guided Functions” mode ⇒ Vehicle diagnostic tester

5 - Nut

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- ❑ Renew
- ❑ Coat 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 574
- ❑ Installation position ⇒ page 565
- ❑ 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: A5 up to vehicle identification no. 8T-8-009 998 ⇒ page 567 ; A4 (all), A5 from vehicle identification no. 8T-8-009 999 onwards ⇒ page 568
- ❑ Stress-free alignment of exhaust system with cutting point ⇒ page 574

12 - Bolt

- ❑ 23 Nm

13 - Tailpipe

- ❑ Renew
- ❑ Aligning ⇒ page 573

14 - Mounting

- ❑ Renew if damaged
- ❑ Check preload
  ⇒ “1.4.1 Stress-free alignment of exhaust system - vehicles without SCR catalytic converter”, page 574

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 574
- ❑ Installation position ⇒ page 565
- ❑ Tighten bolted connections evenly

17 - Nut

- ❑ 23 Nm

18 - Nut

- ❑ Renew
- ❑ 23 Nm

19 - Bolt

- ❑ Tightening torque ⇒ page 566

20 - Mounting

- ❑ Renew if damaged
- ❑ Components ⇒ page 566
- ❑ Check preload ⇒ “1.4.1 Stress-free alignment of exhaust system - vehicles without SCR catalytic converter”, page 574

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1.1.2 Exploded view - silencers, vehicles with SCR catalytic converter

1 - Rear silencer

- ❑ Tailpipes can be renewed separately as required
- ❑ For removal on A5 Cabriolet: remove diagonal struts ⇒ page 566
- ❑ Cutting point between rear silencer and tailpipe ⇒ page 573
- ❑ Align exhaust system so it is free of stress ⇒ page 576

2 - Injector for reducing agent - N474-

- ❑ Removing and installing ⇒ page 595

3 - Nut

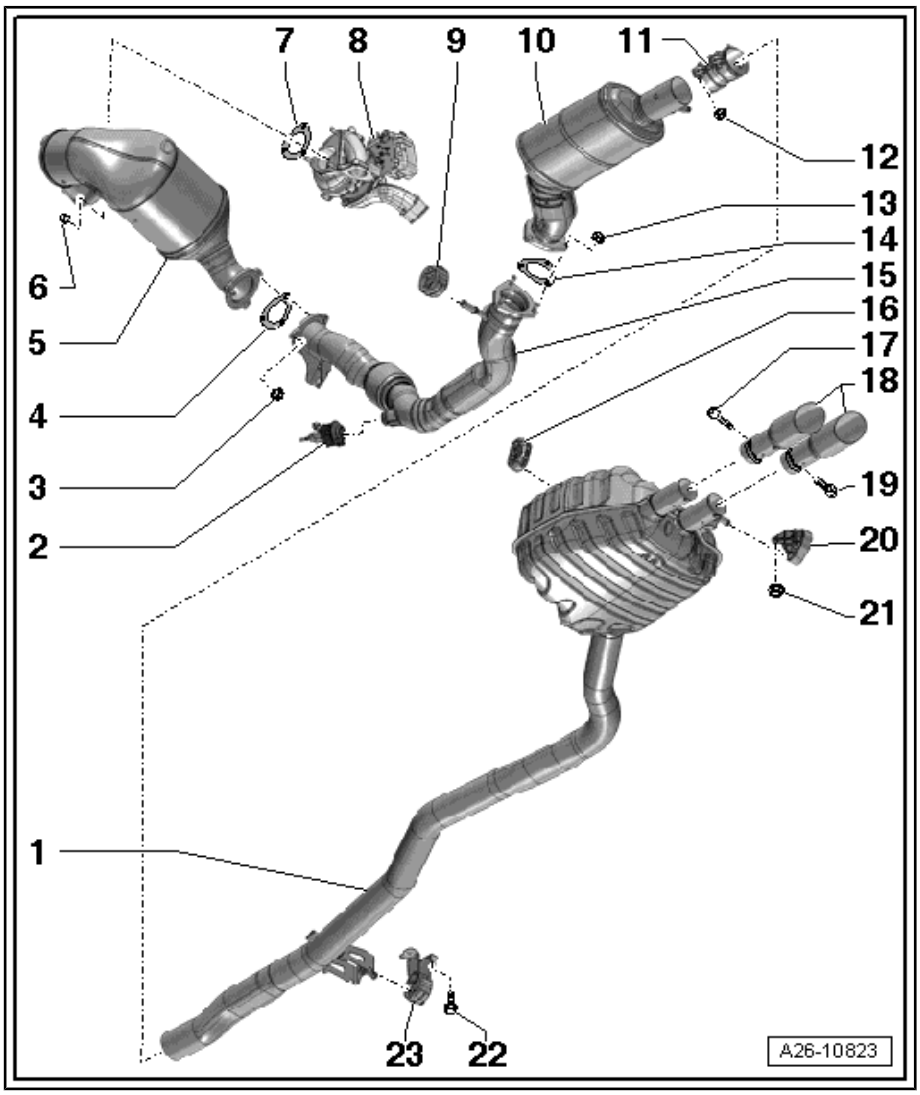
- ❑ Renew
- ❑ Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 23 Nm

4 - Gasket

- ❑ Renew

5 - Particulate filter

- ❑ With catalytic converter
- ❑ With pressure line for exhaust gas pressure sensor 1 - G450- ⇒ Item 11 (page 611)
- ❑ Removing and installing ⇒ page 580
- ❑ After renewing, perform adaption in “Guided Functions” mode ⇒ Vehicle diagnostic tester



6 - Nut
- ❑ Renew
- ❑ 23 Nm

7 - Gasket
- ❑ Renew

8 - Turbocharger

9 - Rubber mounting

10 - SCR catalytic converter
- ❑ Removing and installing ⇒ page 577

11 - Clamp
- ❑ Before tightening, align exhaust system so it is free of stress ⇒ page 576
- ❑ Installation position ⇒ page 565
- ❑ Tighten bolted connections evenly

12 - Nut
- ❑ 23 Nm

13 - Nut
- ❑ Renew
- ❑ Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 23 Nm

14 - Gasket
- ❑ Renew

15 - 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 568
- ❑ Align exhaust system so it is free of stress ⇒ page 576

16 - Rubber mounting

17 - Bolt
- ❑ 23 Nm

18 - Tailpipes
- ❑ Renewing ⇒ page 573
- ❑ Aligning ⇒ page 573

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19 - Nut
- ❑ 20 Nm

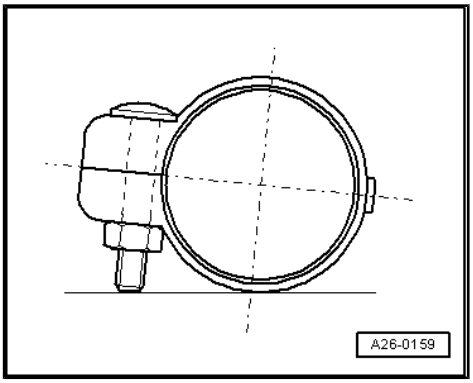
20 - Bolt
- ❑ 23 Nm

21 - Mounting
- ❑ Renew if damaged
- ❑ Check preload
  ⇒ “1.4.2 Stress-free alignment of exhaust system - vehicles with SCR catalytic converter”, page 576

Installation position of front clamp

– Install clamp so that ends of bolts do not protrude beyond bottom of clamp.

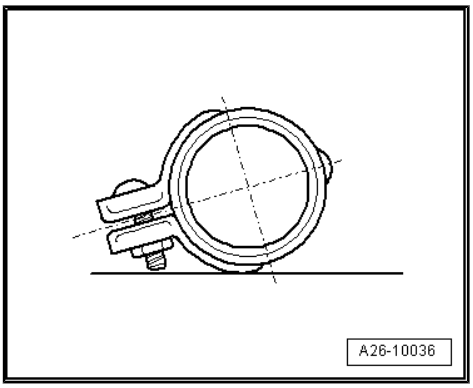
• Bolted connection faces to left.



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.



Mounting components for particulate filter - A5 up to vehicle identification no. 8T-8-009 998

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1 - Spacer sleeve

2 - Compression spring

3 - Washer

4 - Bolt, 23 Nm

5 - Bolt, 23 Nm

6 - Spacer sleeve

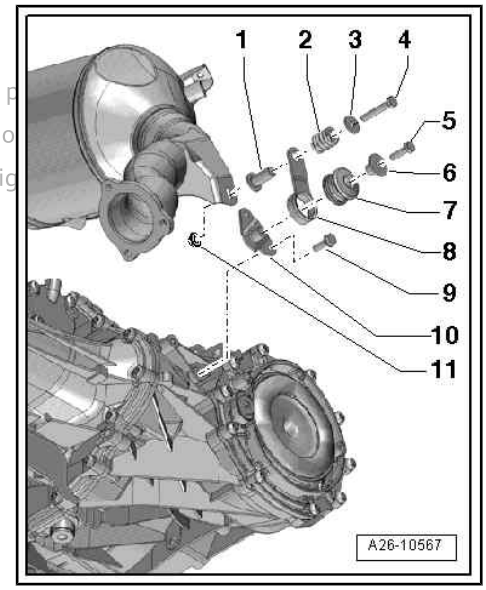
7 - Buffer

8 - Bracket

9 - Bolt, 23 Nm

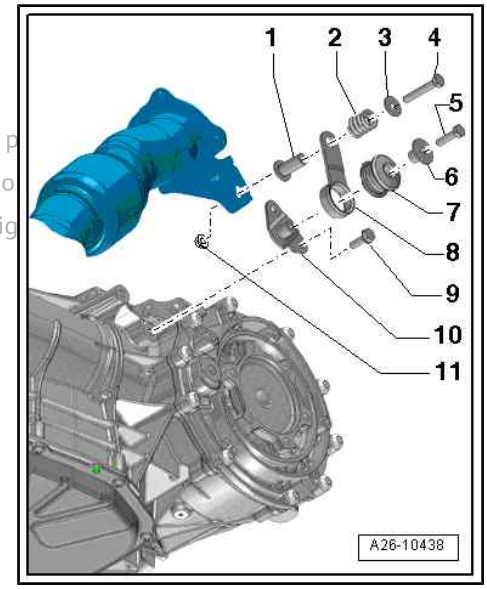
10 - Bracket

11 - Nut



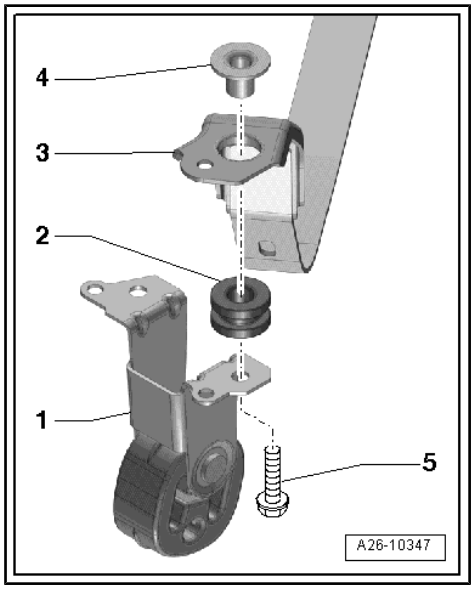
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Mounting components for front exhaust pipe - A4 (all), A5 from vehicle identification no. 8T-8-009 999 onwards



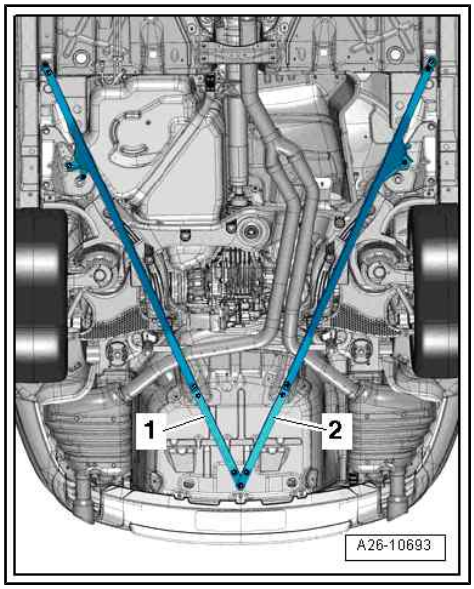
1 - Spacer sleeve
2 - Compression spring
3 - Washer
4 - Bolt, 23 Nm
5 - Bolt, 23 Nm
6 - Spacer sleeve
7 - Buffer
8 - Bracket
9 - Bolt, 23 Nm
10 - Bracket
11 - Nut

Front mounting components for exhaust system



1 - Mounting
2 - Buffer
3 - Securing strap
4 - Spacer sleeve
5 - Bolt, 20 Nm

Diagonal struts (A5 Cabriolet)



– 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 .

1.2 Removing and installing front exhaust pipe

⇒ "1.2.1 Removing and installing front exhaust pipe - A5 up to vehicle identification no. 8T-8-009 998", page 567

⇒ "1.2.2 Removing and installing front exhaust pipe - A4 (all), A5 from vehicle identification no. 8T-8-009 999 onwards", page 568

1.2.1 Removing and installing front exhaust pipe - A5 up to vehicle identification no. 8T-8-009 998

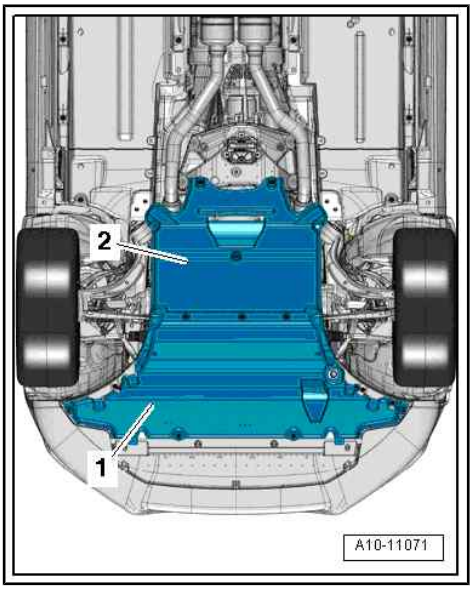
Removing

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

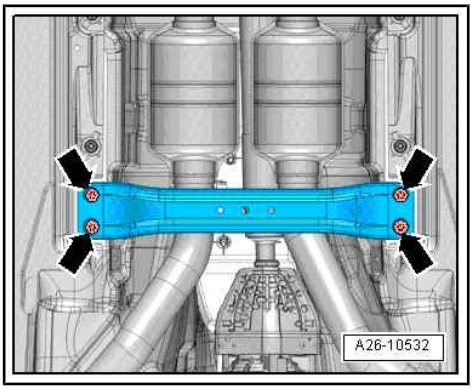
WARNING

When working on all parts of the exhaust system:

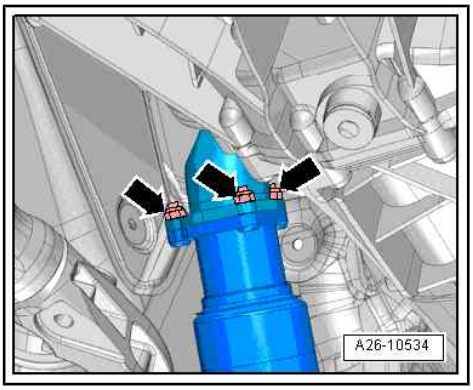
- *Observe safety precautions when working on the exhaust system*
  ⇒ "2.8 Safety precautions when working on the exhaust system", page 7 .



– Remove bolts -arrows- and detach front cross member.



– Remove nuts -arrows- for front exhaust pipe.

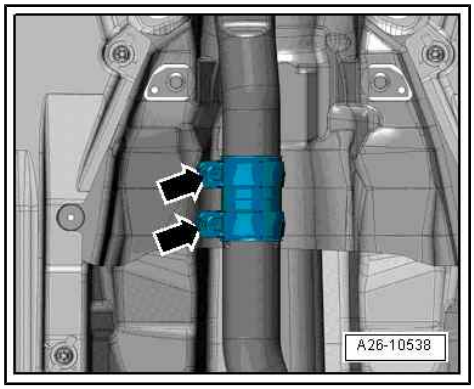


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Caution

Risk of damage to flexible joints in front exhaust pipe

- *Do not bend flexible joints in front exhaust pipe more than 10°.*



– Loosen clamp -arrows-, push back clamp and detach front exhaust pipe.

Installing

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

- Tightening torque
⇒ "1.1 Exploded view - silencers", page 561

Note

Renew seals, gaskets and self-locking nuts.

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

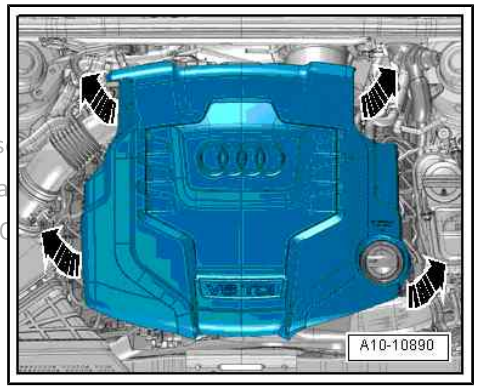
– Align the exhaust system so it is free of stress ⇒ page 574 .

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

1.2.2 Removing and installing front exhaust pipe - A4 (all), A5 from vehicle identification no. 8T-8-009 999 onwards

Removing

– Remove engine cover panel -arrows-.

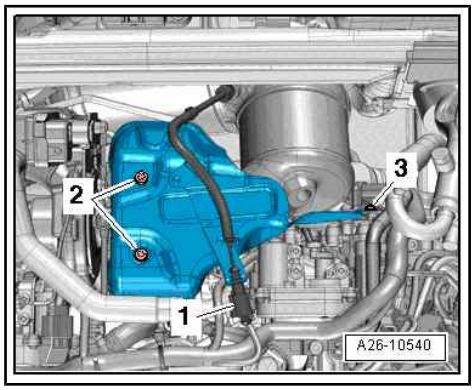


WARNING

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When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system*
⇒ "2.8 Safety precautions when working on the exhaust system", page 7 .

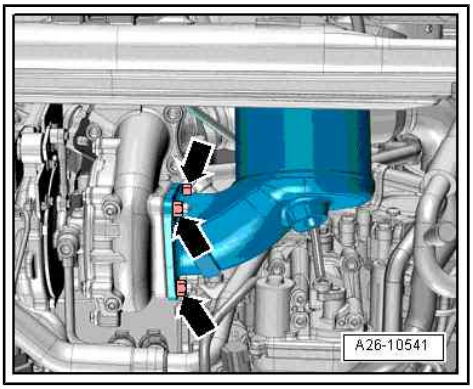


– Unplug electrical connector -1- for exhaust gas temperature sender and move wiring clear.

– Remove bolts -2- and -3-.

– Detach heat shield for turbocharger.

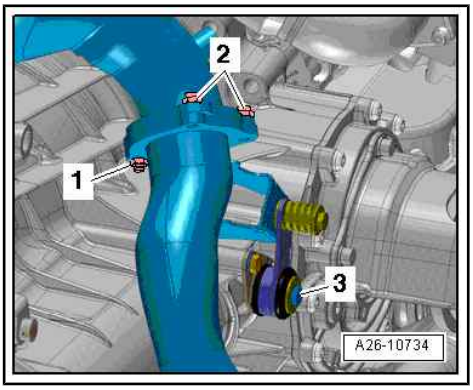
– Remove nuts -arrows- and detach particulate filter from turbocharger.



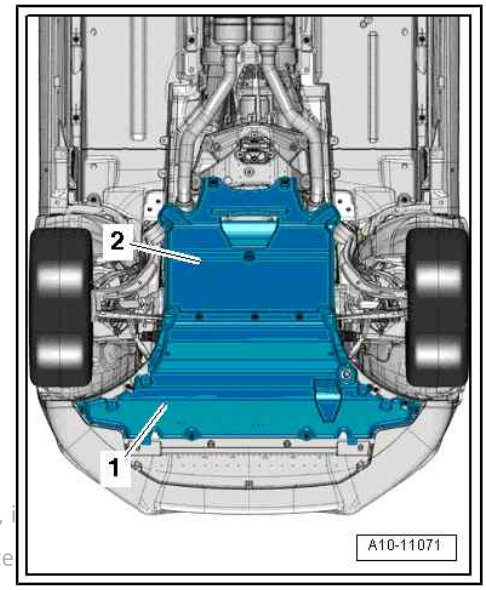
– Remove nuts -2- (accessible from above) for front exhaust pipe.

Note

The nut -1- and bolt -3- are removed at a later stage.

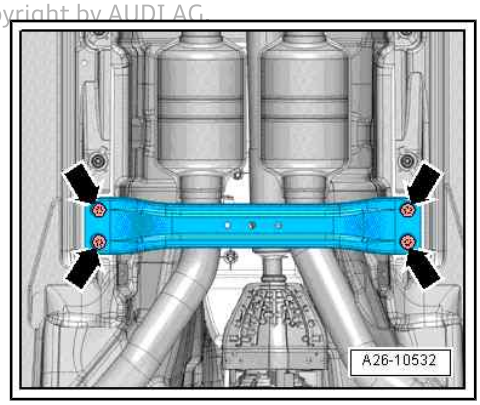


– Remove rear noise insulation -2- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .

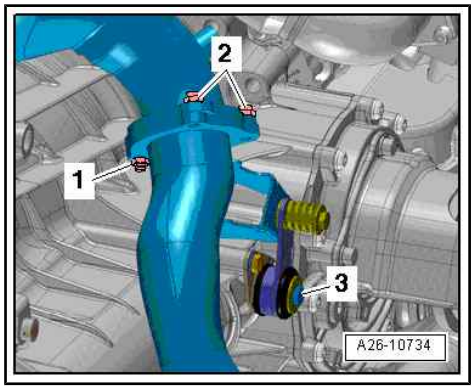


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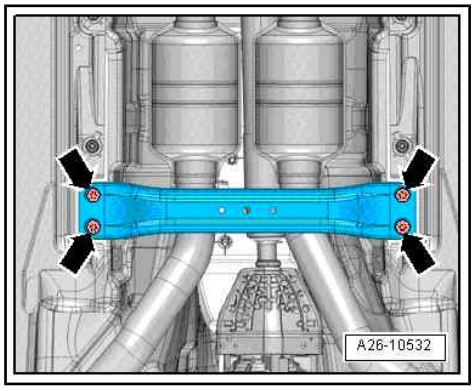
– If fitted, remove bolts -arrows- and detach front cross member.



– Remove nut -1- and bolt -3- for front exhaust pipe.



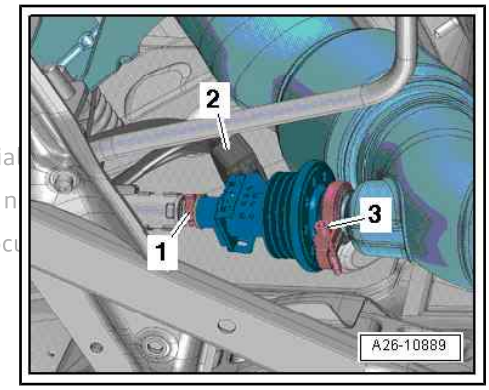
– If fitted, remove bolts -arrows- and detach front cross member.



Vehicles with SCR catalytic converter:

– Unplug electrical connector -2-.

– Release retaining clip -3- and detach injector for reducing agent - N474- .



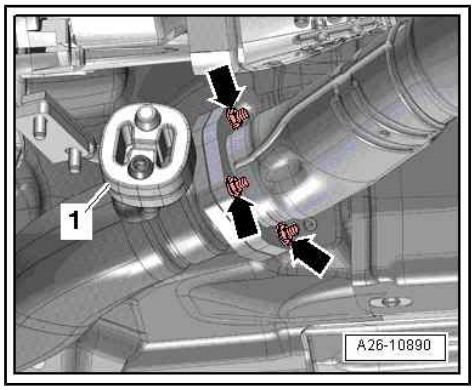
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Note

Disregard -item 1-.

– Remove nuts -arrows-.

– Move front exhaust pipe clear of mounting -1- and detach.

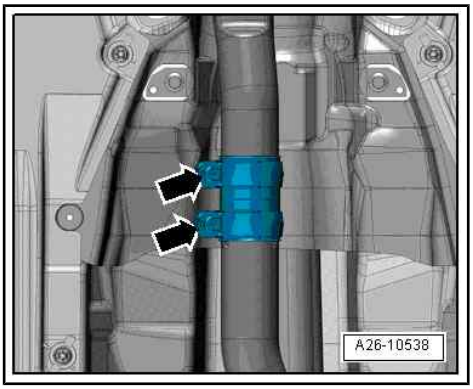


All vehicles (continued):

Caution

Risk of damage to flexible joint in front exhaust pipe.

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



– Loosen bolts -arrows-, push back clamp and detach front exhaust pipe.

Installing

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

Tightening torques

- ⇒ "1.1 Exploded view - silencers", page 561 , ⇒ Fig. ""Mounting components for front exhaust pipe - A4 (all), A5 from vehicle identification no. 8T-8-009 999 onwards"" , page 566

Note

Renew seals, gaskets and self-locking nuts.

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

– Install particulate filter ⇒ page 580 .

– Align the exhaust system so it is free of stress ⇒ page 574 .

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

1.3 Separating exhaust pipes/silencers

⇒ "1.3.1 Separating Y-pipe and rear silencers - vehicles without SCR catalytic converter", page 571

⇒ "1.3.2 Renewing tailpipe - vehicles without SCR catalytic converter", page 573

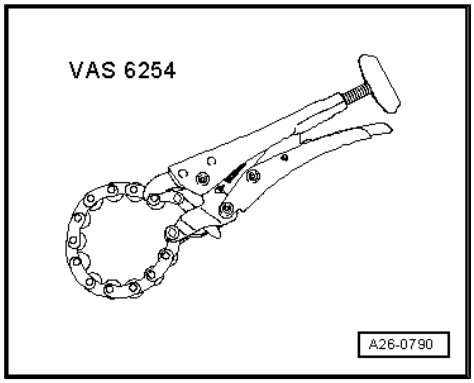
⇒ "1.3.3 Renewing tailpipes - vehicles with SCR catalytic converter", page 573

1.3.1 Separating Y-pipe and rear silencers - vehicles without SCR catalytic converter

- 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-



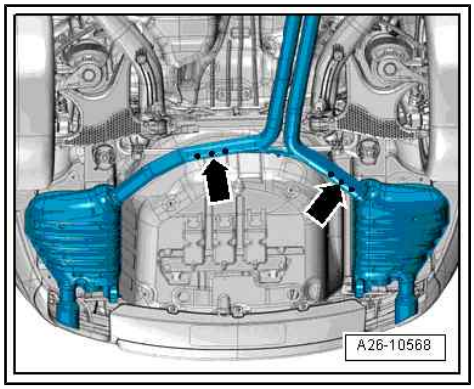
Procedure

WARNING

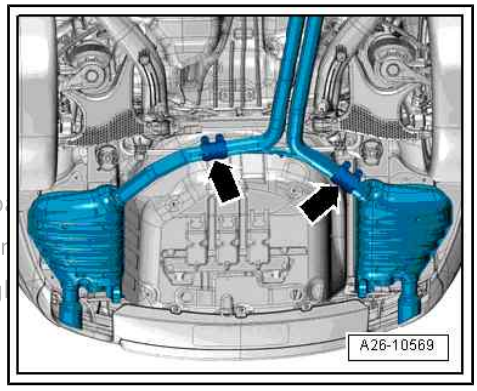
When working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system***
  ⇒ "2.8 Safety precautions when working on the exhaust system", page 7 .

– Cut through exhaust pipes at right angles at the positions marked -arrows- using chain pipe cutter - VAS 6254- .



– Position centre of clamps -arrows- over cutting location.

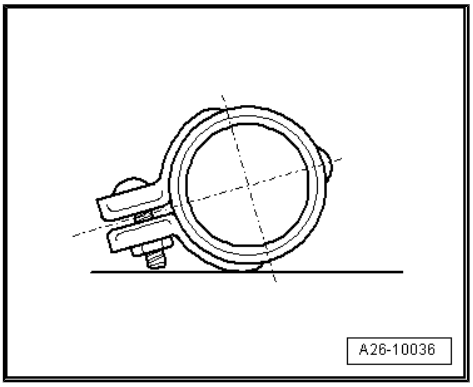


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– Install clamps so that the bolt ends do not protrude beyond bottom of clamp.

• Installation position: bolted connections face forwards.

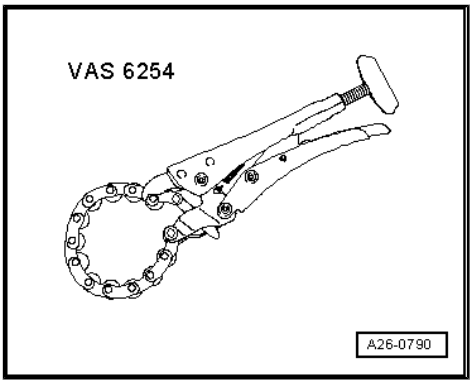
– Align the exhaust system so it is free of stress ⇒ page 574 .



1.3.2 Renewing tailpipe - vehicles without SCR catalytic converter

Special tools and workshop equipment required

♦ Chain pipe cutter - VAS 6254-



WARNING

When working on all parts of the exhaust system:

♦ *Observe safety precautions when working on the exhaust system*
⇒ "2.8 Safety precautions when working on the exhaust system", page 7 .

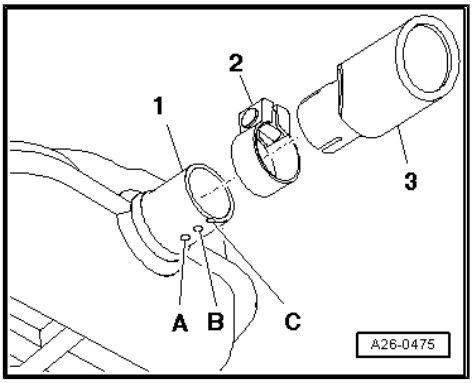
Procedure

• Tightening torque
⇒ "1.1 Exploded view - silencers", page 561

– 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-.



1.3.3 Renewing tailpipes - vehicles with SCR catalytic converter

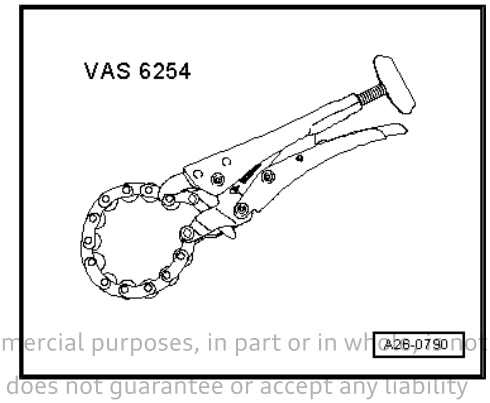
♦ The tailpipes can be cut through at the point marked so that the tailpipes can be renewed separately.

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- 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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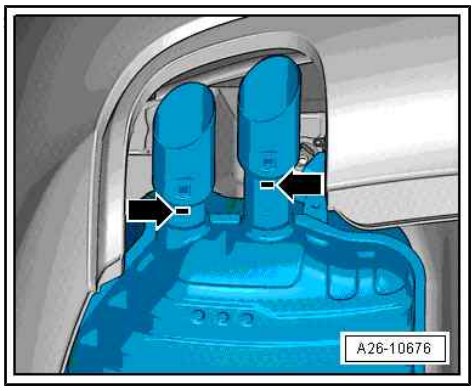
Procedure

- Tightening torque
  ⇒ “1.1 Exploded view - silencers”, page 561

– Cut through tailpipe at right angle at the position marked by -arrows- using chain pipe cutter - VAS 6254- .

– Fit tailpipes.

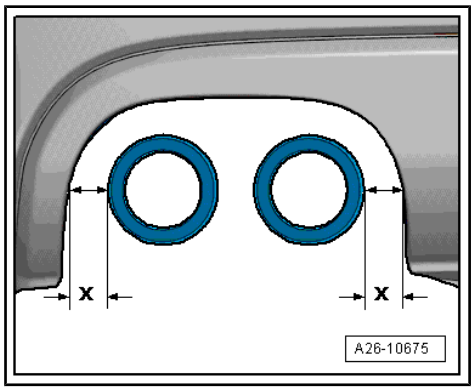
– Tighten nuts for clamps.



– Check clearance between tailpipes and bumper:

- Dimension -x- (left-side) = dimension -x- (right-side)

– Tighten bolt connections on clamps.



1.4 Stress-free alignment of exhaust system

⇒ “1.4.1 Stress-free alignment of exhaust system - vehicles without SCR catalytic converter”, page 574

⇒ “1.4.2 Stress-free alignment of exhaust system - vehicles with SCR catalytic converter”, page 576

1.4.1 Stress-free alignment of exhaust system - vehicles without SCR catalytic converter

Procedure

- The exhaust system must be aligned when it is cool.
- Tightening torque
  ⇒ “1.1 Exploded view - silencers”, page 561

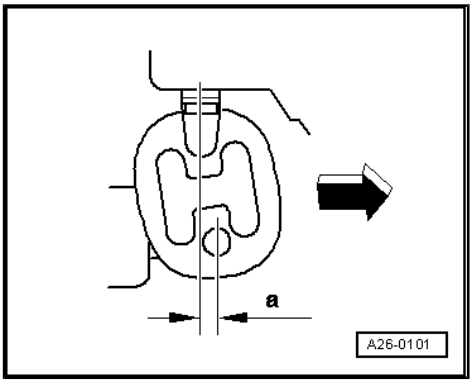
Vehicles without clamps between Y-pipe and rear silencer

– 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.

– Align tailpipes ⇒ page 573 .



Vehicles with clamps between Y-pipe and rear silencer

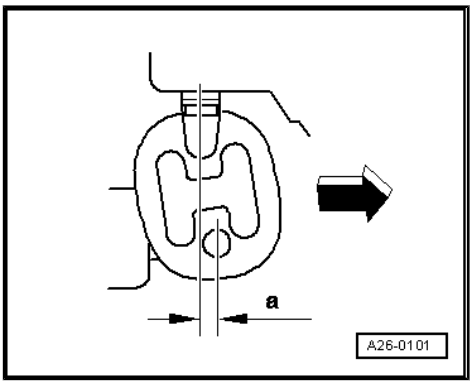
Note

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.

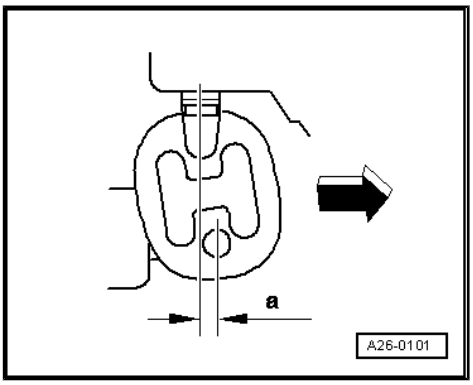
– Tighten bolt connections on front clamp evenly.



– 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.

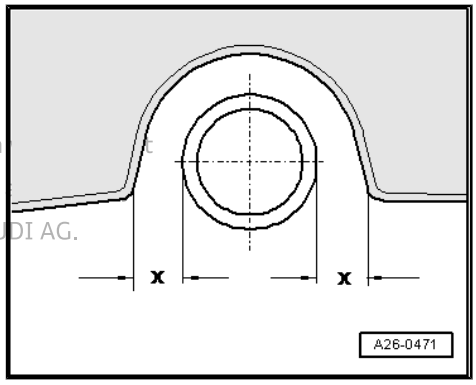
– Align rear silencers so they are horizontal.

– Tighten bolted connections on rear clamps evenly.



– Check clearance between tailpipes and bumper on both sides:

- Dimension -x- (left-side) = dimension -x- (right-side)

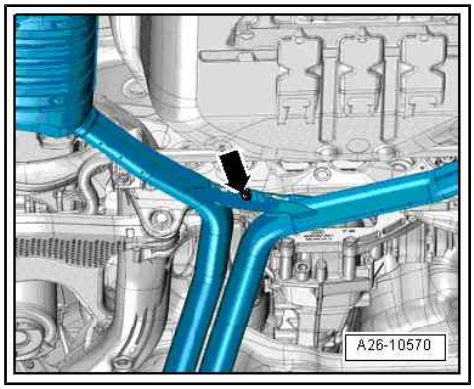


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If necessary, correct dimension -x- as follows:

– Loosen connection -arrow- on strut between exhaust pipes.

– Adjust the distance between the rear silencers.



1.4.2 Stress-free alignment of exhaust system - vehicles with SCR catalytic converter

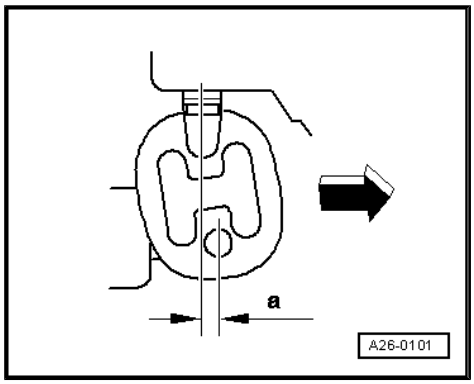
Procedure

- The exhaust system must be aligned when it is cool.
- Tightening torque
⇒ “1.1 Exploded view - silencers”, page 561

– Loosen bolt connections for clamp.

– Push rear silencer towards front of vehicle -arrow- so that rear mounting for rear silencer is preloaded by -a- = 11 ... 15 mm.

– Align rear silencer so it is horizontal.

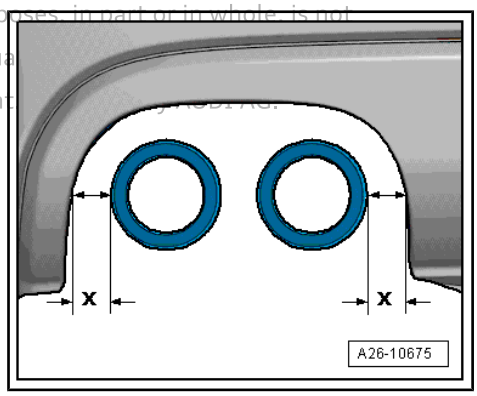


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– Check clearance between tailpipes and bumper.

- Dimension -x- (left-side) = dimension -x- (right-side)

– Tighten bolted connections on rear clamps evenly.



1.5 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.

2 Emission control system

⇒ “2.1 Removing and installing catalytic converter”, page 577

⇒ “2.2 Removing and installing particulate filter”, page 578

2.1 Removing and installing catalytic converter

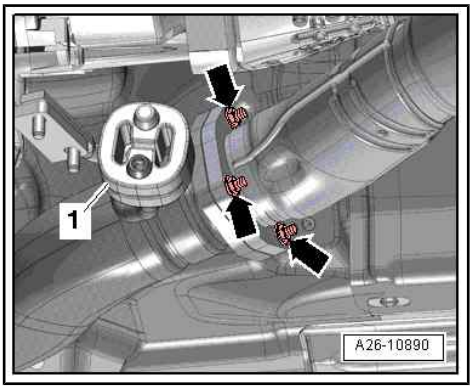
Removing

WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system*
  ⇒ “2.8 Safety precautions when working on the exhaust system”, page 7 .

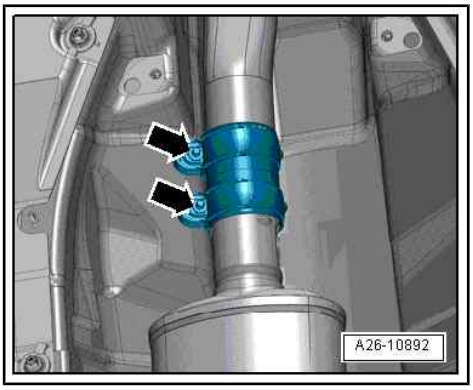
– Remove nuts -arrows-.



Note

Disregard -item 1-.

– Unfasten connections -arrows-, push clamp towards rear and detach SCR catalytic converter.



Installing

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

Tightening torques

- ⇒ “1.1 Exploded view - silencers”, page 561

Note

Renew seals, gaskets and self-locking nuts.

– Align the exhaust system so it is free of stress ⇒ page 574 .

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2.2 Removing and installing particulate filter

⇒ "2.2.1 Removing and installing particulate filter - A5 up to vehicle identification no. 8T-8-009 998", page 578

⇒ "2.2.2 Removing and installing particulate filter - A4 (all), A5 from vehicle identification no. 8T-8-009 999 onwards", page 580

2.2.1 Removing and installing particulate filter - A5 up to vehicle identification no. 8T-8-009 998

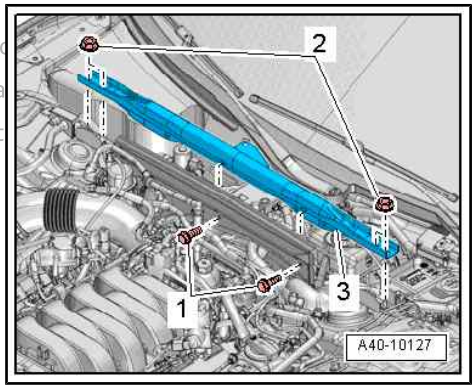
Removing

WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system*
  ⇒ "2.8 Safety precautions when working on the exhaust system", page 7 .

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



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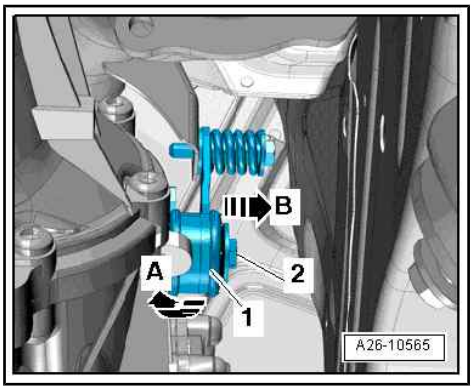
Note

Fit all cable ties in the original positions when installing.

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

– Remove turbocharger ⇒ page 422 .

– Remove front exhaust pipe ⇒ page 567 .



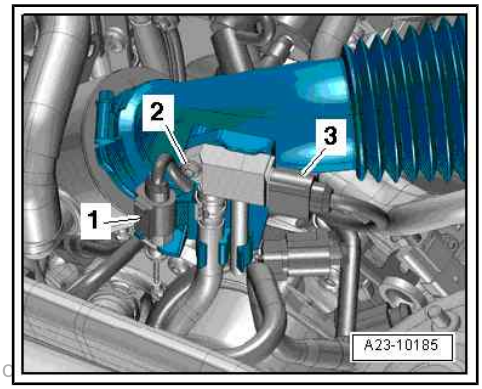
– Remove bolt -2-.

– Press retainer -1- in direction of -arrow B- and pivot to the rear -arrow A-.

– Unplug electrical connectors:

1 - For temperature sender after particulate filter - G527-

3 - For exhaust gas pressure sensor 1 - G450-



Note

- *-Item 2- can be disregarded.*
- *The illustration shows the installation position with the air pipe installed.*

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– Lift out particulate filter.

Installing

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

Tightening torques

- ⇒ “1.1 Exploded view - silencers”, page 561 ,
  ⇒ Fig. ““Mounting components for particulate filter - A5 up to vehicle identification no. 8T-8-009 998”“ , page 565

Note

Renew seals, gaskets and self-locking nuts.

– Install turbocharger ⇒ page 422 .

– Install front exhaust pipe ⇒ page 567 .

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

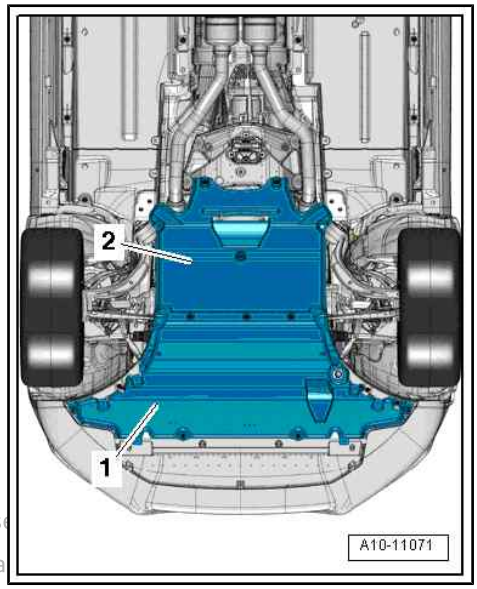
– Install body brace ⇒ Running gear, axles, steering; Rep. gr. 40 ; Suspension strut, upper links; Removing and installing body brace .

– After renewing particulate filter, perform "Adaption" in “Guided Functions” mode ⇒ Vehicle diagnostic tester.

2.2.2 Removing and installing particulate filter - A4 (all), A5 from vehicle identification no. 8T-8-009 999 onwards

Removing

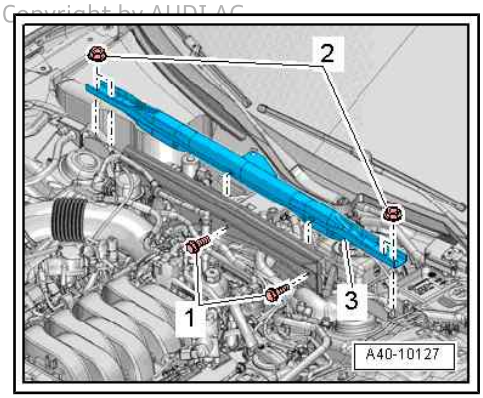
– Remove rear noise insulation -2- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .



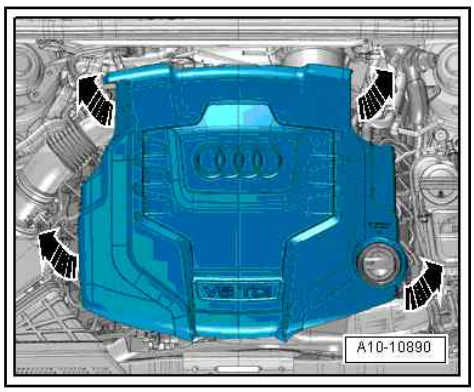
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– Remove body brace ⇒ Running gear, axles, steering; Rep. gr. 40 ; Suspension strut, upper links; Removing and installing body brace .

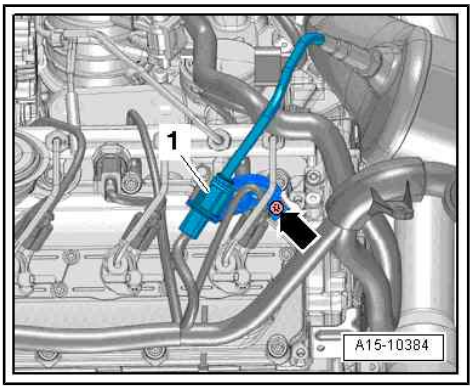
– Remove plenum chamber partition panel ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Exploded view - plenum chamber partition panel .



– Remove engine cover panel -arrows-.



– Remove electrical connector -1- for Lambda probe - G39- from bracket and unplug connector.
– Move electrical wiring clear.



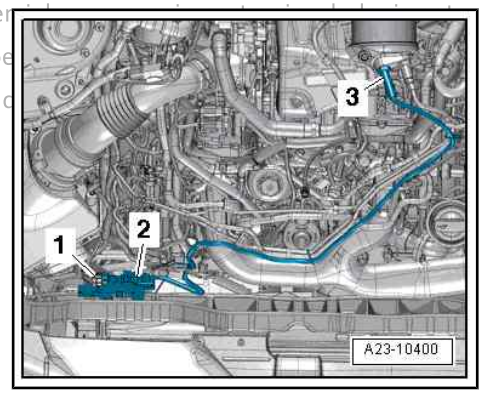
Note

Disregard -arrow-.

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Vehicles with SCR catalytic converter:

– Unplug electrical connector -1-.
– Unclip NOx sensor control unit - J583- -item 2- from bracket and move clear.



Note

Disregard -item 3-.

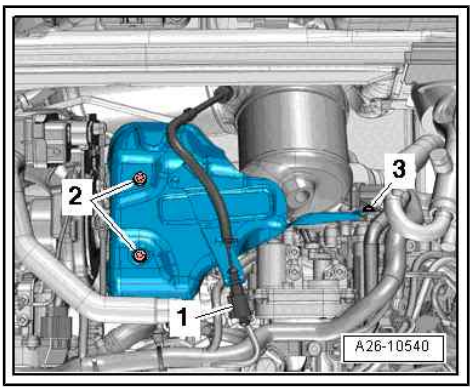
All vehicles (continued):

WARNING

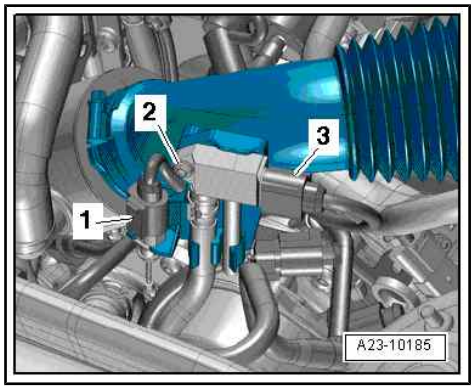
When working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system***
  ⇒ "2.8 Safety precautions when working on the exhaust system", page 7 .

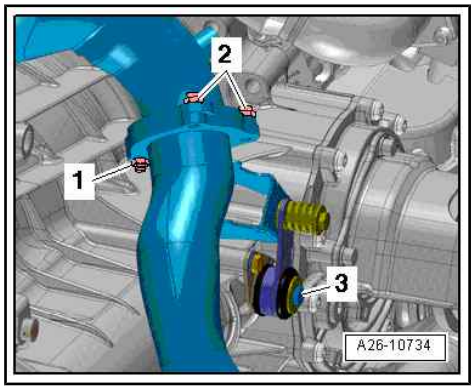
– Unplug electrical connector -1- for exhaust gas temperature sender and move wiring clear.
– Remove bolts -2- and -3-.
– Detach heat shield for turbocharger.



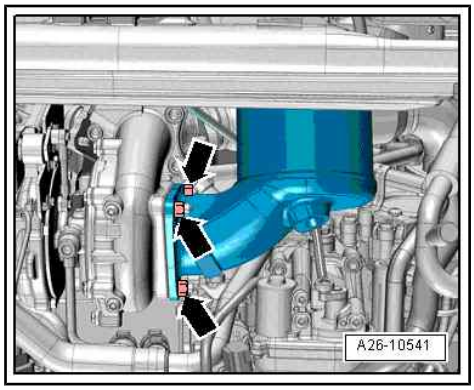
– Unplug electrical connector -1- and move electrical wire clear.
– Unplug electrical connector -3-.
– Remove bolt -2- and move exhaust gas pressure sensor 1 - G450- clear.



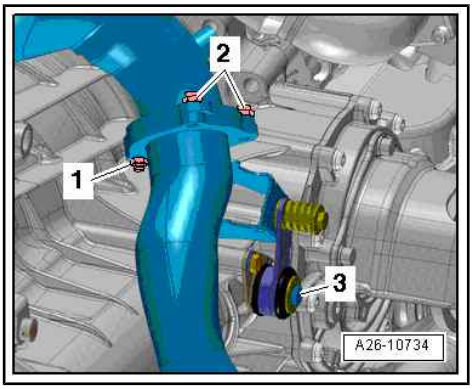
– Remove bolt -3- from underneath.



– Remove nuts -arrows- and detach particulate filter from turbocharger.



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– Remove nut -1- from underneath.
– Remove nuts -2- (accessible from above) and detach particulate filter.

Installing

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

Tightening torques

◆ ⇒ “1.1 Exploded view - silencers”, page 561

Note

Renew seals, gaskets and self-locking nuts.

– Install heat shield for turbocharger ⇒ page 420 .
– Plug in electrical connectors for exhaust gas temperature senders ⇒ page 609 .
– 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 574 .
– Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .

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3 SCR (selective catalytic reduction) system

⇒ “3.1 Exploded view - reducing agent tank”, page 584

⇒ “3.2 Exploded view - delivery unit for reducing agent”, page 588

⇒ “3.3 Exploded view - pump for reducing agent V437 ”, page 589

⇒ “3.4 Exploded view - injector for reducing agent N474 ”, page 591

⇒ “3.5 Exploded view - control unit for reducing agent metering system”, page 592

⇒ “3.6 Removing and installing delivery unit for reducing agent”, page 592

⇒ “3.7 Removing and installing injector for reducing agent N474 ”, page 595

⇒ “3.8 Draining active tank for reducing agent”, page 596

⇒ “3.9 Removing and installing active tank for reducing agent”, page 598

⇒ “3.10 Draining passive tank for reducing agent”, page 600

⇒ “3.11 Removing and installing passive tank for reducing agent”, page 602

⇒ “3.12 Removing and installing pump for reducing agent V437 ”, page 604

⇒ “3.13 Removing and installing transfer pump for reducing agent V436 ”, page 605

⇒ “3.14 Checking control unit for reducing agent metering system J880 ”, page 607

⇒ “3.15 Removing and installing control unit for reducing agent metering system J880 ”, page 607

⇒ “3.16 Adapting learnt value after draining reducing agent or renewing components”, page 608

3.1 Exploded view - reducing agent tank

⇒ “3.1.1 Exploded view - active tank for reducing agent with attached components”, page 584

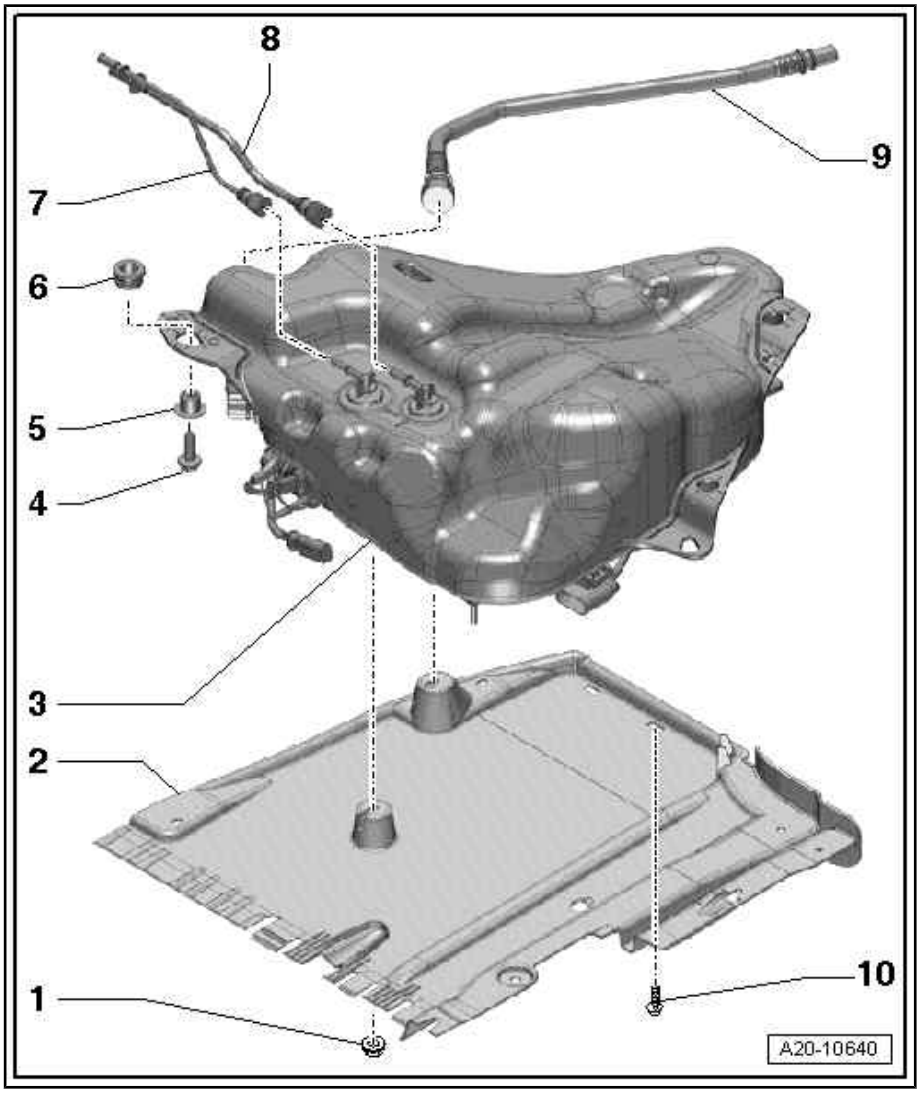
⇒ “3.1.2 Exploded view - passive tank for reducing agent with attached components”, page 586

3.1.1 Exploded view - active tank for reducing agent with attached components

Note

Fitting location: Beneath left rear seat on underside of vehicle.

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1 - Nut

- ❑ 2 Nm

2 - Cover

- ❑ For active tank for reducing agent

3 - Active tank

- ❑ For reducing agent
- ❑ Removing and installing ⇒ page 598

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 5 .

8 - Breather line

- ❑ From filler neck

WARNING

Safety risk due to escaping reducing agent. Observe safety measures for handling reducing agent ⇒ page 5 .

9 - Filler line

- ❑ From filler neck

WARNING

Safety risk due to escaping reducing agent. Observe safety measures for handling reducing agent ⇒ page 5 .

10 - Bolt

- ❑ 4.2 Nm

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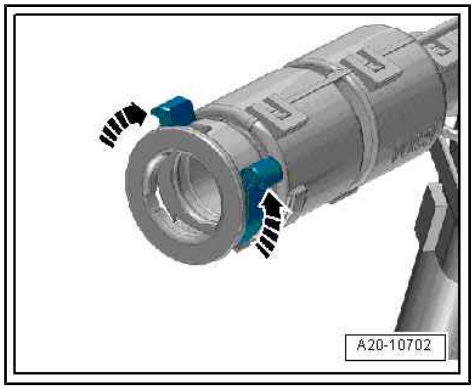
Disconnecting reducing agent lines

WARNING

Safety risk due to escaping reducing agent.

- *Observe safety measures for handling reducing agent ⇒ page 5 .*

– To disconnect reducing agent lines, press release catches in direction of -arrows-.



3.1.2 Exploded view - passive tank for reducing agent with attached components

Note

Fitting location: on underbody (rear right).

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1 - Transfer line

- ❑ To active tank
- ❑ Clip onto fuel tank

WARNING

Safety risk due to escaping reducing agent. Observe safety measures for handling reducing agent ⇒ page 5 .

2 - Connecting hose

- ❑ From passive tank to transfer pump for reducing agent - V436-

3 - Transfer pump for reducing agent - V436-

- ❑ Removing and installing ⇒ page 605

4 - Nut

- ❑ 1.8 Nm

5 - Bolt

- ❑ 20 Nm

6 - Sleeve

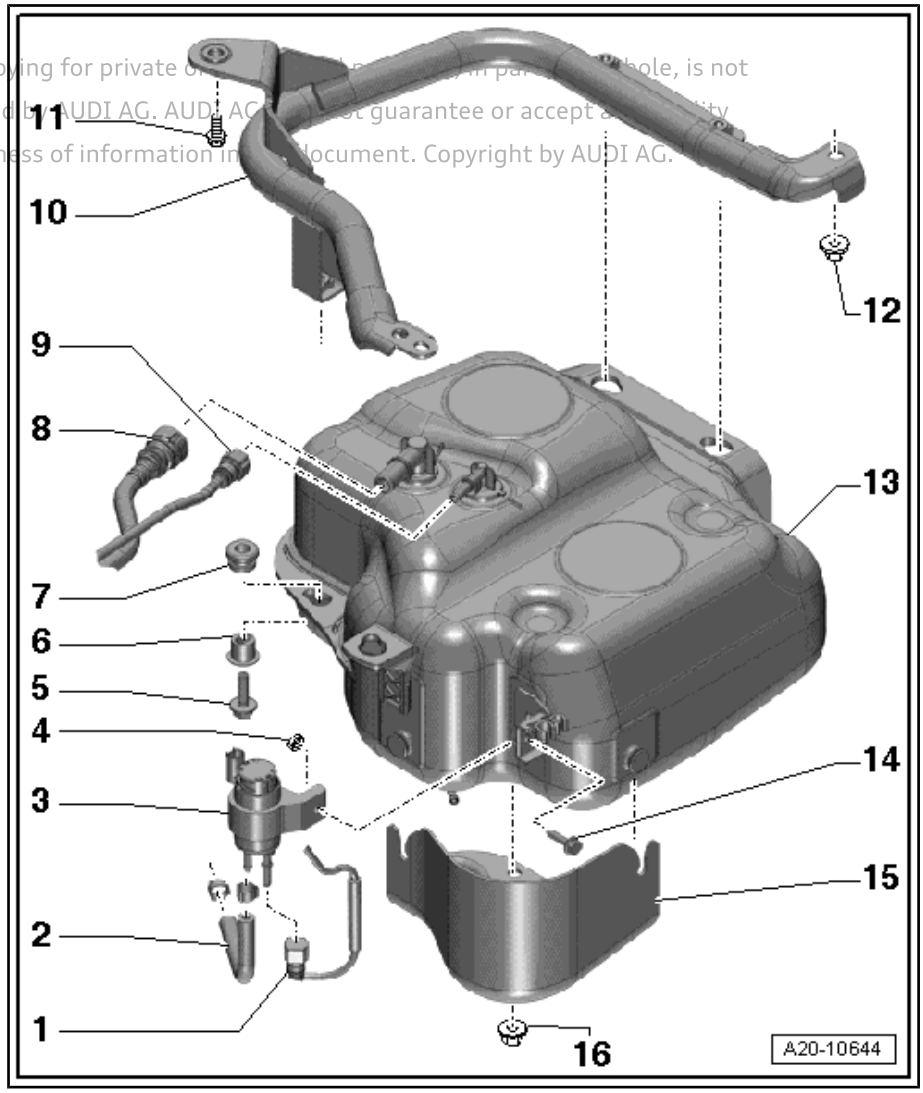
7 - Grommet

8 - Filler line

- ❑ From filler neck

WARNING

Safety risk due to escaping reducing agent. Observe safety measures for handling reducing agent ⇒ page 5 .



9 - Breather line

- ❑ To filler neck
- ❑ Clip onto fuel tank

10 - Retaining frame

- ❑ For passive tank

11 - Bolt

- ❑ 20 Nm

12 - Nut

- ❑ 20 Nm

13 - Passive tank

- ❑ For reducing agent
- ❑ Removing and installing ⇒ page 602

14 - Bolt

- ❑ 1.8 Nm

15 - Cover

- ❑ For transfer pump for reducing agent -V436-

16 - Nut

- ❑ 2.1 Nm

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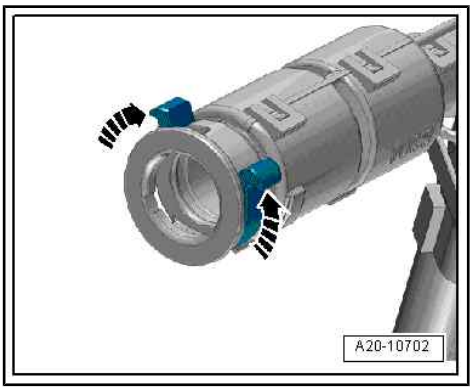
Disconnecting reducing agent lines

WARNING

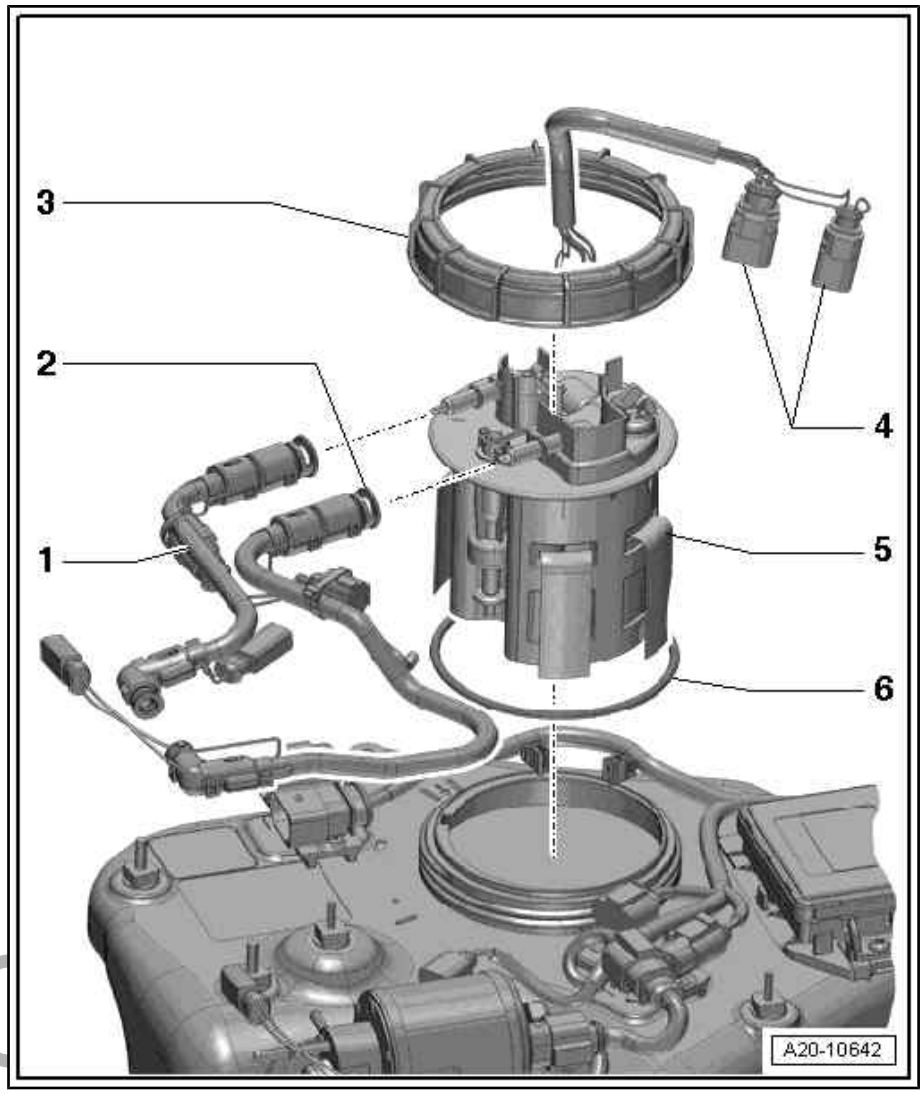
Safety risk due to escaping reducing agent.

- *Observe safety measures for handling reducing agent ⇒ page 5 .*

– To disconnect reducing agent lines, press release catches in direction of -arrows-.



3.2 Exploded view - delivery unit for reducing agent



1 - Return line

- ❑ With heater

> **WARNING**
> *Safety risk due to escaping reducing agent. Observe safety measures for handling reducing agent ⇒ page 5 .*

2 - Supply line

- ❑ With heater

> **WARNING**
> *Safety risk due to escaping reducing agent. Observe safety measures for handling reducing agent ⇒ page 5 .*

3 - Union nut

- ❑ Renew
- ❑ Remove and install using key - T50014-
- ❑ Tightening ⇒ page 594

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
- ❑ Removing and installing ⇒ page 592

6 - Seal

- ❑ Renew
- ❑ Install dry

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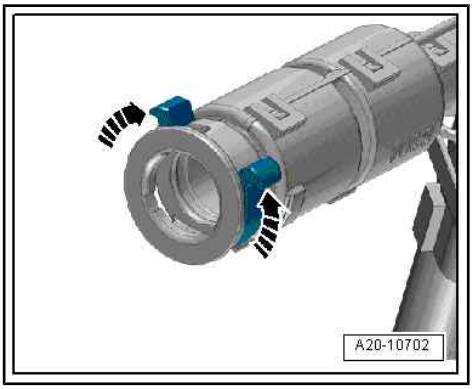
Disconnecting reducing agent lines

WARNING

Safety risk due to escaping reducing agent.

- *Observe safety measures for handling reducing agent ⇒ page 5 .*

– To disconnect reducing agent lines, press release catches in direction of -arrows-.



3.3 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 5 .

3 - Bolt

- ❑ 2 Nm

4 - Electrical wire

- ❑ Version depends on country

5 - Pump for reducing agent - V437-

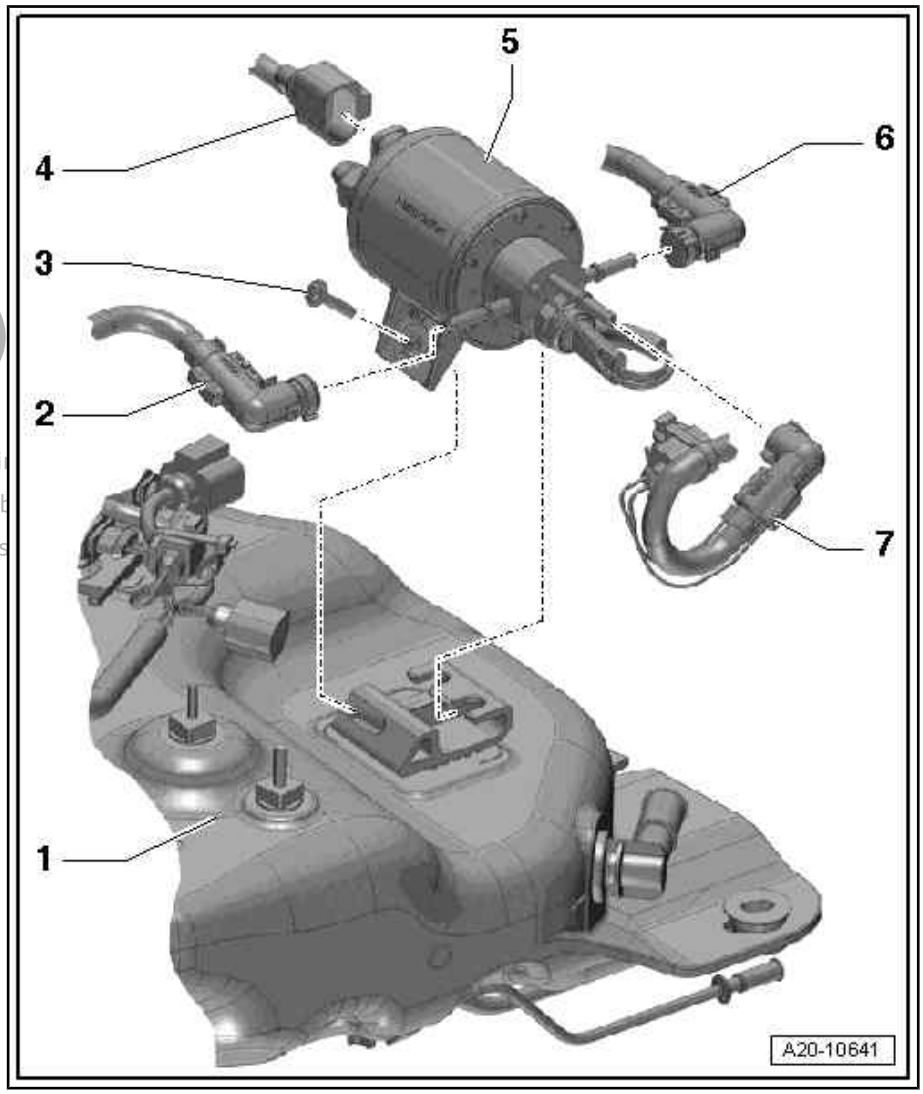
- ❑ With heater for reducing-agent pump - Z103-
- ❑ With pressure sender for reducing agent metering system - G686-
- ❑ Removing and installing ⇒ page 604

6 - Supply line

- ❑ With heater

WARNING

Safety risk due to escaping reducing agent. Observe safety measures for handling reducing agent ⇒ page 5 .



7 - Metering line

- ❑ From pump for reducing agent - V437- to injector for reducing agent - N474-
- ❑ With heater
- ❑ Clip onto fuel tank

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WARNING

Safety risk due to escaping reducing agent.
To prevent large amounts of reducing agent from escaping when the metering line is opened, wait until the reducing agent has been drawn back automatically *⇒ page 5* *.*

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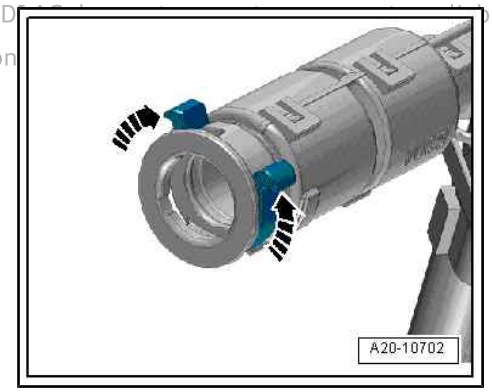
Disconnecting reducing agent lines

WARNING

Safety risk due to escaping reducing agent.

- *Observe safety measures for handling reducing agent* *⇒ page 5* *.*

– To disconnect reducing agent lines, press release catches in direction of -arrows-.



3.4 Exploded view - injector for reducing agent - N474-

1 - Bolt
- ❑ 5 Nm

2 - Retaining clamp

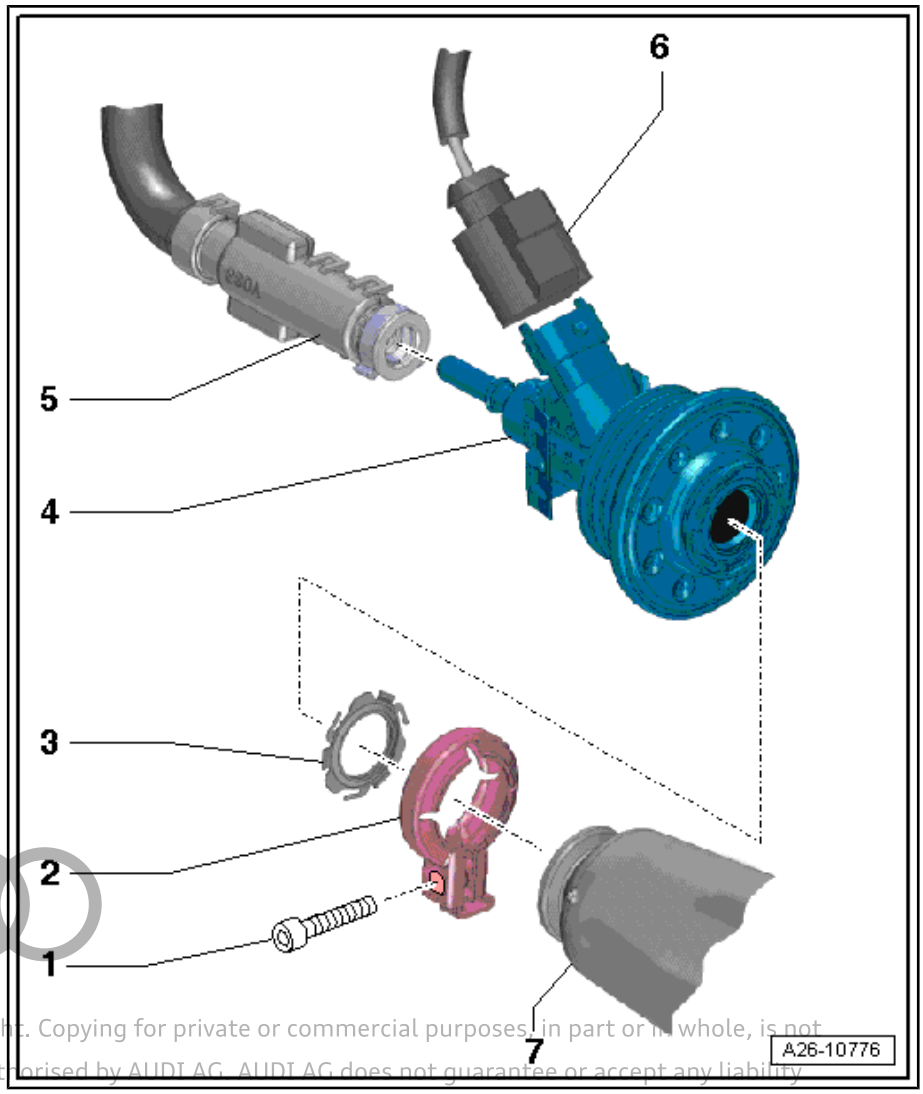
3 - Seal
- ❑ Renew

4 - Injector for reducing agent - N474-
- ❑ Removing and installing ⇒ page 595

5 - Hose
- ❑ For reducing agent
- ❑ Press release catches to remove ⇒ page 591

6 - Electrical connector

7 - Front exhaust pipe

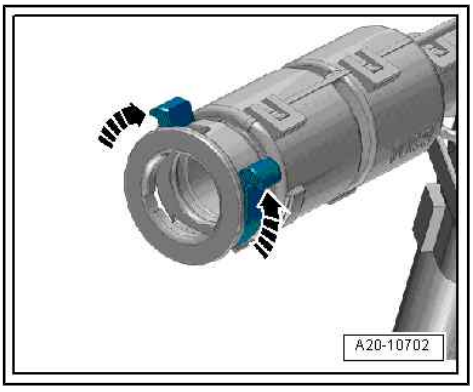


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Disconnecting reducing agent lines

> **WARNING**
>
> *Safety risk due to escaping reducing agent.*
>
> ♦ *Observe safety measures for handling reducing agent ⇒ page 5 .*

– To disconnect reducing agent lines, press release catches in direction of -arrows-.



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

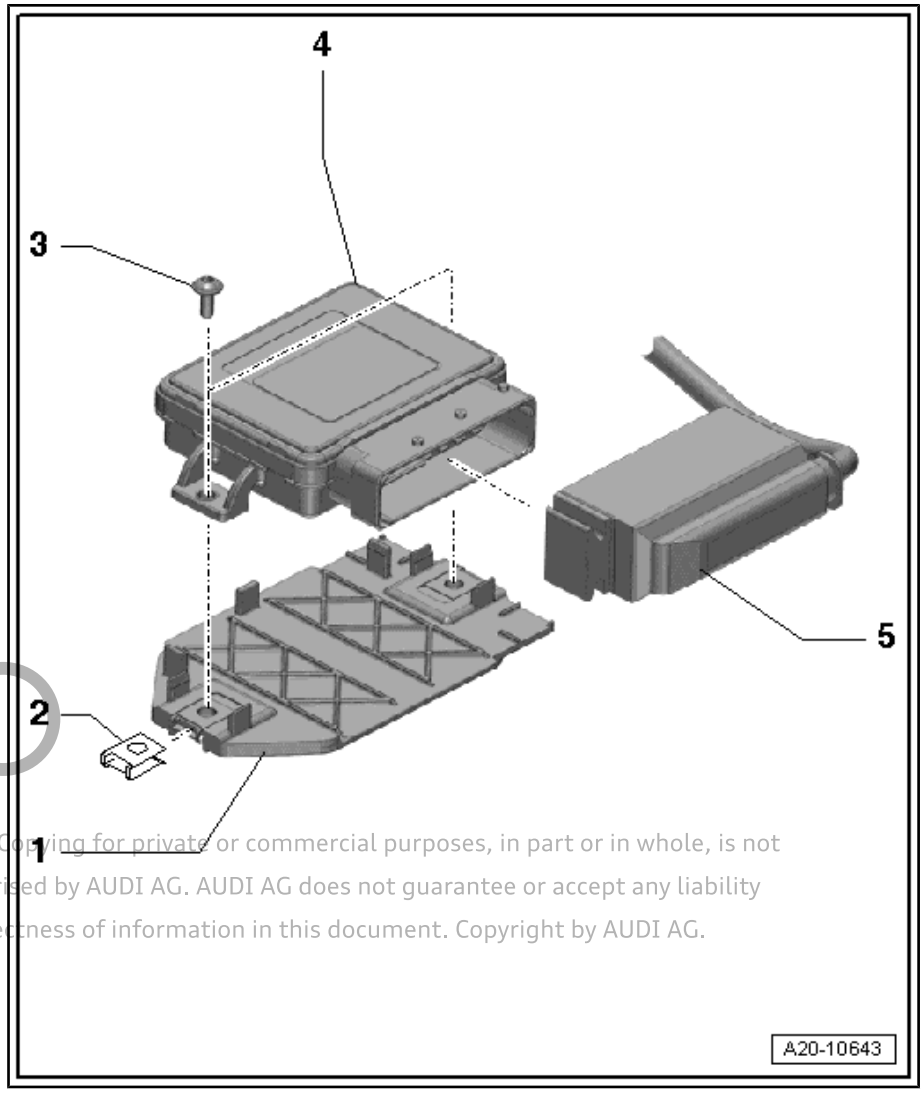
- 4.5 Nm

4 - Control unit for reducing agent metering system - J880-

- Removing and installing ⇒ page 607

5 - Electrical connector

- For control unit for reducing agent metering system - J880-

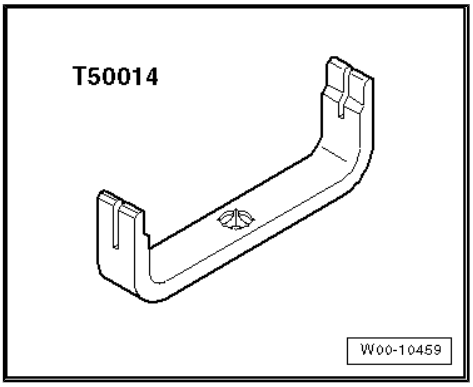


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3.6 Removing and installing delivery unit for reducing agent

Special tools and workshop equipment required

♦ Key - T50014-



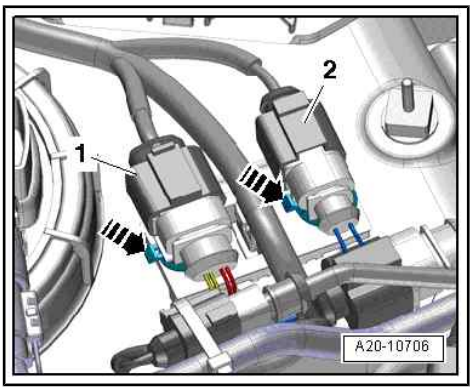
Removing

Observe safety precautions ⇒ page 5 .

Observe rules for cleanliness ⇒ page 9 .

– Remove active tank for reducing agent ⇒ page 598 .

– Press release tabs -arrows-, unplug electrical connectors -1- and -2- and unclip from bracket.

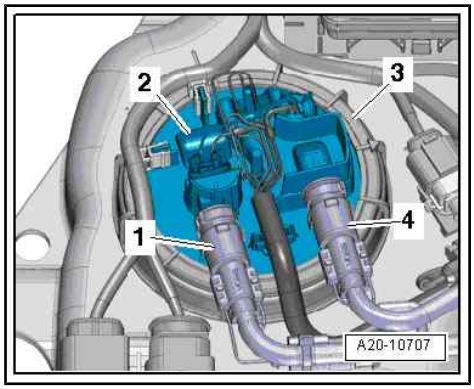


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WARNING

Safety risk due to escaping reducing agent.

- ***Observe safety measures for handling reducing agent ⇒ page 5 .***



Note

Hold a clean cloth under the separating point to catch escaping reducing agent.

– Press release catches ⇒ page 589 and disconnect return line -1- and supply line -4-.
– Move electrical wiring clear.
– Unscrew union nut -3- using key - T50014- and carefully lift off reservoir -2-.

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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

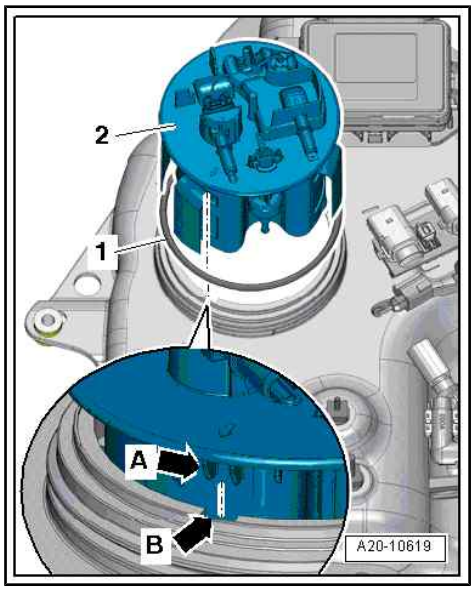
Tightening torques

- ⇒ “3.2 Exploded view - delivery unit for reducing agent”, page 588

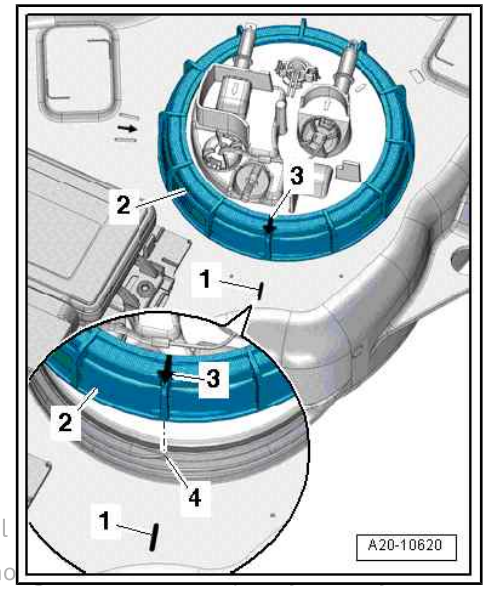
Note

- *Renew seal.*
- *Thoroughly clean sealing surfaces for seal.*

– Insert reservoir -2- in active tank; while doing so, carefully slide heating element 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°).

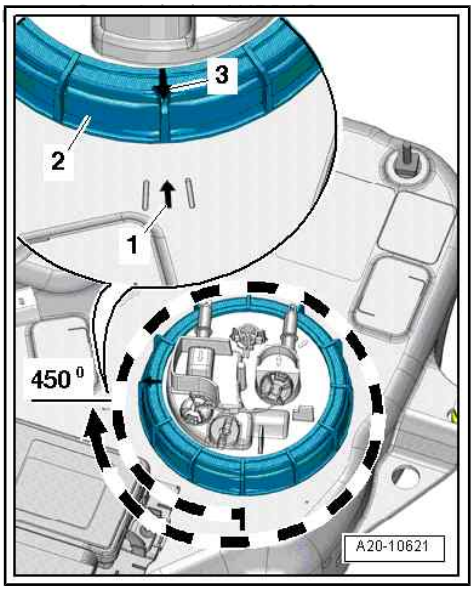


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• Mark -3- on new union nut -2- and mark -1- (arrow with a line on each side) must be aligned.

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

– Install active tank for reducing agent ⇒ page 598 .
– Adapt learnt value after draining reducing agent or renewing components ⇒ page 608 .



3.7 Removing and installing injector for reducing agent - N474-

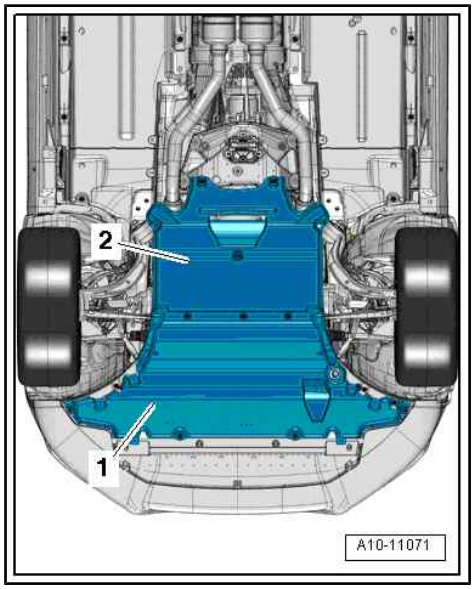
Removing

WARNING

Reducing agent can cause skin irritation.

- *Observe safety measures when handling reducing agent ⇒ page 5 .*
- *Put on safety goggles.*

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



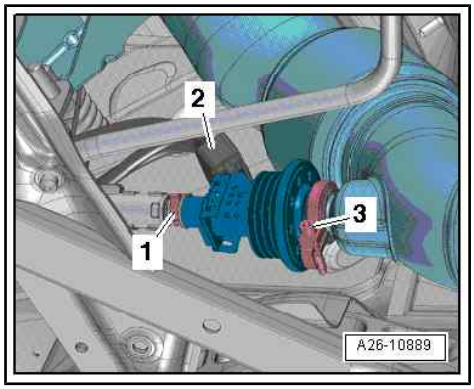
Note

Hold a clean cloth under the separating point to catch escaping reducing agent.

– Press release catches ⇒ page 591 and disconnect hose -1- from injector for reducing agent - N474- .

– Unplug electrical connector -2-.

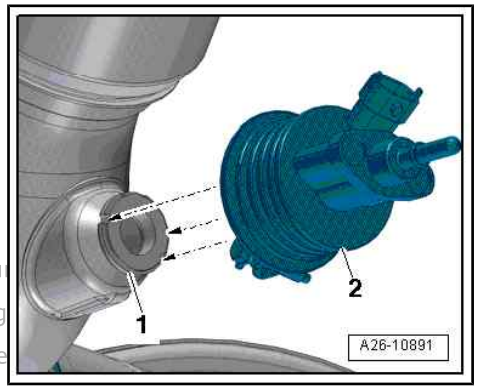
– Release retaining clip -3- and detach injector for reducing agent - N474- .



Installing

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

- Tightening torque ⇒ "3.4 Exploded view - injector for reducing agent N474 ", page 591



Note

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Renew seal.

- Installation position: lugs in injector for reducing agent - N474- -item 2- must be inserted in corresponding mountings in front exhaust pipe -1-.

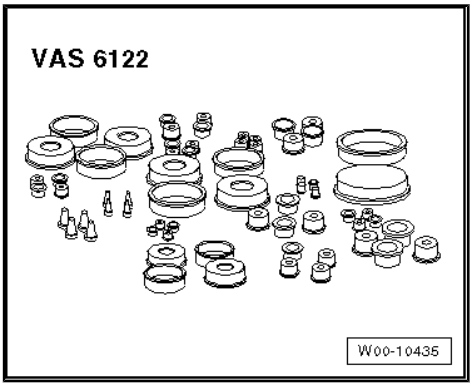
– Install noise insulation (rear) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .

– Adapt learnt value after draining reducing agent or renewing components ⇒ page 608 .

3.8 Draining active tank for reducing agent

Special tools and workshop equipment required

♦ Engine bung set - VAS 6122-



♦ Drip tray

Procedure

Observe safety precautions ⇒ page 5 .

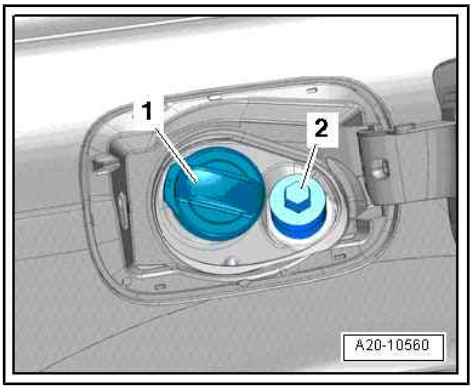
Observe rules for cleanliness ⇒ page 9 .

– Open tank flap.

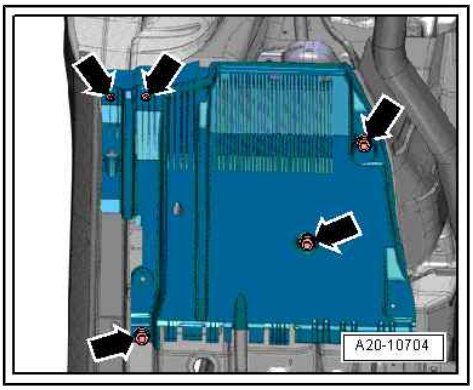
– Unscrew filler cap -2- from filler neck for reducing agent.

Note

Disregard -item 1-.



– Remove bolt and nuts -arrows- and detach cover for active tank.



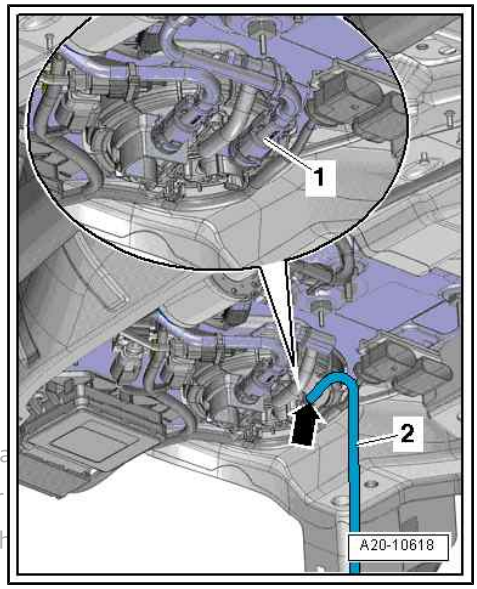
WARNING

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.



Note

Hold a clean cloth under the separating point to catch escaping reducing agent.

– Press release catches ⇒ page 586 and disconnect return line -1- from reservoir.
– Attach auxiliary hose -2- to connection -arrow- on reservoir and drain off reducing agent into drip tray.
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .

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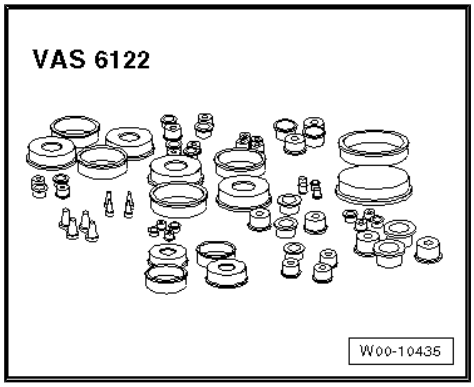
After re-filling, the following step must be carried out:

– Adapt learnt value after draining reducing agent or renewing components ⇒ page 608 .

3.9 Removing and installing active tank for reducing agent

Special tools and workshop equipment required

♦ Engine bung set - VAS 6122-



Removing

Observe safety precautions ⇒ page 5 .

Observe rules for cleanliness ⇒ page 9 .

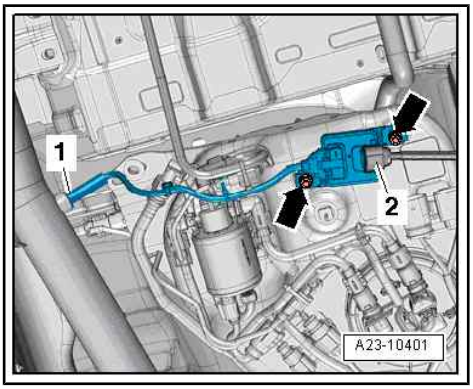
WARNING

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 5 .***

– Drain active tank for reducing agent ⇒ page 596 .

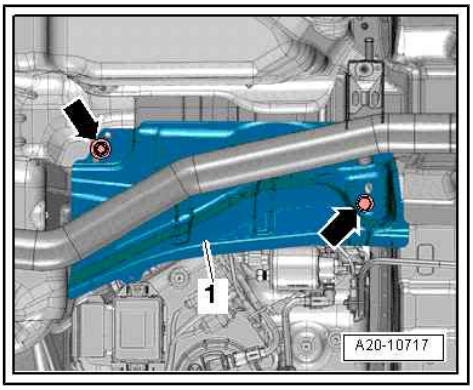
– Unplug electrical connector -2-.
– Unscrew nuts -arrows- for control unit for NOx sender - J583- .
– Move electrical wiring clear.



Note

Disregard -item 1-.

– Remove bolts -arrows- and detach heat shield -1-.

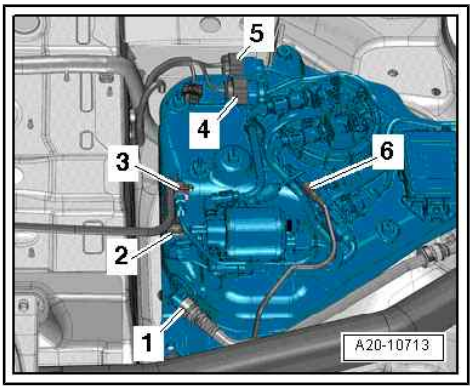


WARNING

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.***

– Press release catches ⇒ page 586 and disconnect filler line -1- and metering line -2-.
– Unplug electrical connectors -3 ... 6- and move electrical wiring harness clear.



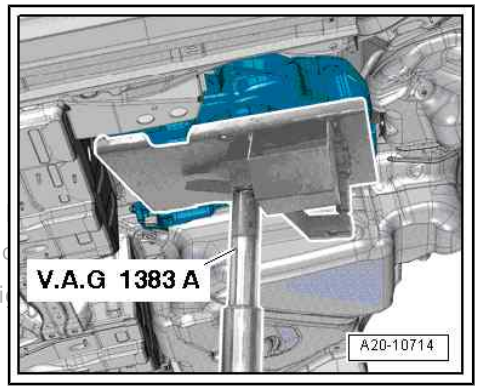
WARNING

Risk of accident caused by weight of active tank.

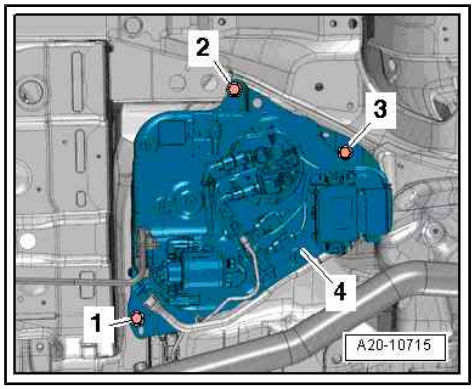
- ***Active tank must be empty when it is removed.***

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– 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).



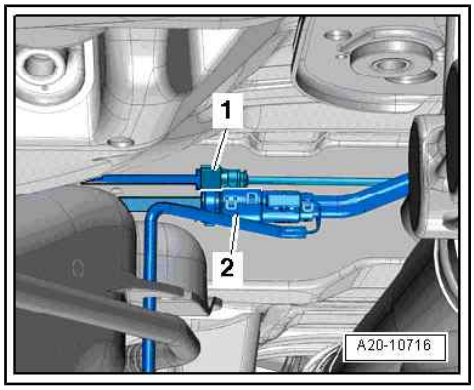
Note

- *For greater clarity the active tank is shown without the engine and gearbox jack.*
- *Disregard -item 1-.*

– 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 586 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

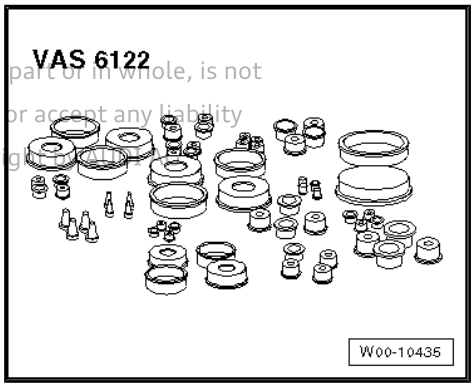
- ⇒ “3.1.1 Exploded view - active tank for reducing agent with attached components”, page 584

– Check that lines are clipped onto active tank.
– Adapt learnt value after draining reducing agent or renewing components ⇒ page 608 .

3.10 Draining passive tank for reducing agent

Special tools and workshop equipment required

- Engine bung set - VAS 6122-



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- Drip tray

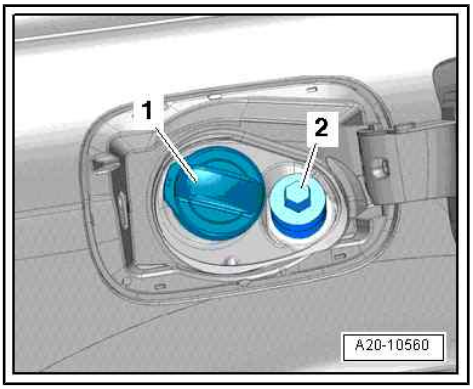
Procedure

Observe safety precautions ⇒ page 5 .

Observe rules for cleanliness ⇒ page 9 .

– Open tank flap.

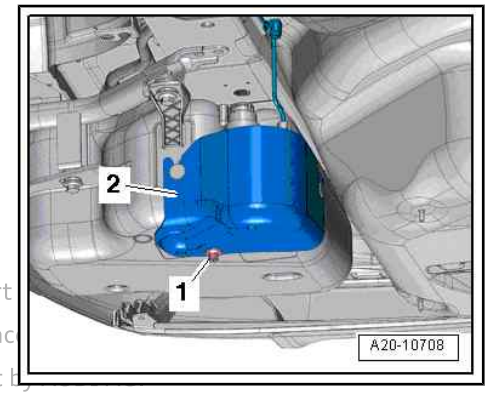
– Unscrew filler cap -2- from filler neck for reducing agent.



Note

Disregard -item 1-.

– Unscrew nut -1- and detach cover -2- for transfer pump for reducing agent - V436- .



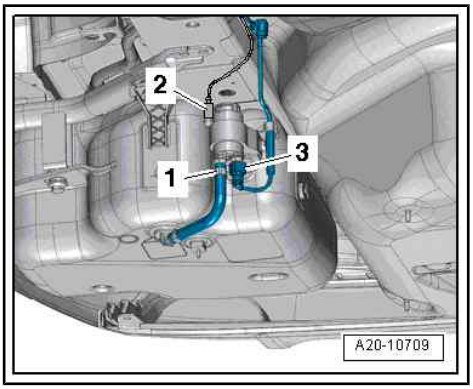
WARNING

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.***

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– Place drip tray underneath.



Note

Hold a clean cloth under the separating point to catch escaping reducing agent.

– Release hose clip and disconnect connecting hose -1- from transfer pump for reducing agent - V436- . Then press hose down and hold end of hose into drip tray.

– Allow reducing agent to drain off into drip tray.

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

Note

Disregard items -2 and 3-.

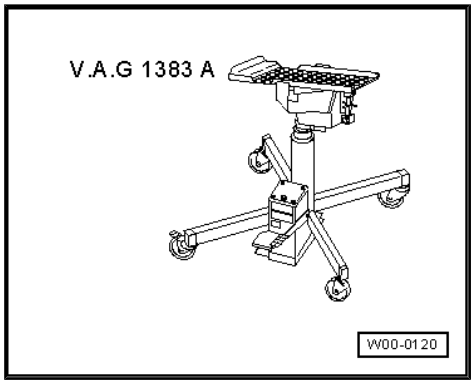
After re-filling, the following step must be carried out:

– Adapt learnt value after draining reducing agent or renewing components ⇒ page 608 .

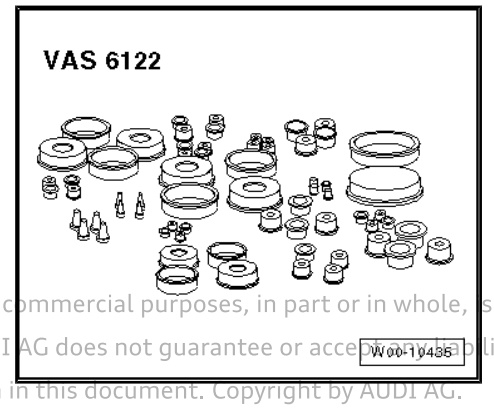
3.11 Removing and installing passive tank for reducing agent

Special tools and workshop equipment required

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



- Engine bung set - VAS 6122-



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Removing

Observe safety precautions ⇒ page 5 .

Observe rules for cleanliness ⇒ page 9 .

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 5 .*

– Drain passive tank for reducing agent ⇒ page 600 .

WARNING

Reducing agent can cause skin irritation.

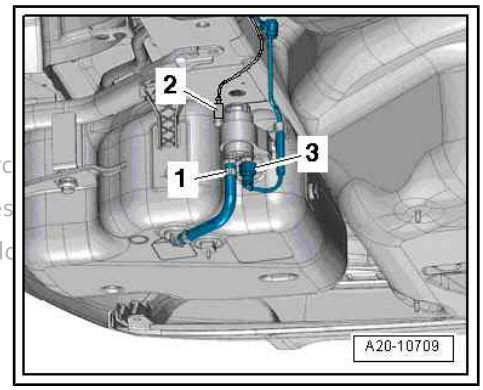
- *Avoid contact with the skin and eyes. Wear gloves and safety goggles.*
- *If your skin has come into contact with reducing agent, rinse it off with soap and water.*
- *If reducing agent gets into your eyes, rinse them out with water for several minutes.*
- *Do not breathe in or swallow reducing agent.*
- *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.

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– 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

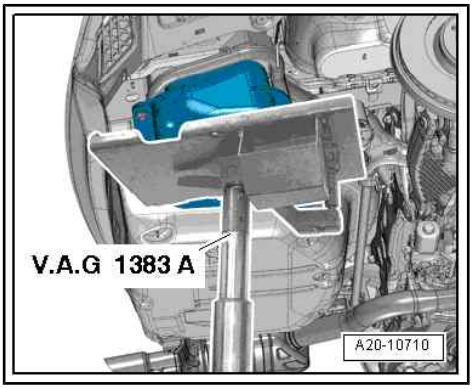
Disregard -item 1-.

WARNING

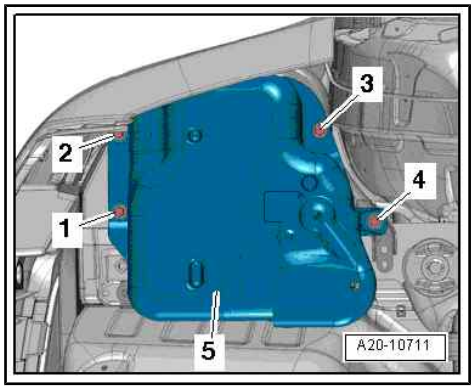
Risk of accident caused by weight of passive tank.

- *When removing passive tank, support it with engine and gearbox jack - V.A.G 1383 A- .*

– Position engine and gearbox jack - V.A.G 1383 A- below vehicle to support passive tank.



– Remove bolts -1 ... 4-.



Note

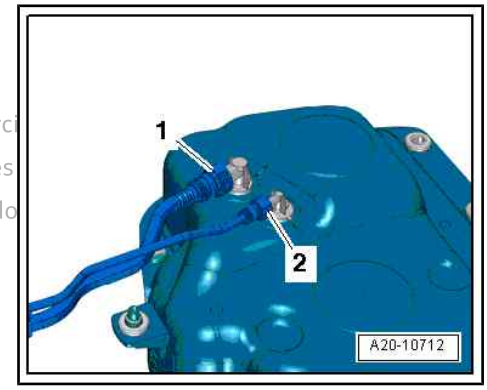
For greater clarity the passive tank is shown without the engine and gearbox jack.

– 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.

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– 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 586

– Check that lines are clipped onto passive tank.
– Adapt learnt value after draining reducing agent or renewing components ⇒ page 608 .

3.12 Removing and installing pump for reducing agent - V437-

Removing

Observe safety precautions ⇒ page 5 .

Observe rules for cleanliness ⇒ page 9 .

– Switch off ignition and remove ignition key.

WARNING

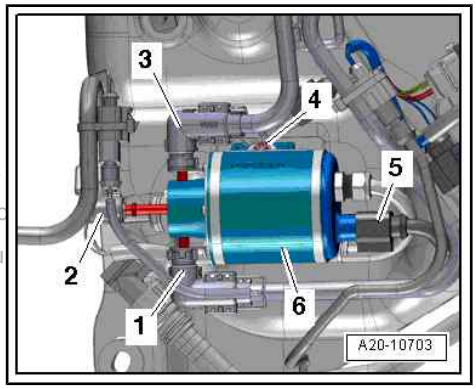
Safety risk due to escaping reducing agent.

◆ ***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 5 .***

– Drain active tank for reducing agent ⇒ page 596 .

– Unplug electrical connector -5-.

– Unscrew bolt -4- and detach pump for reducing agent - V437- -item 6- from active tank.



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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.***

Note

Hold a clean cloth under the separating point to catch escaping reducing agent.

– Press release catches ⇒ page 590 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:

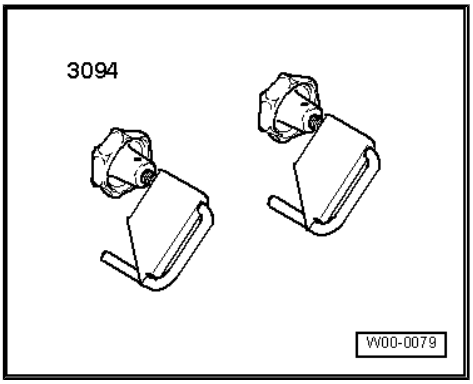
- Tightening torque
⇒ “3.3 Exploded view - pump for reducing agent V437 ”, page 589

– Adapt learnt value after draining reducing agent or renewing components ⇒ page 608 .

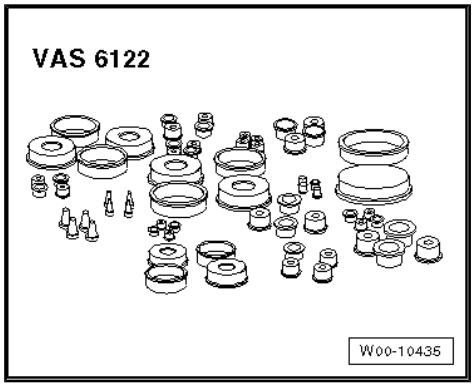
3.13 Removing and installing transfer pump for reducing agent - V436-

Special tools and workshop equipment required

♦ Hose clamps, up to 25 mm - 3094-



- Engine bung set - VAS 6122-



Removing

Observe safety precautions ⇒ page 5 .

Observe rules for cleanliness ⇒ page 9 .

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 5 .*

Note

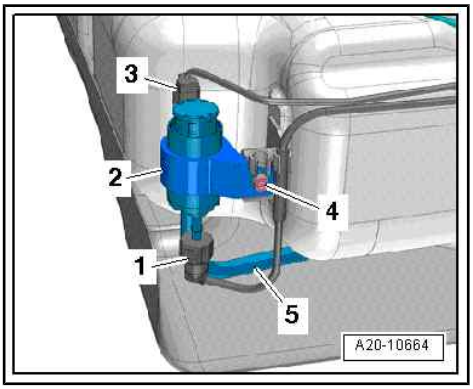
Hold a clean cloth under the separating point to catch escaping reducing agent.

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.*

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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 584

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Note

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

– Adapt learnt value after draining reducing agent or renewing components ⇒ page 608 .

3.14 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.

3.15 Removing and installing control unit for reducing agent metering system - J880-

Note

Fitting location: control unit for reducing agent metering system - J880- is underneath active tank.

Removing

Observe safety precautions ⇒ page 3 .

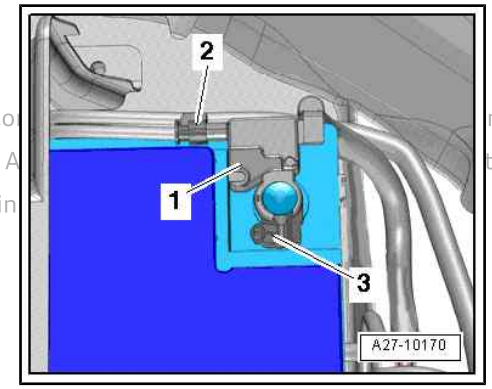
Observe rules for cleanliness ⇒ page 9 .

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Caution

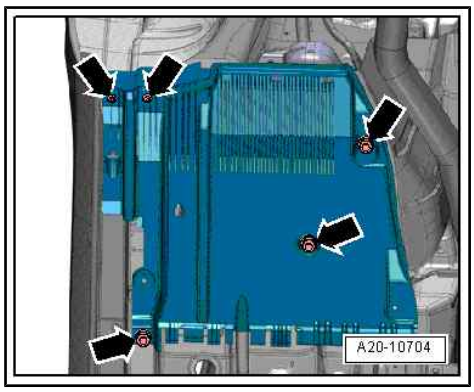
When disconnecting the battery there is a risk of irreparable damage to electronic components.

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



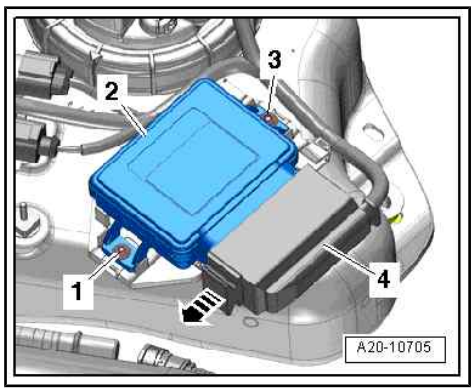
– Disconnect battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .

– Remove bolt and nuts -arrows- and detach cover for active tank.



– Release electrical connector -4- -arrow- and unplug.

– 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:

- Tightening torque
  ⇒ “3.5 Exploded view - control unit for reducing agent metering system”, page 592

– Connect battery and perform steps required after re-connecting battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .

3.16 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.

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

– Perform adaption in “Guided Functions” using a vehicle diagnostic tester .

4 Exhaust gas temperature control

⇒ “4.1 Exploded view - exhaust gas temperature control”, page 609

⇒ “4.2 Removing and installing exhaust gas temperature senders”, page 612

4.1 Exploded view - exhaust gas temperature control

⇒ “4.1.1 Exploded view - exhaust gas temperature control, vehicles without SCR catalytic converter”, page 609

⇒ “4.1.2 Exploded view - exhaust gas temperature control, vehicles with SCR catalytic converter”, page 611

4.1.1 Exploded view - exhaust gas temperature control, vehicles without SCR catalytic converter

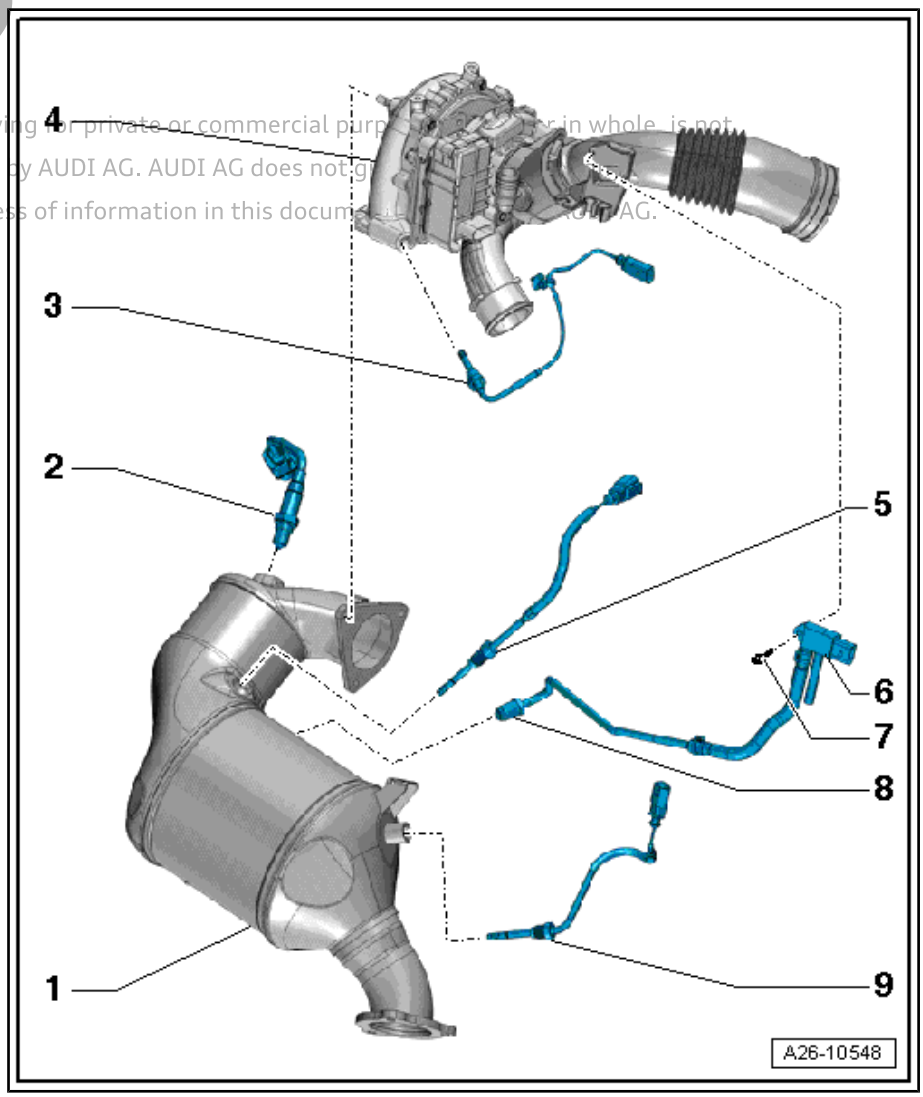
WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system*
  ⇒ “2.8 Safety precautions when working on the exhaust system”, page 7 .

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1 - Particulate filter

2 - Lambda probe - G39- with Lambda probe heater - Z19-

- ❑ Removing and installing ⇒ page 552

3 - Exhaust gas temperature sender 1 - G235-

- ❑ Only fitted on vehicles with engine codes CAPA, CCLA, CCWA, CCWB
- ❑ Removing and installing ⇒ page 612
- ❑ Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 45 Nm

4 - Turbocharger

5 - Exhaust gas temperature sender

- ❑ Engine code CAPA: exhaust gas temperature sender 2 - G448-
- ❑ Engine codes CAMA, CAMB, CCWA, CCWB, CGKA and CGKB: exhaust gas temperature sender 3 - G495-
- ❑ Removing and installing ⇒ page 614

6 - Exhaust gas pressure sensor 1 - G450-

- ❑ Removing and installing ⇒ page 546
- ❑ Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 45 Nm

7 - Bolt

- ❑ Tightening torque ⇒ page 551

8 - Pressure line for exhaust gas pressure sensor 1 - G450-

- ❑ Fit into particulate filter, clip into bracket and tighten.
- ❑ 45 Nm

9 - Exhaust gas temperature sender

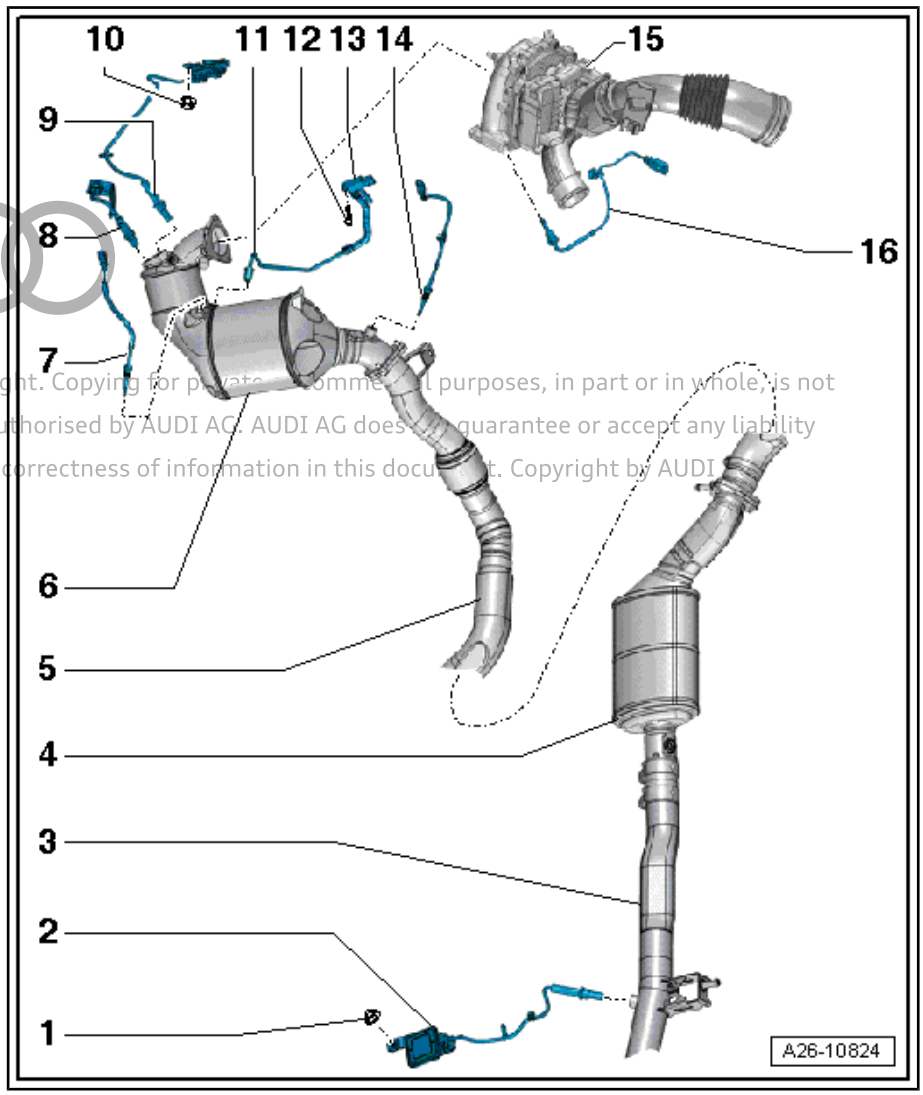
- ❑ Engine code CAPA: exhaust gas temperature sender 3 - G496-
- ❑ Engine codes CAMA, CAMB, CCWA, CCWB, CGKA and CGKB: exhaust gas temperature sender 4 - G648-
- ❑ Removing and installing ⇒ page 614
- ❑ Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 45 Nm

4.1.2 Exploded view - exhaust gas temperature control, vehicles with SCR catalytic converter

WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system*
  ⇒ "2.8 Safety precautions when working on the exhaust system", page 7 .



1 - Nut

- ❑ Attach as far as stop

2 - Control unit for NOx sender 2 - J881- with NOx sender 2 - G687-

- ❑ Removing and installing ⇒ page 548

3 - Rear silencer

4 - SCR catalytic converter

5 - Front exhaust pipe

6 - Particulate filter

7 - Exhaust gas temperature sender 3 - G495-

- ❑ Removing and installing ⇒ page 614

8 - Lambda probe - G39- with Lambda probe heater - Z19-

- ❑ Removing and installing ⇒ page 552

9 - Control unit for NOx sender - J583- with NOx sender - G295-

- ❑ Removing and installing ⇒ page 547

10 - Nut

- ❑ Attach as far as stop

11 - Pressure line for exhaust gas pressure sensor 1 - G450-

- ❑ Fit into particulate filter, clip into bracket and tighten.
- ❑ 45 Nm

12 - Bolt

- ❑ Tightening torque ⇒ page 549

13 - Exhaust gas pressure sensor 1 - G450-

- ❑ Removing and installing ⇒ page 546
- ❑ Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue

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14 - Exhaust gas temperature sender 4 - G648-

- ❑ Removing and installing ⇒ page 614
- ❑ Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 45 Nm

15 - Turbocharger

16 - Exhaust gas temperature sender 1 - G235-

- ❑ Removing and installing ⇒ page 612
- ❑ Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 45 Nm

4.2 Removing and installing exhaust gas temperature senders

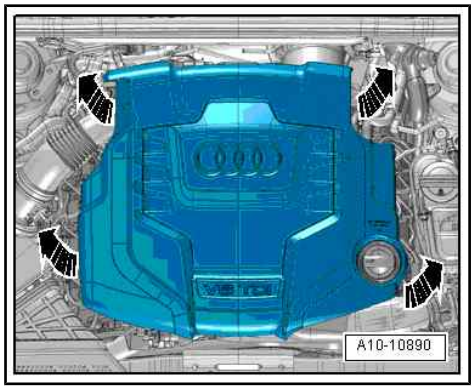
⇒ "4.2.1 Removing and installing exhaust gas temperature sender 1 G235 - engine codes CAPA, CCLA, CCWA, CCWB, CGKA, CGKB", page 612

⇒ "4.2.2 Removing and installing exhaust gas temperature sender G448 / G495 ", page 614

⇒ "4.2.3 Removing and installing exhaust gas temperature sender G496 / G648 ", page 614

4.2.1 Removing and installing exhaust gas temperature sender 1 - G235- - engine codes CAPA, CCLA, CCWA, CCWB, CGKA, CGKB

Removing



Note

Fit all cable ties in the original positions when installing.

– Remove engine cover panel -arrows-.

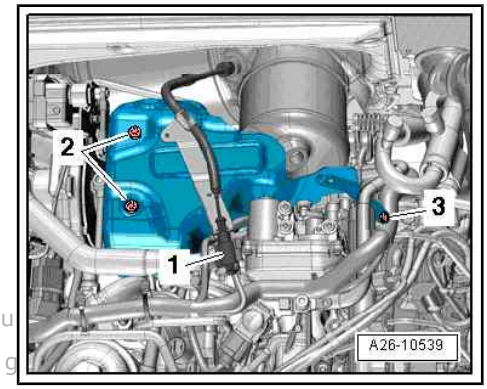
WARNING

When working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system***
  ⇒ "2.8 Safety precautions when working on the exhaust system", page 7 .

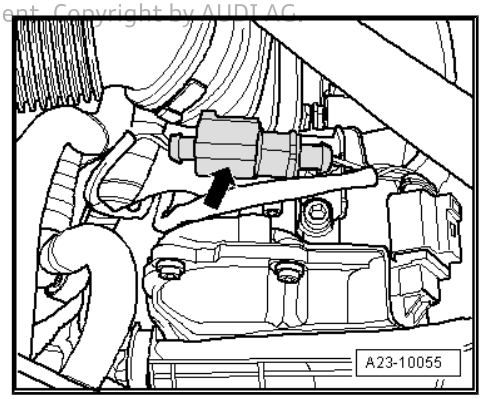
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– Unplug electrical connector -1- for exhaust gas temperature sender and move wiring clear.
– Remove bolts -2- and -3-.
– Detach heat shield for turbocharger.

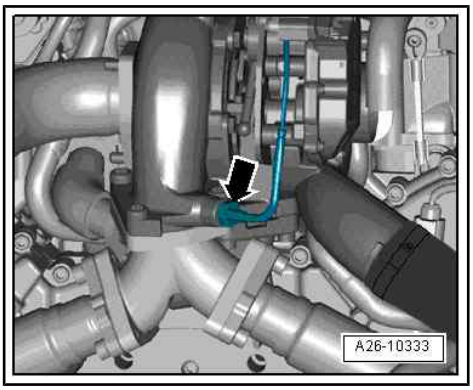


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– Unplug electrical connector -arrow- for exhaust gas temperature sender 1 - G235- .



– Unscrew exhaust gas temperature sender 1 - G235- -arrow-.



Note

For illustration purposes, the installation position is shown from the rear and with the engine removed.

Installing

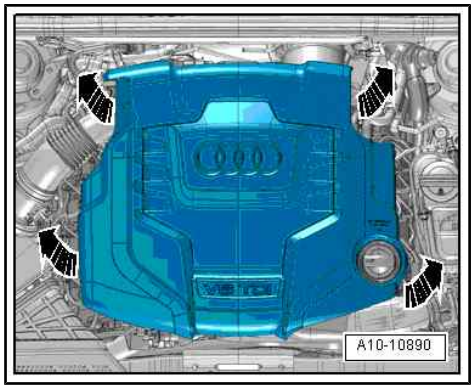
Installation is carried out in reverse order; note the following:

- Tightening torque
  ⇒ “4.1.1 Exploded view - exhaust gas temperature control, vehicles without SCR catalytic converter”, page 609

– Install heat shield for turbocharger ⇒ page 420 .

4.2.2 Removing and installing exhaust gas temperature sender -G448- / -G495-

Removing



Note

Fit all cable ties in the original positions when installing.

– Remove engine cover panel -arrows-.

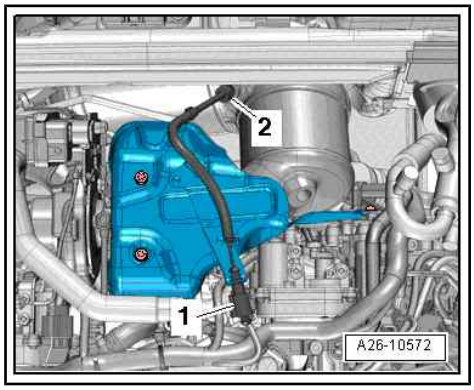
WARNING

When working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system***
  ⇒ "2.8 Safety precautions when working on the exhaust system", page 7 .

– Unplug electrical connector -1- at exhaust gas temperature sender -G448- / -G495- .

– Unscrew exhaust gas temperature sender -2-.



Installing

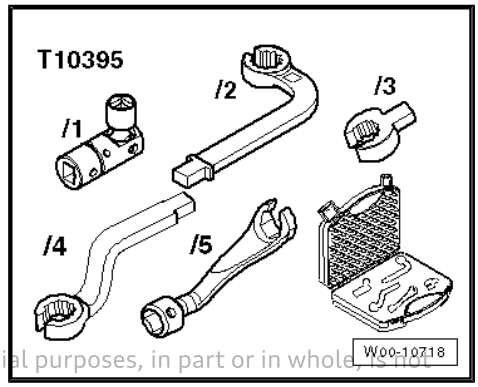
Installation is carried out in reverse sequence.

- Tightening torque
  ⇒ "4.1.1 Exploded view - exhaust gas temperature control, vehicles without SCR catalytic converter", page 609

4.2.3 Removing and installing exhaust gas temperature sender -G496- / -G648-

Special tools and workshop equipment required

- Tool set - T10395 A-

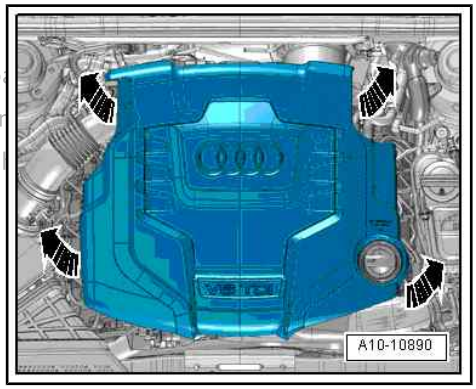


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Removing

– Remove engine cover panel -arrows-.

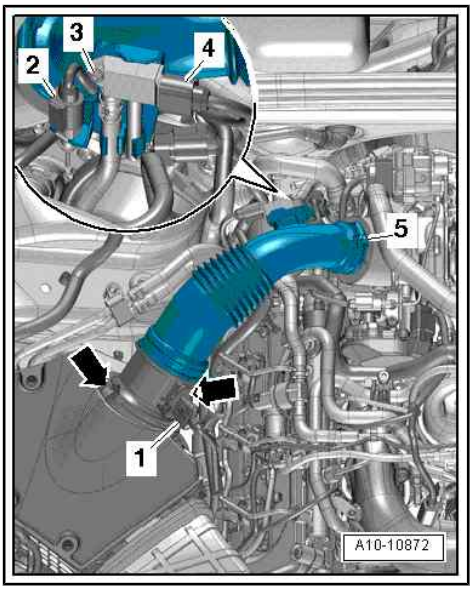


WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system*
  ⇒ "2.8 Safety precautions when working on the exhaust system", page 7 .

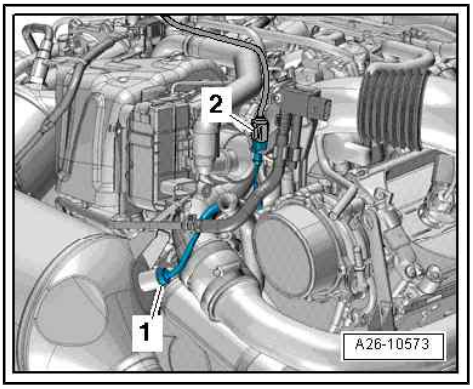
– Remove air hose and air mass meter - G70- . To do so, release hose clip -5- and clamps -arrows-.



Vehicles without SCR catalytic converter:

– Detach electrical connector -2- from bracket and unplug.

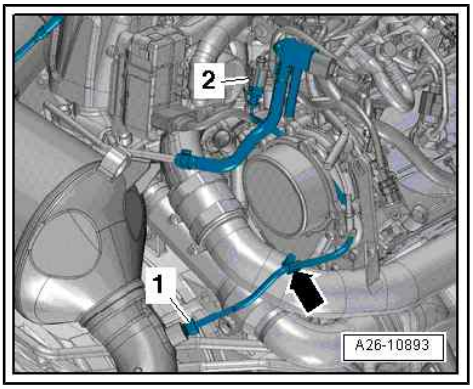
– Remove exhaust gas temperature sender -G496- / -G648- -item 1-.



Vehicles with SCR catalytic converter:

– Detach electrical connector -2- from bracket, unplug and move electrical wire clear -arrow-.

– Remove exhaust gas temperature sender -G496- / -G648- -item 1-.



Installing

Installation is carried out in reverse sequence.

- Tightening torque
  ⇒ "4.1.1 Exploded view - exhaust gas temperature control, vehicles without SCR catalytic converter", page 609

5 Exhaust gas recirculation

⇒ “5.1 Exploded view - exhaust gas recirculation system”, page 616

⇒ “5.2 Removing and installing exhaust gas recirculation control motor V338 ”, page 619

⇒ “5.3 Removing and installing exhaust gas recirculation cooler”, page 623

⇒ “5.4 Removing and installing exhaust gas recirculation temperature sensor G98 ”, page 627

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5.1 Exploded view - exhaust gas recirculation system

⇒ “5.1.1 Exploded view - exhaust gas recirculation system, engine codes CAMA, CAMB, CAPA”, page 616

⇒ “5.1.2 Exploded view - exhaust gas recirculation system, engine codes CCLA, CCWA, CCWB, CGKA, CGKB”, page 618

5.1.1 Exploded view - exhaust gas recirculation system, engine codes CAMA, CAMB, CAPA

1 - Bolt
- ❑ 9 Nm

2 - Bracket
- ❑ For exhaust gas recirculation system

3 - Connecting pipe for exhaust gas recirculation

4 - Bolt
- ❑ 25 Nm

5 - Bolt
- ❑ 9 Nm

6 - Gasket
- ❑ Renew

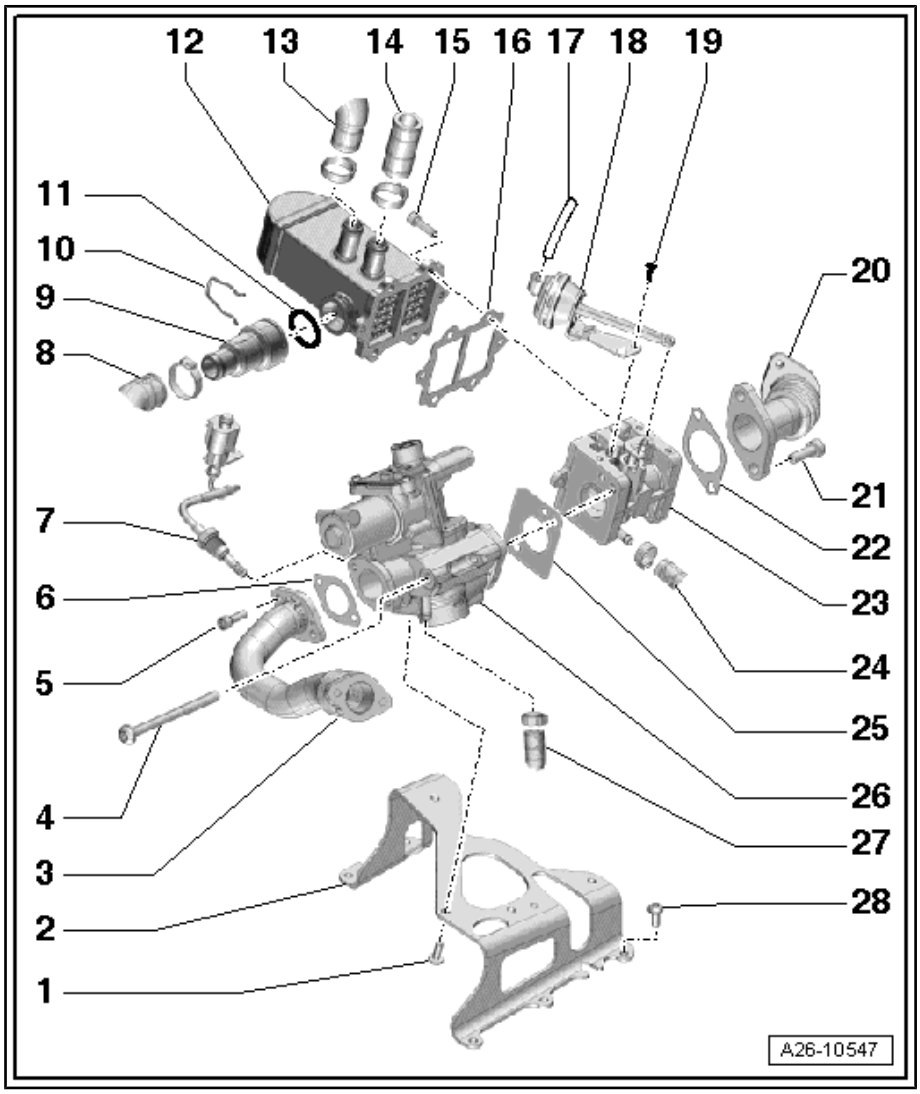
7 - Exhaust gas recirculation temperature sensor - G98-
- ❑ 35 Nm for aluminium exhaust gas recirculation cooler
- ❑ 45 Nm for steel exhaust gas recirculation cooler
- ❑ Removing and installing ⇒ page 627

8 - Coolant hose

9 - Connection with thermostat for exhaust gas recirculation

10 - Retaining clip

11 - O-ring
- ❑ Renew



12 - Exhaust gas recirculation cooler

- ❑ Removing and installing ⇒ page 623

13 - Coolant hose

14 - Coolant hose

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15 - Bolt

- ❑ 9 Nm

16 - Gasket

- ❑ Renew

17 - Vacuum hose

- ❑ From exhaust gas recirculation cooler change-over valve - N345-

18 - Vacuum unit for exhaust gas recirculation changeover function

19 - Bolt

- ❑ 4 Nm

20 - Connecting pipe for exhaust gas recirculation

21 - Bolt

- ❑ 25 Nm

22 - Gasket

- ❑ Renew

23 - Change-over flap for exhaust gas recirculation cooler

24 - Coolant hose

25 - Gasket

- ❑ Renew

26 - Exhaust gas recirculation control motor - V338-

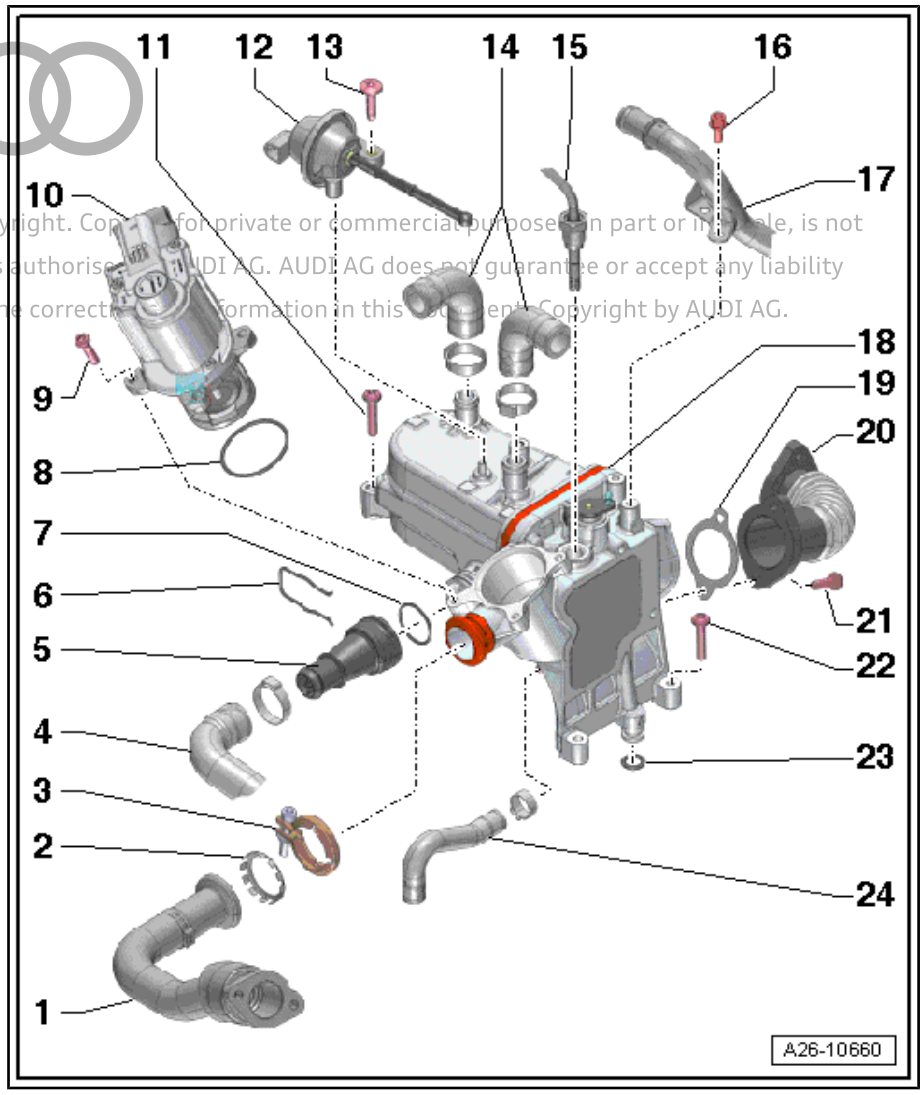
- ❑ With exhaust gas recirculation potentiometer - G212-
- ❑ Removing and installing ⇒ page 619

27 - Coolant hose

28 - Bolt

- ❑ 9 Nm

5.1.2 Exploded view - exhaust gas recirculation system, engine codes CCLA, CCWA, CCWB, CGKA, CGKB



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1 - Connecting pipe for exhaust gas recirculation

2 - Sealing washer
- ❑ Renew

3 - Clamp
- ❑ Installation position: as illustrated
- ❑ 9 Nm

4 - Coolant hose

5 - Connection with thermostat for exhaust gas recirculation

6 - Retaining clip

7 - O-ring
- ❑ Renew

8 - O-ring
- ❑ Renew

9 - Bolt
- ❑ 9 Nm

10 - Exhaust gas recirculation control motor - V338-
- ❑ With exhaust gas recirculation potentiometer - G212-
- ❑ Removing and installing ⇒ page 619

11 - Bolt
- ❑ 9 Nm

12 - Vacuum unit for exhaust gas recirculation changeover function

13 - Bolt
- ❑ 9 Nm

14 - Coolant hoses

15 - 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 627

16 - Bolt
- ❑ 9 Nm

17 - Crankcase breather pipe

18 - Exhaust gas recirculation cooler
- ❑ With change-over flap for exhaust gas recirculation cooler
- ❑ Removing and installing ⇒ page 625

19 - Gasket
- ❑ Renew

20 - Connecting pipe for exhaust gas recirculation

21 - Bolt

- ❑ 9 Nm

22 - Bolt

- ❑ 9 Nm

23 - O-ring

- ❑ Renew

24 - Coolant hose

5.2 Removing and installing exhaust gas recirculation control motor - V338-

⇒ "5.2.1 Removing and installing exhaust gas recirculation control motor V338 - engine codes CAMA, CAMB, CAPA", page 619
⇒ "5.2.2 Removing and installing exhaust gas recirculation control motor V338 - engine codes CCLA, CCWA, CCWB, CGKA, CGKB", page 621

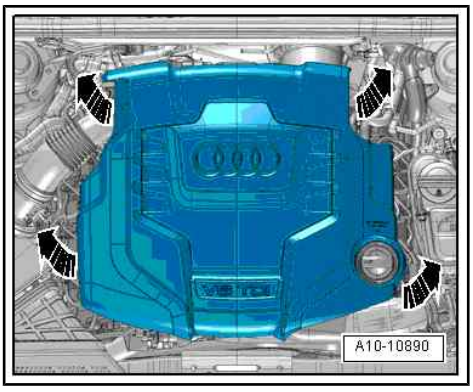
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5.2.1 Removing and installing exhaust gas recirculation control motor - V338- - engine codes CAMA, CAMB, CAPA

Removing

– Drain coolant ⇒ page 353 .

– Remove engine cover panel -arrows-.



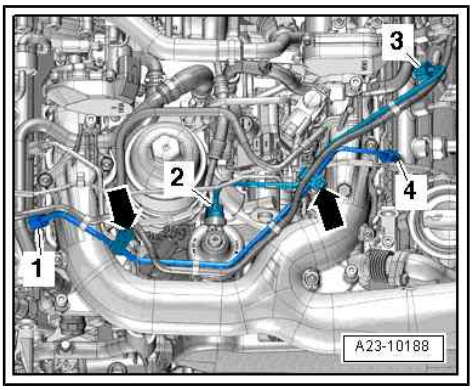
Engine codes CAMA, CAMB:

– Unscrew bolt -left arrow- and remove retaining clip.

– Unscrew union nuts -1 ... 4- and detach high-pressure pipes.

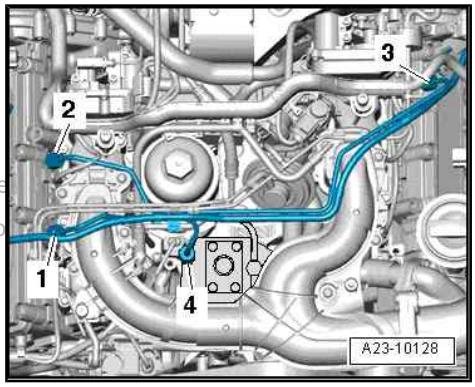
Note

Disregard -arrow- on right-side of illustration.



Engine code CAPA:

– Remove union nuts -1- and -3-, move high-pressure pipe clear and remove.



Note

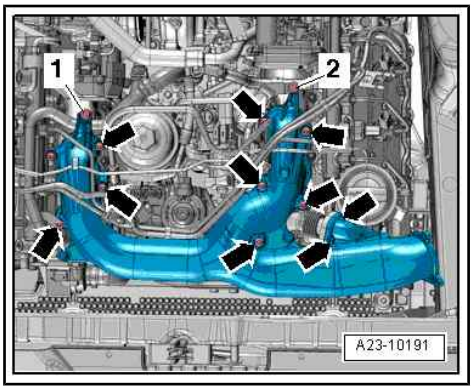
Disregard -item 2-.

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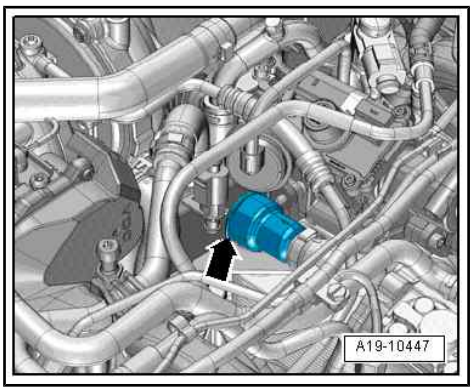
All vehicles (continued):

– Remove intake manifold (top section) ⇒ page 483 .

– Remove oil filter housing ⇒ page 345 .



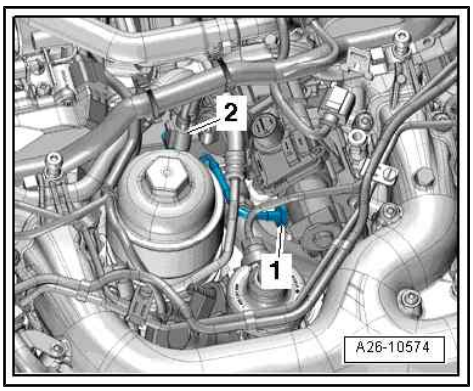
– Pull out retaining clip and detach connection -arrow- with thermostat for exhaust gas recirculation.



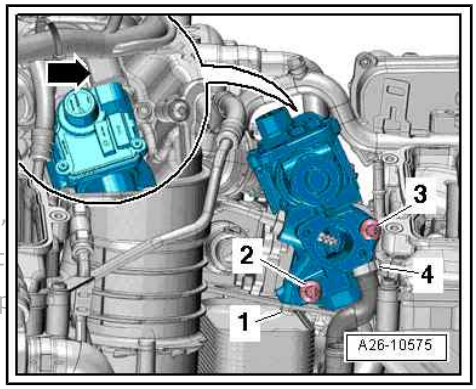
– Detach electrical connector -2- for exhaust gas recirculation temperature sensor - G98- from bracket and unplug.

Note

Disregard -item 1-.



– Unplug electrical connector -arrow- for exhaust gas recirculation control motor - V338- .
– Remove bolts -1, 2, 3-, detach exhaust gas recirculation control motor - V338- and detach from coolant hose -4-.



Installing

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

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- Tightening torque ⇒ “5.1 Exploded view - exhaust gas recirculation system”, page 616

Note

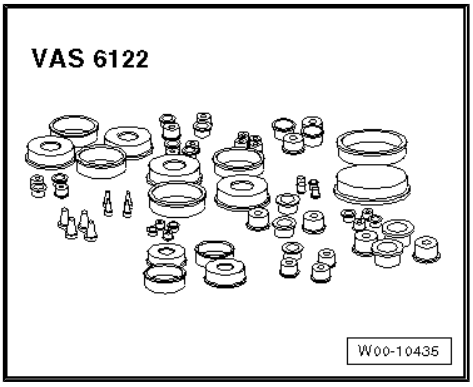
Renew seals.

– Install oil filter housing ⇒ page 345 .
– Install intake manifold (top section) ⇒ page 483 .
– Install high-pressure pipes ⇒ page 507 .
– Fill up with coolant ⇒ page 357 .

5.2.2 Removing and installing exhaust gas recirculation control motor - V338- - engine codes CCLA, CCWA, CCWB, CGKA, CGKB

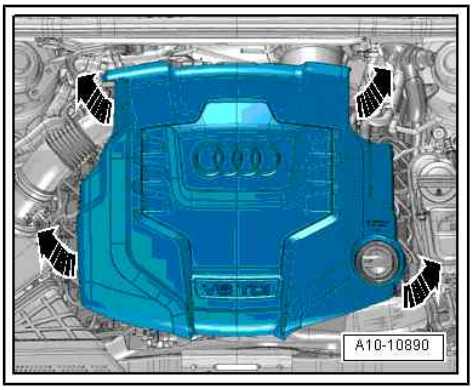
Special tools and workshop equipment required

♦ Engine bung set - VAS 6122- for vehicles with SCR catalytic converter

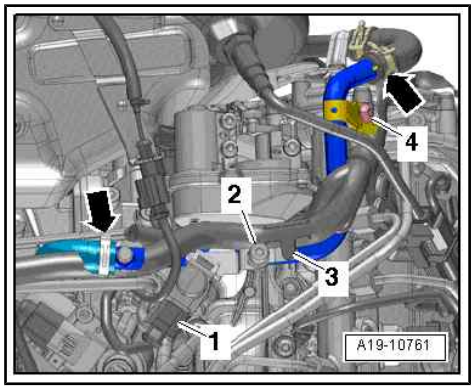


Removing

– Remove engine cover panel -arrows-.



– Detach change-over valve for exhaust gas recirculation cooler - N345- -item 1- from bracket.



Note

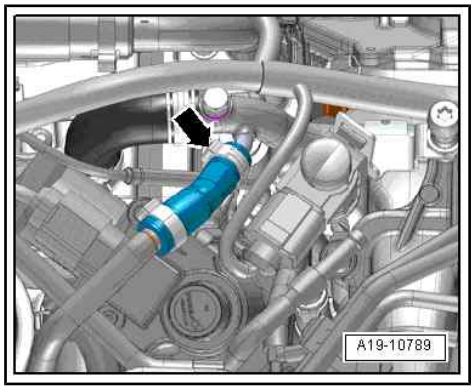
Disregard items -2, 3, 4- and -arrows-.

Vehicles with SCR catalytic converter:

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

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

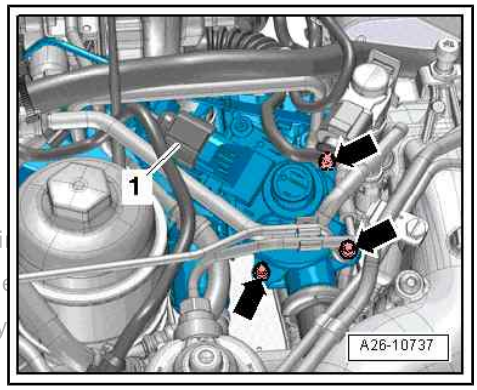
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .



All vehicles (continued):

– Unplug electrical connector -1-.

– Remove bolts -arrows- and detach exhaust gas recirculation control motor - V338- .



Installing

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

- Tightening torque
⇒ "5.1 Exploded view - exhaust gas recirculation system", page 616

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Note

Fit new O-ring.

5.3 Removing and installing exhaust gas recirculation cooler

⇒ "5.3.1 Removing and installing exhaust gas recirculation cooler - engine codes CAMA, CAMB, CAPA", page 623

⇒ "5.3.2 Removing and installing exhaust gas recirculation cooler - engine codes CCLA, CCWA, CCWB, CGKA, CGKB", page 625

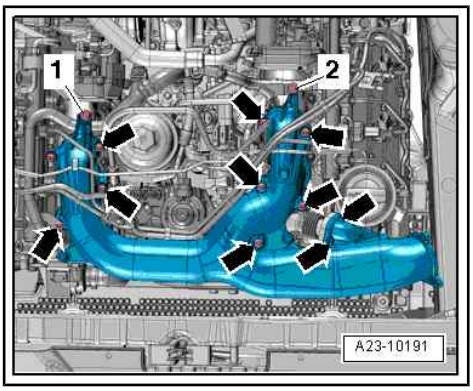
5.3.1 Removing and installing exhaust gas recirculation cooler - engine codes CAMA, CAMB, CAPA

Removing

– Drain coolant ⇒ page 353 .

– Remove particulate filter: A5 up to vehicle identification no. 8T-8-009 998 ⇒ page 578 ; A4 (all), A5 from vehicle identification no. 8T-8-009 999 onwards ⇒ page 580 .

– Remove intake manifold (top section) ⇒ page 483 .



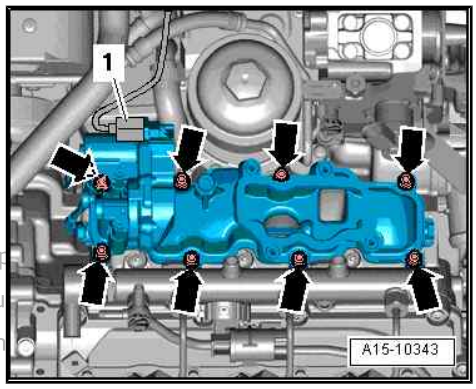
– Remove intake manifold (bottom section, right-side) ⇒ page 485 .

– Remove coolant pipe (rear left) ⇒ page 390 .

– Remove rear coolant pipe (right-side) ⇒ page 399 .

– Remove exhaust gas recirculation control motor - V338- ⇒ page 619 .

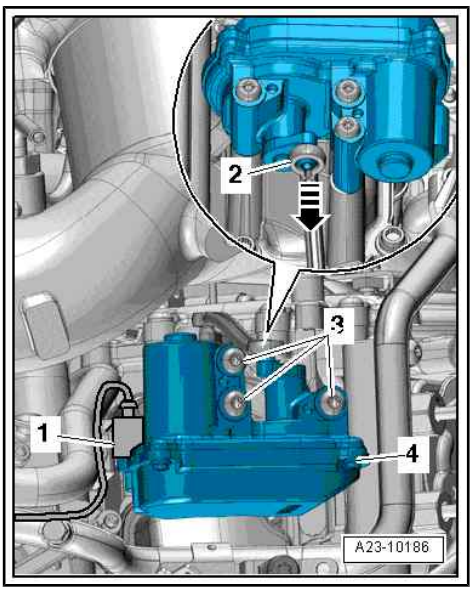
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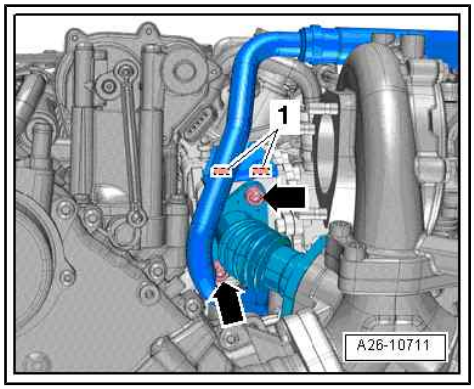
– Unplug electrical connector -1-.

– Carefully press linkage -2- off ball stud -arrow-.

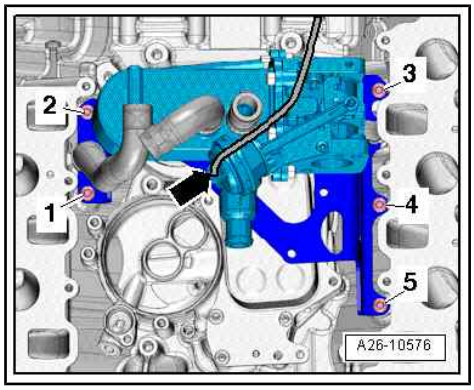
– Remove bolts -3- and detach intake manifold flap motor 2 - V275- -item 4-.



– Remove bolts -arrows- and -1-.



– Detach vacuum hose -arrow- from positioning element for exhaust gas recirculation flap.
– Remove bolts -1 ... 5-.

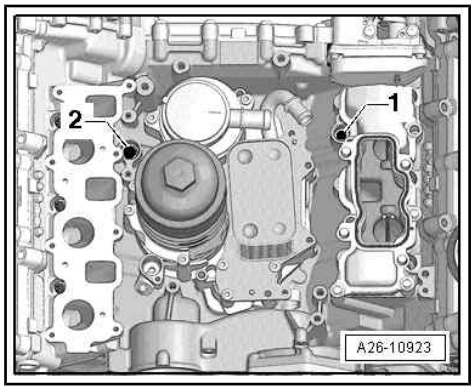


Note

Procedure if coolant hose is stuck ⇒ page 624

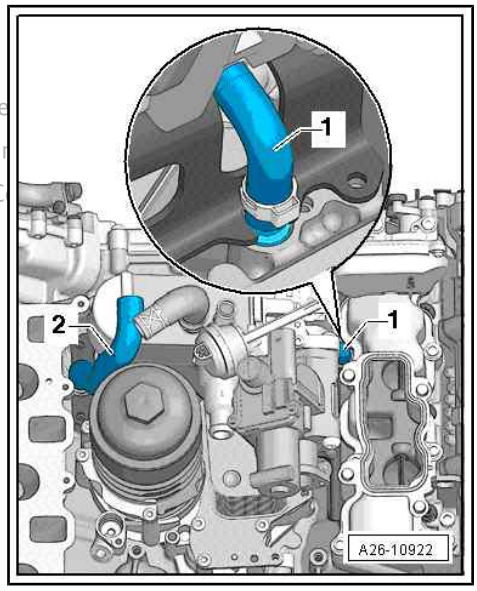
– Lift exhaust gas recirculation cooler with coolant hoses off cylinder block.

– Clean coolant connections in cylinder block -1- and -2-.



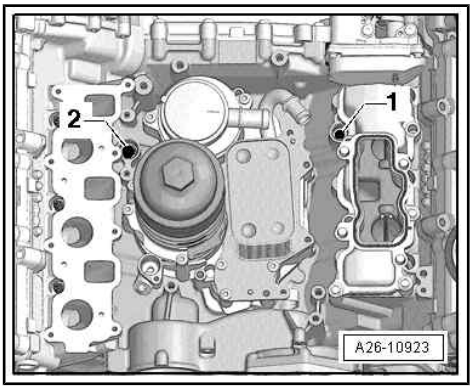
Procedure if coolant hose is stuck

– Use e.g. saw blade or knife to cut through coolant hose -1-.
– Lift exhaust gas recirculation cooler with coolant hose -2- on right side off cylinder block (guide out coolant hose -2-).
– Guide exhaust gas recirculation cooler around coolant hose connection and lift off.
– Remove coolant connection.



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– Clean coolant connections in cylinder block -1- and -2-.



Installing

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

- Tightening torque
  ⇒ “5.1 Exploded view - exhaust gas recirculation system”, page 616

Note

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

– Install intake manifold flap motor 2 - V275- ⇒ page 485 .
– Install exhaust gas recirculation control motor - V338- ⇒ page 619 .

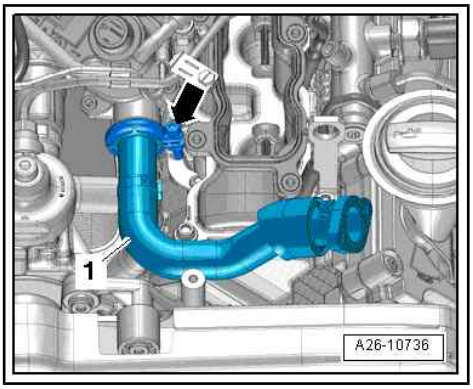
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– Install coolant pipe (rear right) ⇒ page 399 .
– Install coolant pipe (rear left) ⇒ page 390 .
– Install bottom section of intake manifold (right-side) and top section of intake manifold ⇒ page 483 .
– Install particulate filter: A5 up to vehicle identification no. 8T-8-009 998 ⇒ page 578 ; A4 (all), A5 from vehicle identification no. 8T-8-009 999 onwards ⇒ page 580 .
– Fill up with coolant ⇒ page 357 .

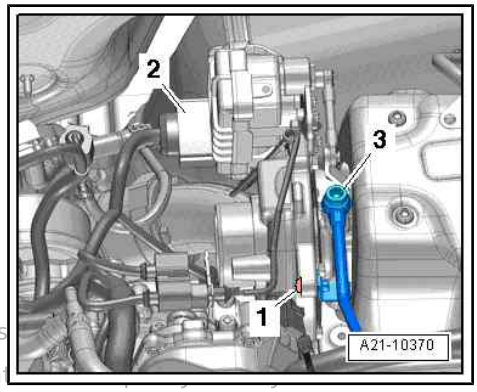
5.3.2 Removing and installing exhaust gas recirculation cooler - engine codes CCLA, CCWA, CCWB, CGKA, CGKB

Removing

– Drain coolant ⇒ page 353 .
– Remove particulate filter ⇒ page 580 .
– Remove coolant pipe (top left): engine codes CCWA, CCWB, CGKA, CGKB ⇒ page 393 , vehicles with SCR catalytic converter ⇒ page 395 .
– Remove coolant pipe (top right) ⇒ page 395 .
– Remove oil filter housing ⇒ page 345 .
– Release clamp -arrow- and detach exhaust gas recirculation pipe -1-.



– Remove bolt -1- and banjo bolt -3- and move oil supply line clear to one side.

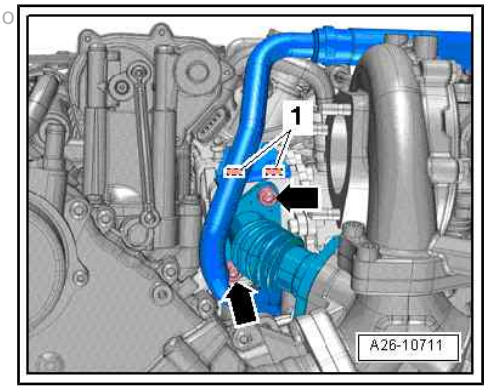


Note

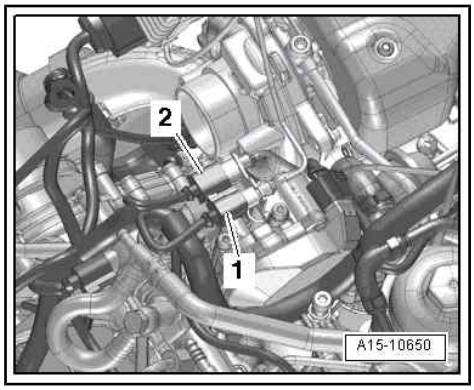
Disregard -item 2-.

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– Remove bolts -arrows- and -1-.



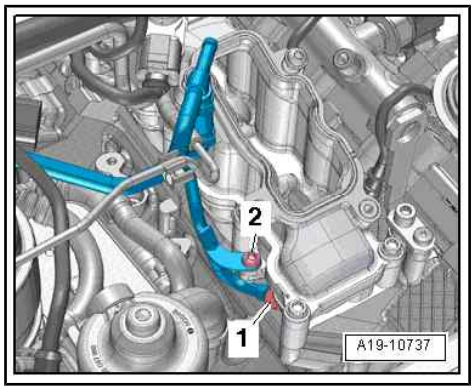
– Detach electrical connector -2- (orange) for exhaust gas recirculation temperature sensor - G98- from bracket and unplug.



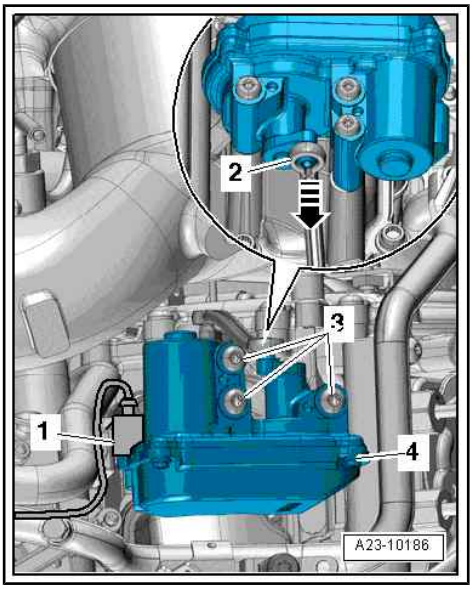
Note

Disregard -item 1-.

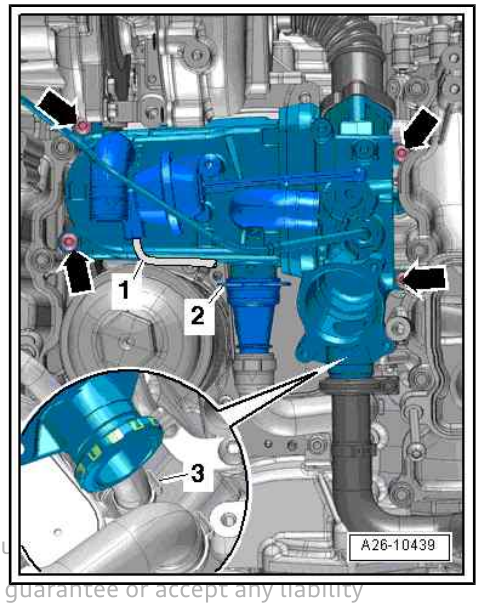
– Remove banjo bolt -1- and bolt -2- and move coolant pipe clear to one side.



– Unplug electrical connector -1-.
– Carefully press linkage -2- off ball stud -arrow-.
– Remove bolts -3- and detach intake manifold flap motor 2 - V275- -item 4-.
– Repeat procedure on opposite side of vehicle.



– Disconnect vacuum hose -1-.
– Lift retaining clip -2- and disconnect coolant hose.
– Release hose clip -3- and detach coolant hose.
– Remove bolts -arrows- and lift off exhaust gas recirculation cooler from cylinder block.



Installing

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

- Tightening torque
  ⇒ “5.1 Exploded view - exhaust gas recirculation system”, page 616

Note

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

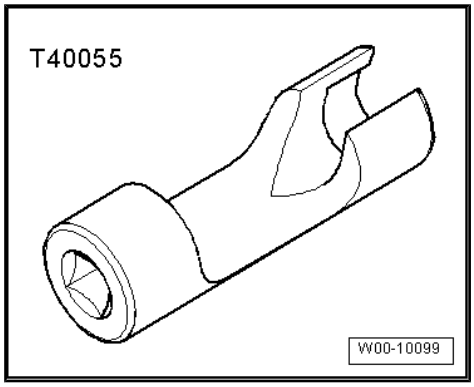
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– Install intake manifold flap motors ⇒ page 485 .
– Install coolant pipe ⇒ page 374 .
– Install oil filter housing ⇒ page 345 .
– Install coolant pipe (top right) ⇒ page 395 .
– Install coolant pipe (top left): engine codes CCWA, CCWB, CGKA, CGKB ⇒ page 393 , vehicles with SCR catalytic converter ⇒ page 395 .
– Install particulate filter ⇒ page 580 .
– Fill up with coolant ⇒ page 357 .

5.4 Removing and installing exhaust gas recirculation temperature sensor - G98-

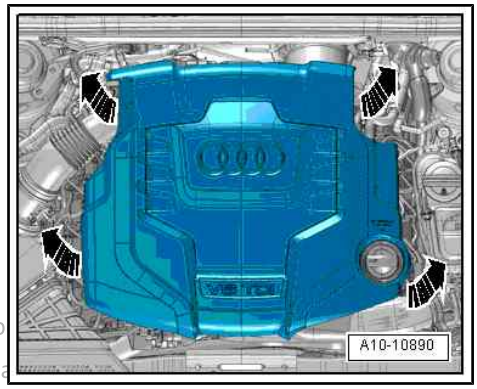
Special tools and workshop equipment required

♦ Socket - T40055-



Removing

– Remove engine cover panel -arrows-.



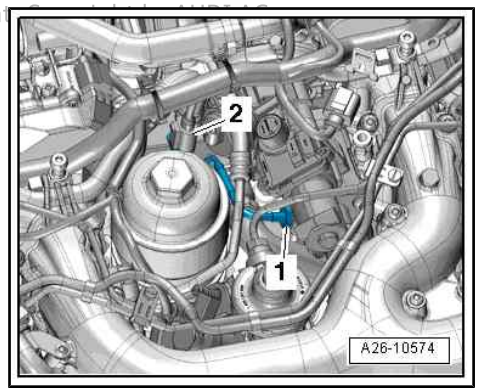
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Engine codes CAMA, CAMB, CAPA:

– Remove oil filter housing ⇒ page 345 .

– Detach electrical connector -2- for exhaust gas recirculation temperature sensor - G98- from bracket and unplug.

– Use socket - G98- to unscrew exhaust gas recirculation temperature sensor - T40055- -item 1-.



Engine codes CCLA, CCWA, CCWB, CGKA, CGKB:

– Detach electrical connector -1- for exhaust gas recirculation temperature sensor - G98- from bracket, unplug and move electrical wiring clear.

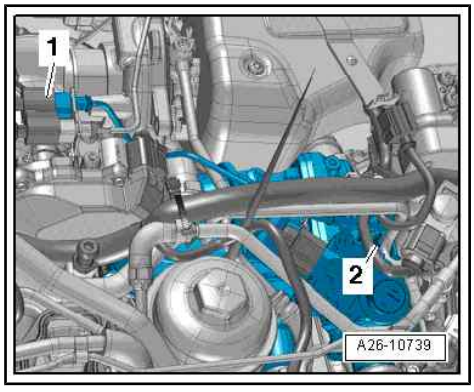
– Use socket - G98- to unscrew exhaust gas recirculation temperature sensor - T40055- -item 2-.

Installing

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

• Tightening torque ⇒ page 616

– Install oil filter housing ⇒ page 345 .



6 Exhaust manifolds

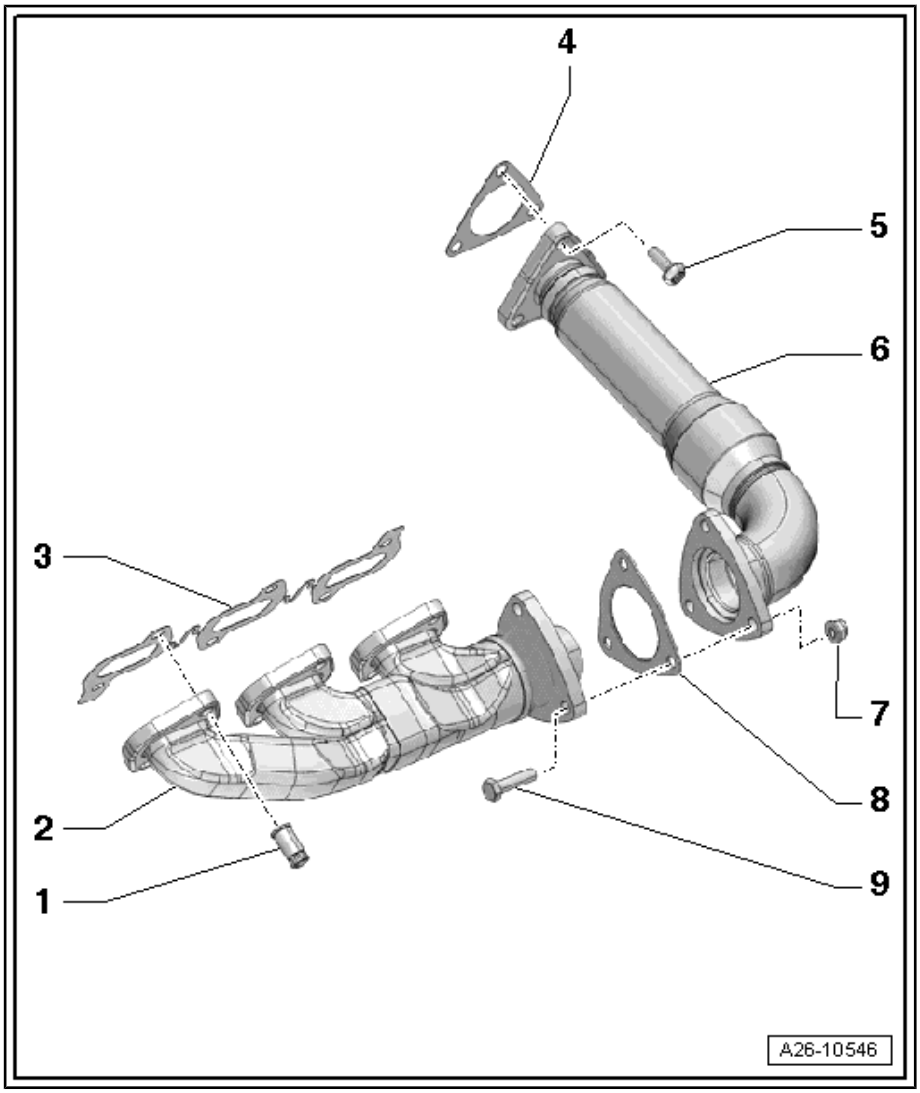
⇒ “6.1 Exploded view - exhaust manifold”, page 629
⇒ “6.2 Removing and installing exhaust manifolds”, page 630

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6.1 Exploded view - exhaust manifold

Note

The diagram shows the exhaust manifold with intermediate pipe on cylinder bank 2 (left-side).



1 - Nut
- ❑ Renew
- ❑ Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 25 Nm

2 - Exhaust manifold
- ❑ Removing and installing: left-side ⇒ page 630 , right-side ⇒ page 630

3 - Gasket
- ❑ Renew

4 - Gasket
- ❑ Renew

5 - Bolt
- ❑ Renew
- ❑ Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 30 Nm + turn 90° further

6 - Intermediate pipe
- ❑ Removing and installing: left-side ⇒ page 631 , right-side ⇒ page 633

7 - Nut
- ❑ Renew
- ❑ 23 Nm

8 - Gasket
- ❑ Renew

9 - Bolt
- ❑ Renew
- ❑ Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue

6.2 Removing and installing exhaust manifolds

⇒ “6.2.1 Removing and installing exhaust manifold (left-side)”, page 630

⇒ “6.2.2 Removing and installing exhaust manifold (right-side)”, page 630

⇒ “6.2.3 Removing and installing intermediate pipe (left-side)”, page 631

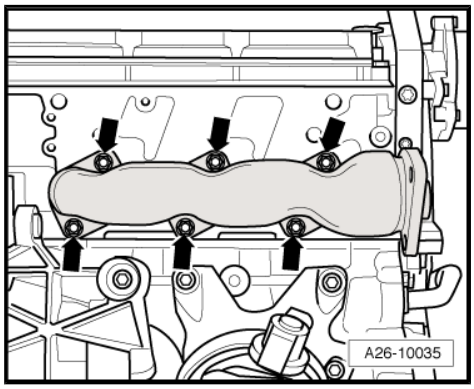
⇒ “6.2.4 Removing and installing intermediate pipe (right-side)”, page 633

6.2.1 Removing and installing exhaust manifold (left-side)

Removing

– Remove intermediate pipe (left-side) ⇒ page 631

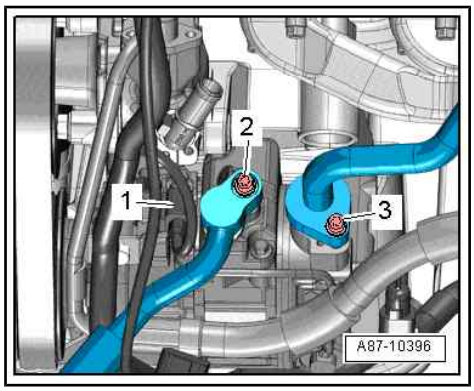
– Remove bolts -arrows- and remove exhaust manifold.



– If it is not possible to remove exhaust manifold, discharge refrigerant circuit ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit .

– Remove bolt -3-, disconnect refrigerant line from air conditioner compressor and move to one side.

– Detach exhaust manifold.



Installing

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

- Tightening torque
  ⇒ “6.1 Exploded view - exhaust manifold”, page 629

Note

Renew seals, gaskets, O-rings and self-locking nuts.

– Install intermediate pipe (left-side) ⇒ page 631 .

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

6.2.2 Removing and installing exhaust manifold (right-side)

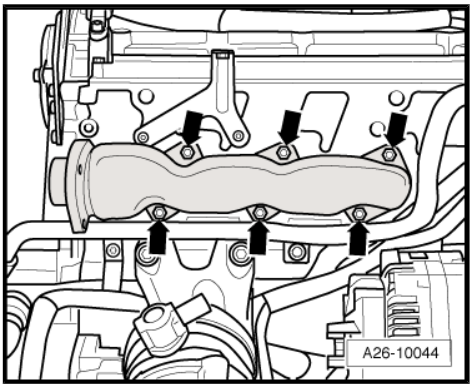
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Removing

– Remove intermediate pipe (right-side) ⇒ page 633 .

– Remove coolant pipe (bottom right) ⇒ page 396 .

– Remove bolts -arrows- and remove exhaust manifold.



Installing

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

- Tightening torque
  ⇒ “6.1 Exploded view - exhaust manifold”, page 629

Note

Renew seals, gaskets and self-locking nuts.

– Install coolant pipe (bottom right) ⇒ page 396 .

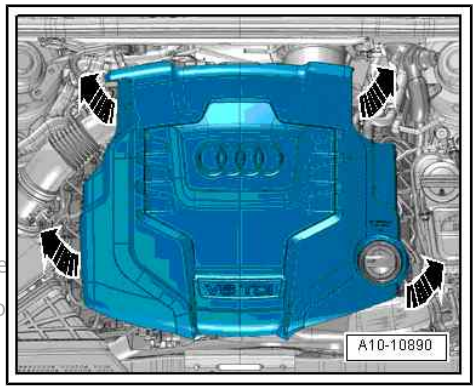
– Install intermediate pipe (right-side) ⇒ page 633 .

6.2.3 Removing and installing intermediate pipe (left-side)

Removing

– Remove engine cover panel -arrows-.

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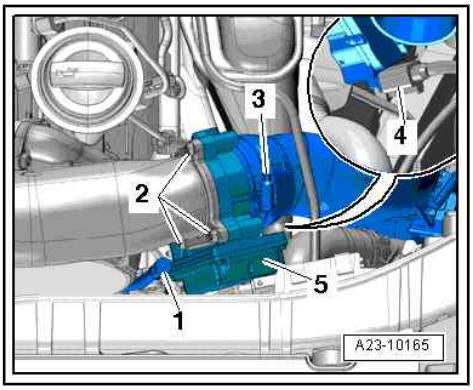


– If fitted, pull out oil dipstick -1-.

– Loosen hose clip -3- and remove air hose.

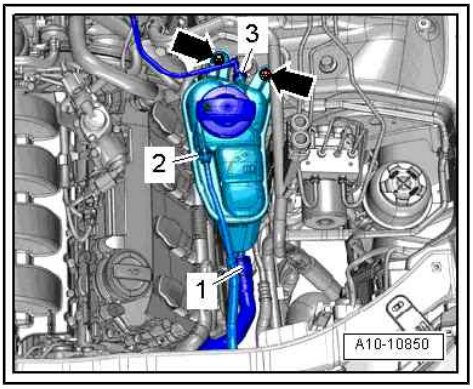
– Unplug electrical connector -4-.

– Remove bolts -2- and detach throttle valve module - J338- -item 5-.

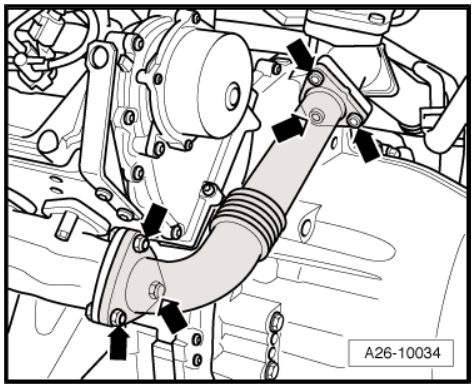


– Disconnect coolant hose -3- from coolant expansion tank.

– Remove bolts -arrows- and move coolant expansion tank to side with coolant hoses -1- and -2- attached.

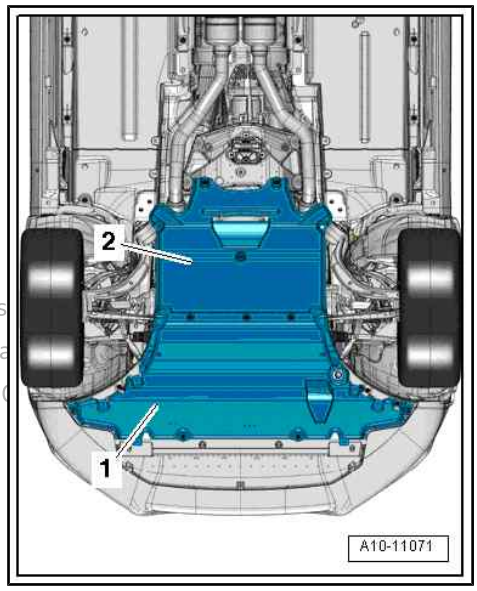


– Remove bolt (accessible from above) -top left arrow- securing intermediate pipe to exhaust manifold.

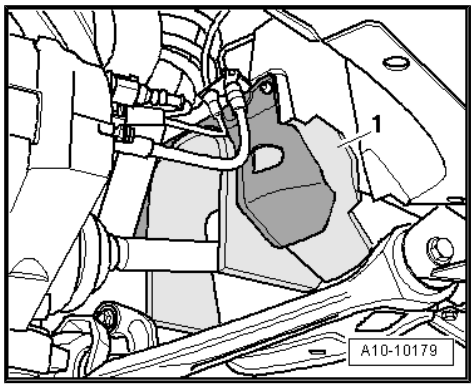


– Remove rear noise insulation -2- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .

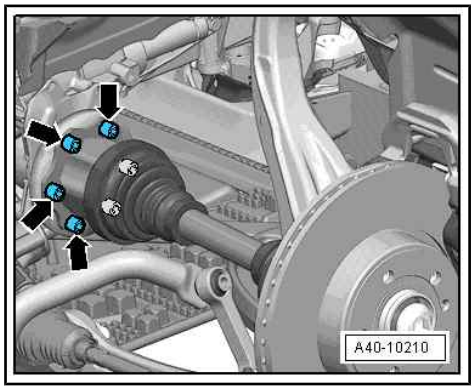
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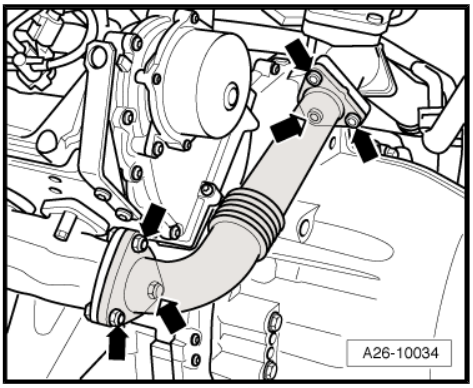
– Remove noise insulation -1- in wheel housing (left-side).



– Unbolt drive shaft (left-side) from gearbox flange shaft ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .



– Remove remaining bolts and nuts securing intermediate pipe to exhaust manifold -arrows- and detach intermediate pipe (left-side).



Installing

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

- Tightening torque ⇒ page 629

Note

Renew seals, gaskets, O-rings and self-locking nuts.

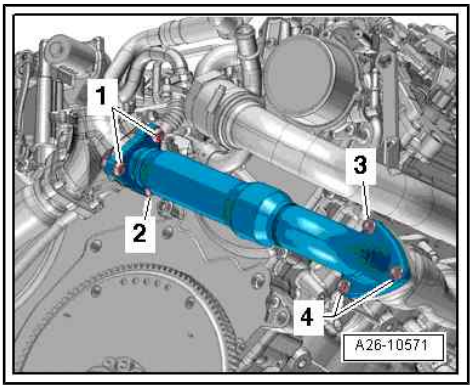
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– Bolt drive shaft (left-side) to gearbox flange shaft ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .
– Install noise insulation panels ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .
– Install throttle valve module - J338- ⇒ page 483 .

6.2.4 Removing and installing intermediate pipe (right-side)

Removing

– Remove air cleaner housing ⇒ page 479 .
– Remove turbocharger ⇒ page 422 .
– Remove particulate filter: A5 up to vehicle identification no. 8T-8-009 998 ⇒ page 578 ; A4 (all), A5 from vehicle identification no. 8T-8-009 999 onwards ⇒ page 580 .
– Remove bolts -1-, -2- and nuts -3- and -4- and remove intermediate pipe (right-side).



Note

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

Installing

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

- Tightening torque
⇒ “6.1 Exploded view - exhaust manifold”, page 629

Note

Renew seals and/or gaskets.

– Install particulate filter: A5 up to vehicle identification no. 8T-8-009 998 ⇒ page 578 ; A4 (all), A5 from vehicle identification no. 8T-8-009 999 onwards ⇒ page 580 .
– Install turbocharger ⇒ page 422 .
– Install air cleaner housing ⇒ page 479 .

28 – Glow plug system

1 Glow plug system

⇒ “1.1 Removing and installing glow plug”, page 634

⇒ “1.2 Removing and installing engine speed sender G28 ”, page 637

1.1 Removing and installing glow plug

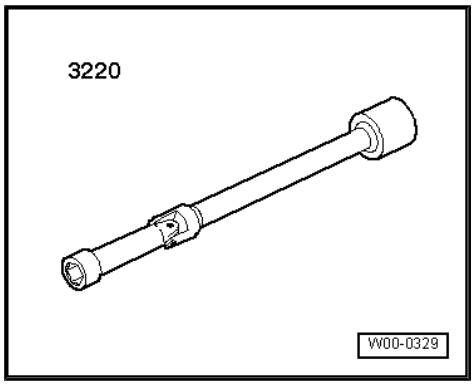
⇒ “1.1.1 Removing and installing glow plugs - engine codes CAMA, CAPA, CAMB, CCWA, CCWB, CGKA, CGKB”, page 634

⇒ “1.1.2 Removing and installing glow plugs - engine code CCLA”, page 635

1.1.1 Removing and installing glow plugs - engine codes CAMA, CAPA, CAMB, CCWA, CCWB, CGKA, CGKB

Special tools and workshop equipment required

- Articulated wrench, 10 mm - 3220-



Removing

– Switch off ignition.

– Remove engine cover panel ⇒ page 162 .

Note

For cylinders No. 3 and 6 the respective intake manifold flap motor must be detached. Do not detach the connecting rod. The wiring harness must also be detached (unscrew the respective retaining stud for the engine cover panel).

– Detach glow plug connectors from glow plugs.

– Clean glow plug openings in cylinder head; make sure no dirt gets into cylinder.

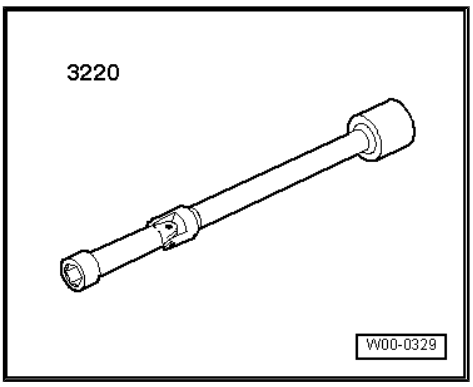
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Note

- *Cleaning procedure:*
- *Use a vacuum cleaner to remove coarse dirt.*
- *Spray brake cleaner or suitable cleaning agent into glow plug openings, let it work in briefly, and blow out with compressed air.*
- *Then clean the glow plug openings using a cloth moistened with oil.*

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– To slacken the glow plugs use special tool U/J extension and socket, 10 mm - 3220- .



Installing

– To tighten the glow plugs use special tool U/J extension and socket, 10 mm - 3220- with a suitable torque wrench.

– Then tighten glow plugs to specified torque.

• Tightening torque: 17 Nm

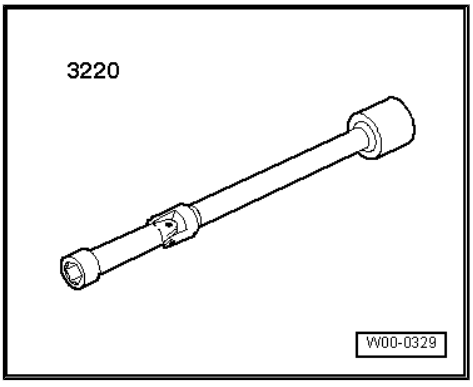
– Attach glow plug connectors correctly and make sure they are securely fitted.

– Install any ancillary units that were previously detached.

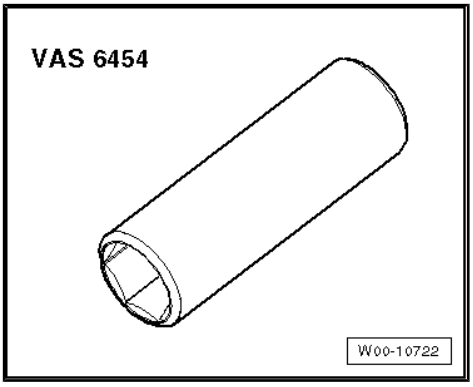
1.1.2 Removing and installing glow plugs - engine code CCLA

Special tools and workshop equipment required

- Articulated wrench, 10 mm - 3220-



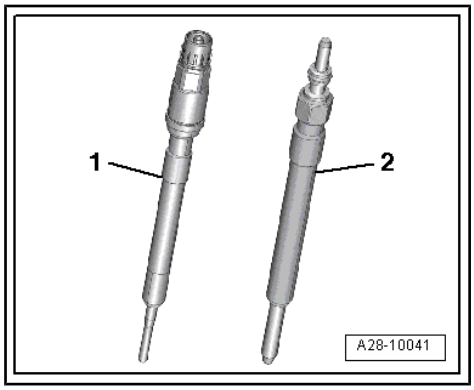
- Socket insert AF 12 for glow plugs 4-cyl.TDI CR diesel - VAS 6454- (for glow plugs for cylinders 2 and 5)



Removing

– Switch off ignition.

– Remove engine cover panel ⇒ page 162 .



Note

- *For cylinders 3 and 6 the respective intake manifold flap motor must be detached. Do not detach the connecting rod. The wiring harness must also be detached (unscrew the respective retaining stud for the engine cover panel).*
- *On cylinders 3 and 5, a combustion chamber pressure sender is integrated in the glow plugs.*
- *Designation: glow plug 2 - Q11- with cylinder 2 combustion chamber pressure sender - G678-*
- *Designation: glow plug 5 - Q14- with cylinder 5 combustion chamber pressure sender - G681-*

Glow plug versions

1 - Glow plug with combustion chamber pressure sender (only installed on cylinders 2 and 5)

2 - Glow plug without combustion chamber pressure sender

– Detach glow plug connectors from glow plugs.

– Clean glow plug openings in cylinder head; make sure no dirt gets into cylinder.

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Note

- *Cleaning procedure:*
- *Use a vacuum cleaner to remove coarse dirt.*
- *Spray brake cleaner or suitable cleaning agent into glow plug openings, let it work in briefly, and blow out with compressed air.*
- *Then clean the glow plug openings using a cloth moistened with oil.*

– To loosen glow plugs 1, 3, 4 and 6, use U/J extension and socket, 10 mm - 3220- .

– To loosen glow plugs 2 and 5, use socket insert AF 12 for glow plugs 4-cyl.TDI CR diesel - VAS 6454- .

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 torque: 17 Nm

– Attach glow plug connectors correctly and make sure connectors are securely fitted.

– Install any ancillary units that were previously detached.

Tightening torques

- For intake manifold flap motor
⇒ “3.1 Exploded view - intake manifold”, page 482

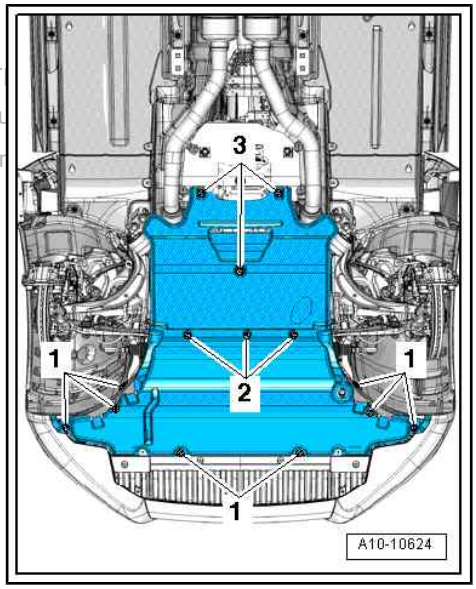
1.2 Removing and installing engine speed sender - G28-

Removing

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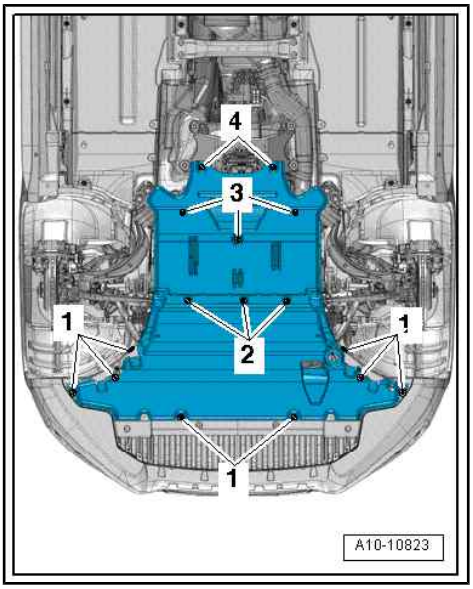
Vehicles with manual gearbox:

– Release fasteners -1, 2, 3- and remove noise insulation panels.



Vehicles with multitronic gearbox:

– Release fasteners -1 ... 4- and remove noise insulation panels.



All vehicles (continued):

– Unplug electrical connector -2-.

– Unscrew bolt -1- and detach engine speed sender - G28- downwards.

Installing

Tightening torques

♦ 9 Nm

Installation is carried out in reverse sequence.

