Workshop Manual

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

6-cylinder direct injection engine with supercharger (3.0 ltr. 4-valve TFSI)								
Engine ID	CAK A	CCB A	CGW C	CGX C	CHM B	CMU A	CTU B		

Edition 01.2016

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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

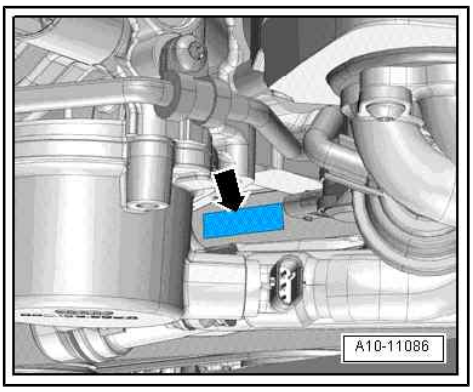
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⇒ "1.1 Engine identification number/engine data", page 1

⇒ "1.2 Technical data of injection system", page 1

1.1 Engine identification number/engine data

Engine number



Note

Pull off engine cover panel (front) to make the engine number visible.

- The engine number ("engine code" and "serial number") can be found on the front of the cylinder block beneath the cylinder head (right-side) -arrow-.
- Starting with the letter "C", the engine codes consist of 4 letters.
- The first 3 characters of the engine code stand for the engine capacity and the mechanical construction and design. They are stamped on the cylinder block, together with the serial number.
- The 4th character indicates the power output and torque of the engine, and is determined by the engine control unit.

Note

- *The 4-character engine code can be found on the type plate (in versions for some countries only) and on the vehicle data sticker and the engine control unit.*
- *Fitting locations of the type plate (certain countries only) and the vehicle data sticker ⇒ Maintenance ; Booklet 811 ; ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .*

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

1.2 Technical data of injection system

3.0 ltr. TFSI engine	
Idling speed	Cannot be adjusted; regulated by idling speed stabilisation
Fuel pressure before high-pressure pump	3.0 ... 6.0 bar
Fuel pressure after high-pressure pump	30 ... 125 bar

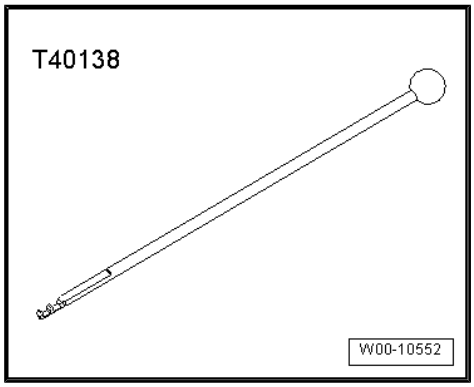
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2 General notes

⇒ “2.1 General notes on self-diagnosis”, page 2

⇒ “2.2 General notes on ignition system”, page 2

2.1 General notes on self-diagnosis



- 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).
- Fuel hoses in engine compartment must only be secured with spring-type clips. O-type clips or screw-type clips must not be used.
- A voltage of at least 11.5 V is required for proper operation of the electrical components.
- Do not use sealants containing silicone. Particles of silicone drawn into the engine will not be burnt in the engine and will damage the Lambda probe.
- The vehicles are fitted with a crash/fuel shut-off system. This system is designed to reduce the risk of a vehicle fire after a crash by deactivating the fuel pump via the fuel pump relay.
- Use release tool - T40138- to unplug connectors that cannot be accessed easily.

2.2 General notes on ignition system

- The engine control unit has a self-diagnosis capability.
- A voltage of at least 11.5 V is required for proper operation of the electrical components.
- Certain tests may lead to faults being stored in the engine control unit. The event memory must be interrogated after completing all tests and repair work. If faults are stored:
- If the engine starts, runs for a short period and then cuts out after completing fault finding, repairs or component tests, this may be due to the immobiliser disabling the engine control unit. The event memory must then be interrogated and, if necessary, the control unit must be adapted.

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3 Safety precautions

⇒ “3.1 Safety precautions when working on the fuel supply system”, page 3

⇒ “3.2 Safety precautions when working on the cooling system”, page 3

⇒ “3.3 Safety precautions when working on vehicles with start/stop system”, page 4

⇒ “3.4 Safety precautions when using testers and measuring instruments during a road test”, page 4

⇒ “3.5 Safety precautions when working on the exhaust system”, page 4

⇒ “3.6 Safety precautions when working on the subframe”, page 4

⇒ “3.7 Safety precautions when working on the ignition system”, page 4

3.1 Safety precautions when working on the fuel supply system

Risk of injury - fuel system operates under high pressure

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

Before opening the fuel system:

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- Put on safety goggles.
- Put on protective gloves.
- Release pressure (wrap clean cloth around connection and open connection carefully).

Risk of fire due to escaping fuel

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

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

3.2 Safety precautions when working on the cooling system

Risk of scalding as hot coolant can escape

The cooling system is under pressure when the engine is hot. Hot steam/hot coolant can escape - risk of scalding.

- Put on protective gloves.
- Put on safety goggles.
- Release pressure (cover filler cap on coolant expansion tank with a cloth and open carefully).

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

Risk of injury - engine may start unexpectedly

On vehicles with the start/stop system activated, the engine may start unexpectedly. If the start/stop system is activated, this is indicated by a message on the dash panel insert.

– Deactivate start/stop system by switching off ignition.

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

Risk of injury if test equipment is not secured

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

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

Or

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

3.5 Safety precautions when working on the exhaust system

Risk of damage to flexible joint

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

– Do not bend flexible joint more than 10°.

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

3.6 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.*

3.7 Safety precautions when working on the ignition system

Risk of injury caused by electric shock

When the engine is running, there are high voltage levels in the ignition system. There is a risk of electric shock when touching the ignition system!

– Never touch or disconnect ignition wiring when the engine is running or being turned at cranking speed.

Risk of damage to components

Washing the engine or connecting/disconnecting electrical wiring may result in components being damaged if the engine is running.

– Switch off ignition before connecting/disconnecting electrical wiring.

– Switch off ignition before cleaning engine.

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4 Repair instructions

⇒ “4.1 Rules for cleanliness”, page 6

⇒ “4.2 Foreign particles in engine”, page 6

⇒ “4.3 Contact corrosion”, page 6

⇒ “4.4 Routing and attachment of pipes, hoses and wiring”, page 7

⇒ “4.5 Installing radiators and condensers”, page 7

⇒ “4.6 Checking vacuum system”, page 7

4.1 Rules for cleanliness

Even small amounts of dirt can cause malfunctions. For this reason, please observe the following rules when working on the fuel supply system, injection system and turbocharger:

- Carefully clean connection points and the surrounding area with engine cleaner or brake cleaner and dry thoroughly before opening.
- Seal off open pipes/lines and connections immediately with clean plugs, e.g. from engine bung set - VAS 6122- .
- Place parts that have been removed on a clean surface and cover them over. Use only 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 their packing (e.g. in tool boxes etc.).
- When the system is open, do not work with compressed air and do not move the vehicle.
- Make sure that no fuel runs onto the fuel hoses. Should this occur, the fuel hoses must be cleaned again immediately. Renew fuel hoses if damaged.
- Protect unplugged electrical connectors against dirt and moisture and make sure connections are dry when attaching.

4.2 Foreign particles in engine

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

4.3 Contact corrosion

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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 used.

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 .

Note the following:

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

4.4 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 prevent damaging pipes, hoses and wiring, ensure sufficient clearance from all moving or hot components in engine compartment (little space in engine compartment).

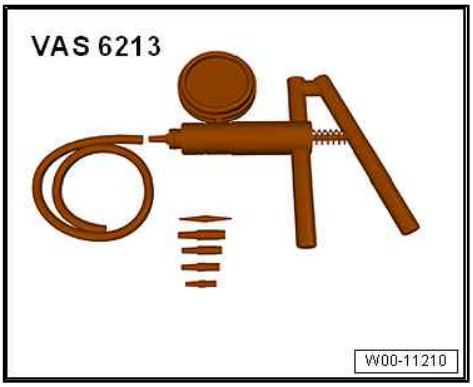
4.5 Installing radiators and condensers

Even when the radiator and condenser 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 or the condenser.

4.6 Checking vacuum system

Special tools and workshop equipment required

- Hand vacuum pump - VAS 6213-



Procedure

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

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

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

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

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

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10 – Removing and installing engine

1 Removing and installing engine

⇒ “1.1 Removing engine”, page 8

⇒ “1.2 Separating engine and gearbox”, page 51

⇒ “1.3 Securing engine to engine and gearbox support”, page 63

⇒ “1.4 Installing engine”, page 66

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1.1 Removing engine

⇒ “1.1.1 Removing engine - vehicles with manual gearbox”, page 8

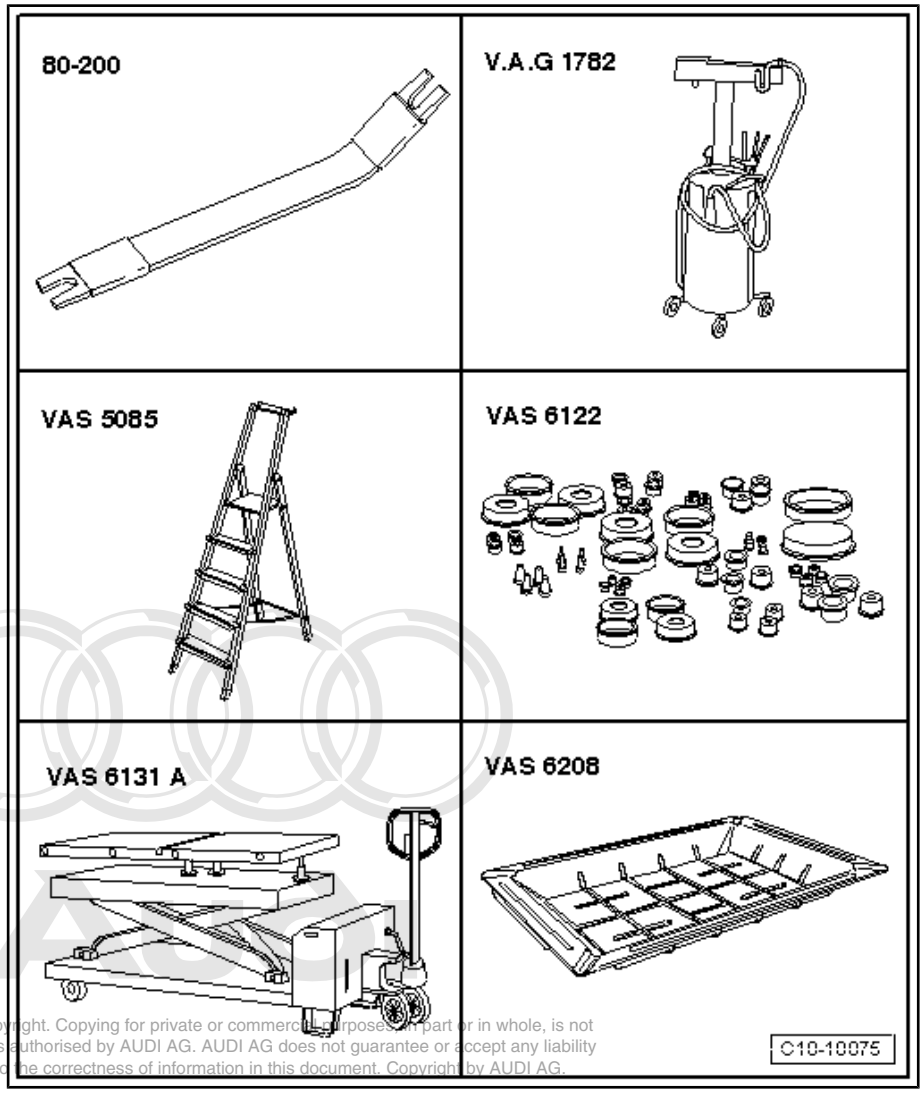
⇒ “1.1.2 Removing engine - vehicles with dual clutch gearbox 0B5”, page 30

1.1.1 Removing engine - vehicles with manual gearbox

Note

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

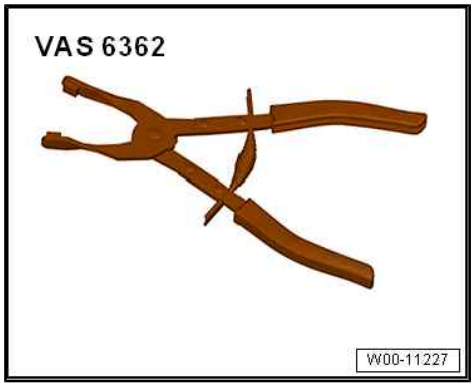
Special tools and workshop equipment required



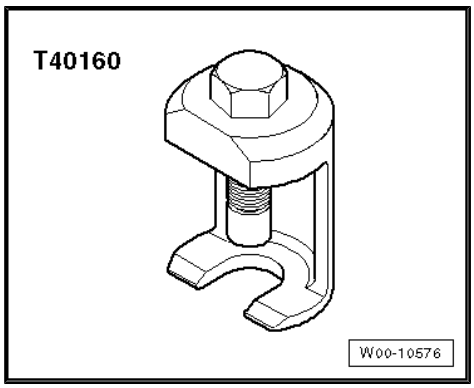
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- Removal lever - 80 - 200-
- Used oil collection and extraction unit - V.A.G 1782-
- Stepladder - VAS 5085-
- Engine bung set - VAS 6122-
- Scissor-type assembly platform - VAS 6131 A- with support set for Audi - VAS 6131/10- and supplementary set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

♦ Hose clip pliers - VAS 6362-



♦ Puller - T40160-



Procedure

WARNING

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

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

– Set front wheels to straight-ahead position.

Note

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

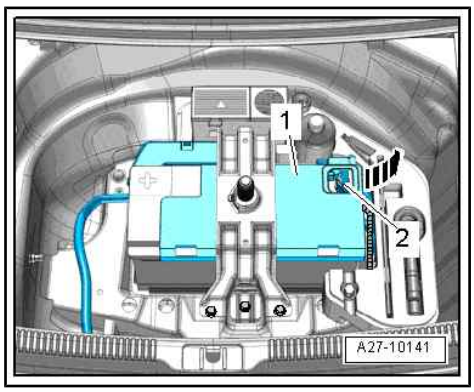
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– Set front wheels to straight-ahead position.

– Switch off ignition and take out ignition key.

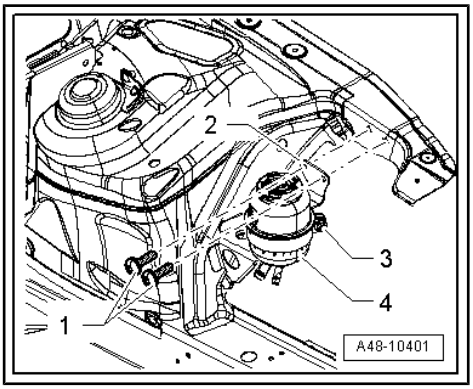
– Disconnect earth wire -2- from battery terminal ⇒ Electrical system; Rep. gr. 27 ; Battery, Disconnecting and connecting battery .

– Discharge refrigerant system ⇒ Air conditioner with refrigerant R134a; Rep. gr. 87 ; Refrigerant circuit .



Vehicles with hydraulic power steering:

– Extract hydraulic fluid for power steering from reservoir -4- using used oil collection and extraction unit - V.A.G 1782- .



Note

Disregard -items 1, 2, 3-.

All vehicles (continued):

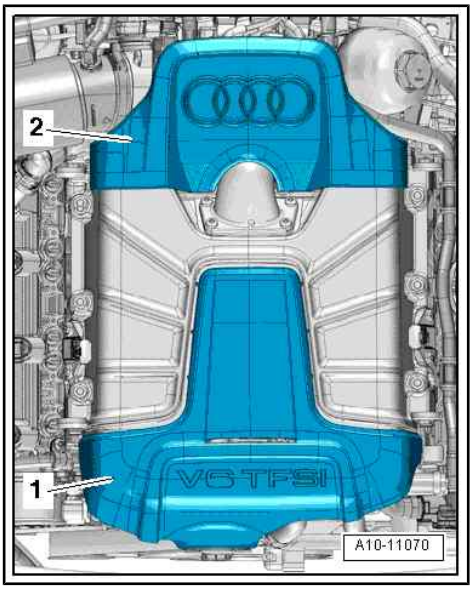
– Lift off engine cover panels -1- and -2-.

WARNING

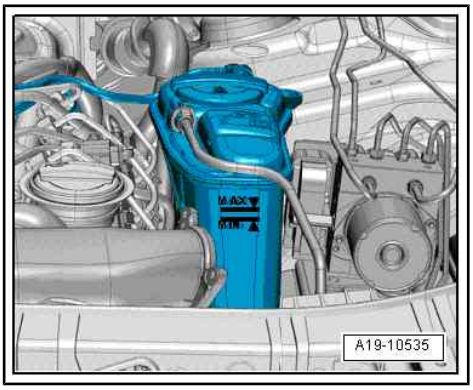
The cooling system is under pressure when the engine is hot. Hot steam/hot coolant can escape - risk of scalding.

Danger of scalding skin and other parts of the body.

- ***Put on protective gloves.***
- ***Put on safety goggles.***
- ***Release pressure (cover filler cap on coolant expansion tank with a cloth and open carefully).***

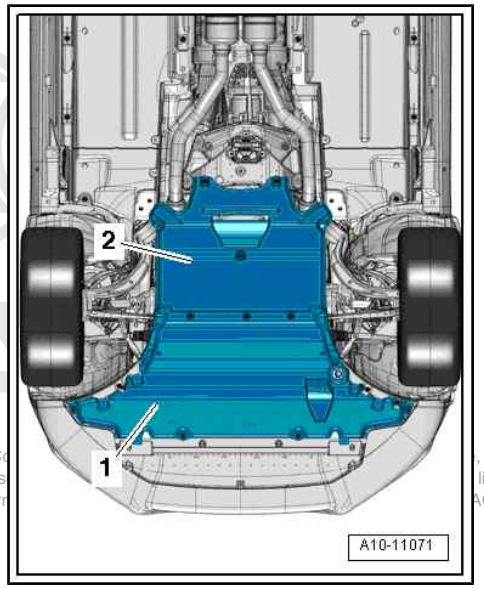


– Open filler cap on coolant expansion tank.



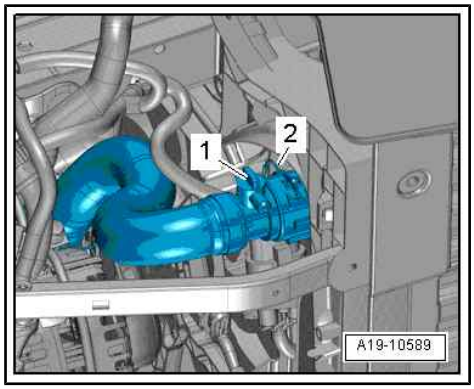
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– Remove both front wheels.
– Remove wheel spoilers (front) on both sides ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front) .
– Remove noise insulation -1- and -2- ⇒ General body repairs,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



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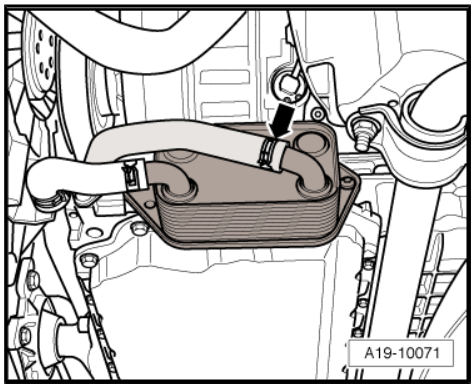
– Place drip tray for workshop hoist - VAS 6208- beneath engine.
– Remove drain plug -1- and drain off coolant.
– Lift retaining clip -2- and disconnect coolant hose from radiator.



– Release hose clip -arrow-, disconnect coolant hose from engine oil cooler and drain off coolant.

Note

For illustration purposes, the installation position is shown in the following illustrations with the engine removed.

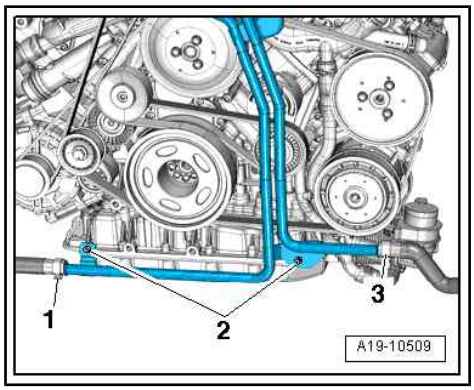


Vehicles with coolant pipes (front left) (version 1):

– Release hose clips -1- and -3-, disconnect coolant hoses from coolant pipes (front left) and drain off remaining coolant.

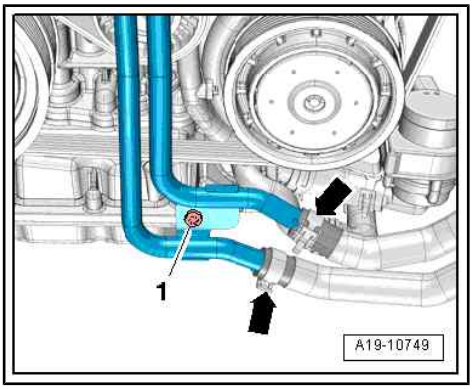
Note

Disregard -item 2-.



Vehicles with coolant pipes (front left) (version 2):

– Release hose clips -arrows-, disconnect coolant hoses from coolant pipes (front left) and drain off remaining coolant.

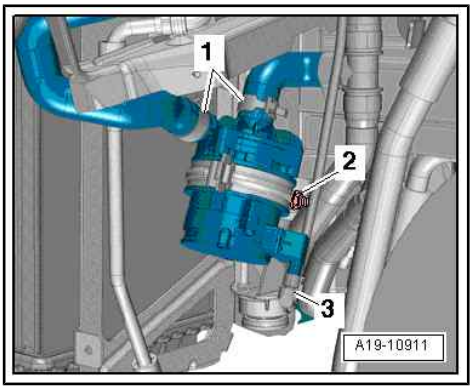


Note

Disregard -item 1-.

All vehicles (continued):

– Unplug electrical connector -3- from charge air cooling pump - V188- and move clear.



Note

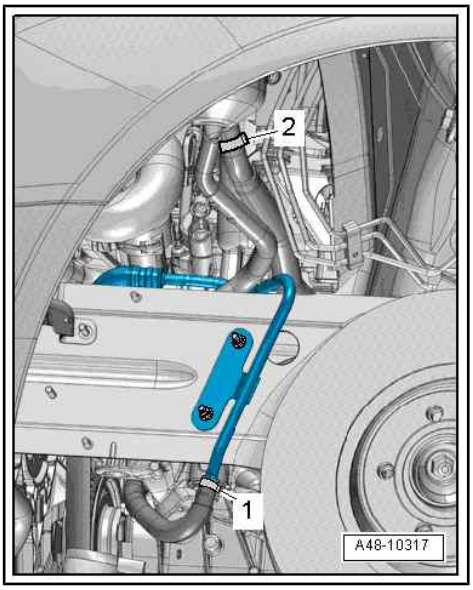
Disregard -items 1, 2-.

Vehicles with hydraulic power steering:

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

– Disconnect supply hose -2- and return hose -1- for power steering hydraulic fluid in front left wheel housing and move clear.

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



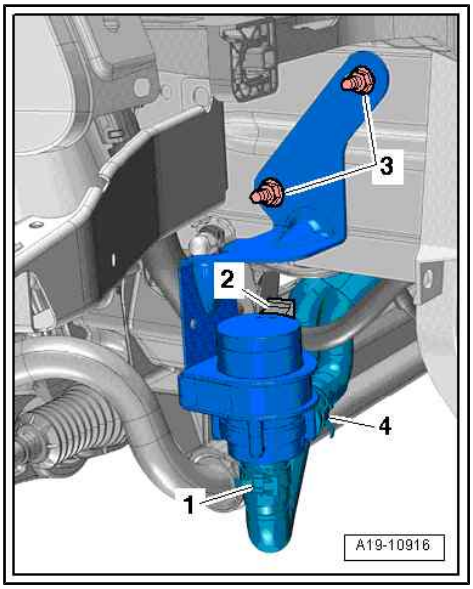
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Vehicles with coolant circulation pump - V50- (version 1):

– Unplug electrical connector -2-.

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

– Release hose clip -1- and disconnect coolant hose from coolant circulation pump - V50- .



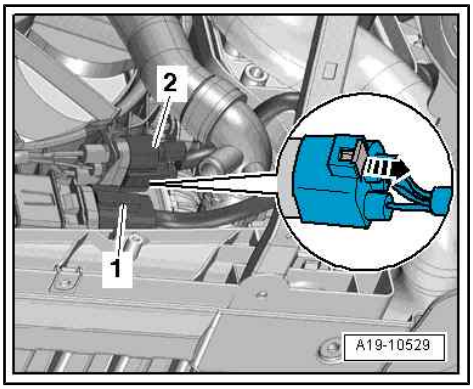
Note

Disregard -items 3, 4-.

All vehicles (continued):

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

– Move electrical wiring harness clear.

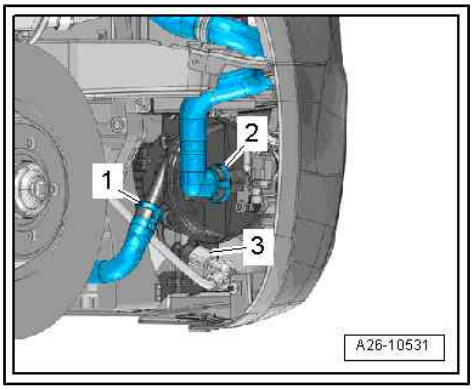


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Vehicles with secondary air pump motor - V101- (version 1):

– Unplug electrical connector -3- at secondary air pump motor - V101- and move electrical wiring clear.

– Press release tabs, disconnect secondary air hose -1- and move hose clear.



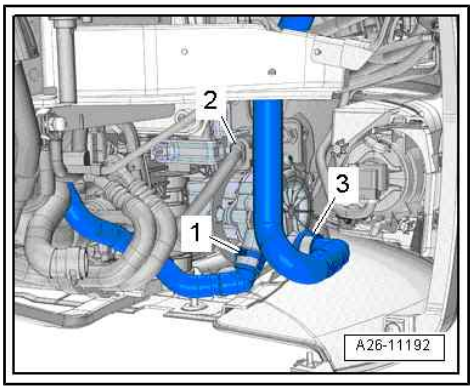
Note

Disregard -item 2-.

Vehicles with secondary air pump motor - V101- (version 2):

– Unplug electrical connector -2- at secondary air pump motor - V101- and move electrical wiring clear.

– Press release tabs, disconnect secondary air hose -1- and move hose clear.

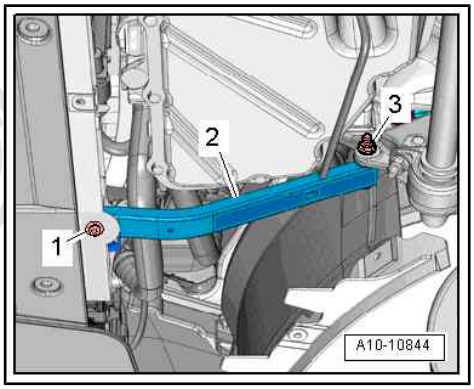


Note

Disregard -item 3-.

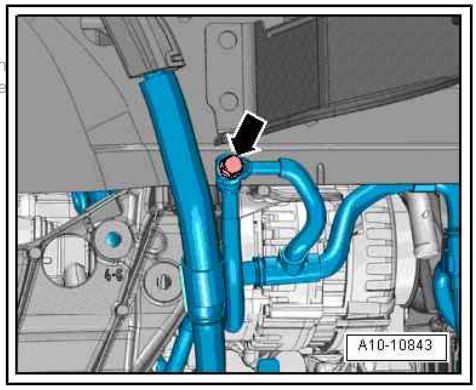
All vehicles (continued):

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



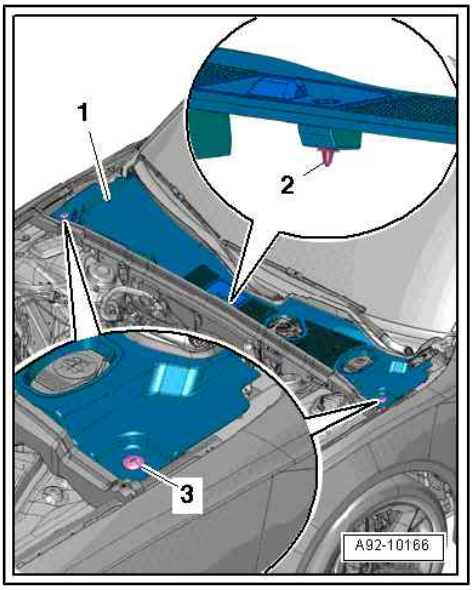
– Unscrew nut -arrow- on longitudinal member (right-side) and move earth cables clear.

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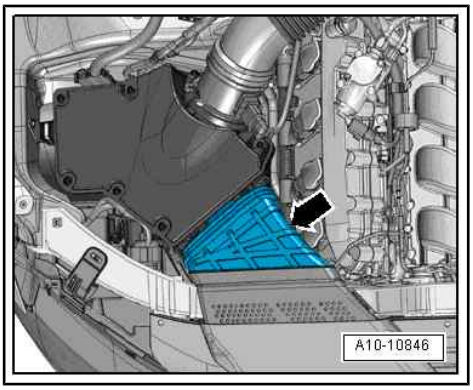


– Pull seal off plenum chamber partition panel.

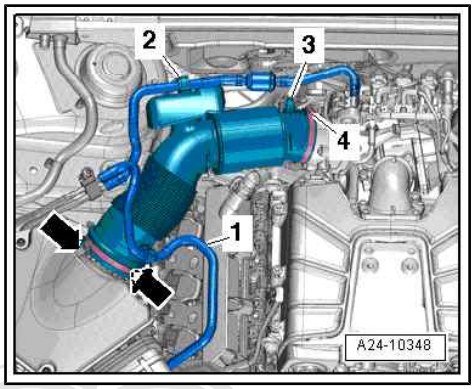
– Remove plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .



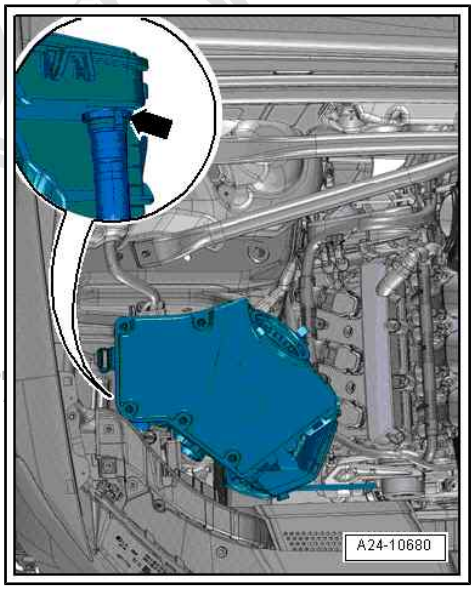
– Remove air duct -arrow-.



– Move fuel hose -1- and hose -2- leading to activated charcoal filter clear at air pipe.
– Detach vacuum hose -3- from connection on air pipe.
– Remove air pipe. To do so, release hose clip -4- and clamps -arrows-.

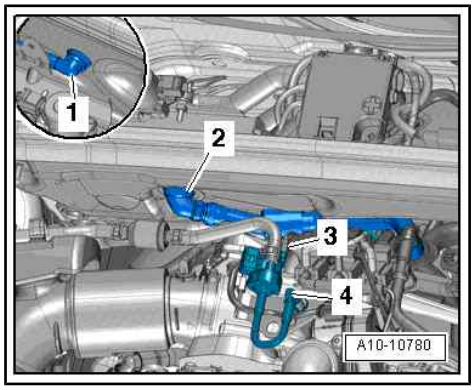


– Press release tabs, detach air cleaner housing and disconnect secondary air hose -arrow- on reverse side.



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– Disconnect vacuum hose -1- on rear side of plenum chamber partition panel and detach vacuum connection -2- from plenum chamber partition panel.
– Unplug electrical connector -3- at activated charcoal filter solenoid valve 1 - N80- and detach vacuum hose -4-.
– Detach activated charcoal filter solenoid valve 1 - N80- from bracket and move it clear to the side with hoses still attached.



USA models:

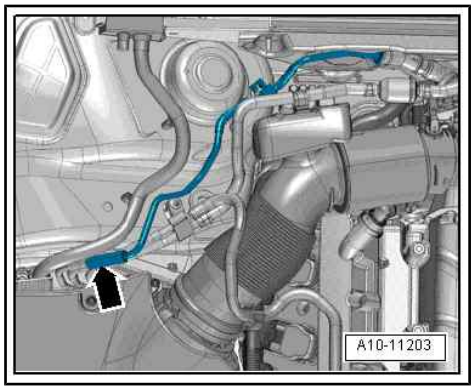
– Disconnect vacuum hose leading to fuel system diagnostic pump - V144- -arrow-.

Version 1 vehicles:

Caution

Take care to keep components clean.

- *Observe rules for cleanliness when working on the fuel supply system ⇒ page 6 .*



WARNING

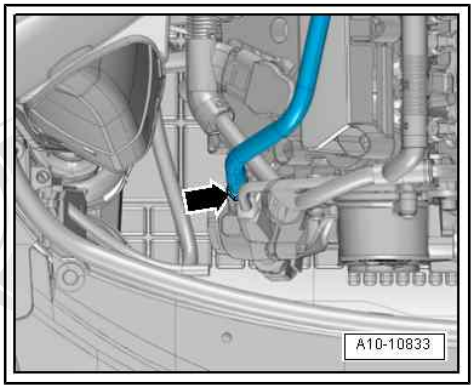
The fuel system is pressurised.

Risk of injury as fuel may spray out.

- *Put on safety goggles.*
- *Put on protective gloves.*
- *Release pressure (wrap clean cloth around connection and open connection carefully).*

– Disconnect fuel supply hose from high-pressure pump -arrow- and move clear to one side.

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



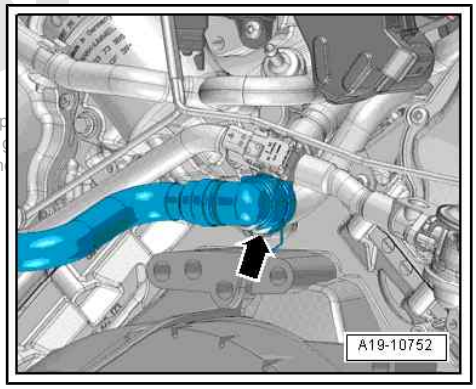
Vehicles not equipped with coolant circulation pump - V50- :

– Lift retaining clip -arrow- and detach coolant hose going to heat exchanger from rear of engine.

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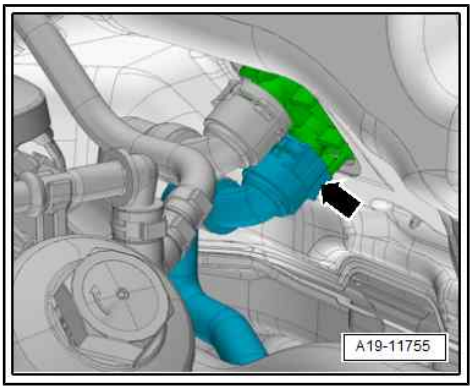
Note

For illustration purposes, the installation position is shown from the rear and with the engine removed.



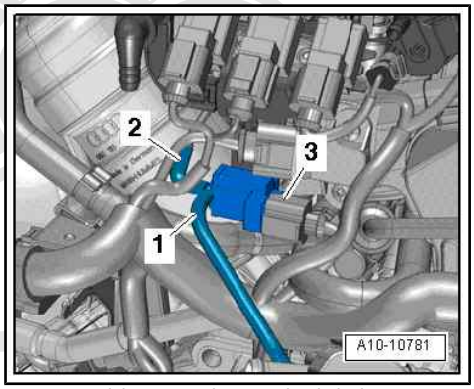
Vehicles with coolant circulation pump - V50- :

– Lift retaining clip -arrow- and disconnect coolant hose at plenum chamber partition panel.



All vehicles (continued):

– Detach vacuum hose -1- and move clear.



Note

Disregard -items 2, 3-.

Version 2 vehicles:

Caution

Take care to keep components clean.

- ***Observe rules for cleanliness when working on the fuel supply system ⇒ page 6 .***

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WARNING

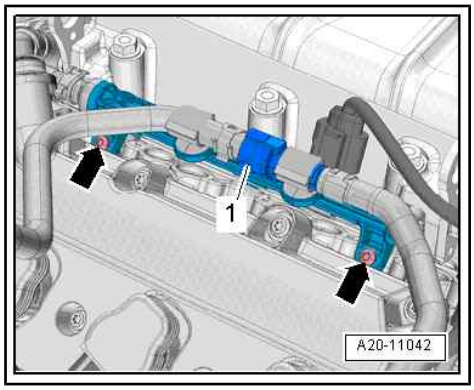
The fuel system is pressurised.

Risk of injury as fuel may spray out.

- ***Put on safety goggles.***
- ***Put on protective gloves.***
- ***Release pressure (wrap clean cloth around connection and open connection carefully).***

– Press release tabs, disconnect fuel hose -1- and move clear.

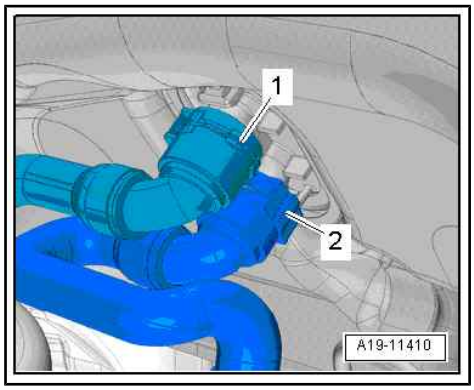
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .



Note

Disregard -arrows-.

– Lift retaining clip -2- and detach coolant hose leading to heat exchanger at plenum chamber partition panel.

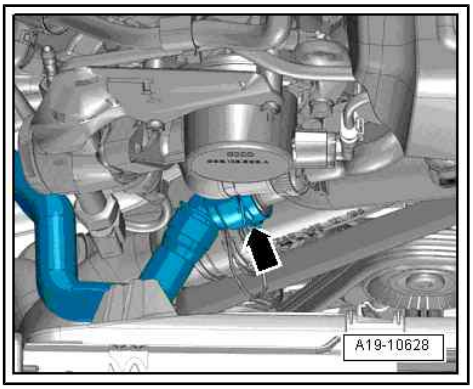


Note

Disregard -item 1-.

All vehicles (continued):

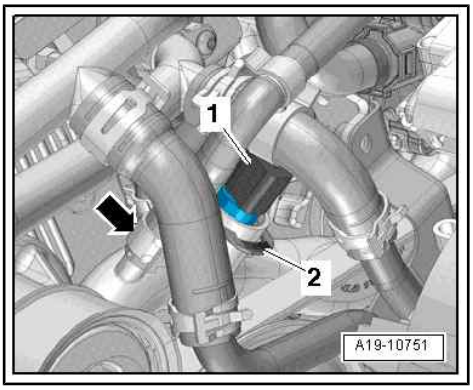
– Lift retaining clip -arrow- and detach coolant hose (front right) from coolant pipe (front).



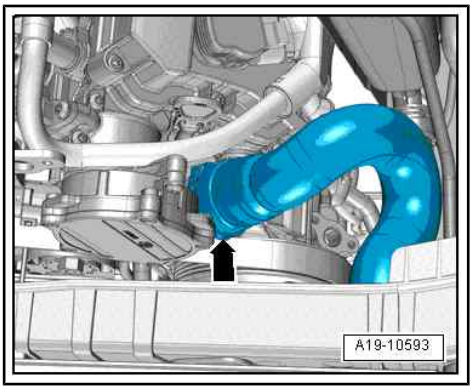
– Release hose clip -arrow- and detach coolant hose.

Note

Disregard -items 1, 2-.



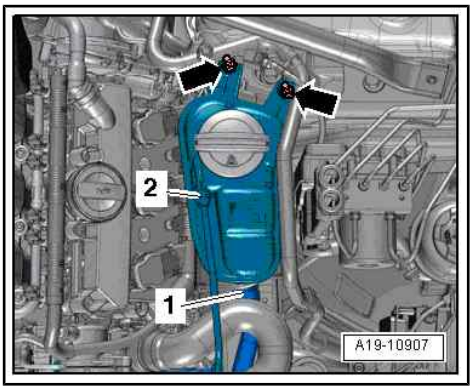
– Lift retaining clip -arrow-, detach coolant hose from coolant pipe (front) and move coolant hose clear.



Vehicles with hydraulic power steering:

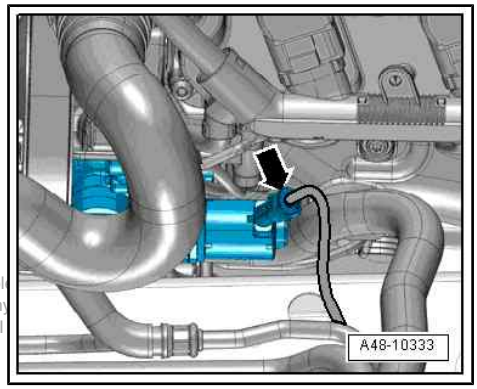
– Disconnect coolant hoses -1- and -2- from coolant expansion tank.

– Unscrew bolts -arrows-, unplug electrical connector at coolant shortage indicator switch - F66- and detach coolant expansion tank.



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– If fitted, unplug electrical connector -arrow- at power steering pump.
– Press hydraulic fluid hose down slightly.



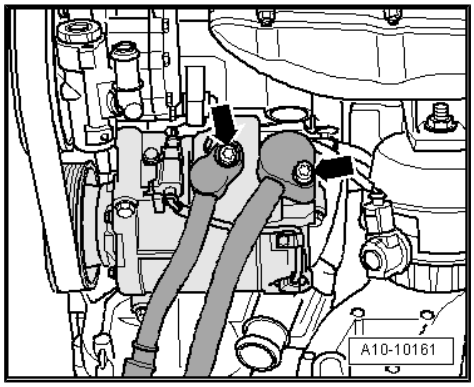
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All vehicles (continued):

Caution

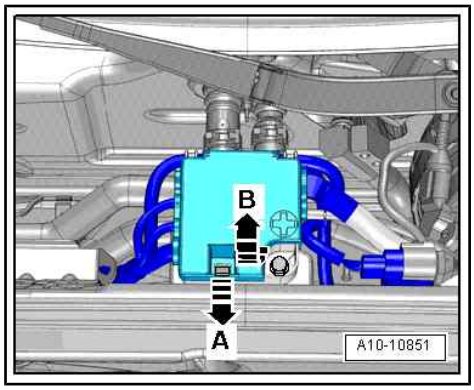
Danger of damage to refrigerant lines and hoses.

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

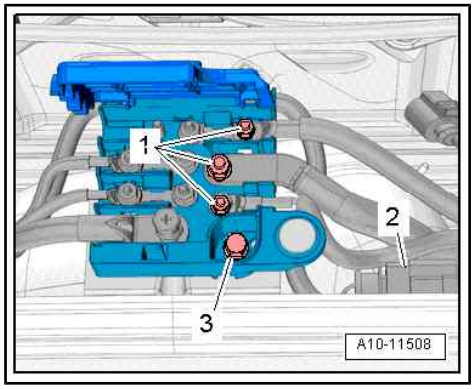


– Remove bolts -arrows- and disconnect refrigerant lines from A/C compressor.
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .

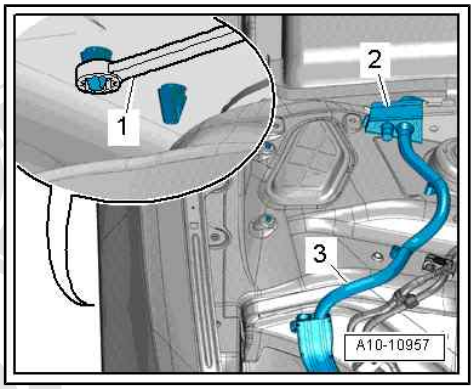
– Release retainer -arrow A- and open cover -arrow B-.



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

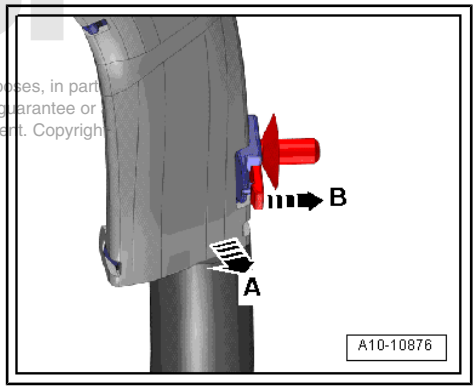


– Working from wheel housing, release catches using a 5.5 mm ring spanner -item 1- and remove wiring protector -2- from above.
– Release wiring harness -3- leading to alternator and starter using removal lever - 80 - 200- and move clear.

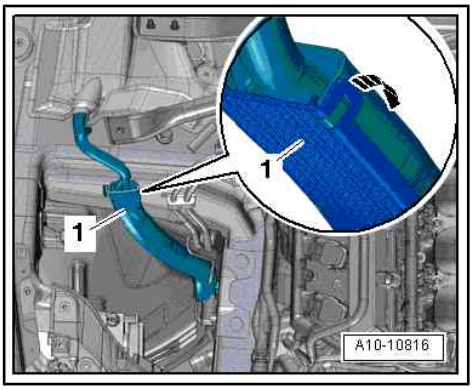


– Wiring duct (version 1): release catch -arrow B- and move wiring harness clear by pulling it towards front -arrow A-.

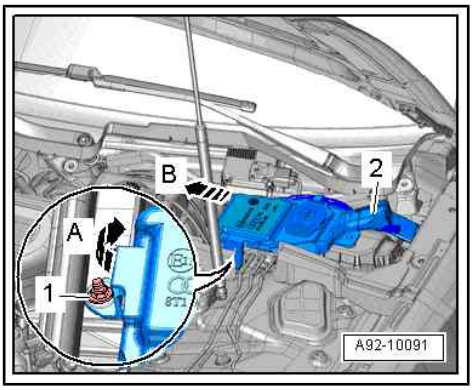
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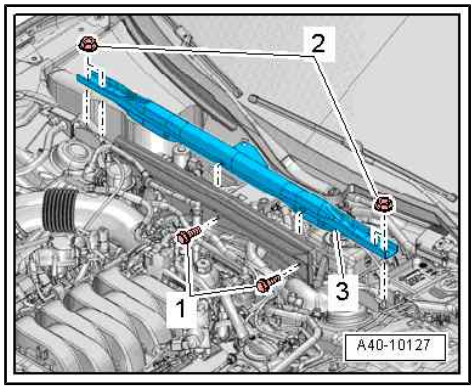
– Wiring duct (version 2): release catch -arrow- to open wiring duct -1- and move wiring harness clear.



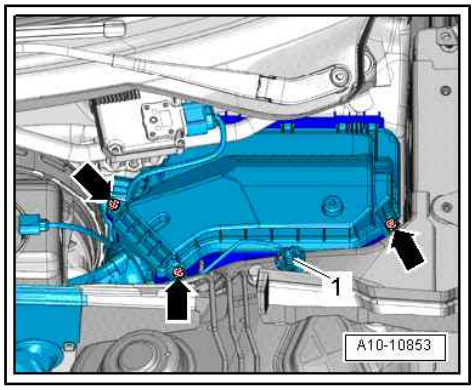
– Remove nut -1- and swivel filler neck -2- for washer fluid reservoir slightly upwards -arrow A-.
– Pull filler neck with filler pipe out of washer fluid reservoir and through opening in body -arrow B-.



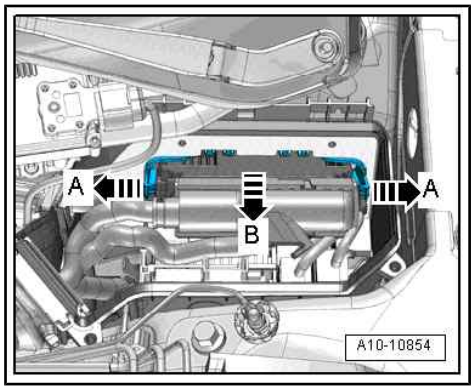
– Remove bolts -1- and nuts -2- and detach body brace -3-.



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

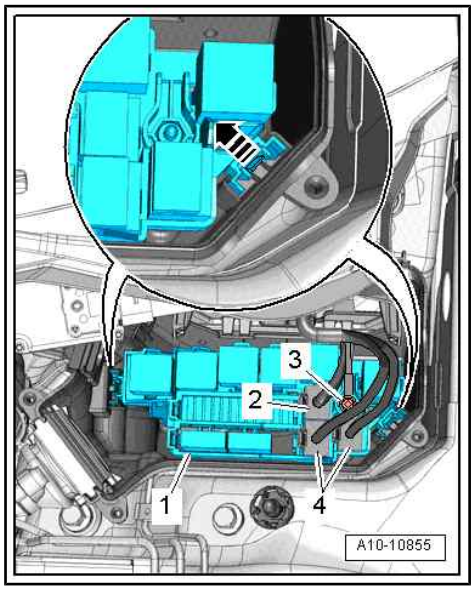


– Release catches -arrows A- and take out engine control unit -arrow B-.

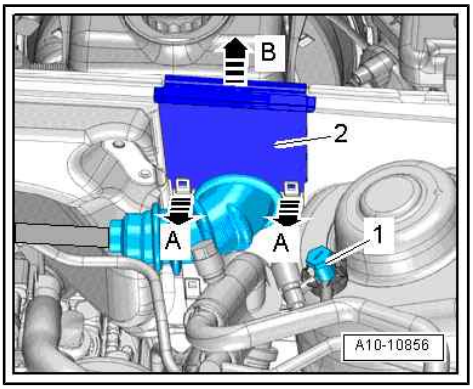


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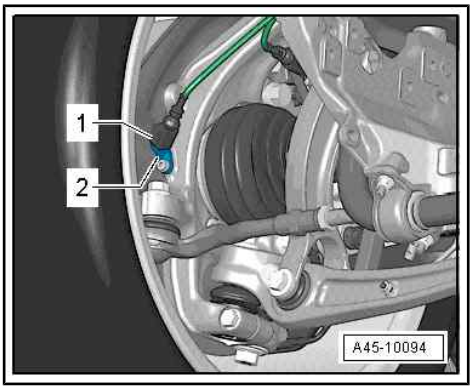
– If fitted, unplug electrical connector -2-.
– Unplug electrical connectors -4- and unscrew nut -3- for wiring.
– Release catches -arrow- and detach relay carrier with fuse holder -1-.
– Disengage engine wiring harness at electronics box in engine compartment and move clear.



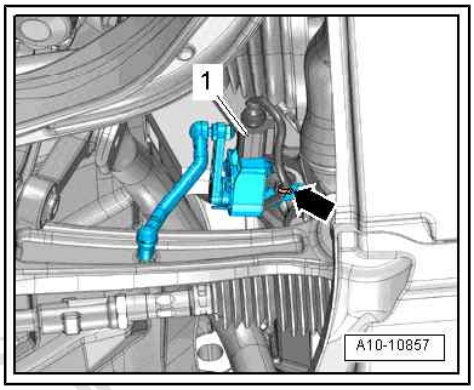
– Release catches -arrows A- and lift off wiring protector -2- -arrow B-.
– Unscrew earth stud -1- and move wiring harness clear.
– Place wiring harness on engine and secure engine control unit to prevent it from dropping.



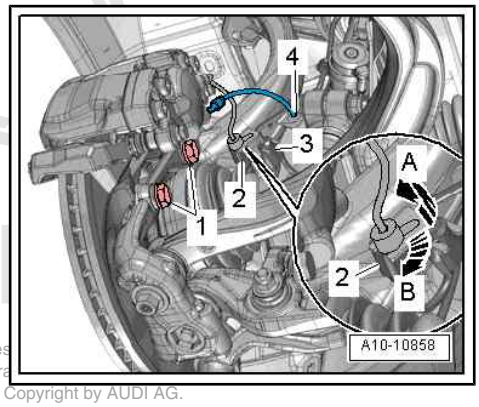
– Unplug electrical connectors -1- at front speed sensors -2- on both sides.



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



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



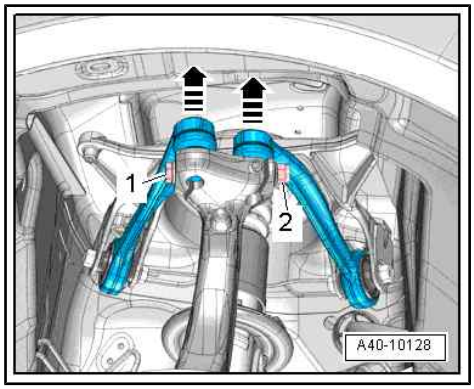
Caution

Risk of damage to brake pistons.

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

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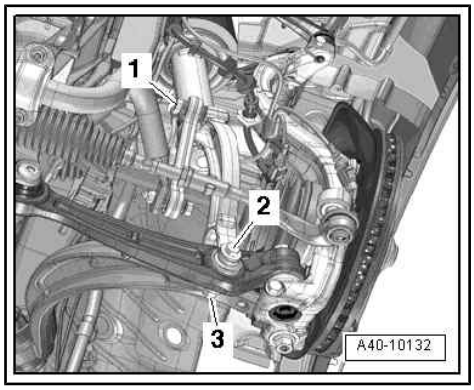
– Remove nut -2- and pull out bolt -1-.
– Pull upper suspension links upwards out of wheel bearing housing -arrows-.
– Perform the same work steps on the other side of the vehicle.



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

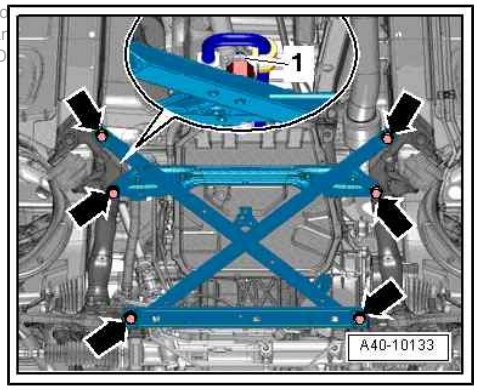
Note

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



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



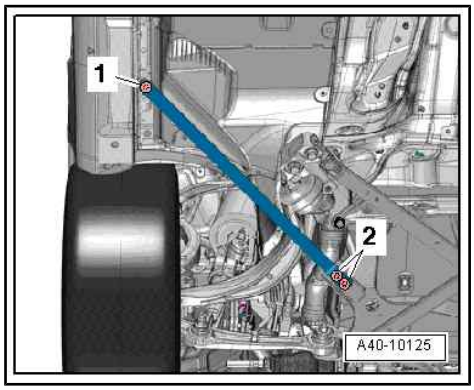
Caution

Risk of damage to running gear components.

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

Audi A5 Cabriolet/Sportback:

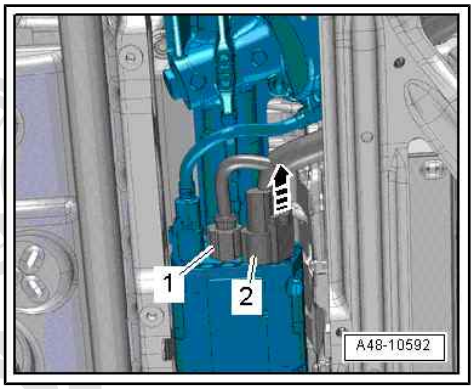
– Remove diagonal struts ⇒ Running gear, axles, steering; Rep. gr. 42 ; Subframe; Exploded view - subframe .



Vehicles with electromechanical power steering:

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

– Move electrical wiring harness clear.



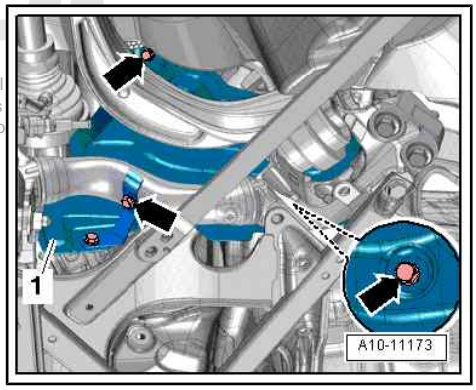
Note

Disregard -item 1-.

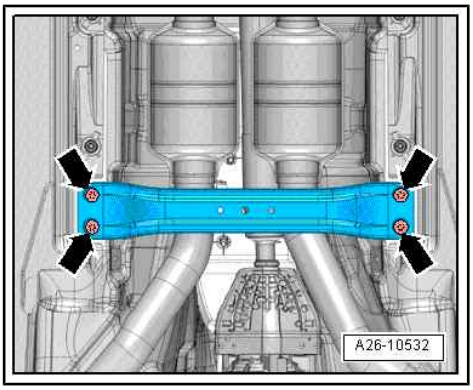
All vehicles (continued):

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

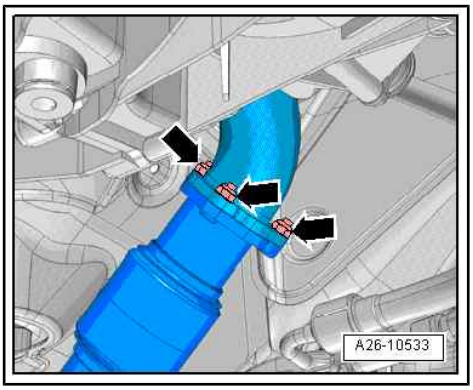
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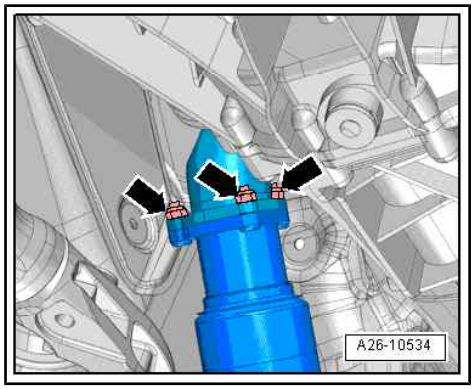
– If fitted, remove bolts -arrows- and detach front cross member.



– Unscrew nuts -arrows- for front silencer (left-side).



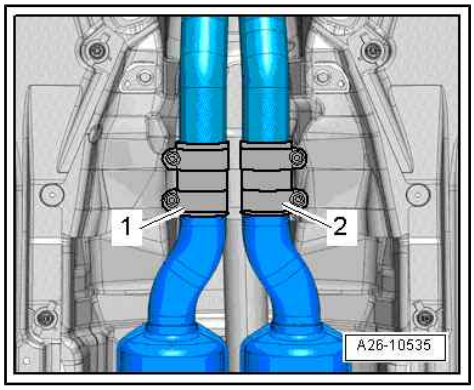
– Unscrew nuts -arrows- for front silencer (right-side).



Caution

Risk of damage to flexible joint if handled incorrectly.

- *Do not bend flexible joint more than 10°.*
- *Install flexible joint so that it is not under tension.*



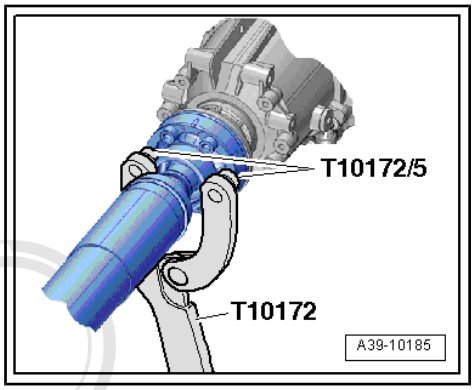
– Loosen and push back clamps -1- and -2- and detach front silencers on both sides.

Vehicles with propshaft (version with bolted connection):

– Unbolt propshaft from gearbox ⇒ Rear final drive; Rep. gr. 39 ; Propshaft; Removing and installing propshaft .

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

– Tie up propshaft on one side.

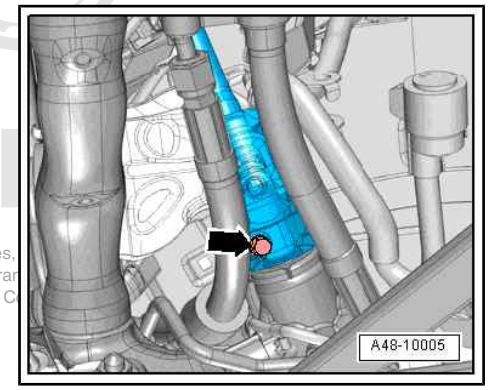


Vehicles with propshaft (version with splined connection):

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

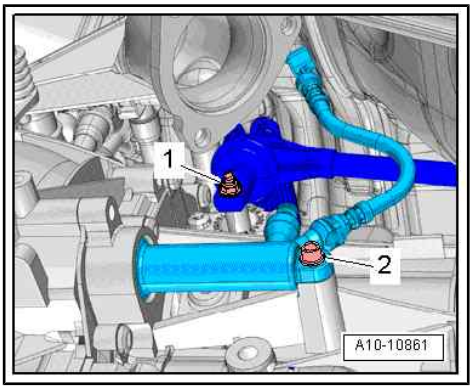
All vehicles (continued):

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



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



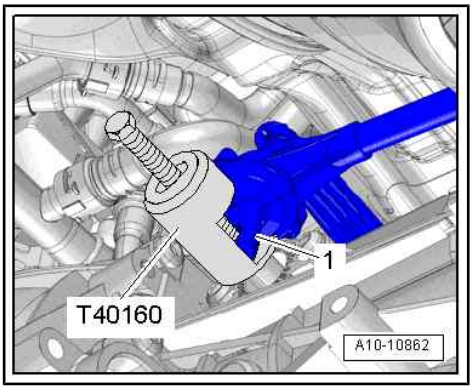
Caution

Avoid damage to clutch slave cylinder.

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

– Remove nut -1- for selector rod.

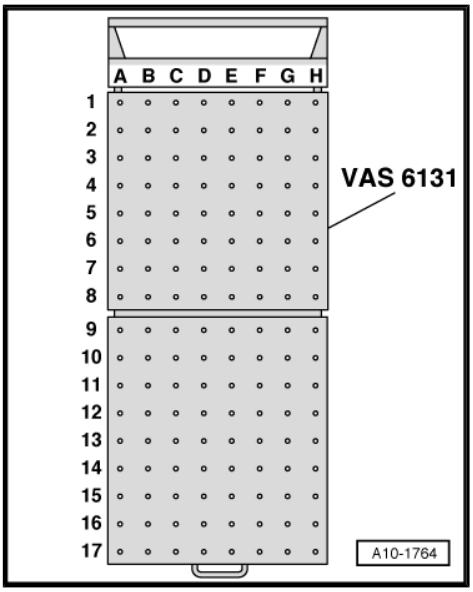
– Apply puller - T40160- and pull off selector rod -1-.



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Set up the scissor-type assembly platform as follows:

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



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

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

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

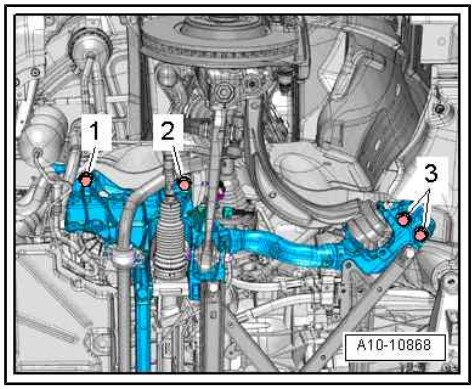
• Take note of spirit level (bubble gauge).

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

WARNING

Accident risk if subframe mountings are detached.

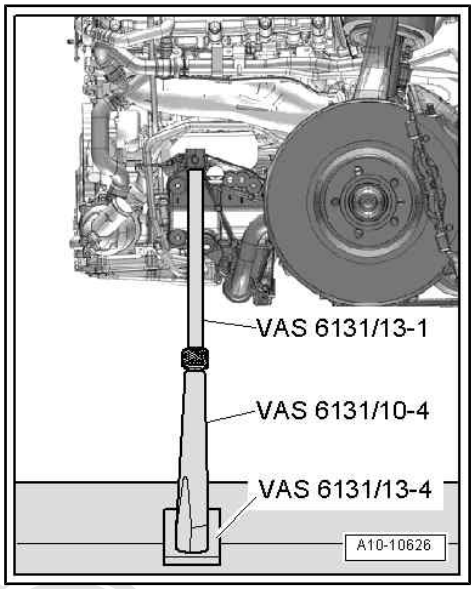
- *Subframe bolts -2- and -3- must not be loosened.*



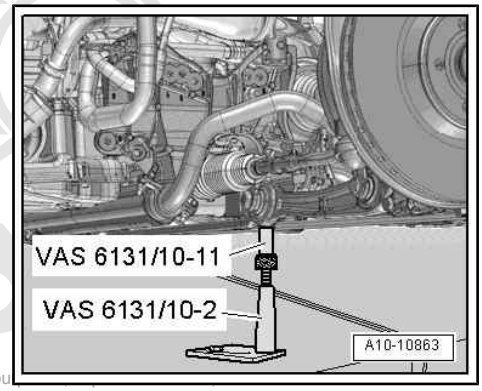
– Remove subframe bolts -1- on both sides.

– 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.

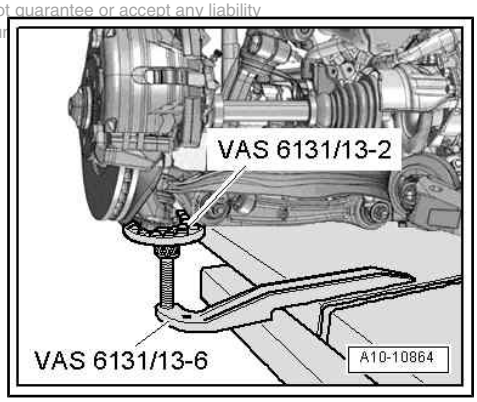


– Position support elements from -VAS 6131/10- (rear left and right) at front attachment points of subframe cross brace as shown.

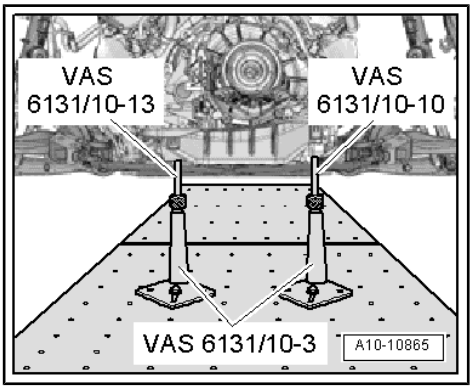


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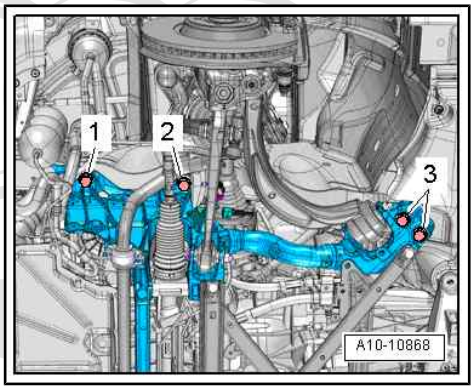
– Position support elements from -VAS 6131/13- under left and right wheel bearing housings as shown.



– Detach retaining clips for noise insulation from cross member.
– Position support elements from -VAS 6131/10- at rear of cross member on both sides, as shown in illustration.
– Turn all spindles for support elements upwards until all locating lugs make contact with mounting points.
– Tighten base plates for support elements to 20 Nm on scissor-type assembly platform - VAS 6131 A- .

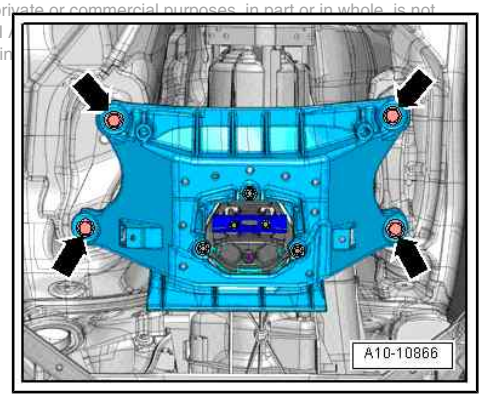


– Mark installation position of subframe and tunnel cross member on longitudinal members with felt-tip pen.
– Unscrew subframe bolts -2- and -3- on both sides in several stages and in diagonal sequence.



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– Remove bolts -arrows- on tunnel cross member.

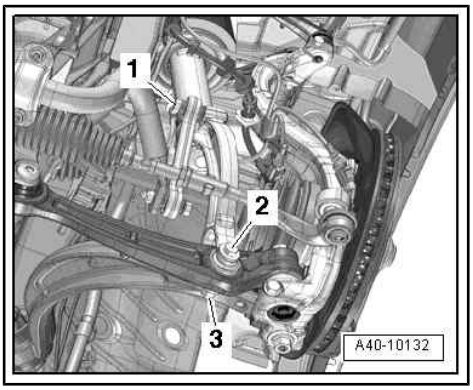


– Remove bolt -2- on both sides.

Caution

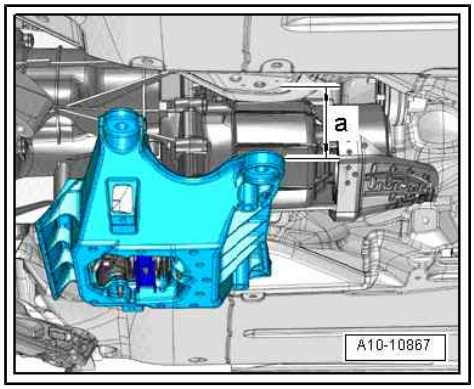
Danger of damage to hoses, pipes and wiring connections and to engine compartment.

- ***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.***

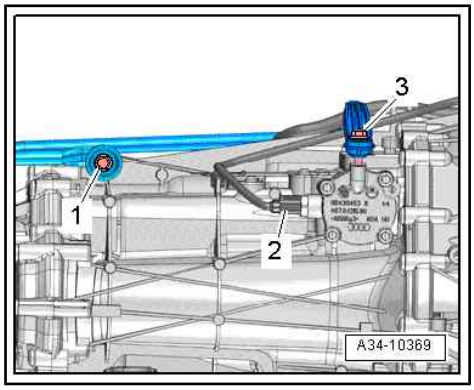


– Lower engine/gearbox assembly using scissor-type assembly platform - VAS 6131 A- initially only as far as distance -a-.

• Dimension -a- = 100 mm (maximum).



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



Note

Disregard -item 2-.

– Lower engine/gearbox assembly further.

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

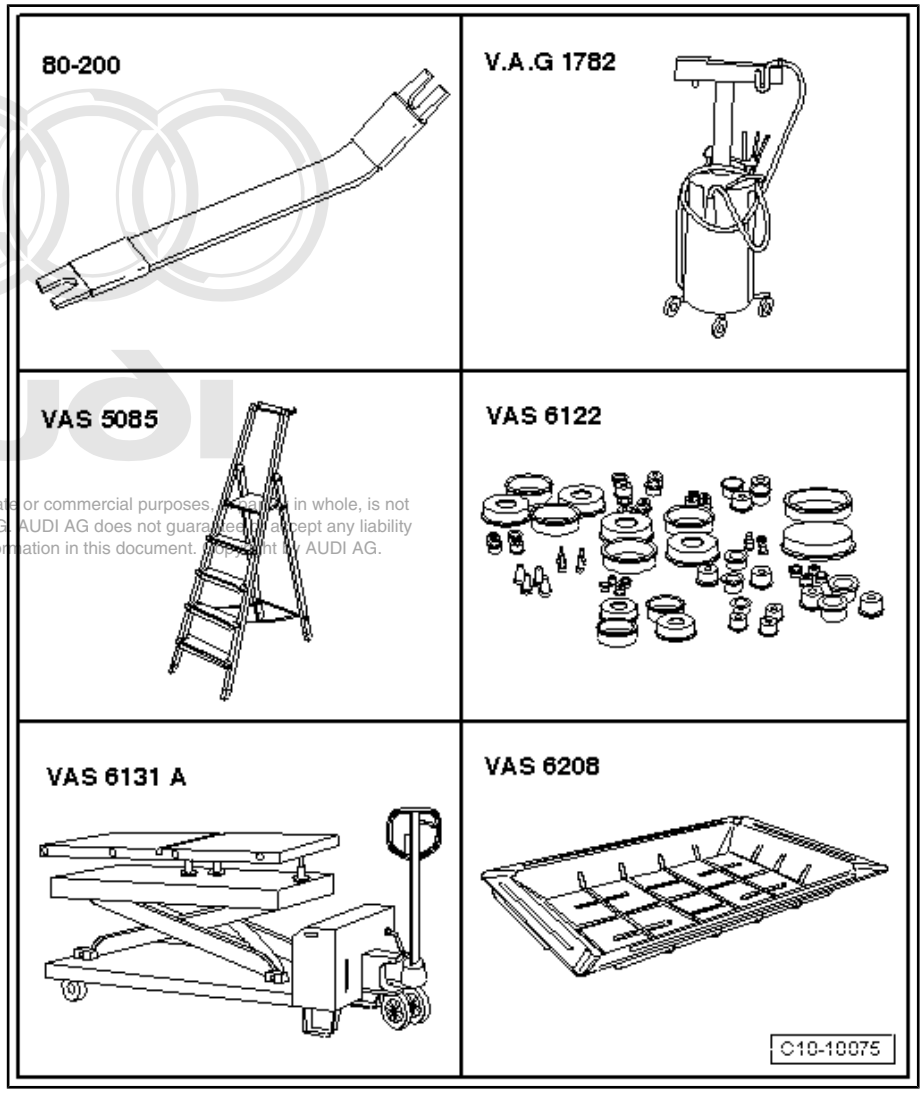
1.1.2 Removing engine - vehicles with dual clutch gearbox 0B5

Note

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

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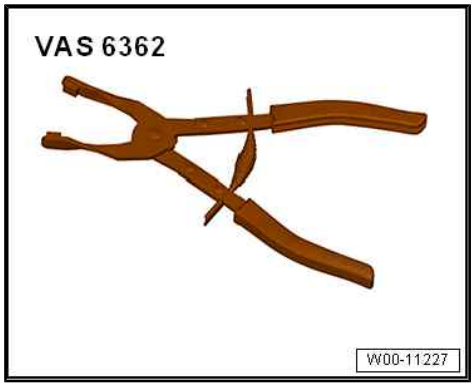
Special tools and workshop equipment required



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- Removal lever - 80 - 200-
- Used oil collection and extraction unit - V.A.G 1782-
- Stepladder - VAS 5085-
- Engine bung set - VAS 6122-
- Scissor-type assembly platform - VAS 6131 A- with support set for Audi - VAS 6131/10- , support set -VAS 6131/11- and supplementary set -VAS 6131/13-
- Drip tray for workshop hoist - VAS 6208-

♦ Hose clip pliers - VAS 6362-



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Procedure

WARNING

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

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

– Set front wheels to straight-ahead position.

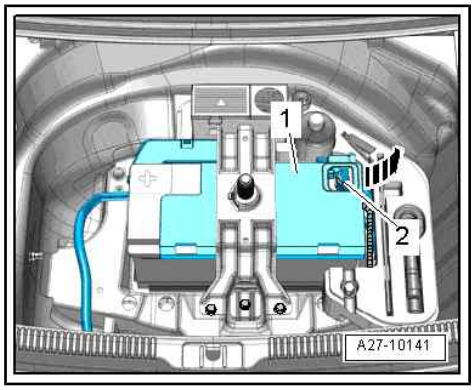
Note

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

– Switch off ignition and take out ignition key.

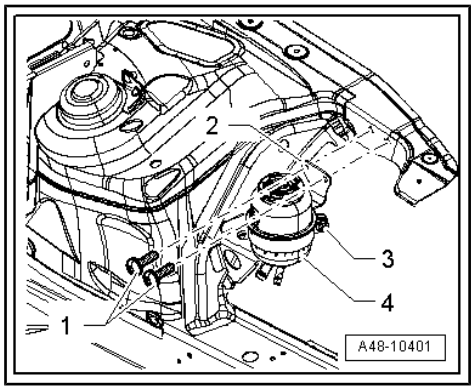
– Disconnect earth wire -2- from battery terminal ⇒ Electrical system; Rep. gr. 27 ; Battery, Disconnecting and connecting battery .

– Discharge refrigerant system ⇒ Air conditioner with refrigerant R134a; Rep. gr. 87 ; Refrigerant circuit .



Vehicles with hydraulic power steering:

– Extract hydraulic fluid for power steering from reservoir -3- using used oil collection and extraction unit - V.A.G 1782- .

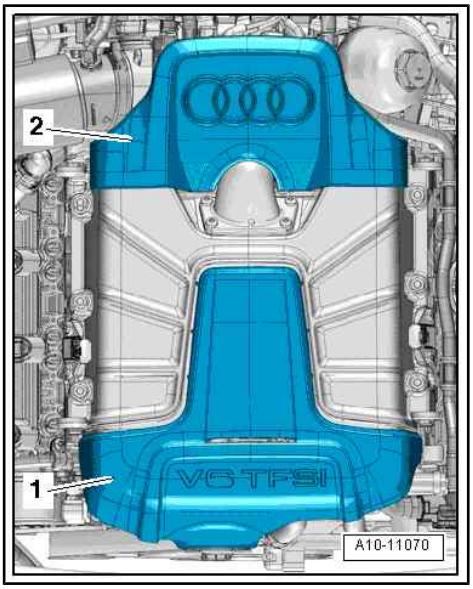


Note

Disregard -items 1, 2, 4-.

All vehicles (continued):

– Lift off engine cover panels -1- and -2-.



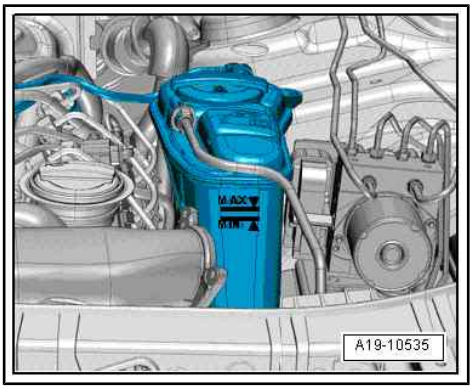
WARNING

The cooling system is under pressure when the engine is hot. Hot steam/hot coolant can escape - risk of scalding.

Danger of scalding skin and other parts of the body.

- *Put on protective gloves.*
- *Put on safety goggles.*
- *Release pressure (cover filler cap on coolant expansion tank with a cloth and open carefully).*

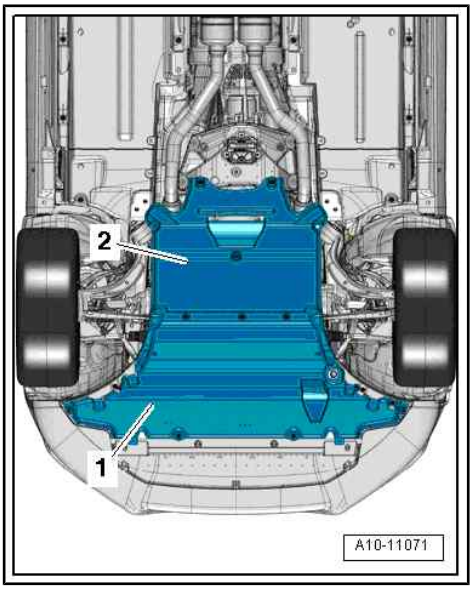
– Open filler cap on coolant expansion tank.



– Remove both front wheels.

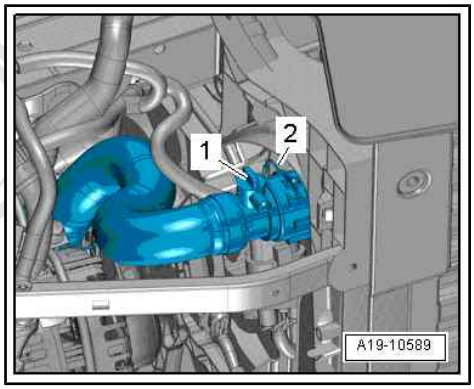
– Remove wheel spoilers (front) on both sides ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front) .

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



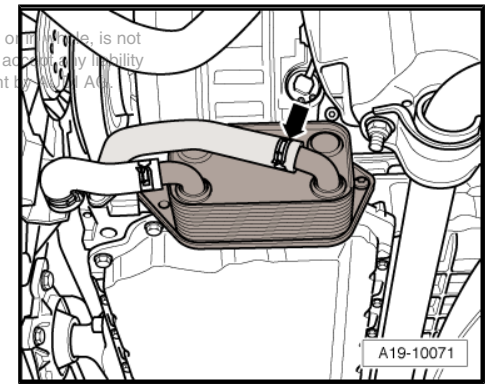
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– Place drip tray for workshop hoist - VAS 6208- beneath engine.
– Remove drain plug -1- and drain off coolant.
– Lift retaining clip -2- and disconnect coolant hose from radiator.



– Release hose clip -arrow-, disconnect coolant hose from engine oil cooler and drain off coolant.

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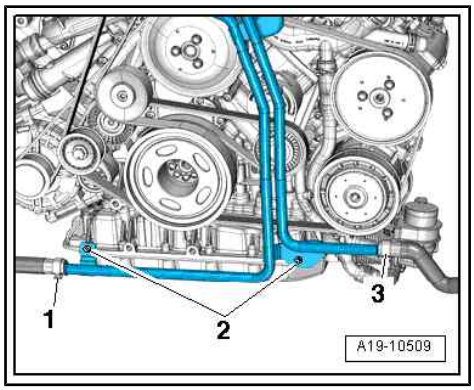


Note

For illustration purposes, the installation position is shown in the following illustrations with the engine removed.

Vehicles with coolant pipes (front left) (version 1):

– Release hose clips -1- and -3-, disconnect coolant hoses from coolant pipes (front left) and drain off remaining coolant.

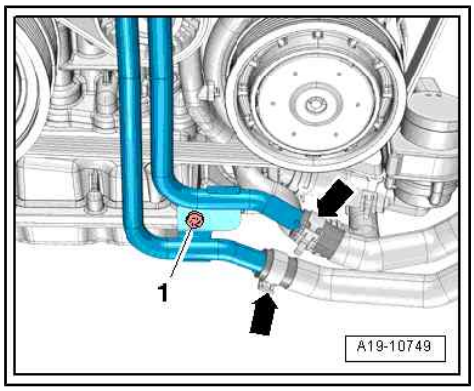


Note

Disregard -item 2-.

Vehicles with coolant pipes (front left) (version 2):

– Release hose clips -arrows-, disconnect coolant hoses from coolant pipes (front left) and drain off remaining coolant.

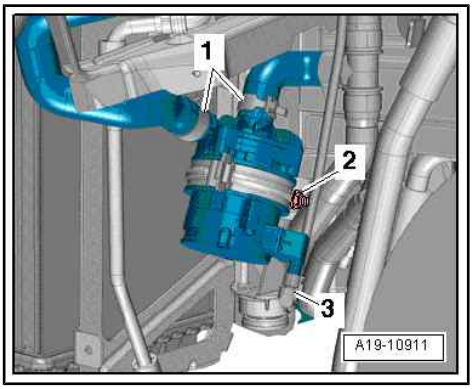


Note

Disregard -item 1-.

All vehicles (continued):

– Unplug electrical connector -3- from charge air cooling pump - V188- and move clear.



Note

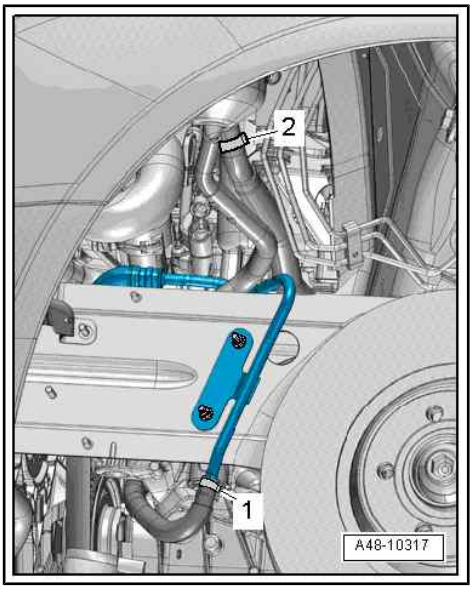
Disregard -items 1, 2-.

Vehicles with hydraulic power steering:

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

– Disconnect supply hose -2- and return hose -1- for power steering hydraulic fluid in front left wheel housing and move clear.

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

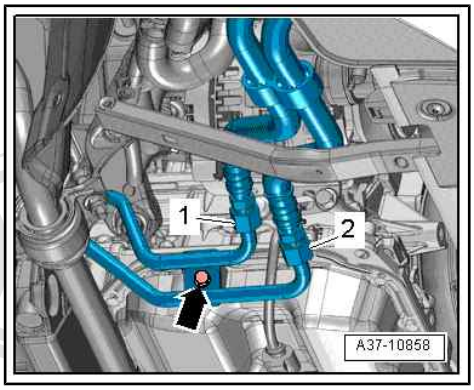


All vehicles (continued):

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

– Mark position of ATF lines -1- and -2- for re-installation and disconnect ATF lines.

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



Note

Disregard -arrow-.

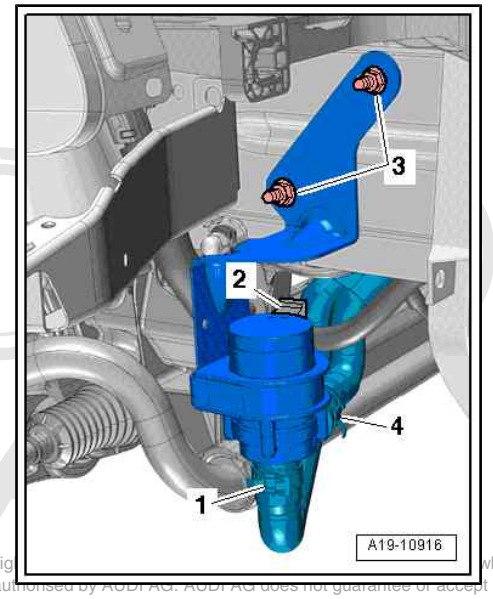
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Vehicles with coolant circulation pump - V50- (version 1):

– Unplug electrical connector -2-.

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

– Release hose clip -1- and disconnect coolant hose from coolant circulation pump - V50- .



Note

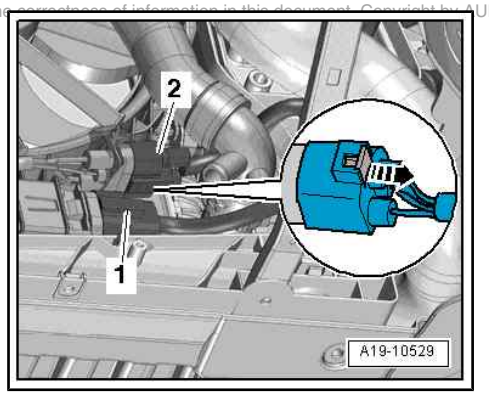
Disregard -items 3, 4-.

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All vehicles (continued):

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

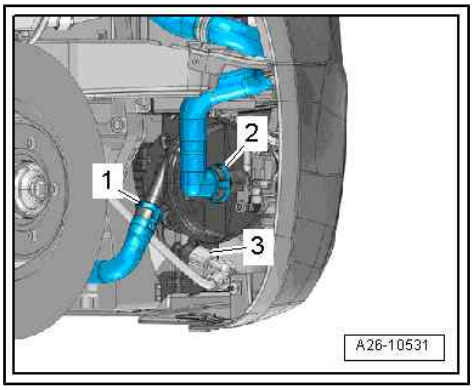
– Move electrical wiring harness clear.



Vehicles with secondary air pump motor - V101- (version 1):

– Unplug electrical connector -3- at secondary air pump motor - V101- and move electrical wiring clear.

– Press release tabs, disconnect secondary air hose -1- and move hose clear.



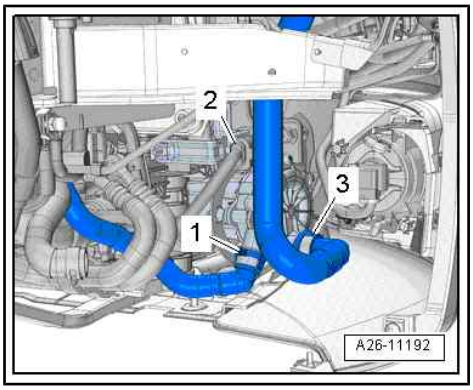
Note

Disregard -item 2-.

Vehicles with secondary air pump motor - V101- (version 2):

– Unplug electrical connector -2- at secondary air pump motor - V101- and move electrical wiring clear.

– Press release tabs, disconnect secondary air hose -1- and move hose clear.

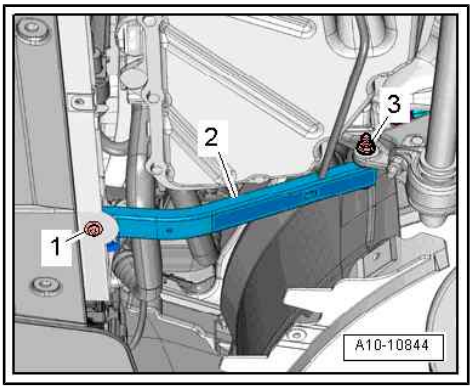


Note

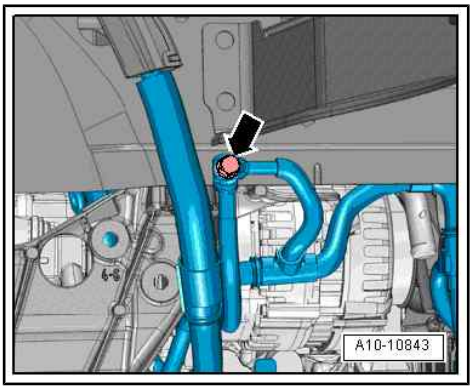
Disregard -item 3-.

All vehicles (continued):

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

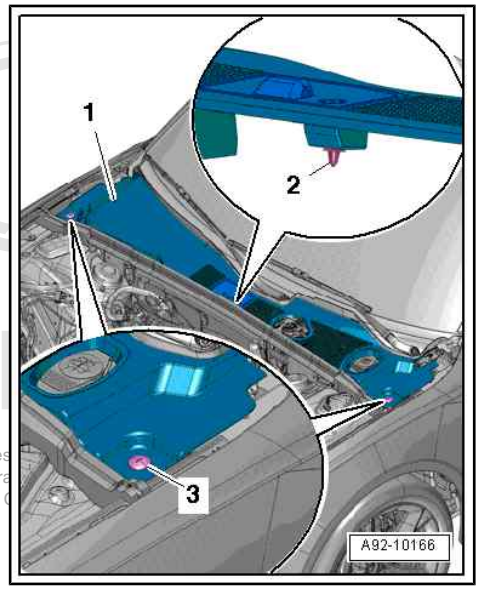


– Unscrew nut -arrow- on longitudinal member (right-side) and move earth cables clear.



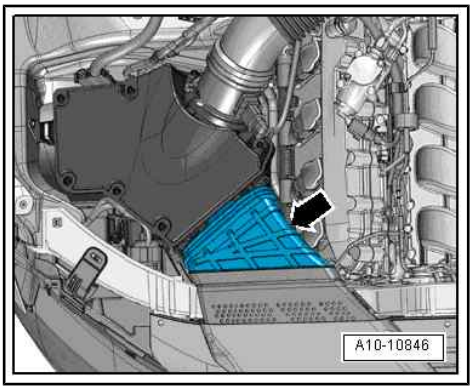
– Pull seal off plenum chamber partition panel.

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

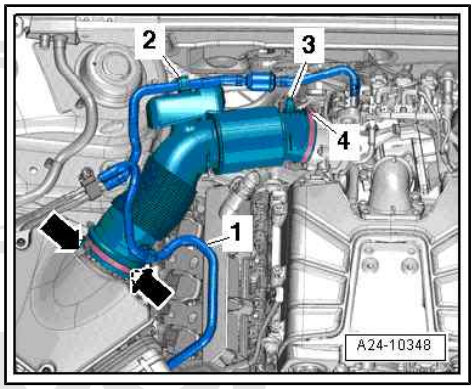


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– Remove air duct -arrow-.

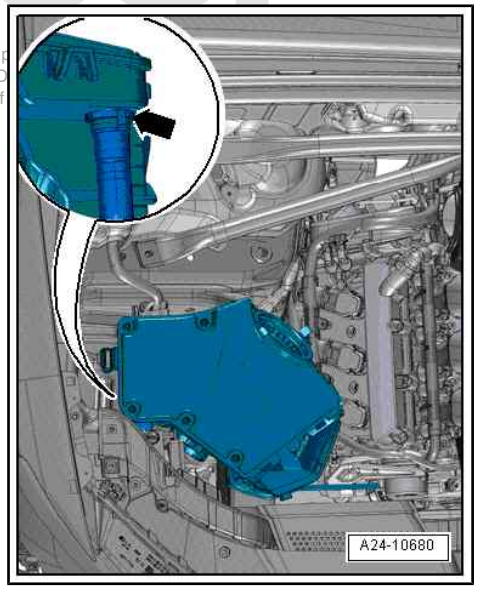


– Move fuel hose -1- and hose -2- leading to activated charcoal filter clear at air pipe.
– Detach vacuum hose -3- from connection on air pipe.
– Remove air pipe. To do so, release hose clip -4- and clamps -arrows-.

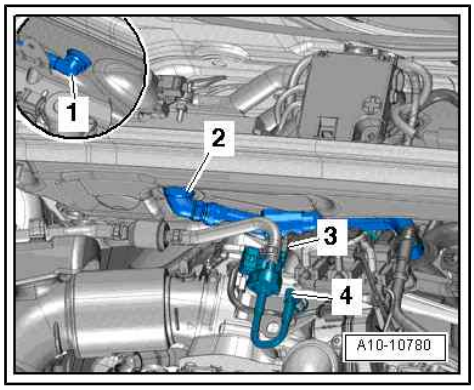


– Press release tabs, detach air cleaner housing and disconnect secondary air hose -arrow- on reverse side.

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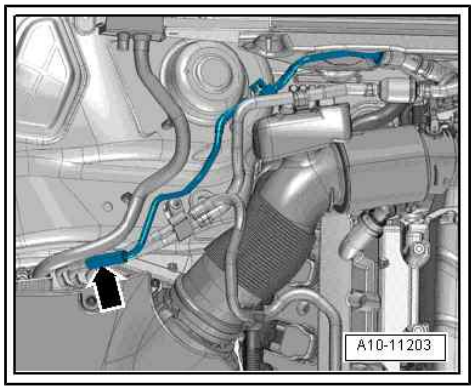


– Disconnect vacuum hose -1- on rear side of plenum chamber partition panel and detach vacuum connection -2- from plenum chamber partition panel.
– Unplug electrical connector -3- at activated charcoal filter solenoid valve 1 - N80- and detach vacuum hose -4-.
– Detach activated charcoal filter solenoid valve 1 - N80- from bracket and move it clear to the side with hoses still attached.

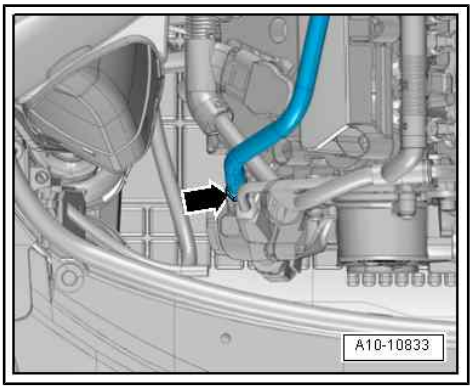


USA models:

– Disconnect vacuum hose leading to fuel system diagnostic pump - V144- -arrow-.



All vehicles (continued):



WARNING

The fuel system is pressurised.

Risk of injury as fuel may spray out.

- *Put on safety goggles.*
- *Put on protective gloves.*
- *Release pressure (wrap clean cloth around connection and open connection carefully).*

Caution

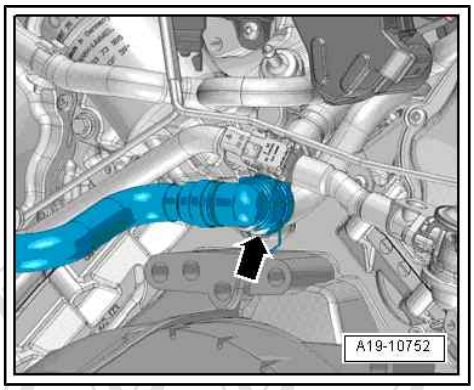
Take care to keep components clean.

- *Observe rules for cleanliness when working on the fuel supply system ⇒ page 6 .*

– Disconnect fuel supply hose from high-pressure pump -arrow- and move clear to one side.

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

Version 1 vehicles:

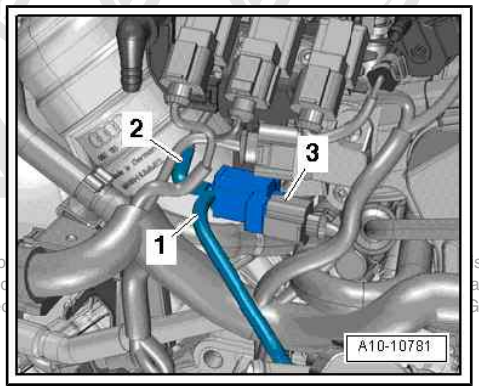


– Lift retaining clip -arrow- and detach coolant hose going to heat exchanger from rear of engine.

Note

For illustration purposes, the installation position is shown from the rear and with the engine removed.

– Disconnect vacuum hose -1- leading to Climatronic coolant shut-off valve - N422- and move hose clear.

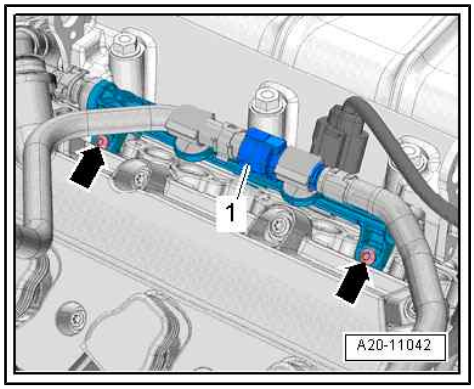


Note

Disregard -items 2, 3-.

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Version 2 vehicles:



WARNING

The fuel system is pressurised.

Risk of injury as fuel may spray out.

- *Put on safety goggles.*
- *Put on protective gloves.*
- *Release pressure (wrap clean cloth around connection and open connection carefully).*

Caution

Take care to keep components clean.

- *Observe rules for cleanliness when working on the fuel supply system ⇒ page 6 .*

– Press release tabs, disconnect fuel hose -1- and move clear.

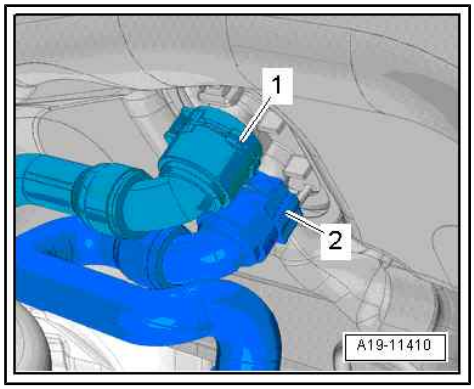
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .

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Note

Disregard -arrows-.

– Lift retaining clip -2- and detach coolant hose leading to heat exchanger at plenum chamber partition panel.

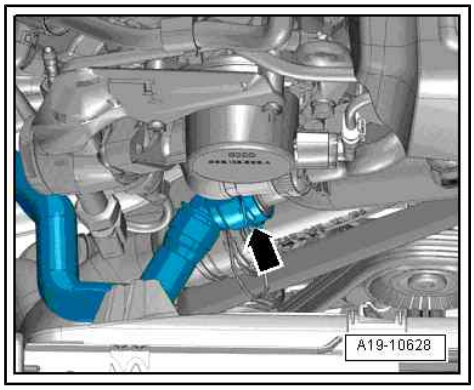


Note

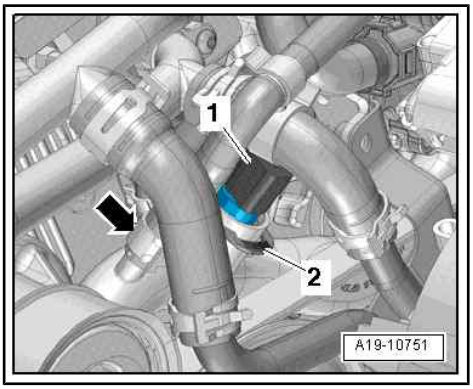
Disregard -item 1-.

All vehicles (continued):

– Lift retaining clip -arrow- and detach coolant hose (front right) from coolant pipe (front).



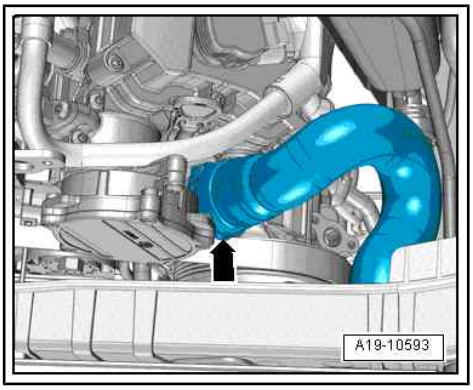
– Release hose clip -arrow- and detach coolant hose.



Note

Disregard -items 1, 2-.

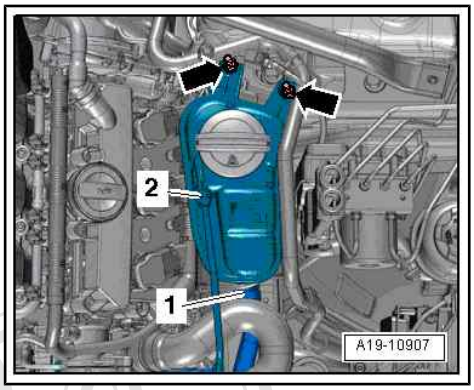
– Lift retaining clip -arrow-, detach coolant hose from coolant pipe (front) and move coolant hose clear.



Vehicles with hydraulic power steering:

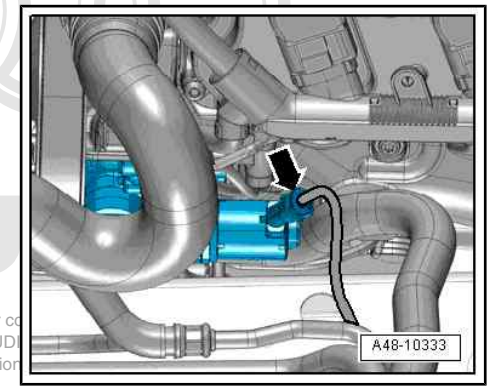
– Disconnect coolant hoses -1- and -2- from coolant expansion tank.

– Unscrew bolts -arrows-, unplug electrical connector at coolant shortage indicator switch - F66- and detach coolant expansion tank.



– If fitted, unplug electrical connector -arrow- at power steering pump.

– Press hydraulic fluid hose down slightly.



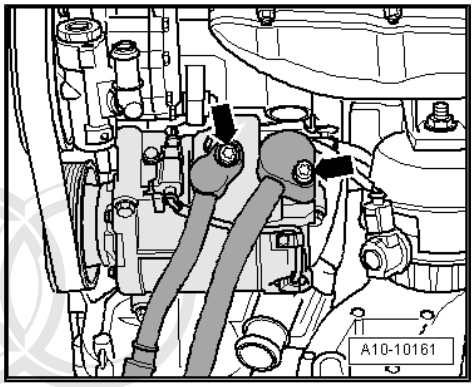
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All vehicles (continued):

Caution

Danger of damage to refrigerant lines and hoses.

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

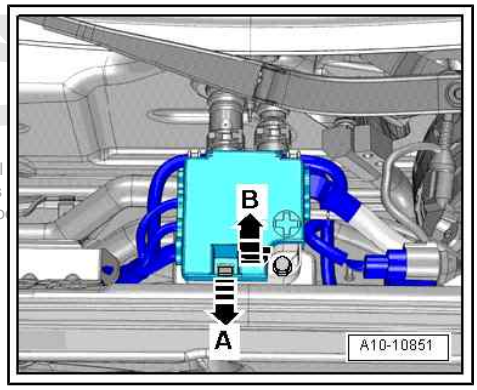


– Remove bolts -arrows- and disconnect refrigerant lines from A/C compressor.

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

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

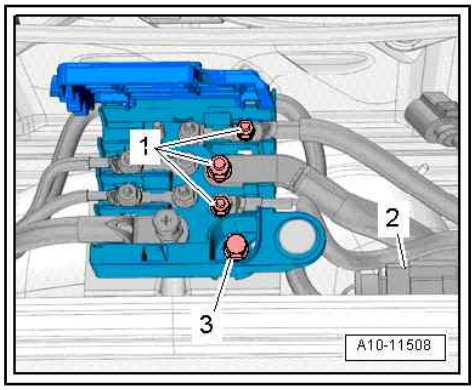
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– Remove nuts -1- for electrical wiring.

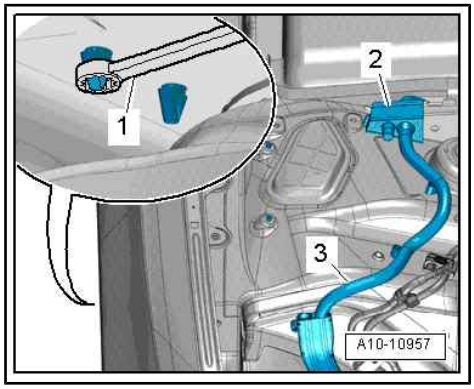
– Detach electrical connector -2- from bracket and unplug.

– Remove bolt -3- and detach terminal 30 wiring junction 2 - TV22- from body brace -arrow-.

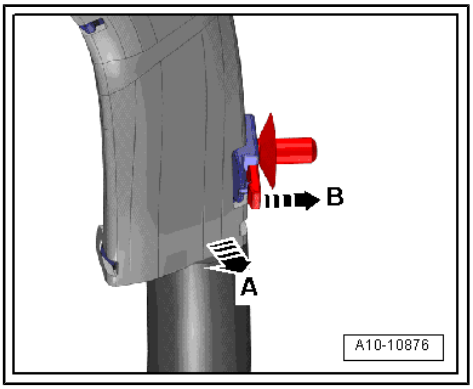


– Working from wheel housing, release catches using a 5.5 mm ring spanner -item 1- and remove wiring protector -2- from above.

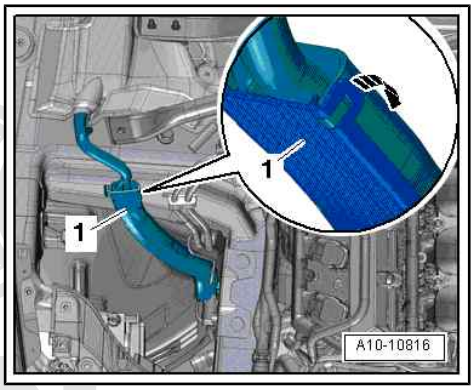
– Release wiring harness -3- leading to alternator and starter using removal lever - 80 - 200- and move clear.



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

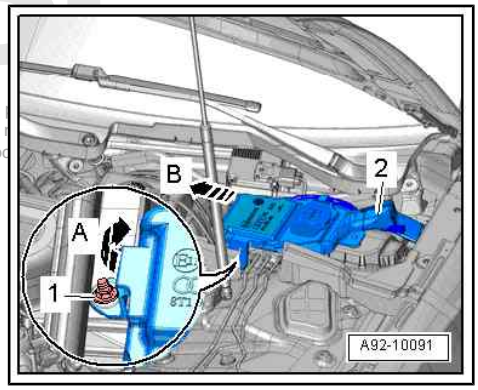


– Wiring duct (version 2): release catch -arrow- to open wiring duct -1- and move wiring harness clear.

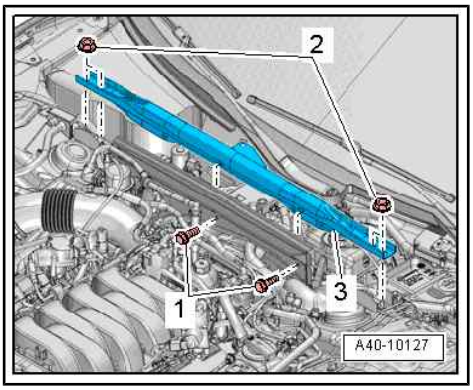


– Remove nut -1- and swivel filler neck -2- for washer fluid reservoir slightly upwards -arrow A-.
– Pull filler neck with filler pipe out of washer fluid reservoir and through opening in body -arrow B-.

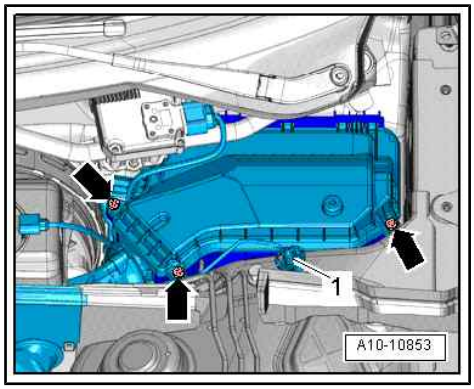
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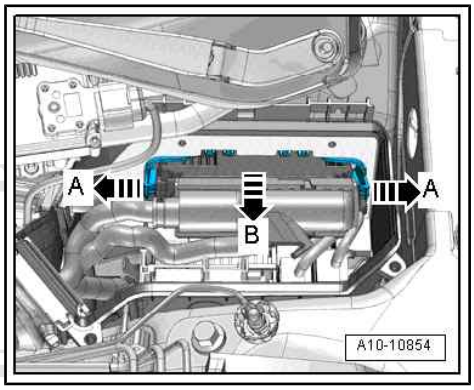
– Remove bolts -1- and nuts -2- and detach body brace -3-.



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

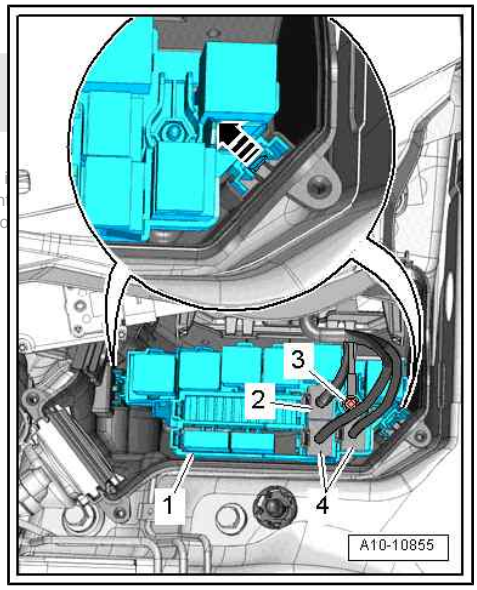


– Release catches -arrows A- and take out engine control unit -arrow B-.

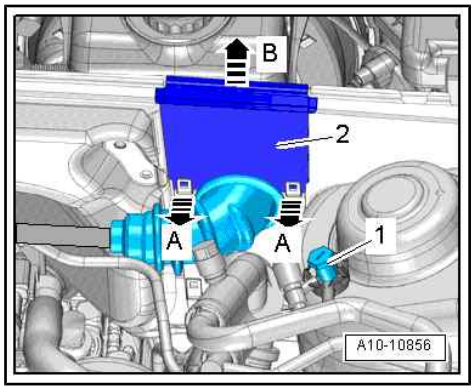


– If fitted, unplug electrical connector -2-.
– Unplug electrical connectors -4- and unscrew nut -3- for wiring.
– Release catches -arrow- and detach relay carrier with fuse holder -1-.
– Disengage engine wiring harness at electronics box in engine compartment and move clear.

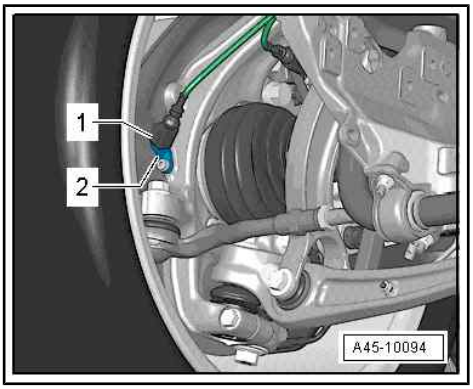
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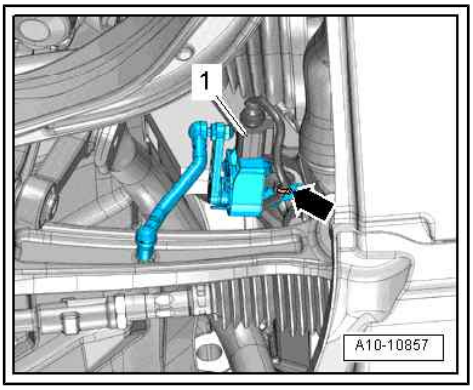
– Release catches -arrows A- and lift off wiring protector -2- -arrow B-.
– Unscrew earth stud -1- and move wiring harness clear.
– Place wiring harness on engine and secure engine control unit to prevent it from dropping.



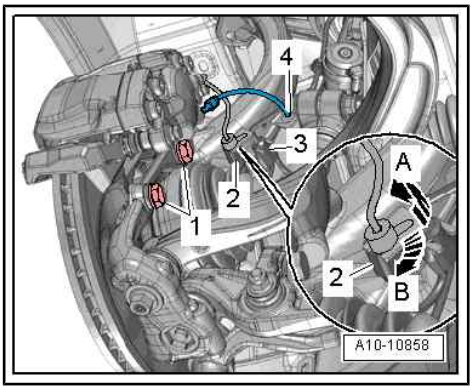
– Unplug electrical connectors -1- at front speed sensors -2- on both sides.



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



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

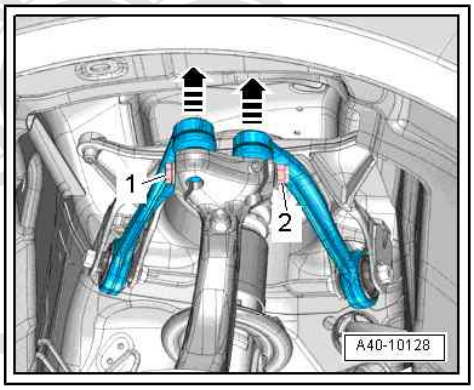


Caution

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-.
– Perform the same work steps on the other side of the vehicle.

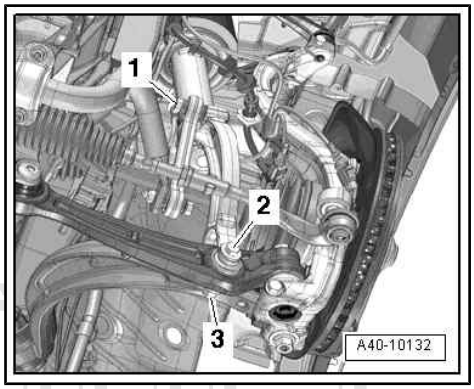


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– Remove bolt -1- for anti-roll bar on both sides.
– Remove nut -3- on both sides.

Note

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



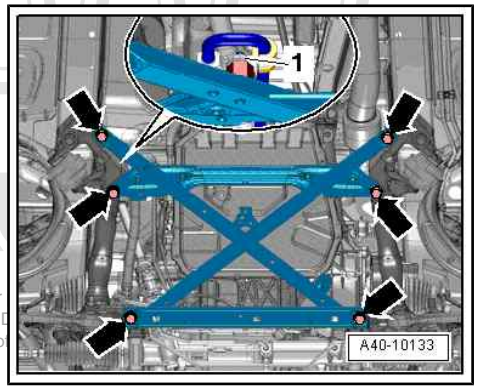
– Remove subframe cross brace ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Removing and installing subframe cross brace .

Caution

Risk of damage to running gear components.

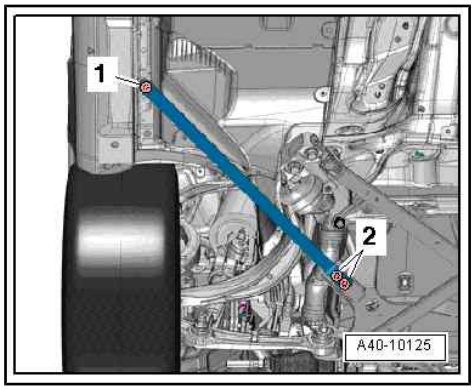
- ***The vehicle must NOT be lowered onto its wheels if the engine/gearbox mountings, steering rack or subframe cross brace are not properly installed.***

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Audi A5 Cabriolet/Sportback:

– Remove diagonal struts ⇒ Running gear, axles, steering; Rep. gr. 42 ; Subframe; Exploded view - subframe .

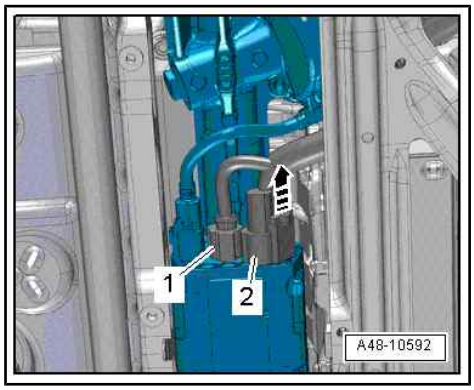


Vehicles with electromechanical power steering:

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

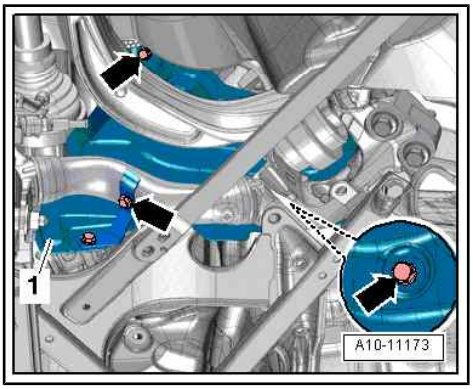
Note

Disregard -item 1-.

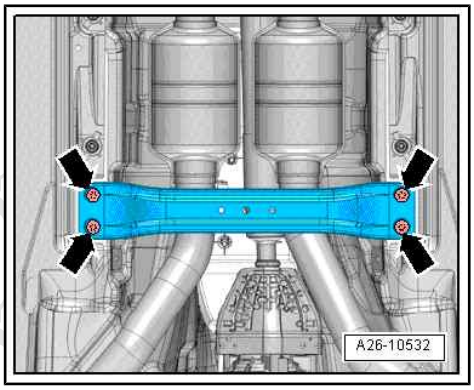


All vehicles (continued):

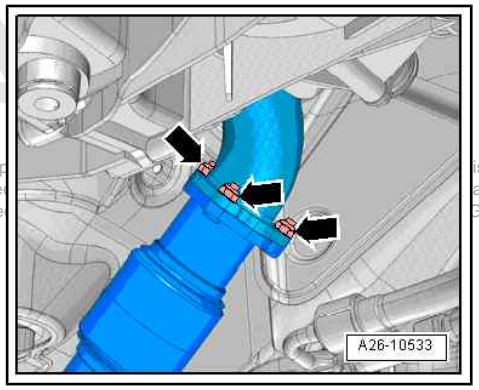
– If fitted, remove bolts -arrows- on both sides and detach heat shield -1-.



– If fitted, remove bolts -arrows- and detach front cross member.

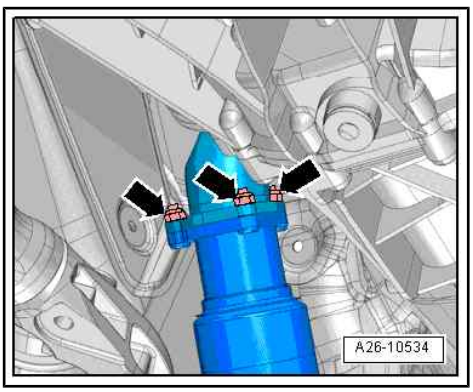


– Unscrew nuts -arrows- for front silencer (left-side).



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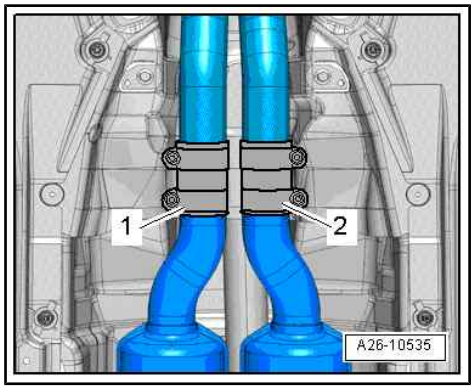
– Unscrew nuts -arrows- for front silencer (right-side).



Caution

Risk of damage to flexible joint if handled incorrectly.

- *Do not bend flexible joint more than 10°.*
- *Install flexible joint so that it is not under tension.*



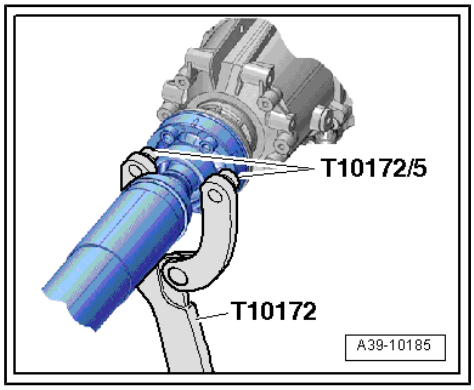
– Loosen and push back clamps -1- and -2- and detach front silencers on both sides.

Vehicles with propshaft (version with bolted connection):

– Unbolt propshaft from gearbox ⇒ Rear final drive; Rep. gr. 39 ; Propshaft; Removing and installing propshaft .

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

– Tie up propshaft on one side.

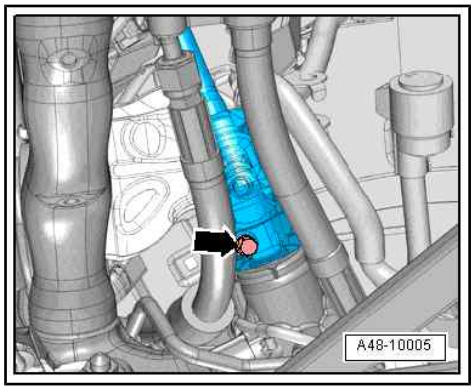


Vehicles with propshaft (version with splined connection):

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

All vehicles (continued):

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

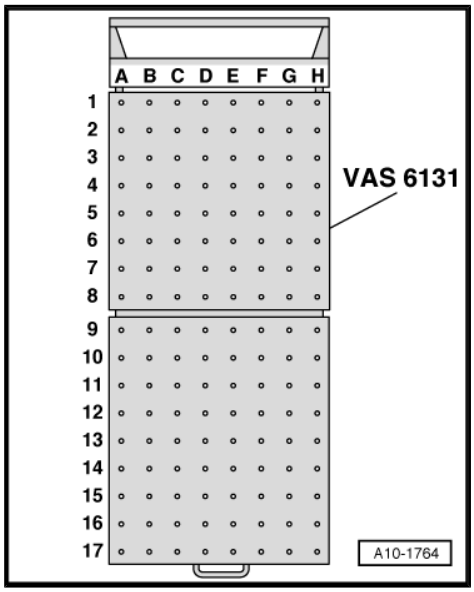


Set up the scissor-type assembly platform as follows:

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

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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	/10-11
G6	/10-1	/10-2	/10-5	/10-11
A8+C8	/13-6	–	–	/13-2
F8+H8	/13-6	–	–	/13-2
C14	/10-1	/10-4	/10-5	/10-7
F14	/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 A- horizontally.

• Take note of spirit level (bubble gauge).

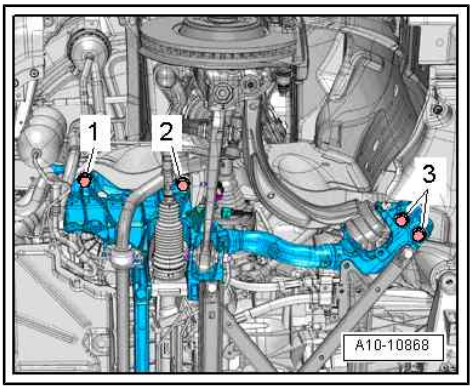
– Position scissor-type assembly platform - VAS 6131 A- below engine/gearbox assembly.

WARNING

Accident risk if subframe mountings are detached.

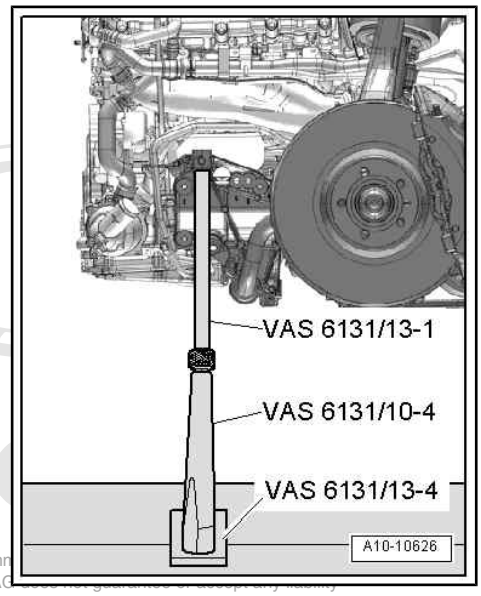
- ***Subframe bolts -2- and -3- must not be loosened.***

– Remove subframe bolts -1- on both sides.



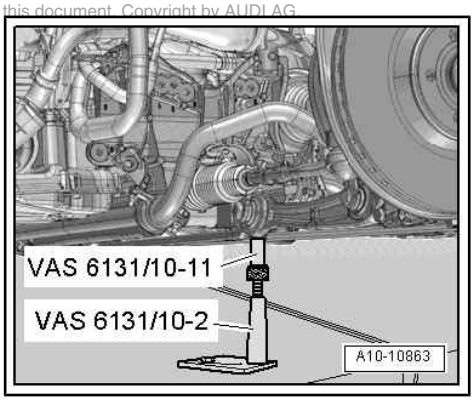
– Position support elements from -VAS 6131/10- and -VAS 6131/13- at front left and right of subframe as shown.

– Make sure that threaded spindles are screwed in completely.

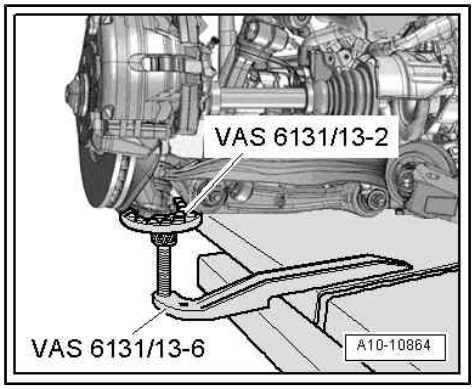


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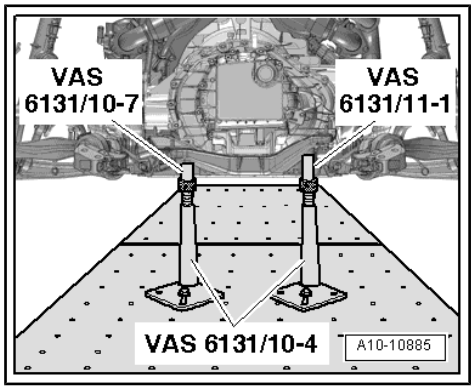
– Position support elements from -VAS 6131/10- (rear left and right) at front attachment points of subframe cross brace as shown.



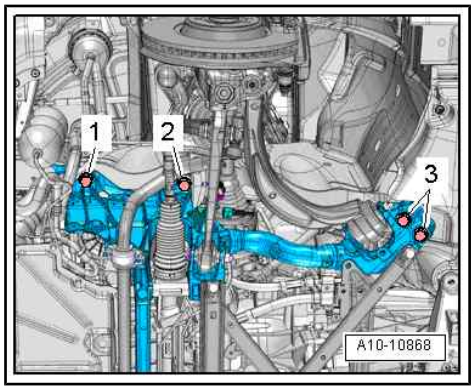
– Position support elements from -VAS 6131/13- under left and right wheel bearing housings as shown.



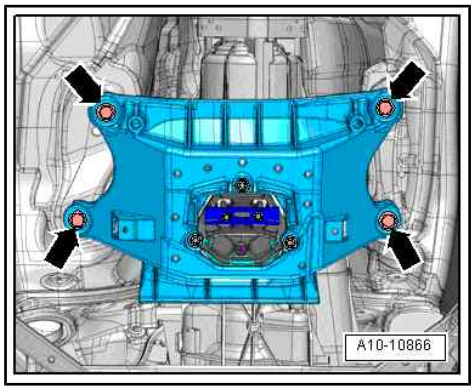
– Position support elements from -VAS 6131/10- and -VAS 6131/11- (rear left and right) at tunnel cross member as shown.
– Turn all spindles for support elements upwards until all locating lugs make contact with mounting points.
– Tighten base plates for support elements to 20 Nm on scissor-type assembly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



– 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.

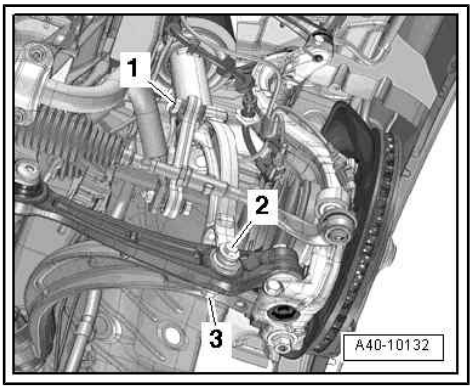


– Remove bolts -arrows- on tunnel cross member.



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– Remove bolt -2- on both sides.



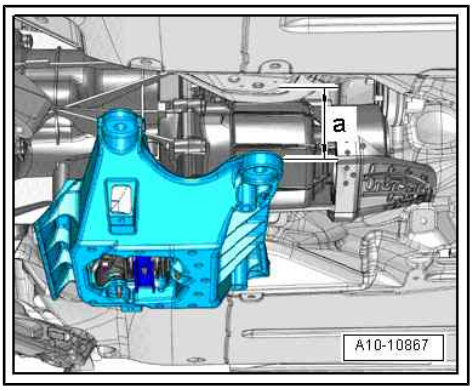
Caution

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.***

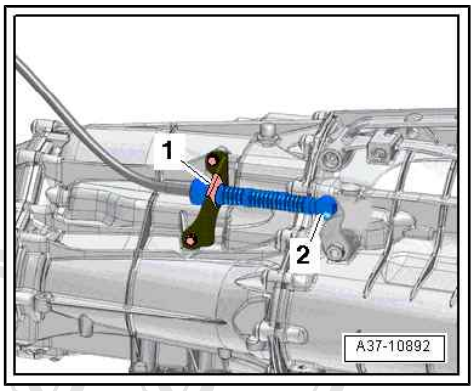
– Lower engine/gearbox assembly using scissor-type assembly platform - VAS 6131 A- initially only as far as distance -a-.

• Dimension -a- = 100 mm (maximum).



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

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



Note

Take care not to bend or kink selector lever cable.

– Lower engine/gearbox assembly further.

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

1.2 Separating engine and gearbox

⇒ “1.2.1 Separating engine and gearbox - vehicles with manual gearbox”, page 51

⇒ “1.2.2 Separating engine and gearbox - vehicles with dual clutch gearbox 0B5”, page 56

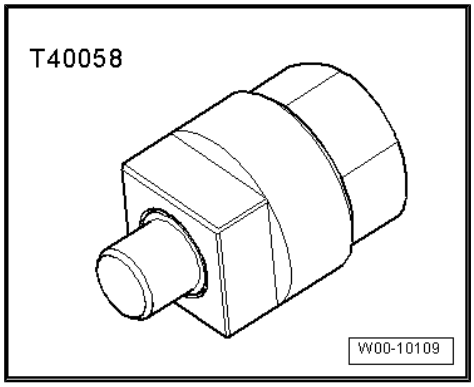
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1.2.1 Separating engine and gearbox - vehicles with manual gearbox

Special tools and workshop equipment required

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

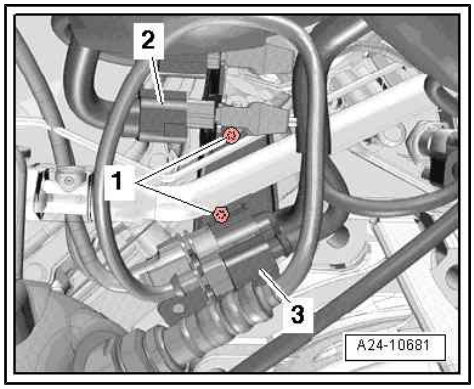
♦ Adapter - T40058-



Procedure

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

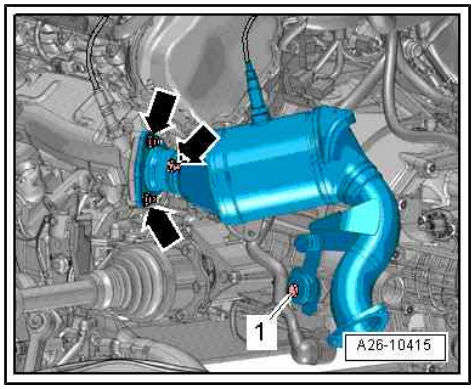
– Remove electrical connector -3- for Lambda probe 2 after catalytic converter - G131- from bracket and unplug connector.



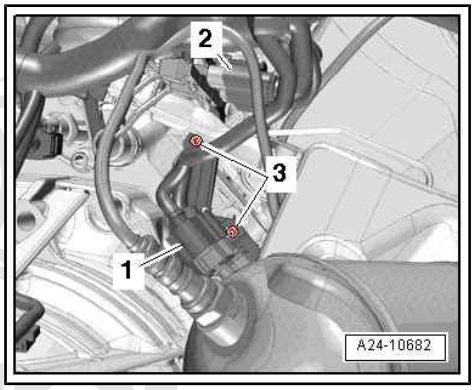
Note

Disregard -items 1, 2-.

– Remove bolt -1- and nuts -arrows- and detach catalytic converter (left-side).



– Remove electrical connector -1- for Lambda probe after catalytic converter - G130- from bracket and unplug connector.

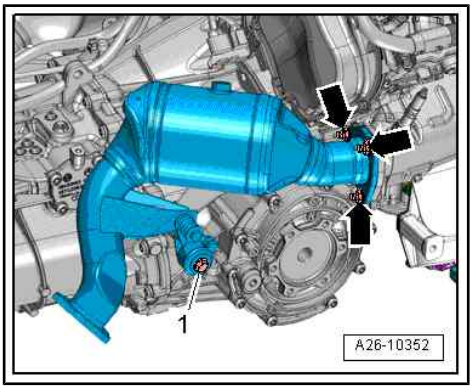


Note

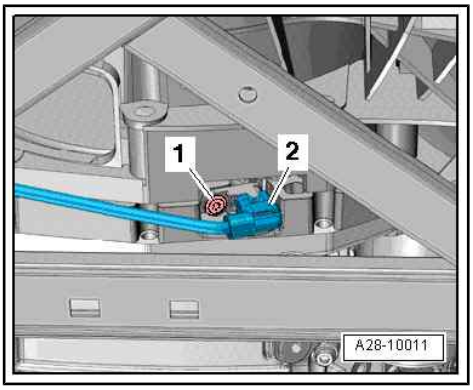
Disregard -items 2, 3-.

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– Remove bolt -1- and nuts -arrows- and detach catalytic converter (right-side).



– Unplug electrical connector -2- at engine speed sender - G28- and move wiring clear.



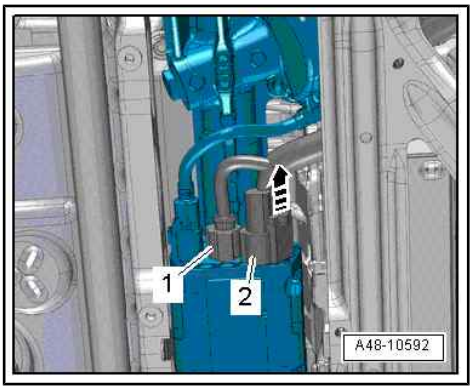
Note

Disregard -item 1-.

Vehicles with electromechanical power steering:

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

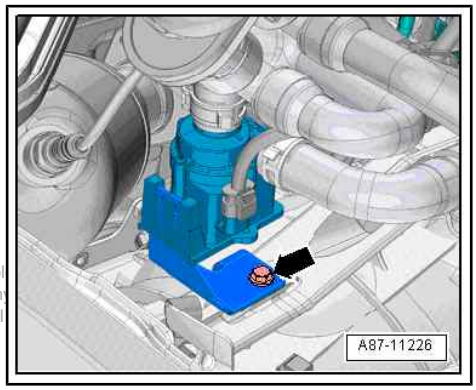
– Move electrical wiring harness clear.



Note

Disregard -item 2-.

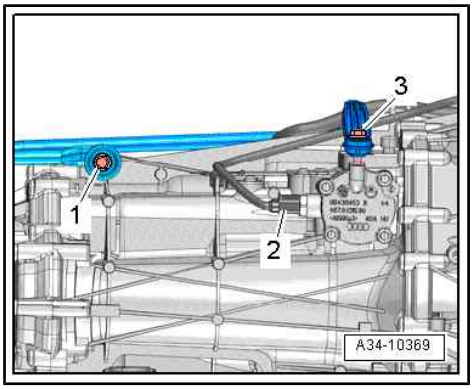
– Remove bolt -arrow- and move coolant circulation pump - V50- clear to one side.



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All vehicles (continued):

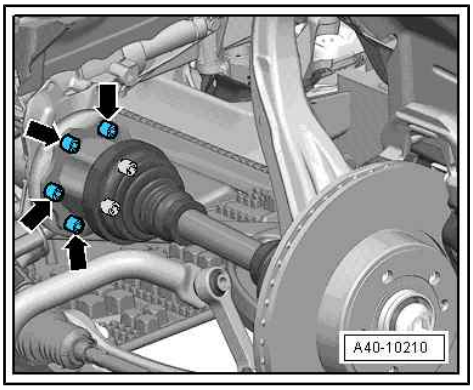
– Unplug electrical connector -2- from gear detection sensor -G604- .



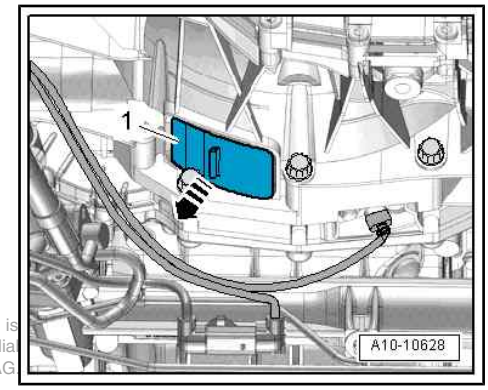
Note

Disregard -items 1, 3-.

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



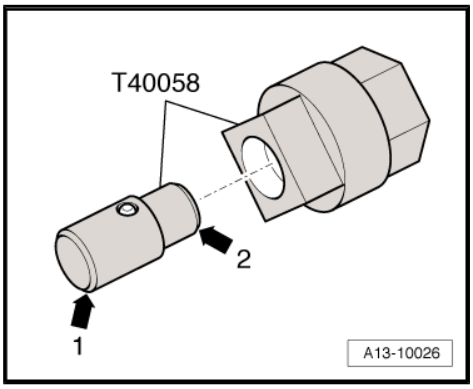
– Detach bottom cover -1- from gearbox -arrow-.



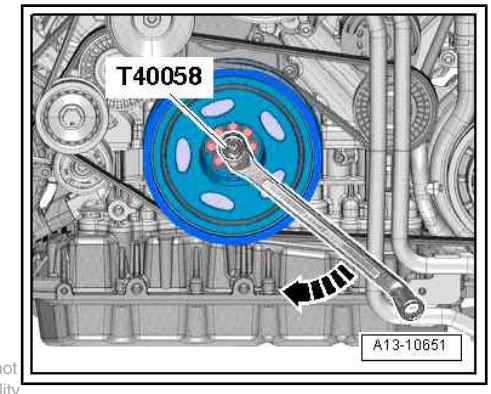
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– Insert guide pin of adapter -T40058- as follows:

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



– Counterhold crankshaft using adapter - T40058- and angled ring spanner when loosening bolts for drive plate.

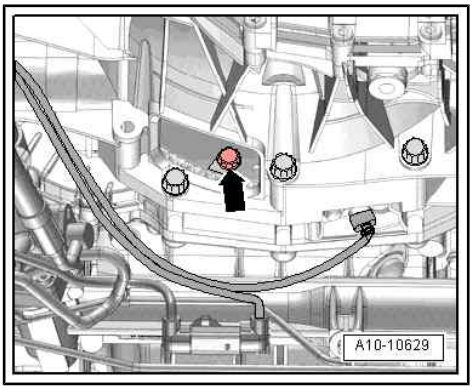


Note

Only rotate crankshaft in direction of engine rotation -arrow-.

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– Remove 6 bolts -arrow- for clutch module. Turn crankshaft each time by 60° in direction of engine rotation.

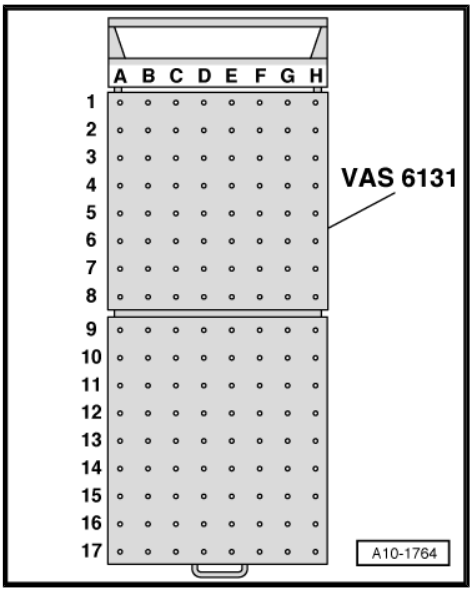


– Set up scissor-type assembly platform - VAS 6131 A- with support set for Audi - VAS 6131/10- , support -VAS 6131/13-7- and gearbox support - VAS 6131/14- as follows:

Note

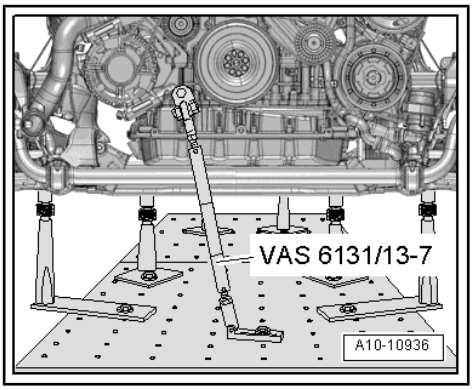
The other support elements remain unchanged.

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

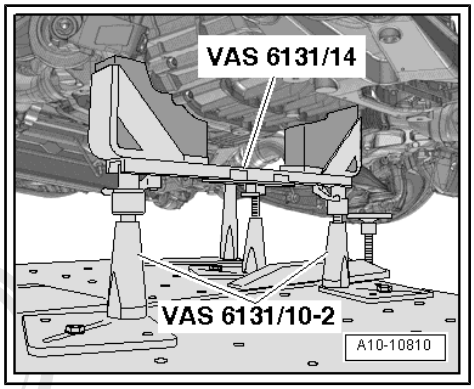


– Secure support -VAS 6131/13-7- at tapped hole at front of engine (right-side) as illustrated.

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



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

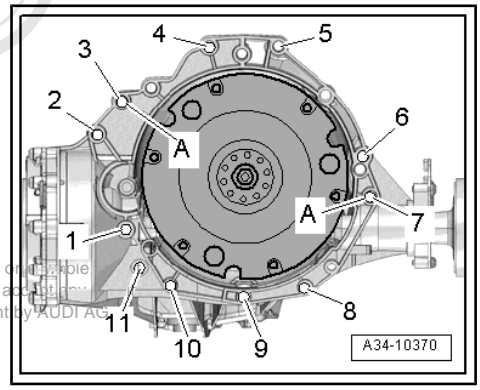


– Remove bolts -1- and -2- for starter.
– Separate starter from gearbox and leave in position.
– Unscrew remaining bolts -3 ... 11- securing engine to gearbox.

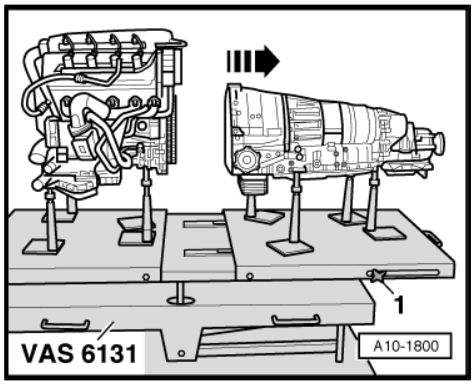
Note

Disregard -item A-.

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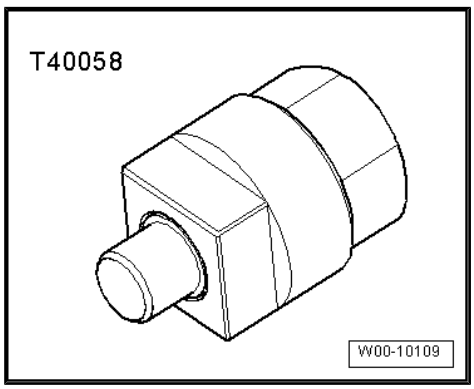
– Loosen clamping bolts -1- on sides of scissor-type assembly platform - VAS 6131 A- and pull rear section of platform together with gearbox towards rear -arrow-.



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

Special tools and workshop equipment required

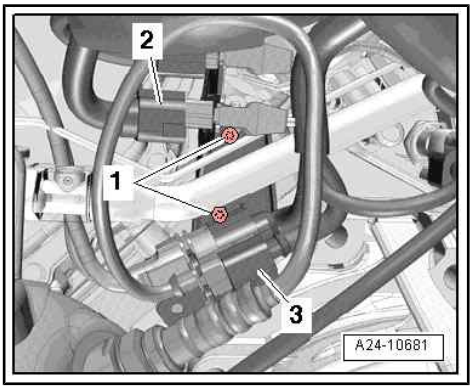
- Support set for Audi - VAS 6131/10- , support -VAS 6131/13-7- and gearbox support - VAS 6131/14-
- Adapter - T40058-



Procedure

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

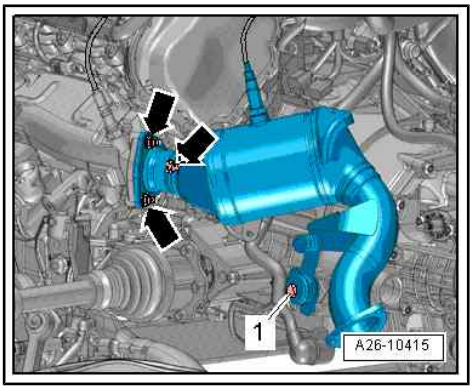
– Remove electrical connector -3- for Lambda probe 2 after catalytic converter - G131- from bracket and unplug connector.



Note

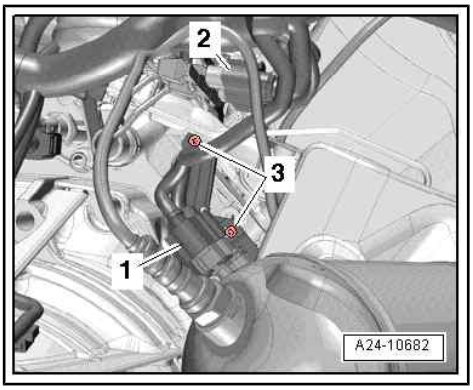
Disregard -items 1, 2-.

– Remove bolt -1- and nuts -arrows- and detach catalytic converter (left-side).



– Remove electrical connector -1- for Lambda probe after catalytic converter - G130- from bracket and unplug connector.

– Remove bolts -3- and move bracket clear to one side.

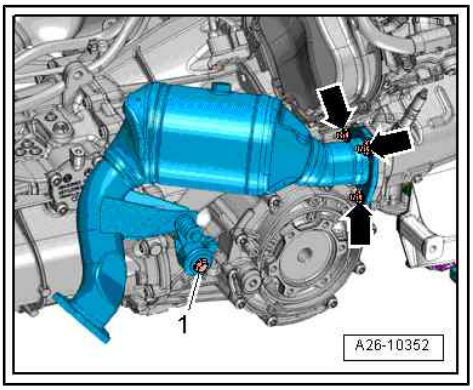


Note

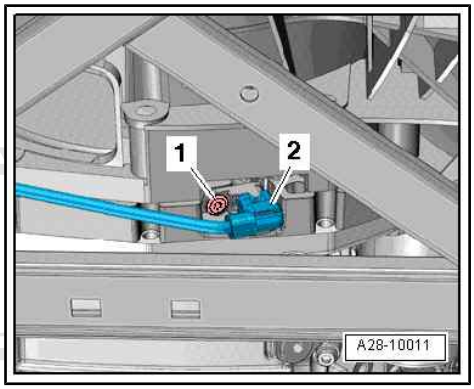
Disregard -item 2-.

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– Remove bolt -1- and nuts -arrows- and detach catalytic converter (right-side).



– Unplug electrical connector -2- at engine speed sender - G28- and move wiring clear.



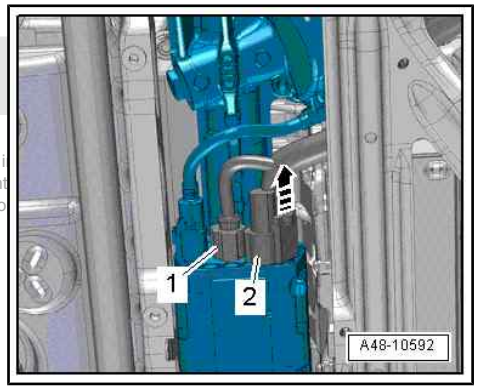
Note

Disregard -item 1-.

Vehicles with electromechanical power steering:

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

– Move electrical wiring harness clear.



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Note

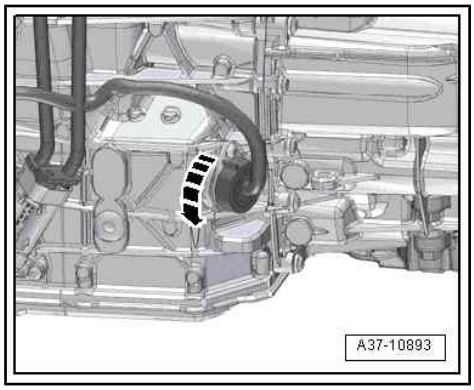
Disregard -item 1-.

All vehicles (continued):

Caution

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

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

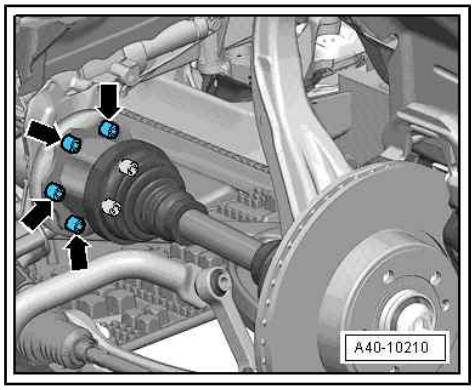


– Touch gearbox housing with your hand (without wearing gloves) to eliminate static charge.

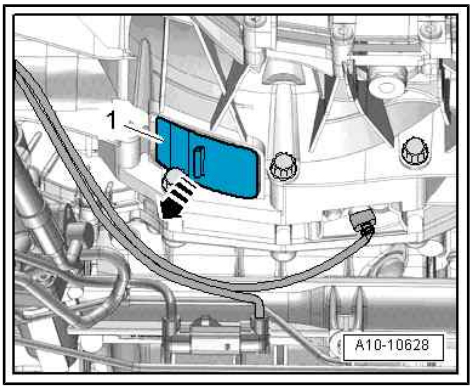
– Turn retainer catch anti-clockwise -arrow- and unplug electrical connector at gearbox.

– Move electrical wiring harness clear at gearbox.

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

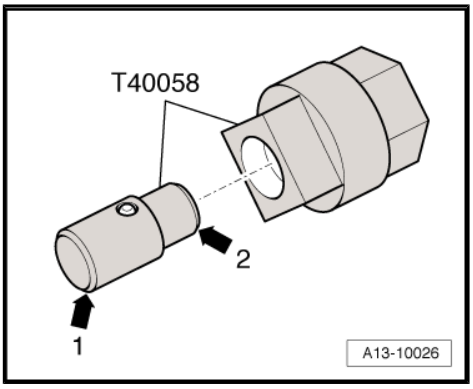


– Detach bottom cover -1- from gearbox -arrow-.

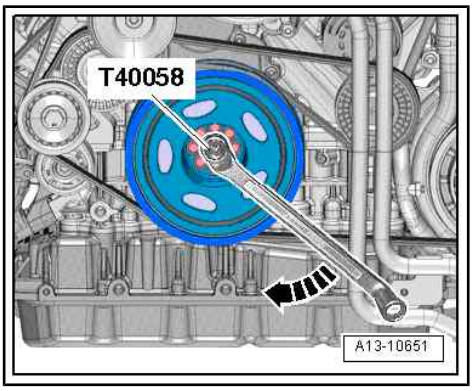


– Insert guide pin of adapter -T40058- as follows:

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



– Counterhold crankshaft using adapter - T40058- and angled ring spanner when loosening bolts for drive plate.

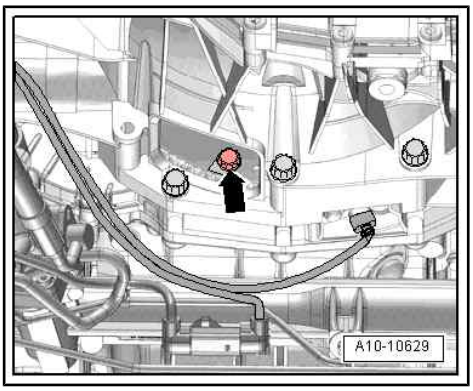


Note

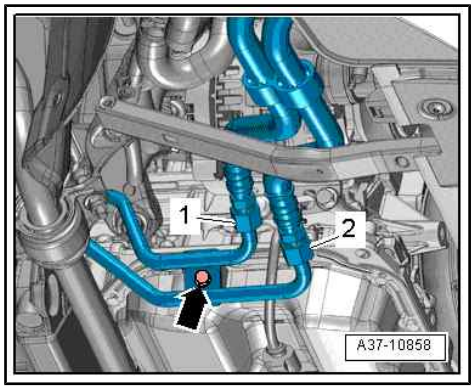
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Only rotate crankshaft in direction of engine rotation -arrow-.

– Remove 6 bolts -arrow- for clutch module. Turn crankshaft each time by 60° in direction of engine rotation.



– Remove bolt -arrow- for ATF lines.

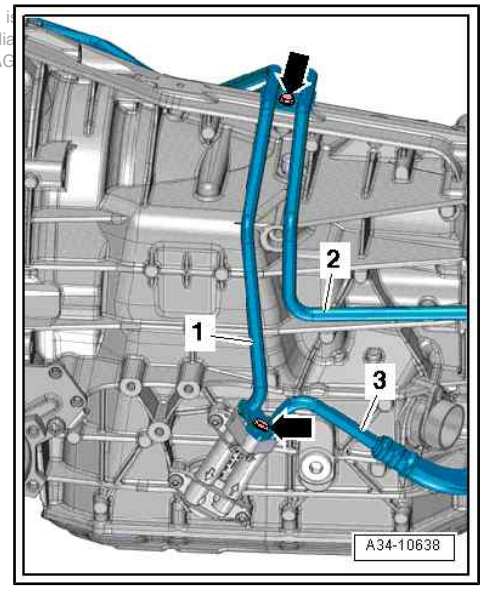


Note

Disregard -items 1, 2-.

Vehicles with ATF lines (version 1):

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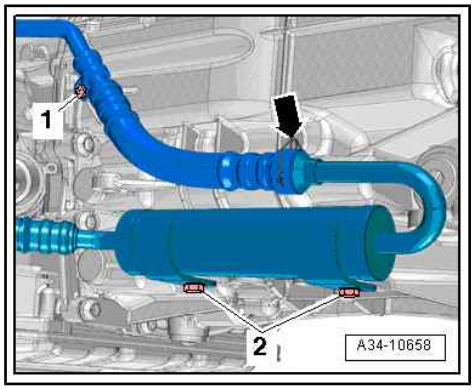
Lay a cloth under the separating point to catch escaping ATF.

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

Note

Disregard -items 2, 3-.

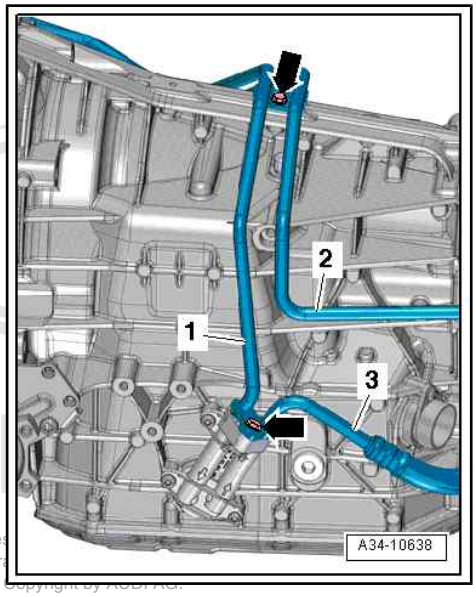
– Remove bolt -1-.
– Pull out securing clip -arrow- and disconnect ATF line from ATF filter.



Note

Disregard -item 2-.

– Tie up ATF lines -1- and -2-.



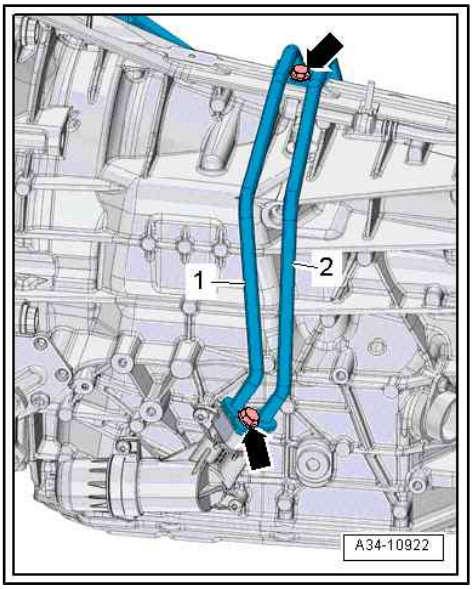
Note

Disregard -item 3-.

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

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Vehicles with ATF lines (version 2):



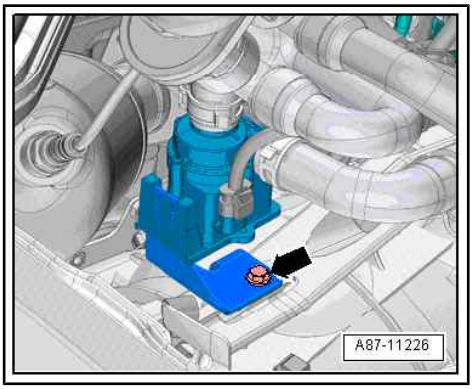
Note

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

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

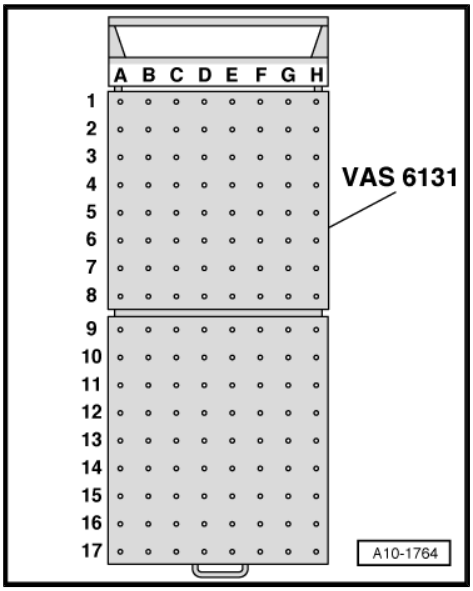
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .

– Remove bolt -arrow- and move coolant circulation pump - V50- clear to one side.



All vehicles (continued):

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



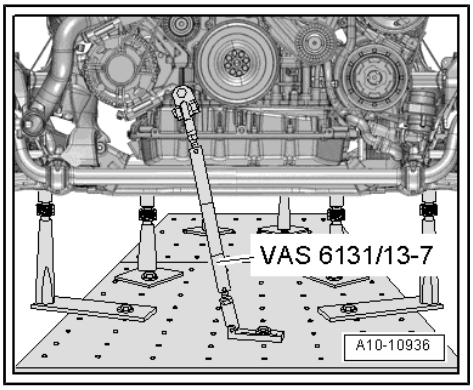
Note

The other support elements remain unchanged.

Platform coordinates	Parts from support set for Audi - VAS 6131/10- , support -VAS 6131/13-7- and gearbox support - VAS 6131/14-			
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 tapped hole at front of engine (right-side) as illustrated.

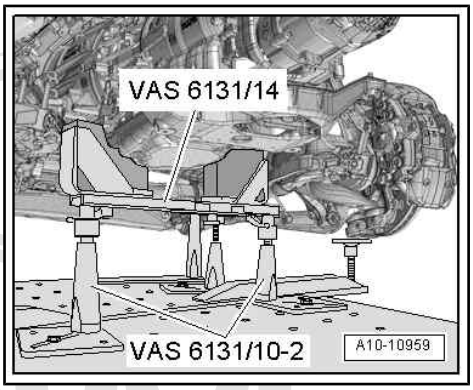
– Secure support -VAS 6131/13-7- to scissor-type assembly platform and tighten to 20 Nm.



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

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

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

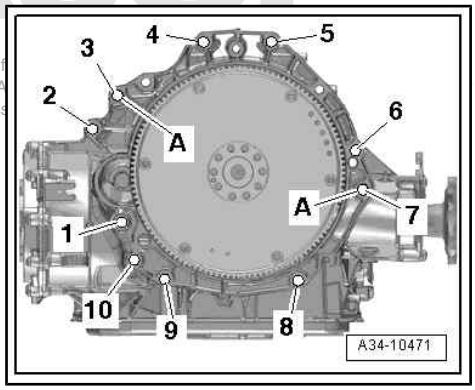


– Remove bolts -1- and -2- for starter.

– Separate starter from gearbox and leave in position.

– Unscrew remaining bolts -3 ... 10- securing engine to gearbox.

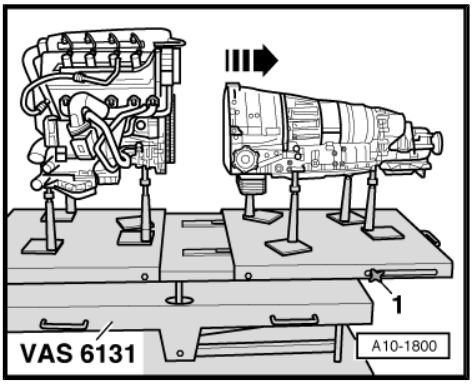
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Note

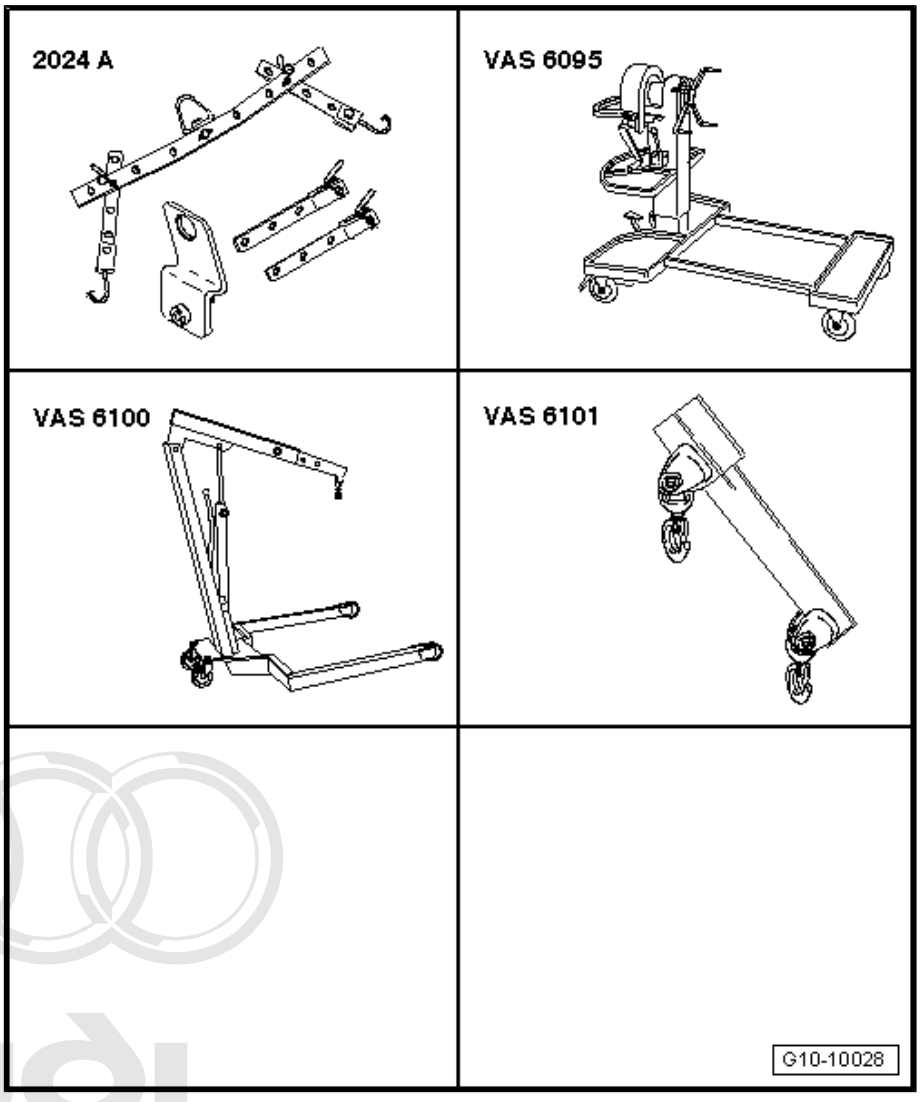
Disregard -item A-.

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



1.3 Securing engine to engine and gearbox support

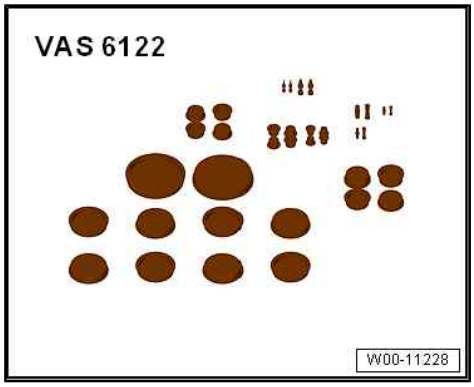
Special tools and workshop equipment required



- Lifting tackle - 2024 A-
- Engine and gearbox support - VAS 6095- with universal mounting - VAS 6095/1- and bracket for V6 FSI engine, Audi A6 - VAS 6095/1-5-
- Workshop hoist - VAS 6100-
- Lift arm extension (workshop hoist) - VAS 6101-

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- Engine bung set - VAS 6122-



Procedure

WARNING

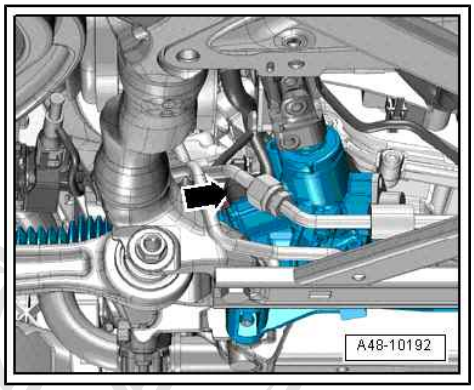
Risk of accident.

- *The engine can only be transported with the gearbox removed using the method described.*

- Engine/gearbox assembly removed; engine separated from gearbox.
- Engine secured with support -VAS 6131/13-7- .

Vehicles with hydraulic power steering:

– Unplug electrical connector -arrow- on steering rack.

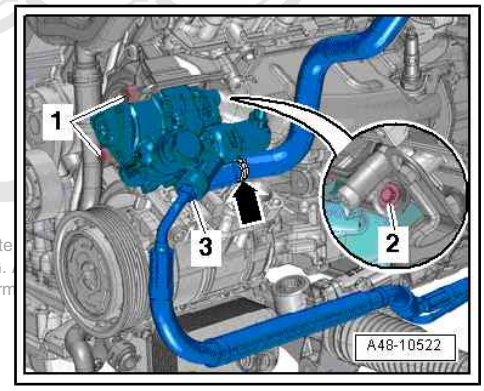


Note

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

– Unscrew connection -3-.

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



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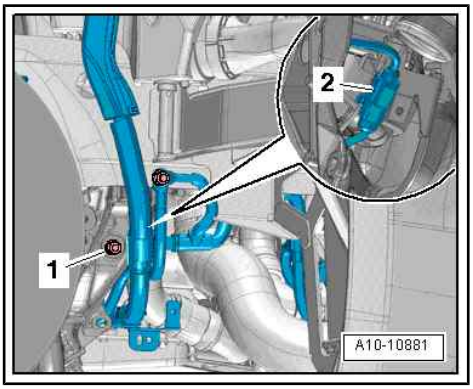
Note

- *The illustration shows the installation position on a vehicle with dynamic steering.*
- *Disregard -items 1, 2- and -arrow-.*

All vehicles (continued):

– Detach electrical connector -2- on solenoid valve (right-side) for electro-hydraulic engine mounting - N145- from bracket and unplug connector.

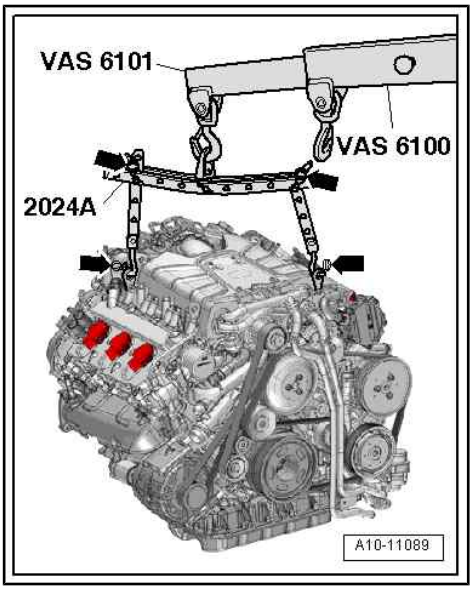
– Unscrew nut -1- and detach bracket with electrical wiring from subframe.



Note

The illustration shows the installation position with the engine installed.

– Attach lifting tackle - 2024 A- to engine lifting eyes and workshop hoist as shown in illustration.



Note

To adjust to the centre of gravity of the assembly, the perforated rails of the support hooks must be positioned as shown.

WARNING

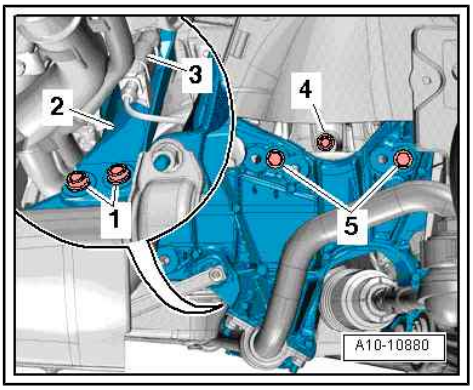
Risk of accident.

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

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

– Unplug electrical connector -3- on left electrohydraulic engine mounting solenoid valve - N144- .

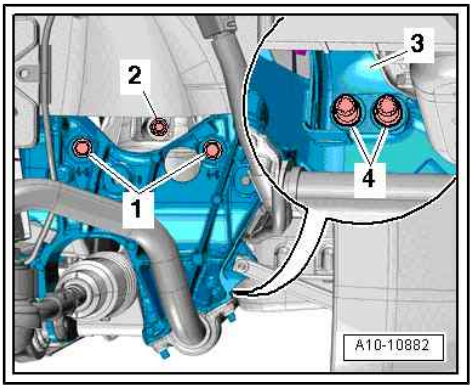
– Remove bolt -4- for engine mounting (left-side).



Note

Disregard -items 1, 2, 5-.

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

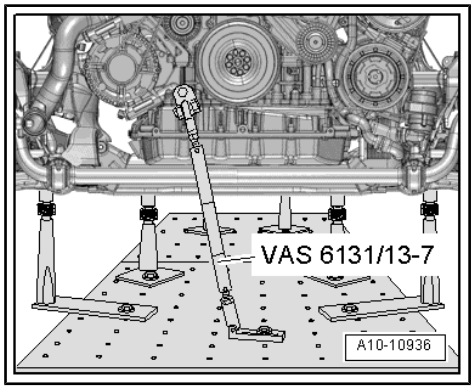


Note

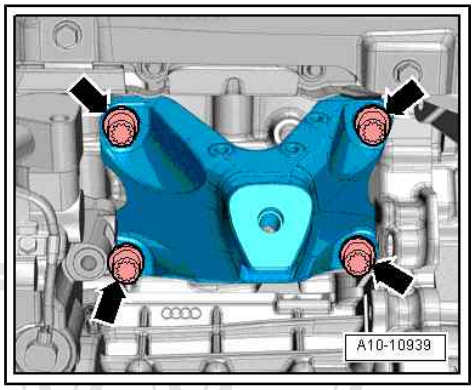
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- *The illustration shows the installation position with the engine installed.*
- *Disregard -items 1, 3, 4-.*

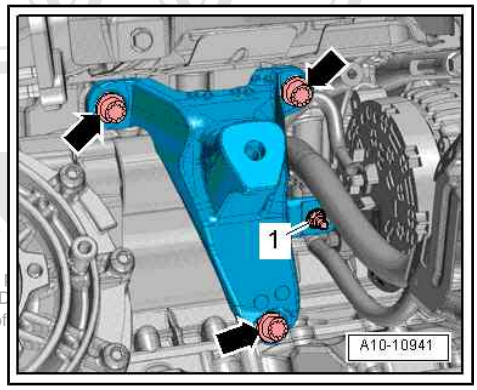
– Remove support -VAS 6131/13-7- from engine.
– Lift engine off engine cross member.



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

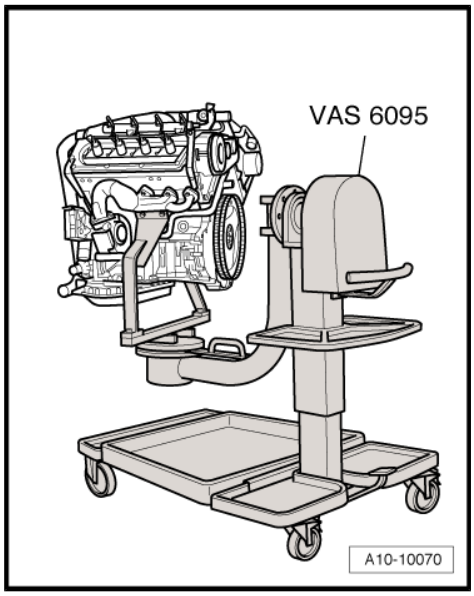


– Remove nut -1- and move earth wire clear at engine support.
– Unscrew bolts -arrows- and remove engine support (right-side).
– Tie up starter on engine.



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– Secure engine with universal mounting - VAS 6095/1- and support bracket for V6 FSI engine, Audi A6 - VAS 6095/1-5- to engine and gearbox support - VAS 6095- as shown in illustration and tighten to 40 Nm.



1.4 Installing engine

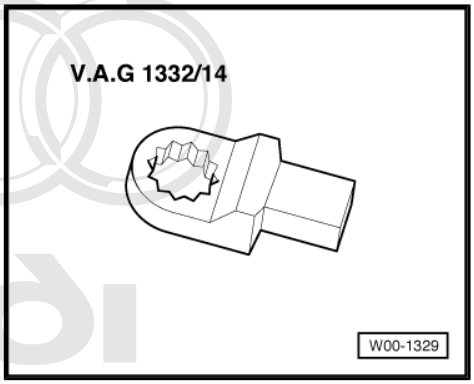
⇒ “1.4.1 Installing engine, vehicles with manual gearbox”, page 67

⇒ “1.4.2 Installing engine, vehicles with dual clutch gearbox 0B5”, page 74

1.4.1 Installing engine, vehicles with manual gearbox

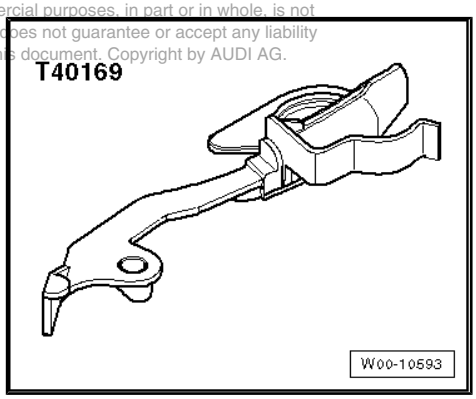
Special tools and workshop equipment required

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

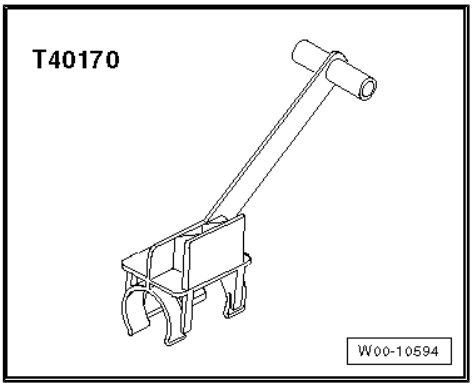


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- Assembly aid - T40169-



- Transport lock - T40170-



Tightening torques

Note

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

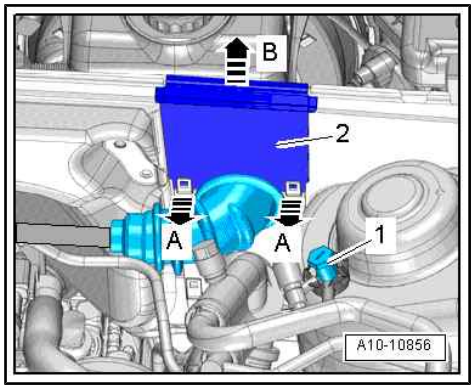
♦ *Tolerance for tightening torques: ± 15 %.*

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

Assembly mountings ⇒ page 82

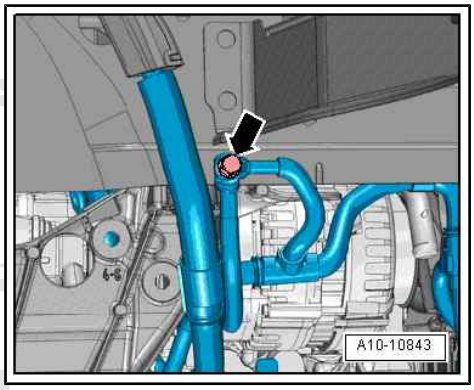
Earth stud at suspension turret - tightening torque

– Tighten earth stud -1- to 9 Nm.



Earth wiring at longitudinal member - tightening torque

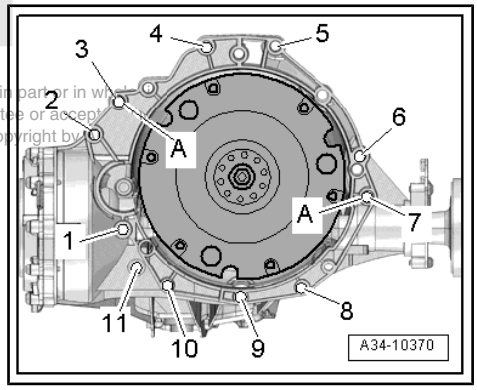
– Tighten nut -arrow- to 9 Nm.



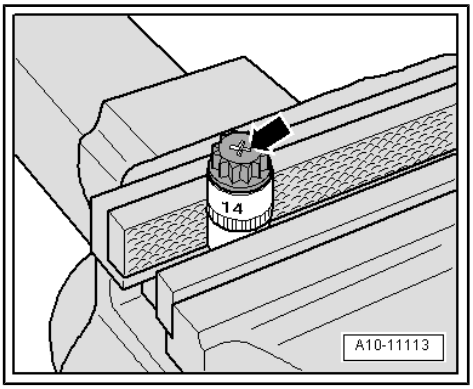
Engine to manual gearbox

Item	Bolt	Nm
1	M10 x 50 1)	65
2 … 6	M12 x 100 2)	30 + 90°
7	M12 x 125 2)	30 + 90°
8, 11	M10 x 60 2)	15 + 90°
9, 10	M10 x 95 2)	15 + 90°
A	Dowel sleeves for centralising	

- 1) Property class 10.9. The steel bolt may be re-used as often as necessary.
- 2) Aluminium bolts must not be used more often than twice ⇒ page 69 .



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- The aluminium bolts -2 … 11- must not be used more often than twice. After first use, bolts must therefore be identified with an “X” made by two chisel marks -arrow-.
- To avoid damaging the bolts when making this mark, do not clamp them directly in a vice. Clamp a 14 mm socket with 1/2" drive in a vice and insert the bolt as shown.
- Bolts already marked with an “X” must not be used again.

Procedure

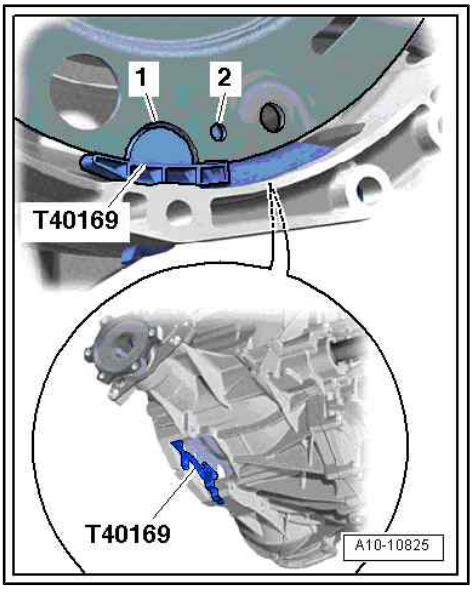
Note

- *Renew the bolts tightened with specified tightening angle.*
- *Renew self-locking nuts and bolts as well as seals, gaskets and O-rings.*
- *On vehicles with manual gearbox, a needle bearing is fitted in the drive plate. Before installing, check that the needle bearing is fitted. Removing and installing needle bearing in drive plate (pressing in and out)* ⇒ page 117 .
- *Hose connections and air pipes and hoses must be free of oil and grease before assembly.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *To secure the air hoses properly at their connections, spray rust remover onto the worm thread of the used hose clips before installing.*
- *Fit all cable ties in the original positions when installing.*

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– Install engine supports and engine mountings ⇒ page 82 .

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



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

– Insert assembly aid - T40169- into gearbox housing between clutch module and gearbox housing from below, as illustrated.

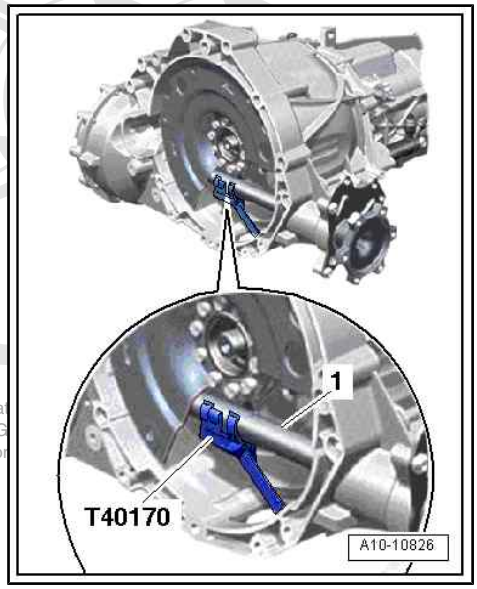
• The assembly aid must engage in the semi-circular recess -1- and in the inspection hole -2-.

Note

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

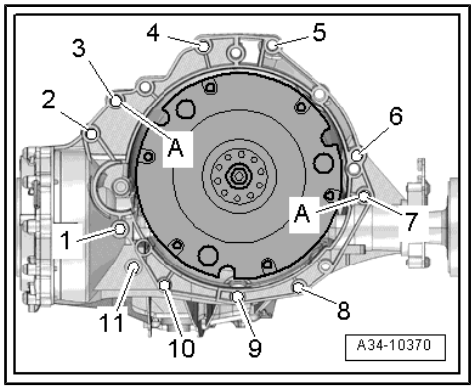
– Insert pin of assembly aid into hole on gearbox housing.

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



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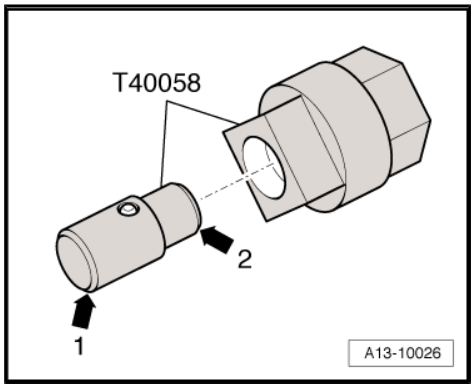
– Check whether dowel sleeves -A- for centring engine and gearbox are fitted in cylinder block; install missing dowel sleeves.
– Check whether aluminium bolts securing engine to gearbox can be reused; if so, apply marking ⇒ page 69 .
– Bring gearbox into position on engine and tighten bolts -1 … 11-.
– Remove transport lock - T40170- and assembly aid - T40169- .



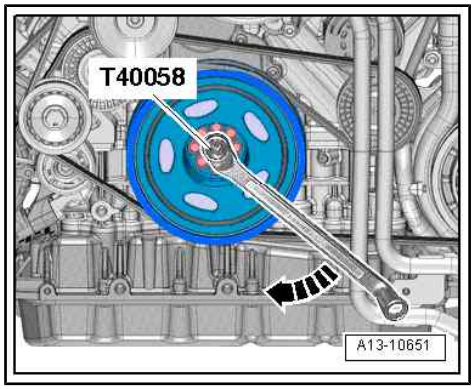
Note

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

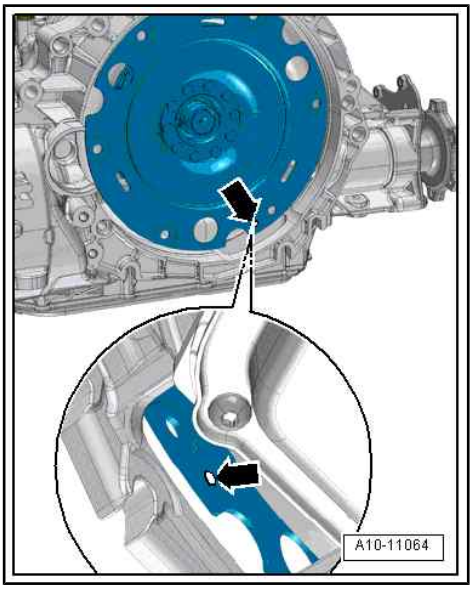
– Insert guide pin of adapter -T40058- as follows:
• The larger-diameter section -arrow 1- faces towards the engine.
• The smaller-diameter section -arrow 2- faces the adapter.



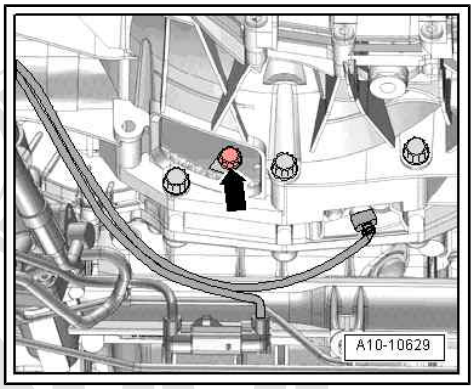
– Use adapter - T40058- and angled ring spanner to turn crankshaft one full turn (360°) in direction of engine rotation -arrow-.



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



– Bolt clutch module onto drive plate as follows:



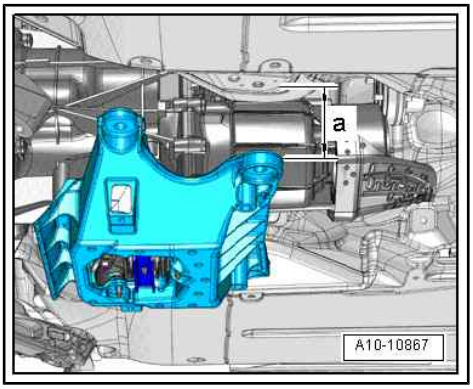
Note

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

– Hand-tighten first bolt -arrow- (2 Nm).
– Turn crankshaft with adapter - T40058- 180° further in direction of engine rotation.
– Tighten bolt accessible in this position to specified torque ⇒ Rep. gr. 30 ; Clutch; Exploded view - clutch .
– Turn crankshaft by 60° each time and tighten remaining 5 bolts to specified torque ⇒ Rep. gr. 30 ; Clutch; Exploded view - clutch .
– Install power steering hydraulic lines ⇒ Running gear, axles, steering; Rep. gr. 48 ; Hydraulic power steering; Exploded view - hydraulic lines, reservoir .
– Secure drive shafts (left and right) to gearbox flange shafts ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Exploded view - drive shaft .
– Install catalytic converters: left-side ⇒ page 395 , right-side ⇒ page 395 .

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



- Dimension -a- = min. 100 mm.

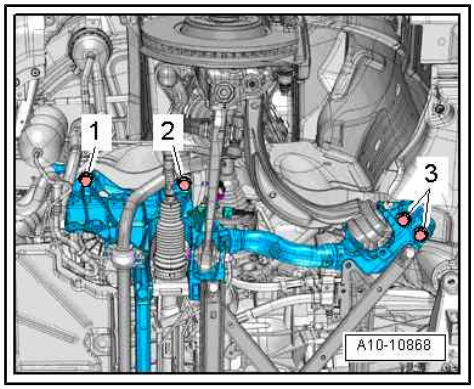
– Install selector rod and push rod ⇒ Rep. gr. 34 ; Selector mechanism; Exploded view - selector mechanism .
– Raise engine/gearbox assembly further using scissor-type assembly platform - VAS 6131 A- .
– Align subframe and gearbox carrier on longitudinal members according to markings made before removal.

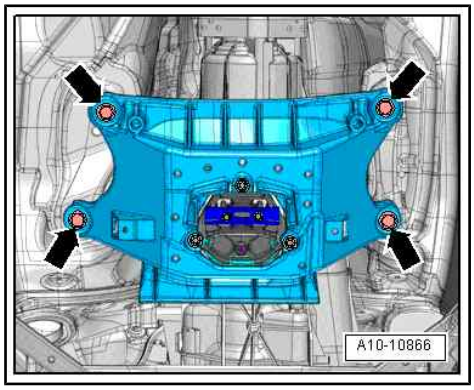
– Tighten subframe bolts only to specified torque (do not turn further); the bolts should only be fully tightened after performing the wheel alignment check ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Exploded view - subframe .

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

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

– Install clutch slave cylinder ⇒ Rep. gr. 30 ; Clutch mechanism; Removing and installing clutch slave cylinder .

– Secure intermediate steering shaft to steering rack ⇒ Running gear, axles, steering; Rep. gr. 48 ; Steering column; Removing and installing intermediate steering shaft .

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

– Install front silencers ⇒ page 388 .

– Align the exhaust system so it is free of stress ⇒ page 392 .

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

– Install subframe cross brace and anti-roll bar ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Exploded view - subframe .

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

– Install diagonal struts ⇒ Running gear, axles, steering; Rep. gr. 42 ; Subframe; Exploded view - subframe .

– Install brake calipers ⇒ Brake system; Rep. gr. 46 ; Front brakes; Removing and installing brake caliper .

– Install engine control unit ⇒ page 362 .

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

– Install electrical wiring, terminal 30 wiring junction 2 - TV22- and cover for electronics box in engine compartment ⇒ page 68 , ⇒ page 68 ⇒ Electrical system; Rep. gr. 97 ; Relay carriers, fuse carriers, electronic boxes; Overview of fitting locations - relay carriers, fuse carriers, electronic boxes .

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

– Install filler neck for washer fluid reservoir ⇒ Electrical system; Rep. gr. 92 ; Windscreen washer system; Exploded view - windscreen washer system .

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

– 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 fuel supply hose and air cleaner housing ⇒ page 342 .

– Install lock carrier braces ⇒ General body repairs, exterior; Rep. gr. 50 ; Lock carrier .

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

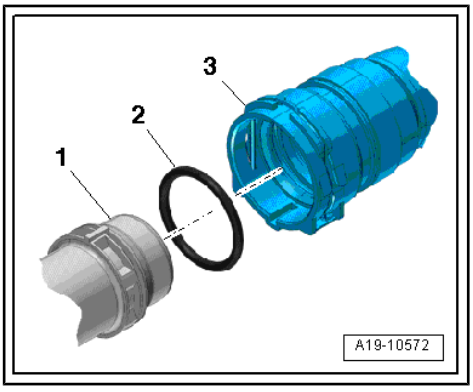
– Before starting engine, top up hydraulic fluid in power steering reservoir ⇒ Running gear, axles, steering; Rep. gr. 48 ; Hydraulic power steering; Checking power steering fluid level .

Note

The power steering pump must not be run when dry.

– Connect coolant hose with plug-in connector ⇒ page 281 .

– Fill up with coolant ⇒ page 243 .



Note

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

– Charge refrigerant system ⇒ Air conditioner with refrigerant R134a; Rep. gr. 87 ; Refrigerant circuit .

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

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

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

Audi
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WARNING

Risk of accident if bolted connections are loose.

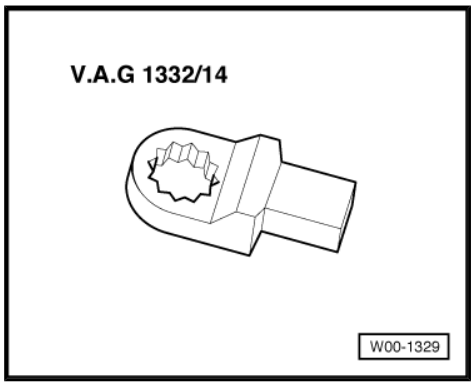
- ***Tighten subframe bolts to final setting after performing wheel alignment check.***

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

1.4.2 Installing engine, vehicles with dual clutch gearbox 0B5

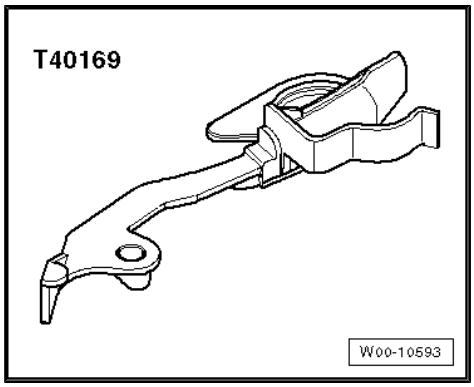
Special tools and workshop equipment required

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

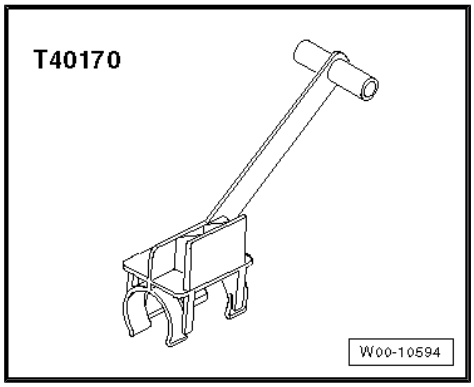


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- Assembly aid - T40169-



- Transport lock - T40170-



Tightening torques

Note

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

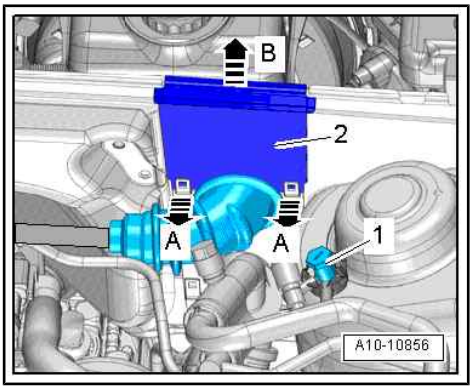
Component		Nm
Bolts/nuts	M6	9
	M7	15
	M8	20
	M10	40
	M12	65

Assembly mountings ⇒ page 82

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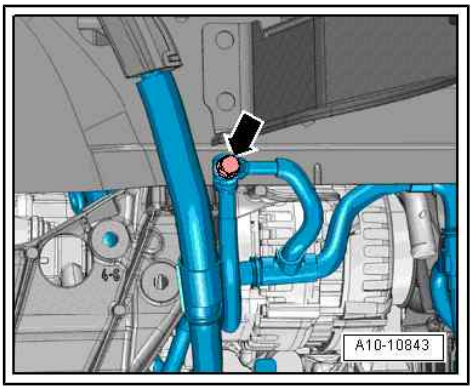
Earth stud at suspension turret - tightening torque

– Tighten earth stud -1- to 9 Nm.



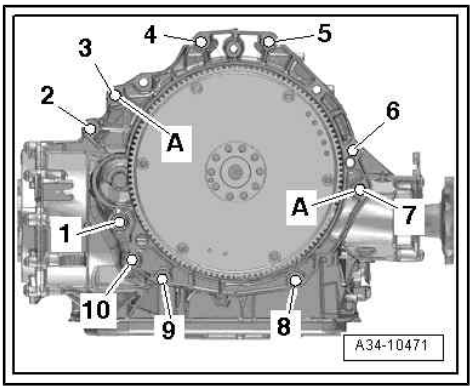
Earth wiring at longitudinal member - tightening torque

– Tighten nut -arrow- to 9 Nm.



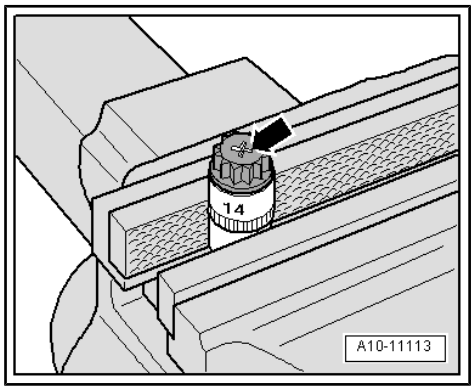
Engine to dual clutch gearbox 0B5

Item	Bolt	Nm
1	M10 x 50 1)	65
2 … 6	M12 x 100 2)	30 + 90°
7	M12 x 125 2)	30 + 90°
8	M10 x 60 2)	15 + 90°
9, 10	M10 x 95 2)	15 + 90°
A	Dowel sleeves for centralising	



Item	Bolt	Nm

- 1) Property class 10.9. The steel bolt may be re-used as often as necessary.
- 2) Aluminium bolts must not be used more often than twice ⇒ page 76 .



- The aluminium bolts -2 … 10- must not be used more often than twice. After first use, bolts must therefore be identified with an “X” made by two chisel marks -arrow-.
- To avoid damaging the bolts when making this mark, do not clamp them directly in a vice. Clamp a 14 mm socket with 1/2" drive in a vice and insert the bolt as shown.
- Bolts already marked with an “X” must not be used again.

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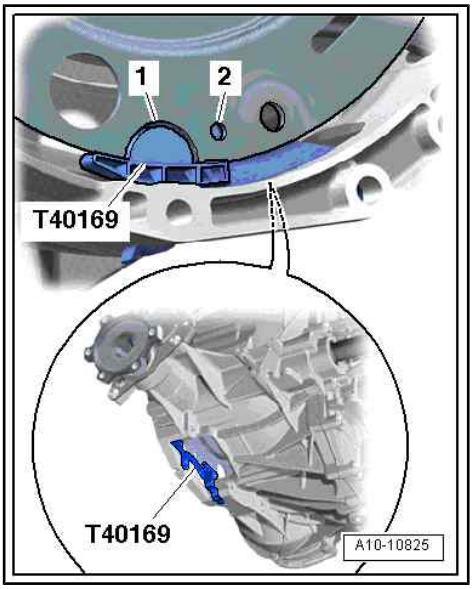
Procedure

Note

- *Renew the bolts tightened with specified tightening angle.*
- *Renew self-locking nuts and bolts as well as seals, gaskets and O-rings.*
- *On vehicles with dual clutch gearbox 0B5, a needle bearing is fitted in the drive plate. Before installing, check that the needle bearing is fitted. Removing and installing needle bearing in drive plate (pressing in and out) ⇒ page 117 .*
- *Hose connections and air pipes and hoses must be free of oil and grease before assembly.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *To secure the air hoses at their connections, spray rust remover onto the worm thread of the used hose clips before installing.*
- *Fit all cable ties in the original positions when installing.*

– Install engine supports and engine mountings ⇒ page 82 .
– Hold ATF lines in installation position when joining engine and subframe.
– Before installing gearbox, always clean threaded holes for engine/gearbox bolts in cylinder block using a thread tap.

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

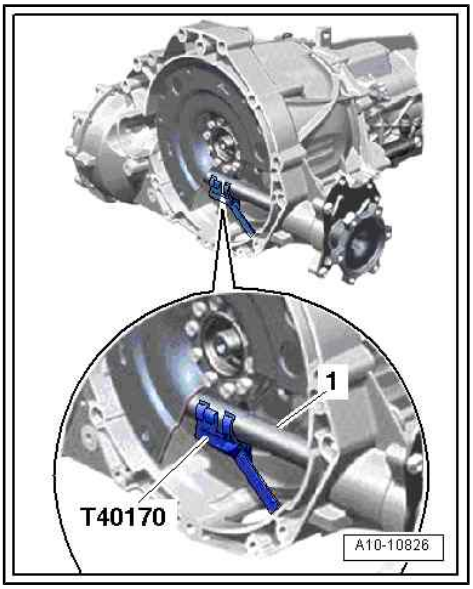


Note

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

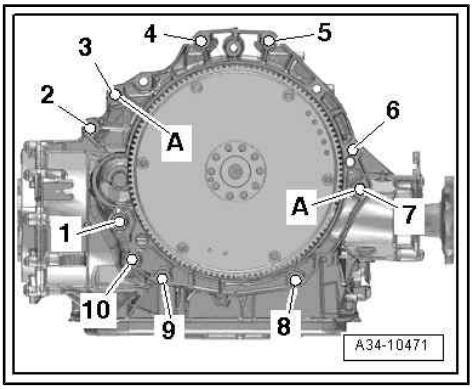
– Insert pin of assembly aid into hole on gearbox housing.

– Insert transport lock - T40170- into gearbox housing and clamp onto flange shaft -1-.



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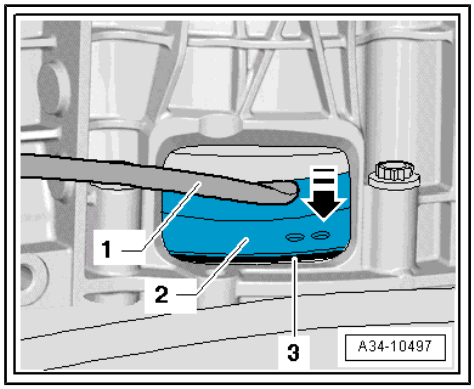
– Check whether dowel sleeves -A- for centring engine and gearbox are fitted in cylinder block; install missing dowel sleeves.
– Check whether aluminium bolts securing engine to gearbox can be reused; if so, apply marking ⇒ page 76 .
– Bring gearbox into position on engine and tighten bolts -1, 6 … 10-.
– Remove transport lock - T40170- and assembly aid - T40169- .



Note

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

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

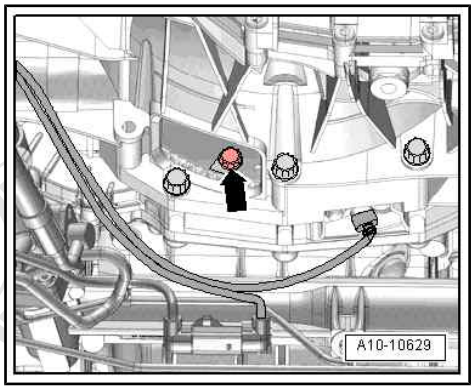


– Bolt clutch module onto drive plate as follows:

Note

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

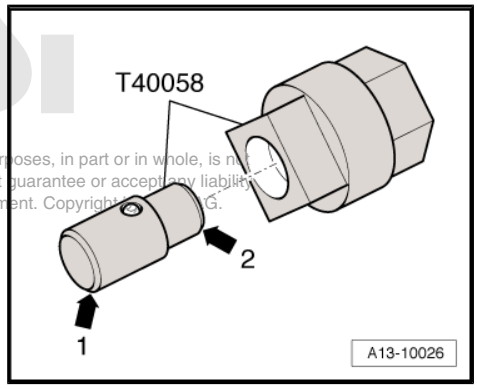
– Hand-tighten first bolt -arrow- (2 Nm).



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

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

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– Use adapter - T40058- and angled ring spanner to turn crankshaft 180° further in direction of engine rotation -arrow-.

– Tighten bolt accessible in this crankshaft position to specified torque ⇒ Rep. gr. 34 ; Removing and installing gearbox; Tightening torques for gearbox .

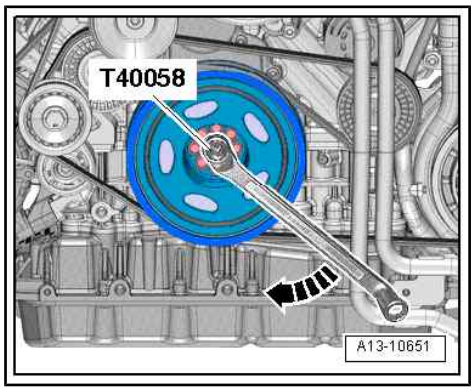
– Turn crankshaft by 60° each time and tighten remaining 5 bolts to specified torque ⇒ Rep. gr. 34 ; Removing and installing gearbox; Tightening torques for gearbox .

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

– Install coolant circulation pump - V50- ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit .

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

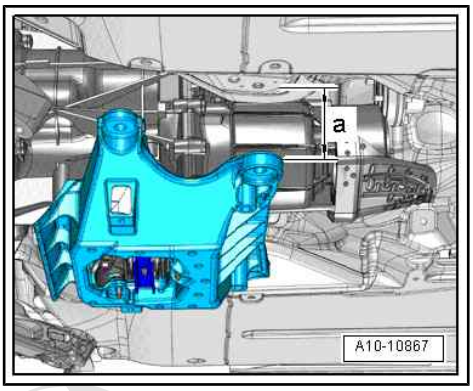
– Secure drive shafts (left and right) to gearbox flange shafts ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Exploded view - drive shaft .



– Install catalytic converters: left-side ⇒ page 395 , right-side ⇒ page 395 .

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

• Dimension -a- = min. 100 mm.

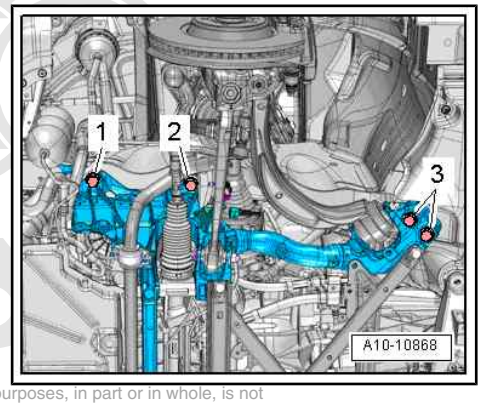


– Install selector lever cable and adjust it if necessary ⇒ Rep. gr. 34 ; Selector mechanism; Removing and installing selector lever cable .

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

– Align subframe and gearbox carrier on longitudinal members according to markings made before removal.

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



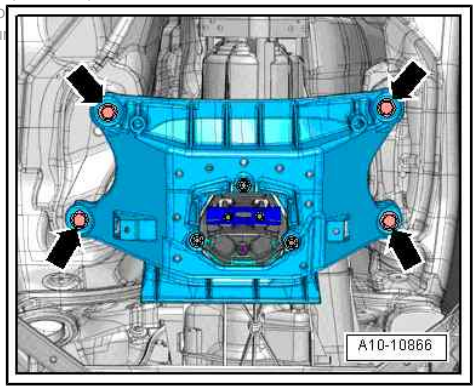
WARNING

Risk of accident if bolted connections are loose.

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

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– Tighten bolts -arrows- for tunnel cross member ⇒ Rep. gr. 34 ; Assembling mountings .



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

– Secure intermediate steering shaft to steering rack ⇒ Running gear, axles, steering; Rep. gr. 48 ; Steering column; Removing and installing intermediate steering shaft .

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

– Install front silencers ⇒ page 388 .

– Align the exhaust system so it is free of stress ⇒ page 392 .

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

– Install subframe cross brace and anti-roll bar ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Exploded view - subframe .

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

– Install diagonal struts ⇒ Running gear, axles, steering; Rep. gr. 42 ; Subframe; Exploded view - subframe .

– Install brake calipers ⇒ Brake system; Rep. gr. 46 ; Front brakes; Removing and installing brake caliper .

– Install engine control unit ⇒ page 362 .

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- Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- Install electrical wiring, terminal 30 wiring junction 2 - TV22- and cover for electronics box in engine compartment ⇒ page 75 , ⇒ page 75 ⇒ Electrical system; Rep. gr. 97 ; Relay carriers, fuse carriers, electronic boxes; Overview of fitting locations - relay carriers, fuse carriers, electronic boxes .
- Install body brace ⇒ Running gear, axles, steering; Rep. gr. 40 ; Suspension strut, upper links; Removing and installing body brace .
- Install filler neck for washer fluid reservoir ⇒ Electrical system; Rep. gr. 92 ; Windscreen washer system; Exploded view - windscreen washer system .
- Install refrigerant lines ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit; Removing and installing refrigerant lines with internal heat exchanger .
- 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.

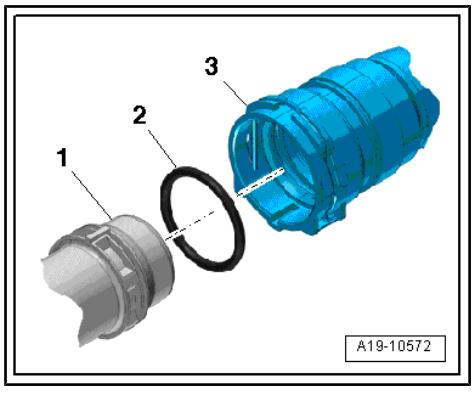
- ***Never use battery charging equipment for boost starting.***

- Install fuel supply hose and air cleaner housing ⇒ page 342 .
- Install lock carrier braces ⇒ General body repairs, exterior; Rep. gr. 50 ; Lock carrier .
- Fill up with engine oil and check oil level ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .
- Before starting engine, top up hydraulic fluid in power steering reservoir ⇒ Running gear, axles, steering; Rep. gr. 48 ; Hydraulic power steering; Checking power steering fluid level .

Note

The power steering pump must not be run when dry.

- Connect coolant hose with plug-in connector ⇒ page 281 .
- Fill up with coolant ⇒ page 243 .



Note

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

- Charge refrigerant system ⇒ Air conditioner with refrigerant R134a; Rep. gr. 87 ; Refrigerant circuit .

– Install wheel housing liners ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front) .
– Fit front wheels ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres; Tightening torque for wheel bolts .
– Perform wheel alignment ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheel alignment .

WARNING

Risk of accident if bolted connections are loose.

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

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

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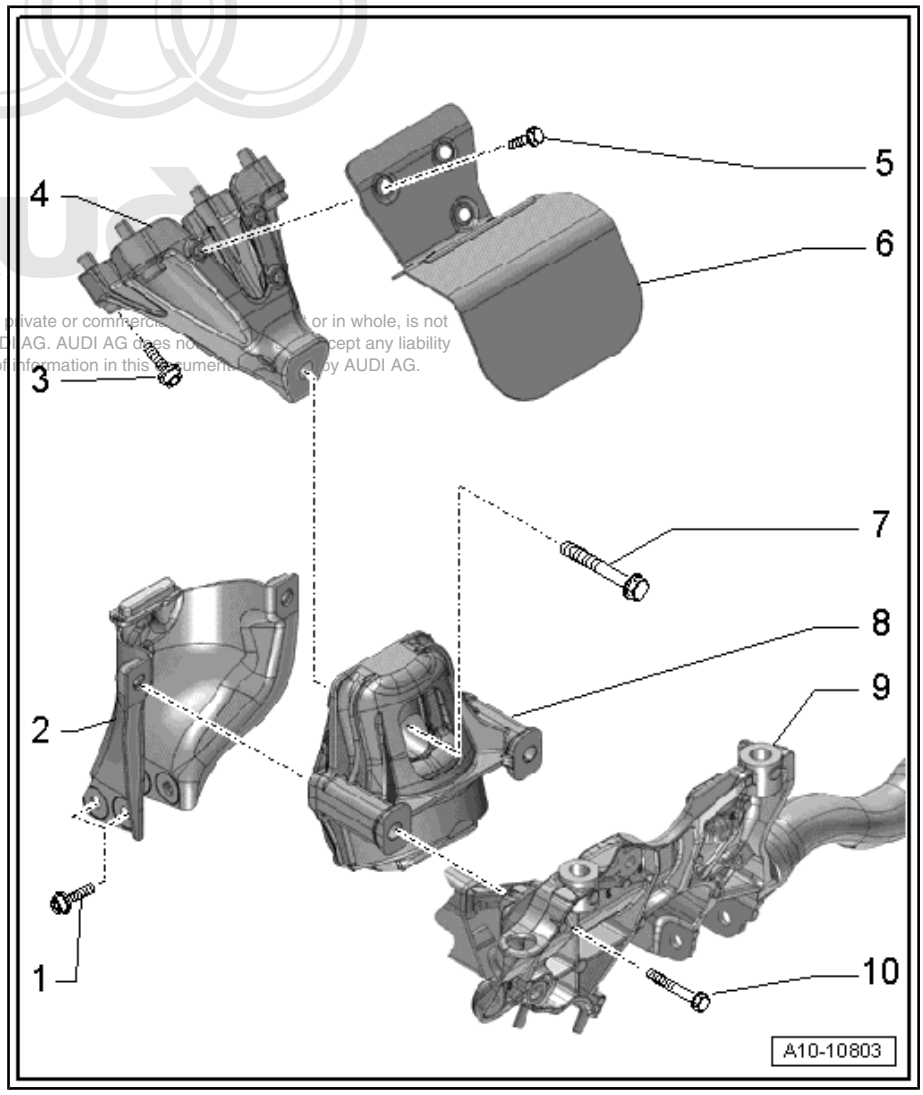
2 Assembly mountings

⇒ “2.1 Exploded view - assembly mountings”, page 82

⇒ “2.2 Removing and installing engine mounting (left-side)”, page 83

⇒ “2.3 Removing and installing engine mounting (right-side)”, page 86

2.1 Exploded view - assembly mountings



1 - Bolt
- ❑ 20 Nm

2 - Bracket
- ❑ For engine mounting
- ❑ Renew bracket if engine mounting is defective
- ❑ Check bracket 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
- ❑ Removing and installing: left-side ⇒ page 83 , right-side ⇒ page 86
- ❑ Renew in pairs

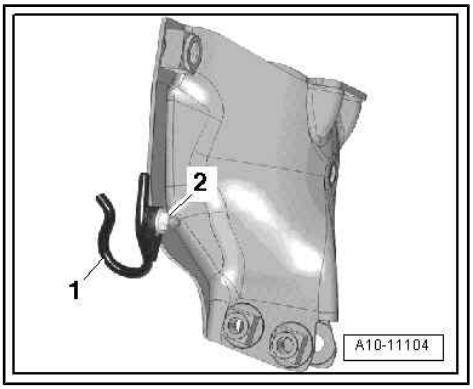
9 - Subframe

10 - Bolt
- ❑ 55 Nm

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Bracket for hydraulic hose (vehicles with hydraulic power steering) - tightening torque

– Tighten nut -2- for bracket -1- for hydraulic hose to 9 Nm.



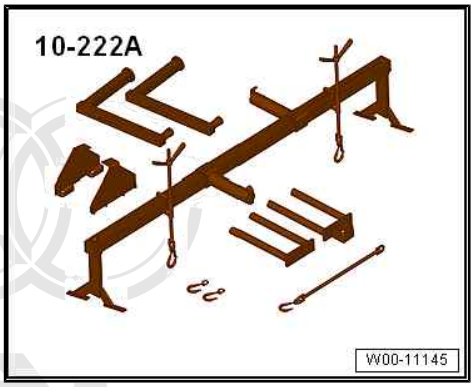
2.2 Removing and installing engine mounting (left-side)

Note

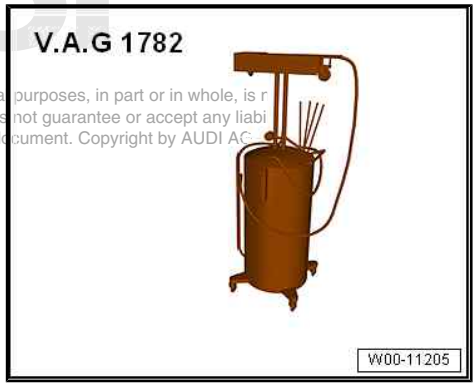
- *To avoid repeat repairs, proceed as follows if an engine mounting is defective:*
- *Renew engine mounting and corresponding bracket.*
- *Also renew engine mounting on opposite side; check corresponding bracket and renew if necessary.*

Special tools and workshop equipment required

- Support bracket - 10 - 222 A-

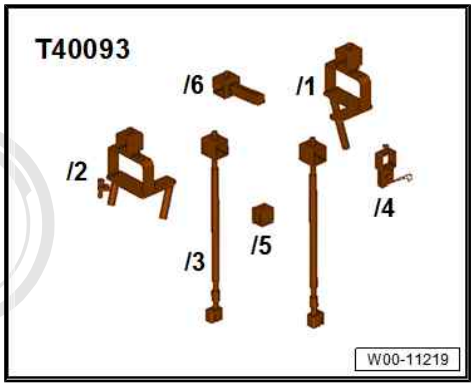


- Used oil collection and extraction unit - V.A.G 1782-



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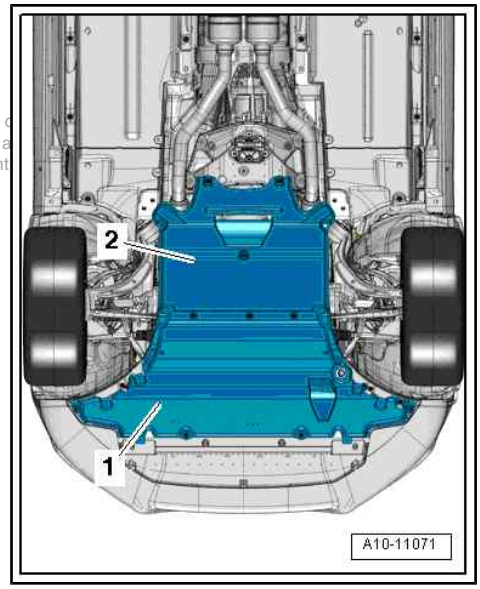
♦ Engine support bracket (supplementary set) - T40093-



Removing

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

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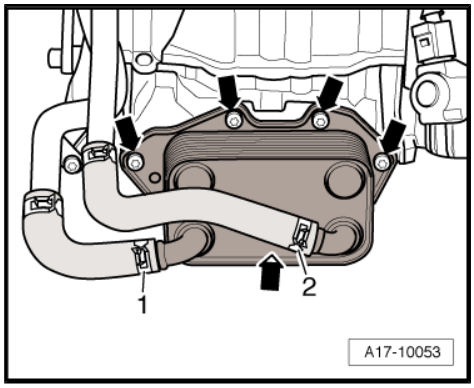


– Position used oil collection and extraction unit - V.A.G 1782- below engine.

– Remove bolts -arrows- and tie up engine oil cooler to one side with coolant hoses -1- and -2- attached.

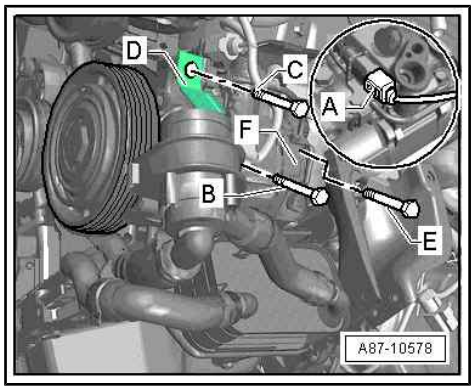
Vehicles with continued coolant circulation pump -V51- :

– Remove continued coolant circulation pump -V51- ⇒ page 254 and engine oil cooler ⇒ page 219 .

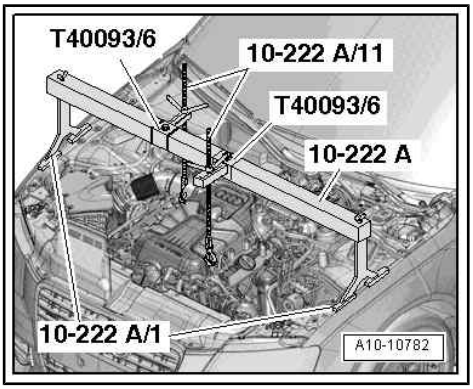


All vehicles (continued):

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

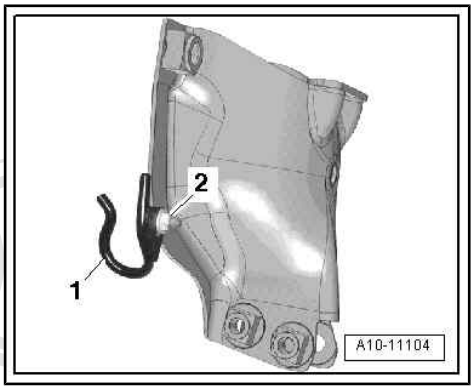


– Set up support bracket - 10 - 222 A- with adapter -T40093/6- on suspension turrets (left and right) as illustrated.
– Engage spindles -10 - 222 A /11- at engine lifting eyes (left and right).
– Partly take up weight of engine with spindles.



Vehicles with hydraulic power steering:

– Remove nut -2- and move bracket -1- clear.

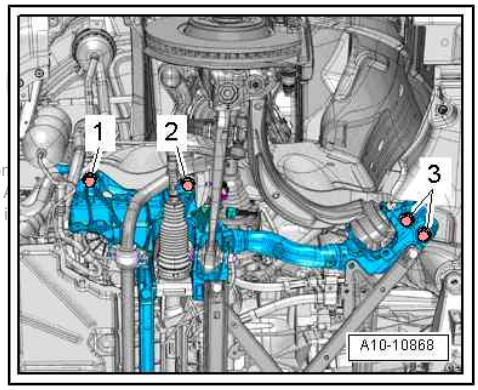


All vehicles (continued):

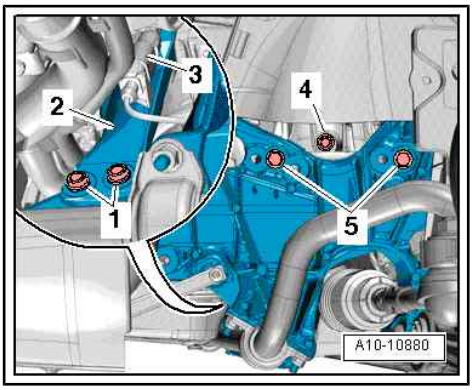
– Remove bolt -2- for subframe (left-side).

Note

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



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



Installing

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

Tightening torques

- ⇒ “2.1 Exploded view - assembly mountings”, page 82 .
- ⇒ Fig. ““Bracket for hydraulic hose (vehicles with hydraulic power steering) - tightening torque”“ , page 83 .

Note

Renew the bolts tightened with specified tightening angle.

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Further specific information

– Secure subframe ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Exploded view - subframe .
– Install air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Removing and installing air conditioner compressor .
– Install engine oil cooler ⇒ page 219 .
– Install noise insulation panels ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .

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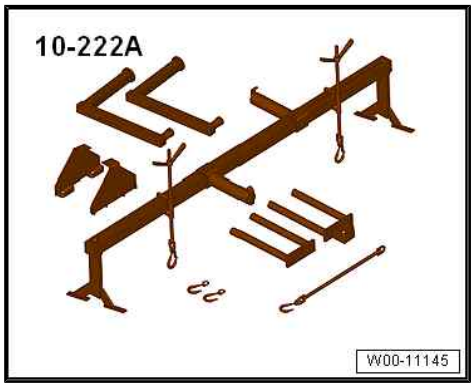
2.3 Removing and installing engine mounting (right-side)

Note

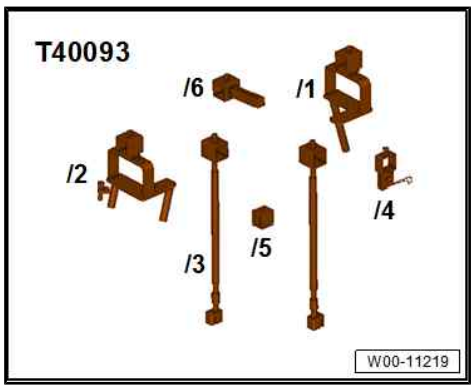
- *To avoid repeat repairs, proceed as follows if an engine mounting is defective:*
- *Renew engine mounting and corresponding bracket.*
- *Also renew engine mounting on opposite side; check corresponding bracket and renew if necessary.*

Special tools and workshop equipment required

- Support bracket - 10 - 222 A-



- Engine support bracket (supplementary set) - T40093-



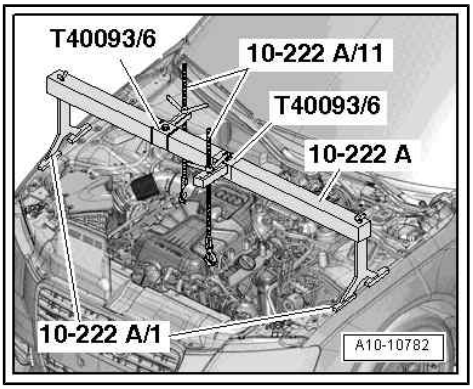
Removing

– Set up support bracket - 10 - 222 A- with adapter -T40093/6- on suspension turrets (left and right) as illustrated.

– Engage spindles -10 - 222 A /11- at engine lifting eyes (left and right).

– Partly take up weight of engine with spindles.

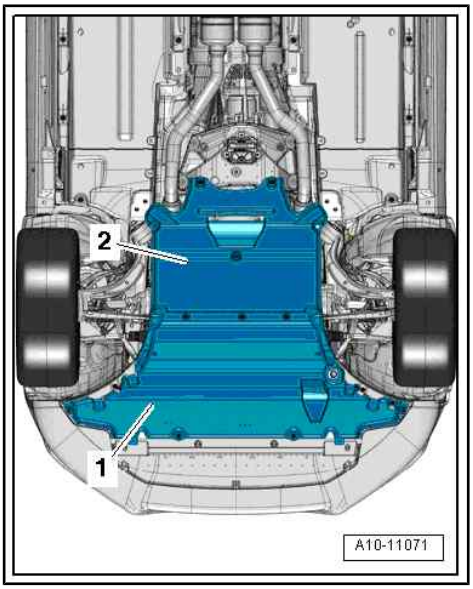
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– Remove front right wheel.

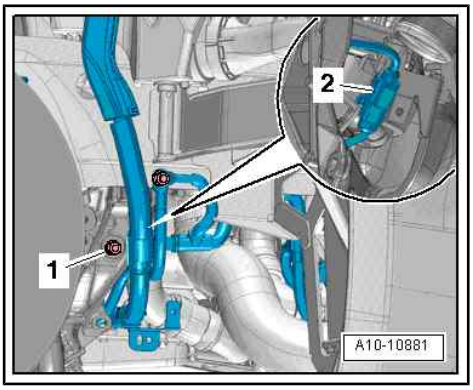
– Remove wheel housing liner (front right) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front) .

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

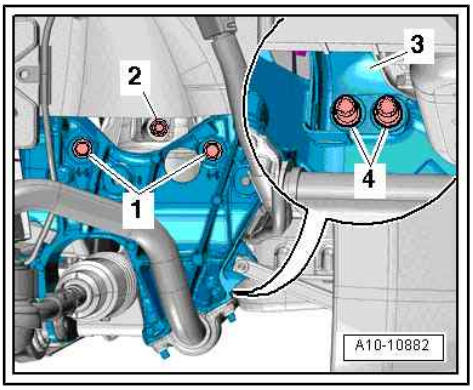


– Detach electrical connector -2- on solenoid valve (right-side) for electro-hydraulic engine mounting - N145- from bracket and unplug connector.

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

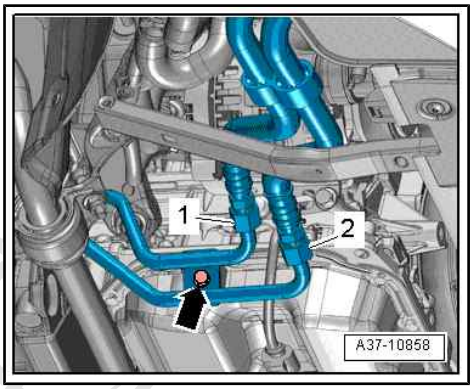


– Remove bolts -1, 2, 4- and move clear retaining plate -3- for engine mounting (right-side).



Vehicles with dual clutch gearbox 0B5:

– Remove bolt -arrow- on bracket for ATF lines.



Note

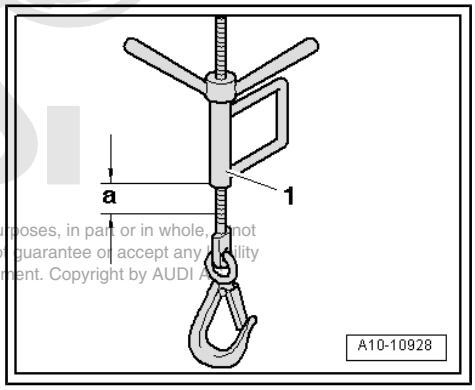
Disregard -items 1, 2-.

All vehicles (continued):

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

• Distance -a- = approx. 20 mm.

– Detach engine mounting (right-side).



Installing

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

• Tightening torques ⇒ “2.1 Exploded view - assembly mountings”, page 82

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Note

Renew the bolts tightened with specified tightening angle.

Vehicles with dual clutch gearbox 0B5:

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

All vehicles (continued):

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

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

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

13 – Crankshaft group

1 Cylinder block (pulley end)

⇒ “1.1 Exploded view - poly V-belt drive”, page 89

⇒ “1.2 Removing and installing poly V-belt”, page 94

⇒ “1.3 Removing and installing tensioner for poly V-belt”, page 101

⇒ “1.4 Removing and installing vibration damper”, page 105

⇒ “1.5 Removing and installing sealing flange (pulley end)”, page 109

1.1 Exploded view - poly V-belt drive

⇒ “1.1.1 Exploded view - poly V-belt drive for supercharger”, page 89

⇒ “1.1.2 Exploded view - poly V-belt drive for vehicles with hydraulic power steering”, page 90

⇒ “1.1.3 Exploded view - poly V-belt drive for vehicles with electromechanical power steering”, page 93

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1.1.1 Exploded view - poly V-belt drive for supercharger

1 - Poly V-belt for supercharger

- ❑ Check for wear
- ❑ Removing and installing ⇒ “1.2.1 Removing and installing poly V-belt for supercharger”, page 94
- ❑ When installing, make sure it is properly seated on pulleys

2 - Bolt

- ❑ 40 Nm
- ❑ 37 Nm if using door alignment tool - 3320-

3 - Washer

4 - Cover

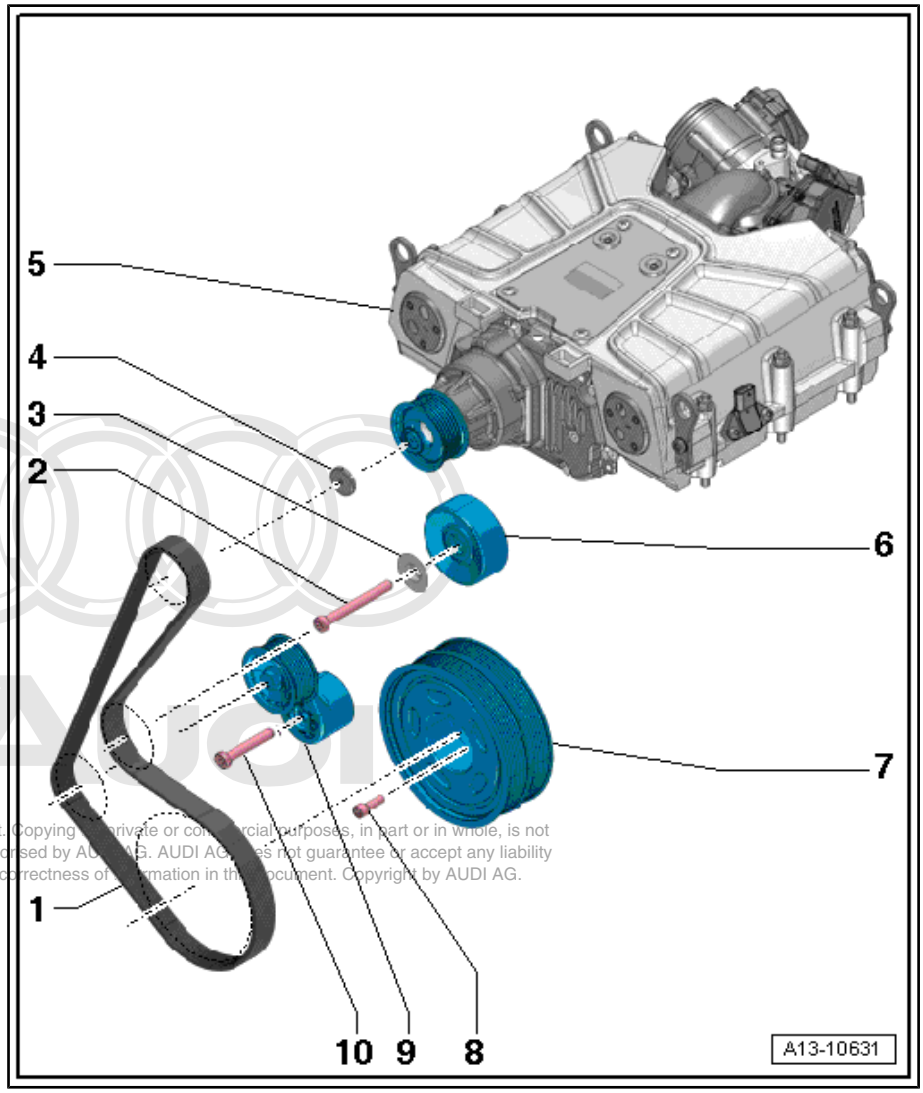
5 - Supercharger

- ❑ Exploded view ⇒ “2.1 Exploded view - supercharger”, page 307

6 - Idler roller for poly V-belt

7 - Vibration damper

- ❑ With double-sided poly V-belt pulley
- ❑ Can only be installed in one position (holes are off-set).
- ❑ Removing and installing ⇒ “1.4 Removing and installing vibration damper”, page 105



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8 - Bolt

- ❑ Tightening torque ⇒ Item 2 (page 91)

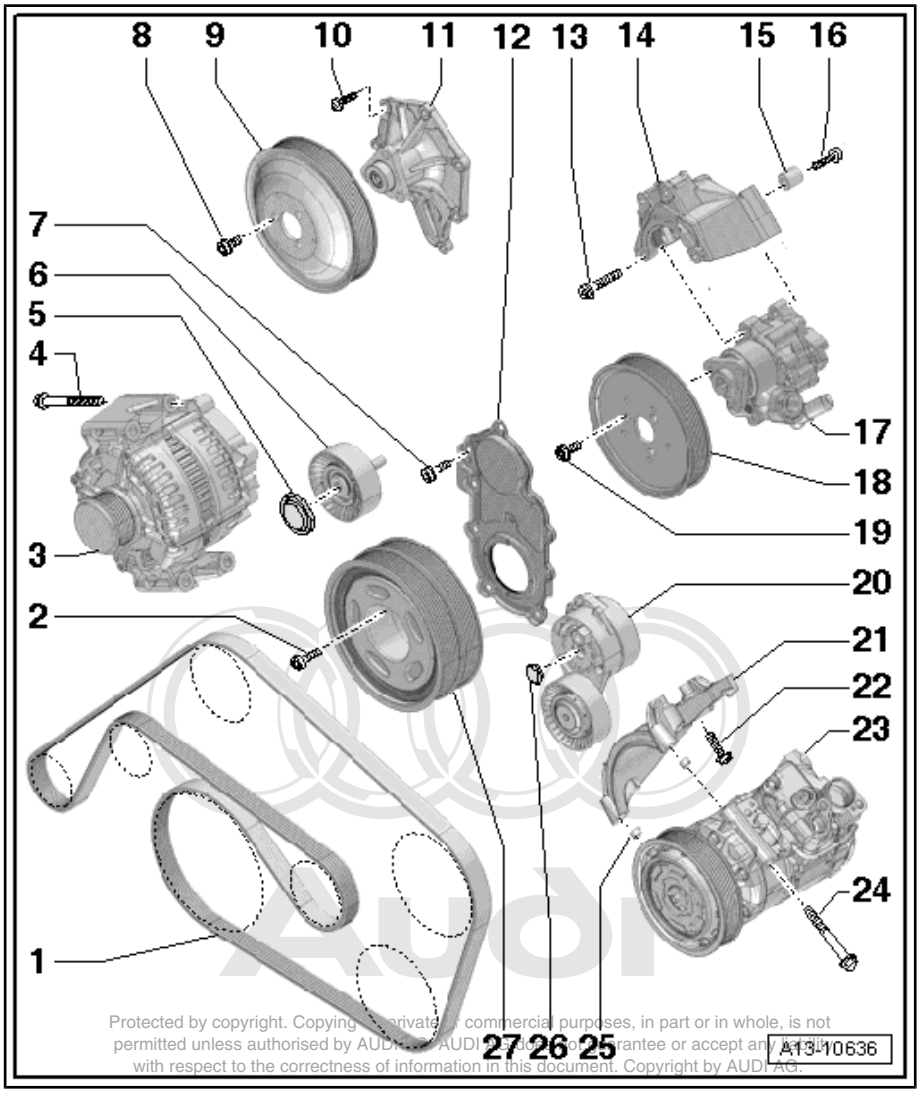
9 - Poly V-belt tensioner

- ❑ Removing and installing ⇒ “1.3.1 Removing and installing poly V-belt tensioner for supercharger”, page 101

10 - Bolt

- ❑ 40 Nm

1.1.2 Exploded view - poly V-belt drive for vehicles with hydraulic power steering



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1 - Poly V-belt

- ❑ Check for wear
- ❑ Before removing, mark direction of rotation with chalk or felt-tip pen
- ❑ Removing and installing ⇒ “1.2.2 Removing and installing poly V-belt - vehicles with hydraulic power steering”, page 96
- ❑ Do not kink
- ❑ When installing, make sure it is properly seated on pulleys

2 - Bolt

- ❑ Renew
- ❑ 20 Nm +90°

3 - Alternator

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

4 - Bolt

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

5 - Cover for idler roller

6 - Idler roller for poly V-belt

- ❑ 40 Nm
- ❑ 37 Nm if using door alignment tool - 3320-

7 - Bolt

- ❑ Tightening torque and sequence ⇒ Fig. ““Sealing flange (pulley end) - tightening torque and sequence”“ , page 93

8 - Bolt

- ❑ Tightening torque ⇒ Item 2 (page 251)

9 - Poly V-belt pulley for coolant pump

- ❑ Removing and installing ⇒ “2.4 Removing and installing coolant pump”, page 255

10 - Bolt

- ❑ Tightening torque ⇒ Item 1 (page 251)

11 - Coolant pump

- ❑ Removing and installing ⇒ “2.4 Removing and installing coolant pump”, page 255

12 - Sealing flange (pulley end)

- ❑ Renewing ⇒ “1.5 Removing and installing sealing flange (pulley end)”, page 109

13 - Bolt

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

14 - Bracket for power steering pump

15 - Sliding bush

16 - Bolt

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

17 - Power steering pump

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

18 - Pulley for power steering pump

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

19 - Bolt

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

20 - Poly V-belt tensioner

- ❑ Removing and installing ⇒ “1.3.3 Removing and installing tensioner for poly V-belt - vehicles with hydraulic power steering”, page 103
- ❑ 40 Nm

21 - Bracket for air conditioner compressor

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

22 - Bolt

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

23 - Air conditioner compressor

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

24 - Bolt

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

25 - Dowel sleeve

- ❑ 2x

26 - Cover for tensioner

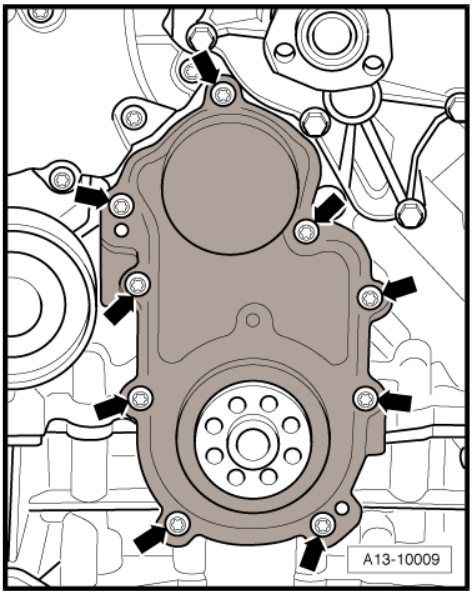
27 - Vibration damper

- ❑ With double-sided poly V-belt pulley
- ❑ Removing and installing ⇒ “1.4 Removing and installing vibration damper”, page 105

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Sealing flange (pulley end) - tightening torque and sequence

– Tighten bolts -arrows- in stages and in diagonal sequence; final torque 9 Nm.



1.1.3 Exploded view - poly V-belt drive for vehicles with electromechanical power steering

1 - Poly V-belt

- ❑ Check for wear
- ❑ Before removing, mark direction of rotation with chalk or felt-tip pen
- ❑ Removing and installing ⇒ “1.2.3 Removing and installing poly V-belt - vehicles with electromechanical power steering”, page 98
- ❑ Do not kink
- ❑ When installing, make sure it is properly seated on pulleys

2 - Alternator

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

3 - Bolt

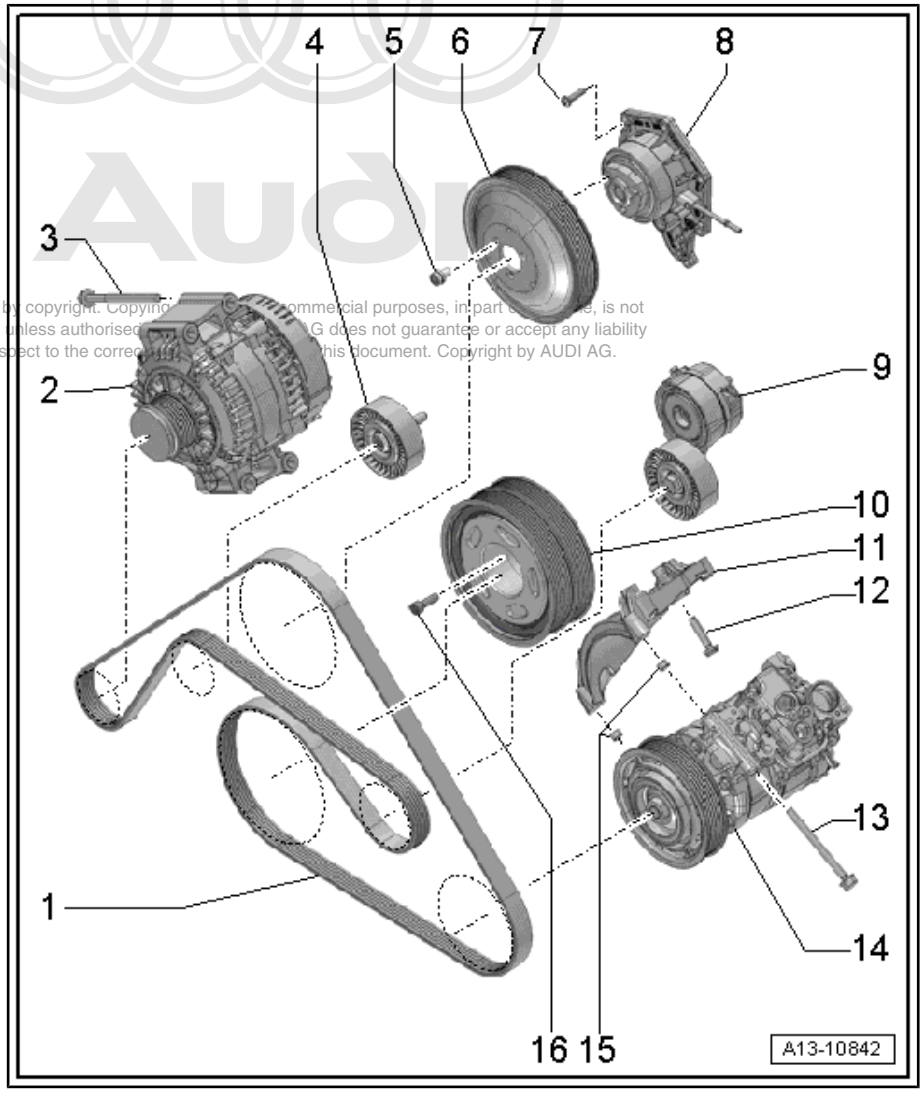
- ❑ Tightening torque ⇒ Electrical system; Rep. gr. 27 ; Alternator; Exploded view - alternator

4 - Idler roller

- ❑ For poly V-belt
- ❑ 40 Nm
- ❑ 37 Nm if using door alignment tool - 3320-

5 - Bolt

- ❑ Tightening torque ⇒ Item 2 (page 251)



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6 - Poly V-belt pulley

- For coolant pump
- Removing and installing ⇒ “2.4 Removing and installing coolant pump”, page 255

7 - Bolt

- Tightening torque ⇒ Item 1 (page 251)

8 - Coolant pump

- Removing and installing ⇒ “2.4 Removing and installing coolant pump”, page 255

9 - Tensioner

- For poly V-belt
- Removing and installing ⇒ “1.3.2 Removing and installing tensioner for poly V-belt - vehicles with electromechanical power steering”, page 101
- 40 Nm

10 - Vibration damper

- With poly V-belt pulley
- Can only be installed in one position (holes are off-set).
- Removing and installing ⇒ “1.4 Removing and installing vibration damper”, page 105

11 - Bracket

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

12 - Bolt

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

13 - Bolt

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

14 - Air conditioner compressor

- Do not unscrew or disconnect refrigerant hoses or pipes.
- Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Removing and installing air conditioner compressor

15 - Dowel sleeve

- 2x

16 - Bolt

- Tightening torque ⇒ Item 2 (page 91)

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1.2 Removing and installing poly V-belt

⇒ “1.2.1 Removing and installing poly V-belt for supercharger”, page 94

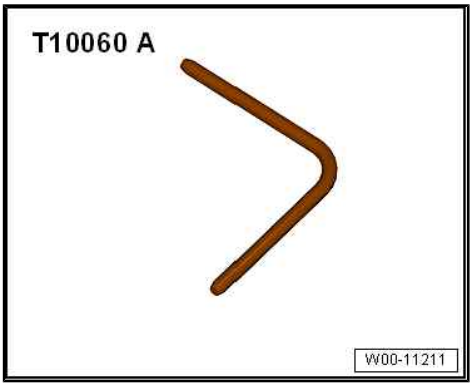
⇒ “1.2.2 Removing and installing poly V-belt - vehicles with hydraulic power steering”, page 96

⇒ “1.2.3 Removing and installing poly V-belt - vehicles with electromechanical power steering”, page 98

1.2.1 Removing and installing poly V-belt for supercharger

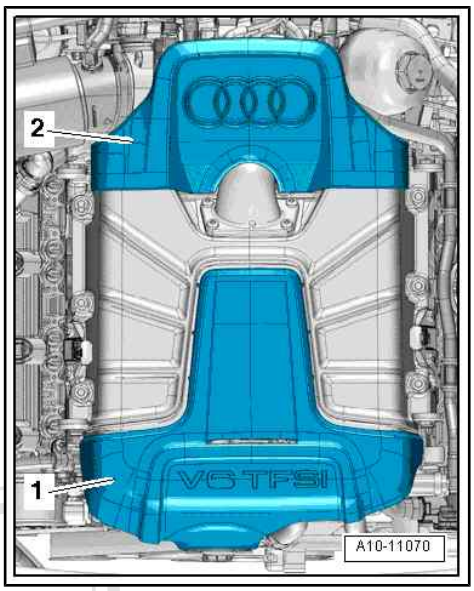
Special tools and workshop equipment required

♦ Locking pin - T10060 A-

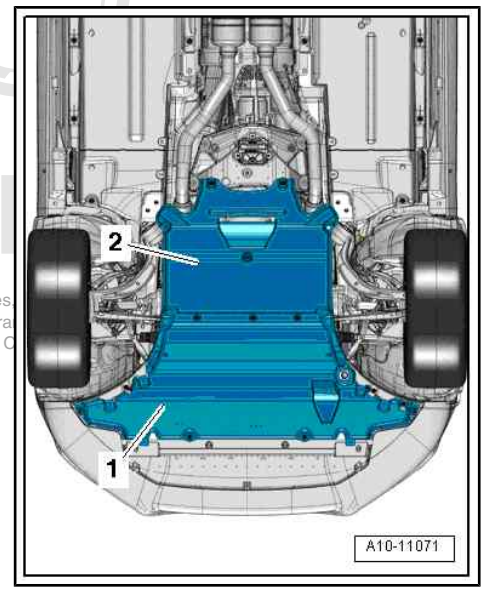


Removing

– Lift off engine cover panel (front) -1-.



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

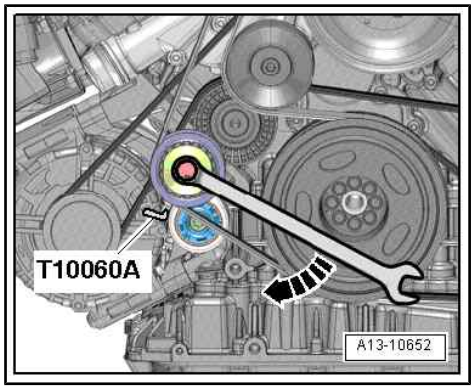


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Caution

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

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



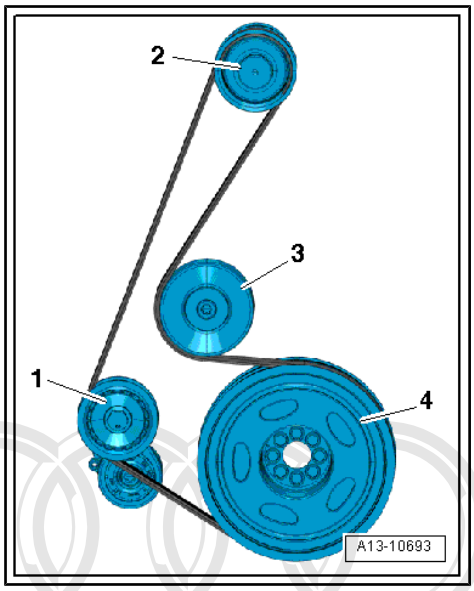
– To slacken poly V-belt turn tensioner in clockwise direction -arrow-.

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

Installing

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

– Fit poly V-belt on pulleys as shown in illustration:



1 - Tensioner

2 - Supercharger

3 - Idler roller

4 - Vibration damper

Note

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

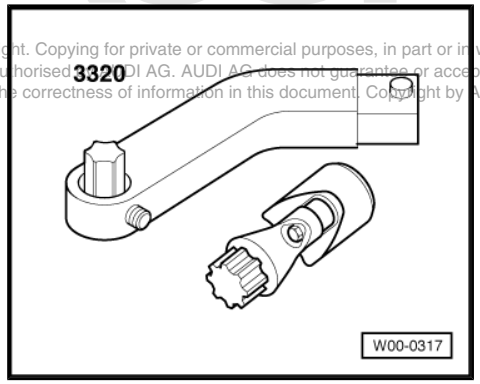
– Start engine and check that belt runs properly.

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

1.2.2 Removing and installing poly V-belt - vehicles with hydraulic power steering

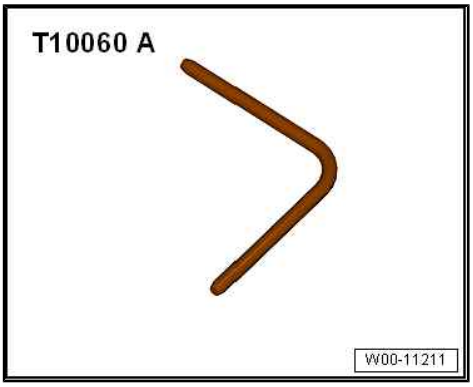
Special tools and workshop equipment required

- Special wrench, long reach -3320/2- (included with door alignment tool - 3320-)



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♦ Locking pin - T10060 A-

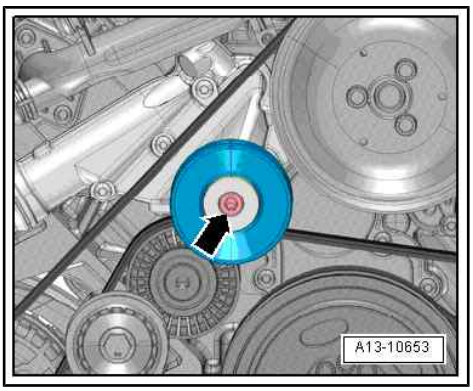


Removing

– Remove poly V-belt for supercharger ⇒ page 94 .

– Remove bolt -arrow- using special wrench, long reach -3320/2- .

– Push guide roller towards radiator cowl.

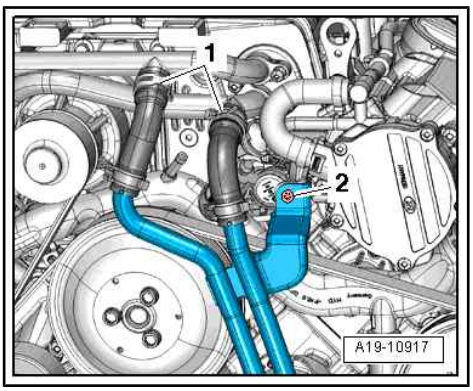


– Remove bolt -2- for coolant pipe (front left).

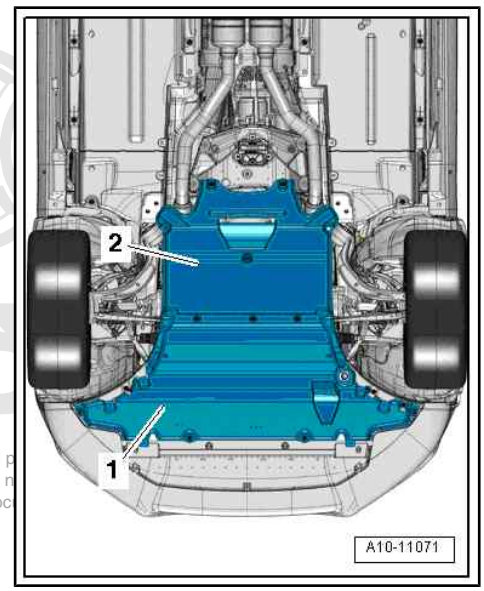
Note

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

♦ *Disregard -item 1-.*

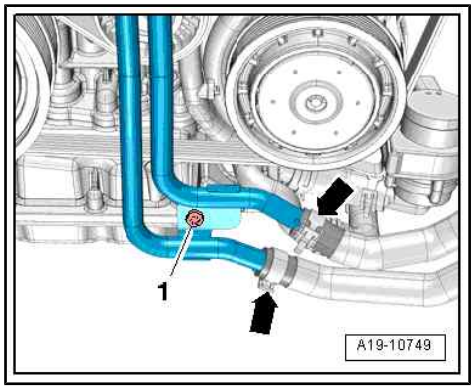


– Remove front noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .



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– Remove bolt -1- for coolant pipes (front left).



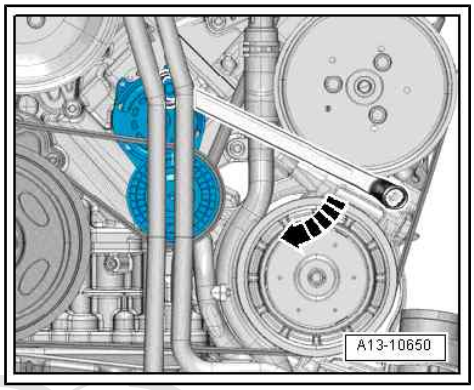
Note

- *For illustration purposes, the installation position is shown with the engine removed.*
- *Disregard -arrows-.*

Caution

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

- ***Mark direction of rotation of poly V-belt with chalk or felt-tip pen for re-installation.***



– To slacken poly V-belt, turn tensioner clockwise -arrow- and lock with locking pin - T10060 A- .

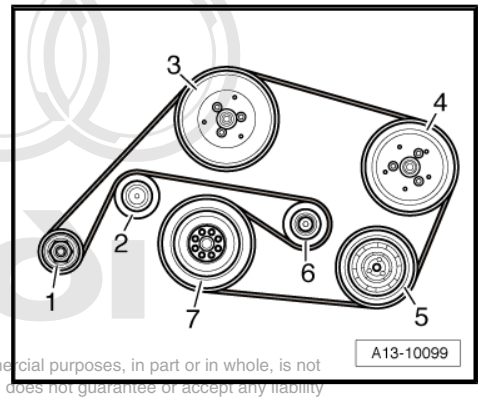
– Remove poly V-belt and release tensioner.

Installing

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

- Tightening torque ⇒ “1.1.2 Exploded view - poly V-belt drive for vehicles with hydraulic power steering”, page 90

– Fit poly V-belt on pulleys as shown in illustration.



1 - Alternator
2 - Idler roller
3 - Coolant pump
4 - Power steering pump
5 - Air conditioner compressor
6 - Tensioner for poly V-belt
7 - Vibration damper

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Note

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

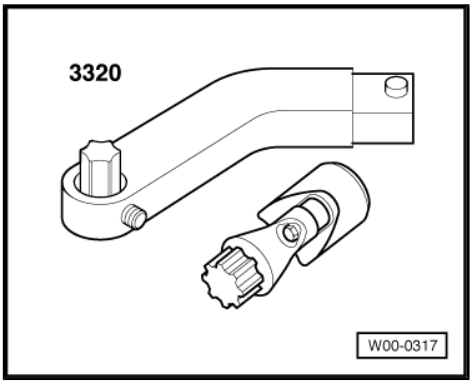
– Start engine and check that belt runs properly.

– Install poly V-belt for supercharger ⇒ page 94 .

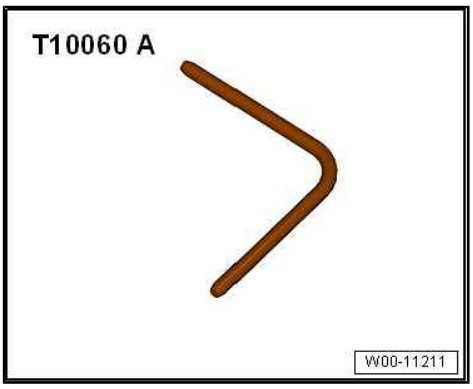
1.2.3 Removing and installing poly V-belt - vehicles with electromechanical power steering

Special tools and workshop equipment required

♦ Special wrench, long reach -3320/2- (included with door alignment tool - 3320-)



♦ Locking pin - T10060 A-

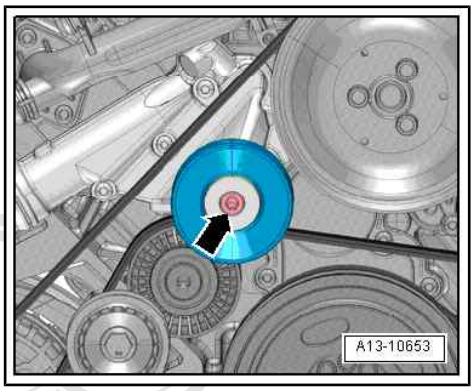


Removing

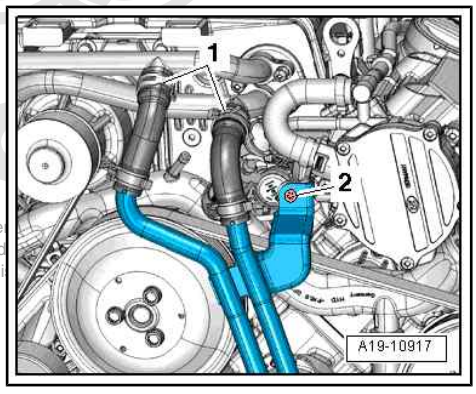
– Remove poly V-belt for supercharger ⇒ page 94 .

– Remove bolt -arrow- using special wrench, long reach -3320/2- .

– Push guide roller towards radiator cowl.



– Remove bolt -2- for coolant pipe (front left).



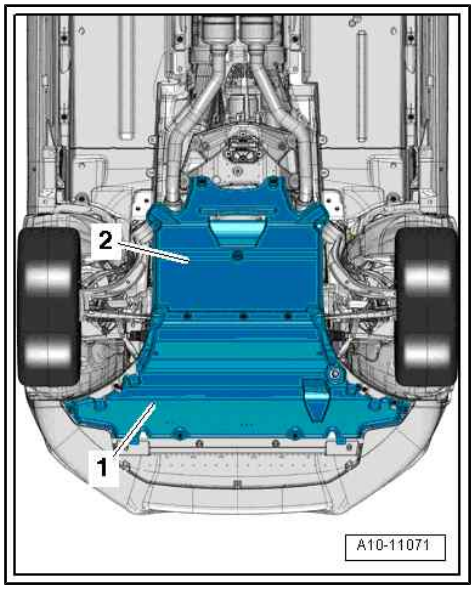
Note

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

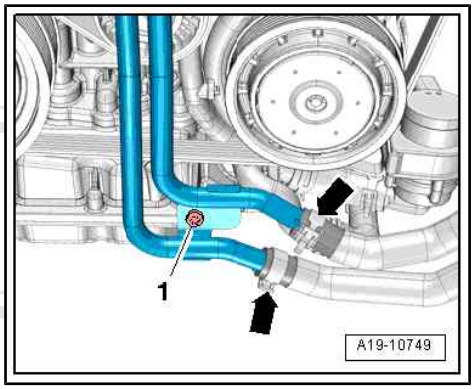
♦ *Disregard -item 1-.*

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



– Remove bolt -1- for coolant pipes (front left).



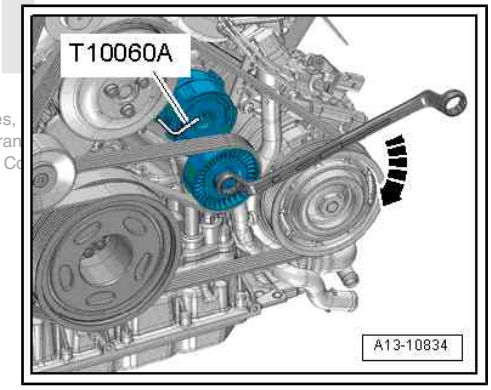
Note

- *For illustration purposes, the installation position is shown with the engine removed.*
- *Disregard -arrows-.*

Caution

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

- ***Mark direction of rotation of poly V-belt with chalk or felt-tip pen for re-installation.***



– To slacken poly V-belt, turn tensioner clockwise -arrow- and lock with locking pin - T10060 A- .

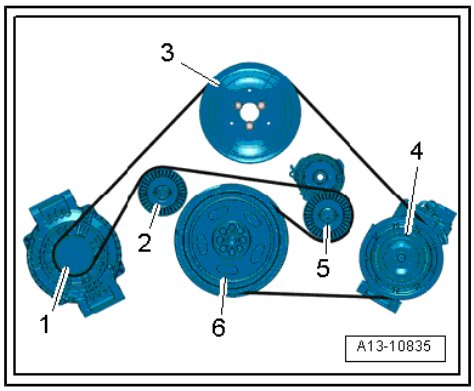
– Take off poly V-belt.

Installing

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

- Tightening torque ⇒ “1.1.1 Exploded view - poly V-belt drive for supercharger”, page 89

– Fit poly V-belt on pulleys as shown in illustration.



1 - Alternator
2 - Idler roller
3 - Coolant pump
4 - Air conditioner compressor

5 - Tensioner for poly V-belt

6 - Vibration damper

Note

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

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– Install coolant pipes (front left) ⇒ page 267 .

– Start engine and check that belt runs properly.

– Install poly V-belt for supercharger ⇒ page 94 .

1.3 Removing and installing tensioner for poly V-belt

⇒ “1.3.1 Removing and installing poly V-belt tensioner for supercharger”, page 101

⇒ “1.3.2 Removing and installing tensioner for poly V-belt - vehicles with electromechanical power steering”, page 101

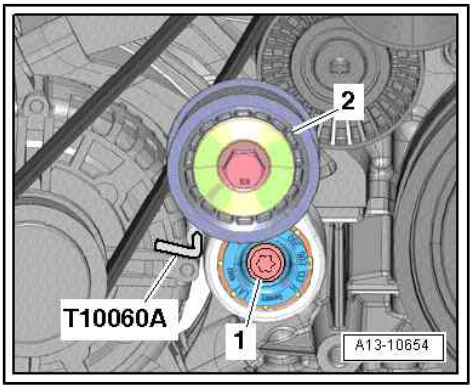
⇒ “1.3.3 Removing and installing tensioner for poly V-belt - vehicles with hydraulic power steering”, page 103

1.3.1 Removing and installing poly V-belt tensioner for supercharger

Removing

– Remove poly V-belt for supercharger ⇒ page 94 .

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



Installing

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

- Tightening torque ⇒ “1.1.1 Exploded view - poly V-belt drive for supercharger”, page 89

– Install poly V-belt for supercharger ⇒ page 94 .

1.3.2 Removing and installing tensioner for poly V-belt - vehicles with electromechanical power steering

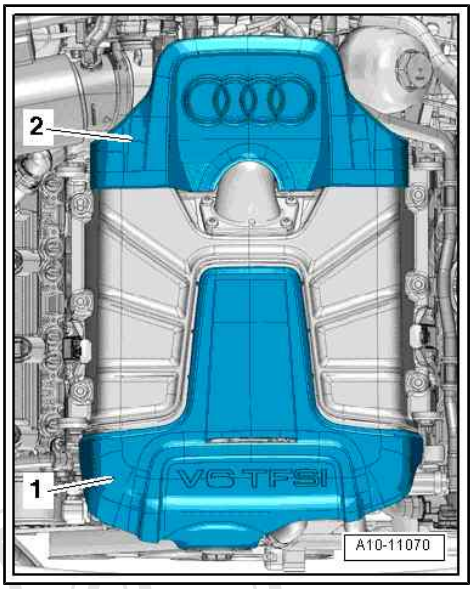
Removing

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.***

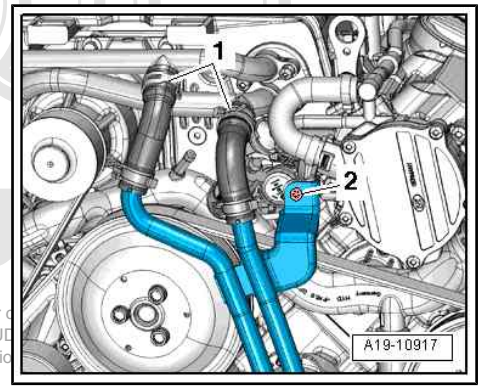
– Lift off engine cover panel (front) -1-.



– Remove bolt -2- for coolant pipe (front left).

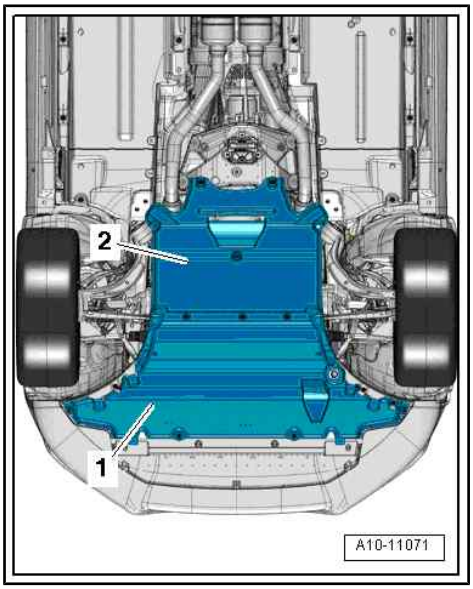
Note

- *For illustration purposes, the installation position is shown with the engine removed.*
- *Disregard -item 1-.*

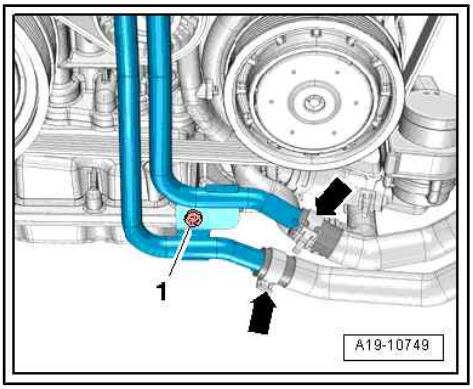


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– Remove front noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .



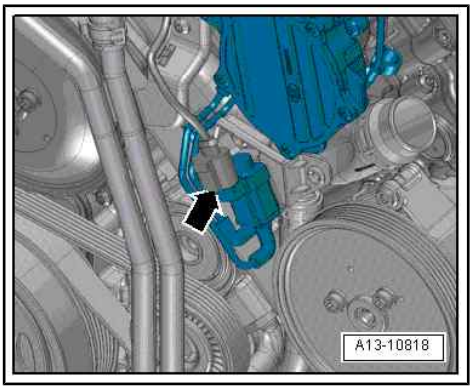
– Remove bolt -1- for coolant pipes (front left).



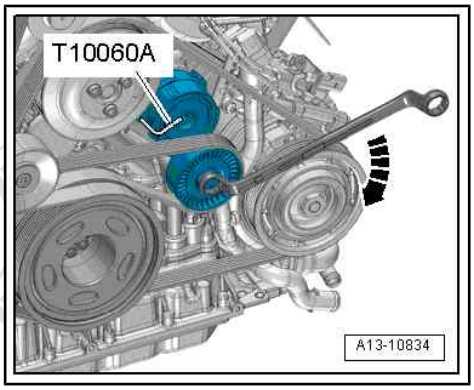
Note

- *For illustration purposes, the installation position is shown with the engine removed.*
- *Disregard -arrows-.*

– Detach coolant valve for cylinder head - N489- -arrow- from bracket and move it clear to the side.



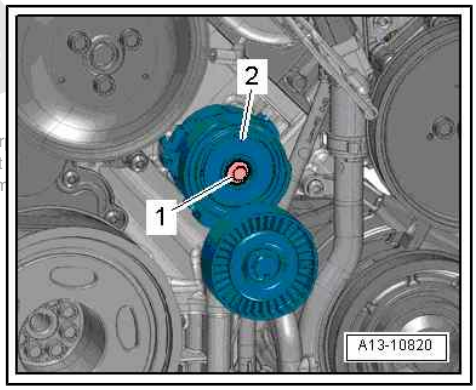
– To slacken poly V-belt turn tensioner in clockwise direction -arrow-.
– Remove poly V-belt from tensioner and release tensioner.



Note

Ignore -T10060 A- .

– Detach cover from tensioner.
– Remove bolt -1- and detach poly V-belt tensioner -2- from cylinder block.



Installing

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

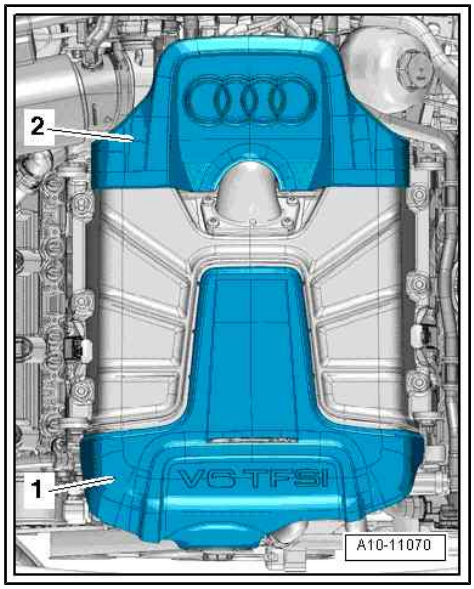
- Tightening torque ⇒ “1.1.3 Exploded view - poly V-belt drive for vehicles with electromechanical power steering”, page 93

– Install poly V-belt ⇒ page 98 .
– Install coolant pipes (front left) ⇒ page 267 .
– Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .

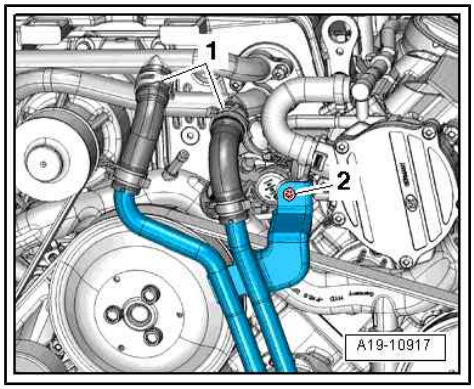
1.3.3 Removing and installing tensioner for poly V-belt - vehicles with hydraulic power steering

Removing

– Lift off engine cover panel (front) -1-.



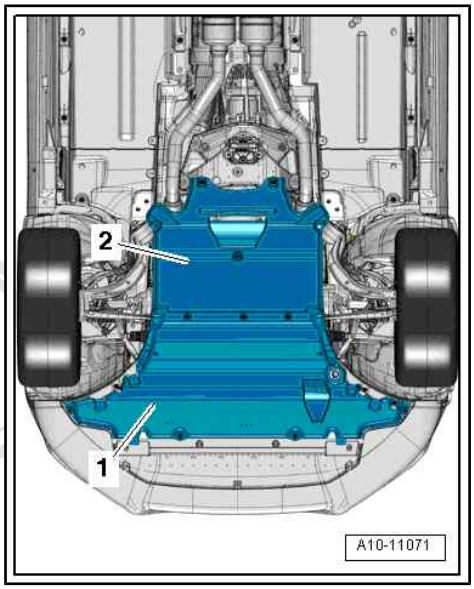
– Remove bolt -2- for coolant pipe (front left).



Note

- *For illustration purposes, the installation position is shown with the engine removed.*
- *Disregard -item 1-.*

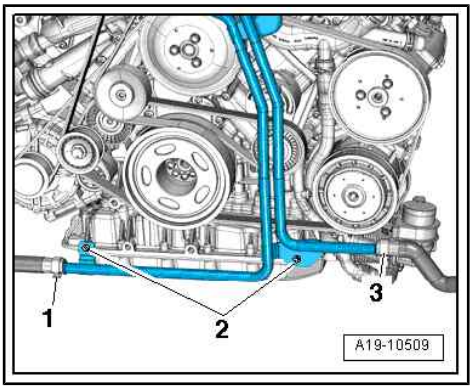
– Remove front noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .



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Vehicles with coolant pipes (front left) (version 1):

– Remove bolts -2- for coolant pipes (front left).

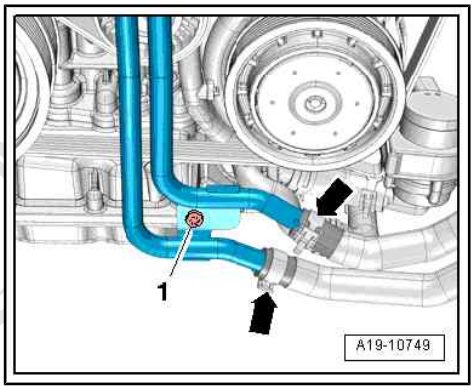


Note

- *For illustration purposes, the installation position is shown with the engine removed.*
- *Disregard -items 1, 3-.*

Vehicles with coolant pipes (front left) (version 2):

– Remove bolt -1- for coolant pipes (front left).



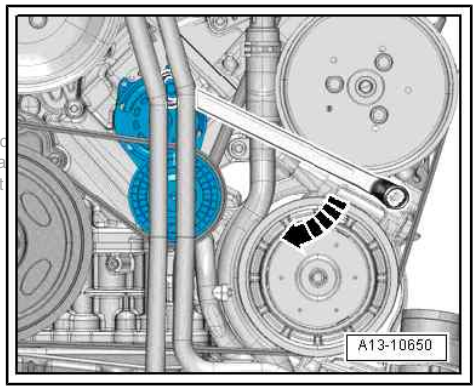
Note

- *For illustration purposes, the installation position is shown with the engine removed.*
- *Disregard -arrows-.*

All vehicles (continued):

– To slacken poly V-belt turn tensioner in clockwise direction -arrow-.

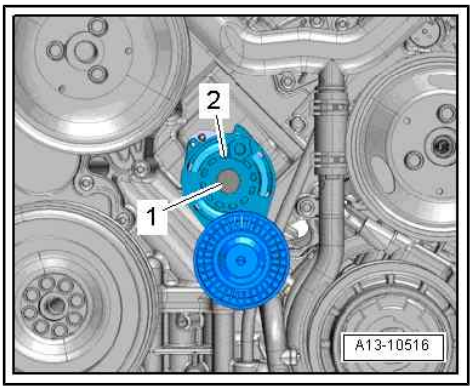
– Remove poly V-belt from tensioner and release tensioner.



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– Detach cover and remove bolt -1- behind it.

– Detach poly V-belt tensioner -2- from cylinder block.



Installing

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

- Tightening torque ⇒ “1.1.2 Exploded view - poly V-belt drive for vehicles with hydraulic power steering”, page 90

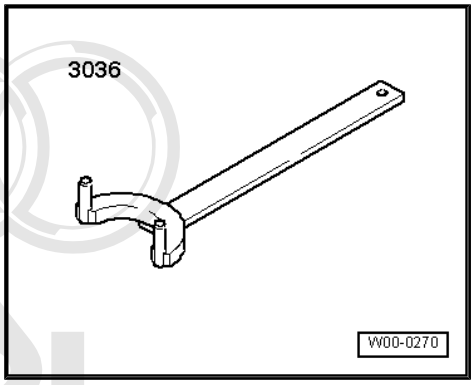
– Install poly V-belt ⇒ page 96 .

– Install coolant pipes (front left) ⇒ page 267 .

1.4 Removing and installing vibration damper

Special tools and workshop equipment required

♦ Counterhold tool - 3036-



Removing

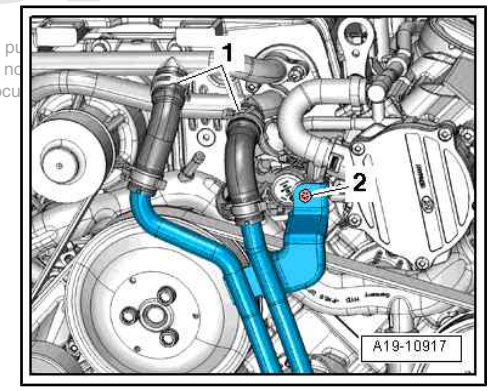
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– Remove poly V-belt for supercharger ⇒ page 94

Note

For illustration purposes, the installation position is shown in the following illustrations with the engine removed.

– Remove bolt -2- for coolant pipes (front left).



Note

Disregard -item 1-.

Note

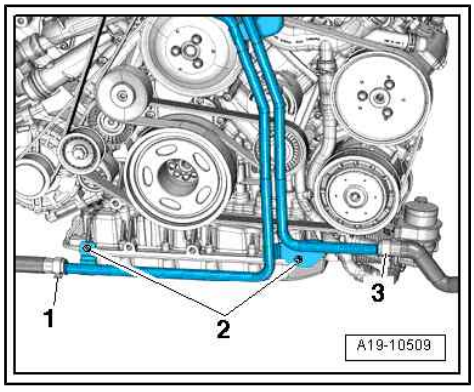
For illustration purposes, the installation position is shown in the following illustrations with the engine removed.

Vehicles with coolant pipes (front left) (version 1):

– Remove bolts -2- for coolant pipes (front left).

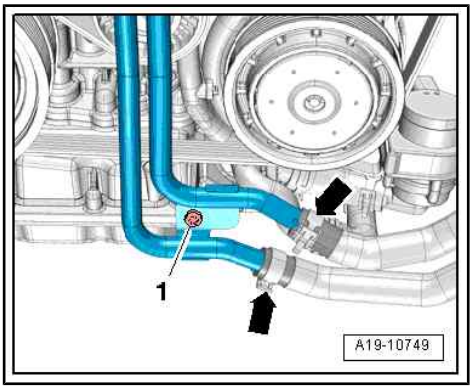
Note

Disregard -items 1, 3-.



Vehicles with coolant pipes (front left) (version 2):

– Remove bolt -1- for coolant pipes (front left).

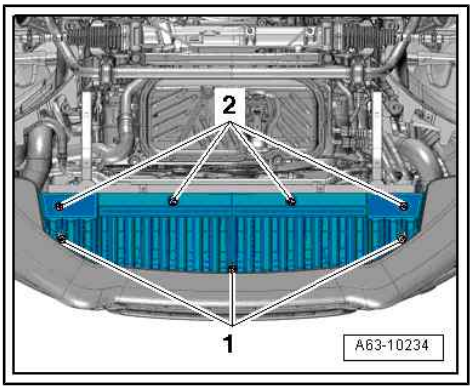


Note

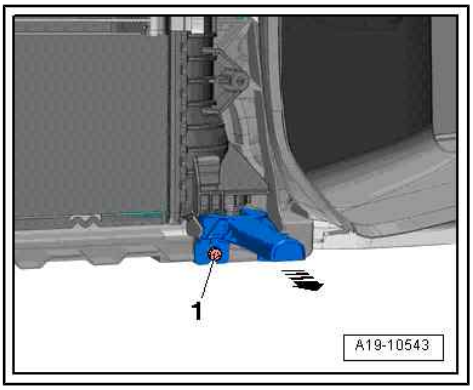
Disregard -arrows-.

All vehicles (continued):

– Remove closure plate at bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover

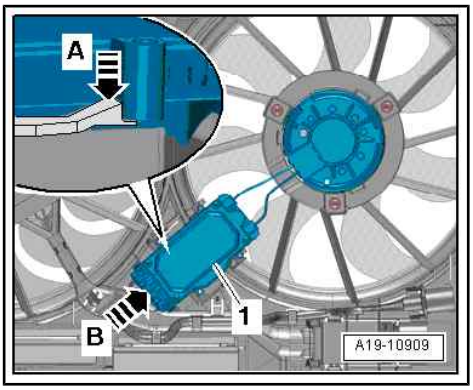


– Remove bolts -1- on both sides and pull off radiator bracket with radiator from lock carrier -arrow- slightly to front.



– Move electrical wiring harness clear.

– Release catch -arrow A-, detach radiator fan control unit 2 - J671- -item 1- from radiator cowl -arrow B- and move clear to one side.

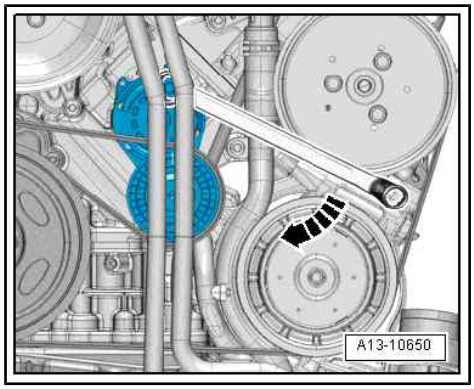


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Vehicles with hydraulic power steering:

– To slacken poly V-belt turn tensioner in clockwise direction -arrow-.

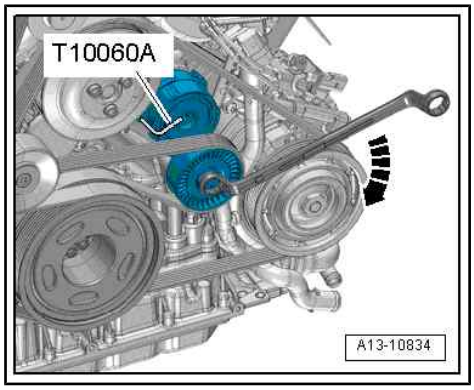
– Remove poly V-belt from vibration damper and release tensioner.



Vehicles with electromechanical power steering:

– To slacken poly V-belt turn tensioner in clockwise direction -arrow-.

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



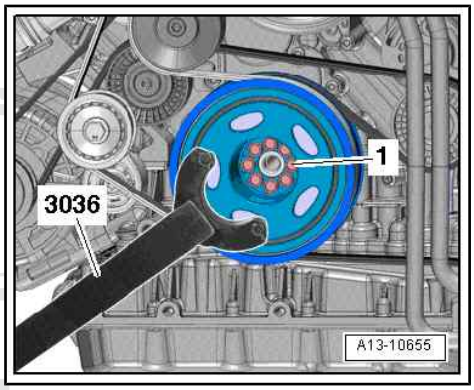
Note

Ignore -T10060 A- .

All vehicles (continued):

– Remove bolts -1- for vibration damper using counterhold tool - 3036- .

– Remove vibration damper.



Installing

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

Tightening torques:

- ⇒ “1.1.2 Exploded view - poly V-belt drive for vehicles with hydraulic power steering”, page 90 .
- ⇒ “1.1.3 Exploded view - poly V-belt drive for vehicles with electromechanical power steering”, page 93 .

Note

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- *Renew the bolts tightened with specified tightening angle.*
- *Can only be installed in one position (holes are off-set)*

– Install radiator bracket with radiator ⇒ page 278 .

– Install closure plate at bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .

– Install coolant pipes (front left) ⇒ page 267 .

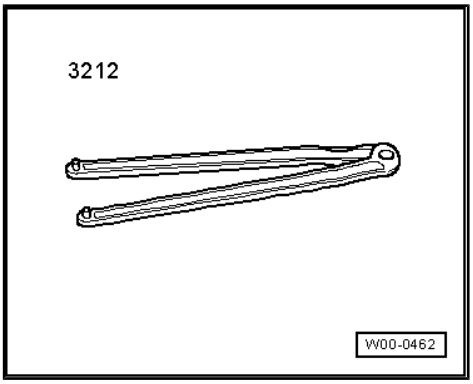
– Install poly V-belt:

- ⇒ “1.2.2 Removing and installing poly V-belt - vehicles with hydraulic power steering”, page 96 .
- ⇒ “1.2.3 Removing and installing poly V-belt - vehicles with electromechanical power steering”, page 98 .

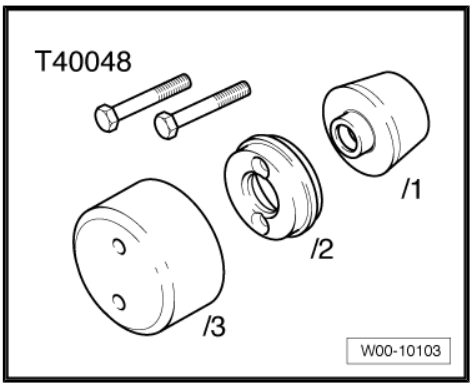
1.5 Removing and installing sealing flange (pulley end)

Special tools and workshop equipment required

- Pin wrench - 3212-



- Assembly tool - T40048-



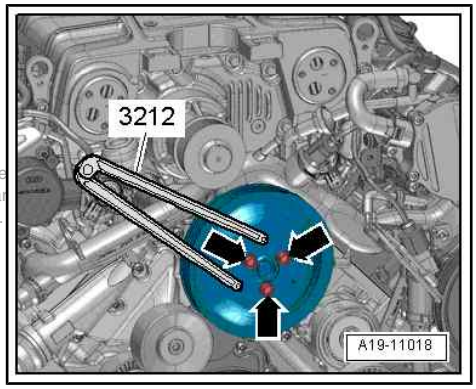
- Electric drill with plastic brush
- Safety goggles
- Sealant ⇒ Electronic parts catalogue

Procedure

- Tightening torque ⇒ Fig. ""Sealing flange (pulley end) - tightening torque and sequence"", page 93

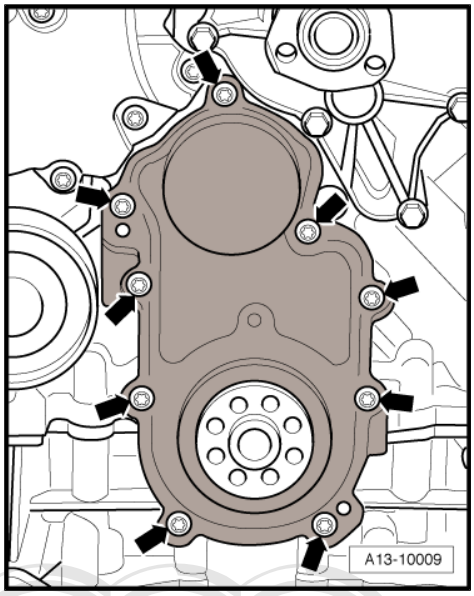
– Remove vibration damper ⇒ page 105 .

– Remove bolts for coolant pump pulley -arrows- (counterhold with pin wrench - 3212-).



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– Remove bolts -arrows-.
– Release sealing flange (pulley end) from bonded joint and take off sealing flange.



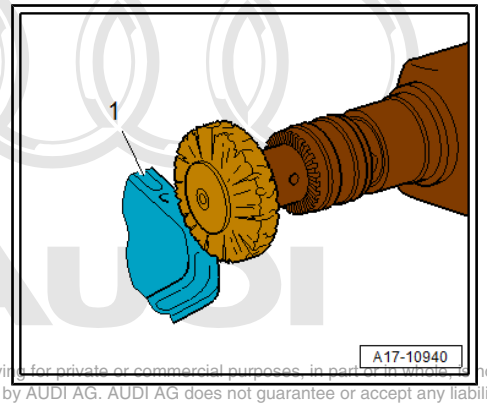
Note

Renew sealing flange (pulley end).

Caution

Protect lubrication system against contamination.

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



WARNING

Risk of eye injury due to sealant residue.

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

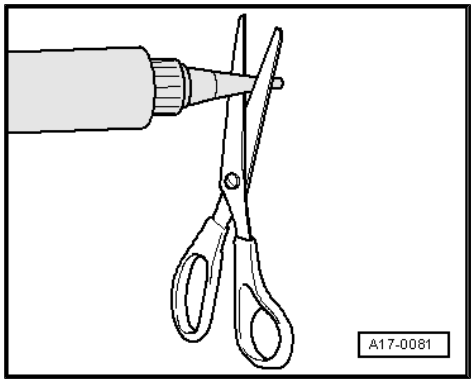
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– Remove sealant residue from cylinder block and sump (top section) using rotating plastic brush or similar.
– Clean surfaces; they must be free of oil and grease.

Note

Note the use-by date of the sealant.

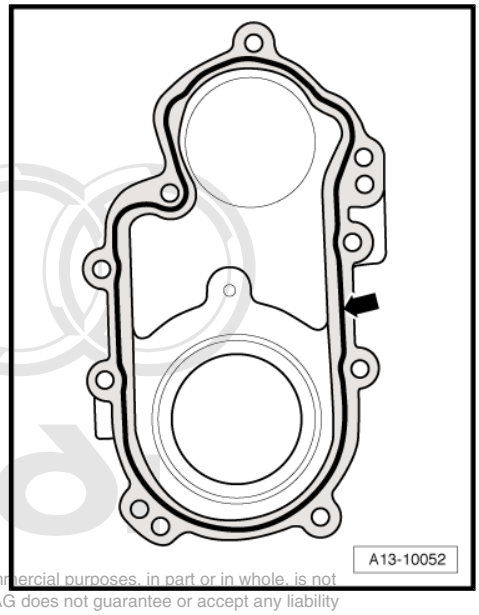
– Cut off nozzle of tube at front marking (nozzle ∅ approx. 1.5 mm).



Caution

Make sure lubrication system is not clogged by excess sealant.

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



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

- The groove on the sealing surface must be completely filled with sealant.
- The bead of sealant must project 1.5 … 2.0 mm above the sealing surface.

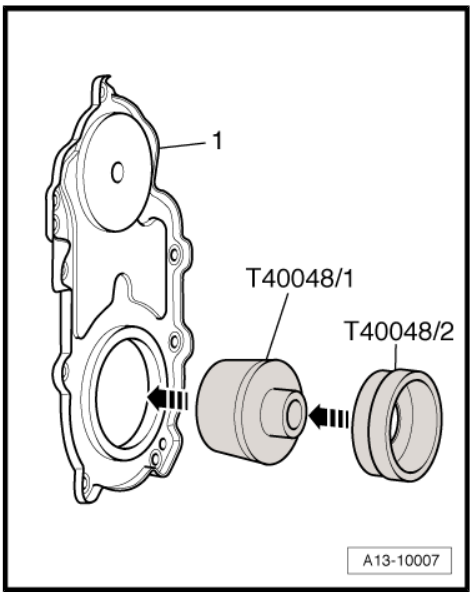
Note

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

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– Fit assembly aid -T40048/1- onto assembly sleeve -T40048/2- and slide sealing flange -1- onto assembly sleeve.

– Detach assembly aid.



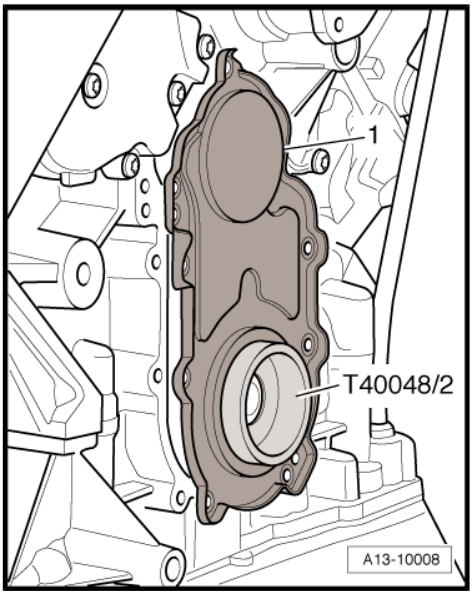
– First position sealing flange (with assembly sleeve -T40048/2- inserted) on crankshaft.

– Keep sealing flange straight while pushing it onto engine sealing surface. Then bolt on ⇒ Fig. ““Sealing flange (pulley end) - tightening torque and sequence”“ , page 93 .

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

– Install poly V-belt pulley for coolant pump ⇒ page 251 .

– Install vibration damper ⇒ page 105 .



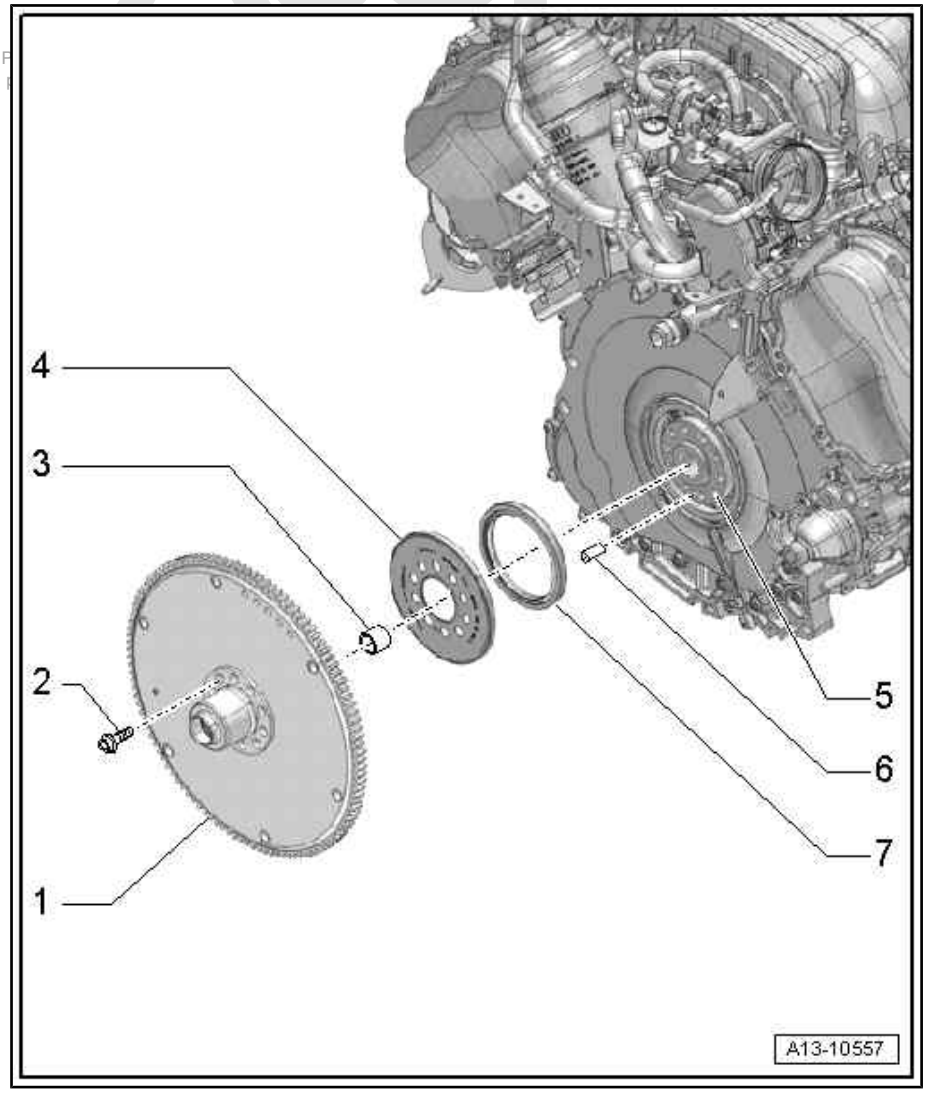
2 Cylinder block (gearbox end)

⇒ “2.1 Exploded view - drive plate”, page 112
⇒ “2.2 Removing and installing drive plate”, page 113
⇒ “2.3 Removing and installing sender wheel”, page 113
⇒ “2.4 Checking sender wheel”, page 114
⇒ “2.5 Renewing crankshaft oil seal (gearbox end)”, page 115
⇒ “2.6 Renewing needle bearing in drive plate”, page 117

2.1 Exploded view - drive plate

Note

When performing assembly work, secure engine to engine and gearbox support - VAS 6095- ⇒ page 63 .



1 - Drive plate
- ❑ With bearing flange
- ❑ Check running surface on bearing flange and holes for clutch module for cracks and scoring.
- ❑ Removing and installing ⇒ “2.2 Removing and installing drive plate”, page 113

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

3 - Needle bearing
- ❑ Installation position: closed side towards engine
- ❑ Removing and installing ⇒ “2.6 Renewing needle bearing in drive plate”, page 117

4 - Sender wheel
- ❑ For engine speed sender - G28-
- ❑ Removing and installing ⇒ “2.3 Removing and installing sender wheel”, page 113
- ❑ Checking ⇒ “2.4 Checking sender wheel”, page 114

5 - Crankshaft

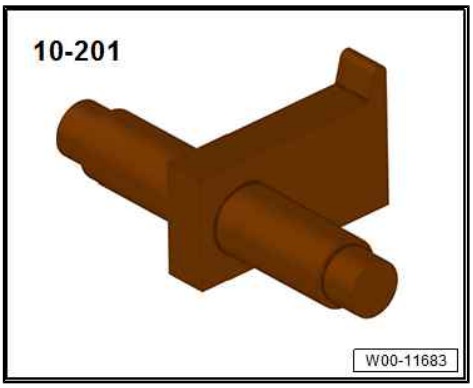
6 - Dowel pin

7 - Crankshaft oil seal (gearbox end)
- ❑ Renewing ⇒ “2.5 Renewing crankshaft oil seal (gearbox end)”, page 115

2.2 Removing and installing drive plate

Special tools and workshop equipment required

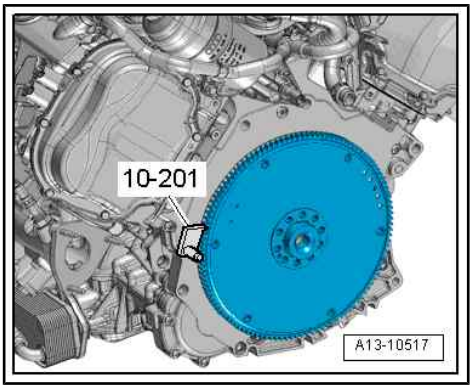
- Counterhold tool - 10 - 201-



Removing

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

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



Caution

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

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

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

Installing

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

- Tightening torque ⇒ “2.1 Exploded view - drive plate”, page 112

Note

- *Renew the bolts tightened with specified tightening angle.*
- *A needle bearing is fitted in the drive plate. Before installing, check that the needle bearing is fitted. Removing and installing needle bearing in drive plate (pressing in and out) ⇒ page 117 .*

– Pay attention to dowel pin when installing drive plate.

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

2.3 Removing and installing sender wheel

Removing

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

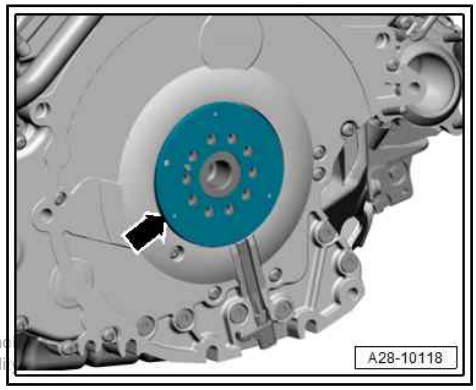
– Remove drive plate ⇒ page 113 .

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 114*** ***.***

– Detach sender wheel -arrow-.



Installing

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

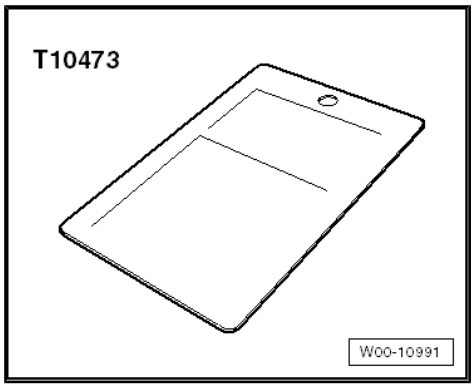
– Install drive plate ⇒ page 113 .

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2.4 Checking sender wheel

Special tools and workshop equipment required

- Sensor gauge - T10473-



Procedure

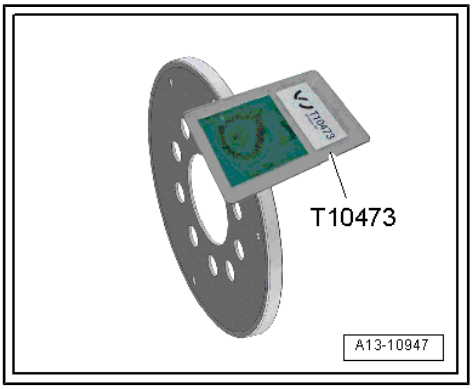
- Sender wheel removed

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.***

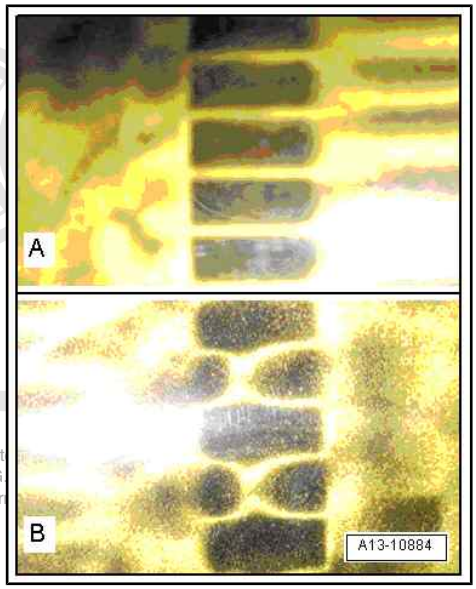
– Check entire circumference of sender wheel using sensor gauge - T10473- , as shown in illustration.



Inspection image of sender wheel

A - Sender wheel OK

B - Sender wheel defective

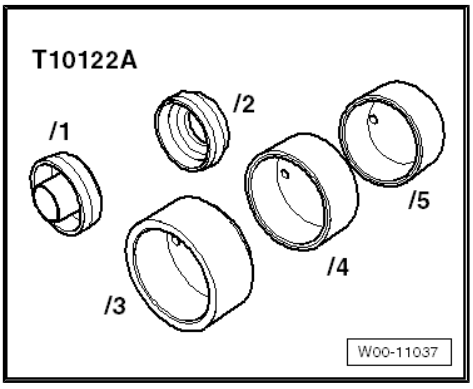


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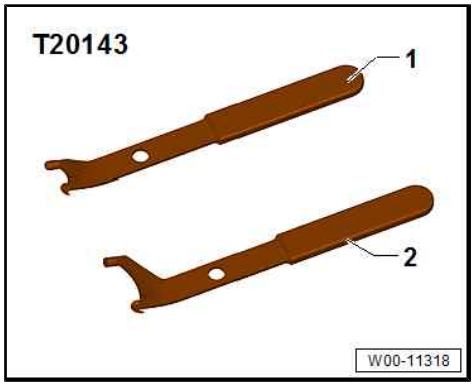
2.5 Renewing crankshaft oil seal (gearbox end)

Special tools and workshop equipment required

- Guide piece - T10122/6-
- Fitting tool - T10122 A-



♦ Extractor tool - T20143/2-



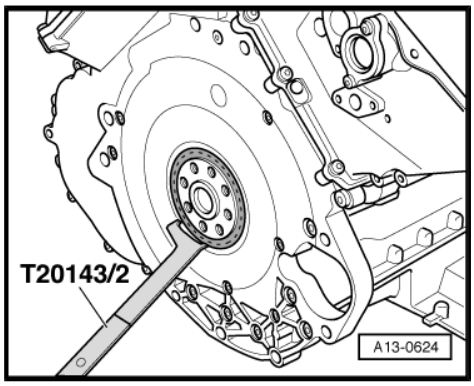
Procedure

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

– Remove drive plate ⇒ page 113 .

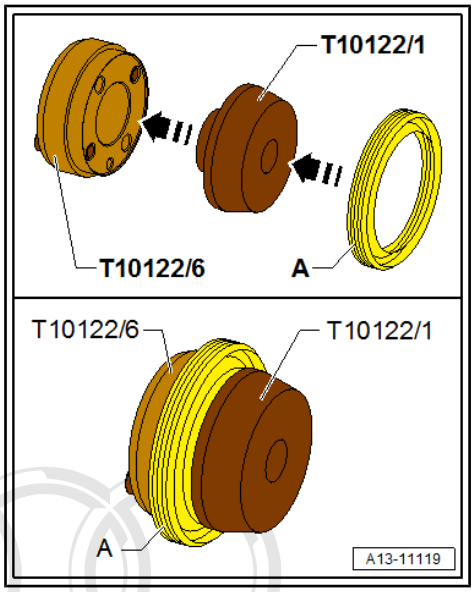
– Pry out oil seal using extractor tool -T20143/2- .

– 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- .



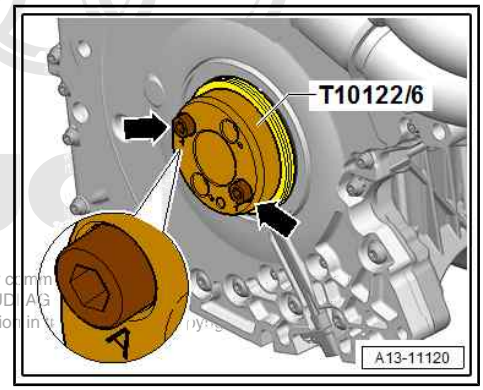
– Fit guide piece - T10122/6- onto crankshaft.

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

Caution

Risk of leaks if installed incorrectly.

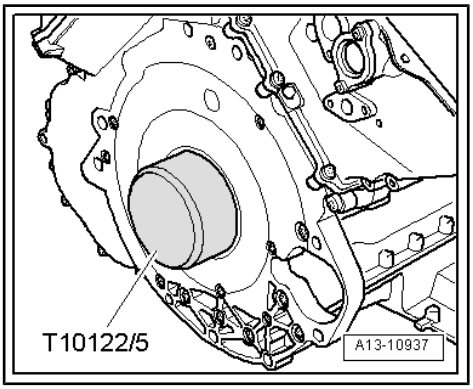
♦ ***Slide oil seal onto crankshaft by hand to prevent sealing lip on oil seal from folding over.***



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

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– Press in oil seal evenly all round using thrust piece - 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 113 .

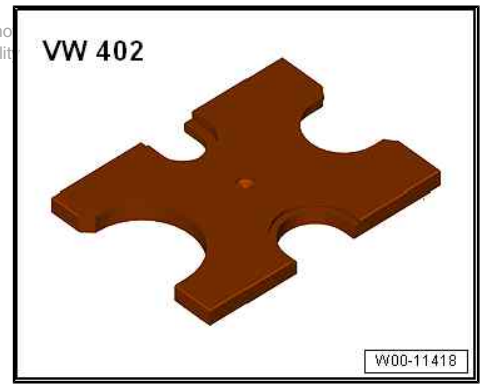


2.6 Renewing needle bearing in drive plate

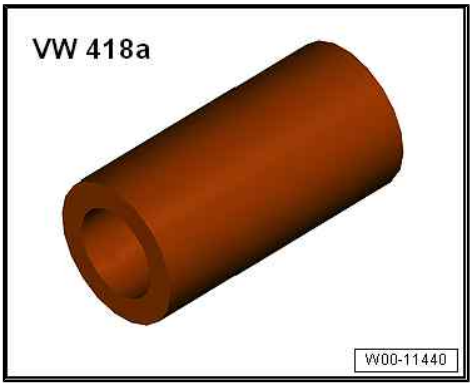
Special tools and workshop equipment required

♦ Thrust plate - VW 402-

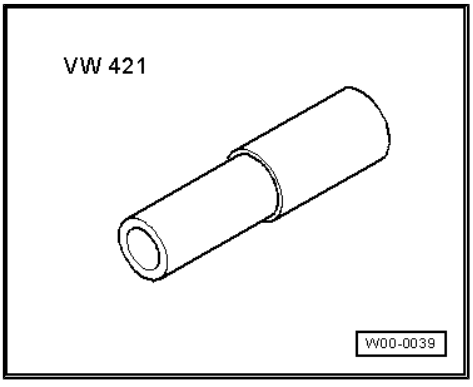
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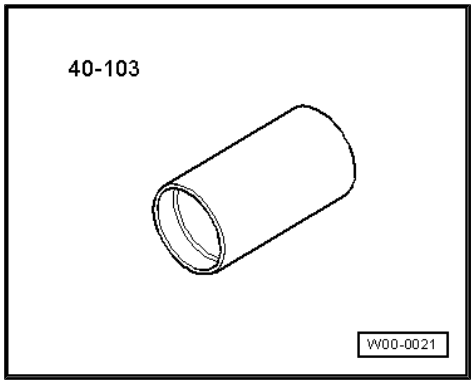
♦ Tube - VW 418 A-



♦ Tube - VW 421-



♦ Support - 40 - 103-



Procedure

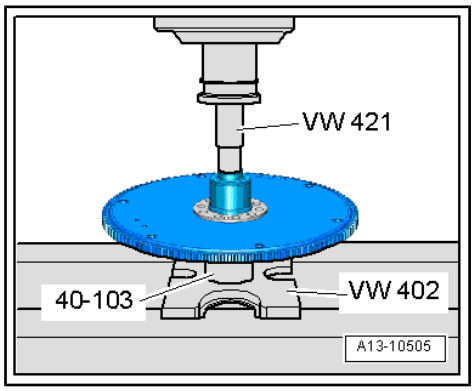
- Gearbox removed ⇒ Rep. gr. 34 ; Removing and installing gearbox; Removing gearbox

– Remove drive plate ⇒ page 113 .

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

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

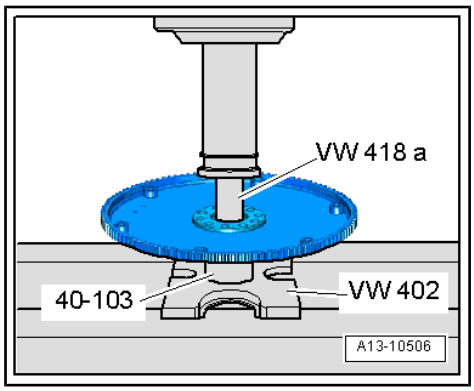
- Smaller diameter of tube -VW 421- faces drive plate.



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

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

– Install drive plate ⇒ page 113 .



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3 Crankshaft

⇒ “3.1 Exploded view - crankshaft”, page 119

⇒ “3.2 Crankshaft dimensions”, page 122

⇒ “3.3 Measuring axial clearance of crankshaft”, page 122

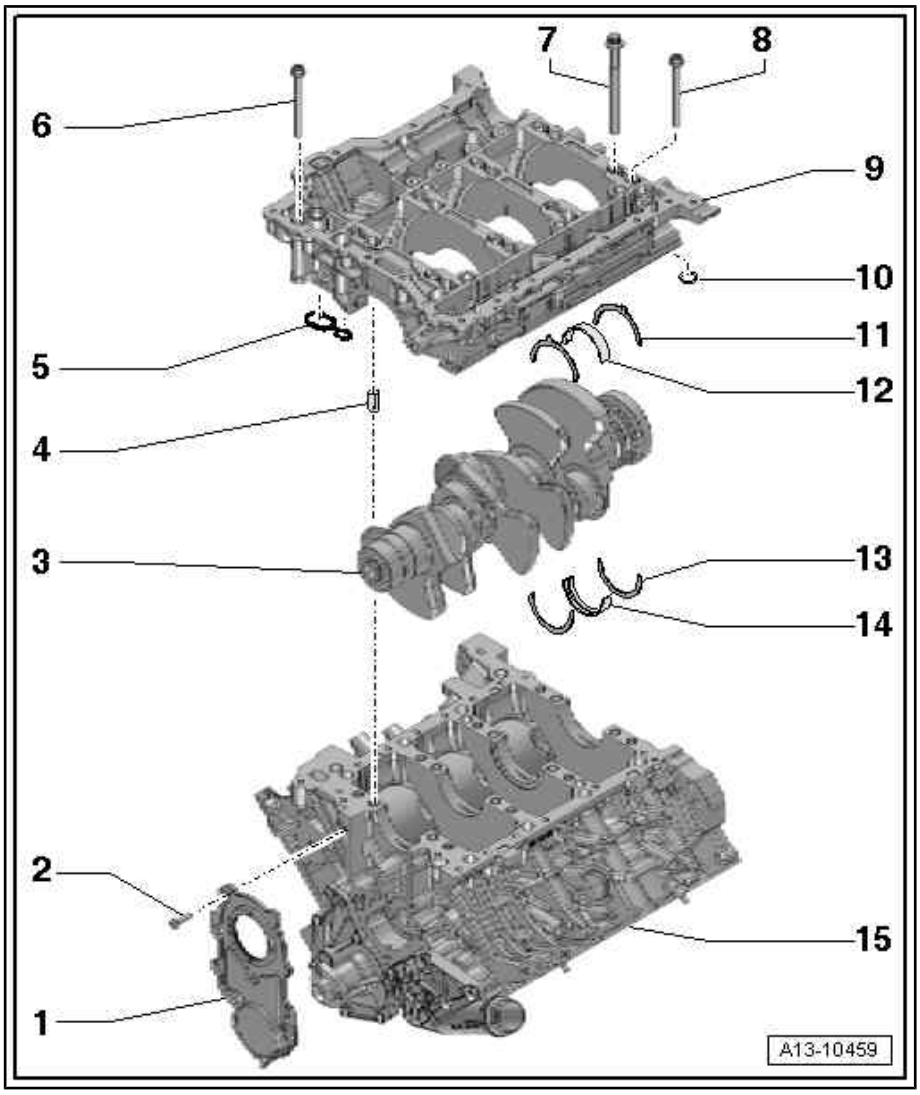
⇒ “3.4 Measuring radial clearance of crankshaft”, page 123

3.1 Exploded view - crankshaft

Note

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When performing assembly work, secure engine to engine and gearbox support - VAS 6095- ⇒ “1.3 Securing engine to engine and gearbox support”, page 63 .



1 - Sealing flange (pulley end)

- ❑ Renewing ⇒ “1.5 Removing and installing sealing flange (pulley end)”, page 109

2 - Bolt

- ❑ Tightening torque and sequence ⇒ Fig. ““Sealing flange (pulley end) - tightening torque and sequence”“ , page 93

3 - Crankshaft

- ❑ Measuring axial clearance ⇒ “3.3 Measuring axial clearance of crankshaft”, page 122
- ❑ Measuring radial clearance ⇒ “3.4 Measuring radial clearance of crankshaft”, page 123
- ❑ Crankshaft dimensions ⇒ “3.2 Crankshaft dimensions”, page 122

4 - Dowel sleeve

- ❑ 4x
- ❑ Inserting in retaining frame ⇒ Fig. ““Applying sealant to retaining frame, position of dowel sleeves”“ , page 121

5 - Seal

- ❑ Renew

6 - Bolt

- ❑ For sealing surfaces: retaining frame to cylinder block
- ❑ Differing bolt lengths and bolt heads
- ❑ Tightening torque and sequence ⇒ Fig. ““Installing retaining frame”“ , page 121

7 - Bolt (long, large collar)

- ❑ For retaining frame (inner row)
- ❑ Renew
- ❑ Use old bolts when measuring radial clearance
- ❑ Tightening torque and sequence ⇒ Fig. ""Installing retaining frame"" , page 121

8 - Bolt (short, small collar)

- ❑ For retaining frame (outer row)
- ❑ Tightening torque and sequence ⇒ Fig. ""Installing retaining frame"" , page 121

9 - Retaining frame

- ❑ With valve for oil pressure control - N428- ⇒ Fig. "" Valve for oil pressure control -N428- "" , page 121
- ❑ To remove, detach guide rail ⇒ Item 1 (page 164) for drive chain for valve gear
- ❑ Applying sealant ⇒ Fig. ""Applying sealant to retaining frame, position of dowel sleeves"" , page 121
- ❑ Removing and installing valve for oil pressure control - N428- ⇒ "4.7 Removing and installing valve for oil pressure control N428 ", page 232

10 - Seal

- ❑ Renew

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11 - Thrust washer

- ❑ Only fitted on 3rd crankshaft bearing
- ❑ Installation position: oil groove faces outwards
- ❑ Make sure it engages in retaining frame

12 - Bearing shell

- ❑ For retaining frame (without oil groove)
- ❑ Renew used bearing shells
- ❑ Note installation position
- ❑ Install new bearing shells for retaining frame with correct coloured markings ⇒ Fig. ""Matching crankshaft bearing shells to bearings in retaining frame"" , page 122

13 - Thrust washer

- ❑ Only fitted on 3rd crankshaft bearing
- ❑ Installation position: oil groove faces outwards
- ❑ Make sure it engages in retaining frame

14 - Bearing shell

- ❑ For cylinder block (with oil groove)
- ❑ Renew used bearing shells
- ❑ Note installation position
- ❑ Install new bearing shells for the cylinder block with the correct coloured markings ⇒ Fig. ""Matching crankshaft bearing shells to bearings in cylinder block"" , page 122

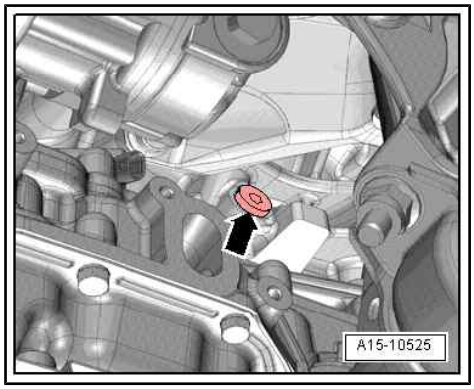
15 - Cylinder block

Plug for "TDC" marking - tightening torque

Note

Fit new O-ring.

– Tighten plug -arrow- to 14 Nm.



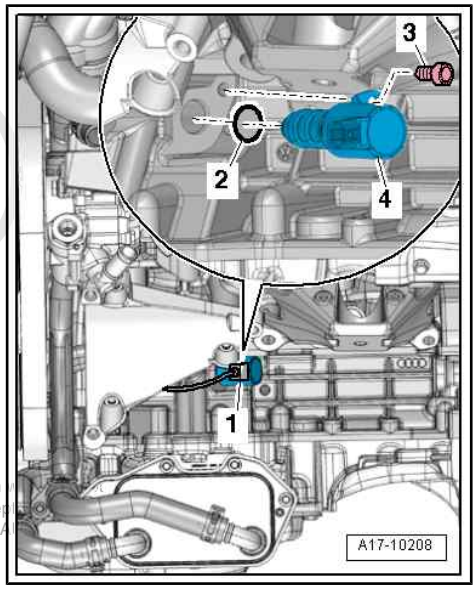
Valve for oil pressure control - N428-

1 - Electrical connector

2 - O-ring - renew

3 - Bolt, 9 Nm

4 - Valve for oil pressure control - N428-



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Applying sealant to retaining frame, position of dowel sleeves

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

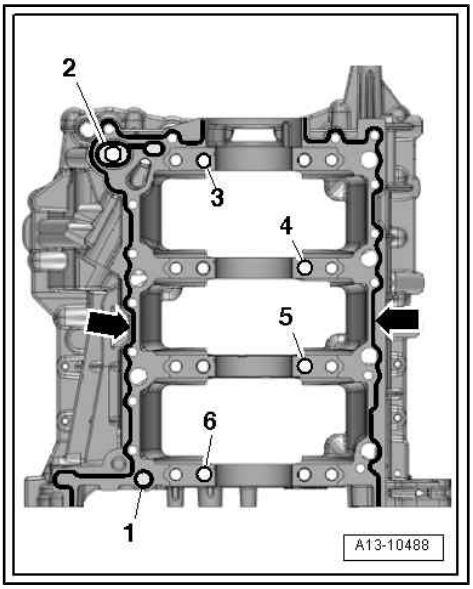
– Apply beads of sealant -arrows- onto clean sealing surfaces of retaining frame as shown in illustration.

• The groove on the sealing surface must be completely filled with sealant.

• The beads of sealant must project 1.5 … 2.0 mm above the sealing surface.

– Fit seals -1- and -2-.

– Check that dowel sleeves -3 ... 6- are inserted in retaining frame at positions shown in illustration.



Installing retaining frame

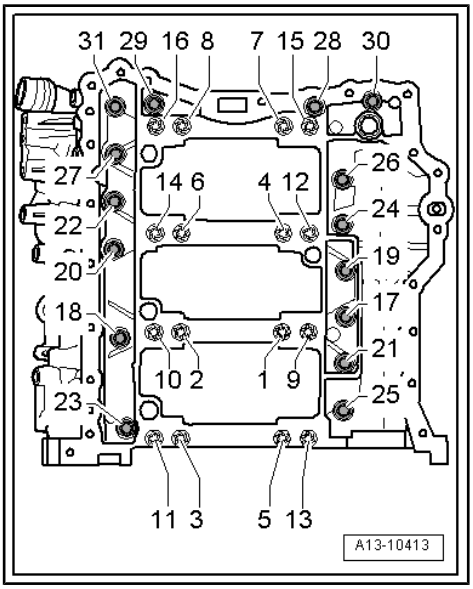
Note

Renew the bolts tightened with specified tightening angle.

– Install long bolts in inner row on retaining frame.

– Tighten bolts in stages in the sequence shown:

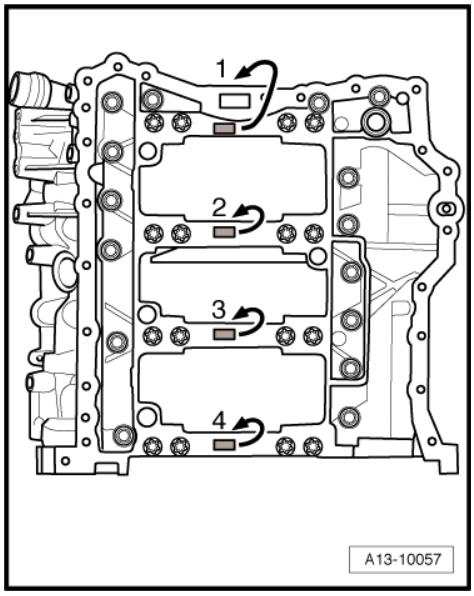
Stage	Bolts	Tightening torque/angle specification
1.	-1 … 16-	50 Nm
2.	-1 … 16-	Turn 90° further
3.	-17 … 31-	20 Nm
4.	-17 … 31-	Turn 90° further



Matching crankshaft bearing shells to bearings in cylinder block

- Bearing shells of the correct thickness are matched to the bearings in the cylinder block 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 cylinder block is indicated by a code letter at the relevant bearing on the retaining frame.

Code letter on retaining frame	Colour coding of bearing
R =	Red
G =	Yellow
B =	Blue
S =	Black

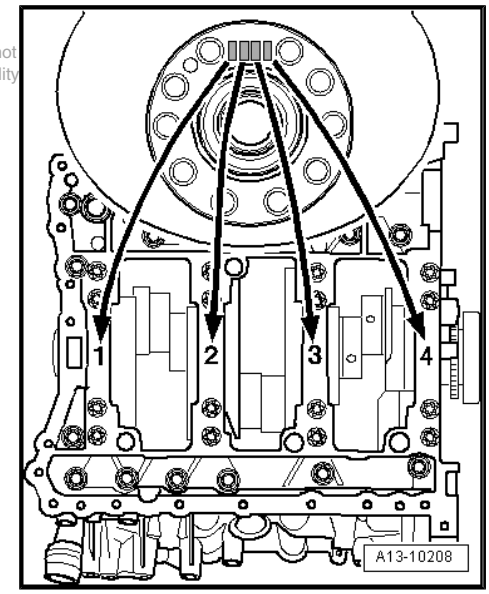


Matching crankshaft bearing shells to bearings in retaining frame

- 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.

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



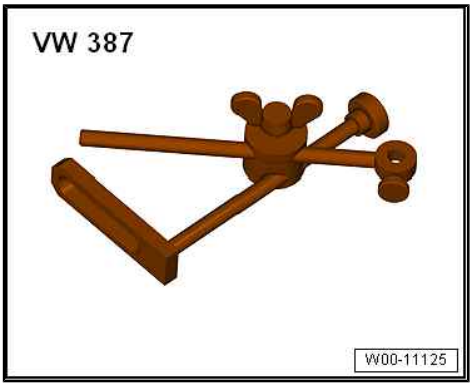
3.2 Crankshaft dimensions

Honing dimension	Main bearing journal ∅ mm	Conrod journal ∅ mm
Basic dimension	65.000 – 0.022 – 0.042	56.000 – 0.022 – 0.042

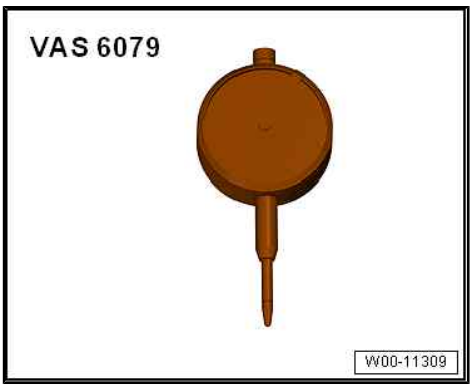
3.3 Measuring axial clearance of crankshaft

Special tools and workshop equipment required

♦ Universal dial gauge bracket - VW 387-



♦ Dial gauge - VAS 6079-



Procedure

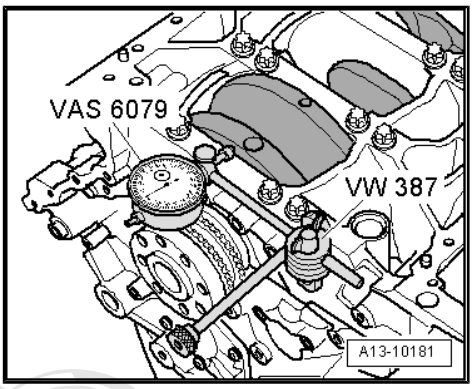
– Secure dial gauge - VAS 6079- with universal dial gauge bracket - VW 387- to cylinder block as shown in illustration.

– 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: 0.15 ... 0.25 mm



3.4 Measuring radial clearance of crankshaft

Special tools and workshop equipment required

♦ Plastigage

Procedure

– Remove retaining frame and clean bearing journals.

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

• The Plastigage must be positioned in the centre of the bearing shell.

– Fit retaining frame, secure with old bolts and tighten to final torque ⇒ Item 7 (page 119) without rotating crankshaft.

– Remove retaining frame again.

– Compare width of Plastigage with measurement scale.

Radial clearance:

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- New: 0.015 ... 0.055 mm.
- Wear limit: 0.080 mm.

– Renew bolts for retaining frame which are tightened by turning through specified angle.

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4 Balance shaft

⇒ “4.1 Exploded view - balance shaft”, page 125

⇒ “4.2 Removing and installing balance shaft”, page 125

4.1 Exploded view - balance shaft

1 - Balance shaft

- ❑ Removing and installing ⇒ “4.2 Removing and installing balance shaft”, page 125

2 - Bolt

- ❑ 60 Nm
- ❑ Use locating pin - T40116- as counterhold when loosening and tightening

3 - Balance weight (gearbox end)

- ❑ Can only be fitted on balance shaft in one position.

4 - Bearing plate

5 - Bolt

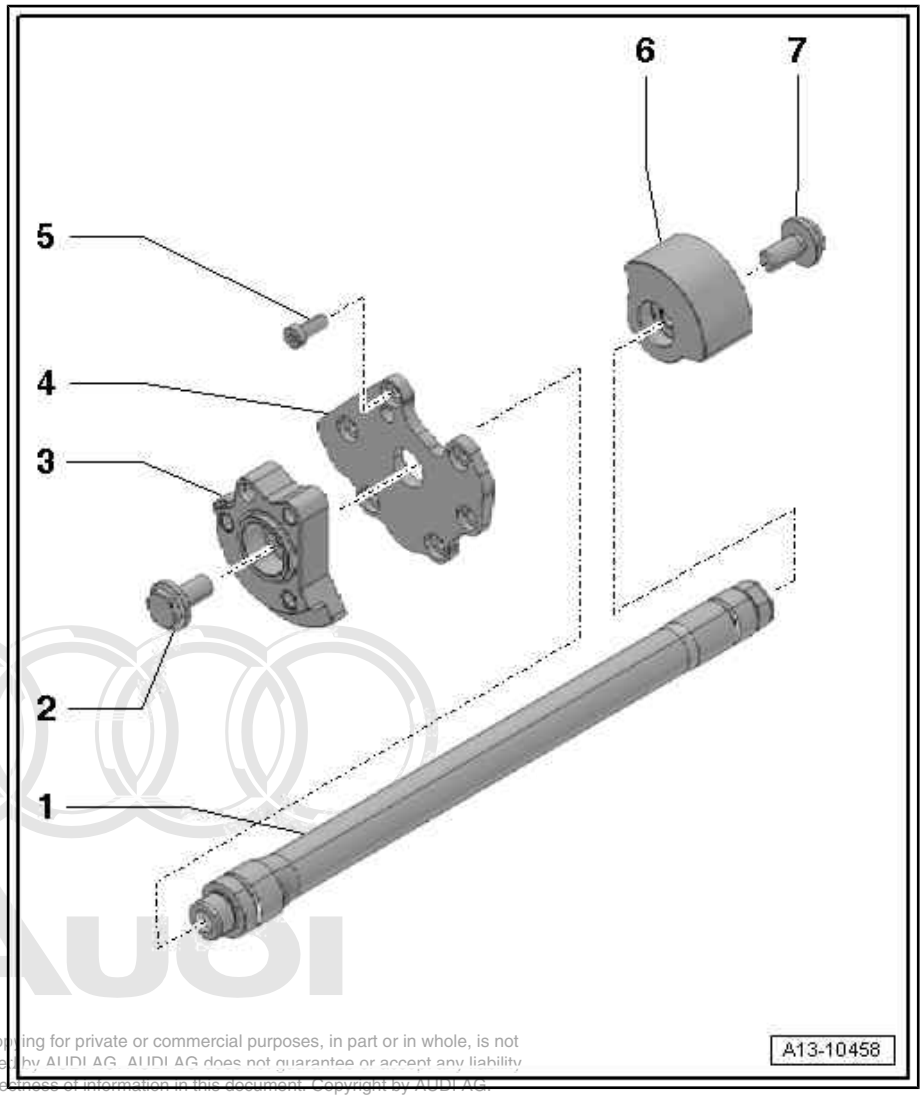
- ❑ 13 Nm

6 - Balance weight (pulley end)

- ❑ Can only be fitted on balance shaft in one position.

7 - Bolt

- ❑ 60 Nm
- ❑ Use locating pin - T40116- as counterhold when loosening and tightening

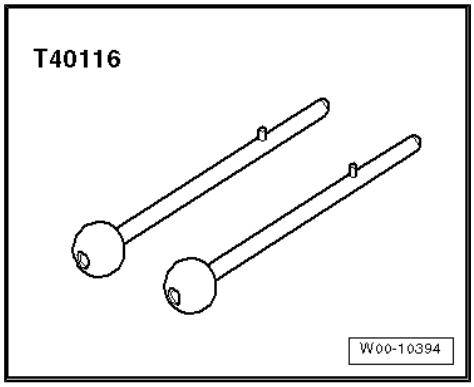


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4.2 Removing and installing balance shaft

Special tools and workshop equipment required

♦ Locating pins - T40116-



Removing

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

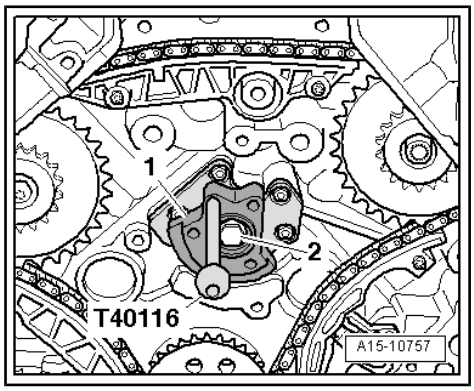
– Remove sealing flange (pulley end) ⇒ page 109 .

– Remove timing chain cover (bottom) ⇒ page 154 .

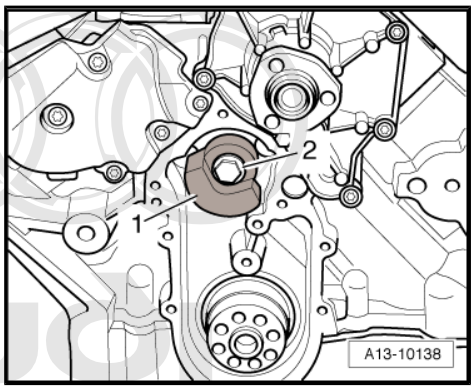
– Remove drive chain for auxiliary drives ⇒ page 182 .

– Use locating pin -T40116- to lock balance weight -1- in position at rear of engine.

– Unscrew bolt -2- and detach balance weight from balance shaft.

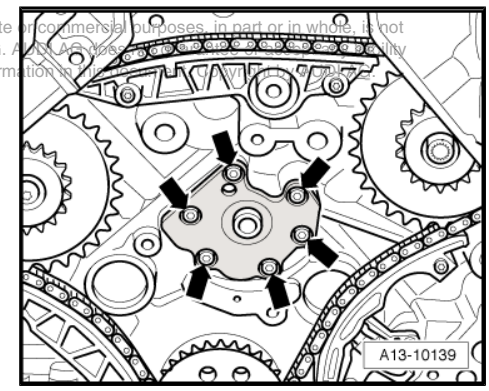


– Unscrew bolt -2- (counterhold balance weight -1- with a suitable pin) and detach balance weight at front of engine from balance shaft.



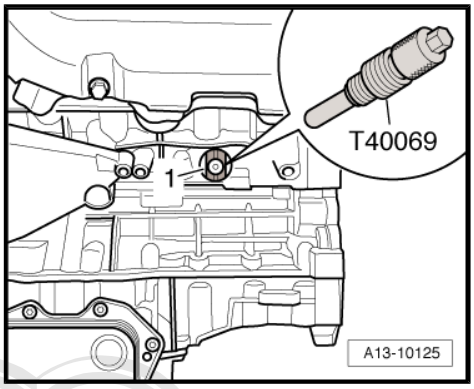
– Unscrew bolts -arrows- and detach bearing plate for balance shaft at rear of engine.

– Pull balance shaft to rear out of cylinder block.



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Installing



- Tightening torque ⇒ “4.1 Exploded view - balance shaft”, page 125
- Crankshaft -1- locked in “TDC” position with locking pin - T40069- .

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

Note

Balance weights can only be fitted on balance shaft in one position.

– Install drive chain for auxiliary drives ⇒ page 182 .
– Install timing chain cover (bottom) ⇒ page 154 .
– Install sealing flange (pulley end) ⇒ page 109 .

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5 Pistons and conrods

⇒ “5.1 Exploded view - pistons and conrods”, page 128

⇒ “5.2 Removing and installing pistons”, page 130

⇒ “5.3 Checking pistons and cylinder bores”, page 131

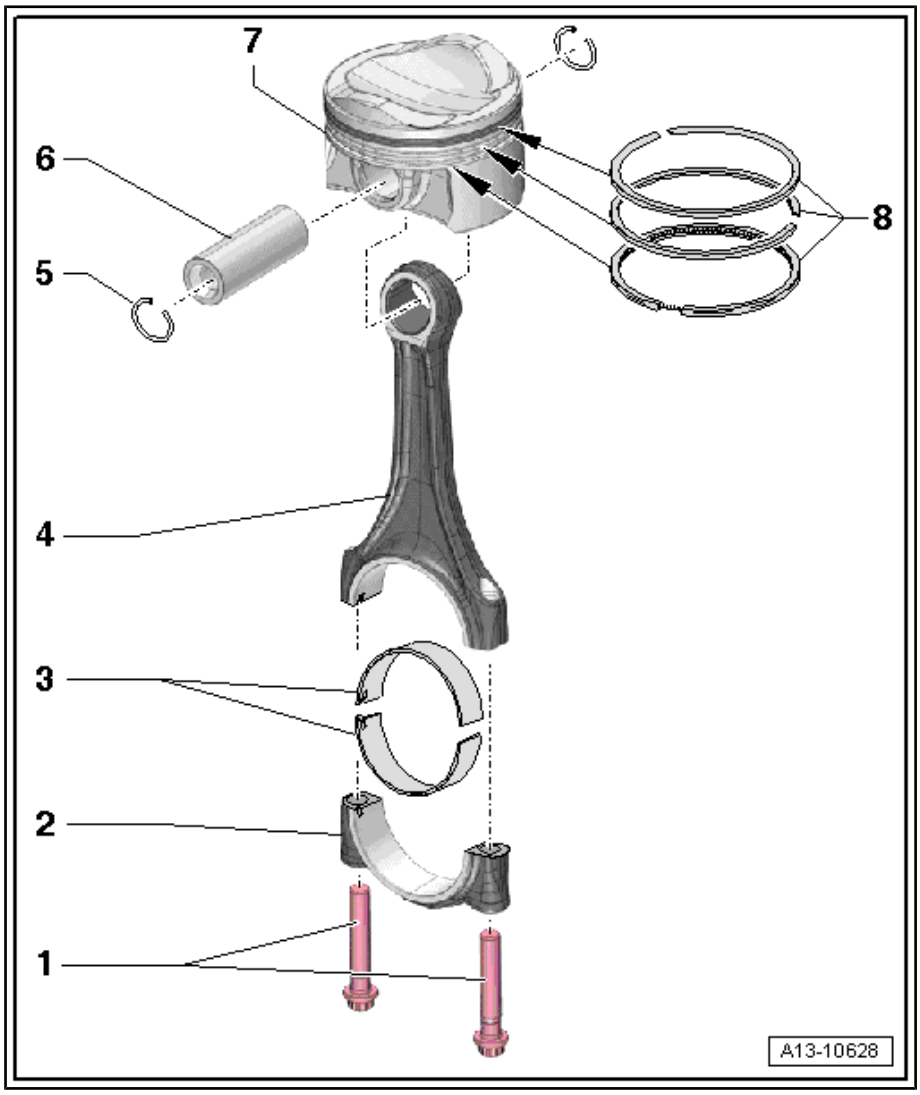
⇒ “5.4 Checking radial clearance of conrod bearings”, page 132

5.1 Exploded view - pistons and conrods

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Note

- *All bearing and running surfaces must be oiled before assembling.*
- *Oil spray jet for piston cooling* ⇒ *Fig. ““Oil spray jet for piston cooling”“ , page 130* .



1 - Bolts

- ❑ Renew
- ❑ Lubricate threads and contact surface
- ❑ 50 Nm + turn 90° further
- ❑ Use old bolts when measuring radial clearance

2 - Conrod bearing cap

- ❑ Mark installation position for re-installation
- ❑ Mark cylinder and conrod allocation in colour ⇒ Fig. ““Marking conrods”“ , page 129
- ❑ Installation position of conrod pairs ⇒ Fig. ““Installation position of conrods”“ , page 130

3 - Bearing shells

- ❑ Ensure that retaining lugs are securely seated.
- ❑ Renew used bearing shells
- ❑ There are oversized bearings available for machined crankshaft conrod journals ⇒ Electronic parts catalogue
- ❑ Lugs on conrod bearings must be on the same side

4 - Conrod

- ❑ Only renew as a complete set
- ❑ Mark cylinder and conrod bearing cap allocation in colour ⇒ Fig. ““Marking conrods”“ , page 129
- ❑ Installation position of conrod pairs ⇒ Fig. ““Installation position of conrods”“ , page 130
- ❑ Axial clearance for each conrod pair (when new): 0.20 … 0.45 mm

- ❑ Measuring radial clearance ⇒ “5.4 Checking radial clearance of conrod bearings”, page 132

5 - Circlip

- ❑ Renew

6 - Piston pin

- ❑ Removing and installing ⇒ “5.2 Removing and installing pistons”, page 130

7 - Piston

- ❑ Mark installation position and cylinder number ⇒ Fig. ““Installation position of pistons”“ , page 129
- ❑ Removing and installing ⇒ “5.2 Removing and installing pistons”, page 130
- ❑ Renew piston if cracking is visible on piston crown or piston skirt
- ❑ Checking pistons and cylinder bores ⇒ “5.3 Checking pistons and cylinder bores”, page 131

8 - Piston rings

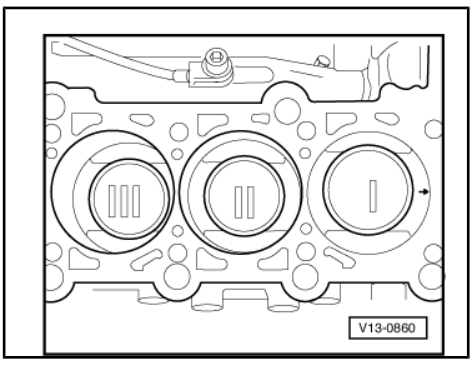
- ❑ Measuring ring gap ⇒ Fig. ““Measuring piston ring gap”“ , page 132
- ❑ Measuring ring-to-groove clearance ⇒ Fig. ““Measuring ring-to-groove clearance”“ , page 132
- ❑ Use piston ring pliers (commercially available) to remove and install
- ❑ Installation position: marking “TOP” or side with lettering faces towards piston crown
- ❑ Offset gaps by 120°

Installation position of pistons

Caution

Do not damage the coating of the piston crown.

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



Installation position:

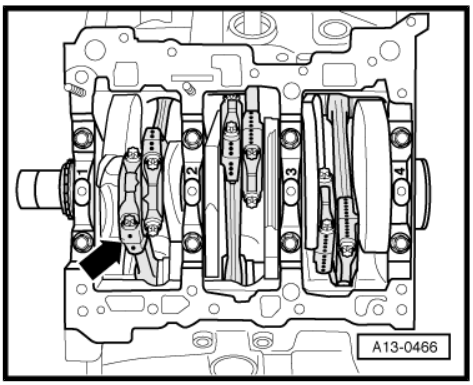
- Arrows on piston crowns point to pulley end.

Marking conrods

Note

Only renew conrods as a complete set.

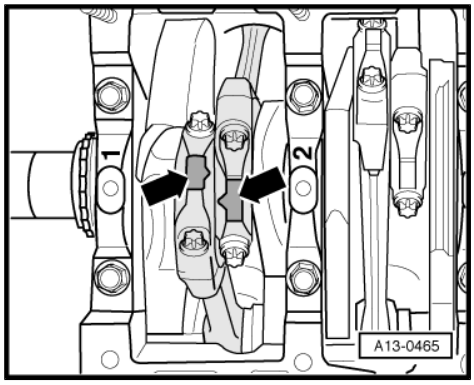
– Use a coloured pen to mark matching conrods and conrod bearing caps with cylinder numbers -arrow- for re-installation.



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Installation position of conrods

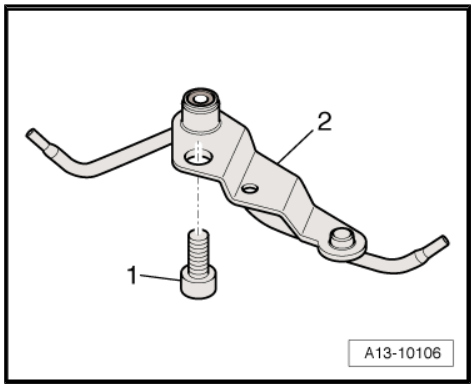
- The cast lugs -arrows- on the ground surfaces of the conrod pairs “1 and 2”, “3 and 4”, and “5 and 6” must face each other.



Oil spray jet for piston cooling

1 - Apply locking fluid to bolt and tighten to 9 Nm; for locking fluid refer to ⇒ Electronic parts catalogue .

2 - Oil spray jet with spray nozzle valve (opening pressure: 2 ... 2.4 bar)



Caution

Risk of damage to oil spray jets due to deformation.

- *Never bend oil spray jets.*

5.2 Removing and installing pistons

Special tools and workshop equipment required

♦ Drift - VW 222 A-



♦ Piston ring clamp, commercially available

Removing

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- Engine secured to engine and gearbox support - VAS 6095- ⇒ page 63 .

– Remove cylinder head ⇒ page 137 .

– Remove upper section of sump ⇒ page 214 .

– Mark installation position and matching of conrod bearing caps to cylinder and to conrods for re-installation ⇒ Fig. ““Marking conrods”“ , page 129 .

– 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 the reverse order; note the following:

- Tightening torques ⇒ “5.1 Exploded view - pistons and conrods”, page 128

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 ⇒ Fig. ““Installation position of pistons”“ , page 129
- Conrods ⇒ Fig. ““Installation position of conrods”“ , page 130

– Install conrod bearing caps according to markings.

– Install sump (upper section) ⇒ page 214 .

– Install cylinder head ⇒ page 137 .

5.3 Checking pistons and cylinder bores

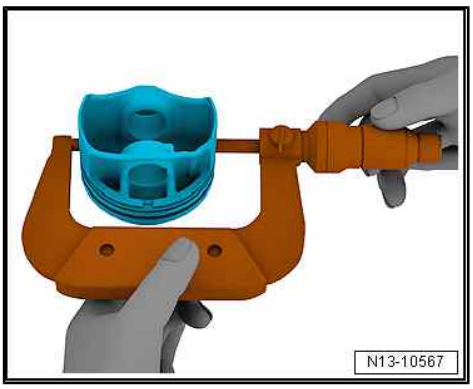
Checking piston

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

- Maximum deviation from nominal dimension: 0.03 mm.

Piston ∅ mm	
Nominal dimension	84.49 1)

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



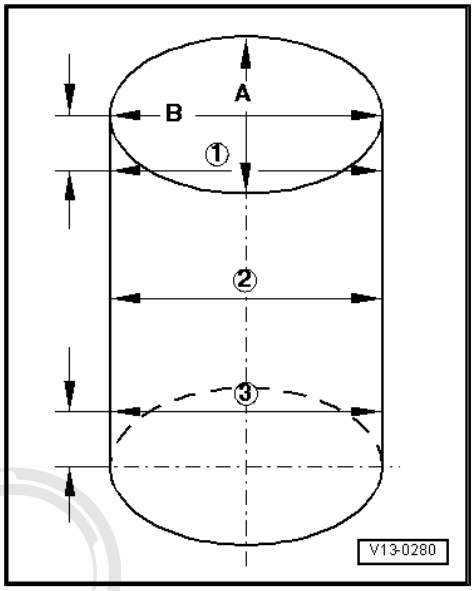
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Measuring cylinder bore

– 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 ∅ mm	
Nominal dimension	84.51 1)
• 1) Measure at 50 mm into cylinder bore.	

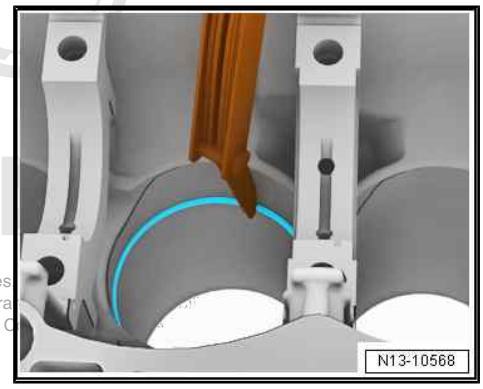


Measuring piston ring gap

– Insert ring at right angle to cylinder wall from above and push down into lower cylinder opening approx. 15 mm from bottom of cylinder.

– To do so, use a piston without rings.

Piston ring	new mm	Wear limit mm
1st compression ring	0.20 … 0.30	0.80
2nd compression ring	0.50 … 0.70	0.80
Oil scraper ring	0.25 … 0.50	– 1)
• 1) Specification not yet available.		

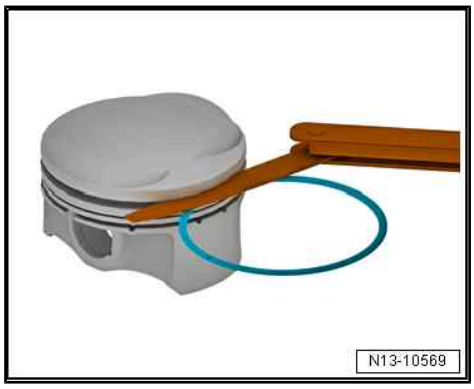


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Measuring ring-to-groove clearance

– Clean groove in piston before checking clearance.

Piston ring	new mm	Wear limit mm
1st compression ring	0.04 … 0.08	0.20
2nd compression ring	0.03 … 0.07	0.20
Oil scraper ring	0.02 … 0.06	0.15



5.4 Checking radial clearance of conrod bearings

Special tools and workshop equipment required

♦ Plastigage

Procedure

– Remove conrod bearing cap.

– Clean bearing cap and bearing journal.

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

– Fit conrod bearing cap, secure with old bolts and tighten to final torque ⇒ Item 1 (page 128) without rotating crankshaft.
– Remove conrod bearing cap again.
– Compare width of Plastigage with measurement scale.

Radial clearance:

- New: 0.010 ... 0.052 mm.
- Wear limit: 0.120 mm.

– Renew conrod bolts.

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15 – Cylinder head, valve gear

1 Cylinder head

⇒ “1.1 Exploded view - cylinder head”, page 134

⇒ “1.3 Removing and installing cylinder head cover (left-side)”, page 143

⇒ “1.4 Removing and installing cylinder head cover (right-side)”, page 144

⇒ “1.2 Removing and installing cylinder head”, page 137

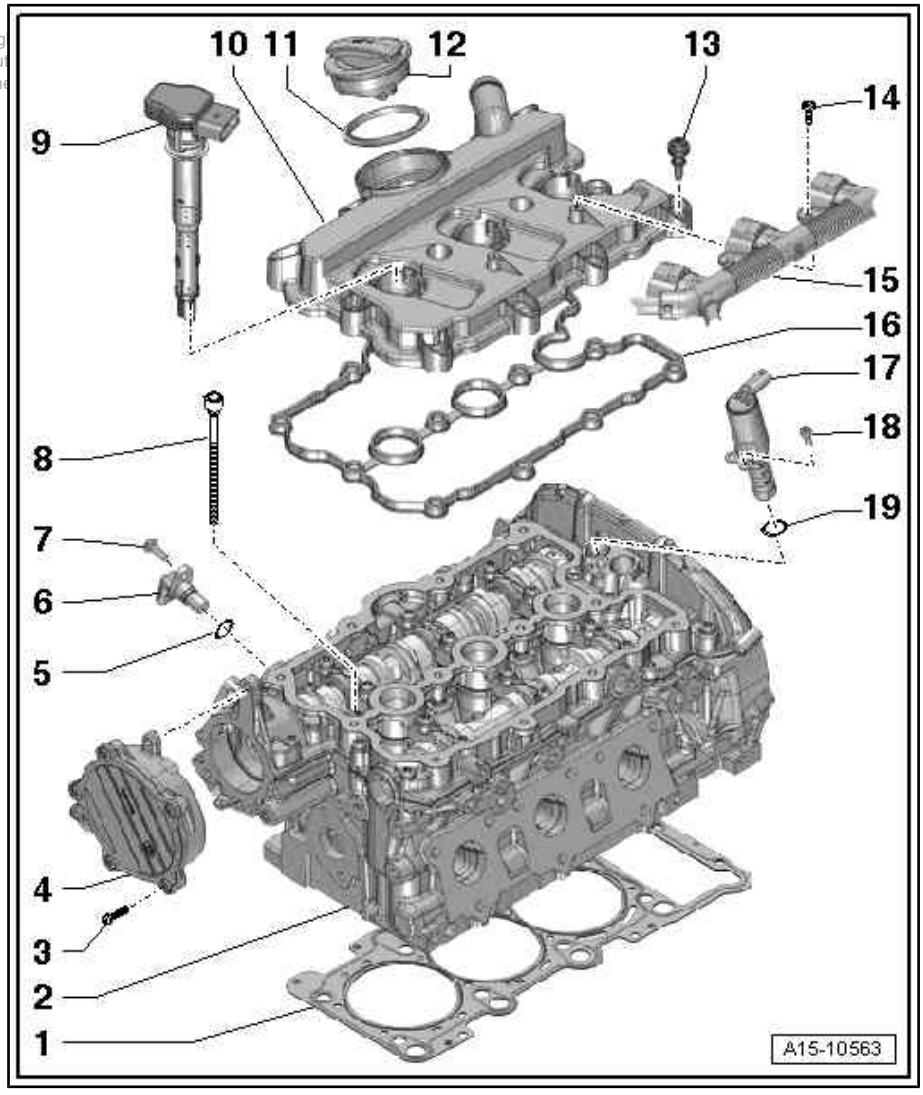
⇒ “1.5 Checking compression”, page 145

1.1 Exploded view - cylinder head

Note

The diagram shows the cylinder head on cylinder bank 2 (left-side).

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1 - Cylinder head gasket

- ❑ Renewing ⇒ “1.2 Removing and installing cylinder head”, page 137
- ❑ Installation position: part number must face cylinder head
- ❑ If renewed, change coolant and engine oil

2 - Cylinder head

- ❑ Removing and installing ⇒ “1.2 Removing and installing cylinder head”, page 137
- ❑ Checking for distortion ⇒ Fig. ““Checking cylinder head for distortion”“ , page 136
- ❑ Machining limit ⇒ Fig. ““Cylinder head machining limit”“ , page 137
- ❑ If renewed, change coolant and engine oil

3 - Bolt

- ❑ Tightening torque ⇒ Brake system; Rep. gr. 47 ; Vacuum system; Exploded view - vacuum pump

4 - Vacuum pump

- ❑ Removing and installing ⇒ Brake system; Rep. gr. 47 ; Vacuum system; Removing and installing vacuum pump

5 - O-ring

- ❑ Renew

6 - Hall sender

- ❑ Cylinder bank 1 (right-side): Hall sender - G40-
- ❑ Cylinder bank 2 (left-side): Hall sender 2 - G163-

7 - Bolt

- ❑ Tightening torque ⇒ “1.1 Exploded view - ignition system”, page 413

8 - Bolt

- ❑ Renew
- ❑ Bolts have been gradually converted from Polydrive to multi-point socket
- ❑ Note correct sequence when loosening ⇒ page 140
- ❑ Tightening torque and sequence ⇒ Fig. ““Cylinder head - tightening torque and sequence”“ , page 136

9 - Ignition coil

- ❑ Removing and installing ⇒ “1.3 Removing and installing ignition coils”, page 414

10 - Cylinder head cover

- ❑ Removing and installing: left-side ⇒ “1.3 Removing and installing cylinder head cover (left-side)”, page 143 , right-side ⇒ “1.4 Removing and installing cylinder head cover (right-side)”, page 144

11 - Seal

- ❑ Renew if damaged or leaking

12 - Filler cap

13 - Bolt

- ❑ Renew if seal is damaged
- ❑ Tightening torque and tightening sequence: cylinder head cover (left-side) ⇒ Fig. ““Cylinder head cover (left-side) - tightening torque and sequence”“ , page 136 , cylinder head cover (right-side) ⇒ Fig. ““Cylinder head cover (right-side) - tightening torque and sequence”“ , page 136

14 - Bolt

- ❑ Tightening torque ⇒ “1.1 Exploded view - ignition system”, page 413

15 - Connector rail

- ❑ For ignition coils

16 - Gasket for cylinder head cover

- ❑ Renew if damaged or leaking

17 - Camshaft control valve

- ❑ Cylinder bank 1 (right-side): camshaft control valve 1 - N205-
- ❑ Cylinder bank 2 (left-side): camshaft control valve 2 - N208-

18 - Bolt

- ❑ 5 Nm

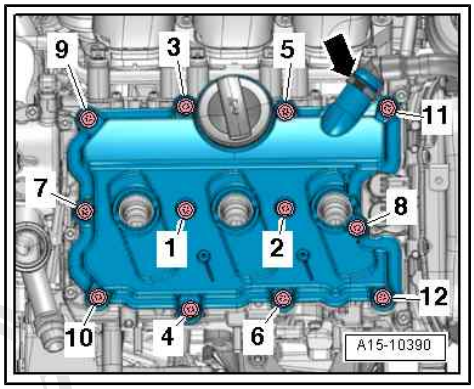
19 - O-ring

- ❑ Renew

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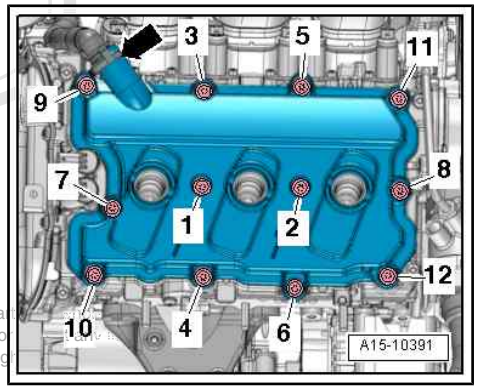
Cylinder head cover (left-side) - tightening torque and sequence

– Tighten bolts in the sequence -1 ... 12- to 9 Nm.



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

– Tighten bolts in the sequence -1 ... 12- to 9 Nm.



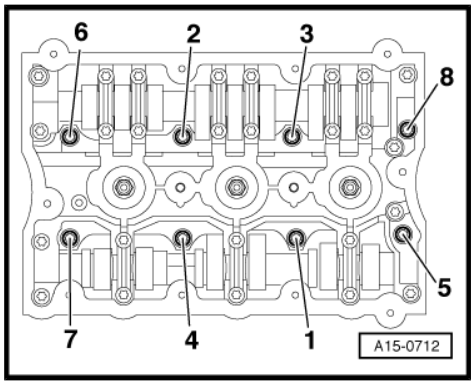
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Cylinder head - tightening torque and sequence

Note

Renew the bolts tightened with specified tightening angle.

– Tighten bolts in 4 stages in the sequence shown:

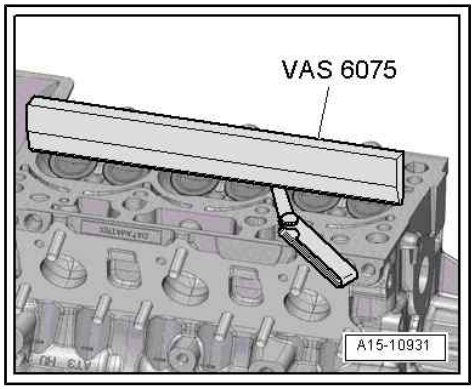


Stage	Bolts	Tightening torque/angle specification
1.	-1 … 8-	Screw in by hand until contact is made
2.	-1 … 8-	40 Nm
3.	-1 … 8-	Turn 90° further
4.	-1 … 8-	Turn 90° further

Checking cylinder head for distortion

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

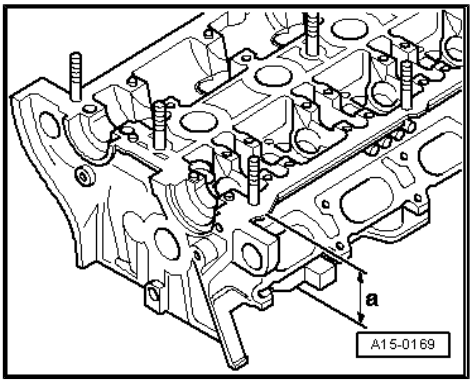
• Max. distortion: 0.05 mm.



Cylinder head machining limit

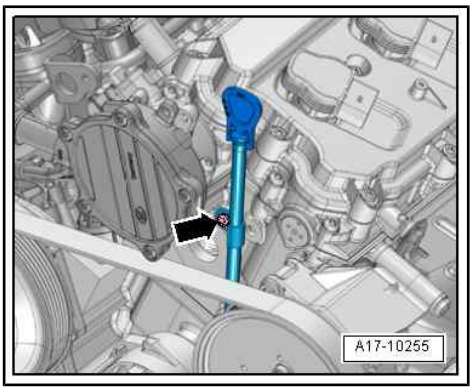
Machining of the cylinder head (surface grinding) is only permissible down to the minimum dimension -a-.

- Minimum dimension: -a- = 139.20 mm



Guide tube for oil dipstick - tightening torque

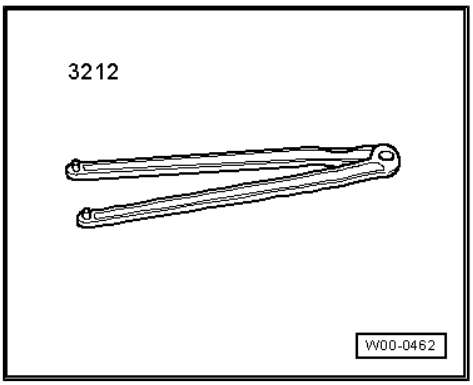
– Tighten bolt -arrow- to 9 Nm.



1.2 Removing and installing cylinder head

Special tools and workshop equipment required

♦ Pin wrench - 3212-

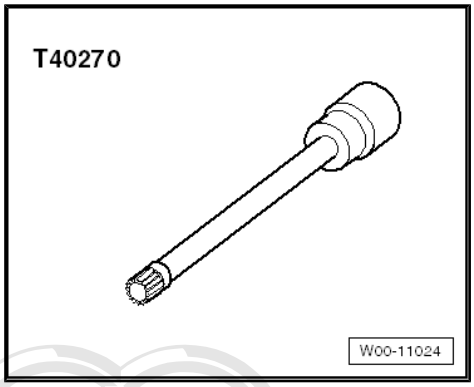


♦ Special wrench, long reach - T10070- for vehicles up to ► July 2011



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♦ Bit XZN 12 - T40270- , for vehicles from July 2011 ► onwards



Removing

- Engine in vehicle.

Note

♦ *The following chapter describes how to remove both cylinder heads together.*

♦ *If only one of the cylinder heads is to be removed, refer to the corresponding procedure described in this chapter.*

♦ *Fit all cable ties in the original positions when installing.*

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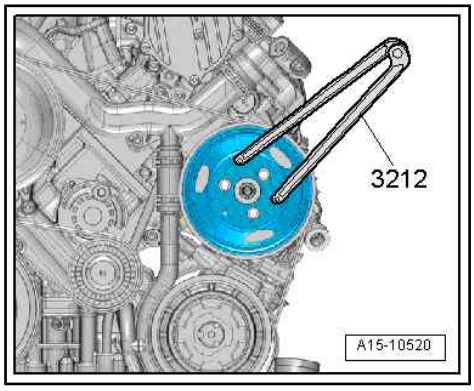
– Remove intake manifold bottom sections ⇒ page 347 .

– Unplug electrical connectors at injectors.

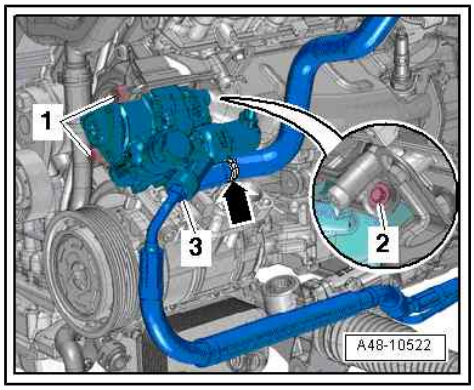
– Remove timing chain from camshafts on relevant side ⇒ page 168 .

Vehicles with hydraulic power steering:

– Remove bolts for power steering pump pulley (counterhold with pin wrench - 3212-).



– Remove bolts -1- and -2- and move power steering pump to one side.

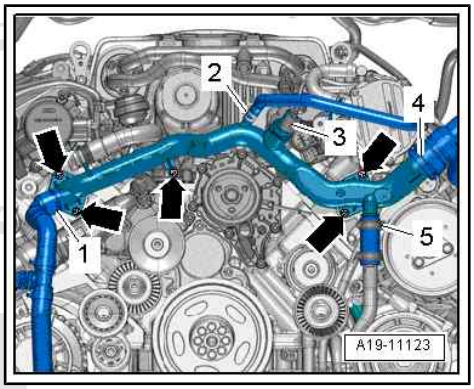


Note

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

♦ *Disregard -item 3- and -arrow-.*

All vehicles (continued):



– Unplug electrical connector -3- for coolant temperature sender - G62- .

– Remove bolts -arrows-.

– Lift retaining clips -1, 4-, release hose clip -2- and detach coolant hoses from coolant pipe (front).

Note

Disregard -item 5-.

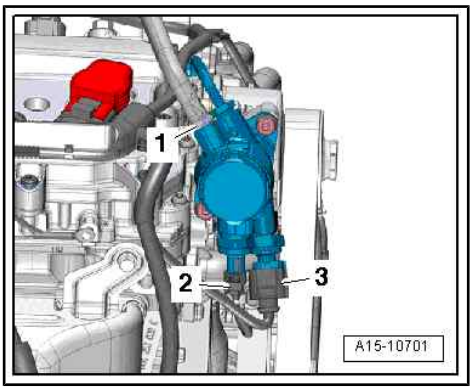
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WARNING

The fuel system is pressurised.

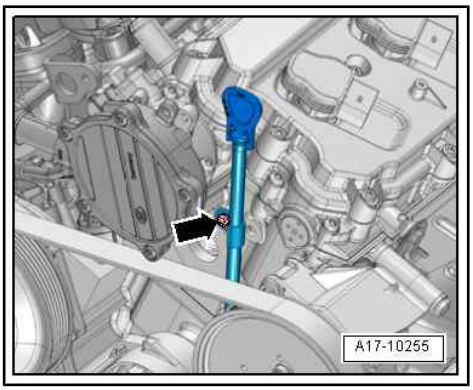
Risk of injury as fuel may spray out.

- ***Put on safety goggles.***
- ***Put on protective gloves.***
- ***Release pressure (wrap clean cloth around connection and open connection carefully).***



– Unscrew connection -1- and move fuel supply hose clear to one side.

– Unplug electrical connectors -2- and -3-.

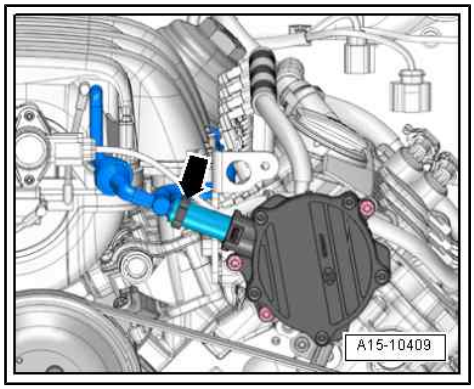


– Remove bolt -arrow- and pull out guide tube for oil dipstick.

– Release hose clip -arrow-, detach vacuum hose from vacuum pump and move vacuum hose clear.

For cylinder head (right-side) only

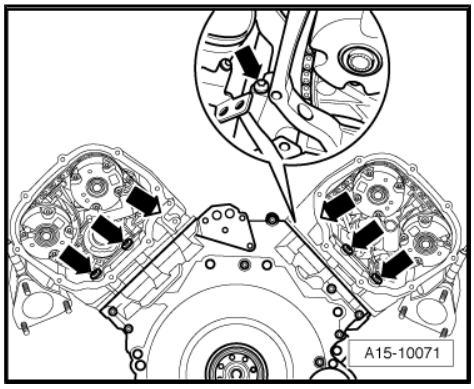
– Remove coolant pipe (top) ⇒ page 273 .



All vehicles (continued)

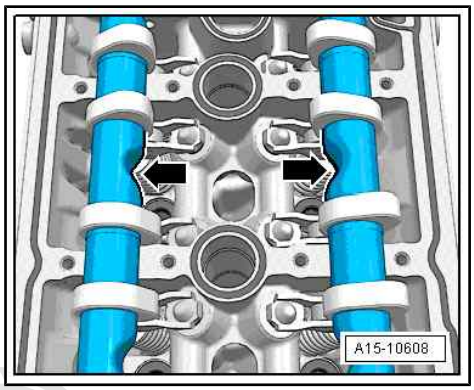
– Remove bolts -arrows- at rear of cylinder head.

- Cylinder head (left-side): 3 bolts
- Cylinder head (right-side): 4 bolts



Note

- *Depending on the version, different camshafts (with or without recesses) and cylinder head bolts (with or without collar) are fitted.*
- *Distinguishing features:*
- *Cylinder head bolts without a collar have a Polydrive head.*
- *Cylinder head bolts with a collar have a multi-point socket head.*
- *Camshafts with assembly clearance feature have tool recesses -arrows-; the cylinder head bolts without a collar can be removed without any further preparation. Those with a collar cannot be removed without further preparation (camshafts must be removed ⇒ page 190 before cylinder head bolts can be unscrewed).*
- *Camshafts without tool recesses must be removed ⇒ page 190 before the cylinder head bolts can be removed.*



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

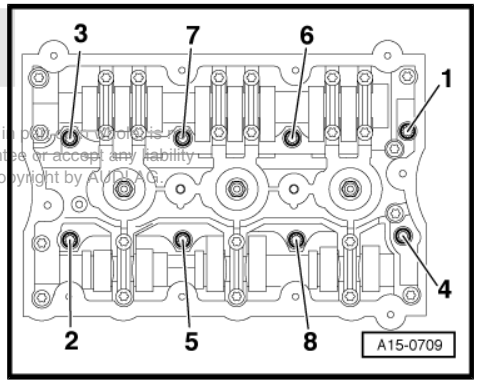
– Unscrew bolts, detach cylinder head and set it down on a soft surface (foam plastic).

Installing

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Tightening torques

- ⇒ Fig. ""Cylinder head - tightening torque and sequence"" , page 136 .
- ⇒ Fig. ""Timing chain cover (bottom) - tightening torque and sequence"" , page 150



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.*

Ensure that cylinder head gasket seals properly:

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

Risk of damage to open valves.

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

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

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

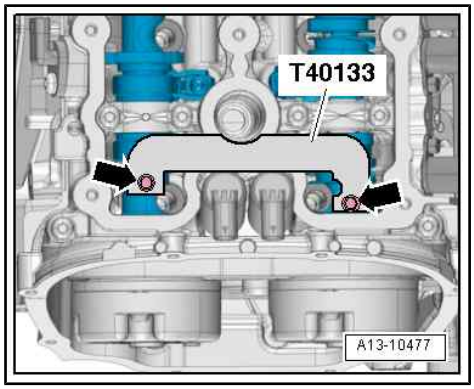
Note

- *Renew the bolts tightened with specified tightening angle.*
- *Renew self-locking nuts as well as seals, gaskets and O-rings.*
- *Note the different sealants for sealing surfaces and cylinder head bolts.*
- *When installing an exchange cylinder head, the contact surfaces between the hydraulic compensation elements, 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 renewing the cylinder head or cylinder head gasket, change the coolant and engine oil.*

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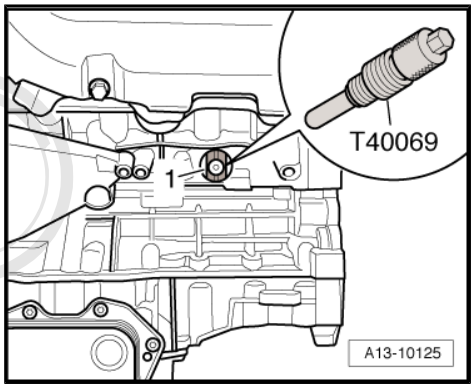
Cylinder head with camshafts installed

- Camshafts on both cylinder heads locked in “TDC” position -arrows- with camshaft clamp - T40133- (25 Nm).
- The camshaft clamp - T40133- is positioned correctly if the holes for the cylinder head bolts remain free.



All vehicles (continued)

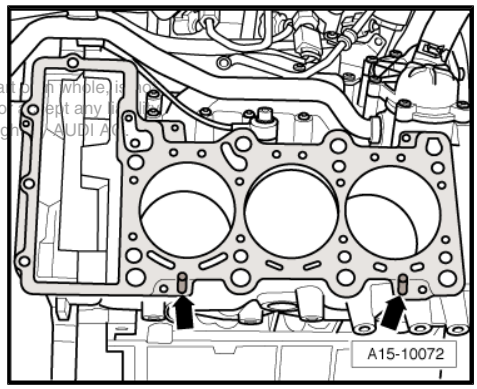
- Crankshaft -1- locked in “TDC” position with locking pin - T40069- .



– Renew seals and O-rings for coolant pipe (front).

– Place cylinder head gasket in position.

- Installation position: the word “oben” (top) or the Part No. should be visible.
- Pay attention to dowel sleeves -arrows- in cylinder block.

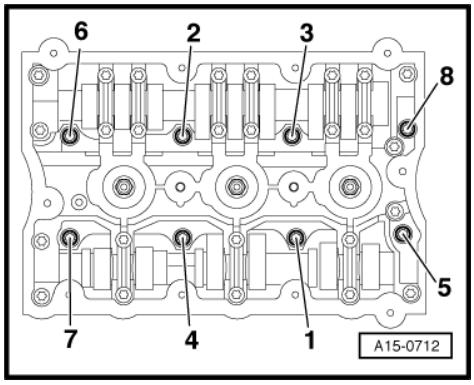


– Fit cylinder head.

– Tighten cylinder head bolts ⇒ Fig. ““Cylinder head - tightening torque and sequence”“ , page 136 .

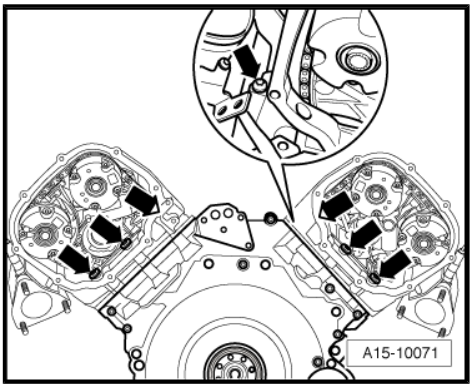
Cylinder head with camshafts removed

– Install camshafts ⇒ page 190 .



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All vehicles (continued)



– Tighten bolts -arrows- for timing chain cover (bottom) ⇒ Fig. ""Timing chain cover (bottom) - tightening torque and sequence"" , page 150 .

◆ Cylinder head (left-side): 3 bolts

◆ Cylinder head (right-side): 4 bolts

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 dipstick guide tube ⇒ page 137 .

– Install coolant pipe (front) ⇒ page 269 .

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

– Fit timing chains on camshafts ⇒ page 168 .

– Install intake manifold (bottom sections) ⇒ page 347 .

– Install poly V-belt:

◆ ⇒ "1.2.2 Removing and installing poly V-belt - vehicles with hydraulic power steering", page 96 .

◆ ⇒ "1.2.3 Removing and installing poly V-belt - vehicles with electromechanical power steering", page 98 .

– Install coolant pipe (top) ⇒ page 273 .

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

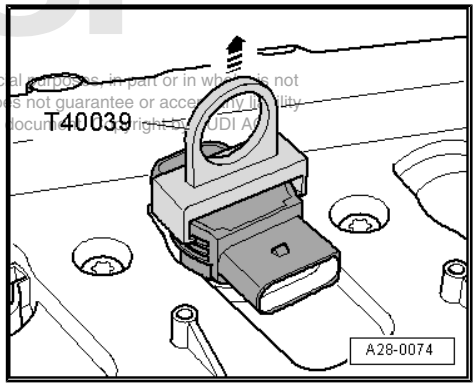
– Fill cooling system with fresh coolant ⇒ page 240 .

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

Removing

– Remove ignition coils ⇒ page 414 .

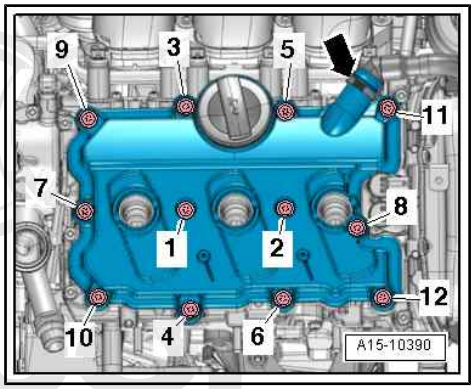
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Rest-of-world vehicles:

– Disconnect crankcase breather hose -arrow- by pressing release tabs.

– Remove bolts in the sequence -12 ... 1- and remove cylinder head cover (left-side).



USA models:

Caution

Risk of violating emission legislation applying to USA models.

- ***Do NOT open hose connection -arrow-.***

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– Remove bolts in the sequence -12 ... 1- and move cylinder head cover (left-side) clear to one side with crankcase breather hose -arrow- still connected.

Installing

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

- Tightening torques ⇒ Fig. ""Cylinder head cover (left-side) - tightening torque and sequence"" , page 136

Note

- *Renew gasket for cylinder head cover if damaged.*
- *Renew bolts for cylinder head cover if seals on bolts are damaged.*
- *Fit new O-ring.*

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

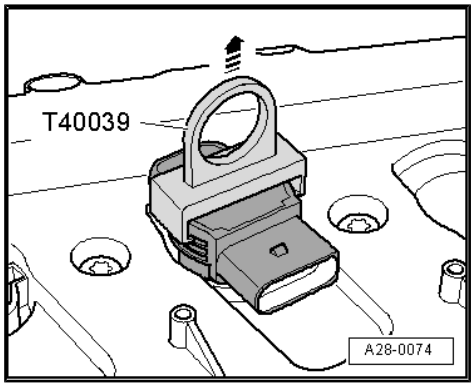
– Tighten bolts for cylinder head cover (left-side) ⇒ page 136 .

– Install ignition coils ⇒ page 414 .

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

Removing

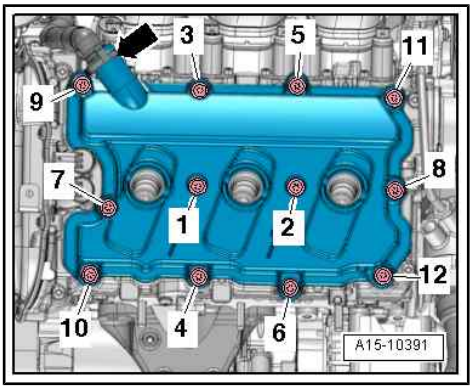
– Remove ignition coils ⇒ page 414 .



Rest-of-world vehicles:

– Disconnect crankcase breather hose -arrow- by pressing release tabs.

– Remove bolts in the sequence -12 ... 1- and remove cylinder head cover (right-side).



USA models:

Caution

Risk of violating emission legislation applying to USA models.

♦ ***Do NOT open hose connection -arrow-.***

– Remove bolts in the sequence -12 ... 1- and move cylinder head cover (right-side) clear to one side with crankcase breather hose -arrow- still connected.

Installing

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

- Tightening torques ⇒ Fig. ""Cylinder head cover (right-side) - tightening torque and sequence"" , page 136

Note

♦ *Renew gasket for cylinder head cover if damaged.*

♦ *Renew bolts for cylinder head cover if seals on bolts are damaged.*

♦ *Fit new O-ring.*

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

– Tighten bolts for cylinder head cover (right-side) ⇒ page 136 .

– Install ignition coils ⇒ page 414 .

1.5 Checking compression

Special tools and workshop equipment required

♦ Spark plug socket and extension - 3122 B-



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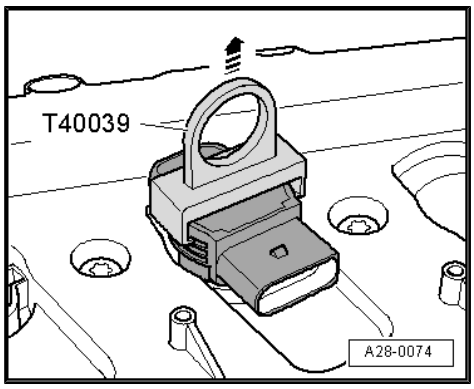
♦ Compression tester - V.A.G 1763-



Procedure

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

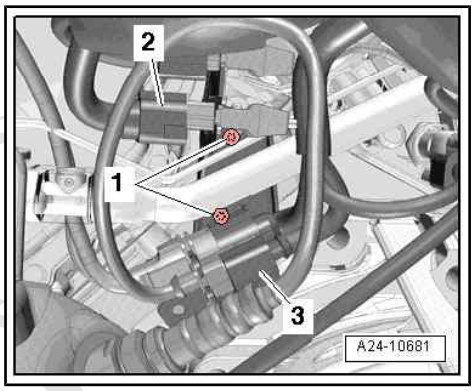
– Remove all ignition coils ⇒ page 414 .



– Unplug electrical connector -2- for injectors at rear of cylinder head (left-side).

Note

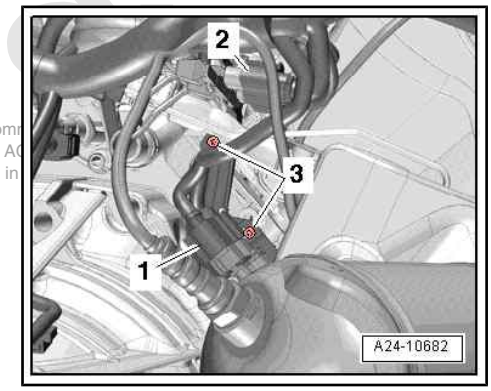
Disregard -items 1, 3-.



– Unplug electrical connector -2- for injectors at rear of cylinder head (right-side).

Note

Disregard -items 1, 3-.



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– Remove spark plugs with spark plug socket and extension - 3122 B- .

– Check compression pressure with compression tester - V.A.G 1763- .

Note

Using the compression tester ⇒ Operating instructions .

– Have a 2nd mechanic press down the accelerator pedal completely and at the same time operate the starter until the pressure on the tester display no longer increases.

– Repeat procedure on each cylinder.

Compression pressure	bar
When new	11.0 … 14.0
Wear limit	10.0
Difference between cylinders	3.0 (maximum)

Assembling

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

– Install spark plugs ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .

– Erase any entries in event memory resulting from testing ⇒ Vehicle diagnostic tester, `Guided Functions`, then `Interrogate event memory`.

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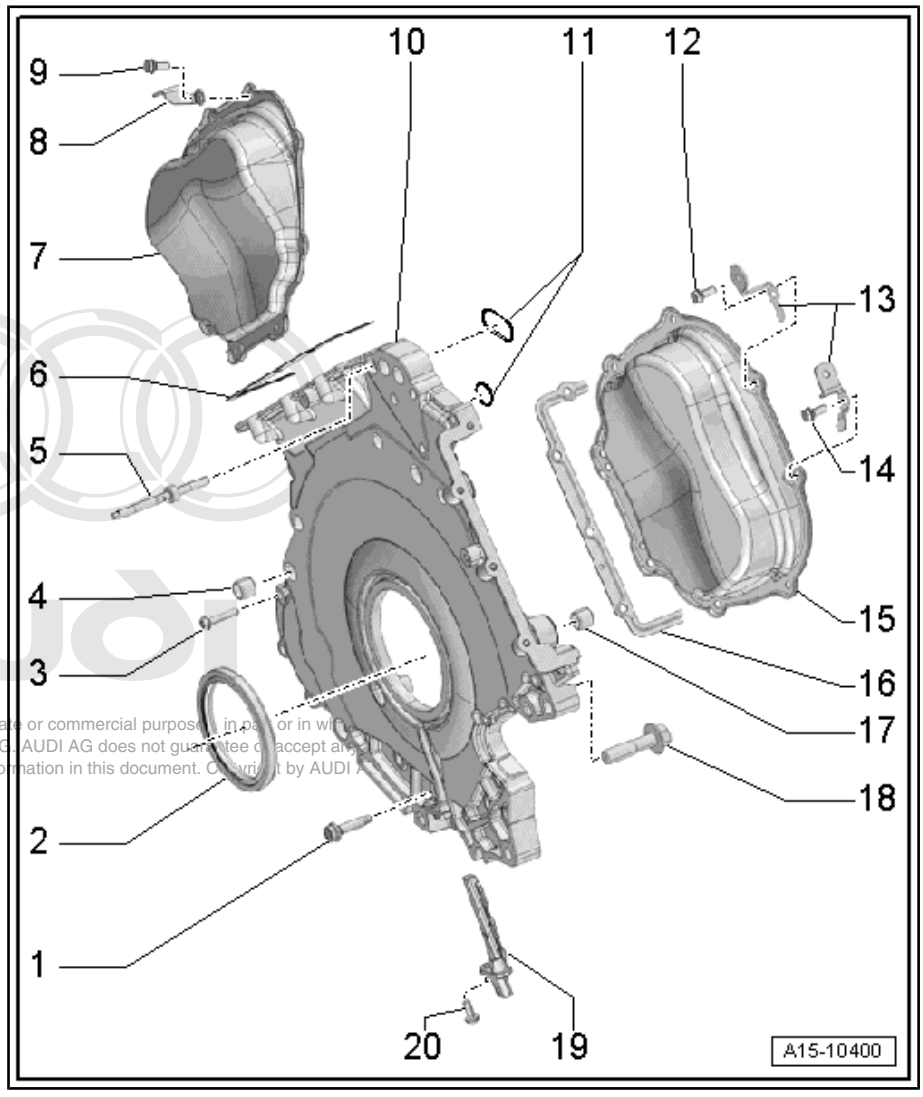
2 Timing chain cover

⇒ “2.1 Exploded view - timing chain cover”, page 148

⇒ “2.2 Removing and installing timing chain covers (left and right)”, page 150

⇒ “2.3 Removing and installing timing chain cover (bottom)”, page 154

2.1 Exploded view - timing chain cover



1 - Bolt

- ❑ Renew
- ❑ Tightening torque and sequence ⇒ Fig. ““Timing chain cover (bottom) - tightening torque and sequence”“ , page 150

2 - Crankshaft oil seal (gearbox end)

- ❑ Renewing ⇒ “2.5 Renewing crankshaft oil seal (gearbox end)”, page 115

3 - Bolt

- ❑ Renew
- ❑ Tightening torque and sequence ⇒ Fig. ““Timing chain cover (bottom) - tightening torque and sequence”“ , page 150

4 - Dowel sleeve

- ❑ 2x

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5 - Threaded pin

- ❑ Tightening torque ⇒ Fig. ““Timing chain cover (bottom) - tightening torque and sequence”“ , page 150

6 - Cylinder head gasket (left-side)

7 - Timing chain cover (left-side)

- ❑ Removing and installing ⇒ “2.2 Removing and installing timing chain covers (left and right)”, page 150

8 - Bracket

- ❑ For wiring harness

9 - Bolt

- ❑ Renew
- ❑ Tightening torque and sequence ⇒ Fig. ““Timing chain cover (left-side) - tightening torque and sequence”“ , page 149

10 - Timing chain cover (bottom)

- ❑ Different types depending on vehicle version; for allocation refer to ⇒ Electronic parts catalogue

- ❑ Installation instructions for sleeve ⇒ page 158
- ❑ Removing and installing ⇒ “2.3 Removing and installing timing chain cover (bottom)”, page 154

11 - Seals

- ❑ Renew

12 - Bolt

- ❑ Tightening torque and sequence ⇒ Fig. ““Timing chain cover (right-side) - tightening torque and sequence”“ , page 149

13 - Bracket

- ❑ For electrical connectors

14 - Bolt

- ❑ Renew
- ❑ Tightening torque and sequence ⇒ Fig. ““Timing chain cover (right-side) - tightening torque and sequence”“ , page 149

15 - Timing chain cover (right-side)

- ❑ Removing and installing ⇒ “2.2 Removing and installing timing chain covers (left and right)”, page 150

16 - Cylinder head gasket (right-side)

17 - Dowel sleeve

- ❑ 2x

18 - Bolt

- ❑ Tightening torque and sequence ⇒ Fig. ““Timing chain cover (bottom) - tightening torque and sequence”“ , page 150

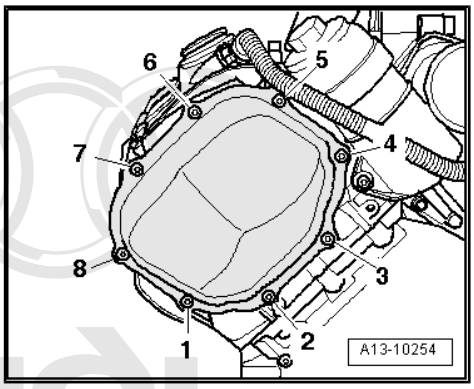
19 - Engine speed sender - G28-

- ❑ Removing and installing ⇒ “1.6 Removing and installing engine speed sender G28 ”, page 418

20 - Bolt

- ❑ Tightening torque ⇒ “1.1 Exploded view - ignition system”, page 413

Timing chain cover (left-side) - tightening torque and sequence



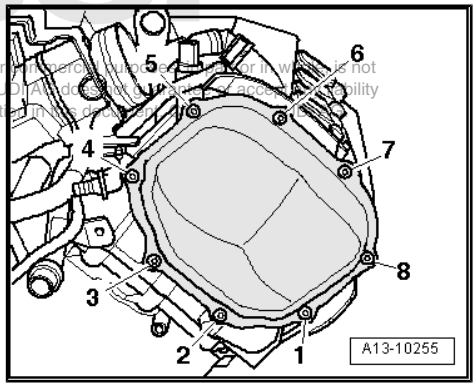
Note

Renew the bolts tightened with specified tightening angle.

– Tighten bolts in 2 stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1.	-1 … 8-	5 Nm
2.	-1 … 8-	Turn 90° further

Timing chain cover (right-side) - tightening torque and sequence



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Note

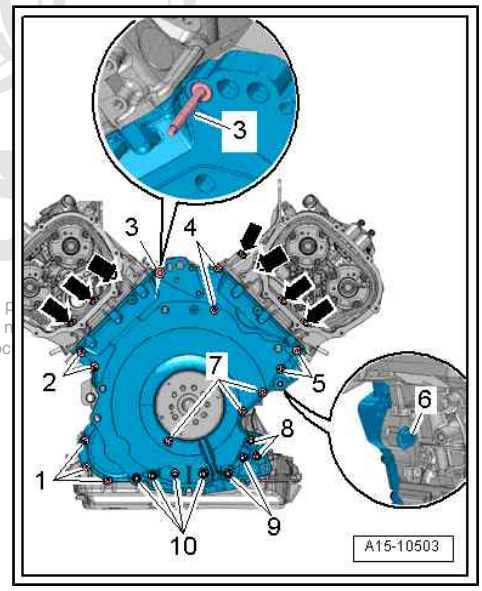
Renew the bolts tightened with specified tightening angle.

– Tighten bolts in 2 stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1.	-1 … 8-	5 Nm

Stage	Bolts	Tightening torque/angle specification
2.	-1 … 8-	Turn 90° further

Timing chain cover (bottom) - tightening torque and sequence



Note

Renew the bolts tightened with specified tightening angle.

Securing with aluminium bolts:

– Tighten aluminium bolts in stages as follows:

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Stage	Bolts	Tightening torque/angle specification
1.	-arrows-	3 Nm
2.	-1 … 10-	3 Nm in diagonal sequence
3.	-1, 2, 4, 5, 7-	Turn 90° further
4.	-arrows-	9 Nm
5.	-8, 9, 10-	8 Nm
6.	-8, 9, 10-	Turn 90° further
7.	-3-	16 Nm
8.	-6-	20 Nm
9.	-6-	Turn 180° further

Securing with steel bolts:

– Tighten steel bolts in stages as follows:

Stage	Bolts	Tightening torque/angle specification
1.	-arrows-	3 Nm
2.	-1 … 10-	3 Nm in diagonal sequence
3.	-1, 2, 4, 5, 7- and -arrows-	9 Nm
4.	-8, 9, 10-	20 Nm
5.	-3-	16 Nm
6.	-6-	70 Nm

2.2 Removing and installing timing chain covers (left and right)

Special tools and workshop equipment required

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

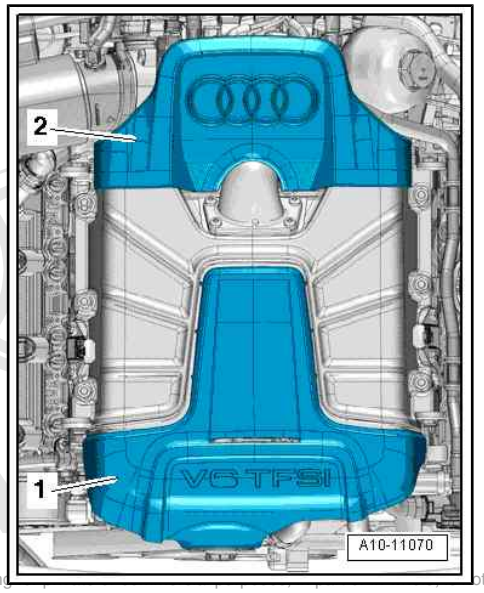
Removing

Note

Fit all cable ties in the original positions when installing.

– Lift off engine cover panel (rear) -2-.

– Remove corresponding combination valve for secondary air system: left-side ⇒ page 402 , right-side ⇒ page 403 .



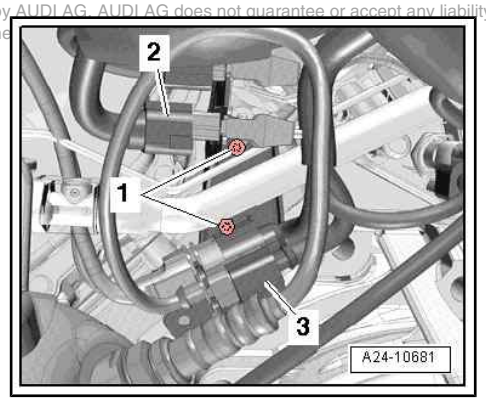
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Timing chain cover (left-side):

– Remove bolts -1- and move bracket with electrical connectors to one side.

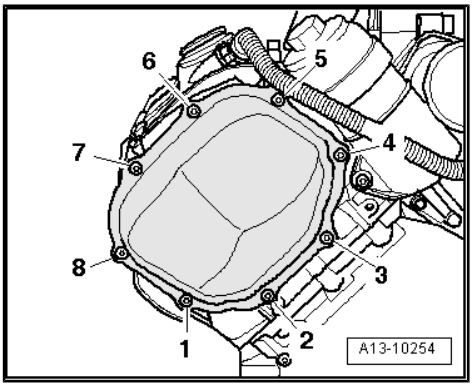
Note

Disregard -items 2, 3-.



– Remove bolts -1 ... 8-.

– Carefully release timing chain cover (left-side) from bonded joint and detach.

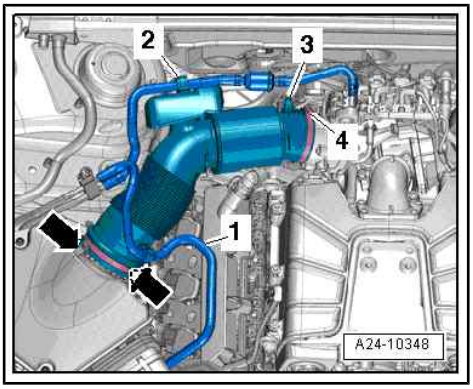


Timing chain cover (right-side):

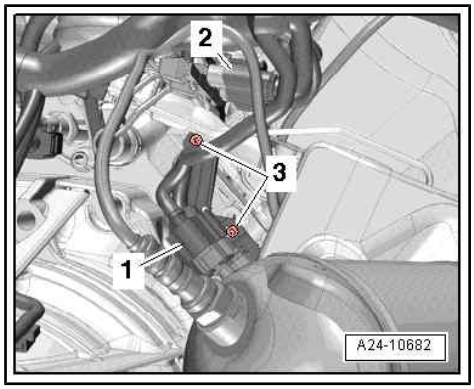
– Move fuel hose -1- and hose -2- leading to activated charcoal filter clear at air pipe.

– Detach vacuum hose -3- from connection on air pipe.

– Remove air pipe. To do so, release hose clip -4- and clamps -arrows-.



– Remove bolts -3- and move bracket with electrical connectors to one side.

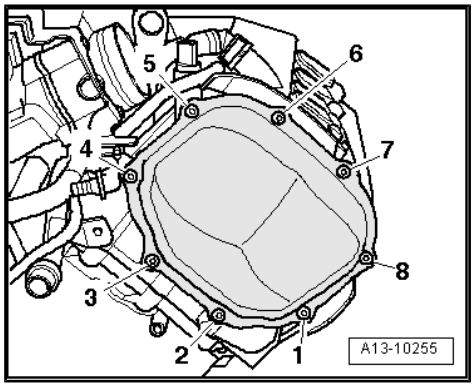


Note

Disregard -items 1, 2-.

– Remove bolts -1 ... 8-.

– Carefully release timing chain cover (right-side) from bonded joint and detach.



Installing

Tightening torques

- ⇒ Fig. ““Timing chain cover (left-side) - tightening torque and sequence”“ , page 149 .
- ⇒ Fig. ““Timing chain cover (right-side) - tightening torque and sequence”“ , page 149 .

Note

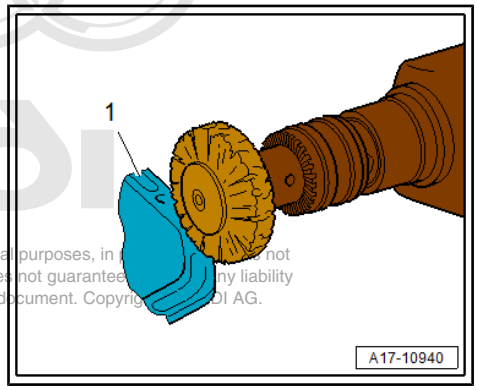
- *Renew the bolts tightened with specified tightening angle.*
- *Fit new O-rings.*

– Remove old sealant from sealing surfaces.

Caution

Protect lubrication system against contamination.

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



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WARNING

Risk of eye injury due to sealant residue.

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

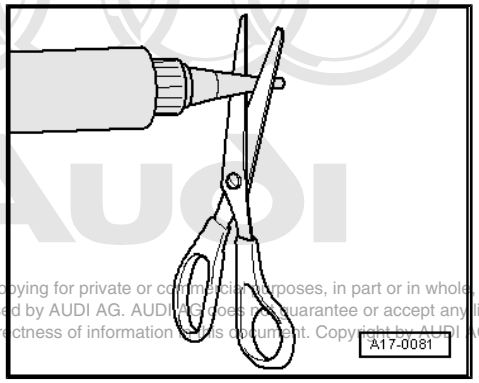
– Remove remaining sealant on timing chain covers, cylinder block and cylinder head using rotating plastic brush or similar.

– 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. 2 mm).

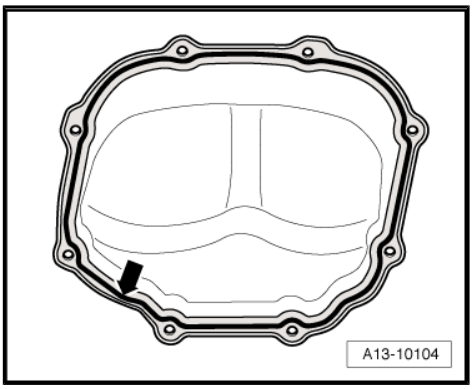


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Caution

Make sure lubrication system is not clogged by excess sealant.

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



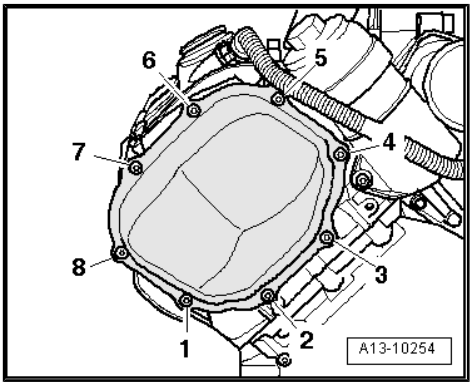
– Apply sealant bead -arrow- onto the clean sealing surface of the timing chain cover (left-side) as illustrated.

- Width of sealant bead: 2.5 mm.

Note

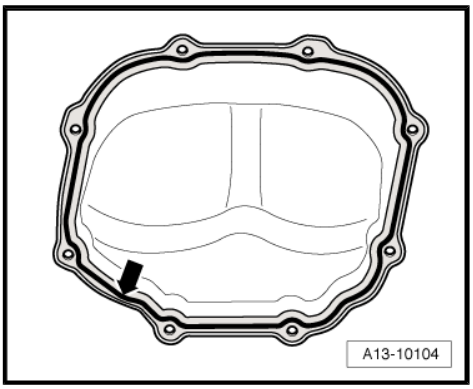
The timing chain covers must be installed within 5 minutes after applying sealant.

– Install timing chain cover (left-side) and tighten bolts ⇒ page 149 .

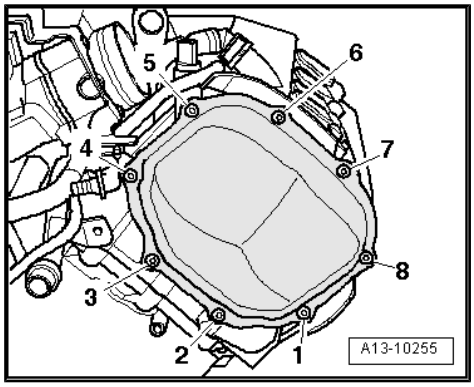


– Apply sealant bead -arrow- onto the clean sealing surface of the timing chain cover (right-side) as illustrated.

- Width of sealant bead: 2.5 mm.



– Install timing chain cover (right-side) and tighten bolts ⇒ page 149 .



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

Note

Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .

– Install combination valve for secondary air system: left-side ⇒ page 402 , right-side ⇒ page 403 .

2.3 Removing and installing timing chain cover (bottom)

Special tools and workshop equipment required

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

Removing

– Remove coolant pipe (top) ⇒ page 273 .

- Gearbox removed ⇒ Rep. gr. 34 ; Removing and installing gearbox; Removing gearbox
- Engine oil drained ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .

Note

Fit all cable ties in the original positions when installing.

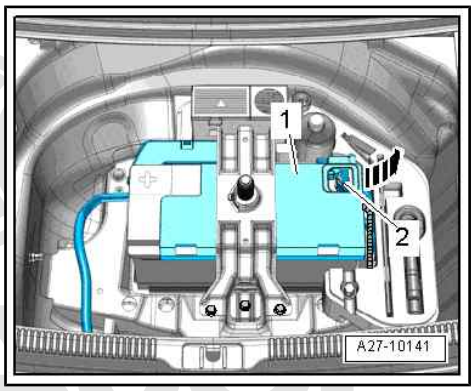
– Switch off ignition and take out ignition key.

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

– Remove drive plate ⇒ page 113 .

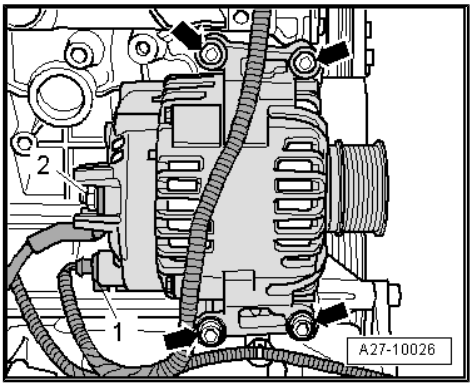
– Remove timing chain covers (left and right) ⇒ page 150 .

– Remove oil filter housing ⇒ page 230 .



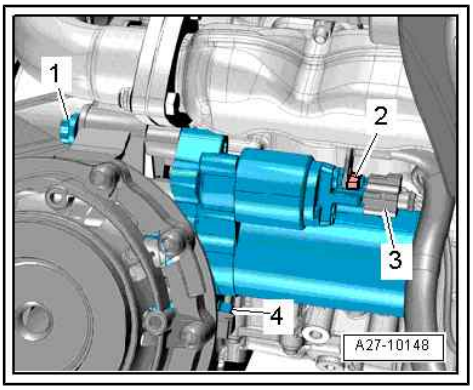
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– Remove alternator ⇒ Electrical system; Rep. gr. 27 ; Alternator; Removing and installing alternator .



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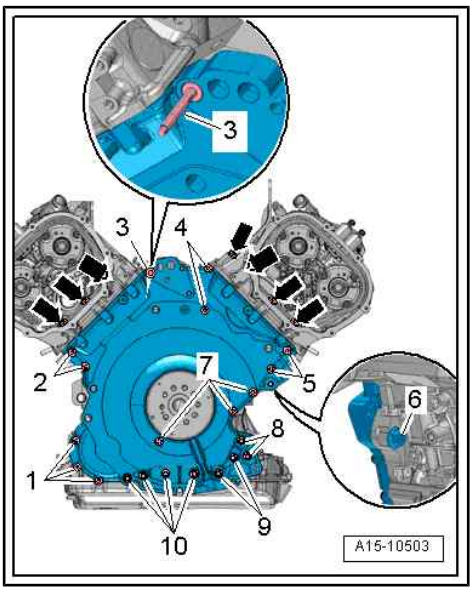
– Unplug electrical connector -3- at starter (push retainer to the rear and press down release catch).
– Remove nut -2- for electrical wiring and detach starter.



Note

Disregard -items 1, 4-.

– Remove bolts -arrows-.
– Slacken bolts -1 ... 10- in diagonal sequence and remove.
– Carefully release timing chain cover (bottom) from bonded joint and remove cover.
– Press crankshaft oil seal (gearbox end) out of timing chain cover (bottom).

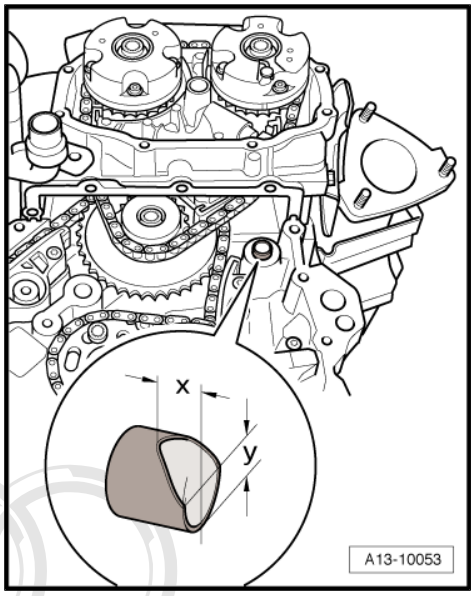


Installing

Note

Renew gaskets, seals and O-rings.

– Pull dowel sleeve at top right out of cylinder block.
– Bevel the dowel sleeve with a file, as illustrated.
• Dimension -x- = 6.5 mm.
• Dimension -y- = 8 mm.
– Fit dowel sleeve on cylinder block in such a way that the bevelled side points upwards.



Note

Bevelling the dowel sleeve makes it easier to fit the timing chain cover (bottom) with the cylinder head installed.

Caution

Protect lubrication system against contamination.

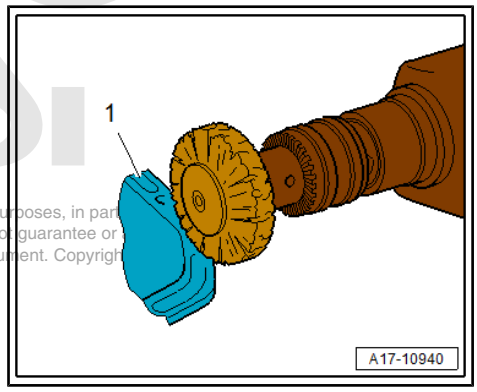
♦ ***Cover exposed parts of the engine.***

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WARNING

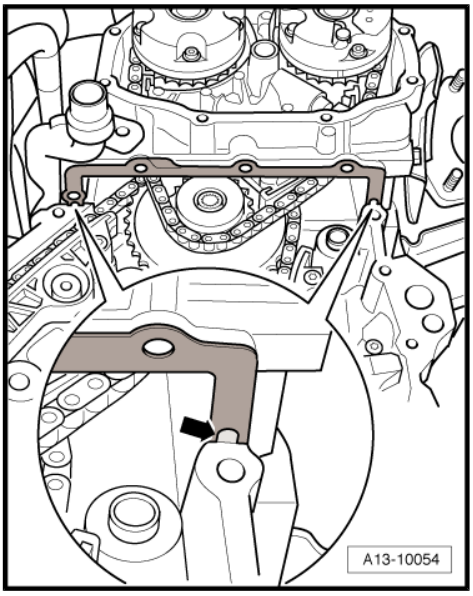
Risk of eye injury due to sealant residue.

• ***Put on safety goggles.***



– Remove remaining sealant on timing chain cover, cylinder block and cylinder head 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.

– Clean old sealant from holes -arrow- in cylinder head gaskets.



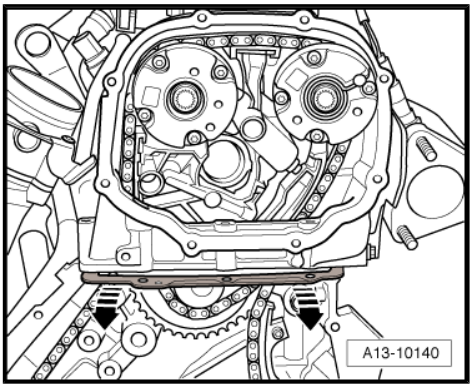
Note

With the cylinder head installed the holes in the cylinder head gasket are only half visible.

Caution

Avoid damage to cylinder head gasket.

- ***Only bend the ends of the cylinder head gaskets slightly and do not kink.***



Note

If the cylinder head gasket has been bent and kinked it must be renewed.

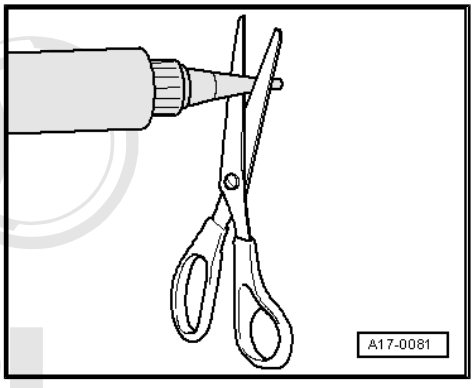
– Carefully bend the ends of the cylinder head gaskets down very slightly -arrows-, just far enough to be able to clean the upper sealing surface on the cylinder head gasket and cylinder head.

– Clean cylinder head gaskets (top and bottom); 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).

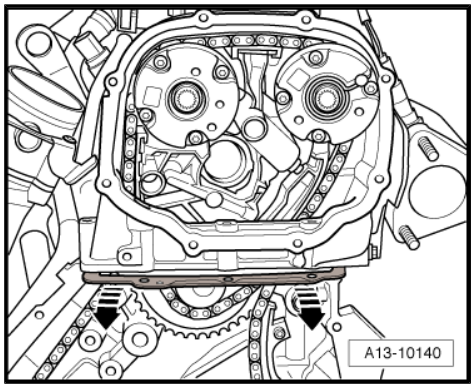


Note

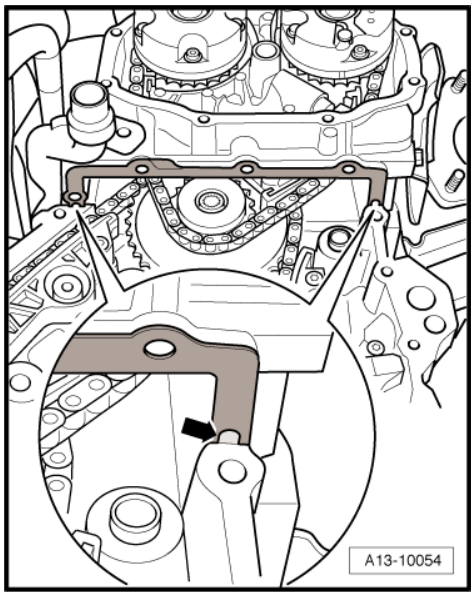
The sealant must be applied at several points on the engine as described below.

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– Apply a small amount of sealant to sealing surfaces of cylinder head gaskets (top and bottom). To do so, you again have to bend cylinder head gaskets down very slightly -arrows-.
– Use a flat object (e.g. a feeler gauge) to apply sealant to the area between cylinder head and gasket.



– Clean holes -arrow- in cylinder head gaskets and fill them with sealant.



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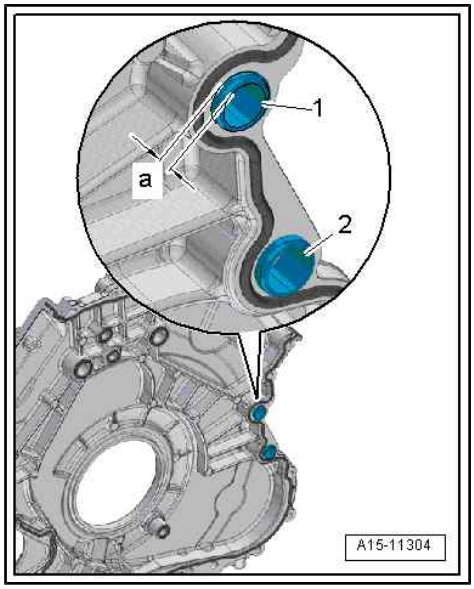
Note

Depending on version, a second sleeve -2- may be fitted between sealing flange and cylinder block on left side of engine.

Caution

Risk of sealant entering hole for gearbox bolt.

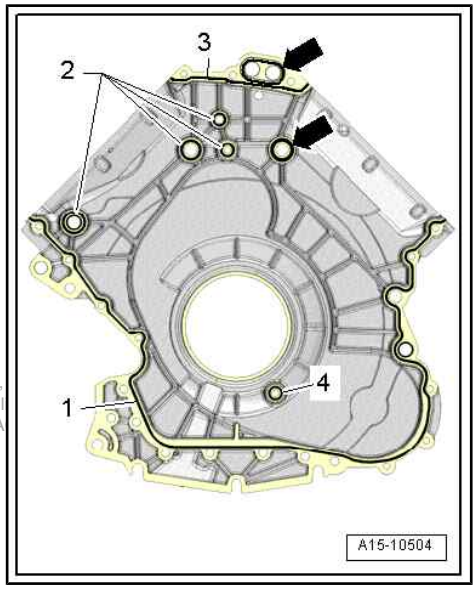
- ***Appropriate sleeve -1- ⇒ Electronic parts catalogue must be fitted before installing timing chain cover (bottom).***
- ***Projection of sleeve -a- = 3 mm above the sealing surface.***



Note

Sleeves -1- and -2- have different diameters and are not interchangeable.

Timing chain cover (bottom), version 1



Caution

Make sure lubrication system is not clogged by excess sealant.

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

– Apply sealant beads -1 ... 4- onto the clean sealing surfaces of the timing chain cover (bottom) as illustrated.

- The groove on the sealing surface must be completely filled with sealant.
- The beads of sealant must project 1.5 … 2.0 mm above the sealing surface.
- Apply sealant -3- in a continuous bead as shown in illustration (although groove is not continuous).

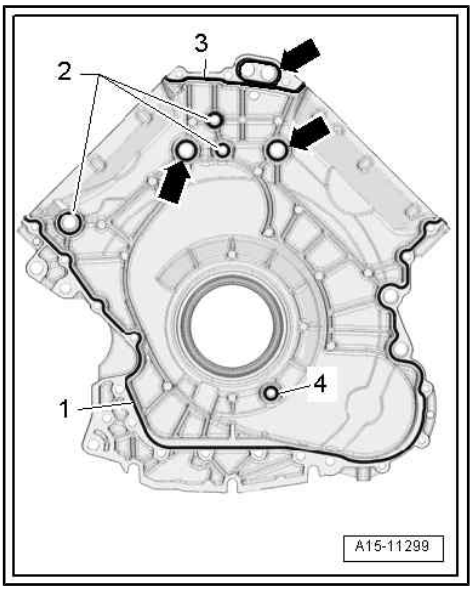
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Note

The timing chain cover must be installed within 5 minutes after applying sealant.

– Insert seals -arrows- in grooves on timing chain cover (bottom).

Timing chain cover (bottom), version 2



Caution

Make sure lubrication system is not clogged by excess sealant.

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

– Apply sealant beads -1 ... 4- onto the clean sealing surfaces of the timing chain cover (bottom) as illustrated.

- The groove on the sealing surface must be completely filled with sealant.
- The beads of sealant must project 1.5 … 2.0 mm above the sealing surface.
- Apply sealant -3- in a continuous bead as shown in illustration (although groove is not continuous).

Note

The timing chain cover must be installed within 5 minutes after applying the sealant.

– Insert seals -arrows- in grooves on timing chain cover (bottom).

All versions (continued):

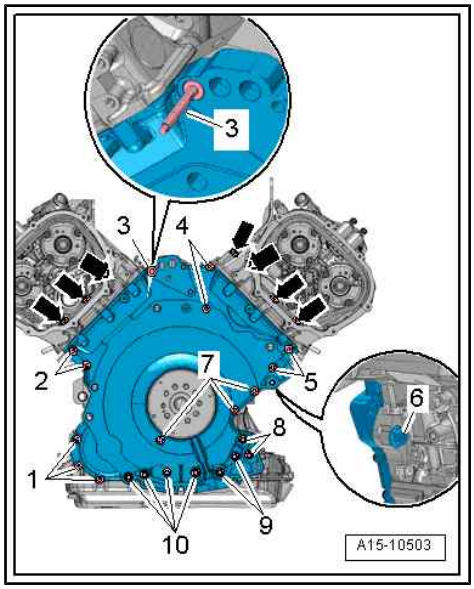
– Fit timing chain cover (bottom), guiding it towards the sealing surface on cylinder block and cylinder head at an angle and from below.

– Take care not to damage the cylinder head gaskets when fitting the cover.

– Tighten bolts for timing chain cover (bottom) ⇒ page 150 .

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

– Install crankshaft oil seal (gearbox end) ⇒ page 115 .
– Install alternator ⇒ Electrical system; Rep. gr. 27 ; Alternator; Removing and installing alternator .
– Install starter ⇒ Electrical system; Rep. gr. 27 ; Starter; Removing and installing starter .
– Install oil filter housing ⇒ page 230 .
– Install coolant pipe (top) ⇒ page 273 .
– Install timing chain covers (left and right) ⇒ page 150 .
– Install supercharger ⇒ page 310 .
– Install drive plate ⇒ page 113 .
– Fill up with engine oil and check oil level ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .



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3 Chain drive

⇒ “3.1 Exploded view - camshaft timing chains”, page 161

⇒ “3.2 Exploded view - drive chain for valve gear”, page 163

⇒ “3.3 Exploded view - drive chain for balance shaft and oil pump”, page 165

⇒ “3.4 Removing and installing camshaft timing chain”, page 166

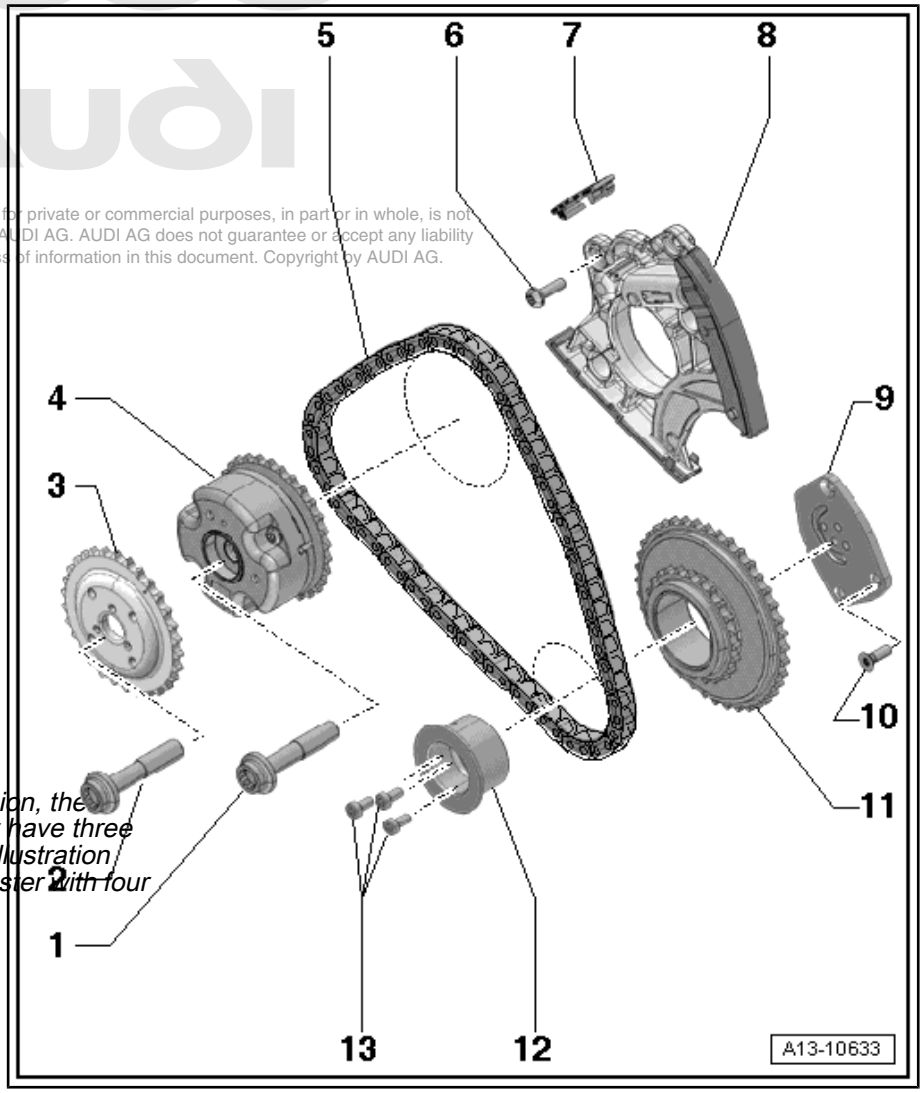
⇒ “3.5 Removing camshaft timing chain from camshafts”, page 168

⇒ “3.6 Removing and installing drive chain for valve gear”, page 181

⇒ “3.7 Removing and installing drive chain for auxiliary drive”, page 182

3.1 Exploded view - camshaft timing chains

Camshaft timing chain (left-side)



1 - Bolt

- ❑ Renew
- ❑ 80 Nm +90°

2 - Bolt

- ❑ Renew
- ❑ 80 Nm +90°

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3 - Camshaft chain sprocket for exhaust camshaft

- ❑ Removing and installing ⇒ “3.5 Removing camshaft timing chain from camshafts”, page 168

4 - Camshaft adjuster for inlet camshaft

- ❑ Identification “Intake”
- ❑ Removing and installing ⇒ “3.5 Removing camshaft timing chain from camshafts”, page 168

Note

Depending on the version, the camshaft adjuster may have three or four recesses. The illustration shows a camshaft adjuster with four recesses.

5 - Camshaft timing chain (left-side)

- ❑ Mark direction of rotation for re-installation with a paint marker
- ❑ Removing from camshafts ⇒ “3.5 Removing camshaft timing chain from camshafts”, page 168
- ❑ Removing and installing ⇒ “3.4 Removing and installing camshaft timing chain”, page 166

6 - Bolt

- ❑ 9 Nm

7 - Slide

8 - Chain tensioner for camshaft timing chain (left-side)

- ❑ Removing and installing ⇒ “3.5 Removing camshaft timing chain from camshafts”, page 168

9 - Bearing plate for drive sprocket

10 - Bolt

- ❑ Renew
- ❑ 8 Nm +45°

11 - Drive sprocket for camshaft timing chain (left-side)

12 - Bearing mounting for drive sprocket

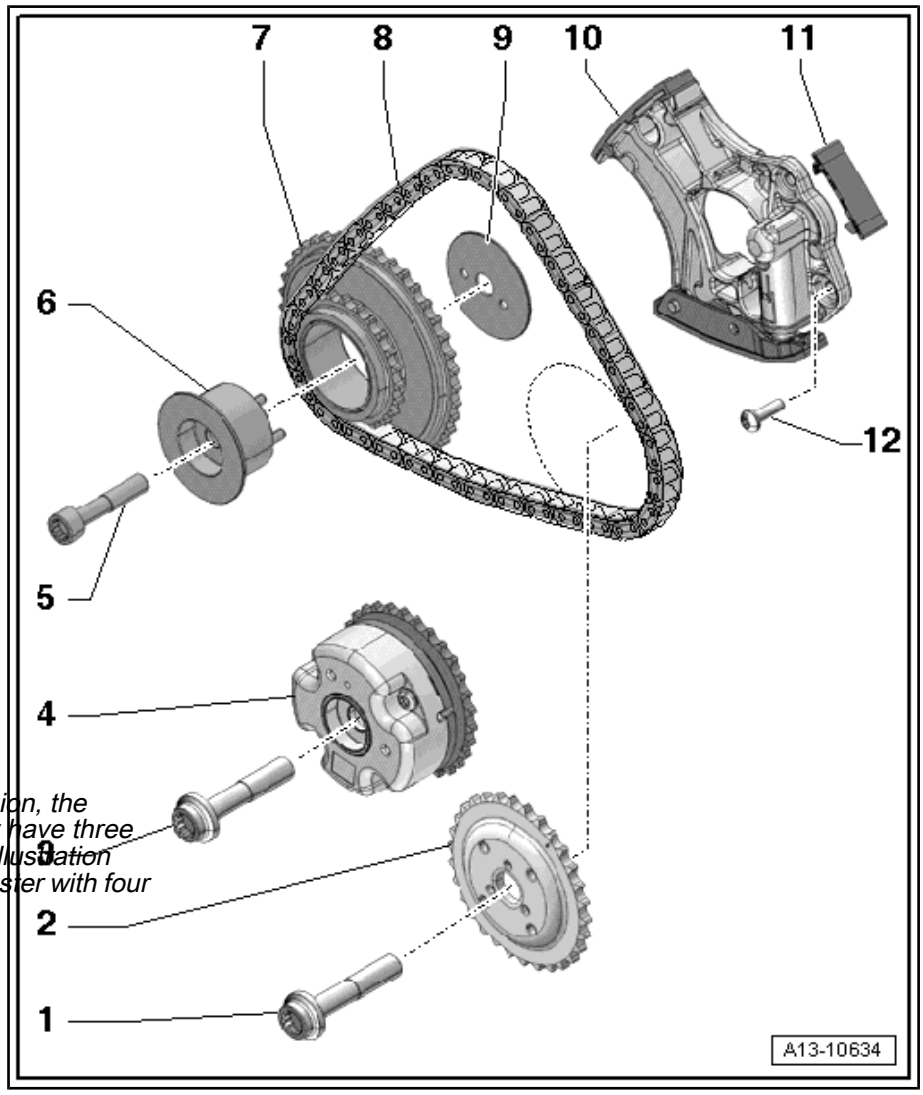
- ❑ For camshaft timing chain (left-side)

13 - Bolts

- ❑ Tightening torque ⇒ Item 3 (page 164)

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Camshaft timing chain (right-side)



1 - Bolt

- ❑ Renew
- ❑ 80 Nm +90°

2 - Camshaft chain sprocket for exhaust camshaft

- ❑ Removing and installing ⇒ “3.5 Removing camshaft timing chain from camshafts”, page 168

3 - Bolt

- ❑ Renew
- ❑ 80 Nm +90°

4 - Camshaft adjuster for inlet camshaft

- ❑ Identification “Intake”
- ❑ Removing and installing ⇒ “3.5 Removing camshaft timing chain from camshafts”, page 168

Note

Depending on the version, the camshaft adjuster may have three or four recesses. The illustration shows a camshaft adjuster with four recesses.

5 - Bolt

- ❑ Tightening torque ⇒ Item 15 (page 164)

6 - Bearing mounting for drive sprocket

- ❑ For camshaft timing chain (right-side)
- ❑ Asymmetric version
- ❑ Installation position ⇒ Fig. ""Installation position: bearing mounting for drive sprocket for camshaft timing chain (right-side)"" , page 165

7 - Drive sprocket for camshaft timing chain (right-side)

- ❑ Installation position ⇒ Fig. ""Installation position: bearing mounting for drive sprocket for camshaft timing chain (right-side)"" , page 165

8 - Camshaft timing chain (right-side)

- ❑ Mark direction of rotation for re-installation with a paint marker
- ❑ Removing from camshafts ⇒ "3.5 Removing camshaft timing chain from camshafts", page 168
- ❑ Removing and installing ⇒ "3.4 Removing and installing camshaft timing chain", page 166

9 - Thrust washer for drive sprocket

- ❑ For camshaft timing chain (right-side)
- ❑ Asymmetric version
- ❑ Installation position ⇒ Fig. ""Installation position: bearing mounting for drive sprocket for camshaft timing chain (right-side)"" , page 165

10 - Chain tensioner for camshaft timing chain (right-side)

- ❑ Removing and installing ⇒ "3.5 Removing camshaft timing chain from camshafts", page 168

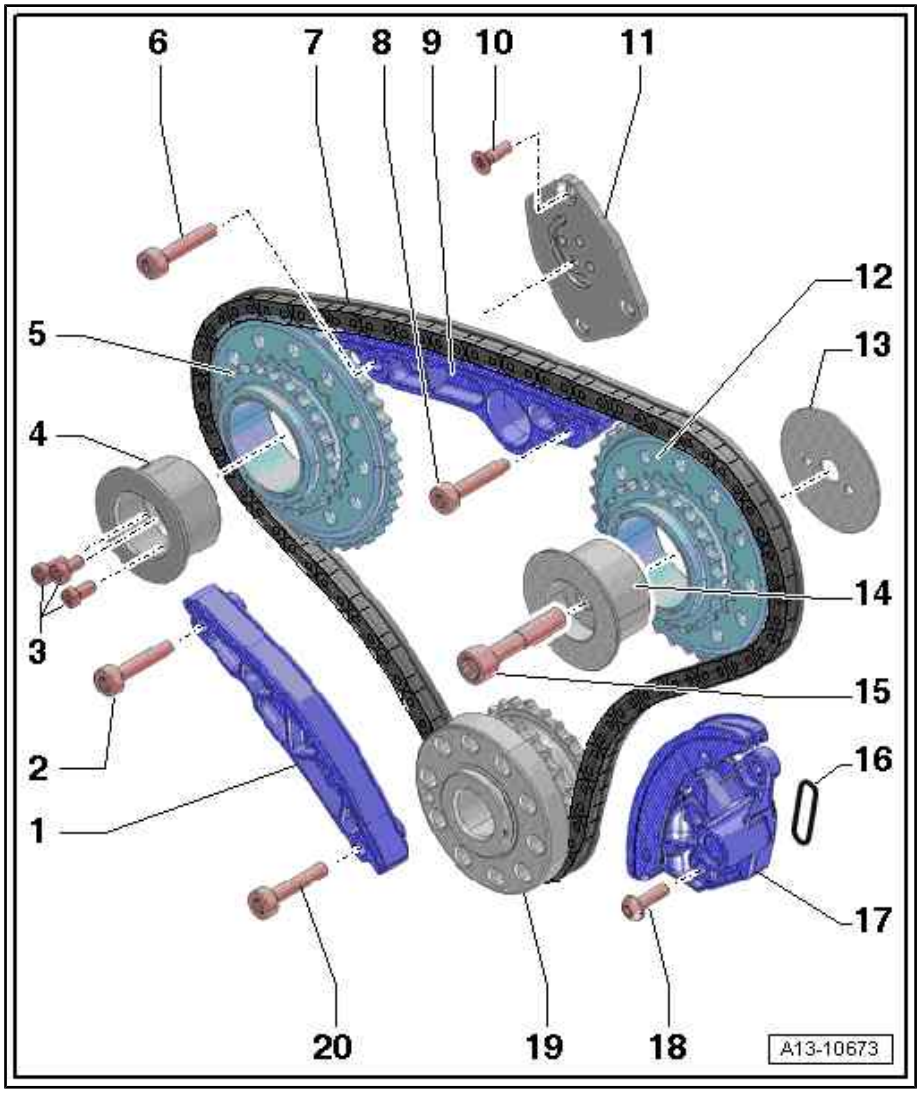
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11 - Slide

12 - Bolt

- ❑ 9 Nm

3.2 Exploded view - drive chain for valve gear



1 - Guide rail

2 - Bolt

- ❑ Renew
- ❑ 10 Nm +90°

3 - Bolts

- ❑ Renew
- ❑ 5 Nm +60°

4 - Bearing mounting for drive sprocket

5 - Drive sprocket for timing chain (left-side)

6 - Bolt

- ❑ Renew
- ❑ 10 Nm +90°

7 - Drive chain for valve gear

- ❑ Mark direction of rotation for re-installation with a paint marker
- ❑ Removing and installing ⇒ “3.6 Removing and installing drive chain for valve gear”, page 181

8 - Bolt

- ❑ Renew
- ❑ 10 Nm +90°

9 - Guide rail

10 - Bolt

- ❑ Renew
- ❑ 8 Nm +45°

11 - Bearing plate for drive sprocket

- ❑ For camshaft timing chain (right-side)
- ❑ Asymmetric version

12 - Drive sprocket for timing chain (right-side)

- ❑ Installation position ⇒ Fig. ““Installation position: bearing mounting for drive sprocket for camshaft timing chain (right-side)”“ , page 165

13 - Thrust washer

- ❑ Asymmetric version
- ❑ Installation position ⇒ Fig. ““Installation position: bearing mounting for drive sprocket for camshaft timing chain (right-side)”“ , page 165

14 - Bearing mounting for drive sprocket

- ❑ Asymmetric version
- ❑ Installation position ⇒ Fig. ““Installation position: bearing mounting for drive sprocket for camshaft timing chain (right-side)”“ , page 165

15 - Bolt

- ❑ 30 Nm +90°

16 - Seal

- ❑ Renew

17 - Chain tensioner

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- ❑ Removing and installing ⇒ “3.6 Removing and installing drive chain for valve gear”, page 181

18 - Bolt

- ❑ 9 Nm

19 - Crankshaft

20 - Bolt

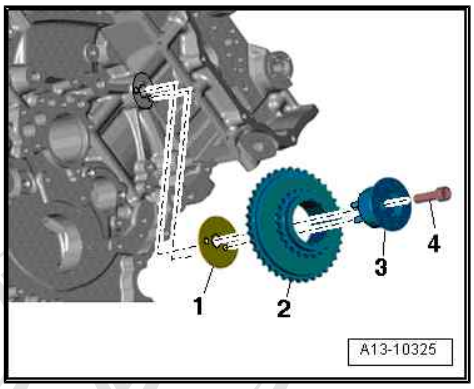
- ❑ Renew
- ❑ 10 Nm +90°

Installation position: bearing mounting for drive sprocket for camshaft timing chain (right-side)

- Dowel pins in bearing mounting -3- for drive sprocket for camshaft timing chain (right-side) must engage in drillings in thrust washer -1- and in cylinder block drillings.

2 - Drive sprocket for camshaft timing chain (right-side)

4 - Bolt



3.3 Exploded view - drive chain for balance shaft and oil pump

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1 - Crankshaft

2 - Drive chain for auxiliary drives

- ❑ Mark direction of rotation for re-installation with a paint marker
- ❑ Removing and installing ⇒ “3.7 Removing and installing drive chain for auxiliary drive”, page 182

3 - Drive chain sprocket for oil pump

- ❑ Installation position: Side with lettering faces engine

4 - Bolt

- ❑ Renew
- ❑ 30 Nm +90°

5 - Compression spring

6 - Bolt

- ❑ Renew
- ❑ 15 Nm +90°

7 - Chain sprocket for balance shaft

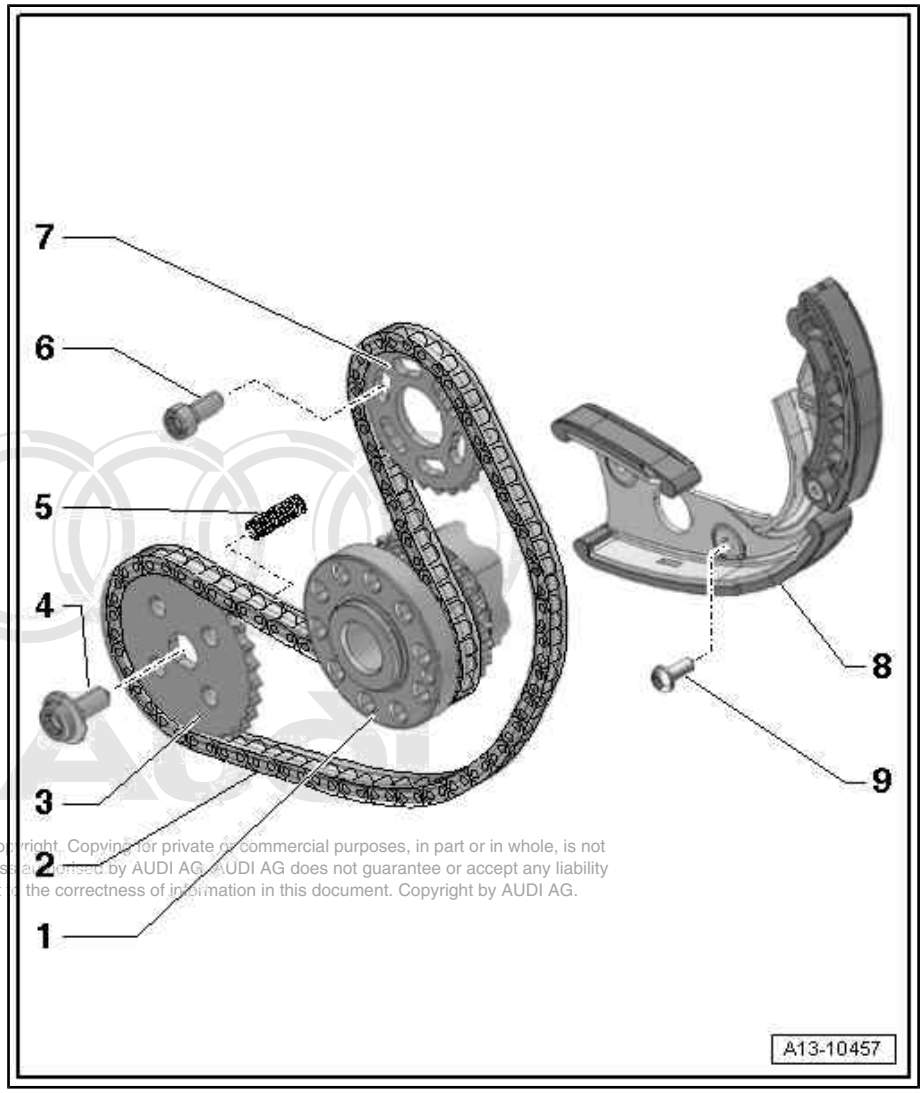
- ❑ Installation position: Side with lettering faces gearbox

8 - Chain tensioner

- ❑ With guide rail

9 - Bolt

- ❑ Renew
- ❑ 10 Nm +45°



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3.4 Removing and installing camshaft timing chain

Removing

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

– Remove timing chain cover (bottom) ⇒ page 154 .

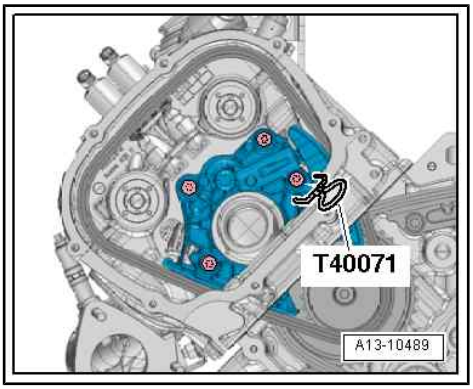
– Remove cylinder head covers: left-side ⇒ page 143 ; right-side ⇒ page 144 .

– Remove timing chain from camshafts on relevant side ⇒ page 168 .

Caution

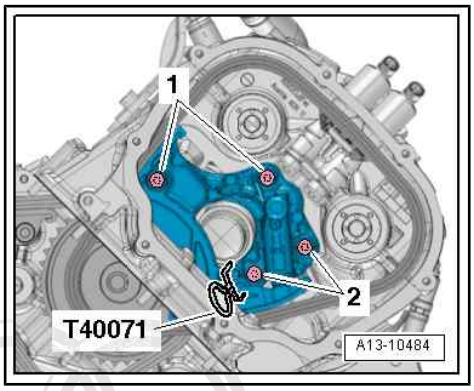
If a used timing chain rotates in the opposite direction when it is refitted, this can cause breakage.

- ***Mark running direction of timing chains (left and right) with paint for re-installation. Do not attempt to mark the timing chain with a centre punch or by making a notch or similar.***



– Remove locking pin - T40071- and detach camshaft timing chain (left-side).

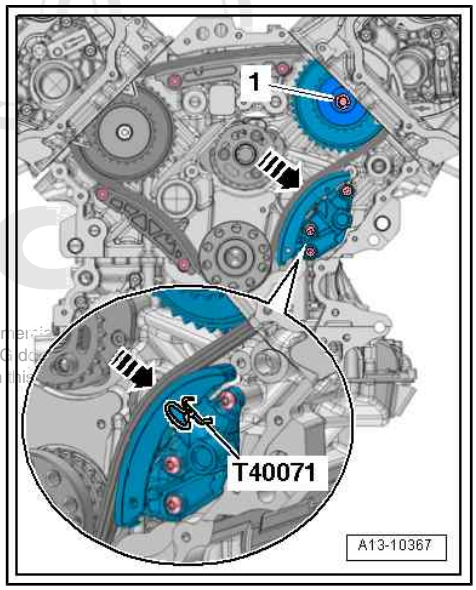
– Remove bolts -1- and -2- and take off chain tensioner (right-side).



– Press guide rail of chain tensioner for drive chain for valve gear in direction of -arrow- and lock chain tensioner by inserting locking pin - T40071- .

– Remove bolt -1- securing drive sprocket.

– Pull off drive sprocket with bearing mounting and lift off camshaft timing chain (right-side).



Installing

- Tightening torques ⇒ “3.1 Exploded view - camshaft timing chains”, page 161

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Note

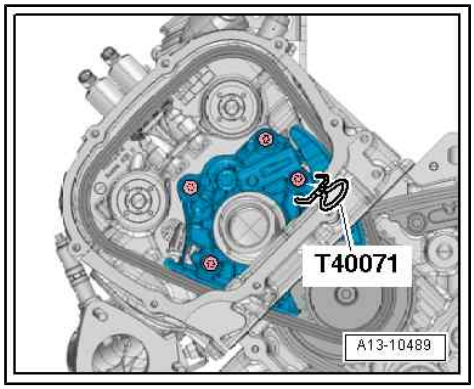
- *Note the correct installation position if the tensioning element has been removed from the chain tensioner: drilling in base of housing faces chain tensioner and piston faces tensioner rail.*
- *Renew the bolts tightened with specified tightening angle.*

Caution

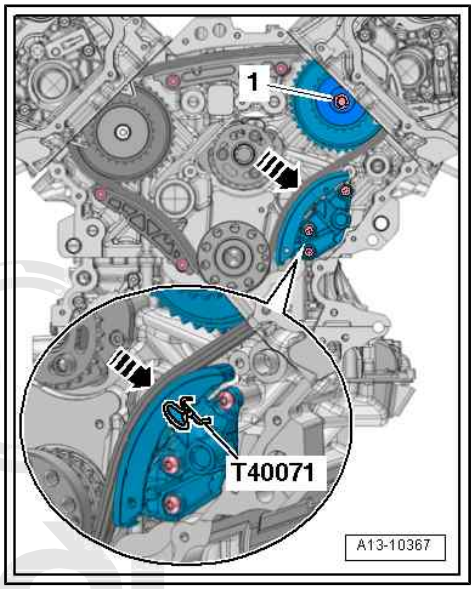
Risk of damage to valves and piston crowns.

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

– Position timing chain (left-side) as shown in the illustration (according to marks applied during removal).
– Press down guide rail of chain tensioner for timing chain (left-side) and lock chain tensioner by inserting locking pin - T40071- .



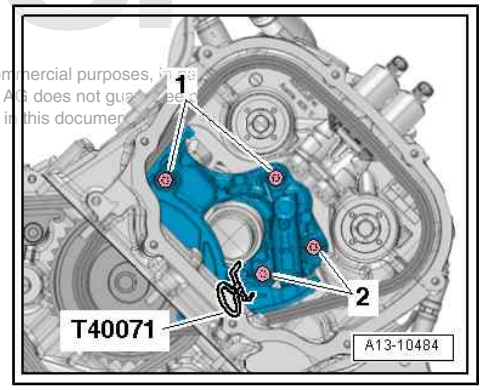
– Guide camshaft timing chain upwards to cylinder head (note marks applied during removal).
– Install drive sprocket ⇒ Fig. ""Installation position: bearing mounting for drive sprocket for camshaft timing chain (right-side)"" , page 165 .
– Tighten bolt -1- for bearing mounting.
– Remove locking pin - T40071- .



Note

Disregard -arrow-.

– Fit chain tensioner on cylinder head (right-side) and position timing chain.
– Tighten bolts -1- and -2-.



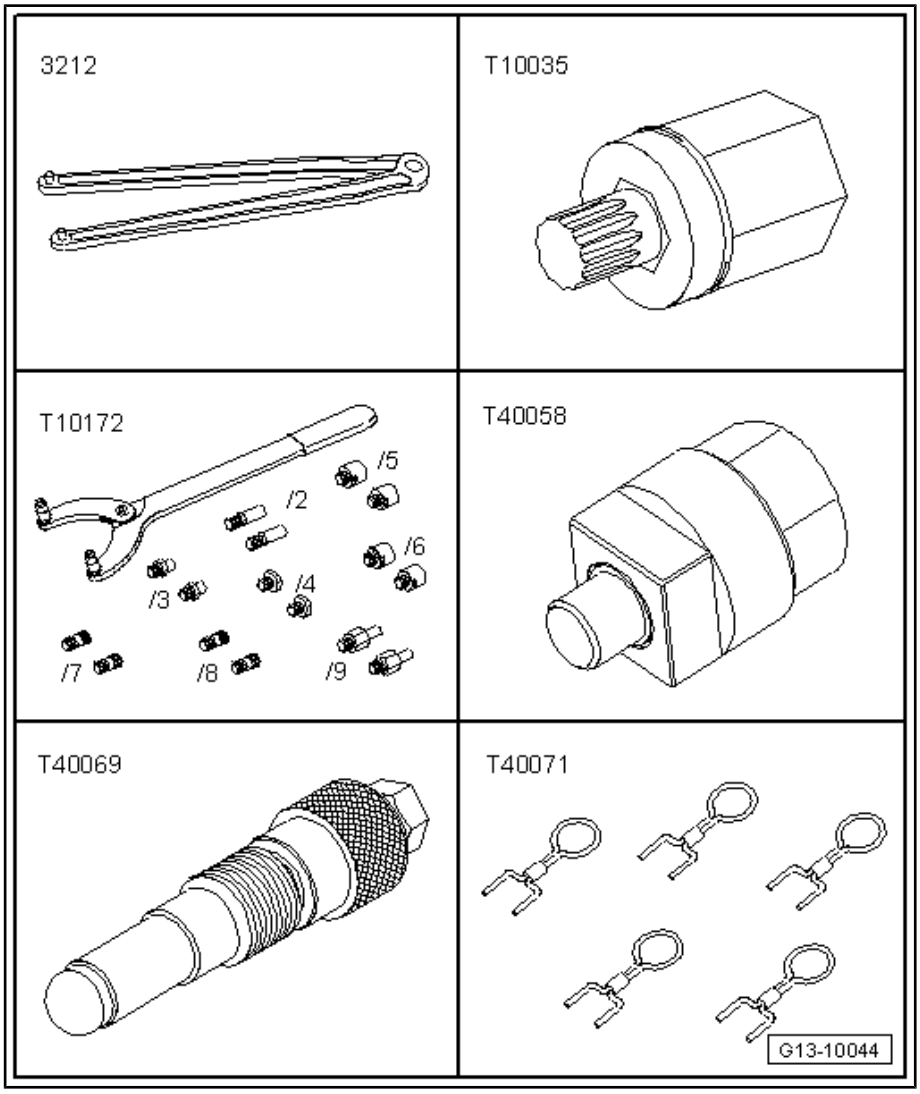
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Remaining installation steps are carried out in reverse sequence; note the following:

– Fit timing chains on camshafts ⇒ page 168 .
– Install timing chain cover (bottom) ⇒ page 154 .

3.5 Removing camshaft timing chain from camshafts

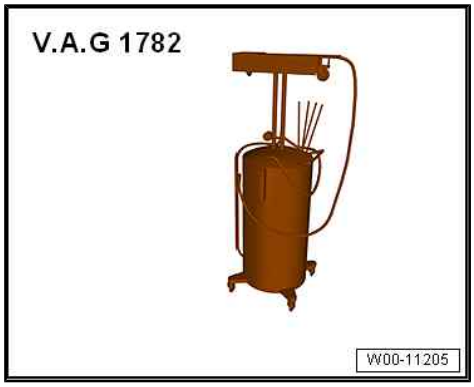
Special tools and workshop equipment required



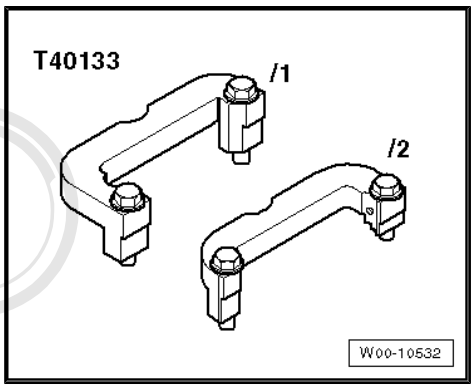
- Pin wrench - 3212-
- Special wrench - T10035-
- Counterhold tool - T10172- with -T10172/2-
- Adapter - T40058-
- Locking pin - T40069-
- 2x Locking pin - T40071-
- Adapters - T10172/10-

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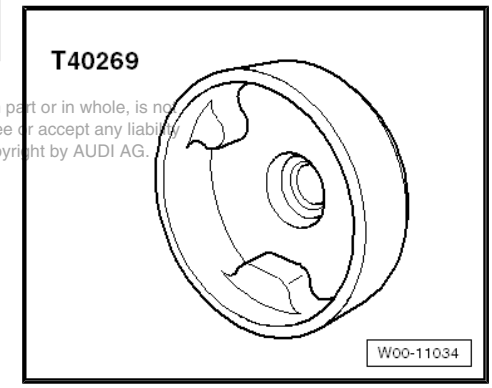
- Used oil collection and extraction unit - V.A.G 1782-



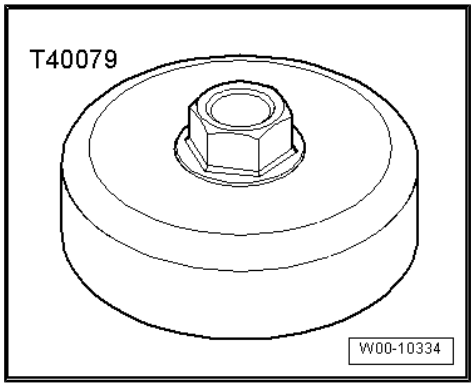
- 2x Camshaft clamp - T40133-



- Special wrench - T40269- for camshaft adjuster with three recesses



- Special wrench - T40079- for camshaft adjuster with 4 recesses



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Removing

Note

- *In the following procedure the camshaft timing chains remain on the engine.*
- *Even when working on one cylinder head only, the procedure must still be carried out on both cylinder banks.*

– Remove timing chain covers ⇒ page 150 .

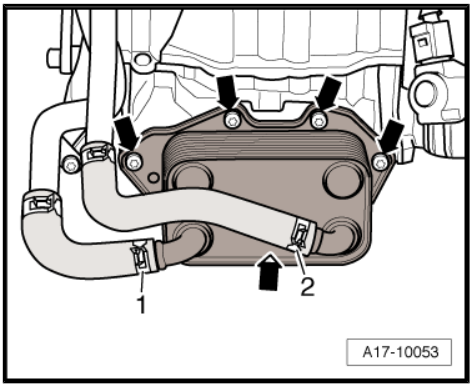
– Remove cylinder head covers: left-side ⇒ page 143 ; right-side ⇒ page 144 .

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

- ⇒ “1.2.2 Removing and installing poly V-belt - vehicles with hydraulic power steering”, page 96
- ⇒ “1.2.3 Removing and installing poly V-belt - vehicles with electromechanical power steering”, page 98

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

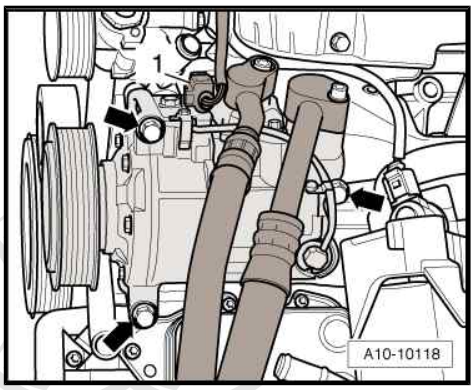
– Remove bolts -arrows- and tie up engine oil cooler to one side with coolant hoses -1- and -2- attached.



WARNING

Risk of injury caused by refrigerant.

- ***The air conditioner refrigerant circuit must not be opened.***



– Remove bolts -arrows- for air conditioner compressor.

Caution

Danger of damage to refrigerant lines and hoses.

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

– Detach air conditioner compressor from bracket and tie up on longitudinal member (left-side) with lines/wiring connected.

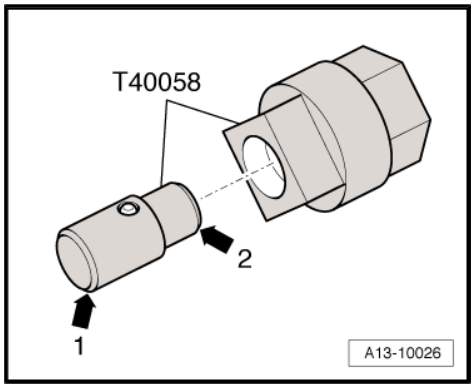
Note

Disregard -item 1-.

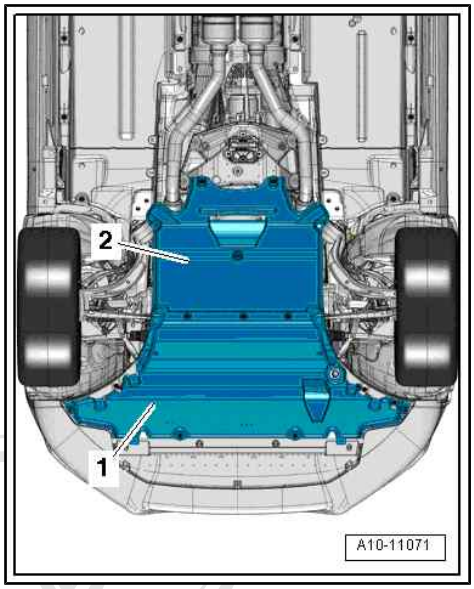
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– Insert guide pin of adapter -T40058- as follows:

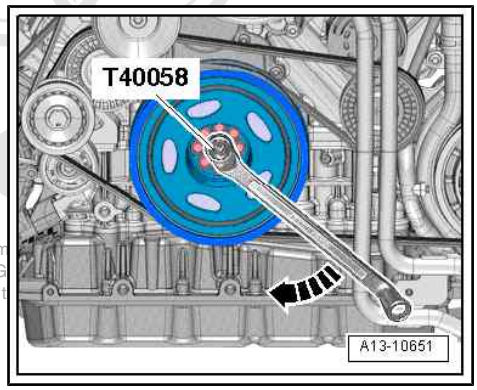
- The larger-diameter section -arrow 1- faces towards the engine.
- The smaller-diameter section -arrow 2- faces the adapter.



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

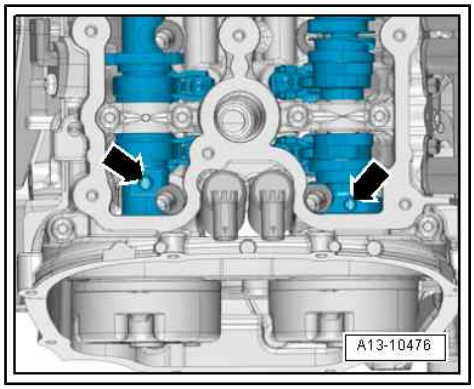


– Use adapter - T40058- and angled ring spanner to turn crankshaft in direction of engine rotation -arrow- to “TDC”.

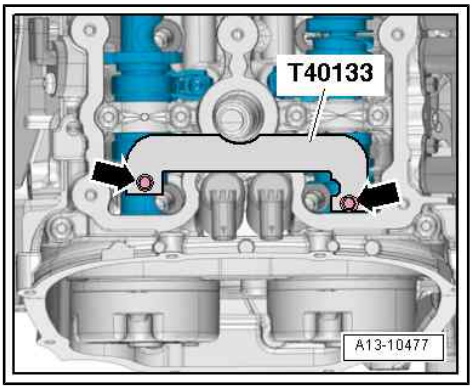


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- The threaded holes -arrows- in the camshafts must face upwards.



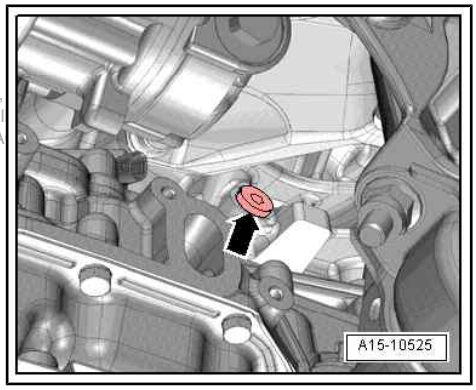
– Fit camshaft clamps - T40133- onto both cylinder heads and tighten bolts -arrows- to 25 Nm.



Note

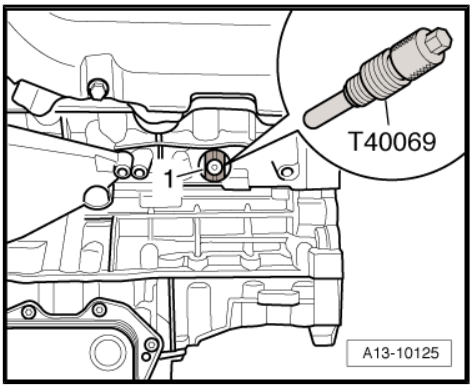
The illustration shows the left-side cylinder head.

– Remove plug -arrow- for crankshaft “TDC” marking from cylinder block.



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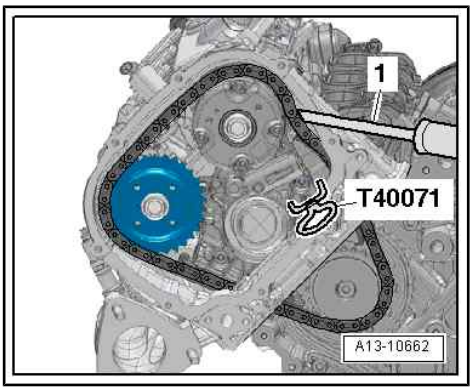
– Screw locking pin - T40069- into hole (20 Nm); if necessary, turn crankshaft -1- backwards and forwards slightly to fully centralise locking pin.



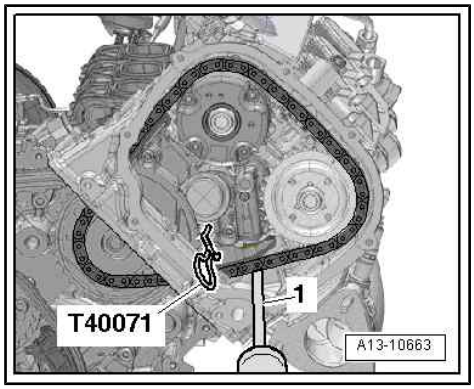
Note

Chain tensioners for camshaft timing chain are oil-damped and can only be compressed slowly by applying constant pressure.

– Press guide rail of chain tensioner for camshaft timing chain (left-side) inwards as far as the stop using a screwdriver -1-. Then lock chain tensioner by inserting locking pin - T40071- .



– Press guide rail of chain tensioner for camshaft timing chain (right-side) inwards as far as the stop using a screwdriver -1-. Then lock chain tensioner by inserting locking pin - T40071- .



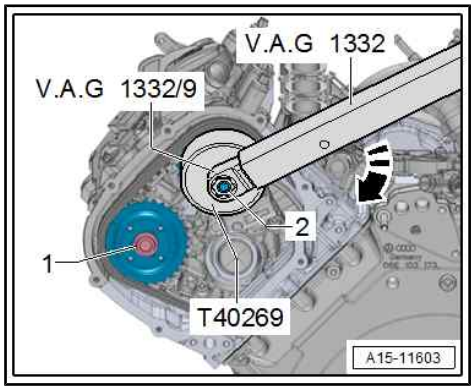
Camshaft adjusters with three recesses:

Caution

Risk of damage to camshaft if handled incorrectly.

- ***Never use camshaft clamp as a counterhold tool.***

– Counterhold at corresponding camshaft adjuster by applying special wrench - T40269- with torque wrench - V.A.G 1332- and open ring spanner insert - V.A.G 1332/9- , and loosen bolt -2-.



Note

Disregard -item 1- and -arrow-.

- Perform the same procedure on the opposite cylinder bank.

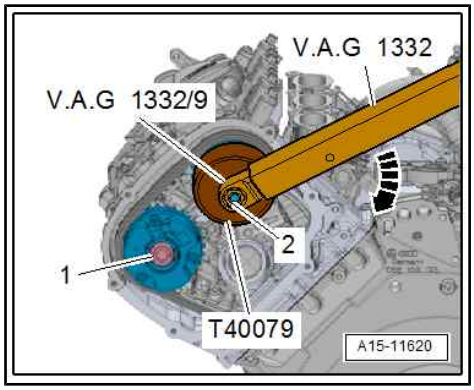
Camshaft adjusters with four recesses:

Caution

Risk of damage to camshaft if handled incorrectly.

- ***Never use camshaft clamp as a counterhold tool.***

– Counterhold at corresponding camshaft adjuster by applying special wrench - T40079- with torque wrench - V.A.G 1332- and open ring spanner insert - V.A.G 1332/9- , and loosen bolt -2-.



Note

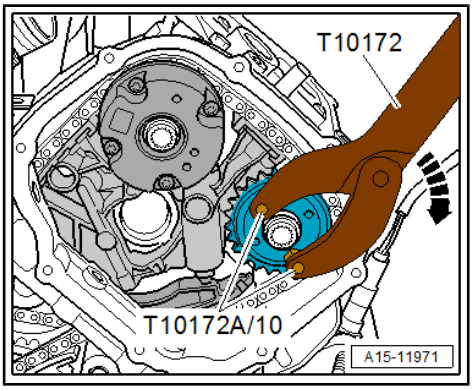
Disregard -item 1- and -arrow-.

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- Perform the same procedure on the opposite cylinder bank.

All vehicles (continued):

– Counterhold at corresponding camshaft sprocket by applying counterhold tool - T10172A- with adapter - T10172/10- and loosen bolt with special wrench - T10035- .



Note

Disregard -arrow-.

• Perform the same procedure on the opposite cylinder bank.

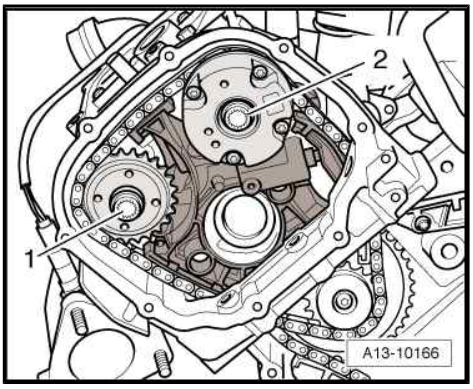
Caution

Risk of irreparable damage to engine.

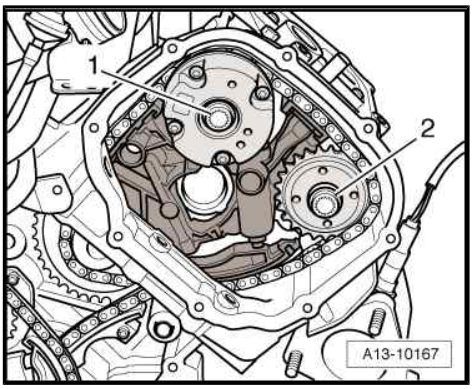
- ***Block off the opening in the valve timing housing with a clean cloth to prevent small items from dropping into the engine.***

– Use paint to mark allocation of camshaft adjuster and camshaft sprocket to corresponding cylinder head for re-installation.

– Unscrew bolts -1- and -2- on cylinder head (left-side) and remove camshaft adjuster and camshaft sprocket.



– Unscrew bolts -1- and -2- on cylinder head (right-side) and remove camshaft adjuster and camshaft sprocket.



Installing

• Tightening torques ⇒ “3.1 Exploded view - camshaft timing chains”, page 161

Note

Renew the bolts tightened with specified tightening angle.

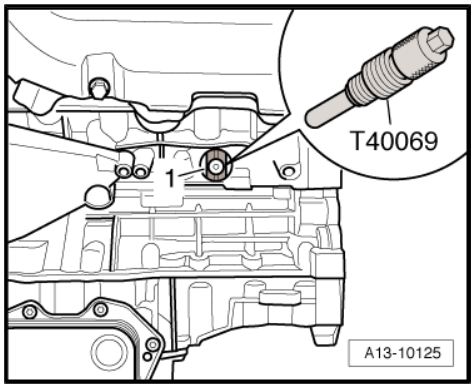
Caution

Risk of damage to valves and piston crowns.

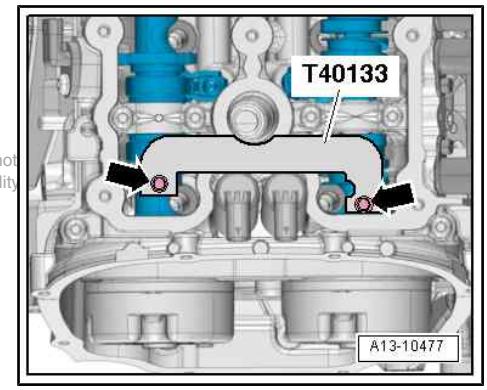
- ***The crankshaft must not be at “TDC” at any cylinder when the camshafts are turned.***

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- Drive chain for valve gear installed ⇒ “3.6 Removing and installing drive chain for valve gear”, page 181
- Crankshaft -1- locked in “TDC” position with locking pin - T40069- .



- Camshafts on both cylinder heads locked in “TDC” position -arrows- with camshaft clamp - T40133- (25 Nm).



Note

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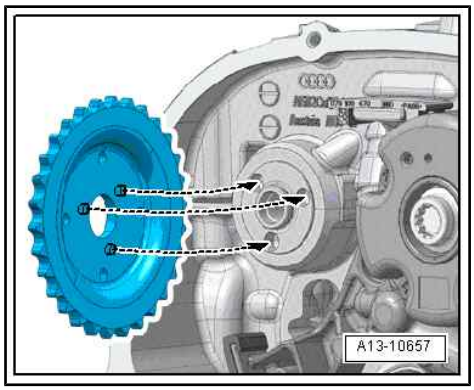
Illustration shows the cylinder head for cylinder bank 2 (left-side).

When assembling, note the following:

Caution

Risk of damage to engine.

- ***The camshaft sprockets MUST be installed as described in the following work steps:***



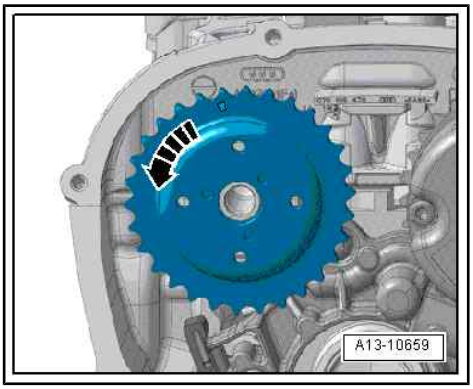
- Fit camshaft sprockets according to marks applied when removing.
- When fitting camshaft sprockets, make sure that the lugs on the camshaft sprockets engage in the slots on the camshafts -arrows-.

Note

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

- Perform the same procedure on the opposite cylinder bank.

- Turn camshaft sprocket on camshaft anti-clockwise onto stop -arrow-.

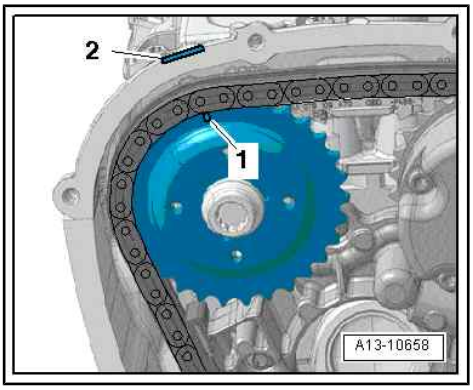


Note

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

- Perform the same procedure on the opposite cylinder bank.

- Dot -1- should align with adjustment window -2-.



Note

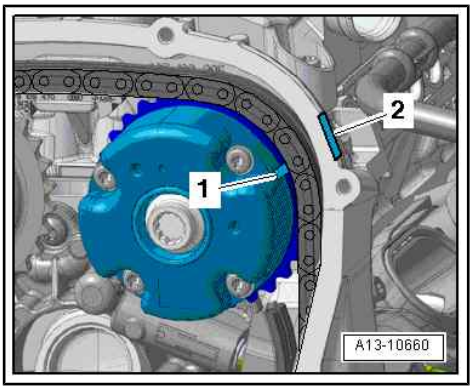
- *Illustration shows the cylinder head for cylinder bank 2 (left-side).*
- *Disregard the camshaft timing chain in the illustration.*

- Perform the same procedure on the opposite cylinder bank.

Caution

Risk of damage to engine.

- ***The camshaft adjusters MUST be installed as described in the following work steps:***



- Fit camshaft adjusters according to marks applied during removal.
- Groove -1- on camshaft adjuster should align with adjustment window -2-.

Note

- *Illustration shows the cylinder head for cylinder bank 1 (right-side).*
- *Disregard the camshaft timing chain in the illustration.*

- Perform the same procedure on the opposite cylinder bank.

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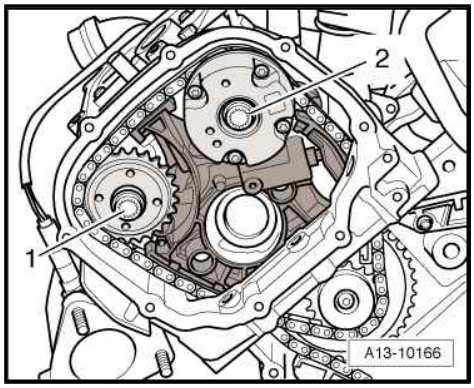
Installation (continued)

– Re-install camshaft adjuster on cylinder head (left-side) in the same position as before (pay attention to marks applied when removing).

– Fit camshaft timing chain (left-side) onto drive sprocket, camshaft adjuster and camshaft sprocket and fit bolts -1- and -2- without tightening.

• It should just be possible to turn the camshaft adjuster and camshaft sprocket on the camshaft without axial movement.

– Remove locking pin - T40071- .

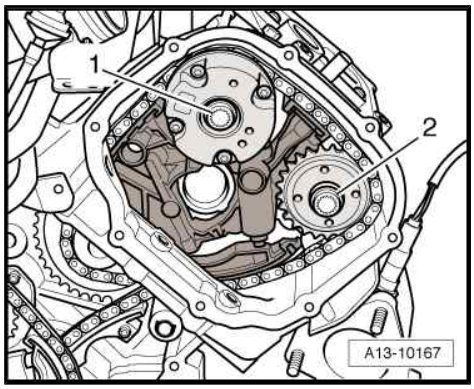


– Re-install camshaft adjuster on cylinder head (right-side) in the same position as before (pay attention to marks applied when removing).

– Fit camshaft timing chain (right-side) onto drive sprocket, camshaft adjuster and camshaft sprocket and fit bolts -1- and -2- without tightening.

• It should just be possible to turn the camshaft adjuster and camshaft sprocket on the camshaft without axial movement.

– Remove locking pin - T40071- .

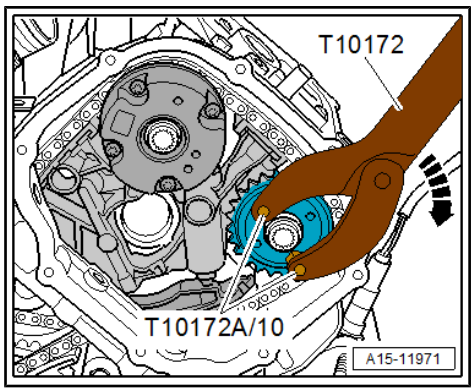


– Apply counterhold tool - T10172A- with adapter - T10172/10- to camshaft sprocket of exhaust camshaft (right-side).

– Have a 2nd mechanic apply tension to camshaft timing chain by pressing camshaft sprocket in direction of -arrow-.

– Tighten bolts as follows while keeping camshaft sprocket under tension:

Stage	Bolt	Tightening torque
1.	On exhaust camshaft	80 Nm
1.	On inlet camshaft	80 Nm

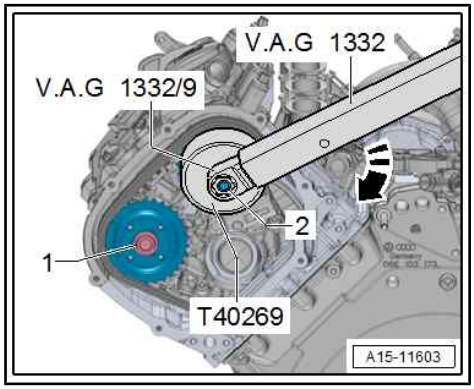


Camshaft adjusters with three recesses:

– Fit special wrench - T40269- onto camshaft adjuster of inlet camshaft (left-side).

– Apply torque wrench - V.A.G 1332- with open ring spanner insert - V.A.G 1332/9- to special wrench - T40269- .

– Have a second mechanic apply approx. 40 Nm of tension to camshaft timing chain by pressing torque wrench - V.A.G 1332- in direction of -arrow-.



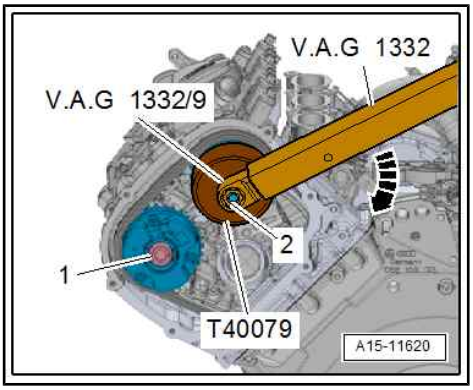
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Camshaft adjusters with four recesses:

– Fit special wrench - T40079- onto camshaft adjuster of inlet camshaft (left-side).

– Apply torque wrench - V.A.G 1332- with open ring spanner insert - V.A.G 1332/9- to key - T40079- .

– Have a second mechanic apply approx. 40 Nm of tension to camshaft timing chain by pressing torque wrench - V.A.G 1332- in direction of -arrow-.



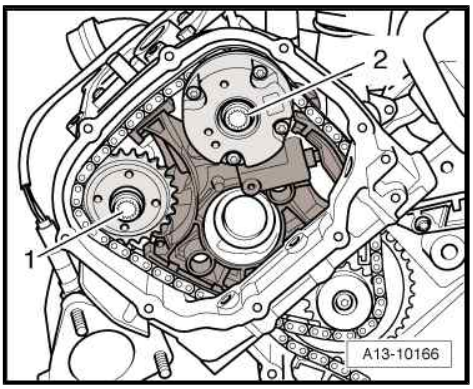
All vehicles (continued):

– Tighten bolts as follows while keeping camshaft adjuster under tension:

Stage	Bolt	Tightening torque
1.	-1-	on exhaust camshaft: 80 Nm
1.	-2-	on inlet camshaft: 80 Nm

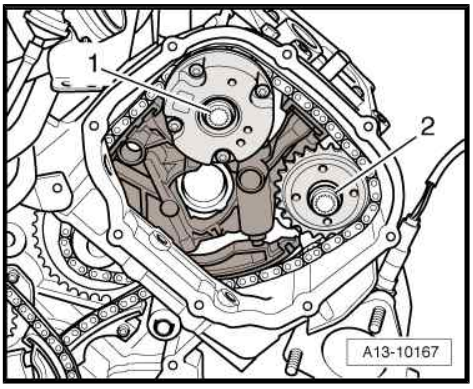
– Tighten bolts securing camshaft adjuster and camshaft sprocket on cylinder head (left-side) as follows:

Stage	Bolt	Tightening torque
2.	-1-	Tighten on exhaust camshaft to final tightening torque ⇒ Item 2 (page 161)
2.	-2-	Tighten on inlet camshaft to final tightening torque ⇒ Item 1 (page 161)

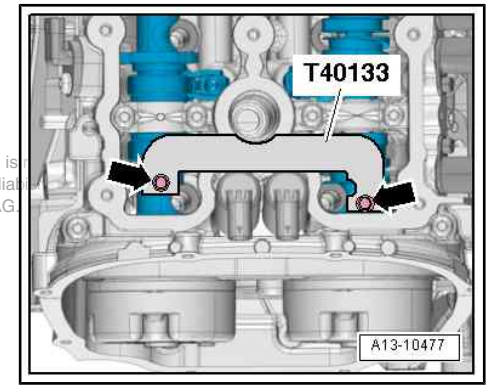


– Tighten bolts securing camshaft adjuster and camshaft sprocket on cylinder head (right-side) as follows:

Stage	Bolt	Tightening torque
2.	-1-	Tighten on inlet camshaft to final tightening torque ⇒ Item 3 (page 162)
2.	-2-	Tighten on exhaust camshaft to final tightening torque ⇒ Item 1 (page 162)



– Remove camshaft clamps - T40133- from both cylinder heads -arrows-.

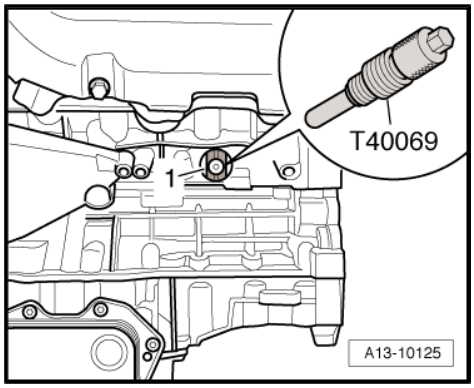


Note

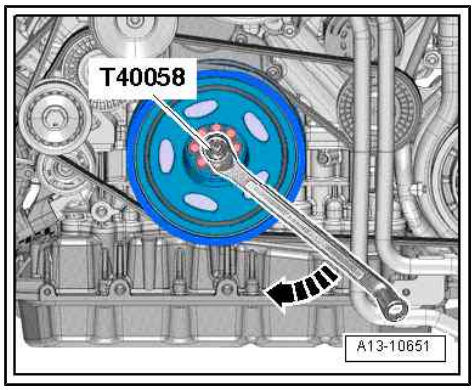
The illustration shows the left-side cylinder head.

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– Remove locking pin - T40069- .



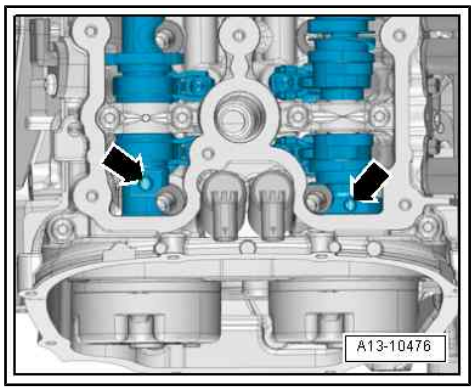
– Using adapter - T40058- and angled ring spanner, turn crankshaft 2 revolutions in normal direction of rotation -arrow- until crankshaft is at “TDC” again.



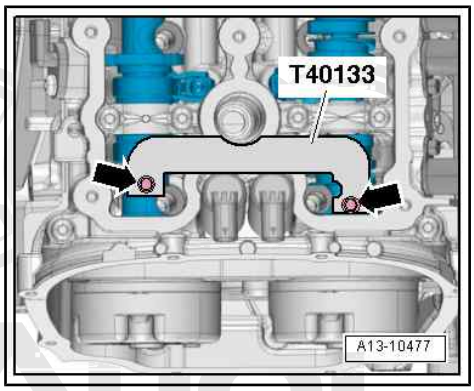
Note

If you turn the crankshaft beyond “TDC” by mistake, turn it back approx. 30° and set to “TDC” again.

• The threaded holes -arrows- in the camshafts must face upwards.



– Fit camshaft clamps - T40133- onto both cylinder heads and tighten bolts -arrows- to 25 Nm.



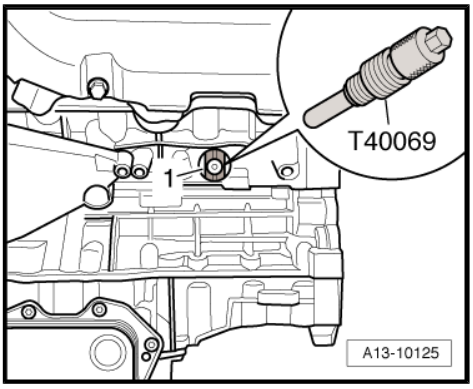
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– Screw the locking pin - T40069- directly into the hole.

• The locking pin - T40069- must engage in the locating hole in crankshaft -1-. If it does not, reset valve timing.

– Remove camshaft clamps from both cylinder heads.

– Remove locking pin.



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

– Install plug for crankshaft “TDC” mark ⇒ page 120 .

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

– Install engine oil cooler ⇒ page 219 .

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

– Install poly V-belt:

♦ ⇒ “1.2.2 Removing and installing poly V-belt - vehicles with hydraulic power steering”, page 96

♦ ⇒ “1.2.3 Removing and installing poly V-belt - vehicles with electromechanical power steering”, page 98

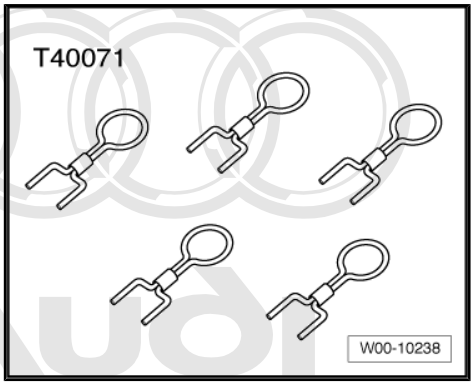
– Install cylinder head covers: left-side ⇒ page 143 ; right-side ⇒ page 144 .

– Install timing chain covers (left and right) ⇒ page 150 .

3.6 Removing and installing drive chain for valve gear

Special tools and workshop equipment required

♦ Locking pin - T40071-



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Removing

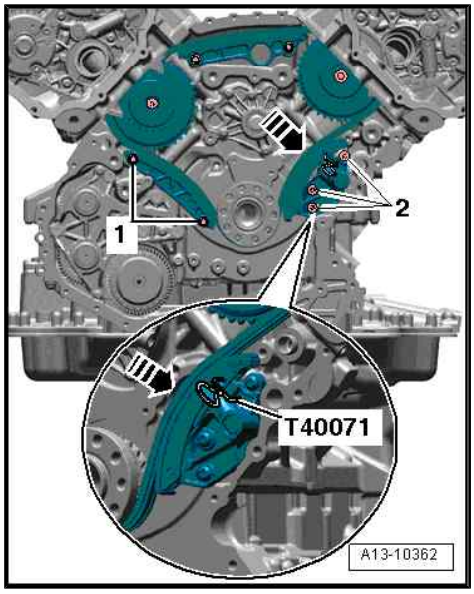
• Gearbox removed ⇒ Rep. gr. 34 ; Removing and installing gearbox; Removing gearbox

– Remove timing chain cover (bottom) ⇒ page 154 .

– Remove timing chains from camshafts ⇒ page 168 .

– Remove drive chain for auxiliary drives ⇒ page 182 .

– Press guide rail of chain tensioner for drive chain in direction of -arrow- and lock chain tensioner by inserting locking pin - T40071- .



Caution

If a used drive chain rotates in the opposite direction when it is refitted, this can cause breakage.

- ***Mark running direction of drive chain with paint for re-installation. Do not attempt to mark the drive chain with a centre punch or by making a notch or similar.***

– Unscrew bolts -1- and remove guide rail.

– Remove bolts -2- and take off chain tensioner.

– Detach drive chain for valve gear.

Installing

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

- Tightening torques ⇒ “3.2 Exploded view - drive chain for valve gear”, page 163

Note

Renew the bolts tightened with specified tightening angle.

– Position drive chain for valve gear onto drive chain sprockets (according to marks applied during removal).

– Install guide rail and tighten bolts -1-.

– Install chain tensioner and tighten bolts -2-.

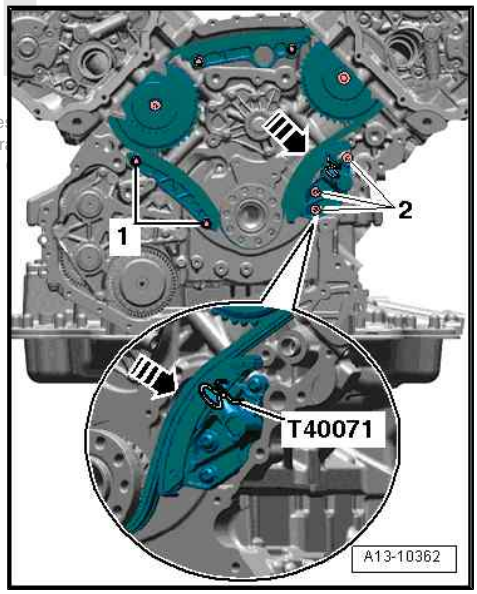
– Press guide rail of chain tensioner for drive chain in direction of -arrow- and remove locking pin - T40071- .

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– Install drive chain for auxiliary drives ⇒ page 182 .

– Fit timing chains on camshafts ⇒ page 168 .

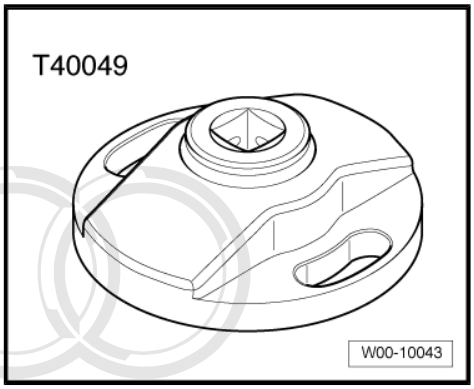
– Install timing chain cover (bottom) ⇒ page 154 .



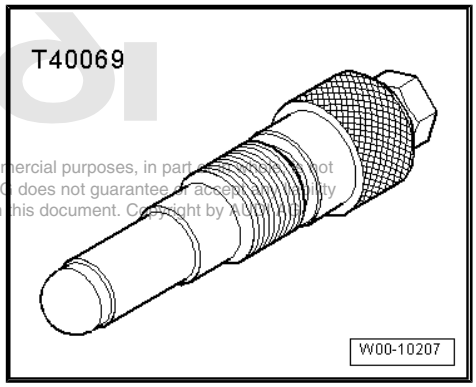
3.7 Removing and installing drive chain for auxiliary drive

Special tools and workshop equipment required

♦ Special wrench - T40049-

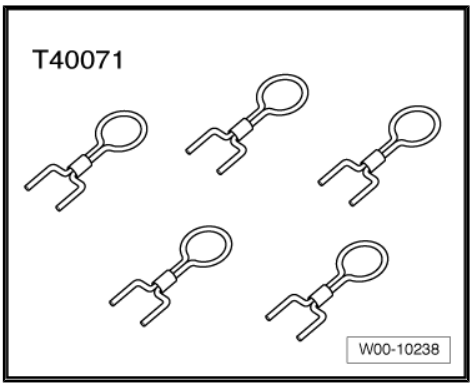


♦ Locking pin - T40069-

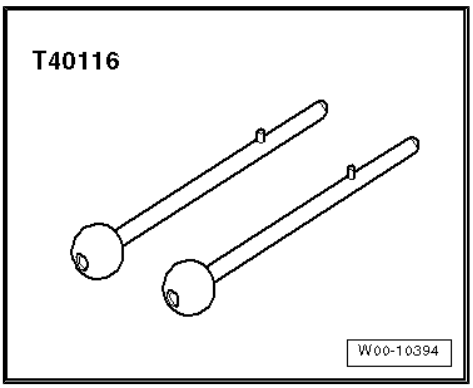


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♦ Locking pin - T40071-



♦ Locating pins - T40116-



Removing

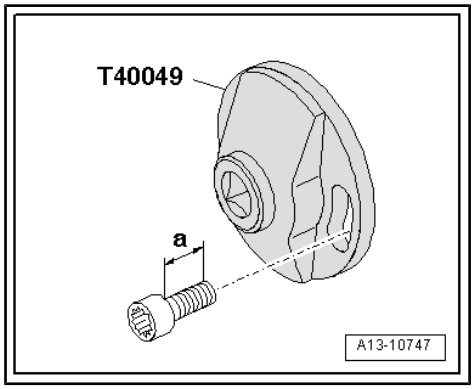
- Gearbox removed ⇒ Rep. gr. 34 ; Removing and installing gearbox; Removing gearbox

– Remove timing chain cover (bottom) ⇒ page 154 .

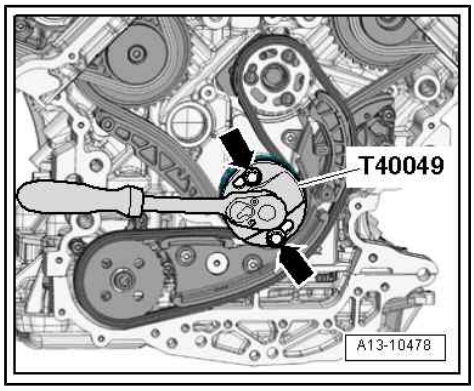
Caution

Risk of damage to drive chain if thread of bolt exceeds specified length.

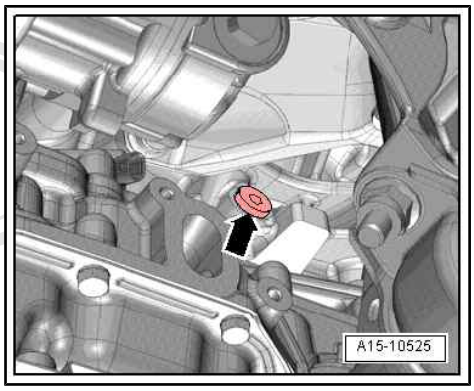
- ***Use bolts with a maximum thread length -a- of 22 mm to attach special wrench -T40049- .***
- ***If no suitable bolts are available, position suitable washer (s) under bolt head so that remaining thread length does not exceed 22 mm.***



– Attach special wrench - T40049- at rear end of crankshaft using 2 bolts -arrows-.

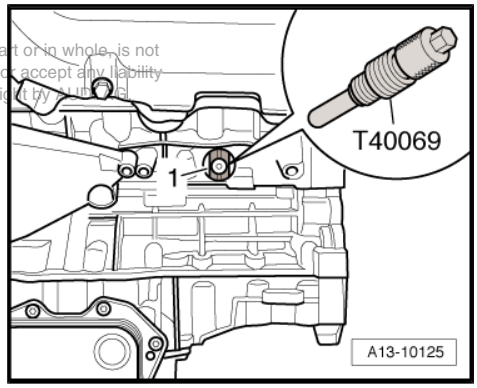


– Remove plug -arrow- for crankshaft “TDC” marking from cylinder block.
– Rotate crankshaft in normal direction of rotation to “TDC”.

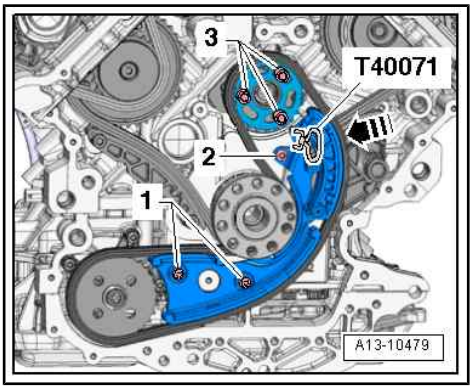


– Screw locking pin - T40069- into hole (20 Nm); if necessary, turn crankshaft -1- backwards and forwards slightly to fully centralise locking pin.

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– Press guide rail of chain tensioner in direction of -arrow- and lock chain tensioner by inserting locking pin - T40071- .



Caution

If a used drive chain rotates in the opposite direction when it is refitted, this can cause breakage.

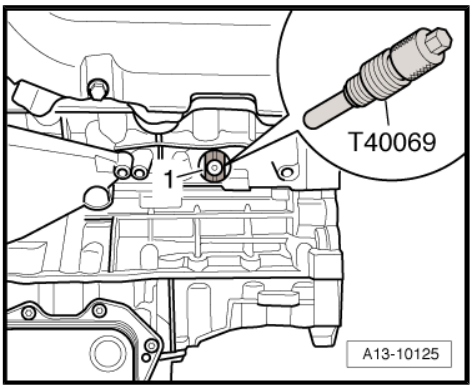
- ***Mark running direction of drive chain with paint for re-installation. Do not attempt to mark the drive chain with a centre punch or by making a notch or similar.***

– Unscrew bolts -3- and detach chain sprocket from balance shaft.

– Remove bolts -1- and -2- and take off chain tensioner with chain.

Installing

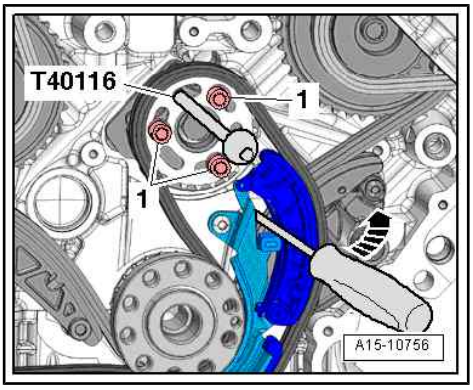
- Tightening torques ⇒ “3.3 Exploded view - drive chain for balance shaft and oil pump”, page 165
- Crankshaft -1- locked in “TDC” position with locking pin - T40069- .



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– Install chain tensioner with chain and balance shaft sprocket.

– Lock balance shaft in “TDC” position using locating pin - T40116- .



- The elongated holes in the balance shaft sprocket must be aligned centrally over the threaded holes in the balance shaft. If necessary move chain one tooth further.

– Tighten bolts for chain tensioner.

– Fit bolts -1- for chain sprocket without tightening.

- It should just be possible to turn the sprocket on the balance shaft without axial movement.

– Pull out locking pin - T40071- to release chain tensioner.

– Press against guide rail of chain tensioner -arrow- using a screwdriver, and at the same time tighten bolts -1- securing chain sprocket.

– Pull locating pin -T40116- out of balance shaft.

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

– Install timing chain cover (bottom) ⇒ page 154 .

– Install plug for crankshaft “TDC” mark ⇒ page 120 .

4 Valve gear

⇒ “4.1 Exploded view - valve gear”, page 186

⇒ “4.2 Measuring axial clearance of camshaft”, page 189

⇒ “4.3 Measuring radial clearance of camshaft”, page 190

⇒ “4.4 Removing and installing camshaft”, page 190

⇒ “4.5 Checking hydraulic compensation elements”, page 196

4.1 Exploded view - valve gear

Caution

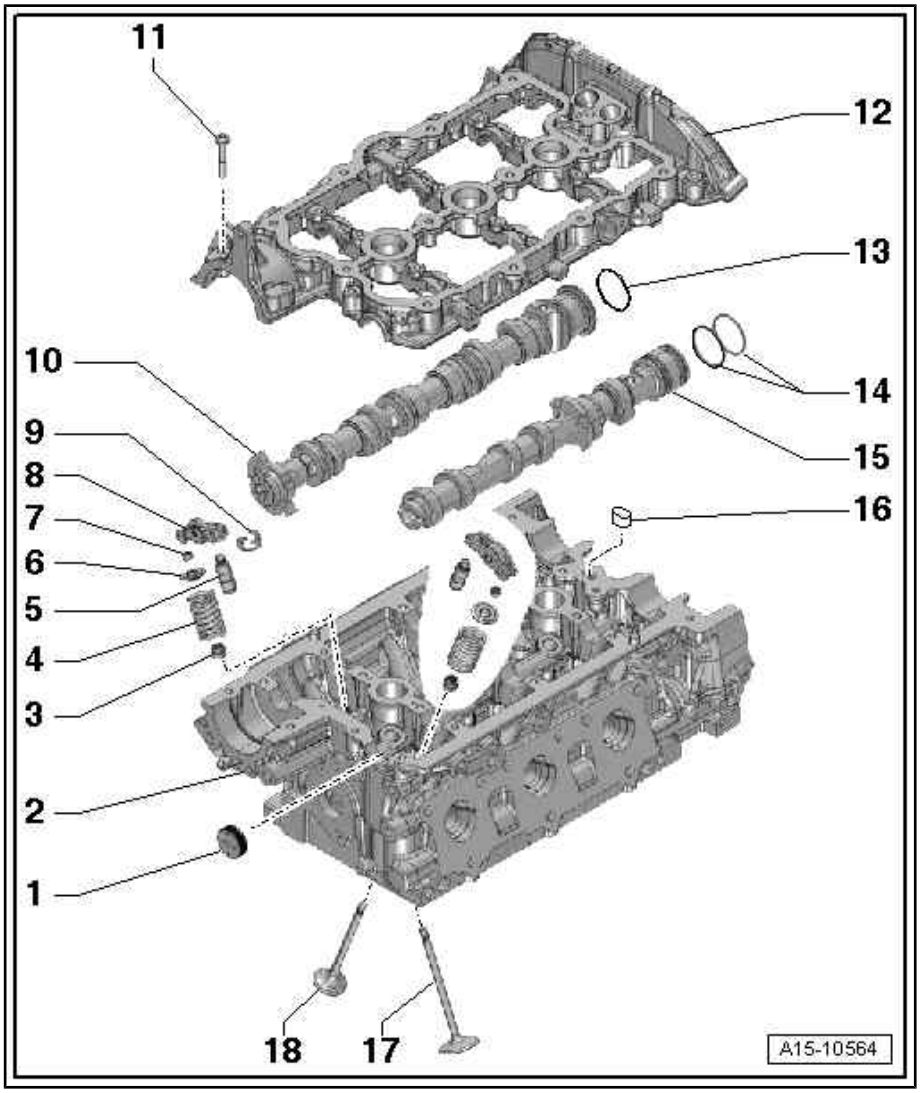
Risk of damage to valves and piston crowns after working on valve gear.

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

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Note

- *Cylinder heads which have cracks between the valve seats or between a valve seat insert and the spark plug thread can be re-installed without reducing service life, provided the cracks are only slight and do not exceed a maximum of 0.3 mm in width, and no more than the first 4 turns of the spark plug threads are cracked.*
- *The diagram shows the cylinder head on cylinder bank 2 (left-side).*



1 - Sealing plug

- ❑ Apply sealant when installing; refer to ⇒ Electronic parts catalogue

2 - Cylinder head

- ❑ Checking valve guides ⇒ “5.1 Checking valve guides”, page 206

3 - Valve stem oil seal

- ❑ Renewing with cylinder head installed ⇒ “4.6.2 Renewing valve stem oil seals with cylinder head installed”, page 202
- ❑ Renewing with cylinder head removed ⇒ “4.6.1 Renewing valve stem oil seals with cylinder head removed”, page 198

4 - Valve spring

- ❑ Installation position ⇒ Fig. ““Installation position of valve spring”“ , page 188

5 - Hydraulic compensation element

- ❑ Clipped into roller rocker finger -item 8-
- ❑ Checking ⇒ “4.5 Checking hydraulic compensation elements”, page 196
- ❑ Mark installation position for re-installation
- ❑ Lubricate contact surface before installing

6 - Valve spring plate

7 - Valve cotters

8 - Roller rocker finger

- ❑ Mark installation position for re-installation
- ❑ Check roller bearings for ease of movement
- ❑ Lubricate contact surface before installing
- ❑ Assembly: attach to hydraulic compensation element -item 5- using securing clip -item 9-

9 - Securing clip

- ❑ Not supplied separately
- ❑ Check for firm attachment

10 - Inlet camshaft

- ❑ Removing and installing ⇒ “4.4 Removing and installing camshaft”, page 190
- ❑ Measuring axial clearance ⇒ “4.2 Measuring axial clearance of camshaft”, page 189
- ❑ Measuring radial clearance ⇒ “4.3 Measuring radial clearance of camshaft”, page 190
- ❑ Runout: max. 0.04 mm

11 - Bolt

- ❑ Renew

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- ❑ Tightening torque and sequence ⇒ Fig. ""Retaining frame for camshafts - tightening torque and sequence"" , page 189

12 - Retaining frame

- ❑ With integrated camshaft bearings
- ❑ Removing and installing ⇒ "4.4 Removing and installing camshaft", page 190

13 - Compression ring

14 - Rectangular section seals

- ❑ One or two fitted depending on version; for allocation, refer to ⇒ Electronic parts catalogue

15 - Exhaust camshaft

- ❑ Removing and installing ⇒ "4.4 Removing and installing camshaft", page 190
- ❑ Measuring axial clearance ⇒ "4.2 Measuring axial clearance of camshaft", page 189
- ❑ Measuring radial clearance ⇒ "4.3 Measuring radial clearance of camshaft", page 190
- ❑ Runout: max. 0.04 mm

16 - Oil strainer

- ❑ Not fitted on all versions; for allocation, refer to ⇒ Electronic parts catalogue

17 - Inlet valve

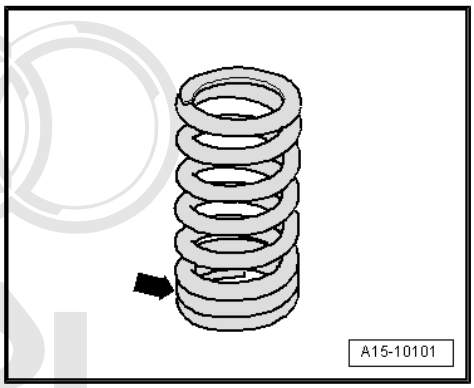
- ❑ Must not be machined; only grinding-in is permissible
- ❑ Mark installation position for re-installation
- ❑ Checking ⇒ "5.2 Checking valves", page 207
- ❑ Valve dimensions ⇒ "5.3 Valve dimensions", page 207
- ❑ Checking valve guides ⇒ "5.1 Checking valve guides", page 206

18 - Exhaust valve

- ❑ Must not be machined; only grinding-in is permissible
- ❑ Mark installation position for re-installation
- ❑ Checking ⇒ "5.2 Checking valves", page 207
- ❑ Valve dimensions ⇒ "5.3 Valve dimensions", page 207
- ❑ Checking valve guides ⇒ "5.1 Checking valve guides", page 206

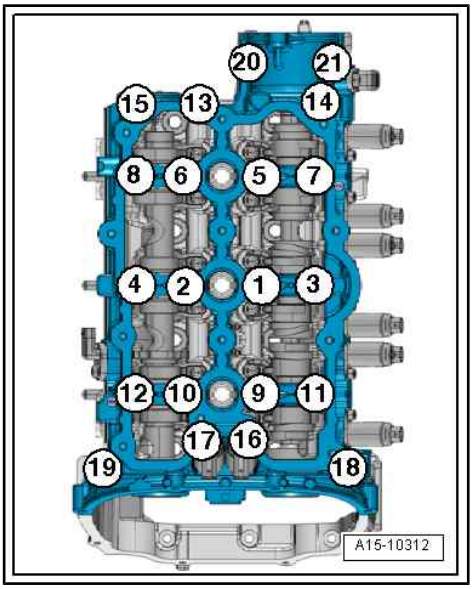
Installation position of valve spring

- Closely spaced spring coils -arrow- face towards cylinder head.



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Retaining frame for camshafts - tightening torque and sequence



Note

- *The illustration shows the retaining frame for the camshafts of the left-hand cylinder head. The procedure is symmetrically opposite on the right-hand cylinder head.*
- *Renew the bolts tightened with specified tightening angle.*

– Tighten bolts in 3 stages in the sequence shown:

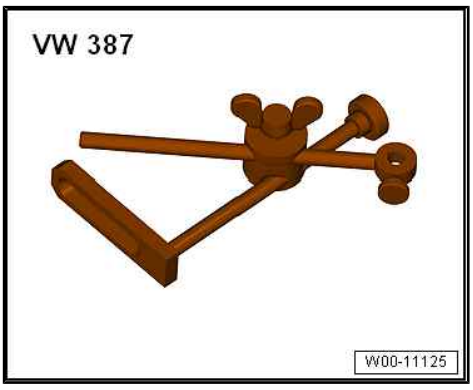
Stage	Bolts	Tightening torque/angle specification
1.	-1 … 21-	Screw in by hand until they make contact. • The retaining frame should make contact with the cylinder head over the full surface
2.	-1 … 21-	8 Nm
3.	-1 … 21-	Turn 90° further

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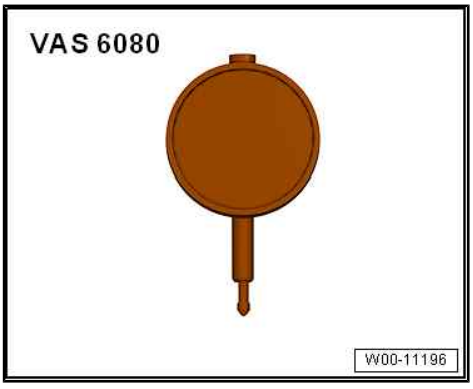
4.2 Measuring axial clearance of camshaft

Special tools and workshop equipment required

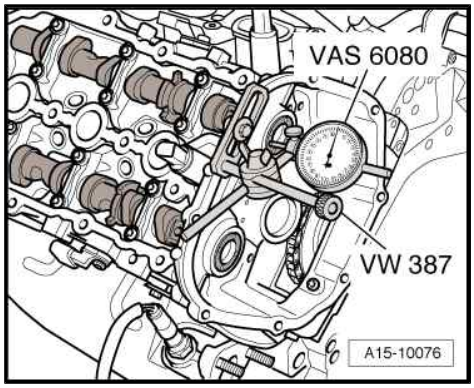
- Universal dial gauge bracket - VW 387-



- Dial gauge - VAS 6080-



Procedure



– Remove camshafts ⇒ page 190 .
– Mark allocation of roller rocker fingers for re-installation.
– Carefully remove roller rocker fingers and place them on a clean surface.
– Re-insert camshafts, install retaining frame ⇒ Fig. ""Retaining frame for camshafts - tightening torque and sequence"" , page 189 and tighten with old bolts to 8 Nm.
– Secure universal dial gauge bracket - VW 387- with dial gauge - VAS 6079- to cylinder head as shown in illustration.
– Press camshaft against dial gauge by hand.
– Set dial gauge to “0”.
– Press camshaft away from dial gauge and read off value:
• Axial clearance: 0.100 ... 0.191 mm

4.3 Measuring radial clearance of camshaft

Special tools and workshop equipment required

♦ Plastigage

Procedure

– Remove camshafts ⇒ page 190 .
– 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 Plastigage corresponding to the width of the bearing on the bearing journal or bearing shell to be measured.
• The Plastigage must be positioned in the centre of the bearing.
– Re-insert camshafts, fit retaining frame, secure with old bolts and tighten to final torque without rotating camshafts ⇒ page 189 .
– Remove retaining frame and camshafts again.
– Compare width of Plastigage with measurement scale.

Radial clearance:

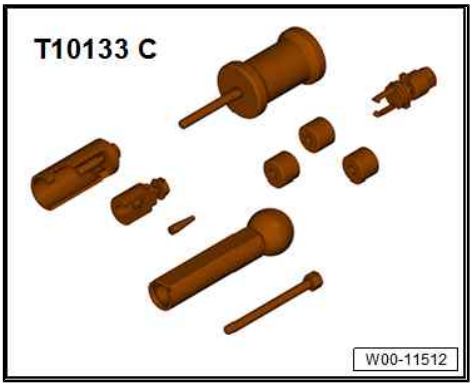
• 24 mm bearing diameter: 0.024 ... 0.066 mm
• 36 mm bearing diameter: 0.032 ... 0.078 mm
– When carrying out final assembly, use new bolts.

4.4 Removing and installing camshaft

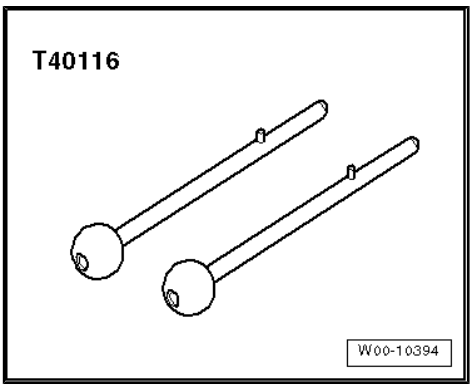
Special tools and workshop equipment required

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- Impact extractor attachment -T10133/3- from tool set for FSI engines - T10133 C-



- Locating pins - T40116-



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

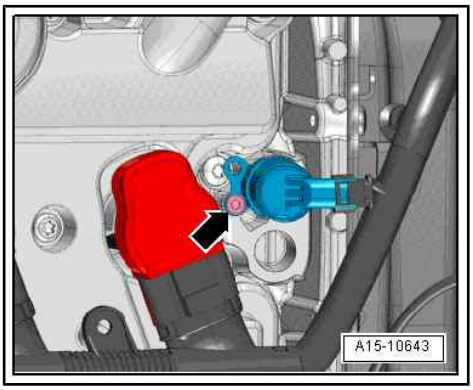
Removing

– Remove timing chains from camshafts ⇒ page 168 .

– To remove camshafts in cylinder head (left-side), remove vacuum pump ⇒ Brake system; Rep. gr. 47 ; Vacuum system; Removing and installing vacuum pump .

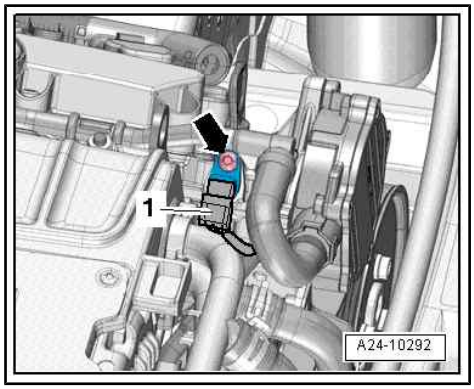
– To remove camshafts in cylinder head (right-side), first remove high-pressure pump and housing for high-pressure pump drive ⇒ page 366 .

– Remove bolt -arrow- and detach camshaft control valve.



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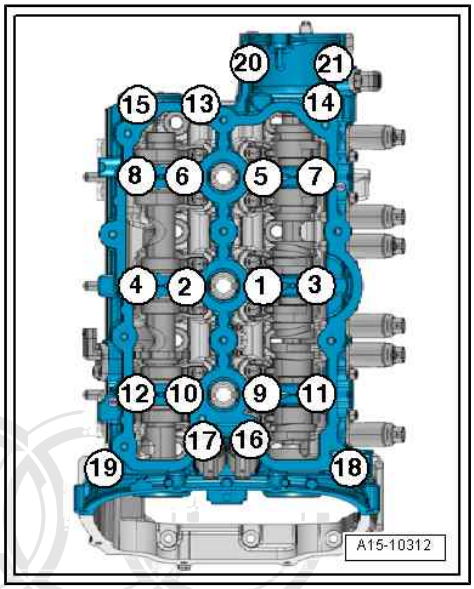
– Unplug electrical connector -1- at Hall sender.



Note

Disregard -arrow-.

– Slacken retaining frame bolts in the sequence -21 ... 1-.



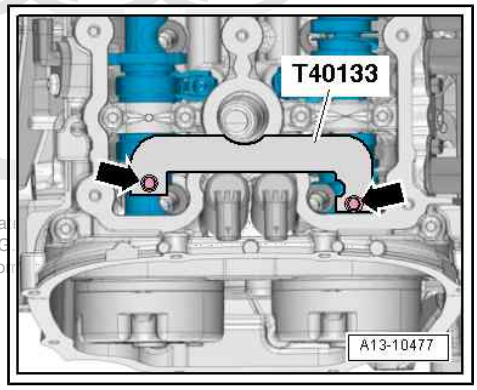
Note

Perform the same procedure (laterally reversed) on retaining frame (right-side).

– Remove bolts, carefully release retaining frame from bonded joint and set it down on a soft surface on workbench.

– Remove camshaft clamp - T40133- -arrows-.

– Mark and remove camshafts.

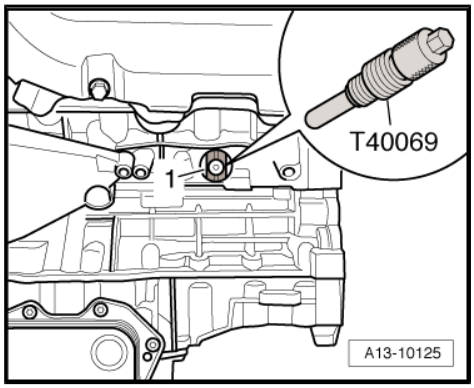


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Installing

Tightening torques

- ⇒ “1.1 Exploded view - cylinder head”, page 134 .
- ⇒ Fig. ““Retaining frame for camshafts - tightening torque and sequence”“ , page 189 .



Note

Renew seals/gaskets and sealing plugs.

- Crankshaft -1- locked in “TDC” position with locking pin - T40069- .

- Hydraulic compensation elements and roller rocker fingers installed.

Caution

Protect lubrication system and bearings against contamination.

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

WARNING

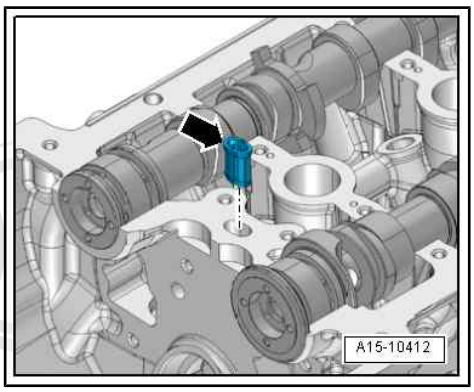
Risk of eye injury due to sealant residue.

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

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

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

– Check strainer -arrow- for dirt and clean as necessary.



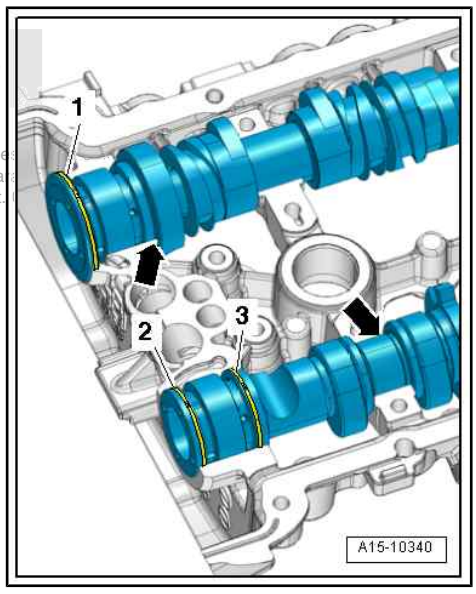
Note

Strainer -arrow- is not fitted on all versions; for allocation refer to ⇒ Electronic parts catalogue .

– Oil running surfaces of both camshafts.

– Fit camshafts in retaining frame.

- Camshafts must be in correct position in axial bearings -arrows- in retaining frame.
- The ends of the rectangular section seals -1, 2, 3- must point up or down. The ends of the rectangular section seals must never point to the side.



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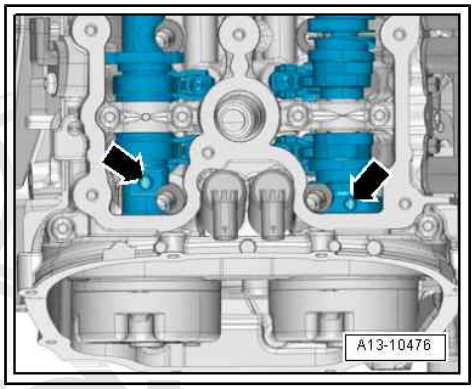
Note

One or two rectangular section seals are installed on the exhaust camshaft -2 and/or 3- (depending on version). For allocation, refer to ⇒ Electronic parts catalogue .

– Turn retaining frame over with camshafts fitted, holding camshafts firmly in position.

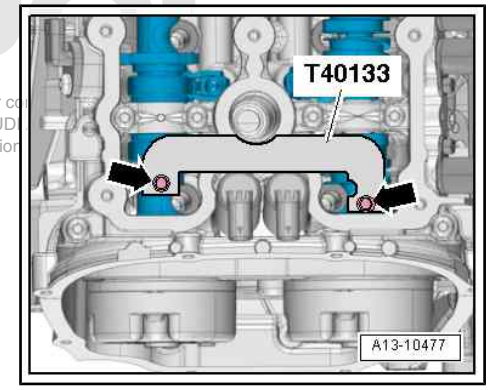
– Turn camshafts until threaded holes -arrows- point upwards.

– Check that camshafts are still in correct position in axial bearings in retaining frame.



– Fit camshaft clamps - T40133- onto both cylinder heads and tighten bolts -arrows- to 25 Nm.

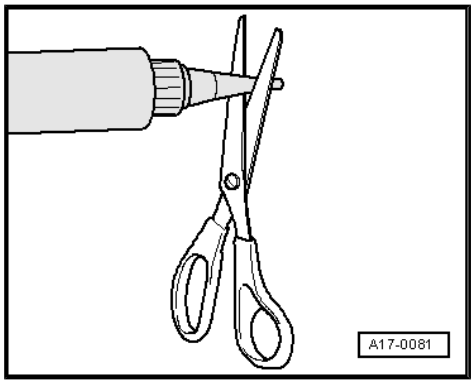
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Note

Note the use-by date of the sealant.

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



– Turn retaining frame upside down again.

Caution

Make sure lubrication system is not clogged by excess sealant.

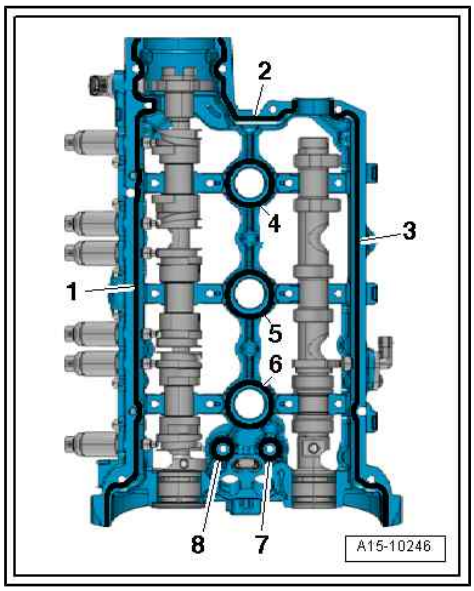
- ***The beads of sealant must not be thicker than specified.***

– Apply beads of sealant -4 ... 8- onto clean sealing surfaces of retaining frame as shown in illustration.

- Width of beads of sealant: 2.0 mm.

– Apply beads of sealant -1 ... 3- onto clean sealing surfaces of retaining frame as shown in illustration.

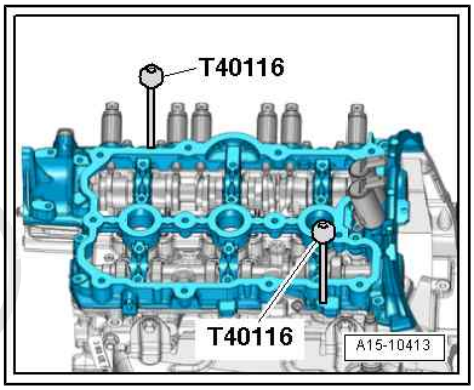
- Width of beads of sealant: 2.5 mm.



Note

The retaining frame must be installed within 5 minutes after applying the sealant.

– Fit retaining frame onto cylinder head.
– Insert locating pins -T40116- in retaining frame and cylinder head.

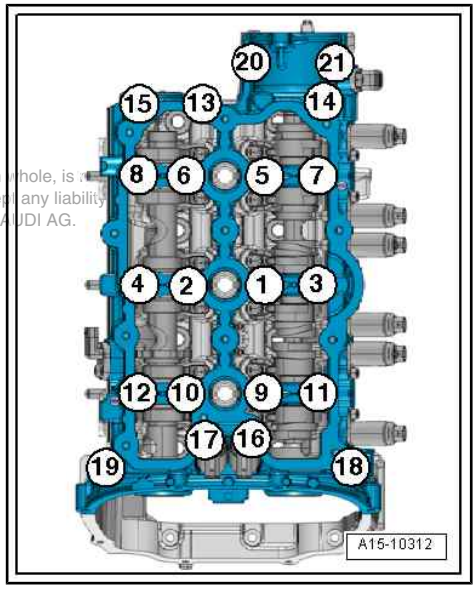


– Tighten bolts securing retaining frame for camshafts ⇒ Fig. ""Retaining frame for camshafts - tightening torque and sequence"" , page 189 .

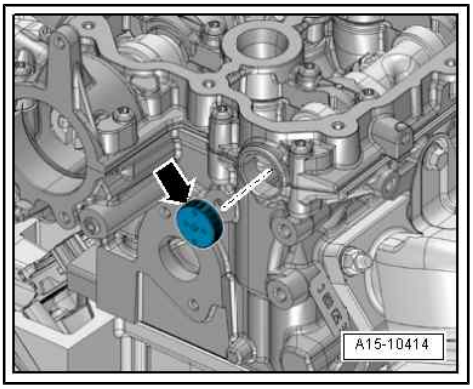
Note

After installing the retaining frame, wait about 30 minutes for the sealant to dry.

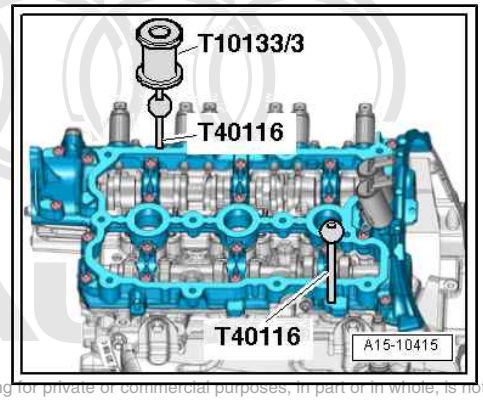
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– Clean bore for sealing plug in cylinder head; it must be free of oil and grease.
– Coat outer circumference of sealing plug -arrow- with sealant; for sealant refer to ⇒ Electronic parts catalogue .
– Drive in sealing plug until flush.



– Use impact extractor attachment -T40116- to pull out locating pins -T10133/3- .



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

– Install housing for high-pressure pump drive and high-pressure pump ⇒ page 366 .

– Install vacuum pump ⇒ Brake system; Rep. gr. 47 ; Vacuum system; Removing and installing vacuum pump .

– Fit timing chains on camshafts ⇒ page 168 .

Caution

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

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

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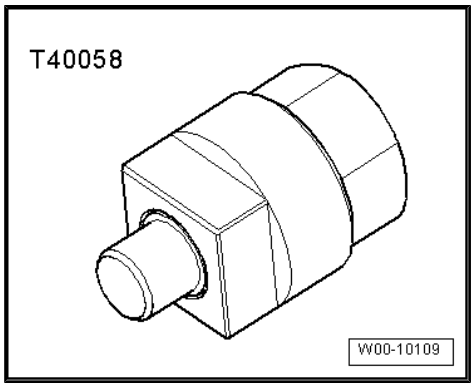
4.5 Checking hydraulic compensation elements

Note

- *The hydraulic compensation elements cannot be serviced.*
- *Irregular valve noises when starting engine are normal.*

Special tools and workshop equipment required

- Feeler gauge



- Adapter - T40058- for vehicles with dual clutch gearbox 0B5

Procedure

– Start engine and run until radiator fan has started up once.

– Increase engine speed to approx. 2500 rpm for 2 minutes (perform road test if necessary).

– If the compensation elements are still noisy, locate the defective compensation element as follows:

WARNING

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

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

– Remove cylinder head cover: left-side ⇒ page 143 ; right-side ⇒ page 144 .

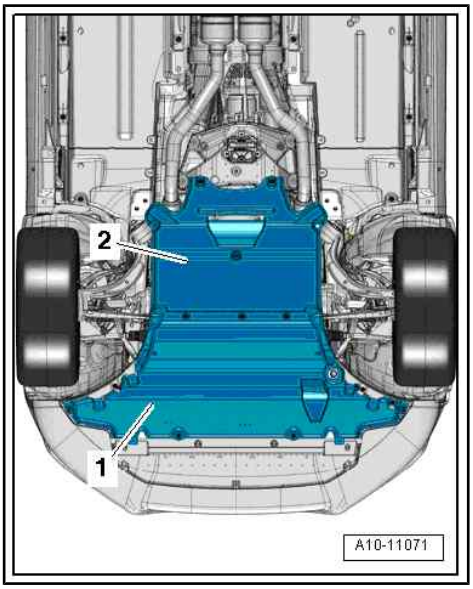
– Turn crankshaft until cam of hydraulic compensation element to be tested is at top:

Vehicles with manual gearbox:

– Push vehicle forwards with 4th gear engaged and ignition switched off.

Vehicles with dual clutch gearbox 0B5:

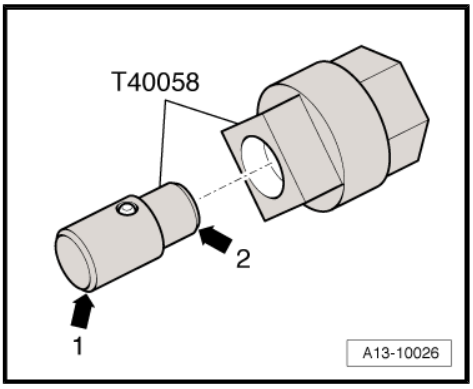
– Remove front noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .



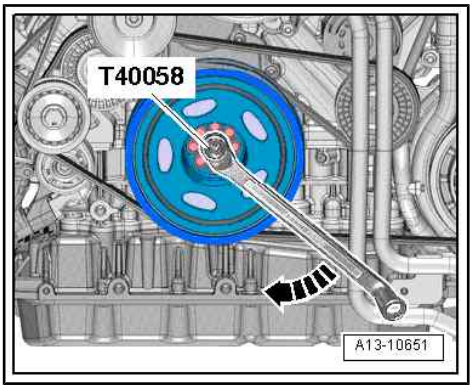
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– Insert guide pin of adapter -T40058- as follows:

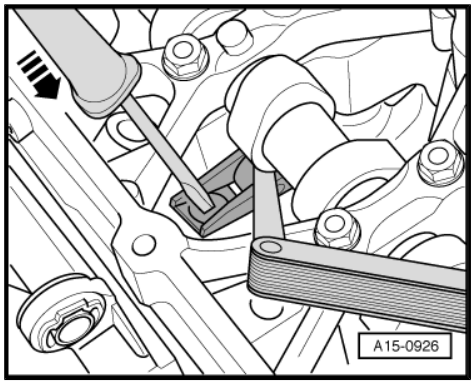
- The larger-diameter section -arrow 1- faces towards the engine.
- The smaller-diameter section -arrow 2- faces the adapter.



– Use adapter - T40058- and angled ring spanner to turn crankshaft in direction of engine rotation -arrow-.



All vehicles (continued):



- Press roller rocker finger down -arrow- to determine clearance between cam and roller rocker finger.
- If it is possible to insert a feeler gauge of 0.20 mm between cam and roller rocker finger, renew hydraulic compensation element ⇒ “4.4 Removing and installing camshaft”, page 190 .

Additional steps required

- Install noise insulation (front) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .
- Install cylinder head cover: left-side ⇒ page 143 ; right-side ⇒ page 144 .

4.6 Removing and installing valve stem oil seals

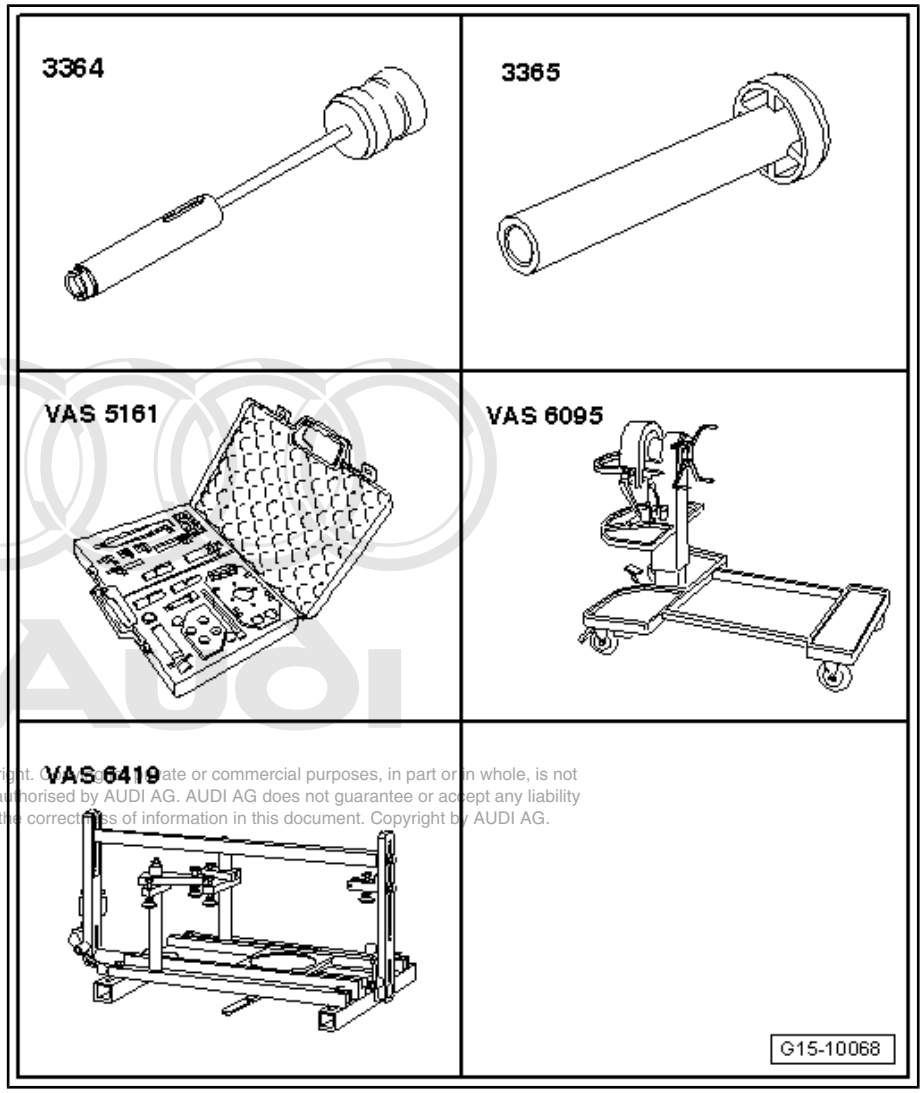
⇒ “4.6.1 Renewing valve stem oil seals with cylinder head removed”, page 198

⇒ “4.6.2 Renewing valve stem oil seals with cylinder head installed”, page 202

4.6.1 Renewing valve stem oil seals with cylinder head removed

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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 guide plate for 2.0 ltr. and 3.0 ltr. FSI engine - VAS 5161/19C-
- ♦ Engine and gearbox support - VAS 6095-
- ♦ Cylinder head tensioning device - VAS 6419-

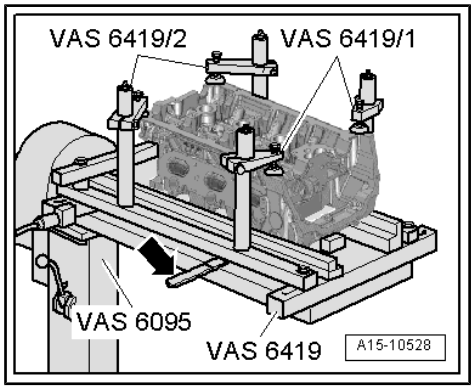
Procedure

– Remove camshafts ⇒ page 190 .

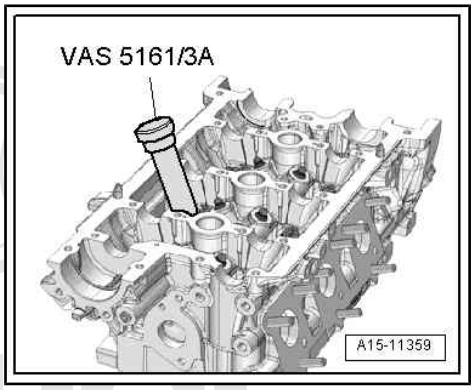
– Mark original positions of roller rocker fingers and hydraulic compensation elements for re-installation.

– 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.
– 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.

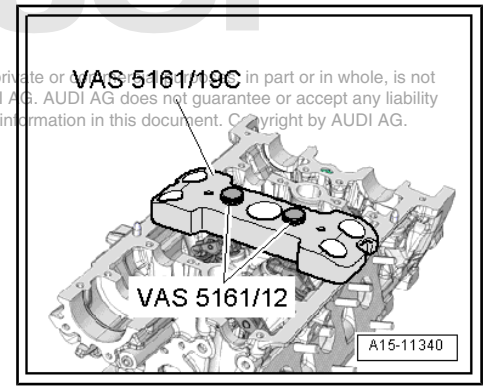


– Apply drift -VAS 5161/3A- to valve spring plate and use plastic-headed hammer to release sticking valve cotters.

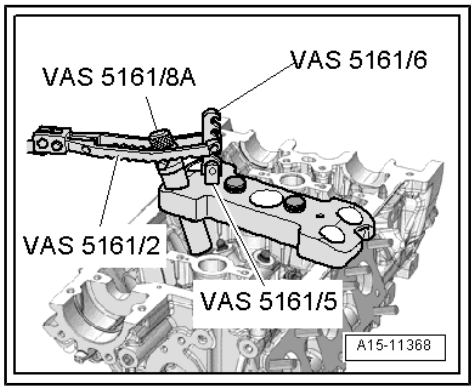


– Fit guide plate -VAS 5161/19C- from removal and installation device for valve cotters - VAS 5161- on cylinder head.
– Secure guide plate with knurled screws -VAS 5161/12-.

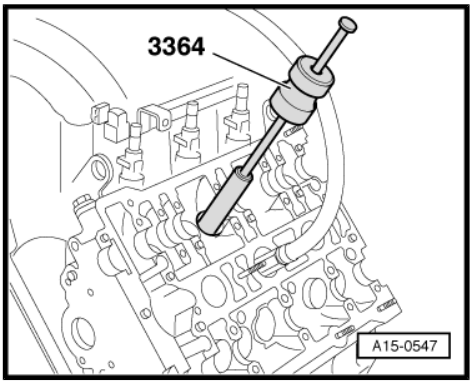
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– Screw snap-in device -VAS 5161/6- with engaging fork - VAS 5161/5- into guide plate.
– Insert assembly cartridge -VAS 5161/8A- in guide plate.
– Attach pressure fork -VAS 5161/2- to snap-in device and push assembly cartridge down.
– At the same time, turn knurled screw of assembly cartridge clockwise until tips engage in valve cotters.
– Move knurled screw back and forth slightly; the valve cotters are thus forced apart and taken up by the assembly cartridge.
– Release pressure fork.
– Take out assembly cartridge.
– Detach guide plate and turn to one side.
– Detach valve spring with valve spring plate.



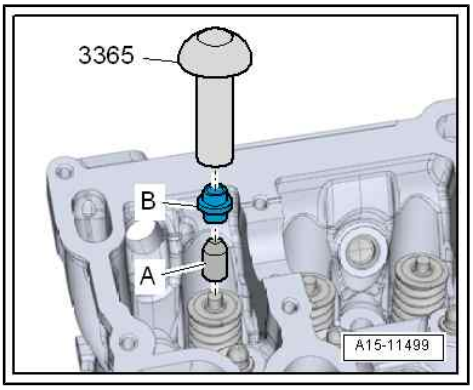
– Pull off valve stem oil seal with valve stem seal puller - 3364- .



Caution

Make sure valve stem oil seals are not damaged when installing.

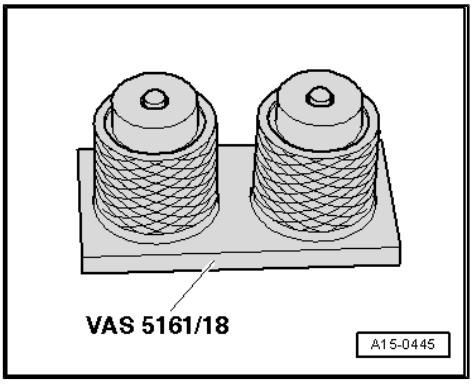
- ***New valve stem oil seals -B- are supplied with plastic sleeve; fit plastic sleeve -A- onto valve stem.***



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

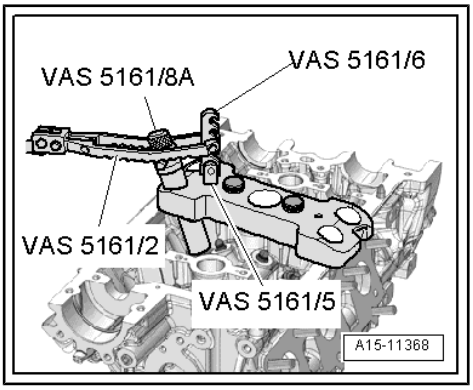
If valve cotters have been removed from assembly cartridge, they must first be inserted in insertion device -VAS 5161/18- .

• Larger diameter of valve cotters faces upwards.
– Press assembly cartridge onto insertion device from above and take up valve cotters.
– Insert valve spring and valve spring plate.
• Installation position of valve spring ⇒ Fig. ""Installation position of valve spring"" , page 188 .



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– Secure guide plate -VAS 5161/19C- back onto cylinder head.
– Insert assembly cartridge in guide plate.
– Press down pressure fork and pull knurled screw upwards while turning screw in both directions - this will insert the valve cotters.
– Release pressure fork with knurled screw still in pulled position.
– Repeat procedure for each valve.



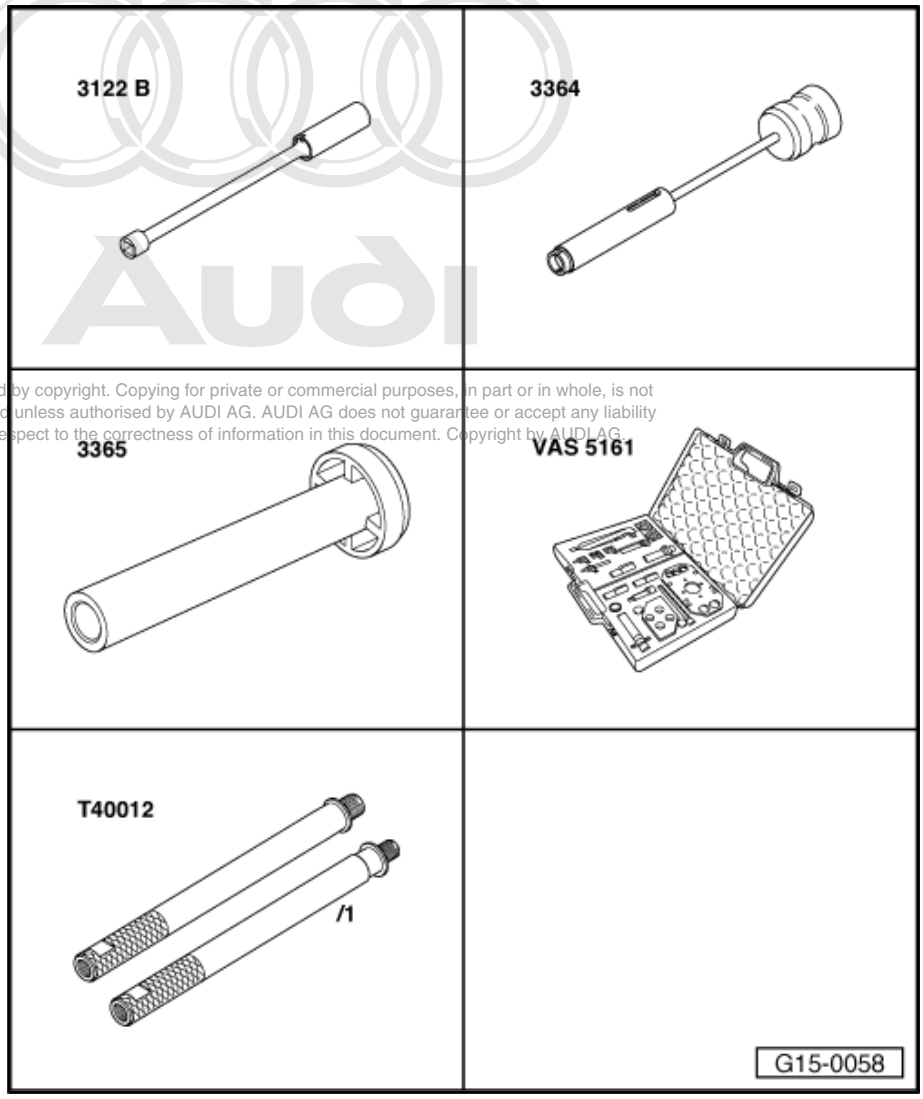
Assembling

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

– Ensure that all roller rocker fingers make contact with the ends of the valve stems correctly and are clipped onto their respective hydraulic compensation elements.
– Install camshafts ⇒ page 190 .

4.6.2 Renewing valve stem oil seals with cylinder head installed

Special tools and workshop equipment required



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- Spark plug socket and extension - 3122 B-
- Valve stem seal puller - 3364-
- Valve stem seal fitting tool - 3365-
- Removal and installation device for valve cotters - VAS 5161- with guide plate for 2.0 ltr. and 3.0 ltr. FSI engine - VAS 5161/19C-
- Adapter - T40012-

Procedure

– Remove camshafts ⇒ page 190 .

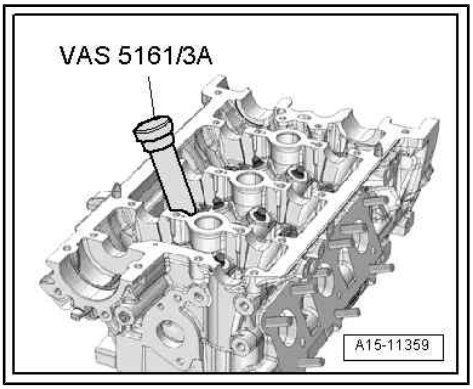
– Mark original positions of roller rocker fingers and hydraulic compensation elements for re-installation.

– Remove roller rocker fingers together with hydraulic compensation elements and put down on a clean surface.

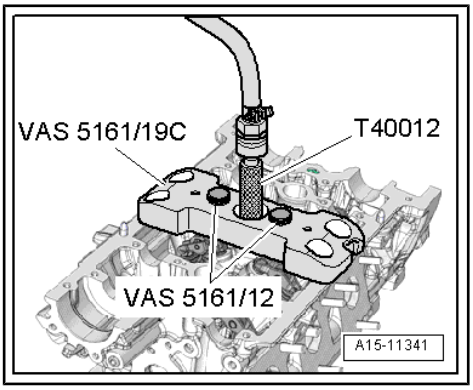
– Remove spark plugs with spark plug socket and extension - 3122 B- .

– Set piston of appropriate cylinder to “bottom dead centre”.

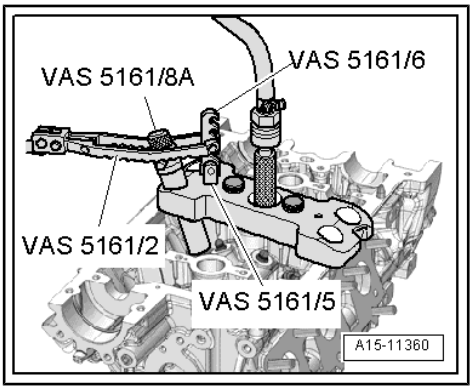
– Apply drift -VAS 5161/3A- to valve spring plate and use plastic-headed hammer to release sticking valve cotters.



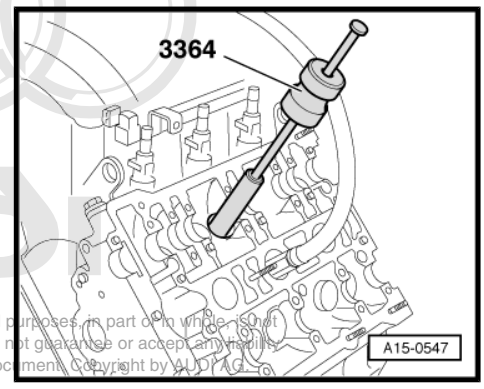
– Fit guide plate -VAS 5161/19C- from removal and installation device for valve cotters - VAS 5161- on cylinder head.
– Secure guide plate with knurled screws -VAS 5161/12- .
– Screw adapter - T40012- with seal hand-tight into the corresponding spark plug thread.
– Connect adapter to compressed air line using a commercially available connection piece, and apply constant air pressure.
• Minimum pressure: 6 bar



– Screw snap-in device -VAS 5161/6- with engaging fork - VAS 5161/5- into guide plate.
– Insert assembly cartridge -VAS 5161/8A- in guide plate.
– Attach pressure fork -VAS 5161/2- to snap-in device and push assembly cartridge down.
– At the same time, turn knurled screw of assembly cartridge clockwise until tips engage in valve cotters.
– Move knurled screw back and forth slightly; the valve cotters are thus forced apart and taken up by the assembly cartridge.
– Release pressure fork.
– Take out assembly cartridge.
– Detach guide plate and turn to one side.
• The compressed air hose remains connected.
– Detach valve spring with valve spring plate.



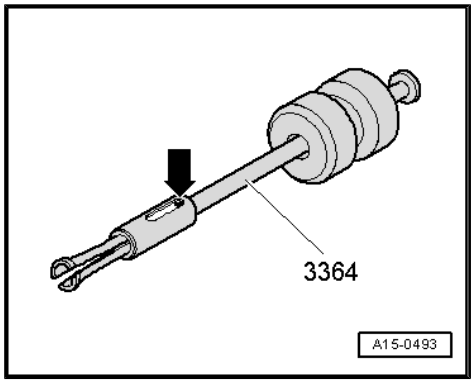
– Pull off valve stem oil seal with valve stem seal puller - 3364- .



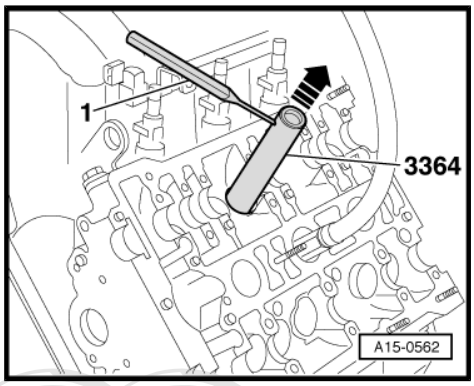
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If the puller -3364- cannot be used on some of the valve stem oil seals due to the confined space, proceed as follows:

– Knock out pin -arrow- of puller using a drift and remove impact extractor attachment.



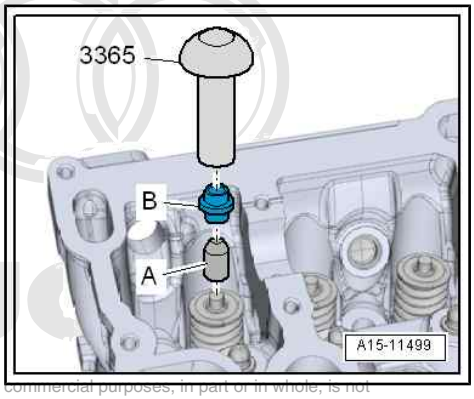
– Apply bottom section of puller -3364- to valve stem oil seal.
– Secure puller with a punch or roll-pin drift -1-, as shown in illustration.
– Apply assembly lever to puller and pull out valve stem oil seal -arrow-.



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.

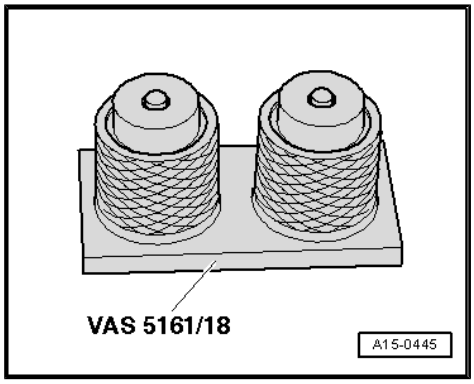
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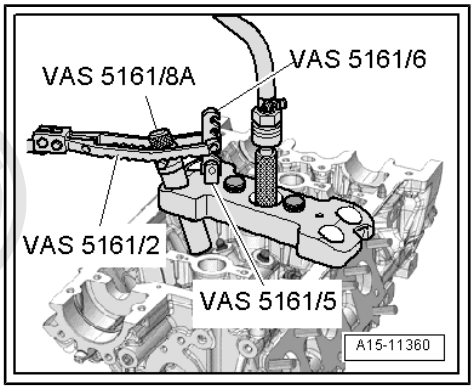
If valve cotters had been removed from assembly cartridge they must first be inserted in insertion device -VAS 5161/18- .

- Larger diameter of valve cotters faces upwards.

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

- Installation position of valve spring ⇒ Fig. ""Installation position of valve spring"" , page 188 .





– Secure guide plate -VAS 5161/19C- back onto cylinder head.
– Insert assembly cartridge in guide plate.
– Press down pressure fork and pull knurled screw upwards while turning screw in both directions - this will insert the valve cotters.
– Release pressure fork with knurled screw still in pulled position.
– Repeat procedure for each valve.

Assembling

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

– Ensure that all roller rocker fingers make contact with the ends of the valve stems correctly and are clipped onto their respective hydraulic compensation elements.
– Install spark plugs ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .
– Install camshafts ⇒ page 190 .

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Caution

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

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

5 Inlet and exhaust valves

⇒ “5.1 Checking valve guides”, page 206

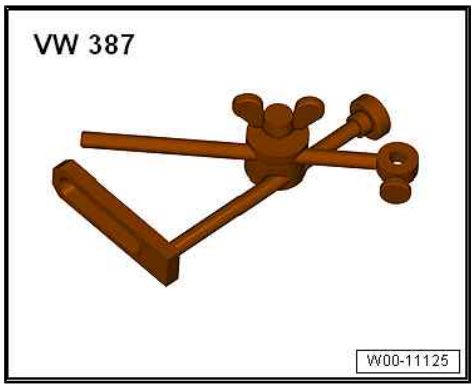
⇒ “5.2 Checking valves”, page 207

⇒ “5.3 Valve dimensions”, page 207

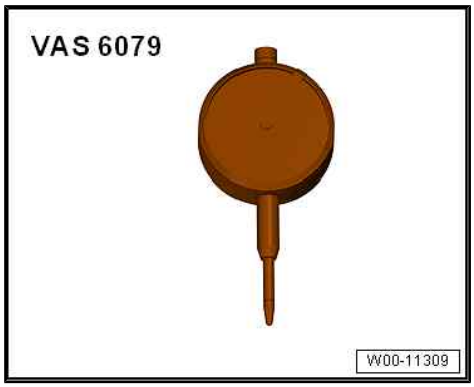
5.1 Checking valve guides

Special tools and workshop equipment required

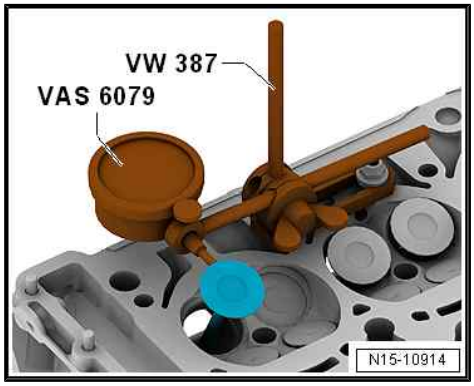
- Universal dial gauge bracket - VW 387-



- Dial gauge - VAS 6079-



Procedure



Note

- *If the valve has to be renewed as part of a repair, use a new valve for the measurement.*
- *Only insert inlet valve into inlet valve guide and exhaust valve into exhaust valve guide, as the stem diameters are different.*

– Insert valve into guide.

• End of valve stem must be flush with valve guide.

– Measure the amount of sideways play.

• Wear limit: 0.8 mm.

– If the wear limit is exceeded, repeat the measurement with new valves.

– Renew cylinder head if wear limit is still exceeded.

Note

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Valve guides cannot be renewed.

5.2 Checking valves

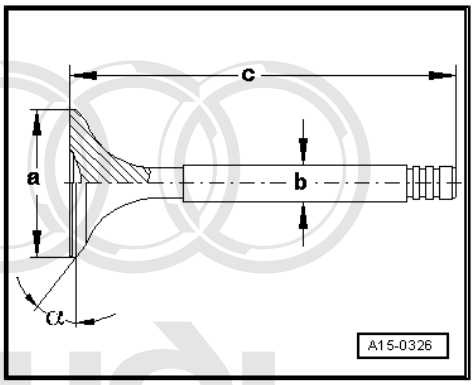
– Visually inspect for scoring on valve stems and contact surfaces.

– Renew valve if scoring is clearly visible.

5.3 Valve dimensions

Note

Inlet and exhaust valves must not be machined. Only grinding-in is permitted.



Dimension		Inlet valve	Exhaust valve
∅ a	mm	33.85 ± 0.10	28.0 ± 0.1
∅ b	mm	5.98 ± 0.01	5.96 ± 0.01
c	mm	104.0 ± 0.2	101.9 ± 0.2
α	∠°	45	45

WARNING

- *Care must be taken when disposing of old sodium-cooled exhaust valves.*
- *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. After preparing the valves, throw a maximum of ten into a bucket of water. Then step away immediately, since a chemical reaction will occur 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 208

⇒ “1.2 Engine oil”, page 211

⇒ “1.3 Removing and installing sump (bottom section)”, page 212

⇒ “1.4 Removing and installing sump (top section)”, page 214

⇒ “1.5 Removing and installing oil pump”, page 217

⇒ “1.6 Removing and installing oil level and oil temperature sender G266 ”, page 217

⇒ “1.7 Checking oil level”, page 218

1.1 Exploded view - sump/oil pump

Caution

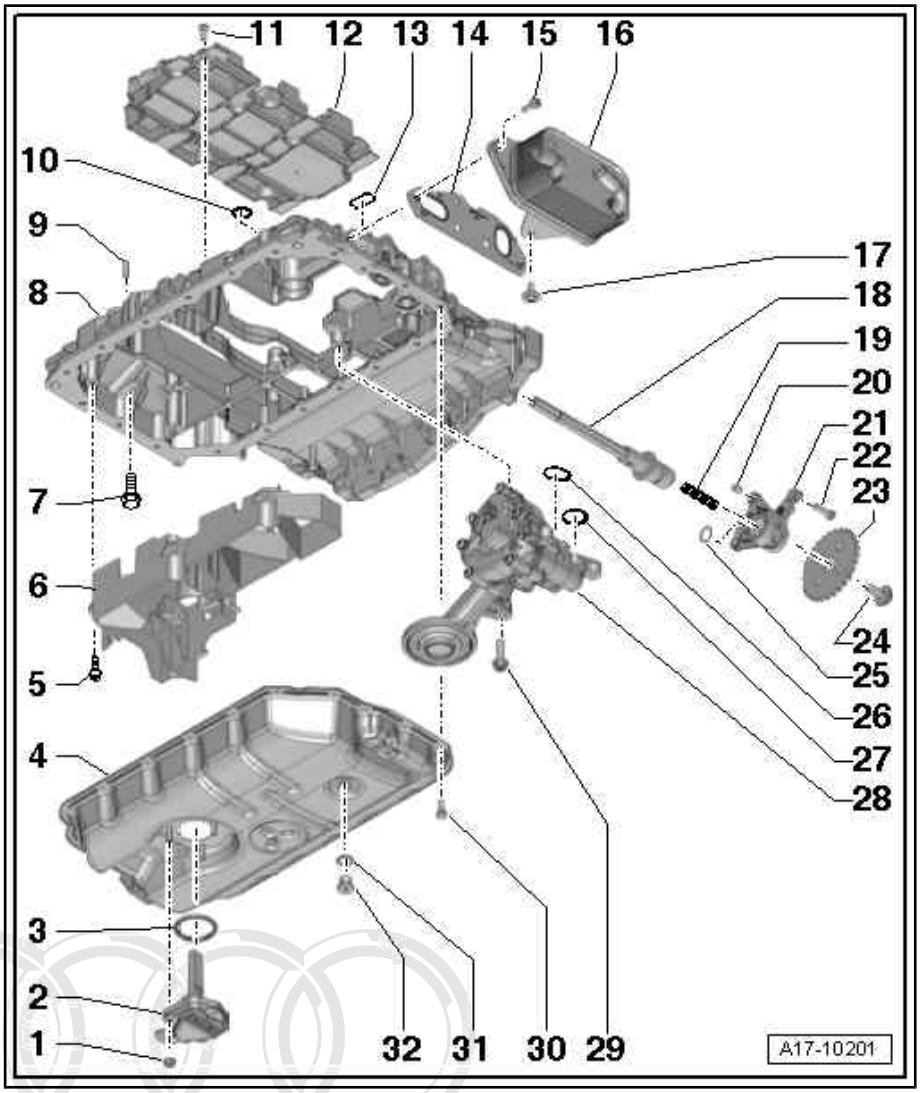
Risk of damage to catalytic converter.

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

Note

- *If large quantities of metal shavings or abrasion are found when performing engine repairs, this may be an indication of damage to the crankshaft or conrod bearings. To prevent further damage, the following steps are required after completion of repair work: clean the oil galleries carefully and renew the oil spray jets, engine oil cooler and oil filter.*
- *For engine oil capacity, oil specifications and viscosity grades, refer to ⇒ Maintenance tables or ⇒ Technical data for petrol engines; Rep. gr. 00 ; Overview of engines .*
- *Oil spray jet for piston cooling ⇒ Fig. ““Oil spray jet for piston cooling”“ , page 130 .*

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1 - Nut

- ❑ 9 Nm

2 - Oil level and oil temperature sender - G266-

- ❑ Removing and installing ⇒ “1.6 Removing and installing oil level and oil temperature sender G266 ”, page 217

3 - Seal

- ❑ Renew

4 - Sump (bottom section)

- ❑ Removing and installing ⇒ “1.3 Removing and installing sump (bottom section)”, page 212

5 - Bolt

- ❑ Steel bolts:

♦ 9 Nm

- ❑ Aluminium bolts:

♦ Renew

♦ 3 Nm +90°

6 - Baffle plate (bottom)

7 - Bolt

- ❑ Renew
- ❑ ⇒ Fig. ““Sump (top section) - tightening torque and sequence”“ , page 211

8 - Sump (top section)

- ❑ Removing and installing ⇒ “1.4 Removing and installing sump (top section)”, page 214

9 - Dowel sleeve

- ❑ 2x

10 - O-ring

- ❑ Insert in retaining frame
- ❑ Renew

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11 - Bolt

- ❑ Clean threaded holes for bolts
- ❑ Apply locking fluid when installing; refer to ⇒ Electronic parts catalogue
- ❑ Steel bolts:

♦ 9 Nm

- ❑ Aluminium bolts:

♦ Renew

♦ 3 Nm +90°

12 - Baffle plate (top)

13 - Seal

- ❑ Insert in retaining frame
- ❑ Renew

14 - Gasket

- ❑ Renew

15 - Bolt

Renew

3 Nm +90°

16 - Engine oil cooler

- ❑ See note ⇒ page 208
- ❑ Removing and installing ⇒ “2.1 Removing and installing engine oil cooler”, page 219
- ❑ With oil cooler bypass valve

17 - Bolt

- ❑ 9 Nm

18 - Oil pump drive shaft

19 - Compression spring

20 - Sleeve

- ❑ 2x

21 - Bearing bracket

22 - Bolt

- ❑ 9 Nm

23 - Chain sprocket for oil pump

- ❑ Can only be fitted in one position on drive shaft

24 - Bolt

- ❑ Renew
- ❑ To loosen and tighten, use pin wrench - 3212- to counterhold chain sprocket
- ❑ 30 Nm +90°

25 - O-ring

- ❑ Renew

26 - Seal

- ❑ Renew

27 - O-ring

- ❑ Renew

28 - Oil pump

- ❑ Do not dismantle
- ❑ Removing and installing ⇒ “1.5 Removing and installing oil pump”, page 217

29 - Bolt

- ❑ 20 Nm

30 - Bolt

- ❑ Renew
- ❑ Tightening torque and sequence ⇒ Fig. ““Sump (bottom section) - tightening torque and sequence”“ , page 211

31 - Seal

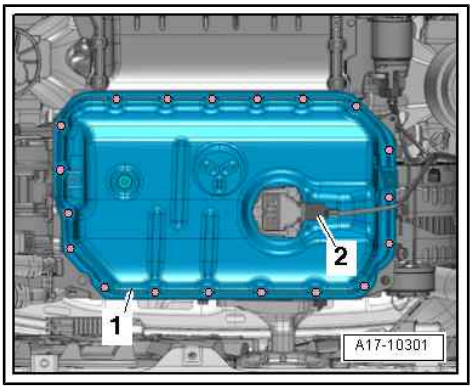
- ❑ Renew

32 - Oil drain plug

- ❑ 30 Nm

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Sump (bottom section) - tightening torque and sequence



Note

Renew the bolts tightened with specified tightening angle.

– Tighten bolts in 2 stages as follows:

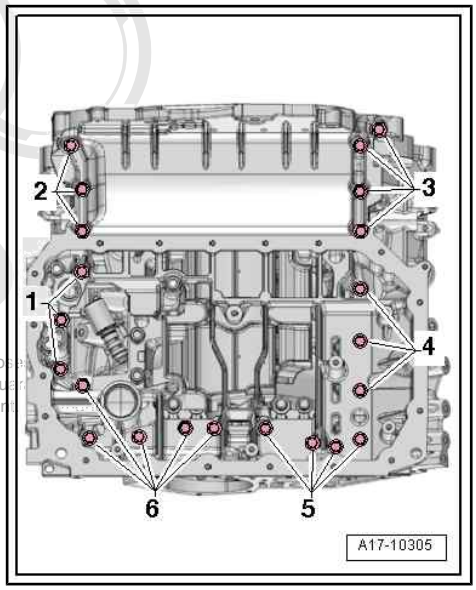
For steel bolts

Stage	Tightening torque/angle specification
1.	8 Nm in diagonal sequence
2.	Turn 90° further in diagonal sequence

For aluminium bolts

Stage	Tightening torque/angle specification
1.	3 Nm in diagonal sequence
2.	Turn 90° further in diagonal sequence

Sump (top section) - tightening torque and sequence



Note

Renew the bolts tightened with specified tightening angle.

– Tighten bolts in the following sequence:

For steel bolts

Stage	Bolts	Tightening torque
1.	M7 -1 … 6-	Screw in by hand until contact is made
2.	M7 -1 … 6-	Tighten in stages and in diagonal sequence; final torque 16 Nm.

Stage	Bolts	Tightening torque
1.	M8 -1 … 6-	Screw in by hand until contact is made
2.	M8 -1 … 6-	Tighten in stages and in diagonal sequence; final torque 20 Nm.

For aluminium bolts

Stage	Bolts	Tightening torque/angle specification
1.	-1 … 6-	Screw in by hand until contact is made
2.	-1 … 6-	8 Nm
3.	-1 … 6-	Turn 90° further

1.2 Engine oil

For engine oil capacity, oil specifications and viscosity grades, refer to ⇒ Maintenance tables or ⇒ Technical data for petrol engines; Rep. gr. 00 ; Overview of engines .

Caution

Risk of damage to catalytic converter.

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- *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

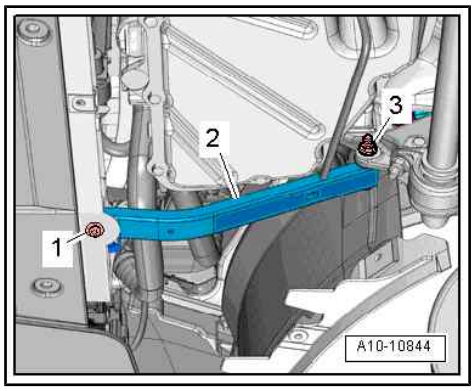
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Removing

- Drain engine oil ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .

Vehicles not equipped with continued coolant circulation pump - V51- :

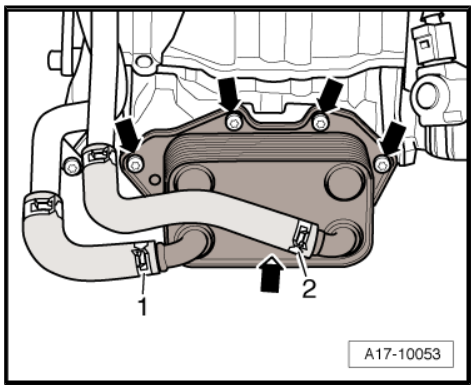
– Remove bolt -1- and nut -3- and detach lock carrier brace (left-side) -2-.



Note

Lay a cloth under the engine oil cooler to catch escaping engine oil.

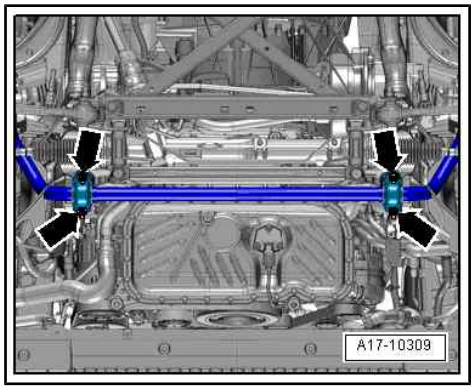
– Remove bolts -arrows- and tie up engine oil cooler to one side with coolant hoses -1- and -2- attached.



Vehicles with continued coolant circulation pump - V51- :

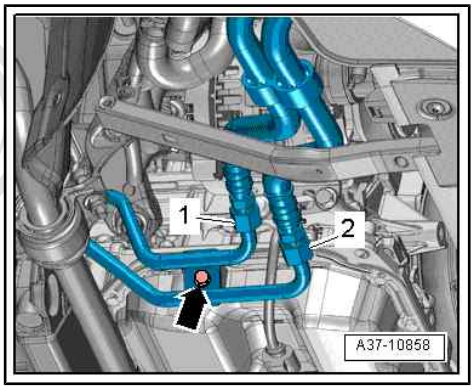
– Remove continued coolant circulation pump - V51- ⇒ page 254 and engine oil cooler ⇒ page 219 .

– Remove nuts -arrows- and lower anti-roll bar.



Vehicles with dual clutch gearbox 0B5:

– Remove bolt -arrow- for ATF lines.



Note

Disregard -items 1, 2-.

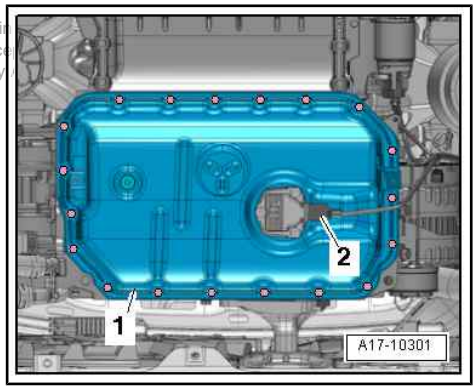
All vehicles (continued):

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www.vwmotive.net/terms-conditions/ | Protected by copyright by

– Unplug electrical connector -2- at oil level and oil temperature sender - G266- and move electrical wiring clear.

– Remove bolts for sump (bottom section) -1-.

– Release sump (bottom section) from bonded joint, taking care not to bend sump.



Installing

- Tightening torques ⇒ Fig. ""Sump (bottom section) - tightening torque and sequence"" , page 211

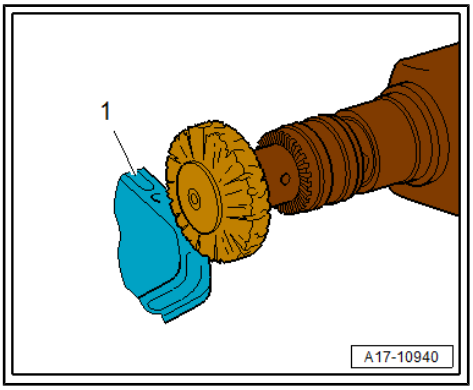
Note

- *Renew seals.*
- *The sump (bottom section) must be renewed if its coating is damaged or if it is bent.*

Caution

Protect lubrication system and bearings against contamination.

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



WARNING

Risk of eye injury due to sealant residue.

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

– Remove remaining sealant on bottom and top sections of sump with a rotating plastic brush or similar.

Note

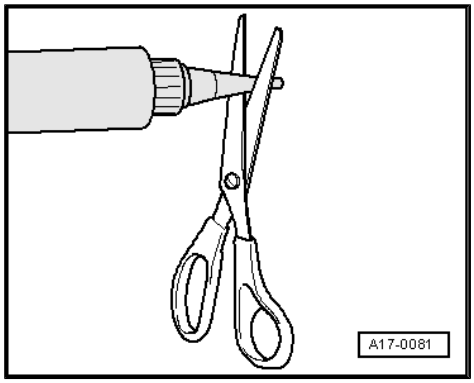
Take care not to damage the coating on the sump (bottom section).

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

Note

Note the use-by date of the sealant.

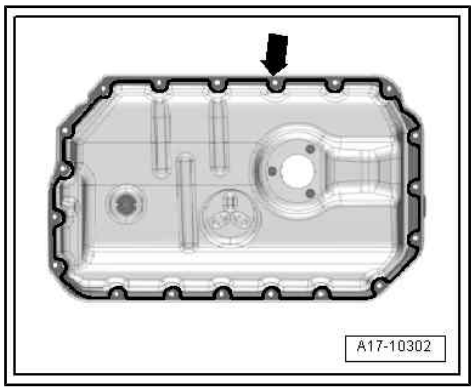
– Cut off nozzle of tube at front marking (nozzle ∅ approx. 1 mm).



Caution

Make sure lubrication system is not clogged by excess sealant.

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



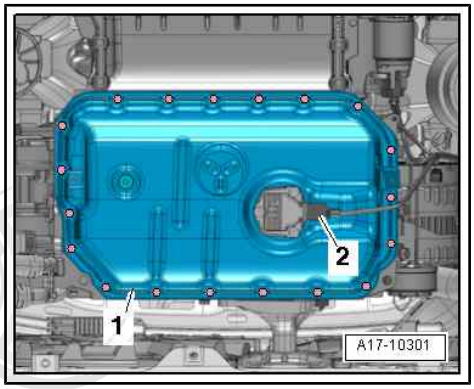
– Apply bead of sealant -arrow- onto clean sealing surface of sump (bottom section) as illustrated.

- Width of sealant bead: approx. 1.5 mm.

Note

The sump (bottom section) must be installed within 5 minutes after applying the sealant.

– Fit sump (bottom section) and tighten bolts ⇒ page 211 .



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

Vehicles with dual clutch gearbox 0B5:

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

All vehicles (continued):

– Install anti-roll bar ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Removing and installing anti-roll bar .

– Install engine oil cooler ⇒ page 219 .

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

1.4 Removing and installing sump (top section)

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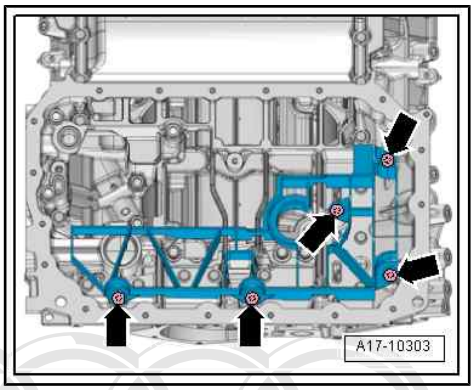
Special tools and workshop equipment required

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

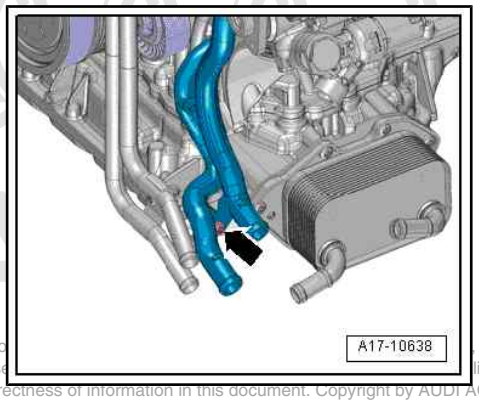
Removing

- Engine secured to engine and gearbox support ⇒ page 63 .

– Remove timing chain cover (bottom) ⇒ page 154 .
– Remove oil pump ⇒ page 217 .
– Remove bolts -arrows- and detach baffle plate (bottom).



– Remove bolt -arrow- for coolant pipes (front left).



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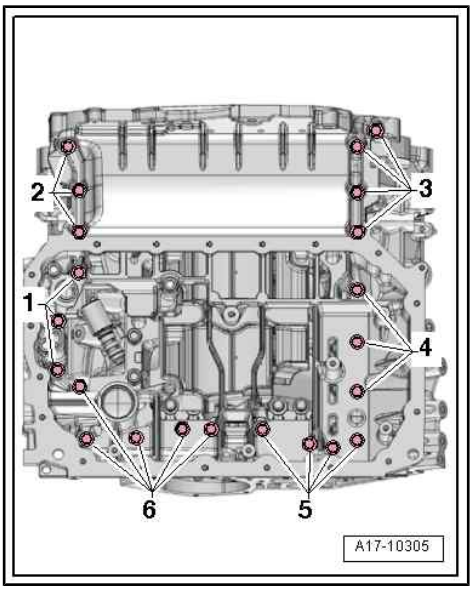
– Remove bolts -1 ... 6- for sump (top section).
– Carefully release sump (top section) from bonded joint and pry sump off dowel pins on cylinder block.

Installing

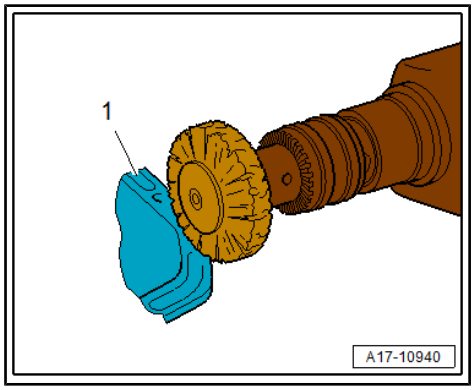
- Tightening torques ⇒ “1.1 Exploded view - sump/oil pump”, page 208

Note

Renew gasket and O-ring.



– Remove old sealant from grooves on sump (top section) and from sealing surfaces.



Caution

Protect lubrication system and bearings against contamination.

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

WARNING

Risk of eye injury due to sealant residue.

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

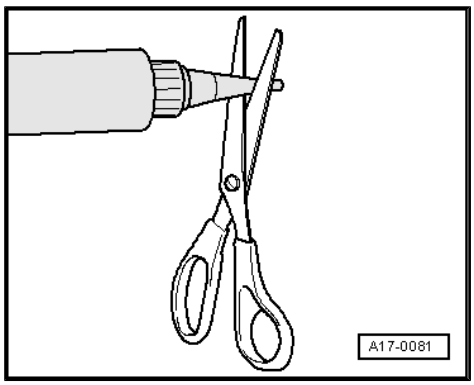
– Remove sealant residue from sump (top section) and cylinder block using rotating plastic brush or similar.

– 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. 1.5 mm).



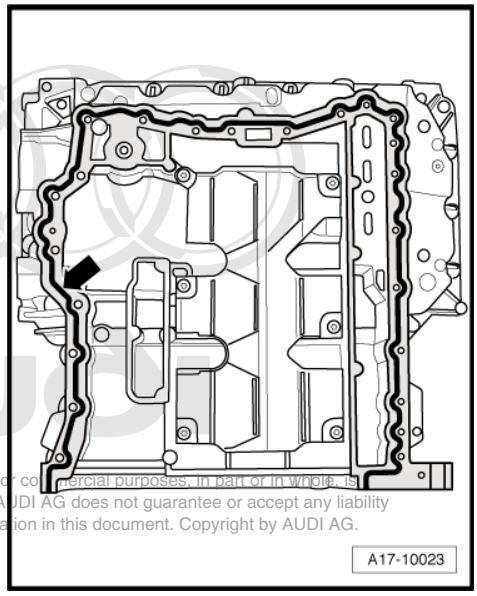
Caution

Make sure lubrication system is not clogged by excess sealant.

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

– Apply bead of sealant -arrow- onto clean sealing surface of sump (top section) as shown in illustration.

- The grooves on the sealing surfaces must be completely filled with sealant.
- The bead of sealant must project 1.5 … 2.0 mm above the sealing surface.

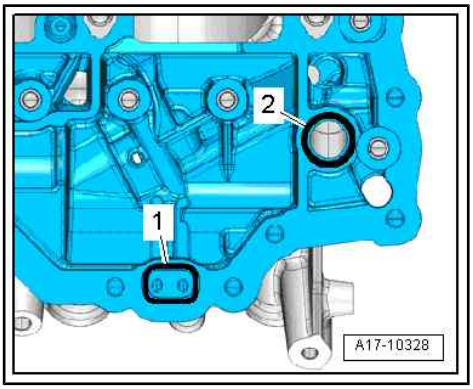


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Note

The sump (top section) must be installed within 5 minutes after applying the sealant.

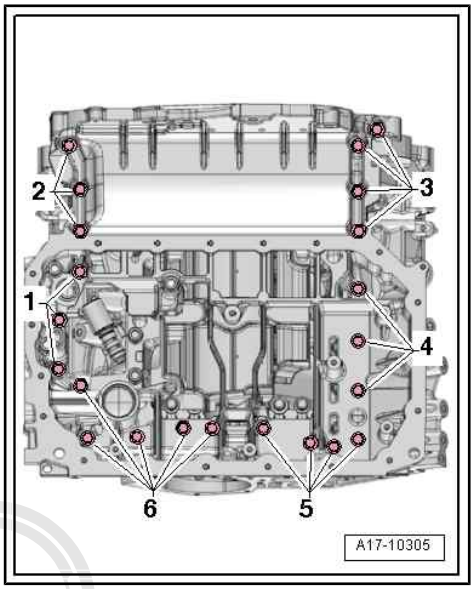
– Fit seal -1- and O-ring -2- in retaining frame.



– Check that dowel sleeves are fitted, fit sump (top section) and tighten bolts ⇒ page 211 .

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

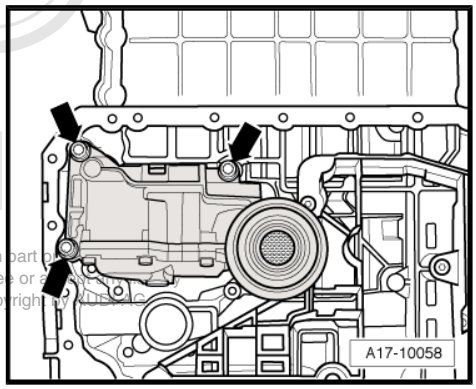
– Secure coolant pipes (left-side) ⇒ page 261 .
– Install oil pump ⇒ page 217 .
– Install timing chain cover (bottom) ⇒ page 154 .



1.5 Removing and installing oil pump

Removing

– Remove sump (bottom section) ⇒ page 212 .
– Remove bolts -arrows-.
– Pull oil pump forwards off drive shaft.



Installing

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

• Tightening torques ⇒ "1.1 Exploded view - sump/oil pump", page 208

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Note

Renew gasket and O-ring.

– Fit oil pump onto drive shaft and tighten bolts.
– Install sump (bottom section) ⇒ page 212 .
– Fill up with engine oil and check oil level ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .

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

Removing

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

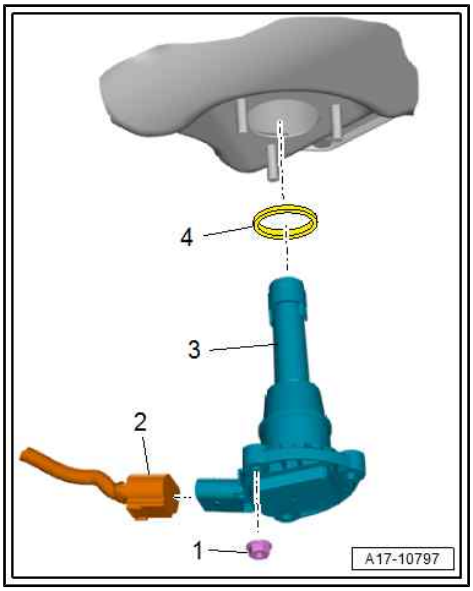
– Unplug electrical connector -2-.

– Remove nuts -1- and detach oil level and oil temperature sender - G266- -item 3-.

Installing

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

- Tightening torques ⇒ “1.1 Exploded view - sump/oil pump”, page 208



Note

Renew seal -4-.

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

1.7 Checking oil level

- Depending on equipment, the oil level is displayed on the MMI or the sound system. Procedure ⇒ Owner's Manual .
- Checking oil level ⇒ Technical data for petrol engines; Rep. gr. 00 ; Overview of engines; Overview of engines with adjustment values (oil gauge tester T40178)

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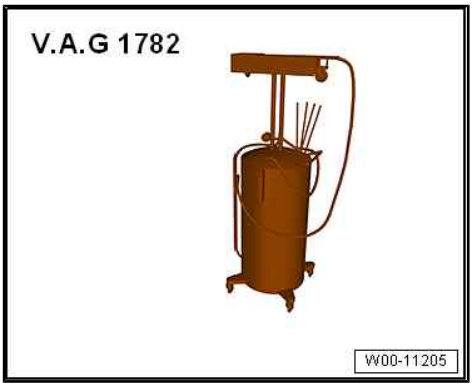
2 Engine oil cooler

⇒ "2.1 Removing and installing engine oil cooler", page 219

2.1 Removing and installing engine oil cooler

Special tools and workshop equipment required

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

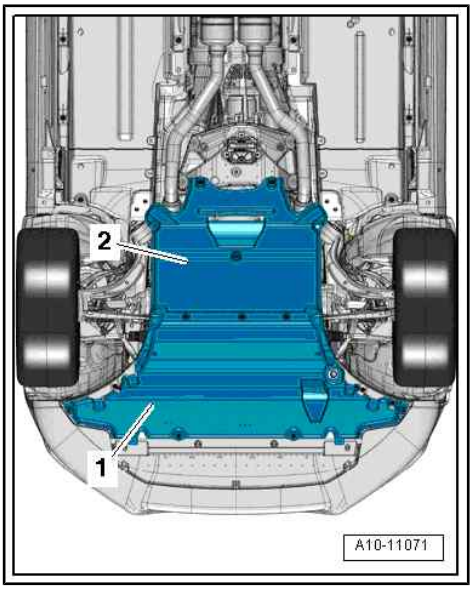


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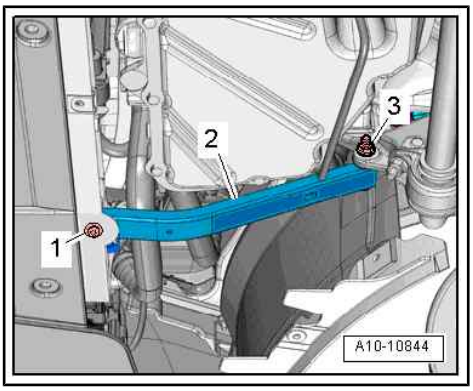
Removing

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

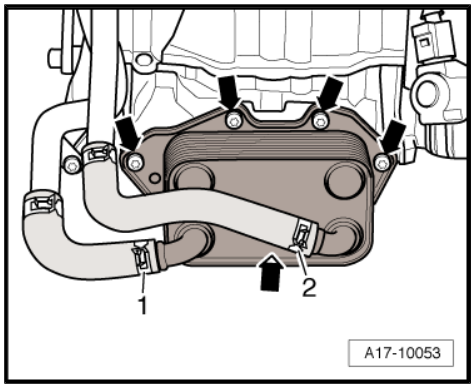
– Drain coolant ⇒ page 240 (or on vehicles equipped with continued coolant circulation pump -V51- remove continued coolant circulation pump ⇒ page 254).



– Remove bolt -1- and nut -3- and detach lock carrier brace (left-side) -2-.



– Detach coolant hose -1- and, if necessary, -2- from engine oil cooler; release hose clip to do so.
– Position used oil collection and extraction unit - V.A.G 1782- below engine.
– Unscrew bolts -arrows- and detach engine oil cooler.



Installing

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

- Tightening torques ⇒ “1.1 Exploded view - sump/oil pump”, page 208

Note

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

– Install lock carrier brace ⇒ General body repairs, exterior; Rep. gr. 50 ; Lock carrier .
– Install continued coolant circulation pump - V51- ⇒ page 254 .
– Check oil level ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 , ⇒ Maintenance ; Booklet 818 or ⇒ Technical data for petrol engines; Rep. gr. 00 ; Overview of engines; Overview of engines with adjustment values (oil gauge tester T40178) .
– Fill up with coolant ⇒ page 243 .

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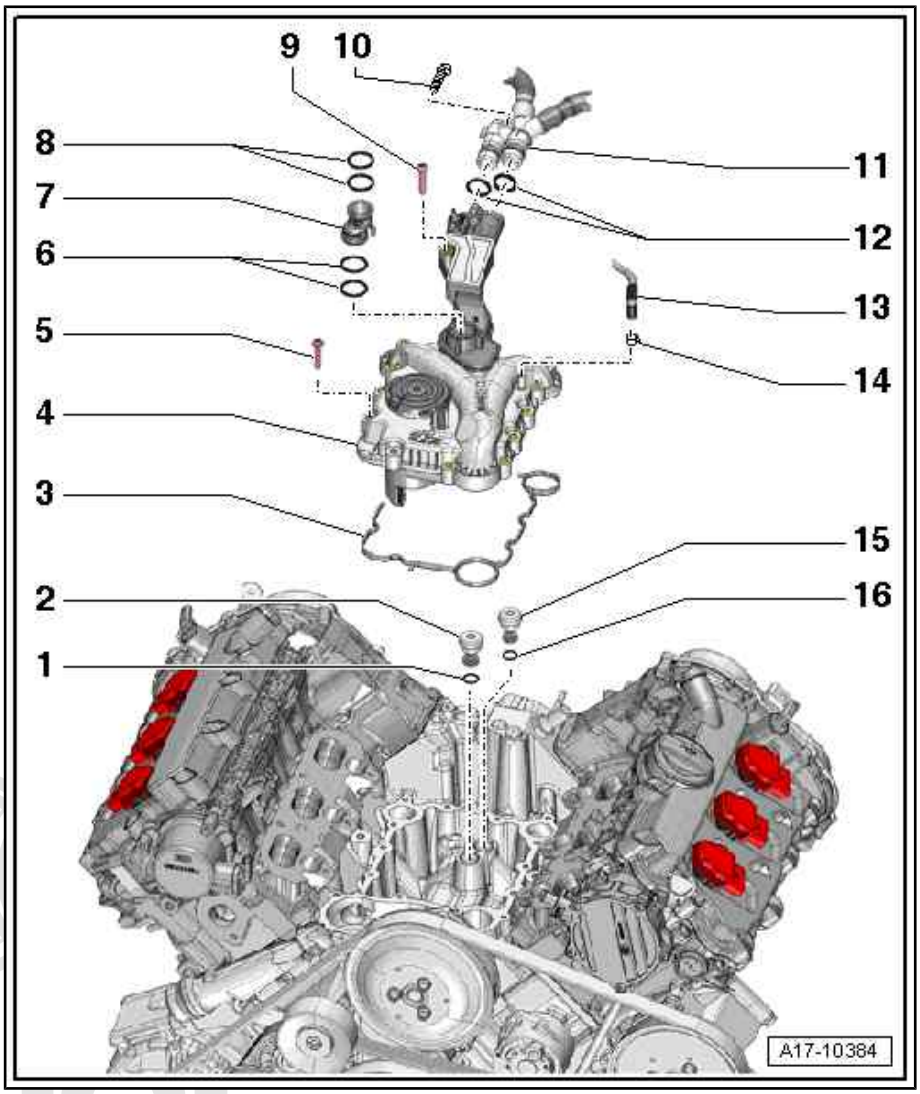
3 Crankcase breather

⇒ “3.1 Exploded view - crankcase breather system”, page 221

⇒ “3.2 Removing and installing crankcase breather hoses”, page 222

⇒ “3.3 Removing and installing oil separator”, page 223

3.1 Exploded view - crankcase breather system



1 - O-ring

- ❑ Only on oil retention valve -item 2-
- ❑ Renew

2 - Oil retention valve or plug

- ❑ Oil retention valve is replaced by plug on later versions ⇒ Electronic parts catalogue
- ❑ 20 Nm

3 - Gasket

- ❑ Renew

4 - Cover with oil separator

- ❑ With connection for crankcase breather
- ❑ Removing and installing ⇒ “3.3 Removing and installing oil separator”, page 223

5 - Bolt

- ❑ 9 Nm

6 - O-ring

- ❑ Renew
- ❑ USA models: 2x

7 - Connection

- ❑ For crankcase breather
- ❑ Installation position ⇒ Fig. ““Installing connection for crankcase breather”“ , page 222

8 - O-ring

- ❑ Renew
- ❑ USA models: 2x

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9 - Bolt

- ❑ 2.5 Nm

10 - Bolt

- ❑ 2.5 Nm

11 - Crankcase breather hoses

- ❑ To cylinder head covers
- ❑ Removing and installing ⇒ “3.2 Removing and installing crankcase breather hoses”, page 222

12 - O-rings

- ❑ Renew

13 - Crankcase breather hose

- ❑ To air pipe

14 - Hose clip

15 - Oil retention valve or plug

- ❑ Oil retention valve is replaced by plug on later versions ⇒ Electronic parts catalogue
- ❑ 20 Nm

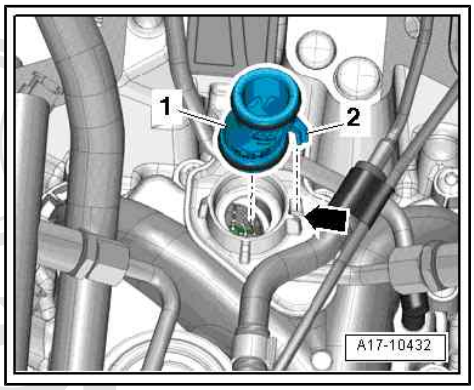
16 - O-ring

- ❑ Only on oil retention valve -item 15-
- ❑ Renew

Installing connection for crankcase breather

– Insert connection -1- for crankcase breather with new O-rings in cover for oil separator.

• Installation position: lug -2- must engage in guide -arrow-.



3.2 Removing and installing crankcase breather hoses

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⇒ “3.2.1 Removing and installing crankcase breather hoses, rest-of-world vehicles”, page 222

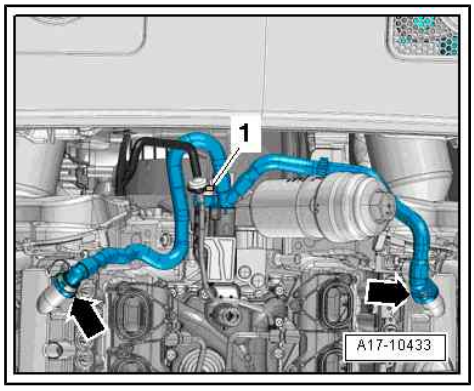
⇒ “3.2.2 Renewing crankcase breather hoses, USA vehicles”, page 223

3.2.1 Removing and installing crankcase breather hoses, rest-of-world vehicles

Removing

Note

Fit all cable ties in the original positions when installing.



– Remove supercharger ⇒ page 310 .

– Detach crankcase breather hoses -arrows- from cylinder head covers.

– Move crankcase breather hoses clear.

– Remove bolt -1- and detach connection with crankcase breather hoses.

Installing

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

• Tightening torque ⇒ “3.1 Exploded view - crankcase breather system”, page 221

Note

Fit new O-rings.

– Install supercharger ⇒ page 310 .

3.2.2 Renewing crankcase breather hoses, USA vehicles

Caution

Risk of violating emission legislation applying to USA models.

- ***Crankcase breather hoses cannot be removed without being irreparably damaged. Once removed, they must be renewed.***

Removing

Note

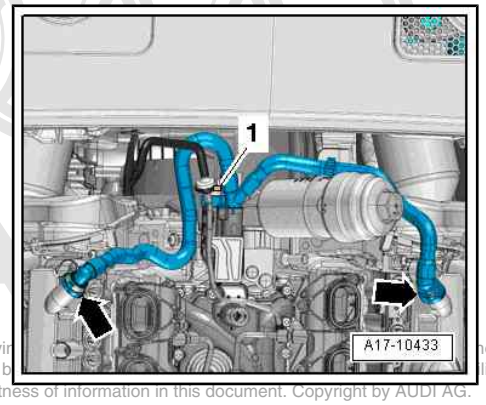
Fit all cable ties in the original positions when installing.

– Remove supercharger ⇒ page 310 .

– Detach crankcase breather hoses -arrows- from cylinder head covers.

– Move crankcase breather hoses clear.

– Remove bolt -1- and detach connection with crankcase breather hoses.



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Installing

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

- Tightening torque ⇒ “3.1 Exploded view - crankcase breather system”, page 221

Note

Fit new O-rings.

– Install supercharger ⇒ page 310 .

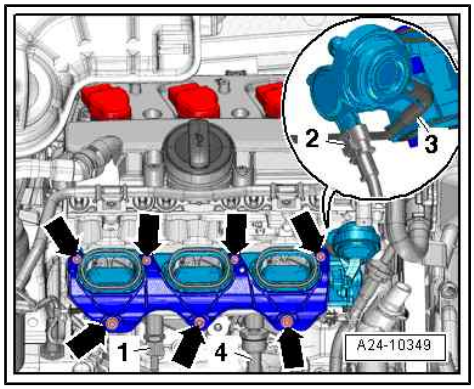
3.3 Removing and installing oil separator

Removing

– Remove crankcase breather hoses ⇒ page 222 .

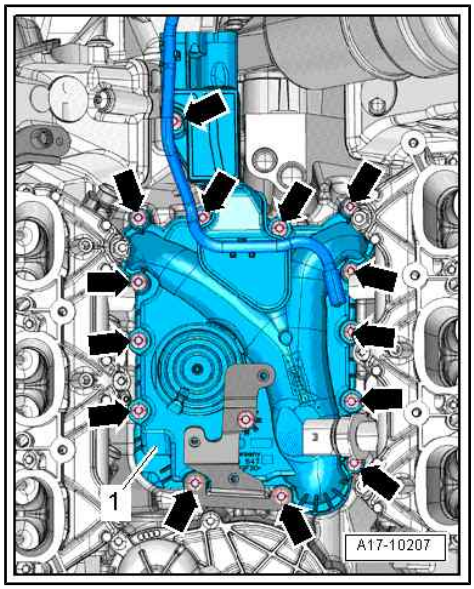
– Remove coolant pipe (top) ⇒ page 273 .

– Remove intake manifold bottom section (left-side) ⇒ page 347 .



– Remove bolts -arrows-.

– Detach bracket for high-pressure pipes and cover -1- with oil separator.



Installing

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

- Tightening torques ⇒ “3.1 Exploded view - crankcase breather system”, page 221

Note

Renew gasket.

– Install intake manifold (bottom section) ⇒ page 347 .

– Install coolant pipe (top) ⇒ page 273 .

– Install crankcase breather hoses ⇒ page 222 .

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4 Oil filter/oil pressure switches

⇒ “4.1 Exploded view - oil filter/oil pressure switch”, page 225

⇒ “4.2 Removing and installing oil pressure switch F22 ”, page 226

⇒ “4.3 Removing and installing oil pressure switch for reduced oil pressure F378 ”, page 228

⇒ “4.4 Checking oil pressure”, page 229

⇒ “4.5 Checking oil pressure and oil pressure switch”, page 230

⇒ “4.6 Removing and installing oil filter housing”, page 230

⇒ “4.7 Removing and installing valve for oil pressure control N428 ”, page 232

4.1 Exploded view - oil filter/oil pressure switch

1 - Bolt
- ❑ 13 Nm

2 - Oil pressure switch - F22-
- ❑ Opening/closing pressure 2.5 ... 3.2 bar
- ❑ With grey insulation
- ❑ Checking in Guided Fault Finding ⇒ Vehicle diagnostic tester
- ❑ Removing and installing ⇒ “4.2 Removing and installing oil pressure switch F22 ”, page 226
- ❑ 20 Nm

3 - Seal
- ❑ Renew

4 - Flange nut
- ❑ 13 Nm

5 - Bolt
- ❑ 9 Nm

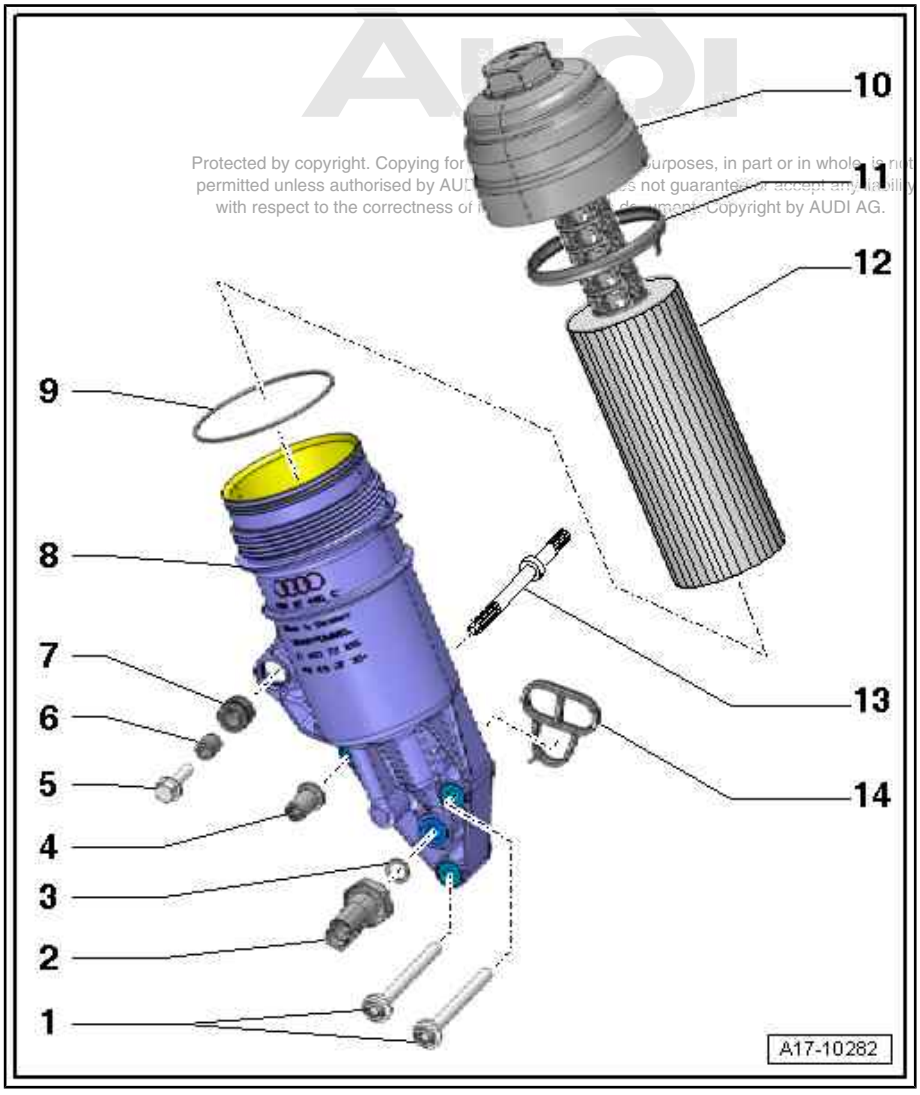
6 - Sleeve

7 - Rubber grommet

8 - Oil filter housing
- ❑ With filter bypass valve
- ❑ With oil retention valve
- ❑ The oil retention valve cannot be renewed

9 - O-ring
- ❑ Renew
- ❑ Installing ⇒ Fig. ““Installing O ring on oil filter housing”“ , page 226

10 - Sealing cap
- ❑ 25 Nm



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11 - Seal

- ❑ Renew
- ❑ Removing and installing ⇒ Fig. ""Renewing seal on sealing cap"" , page 226

12 - Oil filter element

- ❑ Removing and installing ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818

13 - Threaded pin

- ❑ 16 Nm

14 - Gasket

- ❑ Renew

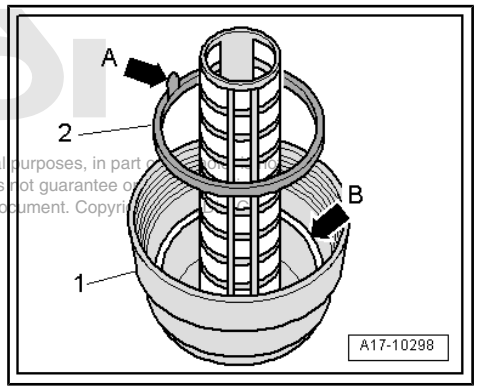
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Renewing seal on sealing cap

– Take hold of tab -arrow A- and pull seal -2- out of sealing cap -1-.

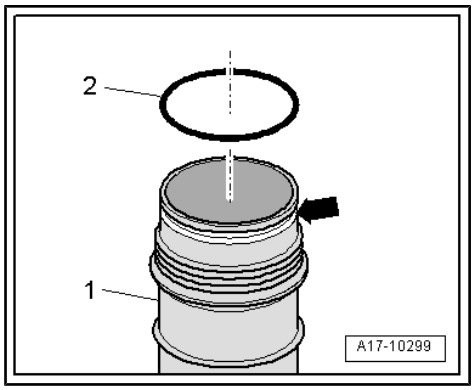
– Install new seal so that semi-circular profile fits in groove -arrow B- in sealing cap.

• The tab -arrow A- must face upwards.



Installing O ring on oil filter housing

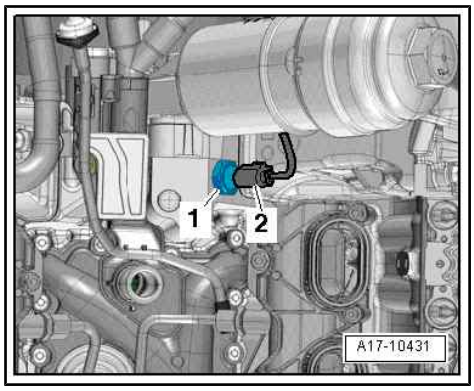
– Install O-ring -2- in groove -arrow- on oil filter housing -1-.



Oil pressure switch for reduced oil pressure - F378-

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

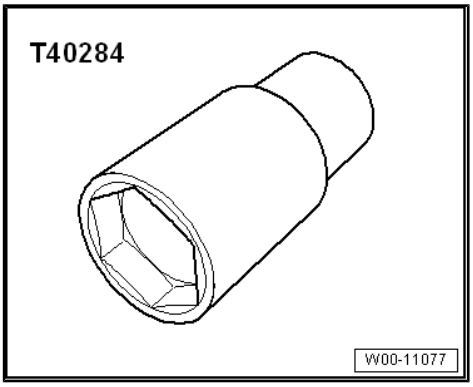
- ♦ Opening/closing pressure 0.75 ... 1.05 bar
- ♦ With grey insulation
- ♦ Checking in `Guided Fault Finding` ⇒ Vehicle diagnostic tester
- ♦ Removing and installing ⇒ page 228
- ♦ 20 Nm



4.2 Removing and installing oil pressure switch - F22-

Special tools and workshop equipment required

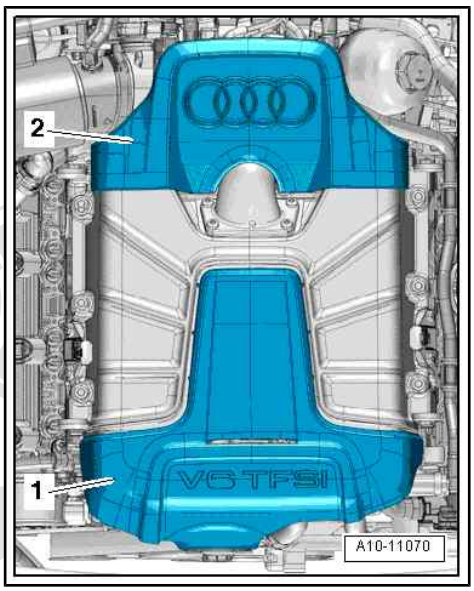
- Socket, AF 24 mm - T40284-



Removing

– Lift off engine cover panel (rear) -2-.

– Press electrical wiring (left-side) to one side at plenum chamber partition panel.



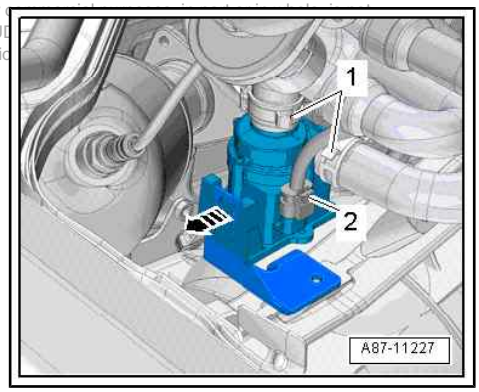
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Vehicles with coolant circulation pump - V50- (version 2):

– Release retainer -arrow-, detach coolant circulation pump - V50- from bracket and press to side.

Note

Disregard -items 1, 2-.



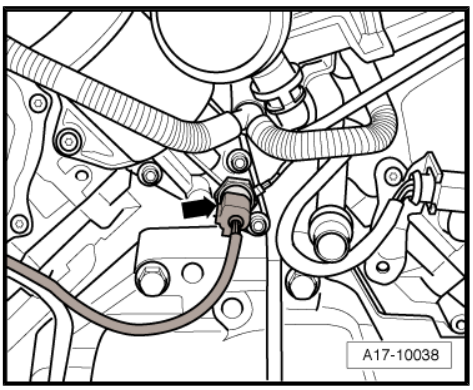
All vehicles (continued):

Note

Place a cloth beneath the oil filter housing to catch escaping oil.

– Unplug electrical connector -arrow- (if necessary, push retainer to the rear and press down release catch).

– Unscrew oil pressure switch - F22- .



Installing

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

- Tightening torque ⇒ “4.1 Exploded view - oil filter/oil pressure switch”, page 225

Note

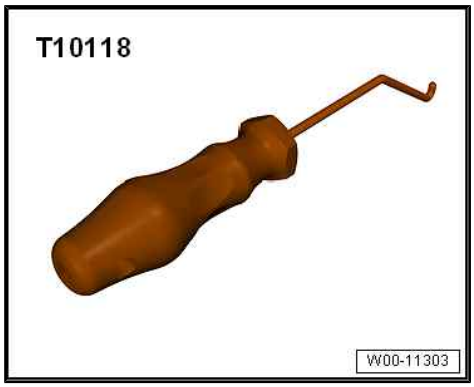
- *Renew seal.*
- *Fit the new oil pressure switch - F22- into the connection immediately to avoid loss of oil.*

– Check oil level ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .

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

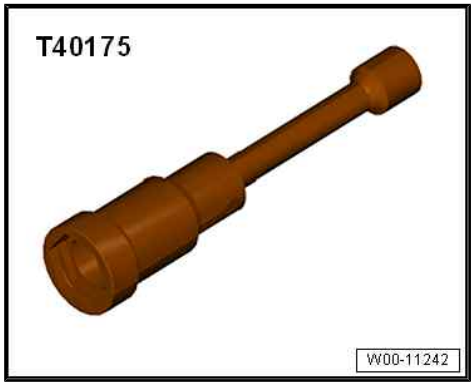
Special tools and workshop equipment required

- Assembly tool - T10118-



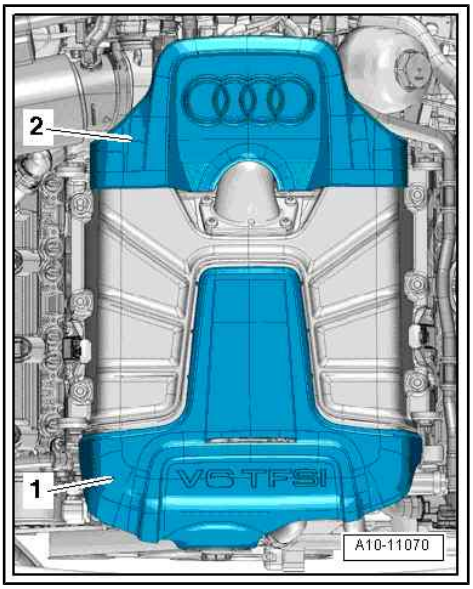
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- Articulated wrench, 24 mm - T40175-

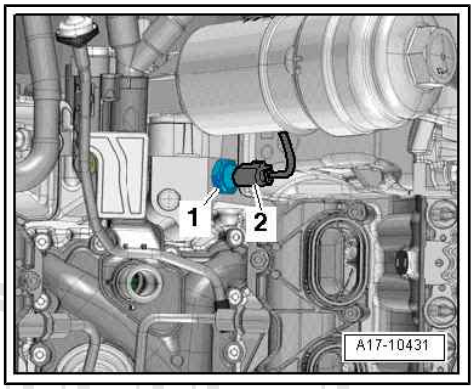


Removing

– Lift off engine cover panel (rear) -2-.



– Take out noise insulation.
– Use assembly tool - T10118- to unplug electrical connector -2-.
– Use articulated wrench (24 mm) - T40175- to unscrew oil pressure switch for reduced oil pressure - F378- -item 1-.



Note

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

Installing

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

Note

Renew seal.

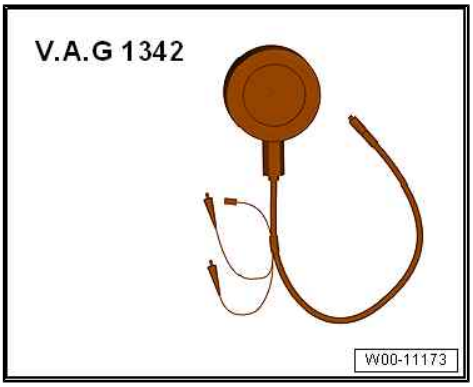
– Tighten oil pressure switch for reduced oil pressure - F378- ⇒ Fig. "" Oil pressure switch for reduced oil pressure -F378- "", page 226 .

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4.4 Checking oil pressure

Special tools and workshop equipment required

♦ Oil pressure tester - V.A.G 1342-



Procedure

- Oil level OK
- Engine oil temperature approx. 80 °C

– Remove oil pressure switch - F22- ⇒ page 226 .

– Connect oil pressure tester - V.A.G 1342- to bore for oil pressure switch.

– Screw oil pressure switch - F22- into oil pressure tester.

– Start engine.

- Minimum oil pressure at idling speed: 1.2 bar.
- Minimum oil pressure at 2000 rpm: 1.5 bar.

Assembling

– Install oil pressure switch - F22- ⇒ page 226 .

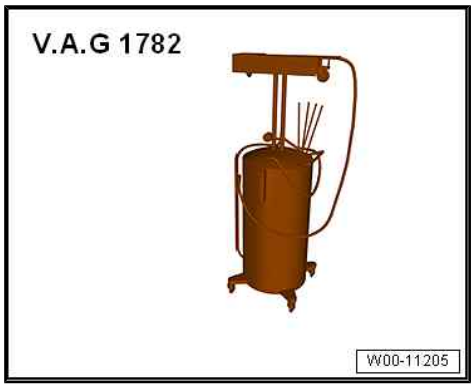
4.5 Checking oil pressure and oil pressure switch

Checking oil pressure switch - F22- / oil pressure switch for reduced oil pressure - F378- in `Guided Fault Finding` ⇒ Vehicle diagnostic tester.

4.6 Removing and installing oil filter housing

Special tools and workshop equipment required

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



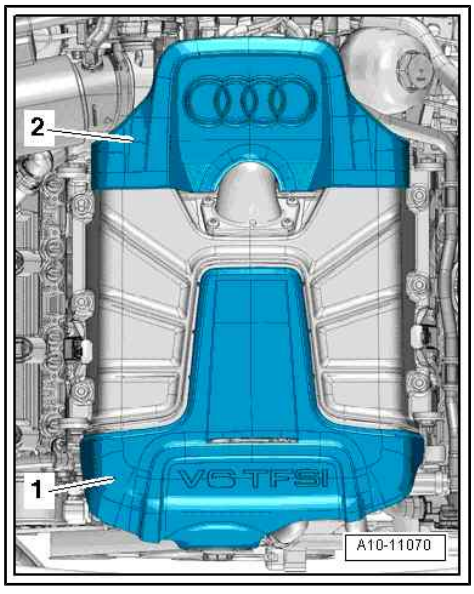
Removing

– Lift off engine cover panel (rear) -2-.

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

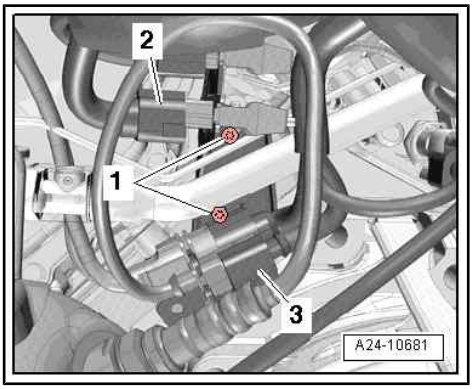
– Extract engine oil from oil filter housing using used oil collection and extraction unit - V.A.G 1782- .

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



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– Move electrical wiring clear.
– Remove bolts -1- and move bracket with electrical connectors to one side.



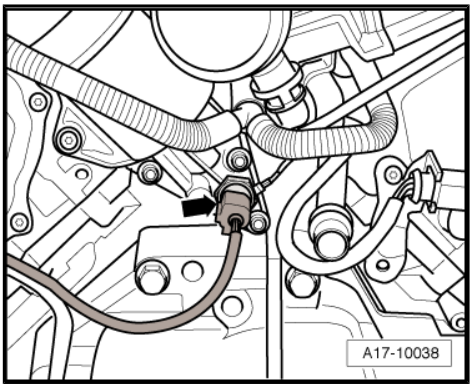
Note

Disregard -items 2, 3-.

Note

Place a cloth beneath the oil filter housing to catch escaping oil.

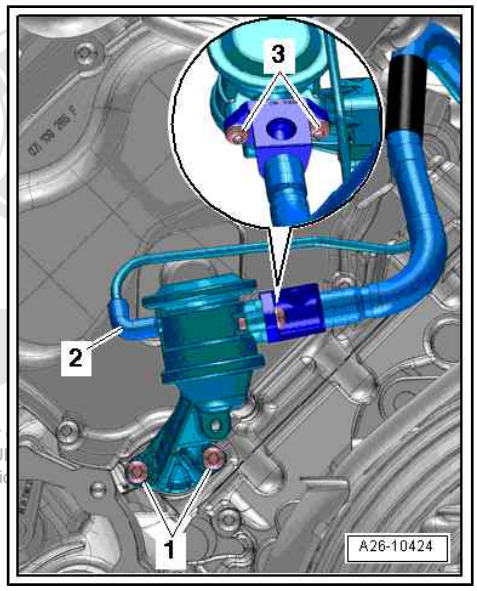
– Unplug electrical connector -arrow- on oil pressure switch - F22- .



– Remove bolts -3- and push secondary air hose to rear.

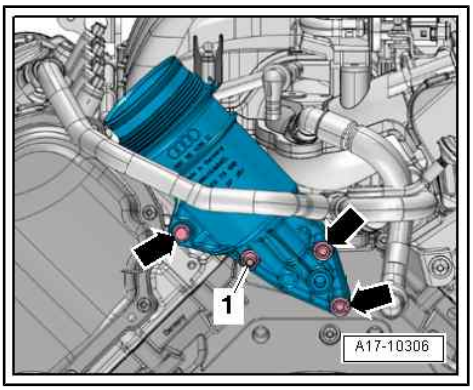
Note

Disregard -items 1, 2-.



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– Remove bolts -arrows-.
– Remove nut -1- and unscrew centre hex stud.
– Remove oil filter housing with centre hex stud.



Installing

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

- Tightening torques ⇒ “4.1 Exploded view - oil filter/oil pressure switch”, page 225

Note

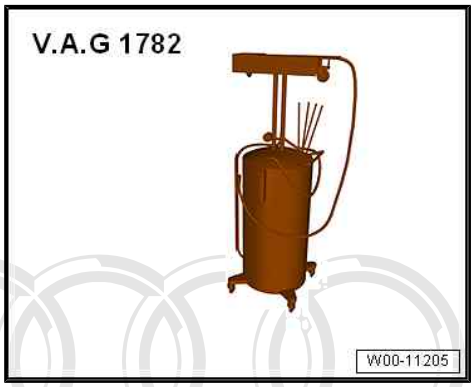
Renew seals, gasket and O-ring.

– Install secondary air hose ⇒ page 397 .
– Install plenum chamber partition panel ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Exploded view - plenum chamber partition panel .
– Install oil filter element ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .
– Fill up with engine oil and check oil level ⇒ Maintenance ; Booklet 811 , ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818 .

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

Special tools and workshop equipment required

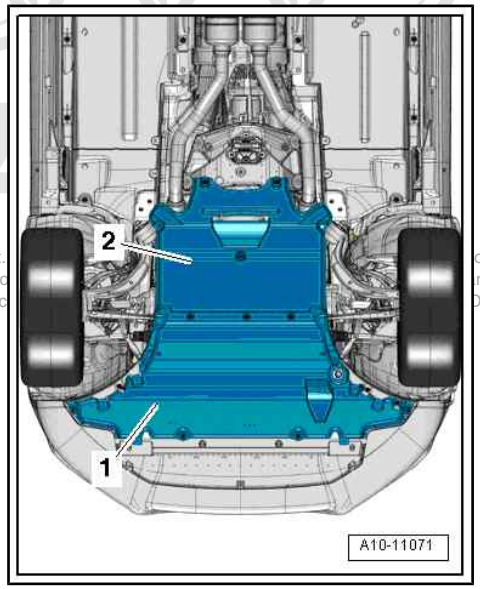
◆ Used oil collection and extraction unit - V.A.G 1782-



Removing

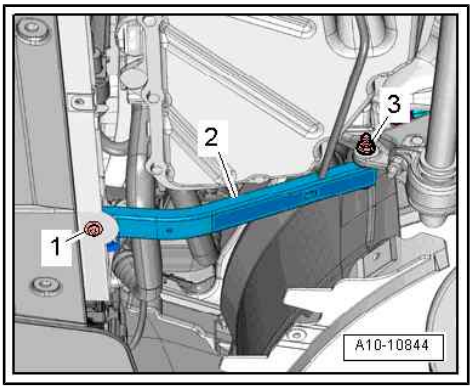
Vehicles not equipped with continued coolant circulation pump - V51- :

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



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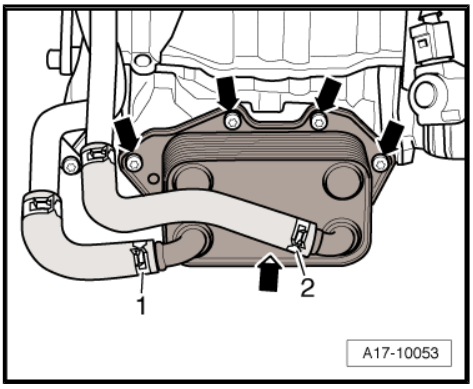
– Remove bolt -1- and nut -3- and detach lock carrier brace (left-side) -2-.



– Position used oil collection and extraction unit - V.A.G 1782- below engine.
– Remove bolts -arrows- and tie up engine oil cooler to one side with coolant hoses -1- and -2- attached.

Vehicles with continued coolant circulation pump - V51- :

– Remove -V51- ⇒ page 254 and engine oil cooler ⇒ page 219 .



All vehicles (continued):

– Unplug electrical connector -1-.
– Remove bolt -3- and detach valve for oil pressure control - N428- -item 4-.

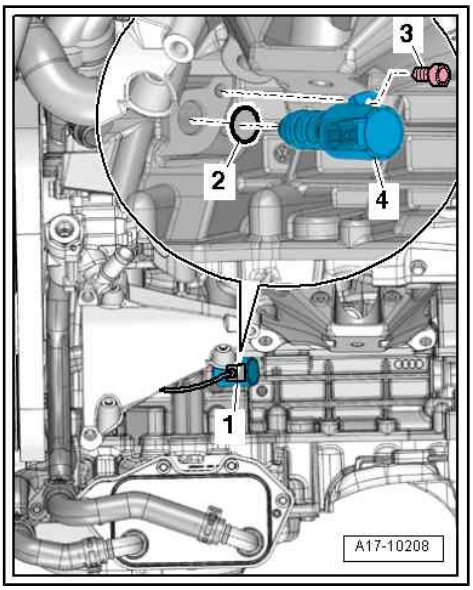
Installing

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

Note

Fit new O-ring -2-.

– Tighten bolt for valve for oil pressure control - N428- ⇒ page 121 .
– Install engine oil cooler ⇒ page 219 .



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19 – Cooling

1 Cooling system/coolant

⇒ “1.1 Connection diagram - coolant hoses”, page 234

⇒ “1.2 Draining and filling cooling system”, page 240

⇒ “1.3 Checking cooling system for leaks”, page 249

1.1 Connection diagram - coolant hoses

Note

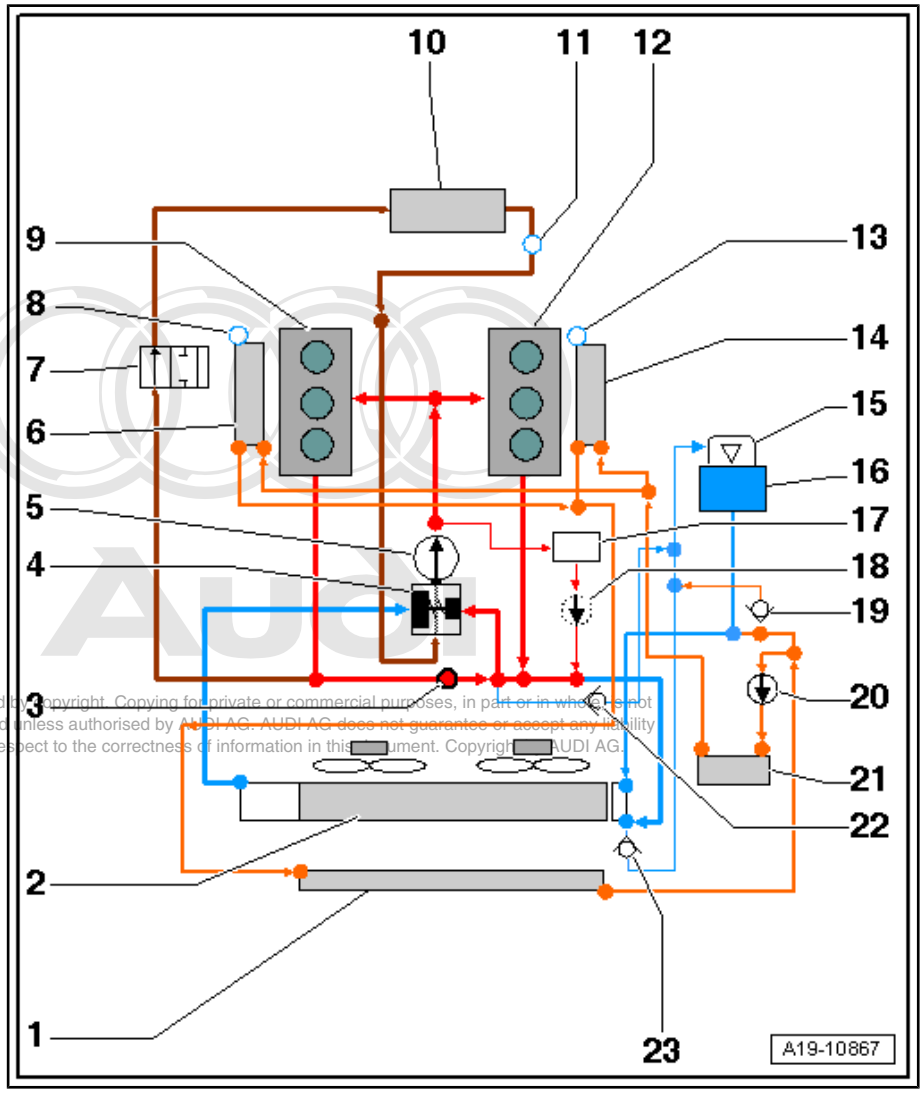
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- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *The arrow markings on coolant pipes and on ends of hoses must align.*

Note

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

A5 models up to model year 2011, A4 models up to model year 2012 without auxiliary heater



1 - Water radiator (front) for charge air cooling circuit

- ❑ If renewed, refill system with fresh coolant

2 - Radiator

- ❑ Vehicles with dual clutch gearbox: with integrated ATF cooler
- ❑ If renewed, refill system with fresh coolant

3 - Coolant temperature sender - G62-

4 - Thermostat

5 - Coolant pump

6 - Charge air cooler (right-side)

- ❑ In supercharger housing
- ❑ If renewed, refill system with fresh coolant

7 - Coolant shut-off valve

- ❑ Activated via Climatronic coolant shut-off valve - N422-
- ❑ Climatronic coolant shut-off valve - N422- is activated via Climatronic control unit - J255-
- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Coolant circuit

8 - Bleeder screw

9 - Cylinder head, bank 1 (right-side)

- ❑ If renewed, refill system with fresh coolant

10 - Heat exchanger for heater

- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Front air conditioning unit; Removing and installing heat exchanger
- ❑ If renewed, refill system with fresh coolant

11 - Bleeder hole

12 - Cylinder head, bank 2 (left-side)

- ❑ If renewed, refill system with fresh coolant

13 - Bleeder screw

14 - Charge air cooler (left-side)

- ❑ In supercharger housing
- ❑ If renewed, refill system with fresh coolant

15 - Filler cap for expansion tank

- ❑ Checking pressure relief valve ⇒ page 250

16 - Coolant expansion tank

17 - Engine oil cooler

18 - Continued coolant circulation pump - V51-

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- ❑ Country-specific version

19 - Non-return valve

- ❑ Located in coolant hose

20 - Charge air cooling pump - V188-

21 - Water radiator (left-side) for charge air cooling circuit

- ❑ If renewed, refill system with fresh coolant

22 - Non-return valve

- ❑ Located in coolant hose

23 - Non-return valve

- ❑ Located in coolant hose

A5 models up to model year 2011, A4 models up to model year 2012 with auxiliary heater

1 - Water radiator (front) for charge air cooling circuit

- ❑ If renewed, refill system with fresh coolant

2 - Radiator

- ❑ Vehicles with dual clutch gearbox: with integrated ATF cooler
- ❑ If renewed, refill system with fresh coolant

3 - Coolant temperature sender - G62-

4 - Auxiliary heater

- ❑ With circulation pump - V55-
- ❑ Removing and installing ⇒ Auxiliary heater, supplementary heater; Rep. gr. 82 ; Auxiliary/supplementary heater; Removing and installing auxiliary/supplementary heater

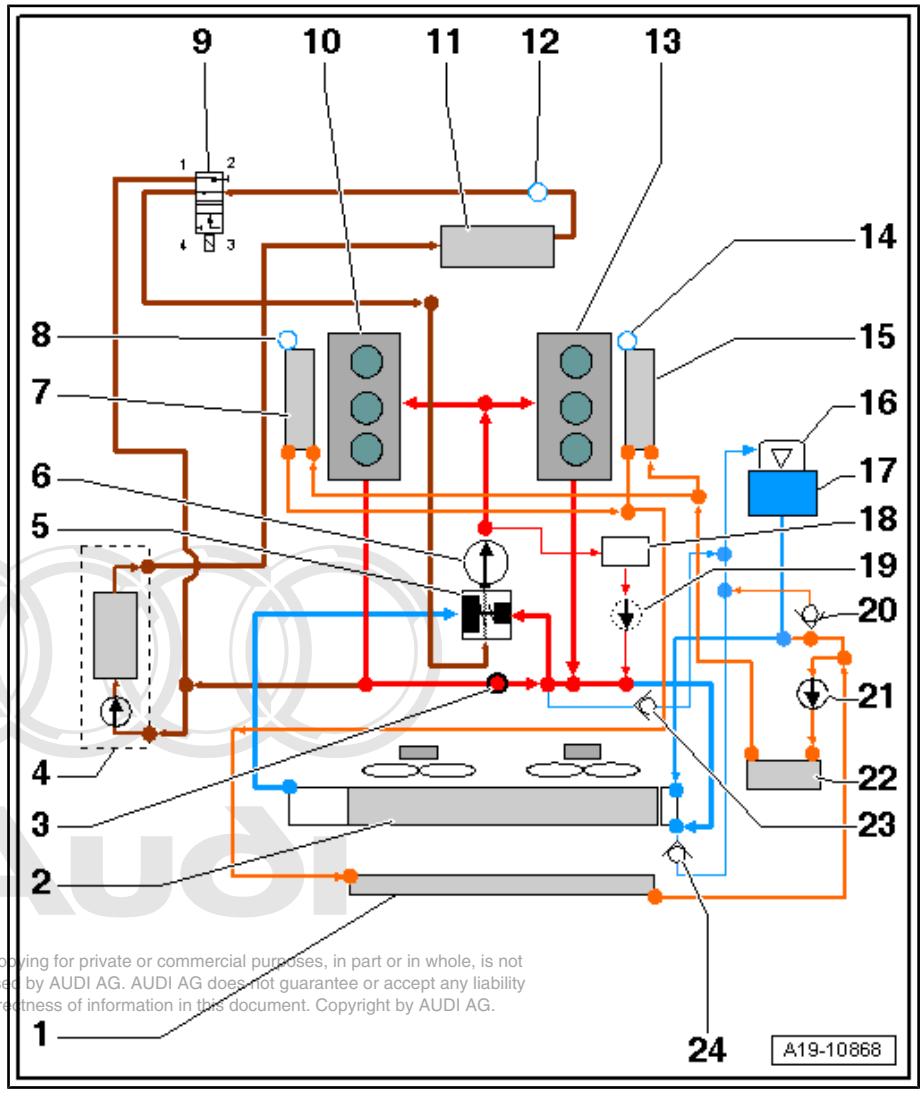
5 - Thermostat

6 - Coolant pump

7 - Charge air cooler (right-side)

- ❑ In supercharger housing
- ❑ If renewed, refill system with fresh coolant

8 - Bleeder screw



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9 - Climatronic coolant shut-off valve - N422-

- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Coolant circuit
- ❑ Activated via Climatronic control unit - J255-

10 - Cylinder head, bank 1 (right-side)

- ❑ If renewed, refill system with fresh coolant

11 - Heat exchanger for heater

- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Front air conditioning unit; Removing and installing heat exchanger
- ❑ If renewed, refill system with fresh coolant

12 - Bleeder hole

13 - Cylinder head, bank 2 (left-side)

- ❑ If renewed, refill system with fresh coolant

14 - Bleeder screw

15 - Charge air cooler (left-side)

- ❑ In supercharger housing
- ❑ If renewed, refill system with fresh coolant

16 - Filler cap for expansion tank

- ❑ Checking pressure relief valve ⇒ page 250

17 - Coolant expansion tank

18 - Engine oil cooler

19 - Continued coolant circulation pump - V51-

- ❑ Country-specific version

20 - Non-return valve

- ❑ Located in coolant hose

21 - Charge air cooling pump - V188-

22 - Water radiator (left-side) for charge air cooling circuit

- ❑ If renewed, refill system with fresh coolant

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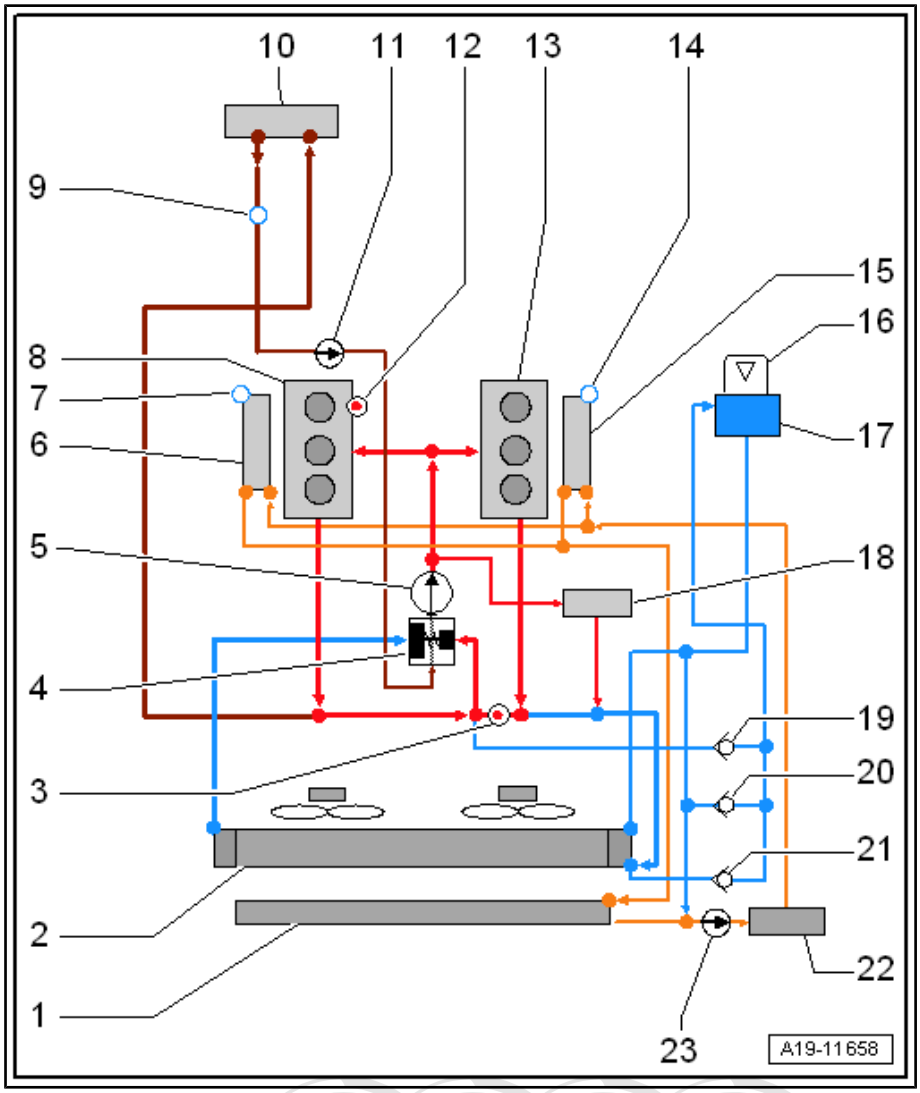
23 - Non-return valve

- ❑ Located in coolant hose

24 - Non-return valve

- ❑ Located in coolant hose

A5 models from model year 2012 onwards, A4 models from model year 2013 onwards without auxiliary heater



1 - Water radiator (front) for charge air cooling circuit

- ❑ If renewed, refill system with fresh coolant

2 - Radiator

- ❑ With ATF cooler
- ❑ If renewed, refill system with fresh coolant

3 - Coolant temperature sender - G62-

4 - Thermostat

5 - Coolant pump

6 - Charge air cooler (right-side)

- ❑ In supercharger housing
- ❑ If renewed, refill system with fresh coolant

7 - Bleeder screw

8 - Cylinder head

- ❑ Cylinder bank 1 (right-side)
- ❑ If renewed, refill system with fresh coolant

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
- ❑ If renewed, refill system with fresh coolant

11 - Coolant circulation pump - V50-

- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Coolant circuit

12 - Temperature sender for engine temperature regulation - G694-

13 - Cylinder head

- ❑ Cylinder bank 2 (left-side)
- ❑ If renewed, refill system with fresh coolant

14 - Bleeder screw

15 - Charge air cooler (left-side)

- ❑ In supercharger housing
- ❑ If renewed, refill system with fresh coolant

16 - Filler cap

- ❑ Checking pressure relief valve ⇒ page 250

17 - Coolant expansion tank

18 - Engine oil cooler

- ❑ If renewed, refill system with fresh coolant

19 - Non-return valve

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- ❑ Located in coolant hose

20 - Non-return valve

- ❑ Located in coolant hose

21 - Non-return valve

- ❑ Located in coolant hose

22 - Water radiator (left-side) for charge air cooling circuit

- ❑ Equipment version depending on vehicle version
- ❑ If renewed, refill system with fresh coolant

23 - Charge air cooling pump - V188-

A5 models from model year 2012 onwards, A4 models from model year 2013 onwards with auxiliary heater

1 - Water radiator (front) for charge air cooling circuit

- ❑ If renewed, refill system with fresh coolant

2 - Radiator

- ❑ With ATF cooler
- ❑ If renewed, refill system with fresh coolant

3 - Coolant temperature sender - G62-

4 - Thermostat

5 - Auxiliary heater

- ❑ With circulation pump - V55-
- ❑ Removing and installing ⇒ Auxiliary heater, supplementary heater; Rep. gr. 82 ; Auxiliary/supplementary heater; Removing and installing auxiliary/supplementary heater

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6 - Coolant pump

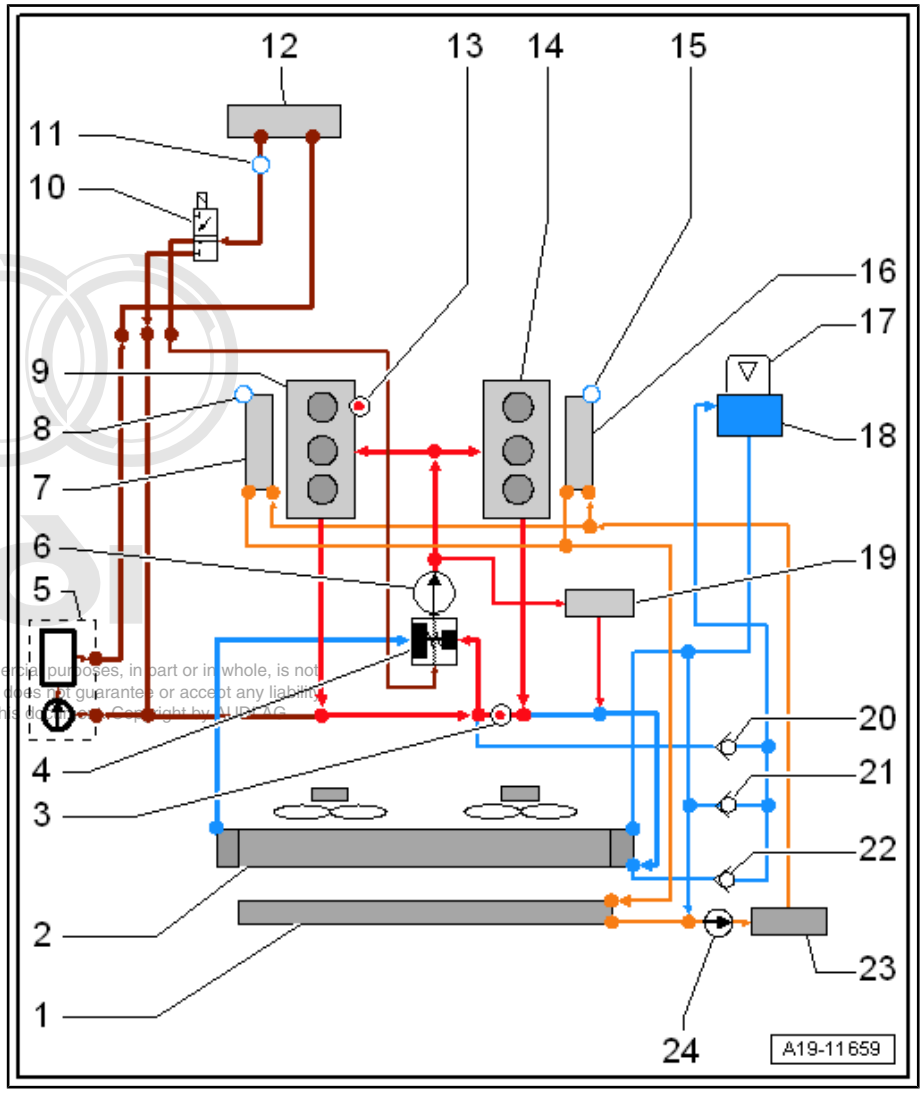
7 - Charge air cooler (right-side)

- ❑ In supercharger housing
- ❑ If renewed, refill system with fresh coolant

8 - Bleeder screw

9 - Cylinder head

- ❑ Cylinder bank 1 (right-side)
- ❑ If renewed, refill system with fresh coolant



10 - Heater coolant shut-off valve - N279-

- ❑ Removing and installing ⇒ Auxiliary heater, supplementary heater; Rep. gr. 82 ; Coolant circuit with auxiliary/supplementary heater; Removing and installing heater coolant shut-off valve

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
- ❑ If renewed, refill system with fresh coolant

13 - Temperature sender for engine temperature regulation - G694-

14 - Cylinder head

- ❑ Cylinder bank 2 (left-side)
- ❑ If renewed, refill system with fresh coolant

15 - Bleeder screw

16 - Charge air cooler (left-side)

- ❑ In supercharger housing
- ❑ If renewed, refill system with fresh coolant

17 - Filler cap

- ❑ Checking pressure relief valve ⇒ page 250

18 - Coolant expansion tank

19 - Engine oil cooler

- ❑ If renewed, refill system with fresh coolant

20 - Non-return valve

- ❑ Located in coolant hose

21 - Non-return valve

- ❑ Located in coolant hose

22 - Non-return valve

- ❑ Located in coolant hose

23 - Water radiator (left-side) for charge air cooling circuit

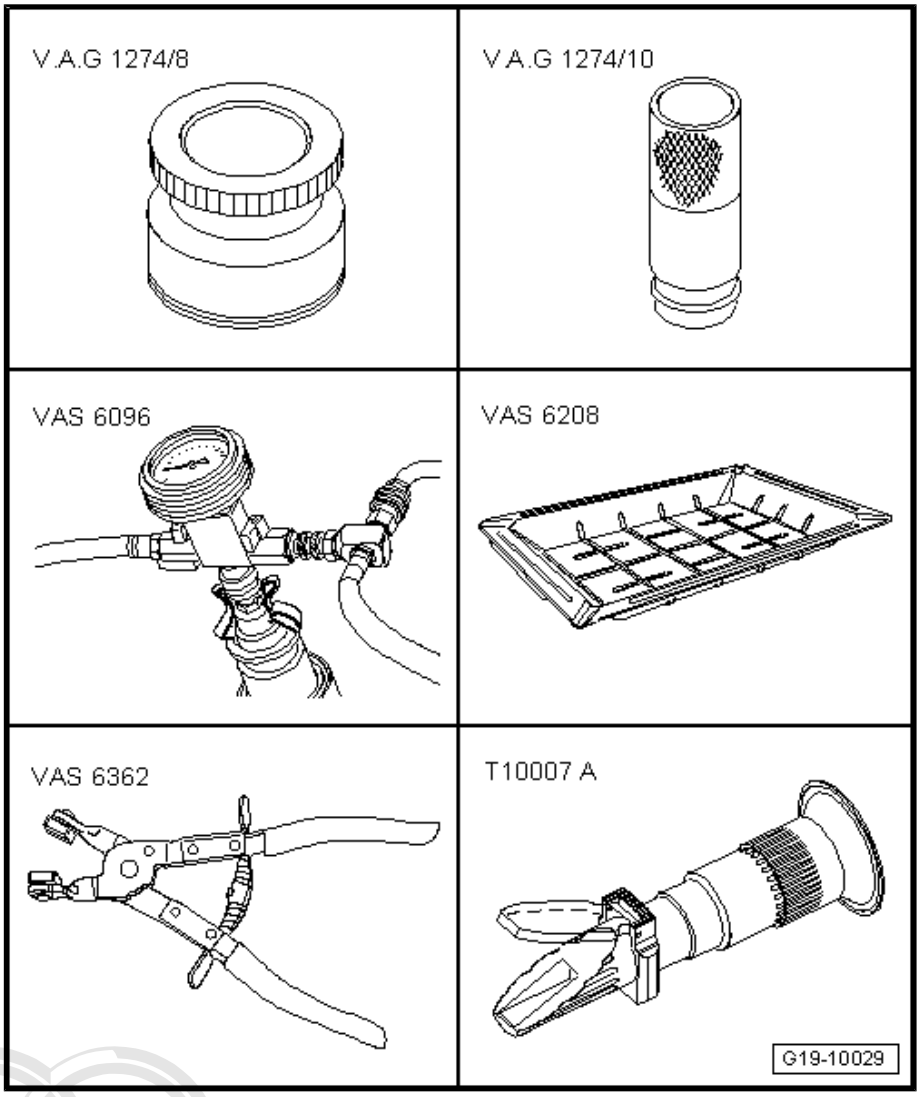
- ❑ Equipment version depending on vehicle version
- ❑ If renewed, refill system with fresh coolant

24 - Charge air cooling pump - V188-

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1.2 Draining and filling cooling system

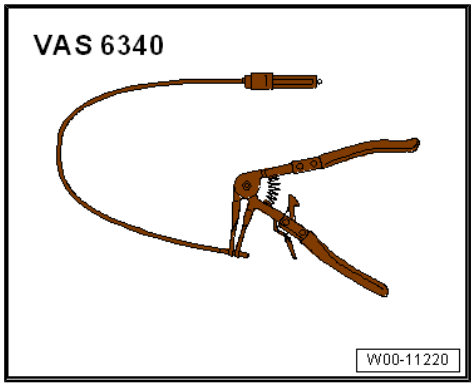
Special tools and workshop equipment required



- Adapter for cooling system tester - V.A.G 1274/8-
- Pipe for cooling system tester - V.A.G 1274/10-
- Cooling system charge unit - VAS 6096-
- Drip tray for workshop hoist - VAS 6208-
- Hose clip pliers - VAS 6362-
- Refractometer - T10007 A-
- ⇒ Vehicle diagnostic tester

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♦ Hose clip pliers - VAS 6340-



Draining

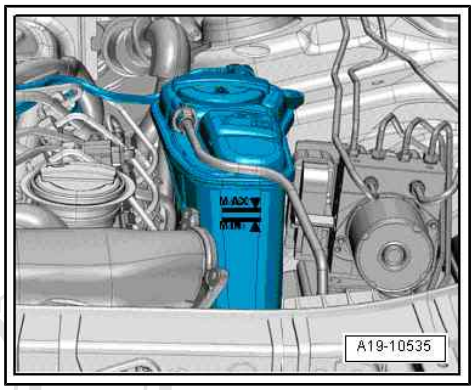
WARNING

The cooling system is under pressure when the engine is hot. Hot steam/hot coolant can escape - risk of scalding.

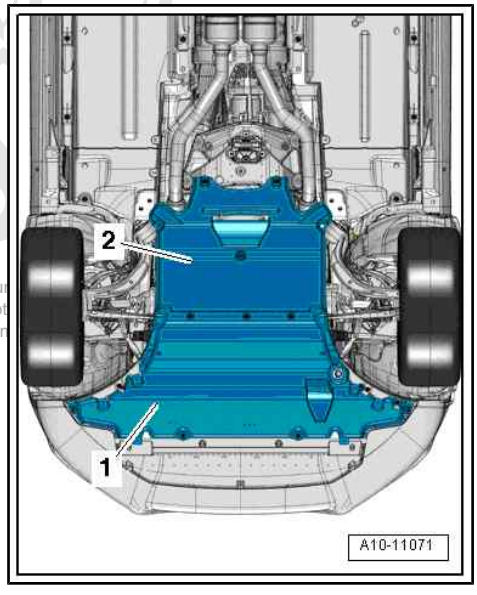
Danger of scalding skin and other parts of the body.

- ***Put on protective gloves.***
- ***Put on safety goggles.***
- ***Release pressure (cover filler cap on coolant expansion tank with a cloth and open carefully).***

– Open filler cap on coolant expansion tank.

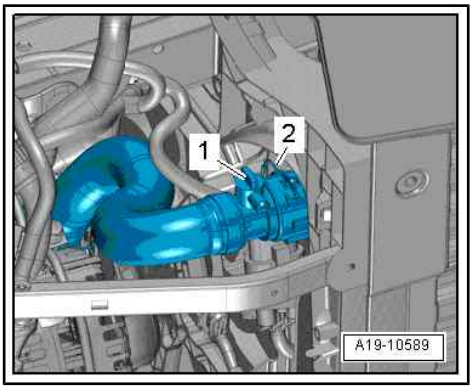


– Remove front noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .



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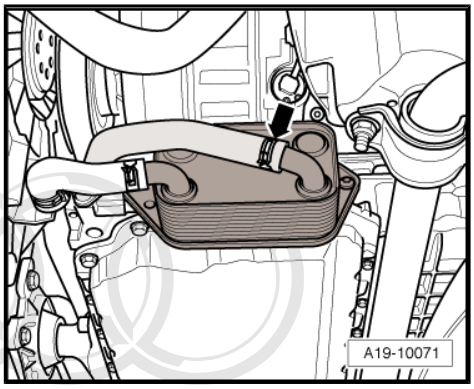
– Place drip tray for workshop hoist - VAS 6208- beneath engine.
– Remove drain plug -1- and drain off coolant.



Note

Disregard -item 2-.

– Release hose clip -arrow-, disconnect coolant hose from engine oil cooler and drain off coolant.

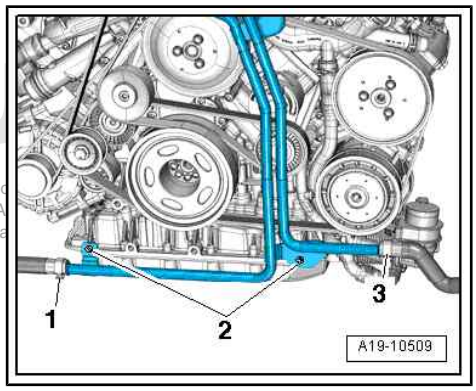


Note

For illustration purposes, the installation position is shown in the following illustrations with the engine removed.

Vehicles with coolant pipes (front left) (version 1):

– Release hose clips -1- and -3-, disconnect coolant hoses from coolant pipes (front left) and drain off remaining coolant.



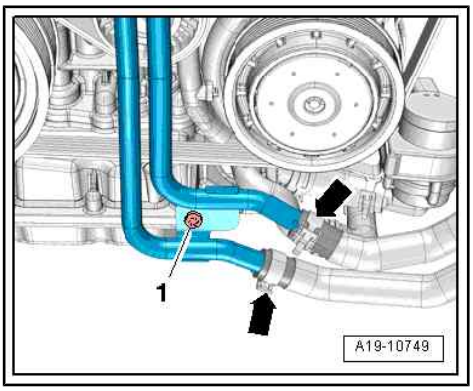
Note

Disregard -item 2-.

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Vehicles with coolant pipes (front left) (version 2):

– Release hose clips -arrows-, disconnect coolant hoses from coolant pipes (front left) and drain off remaining coolant.



Note

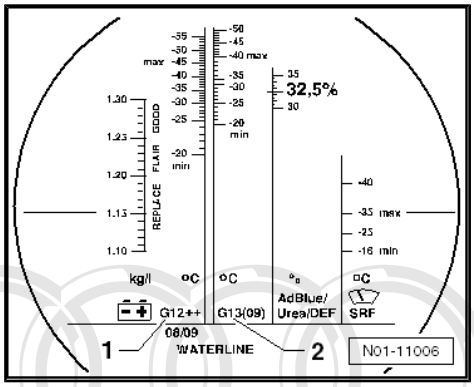
Disregard -item 1-.

Filling

- Ignition off.

Caution

Always use distilled water for mixing coolant additives as this ensures optimum corrosion protection.



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) . Other coolant additives could seriously impair in particular the anti-corrosion properties. 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.*

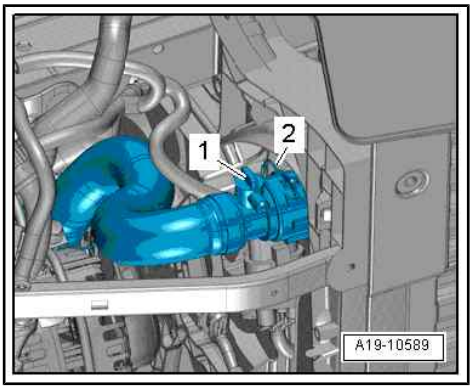
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Recommended mixture ratio for coolant

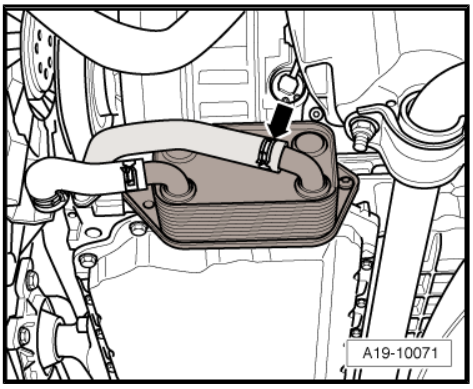
- Coolant additive (40 %) and water (60 %) for frost protection to – 25 °C
- Coolant additive (50 %) and water (50 %) for frost protection to – 36 °C
- Coolant additive ⇒ Electronic parts catalogue

Procedure

– Close drain plug -1-.



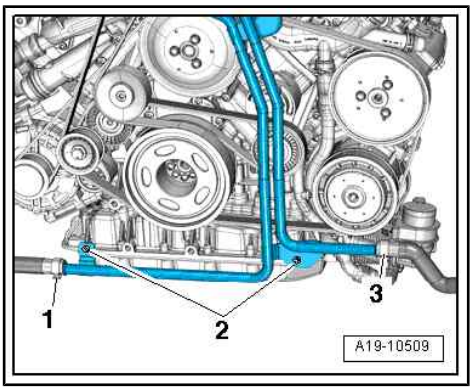
– Connect coolant hose to engine oil cooler -arrow-.



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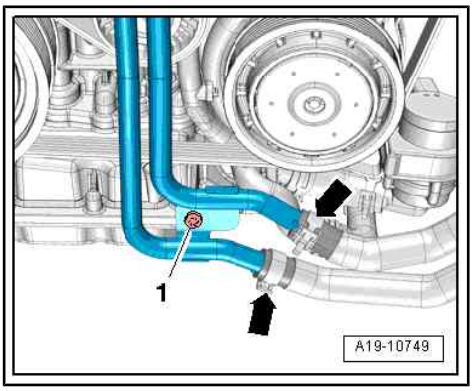
Vehicles with coolant pipes (front left) (version 1):

– Connect coolant hoses -1- and -3- to coolant pipes (front left).

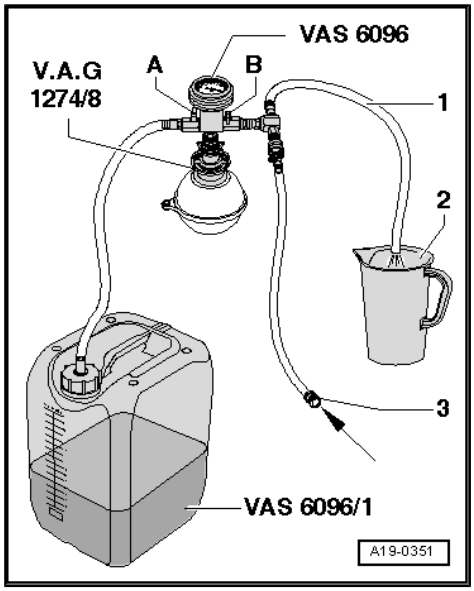


Vehicles with coolant pipes (front left) (version 2):

– Connect coolant hoses -arrows- to coolant pipes (front left).



All vehicles (continued):



– Fill reservoir of cooling system charge unit - VAS 6096- with 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.

• Pressure: 7 ... 10 bar.

– Connect ⇒ Vehicle diagnostic tester to vehicle.

– Select following menu options on ⇒ Vehicle diagnostic tester:

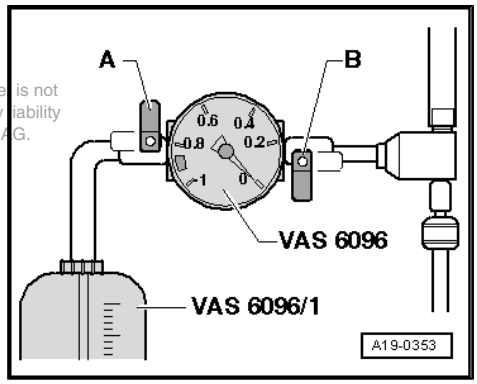
♦ `Guided Functions` mode

♦ `01 - Simos fuel injection and ignition system`

♦ `Functions - engine`

♦ `01 - Coolant circuit vent routine`

– Follow instructions shown on vehicle diagnostic tester .



– Open valve -B- by setting lever in direction of flow.

• The suction jet pump generates a vacuum in the cooling system. The needle on the gauge should move into the green zone.

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– 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 will continue generating a 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.

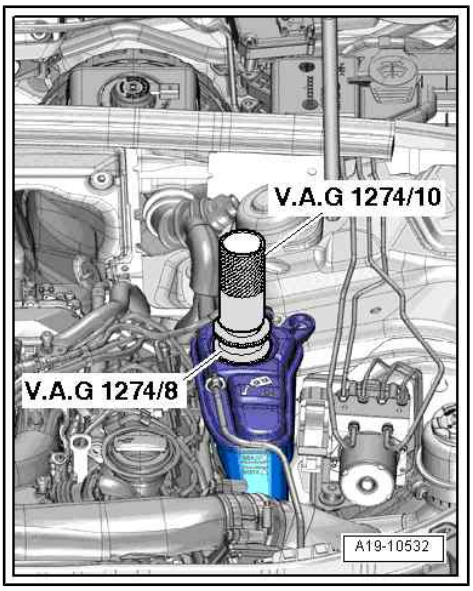
– Open valve -A-.

• The vacuum in the cooling system causes the coolant to be drawn out of the reservoir of the cooling system charge unit - VAS 6096- ; the cooling system is then filled.

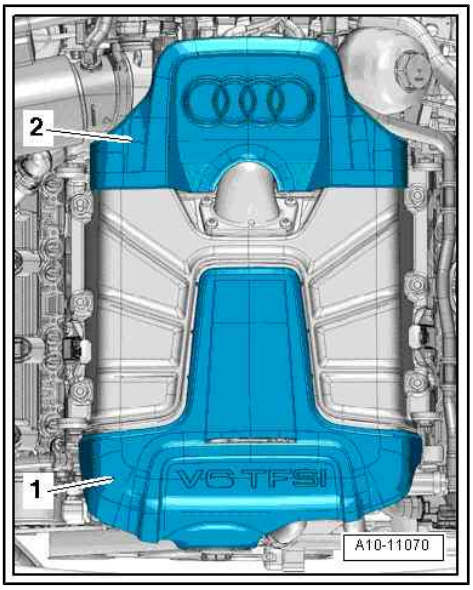
– Detach cooling system charge unit - VAS 6096- from adapter -V.A.G 1274/8- on coolant expansion tank.

– Attach pipe -V.A.G 1274/10- onto adapter -V.A.G 1274/8- .

– Fill up with coolant until pipe for cooling system tester is filled. If required, add further coolant when performing bleeding procedure.



– Lift off engine cover panel (rear) -2-.



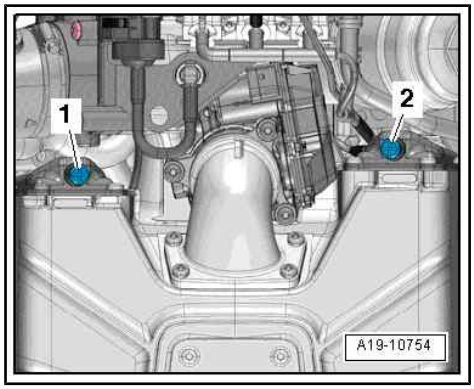
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Note

Place a cloth underneath to catch escaping coolant.

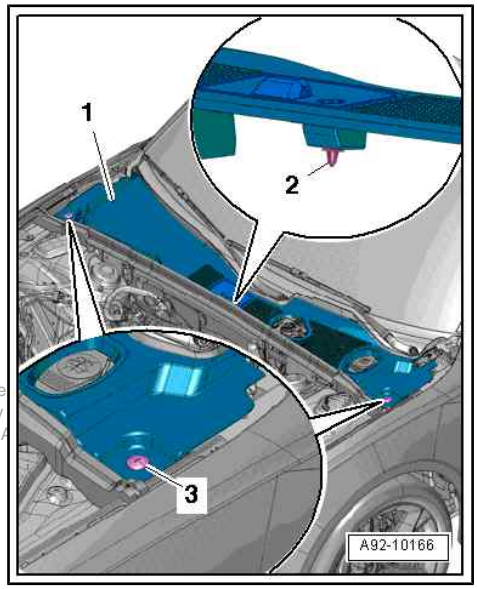
– Open bleeder screws -1- and -2- one after the other until coolant flows out.

– Close bleeder screws.



– Pull seal off plenum chamber partition panel.

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



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– Release coolant hose going to heat exchanger and pull back hose until coolant flows out at bleeder hole -arrow- in coolant hose.

– Push coolant hose back onto connection and secure with spring-type hose clip.

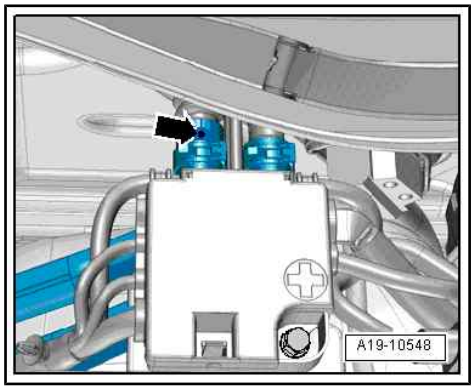
– On vehicles with auxiliary heater, switch heater on (for about 30 seconds) and then off again.

– Tighten filler cap on expansion tank, making sure it engages.

– Start engine.

– Set temperature to “HI” for all zones and select lowest blower speed (= 0).

– Switch off air conditioner compressor (press AC button).



• LED in button should not light up.

– Run engine for 3 minutes at 2000 rpm.

– Allow engine to run at idling speed until both large coolant hoses at radiator become warm.

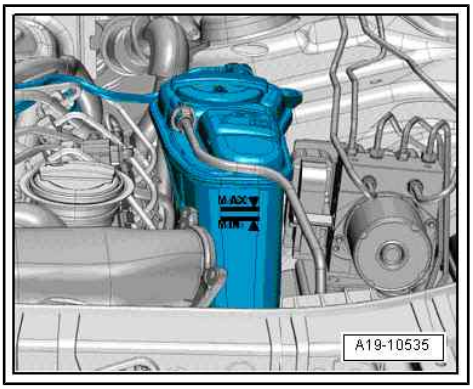
– Run engine for 2 minutes at 2000 rpm.

– Switch off ignition and allow engine to cool down.

– Install noise insulation ⇒ 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.



1.3 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.

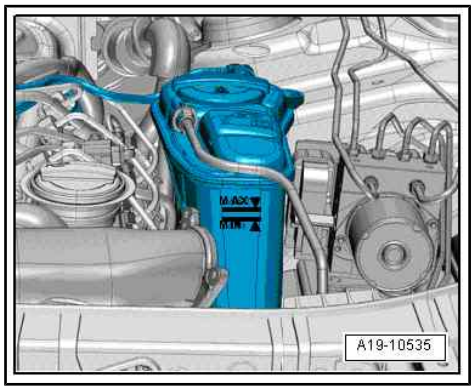
WARNING

The cooling system is under pressure when the engine is hot. Hot steam/hot coolant can escape - risk of scalding.

Danger of scalding skin and other parts of the body.

- *Put on protective gloves.*
- *Put on safety goggles.*
- *Release pressure (cover filler cap on coolant expansion tank with a cloth and open carefully).*

– Open filler cap on coolant expansion tank.

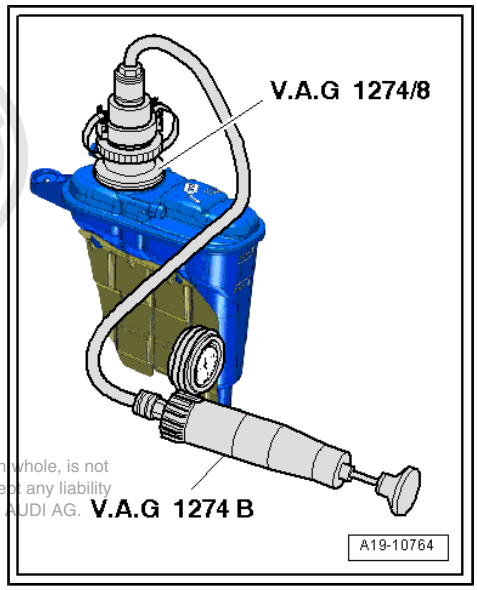


– Fit cooling system tester - V.A.G 1274 B- with adapter - V.A.G 1274/8- onto coolant expansion tank.

– Using hand pump on cooling system tester, build up a pressure of approx. 1.5 bar.

• The pressure should not drop more than 0.2 bar within 10 minutes.

– If the pressure drops more than 0.2 bar, locate leak and eliminate fault.



Note

The drop in pressure of 0.2 bar within 10 minutes is caused by the decrease in coolant temperature. The colder then engine is, the less the pressure will fall. If necessary, check again when the engine is cold.

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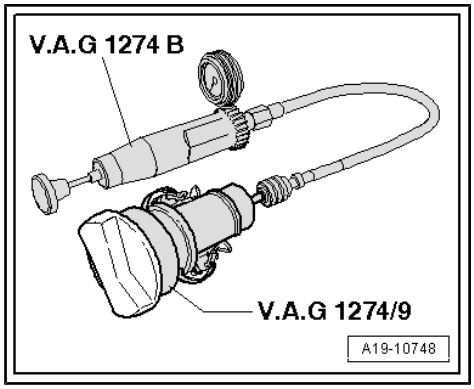
Checking pressure relief valve in filler cap

– Fit cooling system tester - V.A.G 1274 B- with adapter - V.A.G 1274/9- onto filler cap.

– Build up pressure with hand pump on cooling system tester.

• The pressure relief valve should open at a pressure of 1.4 ... 1.6 bar.

– Renew filler cap if pressure relief valve does not open as described.



2 Coolant pump/thermostat assembly

⇒ “2.1 Exploded view - coolant pump/thermostat”, page 251

⇒ “2.2 Exploded view - electric coolant pump”, page 252

⇒ “2.3 Removing and installing electric coolant pump”, page 253

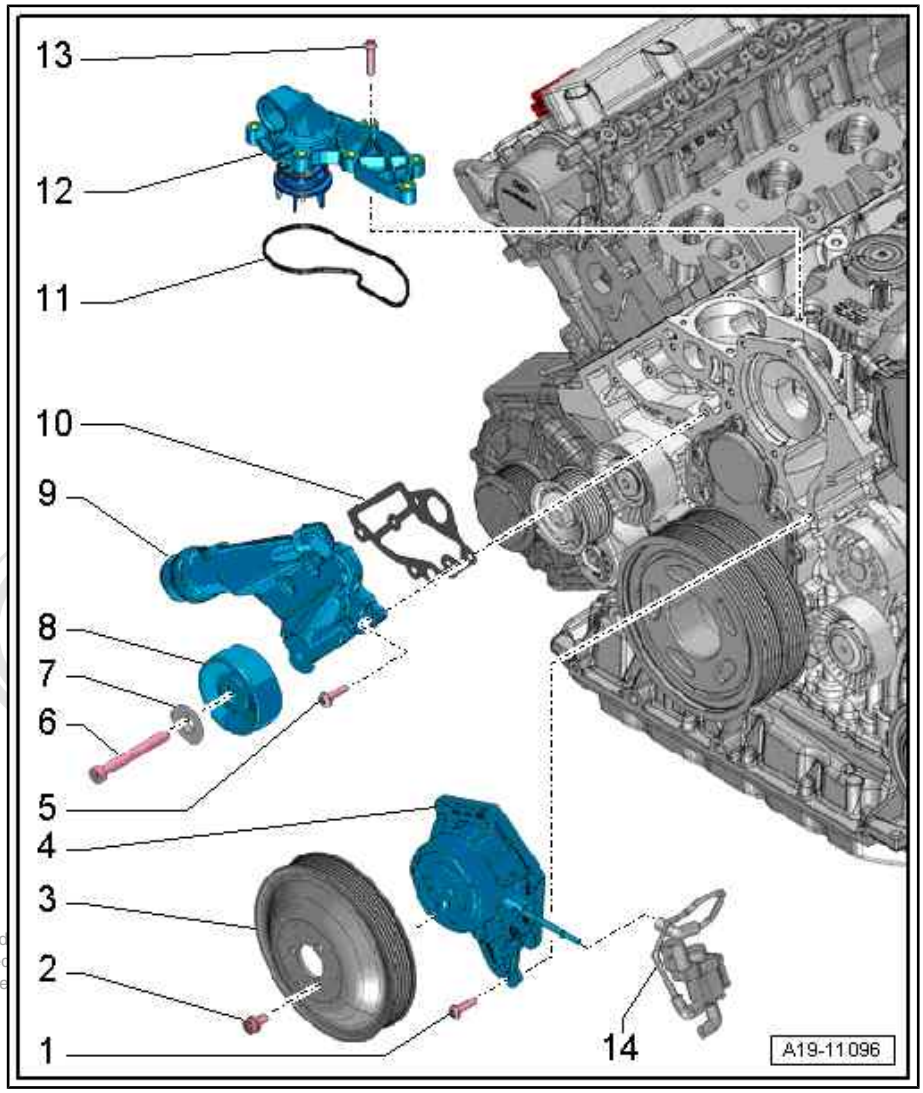
⇒ “2.4 Removing and installing coolant pump”, page 255

⇒ “2.5 Removing and installing thermostat”, page 258

⇒ “2.6 Removing and installing coolant temperature sender G62 ”, page 258

⇒ “2.7 Removing and installing temperature sender for engine temperature regulation G694 ”, page 259

2.1 Exploded view - coolant pump/thermostat



1 - Bolt
- ❑ 9 Nm

2 - Bolt
- ❑ 20 Nm

3 - Poly V-belt pulley for coolant pump

4 - Coolant pump
- ❑ With seal
- ❑ Different versions
- ❑ For A5 models from model year 2012 onwards, A4 models from model year 2013 onwards with vacuum control in conjunction with coolant valve for cylinder head - N489- -item 14-
- ❑ Removing and installing ⇒ “2.4 Removing and installing coolant pump”, page 255

5 - Bolt
- ❑ 9 Nm

6 - Bolt
- ❑ Tightening torque ⇒ Item 2 (page 90)

7 - Washer

8 - Idler roller for poly V-belt

9 - Connection
- ❑ For coolant hose

10 - Gasket
- ❑ Renew

11 - Gasket

12 - Thermostat

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- Removing and installing ⇒ “2.5 Removing and installing thermostat”, page 258

Note

When removing and installing the thermostat, make sure that the needle is fitted correctly (conical end fitted in wax expansion element of thermostat). If necessary, push thermostat needle as far as possible into wax expansion element.

13 - Bolt

- 9 Nm

14 - Coolant valve for cylinder head - N489-

- For A5 models from model year 2012 onwards, A4 models from model year 2013 onwards

2.2 Exploded view - electric coolant pump

⇒ “2.2.1 Exploded view - continued coolant circulation pump V51 ”, page 252

2.2.1 Exploded view - continued coolant circulation pump - V51-

1 - Coolant hose

2 - Bracket

3 - Bolts

- 9 Nm

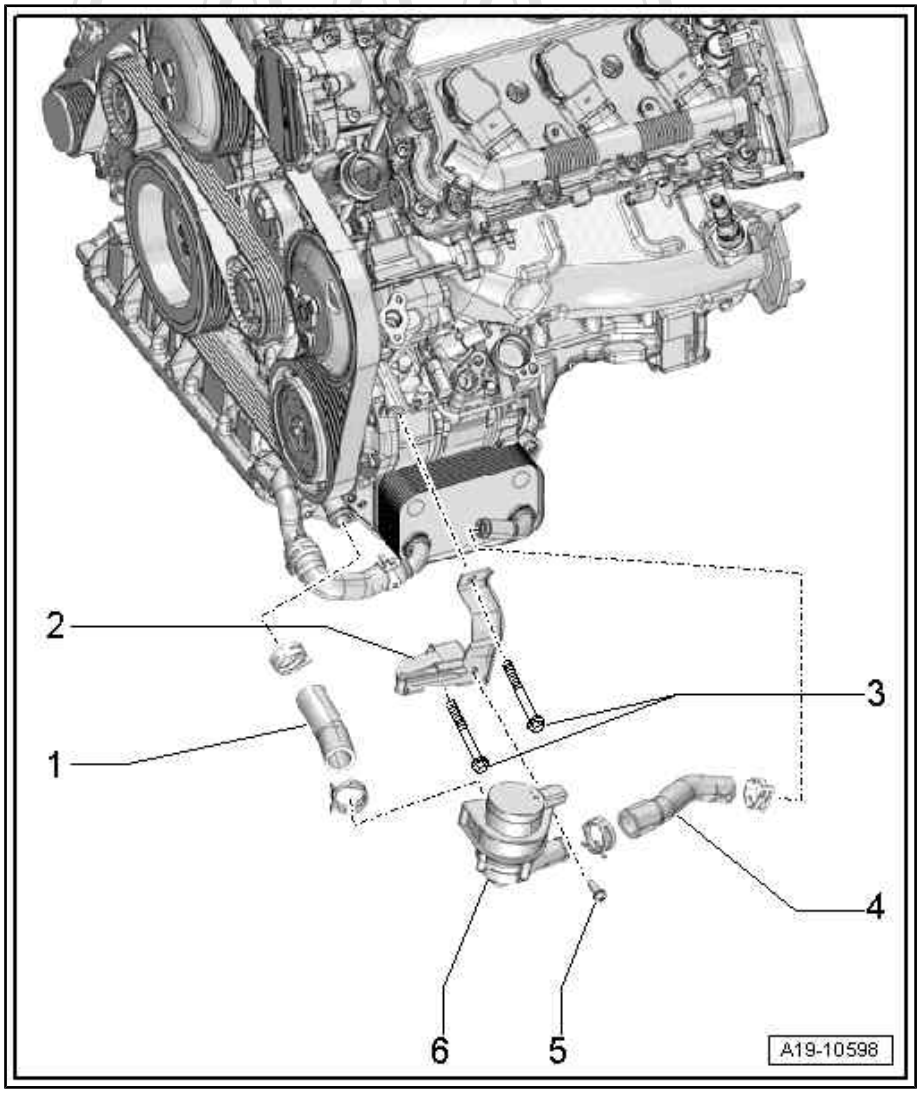
4 - Coolant hose

5 - Bolt

- 4 Nm

6 - Continued coolant circulation pump - V51-

- Removing and installing ⇒ page 254



2.3 Removing and installing electric coolant pump

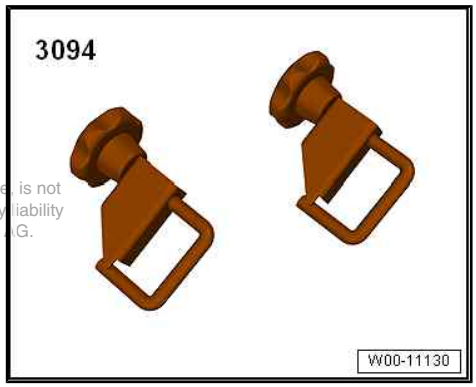
⇒ "2.3.1 Removing and installing charge air cooling pump V188 ", page 253

⇒ "2.3.2 Removing and installing continued coolant circulation pump V51 ", page 254

2.3.1 Removing and installing charge air cooling pump - V188-

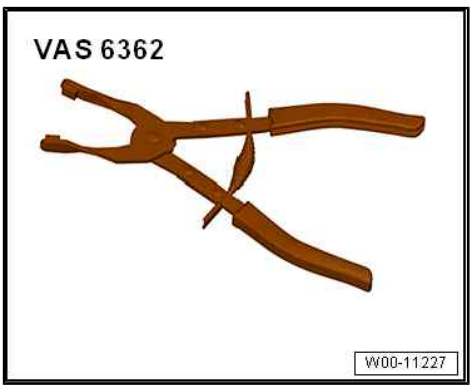
Special tools and workshop equipment required

- Hose clamps, up to 25 mm - 3094-



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- Hose clip pliers - VAS 6362-



Removing

– Remove front left wheel.

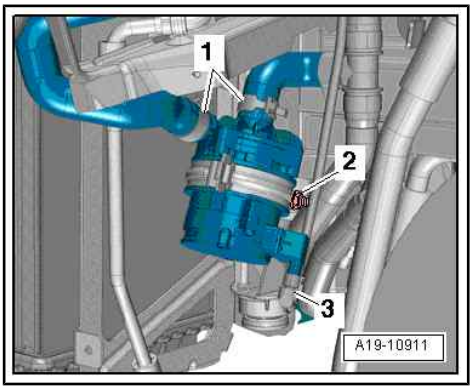
– Remove wheel housing liner (front left) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front) .

– Unplug electrical connector -3-.

– Remove nut -2- and detach bracket.

– Use hose clamps up to 25 mm - 3094- to clamp off coolant hoses at charge air cooling pump - V188- .

– Detach charge air cooling pump, then release hose clips -1- and disconnect coolant hoses.



Installing

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

Note

Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .

– Tighten nut on bracket for charge air cooling pump ⇒ page 264 .
– Install front wheel housing liner ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front) .
– Fit front wheel ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres; Tightening torque for wheel bolts .
– Fill up with coolant ⇒ page 243 .

2.3.2 Removing and installing continued coolant circulation pump - V51-

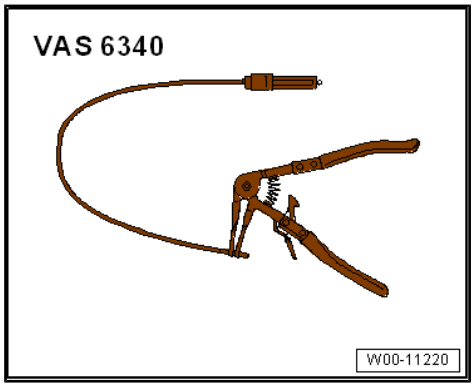
Special tools and workshop equipment required

♦ Drip tray for workshop hoist - VAS 6208-



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♦ Hose clip pliers - VAS 6340-



Removing

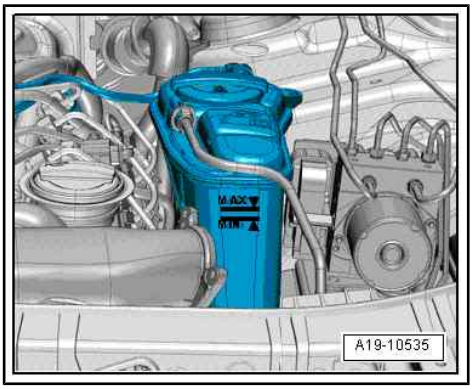
WARNING

The cooling system is under pressure when the engine is hot. Hot steam/hot coolant can escape - risk of scalding.

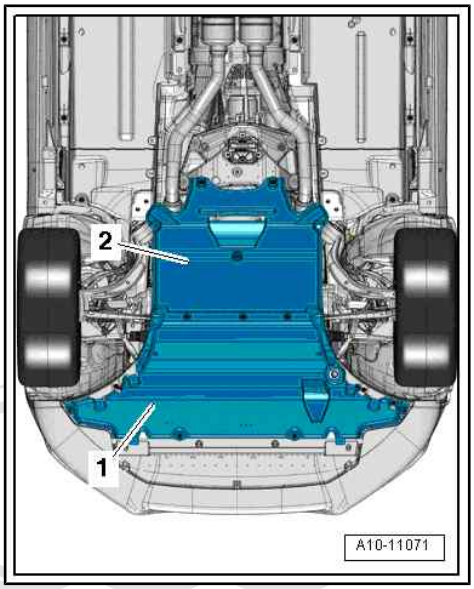
Danger of scalding skin and other parts of the body.

- ***Put on protective gloves.***
- ***Put on safety goggles.***
- ***Release pressure (cover filler cap on coolant expansion tank with a cloth and open carefully).***

– Open filler cap on coolant expansion tank.



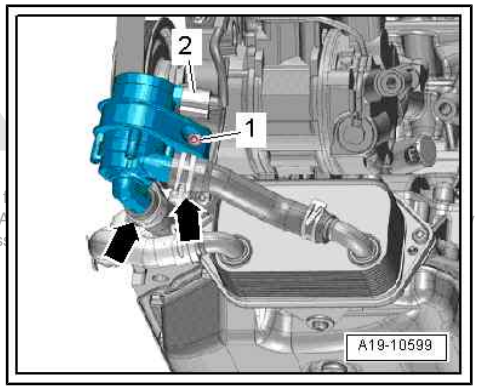
– Remove front noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .



– Unplug electrical connector -2- and remove bolt -1-.

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

– Release hose clips -arrows- and disconnect continued coolant circulation pump - V51- from coolant hoses.



Installing

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

- Tightening torque ⇒ “2.2.1 Exploded view - continued coolant circulation pump V51 ”, page 252

Note

Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .

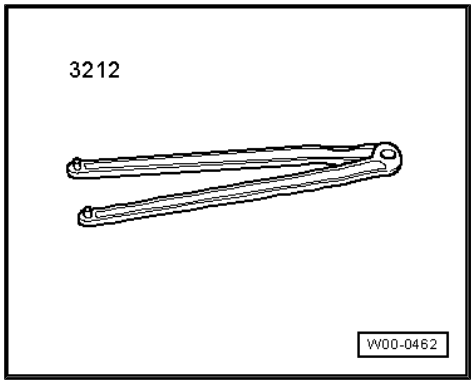
– Fill up with coolant ⇒ page 243 .

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

2.4 Removing and installing coolant pump

Special tools and workshop equipment required

- Pin wrench - 3212-

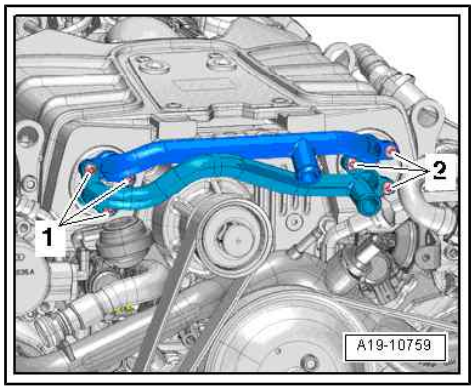


Removing

– Drain coolant ⇒ page 240 .

– Remove coolant pipes (front left) ⇒ page 267 .

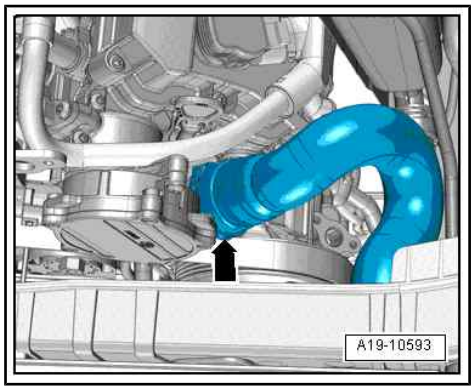
– Remove bolts -1- and -2- and take off coolant pipes.



– Detach poly V-belt from air conditioner compressor, but do not remove completely:

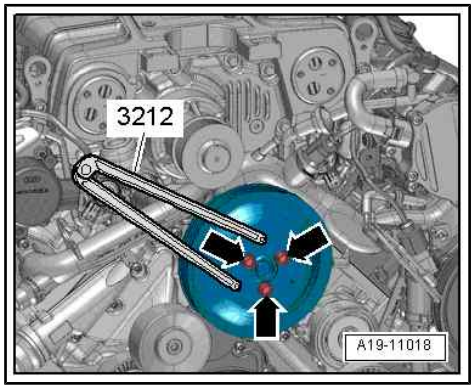
- ⇒ “1.2.2 Removing and installing poly V-belt - vehicles with hydraulic power steering”, page 96 .
- ⇒ “1.2.3 Removing and installing poly V-belt - vehicles with electromechanical power steering”, page 98 .

– Lift retaining clip -arrow- and detach coolant hose from coolant pipe (front).



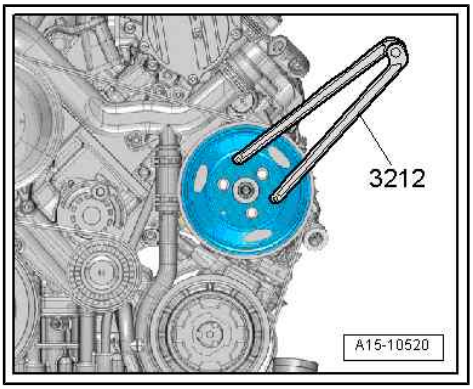
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– Remove bolts for coolant pump pulley (counterhold with pin wrench - 3212-).



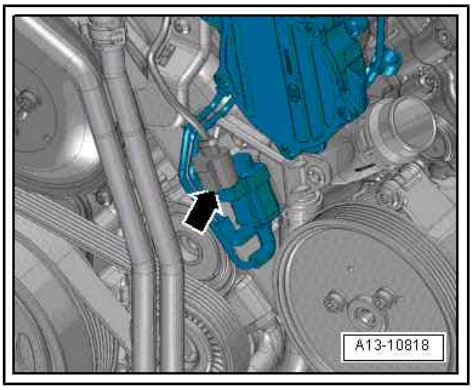
Vehicles with hydraulic power steering:

– Remove bolts for power steering pump pulley (counterhold with pin wrench - 3212-).



Vehicles with electromechanical power steering:

– Detach coolant valve for cylinder head - N489- -arrow- from bracket and move it clear to the side.



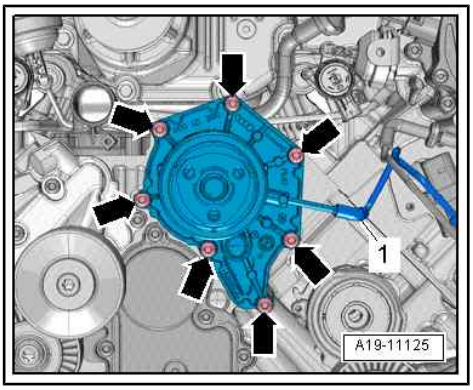
– Disconnect vacuum hose -1-.

All vehicles (continued):

Note

Place a cloth underneath to catch escaping coolant.

– Remove bolts -arrows- for coolant pump and detach coolant pump to the side.



Installing

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

- Tightening torques ⇒ “2.1 Exploded view - coolant pump/thermostat”, page 251

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

– Install poly V-belt pulley for power steering pump ⇒ Running gear, axles, steering; Rep. gr. 48 ; Hydraulic power steering; Exploded view - power steering pump

– Connect coolant hose with plug-in connector ⇒ page 281 .

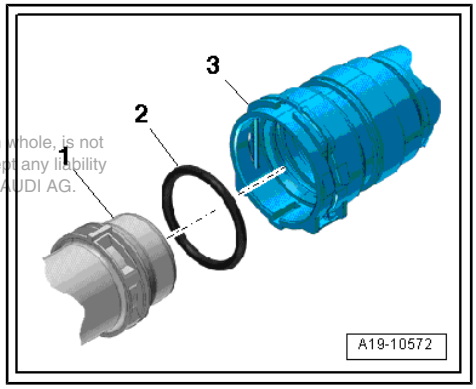
– Install poly V-belt:

◆ ⇒ “1.2.2 Removing and installing poly V-belt - vehicles with hydraulic power steering”, page 96 .

◆ ⇒ “1.2.3 Removing and installing poly V-belt - vehicles with electromechanical power steering”, page 98 .

– Install coolant pipes ⇒ page 261 .

– Fill up with coolant ⇒ page 243 .



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2.5 Removing and installing thermostat

Removing

– Drain coolant ⇒ page 240 .

– Remove supercharger ⇒ page 310 .

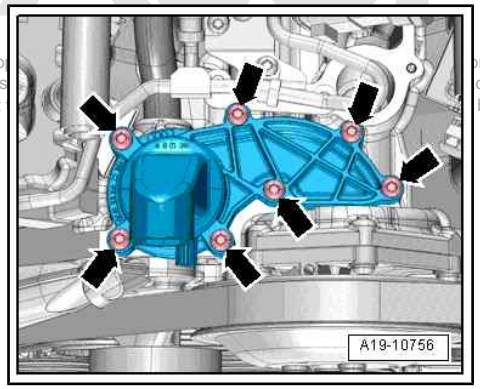
– Remove coolant pipe (front) ⇒ page 269 .

Note

Place a cloth underneath to catch any escaping coolant.

– Remove bolts -arrows-.

– Detach coolant thermostat with hose connection.



Installing

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

Note

When removing and installing the thermostat, make sure that the needle is fitted correctly (conical end fitted in wax expansion element of thermostat). If necessary, push thermostat needle as far as possible into wax expansion element.

• Tightening torques ⇒ “2.1 Exploded view - coolant pump/thermostat”, page 251

Note

Renew gasket.

– Install coolant pipe (front) ⇒ page 269 .

– Install supercharger ⇒ page 310 .

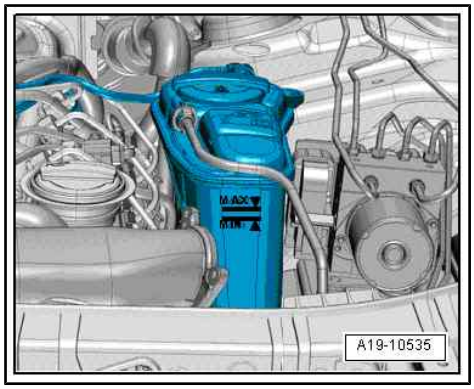
– Fill up with coolant ⇒ page 243 .

2.6 Removing and installing coolant temperature sender - G62-

Removing

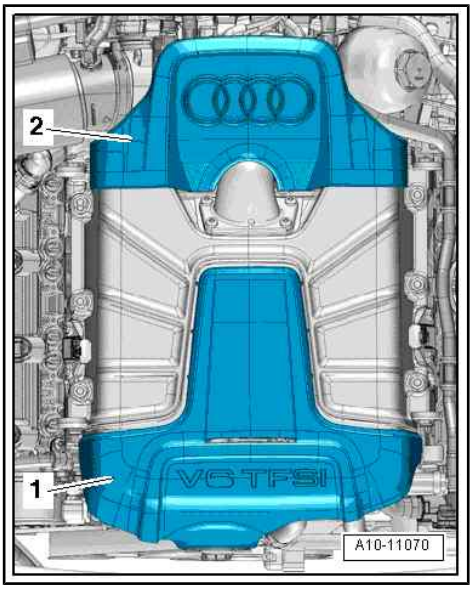
• Engine cold.

– Open filler cap on coolant expansion tank briefly to allow residual pressure in cooling system to dissipate and close cap, making sure it engages.

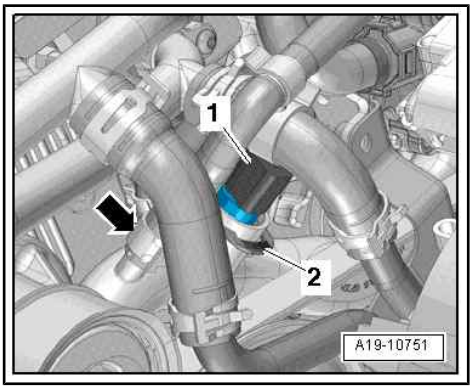


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– Lift off engine cover panel (front) -1-.



– Unplug electrical connector -1- at coolant temperature sender - G62- .



Note

Place a cloth underneath to catch escaping coolant.

– Pull off retaining clip -2- and detach coolant temperature sender - G62- .

Note

Disregard -arrow-.

Installing

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

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Note

- *Fit new O-ring.*
- *Insert new coolant temperature sender - G62- immediately into connection to avoid loss of coolant.*

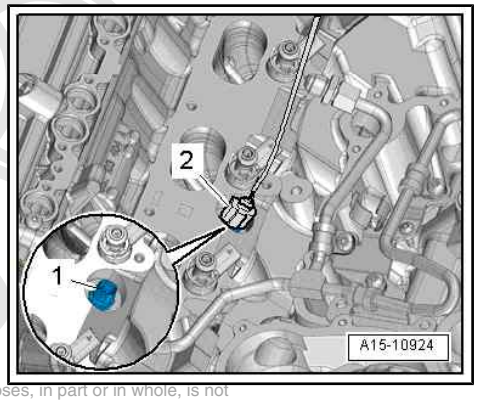
– Check coolant level ⇒ page 249 .

2.7 Removing and installing temperature sender for engine temperature regulation - G694-

Removing

– Remove intake manifold (bottom section, right-side) ⇒ page 347 .

– Unplug electrical connector -2-.
– Unscrew temperature sender for engine temperature regulation - G694- -item 1-



Installing

- Tightening torque ⇒ Fig. "" Temperature sender for engine temperature regulation -G694- - tightening torque"" , page 265

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

– Install intake manifold (bottom section, right-side) ⇒ page 347 .

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3 Coolant pipes

⇒ “3.1 Exploded view - coolant pipes”, page 261

⇒ “3.2 Fitting coolant hoses”, page 265

⇒ “3.3 Removing and installing coolant pipes (left-side)”, page 265

⇒ “3.4 Removing and installing coolant pipes (front left)”, page 267

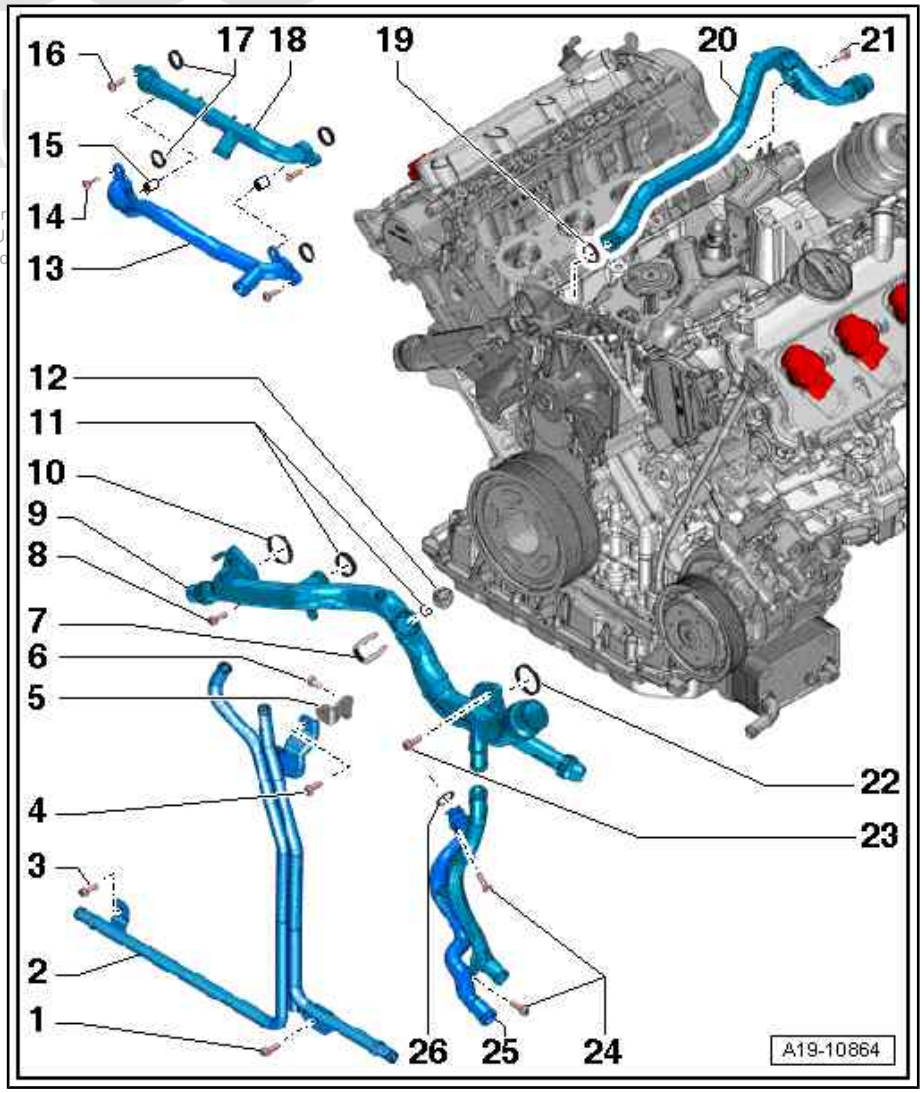
⇒ “3.5 Removing and installing coolant pipes (front)”, page 269

⇒ “3.6 Removing and installing coolant pipes (top)”, page 273

⇒ “3.7 Removing and installing coolant pipes on supercharger”, page 274

3.1 Exploded view - coolant pipes

Version 1



1 - Bolt

- ❑ 9 Nm

2 - Coolant pipes (front left)

- ❑ Removing and installing ⇒ “3.4 Removing and installing coolant pipes (front left)”, page 267

3 - Bolt

- ❑ 9 Nm

4 - Bolt

- ❑ 9 Nm

5 - Bracket

6 - Bolt

- ❑ 22 Nm

7 - Retaining clip

8 - Bolt

- ❑ 9 Nm

9 - Coolant pipe (front)

- ❑ Removing and installing ⇒ “3.5 Removing and installing coolant pipes (front)”, page 269

10 - Seal

- ❑ Renew

11 - O-rings

- ❑ Renew

12 - Coolant temperature sender - G62-

- ❑ Removing and installing ⇒ “2.6 Removing and installing coolant temperature sender G62 ”, page 258

13 - Coolant pipe (bottom) on supercharger

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- ❑ Remove and install together with -item 17- ⇒ “3.7 Removing and installing coolant pipes on supercharger”, page 274

14 - Bolt

- ❑ 5 Nm

15 - Dowel sleeve

- ❑ 2x

16 - Bolt

- ❑ 5 Nm

17 - Seals

- ❑ Renew

18 - Coolant pipe (top) on supercharger

- ❑ Remove and install together with -item 11- ⇒ “3.7 Removing and installing coolant pipes on supercharger”, page 274

19 - O-ring

- ❑ Renew

20 - Coolant pipe (top)

- ❑ Removing and installing ⇒ “3.6 Removing and installing coolant pipes (top)”, page 273

21 - Bolt

- ❑ 9 Nm

22 - Seal

- ❑ Renew

23 - Bolt

- ❑ 9 Nm

24 - Bolts

- ❑ Renew
- ❑ 3 Nm +90°

25 - Coolant pipes (left-side)

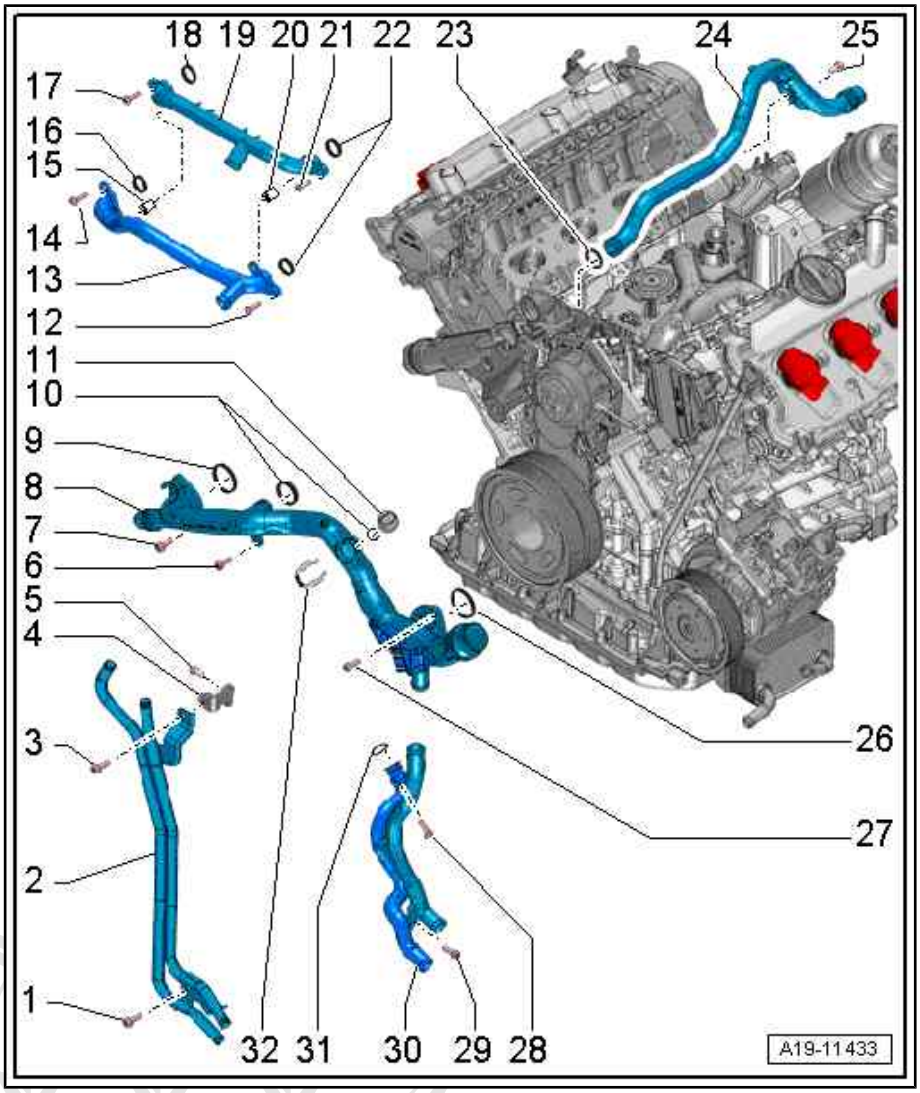
- ❑ Removing and installing ⇒ “3.3 Removing and installing coolant pipes (left-side)”, page 265

26 - O-ring

- ❑ Renew

Version 2

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1 - Bolt
- ❑ 9 Nm

2 - Coolant pipes (front left)
- ❑ Removing and installing ⇒ “3.4 Removing and installing coolant pipes (front left)”, page 267

3 - Bolt
- ❑ 9 Nm

4 - Bracket

5 - Bolt
- ❑ 22 Nm

6 - Bolt
- ❑ 2.5 Nm

7 - Bolt
- ❑ 9 Nm

8 - Coolant pipe (front)
- ❑ Removing and installing ⇒ “3.5 Removing and installing coolant pipes (front)”, page 269

9 - Seal
- ❑ Renew

10 - O-rings
- ❑ Renew

11 - Coolant temperature sender - G62-
- ❑ Removing and installing ⇒ “2.6 Removing and installing coolant temperature sender G62 ”, page 258

12 - Bolt
- ❑ 5 Nm

13 - Coolant pipe (bottom) on supercharger
- ❑ Remove and install together with -item 19- ⇒ “3.7 Removing and installing coolant pipes on supercharger”, page 274

14 - Bolt
- ❑ 5 Nm

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15 - Dowel sleeve

16 - Seal
- ❑ Renew

17 - Bolt
- ❑ 5 Nm

18 - Seal
- ❑ Renew

19 - Coolant pipe (top) on supercharger
- ❑ Remove and install together with -item 13- ⇒ “3.7 Removing and installing coolant pipes on supercharger”, page 274

20 - Dowel sleeve

21 - Bolt

- ❑ 5 Nm

22 - Seals

- ❑ Renew

23 - O-ring

- ❑ Renew

24 - Coolant pipe (top)

- ❑ Removing and installing ⇒ “3.6 Removing and installing coolant pipes (top)”, page 273

25 - Bolt

- ❑ 9 Nm

26 - Seal

- ❑ Renew

27 - Bolt

- ❑ 9 Nm

28 - Bolt

- ❑ Renew
- ❑ 3 Nm +90°

29 - Bolt

- ❑ Renew
- ❑ 3 Nm +90°

30 - Coolant pipes (left-side)

- ❑ Removing and installing ⇒ “3.3 Removing and installing coolant pipes (left-side)”, page 265

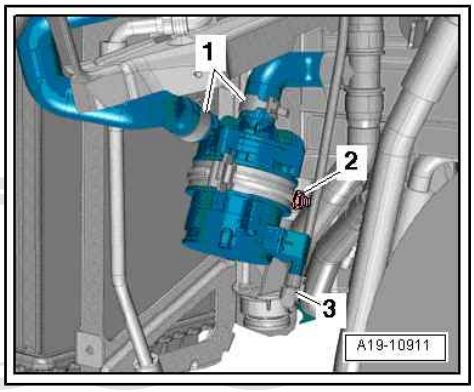
31 - O-ring

- ❑ Renew

32 - Retaining clip

Charge air cooling pump - V188- - tightening torque

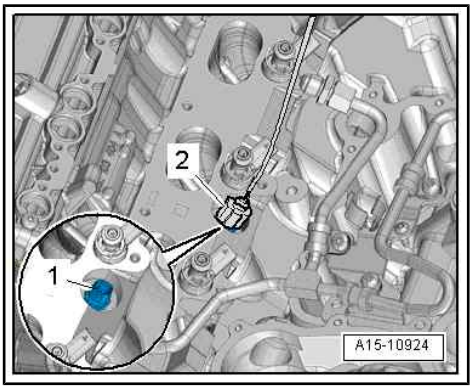
– Tighten nut -2- to 9 Nm.



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Temperature sender for engine temperature regulation - G694- - tightening torque

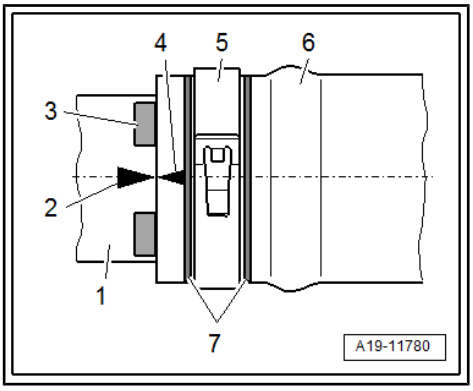
– Tighten temperature sender for engine temperature regulation - G694- -item 1- to 3 Nm.



3.2 Fitting coolant hoses

– Fit coolant hose on connection as follows:

- Push coolant hose -6- onto connection -1- as far as stop -3-.
- If stop is not fitted, push coolant hose 28 mm onto connection.
- Arrow marking -4- on coolant hose must align with arrow marking -2- on connection. Some parts have line markings instead of arrows.
- Use only undamaged hose clips -5- (same as original equipment).
- Position hose clips between coloured markings -7-.
- Position lugs of hose clips for maximum clearance from surrounding parts.

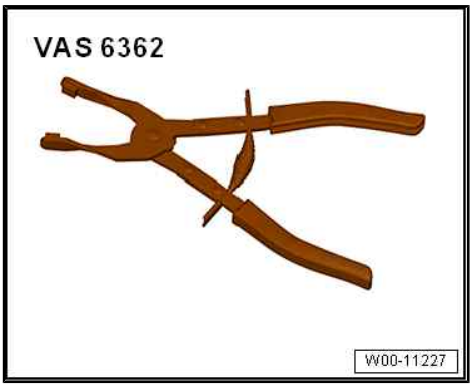


3.3 Removing and installing coolant pipes (left-side)

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Special tools and workshop equipment required

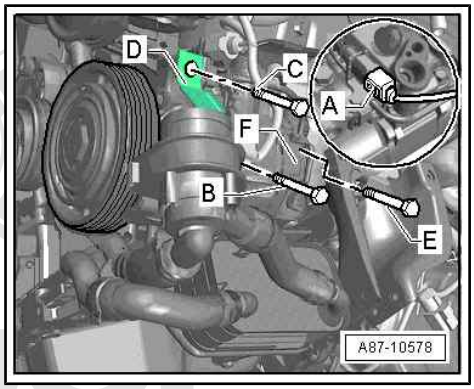
♦ Hose clip pliers - VAS 6362-



Removing

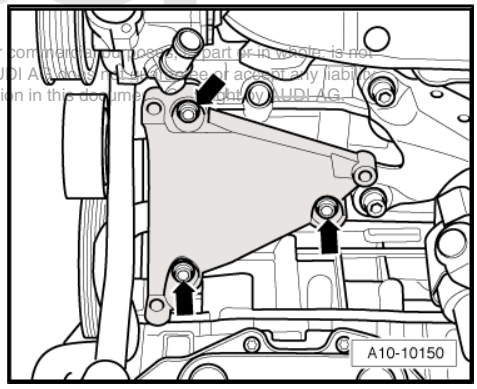
– Drain coolant ⇒ page 240 (or on vehicles equipped with continued coolant circulation pump -V51- remove continued coolant circulation pump ⇒ page 254).

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



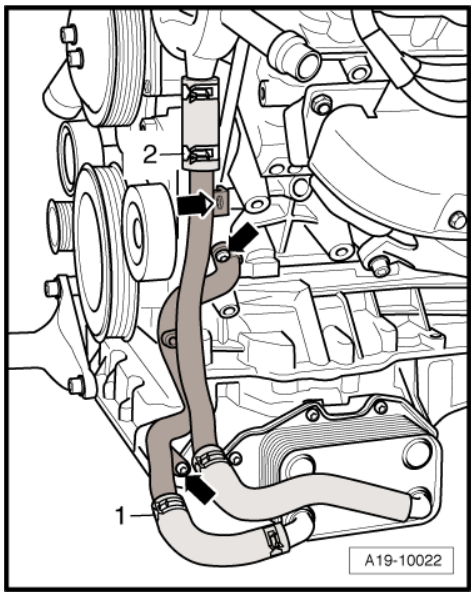
– Remove bolts -arrows- and detach bracket for air conditioner compressor.

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– Remove bolts -arrows-.

– Release hose clips -1- and -2- and disconnect coolant pipes from coolant hoses.



Note

For illustration purposes, the installation position is shown with the power steering pump removed.

Installing

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

- Tightening torques ⇒ “3.1 Exploded view - coolant pipes”, page 261

Note

- *Fit new O-ring.*
- *Renew the bolts tightened with specified tightening angle.*
- *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 bracket for air conditioner compressor ⇒ page 90 .

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

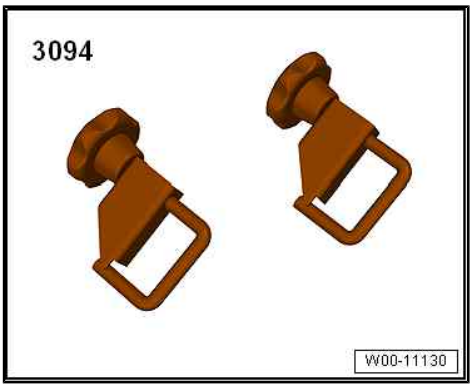
– Install continued coolant circulation pump - V51- ⇒ page 254 .

– Fill up with coolant ⇒ page 243 .

3.4 Removing and installing coolant pipes (front left)

Special tools and workshop equipment required

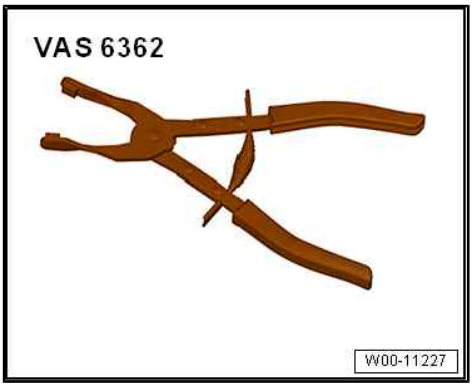
♦ Hose clamps, up to 25 mm - 3094-



♦ Drip tray for workshop hoist - VAS 6208-



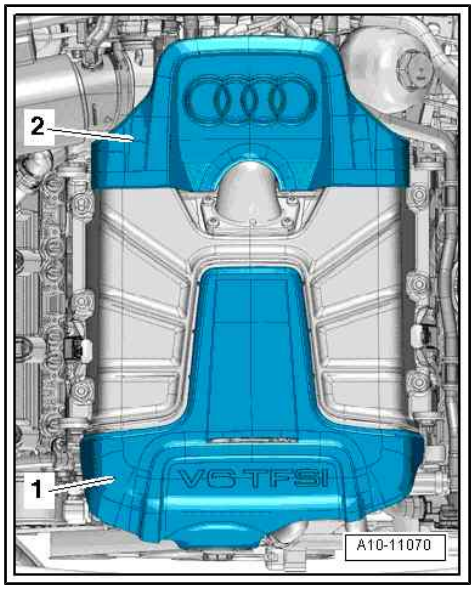
♦ Hose clip pliers - VAS 6362-



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Removing

– Lift off engine cover panel (front) -1-.



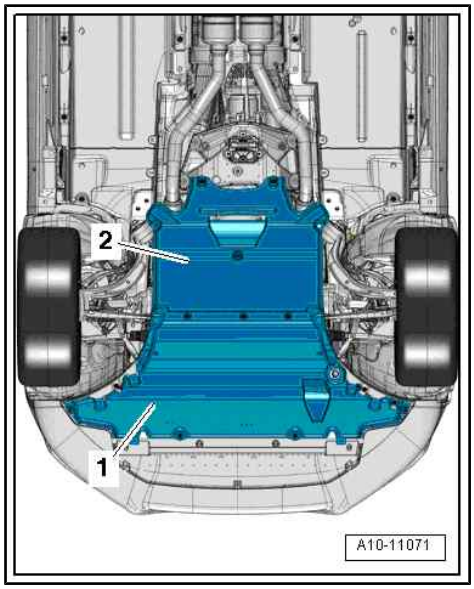
– Remove front noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .

WARNING

The cooling system is under pressure when the engine is hot. Hot steam/hot coolant can escape - risk of scalding.

Danger of scalding skin and other parts of the body.

- ***Put on protective gloves.***
- ***Put on safety goggles.***
- ***Release pressure (cover filler cap on coolant expansion tank with a cloth and open carefully).***

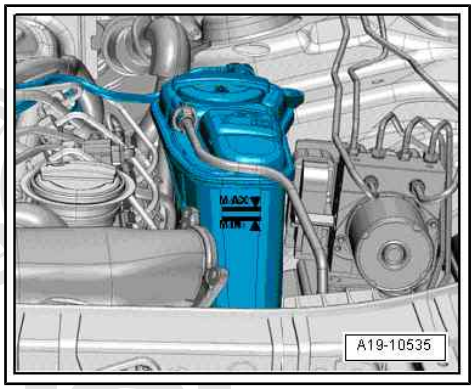


– Open filler cap on coolant expansion tank.

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

Note

For illustration purposes, the installation position is shown in the following illustrations with the engine removed.

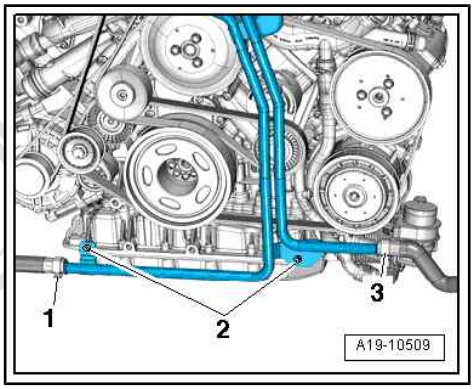


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Vehicles with coolant pipes (front left) (version 1):

– Clamp off coolant hoses using hose clamps up to 25 mm - 3094- , release hose clips -1- and -3- and disconnect coolant hoses from coolant pipes (front left).

– Remove bolts -2-.

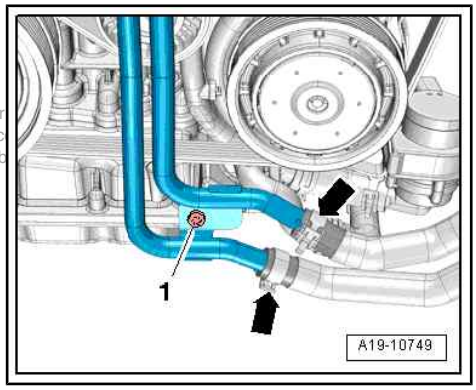


Vehicles with coolant pipes (front left) (version 2):

– Clamp off coolant hoses using hose clamps up to 25 mm - 3094- , release hose clips -arrows- and disconnect coolant hoses from coolant pipes (front left).

– Remove bolt -1-.

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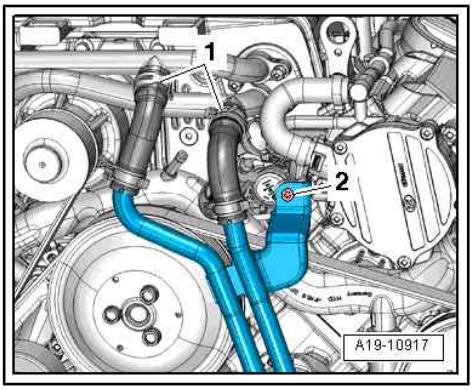


All vehicles (continued):

– Release hose clips -1- and detach coolant hoses from coolant pipes at supercharger.

– Remove bolt -2-.

– Detach coolant pipes (front left) from below.



Installing

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

- Tightening torques ⇒ “3.1 Exploded view - coolant pipes”, page 261

Note

Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .

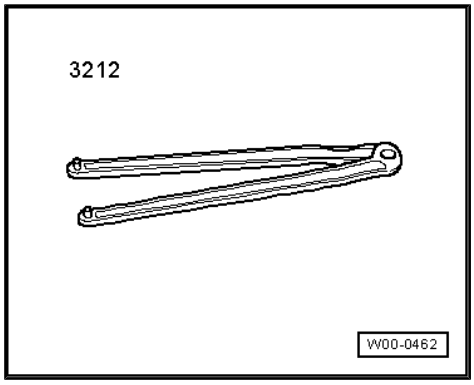
– Fill up with coolant ⇒ page 243 .

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

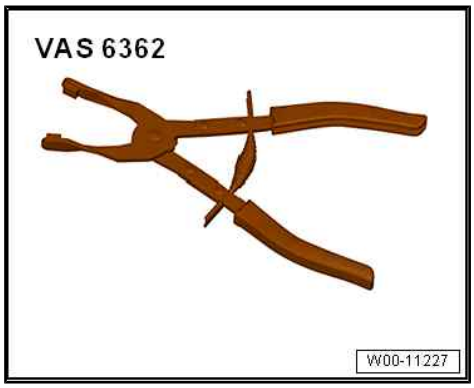
3.5 Removing and installing coolant pipes (front)

Special tools and workshop equipment required

- Pin wrench - 3212-



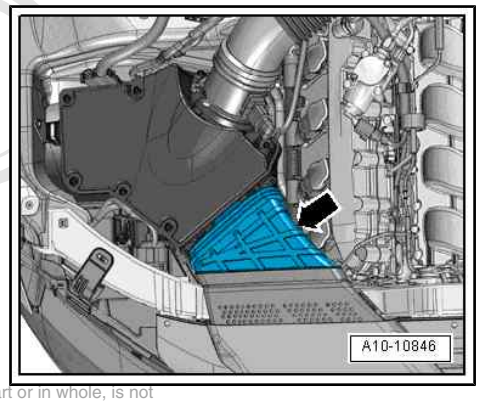
- Hose clip pliers - VAS 6362-



Removing

– Drain coolant ⇒ page 240 (or on vehicles equipped with continued coolant circulation pump -V51- remove continued coolant circulation pump ⇒ page 254).

– Remove air duct -arrow-.



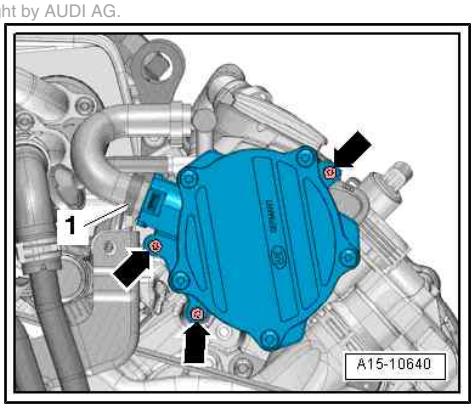
– Remove coolant pipes (front left) ⇒ page 267 .

– Remove poly V-belt:

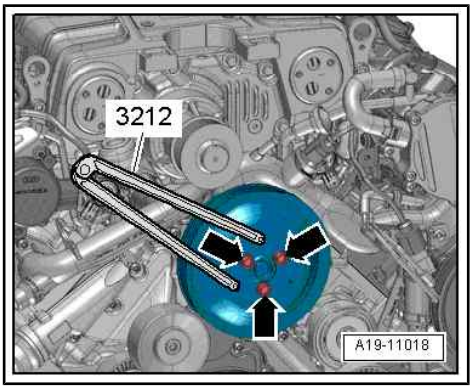
- ⇒ “1.2.2 Removing and installing poly V-belt - vehicles with hydraulic power steering”, page 96 .
- ⇒ “1.2.3 Removing and installing poly V-belt - vehicles with electromechanical power steering”, page 98 .

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– Remove vacuum pump ⇒ Brake system; Rep. gr. 47 ; Vacuum system; Removing and installing vacuum pump .



– Remove bolts for coolant pump pulley (counterhold with pin wrench - 3212-).
– Detach poly-V-belt pulley.

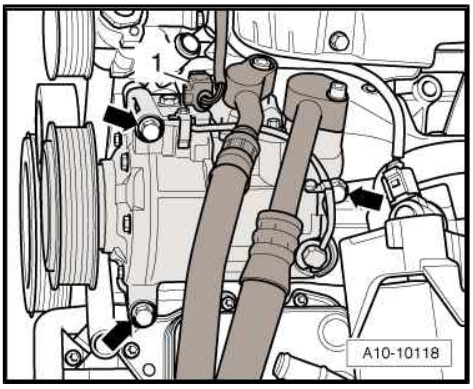


– Unplug electrical connector -1- for magnetic clutch on air conditioner compressor.

WARNING

Risk of injury caused by refrigerant.

- *The air conditioner refrigerant circuit must not be opened.*



– Remove bolts -arrows- for air conditioner compressor.

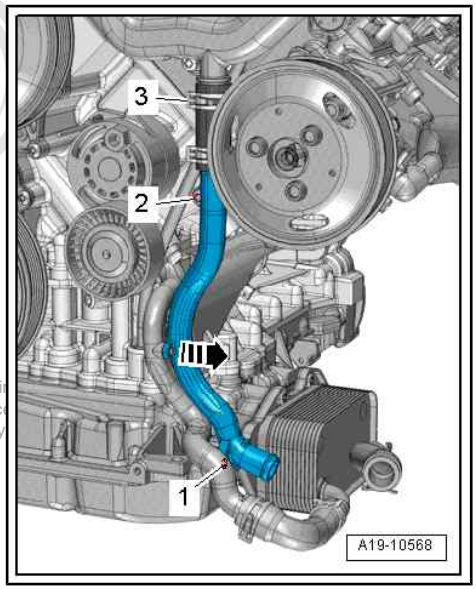
Caution

Danger of damage to refrigerant lines and hoses.

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

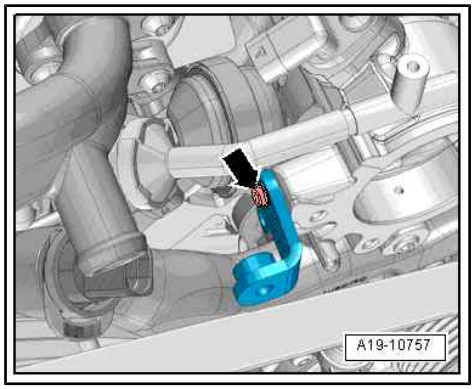
– Detach air conditioner compressor from bracket and place to one side with lines/wiring connected.

– Release hose clip -3- and remove bolts -1- and -2- for coolant pipes (left-side).
– Swivel coolant pipe slightly to the left -arrow- and pull it upwards out of coolant pipe (top).

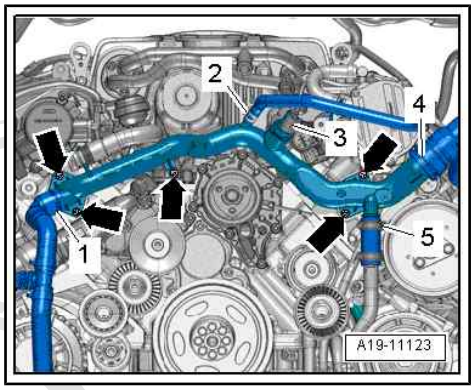


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– Remove bolt -arrow- and detach bracket for coolant pipes (front left).



– Unplug electrical connector -3- at coolant temperature sender - G62- .
– Lift retaining clips and disconnect coolant hoses -1 and 4-.
– Release hose clip -2- and detach coolant hose (top).
– Loosen hose clip -5-.
– Unscrew bolts -arrows- and remove coolant pipe (front).



Installing

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

- Tightening torques ⇒ “3.1 Exploded view - coolant pipes”, page 261

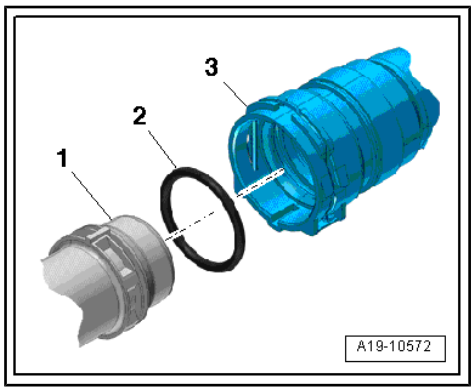
Note

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

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– Clean or smoothen sealing surfaces for seals and O-rings.
– Lubricate seals and O-rings with coolant and slide onto coolant pipe.

– Connect coolant hose with plug-in connector ⇒ page 281 .
– Install coolant pipes (left-side) ⇒ page 265 .
– Install air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Removing and installing air conditioner compressor .
– Install poly V-belt pulley for coolant pump ⇒ page 251 .
– Install vacuum pump ⇒ Brake system; Rep. gr. 47 ; Vacuum system; Removing and installing vacuum pump .
– Install poly V-belt:



- ⇒ “1.2.2 Removing and installing poly V-belt - vehicles with hydraulic power steering”, page 96 .
- ⇒ “1.2.3 Removing and installing poly V-belt - vehicles with electromechanical power steering”, page 98 .

– Install coolant pipes (front left) ⇒ page 267 .
– Install continued coolant circulation pump - V51- ⇒ page 254 .
– Fill up with coolant ⇒ page 243 .

3.6 Removing and installing coolant pipes (top)

Removing

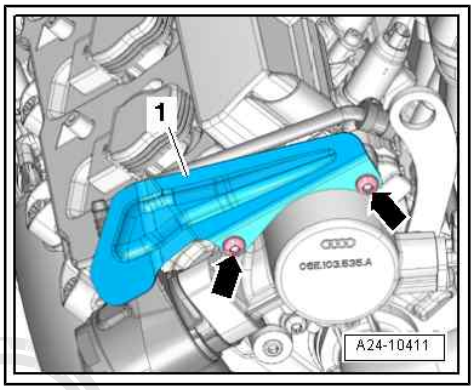
Note

Fit all cable ties in the original positions when installing.

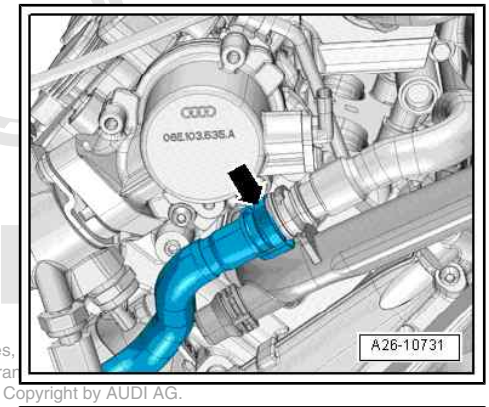
– Drain coolant ⇒ page 240 .

– Remove intake manifold (bottom section, right-side) ⇒ page 347 .

– Remove nuts -arrows- and detach guard plate -1- for high-pressure pipe.



– Press release tabs and detach secondary air hose -arrow- to front from bracket.



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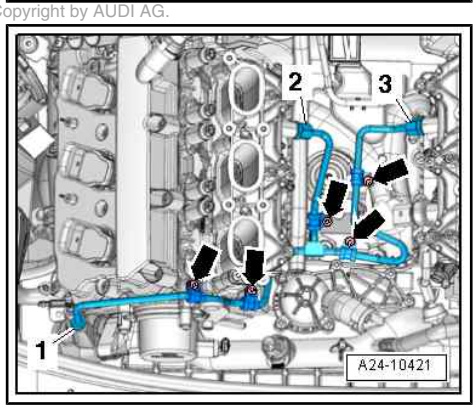
– Unscrew connection -1-.

WARNING

The fuel system is pressurised.

Risk of injury as fuel may spray out.

- ***Put on safety goggles.***
- ***Put on protective gloves.***
- ***Release pressure (wrap clean cloth around connection and open connection carefully).***



– Unscrew union nuts -2- and -3- (counterhold connection).

– Unscrew bolts -arrows- on retaining clips and detach high-pressure pipe.

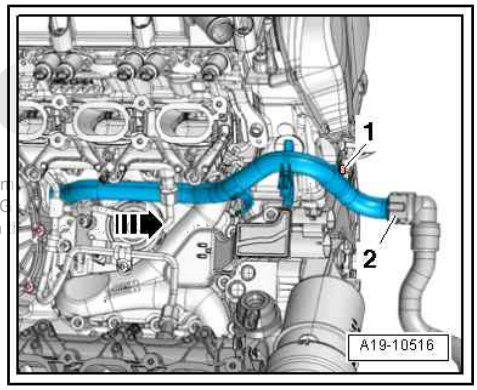
Note

The threaded connection in the fuel rail must be renewed if it has been loosened or removed at union nuts -2- and -3-.

- Place a cloth under coolant pipe to catch escaping coolant.

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

– Remove bolt -1- and pull coolant pipe rearwards out of cylinder block -arrow-.



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Installing

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

- Tightening torque ⇒ “3.1 Exploded view - coolant pipes”, page 261

Note

Fit new O-rings.

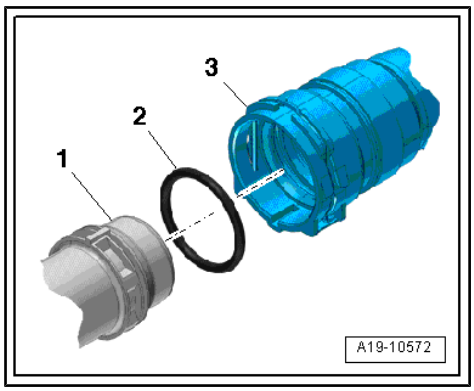
– Clean and smoothen sealing surface for O-ring.

– Lubricate O-ring with coolant and slide onto coolant pipe.

– Connect coolant hose with plug-in connector ⇒ page 281 .

– Install high-pressure pipe and intake manifold (bottom section) ⇒ “8.3 Removing and installing high-pressure pipe”, page 369 / ⇒ “4.2 Removing and installing intake manifold (bottom section) with fuel rail”, page 347 .

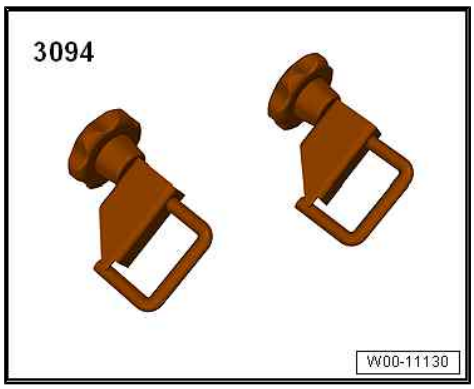
– Fill up with coolant ⇒ page 243 .



3.7 Removing and installing coolant pipes on supercharger

Special tools and workshop equipment required

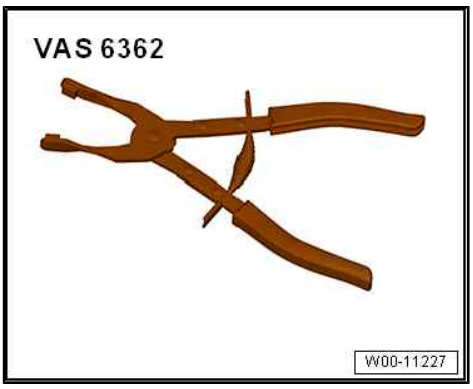
♦ Hose clamps, up to 25 mm - 3094-



♦ Drip tray for workshop hoist - VAS 6208-

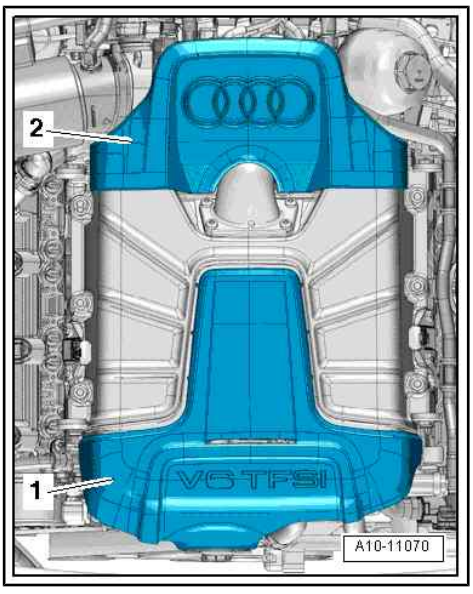


♦ Hose clip pliers - VAS 6362-



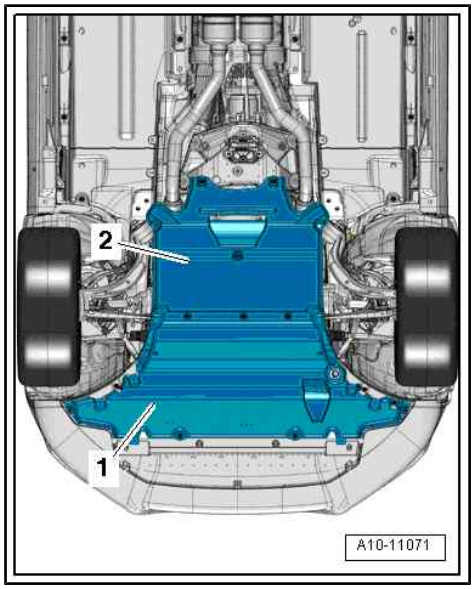
Removing

– Lift off engine cover panel (front) -1-.



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



WARNING

The cooling system is under pressure when the engine is hot. Hot steam/hot coolant can escape - risk of scalding.

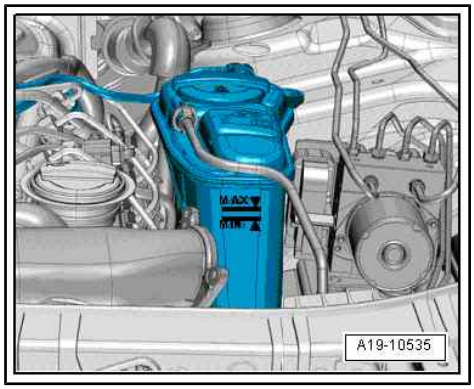
Danger of scalding skin and other parts of the body.

- ***Put on protective gloves.***
- ***Put on safety goggles.***
- ***Release pressure (cover filler cap on coolant expansion tank with a cloth and open carefully).***

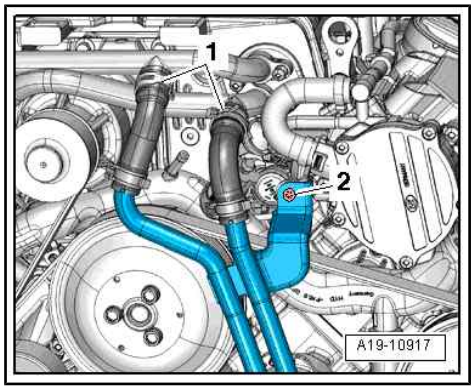
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– Open filler cap on coolant expansion tank.

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



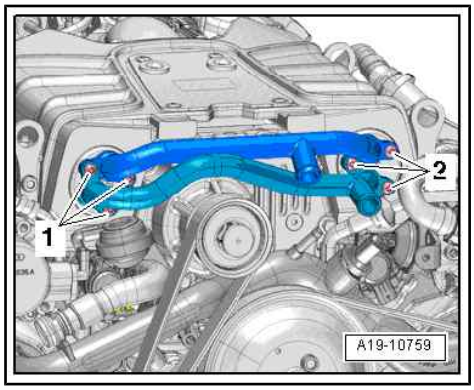
– Clamp off coolant hoses using hose clamps, up to 25 mm - 3094- , release hose clips -1- and disconnect coolant hoses from coolant pipes at supercharger.



Note

Disregard -item 2-.

– Remove bolts -1- and -2- and take off coolant pipes.



Installing

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

- Tightening torques ⇒ “3.1 Exploded view - coolant pipes”, page 261

Note

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

– Fill up with coolant ⇒ page 243 .
– Install noise insulation ⇒ 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 278

⇒ “4.2 Removing and installing radiator”, page 281

⇒ “4.3 Removing and installing radiator cowl”, page 288

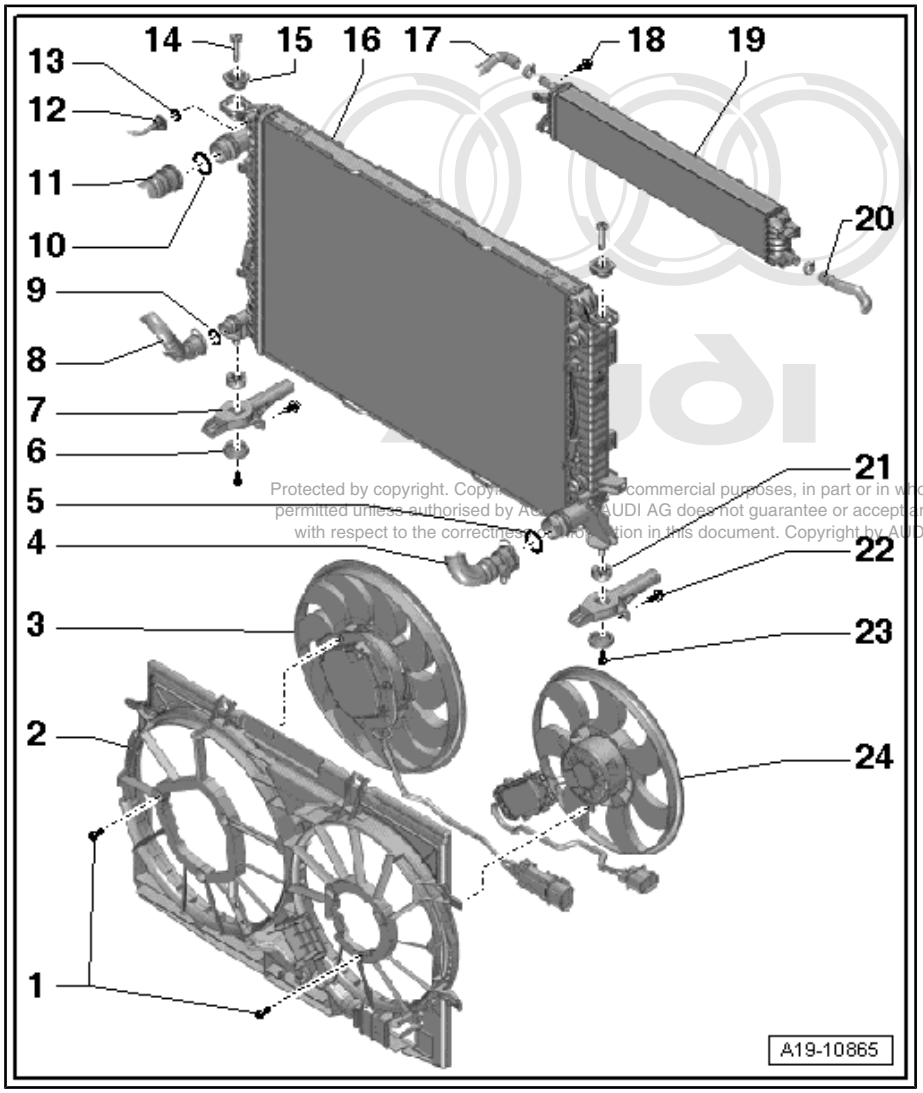
⇒ “4.4 Removing and installing water radiator for charge air cooling circuit (front)”, page 293

⇒ “4.5 Removing and installing water radiator for charge air cooling circuit (left-side)”, page 297

⇒ “4.6 Removing and installing radiator fans”, page 298

4.1 Exploded view - radiator/radiator fans

Radiator, water radiator (front) for charge air cooling circuit, radiator cowl and radiator fans - version 1



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1 - Bolt

- ❑ 4.5 Nm

2 - Radiator cowl

- ❑ Remove and install together with radiator ⇒ “4.2 Removing and installing radiator”, page 281
- ❑ A5 ⇒ “4.3 Removing and installing radiator cowl”, page 288

3 - Radiator fan - V7-

- ❑ With radiator fan control unit - J293-
- ❑ Removing and installing ⇒ “4.6.1 Removing and installing radiator fans V7 / V177 - version 1”, page 299

4 - Coolant hose

- ❑ Lift retaining clip to detach
- ❑ Connecting to radiator ⇒ Fig. ““Connecting coolant hose with plug-in connector”“ , page 281

5 - O-ring

- ❑ Renew

6 - Washer

7 - Radiator bracket

8 - Coolant hose

- ❑ Lift retaining clip to detach
- ❑ Connecting to radiator ⇒ Fig. ““Connecting coolant hose with plug-in connector”“ , page 281

9 - O-ring

- ❑ Renew

10 - O-ring

- ❑ Renew

11 - Coolant hose

- ❑ Lift retaining clip to detach
- ❑ Connecting to radiator ⇒ Fig. ""Connecting coolant hose with plug-in connector"" , page 281

12 - Coolant hose

- ❑ Lift retaining clip to detach
- ❑ Connecting to radiator ⇒ Fig. ""Connecting coolant hose with plug-in connector"" , page 281

13 - O-ring

- ❑ Renew

14 - Retaining pin

- ❑ Use screwdriver to release and pull off

15 - Rubber mounting

- ❑ For radiator

16 - Radiator

- ❑ Remove and install together with radiator cowl ⇒ "4.2 Removing and installing radiator", page 281
- ❑ If renewed, refill system with fresh coolant

17 - Coolant hose

18 - Bolt

- ❑ 4.5 Nm

19 - Water radiator (front) for charge air cooling circuit

- ❑ Removing and installing ⇒ "4.4 Removing and installing water radiator for charge air cooling circuit (front)", page 293

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20 - Coolant hose

21 - Rubber mounting

- ❑ For radiator

22 - Bolt

- ❑ 5 Nm

23 - Bolt

- ❑ 4.5 Nm

24 - Radiator fan 2 - V177-

- ❑ Removing and installing ⇒ "4.6.1 Removing and installing radiator fans V7 / V177 - version 1", page 299

Radiator cowl and radiator fans - version 2

1 - Radiator fan 2 - V177-

- ❑ With radiator fan control unit 2 - J671-
- ❑ Removing and installing ⇒ “4.6.1 Removing and installing radiator fans V7 / V177 - version 1”, page 299

2 - Radiator fan - V7-

- ❑ With radiator fan control unit - J293-
- ❑ Removing and installing ⇒ “4.6.1 Removing and installing radiator fans V7 / V177 - version 1”, page 299

3 - Radiator cowl

- ❑ Removing and installing ⇒ “4.3 Removing and installing radiator cowl”, page 288

4 - Bolt

- ❑ 3.5 Nm

5 - Fan wheel

- ❑ Pin must engage in hole

6 - Bolt

- ❑ 5 Nm

7 - Fan wheel

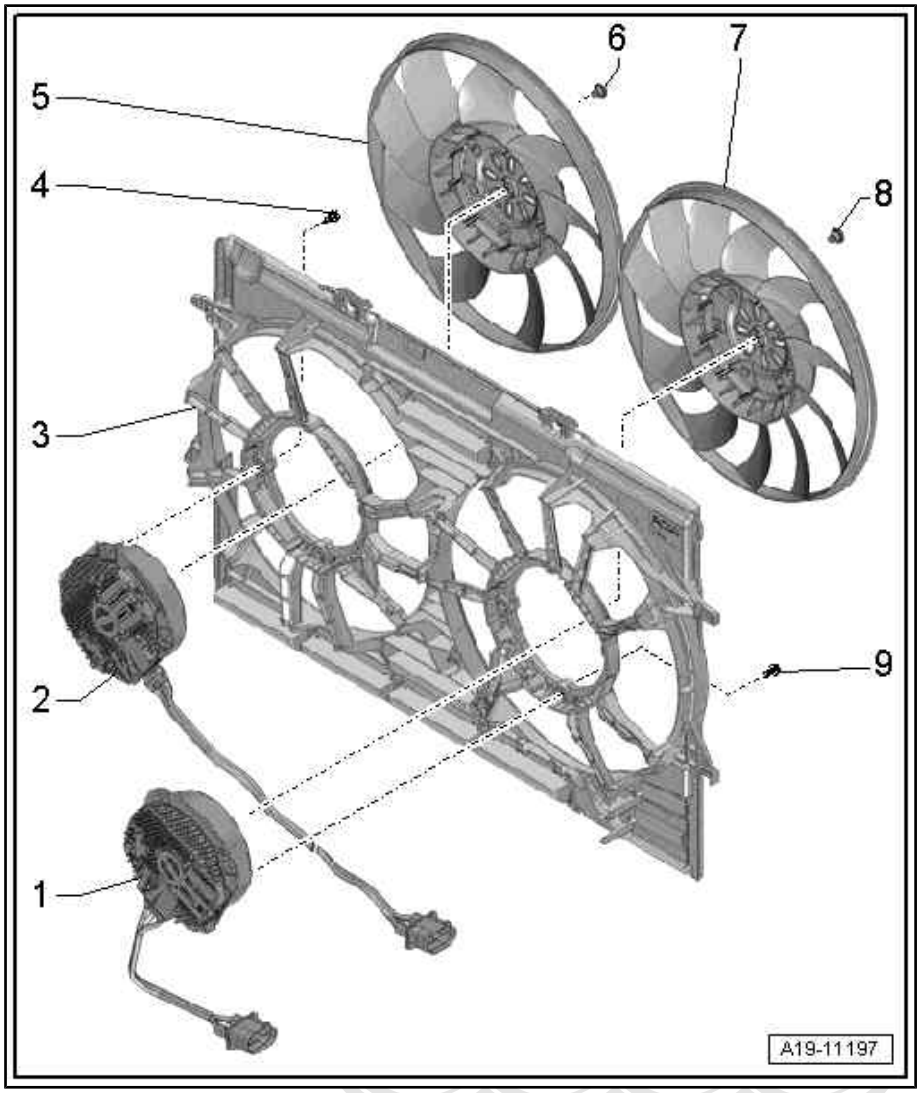
- ❑ Pin must engage in hole

8 - Bolt

- ❑ 5 Nm

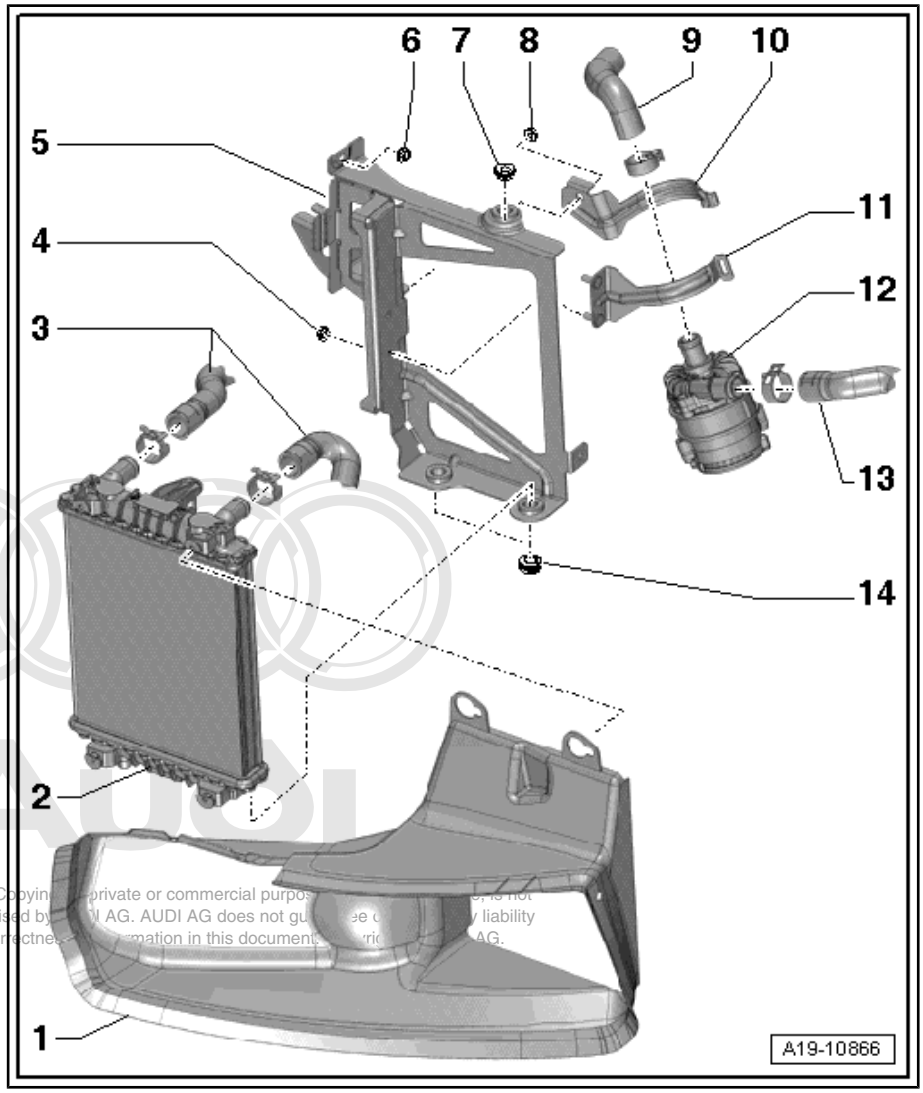
9 - Bolt

- ❑ 3.5 Nm



Water radiator (left-side) for charge air cooling circuit

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1 - Air duct

2 - Water radiator (left-side) for charge air cooling circuit

- ❑ Removing and installing ⇒ “4.5 Removing and installing water radiator for charge air cooling circuit (left-side)”, page 297

3 - Coolant hoses

4 - Nut

- ❑ 9 Nm

5 - Bracket

6 - Nut

- ❑ 9 Nm

7 - Rubber mounting

- ❑ For radiator

8 - Nut

- ❑ 9 Nm

9 - Coolant hose

10 - Bracket

11 - Bracket

12 - Charge air cooling pump - V188-

- ❑ Removing and installing ⇒ “2.3.1 Removing and installing charge air cooling pump V188 ”, page 253

13 - Coolant hose

14 - Rubber mounting

- ❑ For radiator

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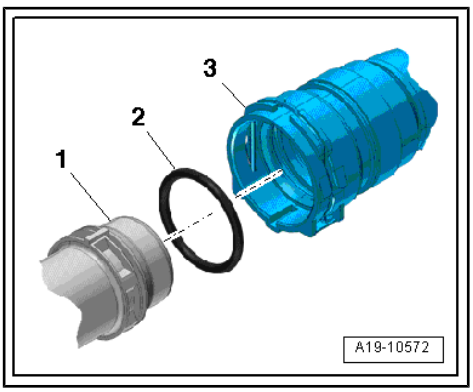
Connecting coolant hose with plug-in connector

– Remove old O-ring -2- from coolant hose -3-.

– Lightly lubricate new O-ring with coolant and fit O-ring in coolant hose.

– Press coolant hose onto connection -1- until it engages audibly.

– Press coolant hose in again and then pull to check that plug-in connector is correctly engaged.



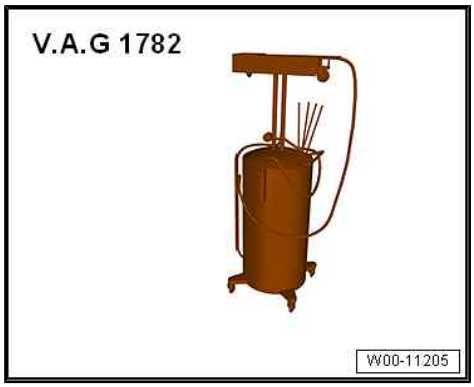
4.2 Removing and installing radiator

Note

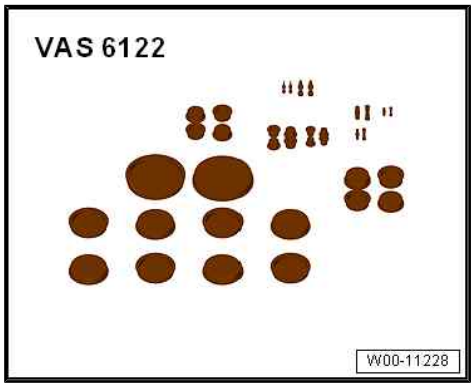
- *Radiator and radiator cowl can only be removed and installed together as one unit.*
- *Audi A5: Radiator cowl can be removed separately ⇒ "4.3 Removing and installing radiator cowl", page 288 .*
- *On more recent versions it is no longer possible to remove the condenser from the radiator with the refrigerant lines attached. This is described below under "version 2".*

Special tools and workshop equipment required

- Used oil collection and extraction unit - V.A.G 1782- for vehicles with dual clutch gearbox 0B5



- Engine bung set - VAS 6122- for vehicles with dual clutch gearbox 0B5



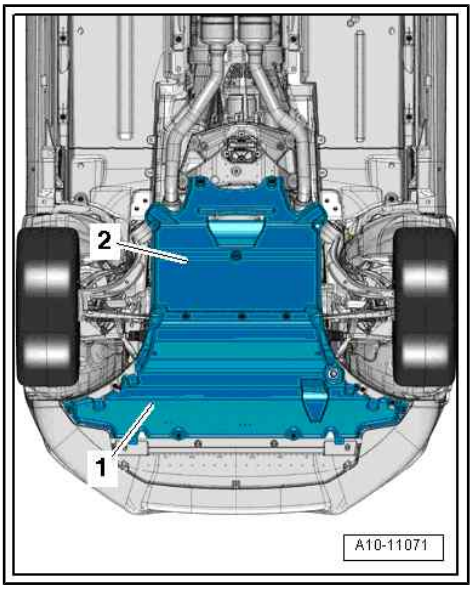
- Drip tray for workshop hoist - VAS 6208-



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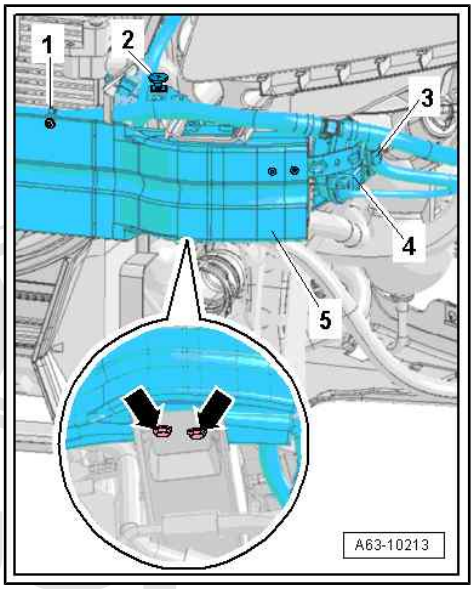
Removing

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



– Remove impact bar -5- ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing impact bar .

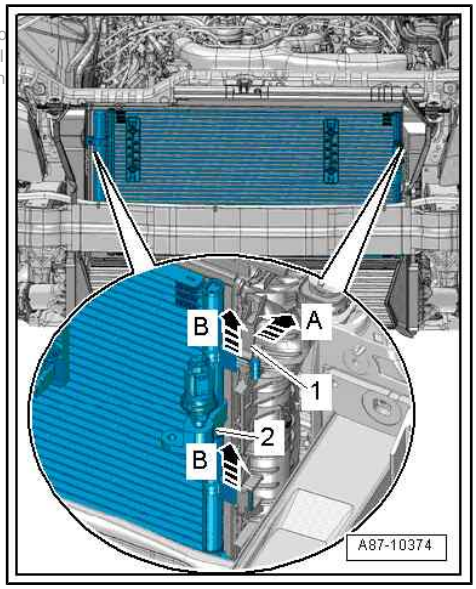
– Remove water radiator (front) for charge air cooling circuit ⇒ page 293 .



Vehicles with refrigerant lines (version 2):

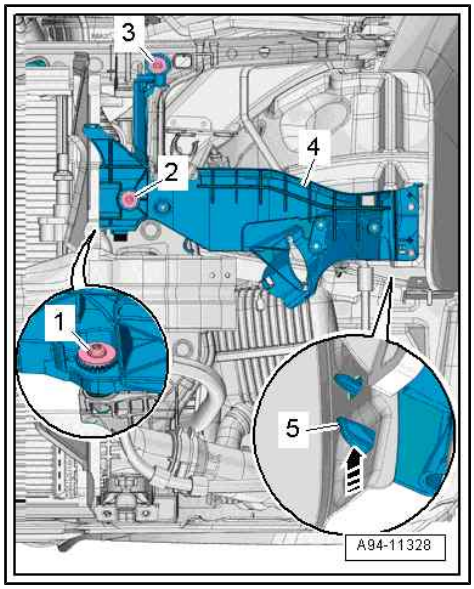
– Remove condenser ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit; Removing and installing condenser .

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Audi A4:

– Install bracket (left-side) for mounting for headlight housing ⇒ General body repairs, exterior; Rep. gr. 50 ; Lock carrier; Exploded view - lock carrier .

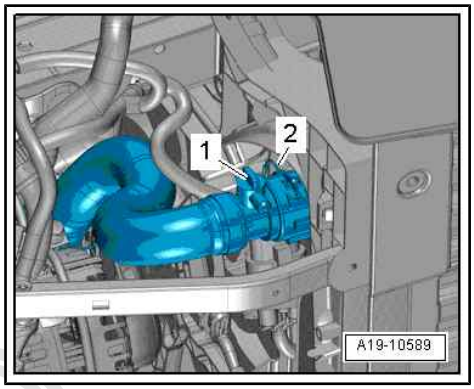


All vehicles (continued):

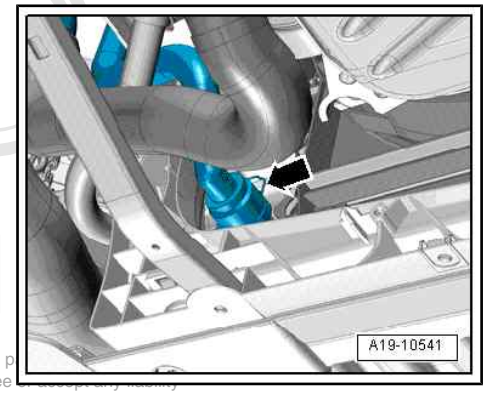
– Place drip tray for workshop hoist - VAS 6208- beneath engine.

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

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



– Detach connection from radiator (lift retaining clip -arrow-).



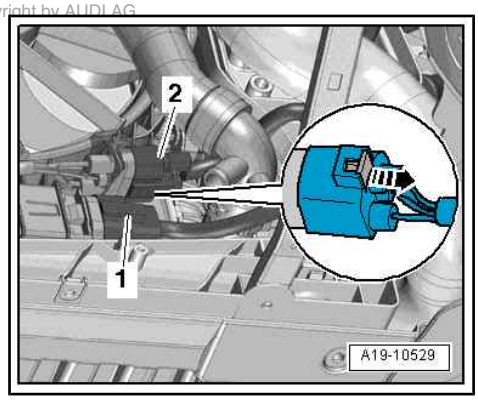
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WARNING

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

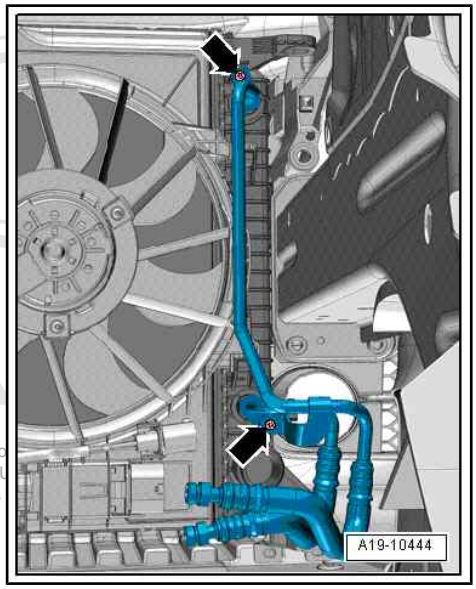
- ***Unplug electrical connectors before starting to work in the area of radiator cowl.***

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



Vehicles with dual clutch gearbox 0B5:

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



Note

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

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

Note

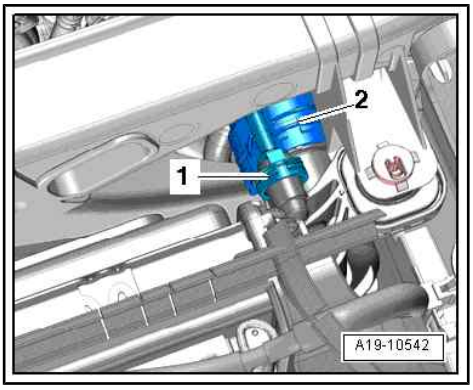
Tie ATF lines up onto longitudinal member to prevent fluid escaping.

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

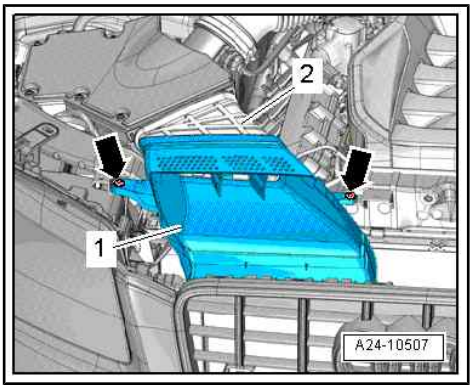
All vehicles (continued):

– Lift retaining clips -1- and -2- and detach connection from radiator.



– Remove bolts -arrows-.

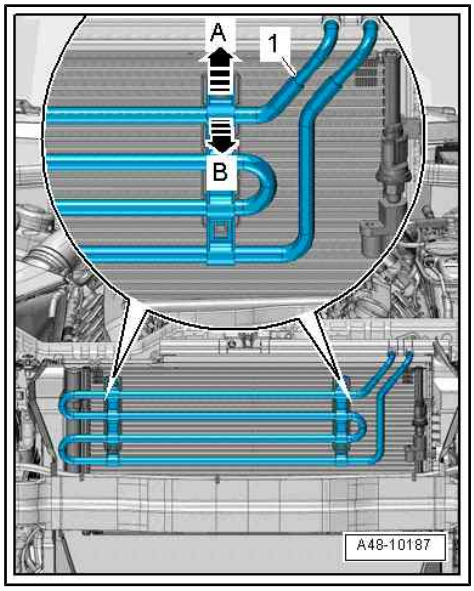
– Detach air duct -1- from intermediate flange -2- for air cleaner housing.



Vehicles with hydraulic power steering:

– If fitted, release retaining clips -arrow A- and swivel power steering cooling pipe -1- to front -arrow B-.

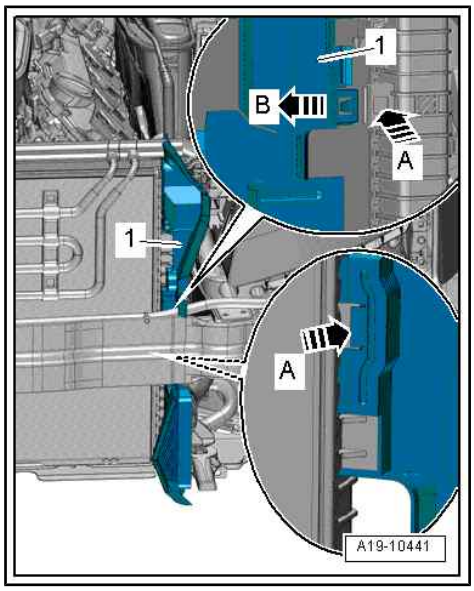
– Lift power steering cooling pipe away from condenser and place onto engine.



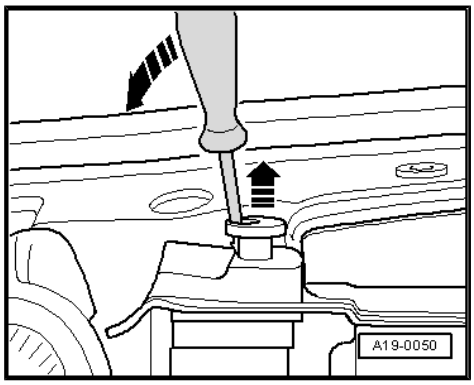
All vehicles (continued):

– Release catches -arrows A- and detach air duct -1- on left and right -arrow B-.

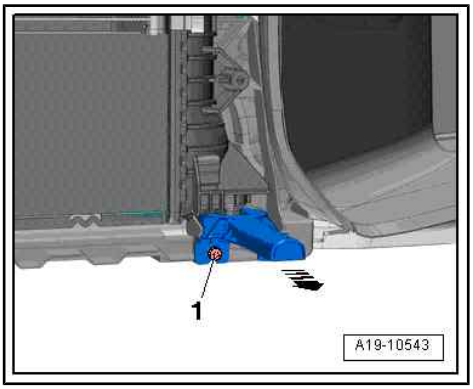
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– Release retaining pins for radiator on both sides and pull out upwards -arrows-.



– Remove bolts -1- on both sides and detach radiator bracket with radiator from lock carrier -arrow-.
– Slightly lower radiator.



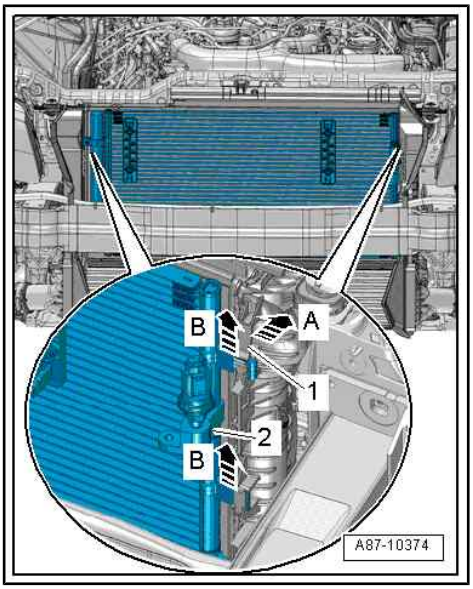
Vehicles with refrigerant lines (version 1):

Caution

Risk of damage to condenser, refrigerant lines and refrigerant hoses.

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

– Have a second mechanic release retaining clips -1- in direction of -arrow A- and lift condenser -2- out of mountings on radiator -arrows B-.
– Pivot condenser forwards with refrigerant lines attached.



All vehicles (continued):

– Detach radiator.
– Press locking tabs on left and right sides of radiator cowl -arrow- and at the same time lift radiator cowl off radiator.

Installing

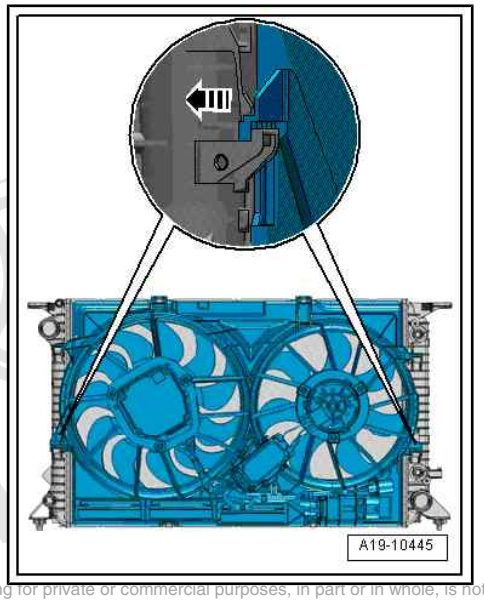
Installation is carried out in the reverse order; note the following:

- Tightening torques ⇒ “4.1 Exploded view - radiator/radiator fans”, page 278

Note

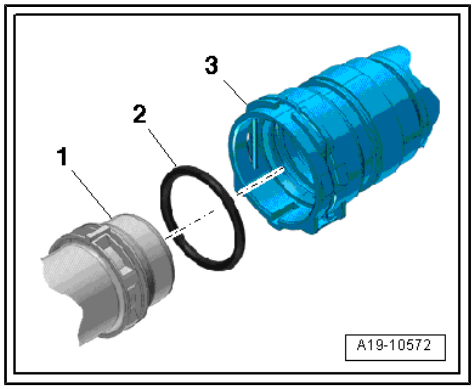
If there are slight impressions on the fins, refer to ⇒ page 7 .

– Attach air duct to intermediate flange for air cleaner housing ⇒ page 342 .
– Vehicles with dual clutch gearbox 0B5: Secure ATF lines ⇒ Rep. gr. 34 ; ATF circuit; Removing and installing ATF lines .



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– Connect coolant hose with plug-in connector ⇒ page 281 .
– Install water radiator (front) for charge air cooling circuit ⇒ page 293 .
– Audi A4: Install bracket for mounting for headlight housing ⇒ General body repairs, exterior; Rep. gr. 50 ; Lock carrier; Exploded view - lock carrier .
– Install condenser ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit; Removing and installing condenser .
– Install impact absorber ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing impact absorber .
– Fill up with coolant ⇒ page 243 .



Note

The coolant in the entire system must be changed if the radiator is renewed.

– Vehicles with dual clutch gearbox 0B5: Check ATF level ⇒ Rep. gr. 34 ; ATF; Checking ATF level .

4.3 Removing and installing radiator cowl

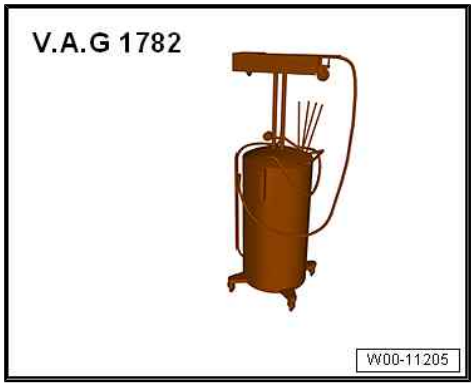
Note

The radiator cowl can be removed separately on the Audi A5. On the Audi A4, the radiator cowl is removed together with the radiator ⇒ "4.2 Removing and installing radiator", page 281 .

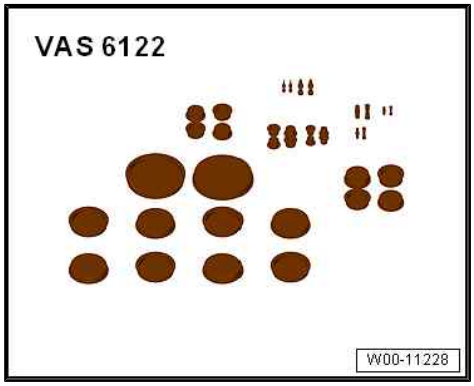
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Special tools and workshop equipment required

♦ Used oil collection and extraction unit - V.A.G 1782- for vehicles with dual clutch gearbox 0B5



♦ Engine bung set - VAS 6122- for vehicles with dual clutch gearbox 0B5

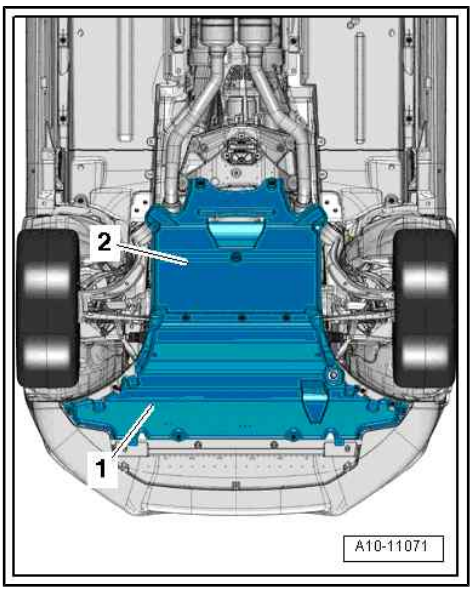


♦ Drip tray for workshop hoist - VAS 6208-



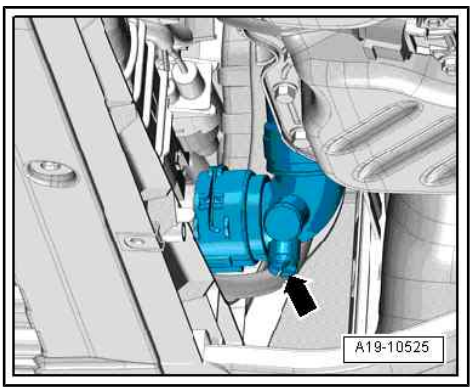
Removing

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

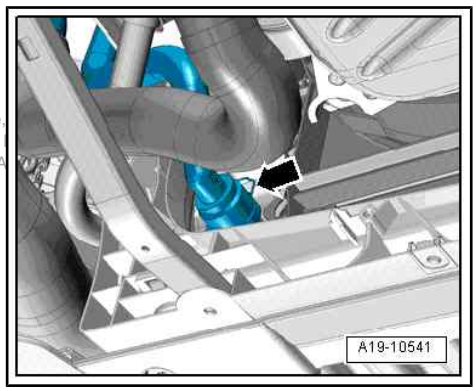


– Place drip tray for workshop hoist - VAS 6208- beneath engine.

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



– Detach connection from radiator (lift retaining clip -arrow-).

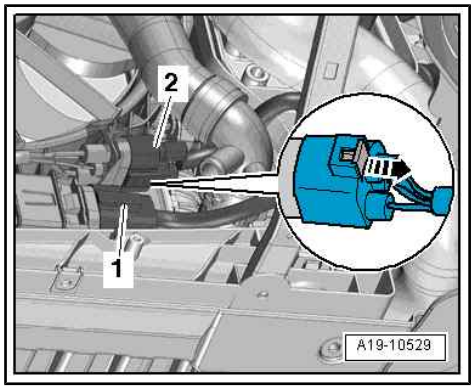


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WARNING

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

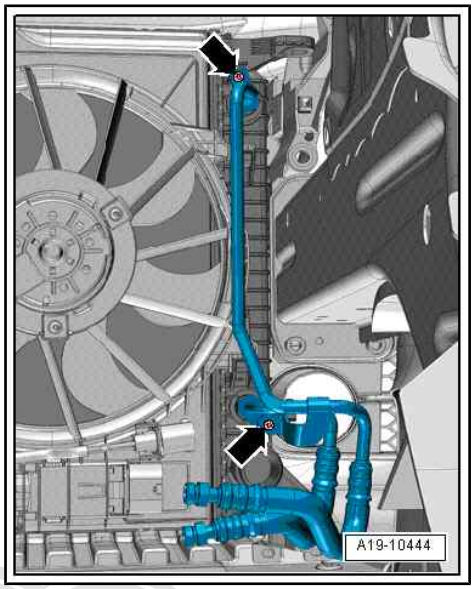
- ***Unplug electrical connectors before starting to work in the area of radiator cowl.***



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

Vehicles with dual clutch gearbox 0B5:

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



Note

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

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

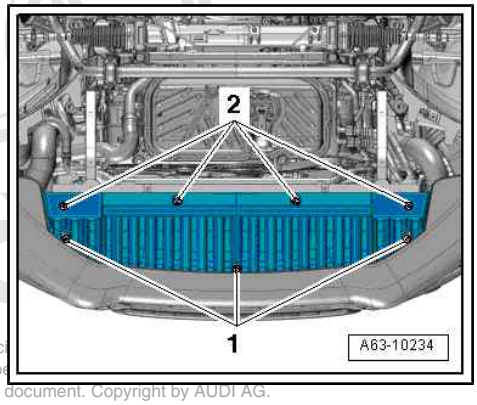
Note

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

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

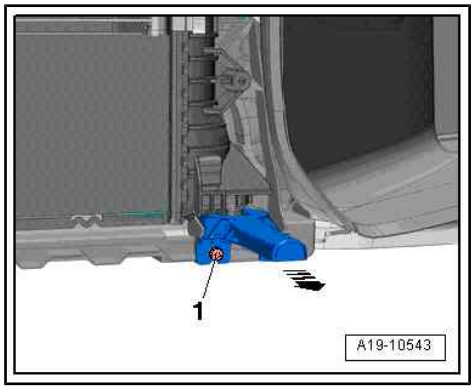
All vehicles (continued):

– Remove closure plate at bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover



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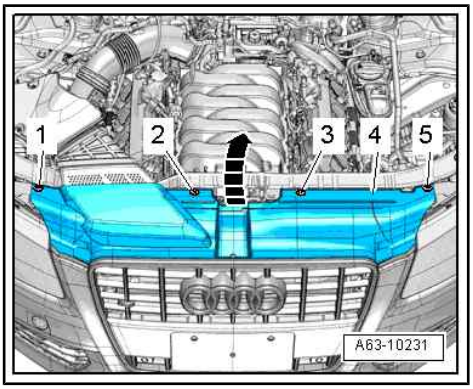
– Remove bolts -1- on both sides.



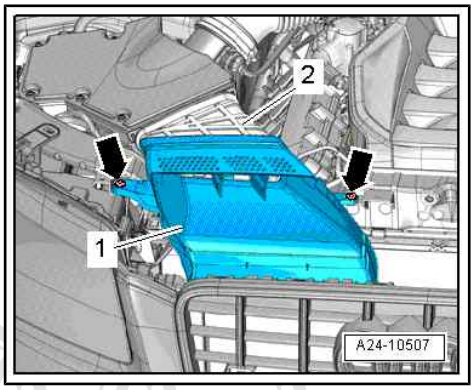
Note

Disregard -arrow-.

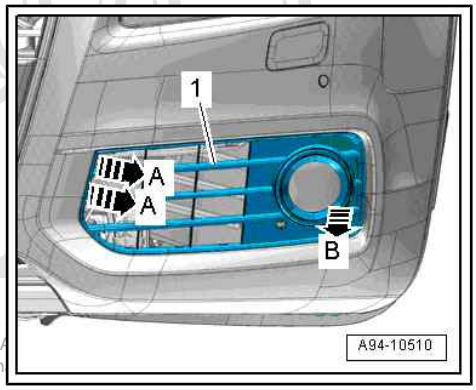
– Remove lock carrier cover -4- ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .



– Remove bolts -arrows-.
– Detach air duct -1- from intermediate flange -2- for air cleaner housing.

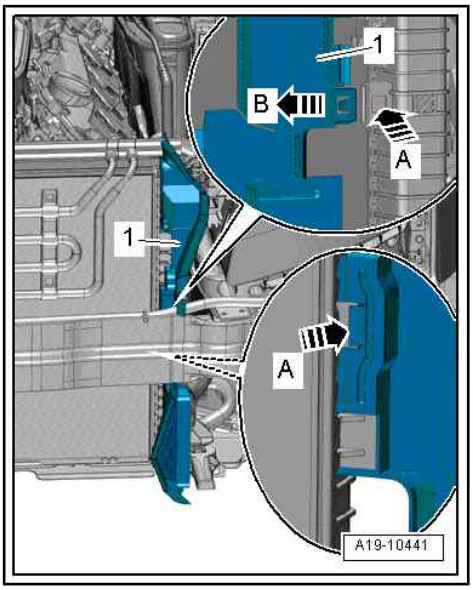


– Remove air intake grille -1- on both sides ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .

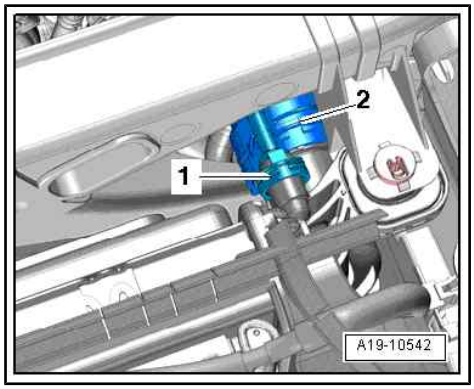


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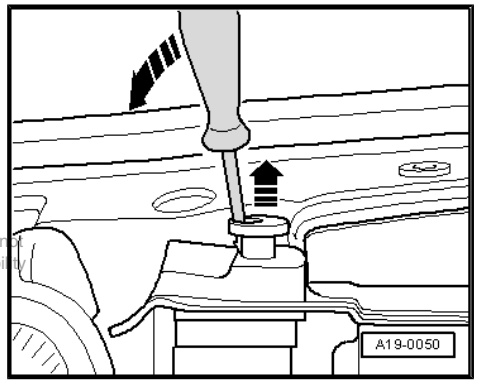
– Release catches -arrows A- and swivel air duct -1- on left and right to centre of vehicle -arrow B-.



– Lift retaining clips -1- and -2- and detach connection from radiator.

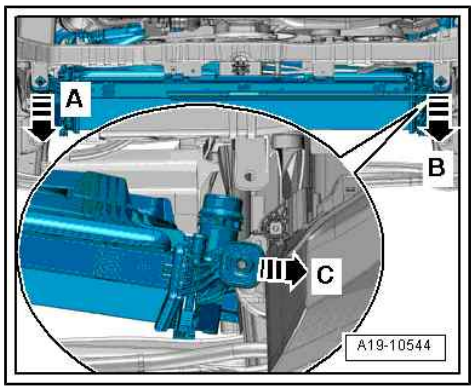


– Release retaining pins for radiator on both sides and pull out upwards -arrows-.

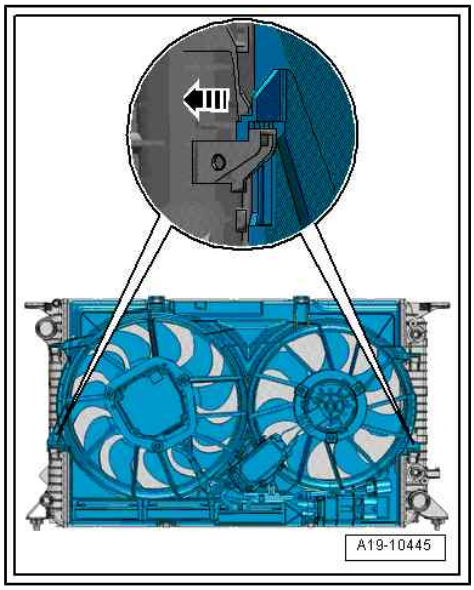


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– Move left side of radiator to front -arrow B-, then press to left -arrow C- and then move forward on right side -arrow A-.



– Press locking tabs on left and right sides of radiator cowl -arrow- and at the same time lift radiator cowl off radiator.



Installing

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

- Tightening torques ⇒ “4.1 Exploded view - radiator/radiator fans”, page 278

Note

Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .

– Vehicles with dual clutch gearbox 0B5: Secure ATF lines ⇒ Rep. gr. 34 ; ATF circuit; Removing and installing ATF lines .

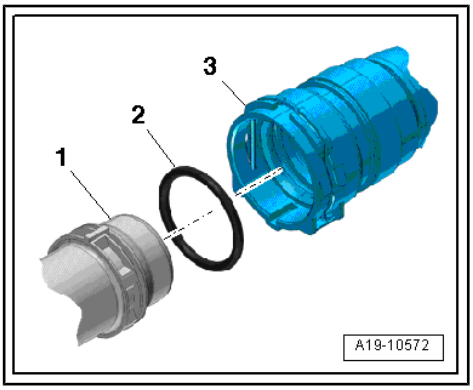
– Attach air duct to intermediate flange for air cleaner housing ⇒ page 342 .

– Install lock carrier cover and closure plate at bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .

– Attach connection with plug-in connector ⇒ page 281 .

– Fill up with coolant ⇒ page 249 .

– Vehicles with dual clutch gearbox 0B5: Check ATF level ⇒ Rep. gr. 34 ; ATF; Checking ATF level .

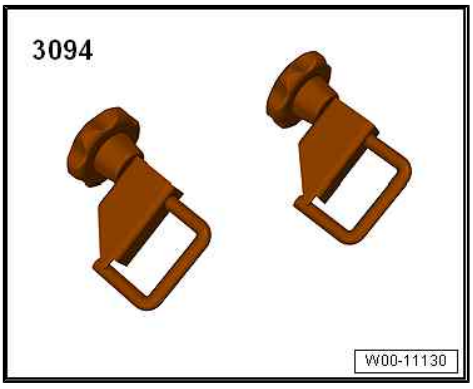


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4.4 Removing and installing water radiator for charge air cooling circuit (front)

Special tools and workshop equipment required

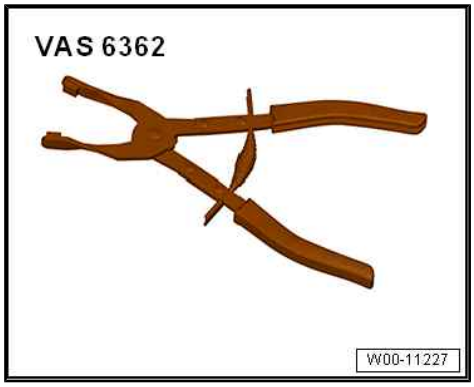
♦ Hose clamps, up to 25 mm - 3094-



♦ Drip tray for workshop hoist - VAS 6208-

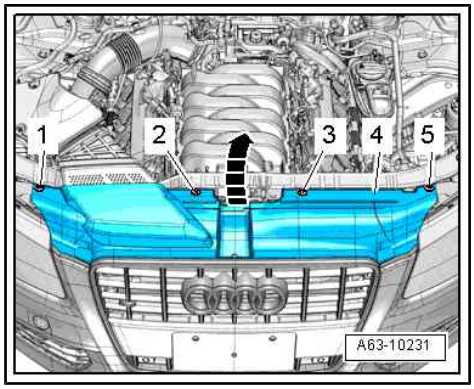


♦ Hose clip pliers - VAS 6362-



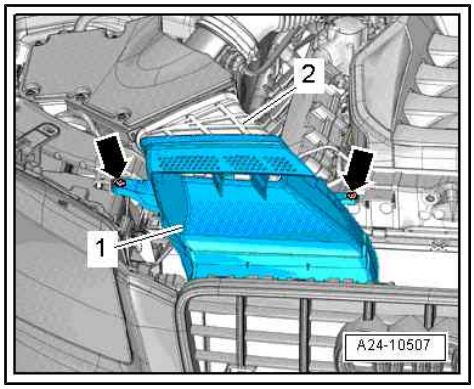
Removing

– Remove lock carrier cover -4- ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .

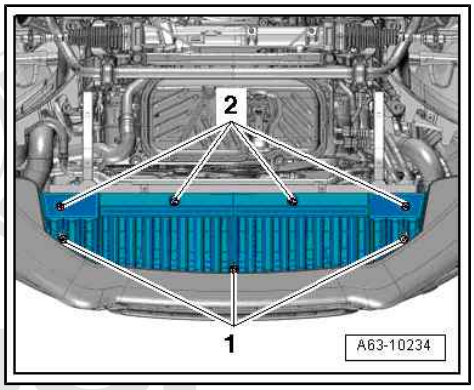


– Remove bolts -arrows-.

– Detach air duct -1- from intermediate flange -2- for air cleaner housing.

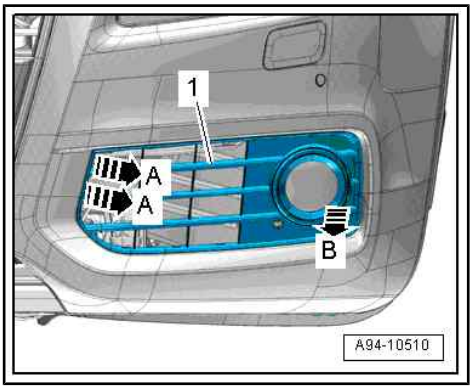


– Remove closure plate at bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover



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– Remove air intake grille -1- on both sides ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .



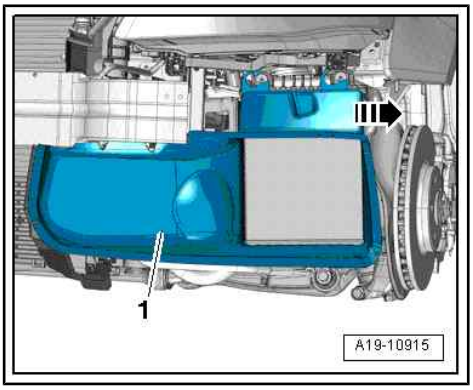
Applies to vehicles with water radiator for charge air cooling circuit on left side of vehicle (depends on country):

– Remove bumper cover (front) ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .

– Remove front left wheel.

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

– Detach air duct -1- -arrow-.



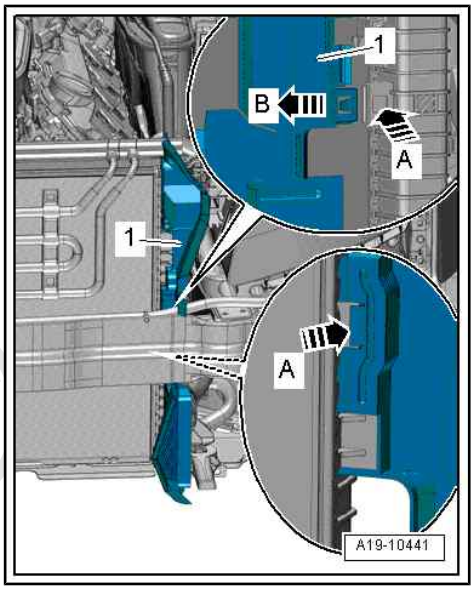
All vehicles (continued):

Note

For illustration purposes, the installation position is shown in the following illustrations with the bumper removed.

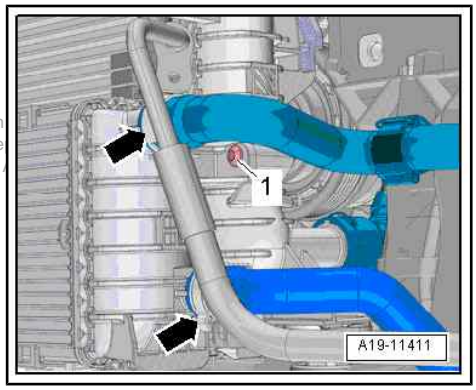
– Release catches -arrows A- and swivel air duct -1- on left and right to centre of vehicle -arrow B-.

– Place drip tray for workshop hoist - VAS 6208- beneath water radiator (front) for charge air cooling circuit.



Vehicles with water radiator (front) for charge air cooling circuit (version 2):

– Clamp off coolant hoses using hose clamps up to 25 mm - 3094- , release hose clips -arrows- and disconnect hoses.

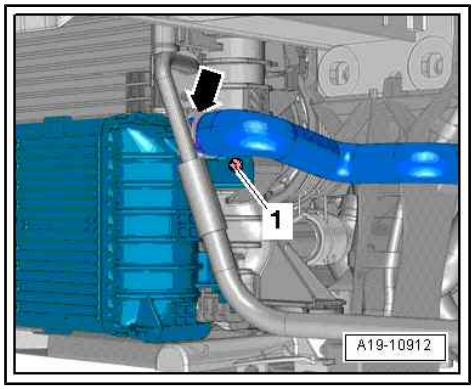


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Vehicles with water radiator (front) for charge air cooling circuit (version 1):

– Clamp off coolant hose using hose clamp up to 25 mm - 3094- , release hose clip -arrow- and disconnect hose.

– Remove bolt -1-.

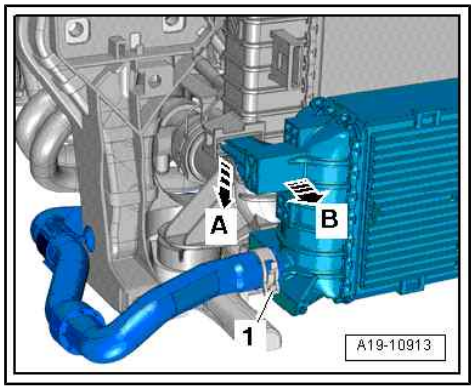


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– Clamp off coolant hose using hose clamp up to 25 mm - 3094- , release hose clip -1- and disconnect hose.

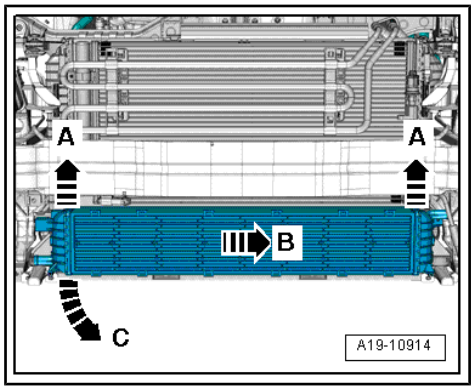
All vehicles (continued):

– Push catch down -arrow A- and move water radiator (front) for charge air cooling circuit slightly in direction of -arrow B-.



– Lift water radiator (front) for charge air cooling circuit off radiator -arrows A- and swivel in direction of -arrow B-.

– Detach water radiator (front) for charge air cooling circuit from right side downwards -arrow C-.



Installing

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

- Tightening torque ⇒ “4.1 Exploded view - radiator/radiator fans”, page 278

Note

Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .

– Install closure plate at bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .

– Attach air duct to intermediate flange for air cleaner housing ⇒ page 342 .

– Install lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .

– Fill up with coolant ⇒ page 243 .

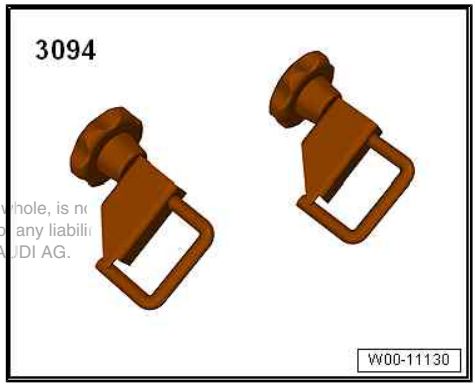
Note

The coolant in the entire system must be changed if the radiator is renewed.

4.5 Removing and installing water radiator for charge air cooling circuit (left-side)

Special tools and workshop equipment required

- Hose clamps, up to 25 mm - 3094-



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- Drip tray for workshop hoist - VAS 6208-



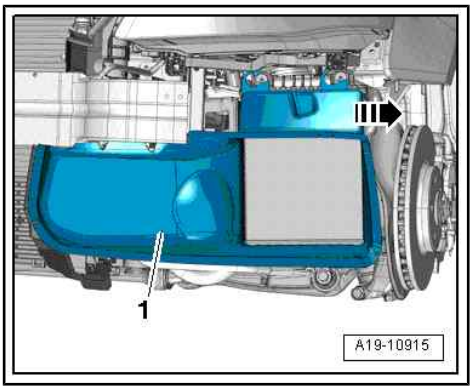
Removing

– Remove bumper cover (front) ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .

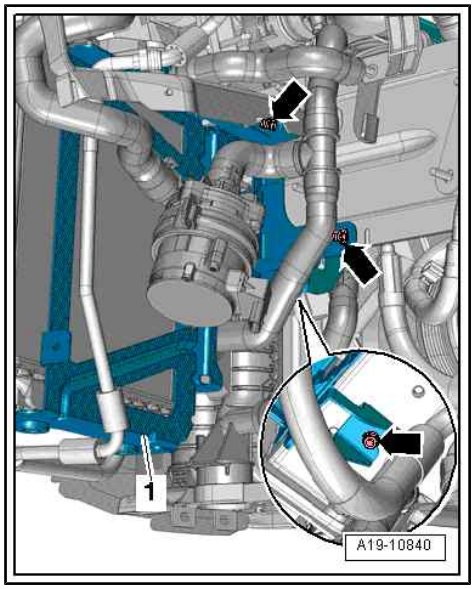
– Remove front left wheel.

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

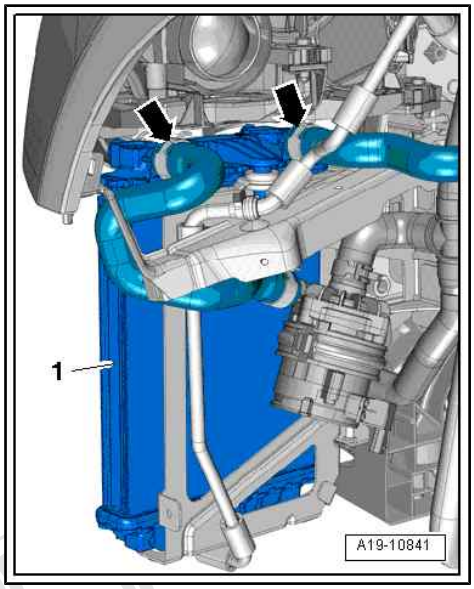
– Detach air duct -1- -arrow-.



– Unscrew nuts -arrows- and lower bracket -1- with water radiator (left-side) for charge air cooling circuit slightly.



– Place drip tray for workshop hoist - VAS 6208- beneath water radiator (left-side) for charge air cooling circuit.
– Clamp off coolant hoses using hose clamps up to 25 mm - 3094- , release hose clips -arrows- and disconnect hoses.
– Lift water radiator (left-side) -1- for charge air cooling circuit off bracket.



Installing

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

- Tightening torques ⇒ “4.1 Exploded view - radiator/radiator fans”, page 278

Note

Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .

– Install front wheel housing liner ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front) .
– Fit front wheel ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres; Tightening torque for wheel bolts .
– Install bumper cover (front) ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .
– Fill up with coolant ⇒ page 243 .

Note

The coolant in the entire system must be changed if the radiator is renewed.

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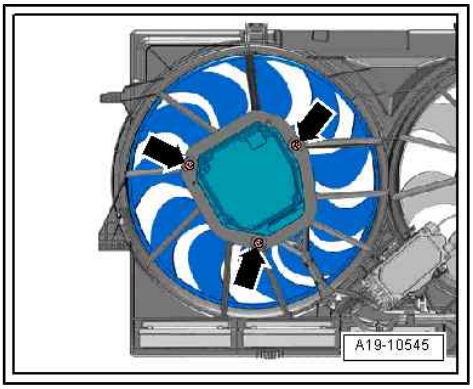
4.6 Removing and installing radiator fans

⇒ “4.6.1 Removing and installing radiator fans V7 / V177 - version 1”, page 299

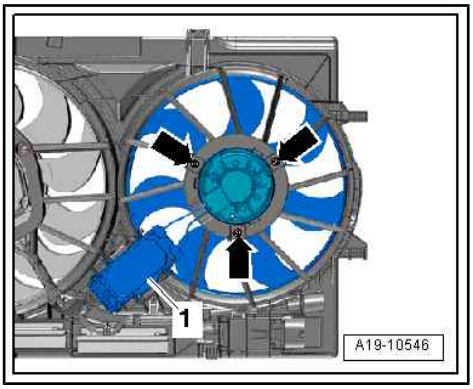
⇒ “4.6.2 Removing and installing radiator fans V7 / V177 - version 2”, page 299

4.6.1 Removing and installing radiator fans - V7- / -V177- - version 1

Removing



– Remove radiator with radiator cowl ⇒ page 281 .
– Remove bolts -arrows- on radiator fan - V7- (left-side).
– Move electrical wiring harness clear and detach radiator fan.



– Remove bolts -arrows- on radiator fan 2 - V177- (right-side).
– Move electrical wiring harness clear.
– Unclip radiator fan control unit -1- from radiator cowl and detach radiator fan with control unit.

Installing

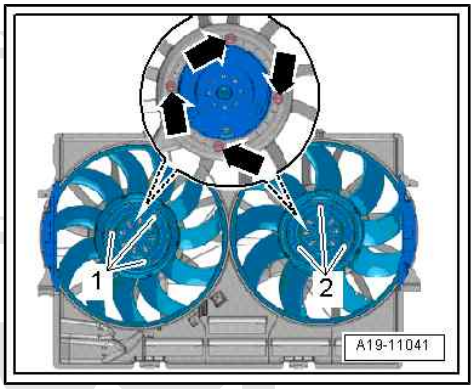
Installation is carried out in the reverse order; note the following:

- Tightening torques ⇒ “4.1 Exploded view - radiator/radiator fans”, page 278

– Install radiator with radiator cowl ⇒ page 281 .

4.6.2 Removing and installing radiator fans - V7- / -V177- - version 2

Removing



Note

Fit all cable ties in the original positions when installing.

– Remove radiator cowl:
♦ Audi A4 ⇒ page 281 .
♦ Audi A5 ⇒ page 288 .
– Remove bolts -1- or -2- and detach corresponding fan wheel.
– Remove bolts -arrows- on radiator fan.
– Move electrical wiring harness clear and detach radiator fan.

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Installing

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

- Tightening torques ⇒ “4.1 Exploded view - radiator/radiator fans”, page 278

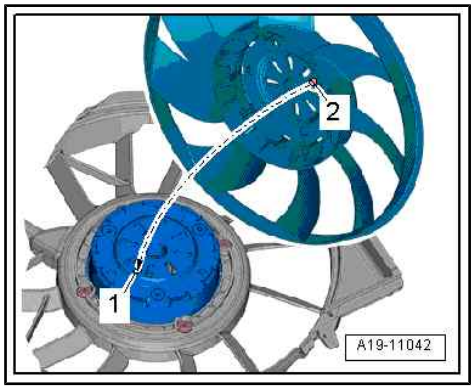
– Note installation position of fan wheel:

• Pin -2- must engage in hole -1-.

– Install radiator cowl:

◆ Audi A4 ⇒ page 281 .

◆ Audi A5 ⇒ page 288 .



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21 – Turbocharging/supercharging

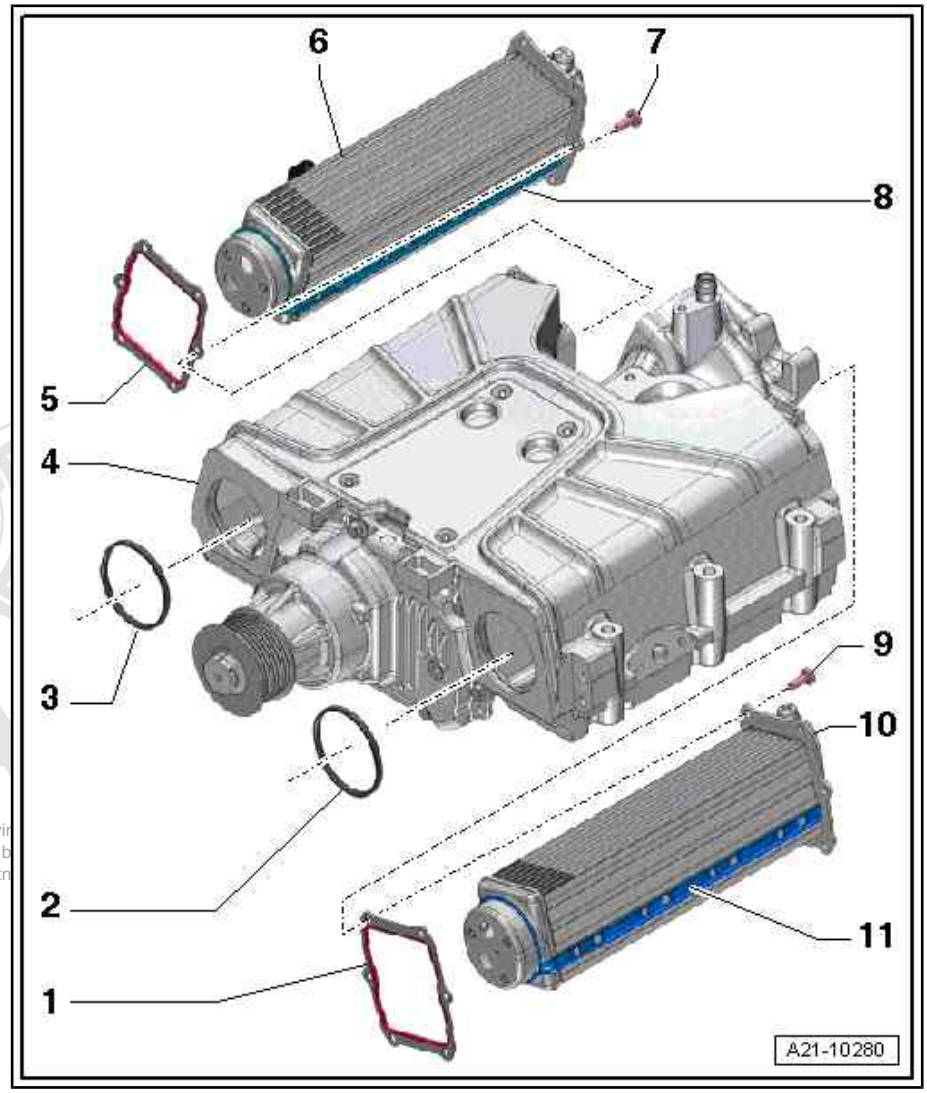
1 Charge air system

⇒ “1.1 Exploded view - charge air system”, page 301

⇒ “1.2 Removing and installing charge air cooler”, page 302

⇒ “1.3 Removing and installing charge pressure sender”, page 305

1.1 Exploded view - charge air system



1 - Gasket
- ❑ Renew

2 - O-ring
- ❑ Renew
- ❑ Coat with engine oil when installing charge air cooler

3 - O-ring
- ❑ Renew
- ❑ Coat with engine oil when installing charge air cooler

4 - Supercharger housing

5 - Gasket
- ❑ Renew

6 - Charge air cooler (right-side)
- ❑ Removing and installing ⇒ “1.2 Removing and installing charge air cooler”, page 302

7 - Bolt
- ❑ Self-locking
- ❑ Renew
- ❑ 10 Nm

8 - Seal
- ❑ Not supplied separately
- ❑ Must not be detached from charge air cooler
- ❑ Coat with engine oil when installing charge air cooler

9 - Bolt
- ❑ Self-locking
- ❑ Renew
- ❑ 10 Nm

10 - Charge air cooler (left-side)
- ❑ Removing and installing ⇒ “1.2 Removing and installing charge air cooler”, page 302

11 - Seal

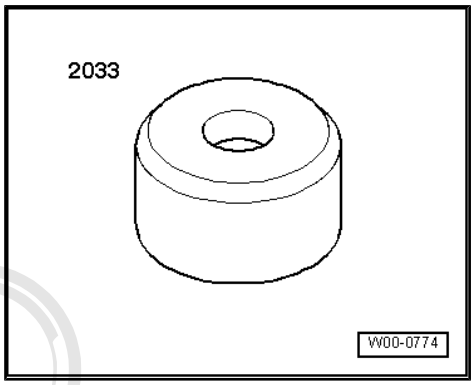
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- ❑ Not supplied separately
- ❑ Must not be detached from charge air cooler
- ❑ Coat with engine oil when installing charge air cooler

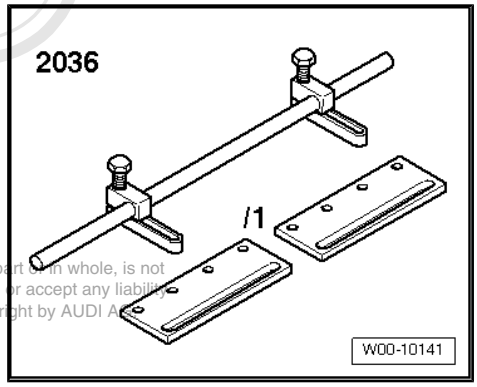
1.2 Removing and installing charge air cooler

Special tools and workshop equipment required

- ♦ Fitting sleeve - 2033-



- ♦ Assembly device for valves - 2036-



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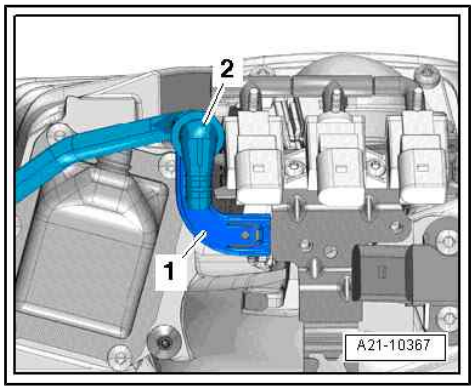
- ♦ Tyre lever for aluminium rims - V.A.G 1942-

Removing

- Supercharger secured to engine and gearbox support - VAS 6095- for assembly work ⇒ page 320 .

Charge air cooler (left-side):

– Unclip bracket -1- for vacuum hose.



Note

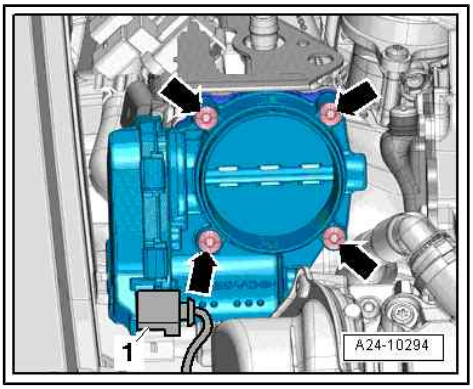
Disregard -item 2-.

– Remove charge pressure sender 2 - G447- ⇒ page 305 .

Charge air cooler (right-side):

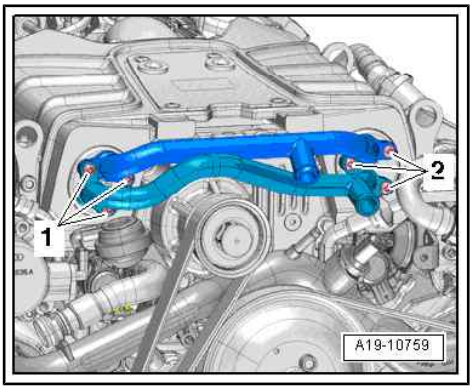
– Remove throttle valve module - J338- ⇒ page 350 .

– Remove charge pressure sender - G31- ⇒ page 305 .

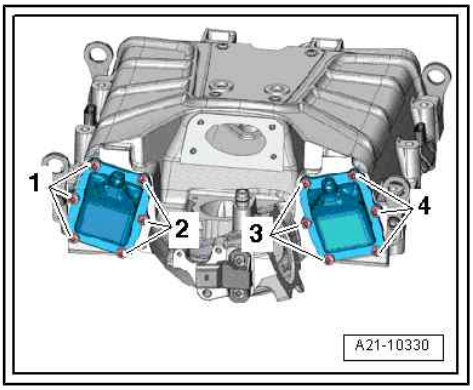


Both sides (continued):

– Remove bolts -1- and -2- and detach coolant pipes from supercharger.



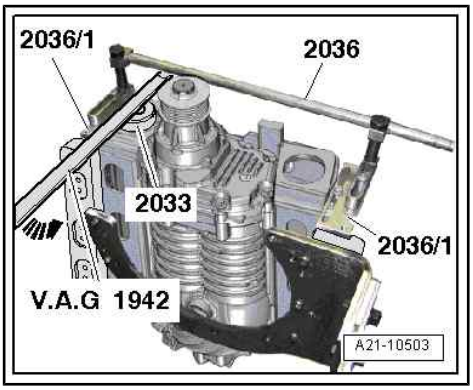
– Remove bolts -1, 2- for charge air cooler (left-side) and bolts -3, 4- for charge air cooler (right-side).



– Attach valve assembly device - 2036- with -2036/1- to supercharger, as shown in illustration.

– Apply fitting sleeve - 2033- at front of charge air cooler.

– Using tyre lever - V.A.G 1942- , apply moderate pressure and slowly press charge air cooler out of supercharger housing.



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Installing

- Tightening torques ⇒ “1.1 Exploded view - charge air system”, page 301

Note

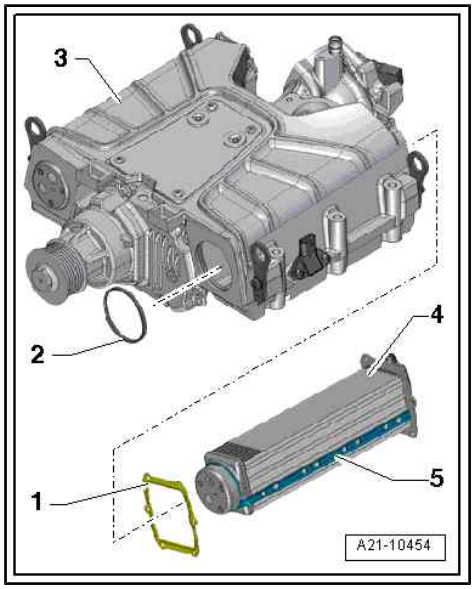
- ♦ *Renew seals, gaskets, O-rings and self-locking bolts.*
- ♦ *Before assembly, always remove residues from threaded holes in supercharger housing using a thread tap.*

– Check gasket -5- on charge air cooler -4-.

- The gasket must not be cracked or damaged.

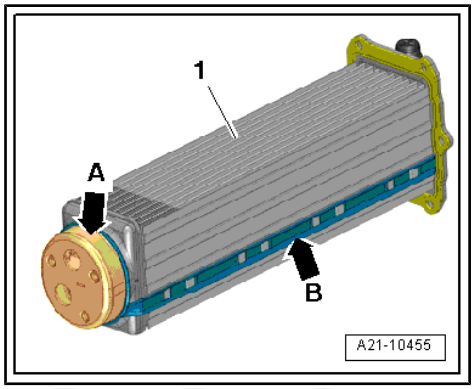
– Slide gasket -1- onto charge air cooler.

– Insert O-ring -2- into opening in supercharger housing -3-.

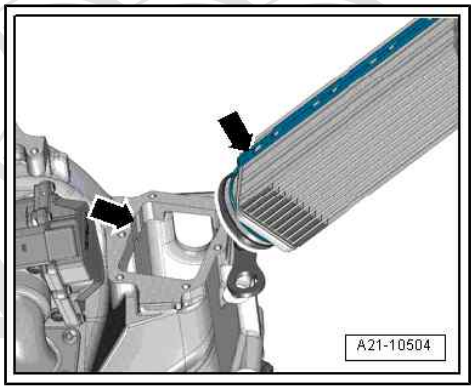


– Coat sealing surface -arrow A- and gasket -arrow B- of charge air cooler -1- with engine oil.

– Also coat sealing surface inside supercharger housing with engine oil.



– When fitting charge air cooler, make sure that seals align with recesses in supercharger housing -arrows-.



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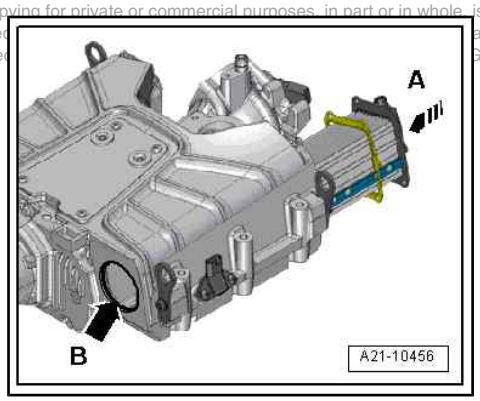
Note

To make it easier to insert and press in the charge air cooler, position the supercharger housing vertically in engine and gear-box support - VAS 6095- .

Caution

Risk of damage to charge air cooler.

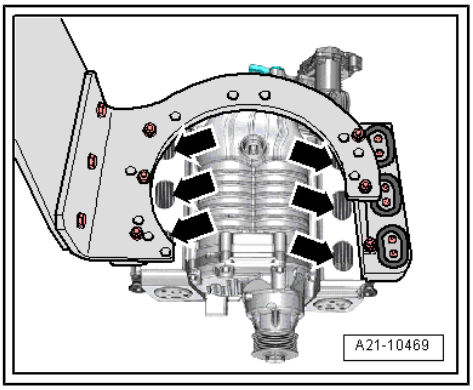
- ♦ ***Only insert charge air cooler by hand.***



– Insert charge air cooler in supercharger housing -arrow A- by hand as far as stop, letting charge air cooler slide into hole -arrow B- in front of supercharger housing.

– If necessary, guide charge air cooler by hand via openings -arrows- in supercharger housing when inserting cooler.

– As soon as possible (due to length of bolts), screw in 2 bolts loosely by hand to guide charge air cooler additionally.

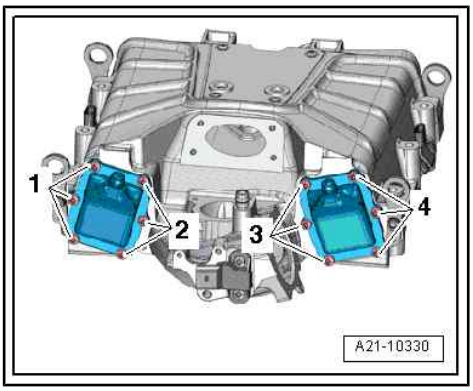


Caution

Risk of damage to charge air cooler.

- ***The charge air cooler must not be pulled in by screwing in the securing bolts.***
- ***Insert charge air cooler by hand (without using tools) until sealing flange with gasket makes contact with supercharger housing (maximum: 1 mm distance). Only then tighten bolts, as described in the following.***

– Tighten bolts -1, 2- for charge air cooler (left-side) and bolts -3, 4- for charge air cooler (right-side) in diagonal sequence and in small steps.



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

– Install coolant pipes on supercharger ⇒ page 274 .

– Install throttle valve module - J338- ⇒ page 350 .

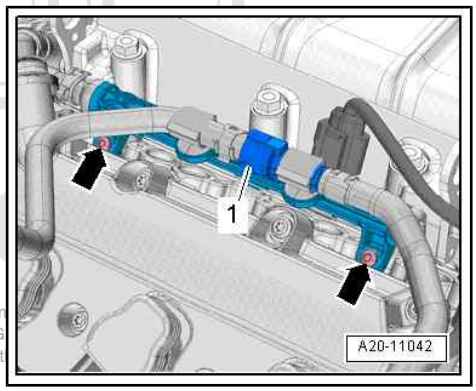
– Check supercharger for leaks ⇒ page 314 .

1.3 Removing and installing charge pressure sender

Removing

Cylinder bank 1 (right-side) (version 2):

– Remove bolts -arrows- and move bracket with fuel hose -1- clear to one side.

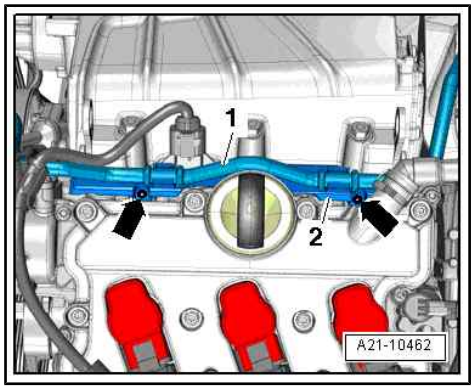


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Cylinder bank 2 (left-side):

– Move clear vacuum hose -1-.

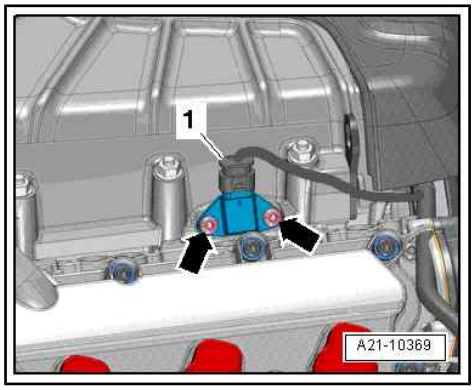
– Remove bolts -arrows- and detach cover -2-.



Both sides (continued):

– Unplug electrical connector -1-.

– Unscrew bolts -arrows- and remove charge pressure sender.



Installing

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

- Tightening torques ⇒ “2.1 Exploded view - supercharger”, page 307

Note

- *Renew self-locking bolts and O-ring.*
- *Before assembly, always remove residues from threaded holes for charge pressure senders in supercharger housing using a thread tap.*

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2 Supercharger

⇒ “2.1 Exploded view - supercharger”, page 307

⇒ “2.2 Exploded view - drive unit”, page 309

⇒ “2.3 Removing and installing supercharger”, page 310

⇒ “2.4 Checking supercharger for leaks”, page 314

⇒ “2.5 Removing and installing drive unit and damper spring”, page 316

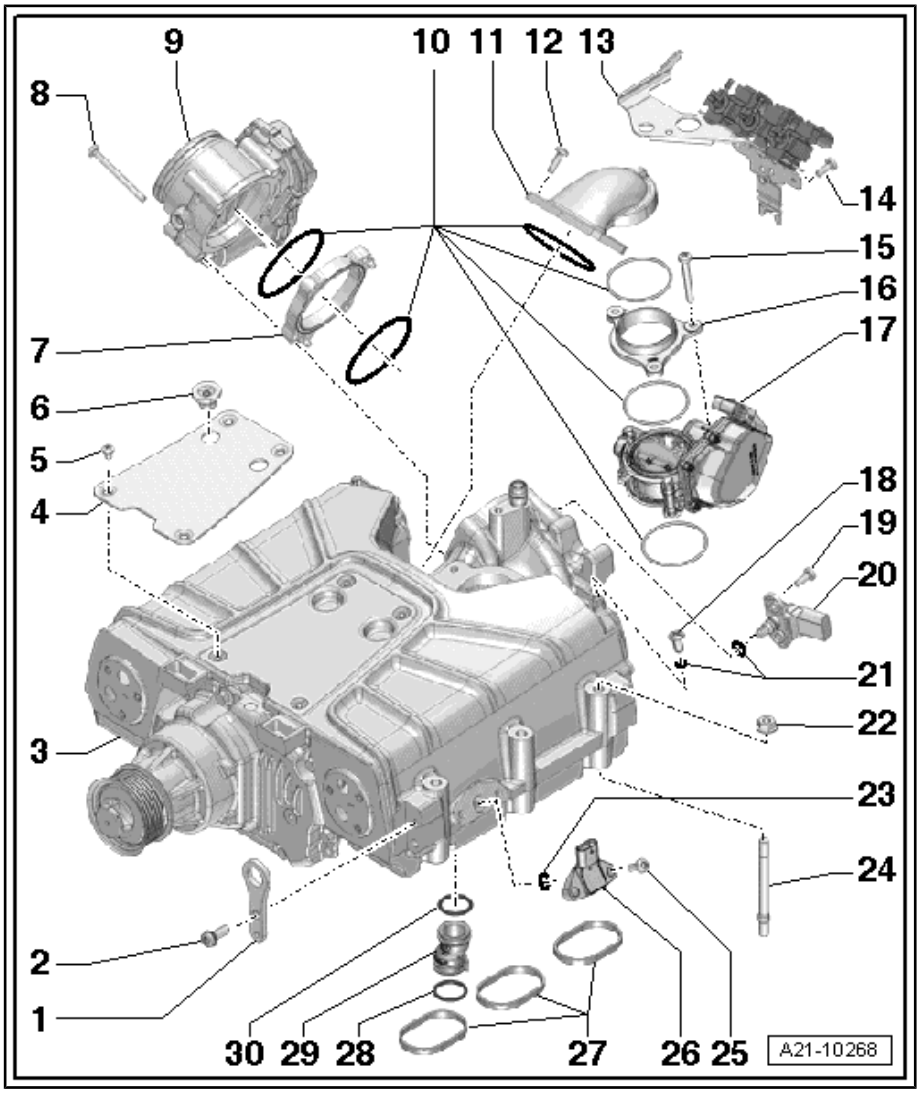
⇒ “2.6 Securing supercharger to engine and gearbox support for leak test”, page 318

⇒ “2.7 Securing supercharger to engine and gearbox support”, page 320

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2.1 Exploded view - supercharger



1 - Engine lifting eye

2 - Bolt

- ❑ 27 Nm

3 - Supercharger

- ❑ With charge air coolers
- ❑ Removing and installing supercharger ⇒ “2.3 Removing and installing supercharger”, page 310
- ❑ Exploded view - charge air coolers ⇒ “1.1 Exploded view - charge air system”, page 301
- ❑ Secure to engine and gearbox support - VAS 6095- when performing assembly work ⇒ “2.7 Securing supercharger to engine and gearbox support”, page 320
- ❑ Secure to engine and gearbox support - VAS 6095- when checking for leaks ⇒ “2.6 Securing supercharger to engine and gearbox support for leak test”, page 318

4 - Insulating plate

5 - Bolt

- ❑ 5 Nm

6 - Rubber grommet

- ❑ 2x

7 - Intermediate flange

8 - Bolt

- ❑ Tightening torque ⇒ “4.3 Removing and installing throttle valve module J338 ”, page 350

9 - Throttle valve module - J338-

- ❑ Removing and installing ⇒ “4.3 Removing and installing throttle valve module J338 ”, page 350

10 - O-rings

- ❑ Renew

11 - Connection

12 - Bolt

- ❑ Tightening torque and sequence ⇒ “4.4 Removing and installing regulating flap control unit J808 ”, page 351

13 - Bracket

- ❑ For change-over valves

14 - Bolt

- ❑ 9 Nm

15 - Bolt

- ❑ Tightening torque and sequence ⇒ “4.4 Removing and installing regulating flap control unit J808 ”, page 351

16 - Intermediate flange

17 - Regulating flap control unit - J808-

- ❑ Removing and installing ⇒ “4.4 Removing and installing regulating flap control unit J808 ”, page 351

18 - Bleeder screw

- ❑ For charge air cooler (left-side)
- ❑ 1.5 … 3.0 Nm

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19 - Bolt

- ❑ Tightening torque ⇒ Fig. ““Fitting location at rear of engine”“ , page 327

20 - Intake air temperature sender - G42-

- ❑ Removing and installing ⇒ Fig. ““Fitting location at rear of engine”“ , page 327

21 - O-rings

- ❑ Renew

22 - Nut

- ❑ 20 Nm

23 - O-ring

- ❑ Renew

24 - Threaded pin

- ❑ 17 Nm

25 - Bolt

- ❑ Self-locking
- ❑ Renew
- ❑ Before assembly, always remove residues from threaded holes using a thread tap.
- ❑ 10 Nm

26 - Charge pressure sender

- ❑ Cylinder bank 1 (right-side): charge pressure sender - G31-
- ❑ Cylinder bank 2 (left-side): charge pressure sender 2 - G447-
- ❑ Removing and installing ⇒ “1.3 Removing and installing charge pressure sender”, page 305

27 - Seals

- ❑ Renew

28 - O-ring

- ❑ 2x on USA versions

❑ Renew

29 - Connection

❑ For crankcase breather

❑ Installation position ⇒ Fig. ""Installing connection for crankcase breather"", page 222

30 - O-ring

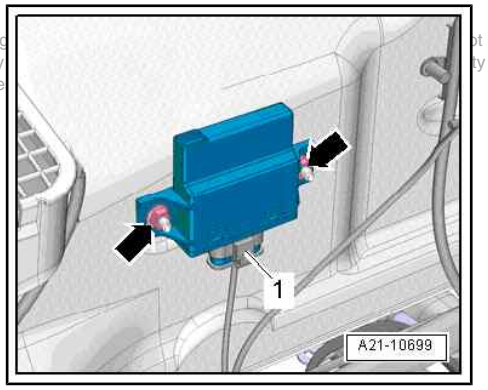
❑ 2x on USA versions

❑ Renew

Control unit for structure-borne sound - J869- - tightening torque

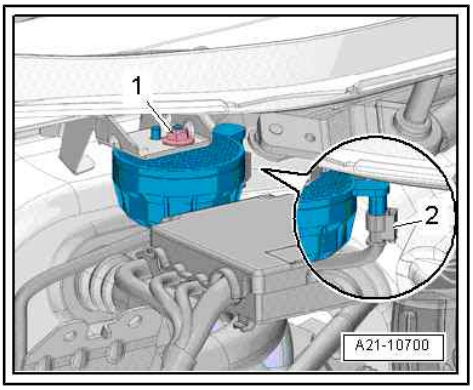
– Tighten nuts -arrows- to 5 Nm.

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Actuator for structure-borne sound - R214- - tightening torque

– Tighten nut -1- to 5 Nm.



2.2 Exploded view - drive unit

1 - Bolt

- ❑ Self-locking
- ❑ Renew
- ❑ Before assembly, always remove residues from threaded holes using a thread tap.
- ❑ 25 Nm

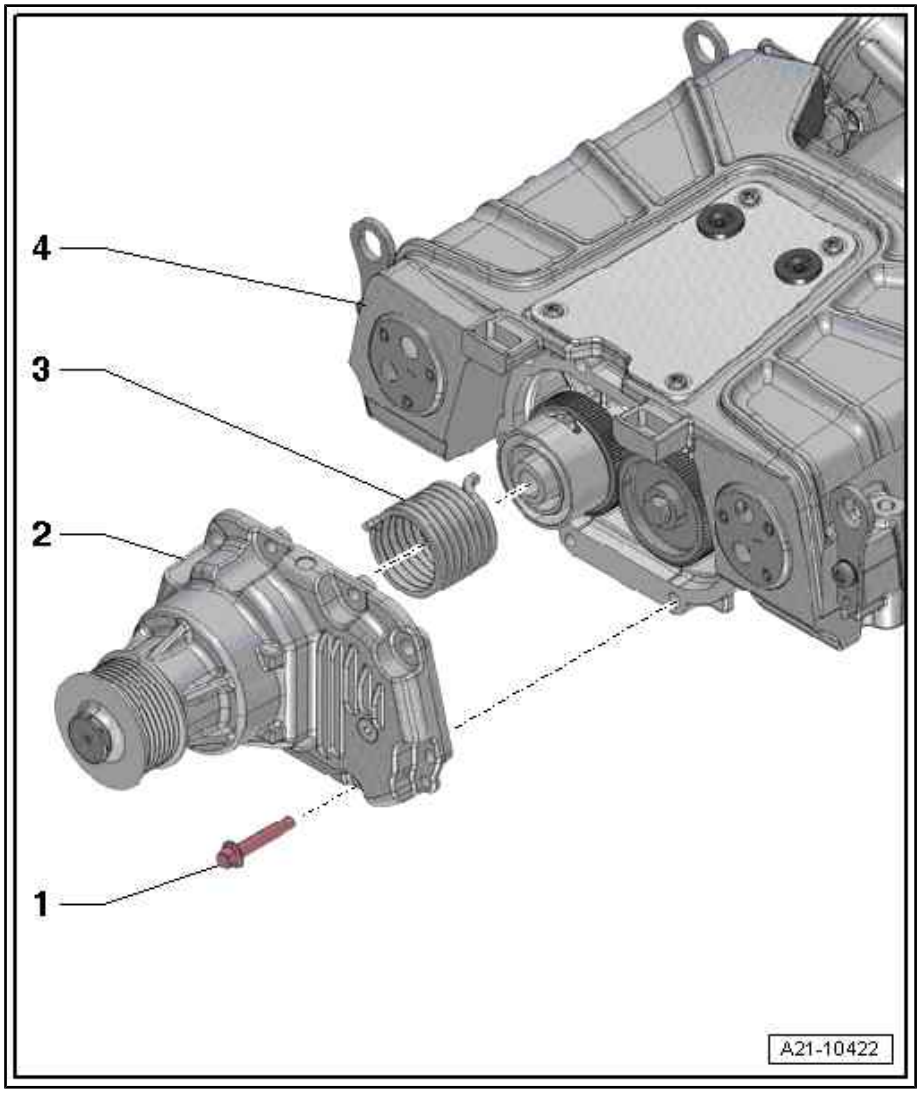
2 - Drive unit

- ❑ Removing and installing ⇒ “2.5 Removing and installing drive unit and damper spring”, page 316

3 - Damper spring

- ❑ Removing and installing ⇒ “2.5 Removing and installing drive unit and damper spring”, page 316

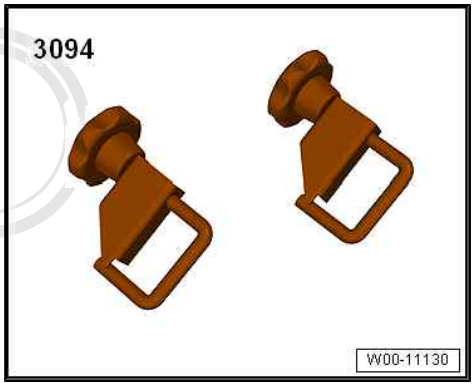
4 - Supercharger housing



2.3 Removing and installing supercharger

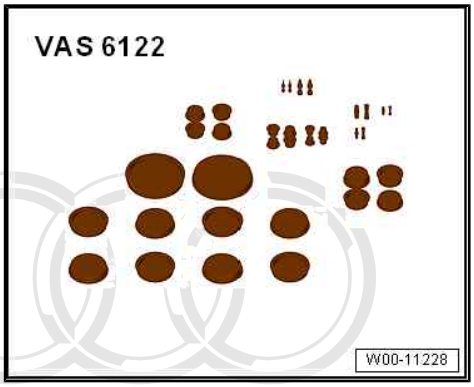
Special tools and workshop equipment required

- ♦ Hose clamps, up to 25 mm - 3094-



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♦ Engine bung set - VAS 6122-

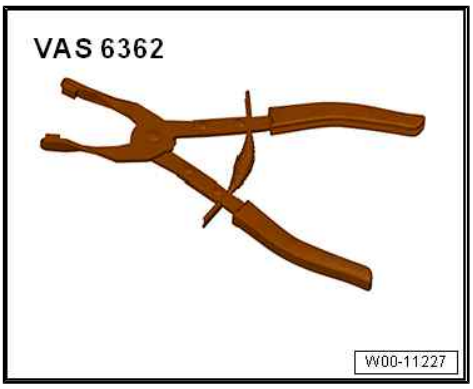


♦ Drip tray for workshop hoist - VAS 6208-



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♦ Hose clip pliers - VAS 6362-

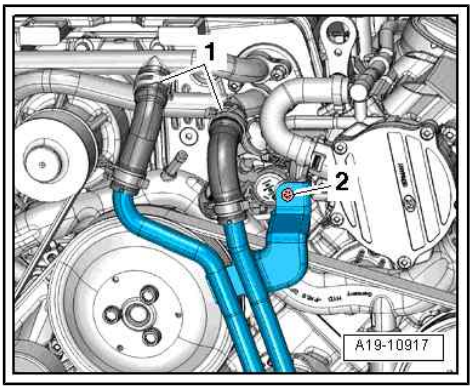


Removing

– Remove poly V-belt for supercharger ⇒ page 94 .

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

– Clamp off coolant hoses using hose clamps, up to 25 mm - 3094- , release hose clips -1- and disconnect coolant hoses from coolant pipes at supercharger.

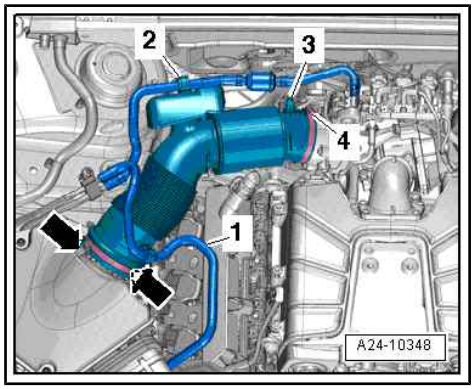


Note

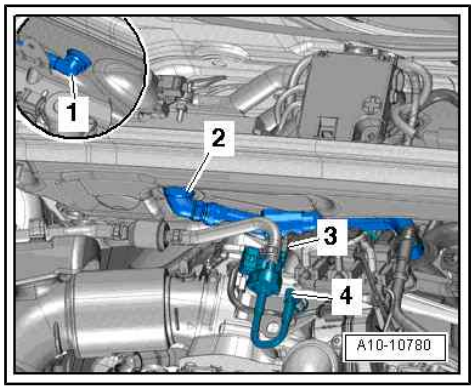
♦ *For illustration purposes, the installation position is shown with the engine removed.*

♦ *Disregard -item 2-.*

– Move fuel hose -1- and hose -2- from activated charcoal filter clear at air pipe.
– Detach vacuum hose -3- from connection on air pipe.
– Remove air pipe. To do so, release hose clip -4- and clamps -arrows-.



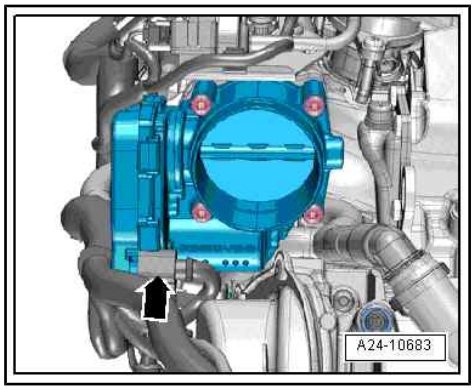
– Unplug electrical connector -3- at activated charcoal filter solenoid valve 1 - N80- and detach vacuum hose -4- (press release tabs).
– Detach activated charcoal filter solenoid valve 1 - N80- from bracket and move it clear to the side with hose still attached.



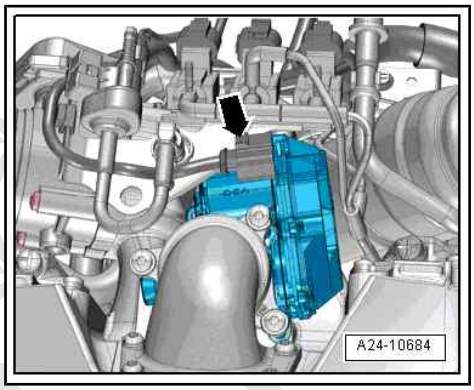
Note

Disregard -items 1, 2-.

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

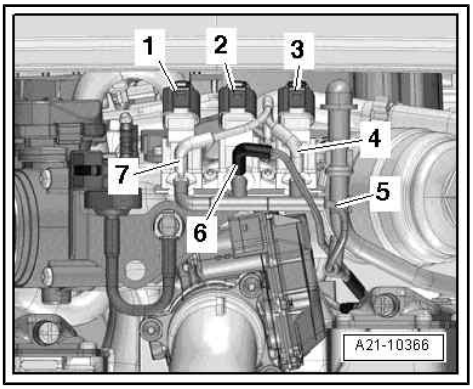


– Unplug electrical connector -arrow- at regulating flap control unit - J808- .



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– Unplug electrical connectors -1, 2, 3-.

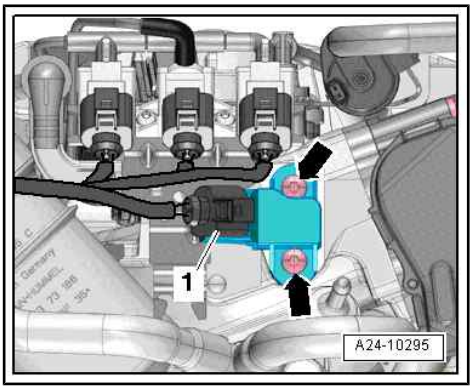


Note

Mark position of vacuum hoses for re-installation.

– Disconnect vacuum hoses -4 ... 7-.

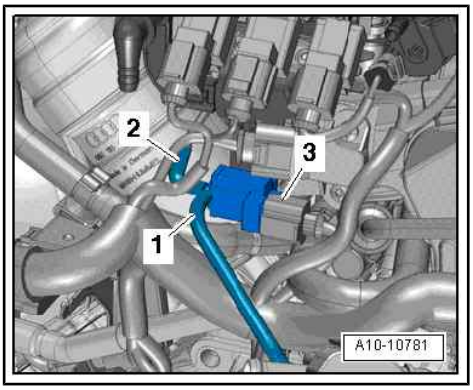
– Unplug electrical connector -1- at intake air temperature sender - G42- / intake manifold pressure sender - G71- .



Note

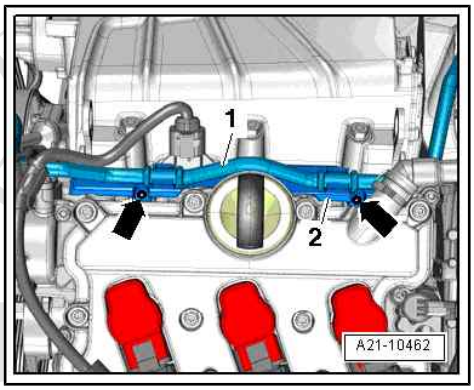
Disregard -arrows-.

– If fitted, unplug electrical connector -3- and disconnect vacuum hoses -1- and -2-.



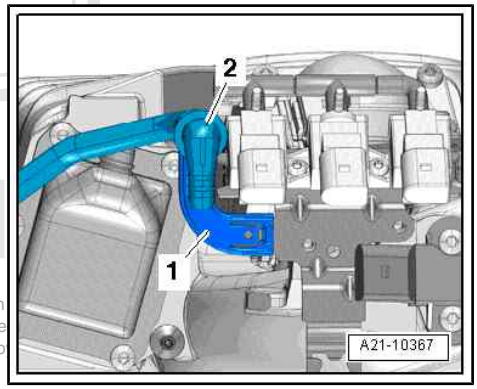
– Move clear vacuum hose -1-.

– Remove bolts -arrows- on both sides and detach cover/bracket -2-.



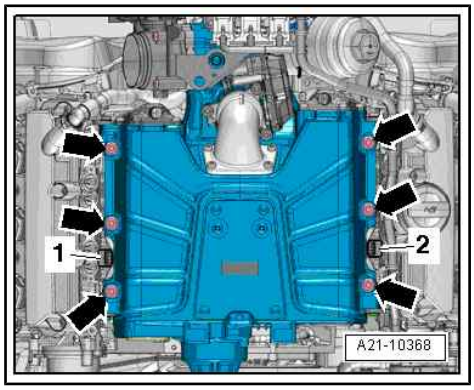
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– Move clear vacuum hose -2- leading to brake servo at bracket -1-.



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– Unplug electrical connectors -1- and -2-.
– Remove nuts -arrows- and lift off supercharger with charge air coolers.
– Seal openings on supercharger and all relevant ducts and hoses of the charge air system with plugs from engine bung set - VAS 6122- .
– Detach noise insulation panels.



Installing

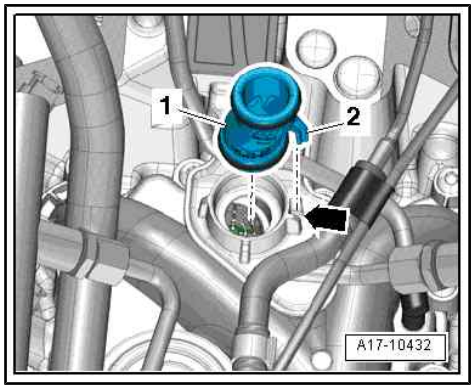
Installation is carried out in the reverse order; note the following:

- Tightening torques ⇒ “2.1 Exploded view - supercharger”, page 307

Note

- *Renew seals and/or gaskets.*
- *Hose connections and air pipes and hoses must be free of oil and grease before assembly.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *To secure the air hoses at their connections, spray rust remover onto the worm thread of the used hose clips before installing.*

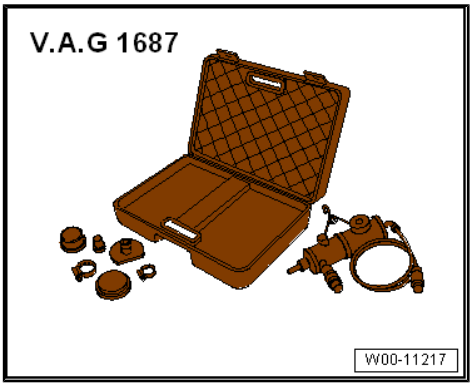
– Ensure that crankcase breather connection is positioned correctly ⇒ page 222 when fitting supercharger.
– Install poly V-belt for supercharger ⇒ page 94 .
– Fill up with coolant ⇒ page 243 .



2.4 Checking supercharger for leaks

Special tools and workshop equipment required

♦ Charge air system tester - V.A.G 1687- with adapters - V.A.G 1687/10- -V.A.G 1687/13-1- , -V.A.G 1687/13-2- and -V.A.G 1687/13-3-

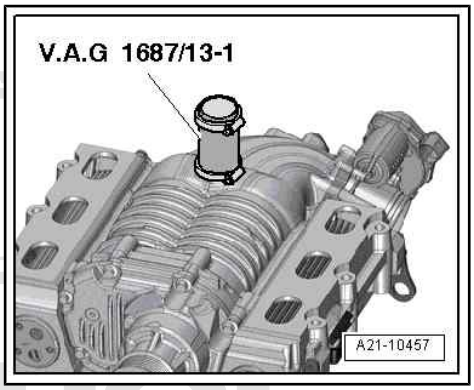


Procedure

- Supercharger secured to engine and gearbox support - VAS 6095- for leak test ⇒ page 320 .
- Regulating flap control unit - J808- installed ⇒ page 351 .

– Secure -V.A.G 1687/13-1- to bottom of supercharger housing.

– Secure hose connections with hose clips.



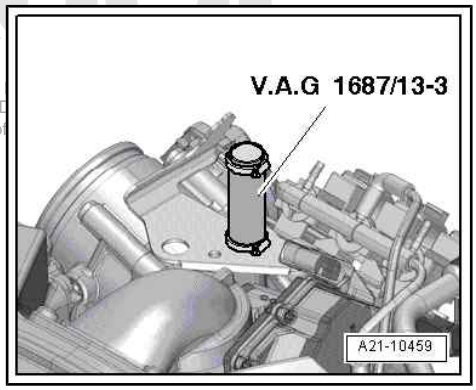
Note

For illustration purposes the supercharger is shown without the gearbox support.

– Secure -V.A.G 1687/13-3- to top of supercharger housing.

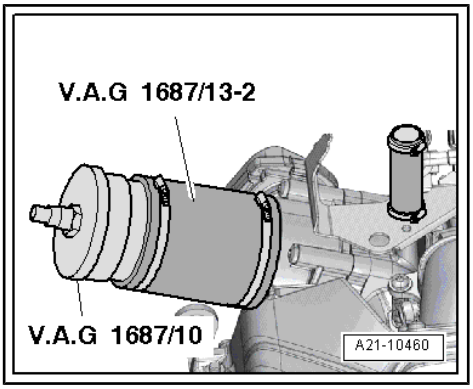
– Secure hose connections with hose clips.

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– Secure -V.A.G 1687/13-2- to supercharger housing with adapter - V.A.G 1687/10- .

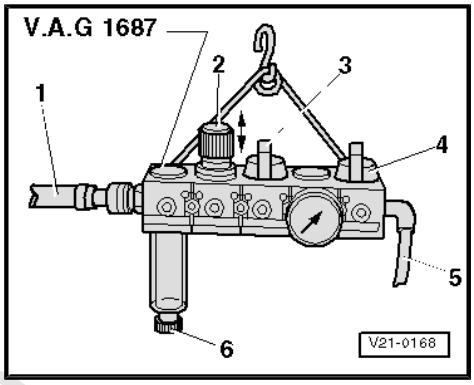
– Secure hose connections with hose clips.



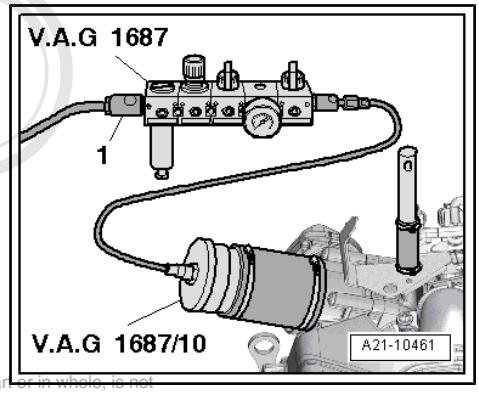
Prepare charge air system tester - V.A.G 1687- as follows:

– Unscrew pressure control valve -2- completely and close valves -3- and -4-.

• Make sure knob is pulled out before turning pressure control valve.



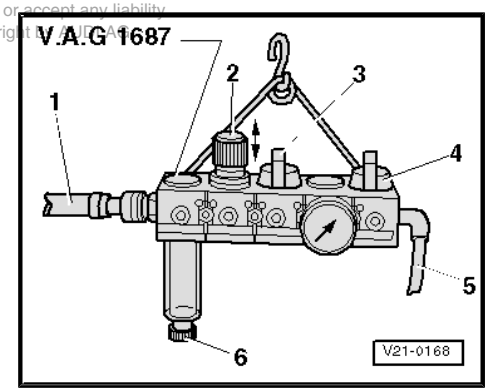
– Connect charge air system tester - V.A.G 1687- as shown in illustration, and connect to compressed air line using a commercially available connection piece -1-.



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– 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.

– Close valve -3-.

• Pressure must not drop by more than 0.1 bar for 30 seconds.

– Check charge air system for audible leaks or leaks that can be felt with the hand; apply commercially available leak detecting spray or use ultrasonic tester - V.A.G 1842- .

Note

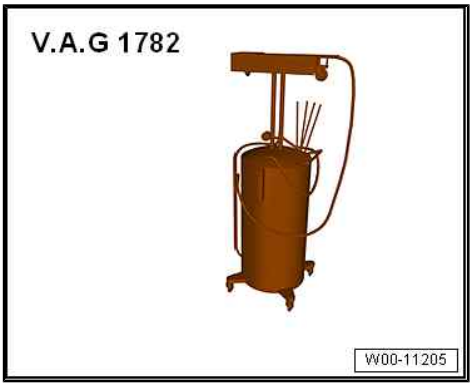
♦ *For operation of ultrasonic tester -V.A.G 1842- , refer to ⇒ Operating instructions .*

♦ *Release pressure in test circuit by detaching hose coupling from adapter before removing adapter.*

2.5 Removing and installing drive unit and damper spring

Special tools and workshop equipment required

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



- Sealant ⇒ Electronic parts catalogue
- Oil for supercharger drive ⇒ Electronic parts catalogue
- Spreader tool (commercially available)

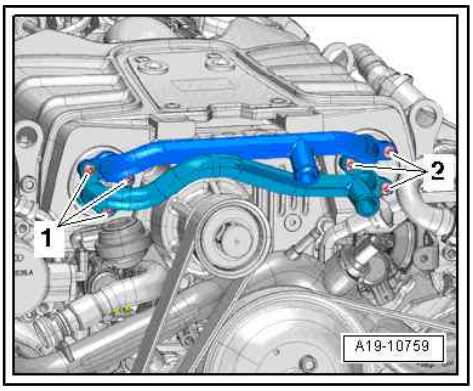
Removing

- Supercharger secured to engine and gearbox support - VAS 6095- ⇒ page 320 .

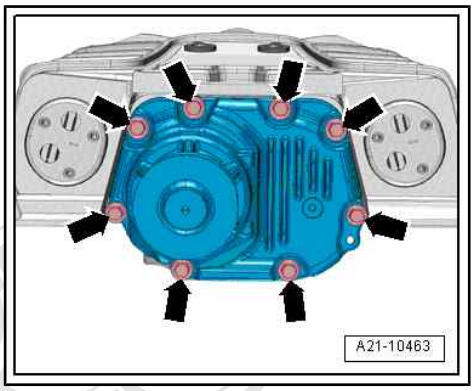
– Detach coolant pipes from supercharger ⇒ page 274 .

– Position supercharger vertically in engine and gearbox support.

- Drive unit faces upwards.

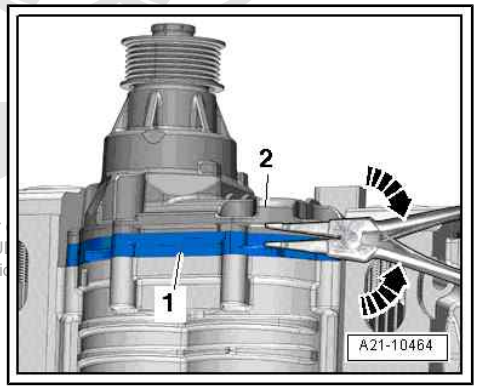


– Remove bolts -arrows-.



Caution

- ***To make sure bearing cover -1- does not come loose and remains properly sealed, always use spreader tool -arrows- to press off drive unit -2- as shown in illustration (do not use a hammer).***

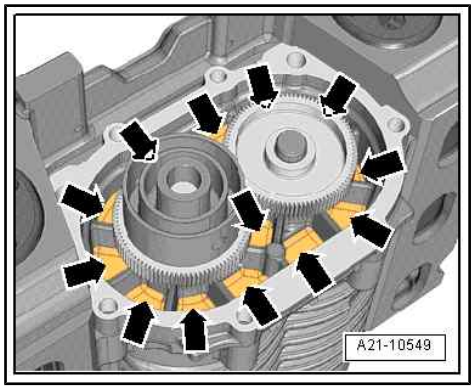


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– Carefully press off drive unit from bearing cover and detach.

– Detach damper spring.

– With the aid of used oil collection and extraction unit - V.A.G 1782- , extract all oil for supercharger drive from bearing cover (including oil chambers -arrows- between ribs).



Installing

- Tightening torques ⇒ “2.2 Exploded view - drive unit”, page 309

Note

- ♦ *Renew the drive unit bolts.*
- ♦ *Fit self-locking bolts or insert bolts with locking fluid ⇒ Electronic parts catalogue .*

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

– Before assembly, always remove residues from threaded holes for drive unit in bearing cover using a thread tap.

– Fill bearing cover with oil for supercharger drive.

Note

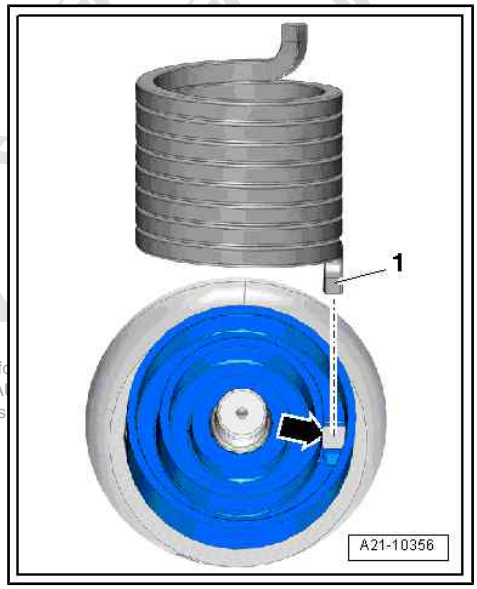
The container is filled with the required amount of oil. It is not possible to check the oil level at a later stage.

– Insert damper spring in damper element.

- End -1- of damper spring must engage in hole -arrow- in rear damper element.

– Apply a thin layer of sealant to sealing surface of drive unit.

– Fit drive unit to supercharger housing (pay attention to dowel sleeves).



Caution

Avoid damage to drive shaft.

♦ ***The drive unit must not be pulled in by screwing in the bolts.***

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– Simultaneously turn drive pulley until opposite end of damper spring engages in hole in drive unit.

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

– Check supercharger for leaks ⇒ page 314 .

– Install coolant pipes on supercharger ⇒ page 274 .

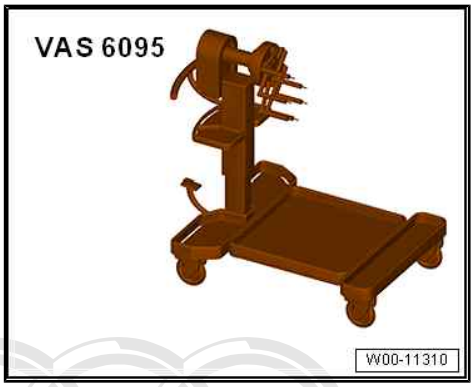
2.6 Securing supercharger to engine and gearbox support for leak test

Note

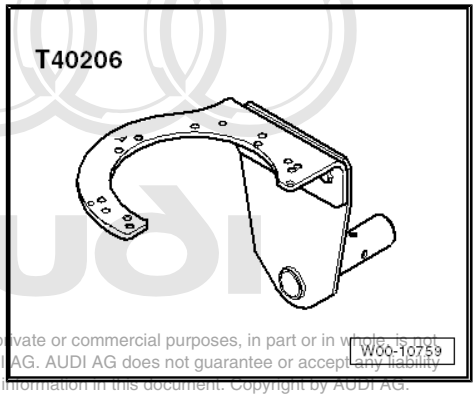
When checking for leaks, the seals on the sealing elements -T40206/2- should seal off the openings in the supercharger housing.

Special tools and workshop equipment required

- Engine and gearbox support - VAS 6095-



- Gearbox support - T40206- with -T40206/1- and -T40206/2-



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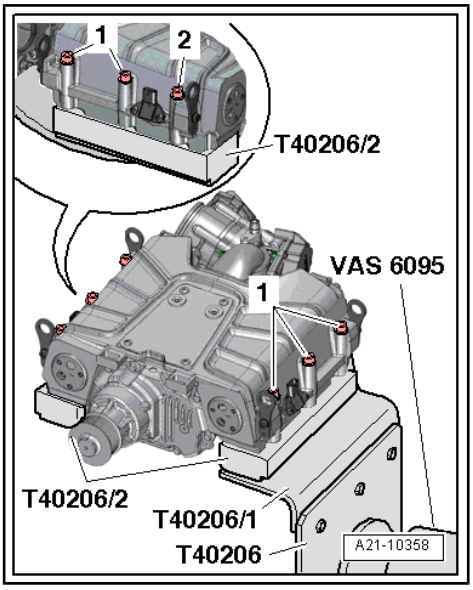
Procedure

- Supercharger removed ⇒ page 310 .

– Insert gearbox support -T40206- with -T40206/1- into engine and gearbox support - VAS 6095- .

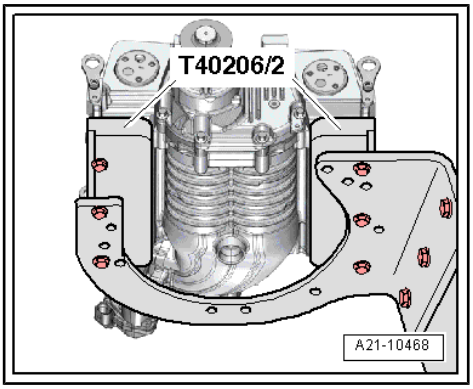
– Secure supercharger to gearbox support, as shown in illustration (use holes “1”, “4”, “9”, “11” and “13” for bolted connections -1-).

– Attach sealing element -T40206/2- directly to supercharger housing at front right with bolt -2-.



Installation position of sealing elements -T40206/2- :

- Seals of sealing elements should seal off openings in supercharger housing.



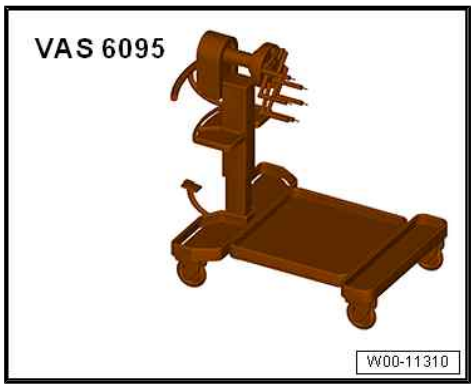
2.7 Securing supercharger to engine and gearbox support

Note

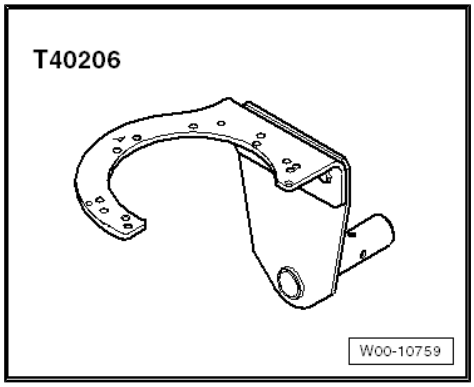
When performing assembly work, the openings in the bottom of the supercharger housing make it possible for you to see and access the charge air coolers.

Special tools and workshop equipment required

- Engine and gearbox support - VAS 6095-



- Gearbox support - T40206- with -T40206/1- and -T40206/2-



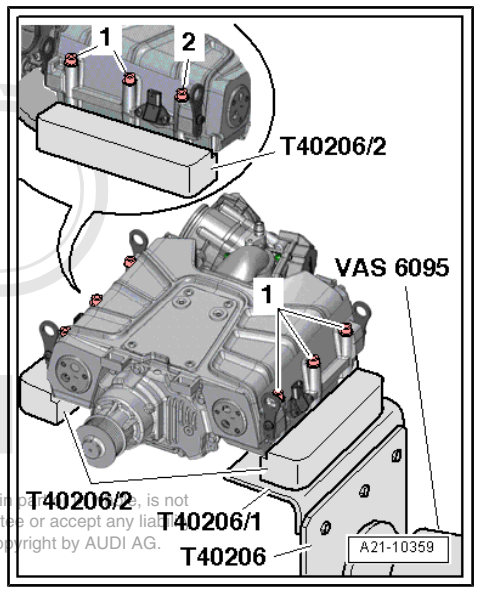
Procedure

- Supercharger removed ⇒ page 310 .

– Insert gearbox support -T40206- with -T40206/1- into engine and gearbox support - VAS 6095- .

– Secure supercharger to gearbox support, as shown in illustration (use holes “1”, “4”, “9”, “11” and “13” for bolted connections -1-).

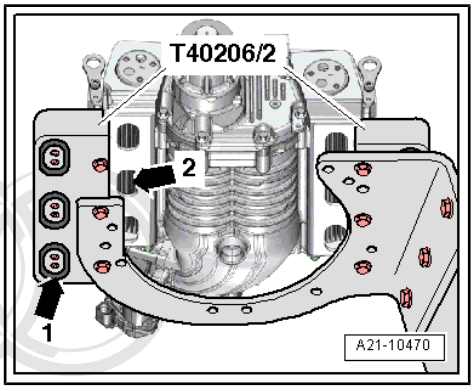
– Attach sealing element -T40206/2- directly to supercharger housing at front right with bolt -2-.



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Installation position of sealing elements -T40206/2- :

- Seals -arrow 1- of sealing elements should point downwards.
- Openings -arrow 2- in supercharger housing make it possible for you to see and access charge air coolers.



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24 – Mixture preparation - injection

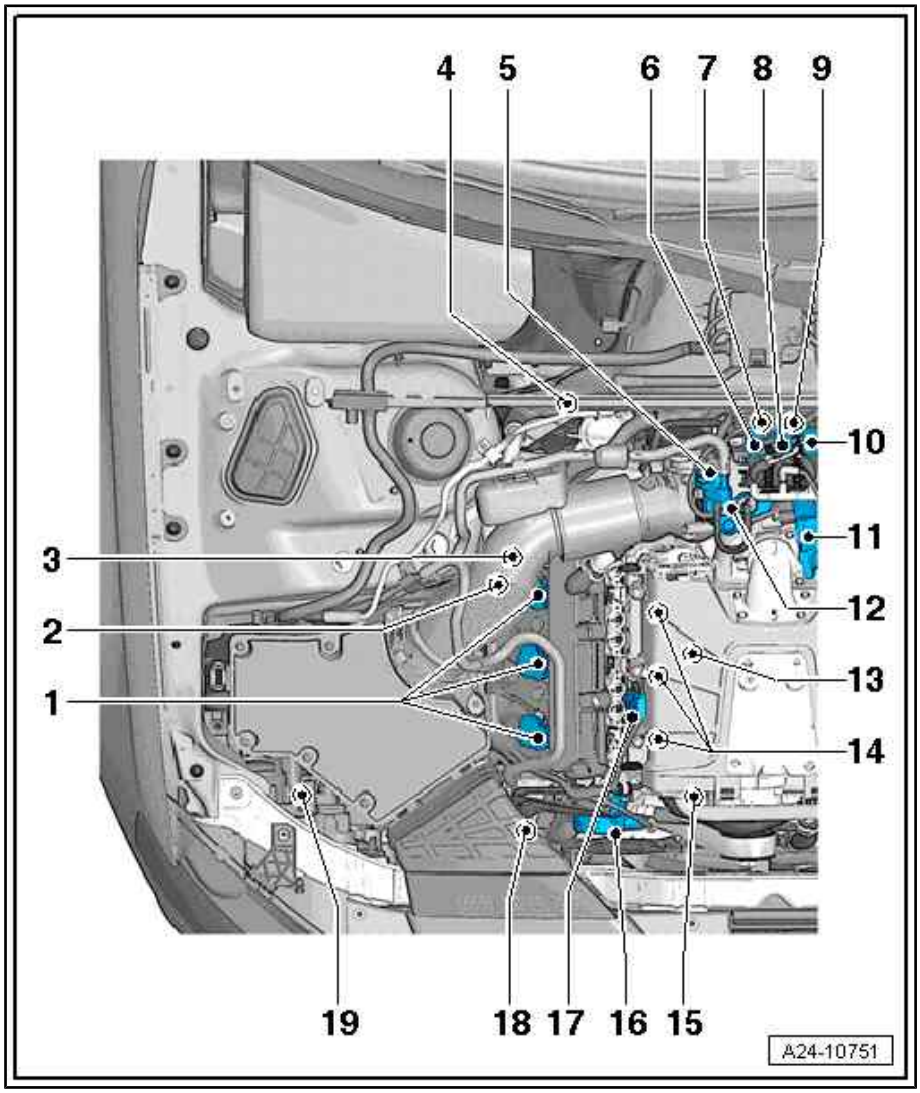
1 Injection system

⇒ “1.1 Overview of fitting locations - injection system”, page 322

⇒ “1.2 Checking fuel system for leaks”, page 332

1.1 Overview of fitting locations - injection system

Engine compartment (right-side)



1 - Ignition coils for cylinder bank 1

- ❑ Ignition coil 1 with output stage - N70-
- ❑ Ignition coil 2 with output stage - N127-
- ❑ Ignition coil 3 with output stage - N291-
- ❑ Removing and installing ⇒ “1.3 Removing and installing ignition coils”, page 414

2 - Lambda probe - G39- with Lambda probe heater - Z19-

- ❑ Fitting location ⇒ Fig. ““Fitting location of Lambda probes on cylinder bank 1 (right-side)”“ , page 332
- ❑ Fitting location of connector ⇒ Fig. ““Connectors of Lambda probes (cylinder bank 1)”“ , page 331
- ❑ Removing and installing ⇒ “9.2.1 Removing and installing Lambda probe G39 ”, page 377
- ❑ 55 Nm

3 - Camshaft control valve 1 - N205-

- ❑ Fitting location ⇒ Fig. ““Hall sender and camshaft control valve on cylinder bank 1 (right-side)”“ , page 328

4 - Lambda probe after catalytic converter - G130- with Lambda probe 1 heater after catalytic converter - Z29-

- ❑ Fitting location ⇒ Fig. ““Fitting location of Lambda probes on cylinder bank 1 (right-side)”“ , page 332
- ❑ Fitting location of connector ⇒ Fig. ““Connectors of Lambda probes (cylinder bank 1)”“ , page 331
- ❑ Removing and installing ⇒ “9.2.2 Removing and installing Lambda probe after catalytic converter G130 ”, page 379
- ❑ 55 Nm

5 - Sender 1 for secondary air pressure - G609-

- ❑ Only on USA models
- ❑ Fitting location ⇒ “3.6 Removing and installing sender 1 for secondary air pressure G609 ”, page 405

6 - Secondary air inlet valve - N112-

- ❑ Fitting location ⇒ Fig. ““Fitting location at rear of engine”“ , page 327

7 - Intake air temperature sender - G42- / intake manifold pressure sender - G71-

8 - Intake manifold flap valve - N316-

- ❑ Fitting location ⇒ Fig. ““Fitting location at rear of engine”“ , page 327

9 - Activated charcoal filter solenoid valve 1 - N80-

- ❑ Fitting location ⇒ Fig. ““Electrical connector for activated charcoal filter solenoid valve 1 -N80- -3-”“ , page 327

10 - Secondary air inlet valve 2 - N320-

- ❑ Fitting location ⇒ Fig. ““Fitting location at rear of engine”“ , page 327

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11 - Regulating flap control unit - J808-

- ❑ Fitting location ⇒ Fig. ““Fitting location of regulating flap control unit -J808- ”“ , page 328
- ❑ After renewing regulating flap control unit - J808- , perform `Adaption` in `Guided Functions` ⇒ vehicle diagnostic tester
- ❑ Removing and installing ⇒ “4.4 Removing and installing regulating flap control unit J808 ”, page 351

12 - Throttle valve module - J338-

- ❑ Fitting location ⇒ Fig. ““Fitting location of throttle valve module -J338- ”“ , page 328
- ❑ After renewing throttle valve module - J338- , perform `Adaption` in `Guided Functions` ⇒ vehicle diagnostic tester .
- ❑ Removing and installing ⇒ “4.3 Removing and installing throttle valve module J338 ”, page 350

13 - Knock sensor 1 - G61-

- ❑ Fitting location ⇒ Fig. ““Fitting locations below intake manifold on cylinder bank 1 (right-side)”“ , page 329
- ❑ Fitting location of connector ⇒ Fig. ““Electrical connectors at rear left of engine”“ , page 327

14 - Injectors, cylinder bank 1

- ❑ Injector, cylinder 1 - N30-
- ❑ Injector, cylinder 2 - N31-
- ❑ Injector, cylinder 3 - N32-
- ❑ Different versions of gasket/seal sets available; for allocation refer to ⇒ Electronic parts catalogue
- ❑ Removing and installing ⇒ “5.1 Removing and installing injectors”, page 354

15 - Intake manifold flap potentiometer - G336-

- ❑ Fitting location ⇒ Fig. ““Fitting location of intake manifold flap potentiometer 2 -G512- ”“ , page 330

16 - Hall sender - G40-

- ❑ Fitting location ⇒ Fig. ““Hall sender and camshaft control valve on cylinder bank 1 (right-side)”“ , page 328

17 - Charge pressure sender - G31- / intake manifold temperature sender - G72-

- ❑ Fitting location ⇒ Fig. ““Fitting location of charge pressure sender -G31- / intake manifold temperature sender -G72- ”“ , page 331

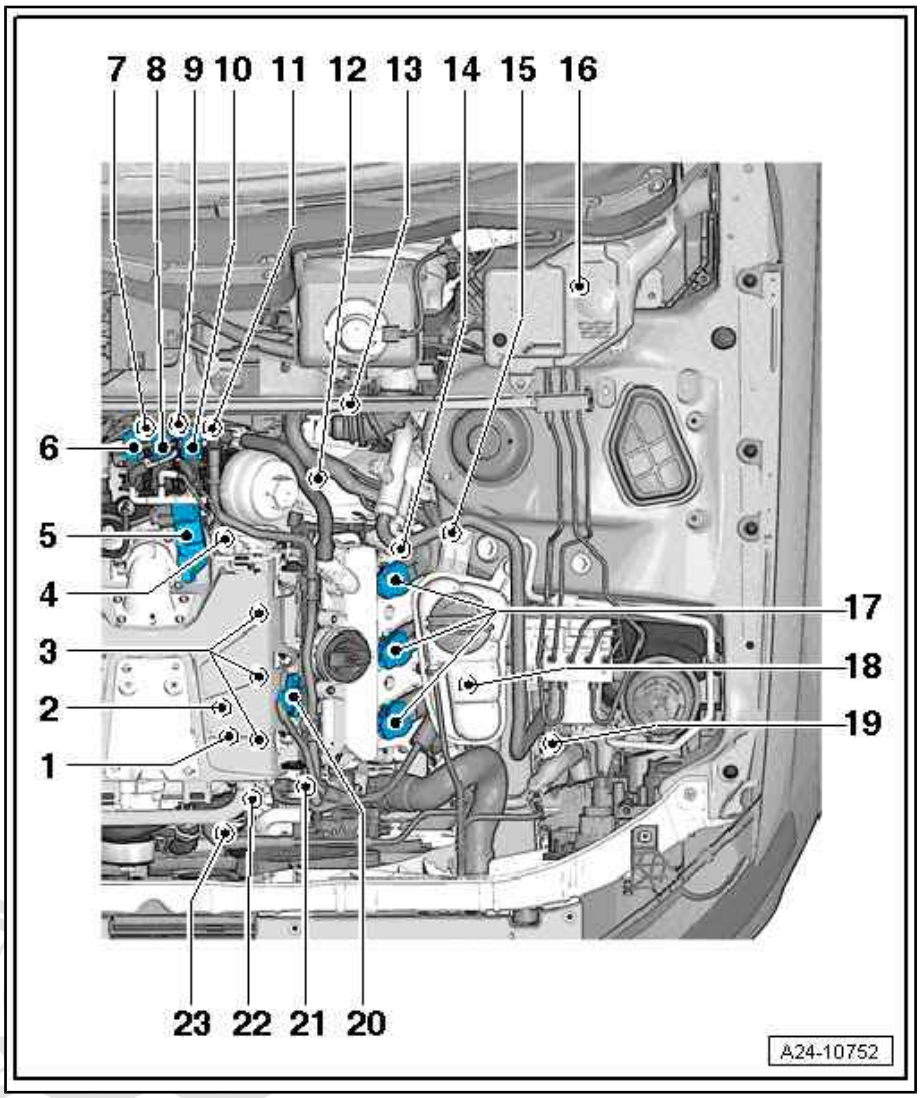
18 - High-pressure pump

- ❑ With fuel metering valve - N290-
- ❑ With fuel pressure sender for low pressure - G410-
- ❑ Fitting location ⇒ Fig. ““Fitting locations at high-pressure pump”“ , page 330
- ❑ Removing and installing ⇒ “8.2 Removing and installing high-pressure pump”, page 367

19 - Secondary air pump motor - V101-

- ❑ Fitting location ⇒ Fig. ““Fitting location of secondary air pump motor -V101- ”“ , page 332

Engine compartment (left-side)



1 - Fuel pressure sender - G247-

- ❑ Fitting location ⇒ Fig. ""Fitting locations below intake manifold on cylinder bank 2 (left-side)"" , page 329
- ❑ 22 Nm
- ❑ Lubricate threads

2 - Knock sensor 2 - G66-

- ❑ Fitting location ⇒ Fig. ""Fitting locations below intake manifold on cylinder bank 2 (left-side)"" , page 329
- ❑ Fitting location of connector ⇒ Fig. ""Electrical connectors at rear left of engine"" , page 327

3 - Injectors, cylinder bank 2

- ❑ Injector, cylinder 4 - N33-
- ❑ Injector, cylinder 5 - N83-
- ❑ Injector, cylinder 6 - N84-
- ❑ Removing and installing ⇒ "5.1 Removing and installing injectors", page 354

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

- ❑ Fitting location ⇒ Fig. "" Oil pressure switch for reduced oil pressure - F378- -1-"" , page 329

5 - Regulating flap control unit - J808-

- ❑ Fitting location ⇒ Fig. ""Fitting location of regulating flap control unit -J808- "" , page 328
- ❑ Removing and installing ⇒ "4.4 Removing and installing regulating flap control unit J808 ", page 351

– After renewing regulating flap control unit - J808- , perform `Adaption` in `Guided Functions` ⇒ vehicle diagnostic tester.

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6 - Secondary air inlet valve - N112-

- ❑ Fitting location ⇒ Fig. ""Fitting location at rear of engine"" , page 327

7 - Intake air temperature sender - G42- / intake manifold pressure sender - G71-

- ❑ Fitting location ⇒ Fig. ""Fitting location at rear of engine"" , page 327

8 - Intake manifold flap valve - N316-

- ❑ Fitting location ⇒ Fig. ""Fitting location at rear of engine"" , page 327

9 - Activated charcoal filter solenoid valve 1 - N80-

10 - Secondary air inlet valve 2 - N320-

- ❑ Fitting location ⇒ Fig. ""Fitting location at rear of engine"" , page 327

11 - Oil pressure switch - F22-

- ❑ Fitting location ⇒ Fig. ""Fitting locations at rear of engine"" , page 326

12 - Engine speed sender - G28-

- ❑ Fitting location ⇒ Fig. ""Fitting location of engine speed sender -G28- "" , page 330
- ❑ Removing and installing ⇒ "1.6 Removing and installing engine speed sender G28 ", page 418
- ❑ 9 Nm

13 - Lambda probe 2 after catalytic converter - G131- with Lambda probe 2 heater after catalytic converter - Z30-

- ❑ Fitting location ⇒ Fig. ""Fitting location of Lambda probes on cylinder bank 2 (left-side)"" , page 332
- ❑ Fitting location of connector ⇒ Fig. ""Connectors of Lambda probes (cylinder bank 2)"" , page 331
- ❑ Removing and installing ⇒ "9.2.4 Removing and installing Lambda probe 2 after catalytic converter G131 ", page 382
- ❑ 55 Nm

14 - Camshaft control valve 2 - N208-

Fitting location ⇒ Fig. ""Hall sender and camshaft control valve on cylinder bank 2 (left-side)"" , page 328

15 - Lambda probe 2 - G108- with Lambda probe heater 2 - Z28-

- ❑ Fitting location ⇒ Fig. ""Fitting location of Lambda probes on cylinder bank 2 (left-side)"" , page 332
- ❑ Fitting location of connector ⇒ Fig. ""Connectors of Lambda probes (cylinder bank 2)"" , page 331
- ❑ Removing and installing ⇒ "9.2.3 Removing and installing Lambda probe 2 G108 ", page 380
- ❑ 55 Nm

16 - Engine control unit - J623-

- ❑ Fitting location ⇒ Fig. ""Fitting location of engine control unit -J623- "" , page 326
- ❑ Removing and installing ⇒ "7.2 Removing and installing engine control unit J623 ", page 362

– After renewing, perform `Adaption` in `Guided Functions` ⇒ vehicle diagnostic tester .

17 - Ignition coils for cylinder bank 2

- ❑ Ignition coil 4 with output stage - N292-
- ❑ Ignition coil 5 with output stage - N323-
- ❑ Ignition coil 6 with output stage - N324-
- ❑ Removing and installing ⇒ "1.3 Removing and installing ignition coils", page 414

18 - Valve for oil pressure control - N428-

- ❑ Fitting location ⇒ Fig. ""Fitting location of valve for oil pressure control -N428- "" , page 329

19 - Continued coolant circulation pump - V51-

- ❑ Not installed on certain equipment versions or on vehicles for certain export markets
- ❑ Fitting location ⇒ Fig. ""Fitting location of continued coolant circulation pump -V51- "" , page 332

20 - Intake manifold temperature sender 2 - G430- / charge pressure sender 2 - G447-

- ❑ Fitting location ⇒ Fig. ""Fitting location of charge pressure sender -G31- / intake manifold temperature sender -G72- "" , page 331

21 - Hall sender 2 - G163-

- ❑ Fitting location ⇒ Fig. ""Hall sender and camshaft control valve on cylinder bank 2 (left-side)"" , page 328

22 - Intake manifold flap potentiometer 2 - G512-

- ❑ Fitting location ⇒ Fig. ""Fitting location of intake manifold flap potentiometer 2 -G512- "" , page 330
- ❑ After renewing, perform `Adaption` in `Guided Functions` ⇒ vehicle diagnostic tester

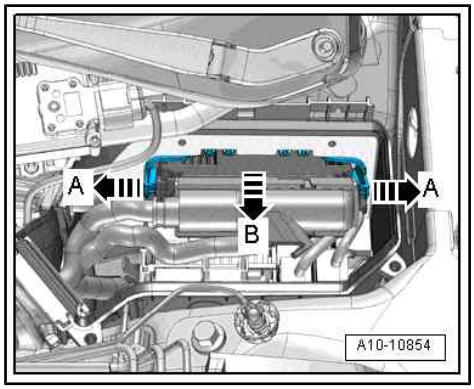
23 - Coolant temperature sender - G62-

- ❑ Fitting location ⇒ Fig. ""Fitting location of coolant temperature sender -G62- "" , page 330

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Fitting location of engine control unit - J623-

- In left electronics box in engine compartment



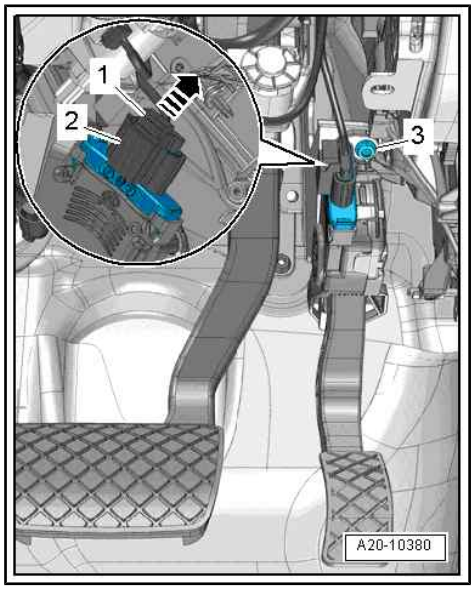
Fitting location of accelerator position sender - G79- / accelerator position sender 2 - G185-

2 - Electrical connector

Note

The accelerator position sender - G79- and accelerator position sender 2 - G185- are integrated in the accelerator pedal module and cannot be renewed individually.

Removing and installing ⇒ Fuel supply system; Rep. gr. 20 ; Accelerator mechanism; Removing and installing accelerator pedal module with accelerator position sender -G79- / -G185-



Fitting location on pedal bracket

1 - Brake light switch - F- / brake pedal switch - F47-

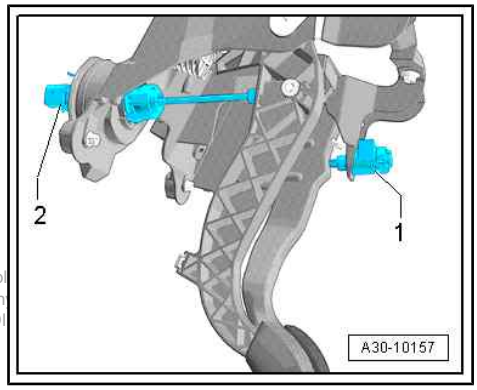
2 - Integrated functions in clutch position sender - G476- : clutch pedal switch for engine start - F194- and clutch pedal switch - F36-

Note

Switches must not be installed more than once, otherwise they may not fit securely.

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Removing and installing ⇒ Brake system; Rep. gr. 45 ; Sensors; Removing and installing brake light sensor

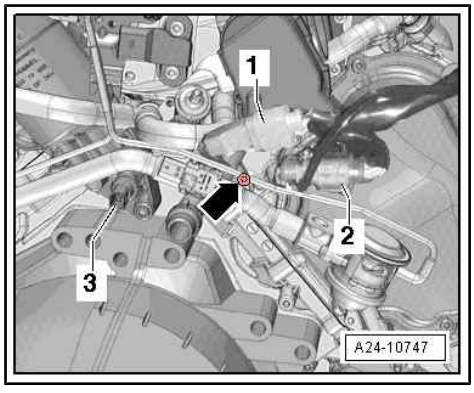


Fitting locations at rear of engine

1 - To knock sensor 1 - G61-

2 - To injectors on cylinder bank 1

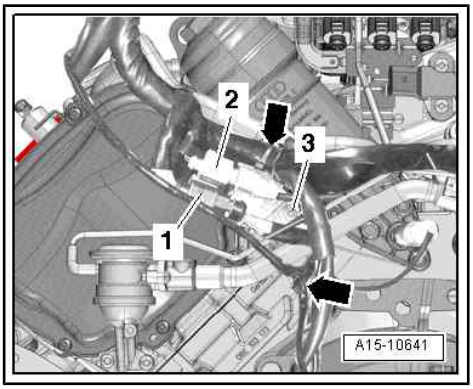
3 - Oil pressure switch - F22-



Electrical connectors at rear left of engine

1 - To injectors on cylinder bank 2 and to fuel pressure sender - G247-

2 - To knock sensor 2 - G66-



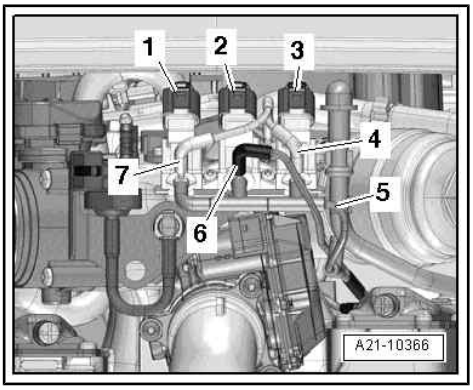
Fitting location at rear of engine

1 - Secondary air inlet valve - N112-

2 - Intake manifold flap valve - N316-

3 - Secondary air inlet valve 2 - N320-

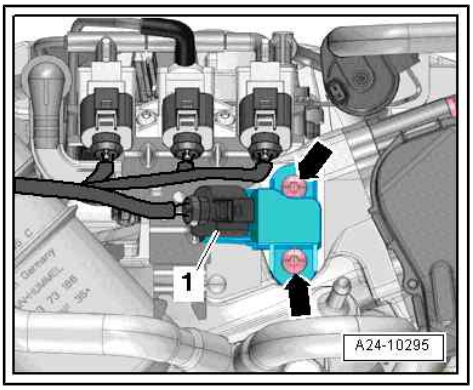
♦ At rear of supercharger with charge air cooler



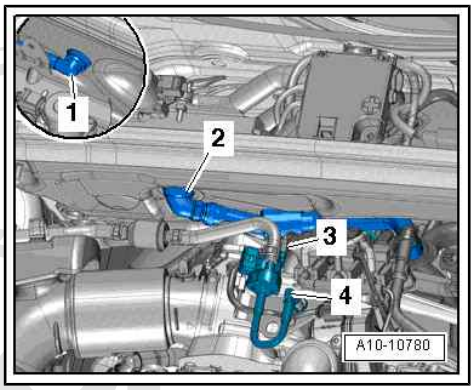
Fitting location at rear of engine

1 - Intake air temperature sender - G42- / intake manifold pressure sender - G71-

♦ At rear of supercharger with charge air cooler



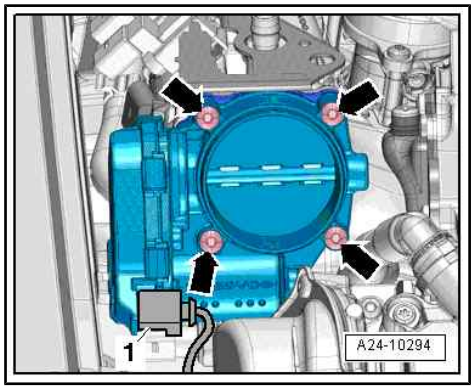
Electrical connector for activated charcoal filter solenoid valve 1 - N80- -3-



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Fitting location of throttle valve module - J338-

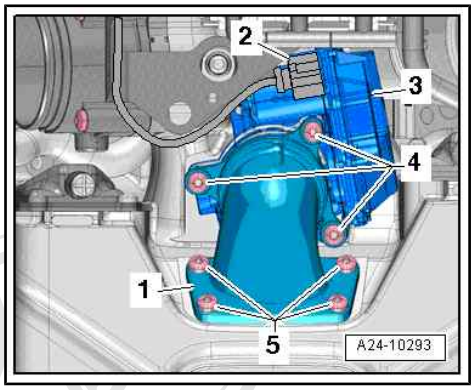
- At rear of supercharger



Fitting location of regulating flap control unit - J808-

3 - Regulating flap control unit - J808-

- At rear of supercharger

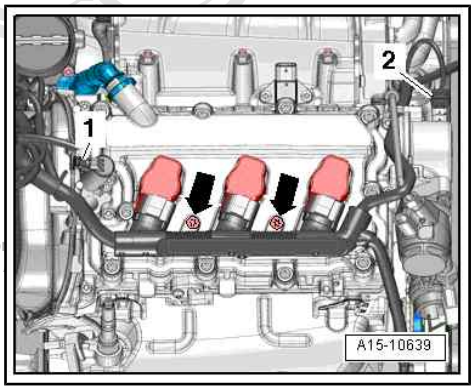


Hall sender and camshaft control valve on cylinder bank 1 (right-side)

1 - Camshaft control valve 1 - N205-

2 - Hall sender - G40-

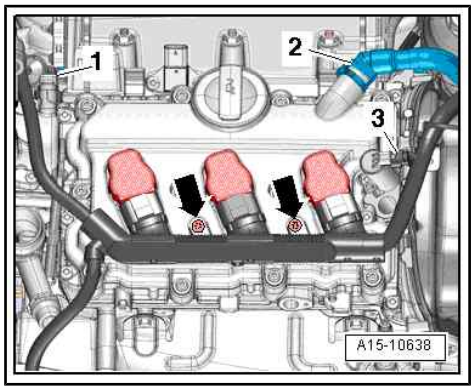
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Hall sender and camshaft control valve on cylinder bank 2 (left-side)

1 - Hall sender 2 - G163-

3 - Camshaft control valve 2 - N208-



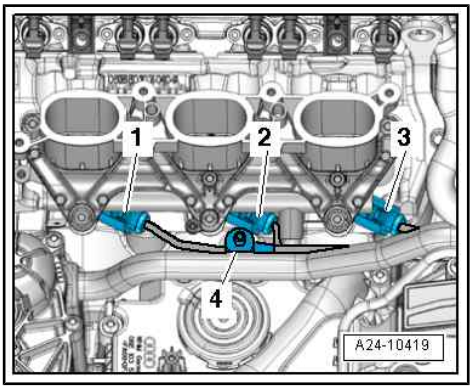
Fitting locations below intake manifold on cylinder bank 1 (right-side)

1 - Injector, cylinder 1 - N30-

2 - Injector, cylinder 2 - N31-

3 - Injector, cylinder 3 - N32-

4 - Knock sensor 1 - G61-



Fitting locations below intake manifold on cylinder bank 2 (left-side)

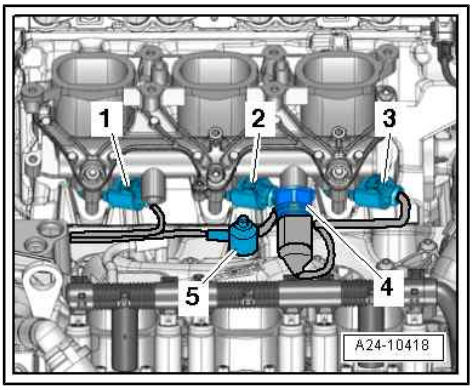
1 - Injector, cylinder 6 - N84-

2 - Injector, cylinder 5 - N83-

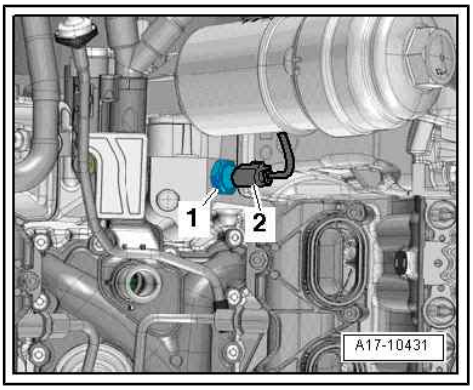
3 - Injector, cylinder 4 - N33-

4 - Fuel pressure sender - G247-

5 - Knock sensor 2 - G66-



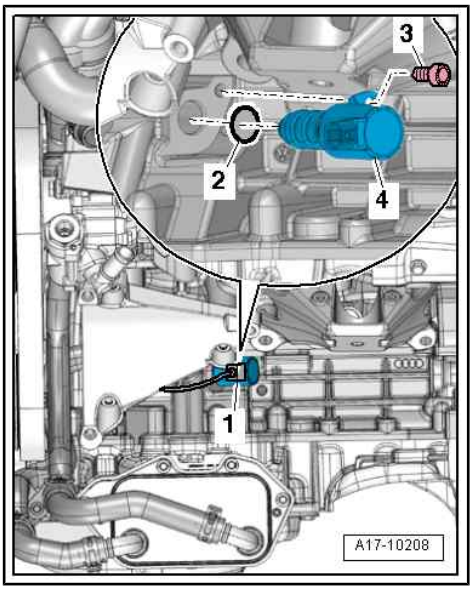
Oil pressure switch for reduced oil pressure - F378- -1-



Fitting location of valve for oil pressure control - N428-

4 - Valve for oil pressure control - N428-

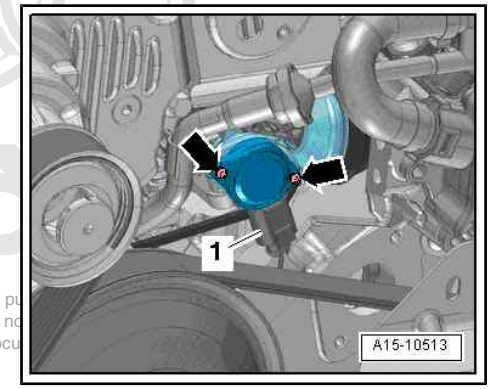
♦ On engine (bottom left)



Removing and installing ⇒ page 121

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Fitting location of intake manifold flap potentiometer 2 - G512-



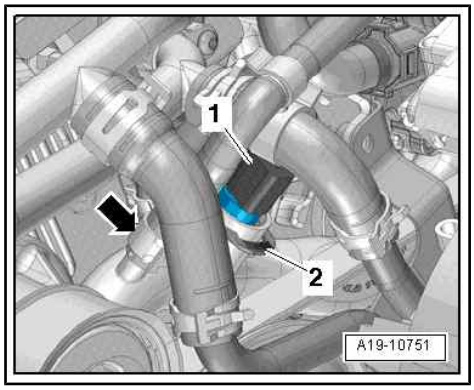
- ♦ At front of intake manifold (bottom section, left-side)
- – The removal and installation procedures are described in chapter ⇒ “2.3 Removing and installing vacuum unit for actuating intake manifold flaps”, page 336 .

Note

The intake manifold flap potentiometer - G336- is located symmetrically reversed.

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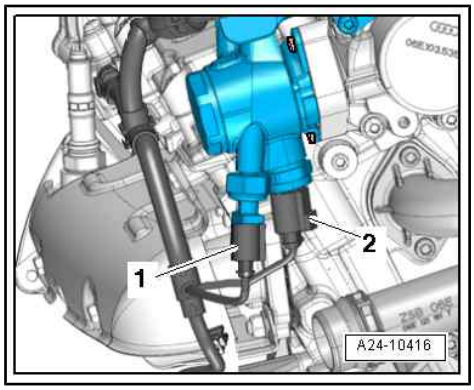
Fitting location of coolant temperature sender - G62-



1 - Coolant temperature sender - G62-

- ♦ At front of engine

Fitting locations at high-pressure pump

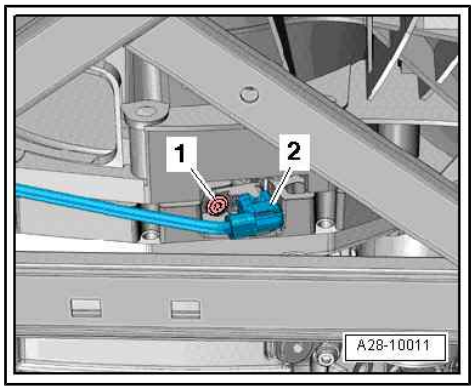


1 - Fuel pressure sender for low pressure - G410-

2 - Fuel metering valve - N290-

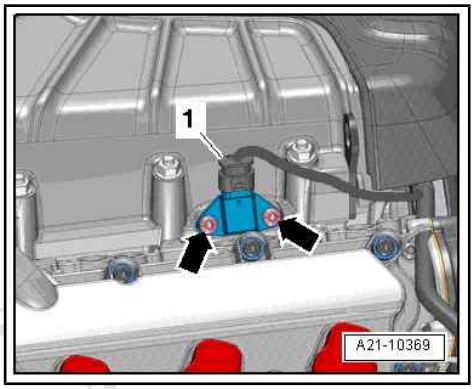
- ♦ On right side of cylinder head

Fitting location of engine speed sender - G28-



- ♦ Bolted into gearbox housing from below.

Fitting location of charge pressure sender - G31- / intake manifold temperature sender - G72-



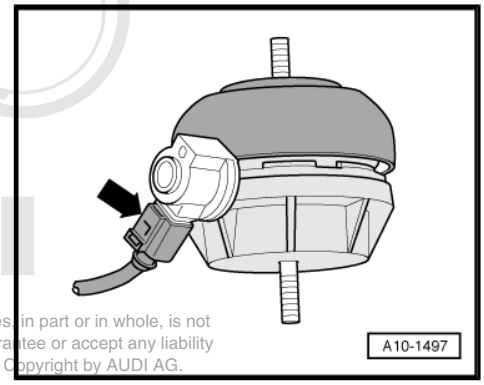
- At right side of supercharger with charge air cooler

Note

Intake manifold temperature sender 2 - G430- / charge pressure sender 2 - G447- are located symmetrically reversed.

Removing and installing ⇒ page 305

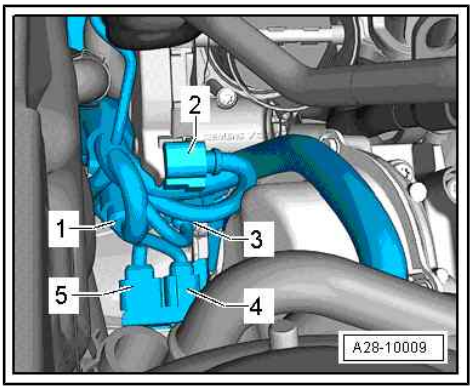
Fitting location of left electrohydraulic engine mounting solenoid valve - N144- and right electrohydraulic engine mounting solenoid valve - N145-



- At engine mountings (left and right) -arrow-.

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Connectors of Lambda probes (cylinder bank 1)



1 - For injectors (cylinder bank 1)

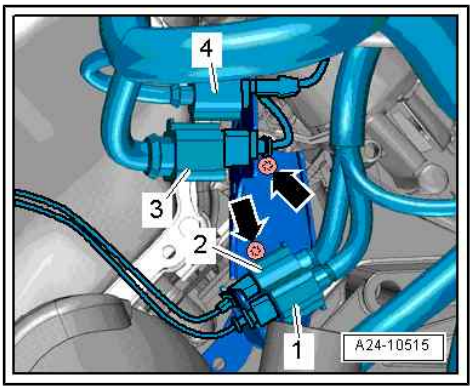
2 - Throttle valve module - J338-

3 - Knock sensor 1 - G61-

4 - For Lambda probe - G39- with Lambda probe heater - Z19-

5 - For Lambda probe after catalytic converter - G130- with Lambda probe 1 heater after catalytic converter - Z29-

Connectors of Lambda probes (cylinder bank 2)



1 - For Lambda probe 2 after catalytic converter - G131- with Lambda probe 2 heater after catalytic converter - Z30-

2 - For Lambda probe 2 - G108- with Lambda probe heater 2 - Z28-

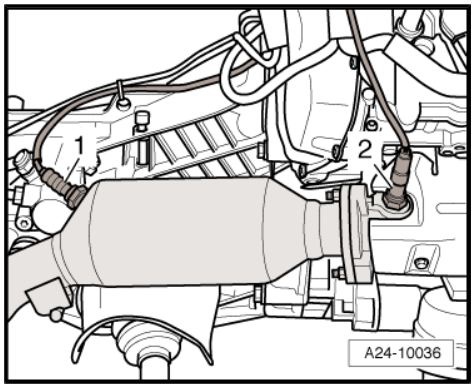
3 - For injectors (cylinder bank 2) and for fuel pressure sender - G247-

4 - For knock sensor 2 - G66-

Fitting location of Lambda probes on cylinder bank 1 (right-side)

1 - Lambda probe after catalytic converter - G130- with Lambda probe 1 heater after catalytic converter - Z29-

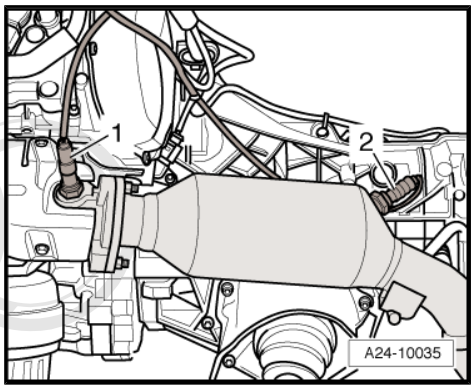
2 - Lambda probe - G39- with Lambda probe heater - Z19-



Fitting location of Lambda probes on cylinder bank 2 (left-side)

1 - Lambda probe 2 - G108- with Lambda probe heater 2 - Z28-

2 - Lambda probe 2 after catalytic converter - G131- with Lambda probe 2 heater after catalytic converter - Z30-

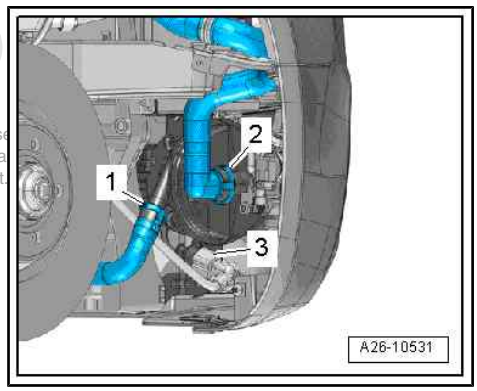


Fitting location of secondary air pump motor - V101-

♦ Beneath headlight (right-side)

Removing and installing ⇒ page 398

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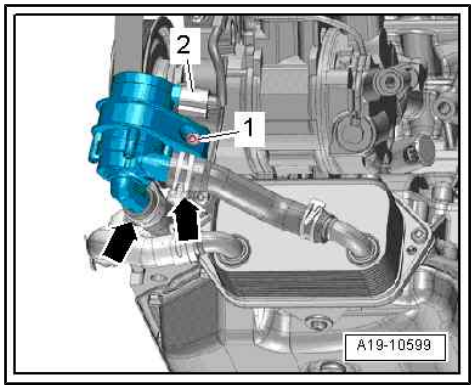
Fitting location of continued coolant circulation pump - V51-

♦ At front left of engine

Note

Continued coolant circulation pump - V51- is not installed on certain equipment versions or on vehicles for certain export markets; only installed on vehicles for very hot countries.

Removing and installing ⇒ page 254



1.2 Checking fuel system for leaks

– Allow engine to run for several minutes at moderate rpm.

– Switch off ignition.

– Check complete fuel system for leaks.

– If leaks are found although the connections have been tightened to the correct torque, the relevant component must be renewed.
– Road-test vehicle and accelerate with full throttle at least once.
– Then inspect high-pressure section of fuel system again for leaks.

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2 Vacuum system

⇒ “2.1 Connection diagram - vacuum system”, page 334

⇒ “2.2 Checking vacuum system”, page 335

⇒ “2.3 Removing and installing vacuum unit for actuating intake manifold flaps”, page 336

2.1 Connection diagram - vacuum system

Note

- *Observe rules for cleanliness ⇒ “4.1 Rules for cleanliness”, page 6 .*
- *Check that all air pipes and hoses and vacuum lines are correctly fitted and that there are no leaks before carrying out tests or repairs.*

Caution

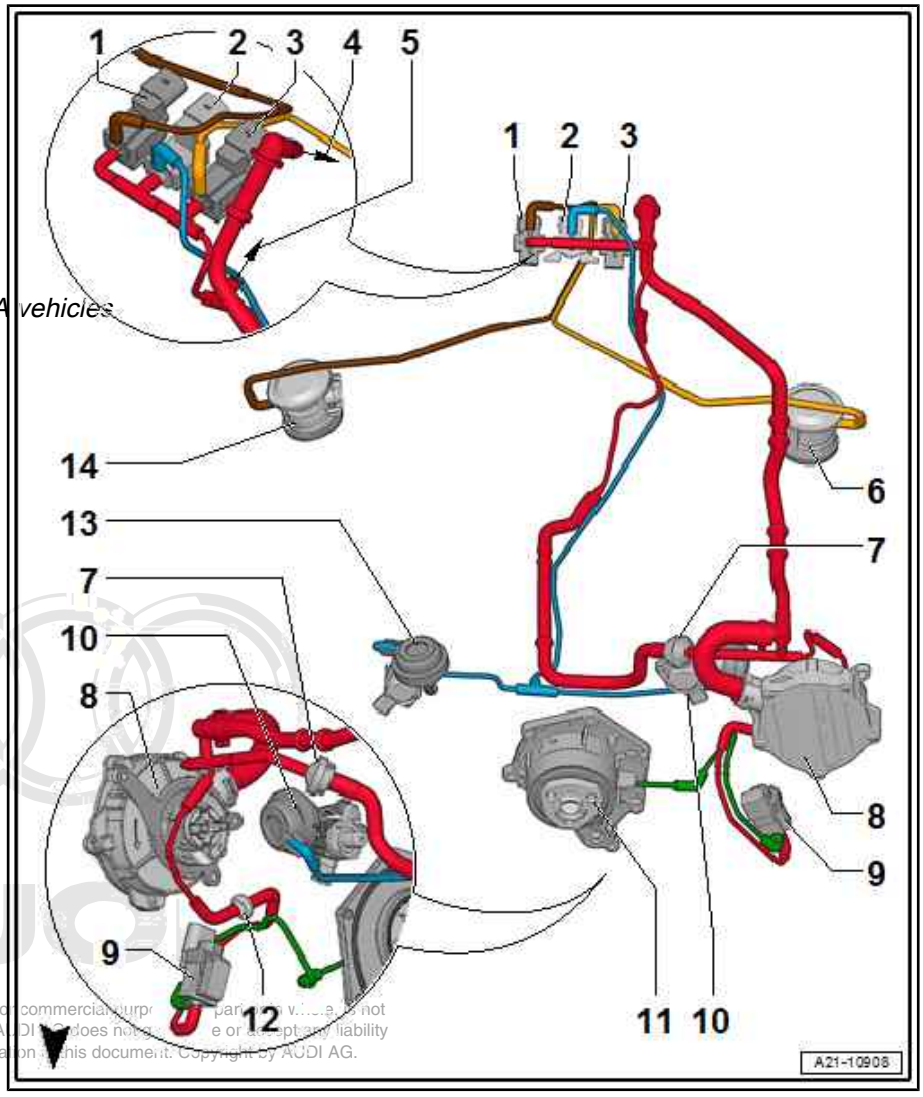
Risk of engine malfunctions

- ***When routing vacuum lines, make sure they are not kinked, twisted or crushed.***

Note

- *Red = Vacuum supply line*
- *Blue = Control pipe to vacuum unit for actuating intake manifold flaps*
- *Orange = Control pipe to combination valve for secondary air system (left-side)*
- *Brown = Control pipe to combination valve for secondary air system (right-side)*
- *Green = Control pipe to switchable coolant pump*

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1 - Secondary air inlet valve - N112-

2 - Intake manifold flap valve - N316-

3 - Secondary air inlet valve 2 - N320-

Note

Not fitted on some USA vehicles

4 - To brake servo

5 - Connecting piece with cap

6 - Combination valve for secondary air system (left-side)

- Checking ⇒ “3.3 Checking combination valve for correct operation and leaks”, page 400
- Removing and installing ⇒ “3.4 Removing and installing combination valve (left-side)”, page 402

7 - Non-return valve

8 - Vacuum pump

9 - Coolant valve for cylinder head - N489-

10 - Vacuum unit

- For intake manifold flap on cylinder bank 2 (left-side)
- Removing and installing ⇒ “2.3.2 Removing and installing vacuum unit for actuating intake manifold flaps, cylinder bank 2 (left-side)”, page 338

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11 - Coolant pump

12 - Non-return valve

13 - Vacuum unit

- For intake manifold flap on cylinder bank 1 (right-side)
- Removing and installing ⇒ “2.3.1 Removing and installing vacuum unit for actuating intake manifold flaps, cylinder bank 1 (right-side)”, page 336

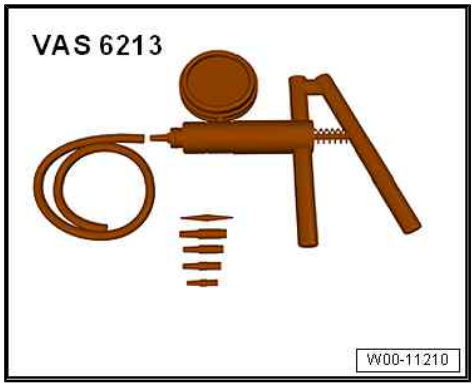
14 - Combination valve for secondary air system (right-side)

- Checking ⇒ “3.3 Checking combination valve for correct operation and leaks”, page 400
- Removing and installing ⇒ “3.5 Removing and installing combination valve (right-side)”, page 403

2.2 Checking vacuum system

Special tools and workshop equipment required

- Hand vacuum pump - VAS 6213-



Procedure

– Check all vacuum lines in the complete vacuum system for:
- Cracks
- Traces of animal bites
- Kinked or crushed lines
- Porous or leaking lines

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

– If an entry is stored in the event memory, check the vacuum lines leading to the corresponding component and also check the other vacuum lines leading to other components.

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

2.3 Removing and installing vacuum unit for actuating intake manifold flaps

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⇒ “2.3.1 Removing and installing vacuum unit for actuating intake manifold flaps, cylinder bank 1 (right-side)”, page 336

⇒ “2.3.2 Removing and installing vacuum unit for actuating intake manifold flaps, cylinder bank 2 (left-side)”, page 338

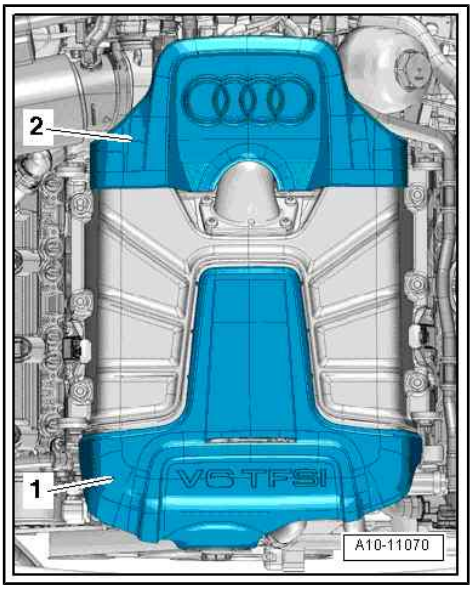
2.3.1 Removing and installing vacuum unit for actuating intake manifold flaps, cylinder bank 1 (right-side)

Special tools and workshop equipment required

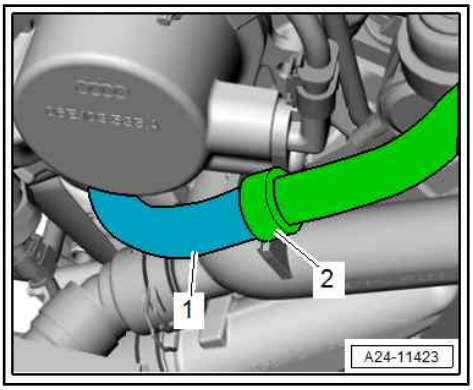
- Torx wrench or bit 10 with ball head (commercially available)
- Magnetic rod (commercially available)

Removing

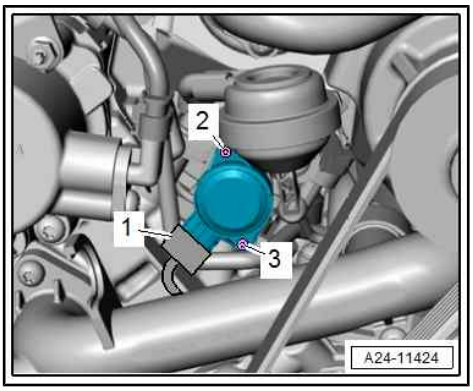
– Lift off engine cover panels -1- and -2-.



– Disconnect secondary air hose -1- at connection point -2- and move clear at retainer.

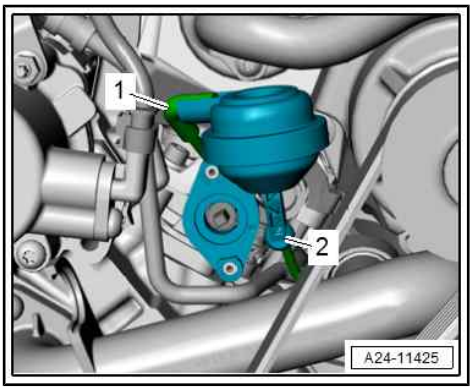


– Remove bolts -2, 3- and detach intake manifold flap potentiometer - G336- .



– Unclip operating rod -2- of vacuum unit from ball head.

– Disconnect vacuum hose -1- and detach vacuum unit.



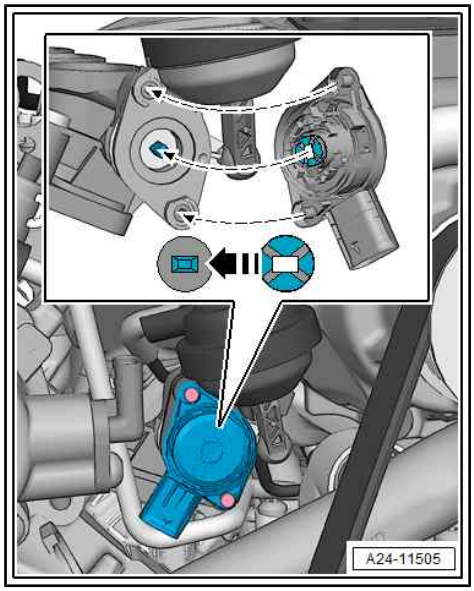
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Installing

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

The shaft for the intake manifold flaps on the intake manifold (bottom section) and the mounting on the intake manifold flap potentiometer 2 - G512- are rectangular.

- Ensure that mounting on intake manifold flap potentiometer - G336- is correctly positioned on shaft for intake manifold flaps on intake manifold (bottom section).



Note

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

– Install engine cover panel.

Tightening torques

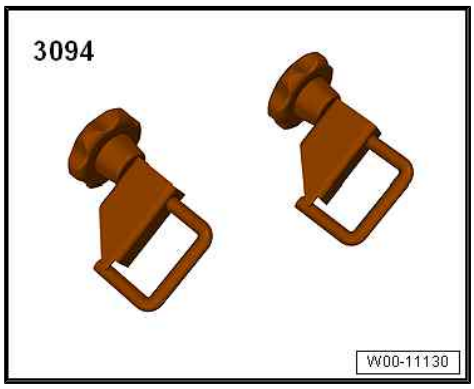
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- ⇒ “4.1 Exploded view - intake manifold (bottom section) with fuel rail”, page 345 .

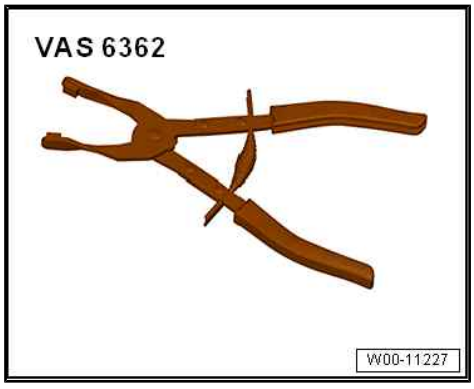
2.3.2 Removing and installing vacuum unit for actuating intake manifold flaps, cylinder bank 2 (left-side)

Special tools and workshop equipment required

- Hose clamps, up to 25 mm - 3094-



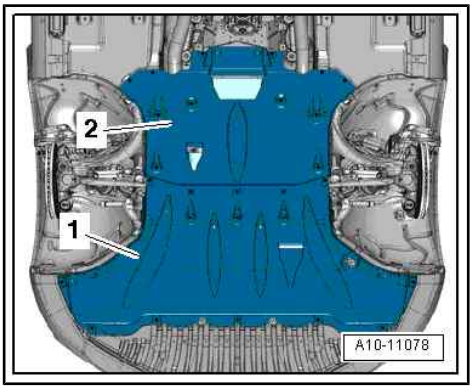
- Hose clip pliers - VAS 6362-



- Torx wrench or bit 10 with ball head (commercially available)
- Magnetic rod (commercially available)

Removing

– Remove noise insulation (front) -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

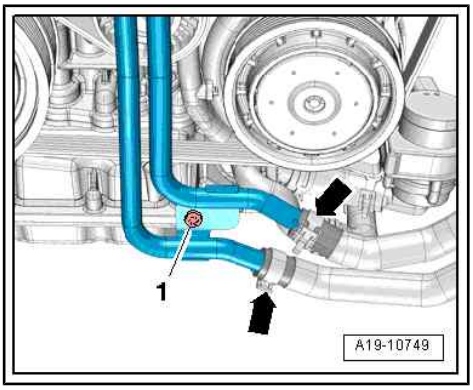


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WARNING

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

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



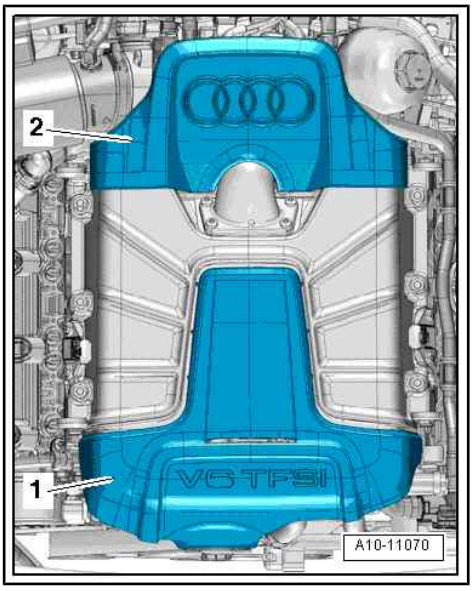
– Clamp off coolant hoses -arrows- with hose clamps up to 25 mm - 3094- .

– Remove bolt -1-.

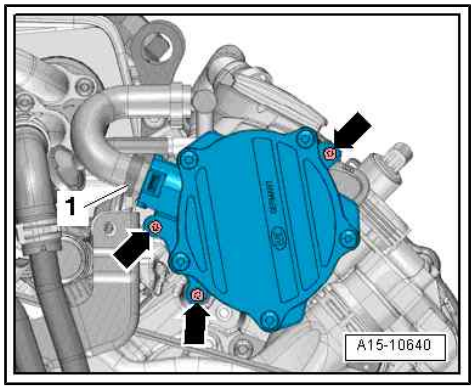
Note

The coolant hoses remain connected.

– Lift off engine cover panels -1- and -2-.



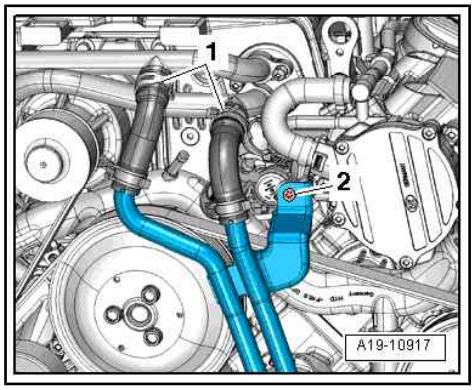
– Release hose clip -1-, disconnect vacuum hose from vacuum pump and move vacuum hose clear.



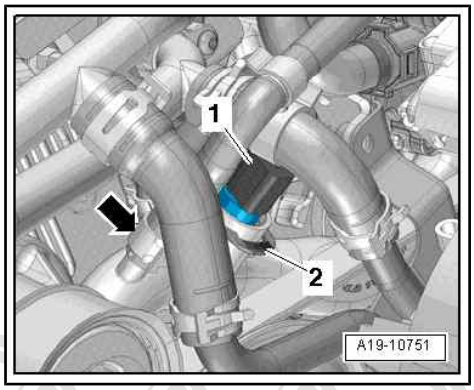
Note

Disregard -arrows-.

– Clamp off coolant hoses -1- using hose clamps (up to 25 mm) - 3094- , release hose clips and disconnect coolant hoses from coolant pipes at supercharger.
– Remove bolt -2-.



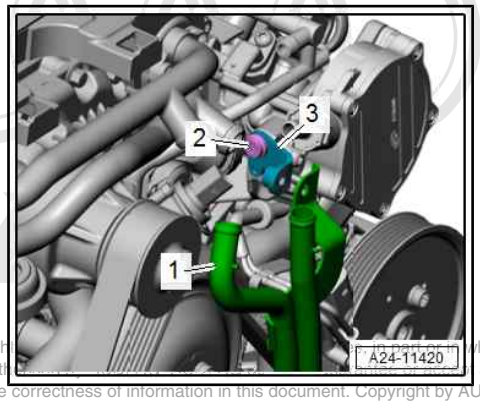
– Unplug electrical connector -1- at coolant temperature sender - G62- .



Note

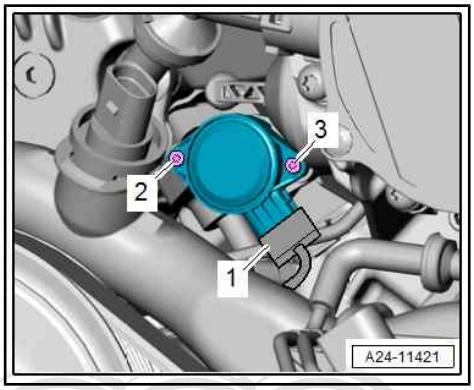
Disregard -item 2- and -arrow-.

– Remove bolt -2- and detach bracket -3-.
– Swivel coolant pipe -1- to side.



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– Remove bolts -2, 3- and detach intake manifold flap potentiometer 2 - G512- .

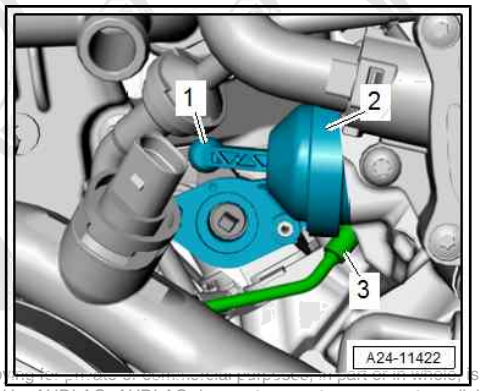


Note

It is recommended to use a magnet at this stage to prevent the bolt from falling out.

– Unclip operating rod -1- of vacuum unit -2- from ball head.

– Disconnect vacuum hose -3- and detach vacuum unit.



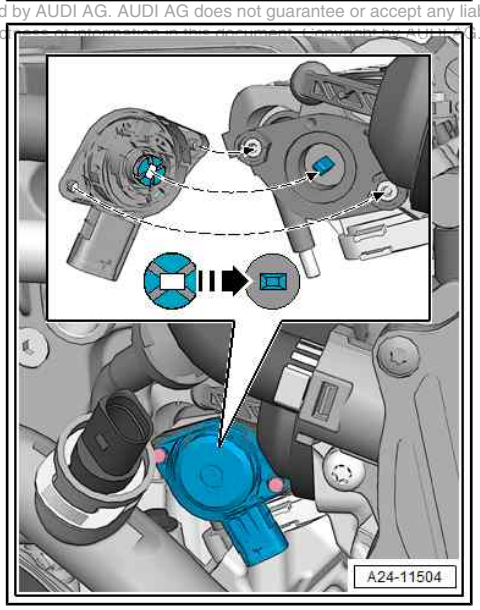
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Installing

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

The shaft for the intake manifold flaps on the intake manifold (bottom section) and the mounting on the intake manifold flap potentiometer 2 - G512- are rectangular.

- Ensure that mounting on intake manifold flap potentiometer 2 - G512- is correctly positioned on shaft for intake manifold flaps on intake manifold (bottom section).



Note

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

– Install engine cover panel.

– Check coolant level ⇒ page 240 .

Tightening torques

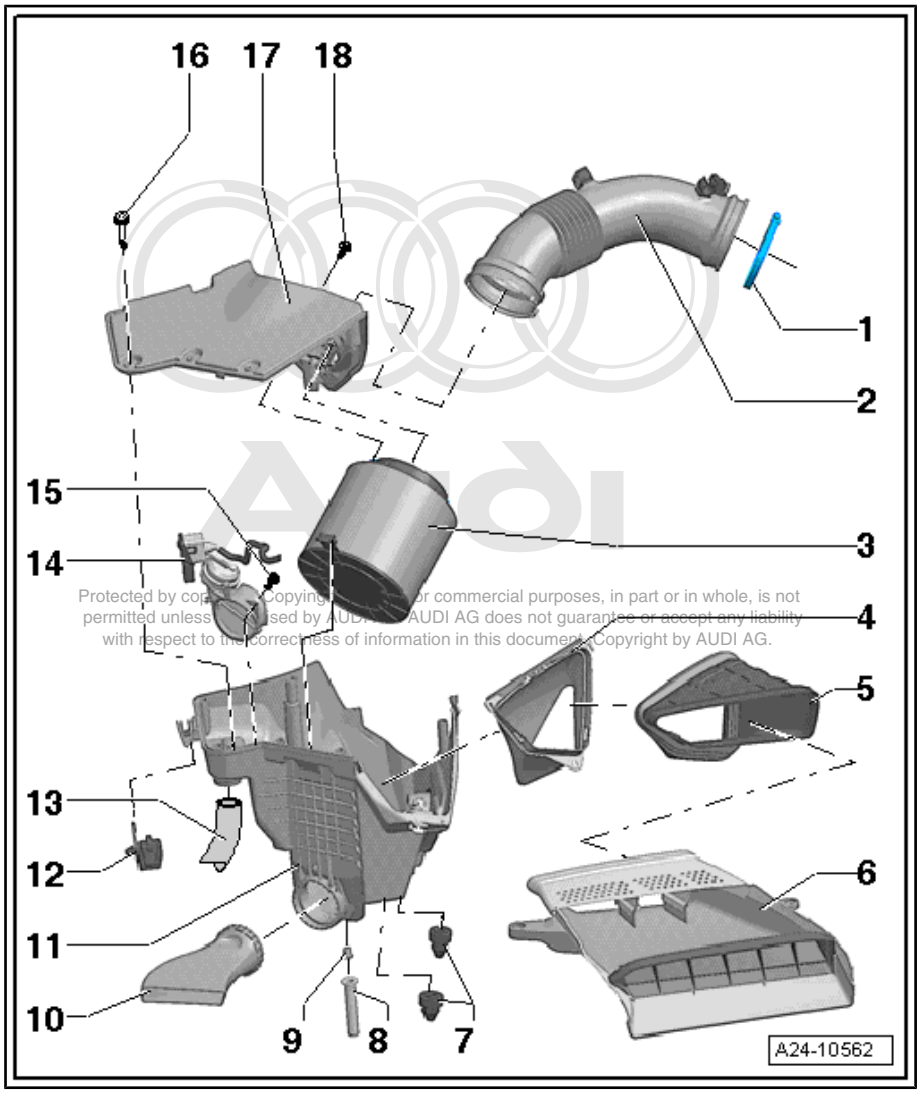
- ⇒ “4.1 Exploded view - intake manifold (bottom section) with fuel rail”, page 345
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

3 Air cleaner

⇒ “3.1 Exploded view - air cleaner housing”, page 342

⇒ “3.2 Removing and installing air filter element”, page 343

3.1 Exploded view - air cleaner housing



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1 - Hose clip

2 - Air hose

- ❑ To throttle valve module - J338-
- ❑ Pay attention to marking when installing (arrow points towards bolt of throttle valve module - J338-)

3 - Air filter element

- ❑ Always use genuine part for air filter element
- ❑ Maintenance intervals ⇒ Maintenance ; Booklet 812 and ⇒ Maintenance ; Booklet 818
- ❑ Removing and installing ⇒ “3.2 Removing and installing air filter element”, page 343
- ❑ Also clean snow screen (if fitted)

4 - Air duct

- ❑ Clipped into air cleaner (top section)
- ❑ Clean dirt and leaves out of air duct

5 - Air duct

- ❑ Clean dirt and leaves out of air duct

6 - Air duct

- ❑ To lock carrier
- ❑ Clean dirt and leaves out of air duct

7 - Rubber grommet

8 - Water drain hose

- ❑ Clean any leaves and dirt out of water drain hose

9 - Guide for water drain hose

10 - Hot air intake (countries with cold climates only)

- ❑ Slide hot air intake into air cleaner as far as stop; then turn clockwise until it engages noticeably

11 - Air cleaner (bottom section)

- ❑ Clean any salt residue, leaves and dirt out of air cleaner (bottom section)
- ❑ Check for dirt in water drain and clean as required

12 - Retainer for air cleaner (bottom section)

13 - Intake hose for secondary air pump

- ❑ Not installed in all vehicles

14 - Variable intake manifold change-over valve - N335-

- ❑ Not installed in all vehicles
- ❑ Valve installed: without function

15 - Bolt

- ❑ For variable intake manifold change-over valve - N335-

16 - Bolt

17 - Air cleaner (top section)

- ❑ Clean any salt residue, leaves and dirt out of air cleaner (top section)

18 - Bolt

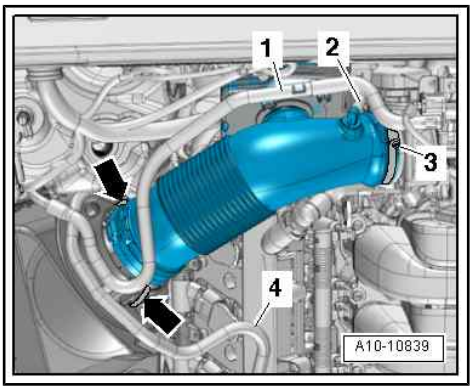
- ❑ For securing air filter element

Audi
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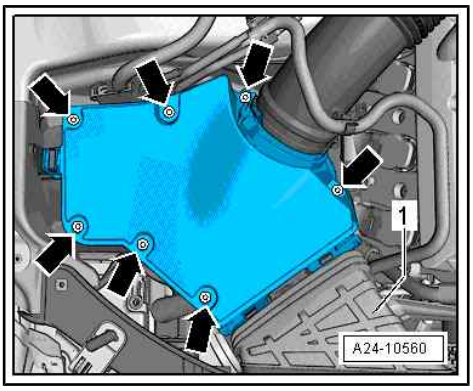
3.2 Removing and installing air filter element

Removing

– Release clamps -arrows- and pull air hose out of air cleaner housing.



– Remove bolts -arrows- from air cleaner (top section) and lift out air cleaner (top section).



Note

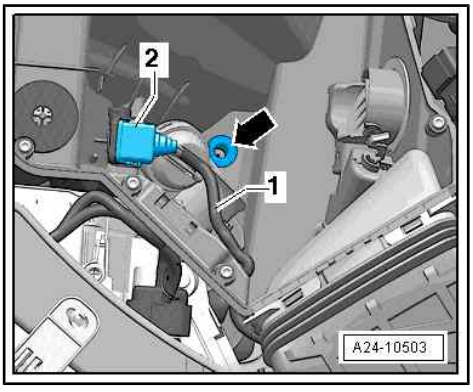
- *Always use genuine part for air filter element.*
- *Use a silicone-free lubricant when installing the air hose.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue .*

– Check water drain hose -arrow- in air cleaner (bottom section) for dirt and other obstructions (clean if necessary).

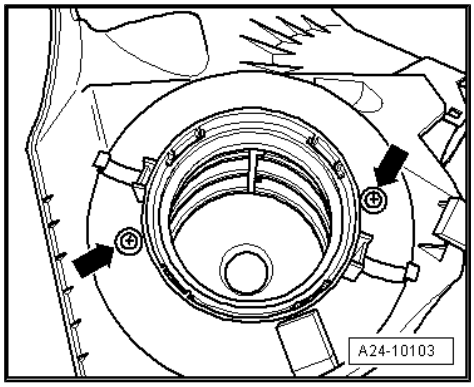
– Clean salt residue, dirt and leaves out of air cleaner housing (top and bottom sections); use a vacuum cleaner if necessary.

– Check for dirt in air duct leading to air filter element.

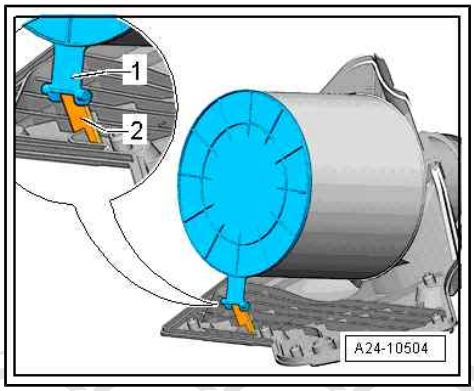
– When installing air filter element, check that it is properly centred in retainer in air cleaner (top section).



– Screw air cleaner (top section) onto new air filter element.



– Lug on air filter element -1- must make contact with lug on air cleaner housing -2-.
– Fit the top section of the air cleaner carefully on the bottom section, without using force.



Note

Before tightening bolts, make sure that top section of air cleaner is inserted into groove on bottom section of air cleaner (to prevent air leaks).

– Then screw top section of air cleaner back onto bottom section.
– Make sure that air hose is securely fitted.
– The remaining installation steps are carried out in the reverse sequence.

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4 Intake manifold

⇒ “4.1 Exploded view - intake manifold (bottom section) with fuel rail”, page 345

⇒ “4.2 Removing and installing intake manifold (bottom section) with fuel rail”, page 347

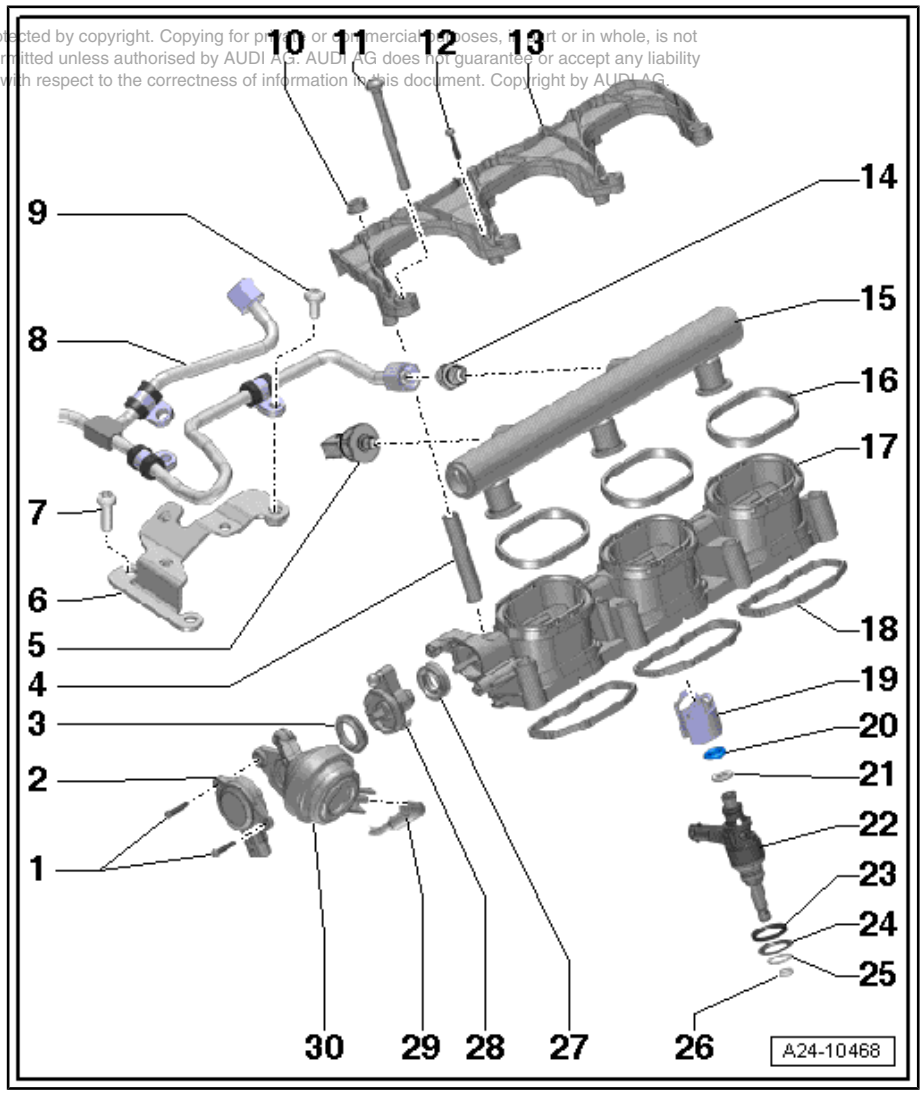
⇒ “4.3 Removing and installing throttle valve module J338 ”, page 350

⇒ “4.4 Removing and installing regulating flap control unit J808 ”, page 351

⇒ “4.5 Cleaning throttle valve module”, page 352

4.1 Exploded view - intake manifold (bottom section) with fuel rail

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1 - Bolts

- ❑ 2.5 Nm

2 - Intake manifold flap potentiometer

- ❑ Left side: intake manifold flap potentiometer 2 - G512- , right side: intake manifold flap potentiometer - G336-
- ❑ The removal and installation procedures are described in chapter ⇒ “2.3 Removing and installing vacuum unit for actuating intake manifold flaps”, page 336 .

3 - Seal

- ❑ Renew if damaged
- ❑ When renewing lever out with screwdriver
- ❑ Press in by hand

4 - Sleeve

5 - Fuel pressure sender - G247-

- ❑ 22 Nm
- ❑ Lubricate threads

6 - Bracket

7 - Bolt

- ❑ 9 Nm

8 - High-pressure pipes

- ❑ Removing and installing ⇒ “8.3 Removing and installing high-pressure pipe”, page 369
- ❑ Do not alter shape
- ❑ Connections must not be damaged
- ❑ To loosen and tighten fuel pipe, counterhold at fuel pipe connection
- ❑ Re-tighten connection for fuel pipe before installing fuel pipe
- ❑ 27 Nm

9 - Bolt

- ❑ 9 Nm

10 - Nut

- ❑ 9 Nm

11 - Bolt

- ❑ 9 Nm

12 - Bolt

- ❑ 2.5 Nm

13 - Retainer for fuel rail

14 - Threaded connection

- ❑ 40 Nm
- ❑ Always renew after removing
- ❑ Check tightening torque of threaded connection before fitting union nut

15 - Fuel rail

16 - Gasket

- ❑ Renew

17 - Intake manifold (bottom section)

- ❑ Removing and installing ⇒ “4.2 Removing and installing intake manifold (bottom section) with fuel rail”, page 347
- ❑ When installing intake manifold (bottom section), intake manifold flaps must be in output position (intake channel fully open)

18 - Gasket

- ❑ Renew

19 - Support ring

- ❑ Always renew after removing
- ❑ Make sure it is correctly seated
- ❑ Via this support ring, the fuel rail exerts the force which holds the injector in the cylinder head.

20 - O-ring

- ❑ Renew
- ❑ Lubricate lightly with clean engine oil

21 - Spacer ring

- ❑ Renew if damaged

22 - Injector

- ❑ Removing and installing ⇒ “5.1 Removing and installing injectors”, page 354
- ❑ Different types depending on version; refer to ⇒ Electronic parts catalogue

23 - Sealing element (top)

- ❑ Different types depending on version

24 - Sealing element (bottom)

- ❑ Different types depending on version

25 - Circlip

- ❑ Different types depending on version

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26 - Combustion chamber ring seal

- ❑ Renewing ⇒ “5.1 Removing and installing injectors”, page 354

27 - Seal

- ❑ Renew if damaged
- ❑ When renewing lever out with screwdriver

❑ Press in by hand

28 - Operating lever

❑ For vacuum unit

29 - Vacuum hose

❑ To intake manifold flap valve - N316-

30 - Vacuum unit for actuating intake manifold flaps

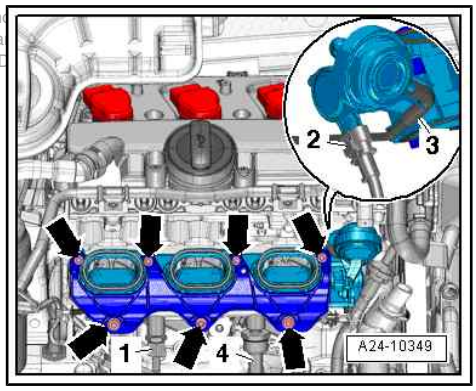
❑ Removing and installing ⇒ “2.3 Removing and installing vacuum unit for actuating intake manifold flaps”, page 336

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Intake manifold (bottom section) - tightening torque

– Tighten bolts and nuts -arrows- for intake manifold (bottom section) in diagonal sequence and in stages.

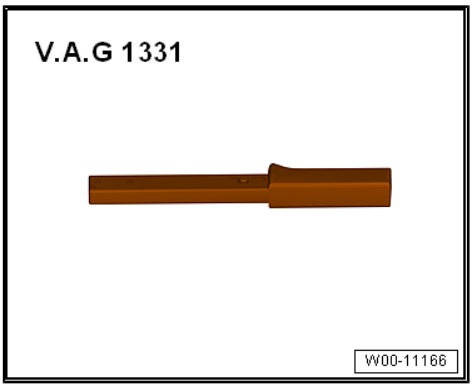
• 10 Nm



4.2 Removing and installing intake manifold (bottom section) with fuel rail

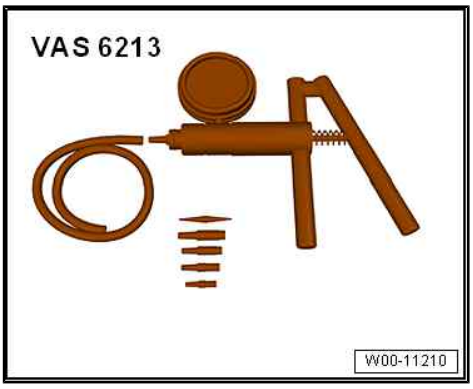
Special tools and workshop equipment required

♦ Torque wrench - V.A.G 1331-



♦ Tool inserts - V.A.G 1331/2-

♦ Hand vacuum pump - VAS 6213-



Removing

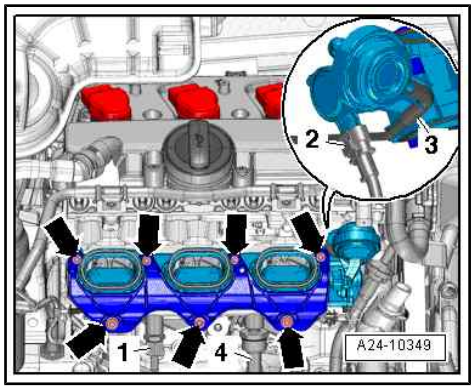
Note

The following description shows the removal and installation of the bottom section of the intake manifold (left-side). The procedure for the other side is more or less identical.

– Remove supercharger ⇒ page 310 .

– Push vacuum hoses to one side.

– Unplug electrical connector -4- at fuel pressure sender - G247- .



WARNING

The fuel system is pressurised.

Risk of injury as fuel may spray out.

- ***Put on safety goggles.***
- ***Put on protective gloves.***
- ***Release pressure (wrap clean cloth around connection and open connection carefully).***

– Unscrew union nut -1- (counterhold threaded connection).

– Remove bolts and nuts -arrows- and detach intake manifold (bottom section) with fuel rail.

– Unplug electrical connector -2- at intake manifold flap potentiometer and pull off vacuum hose -3-.

Caution

Risk of irreparable damage to engine.

- ***Block off the intake ports with clean cloths to prevent small objects from dropping into the engine through the intake ports in the cylinder heads.***

Installing

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

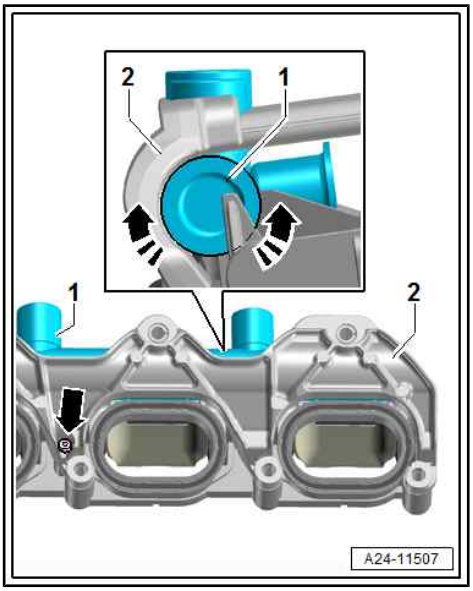
Note

- *If an injector has been pulled out of the cylinder head, the teflon ring seal must be renewed.*
- *If threaded connection ⇒ Item 14 (page 346) has been loosened or removed, it must be renewed.*
- *Renew gaskets and O-rings.*
- *Lubricate O-rings of injectors lightly with clean engine oil.*

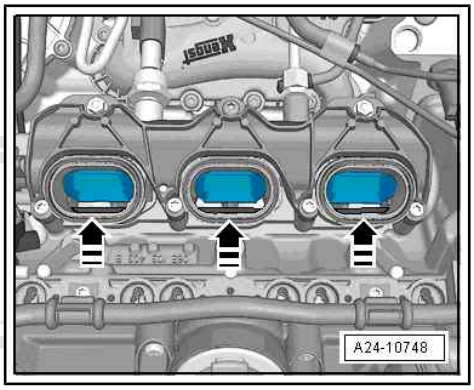
– Before installing intake manifold (bottom section), loosen bolt -arrow- and move fuel rail -1- back and forth in direction of -arrows-.

• If fuel rail -1- cannot be moved, remove and clean retainer for fuel rail -2-.

– Re-assemble retainer for fuel rail -2- and fuel rail -1-, only tightening bolt -arrow- hand-tight.



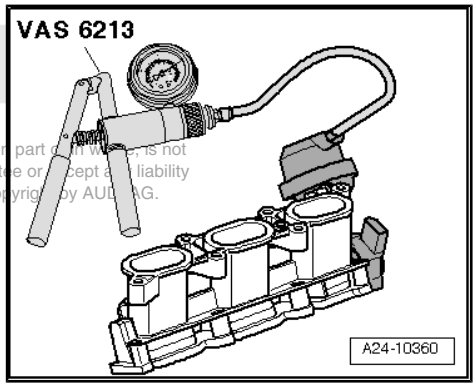
When installing intake manifold (bottom section) move intake manifold flaps in direction of -arrow-.



– Connect hand vacuum pump - VAS 6213- to vacuum unit for actuating intake manifold flaps as shown in illustration.

– Use hand vacuum pump to generate vacuum.

• This will cause the intake manifold flaps to open.



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Note

If the intake manifold flaps are not opened, they can catch on the guide plates in the cylinder head when the intake manifold (bottom section) is installed.

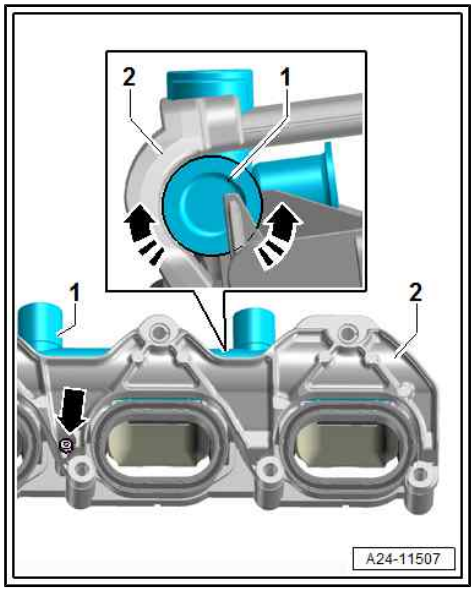
– Then press intake manifold (bottom section) evenly onto injectors.

– Tighten bolts and nuts for intake manifold (bottom section) in diagonal sequence to specified torque.

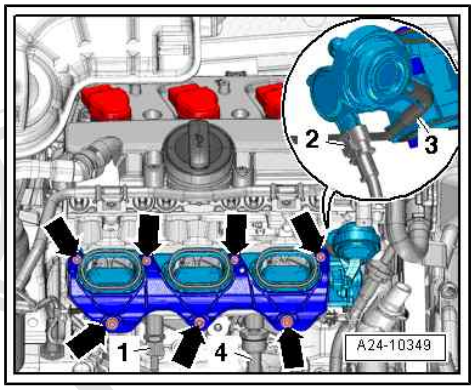
• Tightening torque for intake manifold (bottom section) ⇒ Fig. ""Intake manifold (bottom section) - tightening torque"" , page 347

– Disconnect hand vacuum pump from vacuum unit for actuating intake manifold flaps.

– Tighten bolt -arrow- to 1 Nm.



– Plug in electrical connector -4- at fuel pressure sender - G247- .
– Tighten union nut -1- (counterhold threaded connection).
• Tightening torque: intake manifold (bottom section) - exploded view ⇒ page 345
– Ensure that high-pressure pipe is not under tension.
– Install supercharger ⇒ page 310 .

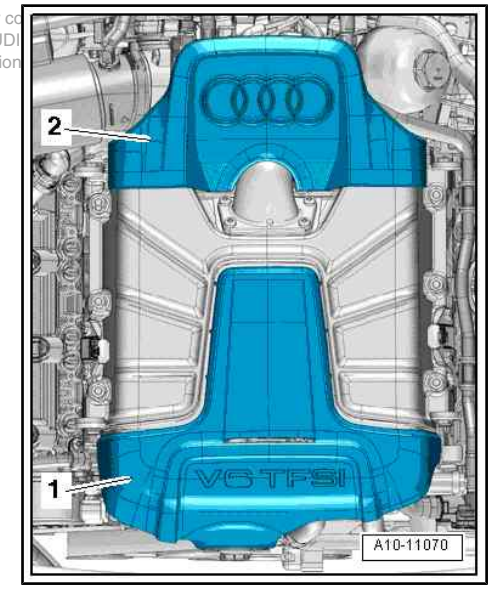


4.3 Removing and installing throttle valve module - J338-

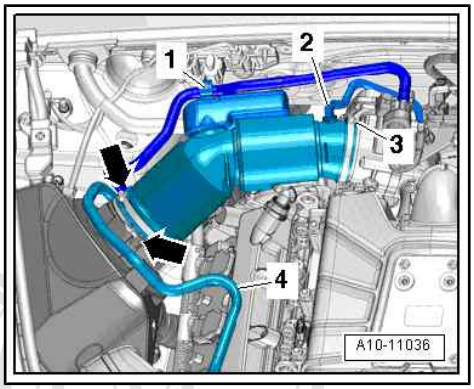
Removing

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– Lift off engine cover panel (rear) -2-.



– Move clear fuel line -4- and line -1- leading to activated charcoal filter on air cleaner housing and air pipe.
– Detach vacuum hose -2- from connection on air hose.
– Remove air pipe. To do so, release hose clip -3- and clamps -arrows-.

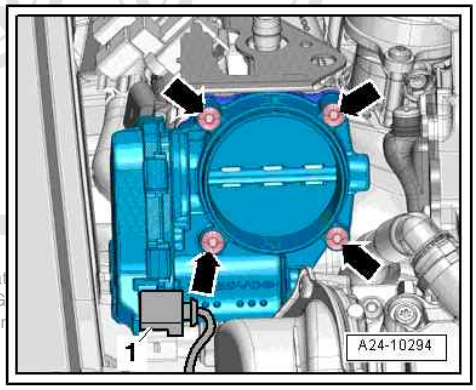


– Unplug electrical connector -1-.
– Remove bolts -arrows- and detach throttle valve module - J338- with intermediate flange.

Caution

Risk of irreparable damage to engine.

- ***Block off the intake port with a clean cloth to prevent small items from dropping into the supercharger.***



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Installing

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

Note

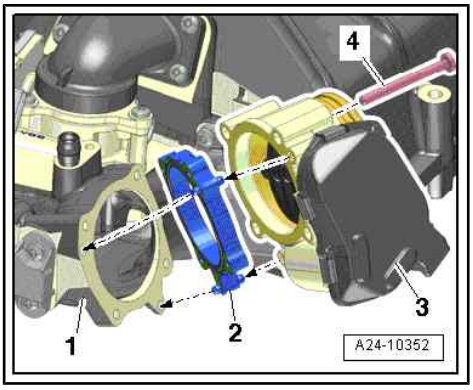
Fit new O-rings.

– Insert intermediate flange -2- with O-rings into supercharger -1- -left arrows-.
– Fit throttle valve module - J338- -item 3- on intermediate flange -right arrows-.

- Tightening torque: 10 Nm

If throttle valve module - J338- has been cleaned or renewed:

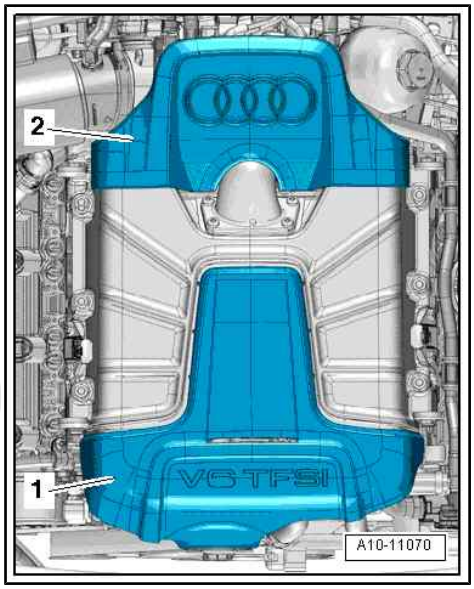
– Erase learnt values and adapt engine control unit - J623- to throttle valve module - J338- ⇒ Vehicle diagnostic tester.



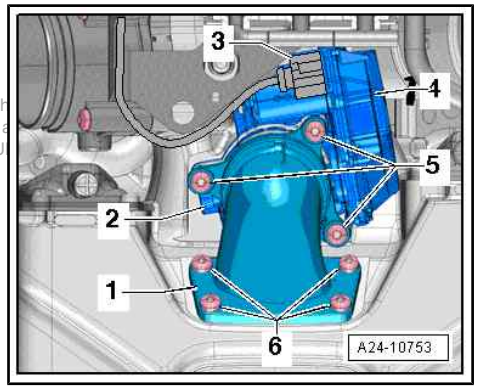
4.4 Removing and installing regulating flap control unit - J808-

Removing

– Lift off engine cover panel (rear) -2-.



– Unplug electrical connector -3- at regulating flap control unit - J808- .
– Remove bolts -5- and -6-.
– Take out bypass elbow -1- with adapter (intermediate flange) -2- and regulating flap control unit - J808- -4-.



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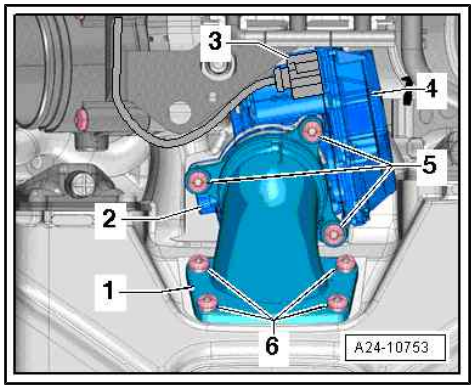
Installing

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

Note

Fit new O-rings.

– Install bypass elbow -1- with adapter (intermediate flange) -2- and regulating flap control unit - J808- -4- using new O-rings.
– Screw in bolts -5- and -6- hand-tight.
– Then first tighten bolts -6- to specified torque.
• Tightening torque: 10 Nm
– Then tighten bolts -5- to the same specified torque.
– Re-attach electrical connector -3-.
– After renewing regulating flap control unit - J808- , perform `Adaption` in `Guided Functions` ⇒ vehicle diagnostic tester .



4.5 Cleaning throttle valve module

Note

Take care not to scratch the throttle valve housing when cleaning it.

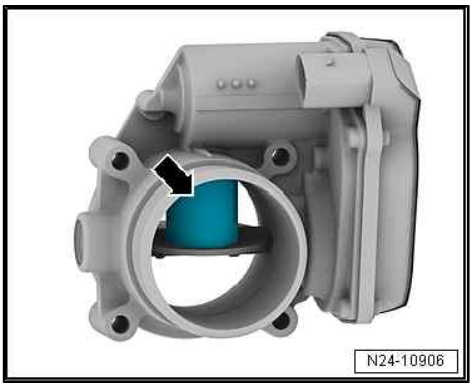
Special tools and workshop equipment required

♦ Acetone (commercially available)
♦ Brush

Procedure

– Remove throttle valve module - J338- ⇒ page 350 .

– Open throttle valve by hand and block it in the open position with a suitable object (e.g. plastic or wooden wedge) -arrow-.

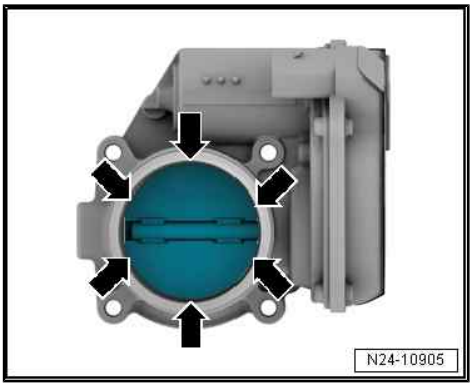


WARNING

Risk of injury caused by acetone. Acetone is highly flammable and can cause irritation to the eyes and skin.

- ***Put on safety goggles.***
- ***Put on protective gloves.***

– Clean throttle valve housing thoroughly, especially around the points -arrows- where the throttle valve closes, using commercially available acetone and a small brush.



– Wipe out throttle valve housing with a lint-free cloth.

– Allow acetone to evaporate completely and re-install throttle valve module after cleaning.

– Install throttle valve module - J338- ⇒ page 350 .

– Erase learnt values and adapt engine control unit - J623- to throttle valve module. Use ⇒ Vehicle diagnostic tester.

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5 Injectors

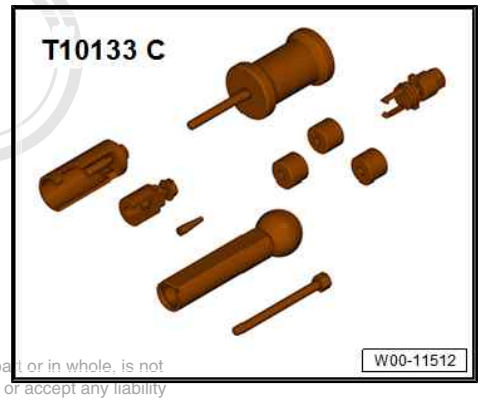
⇒ “5.1 Removing and installing injectors”, page 354

⇒ “5.2 Cleaning injectors”, page 358

5.1 Removing and installing injectors

Special tools and workshop equipment required

- Tool set for FSI engines - T10133 C-



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Removing

– Remove supercharger ⇒ page 310 .

– Remove corresponding intake manifold (bottom section) ⇒ page 347 .

Removing any injectors lodged in fuel rail

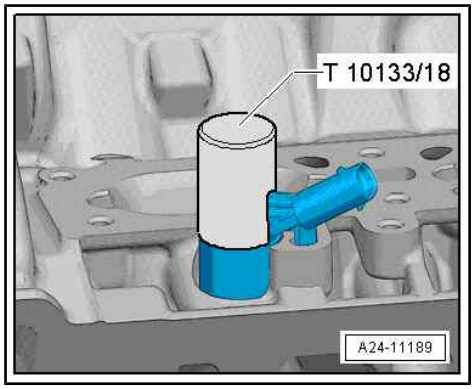
– Carefully pull injectors out of fuel rail.

Removing any injectors lodged in cylinder head

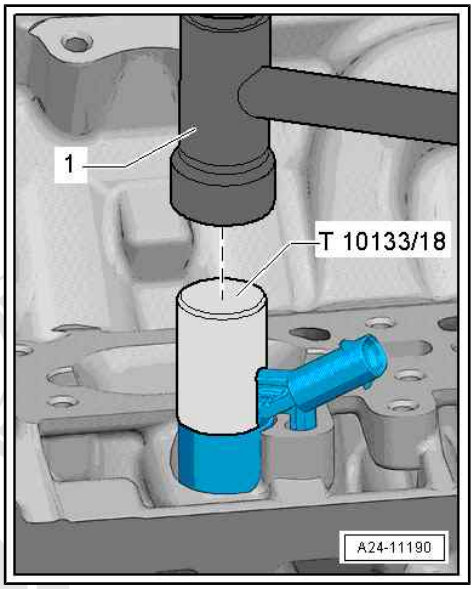
– Cover open inlet ports with a clean cloth.

– Unplug electrical connector at injector that is to be removed.

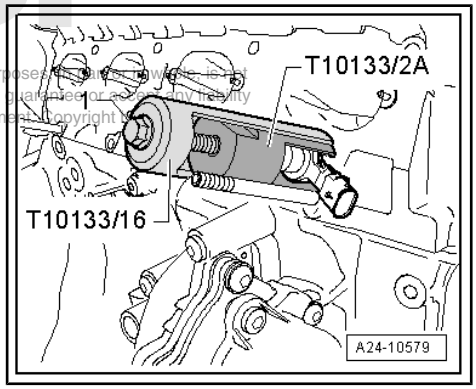
– Slide stop sleeve -T10133/18- over injector.



– Carefully knock against stop sleeve several times to loosen injector.

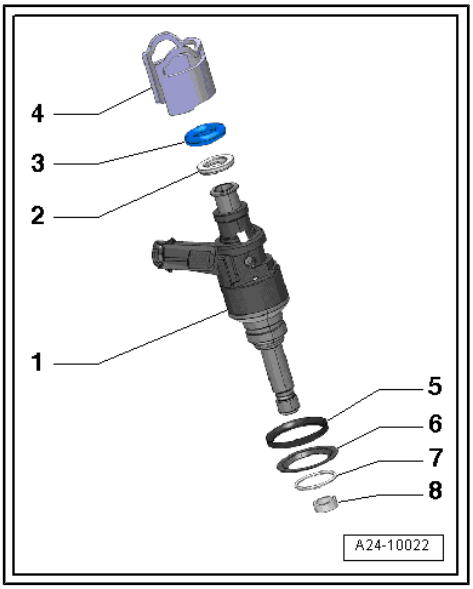


– Apply puller -T10133/2A- to groove on injector.
– Then attach removal tool -T10133/16- and pull out injector by turning bolt -1-.



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Injector (old version)



1 - Injector

2 - Spacer ring - renew

3 - O-ring - renew (apply thin coating of clean engine oil prior to installation)

4 - Support ring - renew (via this support ring, fuel rail exerts force which secures injector in cylinder head)

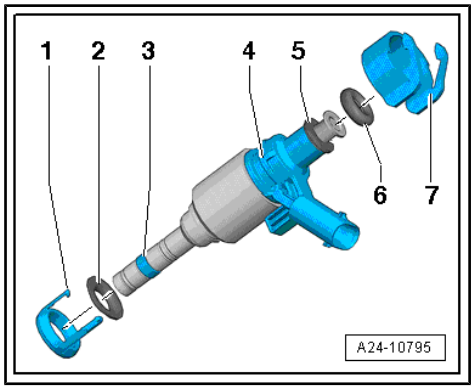
5 - Intermediate ring/retaining ring (top) - note installation position; renew if visibly damaged or worn (no longer available; replaced with an intermediate ring - see next illustration ⇒ Fig. ““Injector (new version)““ , page 356)

6 - Intermediate ring/retaining ring (bottom) - note installation position; renew if visibly damaged or worn (no longer available; replaced with an intermediate ring - see next illustration ⇒ Fig. ““Injector (new version)““ , page 356)

7 - Circlip - do not stretch (no longer available; replaced with a retaining ring - see next illustration ⇒ Fig. ““Injector (new version)““ , page 356)

8 - Combustion chamber ring seal (teflon ring seal) - renew; when fitting, do not grease ring or use any other lubricant. Carefully remove old combustion chamber ring seal. To do so, cut open combustion chamber ring seal using knife or prise open with small screwdriver and then pull off forwards. Take care not to damage groove on injector. Injector must be renewed if groove is damaged.

Injector (new version)



1 - Retaining ring - renew (combined as a unit with intermediate ring -2-)

2 - Intermediate ring - renew (combined as a unit with retaining ring -1-)

3 - Combustion chamber ring seal (teflon ring seal) - renew; when fitting, do not grease ring or use any other lubricant

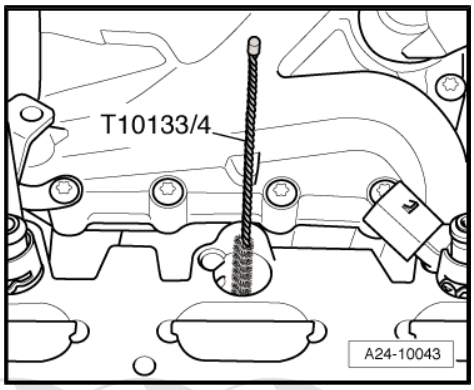
4 - Injector

5 - Spacer ring - renew

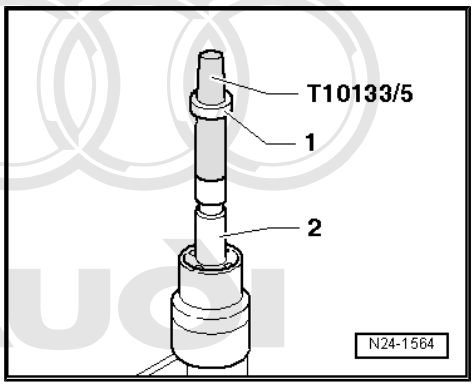
6 - O-ring - renew (apply thin coating of clean engine oil prior to installation)

7 - Support ring - renew (via this support ring, fuel rail exerts force which secures injector in cylinder head)

Installing

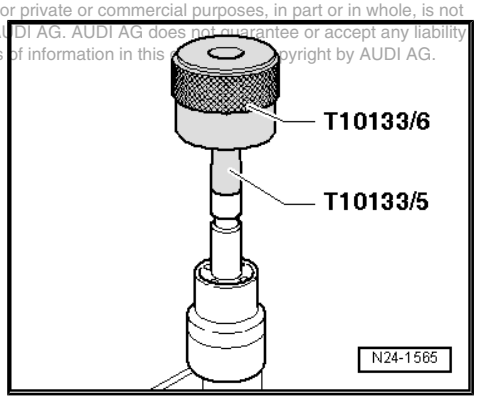


– Clean bore in cylinder head with nylon cylinder brush - T10133/4- .



– Fit assembly cone -T10133/5- with new combustion chamber ring seal -1- from repair set onto injector -2-.

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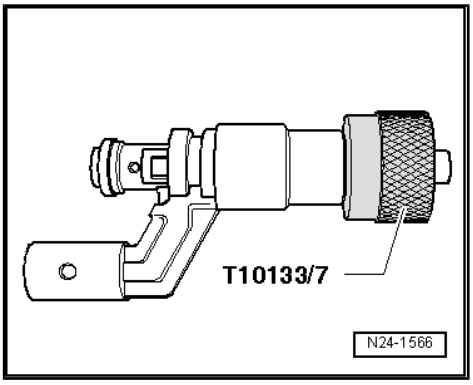
– Push combustion chamber ring seal onto assembly cone - T10133/6- as far as it will go using assembly sleeve - T10133/5- .

– Turn assembly sleeve -T10133/6- upside down and push combustion chamber ring seal into sealing ring groove.

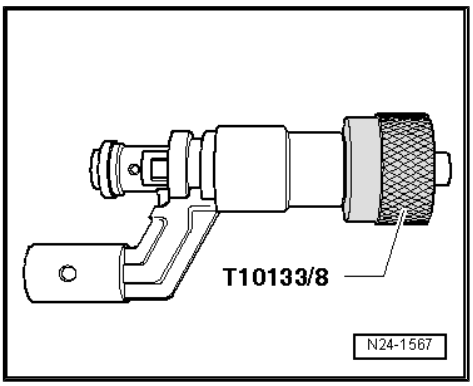
Note

The combustion chamber ring seal is widened when it is pushed onto the injector. After pushing it on, it therefore has to be compressed again. This is done in two stages, as described below.

– Push calibration sleeve -T10133/7- onto injector as far as it will go and simultaneously turn it slightly (approx. 180°).
– Pull calibration sleeve -T10133/7- off again by turning it in the opposite direction.



– Push calibration sleeve -T10133/8- onto injector as far as it will go and simultaneously turn it slightly (approx. 180°).
– Pull calibration sleeve -T10133/8- off again by turning it in the opposite direction.



Fully assembling/installing injector

1 - Retaining ring - renew (combined as a unit with intermediate ring -2-)

2 - Intermediate ring - renew (combined as a unit with retaining ring -1-)

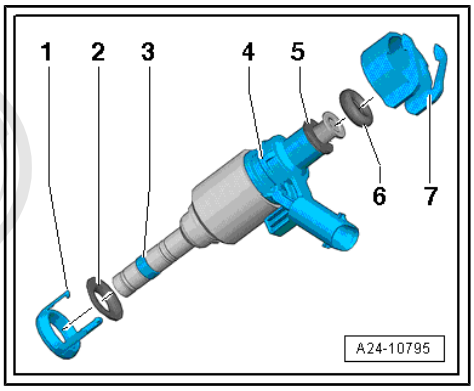
3 - Combustion chamber ring seal (teflon ring seal) - renew; when fitting, do not grease ring or use any other lubricant

4 - Injector

5 - Spacer ring - renew

6 - O-ring - renew (apply thin coating of clean engine oil prior to installation)

7 - Support ring - renew (via this support ring, fuel rail exerts force which secures injector in cylinder head)



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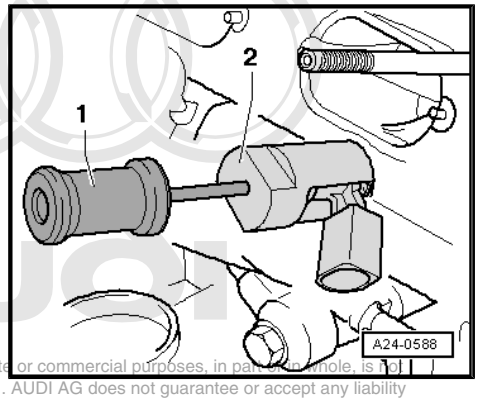
Note

The combustion chamber ring seal must always be renewed prior to re-installing the injector.

– Push injector by hand as far as it will go into aperture in cylinder head (do not use oil or grease). Ensure that the injector is properly seated in the cylinder head.

Note

- ♦ *It should be possible to insert the injector easily. If necessary, wait until the seal has contracted sufficiently.*
- ♦ *Note correct installation position and ensure that injectors are properly seated in cylinder head.*
- ♦ *If the injector cannot be pushed in by hand, use puller - T10133/2A- -2- with striker - T10133/3- to insert the injector.*



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- Electrical connector of injector must engage in recess in cylinder head.
- Coat O-ring of high-pressure injector with clean engine oil to facilitate insertion into fuel rail.
- Renew all seals.

Perform further installation in reverse order, paying attention to the following:

– Install intake manifold (bottom section) ⇒ page 347 .

– Install supercharger ⇒ page 310 .

5.2 Cleaning injectors

Special tools and workshop equipment required

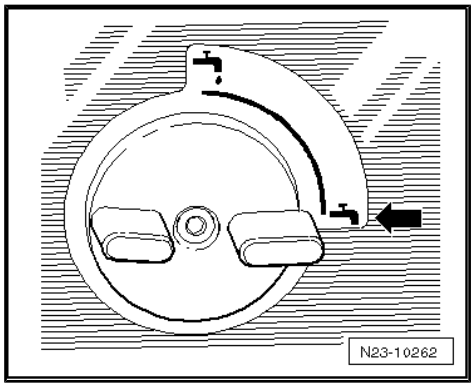
- ♦ Ultrasonic cleaning unit - VAS 6418-
- ♦ Mounting plate for injection modules - VAS 6418/1-
- ♦ Cleaning fluid - VAS 6418/2-

Cleaning

– Remove injectors ⇒ page 354 .

– Close drain tap -arrow- on ultrasonic cleaning unit - VAS 6418- (located on right side of housing).

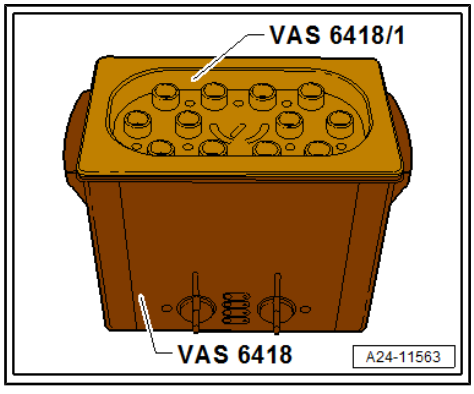
– Fill ultrasonic unit with 2,120 ml of water which has been allowed to settle for a few minutes and cleaning fluid - VAS 6418/2- .



Mixture ratio for cleaning fluid

- 2,100 ml of tap water which has been allowed to settle for a few minutes and 20 ml of cleaning fluid - VAS 6418/2-

– Place mounting plate for injection modules - VAS 6418/1- on top of cleaning unit.



WARNING

It is important to read the safety notes in the operating instructions before switching on the ultrasonic cleaning unit - VAS 6418- .

The ideal fluid level is approx. 1-4 mm above the base of the mounting plate. The ultrasonic cleaning unit - VAS 6418- can be damaged if the fluid level is too low.

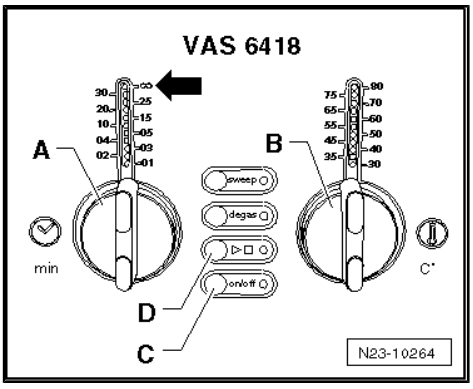
– Insert FSI injectors all the way into guides of mounting plate for injection modules - VAS 6418/1- .

– Switch on cleaning unit by pressing on/off button -C-.

– Select a cleaning time of 30 minutes with rotary control -A-.

– Set rotary control -B- to a temperature of 50°C.

– Press ▶ button -D- to start cleaning procedure.



Note

- *The temperature-controlled cleaning process is now started. While the fluid is being heated, the ultrasound is activated at intervals in order to circulate the cleaning solution. The ultrasound is activated continuously when the preselected temperature is reached.*
- *The actual cleaning process commences when the temperature reaches at least 50 °C and must last for at least 30 minutes.*

– Install injectors with new combustion chamber seal ⇒ page 354 .

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6 Senders and sensors

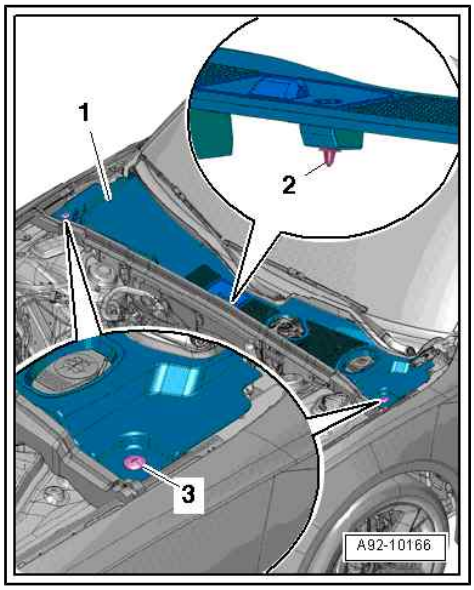
⇒ “6.1 Removing and installing control unit for structure-borne sound J869 and actuator for structure-borne sound R214 ”, page 360

6.1 Removing and installing control unit for structure-borne sound - J869- and actuator for structure-borne sound - R214-

Removing

– Pull seal off plenum chamber partition panel.

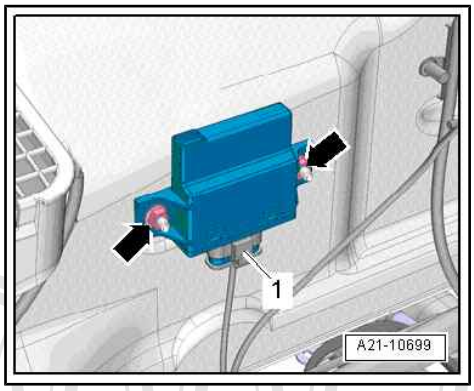
– Remove plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .



Control unit for structure-borne sound - J869- :

– Unplug electrical connector -1-.

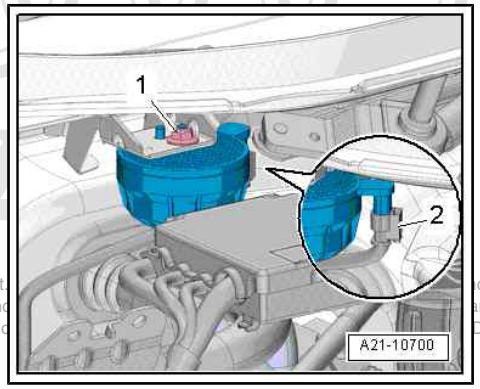
– Unscrew nuts -arrows- and detach control unit for structure-borne sound - J869- .



Actuator for structure-borne sound - R214- :

– Remove nut -1-.

– Detach actuator for structure-borne sound - R214- and disconnect electrical connector -2-.



Installing

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

Tightening torques:

- ⇒ Fig. “” Control unit for structure-borne sound -J869- - tightening torque”“ , page 309 .
- ⇒ Fig. “” Actuator for structure-borne sound -R214- - tightening torque”“ , page 309 .

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

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7 Engine control unit

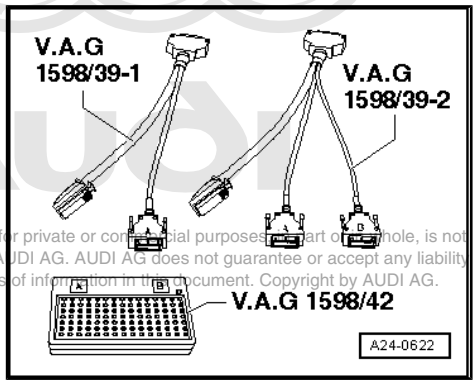
⇒ “7.1 Wiring and component check with test box V.A.G 1598/42 ”, page 361

⇒ “7.2 Removing and installing engine control unit J623 ”, page 362

7.1 Wiring and component check with test box - V.A.G 1598/42-

Special tools and workshop equipment required

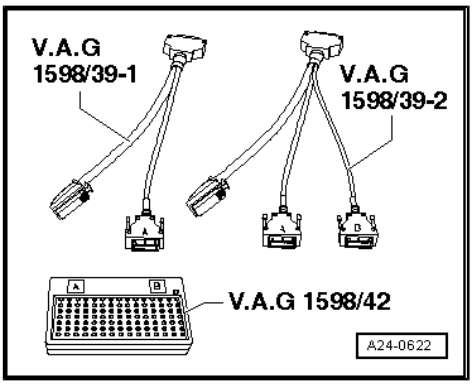
- Adapter cable - V.A.G 1598/39-1-
- Adapter cable - V.A.G 1598/39-2-
- Test box - V.A.G 1598/42-



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Note

- *The test box has 105 sockets. The connecting cable can be disconnected from the test box. This means that only the cable (and not the test box) has to be purchased for future engine control units with different types of connectors.*
- *The smaller of the two connectors on the engine control unit has the contacts 1 to 60. The larger of the two connectors has the contacts 1 to 94.*
- *To carry out tests on the 60-pin wiring harness connector, the adapter cable - V.A.G 1598/39-1- is connected to connector “A” on the test box. For components connected to 60-pin wiring harness connector ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.*
- *To carry out tests on the 94-pin wiring harness connector, the adapter cable - V.A.G 1598/39-2- must be connected to connectors “A” and “B” on the test box. For components connected to 94-pin wiring harness connector ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.*
- *The test box - V.A.G 1598/42- is designed so it can be connected both to the wiring harness for the engine control unit and to the engine control unit itself at the same time.*
- *The advantage of this is that the electronic engine control system remains fully functional when the test box is connected (for example, for measuring signals when the engine is running).*
- *The relevant test procedure will state whether it is necessary to also connect the engine control unit to the test box.*



Procedure

WARNING

To prevent irreparable damage to the electronic components, select appropriate measuring range before connecting the measuring cables and observe the test requirements.

- The engine control unit has to be removed before multi-pin connectors can be unplugged from engine control unit ⇒ page 362 .
- Connect test box - V.A.G 1598/42- to wiring harness with adapter cable - V.A.G 1598/39-1- or adapter cable - V.A.G 1598/39-2- . Connect earth clip of test box to negative terminal of battery. The instructions for performing the individual tests indicate whether or not the engine control unit itself also needs to be connected to the test box.
- Connect earth clip of test box to negative terminal in engine compartment.

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Note

The instructions for performing the individual tests indicate whether or not the engine control unit itself also needs to be connected to the test box.

- Carry out test as described in repair procedure.

Installing engine control unit

Installation is performed in the reverse sequence.

- It is important that the protective housing is re-fitted on the engine control unit (if fitted previously).
- Clean threaded holes for shear bolts to remove any residue from locking fluid. This can be done using a thread tap.
- Always use new shear bolts.

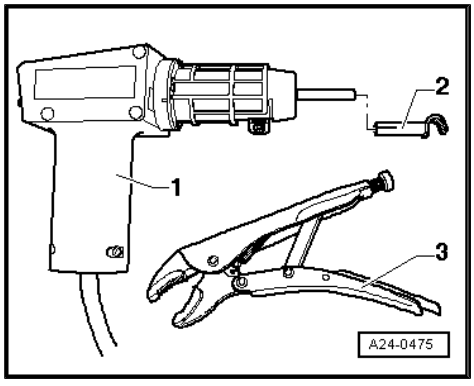
Perform the following after reconnecting engine control unit:

- Interrogate event memory.

7.2 Removing and installing engine control unit - J623-

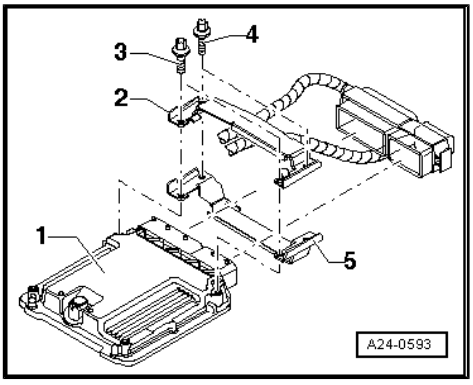
Special tools and workshop equipment required

- Hot air blower - VAS 1978/14A- -item 1- with nozzle attachment -2- from wiring harness repair set - VAS 1978 B-
- Small, commercially available mole grips -3-



Note

- *Not every engine control unit is bolted to a protective housing. Whether a protective housing is fitted depends on the engine/ gearbox combination.*
- *The engine control unit -1- is bolted to the protective housing -5-. To make it more difficult to unscrew the shear bolts -4- for locking plate -2-, their threads have been coated with locking fluid.*
- *The metal housing has to be removed before the connectors can be unplugged from the engine control unit (e.g. to connect the test box or renew the engine control unit).*



Removing

– When renewing engine control unit, select diagnosis object “Replace engine control unit” in “Guided Functions”. Use vehicle diagnostic tester to do so.

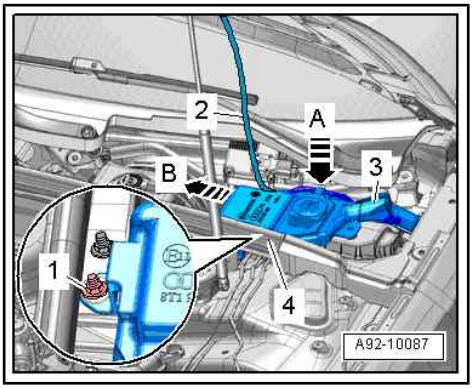
– Switch off ignition and remove ignition key.

– Slightly pull off rubber seal in front of nut -1- on plenum chamber cover.

– Unhook wiring harness -2- from retainer -A-.

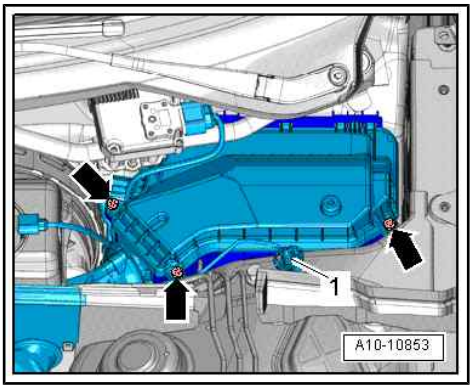
– Remove nut -1-.

– Pull filler neck -3- with filler pipe out of washer fluid reservoir and through opening in body.

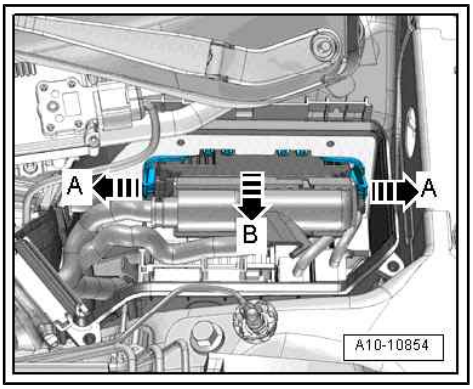


– Unscrew bolts -arrows- and take off lid for electronics box.

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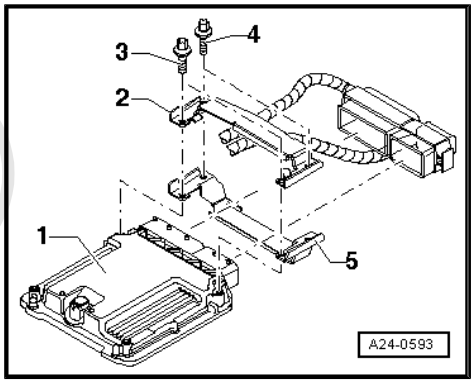


– Release retainers -arrows A- and pull out engine control unit - J623- -arrow B-.



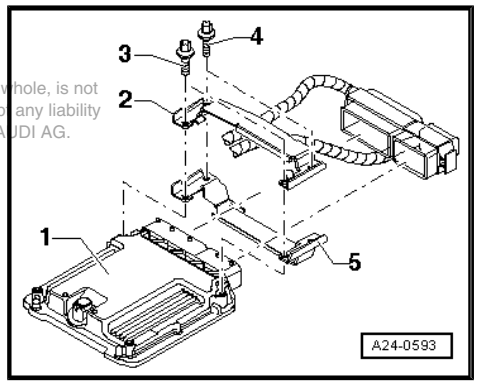
To help prevent unauthorised access to the connectors on the engine control unit, the engine control unit -1- is bolted to a metal casing -5- by means of shear bolts -3 and 4- and a locking plate -2-.

The threads of the two shear bolts -4- which are not screwed into the engine control unit are secured with locking fluid. To unscrew these two bolts, the threads must therefore be heated with the hot air blower.

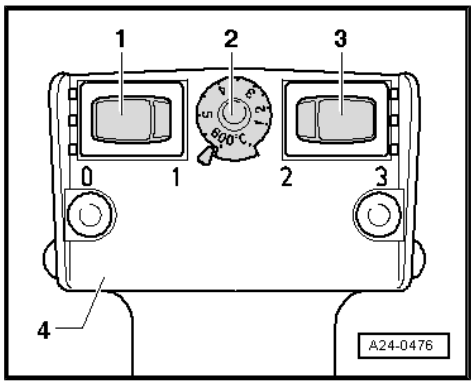


The threads of the two shear bolts -3- which are screwed into the engine control unit are not secured with locking fluid. Do not apply heat to the threads in the control unit housing; this is not necessary and would cause overheating of the control unit.

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– Select settings on hot air blower as shown in illustration, i.e. set temperature potentiometer -2- to maximum heat output and two-stage air flow switch -3- to position 3.

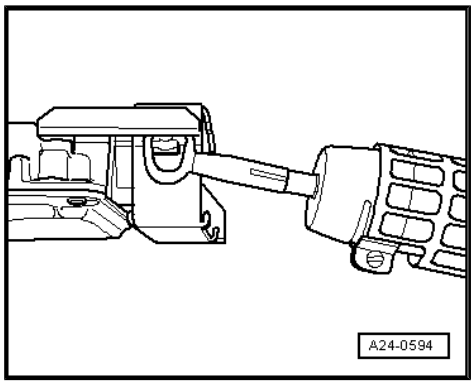


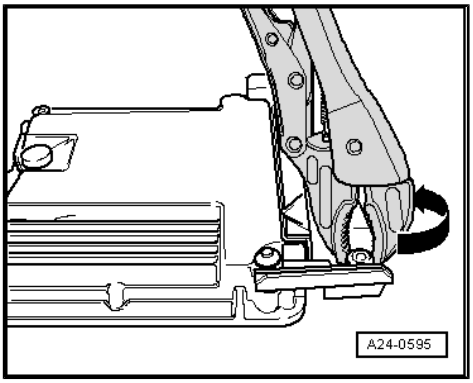
WARNING

Heating the thread of the locking plate also heats up the shear bolts and parts of the metal housing. Take care to avoid burns. It is also important to ensure that only the thread is heated and none of the surrounding components if at all possible. These should be covered if necessary.

– Apply heat to the threads of the shear bolts on the connector side for approx. 25 to 30 seconds.

– Unscrew shear bolts using mole grips (see arrow in illustration).





– The two shear bolts screwed into the engine control unit do not need to be heated. They should be removed without being heated.
– Detach metal locking plate from control unit connectors.
– Release connectors on engine control unit and unplug connectors.
– Take out old engine control unit - J623- and install new engine control unit - J623- .

Installing

Installation is performed in the reverse sequence.

– It is important that the protective housing is re-fitted on the engine control unit (if fitted previously).
– Clean threaded holes for shear bolts to remove any residue from locking fluid. This can be done using a thread tap.
– Always use new shear bolts.
♦ Tightening torque for bolts securing lid of electronics box: 3.5 Nm.

After installing a new engine control unit, the following operation must be performed:

– Activate engine control unit via a vehicle diagnostic tester in “Guided Functions” mode, “Replace engine control unit”.

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8 High-pressure pump

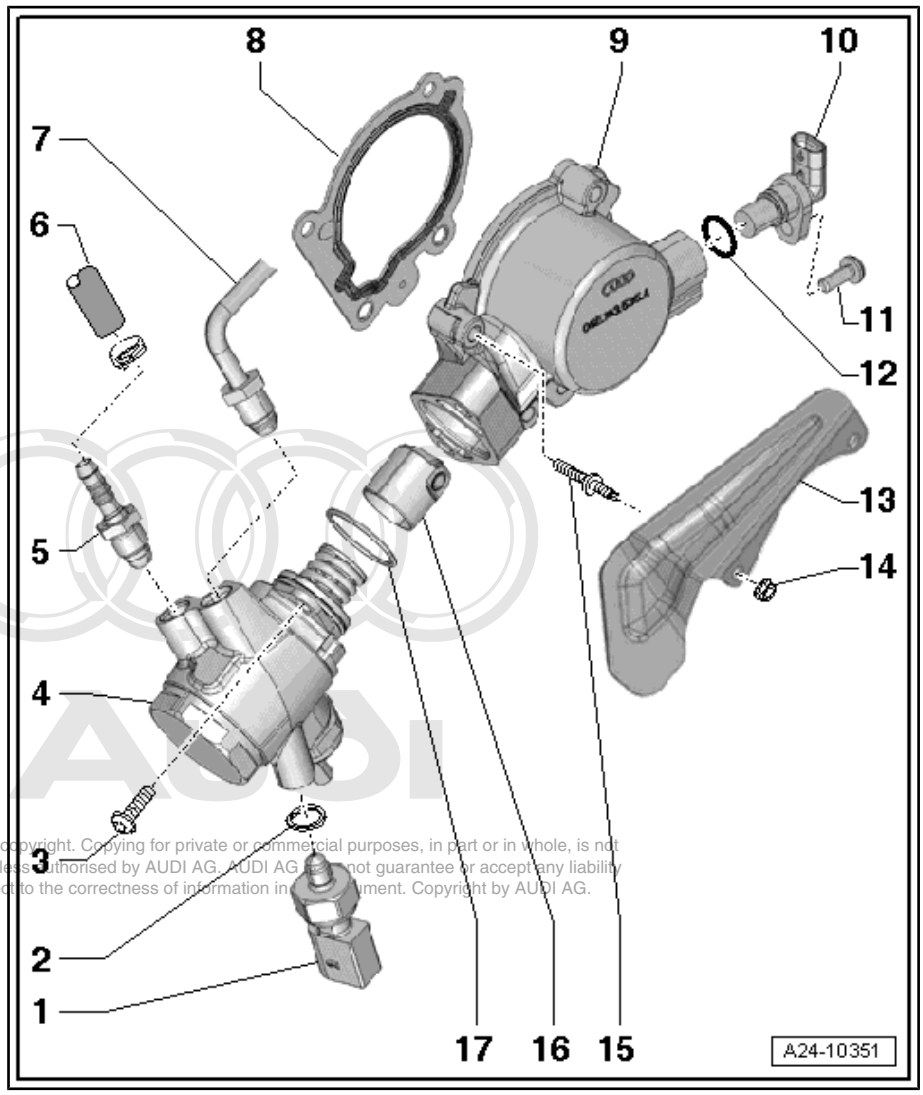
⇒ “8.1 Exploded view - high-pressure pump”, page 366

⇒ “8.2 Removing and installing high-pressure pump”, page 367

⇒ “8.3 Removing and installing high-pressure pipe”, page 369

⇒ “8.4 Checking fuel pressure and residual pressure (up to high-pressure pump)”, page 371

8.1 Exploded view - high-pressure pump



1 - Fuel pressure sender for low pressure - G410-

- ❑ 15 Nm

2 - Seal

- ❑ Renew

3 - Bolt

- ❑ Hand-tighten in diagonal sequence, then tighten to 5 Nm
- ❑ Final torque: 20 Nm
- ❑ Do not tilt high-pressure pump

4 - High-pressure pump

- ❑ With fuel metering valve - N290-
- ❑ Removing and installing ⇒ “8.2 Removing and installing high-pressure pump”, page 367
- ❑ Do not dismantle

5 - Threaded connection

- ❑ Connections must not be damaged
- ❑ Always renew after removing
- ❑ 27 Nm

6 - Fuel supply hose

- ❑ Low-pressure section

7 - High-pressure fuel pipe

- ❑ Removing and installing ⇒ “8.3 Removing and installing high-pressure pipe”, page 369
- ❑ Do not alter shape
- ❑ Check for damage before re-installing
- ❑ Lubricate thread of union nut with fuel
- ❑ 27 Nm

8 - Gasket

- ❑ Renew

9 - Housing

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10 - Hall sender - G40-

- ❑ Removing and installing ⇒ “1.5 Removing and installing Hall senders”, page 417

11 - Bolt

- ❑ 9 Nm

12 - O-ring

- ❑ Renew
- ❑ Lubricate lightly with clean engine oil before installing

13 - Protective plate

- ❑ For high-pressure pipe

14 - Nut

- ❑ 9 Nm

15 - Centre hex stud

- ❑ 9 Nm

16 - Roller tappet

- ❑ Can only be installed in one position
- ❑ Lubricate lightly with clean engine oil before installing

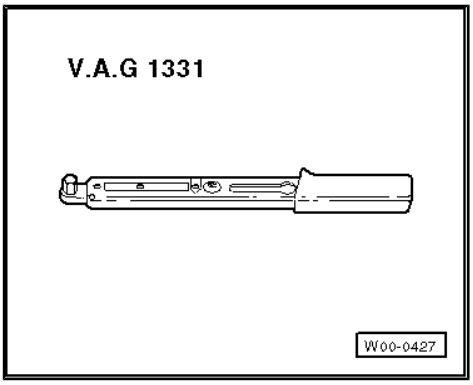
17 - O-ring

- ❑ Renew
- ❑ Lubricate lightly with clean engine oil before installing

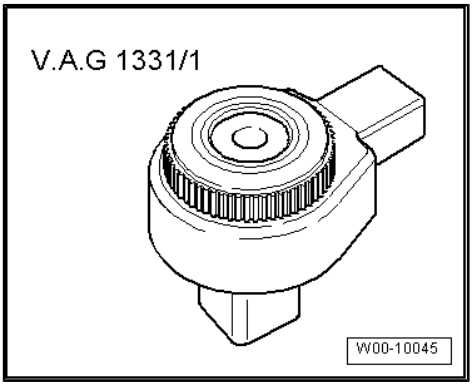
8.2 Removing and installing high-pressure pump

Special tools and workshop equipment required

- ♦ Torque wrench - V.A.G 1331-



- ♦ Ratchet - V.A.G 1331/1-



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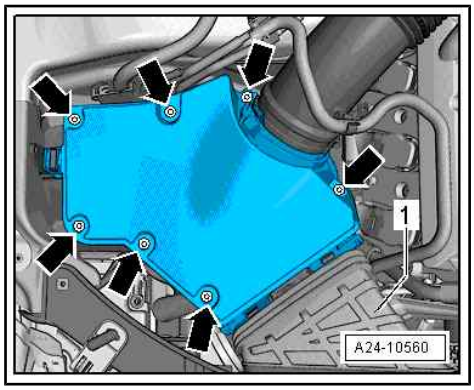
- ♦ Socket insert AF 14, flared ring spanner - V.A.G 1331/8-

Removing

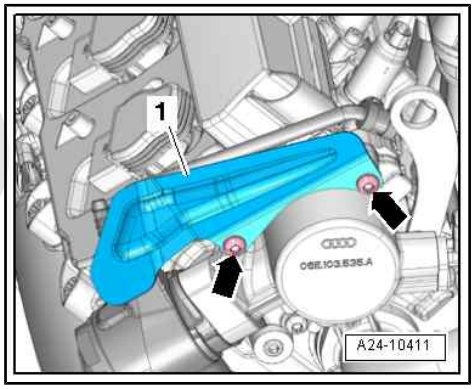
Note

- *The high-pressure pump should only be removed and installed when the engine is cold.*
- *When installing the high-pressure fuel pump, it is essential to ensure that no dirt enters the fuel system.*
- *Use a cloth to catch escaping fuel.*
- *The O-ring must always be renewed.*
- *Always ensure that the high-pressure fuel pipes are free of tension when tightening the connections.*

– Remove air duct -1-.



– Unscrew nuts -arrows- and remove guard plate -1-.



– Unplug electrical connectors -1- and -6-.
– Remove bolt -3- on retaining clip.

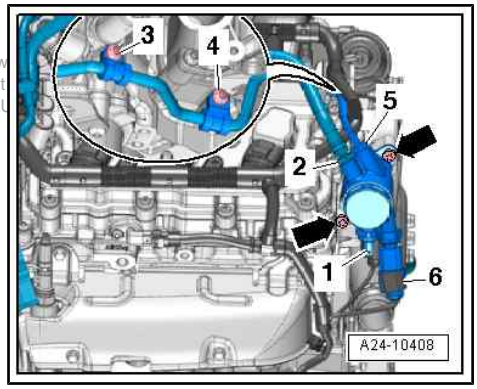
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WARNING

The fuel system is pressurised.

Risk of injury as fuel may spray out.

- ***Put on safety goggles.***
- ***Put on protective gloves.***
- ***Release pressure (wrap clean cloth around connection and open connection carefully).***



– Unscrew connections -2- and -5-.
– Remove bolts -arrows-.
– Carefully pull out high-pressure fuel pump. It is possible that the sleeve may remain lodged inside.

Note

- *Do not bend pipes to a different shape.*
- *Disregard -item 4-.*

Installing

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

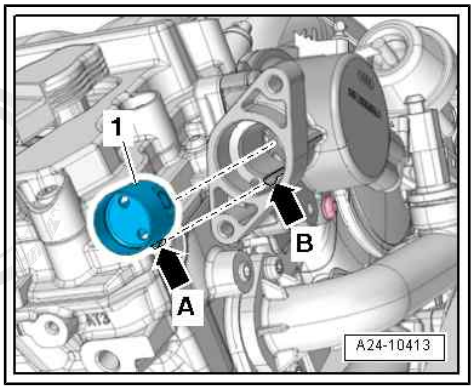
Note

- *The connections of the high-pressure pipe must not be damaged.*
- *Do not attempt to bend high-pressure pipe to a different shape.*

– Renew O-ring for high-pressure pump.

– Check roller tappet -1- for damage and renew if necessary.

– Lightly lubricate roller tappet with oil and insert it so that lug -arrow A- slides into guide notch -arrow B-.



– Rotate crankshaft in direction of engine rotation by turning bolt for vibration damper, and at the same time press roller tappet into cylinder head until it reaches its lowest point.

– Only lift high-pressure pipe slightly to fit high-pressure pump.

– Hand-tighten bolts for high-pressure pump as far as stop.

– Now tighten bolts in diagonal sequence to specified torque.

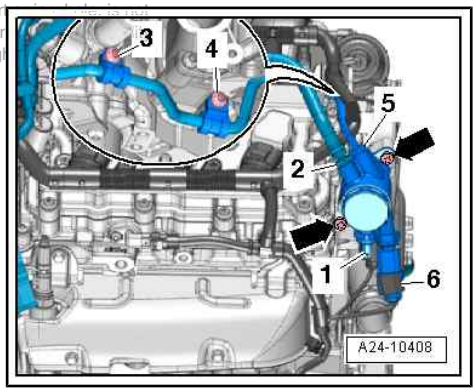
• Tightening torques: exploded view - high-pressure pump ⇒ page 366

– Install high-pressure pipes -2- and -5- ⇒ page 369 .

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– Re-attach electrical connectors -1- and -6-.

– Tighten bolt -3- on retaining clip.



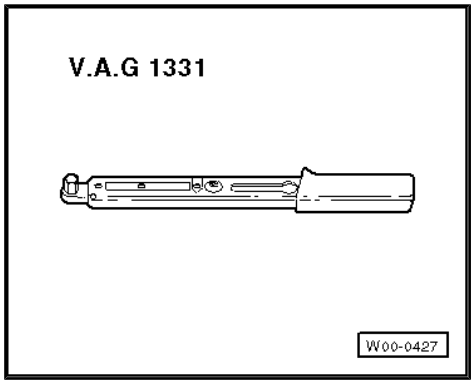
Note

Check fuel system for leaks.

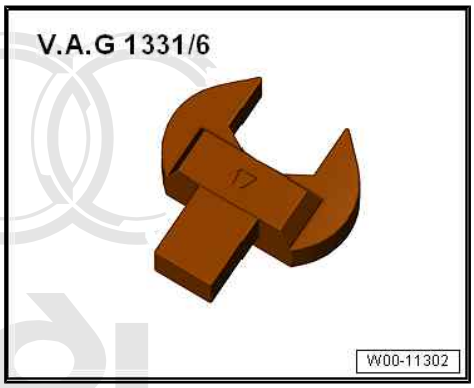
8.3 Removing and installing high-pressure pipe

Special tools and workshop equipment required

- Torque wrench - V.A.G 1331-



- Open end spanner insert, AF 17 - V.A.G 1331/6-

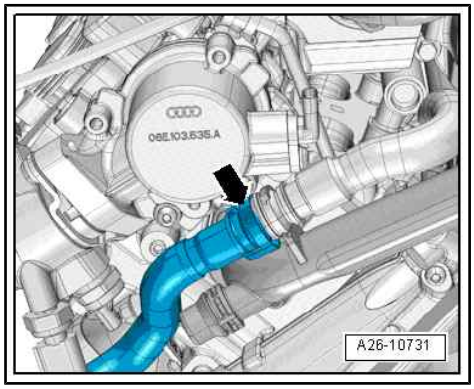


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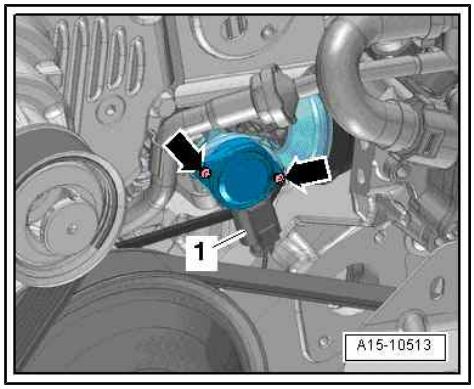
Removing

– Remove supercharger ⇒ page 310

– Press release tabs and detach secondary air hose -arrow- to front from bracket.



– Remove bolts -arrows- and move intake manifold flap potentiometer - G336- with vacuum unit for intake manifold flap clear to one side.



Note

- *Disregard -item 1-.*
- *The procedure is illustrated for the left-side cylinder bank 2.*

WARNING

The fuel system is pressurised.

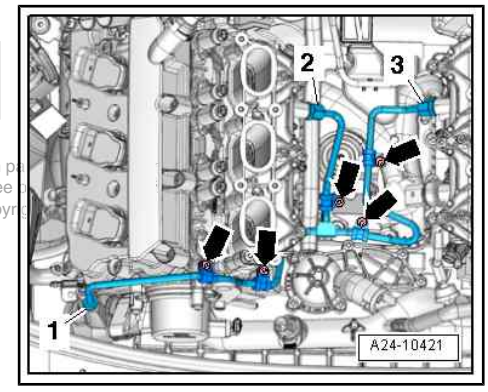
Risk of injury as fuel may spray out.

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

- *Put on protective gloves.*
- *Release pressure (wrap clean cloth around connection and open connection carefully).*

– Unscrew bolts -arrows- and bolted connection -1-.

– Unscrew union nuts -2- and -3- (counterhold threaded connection).



Note

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- *Do not attempt to bend high-pressure pipe to a different shape.*
- *The threaded connection in the fuel rail must be renewed if it has been loosened or removed at union nuts -2- and -3- ⇒ Item 14 (page 346)* .

Installing

- Tightening torques ⇒ “8.1 Exploded view - high-pressure pump”, page 366

Note

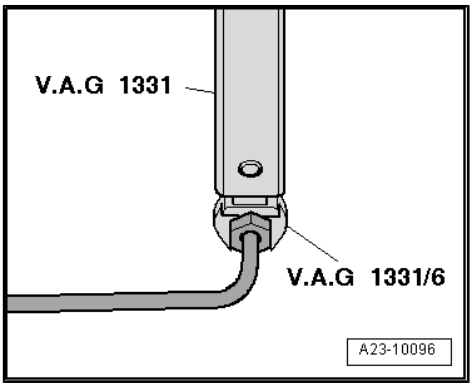
- *The connections of the high-pressure pipe must not be damaged.*
- *Do not attempt to bend high-pressure pipe to a different shape.*

– First tighten union nut by hand until it makes contact, making sure that high-pressure pipe is not under tension.

– Tighten union nut with torque wrench - V.A.G 1331- and tool insert, AF 17 - V.A.G 1331/6- ; to do so, counterhold at hexagon flats of threaded connection on fuel rail with an open-end spanner.

– Do not tighten bolt for retainer until high-pressure pipe has been tightened.

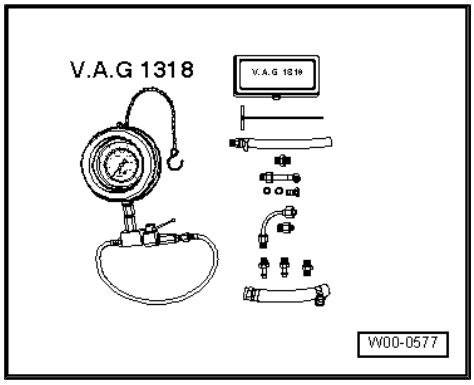
– Install supercharger ⇒ page 310 .



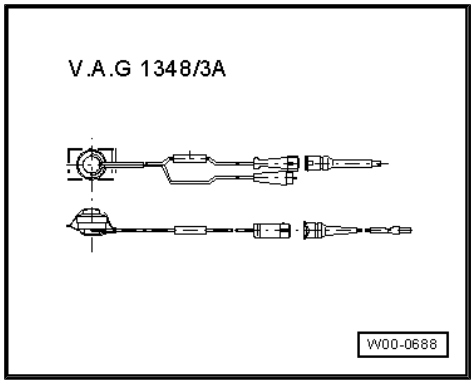
8.4 Checking fuel pressure and residual pressure (up to high-pressure pump)

Special tools and workshop equipment required

- K-Jetronic pressure tester - V.A.G 1318-



- Adapter set - V.A.G 1318/10-12-
- Auxiliary measuring set - V.A.G 1594C-
- Remote control - V.A.G 1348/3A- for V.A.G 1348 with adapter cable -V.A.G 1348/3-3-



- Fuel-resistant measuring container

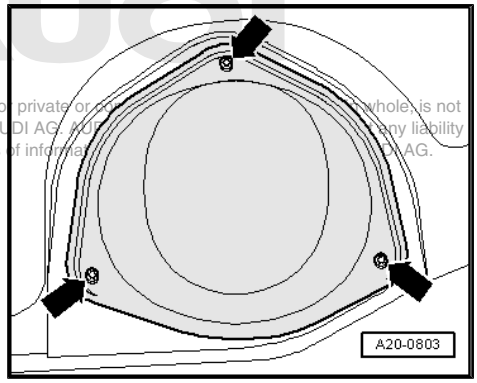
Test conditions

- Battery voltage at least 12.5 Volt.
- Fuel filter OK.
- Fuel tank at least $^1/_4$ full.
- Fuel pump control unit - J538- OK; checking ⇒ Fuel supply system; Rep. gr. 20 ; Fuel pump .
- Ignition off.

Checking fuel pressure

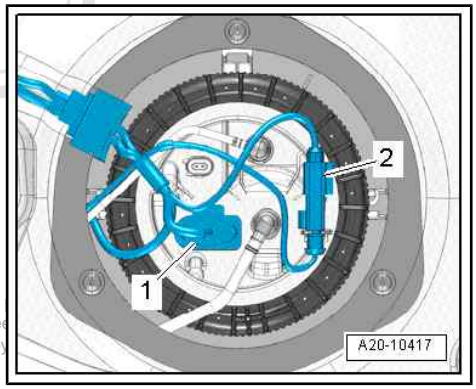
– Remove rear seat bench ⇒ General body repairs, interior; Rep. gr. 72 ; Rear seats; Removing and installing seat bench/ individual seats .

– Unbolt cover from flange -arrows-.



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– Unplug electrical connector -1- at flange.



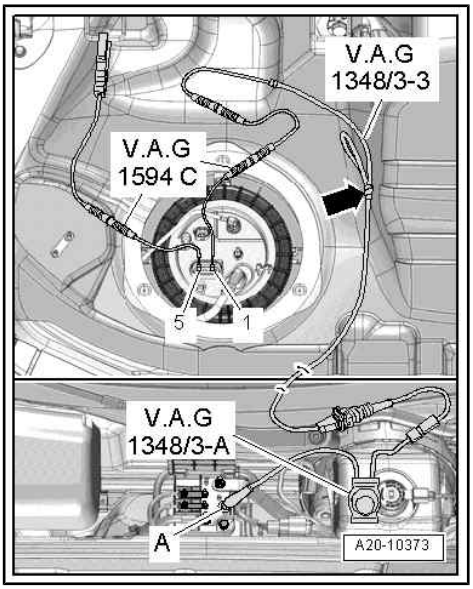
Note

Disregard -item 2-.

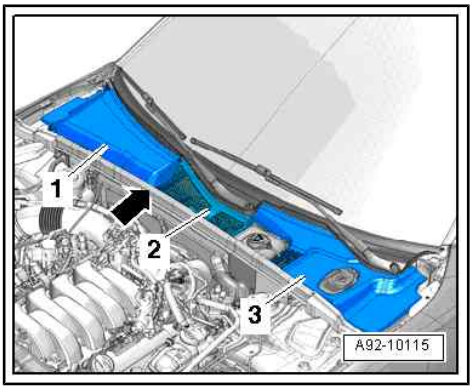
– Connect remote control - V.A.G 1348/3A- for V.A.G 1348 to contact -1- using adapter cable -V.A.G 1348/3-3- and test lead from auxiliary measuring set - V.A.G 1594C- .

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– Tape off second connector contact of adapter cable -V.A.G 1348/3-3- with insulating tape -arrow- to prevent short circuits.
– Connect contact -5- to the body (earth) using a test lead from auxiliary measuring set - V.A.G 1594C- .
– Move switch of remote control - V.A.G 1348/3A- for V.A.G 1348 to front of engine compartment.



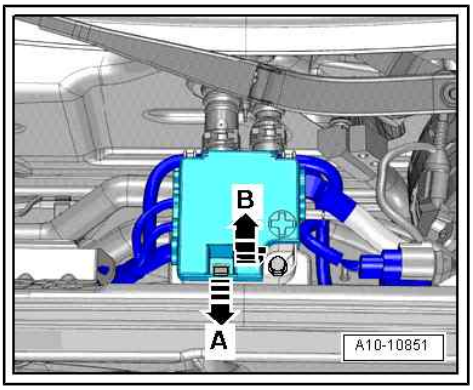
– Remove seal -arrow-.
– Unclip plenum chamber cover -2- and remove.



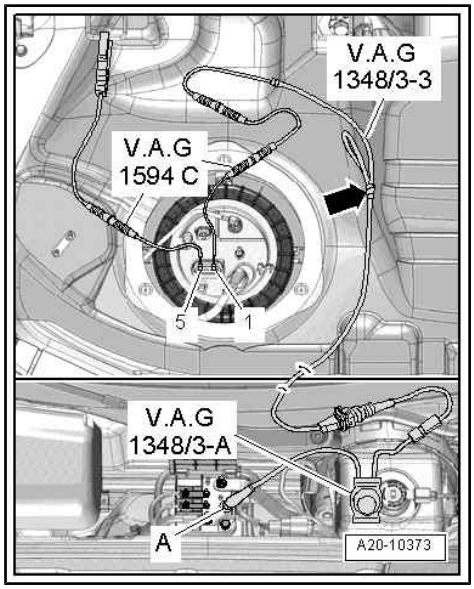
Note

Disregard -items 1 and 3-.

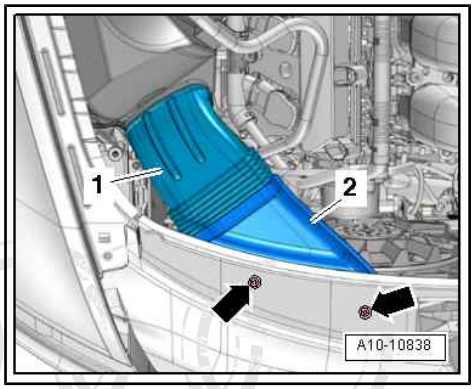
– Release retainer -arrow A- and open cover -arrow B-.



– Connect remote control - V.A.G 1348/3A- for V.A.G 1348 to item -A- of distribution box in plenum chamber (battery positive). For safety reasons an in-line fuse (10 A) must be connected into the lead.



– Remove bolts -arrows-, detach air ducts -1- and -2-.



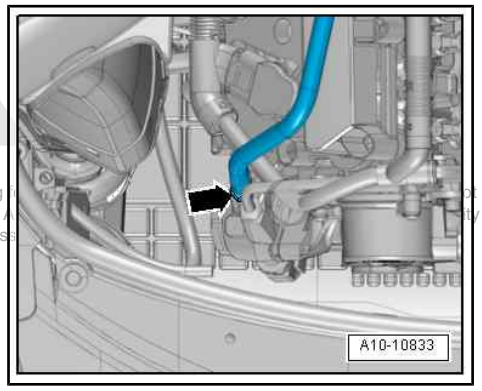
WARNING

The fuel system is pressurised.

Risk of injury as fuel may spray out.

- ***Put on safety goggles.***
- ***Put on protective gloves.***
- ***Release pressure (wrap clean cloth around connection and open connection carefully).***

– Detach fuel supply hose from high-pressure pump -arrow- and move clear.



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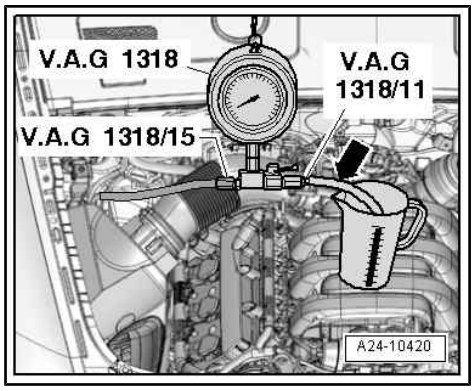
– Connect K-Jetronic pressure tester - V.A.G 1318- with adapters -V.A.G 1318/11- and -V.A.G 1318/15- to fuel line.

– Connect extension hose -arrow- to pressure tester and hold end of hose in measuring container.

– Open cut-off valve on pressure tester.

• Lever points in direction of flow.

– Bleed fuel system by pressing remote control briefly.



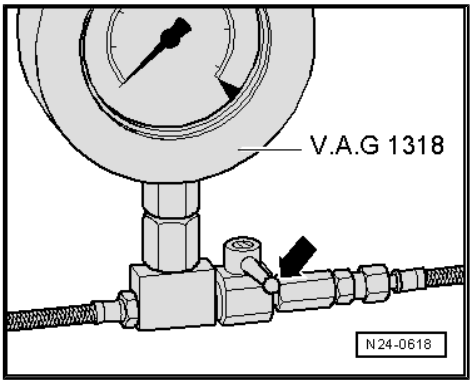
– Close cut-off valve on pressure tester.

• Lever is at right angle to direction of flow -arrow-.

– Press switch on remote control until pressure tester shows no further increase in pressure.

• Specification: approx. 6 bar

– If specification is not attained, check delivery rate of fuel pump ⇒ Fuel supply system; Rep. gr. 20 ; Fuel pump; Checking fuel system pressurisation pump - G6- .



Checking residual pressure

– Check for leaks and check residual pressure by watching pressure drop on pressure tester.

• After 10 minutes pressure should still be at least 3 bar.

If the residual pressure drops below 3 bar:

♦ Check union between pressure tester and fuel line for leaks.

♦ Check pressure tester for leaks.

♦ Check fuel lines and their connections for leaks.

♦ Renew fuel filter with integrated fuel pressure regulator ⇒ Fuel supply system; Rep. gr. 20 ; Fuel filter; Removing and installing fuel filter .

♦ Return valve of fuel pump is defective ⇒ Fuel supply system; Rep. gr. 20 ; Fuel pump; Checking fuel system pressurisation pump - G6- .

Assembling

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

WARNING

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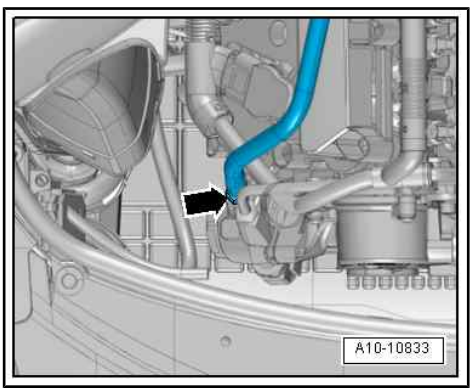
The fuel system operates at extremely high pressure. This can cause injury.

♦ ***Before removing the pressure tester, release the fuel pressure by opening the cut-off valve. Hold a container under the connection.***

– Re-attach fuel supply hose -arrow- to high-pressure pump (make sure that all parts are clean).

• Tightening torque: exploded view - high-pressure pump ⇒ page 366

– Install rear seat bench ⇒ General body repairs, interior; Rep. gr. 72 ; Rear seats; Removing and installing seat bench/individual seats .



Note

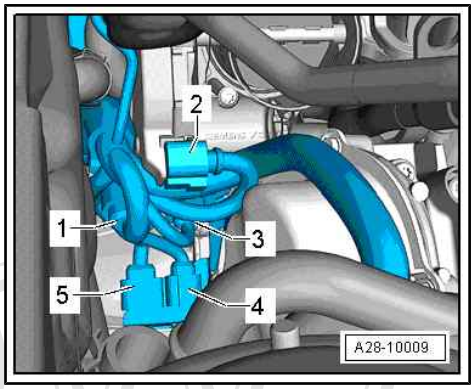
Check fuel system for leaks.

9 Lambda probe

⇒ "9.1 Exploded view - Lambda probe", page 376

⇒ "9.2 Removing and installing Lambda probe", page 377

9.1 Exploded view - Lambda probe



Connectors of Lambda probes (cylinder bank 1)

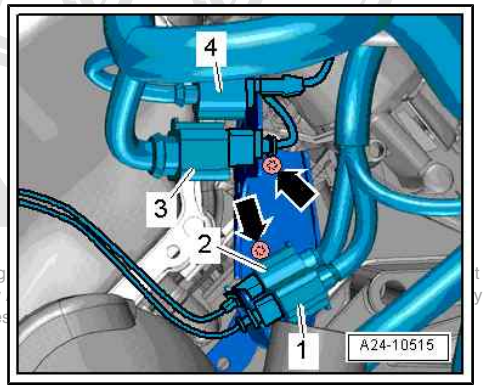
1 - For injectors (cylinder bank 1)

2 - Throttle valve module - J338-

3 - Knock sensor 1 - G61-

4 - For Lambda probe - G39- with Lambda probe heater - Z19-

5 - For Lambda probe after catalytic converter - G130- with Lambda probe 1 heater after catalytic converter - Z29-



Connectors of Lambda probes (cylinder bank 2)

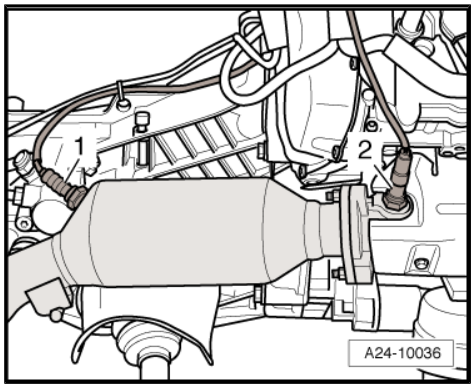
1 - For Lambda probe 2 after catalytic converter - G131- with Lambda probe 2 heater after catalytic converter - Z30-

2 - For Lambda probe 2 - G108- with Lambda probe heater 2 - Z28-

3 - For injectors (cylinder bank 2) and for fuel pressure sender - G247-

4 - For knock sensor 2 - G66-

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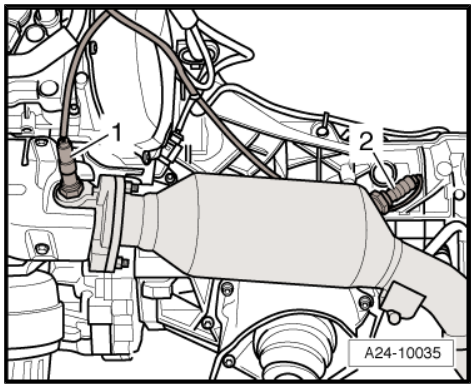


Fitting location of Lambda probes on cylinder bank 1 (right-side)

1 - Lambda probe after catalytic converter - G130- with Lambda probe 1 heater after catalytic converter - Z29-

2 - Lambda probe - G39- with Lambda probe heater - Z19-

- Tightening torque: 55 Nm



Fitting location of Lambda probes on cylinder bank 2 (left-side)

1 - Lambda probe 2 - G108- with Lambda probe heater 2 - Z28-

2 - Lambda probe 2 after catalytic converter - G131- with Lambda probe 2 heater after catalytic converter - Z30-

- Tightening torque: 55 Nm

Note

- *New Lambda probes are coated with an assembly paste.*
- *If re-installing the old Lambda probes, coat the threads with high-temperature paste ⇒ Electronic parts catalogue .*

- *The assembly paste/high-temperature paste must not get into the slots on the Lambda probe body.*
- *When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*
- *Fit all cable ties in the original positions when installing.*

Removing and installing Lambda probe - G39- and Lambda probe heater - Z19- ⇒ page 377 .

Removing and installing Lambda probe after catalytic converter - G130- and Lambda probe 1 heater after catalytic converter - Z29- ⇒ page 379

Lambda probe 2 - G108- with Lambda probe heater 2 - Z28- ⇒ page 380

Lambda probe 2 after catalytic converter - G131- with Lambda probe 2 heater after catalytic converter - Z30- ⇒ page 382

9.2 Removing and installing Lambda probe

⇒ "9.2.1 Removing and installing Lambda probe G39 ", page 377

⇒ "9.2.2 Removing and installing Lambda probe after catalytic converter G130 ", page 379

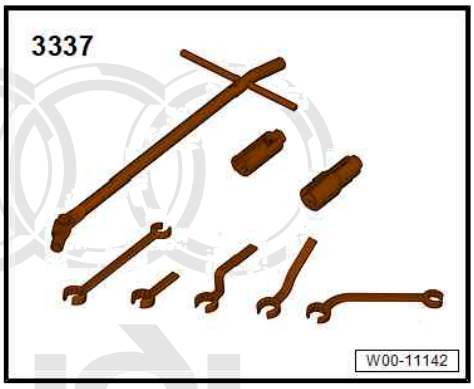
⇒ "9.2.3 Removing and installing Lambda probe 2 G108 ", page 380

⇒ "9.2.4 Removing and installing Lambda probe 2 after catalytic converter G131 ", page 382

9.2.1 Removing and installing Lambda probe - G39-

Special tools and workshop equipment required

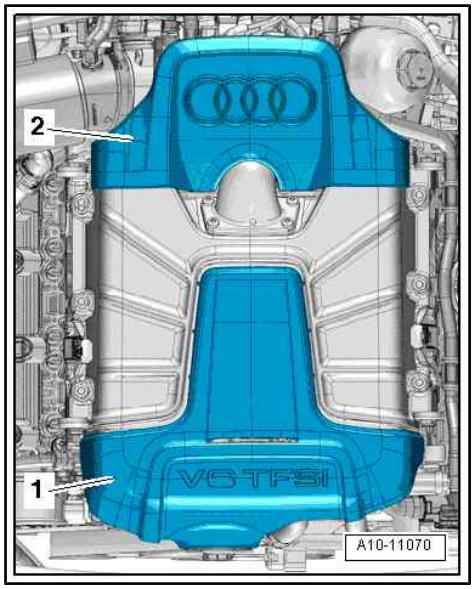
- Lambda probe open ring spanner set - 3337-



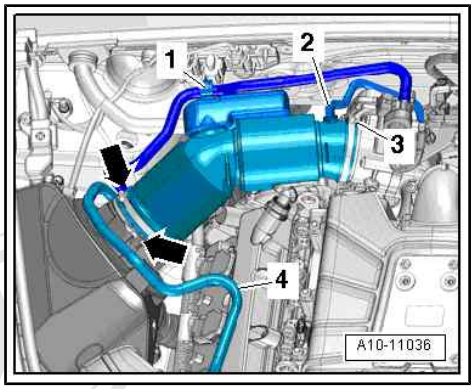
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Removing

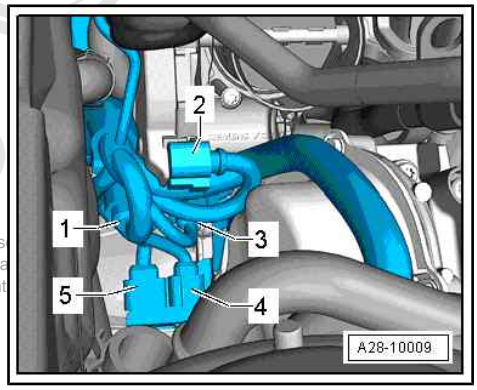
– Lift off engine cover panel (rear) -2-.



– Move clear fuel line -4- and line -1- leading to activated charcoal filter on air cleaner housing and air pipe.
– Detach vacuum hose -2- from connection on air hose.
– Remove air pipe. To do so, release hose clip -3- and clamps -arrows-.
– Remove bottom section of air cleaner ⇒ page 343 .

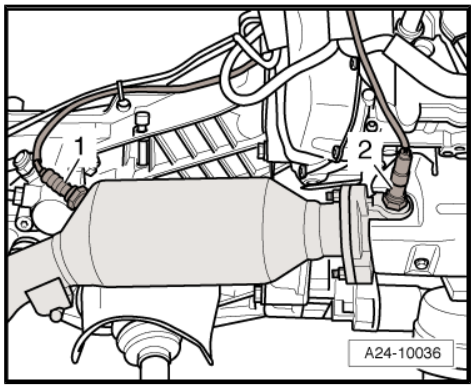


– Unplug electrical connector -4- for Lambda probe - G39- and move wiring clear.



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– Unscrew Lambda probe - G39- -2- using tool from Lambda probe open ring spanner set - 3337- .



Note

For illustration purposes, the installation position is shown from the rear and with the engine removed.

Installing

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

Note

- *New Lambda probes are coated with an assembly paste.*
- *If re-installing the old Lambda probes, coat the threads with high-temperature paste ⇒ Electronic parts catalogue .*
- *The assembly paste/high-temperature paste must not get into the slots on the Lambda probe body.*
- *When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*
- *Fit all cable ties in the original positions when installing.*

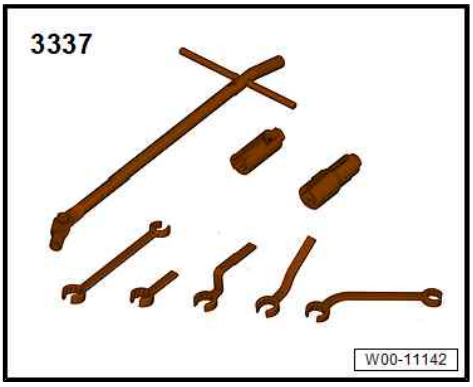
• Tightening torques: Lambda probes - overview ⇒ page 376 .

9.2.2 Removing and installing Lambda probe after catalytic converter - G130-

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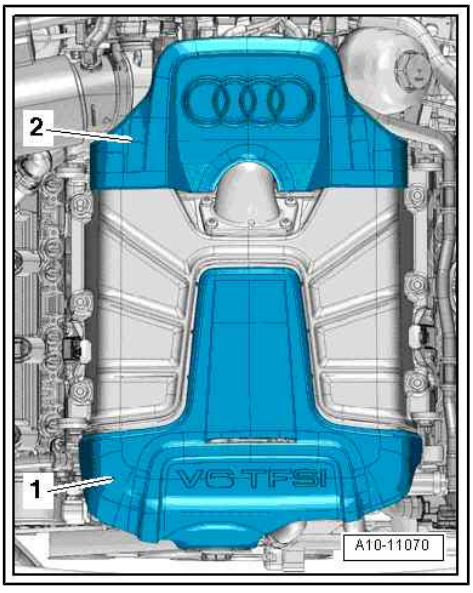
Special tools and workshop equipment required

- Lambda probe open ring spanner set - 3337-

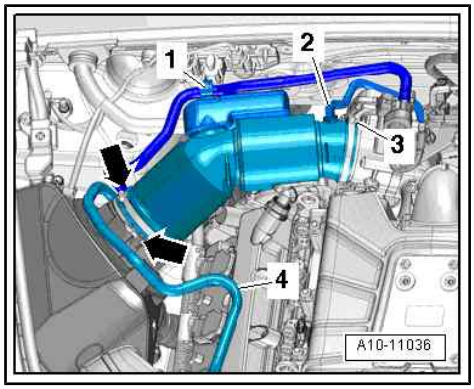


Removing

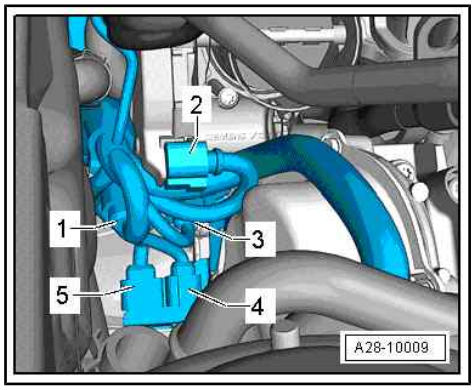
– Lift off engine cover panel (rear) -2-.



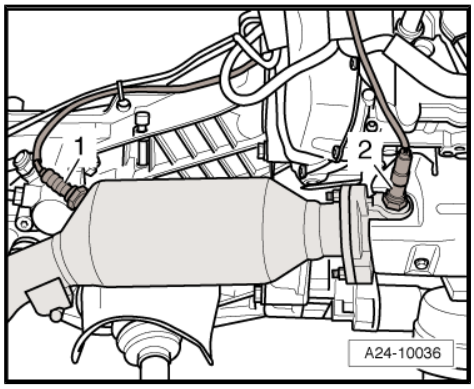
– Move clear fuel line -4- and line -1- leading to activated charcoal filter on air cleaner housing and air pipe.
– Detach vacuum hose -2- from connection on air hose.
– Remove air pipe. To do so, release hose clip -3- and clamps -arrows-.
– Remove bottom section of air cleaner ⇒ page 343 .



– Unplug electrical connector -5- for Lambda probe after catalytic converter - G130- and move wiring clear.



– Unscrew Lambda probe after catalytic converter - G130- -1- using tool from Lambda probe open ring spanner set - 3337- .



Note

For illustration purposes, the installation position is shown from the rear and with the engine removed.

Installing

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

Note

- *New Lambda probes are coated with an assembly paste.*
- *If re-installing the old Lambda probes, coat the threads with high-temperature paste ⇒ Electronic parts catalogue .*
- *The assembly paste/high-temperature paste must not get into the slots on the Lambda probe body.*
- *When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*
- *Fit all cable ties in the original positions when installing.*

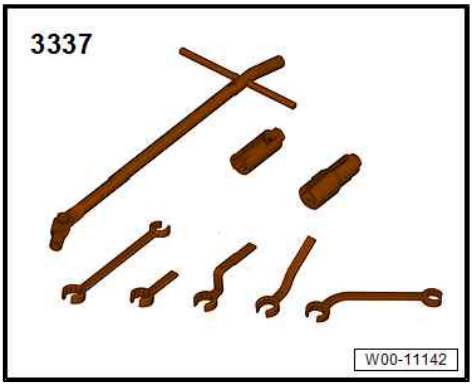
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- Tightening torques: Lambda probes - overview ⇒ page 376 .

9.2.3 Removing and installing Lambda probe 2 - G108-

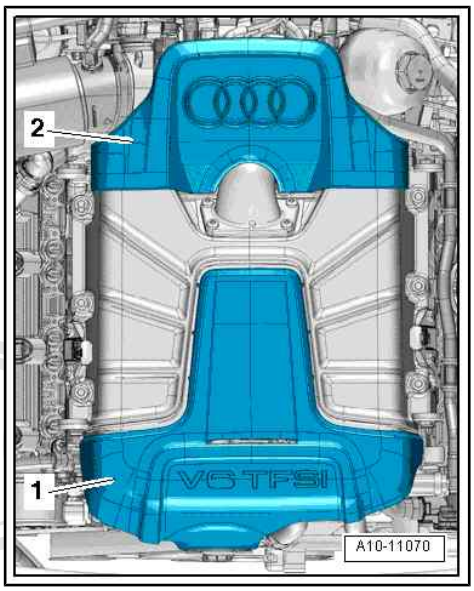
Special tools and workshop equipment required

♦ Lambda probe open ring spanner set - 3337-



Removing

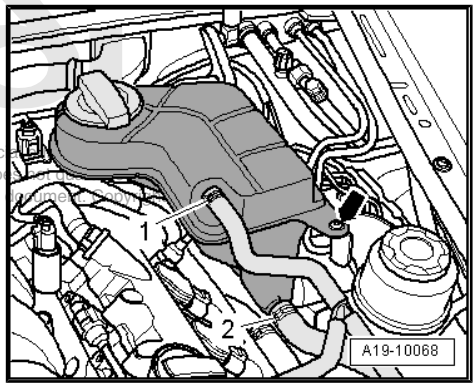
– Lift off engine cover panel (rear) -2-.



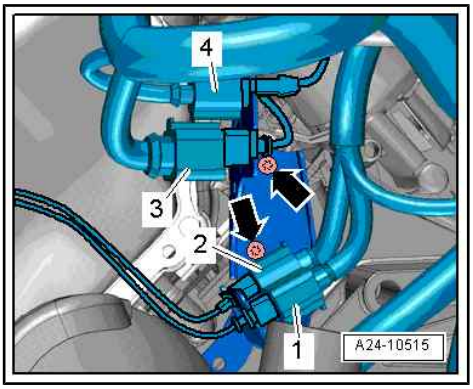
– Remove bolt -arrow-.

– Unplug electrical connector for coolant shortage indicator switch - F66- at bottom of expansion tank and move expansion tank to one side with coolant hoses -1- and -2- attached.

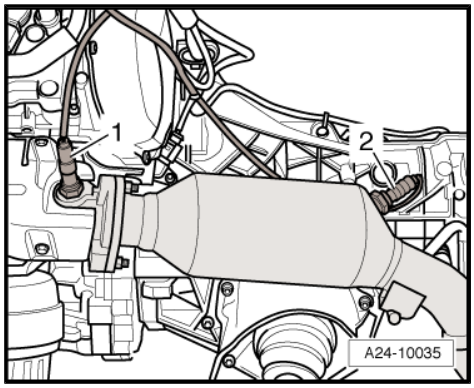
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– Unplug electrical connector -2- for Lambda probe 2 - G108- and move wiring clear.



– Unscrew Lambda probe 2 - G108- -1- using tool from Lambda probe open ring spanner set - 3337- .



Note

For illustration purposes, the installation position is shown from the rear and with the engine removed.

Installing

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

Note

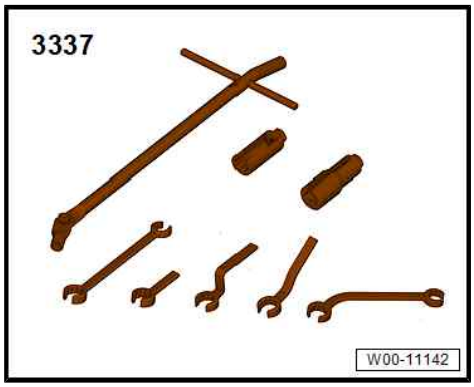
- *New Lambda probes are coated with an assembly paste.*
- *If re-installing the old Lambda probes, coat the threads with high-temperature paste ⇒ Electronic parts catalogue .*
- *The assembly paste/high-temperature paste must not get into the slots on the Lambda probe body.*
- *When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*
- *Fit all cable ties in the original positions when installing.*

• Tightening torques: Lambda probes - overview ⇒ page 376 .

9.2.4 Removing and installing Lambda probe 2 after catalytic converter - G131-

Special tools and workshop equipment required

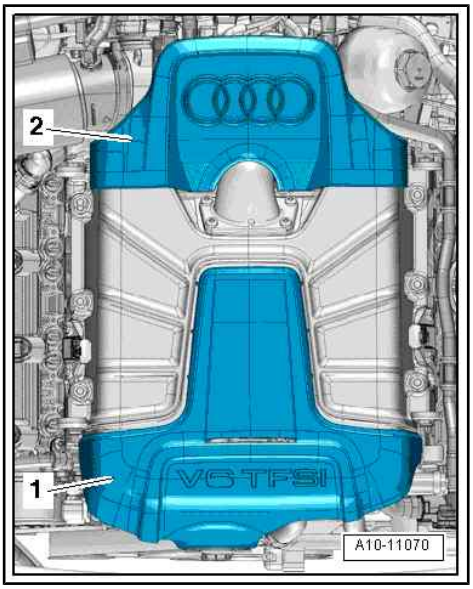
- Lambda probe open ring spanner set - 3337-



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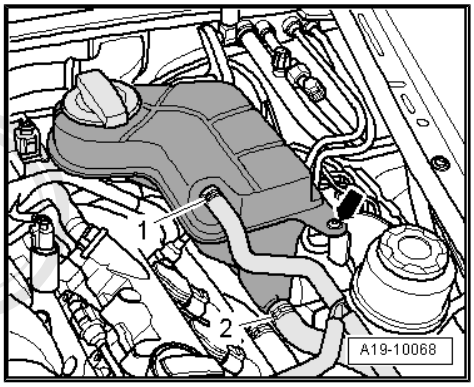
Removing

– Lift off engine cover panel (rear) -2-.



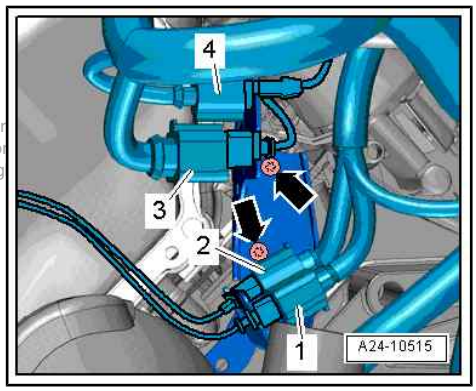
– Remove bolt -arrow-.

– Unplug electrical connector for coolant shortage indicator switch - F66- at bottom of expansion tank and move expansion tank to one side with coolant hoses -1- and -2- attached.

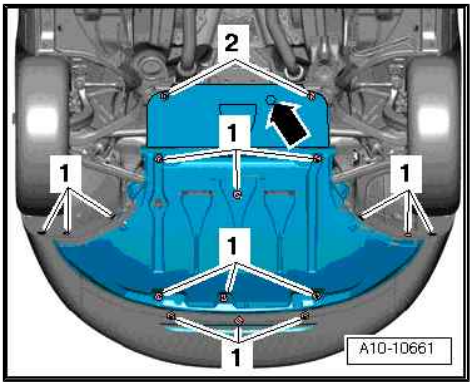


– Unplug electrical connector -1- for Lambda probe 2 after catalytic converter - G131- and move wiring clear.

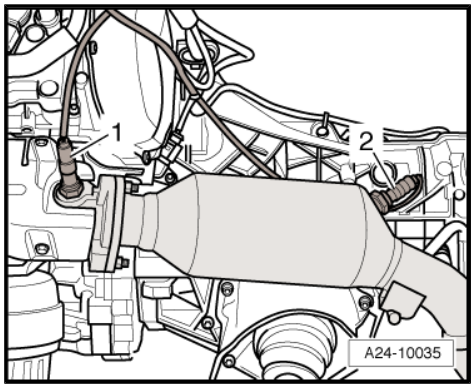
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– Release fasteners -1, 2, arrow- and remove noise insulation panels.



– Unscrew Lambda probe 2 after catalytic converter - G131- -2- using tool from Lambda probe open ring spanner set - 3337- .



Note

For illustration purposes, the installation position is shown from the rear and with the engine removed.

Installing

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

Note

- *New Lambda probes are coated with an assembly paste.*
- *If re-installing the old Lambda probes, coat the threads with high-temperature paste ⇒ Electronic parts catalogue .*
- *The assembly paste/high-temperature paste must not get into the slots on the Lambda probe body.*
- *When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*
- *Fit all cable ties in the original positions when installing.*

• Tightening torques: Lambda probes - overview ⇒ page 376 .

– Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim; Exploded view - underbody trim .

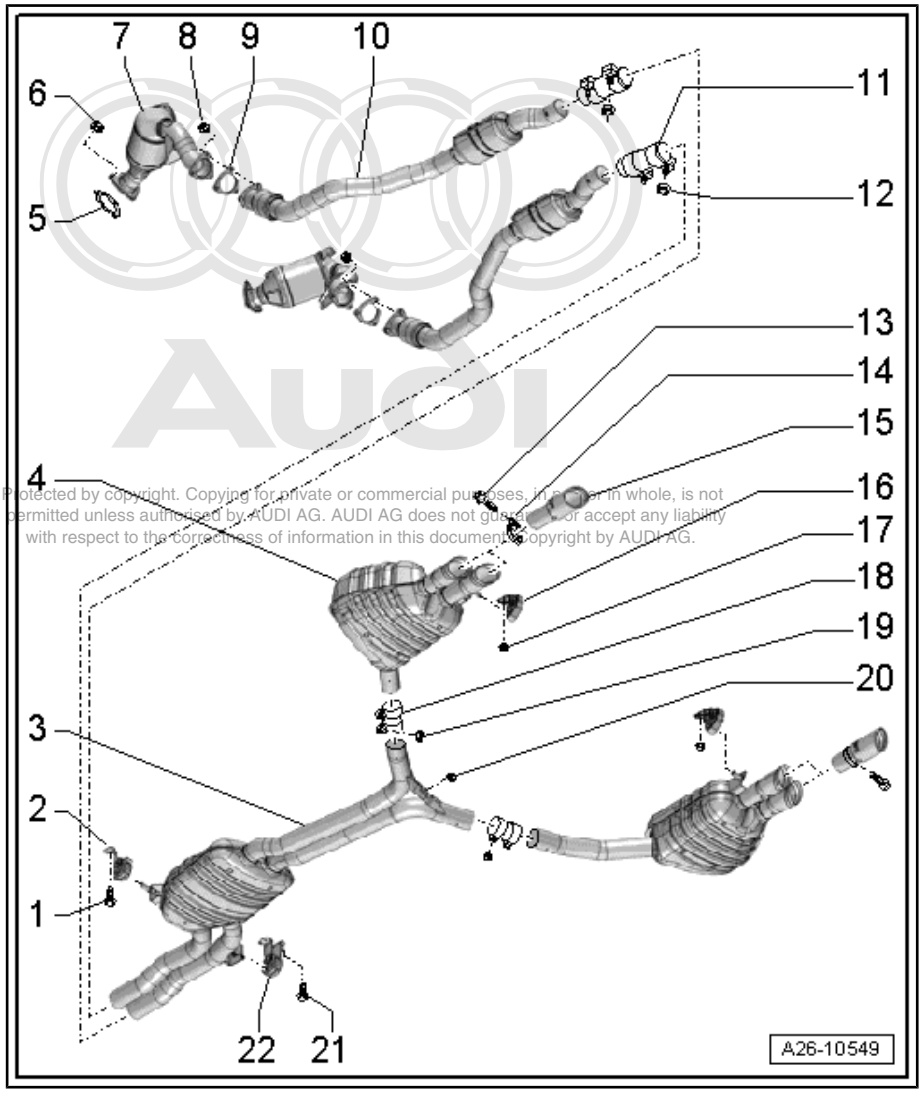
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26 – Exhaust system

1 Exhaust pipes/silencers

⇒ “1.1 Exploded view - silencers”, page 385
⇒ “1.2 Removing and installing front silencer”, page 388
⇒ “1.3 Separating exhaust pipes/silencers”, page 390
⇒ “1.4 Renewing tailpipes”, page 391
⇒ “1.5 Stress-free alignment of exhaust system”, page 392
⇒ “1.6 Aligning tailpipes”, page 393
⇒ “1.7 Checking exhaust system for leaks”, page 394

1.1 Exploded view - silencers



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1 - Bolt

- ❑ 23 Nm

2 - Mounting

- ❑ Renew if damaged
- ❑ Check preload ⇒ “1.5 Stress-free alignment of exhaust system”, page 392

3 - Centre silencer

- ❑ Combined in one unit with rear silencers as original equipment. Can be renewed individually for repair purposes
- ❑ For removal on A5 Cabriolet/Sportback: Remove diagonal struts ⇒ Fig. ““Diagonal struts (Audi A5 Cabriolet/Sportback)“ , page 388
- ❑ Cutting point ⇒ “1.3 Separating exhaust pipes/silencers”, page 390
- ❑ Align exhaust system so it is free of stress ⇒ “1.5 Stress-free alignment of exhaust system”, page 392

4 - Rear silencer

- ❑ Combined as one unit with centre silencer and tailpipe as original equipment
- ❑ Centre silencer, rear silencer and tailpipe can be renewed separately as required
- ❑ For removal on A5 Cabriolet/Sportback: Remove diagonal struts ⇒ Fig. ““Diagonal struts (Audi A5 Cabriolet/Sportback)“ , page 388
- ❑ Cutting point: centre silencer / rear silencer ⇒ “1.3 Separating exhaust pipes/silencers”, page 390

- ❑ Cutting point between rear silencer and tailpipe ⇒ “1.4 Renewing tailpipes”, page 391
- ❑ Align exhaust system so it is free of stress ⇒ “1.5 Stress-free alignment of exhaust system”, page 392

5 - Gasket

- ❑ Renew

6 - Nut

- ❑ 23 Nm
- ❑ Renew

7 - Catalytic converter

- ❑ Protect against knocks and impact
- ❑ Removing and installing: left-side ⇒ “2.1 Removing and installing catalytic converter (left-side)”, page 395 , right-side ⇒ “2.2 Removing and installing catalytic converter (right-side)”, page 395
- ❑ Mounting components ⇒ Fig. ““Components of mountings for catalytic converter”“ , page 388

8 - Nut

- ❑ 23 Nm
- ❑ Renew

9 - Gasket

- ❑ Renew

10 - Front silencer

- ❑ With flexible joint; do not bend flexible joint more than 10° – otherwise it can be damaged
- ❑ Removing and installing ⇒ “1.2 Removing and installing front silencer”, page 388
- ❑ Align exhaust system so it is free of stress ⇒ “1.5 Stress-free alignment of exhaust system”, page 392

11 - Clamp (front)

- ❑ Installation position ⇒ Fig. ““Installation position of front clamps”“ , page 387
- ❑ Before tightening, align exhaust system so it is free of stress ⇒ “1.5 Stress-free alignment of exhaust system”, page 392
- ❑ Tighten bolted connections evenly

12 - Nut

- ❑ 23 Nm

13 - Bolt

- ❑ 23 Nm

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14 - Clamp

15 - Tailpipe

- ❑ Combined in one unit with rear silencer as original equipment. Can be renewed individually for repair purposes
- ❑ Cutting point ⇒ “1.4 Renewing tailpipes”, page 391
- ❑ Aligning ⇒ “1.6 Aligning tailpipes”, page 393

16 - Mounting

- ❑ Renew if damaged
- ❑ Check preload ⇒ “1.5 Stress-free alignment of exhaust system”, page 392

17 - Nut

- ❑ Renew
- ❑ 20 Nm

18 - Clamp (rear)

- ❑ For separate replacement of centre and rear silencers
- ❑ Installation position ⇒ Fig. ““Installation position of rear clamps”“ , page 387

- ❑ Before tightening, align exhaust system so it is free of stress ⇒ “1.5 Stress-free alignment of exhaust system”, page 392
- ❑ Tighten bolted connections evenly

19 - Nut

- ❑ 23 Nm

20 - Nut

- ❑ Renew
- ❑ 23 Nm

21 - Bolt

- ❑ 23 Nm

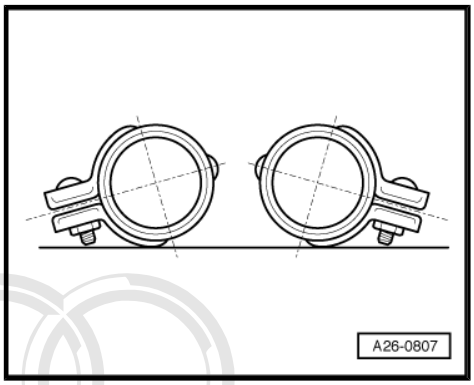
22 - Mounting

- ❑ Renew if damaged
- ❑ Check preload ⇒ “1.5 Stress-free alignment of exhaust system”, page 392

Installation position of front clamps

– Install clamps so that the bolt ends do not protrude beyond bottom of clamp.

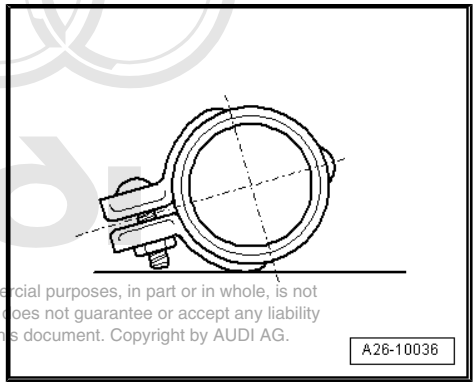
• Installation position: bolted connections face outwards.



Installation position of rear clamps

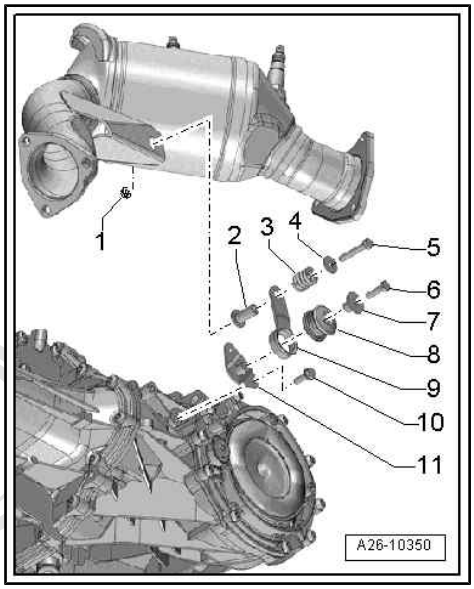
– Install clamps so that the bolt ends do not protrude beyond bottom of clamp.

• Installation position: bolted connections face forwards.



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Components of mountings for catalytic converter



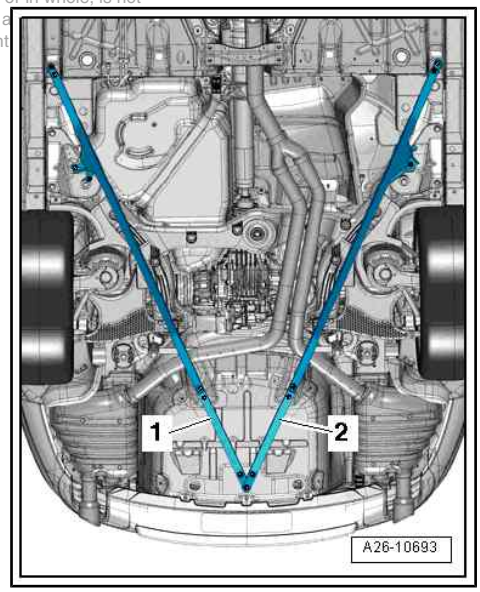
1 - Nut, 23 Nm
2 - Spacer sleeve
3 - Compression spring
4 - Washer
5 - Bolt
6 - Bolt, 23 Nm
7 - Spacer sleeve
8 - Buffer
9 - Bracket
10 - Bolt, 23 Nm
11 - Bracket

Note

The illustration shows the right-side mounting. The mountings (left-side) are symmetrically reversed.

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Diagonal struts (Audi A5 Cabriolet/Sportback)

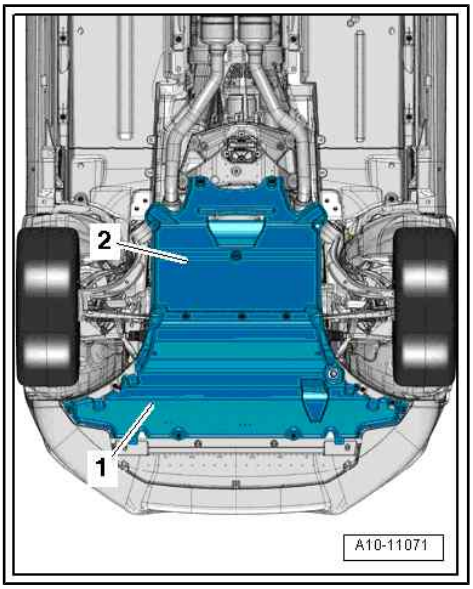


– Remove diagonal struts -1- and -2- before removing Y-pipe and rear silencer unit.
– Install diagonal struts ⇒ Running gear, axles, steering; Rep. gr. 42 ; Subframe; Exploded view - subframe .

1.2 Removing and installing front silencer

Removing

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



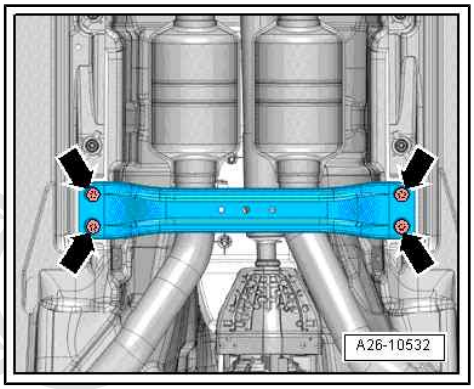
– If fitted, remove bolts -arrows- and detach front cross member.

WARNING

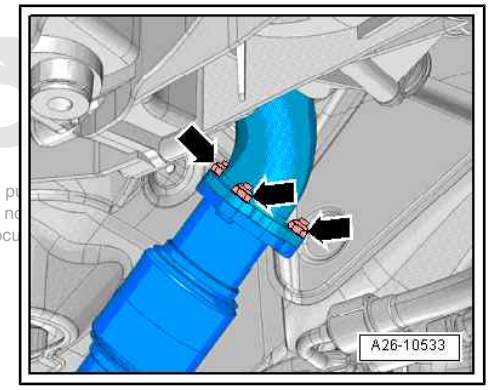
The exhaust system can become extremely hot. This can cause injuries.

Danger of burns to hands and other parts of the body.

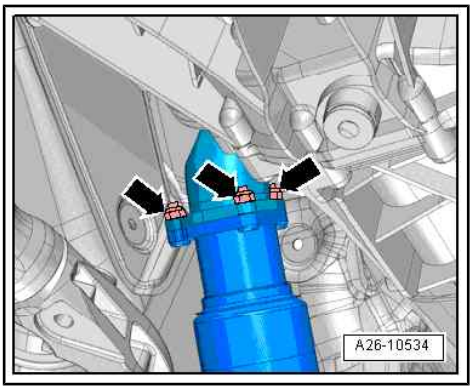
- ***Allow exhaust system to cool down.***



– Unscrew nuts -arrows- for front silencer (left-side).



– Unscrew nuts -arrows- for front silencer (right-side).

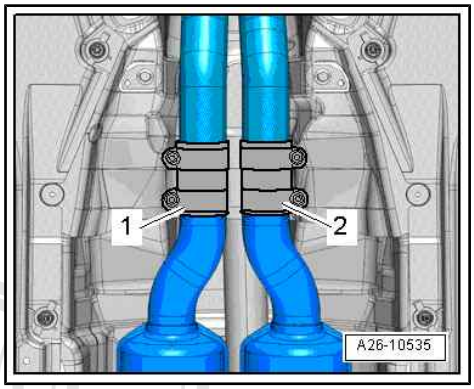


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Caution

Risk of damage to flexible joint if handled incorrectly.

- ***Do not bend flexible joint more than 10°.***
- ***Install flexible joint so that it is not under tension.***



– Release and push back clamp -1- or -2- and detach relevant front silencer.

Installing

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

- Tightening torques ⇒ “1.1 Exploded view - silencers”, page 385

Note

Renew gaskets and self-locking nuts.

– Align the exhaust system so it is free of stress ⇒ page 392 .

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

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

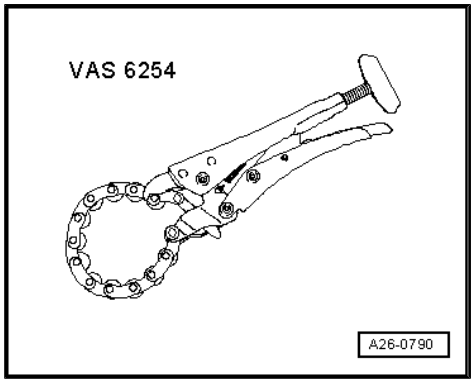
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1.3 Separating exhaust pipes/silencers

- The connecting pipe can be cut through at the cutting point in order to renew the centre or rear silencer separately.
- The cutting point is marked by an indentation on the circumference of the exhaust pipe.

Special tools and workshop equipment required

- Chain pipe cutter - VAS 6254-

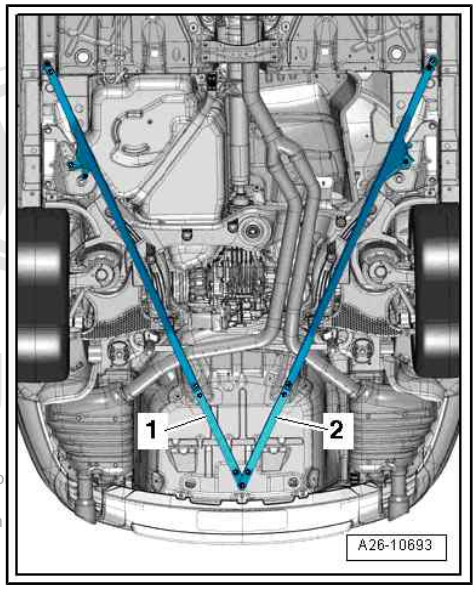


Procedure

- Tightening torques ⇒ “1.1 Exploded view - silencers”, page 385

Audi A5 Cabriolet/Sportback:

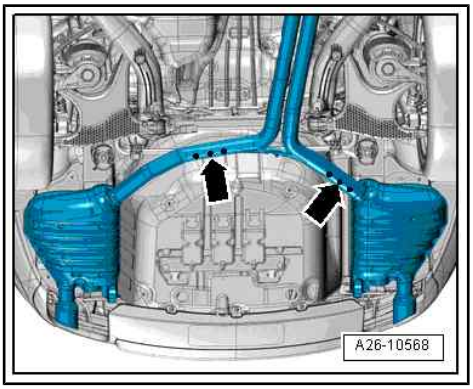
– Remove diagonal struts ⇒ Running gear, axles, steering; Rep. gr. 42 ; Subframe; Exploded view - subframe .



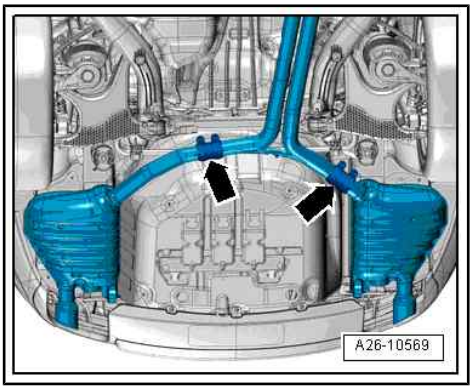
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All vehicles (continued):

– Cut through exhaust pipes at right angle at the position marked -arrows- using chain pipe cutter - VAS 6254- .



– Position centre of clamps -arrows- over cutting location.

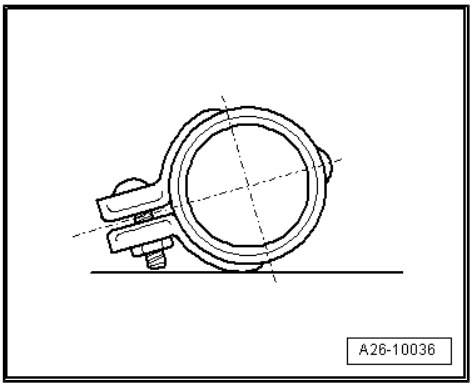


– Install clamps so that the bolt ends do not protrude beyond bottom of clamp.

- Installation position: bolted connections face forwards.

– Align the exhaust system so it is free of stress ⇒ page 392 .

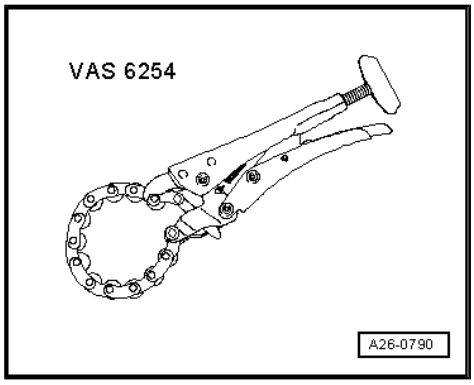
– Install diagonal struts ⇒ Running gear, axles, steering; Rep. gr. 42 ; Subframe; Exploded view - subframe .



1.4 Renewing tailpipes

Special tools and workshop equipment required

- Chain pipe cutter - VAS 6254-



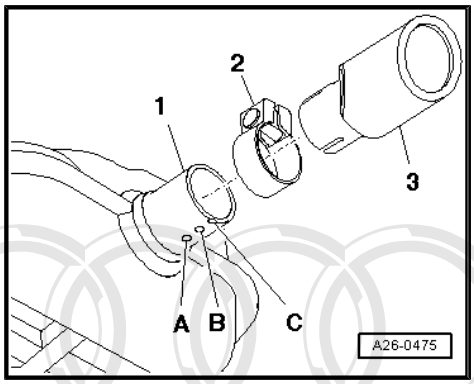
Procedure

- Tightening torques ⇒ “1.1 Exploded view - silencers”, page 385

– Cut through tailpipe -1- with chain pipe cutter - VAS 6254- at the position marked -C-.

– Push on tailpipe -3- as far as marking -A-. Align slit in tailpipe with marking -B-.

– Tighten nut for clamp -2-.



1.5 Stress-free alignment of exhaust system

Procedure

- The exhaust system must be aligned when it is cool.
- Tightening torque ⇒ “1.1 Exploded view - silencers”, page 385

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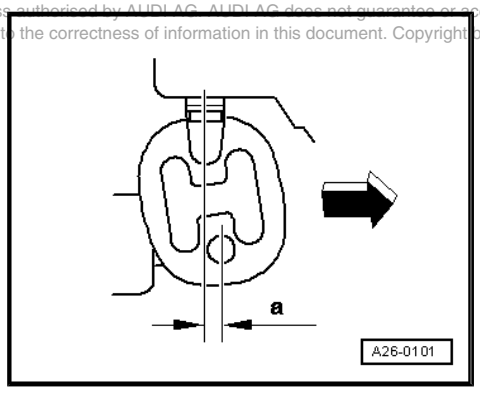
Vehicles without clamps between centre silencer and rear silencers

– Loosen bolted connections on front clamps.

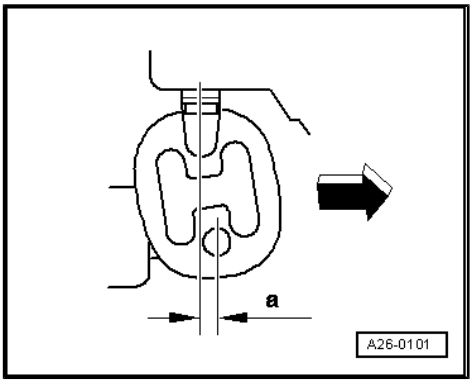
– Push exhaust system towards front of vehicle -arrow- until mountings in front of centre silencer are preloaded by -a- = 6 ... 10 mm.

– Tighten bolted connections on clamps evenly.

– Align tailpipes ⇒ page 393 .



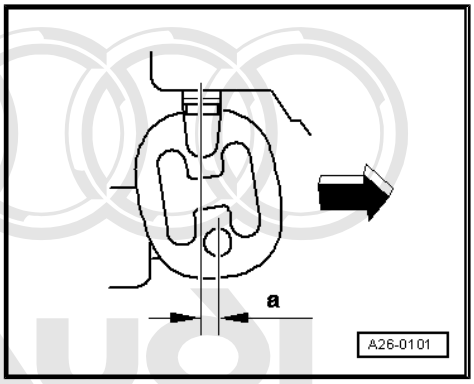
Vehicles with clamps between centre silencer and rear silencers



Note

On a vehicle with clamps fitted between the centre silencer and rear silencers, it is also necessary to align the centre silencer.

– Loosen bolted connections on front and rear clamps.
– Push exhaust system towards front of vehicle -arrow- until mountings in front of centre silencer are preloaded by -a- = 6 ... 10 mm.
– Tighten bolted connections on front clamps 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.
– Align tailpipes ⇒ page 393 .

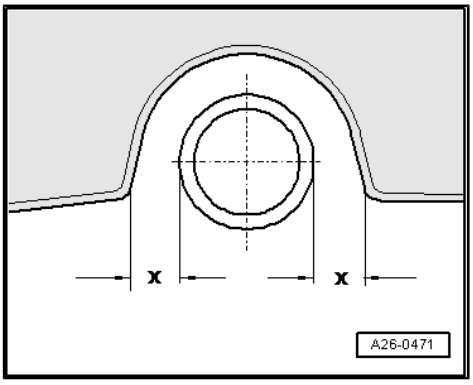
1.6 Aligning tailpipes

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Procedure

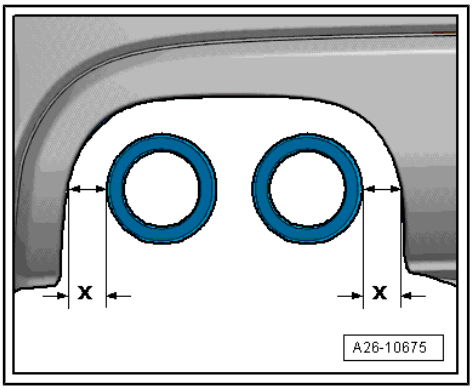
Vehicles with one tailpipe

– Check clearance between tailpipe and bumper on both sides:
• Dimension -x- (left-side) = dimension -x- (right-side)



Vehicles with double tailpipe

– Check clearance between tailpipes and bumper on both sides:
• Dimension -x- (left-side) = dimension -x- (right-side)



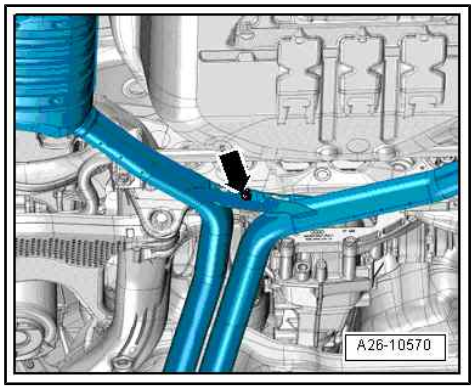
All vehicles (continued):

If necessary, correct dimension “x” as follows:

– Loosen connection -arrow- on strut between exhaust pipes.

– Adjust the distance between the rear silencers.

• Tightening torque ⇒ “1.1 Exploded view - silencers”, page 385



1.7 Checking exhaust system for leaks

– Start the engine and run at idling speed.

– Plug tailpipes during leak test (e.g. with cloth or plugs).

– Listen for noise at connections between cylinder head/exhaust manifold, exhaust manifold/front exhaust pipe, etc. to locate any leaks.

– Rectify any leaks that are found.

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2 Emission control system

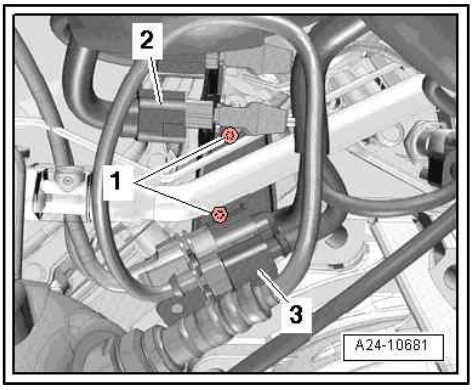
⇒ “2.1 Removing and installing catalytic converter (left-side)”, page 395

⇒ “2.2 Removing and installing catalytic converter (right-side)”, page 395

2.1 Removing and installing catalytic converter (left-side)

Removing

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



Note

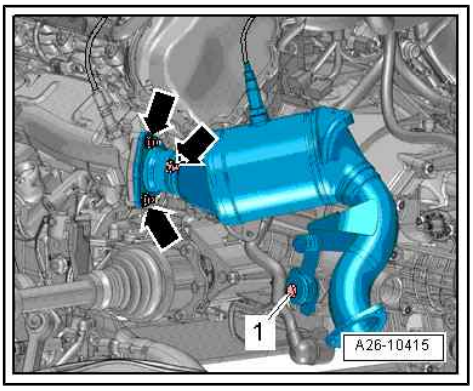
Fit all cable ties in the original positions when installing.

– Take electrical connector -3- for Lambda probe 2 after catalytic converter - G131- out of bracket, unplug and move wiring clear.

Note

Disregard -items 1, 2-.

– Unscrew nuts -arrows- and detach catalytic converter (left-side).



Note

Disregard -item 1-.

Installing

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

- Tightening torques ⇒ “1.1 Exploded view - silencers”, page 385

Note

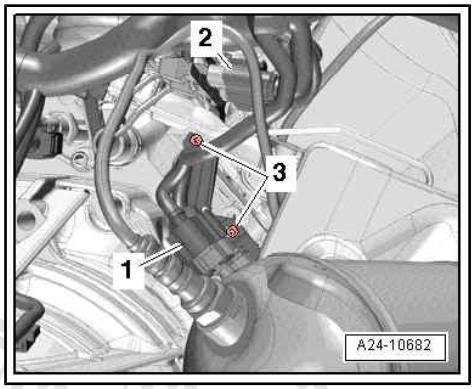
Renew gaskets and self-locking nuts.

2.2 Removing and installing catalytic converter (right-side)

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Removing

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



Note

Fit all cable ties in the original positions when installing.

– Take electrical connector -1- for Lambda probe after catalytic converter - G130- out of bracket, unplug and move wiring clear.

Note

Disregard -items 2, 3-.

– Detach catalytic converter (right-side).

Note

Catalytic converter (right-side) is already unbolted for removal of gearbox.

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Installing

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

- Tightening torques ⇒ “1.1 Exploded view - silencers”, page 385

Note

Renew gaskets and self-locking nuts.

3 Secondary air system

⇒ “3.1 Exploded view - secondary air system”, page 397

⇒ “3.2 Removing and installing secondary air pump motor V101 ”, page 398

⇒ “3.3 Checking combination valve for correct operation and leaks”, page 400

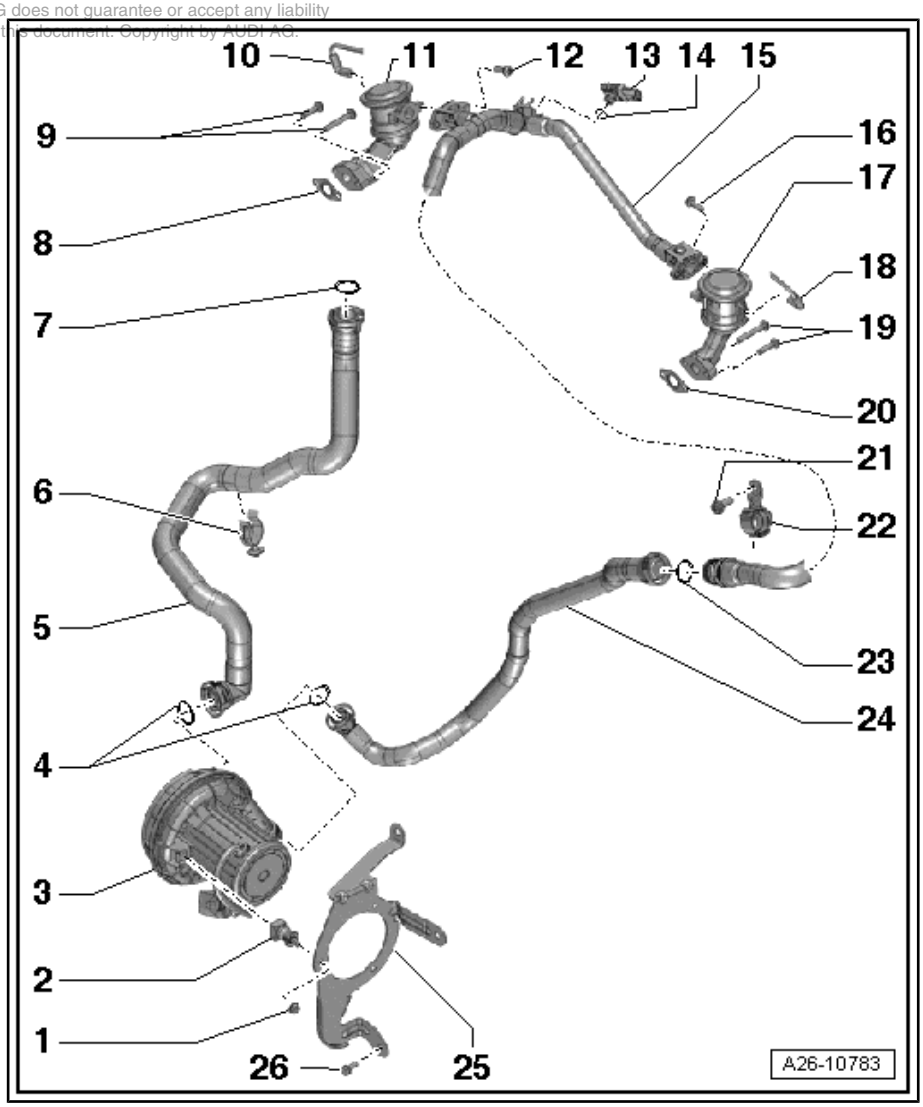
⇒ “3.4 Removing and installing combination valve (left-side)”, page 402

⇒ “3.5 Removing and installing combination valve (right-side)”, page 403

⇒ “3.6 Removing and installing sender 1 for secondary air pressure G609 ”, page 405

3.1 Exploded view - secondary air system

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1 - Nut

- ❑ 9 Nm

2 - Bonded rubber mounting

3 - Secondary air pump motor - V101-

- ❑ Removing and installing ⇒ “3.2 Removing and installing secondary air pump motor V101 ”, page 398
- ❑ Clip electrical connector into bracket
- ❑ Checking in Guided Fault Finding ⇒ Vehicle diagnostic tester

4 - O-rings

- ❑ Renew

5 - Secondary air hose

6 - Clip

7 - O-ring

- ❑ Renew

8 - Gasket

- ❑ Renew

9 - Bolts

- ❑ 9 Nm

10 - Vacuum hose

11 - Combination valve for secondary air system (right-side)

- ❑ Checking ⇒ “3.3 Checking combination valve for correct operation and leaks”, page 400
- ❑ Removing and installing ⇒ “3.5 Removing and installing combination valve (right-side)”, page 403

12 - Bolt

- ❑ 9 Nm

13 - Sender 1 for secondary air pressure - G609-

- ❑ Fitted on some USA vehicles
- ❑ Removing and installing ⇒ “3.6 Removing and installing sender 1 for secondary air pressure G609 ”, page 405

14 - O-ring

- ❑ Renew

15 - Secondary air hose

16 - Bolt

- ❑ 9 Nm

17 - Combination valve for secondary air system (left-side)

- ❑ Checking ⇒ “3.3 Checking combination valve for correct operation and leaks”, page 400
- ❑ Removing and installing ⇒ “3.4 Removing and installing combination valve (left-side)”, page 402

18 - Vacuum hose

19 - Bolts

- ❑ 9 Nm

20 - Gasket

- ❑ Renew

21 - Bolt

- ❑ 9 Nm

22 - Bracket

- ❑ For secondary air hose

23 - O-ring

- ❑ Renew

24 - Secondary air hose

25 - Bracket

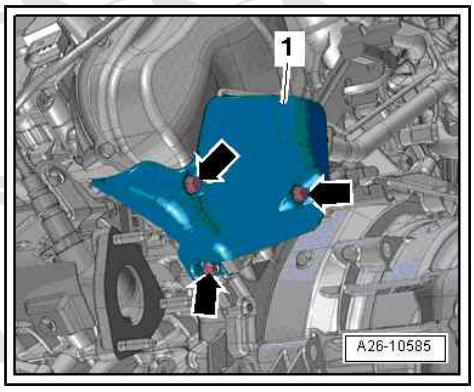
- ❑ For secondary air pump motor - V101-

26 - Bolt

- ❑ 9 Nm

Heat shield for combination valve for secondary air system - tightening torque

– Tighten bolts -arrows- for heat shield -1- to 9 Nm.



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3.2 Removing and installing secondary air pump motor - V101-

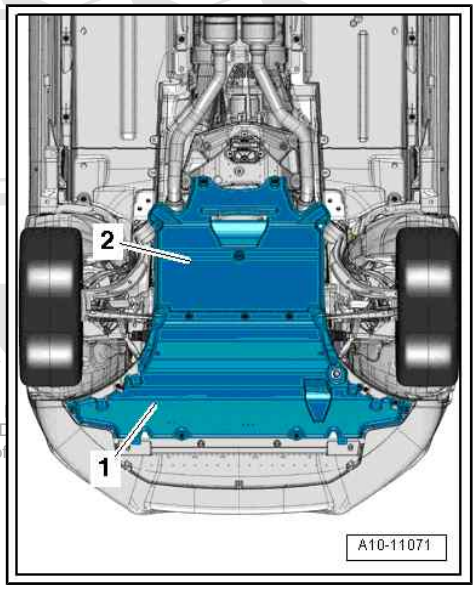
Removing

Note

Fit all cable ties in the original positions when installing.

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

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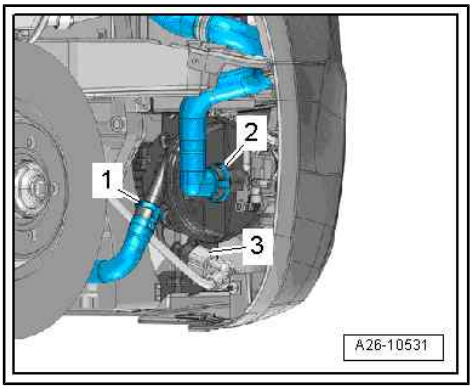
Vehicles with secondary air pump motor - V101- (version 1):

– Unplug electrical connector -3- at secondary air pump motor - V101- .

– Press release tabs and detach secondary air hoses -1- and -2-.

Note

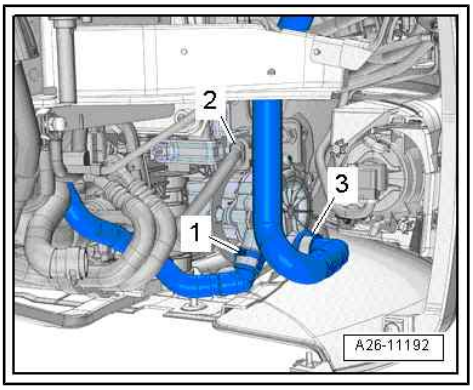
For illustration purposes, the installation position is shown with the wheel housing liner removed.



Vehicles with secondary air pump motor - V101- (version 2):

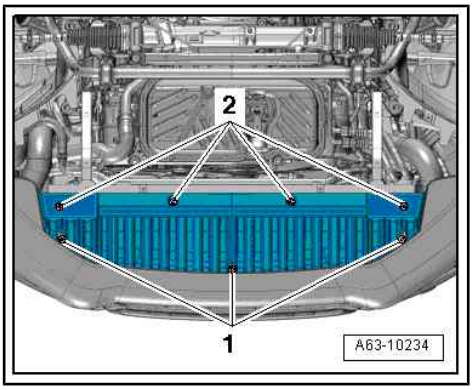
– Unplug electrical connector -2- at secondary air pump motor - V101- .

– Press release tabs and detach secondary air hoses -1- and -3-.

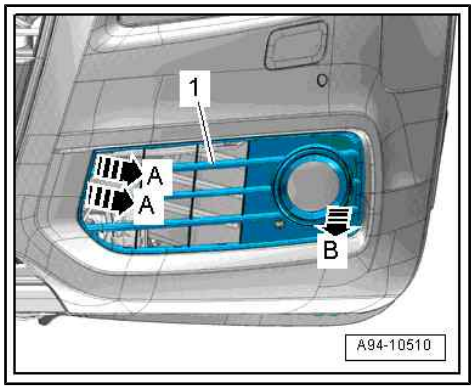


All vehicles (continued):

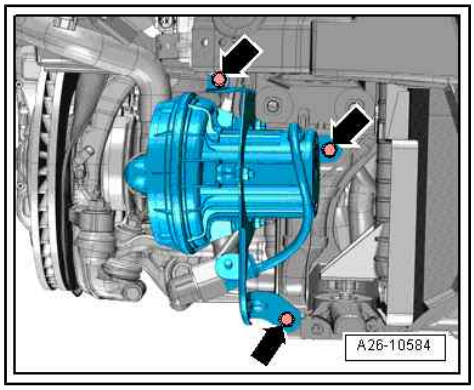
– Remove closure plate at bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover



– Remove air intake grille -1- on both sides ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .



– Remove bolts -arrows- and detach secondary air pump.



Note

For illustration purposes, the installation position is shown with the bumper cover removed.

Installing

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

- Tightening torque ⇒ “3.1 Exploded view - secondary air system”, page 397

Note

Fit new O-rings.

– Install closure plate at bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .

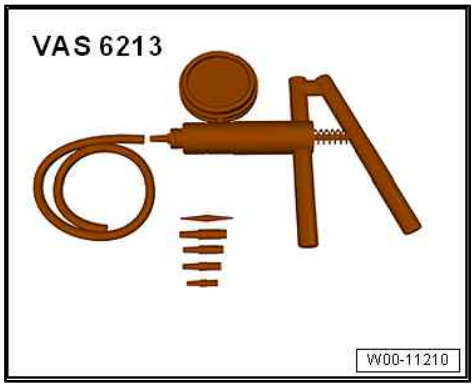
– Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .

3.3 Checking combination valve for correct operation and leaks

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Special tools and workshop equipment required

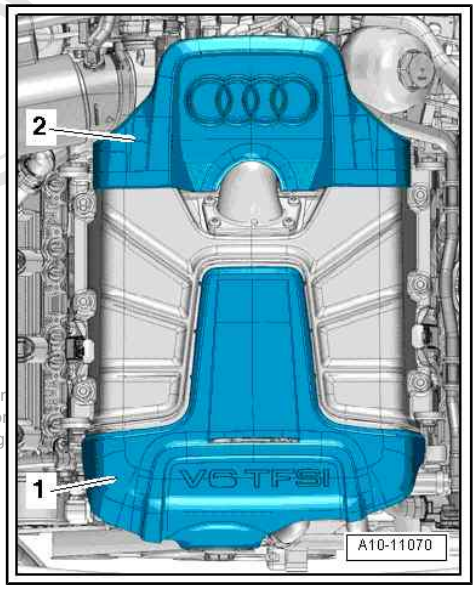
- Hand vacuum pump - VAS 6213-



Procedure

- Vacuum hoses and hose connections do not leak.
- Vacuum hoses are not clogged.

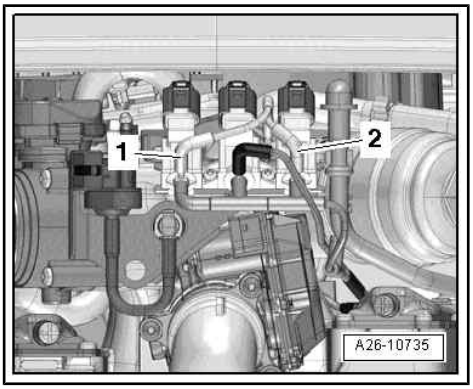
– Lift off engine cover panels -1- and -2-.



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Version with two secondary air inlet valves

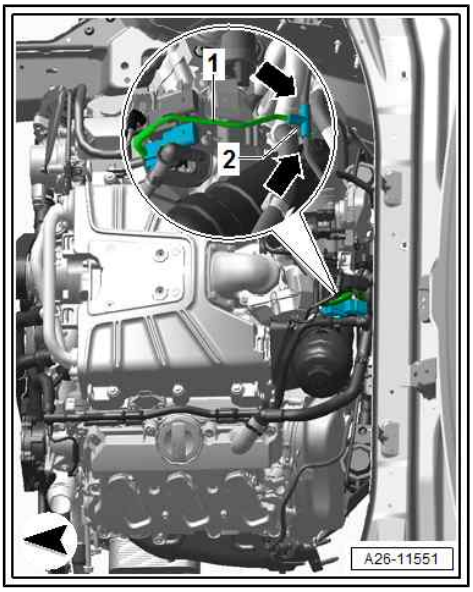
– Detach vacuum hose -1- or -2- from combination valve to be checked.



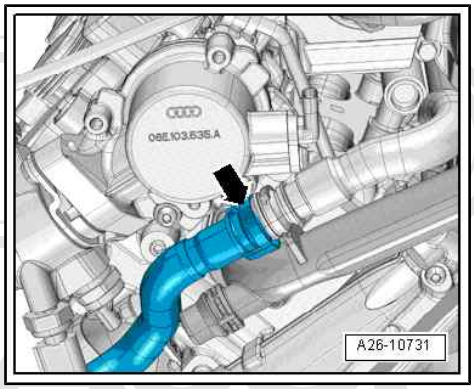
Version with one secondary air inlet valve

– Follow routing of vacuum hose -1- from secondary air inlet valve downwards to T-piece -2-.

– Detach vacuum hose -arrow- from T-piece -2- for combination valve to be checked.



All vehicles (continued)



– Connect hand vacuum pump - VAS 6213- to vacuum hose of combination valve to be checked.
– Press release tabs and detach secondary air hose -arrow- to front from bracket.
– Blow lightly into secondary air hose with your mouth (do not use compressed air).
• The combination valves for secondary air should be closed; it should not be possible to blow through the hose.
– Operate hand vacuum pump.
• The combination valve should open; it should now be possible to blow through the hose.

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Note

It is necessary to overcome slight initial resistance before it is possible to blow through the hose.

– Renew combination valve for secondary air system if it does not open: on left-side ⇒ page 402 , on right-side ⇒ page 403 .

Assembling

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

Note

Fit new O-ring.

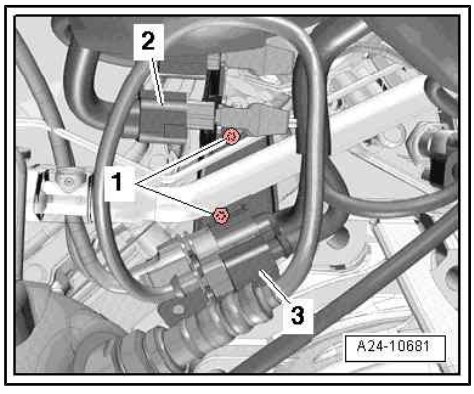
3.4 Removing and installing combination valve (left-side)

Removing

Note

Fit all cable ties in the original positions when installing.

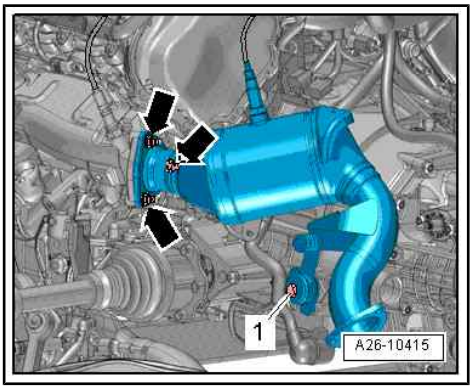
– Remove front silencer (left-side) ⇒ page 388 .
– Remove plenum chamber partition panel ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Exploded view - plenum chamber partition panel .
– Take electrical connector -3- for Lambda probe 2 after catalytic converter - G131- out of bracket, unplug and move wiring clear.



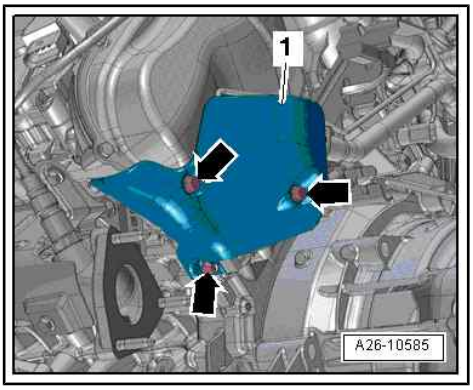
Note

Disregard -items 1, 2-.

– Remove bolt -1- and nuts -arrows-, detach catalytic converter (left-side) from exhaust manifold and move to rear.



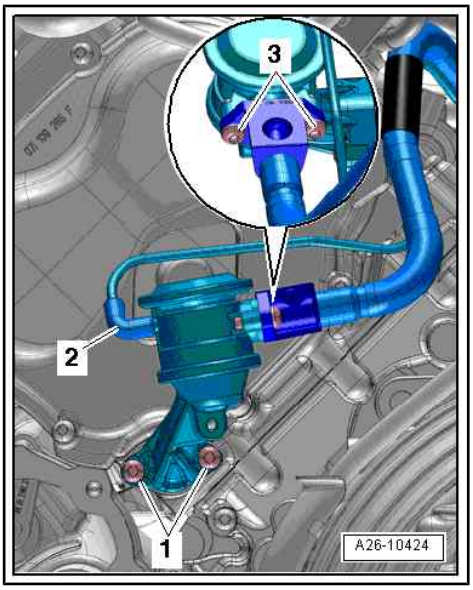
– Remove bolts -arrows- and detach heat shield -1-.



– Remove bolts -3- for secondary air system hose.

– Detach vacuum hose -2- from combination valve for secondary air system.

– Unscrew bolts -1- and detach combination valve for secondary air system.



Installing

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

Tightening torques

- ⇒ “3.1 Exploded view - secondary air system”, page 397
- ⇒ Fig. ““Heat shield for combination valve for secondary air system - tightening torque”“ , page 398 .

Note

Renew gasket.

– Install catalytic converter (left-side) ⇒ page 395 .

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

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– Install front silencer (left-side) ⇒ page 388 .

3.5 Removing and installing combination valve (right-side)

Removing

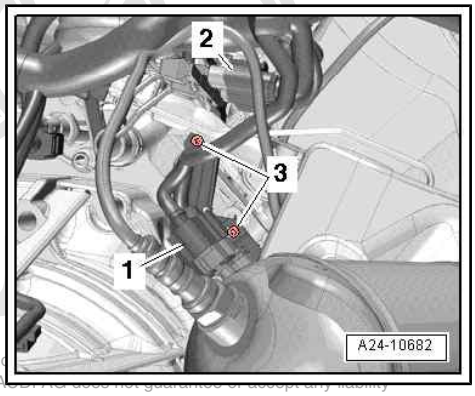
Note

Fit all cable ties in the original positions when installing.

– Remove front silencer (right-side) ⇒ page 388 .

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

– Take electrical connector -1- for Lambda probe after catalytic converter - G130- out of bracket, unplug and move wiring clear.

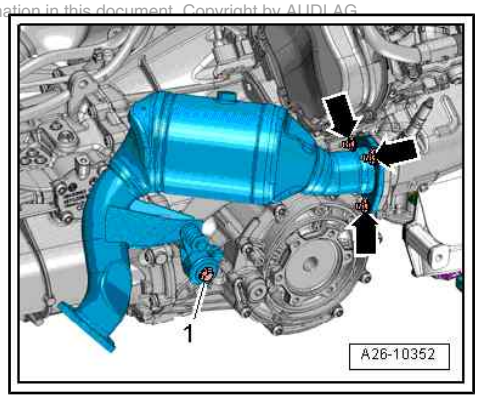


Note

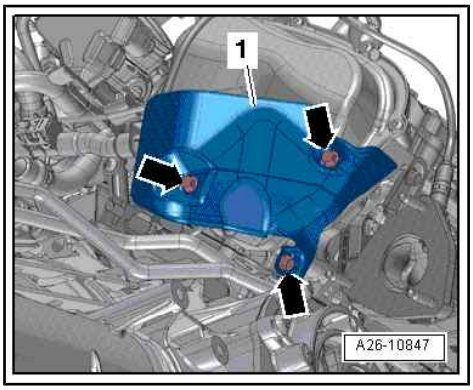
Disregard items marked -2, 3-.

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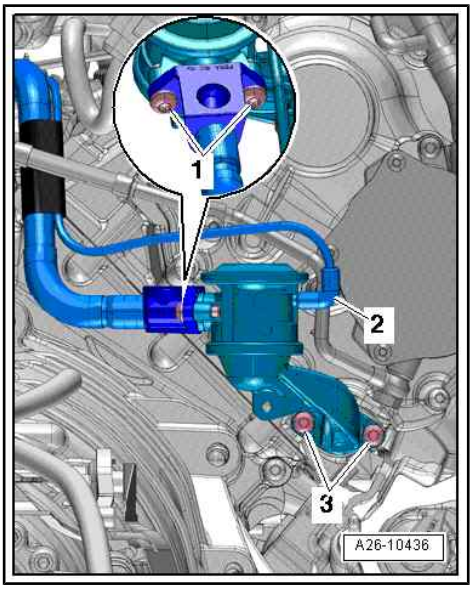
– Remove bolt -1- and nuts -arrows-, detach catalytic converter (right-side) from exhaust manifold and move to rear.



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



– Detach vacuum hose -2- from combination valve for secondary air system.
– Remove bolts -3- and detach combination valve (right-side) for secondary air system and bolts -1- for secondary air hose.



Installing

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

Tightening torques

- ⇒ “3.1 Exploded view - secondary air system”, page 397 .
- ⇒ Fig. ““Heat shield for combination valve for secondary air system - tightening torque”“ , page 398 .

Note

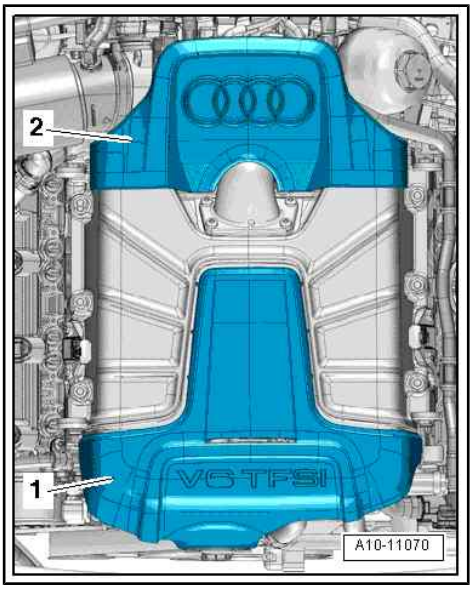
- *Renew gasket.*
- *Hose connections and air pipes and hoses must be free of oil and grease before assembly.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *To secure the air hoses at their connections, spray rust remover onto the worm thread of the used hose clips before installing.*

– Install catalytic converter (right-side) ⇒ page 395 .
– Install plenum chamber partition panel ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Exploded view - plenum chamber partition panel .
– Install front silencer (right-side) ⇒ page 388 .

3.6 Removing and installing sender 1 for secondary air pressure - G609-

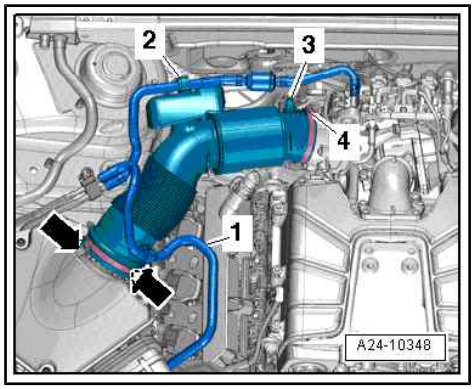
Removing

– Lift off engine cover panel (rear) -2-.

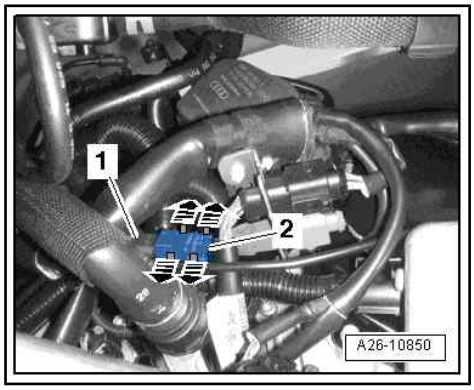


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– Move fuel hose -1- and hose -2- from activated charcoal filter clear at air pipe.
– Detach vacuum hose -3- from connection on air pipe.
– Remove air pipe. To do so, release hose clip -4- and clamps -arrows-.



– Unplug electrical connector -1-.
– Release catches -arrows- and detach sender 1 for secondary air pressure - G609- -item 2-.



Installing

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

Note

- *Fit new O-ring.*
- *Hose connections and air pipes and hoses must be free of oil and grease before assembly.*
- *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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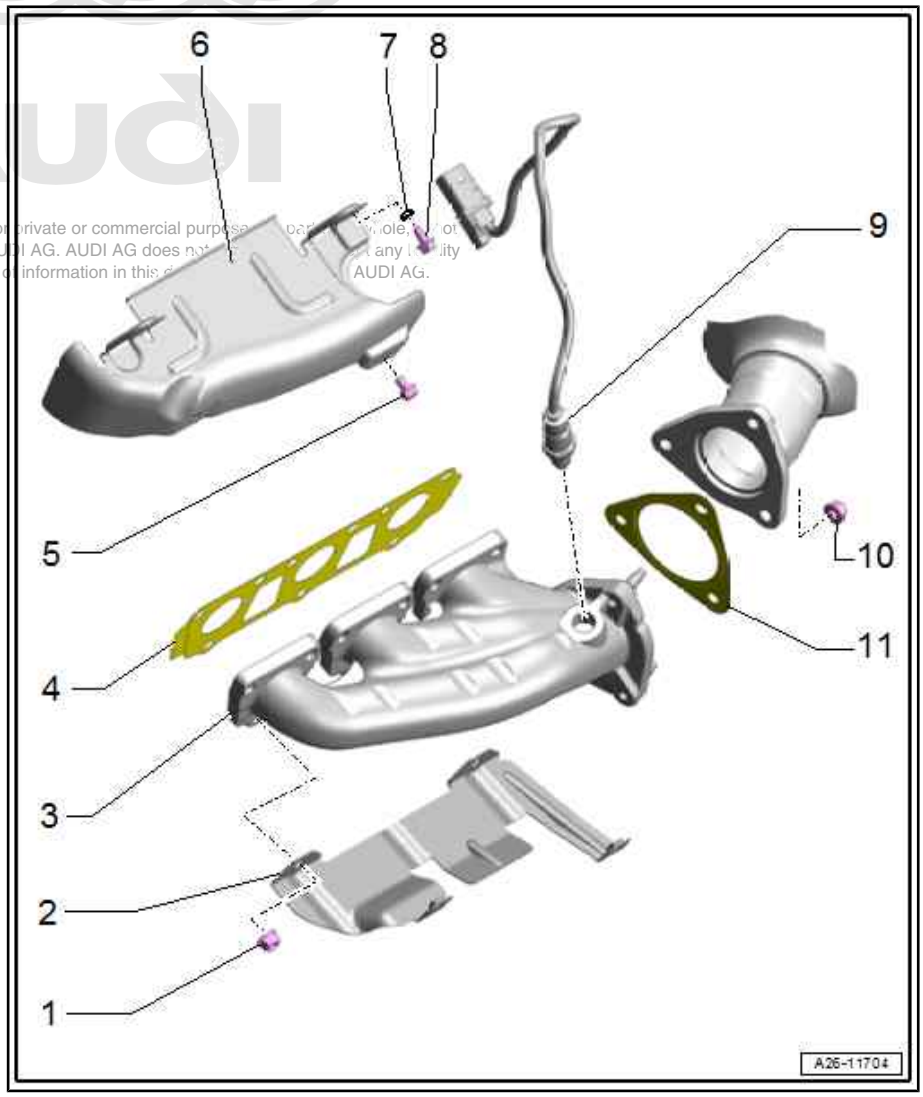
4 Exhaust manifold

⇒ "4.1 Exploded view - exhaust manifold", page 407

⇒ "4.2 Removing and installing exhaust manifold (left-side)", page 408

⇒ "4.3 Removing and installing exhaust manifold (right-side)", page 410

4.1 Exploded view - exhaust manifold



1 - Nut

- ❑ Renew
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ Tightening torque and tightening sequence: left-side ⇒ page 408 ; right-side ⇒ page 408

2 - Bracket for heat shield

3 - Exhaust manifold

- ❑ Removing and installing: left-side ⇒ page 408 , right-side ⇒ page 410

4 - Gasket

- ❑ Renew

5 - Bolt

- ❑ 9 Nm

6 - Heat shield

7 - Washer

8 - Bolt

- ❑ 9 Nm

9 - Lambda probe

- ❑ Before catalytic converter
- ❑ Removing and installing ⇒ page 377

10 - Nut

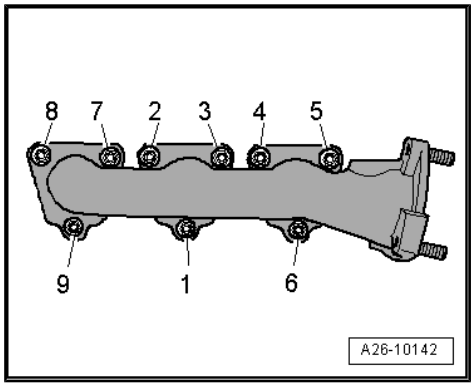
- ❑ Renew
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 23 Nm

11 - Gasket

- ❑ Renew

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Exhaust manifold (left-side) - tightening torque and sequence



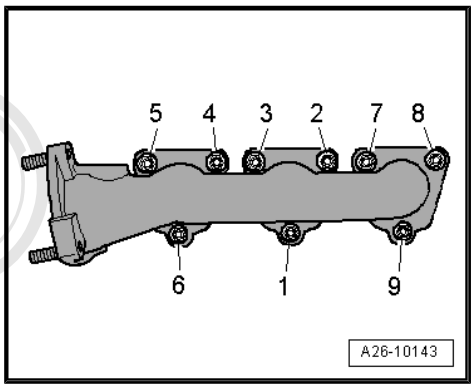
Note

- *Renew the nuts.*
- *Coat threads of nuts with high-temperature paste; for high temperature paste refer to ⇒ Electronic parts catalogue .*

– Tighten nuts in 3 stages in the sequence shown:

Stage	Nuts	Tightening torque
1.	-1 … 9-	Screw in by hand until contact is made
2.	-1 … 9-	15 Nm
3.	-1 … 9-	25 Nm

Exhaust manifold (right-side) - tightening torque and sequence



Note

- *Renew the nuts.*
- *Coat threads of nuts with high-temperature paste; for high temperature paste refer to ⇒ Electronic parts catalogue .*

– Tighten nuts in 3 stages in the sequence shown:

Stage	Nuts	Tightening torque
1.	-1 … 9-	Screw in by hand until contact is made
2.	-1 … 9-	15 Nm
3.	-1 … 9-	25 Nm

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4.2 Removing and installing exhaust manifold (left-side)

Removing

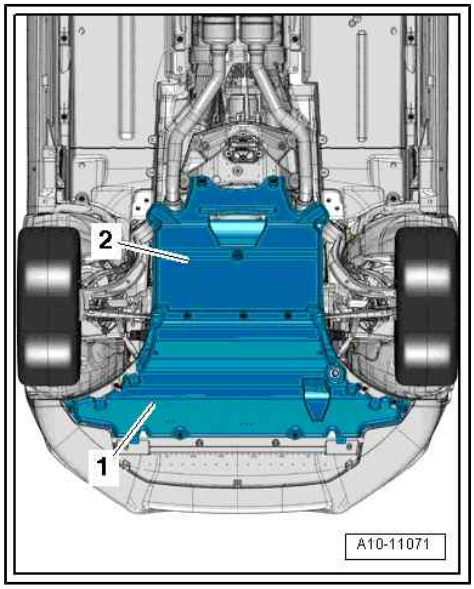
Note

Fit all cable ties in the original positions when installing.

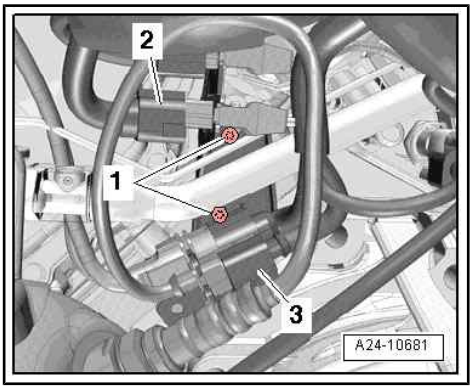
– Remove plenum chamber partition panel ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Exploded view - plenum chamber partition panel .

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

– Remove front silencer (left-side) ⇒ page 388 .



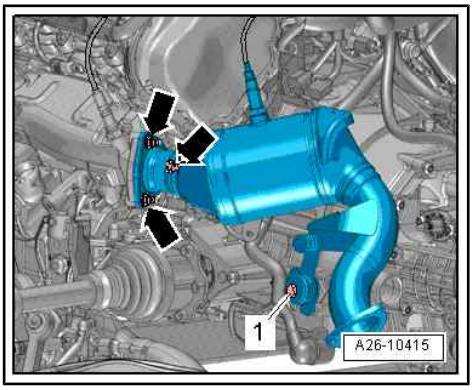
– Take electrical connector -3- for Lambda probe 2 after catalytic converter - G131- out of bracket, unplug and move wiring clear.



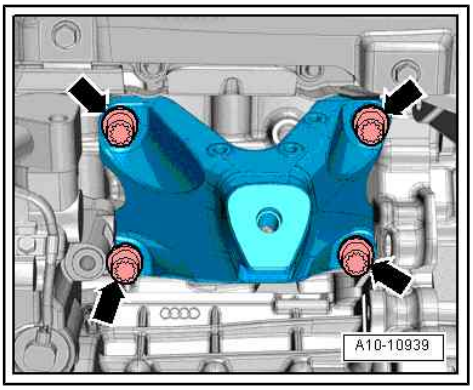
Note

Disregard -items 1, 2-.

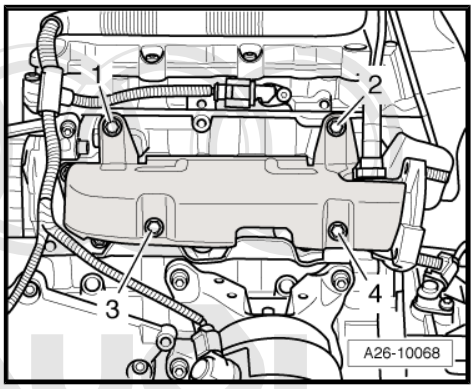
– Remove bolt -1- and nuts -arrows-, detach catalytic converter (left-side) from exhaust manifold and move to rear.



– Remove engine mounting (left-side) ⇒ page 83 .
– Unscrew bolts -arrows- and remove engine support (left-side).

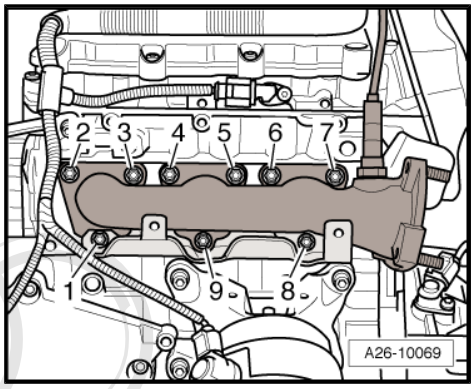


– Remove bolts -1 … 4- and detach heat shield.



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– Remove nuts -1- and -8- and detach bracket for heat shield.
– Remove nuts -2 … 7- and -9- and detach exhaust manifold.



Installing

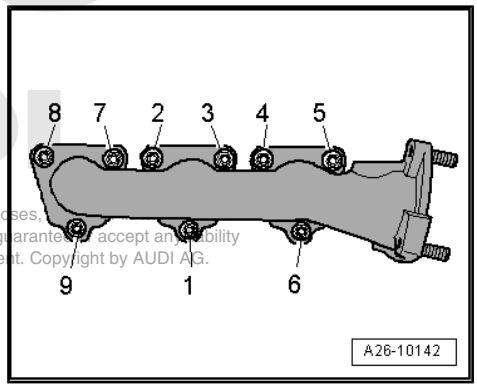
Installation is carried out in the reverse order; note the following:

- Tightening torques ⇒ Fig. ""Exhaust manifold (left-side) - tightening torque and sequence"" , page 408

Note

Renew gasket and self-locking nuts.

– Fit exhaust manifold with gasket for catalytic converter and tighten nuts ⇒ Fig. ""Exhaust manifold (left-side) - tightening torque and sequence"" , page 408 .
– Install engine support with engine mounting (left-side) ⇒ page 83 .
– Install catalytic converter (left-side) ⇒ page 395 .
– Install front silencer (left-side) ⇒ page 388 .
– Install noise insulation panels ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .
– Install plenum chamber partition panel ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Exploded view - plenum chamber partition panel .



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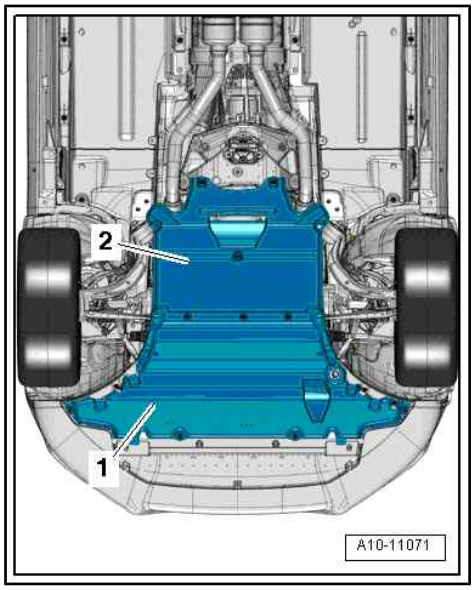
4.3 Removing and installing exhaust manifold (right-side)

Removing

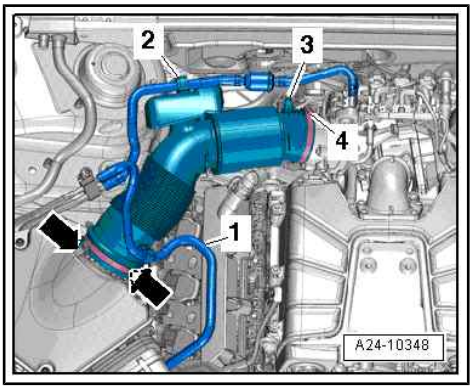
Note

Fit all cable ties in the original positions when installing.

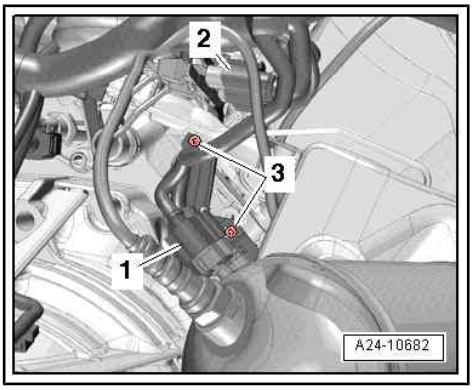
– Remove noise insulation -1- and -2- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .



– Move fuel hose -1- and hose -2- from activated charcoal filter clear at air pipe.
– Detach vacuum hose -3- from connection on air pipe.
– Remove air pipe. To do so, release hose clip -4- and clamps -arrows-.
– Remove plenum chamber partition panel ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Exploded view - plenum chamber partition panel .



– Take electrical connector -1- for Lambda probe after catalytic converter - G130- out of bracket, unplug and move wiring clear.

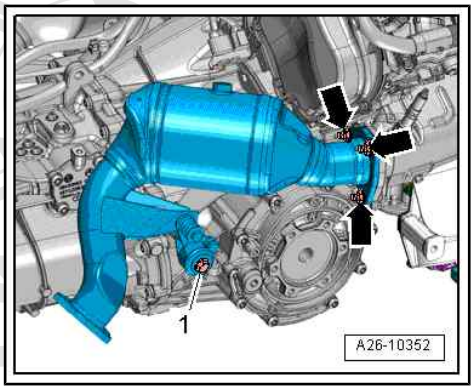


Note

Disregard -items 2, 3-.

– Remove front silencer (right-side) ⇒ page 388 .

– Remove bolt -1- and nuts -arrows- and push catalytic converter clear towards right side.



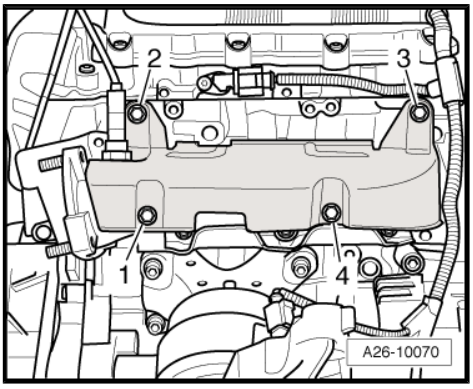
Note

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

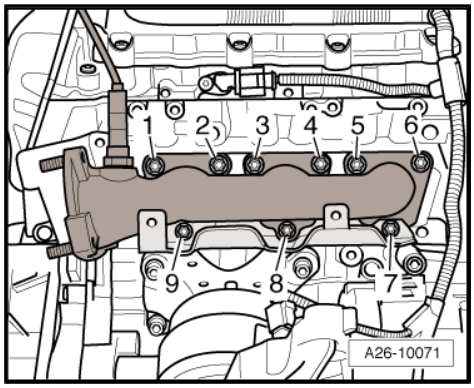
– Remove front right wheel.
– Remove wheel housing liner (front right) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front) .
– Remove nut -1- and bolt -2- and push coolant pipe clear to one side.

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– Remove bolts -1 … 4- and detach heat shield.



– Remove nuts -7- and -9- and detach bracket for heat shield.
– Remove nuts -1 … 6- and -8- and detach exhaust manifold.



Installing

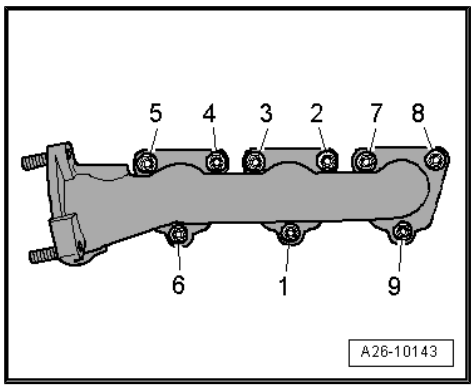
Installation is carried out in the reverse order; note the following:

- Tightening torques ⇒ Fig. ""Exhaust manifold (right-side) - tightening torque and sequence"" , page 408

Note

- *Renew gaskets and self-locking nuts.*
- *Hose connections and air pipes and hoses must be free of oil and grease before assembly.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *To secure the air hoses at their connections, spray rust remover onto the worm thread of the used hose clips before installing.*

– Fit exhaust manifold with gasket for catalytic converter and tighten nuts ⇒ Fig. ""Exhaust manifold (right-side) - tightening torque and sequence"" , page 408 .
– Install front wheel housing liner ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front) .
– Fit front wheel ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres; Tightening torque for wheel bolts .
– Install catalytic converter (right-side) ⇒ page 395 .
– Install front silencer (right-side) ⇒ page 388 .
– Install plenum chamber partition panel ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Exploded view - plenum chamber partition panel .
– Install noise insulation panels ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .



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28 – Ignition system

1 Ignition system

⇒ “1.2 Test data, spark plugs”, page 414

⇒ “1.1 Exploded view - ignition system”, page 413

⇒ “1.3 Removing and installing ignition coils”, page 414

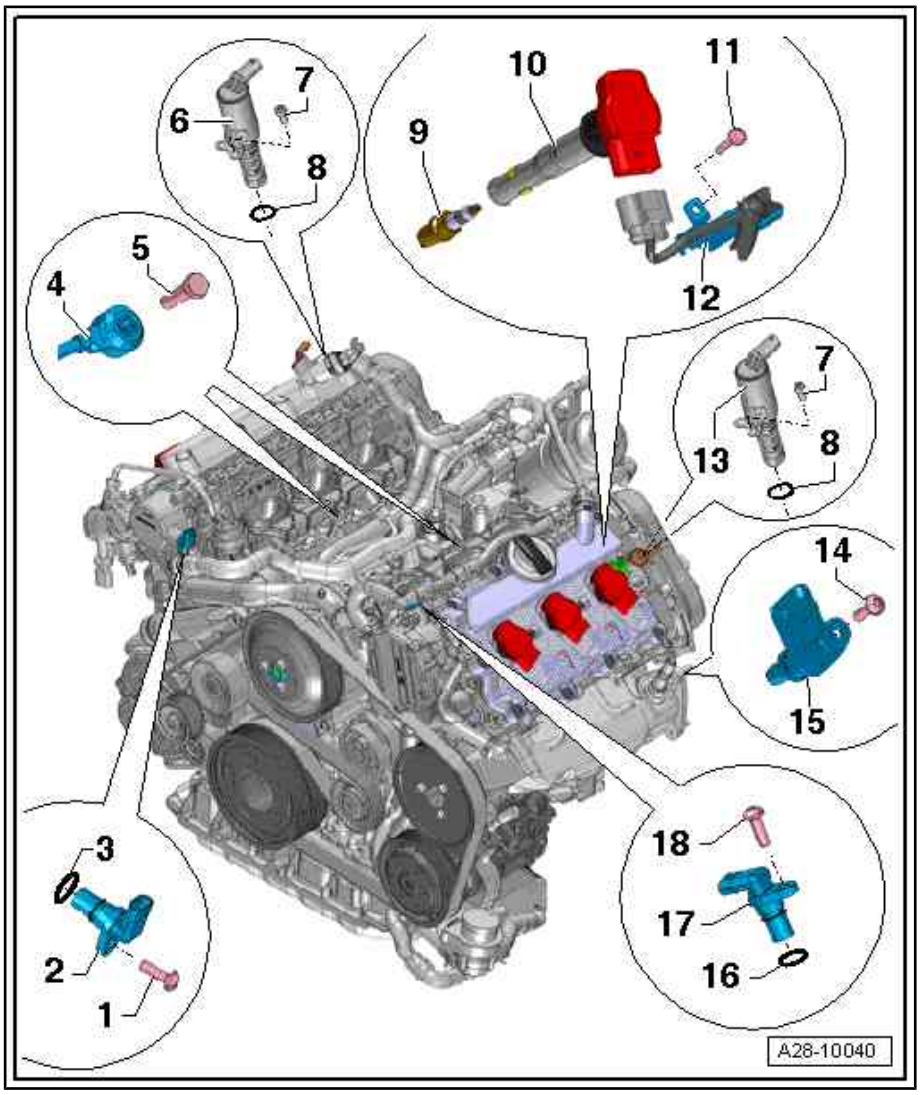
⇒ “1.4 Removing and installing knock sensor”, page 416

⇒ “1.5 Removing and installing Hall senders”, page 417

⇒ “1.6 Removing and installing engine speed sender G28 ”, page 418

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1.1 Exploded view - ignition system



1 - Bolt

- ❑ 9 Nm

2 - Hall sender - G40-

- ❑ Removing and installing ⇒ “1.5 Removing and installing Hall senders”, page 417

3 - O-ring

- ❑ Renew

4 - Knock sensor

- ❑ Knock sensor 1 - G61- (cylinder bank 1), knock sensor 2 - G66- (cylinder bank 2)
- ❑ Removing and installing ⇒ “1.4 Removing and installing knock sensor”, page 416

5 - Bolt

- ❑ 20 Nm
- ❑ Tightening torque influences the function of the knock sensors

6 - Camshaft control valve 1 - N205-

7 - Bolt

- ❑ 5 Nm

8 - O-ring

- ❑ Renew

9 - Spark plug

- ❑ Change interval ⇒ Maintenance tables
- ❑ Tightening torque ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818

10 - Ignition coil

- ❑ Removing and installing ⇒ “1.3 Removing and installing ignition coils”, page 414

11 - Bolt

❑ 5 Nm

12 - Electrical wiring harness

13 - Camshaft control valve 2 - N208-

14 - Bolt

❑ 9 Nm

15 - Engine speed sender - G28-

❑ Removing and installing ⇒ “1.6 Removing and installing engine speed sender G28 ”, page 418

16 - O-ring

❑ Renew

17 - Hall sender 2 - G163-

❑ Removing and installing ⇒ “1.5 Removing and installing Hall senders”, page 417

18 - Bolt

❑ 9 Nm

1.2 Test data, spark plugs

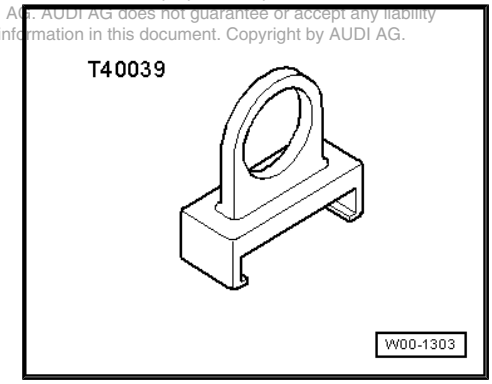
3.0 ltr. TFSI engine		
Idling speed		Cannot be adjusted; regulated by idling speed stabilisation
Ignition timing		Not adjustable (determined by control unit)
Ignition system		Multi-coil system with 6 ignition coils (output stages integrated) connected directly to spark plugs via spark plug connectors
Spark plugs	Designations	⇒ Data sheets for exhaust emissions test
	Tightening torque	⇒ Maintenance ; Booklet 812
Firing order		1-4-3-6-2-5

1.3 Removing and installing ignition coils

Special tools and workshop equipment required

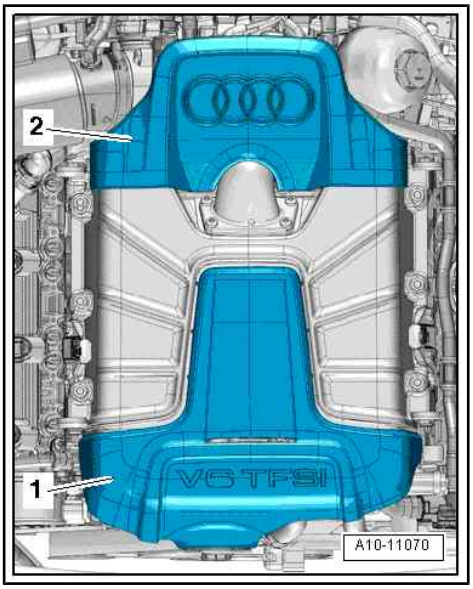
◆ Puller - T40039-

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Removing

– Lift off engine cover panels -1- and -2-.

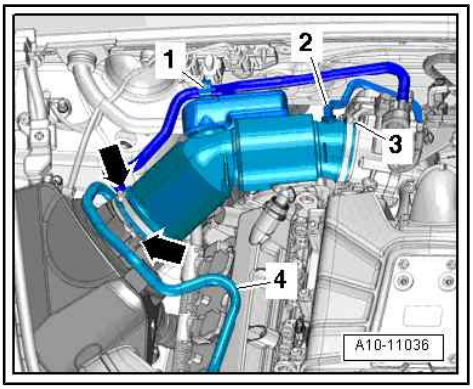


– Move clear fuel line -4- and line -1- leading to activated charcoal filter on air cleaner housing and air pipe.

– Detach vacuum hose -2- from connection on air hose.

– Remove air pipe. To do so, release hose clip -3- and clamps -arrows-.

– Remove air cleaner housing.



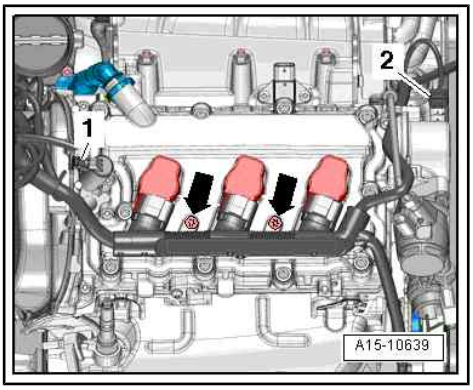
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– Remove bolts -arrows- and unplug electrical connectors at ignition coils.

– Move electrical wiring harness down slightly.

Note

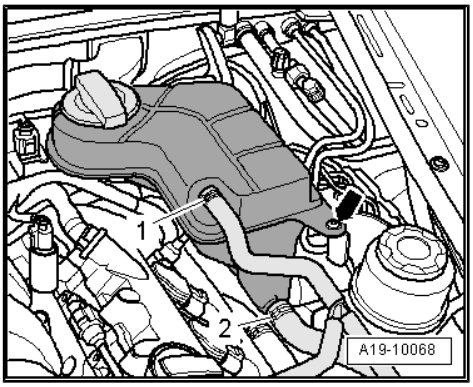
Disregard -items 1, 2-.



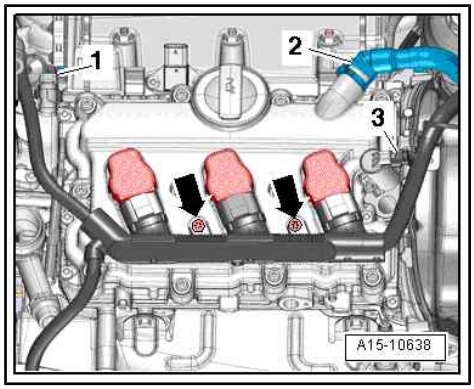
Cylinder bank 2 (left-side):

– Remove bolt -arrow-.

– Unplug electrical connector for coolant shortage indicator switch - F66- at bottom of expansion tank and move expansion tank to one side with coolant hoses -1- and -2- attached.



– Remove bolts -arrows- and unplug electrical connectors at ignition coils.
– Move electrical wiring harness down slightly.

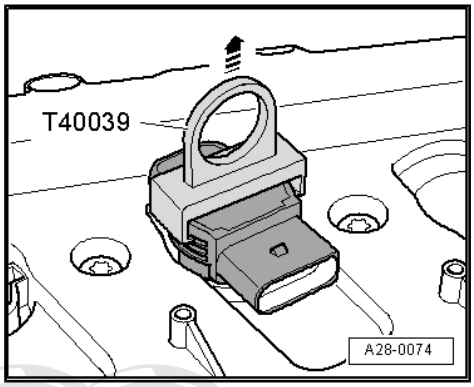


Note

Disregard -items 1, 2, 3-.

Both sides (continued):

– Remove ignition coils using puller - T40039- .

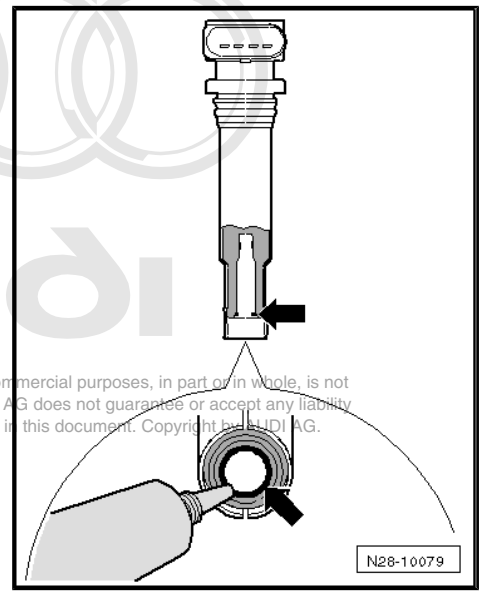


Installing

– Apply a thin bead of silicone paste all around end of sealing hose of ignition coil with output stage -arrow-.

Silicone paste ⇒ Electronic parts catalogue (ETKA) .

– Fit all ignition coils loosely into spark plug holes.
– Align the ignition coils with the connectors and attach all connectors onto ignition coils simultaneously.
– Press ignition coils onto spark plugs by hand evenly (do NOT use tool).



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

• Tightening torques ⇒ page 342 and ⇒ page 413

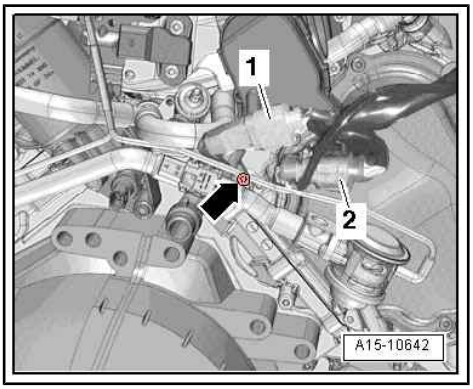
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1.4 Removing and installing knock sensor

Removing

– Remove supercharger ⇒ page 310 .
– Remove intake manifold bottom sections (left and right) ⇒ page 347 .

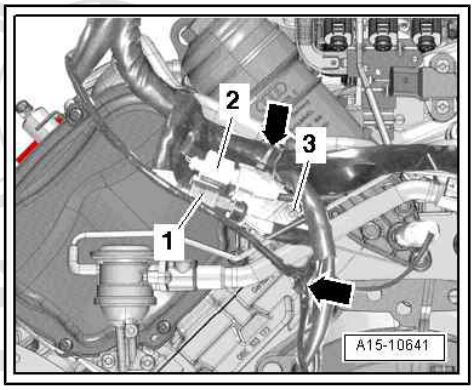
– Remove electrical connector -1- for knock sensor 1 - G61- from bracket (right-side) and unplug connector.



Note

Disregard -item 2- and -arrow-.

– Remove electrical connector -2- for knock sensor 2 - G66- from bracket (left-side) and unplug connector.

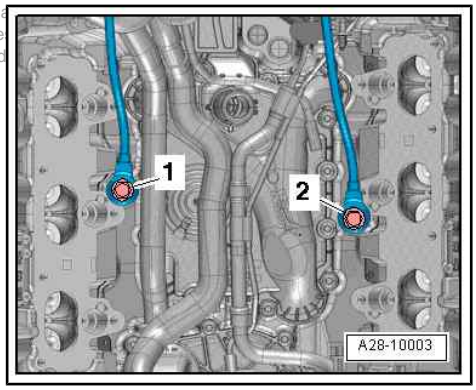


Note

Disregard items marked -1, 3- and -arrows-.

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– Remove bolt -1- for knock sensor 1 - G61- and bolt -2- for knock sensor 2 - G66- and detach knock sensors.



Installing

- Tightening torque ⇒ page 413

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

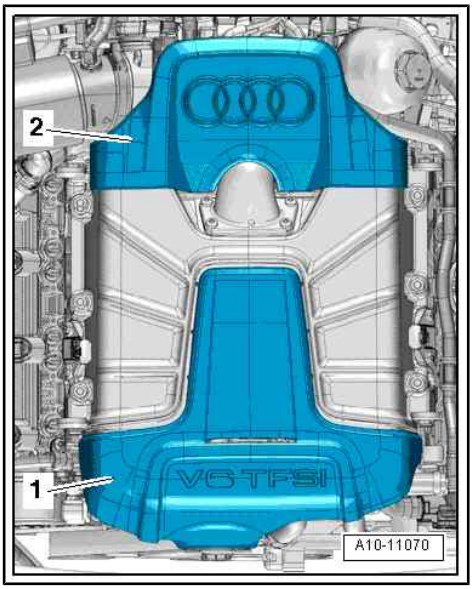
– Install intake manifold bottom sections (left and right) ⇒ page 347 .

– Install supercharger ⇒ page 310 .

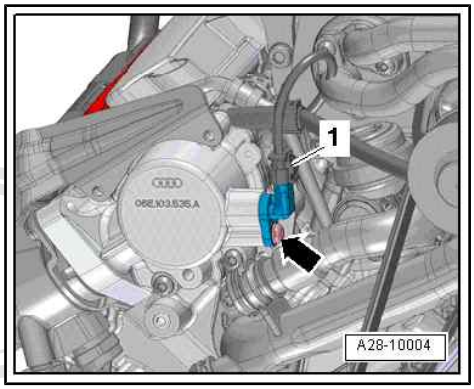
1.5 Removing and installing Hall senders

Removing

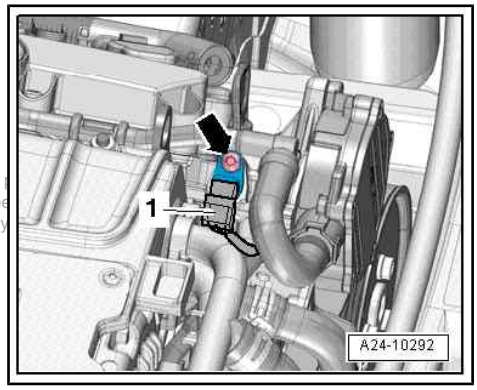
– Lift off engine cover panel (front) -1-.



– Unplug electrical connector -1-.
– Remove bolt -arrow- and detach Hall sender - G40- (cylinder bank 1).



– Unplug electrical connector -1-.
– Remove bolt -arrow- and detach Hall sender 2 - G163- (cylinder bank 2).



Installing

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

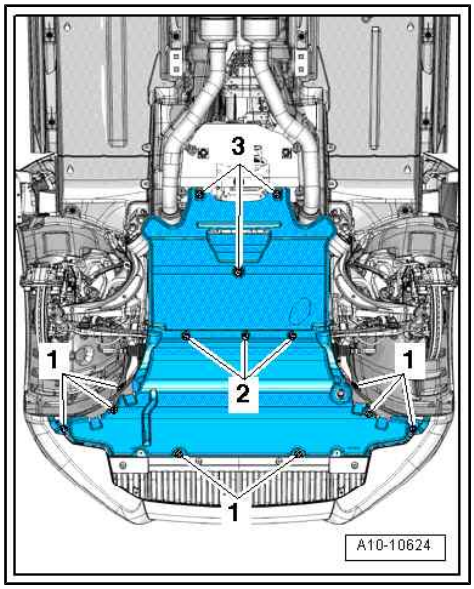
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– Fit new O-rings.
• Tightening torques: ignition system - exploded view ⇒ page 413

1.6 Removing and installing engine speed sender - G28-

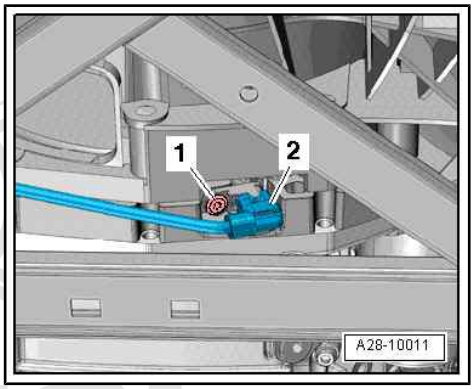
Removing

– Release fasteners -1, 2, 3- and remove noise insulation panels.



– Unplug electrical connector -2-.

– Unscrew bolt -1- and remove engine speed sender - G28- .



Installing

Install in reverse order.

- Tightening torque ⇒ “1.1 Overview of fitting locations - injection system”, page 322

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