Workshop Manual
Audi A6 2011 ➢
Audi A7 Sportback 2011 ➢

6-cylinder TDI engine (3.0 ltr. 4-valve common rail - generation II)									
Engine ID	CLAB	CLAA	CDUC	CGQB	CKVB	CKVC	CDUD	CPNB	CTCB
	CTCC	CVUA	CVUB						

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List of Workshop Manual Repair Groups

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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

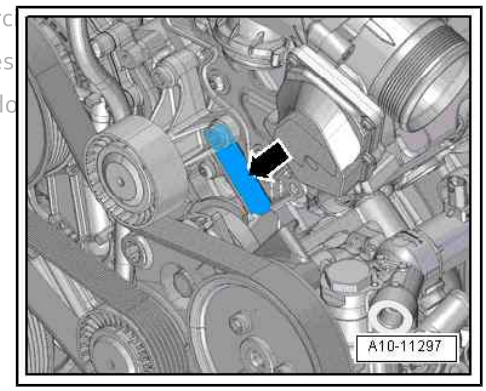
(ARL005994; Edition 09.2018)

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

1.1 Engine number/engine data

Engine number

- The engine number (engine code and serial number) is located on the top of the cylinder block at the front -arrow-.
- There is also a sticker on the intake manifold showing the engine code and serial number.
- Engine codes starting with the letter “C” have four letters (previously three letters).
- The first 3 characters of the engine code stand for the engine capacity and the mechanical construction and design. They are stamped onto the cylinder block together with the serial number.
- The 4th character indicates the power output and torque of the engine and is determined by the engine control unit.



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Note

- *The four-letter engine code is found on the type plate (certain countries only), vehicle data sticker and engine control unit.*
- *Fitting locations of the type plate (certain countries only) and the vehicle data sticker ⇒ Maintenance ; Booklet 411 .*

Engine data

Code letters		CDUC	CDUD	CGQB	CKVB
Capacity	ltr.	2.967	2.967	2.967	2.967
Power output	kW at rpm	180/4000 … 4400	180/4000 … 4500	230/3900 … 4500	180/4000 … 4400
Torque	Nm at rpm	500/2100	580/1750 … 2500	650/1450 … 2800	500/2100
Bore	∅ mm	83.0	83.0	83.0	83.0
Stroke	mm	91.4	91.4	91.4	91.4
Compression ratio		16.8	16.8	16.5	16.8
Fuel	According to	DIN EN 590	DIN EN 590	DIN EN 590	DIN EN 590
Firing order		1-4-3-6-2-5	1-4-3-6-2-5	1-4-3-6-2-5	1-4-3-6-2-5
Exhaust gas recirculation		yes	yes	yes	yes
Turbocharging/supercharging		Turbocharger (1x)	Turbocharger (1x)	Turbocharger (2x)	Turbocharger (1x)
Charge air cooling		yes	yes	yes	yes
Lambda control		1 Lambda probe	1 Lambda probe	1 Lambda probe	1 Lambda probe
Particulate filter		yes	yes	yes	yes
SCR system		no	no	no	yes
Valves per cylinder		4	4	4	4

Code letters		CKVC	CLAA	CLAB	CPNB
Capacity	ltr.	2.967	2.967	2.967	2.967
Power output	kW at rpm	180/4000 … 4400	150/4000 … 4250	150/4000 … 4250	176/4000 … 4500
Torque	Nm at rpm	500/2100	450/1650 … 3200	400/1650 … 3200	580/1700 … 2750
Bore	∅ mm	83.0	83.0	83.0	83.0
Stroke	mm	91.4	91.4	91.4	91.4
Compression ratio		16.8	16.8	16.8	16.8
Fuel	According to	DIN EN 590	DIN EN 590	DIN EN 590	DIN EN 590
Firing order		1-4-3-6-2-5	1-4-3-6-2-5	1-4-3-6-2-5	1-4-3-6-2-5
Exhaust gas recirculation		yes	yes	yes	yes
Turbocharging/supercharging		Turbocharger (1x)	Turbocharger (1x)	Turbocharger (1x)	Turbocharger (1x)
Charge air cooling		yes	yes	yes	yes
Lambda control		1 Lambda probe	1 Lambda probe	1 Lambda probe	1 Lambda probe
Particulate filter		yes	yes	yes	yes
SCR system		yes	no	no	yes
Valves per cylinder		4	4	4	4

Code letters		CTCB	CTCC	CVUA	CVUB
Capacity	ltr.	2.967	2.967	2.967	2.967
Power output	kW at rpm	155/4000	160/4000	235/4250	240/4250
Torque	Nm at rpm	400/1250 … 3500	400/1250 … 3500	650/1450 … 2800	650/1450 … 2800
Bore	∅ mm	83.0	83.0	83.0	83.0
Stroke	mm	91.4	91.4	91.4	91.4
Compression ratio		16.8	16.8	16.8	16.8
CN	at least	51	51	51	51
Fuel	According to	DIN EN 590	DIN EN 590	DIN EN 590	DIN EN 590
Firing order		1-4-3-6-2-5	1-4-3-6-2-5	1-4-3-6-2-5	1-4-3-6-2-5
Exhaust gas recirculation		yes	yes	yes	yes
Turbocharging/supercharging		Turbocharger (1x)	Turbocharger (1x)	Turbocharger (2x)	Turbocharger (2x)
Charge air cooling		yes	yes	yes	yes
Lambda control		1 Lambda probe	1 Lambda probe	1 Lambda probe	1 Lambda probe
Particulate filter		yes	yes	yes	yes
SCR system		yes	yes	yes	yes
Valves per cylinder		4	4	4	4

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2 Safety precautions

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

⇒ “2.2 Safety precautions when working on vehicles with start/stop system”, page 5

⇒ “2.3 Safety precautions when using testers and measuring instruments during a road test”, page 5

⇒ “2.4 Safety precautions when working on the subframe”, page 5

⇒ “2.5 Safety precautions when working on the cooling system”, page 6

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

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

2.1 Safety precautions when working on the fuel system

When working on the fuel system note the following warnings:

WARNING

Fuel under pressure - risk of injuries!

- *Put a clean cloth around the connection before opening the fuel system. Then carefully loosen the connection to relieve the pressure.*
- *Put on protective gloves.*
- *Put on safety goggles.*

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

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

Health risk: avoid skin contact with fuel.

- *Avoid skin contact with fuel. Wear fuel-resistant gloves.*

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.*
- *Disconnect power supply by removing fuse for fuel pump control unit - J538- /fuel delivery unit ⇒ Current flow diagrams, Electrical fault finding and Fitting locations, or disconnect battery.*

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Caution

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

- *If components of the fuel system between the fuel tank and the high-pressure pump are removed or renewed, the fuel system must be filled and bled before the engine is started for the first time ⇒ page 504 .*

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.
- When installing, note colour coding of plug-in connectors.
- Plug-in connectors should engage audibly when connecting.
- Pull plug-in connectors to check that they are correctly engaged.
- Erase any entries in event memory resulting from testing or installation ⇒ Vehicle diagnostic tester, `Vehicle self-diagnosis`, then `Interrogate event memory`.

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 .*

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

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

WARNING

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

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

2.3 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.*

2.4 Safety precautions when working on the subframe

Please note the following warnings when working on the subframe:

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.*

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2.5 Safety precautions when working on the cooling system

When working on the cooling system note the following:

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).*

2.6 Safety precautions when working on the SCR system

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

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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 SCR system, note the following:

- When working on the SCR system, the reducing agent tank must be empty. Refer to the corresponding work description to find out when the reducing agent must be drained from the tank. Drain tank if necessary; procedure ⇒ page 625 .

When removing and installing tank, note the following:

- The reducing agent tank must be empty. Drain tank if necessary; procedure ⇒ page 625 .

Automatic drawing back of reducing agent

- After the ignition is switched off, the reducing agent is automatically drawn back into the tank from the metering line leading to the injector for reducing agent - N474- .
- Before performing work in this area, you must therefore wait until the reducing agent has been drawn back; this can take up to 10 minutes after the ignition has been switched off.
- It is also important to wait until the reducing agent has been drawn back (i.e. 10 minutes after the ignition is switched off) before disconnecting the battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .

WARNING

Safety risk due to escaping reducing agent.

- *To prevent large amounts of reducing agent from escaping when the metering line is opened, wait until the reducing agent has been drawn back automatically* *⇒ page 7* .

2.7 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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3 Repair instructions

⇒ “3.1 Rules for cleanliness”, page 8

⇒ “3.2 General notes”, page 8

⇒ “3.3 General repair instructions”, page 9

⇒ “3.4 Adapting learnt values for SCR system”, page 10

⇒ “3.5 Foreign particles in engine”, page 10

⇒ “3.6 Contact corrosion”, page 11

⇒ “3.7 Routing and attachment of pipes, hoses and wiring”, page 11

⇒ “3.8 Installing radiators and condensers”, 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- .
- 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.
- Protect unplugged electrical connectors against dirt and moisture and make sure connections are dry when attaching.
- 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.

3.2 General notes

Fuel supply/injection

- 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.
- 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 .

Glow plug system

- The glow plug system is activated via the automatic glow period control unit - J179- . The control unit is self-diagnosis compatible.
- Fitting location of automatic glow period control unit - J179- ⇒ Current flow diagrams, Electrical fault finding and Fitting locations
- A fault is stored in the engine control unit - J623- if a fault occurs in the glow plug system.
- The procedure for checking the glow plug system is described in the “Guided Fault Finding”.
- For faster starting, the vehicle is equipped with electronically controlled glow plugs and a separate glow period control unit.
- Each glow plug is activated and diagnosed separately.

Note

- *Wait for 60 seconds each time after performing final control diagnosis of the glow period control unit. The ignition must remain switched on.*
- *If you do not wait for 60 seconds (if ignition is switched off and immediately switched on again), the glow plugs can be damaged (due to repeated pre-heating).*
- *The activation of the glow plugs is controlled according to coolant temperature.*

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 504 .***

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- Clean tools and workbench etc. before working on the injection system.
- Before installing, check the injectors and their surroundings visually; they must be undamaged and clean. Make sure the injector bores in the cylinder head are clean. Wipe out if necessary using a clean cloth, taking care not to cause damage. Do not use sharp objects of any kind.
- If the high-pressure fuel lines are to be re-used, you must mark them before removal. High-pressure pipes must always be re-installed on the same cylinder.
- Take care not to damage the injectors when removing the old copper seals.
- Check all new O-rings for damage before installing. Lubricate O-rings with engine oil or assembly oil before installing.

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

3.4 Adapting learnt values for SCR system

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.

- Tank
- Pump for reducing agent
- Injector for reducing agent
- Reducing agent line
- Engine control unit

– Perform adaption ⇒ Vehicle diagnostic tester `Guided Functions`.

3.5 Foreign particles in engine

- When performing assembly work on the engine, all open passages in the intake and exhaust systems must be sealed with suitable plugs (e.g. from engine bung set - VAS 6122-) to prevent foreign particles from entering the engine.
- In the event of mechanical damage to one of the cylinder banks, the intake and exhaust systems and combustion chambers of the opposite cylinder bank must always be examined to prevent further damage occurring later.

Note

If the turbocharger has suffered mechanical damage
⇒ page 420

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3.6 Contact corrosion

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

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

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

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

Please note:

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

3.7 Routing and attachment of pipes, hoses and wiring

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

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3.8 Installing radiators and condensers

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

10 – Removing and installing engine

1 Removing and installing engine

⇒ “1.1 Removing engine”, page 12

⇒ “1.2 Separating engine and gearbox”, page 102

⇒ “1.3 Securing engine to engine and gearbox support”, page 144

⇒ “1.4 Installing engine”, page 147

1.1 Removing engine

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

⇒ “1.1.2 Removing engine - vehicles with multitronic gearbox”, page 27

⇒ “1.1.3 Removing engine - vehicles with dual clutch gearbox 0B5”, page 42

⇒ “1.1.4 Removing engine - vehicles with dual clutch gearbox 0CK”, page 56

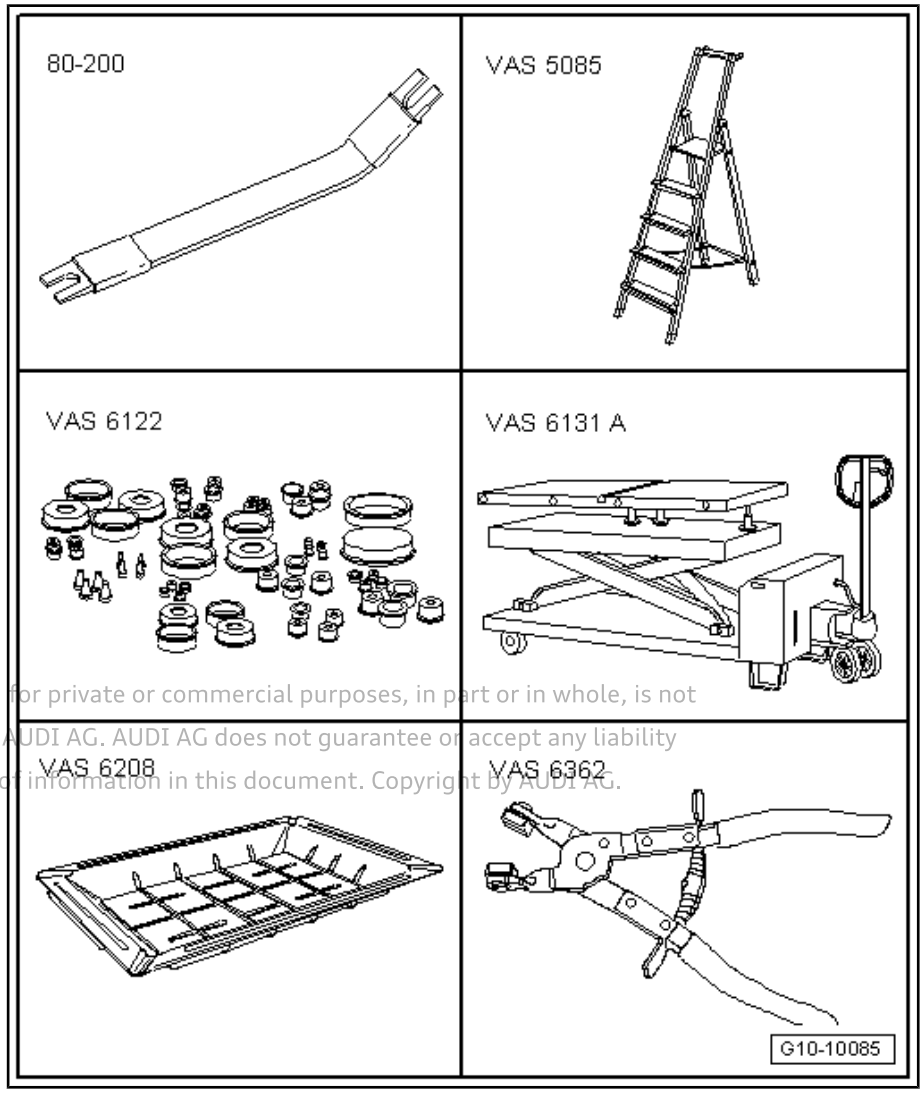
⇒ “1.1.5 Removing engine - vehicles with 8-speed automatic gearbox 0BK”, page 71

⇒ “1.1.6 Removing engine - vehicles with biturbo engine”, page 85

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1.1.1 Removing engine - vehicles with manual gearbox

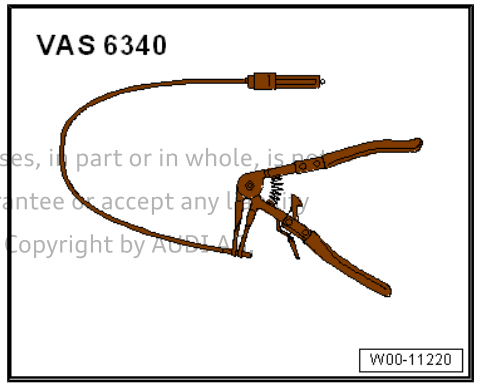
Special tools and workshop equipment required



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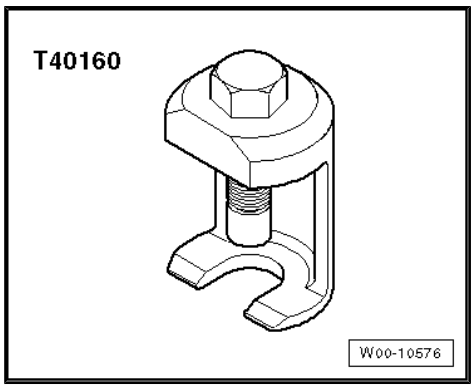
- Removal lever - 80-200-
- Stepladder (commercially available) or -VAS 5085-
- Engine bung set - VAS 6122-
- Scissor-type assembly platform - VAS 6131 B- with support set for Audi - VAS 6131/10- and supplementary set - VAS 6131/11- , -VAS 6131/13-
- Drip tray for workshop hoist - VAS 6208-
- Hose clip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

- Hose clip pliers - VAS 6340-



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- Puller - T40160-



Procedure

Note

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

WARNING

When working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system ⇒ page 7 .***

WARNING

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

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

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

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

– Bring front wheels into straight-ahead position.

Caution

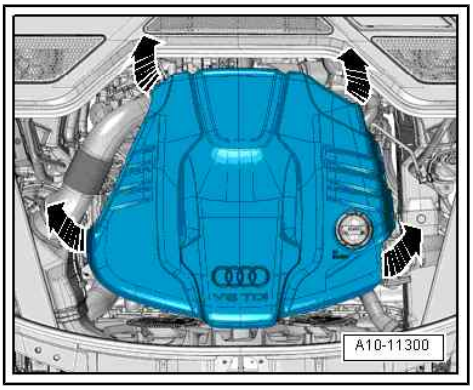
Risk of irreparable damage to electronic components.

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

– Switch off ignition.

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

– Remove engine cover panel -arrows-.



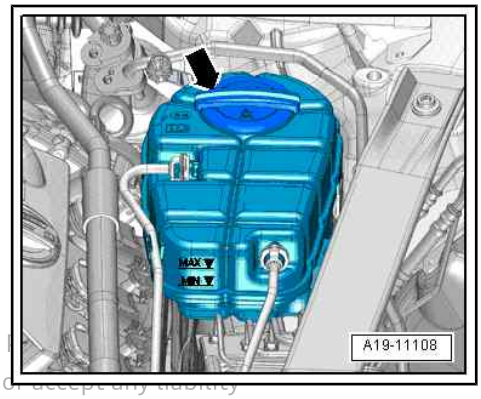
– Discharge refrigerant system ⇒ Air conditioner with refrigerant R134a .

– Remove lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing attachments .

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 -arrow- on coolant expansion tank.

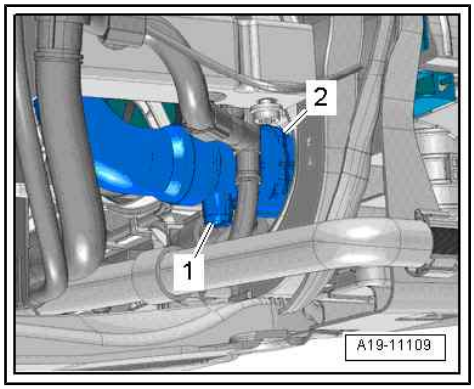
– Remove both front wheels ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres .

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

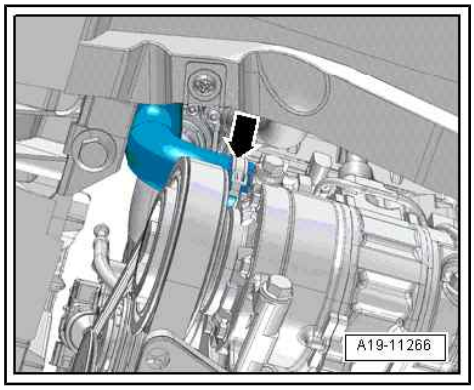
– Remove wheel spoilers (front) on both sides ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front) .

– Remove noise insulation panels ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

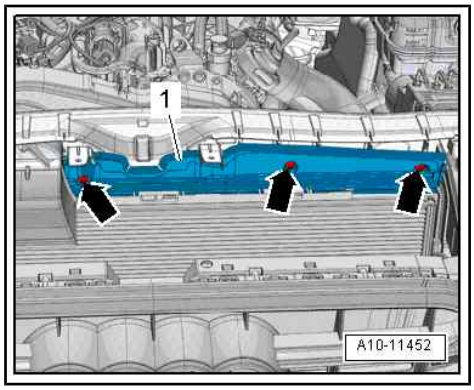
– Place drip tray for workshop hoist - VAS 6208- beneath engine.
– Remove drain plug -1- and drain off coolant.
– Lift retaining clip -2- and disconnect coolant hose from radiator.



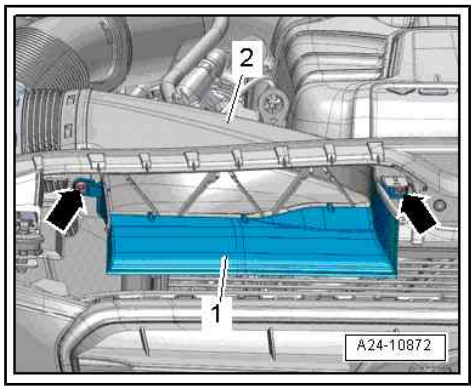
– Release hose clip -arrow-, disconnect coolant hose from coolant pipe (bottom left) and drain off coolant.
– Remove plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .



– Remove bolts -arrows- and detach air duct -1-.



– Remove bolts -arrows- and detach air duct -2-.



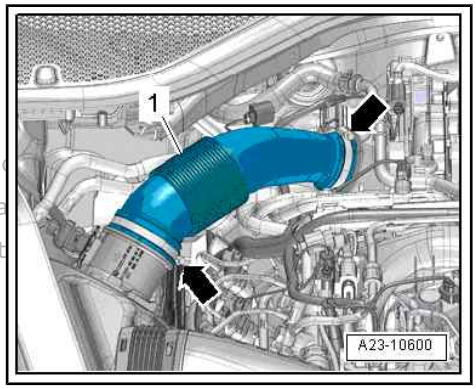
Note

Disregard -item 1-.

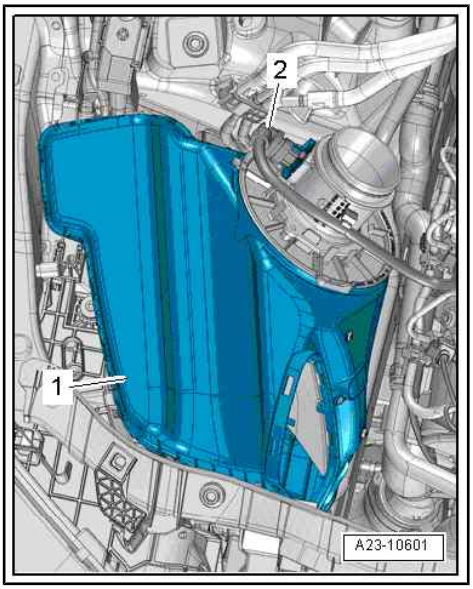
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– Release hose clips -arrows- and detach air pipe -1-.

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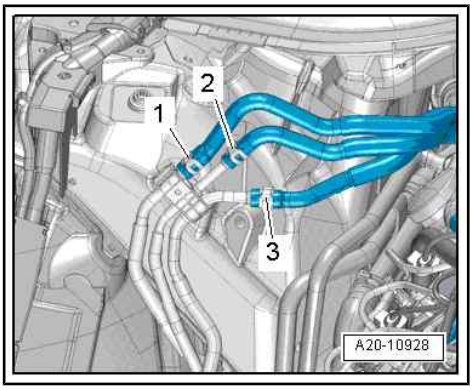
– Unplug electrical connector -2- at air mass meter - G70- and move clear.
– Lift off air cleaner housing -1-.



Caution

Take care to keep components clean.

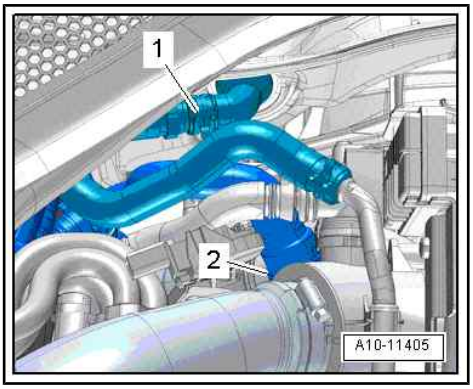
- *Observe rules for cleanliness when working on the fuel supply system ⇒ page 8 .*



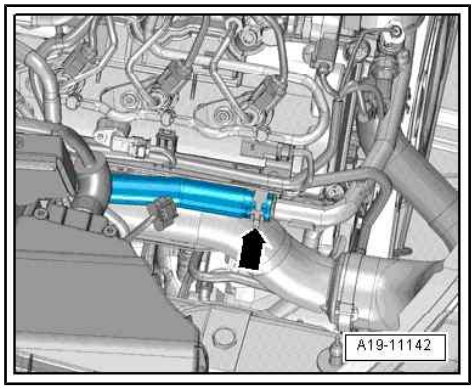
– Release hose clips and detach fuel hoses:

1 - Fuel hose (blue)
2 - Fuel hose (yellow)
3 - Fuel hose (white)

– Lift retaining clip -2- and disconnect coolant hose.
– Release hose clip -1- and disconnect vacuum hose from plenum chamber partition panel.



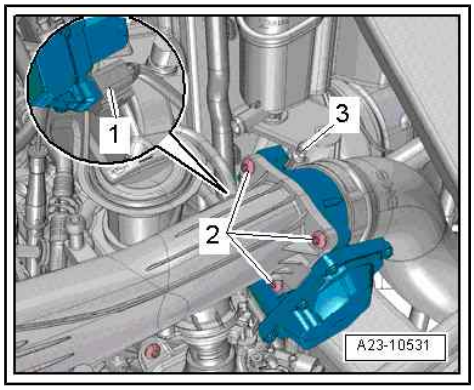
– Release hose clip -arrow- and disconnect coolant hose from coolant pipe (front).



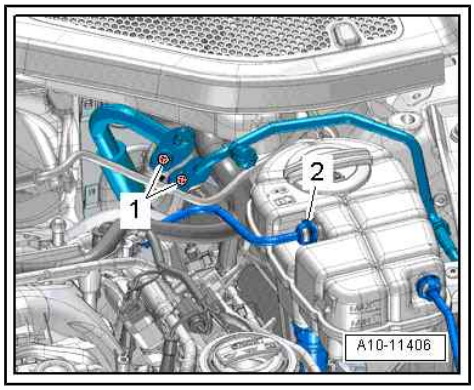
– Release hose clip -3- and detach air hose.

Note

Disregard items -1 and 2-.



– Lift retaining clip -2- and disconnect coolant line.
– Remove bolts -1- and move refrigerant lines clear.

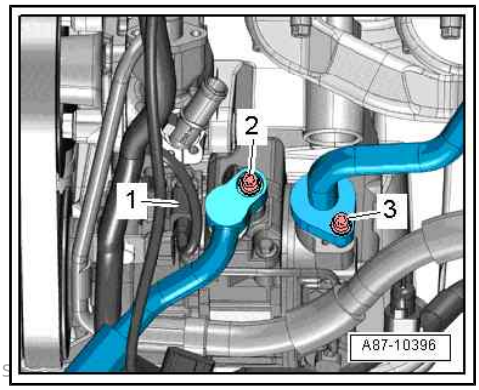


Caution

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 lines and connections with clean plugs from engine bung set - VAS 6122- .

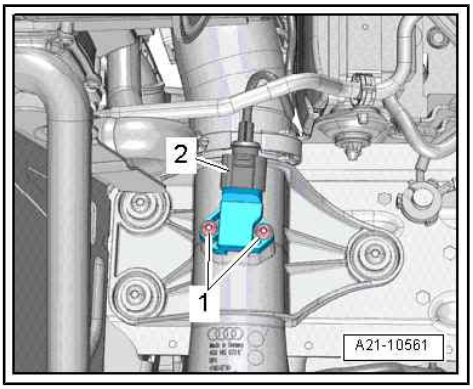


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Note

Disregard items -1 and 3-.

– Unplug electrical connector -2- for charge pressure sender - G31- / intake air temperature sender - G42- and move clear electrical wiring.

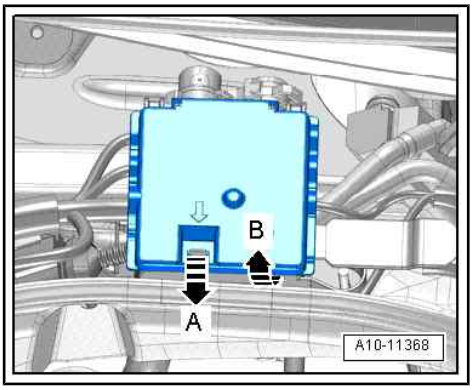


Note

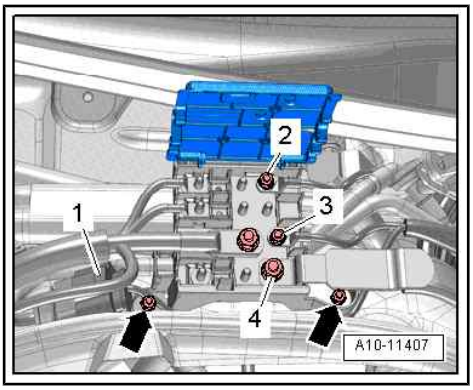
Disregard -item 1-.

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

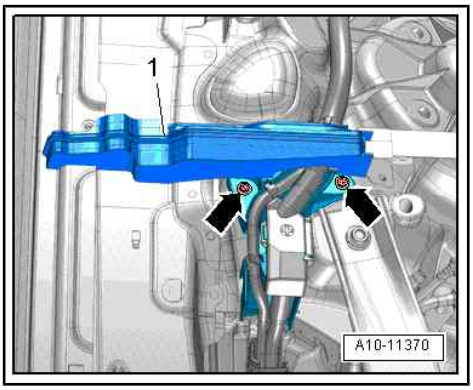
– Release retainer -arrow A- and open cover -arrow B-.



– Remove nuts -2, 3 and 4- and move electrical wiring clear.
– Detach electrical connector -1- from bracket and unplug.
– Remove bolts -arrows- and detach terminal 30 wiring junction 2 - TV22- from plenum chamber partition panel.

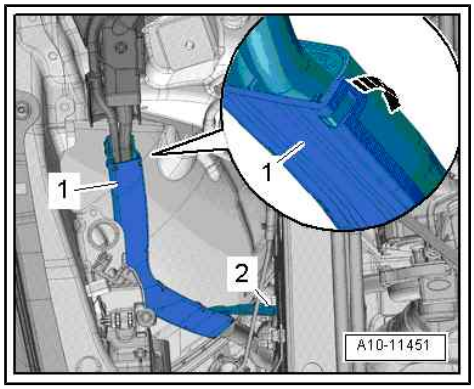


– Press foam wedge -1- to one side.
– Remove bolts -arrows-.

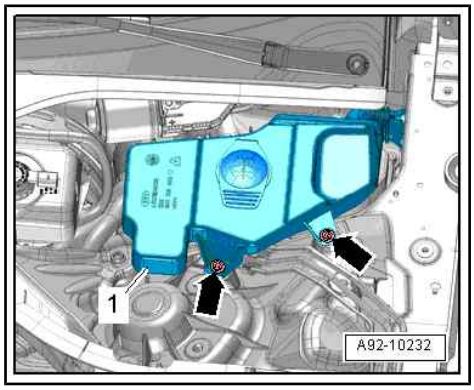


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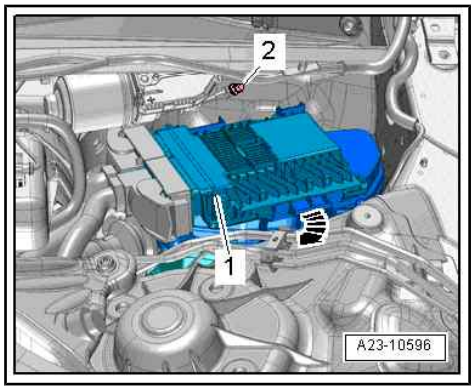
– Unscrew nut -2- on longitudinal member (right-side) and move earth cables clear.
– Release catch -arrow- to open wiring duct -1- and move electrical wiring harness clear.



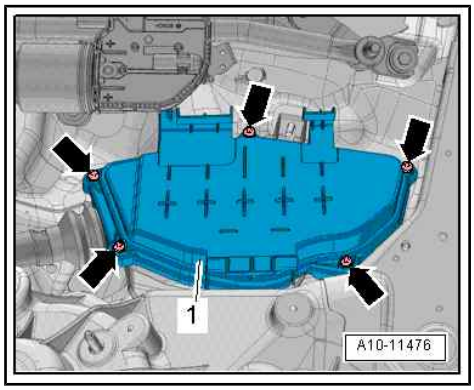
– Unscrew bolts -arrows- and pull filler neck -1- out of washer fluid reservoir and through opening in body to right side.



– Remove cap nut -2- and move earth wiring clear.
– Release fastener -arrow-, detach engine control unit - J623- -item 1- from bracket and swivel it to one side.

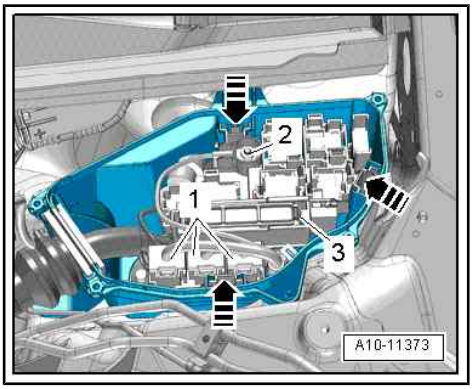


– Remove bolts -arrows- and detach cover -1- for electronics box in plenum chamber.

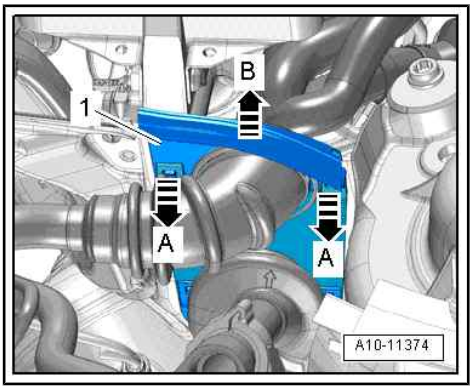


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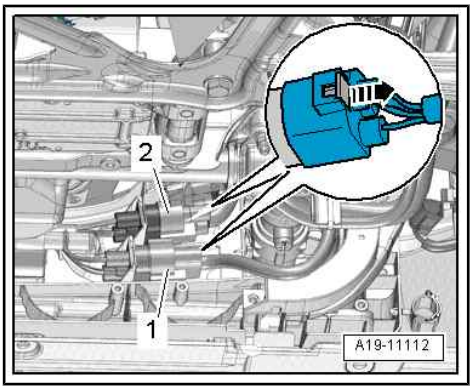
– Unplug electrical connectors -1- and unscrew nut -2- for electrical wiring.
– Release catches -arrows- and detach relay carrier with fuse holder -3-.
– Disengage engine wiring harness at electronics box in plenum chamber and move clear.



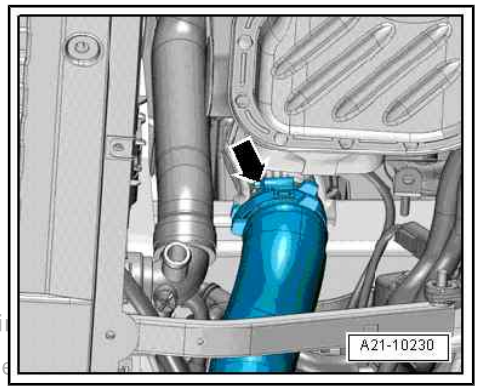
– Release catches -arrows A- and lift off wiring protector -1- -arrow B-.
– Place wiring harness on engine and secure engine/motor control unit - J623- to prevent it from dropping.



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

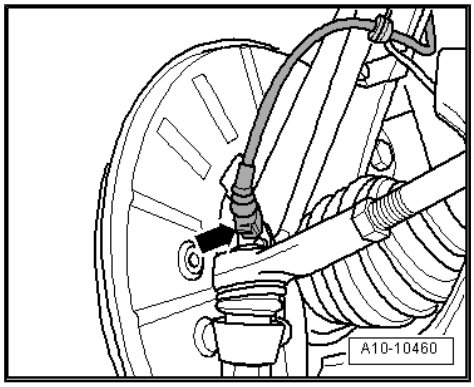


– Release hose clip -arrow- and detach air hose from air pipe.



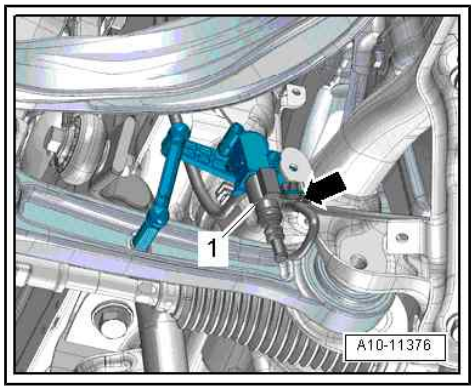
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– Unplug electrical connector -arrow- at front wheel speed sensor on both sides (-G45- and -G47-).



– If fitted, unplug electrical connector -1- at front vehicle level senders on both sides (-G78- and -G289-) and move electrical wiring clear -arrow-.

– Remove brake caliper and tie up in wheel housing with wire (brake hose remains attached) ⇒ Brake system; Rep. gr. 46 ; Front brakes; Removing and installing brake caliper .



Caution

Risk of damage to brake pistons.

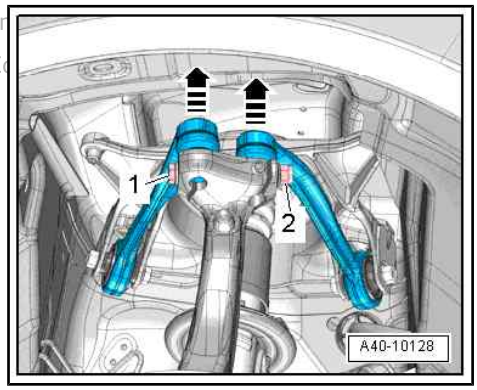
- *Do not press brake pedal with brake caliper removed.*

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– Remove nut -2- and pull out bolt -1-.

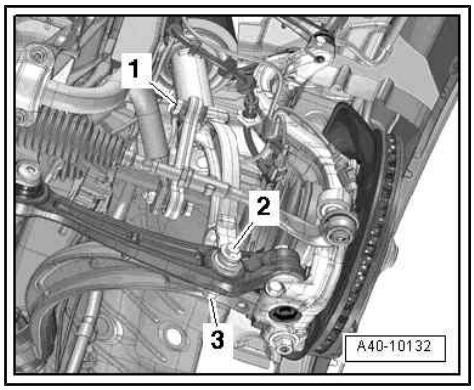
– Pull upper suspension links upwards out of wheel bearing housing -arrows-.

– Repeat procedure on opposite side of vehicle.



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

– Remove nut -3- on both sides.



Note

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

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

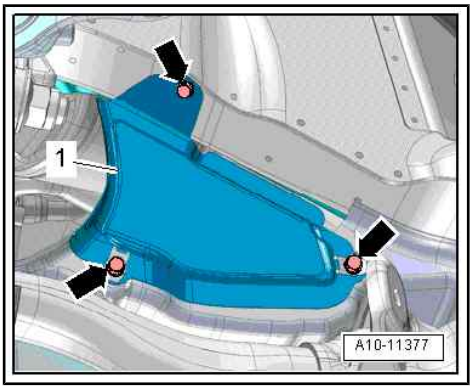
Caution

Risk of damage to running gear components.

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

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

– Detach intermediate steering shaft from steering rack and move clear by telescoping splines together ⇒ Running gear, axles, steering; Rep. gr. 48 ; Steering column; Removing and installing intermediate steering shaft .

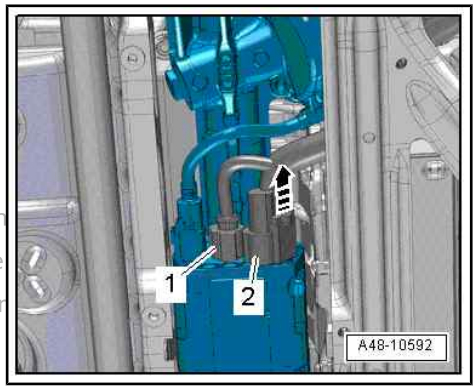


– Unplug electrical connector -2- at power steering control unit - J500- (release retainer -arrow- and press down release catch).

– Unplug electrical connector -1- at power steering control unit - J500- .

– Move electrical wiring harness clear.

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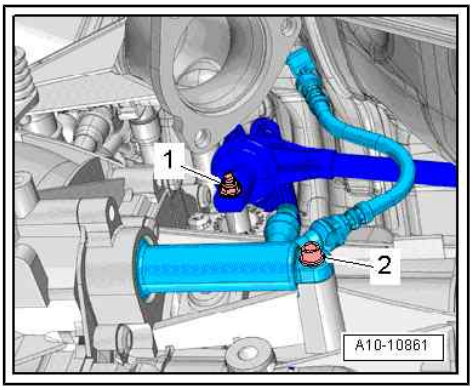


– Remove bolt -2- and tie up clutch slave cylinder at side of engine compartment.

Caution

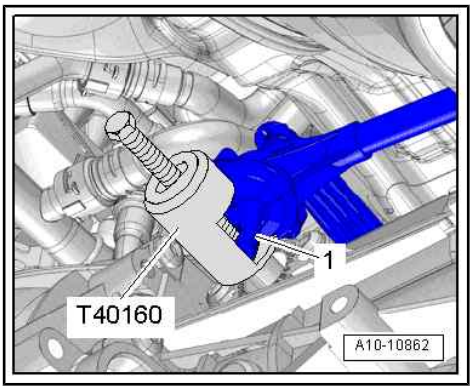
Risk of damage to clutch slave cylinder.

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



– Remove nut -1- for selector rod.

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

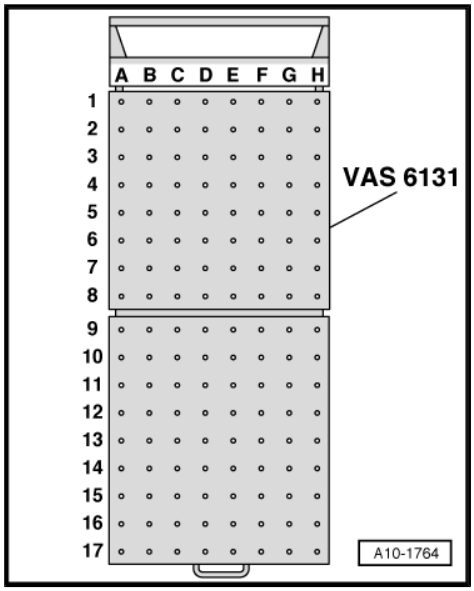


Note

If separating the engine from the gearbox for subsequent work, unscrew the bolted connection securing the drive plate to the flywheel/torque converter *⇒ page 106* *.*

Set up the scissor-type assembly platform as follows:

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



Platform coordinates	Parts of support set for Audi - VAS 6131/10- , support set -VAS 6131/11- and supplementary set - VAS 6131/13-			
B4	/13-4	/10-4	/10-5	/13-1
G4	/13-4	/10-4	/10-5	/13-1
B6	/10-1	/10-2	/10-5	/11-2
G6	/10-1	/10-2	/10-5	/11-2
A8+C8	/13-6			/13-2
F8+H8	/13-5			/13-2
B14	/10-1	/10-3	/10-5	/11-1
G14	/10-1	/10-4	/10-5	/11-1
F17	/10-1	/10-4	/10-5	/13-2

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

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

• Take note of spirit level (bubble gauge).

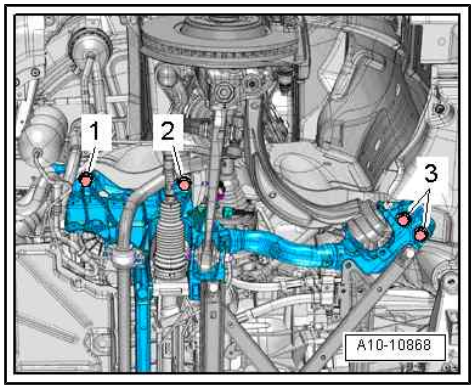
– Position scissor-type assembly platform - VAS 6131 B- below engine/gearbox assembly.

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WARNING

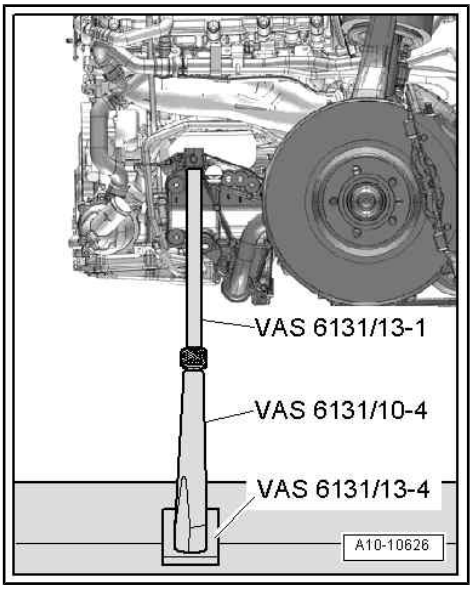
Accident risk if subframe mountings are detached.

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

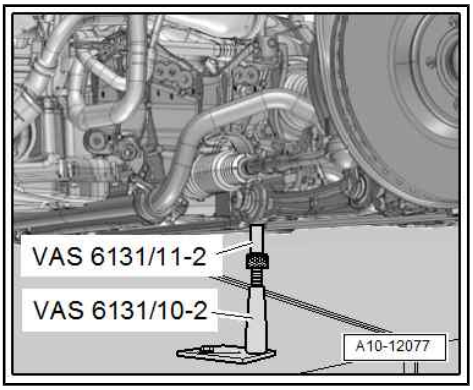


– Remove subframe bolts -1- on both sides.

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

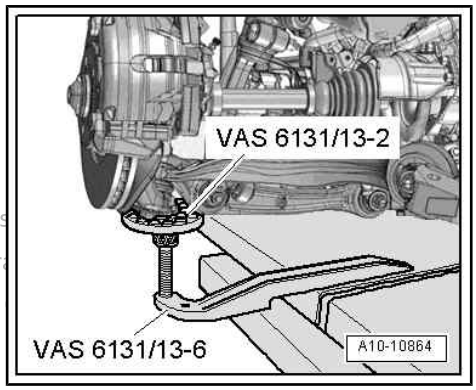


– Position support elements from -VAS 6131/10- and -VAS 6131/11- (rear left and right) at front attachment points of subframe cross brace as shown.

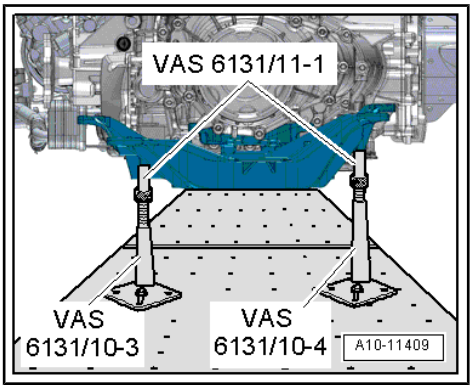


– Position support elements from -VAS 6131/13- under left and right wheel bearing housings as shown.

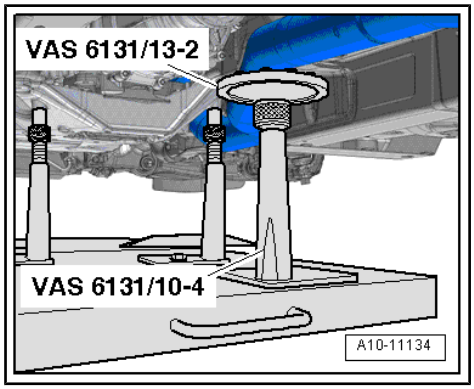
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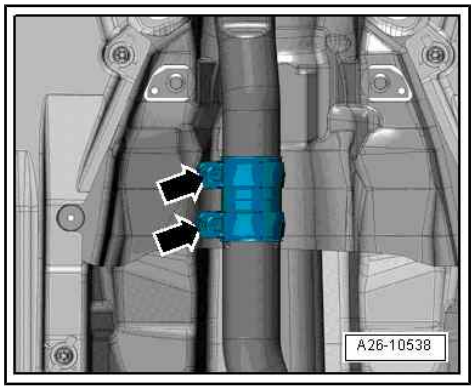
– Position support elements from -VAS 6131/10- and -VAS 6131/11- (rear left and right) at tunnel cross member as shown.



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



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

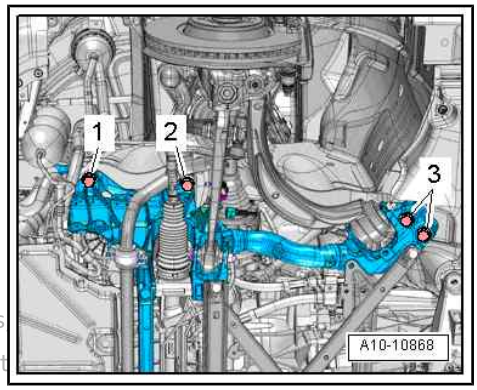


Caution

Risk of damage to flexible joint in front exhaust pipe.

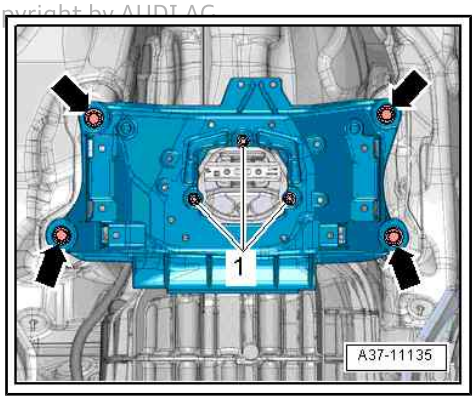
- *Do NOT bend flexible joint in front exhaust pipe more than 10°.*

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



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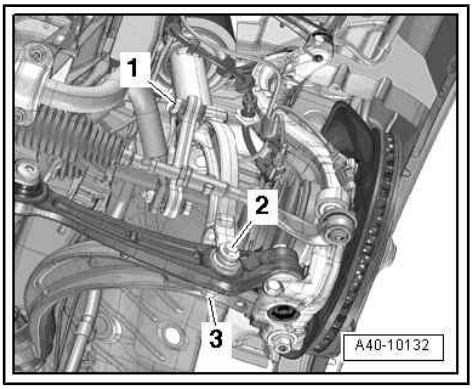
– Remove bolts -arrows- on tunnel cross member.



Note

Disregard -item 1-.

– Remove bolt -2- on both sides.



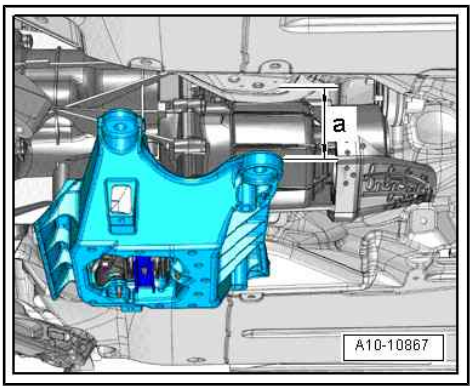
Caution

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

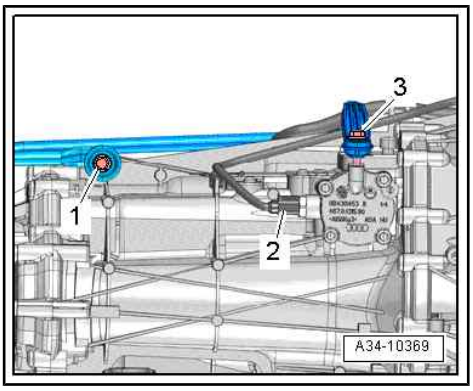
- *Check that all hoses and wiring connections between engine, gearbox, subframe and body have been detached.*
- *Carefully guide out engine/gearbox assembly with subframe from engine compartment when lowering.*
- *Carefully guide suspension struts past longitudinal members.*

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

• Dimension -a- = 100 mm (maximum).



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



Note

Disregard -item 2-.

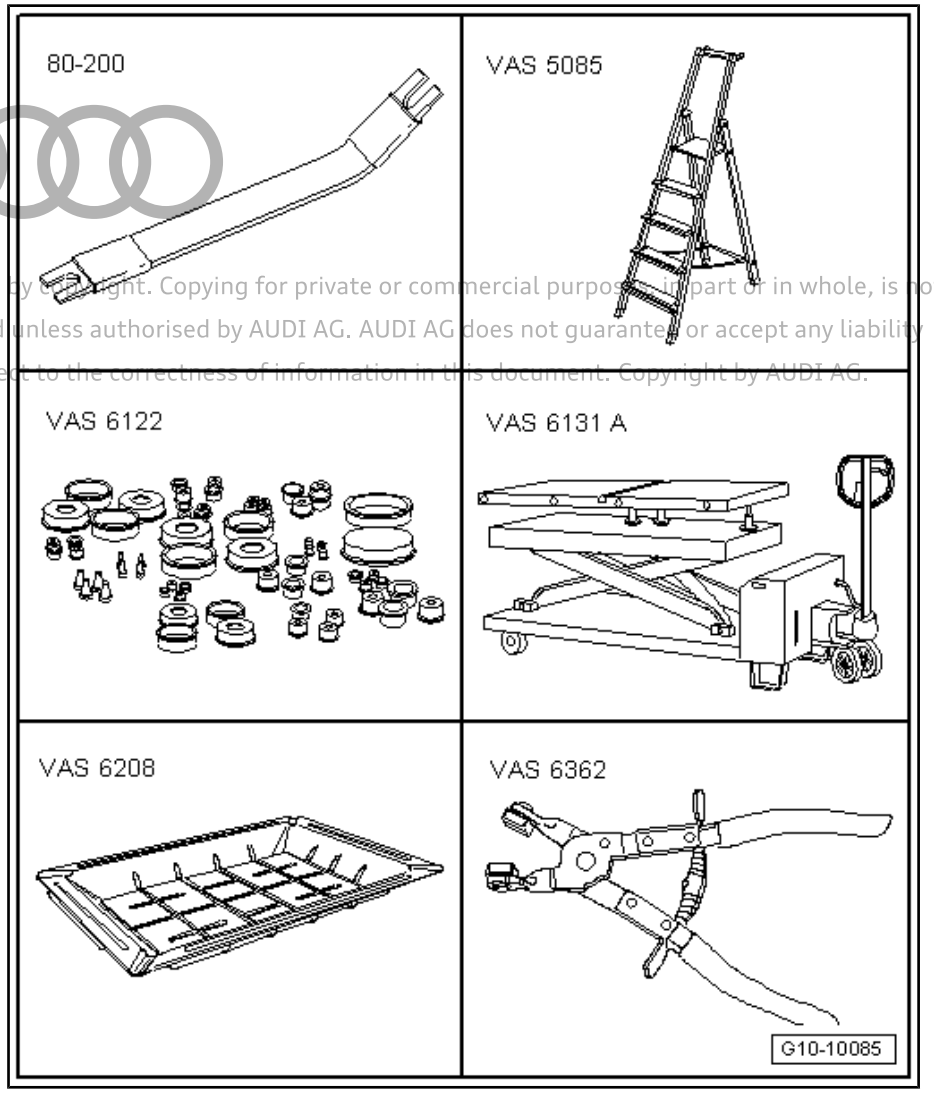
– Lower engine/gearbox assembly further.

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

1.1.2 Removing engine - vehicles with multitronic gearbox

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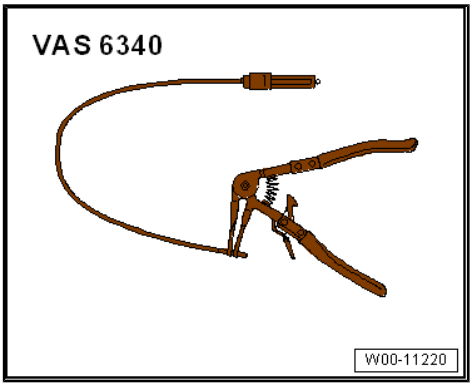
Special tools and workshop equipment required



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

- Hose clip pliers - VAS 6340-



Procedure

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Note

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

WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system ⇒ page 7 .*

WARNING

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

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

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

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

– Bring front wheels into straight-ahead position.

Caution

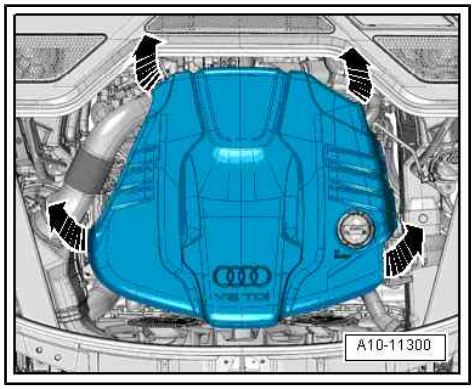
Risk of irreparable damage to electronic components.

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

– Switch off ignition.

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

– Remove engine cover panel -arrows-.



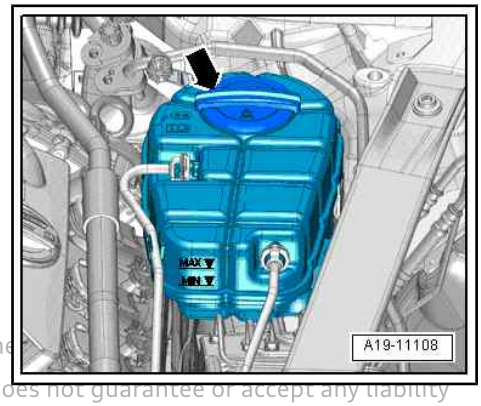
– Discharge refrigerant system ⇒ Air conditioner with refrigerant R134a .

– Remove lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing attachments .

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 -arrow- on coolant expansion tank.

– Remove both front wheels ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres .

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

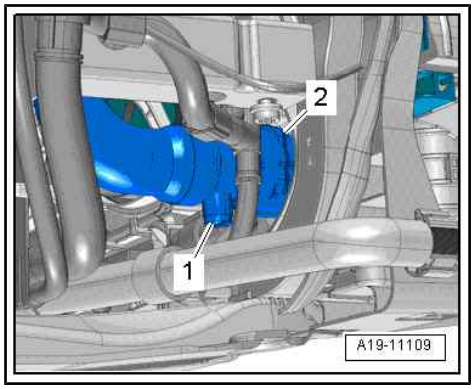
– Remove wheel spoilers (front) on both sides ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front) .

– Remove noise insulation panels ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

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

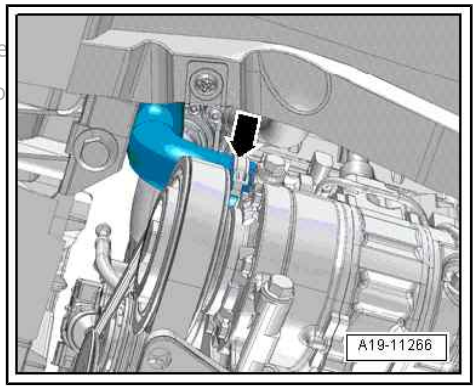
– Remove drain plug -1- and drain off coolant.

– Lift retaining clip -2- and disconnect coolant hose from radiator.

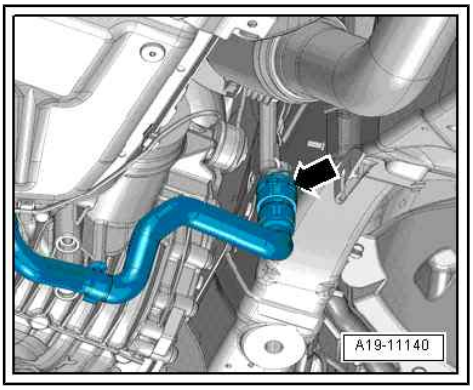


– Release hose clip -arrow-, disconnect coolant hose from coolant pipe (bottom left) and drain off coolant.

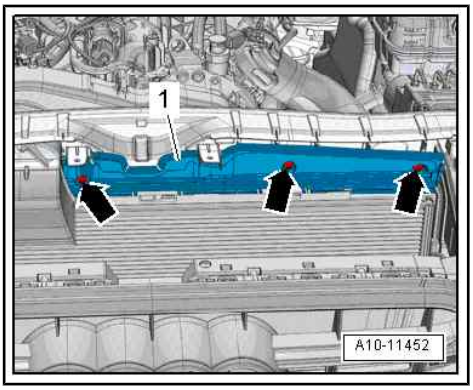
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– Lift retaining clip -arrow-, disconnect coolant hose (rear right) and drain off coolant.
– Remove plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .



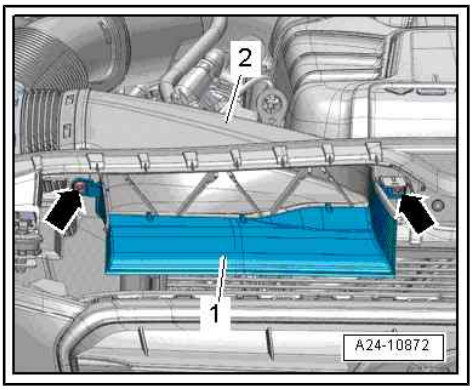
– Remove bolts -arrows- and detach air duct -1-.



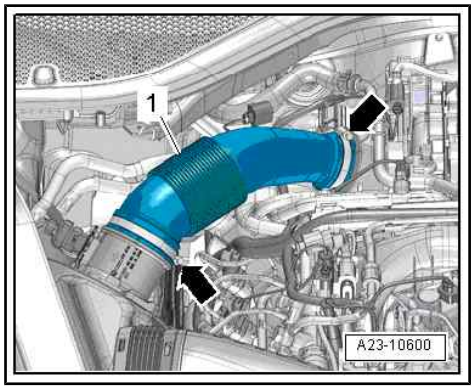
– Remove bolts -arrows- and detach air duct -2-.

Note

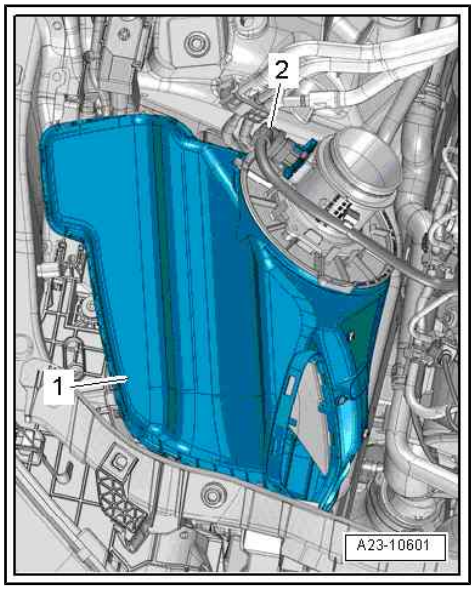
Disregard -item 1-.



– Release hose clips -arrows- and detach air pipe -1-.



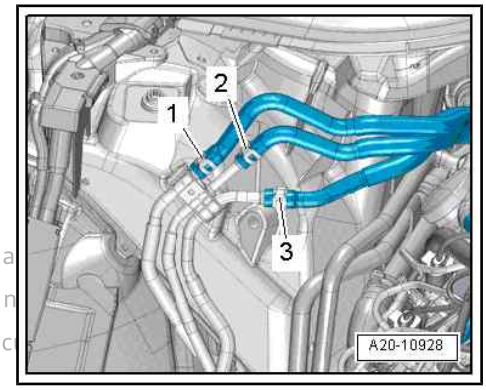
– Unplug electrical connector -2- at air mass meter - G70- and move clear.
– Lift off air cleaner housing -1-.



Caution

Take care to keep components clean.

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

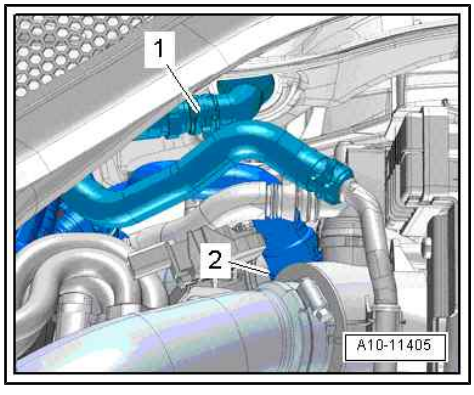


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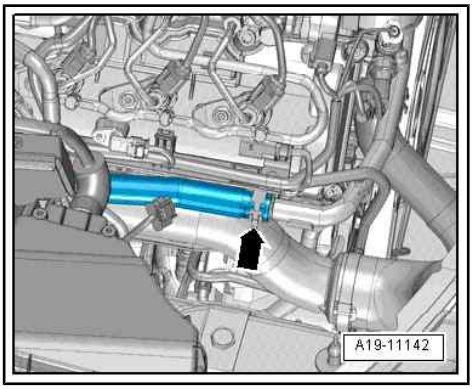
– Release hose clips and detach fuel hoses:

1 - Fuel hose (blue)
2 - Fuel hose (yellow)
3 - Fuel hose (white)

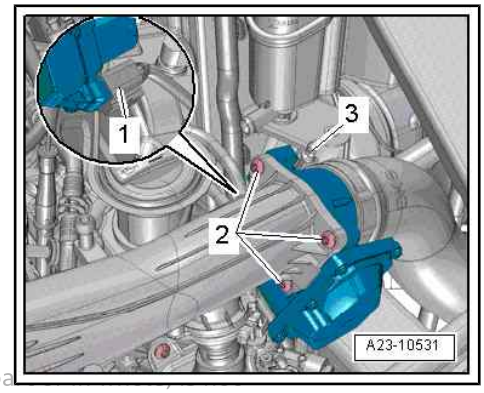
– Lift retaining clip -2- and disconnect coolant hose.
– Release hose clip -1- and disconnect vacuum hose from plenum chamber partition panel.



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



– Release hose clip -3- and detach air hose.

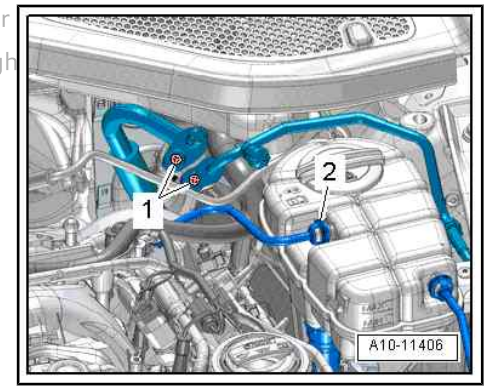


Note

Disregard items -1 and 2-.

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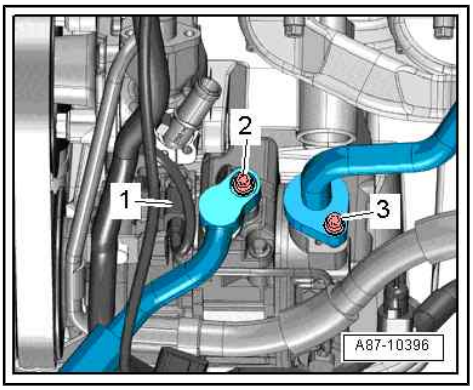
– Lift retaining clip -2- and disconnect coolant line.
– Remove bolts -1- and move refrigerant lines clear.



Caution

Risk of damage to refrigerant lines and hoses

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

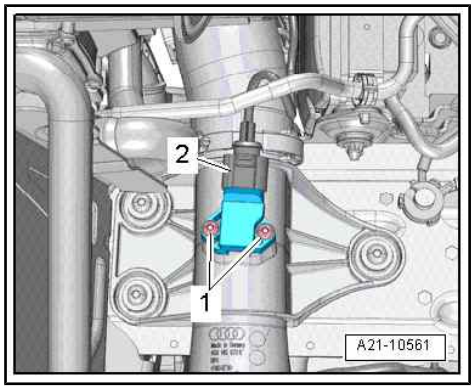


– Remove bolt -2-, disconnect refrigerant line from air conditioner compressor and move to one side.
– Seal off open lines and connections with clean plugs from engine bung set - VAS 6122- .

Note

Disregard items -1 and 3-.

– Unplug electrical connector -2- for charge pressure sender - G31- / intake air temperature sender - G42- and move clear electrical wiring.

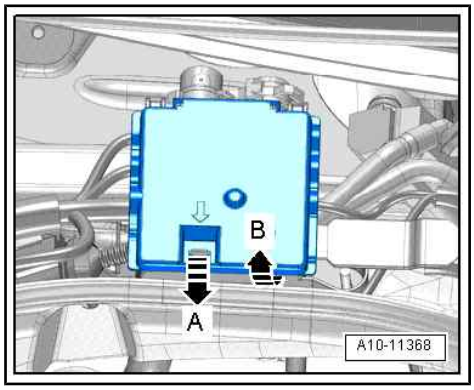


Note

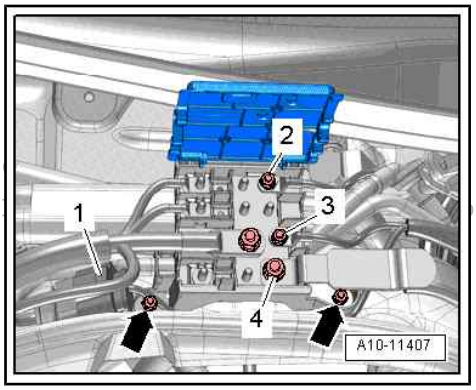
Disregard -item 1-.

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

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

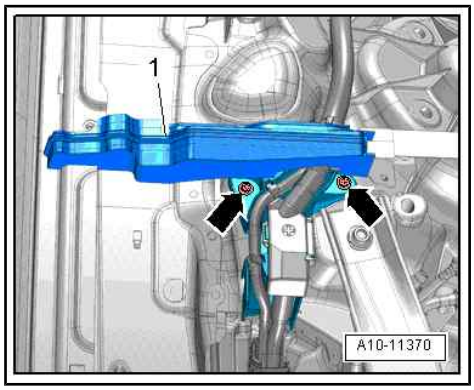


– Remove nuts -2, 3 and 4- and move electrical wiring clear.
– Detach electrical connector -1- from bracket and unplug.
– Remove bolts -arrows- and detach terminal 30 wiring junction 2 - TV22- from plenum chamber partition panel.

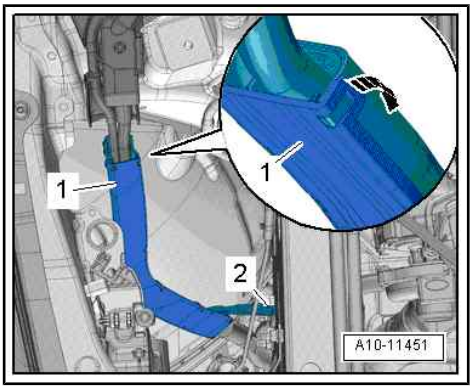


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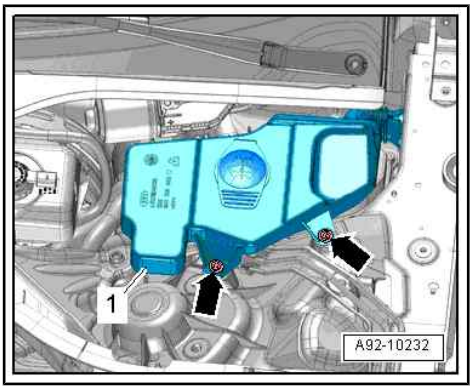
– Press foam wedge -1- to one side.
– Remove bolts -arrows-.



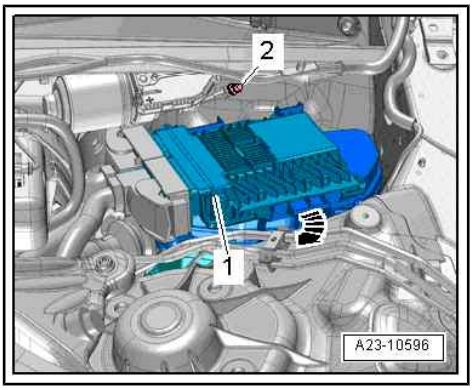
– Unscrew nut -2- on longitudinal member (right-side) and move earth cables clear.
– Release catch -arrow- to open wiring duct -1- and move electrical wiring harness clear.



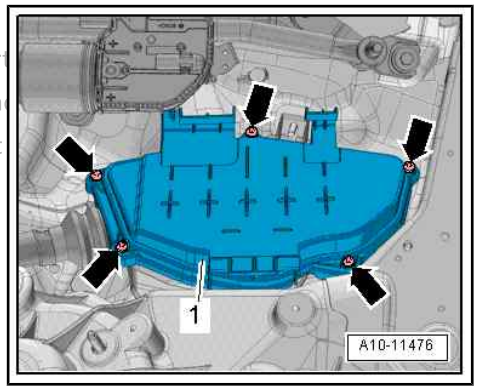
– Unscrew bolts -arrows- and pull filler neck -1- out of washer fluid reservoir and through opening in body to right side.



– Remove cap nut -2- and move earth wiring clear.
– Release fastener -arrow-, detach engine control unit - J623- -item 1- from bracket and swivel it to one side.

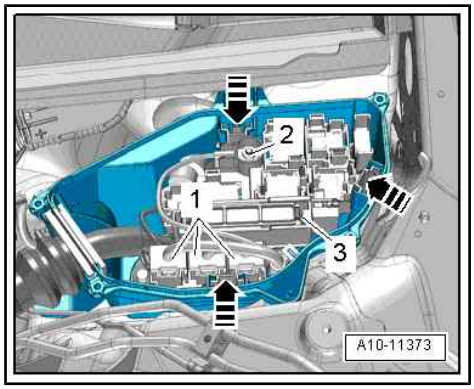


– Remove bolts -arrows- and detach cover -1- for electronics box in plenum chamber.

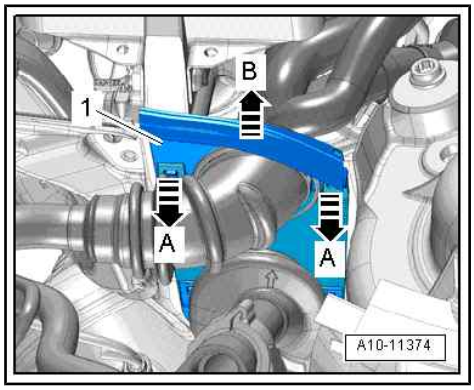


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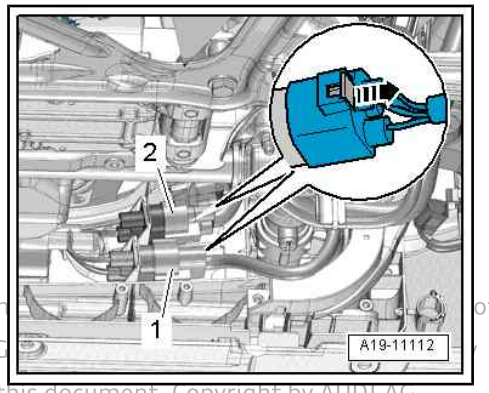
– Unplug electrical connectors -1- and unscrew nut -2- for electrical wiring.
– Release catches -arrows- and detach relay carrier with fuse holder -3-.
– Disengage engine wiring harness at electronics box in plenum chamber and move clear.



– Release catches -arrows A- and lift off wiring protector -1- -arrow B-.
– Place wiring harness on engine and secure engine/motor control unit - J623- to prevent it from dropping.

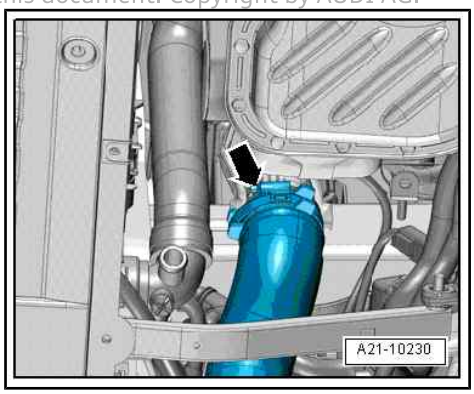


– Unplug electrical connector -1- and, if fitted, -2- for radiator fan (push retainer to the rear -arrow- and press down release catch).
– Move electrical wiring harness clear.

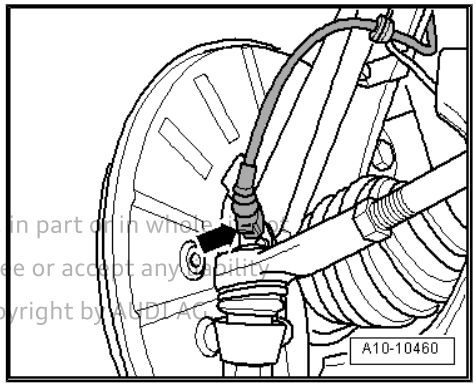


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– Release hose clip -arrow- and detach air hose from air pipe.

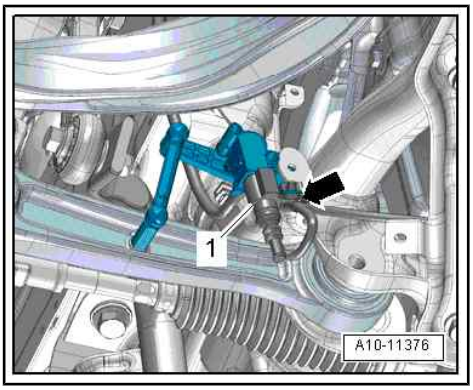


– Unplug electrical connector -arrow- at front wheel speed sensor on both sides (-G45- and -G47-).



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– If fitted, unplug electrical connector -1- at front vehicle level senders on both sides (-G78- and -G289-) and move electrical wiring clear -arrow-.
– Remove brake caliper and tie up in wheel housing with wire (brake hose remains attached) ⇒ Brake system; Rep. gr. 46 ; Front brakes; Removing and installing brake caliper .

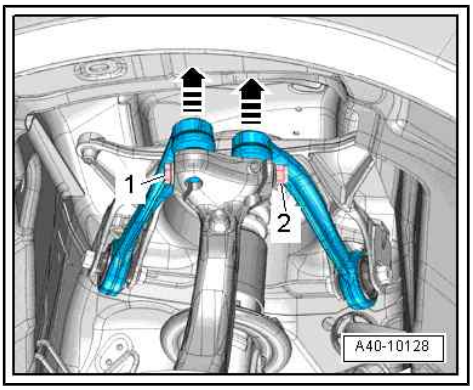


Caution

Risk of damage to brake pistons.

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

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

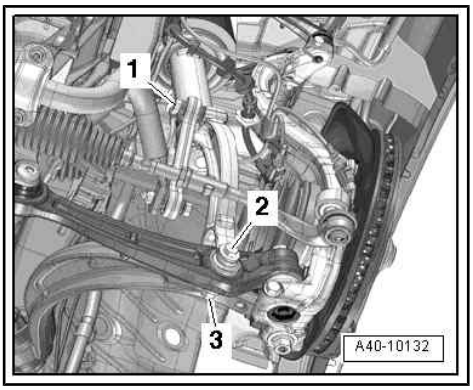


– Remove bolt -1- for anti-roll bar on both sides.
– Remove nut -3- on both sides.

Note

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

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

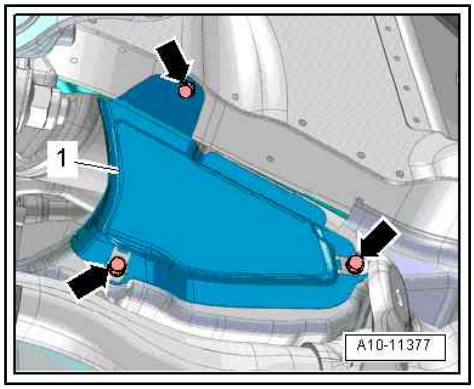


Caution

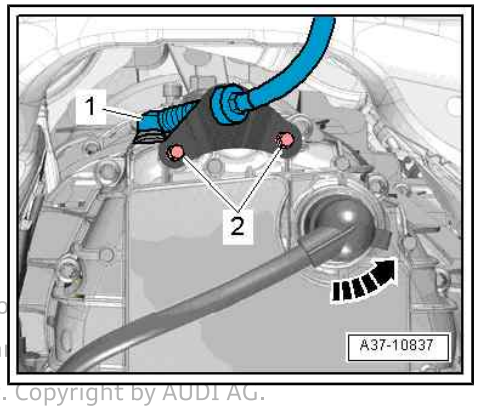
Risk of damage to running gear components.

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

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



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



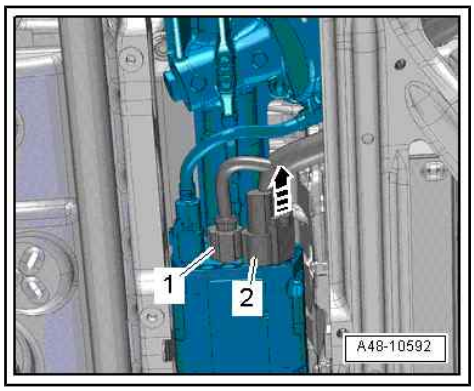
Note

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

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– Detach intermediate steering shaft from steering rack and move clear by telescoping splines together ⇒ Running gear, axles, steering; Rep. gr. 48 ; Steering column; Removing and installing intermediate steering shaft .

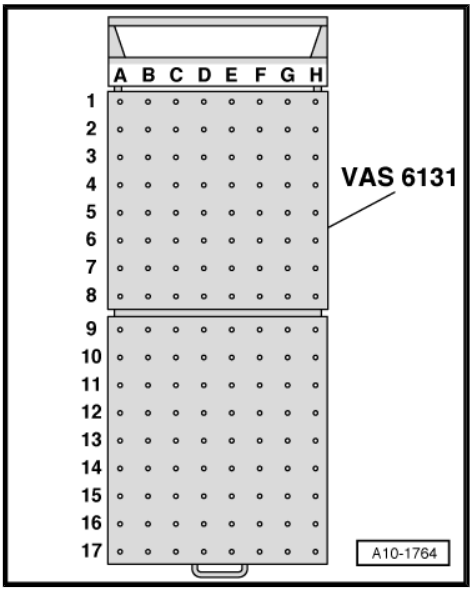
– Unplug electrical connector -2- at power steering control unit - J500- (release retainer -arrow- and press down release catch).
– Unplug electrical connector -1- at power steering control unit - J500- .
– Move electrical wiring harness clear.



Note

If separating the engine from the gearbox for subsequent work, unscrew the bolted connection securing the drive plate to the fly-wheel/torque converter ⇒ page 112 .

Set up the scissor-type assembly platform as follows:



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

Platform coordinates	Parts of support set for Audi - VAS 6131/10- , support set -VAS 6131/11- and supplementary set - VAS 6131/13-			
B4	/13-4	/10-4	/10-5	/13-1
G4	/13-4	/10-4	/10-5	/13-1
B6	/10-1	/10-2	/10-5	/11-2
G6	/10-1	/10-2	/10-5	/11-2
A8+C8	/13-6			/13-2
F8+H8	/13-5			/13-2
B14	/10-1	/10-3	/10-5	/11-1
G14	/10-1	/10-4	/10-5	/11-1
F17	/10-1	/10-4	/10-5	/13-2

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

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

• Take note of spirit level (bubble gauge).

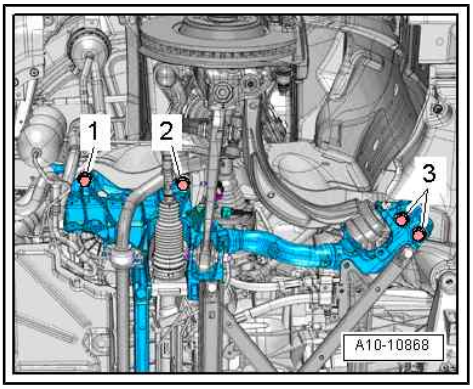
– Position scissor-type assembly platform - VAS 6131 B- below engine/gearbox assembly.

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WARNING

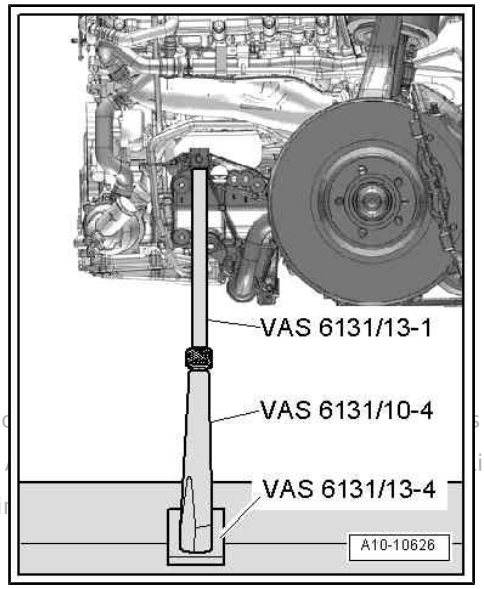
Accident risk if subframe mountings are detached.

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



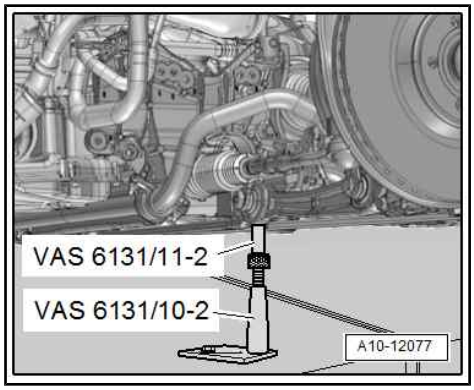
– Remove subframe bolts -1- on both sides.

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

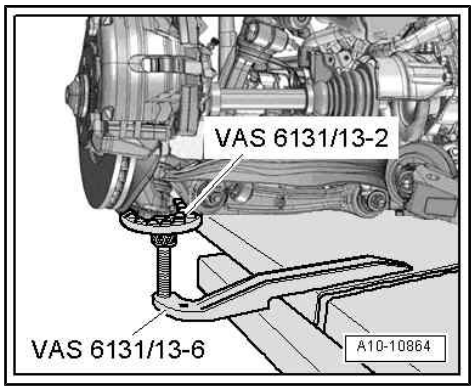


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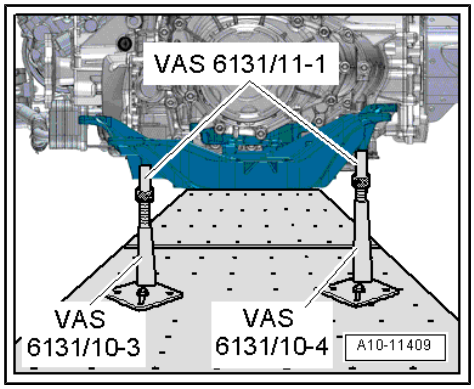
– Position support elements from -VAS 6131/10- and -VAS 6131/11- (rear left and right) at front attachment points of subframe cross brace as shown.



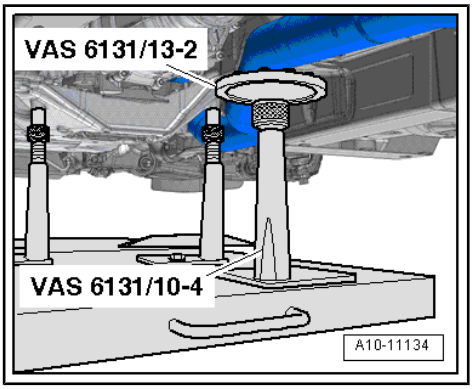
– Position support elements from -VAS 6131/13- under left and right wheel bearing housings as shown.



– Position support elements from -VAS 6131/10- and -VAS 6131/11- (rear left and right) at tunnel cross member as shown.



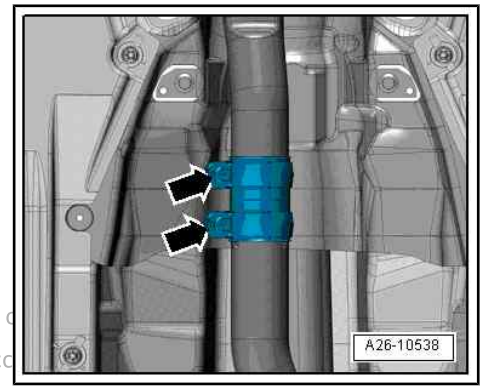
– Position support elements from -VAS 6131/10- and -VAS 6131/13- underneath front exhaust pipe, as shown in illustration.
– Turn all spindles for support elements upwards until all locating lugs make contact with mounting points.
– Tighten base plates for support elements to 20 Nm on scissor-type assembly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



Caution

Risk of damage to flexible joint in front exhaust pipe.

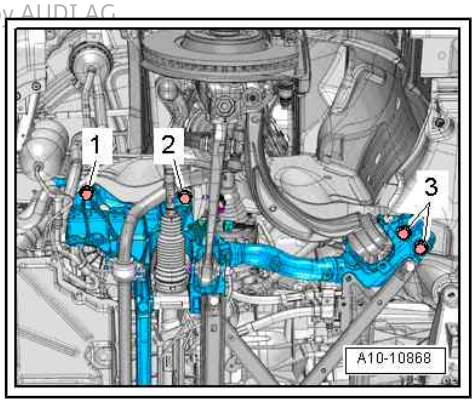
- ***Do NOT bend flexible joint in front exhaust pipe more than 10°.***



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

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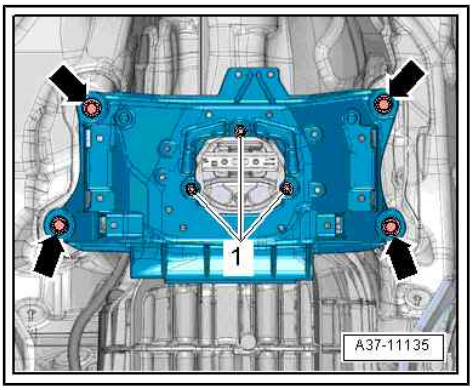
– Mark installation position of subframe and tunnel cross member on longitudinal members with felt-tip pen.
– Unscrew subframe bolts -2- and -3- on both sides in several stages and in diagonal sequence.



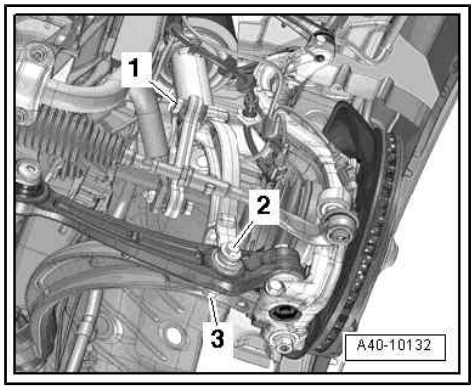
– Remove bolts -arrows- on tunnel cross member.

Note

Disregard -item 1-.



– Remove bolt -2- on both sides.



Caution

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

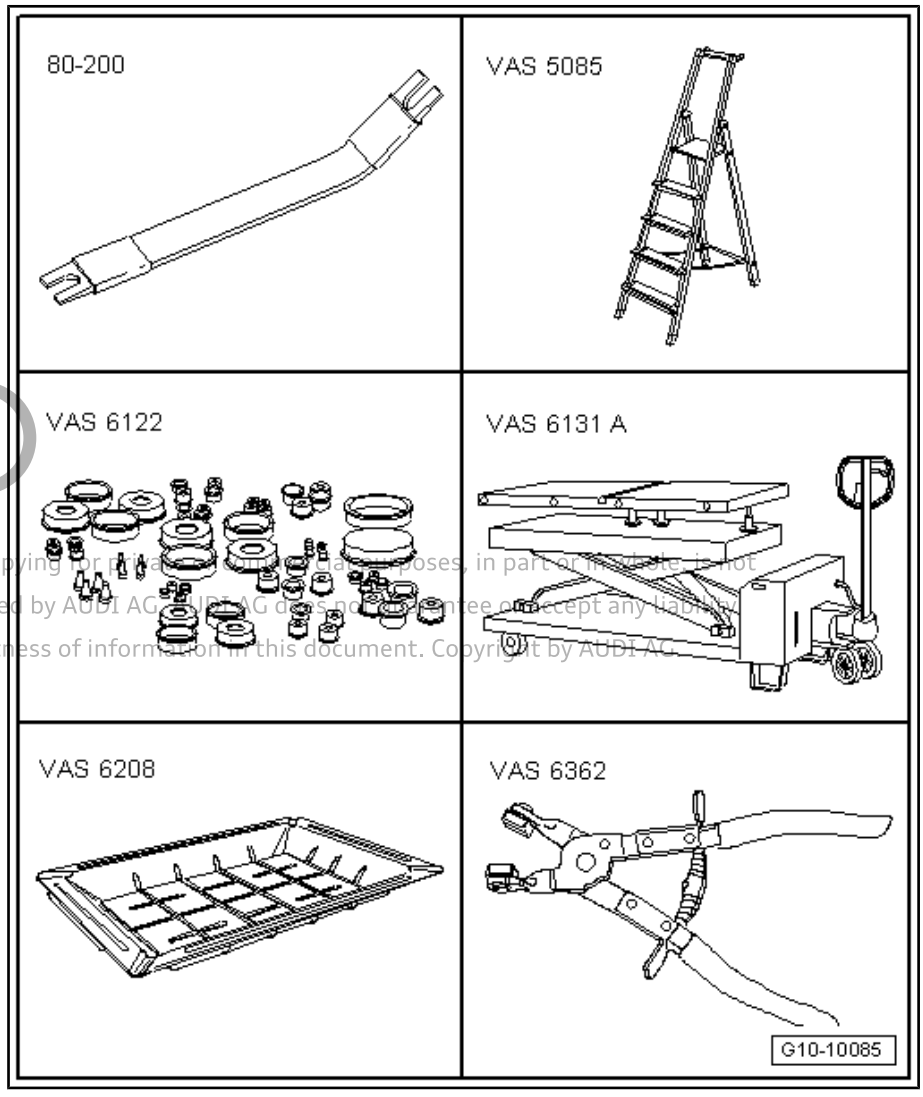
- ***Check that all hoses and wiring connections between engine, gearbox, subframe and body have been detached.***
- ***Carefully guide out engine/gearbox assembly with subframe from engine compartment when lowering.***
- ***Carefully guide suspension struts past longitudinal members.***

– Lower engine/gearbox assembly.

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

1.1.3 Removing engine - vehicles with dual clutch gearbox 0B5

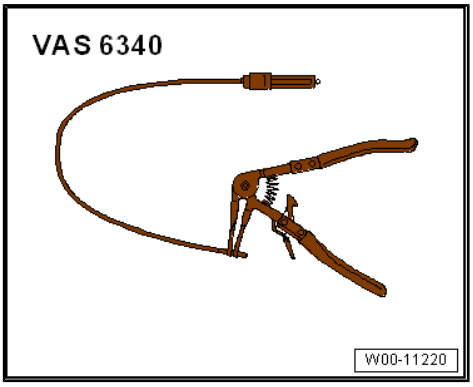
Special tools and workshop equipment required



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- Removal lever - 80 - 200-

- Stepladder (commercially available) or -VAS 5085-
- Engine bung set - VAS 6122-
- Scissor-type assembly platform - VAS 6131 B- with support set for Audi - VAS 6131/10- and supplementary set - VAS 6131/11- , -VAS 6131/13-
- Drip tray for workshop hoist - VAS 6208-
- Hose clip pliers - VAS 6362-
- Hose clip pliers - VAS 6340-



Procedure

Note

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

WARNING

When working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system ⇒ page 7 .***

WARNING

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

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

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

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

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– Bring front wheels into straight-ahead position.

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

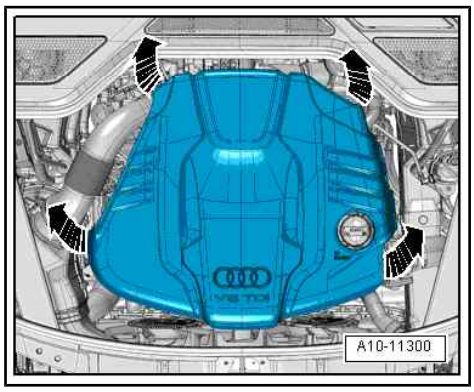
Risk of irreparable damage to electronic components.

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

– Switch off ignition.

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

– Remove engine cover panel -arrows-.



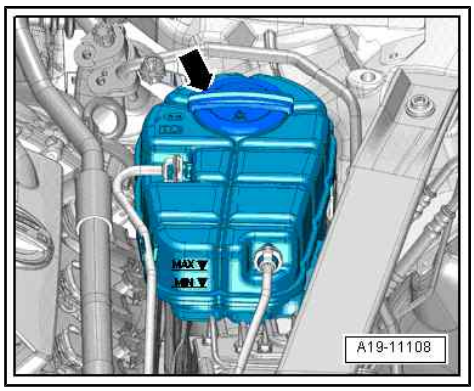
– Discharge refrigerant system ⇒ Air conditioner with refrigerant R134a .

– Remove lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing attachments .

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 -arrow- on coolant expansion tank.

– Remove both front wheels ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres .

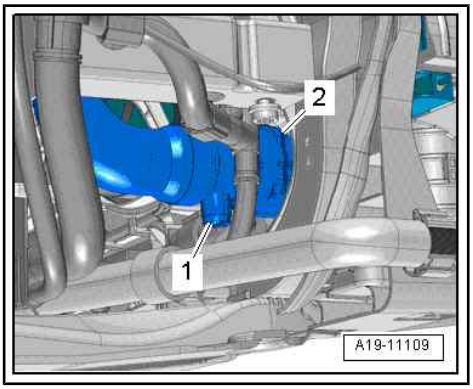
– Remove wheel housing liners (front left and front right) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Removing and installing wheel housing liner (front) .

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

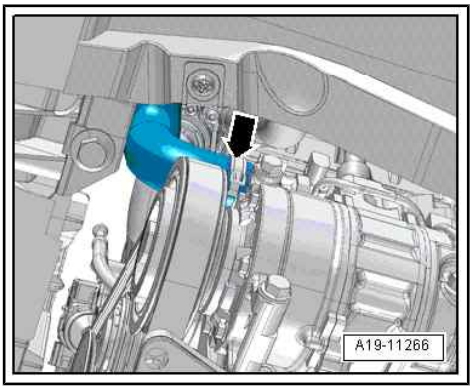
– Remove noise insulation panels ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

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

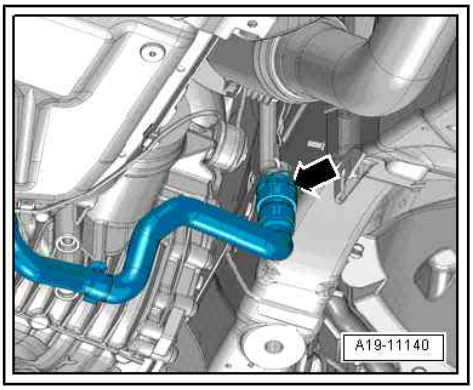
– Place drip tray for workshop hoist - VAS 6208- beneath engine.
– Remove drain plug -1- and drain off coolant.
– Lift retaining clip -2- and disconnect coolant hose from radiator.



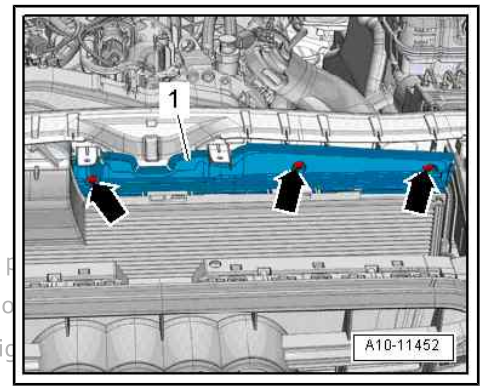
– Release hose clip -arrow-, disconnect coolant hose from coolant pipe (bottom left) and drain off coolant.



– Lift retaining clip -arrow-, disconnect coolant hose (rear right) and drain off coolant.
– Remove plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .

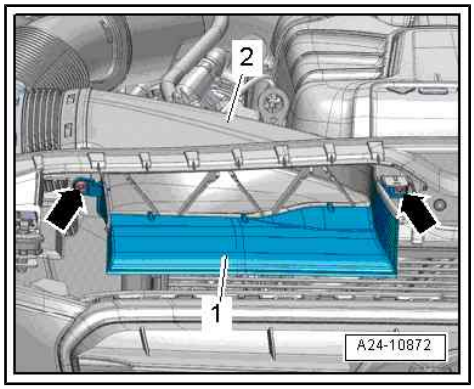


– Remove bolts -arrows- and detach air duct -1-.



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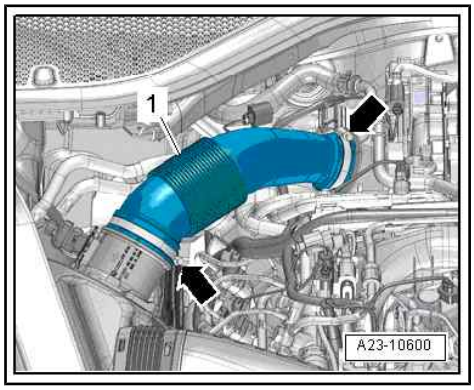
– Remove bolts -arrows- and detach air duct -2-.



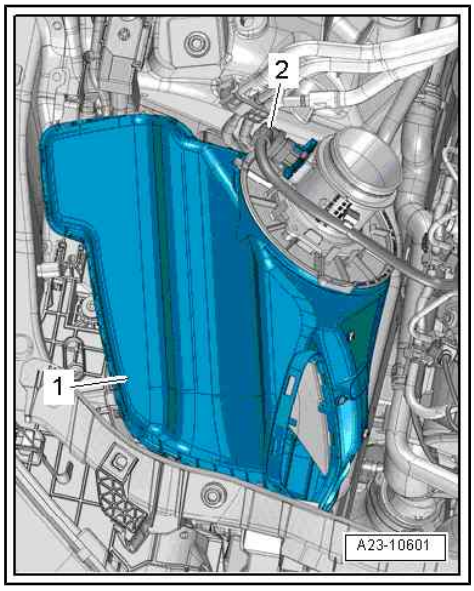
Note

Disregard -item 1-.

– Release hose clips -arrows- and detach air pipe -1-.



– Unplug electrical connector -2- at air mass meter - G70- and move clear.
– Lift off air cleaner housing -1-.

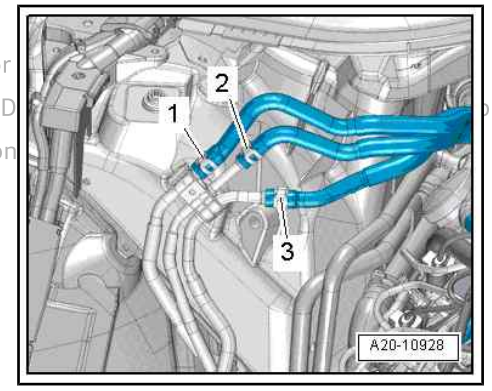


Caution

Take care to keep components clean.

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

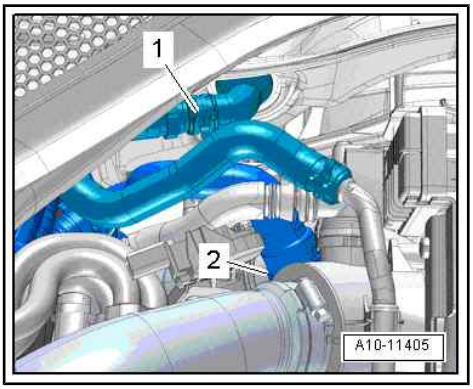
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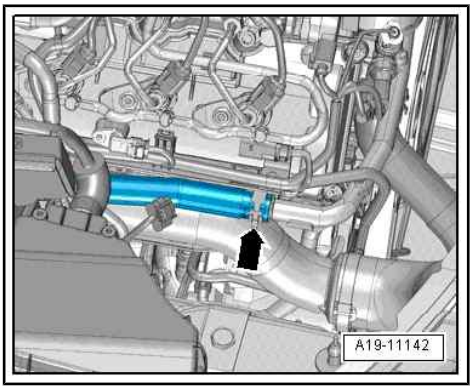
– Release hose clips and detach fuel hoses:

1 - Fuel hose (blue)
2 - Fuel hose (yellow)
3 - Fuel hose (white)

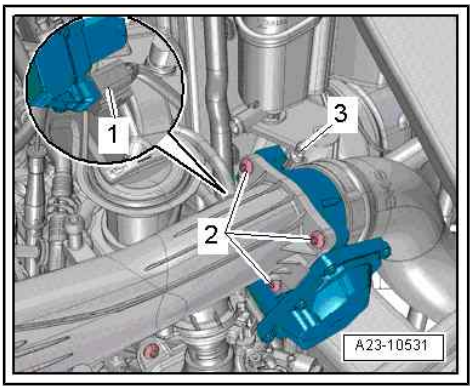
– Lift retaining clip -2- and disconnect coolant hose.
– Release hose clip -1- and disconnect vacuum hose from plenum chamber partition panel.



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

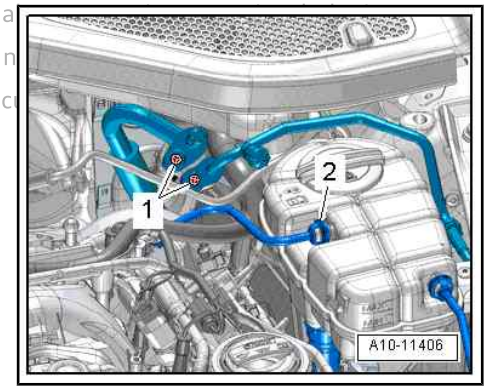


– Release hose clip -3- and detach air hose.
– Unplug electrical connector -1-.
– Remove bolts -2- and detach throttle valve module - J338- .



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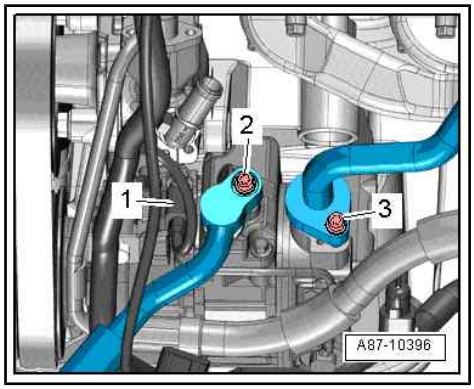
– Lift retaining clip -2- and disconnect coolant line.
– Remove bolts -1- and move refrigerant lines clear.



Caution

Risk of damage to refrigerant lines and hoses

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



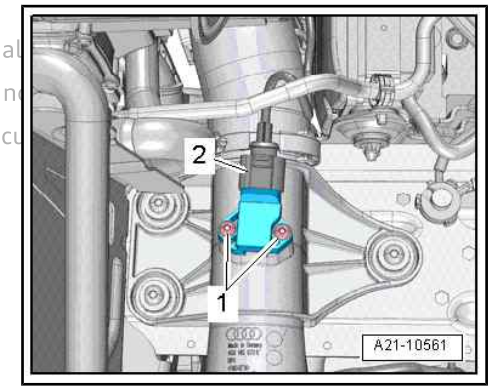
– Remove bolt -2-, disconnect refrigerant line from air conditioner compressor and move to one side.

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

Note

Disregard items -1 and 3-.

– Unplug electrical connector -2- for charge pressure sender - G31- / intake air temperature sender - G42- and move clear electrical wiring.



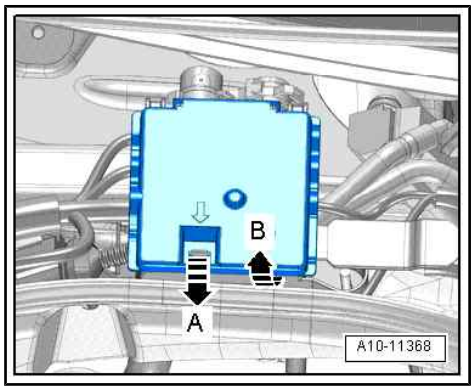
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Note

Disregard -item 1-.

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

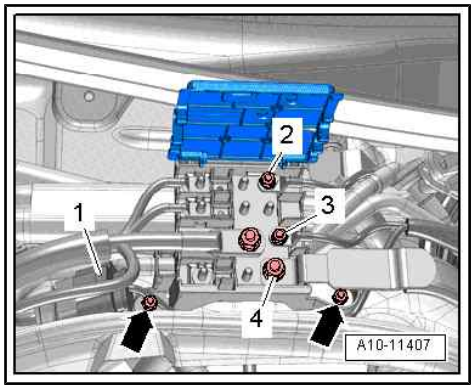
– Release retainer -arrow A- and open cover -arrow B-.



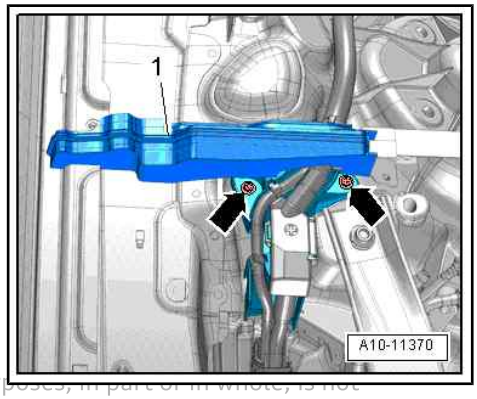
– Remove nuts -2, 3 and 4- and move electrical wiring clear.

– Detach electrical connector -1- from bracket and unplug.

– Remove bolts -arrows- and detach terminal 30 wiring junction 2 - TV22- from plenum chamber partition panel.

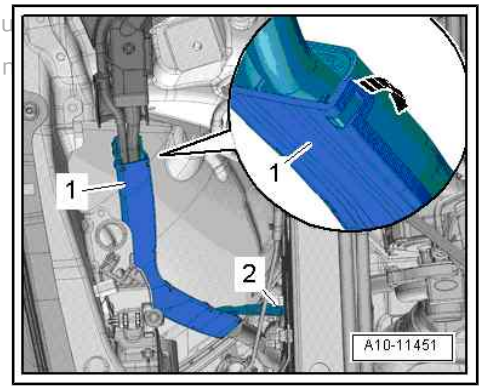


– Press foam wedge -1- to one side.
– Remove bolts -arrows-.

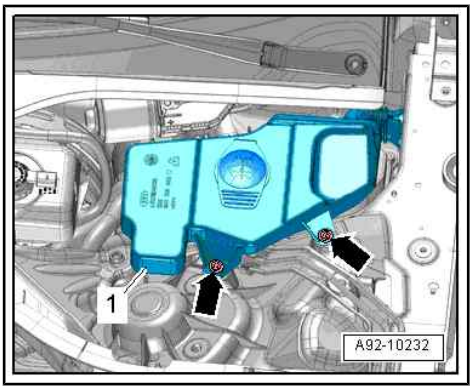


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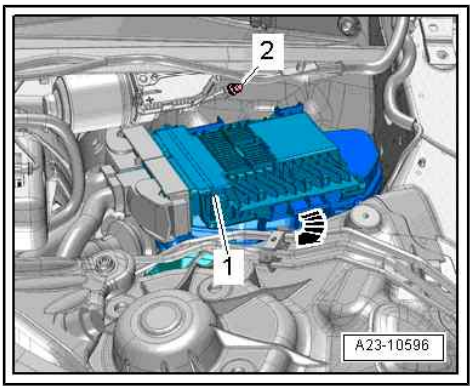
– Unscrew nut -2- on longitudinal member (right-side) and move earth cables clear.
– Release catch -arrow- to open wiring duct -1- and move electrical wiring harness clear.



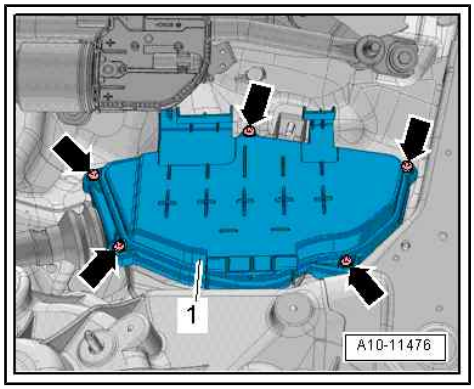
– Unscrew bolts -arrows- and pull filler neck -1- out of washer fluid reservoir and through opening in body to right side.



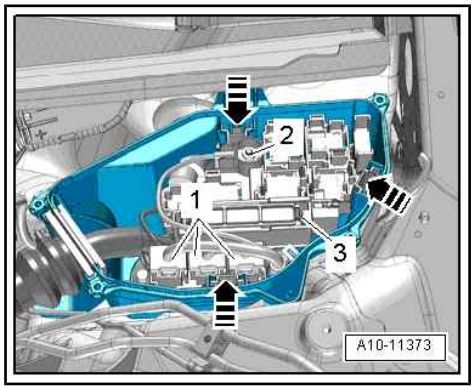
– Remove cap nut -2- and move earth wiring clear.
– Release fastener -arrow-, detach engine control unit - J623- -item 1- from bracket and swivel it to one side.



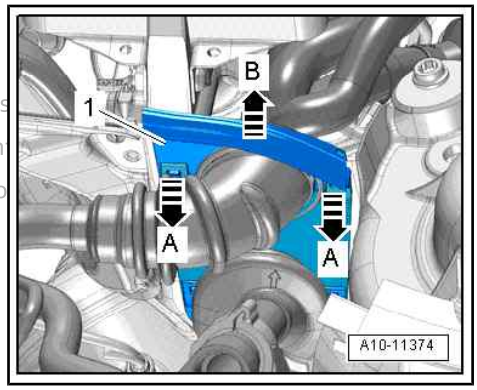
– Remove bolts -arrows- and detach cover -1- for electronics box in plenum chamber.



– Unplug electrical connectors -1- and unscrew nut -2- for electrical wiring.
– Release catches -arrows- and detach relay carrier with fuse holder -3-.
– Disengage engine wiring harness at electronics box in plenum chamber and move clear.

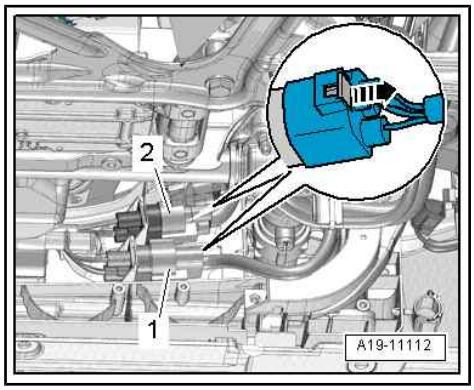


– Release catches -arrows A- and lift off wiring protector -1- -arrow B-.
– Place wiring harness on engine and secure engine/motor control unit - J623- to prevent it from dropping.

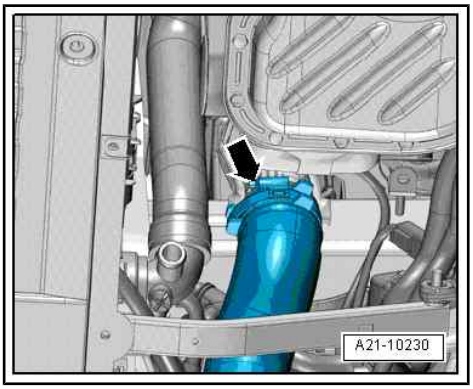


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– Unplug electrical connector -1- and, if fitted, -2- for radiator fan (push retainer to the rear -arrow- and press down release catch).
– Move electrical wiring harness clear.

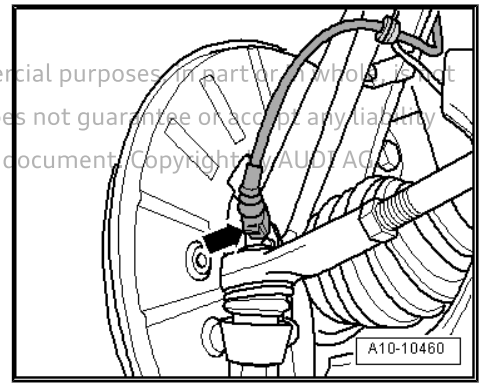


– Release hose clip -arrow- and detach air hose from air pipe.



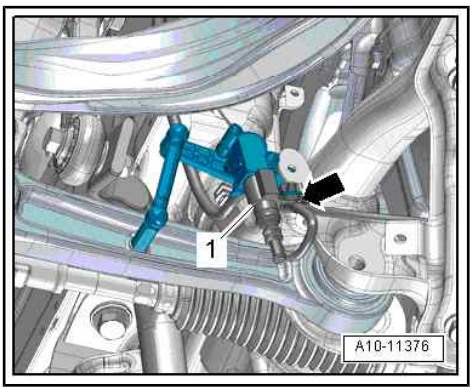
– Unplug electrical connector -arrow- at front wheel speed sensor on both sides (-G45- and -G47-).

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– If fitted, unplug electrical connector -1- at front vehicle level senders on both sides (-G78- and -G289-) and move electrical wiring clear -arrow-.

– Remove brake caliper and tie up in wheel housing with wire (brake hose remains attached) ⇒ Brake system; Rep. gr. 46 ; Front brakes; Removing and installing brake caliper .



Caution

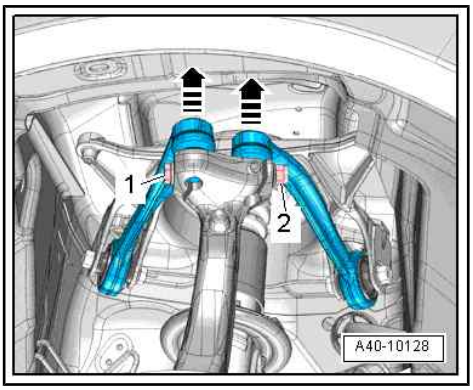
Risk of damage to brake pistons.

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

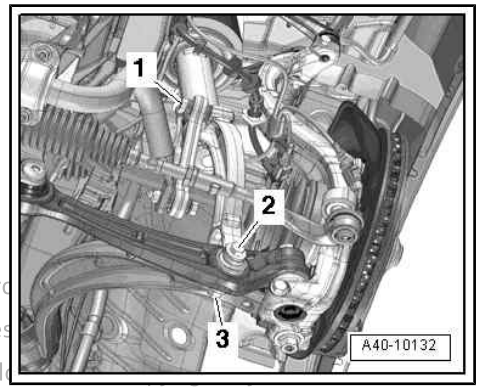
– Remove nut -2- and pull out bolt -1-.

– Pull upper suspension links upwards out of wheel bearing housing -arrows-.

– Repeat procedure on opposite side of vehicle.



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



Note

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

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

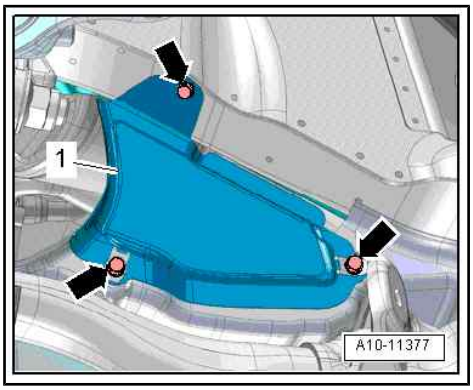
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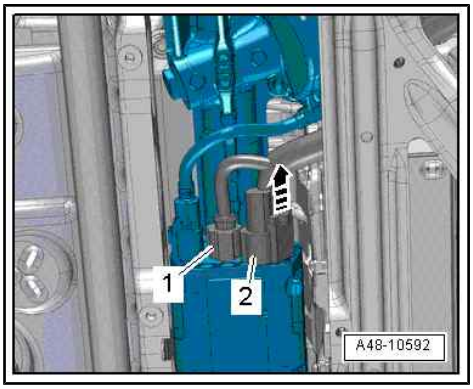
Risk of damage to running gear components.

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

– Remove bolts -arrows- on both sides and detach heat shield -1-.
– Detach intermediate steering shaft from steering rack and move clear by telescoping splines together ⇒ Running gear, axles, steering; Rep. gr. 48 ; Steering column; Removing and installing intermediate steering shaft .

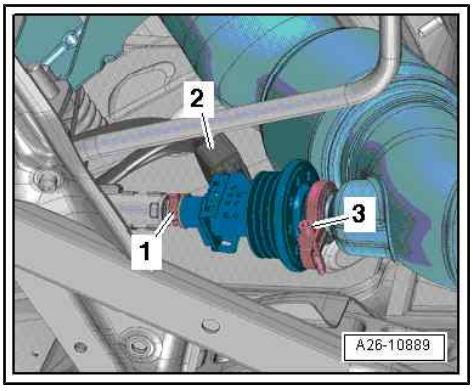


– Unplug electrical connector -2- at power steering control unit - J500- (release retainer -arrow- and press down release catch).
– Unplug electrical connector -1- at power steering control unit - J500- .
– Move electrical wiring harness clear.



Vehicles with SCR system:

– Unplug electrical connector -2- and move wiring clear.
– Release retaining clip -3-, move clear injector for reducing agent - N474- with electrical wire and tie up to underbody.



Note

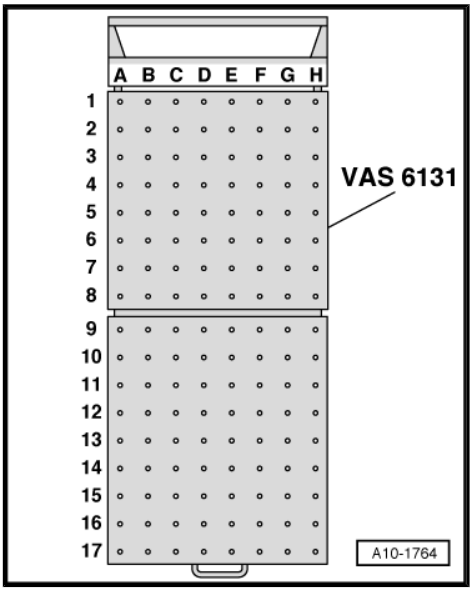
If separating the engine from the gearbox for subsequent work, unscrew the bolted connection securing the drive plate to the flywheel/torque converter ⇒ page 119 .

Set up the scissor-type assembly platform as follows:

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

Platform coordinates	Parts of support set for Audi - VAS 6131/10- , support set -VAS 6131/11- and supplementary set - VAS 6131/13-			
B4	/13-4	/10-4	/10-5	/13-1
G4	/13-4	/10-4	/10-5	/13-1
B6	/10-1	/10-2	/10-5	/11-2
G6	/10-1	/10-2	/10-5	/11-2
A8+C8	/13-6			/13-2
F8+H8	/13-5			/13-2
B14	/10-1	/10-3	/10-5	/11-1
G14	/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 system.



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

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

• Take note of spirit level (bubble gauge).

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

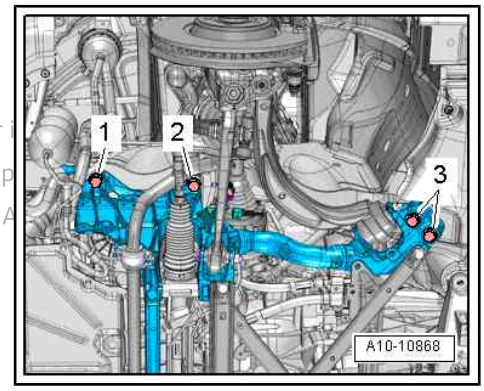
WARNING

Accident risk if subframe mountings are detached.

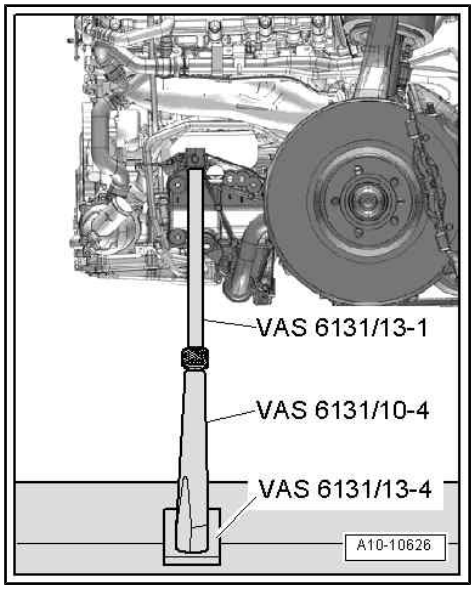
Subframe bolts -2- and -3- must not be loosened.

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– Remove subframe bolts -1- on both sides.

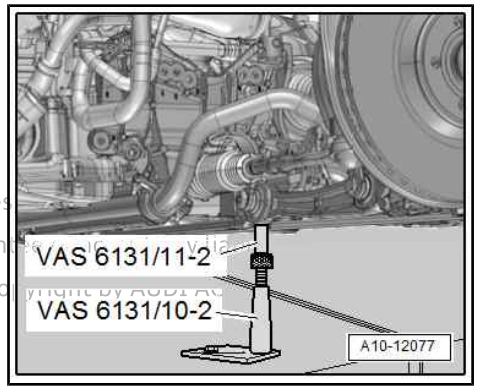


– Position support elements from -VAS 6131/10- and -VAS 6131/13- at front left and right of subframe as shown.
– Make sure that threaded spindles are screwed in completely.

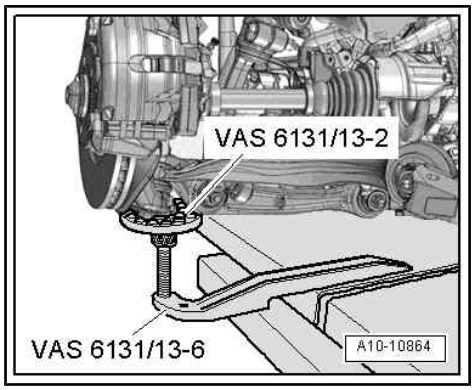


– Position support elements from -VAS 6131/10- and -VAS 6131/11- (rear left and right) at front attachment points of subframe cross brace as shown.

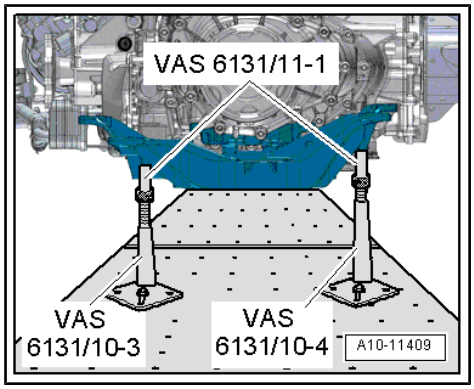
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– Position support elements from -VAS 6131/13- under left and right wheel bearing housings as shown.



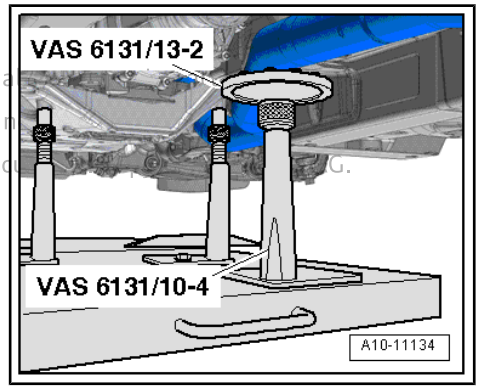
– Position support elements from -VAS 6131/10- and -VAS 6131/11- (rear left and right) at tunnel cross member as shown.



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Vehicles without SCR system:

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



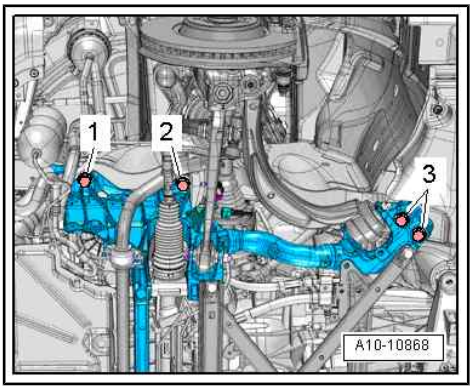
All vehicles (continued):

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

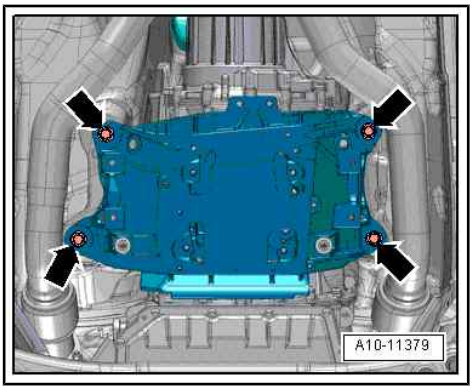
– Tighten base plates for support elements to 20 Nm on scissor-type assembly platform - VAS 6131 B- .

– Mark installation position of subframe and tunnel cross member on longitudinal members with felt-tip pen.

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



– Remove bolts -arrows- on tunnel cross member.

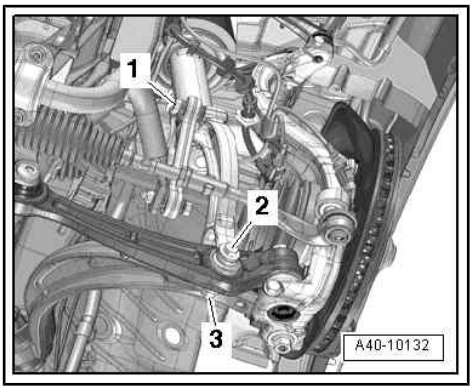


– Remove bolt -2- on both sides.

Caution

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

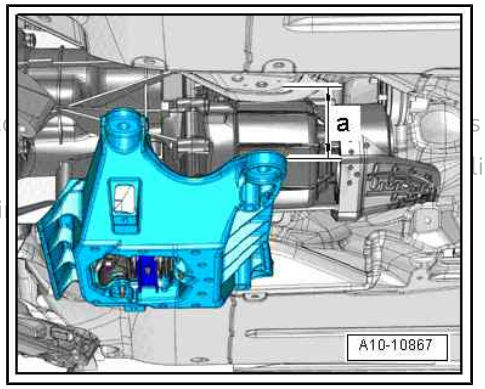
- *Check that all hoses and wiring connections between engine, gearbox, subframe and body have been detached.*
- *Carefully guide out engine/gearbox assembly with subframe from engine compartment when lowering.*
- *Carefully guide suspension struts past longitudinal members.*



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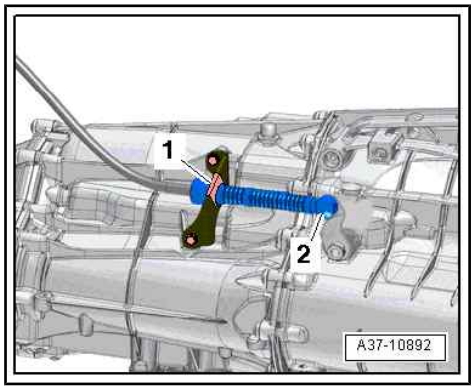
– Lower engine/gearbox assembly using scissor-type assembly platform - VAS 6131 B- initially only as far as distance -a-.

• Dimension -a- = 100 mm (maximum).



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

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



Note

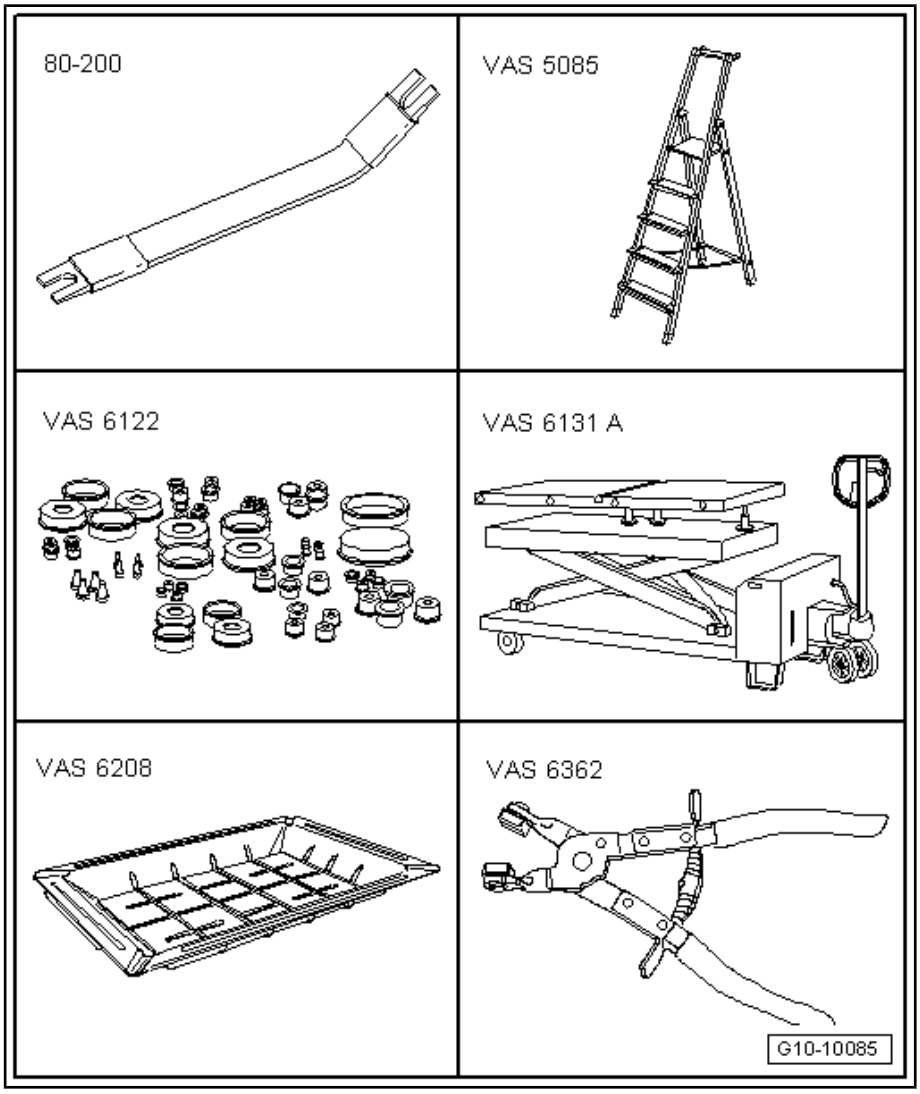
Take care not to bend or kink selector lever cable.

– Lower engine/gearbox assembly further.

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

1.1.4 Removing engine - vehicles with dual clutch gearbox 0CK

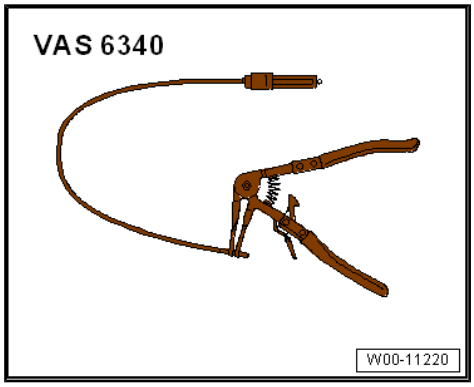
Special tools and workshop equipment required



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

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- Hose clip pliers - VAS 6340-



Procedure

Note

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

WARNING

When working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system ⇒ page 7 .***

WARNING

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

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

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

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

– Bring front wheels into straight-ahead position.

Caution

Risk of irreparable damage to electronic components.

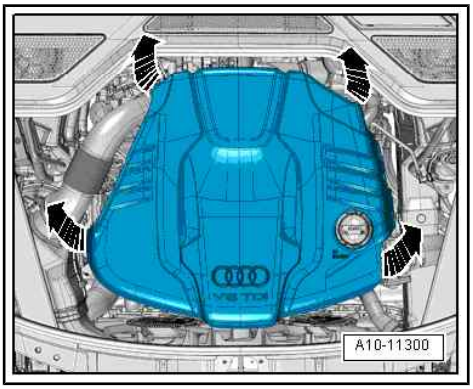
- ***Observe notes on procedure for disconnecting the battery.***

– Switch off ignition.

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

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– Remove engine cover panel -arrows-.



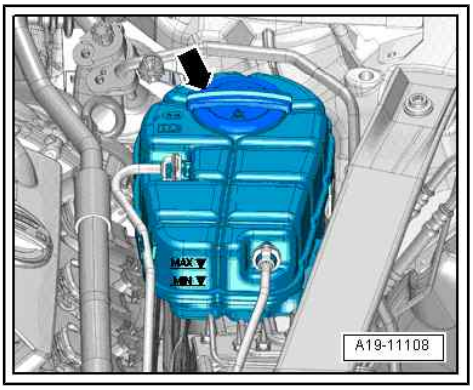
– Discharge refrigerant system ⇒ Air conditioner with refrigerant R134a .

– Remove lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing attachments .

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 -arrow- on coolant expansion tank.

– Remove both front wheels ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres .

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

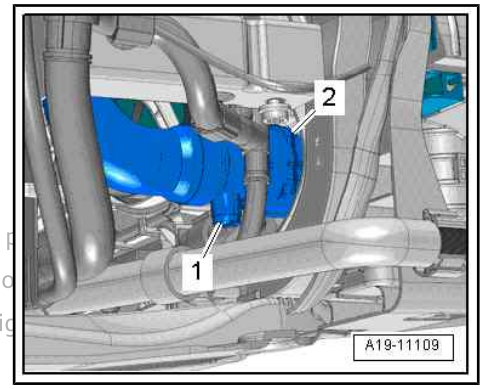
– Remove wheel spoilers (front) on both sides ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front) .

– Remove noise insulation panels ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

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

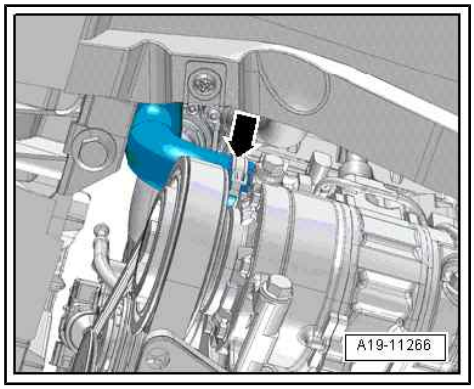
– Remove drain plug -1- and drain off coolant.

– Lift retaining clip -2- and disconnect coolant hose from radiator.

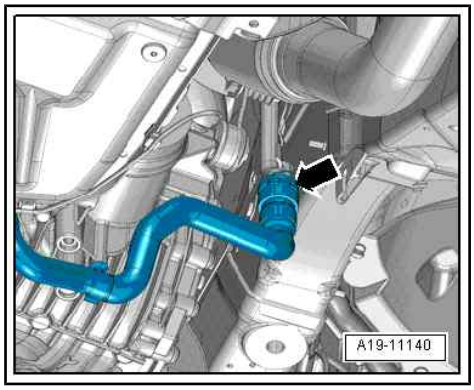


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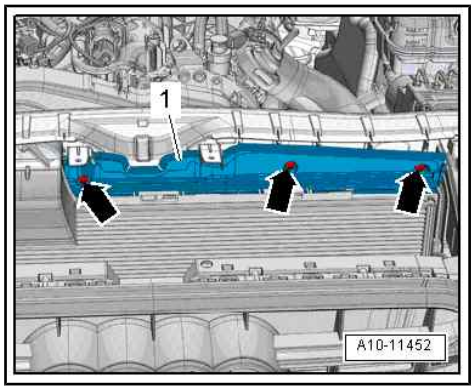
– Release hose clip -arrow-, disconnect coolant hose from coolant pipe (bottom left) and drain off coolant.



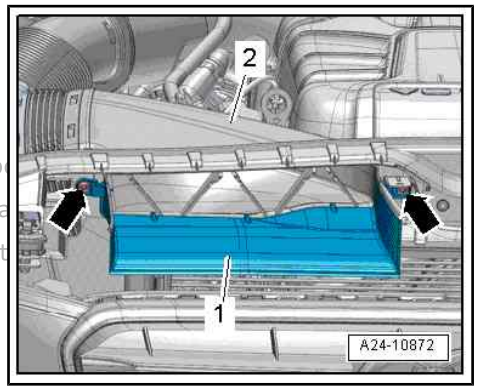
– Lift retaining clip -arrow-, disconnect coolant hose (rear right) and drain off coolant.
– Remove plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .



– Remove bolts -arrows- and detach air duct -1-.



– Remove bolts -arrows- and detach air duct -2-.

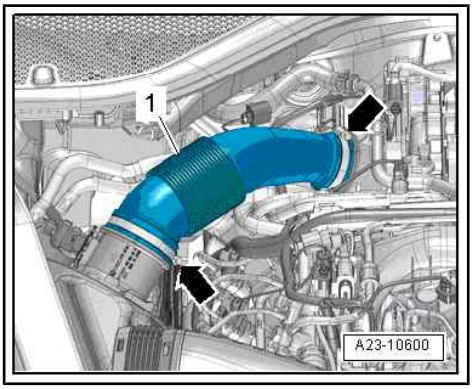


Note

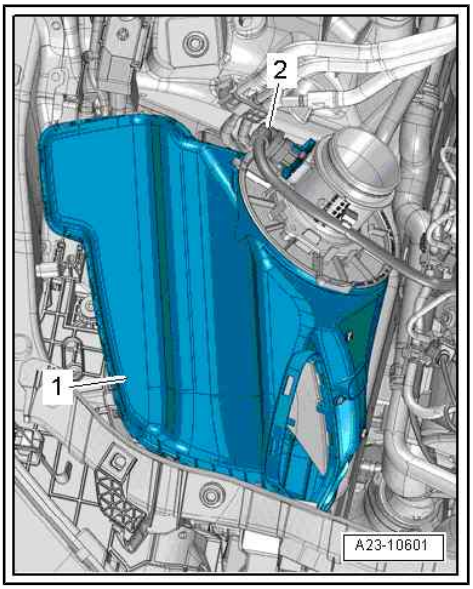
Disregard -item 1-.

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– Release hose clips -arrows- and detach air pipe -1-.



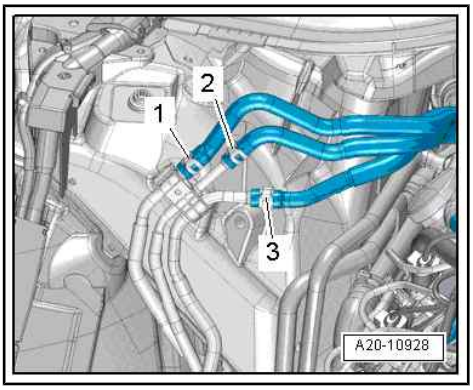
– Unplug electrical connector -2- at air mass meter - G70- and move clear.
– Lift off air cleaner housing -1-.



Caution

Take care to keep components clean.

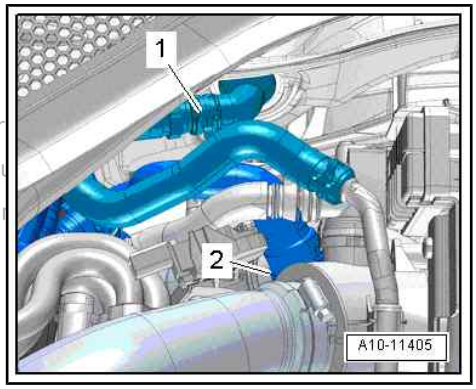
- *Observe rules for cleanliness when working on the fuel supply system ⇒ page 8 .*



– Release hose clips and detach fuel hoses:

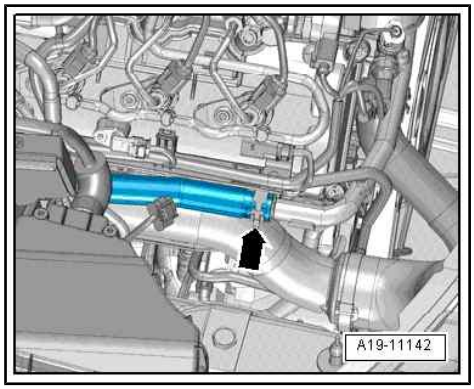
1 - Fuel hose (blue)
2 - Fuel hose (yellow)
3 - Fuel hose (white)

– Lift retaining clip -2- and disconnect coolant hose.
– Release hose clip -1- and disconnect vacuum hose from plenum chamber partition panel.



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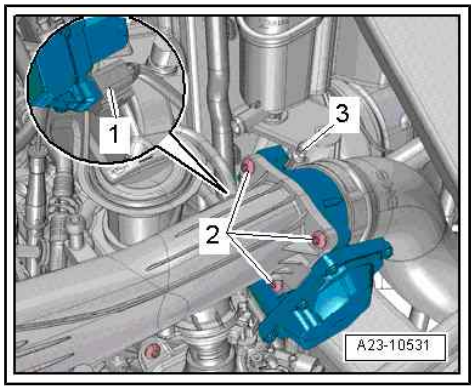
– Release hose clip -arrow- and disconnect coolant hose from coolant pipe (front).



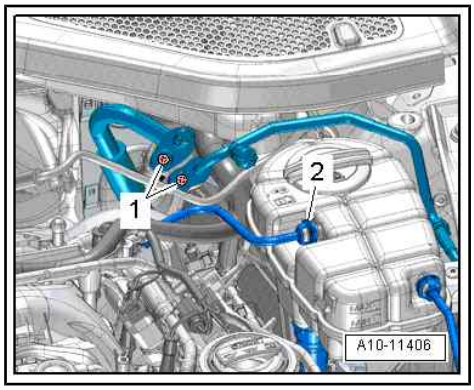
– Release hose clip -3- and detach air hose.

Note

Disregard items -1 and 2-.



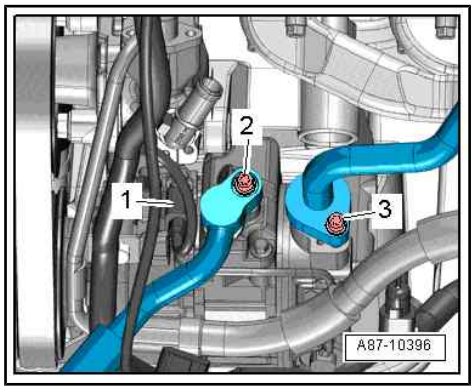
– Lift retaining clip -2- and disconnect coolant line.
– Remove bolts -1- and move refrigerant lines clear.



Caution

Risk of damage to refrigerant lines and hoses

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



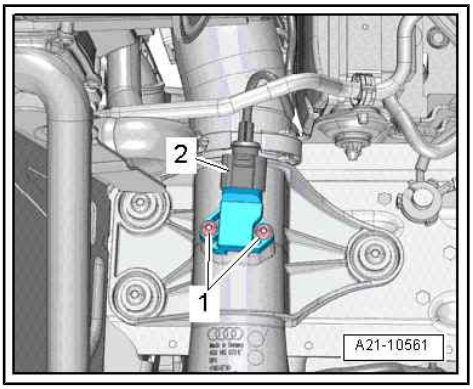
– Remove bolt -2-, disconnect refrigerant line from air conditioner compressor and move to one side.
– Seal off open lines and connections with clean plugs from engine bung set - VAS 6122- .

Note

Disregard items -1 and 3-.

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– Unplug electrical connector -2- for charge pressure sender - G31- / intake air temperature sender - G42- and move clear electrical wiring.

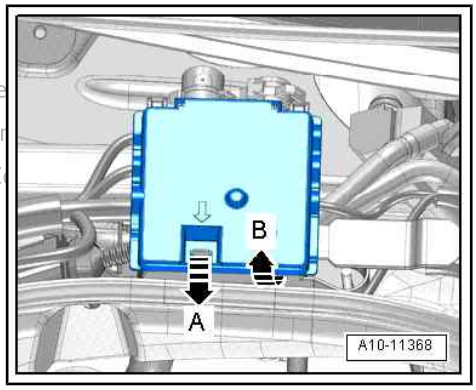


Note

Disregard -item 1-.

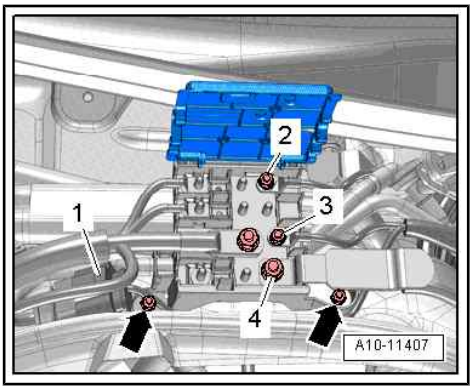
– Remove body brace ⇒ Running gear, axles, steering; Rep. gr. 40 ; Suspension strut, upper links; Removing and installing body brace .

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

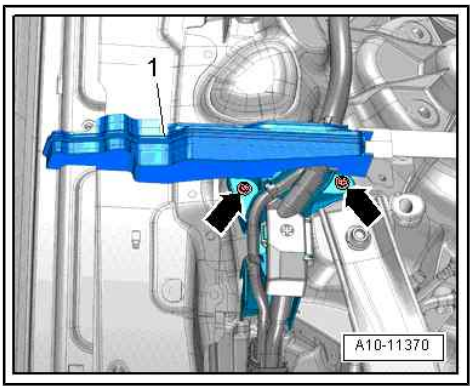


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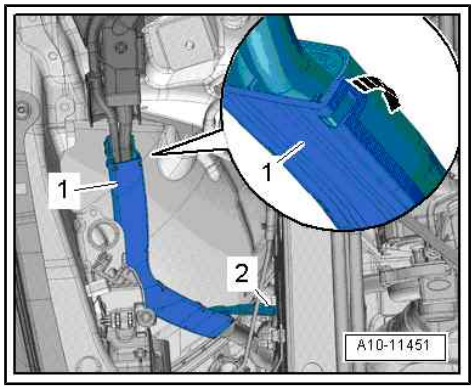
– Remove nuts -2, 3 and 4- and move electrical wiring clear.
– Detach electrical connector -1- from bracket and unplug.
– Remove bolts -arrows- and detach terminal 30 wiring junction 2 - TV22- from plenum chamber partition panel.



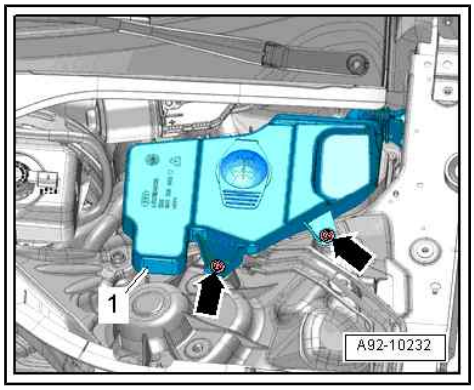
– Press foam wedge -1- to one side.
– Remove bolts -arrows-.



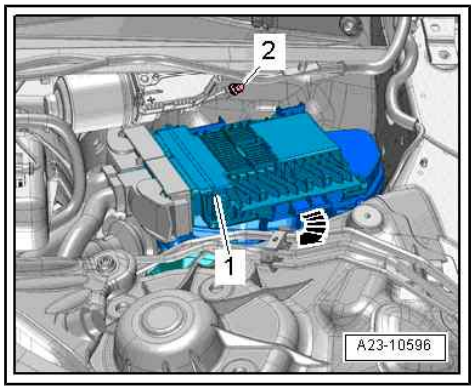
– Unscrew nut -2- on longitudinal member (right-side) and move earth cables clear.
– Release catch -arrow- to open wiring duct -1- and move electrical wiring harness clear.



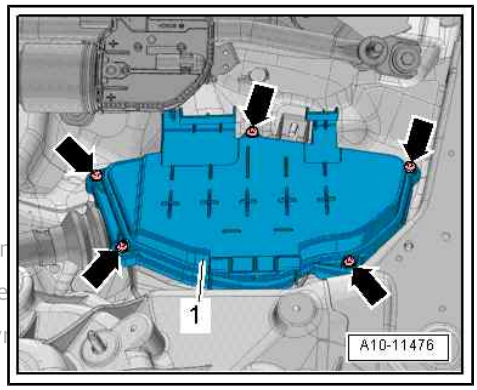
– Unscrew bolts -arrows- and pull filler neck -1- out of washer fluid reservoir and through opening in body to right side.



– Remove cap nut -2- and move earth wiring clear.
– Release fastener -arrow-, detach engine control unit - J623- -item 1- from bracket and swivel it to one side.

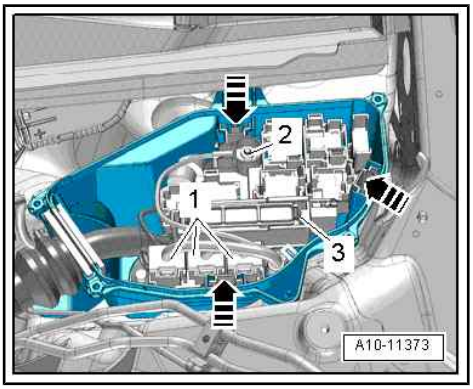


– Remove bolts -arrows- and detach cover -1- for electronics box in plenum chamber.



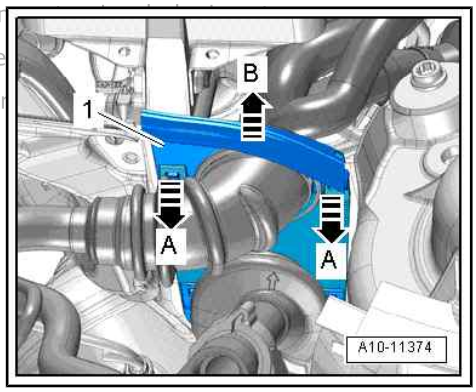
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– Unplug electrical connectors -1- and unscrew nut -2- for electrical wiring.
– Release catches -arrows- and detach relay carrier with fuse holder -3-.
– Disengage engine wiring harness at electronics box in plenum chamber and move clear.

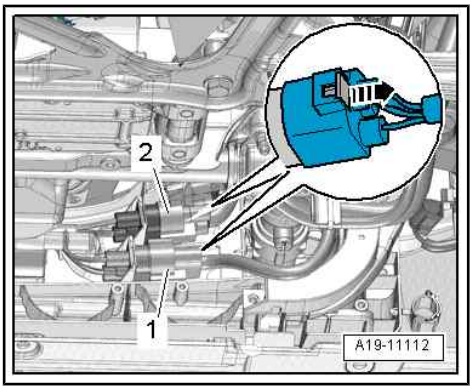


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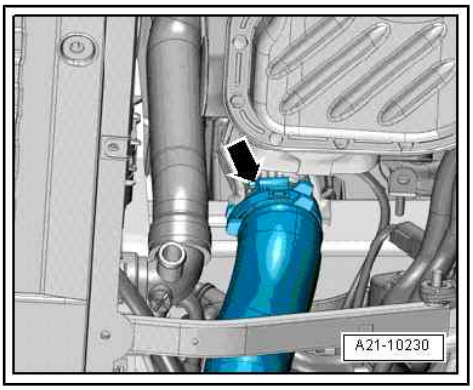
– Release catches -arrows A- and lift off wiring protector -1- -arrow B-.
– Place wiring harness on engine and secure engine/motor control unit - J623- to prevent it from dropping.



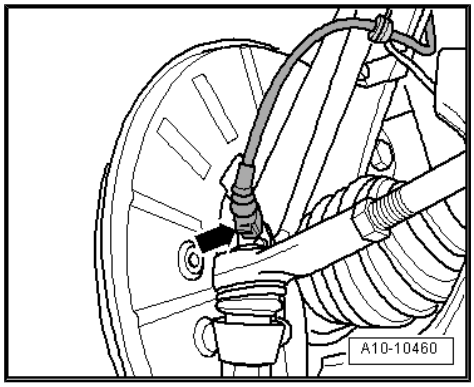
– Unplug electrical connector -1- and, if fitted, -2- for radiator fan (push retainer to the rear -arrow- and press down release catch).
– Move electrical wiring harness clear.



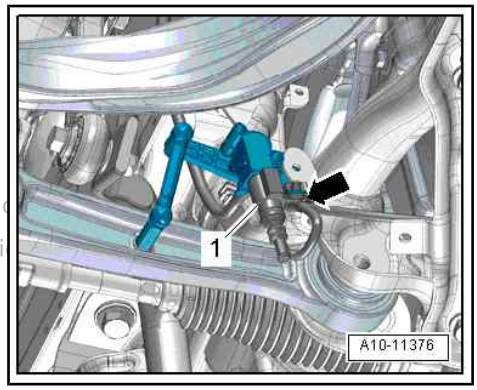
– Release hose clip -arrow- and detach air hose from air pipe.



– Unplug electrical connector -arrow- at front wheel speed sensor on both sides (-G45- and -G47-).



– If fitted, unplug electrical connector -1- at front vehicle level senders on both sides (-G78- and -G289-) and move electrical wiring clear -arrow-.
– Remove brake caliper and tie up in wheel housing with wire (brake hose remains attached) ⇒ Brake system; Rep. gr. 46 ; Front brakes; Removing and installing brake caliper .



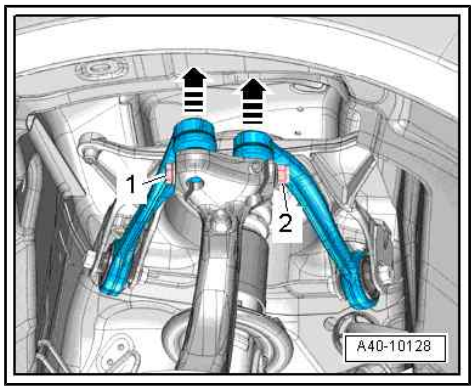
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Caution

Risk of damage to brake pistons.

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

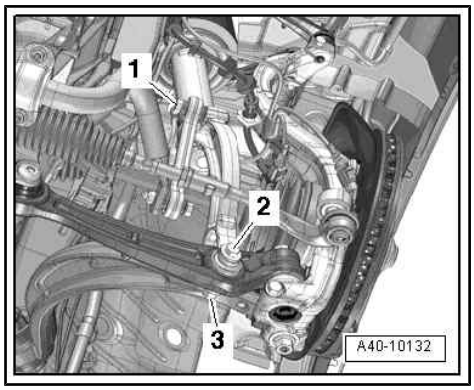
– Remove nut -2- and pull out bolt -1-.
– Pull upper suspension links upwards out of wheel bearing housing -arrows-.
– Repeat procedure on opposite side of vehicle.



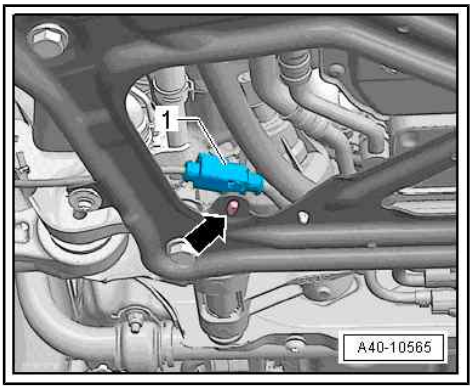
– Remove bolt -1- for anti-roll bar on both sides.
– Remove nut -3- on both sides.

Note

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



– Move clip clear -arrow-.
– Unplug electrical connector -1- and move wiring clear.
– Remove subframe cross brace ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Removing and installing subframe cross brace .

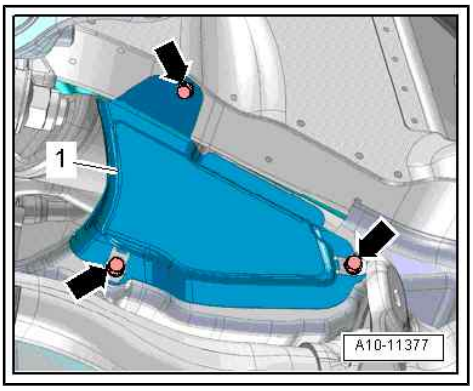


Caution

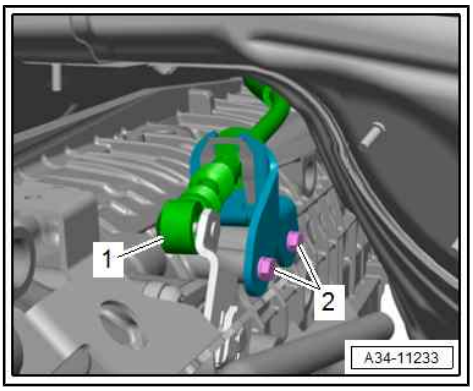
Risk of damage to running gear components.

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

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



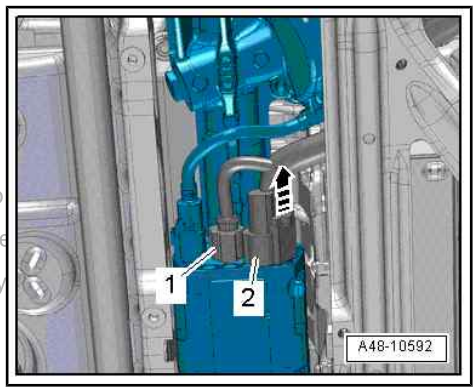
– Pry ball socket -1- of selector lever cable off gearbox selector lever using removal lever - 80-200- .
– Remove bolts -2- for cable support bracket.
– Move clear selector lever cable.



Note

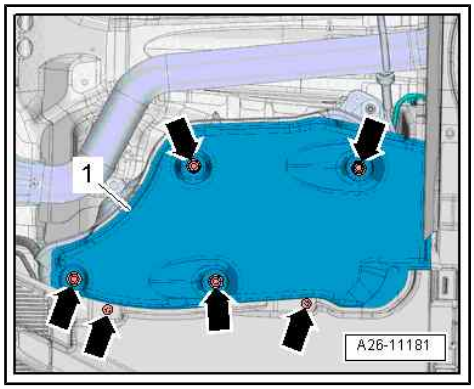
Take care not to bend or kink selector lever cable.

– Detach intermediate steering shaft from steering rack and move clear by telescoping splines together ⇒ Running gear, axles, steering; Rep. gr. 48 ; Steering column; Removing and installing intermediate steering shaft .
– Unplug electrical connector -2- at power steering control unit - J500- (release retainer -arrow- and press down release catch).
– Unplug electrical connector -1- at power steering control unit - J500- .
– Move electrical wiring harness clear.
– Remove underbody trim (centre, left-side) in direction of exhaust system and press downwards slightly ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim; Removing and installing underbody trim .



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– Remove bolt and nuts -arrows- and detach cover -1- for reducing agent tank.



WARNING

Reducing agent can cause skin irritation.

- ***Observe safety measures when handling reducing agent*** ***⇒ page 6*** ***.***
- ***Put on safety goggles.***

Note

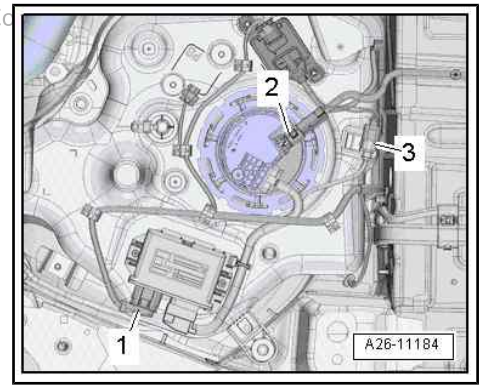
Hold a clean cloth under the separating point to catch escaping reducing agent.

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– Unplug electrical connector -3- and move wiring harness clear.

– Press release tabs and disconnect SCR metering line -2-.

– Move SCR metering line clear as far as subframe.

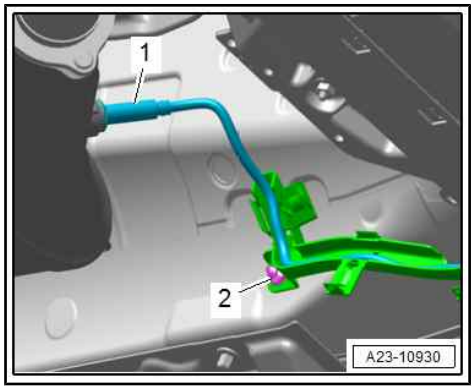


Note

Disregard -item 1-.

– Seal off open lines and connections with plugs (thoroughly cleaned) from engine bung set - VAS 6122- .

– Unscrew speed nut -2- for cable guide.

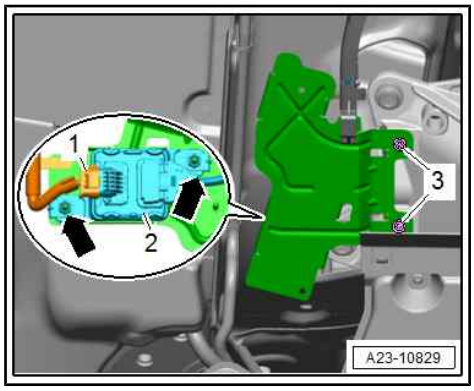


Note

Disregard -item 1-.

– Unplug electrical connector -1-.

– Unscrew bolts -3- and tie control unit for NOx sender 2 - J881- -2- with bracket to SCR catalytic converter.



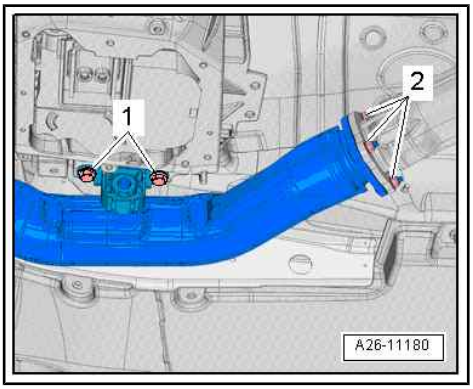
Note

Disregard -arrows-.

WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system ⇒ page 7 .*

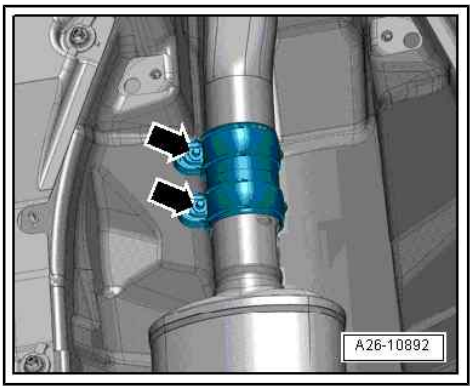


– Remove nuts -2-.

Note

Disregard -item 1-.

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

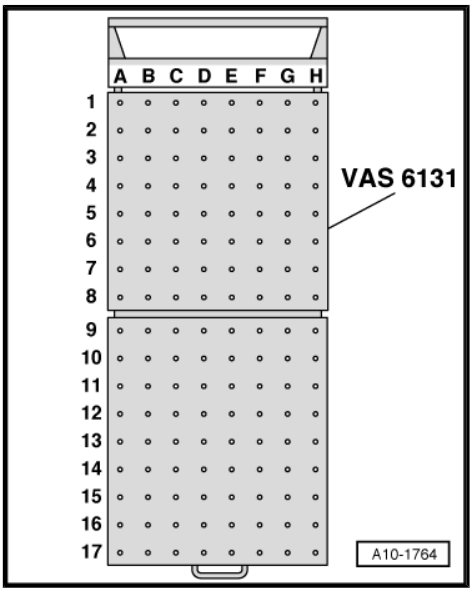


Note

If separating the engine from the gearbox for subsequent work, unscrew the bolted connection securing the drive plate to the flywheel/torque converter ⇒ page 127 .

Set up the scissor-type assembly platform as follows:

– Set up scissor-type assembly platform - VAS 6131 B- 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	/13-5			/13-2
B14	/10-1	/10-4	/10-5	/10-7
G14	/10-1	/10-4	/10-5	/11-1

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

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

- Take note of spirit level (bubble gauge).

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

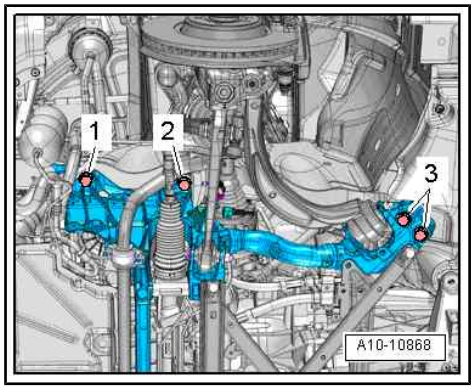
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WARNING

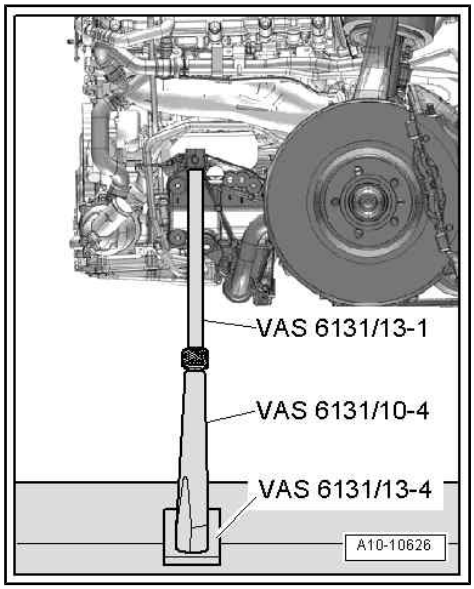
Accident risk if subframe mountings are detached.

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

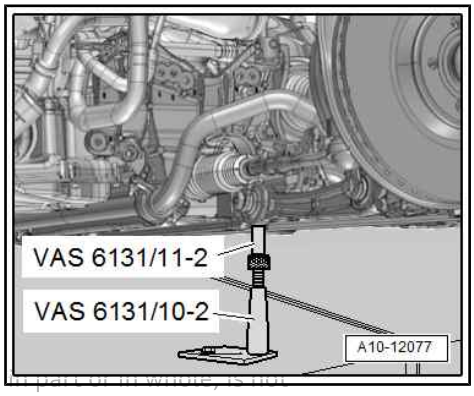
– Remove subframe bolts -1- on both sides.



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

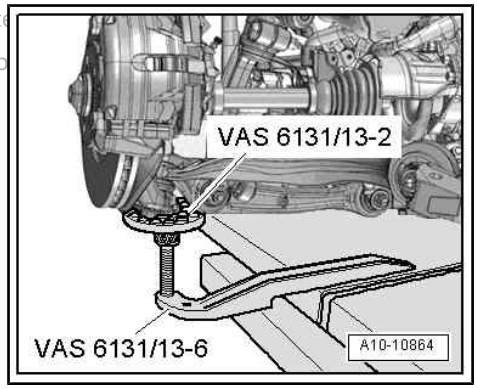


– Position support elements from -VAS 6131/10- and -VAS 6131/11- (rear left and right) at front attachment points of subframe cross brace as shown.



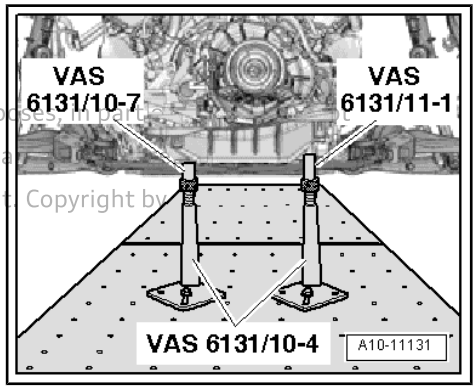
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– Position support elements from -VAS 6131/13- under left and right wheel bearing housings as shown.

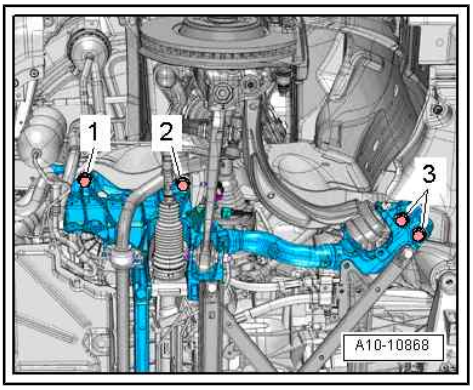


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– Position support elements from -VAS 6131/10- and -VAS 6131/11- (rear left and right) at tunnel cross member as shown.
– Turn all spindles for support elements upwards until all locating lugs make contact with mounting points.
– Tighten base plates for support elements to 20 Nm on scissor-type assembly platform - VAS 6131 B- .



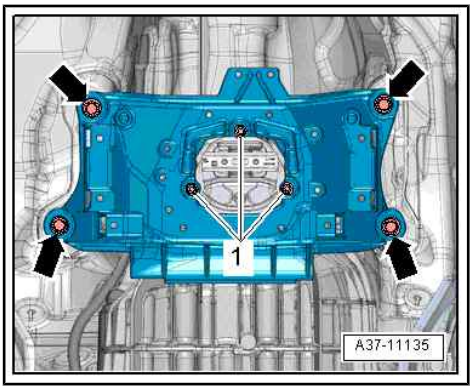
– Mark installation position of subframe and tunnel cross member on longitudinal members with felt-tip pen.
– Unscrew subframe bolts -2- and -3- on both sides in several stages and in diagonal sequence.



– Remove bolts -arrows- on tunnel cross member.

Note

Disregard -item 1-.

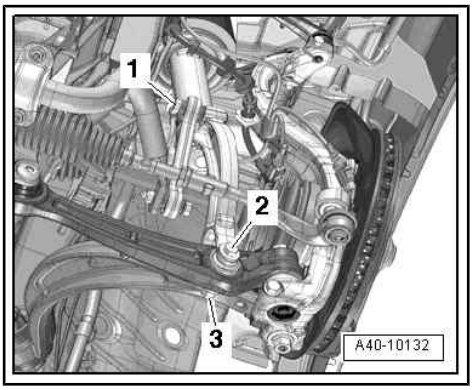


– Remove bolt -2- on both sides.

Caution

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

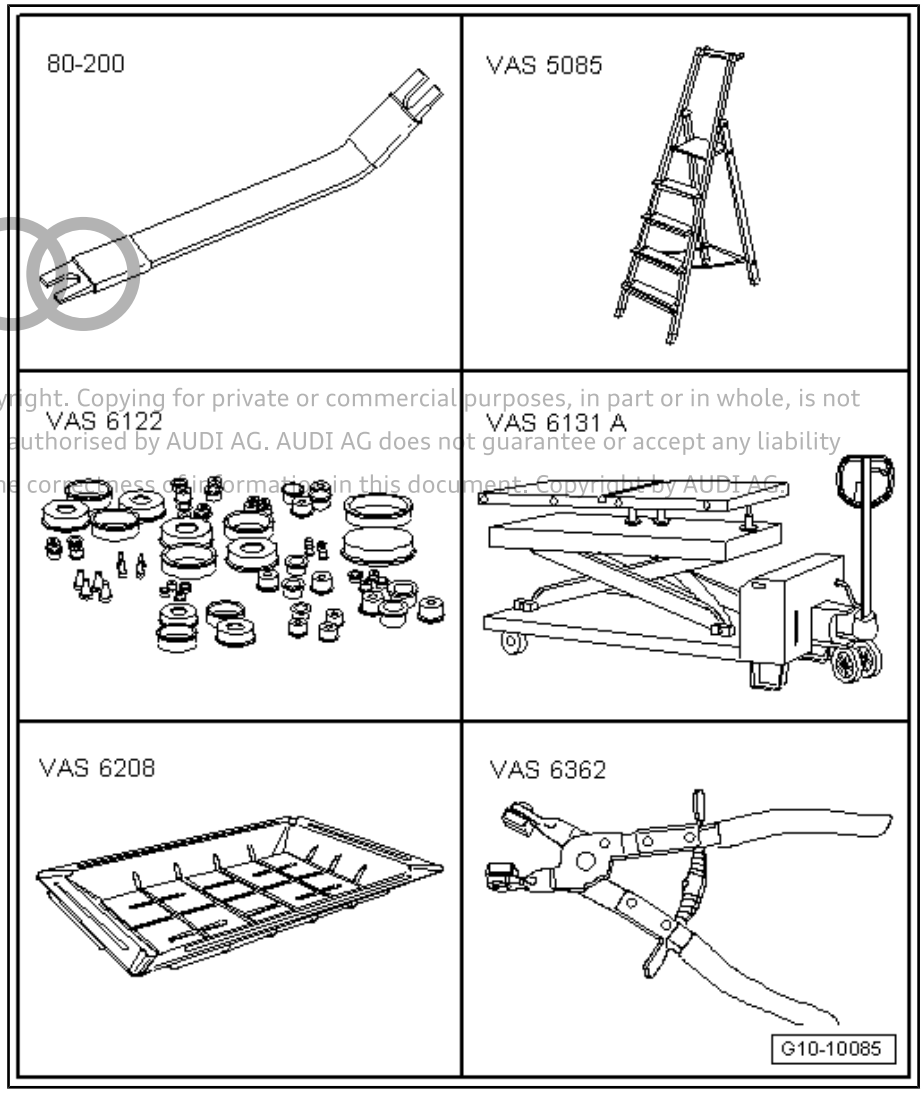
- ***Check that all hoses and wiring connections between engine, gearbox, subframe and body have been detached.***
- ***Carefully guide out engine/gearbox assembly with subframe from engine compartment when lowering.***
- ***Carefully guide suspension struts past longitudinal members.***



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

1.1.5 Removing engine - vehicles with 8-speed automatic gearbox 0BK

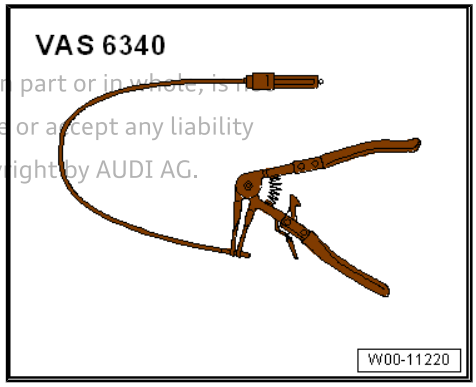
Special tools and workshop equipment required



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

- Hose clip pliers - VAS 6340-



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Procedure

Note

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

WARNING

When working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system ⇒ page 7 .***

WARNING

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

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

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

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

– Bring front wheels into straight-ahead position.

Note

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

Caution

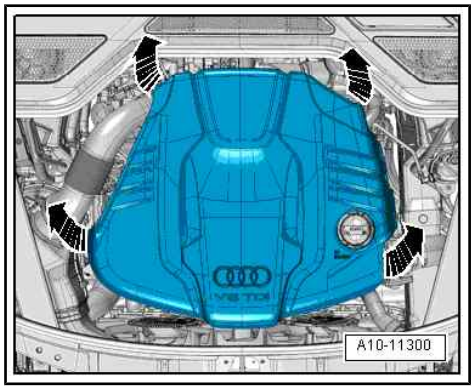
Risk of irreparable damage to electronic components.

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

– Switch off ignition.

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

– Remove engine cover panel -arrows-.



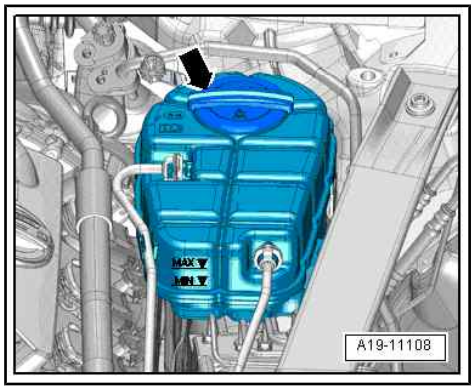
– Discharge refrigerant system ⇒ Air conditioner with refrigerant R134a .

– Remove lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing attachments .

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 -arrow- on coolant expansion tank.

– Remove both front wheels ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres .

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

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

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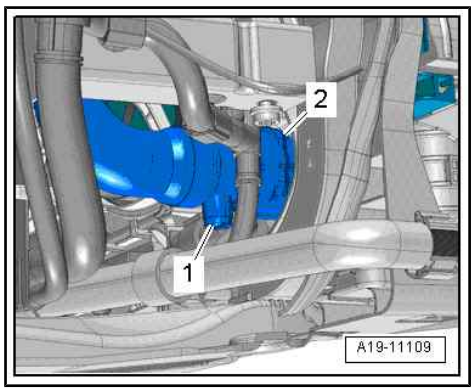
– Remove noise insulation panels ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

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

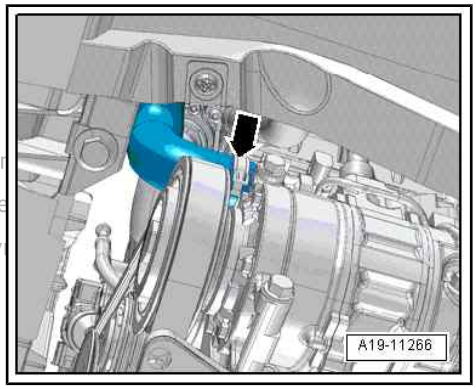
– Place drip tray for workshop hoist - VAS 6208- beneath engine.

– Remove drain plug -1- and drain off coolant.

– Lift retaining clip -2- and disconnect coolant hose from radiator.

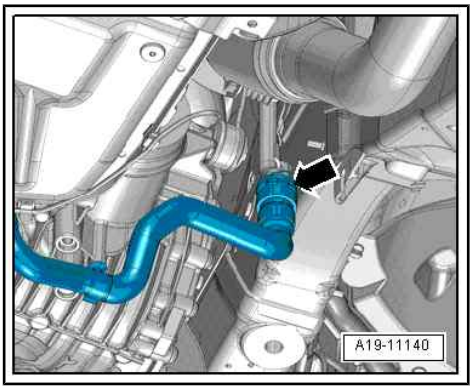


– Release hose clip -arrow-, disconnect coolant hose from coolant pipe (bottom left) and drain off coolant.



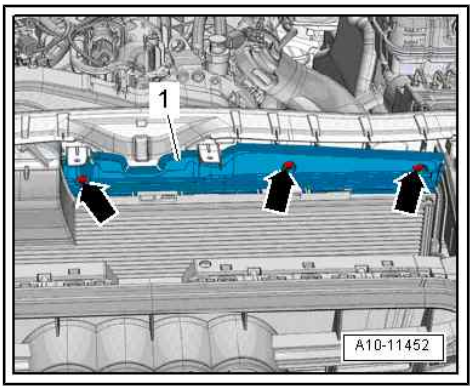
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– Lift retaining clip -arrow-, disconnect coolant hose (rear right) and drain off coolant.



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

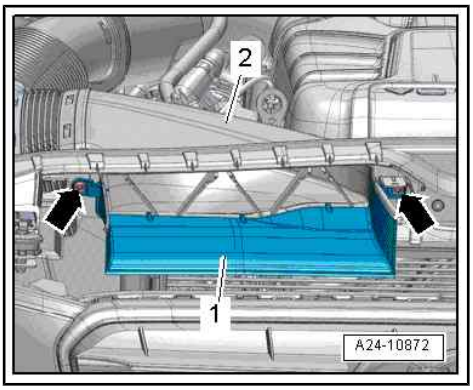
– Remove bolts -arrows- and detach air duct -1-.



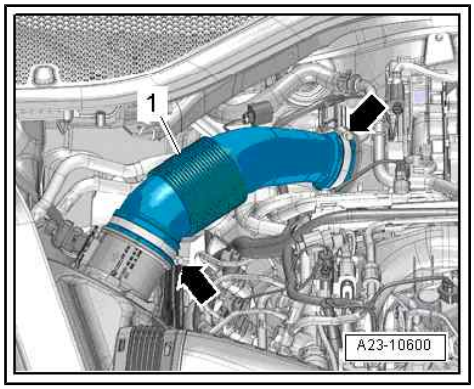
– Remove bolts -arrows- and detach air duct -2-.

Note

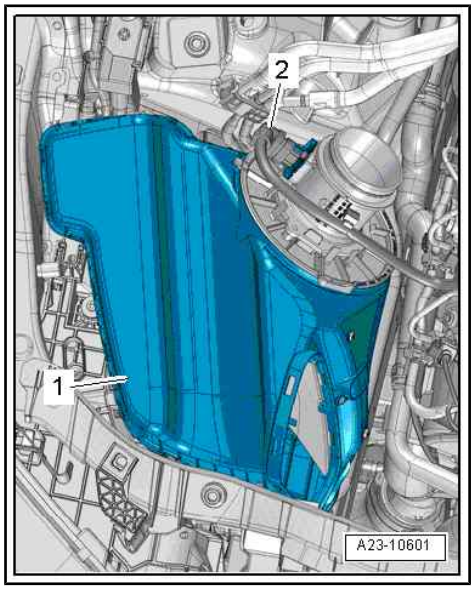
Disregard -item 1-.



– Release hose clips -arrows- and detach air pipe -1-.



– Unplug electrical connector -2- at air mass meter - G70- and move clear.
– Lift off air cleaner housing -1-.

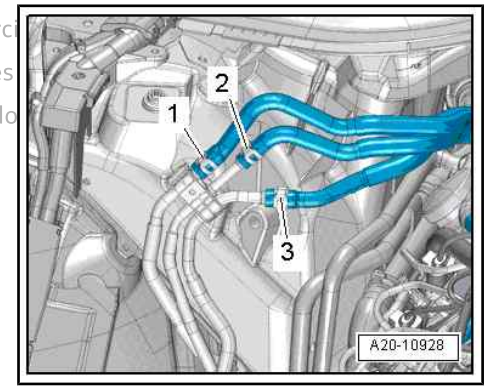


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Caution

Take care to keep components clean.

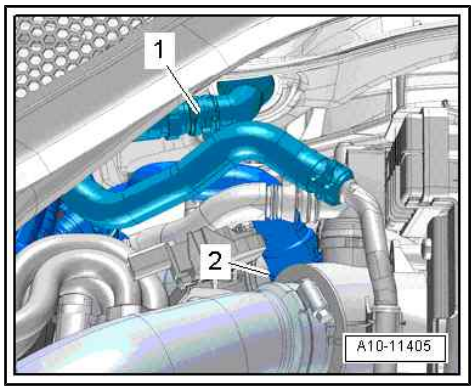
- ***Observe rules for cleanliness when working on the fuel supply system ⇒ page 8 .***



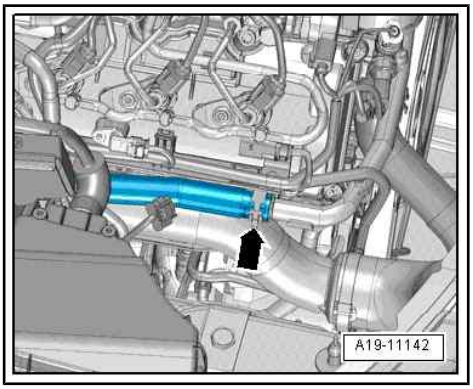
– Release hose clips and detach fuel hoses:

1 - Fuel hose (blue)
2 - Fuel hose (yellow)
3 - Fuel hose (white)

– Lift retaining clip -2- and disconnect coolant hose.
– Release hose clip -1- and disconnect vacuum hose from plenum chamber partition panel.



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

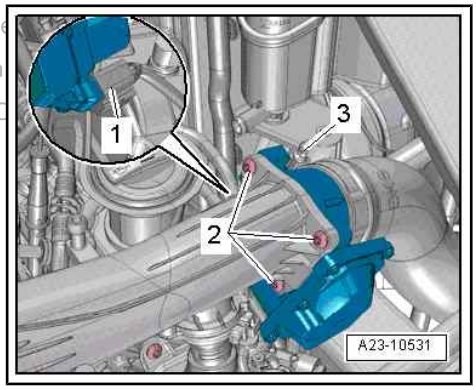


– Release hose clip -3- and detach air hose.

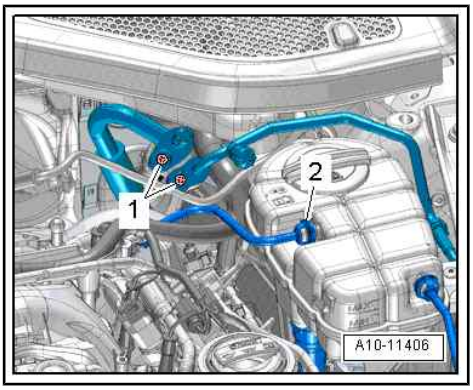
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Note

Disregard items -1 and 2-.



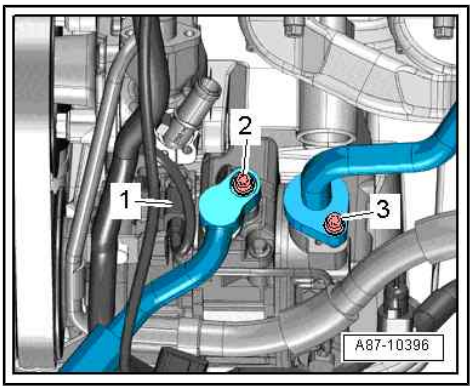
– Lift retaining clip -2- and disconnect coolant line.
– Remove bolts -1- and move refrigerant lines clear.



Caution

Risk of damage to refrigerant lines and hoses

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

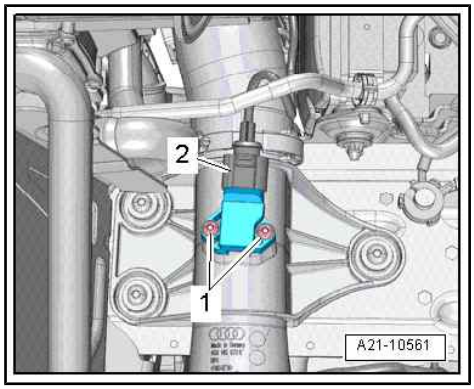


– Remove bolt -2-, disconnect refrigerant line from air conditioner compressor and move to one side.
– Seal off open lines and connections with clean plugs from engine bung set - VAS 6122- .

Note

Disregard items -1 and 3-.

– Unplug electrical connector -2- for charge pressure sender - G31- / intake air temperature sender - G42- and move clear electrical wiring.

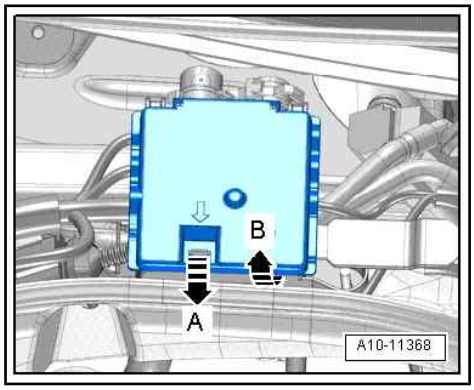


Note

Disregard -item 1-.

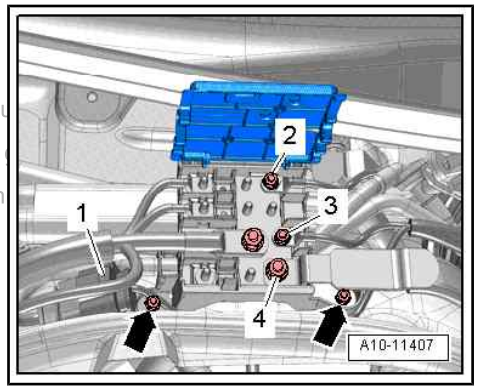
– Remove body brace ⇒ Running gear, axles, steering; Rep. gr. 40 ; Suspension strut, upper links; Removing and installing body brace .

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

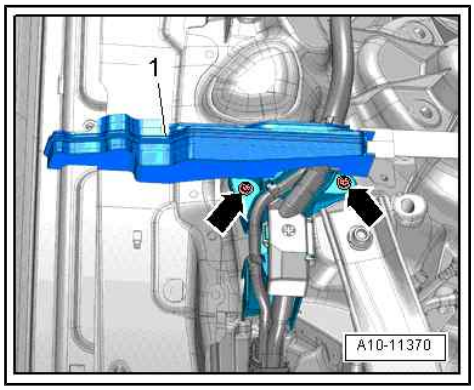


– Remove nuts -2, 3 and 4- and move electrical wiring clear.
– Detach electrical connector -1- from bracket and unplug.
– Remove bolts -arrows- and detach terminal 30 wiring junction 2 - TV22- from plenum chamber partition panel.

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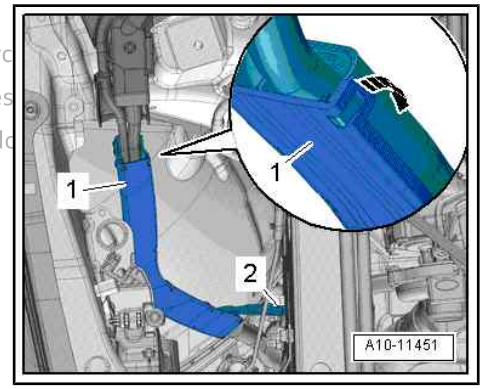


– Press foam wedge -1- to one side.
– Remove bolts -arrows-.

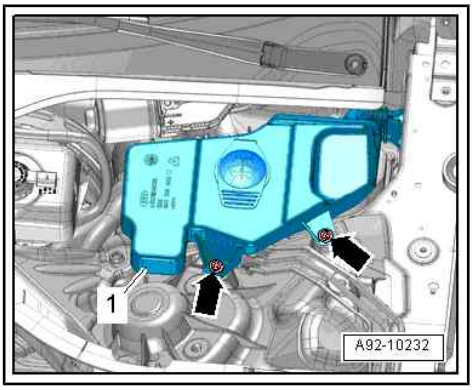


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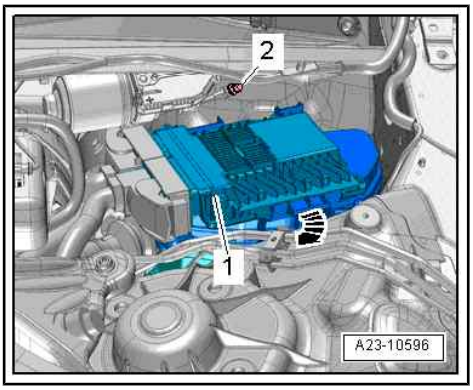
– Unscrew nut -2- on longitudinal member (right-side) and move earth cables clear.
– Release catch -arrow- to open wiring duct -1- and move electrical wiring harness clear.



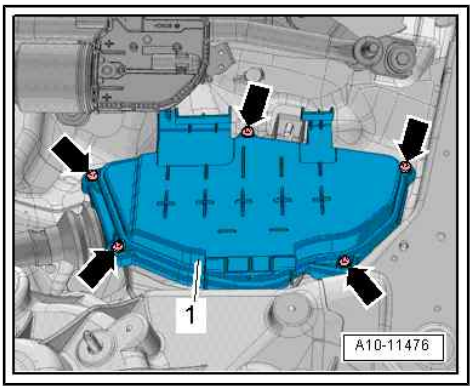
– Unscrew bolts -arrows- and pull filler neck -1- out of washer fluid reservoir and through opening in body to right side.



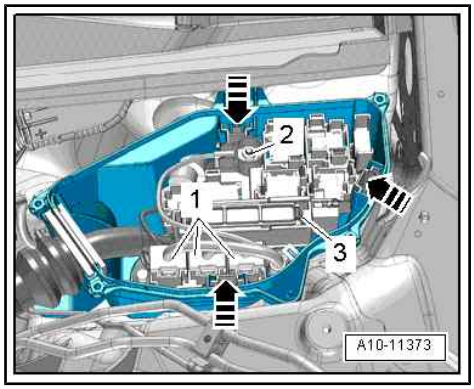
– Remove cap nut -2- and move earth wiring clear.
– Release fastener -arrow-, detach engine control unit - J623- -item 1- from bracket and swivel it to one side.



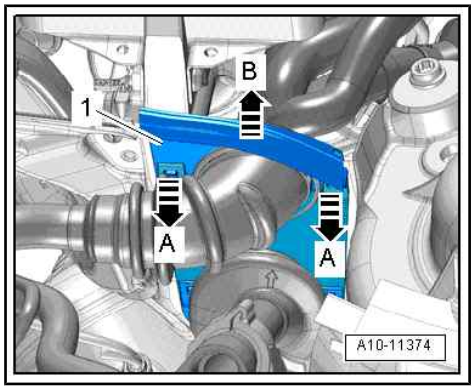
– Remove bolts -arrows- and detach cover -1- for electronics box in plenum chamber.



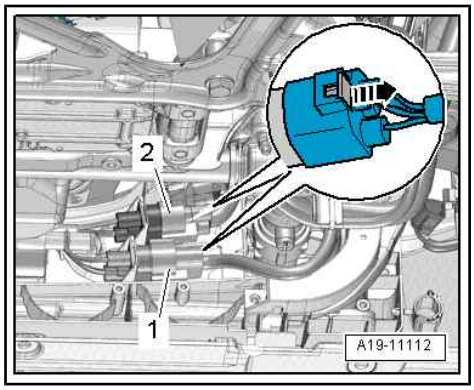
– Unplug electrical connectors -1- and unscrew nut -2- for electrical wiring.
– Release catches -arrows- and detach relay carrier with fuse holder -3-.
– Disengage engine wiring harness at electronics box in plenum chamber and move clear.



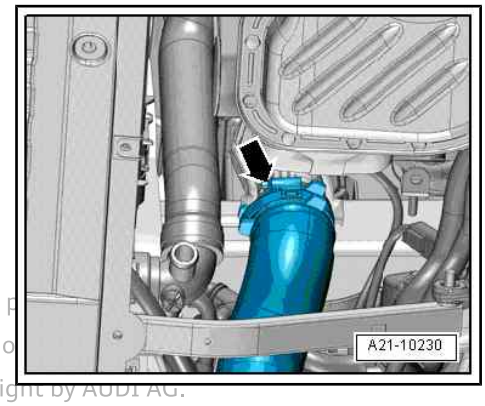
– Release catches -arrows A- and lift off wiring protector -1- -arrow B-.
– Place wiring harness on engine and secure engine/motor control unit - J623- to prevent it from dropping.



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

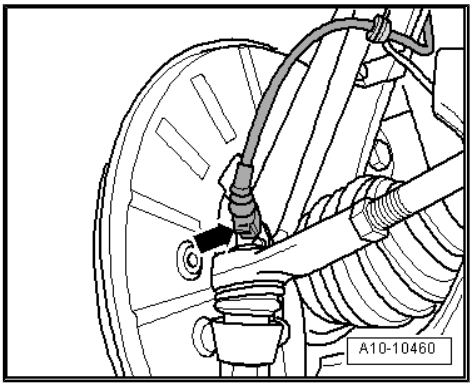


– Release hose clip -arrow- and detach air hose from air pipe.



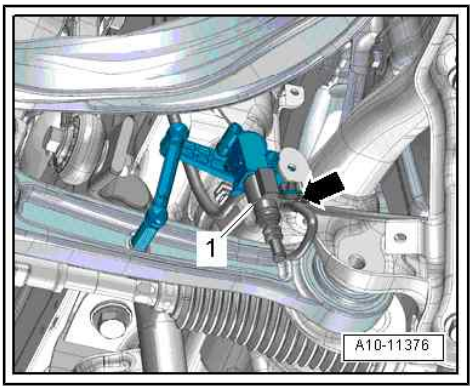
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– Unplug electrical connector -arrow- at front wheel speed sensor on both sides (-G45- and -G47-).



– If fitted, unplug electrical connector -1- at front vehicle level senders on both sides (-G78- and -G289-) and move electrical wiring clear -arrow-.

– Remove brake caliper and tie up in wheel housing with wire (brake hose remains attached) ⇒ Brake system; Rep. gr. 46 ; Front brakes; Removing and installing brake caliper .



Caution

Risk of damage to brake pistons.

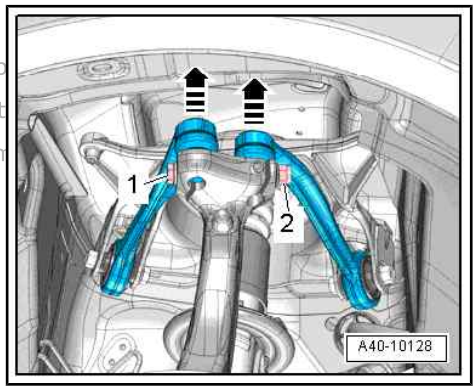
- ***Do not press brake pedal with brake caliper removed.***

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– Remove nut -2- and pull out bolt -1-.

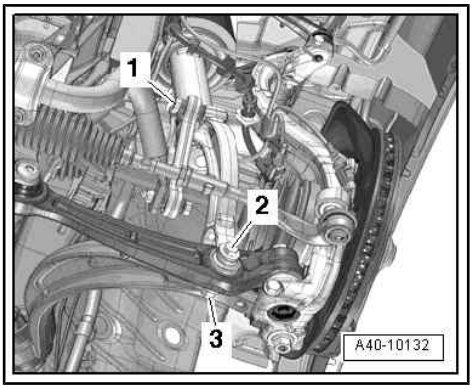
– Pull upper suspension links upwards out of wheel bearing housing -arrows-.

– Repeat procedure on opposite side of vehicle.



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

– Remove nut -3- on both sides.



Note

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

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

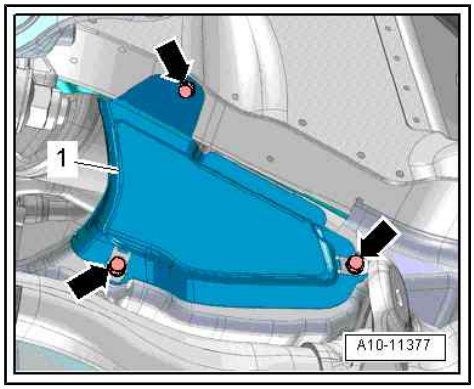
Caution

Risk of damage to running gear components.

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

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

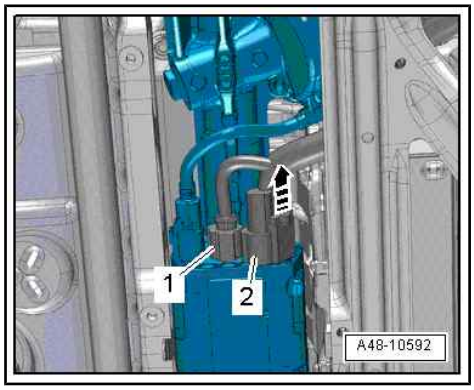
– Detach intermediate steering shaft from steering rack and move clear by telescoping splines together ⇒ Running gear, axles, steering; Rep. gr. 48 ; Steering column; Removing and installing intermediate steering shaft .



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

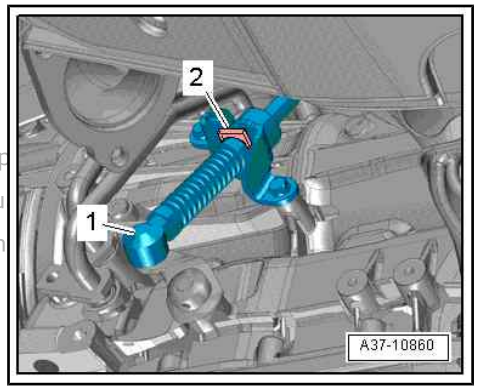
– Unplug electrical connector -1- at power steering control unit - J500- .

– Move electrical wiring harness clear.



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

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



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Note

- *Take care not to bend or kink selector lever cable.*
- *If separating the engine from the gearbox for subsequent work, unscrew the bolted connection securing the drive plate to the flywheel/torque converter ⇒ page 134 .*

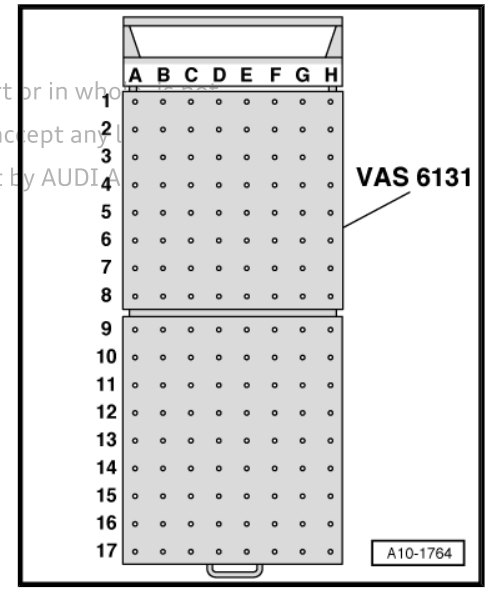
Set up the scissor-type assembly platform as follows:

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

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Platform coordinates	Parts of support set for Audi - VAS 6131/10- , support set -VAS 6131/11- and supplementary set - VAS 6131/13-			
B4	/13-4	/10-4	/10-5	/13-1
G4	/13-4	/10-4	/10-5	/13-1
B6	/10-1	/10-2	/10-5	/11-2
G6	/10-1	/10-2	/10-5	/11-2
A8+C8	/13-6			/13-2
F8+H8	/13-5			/13-2
B14	/10-1	/10-4	/10-5	/10-7
G14	/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 system.



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

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

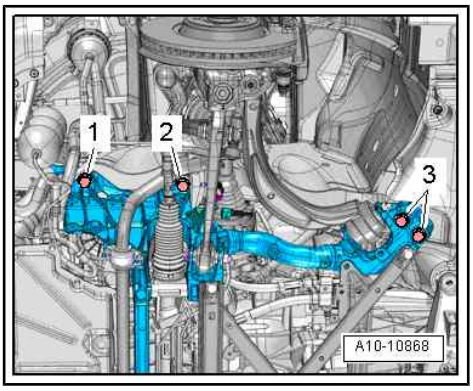
• Take note of spirit level (bubble gauge).

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

WARNING

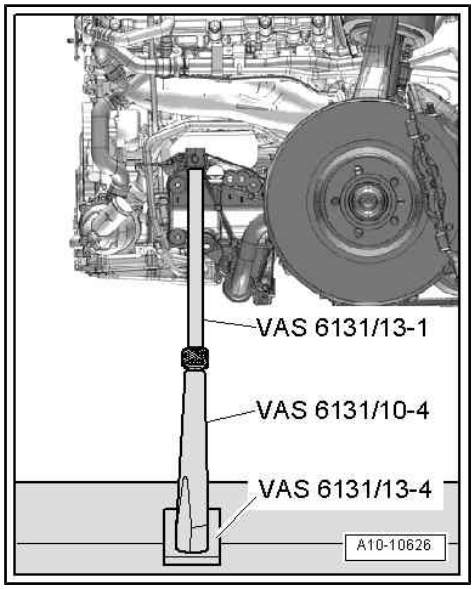
Accident risk if subframe mountings are detached.

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

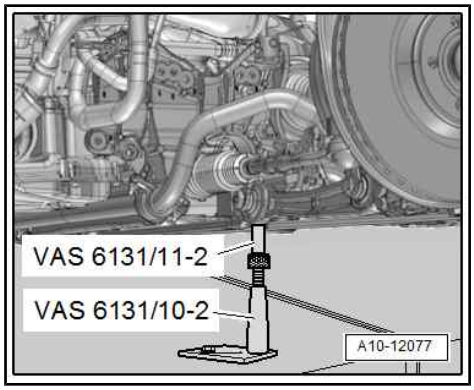


– Remove subframe bolts -1- on both sides.

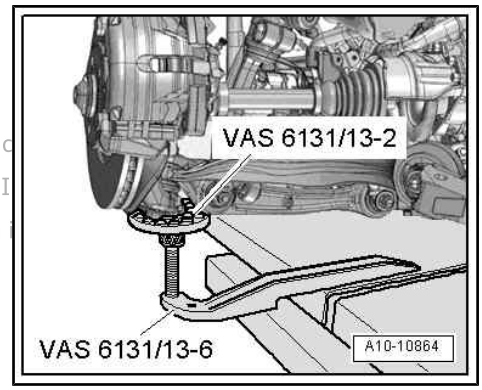
– Position support elements from -VAS 6131/10- and -VAS 6131/13- at front left and right of subframe as shown.
– Make sure that threaded spindles are screwed in completely.



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

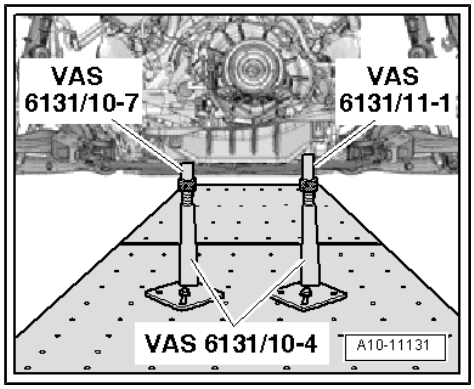


– Position support elements from -VAS 6131/13- under left and right wheel bearing housings as shown.

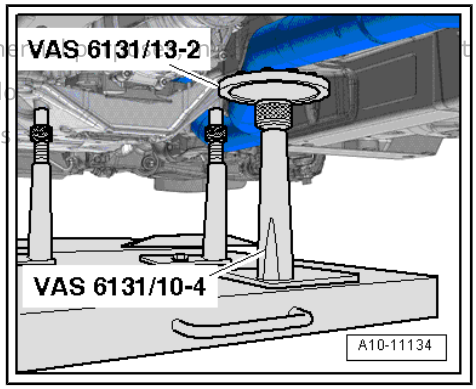


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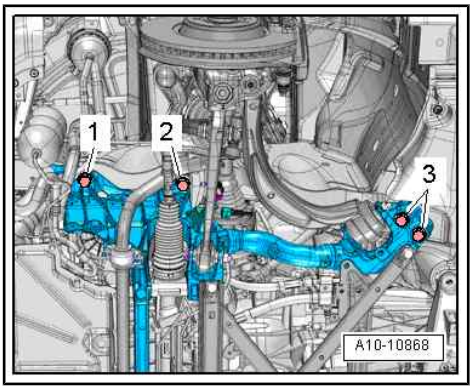
– Position support elements from -VAS 6131/10- at rear of cross member on both sides, as shown in illustration.



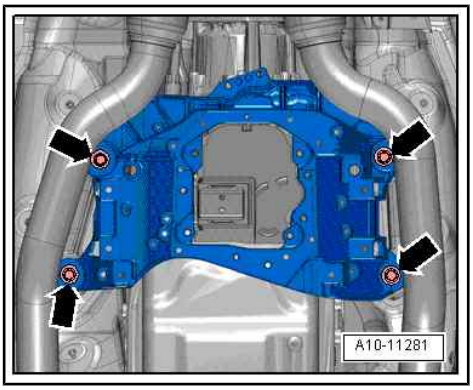
– Position support elements from -VAS 6131/10- and -VAS 6131/13- underneath front exhaust pipe, as shown in illustration.
– Turn all spindles for support elements upwards until all locating lugs make contact with mounting points.
– Tighten base plates for support elements to 20 Nm on scissor-type assembly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



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



– Remove bolts -arrows- on tunnel cross member.

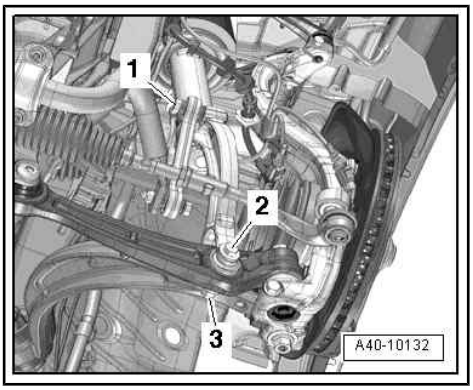


– Remove bolt -2- on both sides.

Caution

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

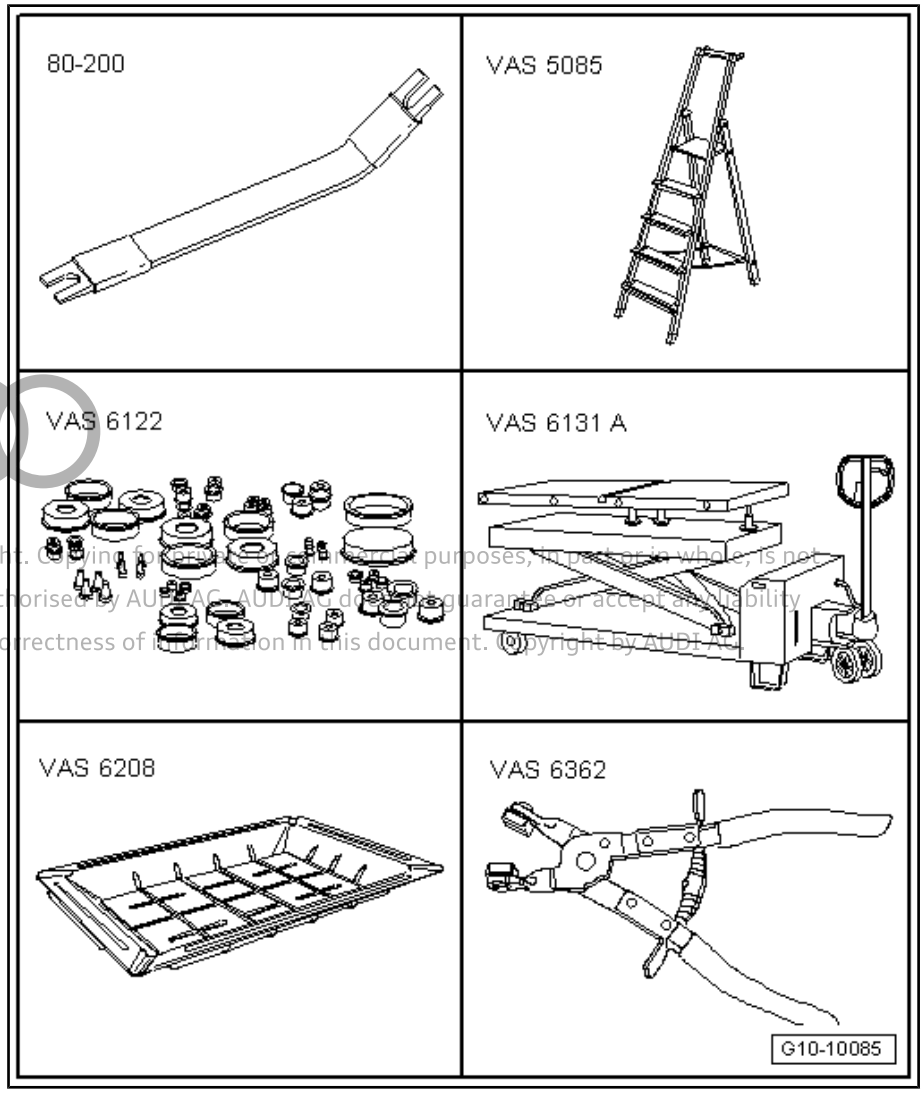
- *Check that all hoses and wiring connections between engine, gearbox, subframe and body have been detached.*
- *Carefully guide out engine/gearbox assembly with subframe from engine compartment when lowering.*
- *Carefully guide suspension struts past longitudinal members.*



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

1.1.6 Removing engine - vehicles with biturbo engine

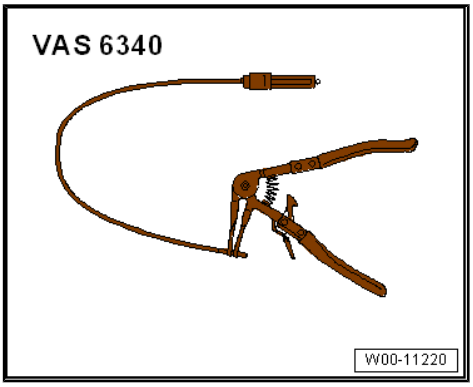
Special tools and workshop equipment required



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

- Hose clip pliers - VAS 6340-



Procedure

Note

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

WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system ⇒ page 7 .*

WARNING

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

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

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

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

– Bring front wheels into straight-ahead position.

Caution

Risk of irreparable damage to electronic components.

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

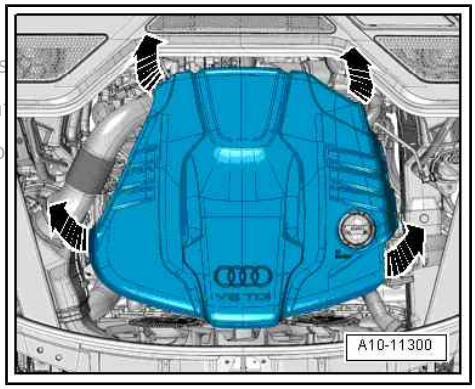
– Switch off ignition.

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

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– Remove engine cover panel -arrows-.

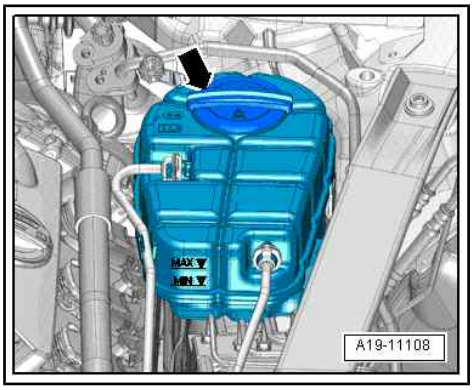


– Discharge refrigerant system ⇒ Air conditioner with refrigerant R134a .
– Remove lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing attachments .

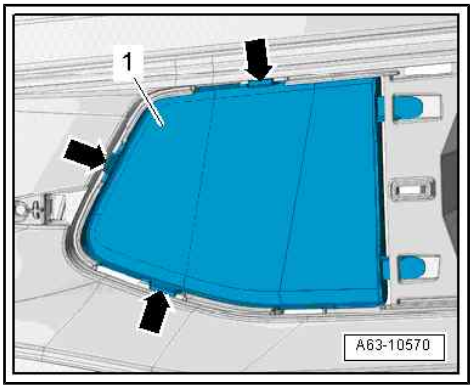
WARNING

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 -arrow- on coolant expansion tank.
– Remove both front wheels ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres .
– Remove wheel housing liners (front left and front right) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Removing and installing wheel housing liner (front) .
– Remove wheel spoilers (front left and front right) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Removing and installing wheel housing liner (front) .
– Remove noise insulation panels ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .
– Remove air intake grille (right-side) ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing attachments .
– If fitted, release fasteners -arrows- and detach cover -1- (right-side).



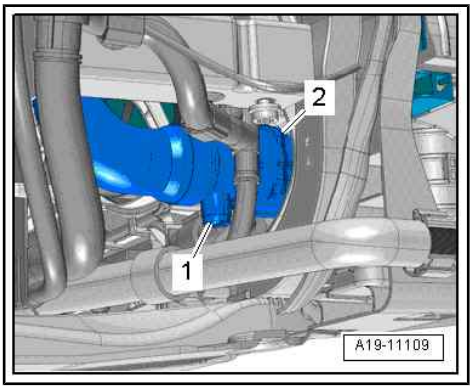
Note

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

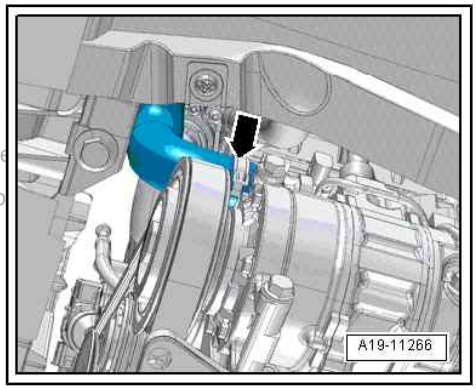
– Place drip tray for workshop hoist - VAS 6208- beneath engine.

– Remove drain plug -1- and drain off coolant.

– Lift retaining clip -2- and disconnect coolant hose from radiator.



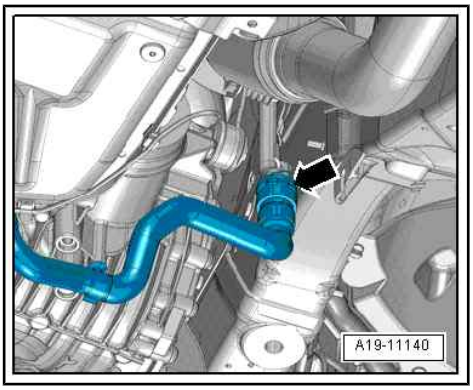
– Release hose clip -arrow-, disconnect coolant hose from coolant pipe (bottom left) and drain off coolant.



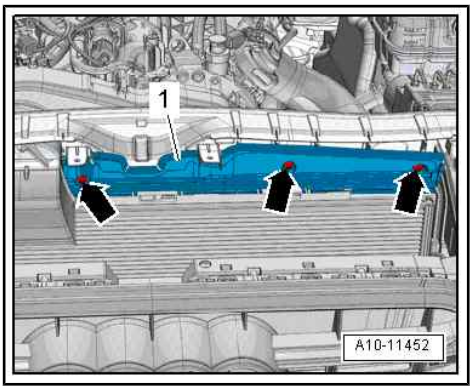
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– Lift retaining clip -arrow-, disconnect coolant hose (rear right) and drain off coolant.

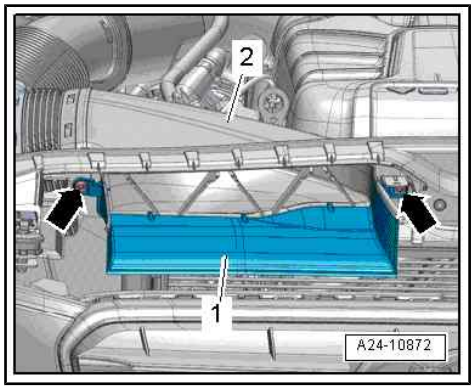
– Remove plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .



– Remove bolts -arrows- and detach air duct -1-.



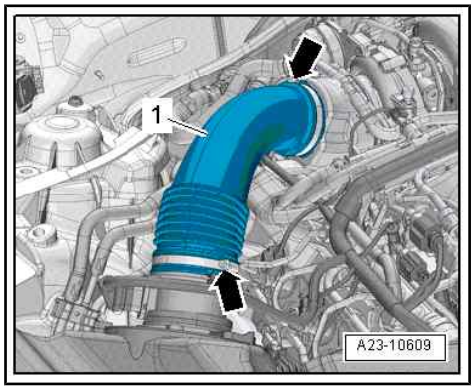
– Remove bolts -arrows- and detach air duct -2-.



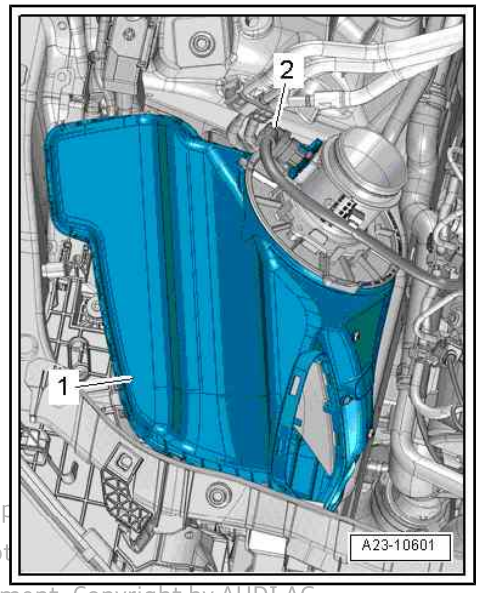
Note

Disregard -item 1-.

– Release hose clips -arrows- and detach air pipe -1-.



– Unplug electrical connector -2- at air mass meter - G70- and move clear.
– Lift off air cleaner housing -1-.

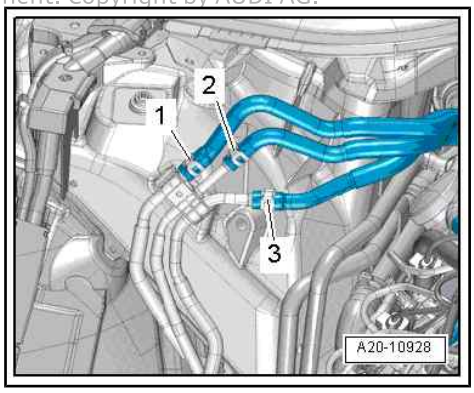


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Caution

Take care to keep components clean.

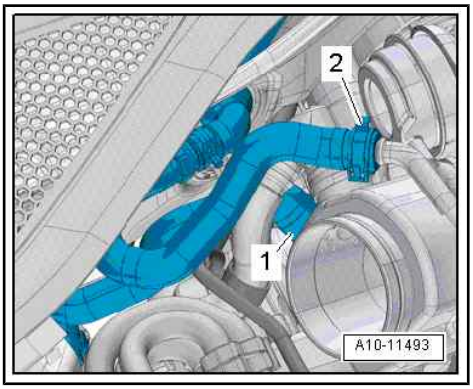
- ***Observe rules for cleanliness when working on the fuel supply system*** ⇒ page 8 .



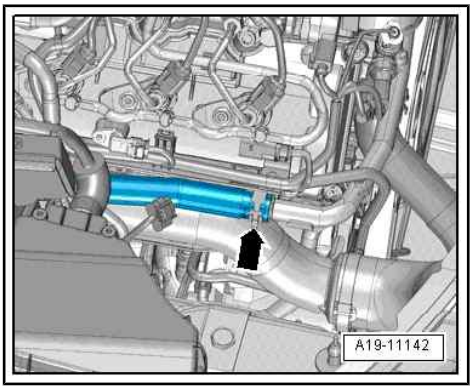
– Release hose clips and detach fuel hoses:

1 - Fuel hose (blue)
2 - Fuel hose (yellow)
3 - Fuel hose (white)

– Lift retaining clip -1- and disconnect coolant hose.
– Release hose clip -2- and detach vacuum hose.



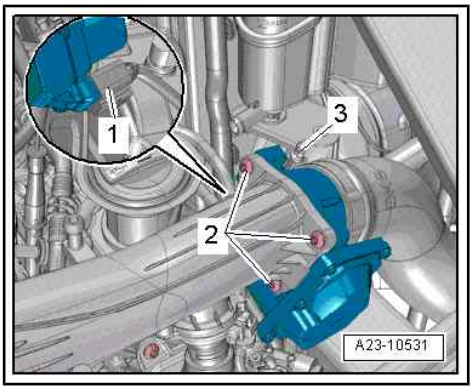
– Release hose clip -arrow- and disconnect coolant hose from coolant pipe (front).



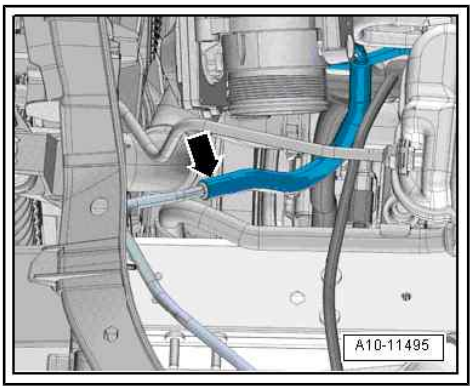
– Release hose clip -3- and detach air hose.

Note

Disregard items -1 and 2-.

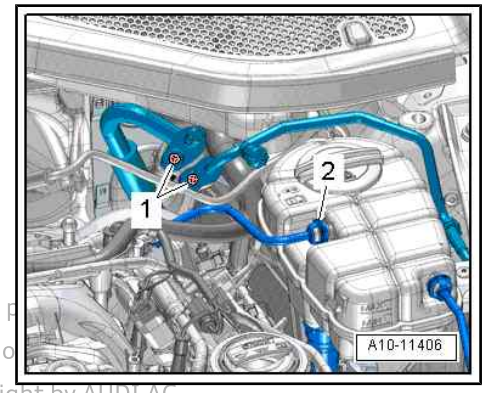


– Disconnect vacuum hose -arrow-.



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– Lift retaining clip -2- and disconnect coolant line.
– Remove bolts -1- and move refrigerant lines clear.

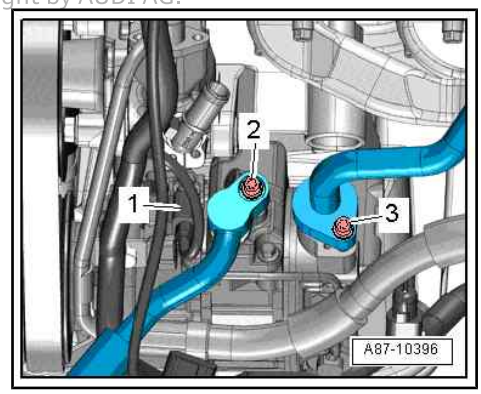


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Caution

Risk of damage to refrigerant lines and hoses

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

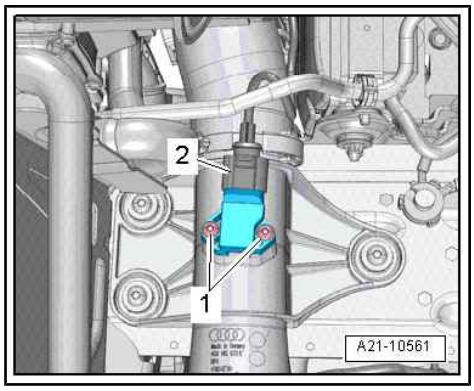


– Remove bolt -2-, disconnect refrigerant line from air conditioner compressor and move to one side.
– Seal off open lines and connections with clean plugs from engine bung set - VAS 6122- .

Note

Disregard items -1 and 3-.

– Unplug electrical connector -2- for charge pressure sender - G31- / intake air temperature sender - G42- and move clear electrical wiring.



Note

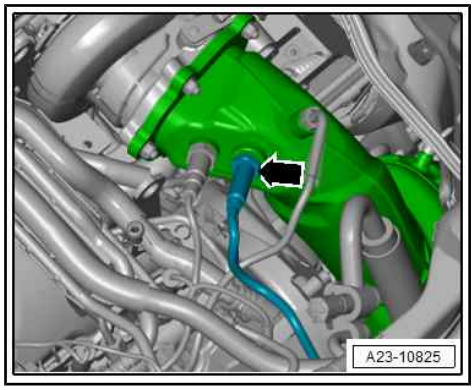
Disregard -item 1-.

Vehicles with SCR system:

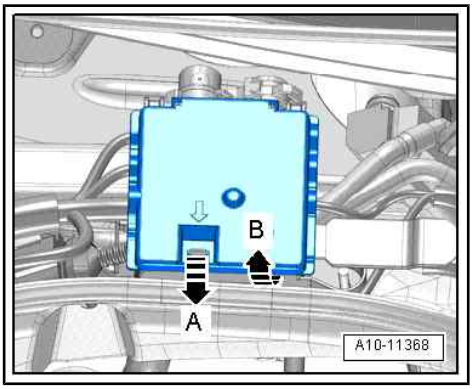
– Unscrew NOx sender - G295- -arrow- and move clear to left side.

All vehicles (continued):

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

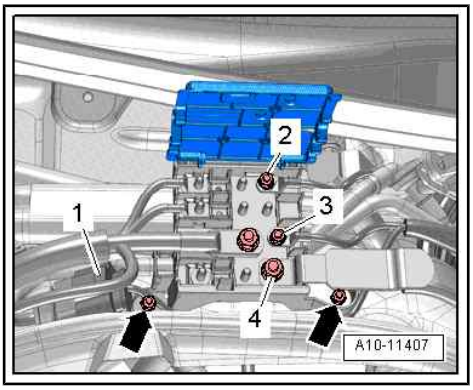


– Release retainer -arrow A- and open cover -arrow B-.



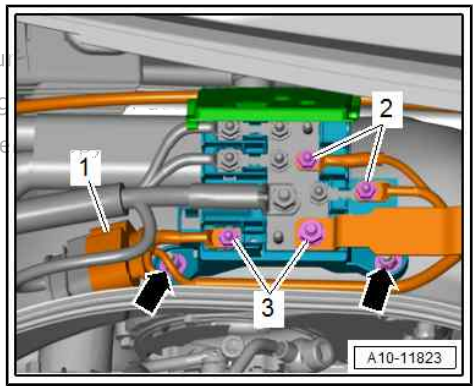
Vehicles without SCR system:

– Remove nuts -2, 3 and 4- and move electrical wiring clear.
– Detach electrical connector -1- from bracket and unplug.

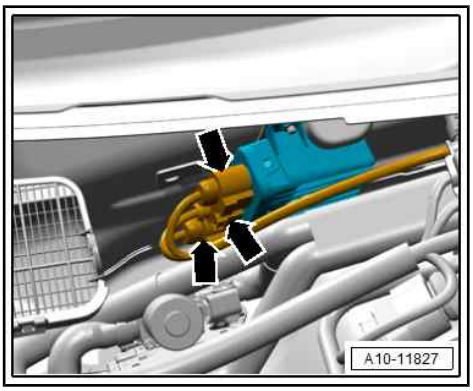


Vehicles with SCR system:

– Remove nuts -2 and 3- and move electrical wiring clear.
– Detach electrical connector -1- from bracket and unplug.
– Remove bolts -arrows- and detach terminal 30 wiring junction 2 - TV22- from plenum chamber partition panel.



– Unplug electrical connectors -arrows- from catalytic converter heater control unit 1 - J1021- and move electrical wiring harness clear.

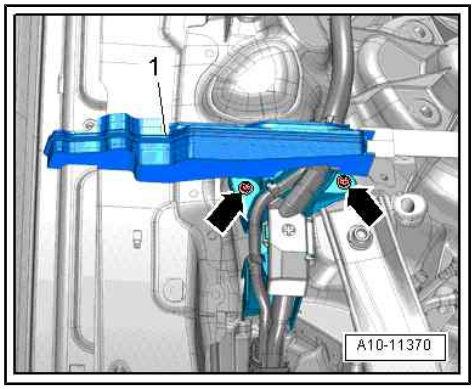


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All vehicles (continued):

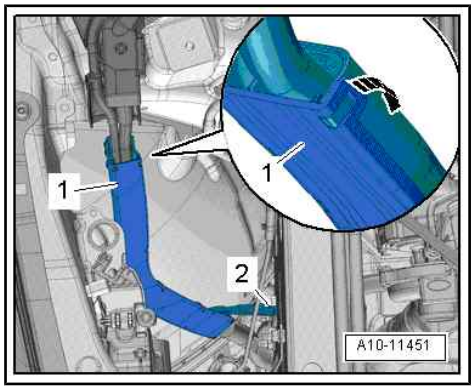
– Press foam wedge -1- to one side.

– Remove bolts -arrows-.

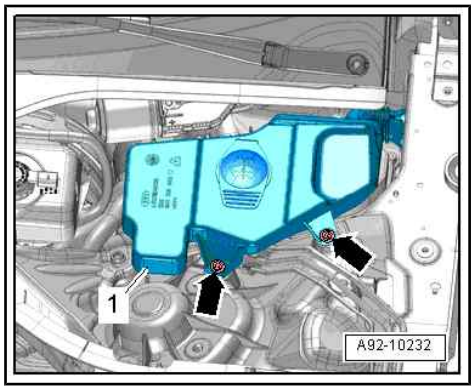


– Unscrew nut -2- on longitudinal member (right-side) and move earth cables clear.

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

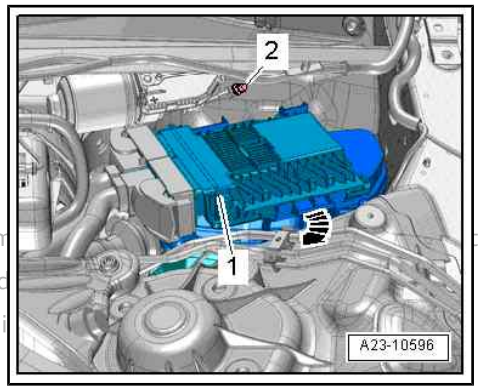


– Unscrew bolts -arrows- and pull filler neck -1- out of washer fluid reservoir and through opening in body to right side.



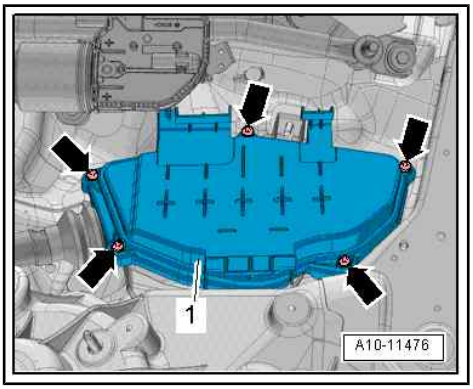
– Remove cap nut -2- and move earth wiring clear.

– Release fastener -arrow-, detach engine control unit - J623- -item 1- from bracket and swivel it to one side.

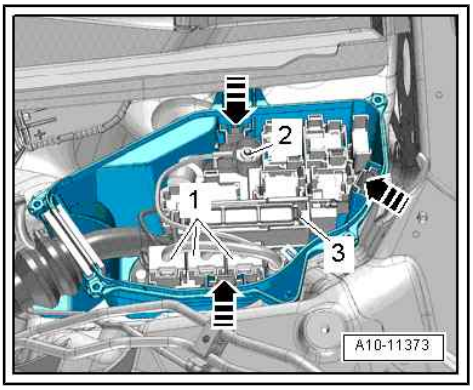


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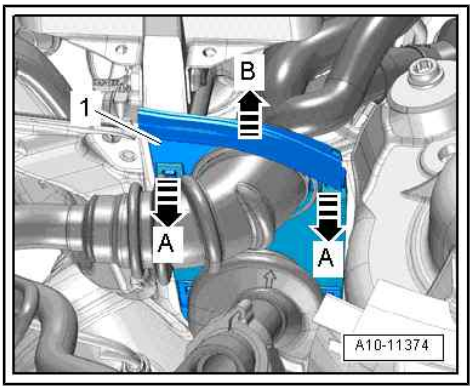
– Remove bolts -arrows- and detach cover -1- for electronics box in plenum chamber.



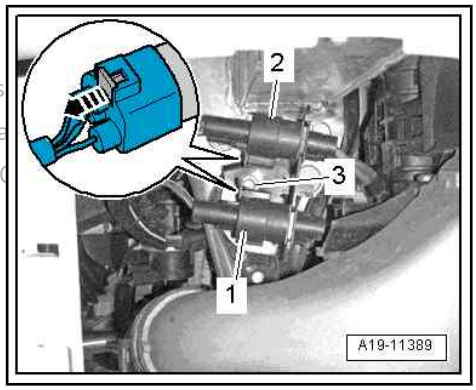
– Unplug electrical connectors -1- and unscrew nut -2- for electrical wiring.
– Release catches -arrows- and detach relay carrier with fuse holder -3-.
– Disengage engine wiring harness at electronics box in plenum chamber and move clear.



– Release catches -arrows A- and lift off wiring protector -1- -arrow B-.
– Place wiring harness on engine and secure engine/motor control unit - J623- to prevent it from dropping.



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

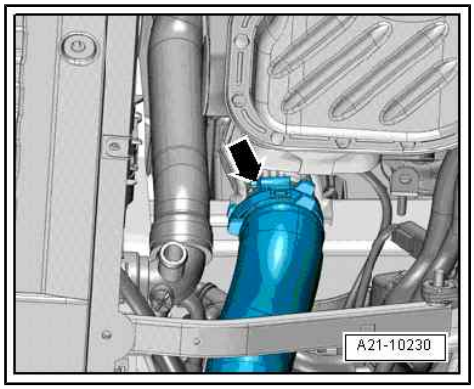


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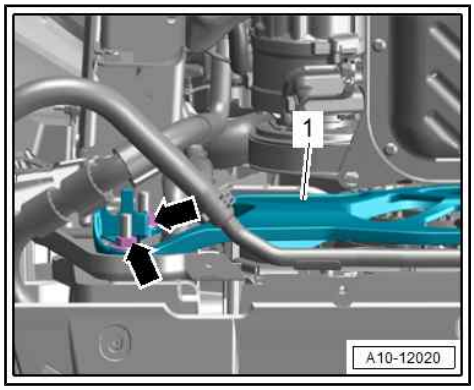
Note

Disregard -item 3-.

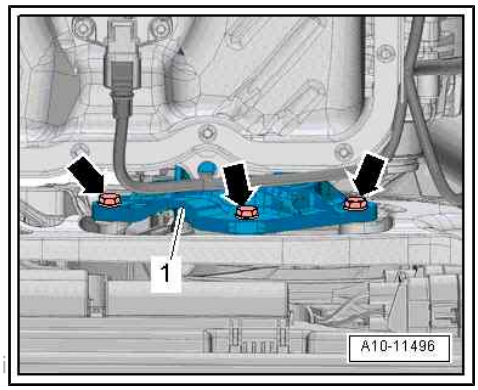
– Release hose clip -arrow- and detach air hose from air pipe.



– Unscrew nuts -arrows- on left and right of cross piece (leave cross piece -1- in installation position).

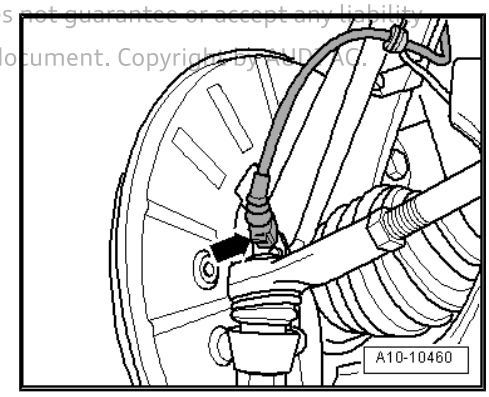


– Unscrew bolts -arrows- and press stop -1- for torque reaction support towards engine.

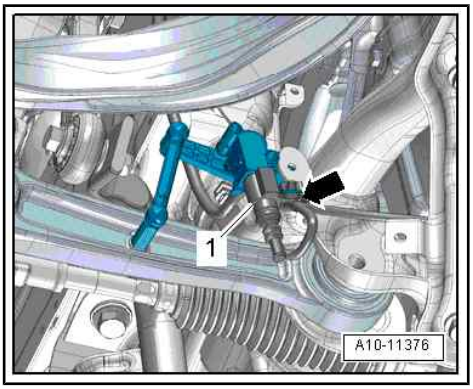


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– Unplug electrical connector -arrow- at front wheel speed sensor on both sides (-G45- and -G47-).



– If fitted, unplug electrical connector -1- at front vehicle level senders on both sides (-G78- and -G289-) and move electrical wiring clear -arrow-.
– Remove brake caliper and tie up in wheel housing with wire (brake hose remains attached) ⇒ Brake system; Rep. gr. 46 ; Front brakes; Removing and installing brake caliper .

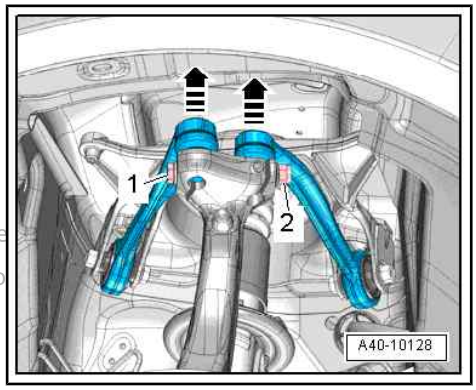


Caution

Risk of damage to brake pistons.

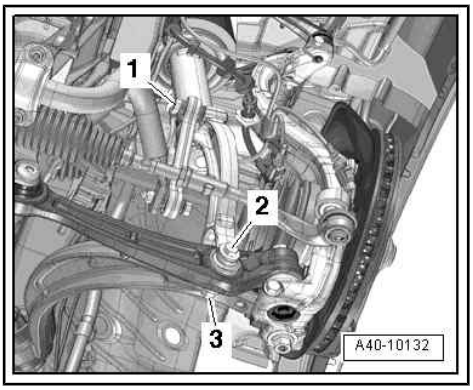
- *Do not press brake pedal with brake caliper removed.*

– 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.



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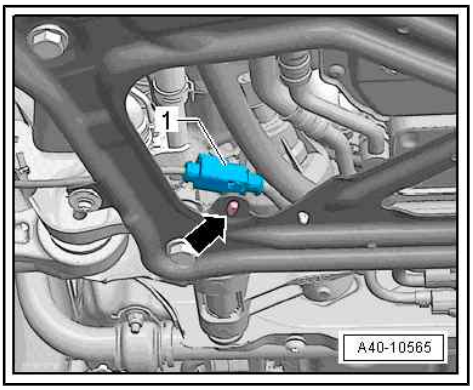
– Remove bolt -1- for anti-roll bar on both sides.
– Remove nut -3- on both sides.



Note

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

– Detach intermediate steering shaft from steering rack and move clear by telescoping splines together ⇒ Running gear, axles, steering; Rep. gr. 48 ; Steering column; Removing and installing intermediate steering shaft .
– Move clip clear -arrow-.
– Unplug electrical connector -1- and move wiring clear.
– Remove subframe cross brace ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Removing and installing subframe cross brace .



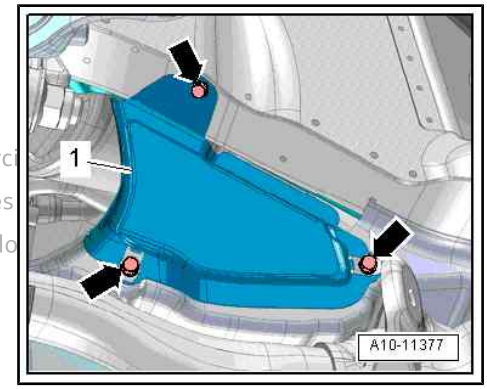
Caution

Risk of damage to running gear components.

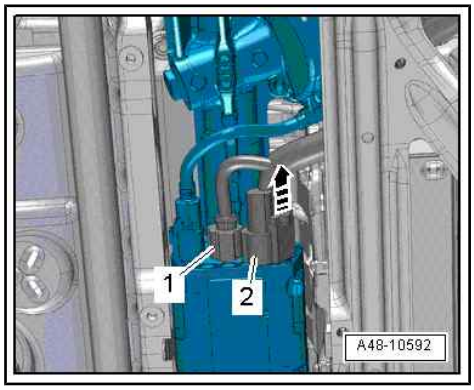
- *The vehicle must NOT be lowered onto its wheels if the engine/gearbox mountings, steering rack or subframe cross brace are not properly installed.*

– Remove bolts -arrows- on both sides and detach heat shield -1-.
– Remove propshaft ⇒ Rear final drive; Rep. gr. 39 ; Propshaft; Removing and installing propshaft .

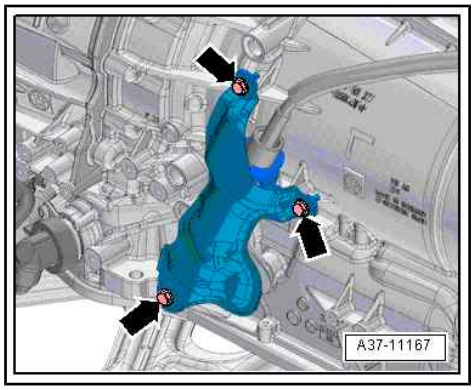
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– Unplug electrical connector -2- at power steering control unit - J500- (release retainer -arrow- and press down release catch).
– Unplug electrical connector -1- at power steering control unit - J500- .
– Move electrical wiring harness clear.



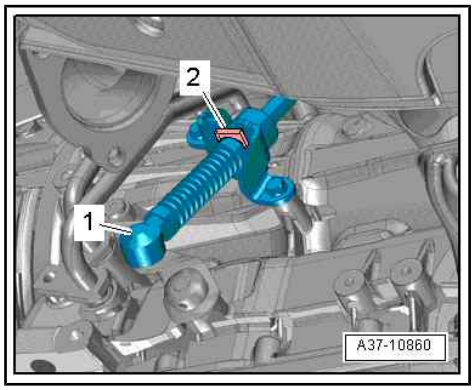
– If fitted, unscrew bolts -arrows- and detach heat shield.



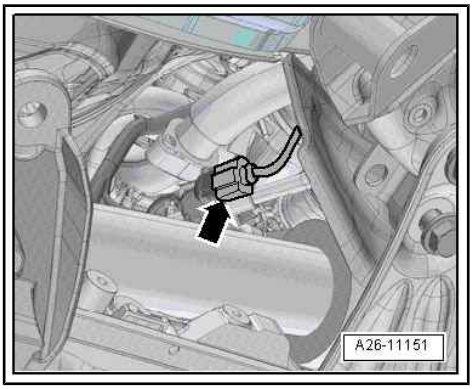
– Pry ball socket -1- of selector lever cable off gearbox selector lever using removal lever - 80 - 200- .
– Press off securing clip -2- and remove selector lever cable from gearbox.

Note

Take care not to bend or kink selector lever cable.



– Unplug electrical connector -arrow-.



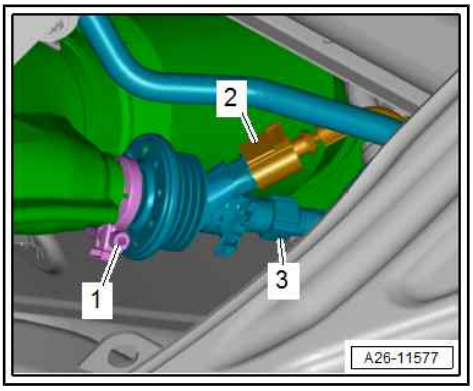
Note

If engine is to be separated from gearbox, detach electrical connector from bracket.

Vehicles with SCR system:

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

– Release retaining clip -1-, move injector for reducing agent - N474- with metering line -3- clear at tunnel cross member and tie up to underbody.

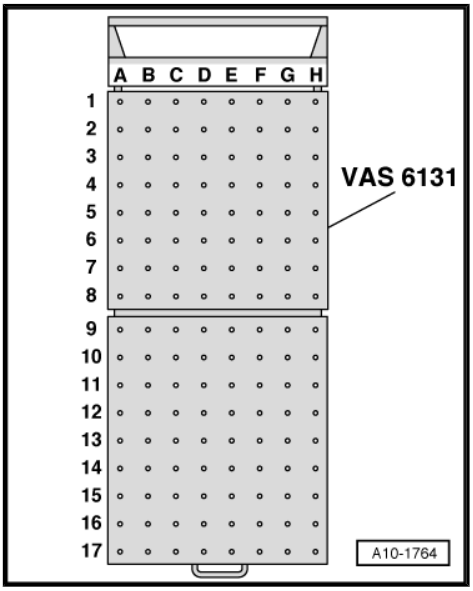


Note

If separating the engine from the gearbox for subsequent work, unscrew the bolted connection securing the drive plate to the flywheel/torque converter *⇒ page 141* *.*

Set up the scissor-type assembly platform as follows:

– Set up scissor-type assembly platform - VAS 6131 B- 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	/13-5			/13-2
B14	/10-1	/10-4	/10-5	/10-7
G14	/10-1	/10-4	/10-5	/11-1

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

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

- Take note of spirit level (bubble gauge).

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

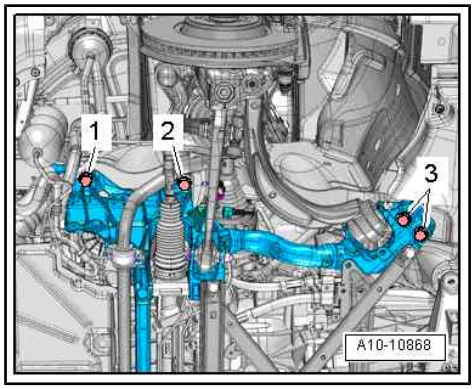
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WARNING

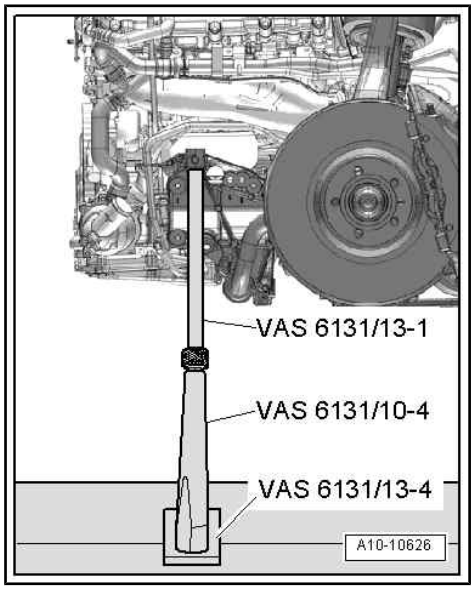
Accident risk if subframe mountings are detached.

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

– Remove subframe bolts -1- on both sides.

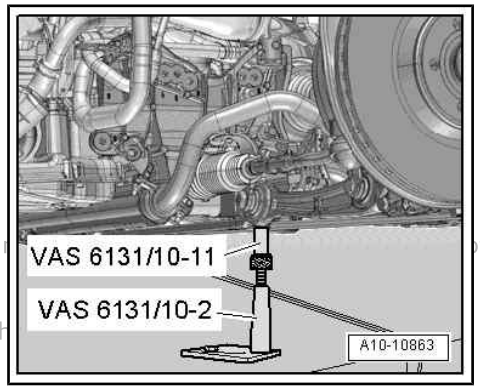


– Position support elements from -VAS 6131/10- and -VAS 6131/13- at front left and right of subframe as shown.
– Make sure that threaded spindles are screwed in completely.

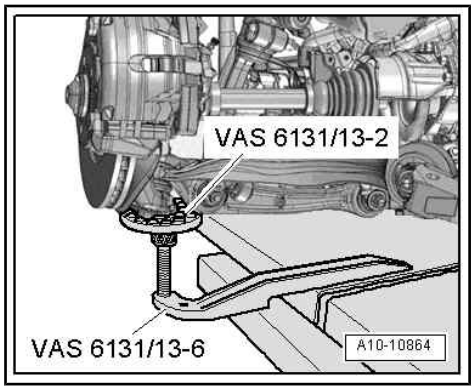


– Position support elements from -VAS 6131/10- (rear left and right) at front attachment points of subframe cross brace as shown.

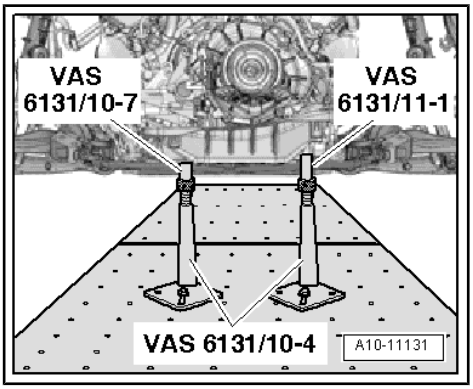
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– Position support elements from -VAS 6131/13- under left and right wheel bearing housings as shown.

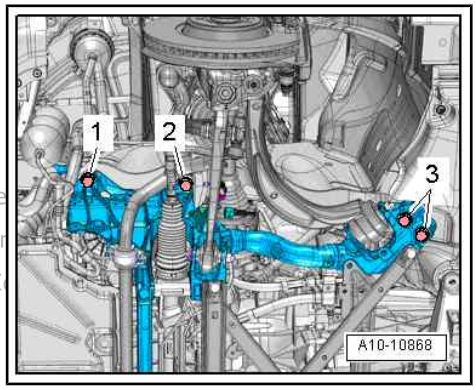


– Position support elements from -VAS 6131/10- and -VAS 6131/11- (rear left and right) at tunnel cross member as shown.
– Turn all spindles for support elements upwards until all locating lugs make contact with mounting points.
– Tighten base plates for support elements to 20 Nm on scissor-type assembly platform - VAS 6131 B- .

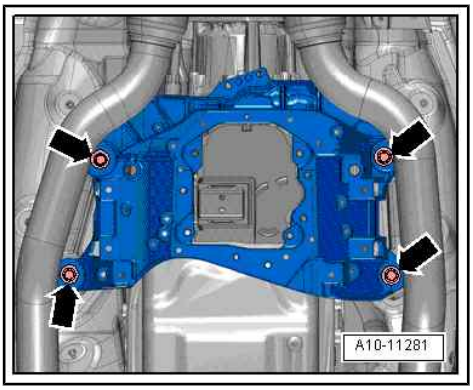


– Mark installation position of subframe and tunnel cross member on longitudinal members with felt-tip pen.
– Unscrew subframe bolts -2- and -3- on both sides in several stages and in diagonal sequence.

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– Remove bolts -arrows- on tunnel cross member.

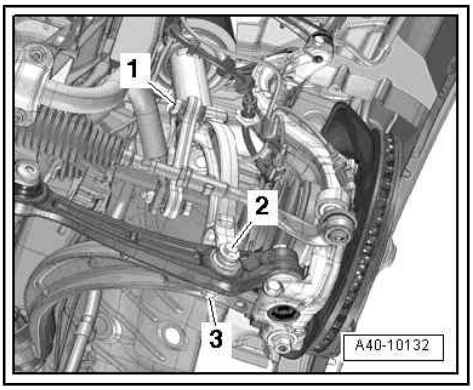


– Remove bolt -2- on both sides.

Caution

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

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



– Lower engine/gearbox assembly.
– Pull out scissor-type assembly platform - VAS 6131 B- 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 102

⇒ “1.2.2 Separating engine and gearbox - vehicles with multitronic gearbox”, page 108

⇒ “1.2.3 Separating engine and gearbox - vehicles with dual clutch gearbox 0B5”, page 115

⇒ “1.2.4 Separating engine and gearbox - vehicles with dual clutch gearbox 0CK”, page 122

⇒ “1.2.5 Separating engine and gearbox - vehicles with automatic gearbox”, page 130

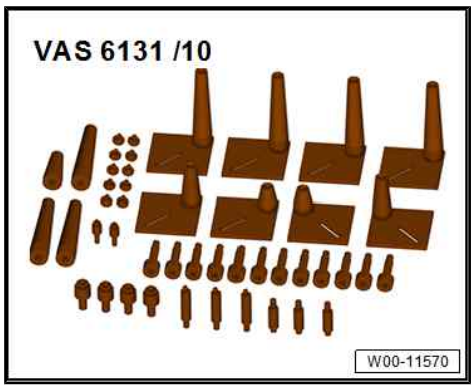
⇒ “1.2.6 Separating engine and gearbox - vehicles with biturbo engine ”, page 136

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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-

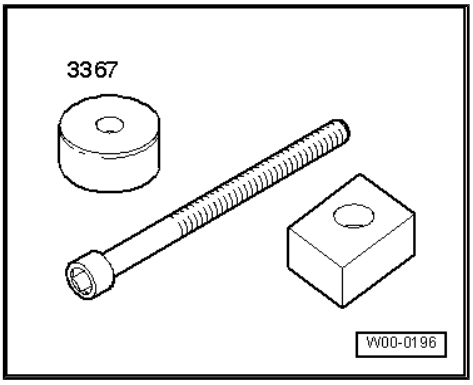


- Support -VAS 6131/13-7- from support set, Audi Q7 >2005 - VAS 6131/13-

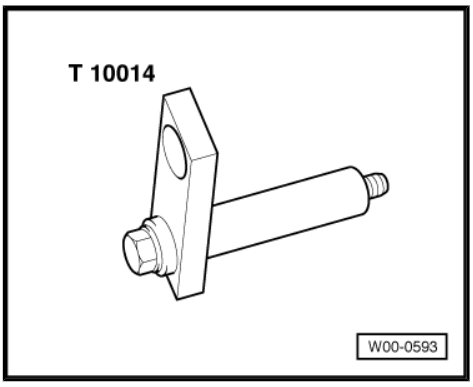


- Gearbox support - VAS 6131/14-

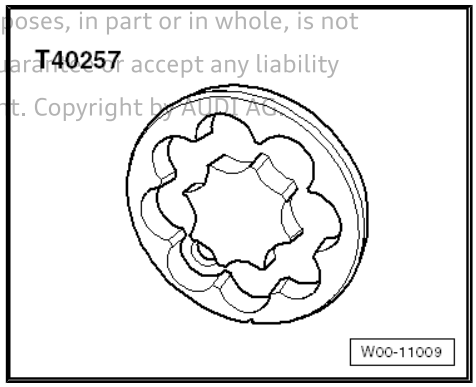
- Bolt -3367/3- from viscous fan fitting tool - 3367-



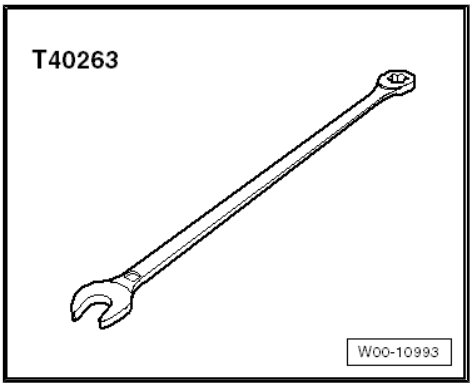
- Bracket - T10014-



- Turning-over tool - T40257-

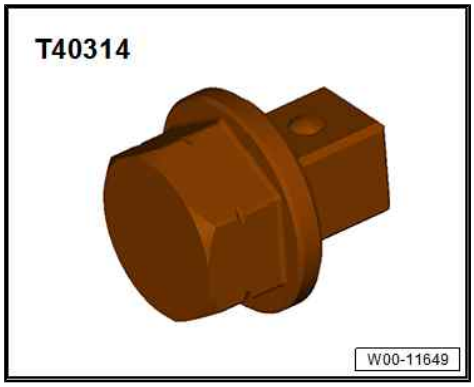


- Wrench, 21 mm - T40263-



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♦ Adapter -T40314-



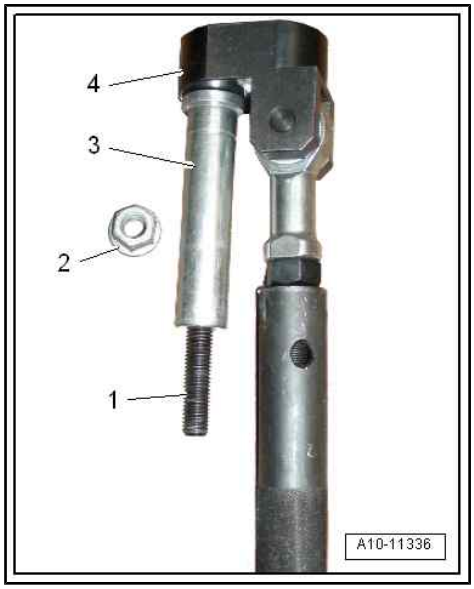
Setting up support -VAS 6131/13-7- :

1 - Bolt -3367/3- from viscous fan fitting tool - 3367-

2 - Nut M10

3 - Bracket - T10014-

4 - Support -VAS 6131/13-7-

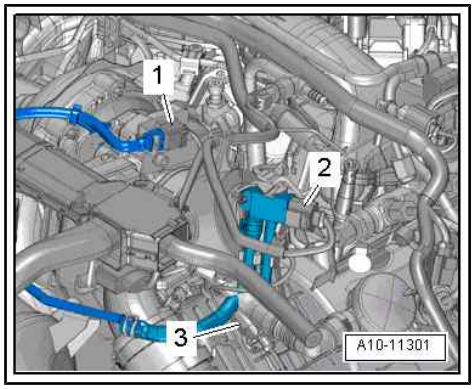


Procedure

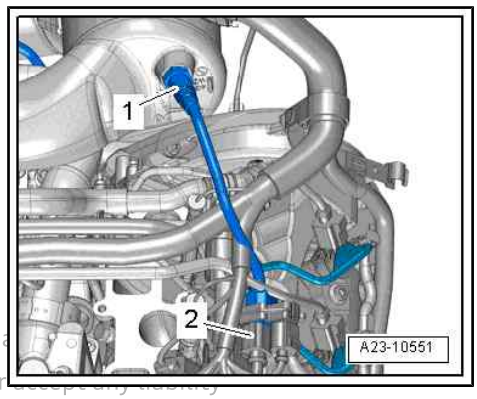
- Engine/gearbox assembly removed and secured to scissor-type assembly platform - VAS 6131 B-

– Take electrical connectors -1, 3- out of bracket, unplug connectors and move electrical wiring clear.

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



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

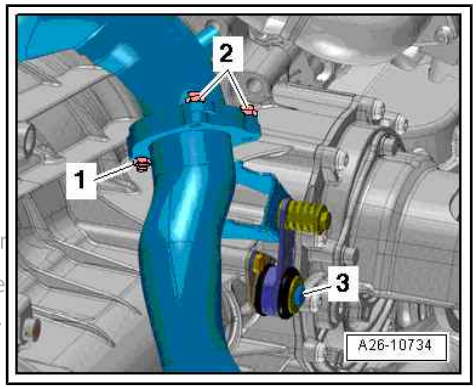


Note

Disregard -item 1-.

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– Remove bolt -3-.

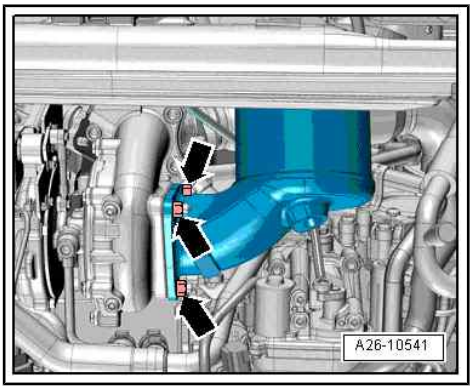


Note

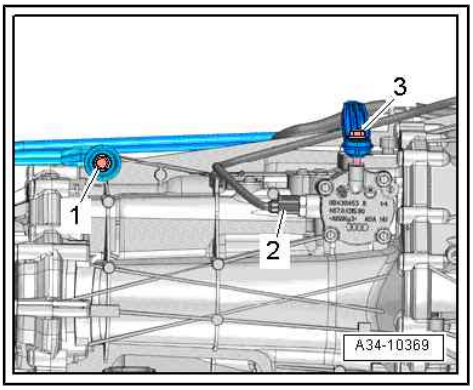
Disregard items -1 and 2-.

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



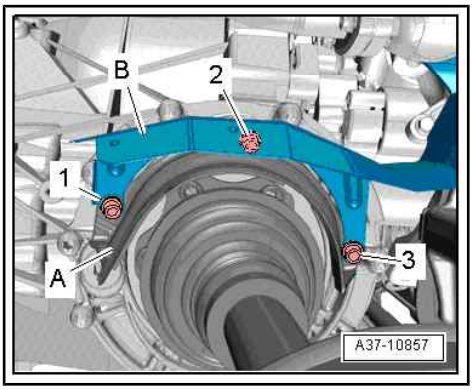
– Unplug electrical connector -2- at gear detection sensor - G604- and move electrical wiring clear.



Note

Disregard items -1 and 3-.

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

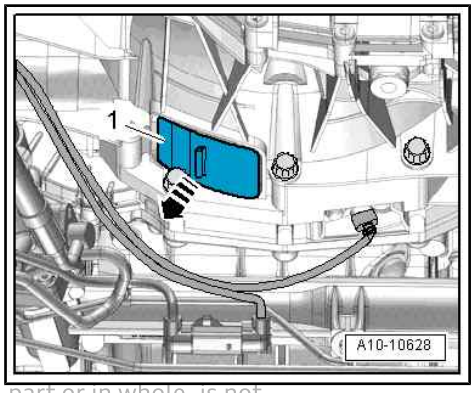


Note

Disregard -item A-.

– Unbolt drive shaft (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.

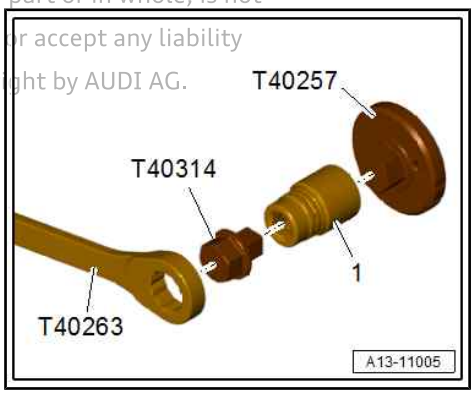
– Detach bottom cover -1- from gearbox -arrow-.



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– Assemble tools as shown in illustration.

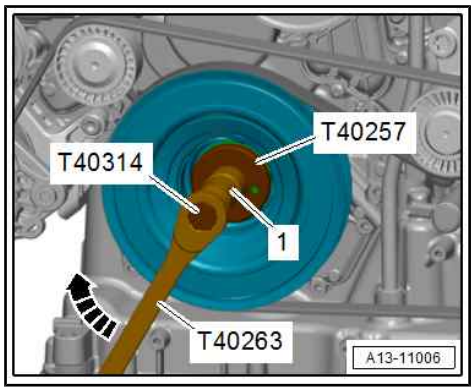
1 - Socket (21 mm) for 1/2" drive



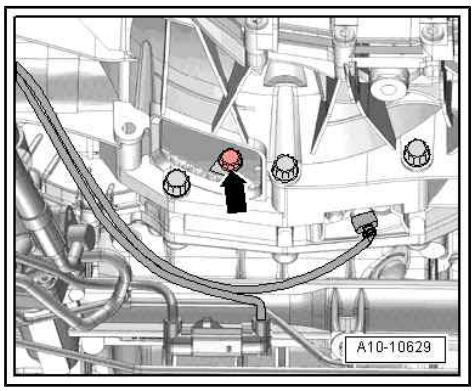
– Counterhold crankshaft to slacken bolts for dual-mass flywheel.

Note

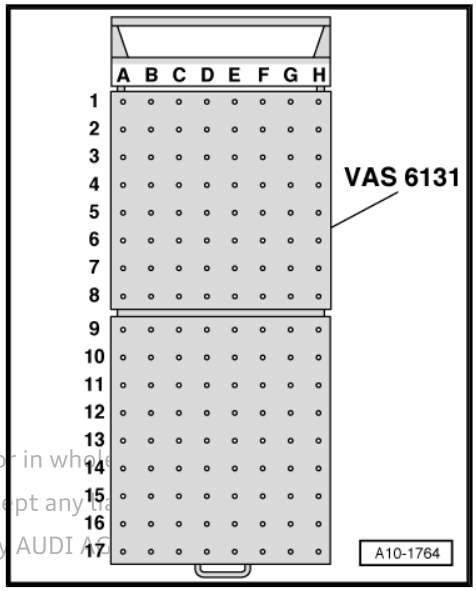
When performing the next step, turn the crankshaft only in the normal direction of rotation -arrow-.



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



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



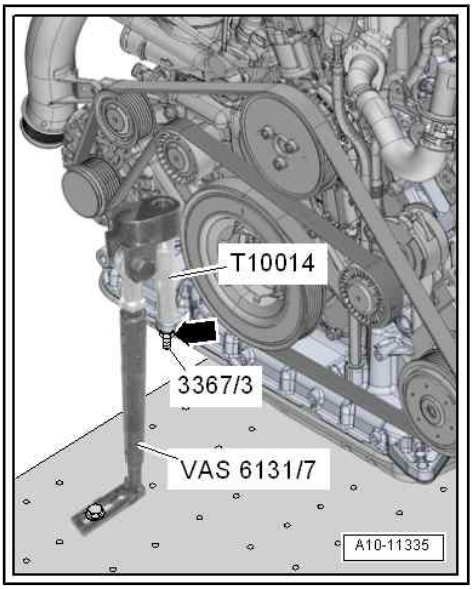
Note

The other support elements remain unchanged.

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

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– Secure support -VAS 6131/13-7- at front of engine (right-side) with M10 nut -arrow-, as illustrated.



Note

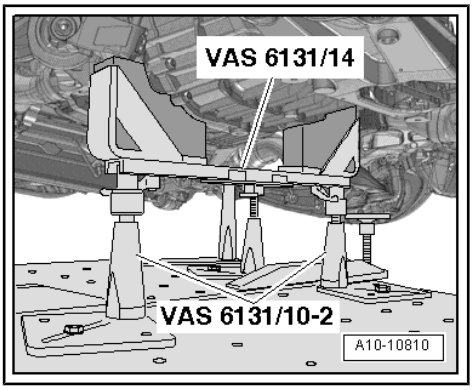
If bore has no thread, tap hole.

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

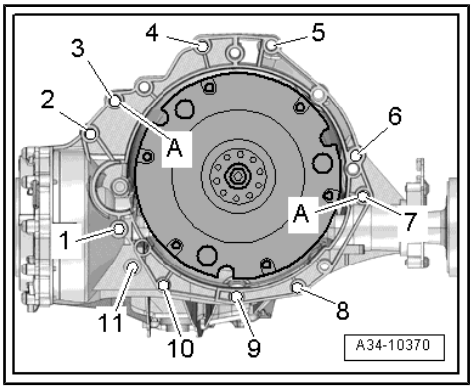
– Position support elements from -VAS 6131/10- and gearbox support - VAS 6131/14- at front of gearbox, as illustrated.

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

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



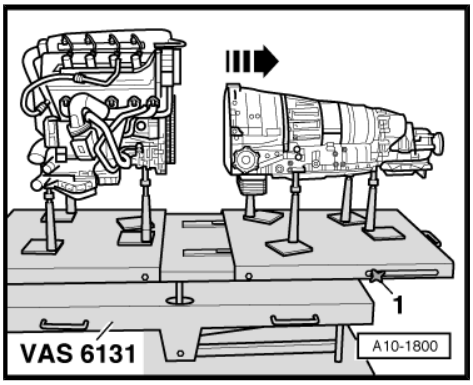
– Remove bolts -1- and -2- for starter.
– Separate starter from gearbox and leave in position.
– Unscrew remaining bolts -3 ... 11- securing engine to gearbox.



Note

Disregard -item A-.

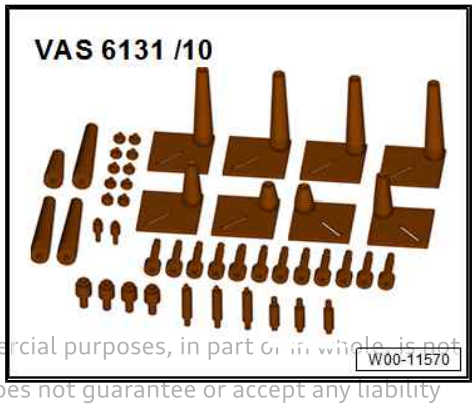
– Loosen clamping bolts -1- on sides of scissor-type assembly platform - VAS 6131 B- and pull rear section of platform together with gearbox towards rear -arrow-.



1.2.2 Separating engine and gearbox - vehicles with multitronic gearbox

Special tools and workshop equipment required

♦ Support set for Audi - VAS 6131/10-



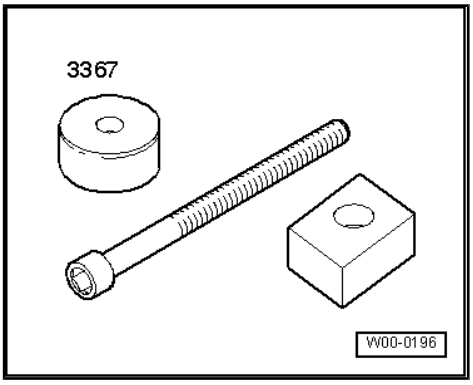
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♦ Support -VAS 6131/13-7- from support set, Audi Q7 >2005 - VAS 6131/13-

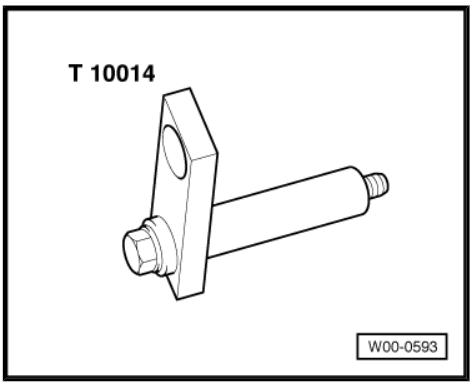


♦ Gearbox support - VAS 6131/14-

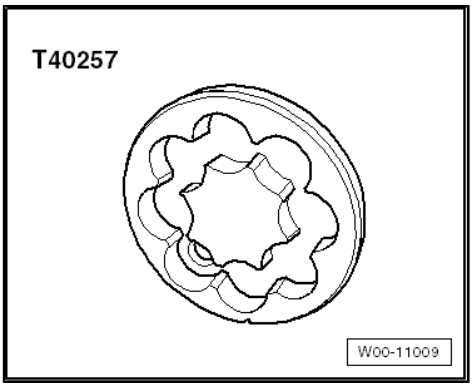
- Bolt -3367/3- from viscous fan fitting tool - 3367-



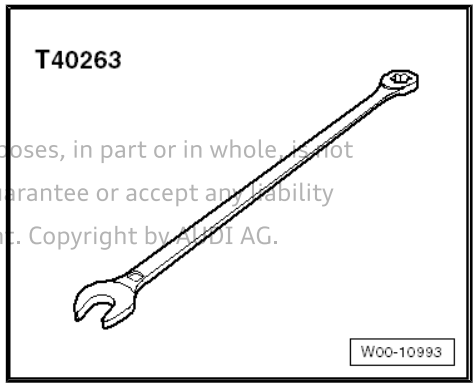
- Bracket - T10014-



- Turning-over tool - T40257-



- Wrench, 21 mm - T40263-



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- Adapter -T40314-



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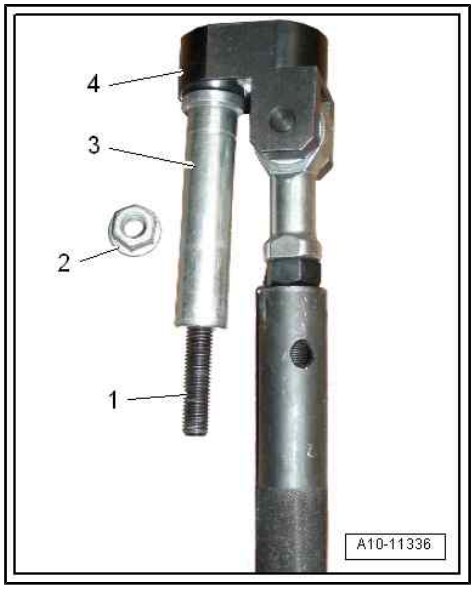
Setting up support -VAS 6131/13-7- :

1 - Bolt -3367/3- from viscous fan fitting tool - 3367-

2 - Nut M10

3 - Bracket - T10014-

4 - Support -VAS 6131/13-7-



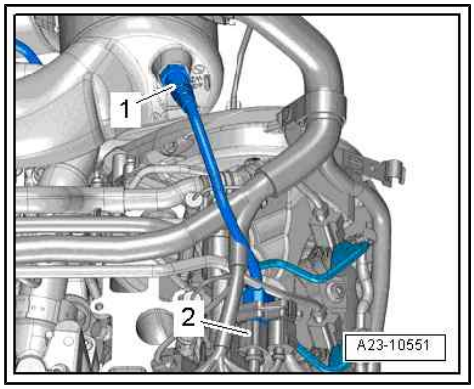
Procedure

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

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

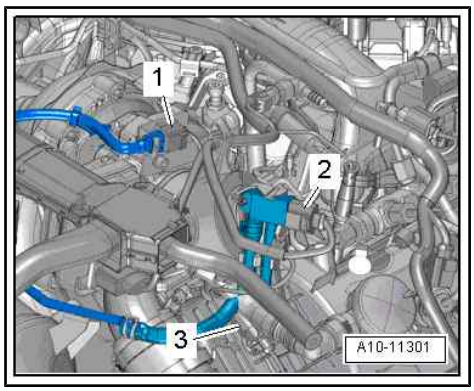
Note

Disregard -item 1-.

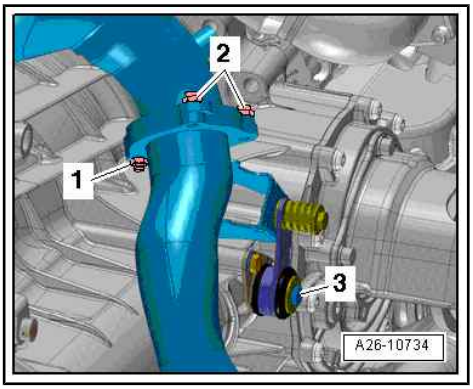


– Take electrical connectors -1, 3- out of bracket, unplug connectors and move electrical wiring clear.

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



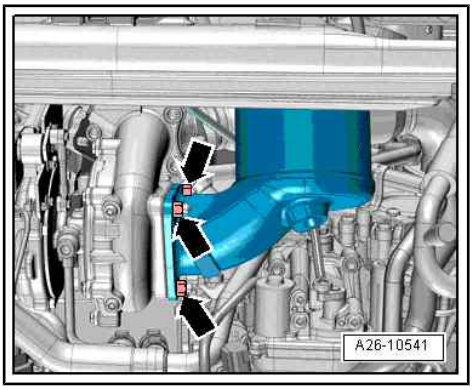
– Remove bolt -3-.



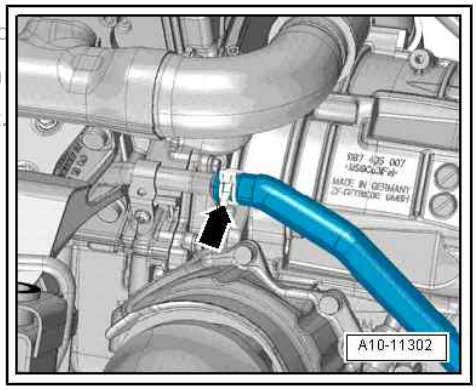
Note

Disregard items -1 and 2-.

– Unscrew nuts -arrows- and detach particulate filter with front exhaust pipe.
– Unbolt drive shaft (left and right) from gearbox flange shafts ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .



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

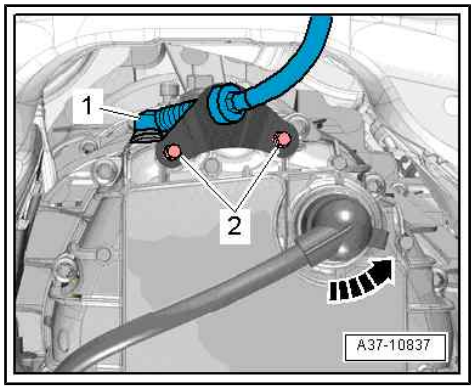


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Caution

Risk of irreparable damage to gearbox control unit (mechatronic unit) because of electrostatic 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 harness clear at gearbox.

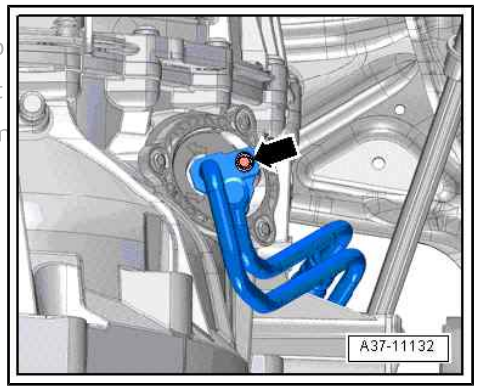
Note

Disregard items -1 and 2-.

Note

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Place a cloth underneath to catch escaping ATF.

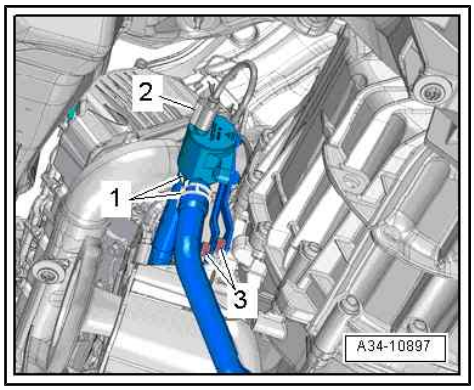


– Remove bolt -arrow- and detach ATF lines from gearbox.

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

– Unplug electrical connector -2-.

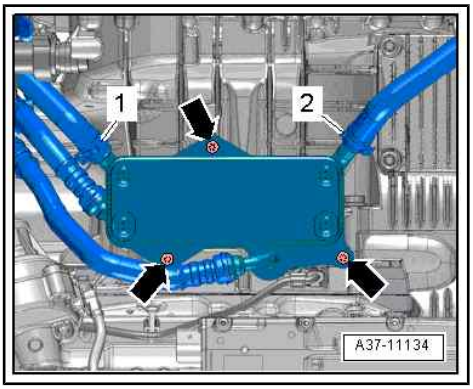
– Remove bolts -3- and move gear oil cooling valve - N509- to one side.



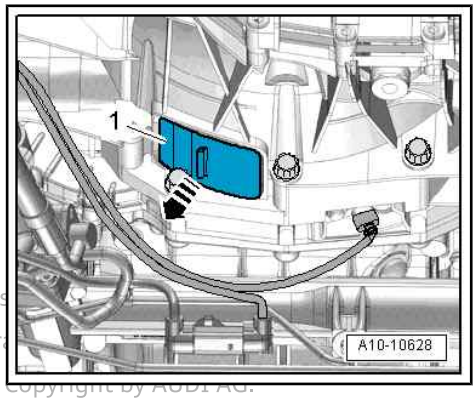
Note

Place a cloth underneath to catch escaping coolant.

– Release hose clips -1, 2- and disconnect coolant hoses.
– Remove bolts -arrows- and detach ATF cooler.



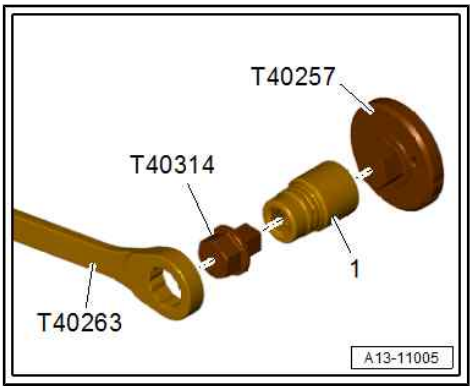
– Detach bottom cover -1- from gearbox -arrow-.



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– Assemble tools as shown in illustration.

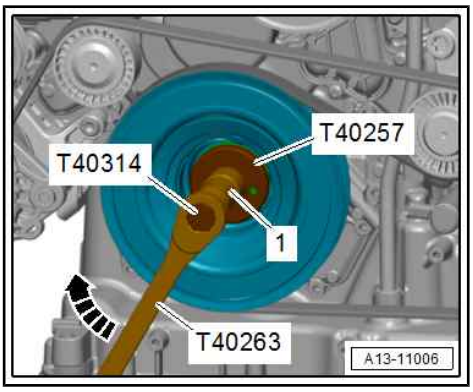
1 - Socket (21 mm) for 1/2" drive



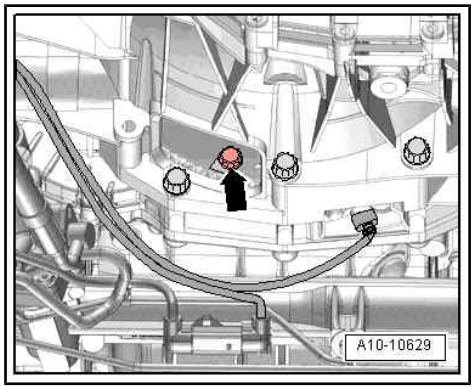
– Counterhold crankshaft to slacken bolts for dual-mass flywheel.

Note

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

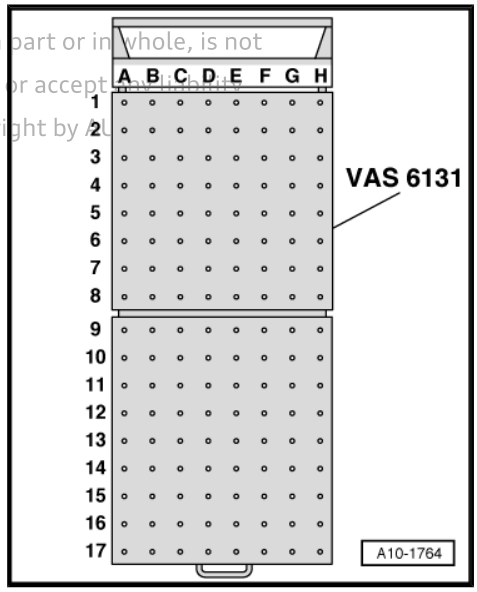


– Remove 6 bolts -arrow- for dual-mass flywheel. Turn crankshaft 60° in direction of engine rotation each time.



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

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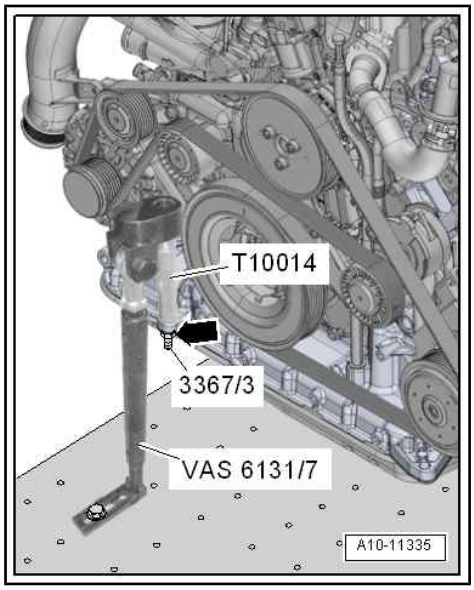
Note

The other support elements remain unchanged.

Platform coordinates	Parts from support set for Audi - VAS 6131/10- , support -VAS 6131/13-7- and gearbox support - VAS 6131/14-			
F2	/13-7			
B10	/10-1	/10-2	/10-5	/14
G10	/10-1	/10-2	/10-5	

– Secure support -VAS 6131/13-7- at front of engine (right-side) with M10 nut -arrow-, as illustrated.

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

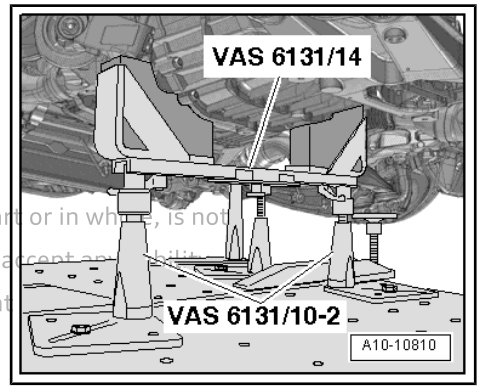


Caution

Risk of leaks at ATF sump.

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

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

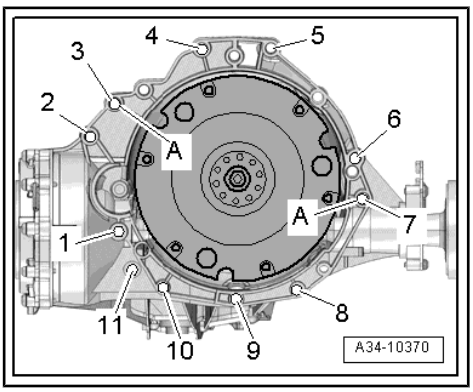
– Screw spindles on both sides upwards until gearbox support - VAS 6131/14- makes full contact with gearbox.

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

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

– Separate starter from gearbox and leave in position.

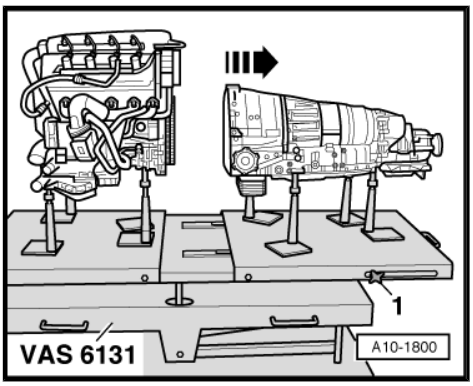
– Unscrew remaining bolts -3 ... 11- securing engine to gearbox.



Note

Disregard -item A-.

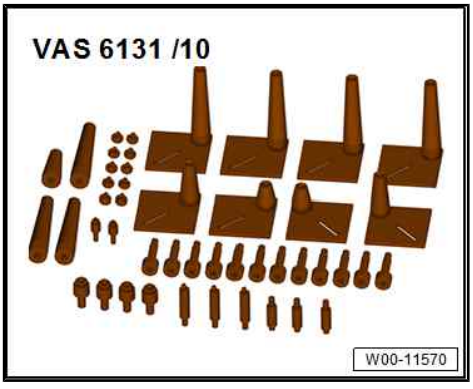
– Loosen clamping bolts -1- on sides of scissor-type assembly platform - VAS 6131 B- and pull rear section of platform together with gearbox slightly towards rear.



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

Special tools and workshop equipment required

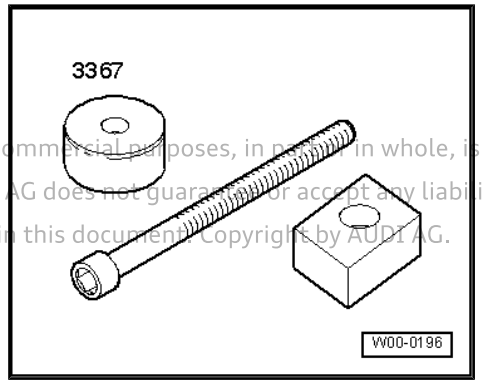
- Support set for Audi - VAS 6131/10-



- Support -VAS 6131/13-7- from support set, Audi Q7 >2005 - VAS 6131/13-

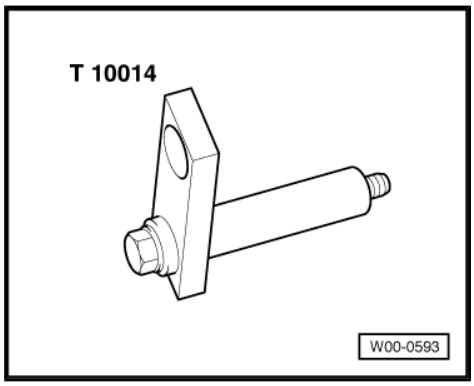


- Gearbox support - VAS 6131/14-
- Bolt -3367/3- from viscous fan fitting tool - 3367-

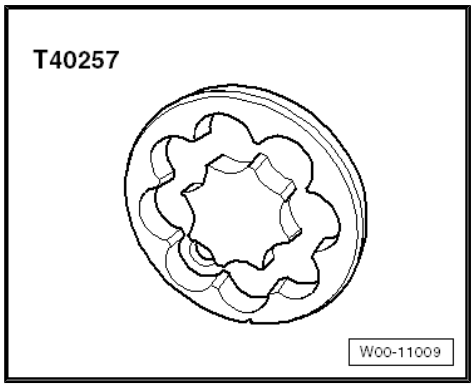


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- Bracket - T10014-



- Turning-over tool - T40257-

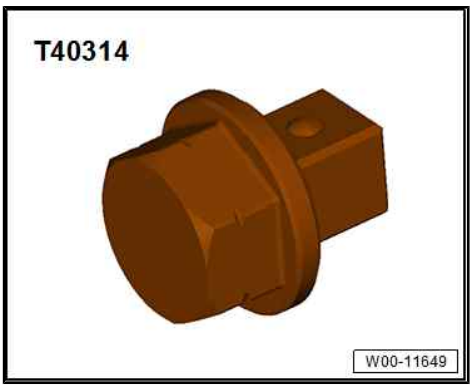


- Wrench, 21 mm - T40263-



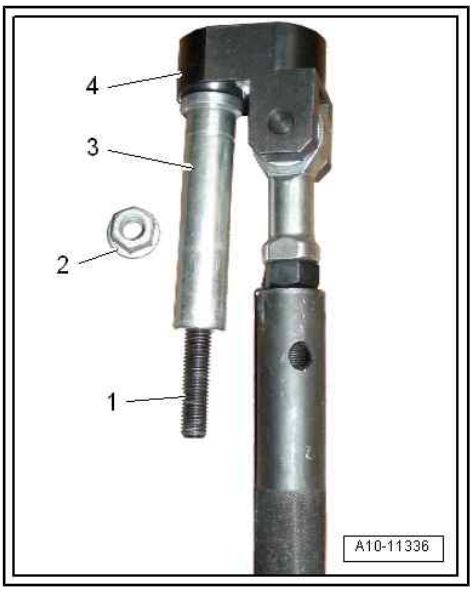
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- Adapter -T40314-



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

1 - Bolt -3367/3- from viscous fan fitting tool - 3367-
2 - Nut M10
3 - Bracket - T10014-
4 - Support -VAS 6131/13-7-



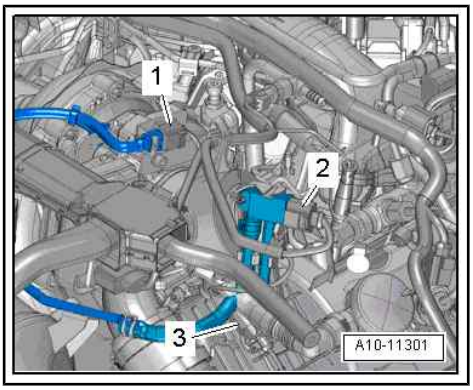
Procedure

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

Exhaust temperature sender - version 1:

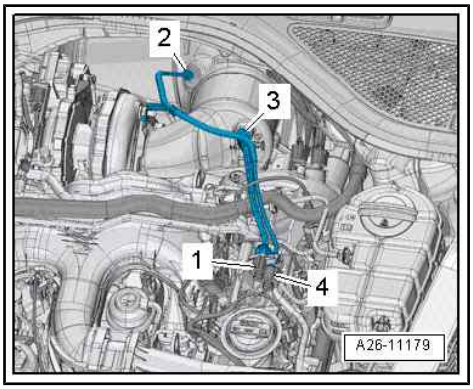
– Take electrical connectors -1, 3- out of bracket, unplug connectors and move electrical wiring clear.

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



Exhaust temperature sender - version 2:

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

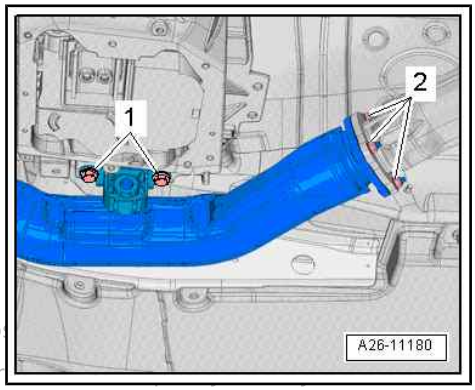


Note

Disregard items -2 and 3-.

Vehicles with SCR system:

– Remove bolts -1-.



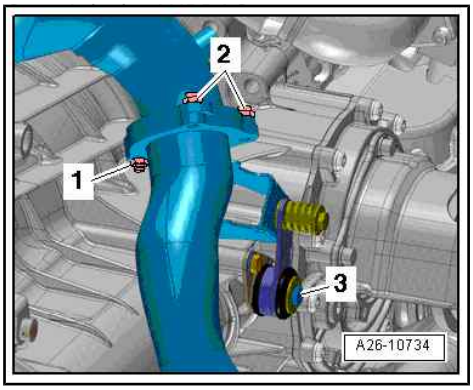
Note

Disregard -item 2-.

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All vehicles (continued):

– Remove bolt -3-.

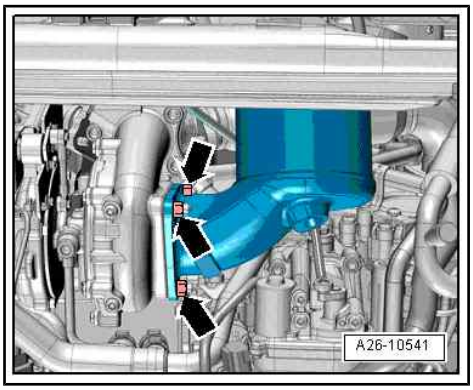


Note

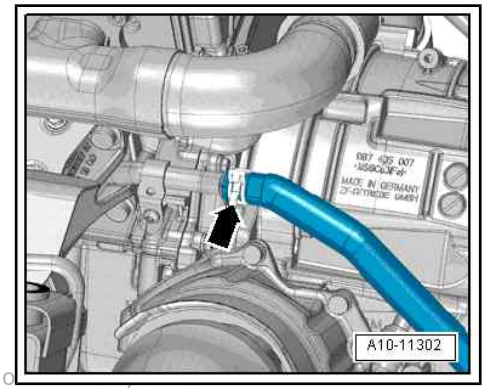
Disregard items -1 and 2-.

– Unscrew nuts -arrows- and detach particulate filter with front exhaust pipe.

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



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

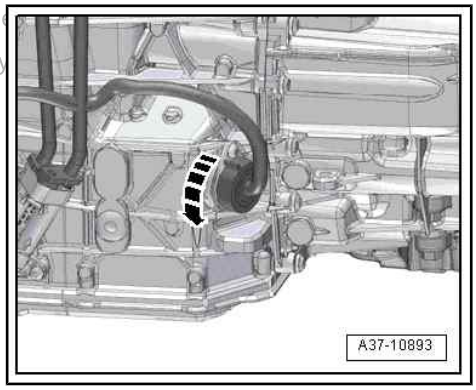


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Caution

Risk of irreparable damage to gearbox control unit (mechatronic unit) because of electrostatic 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.***



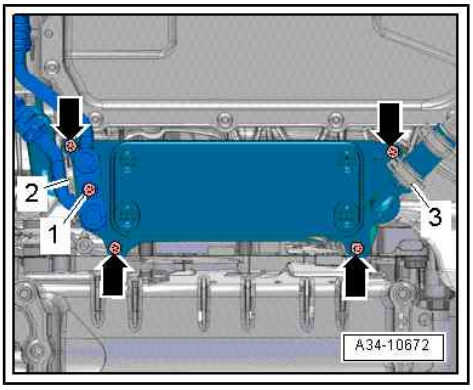
– Turn retainer catch anti-clockwise -arrow- and unplug electrical connector at gearbox.

– Move electrical wiring harness clear at gearbox.

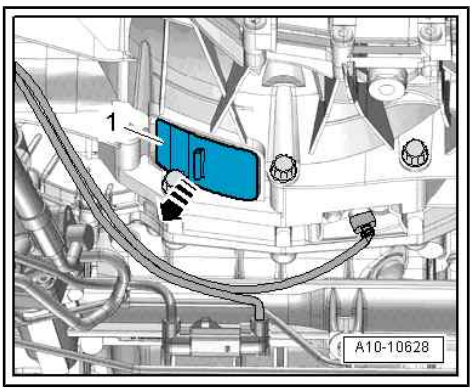
– Remove bolts -arrows- and push ATF cooler to one side.

Note

Disregard -items 1, 2, 3-.

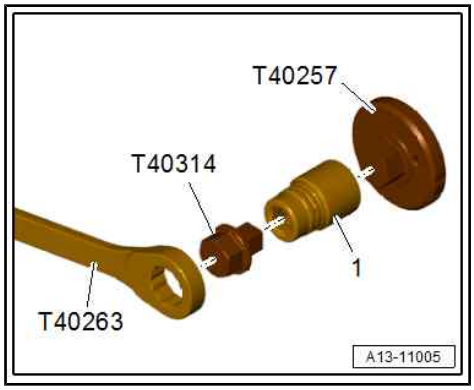


– Detach bottom cover -1- from gearbox -arrow-.



– Assemble tools as shown in illustration.

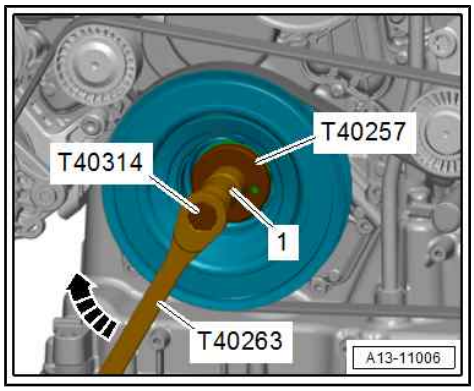
1 - Socket (21 mm) for $^1/_2$" drive



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

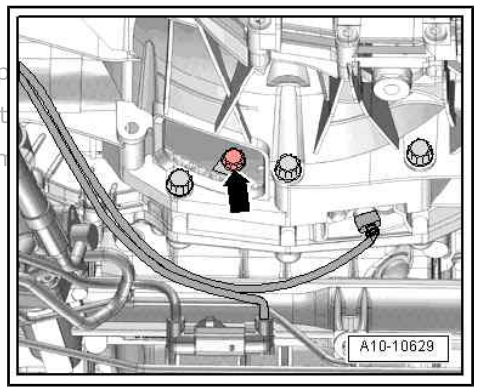
Note

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



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

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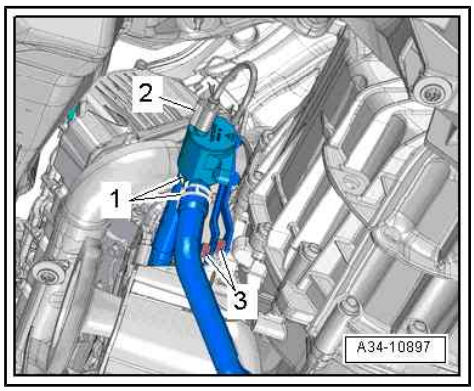


– Unplug electrical connector -2-.

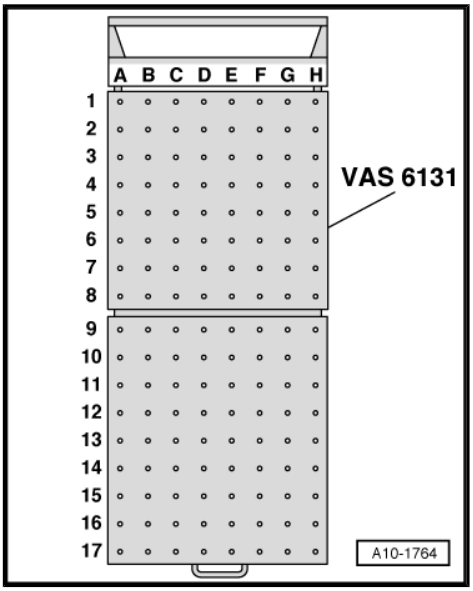
– Remove bolts -3- and move gear oil cooling valve - N509- to one side.

Note

Disregard -item 1-.



– Set up scissor-type assembly platform - VAS 6131 B- with support set for Audi - VAS 6131/10- , supplementary set - VAS 6131/11- and support -VAS 6131/13-7- as follows:



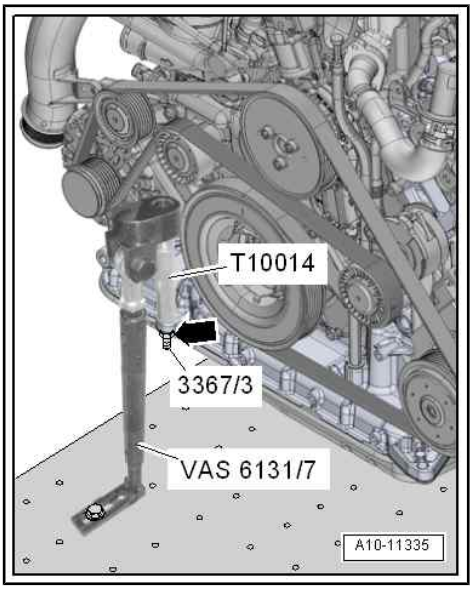
Note

The other support elements remain unchanged.

Platform coordinates	Parts from support set for Audi - VAS 6131/10- , supplementary set -VAS 6131/11- and support - VAS 6131/13-7-			
F2	/13-7			
B10	/10-1	/10-3	/10-5	/11-4
G10	/10-1	/10-3	/10-5	/11-4

– Secure support -VAS 6131/13-7- at front of engine (right-side) with M10 nut -arrow-, as illustrated.

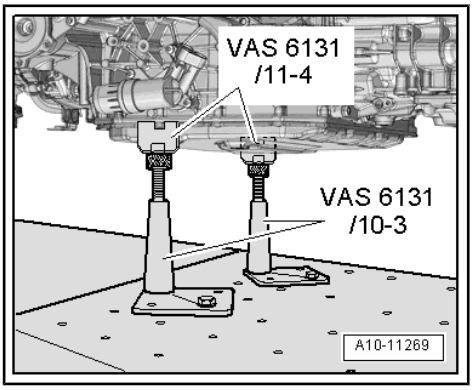
– Secure support to scissor-type assembly platform - VAS 6131 B- and tighten to 20 Nm.



Caution

Risk of leaks at ATF sump.

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



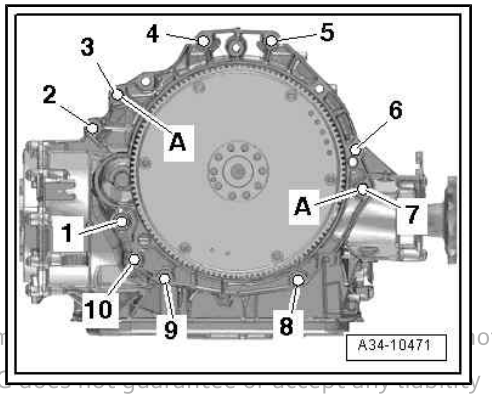
– Position support elements from -VAS 6131/10- and -VAS 6131/11- at front of gearbox, as shown in illustration.

– Screw spindles upwards on both sides until mountings -VAS 6131/11-4- make full contact with gearbox.

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

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– Remove bolts -1- and -2- for starter.
– Separate starter from gearbox and leave in position.
– Unscrew remaining bolts -3 ... 10- securing engine to gearbox.

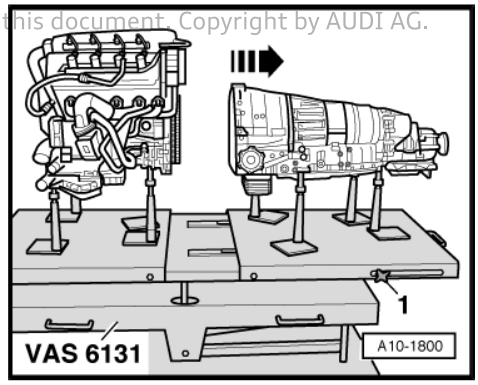


Note

Disregard -item A-.

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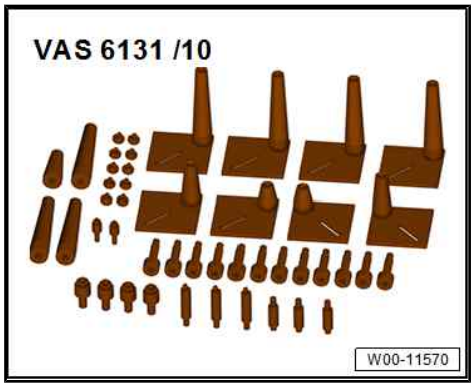
– Loosen clamping bolts -1- on sides of scissor-type assembly platform - VAS 6131 B- and pull rear section of platform together with gearbox slightly towards rear.



1.2.4 Separating engine and gearbox - vehicles with dual clutch gearbox 0CK

Special tools and workshop equipment required

♦ Support set for Audi - VAS 6131/10-

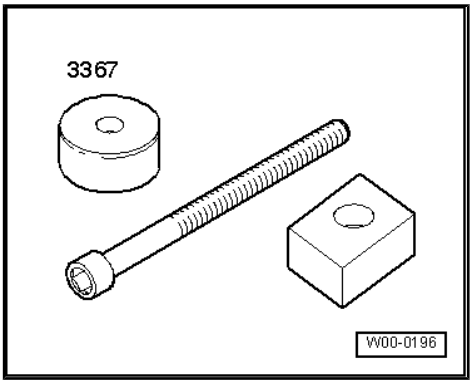


♦ Support -VAS 6131/13-7- from support set, Audi Q7 >2005 - VAS 6131/13-

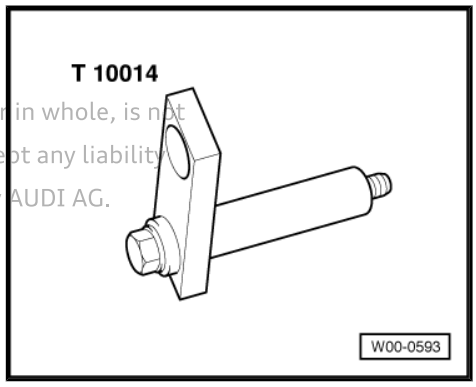


♦ Gearbox support - VAS 6131/14-

- Bolt -3367/3- from viscous fan fitting tool - 3367-

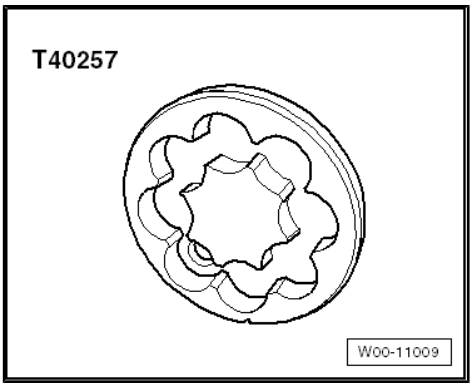


- Bracket - T10014-

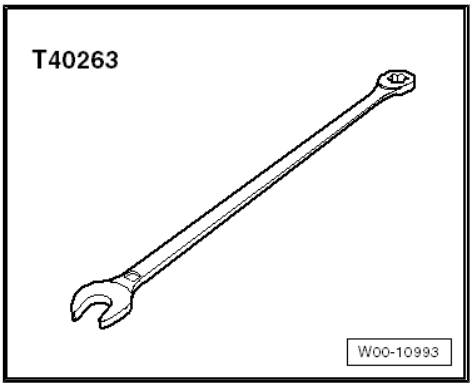


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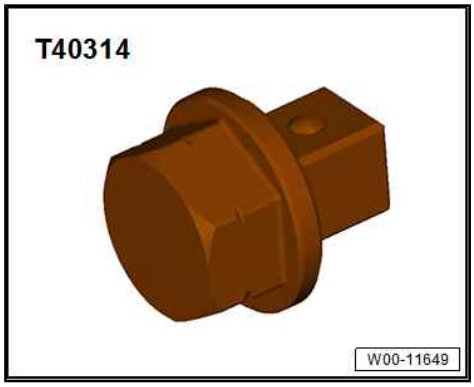
- Turning-over tool - T40257-



- Wrench, 21 mm - T40263-



♦ Adapter -T40314-



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

1 - Bolt -3367/3- from viscous fan fitting tool - 3367-

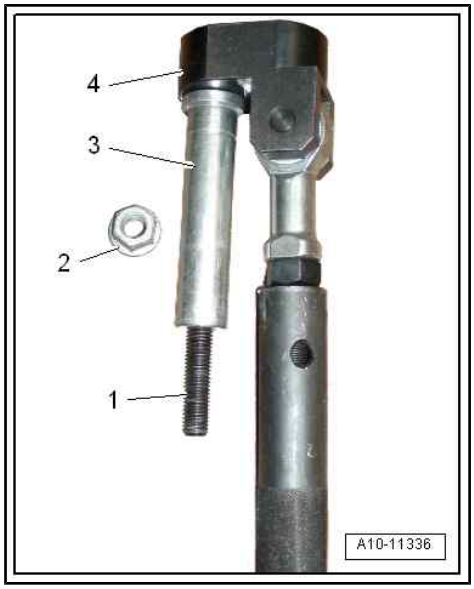
2 - Nut M10

3 - Bracket - T10014-

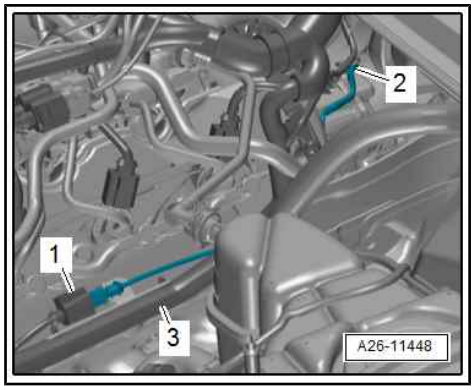
4 - Support -VAS 6131/13-7-

Procedure

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



– Take electrical connector -1- for exhaust gas temperature sender 3 - G495- -item 2- out of bracket and unplug.

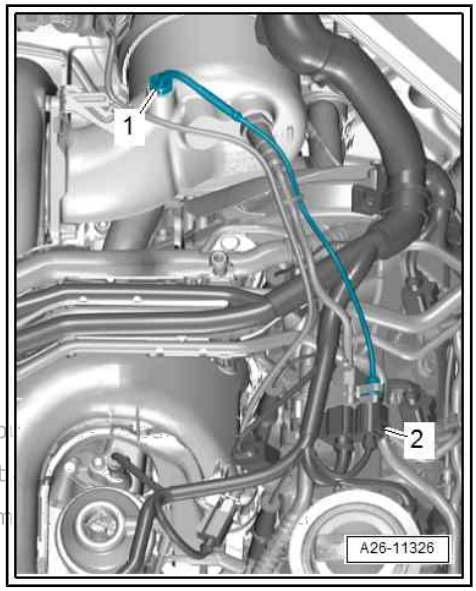


Note

Disregard -item 3-.

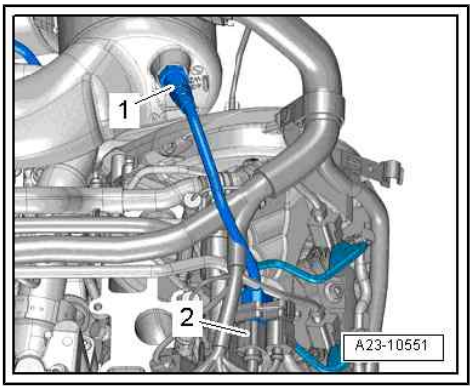
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– Detach electrical connector -2- for exhaust gas temperature sender 2 - G448- -item 1- from bracket, unplug connector and move electrical wiring clear.

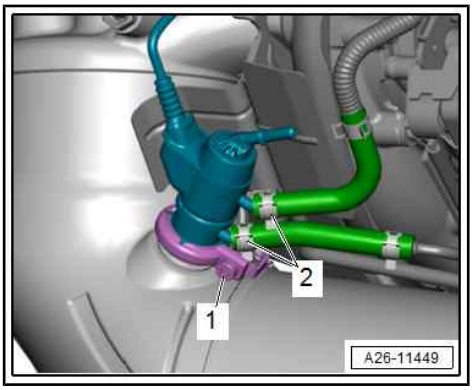


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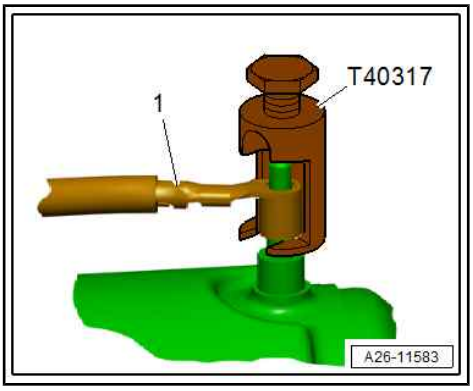
– Take electrical connector -2- for Lambda probe - G39- -item 1- out of bracket, unplug and move wiring clear.



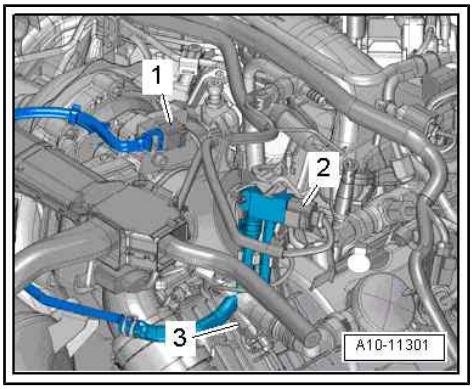
– Release retaining clip -1-, detach injector for reducing agent - N474- and push to one side with coolant hoses -2- attached.



– Unplug electrical connectors for catalytic converter heater 1 - Z119- / catalytic converter heater 2 - Z120- using puller - T40317- and move to one side if necessary.



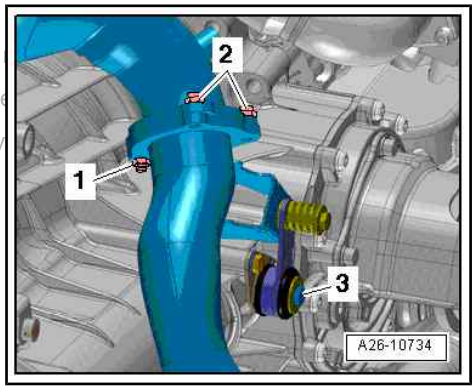
– Take electrical connector -3- out of bracket, unplug it and move electrical wiring clear.
– Unplug electrical connector -2-, unclip pressure differential sender - G505- from bracket and move clear.



Note

Disregard -item 1-.

– Remove bolt -3-.

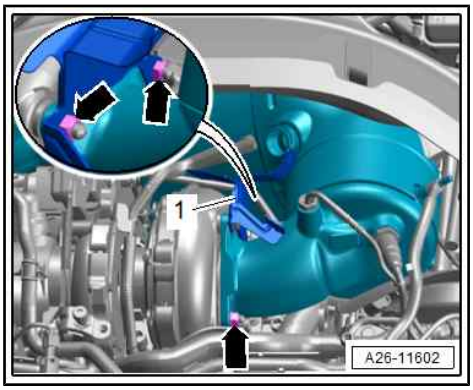


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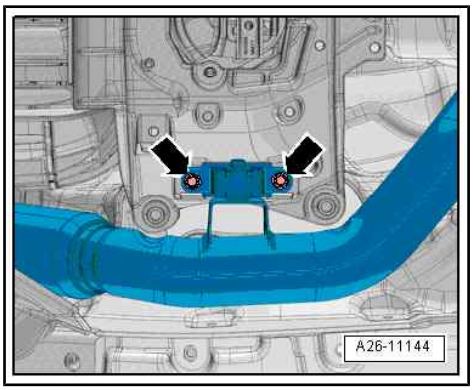
Note

Disregard items -1 and 2-.

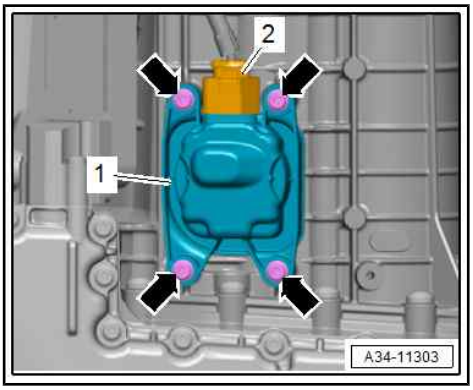
– Remove nuts -arrows- and detach heat shield -1-.



– Remove bolts -arrows-.
– Detach particulate filter with front exhaust pipe.
– Unbolt drive shaft (left and right) from gearbox flange shafts ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .



– Unplug electrical connector -2- at gear oil pump -1-.



Note

Disregard -arrows-.

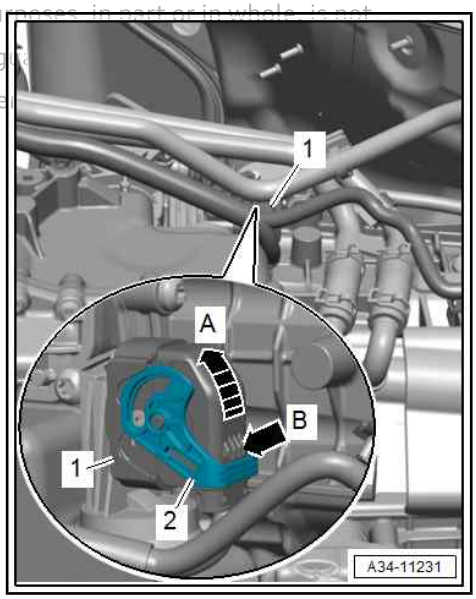
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Caution

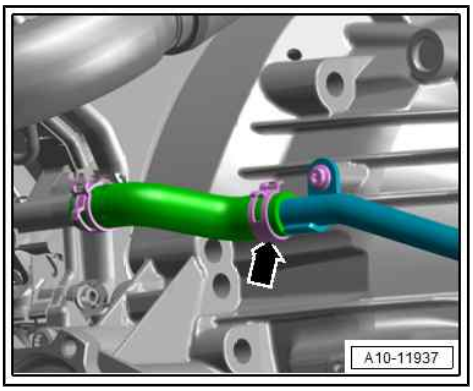
Risk of irreparable damage to gearbox control unit (mechatronic unit) because of static discharge.

- ***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.***

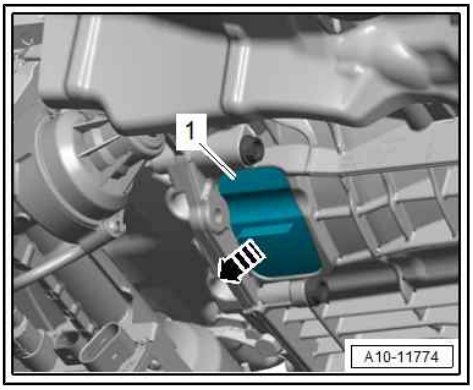
– Unplug electrical connector -1- by pressing catch -arrow B- and pulling fastener -2- in direction of -arrow A-.



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

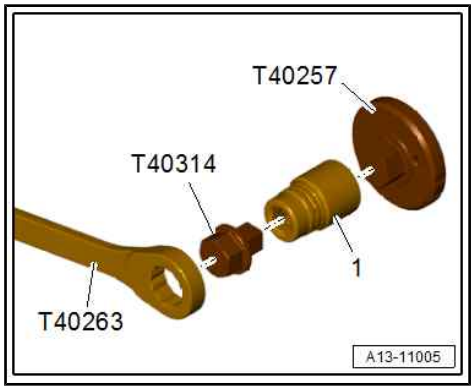


– Detach bottom cover -1- from gearbox -arrow-.



– Assemble tools as shown in illustration.

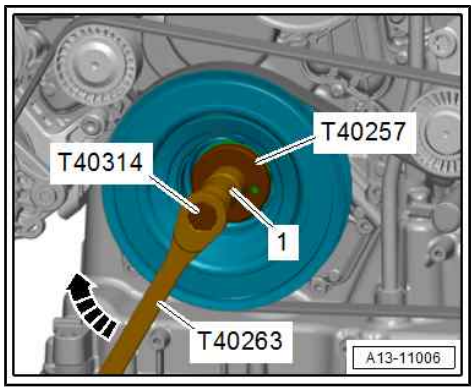
1 - Socket (21 mm) for 1/2" drive



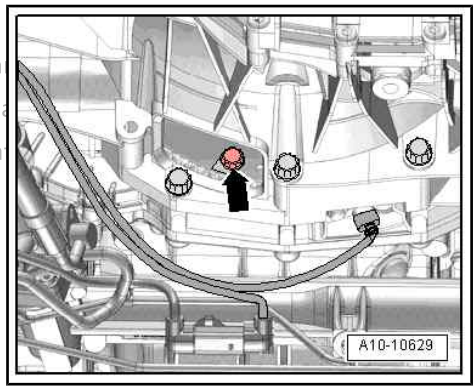
– Counterhold crankshaft to slacken bolts for dual-mass flywheel.

Note

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



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



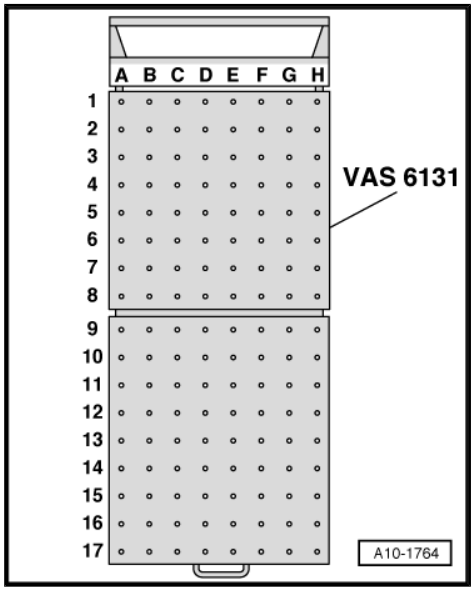
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– Set up scissor-type assembly platform - VAS 6131 B- with support set for Audi - VAS 6131/10- , support -VAS 6131/13-7- and gearbox support - VAS 6131/14- as follows.

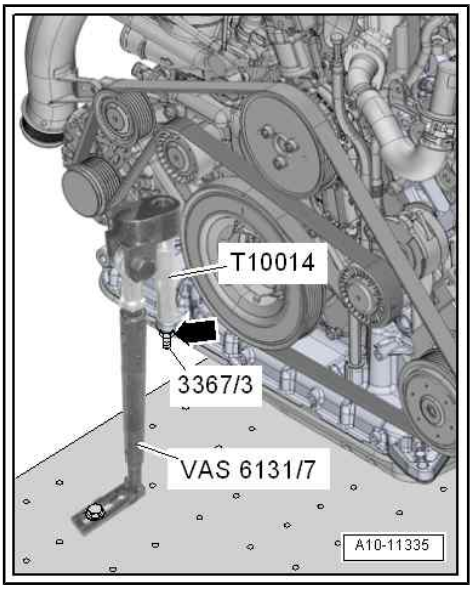
Note

The other support elements remain unchanged.

Platform coordinates	Parts from support set for Audi - VAS 6131/10- , support -VAS 6131/13-7- and gearbox support - VAS 6131/14-			
F2	/13-7			
B10	/10-1	/10-2	/10-5	/14
G10	/10-1	/10-2	/10-5	



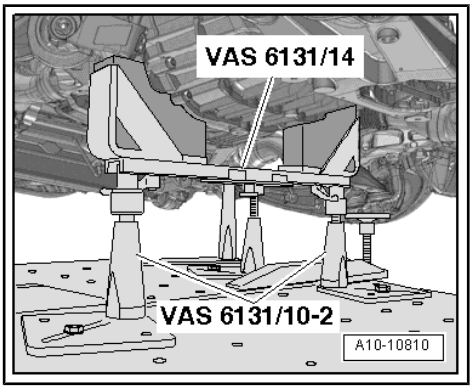
– Secure support -VAS 6131/13-7- at front of engine (right-side) with M10 nut -arrow-, as illustrated.
– Secure support to scissor-type assembly platform - VAS 6131 B- and tighten to 20 Nm.



Caution

Risk of leaks at ATF sump.

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

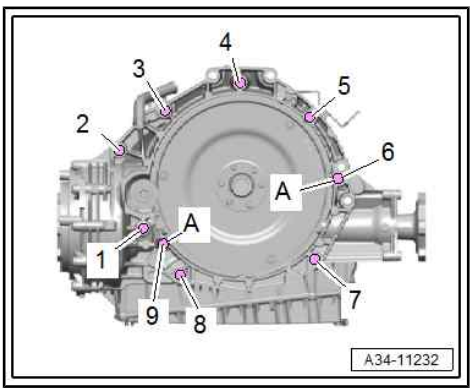


– Position support elements from -VAS 6131/10- and gearbox support - VAS 6131/14- at front of gearbox, as illustrated.
– Screw spindles on both sides upwards until gearbox support - VAS 6131/14- makes full contact with gearbox.
– Tighten base plates for support elements to 20 Nm on scissor-type assembly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

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

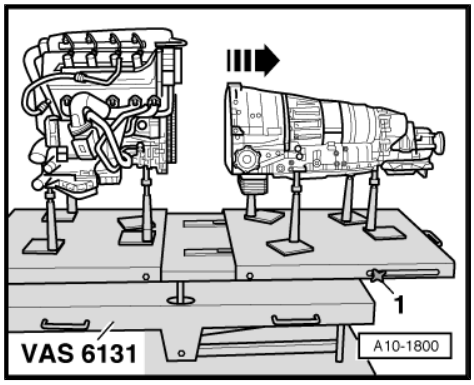
Note

Disregard -item A-.



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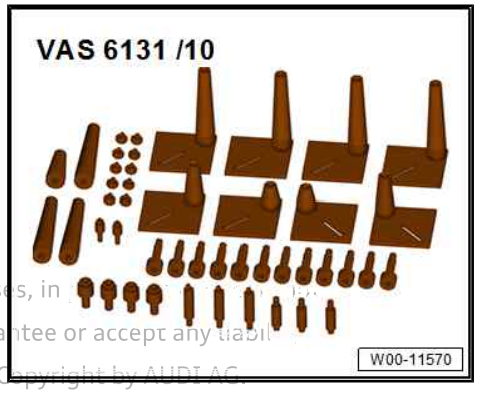
– Loosen clamping bolts -1- on sides of scissor-type assembly platform - VAS 6131 B- and pull rear section of platform together with gearbox slightly towards rear.



1.2.5 Separating engine and gearbox - vehicles with automatic gearbox

Special tools and workshop equipment required

- Support set for Audi - VAS 6131/10-

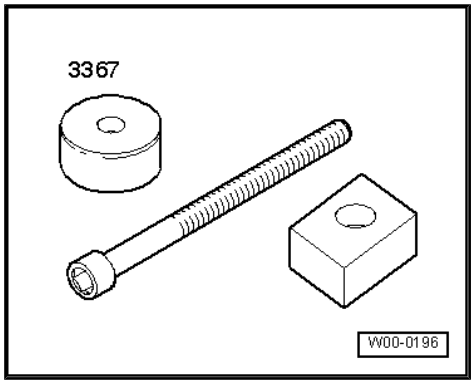


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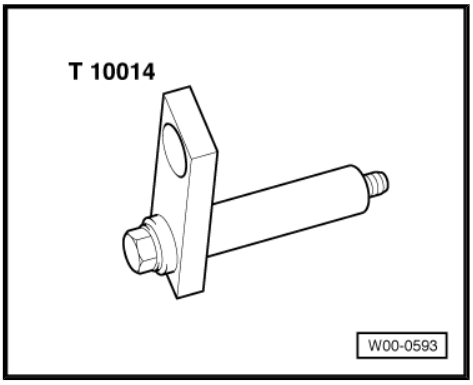
- Support -VAS 6131/13-7- from support set, Audi Q7 >2005 - VAS 6131/13-



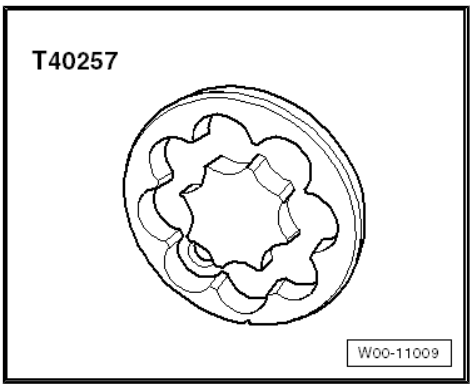
- Gearbox support - VAS 6131/14-
- Bolt -3367/3- from viscous fan fitting tool - 3367-



- Bracket - T10014-

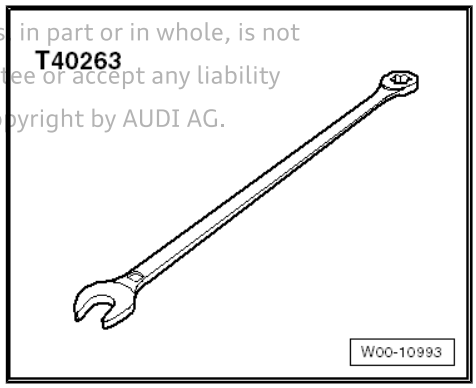


- Turning-over tool - T40257-

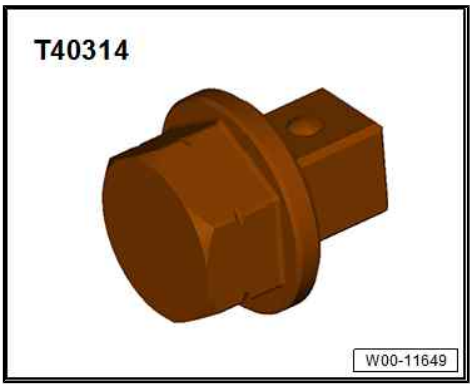


- Wrench, 21 mm - T40263-

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- Adapter -T40314-



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

1 - Bolt -3367/3- from viscous fan fitting tool - 3367-

2 - Nut M10

3 - Bracket - T10014-

4 - Support -VAS 6131/13-7-



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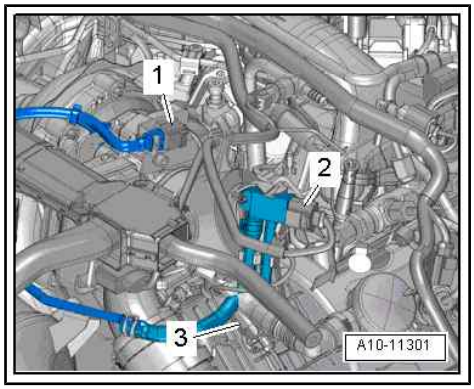
Procedure

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

Exhaust temperature sender - version 1:

– Take electrical connectors -1, 3- out of bracket, unplug connectors and move electrical wiring clear.

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

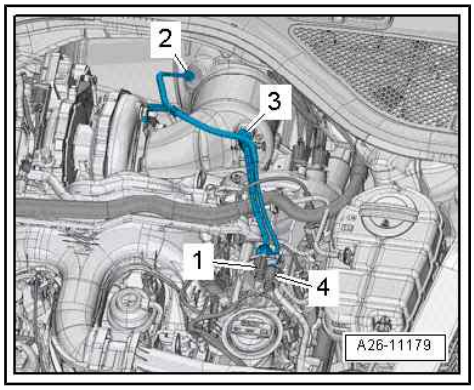


Exhaust temperature sender - version 2:

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

Note

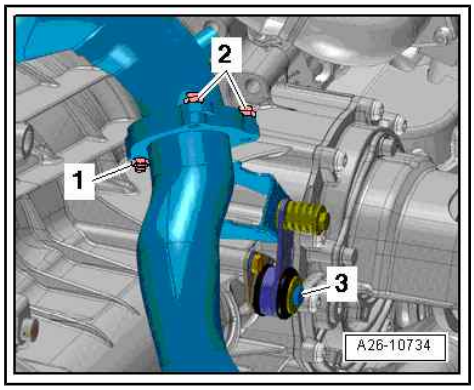
Disregard items -2 and 3-.



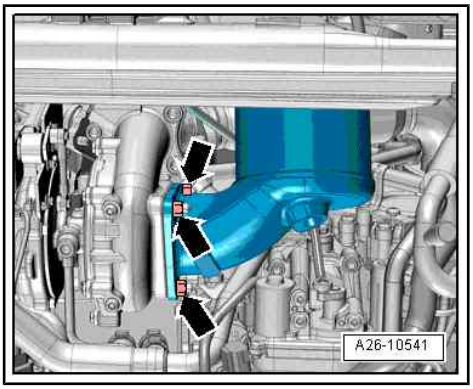
– Remove bolt -3-.

Note

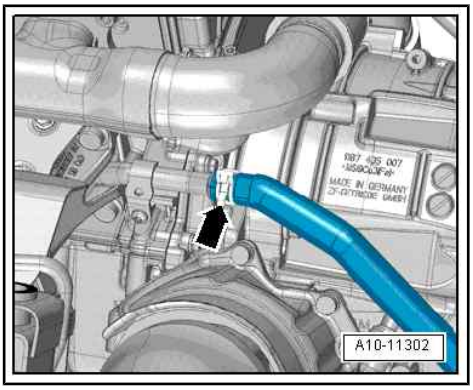
Disregard items -1 and 2-.



– Unscrew nuts -arrows- and detach particulate filter with front exhaust pipe.
– Unbolt drive shaft (left and right) from gearbox flange shafts ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .



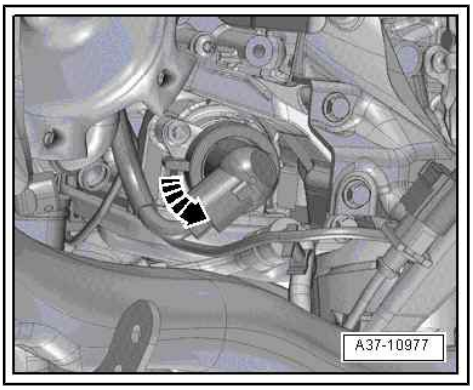
– Release hose clip -arrow- and detach coolant hose.



Caution

Risk of irreparable damage to gearbox control unit (mechatronic unit) because of electrostatic 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.***



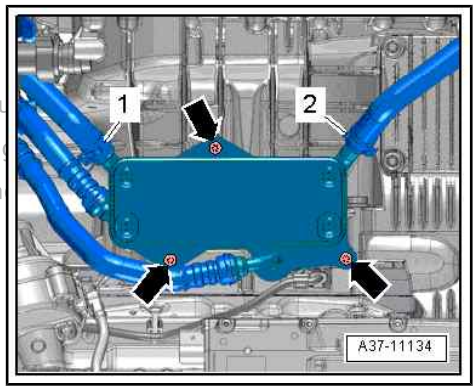
– Turn retainer catch anti-clockwise -arrow- and unplug electrical connector at gearbox.

Note

Place a cloth under the connection to catch escaping coolant.

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– Release hose clip -1- and detach coolant hose.
– Remove bolts -arrows- and pivot ATF cooler to one side.



Note

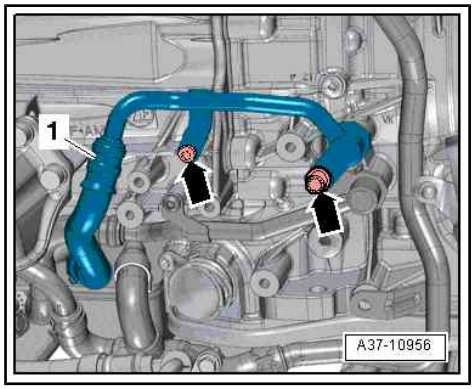
Disregard -item 2-.

Note

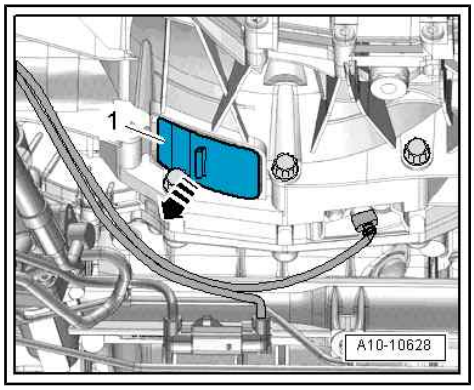
Place a cloth underneath to catch escaping ATF.

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

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

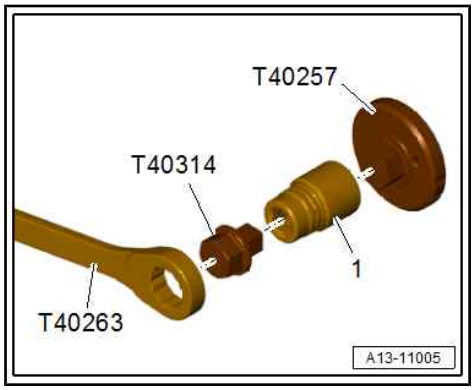


– Detach bottom cover -1- from gearbox -arrow-.

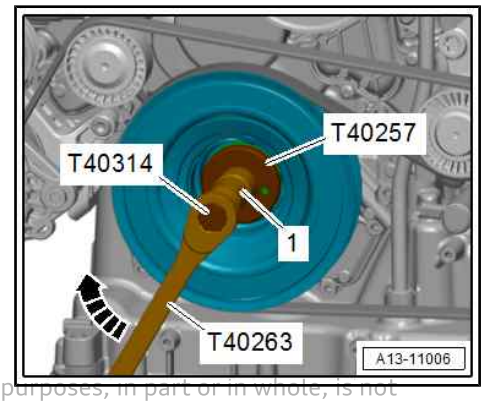


– Assemble tools as shown in illustration.

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



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

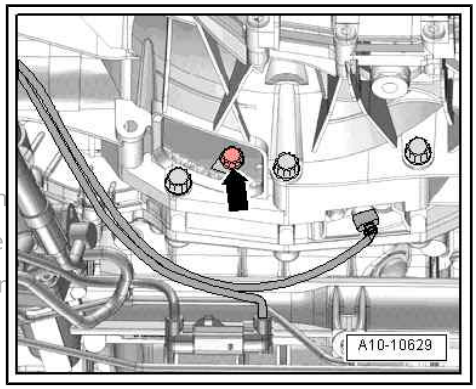


Note

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

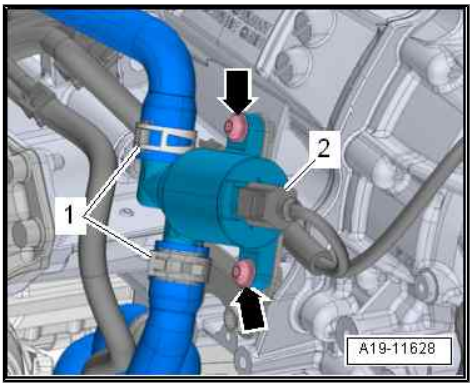
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– Remove 6 bolts -arrow- for dual-mass flywheel. Turn crankshaft 60° in direction of engine rotation each time.



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– Unplug electrical connector -2-.
– Remove bolts -arrows- and move gear oil cooling valve - N509- to one side.



Note

Disregard -item 1-.

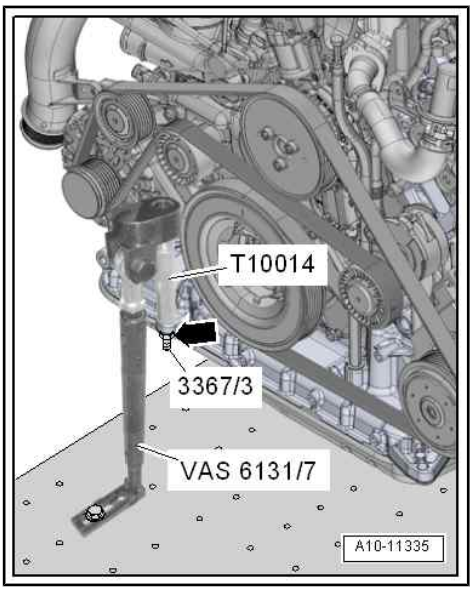
– Set up scissor-type assembly platform - VAS 6131 B- with support set for Audi - VAS 6131/10- , support -VAS 6131/13-7- and gearbox support - VAS 6131/14- as follows.

Note

The other support elements remain unchanged.

Platform coordinates	Parts from support set for Audi - VAS 6131/10- , support -VAS 6131/13-7- and gearbox support - VAS 6131/14-			
F2	/13-7			
B10	/10-1	/10-2	/10-5	/14
G10	/10-1	/10-2	/10-5	

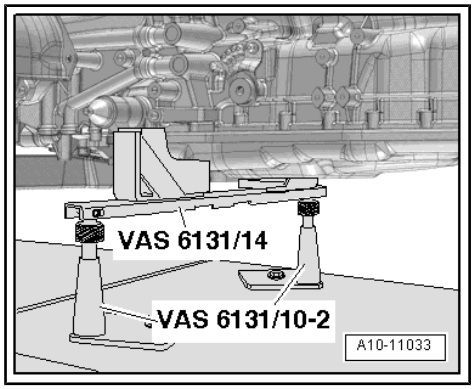
– Secure support -VAS 6131/13-7- at front of engine (right-side) with M10 nut -arrow-, as illustrated.
– Secure support to scissor-type assembly platform - VAS 6131 B- and tighten to 20 Nm.



Caution

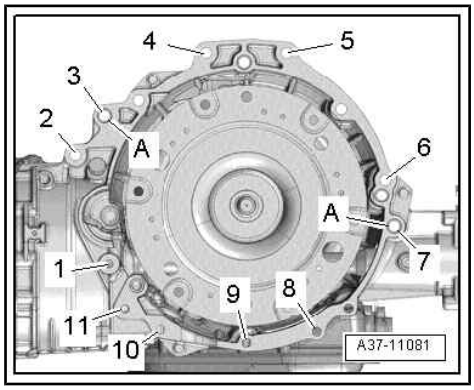
Risk of leaks at ATF sump.

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



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

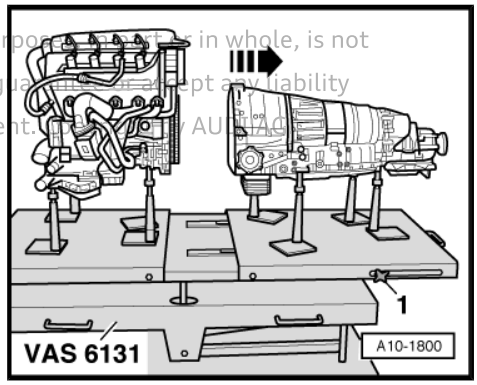
– Remove bolts -1- and -2- for starter.
– Separate starter from gearbox and leave in position.
– Unscrew remaining bolts -3 ... 11- securing engine to gearbox.



Note

Disregard -item A-.

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

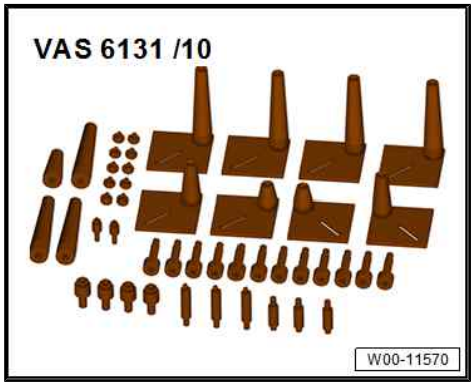


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1.2.6 Separating engine and gearbox - vehicles with biturbo engine

Special tools and workshop equipment required

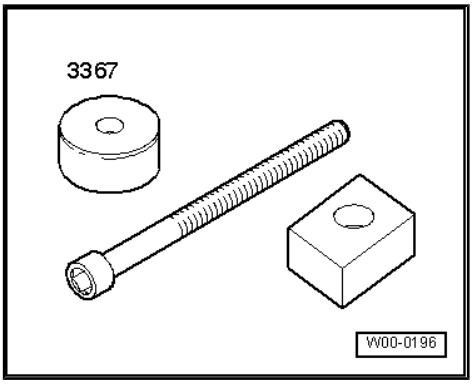
- Support set for Audi - VAS 6131/10-



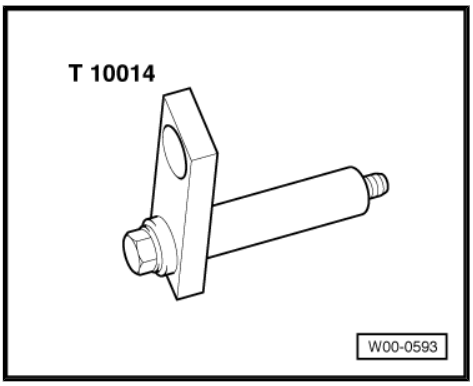
- Support -VAS 6131/13-7- from support set, Audi Q7 >2005 - VAS 6131/13-



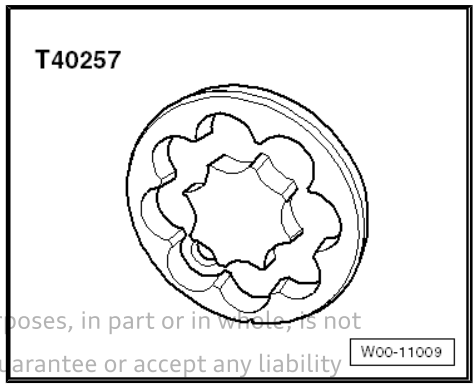
- Gearbox support - VAS 6131/14-
- Bolt -3367/3- from viscous fan fitting tool - 3367-



- Bracket - T10014-



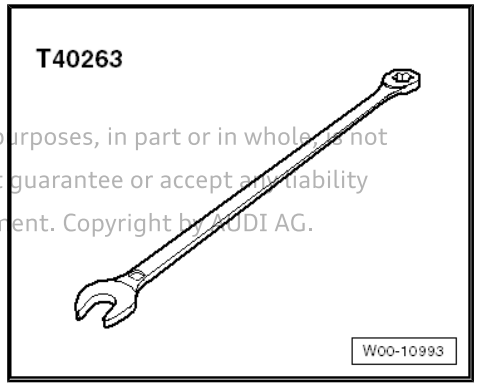
- Turning-over tool - T40257-



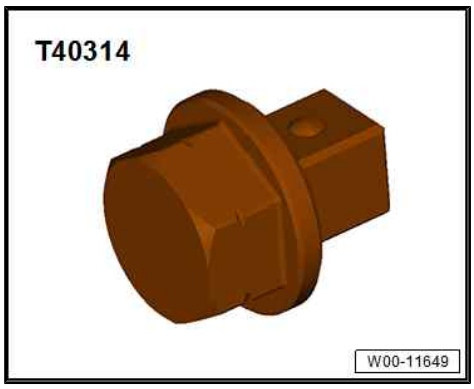
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♦ Wrench, 21 mm - T40263-



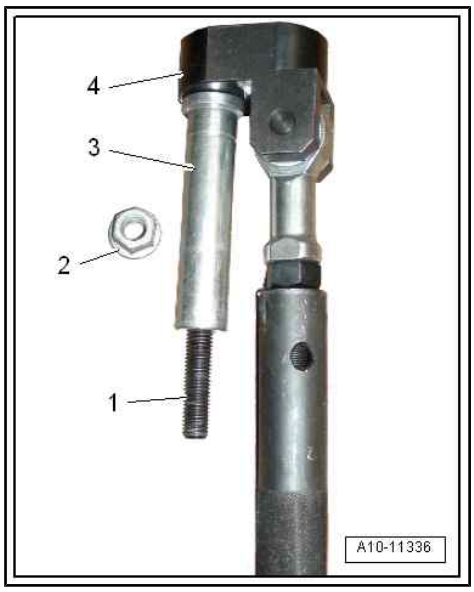
♦ Adapter -T40314-



♦ Puller -T40317-

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

1 - Bolt -3367/3- from viscous fan fitting tool - 3367-
2 - Nut M10
3 - Bracket - T10014-
4 - Support -VAS 6131/13-7-



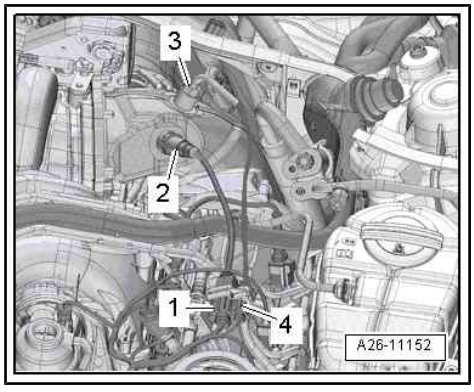
Procedure

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

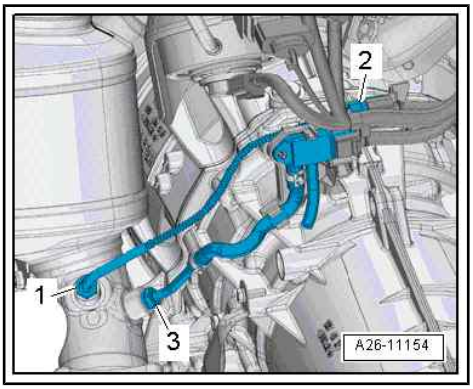
– Detach electrical connector -1- and, if fitted, -4- from bracket and unplug connectors.

Note

Disregard items -2 and 3-.



– Detach electrical connector -2- from bracket, unplug and move clear.

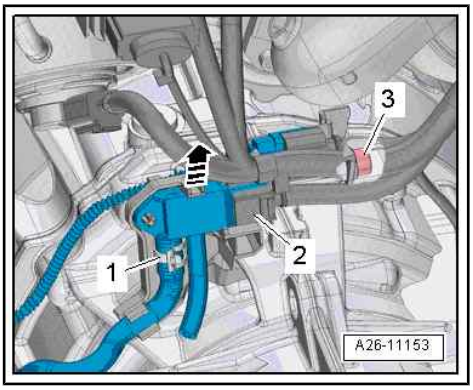


Note

Disregard items -1 and 3-.

– Unplug electrical connector -2-.

– Remove bolt -3- and detach bracket with pressure differential sender - G505- from gearbox.

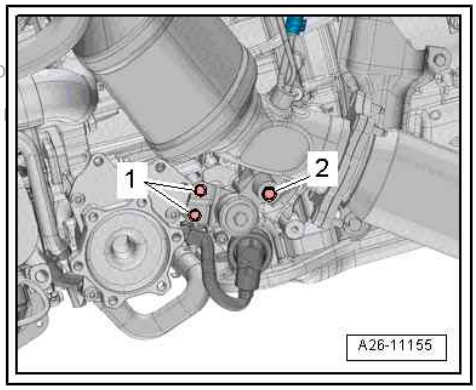


Note

Disregard -item 1- and -arrow-.

– Remove bolts -1-.

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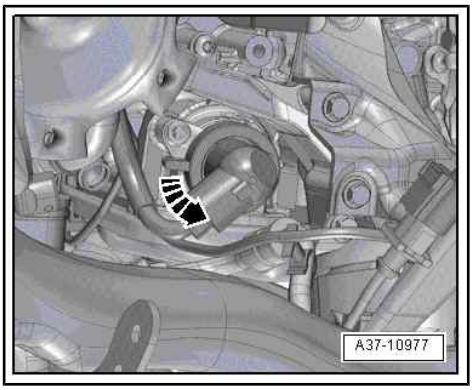
Note

Disregard -item 2-.

Caution

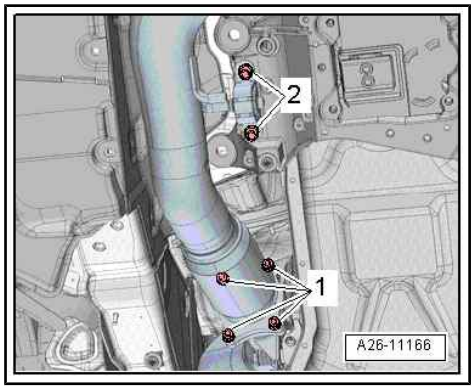
Risk of irreparable damage to gearbox control unit (mechatronic unit) because of electrostatic discharge.

- ***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 -2-.



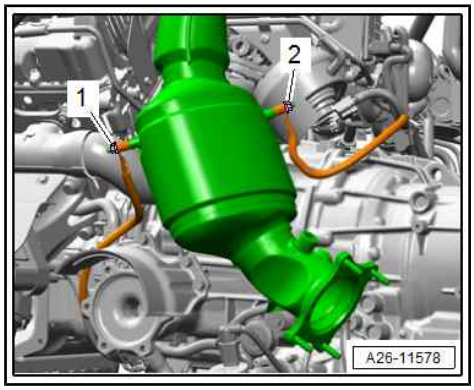
Note

Disregard -item 1-.

Vehicles with SCR system:

– Remove nuts -1, 2-.

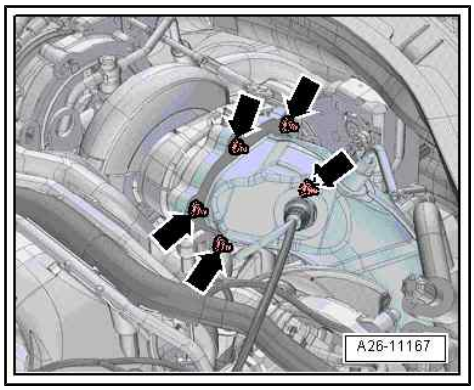
– Unplug electrical connectors for catalytic converter heater 1 - Z119- and catalytic converter heater 2 - Z120- using puller - T40317- .



All vehicles (continued):

– Remove nuts -arrows-.

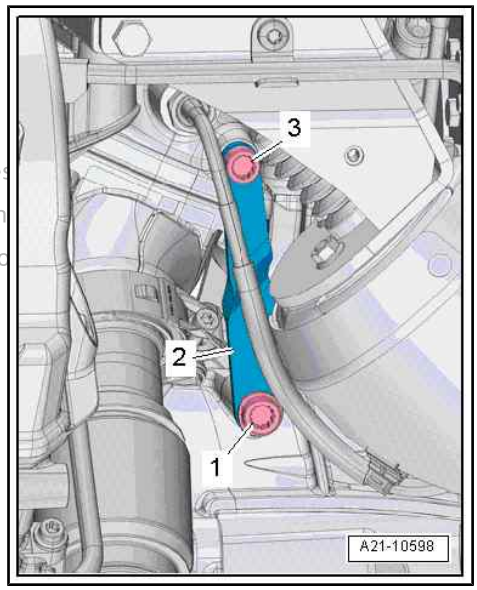
– Detach catalytic converter with front exhaust pipe.



– Remove bolts -1- on both sides and bolt -3- on strut -2- for turbocharger.

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

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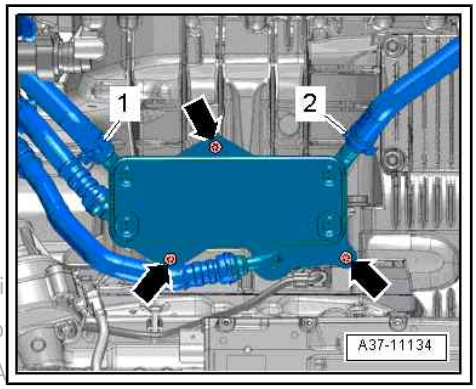


Note

Place a cloth under the connection to catch escaping coolant.

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

– Remove bolts -arrows- and pivot ATF cooler to one side.



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Note

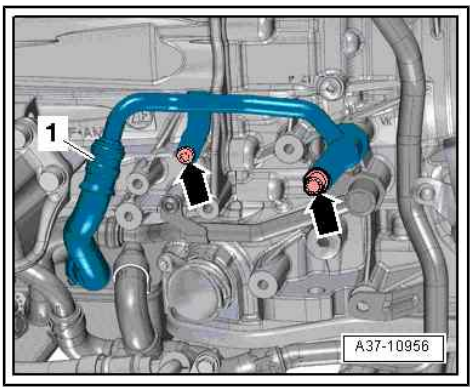
Disregard -item 2-.

Note

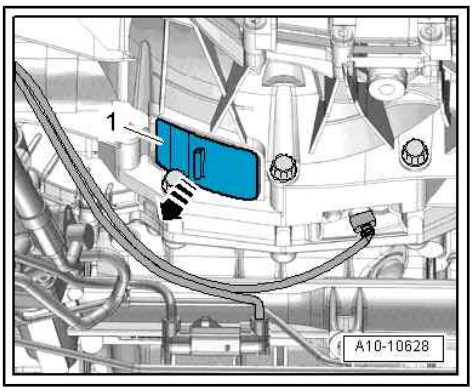
Place a cloth underneath to catch escaping ATF.

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

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

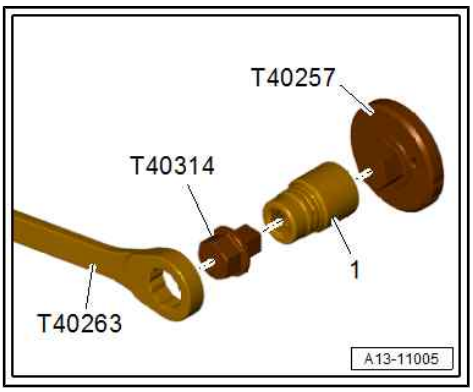


– Detach bottom cover -1- from gearbox -arrow-.

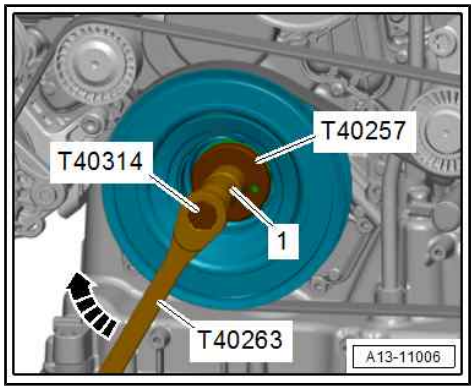


– Assemble tools as shown in illustration.

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



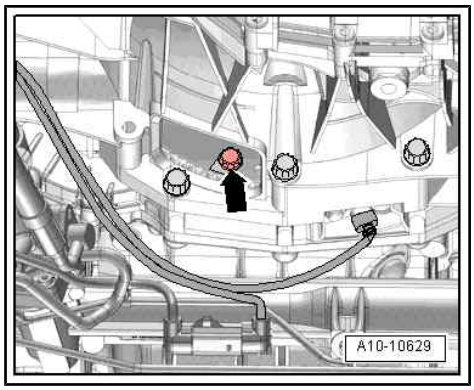
– Counterhold crankshaft to slacken bolts for torque converter.



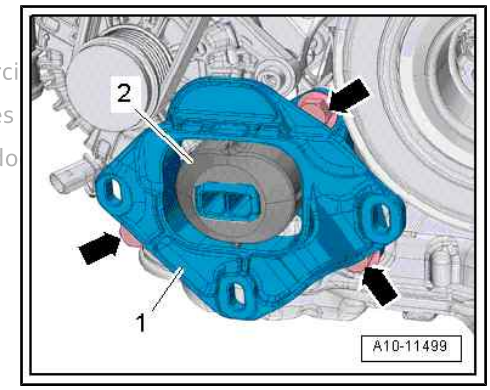
Note

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

– Remove 6 bolts -arrows- for torque converter. Turn crankshaft 60° in direction of engine rotation each time.

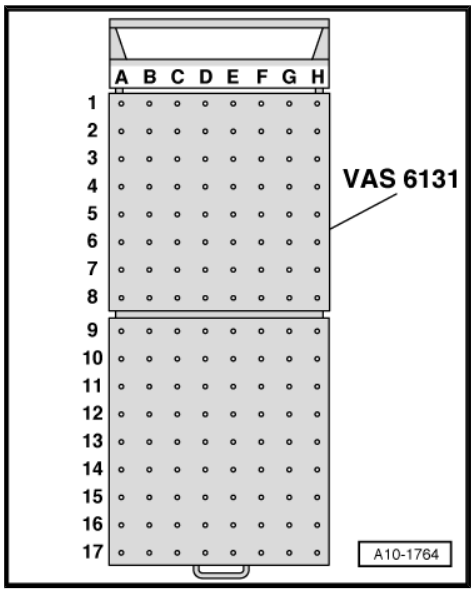


– Unscrew bolts -arrows- and remove torque reaction support -2- with stop -1-.



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



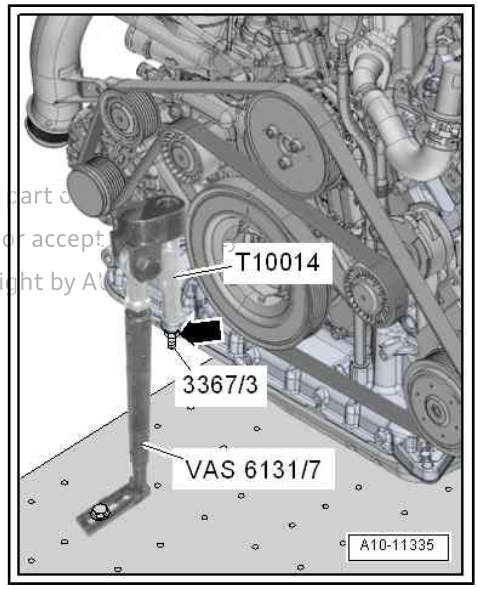
Note

The other support elements remain unchanged.

Platform coordinates	Parts from support set for Audi - VAS 6131/10- , support -VAS 6131/13-7- and gearbox support - VAS 6131/14-			
F2	/13-7			
B10	/10-1	/10-2	/10-5	/14
G10	/10-1	/10-2	/10-5	

– Secure support -VAS 6131/13-7- at front of engine (right-side) with M10 nut -arrow-, as illustrated.
– Secure support to scissor-type assembly platform - VAS 6131 B- and tighten to 20 Nm.

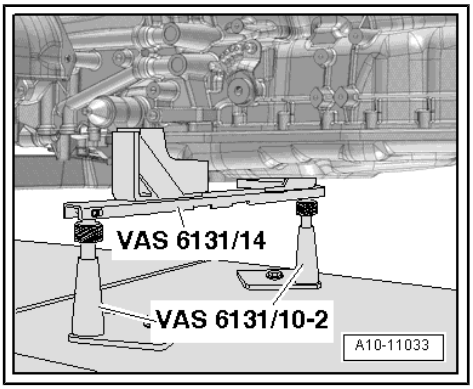
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Caution

Risk of leaks at ATF sump.

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

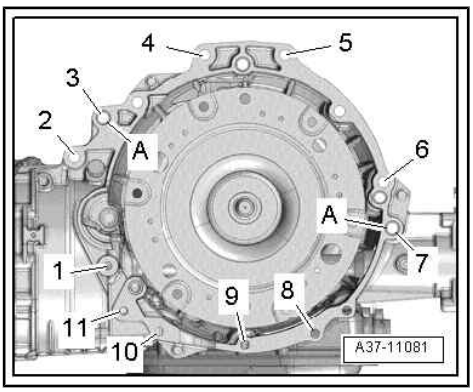


– Position support elements from -VAS 6131/10- and gearbox support - VAS 6131/14- at front of gearbox, as illustrated.
– Screw spindles on both sides upwards until gearbox support - VAS 6131/14- makes full contact with gearbox.
– Tighten base plates for support elements to 20 Nm on scissor-type assembly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

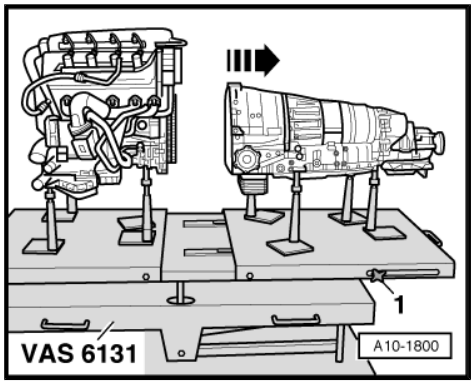
– Remove bolts -1- and -2- for starter.
– Separate starter from gearbox and leave in position.
– Unscrew remaining bolts -3 ... 11- securing engine to gearbox.

Note

Disregard -item A-.



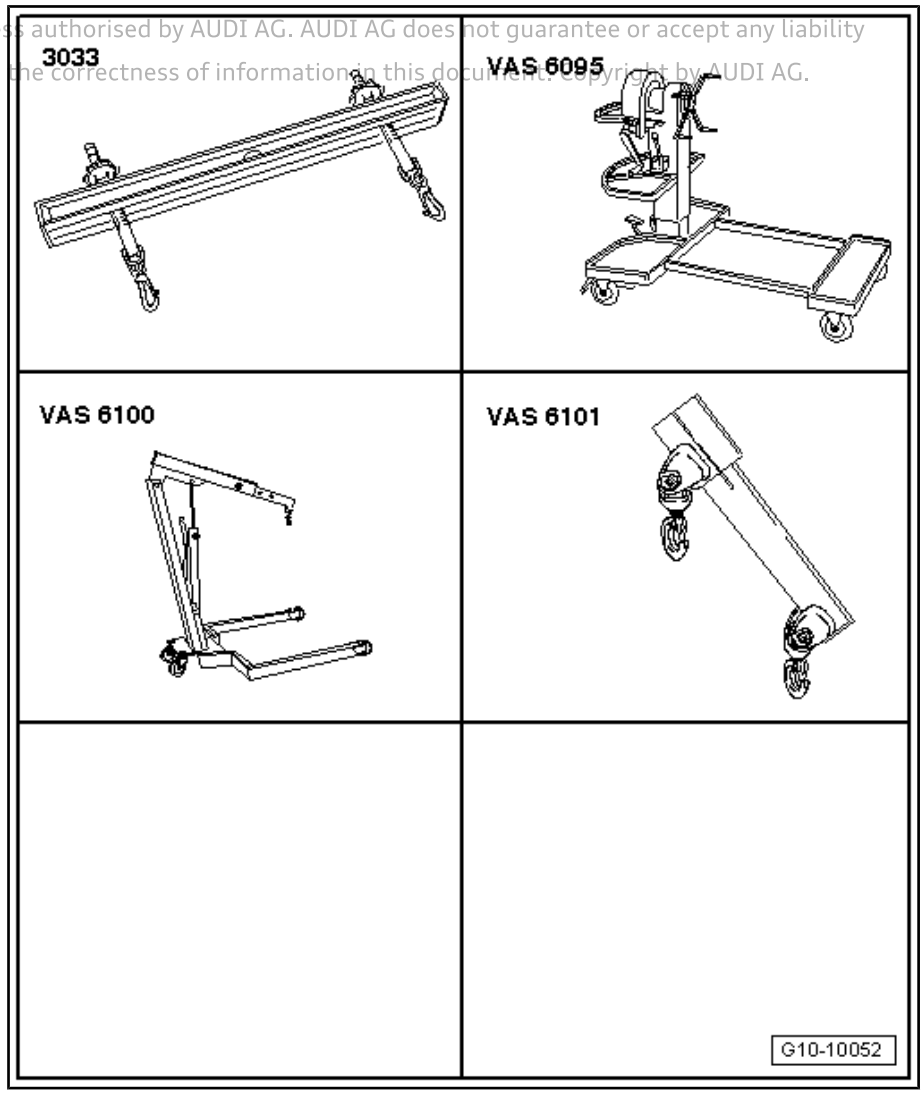
– Loosen clamping bolts -1- on sides of scissor-type assembly platform - VAS 6131 B- and pull rear section of platform together with gearbox slightly towards rear.



1.3 Securing engine to engine and gearbox support

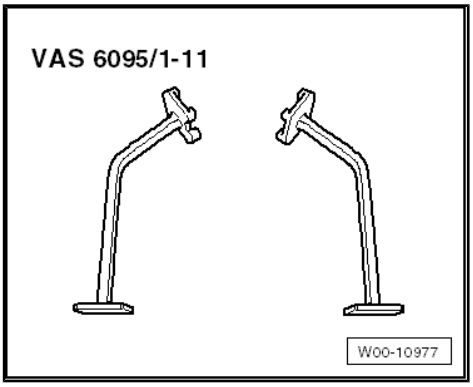
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Special tools and workshop equipment required



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

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



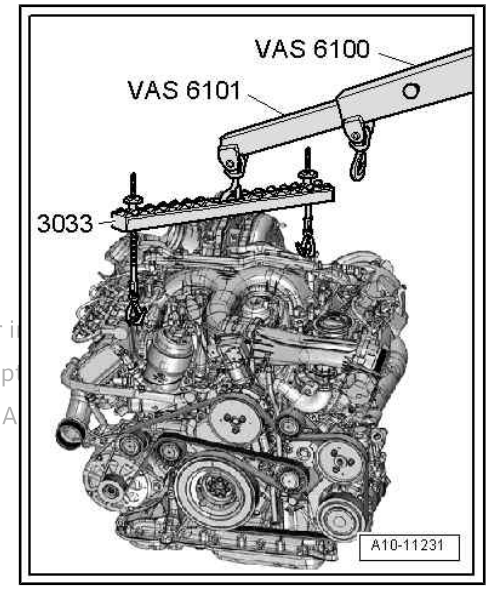
Procedure

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

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

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

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



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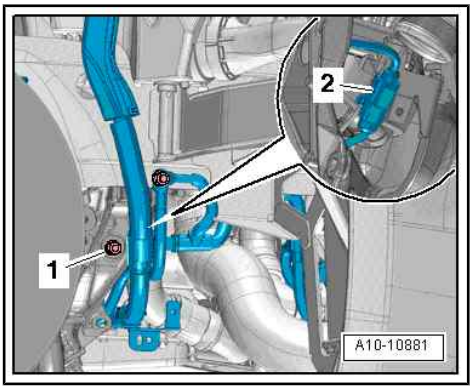
Routing of wires - version 1:

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

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

Note

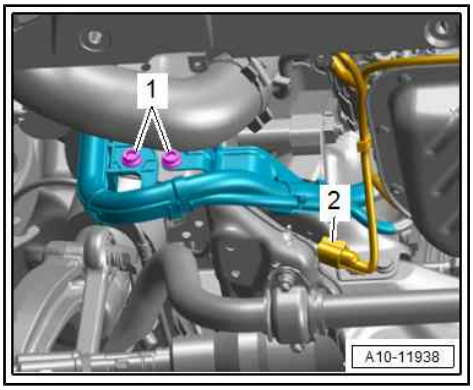
The illustration shows the installation position with the engine installed.



Routing of wires - version 2:

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

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

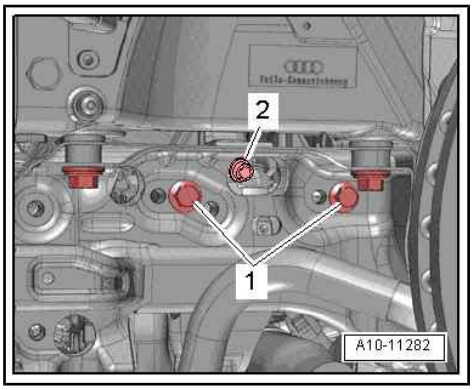


Note

The illustration shows the installation position with the engine installed.

All vehicles (continued):

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

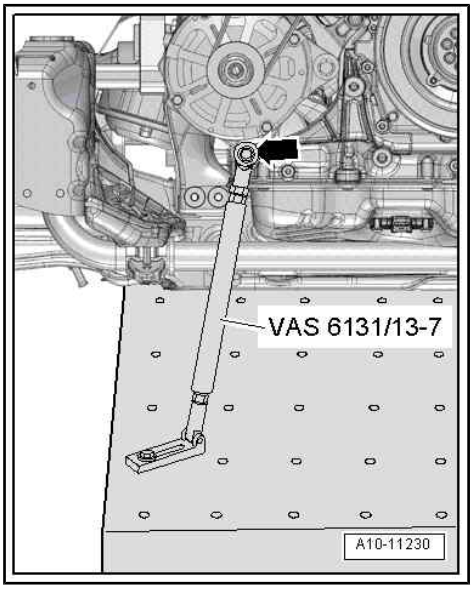


Note

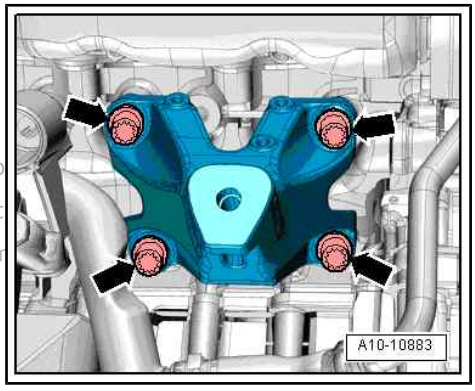
Disregard -item 1-.

– Remove support -VAS 6131/13-7- from engine.

– Lift engine off engine cross member.

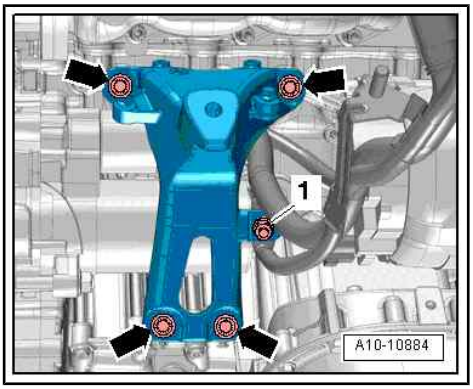


– Unscrew bolts -arrows- and remove engine support (left-side).



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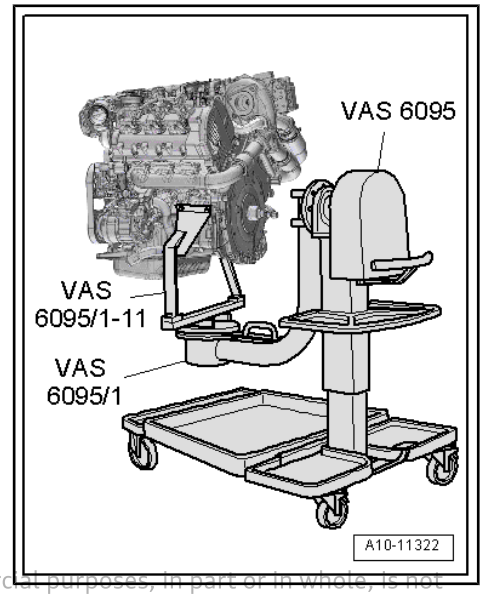
– Unscrew bolts -arrows- and remove engine support (right-side).
– Tie up starter on engine.



Note

Disregard -item 1-.

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

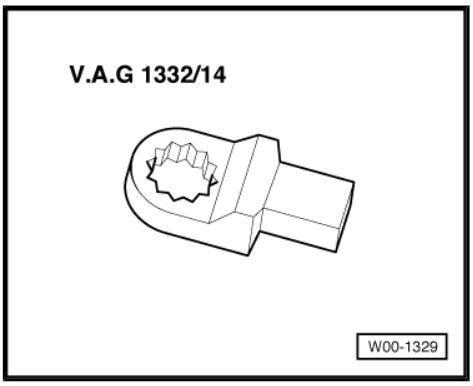


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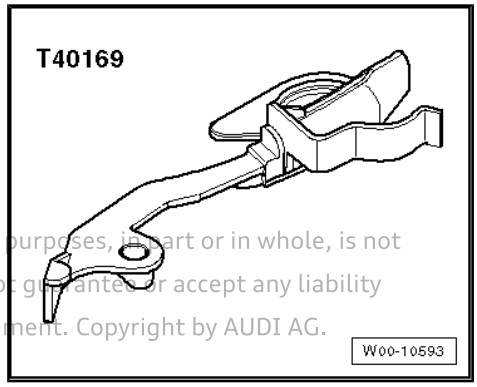
1.4 Installing engine

Special tools and workshop equipment required

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

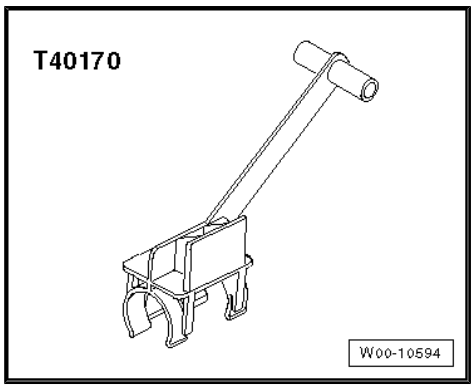


- Assembly aid - T40169-



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- Transportation lock - T40170-



Tightening torques

Note

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

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

- Assembly mountings
⇒ “2.1 Exploded view - assembly mountings”, page 156
- Engine to gearbox ⇒ Rep. gr. 34 ; Removing and installing gearbox; Tightening torques for gearbox or ⇒ Rep. gr. 37 ; Removing and installing gearbox; Tightening torques for gearbox

Procedure

Note

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

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- Engine with subframe positioned on scissor-type assembly platform - VAS 6131 B-
- Engine secured with support -VAS 6131/13-7- .

– Install engine supports and engine mountings ⇒ page 156 .

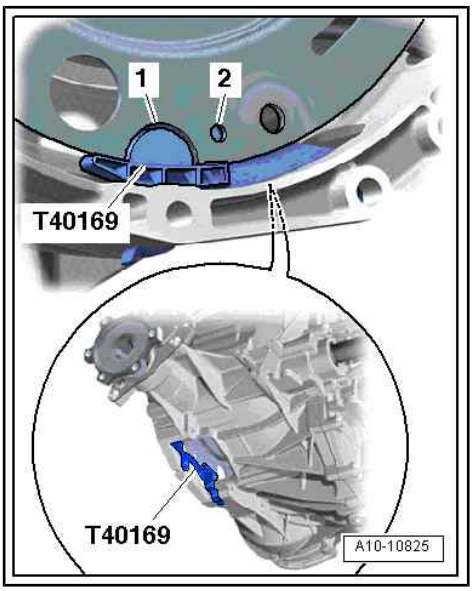
– Before installing gearbox, remove residue from threaded holes for engine/gearbox bolts in cylinder block using a thread tap.

– If fitted, place torque reaction support with stop into installation position and tighten bolts.

– The following preparations are required before joining engine and gearbox:

– Insert assembly aid - T40169- into gearbox housing and dual-mass flywheel/torque converter from below, as illustrated.

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



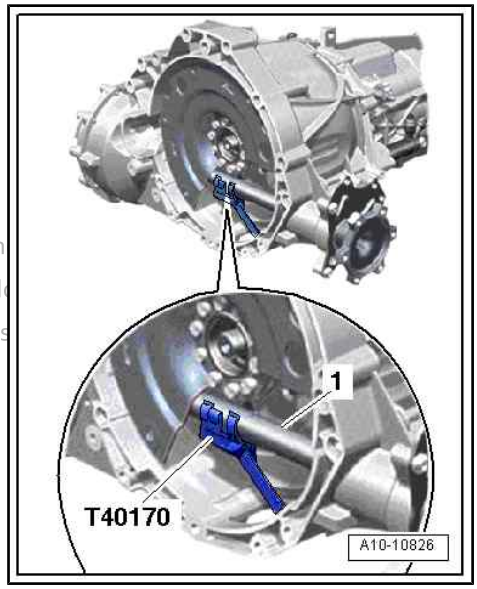
Note

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

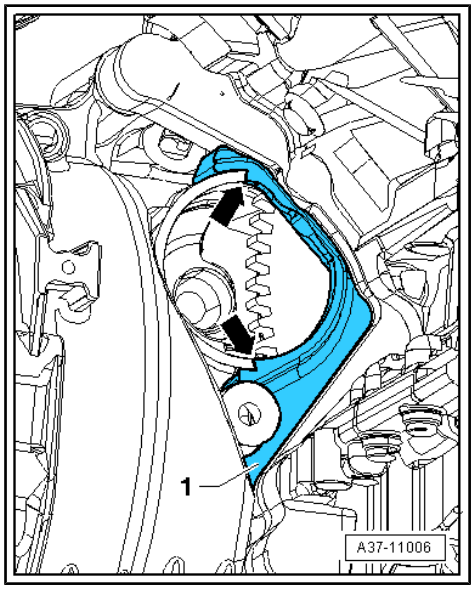
– Insert pin of assembly aid into hole on gearbox housing.

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

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– Fit starter and end seal -1- (where present) in correct installation position.

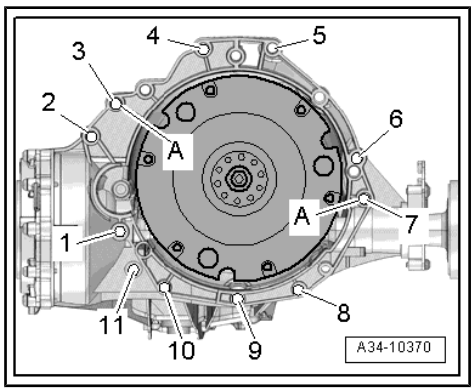


Vehicles with manual gearbox or multitronic gearbox:

– 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 ⇒ Rep. gr. 37 ; Removing and installing gearbox; Tightening torques for gearbox .

– Bring gearbox into position on engine and tighten bolts -3 … 11-.

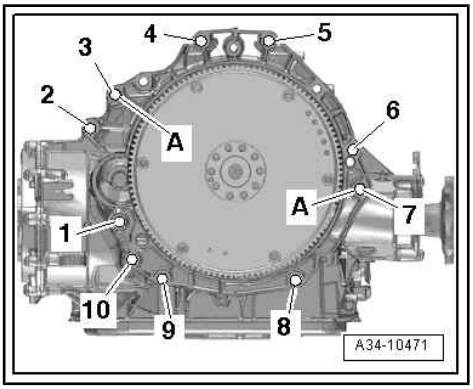


Vehicles with dual clutch gearbox 0B5:

– 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 ⇒ Rep. gr. 34 ; Removing and installing gearbox; Tightening torques for gearbox .

– Bring gearbox into position on engine and tighten bolts -3 … 10-.

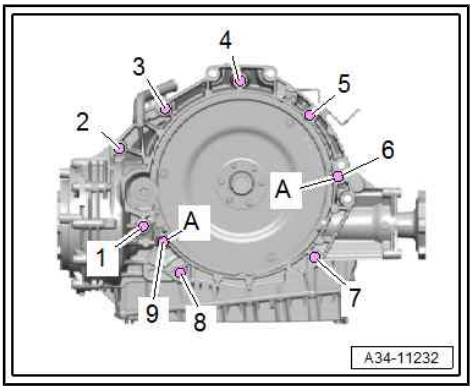


Vehicles with dual clutch gearbox 0CK:

– 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 ⇒ Rep. gr. 34 ; Removing and installing gearbox; Tightening torques for gearbox .

– Bring gearbox into position on engine and tighten bolts -3 … 9-.

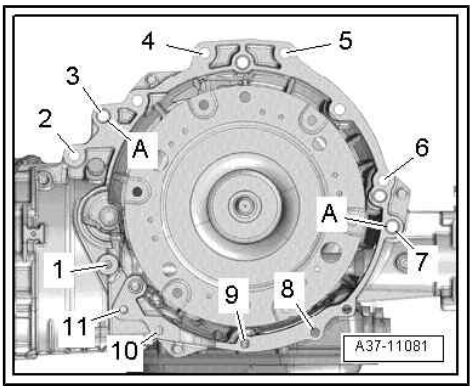


Vehicles with 8-speed automatic gearbox 0BK

– Check whether dowel sleeves -A- for centring engine and gearbox are fitted in cylinder block; install missing dowel sleeves.

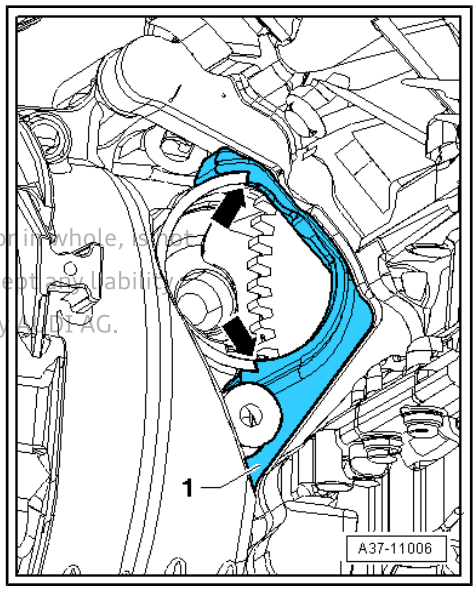
– Check whether aluminium bolts securing engine to gearbox can be reused; if so, apply marking ⇒ Rep. gr. 37 ; Removing and installing gearbox; Tightening torques for gearbox .

– Bring gearbox into position on engine and tighten bolts -3 … 11-.



All vehicles (continued):

- End seal -1- must be correctly fitted -arrows- before installing starter.



Note

Apply a small amount of lubricant to the end seal if the starter cannot be installed easily.

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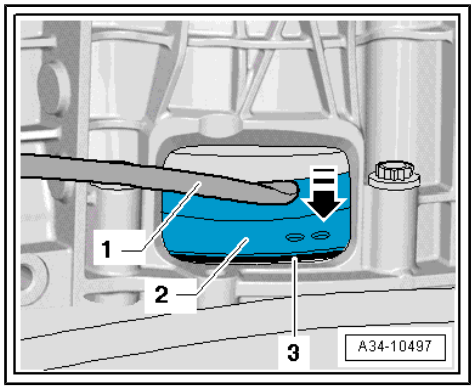
– Install starter ⇒ Electrical system; Rep. gr. 27 ; Starter; Exploded view - starter .

– Remove transport lock - T40170- and assembly aid - T40169- .

Note

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

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

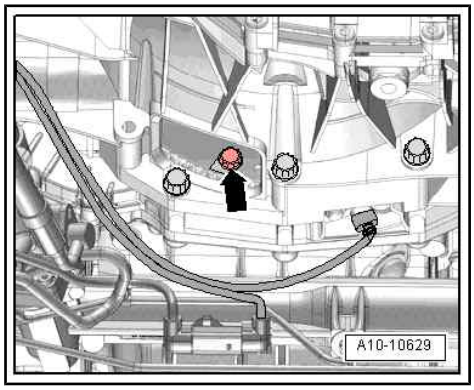


– Bolt dual-mass flywheel/torque converter onto drive plate as follows:

Note

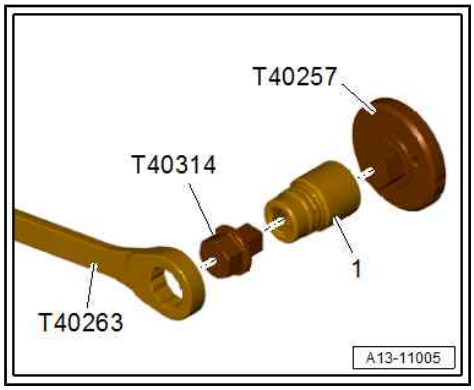
Use ring spanner insert AF 16 - V.A.G 1332/14- to tighten bolts.

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

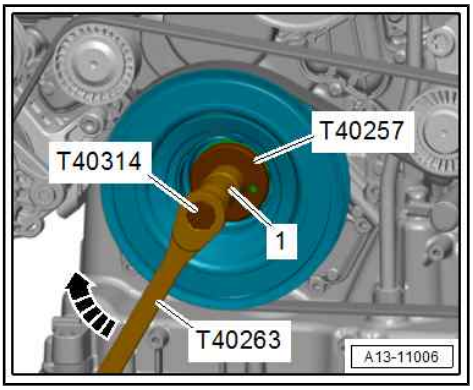


– Assemble tools as shown in illustration.

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



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Caution

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

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

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

– Now tighten bolt accessible in this position to specified torque ⇒ Rep. gr. 30 ; Clutch; Exploded view - flywheel and dual clutch or ⇒ Rep. gr. 32 ; Torque converter; Exploded view - torque converter .

– Turn crankshaft by 60° each time and tighten remaining 5 bolts to specified torque ⇒ Rep. gr. 30 ; Clutch; Exploded view - flywheel and dual clutch or ⇒ Rep. gr. 32 ; Torque converter; Exploded view - torque converter .

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

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

– Install ATF lines ⇒ Rep. gr. 34 ; ATF circuit; Removing and installing ATF lines or ⇒ Rep. gr. 37 ; ATF circuit; Removing and installing ATF lines .

– Install particulate filter:

- Front-wheel drive vehicles ⇒ page 612 .
- Four-wheel drive vehicles ⇒ page 616 .

– Vehicles with biturbo engine: install catalytic converter with front exhaust pipe ⇒ page 605 .

– Secure electrical wiring to catalytic converter heater 1 - Z119- / catalytic converter heater 2 - Z120- ⇒ Item 5 (page 568) .

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

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

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

WARNING

Risk of accident if bolted connections are loose.

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

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

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

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- Install propshaft ⇒ Rear final drive; Rep. gr. 39 ; Propshaft; Removing and installing propshaft .
- Install selector lever cable ⇒ Rep. gr. 34 ; Selector mechanism; Removing and installing selector lever cable or ⇒ Rep. gr. 37 ; Selector mechanism; Removing and installing selector lever cable .
- Secure intermediate steering shaft to steering rack ⇒ Running gear, axles, steering; Rep. gr. 48 ; Steering column; Removing and installing intermediate steering shaft .
- Install upper suspension links and suspension strut ⇒ Running gear, axles, steering; Rep. gr. 40 ; Suspension strut, upper links; Exploded view - suspension strut, upper links .
- Install subframe cross brace and anti-roll bar ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Exploded view - subframe .
- Install brake calipers ⇒ Brake system; Rep. gr. 46 ; Front brakes; Removing and installing brake caliper .
- Install front longitudinal member (bottom) ⇒ General body repairs, exterior; Rep. gr. 50 ; Lock carrier; Exploded view - lock carrier .
- Install engine control unit ⇒ page 582 .
- Install filler neck for washer fluid reservoir ⇒ Electrical system; Rep. gr. 92 ; Windscreen washer system; Exploded view - windscreen washer system .
- 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 plenum chamber ⇒ Electrical system; Rep. gr. 97 ; Relay carriers, fuse carriers, electronics boxes; Overview of fitting locations - relay carriers, fuse carriers, electronics boxes .
- Install body brace ⇒ Running gear, axles, steering; Rep. gr. 40 ; Suspension strut, upper links; Exploded view - suspension strut, upper links .
- Install refrigerant lines ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit; Exploded view - condenser .
- Install poly V-belt ⇒ page 180 .
- Observe steps required after re-connecting battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .

Caution

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

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

- Install air cleaner housing ⇒ page 510 .
- Install lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing attachments .
- Install plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .

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– Fill with engine oil and check oil level ⇒ Maintenance ; Booklet 411 .
– Connect coolant hoses with plug-in connector ⇒ page 394 .

Note

Do not reuse coolant.

– Fill up with coolant ⇒ page 366 .
– Charge refrigerant system ⇒ Air conditioner with refrigerant R134a .
– Install wheel housing liners ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front) .
– Fit front wheels ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres .
– Check wheel alignment ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheel alignment check; Wheel alignment procedure .

WARNING

Risk of accident if bolted connections are loose.

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

– Depending on gearbox version, fill up with ATF ⇒ Rep. gr. 34 ; ATF; Checking ATF level or ⇒ Rep. gr. 37 ; ATF; Checking ATF level .
– Install noise insulation panels ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .

Bleeding fuel system and checking for leaks

– Run engine at idling speed for several minutes (do not press accelerator) and then switch off. Fuel system will bleed itself automatically.
– Check the entire fuel system for leaks.

Renew the affected component if leakage occurs.

– After completing the repair, road-test the vehicle. Accelerate with full throttle at least once. Then check the high-pressure section of the fuel system again for leaks.

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2 Assembly mountings

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

⇒ “2.2 Supporting engine in installation position”, page 162

⇒ “2.3 Removing and installing engine mountings”, page 163

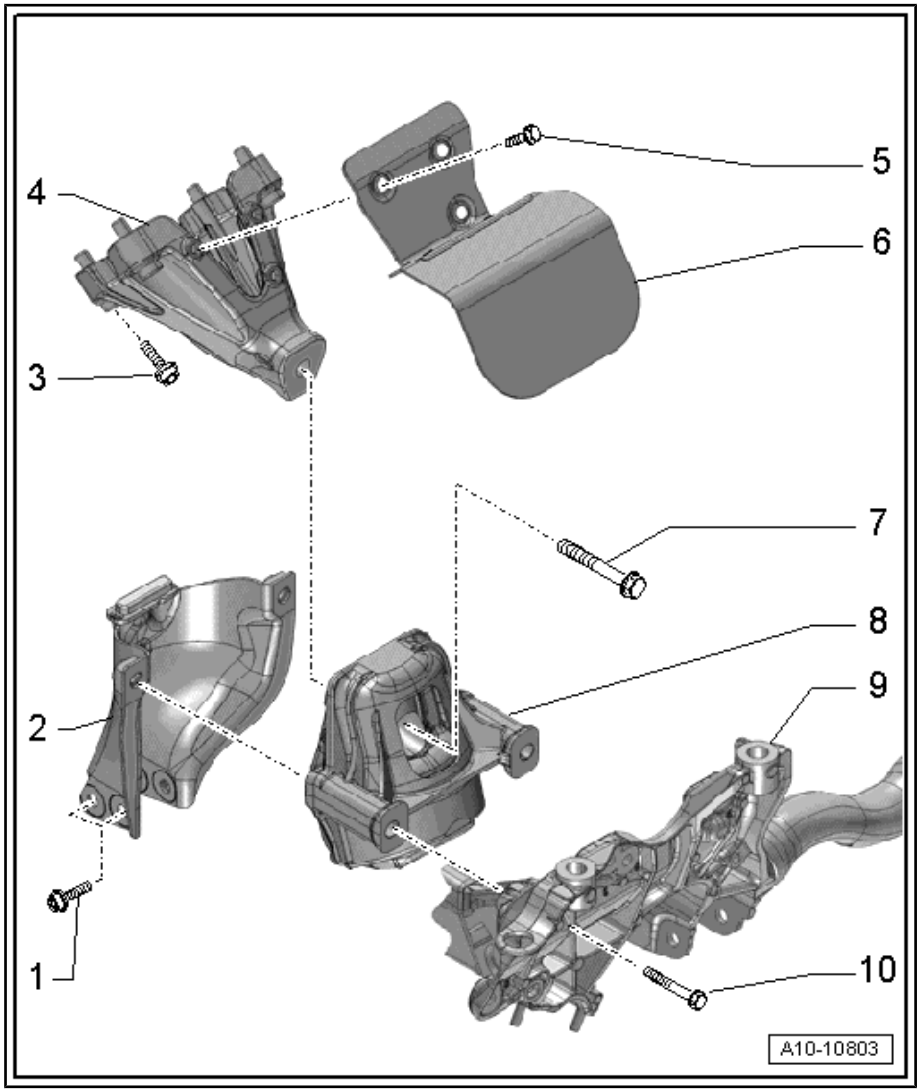
⇒ “2.4 Removing and installing torque reaction support”, page 166

⇒ “2.5 Removing and installing gearbox mounting”, page 167

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2.1 Exploded view - assembly mountings

Engine mounting



1 - Bolt
- ❑ 20 Nm

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

3 - Bolt
- ❑ 40 Nm

4 - Engine support

5 - Bolt
- ❑ 10 Nm

6 - Heat shield

7 - Bolt
- ❑ Renew
- ❑ 90 Nm +90°

8 - Engine mounting
- ❑ Left side: with left electrohydraulic engine mounting solenoid valve - N144-
- ❑ Right side: with right electrohydraulic engine mounting solenoid valve - N145-
- ❑ Removing and installing ⇒ page 163

9 - Subframe
- ❑ Different versions available; for allocation refer to ⇒ Electronic parts catalogue

10 - Bolt
- ❑ 55 Nm

Torque reaction support

1 - Lock carrier

2 - Cross piece

3 - Nut

- ❑ 40 Nm

4 - Stop plate

- ❑ For torque reaction support

5 - Bolt

- ❑ 30 Nm

6 - Buffer

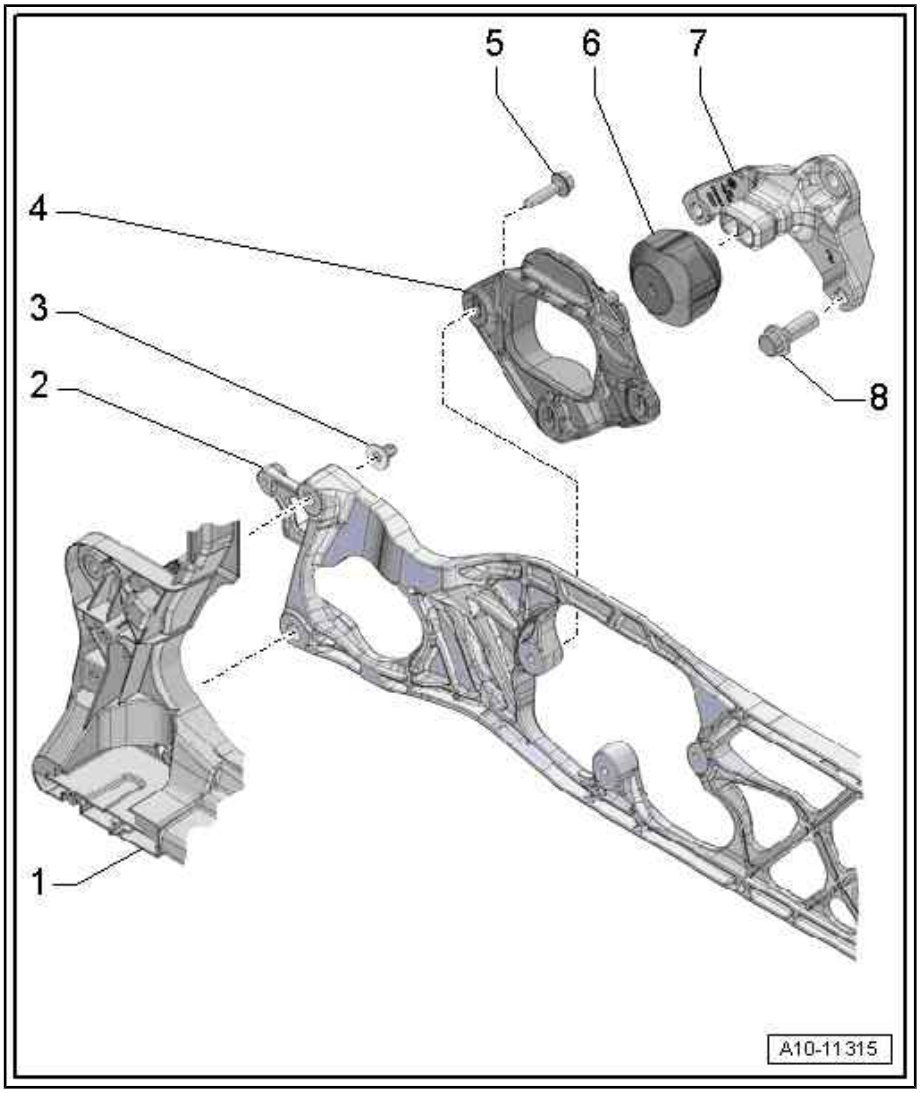
- ❑ For torque reaction support

7 - Torque reaction support

- ❑ Removing and installing ⇒ page 166

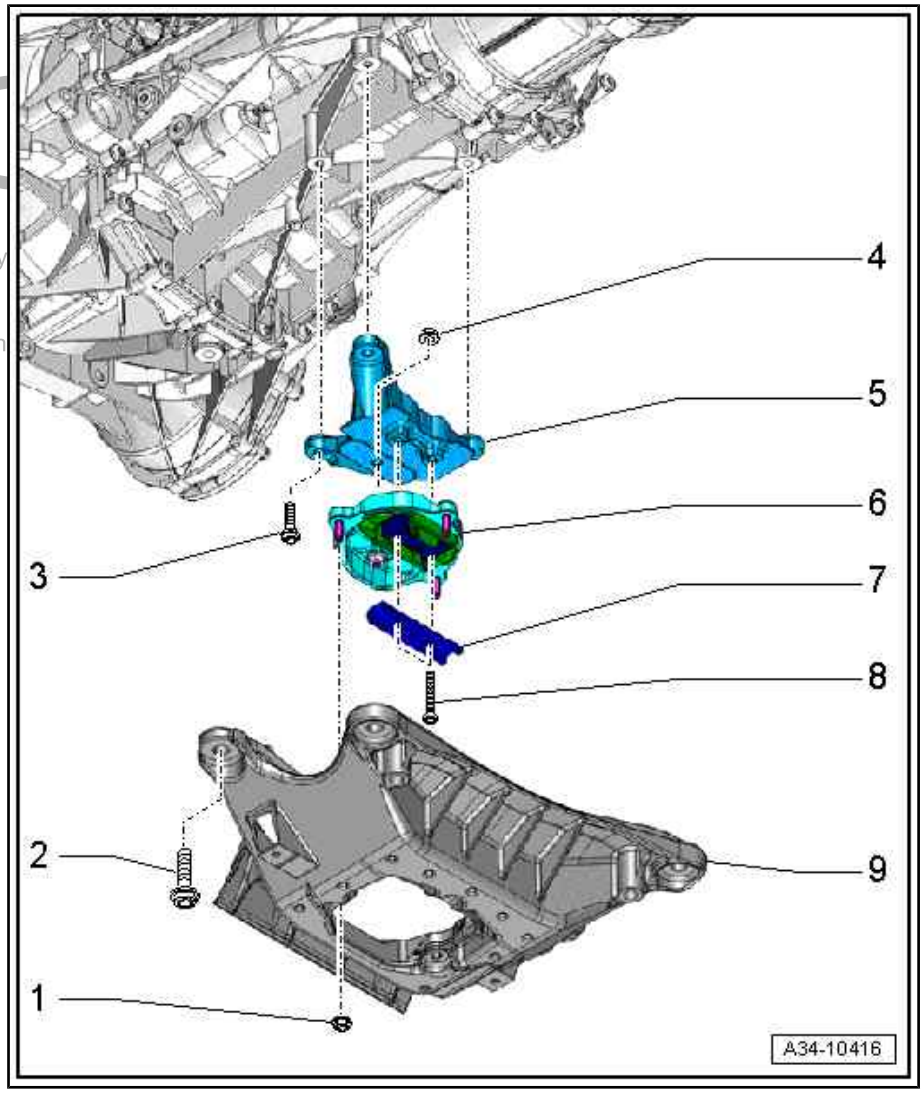
8 - Bolt

- ❑ Renew
- ❑ 20 Nm +90°



Gearbox mounting for manual gearbox

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1 - Nut

- ❑ Tightening torque ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

2 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

3 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

4 - Nut

- ❑ Only remove if detaching gearbox mounting from gearbox support
- ❑ Tightening torque ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

5 - Gearbox support

6 - Gearbox mounting

- ❑ Removing and installing ⇒ page 168

7 - Stop (bottom)

- ❑ For gearbox mounting

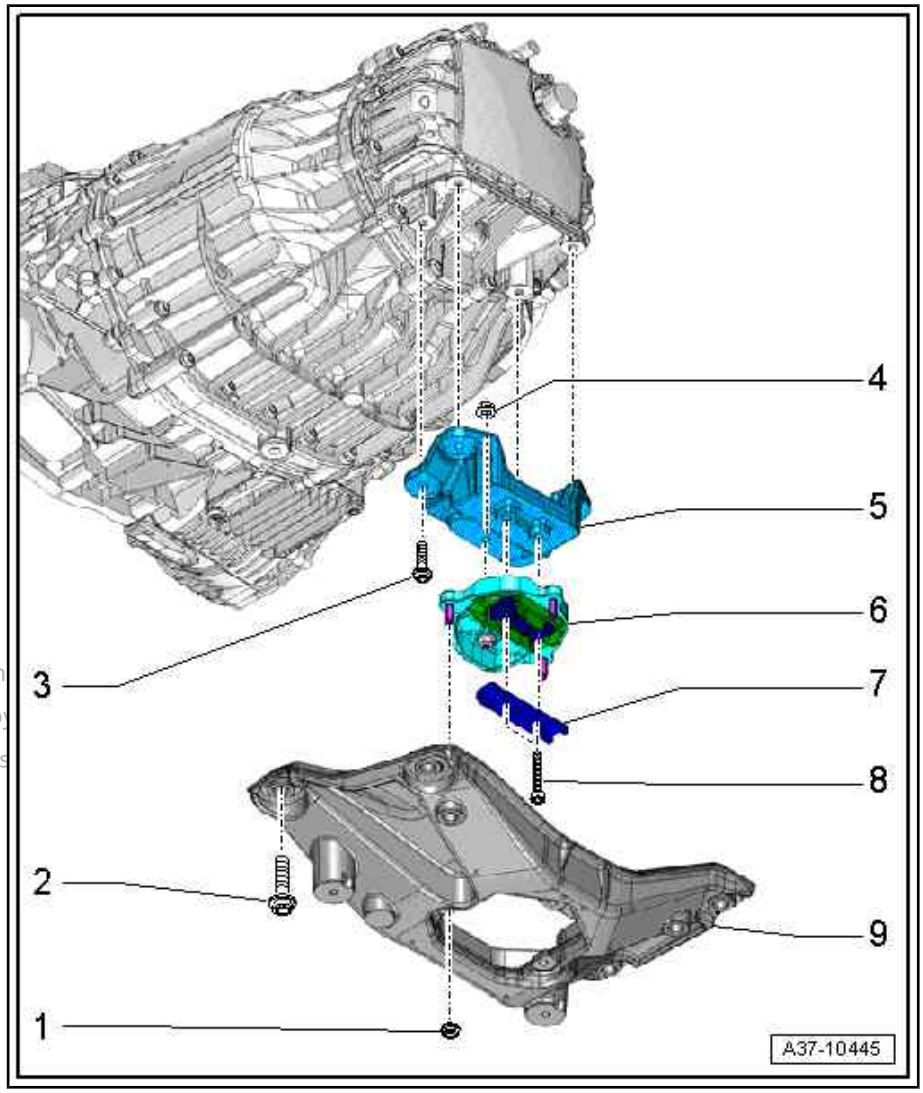
8 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

9 - Tunnel cross member

- ❑ Removing and installing ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

Gearbox mounting for multitronic gearbox



1 - Nut

- ❑ Tightening torque ⇒ Rep. gr. 37 ; Assembly mountings; Exploded view - assembly mountings

2 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 37 ; Assembly mountings; Exploded view - assembly mountings

3 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 37 ; Assembly mountings; Exploded view - assembly mountings

4 - Nut

- ❑ Only remove if detaching gearbox mounting from gearbox support
- ❑ Tightening torque ⇒ Rep. gr. 37 ; Assembly mountings; Exploded view - assembly mountings

5 - Gearbox support

6 - Gearbox mounting

- ❑ Removing and installing ⇒ page 168

7 - Stop (bottom)

- ❑ For gearbox mounting

8 - Bolt

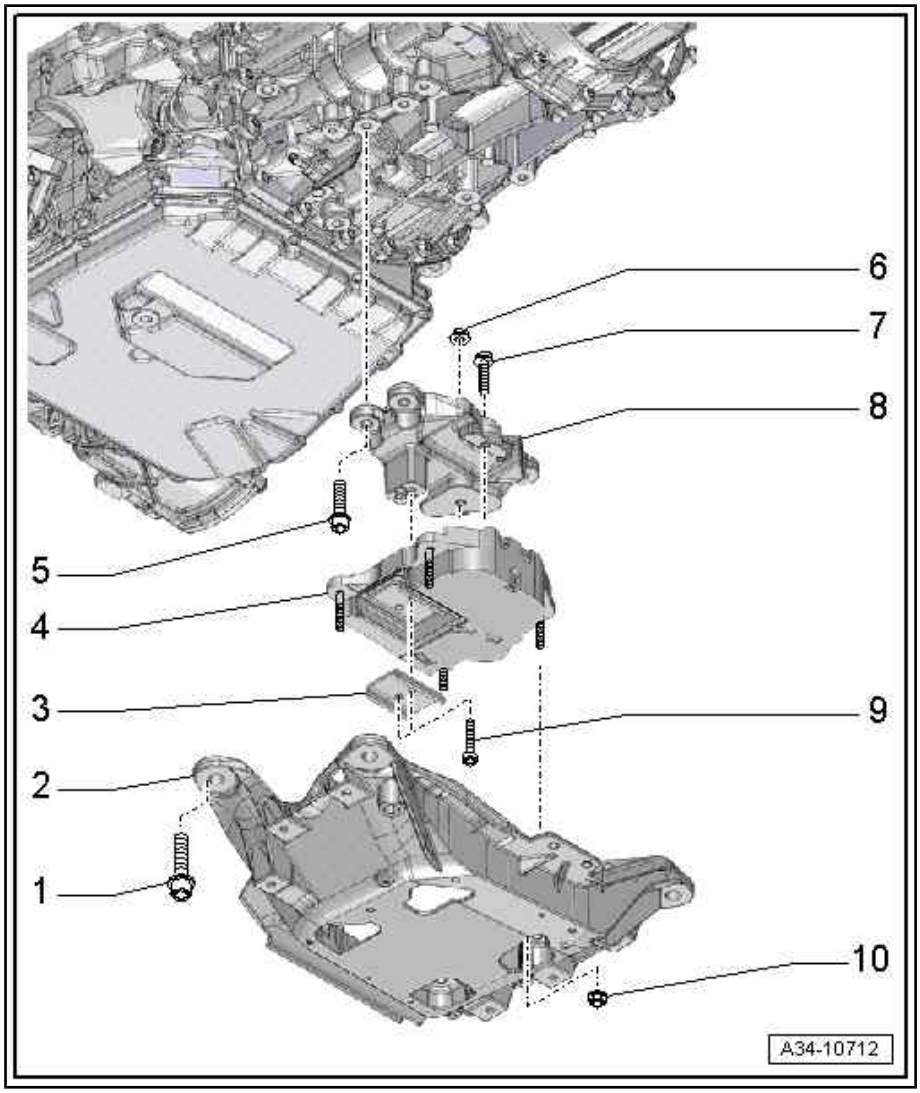
- ❑ Tightening torque ⇒ Rep. gr. 37 ; Assembly mountings; Exploded view - assembly mountings

9 - Tunnel cross member

- ❑ Removing and installing ⇒ Rep. gr. 37 ; Assembly mountings; Exploded view - assembly mountings

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Gearbox mounting for dual clutch gearbox 0B5



1 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

2 - Tunnel cross member

- ❑ Removing and installing ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

3 - Stop plate

- ❑ For gearbox mounting

4 - Gearbox mounting

- ❑ Removing and installing ⇒ page 169

5 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

6 - Nut

- ❑ Only remove if detaching gearbox mounting from gearbox support
- ❑ Tightening torque ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

7 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

8 - Gearbox support

- ❑ Removing and installing ⇒ page 169

9 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

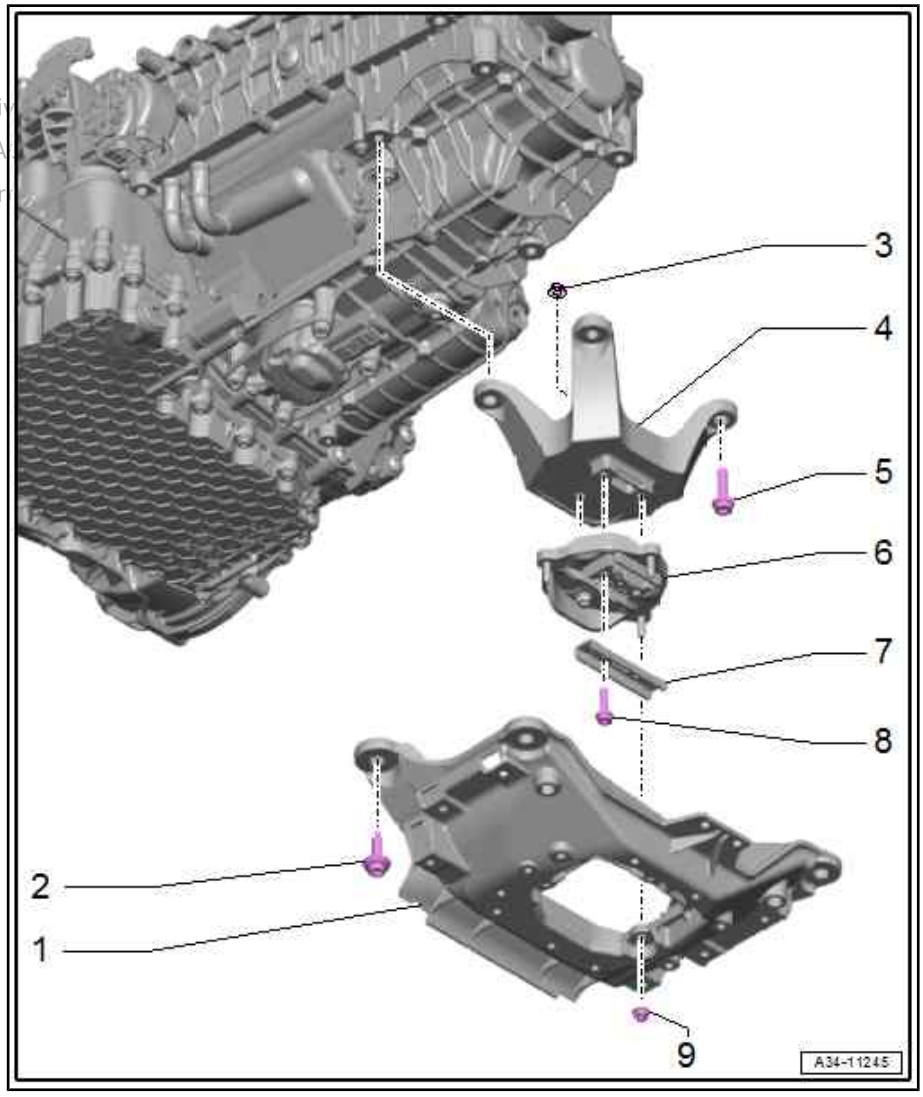
10 - Nut

- ❑ Tightening torque ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

Gearbox mounting for dual clutch gearbox 0CK

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1 - Tunnel cross member

- ❑ Removing and installing ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

2 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

3 - Nut

- ❑ Only remove if detaching gearbox mounting from gearbox support
- ❑ Tightening torque ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

4 - Gearbox support

5 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

6 - Gearbox mounting

- ❑ Removing and installing ⇒ page 169

7 - Stop plate

- ❑ For gearbox mounting

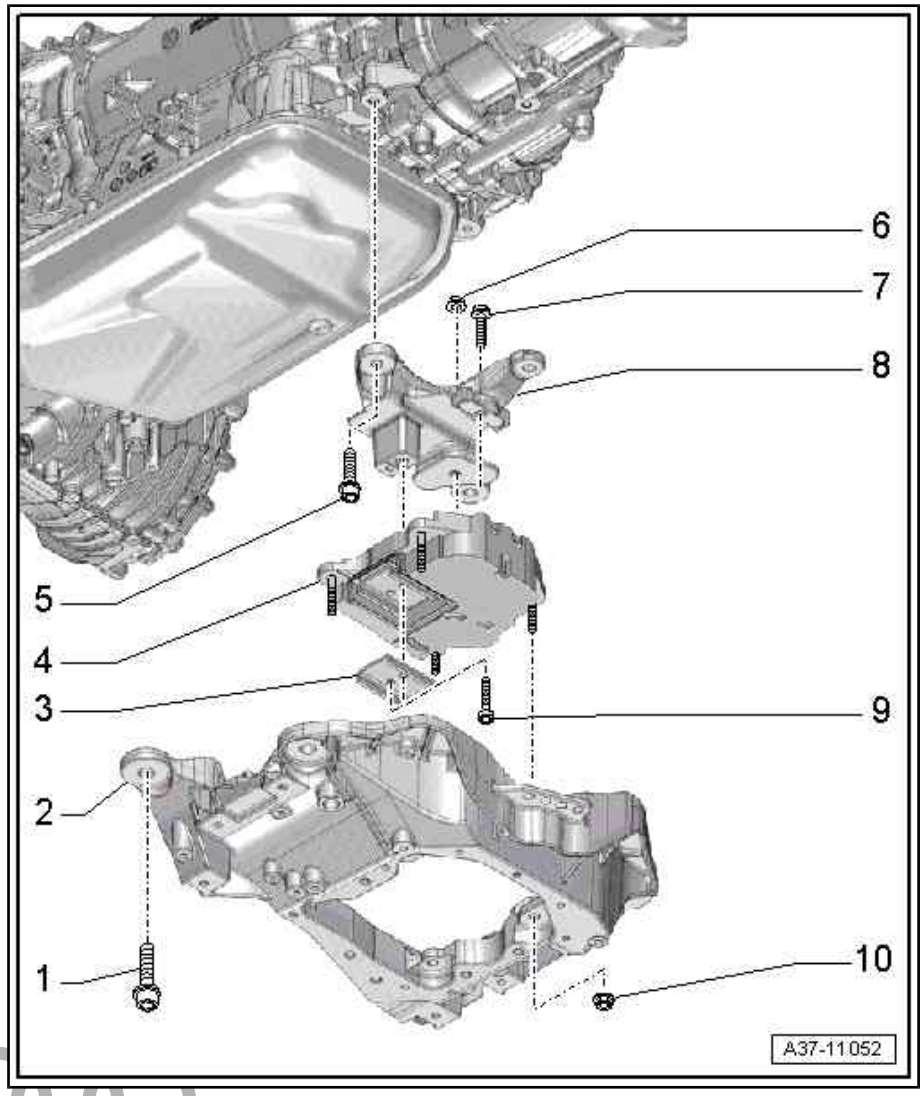
8 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

9 - Nut

- ❑ Tightening torque ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

Gearbox mounting for automatic gearbox 0BK



1 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 37 ; Assembly mountings; Exploded view - assembly mountings

2 - Tunnel cross member

- ❑ Removing and installing ⇒ Rep. gr. 37 ; Assembly mountings; Exploded view - assembly mountings

3 - Stop plate

- ❑ For gearbox mounting

4 - Gearbox mounting

- ❑ Removing and installing ⇒ page 171

5 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 37 ; Assembly mountings; Exploded view - assembly mountings

6 - Nut

- ❑ Only remove if detaching gearbox mounting from gearbox support
- ❑ Tightening torque ⇒ Rep. gr. 37 ; Assembly mountings; Exploded view - assembly mountings

7 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 37 ; Assembly mountings; Exploded view - assembly mountings

8 - Gearbox support

- ❑ Removing and installing ⇒ page 171

9 - Bolt

- ❑ Only remove if detaching gearbox mounting from gearbox support
- ❑ Tightening torque ⇒ Rep. gr. 37 ; Assembly mountings; Exploded view - assembly mountings

10 - Nut

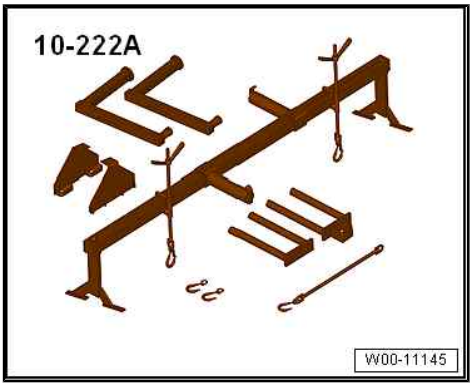
- ❑ Tightening torque ⇒ Rep. gr. 37 ; Assembly mountings; Exploded view - assembly mountings

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2.2 Supporting engine in installation position

Special tools and workshop equipment required

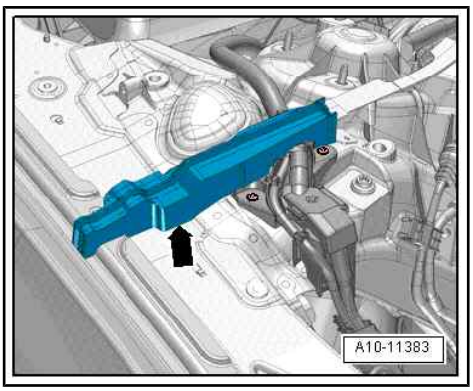
- Support bracket - 10 - 222 A-



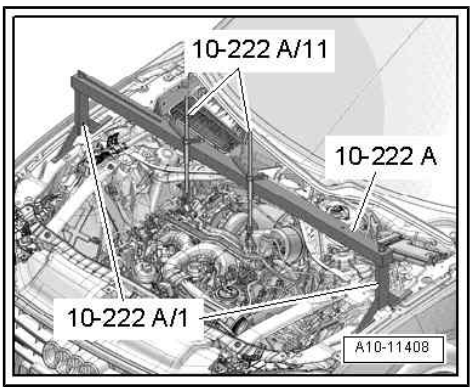
Procedure

– Remove engine cover panel ⇒ page 172 .

– Pull off foam wedge -arrow- (left and right) upwards.



– Set up support bracket - 10 - 222 A- on suspension turrets (left and right) as illustrated.



Caution

Risk of damage to turbocharger unit on biturbo engine.

- ***Support bracket spindles must only be engaged on engine lifting eyes, as described here, and never on turbocharger unit lifting eyes.***

– Engage spindles -10 - 222 A /11- at engine lifting eyes (left and right).

– Partly take up weight of engine with spindles.

2.3 Removing and installing engine mountings

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Note

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

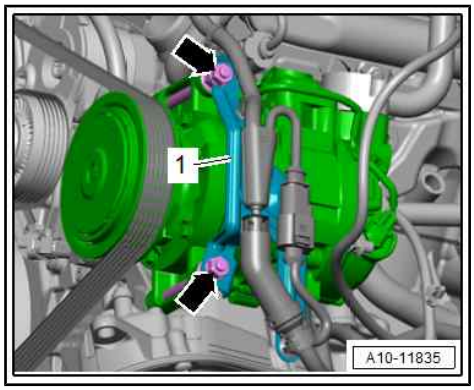
Removing

– Support engine in installation position ⇒ page 162 .

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

Engine mounting (left-side):

– If fitted, remove nuts -arrows- and move bracket -1- to one side.
– Remove poly V-belt ⇒ page 180 .



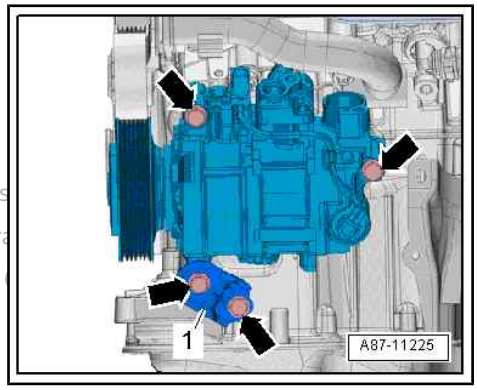
Caution

Risk of damage to refrigerant lines and hoses

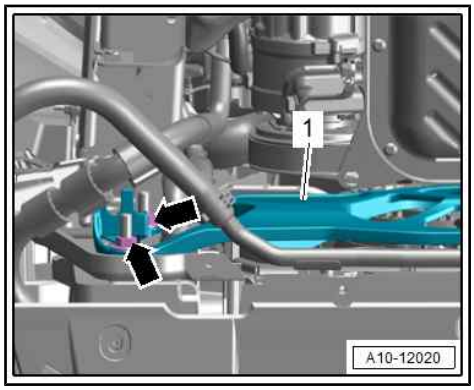
- ***Do NOT stretch, kink or bend refrigerant lines and hoses.***

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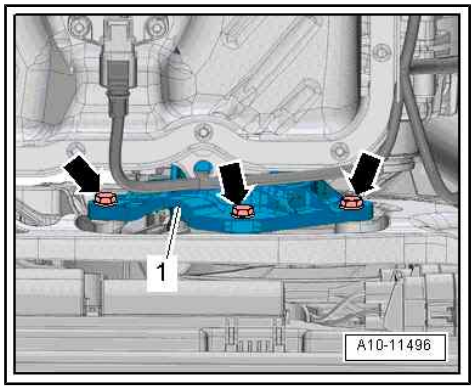
– Remove bolts -arrows-.
– If fitted, remove bracket -1-.
– Detach air conditioner compressor from bracket and tie up.



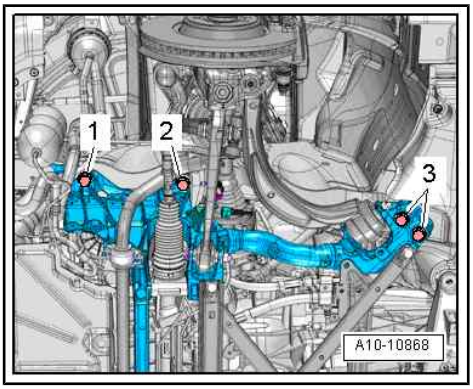
– If fitted, unscrew nuts -arrows- on left and right of cross piece (leave cross piece -1- in installation position).



– If fitted, unscrew bolts -arrows- and press stop -1- for torque reaction support towards engine.



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



Note

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

Routing of wires (right-side) - version 1:

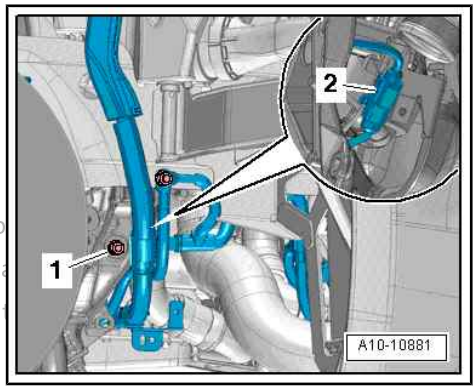
– Unscrew nut -1-.

Routing of wires (both sides) - version 1:

– Detach bracket with electrical connector -2- for electrohydraulic engine mounting solenoid valves -N144- / -N145- from subframe (both sides).

– Unplug electrical connectors and move wiring clear.

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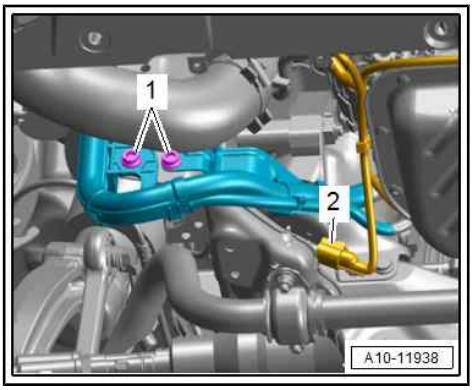


Routing of wires (right-side) - version 2:

– Remove bolts -1-.

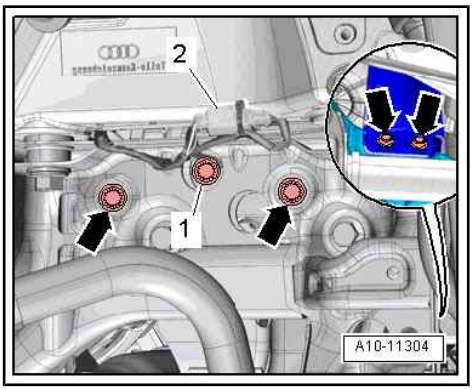
Routing of wires (both sides) - version 2:

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



All vehicles (continued):

– Remove bolts (left and right) -1- and -arrows- and place retaining plate to one side.



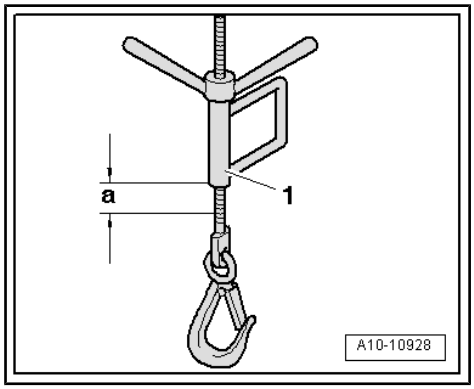
Note

Disregard -item 2-.

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

• Distance -a- = approx. 20 mm.

– Detach engine mounting on relevant side.



Installing

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

Note

Renew the bolts tightened with specified tightening angle.

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

– Install poly V-belt ⇒ page 180 .

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Tightening torques

- ⇒ “2.1 Exploded view - assembly mountings”, page 156
- ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Exploded view - subframe
- ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Exploded view - air conditioner compressor drive unit
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation
- Wheel spoiler ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front)

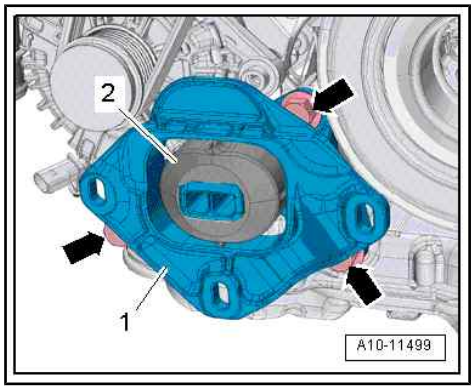
2.4 Removing and installing torque reaction support

Removing

– Remove vibration damper ⇒ page 183 .

– Also remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

– Unscrew bolts -arrows- and remove torque reaction support -2- with stop -1-.



Installing

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

Note

Renew the bolts tightened with specified tightening angle.

– Install vibration damper ⇒ page 183 .

Tightening torques

- ⇒ “2.1 Exploded view - assembly mountings”, page 156
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

2.5 Removing and installing gearbox mounting

⇒ “2.5.1 Removing and installing gearbox support with gearbox mounting - vehicles with manual gearbox”, page 167

⇒ “2.5.2 Removing and installing gearbox mounting - vehicles with manual gearbox”, page 168

⇒ “2.5.3 Removing and installing gearbox mounting - vehicles with multitronic gearbox”, page 168

⇒ “2.5.4 Removing and installing gearbox support with gearbox mounting - vehicles with dual clutch gearbox 0B5”, page 169

⇒ “2.5.5 Removing and installing gearbox mounting - vehicles with dual clutch gearbox 0B5”, page 169

⇒ “2.5.6 Removing and installing gearbox support with gearbox mounting - vehicles with dual clutch gearbox 0CK”, page 170

⇒ “2.5.7 Removing and installing gearbox mounting - vehicles with dual clutch gearbox 0CK”, page 170

⇒ “2.5.8 Removing and installing gearbox support with gearbox mounting - vehicles with automatic gearbox”, page 171

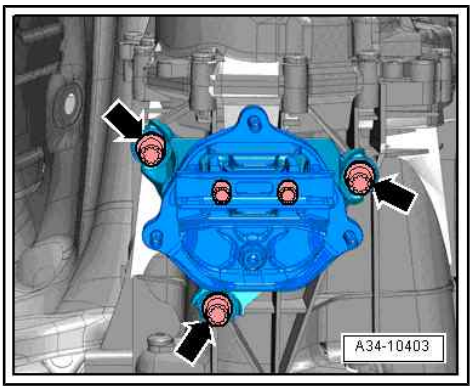
⇒ “2.5.9 Removing and installing gearbox mounting - vehicles with automatic gearbox”, page 171

2.5.1 Removing and installing gearbox support with gearbox mounting - vehicles with manual gearbox

Removing

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

– Remove bolts -arrows- and detach gearbox support and gearbox mounting from gearbox.



Installing

Installation is carried out in reverse sequence.

Tightening torques

♦ ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

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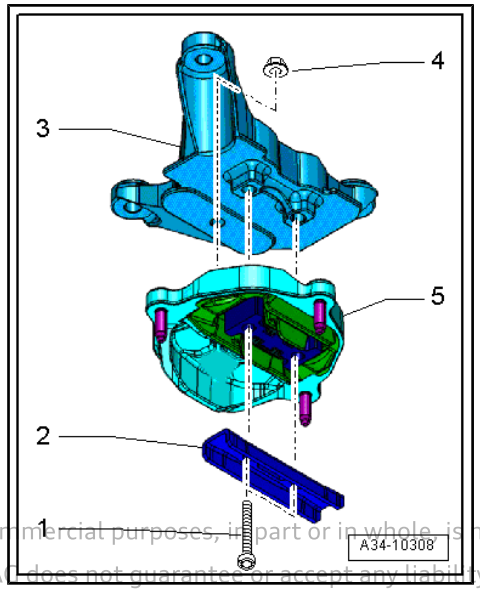
2.5.2 Removing and installing gearbox mounting - vehicles with manual gearbox

Removing

– Remove gearbox support with gearbox mounting ⇒ page 169 .

– Unscrew bolts -1- and detach stop (bottom) -2- for gearbox mounting.

– Remove nut -4- and detach gearbox mounting -5- from gearbox support -3-.



Installing

– Position gearbox support -3- on gearbox mounting -5- and hand-tighten nut -4-.

– Secure stop (bottom) -2- with bolts -1-.

– Tighten nut -4-.

– Install gearbox support with gearbox mounting ⇒ page 169 .

Tightening torques

♦ ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

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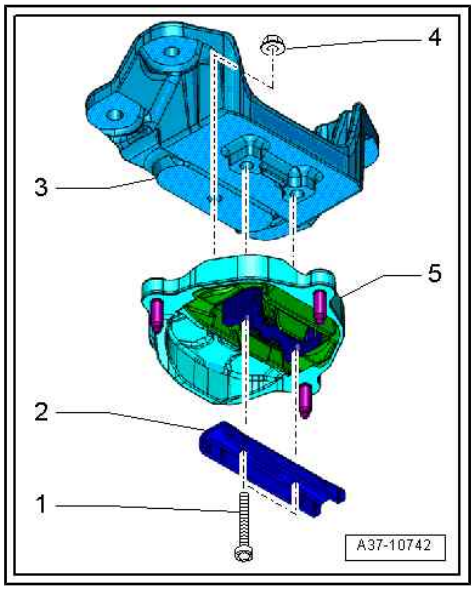
2.5.3 Removing and installing gearbox mounting - vehicles with multitronic gearbox

Removing

– Remove tunnel cross-piece ⇒ Rep. gr. 37 ; Assembly mountings; Exploded view - assembly mountings .

– Unscrew bolts -1- and detach stop (bottom) -2- for gearbox mounting.

– Remove nut -4- and detach gearbox mounting -5- from gearbox support -3-.



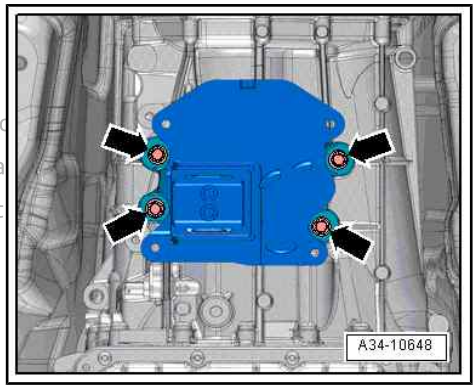
Installing

Installation is carried out in reverse sequence.

Tightening torques

♦ ⇒ Rep. gr. 37 ; Assembly mountings; Exploded view - assembly mountings

2.5.4 Removing and installing gearbox support with gearbox mounting - vehicles with dual clutch gearbox 0B5



Removing

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

– Remove bolts -arrows- and detach gearbox support and gearbox mounting from gearbox.

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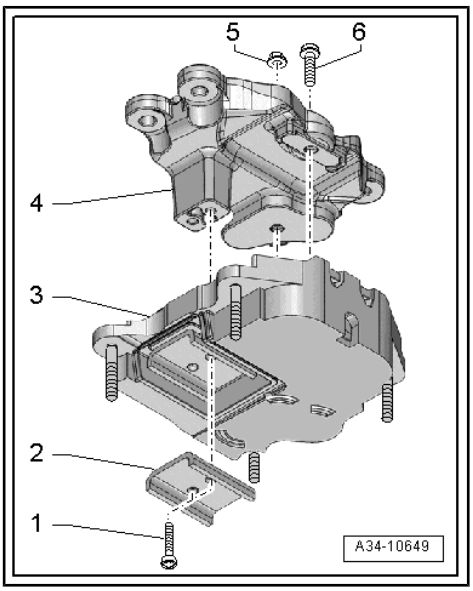
Installing

Installation is carried out in reverse sequence.

Tightening torques

♦ ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

2.5.5 Removing and installing gearbox mounting - vehicles with dual clutch gearbox 0B5



Removing

– Remove gearbox support with gearbox mounting ⇒ page 169 .

– Unscrew bolt -1- and detach stop -2- for gearbox mounting.

– Remove nut -5- and bolt -6- and detach gearbox mounting -3- from gearbox support -4-.

Installing

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

– Position gearbox support -4- on gearbox mounting -3-.

– Hand-tighten nut -5- and bolt -6-.

– Tighten bolt -1- for stop -2-.

– Tighten nut -5- and bolt -6-.

– Install gearbox support with gearbox mounting ⇒ page 169 .

Tightening torques

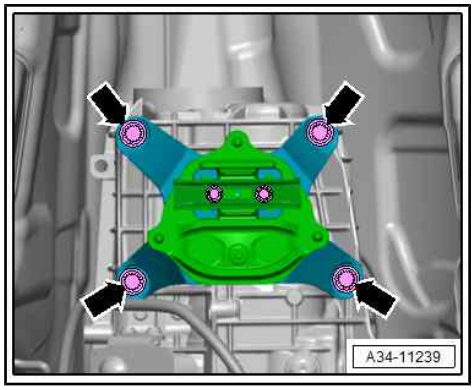
♦ ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

2.5.6 Removing and installing gearbox support with gearbox mounting - vehicles with dual clutch gearbox 0CK

Removing

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

– Remove bolts -arrows- and detach gearbox support and gearbox mounting from gearbox.



Installing

Installation is carried out in reverse sequence.

Tightening torques

♦ ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

2.5.7 Removing and installing gearbox mounting - vehicles with dual clutch gearbox 0CK

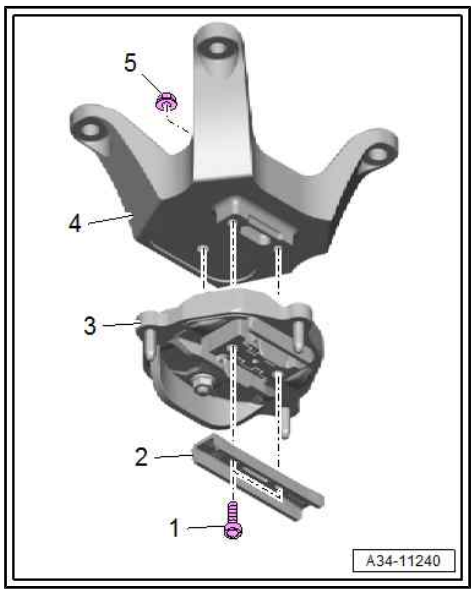
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Removing

– Remove gearbox support with gearbox mounting ⇒ page 169 .

– Unscrew bolt -1- and detach stop -2- for gearbox mounting.

– Remove nut -5- and bolt -6- and detach gearbox mounting -3- from gearbox support -4-.



Installing

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

– Position gearbox support -4- on gearbox mounting -3-.

– Hand-tighten nut -5- and bolt -6-.

– Tighten bolt -1- for stop -2-.

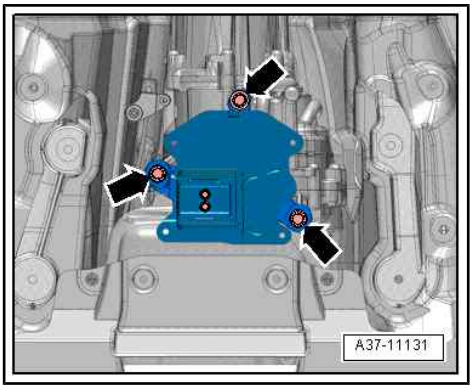
– Tighten nut -5- and bolt -6-.

– Install gearbox support with gearbox mounting ⇒ page 169 .

Tightening torques

♦ ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

2.5.8 Removing and installing gearbox support with gearbox mounting - vehicles with automatic gearbox



Removing

– Remove tunnel cross-piece ⇒ Rep. gr. 37 ; Assembly mountings; Exploded view - assembly mountings .

– Remove bolts -arrows- and detach gearbox support and gearbox mounting from gearbox.

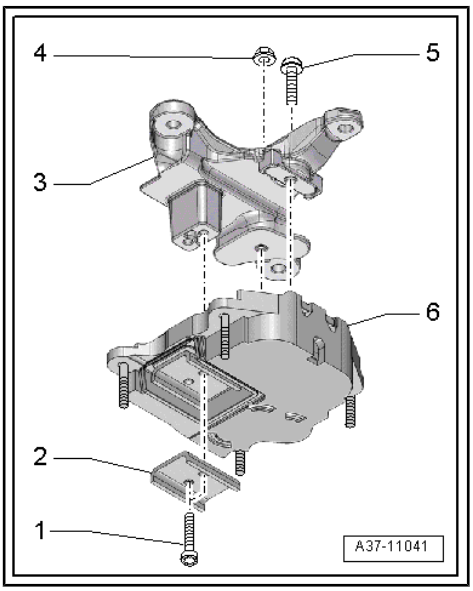
Installing

Installation is carried out in reverse sequence.

Tightening torques

♦ ⇒ Rep. gr. 37 ; Assembly mountings; Exploded view - assembly mountings

2.5.9 Removing and installing gearbox mounting - vehicles with automatic gearbox



Removing

– Remove gearbox support with gearbox mounting ⇒ page 171 .

– Unscrew bolt -1- and detach stop -2- for gearbox mounting.

– Remove nut -4- and bolt -5- and detach gearbox mounting -6- from gearbox support -3-.

Installing

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

– Position gearbox support -3- on gearbox mounting -6-.

– Hand-tighten nut -4- and bolt -5-.

– Tighten bolt -1- for stop -2-.

– Tighten nut -4- and bolt -5-.

– Install gearbox support with gearbox mounting ⇒ page 171 .

Tightening torques

♦ ⇒ Rep. gr. 37 ; Assembly mountings; Exploded view - assembly mountings

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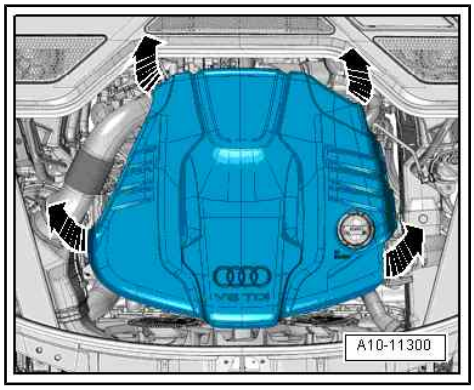
3 Engine cover panel

⇒ “3.1 Removing and installing engine cover panel”, page 172

3.1 Removing and installing engine cover panel

Removing

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



Installing

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

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

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

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13 – Crankshaft group

1 Cylinder block (pulley end)

⇒ “1.1 Exploded view - cylinder block (pulley end)”, page 173

⇒ “1.2 Exploded view - sealing flange (pulley end)”, page 176

⇒ “1.3 Removing and installing poly V-belt”, page 180

⇒ “1.4 Removing and installing tensioner for poly V-belt”, page 182

⇒ “1.5 Removing and installing vibration damper”, page 182

⇒ “1.6 Removing and installing bracket for ancillaries”, page 187

⇒ “1.7 Renewing crankshaft oil seal (pulley end)”, page 187

⇒ “1.8 Removing and installing sealing flange (pulley end)”, page 189

1.1 Exploded view - cylinder block (pulley end)

1 - Poly V-belt
- ❑ Check for wear
- ❑ Before removing, mark direction of rotation with chalk or felt-tip pen
- ❑ Removing and installing ⇒ page 180
- ❑ Do not kink
- ❑ When installing, make sure it is properly seated on pulleys

2 - Vibration damper
- ❑ With poly V-belt pulley
- ❑ Removing and installing:

♦ Vehicles without torque reaction support ⇒ page 182

♦ Vehicles with torque reaction support ⇒ page 183

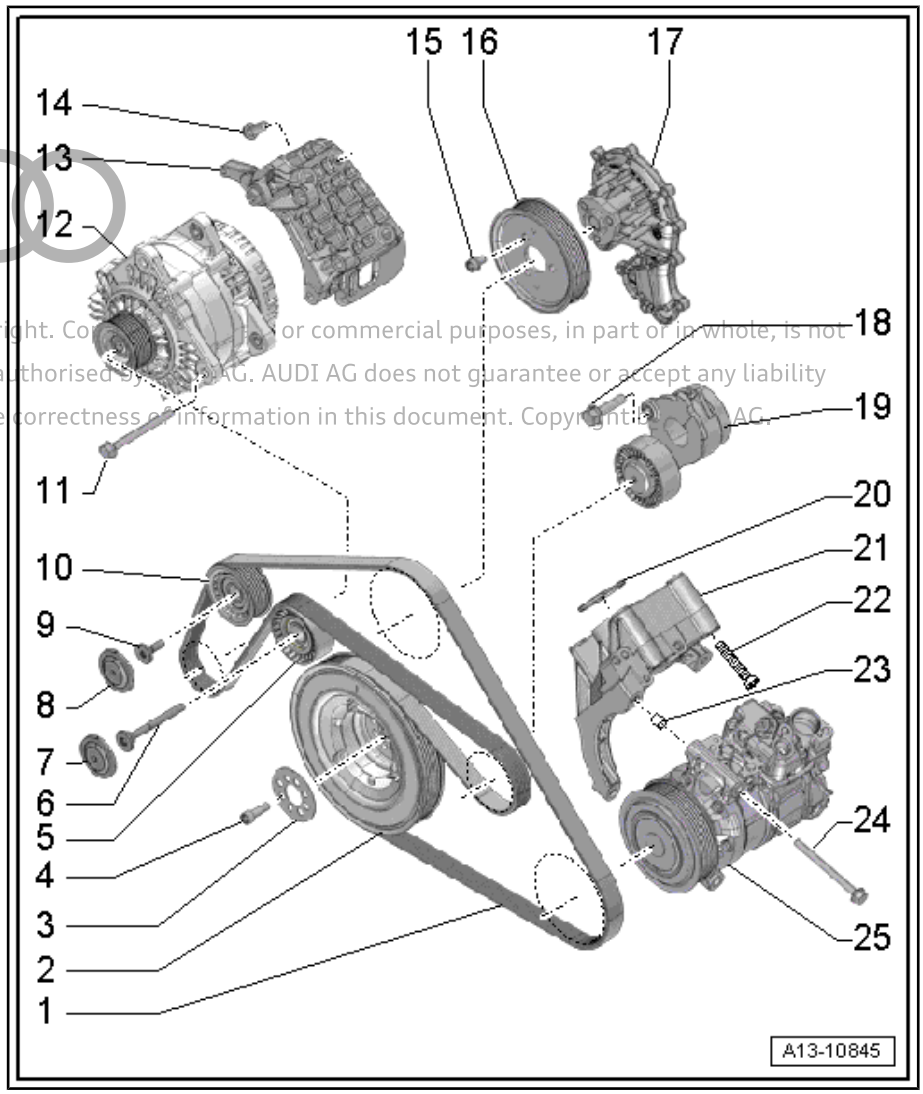
3 - Washer
- ❑ Renew

4 - Bolt
- ❑ Renew
- ❑ 20 Nm +90°

5 - Idler roller
- ❑ For poly V-belt

6 - Bolt
- ❑ 30 Nm

7 - Cover
- ❑ For idler roller



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8 - Cover

- ❑ For idler roller

9 - Bolt

- ❑ 23 Nm

10 - Idler roller

- ❑ For poly V-belt

11 - Bolt

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

12 - Alternator

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

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13 - Bracket

- ❑ For alternator

14 - Bolt

- ❑ Tighten in two stages:

- ◆ 5 Nm in diagonal sequence
- ◆ 40 Nm in diagonal sequence

15 - Bolt

- ❑ Tightening torque ⇒ Item 3 (page 367)

16 - Poly V-belt pulley

- ❑ For coolant pump

17 - Coolant pump

- ❑ Different versions available; for allocation refer to ⇒ Electronic parts catalogue
- ❑ Removing and installing ⇒ page 370

18 - Bolt

- ❑ Renew
- ❑ 50 Nm +90°

19 - Tensioner

- ❑ For poly V-belt
- ❑ Different versions (with or without washer for tensioner) ⇒ page 175
- ❑ Removing and installing ⇒ page 182

20 - Seal

- ❑ Renew

21 - Bracket

- ❑ For air conditioner compressor
- ❑ Removing and installing ⇒ page 187

22 - Bolt

- ❑ Tighten in two stages:

- ◆ 5 Nm in diagonal sequence
- ◆ 40 Nm in diagonal sequence

23 - Dowel sleeve

- ❑ 2x

24 - Bolt

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

25 - Air conditioner compressor

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

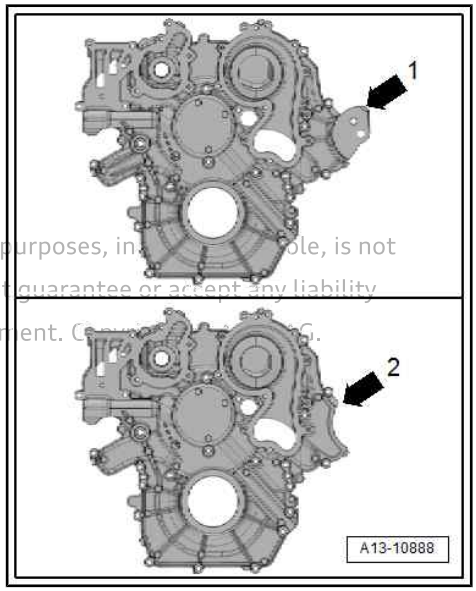
Allocation of washer for tensioner

1 - Sealing flange WITH support for tensioner

– Install tensioner WITHOUT washer.

2 - Sealing flange WITHOUT support for tensioner

– Install tensioner WITH washer.



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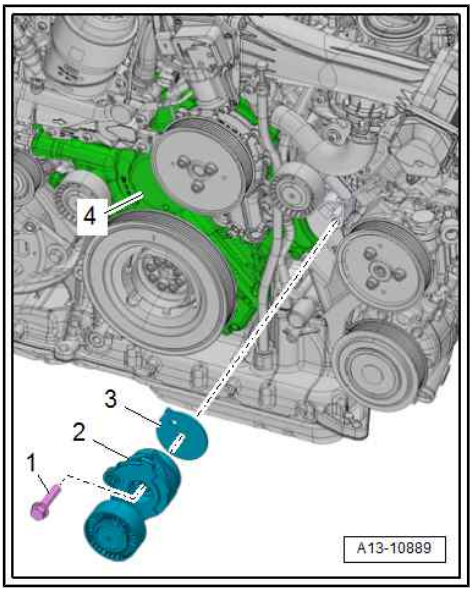
Tensioner with washer for sealing flange without support

1 - Bolt - tightening torque ⇒ Item 18 (page 174)

2 - Tensioner

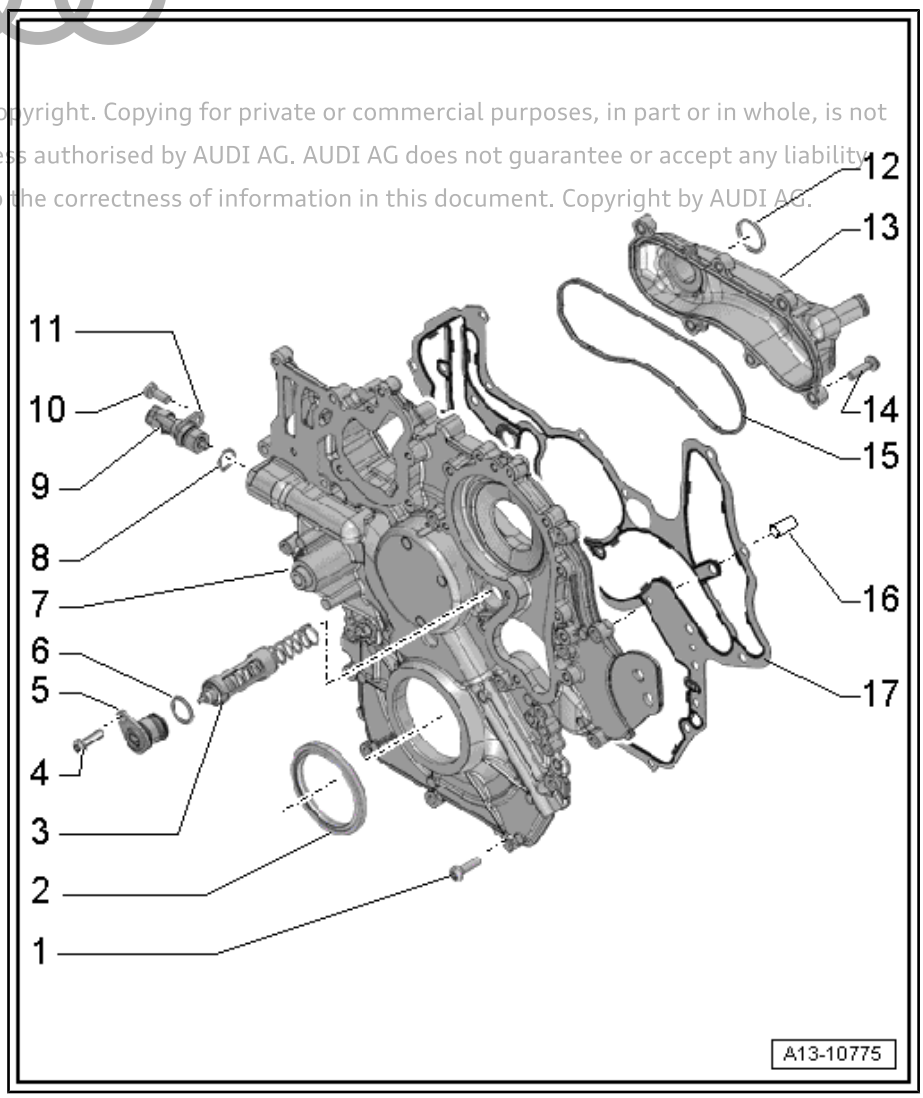
3 - Washer - only for sealing flange without support

4 - Sealing flange - without support



1.2 Exploded view - sealing flange (pulley end)

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1 - Bolt

- ❑ Renew
- ❑ Steel bolts: tightening torque and sequence ⇒ page 177
- ❑ Aluminium bolts: tightening torque and sequence ⇒ page 179

2 - Oil seal

- ❑ For crankshaft (pulley end)
- ❑ Renewing ⇒ page 187

3 - Temperature regulator

- ❑ For engine oil cooler
- ❑ Removing and installing ⇒ page 333

4 - Bolt

- ❑ Tightening torque and sequence ⇒ page 179

5 - Cover

- ❑ For temperature regulator for engine oil cooler
- ❑ Removing and installing ⇒ “2.4 Removing and installing temperature regulator for engine oil cooler”, page 333

6 - O-ring

- ❑ Renew

7 - Sealing flange

- ❑ Pulley end

Caution

Different versions possible; see ⇒ Electronic parts catalogue

The sealing flange version is matched to the gasket version (with or without metal carrier).

Different versions (with or without washer for tensioner) ⇒ page 175

- ❑ Removing and installing ⇒ page 189

8 - O-ring

- ❑ Renew

9 - Oil temperature sender 2 - G664-

- ❑ Removing and installing ⇒ page 340

10 - Bolt

- ❑ 9 Nm

11 - Retainer

- ❑ For oil temperature sender 2 - G664-

12 - O-ring

- ❑ Renew

13 - Cover

- ❑ For sealing flange (pulley end)
- ❑ Removing and installing ⇒ page 193

14 - Bolt

- ❑ 9 Nm

15 - Gasket

- ❑ Renew

16 - Dowel pins

- ❑ 2x

17 - Gasket

- ❑ Renew

Caution

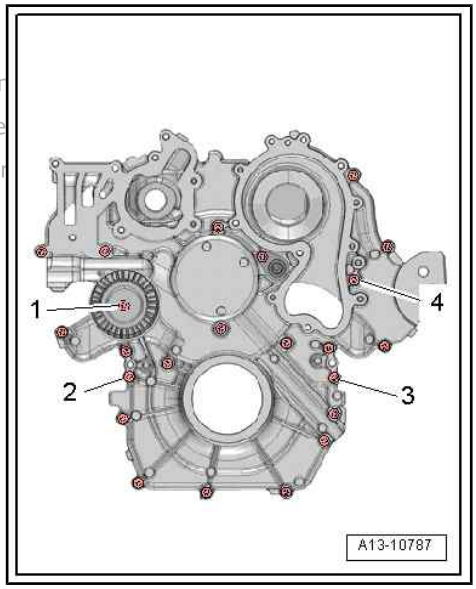
Different versions possible; see ⇒ Electronic parts catalogue
The sealing flange version is matched to the gasket version (with or without metal carrier).

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

– Tighten bolts in 7 stages in the sequence shown.

Stages 1 ... 3:

Stage	Bolts	Tightening torque
1.		Fit sealing flange with gasket on cylinder block
2.	-1-	Tighten for idler roller ⇒ Item 6 (page 173)
3.	-2, 3, 4-	9 Nm

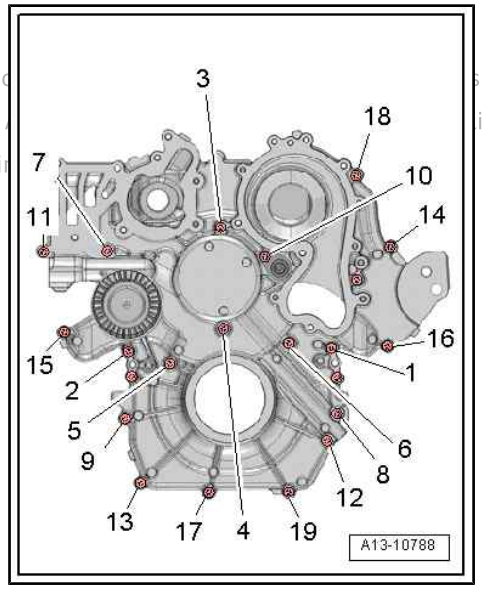


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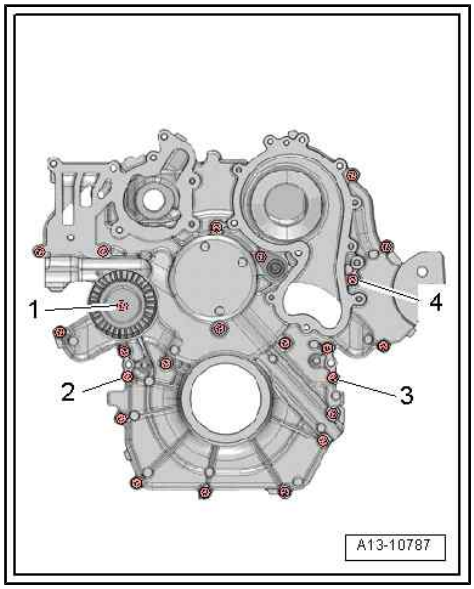
Stages 4 ... 6:

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



Stage 7:

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

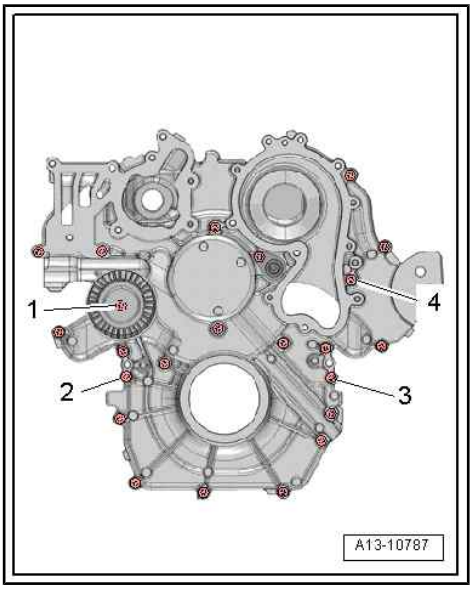


Aluminium bolts: sealing flange (pulley end) - tightening torque and sequence

Caution

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

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



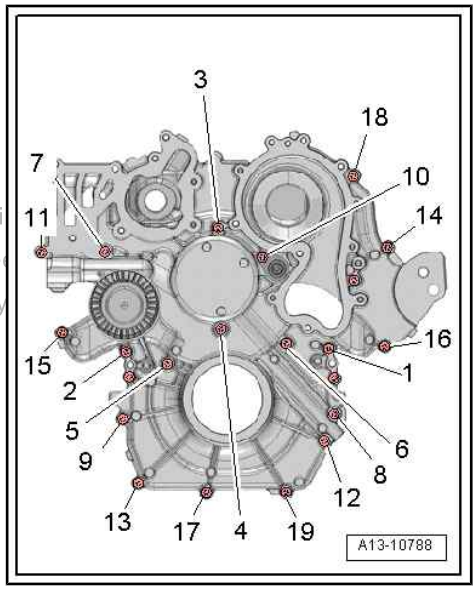
– Tighten bolts in 11 stages as follows:

Stages 1 ... 3:

Stage	Bolts	Tightening torque
1.		Fit sealing flange with gasket on cylinder block
2.	-1-	Tighten for idler roller ⇒ Item 6 (page 173)
3.	-2, 3, 4-	Tighten steel bolts M6x20 to 9 Nm

Stages 4 ... 8:

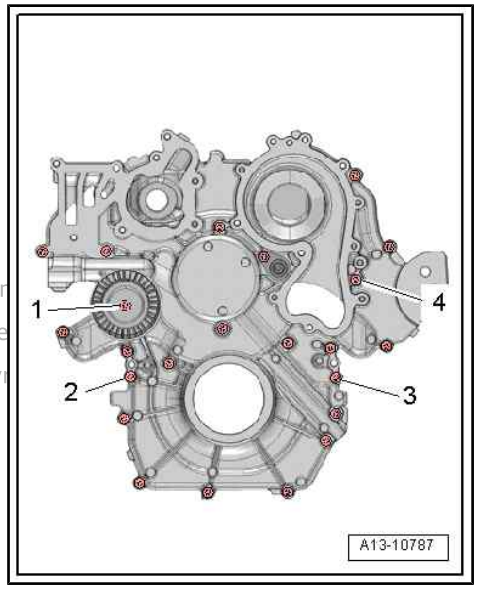
Stage	Bolts	Tightening torque/angle specification
4.		Insert temperature regulator for engine oil cooler with cover
5.	-10-	Screw in by hand until contact is made
6.	-1 … 19-	3 Nm
7.	-1 … 19-	3 Nm; this step is performed to allow for settling of sealing flange (pulley end)
8.	-1 … 19-	Turn 90° further



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Stages 9 ... 11:

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

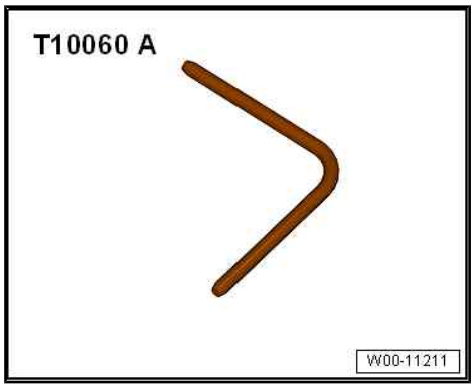


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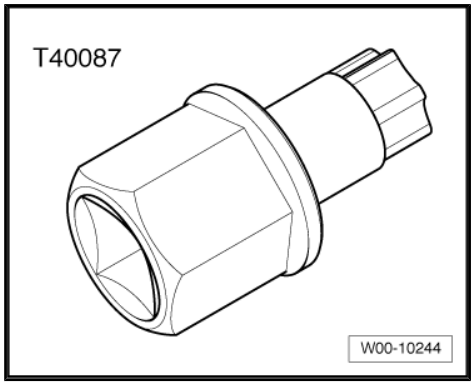
1.3 Removing and installing poly V-belt

Special tools and workshop equipment required

- Locking pin - T10060 A-



- Socket Torx T60 - T40087-

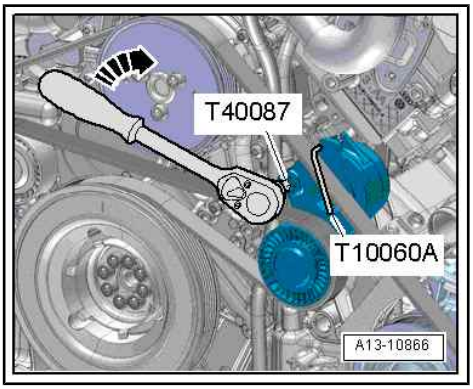


Removing

Caution

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

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

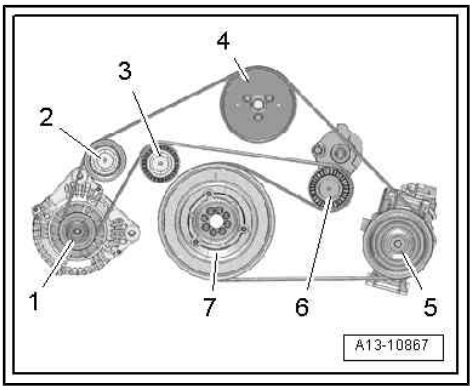


– Slacken poly V-belt by turning tensioner in clockwise direction -arrow- using socket Torx T 60 - T40087- .

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

Installing

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



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

1 - Alternator

2 - Idler roller

3 - Idler roller

4 - Coolant pump

5 - Air conditioner compressor

6 - Poly V-belt tensioner

7 - Vibration damper

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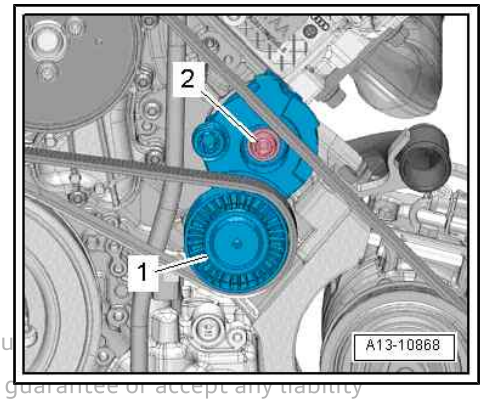
Note

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

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

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 180 .

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

Installing

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

Note

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Depending on version, install tensioner with or without washer ⇒ page 175 .

– Install poly V-belt ⇒ page 180 .

Tightening torques

◆ ⇒ “1.1 Exploded view - cylinder block (pulley end)”, page 173

1.5 Removing and installing vibration damper

⇒ “1.5.1 Removing and installing vibration damper - vehicles without torque reaction support”, page 182

⇒ “1.5.2 Removing and installing vibration damper - vehicles with torque reaction support”, page 183

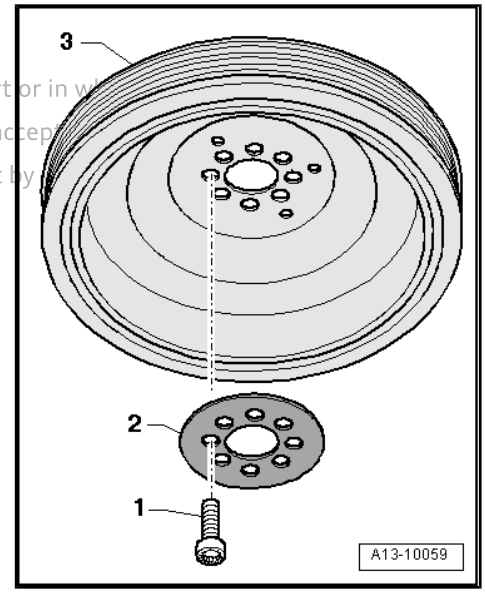
1.5.1 Removing and installing vibration damper - vehicles without torque reaction support

Removing

– Remove noise insulation (front) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

– Remove poly V-belt ⇒ page 180 .

– Remove bolts -1- and detach shim -2- and vibration damper -3-.



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Installing

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

Note

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

– Install poly V-belt ⇒ page 180 .

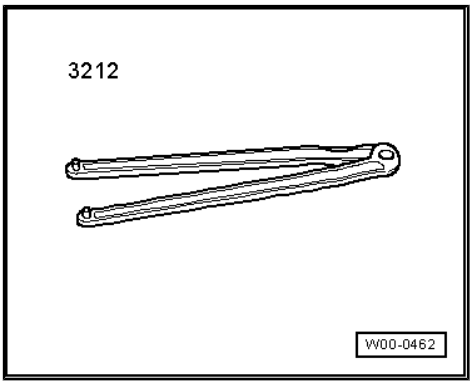
Tightening torques

- ⇒ “1.1 Exploded view - cylinder block (pulley end)”, page 173
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

1.5.2 Removing and installing vibration damper - vehicles with torque reaction support

Special tools and workshop equipment required

- Pin wrench - 3212-

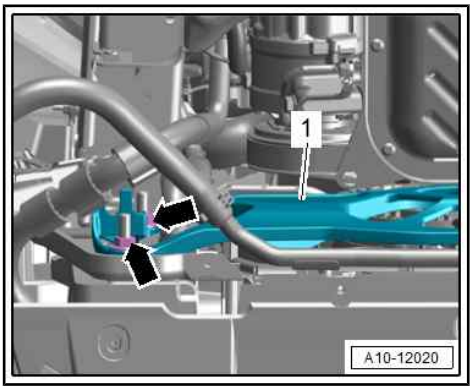


Removing

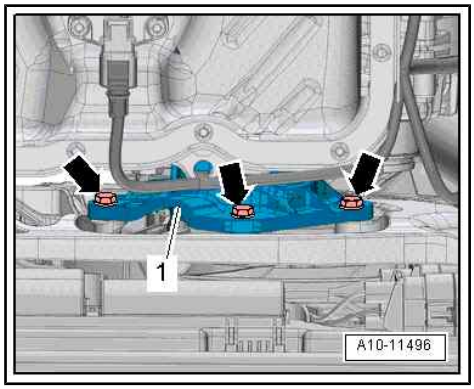
– Remove engine cover panel ⇒ page 172 .

– Remove noise insulation (front) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

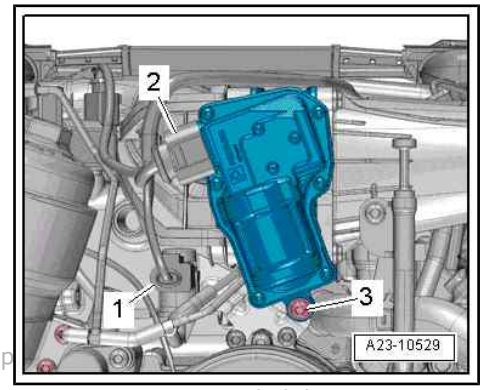
– Unscrew nuts -arrows- on left and right of cross piece (leave cross piece -1- in installation position).



– Unscrew bolts -arrows- and press stop -1- for torque reaction support towards engine.
– Remove poly V-belt ⇒ page 180 .



– Unplug electrical connector -1-.
– Unplug electrical connector -2- and move electrical wiring harness clear.



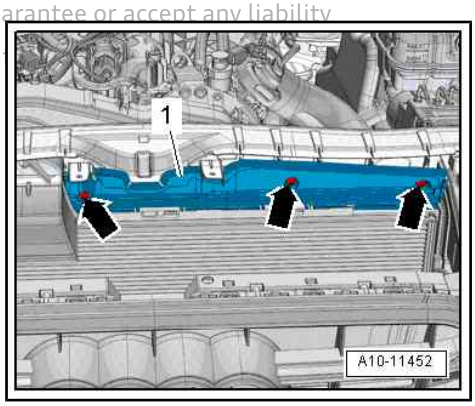
Note

Disregard -item 3-.

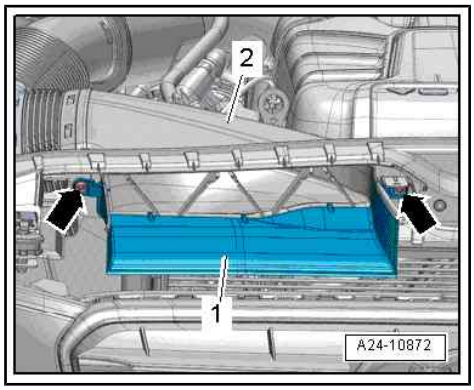
– Remove lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing attachments.

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– Remove bolts -arrows- and detach air duct -1-.



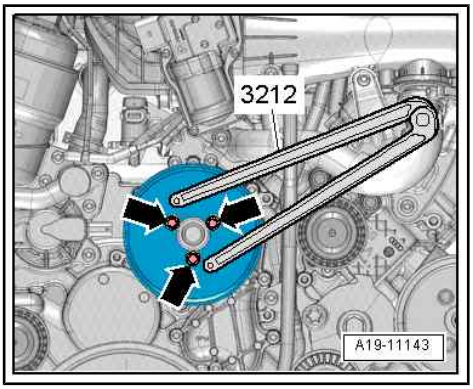
– Remove bolts -arrows- and detach air duct -2-.



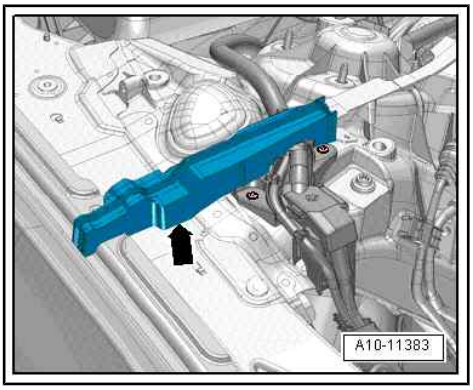
Note

Disregard -item 1-.

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



– Pull off foam wedge -arrow- (left and right) upwards.

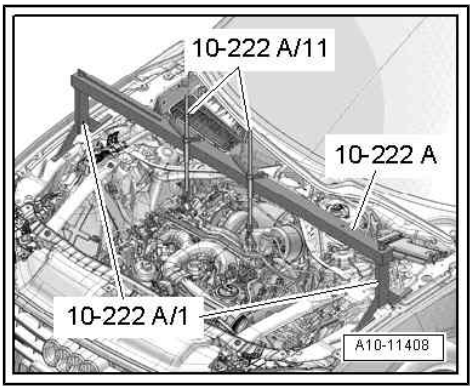


– Set up support bracket - 10 - 222 A- top edges of body flanges (left and right) as illustrated.

Caution

Risk of damage to turbocharger unit on biturbo engine.

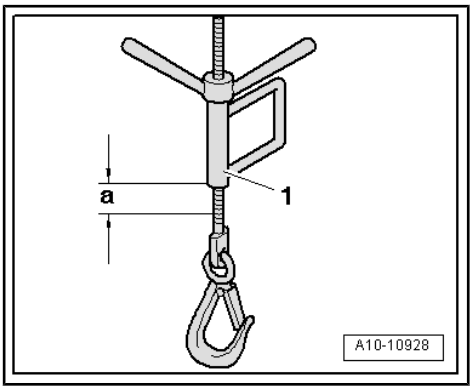
- ***Support bracket spindles must only be engaged on engine lifting eyes, as described here, and never on turbocharger unit lifting eyes.***



– Engage spindles -10 - 222 A /11- at engine lifting eyes (left and right).

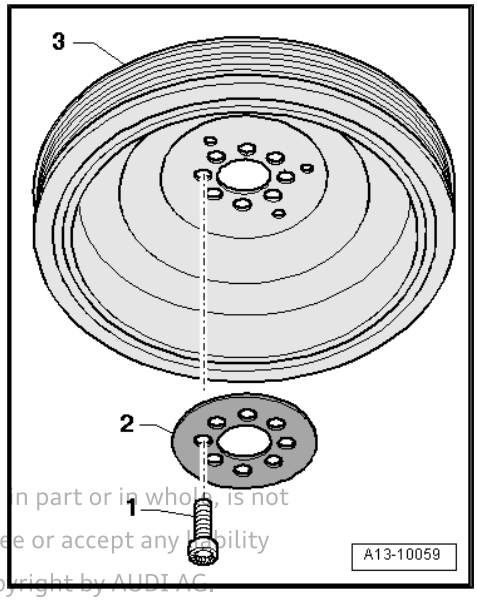
– Using spindles -1- on both sides, raise engine through distance -a-.

• Distance -a- = approx. 10 mm.



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– Remove bolts -1- and detach shim -2- and vibration damper -3-.



Installing

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

Note

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

– Install poly V-belt ⇒ page 180 .

– Install lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing attachments.

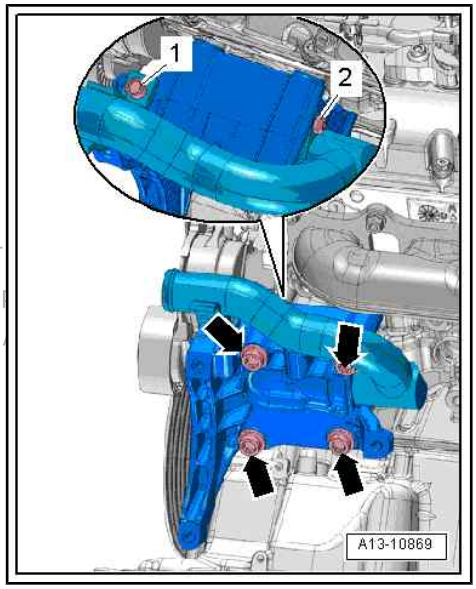
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Tightening torques

- ⇒ “1.1 Exploded view - cylinder block (pulley end)”, page 173
- ⇒ “2.1 Exploded view - assembly mountings”, page 156
- ⇒ “3.1 Exploded view - air cleaner housing”, page 509
- ⇒ “2.1 Exploded view - coolant pump”, page 367
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

1.6 Removing and installing bracket for ancillaries

Removing



– Drain coolant ⇒ page 359 .

– Remove air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Detaching and attaching air conditioner compressor at bracket .

– Unscrew bolts -arrows- and detach bracket for air conditioner compressor.

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Note

Disregard items -1 and 2-.

Installing

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

Note

- *Renew seal.*
- *Do not reuse coolant.*

– Fill up with coolant ⇒ page 361 .

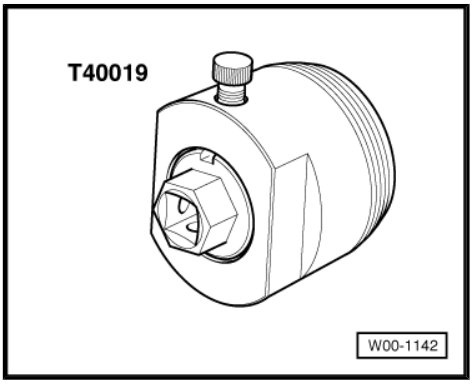
Tightening torques

- ⇒ “1.1 Exploded view - cylinder block (pulley end)”, page 173
- ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Exploded view - air conditioner compressor drive unit

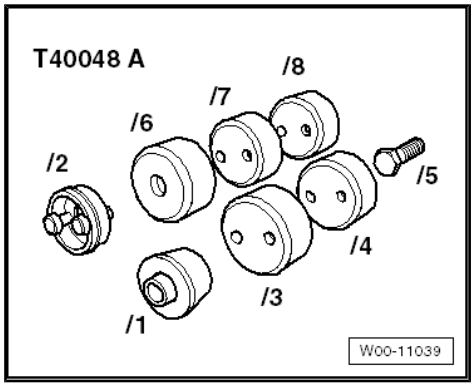
1.7 Renewing crankshaft oil seal (pulley end)

Special tools and workshop equipment required

- Oil seal extractor - T40019-



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



♦ Bolts M8x55 mm (2x)

Procedure

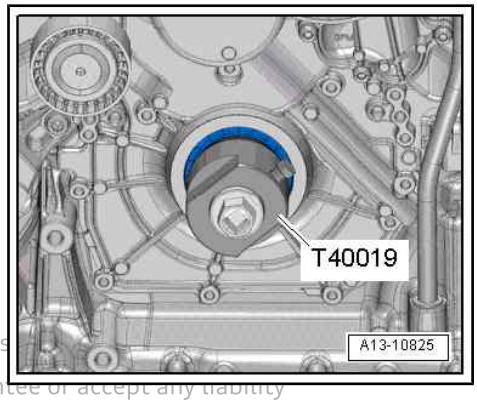
– Remove vibration damper:

♦ Vehicles without torque reaction support ⇒ page 182

♦ Vehicles with torque reaction support ⇒ page 183

– 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).



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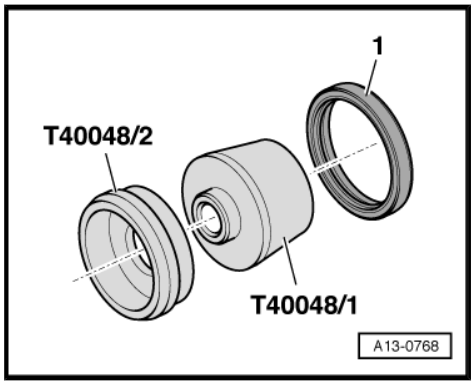
– Loosen knurled screw and turn inner part against crankshaft until the oil seal is pulled out.

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

– Clean contact surface and sealing surface.

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

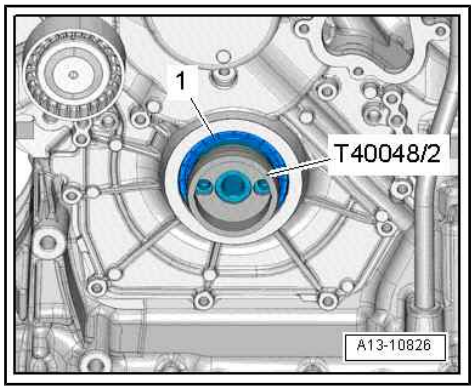
– Detach assembly aid.



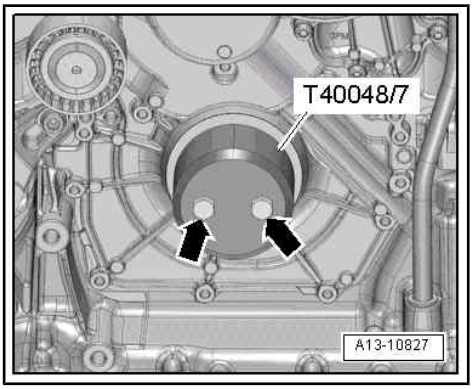
– Fit assembly sleeve -T40048/2- on crankshaft and slide oil seal -1- into sealing flange (pulley end).

Note

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



– Apply press sleeve -T40048/7- to crankshaft using M8×55 mm bolts -arrows-.
– Screw in bolts hand-tight at first.
– Tighten bolts alternately, 1/2 turn at a time, to press in oil seal onto stop.



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

– Installing vibration damper:

♦ Vehicles without torque reaction support ⇒ page 182
♦ Vehicles with torque reaction support ⇒ page 183

1.8 Removing and installing sealing flange (pulley end)

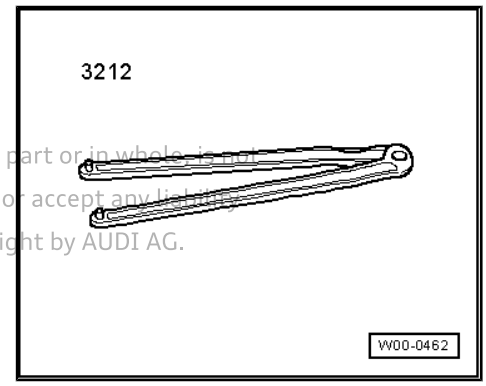
⇒ “1.8.1 Removing and installing sealing flange (pulley end)”, page 189

⇒ “1.8.2 Removing and installing cover for sealing flange (pulley end)”, page 193

1.8.1 Removing and installing sealing flange (pulley end)

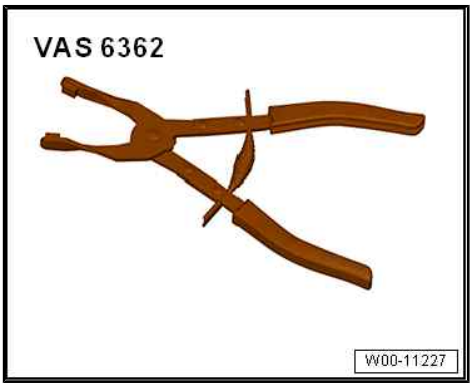
Special tools and workshop equipment required

♦ Pin wrench - 3212-



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♦ Hose clip pliers - VAS 6362-



♦ Steel bolt M6x20 (3x)

Removing

– Drain coolant ⇒ page 359 .

Vehicles without torque reaction support:

– Remove vibration damper ⇒ page 182 .

– Unplug electrical connector -1- and unclip change-over valve from bracket.

– Unplug electrical connector -2-.

Vehicles with torque reaction support:

– Remove vibration damper ⇒ page 183 .

All vehicles (continued):

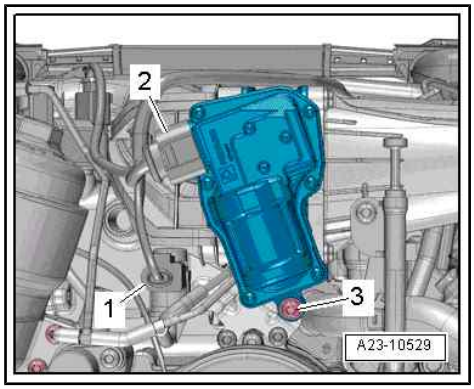
– Remove bolt -3-.

– Remove exhaust gas recirculation cooler ⇒ page 660 .

– Remove poly V-belt tensioner ⇒ page 182 .

– Remove coolant pipe (front) ⇒ page 384 .

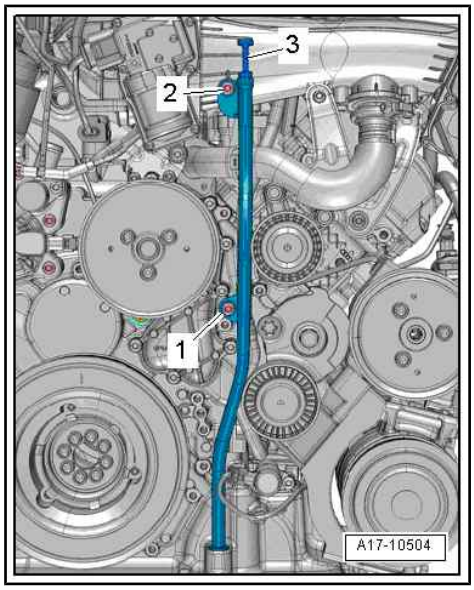
– Remove oil filter element ⇒ Maintenance ; Booklet 411 .



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

Note

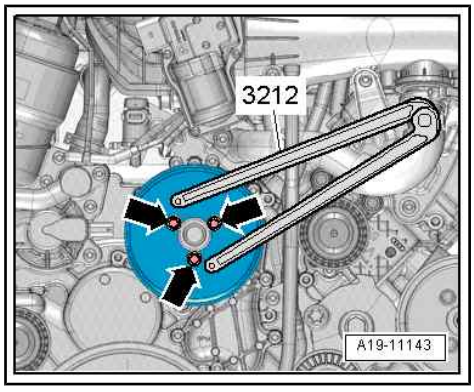
Disregard items -2 and 3-.



Vehicles without torque reaction support:

– Loosen bolts -arrows- for coolant pump pulley (counterhold with pin wrench - 3212-).

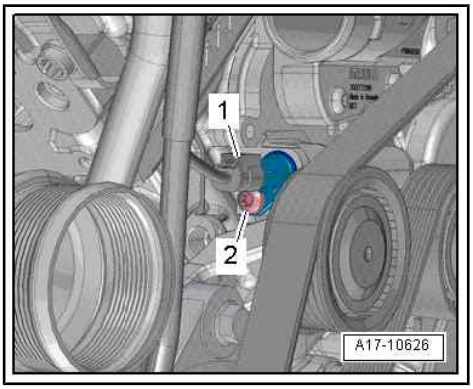
– Remove bolts and take off poly V-belt pulley.



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All vehicles (continued):

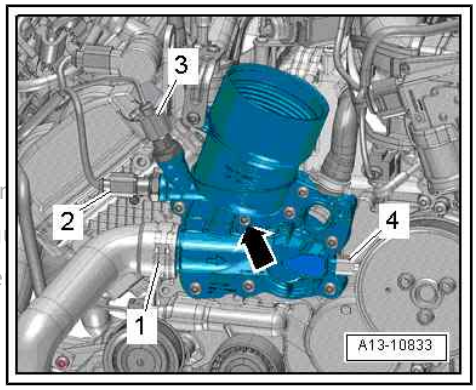
– Unplug electrical connector -1- at oil temperature sender 2 - G664- .



Note

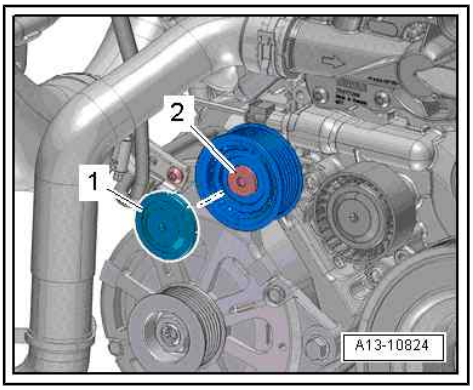
Disregard -item 2-.

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



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

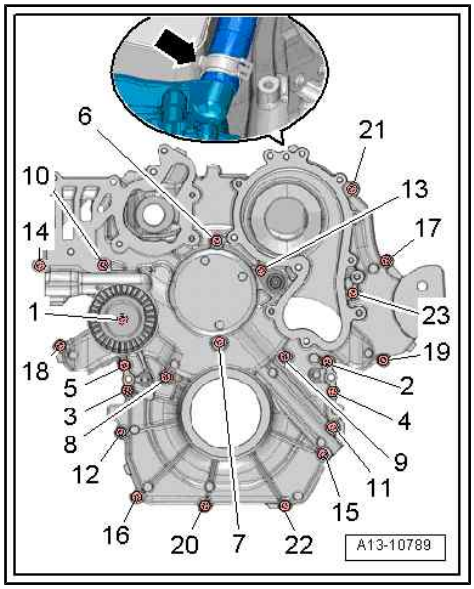


– Slacken and remove bolts in the sequence: -23 ... 1-.

– Detach temperature regulator for engine oil cooler ⇒ page 333 .

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

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



Installing

Note

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

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

– Tighten sealing flange bolts (pulley end) ⇒ page 179 .

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

– Install crankshaft oil seal (pulley end) ⇒ page 187 .

– Install idler roller for poly V-belt ⇒ page 173 .

– Install oil filter element ⇒ Maintenance ; Booklet 411 .

– Install coolant pipe (front) ⇒ page 384 .

– Install poly V-belt tensioner ⇒ page 182 .

– Install exhaust gas recirculation cooler ⇒ page 660 .

– Installing vibration damper:

- Vehicles without torque reaction support ⇒ page 182
- Vehicles with torque reaction support ⇒ page 183

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Note

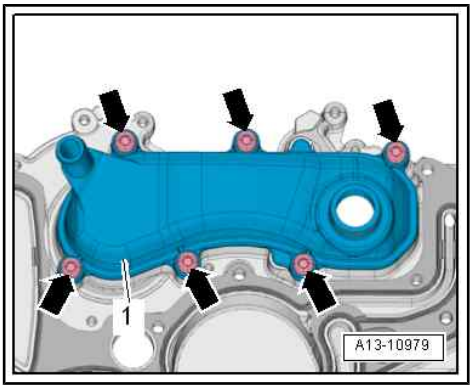
Do not reuse coolant.

– Fill up with coolant ⇒ page 361 .

Tightening torques

- ⇒ “1.2 Exploded view - sealing flange (pulley end)”, page 176
- ⇒ Fig. ““Aluminium bolts: sealing flange (pulley end) - tightening torque and sequence”“ , page 179
- ⇒ “3.1 Exploded view - oil filter housing/oil pressure switch”, page 335
- ⇒ “1.1 Exploded view - sump/oil pump”, page 318
- ⇒ “2.1 Exploded view - coolant pump”, page 367

1.8.2 Removing and installing cover for sealing flange (pulley end)



Removing

– Remove sealing flange (pulley end) ⇒ page 189 .

– Unscrew bolts -arrows- and detach cover -1-.

Installing

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

Note

Renew seal.

– Install sealing flange (pulley end) ⇒ page 189 .

Tightening torques

◆ ⇒ “1.2 Exploded view - sealing flange (pulley end)”, page 176

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2 Cylinder block (gearbox end)

⇒ “2.1 Exploded view - cylinder block (gearbox end)”, page 194
⇒ “2.2 Removing and installing drive plate”, page 195
⇒ “2.3 Removing and installing sender wheel”, page 196
⇒ “2.4 Checking sender wheel”, page 197
⇒ “2.5 Renewing crankshaft oil seal (gearbox end)”, page 198

2.1 Exploded view - cylinder block (gearbox end)

Note

When performing assembly work, secure engine to engine and gearbox support - VAS 6095- ⇒ page 144 .

1 - Bolt
- ❑ Renew
- ❑ 60 Nm +90°

2 - Drive plate
- ❑ Check holes for flywheel/torque converter for cracks and scoring
- ❑ Removing and installing ⇒ page 195

3 - Dowel pin

4 - Crankshaft

5 - Oil seal
- ❑ For crankshaft (gearbox end)
- ❑ Renewing ⇒ page 198

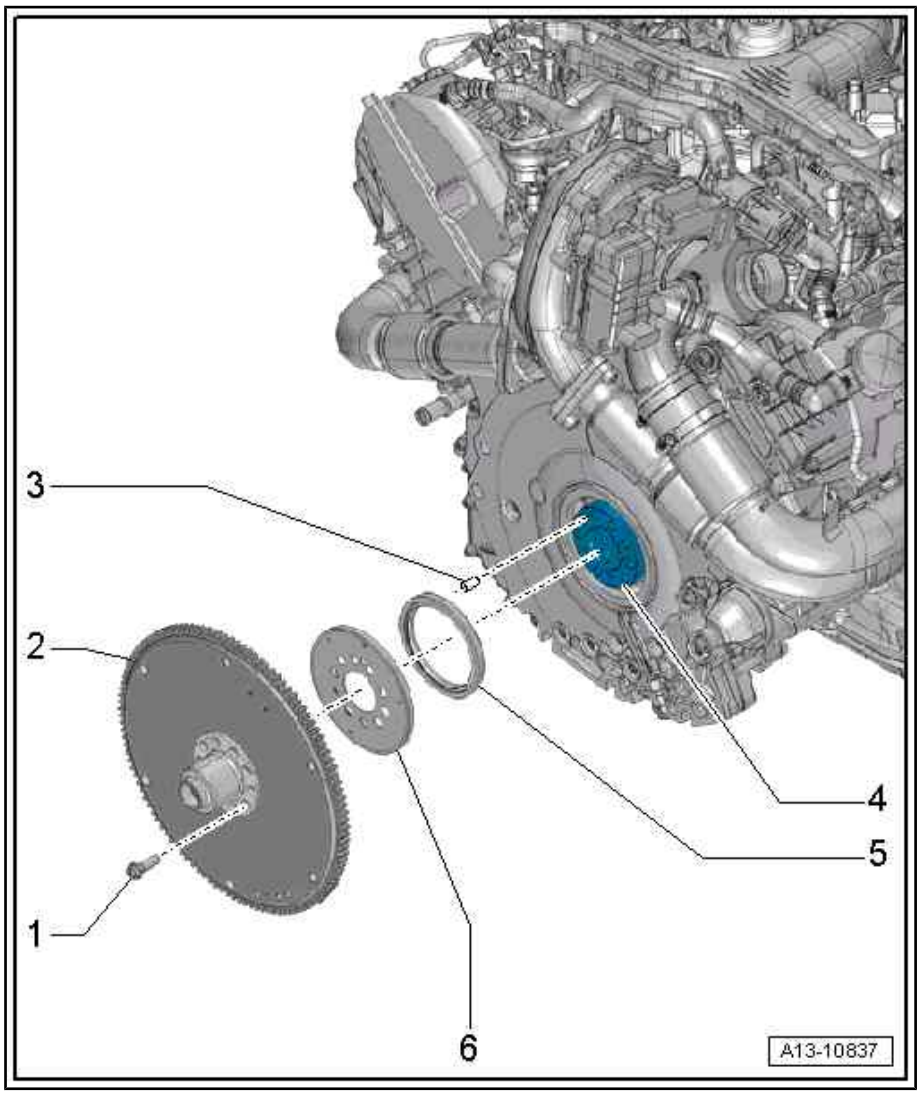
6 - Sender wheel
- ❑ For engine speed sender - G28-

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 197 .

- ❑ Removing and installing ⇒ page 196
- ❑ Checking sender wheel ⇒ page 197

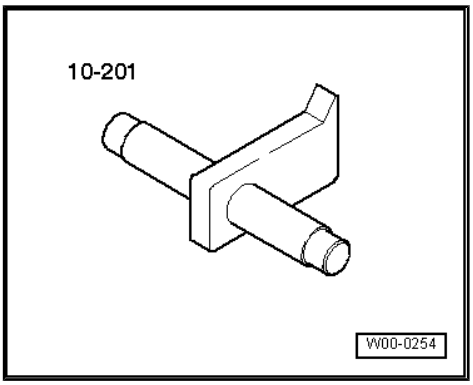


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2.2 Removing and installing drive plate

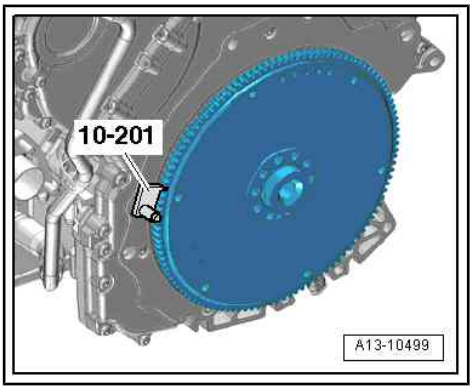
Special tools and workshop equipment required

- Counterhold tool - 10 - 201-



Removing

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



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 197 .*

– 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.*

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

– Detach drive plate and sender wheel.

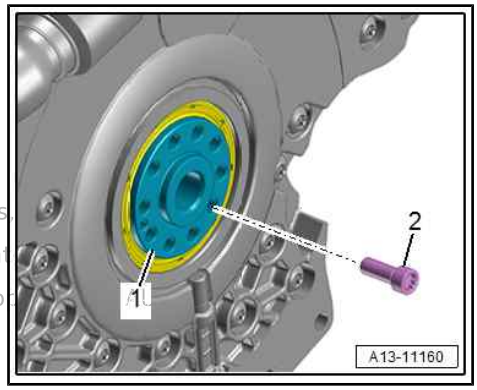
Installing

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

Note

After removing, renew bolts tightened with specified tightening angle.

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



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

• Ensure you do not damage oil seal when cleaning flange.

• Use a vacuum cleaner to hoover up residual adhesive; do NOT use compressed air.

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

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

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

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

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

– Clean crankshaft flange with a cloth.

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

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

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

Tightening torques

♦ ⇒ “2.1 Exploded view - cylinder block (gearbox end)”, page 194

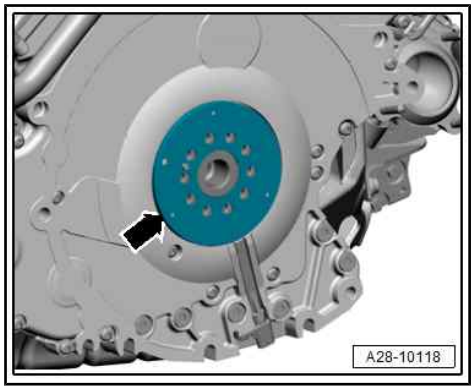
2.3 Removing and installing sender wheel

Removing

• 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 195 .

– Detach sender wheel -arrow-.



Installing

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

– Install drive plate ⇒ page 195 .

2.4 Checking sender wheel

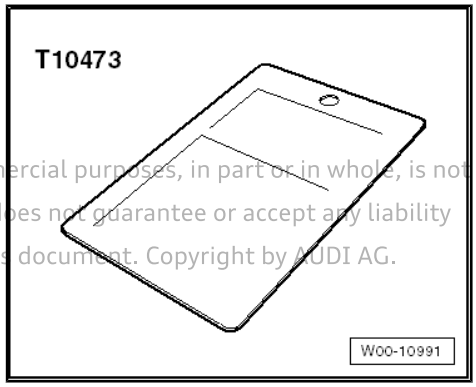
Caution

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 197 .*

Special tools and workshop equipment required

- Sensor gauge - T10473-

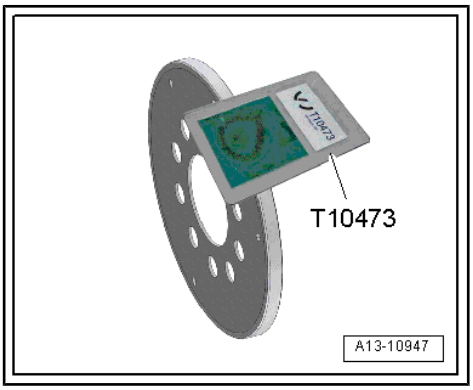


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Procedure

- Sender wheel removed

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

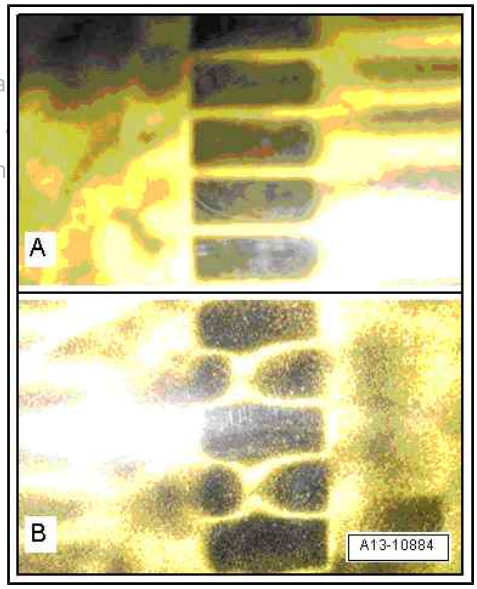


Inspection image of sender wheel

A - Sender wheel OK

B - Sender wheel defective

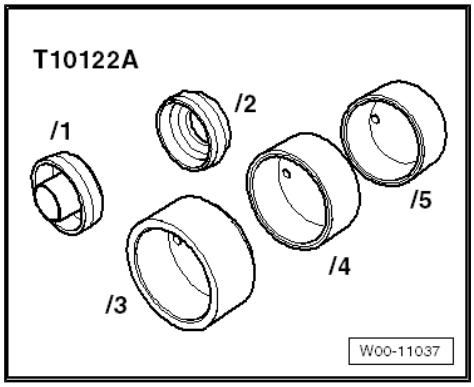
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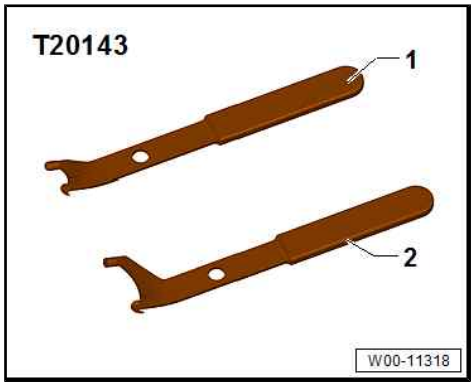
2.5 Renewing crankshaft oil seal (gearbox end)

Special tools and workshop equipment required

- Fitting tool - T10122 A-



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

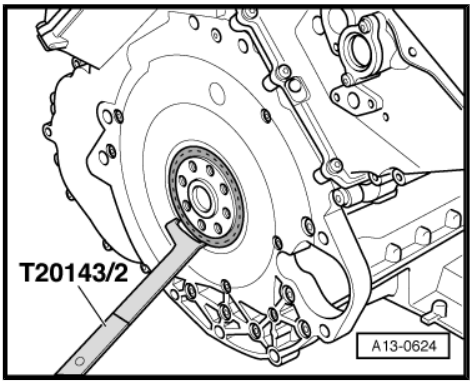


Procedure

- 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 195 .

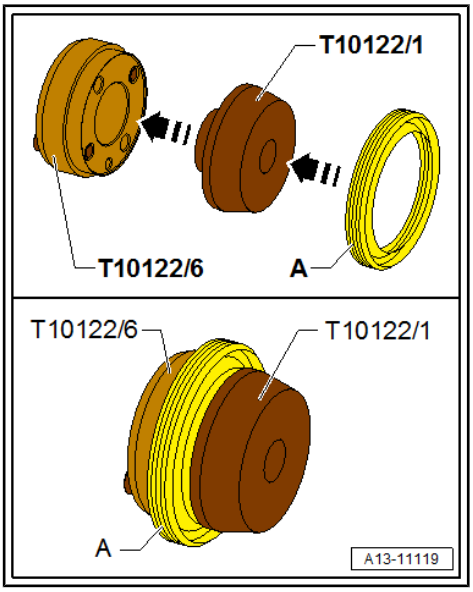
– Pry out oil seal using extractor tool -T20143/2- .



– 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- .



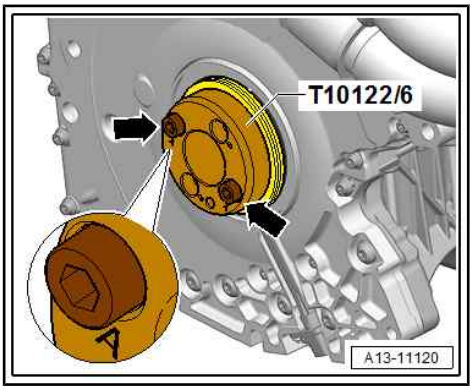
– Fit guide piece - T10122/6- onto crankshaft.

– Bolt guide piece 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.***



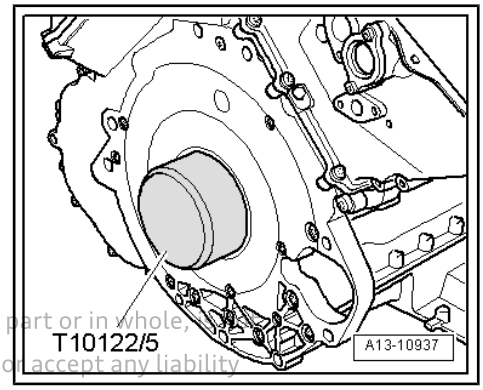
– Slide oil seal over guide piece - T10122/6- onto crankshaft by hand.

– 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 195 .



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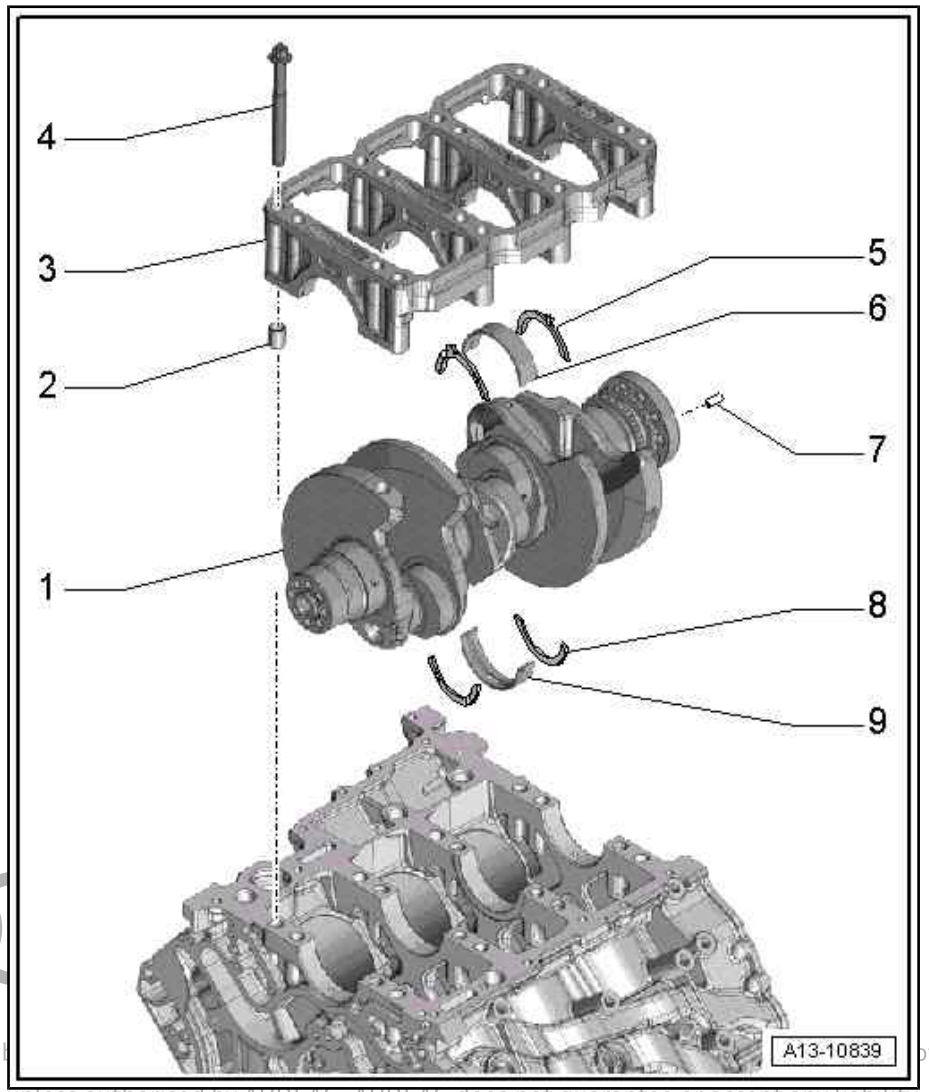
3 Crankshaft

⇒ “3.1 Exploded view - crankshaft”, page 200
⇒ “3.2 Crankshaft dimensions”, page 202
⇒ “3.3 Measuring axial clearance of crankshaft”, page 202
⇒ “3.4 Measuring radial clearance of crankshaft”, page 203

3.1 Exploded view - crankshaft

Note

When performing assembly work, secure engine to engine and gearbox support - VAS 6095- ⇒ page 144 .



1 - Crankshaft
- ❑ Measuring axial clearance ⇒ page 202
- ❑ Measuring radial clearance ⇒ page 203
- ❑ Crankshaft dimensions ⇒ page 202

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

3 - Retaining frame

4 - Bolt
- ❑ Renew
- ❑ Use old bolts when measuring radial clearance
- ❑ Tightening torque and sequence ⇒ page 201

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

6 - Bearing shell
- ❑ For retaining frame (without oil groove)
- ❑ Renew used bearing shells
- ❑ Install new bearing shells for retaining frame with correct coloured markings ⇒ page 202

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

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

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9 - Bearing shell

- ❑ For cylinder block (with oil groove)
- ❑ Renew used bearing shells
- ❑ Install new bearing shells for the cylinder block with the correct coloured markings ⇒ page 201

Retaining frame - tightening torque and sequence

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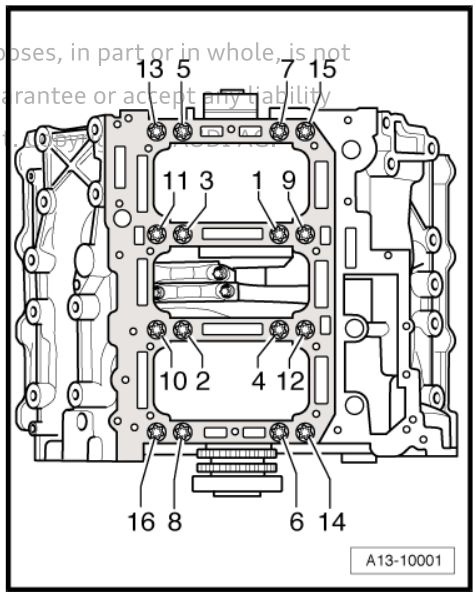
Note

Renew the bolts tightened with specified tightening angle.

– Insert two dowel sleeves in cylinder block.

– Tighten bolts in 3 stages in the sequence shown:

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



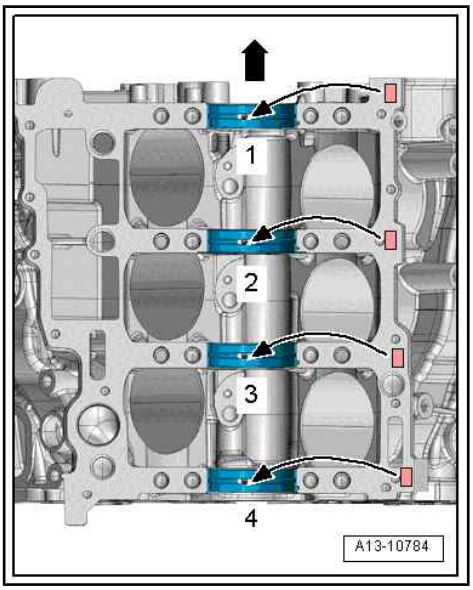
Allocation of crankshaft bearing shells for cylinder block

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

- -Arrow-: Pulley end.

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

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

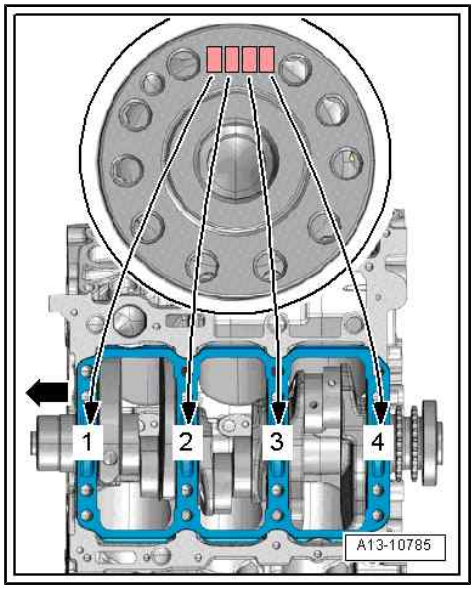


Allocation of crankshaft bearing shells for retaining frame

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

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

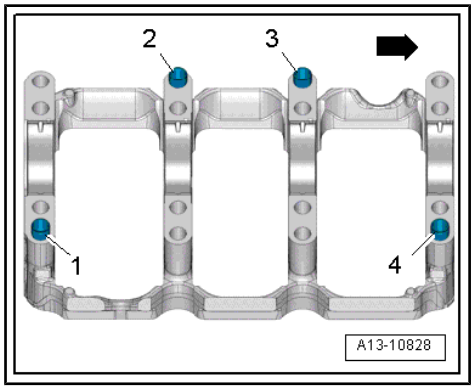
Letter on crankshaft	Colour coding of bearing
R =	Red
G =	Yellow
B =	Blue



Position of dowel sleeves

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

• -Arrow-: Pulley end.



3.2 Crankshaft dimensions

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

3.3 Measuring axial clearance of crankshaft

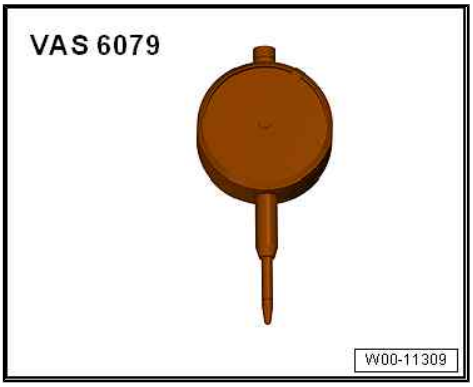
Special tools and workshop equipment required

♦ Universal dial gauge bracket - VW 387-



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♦ Dial gauge - VAS 6079-



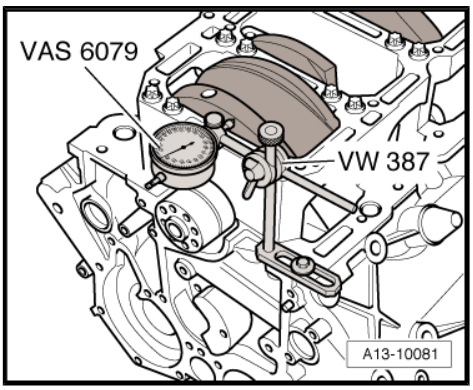
Procedure

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

– Apply dial gauge to crank web.

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

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



Axial clearance:

• New: 0.09 ... 0.25 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 201 without rotating crankshaft.

– Remove retaining frame again.

– Compare width of Plastigauge with measurement scale.

Radial clearance:

• New: 0.02 ... 0.05 mm.

– When carrying out final assembly, renew bolts.

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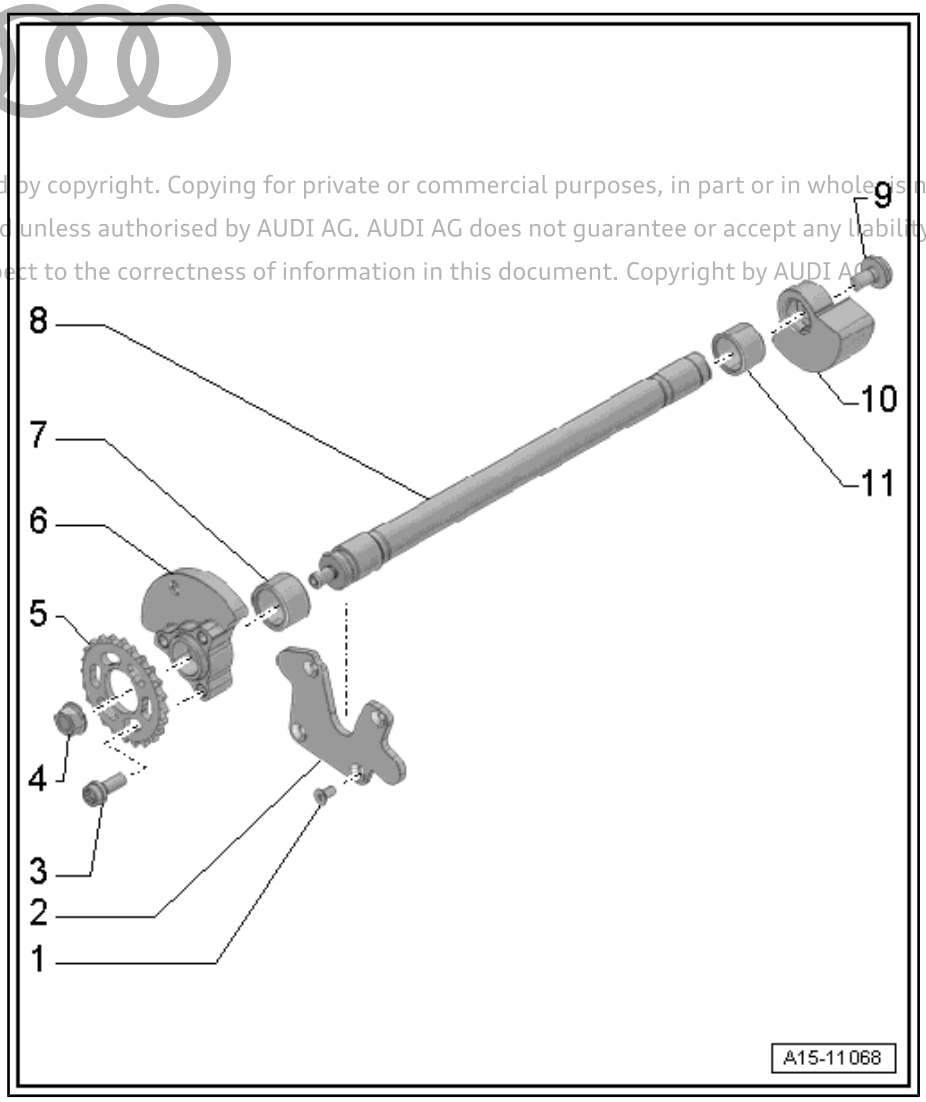
4 Balance shaft

⇒ “4.1 Exploded view - balance shaft”, page 204

⇒ “4.2 Removing and installing balance shaft”, page 204

4.1 Exploded view - balance shaft

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1 - Bolt

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

2 - Bearing plate

3 - Bolt

- ❑ 23 Nm

4 - Nut

- ❑ Counterhold with diesel injection pump locking pin - 3359- when loosening and tightening
- ❑ Balance shaft must be renewed if nut has been loosened
- ❑ 30 Nm +90°

5 - Drive chain sprocket

- ❑ For balance shaft

6 - Balance weight

- ❑ Gearbox end

7 - Roller bearing

8 - Balance shaft

- ❑ Removing and installing ⇒ page 204
- ❑ Balance shaft must be renewed if nut -item 4- has been loosened

9 - Bolt

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

10 - Balance weight

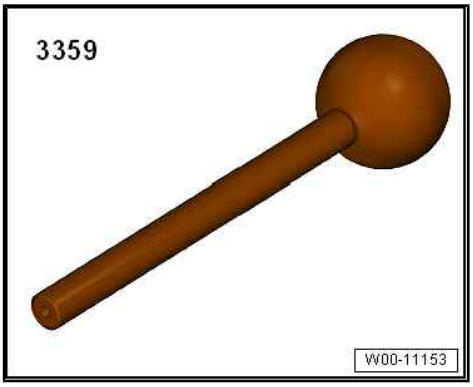
- ❑ Pulley end

11 - Roller bearing

4.2 Removing and installing balance shaft

Special tools and workshop equipment required

♦ Diesel injection pump locking pin - 3359-



Removing

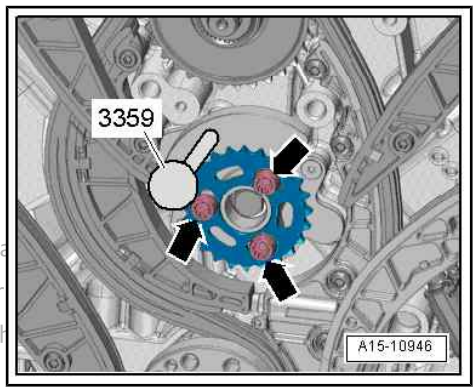
- Gearbox removed

– Remove sealing flange (pulley end) ⇒ page 189 .

– Remove timing chain cover (bottom) ⇒ page 225 .

– Remove camshaft timing chain ⇒ page 240 .

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

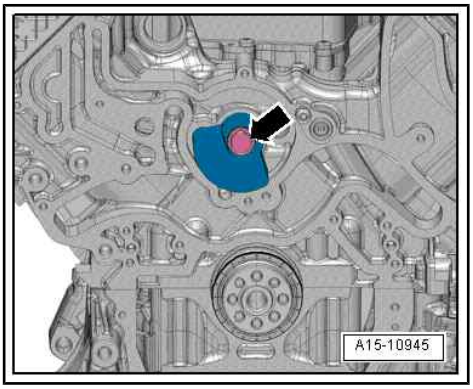


– Remove bolts -arrows- at rear of engine and detach drive chain sprocket from balance weight.

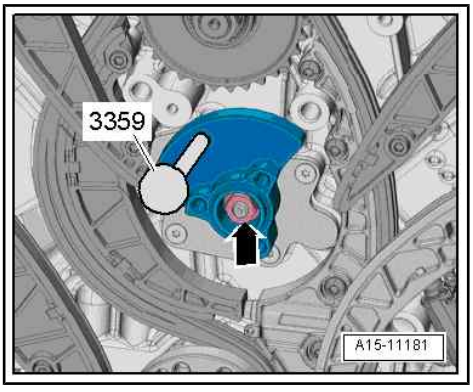
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– Loosen bolt -arrow- at front of engine.

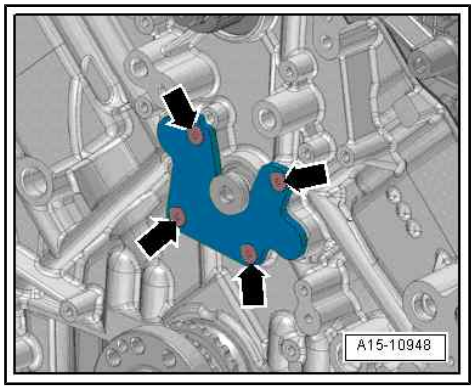
– Remove bolt and detach balance weight from balance shaft.



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



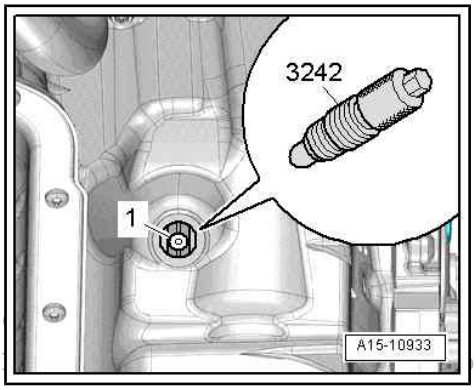
– Remove bolts -arrows- and detach bearing plate for balance shaft.
– Pull balance shaft to rear out of cylinder block.



Installing

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

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



Note

Renew balance shaft.

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– Install camshaft timing chain ⇒ page 240 .
– Install timing chain cover (bottom) ⇒ page 225 .
– Install sealing flange (pulley end) ⇒ page 189 .

Tightening torques

◆ ⇒ “4.1 Exploded view - balance shaft”, page 204

5 Pistons and conrods

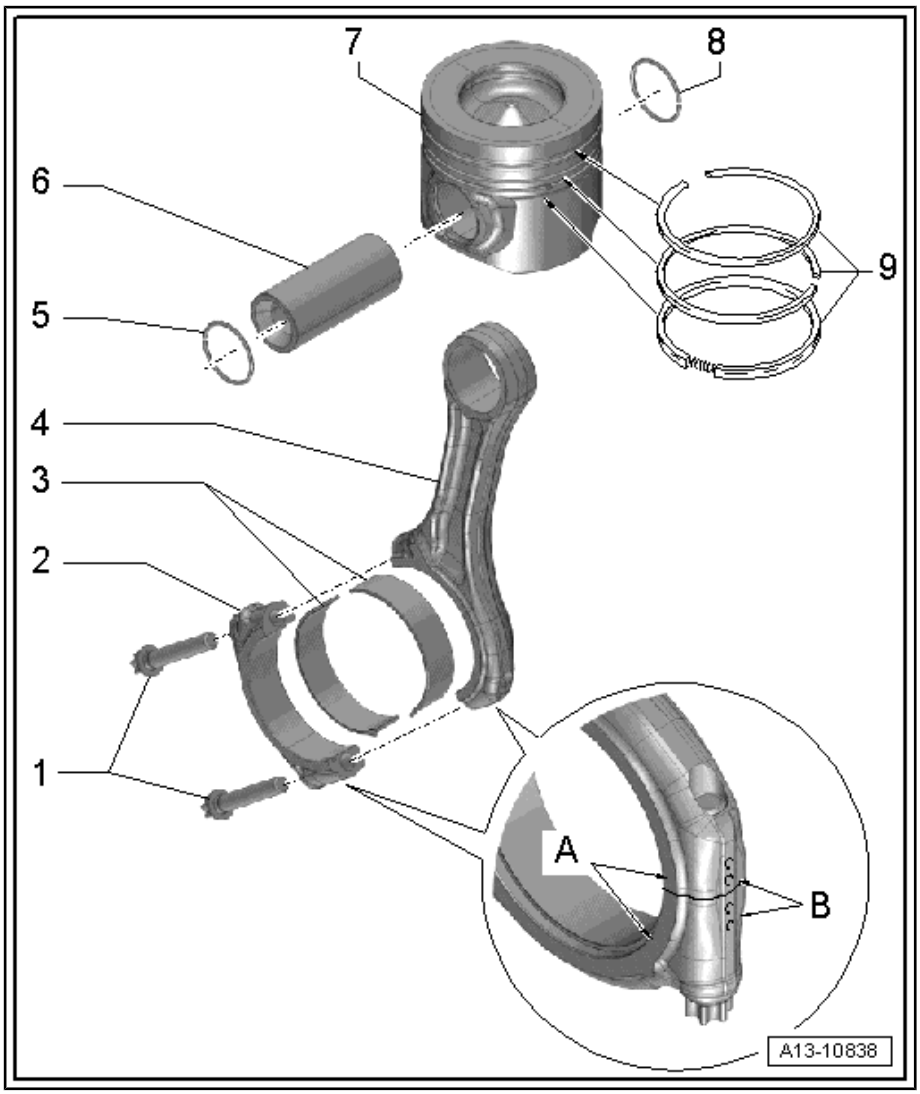
⇒ “5.1 Exploded view - pistons and conrods”, page 207
⇒ “5.2 Removing and installing pistons”, page 209
⇒ “5.3 Measuring piston projection at TDC”, page 210
⇒ “5.4 Checking pistons and cylinder bores”, page 213
⇒ “5.5 Checking radial clearance of conrod bearings”, page 214

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5.1 Exploded view - pistons and conrods

Note

- *All bearing and running surfaces must be oiled before assembling.*
- *Oil spray jet for piston cooling ⇒ page 208 .*



1 - Bolts

- ❑ Renew
- ❑ Use old bolts when measuring radial clearance
- ❑ Lubricate threads and contact surface
- ❑ 35 Nm +90°

2 - Conrod bearing cap

- ❑ Due to the cracking method used to separate the bearing cap from the conrod in manufacture, the caps only fit in one position and only on the appropriate conrod
- ❑ Mark installation position for re-installation
- ❑ Mark cylinder allocation in colour -B- ⇒ page 209
- ❑ Note when fitting: the wide contact shoulder -A- must point towards same side on conrod and conrod bearing cap

3 - Bearing shells

- ❑ Note installation position
- ❑ Renew used bearing shells
- ❑ Note version: Upper bearing shell (closest to piston) is constructed from a more wear-resistant material; refer to ⇒ Electronic parts catalogue
- ❑ Ensure that retaining lugs are securely seated.

4 - Conrod

- ❑ With industrially cracked conrod bearing cap
- ❑ Mark cylinder allocation in colour -B- ⇒ page 209
- ❑ Axial clearance for each conrod pair (when new): 0.20 … 0.44 mm
- ❑ Measuring radial clearance ⇒ page 214
- ❑ Installation position ⇒ page 209
- ❑ Only renew as a complete set
- ❑ Note when fitting: the wide contact shoulder -A- must point towards same side on conrod and conrod bearing cap

5 - Circlip

- ❑ Renew

6 - Piston pin

- ❑ Removing and installing ⇒ “5.2 Removing and installing pistons”, page 209

7 - Piston

- ❑ Measuring piston projection at “TDC” ⇒ page 210
- ❑ Mark installation position and cylinder number ⇒ page 209
- ❑ Renew piston if cracking is visible on piston crown or piston skirt
- ❑ Removing and installing ⇒ page 209
- ❑ Checking pistons and cylinder bores ⇒ page 213

8 - Circlip

- ❑ Renew

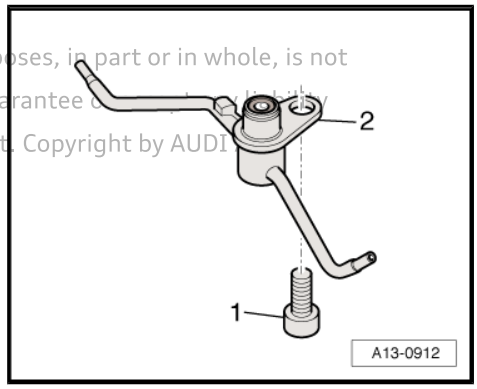
9 - Piston rings

- ❑ Measuring ring gap ⇒ page 213
- ❑ Measuring ring-to-groove clearance ⇒ page 214
- ❑ Use piston ring pliers (commercially available) to remove and install
- ❑ Installation position: marking “TOP” or side with lettering faces towards piston crown
- ❑ Offset gaps by 120°

Oil spray jet for piston cooling

1 - Bolt, 9 Nm

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



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Caution

Risk of damage to oil spray jets.

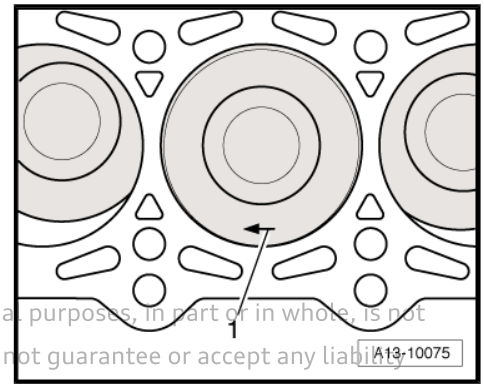
- ***Do not bend oil spray jets.***
- ***Check that oil spray jets have adequate clearance after re-installing pistons.***
- ***Always renew bent oil spray jets.***

Installation position of pistons

Caution

Risk of damage to piston crown.

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

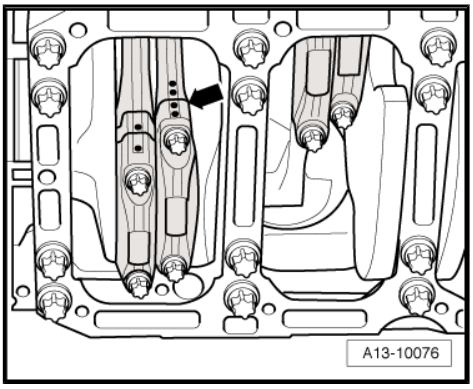


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- Installation position: Arrow -item 1- on piston crown points to pulley end.

Marking conrods

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

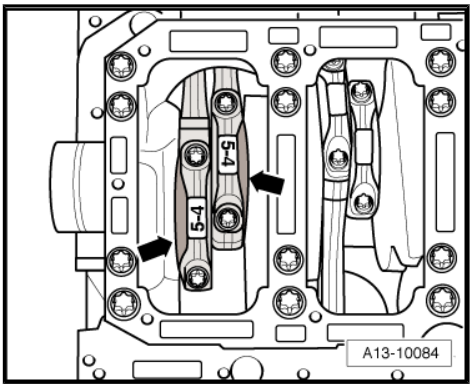


Note

- *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 first conrod pair.

5.2 Removing and installing pistons

Special tools and workshop equipment required

- Pin - VW 222 A-



- Piston ring clamp, commercially available

Removing

- Engine secured to engine and gearbox support - VAS 6095- ⇒ page 144

– Remove cylinder head ⇒ page 257 .

– Remove sump (top section) ⇒ page 324 .

– Mark installation position and matching of conrod bearing caps to cylinder and to conrods for re-installation ⇒ page 209 .

– Unbolt conrod bearing caps.

– Pull out pistons upwards with conrods.

Note

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

– Take circlip out of piston pin boss.

– Use drift - VW 222 A- to drive out piston pin.

Installing

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

Note

Renew the bolts tightened with specified tightening angle.

– Oil running surfaces of bearing shells.

– Install pistons using commercially available piston ring clamp.

Installation position:

- Pistons ⇒ page 209
- Conrods ⇒ page 209

– Install conrod bearing caps according to markings.

– Install sump (upper section) ⇒ page 324 .

– Install cylinder head ⇒ page 257 .

Tightening torques

♦ ⇒ “5.1 Exploded view - pistons and conrods”, page 207

5.3 Measuring piston projection at TDC

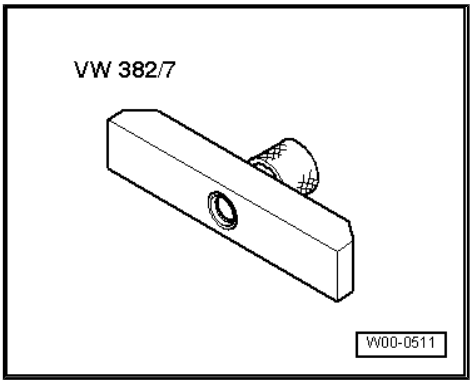
Note

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

Special tools and workshop equipment required

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

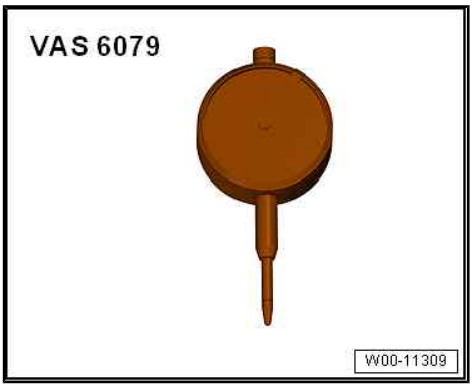


- Measuring plate -VW 385/17- from universal measuring tool - VW 385-



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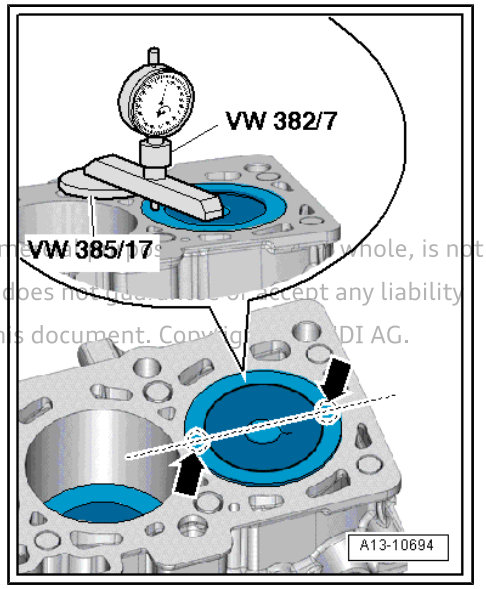
- Dial gauge - VAS 6079-



Procedure

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

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



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Note

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

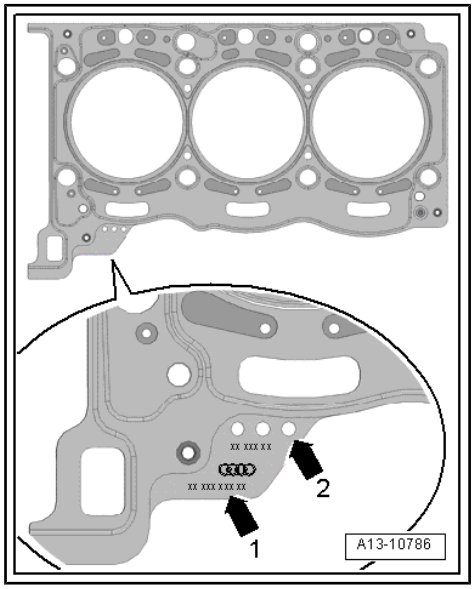
– Depending on piston projection, install corresponding cylinder head gasket according to following table:

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

Identification of cylinder head gasket

1 - Part number

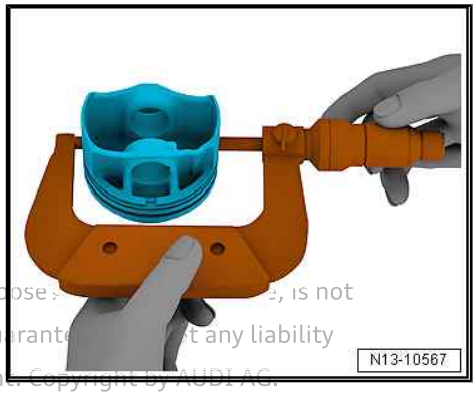
2 - Holes



Note

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

5.4 Checking pistons and cylinder bores



Checking piston

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

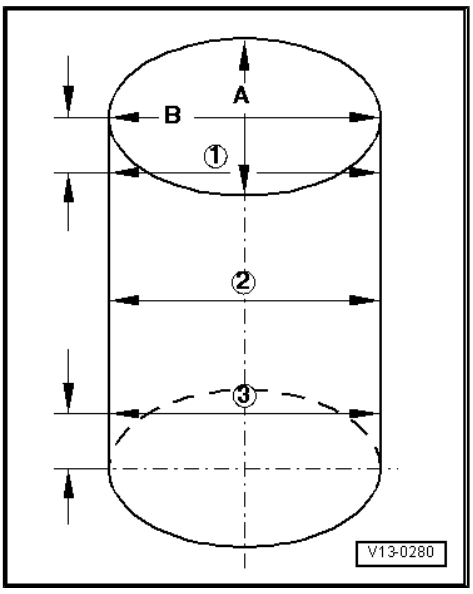
• Maximum deviation from nominal dimension: 0.05 mm.

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

Piston Ø mm	
Nominal dimension	82.924 … 82.936 1)
Repair oversize	82.964 … 82.976 1)
• 1) Dimensions not including coating (thickness 0.02 mm). The coating will wear down partly in service.	

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Measuring cylinder bore

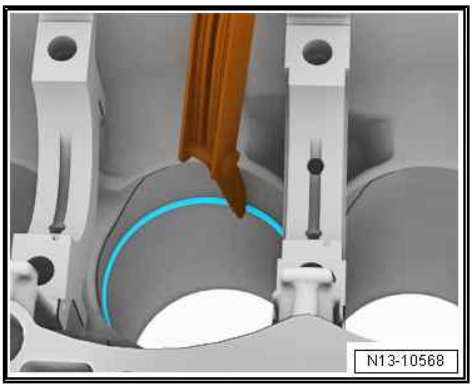


– Use a cylinder gauge - VAS 6078- to take measurements at 3 points in transverse direction -A- and in longitudinal direction -B-.

• Maximum deviation from nominal dimension: 0.08 mm.

Cylinder bore Ø mm	
Nominal dimension	83.006 … 83.014 1)
Repair oversize	83.046 … 83.054 1)
• 1) Measure at 50 mm into cylinder bore.	

Measuring piston ring gap



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

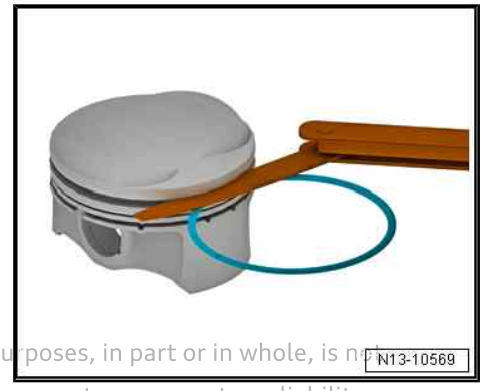
– To do so, use a piston without rings.

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

Measuring ring-to-groove clearance

– Clean groove in piston before checking clearance.

Piston ring	new mm	Wear limit mm
1st compression ring	0.09 ... 0.13	0.16
2nd compression ring	0.05 ... 0.09	0.11
Oil scraper ring	0.03 ... 0.07	0.10



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5.5 Checking radial clearance of conrod bearings

Special tools and workshop equipment required

♦ Plastigauge

Procedure

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

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

– Fit conrod bearing cap and secure with old bolts ⇒ Item 1 (page 207) without rotating crankshaft.

– Remove conrod bearing cap again.

– Compare width of Plastigauge with measurement scale.

Radial clearance:

• New: 0.02 ... 0.07 mm.

– Renew conrod bolts.

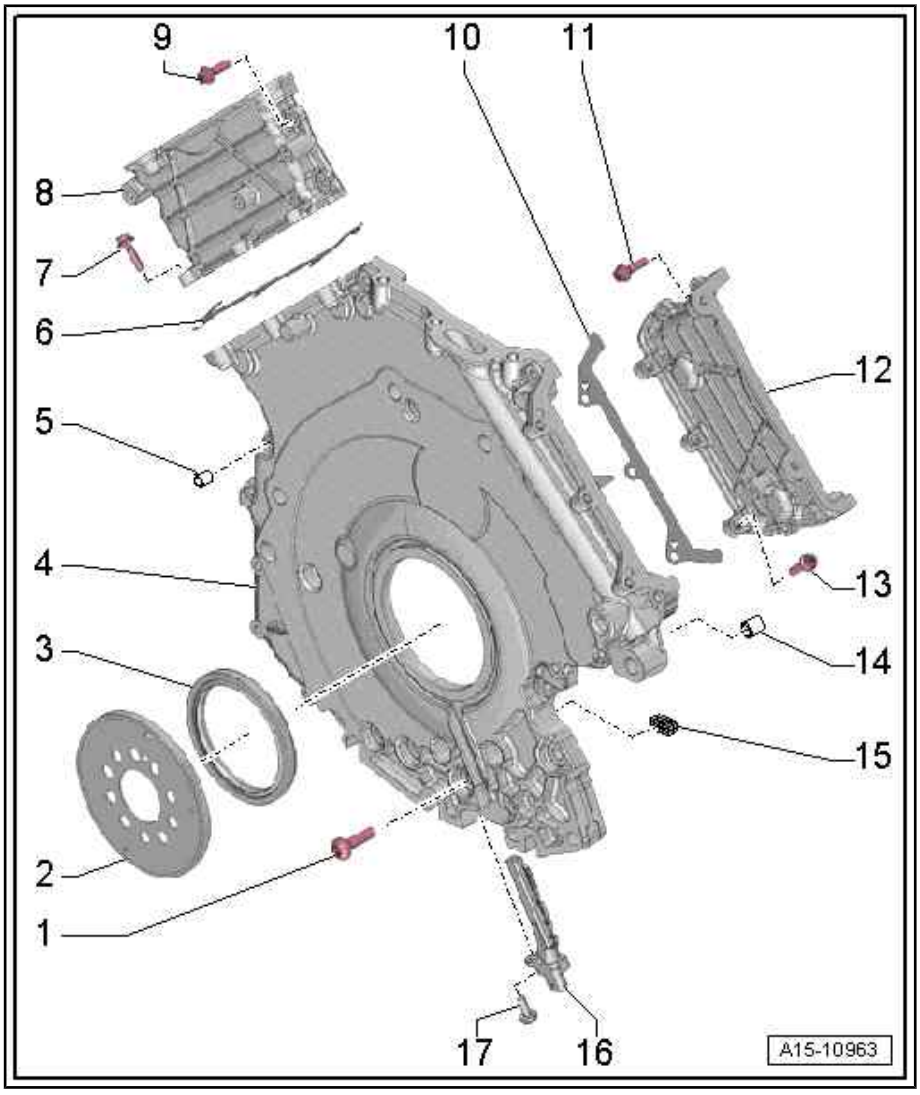
15 – Cylinder head, valve gear

1 Timing chain cover

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⇒ "1.1 Exploded view - timing chain cover", page 215
⇒ "1.2 Removing and installing timing chain cover", page 220

1.1 Exploded view - timing chain cover



1 - Bolt
- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 217

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

3 - Oil seal
- ❑ For crankshaft (gearbox end)
- ❑ Removing and installing ⇒ page 198

4 - Timing chain cover (bottom)
- ❑ Removing and installing ⇒ page 225

5 - Dowel sleeve

6 - Gasket
- ❑ Renew

7 - Bolt
- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 216

8 - Timing chain cover (left-side)
- ❑ Removing and installing ⇒ page 220

9 - Bolt
- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 216

10 - Gasket
- ❑ Renew

11 - Bolt
- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 216

12 - Timing chain cover (right-side)
- ❑ Removing and installing ⇒ page 222

13 - Bolt
- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 216

14 - Dowel sleeve

15 - Sealing element

- ❑ 2x

16 - Engine speed sender - G28-

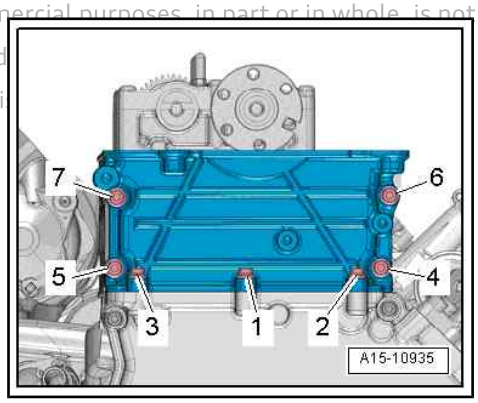
- ❑ Removing and installing ⇒ page 676

17 - Bolt

- ❑ Tightening torque ⇒ Item 8 (page 673)

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Timing chain cover (top left) - tightening torque and tightening sequence



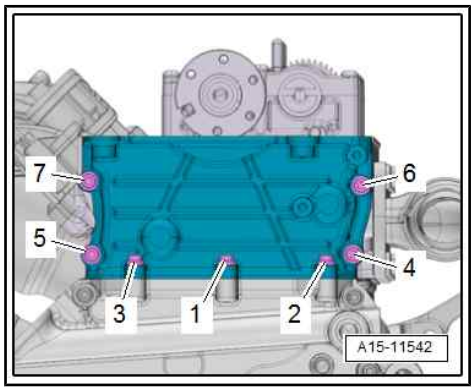
Note

Renew the bolts tightened with specified tightening angle.

– Tighten bolts in 5 stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1.	-1, 2, 3-	Screw in by hand until contact is made
2.	-4 … 7-	Screw in by hand until contact is made
3.	-1 … 7-	8 Nm
4.	-1 … 7-	8 Nm (this step is performed to allow for settling of timing chain cover)
5.	-1 … 7-	Turn 90° further

Timing chain cover (top right) - tightening torque and tightening sequence



Note

Renew the bolts tightened with specified tightening angle.

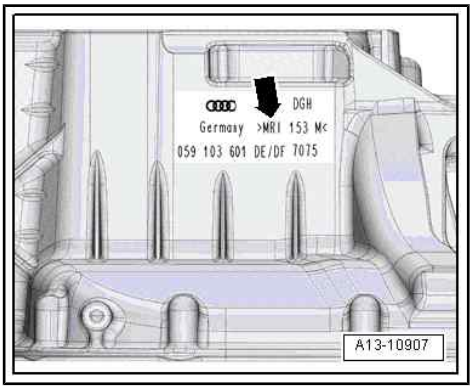
– Tighten bolts in 5 stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1.	-1, 2, 3-	Screw in by hand until contact is made
2.	-4 … 7-	Screw in by hand until contact is made
3.	-1 … 7-	8 Nm
4.	-1 … 7-	8 Nm (this step is performed to allow for settling of timing chain cover)
5.	-1 … 7-	Turn 90° further

Timing chain cover (bottom) - tightening torque and tightening sequence: vehicles with aluminium sump (top section)

Caution

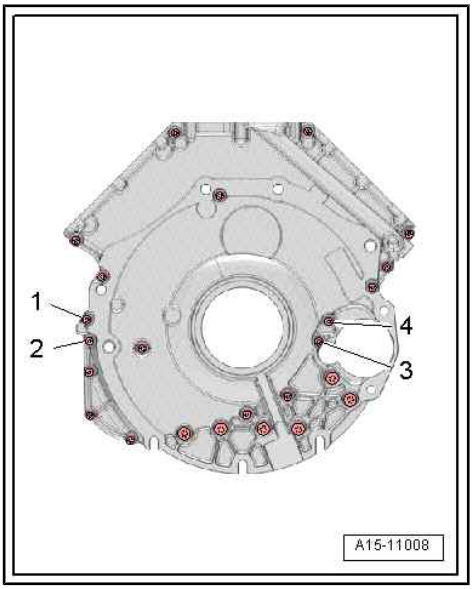
- *For vehicles with magnesium sump (top section) (identification: letter combination "MRI" -arrow- on top section of sump), proceed as follows* ⇒ *page 218* .



– Tighten bolts in 7 stages as follows:

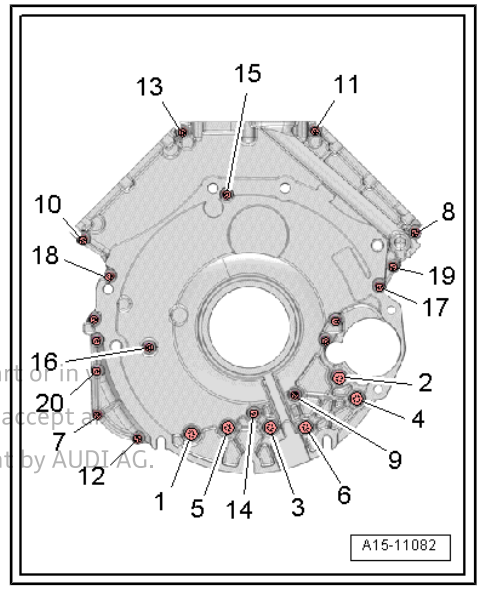
Stages 1 and 2:

Stage	Bolts	Tightening torque
1.		Fit timing chain cover (bottom) on cylinder block with sealant and sealing elements.
2.	-1, 2, 3, 4-	9 Nm



Stages 3 ... 6:

Stage	Bolts	Tightening torque/angle specification
3.	-1 … 20-	3 Nm
4.	-1 … 6-	8 Nm
5.	-1 … 6-	Turn 90° further
6.	-7 … 20-	9 Nm

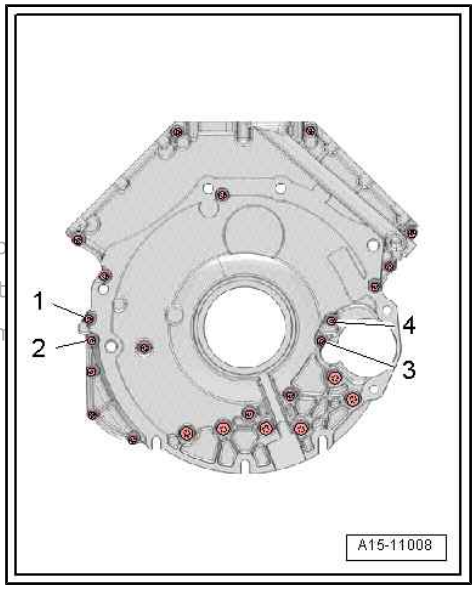


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Stage 7:

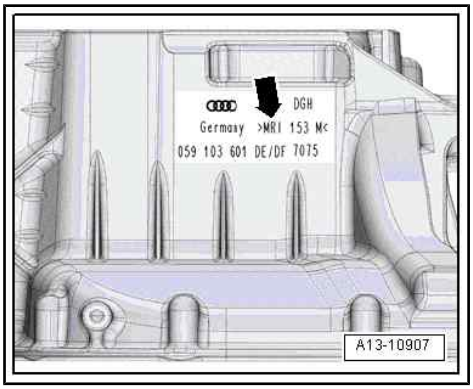
Stage	Bolts	Tightening torque
7.	-1, 2, 3, 4-	9 Nm

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Timing chain cover (bottom) - tightening torque and tightening sequence: vehicles with magnesium sump (top section)

Identification: magnesium sump (top section)



Note

Renew the bolts tightened with specified tightening angle.

Caution

Risk of damage to aluminium bolts when installing timing chain cover (bottom).

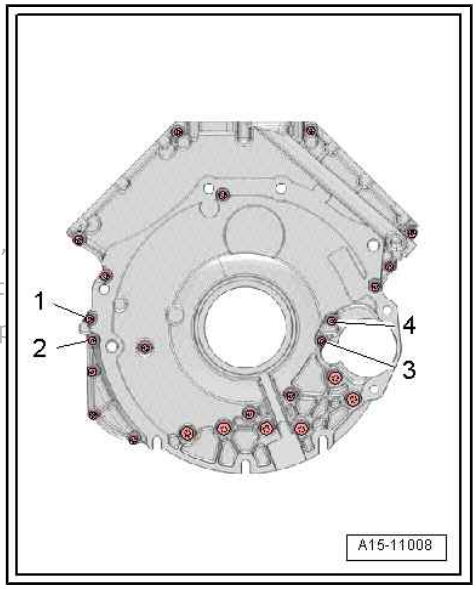
- ***Do not use aluminium bolts to pull timing chain cover (bottom) onto cylinder block.***
- ***Therefore use four steel bolts M6x20 to install the timing chain cover (bottom); see the following description.***

– Tighten bolts in 9 stages as follows:

Stages 1 and 2:

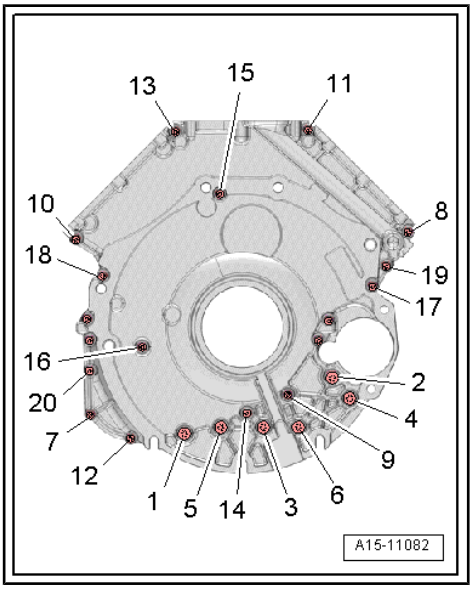
Stage	Bolts	Tightening torque
1.		Fit timing chain cover (bottom) on cylinder block with sealant and sealing elements.
2.	-1, 2, 3, 4-	Tighten steel bolts M6x20 to 9 Nm

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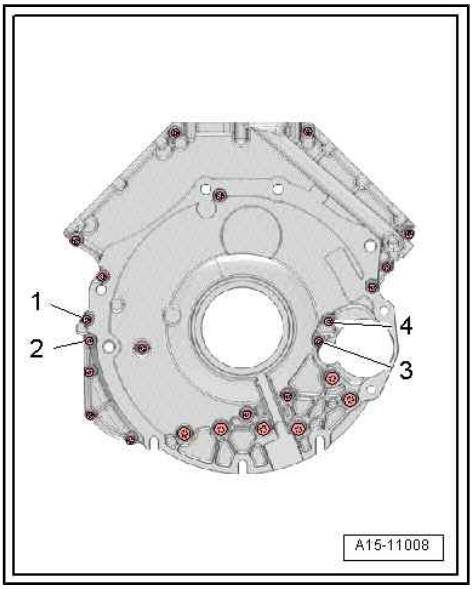
Stages 3 ... 6:

Stage	Bolts	Tightening torque/angle specification
3.	-1 … 20-	3 Nm
4.	-1 … 20-	3 Nm (this step is performed to allow for settling of bottom timing chain cover)
5.	-1 … 6-	8 Nm
6.	-1 … 20-	Turn 90° further



Stages 7 ... 9:

Stage	Bolts	Tightening torque/angle specification
7.	-1, 2, 3, 4-	Unscrew steel bolts M6x20
8.	-1, 2, 3, 4-	Insert aluminium bolts and tighten to 3 Nm
9.	-1, 2, 3, 4-	Turn aluminium bolts 90° further



1.2 Removing and installing timing chain cover

⇒ “1.2.1 Removing and installing timing chain cover (top left)”, page 220

⇒ “1.2.2 Removing and installing timing chain cover (top right)”, page 222

⇒ “1.2.3 Removing and installing timing chain cover (bottom)”, page 225

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1.2.1 Removing and installing timing chain cover (top left)

Special tools and workshop equipment required

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

Removing

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

– Remove cylinder head cover (left-side).

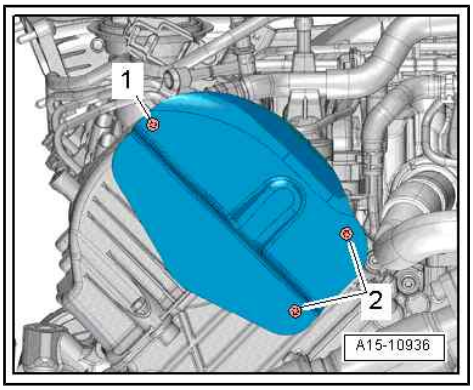
- ⇒ “3.4.1 Removing and installing cylinder head cover (left-side) - vehicles with one turbocharger”, page 267
- ⇒ “3.4.3 Removing and installing cylinder head cover (left-side) - vehicles with two turbochargers”, page 272

⇒ page 267

Vehicles with one turbocharger:

– Remove particulate filter ⇒ page 612 .

– If fitted, unscrew bolts -2- and detach heat shield.



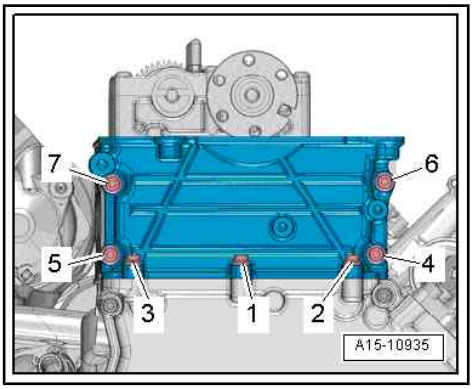
Note

Disregard -item 1-.

All vehicles (continued):

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

– Carefully release timing chain cover (top left) from bonded joint and remove cover.



Installing

– Remove old sealant from sealing surfaces on timing chain cover.

Caution

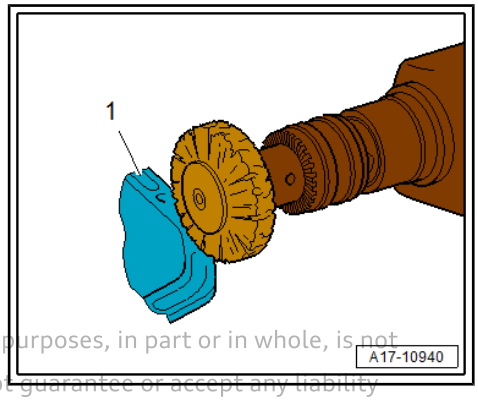
Protect lubrication system against contamination.

- *Cover exposed parts of the engine.*

WARNING

Risk of eye injury.

- *Put on safety goggles.*



– Remove remaining sealant on timing chain cover -1- and cylinder head using rotating plastic brush or similar.

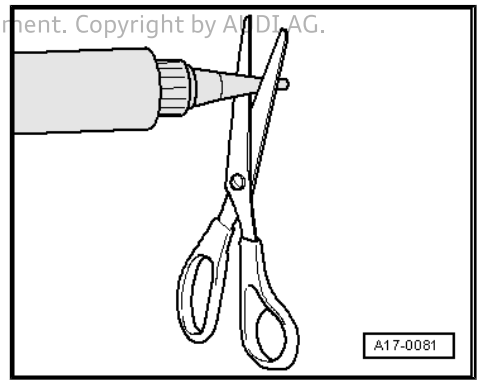
– Clean surfaces; they must be free of oil and grease.

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Note

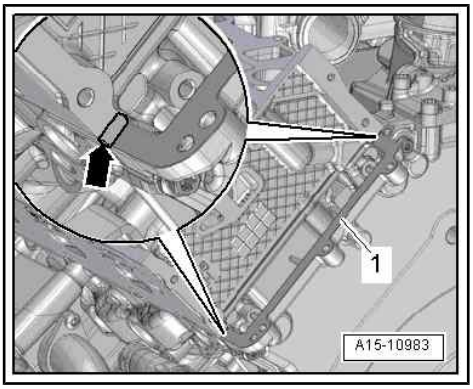
Note the use-by date of the sealant.

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



– Fit gasket -1-.

– Apply sealant at joints between cylinder head and timing chain cover (bottom) -arrow-, as shown in illustration.



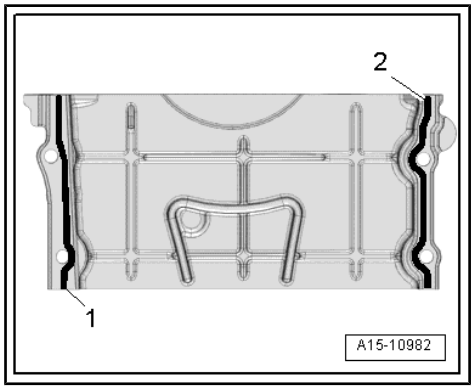
Caution

Make sure lubrication system is not clogged by excess sealant.

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

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

– Apply sealant beads -1 and 2- onto clean sealing surface of timing chain cover (left-side), as illustrated.



Note

The timing chain covers must be installed within 5 minutes after applying the sealant.

– Fit timing chain cover and tighten bolts ⇒ page 216 .

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

– Install cylinder head cover (left-side) ⇒ page 267 .

– Install particulate filter ⇒ page 612 .

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Tightening torques

♦ ⇒ Fig. ""Timing chain cover (top left) - tightening torque and tightening sequence"" , page 216

1.2.2 Removing and installing timing chain cover (top right)

Special tools and workshop equipment required

♦ Electric drill with plastic brush

♦ Safety goggles

♦ Sealant ⇒ Electronic parts catalogue

Removing

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

– Remove cylinder head cover (right-side).

♦ ⇒ "3.4.2 Removing and installing cylinder head cover (right-side) - vehicles with one turbocharger", page 269

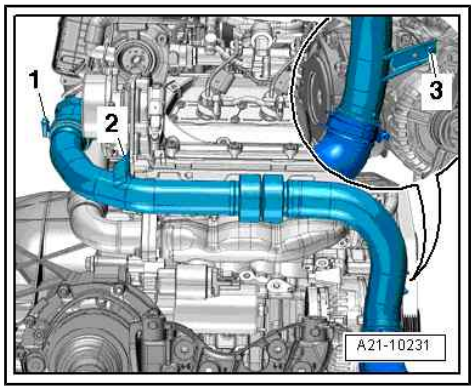
♦ ⇒ "3.4.4 Removing and installing cylinder head cover (right-side) - vehicles with two turbochargers", page 275

Vehicles with one turbocharger:

– Remove bolts -2, 3-.

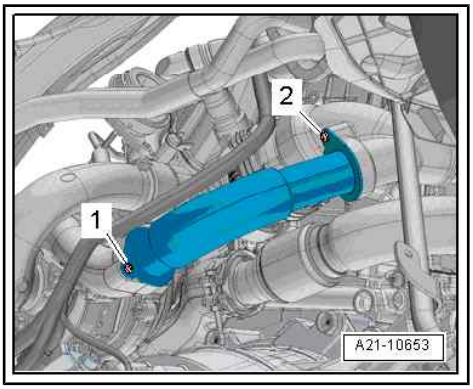
– Release hose clip -1- and detach air pipe.

– Press air pipe to rear.



Vehicles with two turbochargers:

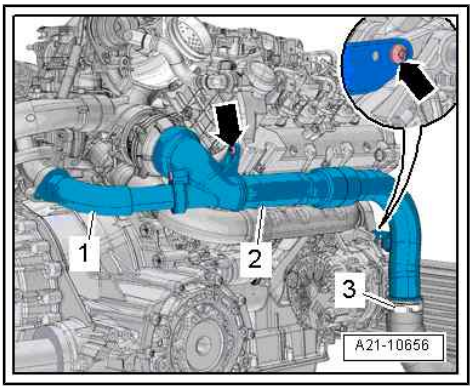
– Remove bolt -1- on intermediate pipe.



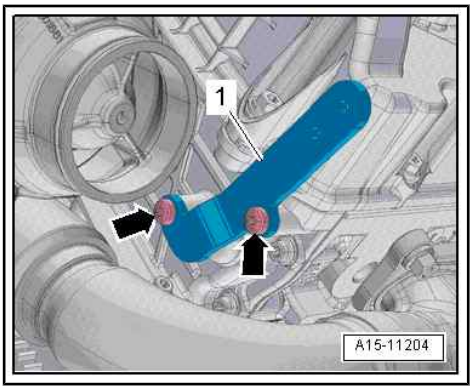
Note

Disregard -item 2-.

– Release clip -3- and detach air hose.
– Remove bolts -arrows-.
– Pull air pipe off bypass valve at right and guide intermediate pipe -1- out of turbocharger at same time.
– Press air pipe to the side.

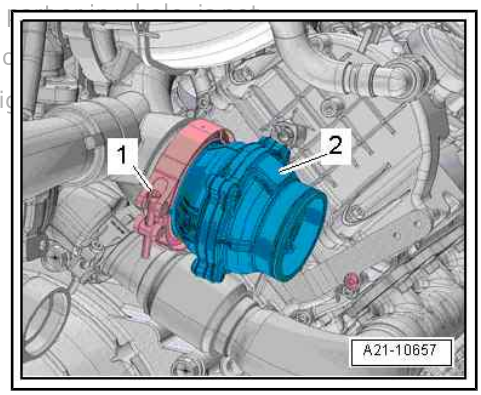


– Unscrew bolts -arrows- and detach bracket -1-.



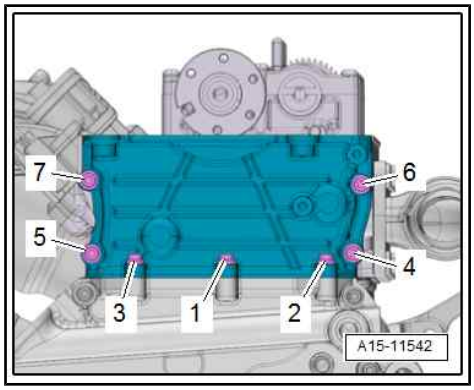
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– Open clip -1- and detach bypass valve -2-.



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

– Carefully release timing chain cover (top) from bonded joint and remove cover.



Installing

– Remove old sealant from sealing surfaces on timing chain cover.

Caution

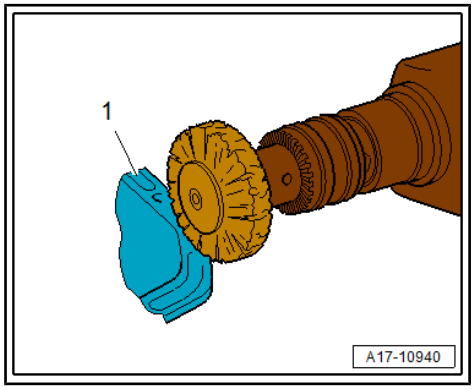
Protect lubrication system against contamination.

- *Cover exposed parts of the engine.*

WARNING

Risk of eye injury.

- *Put on safety goggles.*



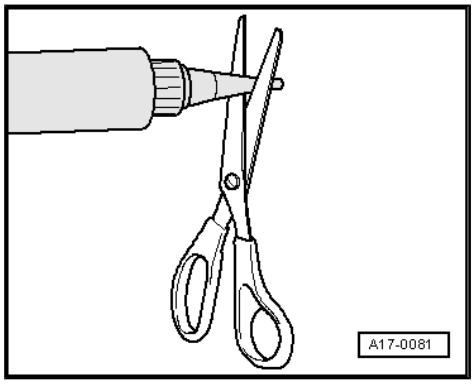
– Remove remaining sealant on timing chain cover -1- and cylinder head using rotating plastic brush or similar.

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

Note

Note the use-by date of the sealant.

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



– Fit gasket -1-.

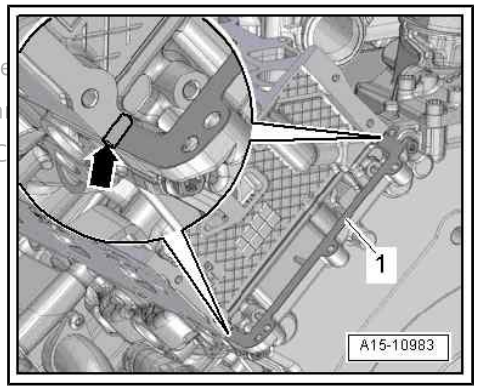
– Apply sealant at joints between cylinder head and timing chain cover (bottom) -arrow-, as shown in illustration.

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Caution

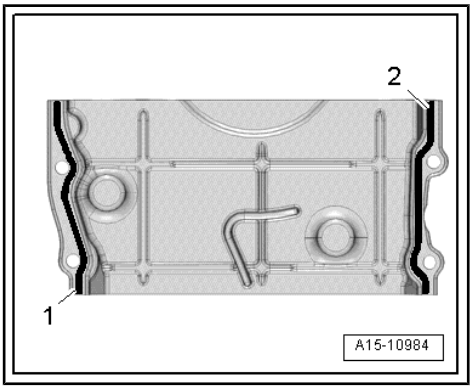
Make sure lubrication system is not clogged by excess sealant.

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



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

– Apply sealant beads -1 and 2- onto clean sealing surface of timing chain cover (right-side), as illustrated.



Note

The timing chain covers must be installed within 5 minutes after applying the sealant.

– Move cover (top right) into installation position, check sealant bead and correct if necessary.

– Fit timing chain cover and tighten bolts ⇒ page 216 .

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

– Install air pipe ⇒ page 463 .

– Install coolant pipe (top) ⇒ page 382 .

– Install exhaust gas temperature sender 4 - G648- ⇒ page 650 .

– Install cylinder head cover (right-side) ⇒ page 269 .

Tightening torques

♦ ⇒ Fig. ""Timing chain cover (top right) - tightening torque and tightening sequence"" , page 216

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

1.2.3 Removing and installing timing chain cover (bottom)

Special tools and workshop equipment required

♦ Electric drill with plastic brush

♦ Safety goggles

♦ Sealant ⇒ Electronic parts catalogue

♦ Steel bolt M6x20 (4x)

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Removing

• Vehicles with one turbocharger: Gearbox removed ⇒ Rep. gr. 34 ; Removing and installing gearbox; Removing gearbox or ⇒ Rep. gr. 37 ; Removing and installing gearbox; Removing gearbox

• Vehicles with two turbochargers: engine separated from gearbox ⇒ page 136

– Remove drive plate ⇒ page 195 .

– Remove turbocharger:

♦ Vehicles with one turbocharger ⇒ page 420

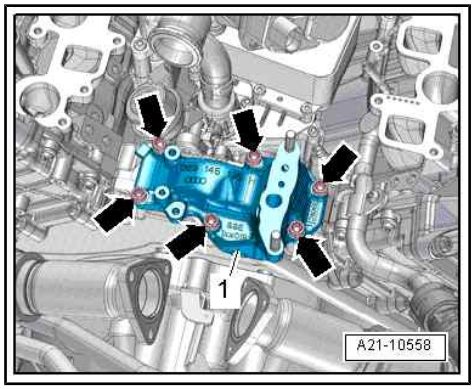
♦ Vehicles with two turbochargers ⇒ page 424

– Remove timing chain covers (top) ⇒ page 220 .

– Remove exhaust manifold (left and right) ⇒ page 666 .

Vehicles with one turbocharger:

– Unscrew bolts -arrows- and detach bracket -1- for turbocharger.

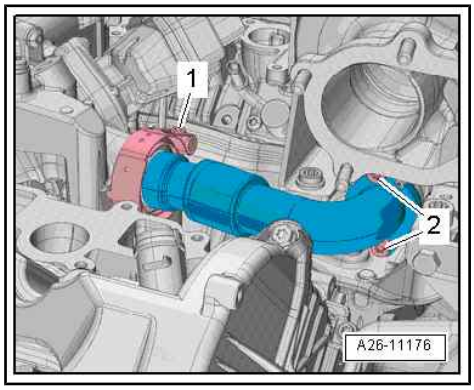


Vehicles with two turbochargers:

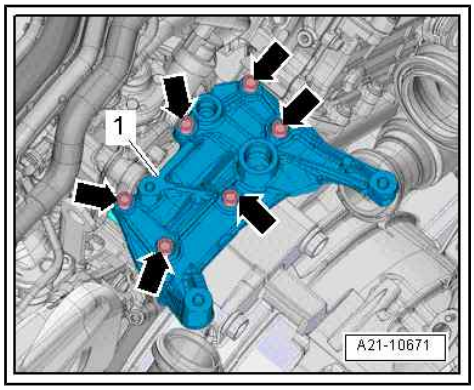
– Release clamp -1- and detach exhaust gas recirculation pipe.

Note

Disregard -item 2-.



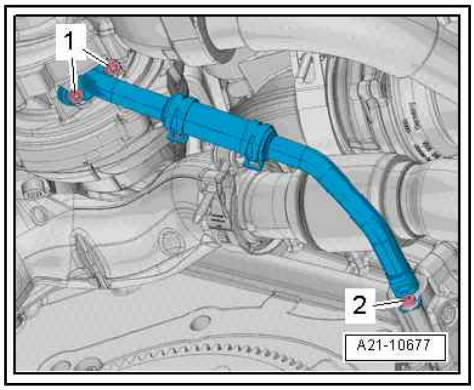
– Unscrew bolts -arrows- and swivel bracket -1- for turbocharger to side.



– Remove bolt -2- and detach oil return pipe.

Note

Disregard -item 1-.



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All vehicles (continued):

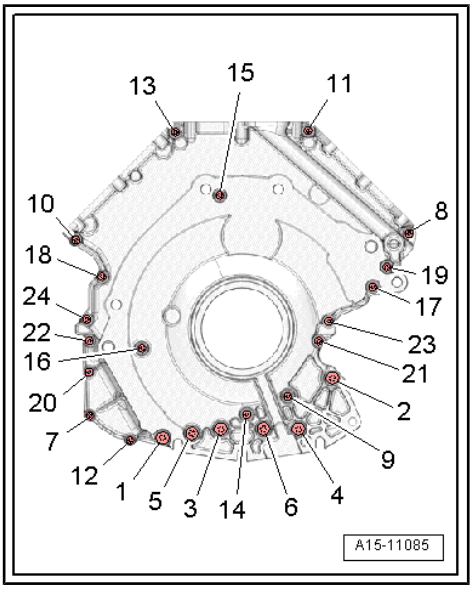
– Slacken and remove bolts in the sequence: -24 ... 1-.

– Carefully release timing chain cover (bottom) from bonded joint and remove cover.

– Press crankshaft oil seal (gearbox end) out of timing chain cover (bottom).

Installing

– Remove old sealant from grooves on timing chain cover and from sealing surfaces.



Caution

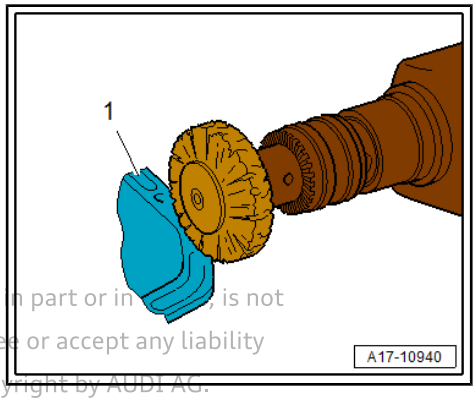
Protect lubrication system against contamination.

- *Cover exposed parts of the engine.*

WARNING

Risk of eye injury.

- *Put on safety goggles.*



– Remove remaining sealant on timing chain cover (bottom) -1- and on cylinder block using rotating plastic brush or similar.

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

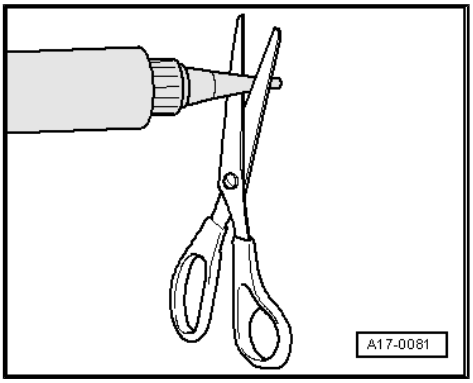
– Before installing gearbox, remove residue from threaded holes for engine/gearbox bolts in cylinder block using a thread tap.

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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).

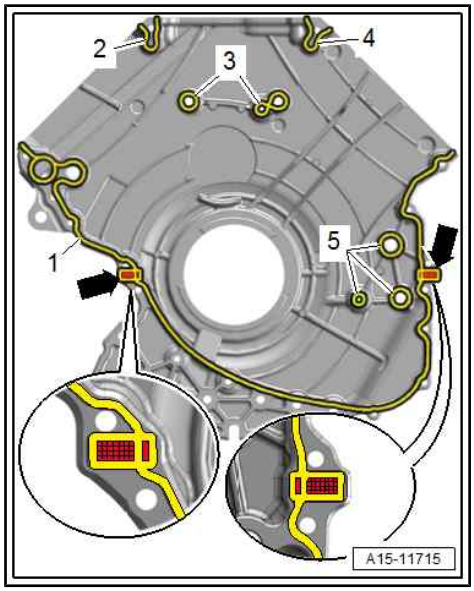


– Fit sealing elements -arrows- (without sealant).

Caution

Make sure lubrication system is not clogged by excess sealant.

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



– Apply beads of sealant onto clean sealing surface of timing chain cover (bottom) as illustrated.

- The beads of sealant -1, 2, 4- must be 1.5 ... 2.0 mm thick.
- The beads of sealant around drillings -3- and -5- must be 1.5 … 2.0 mm thick.

Note

The timing chain cover must be installed within 5 minutes after applying the sealant.

– Check whether the two dowel sleeves are fitted in the cylinder block; install if necessary.

– Install timing chain cover (bottom) and tighten bolts ⇒ page 217 .

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

– Install crankshaft oil seal (gearbox end) ⇒ page 198 .

– Install timing chain covers (top) ⇒ page 220 .

– Install exhaust manifold (left-side) ⇒ page 666 .

– Install exhaust manifold (right-side) ⇒ page 670 .

– Install bracket for turbocharger:

- Vehicles with one turbocharger ⇒ page 412
- Vehicles with two turbochargers ⇒ page 420

– Install turbocharger:

- Vehicles with one turbocharger ⇒ page 420
- Vehicles with two turbochargers ⇒ page 424

– Install drive plate ⇒ page 195 .

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

Tightening torques

- ⇒ page 217
- ⇒ “1.1.1 Exploded view - turbocharger, vehicles with one turbocharger”, page 412
- ⇒ “1.1.2 Exploded view - turbochargers, vehicles with two turbochargers”, page 414

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2 Chain drive

⇒ “2.1 Exploded view - camshaft timing chains”, page 229

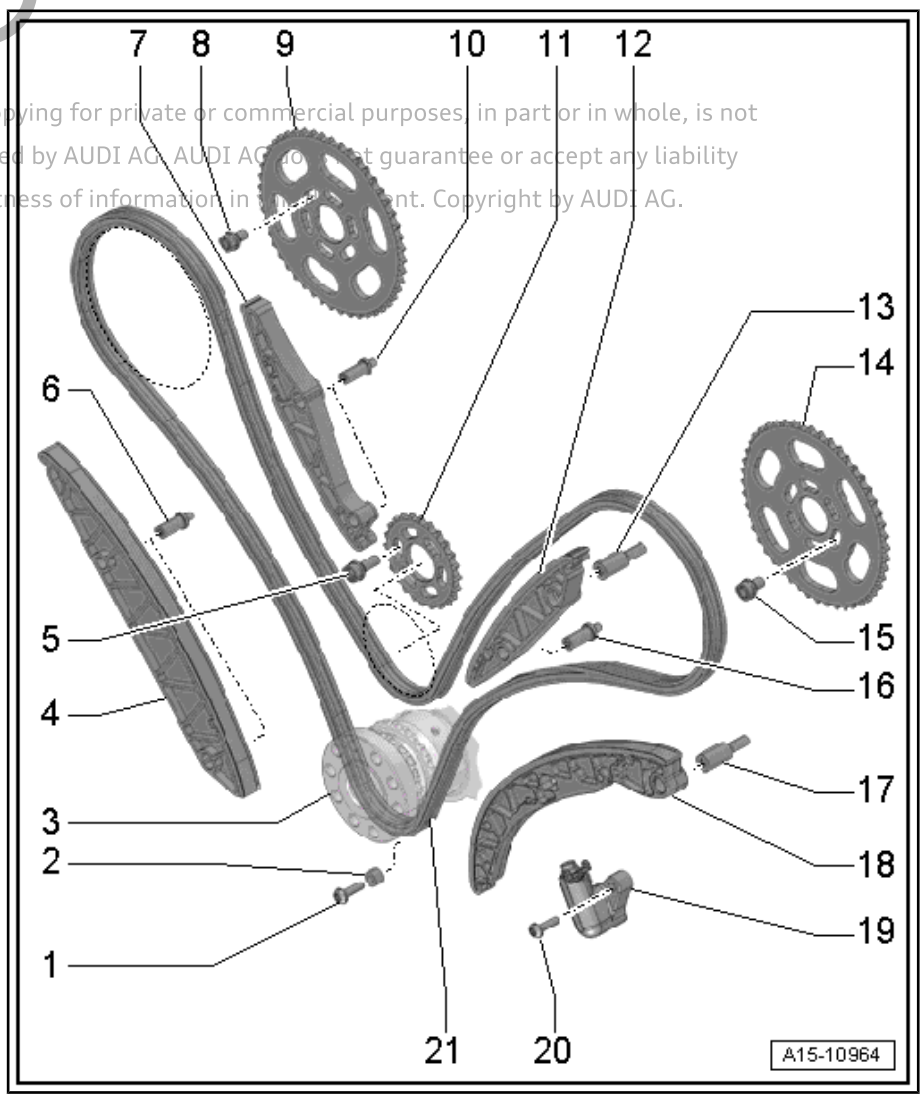
⇒ “2.2 Exploded view - drive chain for oil pump and high-pressure pump”, page 231

⇒ “2.3 Removing camshaft timing chain from camshafts”, page 232

⇒ “2.4 Removing and installing camshaft timing chain”, page 240

⇒ “2.5 Removing and installing drive chain for oil pump and high-pressure pump”, page 250

2.1 Exploded view - camshaft timing chains



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1 - Bolt
- ❑ 9 Nm

2 - Chain slip preventer

3 - Crankshaft
- ❑ With sprocket for camshaft timing chain

4 - Guide rail
- ❑ Note installation position

5 - Bolt
- ❑ Tightening torque ⇒ Item 3 (page 204)

6 - Guide pin
- ❑ For guide rail
- ❑ Renew
- ❑ 5 Nm +90°

7 - Guide rail
- ❑ Note installation position

8 - Bolt
- ❑ 23 Nm

9 - Camshaft chain sprocket
- ❑ For inlet camshaft
- ❑ Installation position: Side with lettering legible from rear

10 - Guide pin
- ❑ For guide rail
- ❑ Renew
- ❑ 5 Nm +90°

11 - Chain sprocket
- ❑ For balance shaft

12 - Guide rail
- ❑ Note installation position

13 - Guide pin

- ❑ For guide rail
- ❑ 23 Nm

14 - Camshaft chain sprocket

- ❑ For inlet camshaft
- ❑ Installation position: Side with lettering legible from rear

15 - Bolt

- ❑ 23 Nm

16 - Guide pin

- ❑ For guide rail
- ❑ Renew
- ❑ 5 Nm +90°

17 - Guide pin

- ❑ For tensioning rail
- ❑ 23 Nm

18 - Tensioning rail

19 - Chain tensioner

- ❑ For camshaft timing chain

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20 - Bolt

- ❑ Renew
- ❑ 5 Nm +90°

21 - Camshaft timing chain

- ❑ Removing from camshafts ⇒ page 232
- ❑ Before removing, mark running direction with paint
- ❑ Removing and installing ⇒ page 240

2.2 Exploded view - drive chain for oil pump and high-pressure pump

1 - Drive chain for oil pump and high-pressure pump
- ❑ Removing and installing ⇒ page 250

2 - Bolt
- ❑ Renew
- ❑ 30 Nm +45°

3 - Drive chain sprocket
- ❑ For oil pump

4 - Compression spring

5 - Crankshaft
- ❑ With drive chain sprocket for oil pump and high-pressure pump

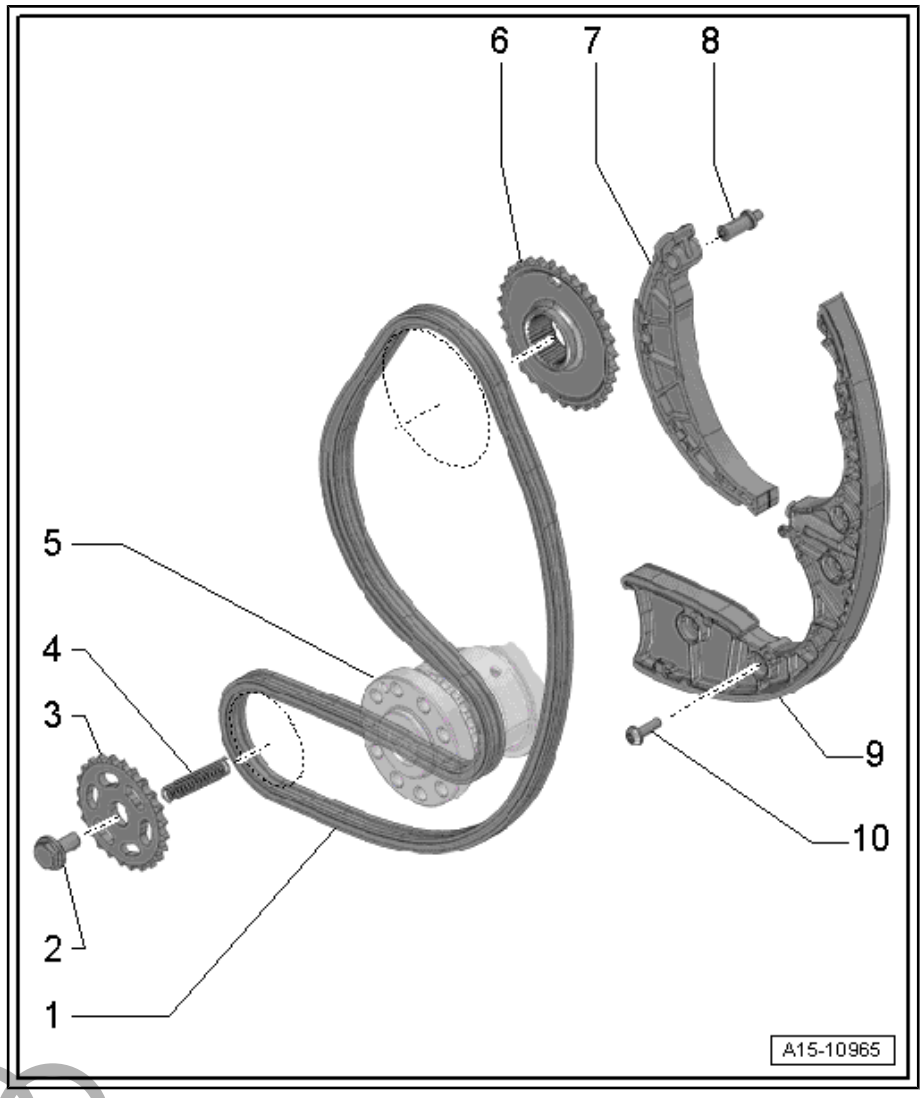
6 - Drive chain sprocket
- ❑ For high-pressure pump

7 - Guide rail

8 - Guide pin
- ❑ For guide rail
- ❑ Renew
- ❑ 5 Nm +90°

9 - Chain tensioner
- ❑ With guide rail

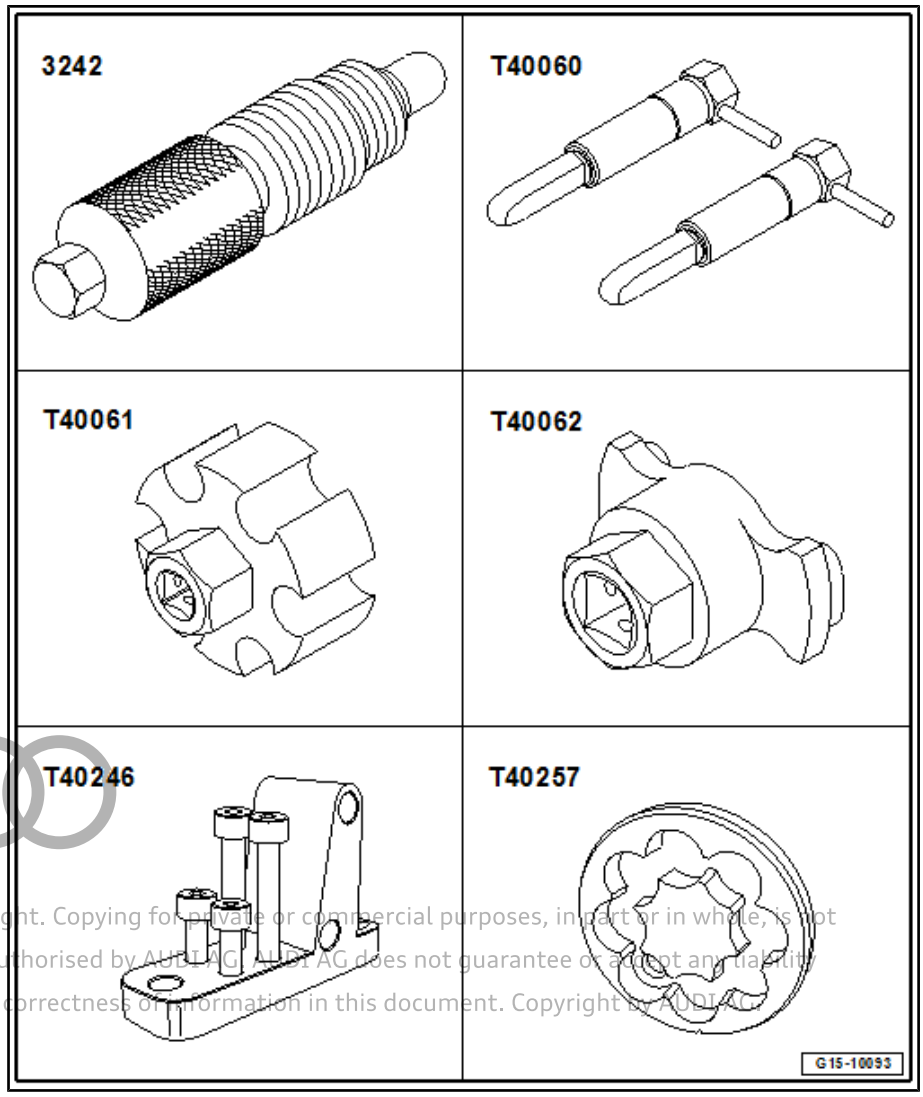
10 - Bolt
- ❑ Renew
- ❑ 5 Nm +90°



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2.3 Removing camshaft timing chain from camshafts

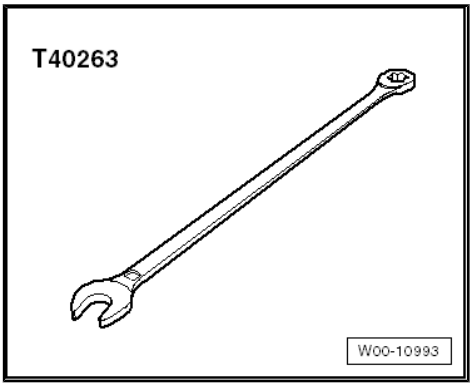
Special tools and workshop equipment required



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- Locking pin - 3242-
- Adjustment pin - T40060- (2x)
- Adapter - T40061-
- Adapter - T40062-
- Bracket - T40246-
- Turning-over tool - T40257-

♦ Wrench, 21 mm - T40263-



♦ Adapter -T40314-



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♦ Bolt, M6x20 (2x)

♦ Bolt, M6x40 (2x)

Removing

• Engine and gearbox in vehicle

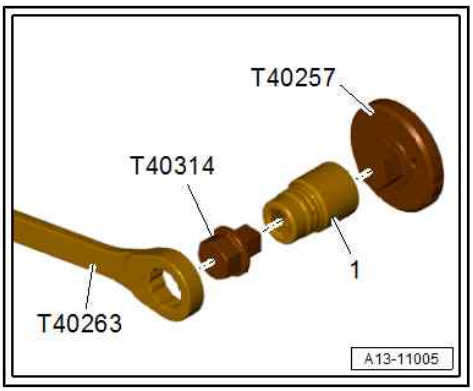
Note

When working on the bank 1 cylinder head (right-side) only, it is not necessary to remove the timing chain cover on the bank 2 cylinder head (left-side).

– Remove timing chain covers (top) ⇒ page 220 .

– Assemble tools as shown in illustration.

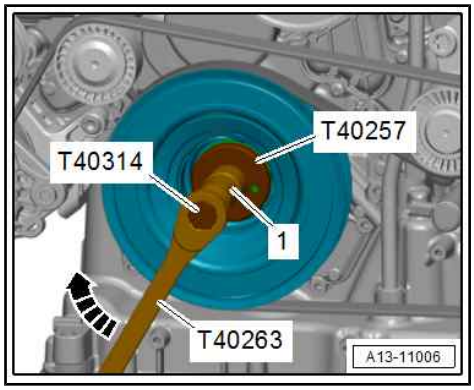
1 - Socket (21 mm) for $^{1}/_{2}$" drive



Caution

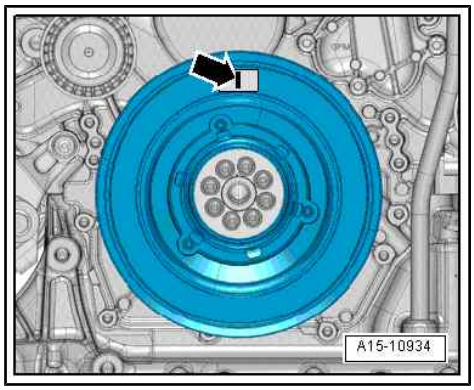
Irreparable damage can be caused if the camshaft timing chain slips.

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



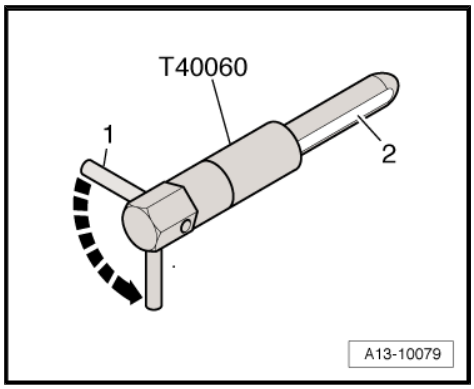
– Turn crankshaft until vibration damper is at “TDC” position.

• Mark (stuck on) -arrow- must be vertical.



Note

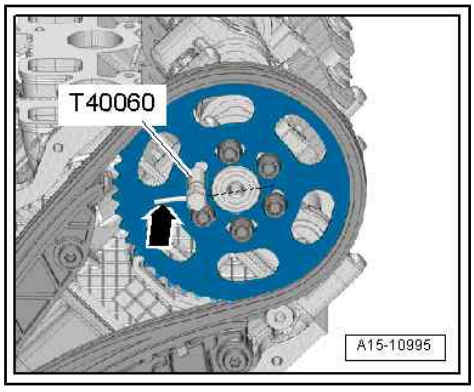
- *The adjustment pin - T40060- has a flat -2- which makes it easier to insert when the locating bores in the camshaft and cylinder head are not exactly in line.*
- *The adjustment pin is inserted initially so that the side pin -1- is perpendicular to the imaginary line between the adjustment pin and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



– Check that camshafts on both cylinder heads are positioned at “TDC”.

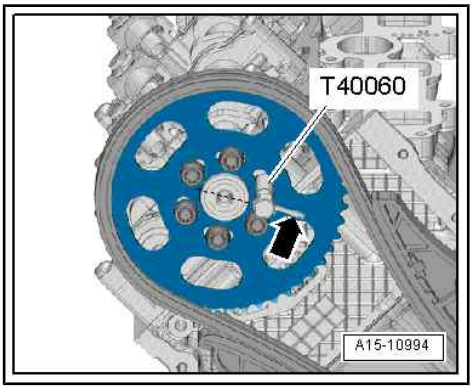
• It should be possible to lock the camshafts with the adjustment pins - T40060- .

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



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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).

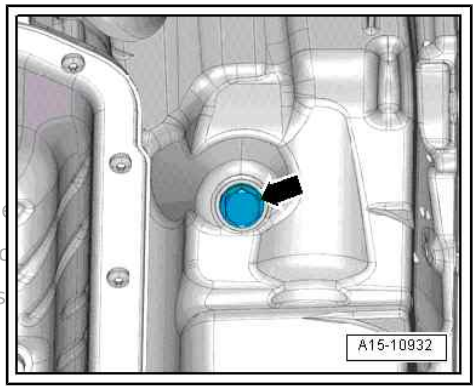


Note

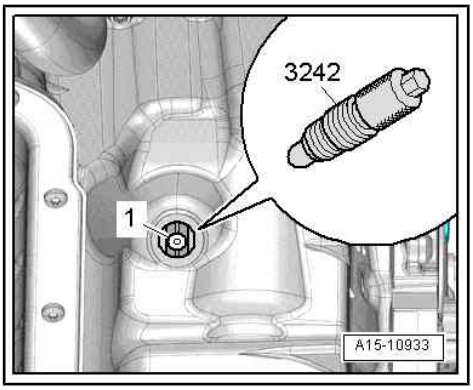
Place a cloth beneath the sump (top section) to catch escaping oil.

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

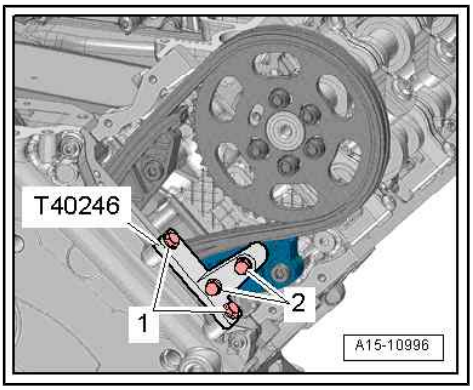


– Screw locking pin - 3242- into hole (20 Nm); if necessary, turn crankshaft -1- backwards and forwards slightly to fully centralise locking pin.



– Secure bracket - T40246- as shown in illustration.

Stage	Bolts	Tightening torque
1.	-1- M6x40	Screw in by hand until contact is made
2.	-2- M6x20	Screw in by hand until contact is made
3.	-2- M6x40	8 Nm
4.	-1- M6x20	8 Nm



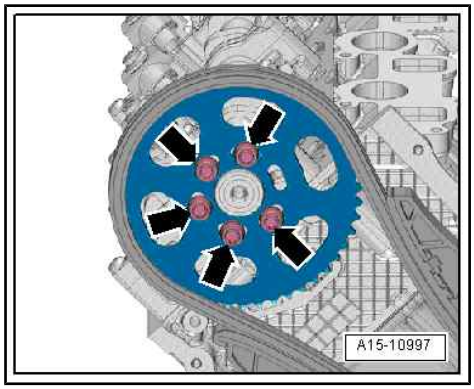
Caution

Risk of irreparable damage to engine.

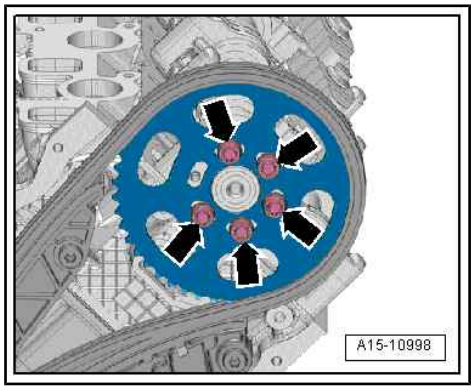
- ***Block off the opening in the valve timing housing with a clean cloth to prevent small items from dropping into the engine.***

– Remove adjustment pin - T40060- from both camshafts.

– Remove bolts -arrows-.



– Remove bolts -arrows-.
– Detach camshaft chain sprockets.

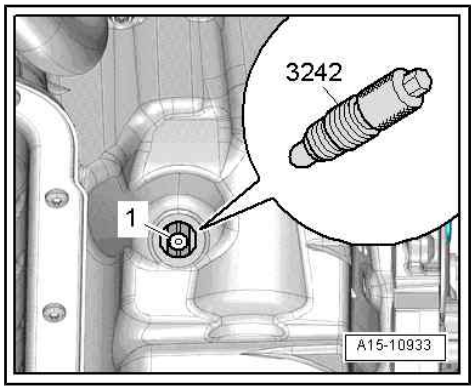


Installing

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

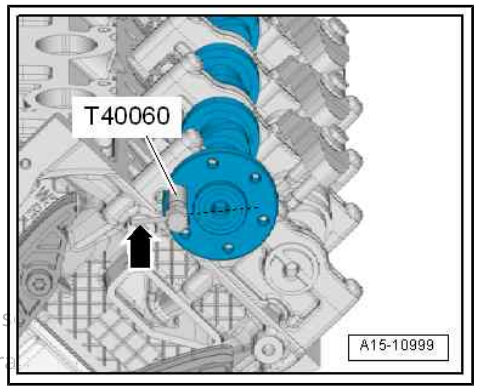
Note

- *Renew the bolts tightened with specified tightening angle.*
- *Renew the seal on the screw plug for the “TDC” mark.*



– Check that camshafts on both cylinder heads are positioned at “TDC”.

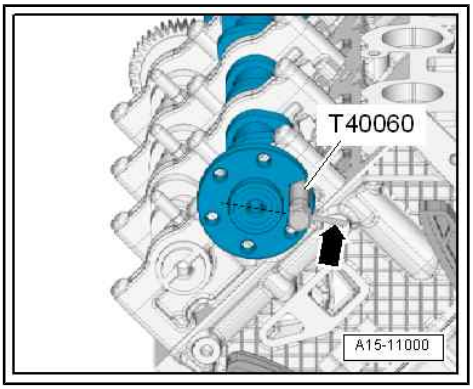
- It should be possible to lock the camshafts with the adjustment pins - T40060- .
- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft on cylinder bank 1 (right-side).



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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).

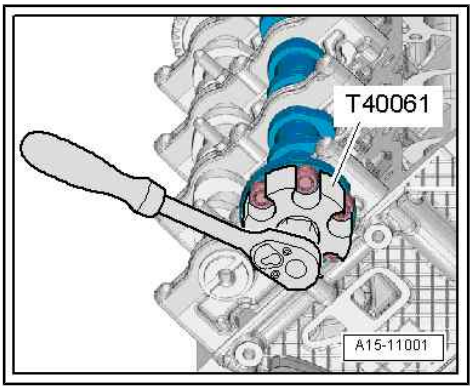
– Remove adjustment pin - T40060- from both camshafts.



Caution

Risk of damage to valves and piston crowns.

- *The crankshaft must not be at "TDC" at any cylinder when the camshafts are to be turned.*



Note

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

– Fit camshaft sprocket (left-side) with camshaft timing chain.

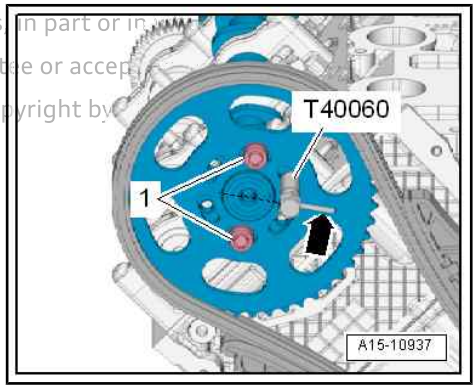
- The elongated holes in the camshaft chain sprocket must be aligned centrally over the threaded holes in the camshaft.

– First screw in two bolts -1- loosely for camshaft chain sprocket.

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

– Use adjustment pin - T40060- to lock camshaft (left-side).

- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.



– Fit camshaft sprocket (right-side) with camshaft timing chain.

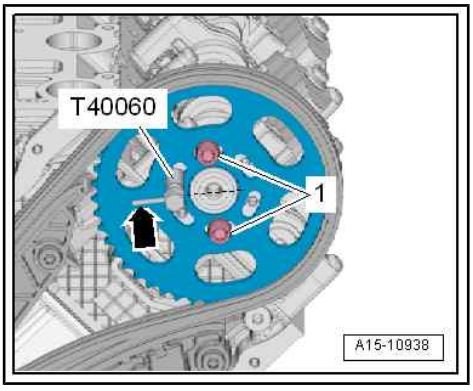
- The elongated holes in the camshaft chain sprocket must be aligned centrally over the threaded holes in the camshaft.

– First screw in two bolts -1- loosely for camshaft chain sprocket.

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

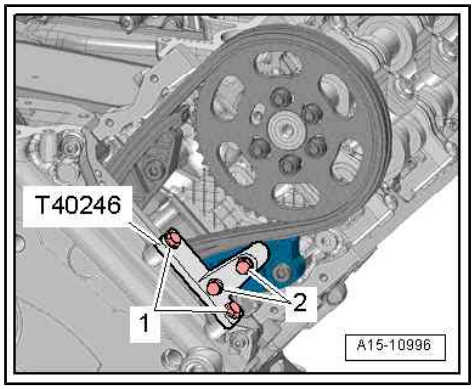
– Use adjustment pin - T40060- to lock camshaft (right-side).

- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.

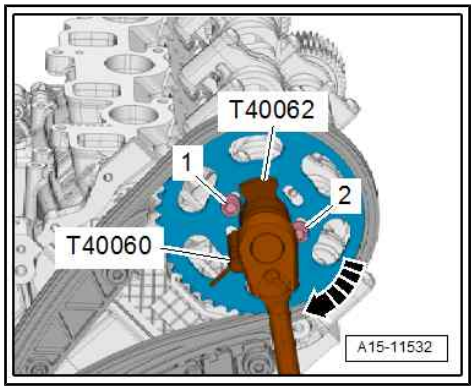


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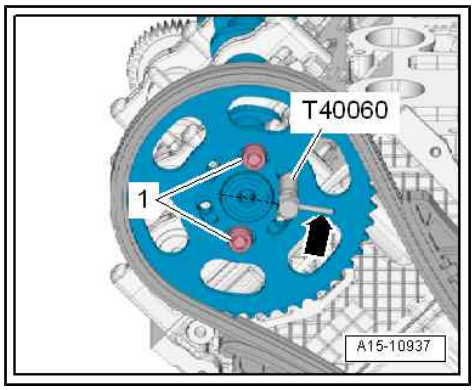
– Remove bracket - T40246- .



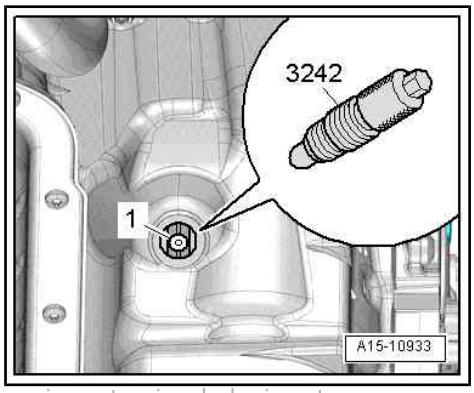
– With the help of a second mechanic, apply a torque of 20 Nm to camshaft chain sprocket (right-side) in clockwise direction -arrow- using a torque wrench and adapter - T40062- and maintain this torque.
– Tighten bolts -1- and -2- for camshaft chain sprocket (right-side).



– Tighten bolts -1- for camshaft chain sprocket (left-side); while doing so, second mechanic must keep maintaining torque.
– Remove adapter - T40062- and adjustment pins -T40060- .
– Tighten remaining bolts for camshaft chain sprockets (both sides).



– Remove locking pin - 3242- .



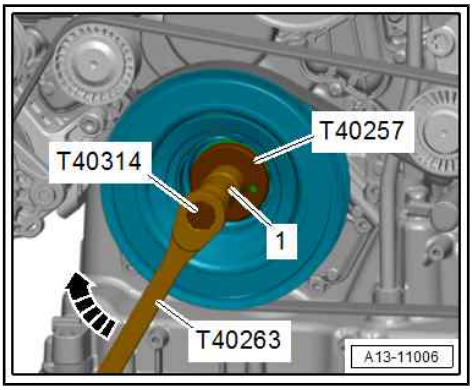
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Checking valve timing

Caution

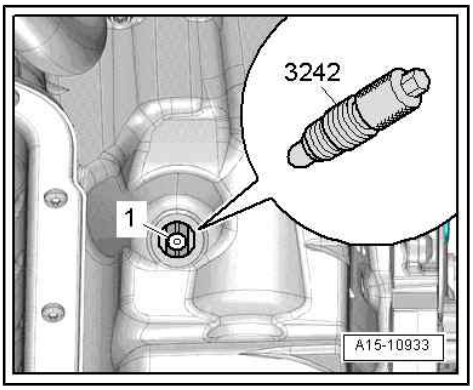
Irreparable damage can be caused if the camshaft timing chain slips.

- *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.



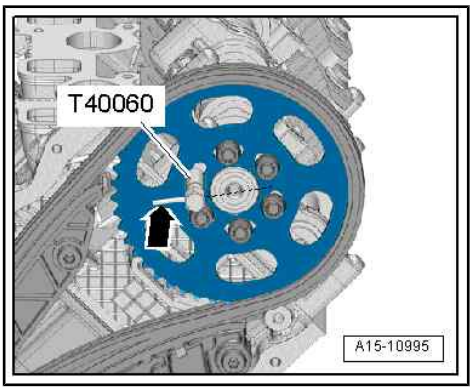
Caution

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

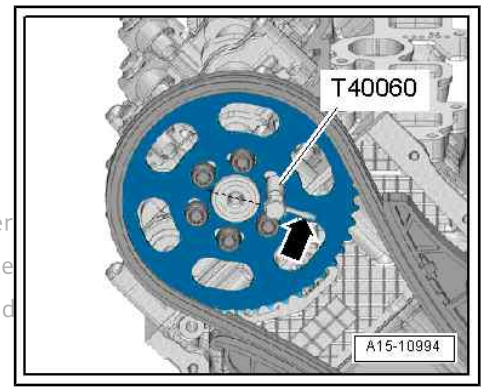
- *If crankshaft has been turned past “TDC” position, turn crankshaft two further rotations until it is again positioned just before “TDC”. Then turn further in the same direction and lock crankshaft with locking pin - 3242- .*

– 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).



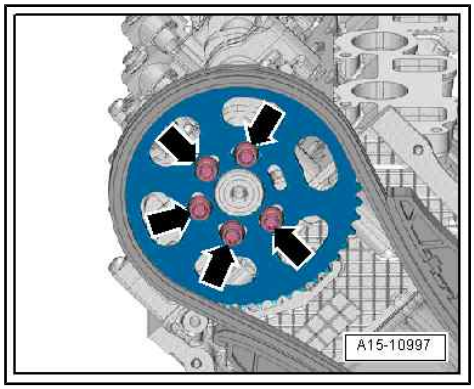
- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft on cylinder bank 2 (left-side).



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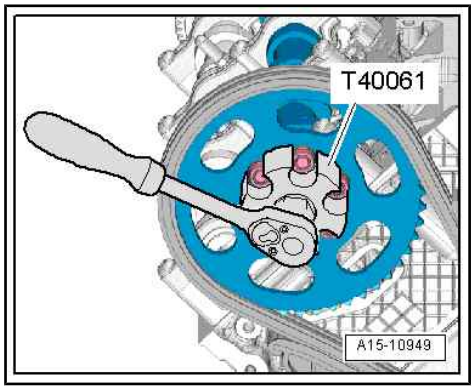
Adjusting valve timing

– 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.

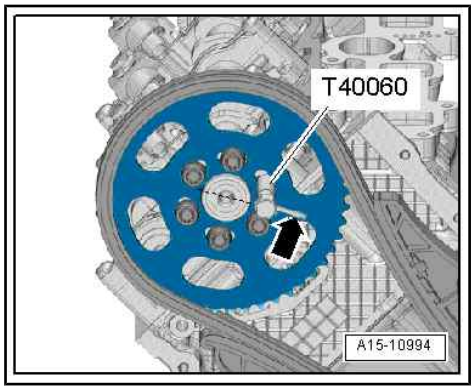
– Remove adjustment pin - T40060- and adapter - T40061- .

– 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 239 .



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

– Install timing chain covers (top) ⇒ page 220 .

Tightening torques

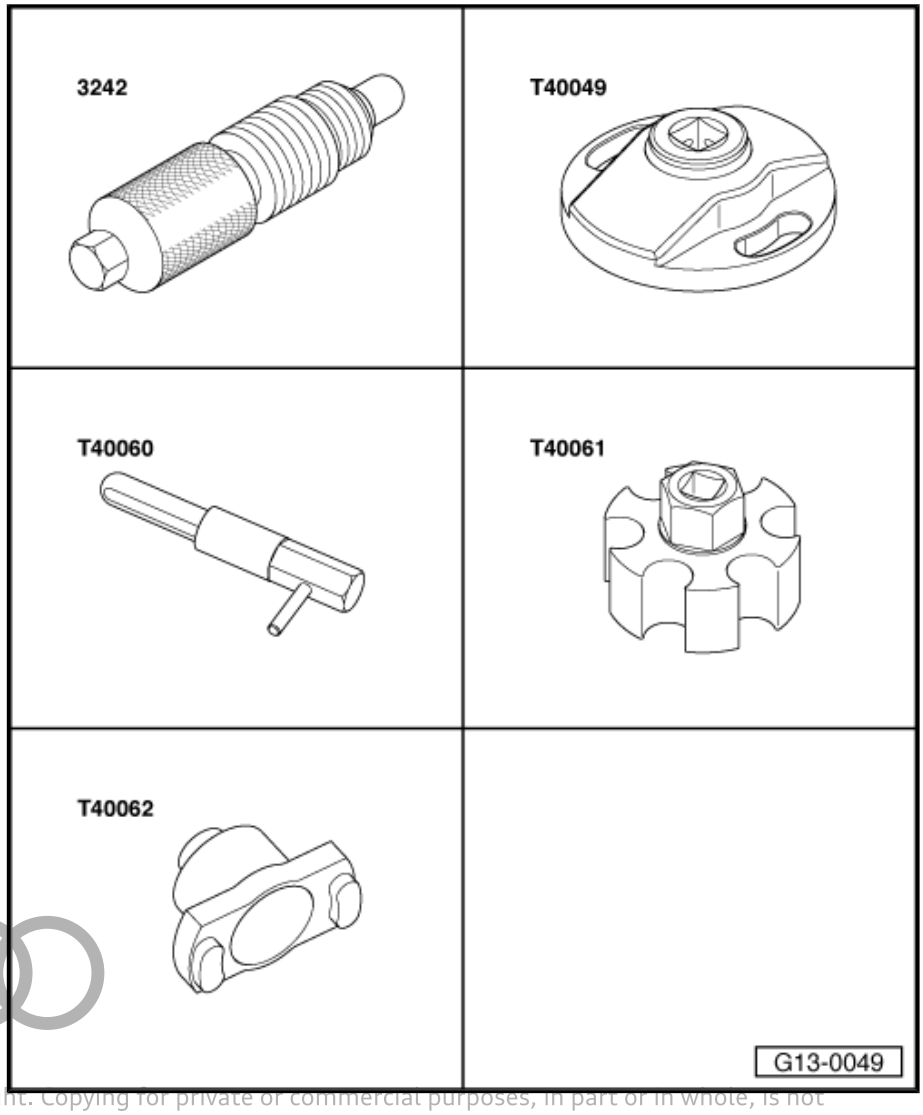
◆ ⇒ “2.1 Exploded view - camshaft timing chains”, page 229

◆ Plug for “TDC” marking ⇒ Item 17 (page 321)

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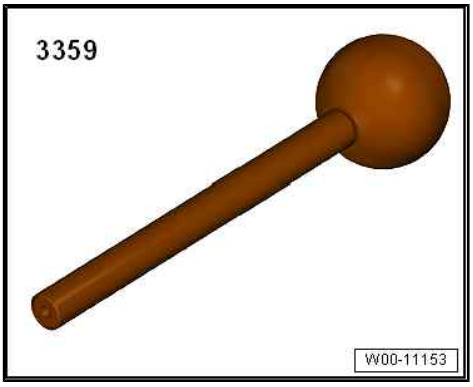
2.4 Removing and installing camshaft timing chain

Special tools and workshop equipment required



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- Locking pin - 3242-
- Key - T40049-
- Adjustment pin - T40060- (2x)
- Adapter - T40061-
- Adapter - T40062-
- Diesel injection pump locking pin - 3359-



- Locking pin - T40316- (not illustrated)

- Nuts M12 (2x)

Removing

Caution

Risk of damage to valves and piston crowns.

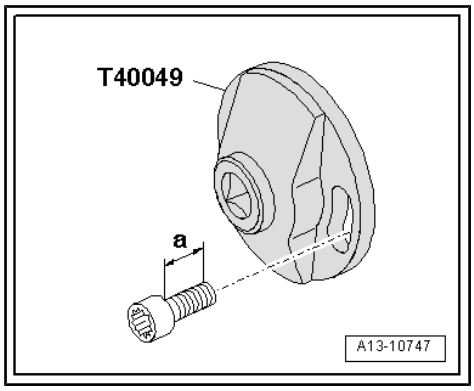
- *The crankshaft and camshafts must only be turned with the chain drive mechanism fully installed.*

– Remove timing chain cover (bottom) ⇒ page 225 .

Caution

Risk of damage to drive chain if thread of bolt exceeds specified length.

- *Use bolts with a maximum thread length -a- of 22 mm to attach key -T40049- .*
- *If no suitable bolts are available, position suitable washer (s) under bolt head so that remaining thread length does not exceed 22 mm.*

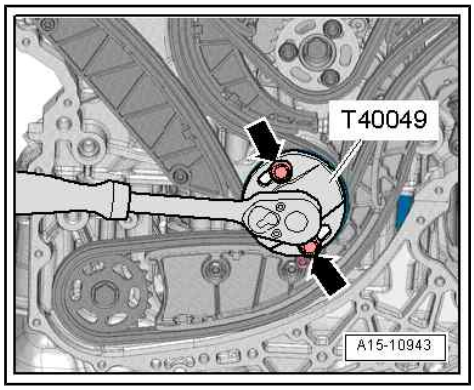


– Secure special wrench - T40049- onto rear of crankshaft -arrows-.

Caution

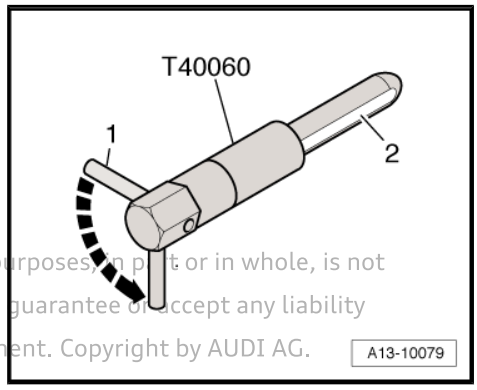
Irreparable damage can be caused if the camshaft timing chain slips.

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



Note

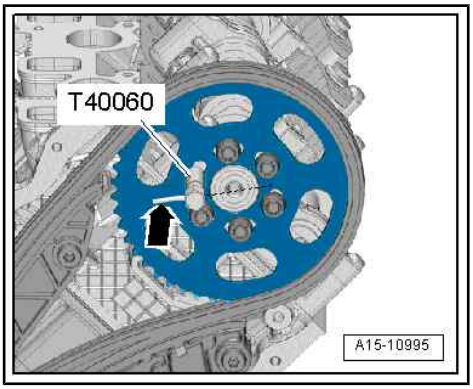
- *The adjustment pin - T40060- has a flat -2- which makes it easier to insert when the locating bores in the camshaft and cylinder head are not exactly in line.*
- *The adjustment pin is inserted initially so that the side pin -1- is perpendicular to the imaginary line between the adjustment pin and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



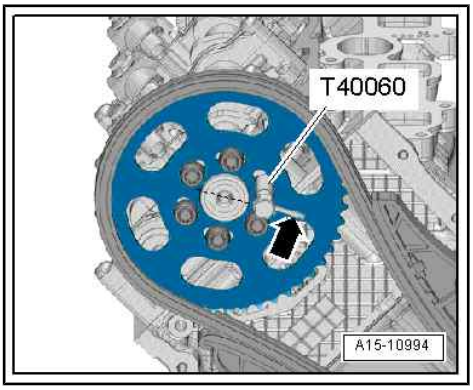
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– Rotate crankshaft to “TDC”:

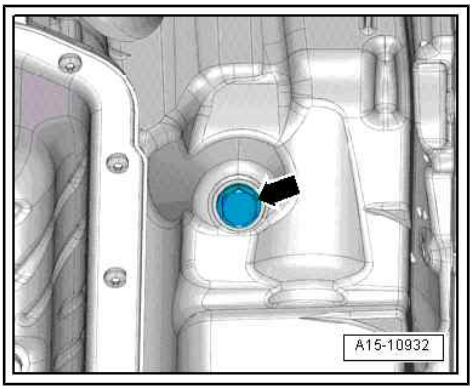
- It should be possible to lock the camshafts with the adjustment pins - T40060- .
- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft on cylinder bank 1 (right-side).



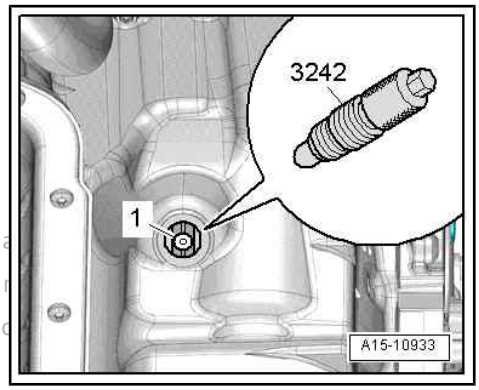
- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft on cylinder bank 2 (left-side).



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

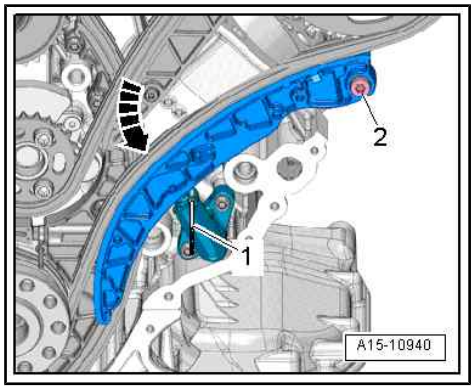


– Screw locking pin - 3242- into hole (20 Nm); if necessary, turn crankshaft -1- backwards and forwards slightly to fully centralise locking pin.



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– Press tensioning rail of camshaft timing chain tensioner in direction of -arrow- and lock chain tensioner by inserting locking pin - T40316- -item 1-.
– Remove guide pin -2- and detach tensioning rail.

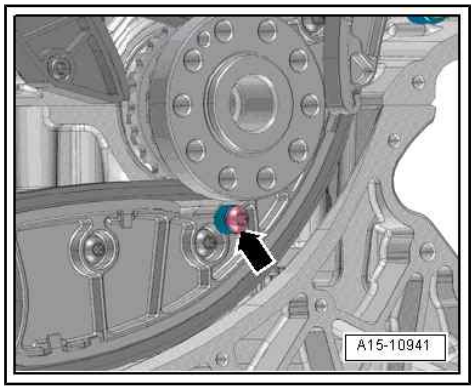


Caution

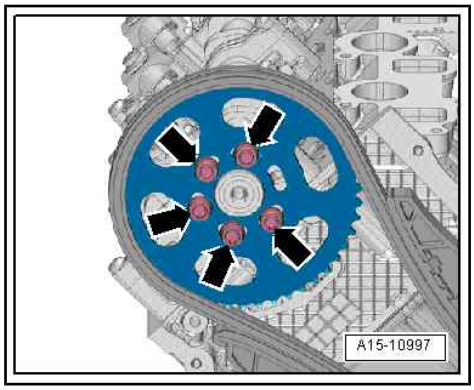
If a used timing chain rotates in the opposite direction when it is refitted, this can cause breakage.

- ***Mark running direction of timing chain with coloured arrows for re-installation.***

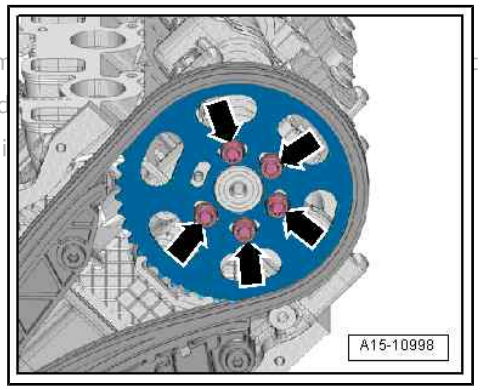
– Remove bolt -arrow- for chain slip preventer.



– Remove adjustment pin - T40060- from both camshafts.
– Remove bolts -arrows-.



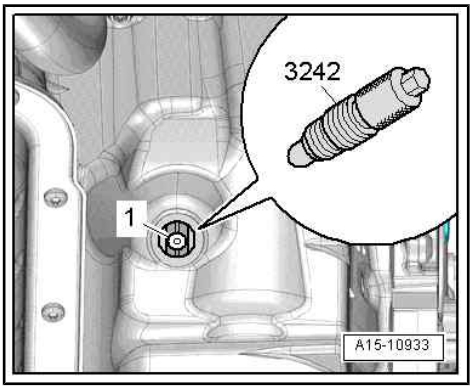
– Remove bolts -arrows-.
– Remove camshaft sprockets and camshaft timing chain.



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Installing

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

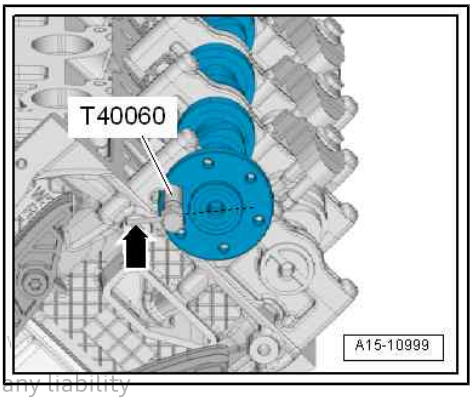


Note

- *Renew the seal on the screw plug for the “TDC” mark.*
- *Renew the bolts tightened with specified tightening angle.*

– Check that camshafts on both cylinder heads are positioned at “TDC”.

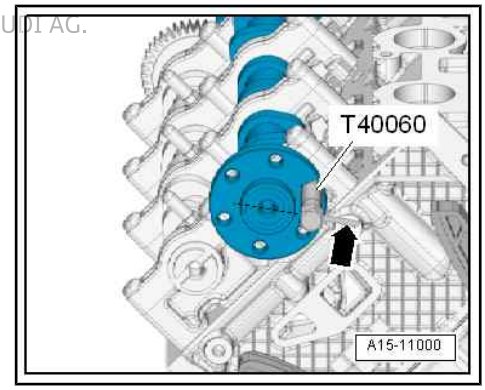
- It should be possible to lock the camshafts with the adjustment pins - T40060- .
- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft on cylinder bank 1 (right-side).



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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).

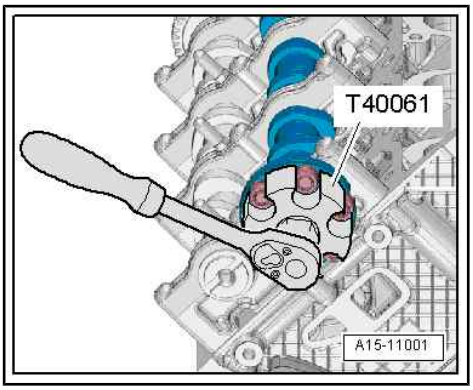
– Remove adjustment pin - T40060- from both camshafts.



Caution

Risk of damage to valves and piston crowns.

- ***The crankshaft must not be at “TDC” at any cylinder when the camshafts are to be turned.***



Note

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

– Fit camshaft sprocket (left-side) with camshaft timing chain.

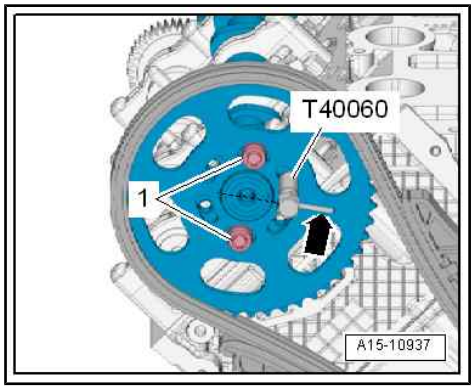
• The elongated holes in the camshaft chain sprocket must be aligned centrally over the threaded holes in the camshaft.

– First screw in two bolts -1- loosely for camshaft chain sprocket.

• It should just be possible to turn the sprocket on the camshaft without axial movement.

– Use adjustment pin - T40060- to lock camshaft (left-side).

• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.



– Fit camshaft sprocket (right-side) with camshaft timing chain.

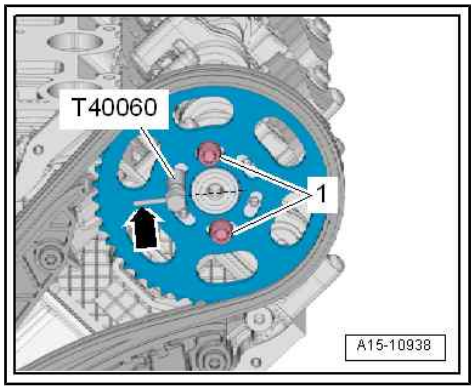
• The elongated holes in the camshaft chain sprocket must be aligned centrally over the threaded holes in the camshaft.

– First screw in two bolts -1- loosely for camshaft chain sprocket.

• It should just be possible to turn the sprocket on the camshaft without axial movement.

– Use adjustment pin - T40060- to lock camshaft (right-side).

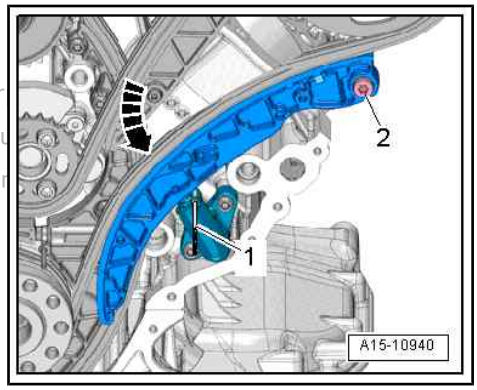
• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.



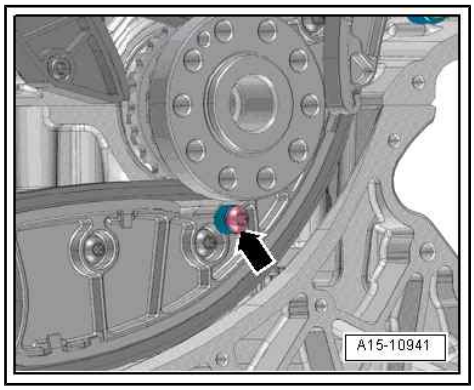
– Secure tensioning rail with guide pin -2-.

– Pull locking pin -T40316- -1- out of locating hole; this releases chain tensioner.

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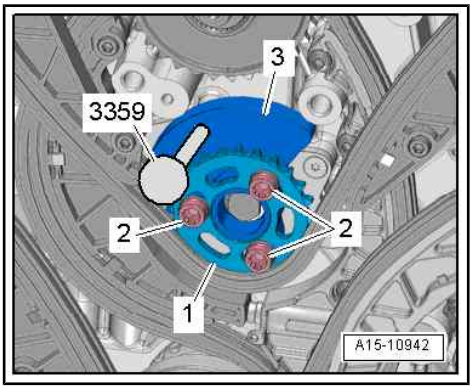


– Screw in bolt -arrow- for chain slip preventer.



– Loosen bolts -2-.

– Lock balance shaft -3- with diesel injection pump locking pin - 3359- , as shown in illustration.



Note

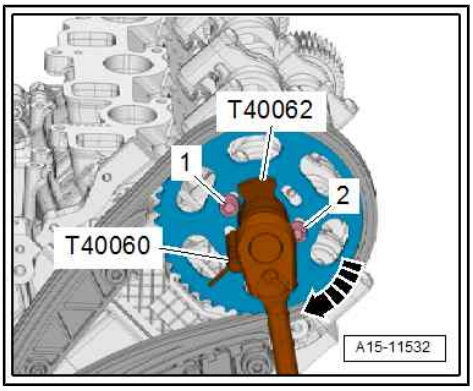
If necessary, remove bolts and bring balance shaft into position.

– Loosely screw in bolts -2-.

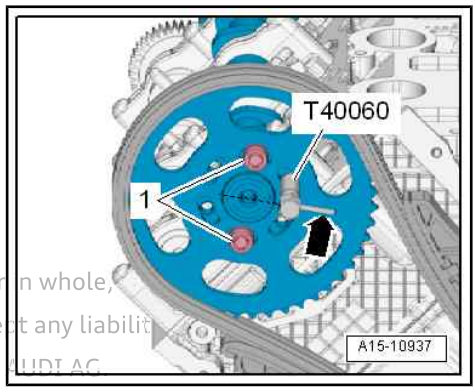
• It should just be possible to turn the sprocket -1- on the balance shaft without axial movement.

– With the help of a second mechanic, apply a torque of 20 Nm to camshaft chain sprocket (right-side) in clockwise direction -arrow- using a torque wrench and adapter - T40062- and maintain this torque.

– Tighten bolts -1- and -2- for camshaft chain sprocket (right-side).



– Tighten bolts -1- for camshaft chain sprocket (left-side); while doing so, second mechanic must keep maintaining torque.

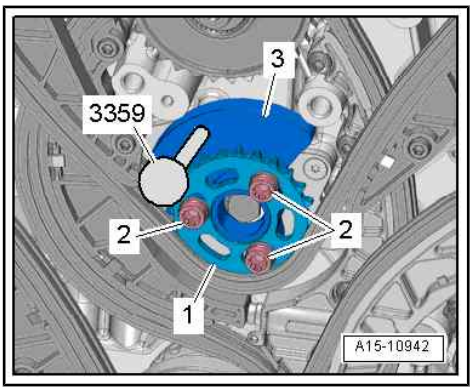


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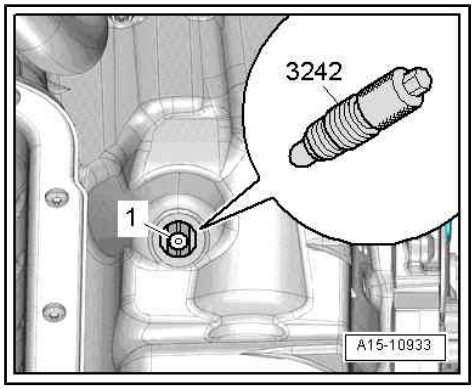
– Tighten bolts -2- at chain sprocket -1- for balance shaft -3-.

– Remove diesel injection pump locking pin - 3359- , adapter - T40062- and adjustment pins -T40060- .

– Tighten remaining bolts for camshaft chain sprockets (both sides).



– Remove locking pin - 3242- .

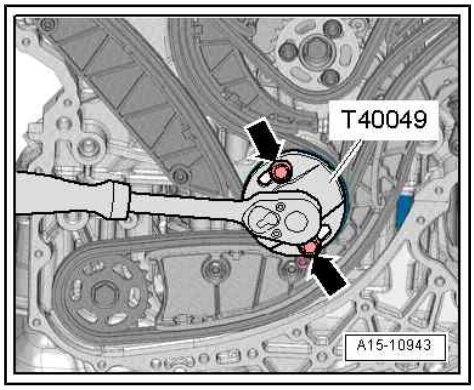


Checking valve timing

Caution

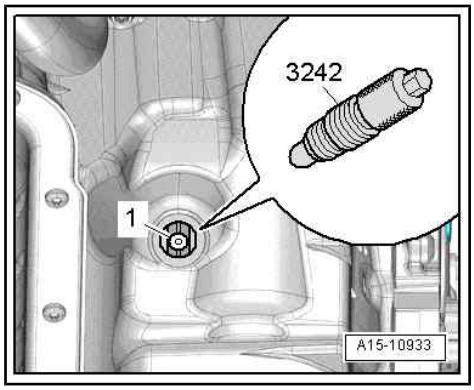
Irreparable damage can be caused if the camshaft timing chain slips.

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



– Turn crankshaft two rotations until it is again positioned just before “TDC”.

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



Caution

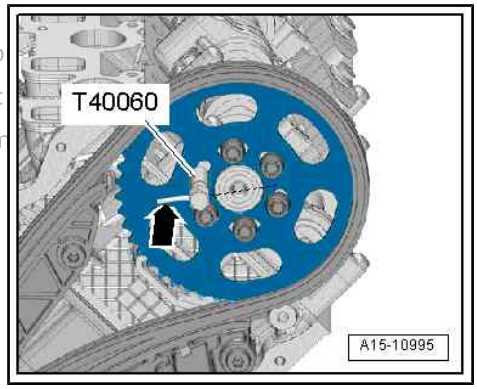
The crankshaft must be exactly in “TDC” position to ensure accurate valve timing adjustment.

- ***If crankshaft has been turned past “TDC” position, turn crankshaft two further rotations until it is again positioned just before “TDC”. Then turn further in the same direction and lock crankshaft with locking pin - 3242- .***

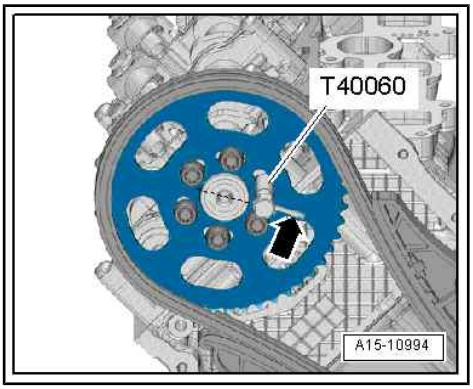
– Check that camshafts on both cylinder heads are positioned at “TDC”.

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- 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).

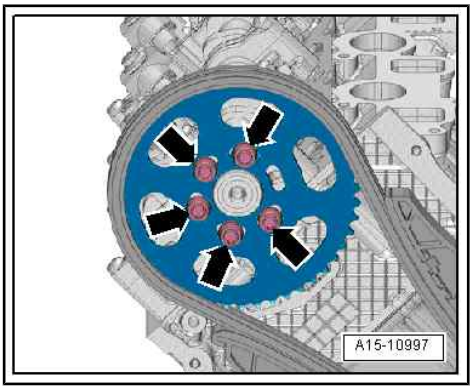


- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft on cylinder bank 2 (left-side).



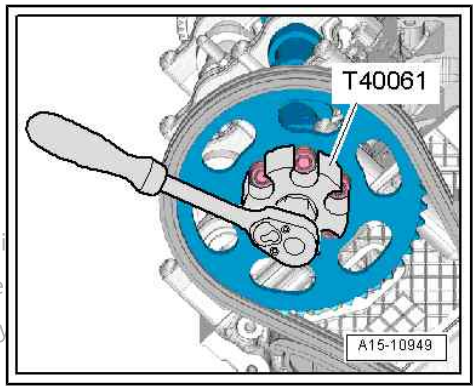
Adjusting valve timing

– If the pin cannot be inserted in one of the camshafts, loosen all bolts -arrows- of relevant camshaft chain sprocket approx. 1 turn.



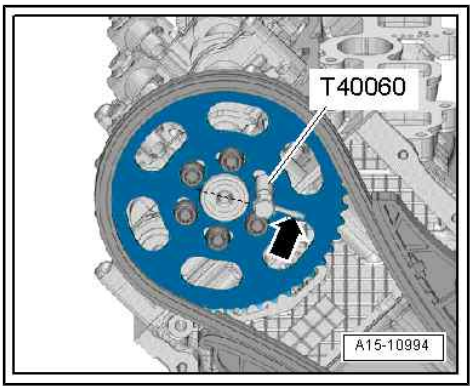
– Apply adapter - T40061- to the heads of the loosened bolts.

– Turn camshaft slightly backwards and forwards with adapter - T40061- until adjustment pin - T40060- can be inserted.



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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.



– 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 248 .

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

– Install timing chain cover (bottom) ⇒ page 225 .

Tightening torques

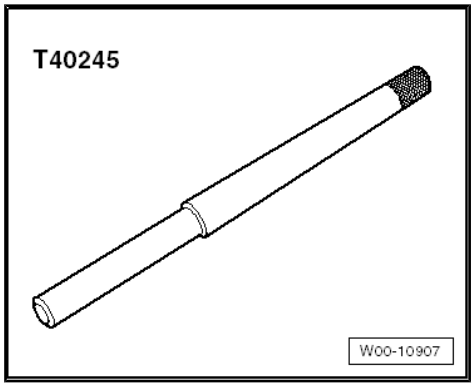
♦ ⇒ “2.1 Exploded view - camshaft timing chains”, page 229

♦ Plug for “TDC” marking ⇒ Item 17 (page 321)

2.5 Removing and installing drive chain for oil pump and high-pressure pump

Special tools and workshop equipment required

- Locking pin - T40245-



- Locking pin -T40316-

Removing

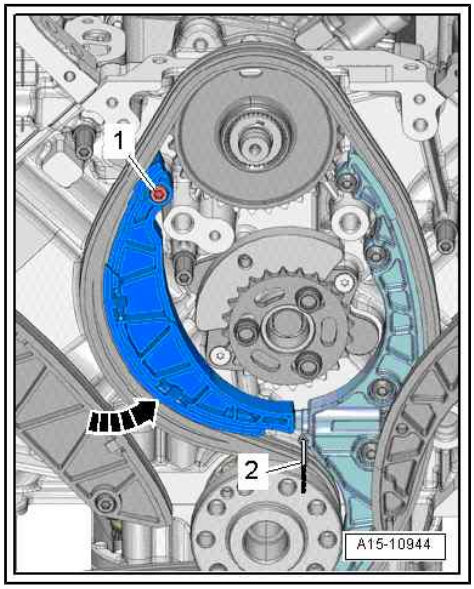
– Remove timing chain cover (bottom) ⇒ page 225 .

– Remove camshaft timing chain ⇒ page 240 .

– Remove both guide rails (top) for camshaft timing chain.

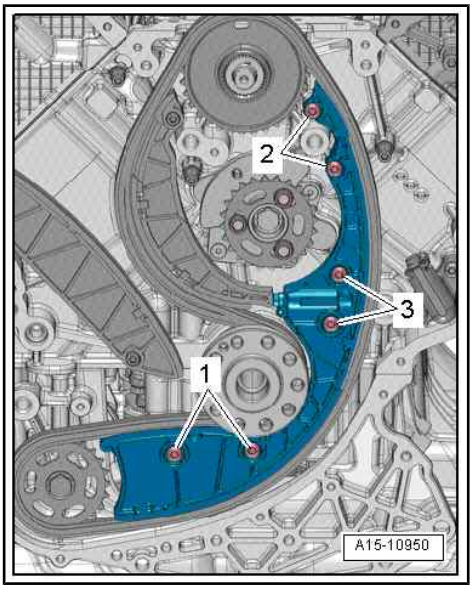
– Press tensioning rail of chain tensioner in direction of -arrow- and lock chain tensioner by inserting locking pin -T40316- -item 2-.

– Unscrew bolt -1- and remove tensioning rail.



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– Remove bolts -1, 2, 3- and take off chain tensioner for drive chain for oil pump and high-pressure pump.
– Detach drive chain for oil pump and high-pressure pump.

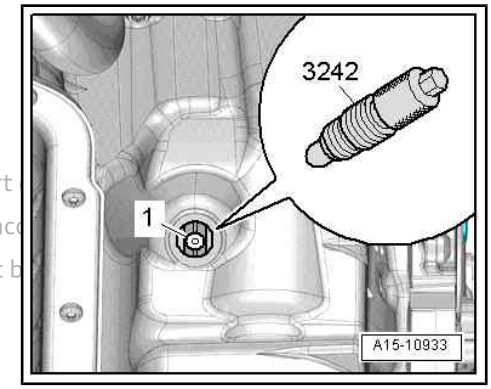


Installing

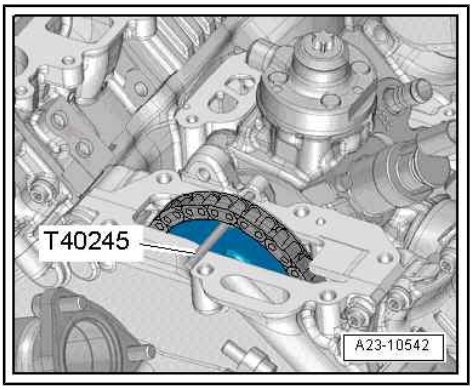
• Crankshaft -1- locked in “TDC” position with locking pin - 3242- .

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

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– Lock chain sprocket for high-pressure pump in position using locking pin - T40245- .



Note

The illustration shows the chain sprocket with the timing chain cover (bottom) installed.

– Install camshaft timing chain ⇒ page 240 .
– Remove locking pin - T40245- for chain sprocket for high-pressure pump.
– Install timing chain cover (bottom) ⇒ page 225 .

Tightening torques

◆ ⇒ “2.2 Exploded view - drive chain for oil pump and high-pressure pump”, page 231

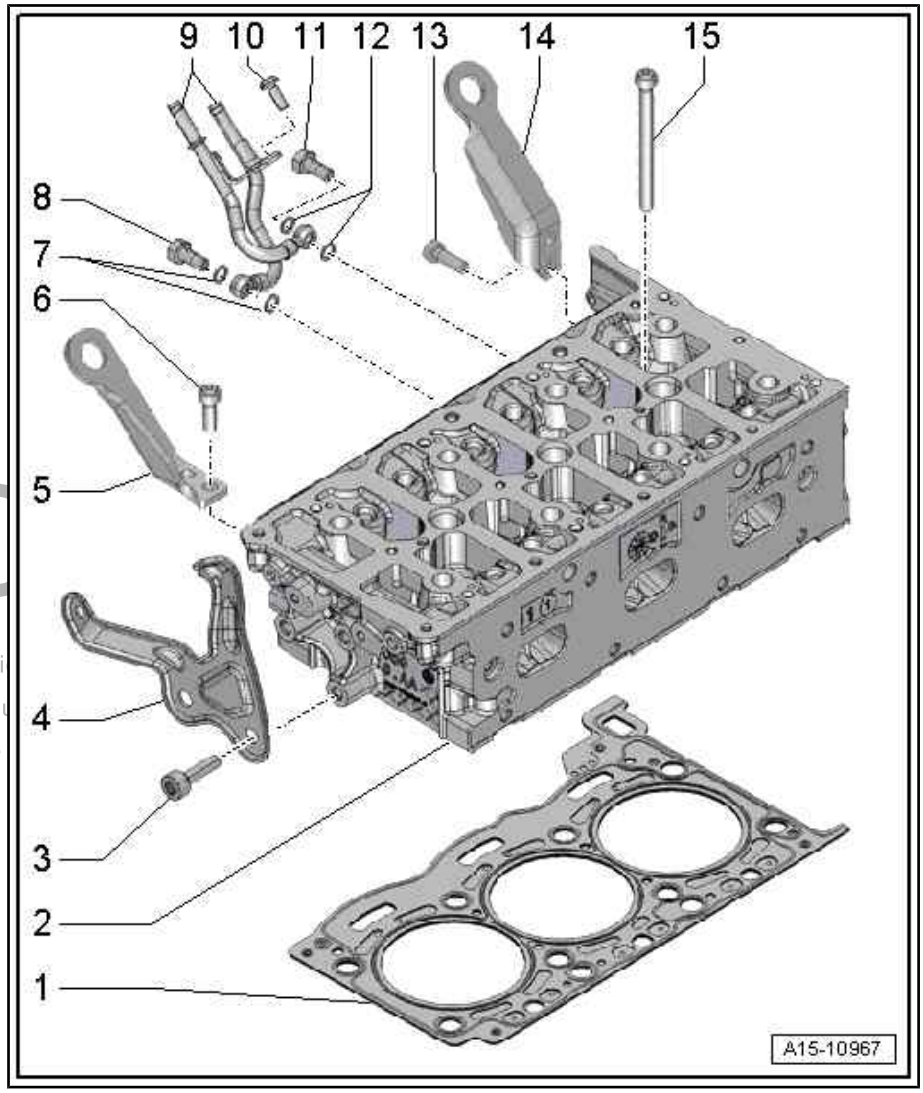
3 Cylinder head

⇒ “3.1 Exploded view - cylinder head”, page 252
⇒ “3.2 Exploded view - cylinder head cover”, page 255
⇒ “3.3 Removing and installing cylinder head”, page 257
⇒ “3.4 Removing and installing cylinder head cover”, page 267
⇒ “3.5 Removing and installing seals for injectors”, page 277
⇒ “3.6 Checking compression”, page 279

3.1 Exploded view - cylinder head

Note

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



1 - Cylinder head gasket

- ❑ Renewing:
- ♦ Vehicles with one turbocharger ⇒ page 257
- ♦ Vehicles with two turbochargers ⇒ page 259
- ❑ Identification ⇒ page 254
- ❑ Installation position: part number must face cylinder head
- ❑ If renewed, change coolant and engine oil

2 - Cylinder head

- ❑ To prevent damage to glow plugs, always place cylinder head on a soft foam surface after removal.
- ❑ Removing:
- ♦ Vehicles with one turbocharger ⇒ page 257
- ♦ Vehicles with two turbochargers ⇒ page 259
- ❑ Installing ⇒ page 264
- ❑ Checking for distortion ⇒ page 253
- ❑ Cylinder heads must not be reworked on TDI engines
- ❑ If renewed, change coolant and engine oil

3 - Bolt

- ❑ 23 Nm

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4 - Bracket

5 - Engine lifting eye

6 - Bolt

- ❑ 23 Nm

7 - Seals

- ❑ Renew

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8 - Banjo bolt

- ❑ Tightening torque ⇒ Item 13 (page 380)

9 - Coolant lines

10 - Bolt

- ❑ Tightening torque ⇒ Item 15 (page 381)

11 - Banjo bolt

- ❑ Tightening torque ⇒ Item 16 (page 381)

12 - Seals

- ❑ Renew

13 - Bolt

- ❑ 23 Nm

14 - Engine lifting eye

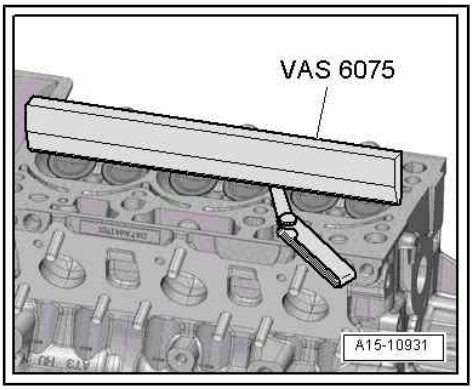
15 - Bolt

- ❑ Correct sequence when slackening ⇒ page 259
- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 254

Checking cylinder head for distortion

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

• Max. permissible distortion: 0.1 mm.



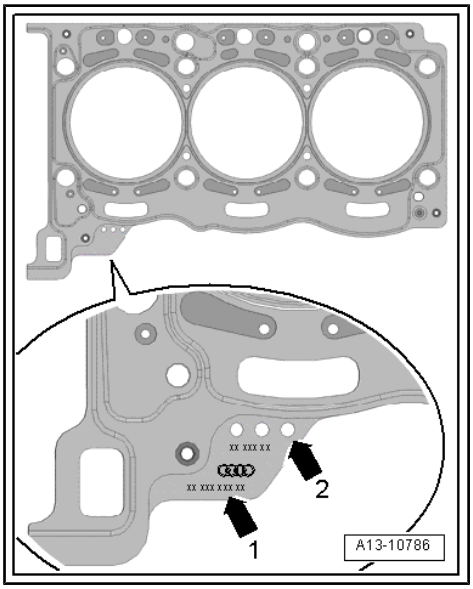
Note

Cylinder heads must not be reworked on TDI engines.

Identification of cylinder head gasket

1 - Part number

2 - Holes



Note

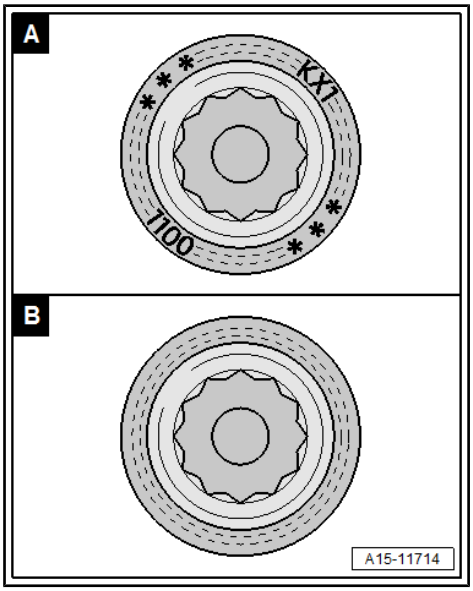
- *Cylinder head gaskets of different thicknesses are fitted depending on the amount of piston projection ⇒ page 210 . When renewing only the cylinder head gasket, the new gasket should have the same identification as the old one.*
- *The gaskets for the left and right cylinder heads have different shapes and cannot be interchanged.*

Cylinder head - tightening torque and sequence

Identification based on lettering on bolt head

A - Bolt head with lettering

B - Bolt head without lettering



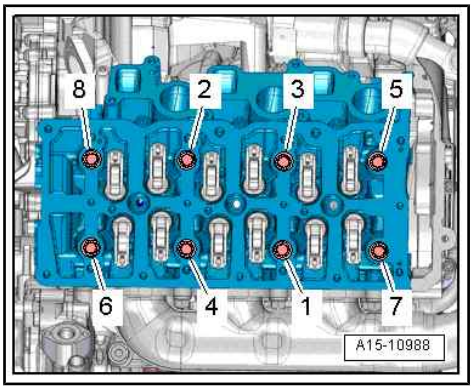
Note

Renew the bolts tightened with specified tightening angle.

Tightening torque/angle specification for bolts -A-:

– Tighten bolts in 6 stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1.	-1 … 8-	Screw in by hand until contact is made
2.	-1 … 8-	35 Nm
3.	-1 … 8-	50 Nm
4.	-1 … 8-	Turn 90° further
5.	-1 … 8-	Turn 90° further
6.	-1 … 8-	Turn 90° further

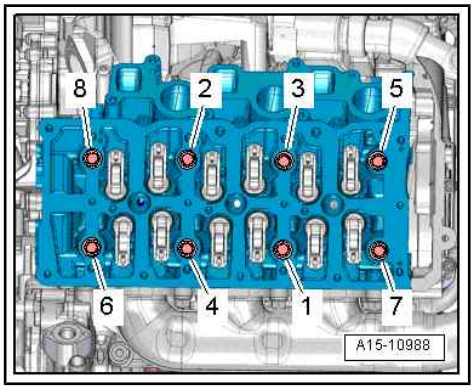


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Tightening torque/angle specification for bolts -B-:

– Tighten bolts in 5 stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1.	-1 … 8-	Screw in by hand until contact is made
2.	-1 … 8-	35 Nm
3.	-1 … 8-	60 Nm
4.	-1 … 8-	Turn 90° further
5.	-1 … 8-	Turn 90° further

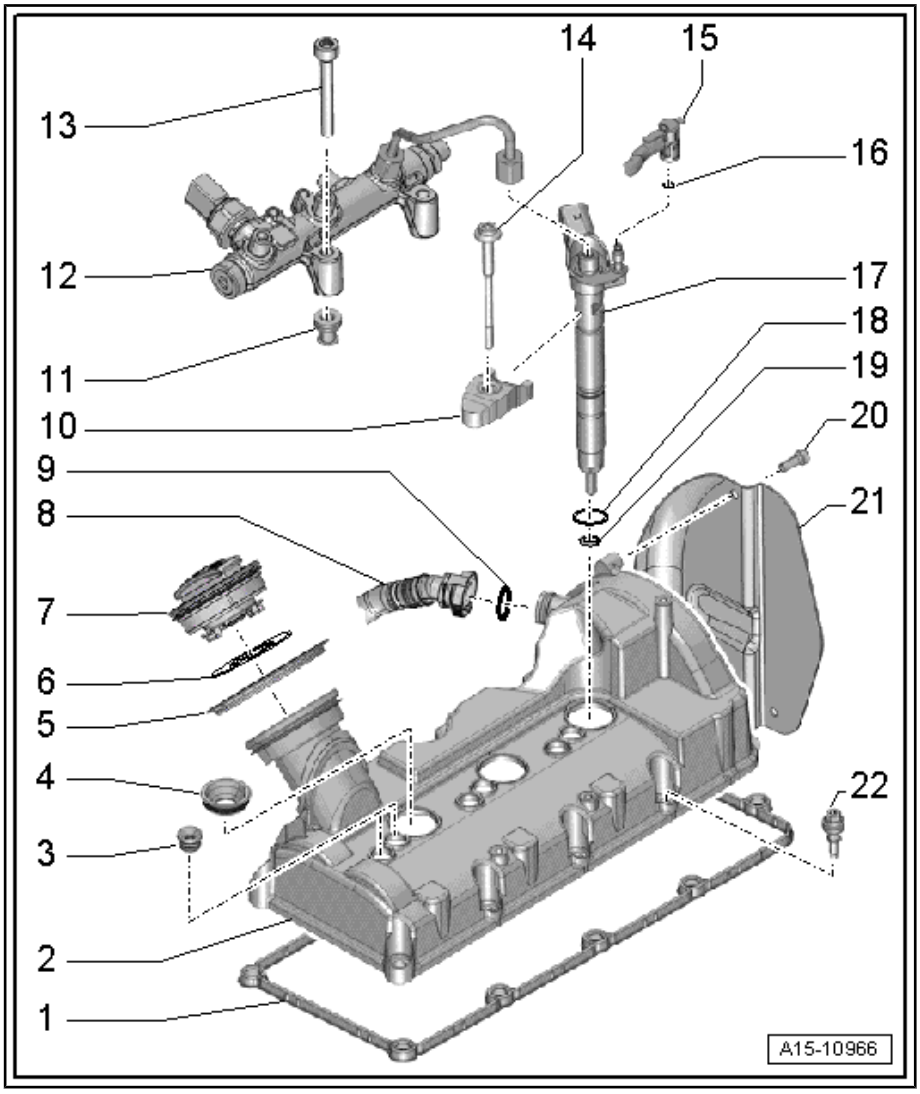


3.2 Exploded view - cylinder head cover

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Note

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



1 - Gasket

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

2 - Cylinder head cover

- ❑ Removing and installing ⇒ page 257

3 - Grommet

- ❑ Renew if damaged or leaking

4 - Seal

- ❑ For injector
- ❑ Renewing ⇒ page 277

5 - Grommet

6 - Seal

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

7 - Filler cap

8 - Hose

- ❑ For crankcase breather

9 - O-ring

10 - Clamping piece

- ❑ Removing and installing ⇒ “5.8 Removing and installing injectors”, page 533

11 - Sealing bush

- ❑ For fuel rail

12 - Fuel rail

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

- ❑ Installing high-pressure pipes ⇒ page 539

13 - Bolt

- ❑ Tightening torque ⇒ Item 17 (page 523)

14 - Bolt

- ❑ Tightening torque ⇒ Item 3 (page 522)

15 - Fuel return hose

- ❑ Observe rules for cleanliness ⇒ page 8

16 - O-ring

- ❑ Renew

17 - Injector

- ❑ Observe rules for cleanliness ⇒ page 8
- ❑ Removing and installing ⇒ page 533

18 - O-ring

- ❑ Renew

19 - Copper seal

- ❑ Renew

20 - Bolt

- ❑ 9 Nm

21 - Heat shield

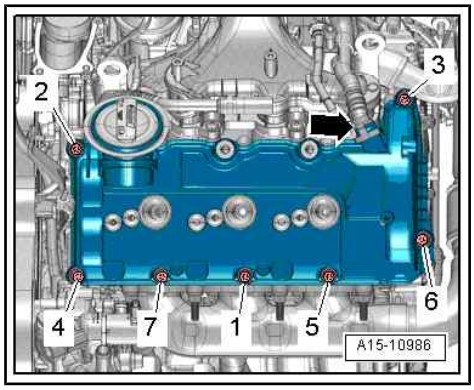
- ❑ Not installed on all versions

22 - Bolt

- ❑ With seal
- ❑ Renew
- ❑ Tightening torque and tightening sequence: left-side ⇒ page 256 ; right-side ⇒ page 257

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



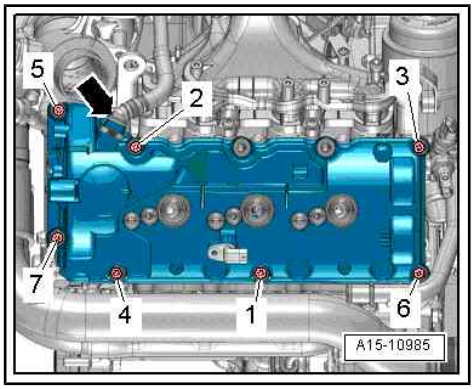
Note

Renew the bolts tightened with specified tightening angle.

– Tighten bolts in 3 stages in the sequence shown:

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

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



Note

Renew the bolts tightened with specified tightening angle.

– Tighten bolts in 3 stages in the sequence shown:

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

3.3 Removing and installing cylinder head

⇒ "3.3.1 Removing cylinder head - vehicles with one turbocharger", page 257

⇒ "3.3.2 Removing cylinder head - vehicles with two turbochargers", page 259

⇒ "3.3.3 Installing cylinder head, all engines", page 264

3.3.1 Removing cylinder head - vehicles with one turbocharger

Special tools and workshop equipment required

♦ Hose clip pliers - VAS 6362-



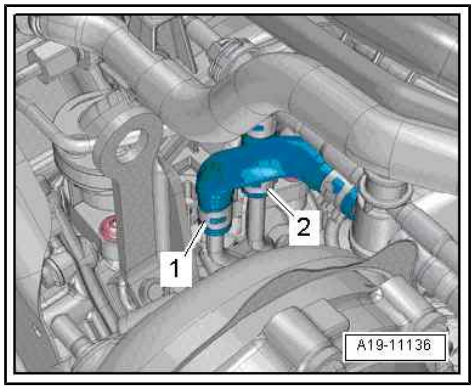
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Removing

– Drain coolant ⇒ page 359 .
– Remove turbocharger ⇒ page 420 .
– Remove intake manifold ⇒ page 513 .
– Remove corresponding camshafts ⇒ page 285 .

Cylinder head (left-side):

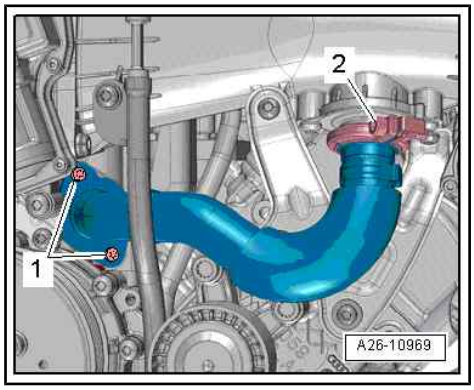
– Release hose clip -1- and detach coolant hose.



Note

Disregard -item 2-.

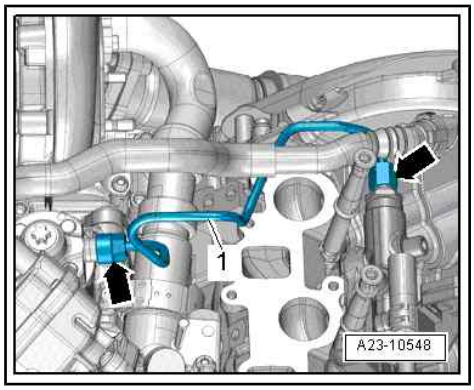
– Remove bolts -1- and detach exhaust gas recirculation pipe.



Note

Disregard -item 2-.

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



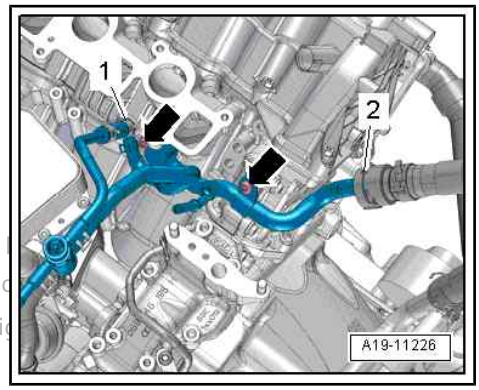
Note

Disregard -arrow- on right-side of illustration.

Cylinder head (right-side):

– Remove coolant pipe (front) ⇒ page 384 .

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

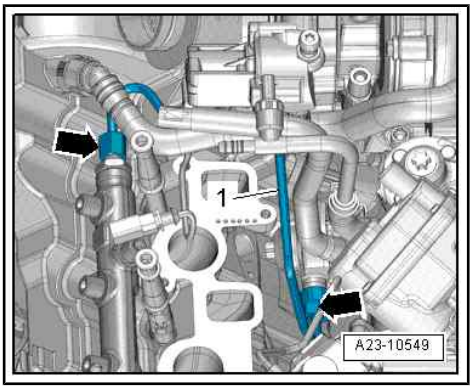


Note

Disregard -arrows-.

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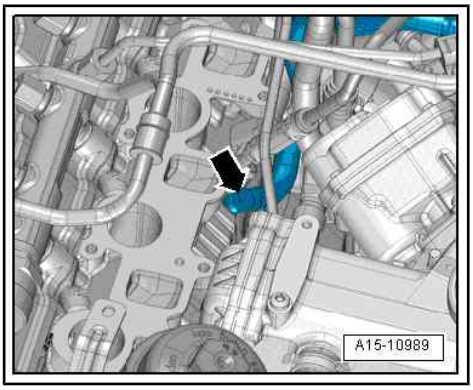
– Unscrew union nut -right arrow- and detach high-pressure pipe -1-.



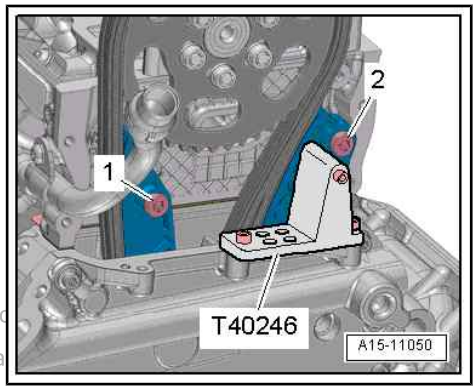
Note

Ignore -arrow on left side of illustration-.

– Remove banjo bolt -arrow-.



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



Note

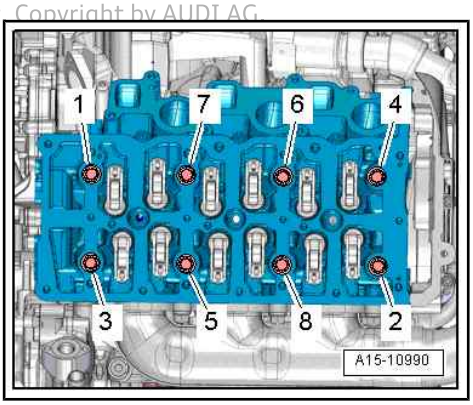
Ignore -T40246-.

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Both sides (continued):

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

– Remove bolts and carefully take off cylinder head.



Caution

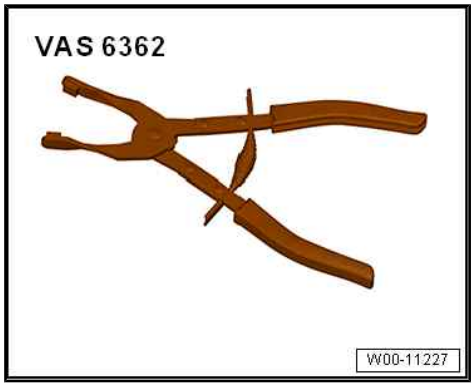
Risk of damage to glow plugs when putting down cylinder head.

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

3.3.2 Removing cylinder head - vehicles with two turbochargers

Special tools and workshop equipment required

♦ Hose clip pliers - VAS 6362-



Removing

– Drain coolant ⇒ page 359 .

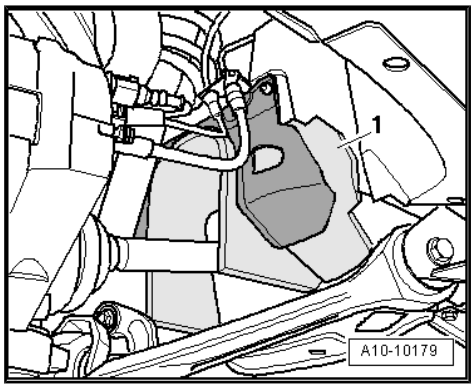
– Remove intake manifold ⇒ page 513 .

– Remove corresponding camshafts ⇒ page 285 .

Cylinder head (left-side):

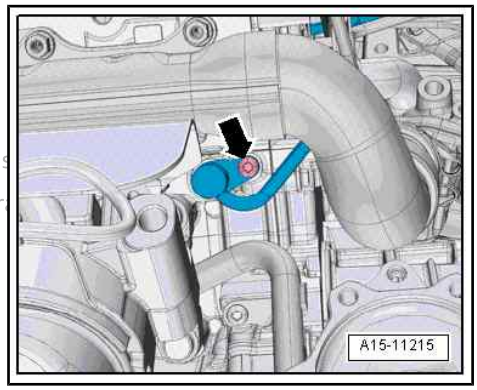
– Remove front wheel (left-side) ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres .

– Remove cover (left-side) -1- for drive shaft in wheel housing.

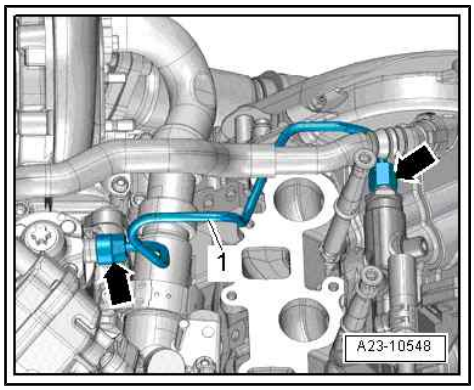


– Remove bolt -arrow-.

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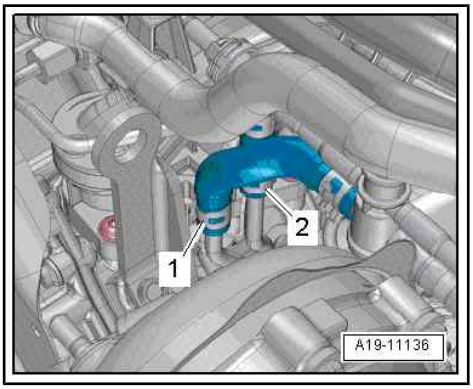
– Unscrew union nut -left arrow- and detach high-pressure pipe -1-.



Note

Disregard -arrow- on right-side of illustration.

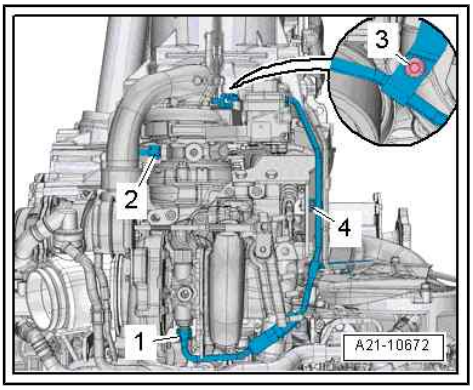
– Release hose clip -1- and detach coolant hose.



Note

Disregard -item 2-.

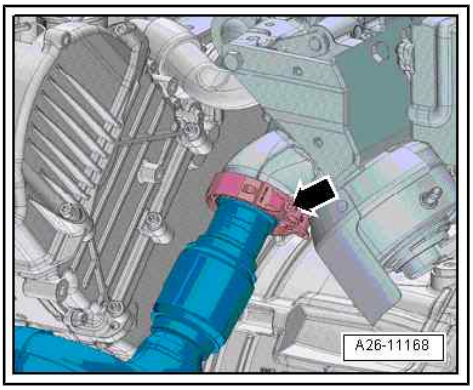
– Remove bolts -3, 4- and union nut -2-.
– Disconnect coolant line from cylinder block and push slightly towards front.



Note

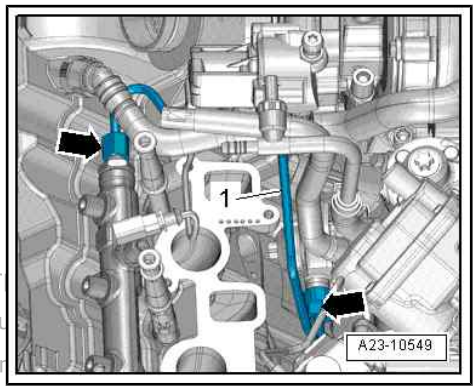
Disregard -item 1-.

– Open clip -arrow- and detach.



Cylinder head (right-side):

– Remove coolant pipe (front) ⇒ page 384 .
– Remove coolant pipe (top) ⇒ page 382 .
– Unscrew union nut -right arrow- and detach high-pressure pipe -1-.

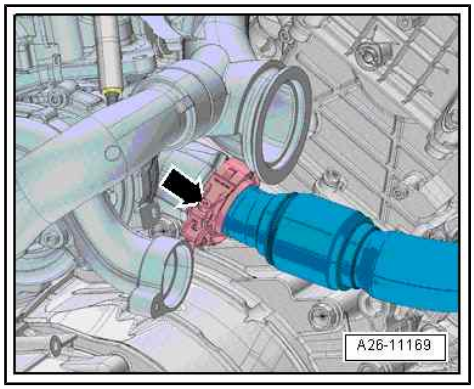


Note

Ignore -arrow on left side of illustration-.

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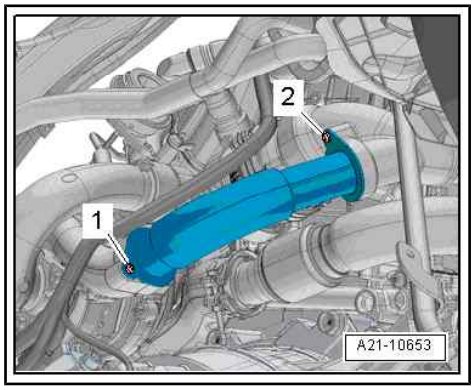
– Open clip -arrow- and detach.



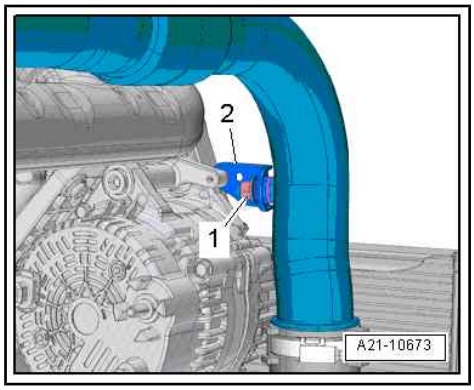
– Unscrew bolt -2- and detach intermediate pipe from air pipe (right-side).

Note

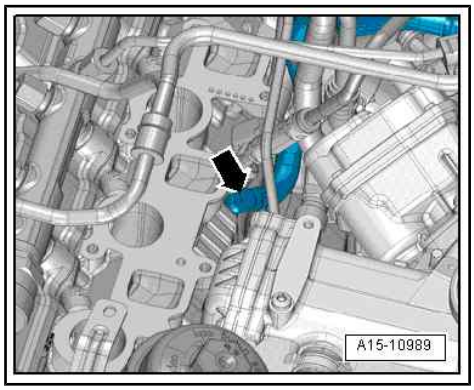
Disregard -item 1-.



– Remove nut -1- and detach bracket -2- for air pipe (right-side).
– Detach air pipe (right-side) towards rear.

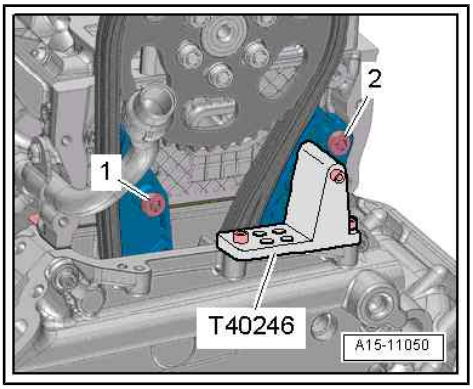


– Remove banjo bolt -arrow-.



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



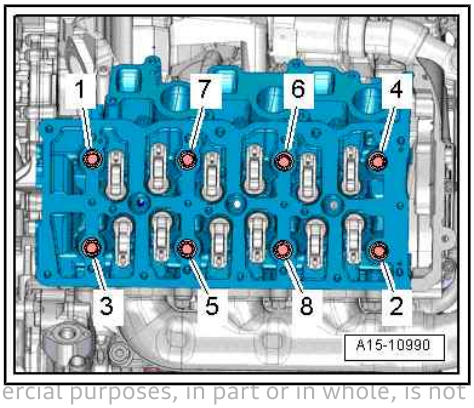
Note

Ignore -T40246- .

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.***

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3.3.3 Installing cylinder head, all engines

Procedure

Caution

Risk of damage to sealing surfaces.

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

Risk of damage to cylinder block.

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

Risk of leaks at cylinder head gasket.

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

Risk of damage to open valves.

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

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

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

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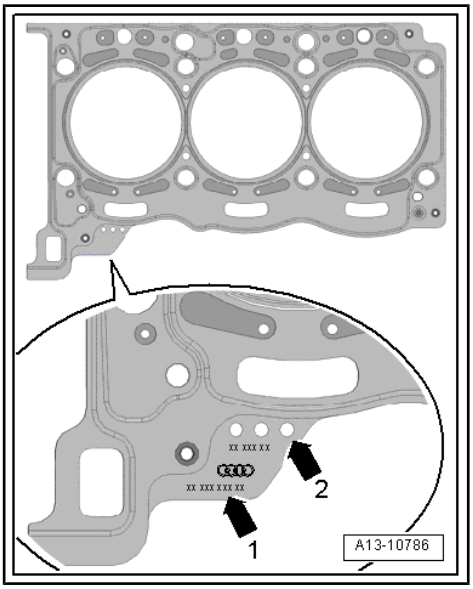
Note

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

– Note cylinder head gasket identification:

1 - Part number

2 - Holes



Note

- *If the cylinder head gasket or cylinder head have been replaced, select the new cylinder head gasket according to the number of holes on the old gasket.*
- *If parts of the crankshaft drive have been renewed, the new cylinder head gasket must be selected by measuring the piston projection at "TDC" ⇒ page 210 .*
- *The gaskets for the left and right cylinder heads have different shapes and cannot be interchanged.*

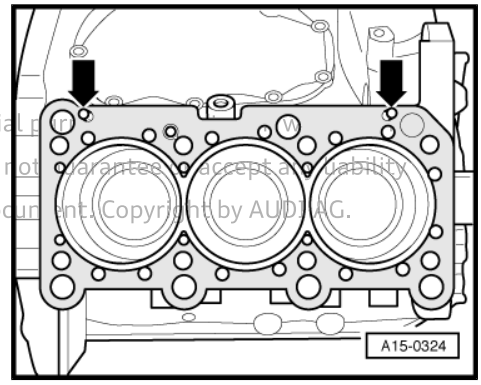
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– Place cylinder head gasket in position.

• Pay attention to dowel sleeves -arrows- in cylinder block.

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



– Fit cylinder head.

– Tighten cylinder head bolts ⇒ page 254 .

Note

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

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

– Install coolant pipe (top) ⇒ page 382 .

– Install coolant pipe (front) ⇒ page 384 .

– Install high-pressure pipes ⇒ page 539 .

– Install camshafts:

◆ ⇒ “4.4.1 Removing camshafts and re-installing used camshafts - cylinder bank 1 (right-side)”, page 285

◆ ⇒ “4.4.3 Removing camshafts and re-installing used camshafts - cylinder bank 2 (left-side)”, page 298

– Install intake manifold ⇒ page 513 .

– Install turbocharger ⇒ page 420 .

– Change engine oil ⇒ Maintenance ; Booklet 411 .

– Connect coolant hose with plug-in connector ⇒ page 394 .

– Fill cooling system with fresh coolant ⇒ page 361 .

Tightening torques

◆ ⇒ “3.1 Exploded view - cylinder head”, page 252

◆ Cylinder head - tightening torque and sequence ⇒ page 254

◆ ⇒ “1.1.2 Exploded view - turbochargers, vehicles with two turbochargers”, page 414

◆ ⇒ “2.1.2 Exploded view - charge air system, vehicles with two turbochargers”, page 465

◆ ⇒ “2.2 Exploded view - hose connections for charge air system”, page 466

◆ ⇒ “5.1 Exploded view - exhaust gas recirculation system”, page 657

◆ ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres

3.4 Removing and installing cylinder head cover

⇒ "3.4.1 Removing and installing cylinder head cover (left-side) - vehicles with one turbocharger", page 267

⇒ "3.4.2 Removing and installing cylinder head cover (right-side) - vehicles with one turbocharger", page 269

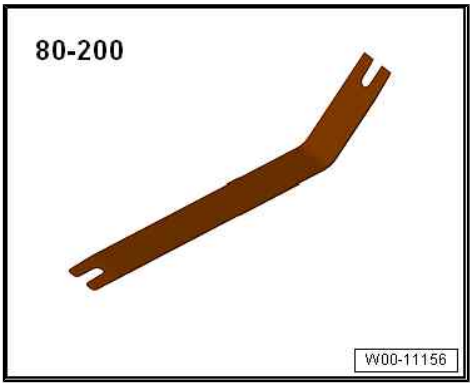
⇒ "3.4.3 Removing and installing cylinder head cover (left-side) - vehicles with two turbochargers", page 272

⇒ "3.4.4 Removing and installing cylinder head cover (right-side) - vehicles with two turbochargers", page 275

3.4.1 Removing and installing cylinder head cover (left-side) - vehicles with one turbocharger

Special tools and workshop equipment required

- Removal lever - 80 - 200-



- Sealant ⇒ Electronic parts catalogue

Removing

– Remove engine cover panel ⇒ page 172 .

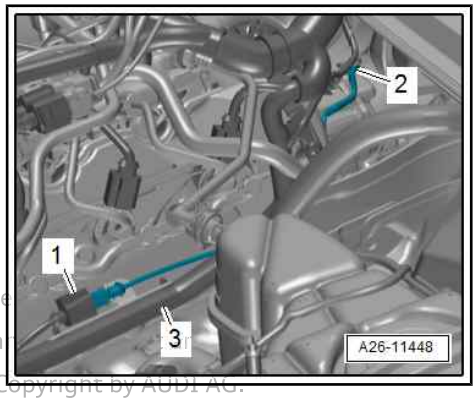
– Remove injectors (left-side) ⇒ page 533 .

– Remove fuel rail (left-side) ⇒ page 541 .

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

– Remove intake manifold flap motor - V157- ⇒ page 518 .

– If fitted, detach electrical connector -1- for exhaust gas temperature sender 3 - G495- -item 2- from bracket and unplug connector.

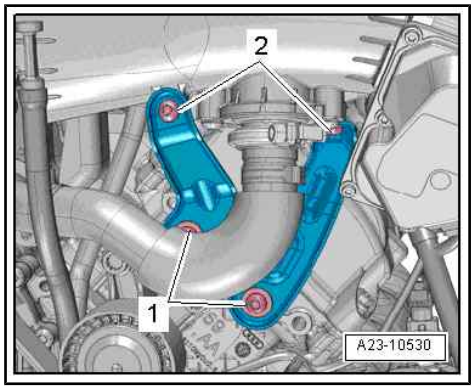


Note

Disregard -item 3-.

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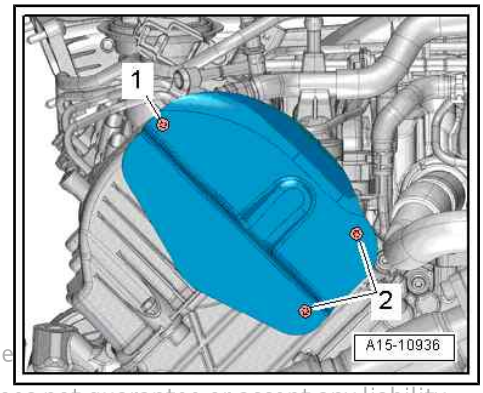
– Remove bolts -1- and detach bracket for intake manifold.



Note

Disregard -item 2-.

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



Note

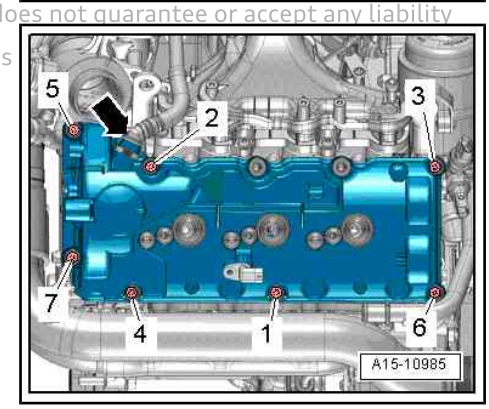
Disregard -item 2-.

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

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Caution

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



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

Installing

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

Note

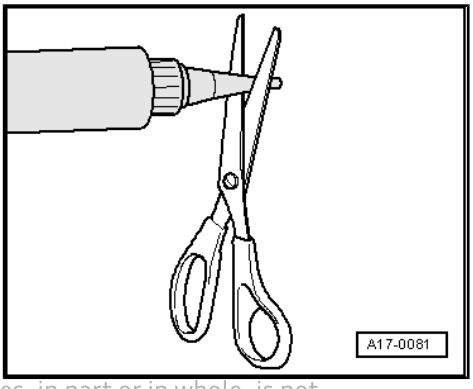
- *Renew the bolts tightened with specified tightening angle.*
- *Renew gasket for cylinder head cover if damaged.*
- *Renew crankcase breather hose if it was damaged irreparably during removal.*

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

Note

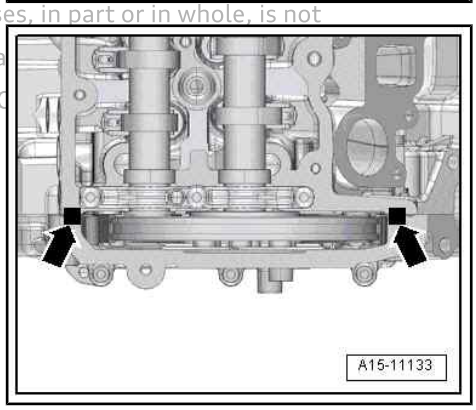
Note the use-by date of the sealant.

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



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



• Width of sealant beads: approx. 2 mm.

– Tighten cylinder head cover bolts ⇒ page 256 .

– Install intake manifold flap motor - V157- ⇒ page 518 .

– Install injectors ⇒ page 533 .

– Check fuel system for leaks ⇒ page 505 .

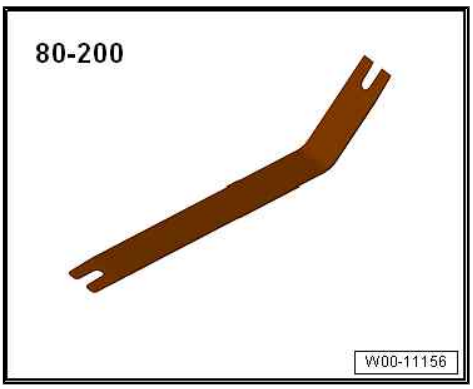
Tightening torques

♦ ⇒ Fig. ""Cylinder head cover (left-side) - tightening torque and sequence"" , page 256

3.4.2 Removing and installing cylinder head cover (right-side) - vehicles with one turbocharger

Special tools and workshop equipment required

♦ Removal lever - 80 - 200-



♦ Sealant ⇒ Electronic parts catalogue

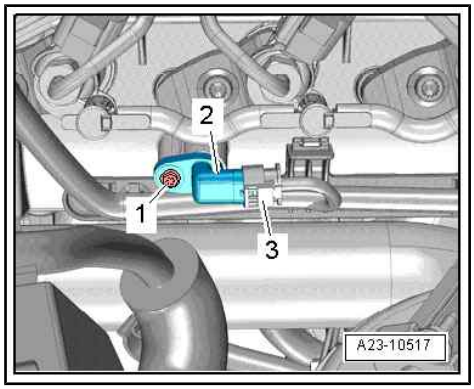
Removing

– Remove engine cover panel ⇒ page 172 .

– Remove injectors (right-side) ⇒ page 533 .

– Remove fuel rail (right-side) ⇒ page 541 .

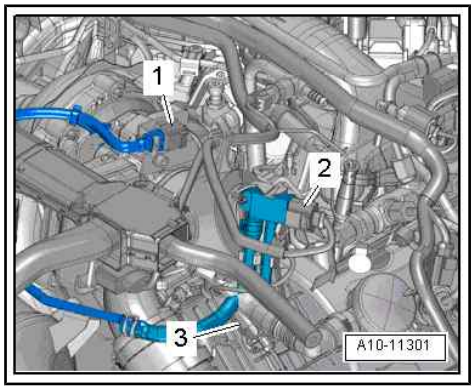
– Unplug electrical connector -3- at Hall sender - G40- -item 2- and move clear wiring harness at cylinder head cover using removal lever - 80 - 200- .



Note

Disregard -item 1-.

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



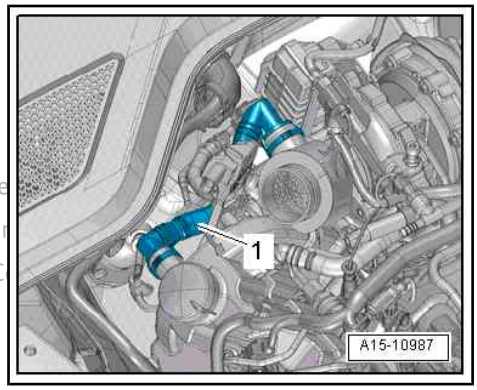
Note

Disregard -item 1-.

Caution

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

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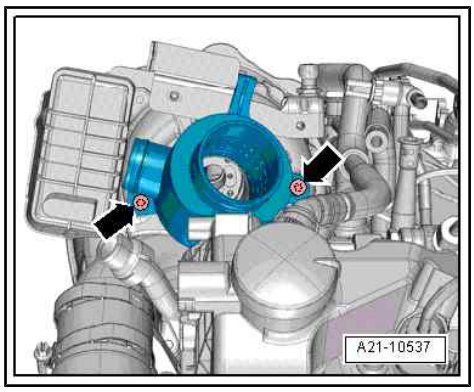


– Press release tabs and remove crankcase breather hose -1-.

Note

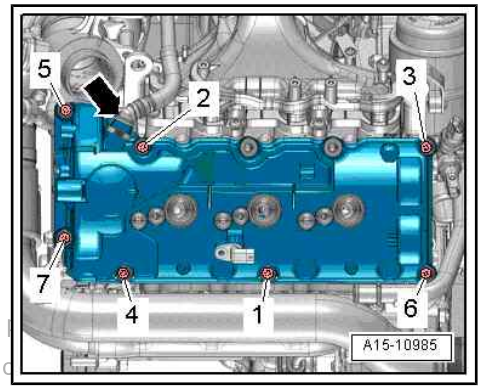
If the crankcase breather hose cannot be detached from the cylinder head cover without being damaged irreparably, detach it from the connection for the turbocharger only.

– Unscrew bolts -arrows- and detach connection from turbocharger.



Caution

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



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

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

– Remove bolts and take off cylinder head cover.

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Installing

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

Note

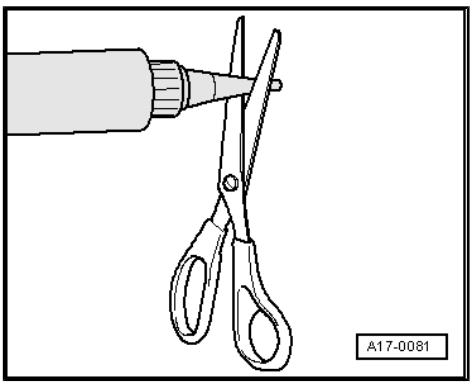
- *Renew the bolts tightened with specified tightening angle.*
- *Fit new O-rings.*
- *Renew gasket for cylinder head cover if damaged.*
- *Renew crankcase breather hose if it was damaged irreparably during removal.*

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

Note

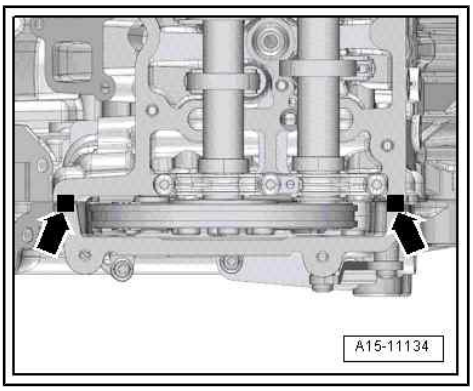
Note the use-by date of the sealant.

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



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

• Width of sealant beads: approx. 2 mm.



– Tighten cylinder head cover bolts ⇒ page 256 .

– Install injectors ⇒ page 533 .

– Install fuel rail (right-side) ⇒ page 541 .

– Check fuel system for leaks ⇒ page 505 .

Tightening torques

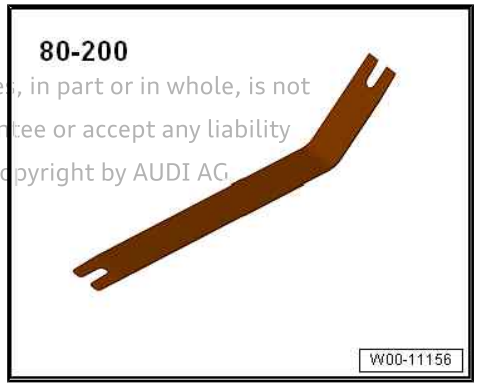
- ⇒ Fig. ""Cylinder head cover (right-side) - tightening torque and sequence"" , page 257
- ⇒ "1.1.1 Exploded view - turbocharger, vehicles with one turbocharger", page 412

3.4.3 Removing and installing cylinder head cover (left-side) - vehicles with two turbochargers

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Special tools and workshop equipment required

- Removal lever - 80 - 200-



- Sealant ⇒ Electronic parts catalogue

Removing

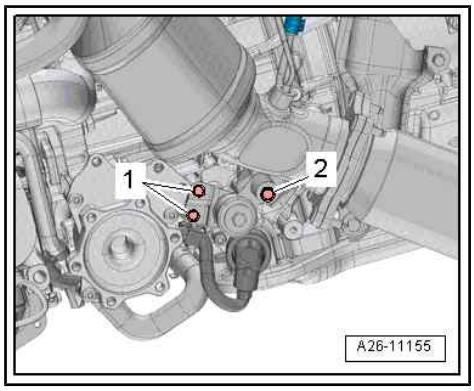
– Remove injectors (left-side) ⇒ page 533 .

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

– Remove intake manifold flap motor - V157- ⇒ page 518 .

– Remove front exhaust pipe ⇒ page 599 .

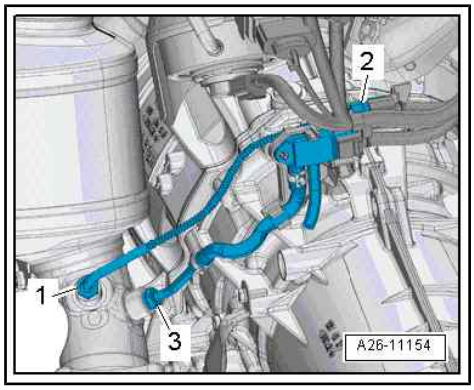
– Remove bolts -1-.



Note

Disregard -item 2-.

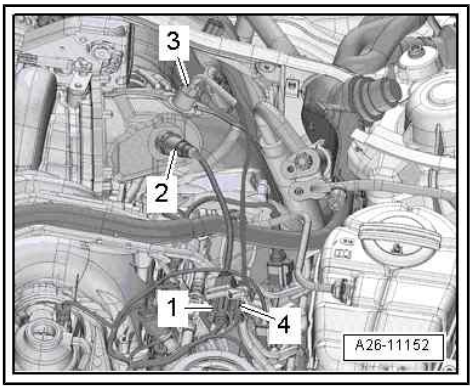
– Remove exhaust gas temperature sender 3 - G495- -item 1- and pressure pipe -3- for pressure differential sender - G505- .



Note

Disregard -item 2-.

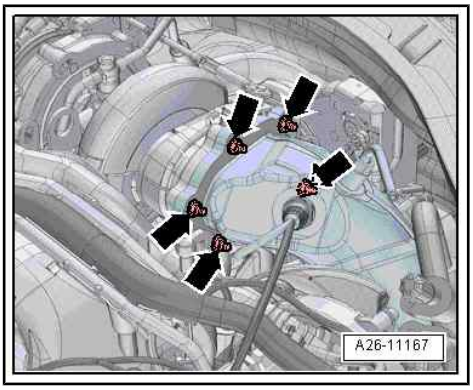
– Detach electrical connector -1- and, if fitted, -4- from bracket and unplug connectors.
– If fitted, unscrew and detach exhaust gas temperature sender 2 - G448- -item 3-.



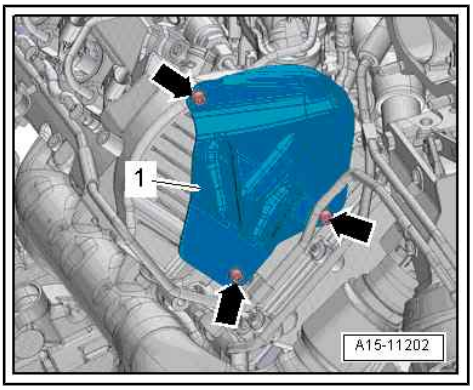
Note

Disregard -item 2-.

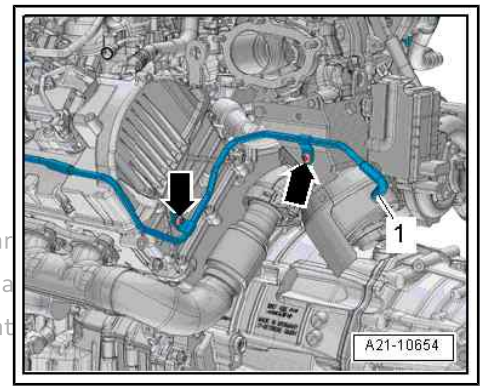
– Unscrew nuts -arrows- and press catalytic converter towards rear.



– Remove bolts -arrows- and detach heat shield -1-.



– Remove bolts -arrows- and push vacuum line to the side.

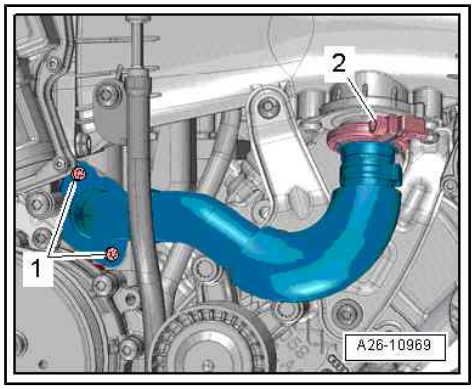


Note

Disregard -item 1-.

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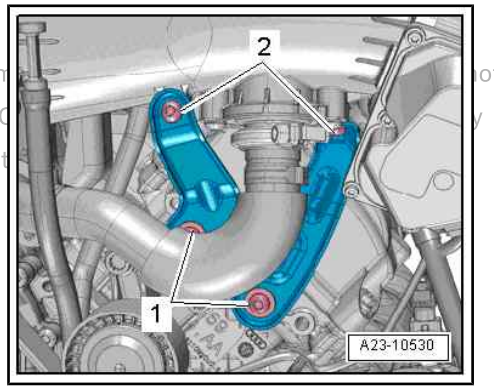
– Remove bolts -1- and detach exhaust gas recirculation pipe.



Note

Disregard -item 2-.

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



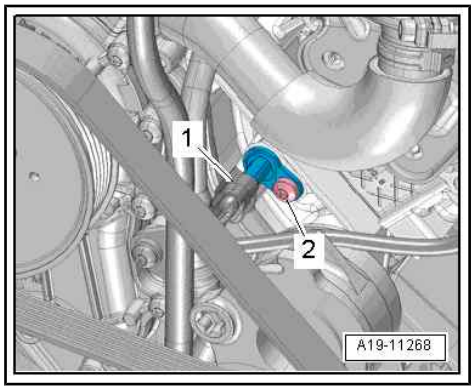
Note

Disregard -item 2-.

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

– Unplug electrical connector -1-.

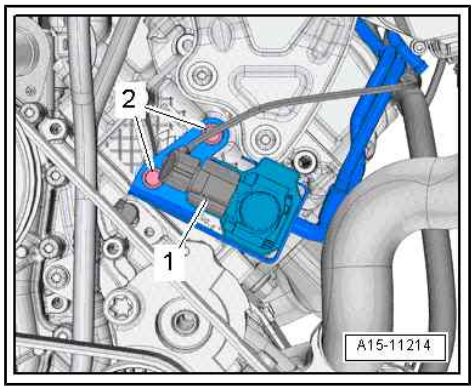


Note

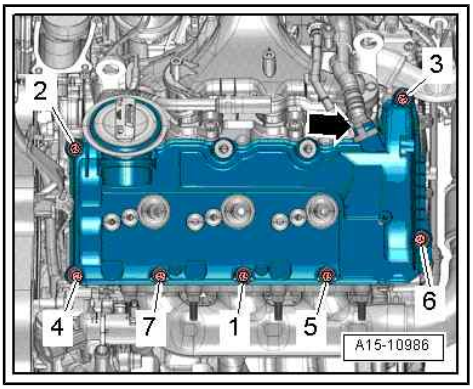
Disregard -item 2-.

– Unplug electrical connector -1- and move wiring harness clear.

– Remove bolts -2- and move turbine changeover valve - N529- clear to one side.



– Press release tabs and disconnect crankcase breather hose -arrow-.
– Loosen bolts in the sequence -7 ... 1-.
– Remove bolts and take off cylinder head cover.



Installing

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

Note

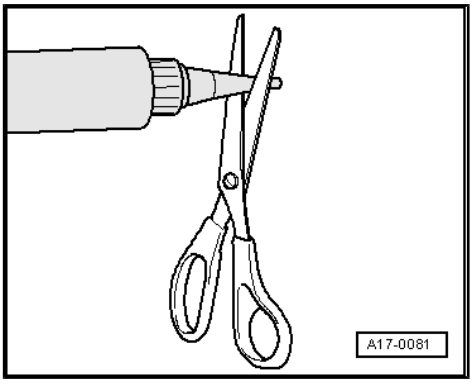
- *Renew the bolts tightened with specified tightening angle.*
- *Renew gasket for cylinder head cover if damaged.*

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

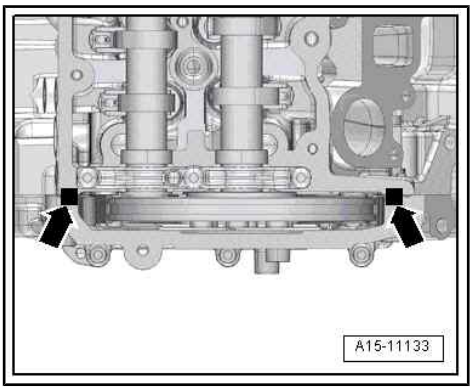
Note

Note the use-by date of the sealant.

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



– Apply sealant bead -arrows- at each joint between cylinder head and timing chain cover (top).
- Width of sealant beads: approx. 2 mm.
– Tighten cylinder head cover bolts ⇒ page 256 .
– Install intake manifold flap motor - V157- ⇒ page 518 .
– Install injectors ⇒ page 533 .
– Check fuel system for leaks ⇒ page 505 .



Tightening torques

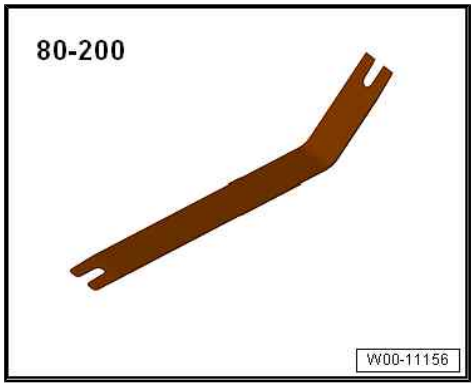
- ⇒ Fig. ""Cylinder head cover (left-side) - tightening torque and sequence"" , page 256

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3.4.4 Removing and installing cylinder head cover (right-side) - vehicles with two turbochargers

Special tools and workshop equipment required

♦ Removal lever - 80 - 200-



♦ Sealant ⇒ Electronic parts catalogue

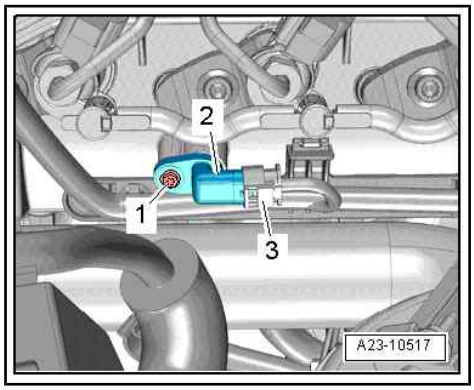
Removing

– Remove engine cover panel ⇒ page 172 .

– Remove injectors (right-side) ⇒ page 533 .

– Remove fuel rail (right-side) ⇒ page 541 .

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



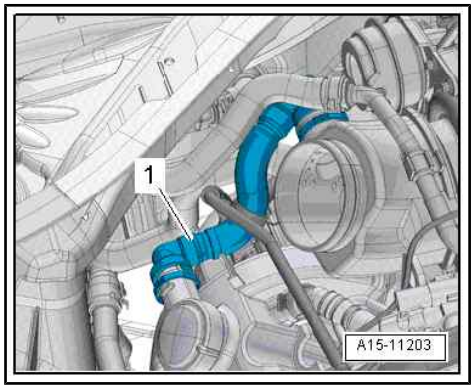
Note

Disregard -item 1-.

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

Caution

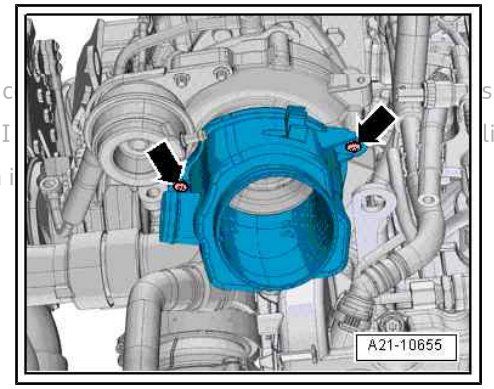
Depending on the vehicle version and country version, a crankcase breather hose may be fitted which cannot be detached from the cylinder head cover without being damaged irreparably. For these versions, only detach the crankcase breather hose at the connection piece for the air intake hose.



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

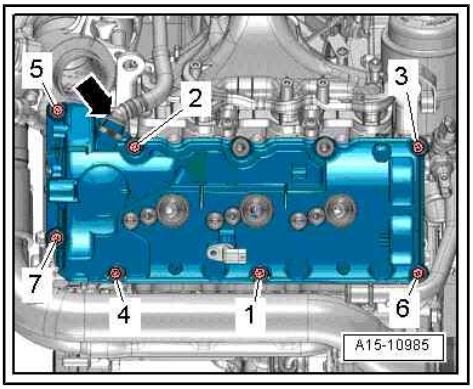
– Move vacuum lines clear.

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



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– Press release tabs and disconnect crankcase breather hose -arrow-.
– Loosen bolts in the sequence -7 ... 1-.
– Remove bolts and take off cylinder head cover.



Installing

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

Note

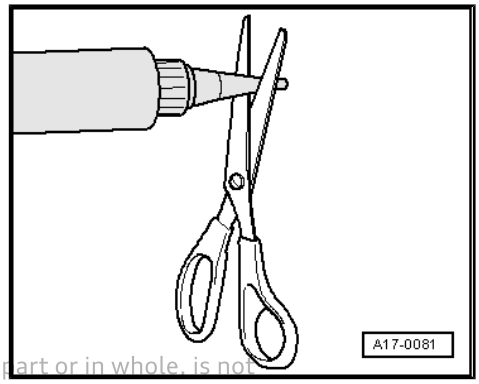
- *Renew the bolts tightened with specified tightening angle.*
- *Fit new O-rings.*
- *Renew gasket for cylinder head cover if damaged.*

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

Note

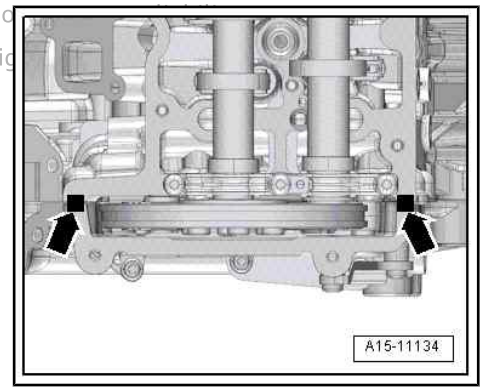
Note the use-by date of the sealant.

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



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



- Width of sealant beads: approx. 2 mm.

– Tighten cylinder head cover bolts ⇒ page 256 .
– Install injectors ⇒ page 533 .
– Install fuel rail (right-side) ⇒ page 541 .
– Check fuel system for leaks ⇒ page 505 .

Tightening torques

- ⇒ Fig. ""Cylinder head cover (right-side) - tightening torque and sequence"" , page 257
- ⇒ "1.1.1 Exploded view - turbocharger, vehicles with one turbocharger", page 412

3.5 Removing and installing seals for injectors

Special tools and workshop equipment required

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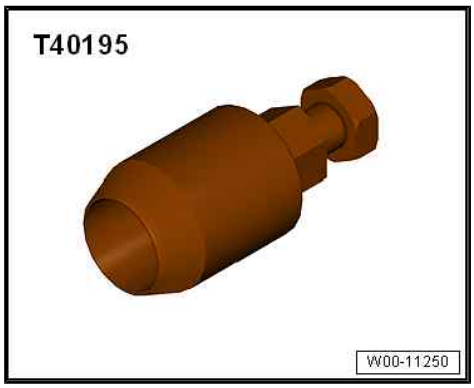
♦ Tool set for FSI engines - T10133 C-



♦ Socket, 24 mm - T10361 A-



♦ Oil seal extractor - T40195-

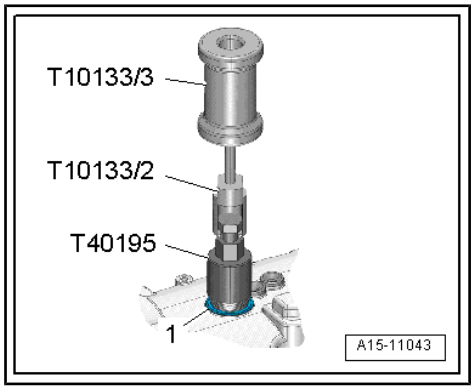


Procedure

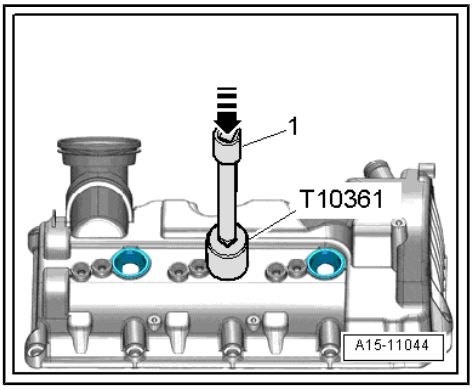
– Remove corresponding injector ⇒ page 533 .

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

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



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



3.6 Checking compression

Special tools and workshop equipment required

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



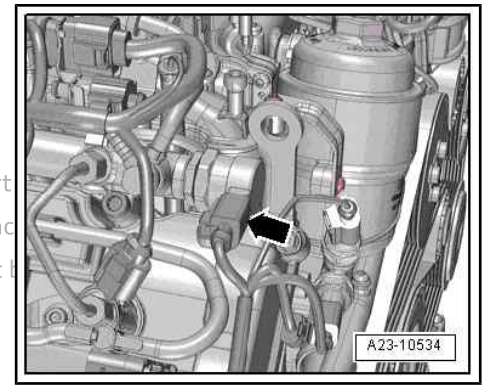
Procedure

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

– Remove engine cover panel ⇒ page 172 .

– Unplug electrical connectors on all glow plugs.

– Unplug electrical connector -arrow- at fuel pressure regulating valve - N276- on fuel rail (cylinder bank 1, right-side).

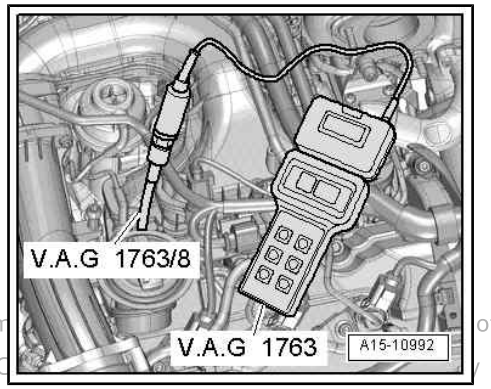


– Briefly start engine to relieve fuel pressure in fuel rail.

– Remove all glow plugs ⇒ page 674 .

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– 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.

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Compression pressure	Vehicles with 1 turbo-charger	Vehicles with 2 turbo-chargers
	bar	
When new	28 … 33	26 … 31
Wear limit	21	20
Maximum difference between cylinders	5	5

Attaching

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

– Install glow plugs ⇒ page 674 .

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

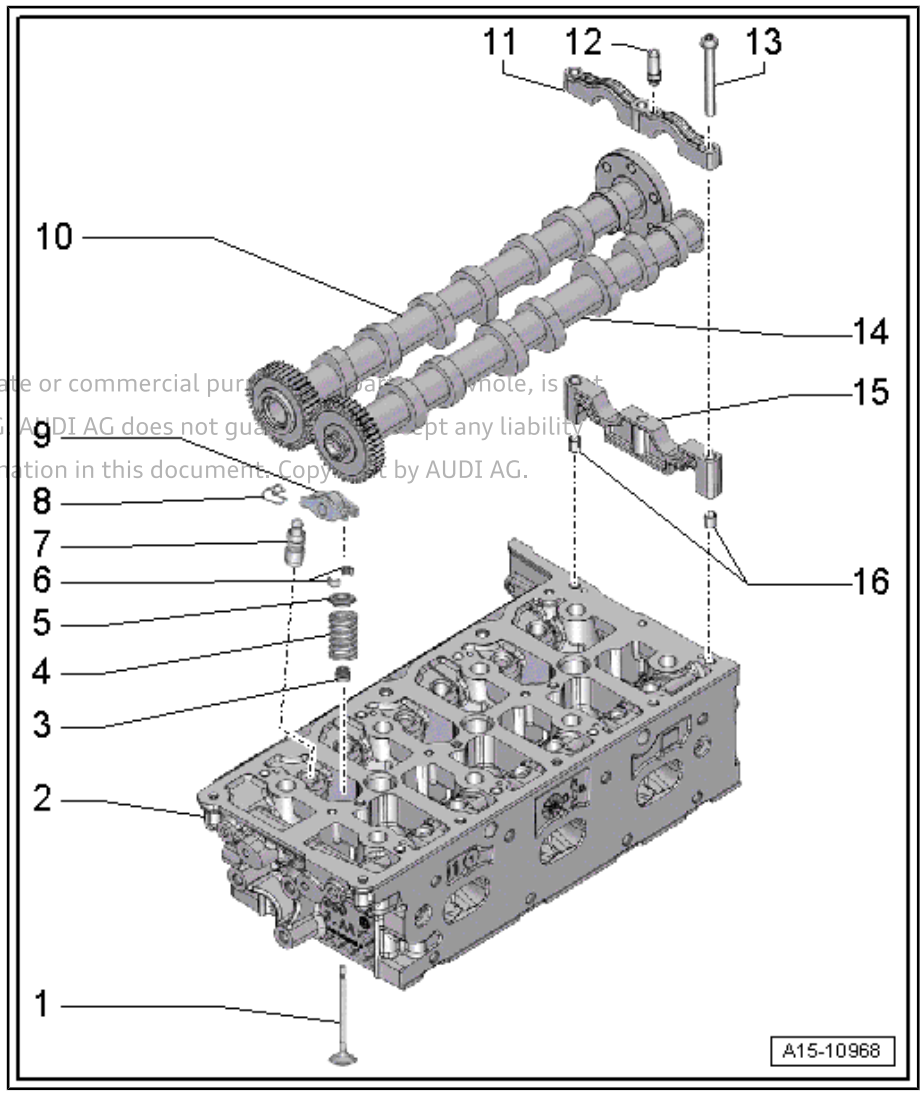
4 Valve gear

⇒ “4.1 Exploded view - valve gear”, page 281
⇒ “4.2 Measuring axial clearance of camshaft”, page 283
⇒ “4.3 Measuring radial clearance of camshaft”, page 284
⇒ “4.4 Removing and installing camshaft”, page 285
⇒ “4.5 Removing and installing valve stem oil seals”, page 308

4.1 Exploded view - valve gear

Note

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



1 - Valve

- ❑ Do not machine, only grinding-in is permitted
- ❑ Mark installation position for re-installation
- ❑ Checking ⇒ page 316
- ❑ Valve dimensions ⇒ page 317
- ❑ Checking valve guides ⇒ page 315

2 - Cylinder head

- ❑ Checking valve guides ⇒ page 315
- ❑ Machining valve seats ⇒ page 315

3 - Valve stem oil seal

- ❑ Renewing ⇒ page 308

4 - Valve spring

5 - Valve spring plate

6 - Valve cotters

7 - Hydraulic compensation element

- ❑ Clipped into roller rocker finger -item 9-
- ❑ Mark installation position for re-installation
- ❑ Lubricate contact surfaces before installing

8 - Securing clip

- ❑ Not supplied separately
- ❑ Check for firm attachment

9 - Roller rocker finger

- ❑ Mark installation position for re-installation
- ❑ Check roller bearings for ease of movement
- ❑ Lubricate contact surfaces before installing

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❑ Assembly: attach to hydraulic compensation element -item 7- using securing clip -item 8-

10 - Inlet camshaft

❑ Removing and installing:

♦ Cylinder bank 1 (right-side) ⇒ page 285 , ⇒ page 291

♦ Cylinder bank 2 (left-side) ⇒ page 298 , ⇒ page 303

❑ Measuring axial clearance ⇒ page 283

❑ Measuring radial clearance ⇒ page 284

❑ Runout: max. 0.01 mm

11 - Bearing cap

❑ Removing and installing:

♦ Cylinder bank 1 (right-side) ⇒ page 285

♦ Cylinder bank 2 (left-side) ⇒ page 298

❑ Note installation position

12 - Support bracket

❑ For clamping piece

❑ Tightening torque ⇒ Item 1 (page 522)

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13 - Bolt

❑ Tightening torque and tightening sequence: cylinder bank 1 (right-side) ⇒ page 282 , cylinder bank 2 (left-side) ⇒ page 283

14 - Exhaust camshaft

❑ Removing and installing:

♦ Cylinder bank 1 (right-side) ⇒ page 285 , ⇒ page 291

♦ Cylinder bank 2 (left-side) ⇒ page 298 , ⇒ page 303

❑ Measuring axial clearance ⇒ page 283

❑ Measuring radial clearance ⇒ page 284

❑ Runout: max. 0.01 mm

15 - Bearing pedestal

❑ Removing and installing:

♦ Cylinder bank 1 (right-side) ⇒ page 285

♦ Cylinder bank 2 (left-side) ⇒ page 298

❑ Note installation position

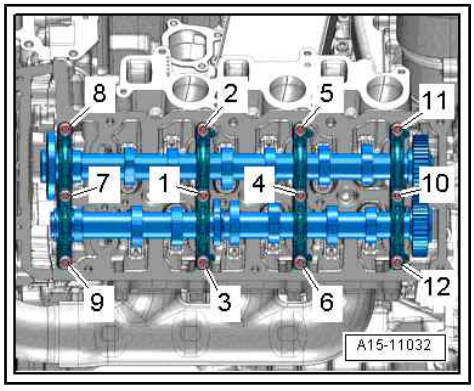
16 - Spring pins

❑ Only for bearing pedestal (rear) with camshaft axial bearing

Bearing cap, cylinder bank 1 (right-side) - tightening torque and sequence

– Tighten bolts in 2 stages in the sequence shown:

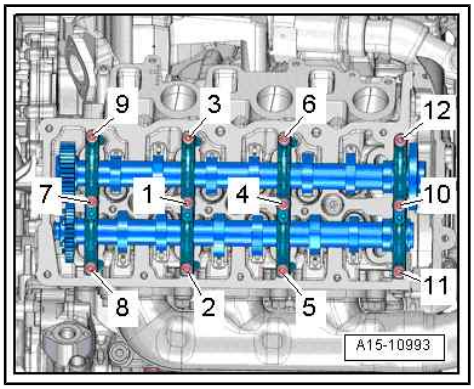
Stage	Bolts	Tightening torque
1.	-1 … 12-	Screw in by hand until contact is made
2.	-1 … 12-	9 Nm



Bearing cap, cylinder bank 2 (left-side) - tightening torque and sequence

– Tighten bolts in 2 stages in the sequence shown:

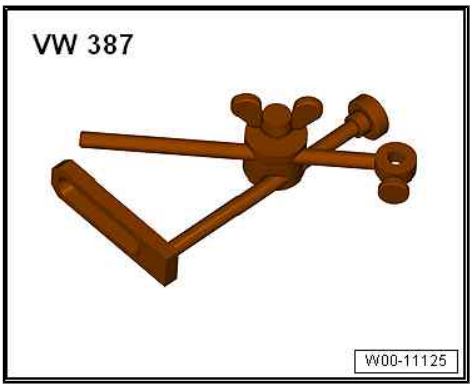
Stage	Bolts	Tightening torque
1.	-1 … 12-	Screw in by hand until contact is made
2.	-1 … 12-	9 Nm



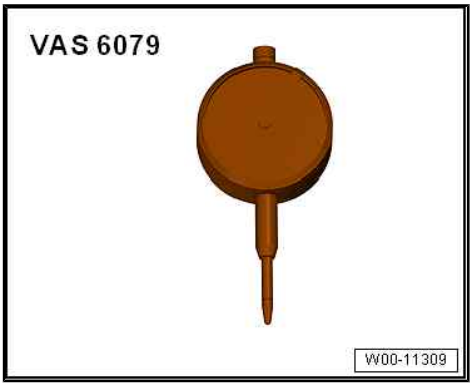
4.2 Measuring axial clearance of camshaft

Special tools and workshop equipment required

♦ Universal dial gauge bracket - VW 387-



♦ Dial gauge - VAS 6079-



Procedure

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– Remove camshafts ⇒ page 285 .

– Mark allocation of roller rocker fingers for re-installation.

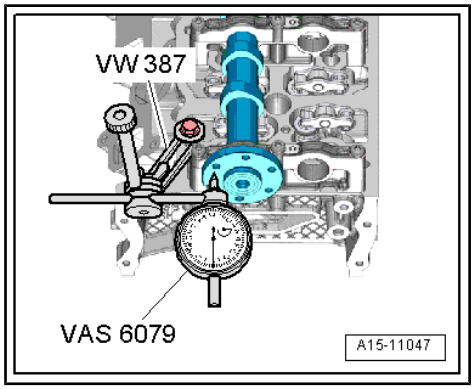
– Carefully remove roller rocker fingers and place them on a clean surface.

– Re-install camshafts with outer bearings ⇒ page 283 .

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

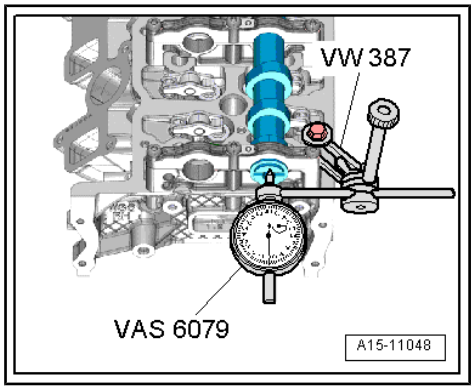
Axial clearance (inlet camshaft)

- Specification: 0.0682 … 0.0750 mm.



Axial clearance (exhaust camshaft)

- Specification: 0.0682 … 0.0750 mm.



4.3 Measuring radial clearance of camshaft

Special tools and workshop equipment required

♦ Plastigauge

Procedure

– Remove camshafts ⇒ page 285 .

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– 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 with bearing caps and secure with old bolts without rotating camshafts.

♦ Bearing cap, cylinder bank 1 (right-side) - tightening torque and sequence ⇒ page 282

♦ Bearing cap, cylinder bank 2 (left-side) - tightening torque and sequence ⇒ page 283

– Remove camshafts with bearing caps again.

– Compare width of Plastigauge with measurement scale.

Radial clearance:

- New: 0.037 ... 0.063 mm.

4.4 Removing and installing camshaft

⇒ “4.4.1 Removing camshafts and re-installing used camshafts - cylinder bank 1 (right-side)”, page 285

⇒ “4.4.2 Removing and renewing camshafts or camshaft bearings - cylinder bank 1 (right-side)”, page 291

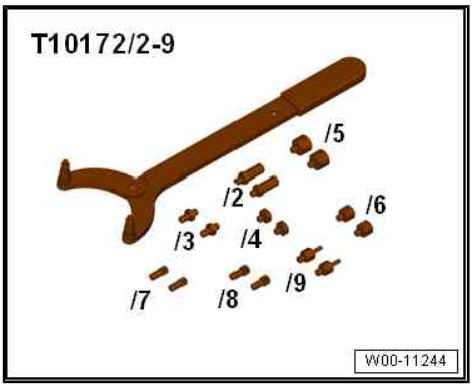
⇒ “4.4.3 Removing camshafts and re-installing used camshafts - cylinder bank 2 (left-side)”, page 298

⇒ “4.4.4 Removing and renewing camshafts or camshaft bearings - cylinder bank 2 (left-side)”, page 303

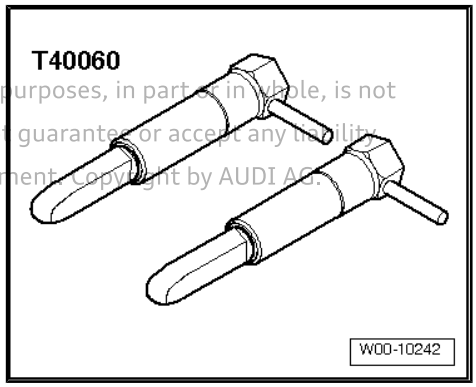
4.4.1 Removing camshafts and re-installing used camshafts - cylinder bank 1 (right-side)

Special tools and workshop equipment required

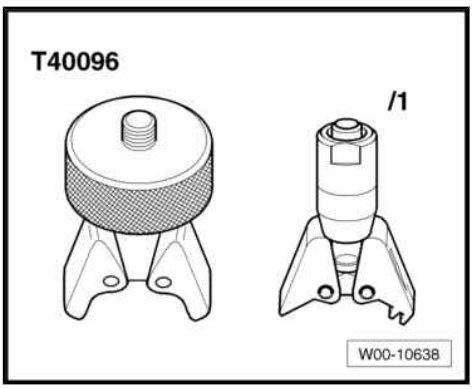
- Counterhold tool - T10172A- with adapters -T10172/5-



- Adjustment pin - T40060-



- Camshaft fitting tool - T40096-



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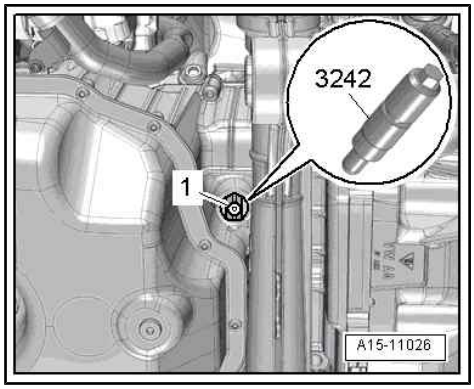
♦ Setting tool - T40311-



Removing

– Remove timing chain from inlet camshaft ⇒ page 232 .

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

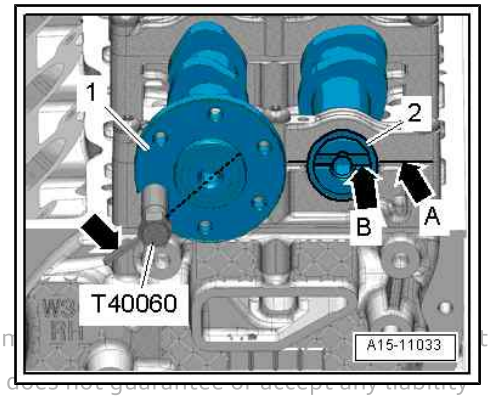


– Check “TDC” position of camshafts:

• It should be possible to lock the inlet camshaft -1- with the adjustment pin - T40060- .

• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.

• Exhaust camshaft -2- must be set so that groove -arrow B- is parallel above joint -arrow A- between bearing pedestal and bearing cap.

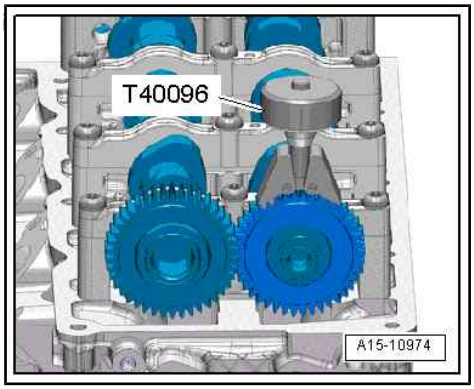


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– Place camshaft fitting tool - T40096- on teeth of inlet camshaft so that the two arms of the tool engage on the two halves of the gear (one in each half, as shown in illustration).

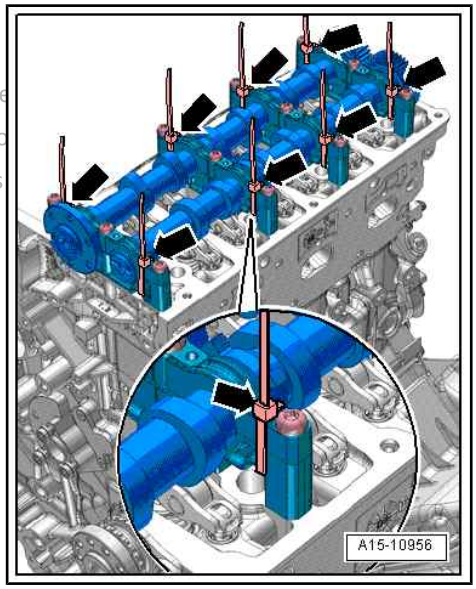
• The wider arm must engage in the wider half of the gear.

– Tighten the clamping tool using the knurled wheel so that the faces of the gear teeth are in alignment.



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– Wrap one cable tie -arrows- on each side around bearing pedestal and bearing cap and secure.

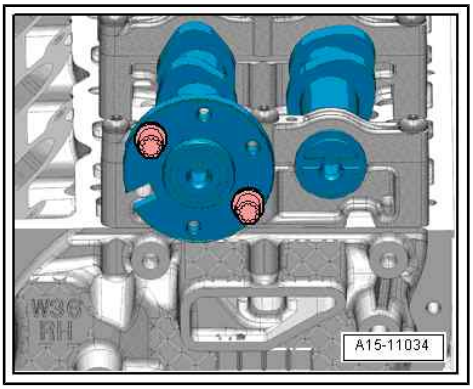


Note

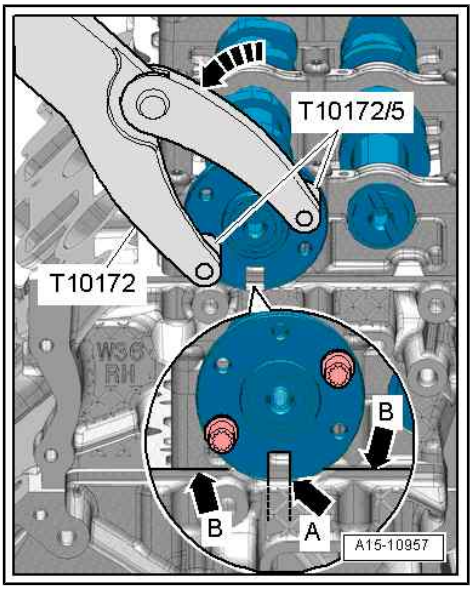
With the cable ties it is possible to detach the camshafts together with the camshaft bearings. This prevents components from being interchanged.

– Pull off adjustment pin - T40060- .

– Screw two bolts for camshaft chain sprocket five turns into threaded holes in camshaft, as shown in illustration.



– Fit counterhold tool - T10172A- with adapters -T10172/5- on both bolts and turn camshafts approx. 30° in anti-clockwise direction -arrow- until groove -arrow A- in camshaft points vertically to sealing surface -arrows B- of cylinder head.

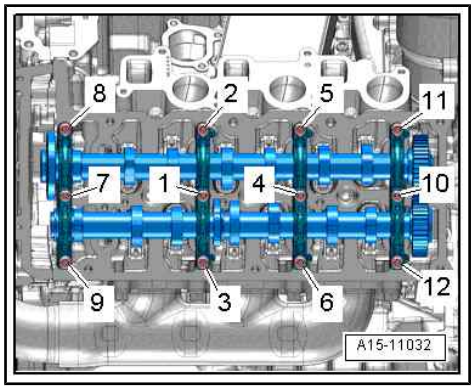


Caution

Risk of damage to valves.

- ***Do not turn camshafts any further than specified.***

– Loosen bearing cap bolts in the sequence -12 ... 1-.



Note

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

– Carefully detach bearing caps together with camshafts.

Caution

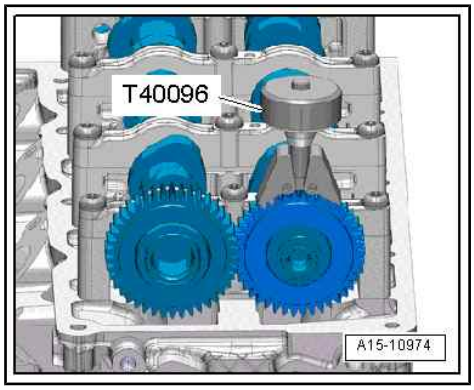
Do NOT interchange components!

- ***Do not release cable ties until after re-installation.***

Installing

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

– Place camshaft fitting tool - T40096- on teeth of inlet camshaft so that the two arms of the tool engage on the two halves of the gear (one in each half, as shown in illustration).

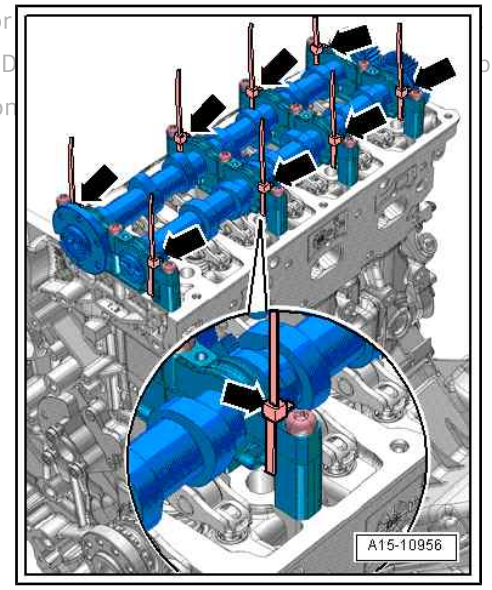


- The wider arm must engage in the wider half of the gear.

– Tighten the clamping tool using the knurled wheel so that the faces of the gear teeth are in alignment.

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– Fit camshafts and camshaft bearings (secured with cable ties -arrows-) on cylinder head.



Note

The cable ties help to keep the camshafts and camshaft bearings straight when they are tightened.

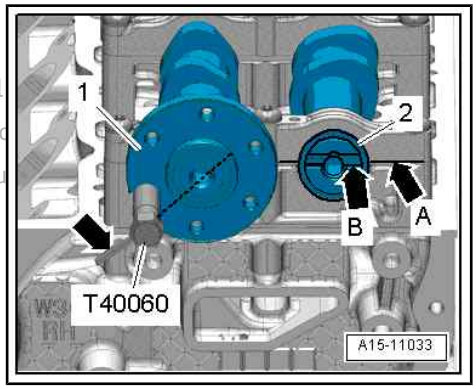
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– Check “TDC” position of camshafts:

• It should be possible to lock the inlet camshaft -1- with the adjustment pin - T40060-.

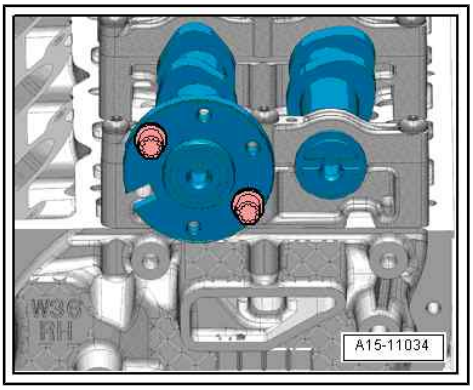
• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.

• Exhaust camshaft -2- must be set so that groove -arrow A- is parallel above joint -arrow B- between bearing pedestal and bearing cap.



– Pull off adjustment pin - T40060- .

– Screw two bolts for camshaft chain sprocket five turns into threaded holes in camshaft, as shown in illustration.

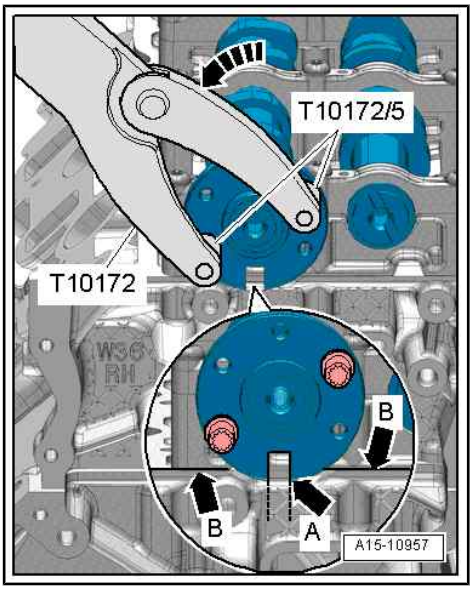


– Fit counterhold tool - T10172A- with adapters -T10172/5- on both bolts and turn camshafts approx. 30° in anti-clockwise direction -arrow- until groove -arrow A- in camshaft points vertically to sealing surface -arrows B- of cylinder head.

Caution

Risk of damage to valves.

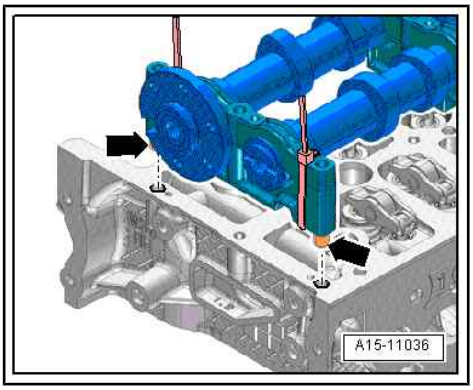
- ***Do not turn camshafts any further than specified.***



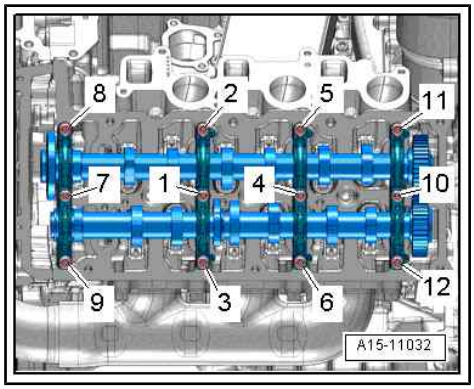
– Check installation position of dowel sleeves:

• Both dowel sleeves -arrows- must be inserted in holes in bearing pedestal “IV”.

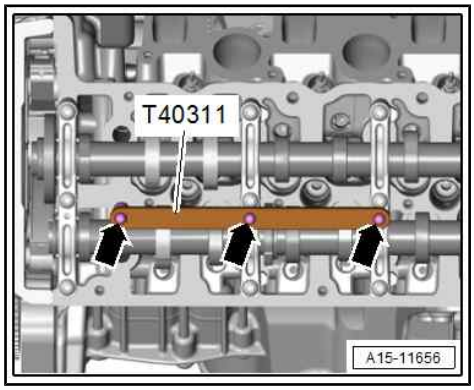
• Dowel sleeves must engage in holes in cylinder head.



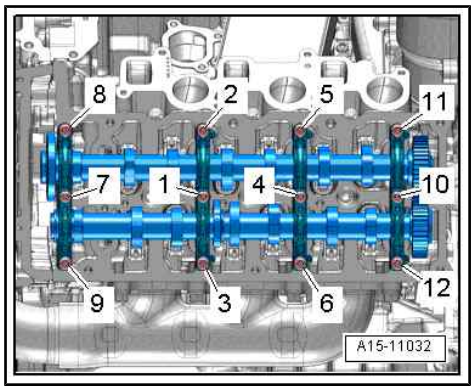
– Fit bolts -1 … 12- in bearing caps.



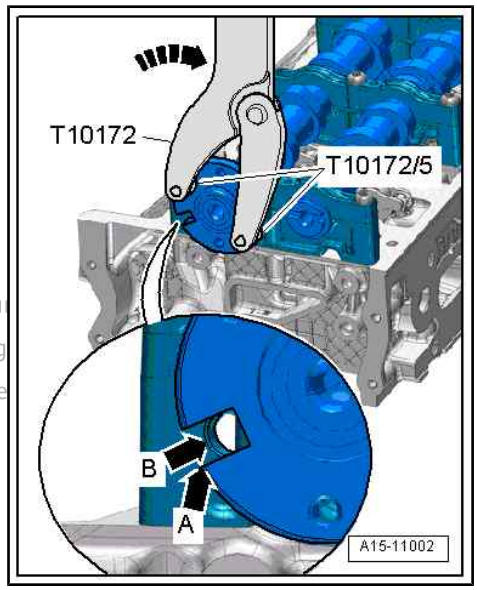
– Fit setting tool - T40311- onto support brackets -arrows- for clamping pieces, as shown in illustration.



– Tighten bearing cap bolts ⇒ page 283 .
– Detach setting tool - T40311- .

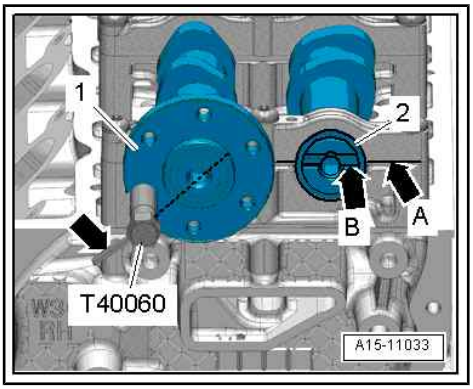


– Fit counterhold tool - T10172A- with adapters -T10172/5- on both bolts and turn camshafts approx. 30° in clockwise direction -arrow- until groove -arrow A- in camshaft is aligned with hole -arrow B- for adjustment pin - T40060- .



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– Check “TDC” position of camshafts:



- It should be possible to lock the inlet camshaft -1- with the adjustment pin - T40060- .
- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.
- Exhaust camshaft -2- must be set so that groove -arrow A- is parallel above joint -arrow B- between bearing pedestal and bearing cap.

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

– Remove camshaft fitting tool - T40096- .

– Install camshaft timing chains ⇒ page 232 .

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.*

Tightening torques

- ⇒ “4.1 Exploded view - valve gear”, page 281

4.4.2 Removing and renewing camshafts or camshaft bearings - cylinder bank 1 (right-side)

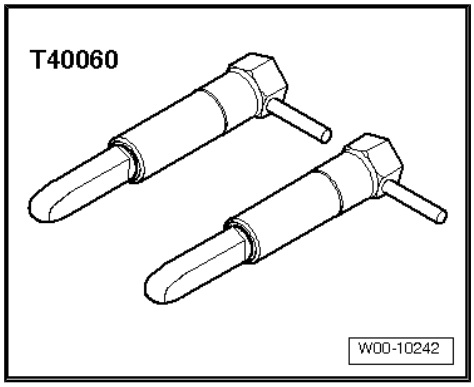
Special tools and workshop equipment required

- Counterhold tool - T10172A- with adapters -T10172/5-

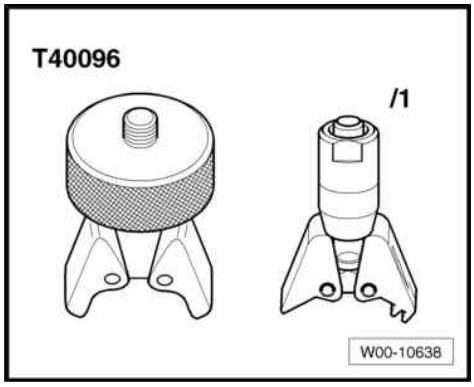


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♦ Adjustment pin - T40060-



♦ Camshaft fitting tool - T40096-



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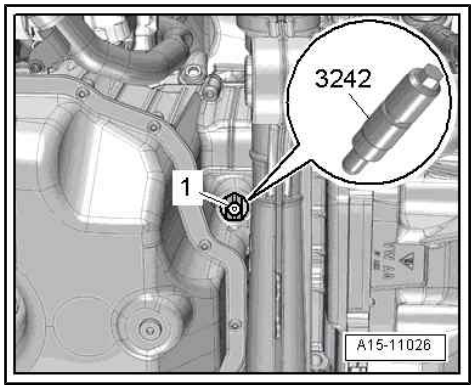
♦ Setting tool - T40311-



Removing

– Remove timing chain from inlet camshaft ⇒ page 232 .

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

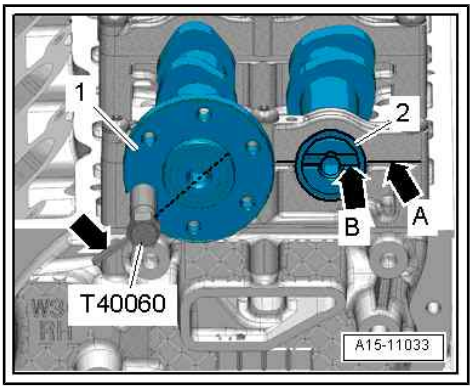


– Check “TDC” position of camshafts:

• It should be possible to lock the inlet camshaft -1- with the adjustment pin - T40060- .

• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.

• Exhaust camshaft -2- must be set so that groove -arrow B- is parallel above joint -arrow A- between bearing pedestal and bearing cap.

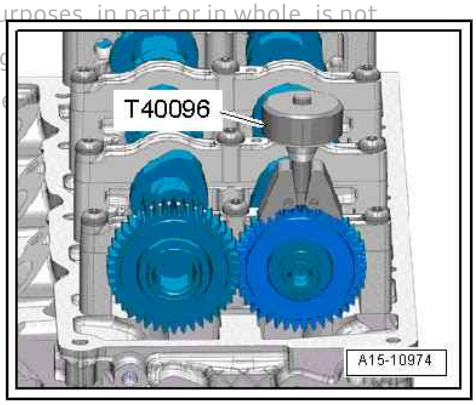


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– Place camshaft fitting tool - T40096- on teeth of inlet camshaft so that the two arms of the tool engage on the two halves of the gear (one in each half, as shown in illustration).

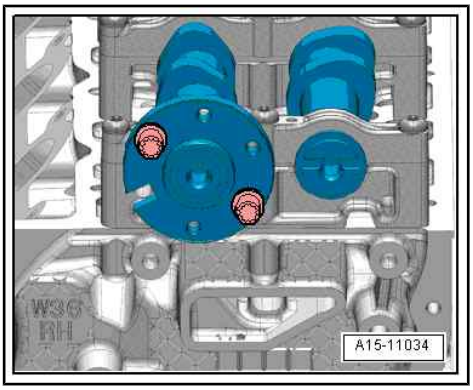
• The wider arm must engage in the wider half of the gear.

– Tighten the clamping tool using the knurled wheel so that the faces of the gear teeth are in alignment.



– Pull off adjustment pin - T40060- .

– Screw two bolts for camshaft chain sprocket five turns into threaded holes in camshaft, as shown in illustration.

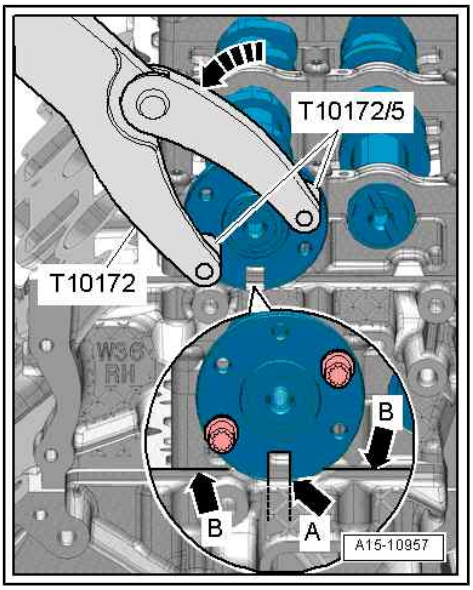


– Fit counterhold tool - T10172A- with adapters -T10172/5- on both bolts and turn camshafts approx. 30° in anti-clockwise direction -arrow- until groove -arrow A- in camshaft points vertically to sealing surface -arrows B- of cylinder head.

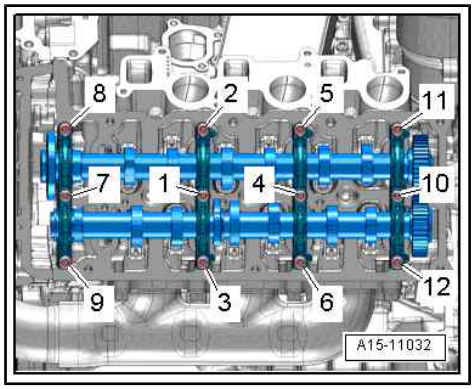
Caution

Risk of damage to valves.

- *Do not turn camshafts any further than specified.*



– Loosen bearing cap bolts in the sequence -12 ... 1-.



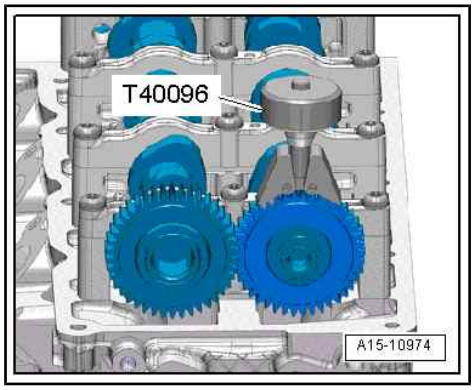
Note

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

– Carefully detach bearing caps and camshafts.

Installing

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



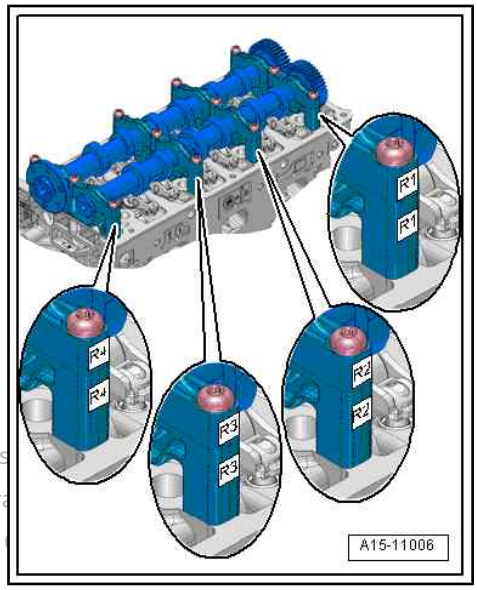
– Place camshaft fitting tool - T40096- on teeth of inlet camshaft so that the two arms of the tool engage on the two halves of the gear (one in each half, as shown in illustration).

- The wider arm must engage in the wider half of the gear.

– Tighten the clamping tool using the knurled wheel so that the faces of the gear teeth are in alignment.

To prevent installation at the wrong locations, the camshaft bearing pedestals and bearing caps for cylinder bank 1 are marked at the factory on the exhaust side:

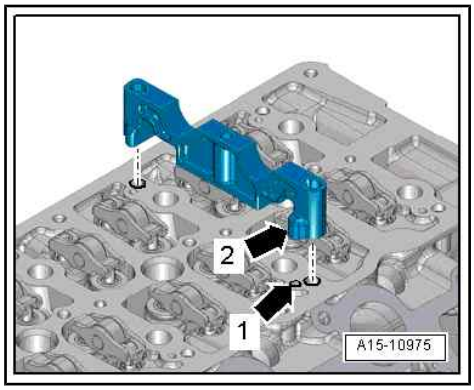
Cylinder bank 1 (right-side)	
R1/R1	Front
R2/R2	Front centre
R3/R3	Rear centre
R4/R4	Rear



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– Fit camshaft bearing pedestals “I, II and III” on cylinder head.

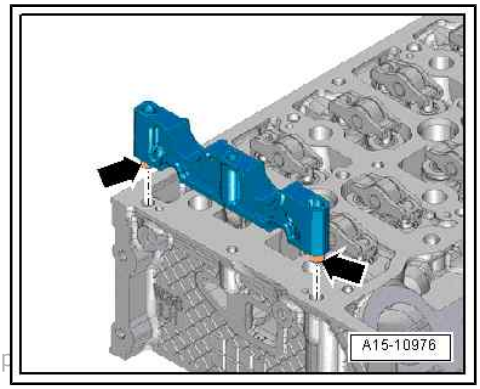
- The oil drillings -arrow 1- in the cylinder head must be in line with the oil passages -arrow 2- in the bearing pedestals.



– Fit camshaft bearing pedestal “IV” on cylinder head.

• Both dowel sleeves -arrows- must be inserted in holes in bearing pedestal.

• Dowel sleeves must engage in holes in cylinder head.

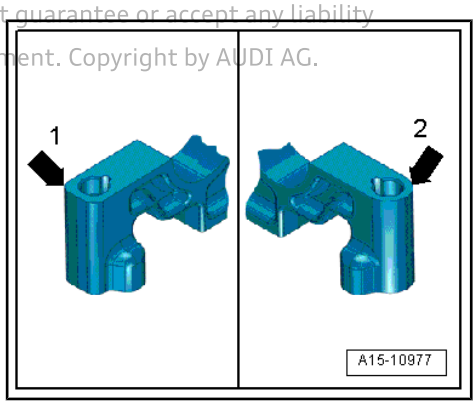


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– Check that bearing pedestals are positioned correctly:

• The round side -arrow 2- faces the inlet side.

• The square side -arrow 1- faces the exhaust side.



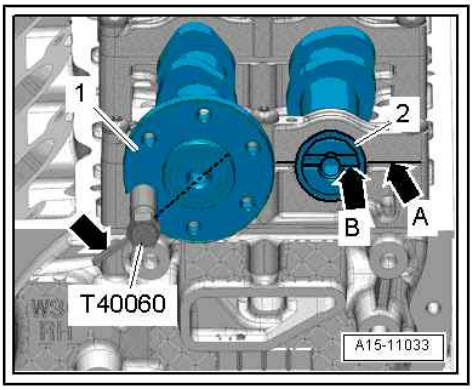
– Insert camshafts in bearing pedestals in “TDC” position.

• It should be possible to lock the inlet camshaft -1- with the adjustment pin - T40060- .

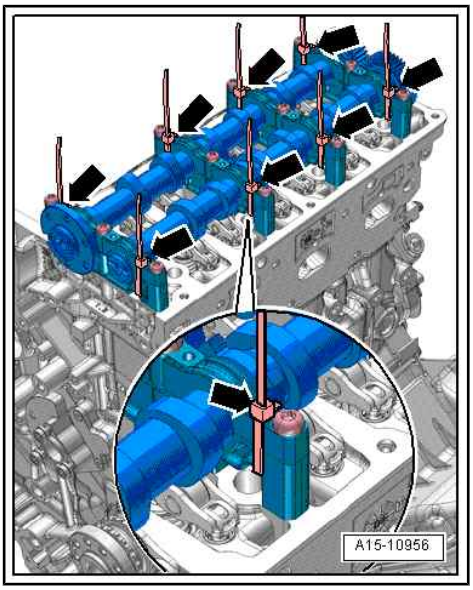
• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.

• Exhaust camshaft -2- must be set so that groove -arrow A- is parallel above joint -arrow B- between bearing pedestal and bearing cap.

– Fit matching bearing caps on bearing pedestals.



– Wrap one cable tie -arrows- on each side around bearing pedestal and bearing cap and secure.

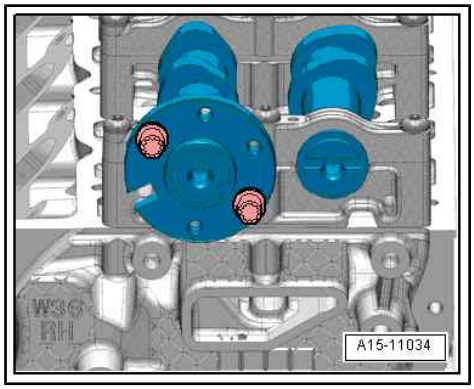


Note

The cable ties help to keep the camshafts and camshaft bearings straight when they are tightened.

– Pull off adjustment pin - T40060- .

– Screw two bolts for camshaft chain sprocket five turns into threaded holes in camshaft, as shown in illustration.

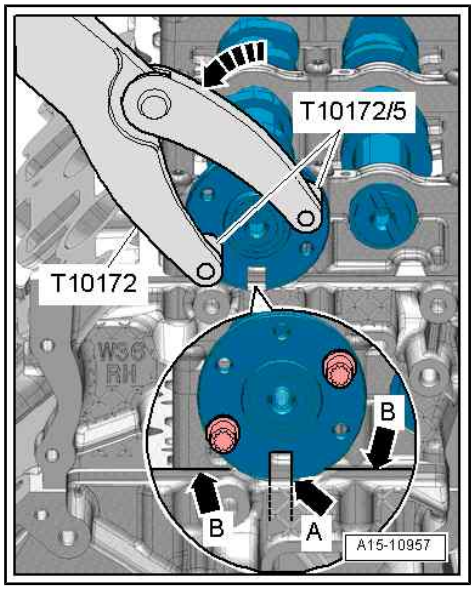


– Fit counterhold tool - T10172A- with adapters -T10172/5- on both bolts and turn camshafts approx. 30° in anti-clockwise direction -arrow- until groove -arrow A- in camshaft points vertically to sealing surface -arrows B- of cylinder head.

Caution

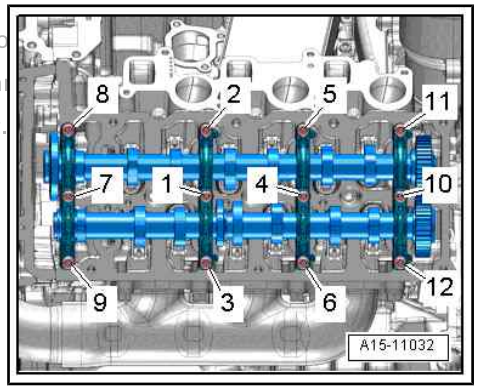
Risk of damage to valves.

- *Do not turn camshafts any further than specified.*

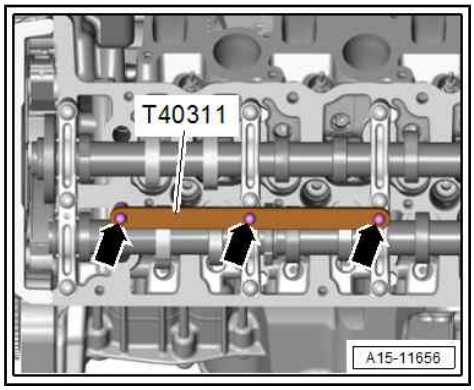


– Fit bolts -1 … 12- in bearing caps.

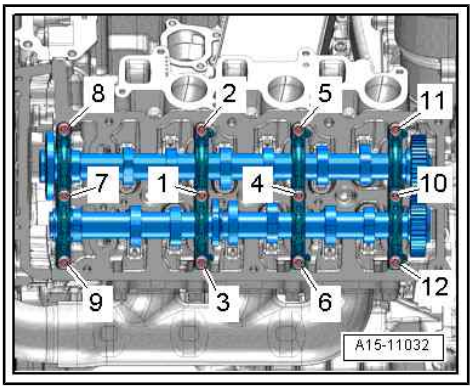
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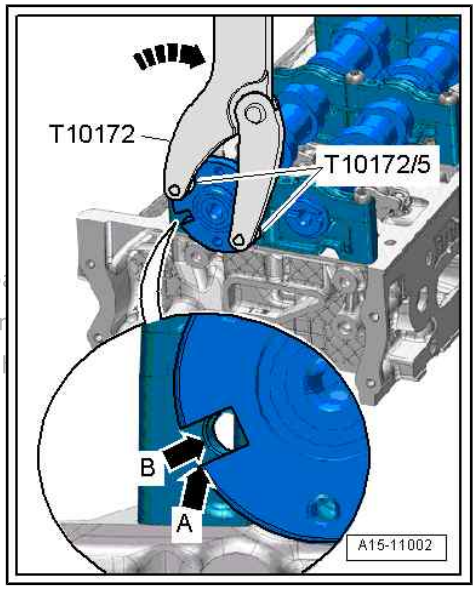
– Fit setting tool - T40311- onto support brackets -arrows- for clamping pieces, as shown in illustration.



– Tighten bearing cap bolts ⇒ page 283 .
– Detach setting tool - T40311- .



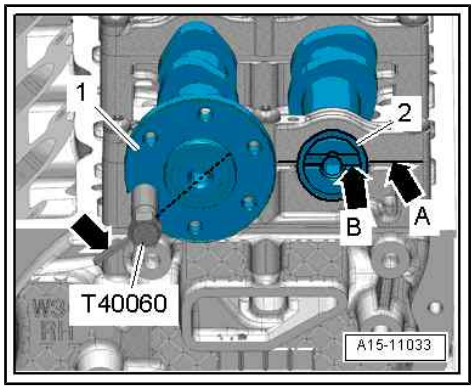
– Fit counterhold tool - T10172A- with adapters -T10172/5- on both bolts and turn camshafts approx. 30° in clockwise direction -arrow- until groove -arrow A- in camshaft is aligned with hole -arrow B- for adjustment pin - T40060- .



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– Check “TDC” position of camshafts:

- It should be possible to lock the inlet camshaft -1- with the adjustment pin - T40060- .
- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.
- Exhaust camshaft -2- must be set so that groove -arrow A- is parallel above joint -arrow B- between bearing pedestal and bearing cap.



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

– Remove camshaft fitting tool - T40096- .

– Install camshaft timing chains ⇒ page 232 .

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.***

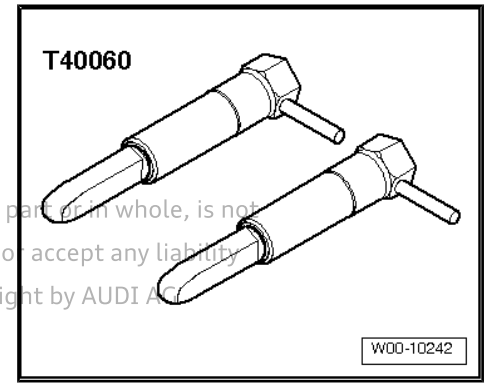
Tightening torques

- ⇒ “4.1 Exploded view - valve gear”, page 281

4.4.3 Removing camshafts and re-installing used camshafts - cylinder bank 2 (left-side)

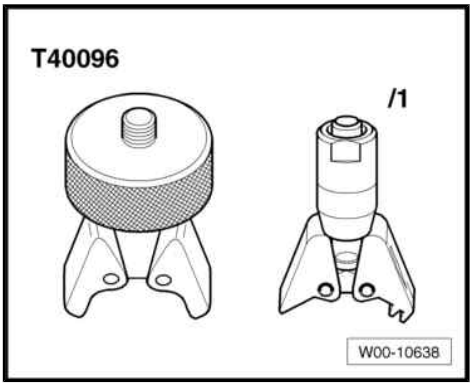
Special tools and workshop equipment required

- Adjustment pin - T40060-



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♦ Camshaft fitting tool - T40096-



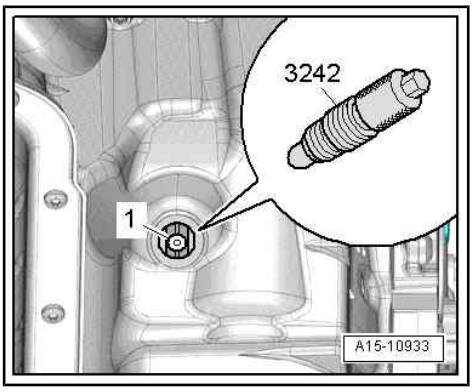
♦ Setting tool - T40311-



Removing

– Remove timing chain from inlet camshaft ⇒ page 232 .

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

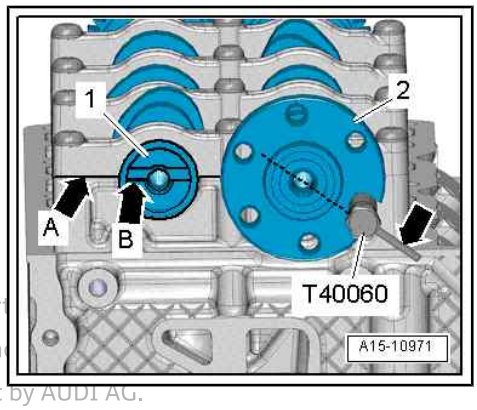


– Check “TDC” position of camshafts:

• It should be possible to lock the inlet camshaft -2- with the adjustment pin - T40060- .

• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.

• Exhaust camshaft -1- must be set so that groove -arrow B- is parallel above joint -arrow A- between bearing pedestal and bearing cap.

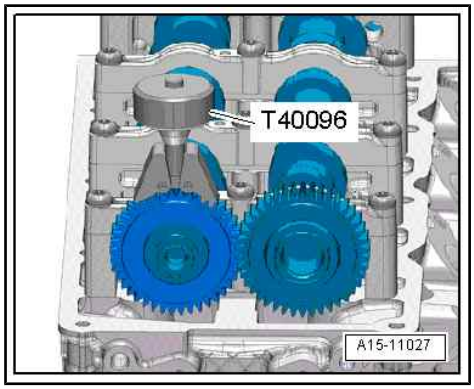


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– Place camshaft fitting tool - T40096- on teeth of inlet camshaft so that the two arms of the tool engage on the two halves of the gear (one in each half, as shown in illustration).

• The wider arm must engage in the wider half of the gear.

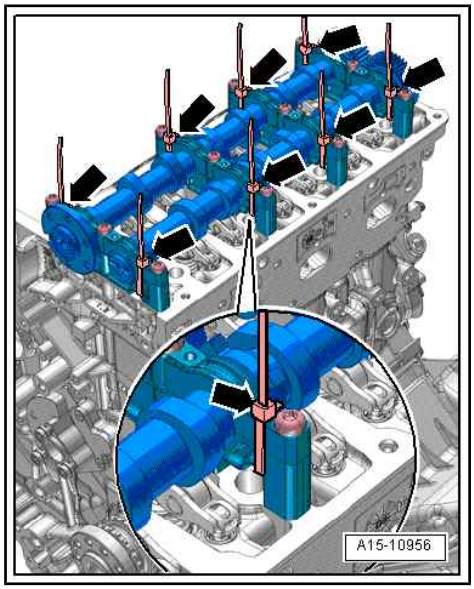
– Tighten the clamping tool using the knurled wheel so that the faces of the gear teeth are in alignment.



– Wrap one cable tie -arrows- on each side around bearing pedestal and bearing cap and secure.

Note

With the cable ties it is possible to detach the camshafts together with the camshaft bearings. This prevents components from being interchanged.

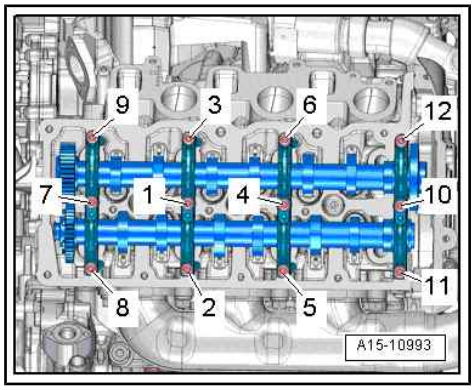


– Loosen bearing cap bolts in the sequence -12 ... 1-.

Note

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

– Carefully detach bearing caps together with camshafts.



Caution

Do NOT interchange components!

- ***Do not release cable ties until after re-installation.***

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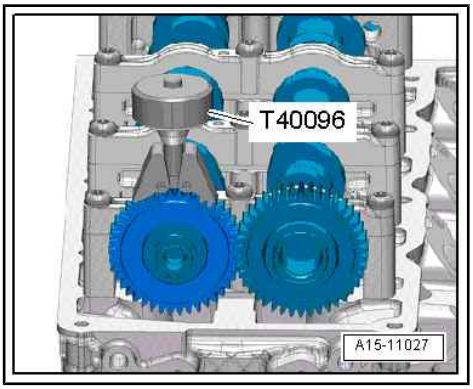
Installing

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

– Place camshaft fitting tool - T40096- on teeth of inlet camshaft so that the two arms of the tool engage on the two halves of the gear (one in each half, as shown in illustration).

- The wider arm must engage in the wider half of the gear.

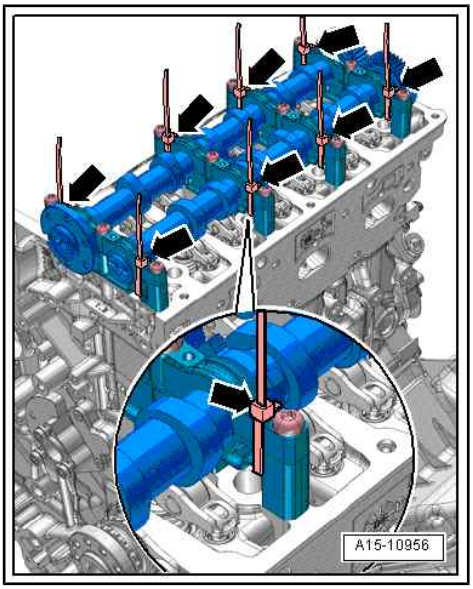
– Tighten the clamping tool using the knurled wheel so that the faces of the gear teeth are in alignment.



– Fit camshafts and camshaft bearings (secured with cable ties -arrows-) on cylinder head.

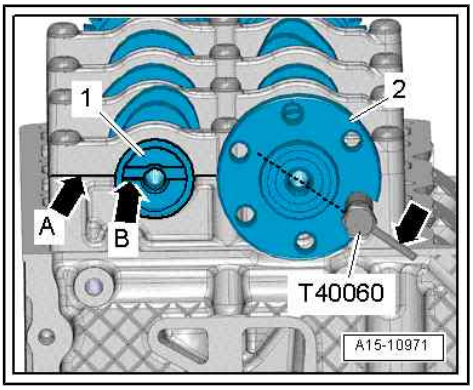
Note

The cable ties help to keep the camshafts and camshaft bearings straight when they are tightened.



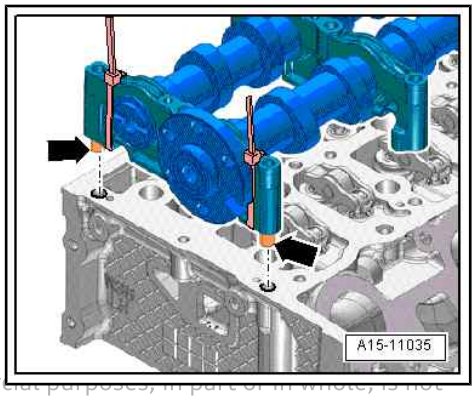
– Check “TDC” position of camshafts:

- It should be possible to lock the inlet camshaft -2- with the adjustment pin - T40060- .
- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.
- Exhaust camshaft -1- must be set so that groove -arrow A- is parallel above joint -arrow B- between bearing pedestal and bearing cap.



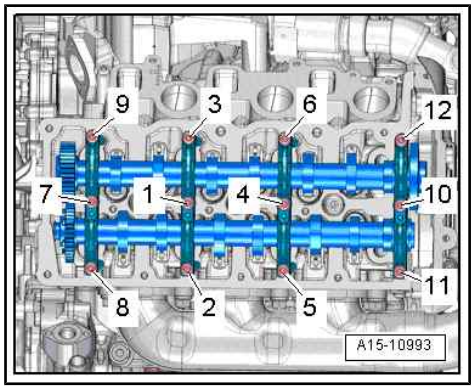
– Check installation position of dowel sleeves:

- Both dowel sleeves -arrows- must be inserted in holes in bearing pedestal “IV”.
- Dowel sleeves must engage in holes in cylinder head.

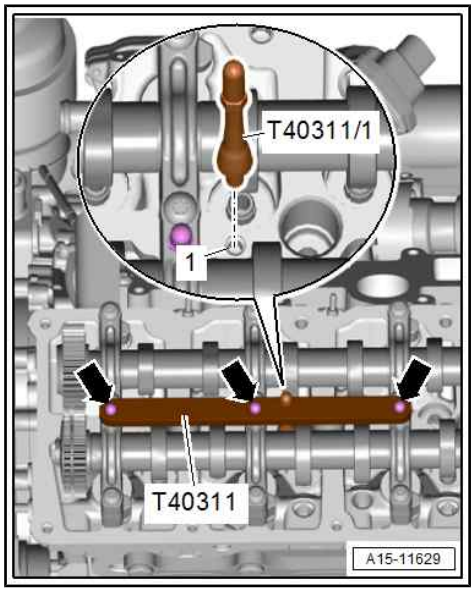


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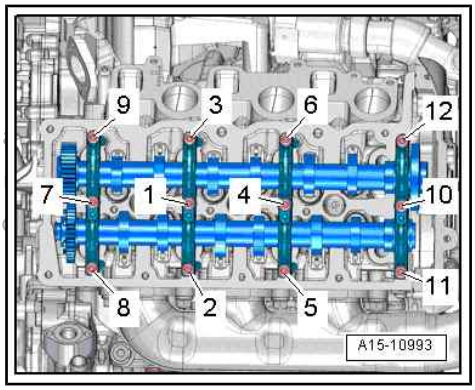
– Fit bolts -1 … 12- in bearing caps.



– Screw locating pin -T40311/1- into threaded hole -1- in line with cylinder 5, as shown in illustration.
– Fit setting tool - T40311- onto support brackets for clamping pieces -arrows-, as shown in illustration.



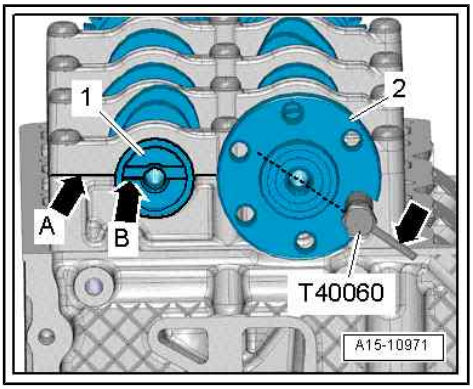
– Tighten bearing cap bolts ⇒ page 283 .
– Detach setting tool - T40311- and unscrew locating pin - T40311/1- .



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– Check “TDC” position of camshafts:

- It should be possible to lock the inlet camshaft -2- with the adjustment pin - T40060- .
- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.
- Exhaust camshaft -1- must be set so that groove -arrow A- is parallel above joint -arrow B- between bearing pedestal and bearing cap.



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

– Remove camshaft fitting tool - T40096- .

– Install camshaft timing chains ⇒ page 232 .

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.***

Tightening torques

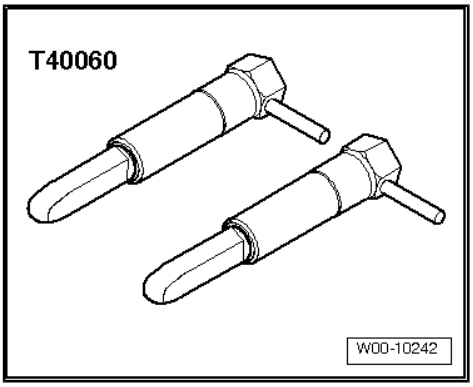
- ⇒ “4.1 Exploded view - valve gear”, page 281

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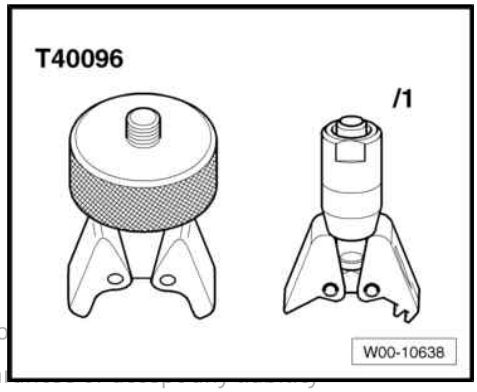
4.4.4 Removing and renewing camshafts or camshaft bearings - cylinder bank 2 (left-side)

Special tools and workshop equipment required

- Adjustment pin - T40060-



♦ Camshaft fitting tool - T40096-



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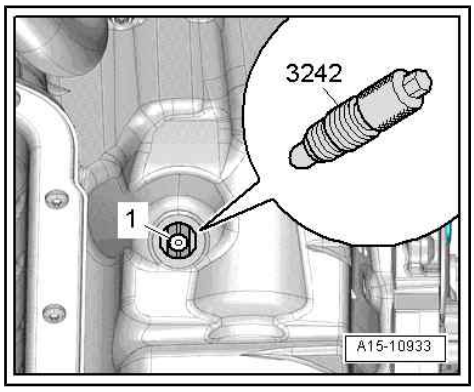
♦ Setting tool - T40311-



Removing

– Remove timing chain from inlet camshaft ⇒ page 232 .

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

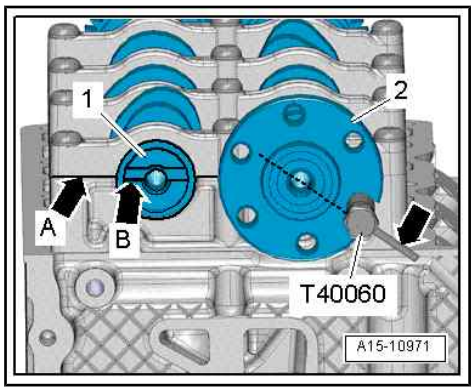


– Check “TDC” position of camshafts:

• It should be possible to lock the inlet camshaft -2- with the adjustment pin - T40060- .

• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.

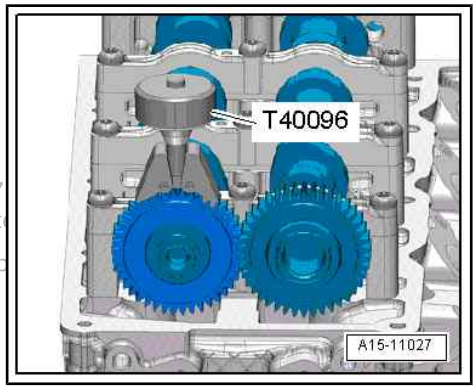
• Exhaust camshaft -1- must be set so that groove -arrow B- is parallel above joint -arrow A- between bearing pedestal and bearing cap.



– Place camshaft fitting tool - T40096- on teeth of inlet camshaft so that the two arms of the tool engage on the two halves of the gear (one in each half, as shown in illustration).

• The wider arm must engage in the wider half of the gear.

– Tighten the clamping tool using the knurled wheel so that the faces of the gear teeth are in alignment.



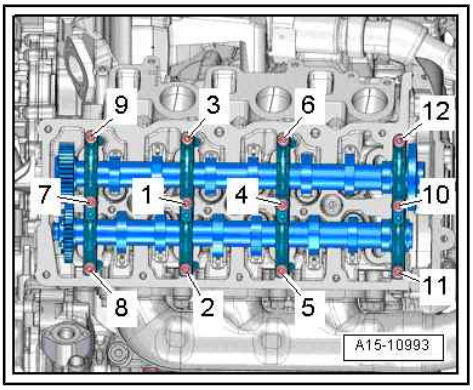
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– Loosen bearing cap bolts in the sequence -12 ... 1-.

Note

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

– Carefully detach bearing caps and camshafts.



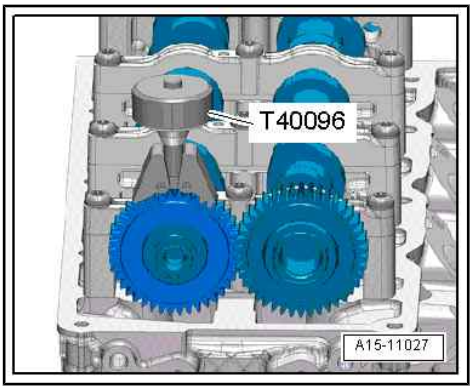
Installing

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

– Place camshaft fitting tool - T40096- on teeth of inlet camshaft so that the two arms of the tool engage on the two halves of the gear (one in each half, as shown in illustration).

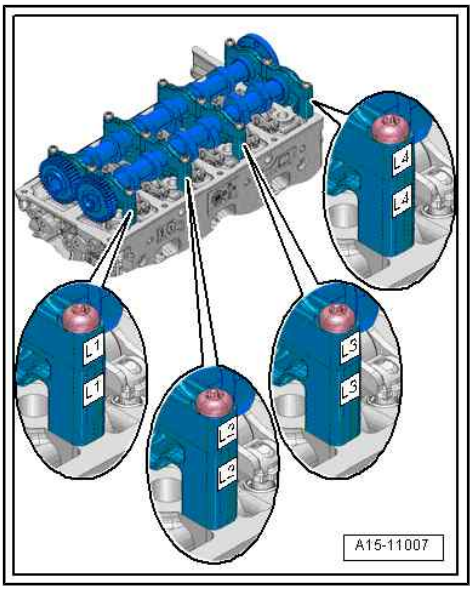
• The wider arm must engage in the wider half of the gear.

– Tighten the clamping tool using the knurled wheel so that the faces of the gear teeth are in alignment.



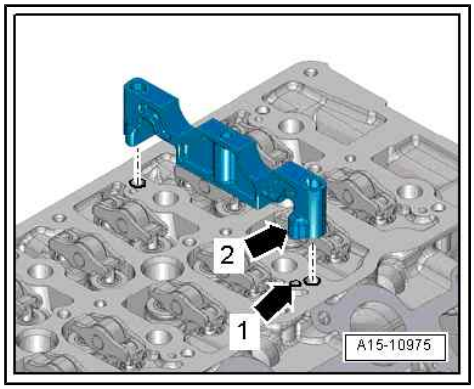
To prevent installation at the wrong locations, the camshaft bearing pedestals and bearing caps for cylinder bank 2 are marked at the factory on the exhaust side:

Cylinder bank 2 (left-side)	
L1/L1	Front
L2/L2	Front centre
L3/L3	Rear centre
L4/L4	Rear



– Fit camshaft bearing pedestals “I, II and III” on cylinder head.

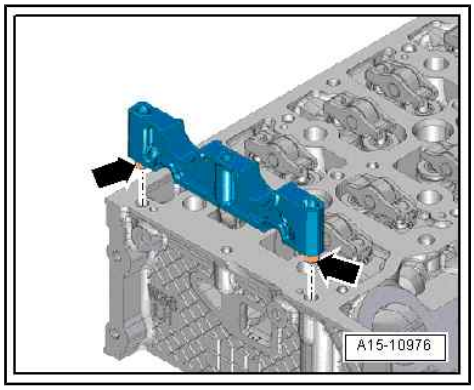
• The oil drillings -arrow 1- in the cylinder head must be in line with the oil passages -arrow 2- in the bearing pedestals.



– Fit camshaft bearing pedestal “IV” on cylinder head.

• Both dowel sleeves -arrows- must be inserted in holes in bearing pedestal.

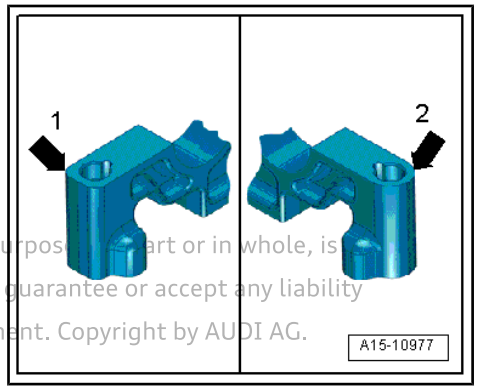
• Dowel sleeves must engage in holes in cylinder head.



– Check that bearing pedestals are positioned correctly:

• The round side -arrow 2- faces the inlet side.

• The square side -arrow 1- faces the exhaust side.



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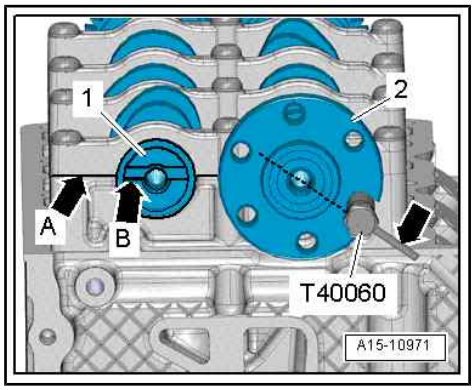
– Insert camshafts in bearing pedestals in “TDC” position.

• It should be possible to lock the inlet camshaft -2- with the adjustment pin - T40060- .

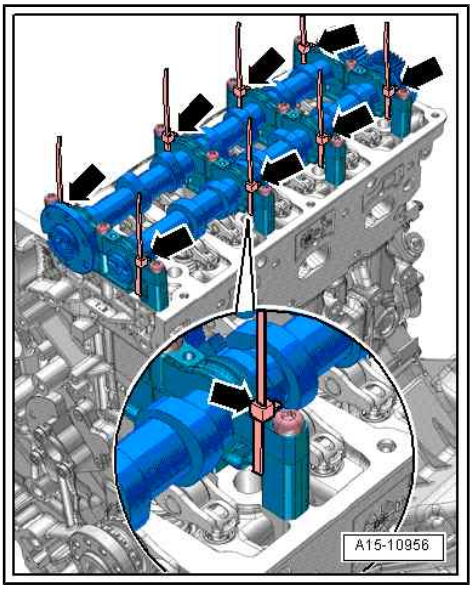
• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.

• Exhaust camshaft -1- must be set so that groove -arrow A- is parallel above joint -arrow B- between bearing pedestal and bearing cap.

– Fit matching bearing caps on bearing pedestals.



– Wrap one cable tie -arrows- on each side around bearing pedestal and bearing cap and secure.

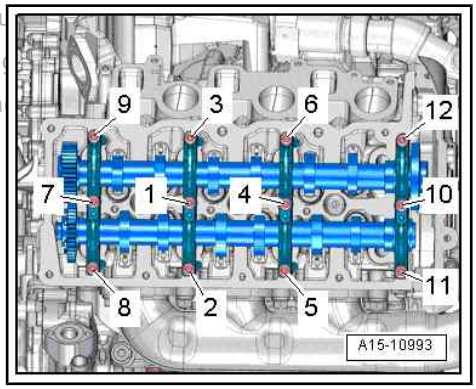


Note

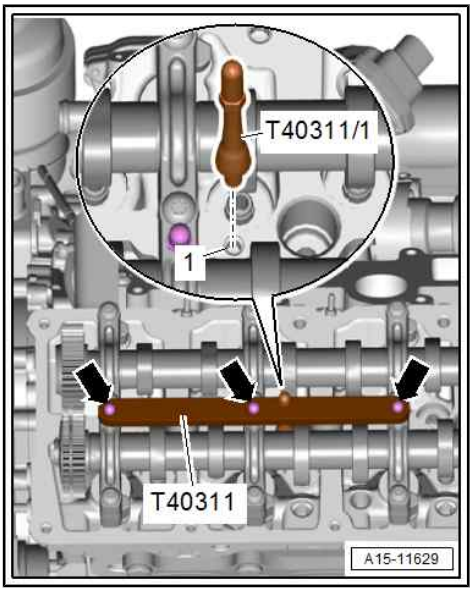
The cable ties help to keep the camshafts and camshaft bearings straight when they are tightened.

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– Fit bolts -1 ... 12- in bearing caps.

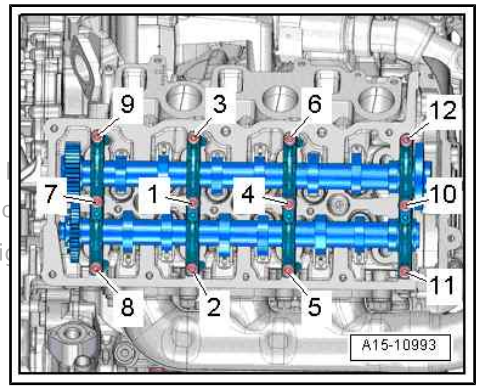


– Screw locating pin -T40311/1- into threaded hole -1- in line with cylinder 5, as shown in illustration.
– Fit setting tool - T40311- onto support brackets -arrows- for clamping pieces, as shown in illustration.



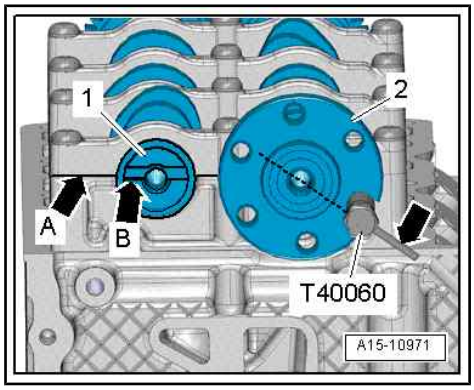
– Tighten bearing cap bolts ⇒ page 283 .
– Detach setting tool - T40311- and unscrew locating pin - T40311/1- .

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– Check “TDC” position of camshafts:

- It should be possible to lock the inlet camshaft -2- with the adjustment pin - T40060- .
- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.
- Exhaust camshaft -1- must be set so that groove -arrow A- is parallel above joint -arrow B- between bearing pedestal and bearing cap.



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

– Remove camshaft fitting tool - T40096- .
– Install camshaft timing chains ⇒ page 232 .

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.***

Tightening torques

- ⇒ “4.1 Exploded view - valve gear”, page 281

4.5 Removing and installing valve stem oil seals

⇒ “4.5.1 Removing and installing valve stem oil seals (cylinder head installed)”, page 308

⇒ “4.5.2 Removing and installing valve stem oil seals (cylinder head removed)”, page 312

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

Special tools and workshop equipment required

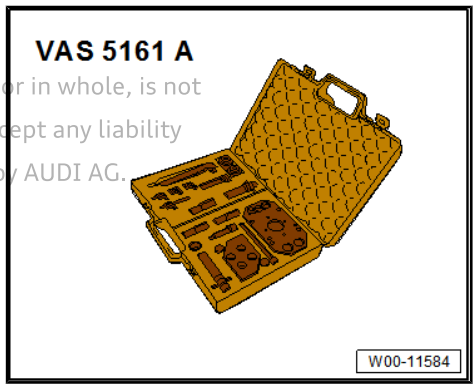
- Valve stem seal puller - 3364-



- Valve stem seal fitting tool - 3365-



- Removal and installation device for valve cotters - VAS 5161 A- with drift -VAS 5161/3 A- , assembly cartridge -VAS 5161/8 A- , guide plate -VAS 5161/29- and sealing pin -VAS 5161/29-1-



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Procedure

– Remove all glow plugs ⇒ page 674 .

– Remove camshafts:

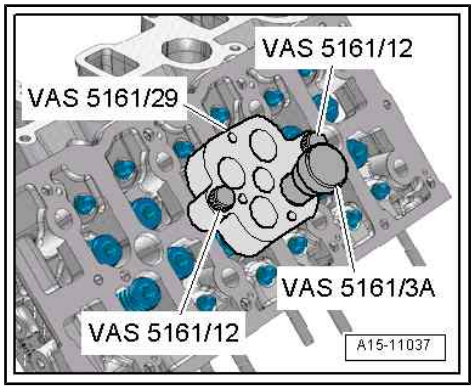
- ⇒ “4.4.1 Removing camshafts and re-installing used camshafts - cylinder bank 1 (right-side)”, page 285
- ⇒ “4.4.3 Removing camshafts and re-installing used camshafts - cylinder bank 2 (left-side)”, page 298

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

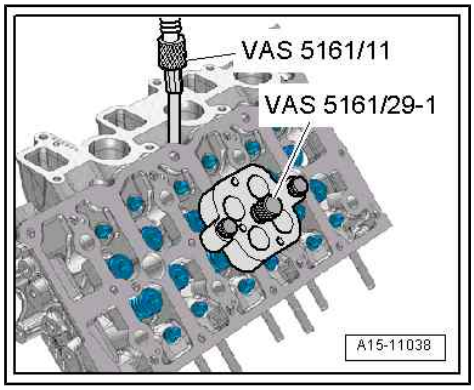
– Remove roller rocker fingers together with hydraulic compensation elements and put down on a clean surface.

– Set piston of appropriate cylinder to “bottom dead centre”.

– Fit guide plate -VAS 5161/29- onto cylinder head.
– Secure guide plate with knurled screws -VAS 5161/12- .
– Insert drift -VAS 5161/3 A- into guide plate and use plastic-headed hammer to release sticking valve cotters.



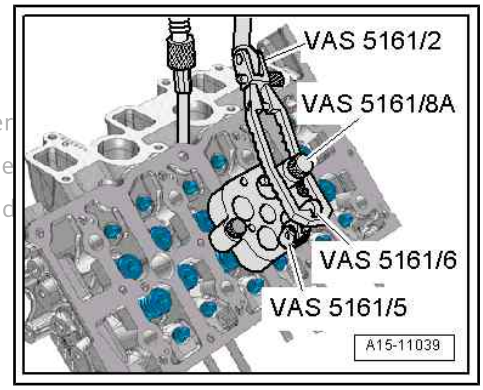
– Screw sealing pin -VAS 5161/29-1- into guide plate.
– Screw adapter -VAS 5161/11- hand-tight into corresponding glow plug thread.



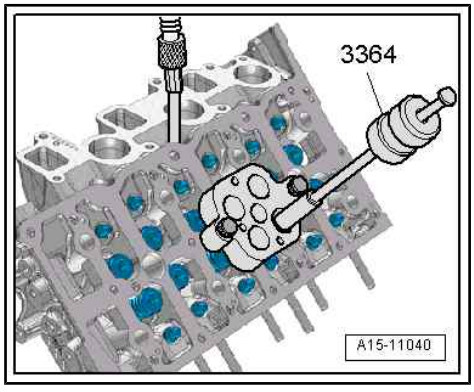
– Screw snap-in device -VAS 5161/6- with engaging fork -VAS 5161/5- into guide plate.
– Insert assembly cartridge -VAS 5161/8 A- in hole above valve spring that is to be removed.
– Connect adapter to compressed air line using a commercially available connection piece and apply constant air pressure.

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• Minimum pressure: 6 bar

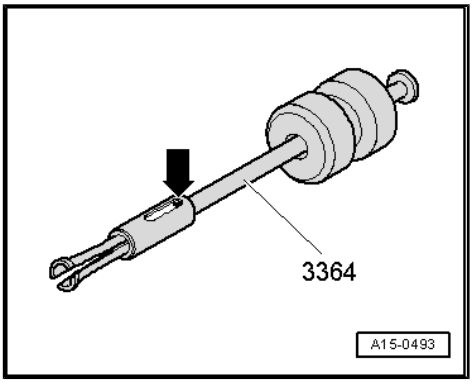


– Attach pressure fork -VAS 5161/2- to snap-in device and push assembly cartridge down.
– At the same time, turn knurled screw of assembly cartridge clockwise until tips engage in valve cotters.
– Move knurled screw back and forth slightly; the valve cotters are thus forced apart and taken up by the assembly cartridge.
– Release pressure fork.
– Take off assembly cartridge with knurled spacer ring.
– Detach valve spring with valve spring plate.
– Pull off valve stem oil seal with valve stem seal puller - 3364- .

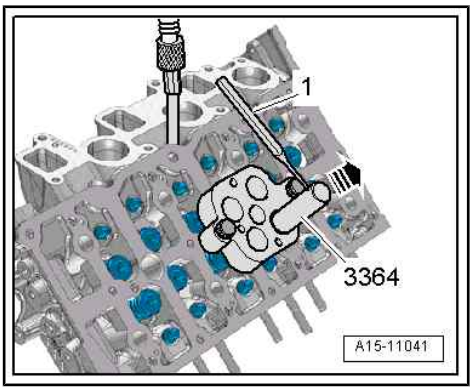


If the puller cannot be used on some of the valve stem oil seals due to the confined space, proceed as follows:

– Knock out pin -arrow- of puller using a drift and remove impact extractor attachment.



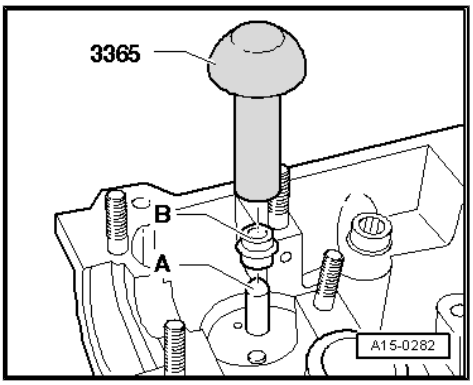
– Apply bottom section of puller -3364- to valve stem oil seal.
– Secure puller with a punch or roll-pin drift -1-, as shown in illustration.
– Apply assembly lever to puller and pull out valve stem oil seal -arrow-.



Caution

Make sure valve stem oil seals are not damaged when installing.

- ***New valve stem oil seals -B- are supplied with plastic sleeve; fit plastic sleeve -A- onto valve stem.***

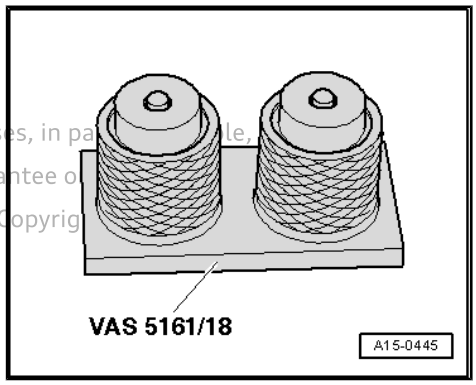


– Lightly oil sealing lip of valve stem oil seal.
– Slide valve stem oil seal onto plastic sleeve.
– Carefully press valve stem oil seal onto valve guide using valve stem seal fitting tool - 3365- .
– Take off plastic sleeve.

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

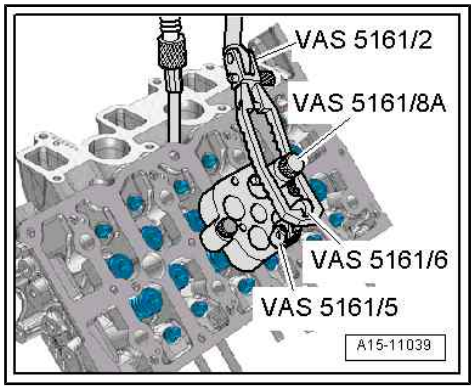
- Larger diameter of valve cotters faces upwards.

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



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– Insert assembly cartridge in guide plate -VAS 5161/29- again.
– Press down pressure fork and pull knurled screw upwards while turning screw in both directions - this will insert the valve cotters.
– Release pressure fork with knurled screw still in pulled position.
– Repeat procedure for each valve.



Attaching

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

– Install camshafts:

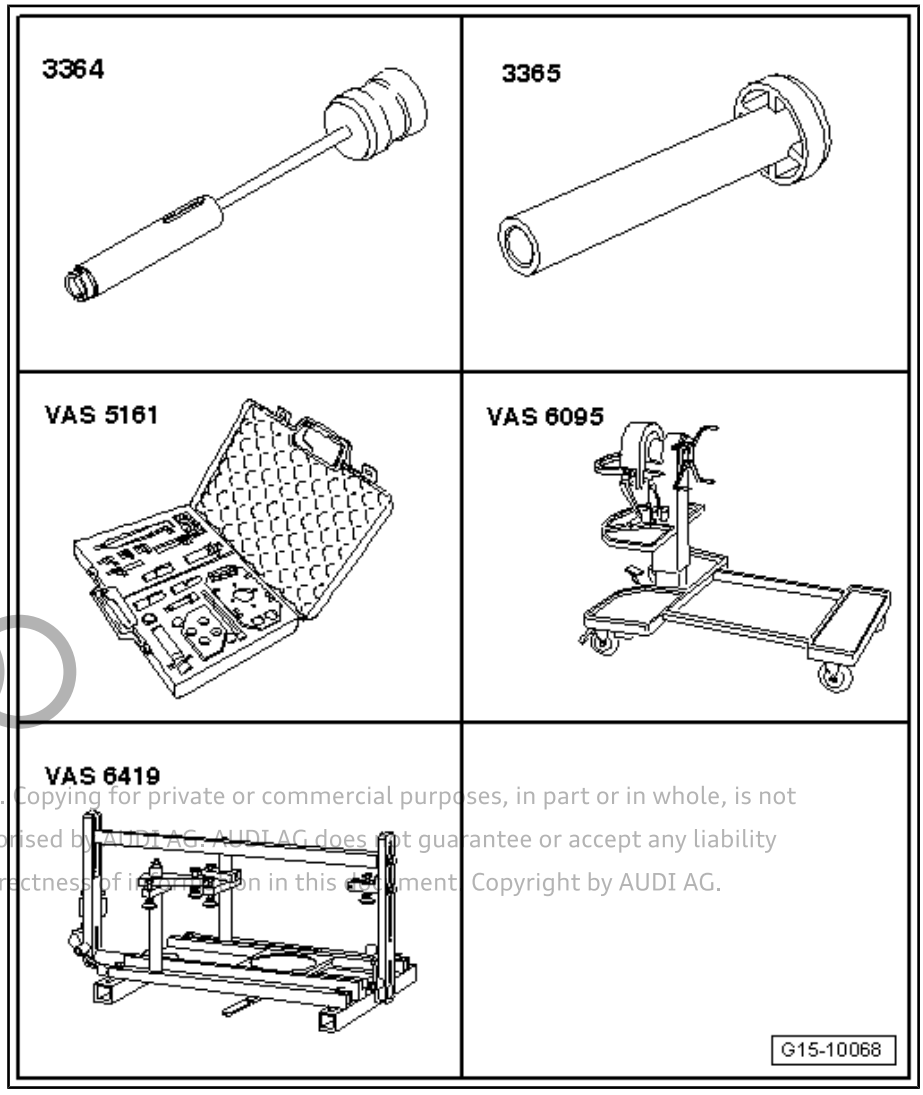
♦ ⇒ “4.4.1 Removing camshafts and re-installing used camshafts - cylinder bank 1 (right-side)”, page 285

♦ ⇒ “4.4.3 Removing camshafts and re-installing used camshafts - cylinder bank 2 (left-side)”, page 298

– Install glow plugs ⇒ page 674 .

4.5.2 Removing and installing valve stem oil seals (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 A- with drift -VAS 5161/3 A- , assembly cartridge -VAS 5161/8 A- and guide plate -VAS 5161/29-
- Engine and gearbox support - VAS 6095-
- Cylinder head tensioning device - VAS 6419-

Procedure

- Exhaust manifold removed ⇒ page 666 .

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

– Remove roller rocker fingers together with hydraulic compensation elements and put down on a clean surface.

– Insert cylinder head tensioning device - VAS 6419- into engine and gearbox support - VAS 6095- .

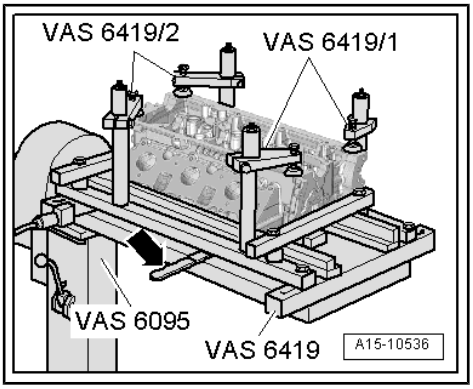
– Secure cylinder head in cylinder head tensioning device, as shown in illustration.

– Connect cylinder head tensioning device to compressed air supply.

– Using lever -arrow-, slide air pad under combustion chamber where valve stem oil seal is to be removed.

– Apply just enough compressed air to bring air pad into contact with valve heads.

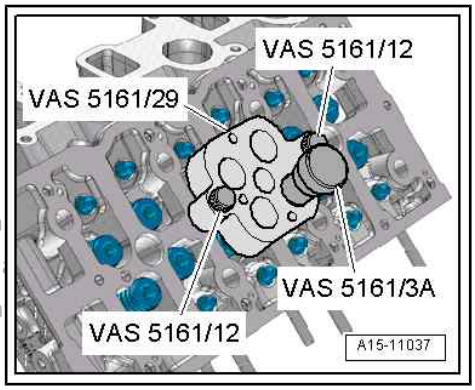
– Mark fitting location of roller rocker fingers for re-installation and remove.



– Fit guide plate -VAS 5161/29- onto cylinder head.

– Secure guide plate with knurled screws -VAS 5161/12- .

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



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– Screw snap-in device -VAS 5161/6- with engaging fork - VAS 5161/5- into guide plate.

– Insert assembly cartridge -VAS 5161/8 A- in hole above valve spring that is to be removed.

– Attach pressure fork -VAS 5161/2- to snap-in device and push assembly cartridge down.

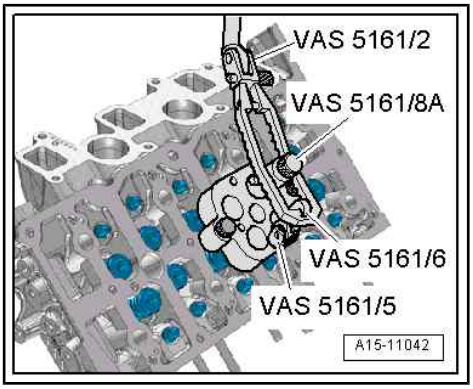
– At the same time, turn knurled screw of assembly cartridge clockwise until tips engage in valve cotters.

– Move knurled screw back and forth slightly; the valve cotters are thus forced apart and taken up by the assembly cartridge.

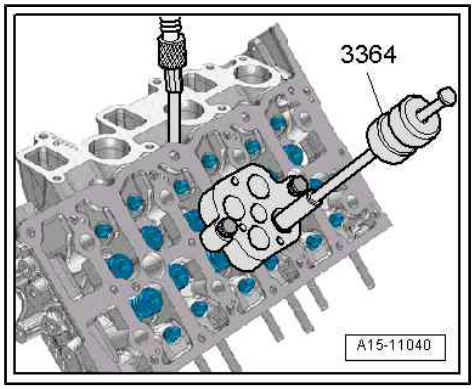
– Release pressure fork.

– Take off assembly cartridge with knurled spacer ring.

– Detach valve spring with valve spring plate.



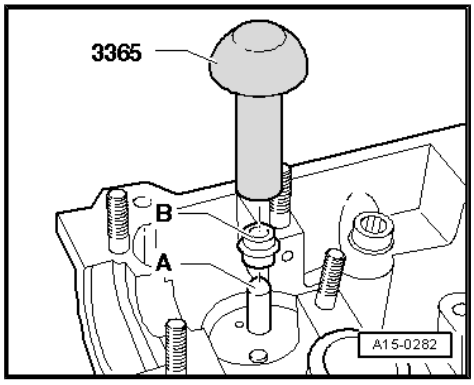
– Pull off valve stem oil seal with valve stem seal puller - 3364- .



Caution

Make sure valve stem oil seals are not damaged when installing.

- *New valve stem oil seals -B- are supplied with plastic sleeve; fit plastic sleeve -A- onto valve stem.*

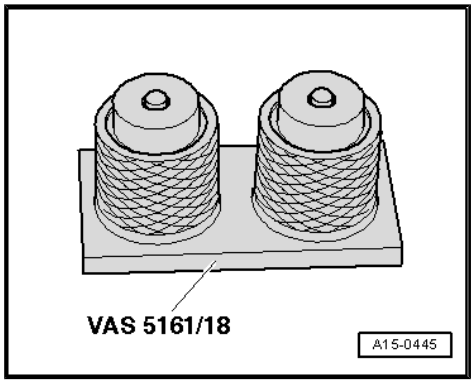


– Lightly oil sealing lip of valve stem oil seal.
– Slide valve stem oil seal onto plastic sleeve.
– Carefully press valve stem oil seal onto valve guide using valve stem seal fitting tool - 3365- .
– Take off plastic sleeve.

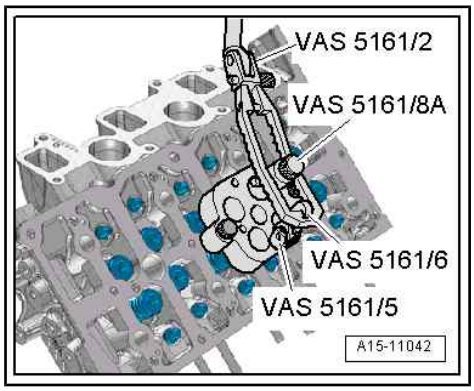
If valve cotters have been removed from assembly cartridge, they must first be inserted in insertion device -VAS 5161/18- .

- Larger diameter of valve cotters faces upwards.

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



– Insert assembly cartridge in guide plate -VAS 5161/29- again.
– Press down pressure fork and pull knurled screw upwards while turning screw in both directions - this will insert the valve cotters.
– Release pressure fork with knurled screw still in pulled position.
– Repeat procedure for each valve.



Attaching

Assemble in reverse order.

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5 Inlet and exhaust valves

⇒ “5.1 Machining valve seats”, page 315
⇒ “5.2 Checking valve guides”, page 315
⇒ “5.3 Checking valves”, page 316
⇒ “5.4 Valve dimensions”, page 317

5.1 Machining valve seats

Note

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

5.2 Checking valve guides

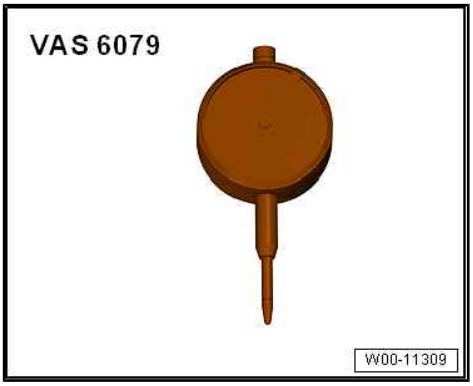
Special tools and workshop equipment required

- Universal dial gauge bracket - VW 387-

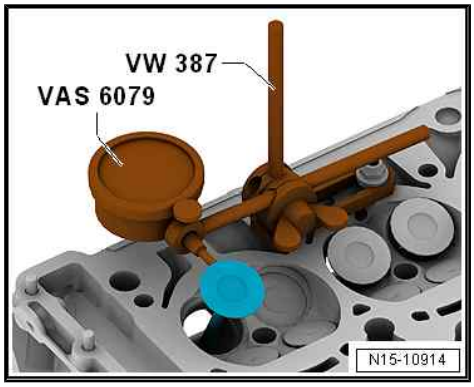


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- Dial gauge - VAS 6079-



Procedure



Note

- *If the valve has to be renewed as part of a repair, use a new valve for the measurement.*
- *Only insert inlet valve into inlet valve guide and exhaust valve into exhaust valve guide, as the stem diameters are different.*

– Insert valve into guide.

• End of valve stem must be flush with valve guide.

– Measure the amount of sideways play.

• Wear limit: 1.0 mm.

– If the wear limit is exceeded, repeat the measurement with new valves.

– Renew cylinder head if wear limit is still exceeded.

Note

Valve guides cannot be renewed.

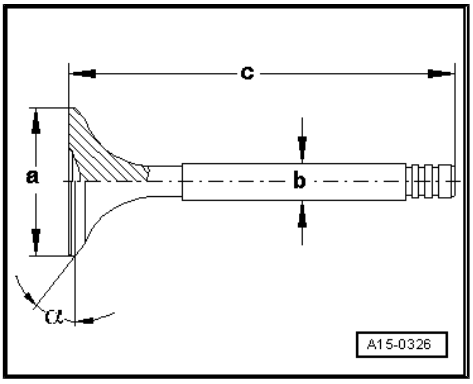
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5.3 Checking valves

– Visually inspect for scoring on valve stems and valve seat surfaces.

– Renew valve if scoring is clearly visible.

5.4 Valve dimensions



Note

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

Dimension		Inlet valve	Exhaust valve
∅ a	mm	28.5 … 28.7	25.9 … 26.1
∅ b	mm	5.968 … 5.982	5.958 … 5.972
c	mm	97.2 … 97.4	99.0 … 99.2
α	∠°	45° 10'	45° 10'

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 318

⇒ “1.2 Engine oil”, page 322

⇒ “1.3 Removing and installing sump (bottom section)”, page 322

⇒ “1.4 Removing and installing sump (top section)”, page 324

⇒ “1.5 Removing and installing oil pump”, page 329

⇒ “1.6 Removing and installing oil level and oil temperature sender G266 ”, page 330

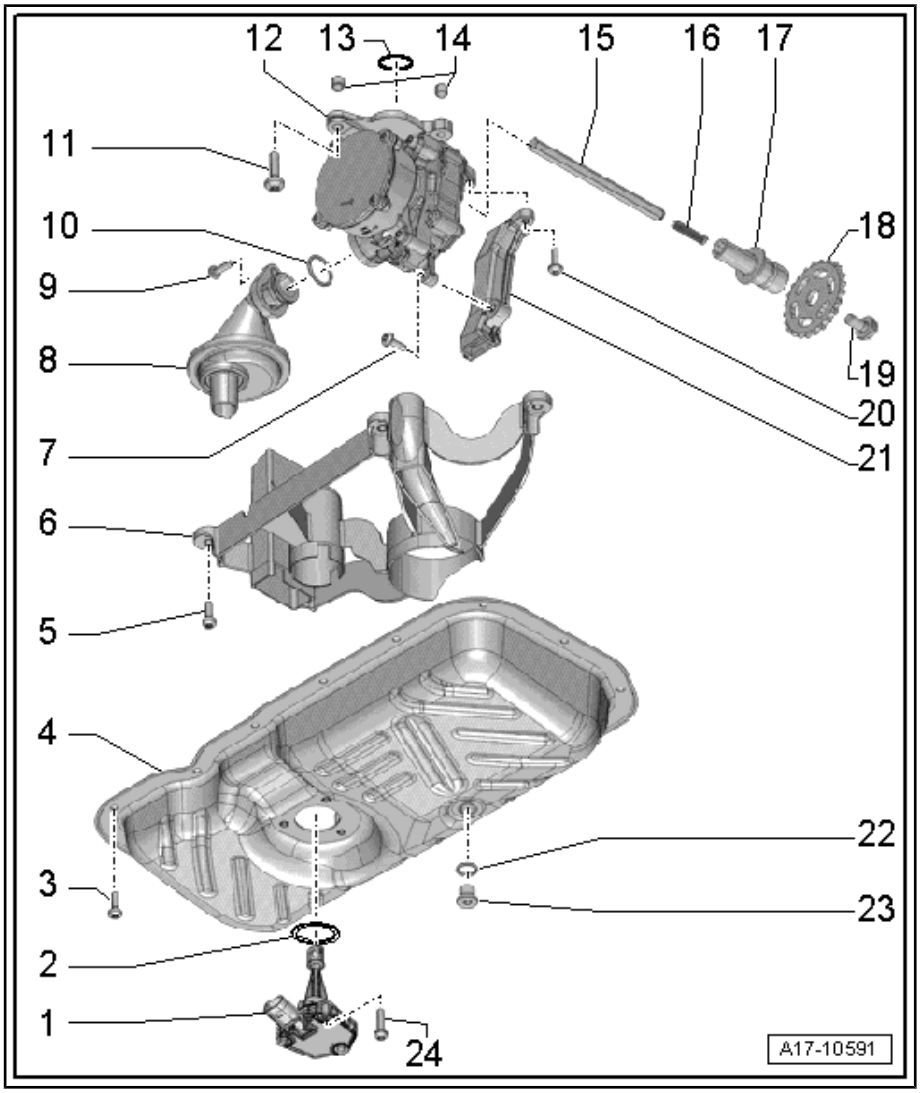
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1.1 Exploded view - sump/oil pump

Note

- *If large quantities of metal shavings or particles are found in the engine oil when repairing the engine, the oil passages must be cleaned carefully, and the engine oil cooler must be renewed in order to prevent further damage occurring later.*
- *The oil level must not be above max. mark on dipstick – danger of damage to catalytic converter.*
- *Oil spray jet for piston cooling ⇒ page 208 .*

Sump/oil pump



1 - Oil level and oil temperature sender - G266-

- ❑ Removing and installing ⇒ page 330

2 - Seal

- ❑ Renew

3 - Bolt

- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 320

4 - Sump (bottom section)

- ❑ Removing and installing ⇒ page 322

5 - Bolt

- ❑ Renew
- ❑ 3 Nm +90°

6 - Baffle plate

7 - Bolt

- ❑ Aluminium or steel bolts, depending on version
- ❑ Renew aluminium bolts
- ❑ Aluminium bolts: 3 Nm + 90°
- ❑ Steel bolts: 9 Nm

8 - Suction pipe

9 - Bolt

- ❑ 9 Nm

10 - O-ring

- ❑ Renew

11 - Bolt

- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 320

12 - Oil pump

- ❑ With vacuum pump for brake servo
- ❑ Do not dismantle
- ❑ Removing and installing ⇒ page 329

13 - O-ring

- ❑ Renew

14 - Dowel sleeves

- ❑ 2x

15 - Drive shaft

- ❑ For oil pump

16 - Compression spring

17 - Coupling

18 - Chain sprocket

- ❑ For oil pump
- ❑ Installation position: Side with lettering faces engine

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19 - Bolt

- ❑ To loosen, use pin wrench - 3212- to counterhold chain sprocket
- ❑ Renew
- ❑ 30 Nm +45°
- ❑ If bolt cannot be tightened to torque, remove sump (bottom section) with baffle plate and counterhold oil pump drive shaft using an open-end spanner.

20 - Bolt

- ❑ Aluminium or steel bolts, depending on version
- ❑ Renew aluminium bolts
- ❑ Aluminium bolts: 3 Nm + 90°
- ❑ Steel bolts: 9 Nm

21 - Oil return pipe

22 - Seal

- ❑ Renew

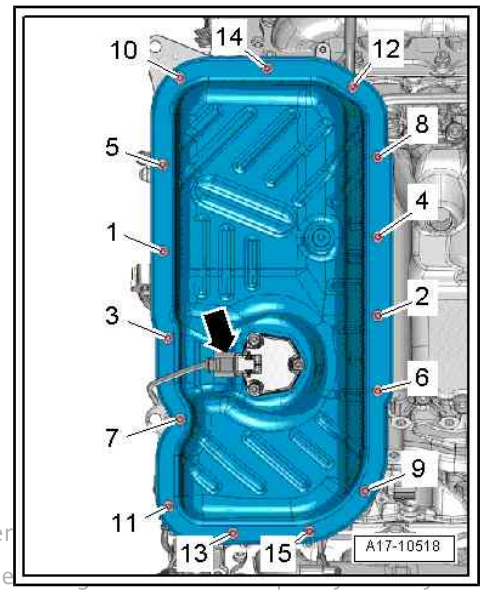
23 - Oil drain plug

- ❑ 30 Nm

24 - Bolt

- ❑ 9 Nm

Sump (bottom section) - tightening torque and sequence



Note

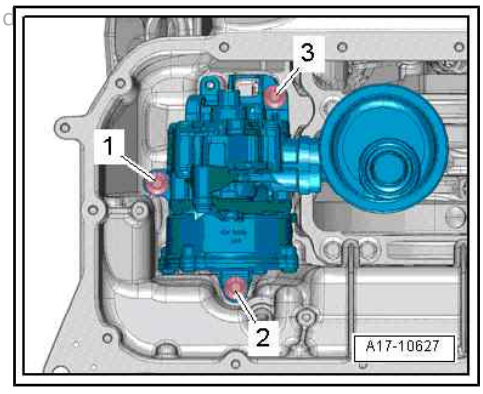
Renew the bolts tightened with specified tightening angle.

– Tighten bolts in 3 stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1.	-1 … 15-	2 Nm
2.	-1 … 15-	3 Nm
3.	-1 … 15-	Turn 45° further

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Oil pump with vacuum pump - tightening torque and sequence



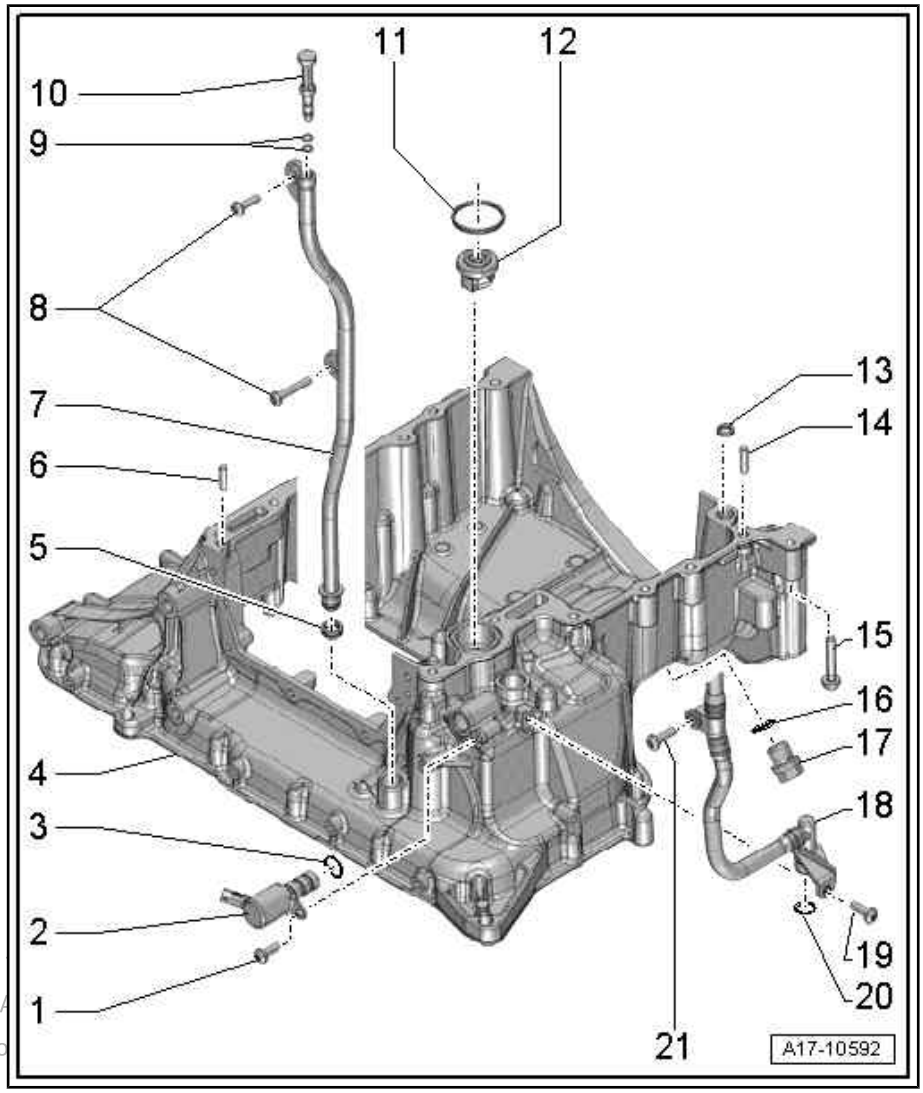
Note

Renew the bolts tightened with specified tightening angle.

– Tighten bolts in 3 stages in the sequence shown:

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

Sump (top section)



1 - Bolt
- ❑ 9 Nm

2 - Valve for oil pressure control - N428-
- ❑ Removing and installing ⇒ page 339

3 - O-ring
- ❑ Renew

4 - Sump (top section)
- ❑ Removing and installing ⇒ page 324

5 - Seal
- ❑ Renew

6 - Dowel sleeve

7 - Guide tube
- ❑ For oil dipstick

8 - Bolts
- ❑ 9 Nm

9 - O-rings
- ❑ Renew

10 - Sealing plug

11 - Seal
- ❑ Renew

12 - Oil return valve
- ❑ For engine oil cooler

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13 - Seal
- ❑ Renew

14 - Dowel sleeve

15 - Bolt
- ❑ Tightening torque and sequence ⇒ page 322

16 - Seal
- ❑ Renew

17 - Plug
- ❑ For “TDC” marking
- ❑ 25 Nm

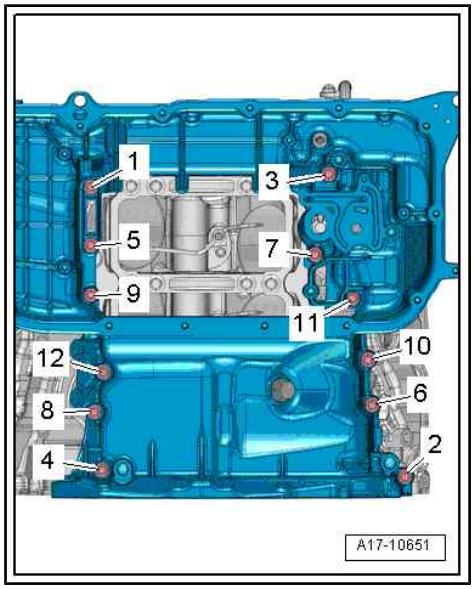
18 - Vacuum line
- ❑ From vacuum pump

19 - Bolt
- ❑ Renew
- ❑ 3 Nm +45°

20 - O-ring
- ❑ Renew

21 - Bolt
- ❑ 9 Nm

Sump (top section) - tightening torque and sequence



Note

Renew the bolts tightened with specified tightening angle.

– Tighten bolts in 3 stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1.	-1 … 12-	2 Nm
2.	-1 … 12-	5 Nm
3.	-1 … 12-	Turn 90° further

1.2 Engine oil

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

Caution

Risk of damage to catalytic converter.

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

1.3 Removing and installing sump (bottom section)

Special tools and workshop equipment required

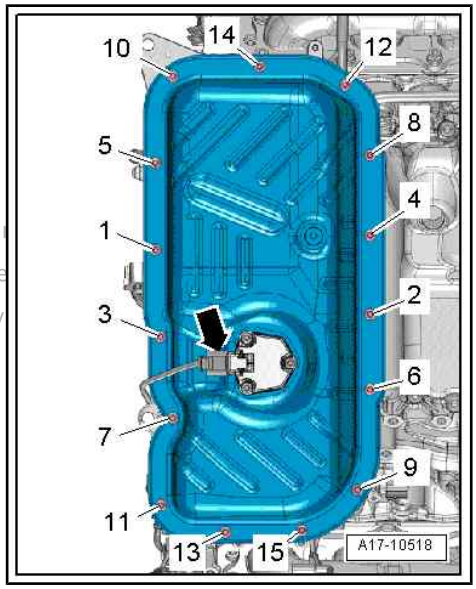
- Electric drill with plastic brush
- Safety goggles
- Sealant ⇒ Electronic parts catalogue

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Removing

- Engine oil drained ⇒ Maintenance ; Booklet 411

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



Caution

Take care to keep components clean.

- *There will still be some oil in the sump (bottom section).*

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– Slacken and remove bolts in the sequence: -15 ... 1-.

– Carefully release sump (bottom section) from bonded joint and detach.

Installing

Caution

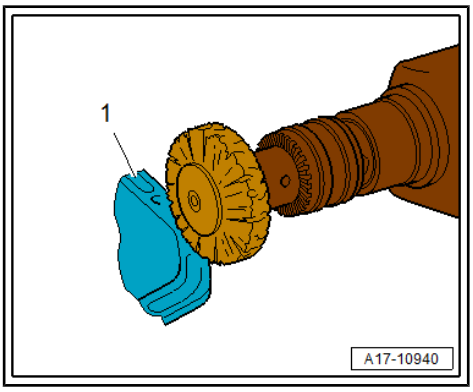
Protect lubrication system and bearings against contamination.

- *Cover exposed parts of the engine.*

WARNING

Risk of eye injury.

- *Put on safety goggles.*

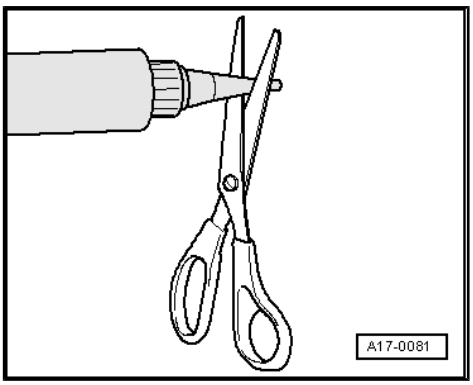


– Remove remaining sealant on bottom and top sections of sump with a rotating plastic brush or similar.

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

Note

Note the use-by date of the sealant.

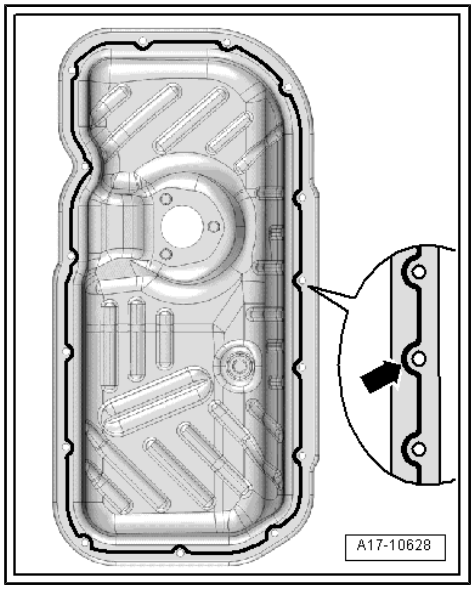


– Cut off nozzle of tube at front marking (nozzle ∅ approx. 3 mm).

Caution

Make sure lubrication system is not clogged by excess sealant.

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



– Apply sealant bead -arrow- onto clean sealing surface of sump (bottom section) as shown in illustration.

• Width of sealant bead: 3.5 mm.

Note

The sump (bottom section) must be installed within 5 minutes after applying the sealant.

– Fit sump (bottom section) and tighten bolts ⇒ page 320 .

– Fill with engine oil and check oil level ⇒ Maintenance ; Booklet 411 .

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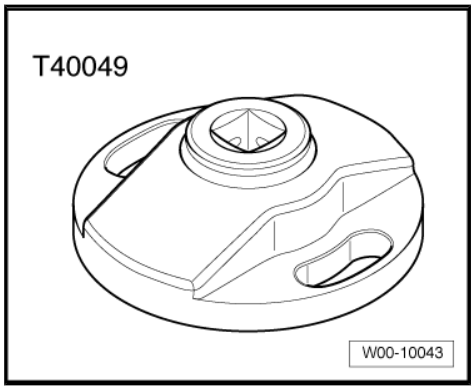
Tightening torques

- ⇒ Fig. ""Sump (bottom section) - tightening torque and sequence"" , page 320

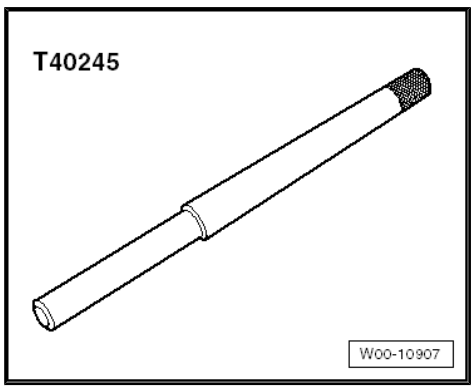
1.4 Removing and installing sump (top section)

Special tools and workshop equipment required

- Key - T40049-



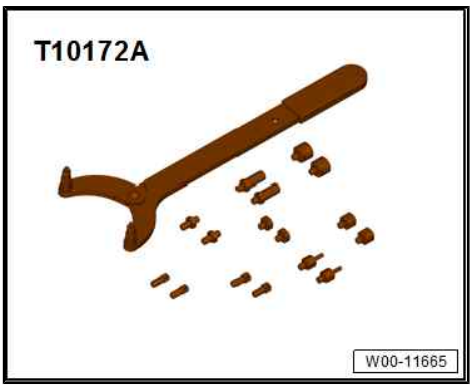
- Locking pin - T40245-



♦ Locking pin - T40316-



♦ Counterhold tool - T10172A-



♦ Safety goggles

♦ Electric drill with plastic brush

♦ Sealant ⇒ Electronic parts catalogue

Removing

• Engine removed and secured to engine and gearbox support ⇒ page 144

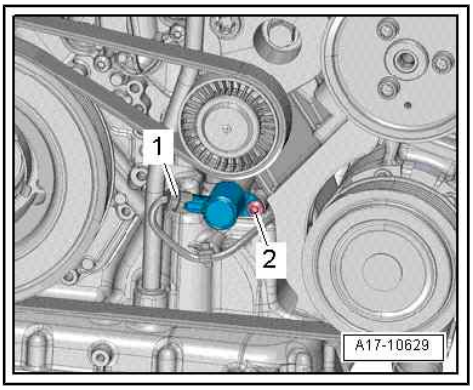
• Engine oil drained ⇒ Maintenance ; Booklet 411

– Remove timing chain cover (bottom) ⇒ page 225 .

– Remove sealing flange (pulley end) ⇒ page 189 .

– Remove oil pump ⇒ page 329 .

– Unplug electrical connector -1- at valve for oil pressure control - N428- .

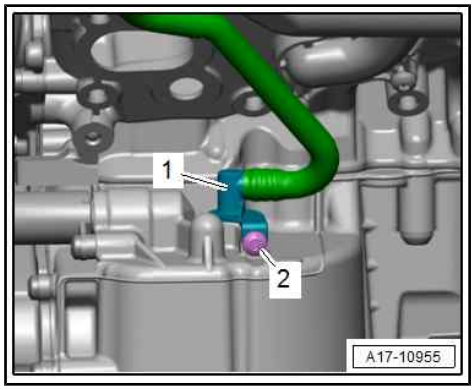


Note

Disregard -item 2-.

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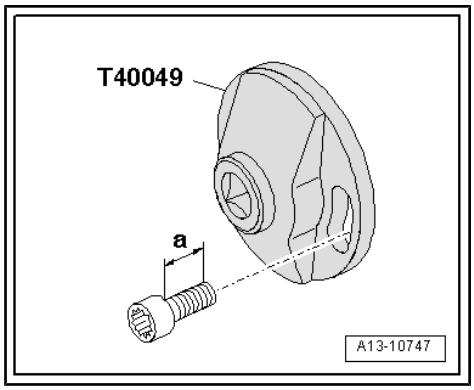
– Remove bolt -item 2- and disconnect vacuum hose -item 1-.



Caution

Risk of damage to drive chain if thread of bolt exceeds specified length.

- *Use bolts with a maximum thread length -a- of 22 mm to attach key -T40049- .*
- *If no suitable bolts are available, position suitable washer (s) under bolt head so that remaining thread length does not exceed 22 mm.*

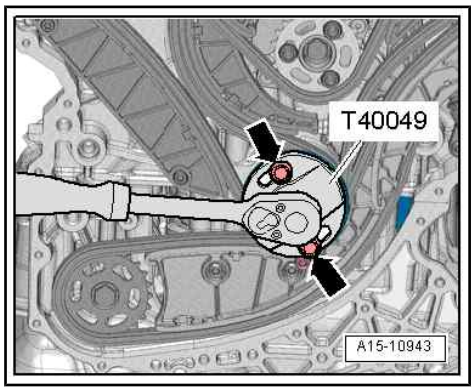


– Secure special wrench - T40049- onto rear of crankshaft -arrows-.

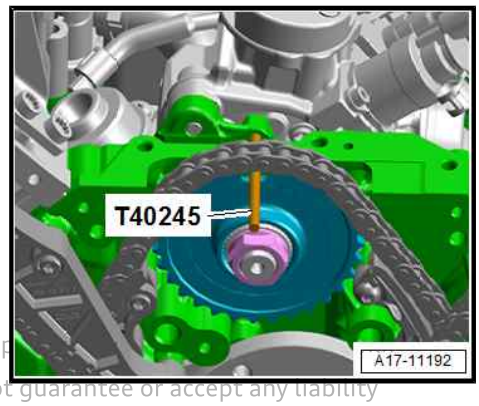
Caution

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

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

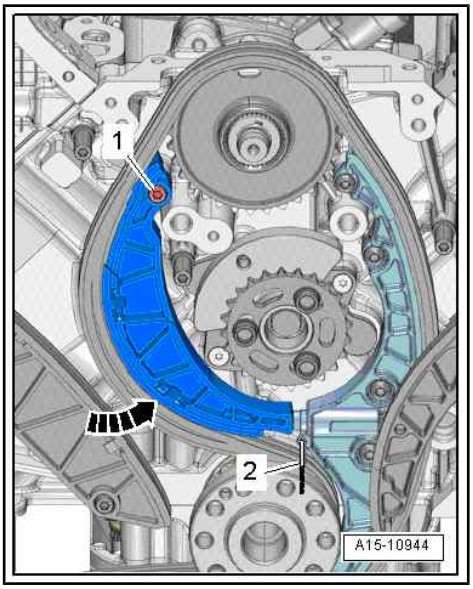


– Turn crankshaft in direction of engine rotation until high-pressure pump sprocket can be locked in position with locking pin - T40245- , as shown in illustration.

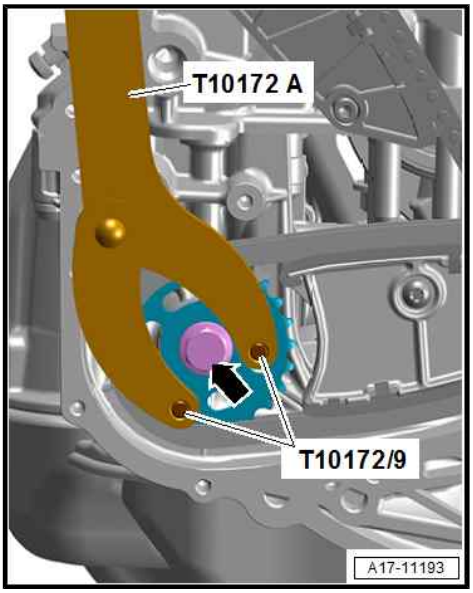


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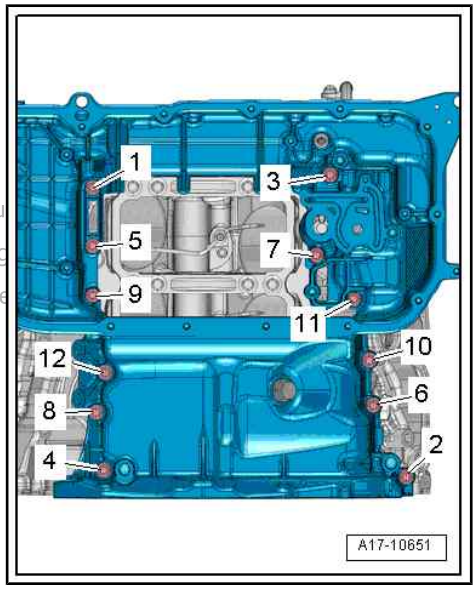
– Press tensioning rail of chain tensioner in direction of -arrow- and lock chain tensioner by inserting locking pin -T40316- -item 2-.



– Using counterhold tool - T10172A- , release and remove bolt -1-.
– Pull off drive chain with chain sprocket (leave in installation position).



– Slacken and remove bolts in the sequence: -12 ... 1-.
– Carefully release sump (top section) from bonded joint, pry sump off dowel sleeves and detach.



Installing

Note

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Renew gaskets, seals and O-rings.

Caution

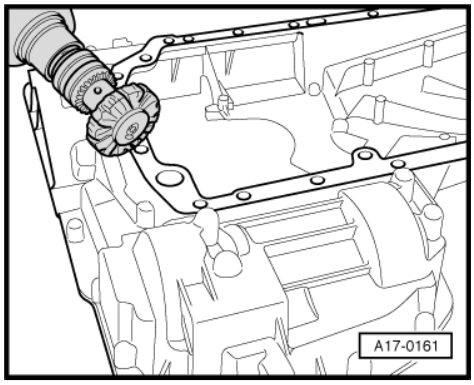
Protect lubrication system against contamination.

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

WARNING

Risk of eye injury.

- *Put on safety goggles.*



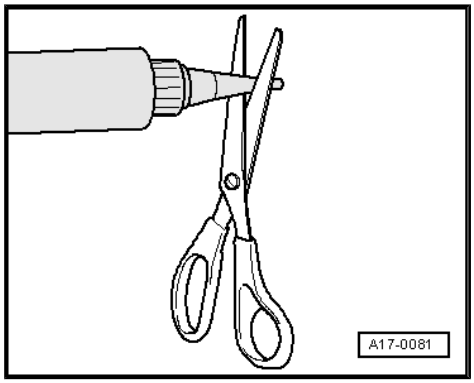
– Remove remaining sealant from sump (top section) and cylinder block using rotating plastic brush or similar.

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

Note

Note the use-by date of the sealant.

– Cut off nozzle of tube at front marking (nozzle ∅ approx. 3 mm).

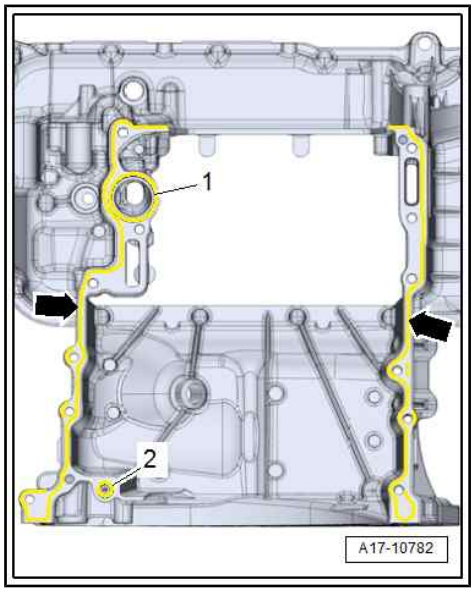


– Fit seals -1 and 2- in sump (top section).

Caution

Make sure lubrication system is not clogged by excess sealant.

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



– Apply beads of sealant -arrows- onto clean sealing surface of sump (top section) as shown in illustration.

- The grooves on the sealing surfaces must be completely filled with sealant.
- The beads of sealant must project 3.5 mm above the sealing surface.

Note

The sump (top section) must be installed within 5 minutes after applying the sealant.

– Fit sump (top section) and tighten bolts ⇒ page 322 .

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

– Install oil pump ⇒ page 329 .

– Install sealing flange (pulley end) ⇒ page 189 .

– Install timing chain cover (bottom) ⇒ page 225 .

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1.5 Removing and installing oil pump

Note

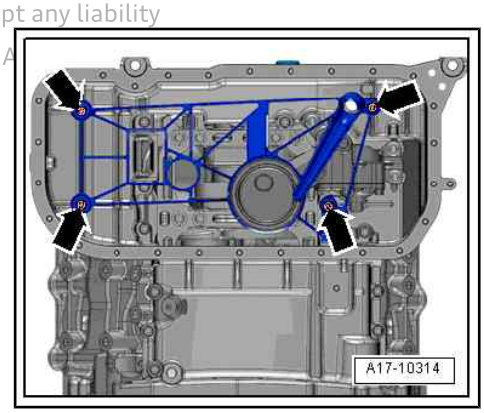
The oil pump is removed and installed together with the vacuum pump.

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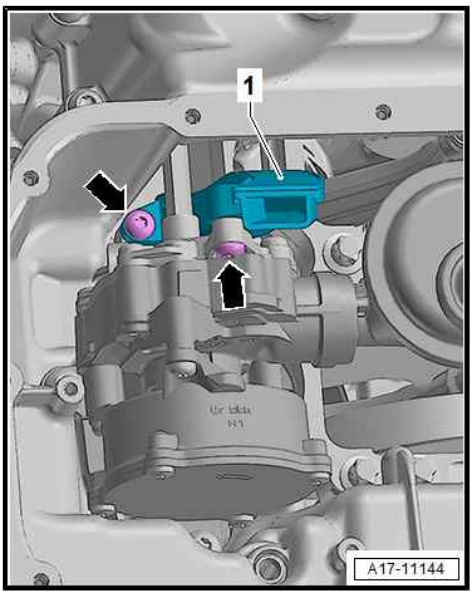
Removing

– Remove sump (bottom section) ⇒ page 322 .

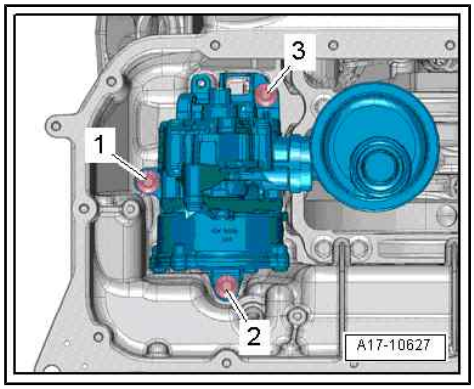
– Remove bolts -arrows- and detach baffle plate.



– Remove bolts -arrows- and detach oil return pipe -1-.



– Remove bolts -1, 2, 3-.
– Press oil pump drive shaft back against spring pressure and detach oil pump.



Note

Oil pump drive shaft remains in position.

Installing

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

– Check that the two dowel sleeves are fitted in the oil pump. Install missing dowel sleeves.
– Install sump (bottom section) ⇒ page 322 .
– Fill with engine oil and check oil level ⇒ Maintenance ; Booklet 411 .

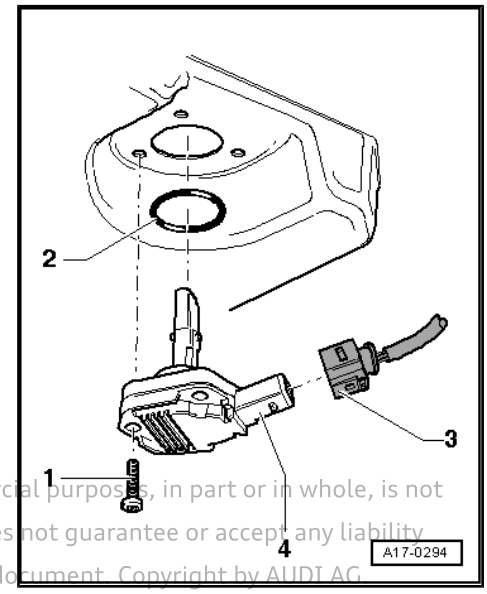
Tightening torques

♦ ⇒ “1.1 Exploded view - sump/oil pump”, page 318

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

Removing

• Engine oil drained ⇒ Maintenance ; Booklet 411
– Unplug electrical connector -3-.
– Remove bolts -1- and detach oil level and oil temperature sender - G266- -item 4-.



Installing

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

Note

Renew seal -2-.

– Fill with engine oil and check oil level ⇒ Maintenance ; Booklet 411 .

Tightening torques

♦ ⇒ “1.1 Exploded view - sump/oil pump”, page 318

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2 Engine oil cooler

⇒ “2.1 Exploded view - engine oil cooler”, page 331

⇒ “2.2 Removing and installing engine oil cooler”, page 332

⇒ “2.3 Removing and installing mounting plate for engine oil cooler/coolant shut-off valve”, page 333

⇒ “2.4 Removing and installing temperature regulator for engine oil cooler”, page 333

2.1 Exploded view - engine oil cooler

Engine oil cooler, coolant shut-off valve

1 - Gaskets
- ❑ For mounting plate

2 - Mounting plate
- ❑ For engine oil cooler

3 - Bolt
- ❑ 9 Nm

4 - Gasket
- ❑ For engine oil cooler
- ❑ Renew

5 - Bolt
- ❑ 9 Nm

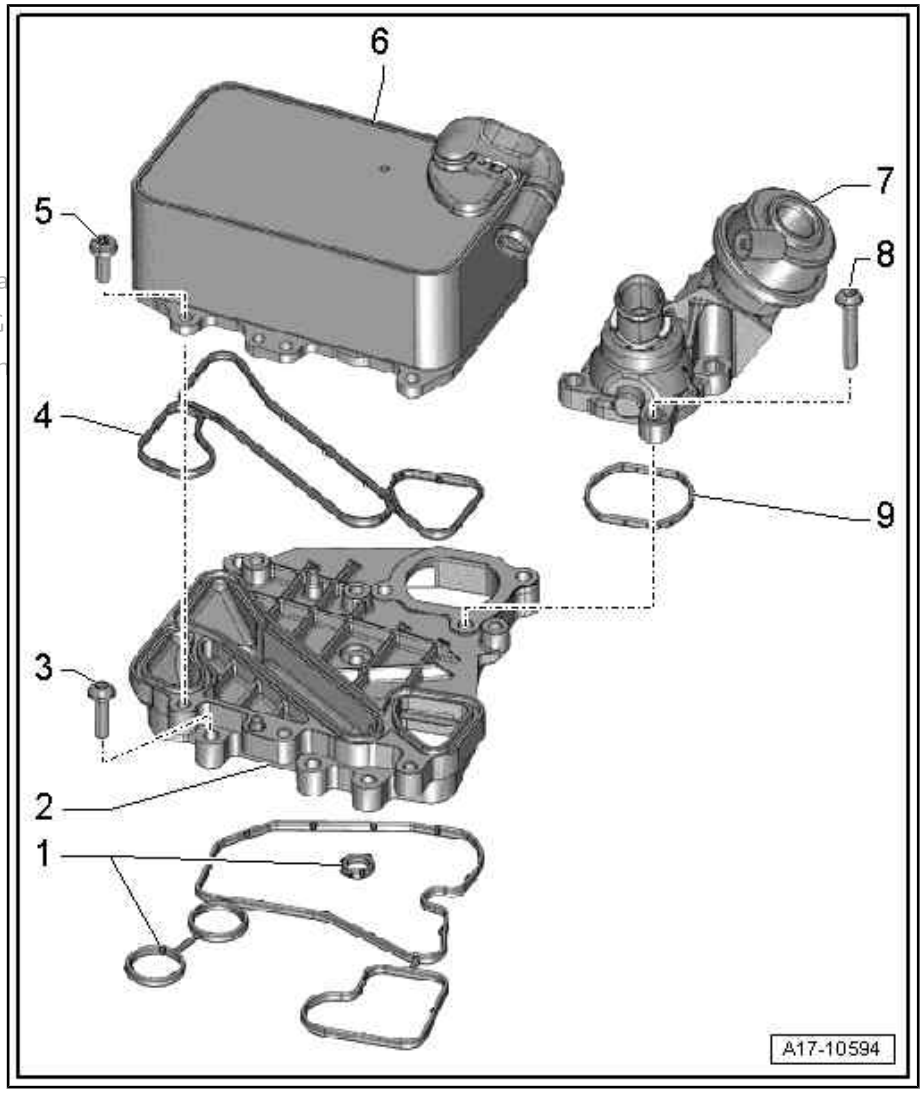
6 - Engine oil cooler
- ❑ See note ⇒ page 318
- ❑ Removing and installing ⇒ page 332

7 - Coolant shut-off valve
- ❑ Removing and installing ⇒ page 375

8 - Bolt
- ❑ Tightening torque ⇒ Item 3 (page 368)

9 - Gasket
- ❑ For shut-off valve
- ❑ Renew

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Temperature regulator for engine oil cooler

1 - Cover

- ❑ For temperature regulator for engine oil cooler
- ❑ Removing and installing ⇒ “1.8.1 Removing and installing sealing flange (pulley end)”, page 189

2 - Bolt

- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 179

3 - O-ring

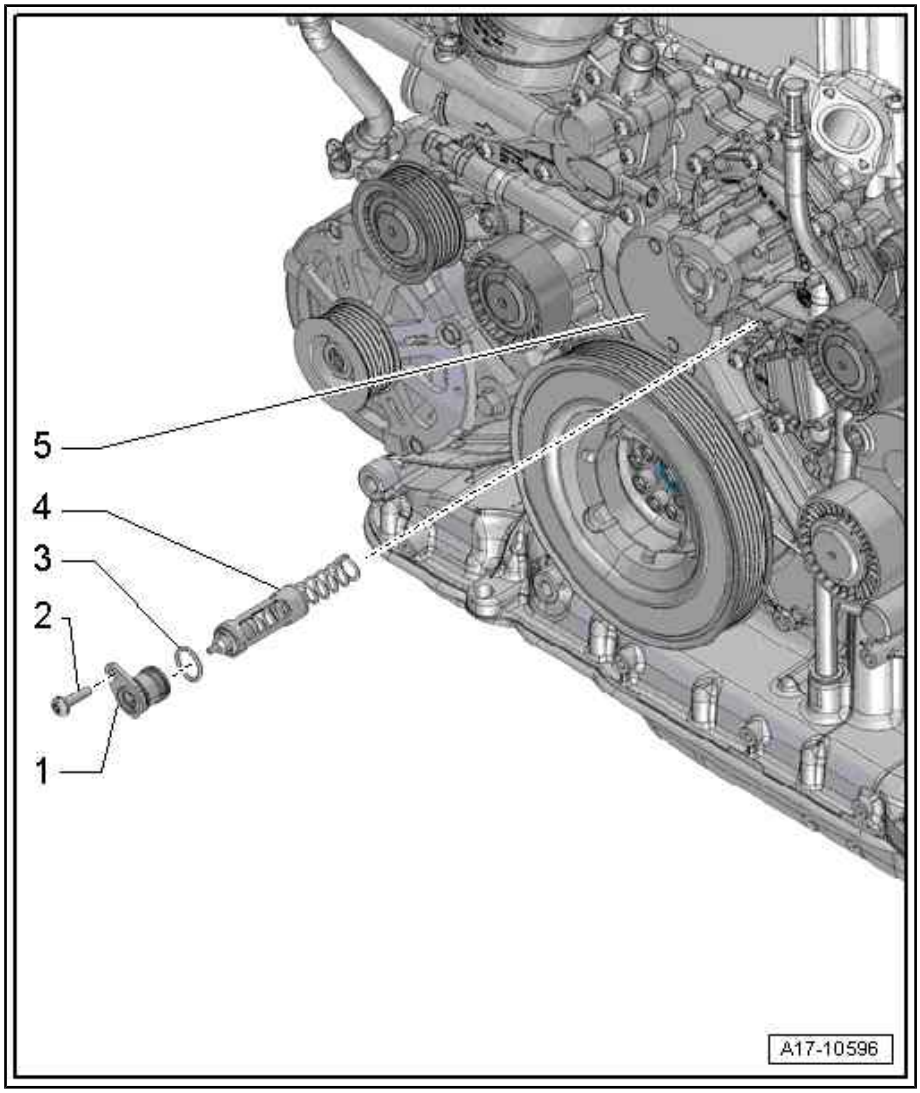
- ❑ Renew

4 - Temperature regulator for engine oil cooler

- ❑ Removing and installing ⇒ page 333

5 - Sealing flange

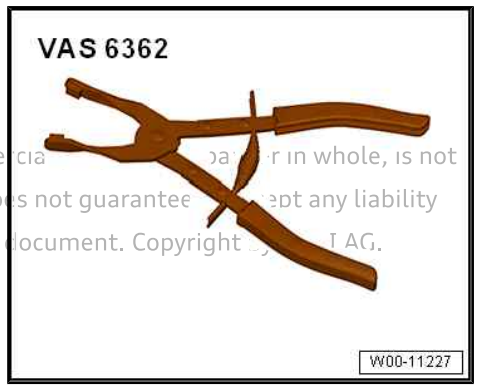
- ❑ Pulley end
- ❑ Removing and installing ⇒ page 189



2.2 Removing and installing engine oil cooler

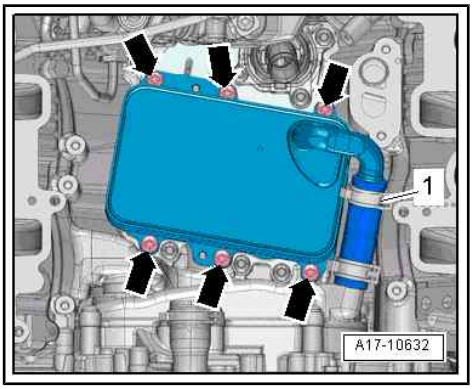
Special tools and workshop equipment required

- ♦ Hose clip pliers - VAS 6362-



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Removing



– Remove exhaust gas recirculation cooler ⇒ page 660 .
– Remove bolts -arrows-.
– Open hose clip -1- and disconnect coolant hose from engine oil cooler.
– Detach engine oil cooler.

Installing

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

Note

♦ *Renew seal.*
♦ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

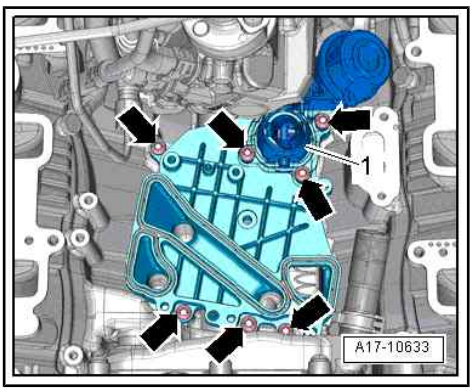
– Install exhaust gas recirculation cooler ⇒ page 660 .
– Check engine oil level.

Tightening torques

♦ ⇒ “2.1 Exploded view - engine oil cooler”, page 331

2.3 Removing and installing mounting plate for engine oil cooler/coolant shut-off valve

Removing



– Remove engine oil cooler ⇒ page 332 .
– Remove bolts -arrows-.
– Move coolant shut-off valve -1- to one side and detach mounting plate for engine oil cooler and shut-off valve.

Installing

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

Note

Renew seals and/or gaskets.

– Install engine oil cooler ⇒ page 332 .

Tightening torques

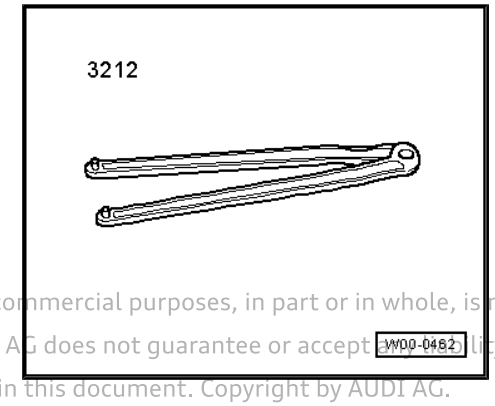
♦ ⇒ “2.1 Exploded view - engine oil cooler”, page 331

2.4 Removing and installing temperature regulator for engine oil cooler

Special tools and workshop equipment required

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- Pin wrench - 3212-



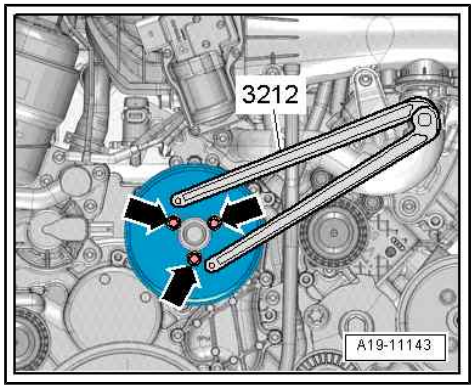
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- M6 bolt

Removing

– Remove poly V-belt ⇒ page 180 .

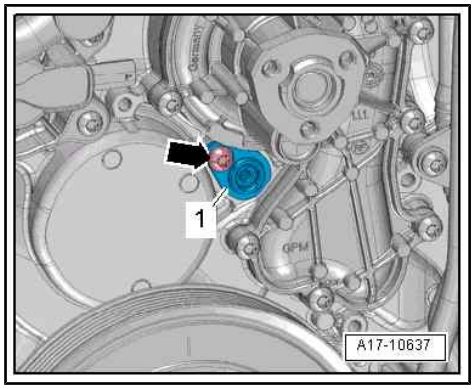
– Remove bolts for coolant pump pulley -arrows- (counterhold with pin wrench - 3212-).



Note

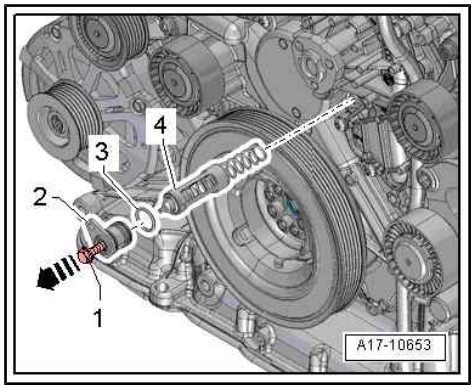
Place a cloth underneath to catch escaping engine oil.

– Remove bolt -arrow- for cover -1-.



– To remove cover -2-, screw M6 bolt -item 1- into thread in cover and pull out cover by lifting bolt.

– Pull out temperature regulator -4- for engine oil cooler.



Installing

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

Note

Fit new O-ring -3-.

– Install poly V-belt pulley for coolant pump ⇒ page 367 .

– Install poly V-belt ⇒ page 180 .

Tightening torques

- ⇒ “2.1 Exploded view - engine oil cooler”, page 331

3 Oil filter/oil pressure switches

⇒ “3.1 Exploded view - oil filter housing/oil pressure switch”, page 335

⇒ “3.2 Removing and installing oil pressure switch F22 / F378 ”, page 336

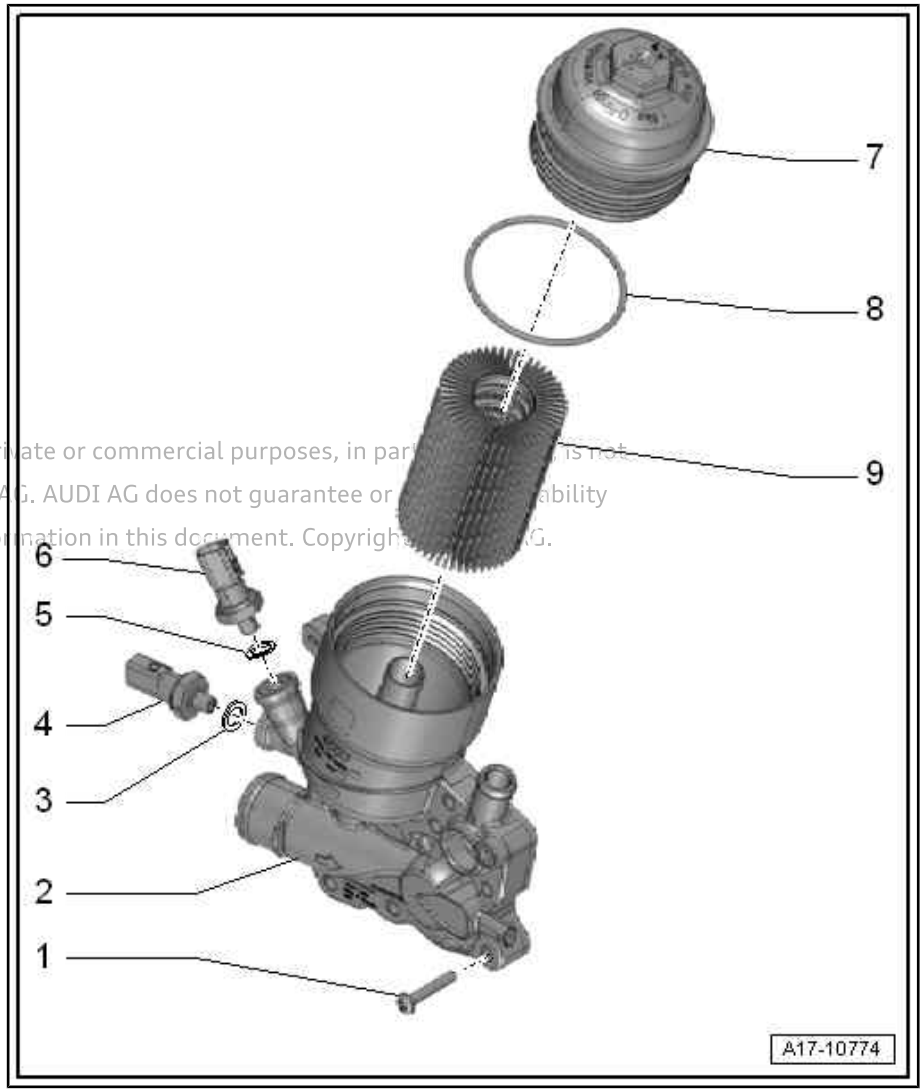
⇒ “3.3 Checking oil pressure”, page 337

⇒ “3.4 Removing and installing oil filter housing”, page 338

⇒ “3.5 Removing and installing valve for oil pressure control N428 ”, page 339

⇒ “3.6 Removing and installing oil temperature sender 2 G664 ”, page 340

3.1 Exploded view - oil filter housing/oil pressure switch



1 - Bolt

- ❑ 9 Nm

2 - Oil filter housing

- ❑ With map-controlled engine cooling system thermostat - F265-
- ❑ Removing and installing ⇒ page 338
- ❑ Renew after removing

3 - Seal

- ❑ Permanently attached to oil pressure switch; not available as a replacement part

4 - Oil pressure switch - F22-

- ❑ Opening/closing pressure 2.0 ... 2.5 bar
- ❑ Green insulation
- ❑ Check in Guided Fault Finding ⇒ Vehicle diagnostic tester
- ❑ Removing and installing ⇒ page 336
- ❑ 20 Nm

5 - Seal

- ❑ Permanently attached to oil pressure switch; not available as a replacement part

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

- ❑ Opening/closing pressure 0.75 ... 1.05 bar
- ❑ Grey insulation
- ❑ Check in Guided Fault Finding ⇒ Vehicle diagnostic tester
- ❑ Removing and installing ⇒ page 336
- ❑ 20 Nm

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7 - Sealing cap

- ❑ With oil filter bypass valve
- ❑ 35 Nm

8 - O-ring

- ❑ Renew

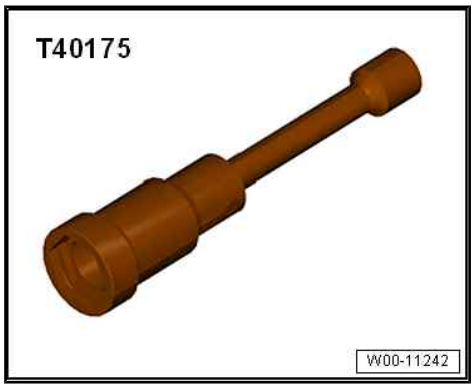
9 - Oil filter element

- ❑ Removing and installing ⇒ Maintenance ; Booklet 411

3.2 Removing and installing oil pressure switch -F22- / -F378-

Special tools and workshop equipment required

- ♦ Articulated wrench, 24 mm - T40175-



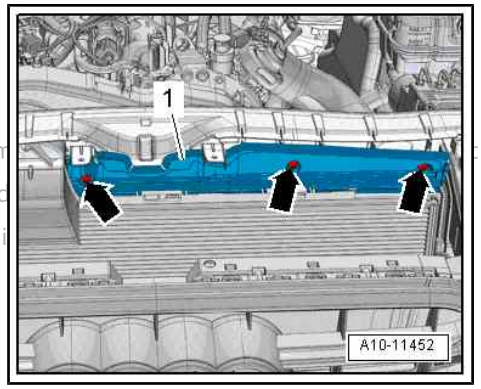
Removing

– Remove engine cover panel ⇒ page 172 .

Oil pressure switch - F22- :

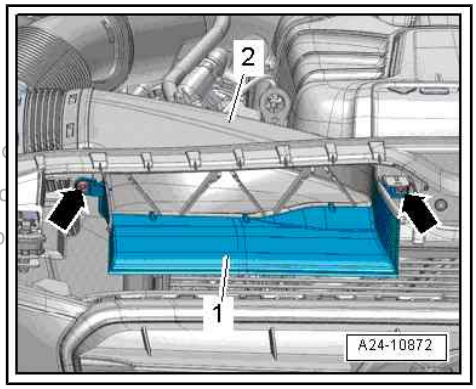
– Remove lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing attachments .

– Remove bolts -arrows- and detach air duct -1-.



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– Remove bolts -arrows- and detach air duct -2-.



Note

Disregard -item 1-.

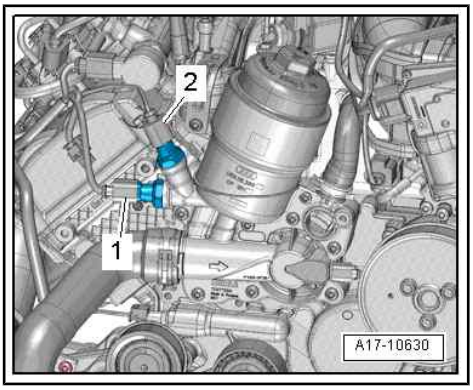
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Continuation for both oil pressure switches:

– Unplug electrical connectors:

1 - For oil pressure switch - F22-

2 - For oil pressure switch for reduced oil pressure - F378-



Note

Place a cloth underneath to catch escaping engine oil.

– Use articulated wrench, 24 mm - T40175- to remove relevant oil pressure switch.

Installing

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

– Install lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing attachments .

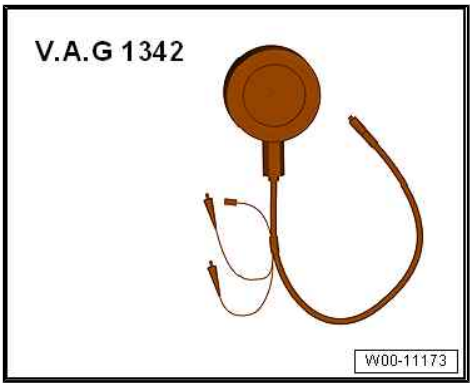
Tightening torques

- ⇒ “3.1 Exploded view - oil filter housing/oil pressure switch”, page 335
- ⇒ “3.1 Exploded view - air cleaner housing”, page 509

3.3 Checking oil pressure

Special tools and workshop equipment required

- Oil pressure tester - V.A.G 1342- with adapter -V.A.G 1342/14-



Procedure

- Oil level OK

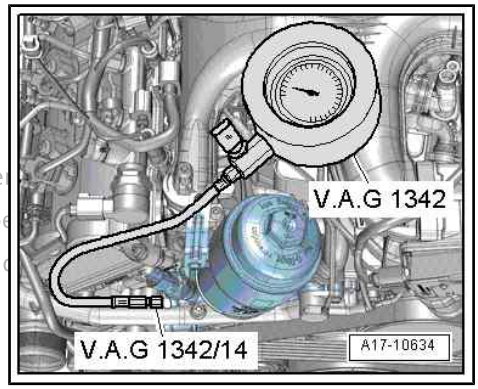
– Remove oil pressure switch - F22- ⇒ page 336 .

– Connect oil pressure tester - V.A.G 1342- with adapter -V.A.G 1342/14- , as shown in illustration.

– Screw oil pressure switch - F22- into hole in -V.A.G 1342- to seal hole.

– Start engine.

- Oil pressure when starting and then at idling speed: at least 0.8 bar.



If specification is not obtained, switch off engine immediately and check oil pump drive; renew oil pump if necessary ⇒ “1.5 Removing and installing oil pump”, page 329 .

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:

– Unscrew adapter -V.A.G 1342/14- and install oil pressure switch - F22- ⇒ page 336 .

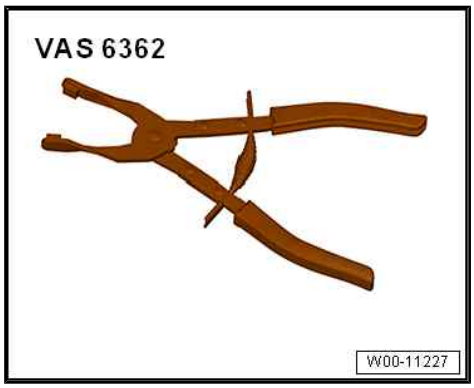
3.4 Removing and installing oil filter housing

Note

The seals on the oil filter housing can only be used once and cannot be supplied as replacement parts. After removing the oil filter housing, it must always be renewed.

Special tools and workshop equipment required

♦ Hose clip pliers - VAS 6362-



Removing

– Remove coolant pipe (front) ⇒ page 384 .

– Remove oil filter element ⇒ Maintenance ; Booklet 411 .

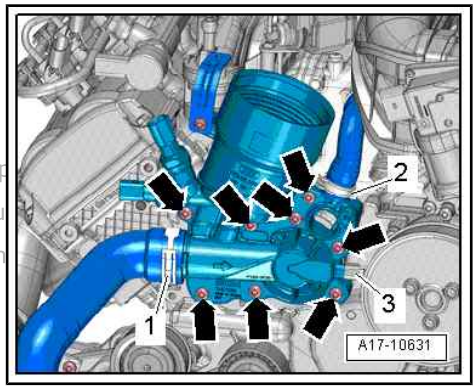
– Remove poly V-belt ⇒ page 180 .

– Remove oil pressure switch - F22- and oil pressure switch for reduced oil pressure - F378- ⇒ page 336 .

– Open hose clips -1 and 2- and disconnect coolant hoses from oil filter housing.

– Remove bolts -arrows-.

– Detach oil filter housing and unplug electrical connector -3-.



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Installing

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

Note

- *Renew oil filter housing.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

– Install oil pressure switch - F22- and oil pressure switch for reduced oil pressure - F378- ⇒ page 336 .

– Install poly V-belt ⇒ page 180 .

– Install oil filter element ⇒ Maintenance ; Booklet 411 .

– Install coolant pipe (front) ⇒ page 384 .

Tightening torques

- ⇒ “3.1 Exploded view - oil filter housing/oil pressure switch”, page 335

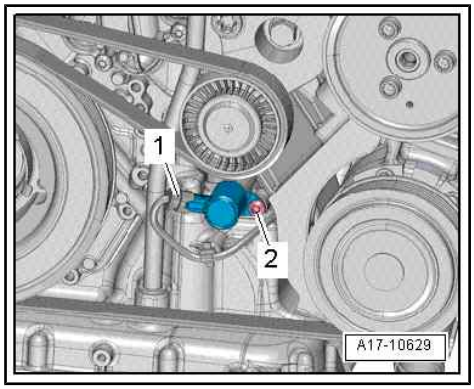
3.5 Removing and installing valve for oil pressure control - N428-

Removing

– Vehicles with two turbochargers: Remove poly V-belt ⇒ page 180 .

– Remove noise insulation (front) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

– Unplug electrical connector -1-.



Note

Place a cloth underneath to catch escaping engine oil.

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

Installing

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

Note

Fit new O-ring.

– Check oil level ⇒ Maintenance ; Booklet 411 .
– Vehicles with two turbochargers: Install poly V-belt ⇒ page 180 .

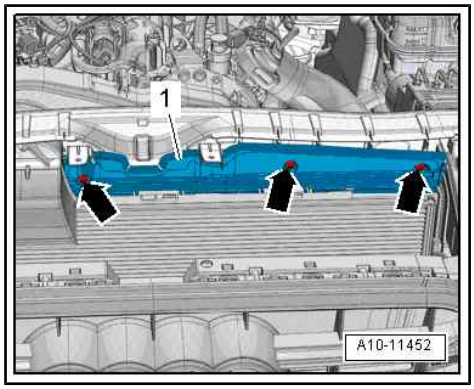
Tightening torques

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

3.6 Removing and installing oil temperature sender 2 - G664-

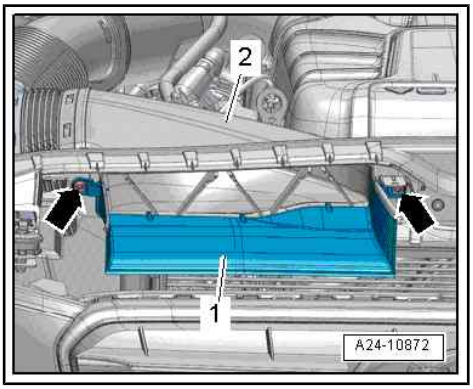
Removing

– Remove engine cover panel ⇒ page 172 .
– Remove lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing attachments .
– Remove bolts -arrows- and detach air duct -1-.



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– Remove bolts -arrows- and detach air duct -2-.



Note

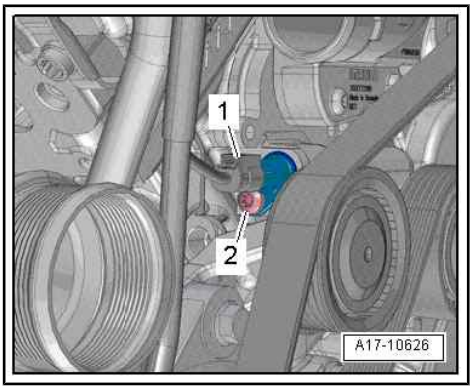
Disregard -item 1-.

– Unplug electrical connector -1-.

Caution

Oil will escape through mounting hole for oil temperature sender.

- ***Lay a cloth under the mounting hole to catch escaping engine oil or close the mounting hole using a clean plug from the engine bung set - VAS 6122- .***



– Unscrew bolt -2- and remove oil temperature sender 2 - G664- .

Installing

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

Note

Fit new O-ring.

– Install lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing attachments .

Tightening torques

- ⇒ “1.2 Exploded view - sealing flange (pulley end)”, page 176
- ⇒ “3.1 Exploded view - air cleaner housing”, page 509

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19 – Cooling

1 Cooling system/coolant

⇒ “1.1 Connection diagram - coolant hoses”, page 342

⇒ “1.2 Checking cooling system for leaks”, page 358

⇒ “1.3 Draining and filling cooling system”, page 359

1.1 Connection diagram - coolant hoses

⇒ “1.1.1 Connection diagram - coolant hoses, vehicles with one turbocharger and without auxiliary heater”, page 342

⇒ “1.1.2 Connection diagram - coolant hoses, vehicles with one turbocharger and with auxiliary heater”, page 345

⇒ “1.1.3 Connection diagram - coolant hoses, vehicles with one turbocharger and water-cooled SCR valve and without auxiliary heater”, page 347

⇒ “1.1.4 Connection diagram - coolant hoses, vehicles with one turbocharger and water-cooled SCR valve and with auxiliary heater”, page 349

⇒ “1.1.5 Connection diagram - coolant hoses, vehicles with two turbochargers, without SCR system and without auxiliary heater”, page 351

⇒ “1.1.6 Connection diagram - coolant hoses, vehicles with two turbochargers, without SCR system and with auxiliary heater”, page 353

⇒ “1.1.7 Connection diagram - coolant hoses, vehicles with two turbochargers, with SCR system and without auxiliary heater”, page 354

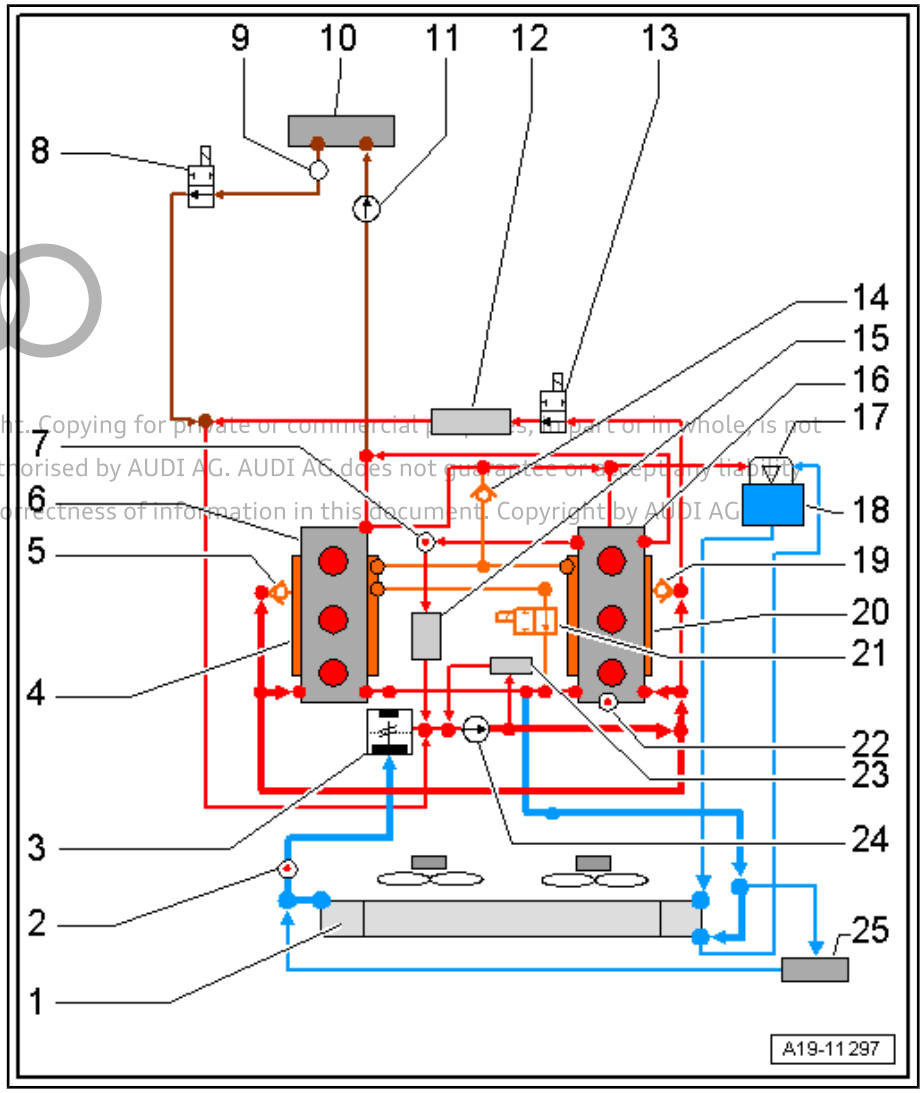
⇒ “1.1.8 Connection diagram - coolant hoses, vehicles with two turbochargers, with SCR system and with auxiliary heater”, page 356

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1.1.1 Connection diagram - coolant hoses, vehicles with one turbocharger and without auxiliary heater

Note

- *Blue = Large coolant circuit*
- *Red = Small coolant circuit*
- *Orange = Coolant circuit for cylinder block.*
- *Brown = Heating circuit*
- *Arrows show direction of coolant flow.*



1 - Radiator

2 - Radiator outlet coolant temperature sender - G83-

3 - Map-controlled engine cooling system thermostat - F265-

4 - Cylinder block

- Cylinder bank 1 (right-side)

5 - Non-return valve

- Removing and installing ⇒ page 377

6 - Cylinder head

- Cylinder bank 1 (right-side)

7 - Coolant temperature sender - G62-

8 - Coolant shut-off valve - N82-

- In RHD vehicles: In supply line for heat exchanger for heater
- Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Coolant circuit; Removing and installing coolant shut-off valve - N82-

9 - Bleeder screw

10 - Heat exchanger for heater

- Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Front air conditioning unit; Removing and installing heat exchanger

11 - Coolant circulation pump - V50-

- Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Coolant circuit; Overview of fitting locations - coolant circuit

12 - ATF cooler

- Removing and installing ⇒ Rep. gr. 34 ; ATF circuit; Removing and installing ATF cooler or ⇒ Rep. gr. 37 ; ATF circuit; Removing and installing ATF cooler .

13 - Gearbox oil cooling valve - N509-

14 - Non-return valve

15 - Exhaust gas recirculation cooler

16 - Cylinder head

- Cylinder bank 2 (left-side)

17 - Filler cap

- Checking pressure relief valve ⇒ page 359

18 - Coolant expansion tank

19 - Non-return valve

- Removing and installing ⇒ page 378

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20 - Cylinder block

- ❑ Cylinder bank 2 (left-side)

21 - Coolant shut-off valve

22 - Temperature sender for engine temperature regulation - G694-

23 - Engine oil cooler

24 - Coolant pump

25 - Auxiliary radiator

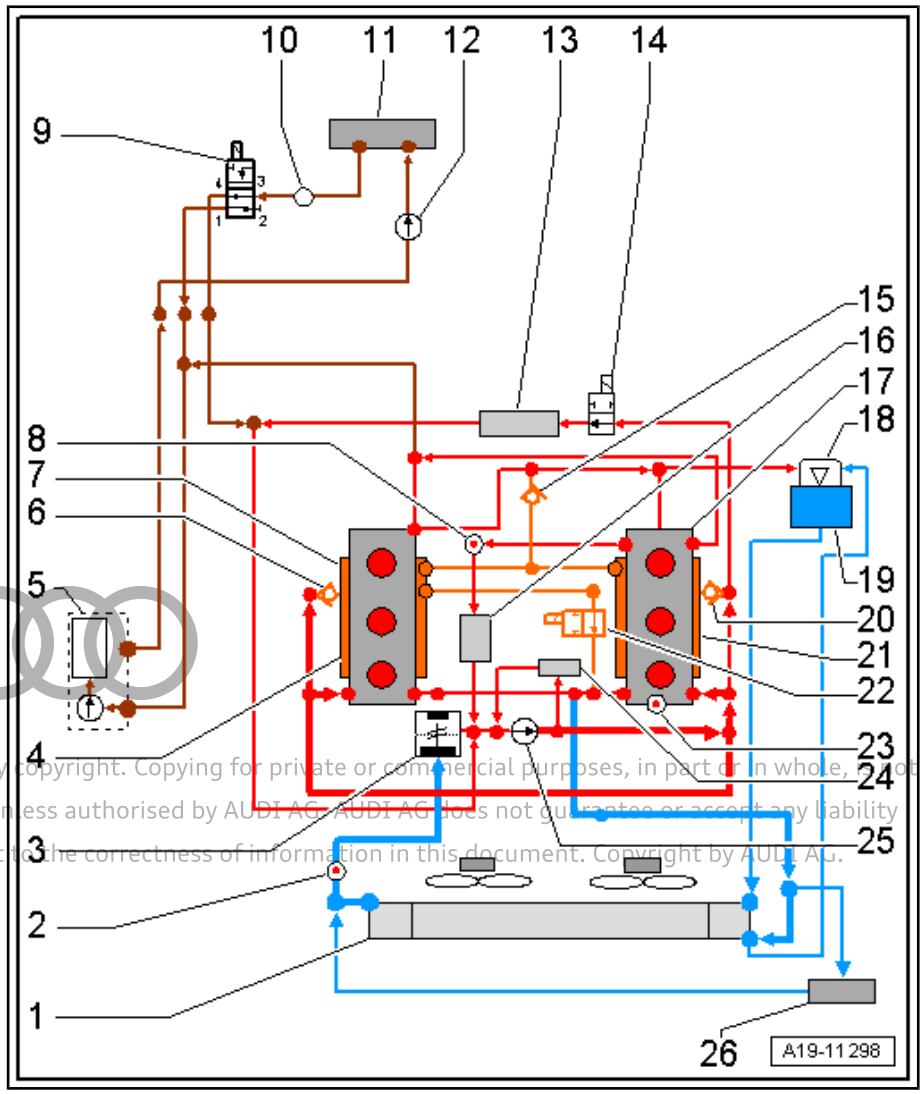
- ❑ Optional equipment

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1.1.2 Connection diagram - coolant hoses, vehicles with one turbocharger and with auxiliary heater

Note

- *Blue = Large coolant circuit*
- *Red = Small coolant circuit*
- *Orange = Coolant circuit for cylinder block.*
- *Brown = Heating circuit*
- *Arrows show direction of coolant flow.*



1 - Radiator

2 - Radiator outlet coolant temperature sender - G83-

3 - Map-controlled engine cooling system thermostat - F265-

4 - Cylinder block

- ❑ Cylinder bank 1 (right-side)

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 - Non-return valve

- ❑ Removing and installing ⇒ page 377

7 - Cylinder head

- ❑ Cylinder bank 1 (right-side)

8 - Coolant temperature sender - G62-

9 - Heater coolant shut-off valve - N279-

- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Coolant circuit; Overview of fitting locations - coolant circuit

10 - Bleeder screw

11 - Heat exchanger for heater

- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Front air conditioning unit; Removing and installing heat exchanger

12 - Coolant circulation pump - V50-

- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Coolant circuit; Overview of fitting locations - coolant circuit

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13 - ATF cooler

- ❑ Removing and installing ⇒ Rep. gr. 34 ; ATF circuit; Removing and installing ATF cooler or ⇒ Rep. gr. 37 ; ATF circuit; Removing and installing ATF cooler .

14 - Gearbox oil cooling valve - N509-

15 - Non-return valve

16 - Exhaust gas recirculation cooler

17 - Cylinder head

- ❑ Cylinder bank 2 (left-side)

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18 - Filler cap

- ❑ Checking pressure relief valve ⇒ page 359

19 - Coolant expansion tank

20 - Non-return valve

- ❑ Removing and installing ⇒ page 378

21 - Cylinder block

- ❑ Cylinder bank 2 (left-side)

22 - Coolant shut-off valve

23 - Temperature sender for engine temperature regulation - G694-

24 - Engine oil cooler

25 - Coolant pump

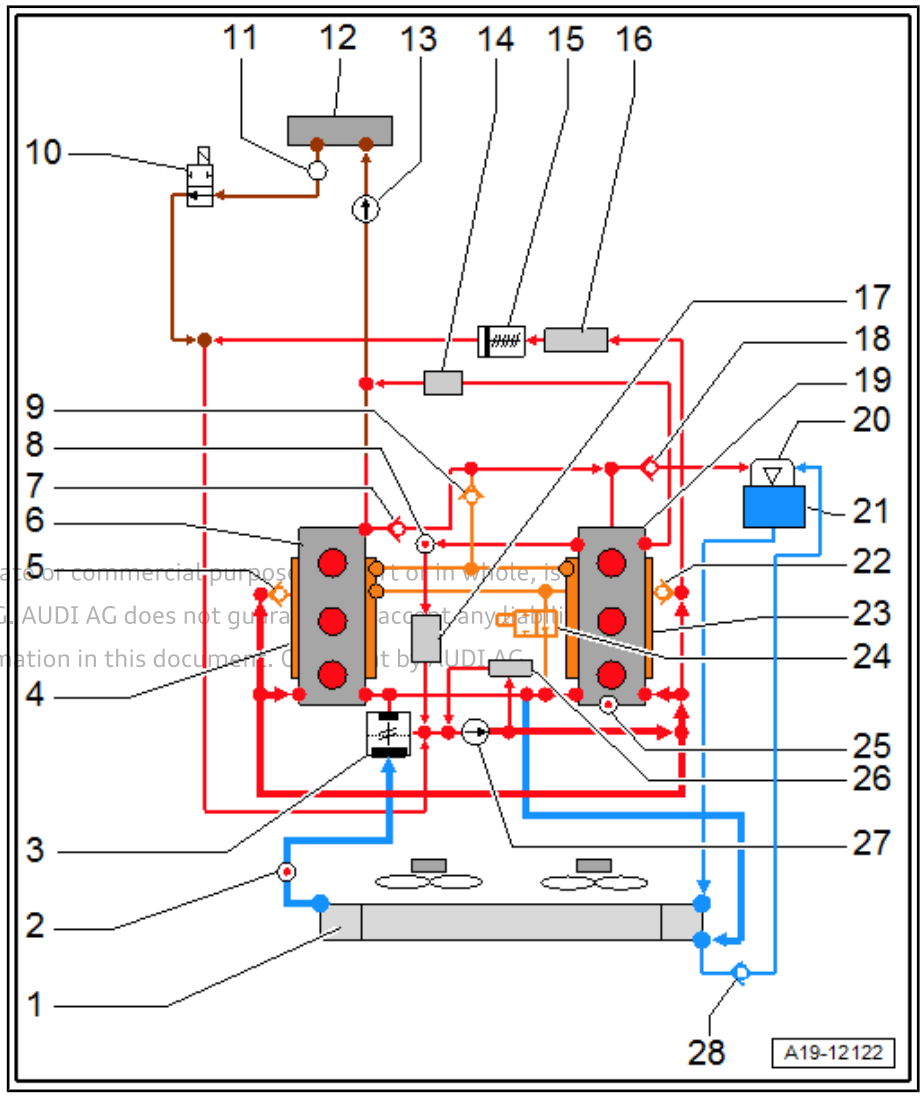
26 - Auxiliary radiator

- ❑ Optional equipment

1.1.3 Connection diagram - coolant hoses, vehicles with one turbocharger and water-cooled SCR valve and without auxiliary heater

Note

- *Blue = Large coolant circuit*
- *Red = Small coolant circuit*
- *Orange = Coolant circuit for cylinder block.*
- *Brown = Heating circuit*
- *Arrows show direction of coolant flow.*



1 - Radiator

2 - Radiator outlet coolant temperature sender - G83-

3 - Map-controlled engine cooling system thermostat - F265-

4 - Cylinder block

- ❑ Cylinder bank 1 (right-side)

5 - Non-return valve

- ❑ Removing and installing ⇒ page 377

6 - Cylinder head

- ❑ Cylinder bank 1 (right-side)

7 - Non-return valve

8 - Coolant temperature sender - G62-

9 - Non-return valve

10 - Coolant shut-off valve - N82-

- ❑ In RHD vehicles: In supply line for heat exchanger for heater
- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Coolant circuit; Removing and installing coolant shut-off valve - N82-

11 - Bleeder screw

12 - Heat exchanger for heater

- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Front air conditioning unit; Removing and installing heat exchanger

13 - Coolant circulation pump - V50-

- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Coolant circuit; Overview of fitting locations - coolant circuit

14 - Injector for reducing agent - N474-

- ❑ Water-cooled

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15 - Thermostat

- ❑ For ATF coolant circuit

16 - ATF cooler

- ❑ Removing and installing ⇒ Rep. gr. 34 ; ATF circuit; Removing and installing ATF cooler or ⇒ Rep. gr. 37 ; ATF circuit; Removing and installing ATF cooler .

17 - Exhaust gas recirculation cooler

18 - Non-return valve

19 - Cylinder head

- ❑ Cylinder bank 2 (left-side)

20 - Filler cap

- ❑ Checking pressure relief valve ⇒ page 359

21 - Coolant expansion tank

22 - Non-return valve

- ❑ Removing and installing ⇒ page 378

23 - Cylinder block

- ❑ Cylinder bank 2 (left-side)

24 - Coolant shut-off valve

25 - Temperature sender for engine temperature regulation - G694-

26 - Engine oil cooler

27 - Coolant pump

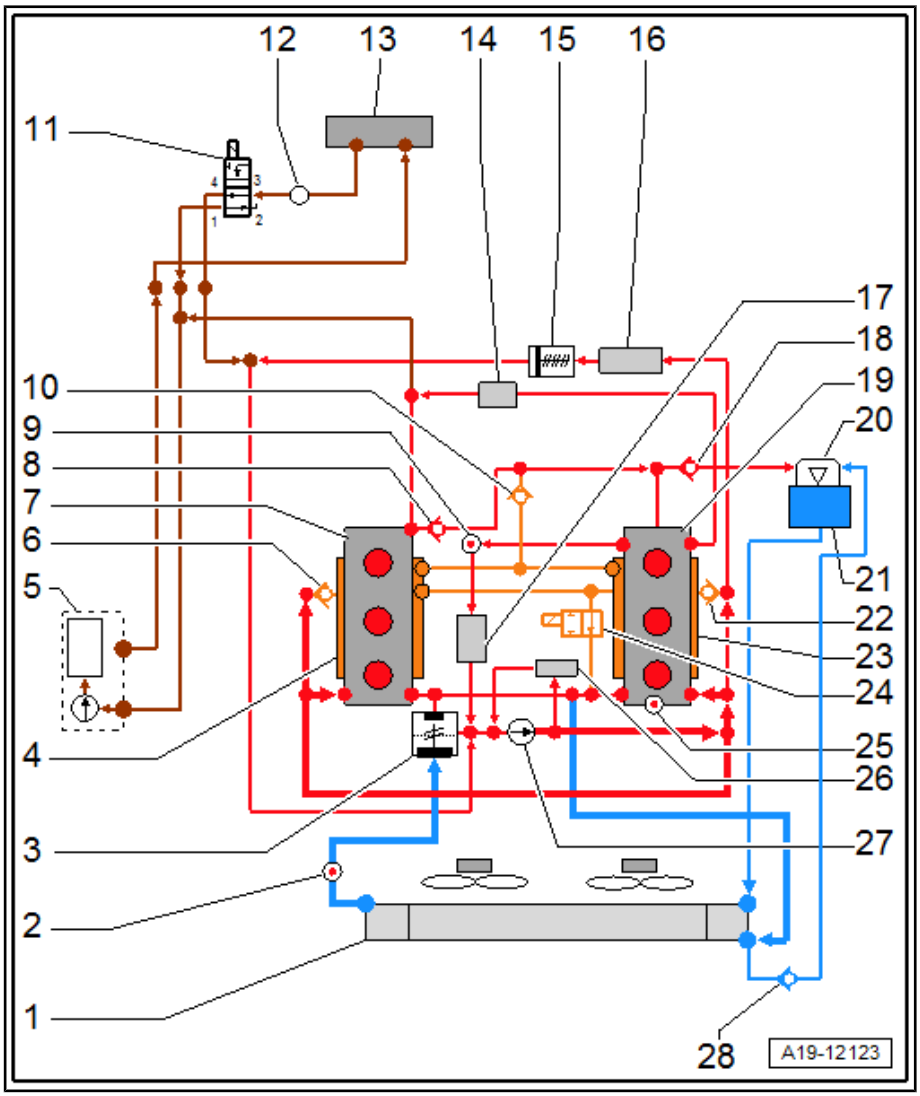
28 - Non-return valve

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1.1.4 Connection diagram - coolant hoses, vehicles with one turbocharger and water-cooled SCR valve and with auxiliary heater

Note

- *Blue = Large coolant circuit*
- *Red = Small coolant circuit*
- *Orange = Coolant circuit for cylinder block.*
- *Brown = Heating circuit*
- *Arrows show direction of coolant flow.*



1 - Radiator

2 - Radiator outlet coolant temperature sender - G83-

3 - Map-controlled engine cooling system thermostat - F265-

4 - Cylinder block

- ❑ Cylinder bank 1 (right-side)

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 - Non-return valve

- ❑ Removing and installing ⇒ page 377

7 - Cylinder head

- ❑ Cylinder bank 1 (right-side)

8 - Non-return valve

9 - Coolant temperature sender - G62-

10 - Non-return valve

11 - Heater coolant shut-off valve - N279-

- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Coolant circuit; Overview of fitting locations - coolant circuit

12 - Bleeder screw

13 - Heat exchanger for heater

- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Front air conditioning unit; Removing and installing heat exchanger

14 - Injector for reducing agent - N474-

- ❑ Water-cooled

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15 - Thermostat

- ❑ For ATF coolant circuit

16 - ATF cooler

- ❑ Removing and installing ⇒ Rep. gr. 34 ; ATF circuit; Removing and installing ATF cooler or ⇒ Rep. gr. 37 ; ATF circuit; Removing and installing ATF cooler .

17 - Exhaust gas recirculation cooler

18 - Non-return valve

19 - Cylinder head

- ❑ Cylinder bank 2 (left-side)

20 - Filler cap

- ❑ Checking pressure relief valve ⇒ page 359

21 - Coolant expansion tank

22 - Non-return valve

- ❑ Removing and installing ⇒ page 378

23 - Cylinder block

- ❑ Cylinder bank 2 (left-side)

24 - Coolant shut-off valve

25 - Temperature sender for engine temperature regulation - G694-

26 - Engine oil cooler

27 - Coolant pump

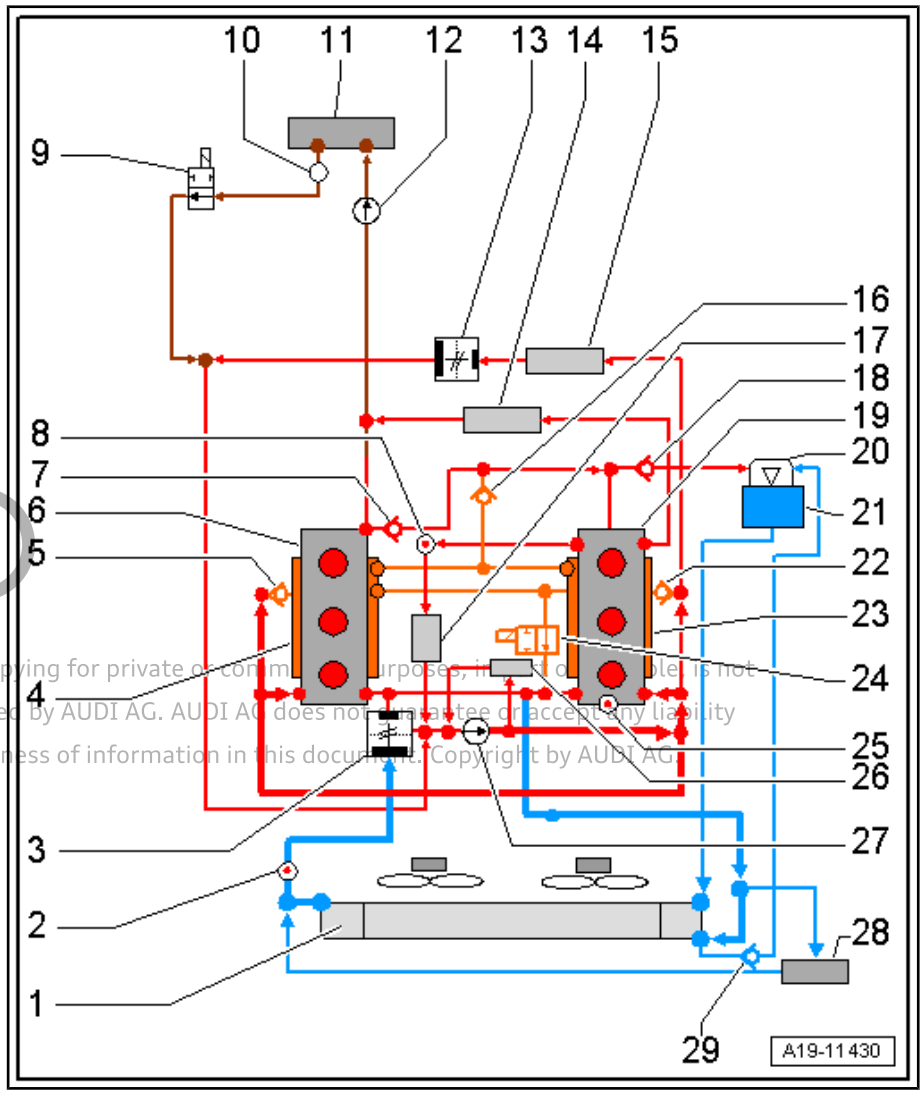
28 - Non-return valve

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1.1.5 Connection diagram - coolant hoses, vehicles with two turbochargers, without SCR system and without auxiliary heater

Note

- *Blue = Large coolant circuit*
- *Red = Small coolant circuit*
- *Orange = Coolant circuit for cylinder block.*
- *Brown = Heating circuit*
- *Arrows show direction of coolant flow.*



1 - Radiator

2 - Radiator outlet coolant temperature sender - G83-

3 - Map-controlled engine cooling system thermostat - F265-

4 - Cylinder block

- ❑ Cylinder bank 1 (right-side)

5 - Non-return valve

- ❑ Removing and installing ⇒ page 377

6 - Cylinder head

- ❑ Cylinder bank 1 (right-side)

7 - Non-return valve

8 - Coolant temperature sender - G62-

9 - Coolant shut-off valve - N82-

- ❑ In RHD vehicles: In supply line for heat exchanger for heater
- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Coolant circuit; Removing and installing coolant shut-off valve - N82-

10 - Bleeder screw

11 - Heat exchanger for heater

- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Front air conditioning unit; Removing and installing heat exchanger

12 - Coolant circulation pump - V50-

- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Coolant circuit; Overview of fitting locations - coolant circuit

13 - Thermostat

- ❑ For ATF cooler

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14 - Turbocharger unit

15 - ATF cooler

- ❑ Removing and installing ⇒ Rep. gr. 37 ; ATF circuit; Removing and installing ATF cooler

16 - Non-return valve

17 - Exhaust gas recirculation cooler

18 - Non-return valve

19 - Cylinder head

- ❑ Cylinder bank 2 (left-side)

20 - Filler cap

- ❑ Checking pressure relief valve ⇒ page 359

21 - Coolant expansion tank

22 - Non-return valve

- ❑ Removing and installing ⇒ page 378

23 - Cylinder block

- ❑ Cylinder bank 2 (left-side)

24 - Coolant shut-off valve

25 - Temperature sender for engine temperature regulation - G694-

26 - Engine oil cooler

27 - Coolant pump

28 - Auxiliary radiator

- ❑ Optional equipment

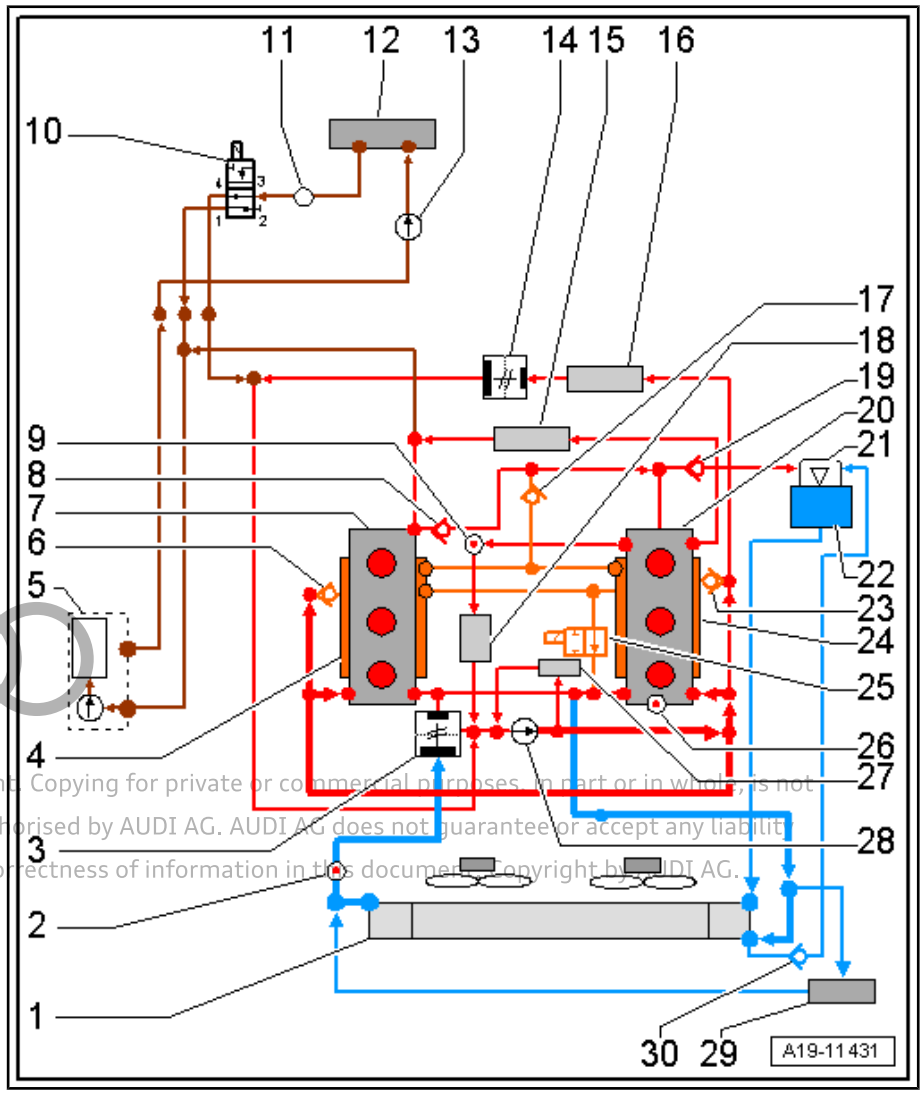
29 - Non-return valve

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1.1.6 Connection diagram - coolant hoses, vehicles with two turbochargers, without SCR system and with auxiliary heater

Note

- *Blue = Large coolant circuit*
- *Red = Small coolant circuit*
- *Orange = Coolant circuit for cylinder block.*
- *Brown = Heating circuit*
- *Arrows show direction of coolant flow.*



1 - Radiator

2 - Radiator outlet coolant temperature sender - G83-

3 - Map-controlled engine cooling system thermostat - F265-

4 - Cylinder block

- ❑ Cylinder bank 1 (right-side)

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 - Non-return valve

- ❑ Removing and installing ⇒ page 377

7 - Cylinder head

- ❑ Cylinder bank 1 (right-side)

8 - Non-return valve

9 - Coolant temperature sender - G62-

10 - Heater coolant shut-off valve - N279-

- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Coolant circuit; Overview of fitting locations - coolant circuit

11 - Bleeder screw

12 - Heat exchanger for heater

- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Front air conditioning unit; Removing and installing heat exchanger

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13 - Coolant circulation pump - V50-

- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Coolant circuit; Overview of fitting locations - coolant circuit

14 - Thermostat

- ❑ For ATF cooler

15 - Turbocharger unit

16 - ATF cooler

- ❑ Removing and installing ⇒ Rep. gr. 37 ; ATF circuit; Removing and installing ATF cooler

17 - Non-return valve

18 - Exhaust gas recirculation cooler

19 - Non-return valve

20 - Cylinder head

- ❑ Cylinder bank 2 (left-side)

21 - Filler cap

- ❑ Checking pressure relief valve ⇒ page 359

22 - Coolant expansion tank

23 - Non-return valve

- ❑ Removing and installing ⇒ page 378

24 - Cylinder block

- ❑ Cylinder bank 2 (left-side)

25 - Coolant shut-off valve

26 - Temperature sender for engine temperature regulation - G694-

27 - Engine oil cooler

28 - Coolant pump

29 - Auxiliary radiator

- ❑ Optional equipment

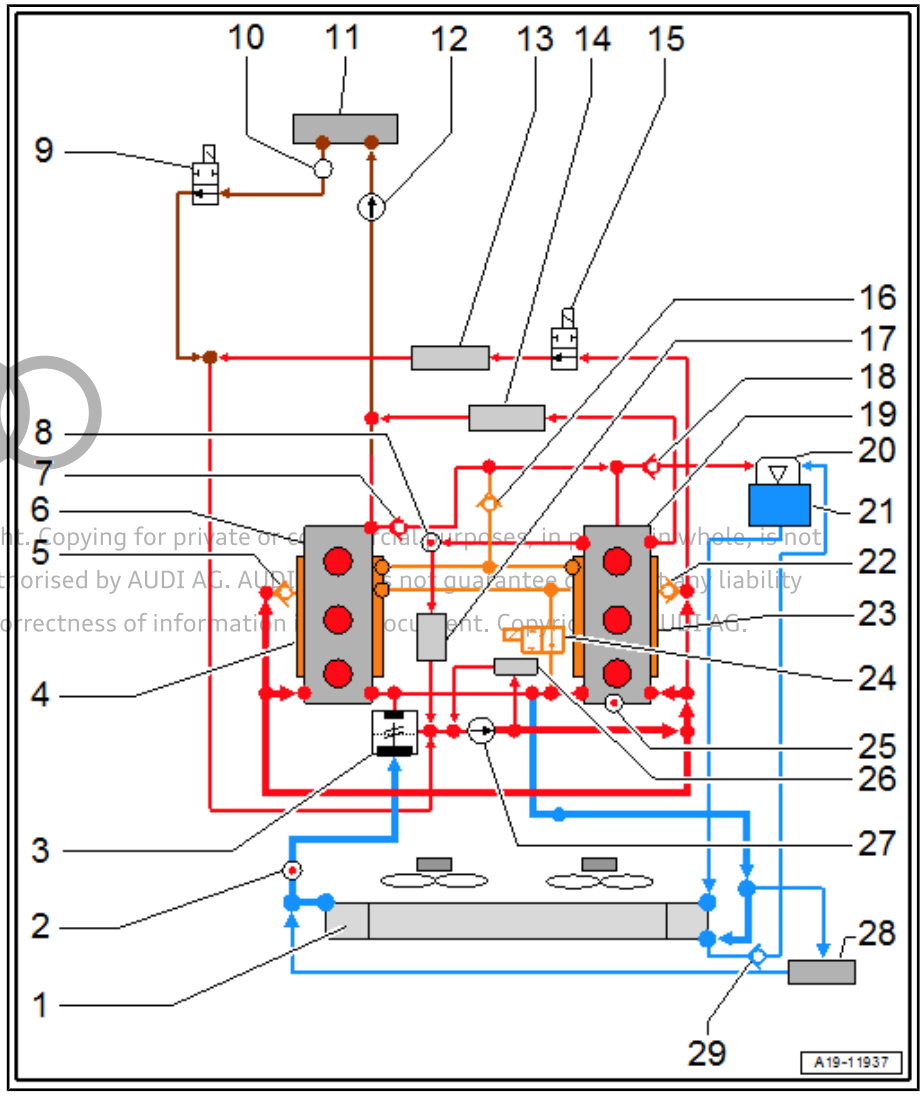
30 - Non-return valve

1.1.7 Connection diagram - coolant hoses, vehicles with two turbochargers, with SCR system and without auxiliary heater

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Note

- *Blue = Large coolant circuit*
- *Red = Small coolant circuit*
- *Orange = Coolant circuit for cylinder block.*
- *Brown = Heating circuit*
- *Arrows show direction of coolant flow.*



1 - Radiator

2 - Radiator outlet coolant temperature sender - G83-

3 - Map-controlled engine cooling system thermostat - F265-

4 - Cylinder block

- ❑ Cylinder bank 1 (right-side)

5 - Non-return valve

- ❑ Removing and installing ⇒ page 377

6 - Cylinder head

- ❑ Cylinder bank 1 (right-side)

7 - Non-return valve

8 - Coolant temperature sender - G62-

9 - Coolant shut-off valve - N82-

- ❑ In RHD vehicles: In supply line for heat exchanger for heater
- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Coolant circuit; Removing and installing coolant shut-off valve - N82-

10 - Bleeder screw

11 - Heat exchanger for heater

- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Front air conditioning unit; Removing and installing heat exchanger

12 - Coolant circulation pump - V50-

- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Coolant circuit; Overview of fitting locations - coolant circuit

13 - ATF cooler

- ❑ Removing and installing ⇒ Rep. gr. 37 ; ATF circuit; Removing and installing ATF cooler

14 - Turbocharger unit

15 - Gearbox oil cooling valve - N509-

16 - Non-return valve

17 - Exhaust gas recirculation cooler

18 - Non-return valve

19 - Cylinder head

- ❑ Cylinder bank 2 (left-side)

20 - Filler cap

- ❑ Checking pressure relief valve ⇒ page 359

21 - Coolant expansion tank

22 - Non-return valve

- ❑ Removing and installing ⇒ page 378

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23 - Cylinder block

- ❑ Cylinder bank 2 (left-side)

24 - Coolant shut-off valve

25 - Temperature sender for engine temperature regulation - G694-

26 - Engine oil cooler

27 - Coolant pump

28 - Auxiliary radiator

- ❑ Optional equipment

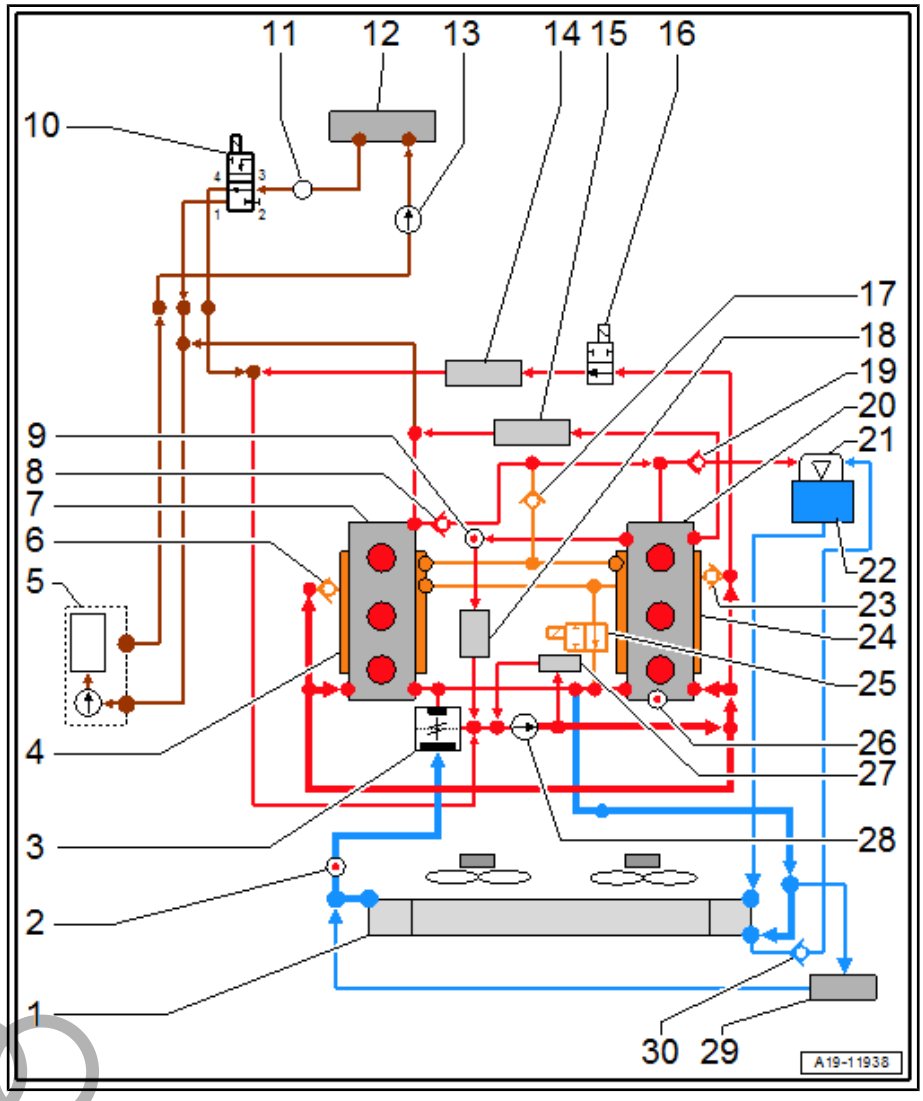
29 - Non-return valve

1.1.8 Connection diagram - coolant hoses, vehicles with two turbochargers, with SCR system and with auxiliary heater

Note

- *Blue = Large coolant circuit*
- *Red = Small coolant circuit*
- *Orange = Coolant circuit for cylinder block.*
- *Brown = Heating circuit*
- *Arrows show direction of coolant flow.*

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1 - Radiator

2 - Radiator outlet coolant temperature sender - G83-

3 - Map-controlled engine cooling system thermostat - F265-

4 - Cylinder block

- ❑ Cylinder bank 1 (right-side)

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 - Non-return valve

- ❑ Removing and installing ⇒ page 377

7 - Cylinder head

- ❑ Cylinder bank 1 (right-side)

8 - Non-return valve

9 - Coolant temperature sender - G62-

10 - Heater coolant shut-off valve - N279-

- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Coolant circuit; Overview of fitting locations - coolant circuit

11 - Bleeder screw

12 - Heat exchanger for heater

- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Front air conditioning unit; Removing and installing heat exchanger

13 - Coolant circulation pump - V50-

- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Coolant circuit; Overview of fitting locations - coolant circuit

14 - ATF cooler

- ❑ Removing and installing ⇒ Rep. gr. 37 ; ATF circuit; Removing and installing ATF cooler

15 - Turbocharger unit

16 - Gearbox oil cooling valve - N509-

17 - Non-return valve

18 - Exhaust gas recirculation cooler

19 - Non-return valve

20 - Cylinder head

- ❑ Cylinder bank 2 (left-side)

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21 - Filler cap

- ❑ Checking pressure relief valve ⇒ page 359

22 - Coolant expansion tank

23 - Non-return valve

- ❑ Removing and installing ⇒ page 378

24 - Cylinder block

- ❑ Cylinder bank 2 (left-side)

25 - Coolant shut-off valve

26 - Temperature sender for engine temperature regulation - G694-

27 - Engine oil cooler

28 - Coolant pump

29 - Auxiliary radiator

- ❑ Optional equipment

30 - Non-return valve

1.2 Checking cooling system for leaks

Special tools and workshop equipment required

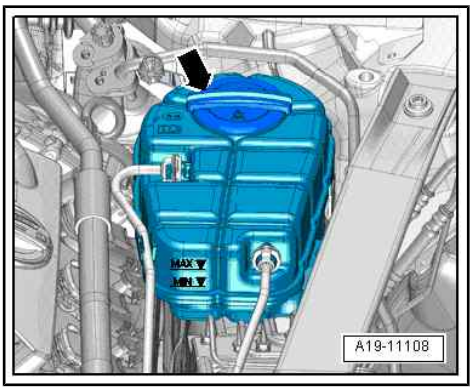
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- Adapter for cooling system tester - V.A.G 1274/8-
- Adapter for cooling system tester - V.A.G 1274/9-
- Cooling system tester - V.A.G 1274 B-

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.

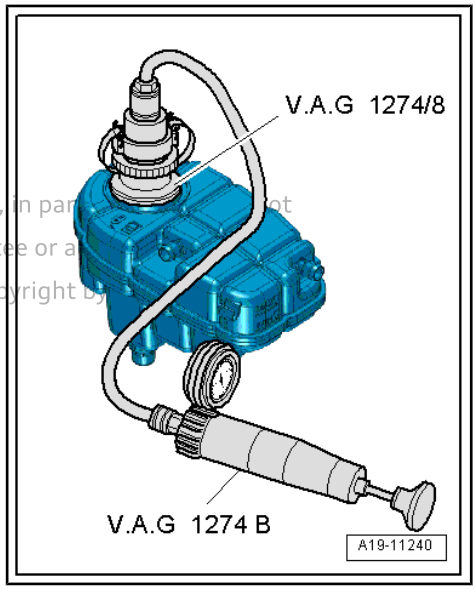
Danger of scalding skin and other parts of the body.

- *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 -arrow- 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.

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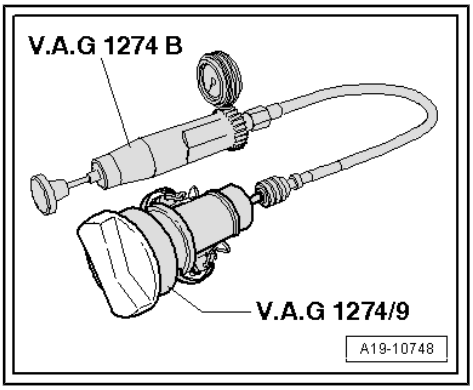
Note

The drop in pressure of 0.2 bar within 10 minutes is caused by the decrease in coolant temperature. The colder the engine is, the less the pressure will fall. If necessary, check again when the engine is cold.

Checking pressure relief valve in filler cap

– Fit cooling system tester - V.A.G 1274 B- with adapter - V.A.G 1274/9- onto filler cap.

– Build up pressure with hand pump on cooling system tester.

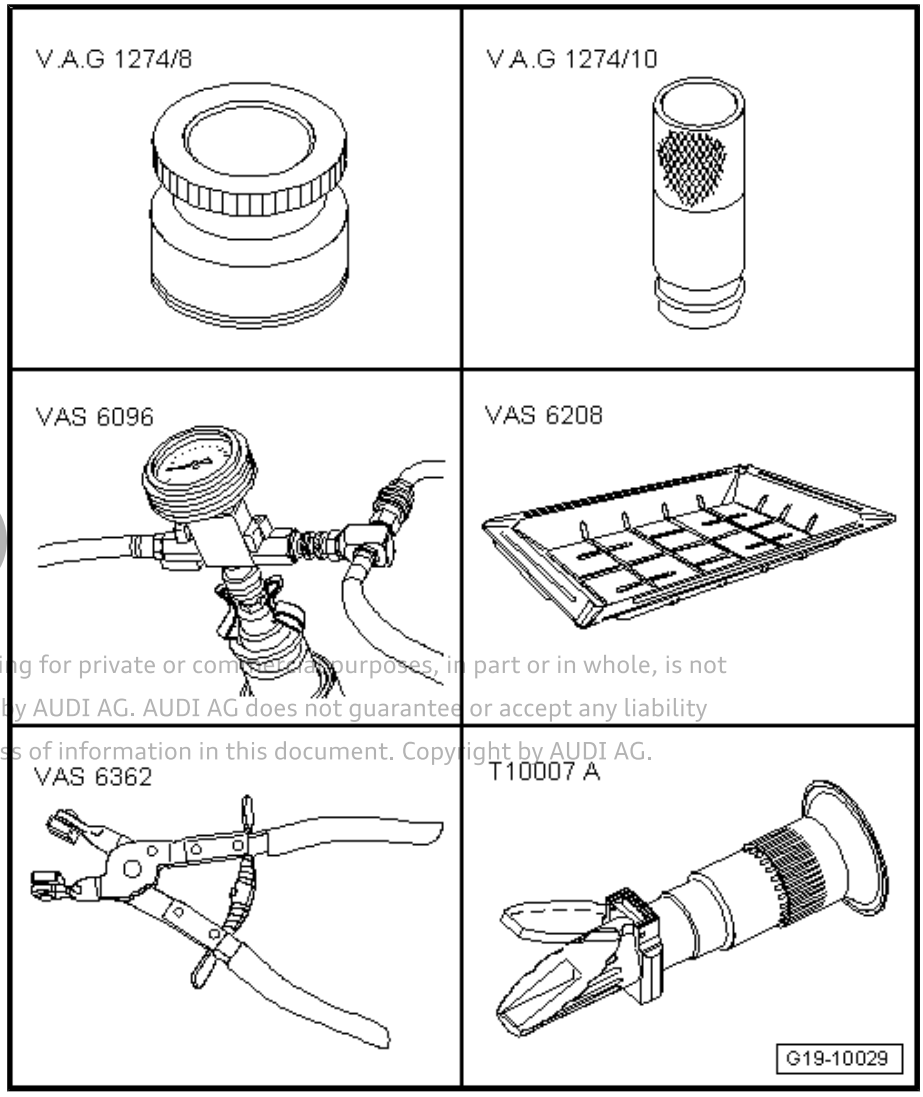


• The pressure relief valve should open at a pressure of 1.4 ... 1.6 bar.

– Renew filler cap if pressure relief valve does not open as described.

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 A-

Draining

WARNING

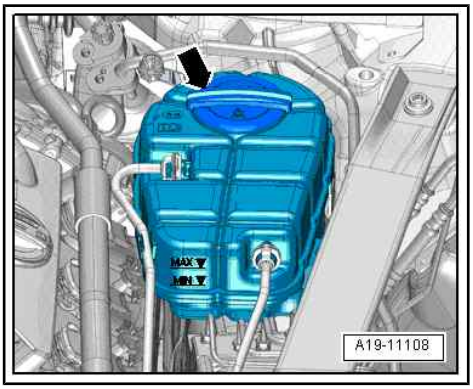
Risk of injury as the radiator fans may start up automatically.

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

WARNING

Risk of scalding due to hot steam and hot coolant.

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



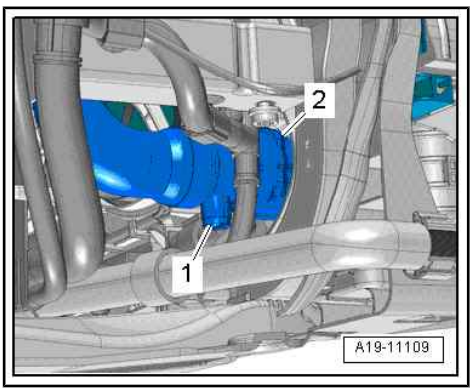
– Open filler cap -arrow- on coolant expansion tank.

– Remove noise insulation panels ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

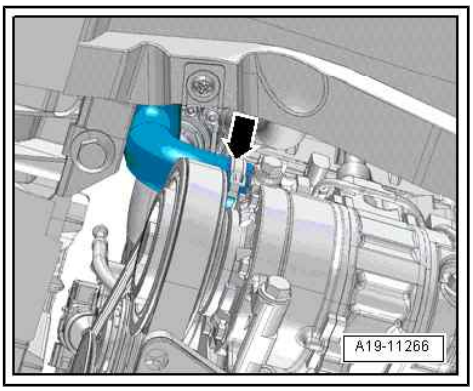
– Place drip tray for workshop hoist - VAS 6208- beneath engine.

– Remove drain plug -1- and drain off coolant.

– Lift retaining clip -2- and disconnect coolant hose from radiator.

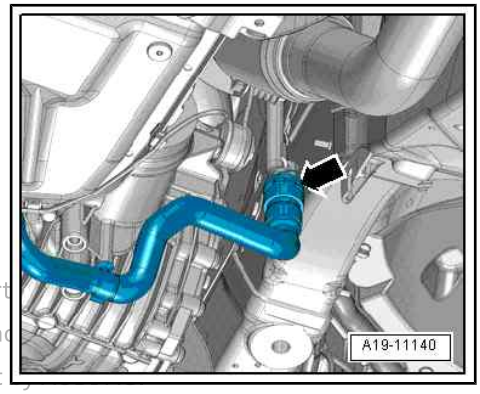


– Release hose clip -arrow-, disconnect coolant hose from coolant pipe (front left) and drain off coolant.



Vehicles with automatic/dual clutch gearbox:

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



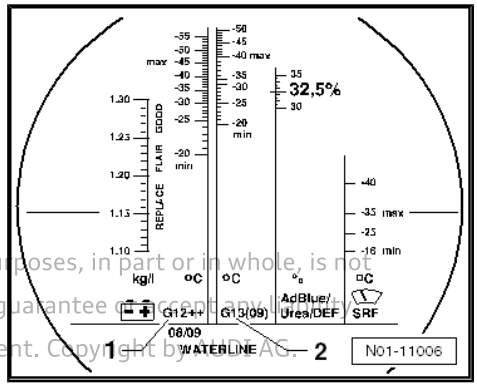
Filling

- Ignition switched off.

Caution

To ensure optimal corrosion protection, only distilled water may be mixed with coolant additives.

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Note

- *The effectiveness of the coolant is greatly influenced by the quality of the water with which it is mixed. Because water may contain different substances depending on the country or even the region, the water quality to be used for cooling systems has been specified. Distilled water meets all the requirements and is therefore recommended for use when topping up or filling up with coolant.*
- *Use only coolant additives listed in the ⇒ Electronic parts catalogue (ETKA). If you use other coolant additives, this can significantly impair in particular the corrosion protection effect. The resulting damage could lead to loss of coolant and consequently to serious engine damage.*
- *Coolant with the recommended mixture ratio prevents frost and corrosion damage and stops scaling. At the same time it raises the boiling point of the fluid in the system. For this reason the cooling system must be filled all year round with the correct coolant additive.*
- *Because of its high boiling point, the coolant improves engine reliability under heavy loads, particularly in countries with tropical climates.*
- *The refractometer - T10007A- MUST be used to determine the current level of frost protection.*
- *The mixture must guarantee frost protection down to at least -25 °C (in countries with arctic climate: down to -36 °C). The amount of antifreeze should only be increased if greater frost protection is required in very cold climates. This must only be down to -48 °C, however, as otherwise the cooling efficiency of the coolant is impaired.*
- *The coolant concentration must not be reduced by adding water even in warmer seasons and in warmer countries. Frost protection must be provided to at least -25 °C.*
- *Read off the level of frost protection on the scale for the relevant coolant additive.*
- *The temperature indicated on the refractometer - T10007A- corresponds to the temperature at which the first ice crystals can form in the coolant.*
- *Do not reuse coolant.*
- *Only use water/coolant additive as a lubricant for coolant hoses.*

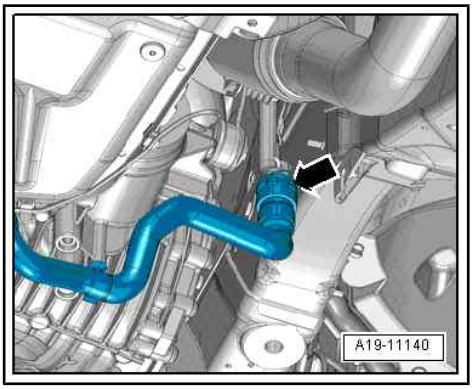
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Recommended mixture ratio for coolant

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

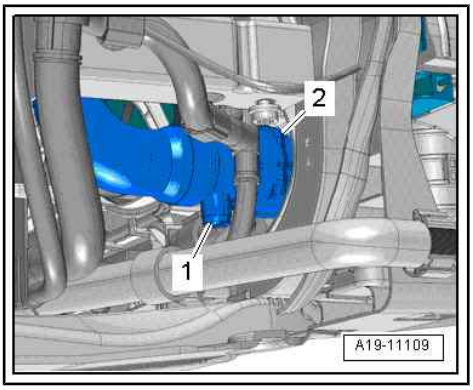
Procedure

– Connect coolant hose (rear right) with plug-in connector -arrow- ⇒ page 394 .



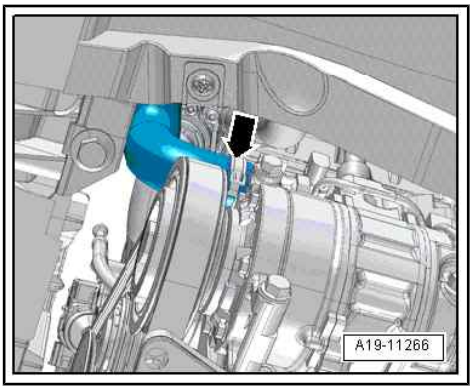
– Close drain plug -1-.

– Connect coolant hose to radiator with plug-in connector -2- ⇒ page 394 .



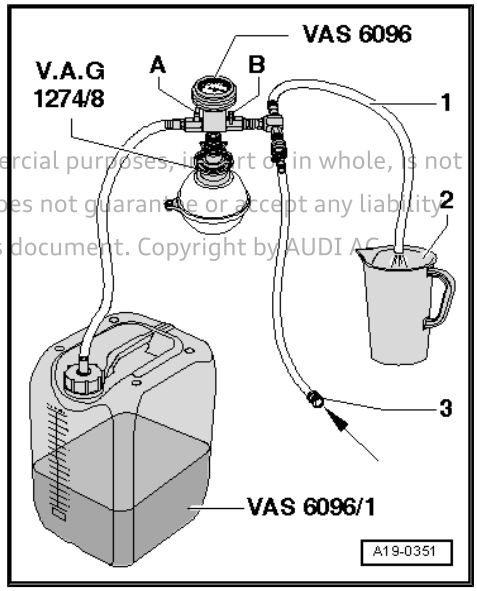
Vehicles with automatic/dual clutch gearbox:

– Connect coolant hose to coolant pipe (front left) with hose clip -arrow-.



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All vehicles (continued):



– 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-.

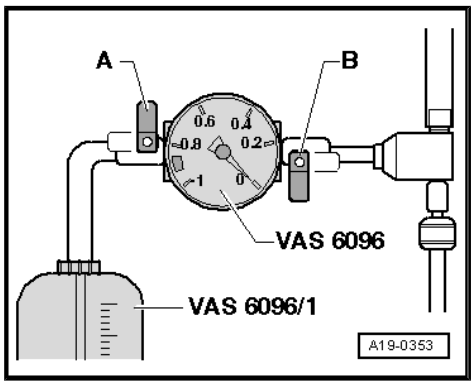
Note

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.

– 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.

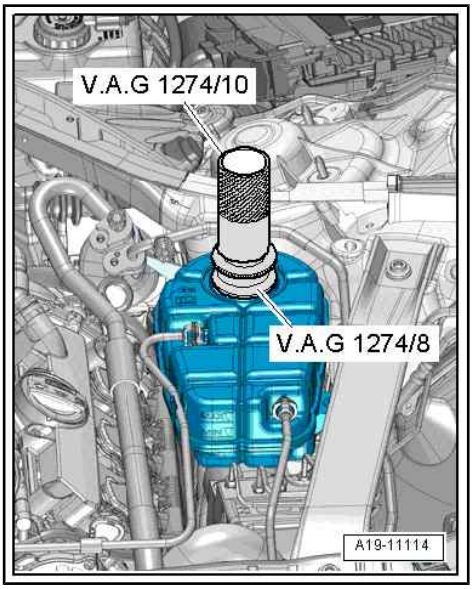
– Open valve -A-.

• 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.

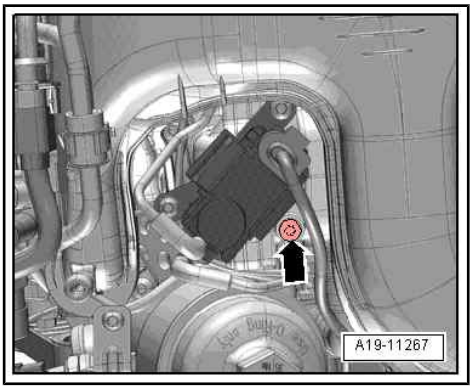
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– Attach pipe -V.A.G 1274/10- onto adapter -V.A.G 1274/8- .
– Fill up with coolant until pipe for cooling system tester is filled. If required, add further coolant when performing bleeding procedure.
– Remove engine cover panel ⇒ page 172 .
– Remove plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .



Vehicles with one turbocharger:

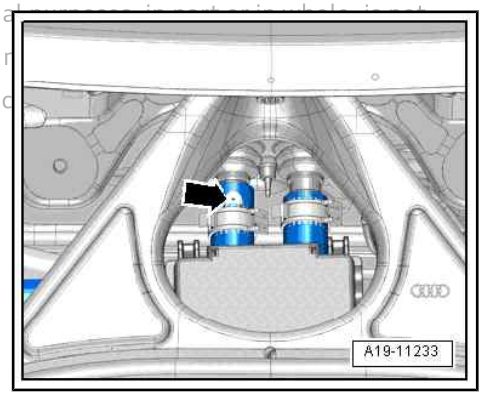
– Open bleeder screw -arrow- at exhaust gas recirculation cooler until coolant flows out.
– Close bleeder screw.



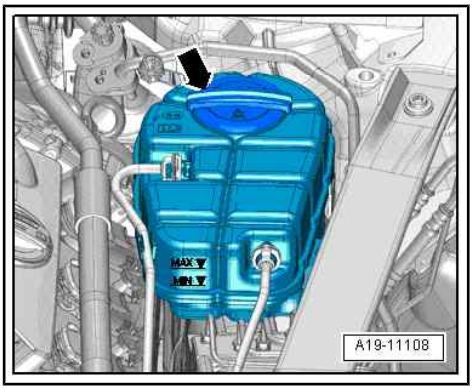
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All vehicles (continued):

– Release coolant hose going to heat exchanger and pull back hose until coolant flows out at bleeder hole -arrow- in coolant hose.
– Push coolant hose back onto connection and secure with hose clip.
– On vehicles with auxiliary heater, switch heater on (for about 30 seconds) and then off again.



– Close filler cap -arrow- on coolant expansion tank (make sure it engages).
– Start engine.

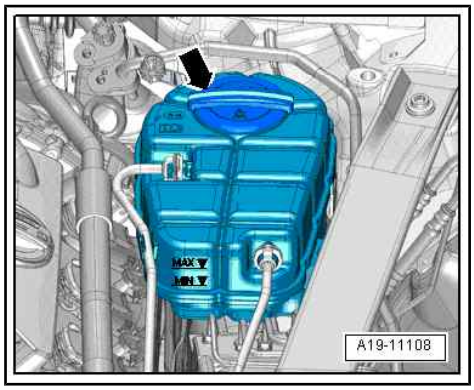


Time period	Engine speed	Air conditioner/heater setting
3 minutes	2000 rpm	• Air conditioning system “OFF”, LED in AC button not lit • Heating at “HI”, select lowest possible blower speed (= 0)
Until both large coolant hoses at radiator become warm	Idling	• Air conditioning system “OFF” • Heating at “HI”
2 minutes	2000 rpm	• Air conditioning system “OFF” • Heating at “HI”

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– 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.



2 Coolant pump/thermostat assembly

⇒ “2.1 Exploded view - coolant pump”, page 367

⇒ “2.2 Exploded view - coolant valve”, page 368

⇒ “2.3 Exploded view - coolant temperature senders”, page 369

⇒ “2.4 Removing and installing coolant pump”, page 370

⇒ “2.5 Removing and installing map-controlled engine cooling system thermostat F265 ”, page 371

⇒ “2.6 Removing and installing coolant temperature sender G62 ”, page 371

⇒ “2.7 Removing and installing radiator outlet coolant temperature sender G83 ”, page 372

⇒ “2.8 Removing and installing temperature sender for engine temperature regulation G694 ”, page 373

⇒ “2.9 Removing and installing coolant valves”, page 375

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2.1 Exploded view - coolant pump

1 - Bolt

- ❑ Aluminium or steel bolts, depending on version
- ❑ Renew aluminium bolts
- ❑ Tighten in stages and in diagonal sequence
- ❑ Aluminium bolts: 3 Nm + 90°
- ❑ Steel bolts: 9 Nm

2 - Poly V-belt pulley for coolant pump

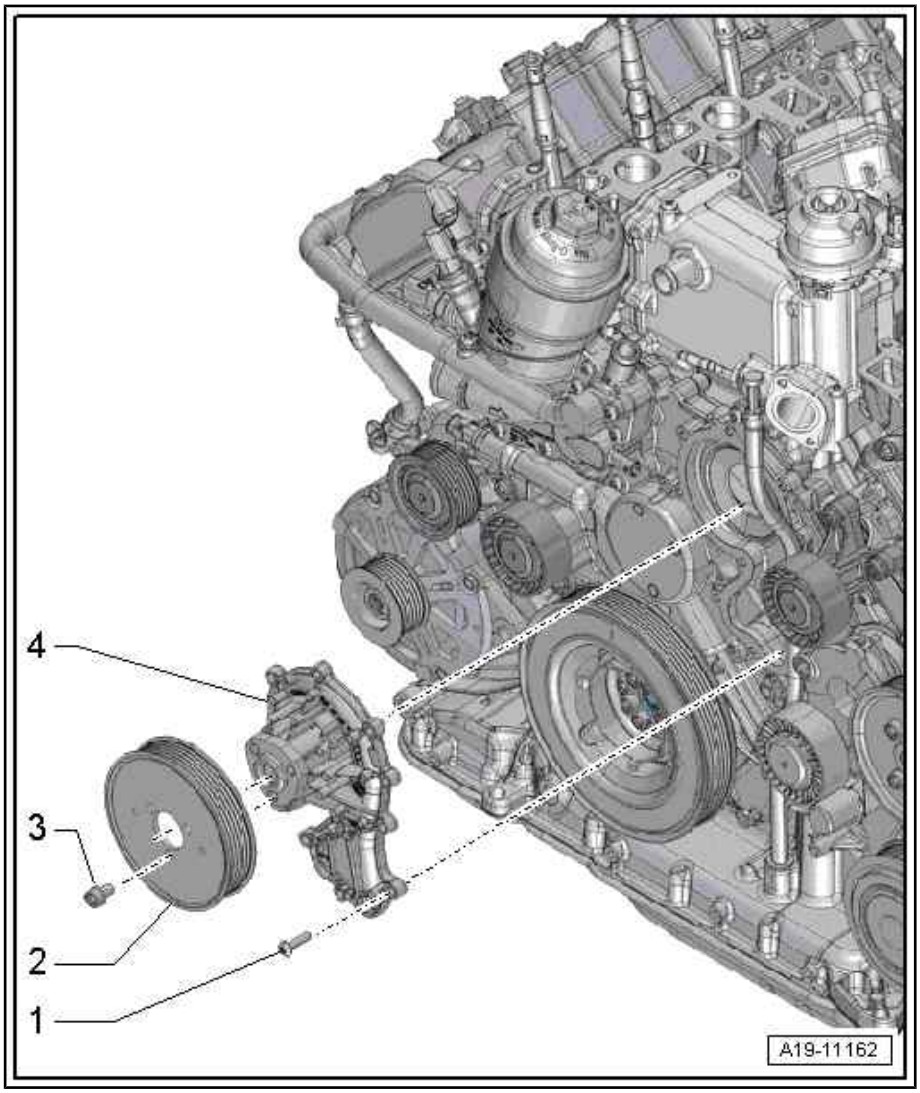
- ❑ Installation position: marking “vorne” (front) faces in direction of travel

3 - Bolt

- ❑ 23 Nm

4 - Coolant pump

- ❑ Different versions available; for allocation refer to ⇒ Electronic parts catalogue
- ❑ Removing and installing ⇒ page 370
- ❑ Renew coolant pump if seal is damaged



2.2 Exploded view - coolant valve

1 - Mounting plate
- ❑ For engine oil cooler and coolant shut-off valve

2 - Gasket
- ❑ Renew

3 - Bolt
- ❑ 9 Nm

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4 - Coolant hose

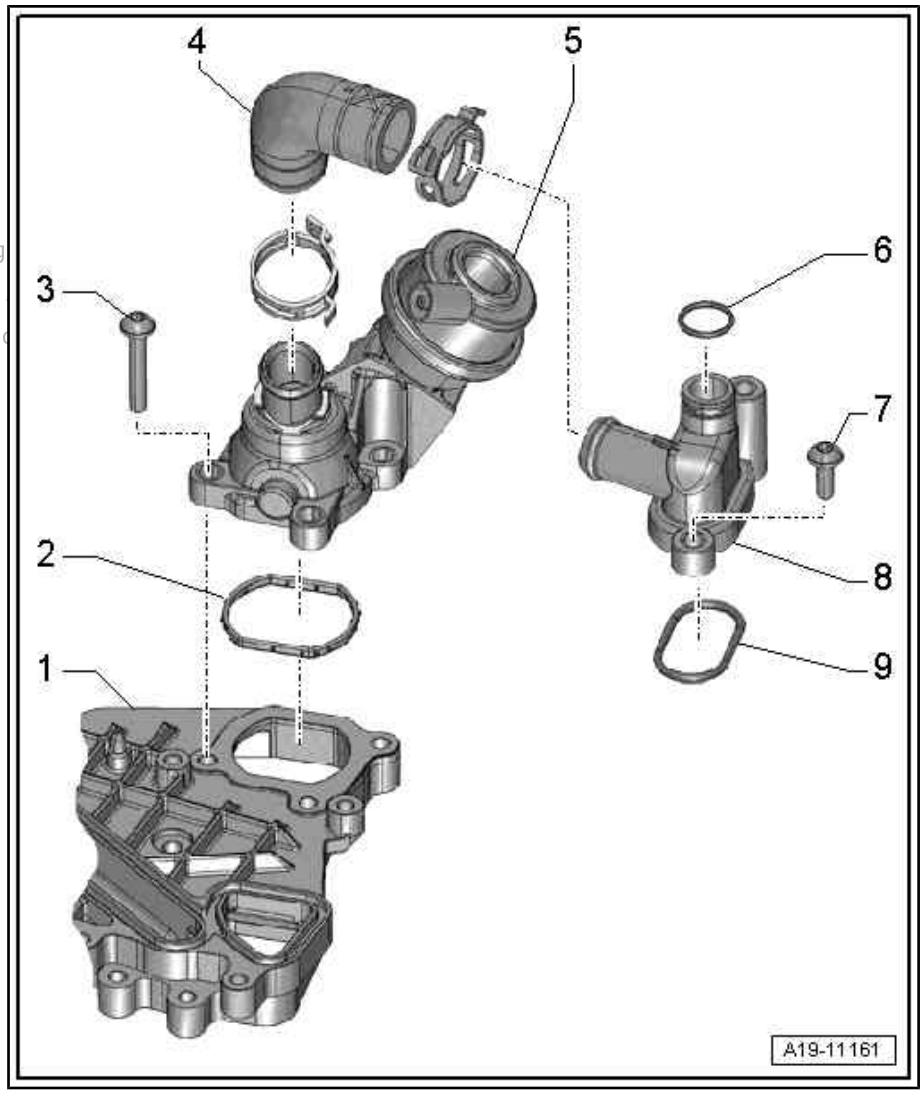
5 - Coolant shut-off valve
- ❑ Removing and installing ⇒ page 375

6 - O-ring
- ❑ Renew

7 - Bolt
- ❑ 9 Nm

8 - Coolant connection

9 - Gasket
- ❑ Renew



2.3 Exploded view - coolant temperature senders

1 - Radiator outlet coolant temperature sender - G83-

- ❑ Removing and installing ⇒ page 372

2 - Retaining clip

- ❑ Check that it is securely seated

3 - O-ring

- ❑ Renew

4 - O-rings

- ❑ Renew

5 - Coolant temperature sender - G62-

- ❑ Removing and installing ⇒ page 371

6 - Bolt

- ❑ 9 Nm

7 - O-rings

- ❑ Renew

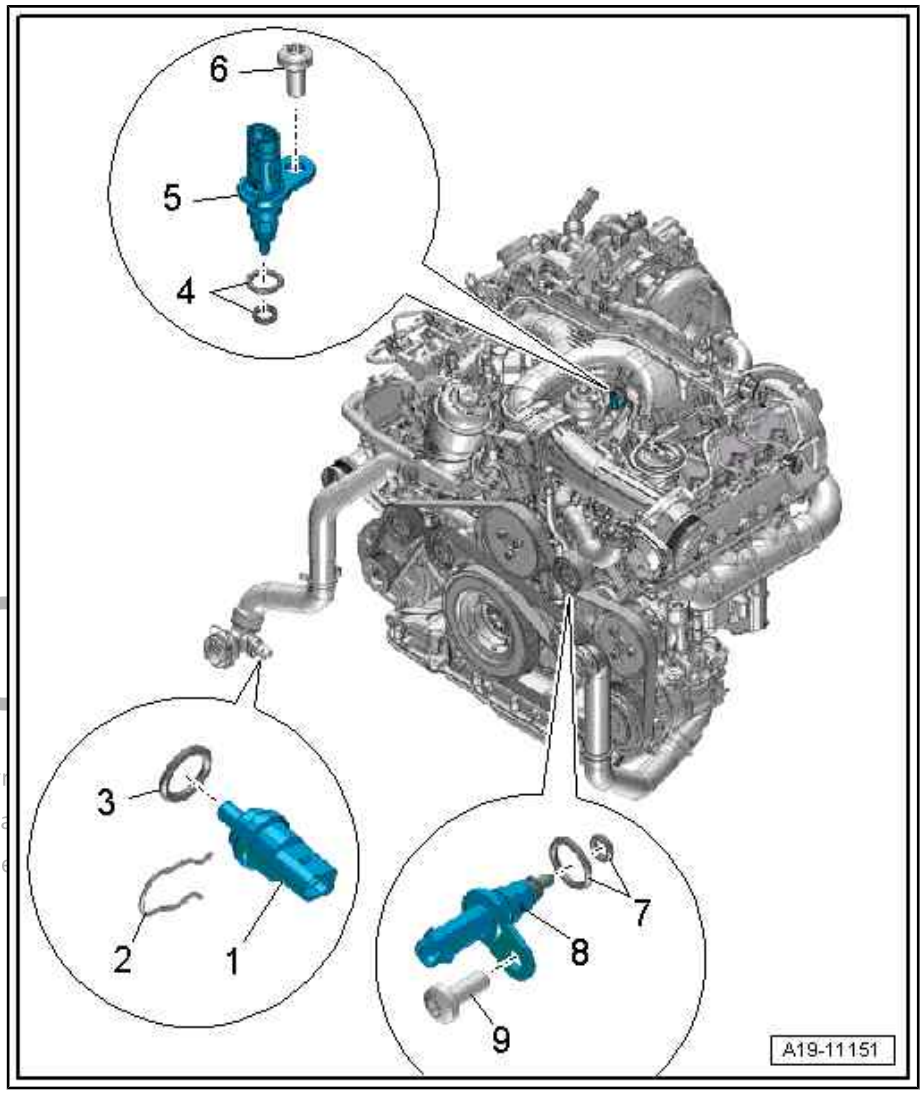
8 - Temperature sender for engine temperature regulation - G694-

- ❑ Removing and installing ⇒ page 373

9 - Bolt

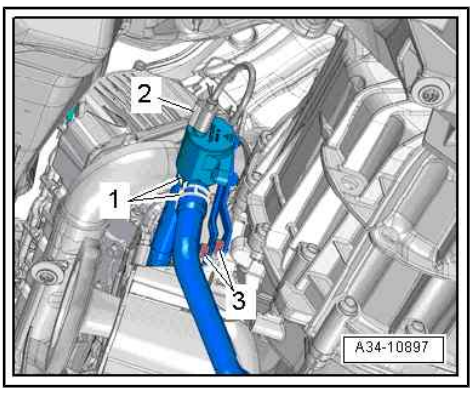
- ❑ 9 Nm

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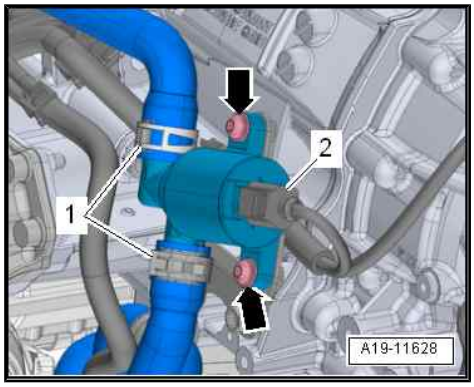
Gearbox oil cooling valve - N509- on vehicles with dual clutch gearbox 0B5 or 8-speed automatic gearbox 0BK - tightening torque

– Tighten bolts -3- to 20 Nm.



Gearbox oil cooling valve - N509- on vehicles with multitronic gearbox - tightening torque

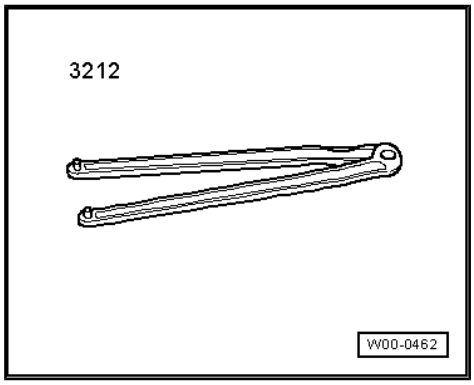
– Tighten bolts -arrows- to 9 Nm.



2.4 Removing and installing coolant pump

Special tools and workshop equipment required

♦ Pin wrench - 3212-



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♦ Drip tray for workshop hoist - VAS 6208-

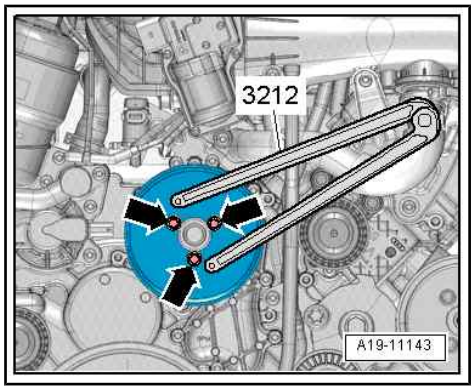


Removing

– Drain coolant ⇒ page 359 .

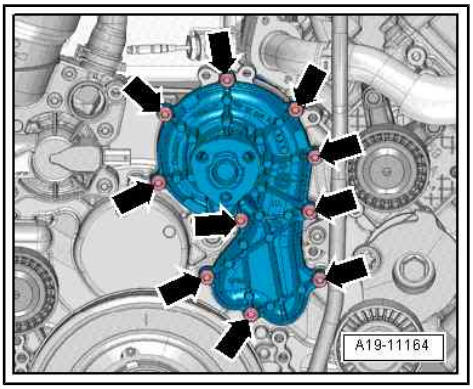
– Remove poly V-belt ⇒ page 180 .

– Remove bolts for coolant pump pulley -arrows- (counterhold with pin wrench - 3212-).



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

– Remove bolts -arrows- and detach coolant pump.



Installing

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

– Clean sealing surface.

– Install poly V-belt ⇒ page 180 .

Note

Do not reuse coolant.

– Fill up with coolant ⇒ page 361 .

Tightening torques

♦ ⇒ “2.1 Exploded view - coolant pump”, page 367

2.5 Removing and installing map-controlled engine cooling system thermostat - F265-

Note

♦ *The map-controlled engine cooling system thermostat - F265- is integrated in the oil filter housing and cannot be renewed separately.*

♦ *The seals on the oil filter housing can only be used once and cannot be supplied as replacement parts. After removing the oil filter housing, it must always be renewed.*

– Oil filter housing must be removed and installed ⇒ page 338 .

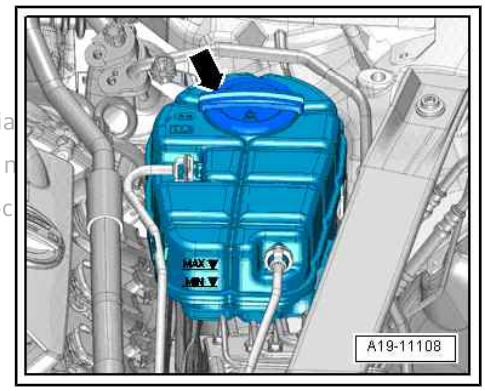
2.6 Removing and installing coolant temperature sender - G62-

Removing

• Engine cold.

– Open filler cap -arrow- on coolant expansion tank briefly to relieve residual pressure in cooling system.

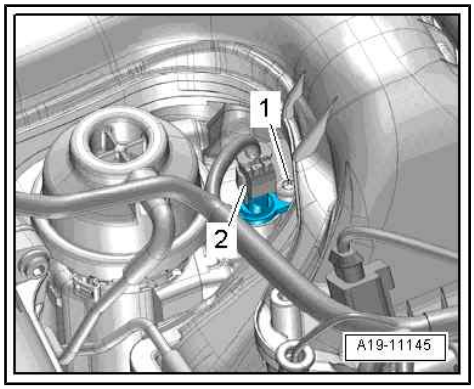
– Remove engine cover panel ⇒ page 172 .



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– Unplug electrical connector -2-.

– Unscrew bolt -1- and pull off coolant temperature sender - G62- .



Installing

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

Note

- *Fit new O-rings.*
- *To avoid loss of coolant, insert new coolant temperature sender - G62- immediately.*

– Check coolant level ⇒ page 366 .

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Tightening torques

- ⇒ "2.3 Exploded view - coolant temperature senders", page 369

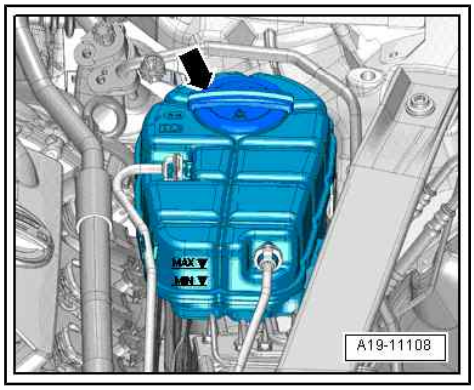
2.7 Removing and installing radiator outlet coolant temperature sender - G83-

Removing

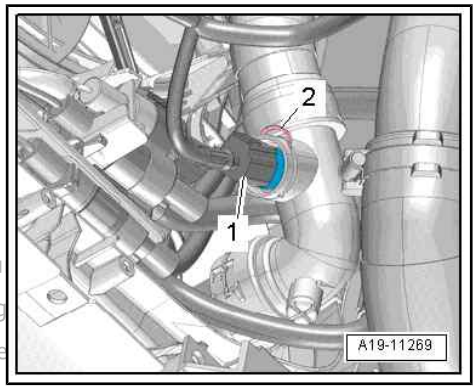
- Engine cold.

– Open filler cap -arrow- on coolant expansion tank briefly to relieve residual pressure in cooling system.

– Remove noise insulation (front) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .



– Unplug electrical connector -1-.



Note

Place a cloth underneath to catch escaping coolant.

– Pull off retaining clip -2- and detach radiator outlet coolant temperature sender - G83- .

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Installing

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

Note

- *Fit new O-rings.*
- *To avoid loss of coolant, insert new radiator outlet coolant temperature sender - G83- immediately.*

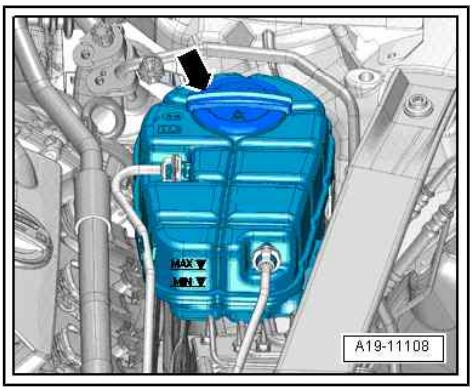
– Check coolant level ⇒ page 366 .

Tightening torques

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

2.8 Removing and installing temperature sender for engine temperature regulation - G694-

Removing

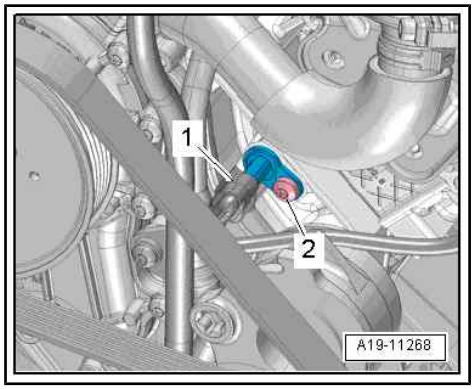


- Engine cold.

– Open filler cap -arrow- on coolant expansion tank briefly to relieve residual pressure in cooling system.

– Remove engine cover panel ⇒ page 172 .

– Unplug electrical connector -1-.



Note

Place a cloth underneath to catch escaping coolant.

– Unscrew bolt -2- and detach temperature sender for engine temperature regulation - G694- .

Installing

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

Note

- *Fit new O-rings.*
- *To avoid loss of coolant, insert new temperature sender for engine temperature regulation - G694- immediately.*

– Check coolant level ⇒ page 366 .

Tightening torques

- ⇒ “2.3 Exploded view - coolant temperature senders”, page 369

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2.9 Removing and installing coolant valves

⇒ “2.9.1 Removing and installing coolant shut-off valve”, page 375

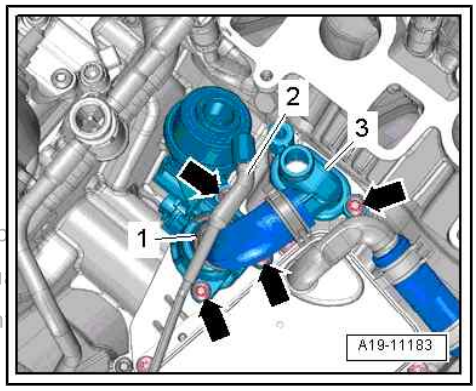
⇒ “2.9.2 Removing and installing gearbox oil cooling valve N509 ”, page 375

⇒ “2.9.3 Removing and installing non-return valve - cylinder bank 1 (right-side)”, page 377

⇒ “2.9.4 Removing and installing non-return valve - cylinder bank 2 (left-side)”, page 378

2.9.1 Removing and installing coolant shut-off valve

Removing



– Remove exhaust gas recirculation cooler ⇒ page 660 .
– Remove engine oil cooler ⇒ page 332 .
– Unscrew bolts -arrows- and detach shut-off valve with coolant connection -3-.
– Disconnect vacuum hose -2-.
– Release hose clip -1- and detach coolant connection.

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Installing

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

Note

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

– Install engine oil cooler ⇒ page 332 .
– Install exhaust gas recirculation cooler ⇒ page 660 .

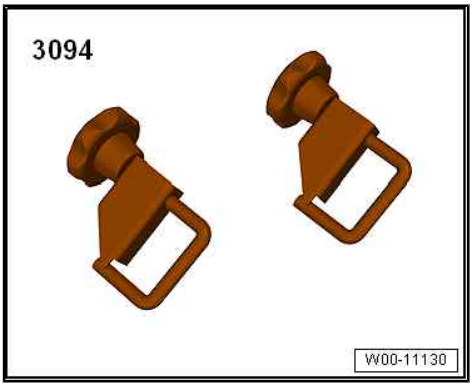
Tightening torques

- ⇒ “2.2 Exploded view - coolant valve”, page 368

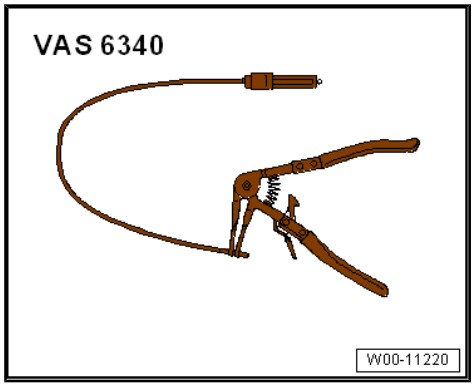
2.9.2 Removing and installing gearbox oil cooling valve - N509-

Special tools and workshop equipment required

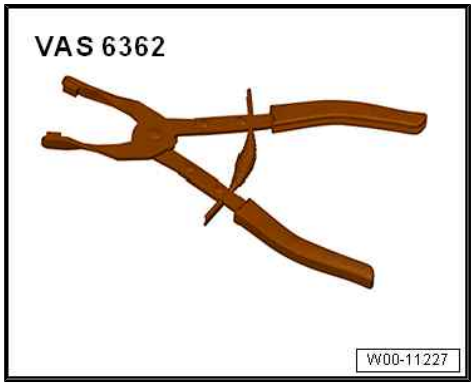
- Hose clamps, up to 25 mm - 3094-



- Hose clip pliers - VAS 6340-



- Hose clip pliers - VAS 6362-



Removing

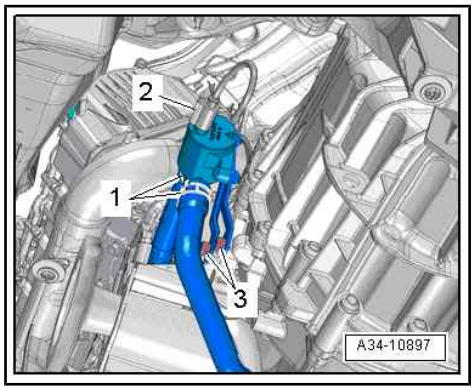
– Remove noise insulation (rear) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

Vehicles with multitronic gearbox:

– Unplug electrical connector -2-.

– Clamp off coolant hoses using hose clamps -3094- , release hose clips -1- and disconnect coolant hoses.

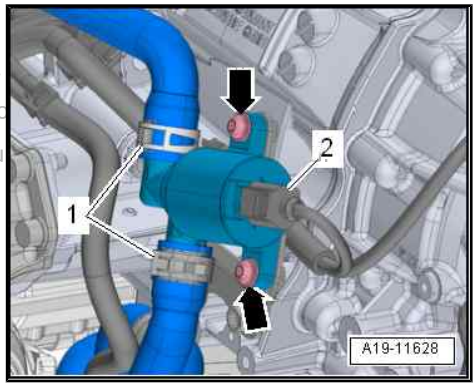
– Remove bolts -3- and move gear oil cooling valve - N509- to one side.



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Vehicles with dual clutch gearbox 0B5 or 8-speed automatic gearbox 0BK:



– Unplug electrical connector -2-.
– Clamp off coolant hoses using hose clamps -3094- , release hose clips -1- and disconnect coolant hoses.
– Unscrew bolts -arrows- and remove gearbox oil cooling valve - N509- .

Installing

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

Note

- *To avoid loss of coolant, insert new gearbox oil cooling valve - N509- immediately.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

– Check coolant level ⇒ page 366 .

Tightening torques

- ⇒ Fig. “” Gearbox oil cooling valve -N509- on vehicles with dual clutch gearbox 0B5 or 8-speed automatic gearbox 0BK - tightening torque”“ , page 369
- ⇒ Fig. “” Gearbox oil cooling valve -N509- on vehicles with multitronic gearbox - tightening torque”“ , page 370
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

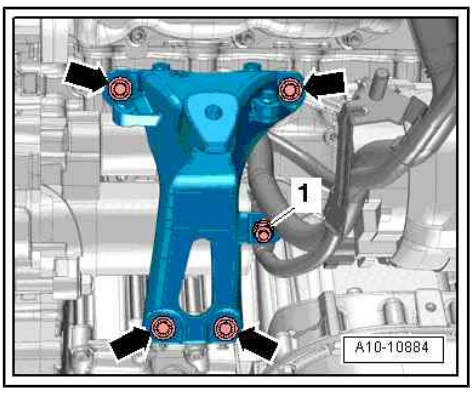
2.9.3 Removing and installing non-return valve - cylinder bank 1 (right-side)

Note

The removal and installation procedures are described for the version without a connection for a coolant hose.

Removing

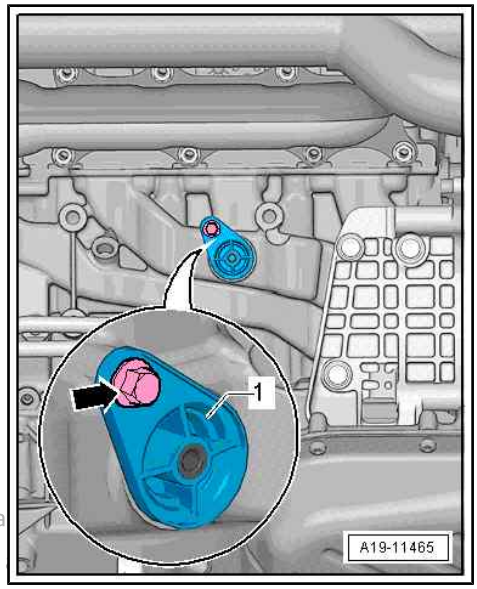
– Drain coolant ⇒ page 359 .
– Remove engine mounting (right-side) ⇒ page 163 .
– If fitted: Remove nut -1- and move earth wire clear at engine support (right-side).
– Unscrew bolts -arrows- and remove engine support (right-side).



Note

Illustration shows engine support without heat shield.

– Remove bolt -arrow-.
– Detach non-return valve -1-.



Installing

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

– Install engine support and engine mounting ⇒ page 156 .

Note

Do not reuse coolant.

– Fill up with coolant ⇒ page 361 .

Tightening torques

♦ ⇒ "3.1 Exploded view - coolant pipes", page 380

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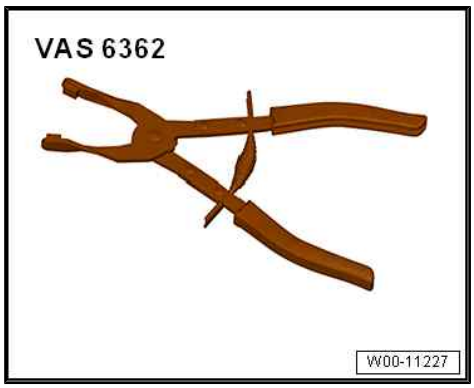
2.9.4 Removing and installing non-return valve - cylinder bank 2 (left-side)

Note

The removal and installation procedures are described for the version with a connection for a coolant hose.

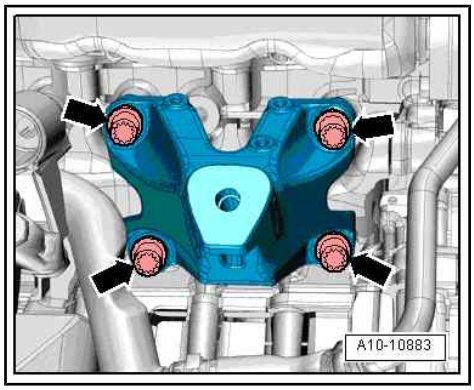
Special tools and workshop equipment required

♦ Hose clip pliers - VAS 6362-

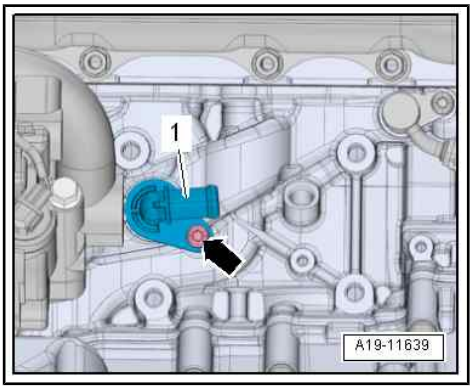


Removing

– Drain coolant ⇒ page 359 .
– Remove engine mounting (left-side) ⇒ page 163 .
– Unscrew bolts -arrows- and remove engine support (left-side).

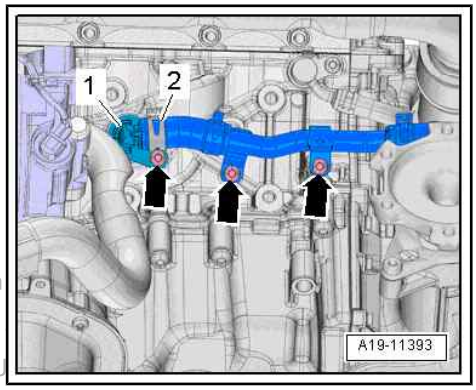


Vehicles with manual gearbox:



– Remove bolt -arrow-.
– Detach non-return valve -1-.

Vehicles with automatic/dual clutch gearbox:



– Remove bolts -arrows-.
– Release hose clip -2- and detach coolant hose.
– Detach non-return valve -1-.

Installing

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

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Note

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

– Install engine support and engine mounting ⇒ page 156 .

Note

Do not reuse coolant.

– Fill up with coolant ⇒ page 361 .

Tightening torques

♦ ⇒ “3.1 Exploded view - coolant pipes”, page 380

3 Coolant pipes

⇒ “3.1 Exploded view - coolant pipes”, page 380

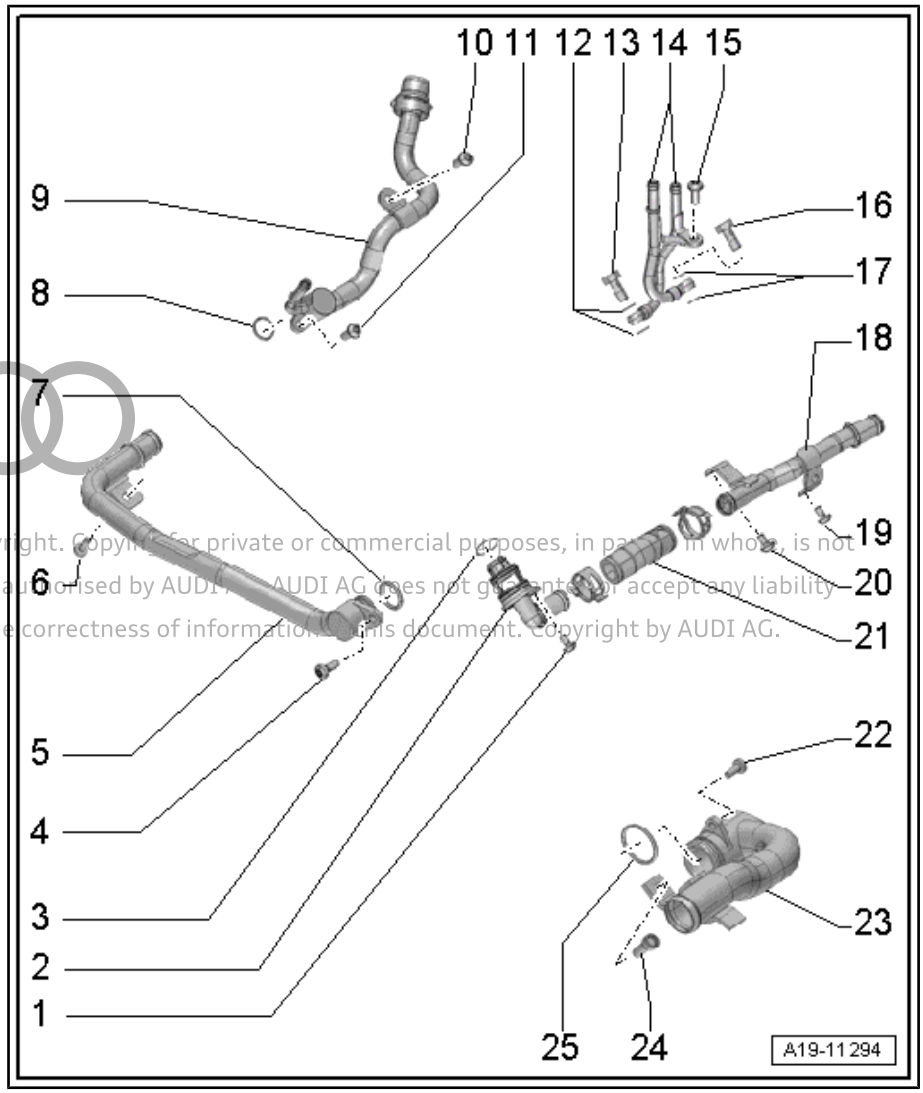
⇒ “3.2 Removing and installing coolant pipes”, page 382

3.1 Exploded view - coolant pipes

Note

The arrow markings on coolant pipes and on ends of hoses must align.

Coolant pipes on engine



1 - Bolt
- ❑ 9 Nm

2 - Non-return valve
- ❑ Removing and installing:
- ♦ Cylinder bank 1 ⇒ page 377
- ♦ Cylinder bank 2 ⇒ page 378

3 - O-ring
- ❑ Renew

4 - Bolt
- ❑ 9 Nm

5 - Coolant pipe (front)
- ❑ Removing and installing ⇒ page 384

6 - Bolt
- ❑ 9 Nm

7 - O-ring
- ❑ Renew

8 - O-ring
- ❑ Renew

9 - Coolant pipe (top)
- ❑ Removing and installing ⇒ page 382

10 - Bolt
- ❑ 9 Nm

11 - Bolt
- ❑ 9 Nm

12 - Seals
- ❑ Renew

13 - Banjo bolt
- ❑ 12 Nm

14 - Coolant lines
- ❑ For cylinder head, bank 2 (left-side)

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15 - Bolt

- ❑ 9 Nm

16 - Banjo bolt

- ❑ 12 Nm

17 - Seals

- ❑ Renew

18 - Coolant pipe (rear left)

- ❑ Only fitted on vehicles with automatic/dual clutch gearbox
- ❑ Different versions available; for allocation refer to ⇒ Electronic parts catalogue
- ❑ Removing and installing ⇒ page 386

19 - Bolt

- ❑ Only fitted on vehicles with automatic/dual clutch gearbox
- ❑ 9 Nm

20 - Bolt

- ❑ Only fitted on vehicles with automatic/dual clutch gearbox
- ❑ 9 Nm

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21 - Coolant hose

- ❑ Only fitted on vehicles with automatic/dual clutch gearbox

22 - Bolt

- ❑ 9 Nm

23 - Coolant pipe (front left)

- ❑ Removing and installing ⇒ page 386

24 - Bolt

- ❑ 20 Nm

25 - O-ring

- ❑ Renew

Coolant pipes on dual clutch gearbox 0CK

1 - Bolt

- ❑ 9 Nm

2 - Coolant pipe (bottom) on gearbox

- ❑ Removing and installing ⇒ page 390

3 - Coolant pipe (left-side) on gearbox

- ❑ Removing and installing ⇒ page 388

4 - Bolt

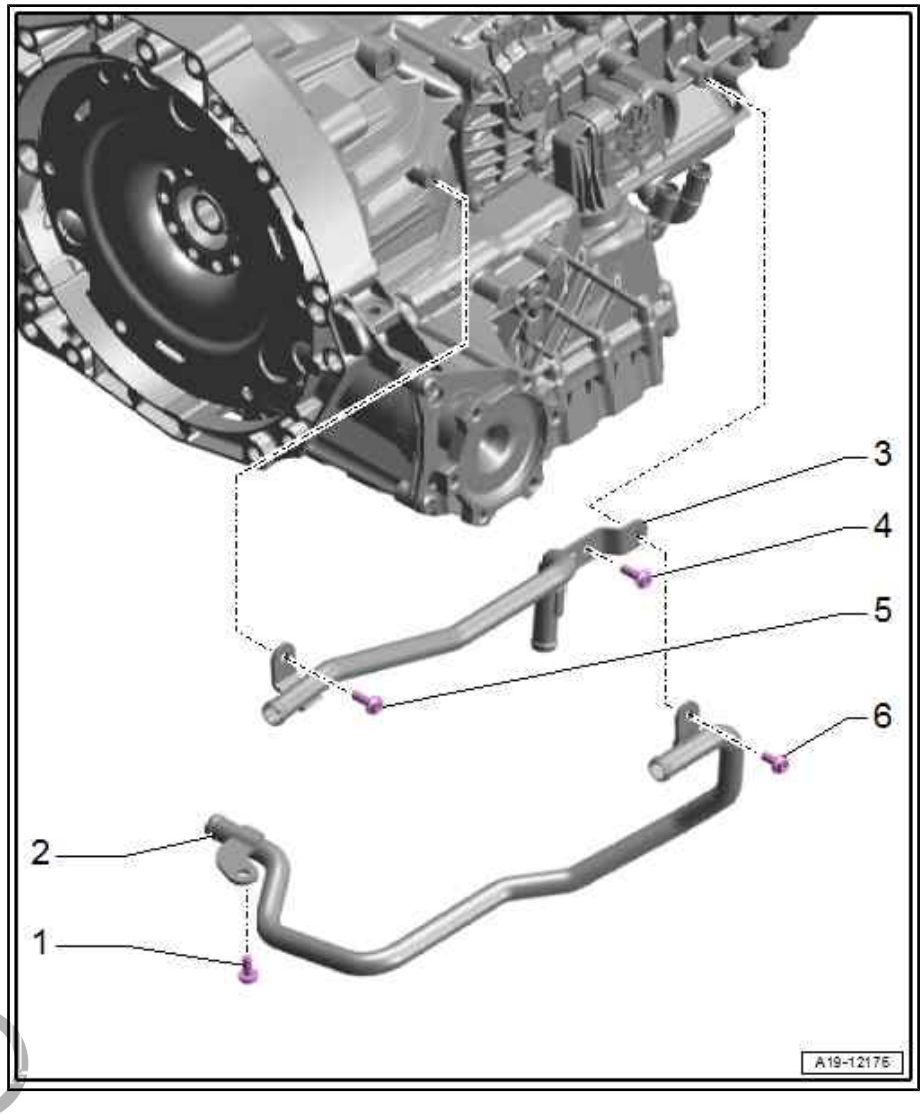
- ❑ 9 Nm

5 - Bolt

- ❑ 9 Nm

6 - Bolt

- ❑ 9 Nm



3.2 Removing and installing coolant pipes

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⇒ “3.2.1 Removing and installing coolant pipe (top)”, page 382

⇒ “3.2.2 Removing and installing coolant pipe (front)”, page 384

⇒ “3.2.3 Removing and installing coolant pipe (front left)”, page 386

⇒ “3.2.4 Removing and installing coolant pipe (rear left)”, page 386

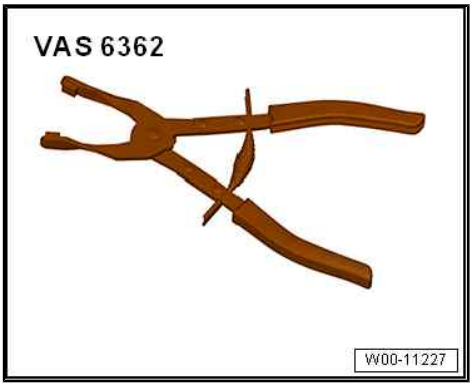
⇒ “3.2.5 Removing and installing coolant pipe on gearbox (left-side) - vehicles with dual clutch gearbox 0CK”, page 388

⇒ “3.2.6 Removing and installing coolant pipe on gearbox (bottom) - vehicles with dual clutch gearbox 0CK”, page 390

3.2.1 Removing and installing coolant pipe (top)

Special tools and workshop equipment required

♦ Hose clip pliers - VAS 6362-



Removing

– Drain coolant ⇒ page 359 .

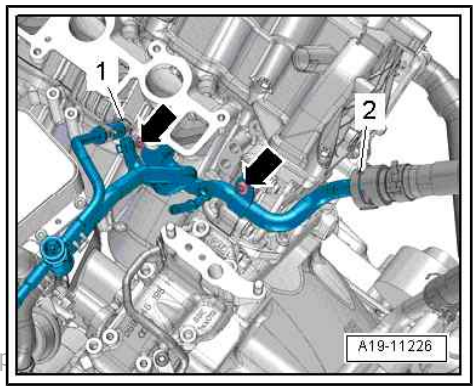
– Remove intake manifold ⇒ page 513 .

Vehicles with one turbocharger:

– Remove turbocharger ⇒ page 420 .

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

– Remove bolts -arrows- and detach coolant pipe (top) from cylinder head.

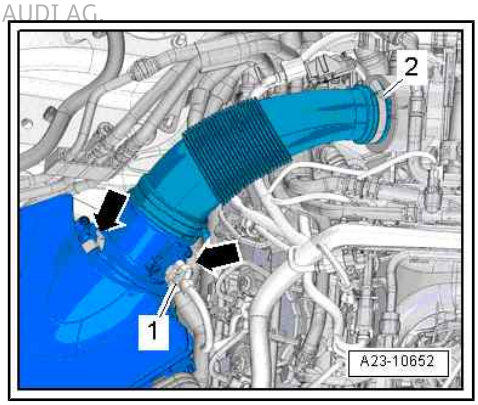


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Vehicles with two turbochargers:

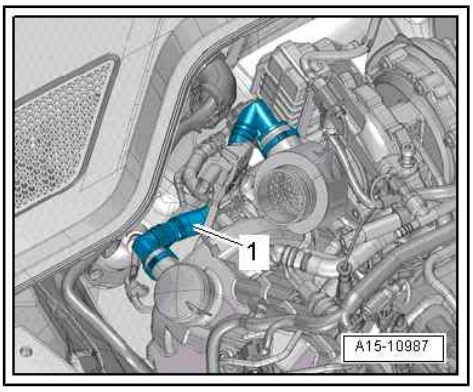
– Unplug electrical connector -1- at air mass meter - G70- .

– Remove air hose and air mass meter - G70- . To do so, release hose clip -2- and clamps -arrows-.



Caution

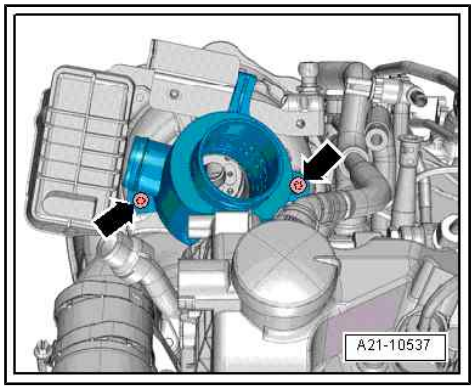
Depending on the vehicle version and country version, a crankcase breather hose may be fitted which cannot be detached from the cylinder head cover without being damaged irreparably. For these versions, the hose on the cylinder head cover will be damaged irreparably and must then be renewed.



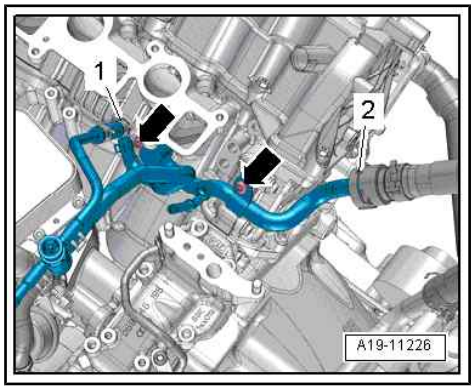
– Remove crankcase breather hose -arrow-; to do so, press release tabs (if present) or break hose connection at cylinder head cover as necessary.

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

– Move clear vacuum hose.
– Unscrew bolts -arrows- and detach connection from turbocharger.



– Release hose clip -1-, lift retaining clip -2- and detach coolant hoses.
– Remove bolts -arrows- and detach coolant pipe (top) from cylinder head.



Installing

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

Note

- *Fit new O-ring.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

– Clean and smoothen sealing surface for O-ring.
– Lubricate O-ring with coolant and slide onto coolant pipe.
– Install intake manifold ⇒ page 513 .
– Vehicles with one turbocharger: Install turbocharger ⇒ page 420 .
– Connect coolant hose with plug-in connector ⇒ page 394 .

Note

Do not reuse coolant.

– Fill up with coolant ⇒ page 361 .

Tightening torques

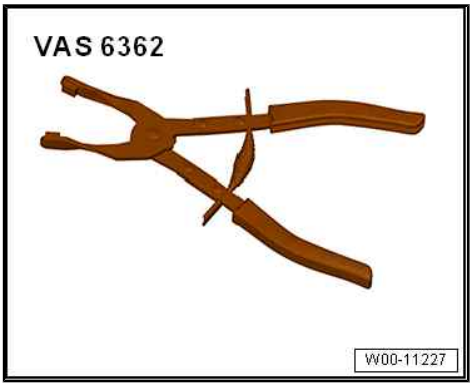
- ⇒ “3.1 Exploded view - coolant pipes”, page 380

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3.2.2 Removing and installing coolant pipe (front)

Special tools and workshop equipment required

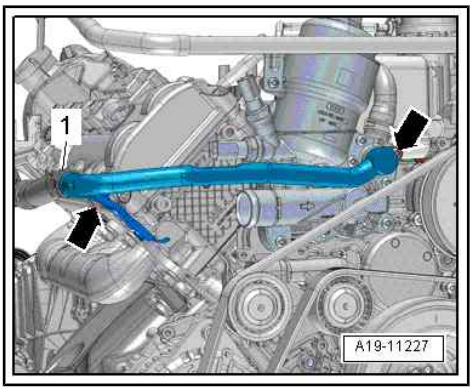
- Hose clip pliers - VAS 6362-



Removing

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– Remove engine cover panel ⇒ page 172 .
– Remove air cleaner housing ⇒ page 510 .
– Drain coolant ⇒ page 359 .
– Release hose clip -1- and detach coolant hose.
– Remove bolts -arrows- and detach coolant pipe (front) from oil filter housing.



Installing

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

Note

- *Fit new O-ring.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

– Clean and smoothen sealing surface for O-ring.
– Lubricate O-ring with coolant and slide onto coolant pipe.
– Install air cleaner housing ⇒ page 510 .

Note

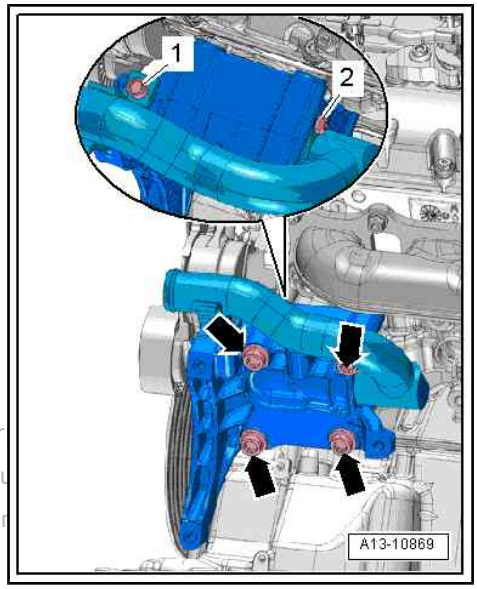
Do not reuse coolant.

– Fill up with coolant ⇒ page 361 .

Tightening torques

- ⇒ “3.1 Exploded view - coolant pipes”, page 380

3.2.3 Removing and installing coolant pipe (front left)



Removing

– Remove bracket for air conditioner compressor ⇒ page 187 .

– Remove bolts -1 and 2- and detach coolant pipe (front left).

Note

Disregard -arrows-.

Installing

Note

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- *Fit new O-ring.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

– Clean and smoothen sealing surface for O-ring.

– Lubricate O-ring with coolant and slide onto coolant pipe.

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

– Install bracket for air conditioner compressor ⇒ page 187 .

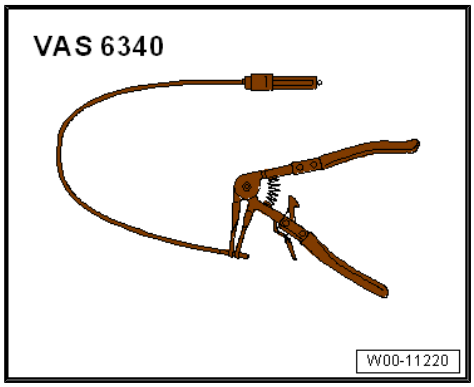
Tightening torques

- ⇒ “3.1 Exploded view - coolant pipes”, page 380

3.2.4 Removing and installing coolant pipe (rear left)

Special tools and workshop equipment required

- Hose clip pliers - VAS 6340- for vehicles with two turbochargers.



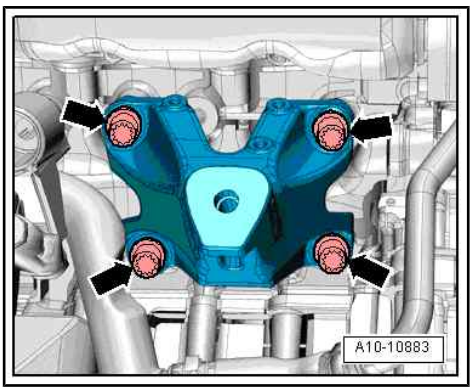
♦ Hose clip pliers - VAS 6362-



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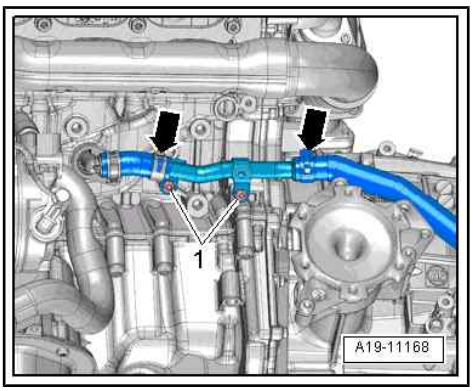
Removing

– Drain coolant ⇒ page 359 .
– Remove engine mounting (left-side) ⇒ page 163 .
– Unscrew bolts -arrows- and remove engine support (left-side).

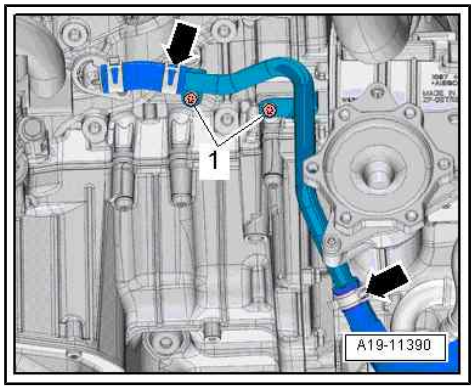


Vehicles with one turbocharger:

– Remove bolts -1-.
– Release hose clips -arrows- and detach coolant hoses from coolant pipe.
– Detach coolant pipe (rear left).



Vehicles with two turbochargers:



– Remove bolts -1-.
– Release hose clips -arrows- and detach coolant hoses from coolant pipe.
– Detach coolant pipe (rear left).

Installing

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

Note

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

– Install engine support and engine mounting ⇒ page 156 .

Note

Do not reuse coolant.

– Fill up with coolant ⇒ page 361 .

Tightening torques

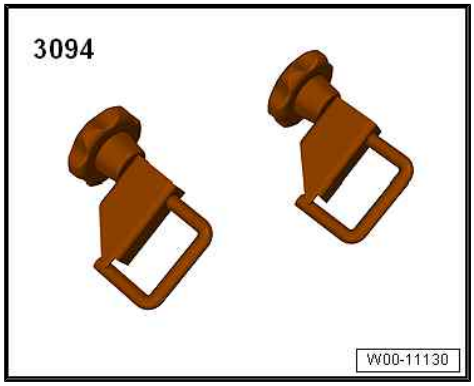
♦ ⇒ “3.1 Exploded view - coolant pipes”, page 380

3.2.5 Removing and installing coolant pipe on gearbox (left-side) - vehicles with dual clutch gearbox 0CK

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Special tools and workshop equipment required

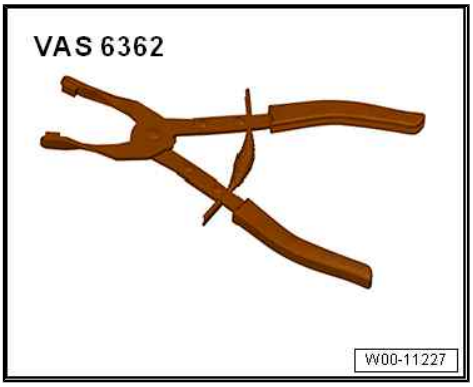
♦ Hose clamps, up to 25 mm - 3094-



♦ Drip tray for workshop hoist - VAS 6208-



♦ Hose clip pliers - VAS 6362-



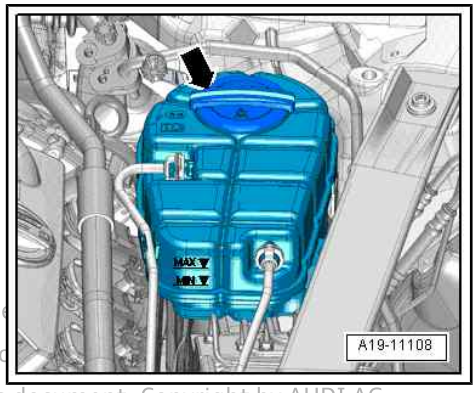
Removing

– Remove engine cover panel ⇒ page 172 .

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.***



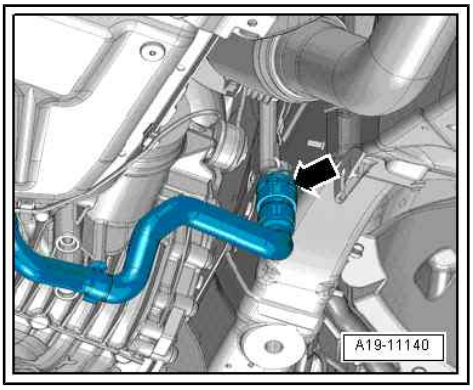
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– Open filler cap -arrow- on coolant expansion tank.

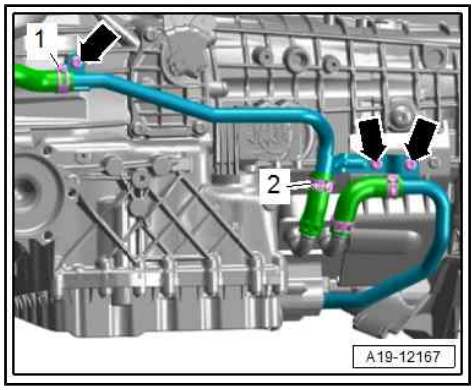
– Remove noise insulation (rear) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

– Place drip tray for workshop hoist - VAS 6208- under connection.

– Clamp off coolant hose with hose clamp -3094- .



– Place drip tray for workshop hoist - VAS 6208- under connection.
– Remove bolts -arrows-.
– Clamp off coolant hose using hose clamp -3094- , release hose clip -1- and disconnect coolant hose.
– Loosen hose clip -2- and detach coolant pipe.



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 .*
- *Do not reuse coolant.*

– Fill up with coolant ⇒ page 361 .

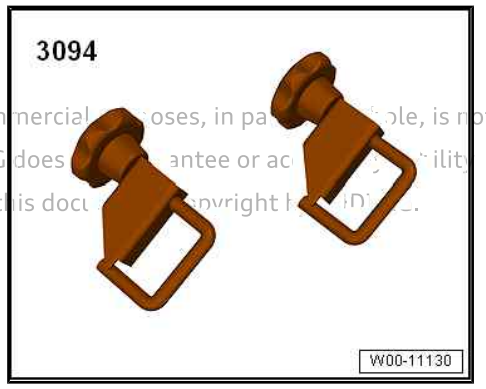
Tightening torques

- ⇒ “3.1 Exploded view - coolant pipes”, page 380
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

3.2.6 Removing and installing coolant pipe on gearbox (bottom) - vehicles with dual clutch gearbox 0CK

Special tools and workshop equipment required

- Hose clamps, up to 25 mm - 3094-

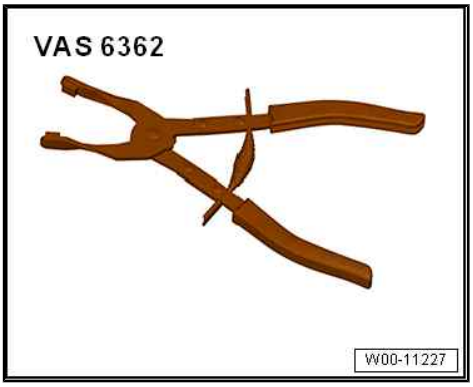


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- Drip tray for workshop hoist - VAS 6208-



- Hose clip pliers - VAS 6362-



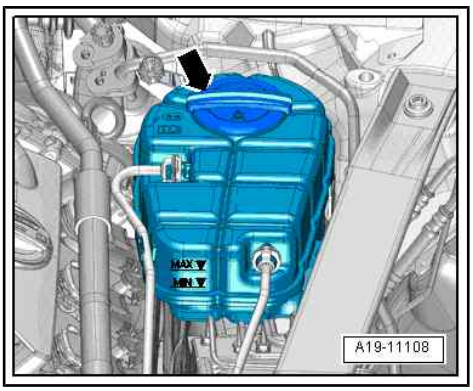
Removing

– Remove engine cover panel ⇒ page 172 .

WARNING

Risk of scalding due to hot steam and hot coolant.

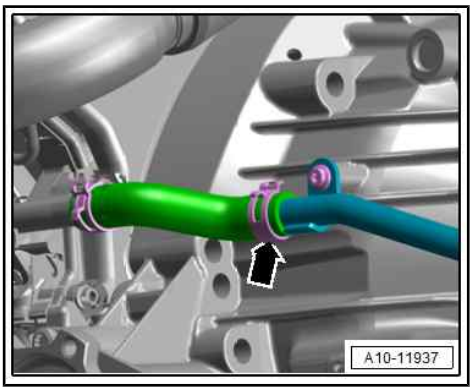
- *The cooling system is under pressure when the engine is hot.*
- *To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.*



– Open filler cap -arrow- on coolant expansion tank.

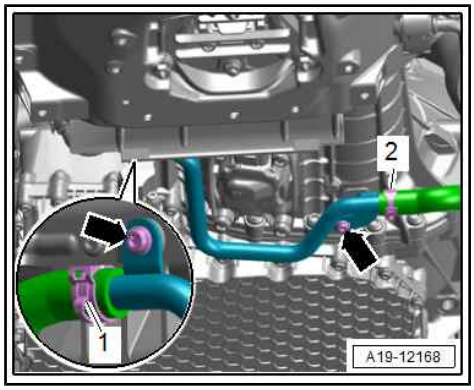
– Remove noise insulation (rear) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

– Clamp off coolant hose -arrow- with hose clamp -3094- .



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– Place drip tray for workshop hoist - VAS 6208- under connection.
– Remove bolts -arrows-.
– Clamp off coolant hose using hose clamp -3094- , release hose clip -2- and disconnect coolant hose.
– Loosen hose clip -1- and detach coolant pipe.



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 .*
- *Do not reuse coolant.*

– Fill up with coolant ⇒ page 361 .

Tightening torques

- ⇒ “3.1 Exploded view - coolant pipes”, page 380
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

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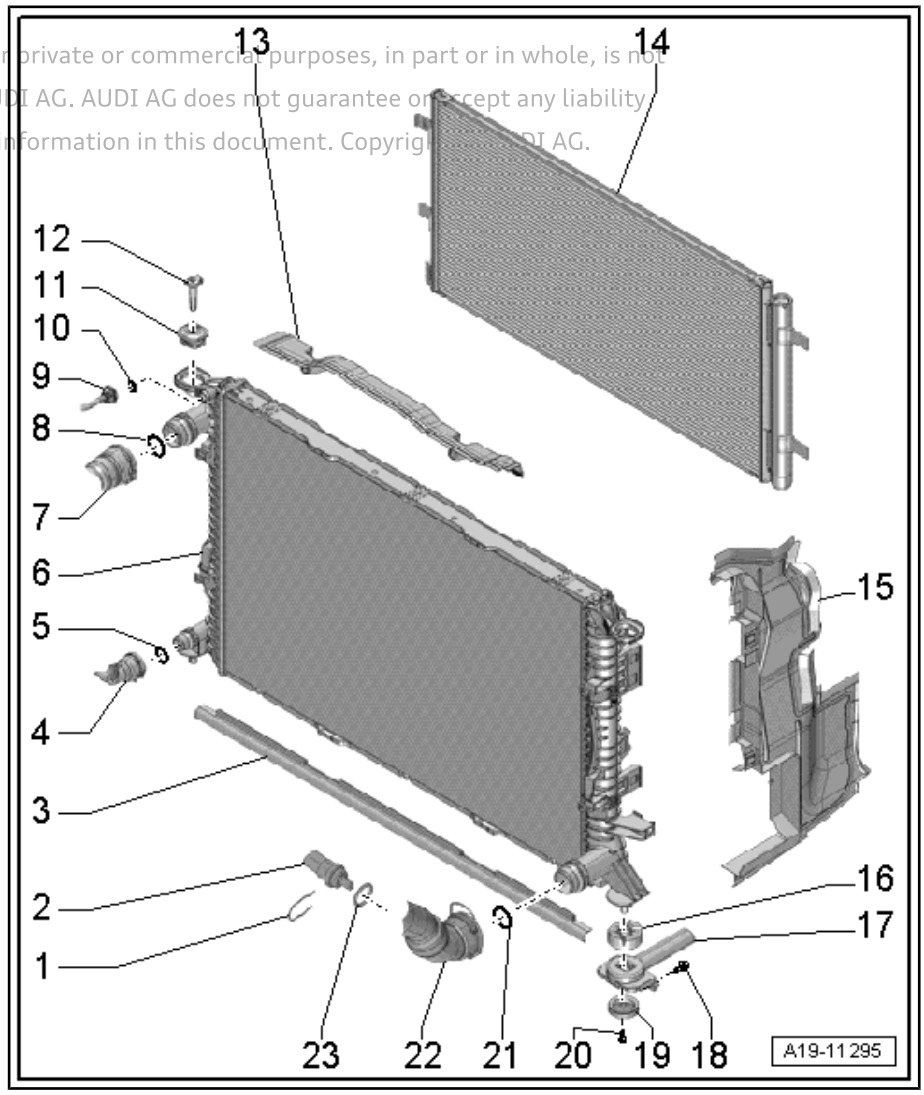
4 Radiator/radiator fans

⇒ “4.1 Exploded view - radiator/radiator fans”, page 393
⇒ “4.2 Exploded view - auxiliary radiator”, page 397
⇒ “4.3 Removing and installing radiator”, page 397
⇒ “4.4 Removing and installing radiator cowl”, page 402
⇒ “4.5 Removing and installing radiator fan V7 ”, page 408
⇒ “4.6 Removing and installing auxiliary radiator”, page 410

4.1 Exploded view - radiator/radiator fans

Radiator and condenser

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1 - Retaining clip

2 - Radiator outlet coolant temperature sender - G83-
- ❑ Removing and installing ⇒ page 372

3 - Air duct

4 - Coolant hose
- ❑ Lift retaining clip to detach
- ❑ Connecting ⇒ page 394

5 - O-ring
- ❑ Renew

6 - Radiator
- ❑ Removing and installing ⇒ page 397
- ❑ If renewed, change coolant in entire system

7 - Coolant hose
- ❑ Lift retaining clip to detach
- ❑ Connecting ⇒ page 394

8 - O-ring
- ❑ Renew

9 - Coolant pipe
- ❑ To coolant expansion tank
- ❑ Press release ring to detach
- ❑ Connecting ⇒ page 394

10 - O-ring
- ❑ Renew

11 - Rubber bush
- ❑ For radiator

12 - Retaining pin

- ❑ Use screwdriver to release and pull off

13 - Air duct

14 - Condenser

- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit; Removing and installing condenser

15 - Air duct

16 - Rubber bush

- ❑ For radiator

17 - Radiator bracket

18 - Bolt

- ❑ 5 Nm

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19 - Washer

20 - Bolt

- ❑ 4.5 Nm

21 - O-ring

- ❑ Renew

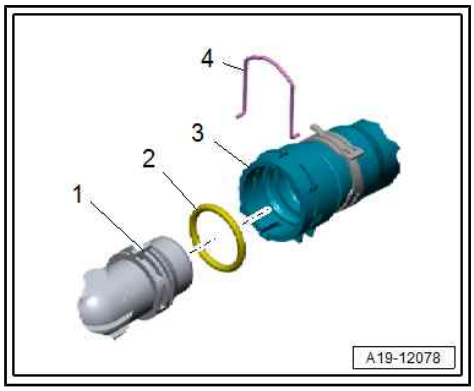
22 - Coolant hose

- ❑ Lift retaining clip to detach
- ❑ Connecting to radiator ⇒ page 394

23 - O-ring

- ❑ Renew

Connecting coolant hose with plug-in connector



Note

If damaged, renew retaining clip -4-.

– 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 cowl and radiator fans - version 1

1 - Radiator fan control unit

- ❑ Radiator fan control unit - J293- with radiator fan control unit 2 - J671-
- ❑ Removing and installing ⇒ page 409

2 - Bolt

- ❑ 3.5 Nm

3 - Bolt

- ❑ 5 Nm

4 - Radiator cowl

- ❑ Different versions available; for allocation refer to ⇒ Electronic parts catalogue
- ❑ Removing and installing ⇒ page 405

5 - Radiator fan - V7-

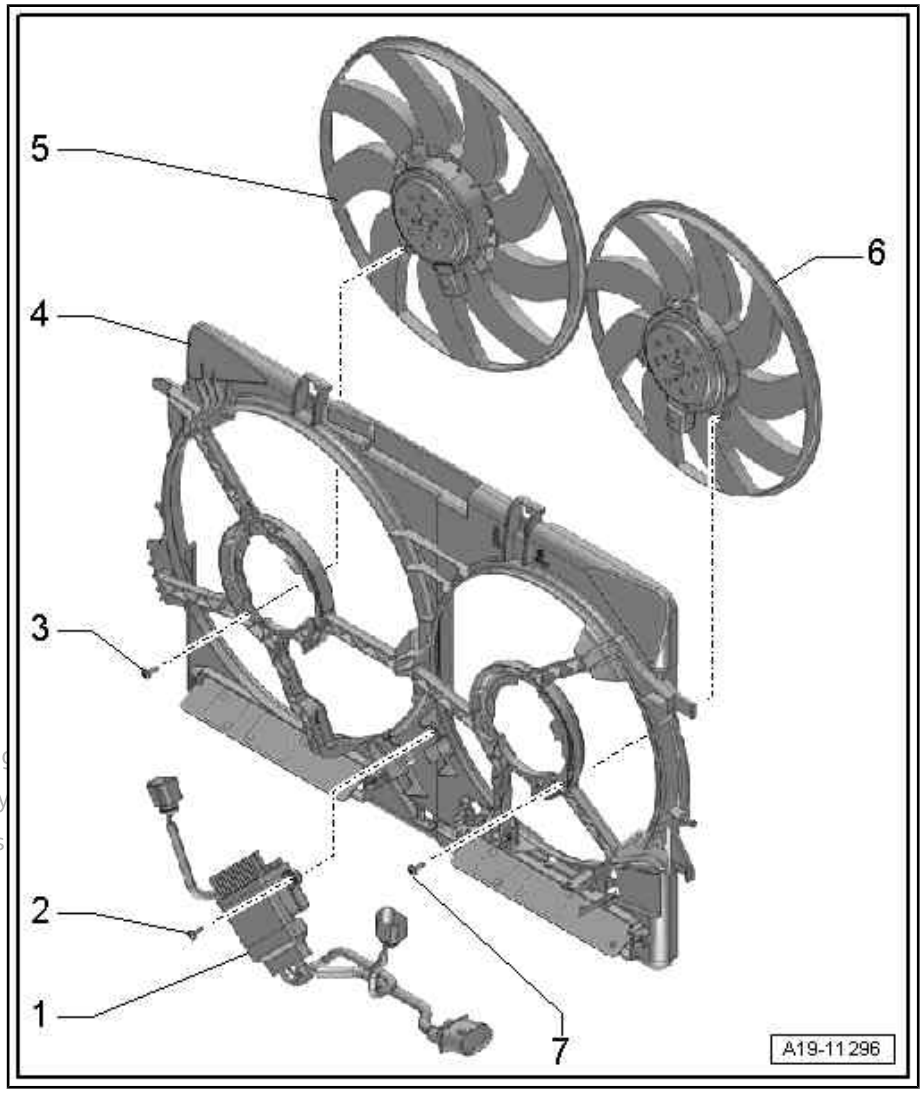
- ❑ Removing and installing ⇒ page 408

6 - Radiator fan 2 - V177-

- ❑ Optional equipment
- ❑ Removing and installing ⇒ page 408

7 - Bolt

- ❑ 5 Nm



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Radiator cowl and radiator fans - version 2

1 - Radiator fan 2 - V177-

- With radiator fan control unit 2 - J671-
- Removing and installing ⇒ page 408

2 - Radiator fan - V7-

- With radiator fan control unit - J293-
- Removing and installing ⇒ page 408

3 - Radiator cowl

- Removing and installing ⇒ page 405

4 - Bolt

- 3.5 Nm

5 - Fan wheel

- Pin must engage in hole

6 - Bolt

- 5 Nm

7 - Fan wheel

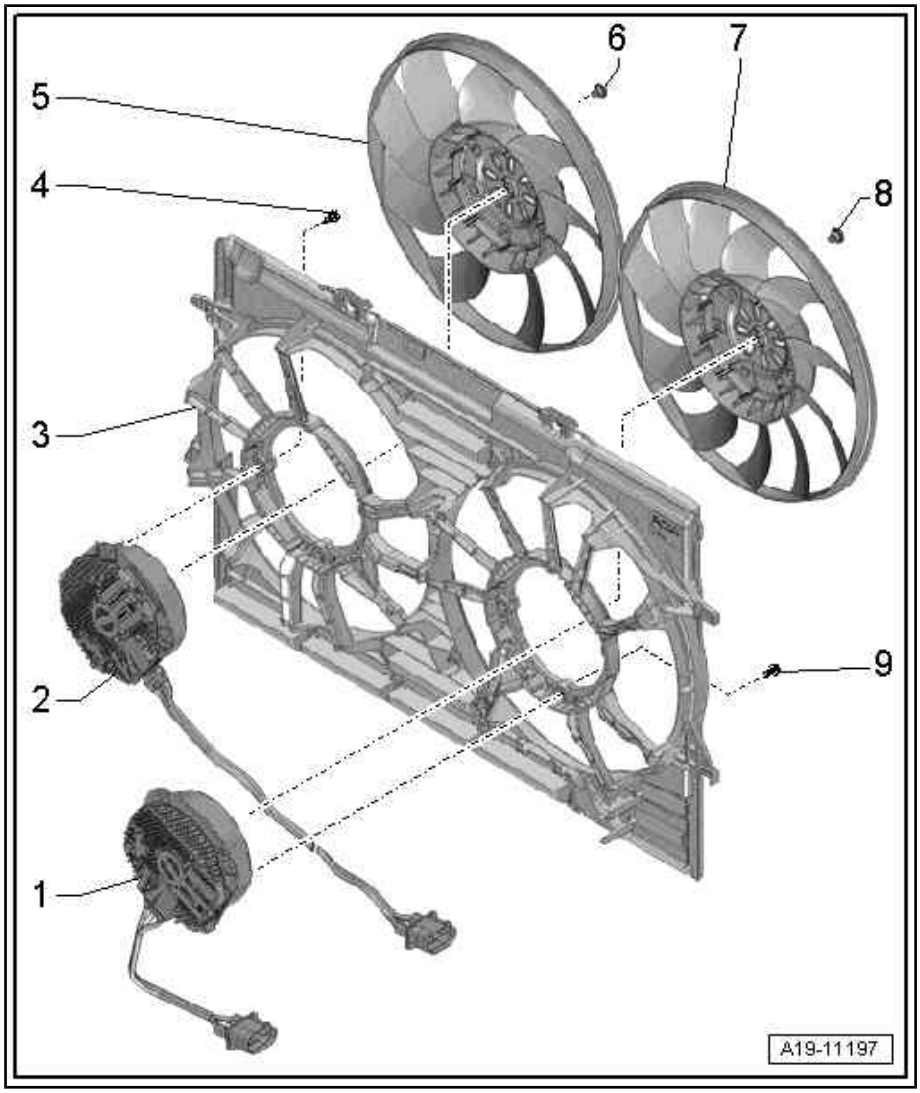
- Pin must engage in hole

8 - Bolt

- 5 Nm

9 - Bolt

- 3.5 Nm



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4.2 Exploded view - auxiliary radiator

1 - Front air duct
- ❑ Clipped onto rear air duct
- ❑ Move to side to unclip and remove

2 - Clip

3 - Auxiliary radiator
- ❑ Removing and installing ⇒ page 410
- ❑ If renewed, change coolant in entire system

4 - Clip

5 - Coolant hoses

6 - Bolt
- ❑ 20 Nm

7 - Nut
- ❑ 8 Nm

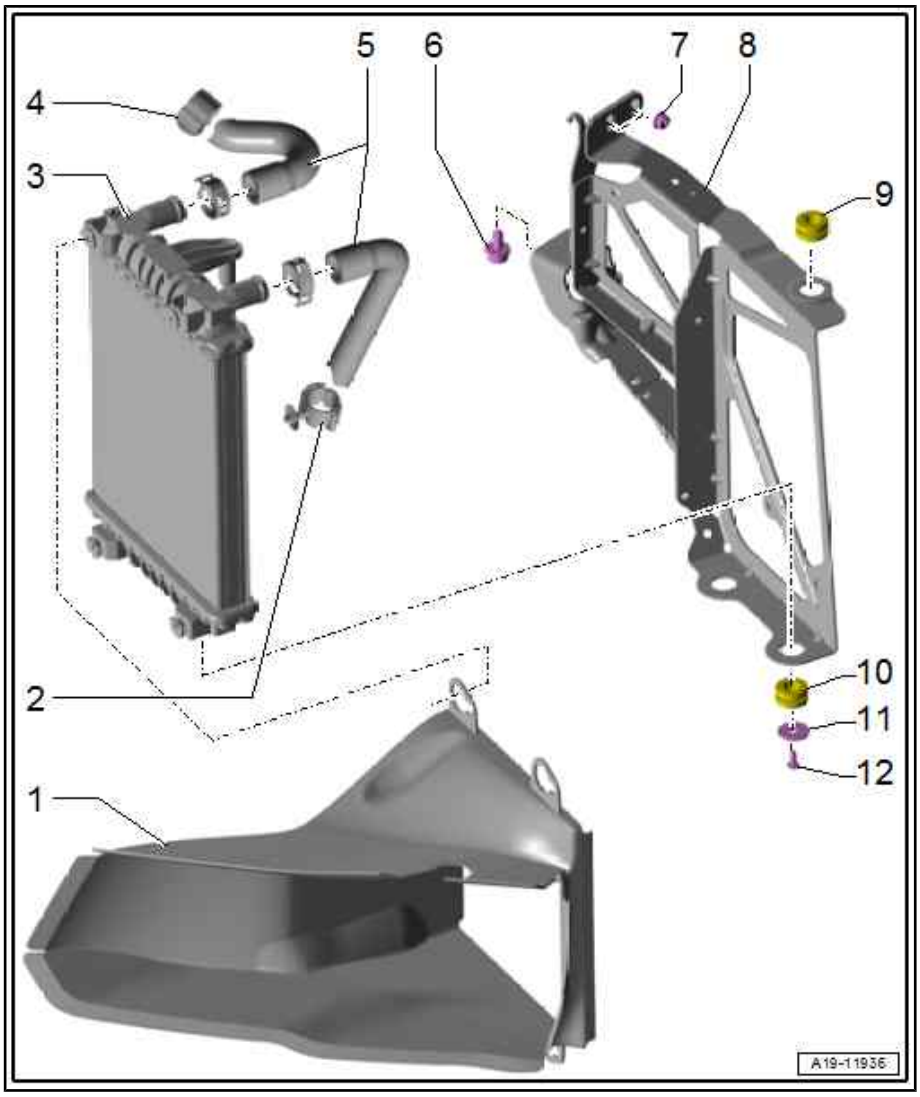
8 - Bracket

9 - Rubber bush
- ❑ For radiator

10 - Rubber bush
- ❑ For radiator

11 - Washer

12 - Bolt
- ❑ 3.5 Nm



4.3 Removing and installing radiator

Note

Radiator and radiator cowl can only be removed and installed together as one unit.

Special tools and workshop equipment required

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♦ Drip tray for workshop hoist - VAS 6208-



♦ Hose clip pliers - VAS 6362-



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Removing

– Remove noise insulation (front) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

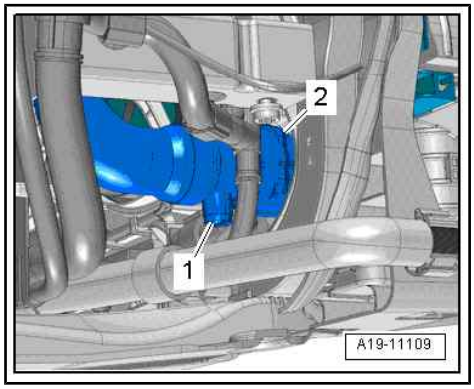
– Remove impact absorber (front) ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing impact absorber .

– Remove charge air cooler ⇒ page 467 .

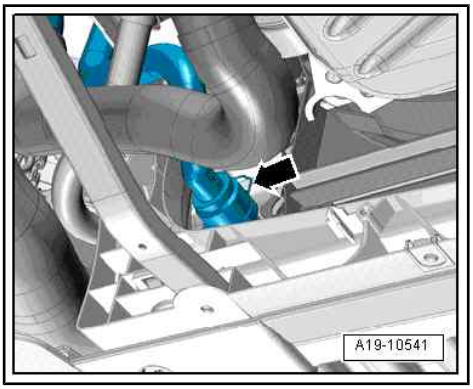
– Place drip tray for workshop hoist - VAS 6208- beneath engine.

– Remove drain plug -1- and drain off coolant.

– Pull out retaining clip -2- and disconnect coolant hose from radiator.



– Lift retaining clip -arrow- and detach connection (bottom left) from radiator.



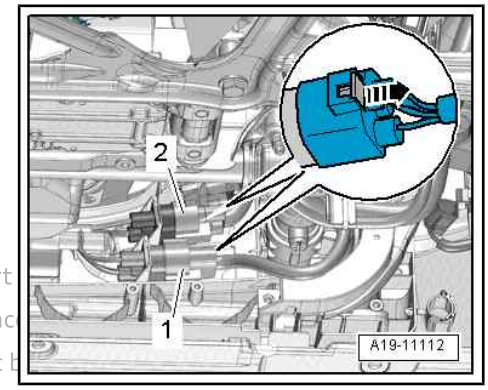
WARNING

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

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

Vehicles without torque reaction support:

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

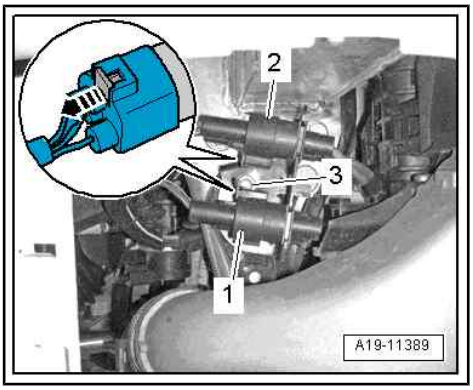


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Vehicles with torque reaction support:

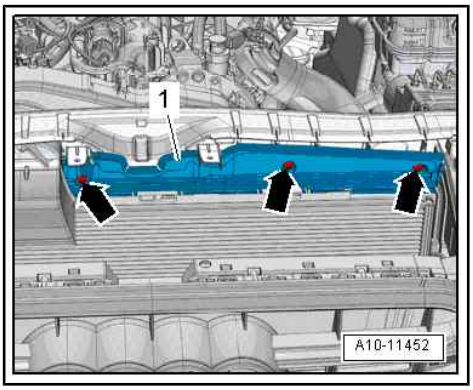
– Unplug electrical connectors -1, 2- for radiator fan (push retainer to the rear -arrow- and press down release catch).

– Remove bolt -3- securing bracket.



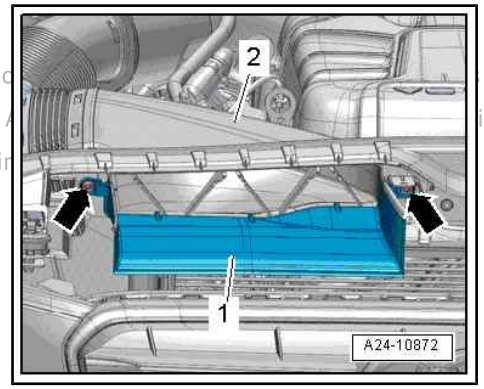
All vehicles (continued):

– Remove bolts -arrows- and detach air duct -1-.



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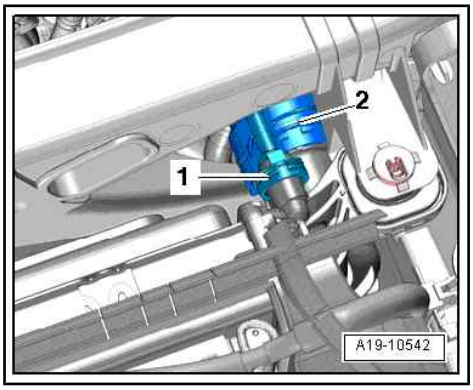
– Remove bolts -arrows- and detach air duct -2-.



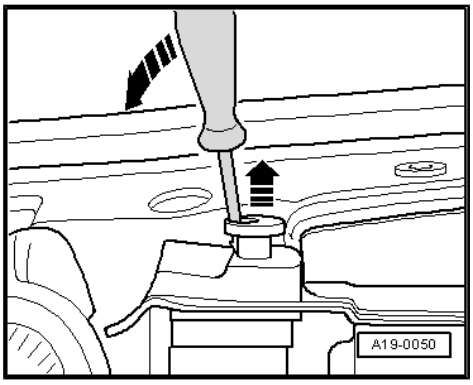
Note

Disregard -item 1-.

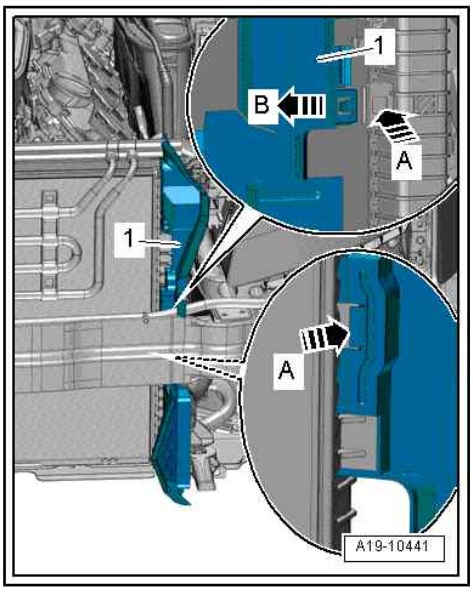
– Lift retaining clips -1- and -2- and detach connection from radiator.



– Release retaining pins for radiator on both sides and pull out upwards -arrows-.



– Release catches -arrows A- and detach air duct (left-side) -1- slightly -arrow B-.



Condenser with angled connection for refrigerant line:

– Have a second mechanic release retaining clips -1- in direction of -arrow A- and lift condenser -2- out of mountings on radiator -arrows B-.

Caution

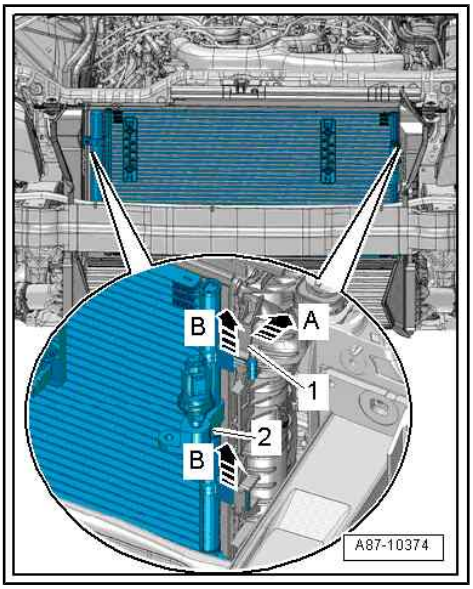
Risk of damage to condenser, refrigerant lines and refrigerant hoses.

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

– Pivot condenser forwards with pipes/hoses attached.

Condenser with straight connection for refrigerant line:

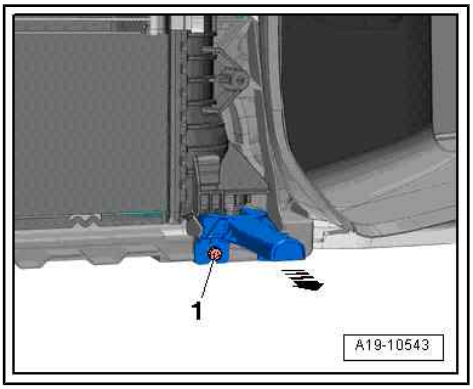
– Remove condenser ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit; Removing and installing condenser .



All vehicles (continued):

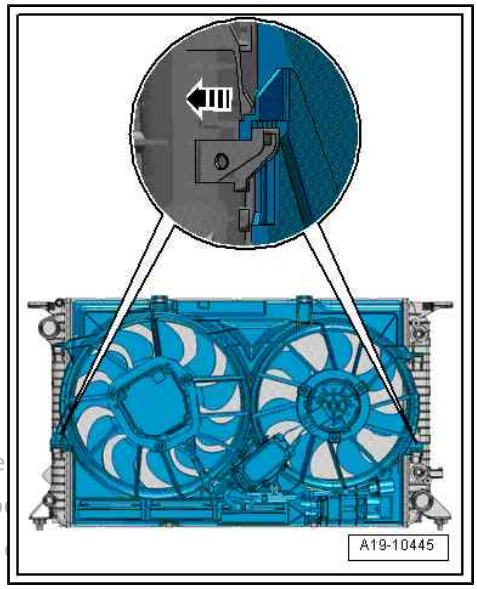
– Remove bolt -1- on both sides and detach radiator bracket with radiator from lock carrier -arrow-.

– Detach radiator.



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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:

Note

If there are slight impressions on the fins, refer to ⇒ page 11 .

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

– Connect coolant hose with plug-in connector ⇒ page 394 .

– Install charge air cooler ⇒ page 467 .

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Note

Do not reuse coolant.

– Fill up with coolant ⇒ page 366 .

Tightening torques

- ⇒ “4.1 Exploded view - radiator/radiator fans”, page 393
- ⇒ “3.1 Exploded view - air cleaner housing”, page 509
- ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit; Exploded view - condenser
- ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - impact bar

4.4 Removing and installing radiator cowl

⇒ “4.4.1 Removing and installing radiator cowl - Audi A6”, page 402

⇒ “4.4.2 Removing and installing radiator cowl - Audi A7”, page 405

4.4.1 Removing and installing radiator cowl - Audi A6

Special tools and workshop equipment required

- Drip tray for workshop hoist - VAS 6208-



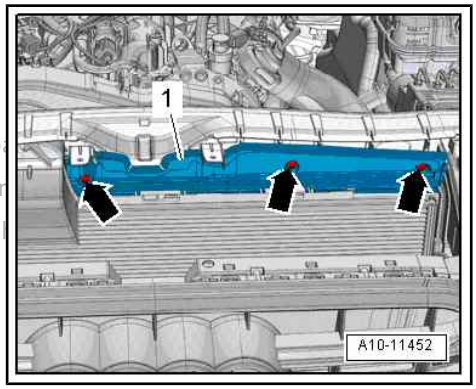
Removing

– Remove charge air cooler ⇒ page 467 .

Vehicles with one turbocharger:

– Remove bolts -arrows- and detach air duct -1-.

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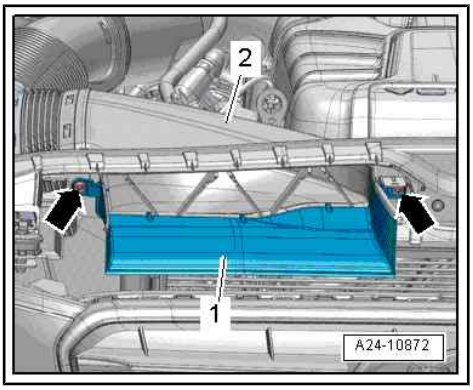


– Remove bolts -arrows- and detach air duct -1-.

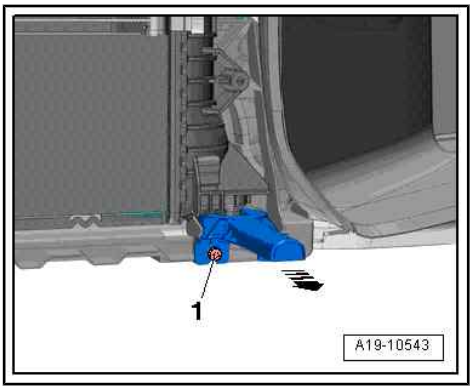
Note

Disregard -item 2-.

– Remove noise insulation (front) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

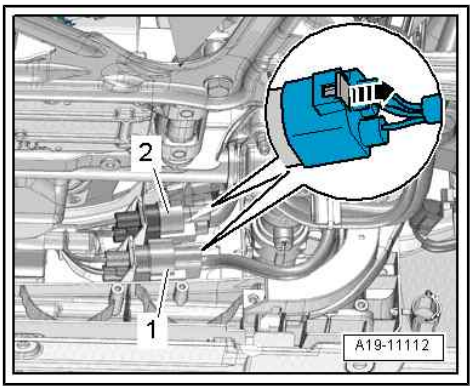


– Remove bolts -1- on both sides and detach radiator bracket with radiator from lock carrier -arrow-.



Vehicles without torque reaction support:

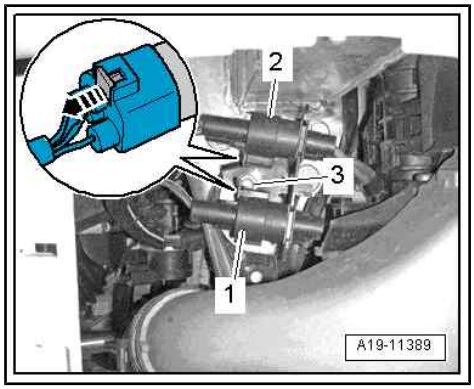
– Unplug electrical connector -1- and, if fitted, -2- for radiator fan (push retainer to the rear -arrow- and press down release catch).



Vehicles with torque reaction support:

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

– Remove bolt -3- securing bracket.

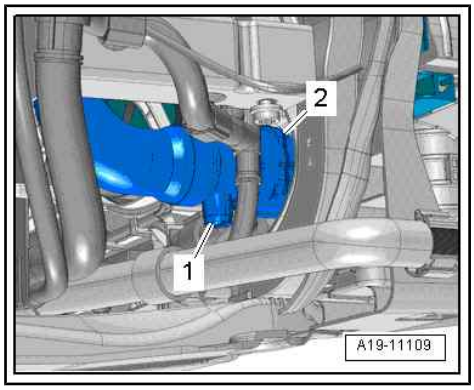


All vehicles (continued):

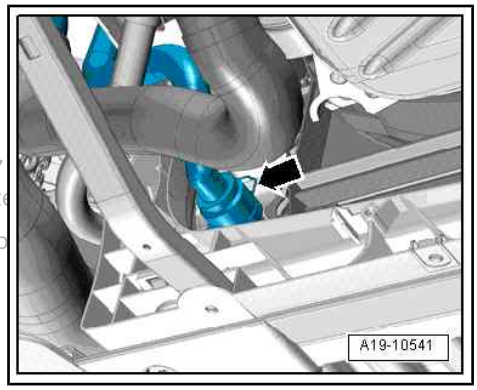
– Place drip tray for workshop hoist - VAS 6208- beneath engine.

– Remove drain plug -1- and drain off coolant.

– Lift retaining clip -2- and disconnect coolant hose from radiator.



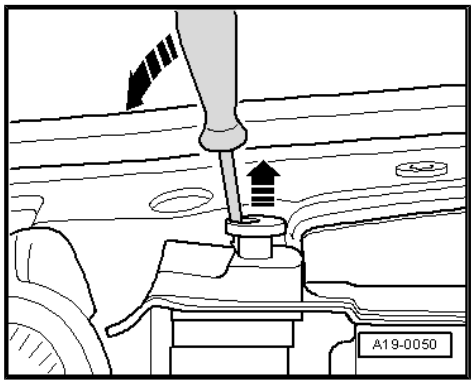
– Detach connection from radiator (lift retaining clip -arrow-).



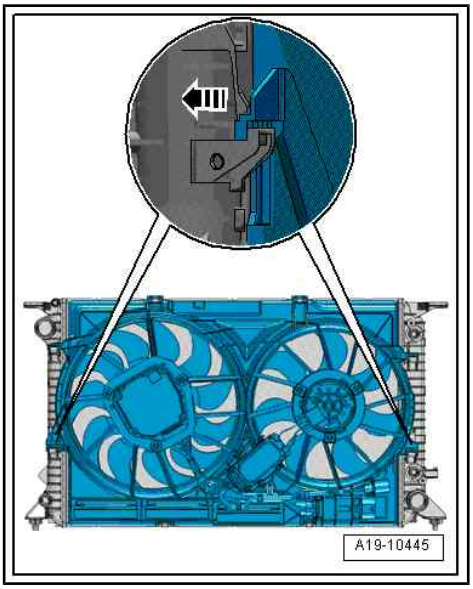
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– Release retaining pins for radiator on both sides and pull out upwards -arrows-.

– Press radiator slightly towards front.



– Press locking tabs on left and right sides of radiator cowl simultaneously -arrow-, lift radiator cowl off radiator and remove from below.



Installing

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

– Connect coolant hose with plug-in connector ⇒ page 394 .

– Install charge air cooler ⇒ page 467 .

Note

Do not reuse coolant.

– Fill up with coolant ⇒ page 366 .

Tightening torques

- ⇒ “4.1 Exploded view - radiator/radiator fans”, page 393
- ⇒ “3.1 Exploded view - air cleaner housing”, page 509
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

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4.4.2 Removing and installing radiator cowl - Audi A7

Removing

– Drain coolant ⇒ page 359 .

– Remove closure plate for bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing attachments .

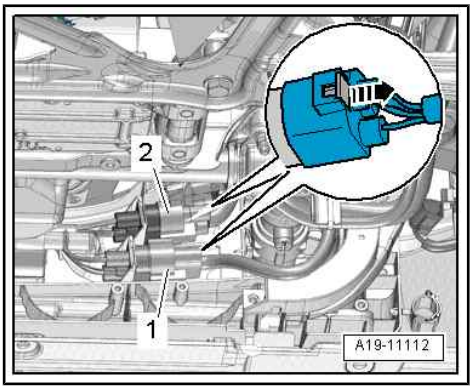
WARNING

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

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

Vehicles without torque reaction support:

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



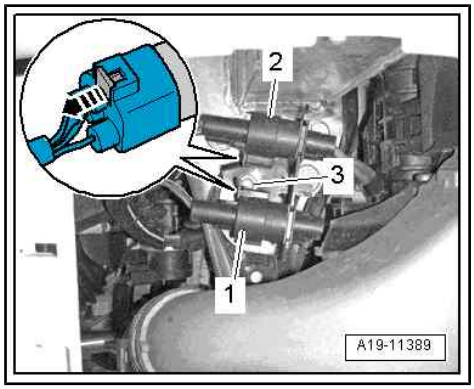
Vehicles with torque reaction support:

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

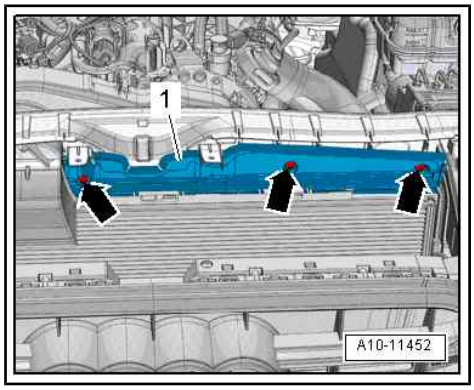
– Remove bolt -3- securing bracket.

All vehicles (continued):

– Remove lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing attachments .



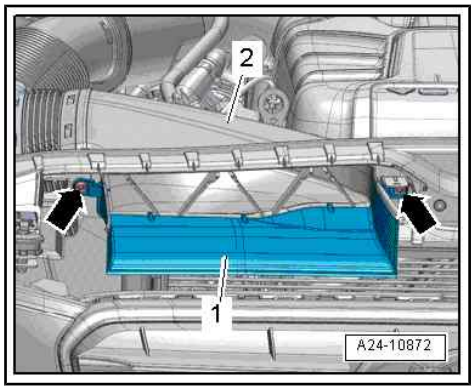
– Remove bolts -arrows- and detach air duct -1-.



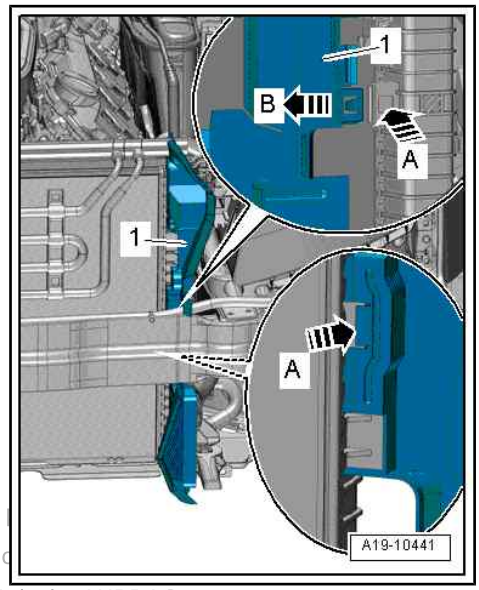
– Remove bolts -arrows- and detach air duct -1-.

Note

Disregard -item 2-.

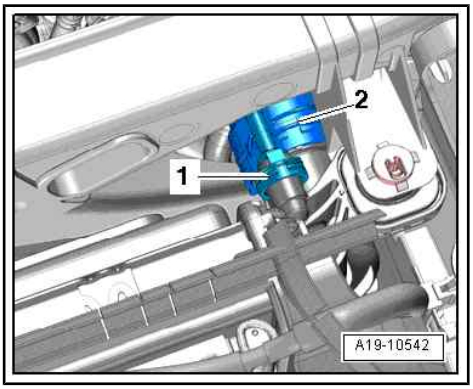


– Release catches -arrows A- and swivel air duct -1- on left and right to centre of vehicle -arrow B-.

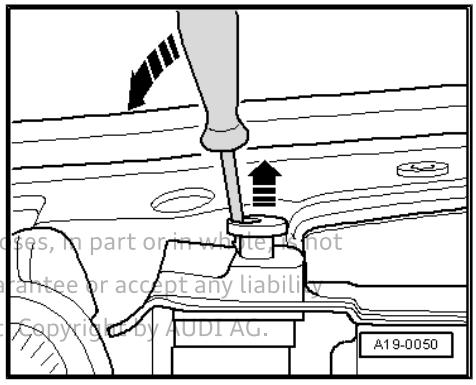


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– Release retaining clips -1 and 2- and detach connection from radiator.

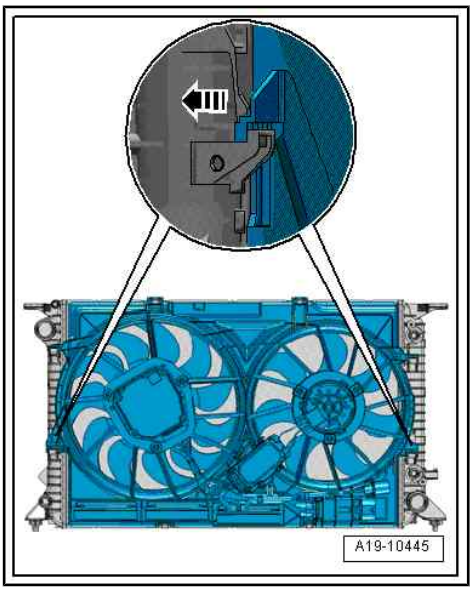


– Release retaining pins for radiator on both sides and pull out upwards -arrows-.
– Press radiator slightly towards front.



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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:

– Connect coolant hose with plug-in connector ⇒ page 394 .
– Install closure plate and lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .

Tightening torques

- ⇒ “4.1 Exploded view - radiator/radiator fans”, page 393
- ⇒ “3.1 Exploded view - air cleaner housing”, page 509

4.5 Removing and installing radiator fan - V7-

⇒ “4.5.1 Removing and installing radiator fans V7 / V177 - version 1”, page 408

⇒ “4.5.2 Removing and installing radiator fans V7 / V177 - version 2”, page 409

⇒ “4.5.3 Removing and installing radiator fan control unit J293 / J671 ”, page 409

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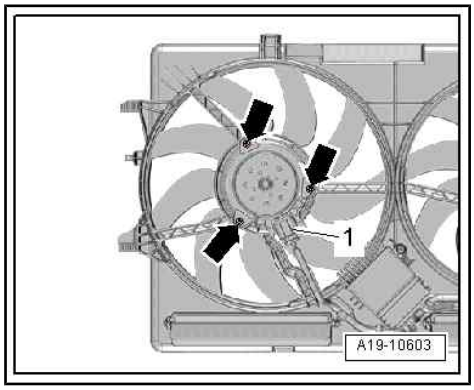
4.5.1 Removing and installing radiator fans - V7- / -V177- - version 1

Removing

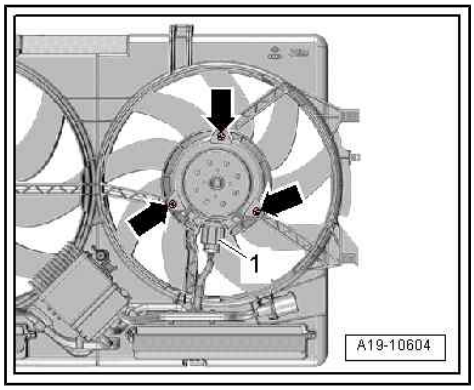
Note

Fit all cable ties in the original positions when installing.

– Remove radiator cowl ⇒ page 405 .
– Unplug electrical connector -1-.
– Remove bolts -arrows- and detach radiator fan - V7- (left-side).



– Unplug electrical connector -1-.
– Remove bolts -arrows- and detach radiator fan 2 - V177- (right-side).



Installing

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

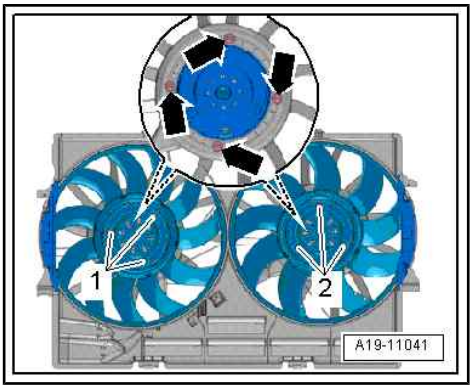
– Install radiator cowl ⇒ page 405 .

Tightening torques

◆ ⇒ “4.1 Exploded view - radiator/radiator fans”, page 393

4.5.2 Removing and installing radiator fans - V7- / -V177- - version 2

Removing



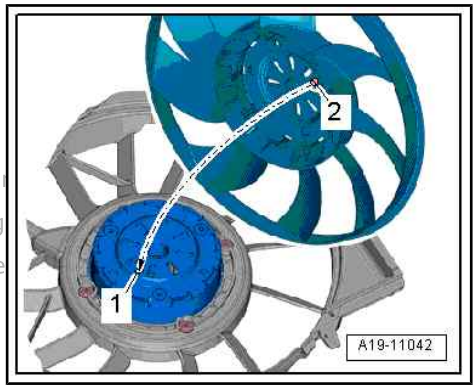
Note

Fit all cable ties in the original positions when installing.

– Remove radiator cowl ⇒ page 402 .
– Remove bolts -1- or -2- and detach corresponding fan wheel.
– Remove bolts -arrows- on radiator fan.
– Move electrical wiring harness clear and detach radiator fan.

Installing

Installation is carried out in reverse order; note the following:



– Note installation position of fan wheel:
• Pin -2- must engage in hole -1-.
– Install radiator cowl ⇒ page 405 .

Tightening torques

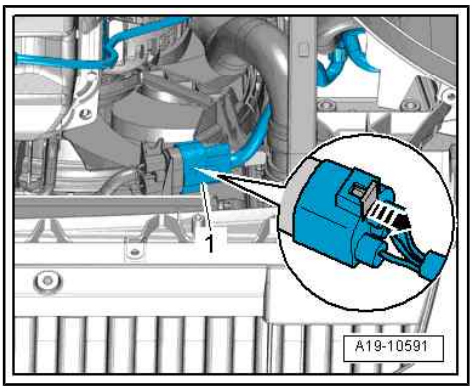
◆ ⇒ “4.1 Exploded view - radiator/radiator fans”, page 393

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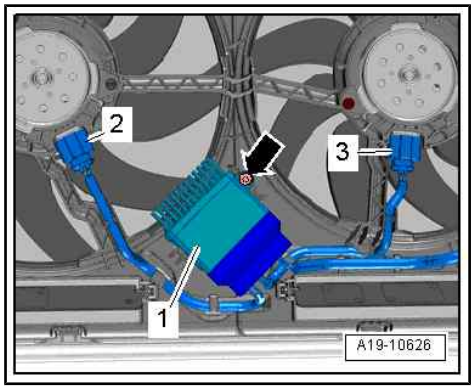
4.5.3 Removing and installing radiator fan control unit -J293- / -J671-

Removing

– Remove noise insulation (front) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing 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 clear electrical wiring harness going to radiator fan control unit.



– Unplug electrical connectors -2- and -3- (if fitted).
– Unscrew bolt -arrow- and remove radiator fan control unit -1-.



Installing

Installation is carried out in reverse order; note the following:

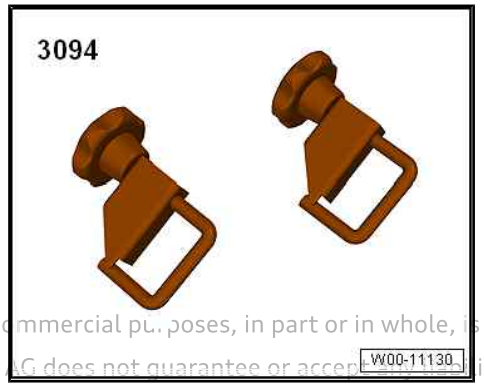
Tightening torques

- ⇒ “4.1 Exploded view - radiator/radiator fans”, page 393
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

4.6 Removing and installing auxiliary radiator

Special tools and workshop equipment required

- Hose clamps, up to 25 mm - 3094-

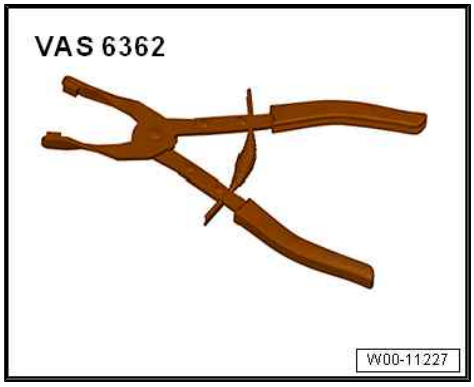


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- Drip tray for workshop hoist - VAS 6208-



- Hose clip pliers - VAS 6362-



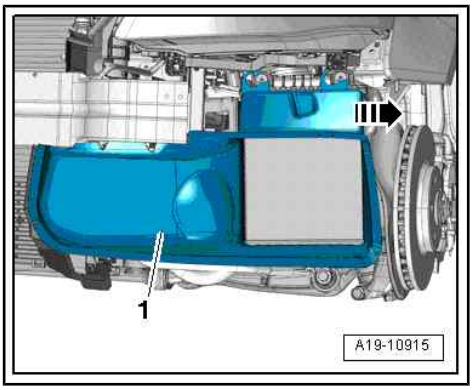
Removing

– Remove noise insulation (front) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

– Remove wheel housing liner (front left) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Removing and installing wheel housing liner (front) .

– Remove bumper cover (front) ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing bumper cover .

– Unclip air duct -1- in direction of -arrow- and remove.

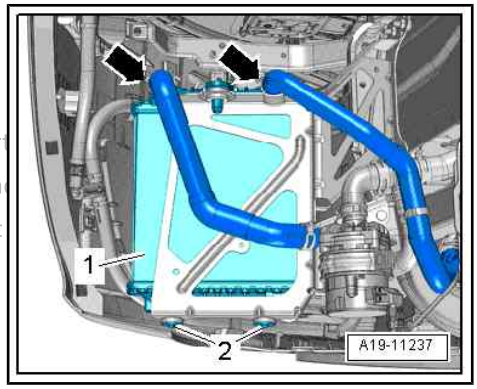


– Place drip tray for workshop hoist - VAS 6208- underneath.

– Clamp off coolant hoses using hose clamps -3094- , release hose clips -arrows- and disconnect hoses.

– Remove bolts -2-.

– Lift radiator -1- off bracket.



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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 .*
- *The coolant in the entire system must be changed if the radiator is renewed.*

– Install bumper cover (front) ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing bumper cover .

– Check coolant level ⇒ page 366 .

Tightening torques

- ⇒ “4.1 Exploded view - radiator/radiator fans”, page 393
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front)

21 – Turbocharging/supercharging

1 Turbochargers

⇒ “1.1 Exploded view - turbochargers”, page 412

⇒ “1.2 Removing and installing turbocharger”, page 420

⇒ “1.3 Removing and installing turbocharger 1 control unit J724 ”, page 434

⇒ “1.4 Adjusting vacuum unit for turbocharger”, page 455

⇒ “1.5 Renewing vacuum unit for turbocharger”, page 461

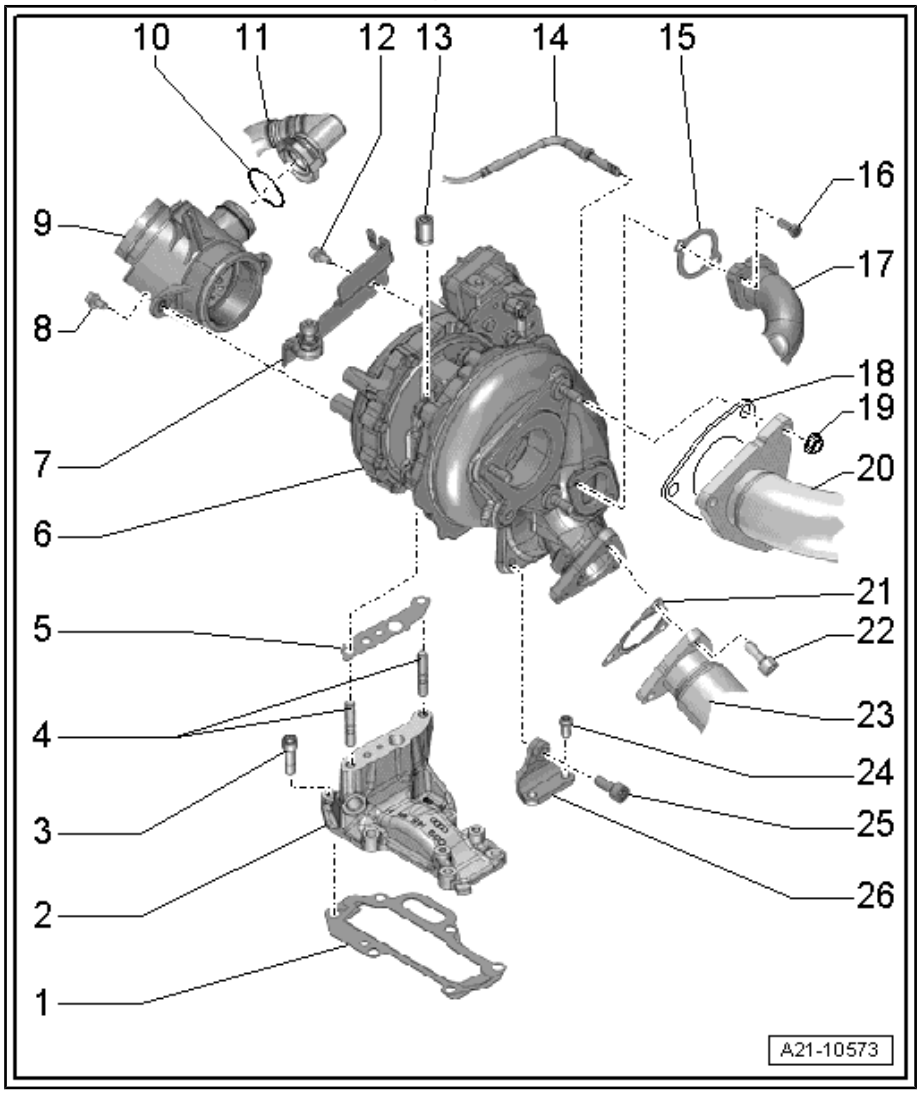
1.1 Exploded view - turbochargers

⇒ “1.1.1 Exploded view - turbocharger, vehicles with one turbocharger”, page 412

⇒ “1.1.2 Exploded view - turbochargers, vehicles with two turbochargers”, page 414

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1.1.1 Exploded view - turbocharger, vehicles with one turbocharger



1 - Gasket

- ❑ Renew

2 - Bracket

- ❑ For turbocharger

3 - Bolt

- ❑ Tighten in stages and in diagonal sequence; final torque 23 Nm.

4 - Studs

- ❑ Must always be renewed if nuts are loosened
- ❑ 10 Nm

5 - Gasket

- ❑ Renew

6 - Turbocharger

- ❑ With turbocharger 1 control unit - J724-
- ❑ Removing and installing turbocharger ⇒ page 420
- ❑ Removing and installing turbocharger 1 control unit - J724- ⇒ page 434

7 - Bracket

- ❑ For electrical connector and engine cover panel

8 - Bolt

- ❑ 9 Nm

9 - Connection

- ❑ For air hose

- From air mass meter - G70- to turbocharger
- Must be free of oil and grease when installing

10 - O-ring
- Renew

11 - Hose
- For crankcase breather

12 - Bolt
- 9 Nm

13 - Nut
- Renew
- Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- Tightening torque and sequence ⇒ page 414

14 - Exhaust gas temperature sender 1 - G235-
- Removing and installing ⇒ page 641

15 - Gasket
- Renew

16 - Bolt
- Renew
- Tightening torque and sequence ⇒ page 660

17 - Pipe
- To exhaust gas recirculation cooler

18 - Gasket
- Renew

19 - Nut
- Renew
- Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- Tightening torque - vehicles without SCR system ⇒ Item 6 (page 585)
- Tightening torque - vehicles with SCR system ⇒ Item 7 (page 588)

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20 - Exhaust pipe

21 - Gasket
- Renew

22 - Bolt
- Renew
- Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- Tightening torque ⇒ Item 5 (page 664)

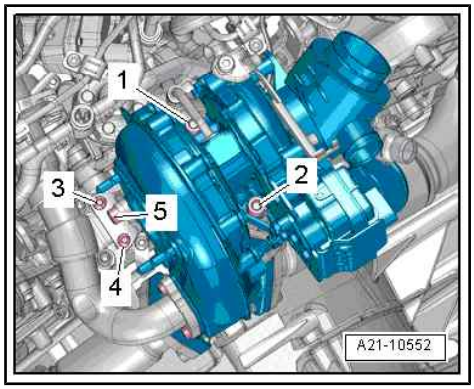
23 - Exhaust manifold
- Removing and installing: left-side ⇒ page 666 , right-side ⇒ page 670

24 - Bolt
- Tightening torque and sequence ⇒ page 414

25 - Bolt
- Tightening torque and sequence ⇒ page 414

26 - Bracket
- For turbocharger

Turbocharger - tightening torque and sequence



Note

Renew studs and nuts.

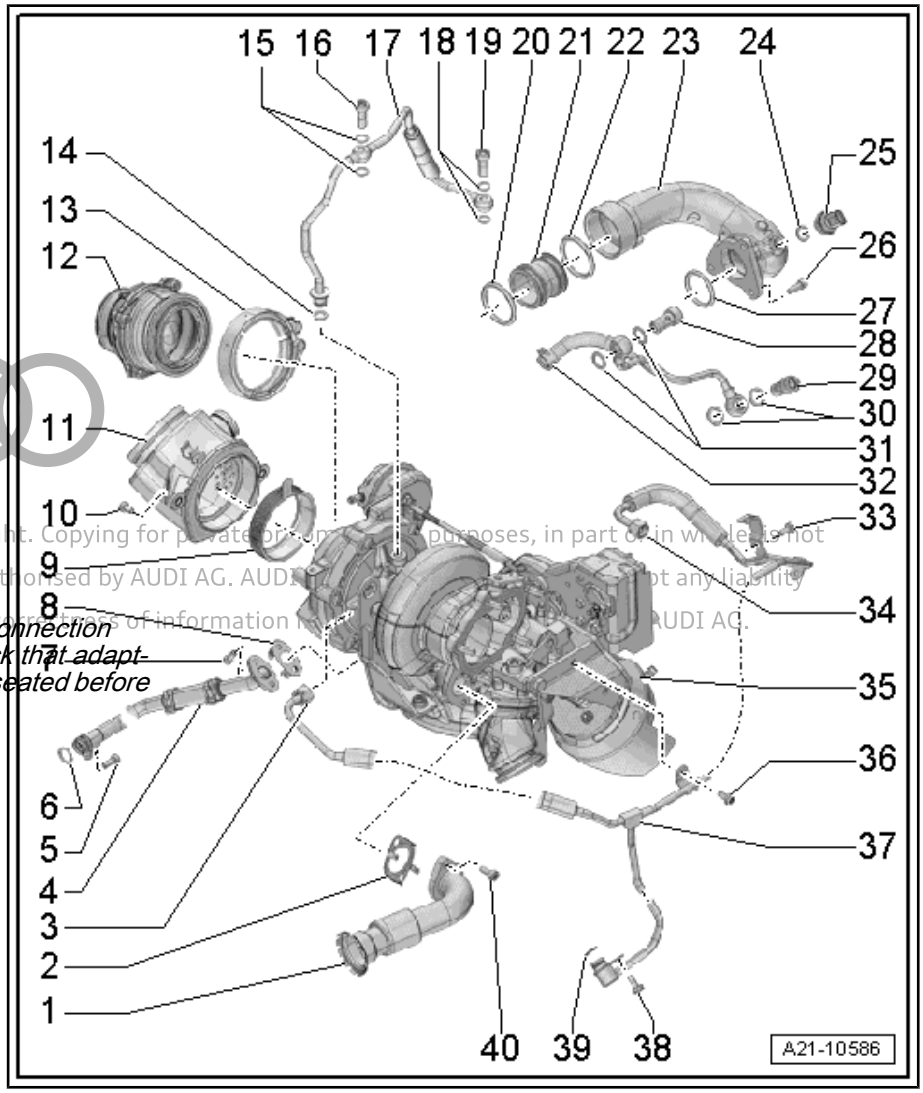
– Tighten bolts and nuts in 7 stages in the sequence shown:

Stage	Bolts/nuts	Torque for tightening/tightening further
1.	Studs for nuts -1, 2-	10 Nm
2.	-1, 2-	Screw in by hand until contact is made
3.	-1, 2-	9 Nm
4.	-1, 2-	Turn 90° further
5.	-3, 4, 5-	Screw in by hand until contact is made
6.	-3, 4-	9 Nm
7.	-5-	23 Nm

1.1.2 Exploded view - turbochargers, vehicles with two turbochargers

Part 1

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1 - Exhaust gas recirculation pipe

- ❑ To exhaust gas recirculation cooler
- ❑ If screw-type clip has been unfastened, pipe for exhaust gas recirculation and screw-type clip must always be renewed
- ❑ Tightening torque and sequence ⇒ page 660

2 - Gasket

- ❑ Renew

3 - Union nut

- ❑ 25 Nm

Note

Counterhold adapter connection when slackening; check that adapter connection is firmly seated before installing.

4 - Oil return pipe

5 - Bolt

- ❑ 9 Nm

6 - O-ring

- ❑ Renew

7 - Bolt

- ❑ 9 Nm

8 - Gasket

- ❑ Renew

9 - Gasket

- ❑ Renew if damaged

10 - Bolt

- ❑ 9 Nm

11 - Connection

12 - Bypass valve

- ❑ Installation position ⇒ page 417

13 - Clamp

- ❑ Installation position ⇒ page 417
- ❑ 6 Nm

14 - O-ring

- ❑ Renew

15 - Seals

- ❑ Renew

16 - Banjo bolt

- ❑ 15 Nm

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Note

Counterhold adapter connection when slackening; check that adapter connection is firmly seated before installing.

17 - Oil supply line

18 - Seals

- ❑ Renew

19 - Banjo bolt

- ❑ 15 Nm

20 - O-ring

- ❑ Renew

21 - Intermediate pipe

22 - O-ring

- ❑ Renew

23 - Connecting pipe

24 - Seal

- ❑ Renew

25 - Charge pressure sender 2 - G447-

- ❑ 25 Nm

26 - Bolt

- ❑ 7 Nm

27 - O-ring

- ❑ Renew

28 - Banjo bolt

- ❑ 35 Nm

Note

Counterhold adapter connection when slackening; check that adapter connection is firmly seated before installing.

29 - Banjo bolt

- ❑ 35 Nm

Note

Counterhold adapter connection when slackening; check that adapter connection is firmly seated before installing.

30 - Seals

- ❑ Renew

31 - Seals

- ❑ Renew

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32 - Coolant return line

33 - Bolt

- ❑ 9 Nm

34 - Union nut

- ❑ 25 Nm

Note

Counterhold adapter connection when slackening; check that adapter connection is firmly seated before installing.

35 - Turbocharger unit

- ❑ With:

- ♦ High-pressure turbocharger
- ♦ Low-pressure turbocharger
  - ❑ Removing and installing ⇒ page 424
  - ❑ Must not be disconnected

36 - Bolt

- ❑ 9 Nm

37 - Coolant supply line

38 - Bolt

- ❑ 9 Nm

39 - O-ring

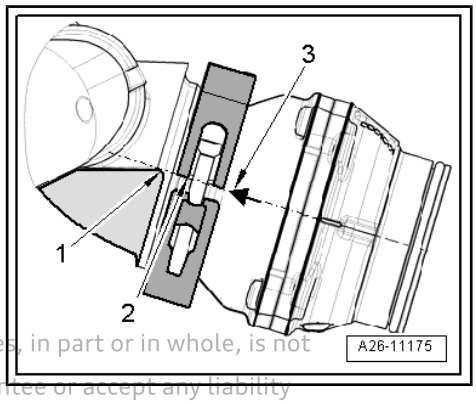
- ❑ Renew

40 - Bolt

- ❑ Tightening torque and sequence ⇒ page 660

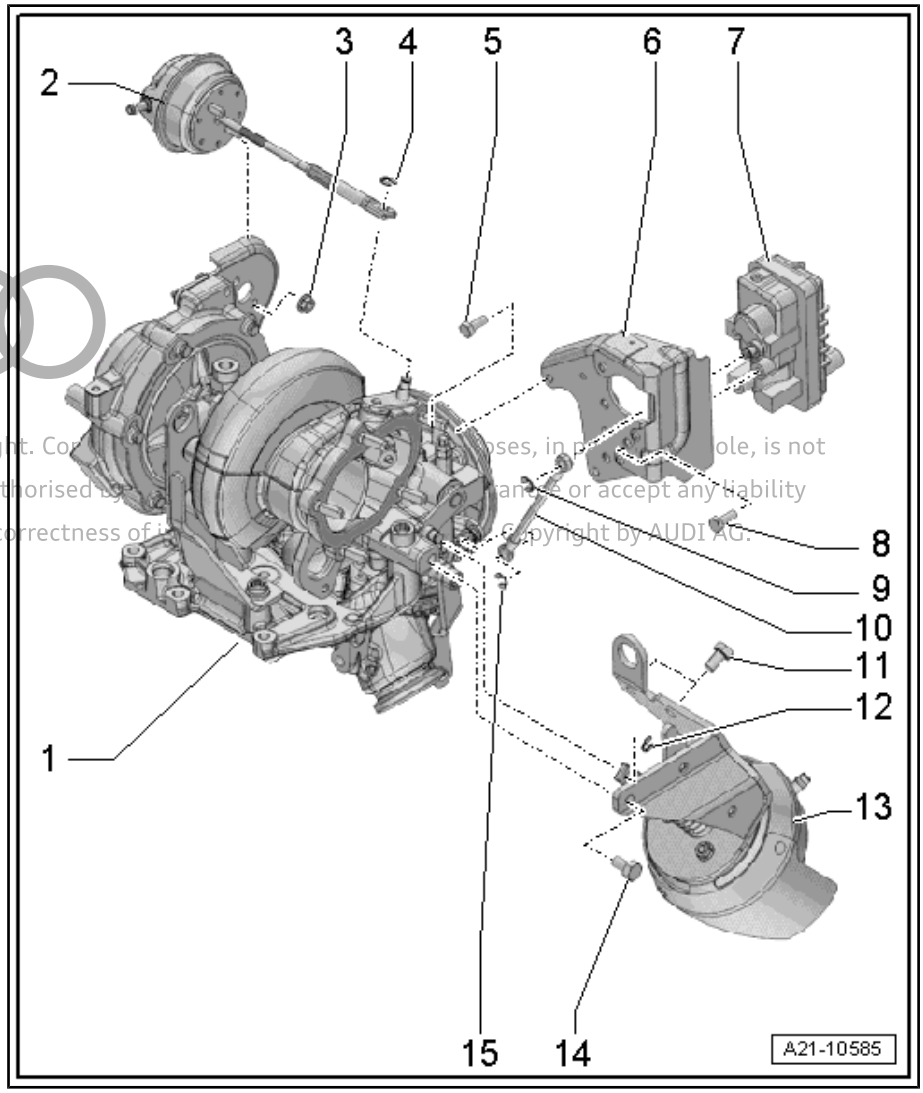
Installation position of bypass valve and clamp

- Bypass valve -3- and clamp -2- must be aligned with edge -1- of turbocharger unit.
- Tolerance for installation of clamp ± 10°.



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Part 2



1 - Turbocharger unit

- ❑ With:

- ♦ High-pressure turbocharger
- ♦ Low-pressure turbocharger
  - ❑ Removing and installing ⇒ page 424
  - ❑ Must not be disconnected

2 - Vacuum unit

- ❑ For low-pressure turbocharger
- ❑ Removing and installing ⇒ page 461
- ❑ Adjusting ⇒ page 461
- ❑ Tightening torque for operating rod locking nut: 7 Nm.

3 - Nut

- ❑ 7 Nm

4 - Securing clip

- ❑ Renew

5 - Bolt

- ❑ 7 Nm

6 - Bracket

- ❑ For turbocharger 1 control unit - J724-

7 - Control unit for turbocharger 1 - J724-

- ❑ For high-pressure turbocharger
- ❑ Removing and installing ⇒ page 444

8 - Bolt

- ❑ 7 Nm

9 - Securing clip

- ❑ Renew

10 - Operating rod

11 - Bolt

- ❑ 23.5 Nm

12 - Securing clip

- ❑ Renew

13 - Vacuum unit

- ❑ For turbine changeover between high and low pressure
- ❑ With regulating flap potentiometer - G584-
- ❑ Removing and installing ⇒ page 462
- ❑ Adjusting ⇒ page 458
- ❑ Tightening torque for operating rod locking nut: 11 Nm.

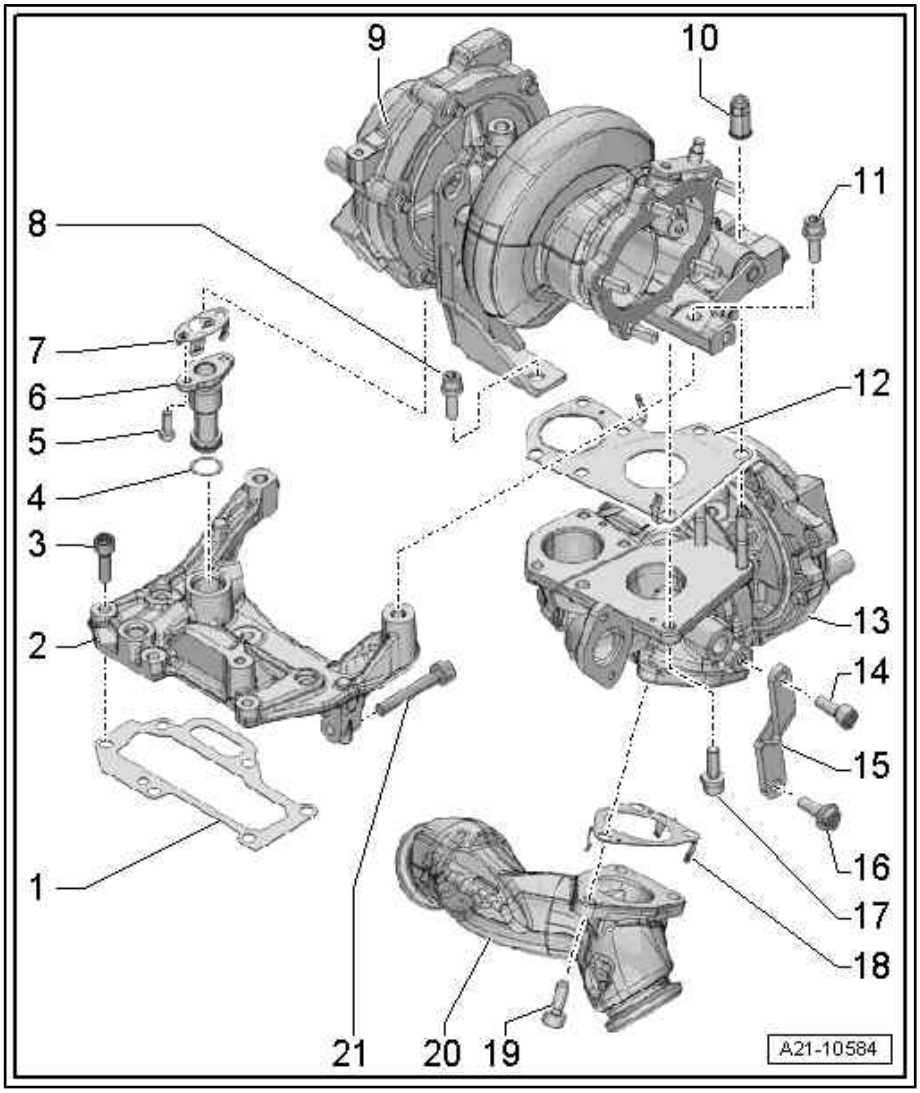
14 - Bolt

- ❑ 23.5 Nm

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15 - Securing clip
- ❑ Renew

Part 3



1 - Gasket
- ❑ Renew

2 - Bracket
- ❑ For turbocharger

3 - Bolt
- ❑ Tightening torque and sequence ⇒ page 420

4 - O-ring
- ❑ Renew

5 - Bolt
- ❑ 9 Nm

6 - Oil return connection

7 - Gasket
- ❑ Renew

8 - Bolt
- ❑ 23 Nm

9 - Low-pressure turbocharger
- ❑ Combined as a unit with -item 13-
- ❑ Must not be disconnected
- ❑ Removing and installing ⇒ page 424

10 - Nut
- ❑ Not available as replacement part

11 - Bolt
- ❑ 60 Nm

12 - Gasket
- ❑ Not available as replacement part

13 - High-pressure turbocharger
- ❑ Combined as a unit with -item 9-
- ❑ Must not be disconnected
- ❑ Removing and installing ⇒ page 424

14 - Bolt
- ❑ 23 Nm

15 - Support
- ❑ For turbocharger

16 - Bolt
- ❑ 23 Nm

17 - Bolt
- ❑ Not available as replacement part

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18 - Gasket

- ❑ Renew

19 - Bolt

- ❑ 23.5 Nm

20 - Intermediate flange

- ❑ Attached to exhaust manifolds with clamp ⇒ Item 5 (page 665)

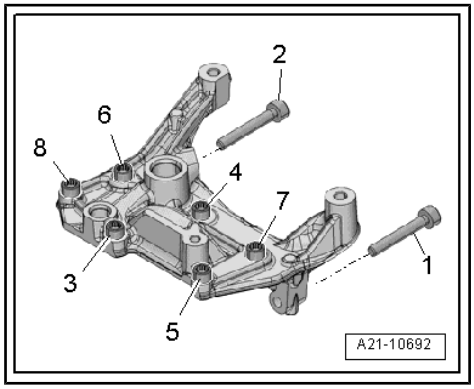
21 - Bolt

- ❑ Tightening torque and sequence ⇒ page 420

Bracket for turbocharger - tightening torque and tightening sequence

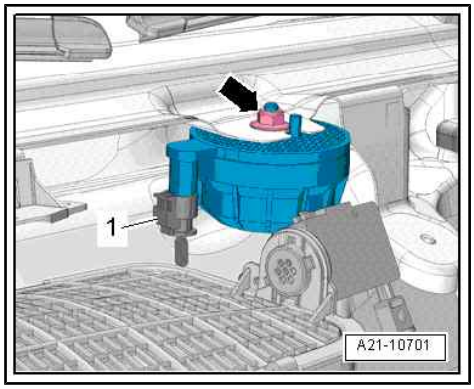
– Tighten bolts in 4 stages in the sequence shown:

Stage	Bolts	Tightening torque
1.	-1, 2-	3 Nm
2.	-3 … 8-	15 Nm
3.	-3 … 8-	28 Nm
4.	-1, 2-	28 Nm



Actuator for structure-borne sound - R214- - tightening torque

– Tighten nut -arrow- to 5 Nm.



1.2 Removing and installing turbocharger

⇒ “1.2.1 Removing and installing turbocharger - vehicles with one turbocharger”, page 420

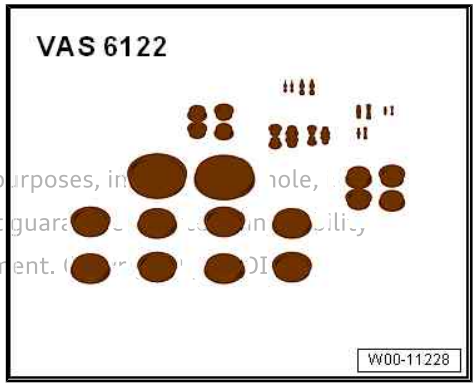
⇒ “1.2.2 Removing and installing turbochargers - vehicles with two turbochargers”, page 424

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1.2.1 Removing and installing turbocharger - vehicles with one turbocharger

Special tools and workshop equipment required

- Engine bung set - VAS 6122-



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Removing

WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system ⇒ page 7 .*

Caution

If the turbocharger has suffered mechanical damage (e.g. damaged compressor wheel), it is not sufficient merely to fit a new turbocharger. The following work must be performed in order to avoid further damage:

- *Check air cleaner housing, air filter element and air hoses for dirt and foreign particles.*
- *Mechanical faults on the turbocharger can be caused by foreign matter from the exhaust manifold.*
- *Check the entire charge air system (including the charge air cooler) for foreign matter.*
- *If foreign matter is found in the charge air system, clean all relevant ducts and hoses and renew charge air cooler if necessary.*

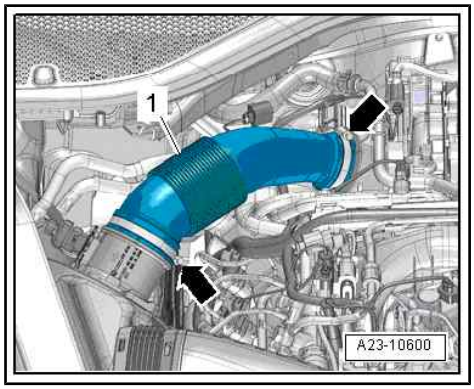
Note

Observe rules for cleanliness ⇒ page 8 .

– Remove lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing attachments .

– Remove particulate filter ⇒ page 612 .

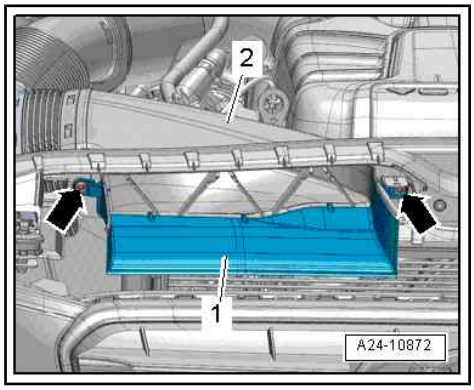
– Release hose clips -arrows- and detach air pipe -1-.



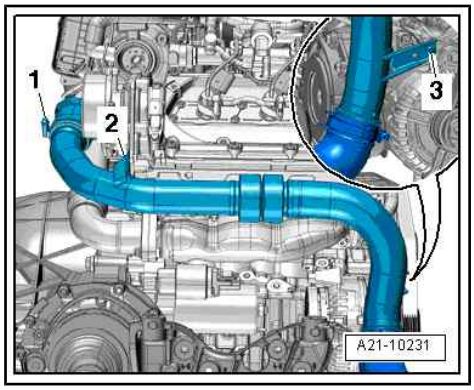
– Remove bolts -arrows- and detach air duct -1-.

Note

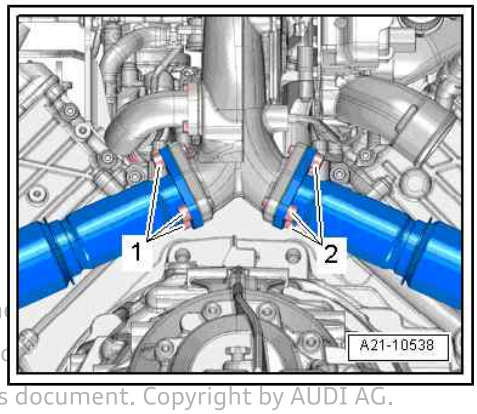
Disregard -item 2-.



– Remove bolts -2, 3-.
– Release hose clip -1- and detach air pipe.



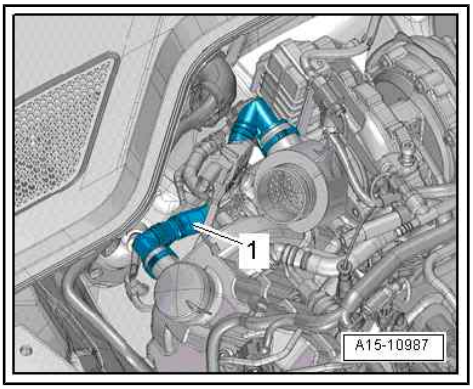
– Remove bolts -1, 2-.



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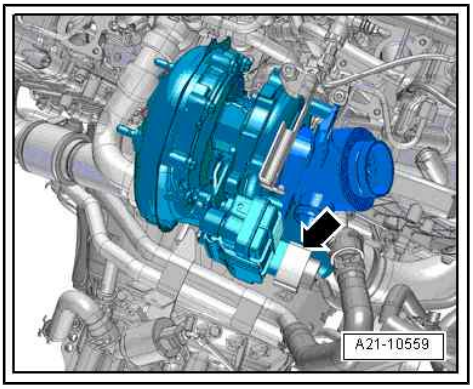
Caution

Depending on the vehicle version and country version, a crankcase breather hose may be fitted which cannot be detached from the cylinder head cover without being damaged irreparably. For these versions, the hose on the cylinder head cover will be damaged irreparably and must then be renewed.



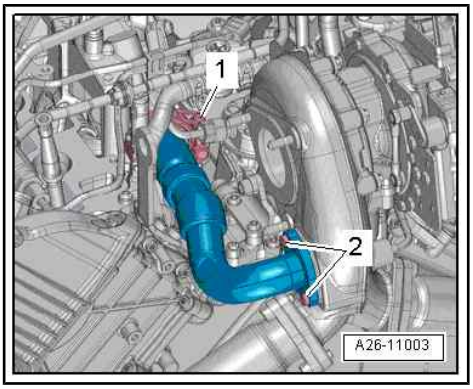
– Remove crankcase breather hose -arrow-; to do so, press release tabs (if present) or break hose connection at cylinder head cover as necessary.

– Unplug electrical connector -arrow-.



– Remove bolts -2-.

– Release screw-type clip -1- and detach exhaust gas recirculation pipe.

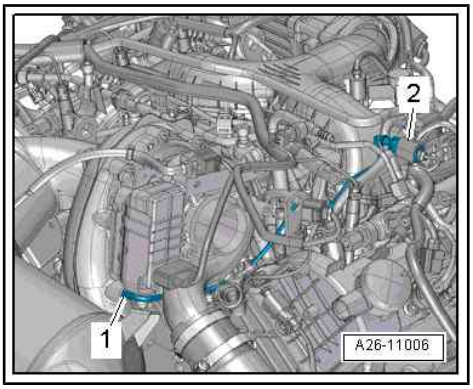


– Detach electrical connector -2- from bracket and unplug.

– Move clear electrical wiring.

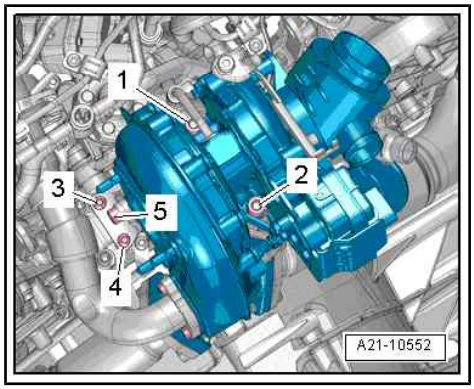
Note

Disregard -item 1-.



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– Loosen bolt -5-.
– Remove nuts -1, 2- and bolts -3, 4-.
– Remove turbocharger.



Installing

Installation is carried out in reverse order; note the following:

Note

- *Renew seals and O-rings.*
- *Fill turbocharger with engine oil at connection for oil supply line.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *After installing the turbocharger, allow the engine to idle for approx. 1 minute without pressing the accelerator to ensure that the turbocharger is supplied with oil.*

– Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
– Install exhaust gas recirculation pipe ⇒ page 660 .
– Install air pipe ⇒ page 463 .
– Install particulate filter ⇒ page 612 .
– Install lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing attachments .

Tightening torques

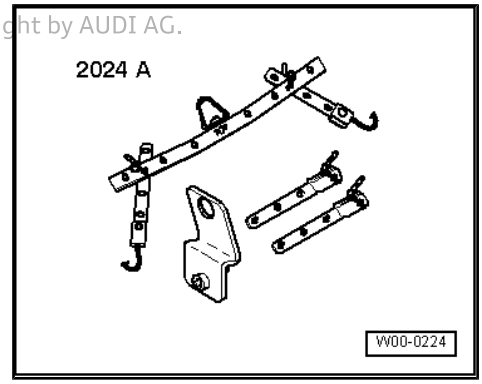
- ⇒ “1.1.1 Exploded view - turbocharger, vehicles with one turbocharger”, page 412
- ⇒ Fig. ““Turbocharger - tightening torque and sequence”“ , page 414
- ⇒ “3.1 Exploded view - air cleaner housing”, page 509
- ⇒ “2.2 Exploded view - hose connections for charge air system”, page 466

1.2.2 Removing and installing turbochargers - vehicles with two turbochargers

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Special tools and workshop equipment required

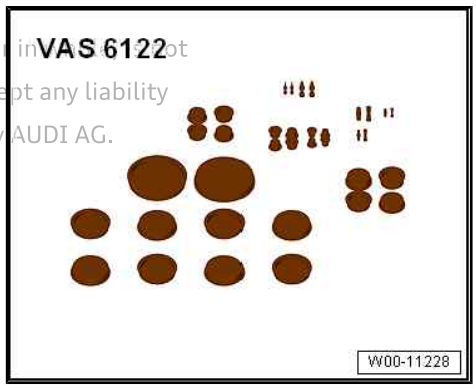
- Lifting tackle - 2024 A-



- Workshop hoist - VAS 6100-



- Engine bung set - VAS 6122-



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Removing

WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system ⇒ page 7 .*

Caution

If the turbocharger has suffered mechanical damage (e.g. damaged compressor wheel), it is not sufficient merely to fit a new turbocharger. The following work must be performed in order to avoid further damage:

- *Check air cleaner housing, air filter element and air hoses for dirt and foreign particles.*
- *Mechanical faults on the turbocharger can be caused by foreign matter from the exhaust manifold.*
- *Check the entire charge air system (including the charge air cooler) for foreign matter.*
- *If foreign matter is found in the charge air system, clean all relevant ducts and hoses and renew charge air cooler if necessary.*

Note

Observe rules for cleanliness ⇒ page 8 .

– Remove air cleaner housing ⇒ page 510 .

– Drain coolant ⇒ page 359 .

– Remove plenum chamber partition panel ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber partition panel .

Caution

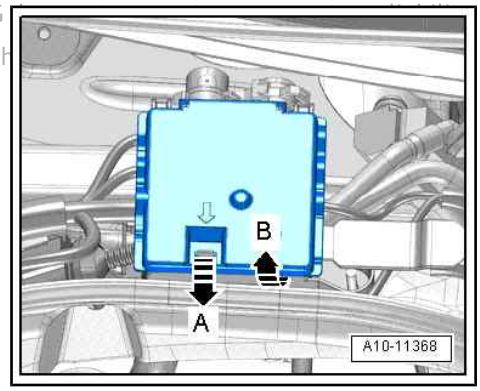
Risk of irreparable damage to electronic components.

- *Observe notes on procedure for disconnecting the battery.*

– Disconnect earth wire from battery terminal ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .

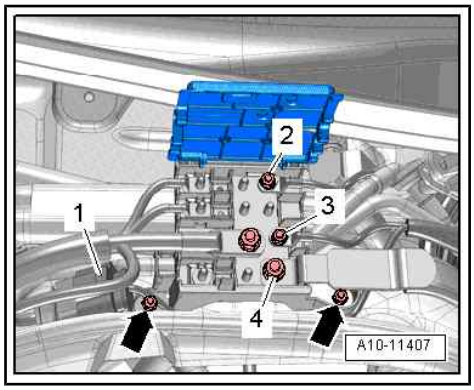
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– Release retainer -arrow A- and open cover -arrow B-.



– Unplug electrical connector -1-.

– Remove nuts -2, 3 and 4- and move electrical wiring clear.



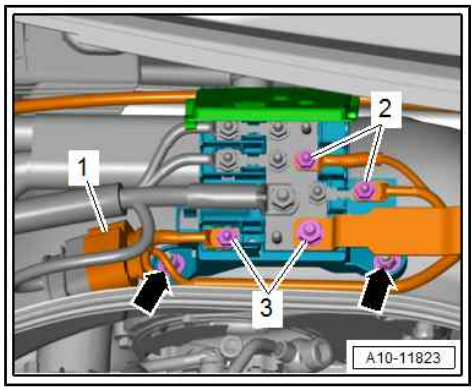
Note

Disregard -arrows-.

Vehicles with SCR system:

– Remove nuts -2 and 3- and move electrical wiring clear.

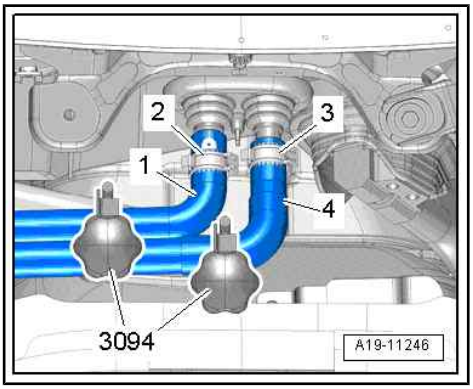
– Detach electrical connector -1- from bracket and unplug.



Note

Disregard -arrows-.

All vehicles (continued):



Note

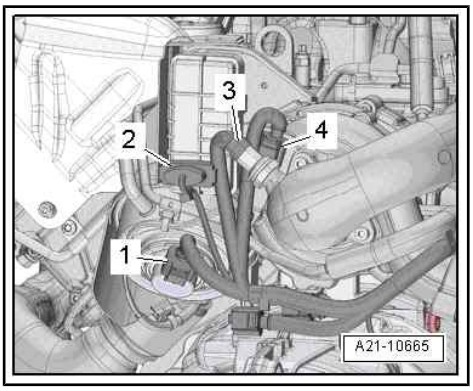
Place a cloth underneath to catch escaping coolant.

– Release hose clips -2 and 3- and disconnect coolant hoses -1 and 4- from heat exchanger.

Note

Ignore -3094- .

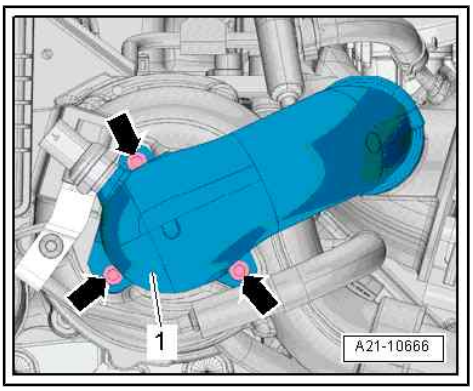
– Unplug electrical connectors -1 ... 4- and move wiring harness clear.



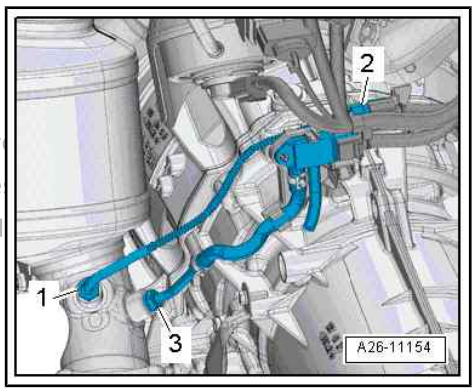
Caution

Risk of damage to turbocharger shaft.

- ***The shaft of the compressor blades projects beyond the contour of the turbocharger housing.***
- ***Take care not to damage compressor blades when connecting pipe is removed.***



– Remove bolts -arrows- and detach connecting pipe -1-.
– Remove front exhaust pipe ⇒ page 599 .
– Remove exhaust gas temperature sender 3 - G495- -item 1- and pressure pipe -3- for pressure differential sender - G505- .

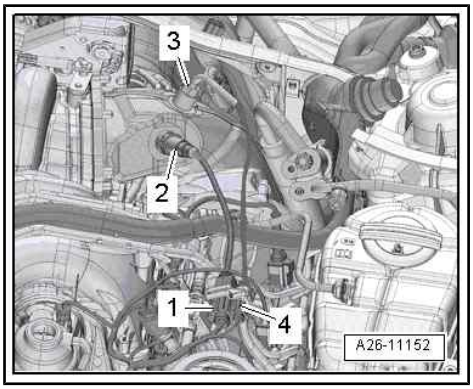


Note

Disregard -item 2-.

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– Detach electrical connector -1- and, if fitted, -4- from bracket and unplug connectors.
– If fitted, unscrew and detach exhaust gas temperature sender 2 - G448- -item 3-.

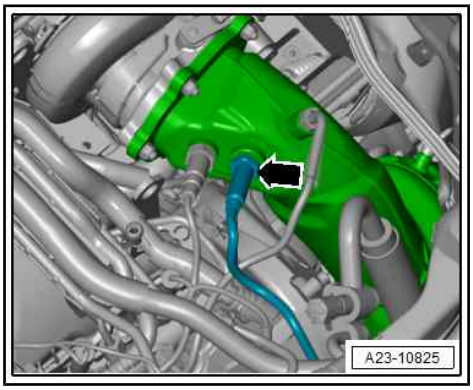


Note

Disregard -item 2-.

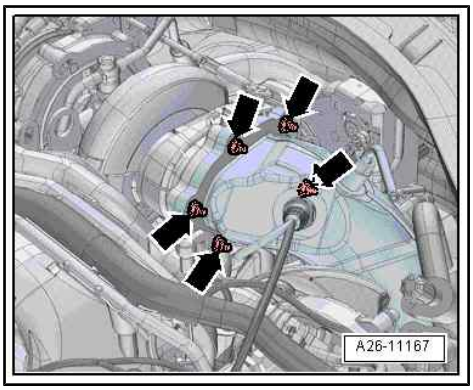
Vehicles with SCR system:

– Unscrew NOx sender - G295- -arrow- and move clear to left side.

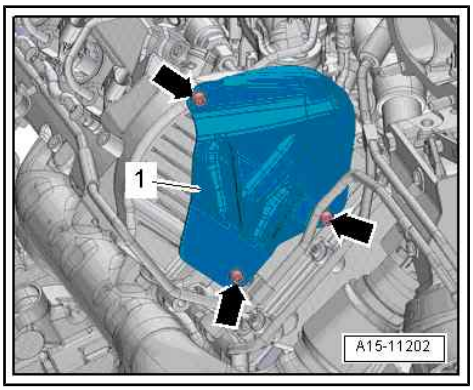


All vehicles (continued):

– Unscrew nuts -arrows- and push catalytic converter towards rear; on vehicles with SCR system, pay attention to electrical wiring of catalytic converter heater when doing so.

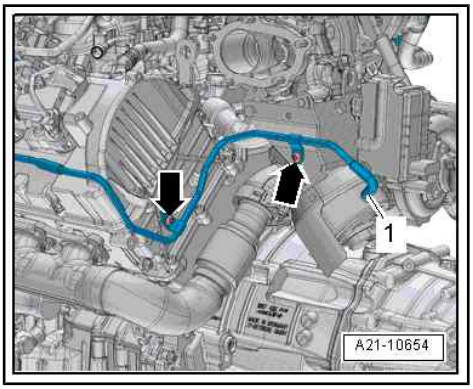


– Remove bolts -arrows- and detach heat shield -1-.

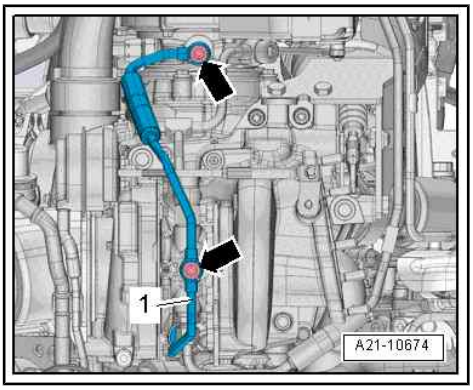


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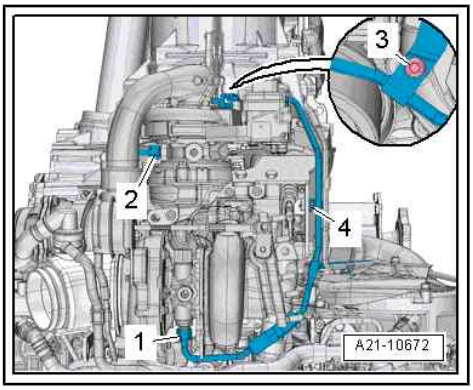
– Remove bolts -arrows-.
– Detach vacuum hose -1- and press vacuum line to one side.



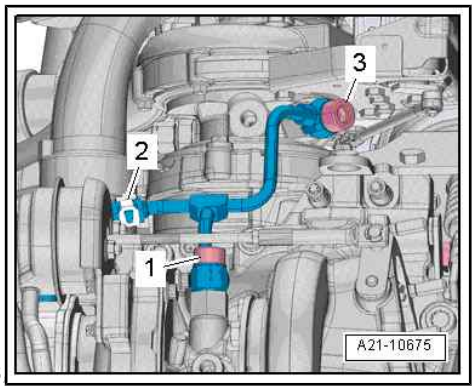
– Remove banjo bolts -arrows- and disconnect oil supply line -1-.



Remove bolts -3, 4- and union nuts -1, 2- for coolant supply line.



– Release hose clip -2- and detach coolant hose.

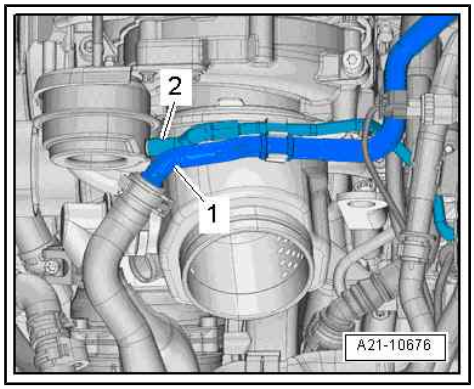


Note

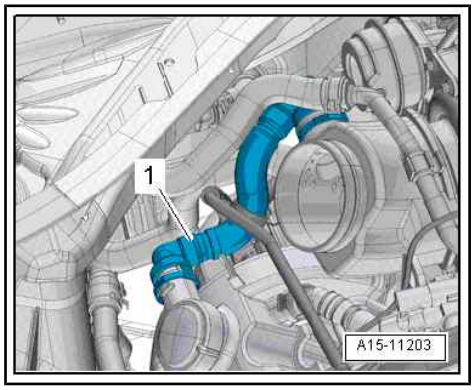
Disregard items -1 and 3-.

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– Disconnect vacuum hose -2- and move clear vacuum hose and vacuum line -1- at connection.



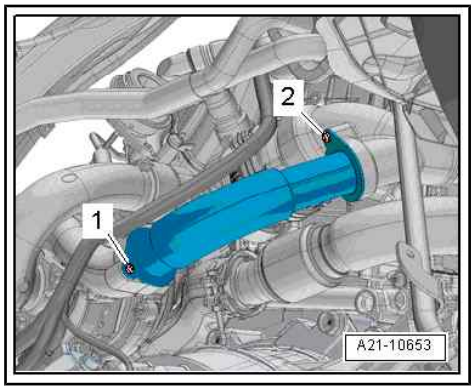
– Press release tabs and remove crankcase breather hose -1-.



– Remove bolt -1-.

Note

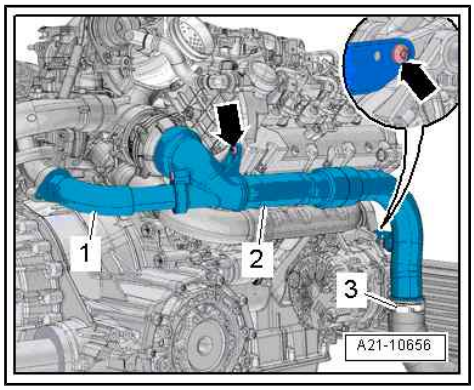
Disregard -item 2-.



– Remove bolts -arrows-.
– Disconnect air pipe (right-side) -2- together with intermediate pipe -1- from turbocharger unit and move clear to one side.

Note

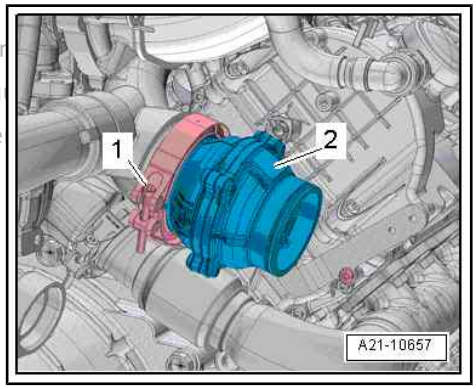
Disregard -item 3-.



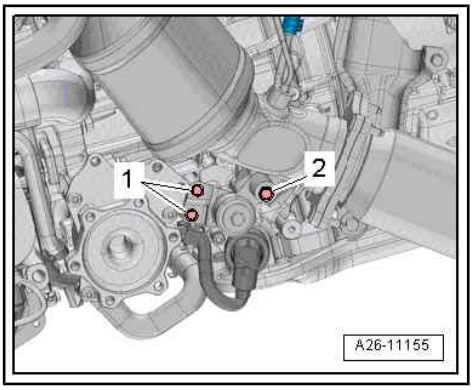
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– Open clamp -1- and detach bypass valve -2-.

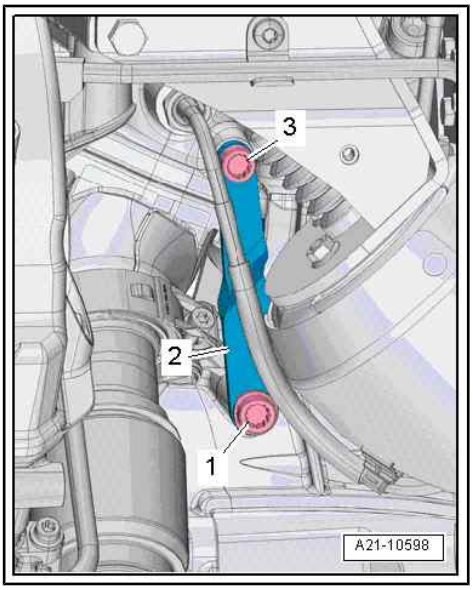
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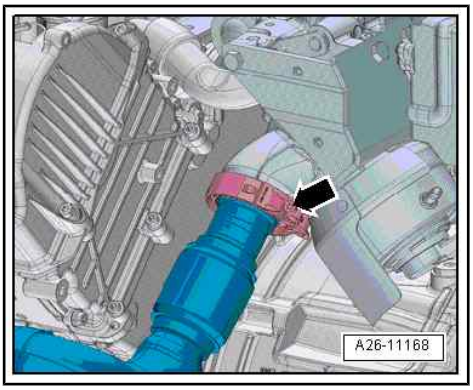
– Unscrew bolts -1- and swivel lug to one side.



– Remove bolts -1- on both sides.
– Loosen bolts (left and right) -3- on bracket -2- for turbocharger.



– Open clamp -arrow- on both sides and slide onto exhaust manifold.

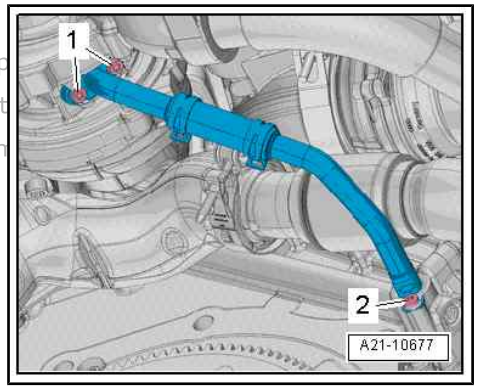


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Caution

Risk of damage to oil return pipe.

- ***Do not bend oil return pipe.***

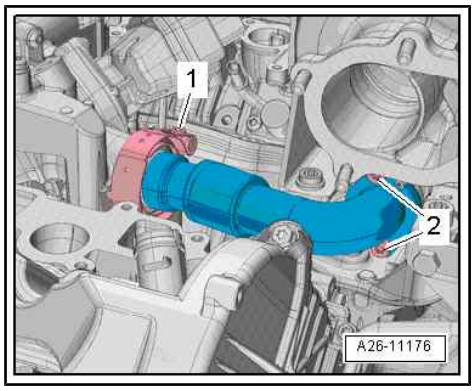


– Remove bolts -1- for oil return pipe.

Note

Disregard -item 2-.

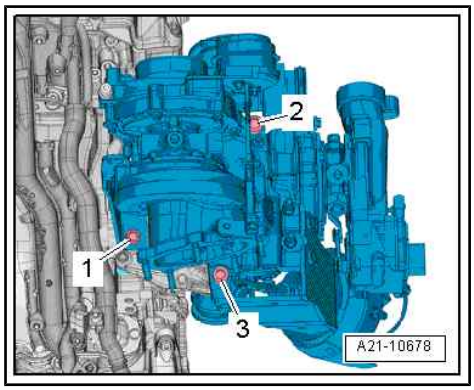
– Remove bolts -2- for exhaust gas recirculation pipe.



Note

Disregard -item 1-.

– Remove bolts -1, 2, 3-.

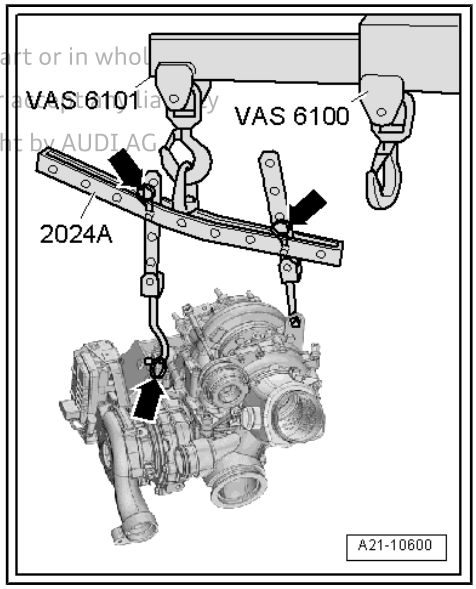


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WARNING

Accident risk from loose components of lifting tackle.

- ***The support hooks and retaining pins on the lifting tackle must be secured with locking pins -arrows-.***



Caution

Risk of damage to turbocharger shaft.

- ***The turbocharger shaft projects beyond the contour of the turbocharger housing.***

– Engage lifting tackle - 2024 A- on turbocharger unit and workshop hoist - VAS 6100- .

– Take care when detaching turbocharger unit.

Note

The turbocharger unit must not be disconnected.

Installing

Installation is carried out in reverse order; note the following:

Note

- *Renew seals and O-rings.*
- *Fill turbochargers with engine oil at connections for oil supply line.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *After installing the turbocharger unit, allow the engine to idle for approx. 1 minute without pressing the accelerator to ensure that the turbocharger is supplied with oil.*

– Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.

– Install front exhaust pipe ⇒ page 599 .

– Install air pipe ⇒ page 463 .

Note

Do not reuse coolant.

– Fill up with coolant ⇒ page 366 .

Tightening torques

- ⇒ “1.1.2 Exploded view - turbochargers, vehicles with two turbochargers”, page 414
- ⇒ Fig. ““Exhaust gas recirculation pipe to turbocharger - tightening torque and sequence”“ , page 660

- ⇒ “2.2 Exploded view - hose connections for charge air system”, page 466
- ⇒ “3.1 Exploded view - air cleaner housing”, page 509

1.3 Removing and installing turbocharger 1 control unit - J724-

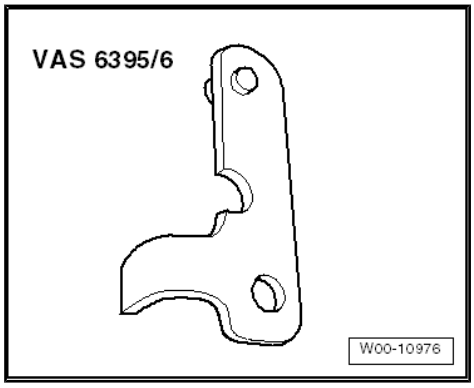
⇒ “1.3.1 Removing and installing turbocharger 1 control unit J724 - vehicles with one turbocharger”, page 434

⇒ “1.3.2 Removing and installing turbocharger 1 control unit J724 - vehicles with two turbochargers, manual mode”, page 444

1.3.1 Removing and installing turbocharger 1 control unit - J724- - vehicles with one turbocharger

Special tools and workshop equipment required

- Tester for E-positioner - VAS 6395- or -VAS 6395A-
- Bracket - VAS 6395 /6-

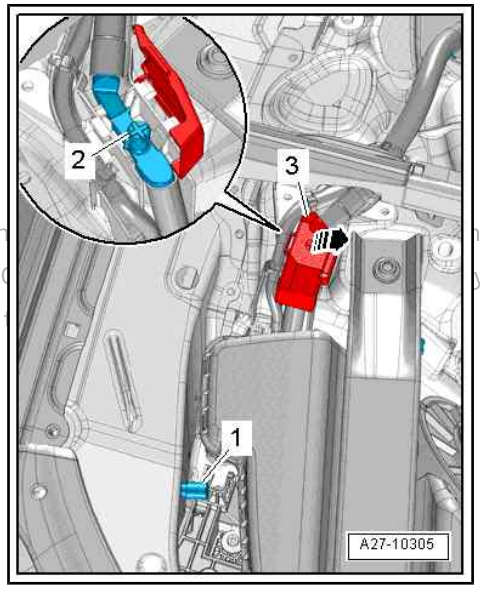


Removing

Note

Observe rules for cleanliness ⇒ page 8 .

– Remove engine cover panel ⇒ page 172 .
– Release cover -3- and swivel to side -arrow-.
– Connect tester - VAS 6395 A/1- to positive terminal -2- and earth -1- with connection lead - VAS 6395/2- .

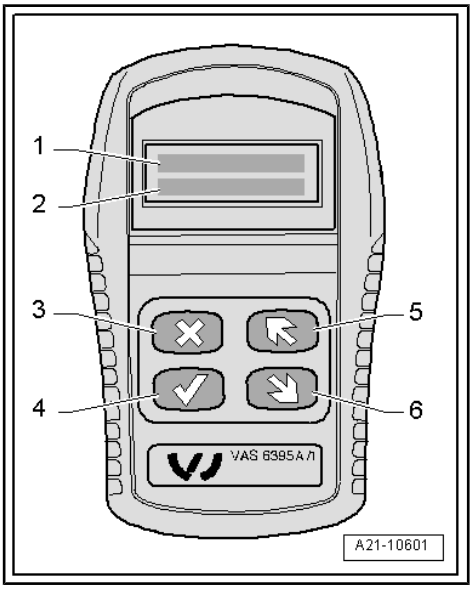


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Procedure for tester for E-positioner - VAS 6395 A/1- :

– Select software version with buttons [↑] -item 5- and [↓] -item 6-.

– To confirm software version, press [V] button -item 4-.



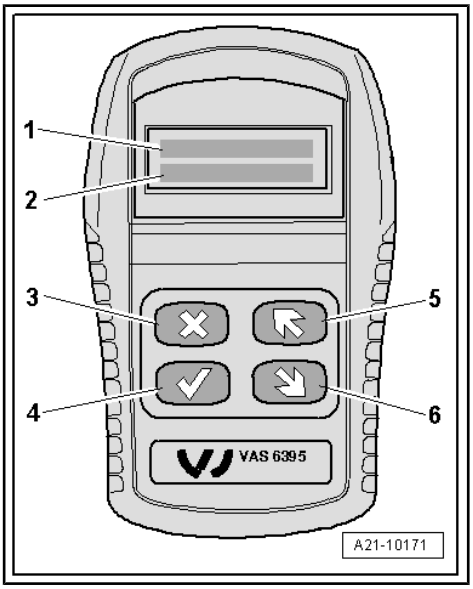
Procedure for tester for E-positioner - VAS 6395 /1- :

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

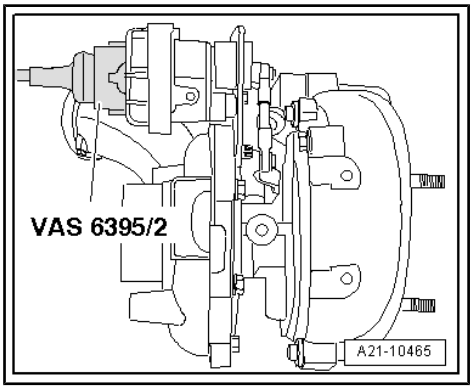
- *If the following appears on the display, an incorrect software version has been loaded:*
- *1. >TEST*
- *2. LEARN*
- *German market: If this is the case, download the correct software version from the "Audi Partner Portal (under Service)" in the section "Workshop Equipment".*
- *Rest of the world: If this is the case, download the correct software version from your Importer's information platform.*

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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 A/1- .



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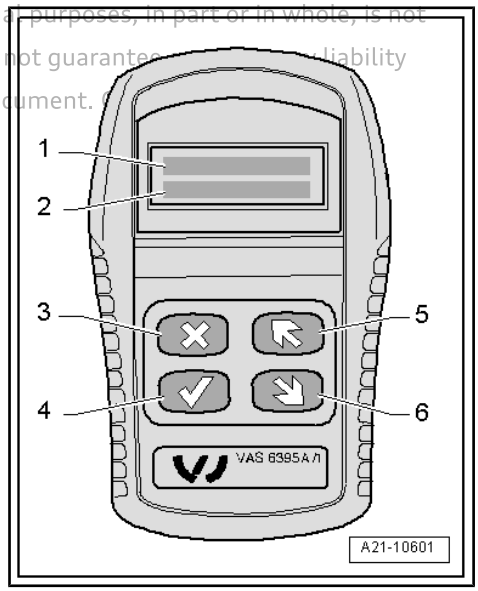
Display on -VAS 6395 A/1- :

1 - > 1. START

2 - 2. NEXT [>]

– To continue, press [V] button -item 4-.

• The tester - VAS 6395 A/1- runs through the adjustment range of the turbocharger 1 control unit - J724- and checks that the end positions are reached; display indicates “CHECK”.



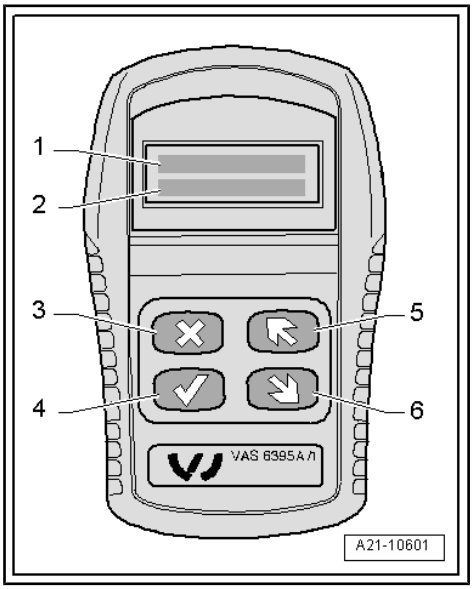
Display on -VAS 6395 A/1- :

1 -

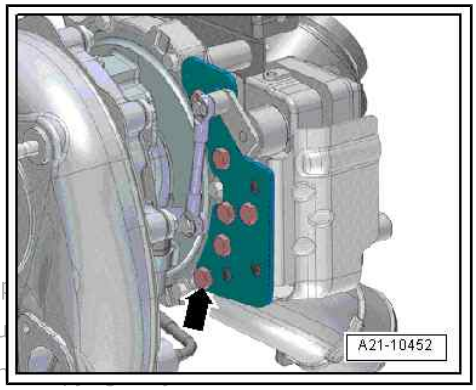
2 - [OK]

Note

- *If the display indicates “[OK]”, the adjustment range of the turbocharger 1 control unit - J724- is OK.*
- *If the display shows “FAULT [OK]”, tap gently several times on the housing of turbocharger 1 control unit - J724- with the handle of a screwdriver and repeat the check by pressing [V] button -item 4-.*



– Remove bolt -arrow-.

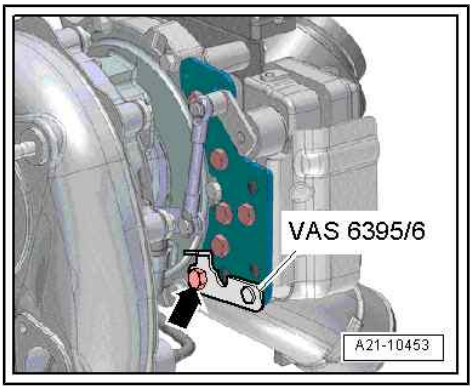


Note

Do NOT unscrew any of the other bolts visible in the illustration.

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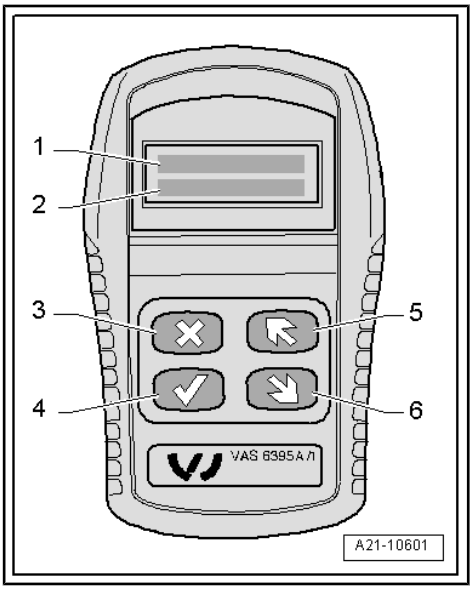
– Fit bracket - VAS 6395 /6- on centring hole of bracket for turbocharger 1 control unit - J724- and tighten bolt to 8 Nm.



– 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 A/1- :

1 - X.XXX V

2 - [↑][↓][OK]

– Note voltage value.

- Specification: 3.3 ... 3.7 V

Note

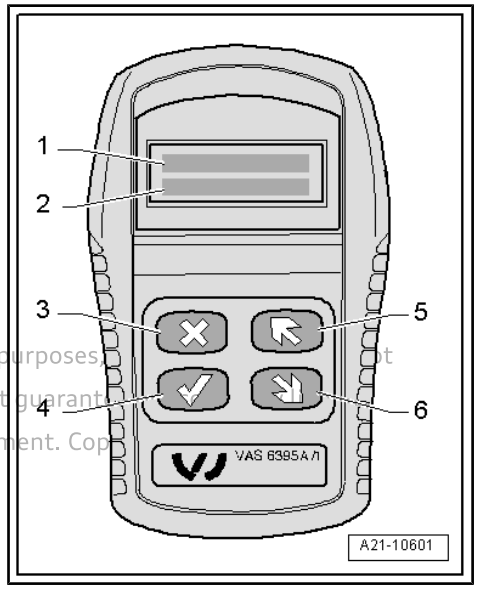
- *If the display indicates "FAULT [OK]" or the voltage is less than 3.3 V or greater than 3.7 V, unplug tester - VAS 6395 A/1- and repeat the complete procedure* ⇒ page 436 .
- *The turbocharger must be renewed if no voltage value can be read out.*

Display on -VAS 6395 A/1- :

1 - X.XXX V

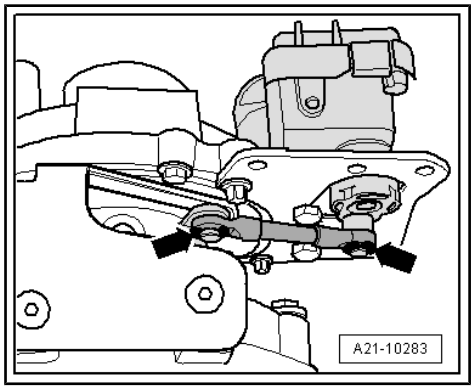
2 - [↑][↓][OK]

– By pressing buttons [↑] -item 5- and [↓] -item 6-, adjust turbocharger 1 control unit - J724- so that coupling rod can be accessed easily for removal.



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– Unclip circlips -arrows- and dispose of them, detach coupling rod.

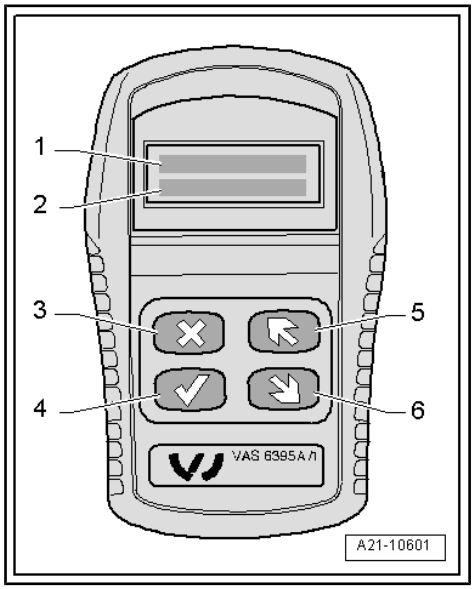


Display on -VAS 6395 A/1- :

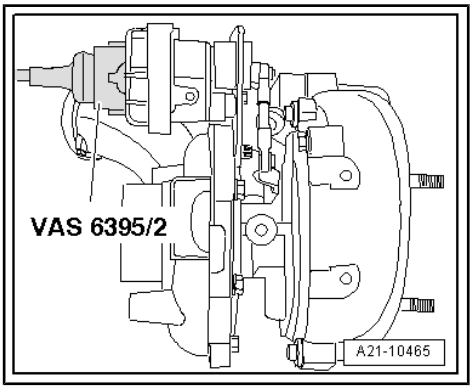
1 - X.XXX V

2 - [↑][↓][OK]

– By pressing buttons [↑] -item 5- and [↓] -item 6-, adjust turbocharger 1 control unit - J724- so that bolts for -J724- can be accessed easily.



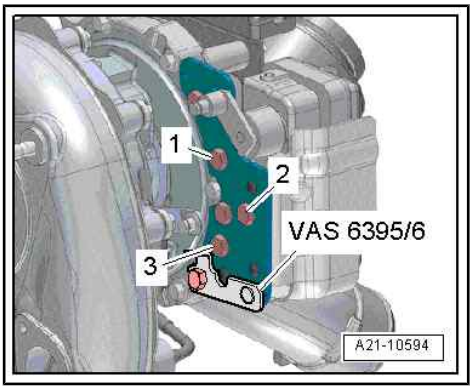
– Disconnect connection lead - VAS 6395/2- from turbocharger 1 control unit - J724- .



Caution

Power supply for tester - VAS 6395 A/1- must remain connected.

– Remove bolts -1, 2, 3- and dispose of them.



Note

Do NOT unscrew any of the other bolts visible in the illustration.

– Remove old turbocharger 1 control unit - J724- and dispose of it.

Caution

Check that the three insulating washers are fitted between turbocharger 1 control unit - J724- and the bracket.

– Install new turbocharger 1 control unit - J724- in reverse sequence of removal.

– Fit new bolts as follows:

1 - M6x15 with tapered shank

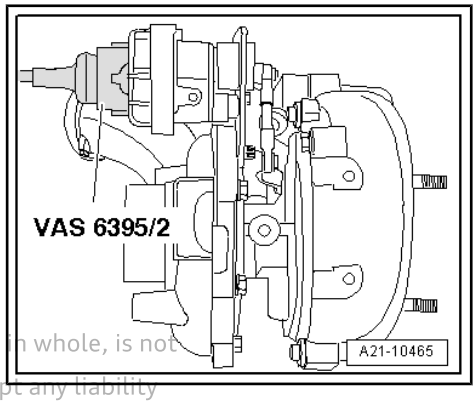
2 - M6x15 with tapered shank

3 - M6x15

– Initially hand-tighten bolts.

• Turbocharger 1 control unit - J724- must rest on retaining plate so there is no play; it must still be possible to move control unit by hand.

– Connect connection lead - VAS 6395/2- to new turbocharger 1 control unit - J724- .



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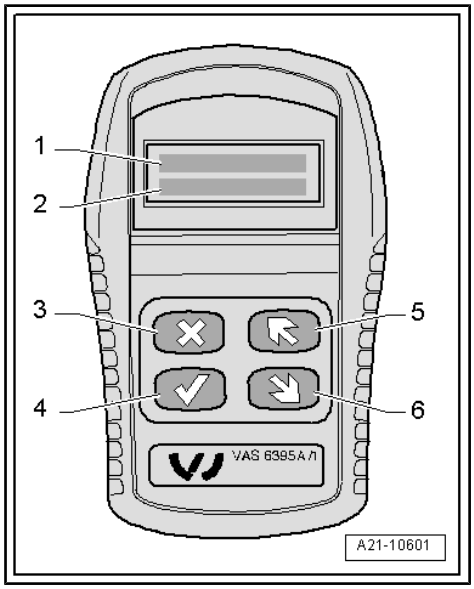
– To continue, press [v] button -item 4-.

Display on -VAS 6395 A/1- :

1 - > 1. START

2 - 2. NEXT [>]

– Select menu item “NEXT” with [↓] button -item 6-.



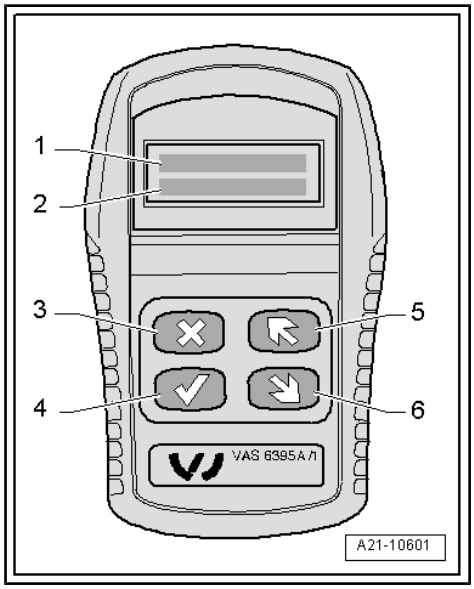
– To continue, press [v] button -item 4-.

• The tester - VAS 6395 A/1- runs through the adjustment range of the turbocharger 1 control unit - J724- and checks that the end positions are reached; display indicates “CHECK”.

Display on -VAS 6395 A/1- :

1 - X.XXX V

2 - [OK]



Note

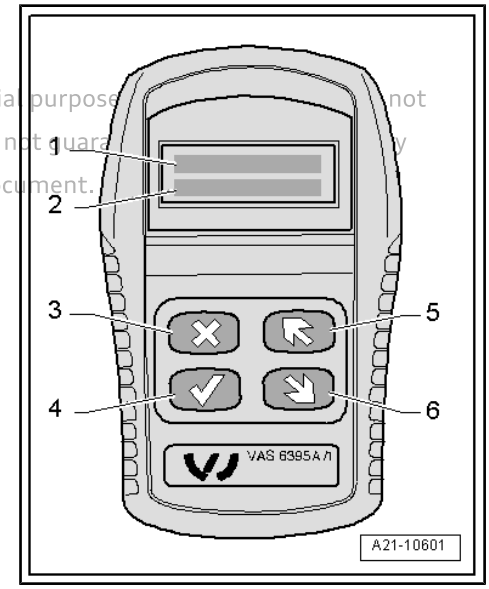
If the display indicates “FAULT”, the new turbocharger 1 control unit - J724- must be renewed for a second time.

– To continue, press [v] button -item 4-.

Display on -VAS 6395 A/1- :

1 -

2 - [OK]



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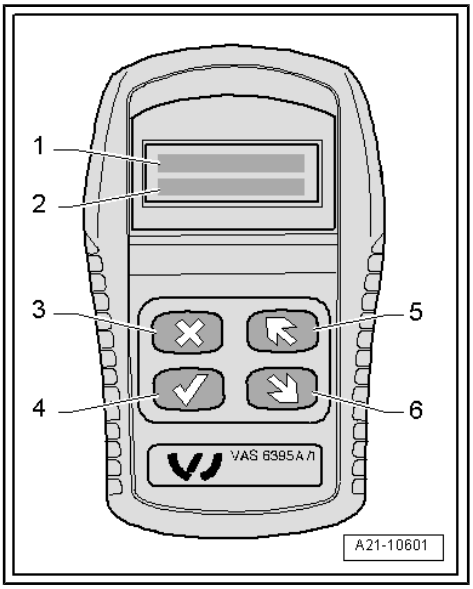
– To continue, press [V] button -item 4-.

Display on -VAS 6395 A/1- :

1 - X.XXX V (voltage determined with first measurement)

2 - [OK]

• Turbocharger 1 control unit - J724- moves into installation position.

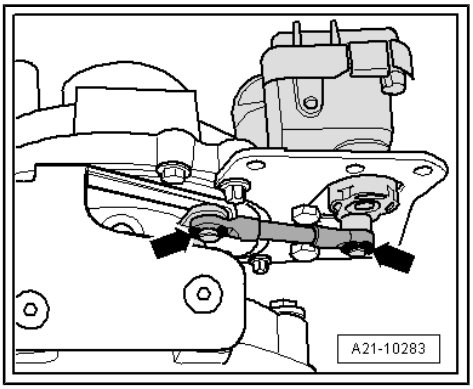


– Insert coupling rod.

• Installation position: The thicker eyelet is fitted onto the shaft of turbocharger 1 control unit - J724- .

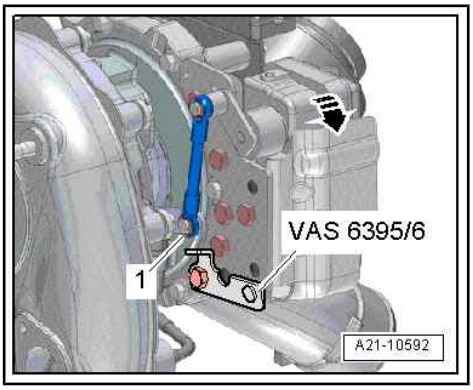
– Fit circlips -arrows-.

• The circlips must engage audibly.

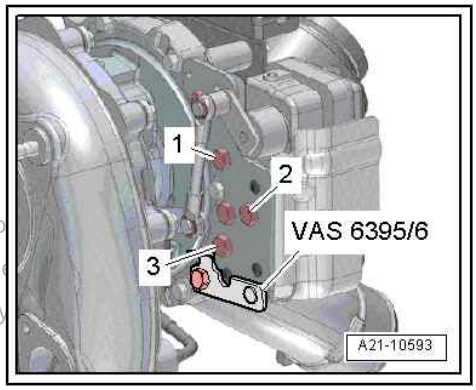


– Press turbocharger 1 control unit - J724- towards the rear without applying force -arrow- until lever -1- rests lightly on bracket - VAS 6395/6- .

– Hold -J724- in this position.



– Tighten bolts -1, 2, 3- to 5 Nm.



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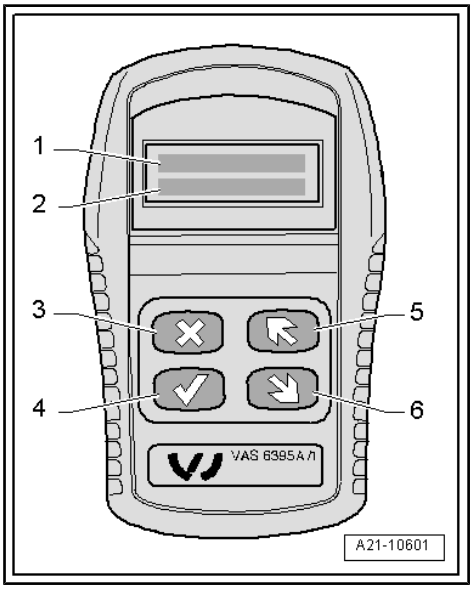
– To continue, press [V] button -item 4-.

- Turbocharger 1 control unit - J724- moves back and forth between the stops several times and is adjusted to the voltage value determined with the first measurement.

Display on -VAS 6395 A/1- :

1 - X.XXX V (voltage determined with first measurement)

2 - [OK]



Note

- *If [OK] is indicated on display, terminate adjustment* *⇒ page 443* *.*
- *If "CHECK" is indicated on display, proceed as follows.*

Procedure if display indicates "CHECK":

Display on -VAS 6395 A/1- :

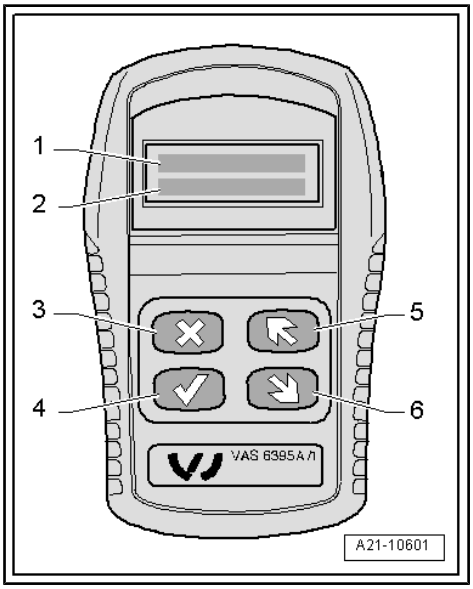
1 - [<<<]

2 - CHECK

Or

1 - [>>>]

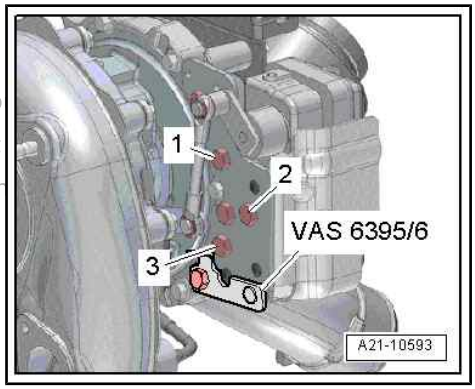
2 - CHECK



– 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.



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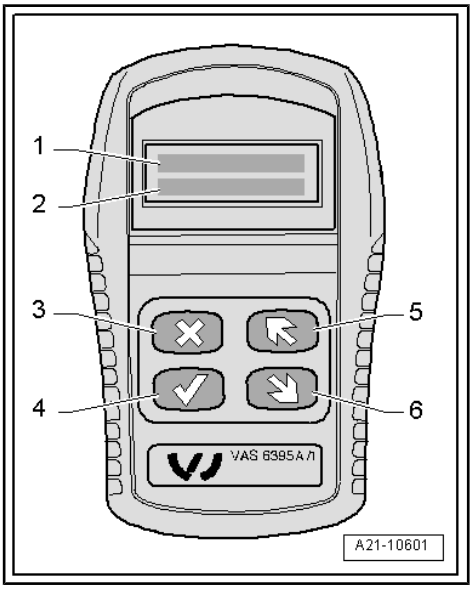
– To continue, press V button -item 4-.

- Turbocharger 1 control unit - J724- again moves back and forth between the stops several times and is adjusted to the voltage value determined with the first measurement.

Display on -VAS 6395 A/1- :

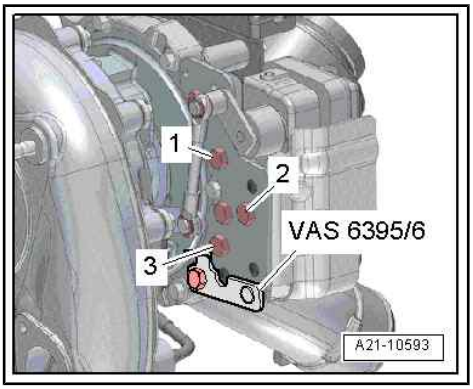
1 - X.XXX V

2 - [OK]



Terminating adjustment:

– Tighten bolts -1, 2, 3- to 10 Nm.

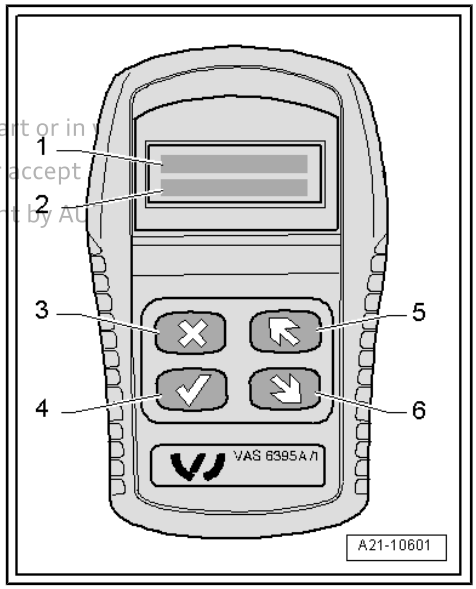


– To continue, press V button -item 4-.

Display on -VAS 6395 A/1- :

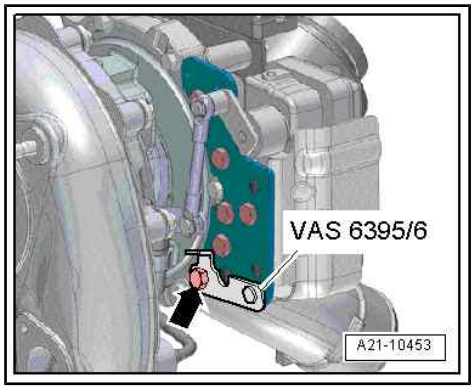
1 - X.XXX V

2 - [OK]



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– Unbolt bracket - VAS 6395/6- -arrow-.



– To continue, press [V] button -item 4-.

• Turbocharger 1 control unit - J724- moves to end positions.

Note

If the display indicates "FAULT", the new turbocharger 1 control unit - J724- must be renewed ⇒ page 439 .

Display on -VAS 6395 A/1- :

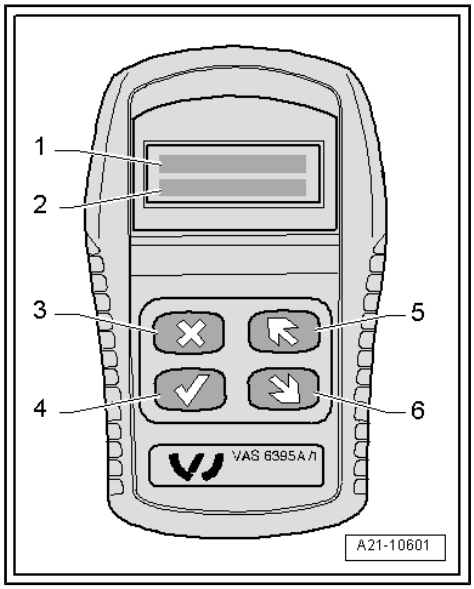
1 -

2 - [OK]

• Adjustment is completed.

– Unplug electrical connectors for tester - VAS 6395 A/1- .

Assemble in reverse order.



1.3.2 Removing and installing turbocharger 1 control unit - J724- - vehicles with two turbochargers, manual mode

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Special tools and workshop equipment required

♦ Tester for E-positioner - VAS 6395- / -VAS 6395A- or -VAS 6395B-

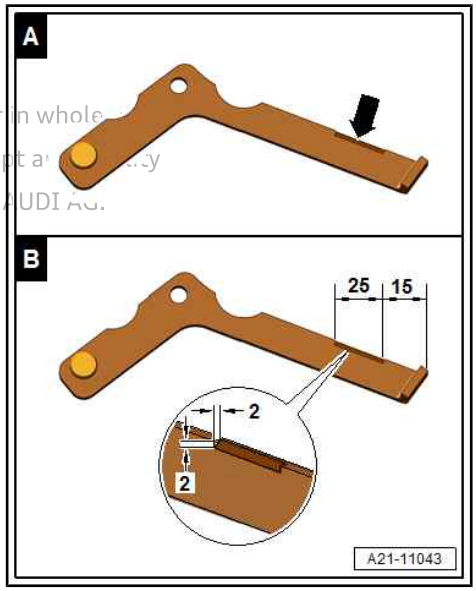
♦ Bracket -VAS 6395 /7-

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Modifying bracket -VAS 6395 /7- (if necessary)

If there is already a recess -arrow- as shown in illustration -A-, no modification is necessary.

– If there is no recess, modify bracket -VAS 6395 /7- as shown in illustration -B-.



Removing

Note

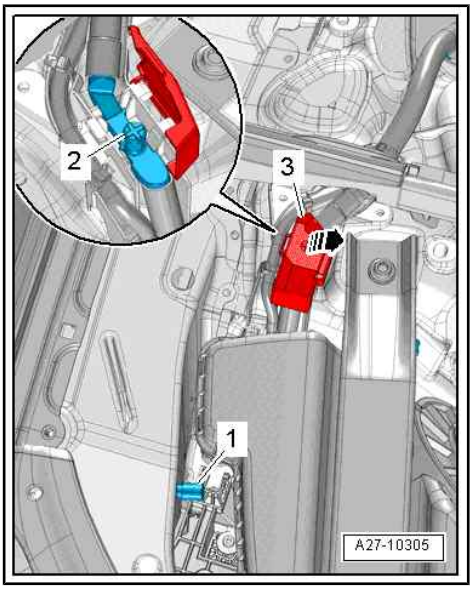
Observe rules for cleanliness ⇒ page 8 .

– Remove engine cover panel ⇒ page 172 .

– Remove plenum chamber partition panel ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber partition panel .

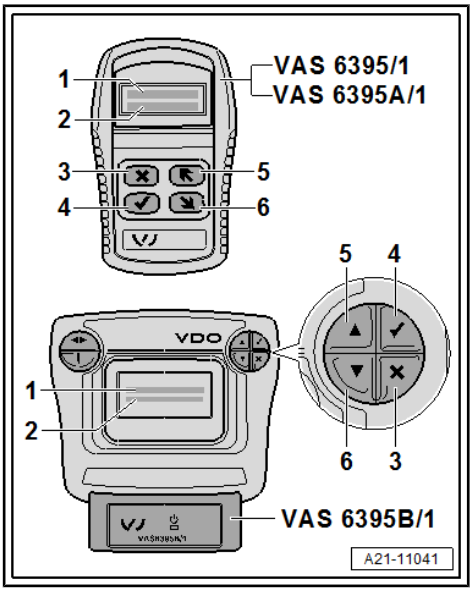
– Release cover -3- and swivel to side -arrow-.

– Connect tester - VAS 6395- to positive terminal -2- and earth -1- with connection lead - VAS 6395/2- .



Note

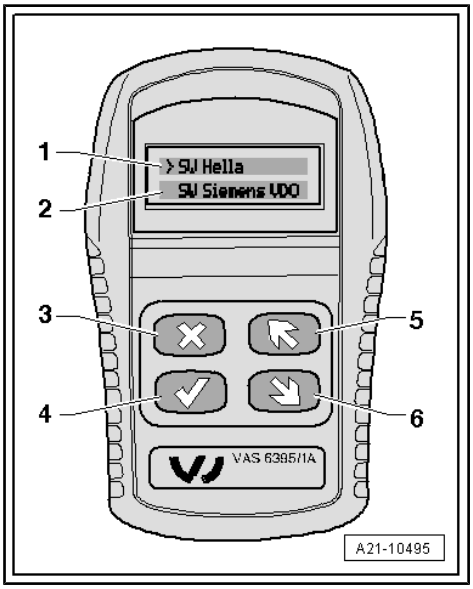
- *The following procedure is described for using tester - VAS 6395 /1- / -VAS 6395 A/1- .*
- *Depending on the equipment and tools available in your workshop, tester - VAS 6395 B/1- may also be used.*
- *Although the buttons are arranged in different positions, the designations/functions are the same (see illustration).*



Procedure for tester for E-positioner - VAS 6395 B/1- and E-box - VAS 6395 A/1- :

– Select software version SW Hella using buttons ↑ -item 5- and ↓ -item 6-.

– To confirm software version, press V button -item 4-.



Note

In this example, software version Hella -item 1- is selected.

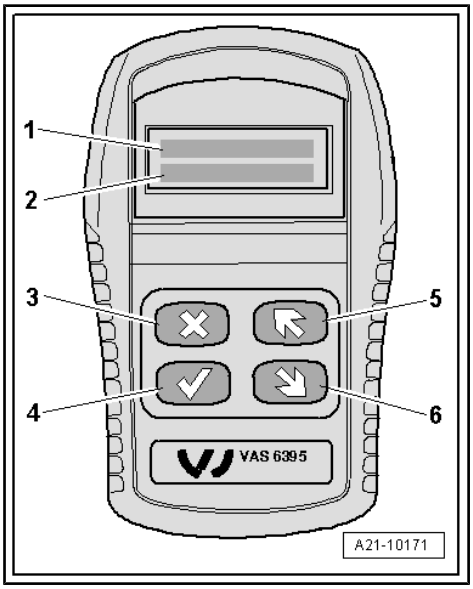
Procedure for tester for E-positioner - VAS 6395 /1- :

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 [>]

Or

> 1. START Bi-Turbo

2. NEXT [>]

If the following appears on the display, an incorrect software version has been loaded:

1 - > 1. TEST

2 - 2. LEARN

Note

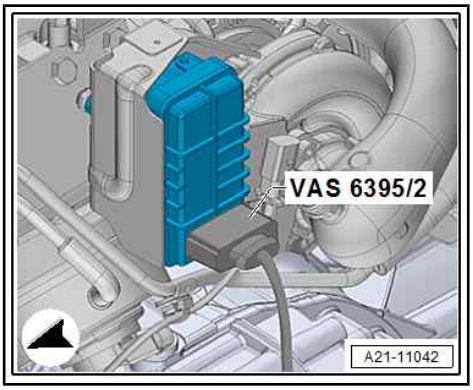
- *German market: If this is the case, download the correct software version ("Hella") from the "Audi Partner Portal (under Service)" in the section "Workshop Equipment".*
- *Rest of the world: If this is the case, download the correct software version ("Hella") from your Importer's information platform.*

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Continuation for all 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- .



Display on -VAS 6395- :

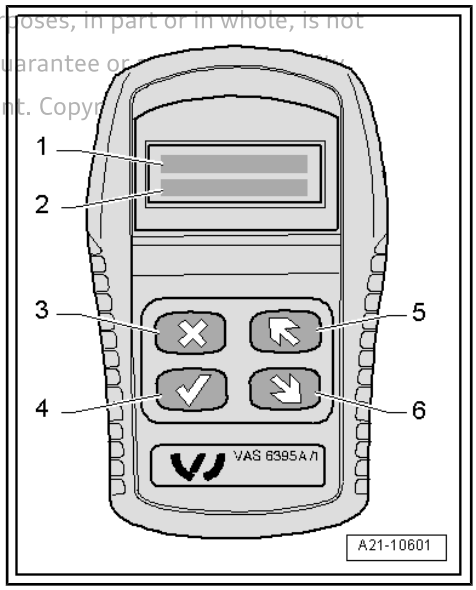
– Press ↓ button -item 6- twice to select MANUAL mode.

– Confirm MANUAL mode by pressing √ button -item 4-.

1 - 2. NEXT [>]

2 - > 3. MANUAL

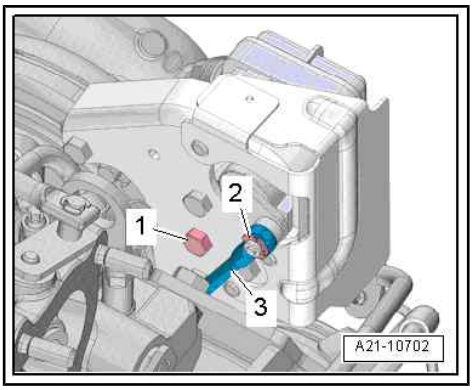
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– Remove bolt -1-.

Note

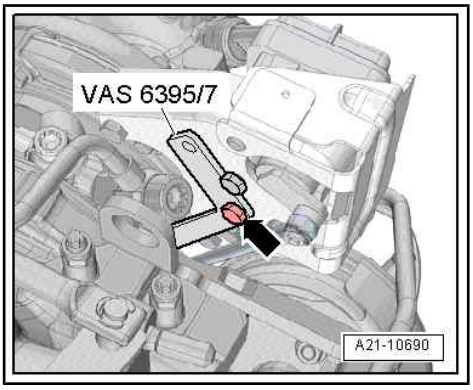
Do NOT unscrew any of the other bolts visible in the illustration.



– Fit bracket -VAS 6395 /7- on centring hole of bracket for turbocharger 1 control unit - J724- and tighten -bolt- to 7 Nm.

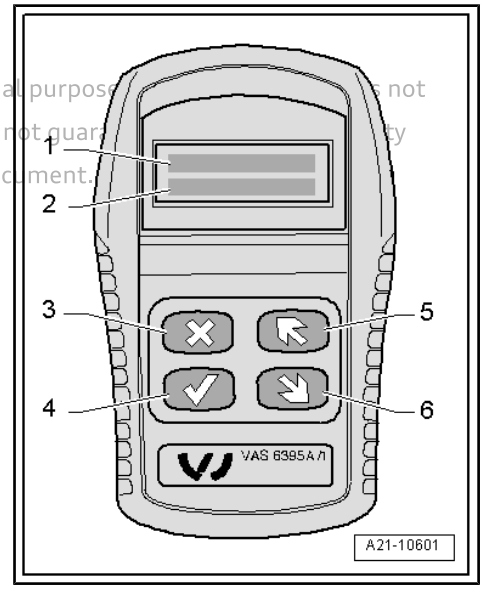
Note

Centring pin on bracket -VAS 6395 /7- must engage in hole in bracket for turbocharger 1 control unit - J724- .

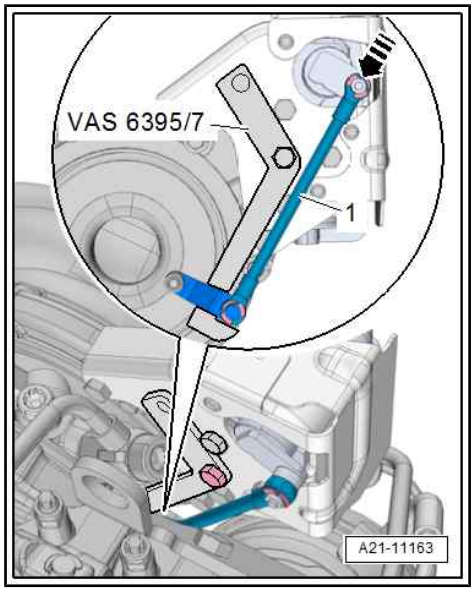


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Determining voltage value:



– Press [↑] button -item 5- on -VAS 6395- to move coupling rod -1- onto bracket -VAS 6395 /7- .



Note

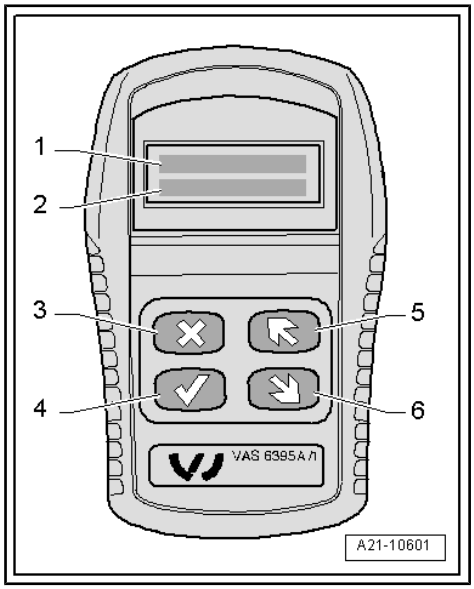
If the control unit stops moving during this process, assist it by pushing gently with your finger -arrow-.

Display on -VAS 6395- :

1 - X.XXX V

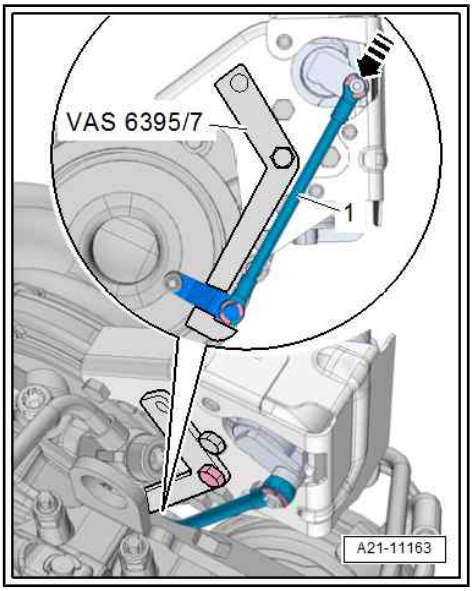
2 -

– Note down voltage value -1-.



– Press ↓ button -item 6- on -VAS 6395- to move coupling rod -1- back off bracket -VAS 6395 /7- .

– Repeat process for determining voltage value two more times and note down voltage values.



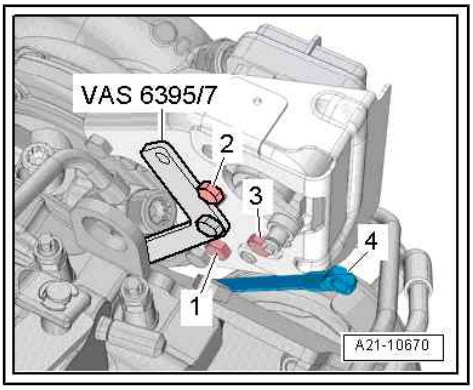
Note

If it is necessary to assist the control unit by pushing the coupling rod -3- with your finger in order to determine the voltage value, you must do this each time the process is repeated (try to apply the same amount of pressure) -arrow-.

– Calculate average of 3 recorded voltage values.

– Unclip securing clip.

– Disengage coupling rod -4- at turbocharger 1 control unit - J724- and lay coupling rod down.



Caution

Do not bend coupling rod.

– Remove bolts -1, 2, 3- and dispose of them.

Note

Do NOT unscrew any of the other bolts visible in the illustration.

– Remove old turbocharger 1 control unit - J724- and dispose of it.

– Install new turbocharger 1 control unit - J724- in reverse sequence of removal.

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Note

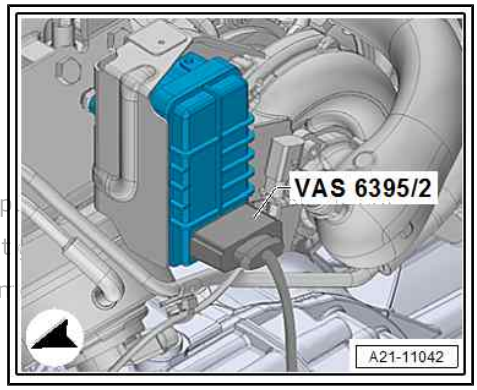
Only exchange the coupling rod from the replacement part kit if necessary (e.g. due to damage).

– Fit new bolts -1, 2, 3-, M6x15 with tapered shank:

– 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.

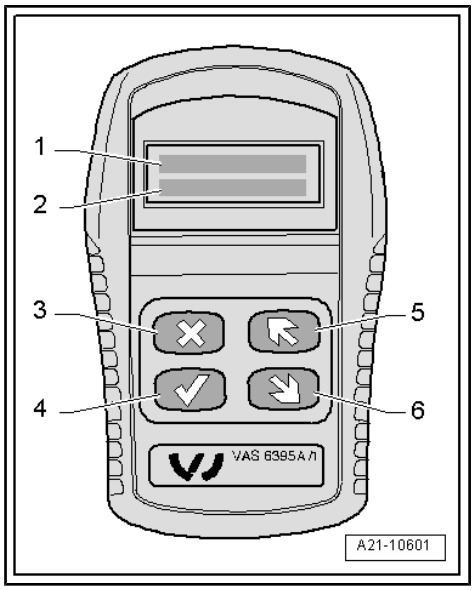
– Connect connection lead - VAS 6395/2- with adapter to new turbocharger 1 control unit - J724- .



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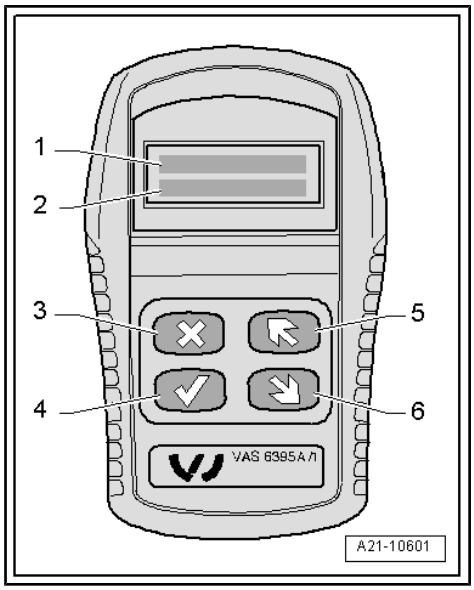
– Set new turbocharger 1 control unit - J724- to a value 0.020 - 0.030V higher than value calculated previously.

• To set voltage value, press [↑] button -item 5- or [↓] -item 6-.

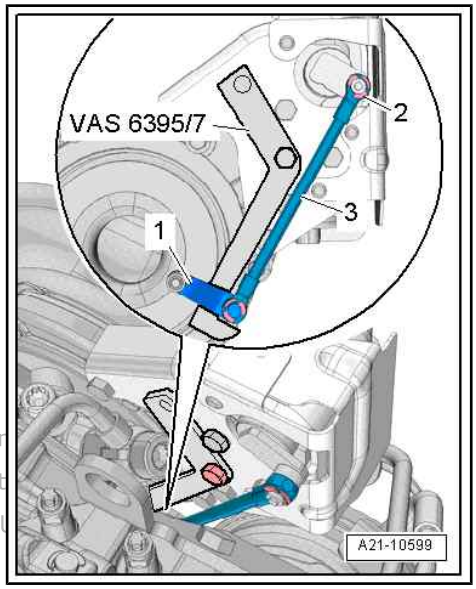


Display on -VAS 6395- :

1 - X.XXX V

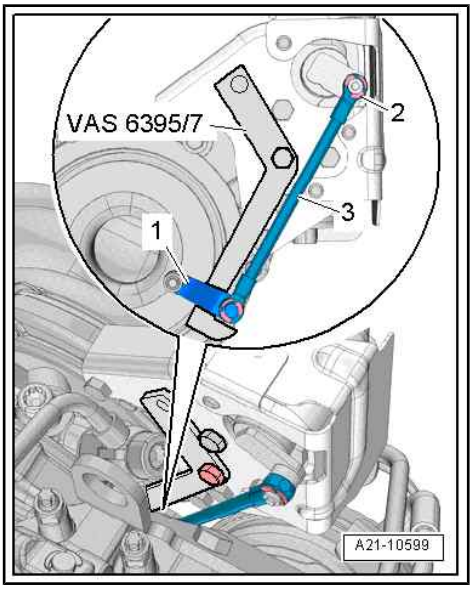


– Insert coupling rod -3-.
– Attach securing clip -2-.
• The securing clip must engage audibly.

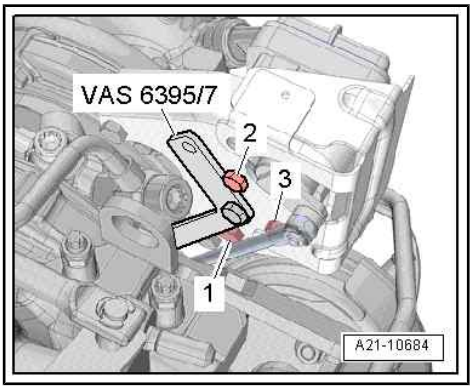


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– Now turn turbocharger 1 control unit - J724- so that arm -1- rests against bracket -VAS 6395 /7- .



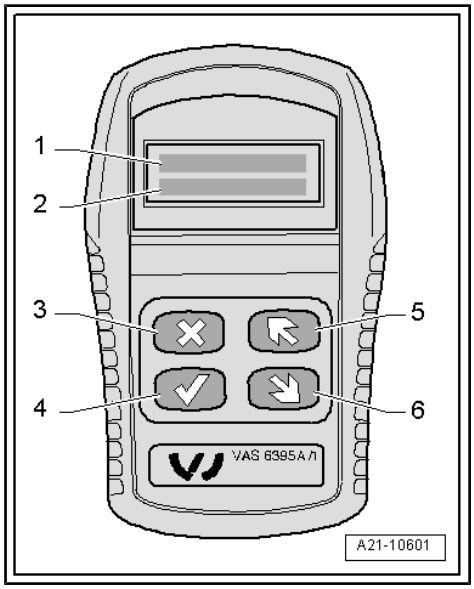
– Tighten bolts -1, 2, 3- to 5 Nm.



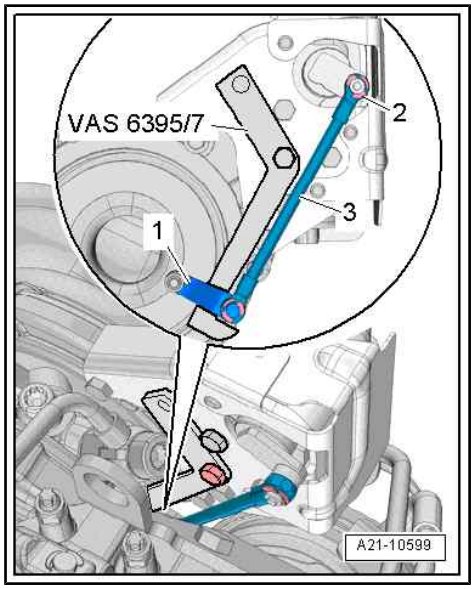
Set voltage value on new turbocharger 1 control unit - J724- as follows:

Caution

Setting the turbocharger 1 control unit - J724- incorrectly can lead to problems with noise and/or poor driveability.



– Press ↑ button -item 5- on -VAS 6395- to move coupling rod -3- onto bracket -VAS 6395 /7- .



Display on -VAS 6395- :

1 - X.XXX V

– Compare voltage value -1- with calculated average.

Note

The voltage of the new turbocharger 1 control unit must not differ from the average value for the old control unit by more than +/- 0.020V.

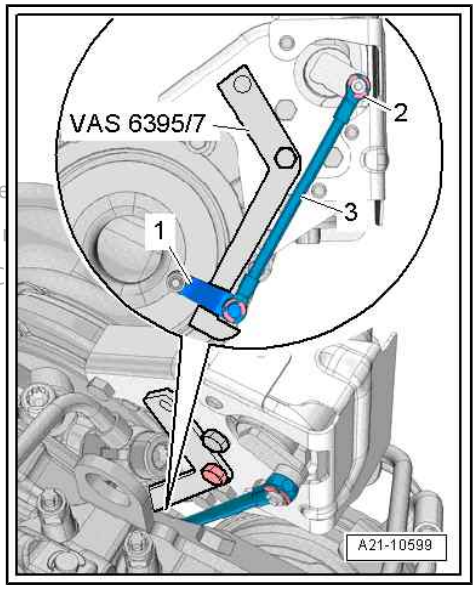


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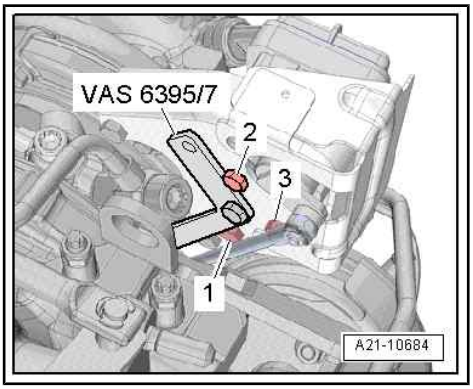
– Press ↓ button -item 6- on -VAS 6395- to move coupling rod -3- back off bracket -VAS 6395 /7- .

If voltage value is not within range of tolerance:

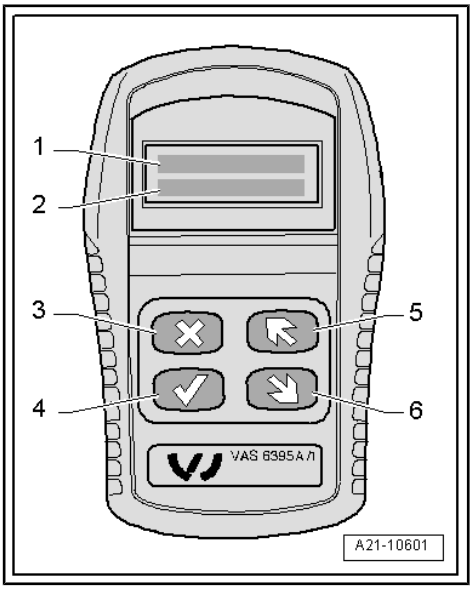
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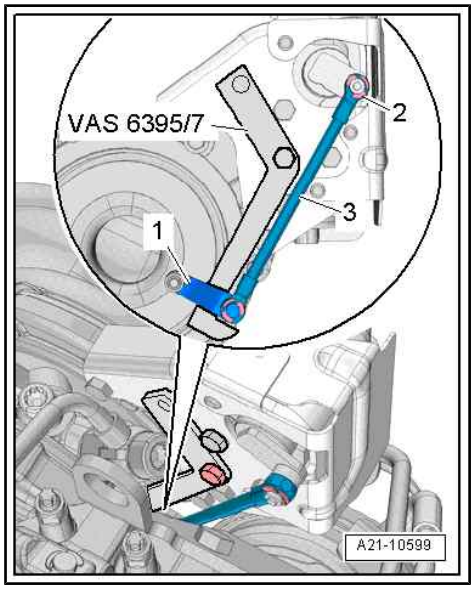
– Loosen bolts -1, 2, 3- just enough so that turbocharger 1 control unit - J724- can be moved by applying light force.
– Push turbocharger 1 control unit in appropriate direction and tighten bolts -1, 2, 3- to 5 Nm.
♦ If voltage value is too high, push turbocharger 1 control unit downwards.
♦ If voltage value is too low, push turbocharger 1 control unit upwards.



Measure voltage with new turbocharger 1 control unit - J724- as follows:



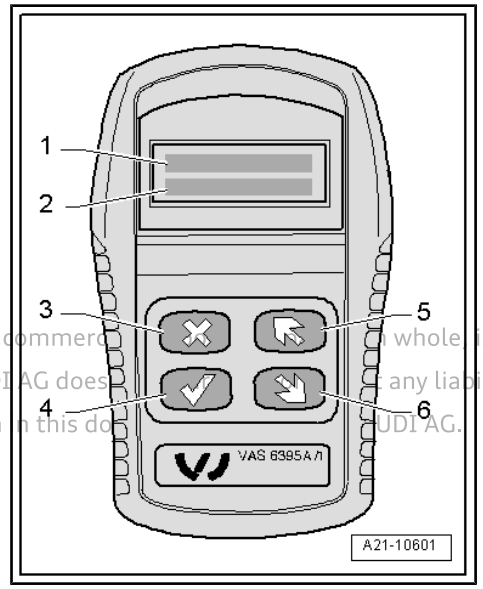
– Press ↑ button -item 5- on -VAS 6395- to move coupling rod -3- onto bracket -VAS 6395 /7- .



Display on -VAS 6395- :

1 - X.XXX V

– Compare voltage value -1- with calculated average.

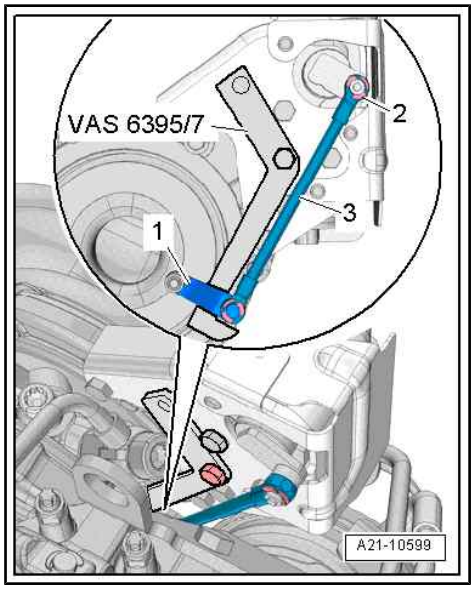


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– Press ↓ button -item 6- on -VAS 6395- to move coupling rod -3- back off bracket -VAS 6395 /7- .

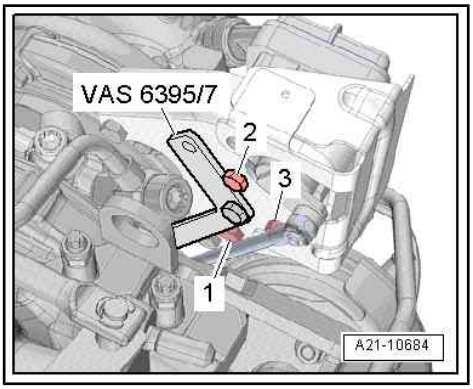
Voltage value outside range of tolerance

– Re-adjust turbocharger 1 control unit - J724- ⇒ page 453 .



Voltage value within range of tolerance

– Tighten bolts -1, 2, 3- to 10 Nm.



– Check voltage value again.

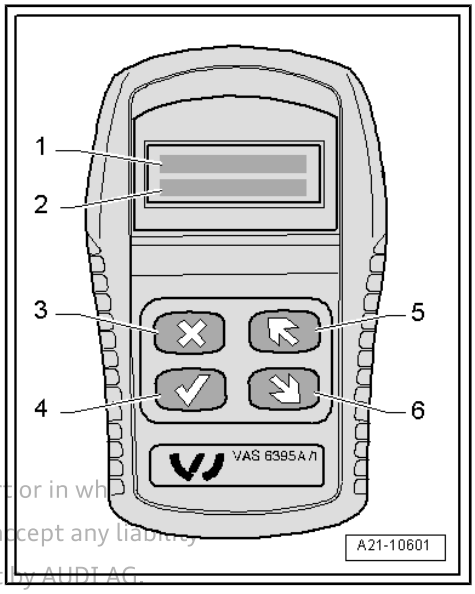
Display on -VAS 6395- :

1 - X.XXX V

Voltage value outside range of tolerance

– Re-adjust turbocharger 1 control unit - J724- ⇒ page 453 .

Voltage value within range of tolerance



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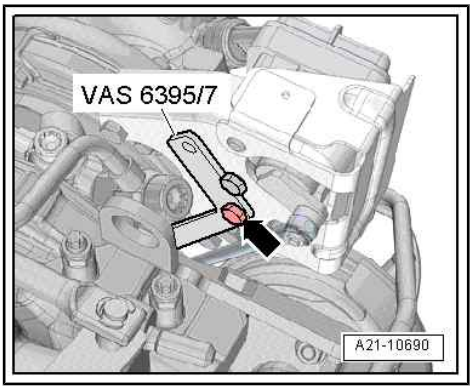
– Remove bolt -arrow- and detach bracket -VAS 6395 /7- .

– Screw bolt back in and tighten ⇒ Item 5 (page 418) .

• Adjustment is completed.

– Unplug electrical connectors for tester - VAS 6395- .

Assemble in reverse order.



1.4 Adjusting vacuum unit for turbocharger

⇒ "1.4.1 Adjusting vacuum unit for low-pressure turbocharger", page 455

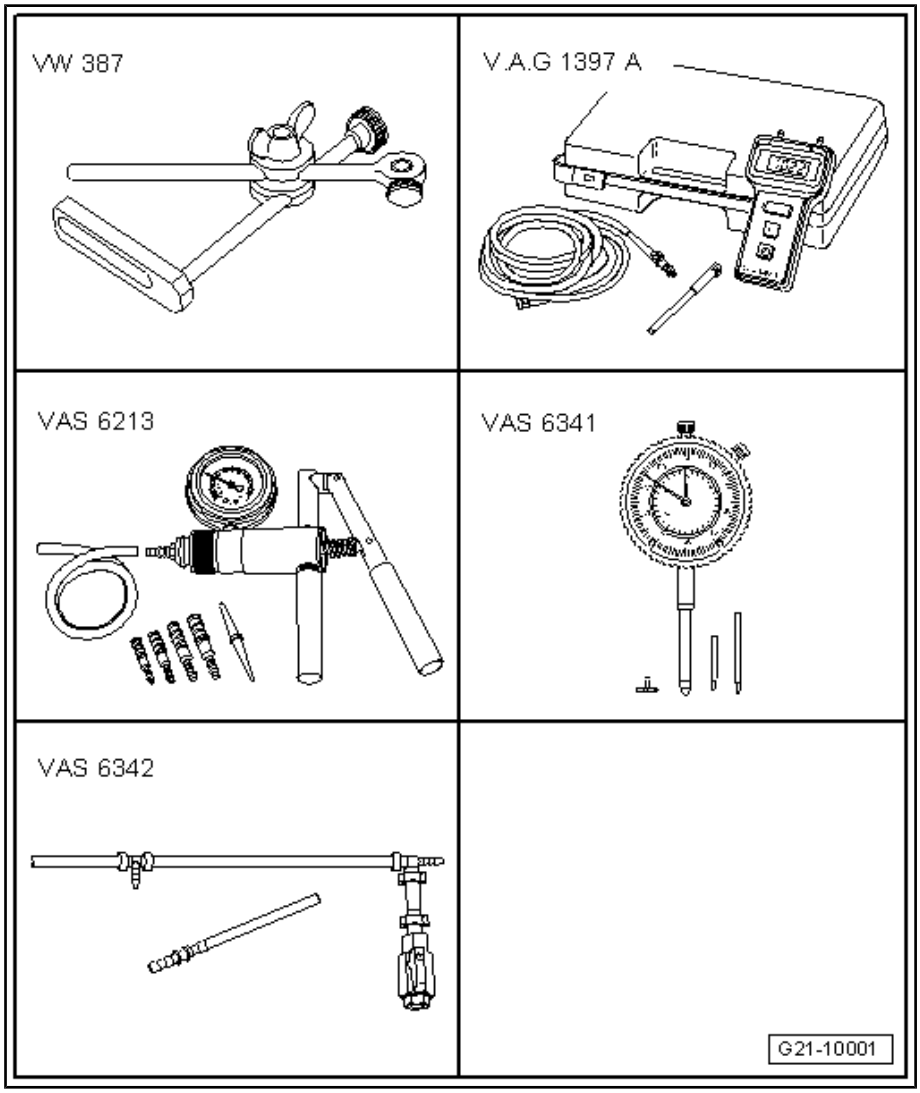
⇒ "1.4.2 Adjusting vacuum unit for turbine changeover", page 458

1.4.1 Adjusting vacuum unit for low-pressure turbocharger

Note

Adjustment only applies to a new vacuum unit.

Special tools and workshop equipment required



- Universal dial gauge bracket - VW 387-
- Turbocharger tester - V.A.G 1397A-
- Hand vacuum pump - VAS 6213-
- Dial gauge set, 4-part - VAS 6341-
- Pressure control valve - VAS 6342-

Procedure

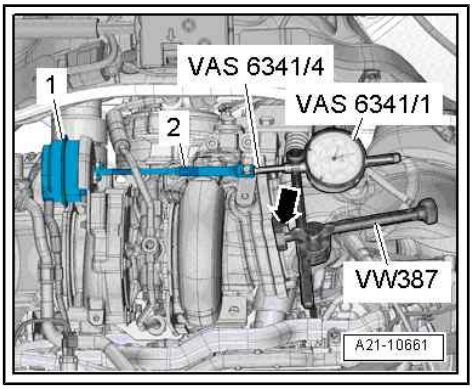
Note

Observe rules for cleanliness ⇒ page 8 .

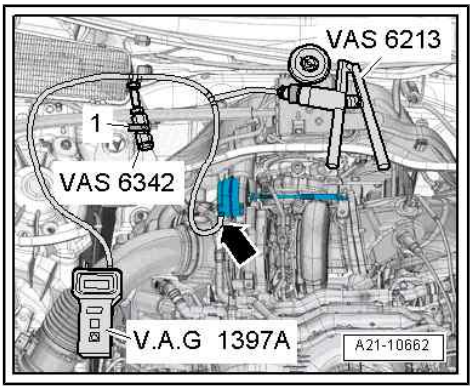
– Remove engine cover panel ⇒ page 172 .

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– Secure universal dial gauge bracket - VW 387- using a nut -arrow- on catalytic converter.
– Attach dial gauge - VAS 6341/1- with flat probe - VAS 6341/4- to universal dial gauge bracket - VW 387-
– Align dial gauge so that it is aligned with operating rod of vacuum unit.
– Set dial gauge to 20... 25 mm preload.



– Connect hand vacuum pump - VAS 6213- and pressure control valve - VAS 6342- to vacuum unit -arrow- and connection “II” of turbocharger tester -V.A.G 1397A- , as shown in illustration.
– Close pressure control valve - VAS 6342- .
• Lever -1- should be horizontal.
– Move adjuster ring on hand vacuum pump - VAS 6213- to position for “vacuum”.
– Switch on turbocharger tester - V.A.G 1397A- and set sliding switch to position “II”.
– Make sure that dial gauge can move freely.
– Operate hand vacuum pump - VAS 6213- until turbocharger tester - V.A.G 1397A- indicates the following value:
• 580 ± 5 mbar.



Note

The turbocharger tester - V.A.G 1397A- cannot display values greater than 580 mbar.

– Set dial gauge to “0”.
– Note measured value.
– Vent vacuum using pressure control valve - VAS 6342- .
• 440 mbar.

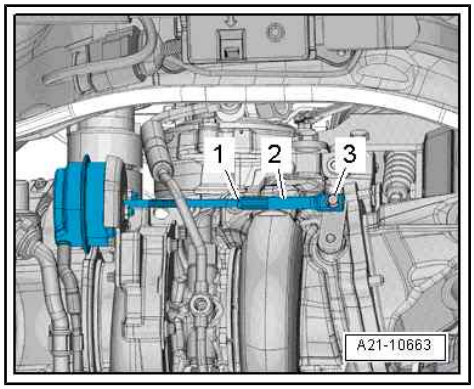
Note

If too much vacuum is vented, bring pressure back up to 580 mbar and then adjust by venting again.

• The operating rod should have moved in the direction of the dial gauge by 0.8 ... 1.2 mm from the previously recorded value.
– Vent vacuum using pressure control valve - VAS 6342- .
• 100 mbar.
• The operating rod should have moved in the direction of the dial gauge by 7 ... 9.5 mm from the previously recorded value.

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– If specification is not attained, loosen lock nut -1-.
– Remove securing clip -3- and detach operating rod -2- from mounting pin.
– Lengthen or shorten front part of operating rod by turning it to left/right.
– Fit operating rod -2- on mounting pin again.
– Repeat test with hand vacuum pump - VAS 6213- and dial gauge - VAS 6341/1- .
– If specification is attained, fit securing clip and tighten lock nut.



1.4.2 Adjusting vacuum unit for turbine changeover

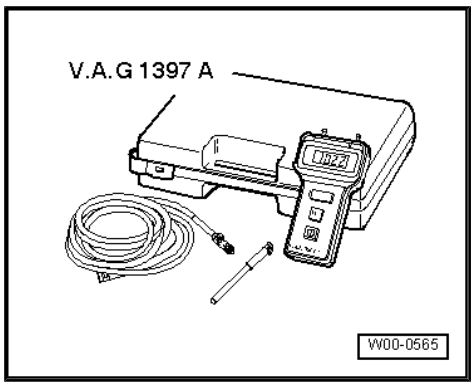
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Note

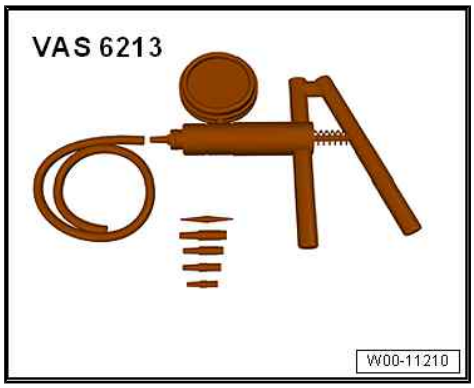
The vacuum unit for turbine changeover controls the generation of charge pressure between the low-pressure turbocharger and the high-pressure turbocharger.

Special tools and workshop equipment required

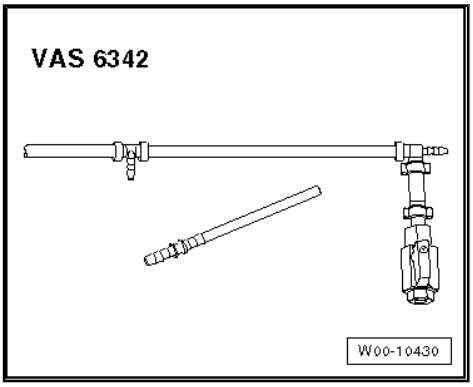
- Vehicle diagnostic tester
- Turbocharger tester - V.A.G 1397A-



- Hand vacuum pump - VAS 6213-



♦ Pressure control valve - VAS 6342-



Procedure

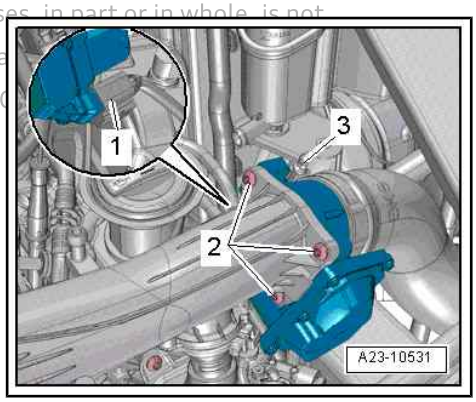
Note

Observe rules for cleanliness ⇒ page 8 .

– Remove engine cover panel ⇒ page 172 .

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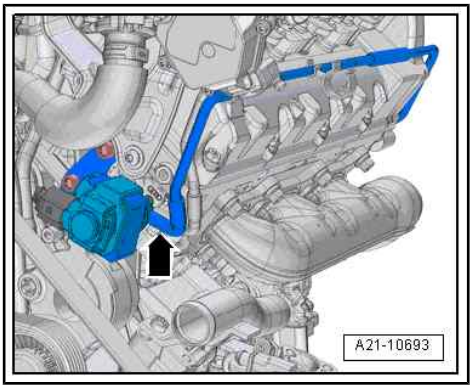
– Release hose clip -3- and detach air hose.



Note

Disregard items -1 and 2-.

– Disconnect vacuum line to vacuum unit for turbine changeover at turbine changeover valve - N529- -arrow-.



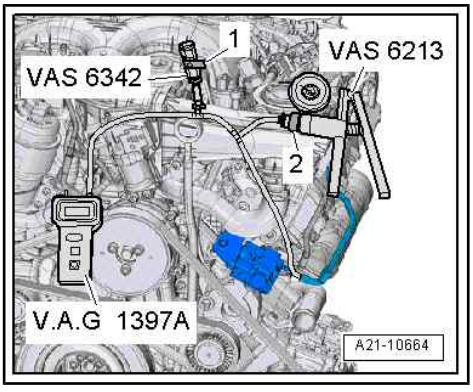
– Connect hand vacuum pump - VAS 6213- and pressure control valve - VAS 6342- to disconnected vacuum line and connection “II” of turbocharger tester -V.A.G 1397A- , as shown in illustration.

– Close pressure control valve - VAS 6342- .

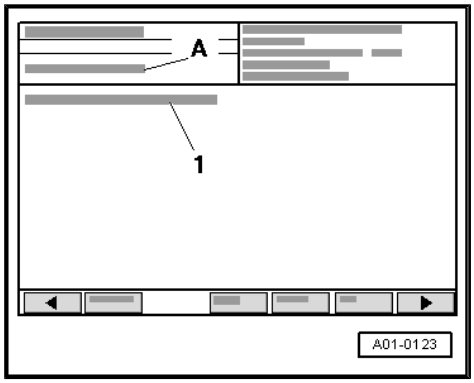
• Lever -1- should be horizontal.

– Move adjuster ring -2- on hand vacuum pump - VAS 6213- to select “vacuum”.

– Switch on turbocharger tester - V.A.G 1397A- and set sliding switch to position “II”.



– On vehicle diagnostic tester select function `02-Measured values` in Guided Fault Finding `01-Engine electronics`.
– Select measured value `Bypass valve turbocharger hp turbine inlet, raw voltage` from list.
– Operate hand vacuum pump - VAS 6213- until turbocharger tester - V.A.G 1397A- indicates the following value:
• 200 mbar.
– Read voltage level off vehicle diagnostic tester :
• Specification: 4090 ... 4190 mV
– Check setting by operating hand vacuum pump - VAS 6213- until pressure tester of -VAS 6213- indicates the following value:
• 700 mbar.



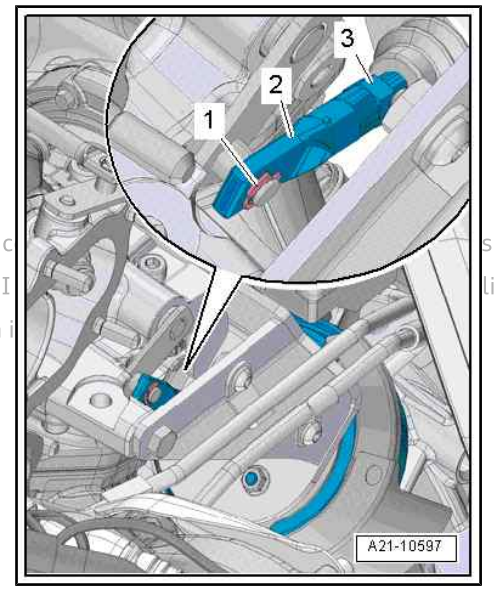
Note

The turbocharger tester - V.A.G 1397A- cannot display values greater than 580 mbar.

– Read voltage level off vehicle diagnostic tester :
• Specification: 4150 ... 4250 mV

If specification is not attained:

– Remove catalytic converter ⇒ page 605 .
– Vent system via pressure control valve - VAS 6342- so that vacuum reading drops to approx. 100 mbar.



Note

Counterhold operating rod -2- when loosening lock nut -3-.

– Loosen lock nut -3- using crow foot wrench.
– Unclip securing clip -1- and detach operating rod from adjusting lever.
– Lengthen or shorten upper part of operating rod -2- by turning it about its own axis.

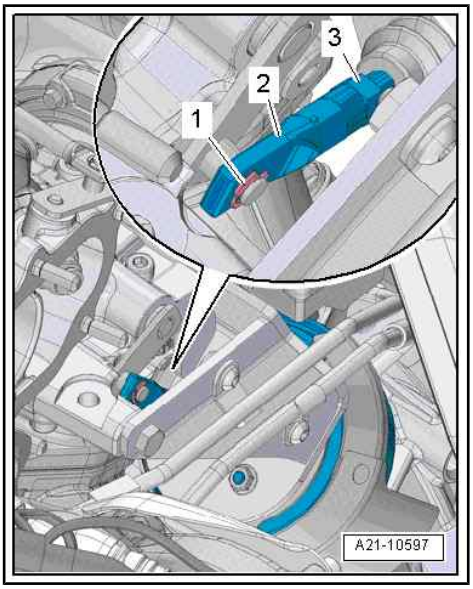
Note

A half turn of the operating rod -2- corresponds to a change in voltage of 68 mV.

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– Slide operating rod -2- onto adjusting lever.

– Repeat test with hand vacuum pump - VAS 6213- and vehicle diagnostic tester .



Note

Counterhold operating rod -2- when tightening lock nut -3-.

– If specification is attained, fit securing clip -1- and tighten lock nut -3-.

– Check setting again by operating hand vacuum pump - VAS 6213- until pressure tester of -VAS 6213- indicates the following value:

• 700 mbar.

Note

The turbocharger tester - V.A.G 1397A- cannot display values greater than 580 mbar.

– Read voltage level off vehicle diagnostic tester :

• Specification: 4150 ... 4250 mV

If the specification is attained:

– Install catalytic converter ⇒ page 605 .

1.5 Renewing vacuum unit for turbocharger

⇒ "1.5.1 Renewing vacuum unit for low-pressure turbocharger", page 461

⇒ "1.5.2 Renewing vacuum unit for turbine changeover", page 462

1.5.1 Renewing vacuum unit for low-pressure turbocharger

Removing

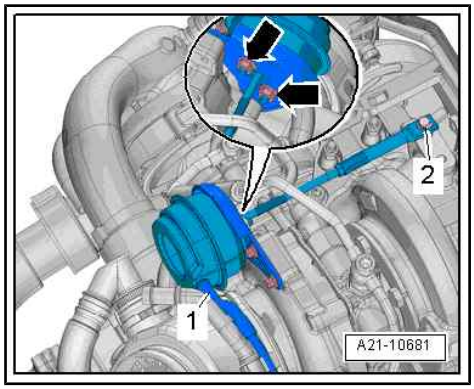
Note

Observe rules for cleanliness ⇒ page 8 .

– Remove engine cover panel ⇒ page 172 .

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– Disconnect vacuum hose -1-.
– Detach securing clip -2-.
– Remove nuts -arrows- and detach vacuum unit for low-pressure turbocharger.



Installing

Installation is carried out in reverse order; note the following:

– Adjust vacuum unit for low-pressure turbocharger ⇒ page 455 .

Tightening torques

◆ ⇒ “1.1.2 Exploded view - turbochargers, vehicles with two turbochargers”, page 414

1.5.2 Renewing vacuum unit for turbine changeover

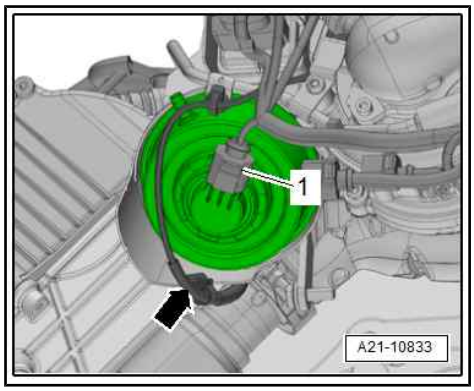
Removing

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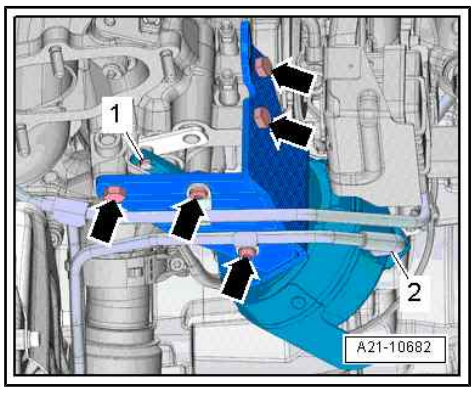
Note

Observe rules for cleanliness ⇒ page 8 .

– Remove catalytic converter ⇒ page 605 .
– Unplug electrical connector -1- and move wiring -arrow- clear.



– Unclip securing clip -1-.
– Disconnect vacuum hose -2-.
– Unscrew bolts -arrows- and detach vacuum unit for turbine changeover.



Installing

Installation is carried out in reverse order; note the following:

– Adjust vacuum unit for turbine changeover ⇒ page 458 .

Tightening torques

◆ ⇒ “1.1.2 Exploded view - turbochargers, vehicles with two turbochargers”, page 414

2 Charge air system

⇒ “2.1 Exploded view - charge air system”, page 463

⇒ “2.2 Exploded view - hose connections for charge air system”, page 466

⇒ “2.3 Removing and installing charge air cooler”, page 467

⇒ “2.4 Removing and installing charge pressure sender G31 / intake air temperature sender G42 ”, page 472

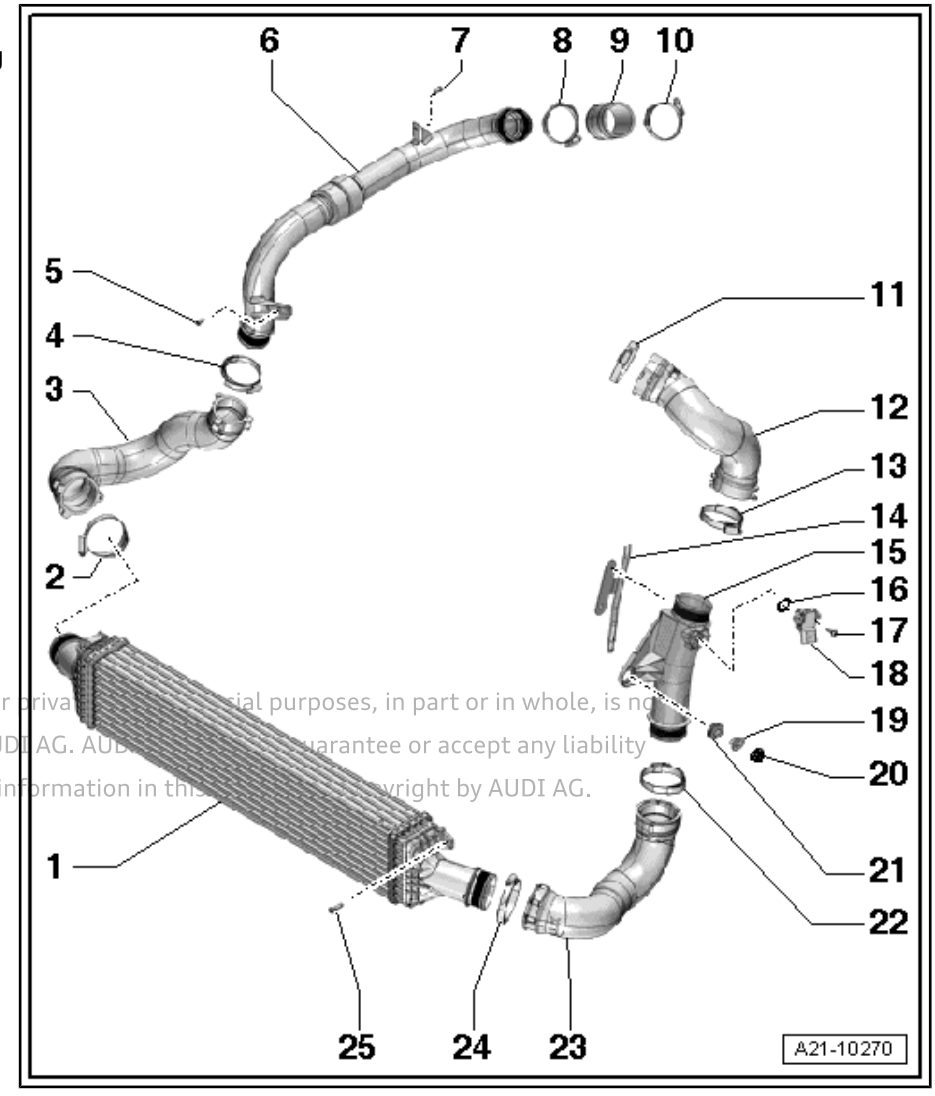
⇒ “2.5 Checking charge air system for leaks”, page 473

2.1 Exploded view - charge air system

⇒ “2.1.1 Exploded view - charge air system, vehicles with one turbocharger”, page 463

⇒ “2.1.2 Exploded view - charge air system, vehicles with two turbochargers”, page 465

2.1.1 Exploded view - charge air system, vehicles with one turbocharger



1 - Charge air cooler

- ❑ Removing and installing ⇒ page 467

2 - Hose clip

- ❑ Tightening torque ⇒ page 466

3 - Air hose

- ❑ To charge air cooler
- ❑ Must be free of oil and grease when installing

4 - Hose clip

- ❑ Tightening torque ⇒ page 466

5 - Bolt

- ❑ 9 Nm

6 - Air pipe (right-side)

7 - Bolt

- ❑ 9 Nm

8 - Hose clip

- ❑ Tightening torque ⇒ page 466

9 - Air hose

- ❑ To turbocharger
- ❑ Must be free of oil and grease when installing

10 - Hose clip

- ❑ Tightening torque ⇒ page 466

11 - Hose clip

- ❑ Tightening torque ⇒ page 466

12 - Air hose

- ❑ To intake manifold

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- ❑ Must be free of oil and grease when installing

13 - Hose clip

- ❑ Tightening torque ⇒ page 466

14 - Not fitted

15 - Air pipe (left-side)

16 - O-ring

- ❑ Renew

17 - Bolt

- ❑ 5 Nm

18 - Charge pressure sender - G31- / intake air temperature sender - G42-

- ❑ Removing and installing ⇒ page 472

19 - Bush

20 - Nut

- ❑ 9 Nm

21 - Rubber grommet

22 - Hose clip

- ❑ Tightening torque ⇒ page 466

23 - Air hose

- ❑ From charge air cooler
- ❑ Must be free of oil and grease when installing

24 - Hose clip

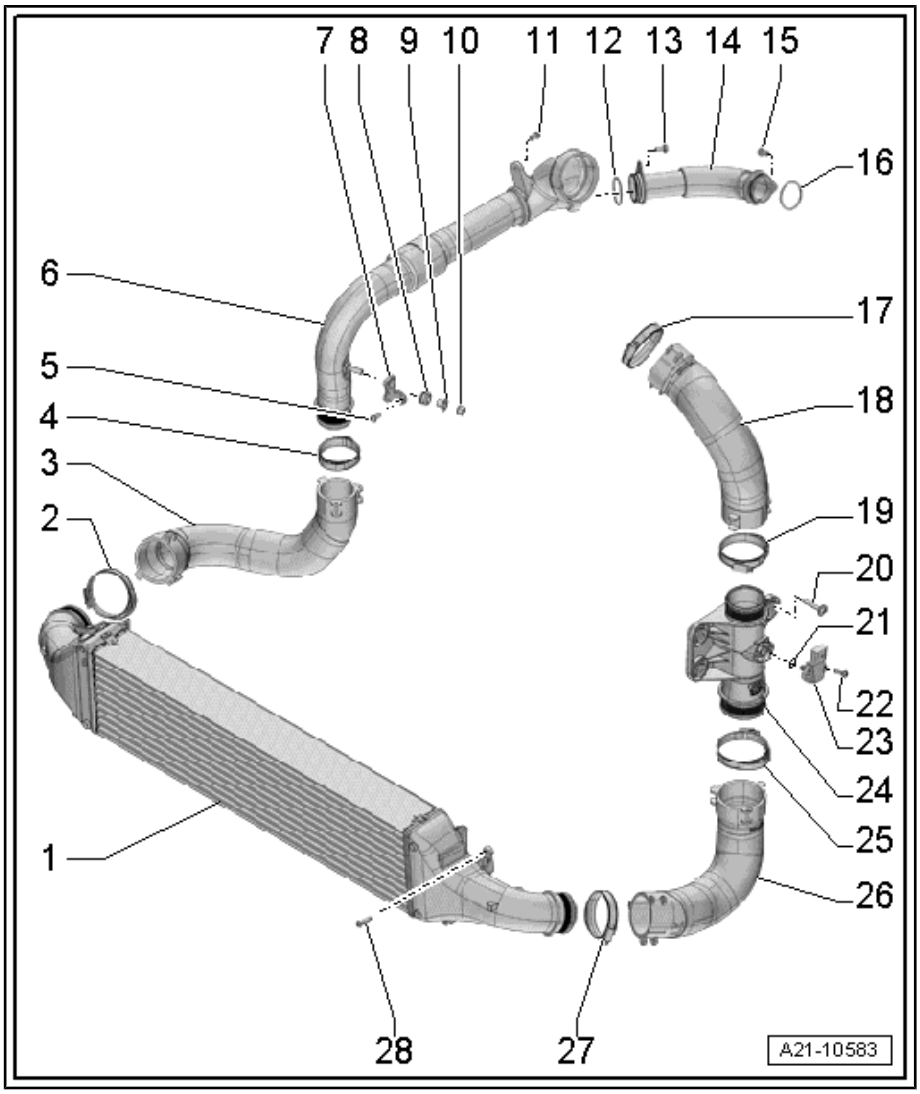
- ❑ Tightening torque ⇒ page 466

25 - Bolt

- ❑ 7 Nm

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2.1.2 Exploded view - charge air system, vehicles with two turbochargers



1 - Charge air cooler
- ❑ Removing and installing ⇒ page 467

2 - Hose clip
- ❑ Tightening torque ⇒ page 466

3 - Air hose
- ❑ Must be free of oil and grease when installing

4 - Hose clip
- ❑ Tightening torque ⇒ page 466

5 - Bolt
- ❑ 9 Nm

6 - Air pipe (right-side)
- ❑ From turbocharger

7 - Retainer

8 - Grommet

9 - Sleeve

10 - Nut
- ❑ 9 Nm

11 - Bolt
- ❑ 9 Nm

12 - O-ring
- ❑ Renew

13 - Bolt
- ❑ 9 Nm

14 - Intermediate pipe
- ❑ From turbocharger

15 - Bolt
- ❑ 9 Nm

16 - O-ring
- ❑ Renew

17 - Hose clip
- ❑ Tightening torque ⇒ page 466

18 - Air hose
- ❑ To intake manifold
- ❑ Must be free of oil and grease when installing

19 - Hose clip
- ❑ Tightening torque ⇒ page 466

20 - Bolt
- ❑ 9 Nm

21 - O-ring
- ❑ Renew

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22 - Bolt

- ❑ 5 Nm

23 - Charge pressure sender - G31- / intake air temperature sender - G42-

- ❑ Removing and installing ⇒ page 472

24 - Air pipe (left-side)

25 - Hose clip

- ❑ Tightening torque ⇒ page 466

26 - Air hose

- ❑ Must be free of oil and grease when installing

27 - Hose clip

- ❑ Tightening torque ⇒ page 466

28 - Bolt

- ❑ 7 Nm

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2.2 Exploded view - hose connections for charge air system

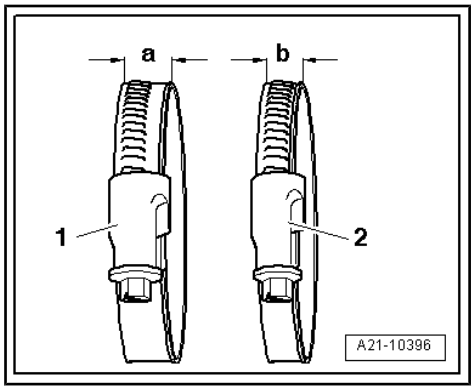
Note

- *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *The screw sections of used screw-type clips must be sprayed with rust remover prior to fitting so that the air hoses can be attached securely to the hose connections.*

Tightening torque for

1 - Hose clip with width -a- = 13 mm: 5.5 Nm

2 - Hose clip with width -b- = 9 mm: 3.4 Nm



2.3 Removing and installing charge air cooler

⇒ "2.3.1 Removing and installing charge air cooler - vehicles with one turbocharger", page 467

⇒ "2.3.2 Removing and installing charge air cooler - vehicles with two turbochargers", page 468

2.3.1 Removing and installing charge air cooler - vehicles with one turbocharger

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Removing

Note

Observe rules for cleanliness ⇒ page 8 .

– Remove closure plate for bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing attachments .

– Remove lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing attachments .

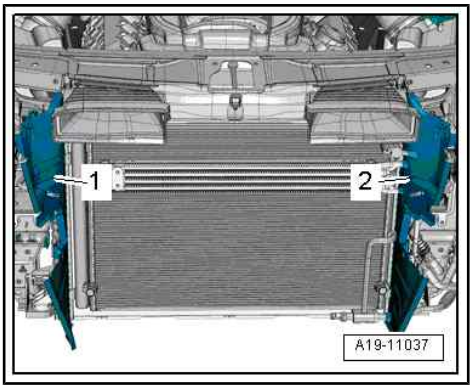
– Remove air intake grille (left and right) ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing attachments .

WARNING

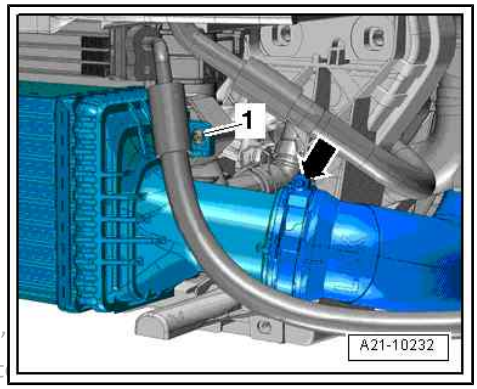
Risk of injury as the radiator fans may start up automatically.

- ***Unplug electrical connectors before working in vicinity of radiator cowl.***

– Unclip air ducts -1 and 2-.

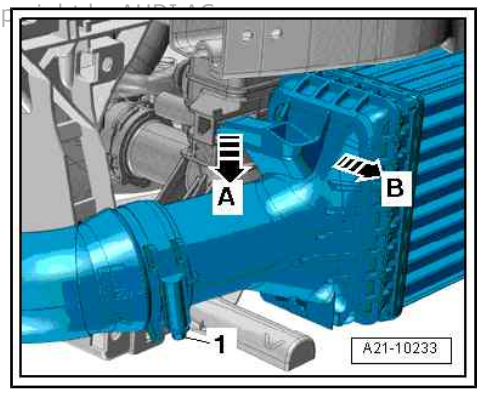


– Release hose clip -arrow- and detach air hose from charge air cooler.
– Remove bolt -1-.



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– 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-.
– Disengage and detach charge air cooler upwards.



Installing

Installation is carried out in reverse order; note the following:

Note

If there are slight impressions on the fins, refer to ⇒ page 11 .

– Install lock carrier cover and closure plate at bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .

Tightening torques

- ⇒ “2.1.1 Exploded view - charge air system, vehicles with one turbocharger”, page 463
- ⇒ “2.2 Exploded view - hose connections for charge air system”, page 466

2.3.2 Removing and installing charge air cooler - vehicles with two turbochargers

Special tools and workshop equipment required

- Drip tray for workshop hoist - VAS 6208-



Removing

Note

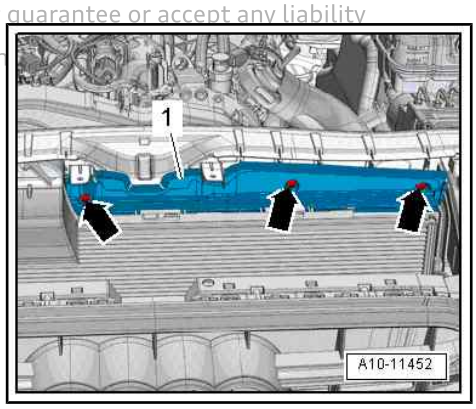
Observe rules for cleanliness ⇒ page 8 .

– Remove closure plate for bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing attachments .

– Remove lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing attachments .

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– Remove bolts -arrows- and detach air duct -1-.

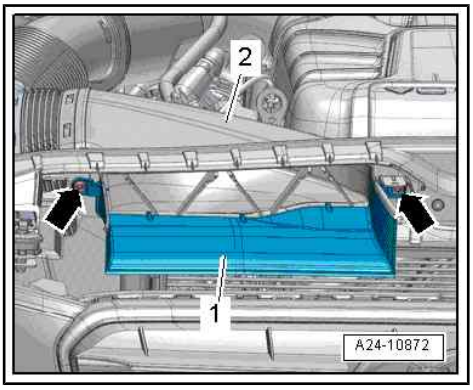


– Remove bolts -arrows- and detach air duct -1-.

Note

Disregard -item 2-.

– Remove air intake grille -1- (left and right) ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing attachments .



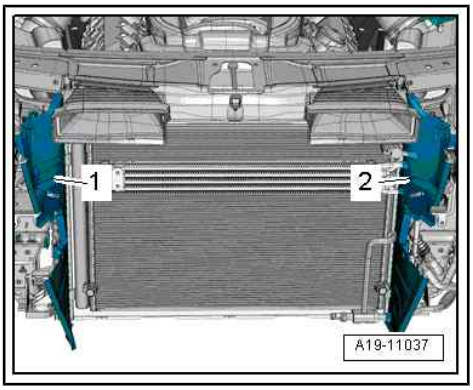
WARNING

Risk of injury as the radiator fans may start up automatically.

- ***Unplug electrical connectors before working in vicinity of radiator cowl.***

– Unclip air ducts -1 and 2- and detach.

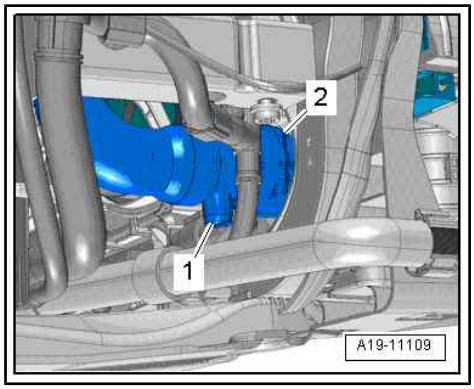
– Remove noise insulation (front) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .



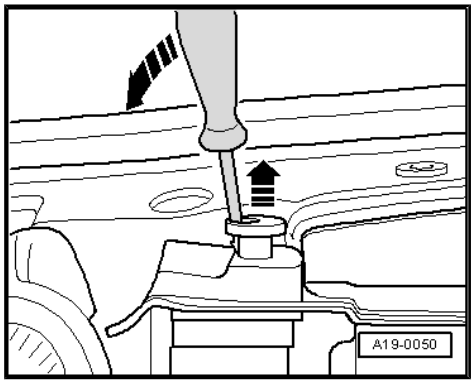
Note

Collect drained coolant in a clean container for re-use or disposal.

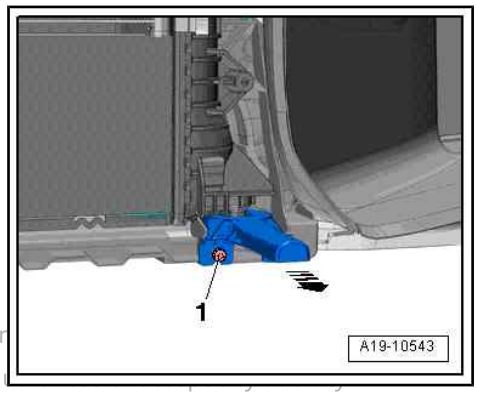
– Place drip tray for workshop hoist - VAS 6208- beneath engine.
– Remove drain plug -1- and drain off coolant.
– Lift retaining clip -2- and disconnect coolant hose from radiator.



– Release retaining pins for radiator on both sides and pull out upwards -arrows-.

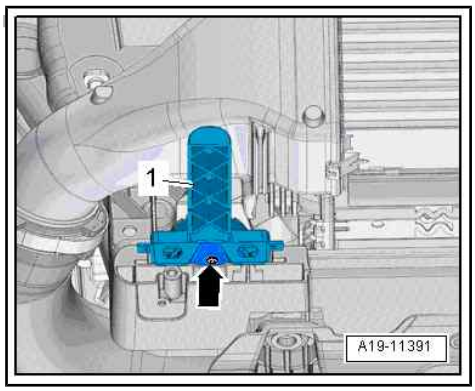


– Remove bolt -1- (right-side) and pull radiator bracket with radiator on right side slightly to front -arrow-.

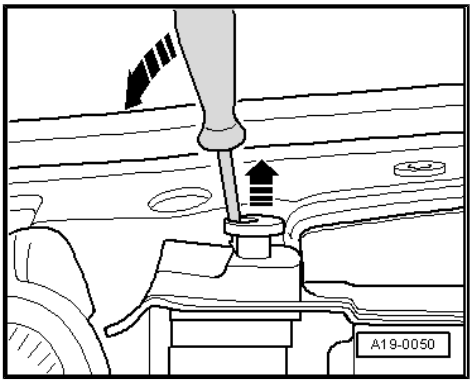


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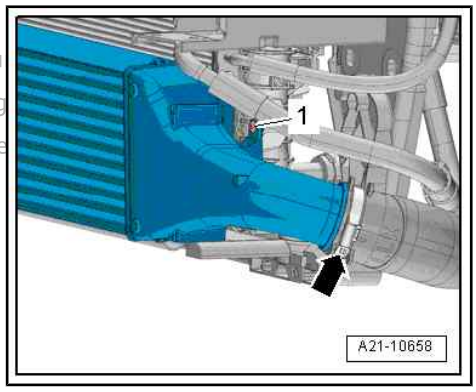
– Remove bolt -arrow- and detach radiator bracket -1-.



– Move radiator back into installation position and fit retaining pins (left and right) for radiator -arrows-.

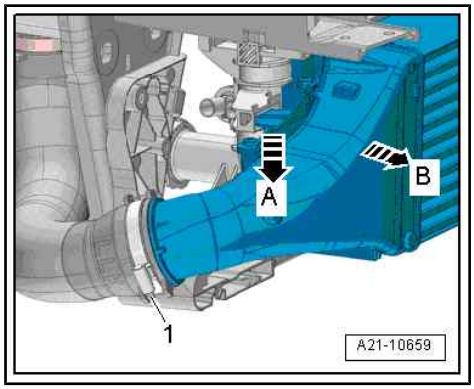


– Release hose clip -arrow- and detach air hose from charge air cooler.
– Remove bolt -1-.



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– 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-.
– Detach charge air cooler by pulling upwards.
– Remove charge air cooler, paying special attention to air ducts (left-side).



Installing

Installation is carried out in reverse order; note the following:

Note

If there are slight impressions on the fins, refer to ⇒ page 11 .

– Install radiator ⇒ "4.1 Exploded view - radiator/radiator fans", page 393 .
– Install lock carrier cover and closure plate at bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .

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Note

Do not reuse coolant.

– Fill up with coolant ⇒ page 366 .

Tightening torques

- ⇒ "2.1.2 Exploded view - charge air system, vehicles with two turbochargers", page 465
- ⇒ "2.2 Exploded view - hose connections for charge air system", page 466
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

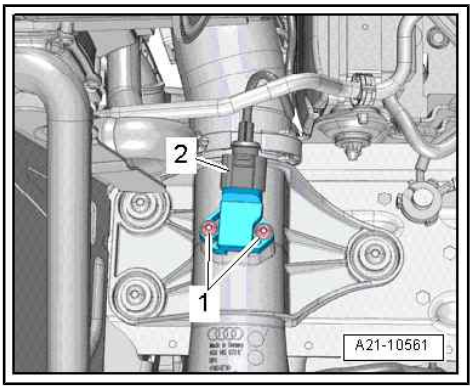
2.4 Removing and installing charge pressure sender - G31- / intake air temperature sender - G42-

Removing

– Remove front left wheel spoiler ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Removing and installing wheel housing liner (front) .

– Unplug electrical connector -2-.

– Remove bolts -1- and pull charge pressure sender - G31- / intake air temperature sender - G42- out of air pipe.



Installing

Installation is carried out in reverse order; note the following:

Note

Fit new O-ring.

Tightening torques

- ⇒ "2.1.1 Exploded view - charge air system, vehicles with one turbocharger", page 463
- Front wheel spoiler ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front)

2.5 Checking charge air system for leaks

⇒ "2.5.1 Checking charge air system for leaks, vehicles with one turbocharger", page 473

⇒ "2.5.2 Checking charge air system for leaks, vehicles with two turbochargers", page 476

2.5.1 Checking charge air system for leaks, vehicles with one turbocharger

Special tools and workshop equipment required

- Charge air system tester - V.A.G 1687- with adapters -V.A.G 1687/11- , -1687/16- and -1687/17- .



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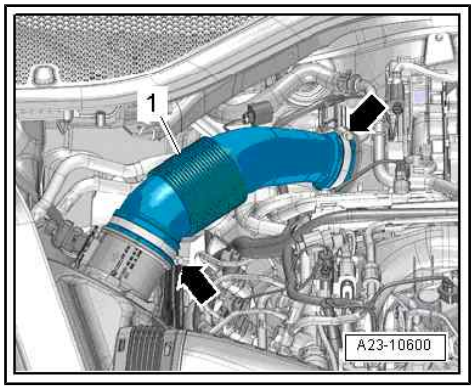
Procedure

Note

Observe rules for cleanliness ⇒ page 8 .

– Remove engine cover panel ⇒ page 172 .

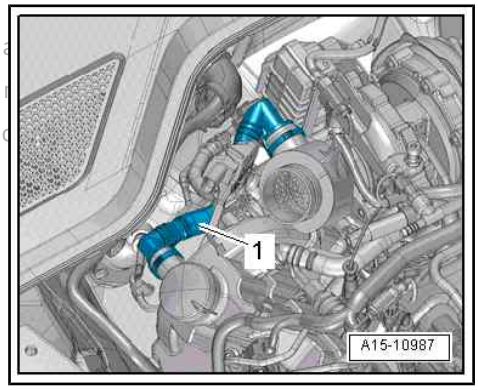
– Release hose clips -arrows- and detach air pipe -1-.



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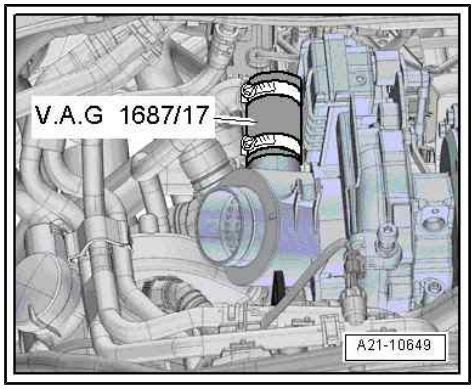
Caution

Depending on the vehicle version and country version, a crankcase breather hose may be fitted which cannot be detached from the cylinder head cover without being damaged irreparably. For these versions, the hose on the cylinder head cover will be damaged irreparably and must then be renewed.

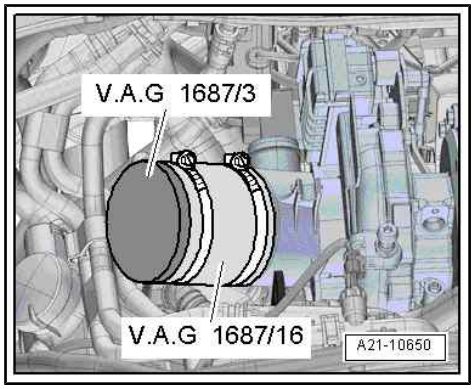


– Remove crankcase breather hose -arrow-; to do so, press release tabs (if present) or break hose connection at cylinder head cover as necessary.

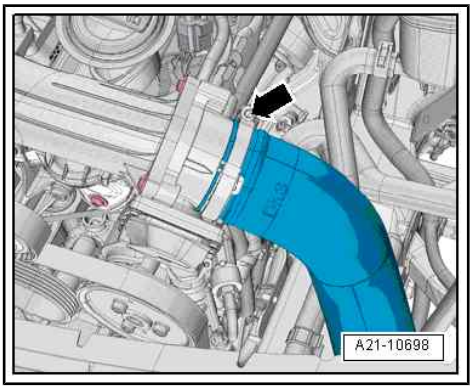
– Seal connection for crankcase breather on turbocharger with adapter -1687/17- .



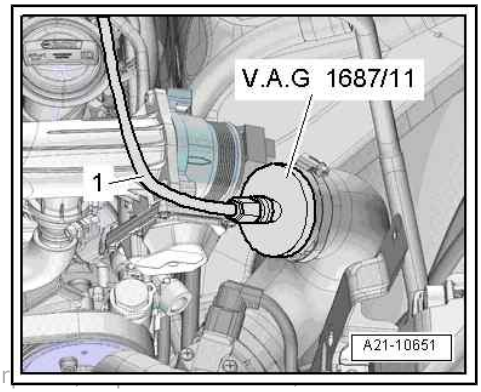
– Connect end seal -V.A.G 1687/3- to turbocharger with adapter -1687/16- .



– Release hose clip -arrow- and detach air hose.

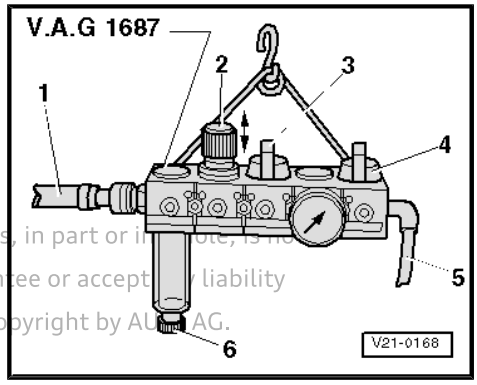


– Connect adapter - 1687/11- to air hose going to throttle valve module - J338- .
– Connect hose -1- of charge air system tester - V.A.G 1687- to adapter.



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Prepare charge air system tester - V.A.G 1687- as follows:



– Unscrew pressure control valve -2- completely and close valves -3- and -4-.

• Make sure knob is pulled out before turning pressure control valve -2-.

– Using a commercially available connection piece, connect charge air system tester - V.A.G 1687- to compressed air -1-.

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Note

If there is water in sight glass, remove drain plug -6- and drain water.

– Open valve -3-.

Caution

Risk of damage if pressure is set too high.

- ***The pressure must not exceed 0.5 bar.***

– Adjust pressure to 0.5 bar via pressure control valve -2-.

– Open valve -4- and wait until test system is pressurised. If necessary, adjust pressure to 0.5 bar again.

– Check charge air system for audible leaks or leaks that can be felt with the hand; apply commercially available leak detection spray or use ultrasonic tester - V.A.G 1842- .

Note

- *For operation of ultrasonic tester -V.A.G 1842- , refer to ⇒ Operating instructions .*
- *Release pressure in test circuit by detaching hose coupling from adapter before removing adapter.*

Attaching

Installation is carried out in the reverse order; note the following:

Note

Renew gasket and O-rings.

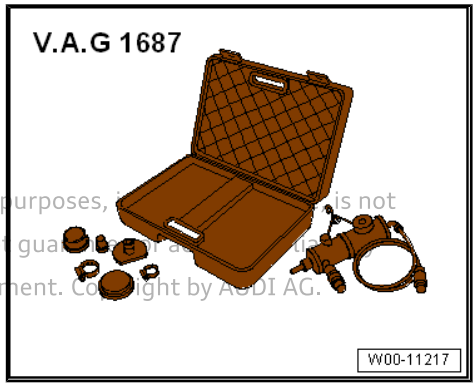
Tightening torques

- ⇒ “2.2 Exploded view - hose connections for charge air system”, page 466

2.5.2 Checking charge air system for leaks, vehicles with two turbochargers

Special tools and workshop equipment required

♦ Charge air system tester - V.A.G 1687- with adapters -V.A.G 1687/11- and -V.A.G 1687/18-



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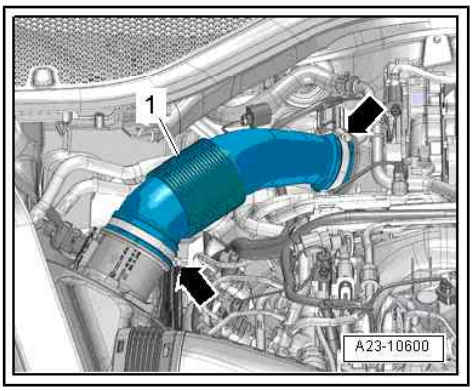
Procedure

Note

Observe rules for cleanliness ⇒ *page 8* .

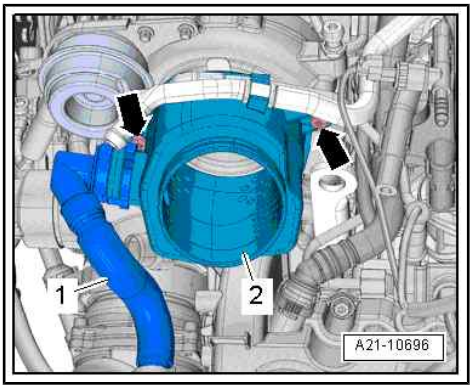
– Remove engine cover panel ⇒ page 172 .

– Release hose clips -arrows- and detach air pipe -1-.

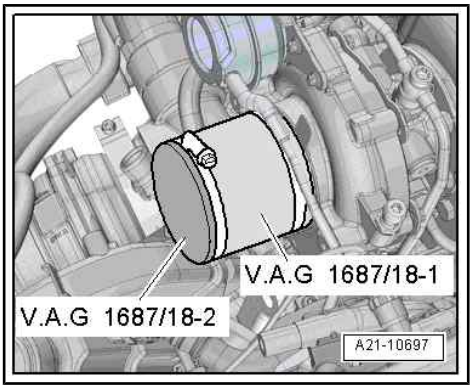


– Press release tabs and disconnect crankcase breather hose -1- from connection-2-.

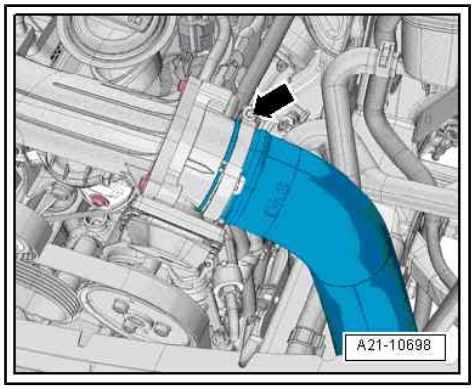
– Remove bolts -arrows- and detach connection from turbocharger.



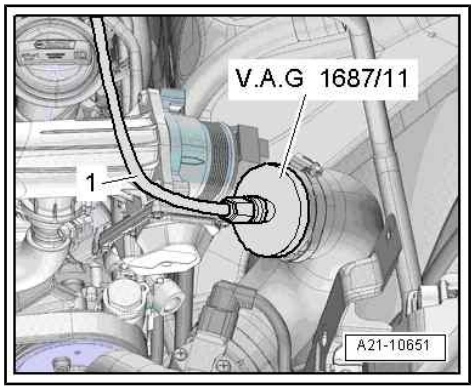
– Connect adapter -V.A.G 1687/18-1- with -V.A.G 1687/18-2- to turbocharger.



– Release hose clip -arrow- and detach air hose.



– Connect adapter - 1687/11- to air hose going to throttle valve module - J338- .
– Connect hose -1- of charge air system tester - V.A.G 1687- to adapter.



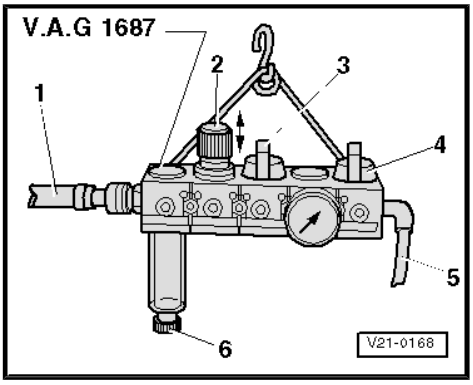
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Prepare charge air system tester - V.A.G 1687- as follows:

– Unscrew pressure control valve -2- completely and close valves -3- and -4-.

• Make sure knob is pulled out before turning pressure control valve -2-.

– Using a commercially available connection piece, connect charge air system tester - V.A.G 1687- to compressed air -1-.



Note

If there is water in sight glass, remove drain plug -6- and drain water.

– Open valve -3-.

Caution

Risk of damage if pressure is set too high.

- ***The pressure must not exceed 0.5 bar.***

– Adjust pressure to 0.5 bar via pressure control valve -2-.

– Open valve -4- and wait until test system is pressurised. If necessary, adjust pressure to 0.5 bar again.

– Check charge air system for audible leaks or leaks that can be felt with the hand; apply commercially available leak detection spray or use ultrasonic tester - V.A.G 1842- .

Note

- *A small amount of air escapes through the valves and enters the engine. Therefore it is not possible to perform a pressure retention test.*
- *For operation of ultrasonic tester -V.A.G 1842-, refer to ⇒ Operating instructions .*
- *Release pressure in test circuit by detaching hose coupling from adapter before removing adapter.*

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Attaching

Installation is carried out in the reverse order; note the following:

Note

Renew gasket and O-rings.

Tightening torques

- ⇒ “2.2 Exploded view - hose connections for charge air system”, page 466

23 – Mixture preparation - injection

1 Injection system

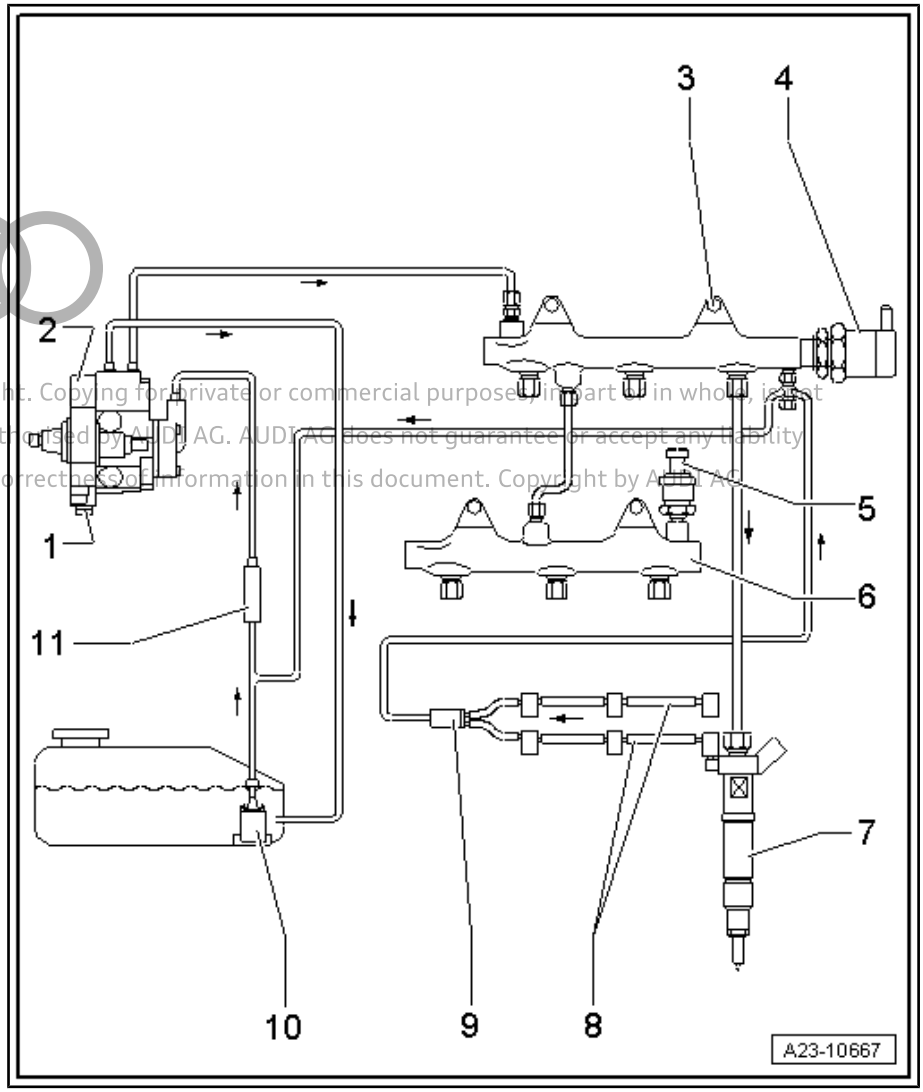
⇒ “1.1 Overview - fuel system”, page 480

⇒ “1.2 Overview of fitting locations - injection system”, page 482

⇒ “1.3 Filling and bleeding fuel system”, page 504

⇒ “1.4 Checking fuel system for leaks”, page 505

1.1 Overview - fuel system



1 - Fuel metering valve - N290-

- ❑ Do not unscrew

2 - High-pressure pump

- ❑ Exploded view ⇒ page 556

3 - Fuel rail

- ❑ For cylinder bank 1 (right-side)

4 - Fuel pressure regulating valve - N276-

- ❑ With deformable sealing lip
- ❑ Cannot be re-installed
- ❑ After renewing, perform adaption ⇒ Vehicle diagnostic tester using `Guided Functions`
- ❑ Removing and installing ⇒ page 547
- ❑ Tightening torque ⇒ Fig. “” Fuel pressure regulating valve -N276- - tightening torque”“ , page 481

5 - Fuel pressure sender - G247-

- ❑ With deformable sealing lip
- ❑ Cannot be re-installed
- ❑ Removing and installing ⇒ page 551
- ❑ Tightening torque ⇒ Fig. “” Fuel pressure sender -G247- - tightening torque”“ , page 481

6 - Fuel rail

- ❑ For cylinder bank 2 (left-side)

7 - Injector

- ❑ Removing and installing ⇒ page 533

8 - Fuel return hoses

- ❑ Do not dismantle

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❑ Renew together with restrictor

9 - Restrictor

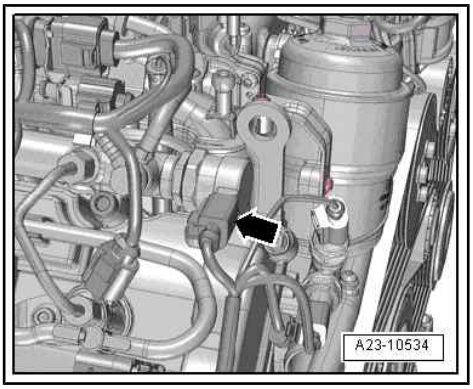
❑ Maintains a residual pressure in fuel return hoses

❑ Cannot be renewed separately; if defective, renew fuel return hoses

10 - Fuel system pressurisation pump - G6-

11 - Fuel filter

Fuel pressure regulating valve - N276- - tightening torque

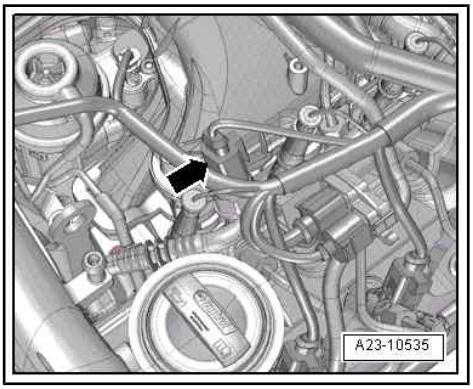


– Position fuel pressure regulating valve - N276- so that electrical wiring is not under tension when connector -arrow- is plugged in.

– Tighten union nut on regulating valve in 4 stages as follows (counterhold hexagon flats on housing):

Stage	Tightening torque
1.	Screw in by hand until contact is made
2.	60 Nm
3.	Turn back by 90°
4.	85 Nm

Fuel pressure sender - G247- - tightening torque



– Tighten fuel pressure sender - G247- in 4 stages as follows:

Note

An open-end spanner must not be used for loosening or tightening.

Special tools and workshop equipment required

♦ Socket - T40218-

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♦ Torque wrench

Stage	Tightening torque
1.	Screw in by hand until contact is made
2.	60 Nm
3.	Turn back by 180°
4.	85 Nm

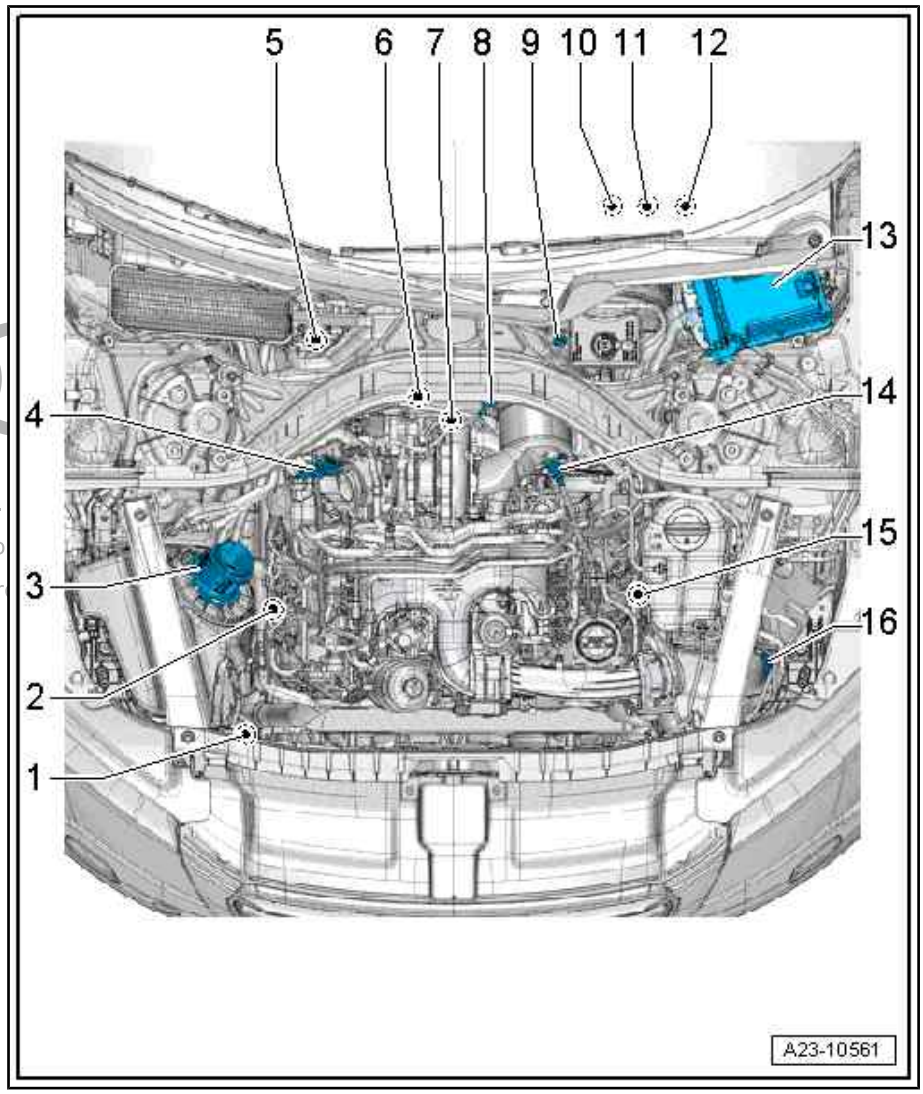
1.2 Overview of fitting locations - injection system

⇒ "1.2.1 Overview of fitting locations - injection system, vehicles with one turbocharger", page 482

⇒ "1.2.2 Overview of fitting locations - injection system, vehicles with two turbochargers", page 492

1.2.1 Overview of fitting locations - injection system, vehicles with one turbocharger

Engine compartment



1 - Radiator outlet coolant temperature sender - G83-

- ❑ Fitting location ⇒ page 489
- ❑ Exploded view ⇒ page 369

2 - Right electrohydraulic engine mounting solenoid valve - N145-

- ❑ Integrated in engine mounting (right-side)

3 - Air mass meter - G70-

- ❑ Exploded view ⇒ page 509

4 - Pressure differential sender - G505-

- ❑ Fitting location ⇒ page 488
- ❑ Exploded view ⇒ page 563

5 - Exhaust gas temperature sender 4 - G648-

- ❑ Exploded view ⇒ page 634

6 - Engine speed sender - G28-

- ❑ Exploded view ⇒ page 673

7 - Exhaust gas temperature sender 1 - G235-

- ❑ Exploded view ⇒ page 634

8 - Exhaust gas temperature sender 3 - G495-

- ❑ Exploded view ⇒ page 634

9 - Brake servo pressure sensor - G294-

10 - Accelerator position sender - G79- and accelerator position sender 2 - G185-

- ❑ Fitting location ⇒ page 487

11 - Instrument cluster with control unit in dash panel insert - J285-

- ❑ Removing and installing ⇒ Electrical system; Rep. gr. 90 ; Dash panel insert; Exploded view - dash panel insert

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12 - Brake light switch - F-

- ❑ Fitting location ⇒ page 487

13 - Engine control unit - J623-

- ❑ Fitting location ⇒ page 487
- ❑ Removing and installing ⇒ page 582

14 - Lambda probe - G39- with Lambda probe heater - Z19-

- ❑ Exploded view ⇒ page 563

15 - Left electrohydraulic engine mounting solenoid valve - N144-

- ❑ Integrated in engine mounting (left-side)

16 - Charge pressure sender - G31- / intake air temperature sender - G42-

- ❑ Fitting location ⇒ page 488

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Engine (top view)

1 - Fuel pressure regulating valve - N276-

- ❑ With deformable sealing lip
- ❑ Cannot be re-installed
- ❑ Removing and installing ⇒ page 551
- ❑ Tightening torque ⇒ Fig. "" Fuel pressure regulating valve -N276- - tightening torque"" , page 481

2 - Injector, cylinder 1 - N30-

- ❑ Exploded view ⇒ page 556

3 - Glow plug 1 - Q10-

- ❑ Exploded view ⇒ page 673

4 - Injector, cylinder 2 - N31-

- ❑ Exploded view ⇒ page 556

5 - Hall sender - G40-

- ❑ Fitting location ⇒ page 488
- ❑ Exploded view ⇒ page 673

6 - Glow plug 2 - Q11-

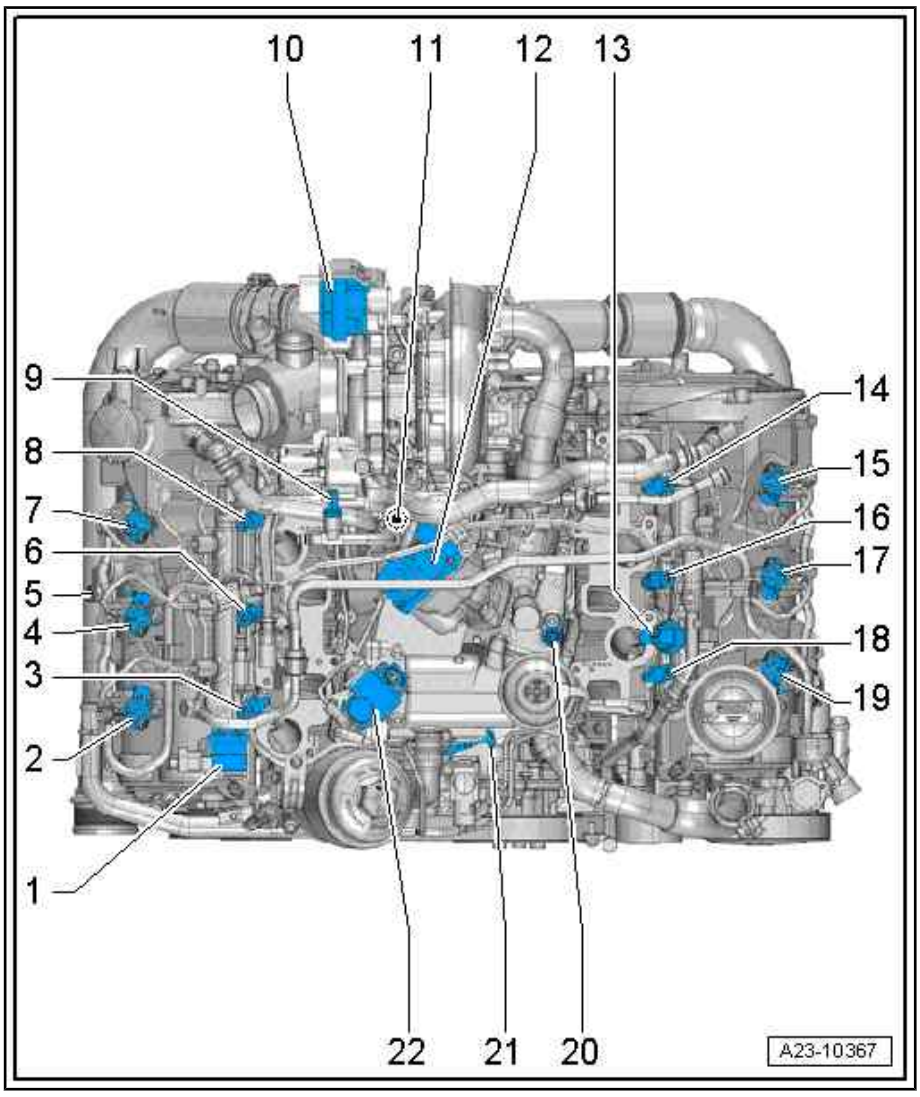
- ❑ Exploded view ⇒ page 673

7 - Injector, cylinder 3 - N32-

- ❑ Exploded view ⇒ page 556

8 - Glow plug 3 - Q12-

- ❑ Exploded view ⇒ page 673



9 - Fuel temperature sender - G81-

10 - Control unit for turbocharger 1 - J724-

- On turbocharger
- Exploded view ⇒ page 412

11 - Fuel metering valve - N290-

- Fitting location ⇒ page 488

12 - Exhaust gas recirculation control motor - V338-

- Exploded view ⇒ page 657

13 - Fuel pressure sender - G247-

- With deformable sealing lip
- Cannot be re-installed
- Removing and installing ⇒ page 551
- Tightening torque ⇒ Fig. “” Fuel pressure sender -G247- - tightening torque”“ , page 481

14 - Glow plug 6 - Q15-

- Exploded view ⇒ page 673

15 - Injector, cylinder 6 - N84-

- Exploded view ⇒ page 556

16 - Glow plug 5 - Q14-

- Exploded view ⇒ page 673

17 - Injector, cylinder 5 - N83-

- Exploded view ⇒ page 556

18 - Glow plug 4 - Q13-

- Exploded view ⇒ page 673

19 - Injector, cylinder 4 - N33-

- Exploded view ⇒ page 556

20 - Coolant temperature sender - G62-

- Exploded view ⇒ page 369

21 - Exhaust gas recirculation temperature sensor - G98-

- Exploded view ⇒ page 657

22 - Coolant valve for cylinder head - N489-

Engine (front view)

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1 - Oil level and oil temperature sender - G266-

- ❑ Exploded view
  ⇒ page 318

2 - Map-controlled engine cooling system thermostat - F265-

- ❑ Integrated in oil filter housing; cannot be renewed individually

3 - Oil temperature sender 2 - G664-

- ❑ Fitting location
  ⇒ page 489
- ❑ Exploded view
  ⇒ page 176

4 - Oil pressure switch - F22-

- ❑ Exploded view
  ⇒ page 335

5 - Oil pressure switch for reduced oil pressure - F378-

- ❑ Exploded view
  ⇒ page 335

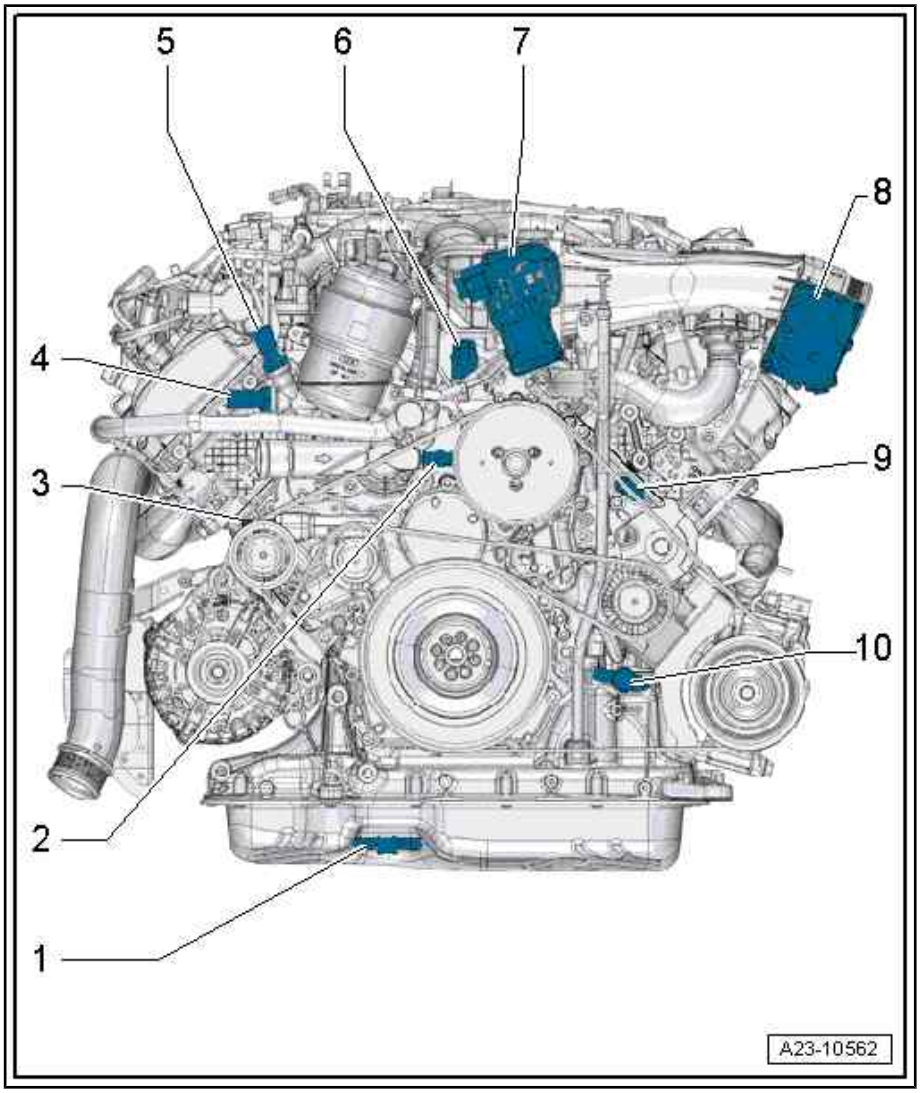
6 - Exhaust gas recirculation cooler change-over valve - N345-

7 - Intake manifold flap motor - V157-

- ❑ Exploded view
  ⇒ page 512

8 - Throttle valve module - J338-

- ❑ Exploded view



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⇒ page 512

9 - Temperature sender for engine temperature regulation - G694-

- ❑ Fitting location ⇒ page 489

10 - Valve for oil pressure control - N428-

- ❑ Fitting location ⇒ page 489
- ❑ Exploded view ⇒ page 318

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A - Fuel pump control unit - J538-

- ❑ Fitting location ⇒ page 487

B - Injector for reducing agent - N474-

- ❑ Only fitted on vehicles with SCR system
- ❑ Fitting location ⇒ page 490
- ❑ Exploded view ⇒ page 621

C - NOx sender 2 - G687- with control unit for NOx sender 2 - J881-

- ❑ Only fitted on vehicles with SCR system
- ❑ Fitting location for engine code CKVB ⇒ page 490
- ❑ Fitting location for engine code CPNB ⇒ page 491
- ❑ Exploded view ⇒ page 564

D - NOx sender - G295- with control unit for NOx sender - J583-

- ❑ Only fitted on vehicles with SCR system
- ❑ Fitting location ⇒ page 491
- ❑ Exploded view ⇒ page 564

E - Control unit for reducing agent metering system - J880-

- ❑ Only fitted on vehicles with SCR system
- ❑ Fitting location ⇒ page 490

F - Exhaust gas temperature sender 4 - G648-

- ❑ Only fitted on vehicles with SCR system
- ❑ Fitting location ⇒ page 491
- ❑ Exploded view ⇒ page 636

G - Exhaust gas temperature sender 2 - G448-

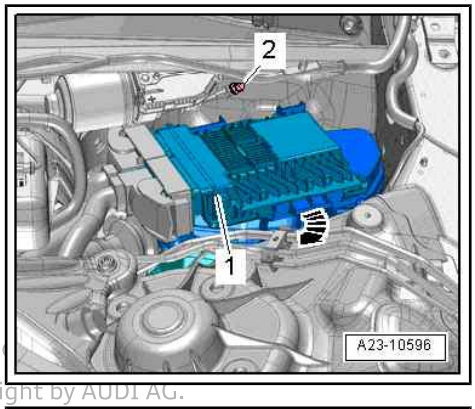
- ❑ Fitted on vehicles with SCR system (depending on version)
- ❑ Fitting location ⇒ page 491
- ❑ Exploded view ⇒ page 636

H - Particulate sensor - G784-

- ❑ Only fitted on vehicles with SCR system
- ❑ Fitting location ⇒ page 491
- ❑ Exploded view ⇒ page 636

Fitting location of engine control unit - J623-

- -Item 1- in plenum chamber (left-side)



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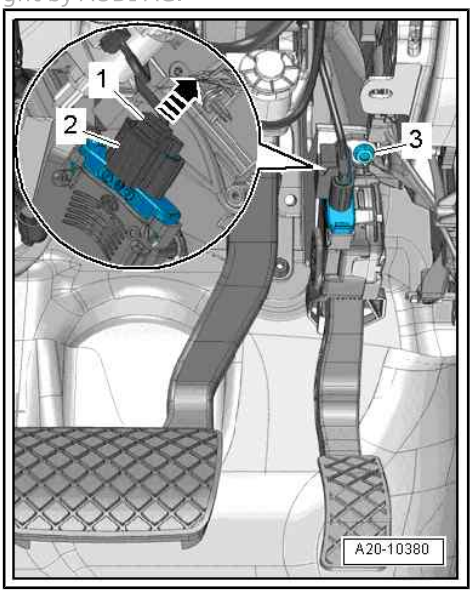
Fitting location of accelerator position sender - G79- / accelerator position sender 2 - G185-

- In accelerator pedal module

Note

The accelerator position sender - G79- and accelerator position sender 2 - G185- are integrated in the accelerator pedal module and cannot be renewed individually.

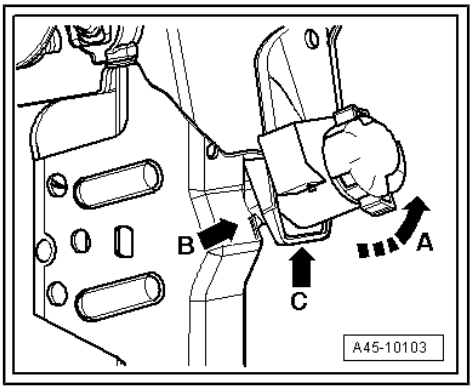
Removing and installing ⇒ Fuel supply system, diesel engines; Rep. gr. 20 ; Accelerator mechanism; Removing and installing accelerator pedal module with accelerator position sender -G79- / -G185- .



Fitting location of brake light switch - F-

- In footwell on brake pedal

Removing and installing ⇒ Brake system; Rep. gr. 45 ; Sensors; Removing and installing brake light switch



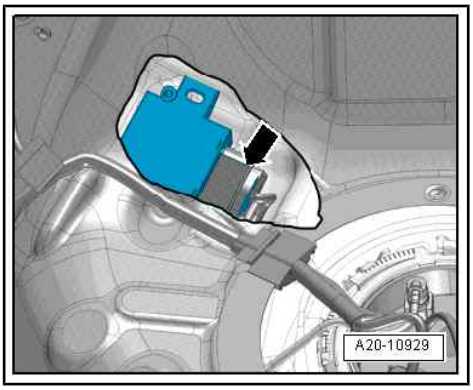
Fitting location of fuel pump control unit - J538-

- Fuel pump control unit - J538- -arrow- is located between floor panel and fuel tank level with rear seat bench (right-side).

Note

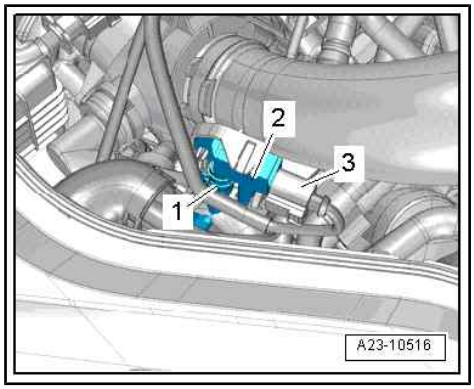
For illustration purposes, the floor panel is cut open in the illustration.

Removing and installing ⇒ Fuel supply system - diesel engines; Rep. gr. 20 ; Fuel pump; Removing and installing fuel pump control unit - J538-



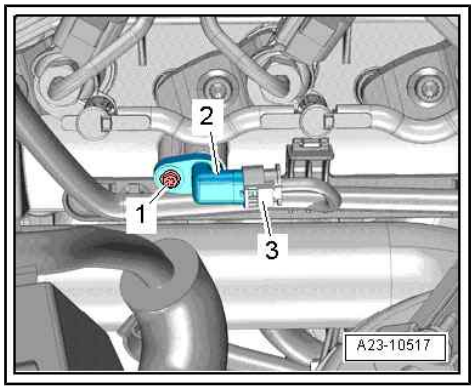
Fitting location of pressure differential sender - G505-

- -Item 2- at rear right of engine



Fitting location of Hall sender - G40-

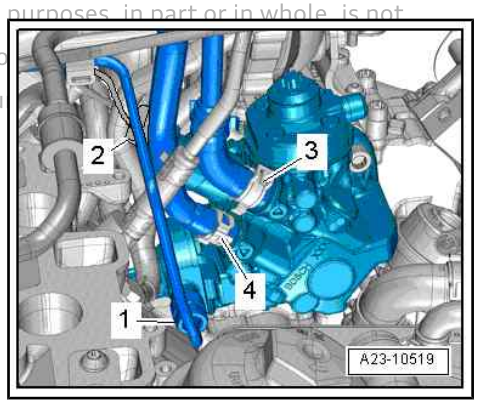
- -Item 2- on cylinder head cover, cylinder bank 1 (right-side)



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Fitting location of fuel metering valve - N290-

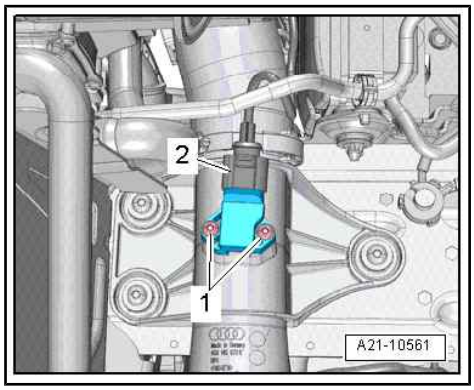
- -Item 2- in high-pressure pump



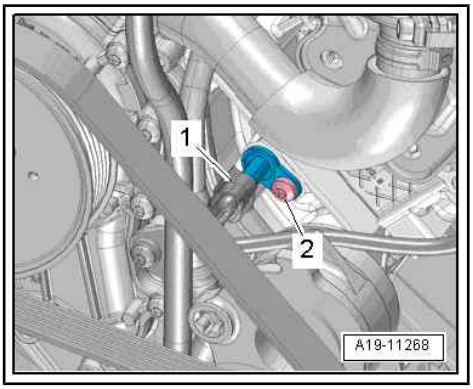
Fitting location of charge pressure sender - G31- / intake air temperature sender - G42-

- -Item 2- at air pipe (left-side) in engine compartment

Removing and installing ⇒ page 472



Fitting location of temperature sender for engine temperature regulation - G694-

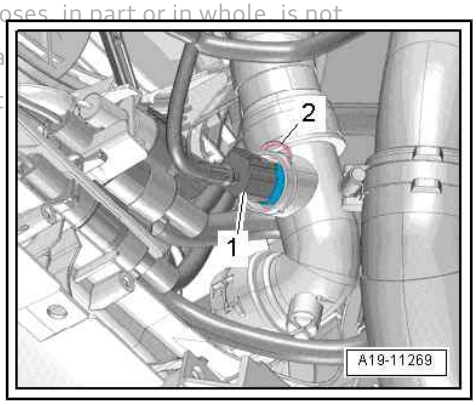


- -Item 1- at front left of cylinder block

Removing and installing ⇒ page 373

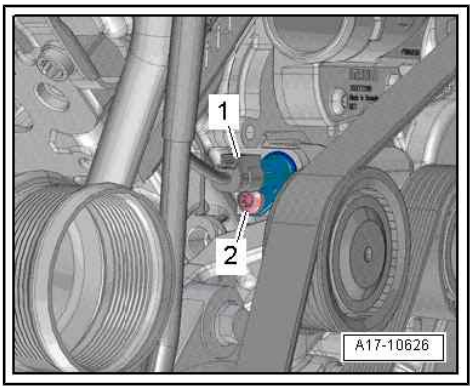
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Fitting location of radiator outlet coolant temperature sender - G83-

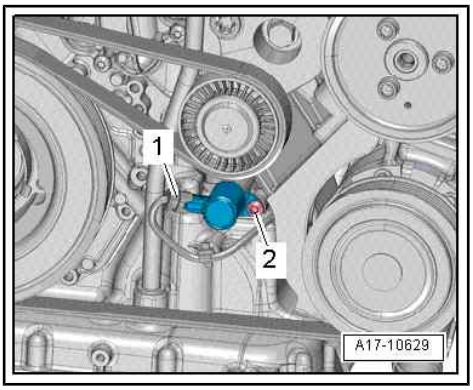


Removing and installing ⇒ page 372

Oil temperature sender 2 - G664-



Valve for oil pressure control - N428-

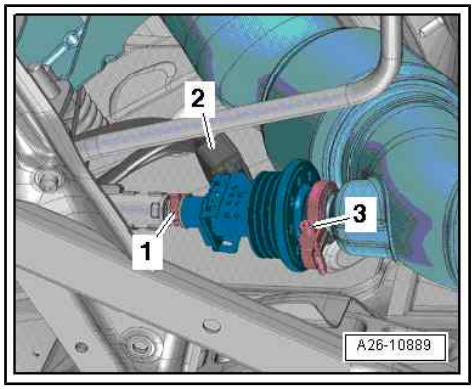


Injector for reducing agent - N474- for vehicles with SCR system

Injector for reducing agent - N474- - not water-cooled

2 - Electrical connector for injector for reducing agent - N474-

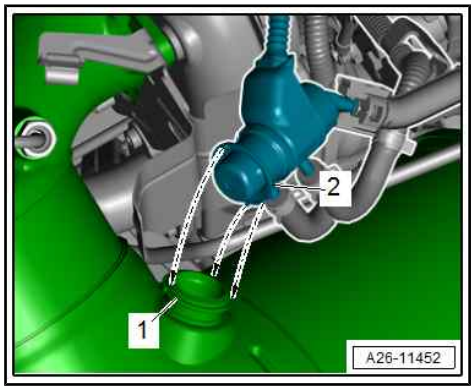
Removing and installing ⇒ page 630



Injector for reducing agent - N474- - water-cooled

2 - Injector for reducing agent - N474-

Removing and installing ⇒ page 630



Components at bottom of tank (engine code CKVB only)

1 - Control unit for reducing agent metering system - J880-

2 - Reservoir

3 - Control unit for NOx sender 2 - J881- and NOx sender 2 - G687-

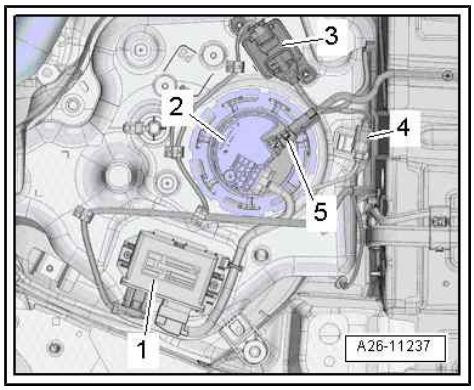
4 - Electrical connector for heater for reducing agent line - Z104-

5 - Reducing agent line

The following components are located in the reservoir -item 2-:

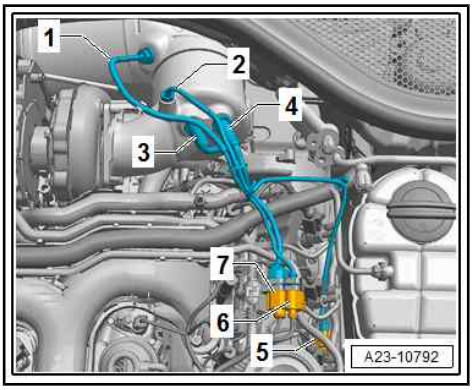
- Tank sender for reducing agent - G684-
- Temperature sender for reducing agent - G685-
- Pressure sender for reducing agent metering system - G686-
- Pump for reducing agent - V437-
- Heater for reducing agent tank - Z102-

Exploded view ⇒ page 620 .



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Fitting locations of exhaust gas temperature sensors (engine code CPNB only)



1 - Exhaust gas temperature sender 3 - G495-

2 - Exhaust gas temperature sender 2 - G448-

3 - NOx sender - G295-

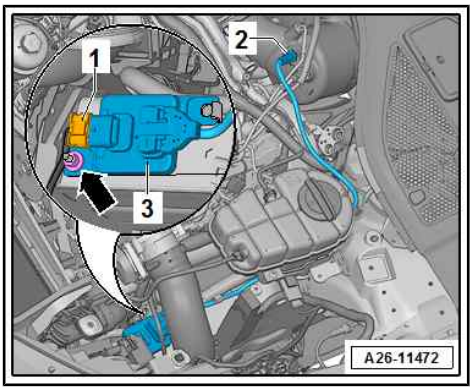
4 - Lambda probe - G39-

5 - Electrical connector for exhaust gas temperature sender 2 - G448-

6 - Electrical connector for exhaust gas temperature sender 3 - G495-

7 - Electrical connector for Lambda probe - G39-

Control unit for NOx sender - J583- with NOx sender - G295- (engine code CPNB only)

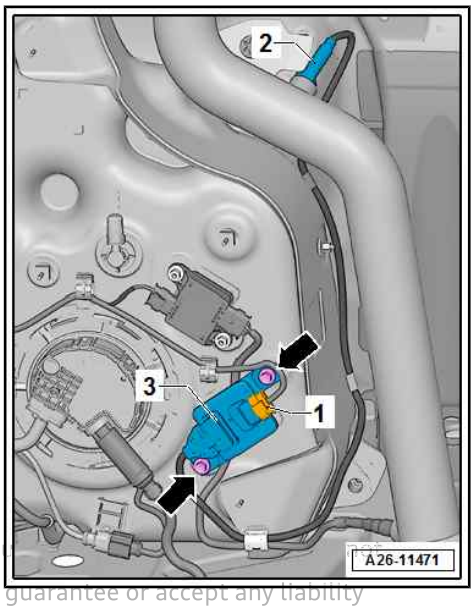


1 - Electrical connector for control unit for NOx sender - J583-

2 - NOx sender - G295-

3 - Control unit for NOx sender - J583-

Control unit for NOx sender 2 - J881- and NOx sender 2 - G687- (engine code CPNB only)



1 - Electrical connector for control unit for NOx sender 2 - J881-

2 - NOx sender 2 - G687-

3 - Control unit for NOx sender 2 - J881-

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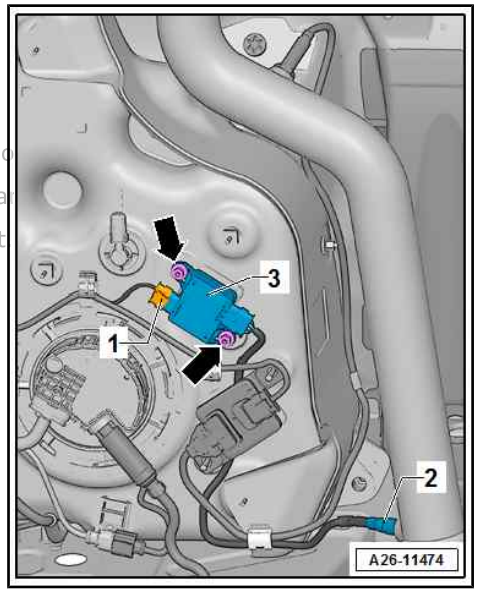
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Particulate sensor - G784- (engine code CPNB only)

1 - Electrical connector for particulate sensor - G784-

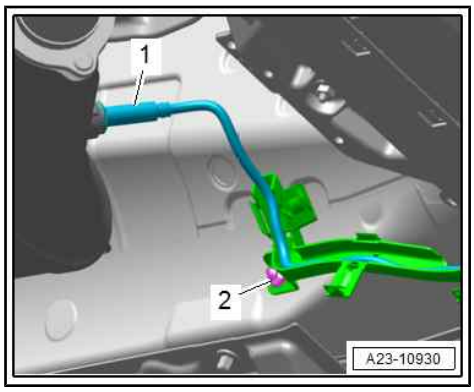
2 - Particulate sensor - G784-

3 - Control unit for particulate sensor - G784-



Fitting location of NOx sender 2 - G687- (engine codes CTCB and CTCC only)

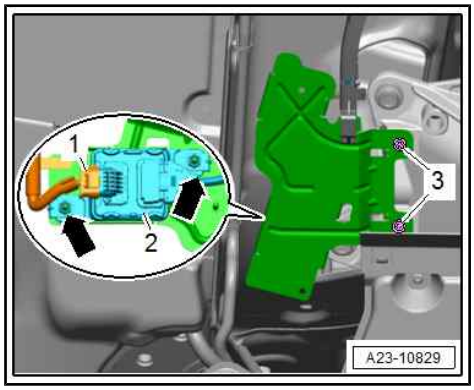
1 - NOx sender 2 - G687-



Fitting location of control unit for NOx sender 2 - J881- (engine codes CTCB and CTCC only)

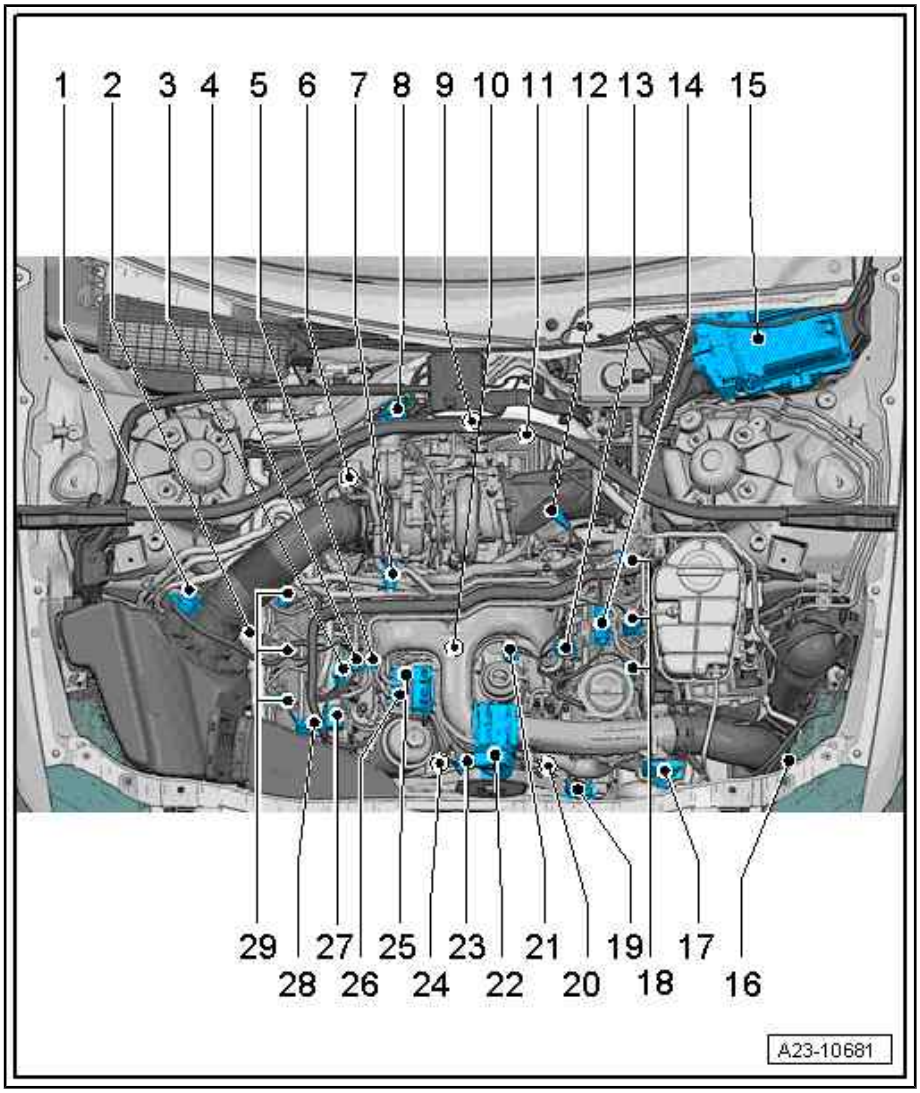
1 - Electrical connector for control unit for NOx sender 2 - J881-

2 - Control unit for NOx sender 2 - J881-



1.2.2 Overview of fitting locations - injection system, vehicles with two turbo-chargers

Engine compartment



1 - Air mass meter - G70-

- ❑ Removing and installing ⇒ page 552

2 - Hall sender - G40-

- ❑ Fitting location ⇒ page 499
- ❑ Exploded view ⇒ page 673

3 - Electrical connector for exhaust gas recirculation temperature sensor - G98-

- ❑ Fitting location ⇒ page 499

4 - Electrical connector

- ❑ For map-controlled engine cooling system thermostat - F265- , fuel metering valve - N290- and exhaust gas recirculation control motor - V338-
- ❑ Fitting location ⇒ page 499

5 - Restrictor

- ❑ In fuel return line
- ❑ Fitting location ⇒ page 499

6 - Pressure differential sender - G505-

- ❑ Fitting location ⇒ page 501

7 - Fuel temperature sender - G81-

8 - Control unit for structure-borne sound - J869-

9 - Control unit for turbocharger 1 - J724-

- ❑ Exhaust gas temperature sender 1 - G235-
- ❑ Charge pressure sender 2 - G447-
- ❑ Fitting location ⇒ page 502
- ❑ Exploded view ⇒ page 414

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10 - Exhaust gas recirculation control motor - V338-

- ❑ Exploded view ⇒ page 657

11 - Regulating flap potentiometer - G584-

- ❑ Fitting location ⇒ page 500

12 - Lambda probe - G39- with Lambda probe heater - Z19-

- ❑ Fitting location ⇒ page 501
- ❑ Exploded view ⇒ page 563

13 - Fuel pressure sender - G247-

- ❑ With deformable sealing lip
- ❑ Cannot be re-installed
- ❑ Removing and installing ⇒ page 551
- ❑ Tightening torque ⇒ Fig. "" Fuel pressure sender -G247- - tightening torque"" , page 481

14 - Electrical connector for Lambda probe - G39-

15 - Engine control unit - J623-

- ❑ Fitting location ⇒ page 487
- ❑ Removing and installing ⇒ page 582

16 - Charge pressure sender - G31- / intake air temperature sender - G42-

- ❑ Fitting location ⇒ page 499

17 - Throttle valve module - J338-

- ❑ Exploded view ⇒ page 512

18 - Injectors

- ❑ Cylinder bank 2
- ❑ Removing and installing ⇒ page 533

19 - Turbine changeover valve - N529-

20 - Temperature sender for engine temperature regulation - G694-

- ❑ Fitting location ⇒ page 500

21 - Exhaust gas recirculation temperature sensor - G98-

- ❑ Exploded view ⇒ page 657

22 - Intake manifold flap motor - V157-

- ❑ Exploded view ⇒ page 512

23 - Exhaust gas recirculation cooler change-over valve - N345-

24 - Map-controlled engine cooling system thermostat - F265-

- ❑ Fitting location ⇒ page 499
- ❑ Integrated in oil filter housing; cannot be renewed individually

25 - Coolant valve for cylinder head - N489-

26 - Charge pressure control solenoid valve - N75-

27 - Oil pressure switch for reduced oil pressure - F378-

- ❑ Exploded view ⇒ page 335

28 - Fuel pressure regulating valve - N276-

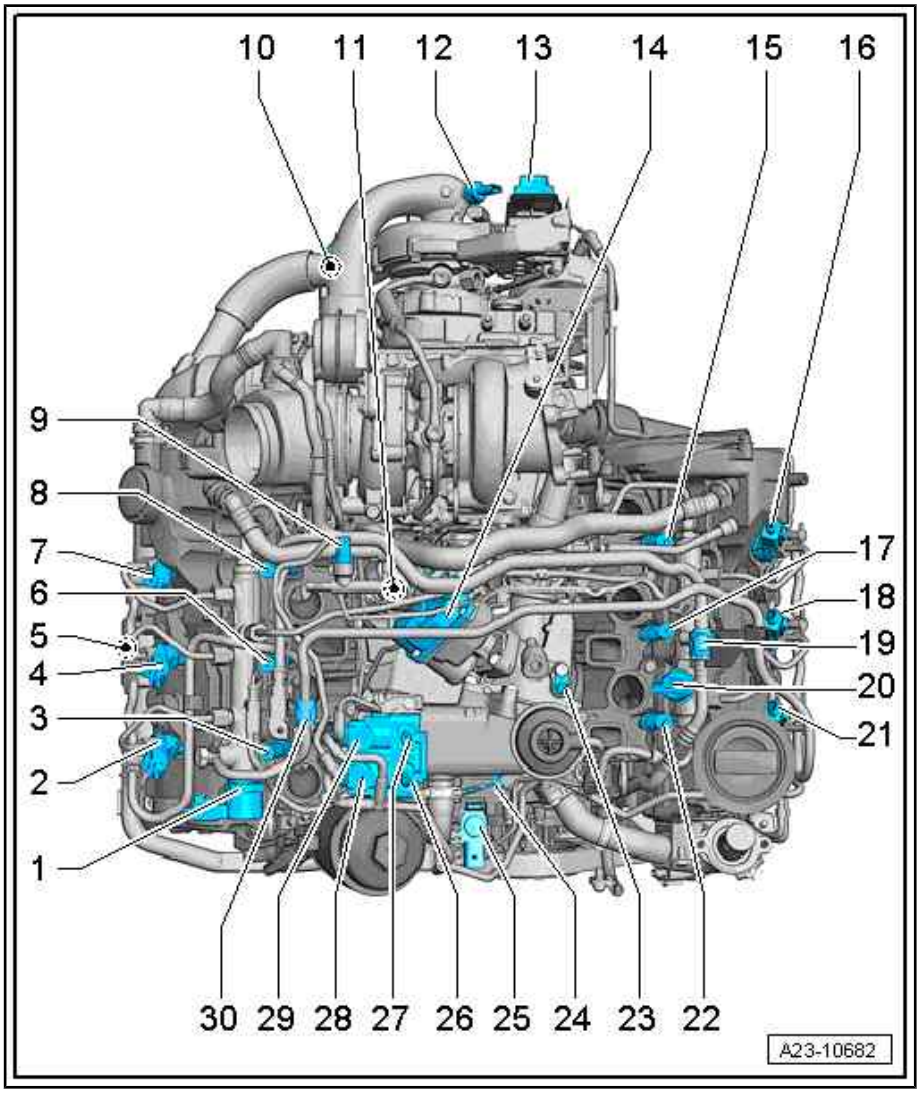
- ❑ With deformable sealing lip
- ❑ Cannot be re-installed
- ❑ Removing and installing
  ⇒ “6.3 Removing and installing fuel pressure regulating valve N276 ”, page 547
- ❑ Tightening torque ⇒ Fig. “” Fuel pressure regulating valve -N276- - tightening torque”“ , page 481

29 - Injectors

- ❑ Cylinder bank 1
- ❑ Removing and installing ⇒ page 533

Engine (top view)

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1 - Fuel pressure regulating valve - N276-

- ❑ With deformable sealing lip
- ❑ Cannot be re-installed
- ❑ Removing and installing ⇒ page 551
- ❑ Tightening torque ⇒ Fig. "" Fuel pressure regulating valve -N276- - tightening torque"" , page 481

2 - Injector, cylinder 1 - N30-

- ❑ Exploded view ⇒ page 556

3 - Glow plug 1 - Q10-

- ❑ Exploded view ⇒ page 673

4 - Injector, cylinder 2 - N31-

- ❑ Exploded view ⇒ page 556

5 - Hall sender - G40-

- ❑ Fitting location ⇒ page 499
- ❑ Exploded view ⇒ page 673

6 - Glow plug 2 - Q11-

- ❑ Exploded view ⇒ page 673

7 - Injector, cylinder 3 - N32-

- ❑ Exploded view ⇒ page 556

8 - Glow plug 3 - Q12-

- ❑ Exploded view ⇒ page 673

9 - Fuel temperature sender - G81-

10 - Exhaust gas temperature sender 1 - G235-

- ❑ Fitting location ⇒ page 502
- ❑ Exploded view ⇒ page 639

11 - Fuel metering valve - N290-

- ❑ Fitting location ⇒ page 499

12 - Charge pressure sender 2 - G447-

- ❑ Fitting location ⇒ page 502

13 - Control unit for turbocharger 1 - J724-

- ❑ On turbocharger
- ❑ Exploded view ⇒ page 414

14 - Exhaust gas recirculation control motor - V338-

- ❑ Exploded view ⇒ page 657

15 - Glow plug 6 - Q15-

- ❑ Exploded view ⇒ page 673

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16 - Injector, cylinder 6 - N84-

- ❑ Exploded view ⇒ page 556

17 - Glow plug 5 - Q14-

- ❑ Exploded view ⇒ page 673

18 - Injector, cylinder 5 - N83-

- ❑ Exploded view ⇒ page 556

19 - Electrical connector for Lambda probe - G39-

20 - Fuel pressure sender - G247-

- ❑ With deformable sealing lip
- ❑ Cannot be re-installed
- ❑ Removing and installing ⇒ page 551
- ❑ Tightening torque ⇒ Fig. “ Fuel pressure sender -G247- - tightening torque” , page 481

21 - Injector, cylinder 4 - N33-

- ❑ Exploded view ⇒ page 556

22 - Glow plug 4 - Q13-

- ❑ Exploded view ⇒ page 673

23 - Coolant temperature sender - G62-

- ❑ Exploded view ⇒ page 369

24 - Exhaust gas recirculation temperature sensor - G98-

- ❑ Exploded view ⇒ page 657

25 - Exhaust gas recirculation cooler change-over valve - N345-

26 - Electrical connector for charge pressure control solenoid valve - N75-

27 - Electrical connector coolant valve for cylinder head - N489-

28 - Charge pressure control solenoid valve - N75-

29 - Coolant valve for cylinder head - N489-

30 - Restrictor in fuel return line

- ❑ Checking ⇒ page 532

Engine (front view)

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1 - Oil level and oil temperature sender - G266-

- ❑ Exploded view
  ⇒ page 318

2 - Map-controlled engine cooling system thermostat - F265-

- ❑ Integrated in oil filter housing; cannot be renewed individually

3 - Oil temperature sender 2 - G664-

- ❑ Fitting location
  ⇒ page 500
- ❑ Exploded view
  ⇒ page 176

4 - Oil pressure switch - F22-

- ❑ Exploded view
  ⇒ page 335

5 - Oil pressure switch for reduced oil pressure - F378-

- ❑ Exploded view
  ⇒ page 335

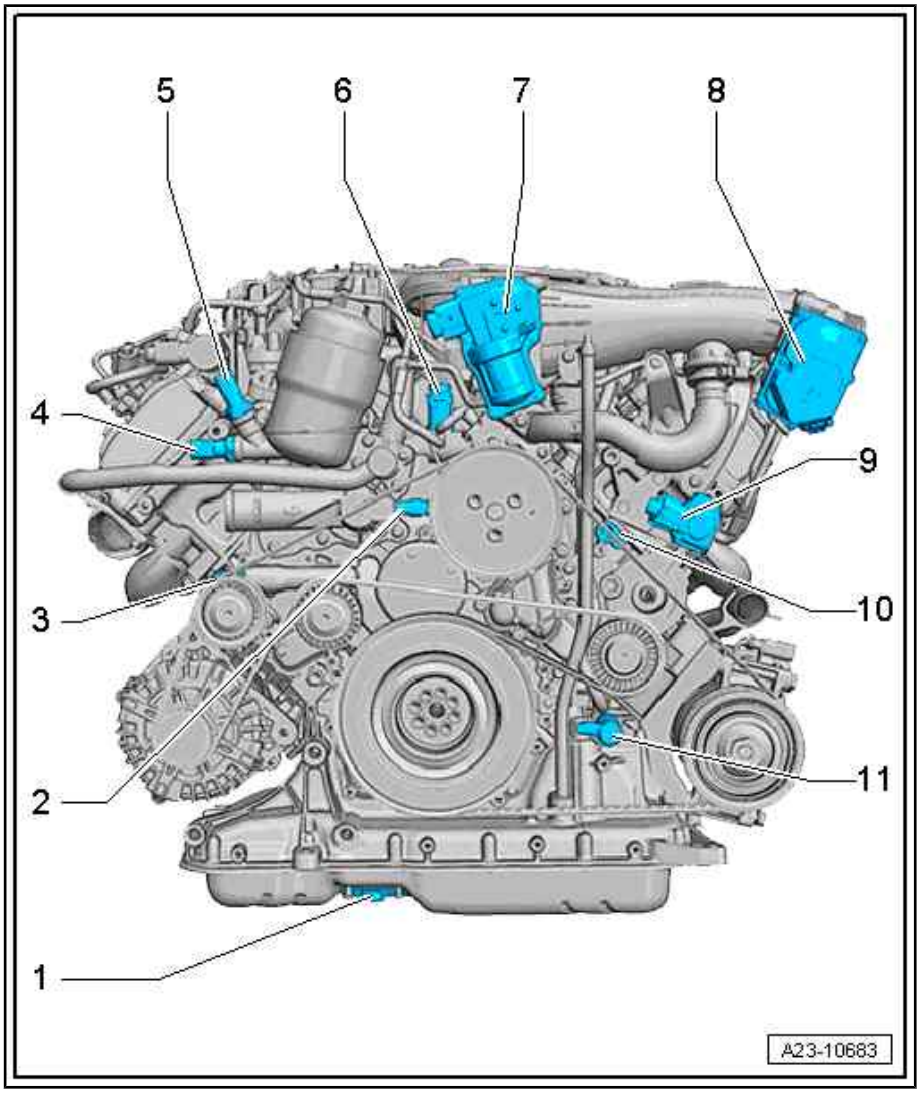
6 - Exhaust gas recirculation cooler change-over valve - N345-

7 - Intake manifold flap motor - V157-

- ❑ Exploded view
  ⇒ page 512

8 - Throttle valve module - J338-

- ❑ Exploded view



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⇒ page 512

9 - Turbine changeover valve - N529-

10 - Temperature sender for engine temperature regulation - G694-

- ❑ Fitting location ⇒ page 500

11 - Valve for oil pressure control - N428-

- ❑ Fitting location ⇒ page 501
- ❑ Exploded view ⇒ page 318

A - Fuel pump control unit - J538-

- ❑ Fitting location ⇒ page 487

B - Injector for reducing agent - N474-

- ❑ Only fitted on vehicles with SCR system
- ❑ Fitting location ⇒ page 490
- ❑ Exploded view ⇒ page 621

C - NOx sender - G295- with control unit for NOx sender - J583-

- ❑ Only fitted on vehicles with SCR system
- ❑ Fitting location of NOx sender - G295- ⇒ page 502
- ❑ Fitting location of control unit for NOx sender - J583- ⇒ page 503
- ❑ Exploded view ⇒ page 564

D - NOx sender 2 - G687- with control unit for NOx sender 2 - J881-

- ❑ Only fitted on vehicles with SCR system
- ❑ Fitting location ⇒ page 503
- ❑ Exploded view ⇒ page 564

E - Control unit for reducing agent metering system - J880-

- ❑ Only fitted on vehicles with SCR system
- ❑ Fitting location ⇒ page 490

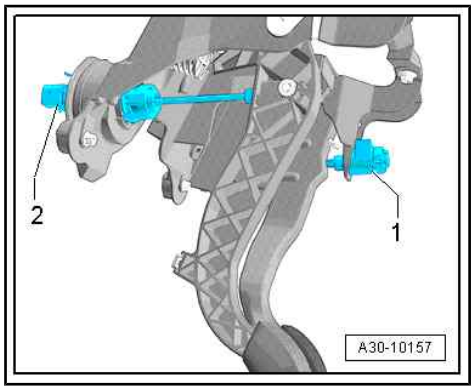
Fitting locations (driver's side)

1 - Brake light switch - F-

2 - Clutch position sender - G476- with clutch pedal switch for engine start - F194- and clutch pedal switch - F36- (manual gearbox only)

Removing and installing ⇒ Brake system; Rep. gr. 45 ; Sensors; Removing and installing brake light switch

Removing and installing ⇒ Rep. gr. 30 ; Clutch mechanism; Removing and installing clutch position sender - G476-

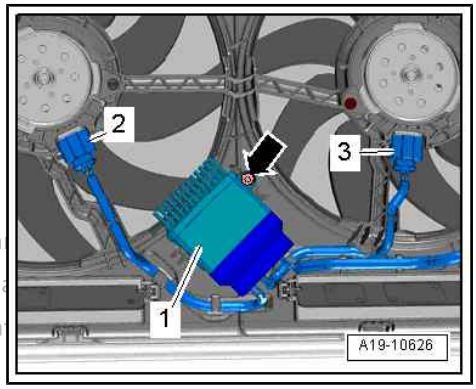


Radiator fan control unit - J293-

1 - Radiator fan control unit - J293-

2 - Electrical connector for radiator fan - V7-

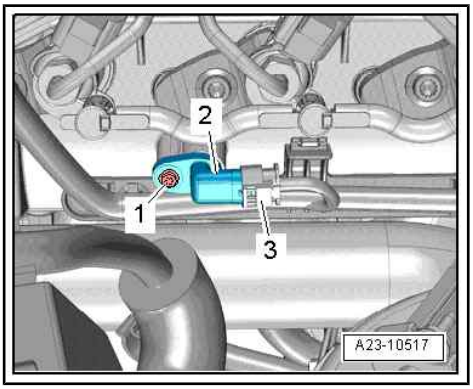
3 - Electrical connector for radiator fan 2 - V177-



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Fitting location of Hall sender - G40-

- -Item 2- on cylinder head cover, cylinder bank 1 (right-side)



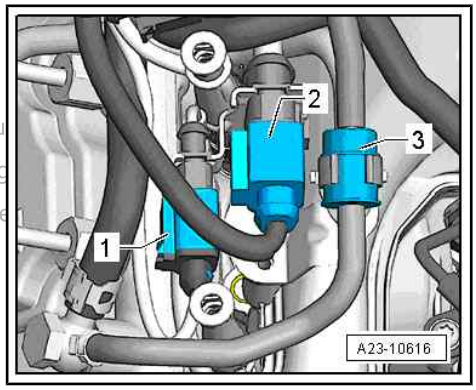
Electrical connectors

1 - For exhaust gas recirculation temperature sensor - G98-

2 - For map-controlled engine cooling system thermostat - F265- , fuel metering valve - N290- and exhaust gas recirculation control motor - V338-

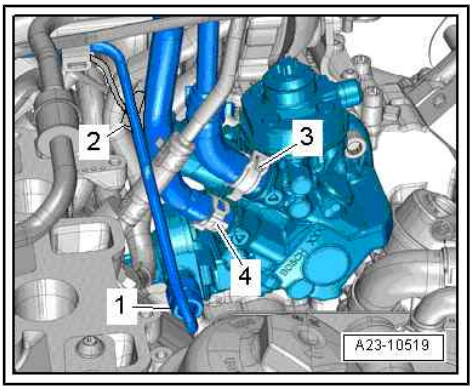
3 - Restrictor in fuel return line

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Fitting location of fuel metering valve - N290-

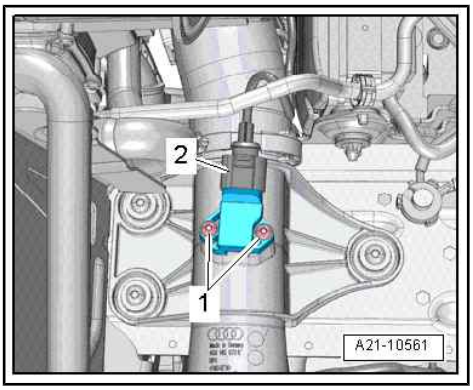
- -Item 2- in high-pressure pump



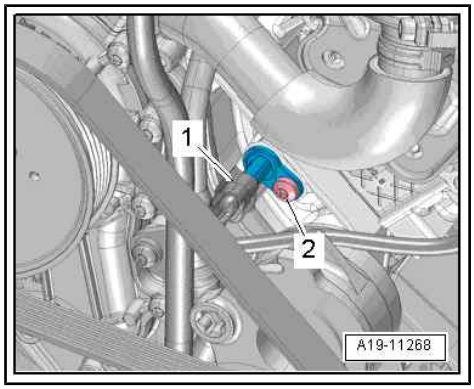
Fitting location of charge pressure sender - G31- / intake air temperature sender - G42-

- -Item 2- at air pipe (left-side) in engine compartment

Removing and installing ⇒ page 472



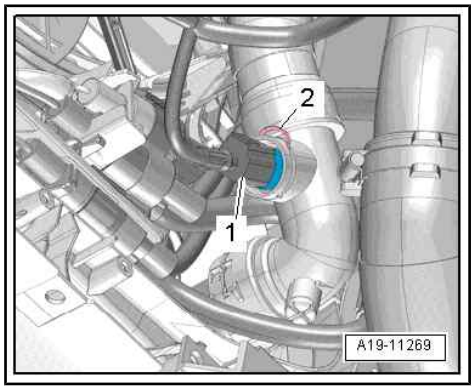
Fitting location of temperature sender for engine temperature regulation - G694-



- -Item 1- at front left of cylinder block

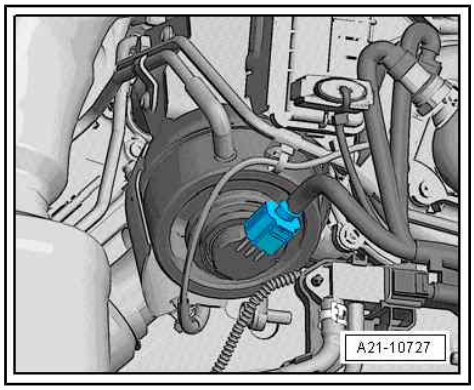
Removing and installing ⇒ page 373

Fitting location of radiator outlet coolant temperature sender - G83-

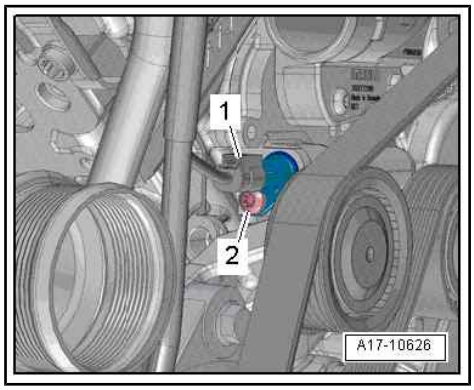


Removing and installing ⇒ page 372

Regulating flap potentiometer - G584-

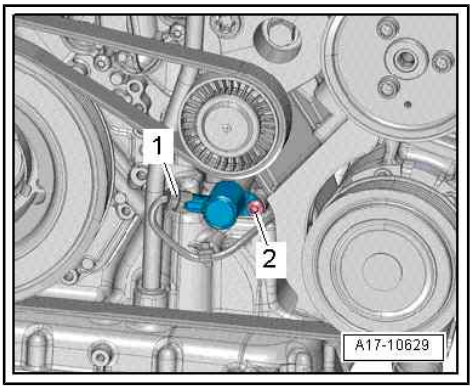


Oil temperature sender 2 - G664-

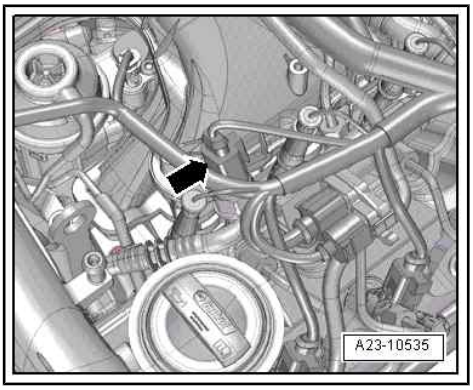


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Valve for oil pressure control - N428-



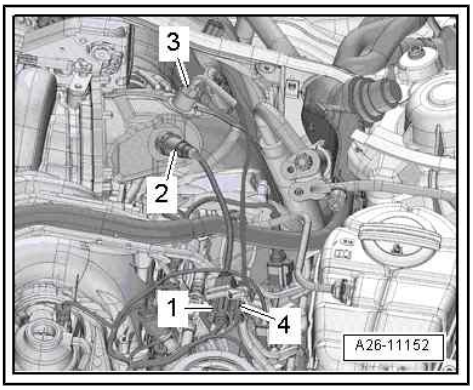
Fuel pressure sender - G247- -arrow-



Lambda probe - G39-

2 - Lambda probe - G39-

4 - Electrical connector for Lambda probe - G39-



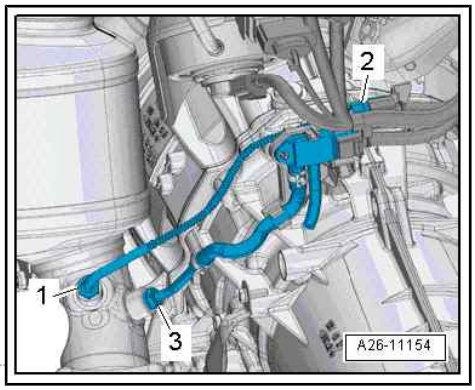
Fitting location of pressure differential sender - G505-

1 - Exhaust gas temperature sender 3 - G495-

2 - Pressure differential sender - G505-

3 - Connection from pressure pipe for pressure differential sender - G505-

♦ -Item 2- at rear right of engine



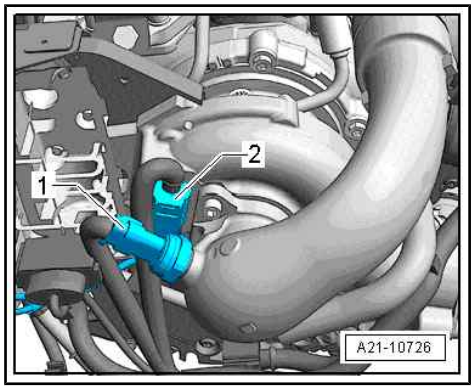
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Fitting locations on turbocharger

1 - Charge pressure sender 2 - G447-

2 - Exhaust gas temperature sender 1 - G235-

The turbocharger 1 control unit - J724- can be seen on the left.

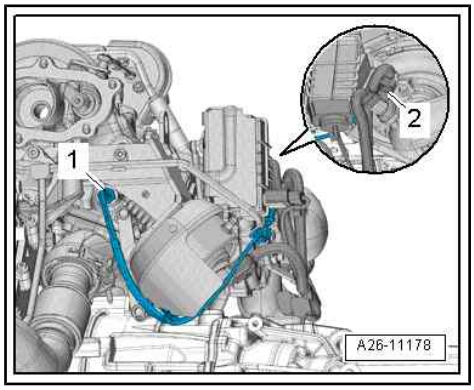


Exhaust gas temperature sender in turbocharger

1 - Exhaust gas temperature sender 1 - G235-

2 - Electrical connector for exhaust gas temperature sender 1 - G235-

Removing and installing ⇒ page 643



Exhaust gas temperature sender

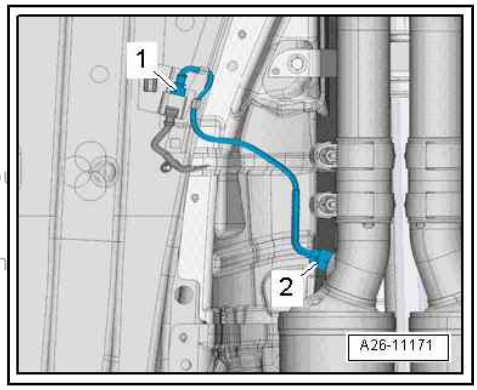
1 - Electrical connector for bank 2 exhaust gas temperature sender 4 - G649-

2 - Exhaust gas temperature sender 4 for cylinder bank 2 - G649-

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Note

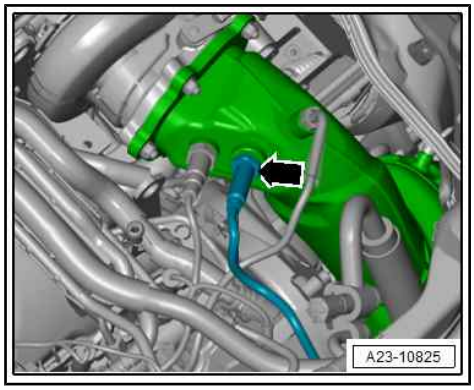
- *The exhaust gas temperature sender 4 for bank 2 - G649- is shown as an example.*
- *Exhaust gas temperature sender 4 - G648- is fitted on the opposite side.*



Removing and installing ⇒ page 652

Fitting location of NOx sender - G295-

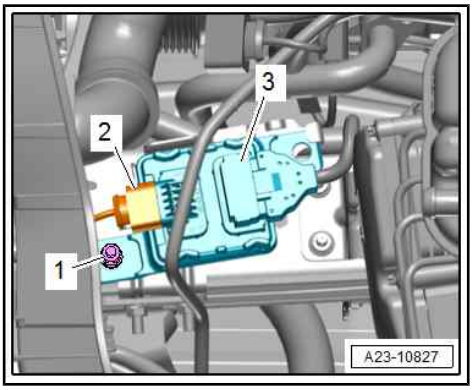
NOx sender - G295- -arrow-



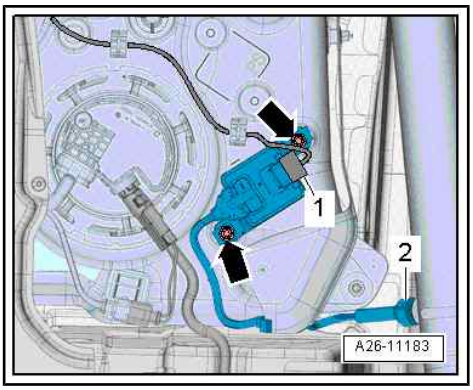
Fitting location of control unit for NOx sender - J583-

2 - Electrical connector for control unit for NOx sender - J583-

3 - Control unit for NOx sender - J583-



Fitting location of NOx sender 2 - G687- with control unit for NOx sender 2 - J881-

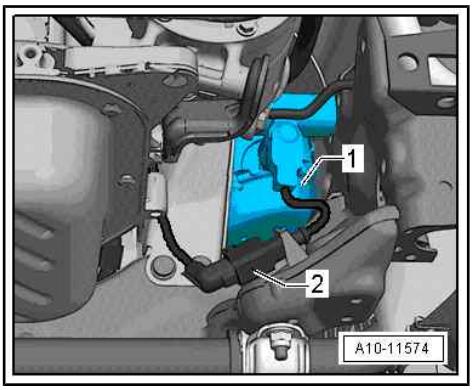


Engine mounting (left-side)

1 - Left electrohydraulic engine mounting solenoid valve - N144-

2 - Electrical connector for left electrohydraulic engine mounting solenoid valve - N144-

Removing and installing ⇒ page 163

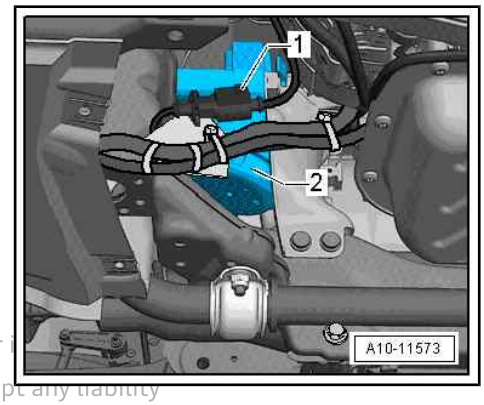


Engine mounting (right-side)

1 - Electrical connector for right electrohydraulic engine mounting solenoid valve - N145-

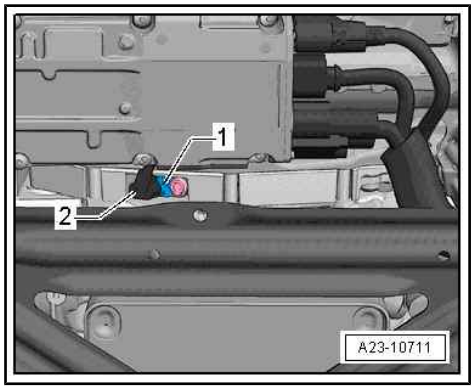
2 - Right electrohydraulic engine mounting solenoid valve - N145-

Removing and installing ⇒ page 163



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Engine speed sender - G28-



1.3 Filling and bleeding fuel system

Special tools and workshop equipment required

- Vehicle diagnostic tester

If components of the fuel system between the fuel tank and the high-pressure pump are removed or renewed, the fuel system must be bled.

Risk of irreparable damage to fuel pump

After working on the fuel system, the fuel pump may be irreparably damaged if it is allowed to run while empty.

– Never allow fuel pump to run while it is empty.

– Fill/bleed fuel pump.

Proceed as follows to fill high-pressure pump with fuel.

- Check fuel gauge in instrument cluster; fuel gauge needle must indicate that fuel is above reserve level.

– Connect ⇒ Vehicle diagnostic tester.

– Select `Diagnosis` mode and then `Start diagnosis`.

– Choose `Select own test` tab and select following options one after the other:

- `Drive train`
- `Select engine code and engine`
- `01 - Self-diagnosis compatible systems`
- `01 - Engine electronics`
- `01 - Engine electronics, functions`
- `Activate fuel pump`
- Press `Carry out check`
- Select 120 seconds.

– The fuel pump must run for 120 seconds to ensure that the fuel system is filled sufficiently with fuel.

– Start engine after filling fuel system.

– Run engine at moderate speed for several minutes and then switch off.

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– Check fuel system for leaks.
– Road-test vehicle and accelerate with full throttle at least once.
– Then inspect high-pressure section again for leaks.

1.4 Checking fuel system for leaks

Procedure

– Allow engine to run for several minutes at moderate rpm.
– Switch off ignition.
– Check complete fuel system for leaks.
– If leaks are found although the connections have been tightened to the correct torque, the relevant component must be renewed.
– Road-test vehicle and accelerate with full throttle at least once.
– Then inspect high-pressure section of fuel system again for leaks.

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2 Vacuum system

⇒ “2.1 Connection diagram - vacuum system”, page 506

⇒ “2.2 Checking vacuum system”, page 507

2.1 Connection diagram - vacuum system

⇒ “2.1.1 Connection diagram - vacuum system, vehicles with one turbocharger”, page 506

⇒ “2.1.2 Connection diagram - vacuum system, vehicles with two turbochargers”, page 507

2.1.1 Connection diagram - vacuum system, vehicles with one turbocharger

1 - Exhaust gas recirculation cooler change-over valve - N345-

2 - Coolant valve for cylinder head - N489-

3 - Vacuum unit

- ❑ For exhaust gas recirculation cooler

4 - Non-return valve

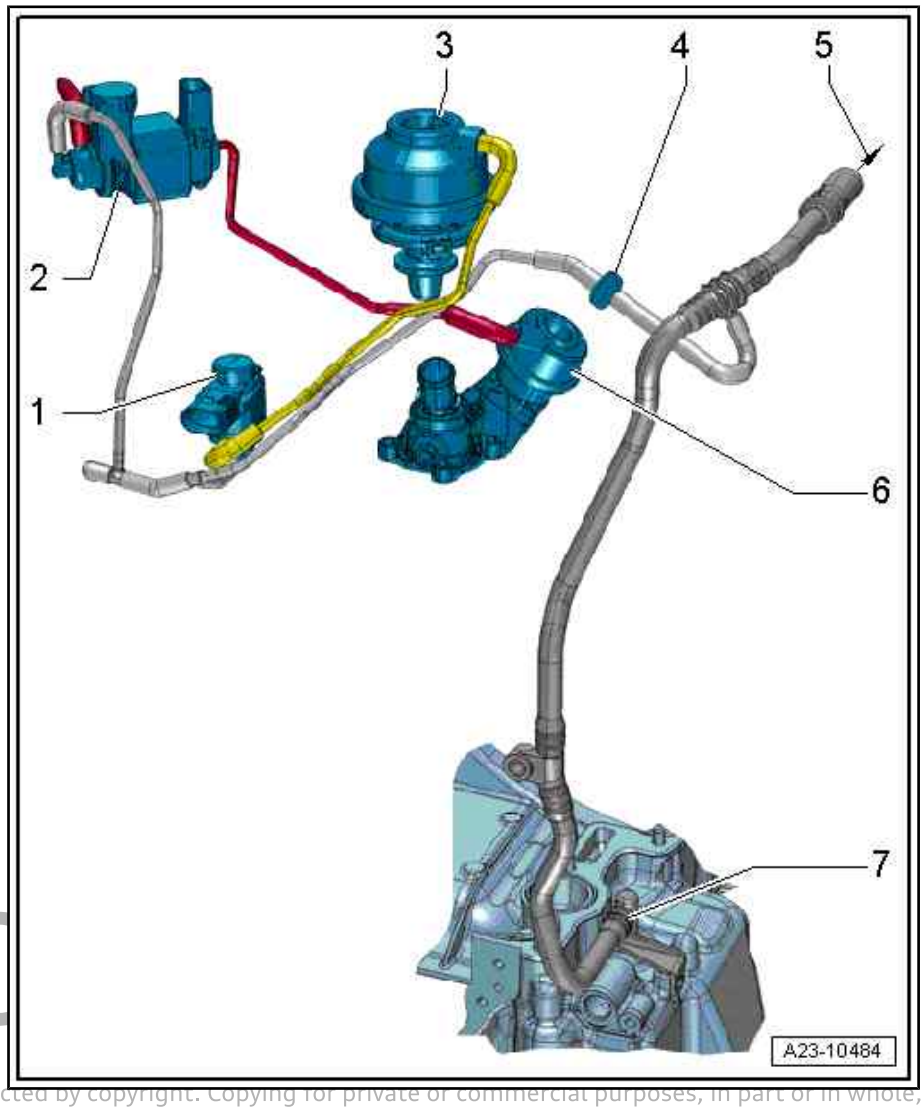
5 - To brake servo

6 - Shut-off valve

- ❑ For coolant

7 - Vacuum connection

- ❑ On sump (top section)
- ❑ To vacuum pump



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2.1.2 Connection diagram - vacuum system, vehicles with two turbochargers

Caution

Risk of engine malfunctions

- *When routing vacuum lines, make sure they are not kinked, twisted or crushed.*

1 - To vacuum pump

- In sump (bottom section)

2 - Turbine changeover valve - N529-

3 - Non-return valve

- Note installation position

4 - Exhaust gas recirculation cooler change-over valve - N345-

5 - Charge pressure control solenoid valve - N75-

6 - Coolant valve for cylinder head - N489-

7 - Actuator

- For exhaust gas recirculation cooler

8 - Vacuum unit

- For charge pressure control

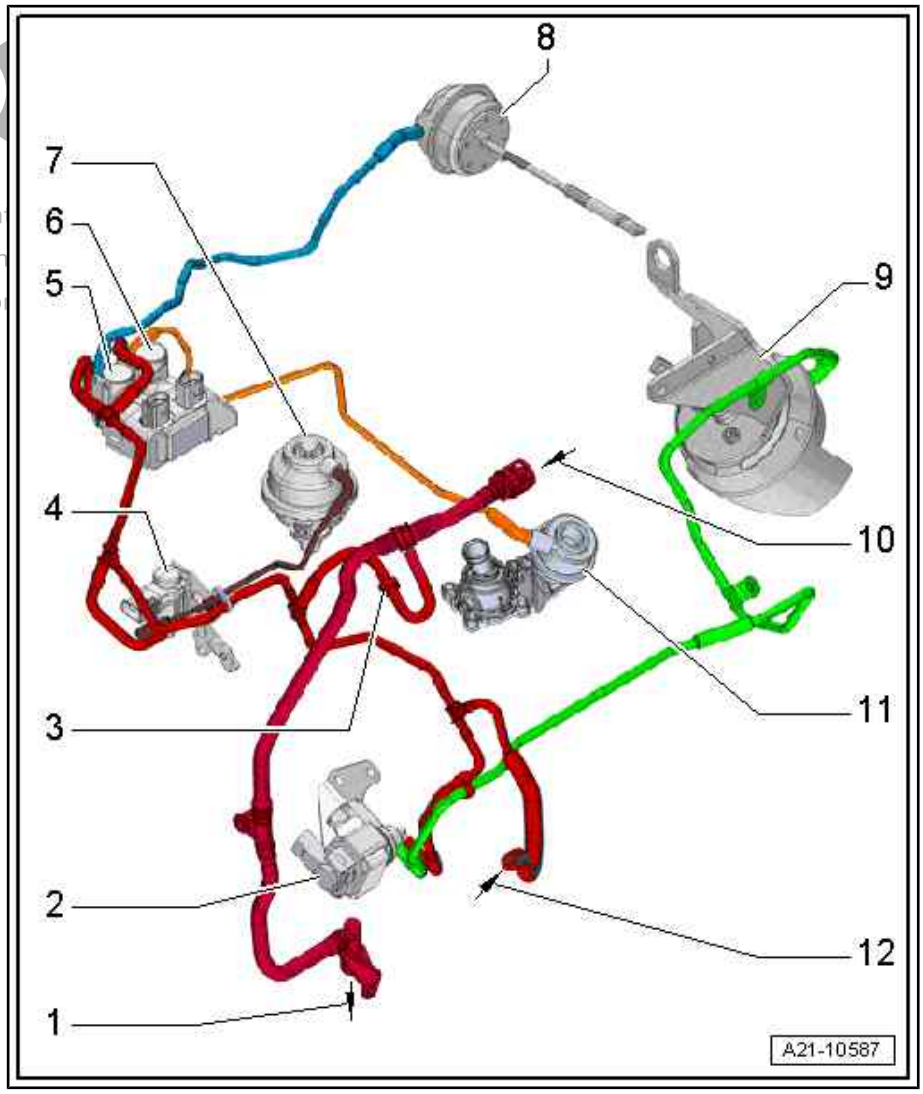
9 - Vacuum unit

- For turbine changeover valve - N529-
- With regulating flap potentiometer - G584-

10 - To brake servo

11 - Coolant shut-off valve

12 - To vacuum reservoir

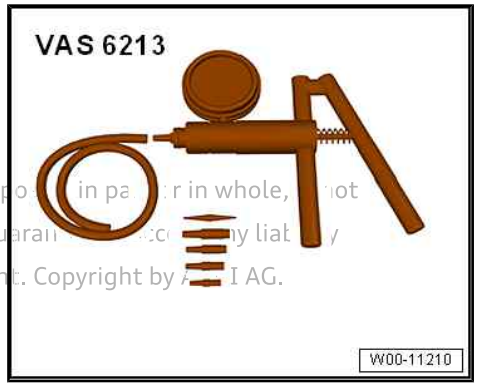


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2.2 Checking vacuum system

Special tools and workshop equipment required

- Hand vacuum pump - VAS 6213-



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Procedure

– Check all vacuum lines in the complete vacuum system for:
- Cracks
- Traces of animal bites
- Kinked or crushed lines
- Porous or leaking lines

– Check vacuum line to solenoid valve and from solenoid valve to corresponding component.

– If 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.

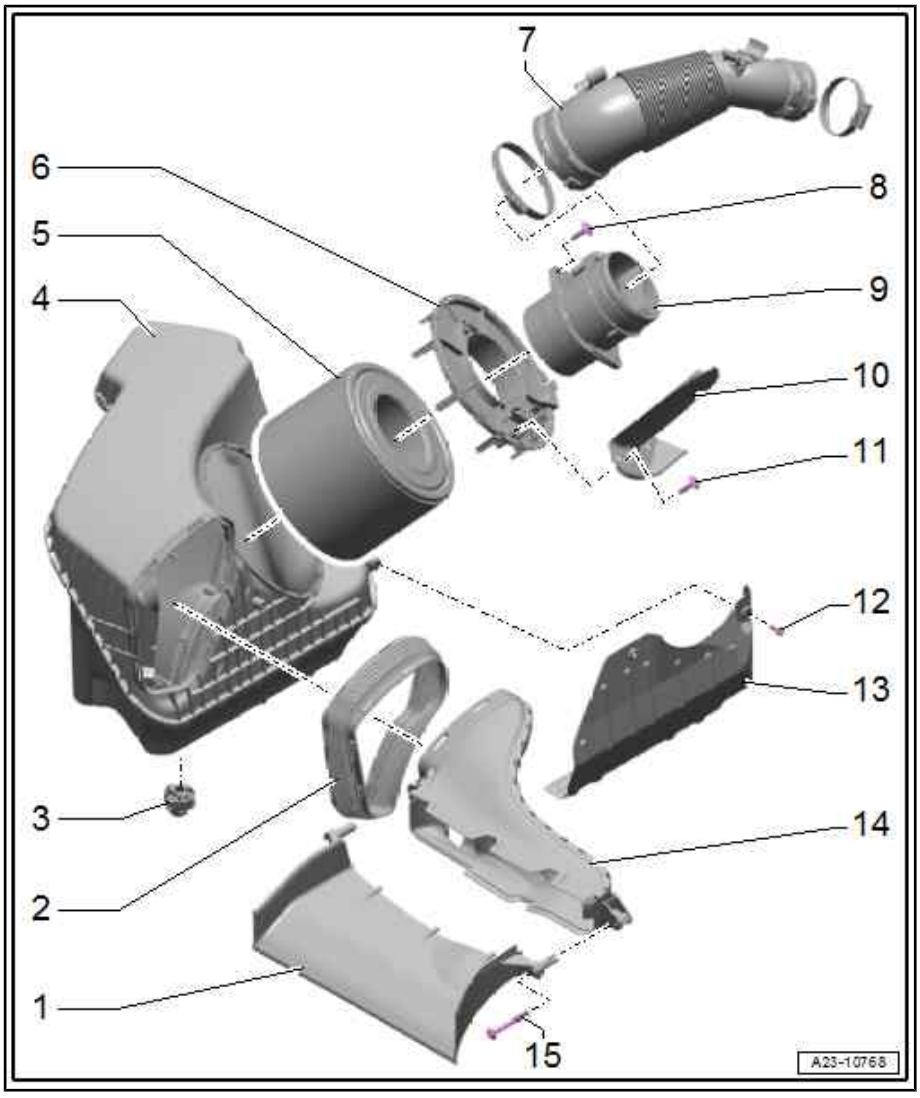
– If it is not possible to build up a vacuum with the hand vacuum pump - VAS 6213- or if the vacuum pressure drops again immediately, check the hand vacuum pump and connecting hoses for leaks.

3 Air cleaner

⇒ “3.1 Exploded view - air cleaner housing”, page 509

⇒ “3.2 Removing and installing air cleaner housing”, page 510

3.1 Exploded view - air cleaner housing



1 - Air duct

- ❑ Clean out salt deposits, dirt and leaves, etc.

2 - Sealing element

3 - Mounting

- ❑ For air cleaner housing

4 - Air cleaner housing

- ❑ Clean out salt deposits, dirt and leaves, etc.
- ❑ Removing and installing ⇒ page 510

5 - Air filter element

- ❑ Use genuine air filter element ⇒ Electronic parts catalogue
- ❑ Change intervals ⇒ Maintenance tables
- ❑ Removing and installing ⇒ Maintenance ; Booklet 411

6 - Lid

- ❑ For air cleaner housing
- ❑ Remove any salt deposits or dirt
- ❑ Removing and installing ⇒ Maintenance ; Booklet 411

7 - Air pipe

- ❑ Tightening torque for hose clips ⇒ page 466

8 - Bolt

- ❑ For securing air mass meter - G70- to air pipe (“version 1”) or repair method if retaining tabs on air pipe have broken off (“version 2”) ⇒ Electronic parts catalogue
- ❑ Thread-forming
- ❑ Fit and screw in bolt by hand so that it is screwed into old thread. Then tighten bolt to torque
- ❑ 3.5 Nm

9 - Air mass meter - G70-

- ❑ Removing and installing ⇒ page 552

10 - Heat shield

11 - Bolt

- ❑ 1.5 Nm

12 - Bolt

- ❑ 1.5 Nm

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13 - Heat shield

14 - Air duct

- ❑ Clean out salt deposits, dirt and leaves, etc.

15 - Bolt

- ❑ 3.5 Nm

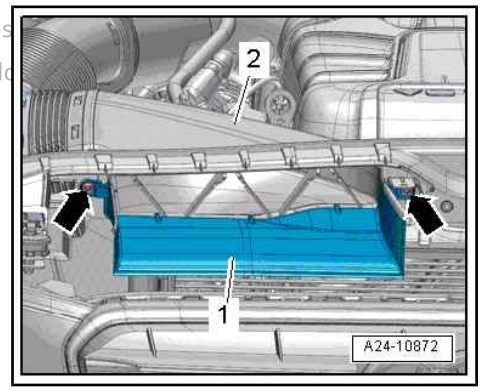
3.2 Removing and installing air cleaner housing

Removing

– Remove lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing attachments .

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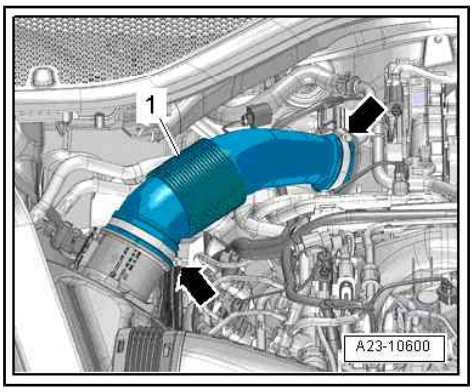
– Remove bolts -arrows- and detach air duct -2-.



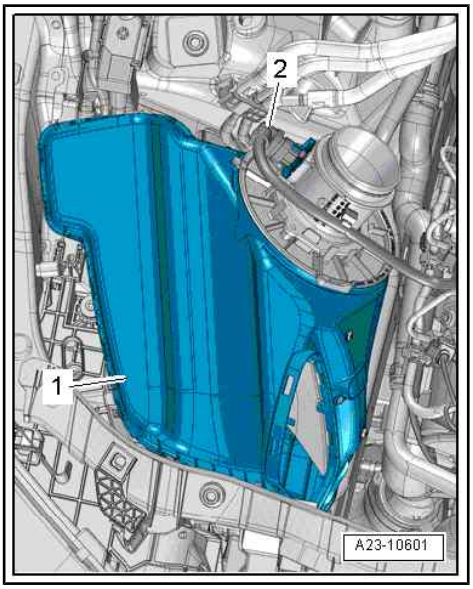
Note

Disregard -item 1-.

– Release hose clips -arrows- and detach air pipe -1-.



– Unplug electrical connector -2- at air mass meter - G70- and move clear.
– Lift off air cleaner housing -1-.



Installing

Note

- *The air cleaner housing must always be clean.*
- *To prevent malfunctions, cover critical parts of the engine air intake (air mass meter, air pipes etc.) with a clean cloth when blowing out the air cleaner housing with compressed air.*
- *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- *Use a lubricant (silicone-free) when installing air hoses.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

– Check air pipe (engine intake side) for salt residue, dirt and leaves.
– Check air duct leading from lock carrier to air cleaner housing for dirt and leaves.

Remaining installation steps are carried out in reverse sequence; note the following:

– Install lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing attachments .

Tightening torques

- ⇒ “3.1 Exploded view - air cleaner housing”, page 509

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4 Intake manifold

⇒ “4.1 Exploded view - intake manifold”, page 512

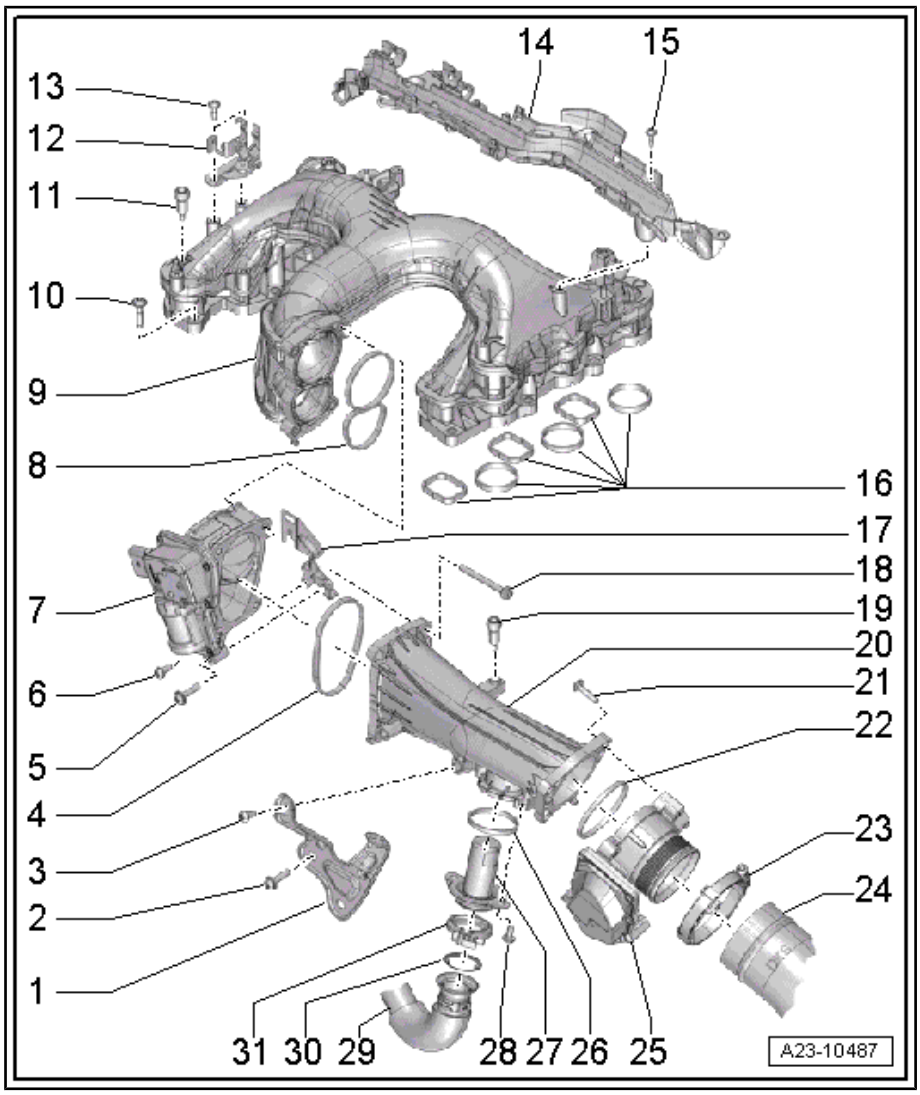
⇒ “4.2 Removing and installing intake manifold”, page 513

⇒ “4.3 Removing and installing intake manifold flap motor V157 ”, page 518

⇒ “4.4 Removing and installing throttle valve module J338 ”, page 520

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4.1 Exploded view - intake manifold



1 - Bracket
- ❑ For air pipe

2 - Bolt
- ❑ 9 Nm

3 - Bolt
- ❑ 9 Nm

4 - Gasket
- ❑ Renew

5 - Bolt
- ❑ 9 Nm

6 - Bolt
- ❑ 9 Nm

7 - Intake manifold flap motor - V157-
- ❑ Removing and installing ⇒ page 518

8 - Gasket
- ❑ Renew

9 - Intake manifold
- ❑ Removing and installing ⇒ page 513

10 - Bolt
- ❑ Tightening torque and sequence ⇒ page 513

11 - Mounting pin
- ❑ For engine cover panel
- ❑ 5 Nm

12 - Bracket
- ❑ For electrical connector

13 - Bolt
- ❑ 4 Nm

14 - Cable guide

15 - Bolt
- ❑ 4 Nm

16 - Gaskets
- ❑ Renew

17 - Bracket

- ❑ For exhaust gas recirculation cooler change-over valve - N345-

18 - Bolt

- ❑ 9 Nm

19 - Mounting pin

- ❑ For engine cover panel
- ❑ 5 Nm

20 - Air pipe

21 - Bolt

- ❑ 9 Nm

22 - Gasket

- ❑ Renew

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23 - Screw-type clip

- ❑ Tightening torque ⇒ page 466

24 - Air hose

25 - Throttle valve module - J338-

- ❑ Removing and installing ⇒ page 520

26 - Gasket

- ❑ Renew

27 - Pipe

- ❑ For exhaust gas recirculation

28 - Bolt

- ❑ 9 Nm

29 - Pipe

- ❑ For exhaust gas recirculation

30 - Gasket

- ❑ Renew

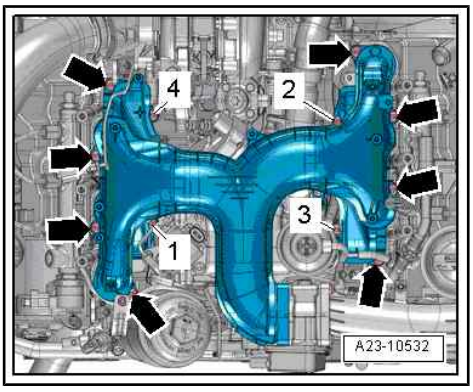
31 - Screw-type clip

- ❑ Tightening torque ⇒ page 659

Intake manifold - tightening torque and sequence

– Tighten bolts in 3 stages as follows:

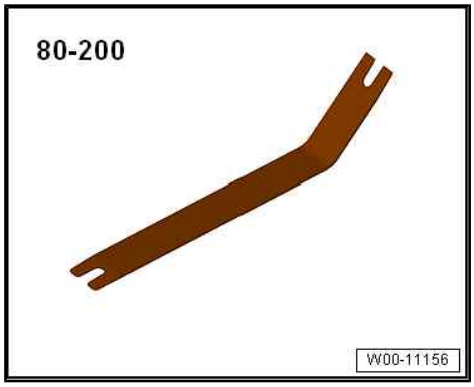
Stage	Bolts	Tightening torque
1.	-1 to 4-, -arrows-	Screw in by hand until contact is made
2.	-1 to 4-	5 Nm, in sequence indicated
3.	-1 to 4- -arrows-	9 Nm, in any sequence



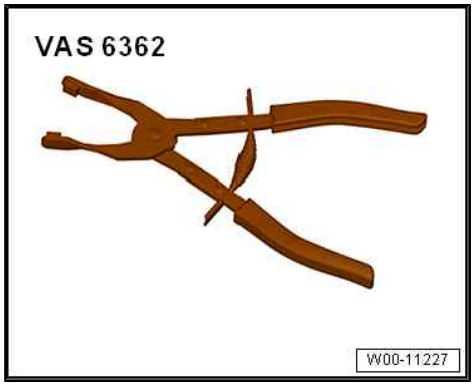
4.2 Removing and installing intake manifold

Special tools and workshop equipment required

- Removal lever - 80 - 200-



- Hose clip pliers - VAS 6362-



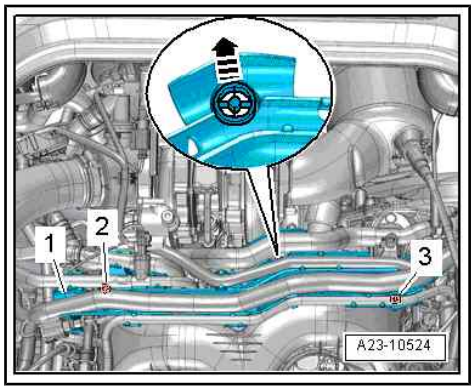
Removing

Caution

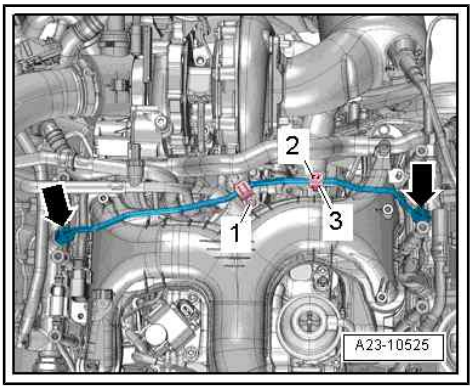
- *Use an absorbent cloth to catch escaping fuel.*
- *No fuel must be allowed to spill onto components or seals in the vicinity of the engine; this can ultimately lead to damage caused by leaking seals.*
- *Risk of malfunctions caused by dirt.*
- *Observe ⇒ "3.1 Rules for cleanliness", page 8 .*

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– Remove engine cover panel ⇒ page 172 .
– Use removal lever - 80 - 200- to move electrical wiring harness and hoses clear at cable guide -1-.
– Pull coolant hose off to rear -arrow-.
– Unscrew bolts -2 and 3- and remove cable guide -1-.

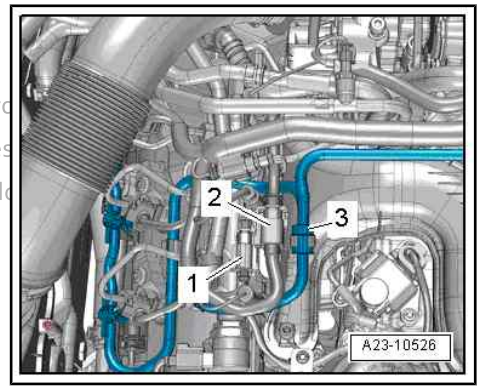


– Unscrew bolts -1, 2- and detach retaining clamp -3-.
– Unscrew union nuts -arrows- and detach high-pressure pipe (top).



– Detach electrical connectors -1 and 2- and remove non-return valve -3- from bracket.

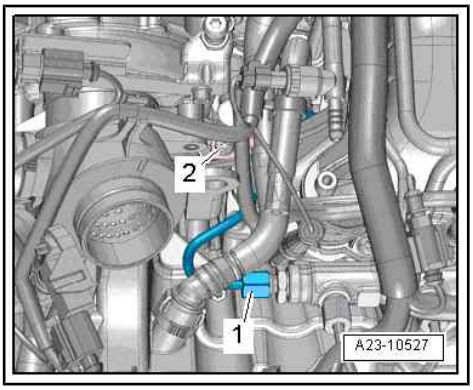
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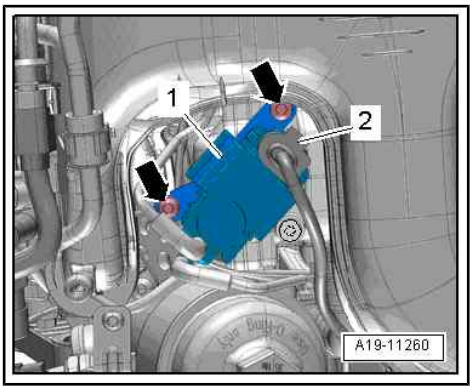
– If fitted, remove bolt -2- at retaining clamp for high-pressure pipe.

Note

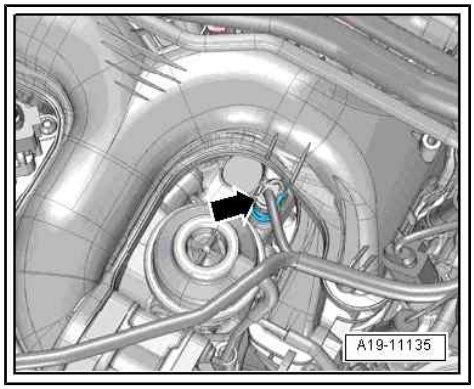
Disregard -item 1-.



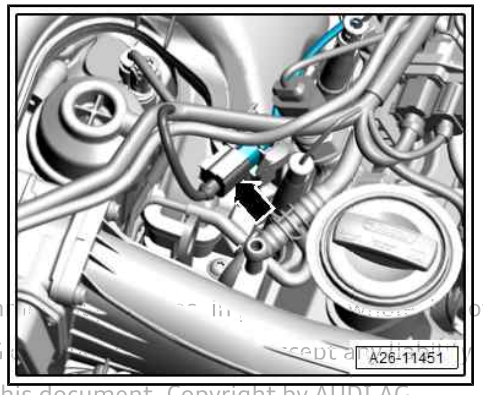
– Unplug electrical connector -2- at coolant valve for cylinder head - N489- -item 1-.
– Unscrew bolts -arrows- and place bracket with coolant valve for cylinder head - N489- to the side.



– Unplug electrical connector -arrow- at coolant temperature sender - G62- .

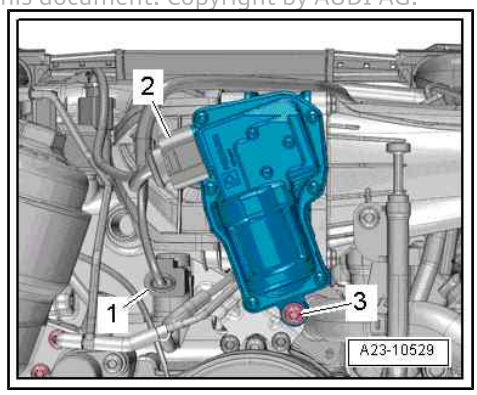


– If fitted, remove electrical connector -arrow- for injector for reducing agent - N474- from bracket and unplug connector.
– Move clear electrical wiring.



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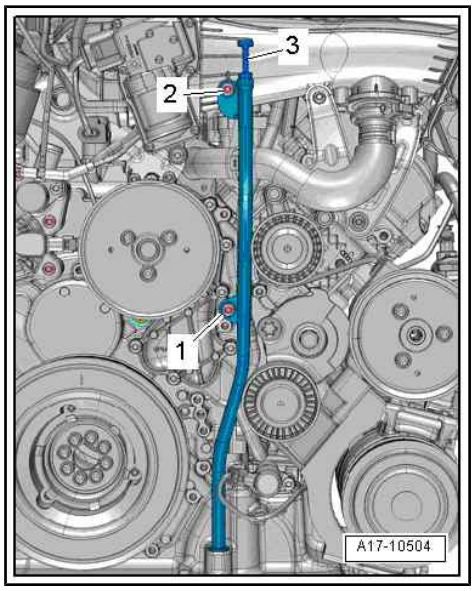
– Unplug electrical connectors -1 and 2- and move wiring harness clear to left side.
– Remove bolt -3- from bracket (centre) for intake manifold.



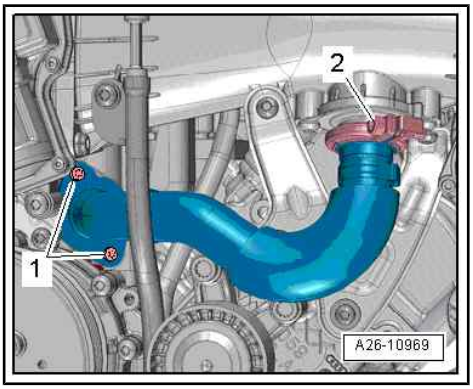
– Pull out plug -3-.
– Remove bolt -2- for dipstick guide tube.

Note

Disregard -item 1-.



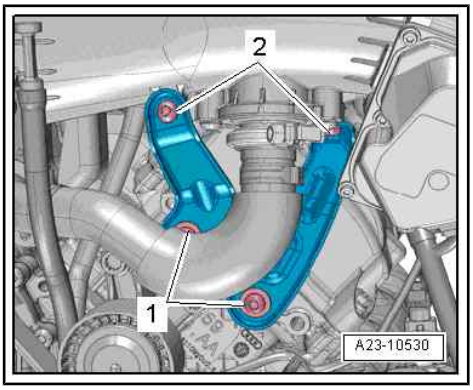
– Release screw-type clip -2- on exhaust gas recirculation pipe.



Note

Disregard -item 1-.

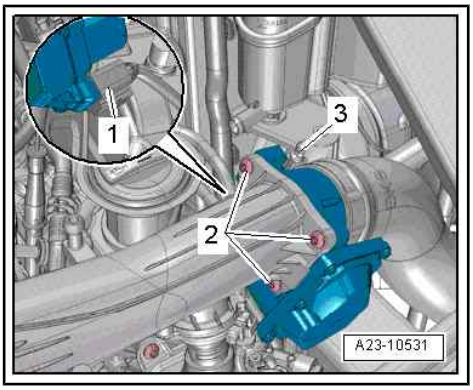
– Remove bolts -2- from bracket (left-side) for air pipe.



Note

Disregard -item 1-.

– Unplug electrical connector -1- at throttle valve module - J338- .
– Release screw-type clip -3- and detach air hose.



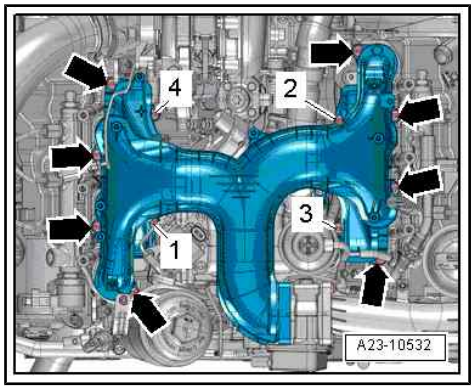
Note

Disregard -item 2-.

– Unplug electrical connectors on glow plugs.
– Remove fuel pressure sender - G247- ⇒ page 551 .

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– Remove bolts -1 ... 4- and -arrows- and detach intake manifold.



Installing

Installation is carried out in reverse order; note the following:

Note

- *Renew seals and/or gaskets.*
- *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *To ensure that the air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.*

– Install high-pressure pipe ⇒ page 539 .

Tightening torques

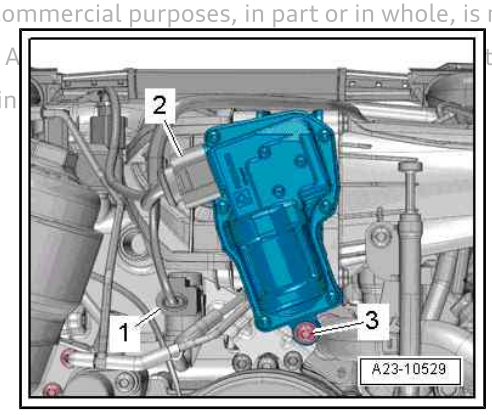
- ⇒ Fig. ""Intake manifold - tightening torque and sequence"" , page 513
- ⇒ Item 8 (page 321)
- ⇒ Fig. ""Exhaust gas recirculation pipe to intake manifold - tightening torque and sequence"" , page 659

4.3 Removing and installing intake manifold flap motor - V157-

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Removing

– Remove engine cover panel ⇒ page 172 .



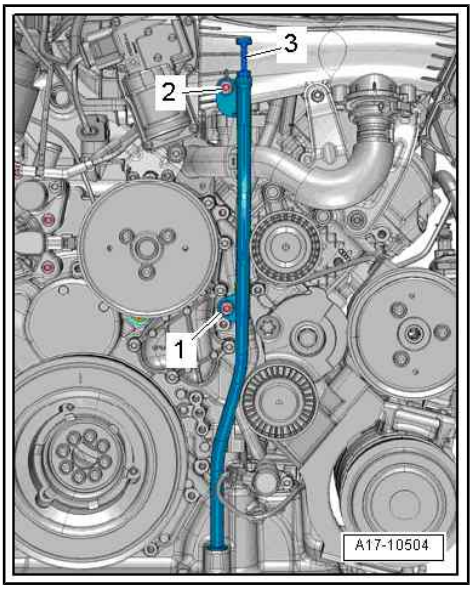
– Unplug electrical connector -2-.

– Remove bolt -3- from bracket (centre) for intake manifold.

Note

Disregard -item 1-.

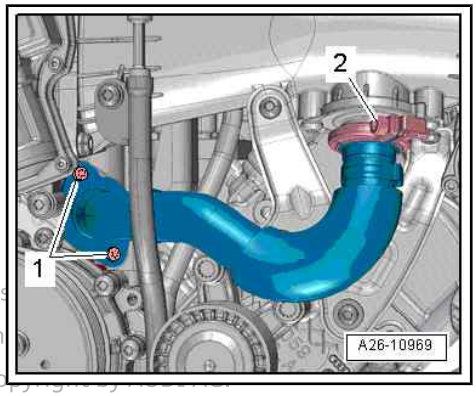
– Remove bolt -2- for dipstick guide tube.



Note

Disregard items -1 and 3-.

– Release screw-type clip -2- on exhaust gas recirculation pipe.

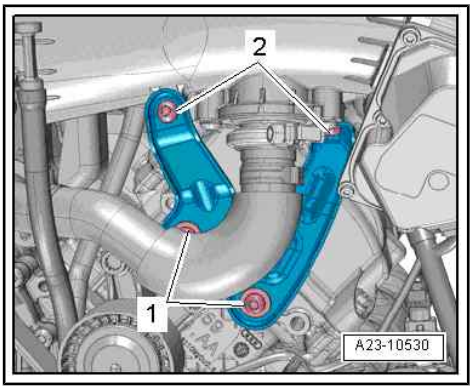


Note

Disregard -item 1-.

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– Remove bolts -2- from bracket (left-side) for air pipe.

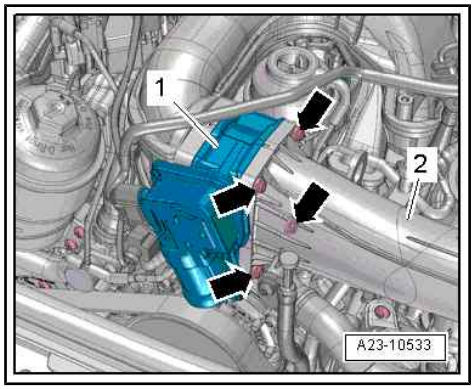


Note

Disregard -item 1-.

– Remove bolts -arrows-.

– Press air pipe -2- to left side and detach intake manifold flap motor - V157- -item 1-.



Installing

Installation is carried out in reverse order; note the following:

Note

- *Renew seals and/or gaskets.*
- *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*

Tightening torques

- ⇒ “4.1 Exploded view - intake manifold”, page 512
- ⇒ Item 8 (page 321)
- ⇒ Fig. ““Exhaust gas recirculation pipe to intake manifold - tightening torque and sequence”“ , page 659

4.4 Removing and installing throttle valve module - J338-

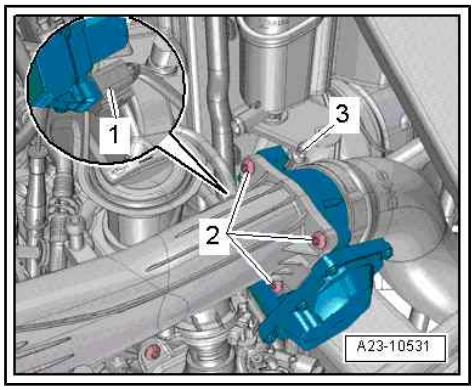
Removing

– Remove engine cover panel ⇒ page 172 .

– Release hose clip -3- and detach air hose.

– Unplug electrical connector -1-.

– Remove bolts -2- and detach throttle valve module - J338- .



Installing

Installation is carried out in reverse order; note the following:

Note

- *Renew seal.*
- *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *To ensure that the air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.*

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Tightening torques

- ⇒ “4.1 Exploded view - intake manifold”, page 512

5 Injectors/high-pressure reservoir (rail)

⇒ “5.1 Exploded view - injectors”, page 521

⇒ “5.2 Checking injectors”, page 524

⇒ “5.3 Performing adaption of correction values for injectors”, page 525

⇒ “5.4 Checking for injectors sticking open”, page 525

⇒ “5.5 Checking return flow rate of injectors with engine running”, page 527

⇒ “5.6 Checking return flow rate of injectors at starter cranking speed”, page 530

⇒ “5.7 Checking restrictor in fuel return line”, page 532

⇒ “5.8 Removing and installing injectors”, page 533

⇒ “5.9 Removing and installing high-pressure pipes”, page 539

⇒ “5.10 Removing and installing high-pressure reservoir (rail)”, page 541

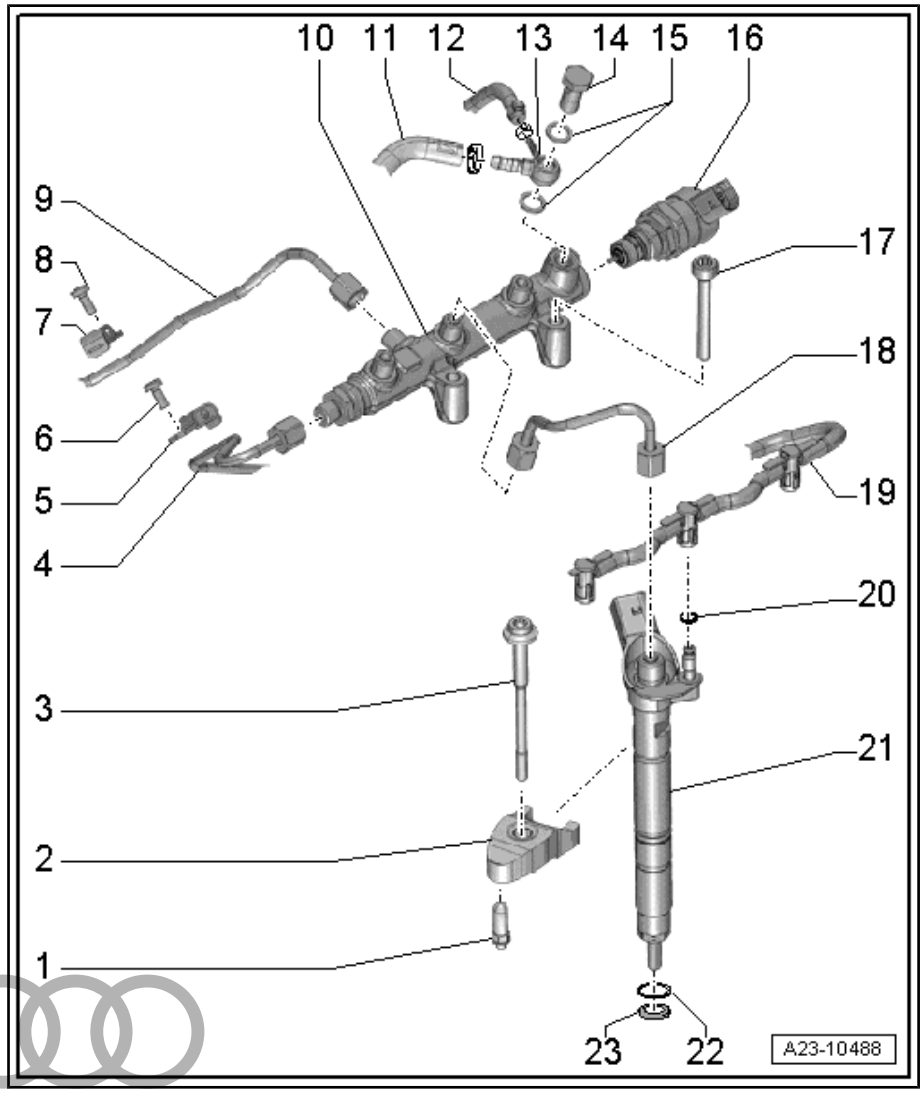
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5.1 Exploded view - injectors

Caution

Risk of malfunctions caused by dirt.

- *Observe ⇒ “3.1 Rules for cleanliness”, page 8 .*



1 - Support bracket

- ❑ For clamping piece
- ❑ Different tightening torques:

- ◆ To camshaft bearing: 2.5 Nm
- ◆ To cylinder head: 9 Nm

2 - Clamping piece

- ❑ Use a coloured pen to mark injectors and corresponding clamping piece and cylinder for re-installation; pay attention to markings when installing
- ❑ If the injector is installed on another cylinder for testing purposes, the clamping piece must also be moved
- ❑ After looking for the fault, the injector and the clamping piece must be re-installed on their original cylinder
- ❑ The clamping pieces can be re-used when installing new injectors

3 - Bolt

- ❑ Renew
- ❑ Tighten initially to 6 Nm
- ❑ Then tighten 90° further

4 - High-pressure pipe

- ❑ From high-pressure pump to fuel rail
- ❑ Do not alter shape
- ❑ Check for damage before re-installing
- ❑ Installing ⇒ page 539
- ❑ Lubricate threads of union nuts with clean engine oil
- ❑ 25 Nm

5 - Retaining clamp

- ❑ For high-pressure pipe

6 - Bolt

- ❑ 9 Nm

7 - Retaining clamp

- ❑ For high-pressure pipe

8 - Bolt

- ❑ 9 Nm

9 - High-pressure pipe

- ❑ From fuel rail on opposite side
- ❑ Do not alter shape
- ❑ Check for damage before re-installing
- ❑ Installing ⇒ page 539

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- ❑ Lubricate threads of union nuts with clean engine oil
- ❑ 25 Nm

10 - Fuel rail

- ❑ Removing and installing ⇒ page 541

11 - Fuel return hose

- ❑ To fuel tank

12 - Fuel return hose

- ❑ From injectors
- ❑ Do not dismantle
- ❑ Renew together with restrictor
- ❑ After renewing, engine must be run at idling speed for approx. 2 minutes to bleed fuel system
- ❑ Then check fuel return hoses for leaks

13 - Ring connection for hose

14 - Banjo bolt

- ❑ 25 Nm

15 - Seals

- ❑ Renew

16 - Fuel pressure regulating valve - N276-

- ❑ With deformable sealing lip
- ❑ Cannot be re-installed
- ❑ After renewing high-pressure pump and/or fuel pressure regulating valve - N276- , adaption must be performed. Use ⇒ Vehicle diagnostic tester
- ❑ Removing and installing ⇒ page 547
- ❑ Tightening torque ⇒ page 481

17 - Bolt

- ❑ 22 Nm

18 - High-pressure pipe

- ❑ From fuel rail to injector
- ❑ Do not alter shape
- ❑ Mark allocation for re-installation; pay attention to marking when installing
- ❑ Check for damage before re-installing
- ❑ Installing ⇒ page 539
- ❑ Lubricate threads of union nuts with clean engine oil
- ❑ 25 Nm

19 - Fuel return hose

- ❑ From injectors
- ❑ Do not dismantle
- ❑ Renew together with restrictor
- ❑ After renewing, engine must be run at idling speed for approx. 2 minutes to bleed fuel system
- ❑ Then check fuel return hoses for leaks

20 - O-ring

- ❑ Renew

21 - Injector

- ❑ Use a coloured pen to mark allocation of injectors to corresponding clamping piece and high-pressure pipe, and to corresponding cylinder for re-installation; pay attention to markings when installing
- ❑ If the injector is installed on another cylinder for testing purposes, the clamping piece must also be moved
- ❑ Always renew copper seal when removing and installing

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- ❑ After looking for the fault (switching the injectors around), the injector and the clamping piece must be re-installed on their original cylinder
- ❑ To remove carbon deposits from the injector sealing surface, clean the injector bore in the cylinder head with cleaning kit - VAS 6811- (it is important to do this to avoid leaks)
- ❑ Removing and installing ⇒ page 533

22 - O-ring

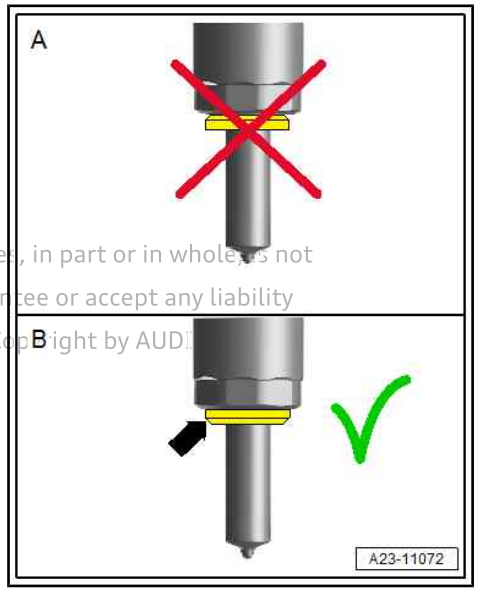
- ❑ Renew

23 - Copper seal

- ❑ Always renew copper seal when removing and installing
- ❑ Copper seal without chamfer: has no specified installation position
- ❑ Copper seal with chamfer: note installation position ⇒ page 524

Note installation position for copper seal with chamfer:

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5.2 Checking injectors

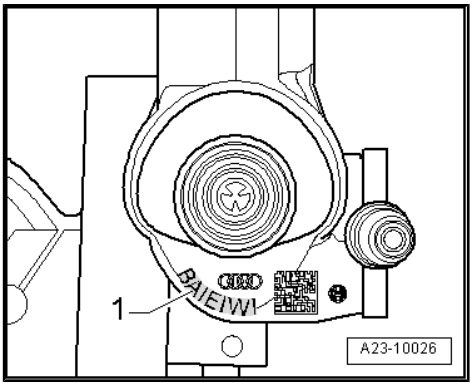
There are four different tests for checking the operation of the injectors.

- ⇒ “5.3 Performing adaption of correction values for injectors”, page 525
- ⇒ “5.4 Checking for injectors sticking open”, page 525
- ⇒ “5.5 Checking return flow rate of injectors with engine running”, page 527
- ⇒ “5.6 Checking return flow rate of injectors at starter cranking speed”, page 530

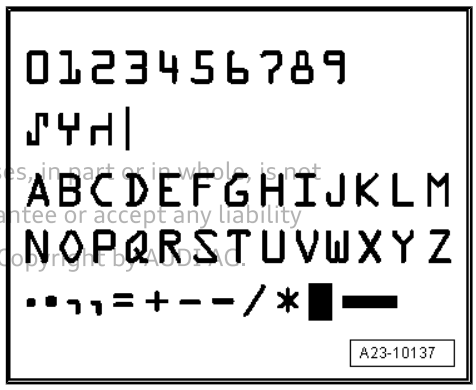
Perform the following tests first if the engine does not start at all:

- ◆ ⇒ “5.4 Checking for injectors sticking open”, page 525
- ◆ ⇒ “5.6 Checking return flow rate of injectors at starter cranking speed”, page 530
- ◆ ⇒ “6.4 Checking fuel pressure regulating valve N276 ”, page 549

5.3 Performing adaption of correction values for injectors



- The “Injector delivery calibration” and “Injector voltage calibration” serve to correct the injection rates for each cylinder of a common rail system individually across the entire operating range.
- The 7-digit adaption value -1- (example) is marked separately on each injector. It may consist of letters and/or numbers (ASCII code).
- Reference table for reading out letters and/or numbers on each injector



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Special tools and workshop equipment required

- Vehicle diagnostic tester

The adaption procedure is described in the “Guided Fault Finding”. (The procedure is also described under “Guided Functions”.) Use ⇒ Vehicle diagnostic tester.

– When a new injector is installed, the adaption value for the new injector must be stored in the engine control unit.

– Additionally, check that the “Injector delivery calibration values” with “Injector voltage calibration values” are correctly entered for all the other injectors. Do NOT attempt to re-enter these values if the correct values are already stored in the engine control unit.

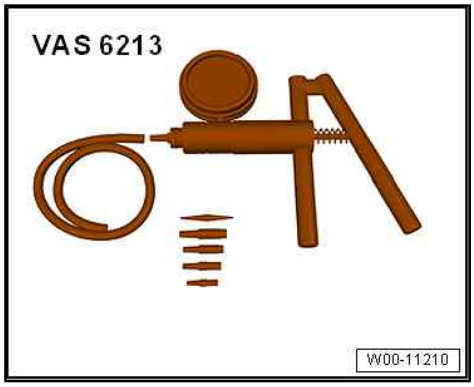
– When the engine control unit is renewed, the appropriate “Injector delivery calibration values” with “Injector voltage calibration” values must be written into the new engine control unit.

5.4 Checking for injectors sticking open

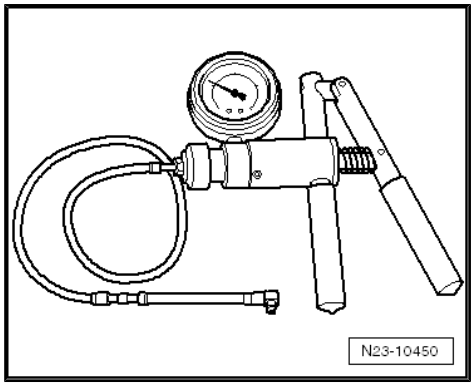
If one of the injectors is sticking open, this means that the injector needle is not closing fully and fuel escapes into the cylinder.

Special tools and workshop equipment required

- Hand vacuum pump - VAS 6213-



- Use a return line to make an -adapter-.



Procedure

– Remove engine cover panel ⇒ page 172 .

– Clean all fuel rail connections with engine cleaner or brake cleaner and dry.

Caution

Risk of malfunctions caused by dirt.

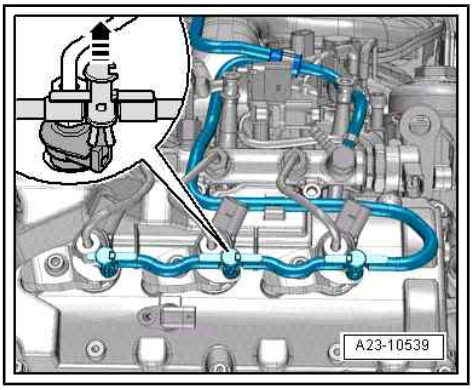
- ***Observe ⇒ "3.1 Rules for cleanliness", page 8 .***

Check all cylinders in turn.

Starting with cylinder 1

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– Disconnect fuel return hoses from injectors you want to check; 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 hand vacuum pump - VAS 6213- with improvised adapter to return line connection of injector to be tested.
– 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 533 .

Attaching

– Check O-ring for fuel return line connection for damage and deformation.

If O-ring is damaged or deformed, renew O-ring.

Note

Lubricate all O-rings with engine oil or assembly oil before installing.

– Push return line connections carefully over seals and onto injectors. The catch should engage audibly. Then press release pin down carefully.

Checking fuel system for leaks

– Run engine at idling speed for several minutes (do not press accelerator) and then switch off. Fuel system will bleed itself automatically.
– Check the entire fuel system for leaks.

Renew the affected component if leakage occurs.

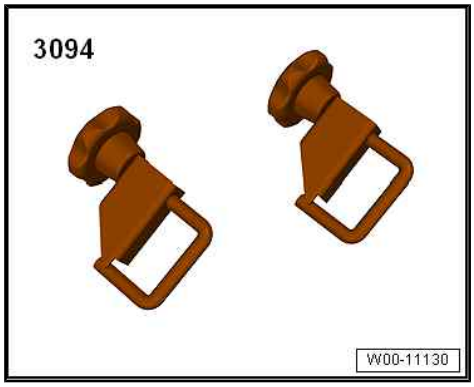
– After completing the repair, road-test the vehicle. Accelerate with full throttle at least once. Then check the high-pressure section of the fuel system again for leaks.
– Install engine cover panel ⇒ page 172 .

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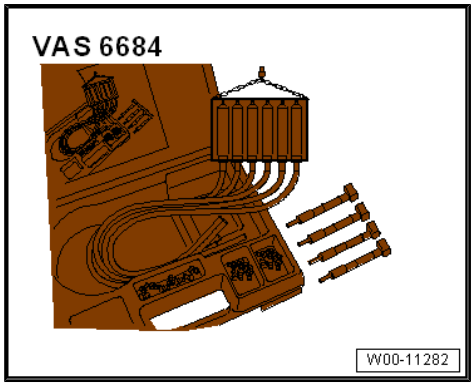
5.5 Checking return flow rate of injectors with engine running

Special tools and workshop equipment required

- Hose clamps, up to 25 mm - 3094-



- Return flow meter - VAS 6684-



- Fuel-resistant measuring container

Caution

Risk of malfunctions caused by dirt.

- *Observe ⇒ "3.1 Rules for cleanliness", page 8 .*

– Remove engine cover panel ⇒ page 172 .

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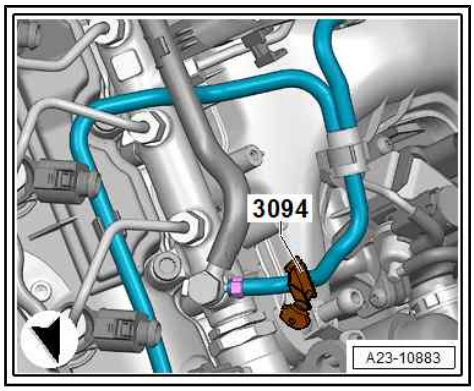
Measuring return flow rate of individual injectors

Each injector normally has a relatively low fuel return flow rate. If the return flow rate at one injector is relatively high compared to the other injectors, that injector is probably defective.

– Remove engine cover panel ⇒ page 172 .

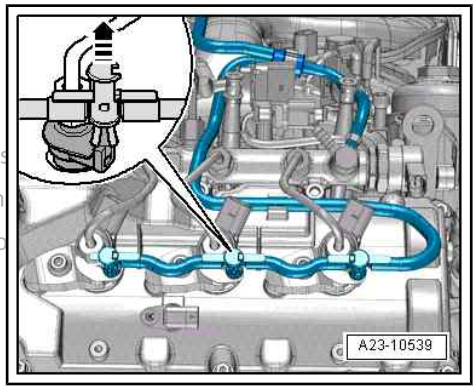
– Clean all return line connections with engine cleaner or brake cleaner and dry.

– Clamp off fuel return line downstream of restrictor using hose clamp up to 25 mm - 3094- .

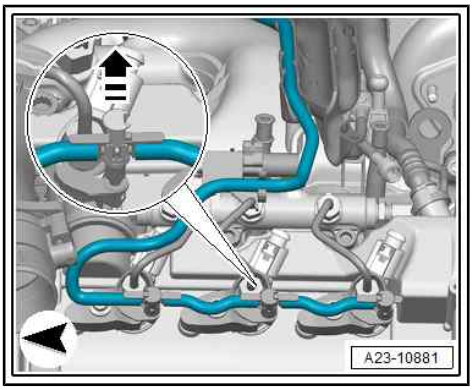


– Disconnect fuel return hoses from injectors on cylinder bank 1; to do so, press down both tabs and at the same time pull centre piece up to release connection -arrow-.

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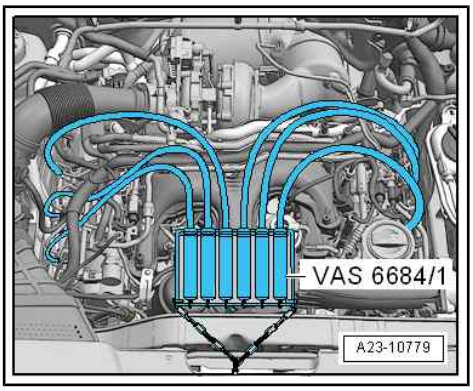


– Disconnect fuel return hoses from injectors on cylinder bank 2; to do so, press down both tabs and at the same time pull centre piece up to release connection -arrow-.



– Connect hoses of return flow meter - VAS 6684- to all return line connections of the six injectors.

– Start engine and run at idling speed for several minutes:



Caution

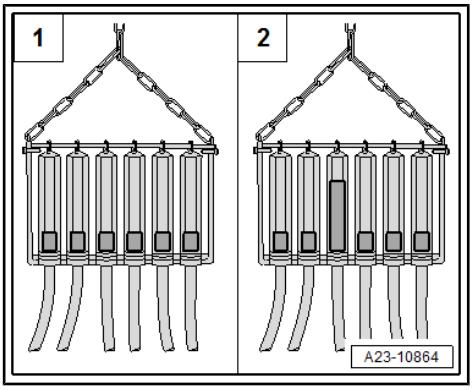
Risk of damage to injectors due to increased engine speed.

- ***Do NOT press the accelerator during this test; the engine must only run at idling speed.***

– When the engine is warm and running at idling speed, the return flow rates at each of the 6 injectors must not differ by more than a small amount.

Evaluating return flow rate:

- 1 = injectors OK; return flow rate approx. identical on all injectors.
- 2 = injector for cylinder 3 not OK; return flow rate surpasses value three times the volume of smallest measured return flow rate.

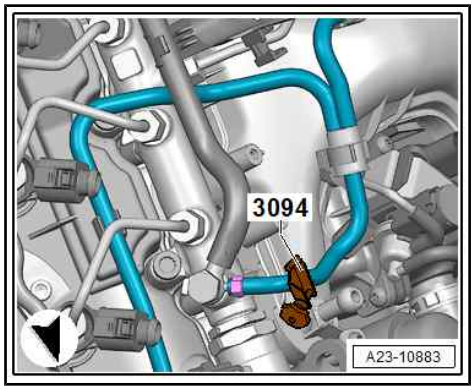


Note

There is a mechanical fault at the injector if the return flow rate is greater than three times the volume of the smallest measured return flow rate.

– If one injector has a significantly higher return flow rate than the others it must be renewed ⇒ page 533 .

– Remove hose clamp up to 25 mm - 3094- from fuel return line.



Attaching

– Check O-ring for fuel return line connection for damage and deformation.

If O-ring is damaged or deformed, renew O-ring.

Note

Lubricate all O-rings with engine oil or assembly oil before installing.

– Push return line connections carefully over seals and onto injectors. The catch should engage audibly. Then press release pin down carefully.

Checking fuel system for leaks

– Run engine at idling speed for several minutes (do not press accelerator) and then switch off. Fuel system will bleed itself automatically.

– Check the entire fuel system for leaks.

Renew the affected component if leakage occurs.

– After completing the repair, road-test the vehicle. Accelerate with full throttle at least once. Then check the high-pressure section of the fuel system again for leaks.

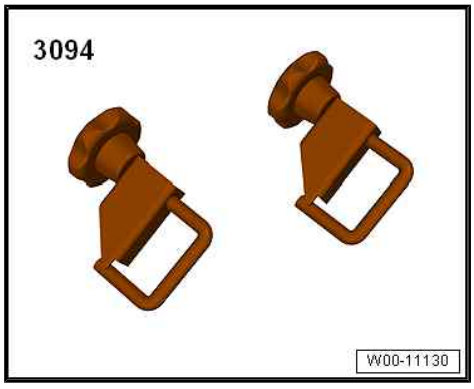
– Install engine cover panel ⇒ page 172 .

5.6 Checking return flow rate of injectors at starter cranking speed

Only perform this test if the engine does not start at all.

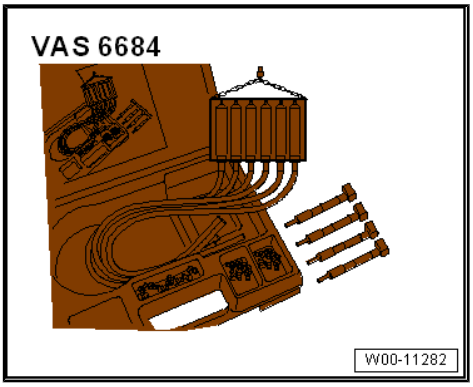
Special tools and workshop equipment required

♦ Hose clamps, up to 25 mm - 3094-



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♦ Return flow meter - VAS 6684-



Caution

Risk of malfunctions caused by dirt.

♦ *Observe ⇒ "3.1 Rules for cleanliness", page 8 .*

Measuring return flow rate of individual injectors

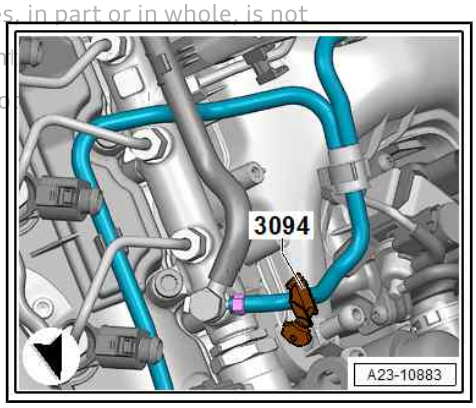
Each injector normally has a relatively low fuel return flow rate. If the return flow rate at one injector is relatively high compared to the other injectors, that injector is probably defective.

– Remove engine cover panel ⇒ page 172 .

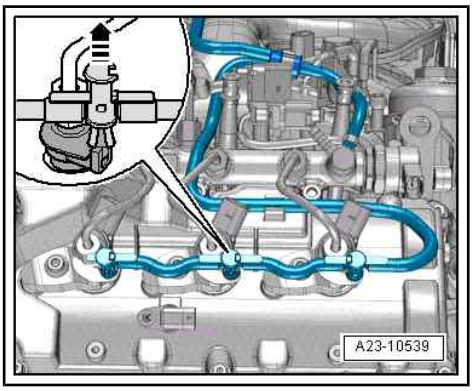
– Clean all return line connections with engine cleaner or brake cleaner and dry.

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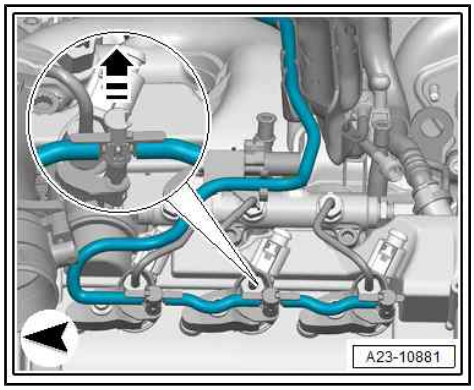
– Clamp off fuel return line downstream of restrictor using hose clamp up to 25 mm - 3094- .



– Disconnect fuel return hoses from injectors on cylinder bank 1; to do so, press down both tabs and at the same time pull centre piece up to release connection -arrow-.



– Disconnect fuel return hoses from injectors on cylinder bank 2; to do so, press down both tabs and at the same time pull centre piece up to release connection -arrow-.

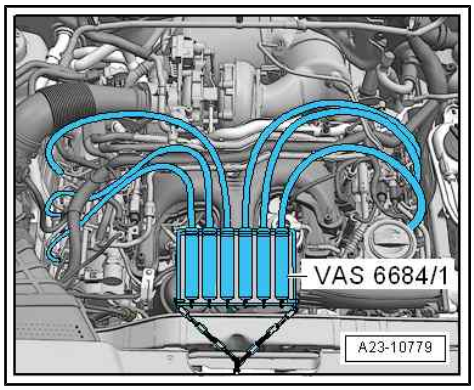


– Connect hoses of return flow meter - VAS 6684- to all return line connections of the six injectors.

– Operate starter three times (wait approx. 20 seconds each time after operating starter to prevent it from overheating).

• Specification of return flow rate: 0 ml

– If fuel comes out of one injector, that injector must be renewed ⇒ page 533 .



– Remove hose clamp up to 25 mm - 3094- from fuel return line.

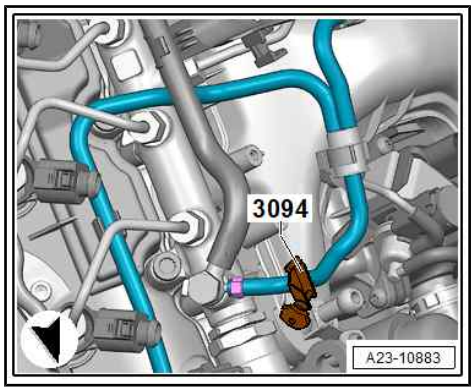
Attaching

– Check O-ring for fuel return line connection for damage and deformation.

If O-ring is damaged or deformed, renew O-ring.

Note

Lubricate all O-rings with engine oil or assembly oil before installing.



– Push return line connections carefully over seals and onto injectors. The catch should engage audibly. Then press release pin down carefully.

Checking fuel system for leaks

– Run engine at idling speed for several minutes (do not press accelerator) and then switch off. Fuel system will bleed itself automatically.

– Check the entire fuel system for leaks.

Renew the affected component if leakage occurs.

– After completing the repair, road-test the vehicle. Accelerate with full throttle at least once. Then check the high-pressure section of the fuel system again for leaks.

– Install engine cover panel ⇒ page 172 .

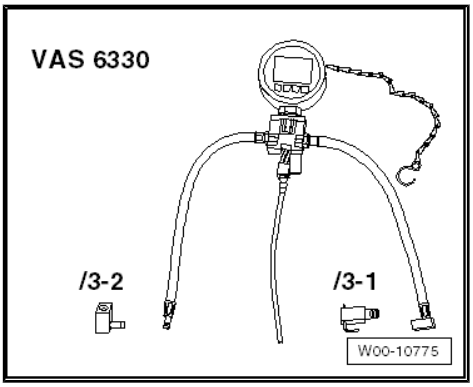
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5.7 Checking restrictor in fuel return line

On vehicles with fuel systems with 6 bar, the restrictor maintains a constant residual pressure in the fuel return line. This residual pressure is required for the control function of the injectors.

Special tools and workshop equipment required

- Tester for fuel return system - VAS 6330-



Caution

Risk of malfunctions caused by dirt.

- ***Observe ⇒ "3.1 Rules for cleanliness", page 8 .***

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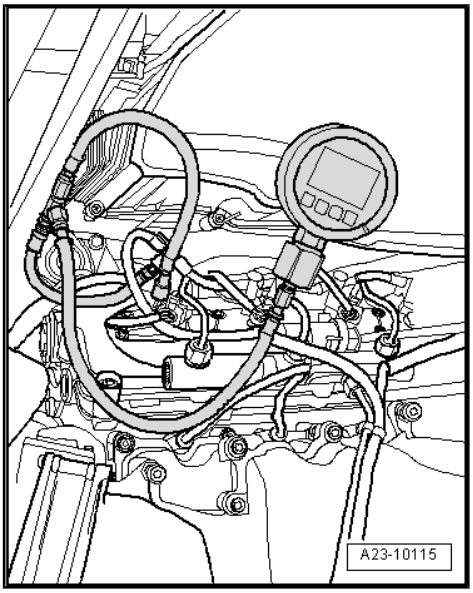
– Remove engine cover panel ⇒ page 172 .
– Clean return line connection on cylinder 1 (with commercial cleaning solution or similar) before removing.
– Dry return line connection on cylinder 1.
– Cover return line connection on cylinder 1 with a cloth.
– Detach return line connection from cylinder 1. To do so, press tabs down and pull centre piece up to release connection.

Note

No dirt must be allowed to get into the disconnected return line or the open connection on the injector.

– Connect tester for fuel return system - VAS 6330- between return line connection on injector and return line.
– Start engine.
– Check pressure indicated on tester.
- Specification: approx. 4 bar

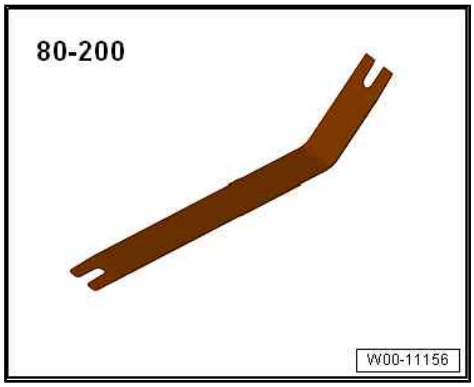
If specification is not attained, renew fuel return line with restrictor and ring/hose connector.



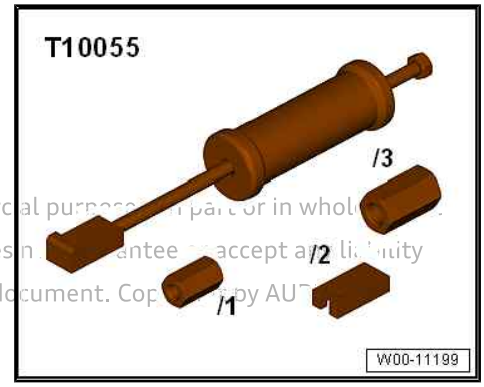
5.8 Removing and installing injectors

Special tools and workshop equipment required

- Cleaning kit - VAS 6811-
- Removal lever - 80 - 200-

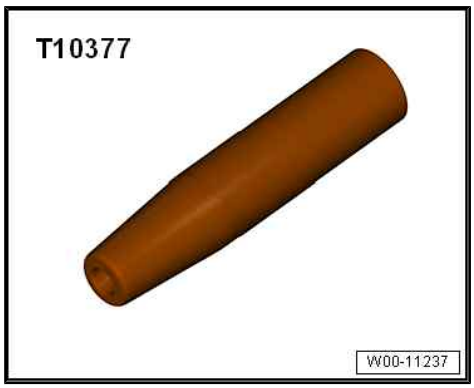


- Puller - T10055-

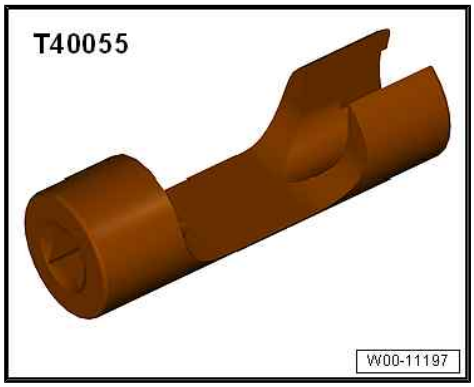


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- Assembly sleeve - T10377-



- Socket - T40055-



Removing

Note

All cable ties which are released or cut open when removing must be fitted in the same position when installing.

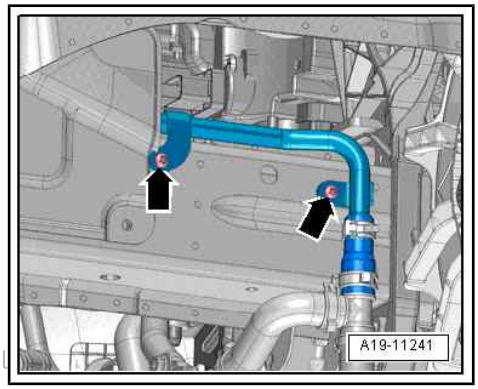
– Remove engine cover panel ⇒ page 172 .

Cylinder bank 1 (right-side):

– Remove air cleaner housing ⇒ page 510 .

Cylinder bank 2 (left-side):

– Unscrew nuts -arrows- and move clear coolant pipe on longitudinal member.

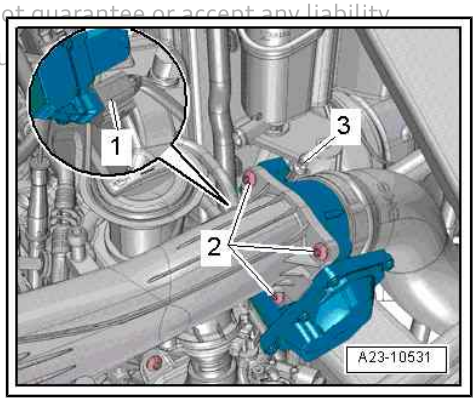


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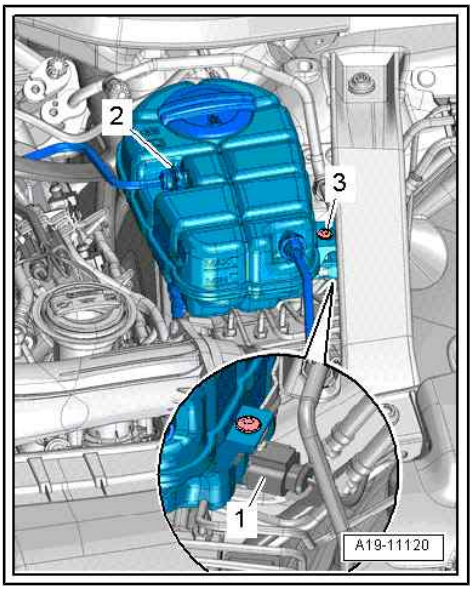
– Release hose clip -3- and detach air hose.

Note

Disregard items -1 and 2-.



– Unplug electrical connector -1-.
– Remove bolt -3-.
– Lift retaining clip -2- and disconnect coolant line.
– Place coolant expansion tank to one side.
– Seal off open lines and connections with clean plugs.



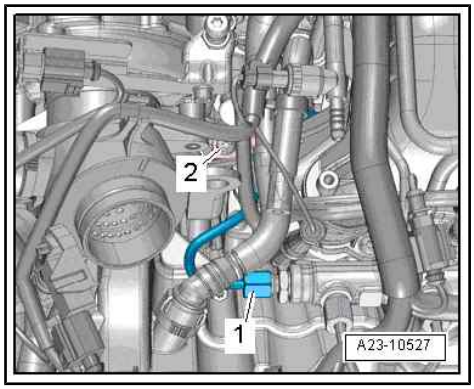
Both sides (continued)

Caution

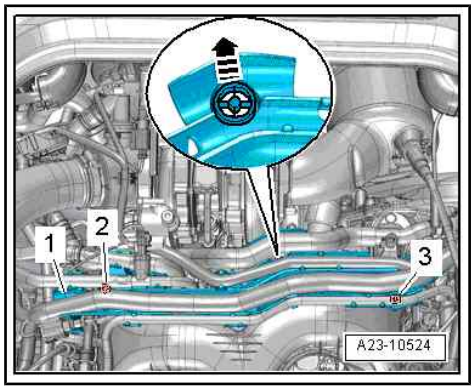
Risk of malfunctions caused by dirt.

- *Observe ⇒ "3.1 Rules for cleanliness", page 8 .*

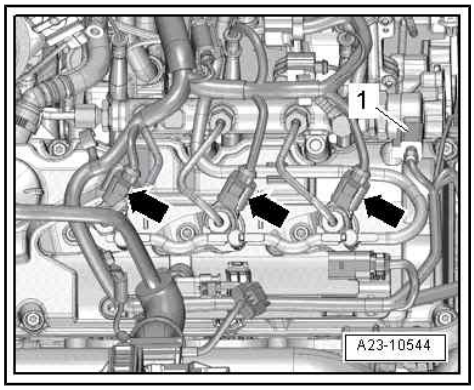
– Unscrew union nut -1- and bolt -2-.



– Use removal lever - 80 - 200- to move electrical wiring harness and hoses clear at cable guide -1-.
– Pull coolant hose off to rear -arrow-.
– Unscrew bolts -2 and 3- and remove cable guide.



– Unplug electrical connectors at injectors -arrows- and at fuel pressure regulating valve - N276- -item 1-.
– Move clear electrical wiring harness at cylinder head cover and fuel rail.

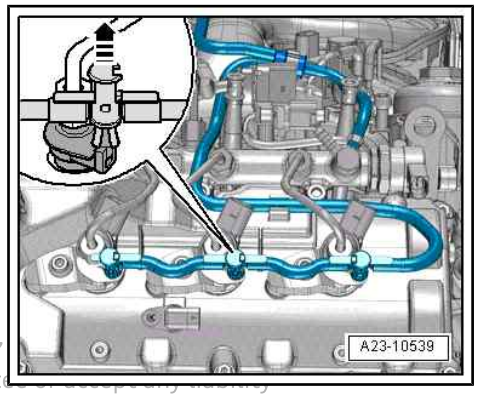


– Disconnect fuel return hoses from injectors; to do so, press down both tabs and at the same time pull centre piece up to release connection -arrow-.

Caution

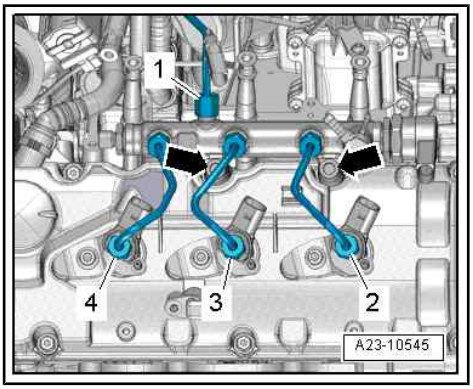
Used injectors must always be re-installed on the same cylinder.

- *Mark injectors to ensure that they are re-installed at the correct cylinders.*

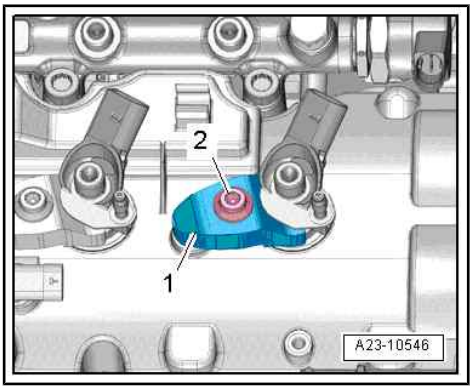


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– Loosen union nuts for high-pressure pipes -2, 3 and 4- using socket - T40055- .
– Seal off open lines and connections with clean plugs.

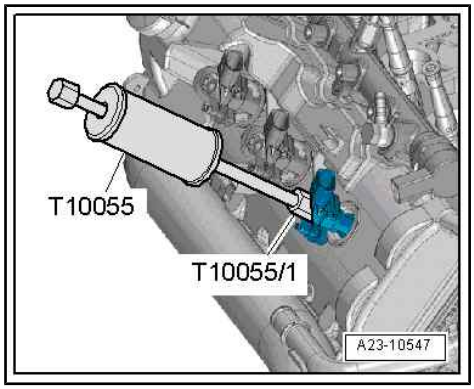


– Mark position of clamping piece -1- in relation to injector with paint for re-installation.
– Unscrew bolt -2- and detach clamping piece.
– Repeat work steps on remaining injectors.



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– Apply puller - T10055- with adapter -T10055/1- to injector, as shown in illustration. Pull off injector by tapping gently.



– Place removed injectors on a clean cloth.

Installing new injectors

When installing a new injector, the following components must be renewed:

- Bolt for clamping piece
- Copper seal
- O-ring for injector bore
- O-ring for fuel return line connection

Installing used injectors

When re-installing a used injector in the same cylinder, the following components must be renewed:

- Bolt for clamping piece
- Copper seal
- O-ring for injector bore
- O-ring for fuel return line connection

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– Spray tip of injector nozzle with rust-solvent spray. Wait approx. 5 minutes and wipe off soot particles and oil with a cloth.

– To remove the old copper seal from the injector, clamp the seal carefully in a vice so that it is just held between the jaws without turning. Then carefully pull and twist the injector out of the copper seal by hand.

– Clean off deposits under the copper seal using a suitable scraper.

Continued (same procedure for used and new injectors):

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- .***

– Fit new copper seal.

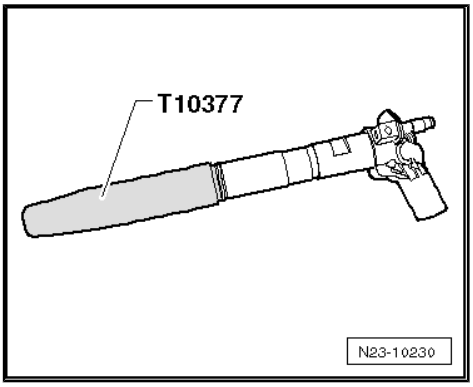
– Lubricate all O-rings with engine oil or assembly oil before installing.

– Renew O-ring for injector bore using assembly sleeve - T10377- .

– Install injectors.

Remaining installation steps are carried out in reverse sequence; note the following:

– Install high-pressure pipes ⇒ page 539 .



Note

Lubricate all O-rings with engine oil or assembly oil before installing.

– Push the return line connections carefully over the new seals and onto the injectors. The catch should engage audibly. Then press release pin down carefully.

After renewing one or more injectors, the “injector delivery calibration values” and “injector voltage calibration values” for the new injectors must be written into the engine control unit ⇒ page 525 .

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.

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Note

If there is any air left in the fuel system, the engine may switch to the backup mode ('emergency running' mode) during the road test. Switch off the engine and erase the event memory. Then continue the road test.

– Interrogate the event memory again after road-testing.

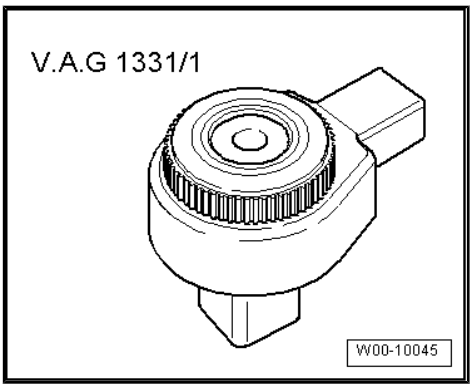
Tightening torques

♦ ⇒ “5.1 Exploded view - injectors”, page 521

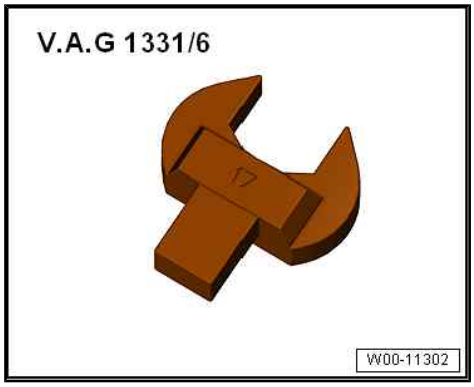
5.9 Removing and installing high-pressure pipes

Special tools and workshop equipment required

♦ Ratchet - V.A.G 1331/1-



- Open end spanner insert, AF 17 - V.A.G 1331/6-



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- Socket - T40055-



Procedure

Note

- *Before re-installation, check taper seats for deformation, cracks, damage, scores and corrosion. Renew high-pressure pipes if they are damaged or corroded.*
- *Check that bore in pipe is not distorted, restricted or damaged in any other way.*
- *When re-installing "old" high-pressure pipe, observe marking for installation position.*

– Use vacuum cleaner to remove dirt from taper seat at fuel rail.

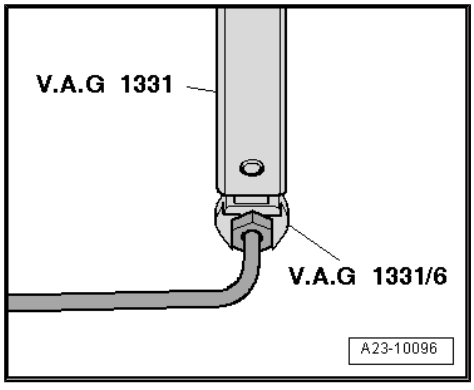
– Clean fuel pipe and end of pipe with engine cleaner or brake cleaner and dry.

– Lubricate threads of union nuts with clean engine oil.

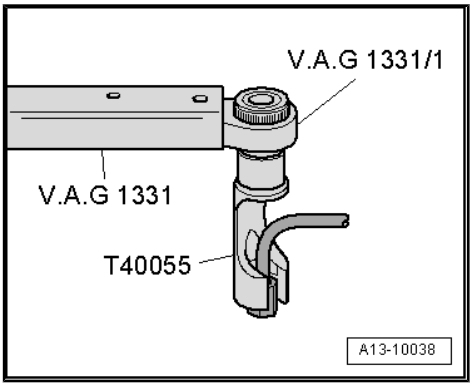
– Hand-tighten union nuts on high-pressure pipes until they make contact (ensure that pipes are not under tension).

Union nuts (AF 17) on fuel rail:

– To secure high-pressure pipes, use torque wrench - V.A.G 1331- with tool insert, AF 17 - V.A.G 1331/6- .



Union nuts (AF 17) on injectors:



– To tighten unions of injectors, use torque wrench - V.A.G 1331- with ratchet - V.A.G 1331/1- and socket - T40055- .

Bleeding fuel system and checking for leaks

– Run engine at idling speed for several minutes (do not press accelerator) and then switch off.

Note

The fuel system is self-bleeding; do not open the high-pressure connections.

– Switch off ignition.

– Carefully check the complete fuel system including all 6 return line connections for leaks.

Renew affected component if leakage still occurs after tightening to correct torque.

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– After completing the repair, road-test the vehicle. Accelerate with full throttle at least once. Then inspect high-pressure section of fuel system again for leaks.

Note

If there is any air left in the fuel system, the engine may switch to the backup mode ('emergency running' mode) during the road test. Switch off the engine and erase the event memory. Then continue the road test.

– Interrogate the event memory again after road-testing.

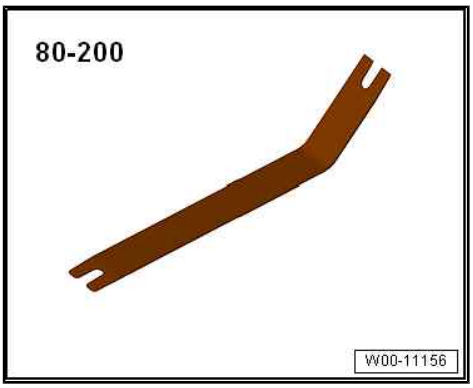
Tightening torques

♦ ⇒ “5.1 Exploded view - injectors”, page 521

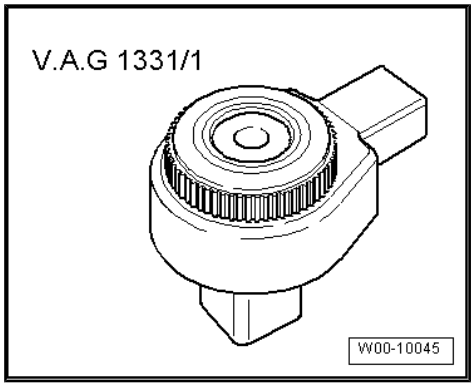
5.10 Removing and installing high-pressure reservoir (rail)

Special tools and workshop equipment required

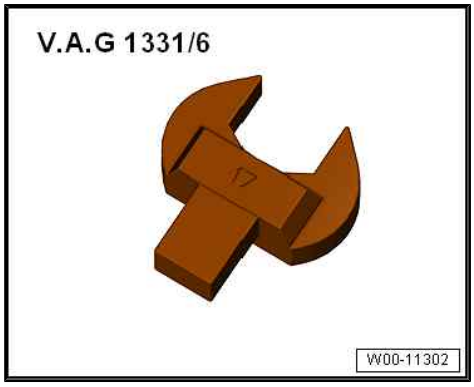
♦ Removal lever - 80 - 200-



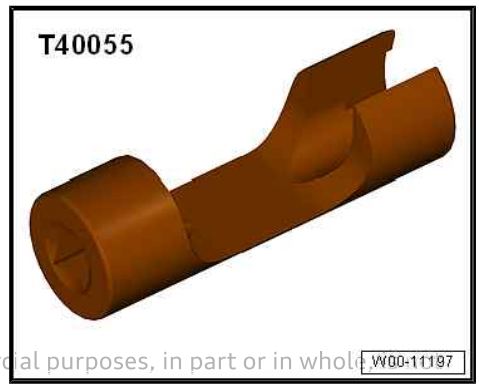
♦ Ratchet - V.A.G 1331/1-



♦ Open end spanner insert, AF 17 - V.A.G 1331/6-



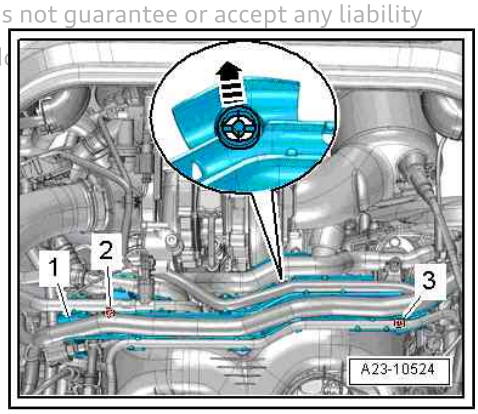
♦ Socket - T40055-



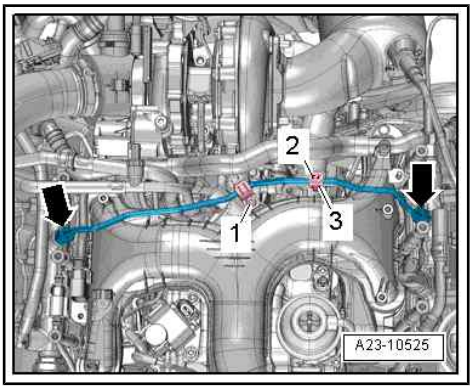
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Removing

– Remove engine cover panel ⇒ page 172 .
– Use removal lever - 80 - 200- to move electrical wiring harness and hoses clear at cable guide -1-.
– Pull coolant hose off to rear -arrow-.
– Remove bolts -2, 3- and move cable guide to rear.



– Unscrew union nut on fuel rail to be removed.

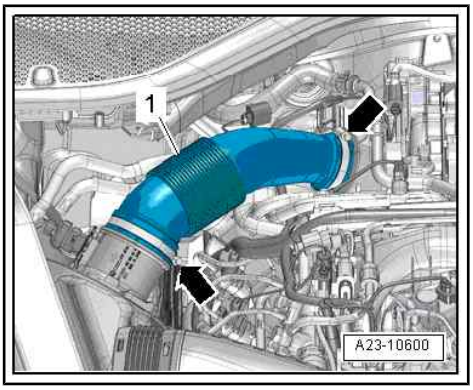


Note

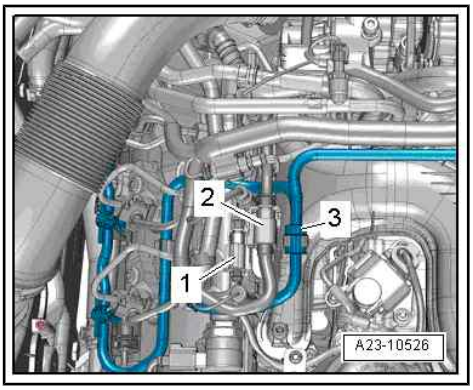
- *-Left arrow- for fuel rail on cylinder bank 1*
- *-Right arrow- for fuel rail on cylinder bank 2*

Fuel rail on cylinder bank 1

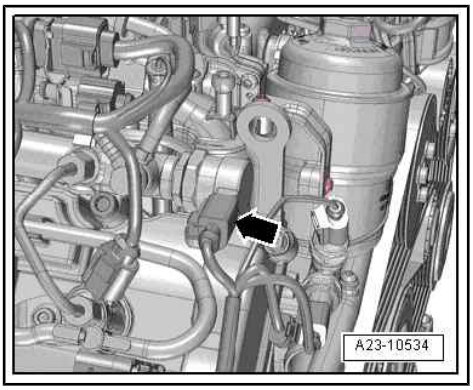
– Release hose clips -arrows- and detach air pipe -1-.



– Detach electrical connectors -1 and 2- and remove non-return valve -3- from bracket.

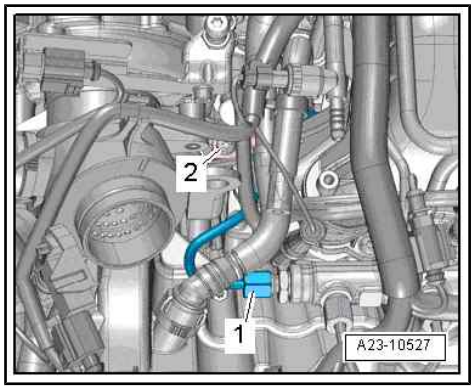


– Unplug electrical connector -arrow- at fuel pressure regulating valve - N276- .

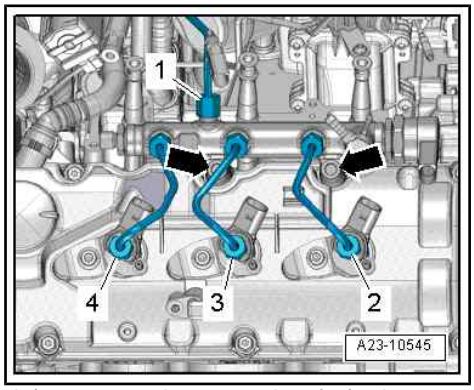


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– Remove union nut -1- on fuel rail.
– Remove banjo bolt ⇒ Item 14 (page 523) for fuel return lines from fuel rail.



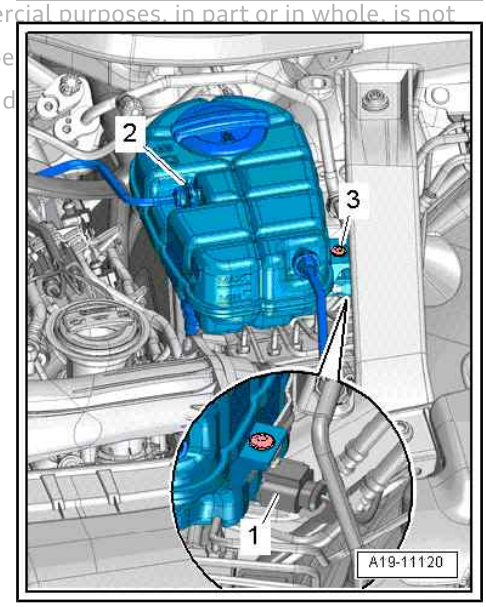
– Loosen union nuts of high-pressure pipes -2, 3 and 4-.
– Remove bolts -arrows- from fuel rail and place them down carefully on a clean surface.
– Seal off open lines and connections with clean plugs.



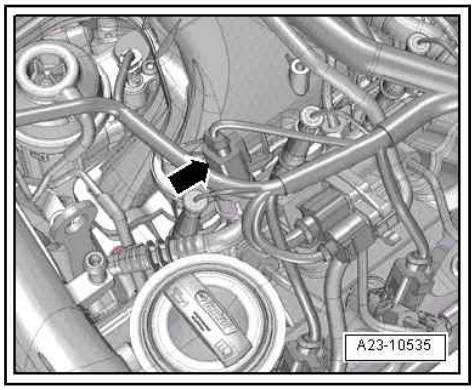
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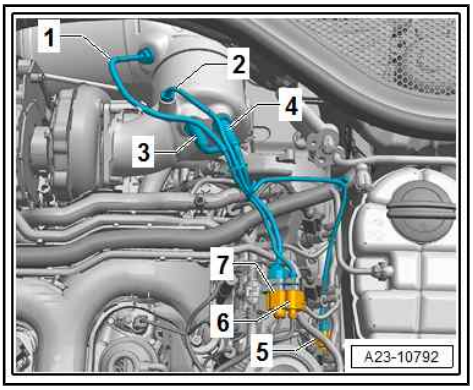
Fuel rail on cylinder bank 2

– Unplug electrical connector -1-.
– Remove bolt -3-.
– Lift retaining clip -2- and disconnect coolant line.
– Place coolant expansion tank to one side.
– Seal off open lines and connections with clean plugs.



– Unplug electrical connector at fuel pressure sender - G247- -arrow-.





– Unclip bracket for electrical connectors -6 and 7-.
– Move electrical wiring harness clear.
– Remove union nut of rear fuel supply line on fuel rail.
– Unscrew union nuts for high-pressure pipes between injectors and fuel rail.
– Remove bolts from fuel rail and place them down carefully on a clean surface.
– Seal off open lines and connections with clean plugs.

Installing

Installation is carried out in reverse order; note the following:

– Install high-pressure pipes ⇒ page 539 .

Tightening torques

◆ ⇒ “5.1 Exploded view - injectors”, page 521

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6 Senders and sensors

⇒ “6.1 Removing and installing control unit for structure-borne sound J869 and actuator for structure-borne sound R214 ”, page 546

⇒ “6.2 Removing and installing engine sound generator control unit J943 ”, page 547

⇒ “6.3 Removing and installing fuel pressure regulating valve N276 ”, page 547

⇒ “6.4 Checking fuel pressure regulating valve N276 ”, page 549

⇒ “6.5 Removing and installing fuel pressure sender G247 ”, page 551

⇒ “6.6 Removing and installing air mass meter G70 ”, page 552

⇒ “6.7 Removing and installing pressure differential sender G505 ”, page 553

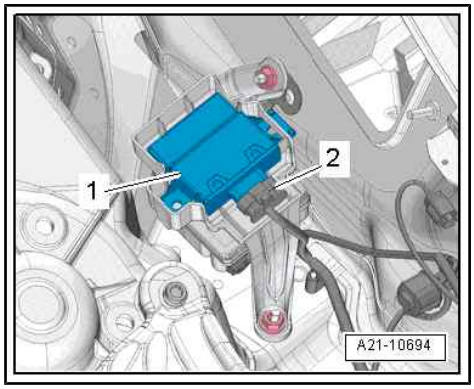
6.1 Removing and installing control unit for structure-borne sound - J869- and actuator for structure-borne sound - R214-

Removing

– Remove plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .

Control unit for structure-borne sound - J869- :

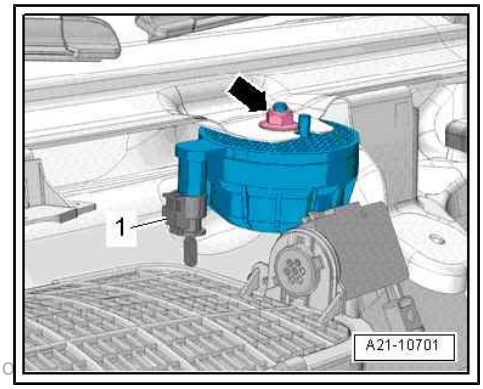
– Unplug electrical connector -2- and unclip control unit for structure-borne sound - J869- .



Actuator for structure-borne sound - R214- :

– Remove nut -arrow-.

– Detach actuator for structure-borne sound - R214- and disconnect electrical connector -1-.



Installing

Installation is carried out in the reverse order; note the following.

– Install plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .

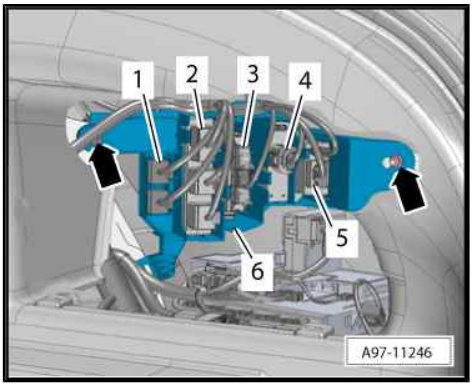
Tightening torques

◆ ⇒ Fig. “Actuator for structure-borne sound -R214- - tightening torque”, page 420

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6.2 Removing and installing engine sound generator control unit - J943-

Removing



– Remove retaining frame (top) for control units ⇒ Electrical system; Rep. gr. 97 ; Relay carriers, fuse carriers, electronics boxes; Overview of fitting locations - relay carriers, fuse carriers, electronics boxes .

– Unplug electrical connector -4- and unclip engine sound generator control unit - J943- .

Note

Other items can be disregarded.

Installing

Installation is carried out in reverse sequence.

6.3 Removing and installing fuel pressure regulating valve - N276-

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Special tools and workshop equipment required

♦ Open-end spanner insert, 30 mm - T10553-

Note

♦ *The fuel pressure regulating valve - N276- maintains a constant pressure in the fuel rail and the injector pipes (high-pressure fuel circuit).*

♦ *It is not possible to start engine if fuel pressure regulating valve - N276- is defective.*

♦ *If the pressure in the high-pressure fuel circuit is too high, the regulating valve opens to allow some of the fuel to flow back from the fuel rail to the fuel tank via a return hose.*

♦ *If the pressure in the high-pressure fuel circuit is too low, the valve closes and seals off the high-pressure section of the system from the low-pressure section.*

♦ *The fuel pressure regulating valve - N276- has a deformable sealing lip and can only be used once. Do not install it for test purposes.*

Removing

– Remove engine cover panel ⇒ page 172 .

WARNING

Risk of malfunctions caused by dirt.

♦ ***Observe ⇒ "3.1 Rules for cleanliness", page 8 .***

– Clean thread and area all around fuel pressure regulating valve with engine cleaner or brake cleaner and dry.

Note

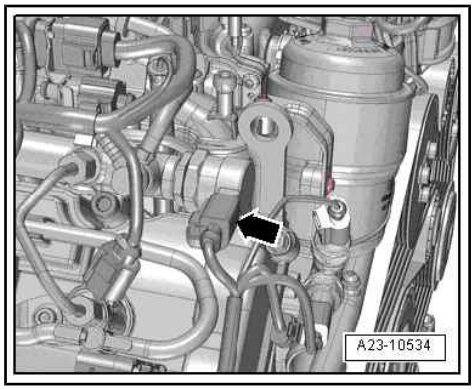
- *Clean carefully; cleaning solution must not enter the electrical connector.*
- *Make sure no dirt gets into opening in fuel rail.*

– Remove banjo bolt for fuel return hoses.

– Unplug electrical connector -arrow- at fuel pressure regulating valve - N276- .

– Loosen union nut using open-end spanner insert, 30 mm - T10553- (at the same time, counterhold at hexagon flats on housing). Then unscrew and remove by hand.

– Remove dirt from thread and sealing surface of fuel rail using a vacuum cleaner. Do not use metal tools, etc.



Note

Seal off opening in fuel rail immediately with a suitable plug to prevent dirt from entering.

Installing

Installation is carried out in reverse order; note the following:

Note

- *The fuel pressure regulating valve - N276- has a deformable sealing lip and no separate seal; it can therefore be used only once.*
- *Check that deformable sealing lip and thread on new fuel pressure regulating valve - N276- are not damaged.*
- *Check sealing surface at opening in fuel rail.*
- *The beginning of the thread, the deformable sealing lip and the O-ring of the fuel pressure regulating valve - N276- must be coated with diesel fuel.*

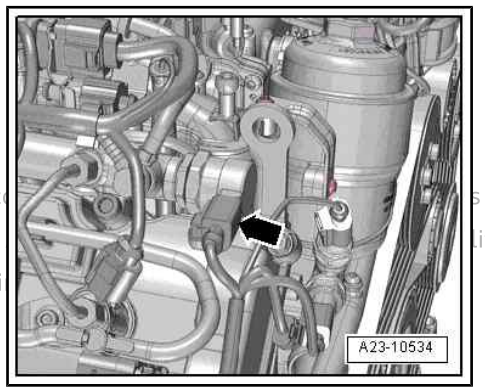
– Position fuel pressure regulating valve - N276- so that electrical wiring is not under tension when connector -arrow- is plugged in.

– Tighten union nut using open-end spanner insert, 30 mm - T10553- (at the same time, counterhold at hexagon flats on housing).

– Tighten banjo bolt for fuel return lines with new seals to 25 Nm.

– Install engine cover panel ⇒ page 172 .

– Check fuel system for leaks ⇒ page 505 .



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After renewing high-pressure pump and/or fuel pressure regulating valve - N276- , adaption must be performed. Use ⇒ Vehicle diagnostic tester.

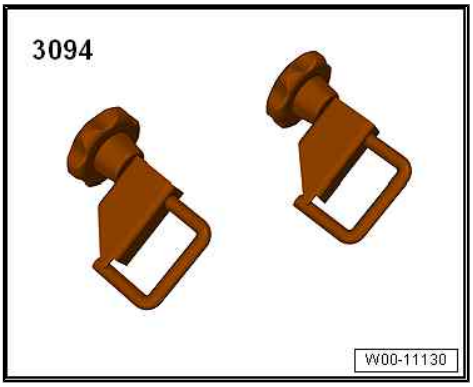
Tightening torques

- ⇒ Fig. "" Fuel pressure regulating valve -N276- - tightening torque"" , page 481

6.4 Checking fuel pressure regulating valve - N276-

Special tools and workshop equipment required

- Hose clamps, up to 25 mm - 3094-



- Fuel-resistant measuring container
- Test hose for return line connection

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Procedure

WARNING

Risk of malfunctions caused by dirt.

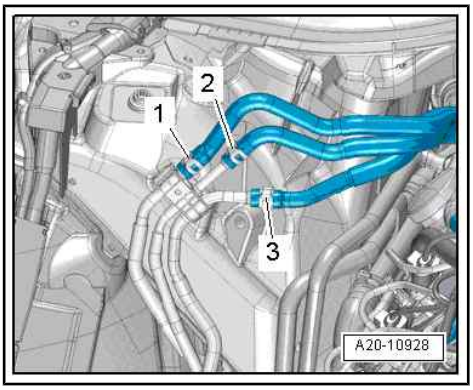
- ***Observe ⇒ "3.1 Rules for cleanliness", page 8 .***

– Remove engine cover panel ⇒ page 172 .

Note

Fuel temperature above 15 °C.

– Detach fuel return hose -2-.



Note

Disregard items -1 and 3-.

– Seal off open return line connection with a test hose -2- and a hose clamp up to 25 mm - 3094- .

– Hold end of fuel return hose -1- in measuring container.

– Start engine and run at idling speed for one minute.

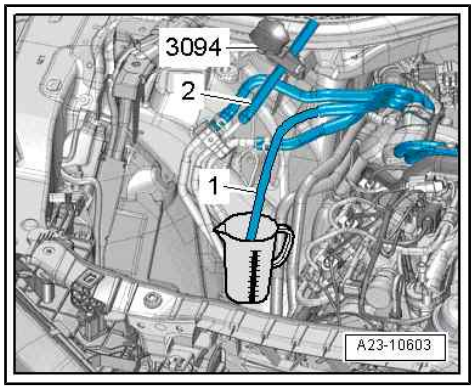
• Return flow rate (engine start): 0 ml

– Leave engine running at idling speed.

– While engine is running, empty measuring container, or exchange it for an empty container and begin measurement.

– Leave engine running at idling speed for two minutes and measure return flow rate.

• Return flow rate after 2 minutes: 0 ... 60 ml



Note

If specified values are obtained, fuel pressure regulating valve - N276- is OK.

If values do not match specifications:

Note

◆ *The fuel pressure regulating valve - N276- and injectors were checked during the preceding measuring process.*

◆ *To determine which component is defective, you must check the return flow rate of the injectors.*

– Measure return flow rate of injectors with engine running ⇒ page 527 .

– If return flow rate of injectors is OK, renew fuel pressure regulating valve - N276- .

– If return flow rate of injectors is not OK, renew defective injector.

Bleeding fuel system and checking for leaks

– Run engine at idling speed for several minutes (do not press accelerator) and then switch off. Fuel system will bleed itself automatically.

– Check the entire fuel system for leaks.

Renew the affected component if leakage occurs.

– After completing the repair, road-test the vehicle. Accelerate with full throttle at least once. Then check the high-pressure section of the fuel system again for leaks.

– Install engine cover panel ⇒ page 172 .

Note

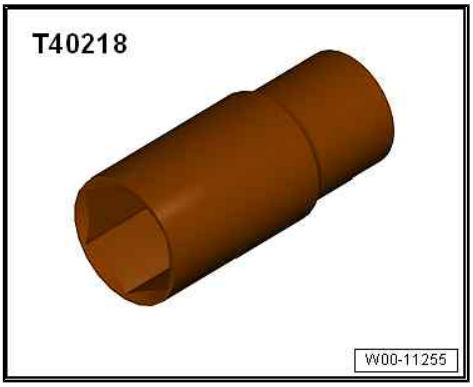
If there is any air left in the fuel system, the engine may switch to the backup mode ('emergency running' mode) during the road test. Switch off the engine and erase the event memory. Then continue the road test.

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6.5 Removing and installing fuel pressure sender - G247-

Special tools and workshop equipment required

- Socket - T40218-



- Torque wrench

Removing

Caution

Risk of malfunctions caused by dirt.

- *Observe ⇒ "3.1 Rules for cleanliness", page 8 .*

– Remove engine cover panel ⇒ page 172 .

– Clean thread and area all around fuel pressure sender with engine cleaner or brake cleaner and dry.

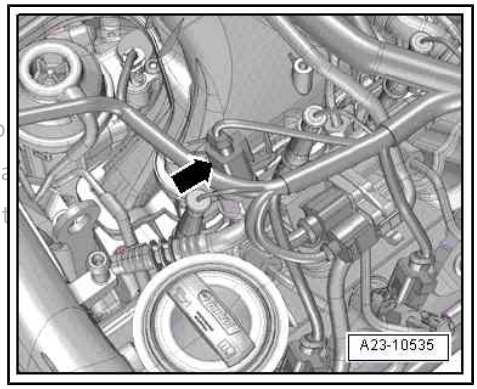
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Note

- *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 and no separate seal; it can therefore be used only once.*
- *Clean carefully; cleaning solution must not enter the electrical connector.*
- *Make sure no dirt gets into opening in high-pressure reservoir.*

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– Unplug electrical connector at fuel pressure sender - G247- -arrow-.



– Unscrew fuel pressure sender - G247- using socket, 27 mm - T40218-.

Note

An open-end spanner must not be used for loosening or tightening.

– Remove dirt from opening in fuel rail using a vacuum cleaner. Do not use metal tools, etc.

Seal off opening in fuel rail immediately with a suitable plug to prevent dirt from entering.

Installing

Installation is carried out in reverse order; note the following:

Note

- *The fuel pressure sender - G247- has a deformable sealing lip and no separate seal; it can therefore be used only once.*
- *Check that the deformable sealing lip and the thread on the new fuel pressure sender - G247- are not damaged.*
- *Check sealing surface at opening in high-pressure reservoir.*
- *The beginning of the thread and the deformable sealing lip of the fuel pressure sender - G247- must be coated with diesel fuel.*

– Screw in fuel pressure sender - G247- by hand.

– Then tighten fuel pressure sender - G247- to specified torque.

– Install engine cover panel ⇒ page 172 .

– Check fuel system for leaks ⇒ page 505 .

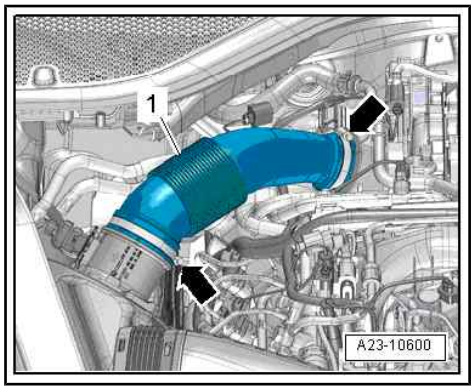
Tightening torques

- ⇒ Fig. “ Fuel pressure sender -G247- - tightening torque” , page 481

6.6 Removing and installing air mass meter - G70-

Removing

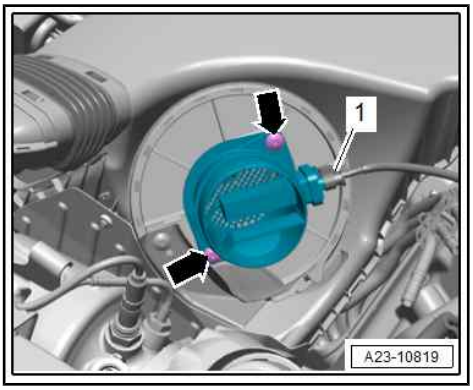
– Release hose clips -arrows- and detach air pipe -1-.



Air pipe - version 1:

– Unplug electrical connector -1-.

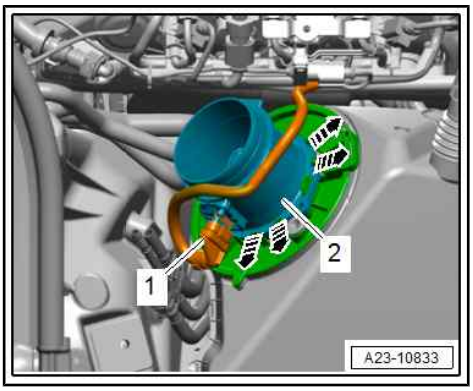
– Unscrew bolts -arrows- and detach air mass meter - G70- .



Air pipe - version 2:

– Unplug electrical connector -1-.

– Release fasteners -arrows- all around and detach air mass meter - G70- -item 2-.



Installing

Installation is carried out in reverse order; note the following:

To ensure that the air mass meter - G70- functions correctly, it is important to observe the following notes and procedures.

Note

- *If the air filter element is very dirty or wet, dirt particles or water can reach the air mass meter and falsify the detected air mass values. This will cause a loss of power as the calculated injection quantities will be too low.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *If fasteners on air pipe ("version 2") have broken off, secure air mass meter - G70- with bolts ⇒ Item 8 (page 509) ; for bolts, refer to ⇒ Electronic parts catalogue .*

Tightening torques

- ⇒ "3.1 Exploded view - air cleaner housing", page 509

6.7 Removing and installing pressure differential sender - G505-

Note

The pressure differential sender - G505- detects the amount of deposits in the particulate filter.

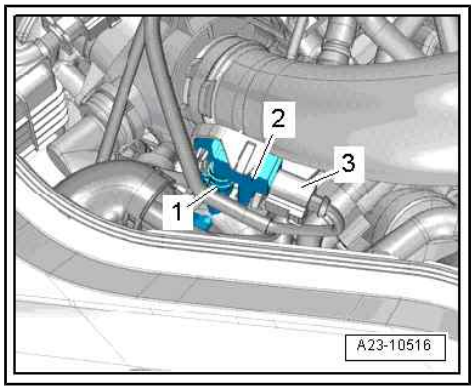
Special tools and workshop equipment required

- Vehicle diagnostic tester

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Removing

– Remove engine cover panel ⇒ page 172 .



Procedure for vehicles with one turbocharger

– Unplug electrical connector -3-.

– Unclip pressure differential sender - G505- -2- from bracket and detach.

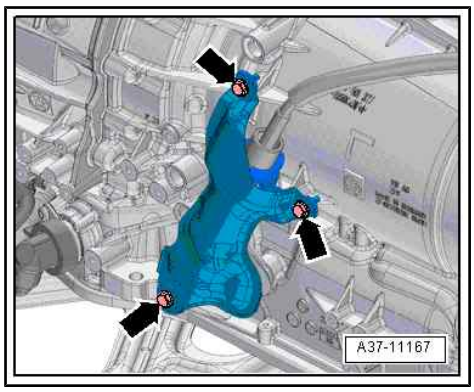
– If hose is to be disconnected from pressure sender, release hose clips (if fitted) and spray hose with silicone-free lubricant.

– To prevent hose connection from breaking off, carefully disconnect hose and keep it straight when pulling it off.

Procedure for vehicles with two turbochargers

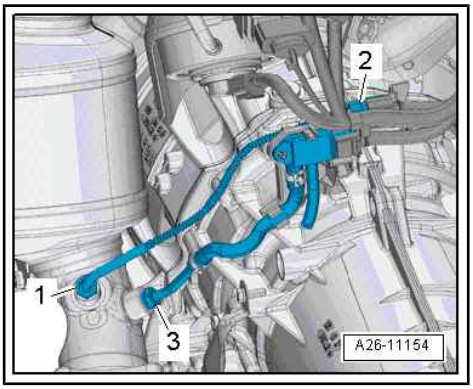
– Remove front exhaust pipe ⇒ page 599 .

– Remove bolts -arrows- and detach heat shield.



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– Unplug electrical connector -2-.
– Unclip pressure differential sender - G505- from bracket and detach.
– If hose is to be disconnected from pressure sender, release hose clips (if fitted) and spray hose with silicone-free lubricant.
– To prevent hose connection from breaking off, carefully disconnect hose and keep it straight when pulling it off.



Note

The short measuring line can be pulled off with the pressure differential sender - G505- removed.

Installing

Installation is carried out in reverse order; note the following:

Note

- *Blow through hose (towards particulate filter) with compressed air to remove dirt or ice (frozen condensation).*
- *Make sure that hoses are securely fitted and that there are no leaks.*
- *If pressure pipes have been detached from particulate filter, tighten connections to specified torque.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

Adaption must be performed after renewing pressure differential sender - G505- and/or particulate filter. Use ⇒ Vehicle diagnostic tester.

Tightening torques

- ⇒ “8.1.1 Exploded view - Lambda probe, vehicles with one turbocharger and without SCR system”, page 563

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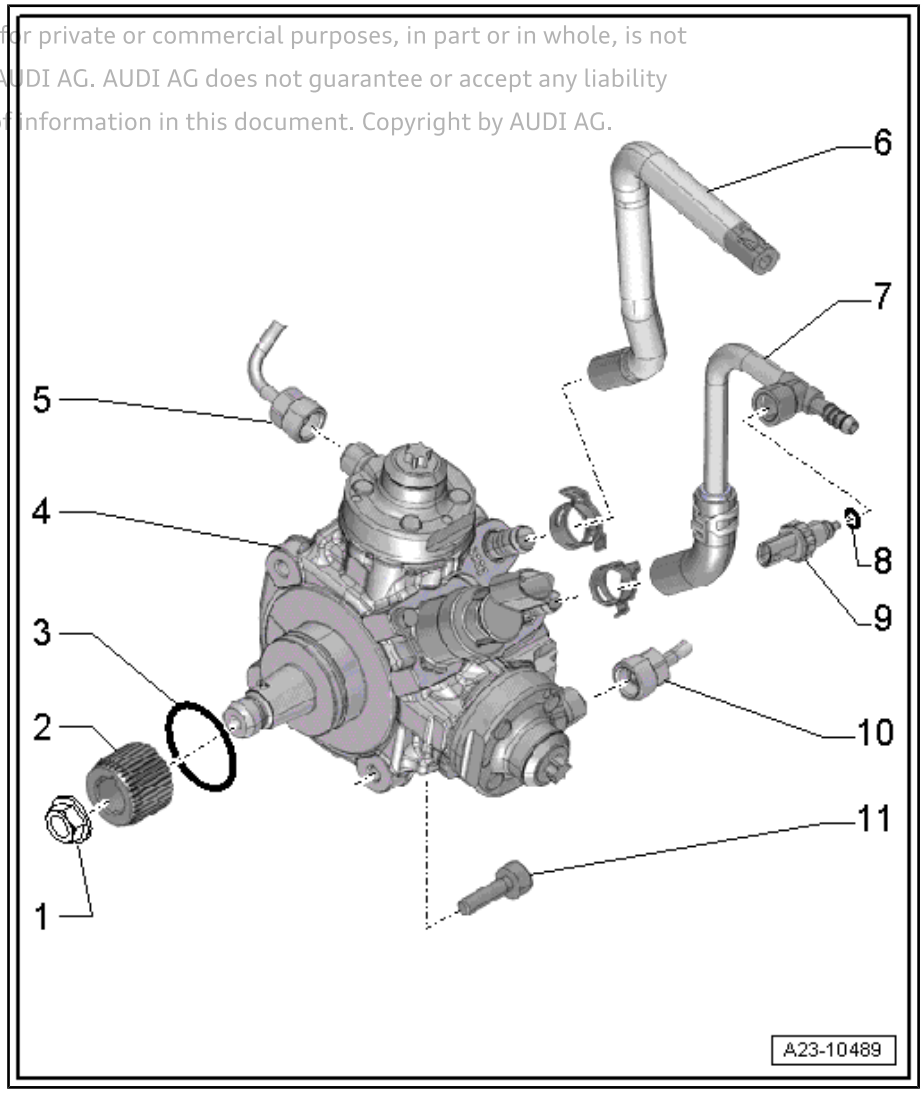
7 High-pressure pump

⇒ “7.1 Exploded view - high-pressure pump”, page 556

⇒ “7.2 Removing and installing high-pressure pump”, page 557

7.1 Exploded view - high-pressure pump

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1 - Nut

- To loosen, counterhold adapter -item 2- using counterhold tool - T40248- or counterhold tool - T40292-
- 70 Nm

2 - Adapter

- For chain sprocket for high-pressure pump
- Different types of adapters are fitted depending on version
- To loosen nut -item 1-, use counterhold tool - T40248- or counterhold tool - T40292-
- Install on new high-pressure pump when renewing high-pressure pump

3 - O-ring

- Renew

4 - High-pressure pump

> **Caution**
>
> *Risk of malfunctions caused by dirt.*
> *Observe ⇒ “3.1 Rules for cleanliness”, page 8 .*
>
> *Running when dry causes irreparable damage to high-pressure pump.*
> *After installing the high-pressure pump, the pump must first be filled with fuel before the engine is started for the first time ⇒ page 504 .*

- Removing and installing ⇒ page 557

5 - High-pressure pipe

- Do not alter shape
- Check for damage before re-installing
- Always renew high-pressure pipe when renewing high-pressure pump
- Installing ⇒ page 539
- Lubricate threads of union nuts with clean engine oil

- ❑ 25 Nm

6 - Fuel return hose

7 - Fuel supply hose

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8 - O-ring

- ❑ Renew

9 - Fuel temperature sender - G81-

- ❑ 2 Nm

10 - High-pressure pipe

- ❑ Do not alter shape
- ❑ Check for damage before re-installing
- ❑ Always renew high-pressure pipe when renewing high-pressure pump
- ❑ Installing ⇒ page 539
- ❑ Lubricate threads of union nuts with clean engine oil
- ❑ 25 Nm

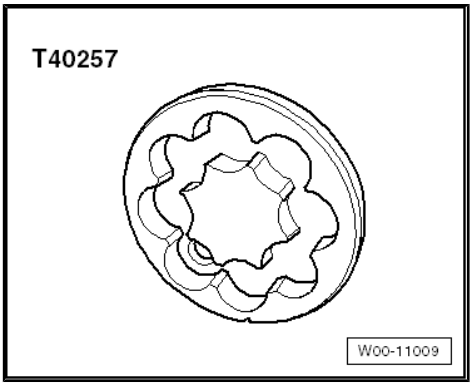
11 - Bolt

- ❑ Renew
- ❑ 22 Nm

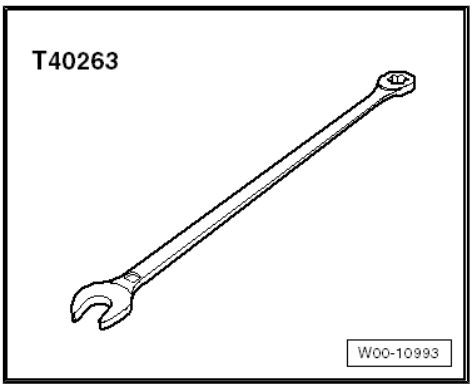
7.2 Removing and installing high-pressure pump

Special tools and workshop equipment required

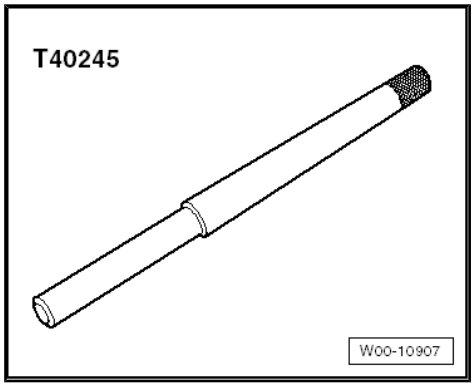
- ♦ Turning-over tool - T40257-



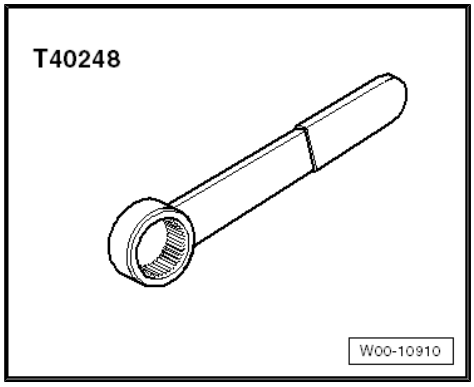
- ♦ Wrench, 21 mm - T40263-



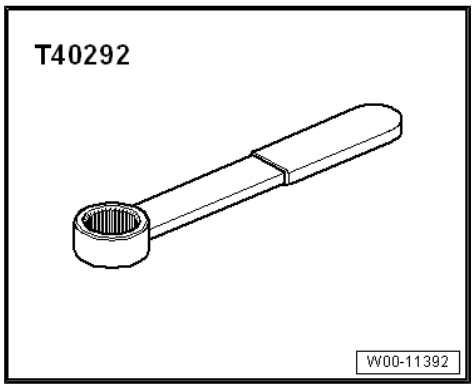
- Locking pin - T40245-



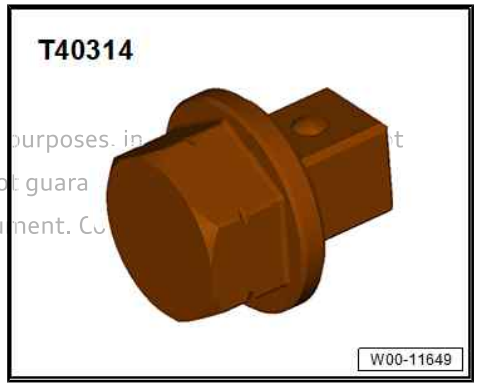
- Counterhold tool - T40248- or counterhold tool - T40292- (different types of adapters are fitted depending on version)



- Counterhold tool - T40292-



- Adapter -T40314-



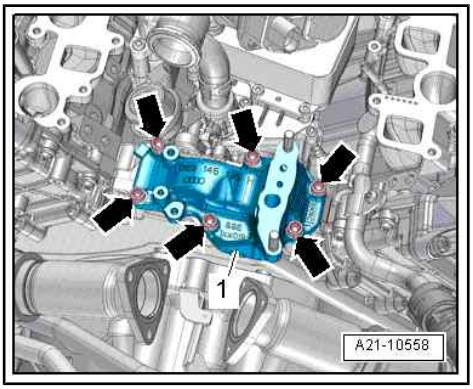
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Removing

– Remove intake manifold ⇒ page 513 .
– Remove turbocharger ⇒ page 420 .
– Remove engine oil cooler ⇒ page 332 .
– Remove coolant shut-off valve ⇒ page 375 .

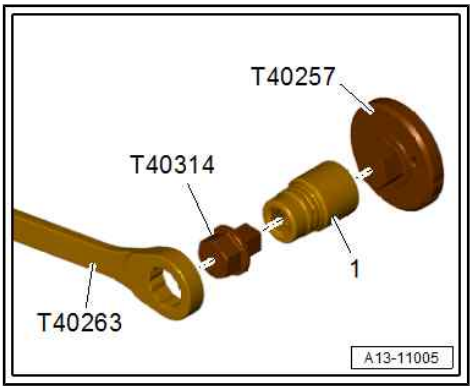
– Unscrew bolts -arrows- and swivel bracket -1- for turbocharger to side.

– Remove noise insulation (rear) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .



– Assemble tools as shown in illustration.

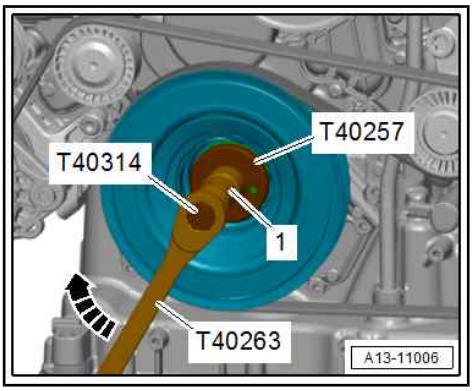
1 - Socket (21 mm) for 1/2" drive



Caution

Irreparable damage can be caused if the camshaft timing chain slips.

- ***Turn crankshaft only in direction of engine rotation -arrow-.***



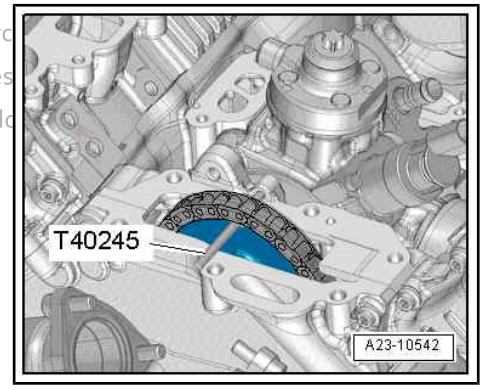
– Turn crankshaft until chain sprocket for high-pressure pump can be locked in position using locking pin -T40245- .

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th respect to the correctness of information in this do

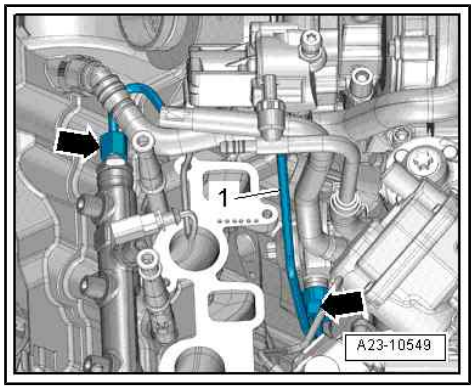
Caution

Risk of malfunctions caused by dirt.

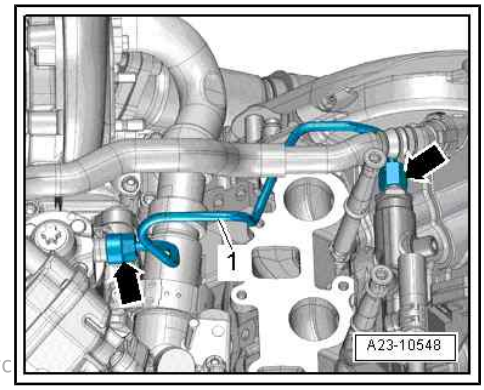
- ***Observe ⇒ "3.1 Rules for cleanliness", page 8 .***



– Unscrew union nuts -arrows- and detach high-pressure pipe (right-side) -1-.

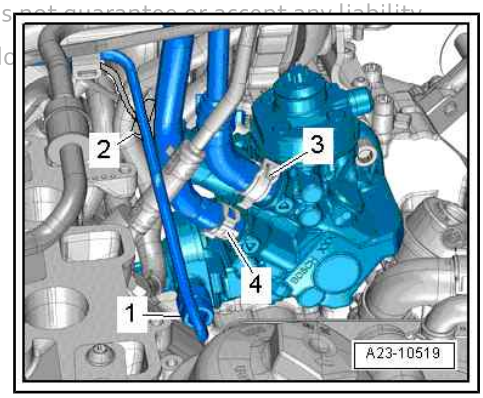


– Unscrew union nuts -arrows- and detach high-pressure pipe (left-side) -1-.
– Seal off open lines and connections with clean plugs.



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– Unplug electrical connector -2-.
– Release hose clips -3 and 4- and detach fuel hoses.



Note

Lay a cloth under the connection to catch escaping fuel.

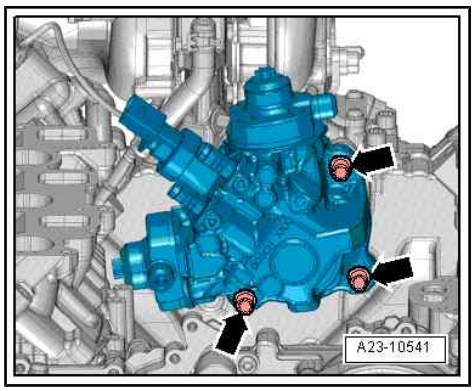
Note

Disregard -item 1-.

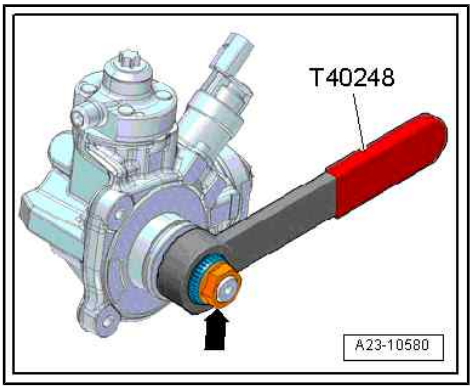
– Unscrew bolts -arrows- and detach high-pressure pump.

Installing

Installation is carried out in reverse order; note the following:



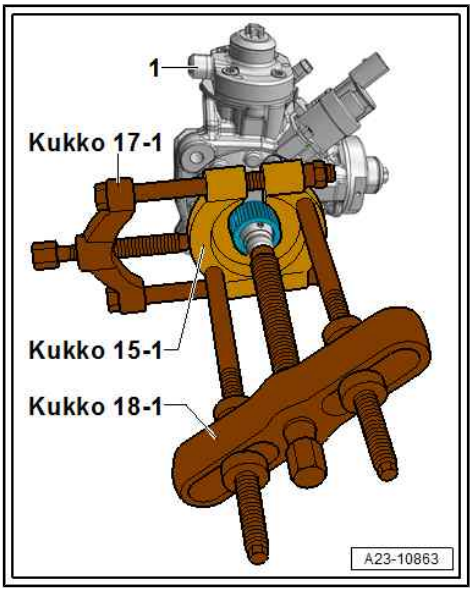
– When renewing high-pressure pump, install adapter from old high-pressure pump on new pump.
– Use counterhold tool - T40248- or counterhold tool - T40292- to loosen and tighten nut -arrow-.



– Detach adapter from high-pressure pump -1-, as shown in illustration. Use commercially available pullers, e.g. Kukko 15-1/, 17-1/ and 18-1.

Note

- *Different types of adapters are fitted depending on version.*
- *Always renew high-pressure pipes when renewing high-pressure pump.*



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– Insert high-pressure pump into chain sprocket.

• The dual toothing -arrow A- on the chain sprocket must align with the groove -arrow B- in the adapter on the high-pressure pump shaft.

– Remove locking pin - T40245- .

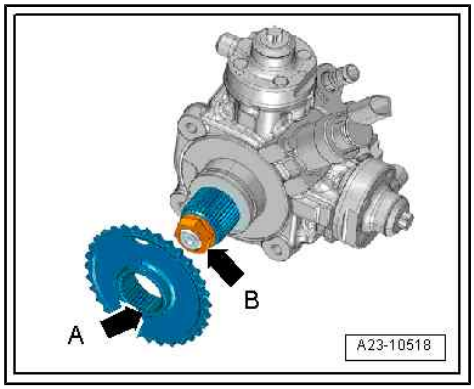
– Install high-pressure pipes ⇒ page 539 .

– Install coolant shut-off valve ⇒ page 375 .

– Install engine oil cooler ⇒ page 332 .

– Install turbocharger ⇒ page 420 .

– Install intake manifold ⇒ page 513 .



Caution

Running when dry causes irreparable damage to high-pressure pump.

- ***After installing the high-pressure pump, the pump must first be filled with fuel before the engine is started for the first time ⇒ page 504 .***

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Tightening torques

- ⇒ “7.1 Exploded view - high-pressure pump”, page 556
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

8 Lambda probe

⇒ “8.1 Exploded view - Lambda probe”, page 563

⇒ “8.2 Removing and installing Lambda probe”, page 569

⇒ “8.3 Removing and installing NOx sender”, page 573

8.1 Exploded view - Lambda probe

⇒ “8.1.1 Exploded view - Lambda probe, vehicles with one turbocharger and without SCR system”, page 563

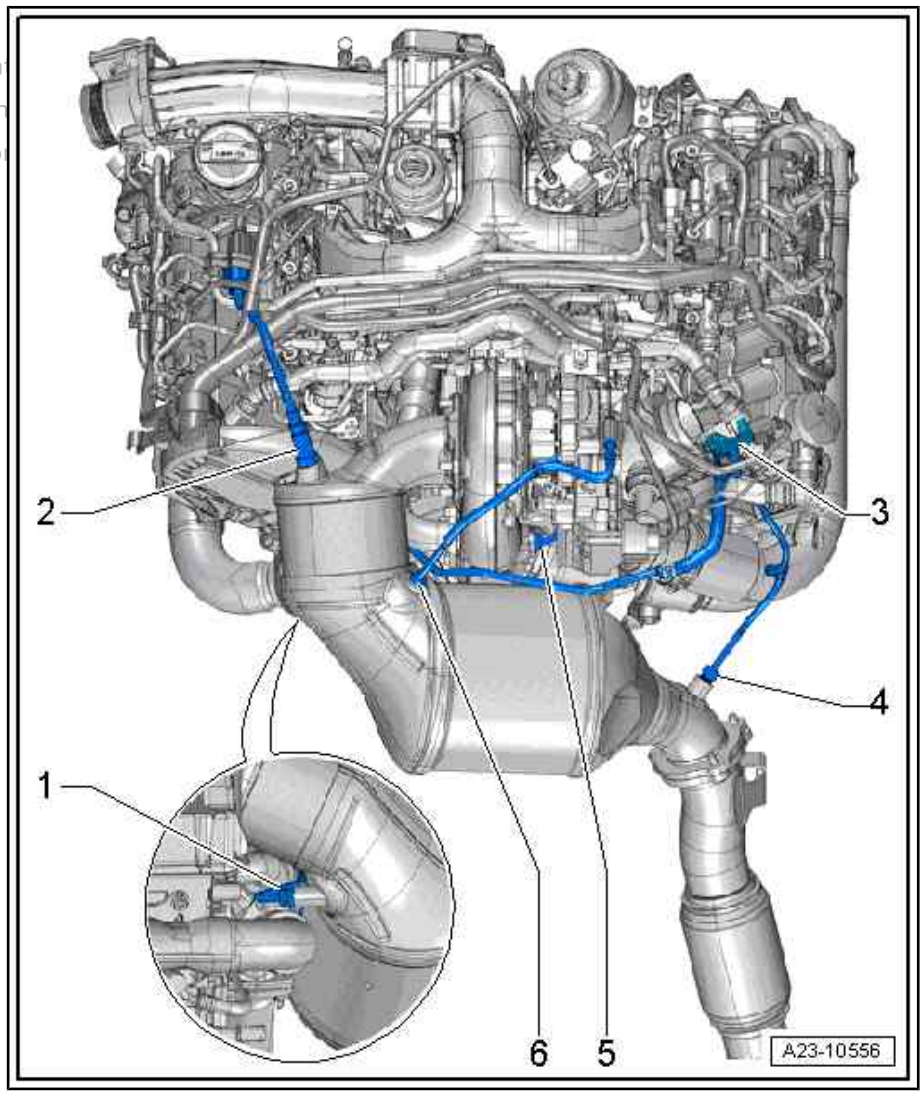
⇒ “8.1.2 Exploded view - Lambda probe, vehicles with one turbocharger and with SCR system, version 1”, page 564

⇒ “8.1.4 Exploded view - Lambda probe, vehicles with two turbochargers and without SCR system”, page 567

⇒ “8.1.5 Exploded view - Lambda probe, vehicles with two turbochargers and with SCR system”, page 568

8.1.1 Exploded view - Lambda probe, vehicles with one turbocharger and without SCR system

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1 - Pressure pipe

- For pressure differential sender - G505-
- 45 Nm

2 - Lambda probe - G39- with Lambda probe heater - Z19-

- Removing and installing ⇒ page 569
- After renewing, learnt values must be re-adapted; see ⇒ Vehicle diagnostic tester
- New Lambda probes are coated with an assembly paste
- If you are re-using Lambda probe, coat only thread with high-temperature paste; refer to ⇒ Electronic parts catalogue for high-temperature paste
- The assembly paste/ high-temperature paste must not get into the slots on the Lambda probe body
- 52 Nm

3 - Pressure differential sender - G505-

- Removing and installing ⇒ page 553
- 4.5 Nm

4 - Exhaust gas temperature sender 4 - G648-

- Removing and installing ⇒ page 650

5 - Exhaust gas temperature sender 1 - G235-

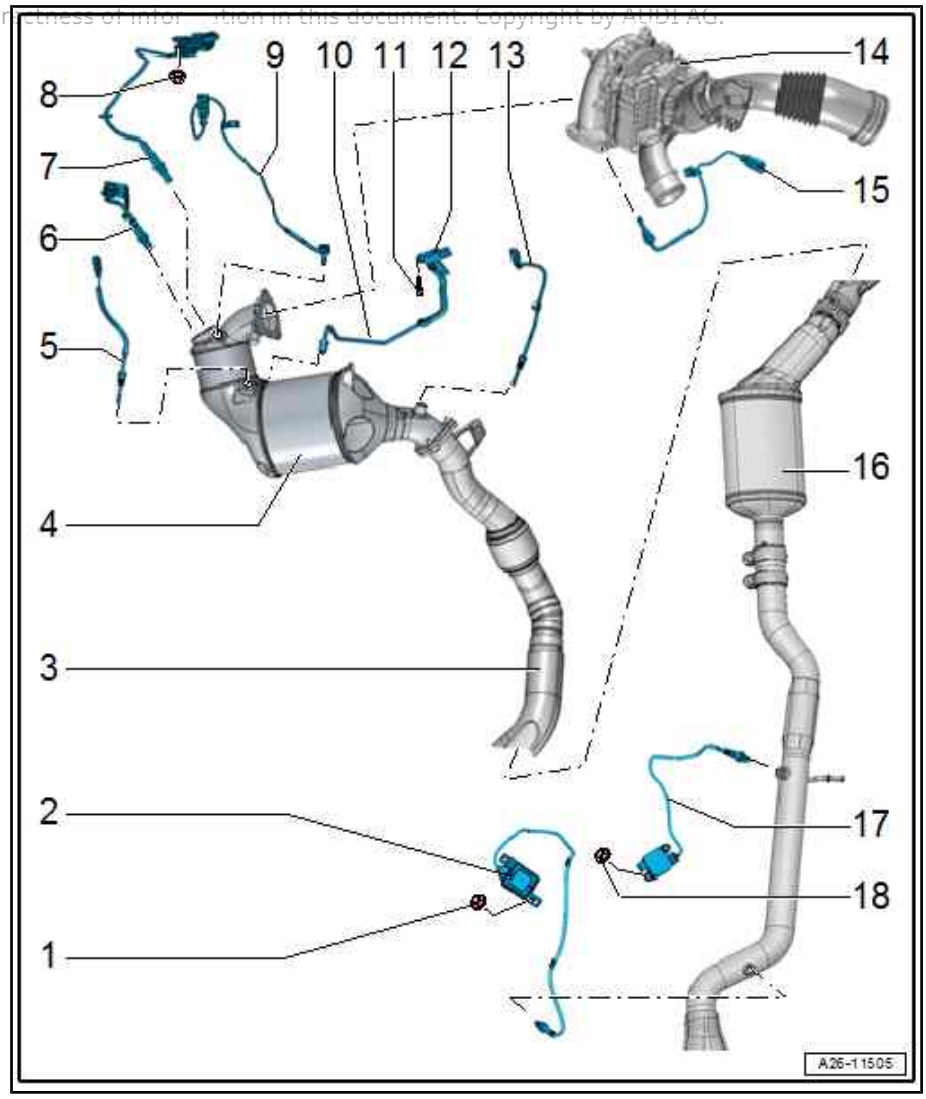
- ❑ Removing and installing ⇒ page 641

6 - Exhaust gas temperature sender 3 - G495-

- ❑ Removing and installing ⇒ page 647

8.1.2 Exploded view - Lambda probe, vehicles with one turbocharger and with SCR system, version 1

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1 - Nut

- ❑ 2 Nm

2 - NOx sender 2 - G687- with control unit for NOx sender 2 - J881-

- ❑ Removing and installing ⇒ page 576
- ❑ Tightening torque for NOx sender 2 - G687- : 52 Nm

3 - Front exhaust pipe

4 - Particulate filter

5 - Exhaust gas temperature sender 3 - G495-

- ❑ Removing and installing ⇒ page 649

6 - Lambda probe - G39- with Lambda probe heater - Z19-

- ❑ Fitting location ⇒ page 565
- ❑ Removing and installing ⇒ page 569
- ❑ After renewing, learnt values must be re-adapted; see ⇒ Vehicle diagnostic tester
- ❑ New Lambda probes are coated with an assembly paste
- ❑ If you are re-using Lambda probe, coat only thread with high-temperature paste; refer to ⇒ Electronic parts catalogue for high-temperature paste
- ❑ The assembly paste/high-temperature paste must not get into the slots on the Lambda probe body
- ❑ 52 Nm

7 - NOx sender - G295- with control unit for NOx sender - J583-

- ❑ Only installed on vehicles with engine code CPNB
- ❑ Removing and installing ⇒ page 573
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ Tightening torque for NOx sender - G295- : 52 Nm

8 - Nut

- ❑ Only installed on vehicles with engine code CPNB
- ❑ 2 Nm

9 - Exhaust gas temperature sender 2 - G448-

- ❑ Only installed on vehicles with engine code CPNB
- ❑ Fitting location ⇒ page 565
- ❑ Removing and installing ⇒ page 645

10 - Pressure line for exhaust gas pressure sensor 1 - G450-

- ❑ Fit into particulate filter, clip into bracket and tighten.
- ❑ 45 Nm

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11 - Bolt

- ❑ 4 Nm

12 - Pressure differential sender - G505-

- ❑ Removing and installing ⇒ page 553

13 - Exhaust gas temperature sender 4 - G648-

- ❑ Removing and installing ⇒ page 650

14 - Turbocharger

15 - Exhaust gas temperature sender 1 - G235-

- ❑ Removing and installing ⇒ page 641

16 - SCR catalytic converter

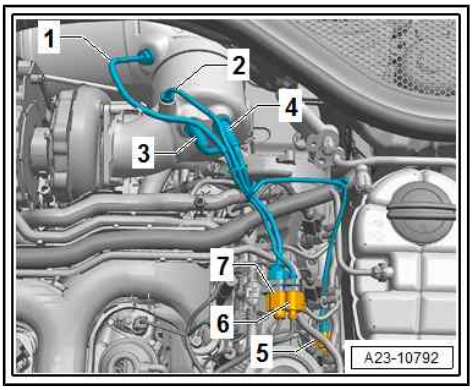
17 - Particulate sensor - G784-

- ❑ Only installed on vehicles with engine code CPNB
- ❑ Removing and installing ⇒ page 654

18 - Nut

- ❑ 2 Nm

Fitting locations



1 - Exhaust gas temperature sender 3 - G495-

2 - Exhaust gas temperature sender 2 - G448- (engine code CPNB only)

3 - NOx sender - G295-

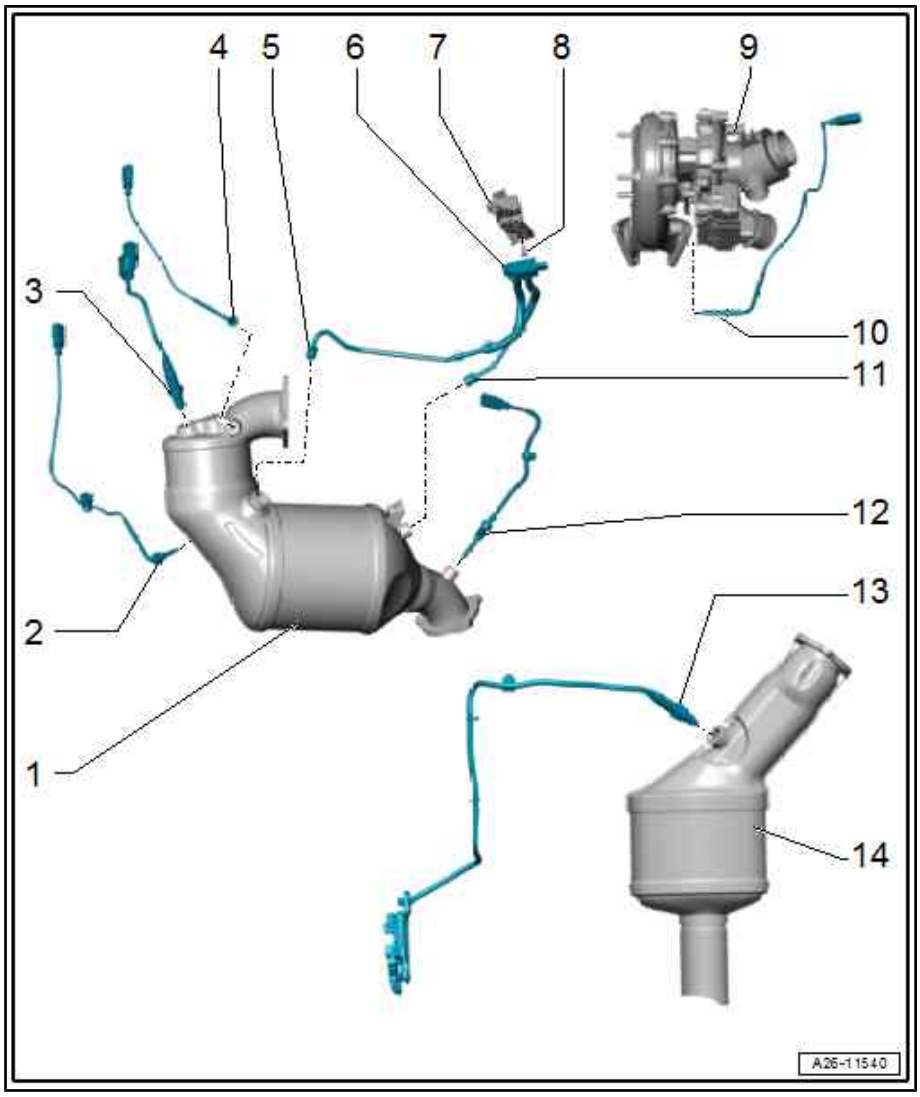
4 - Lambda probe - G39-

5 - Electrical connector for exhaust gas temperature sender 2 - G448- (engine code CPNB only)

6 - Electrical connector for exhaust gas temperature sender 3 - G495-

7 - Electrical connector for Lambda probe - G39-

8.1.3 Exploded view - Lambda probe, vehicles with one turbocharger and with SCR system, version 2



1 - Particulate filter

2 - Exhaust gas temperature sender 3 - G495-

- ❑ Removing and installing ⇒ page 647

3 - Lambda probe - G39- with Lambda probe heater - Z19-

- ❑ Removing and installing ⇒ page 569
- ❑ After renewing, learnt values must be re-adapted; see ⇒ Vehicle diagnostic tester
- ❑ New Lambda probes are coated with an assembly paste
- ❑ If you are re-using Lambda probe, coat only thread with high-temperature paste; refer to ⇒ Electronic parts catalogue for high-temperature paste
- ❑ The assembly paste/ high-temperature paste must not get into the slots on the Lambda probe body
- ❑ 55 Nm

4 - Exhaust gas temperature sender 2 - G448-

- ❑ Removing and installing ⇒ page 646

5 - Union screw

6 - Pressure differential sender - G505-

- ❑ Removing and installing ⇒ page 553

7 - Bracket

- ❑ For pressure differential sender - G505-

8 - Bolt

- ❑ 4.5 Nm

9 - Turbocharger

10 - Exhaust gas temperature sender 1 - G235-

- ❑ Removing and installing ⇒ page 641

11 - Union screw

12 - Exhaust gas temperature sender 4 - G648-

- ❑ Removing and installing ⇒ page 650

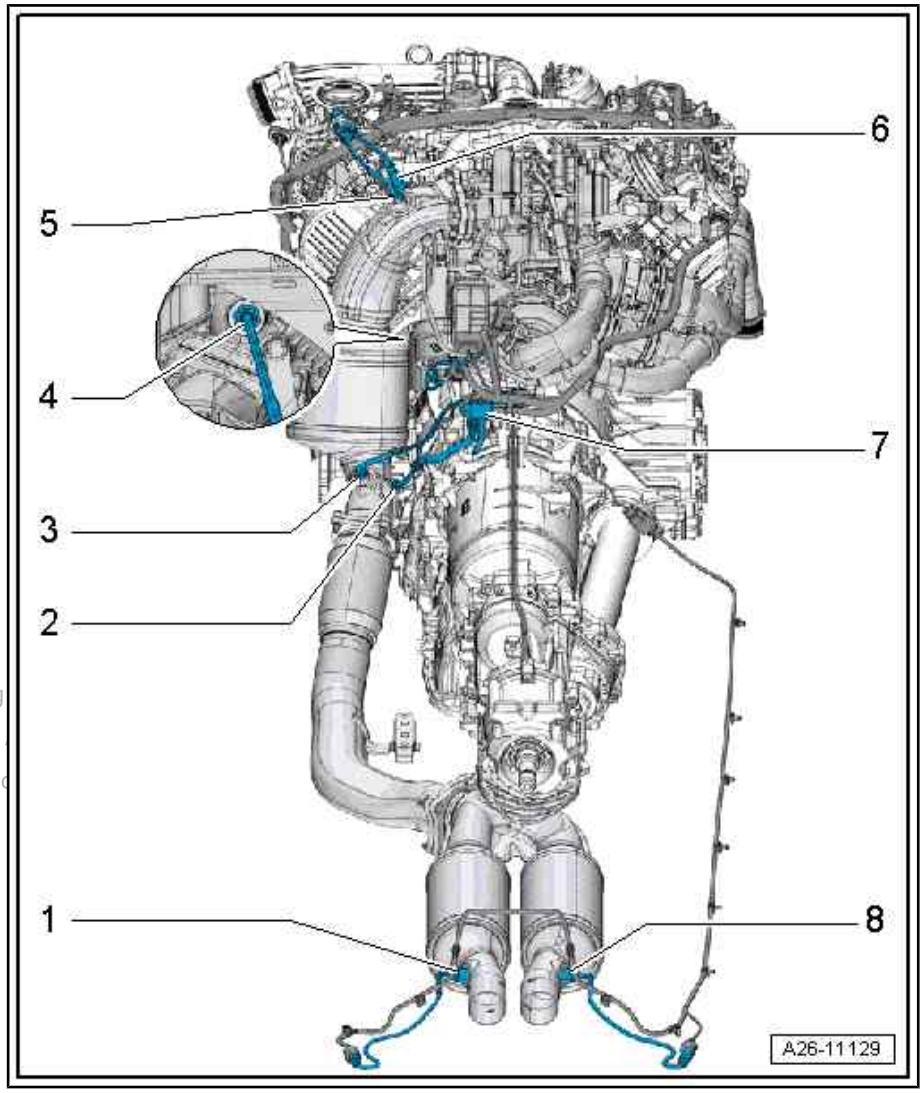
13 - Control unit for NOx sender 2 - J881- with NOx sender 2 - G687-

- ❑ Removing and installing ⇒ page 577

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14 - SCR catalytic converter

8.1.4 Exploded view - Lambda probe, vehicles with two turbochargers and without SCR system



1 - Exhaust gas temperature sender 4 for cylinder bank 2 - G649-

- ❑ Removing and installing ⇒ page 652

2 - Pressure pipe

- ❑ For pressure differential sender - G505-
- ❑ 45 Nm

3 - Exhaust gas temperature sender 3 - G495-

- ❑ Removing and installing ⇒ page 649

4 - Exhaust gas temperature sender 1 - G235-

- ❑ Removing and installing ⇒ page 643

5 - Lambda probe - G39- with Lambda probe heater - Z19-

- ❑ Removing and installing ⇒ page 570
- ❑ After renewing, learnt values must be re-adapted; see ⇒ Vehicle diagnostic tester
- ❑ New Lambda probes are coated with an assembly paste
- ❑ If you are re-using Lambda probe, coat only thread with high-temperature paste; refer to ⇒ Electronic parts catalogue for high-temperature paste
- ❑ The assembly paste/high-temperature paste must not get into the slots on the Lambda probe body
- ❑ 52 Nm

6 - Exhaust gas temperature sender 2 - G448-

- ❑ Not fitted on all versions
- ❑ Removing and installing ⇒ page 646

7 - Pressure differential sender - G505-

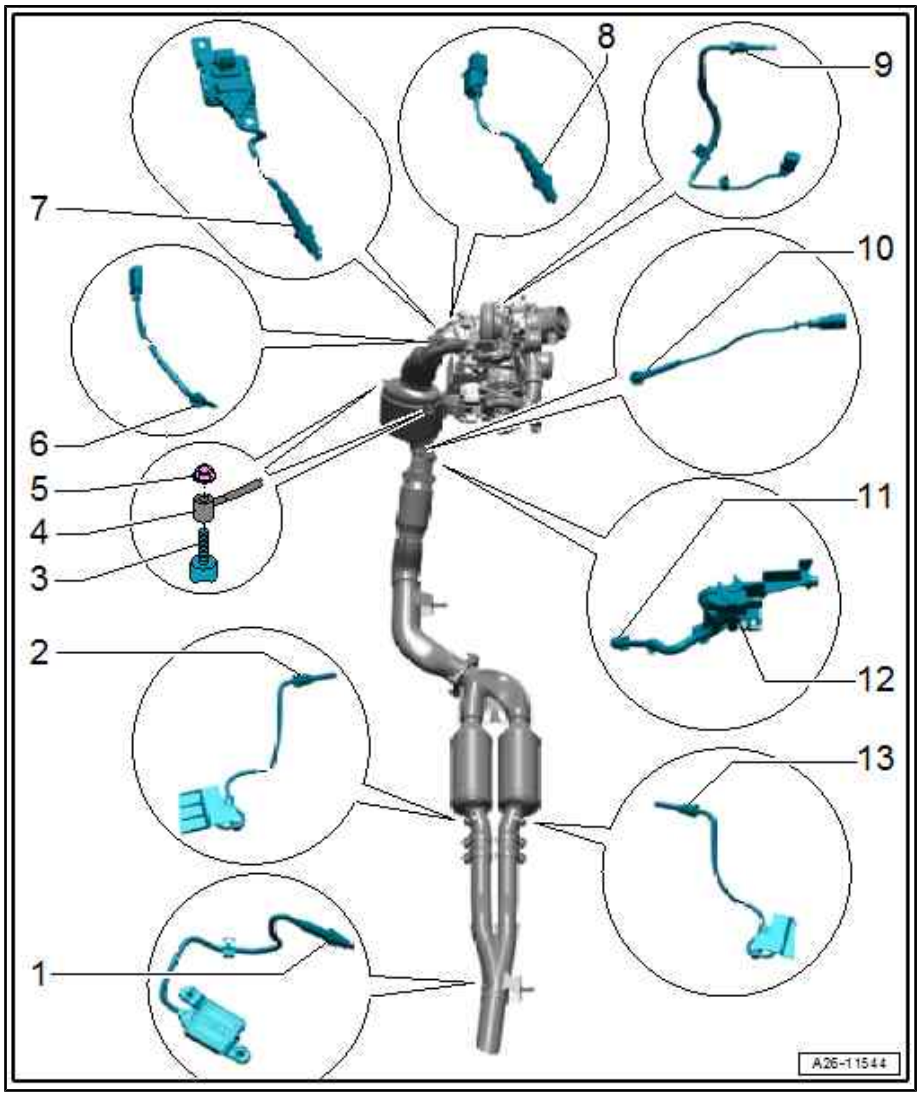
- ❑ Removing and installing ⇒ page 553

8 - Exhaust gas temperature sender 4 - G648-

- ❑ Removing and installing ⇒ page 652

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8.1.5 Exploded view - Lambda probe, vehicles with two turbochargers and with SCR system



1 - NOx sender 2 - G687- with control unit for NOx sender 2 - J881-

- ❑ Removing and installing ⇒ page 578
- ❑ Coat thread of NOx sender 2 - G687- with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .
- ❑ Tightening torque for NOx sender 2 - G687- : 52 Nm

2 - Exhaust gas temperature sender 4 - G648- / exhaust gas temperature sender 4 for bank 2 - G649-

- ❑ Removing and installing ⇒ page 652
- ❑ Which of the two exhaust gas temperature senders is fitted depends on the model year; for allocation, refer to ⇒ Vehicle diagnostic tester

3 - Catalytic converter heater 1 - Z119- / catalytic converter heater 2 - Z120-

4 - Electrical wire

- ❑ Remove using puller - T40317-

5 - Nut

- ❑ 5 Nm

6 - Exhaust gas temperature sender 2 - G448-

- ❑ Removing and installing ⇒ page 646

7 - NOx sender - G295- with control unit for NOx sender - J583-

- ❑ Removing and installing ⇒ page 574
- ❑ Coat thread of NOx sender - G295- with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .
- ❑ Tightening torque for NOx sender - G295- : 52 Nm

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8 - Lambda probe - G39- with Lambda probe heater - Z19-

- ❑ Removing and installing ⇒ page 570
- ❑ After renewing, learnt values must be re-adapted; see ⇒ Vehicle diagnostic tester
- ❑ New Lambda probes are coated with an assembly paste
- ❑ If you are re-using Lambda probe, coat only thread with high-temperature paste; refer to ⇒ Electronic parts catalogue for high-temperature paste
- ❑ The assembly paste/high-temperature paste must not get into the slots on the Lambda probe body
- ❑ 52 Nm

9 - Exhaust gas temperature sender 1 - G235-

- ❑ Removing and installing ⇒ page 643

10 - Exhaust gas temperature sender 3 - G495-

- ❑ Removing and installing ⇒ page 649

11 - Pressure line for pressure differential sender - G505-

- ❑ Fit into particulate filter, clip into bracket and tighten.
- ❑ 45 Nm

12 - Pressure differential sender - G505-

- ❑ Removing and installing ⇒ page 553

13 - Exhaust gas temperature sender 4 for bank 2 - G649- or exhaust gas temperature sender 4 - G648-

- ❑ Removing and installing ⇒ page 652
- ❑ Which of the two exhaust gas temperature senders is fitted depends on the model year; for allocation, refer to ⇒ Vehicle diagnostic tester

8.2 Removing and installing Lambda probe

⇒ "8.2.1 Removing and installing Lambda probe G39 - vehicles with one turbocharger", page 569

⇒ "8.2.2 Removing and installing Lambda probe G39 - vehicles with two turbochargers", page 570

8.2.1 Removing and installing Lambda probe - G39- - vehicles with one turbocharger

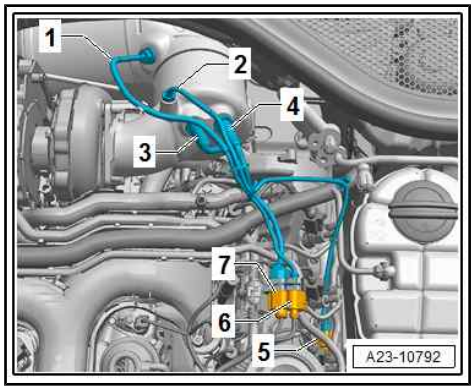
Special tools and workshop equipment required

- ♦ Tool set - T10395 A- with suitable tool insert



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Removing



WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system ⇒ page 7 .*

– Remove engine cover panel ⇒ page 172 .

– Unplug electrical connector -7- for Lambda probe - G39- .

– Unscrew Lambda probe - G39- -item 4- using a tool from tool set - T10395 A- .

Installing

Installation is carried out in reverse order; note the following:

Note

- *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the Lambda probe body. For high-temperature paste refer to ⇒ Electronic parts catalogue*
- *When installing, the Lambda probe wiring must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*

Tightening torques

- ⇒ “8.1 Exploded view - Lambda probe”, page 563

Adapting learnt values if Lambda probe was renewed

– Connect ⇒ Vehicle diagnostic tester.

– Switch on ignition.

– Select and start `Diagnosis`.

– Choose `Select own test` and select following options one after the other:

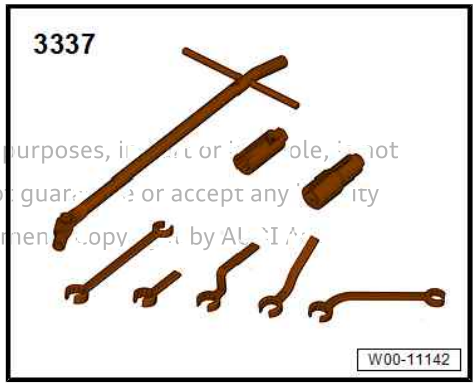
- `Drive train`
- `Select engine code and engine`
- `01 - Self-diagnosis compatible systems`
- `01 - Engine electronics J623`
- `01 - Engine electronics, functions`
- `01 - Lambda probe - Adapt learnt values`

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8.2.2 Removing and installing Lambda probe - G39- - vehicles with two turbochargers

Special tools and workshop equipment required

♦ Lambda probe open ring spanner set - 3337-



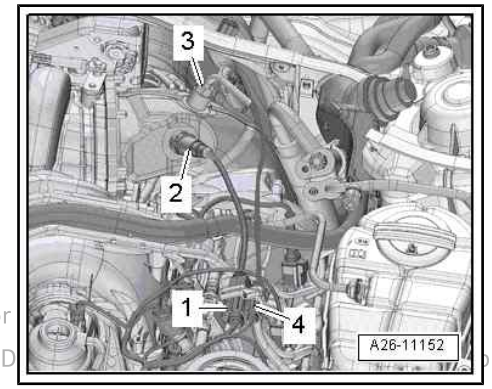
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Removing

WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system ⇒ page 7 .*



– Remove engine cover panel ⇒ page 172

– Unplug electrical connector -1- for Lambda probe - G39-.

– Unscrew Lambda probe - G39- -2- using tool from Lambda probe open ring spanner set - 3337- .

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Installing

Installation is carried out in reverse order; note the following:

Note

- *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the Lambda probe body. For high-temperature paste refer to ⇒ Electronic parts catalogue*
- *When installing, the Lambda probe wiring must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*

Tightening torques

- ⇒ “8.1 Exploded view - Lambda probe”, page 563

Adapting learnt values if Lambda probe was renewed

– Connect ⇒ Vehicle diagnostic tester.

– Switch on ignition.

– Select and start `Diagnosis`.

– Choose `Select own test` and select following options one after the other:

- `Drive train`
- `Select engine code and engine`
- `01 - Self-diagnosis compatible systems`
- `01 - Engine electronics J623`
- `01 - Engine electronics, functions`
- `01 - Lambda probe - Adapt learnt values`

8.3 Removing and installing NOx sender

⇒ "8.3.1 Removing and installing NOx sender G295 - vehicles with one turbocharger", page 573

⇒ "8.3.2 Removing and installing NOx sender G295 - vehicles with two turbochargers", page 574

⇒ "8.3.3 Removing and installing NOx sender 2 G687 - vehicles with one turbocharger and with SCR system, version 1", page 576

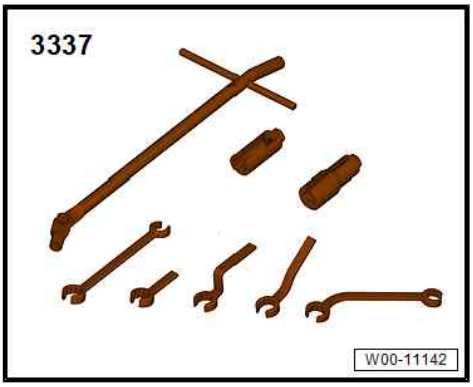
⇒ "8.3.4 Removing and installing NOx sender 2 G687 - vehicles with one turbocharger and with SCR system, version 2", page 577

⇒ "8.3.5 Removing and installing NOx sender 2 G687 - vehicles with two turbochargers", page 578

8.3.1 Removing and installing NOx sender - G295- - vehicles with one turbocharger

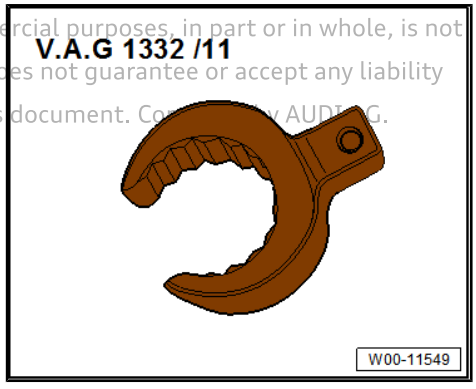
Special tools and workshop equipment required

- Lambda probe open ring spanner set - 3337-



- Open end spanner insert, AF 24 - V.A.G 1332/11-

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Removing

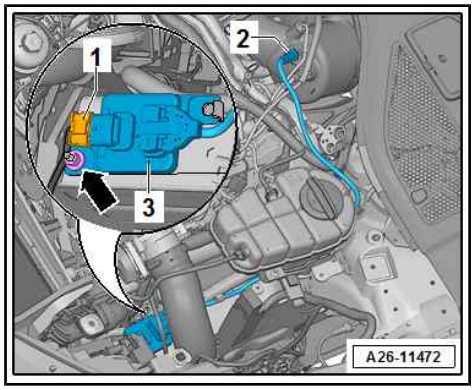
WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system ⇒ page 7 .*

– Remove engine cover panel ⇒ page 172 .

– Unplug electrical connector -1-.
– Remove nut -arrow-.
– Move clear electrical wiring.



Note

Different spanner sizes are required depending on the NOx sender fitted.

– Unscrew NOx sender - G295- -2- with appropriate size tool.

Installing

Installation is carried out in the reverse order; note the following.

Note

Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .

Tightening torques

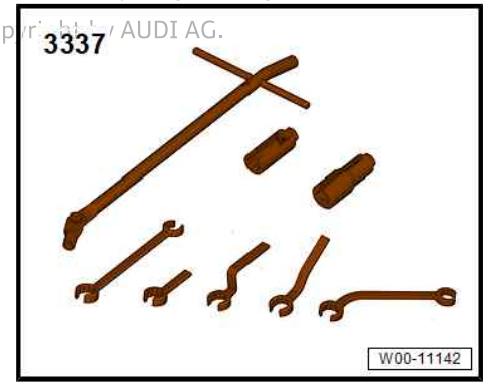
♦ ⇒ "8.1.2 Exploded view - Lambda probe, vehicles with one turbocharger and with SCR system, version 1", page 564

8.3.2 Removing and installing NOx sender - G295- - vehicles with two turbochargers

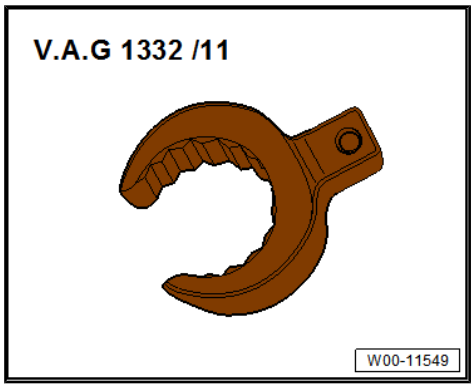
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Special tools and workshop equipment required

♦ Lambda probe open ring spanner set - 3337-



♦ Open end spanner insert, AF 24 - V.A.G 1332/11-



Removing

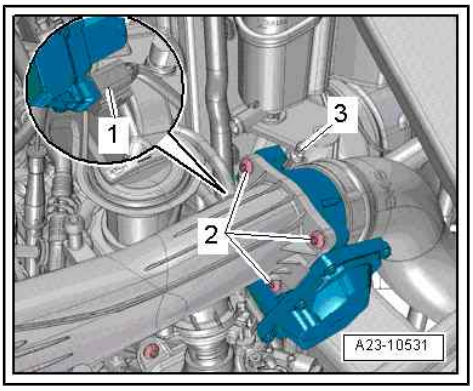
WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system ⇒ page 7 .*

– Remove engine cover panel ⇒ page 172 .

– Release hose clip -3- and detach air hose.



Note

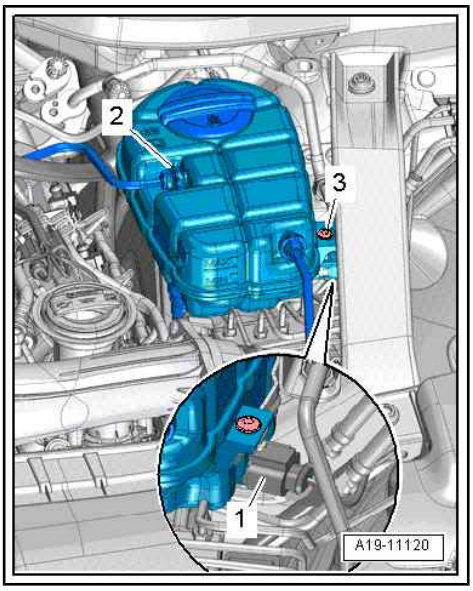
Disregard items -1 and 2-.

– Unplug electrical connector -1-.

– Lift retaining clip and disconnect coolant line -2-.

– Seal off open lines and connections with clean plugs from engine bung set - VAS 6122- .

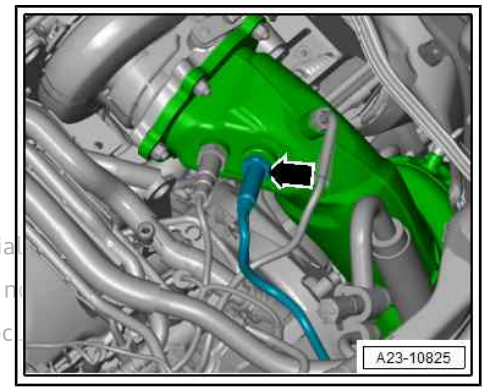
– Remove bolt -3- and place coolant expansion tank to one side.



Note

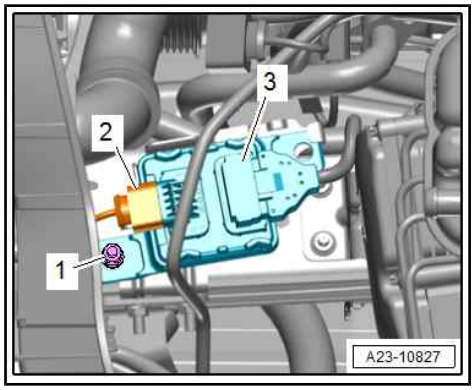
Different spanner sizes are required depending on the NOx sender - G295- fitted.

– Unscrew NOx sender - G295- -arrow- with appropriate size tool.



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– Unplug electrical connector -2-.
– Unscrew nut -1- and detach control unit for NOx sender - J583- -item 3- from bracket.
– Move electrical wiring harness clear and detach NOx sender - G295- with control unit for NOx sender - J583- .



Installing

Installation is carried out in the reverse order; note the following.

Note

Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .

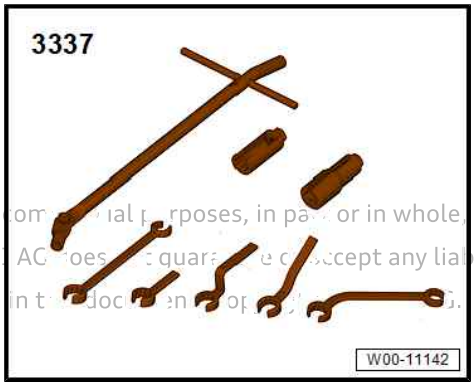
Tightening torques

- ⇒ “8.1.5 Exploded view - Lambda probe, vehicles with two turbochargers and with SCR system”, page 568
- ⇒ “2.2 Exploded view - hose connections for charge air system”, page 466

8.3.3 Removing and installing NOx sender 2 - G687- - vehicles with one turbocharger and with SCR system, version 1

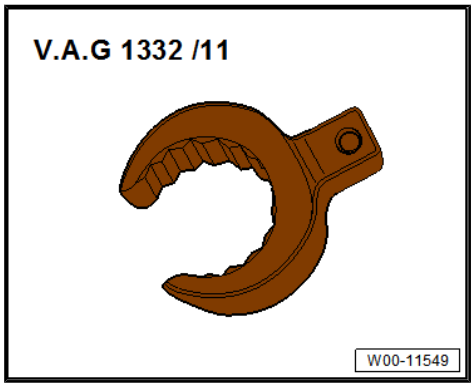
Special tools and workshop equipment required

- Lambda probe open ring spanner set - 3337-



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- Open end spanner insert, AF 24 - V.A.G 1332/11-



Removing

WARNING

When working on all parts of the exhaust system:

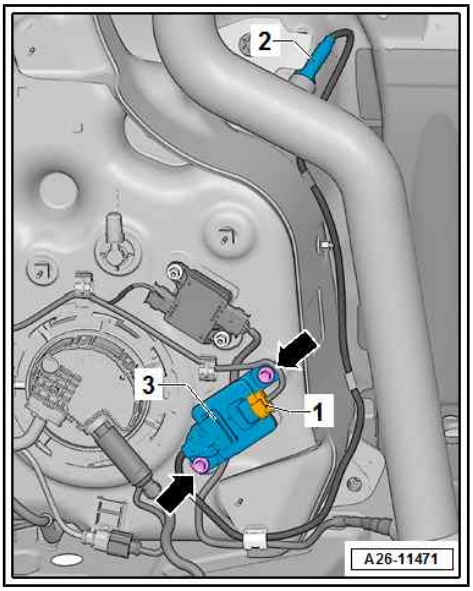
- *Observe safety precautions when working on the exhaust system ⇒ page 7 .*

– Detach underbody trim (rear left) ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim; Removing and installing underbody trim .

– Unplug electrical connector -1-.

– Remove nuts -arrows-.

– Move clear electrical wiring.



Note

Different spanner sizes are required depending on the NOx sender 2 - G687- fitted.

– Unscrew NOx sender 2 - G687- -2- with appropriate size tool.

Installing

Installation is carried out in the reverse order; note the following.

Note

Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .

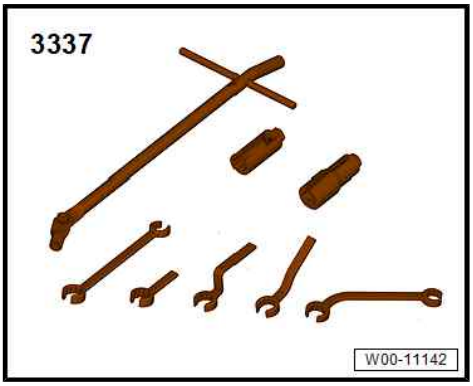
Tightening torques

- ⇒ “8.1 Exploded view - Lambda probe”, page 563
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim; Exploded view - underbody trim

8.3.4 Removing and installing NOx sender 2 - G687- - vehicles with one turbocharger and with SCR system, version 2

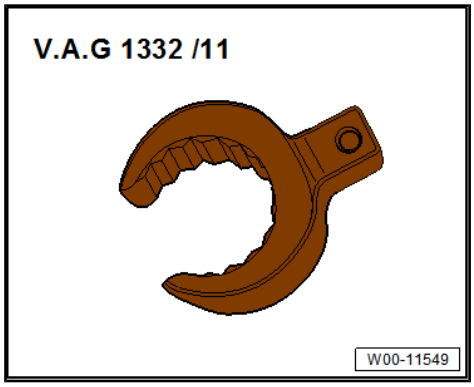
Special tools and workshop equipment required

- Lambda probe open ring spanner set - 3337-



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♦ Open end spanner insert, AF 24 - V.A.G 1332/11-



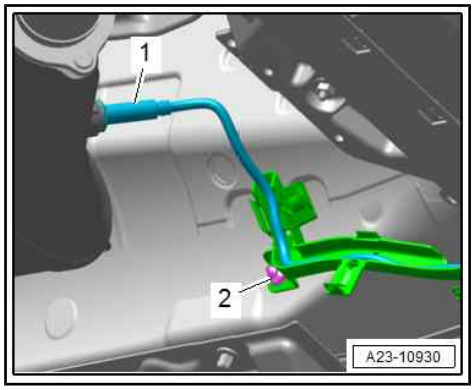
Removing

WARNING

When working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system ⇒ page 7 .***

– Unscrew speed nut -2- for cable guide.



Note

Different spanner sizes are required depending on the NOx sender 2 - G687- fitted.

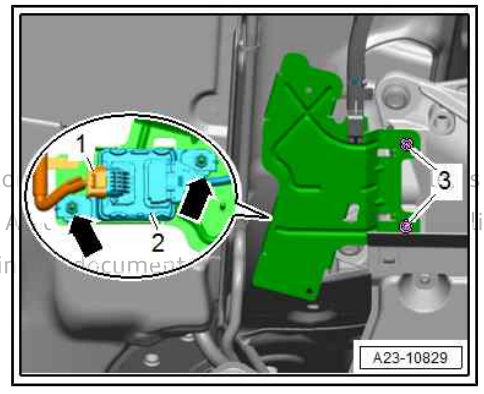
– Unscrew NOx sender 2 - G687- -1- with appropriate size tool.

– Remove bolts -3-.

– Unplug electrical connector -1-.

– Unscrew nuts -arrows- and detach control unit for NOx sender 2 - J881- -item 2- from bracket.

– Move clear electrical wiring.



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Installing

Installation is carried out in the reverse order; note the following.

Note

Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .

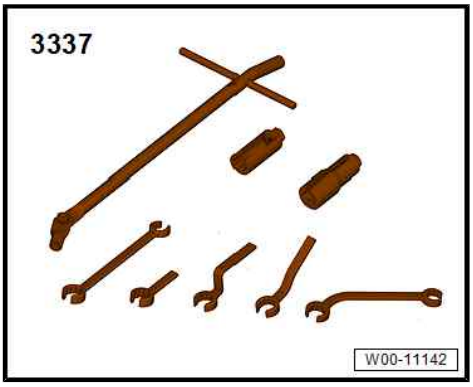
Tightening torques

♦ ⇒ “8.1 Exploded view - Lambda probe”, page 563

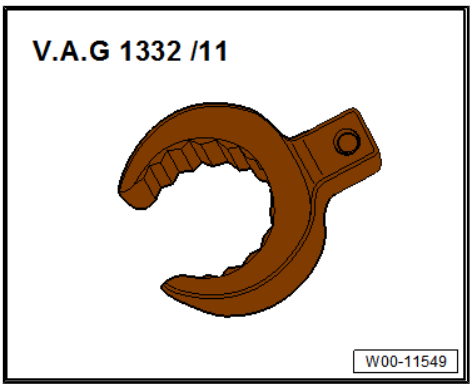
8.3.5 Removing and installing NOx sender 2 - G687- - vehicles with two turbochargers

Special tools and workshop equipment required

♦ Lambda probe open ring spanner set - 3337-



♦ Open end spanner insert, AF 24 - V.A.G 1332/11-



Removing

WARNING

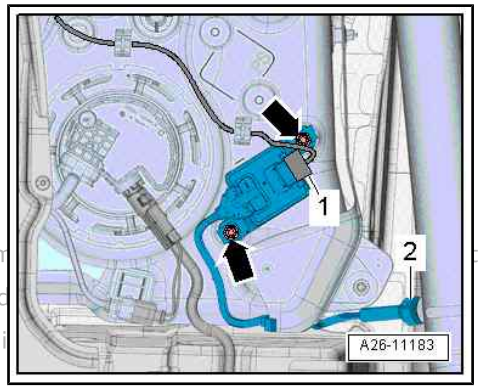
When working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system ⇒ page 7 .***

– Detach underbody trim (rear left) ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim; Removing and installing underbody trim .

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– Unplug electrical connector -1-.
– Unscrew nuts -arrows- for control unit for NOx sender 2 - J881- .
– Move clear electrical wiring.



Note

Different spanner sizes are required depending on the NOx sender 2 - G687- fitted.

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– Unscrew NOx sender 2 - G687- -2- with appropriate size tool.

Installing

Installation is carried out in the reverse order; note the following.

Note

Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .

Tightening torques

- ⇒ “8.1 Exploded view - Lambda probe”, page 563
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim; Exploded view - underbody trim

9 Engine control unit

⇒ "9.1 Wiring and component check", page 581

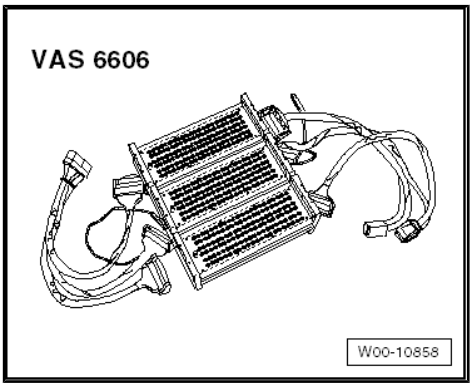
⇒ "9.2 Removing and installing engine/motor control unit J623 ", page 582

9.1 Wiring and component check

Special tools and workshop equipment required

- Isolator box, 198-pin - VAS 6606/1-1-
- Isolator box, 198-pin - VAS 6606/1-2-
- Isolator box, 198-pin - VAS 6606/1-3-
- Sheets -VAS 6606/1-1-
- Sheets -VAS 6606/2-1-
- Sheets -VAS 6606/3-1-
- Set of cables -VAS 6606/7-1- and -VAS 6606/7-2-

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Note

- *Always make sure that the cables are properly connected.*
- *Do not use damaged or worn tools and accessories.*
- *Observe operating instructions.*

– Connect both cable sets -VAS 6606/7-1- and -VAS 6606/7-2- to the three isolator boxes -VAS 6606- .

– Use the following sheets:

- -VAS 6606/1-1- for isolator box, 198-pin - VAS 6606/1-1-
- -VAS 6606/2-1- for isolator box, 198-pin - VAS 6606/1-2-
- -VAS 6606/3-1- for isolator box, 198-pin - VAS 6606/1-3-

Note

Make sure that all plug-in bridges are inserted completely in all isolator boxes.

– Connect earth strap to an isolator box and to an earth point on the vehicle.

– Remove engine control unit ⇒ page 582 .

– Connect engine control unit to cable set -VAS 6606/7-1- .

– Connect vehicle wiring harness to cable set -VAS 6606/7-2- .

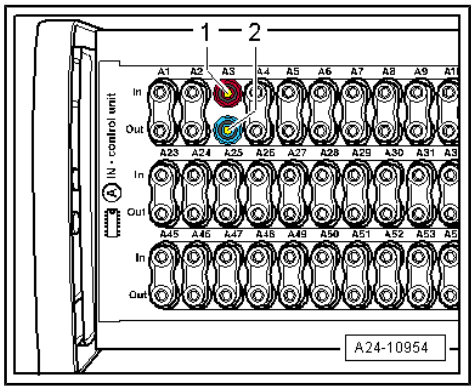
The connection on the engine control unit consists of a large and a small connector.

The large connector has 105 pins and is assigned to the sheets for the isolator box marked “A 1 to A 105”.

The small connector has 91 pins and is assigned to the sheets for the isolator box marked “B 1 to B 91”.

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When a push-in bridge is pulled out, the corresponding wiring connection is disconnected.



Note

- *The “In” contact -1- (red socket) leads to the engine control unit.*
- *The “Out” contact -2- (blue socket) leads to the wiring harness.*

– Carry out test as described in appropriate repair procedures.

Installing engine control unit

Installation is performed in the reverse sequence.

The procedure required after connecting the new engine control unit is described in the Guided Fault Finding or Guided Functions. Use ⇒ Vehicle diagnostic tester.

Note

After completion of the Guided Fault Finding routine, the tester will attempt to erase the event memories of all control units. If this is not successful, the remaining events saved in the memories must be dealt with so that all event memory entries can be erased.

9.2 Removing and installing engine/motor control unit - J623-

Removing

– Before removing the engine control unit - J623- , the adaption values of the injectors and the ash deposit mass must be read out. Use ⇒ Vehicle diagnostic tester.

The adaption values for the injectors in the old (defective) engine control unit can be read out via the Guided Fault Finding or Guided Functions mode and can be stored as an electronic file in the ⇒ Vehicle diagnostic tester.

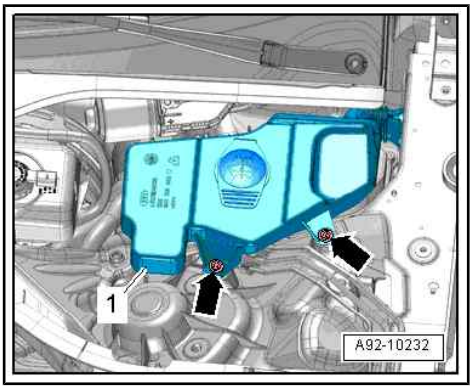
– Switch off ignition and remove ignition key after storing electronic file containing adaption values.

Note

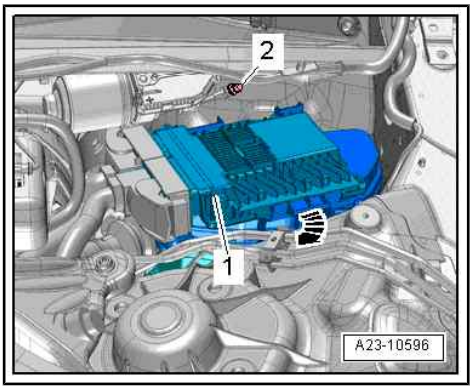
If the adaption values of the injectors cannot be read out of the old (defective) engine control unit, they must be entered into the new engine control unit manually and the adaption procedure must be performed accordingly.

– Remove plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .

– Unscrew bolts -arrows- and pull filler neck out of washer fluid reservoir and through opening in body to right side.



– Release catch -arrow- and detach engine control unit - J623- -item 1-.



Note

Disregard -item 2-.

Installing

Installation is carried out in reverse order; note the following:

– After the engine control unit - J623- has been renewed, the “Injector delivery calibration” and the “Injector voltage calibration” must also be re-adapted in the engine control unit (these functions influence engine power and exhaust emissions).

– On vehicles with particulate filter the current mileage (km) reading must be stored in the engine control unit - J623- via an adaption procedure.

The procedure required after connecting the new engine control unit is described in the Guided Fault Finding or Guided Functions. Use ⇒ Vehicle diagnostic tester.

– Install filler neck for washer fluid reservoir ⇒ Electrical system; Rep. gr. 92 ; Windscreen washer system; Exploded view - windscreen washer system .

– Install plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .

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26 – Exhaust system

1 Exhaust pipes/silencers

⇒ “1.1 Exploded view - silencers”, page 584

⇒ “1.2 Removing and installing front exhaust pipe”, page 594

⇒ “1.3 Separating exhaust pipes/silencers”, page 600

⇒ “1.5 Stress-free alignment of exhaust system”, page 602

⇒ “1.6 Checking exhaust system for leaks”, page 604

1.1 Exploded view - silencers

⇒ “1.1.1 Exploded view - silencers, vehicles with one turbocharger and without SCR system”, page 584

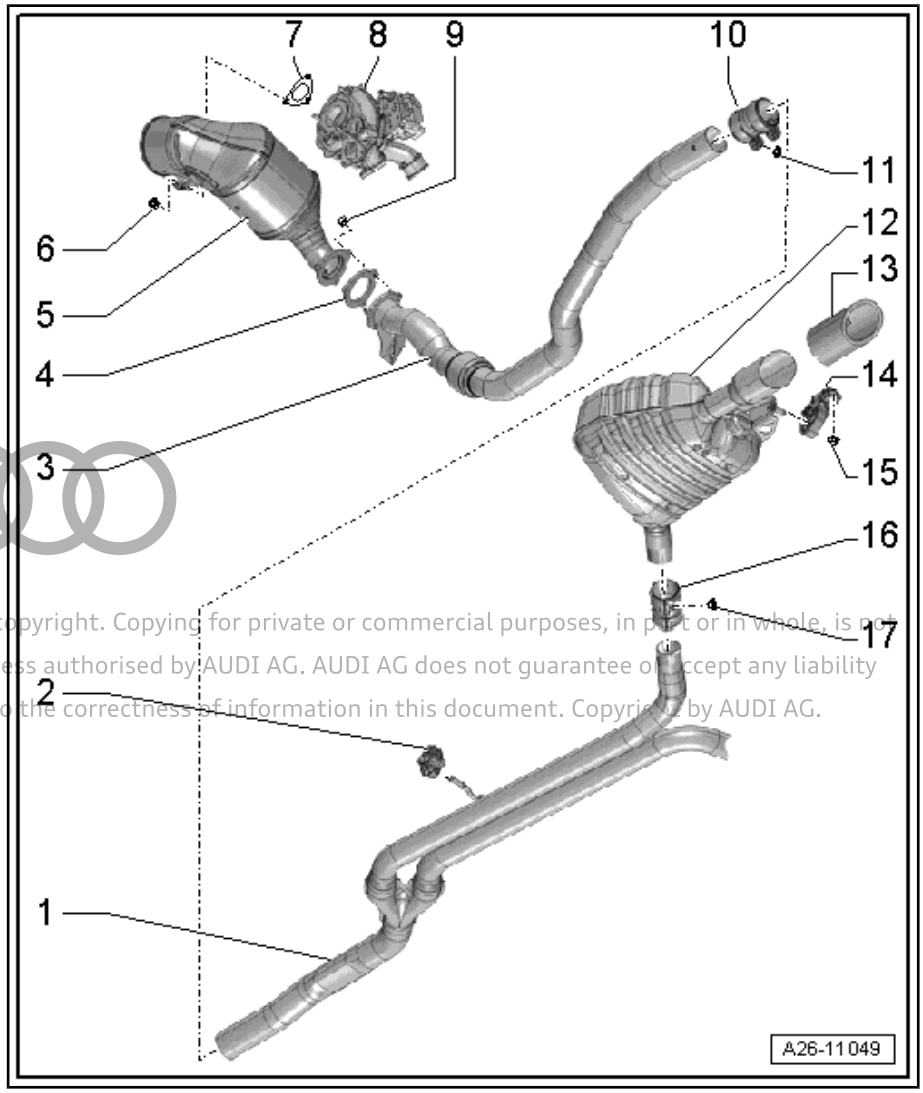
⇒ “1.1.2 Exploded view - silencers, vehicles with one turbocharger and with SCR system”, page 587

⇒ “1.1.3 Exploded view - silencers, vehicles with two turbochargers and without SCR system”, page 590

⇒ “1.1.4 Exploded view - silencers, vehicles with two turbochargers and with SCR system”, page 592

1.1.1 Exploded view - silencers, vehicles with one turbocharger and without SCR system

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1 - Y-pipe

- ❑ Combined in one unit with rear silencers as original equipment
- ❑ Y-pipe and rear silencer can be renewed separately as required
- ❑ Cutting point: Y-pipe / rear silencer ⇒ page 600
- ❑ Align exhaust system so it is free of stress ⇒ page 602

2 - Mounting

- ❑ Renew if damaged
- ❑ Check preload ⇒ “1.5 Stress-free alignment of exhaust system”, page 602

3 - 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 594
- ❑ Align exhaust system so it is free of stress ⇒ page 602

4 - Gasket

- ❑ Renew

5 - Particulate filter

- ❑ With catalytic converter
- ❑ Mounting components:

◆ Vehicles with manual gearbox/multitronic gearbox ⇒ page 587

◆ Vehicles with dual clutch gearbox 0B5 ⇒ page 587

- ❑ Removing and installing ⇒ page 612
- ❑ After renewing, perform `Adaption` in `Guided Functions` ⇒ Vehicle diagnostic tester

6 - Nut

- ❑ Renew
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 23 Nm

7 - Gasket

- ❑ Renew

8 - Turbocharger

9 - Nut

- ❑ Renew
- ❑ 23 Nm

10 - Clamp (front)

- ❑ Before tightening, align exhaust system so it is free of stress ⇒ page 602

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- ❑ Installation position ⇒ page 586
- ❑ Tighten bolted connections evenly

11 - Nut

- ❑ 23 Nm

12 - Rear silencer

- ❑ Combined with Y-pipe in one unit as original equipment
- ❑ Y-pipe and rear silencer can be renewed separately as required
- ❑ Cutting point: Y-pipe / rear silencer ⇒ page 600
- ❑ Align exhaust system so it is free of stress ⇒ page 602

13 - Trim

- ❑ For tailpipe
- ❑ Slide onto tailpipe as far as stop

14 - Mounting

- ❑ Renew if damaged
- ❑ Check preload ⇒ “1.5 Stress-free alignment of exhaust system”, page 602

15 - Nut

- ❑ 23 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 602
- ❑ Installation position ⇒ page 586
- ❑ Tighten bolted connections evenly

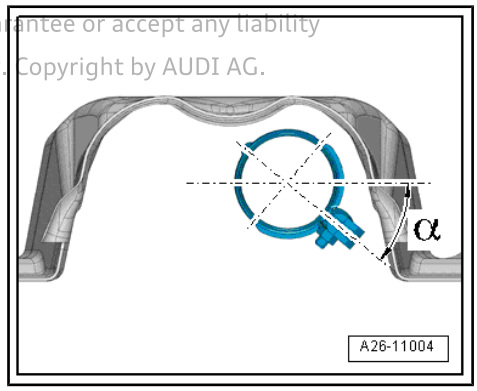
17 - Nut

- ❑ 23 Nm

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Installation position of front clamp - vehicles with one turbocharger

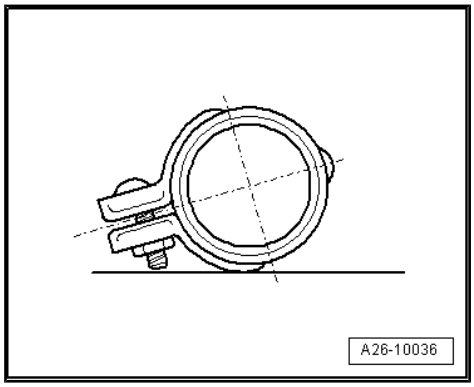
- Installation position: bolted connections face outwards.
- Angle -α- = 10°



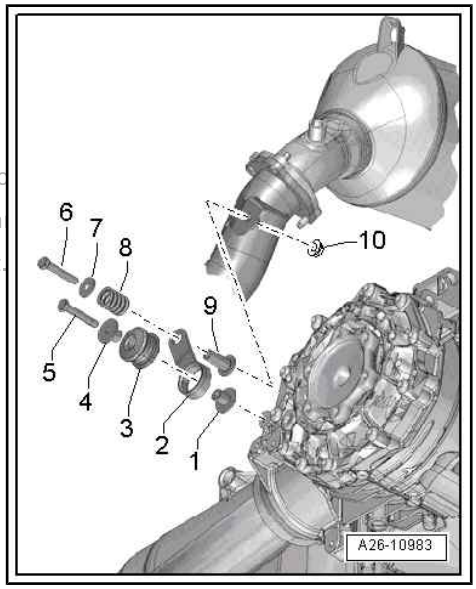
Installation position of rear clamps

– Install clamps so that the bolt ends do not protrude beyond bottom of clamp.

- Installation position: bolted connections face forwards.



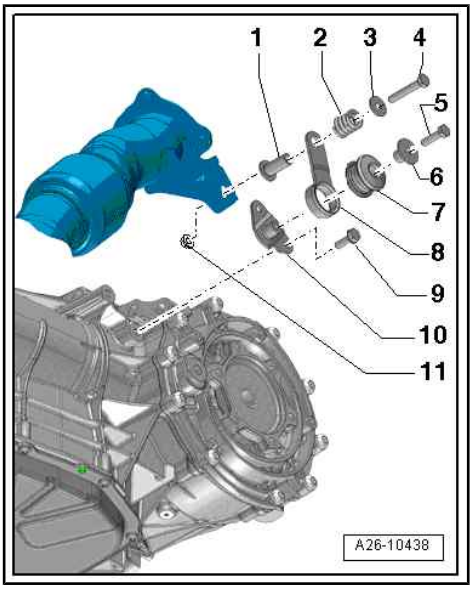
Components of front exhaust pipe mountings - vehicles with manual gearbox/multitronic gearbox



1 - Spacer sleeve
2 - Bracket
3 - Rubber buffer
4 - Spacer sleeve
5 - Bolt, 23 Nm
6 - Bolt
7 - Washer
8 - Compression spring
9 - Spacer sleeve
10 - Nut, 23 Nm

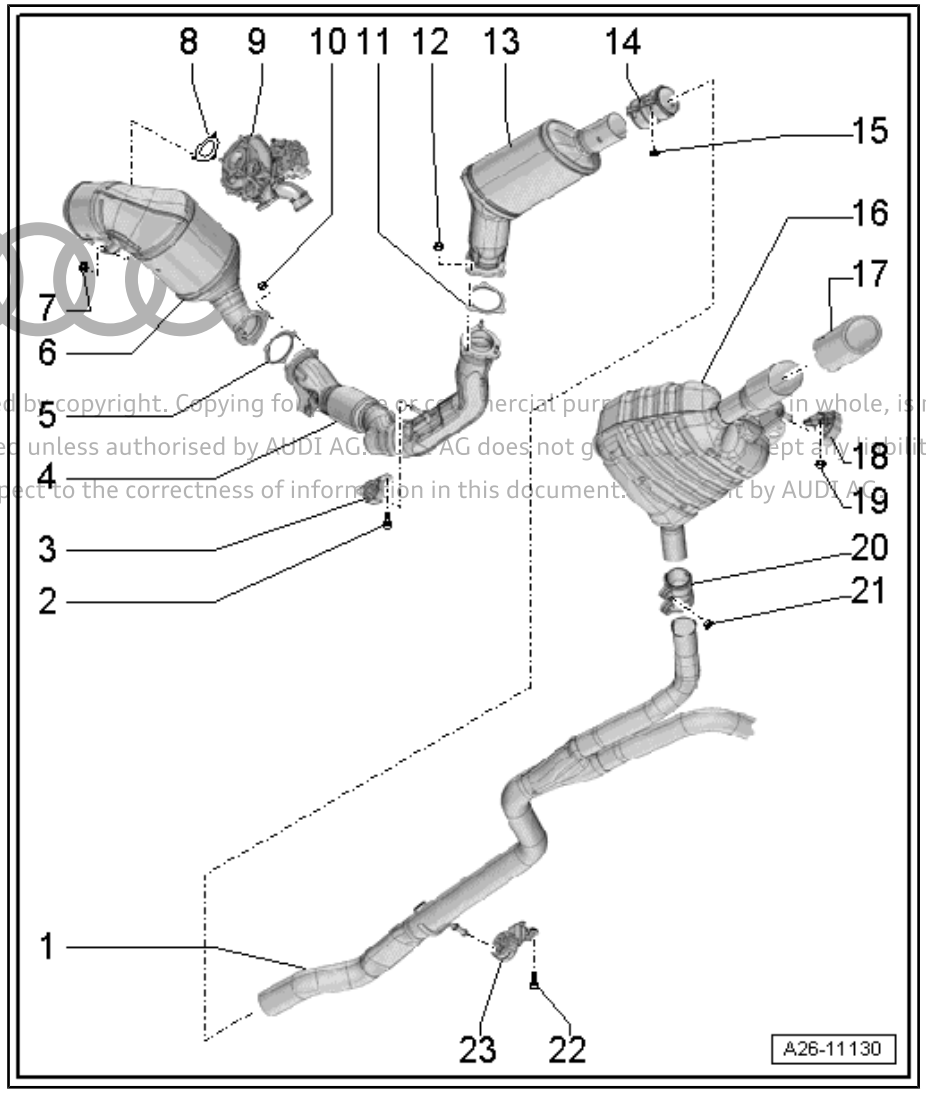
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Components of mountings (front) for front exhaust pipe - vehicles with dual clutch gearbox 0B5



1 - Spacer sleeve
2 - Compression spring
3 - Washer
4 - Bolt, 23 Nm
5 - Bolt, 23 Nm
6 - Spacer sleeve
7 - Rubber buffer
8 - Bracket
9 - Bolt, 23 Nm
10 - Bracket
11 - Nut

1.1.2 Exploded view - silencers, vehicles with one turbocharger and with SCR system



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1 - Y-pipe

- ❑ Combined in one unit with rear silencers as original equipment
- ❑ Y-pipe and rear silencer can be renewed separately as required
- ❑ Cutting point: Y-pipe / rear silencer ⇒ page 600
- ❑ Align exhaust system so it is free of stress ⇒ page 602

2 - Bolt

- ❑ 23 Nm

3 - Mounting

- ❑ Renew if damaged
- ❑ Check preload ⇒ “1.5 Stress-free alignment of exhaust system”, page 602

4 - Front exhaust pipe

- ❑ With flexible joint; do not bend flexible joint more than 10° – otherwise it can be damaged
- ❑ Protect against knocks and impact
- ❑ Removing and installing ⇒ page 594
- ❑ Align exhaust system so it is free of stress ⇒ page 602

5 - Gasket

- ❑ Renew

6 - Particulate filter

- ❑ With catalytic converter
- ❑ With pressure line for pressure differential sender - G505- ⇒ Item 10 (page 636)
- ❑ Removing and installing ⇒ page 612
- ❑ After renewing, perform `Adaption` in `Guided Functions` ⇒ Vehicle diagnostic tester

7 - Nut

- ❑ Renew
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 23 Nm

8 - Gasket

- ❑ Renew

9 - Turbocharger

10 - Nut

- ❑ Renew
- ❑ 23 Nm

11 - Gasket

- ❑ Renew

12 - Nut

- ❑ 23 Nm

13 - SCR catalytic converter

- ❑ Removing and installing ⇒ page 609
- ❑ After renewing, perform `Adaption` in `Guided Functions` ⇒ Vehicle diagnostic tester

14 - Clamp

- ❑ Before tightening, align exhaust system so it is free of stress ⇒ page 602
- ❑ Installation position ⇒ page 586
- ❑ Tighten bolted connections evenly

15 - Nut

- ❑ 23 Nm

16 - Rear silencer

- ❑ Combined with Y-pipe in one unit as original equipment
- ❑ Y-pipe and rear silencer can be renewed separately as required
- ❑ Cutting point: Y-pipe / rear silencer ⇒ page 600
- ❑ Align exhaust system so it is free of stress ⇒ page 602

17 - Trim

- ❑ For tailpipe
- ❑ Depending on version
- ❑ Slide onto tailpipe as far as stop

18 - Mounting

- ❑ Renew if damaged
- ❑ Check preload ⇒ "1.5 Stress-free alignment of exhaust system", page 602

19 - Nut

- ❑ 23 Nm

20 - Clamp (rear)

- ❑ For separate replacement of double pipe and rear silencer
- ❑ Before tightening, align exhaust system so it is free of stress ⇒ page 602
- ❑ Installation position ⇒ page 586
- ❑ Tighten bolted connections evenly

21 - Nut

- ❑ 23 Nm

22 - Bolt

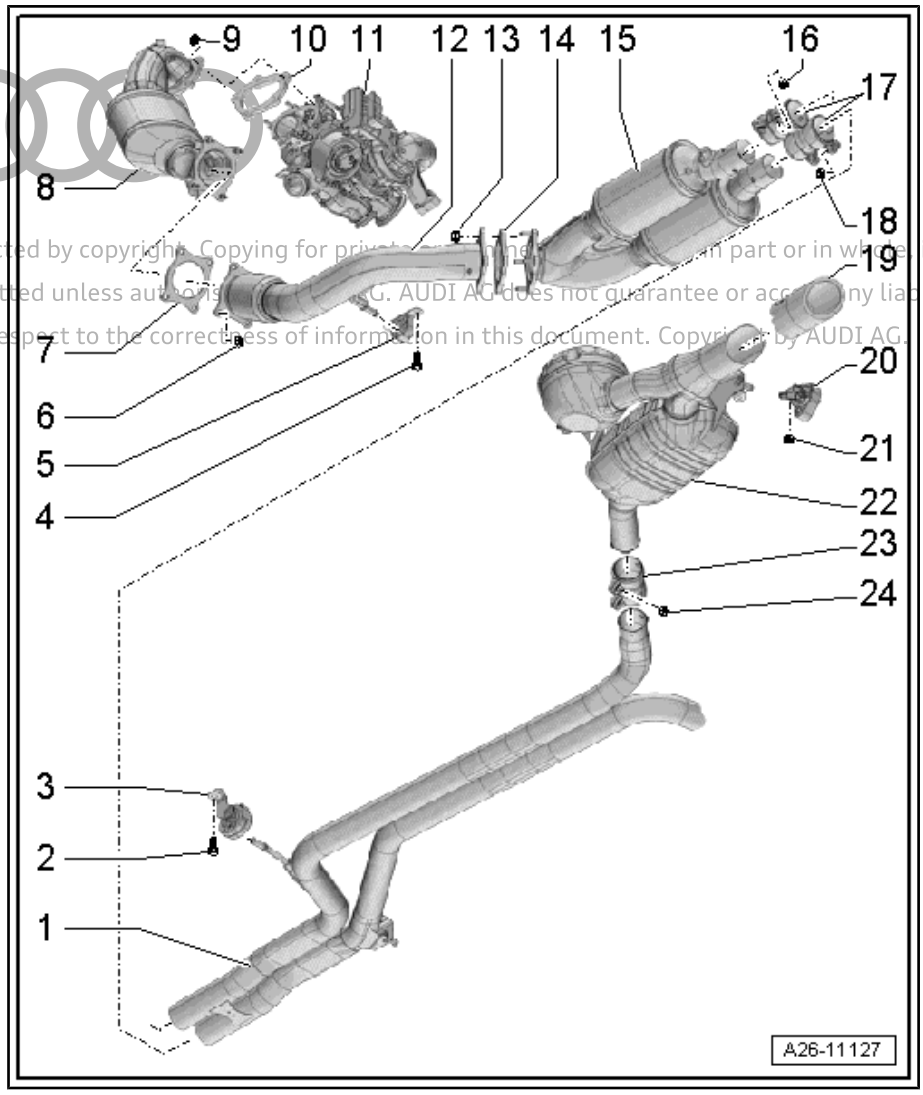
- ❑ 23 Nm

23 - Mounting

- ❑ Renew if damaged

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1.1.3 Exploded view - silencers, vehicles with two turbochargers and without SCR system



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1 - Double pipe

- ❑ Combined in one unit with rear silencers as original equipment
- ❑ Double pipe and rear silencers can be renewed separately
- ❑ Cutting point between double pipe and rear silencer ⇒ page 600
- ❑ Align exhaust system so it is free of stress ⇒ page 602

2 - Bolt

- ❑ 23 Nm

3 - Mounting

- ❑ Renew if damaged

4 - Bolt

- ❑ 23 Nm

5 - Mounting

- ❑ Renew if damaged

6 - Nut

- ❑ Renew
- ❑ 23 Nm

7 - Gasket

- ❑ Renew

8 - Catalytic converter

- ❑ Mounting components ⇒ page 592
- ❑ Removing and installing ⇒ page 605

9 - Nut

- ❑ Renew
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 23 Nm

10 - Gasket

- ❑ Renew

11 - Turbocharger unit

12 - 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 599
- ❑ Align exhaust system so it is free of stress ⇒ page 602

13 - Nut

- ❑ Renew
- ❑ 23 Nm

14 - Gasket

- ❑ Renew

15 - Particulate filter

- ❑ Removing and installing ⇒ page 618
- ❑ After renewing, perform `Adaption` in `Guided Functions` ⇒ Vehicle diagnostic tester

16 - Nut

- ❑ 23 Nm

17 - Clamps (front)

- ❑ Before tightening, align exhaust system so it is free of stress ⇒ page 602
- ❑ Installation position ⇒ page 591
- ❑ Tighten bolted connections evenly

18 - Nut

- ❑ 23 Nm

19 - Trim

- ❑ For tailpipe
- ❑ Slide onto tailpipe as far as stop

20 - Mounting

- ❑ Renew if damaged
- ❑ Check preload ⇒ “1.5 Stress-free alignment of exhaust system”, page 602

21 - Nut

- ❑ 23 Nm

22 - Rear silencer

- ❑ On right side with actuator 1 for engine sound generator - R257-
- ❑ On left side with actuator 2 for engine sound generator - R258-
- ❑ Combined in one unit with double pipe as original equipment
- ❑ Double pipe and rear silencers can be renewed separately
- ❑ Cutting point between double pipe and rear silencer ⇒ page 600
- ❑ Align exhaust system so it is free of stress ⇒ page 602

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23 - Clamp (rear)

- ❑ For separate replacement of double pipe and rear silencer
- ❑ Before tightening, align exhaust system so it is free of stress ⇒ page 602
- ❑ Installation position ⇒ page 586
- ❑ Tighten bolted connections evenly

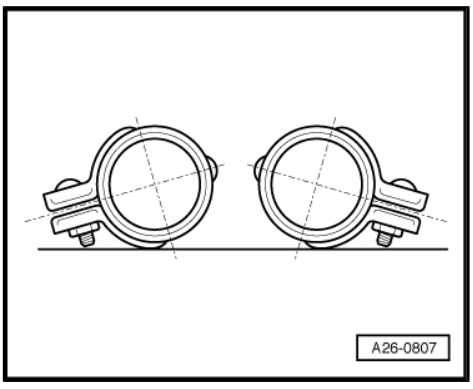
24 - Nut

- ❑ 23 Nm

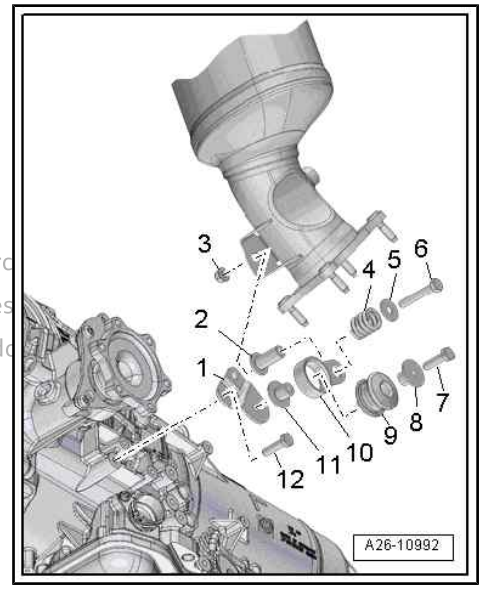
Installation position of front clamps - vehicles with two turbochargers

– Install clamps so that the bolt ends do not protrude beyond bottom of clamp.

• Installation position: bolted connections face outwards.



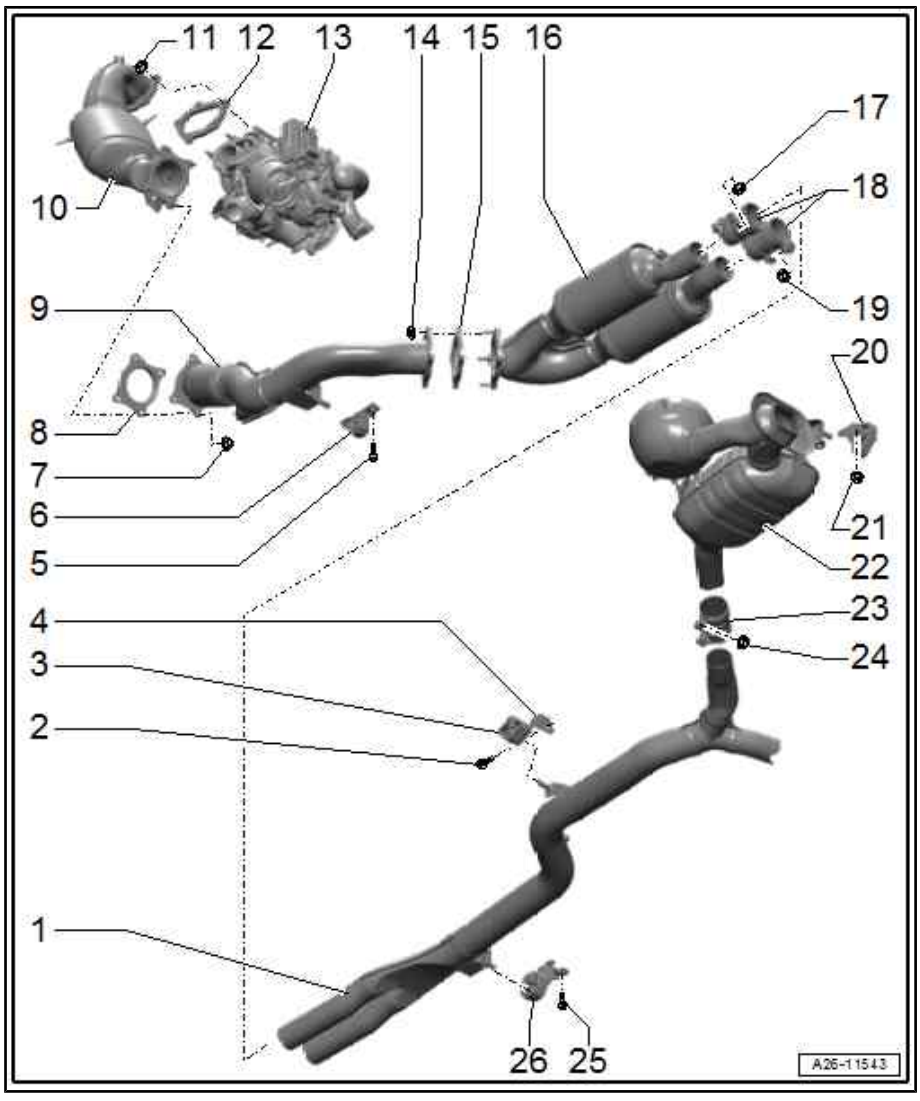
Components of mountings (front) for catalytic converter - vehicles with two turbochargers



1 - Bracket
2 - Nut
3 - Spacer sleeve
4 - Compression spring
5 - Washer
6 - Bolt, 23 Nm
7 - Bolt, 23 Nm
8 - Spacer sleeve
9 - Rubber buffer
10 - Bracket
11 - Spacer sleeve
12 - Bolt, 23 Nm

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1.1.4 Exploded view - silencers, vehicles with two turbochargers and with SCR system



1 - Y-pipe
- ❑ Combined in one unit with rear silencers as original equipment
- ❑ Y-pipe and rear silencer can be renewed separately as required
- ❑ Cutting point: Y-pipe / rear silencer
⇒ page 600
- ❑ Align exhaust system so it is free of stress
⇒ page 602

2 - Bolt
- ❑ 23 Nm

3 - Mounting
- ❑ Renew if damaged

4 - Bracket

5 - Bolt
- ❑ 23 Nm

6 - Mounting
- ❑ Renew if damaged

7 - Nut
- ❑ Renew
- ❑ 23 Nm

8 - Gasket
- ❑ Renew

9 - 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 599
- ❑ Align exhaust system so it is free of stress ⇒ page 602

10 - Catalytic converter

- ❑ With catalytic converter heater 1 - Z119- / catalytic converter heater 2 - Z120-
- ❑ Mounting components ⇒ page 592
- ❑ Removing and installing ⇒ page 605

11 - Nut

- ❑ 23 Nm

12 - Gasket

- ❑ Renew

13 - Turbocharger unit

14 - Nut

- ❑ Renew
- ❑ 23 Nm

15 - Gasket

- ❑ Renew

16 - Particulate filter with NOx storage catalytic converter

- ❑ Removing and installing ⇒ page 618
- ❑ After renewing, perform `Adaption` in `Guided Functions` ⇒ Vehicle diagnostic tester

17 - Nut

- ❑ 23 Nm

18 - Clamps (front)

- ❑ Before tightening, align exhaust system so it is free of stress ⇒ page 602
- ❑ Installation position ⇒ page 591
- ❑ Tighten bolted connections evenly

19 - Nut

- ❑ 23 Nm

20 - Mounting

- ❑ Renew if damaged
- ❑ Check preload ⇒ “1.5 Stress-free alignment of exhaust system”, page 602

21 - Nut

- ❑ 23 Nm

22 - Rear silencer

- ❑ On right side with actuator 1 for engine sound generator - R257-
- ❑ On left side with actuator 2 for engine sound generator - R258-
- ❑ Combined in one unit with double pipe as original equipment
- ❑ Double pipe and rear silencers can be renewed separately
- ❑ Cutting point between double pipe and rear silencer ⇒ page 600
- ❑ Removing and installing ⇒ page 601
- ❑ Align exhaust system so it is free of stress ⇒ page 602

23 - Clamp (rear)

- ❑ For separate replacement of double pipe and rear silencer
- ❑ Before tightening, align exhaust system so it is free of stress ⇒ page 602
- ❑ Installation position ⇒ page 586

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❑ Tighten bolted connections evenly

24 - Nut

❑ 23 Nm

25 - Bolt

❑ 23 Nm

26 - Mounting

❑ Renew if damaged

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1.2 Removing and installing front exhaust pipe

⇒ "1.2.1 Removing and installing front exhaust pipe - vehicles with manual gearbox/multitronic gearbox", page 594

⇒ "1.2.2 Removing and installing front exhaust pipe - vehicles with dual clutch gearbox 0CK", page 596

⇒ "1.2.3 Removing and installing front exhaust pipe - vehicles with four-wheel drive", page 597

⇒ "1.2.4 Removing and installing front exhaust pipe - vehicles with two turbochargers", page 599

1.2.1 Removing and installing front exhaust pipe - vehicles with manual gearbox/ multitronic gearbox

Removing

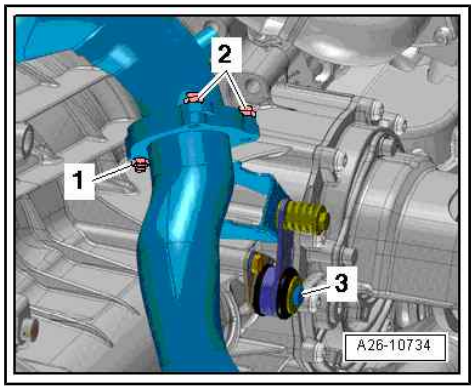
WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system ⇒ page 7 .*

– Remove engine cover panel ⇒ page 172 .

– Remove nuts -2- (accessible from above) for front exhaust pipe.

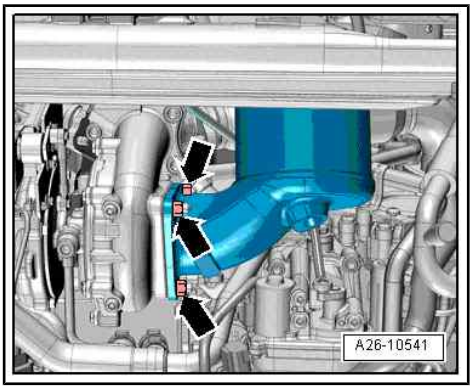


Note

The nut -1- and bolt -3- are removed at a later stage.

– Remove nuts -arrows-.

– Remove noise insulation (rear) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .



Caution

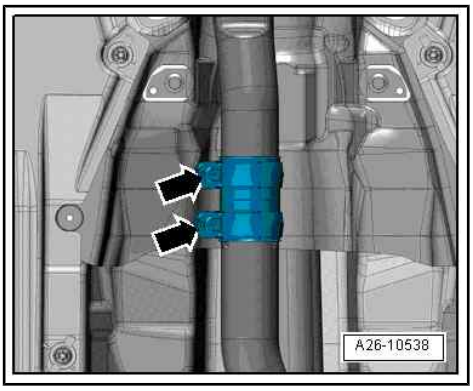
Risk of damage to flexible joint in front exhaust pipe.

- *Do NOT bend flexible joint in front exhaust pipe more than 10°.*

Vehicles without SCR system:

– Loosen bolt connections -arrows- on clamp.

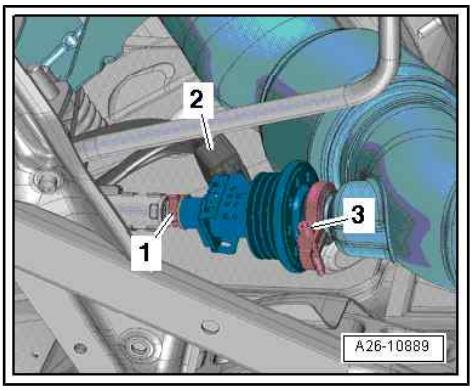
– Push clamp back and lower front exhaust pipe slightly.



Vehicles with SCR system:

– Unplug electrical connector -2-.

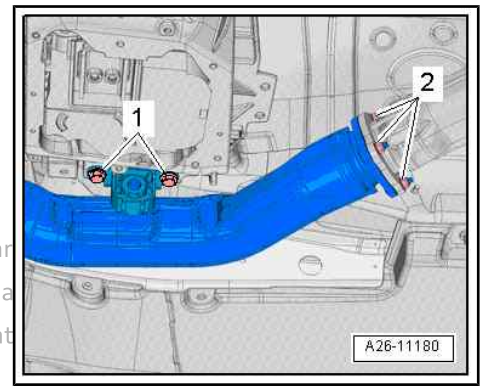
– Release retaining clip -3- and detach injector for reducing agent - N474- .



Note

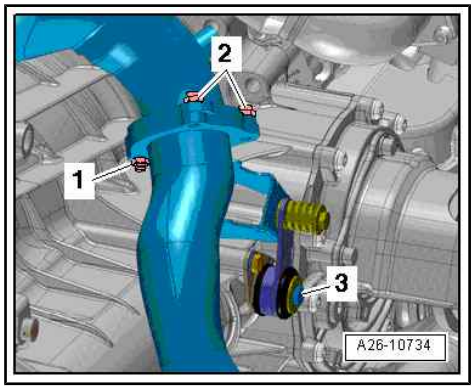
Disregard -item 1-.

– Remove bolts -1- and nuts -2- and lower exhaust pipe slightly.



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All vehicles (continued):



– Remove bolt -3-.
– Press front exhaust pipe with particulate filter up slightly and unscrew nut -1-.
– Detach front exhaust pipe.

Installing

Installation is carried out in reverse order; note the following:

Note

Renew gaskets and self-locking nuts.

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– Install particulate filter ⇒ page 612 .
– Align the exhaust system so it is free of stress ⇒ page 602 .

Tightening torques

- ⇒ “1.1 Exploded view - silencers”, page 584
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

1.2.2 Removing and installing front exhaust pipe - vehicles with dual clutch gearbox 0CK

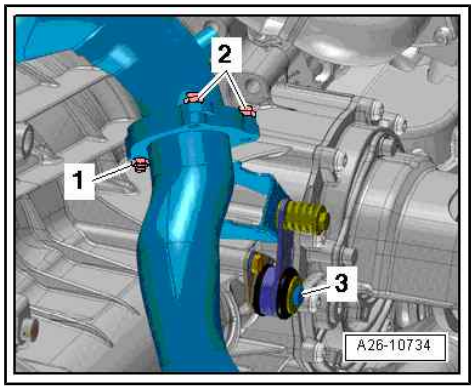
Removing

WARNING

When working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system ⇒ page 7 .***

– Remove engine cover panel ⇒ page 172 .
– Remove nuts -2- (accessible from above) for front exhaust pipe.

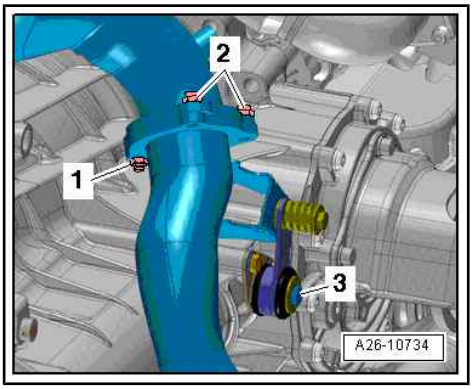


Note

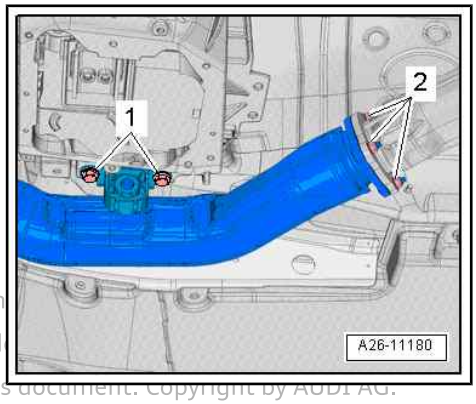
The nut -1- and bolt -3- are removed at a later stage.

– Remove noise insulation (rear) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

– Remove bolt -3-.
– Press front exhaust pipe with particulate filter up slightly and unscrew nut -1-.



– Remove bolts -1- and nuts -2-.
– Detach front exhaust pipe.



Installing

Installation is carried out in reverse order; note the following:

Note

Renew gaskets and self-locking nuts.

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– Install particulate filter ⇒ page 612 .
– Align the exhaust system so it is free of stress ⇒ page 602 .

Tightening torques

- ⇒ “1.1 Exploded view - silencers”, page 584
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

1.2.3 Removing and installing front exhaust pipe - vehicles with four-wheel drive

Removing

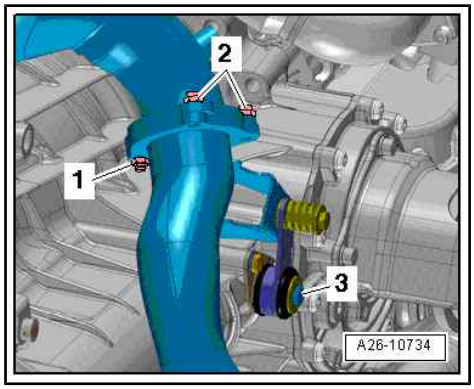
WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system ⇒ page 7 .*

– Remove engine cover panel ⇒ page 172 .

– Remove nuts -2- (accessible from above) for front exhaust pipe.



Note

The nut -1- and bolt -3- are removed at a later stage.

– Remove noise insulation (rear) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

Caution

Risk of damage to flexible joint in front exhaust pipe.

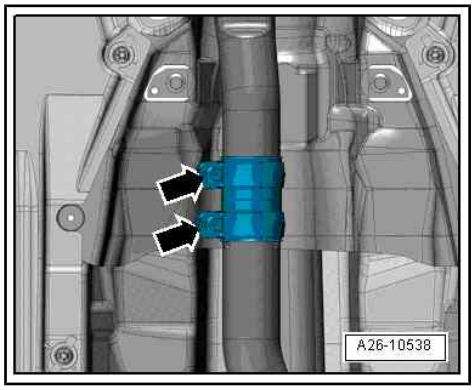
- ***Do NOT bend flexible joint in front exhaust pipe more than 10°.***

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Vehicles without SCR system:

– Loosen bolt connections -arrows- on clamp.

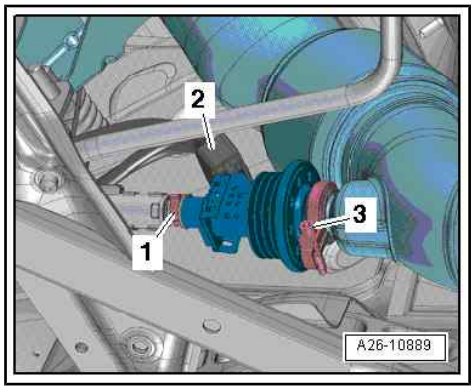
– Push clamp back and lower front exhaust pipe slightly.



Vehicles with SCR system:

– Unplug electrical connector -2-.

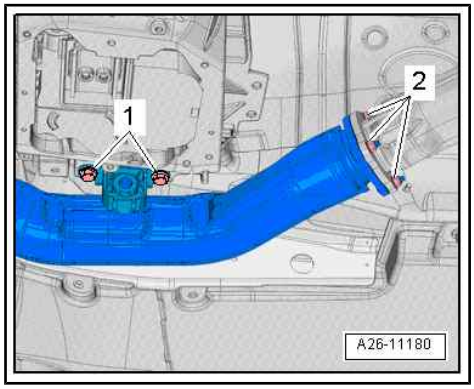
– Release retaining clip -3- and detach injector for reducing agent - N474- .



Note

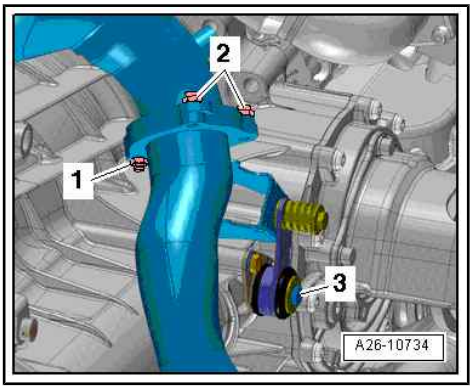
Disregard -item 1-.

– Remove bolts -1- and nuts -2- and lower exhaust pipe slightly.



All vehicles (continued):

– Remove nut -1- and bolt -3- and detach front exhaust pipe.



Installing

Installation is carried out in reverse order; note the following:

Note

Renew gaskets and self-locking nuts.

– Align the exhaust system so it is free of stress ⇒ page 602 .

Tightening torques

- ⇒ “1.1.1 Exploded view - silencers, vehicles with one turbocharger and without SCR system”, page 584
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

1.2.4 Removing and installing front exhaust pipe - vehicles with two turbochargers

Removing

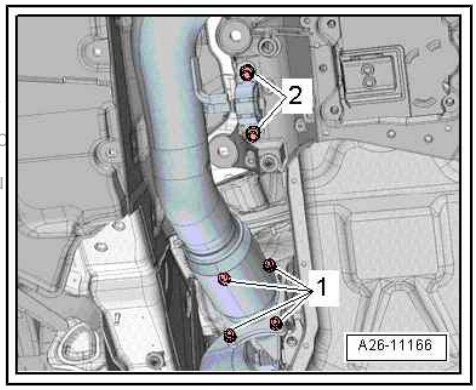
WARNING

When working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system ⇒ page 7 .***

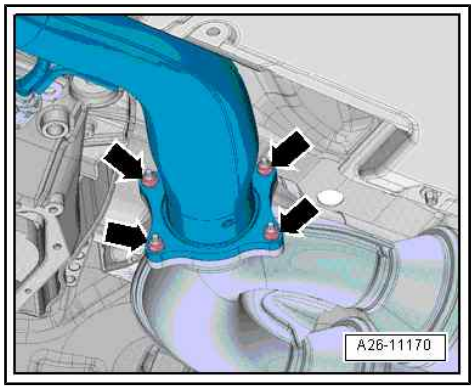
– Remove noise insulation (rear) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

– Remove bolts -2- and nuts -1-.



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– Remove nuts -arrows- and detach front exhaust pipe.



Installing

Installation is carried out in reverse order; note the following:

Note

Renew gaskets and self-locking nuts.

– Align the exhaust system so it is free of stress ⇒ page 602 .

Tightening torques

- ⇒ “1.1.3 Exploded view - silencers, vehicles with two turbo-chargers and without SCR system”, page 590
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

1.3 Separating exhaust pipes/silencers

WARNING

When working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system ⇒ page 7 .***

- The connecting pipe can be cut through at the point marked in order to renew the Y-pipe/intermediate pipe or rear silencer (s) separately.
- The cutting point is marked by an indentation on the circumference of the exhaust pipe.

Special tools and workshop equipment required

- Chain pipe cutter - VAS 6254-

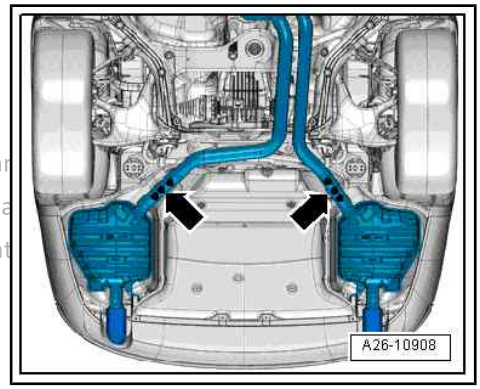


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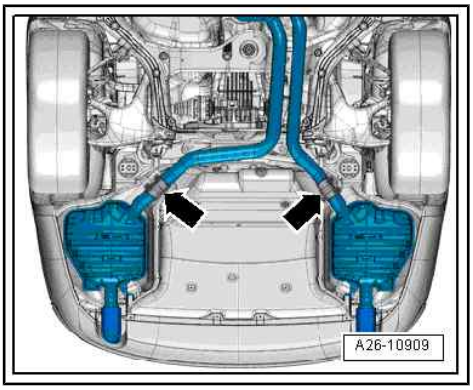
Procedure

– Cut through exhaust pipes at right angles at the positions marked -arrows- using chain pipe cutter - VAS 6254- .

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– Position centre of clamps -arrows- over cutting location.



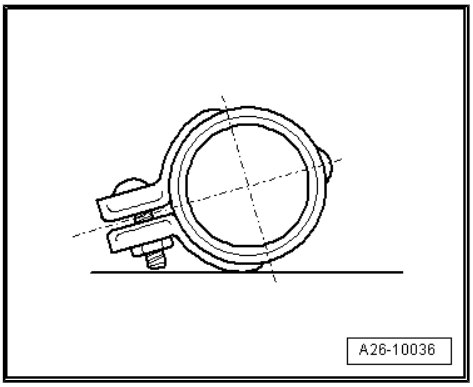
– Install clamps so that the bolt ends do not protrude beyond bottom of clamp.

• Installation position: bolted connections face forwards.

– Align the exhaust system so it is free of stress ⇒ page 602 .

Tightening torques

◆ ⇒ “1.1 Exploded view - silencers”, page 584



1.4 Removing and installing silencers

Removing

WARNING

When working on all parts of the exhaust system:

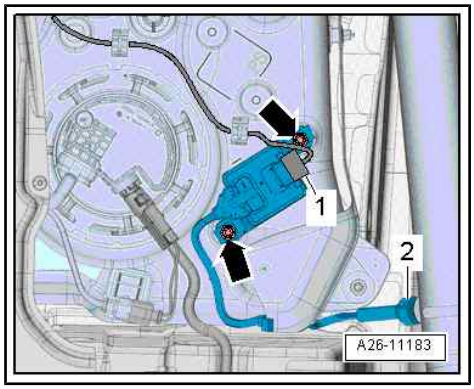
◆ *Observe safety precautions when working on the exhaust system ⇒ page 7 .*

Vehicles with four-wheel drive:

– Remove tunnel cross-piece (rear) ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim; Removing and installing tunnel cross-piece .

All vehicles (continued):

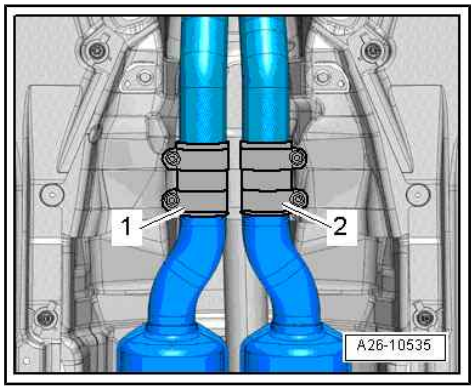
– If fitted, remove NOx sender 2 - G687- -item 2-.



Note

-Item 1- and -arrows- can be disregarded.

– Loosen and push back clamps -1, 2- and tie up particulate filter to underbody.



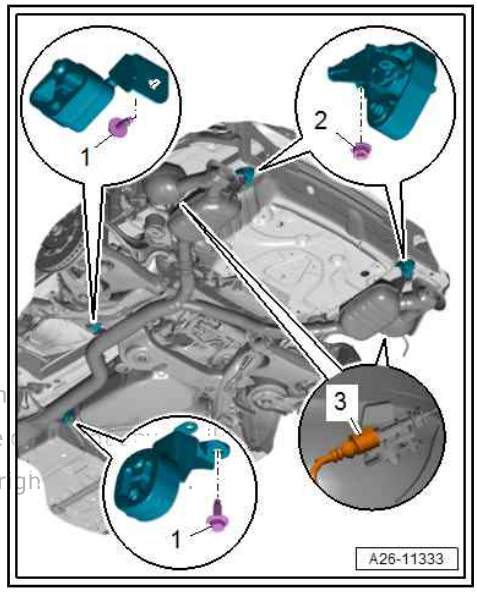
Note

The illustration shows the fitting location on a vehicle with two turbochargers as an example.

WARNING

Risk of accident caused by weight of silencers.

- ***A second mechanic is required for removal of the rear silencer.***



– Unplug electrical connector -3- and move wiring clear.

– Unscrew bolts -1- and nuts -2- and remove silencer(s).

Installing

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Installation is carried out in reverse order; note the following:

Note

Renew seals, gaskets and self-locking nuts.

– Align the exhaust system so it is free of stress ⇒ page 602 .

Tightening torques

- ⇒ “1.1 Exploded view - silencers”, page 584
- NOx sender 2 - G687-
  ⇒ “8.1 Exploded view - Lambda probe”, page 563
- Tunnel cross-piece ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim; Exploded view - underbody trim

1.5 Stress-free alignment of exhaust system

Procedure

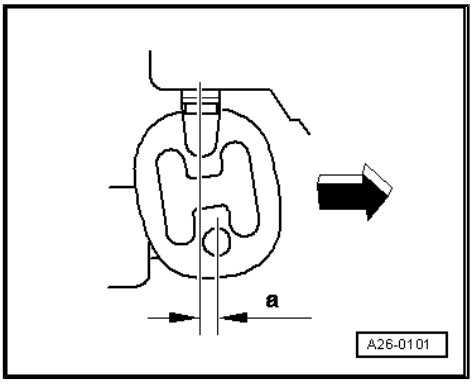
- The exhaust system must be aligned when it is cool.

Vehicles without clamps between Y-pipe/intermediate pipe and rear silencers

– Loosen bolt connections for front clamp(s).

– Push exhaust system towards front of vehicle -arrow- until mountings for Y-pipe/intermediate pipe are preloaded by -a- = 6 ... 10 mm.

– Tighten bolted connections on clamps evenly.

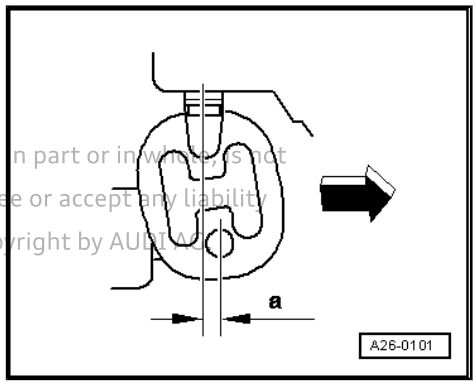


Vehicles with clamps between Y-pipe/intermediate pipe and rear silencers

Note

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On a vehicle with clamps fitted between Y-pipe/intermediate pipe and rear silencers, it is also necessary to align the Y-pipe/intermediate pipe.



– Loosen bolted connections on front and rear clamps.

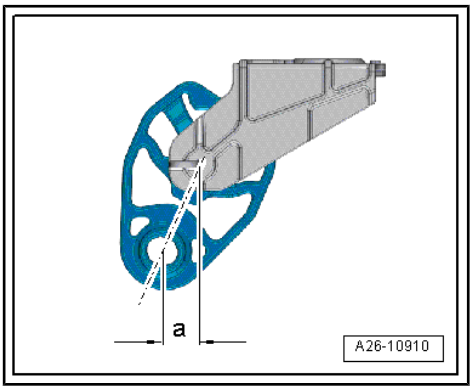
– Push exhaust system towards front of vehicle -arrow- until mountings for Y-pipe/intermediate pipe are preloaded by -a- = 6 ... 10 mm.

– Tighten bolt connections on front clamp(s) evenly.

– Push rear section of exhaust system towards front of vehicle -arrow-, so that mountings (rear) for rear silencers are preloaded by -a- = 11 ... 15 mm.

– Align rear silencers so they are horizontal.

– Tighten bolted connections on rear clamps evenly.

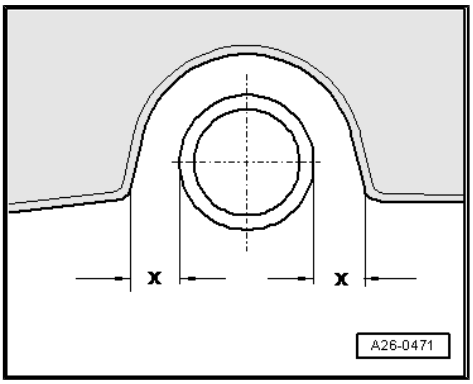


– Check clearance between tailpipes and bumper on both sides:

• Dimension -x- (left-side) = dimension -x- (right-side)

Tightening torques

◆ ⇒ “1.1 Exploded view - silencers”, page 584



1.6 Checking exhaust system for leaks

Procedure

WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system ⇒ page 7 .*

– Start the engine and run at idling speed.

– Plug tailpipes during leak test (e.g. with cloth or plug).

– Listen for leaks at connection points between cylinder head/ exhaust manifold, exhaust manifold/intermediate pipe and turbocharger/intermediate flange etc.

– Rectify any leaks that are found.

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2 Emission control system

⇒ “2.1 Removing and installing catalytic converter”, page 605

⇒ “2.2 Removing and installing particulate filter”, page 612

2.1 Removing and installing catalytic converter

⇒ “2.1.1 Removing and installing catalytic converter - vehicles with two turbochargers”, page 605

⇒ “2.1.2 Removing and installing SCR catalytic converter”, page 609

⇒ “2.1.3 Removing and installing catalytic converter heater control unit 1 J1021 ”, page 611

2.1.1 Removing and installing catalytic converter - vehicles with two turbochargers

Special tools and workshop equipment required

- Puller - T40317- for vehicles with SCR system

Removing

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WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system ⇒ page 7 .*

– Remove intermediate steering shaft ⇒ Running gear, axles, steering; Rep. gr. 48 ; Steering column; Removing and installing intermediate steering shaft .

– Remove front exhaust pipe ⇒ page 599 .

– Remove Lambda probe ⇒ page 569 .

– Remove exhaust gas temperature sender 2 - G448- ⇒ page 646 .

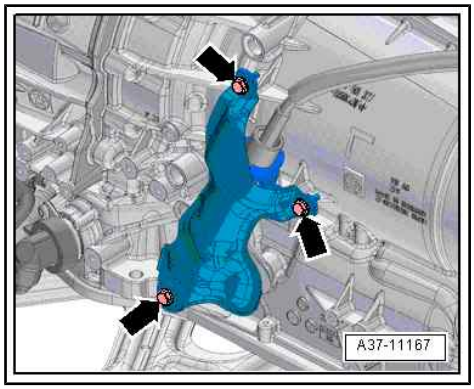
– Remove subframe cross brace ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Removing and installing subframe cross brace .

Caution

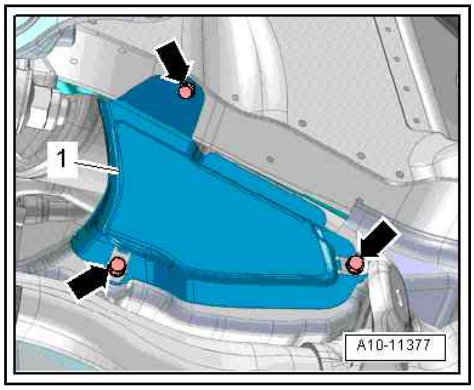
Risk of damage to running gear components.

- *The vehicle must NOT be lowered onto its wheels if the engine/gearbox mountings, steering rack or subframe cross brace are not properly installed.*

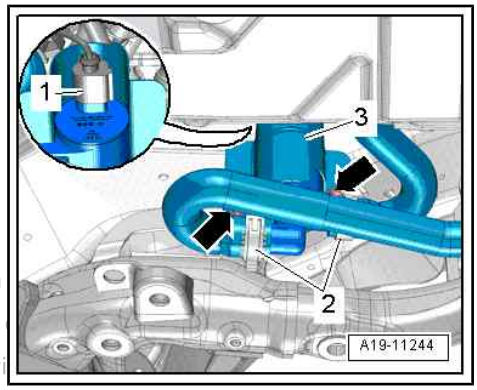
– Remove bolts -arrows- and detach heat shield.



– Remove bolts -arrows- on longitudinal member (left-side) and detach heat shield -1-.

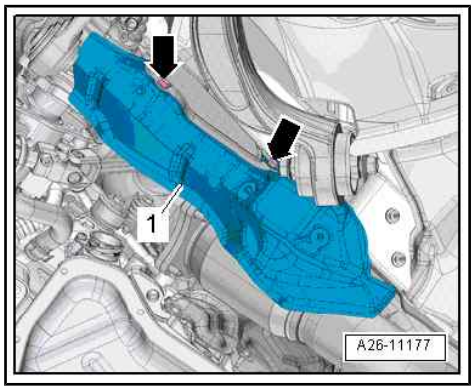


– If fitted, remove bolts -arrows-.
– Unplug electrical connector -1- and move gearbox oil cooling valve - N509- to side with coolant hoses -2- attached.

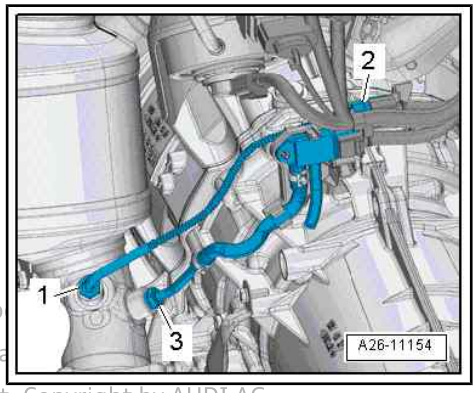


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– Unscrew bolts and nuts -arrows- and detach heat shield -1-.



– Remove exhaust gas temperature sender 3 - G495- -item 1- and pressure pipe -3- for pressure differential sender - G505- .



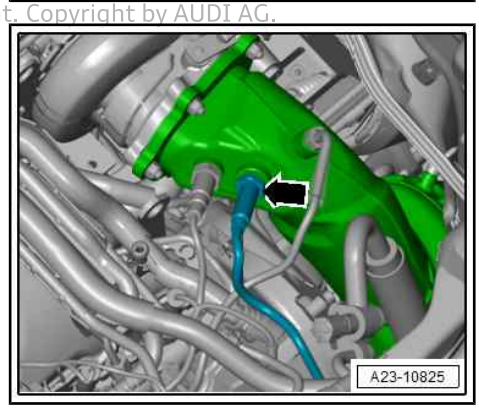
Note

Disregard -item 2-.

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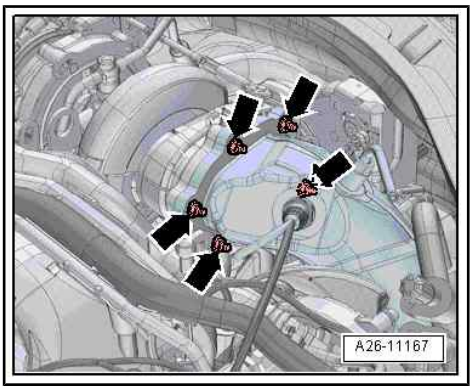
Vehicles with SCR system:

– Unscrew NOx sender - G295- -arrow- and move clear to left side.

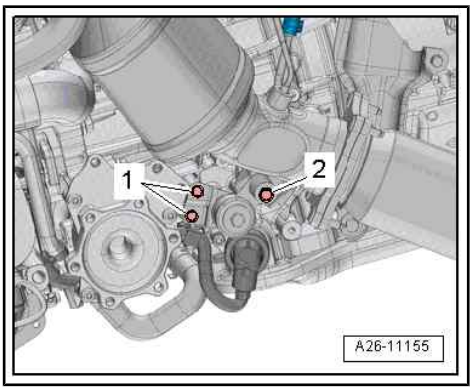


All vehicles (continued):

– Remove nuts -arrows-.

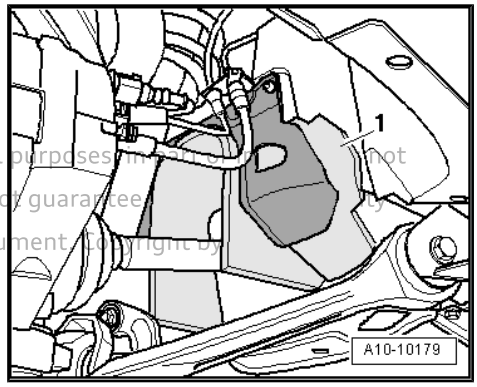


– Remove bolts -1, 2- and detach bracket.



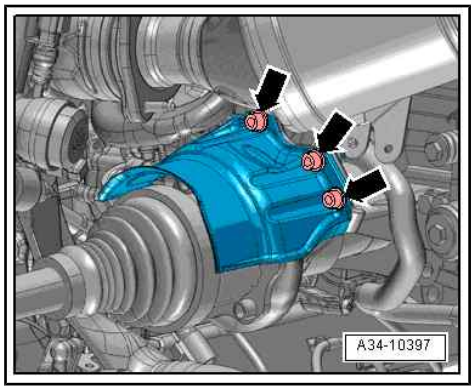
Vehicles with SCR system:

– Remove cover (left-side) -1- for drive shaft in wheel housing.



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– Remove bolts -arrows- and detach heat shield for drive shaft (left-side).

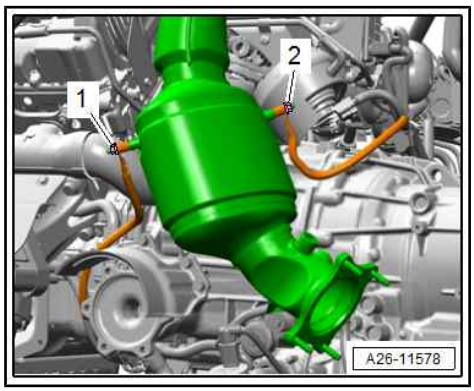


– Remove nuts -1, 2-. If necessary, disengage catalytic converter at turbocharger with the help of a second mechanic.

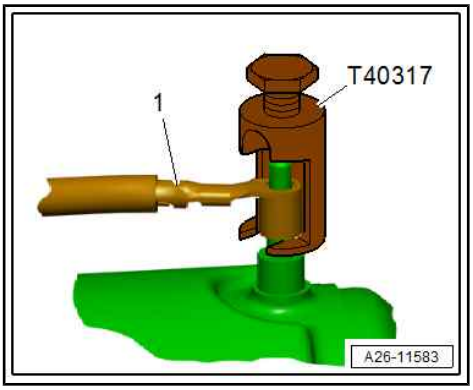
– For better access when performing the next step, turn catalytic converter to side.

♦ Item -1- = catalytic converter heater 1 - Z119-

♦ Item -2- = catalytic converter heater 2 - Z120-



– Unplug electrical connectors for catalytic converter heater 1 - Z119- / catalytic converter heater 2 - Z120- using puller - T40317- .



All vehicles (continued):

– Detach catalytic converter.

Installing

Installation is carried out in reverse order; note the following:

Note

Renew gaskets and self-locking nuts.

– Install Lambda probe ⇒ page 570 .
– Install NOx sender 2 - G687- ⇒ page 576 .
– Secure electrical wiring to catalytic converter heater 1 - Z119- / catalytic converter heater 2 - Z120- ⇒ Item 5 (page 568) .
– Install intermediate steering shaft ⇒ Running gear, axles, steering; Rep. gr. 48 ; Steering column; Removing and installing intermediate steering shaft .
– Align the exhaust system so it is free of stress ⇒ page 602 .

Tightening torques

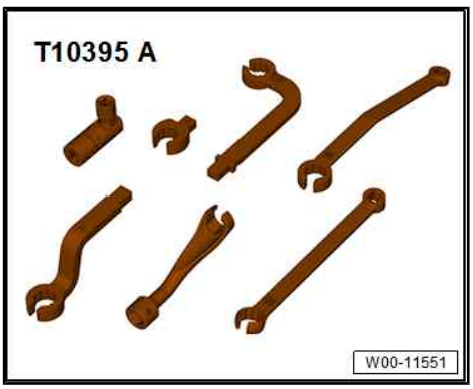
- ⇒ “1.1 Exploded view - silencers”, page 584
- ⇒ “4.1 Exploded view - exhaust gas temperature control”, page 634
- Heat shield for drive shaft ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Exploded view - drive shaft
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Strips / trim panels / extensions; Exploded view - heat shield
- Subframe cross brace ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Exploded view - subframe

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2.1.2 Removing and installing SCR catalytic converter

Special tools and workshop equipment required

- Tool set - T10395 A- with suitable tool insert



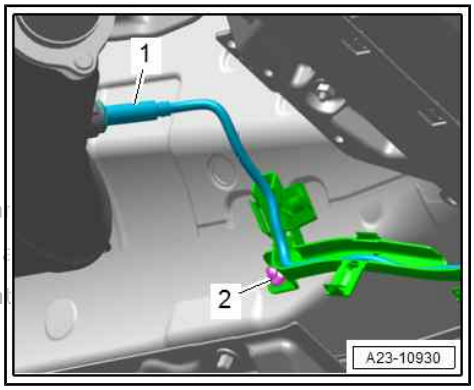
Removing

WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system ⇒ page 7 .*

– If fitted, remove NOx sender 2 - G687- -item 1- using a tool from tool set - T10395A- .

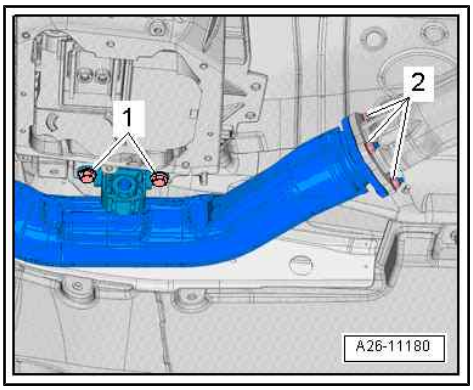


Note

Disregard -item 2-.

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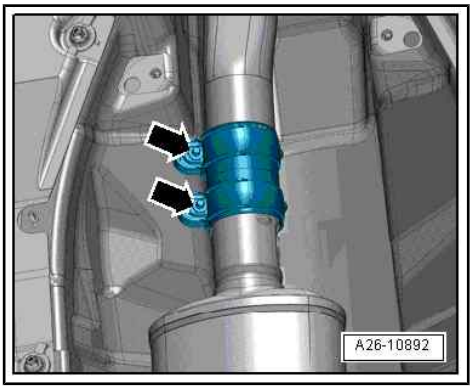
– Remove nuts -2-.



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:

Adapting learnt values if SCR catalytic converter has been renewed

– Connect ⇒ Vehicle diagnostic tester.

– Switch on ignition.

– Select and start `Diagnosis`.

– Choose `Select own test` and select following options one after the other:

- `Drive train`
- `Engine code`
- `01 - Self-diagnosis compatible systems`
- `01 - Engine electronics J623`
- `01 - Engine electronics, functions`
- `01 - Adapt learnt values - after component replacement`

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Note

Renew seals, gaskets and self-locking nuts.

– Align the exhaust system so it is free of stress ⇒ page 602 .

Tightening torques

- ⇒ “1.1.2 Exploded view - silencers, vehicles with one turbocharger and with SCR system”, page 587

2.1.3 Removing and installing catalytic converter heater control unit 1 - J1021-

Removing

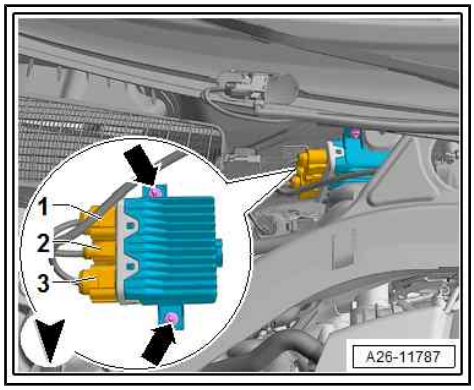
Note

Fitting location: catalytic converter heater control unit 1 - J1021- is fitted in plenum chamber partition panel on right side (as seen in direction of travel).

– Remove plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .

– Unplug electrical connectors -1, 2 and 3-.

– Remove nuts -arrows- and detach catalytic converter heater control unit 1 .



Installing

Installation is carried out in reverse order; note the following:

– Install plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .

2.2 Removing and installing particulate filter

⇒ “2.2.1 Removing and installing particulate filter - vehicles with manual gearbox/multitronic gearbox”, page 612

⇒ “2.2.2 Removing and installing particulate filter - vehicles with dual clutch gearbox 0CK”, page 613

⇒ “2.2.3 Removing and installing particulate filter - vehicles with four-wheel drive”, page 616

⇒ “2.2.4 Removing and installing particulate filter - vehicles with two turbochargers”, page 618

2.2.1 Removing and installing particulate filter - vehicles with manual gearbox/multitronic gearbox

Removing

WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system ⇒ page 7 .*

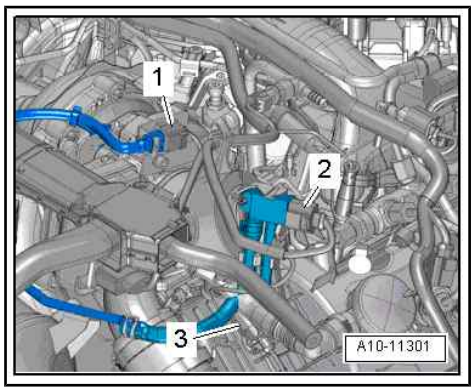
– Remove plenum chamber partition panel ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber partition panel .

– Remove front exhaust pipe ⇒ page 594 .

Exhaust temperature sender - version 1:

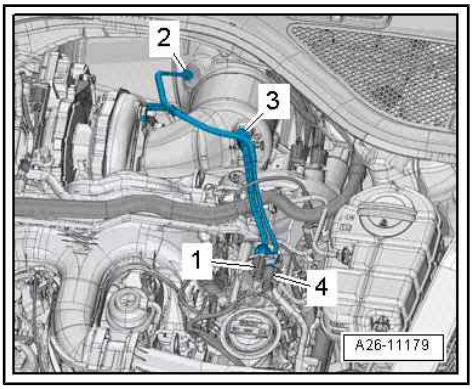
– Take electrical connectors -1, 3- out of bracket, unplug connectors and move electrical wiring clear.

– Unplug electrical connector -2-, unclip pressure differential sender - G505- from bracket and move clear.



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Exhaust temperature sender - version 2:



– Detach electrical connectors -1 and 4- from bracket and unplug.

Note

Disregard items -2 and 3-.

– Detach particulate filter.

Installing

Installation is carried out in reverse order; note the following:

Note

Renew seals, gaskets and self-locking nuts.

– Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.

– Install front exhaust pipe ⇒ page 594 .

– Secure electrical wiring to catalytic converter heater 1 - Z119- ⇒ Item 5 (page 568) .

– Install plenum chamber partition panel ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber partition panel .

– After renewing particulate filter, perform `Adaption` in `Guided Functions` ⇒ Vehicle diagnostic tester.

Tightening torques

◆ ⇒ “1.1 Exploded view - silencers”, page 584

2.2.2 Removing and installing particulate filter - vehicles with dual clutch gearbox 0CK

Special tools and workshop equipment required

◆ Puller - T40317- for vehicles with catalytic converter heater

Removing

WARNING

When working on all parts of the exhaust system:

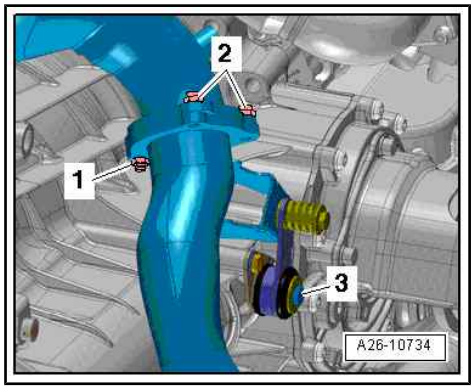
- ***Observe safety precautions when working on the exhaust system ⇒ page 7 .***

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– Remove plenum chamber partition panel ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber partition panel .

– Remove noise insulation (rear) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

– Unscrew nut -1-.

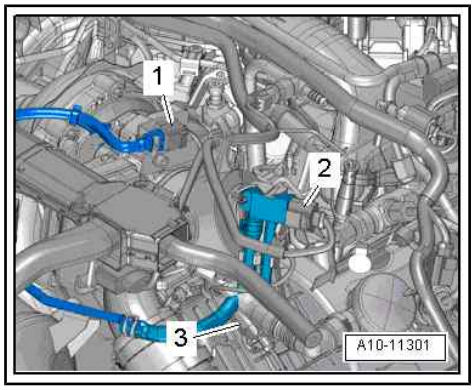


Note

- *The nuts -2- are removed at a later stage.*
- *Disregard -item 3-.*

– Take electrical connector -3- out of bracket, unplug it and move electrical wiring clear.

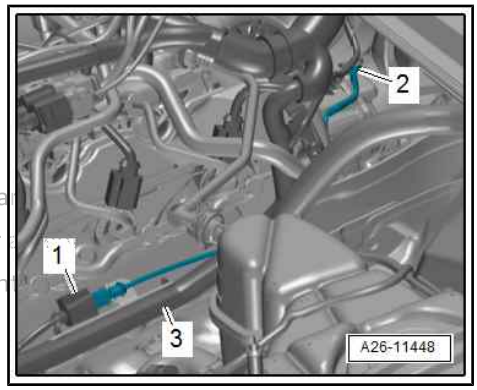
– Unplug electrical connector -2-, unclip pressure differential sender - G505- from bracket and move clear.



Note

Disregard -item 1-.

– Take electrical connector -1- for exhaust gas temperature sender 3 - G495- -item 2- out of bracket and unplug.

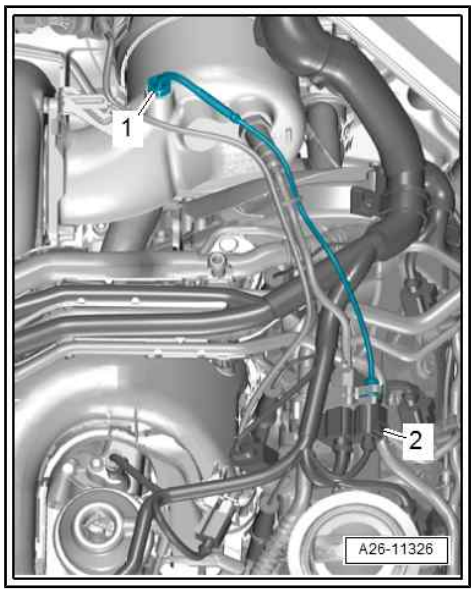


Note

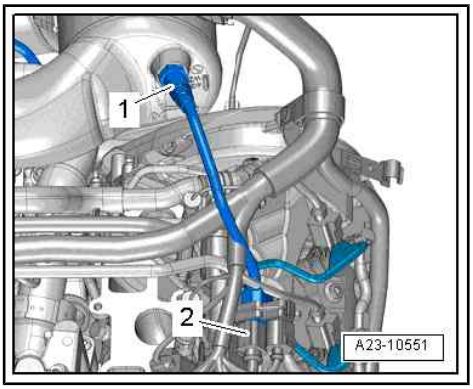
Disregard -item 3-.

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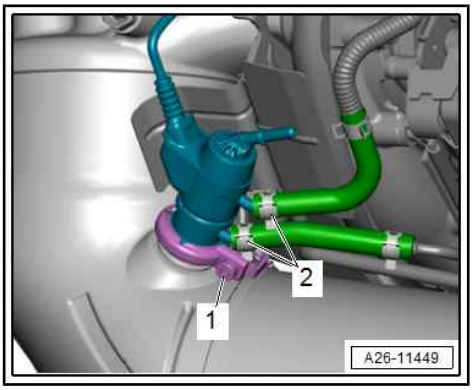
– Detach electrical connector -2- for exhaust gas temperature sender 2 - G448- -item 1- from bracket, unplug connector and move electrical wiring clear.



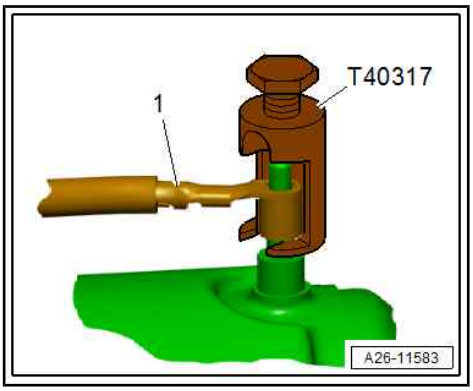
– Take electrical connector -2- for Lambda probe - G39- -item 1- out of bracket, unplug connector and move wiring clear.



– Release retaining clip -1-, detach injector for reducing agent - N474- and push to one side with coolant hoses -2- attached.

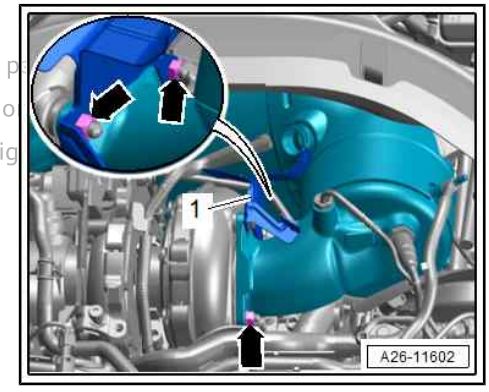


– Unplug electrical connector for catalytic converter heater 1 - Z119- using puller - T40317- .



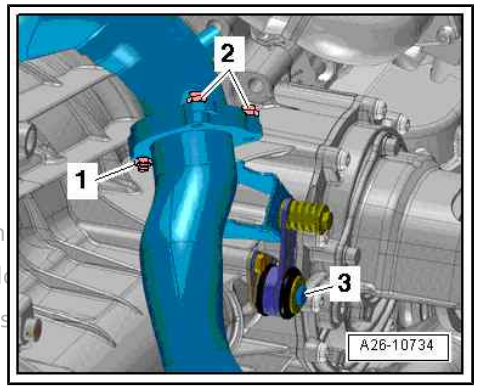
– Remove nuts -arrows-.

– If fitted, detach heat shield -1-.



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– Remove nuts -2- (accessible from above) and detach particulate filter.



Installing

Installation is carried out in reverse order; note the following:

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Note

Renew seals, gaskets and self-locking nuts.

– Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.

– Install front exhaust pipe ⇒ page 594 .

– Secure electrical wiring to catalytic converter heater 1 - Z119- ⇒ Item 5 (page 568) .

– Install plenum chamber partition panel ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber partition panel .

– After renewing particulate filter, perform `Adaption` in `Guided Functions` ⇒ Vehicle diagnostic tester.

Tightening torques

◆ ⇒ “1.1 Exploded view - silencers”, page 584

2.2.3 Removing and installing particulate filter - vehicles with four-wheel drive

Removing

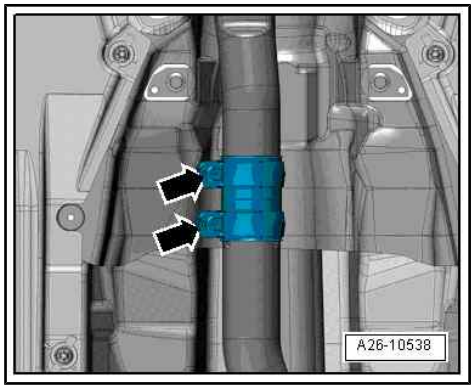
WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system ⇒ page 7 .*

– Remove noise insulation (rear) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

Vehicles with dual clutch gearbox 0B5:



Caution

Risk of damage to flexible joint in front exhaust pipe.

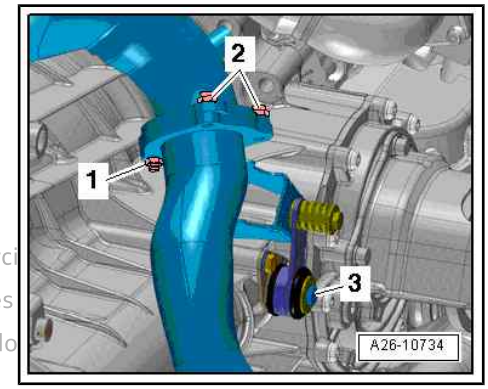
- *Do NOT bend flexible joint in front exhaust pipe more than 10°.*

– Loosen bolt connections -arrows- on clamp.

– Push clamp back and lower front exhaust pipe slightly.

All vehicles (continued):

– Unscrew nut -1-.



Note

- *The nuts -2- are removed at a later stage.*
- *Disregard -item 3-.*

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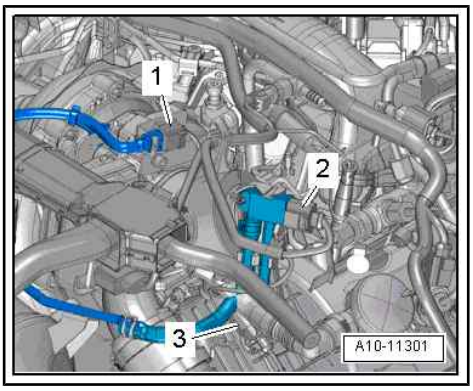
– Secure front exhaust pipe with clamp.

– Remove plenum chamber partition panel ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber partition panel .

Exhaust temperature sender - version 1:

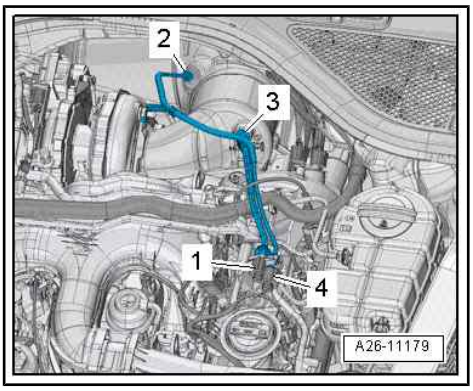
– Take electrical connectors -1, 3- out of bracket, unplug connectors and move electrical wiring clear.

– Unplug electrical connector -2-, unclip pressure differential sender - G505- from bracket and move clear.



Exhaust temperature sender - version 2:

– Detach electrical connectors -1 and 4- from bracket and unplug.

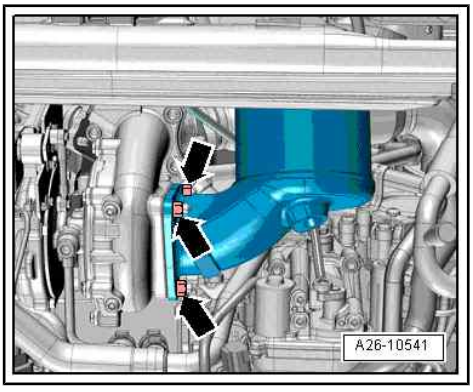


Note

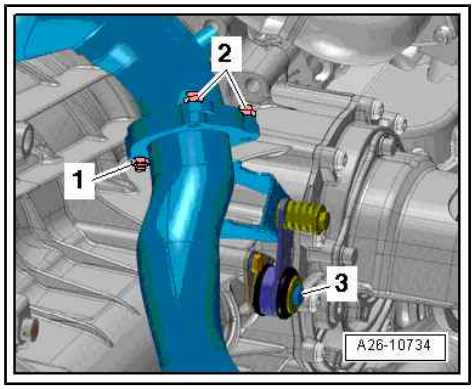
Disregard items -2 and 3-.

All vehicles (continued):

– Remove nuts -arrows- and detach particulate filter from turbocharger.



– Remove nuts -2- (accessible from above) and detach particulate filter.



Note

Disregard -item 3-.

Installing

Installation is carried out in reverse order; note the following:

Note

Renew seals, gaskets and self-locking nuts.

– Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
– Install plenum chamber partition panel ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber partition panel .
– Align the exhaust system so it is free of stress ⇒ page 602 .
– After renewing particulate filter, perform `Adaption` in `Guided Functions` ⇒ Vehicle diagnostic tester.

Tightening torques

◆ ⇒ “1.1 Exploded view - silencers”, page 584
◆ ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

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2.2.4 Removing and installing particulate filter - vehicles with two turbochargers

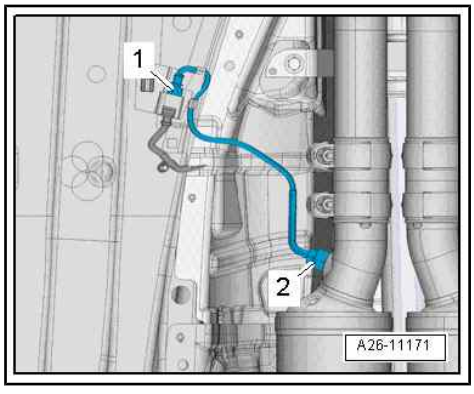
Removing

WARNING

When working on all parts of the exhaust system:

◆ ***Observe safety precautions when working on the exhaust system ⇒ page 7 .***

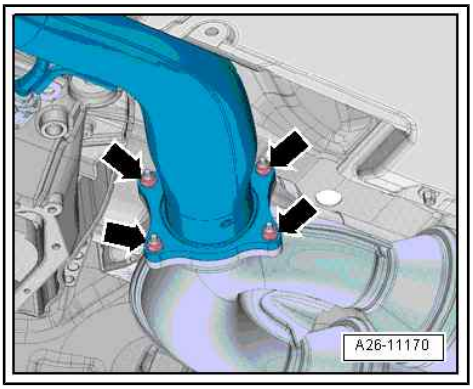
– Detach underbody trim (centre) in direction of exhaust system and press downwards slightly ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim; Removing and installing underbody trim .
– Detach electrical connector -1- on both sides from bracket and unplug.



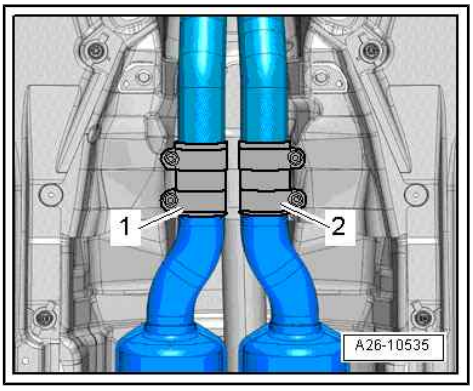
Note

Disregard -item 2-.

– Remove nuts -arrows-.



– Loosen and push back clamps -1, 2- and remove particulate filter.



Installing

Installation is carried out in reverse order; note the following:

Note

Renew seals, gaskets and self-locking nuts.

– Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.

– Align the exhaust system so it is free of stress ⇒ page 602 .

– After renewing particulate filter, perform `Adaption` in `Guided Functions` ⇒ Vehicle diagnostic tester.

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Tightening torques

- ⇒ “1.1.3 Exploded view - silencers, vehicles with two turbo-chargers and without SCR system”, page 590
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim; Exploded view - underbody trim

3 SCR (selective catalytic reduction) system

⇒ “3.1 Exploded view - reducing agent tank”, page 620

⇒ “3.2 Exploded view - reducing agent supply line”, page 621

⇒ “3.3 Exploded view - delivery unit for reducing agent”, page 623

⇒ “3.4 Exploded view - control unit for reducing agent metering system J880 ”, page 624

⇒ “3.5 Draining reducing agent tank”, page 625

⇒ “3.6 Removing and installing reducing agent tank”, page 625

⇒ “3.7 Removing and installing delivery unit for reducing agent”, page 628

⇒ “3.8 Removing and installing injector for reducing agent N474 ”, page 630

⇒ “3.9 Removing and installing control unit for reducing agent metering system J880 ”, page 633

3.1 Exploded view - reducing agent tank

1 - Nut
- ❑ 2 Nm

2 - Cover
- ❑ For reducing agent tank

3 - Bolt
- ❑ 20 Nm

4 - Sleeve

5 - Grommet

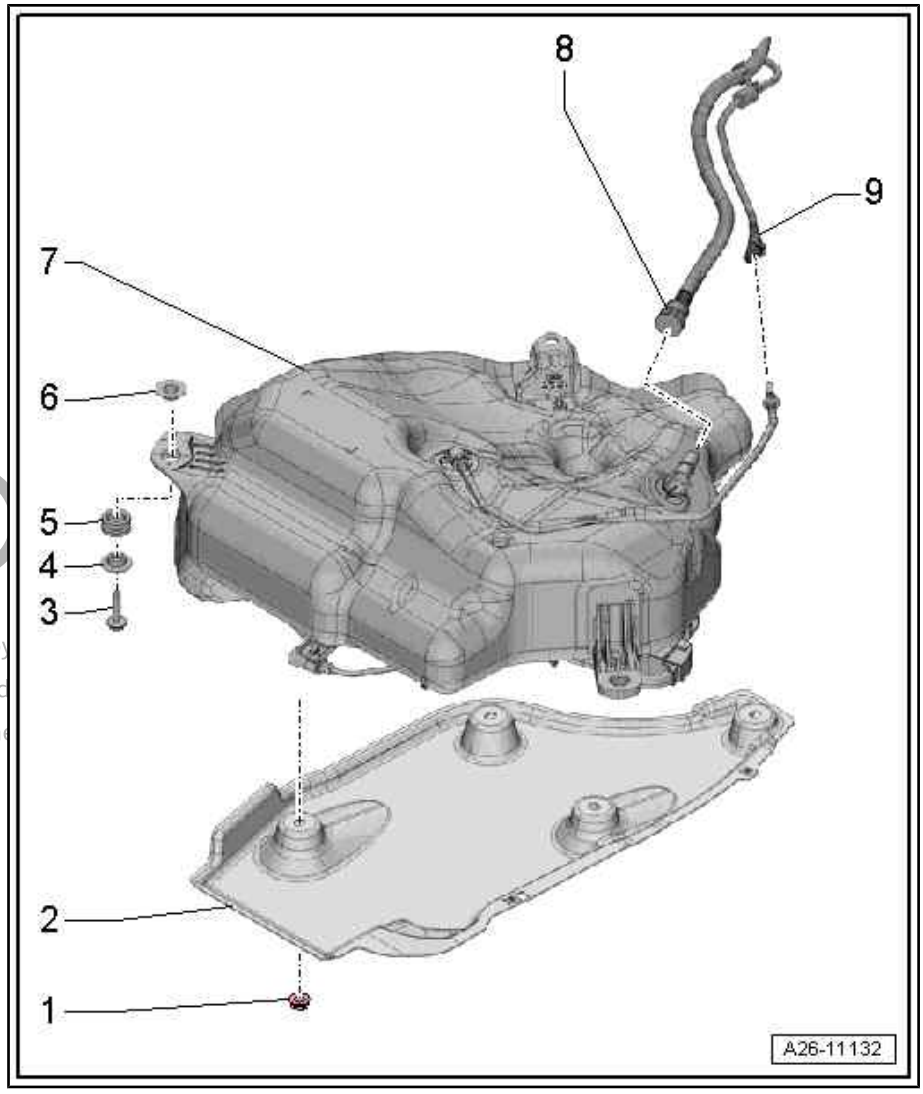
6 - Sleeve

7 - Tank
- ❑ For reducing agent
- ❑ Fitting location: Beneath left rear seat on underside of vehicle.
- ❑ Removing and installing ⇒ page 625

8 - Filler line
- ❑ From filler neck

WARNING

Safety risk due to escaping reducing agent. Observe safety measures for handling reducing agent ⇒ page 6 .



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9 - Breather line

- ❑ To filler neck

3.2 Exploded view - reducing agent supply line

⇒ "3.2.1 Exploded view - reducing agent supply line, not water-cooled", page 621

⇒ "3.2.2 Exploded view - reducing agent supply line, water-cooled", page 622

3.2.1 Exploded view - reducing agent supply line, not water-cooled

1 - Front exhaust pipe

2 - Retaining clamp

- ❑ Renew

3 - Bolt

- ❑ 5 Nm

4 - Gasket

- ❑ Renew

5 - Injector for reducing agent - N474-

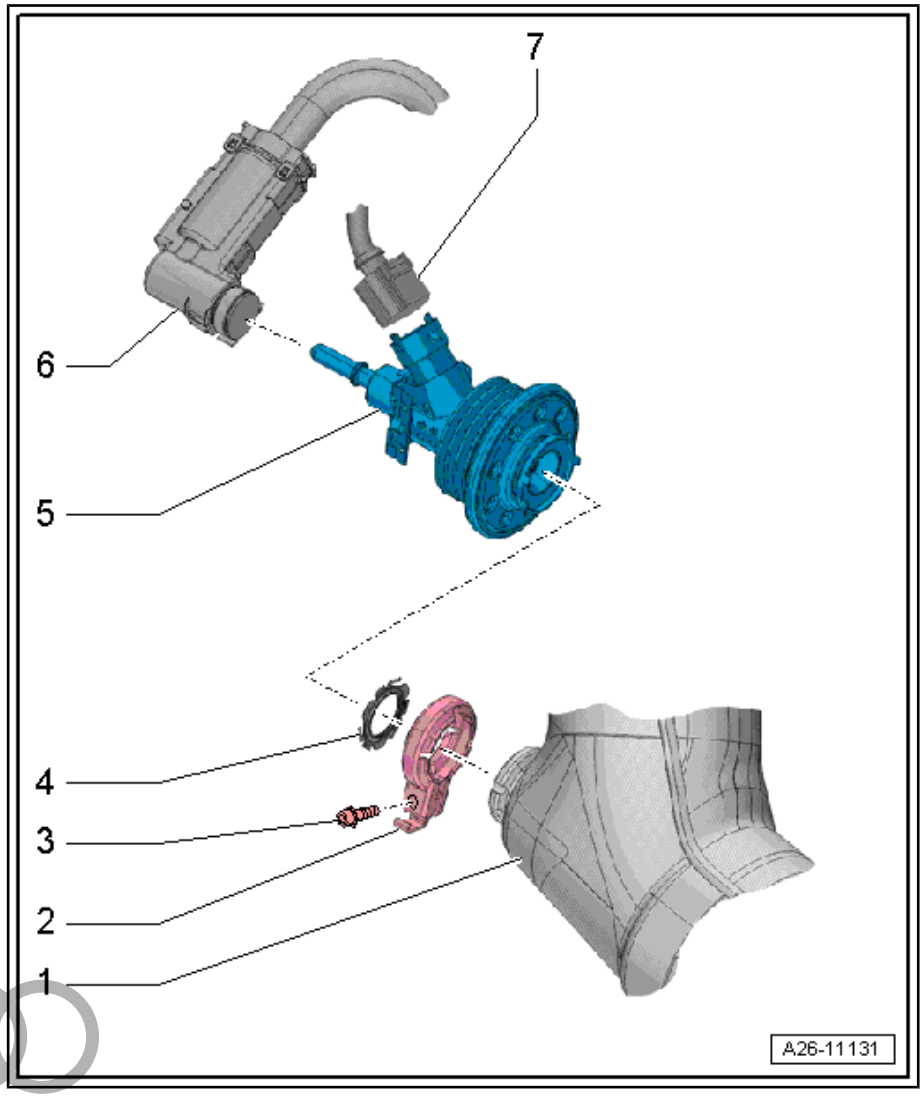
- ❑ Removing and installing ⇒ page 630
- ❑ Lugs in injector for reducing agent - N474- must be inserted in corresponding mountings in front exhaust pipe.

6 - Metering line

- ❑ From reducing agent pump - V437-
- ❑ With heater for reducing agent line (heater circuit 2) - Z104-
- ❑ Press release tabs to disconnect

WARNING

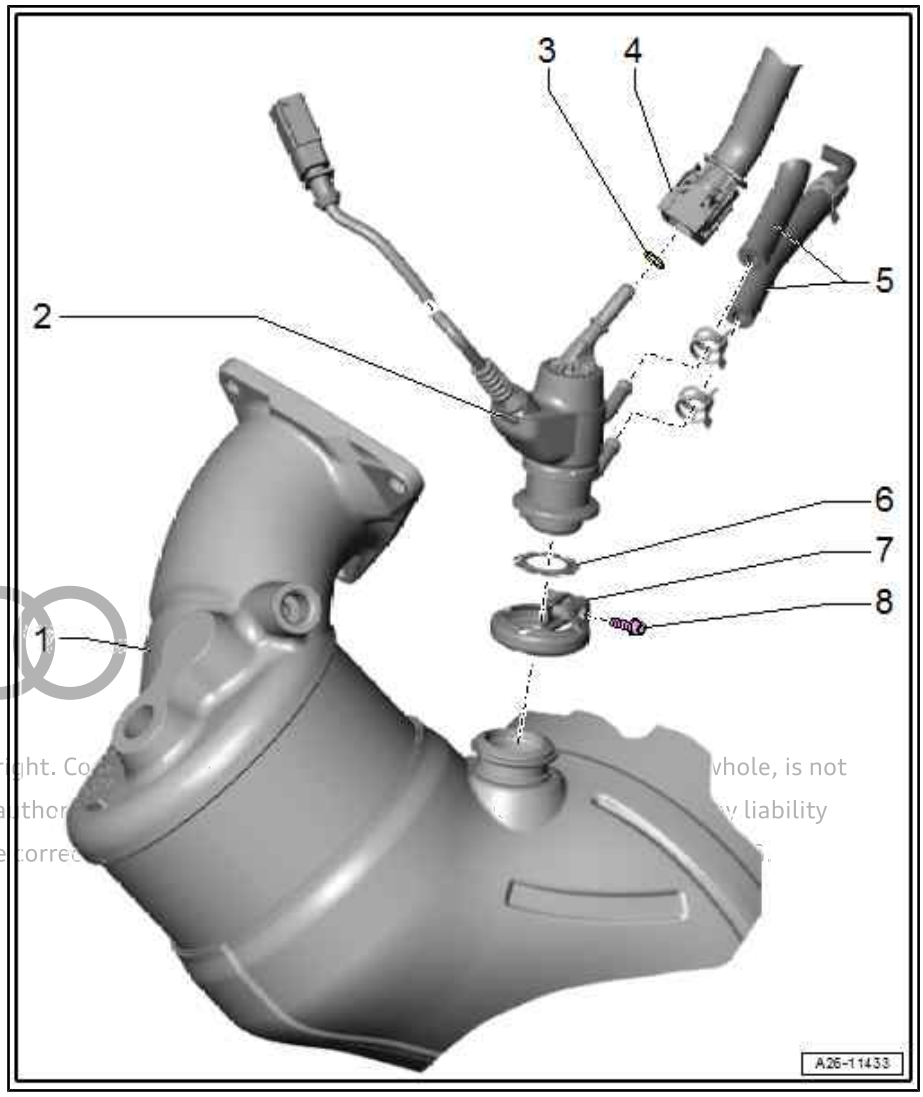
Safety risk due to escaping reducing agent.
To prevent large amounts of reducing agent from escaping when the metering line is opened, wait until the reducing agent has been drawn back automatically ⇒ page 7.



7 - Electrical connector

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3.2.2 Exploded view - reducing agent supply line, water-cooled



1 - Particulate filter

2 - Injector for reducing agent - N474-

- ❑ Removing and installing ⇒ page 631
- ❑ Lugs in injector for reducing agent - N474- must be inserted in corresponding mountings in front exhaust pipe.

3 - O-ring

- ❑ Renew

4 - Metering line

- ❑ From reducing agent pump - V437-
- ❑ With heater
- ❑ Press release tabs to disconnect
- ❑ Clip onto fuel tank

> **WARNING**
>
> ***Safety risk due to escaping reducing agent.***
>
> ***To prevent large amounts of reducing agent from escaping when the metering line is opened, wait until the reducing agent has been drawn back automatically ⇒ page 7 .***

5 - Coolant hoses

6 - Gasket

- ❑ Renew

7 - Retaining clamp

- ❑ Renew

8 - Bolt

- ❑ 5 Nm

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3.3 Exploded view - delivery unit for reducing agent

1 - Tank

- ❑ For reducing agent
- ❑ Removing and installing ⇒ page 625

2 - Electrical wiring harness

3 - Seal

- ❑ Renew
- ❑ Install dry

4 - Reservoir

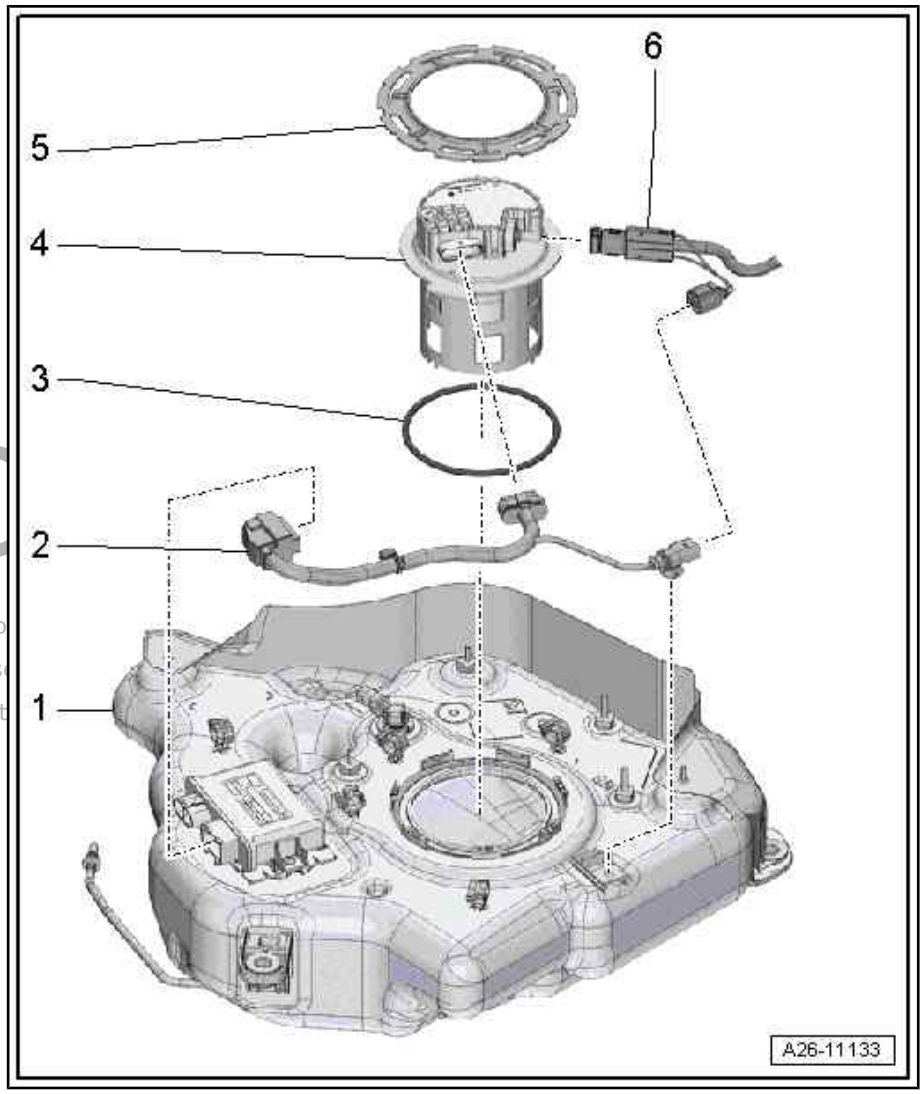
- ❑ With:

- ♦ Filter
- ♦ Pump for reducing agent - V437-
- ♦ Tank sender for reducing agent - G684-
- ♦ Temperature sender for reducing agent - G685-
- ♦ Pressure sender for reducing agent metering system - G686-
- ♦ Heater for reducing agent tank - Z102-

- ❑ Removing and installing reservoir ⇒ page 628
- ❑ Do not kink heating mats when installing

5 - Locking ring

- ❑ Release and lock with wrench -T40268-
- ❑ Always renew after removing



6 - Metering line

- ❑ To injector for reducing agent - N474-
- ❑ With heater for reducing-agent line - Z104-
- ❑ Press release tabs to disconnect

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 7* *.*

3.4 Exploded view - control unit for reducing agent metering system - J880-

Note

Fitting location: control unit for reducing agent metering system - J880- is underneath tank.

1 - Base plate

- For control unit for reducing agent metering system - J880-
- Part of tank

2 - Clip nut

3 - Control unit for reducing agent metering system - J880-

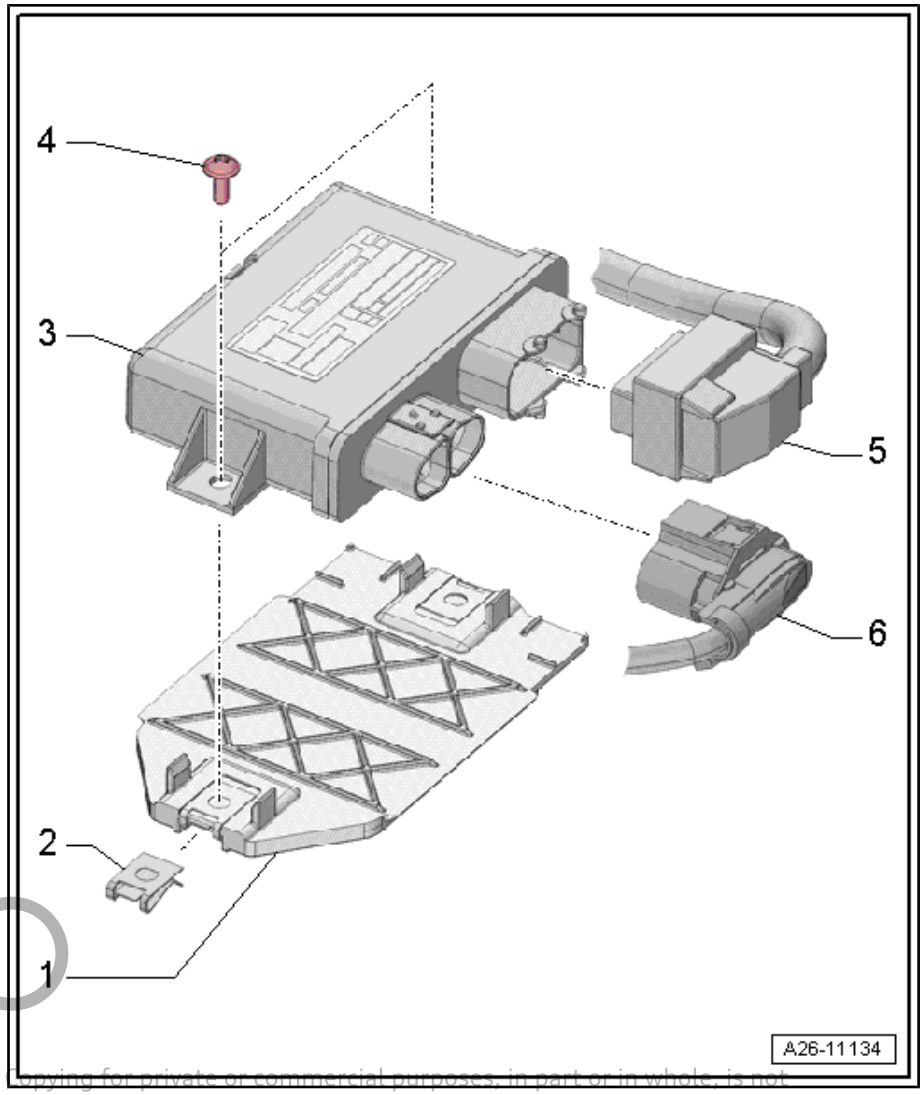
- Check in Guided Fault Finding ⇒ Vehicle diagnostic tester
- After renewal, parameters of control unit for reducing agent metering system - J880- must be set; see Guided Functions ⇒ Vehicle diagnostic tester
- Removing and installing ⇒ page 633

4 - Bolt

- 4.5 Nm

5 - Electrical connector

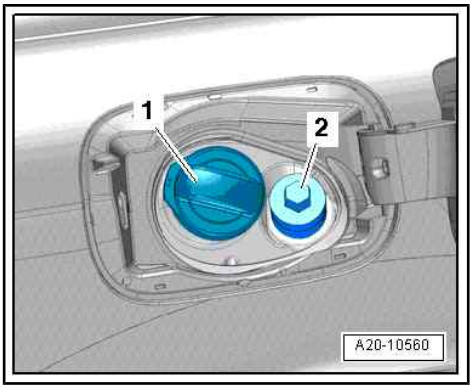
6 - Electrical connector



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3.5 Draining reducing agent tank

Procedure



WARNING

Reducing agent can cause skin irritation.

- *Observe safety measures when handling reducing agent ⇒ page 6 .*
- *Put on safety goggles.*

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 7 .*

– Switch off ignition.

– Open tank flap.

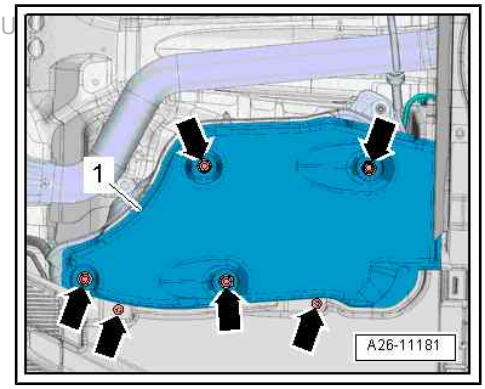
– Unscrew filler cap -2- from filler neck for reducing agent.

Note

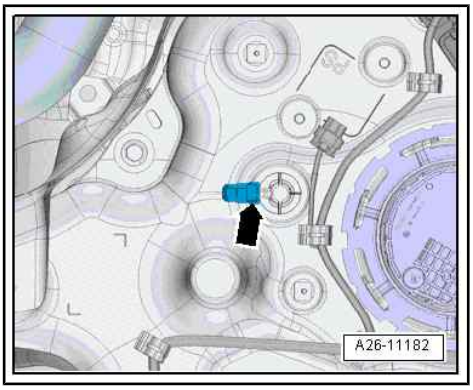
Disregard -item 1-.

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– Remove bolt and nuts -arrows- and detach cover -1- for tank.



– Place drip tray underneath.



Note

Hold a clean cloth under the separating point to catch escaping reducing agent.

– Press release tab to remove plug -arrow-, drain off reducing agent into a drip tray and refit plug.

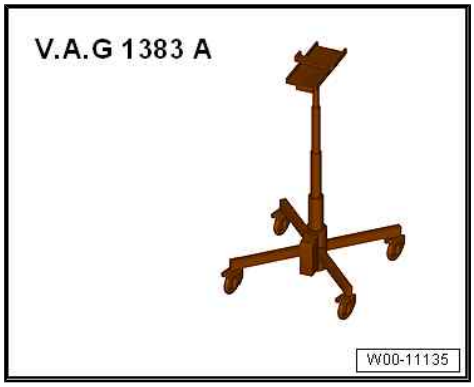
After re-filling, the following step must be carried out:

– Adapt learnt value after draining reducing agent or renewing components ⇒ page 10 .

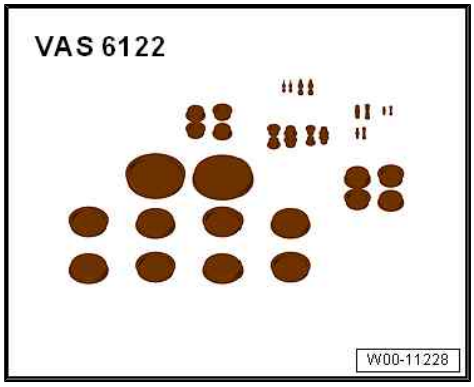
3.6 Removing and installing reducing agent tank

Special tools and workshop equipment required

- Engine and gearbox jack - V.A.G 1383 A-



- Engine bung set - VAS 6122-



Removing

WARNING

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Reducing agent can cause skin irritation.

- ***Observe safety measures when handling reducing agent*** ***⇒ page 6*** .
- ***Put on safety goggles.***

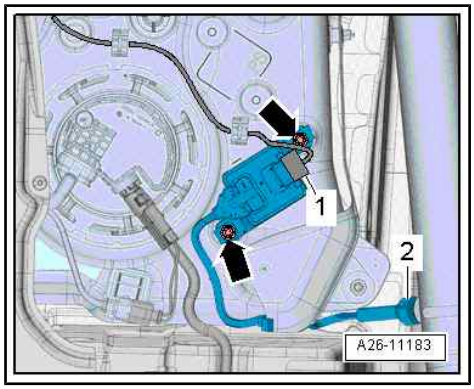
– Drain reducing agent tank ⇒ page 625 .

– Detach underbody trim (rear left) ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim; Removing and installing underbody trim .

– If fitted, unplug electrical connector -1-.

– Unscrew nuts -arrows- for control unit for NOx sender 2 - J881- .

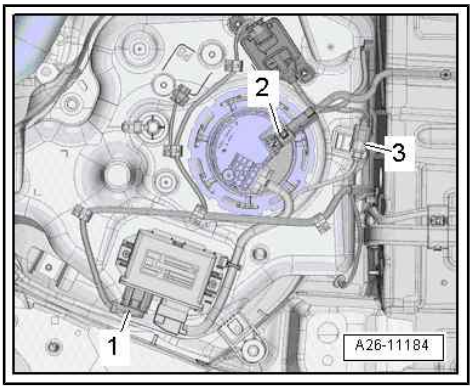
– Move clear electrical wiring.



Note

Disregard -item 1-.

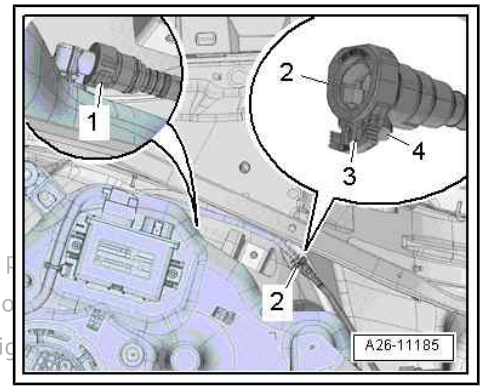
– Press release tabs and disconnect metering line -2-.
– Unplug electrical connectors -1, 3- and move electrical wiring harness clear.



Note

Hold a clean cloth under the separating point to catch escaping reducing agent.

– Press release tab and disconnect filler line -1-.
– Press blue slider -4- to release catch -3- and disconnect breather lines -2-.
– Seal off open lines and connections with clean plugs from engine bung set - VAS 6122- .



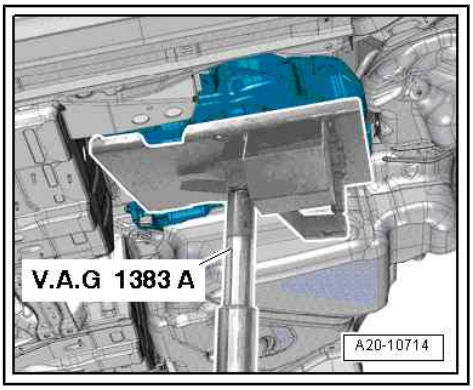
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WARNING

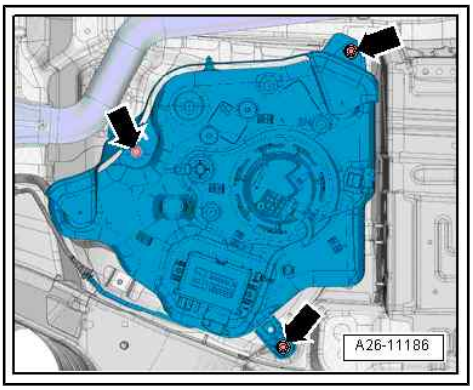
Safety risk due to escaping reducing agent.

- ***Tank must be empty when it is removed.***

– Position engine and gearbox jack - V.A.G 1383 A- underneath vehicle with a soft foam surface to support tank.



– Remove bolts -arrows- (have a second mechanic support the tank -1- by hand).



Note

For greater clarity the tank is shown without the engine and gearbox jack.

– Lower tank using engine and gearbox jack - V.A.G 1383 A- (also guiding tank down by hand).
– Seal off open lines and connections with clean plugs from engine bung set - VAS 6122- .

Installing

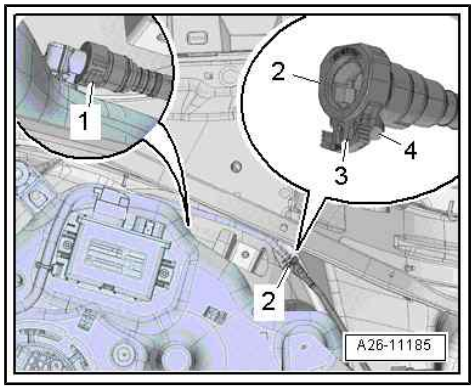
Installation is carried out in reverse order; note the following:

– Push filler line -1- and breather line -2- onto connection so that they engage audibly.

– Pull to check that plug-in connectors are correctly engaged.

– Press in catch -3- to secure.

– Check that lines are clipped onto tank.



Note

Disregard -item 4-.

– Adapt learnt value after draining reducing agent or renewing components ⇒ page 10 .

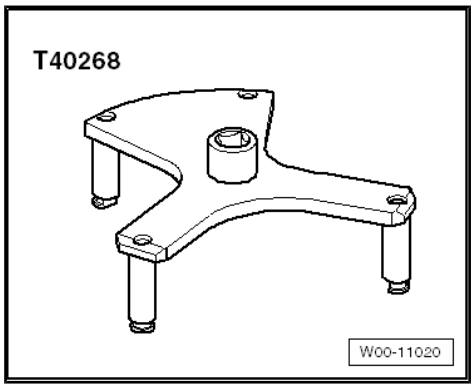
Tightening torques

♦ ⇒ “3.1 Exploded view - reducing agent tank”, page 620

3.7 Removing and installing delivery unit for reducing agent

Special tools and workshop equipment required

♦ Key - T40268-



Removing

WARNING

Reducing agent can cause skin irritation.

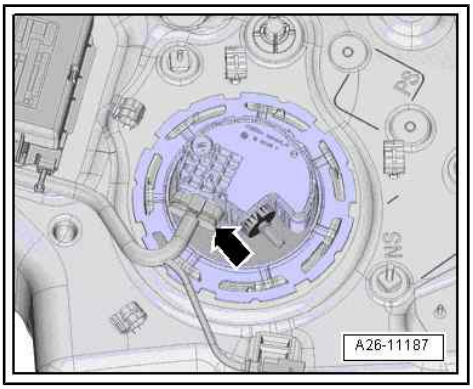
♦ ***Observe safety measures when handling reducing agent ⇒ page 6 .***

– Remove reducing agent tank ⇒ page 625 .

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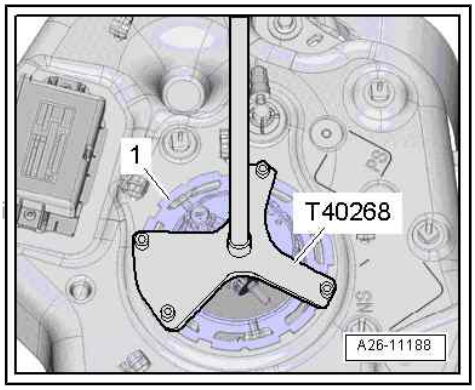
– Unplug electrical connector -arrow-.

– Seal off open lines and connections with clean plugs from engine bung set - VAS 6122- .



– Turn locking ring -1- anti-clockwise with wrench -T40268- to release and detach.

– Pull reservoir with pump for reducing agent - V437- out of tank.



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Installing

Installation is carried out in reverse order; note the following:

Caution

Take care to keep components clean.

- ***Observe rules for cleanliness when working on the fuel supply system ⇒ page 8 .***

Note

- *Renew seal.*
- *Clean the sealing surfaces for seal thoroughly.*

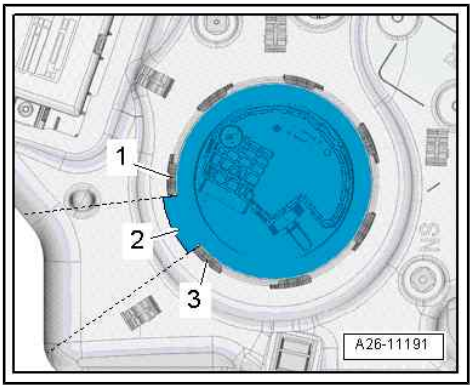
Caution

Risk of malfunctions.

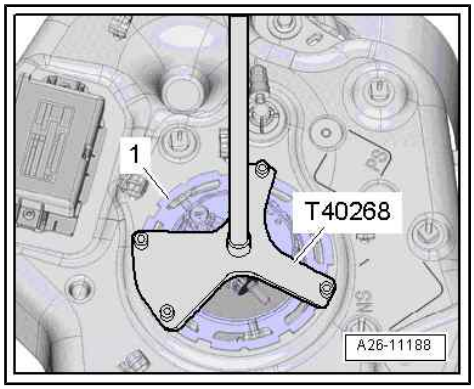
- ***The seal must not be twisted.***
- ***Do not kink heating mats when installing.***

– Move reservoir into installation position:

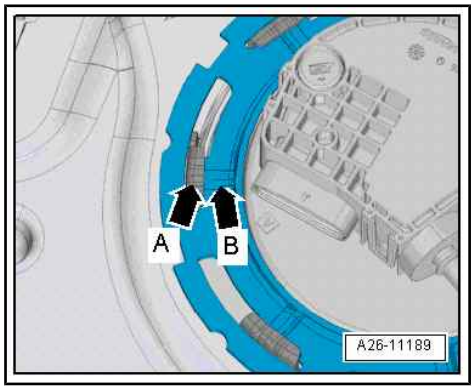
- Lug -2- on flange must be between tabs -1- and -3-.
- Direction of installation for lug -2- as shown in illustration.



– Turn locking ring -1- clockwise with wrench -T40268- to lock.



- Locking ring is properly locked when lugs on locking ring are opposite lugs on support ring of tank -arrows A, B-



– Install reducing agent tank ⇒ page 625 .

– Adapt learnt value after draining reducing agent or renewing components ⇒ page 10 .

3.8 Removing and installing injector for reducing agent - N474-

⇒ “3.8.1 Removing and installing injector for reducing agent N474 - not water-cooled”, page 630

⇒ “3.8.2 Removing and installing injector for reducing agent N474 - water-cooled”, page 631

3.8.1 Removing and installing injector for reducing agent - N474- - not water-cooled

Removing

WARNING

Reducing agent can cause skin irritation.

- *Observe safety measures when handling reducing agent ⇒ page 6 .*
- *Put on safety goggles.*

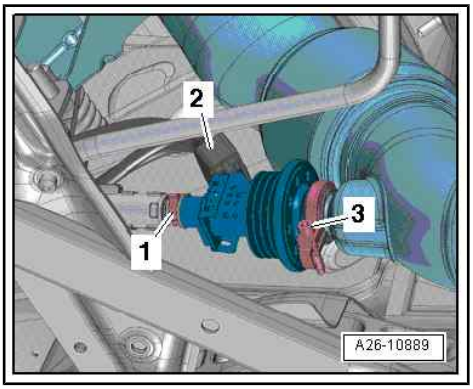
– Remove noise insulation (rear) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

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Note

Hold a clean cloth under the separating point to catch escaping reducing agent.

– Press release tabs -1- and disconnect metering line from injector for reducing agent - N474- .
– Unplug electrical connector -2-.
– Release retaining clip -3- and detach injector for reducing agent - N474- .



Installing

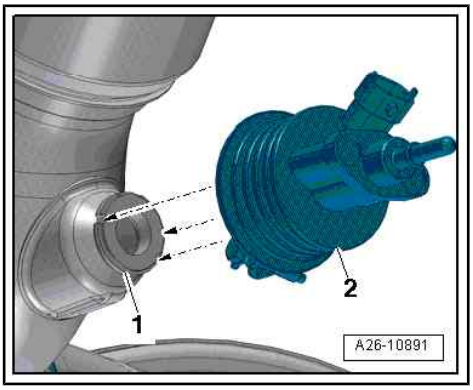
Installation is carried out in reverse order; note the following:

Note

Renew gasket and retaining clip.

- Installation position: lugs in injector for reducing agent - N474- -item 2- must be inserted in corresponding mountings in front exhaust pipe -1-.

– Adapt learnt value after draining reducing agent or renewing components ⇒ page 10 .



Tightening torques

◆ ⇒ “3.2.1 Exploded view - reducing agent supply line, not water-cooled”, page 621

3.8.2 Removing and installing injector for reducing agent - N474- - water-cooled

Removing

WARNING

Reducing agent can cause skin irritation.

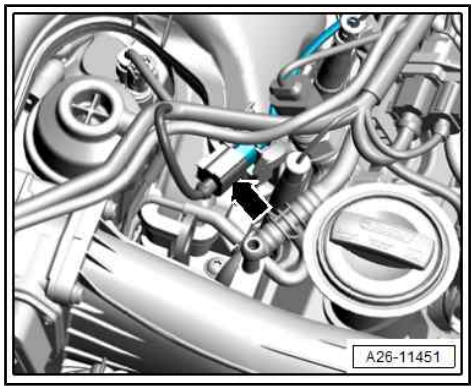
- ***Observe safety measures when handling reducing agent ⇒ page 6 .***
- ***Put on safety goggles.***

Observe rules for cleanliness ⇒ page 8 .

– Remove engine cover panel ⇒ page 172 .

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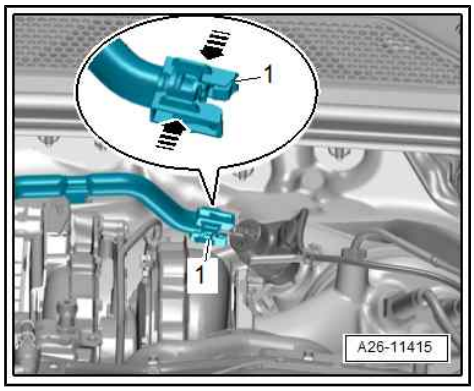
– Take electrical connector -arrow- out of bracket, unplug it and move it clear.



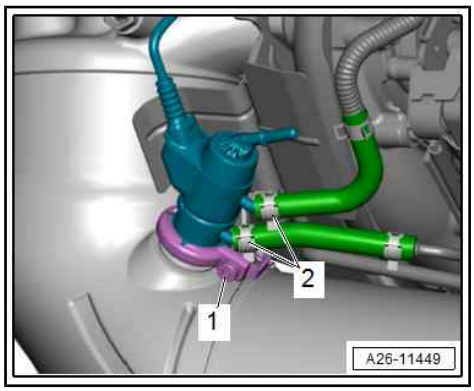
Note

Hold a clean cloth under the separating point to catch escaping reducing agent.

– Press release tabs -arrows- and disconnect metering line -1- from injector for reducing agent - N474- .



– Fold up heat insulation sleeves on coolant hoses.
– Clamp off coolant hoses -2- with hose clamps -3094- and detach.
– Release retaining clip -1- and detach injector for reducing agent - N474- .



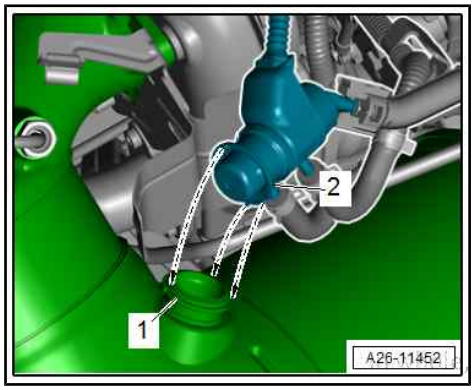
Installing

Installation is carried out in reverse order; note the following:

Note

Renew retaining clip and gasket.

- Installation position: lugs in injector for reducing agent - N474- -item 2- must be inserted -arrows- in corresponding mountings in particulate filter -1-.



– Install engine cover panel ⇒ page 172 .
– Adapt learnt value after draining reducing agent or renewing components ⇒ page 10 .

Tightening torques

◆ ⇒ “3.2.2 Exploded view - reducing agent supply line, water-cooled”, page 622

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3.9 Removing and installing control unit for reducing agent metering system - J880-

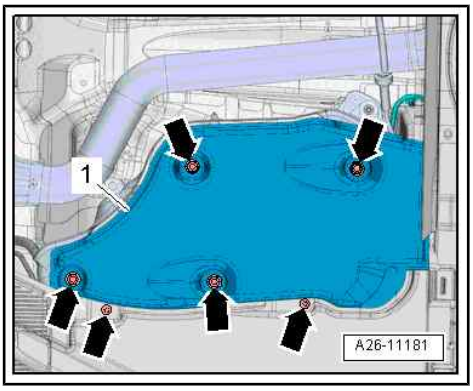
Special tools and workshop equipment required

- Vehicle diagnostic tester

Removing

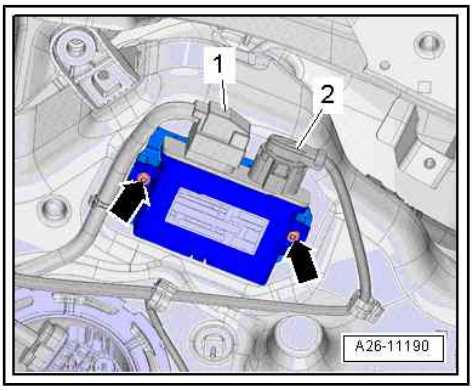
– Switch off ignition.

– Remove bolt and nuts -arrows- and detach cover for tank.



– Remove bolts -arrows- and detach control unit for reducing agent metering system - J880- .

– Unplug electrical connectors -1, 2-.



Installing

Installation is carried out in reverse sequence.

– After renewal, parameters of control unit for reducing agent metering system - J880- must be set; see Guided Functions ⇒ Vehicle diagnostic tester.

Tightening torques

- ⇒ “3.4 Exploded view - control unit for reducing agent metering system J880 ”, page 624

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4 Exhaust gas temperature control

⇒ “4.1 Exploded view - exhaust gas temperature control”, page 634

⇒ “4.2 Removing and installing exhaust gas temperature sender”, page 641

4.1 Exploded view - exhaust gas temperature control

⇒ “4.1.1 Exploded view - exhaust gas temperature control, vehicles with one turbocharger and without SCR system”, page 634

⇒ “4.1.2 Exploded view - exhaust gas temperature control, vehicles with one turbocharger and with SCR system, version 1”, page 636

⇒ “4.1.3 Exploded view - exhaust gas temperature control, vehicles with one turbocharger and with SCR system, version 2”, page 637

⇒ “4.1.4 Exploded view - exhaust gas temperature control, vehicles with two turbochargers and without SCR system”, page 639

⇒ “4.1.5 Exploded view - exhaust gas temperature control, vehicles with two turbochargers and with SCR system”, page 640

4.1.1 Exploded view - exhaust gas temperature control, vehicles with one turbocharger and without SCR system

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1 - Pressure pipe

- ❑ For pressure differential sender - G505-
- ❑ 45 Nm

2 - Lambda probe - G39- with Lambda probe heater - Z19-

- ❑ Removing and installing ⇒ page 569

3 - Pressure differential sender - G505-

- ❑ Removing and installing ⇒ page 553

4 - Exhaust gas temperature sender 4 - G648-

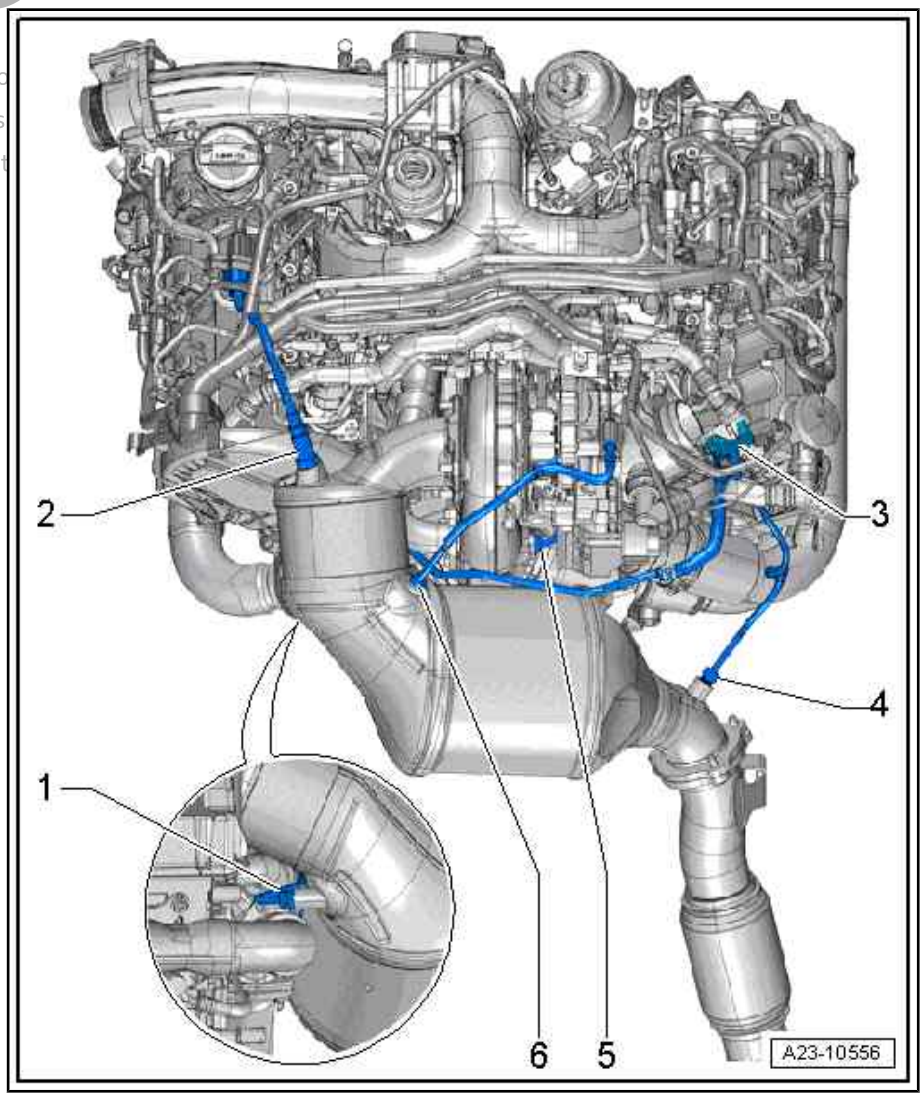
- ❑ Removing and installing ⇒ page 650
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 45 Nm

5 - Exhaust gas temperature sender 1 - G235-

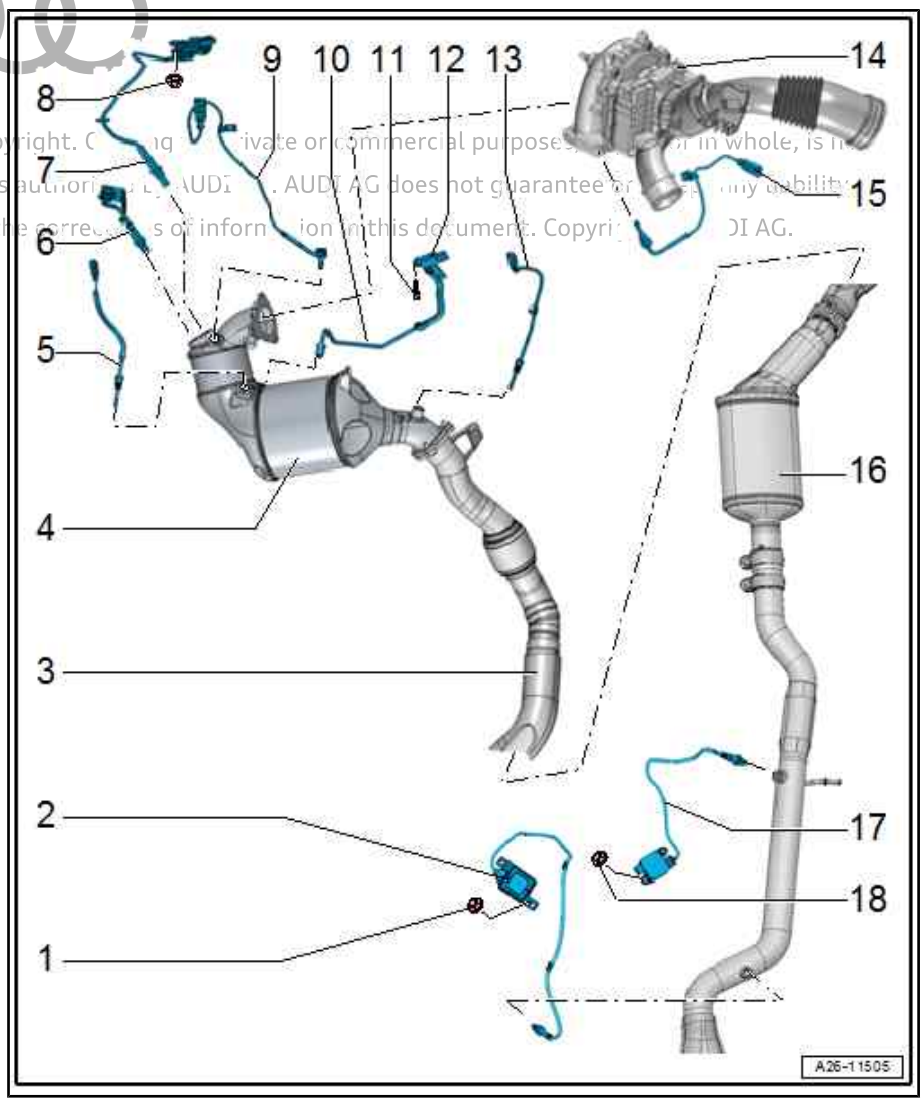
- ❑ Removing and installing ⇒ page 641
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 45 Nm

6 - Exhaust gas temperature sender 3 - G495-

- ❑ Removing and installing ⇒ page 647
- ❑ Coat thread 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 one turbocharger and with SCR system, version 1



1 - Nut

- ❑ Tightening torque ⇒ Item 1 (page 564)

2 - NOx sender 2 - G687- with control unit for NOx sender 2 - J881-

- ❑ Removing and installing ⇒ page 576

3 - Front exhaust pipe

4 - Particulate filter

5 - Exhaust gas temperature sender 3 - G495-

- ❑ Removing and installing ⇒ page 647
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 45 Nm

6 - Lambda probe - G39- with Lambda probe heater - Z19-

- ❑ Removing and installing ⇒ page 569

7 - NOx sender - G295- with control unit for NOx sender - J583-

- ❑ Only installed on vehicles with engine code CPNB
- ❑ Removing and installing ⇒ page 573

8 - Nut

- ❑ Tightening torque ⇒ Item 8 (page 564)

9 - Exhaust gas temperature sender 2 - G448-

- ❑ Only installed on vehicles with engine code CPNB
- ❑ Removing and installing ⇒ page 645
- ❑ 45 Nm

10 - Pressure pipe for pressure differential sender - G505-

- ❑ Fit into particulate filter, clip into bracket and tighten.
- ❑ 45 Nm

11 - Bolt

- ❑ Tightening torque ⇒ Item 11 (page 565)

12 - Pressure differential sender - G505-

- ❑ Removing and installing ⇒ page 553

13 - Exhaust gas temperature sender 4 - G648-

- ❑ Removing and installing ⇒ page 650
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue

- ❑ 45 Nm

14 - Turbocharger

15 - Exhaust gas temperature sender 1 - G235-

- ❑ Removing and installing ⇒ page 641
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 45 Nm

16 - SCR catalytic converter

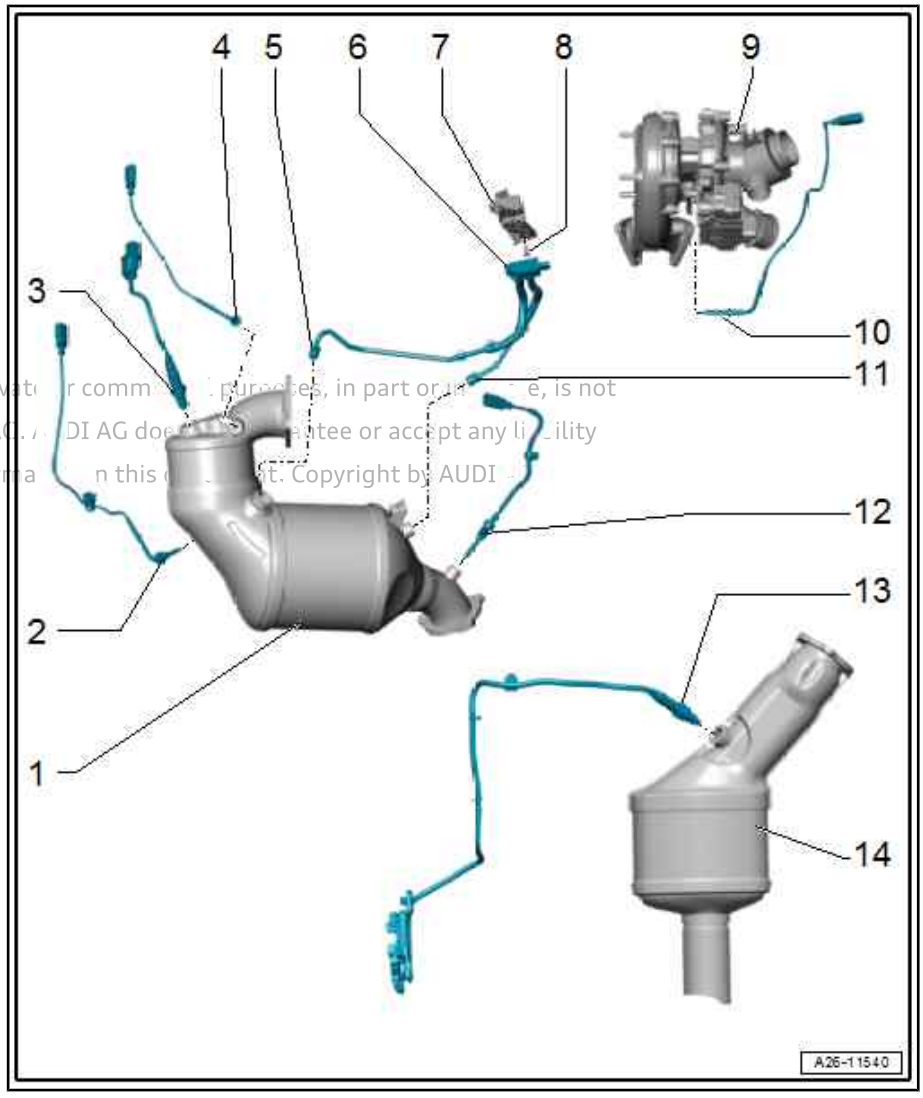
17 - Particulate sensor - G784-

- ❑ Only installed on vehicles with engine code CPNB
- ❑ Removing and installing ⇒ page 654
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 52 Nm

18 - Nut

- ❑ 2 Nm

4.1.3 Exploded view - exhaust gas temperature control, vehicles with one turbocharger and with SCR system, version 2



1 - Particulate filter

2 - Exhaust gas temperature sender 3 - G495-

- ❑ Removing and installing ⇒ page 647
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 45 Nm

3 - Lambda probe - G39- with Lambda probe heater - Z19-

- ❑ Removing and installing ⇒ page 569

4 - Exhaust gas temperature sender 2 - G448-

- ❑ Removing and installing ⇒ page 646
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 45 Nm

5 - Union screw

6 - Pressure differential sender - G505-

- ❑ Removing and installing ⇒ page 553

7 - Bracket

- ❑ For pressure differential sender - G505-

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8 - Bolt

- ❑ Tightening torque ⇒ Item 8 (page 566)

9 - Turbocharger

10 - Exhaust gas temperature sender 1 - G235-

- ❑ Removing and installing ⇒ page 641
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 45 Nm

11 - Union screw

12 - Exhaust gas temperature sender 4 - G648-

- ❑ Removing and installing ⇒ page 650
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 45 Nm

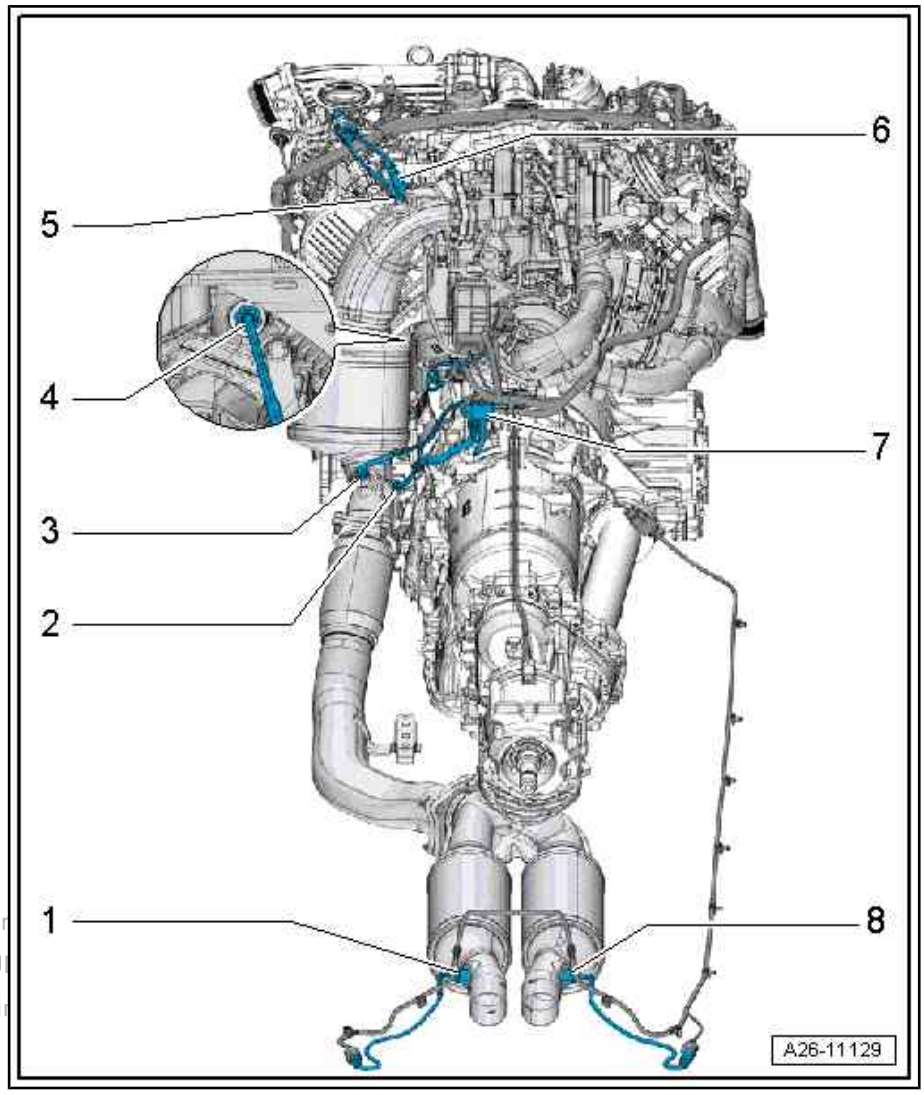
13 - Control unit for NOx sender 2 - J881- with NOx sender 2 - G687-

- ❑ Removing and installing ⇒ page 577

14 - SCR catalytic converter

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4.1.4 Exploded view - exhaust gas temperature control, vehicles with two turbochargers and without SCR system



1 - Exhaust gas temperature sender 4 for cylinder bank 2 - G649-

- ❑ Removing and installing ⇒ page 652
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 45 Nm

2 - Pressure pipe

- ❑ For pressure differential sender - G505-
- ❑ Tightening torque ⇒ Item 2 (page 567)

3 - Exhaust gas temperature sender 3 - G495-

- ❑ Removing and installing ⇒ page 649
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 45 Nm

4 - Exhaust gas temperature sender 1 - G235-

- ❑ Removing and installing ⇒ page 643
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 45 Nm

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5 - Exhaust gas temperature sender 2 - G448-

- ❑ Not fitted on all versions
- ❑ Removing and installing ⇒ page 646
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 45 Nm

6 - Lambda probe - G39- with Lambda probe heater - Z19-

- ❑ Removing and installing ⇒ page 570

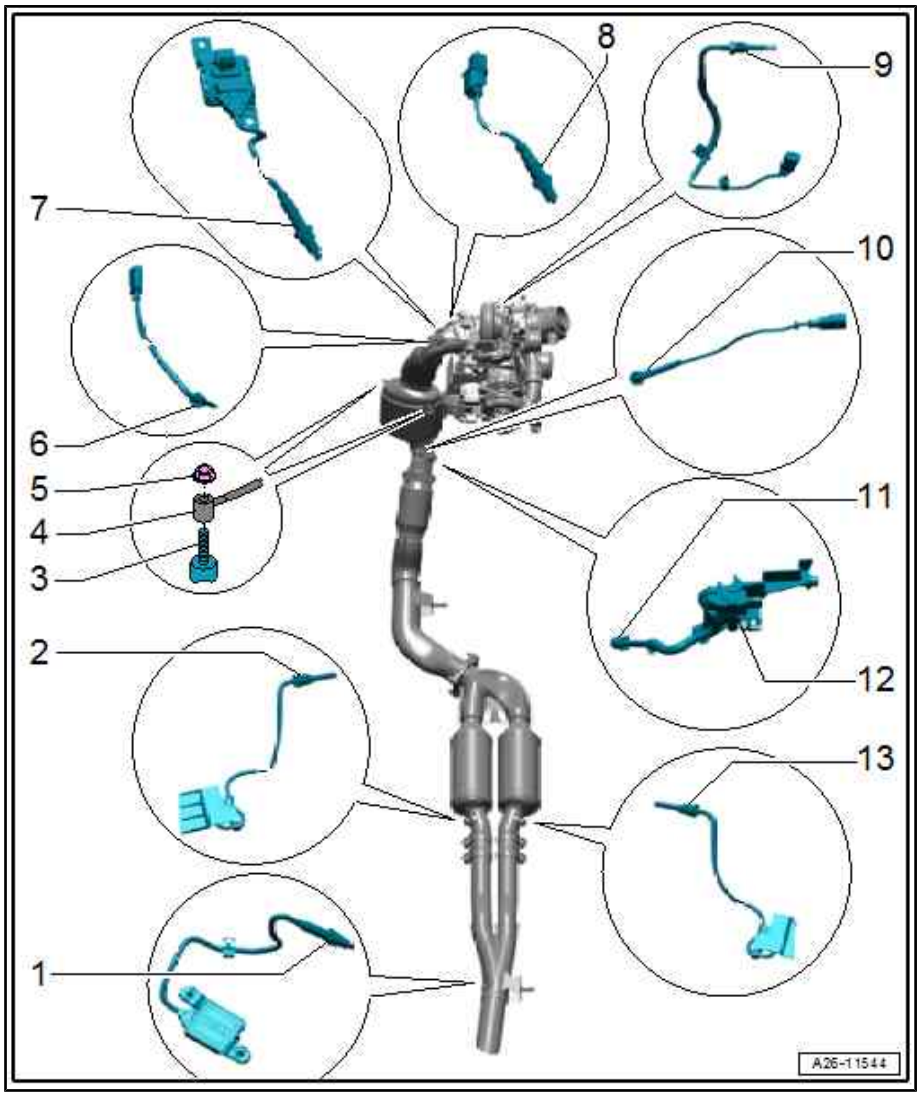
7 - Pressure differential sender - G505-

- ❑ Removing and installing ⇒ page 553

8 - Exhaust gas temperature sender 4 - G648-

- ❑ Removing and installing ⇒ page 652
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 45 Nm

4.1.5 Exploded view - exhaust gas temperature control, vehicles with two turbochargers and with SCR system



1 - NOx sender 2 - G687- with control unit for NOx sender 2 - J881-

- ❑ Removing and installing ⇒ page 576

2 - Exhaust gas temperature sender 4 - G648- / exhaust gas temperature sender 4 for bank 2 - G649-

- ❑ Removing and installing ⇒ page 653
- ❑ Which of the two exhaust gas temperature senders is fitted depends on the model year; for allocation, refer to ⇒ Vehicle diagnostic tester
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 45 Nm

3 - Catalytic converter heater 1 - Z119- / catalytic converter heater 2 - Z120-

4 - Electrical wire

- ❑ Remove using puller - T40317-

5 - Nut

- ❑ Tightening torque ⇒ Item 5 (page 568)

6 - Exhaust gas temperature sender 2 - G448-

- ❑ Removing and installing ⇒ page 646
- ❑ 45 Nm

7 - NOx sender - G295- with control unit for NOx sender - J583-

- ❑ Removing and installing ⇒ page 574

8 - Lambda probe - G39- with Lambda probe heater - Z19-

- ❑ Removing and installing ⇒ page 570

9 - Exhaust gas temperature sender 1 - G235-

- ❑ Removing and installing ⇒ page 643
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 45 Nm

10 - Exhaust gas temperature sender 3 - G495-

- ❑ Removing and installing ⇒ page 649
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 45 Nm

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11 - Pressure line for pressure differential sender - G505-

12 - Pressure differential sender - G505-

- ❑ Removing and installing ⇒ page 553

13 - Exhaust gas temperature sender 4 for bank 2 - G649- or exhaust gas temperature sender 4 - G648-

- ❑ Removing and installing ⇒ page 653
- ❑ Which of the two exhaust gas temperature senders is fitted depends on the model year; for allocation, refer to ⇒ Vehicle diagnostic tester
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 45 Nm

4.2 Removing and installing exhaust gas temperature sender

⇒ “4.2.1 Removing and installing exhaust gas temperature sender 1 G235 - vehicles with one turbocharger”, page 641

⇒ “4.2.2 Removing and installing exhaust gas temperature sender 1 G235 - vehicles with two turbochargers”, page 643

⇒ “4.2.3 Removing and installing exhaust gas temperature sender 2 G448 - vehicles with one turbocharger”, page 645

⇒ “4.2.4 Removing and installing exhaust gas temperature sender 2 G448 - vehicles with two turbochargers”, page 646

⇒ “4.2.5 Removing and installing exhaust gas temperature sender 3 G495 - vehicles with one turbocharger”, page 647

⇒ “4.2.6 Removing and installing exhaust gas temperature sender 3 G495 - vehicles with two turbochargers”, page 649

⇒ “4.2.7 Removing and installing exhaust gas temperature sender 4 G648 - vehicles with one turbocharger”, page 650

⇒ “4.2.8 Removing and installing exhaust gas temperature sender 4 G648 / exhaust gas temperature sender 4 for bank 2 G649 - vehicles with two turbochargers and without SCR system”, page 652

⇒ “4.2.9 Removing and installing exhaust gas temperature sender 4 G648 / exhaust gas temperature sender 4 for bank 2 G649 - vehicles with two turbochargers and SCR system”, page 653

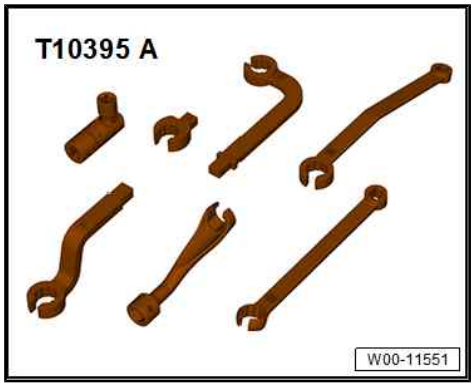
⇒ “4.2.10 Removing and installing particulate sensor G784 ”, page 654

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4.2.1 Removing and installing exhaust gas temperature sender 1 - G235- - vehicles with one turbocharger

Special tools and workshop equipment required

- Tool set - T10395 A- with suitable tool insert



Removing

WARNING

When working on all parts of the exhaust system:

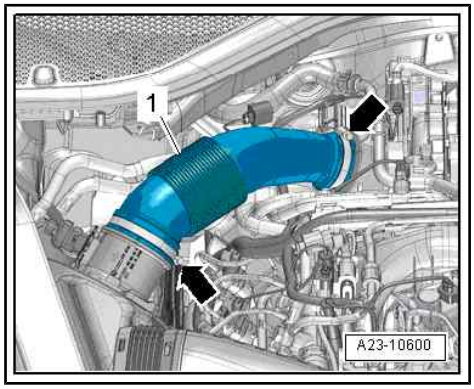
- ***Observe safety precautions when working on the exhaust system ⇒ page 7 .***

Note

- *Fit all cable ties in the original positions when installing.*
- *When removing, the electrical wiring must not be cut, otherwise a fault diagnosis would no longer be possible.*

– Remove plenum chamber partition panel ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber partition panel .

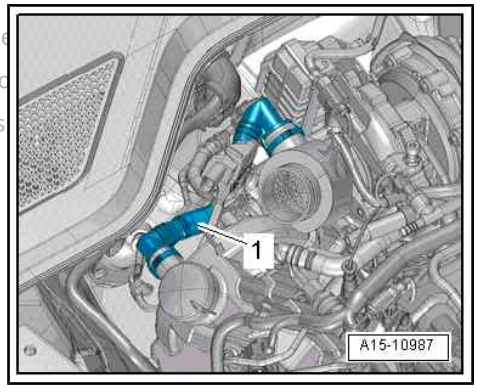
– Release hose clips -arrows- and detach air pipe -1-.



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for the correctness of the information in this

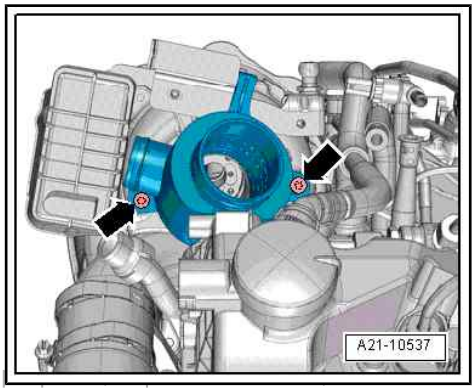
Caution

Depending on the vehicle version and country version, a crankcase breather hose may be fitted which cannot be detached from the cylinder head cover without being damaged irreparably. For these versions, the hose on the cylinder head cover will be damaged irreparably and must then be renewed.



– Remove crankcase breather hose -arrow-; to do so, press release tabs (if present) or break hose connection at cylinder head cover as necessary.

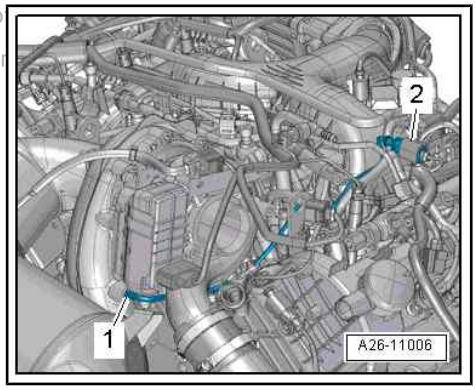
– Unscrew bolts -arrows- and detach connection from turbocharger.



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– Detach electrical connector -2- from bracket and unplug.

– Unscrew exhaust gas temperature sender 1 - G235- -item 1- using a tool from tool set - T10395 A- .



Installing

Installation is carried out in reverse order; note the following:

Note

- *Fit new O-rings.*
- *Take care to protect exhaust gas temperature sender from knocks and impact; if dropped, the exhaust gas temperature sender can no longer be used.*
- *Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .*

– Install plenum chamber partition panel ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber partition panel .

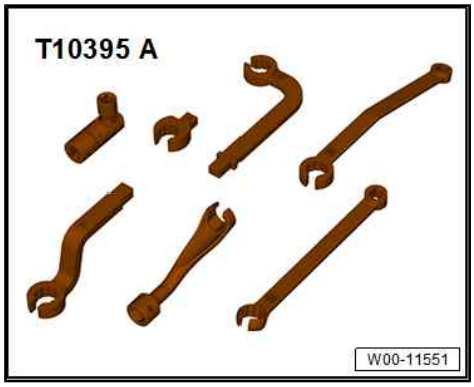
Tightening torques

- ⇒ “4.1 Exploded view - exhaust gas temperature control”, page 634
- ⇒ “1.1.1 Exploded view - turbocharger, vehicles with one turbocharger”, page 412
- ⇒ “2.1.1 Exploded view - charge air system, vehicles with one turbocharger”, page 463

4.2.2 Removing and installing exhaust gas temperature sender 1 - G235- - vehicles with two turbochargers

Special tools and workshop equipment required

- Tool set - T10395 A- with suitable tool insert



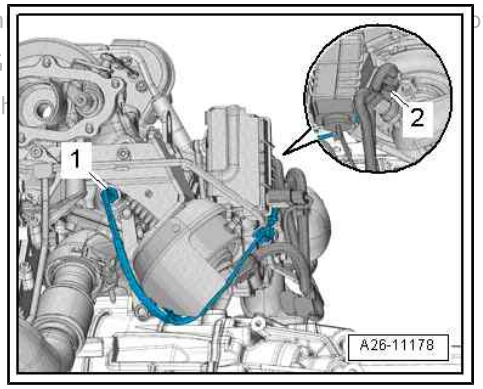
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Removing

WARNING

When working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system ⇒ page 7 .***



Note

- *Fit all cable ties in the original positions when installing.*
- *When removing, the electrical wiring must not be cut, otherwise a fault diagnosis would no longer be possible.*

– Remove catalytic converter ⇒ page 605 .

– Take electrical connector -2- out of bracket, unplug it and move electrical wiring clear.

– Remove exhaust gas temperature sender 1 - G235- -item 1-.

Installing

Installation is carried out in reverse order; note the following:

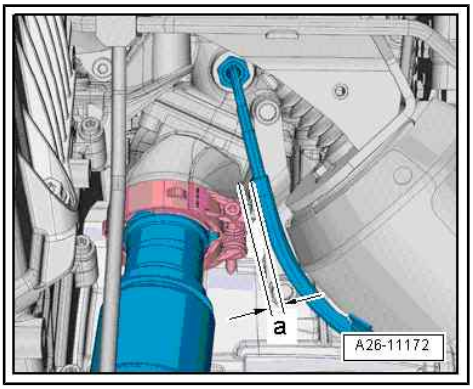
Note

- *Take care to protect exhaust gas temperature sender from knocks and impact; if dropped, the exhaust gas temperature sender can no longer be used.*
- *Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .*

– Observe correct installation position.

• Distance -a- to clamp = min. 5 mm.

– Install catalytic converter ⇒ page 605 .



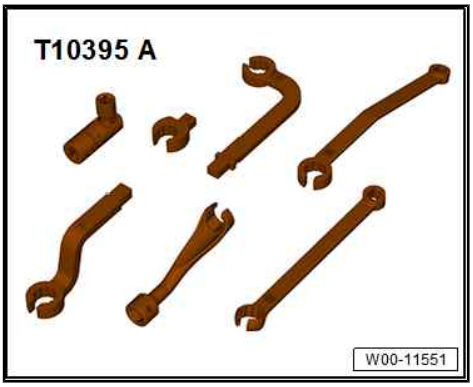
Tightening torques

♦ ⇒ “4.1.4 Exploded view - exhaust gas temperature control, vehicles with two turbochargers and without SCR system”, page 639

4.2.3 Removing and installing exhaust gas temperature sender 2 - G448- - vehicles with one turbocharger

Special tools and workshop equipment required

♦ Tool set - T10395 A- with suitable tool insert



Removing

WARNING

When working on all parts of the exhaust system:

♦ *Observe safety precautions when working on the exhaust system ⇒ page 7 .*

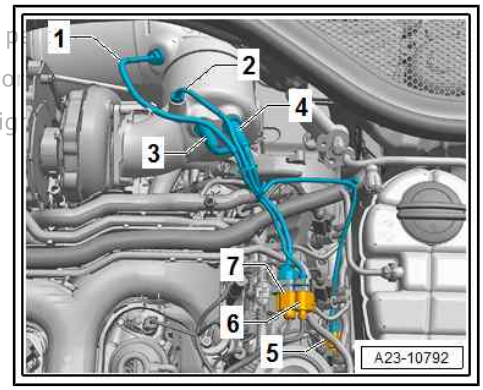
– Remove engine cover panel ⇒ page 172 .

Vehicles with SCR system, version 1:

– Unplug electrical connector -5- from exhaust gas temperature sender 2 - G448- .

– Move clear electrical wiring.

– Unscrew exhaust gas temperature sender 2 - G448- -item 2- using a tool from tool set - T10395 A- .

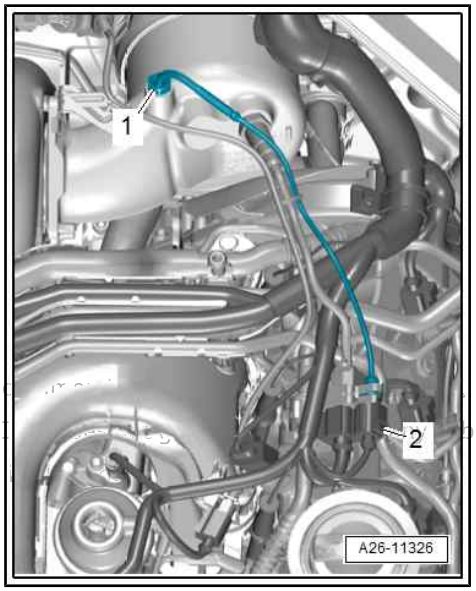


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Vehicles with SCR system, version 2:

– Take electrical connector -2- out of bracket, unplug it and move electrical wiring clear.

– Unscrew exhaust gas temperature sender 2 - G448- -item 1- using a tool from tool set - T10395 A- .



Installing

Installation is carried out in reverse order; note the following:

Note

Fit all cable ties in the original positions when installing.

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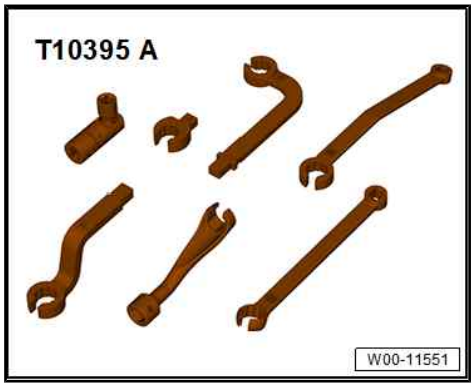
Tightening torques

- ⇒ "4.1 Exploded view - exhaust gas temperature control", page 634

4.2.4 Removing and installing exhaust gas temperature sender 2 - G448- - vehicles with two turbochargers

Special tools and workshop equipment required

- Tool set - T10395 A- with suitable tool insert



Removing

WARNING

When working on all parts of the exhaust system:

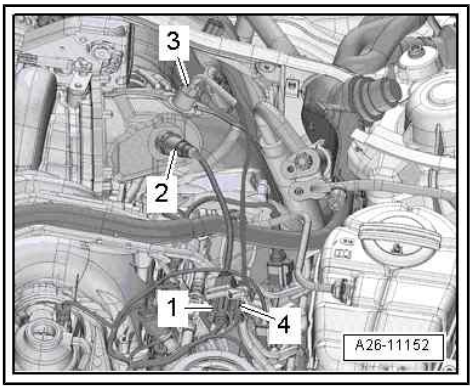
- ***Observe safety precautions when working on the exhaust system ⇒ page 7 .***

Note

When removing, the electrical wiring must not be cut, otherwise a fault diagnosis would no longer be possible.

– Remove engine cover panel ⇒ page 172 .

– Take electrical connector -4- out of bracket, unplug it and move electrical wiring clear.
– Remove exhaust gas temperature sender 2 - G448- -item 3-.



Note

Disregard items -1 and 2-.

Installing

Installation is carried out in reverse order; note the following:

Note

- *Take care to protect exhaust gas temperature sender from knocks and impact; if dropped, the exhaust gas temperature sender can no longer be used.*
- *Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .*

Tightening torques

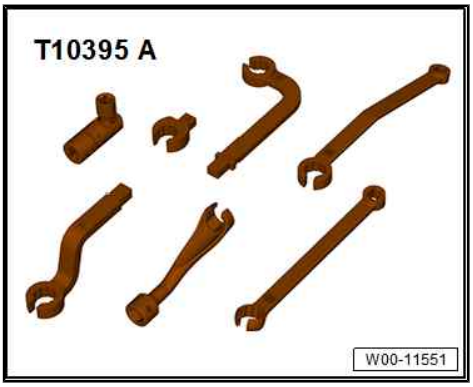
- ⇒ "4.1.4 Exploded view - exhaust gas temperature control, vehicles with two turbochargers and without SCR system", page 639

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4.2.5 Removing and installing exhaust gas temperature sender 3 - G495- - vehicles with one turbocharger

Special tools and workshop equipment required

- Tool set - T10395 A- with suitable tool insert



Removing

WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system ⇒ page 7 .*

Note

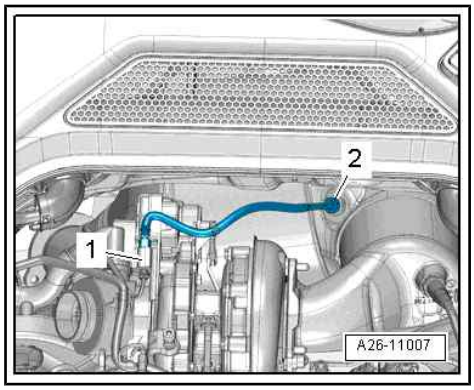
- *Fit all cable ties in the original positions when installing.*
- *When removing, the electrical wiring must not be cut, otherwise a fault diagnosis would no longer be possible.*

– Remove engine cover panel ⇒ page 172 .

Exhaust temperature sender 3 - G495- - version 1:

– Detach electrical connector -1- from bracket and unplug.

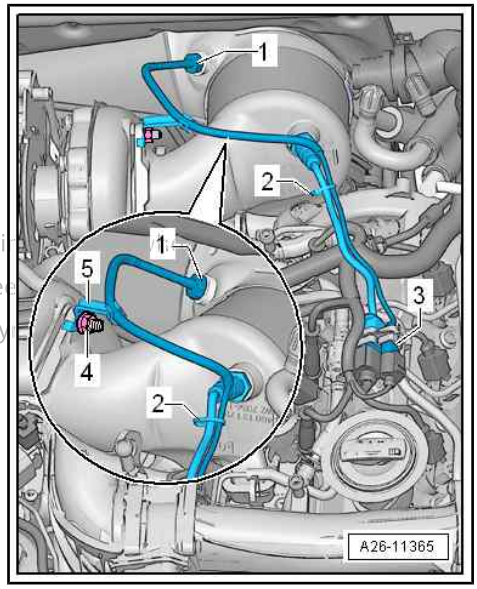
– Remove exhaust gas temperature sender 3 - G495- -item 2-.



Exhaust temperature sender 3 - G495- - version 2:

– Detach electrical connector -3- from bracket and unplug.

– Unscrew exhaust gas temperature sender 3 - G495- -item 1- using a tool from tool set - T10395 A- .

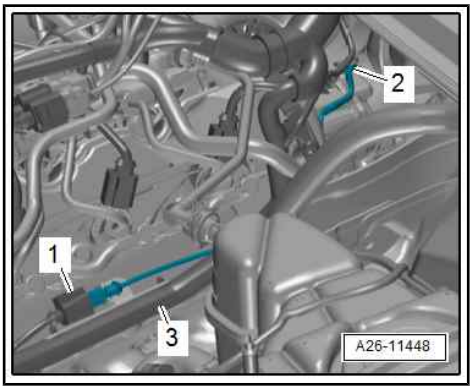


Note

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- *On vehicles without bracket -5-, remove nut -4- and install bracket.*
- *Route electrical wiring as shown in illustration.*
- *Attach cable tie -2- as shown in illustration.*

Exhaust temperature sender 3 - G495- - version 3:



– Take electrical connector -1- out of bracket, unplug it and move electrical wiring clear.
– Unscrew exhaust gas temperature sender 3 - G495- -item 2- using a tool from tool set - T10395 A- .

Note

Disregard -item 3-.

Installing

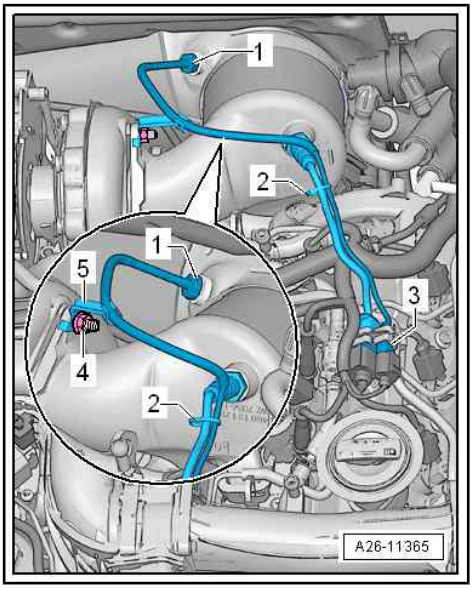
Installation is carried out in reverse order; note the following:

Note

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- *Take care to protect exhaust gas temperature sender from knocks and impact; if dropped, the exhaust gas temperature sender can no longer be used.*
- *Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .*
- *Following installation, check that the distance between the electrical wiring leading to the exhaust gas temperature sender 3 - G495- and the catalytic converter is at least 20 mm (check entire length of wiring).*

Exhaust temperature sender 3 - G495- - version 2:



Note

- *On vehicles without bracket -5-, remove nut -4- and install bracket.*
- *Route electrical wiring as shown in illustration.*
- *Attach cable tie -2- as shown in illustration.*

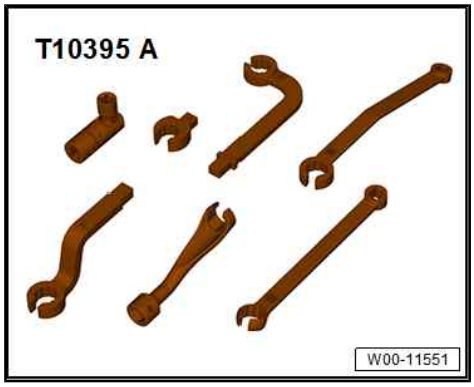
Tightening torques

- ⇒ “4.1 Exploded view - exhaust gas temperature control”, page 634

4.2.6 Removing and installing exhaust gas temperature sender 3 - G495- - vehicles with two turbochargers

Special tools and workshop equipment required

♦ Tool set - T10395 A- with suitable tool insert



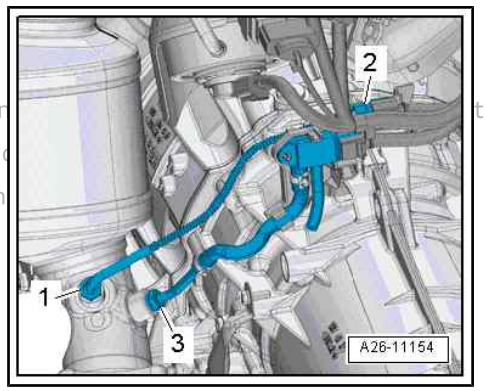
Removing

WARNING

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When working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system ⇒ page 7 .***



Note

When removing, the electrical wiring must not be cut, otherwise a fault diagnosis would no longer be possible.

– Remove front exhaust pipe ⇒ page 599 .
– Take electrical connector -2- out of bracket, unplug it and move electrical wiring clear.
– Remove exhaust gas temperature sender 3 - G495- -item 1-.

Installing

Installation is carried out in reverse order; note the following:

Note

- *Take care to protect exhaust gas temperature sender from knocks and impact; if dropped, the exhaust gas temperature sender can no longer be used.*
- *Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .*

– Install front exhaust pipe ⇒ page 599 .

Tightening torques

- ⇒ “4.1.4 Exploded view - exhaust gas temperature control, vehicles with two turbochargers and without SCR system”, page 639

4.2.7 Removing and installing exhaust gas temperature sender 4 - G648- - vehicles with one turbocharger

Special tools and workshop equipment required

- Tool set - T10395 A- with suitable tool insert



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Removing

WARNING

When working on all parts of the exhaust system:

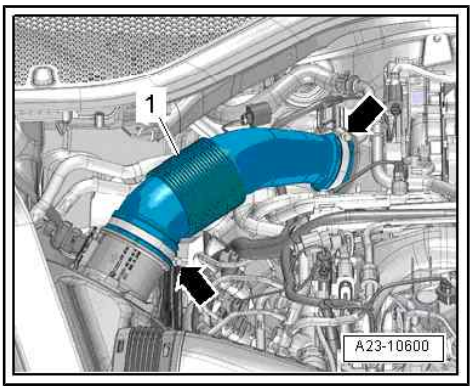
- ***Observe safety precautions when working on the exhaust system*** ⇒ page 7 .

Note

When removing, the electrical wiring must not be cut, otherwise a fault diagnosis would no longer be possible.

– Remove engine cover panel ⇒ page 172 .

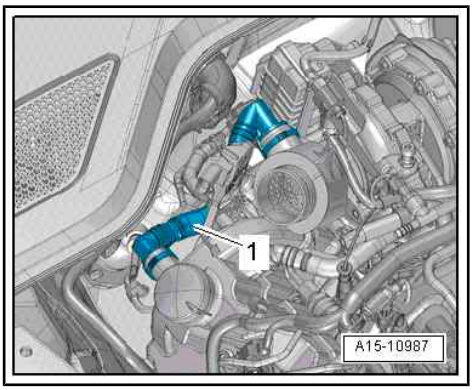
– Release hose clips -arrows- and detach air pipe -1-.



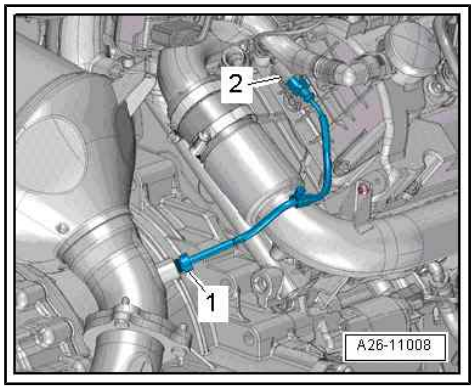
Caution

Depending on the vehicle version and country version, a crankcase breather hose may be fitted which cannot be detached from the cylinder head cover without being damaged irreparably. For these versions, the hose on the cylinder head cover will be damaged irreparably and must then be renewed.

– Remove crankcase breather hose -arrow-; to do so, press release tabs (if present) or break hose connection at cylinder head cover as necessary.



– Detach bracket for electrical connector -2-, move electrical connector clear and unplug it.
– Unscrew exhaust gas temperature sender 4 - G648- -item 1- using a tool from tool set - T10395 A- .



Installing

Installation is carried out in reverse order; note the following:

Note

- *Fit new O-rings.*
- *Take care to protect exhaust gas temperature sender from knocks and impact; if dropped, the exhaust gas temperature sender can no longer be used.*
- *Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .*

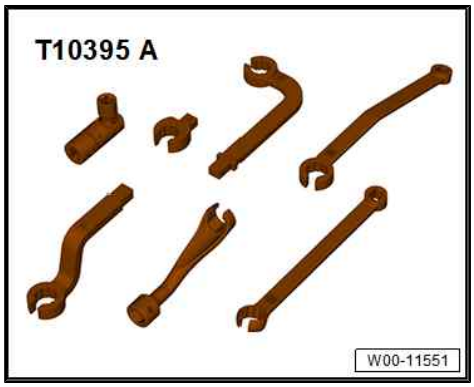
Tightening torques

- ⇒ “4.1 Exploded view - exhaust gas temperature control”, page 634
- ⇒ “2.2 Exploded view - hose connections for charge air system”, page 466

4.2.8 Removing and installing exhaust gas temperature sender 4 - G648- / exhaust gas temperature sender 4 for bank 2 - G649- - vehicles with two turbochargers and without SCR system

Special tools and workshop equipment required

- Tool set - T10395 A- with suitable tool insert



Removing

WARNING

When working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system ⇒ page 7 .***

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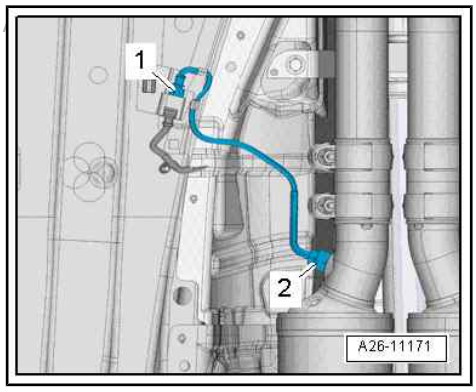
Note

- *The removal of the exhaust gas temperature sender 4 for bank 2 - G649- is shown as an example.*
- *When removing, the electrical wiring must not be cut, otherwise a fault diagnosis would no longer be possible.*

– Remove underbody trim (centre) in direction of exhaust system and press downwards slightly ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim; Removing and installing underbody trim .

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– Detach electrical connector -1- from bracket and unplug.



– Unscrew exhaust gas temperature sender 4 for bank 2 - G649- -item 2-.

Installing

Installation is carried out in reverse order; note the following:

Note

- *Take care to protect exhaust gas temperature sender from knocks and impact; if dropped, the exhaust gas temperature sender can no longer be used.*
- *Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .*

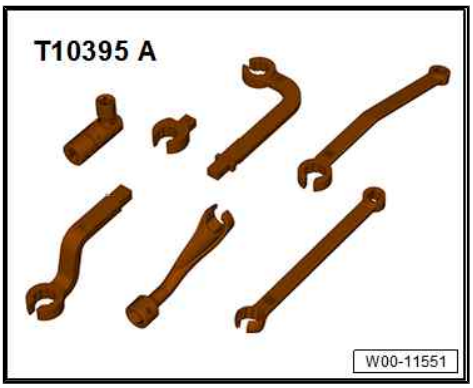
Tightening torques

- ⇒ “4.1.4 Exploded view - exhaust gas temperature control, vehicles with two turbochargers and without SCR system”, page 639
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim; Exploded view - underbody trim

4.2.9 Removing and installing exhaust gas temperature sender 4 - G648- / exhaust gas temperature sender 4 for bank 2 - G649- - vehicles with two turbochargers and SCR system

Special tools and workshop equipment required

- Tool set - T10395 A- with suitable tool insert



Removing

WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system ⇒ page 7 .*

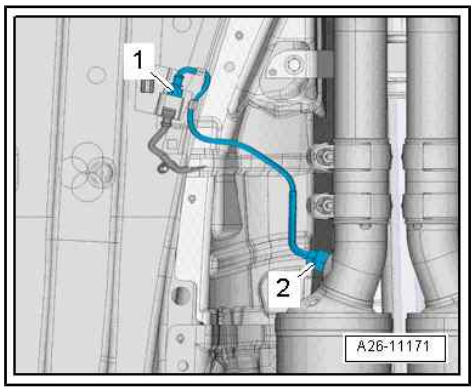
Note

When removing, the electrical wiring must not be cut, otherwise a fault diagnosis would no longer be possible.

– Remove underbody trim (centre) in direction of exhaust system and press downwards slightly ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim; Removing and installing underbody trim .

– Detach electrical connector -1- from bracket and unplug.

– Unscrew exhaust gas temperature sender 4 - G648- / exhaust gas temperature sender 4 for bank 2 - G649- -item 2-.



Installing

Installation is carried out in reverse order; note the following:

Note

- *Take care to protect exhaust gas temperature sender from knocks and impact; if dropped, the exhaust gas temperature sender can no longer be used.*
- *Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .*

Tightening torques

- ⇒ “4.1.5 Exploded view - exhaust gas temperature control, vehicles with two turbochargers and with SCR system”, page 640
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim; Exploded view - underbody trim

4.2.10 Removing and installing particulate sensor - G784-

Special tools and workshop equipment required

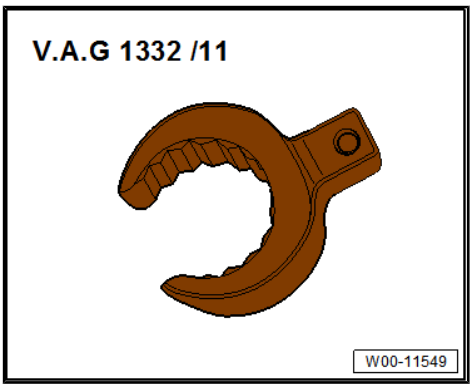
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- Lambda probe open ring spanner set - 3337-



- Open end spanner insert, AF 24 - V.A.G 1332/11-



Removing

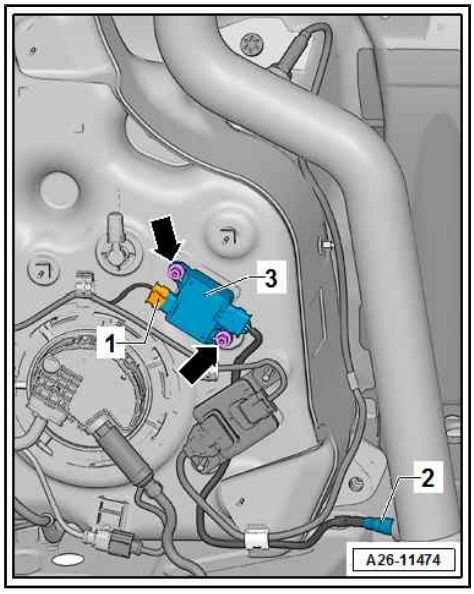
WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system ⇒ page 7 .*

– Detach underbody trim (rear left) ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim; Removing and installing underbody trim .

– Unplug electrical connector -1-.
– Remove nuts -arrows-.
– Move clear electrical wiring.



Note

Different spanner sizes are required depending on the particulate sensors fitted.

– Unscrew particulate sensor - G784- -2- with appropriate size tool.

Installing

Installation is carried out in the reverse order; note the following.

Note

- *New particulate sensors are coated with an assembly paste.*
- *When re-installing, coat thread of particulate sensor with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .*

Tightening torques

- ⇒ “4.1.2 Exploded view - exhaust gas temperature control, vehicles with one turbocharger and with SCR system, version 1”, page 636
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim; Exploded view - underbody trim

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5 Exhaust gas recirculation

⇒ “5.1 Exploded view - exhaust gas recirculation system”, page 657

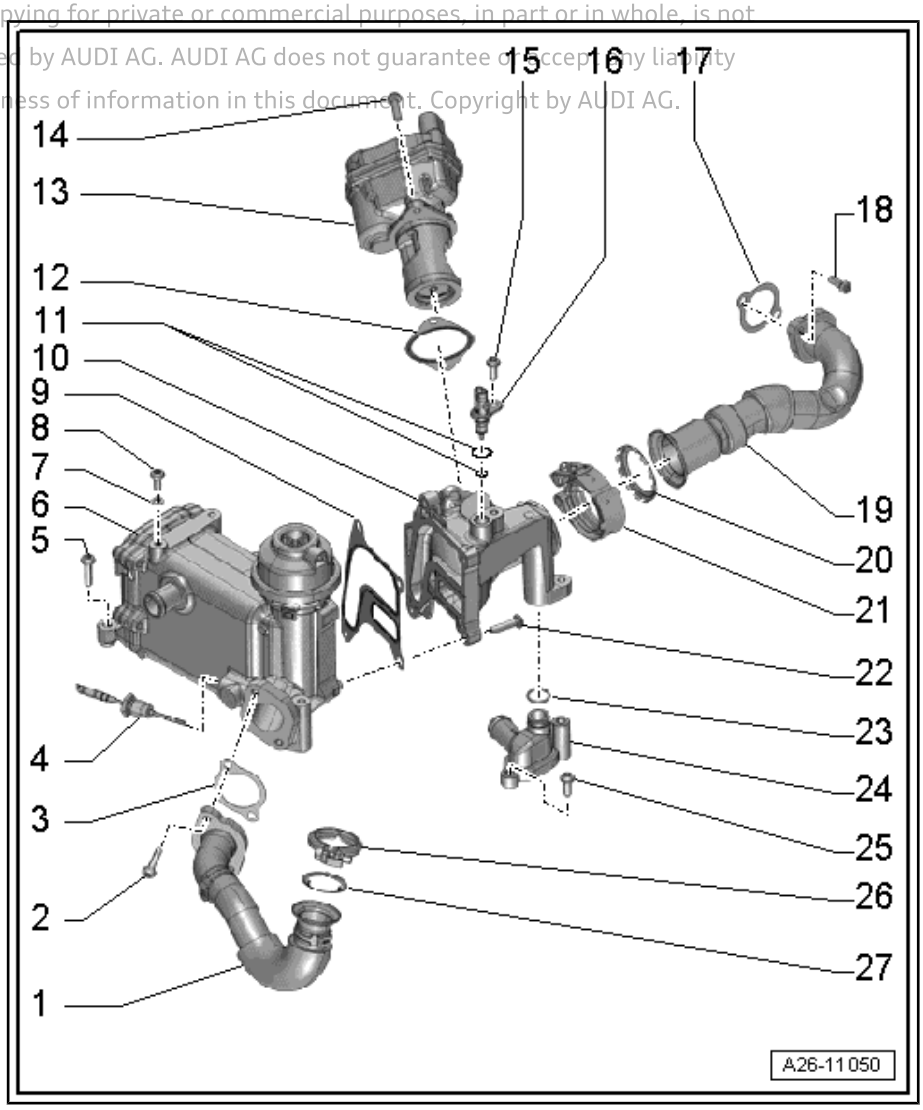
⇒ “5.2 Removing and installing exhaust gas recirculation cooler”, page 660

⇒ “5.3 Removing and installing exhaust gas recirculation control motor V338 ”, page 662

⇒ “5.4 Removing and installing exhaust gas recirculation temperature sensor G98 ”, page 663

5.1 Exploded view - exhaust gas recirculation system

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1 - Exhaust gas recirculation pipe

- ❑ To intake manifold
- ❑ Tightening torque and sequence ⇒ page 659

2 - Bolt

- ❑ Tightening torque and sequence ⇒ page 659

3 - Gasket

- ❑ Renew

4 - Exhaust gas recirculation temperature sensor - G98-

- ❑ Removing and installing ⇒ page 663
- ❑ 35 Nm for aluminium exhaust gas recirculation cooler
- ❑ 45 Nm for steel exhaust gas recirculation cooler

5 - Bolt

- ❑ 9 Nm

6 - Exhaust gas recirculation cooler

- ❑ Removing and installing ⇒ page 660
- ❑ Before fitting, grease exhaust gas recirculation pipe at exhaust gas recirculation cooler ⇒ page 659

7 - Seal

- ❑ Renew

8 - Bleeder screw

9 - Gasket

- ❑ Renew

10 - Connection

11 - O-rings

- ❑ Renew

12 - Gasket

- ❑ Renew

13 - Exhaust gas recirculation control motor - V338-

- ❑ Note installation position
- ❑ With exhaust gas recirculation potentiometer - G212-
- ❑ Removing and installing ⇒ page 662

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14 - Bolt

- ❑ 9 Nm

15 - Bolt

- ❑ 9 Nm

16 - Coolant temperature sender - G62-

- ❑ Removing and installing ⇒ page 371

17 - Gasket

- ❑ Renew

18 - Bolt

- ❑ Tightening torque and sequence ⇒ page 660

19 - Exhaust gas recirculation pipe

- ❑ From turbocharger
- ❑ Exhaust gas recirculation pipe and screw-type clip must always be renewed if screw-type clip -item 21- has been loosened
- ❑ Before fitting, grease exhaust gas recirculation pipe at exhaust gas recirculation cooler ⇒ page 659
- ❑ Tightening torque and sequence ⇒ page 660

20 - Gasket

- ❑ Renew

21 - Screw-type clip

- ❑ Renew
- ❑ If screw-type clip has been unfastened, exhaust gas recirculation pipe -item 19- and screw-type clip must always be renewed
- ❑ Tightening torque and sequence ⇒ page 660

22 - Bolt

- ❑ 9 Nm

23 - O-ring

- ❑ Renew

24 - Coolant connection

25 - Bolt

- ❑ Tightening torque ⇒ Item 7 (page 368)

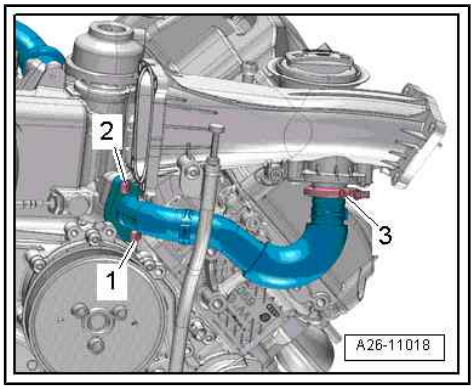
26 - Screw-type clip

- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 659

27 - Gasket

- ❑ Renew

Exhaust gas recirculation pipe to intake manifold - tightening torque and sequence



- Collar of exhaust gas recirculation pipe must not be distorted or bent.

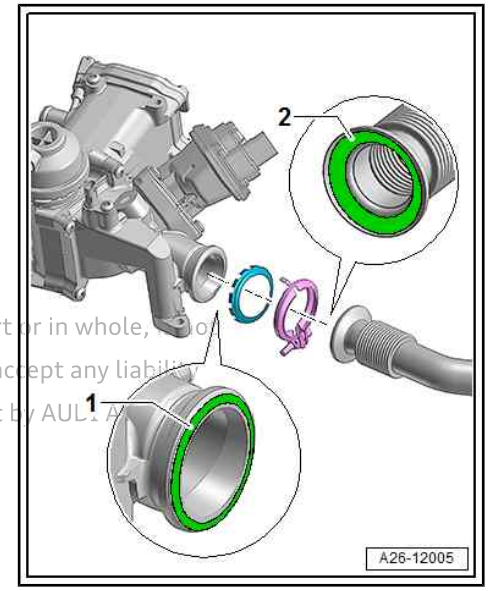
– Fit exhaust gas recirculation pipe with gaskets and screw-type clip.

Note

Coat threads of bolts with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .

Stage	Bolts/screw-type clip	Tightening torque
1.	-1, 2-	Screw in by hand until bolt heads make contact
2.	-3-	Position as illustrated 2.5 Nm
3.	-1, 2-	9 Nm

Greasing exhaust gas recirculation pipe at exhaust gas recirculation cooler before fitting

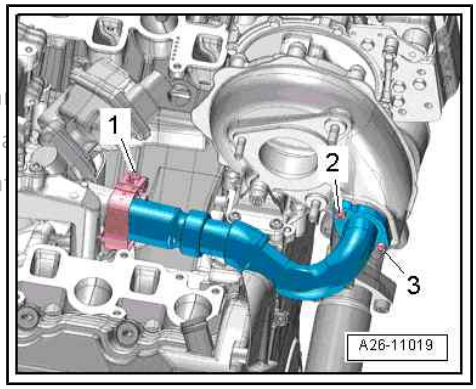


– Before fitting, grease illustrated areas -1- and -2- lightly with commercially available grease.

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Exhaust gas recirculation pipe to turbocharger - tightening torque and sequence



Note

- *Illustration shows installation position on vehicles with one turbocharger as an example.*
- *Renew exhaust gas recirculation pipe and screw-type clip if screw-type clip has been unfastened*
- *Renew the bolts tightened with specified tightening angle.*

– Fit exhaust gas recirculation pipe with gaskets and screw-type clip.

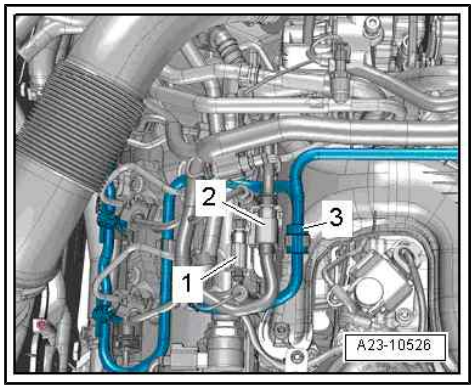
Note

Coat threads of bolts with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .

Stage	Bolts/screw-type clip	Tightening torque
1.	-2, 3-	Screw in by hand until bolt heads make contact
2.	-1-	Position according to tab on exhaust gas recirculation pipe Tightening torque: ♦ Part number 059 131 548 C: 5 Nm ♦ Part number 059 131 548 D: 3.5 Nm ♦ Part number 059 131 548 E: 3.5 Nm
3.	-2, 3-	5 Nm
4.	-2, 3-	Turn 90° further

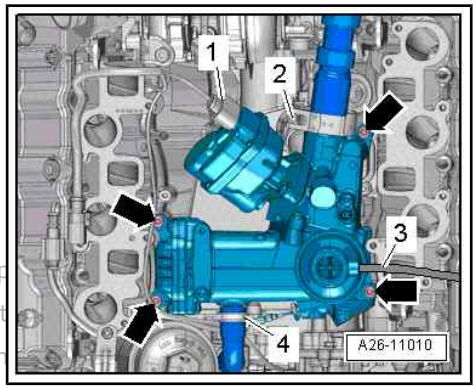
5.2 Removing and installing exhaust gas recirculation cooler

Removing



– Drain coolant ⇒ page 359 .
– Detach electrical connector -1- from bracket and unplug.
– Take electrical connector -2- and retention valve -3- out of bracket.
– Remove intake manifold ⇒ page 513 .

– Disconnect vacuum hose -3-.
– Unplug electrical connector -1-.
– Loosen clamp -2- and push to rear.
– Release hose clip -4- and detach coolant hose.
– Remove bolts -arrows- and lift exhaust gas recirculation cooler off connection.



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Note

Disregard -item 3-.

Installing

Installation is carried out in reverse order; note the following:

Note

- *Renew gaskets, seals and O-rings.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

– Install intake manifold ⇒ page 513 .

Note

Do not reuse coolant.

– Fill up with coolant ⇒ page 361 .

Tightening torques

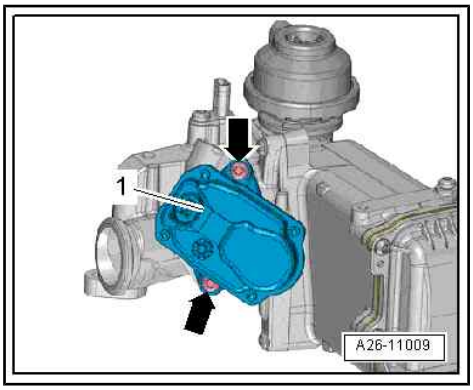
- ⇒ “5.1 Exploded view - exhaust gas recirculation system”, page 657

5.3 Removing and installing exhaust gas recirculation control motor - V338-

Removing

Vehicles with two turbochargers:

– Remove exhaust gas recirculation cooler ⇒ “5.2 Removing and installing exhaust gas recirculation cooler”, page 660 .



Note

Note installation position of exhaust gas recirculation control motor .

– Remove bolts -arrows-.

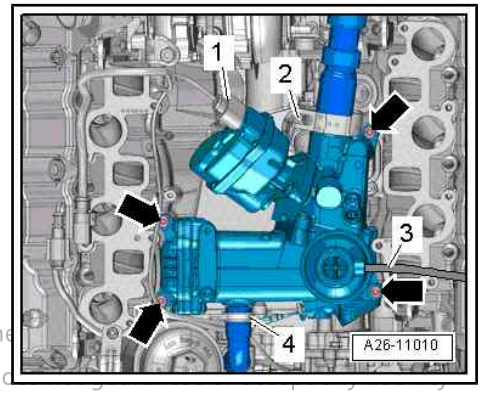
– If fitted, detach bracket between exhaust gas recirculation cooler and exhaust gas recirculation control motor - V338- .

– Pull exhaust gas recirculation control motor - V338- out of exhaust gas recirculation cooler.

Vehicles with one turbocharger:

– Remove intake manifold ⇒ page 513 .

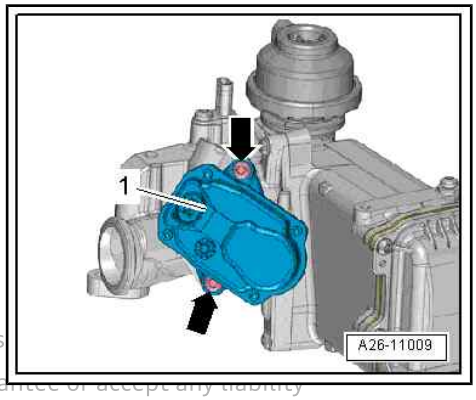
– Unplug electrical connector -1-.



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Note

Note installation position of exhaust gas recirculation control motor .



– Remove bolts -arrows-.
– Move coolant line and fuel line clear.
– Press coolant line and fuel line back and pull exhaust gas recirculation control motor - V338- out of exhaust gas recirculation cooler.

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Installing

Installation is carried out in reverse order; note the following:

Note

Note installation position of exhaust gas recirculation control motor .

– Install intake manifold ⇒ page 513 .

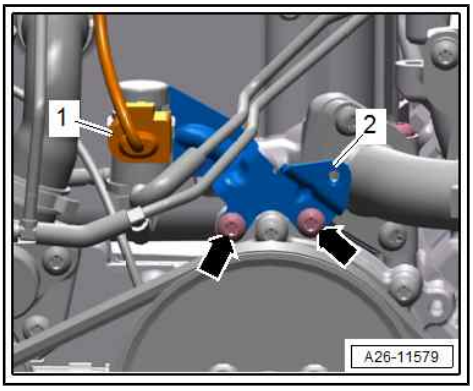
Tightening torques

♦ ⇒ “5.1 Exploded view - exhaust gas recirculation system”, page 657

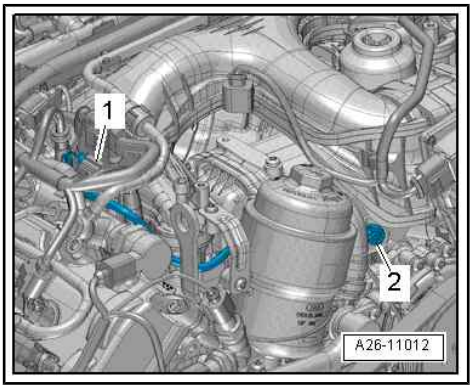
5.4 Removing and installing exhaust gas recirculation temperature sensor - G98-

Removing

– Remove intake manifold flap motor - V157- ⇒ page 518 .
– Unscrew bolts -arrows- and push bracket -2- with exhaust gas recirculation cooler change-over valve - N345- -item 1- to one side.



– Take electrical connector -1- out of bracket, unplug it and move electrical wiring clear.
– Unscrew exhaust gas recirculation temperature sensor - G98- -item 2-.



Installing

Installation is carried out in reverse order; note the following:

– Install intake manifold flap motor - V157- ⇒ page 518 .

Tightening torques

♦ ⇒ “5.1 Exploded view - exhaust gas recirculation system”, page 657

6 Exhaust manifolds

⇒ “6.1 Exploded view - exhaust manifold”, page 664

⇒ “6.2 Removing and installing exhaust manifolds”, page 666

6.1 Exploded view - exhaust manifold

⇒ “6.1.1 Exploded view - exhaust manifold, vehicles with one turbocharger”, page 664

⇒ “6.1.2 Exploded view - exhaust manifold, vehicles with two turbochargers”, page 665

6.1.1 Exploded view - exhaust manifold, vehicles with one turbocharger

Note

The illustration shows the exhaust manifold for cylinder bank 2 (left-side).

1 - Nut
- ❑ Renew
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ Observe tightening torque and sequence ⇒ page 665

2 - Exhaust manifold
- ❑ Removing and installing:

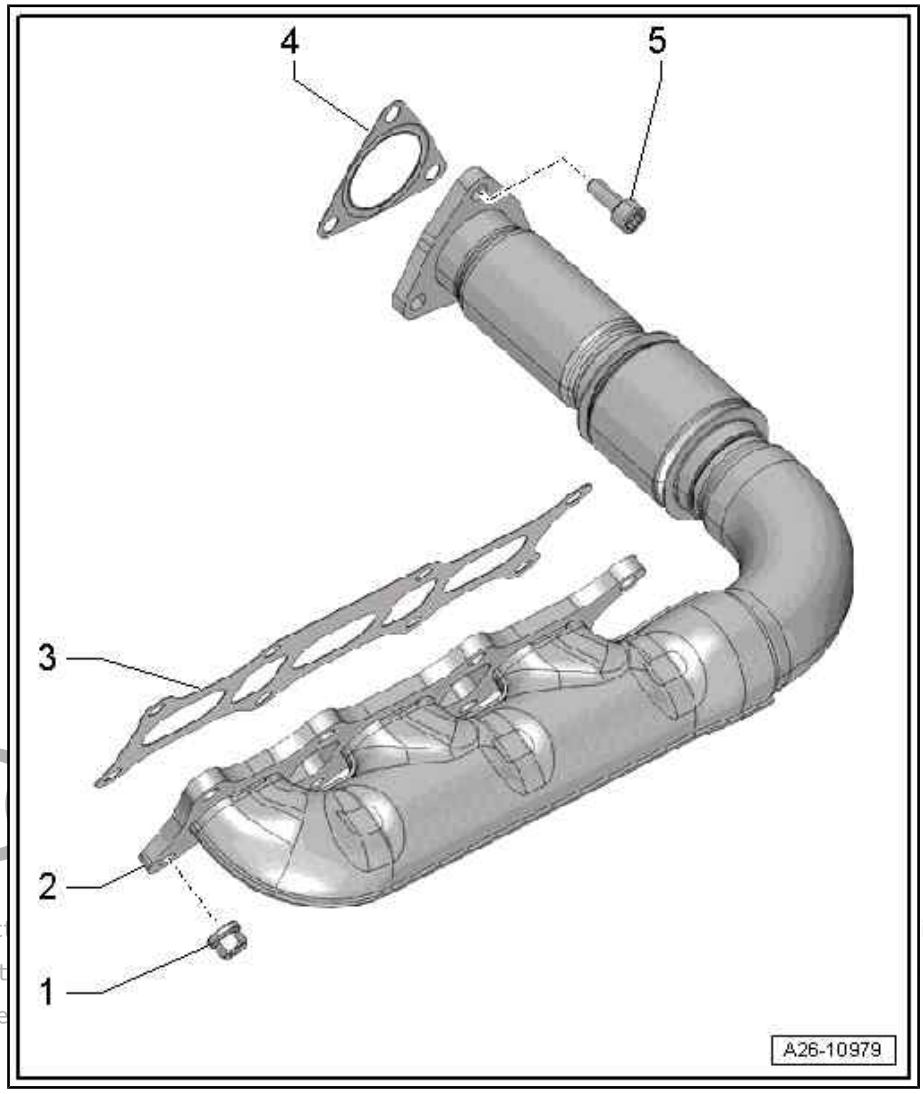
◆ Left-side ⇒ page 666

◆ Right-side ⇒ page 670

3 - Gasket
- ❑ Renew

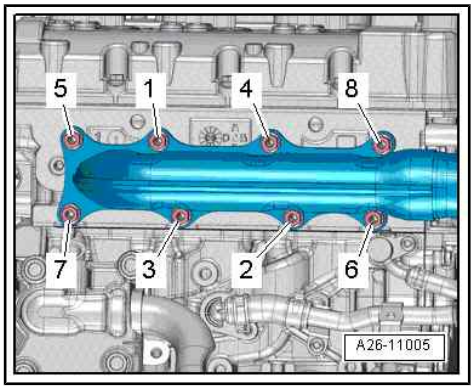
4 - Gasket
- ❑ Renew

5 - Bolt
- ❑ Renew
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 30 Nm +90°



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Exhaust manifold - tightening torque and sequence



Note

- *Renew nuts.*
- *Coat threads of nuts with high-temperature paste; for high temperature paste refer to ⇒ Electronic parts catalogue .*

– Tighten nuts in 3 stages in the sequence shown:

Stage	Nuts	Tightening torque
1.	-1 … 8-	Screw in by hand until contact is made
2.	-1 … 8-	15 Nm
3.	-1 … 8-	25 Nm

6.1.2 Exploded view - exhaust manifold, vehicles with two turbochargers

Note

The illustration shows the exhaust manifold for cylinder bank 2 (left-side).

1 - Nut

- ❑ Renew
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ Observe tightening torque and sequence ⇒ page 666

2 - Exhaust manifold

- ❑ Removing and installing:

- ♦ Left-side ⇒ page 666
- ♦ Right-side ⇒ page 670

3 - Gasket

- ❑ Renew

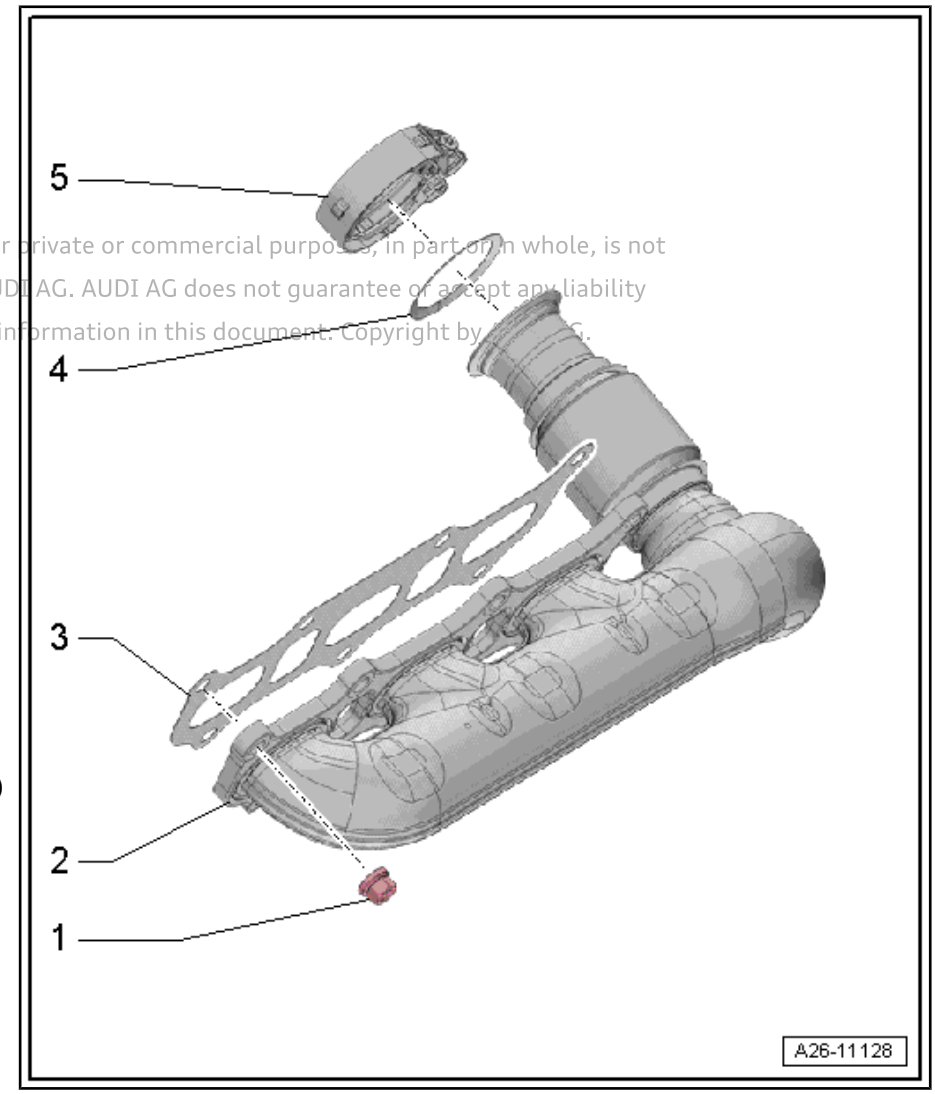
4 - Seal

- ❑ Renew

5 - Clamp

- ❑ Installation position:

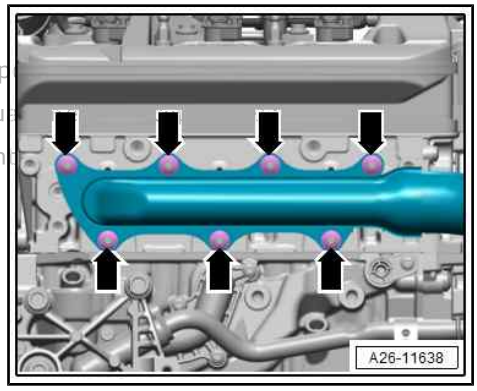
- ♦ Exhaust manifold (left-side) ⇒ page 666
- ♦ Exhaust manifold (right-side) ⇒ page 666



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❑ 8 Nm

Exhaust manifold - tightening torque and sequence



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Note

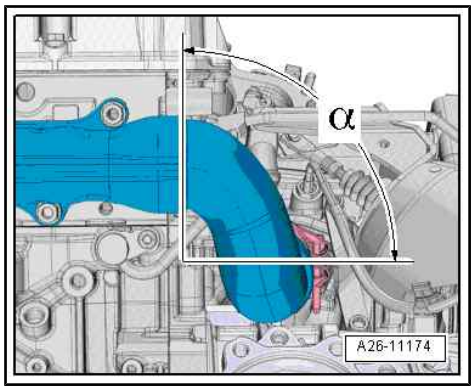
- *Renew nuts.*
- *Coat threads of nuts with high-temperature paste; for high temperature paste refer to ⇒ Electronic parts catalogue .*

– Tighten nuts in three stages as follows:

Stage	Nuts	Tightening torque
1.	-arrows-	Screw in by hand until contact is made
2.	-arrows-	Starting from the centre, tighten in diagonal sequence to 15 Nm
3.	-arrows-	Starting from the centre, tighten in diagonal sequence to 25 Nm

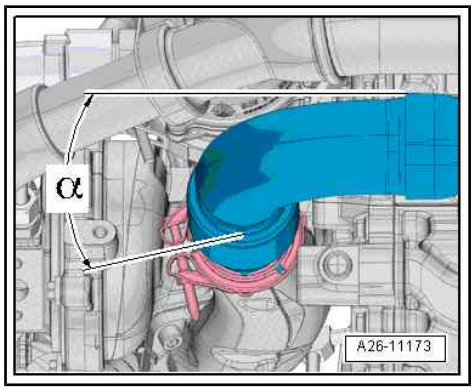
Installation position of clamp for exhaust manifold (left-side)

- Angle α = 90° ± 10°.



Installation position of clamp for exhaust manifold (right-side)

- Angle α = 18° ± 10°.



6.2 Removing and installing exhaust manifolds

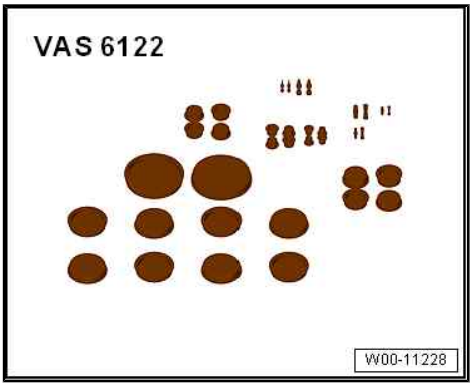
⇒ “6.2.1 Removing and installing exhaust manifold (left-side)”, page 666

⇒ “6.2.2 Removing and installing exhaust manifold (right-side)”, page 670

6.2.1 Removing and installing exhaust manifold (left-side)

Special tools and workshop equipment required

- Engine bung set - VAS 6122-



Removing

WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system ⇒ page 7 .*

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Vehicles with one turbocharger:

– Remove particulate filter ⇒ page 612 .

Vehicles with two turbochargers:

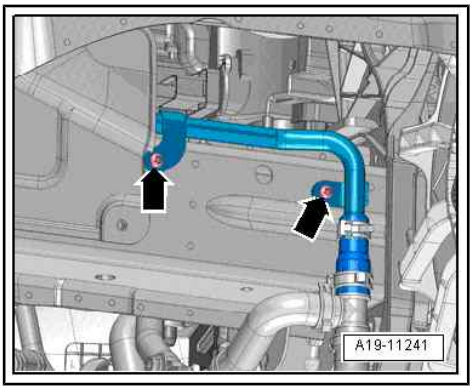
– Remove catalytic converter ⇒ page 605 .

All vehicles (continued):

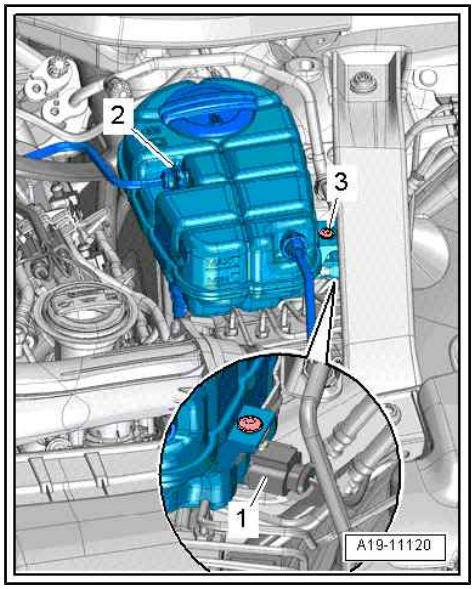
– Remove throttle valve module - J338- ⇒ page 520 .

– Remove poly V-belt ⇒ page 180 .

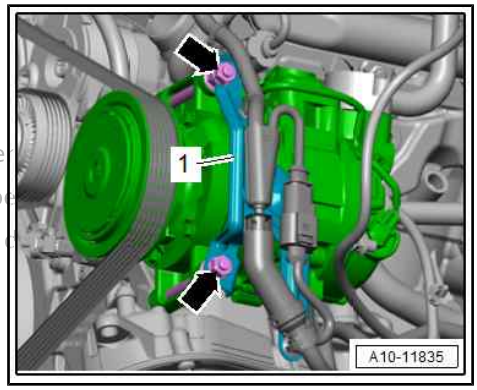
– Unscrew nuts -arrows- and move clear coolant pipe on longitudinal member.



– Unplug electrical connector -1-.
– Lift retaining clip and disconnect coolant line -2-.
– Seal off open lines and connections with clean plugs from engine bung set - VAS 6122- .
– Remove bolt -3- and place coolant expansion tank to one side.
– Remove noise insulation (front) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .
– Remove wheel spoiler (front left) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front) .



– If fitted, remove nuts -arrows- and press bracket -1- to one side.

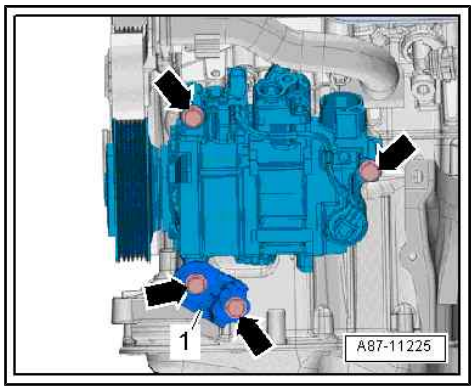


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Caution

Risk of damage to refrigerant lines and hoses

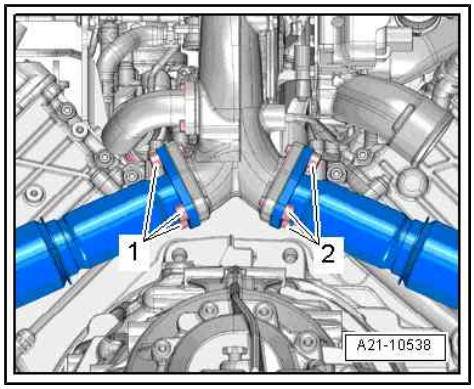
- ***Do NOT stretch, kink or bend refrigerant lines and hoses.***



– Remove bolts -arrows-.
– If fitted, remove bracket -1-.
– Push A/C compressor to one side.

Vehicles with one turbocharger:

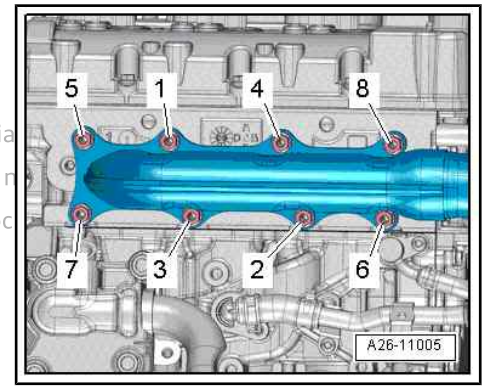
– Remove bolts -1-.



Note

Disregard -item 2-.

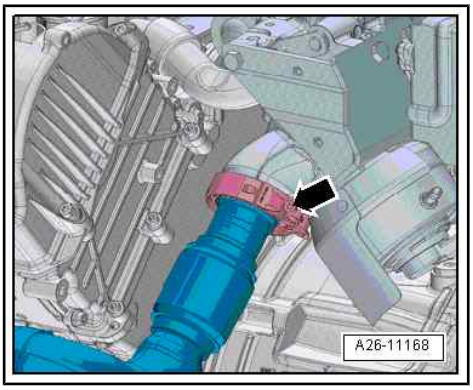
– Loosen and remove nuts in the sequence: -8 ... 1- and detach exhaust manifold.



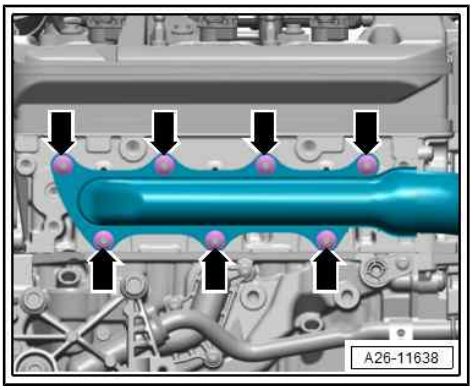
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Vehicles with two turbochargers:

– Open clip -arrow- and detach.



– Remove nuts -arrows- and detach exhaust manifold.



Installing

Installation is carried out in reverse order; note the following:

Note

Renew gaskets and self-locking nuts.

– Tighten nuts for exhaust manifold (vehicles with one turbocharger) ⇒ page 665 .
– Tighten nuts for exhaust manifold (vehicles with two turbochargers) ⇒ page 666 .
– Install poly V-belt ⇒ page 180 .
– Connect coolant line with plug-in connector ⇒ page 394 .
– Install throttle valve module - J338- ⇒ page 520 .
– Install particulate filter ⇒ page 612 /install catalytic converter ⇒ page 605 .

Tightening torques

- ⇒ “6.1 Exploded view - exhaust manifold”, page 664
- ⇒ “2.2 Exploded view - hose connections for charge air system”, page 466
- ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Exploded view - air conditioner compressor drive unit
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front)
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

6.2.2 Removing and installing exhaust manifold (right-side)

Removing

WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system ⇒ page 7 .*

Vehicles with one turbocharger:

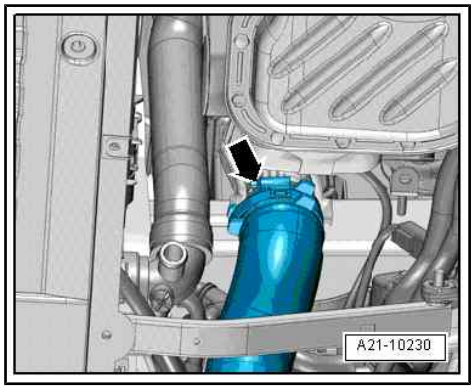
– Remove particulate filter ⇒ page 612 .

All vehicles (continued):

– Remove air cleaner housing ⇒ page 510 .

– Remove noise insulation (front) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

– Release hose clip -arrow- and detach air hose from air pipe.

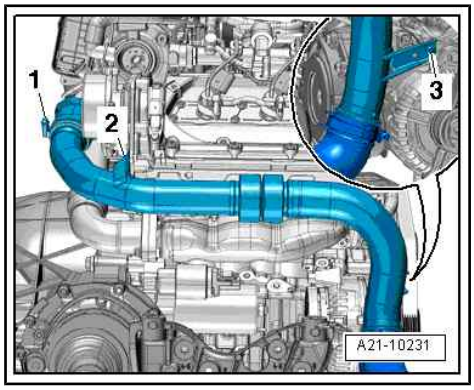


Vehicles with one turbocharger:

– Remove bolts -2, 3-.

– Release hose clip -1- and detach air hose.

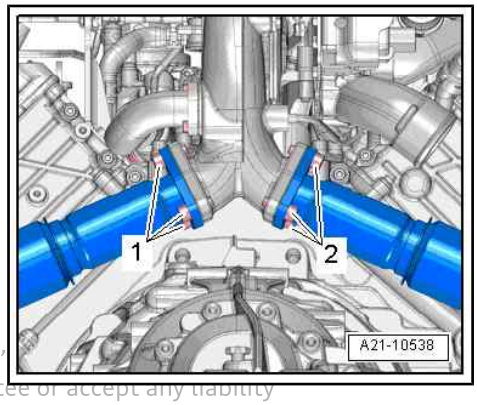
– Press air pipe to the side.



– Remove bolts -2-.

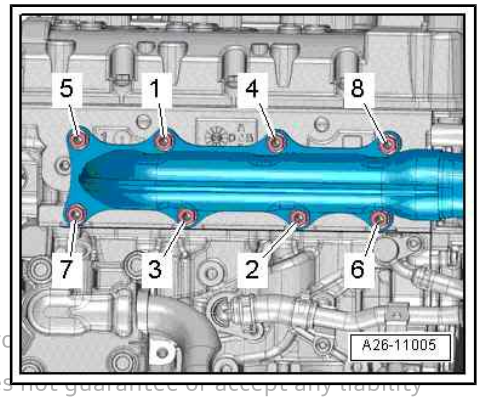
Note

Disregard -item 1-.



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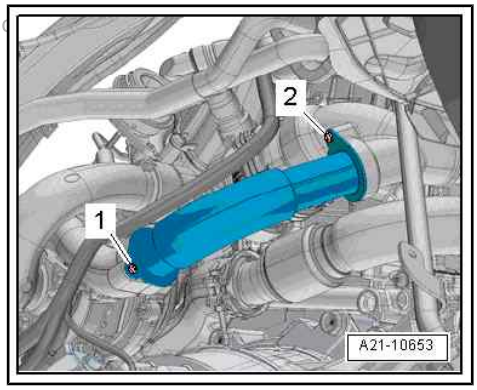
– Loosen and remove nuts in the sequence: -8 ... 1- and detach exhaust manifold.



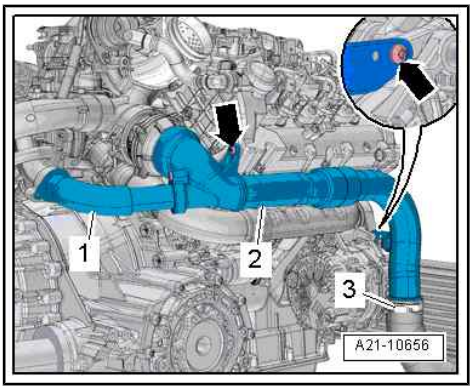
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Vehicles with two turbochargers:

– Remove bolts -1, 2-.



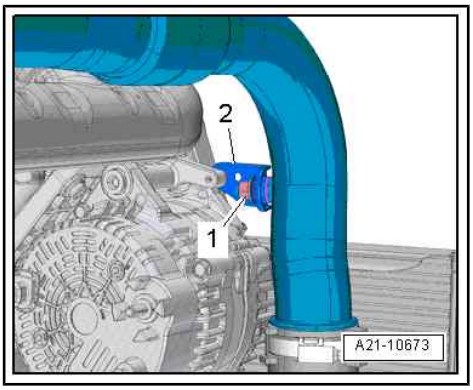
– Remove bolts -arrows-.
– Disconnect air pipe (right-side) -2- together with intermediate pipe -1- from turbocharger unit and move clear to one side.



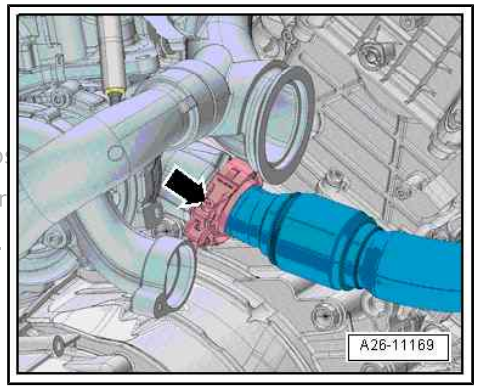
Note

Disregard -item 3-.

– Remove nut -1- and detach bracket -2-.
– Detach air pipe (right-side) towards rear.

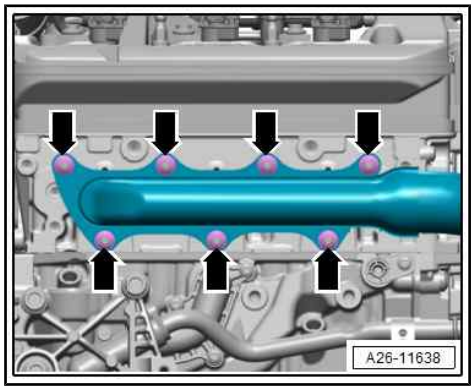


– Open clip -arrow- and detach.



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– Remove nuts -arrows- and detach exhaust manifold.



Installing

Installation is carried out in reverse order; note the following:

Note

Renew gaskets and self-locking nuts.

– Tighten nuts for exhaust manifold (vehicles with one turbocharger) ⇒ page 665 .
– Tighten nuts for exhaust manifold (vehicles with two turbochargers) ⇒ page 666 .
– Install air pipe ⇒ page 463 .
– Install air cleaner housing ⇒ page 510 .
– Install particulate filter ⇒ page 612 .

Tightening torques

- ⇒ “6.1 Exploded view - exhaust manifold”, page 664
- ⇒ “2.2 Exploded view - hose connections for charge air system”, page 466
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

28 – Glow plug system

1 Glow plug system

⇒ “1.1 Exploded view - glow plug system”, page 673

⇒ “1.2 Removing and installing glow plug”, page 674

⇒ “1.3 Removing and installing Hall sender G40 ”, page 676

⇒ “1.4 Removing and installing engine speed sender G28 ”, page 676

1.1 Exploded view - glow plug system

1 - Sender wheel

- ❑ For engine speed sender - G28-
- ❑ Removing and installing ⇒ page 196

2 - Glow plug

Cylinder bank 1 (right-side):

- ❑ Glow plug 1 - Q10- , glow plug 2 - Q11- , glow plug 3 - Q12-
- ❑ Depending on emission standard, cylinder 2 combustion chamber pressure sender - G678- may be fitted on cylinder 2 ⇒ page 674

Cylinder bank 2 (left-side):

- ❑ Glow plug 4 - Q13- , glow plug 5 - Q14- , glow plug 6 - Q15-
- ❑ Removing and installing ⇒ page 674
- ❑ 12 Nm

3 - Electrical connector

4 - Bolt

- ❑ 9 Nm

5 - Hall sender - G40-

- ❑ Removing and installing ⇒ page 676

6 - O-ring

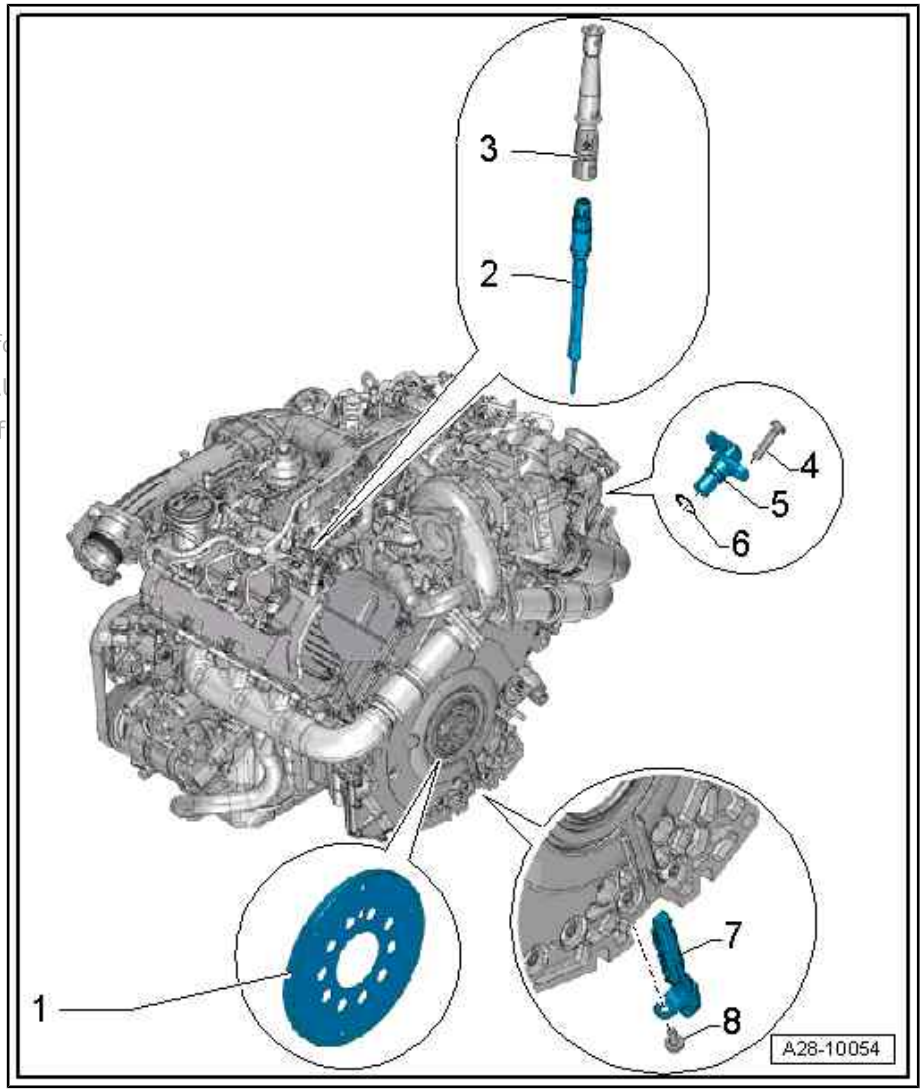
- ❑ Renew

7 - Engine speed sender - G28-

- ❑ Removing and installing ⇒ page 676

8 - Bolt

- ❑ 9 Nm

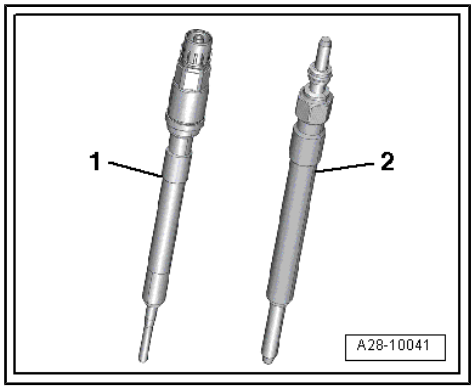


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Glow plug versions (depends on emission standard)

1 - Glow plug with combustion chamber pressure sender (only installed on cylinder 2)

2 - Glow plug without combustion chamber pressure sender



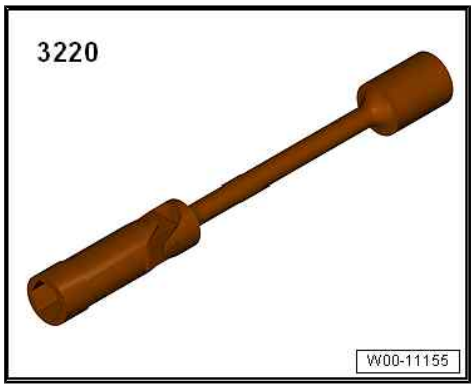
Note

- *Depending on the emission standard, a combustion chamber pressure sender is integrated in the glow plug on cylinder 2.*
- *Designation: glow plug 2 - Q11- with cylinder 2 combustion chamber pressure sender - G678-*

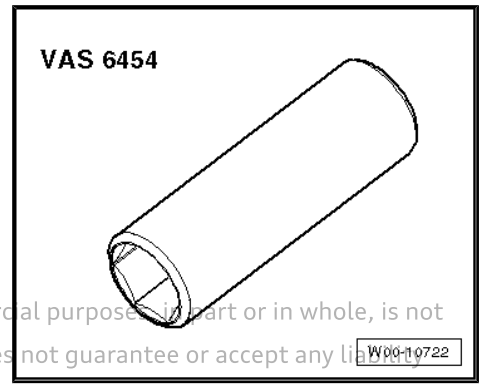
1.2 Removing and installing glow plug

Special tools and workshop equipment required

- Articulated wrench, 10 mm - 3220-



- Socket insert AF 12 for glow plugs 4-cyl.TDI CR diesel - VAS 6454- (for glow plug for cylinder 2, depends on emission standard)



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Removing

– Switch off ignition.

– Remove engine cover panel ⇒ page 172 .

– Detach glow plug connectors from glow plugs.

– Clean glow plug opening to make sure no dirt gets into cylinders.

– Clean glow plug openings in cylinder head; make sure no dirt gets into cylinder.

Note

- *Cleaning procedure:*
- *Use a vacuum cleaner to remove coarse dirt.*
- *Spray brake cleaner or suitable cleaning agent into glow plug apertures, let it work in briefly, and blow out with compressed air.*
- *Then clean the glow plug openings using a cloth moistened with oil.*

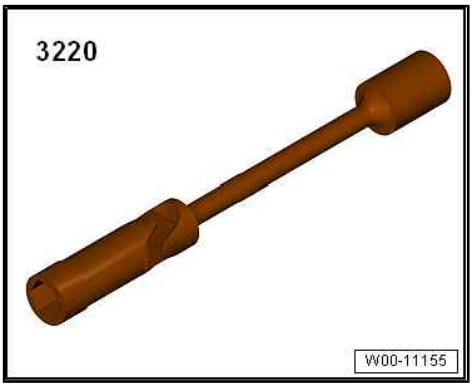
WARNING

Risk of eye injury.

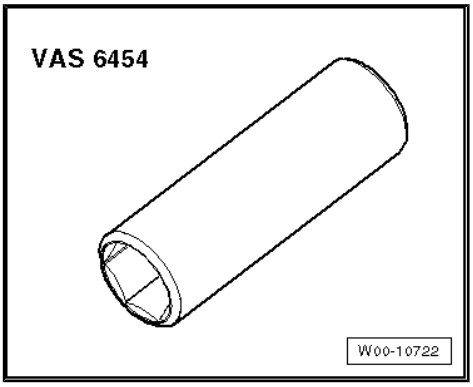
- ***Put on safety goggles.***

– Loosen glow plugs using tool and unscrew by hand:

Use U/J extension and socket, 10 mm - 3220- for cylinders 1, 3, 4, 5 and 6.



Use socket insert AF 12 for glow plugs 4-cyl.TDI CR diesel - VAS 6454- for cylinder 2.



– Then unscrew glow plugs carefully by hand or using a suitable hose. Keep the glow plugs straight while unscrewing.

Installing

Installation is carried out in reverse order; note the following:

– 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.

– Attach glow plug connectors correctly and make sure connectors are securely fitted.

The remaining installation steps are carried out in the reverse sequence.

Tightening torques

- ⇒ “1.1 Exploded view - glow plug system”, page 673

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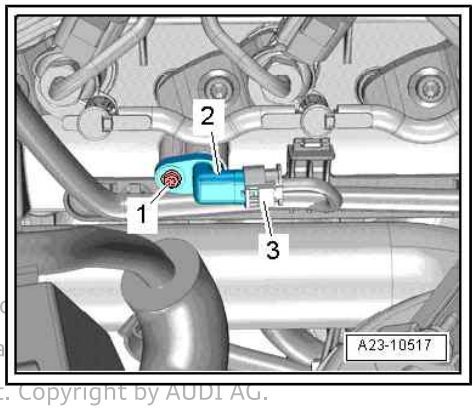
1.3 Removing and installing Hall sender - G40-

Removing

– Remove engine cover panel ⇒ page 172 .

– Unplug electrical connector -3-.

– Unscrew bolt -1- and remove Hall sender - G40- -item 2-.



Installing

Installation is carried out in reverse order; note the following:

Note

Fit new O-ring.

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Tightening torques

◆ ⇒ “1.1 Exploded view - glow plug system”, page 673

1.4 Removing and installing engine speed sender - G28-

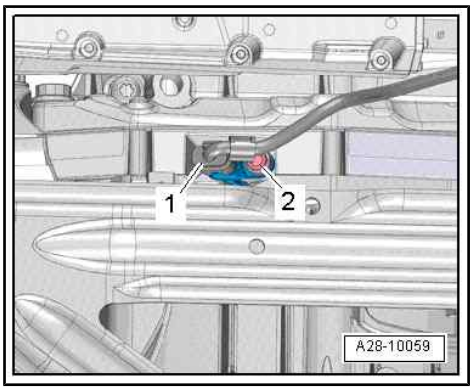
Removing

– Remove noise insulation (rear) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

Vehicles with front-wheel drive:

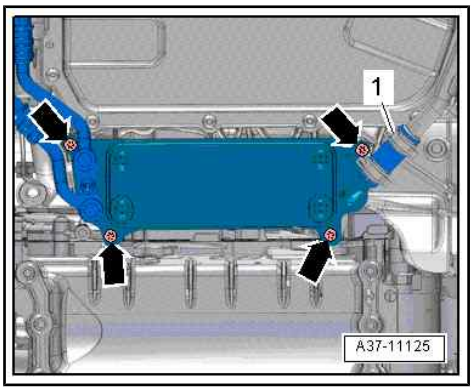
– Unplug electrical connector -1-.

– Unscrew bolt -2- and detach engine speed sender - G28- .

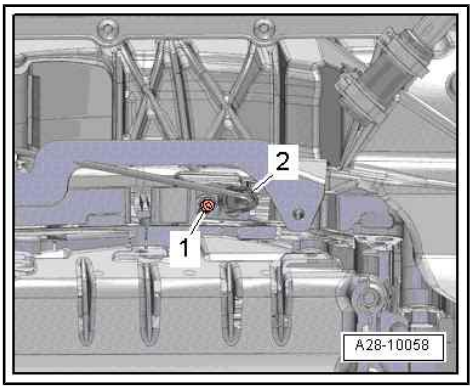


Vehicles with dual clutch gearbox 0B5:

– Remove bolts -arrows- and push ATF cooler slightly to one side.

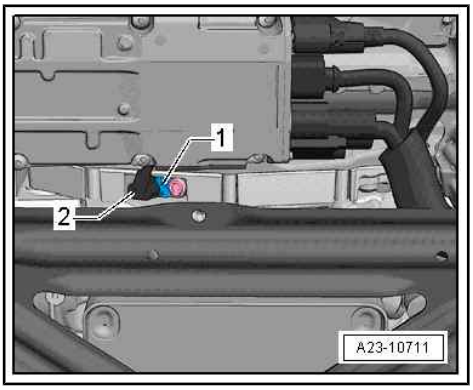


– Unplug electrical connector -2-.
– Unscrew bolt -1- and detach engine speed sender - G28- .



Vehicles with two turbochargers:

– Unplug electrical connector -2-.
– Unscrew bolt from engine speed sender - G28- -1- and remove engine speed sender.



Installing

Installation is carried out in reverse order; note the following:

Vehicles with dual clutch gearbox 0B5:

– Install ATF cooler ⇒ Rep. gr. 34 ; ATF circuit; Removing and installing ATF cooler .

Tightening torques

♦ ⇒ “1.1 Exploded view - glow plug system”, page 673

♦ ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

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