Workshop Manual

Audi A6 2005 ➢

6-cylinder TDI engine (2.7 ltr.; 3.0 ltr. 4-valve common rail, EU5), mechanics									
Engine ID	CAN A	CAN B	CAN C	CAN D	CDY A	CDY B	CDY C		

Edition 10.2014

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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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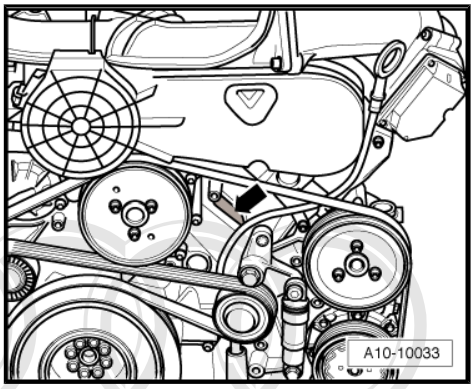
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00 – Technical data

1 Engine number

(ARL004032; Edition 10.2014)



- The engine number (“engine code” and “serial number”) can be found at the front below the toothed belt for the high-pressure pump (left-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 engine number is concealed by an idler roller for the poly V-belt. Removing idler roller (left-side) for poly V-belt* *⇒ page 118* *.*
- *The 4-character engine code can be found on the type plate (in versions for some countries only), the vehicle data sticker, the engine control unit and on the toothed belt cover for high-pressure pump.*
- *Fitting locations of the type plate (certain countries only) and the vehicle data sticker ⇒ Maintenance ; Booklet 405 .*

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2 Engine data

Code letters		CANA	CANB	CANC
Capacity	ltr.	2.698	2.698	2.698
Power output	kW at rpm	140/3500 … 4400	120/3500 … 4400	140/3500 … 4400
Torque	Nm at rpm	380/1400 … 3500	380/1400 … 3500	450/1750 … 2250
Bore	∅ in mm	83.0	83.0	83.0
Stroke	mm	83.1	83.1	83.1
Compression ratio		16.4	16.4	16.4
CN	at least	51	51	51
Firing order		1-4-3-6-2-5	1-4-3-6-2-5	1-4-3-6-2-5
Emission standards		EU 5	EU 5	EU 5
Exhaust gas recirculation		yes	yes	yes
Exhaust gas temperature control		2 sensors	2 sensors	2 sensors
Turbocharging/supercharging		Turbocharger	Turbocharger	Turbocharger
Charge air cooling		yes	yes	yes
Lambda control		1 Lambda probe	1 Lambda probe	1 Lambda probe
Particulate filter		yes	yes	yes
Valves per cylinder		4	4	4

Code letters		CAND	CDYA	CDYB
Capacity	ltr.	2.698	2.967	2.967
Power output	kW at rpm	120/3500 … 4400	176/4000 … 4400	155/4000 … 4400
Torque	Nm at rpm	450/1750 … 2250	500/1500 … 3000	500/1500 … 3000
Bore	∅ in mm	83.0	83.0	83.0
Stroke	mm	83.1	91.4	91.4
Compression ratio		16.4	16.4	16.4
CN	at least	51	51	51
Firing order		1-4-3-6-2-5	1-4-3-6-2-5	1-4-3-6-2-5
Emission standards		EU 5	EU 5	EU 5
Exhaust gas recirculation		yes	yes	yes
Exhaust gas temperature control		2 sensors	3 sensors	3 sensors
Turbocharging/supercharging		Turbocharger	Turbocharger	Turbocharger
Charge air cooling		yes	yes	yes
Lambda control		1 Lambda probe	1 Lambda probe	1 Lambda probe
Particulate filter		yes	yes	yes
Valves per cylinder		4	4	4

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Code letters		CDYC		
Capacity	ltr.	2.967		
Power output	kW at rpm	176/4000 … 4400		
Torque	Nm at rpm	450/1400 … 3500		
Bore	∅ in mm	83.0		
Stroke	mm	91.4		
Compression ratio		16.4		
CN	at least	51		
Firing order		1-4-3-6-2-5		

Code letters	CDYC		
Emission standards	EU 5		
Exhaust gas recirculation	yes		
Exhaust gas temperature control	3 sensors		
Turbocharging/supercharging	Turbocharger		
Charge air cooling	yes		
Lambda control	1 Lambda probe		
Particulate filter	yes		
Valves per cylinder	4		

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3 Safety precautions

Overview

- ⇒ “3.1 Working on the fuel system”, page 4
- ⇒ “3.2 Working on the cooling system”, page 5
- ⇒ “3.3 Using testers and measuring instruments during a road test”, page 5
- ⇒ “3.4 Safety precautions when working on the exhaust system”, page 5
- ⇒ “3.5 Working on the subframe”, page 6

3.1 Working on the fuel system

When working on the fuel system note the following warnings:

WARNING

Risk of injury - fuel system operates under pressure.

- *Wrap a cloth around the connection before opening the fuel system. Then release pressure by carefully loosening the connection.*

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

- *In extreme cases the temperature of the fuel lines and the fuel can be up to 100 °C after the engine is switched off. Allow the fuel to cool down before disconnecting the lines - danger of scalding.*
- *Wear protective gloves.*
- *Wear safety goggles.*

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

- Always switch off the ignition before connecting or disconnecting tester cables or electrical wiring for the injection or glow plug system.
- Always switch off ignition before washing engine.
- Faults are stored in the engine control unit if electrical connectors were unplugged and the engine was started: “Interrogate event memory” in “Vehicle self-diagnosis” ⇒ Vehicle diagnostic tester.

Caution

To prevent irreparable damage to the electronic components when disconnecting the battery:

- *Observe notes on procedure for disconnecting the battery.*
- *Always switch off the ignition before disconnecting the battery.*

– Disconnect battery ⇒ Electrical system; Rep. gr. 27

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3.2 Working on the cooling system

When working on the cooling system note the following warnings:

WARNING

Hot steam/hot coolant can escape - risk of scalding.

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

3.3 Using testers and measuring instruments during a road test

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

WARNING

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

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

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

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3.4 Safety precautions when working on the exhaust system

WARNING

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

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

Caution

Avoid damage to flexible joint.

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

3.5 Working on the subframe

When working on the subframe note the following warnings:

Caution

Risk of damage to running gear components.

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

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4 General repair instructions

Overview

- ⇒ “4.1 Rules for cleanliness when working on fuel supply system, injection system and turbocharger”, page 7
- ⇒ “4.2 Checking for leaks in the fuel system”, page 7
- ⇒ “4.3 Foreign particles in engine”, page 7
- ⇒ “4.5 Routing and attachment of pipes, hoses and wiring”, page 8
- ⇒ “4.6 Installing radiators, condensers and charge air coolers”, page 8
- ⇒ “4.7 Checking vacuum system”, page 8

4.1 Rules for cleanliness when working on fuel supply system, injection system and turbocharger

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

- Carefully clean connection points and the surrounding area with engine cleaner or brake cleaner and dry thoroughly before opening.
- Plug open lines and connections with suitable protective caps immediately.
- Place parts that have been removed on a clean surface and cover them over. Do not use fluffy cloths.
- Only install clean components; replacement parts should only be unpacked immediately prior to installation. Do not use parts that have been previously unpacked and stored away loose (e.g. in toolboxes, etc.).
- When the system is open: Do not work with compressed air. Do not move the vehicle unless absolutely necessary.
- Protect unplugged electrical connectors against dirt and moisture and make sure connections are dry when attaching.

4.2 Checking for leaks in the fuel system

– 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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4.3 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 to prevent further damage occurring later.

4.4 Contact corrosion!

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

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

4.5 Routing and attachment of pipes, hoses and wiring

Mark hydraulic lines, vacuum lines and electrical wiring before removal so they can be re-installed in the original positions and correctly connected. Make sketches or take photographs if necessary.

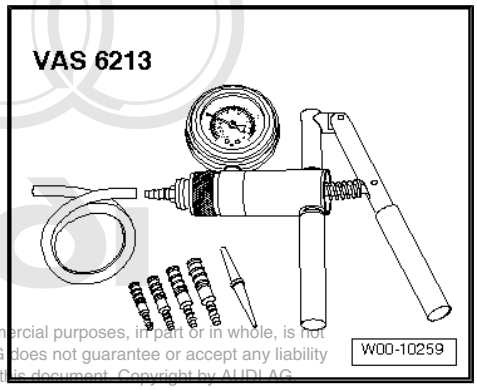
4.6 Installing radiators, condensers and charge air coolers

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

4.7 Checking vacuum system

Special tools and workshop equipment required

- Hand vacuum pump - VAS 6213-



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Procedure

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

- Cracks
- Traces of animal bites

- ♦ Kinked or crushed lines
- ♦ Lines porous or leaking

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

– If a fault is stored in the 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 - vehicles with manual gearbox

Overview

- ⇒ “1.1 Removing engine”, page 10
- ⇒ “1.2 Separating engine from manual gearbox”, page 28
- ⇒ “1.3 Installing engine”, page 32

Note

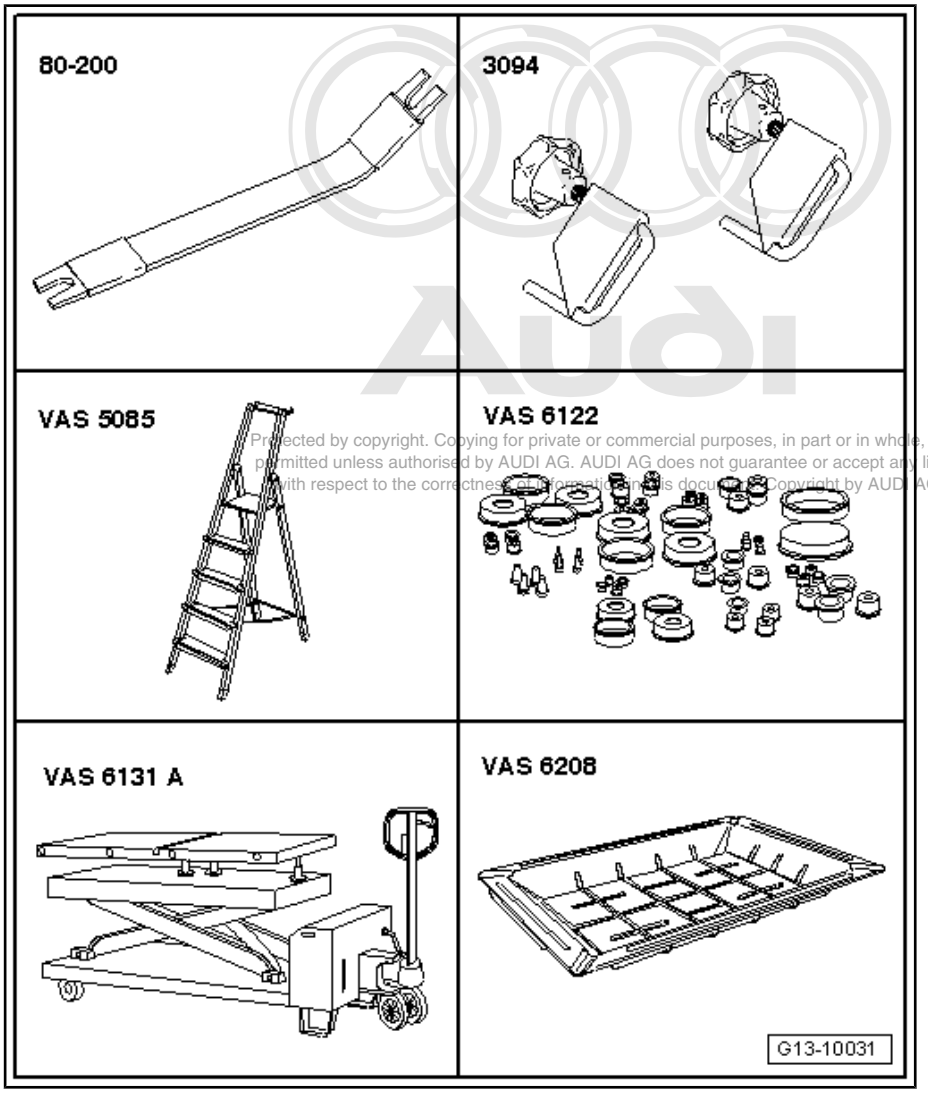
- *The engine is removed from underneath together with the gearbox and subframe (with lock carrier installed).*
- *All cable ties which are released or cut open when removing must be fitted in the same position when installing.*
- *Collect drained coolant in a clean container for re-use or disposal.*

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1.1 Removing engine

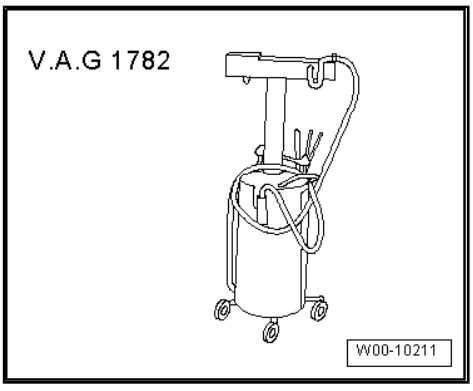
Special tools and workshop equipment required

- Removal lever - 80 - 200-
- Hose clamps, up to 25 mm - 3094-
- Stepladder - VAS 5085-
- Engine bung set - VAS 6122-
- Scissor-type assembly platform - VAS 6131 A- with support set for Audi - VAS 6131/10-
- Drip tray for workshop hoist - VAS 6208-

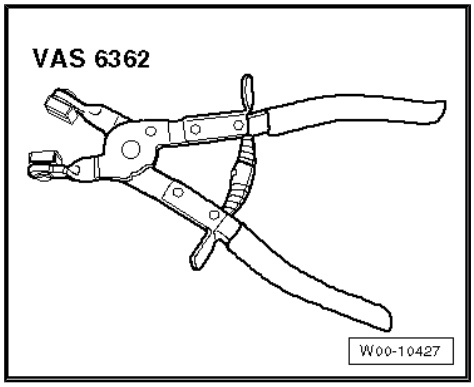


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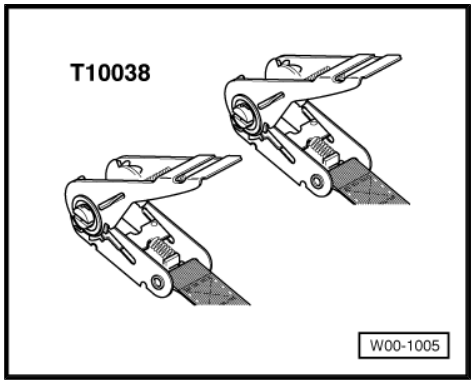
- Used oil collection and extraction unit - V.A.G 1782-



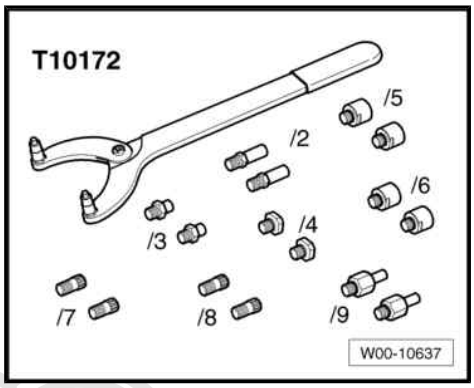
- Hose clip pliers - VAS 6362-



- Tensioning strap - T10038-



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



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.*

Caution

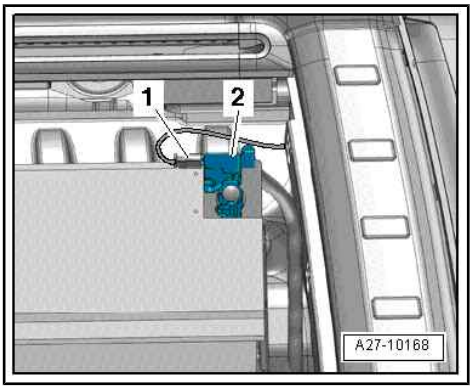
Electronic components are susceptible to damage.

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

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– Switch off ignition.

– Disconnect earth wire -2- from battery terminal ⇒ Electrical system; Rep. gr. 27 .
– Discharge refrigerant system ⇒ Air conditioner with refrigerant R134a .
– Extract hydraulic fluid for power steering from reservoir using used oil collection and extraction unit - V.A.G 1782- .

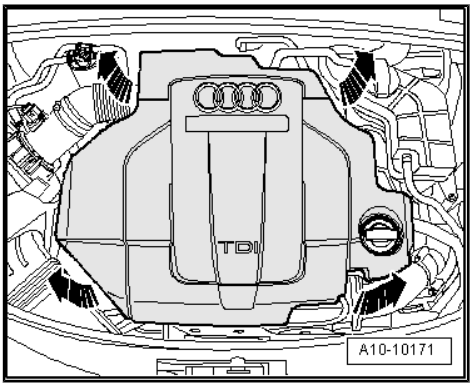


– Carefully pull engine cover panel off four retaining pins one after the other -arrows-.

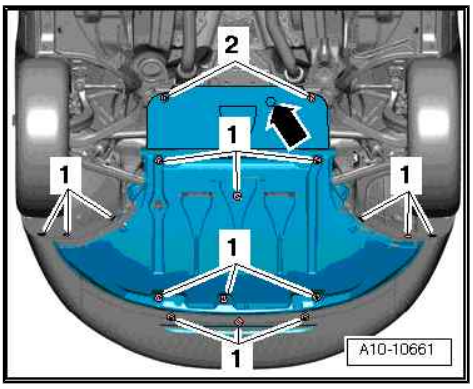
WARNING

Hot steam/hot coolant can escape - risk of scalding.

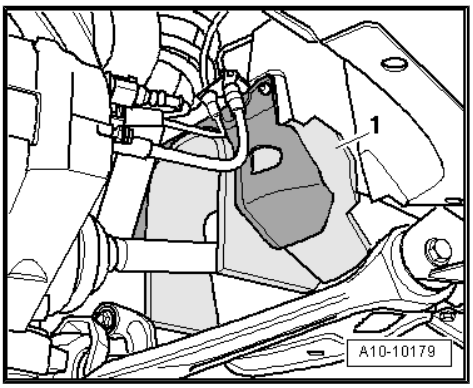
- *The cooling system is under pressure when the engine is hot.*
- *To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.*



– Open filler cap on coolant expansion tank.
– Remove both front wheels ⇒ Wheels and tyres; Rep. gr. 44 .
– Remove front and rear noise insulation ⇒ Rep. gr. 50 .

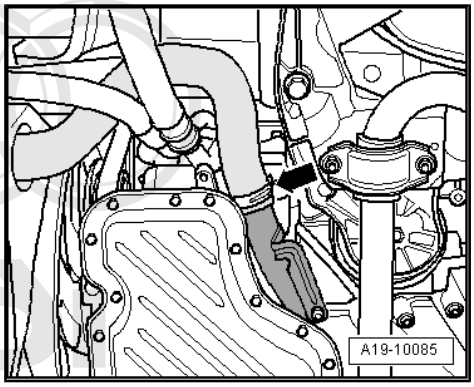


– Remove cover -1- for drive shaft in wheel housing (left and right).



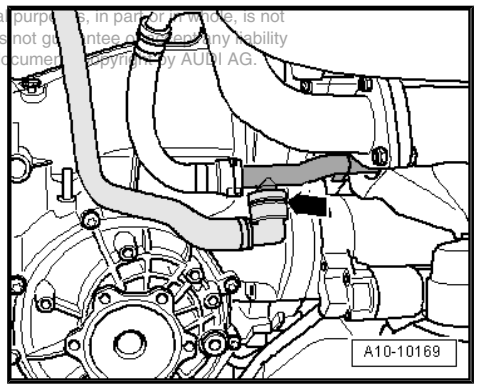
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– Place drip tray for workshop hoist - VAS 6208- beneath engine.
– Release hose clip -arrow-, disconnect coolant hose from coolant pipe (left-side) and drain off coolant.

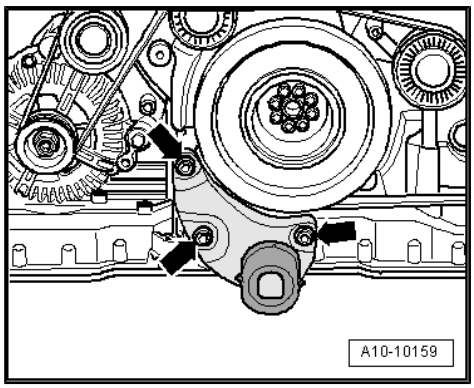


– Lift retaining clip -arrow- to disconnect coolant hose from coolant pipe (right-side) and drain off remaining coolant.

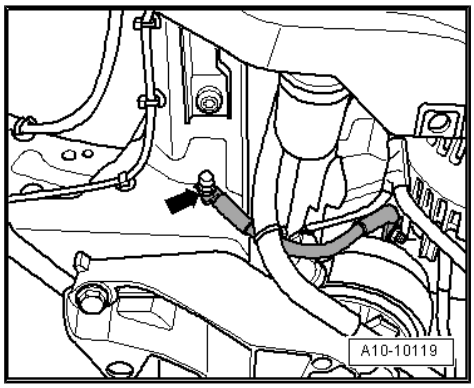
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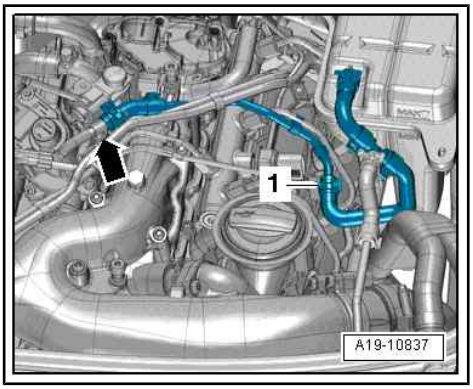
– Unscrew bolts -arrows- and detach torque reaction support from engine.



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



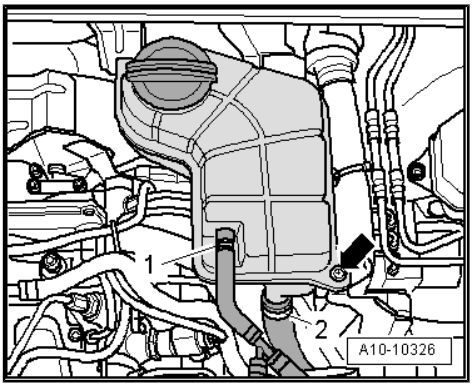
– Disconnect coolant hose -1-.



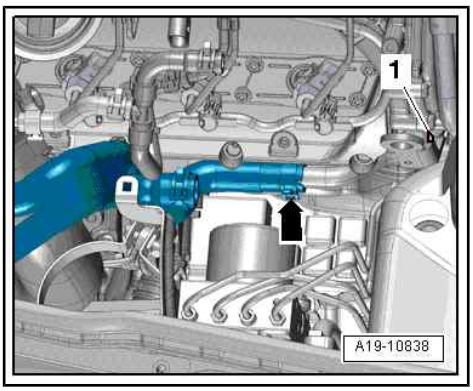
Note

Disregard -arrow-.

– 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.



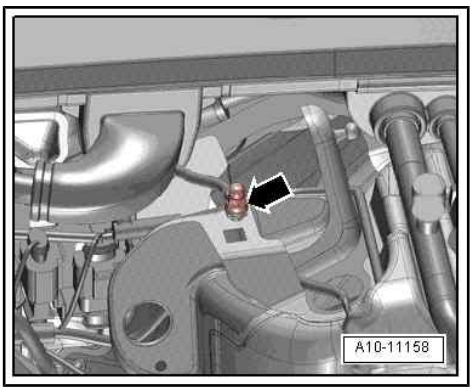
– Release hose clip -arrow- and detach coolant hose.



Note

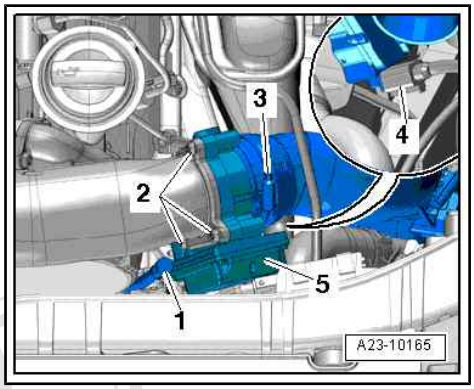
Disregard -item 1-.

– Unscrew nut -arrow- on suspension turret (left-side) and move earth wire clear.



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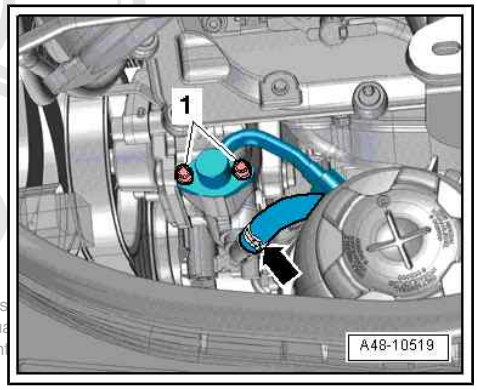
– Pull out oil dipstick -1-.
– Release hose clip -3- and detach air hose.
– Unplug electrical connector -4-.
– Remove bolts -2- and detach throttle valve module - J338- -item 5-.



Note

Lay a cloth under the hydraulic lines to catch escaping hydraulic fluid.

– Clamp off hydraulic hose -arrow- with hose clamp -3094- and detach.
– Remove bolts -1- and lay hydraulic line aside on top of longitudinal member.
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .



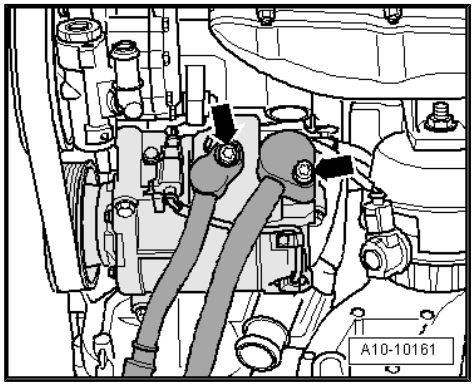
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Caution

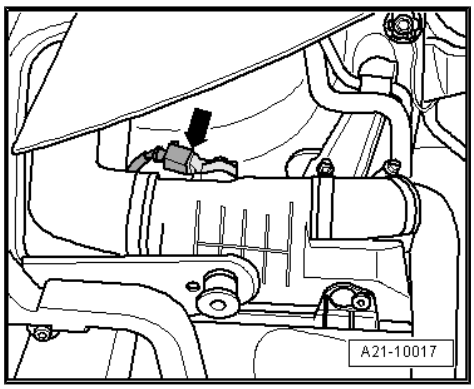
Danger of damage to refrigerant lines and hoses.

- ***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- .



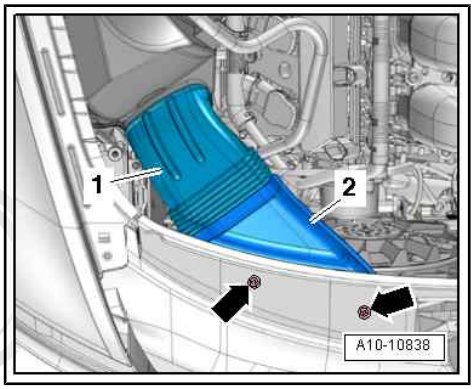
– Unplug electrical connector -arrow- for charge pressure sender - G31- at charge air cooler (left-side).



Note

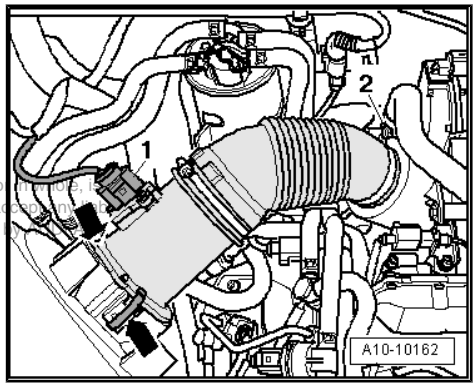
For illustration purposes, the installation position is shown with the headlight removed.

– Remove bolts -arrows-, detach air ducts -1- and -2-.

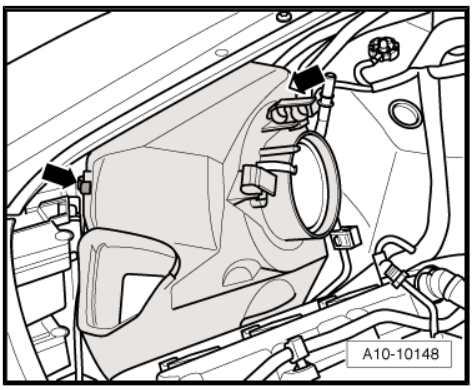


– Unplug electrical connector -1- from air mass meter - G70- .
– Remove air hose. To do so, release hose clip -2- and clamps -arrows-.

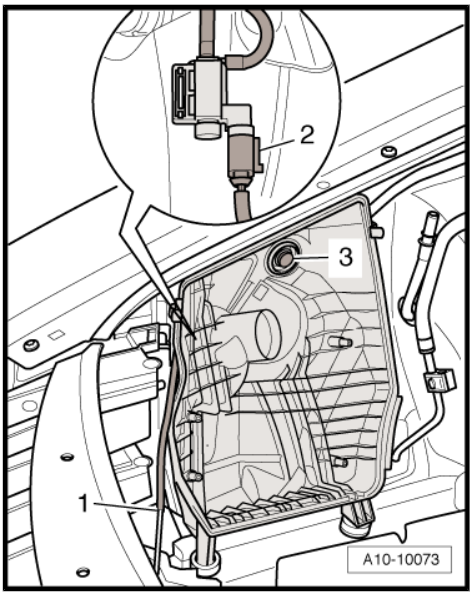
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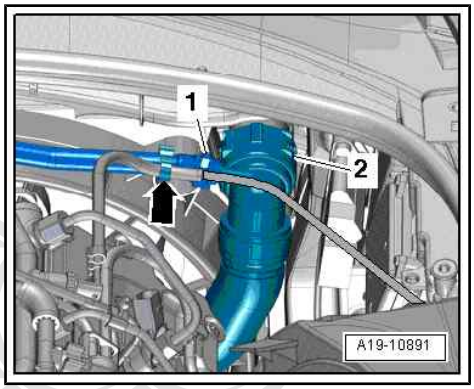
– Release clamps -arrows- and detach air cleaner (top section).



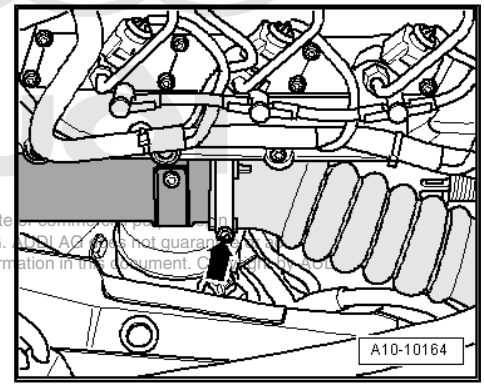
– Disconnect vacuum line -1-.
– Pull pin out of fastener -3-.
– Detach air cleaner (bottom section) and disconnect electrical connector -2- for air filter bypass flap valve - N275- on reverse side of air cleaner.



– Release hose clip -1- and detach coolant hose.
– Move vacuum hose clear -arrow-.
– Lift retaining clip -2- and disconnect coolant hose (top right) from radiator.

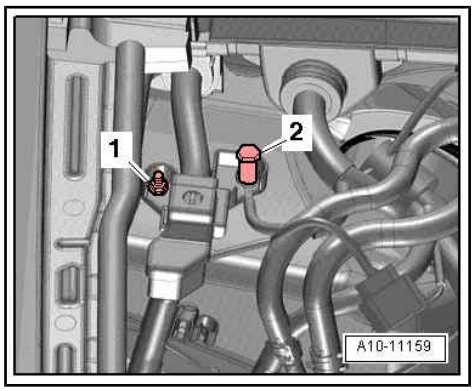


– Release hose clip -arrow- and detach air hose from air pipe.



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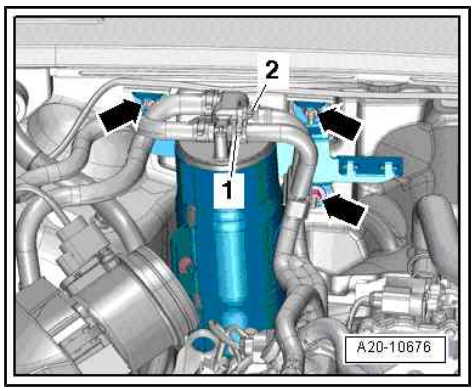
– Remove nut -1- on remote positive terminal.
– Remove earth stud -2-.
– Move clear electrical wiring to turbocharger 1 control motor - V280- .



Caution

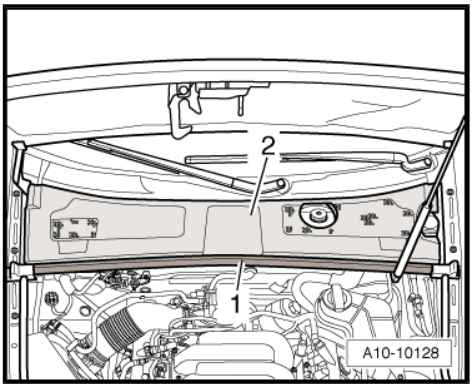
Take care to keep components clean.

- *Rules for cleanliness when working on the injection system ⇒ page 7 .*

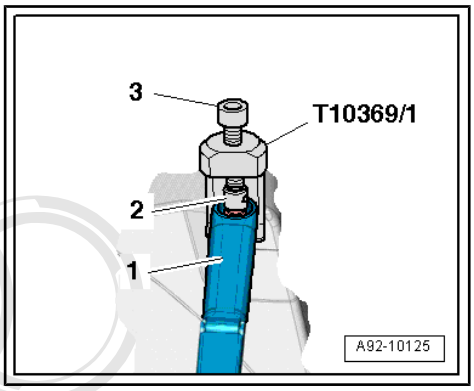


– Release hose clips and detach return hose -1- and supply hose -2- from fuel filter.
– Unscrew nuts -arrows- and move bracket with fuel filter to one side.
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .

– Pull off seal -1- and remove plenum chamber cover -2-.



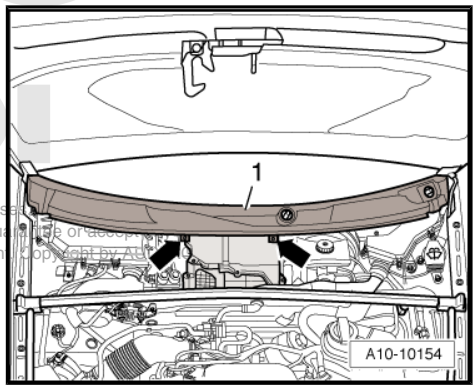
– Remove wiper arms ⇒ Electrical system; Rep. gr. 92 .



Caution

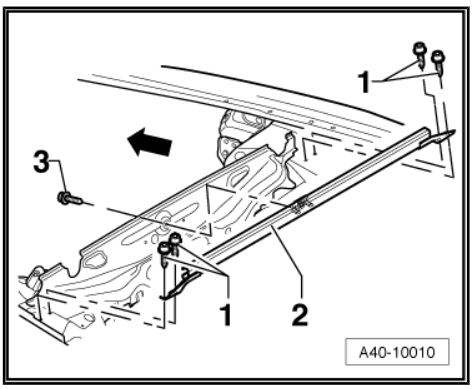
Risk of damage to cowl panel trim.

- *To avoid cracking the cowl panel trim -1- during removal, apply a small amount of soap solution to the joint between the windscreen and the cowl panel trim and pull the trim vertically up out of the windscreen surround, starting from the edge of the windscreen.*



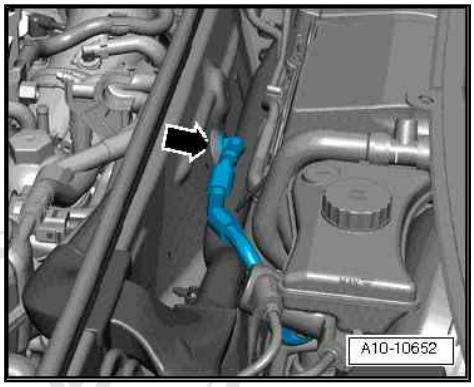
– Unscrew bolts -arrows- and pull cowl panel trim off windscreen.

– If fitted, remove bolts -1- and -3- and detach body brace -2-.

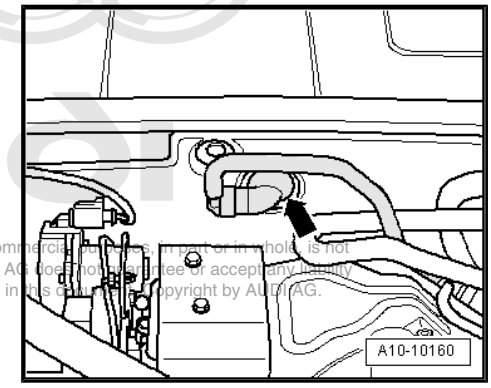


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– Detach vacuum line -arrow- going to brake servo at plenum chamber partition panel.

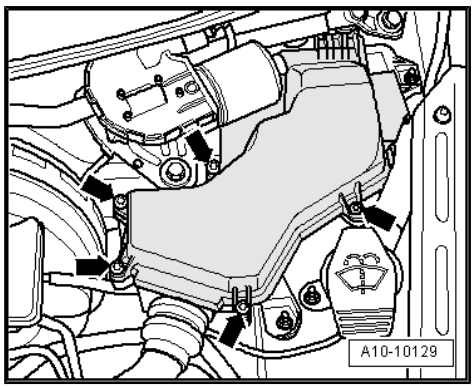


– Detach vacuum hose -arrow- going to brake servo at plenum chamber partition panel.

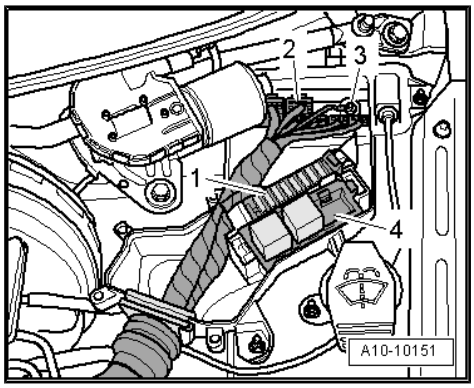


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– Remove bolts -arrows- and detach cover for electronics box in engine compartment (left-side).



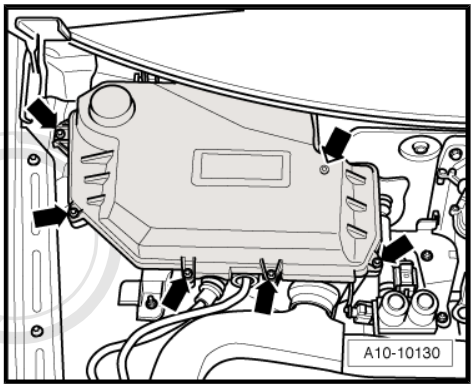
– Release fasteners, pull off fuse holder -1- and then 3-position relay carrier -4- upwards.
– Unscrew wiring -3-.
– Unplug three front electrical connectors -2- at rear of connector console.
– Disengage engine wiring harness at electronics box and move clear.



WARNING

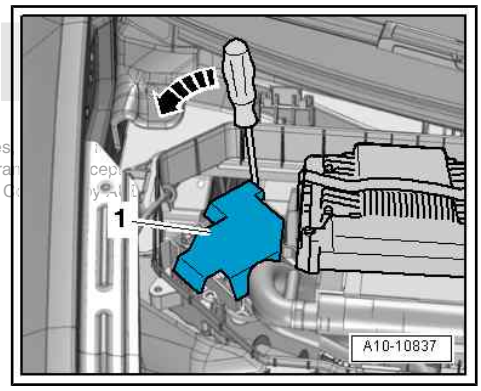
Risk of burns at the pump valve unit for the heating system (left-side in front of electronics box).

- ***Wear protective gloves when working near the pump valve unit for the heating system.***



– Remove bolts -arrows- and detach cover for electronics box in engine compartment (right-side).

– Open cover -1- with screwdriver -arrow- and detach.



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– Use screwdriver -arrows 1, 2- to carefully lever off retaining strap -3- and remove engine control unit from electronics box.

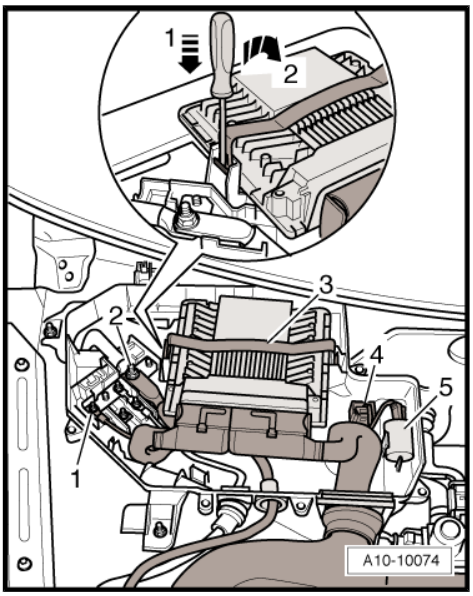
Note

The engine control unit remains connected to the wiring harness.

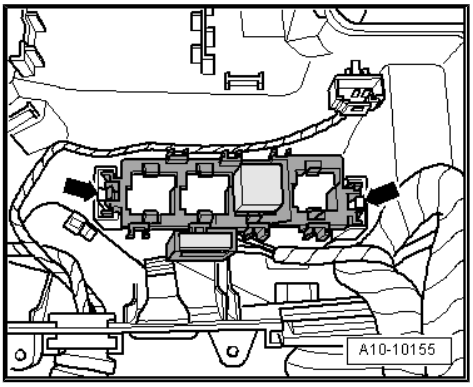
– Unclip suppressor capacitor -5- and take out of retainer in electronics box.

– Unplug electrical connector -4- at rear of connector console.

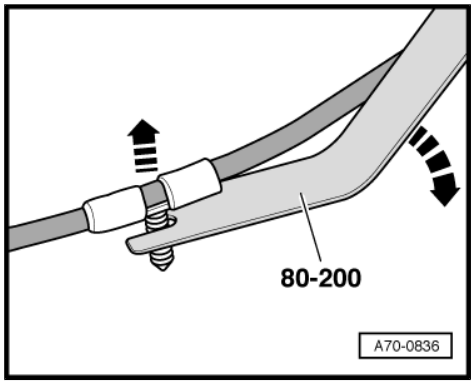
– Unscrew electrical wiring -1- and -2-.



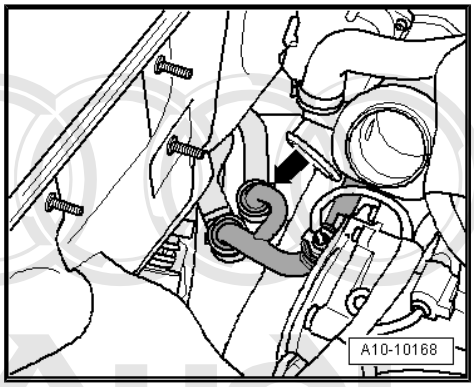
– Release catches -arrows- and detach relay carrier from electronics box in engine compartment (right-side).



– Use removal lever - 80 - 200- to release electrical wiring up to the alternator.
– Place both wiring harnesses on engine and secure engine control unit to prevent it from dropping.



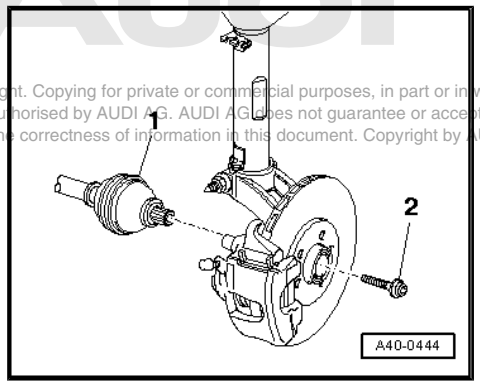
– Detach coolant hose -arrow- leading to heat exchanger at rear of engine.



Caution

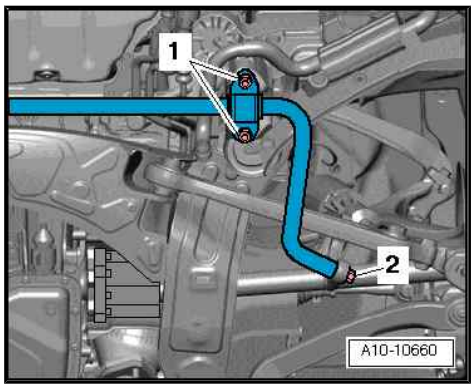
Risk of injury and risk of damage to brake discs and wheel bearings.

- ***When slackening the flange bolt securing the drive shaft, the vehicle must not be standing on its wheels.***
- ***Secure brake discs by screwing in two wheel bolts.***



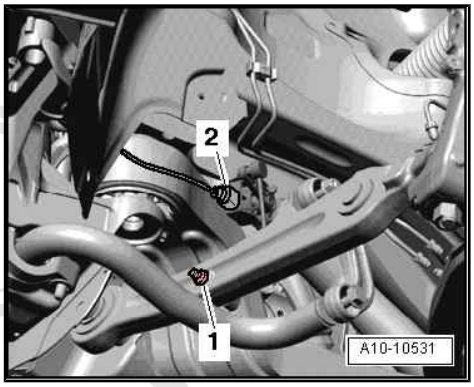
– Have a 2nd mechanic press the brake pedal.
– Unscrew flange bolt -2- at drive shaft -1- (left and right).

– Unscrew nuts -1- on both sides evenly.
– Unscrew bolts -2- on both sides and remove anti-roll bar.



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– Unplug electrical connector -2- at front left vehicle level sender - G78- .
– Remove nut -1- and detach coupling rod from track control link.



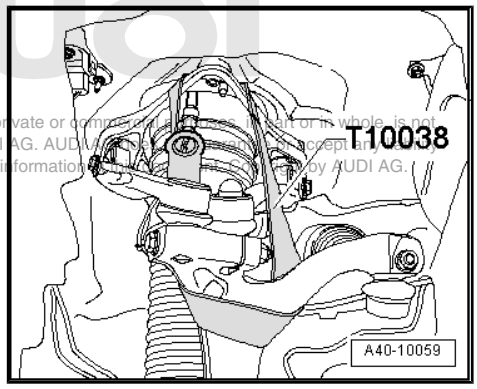
Caution

Danger of damage to the swivel joints of the upper links.

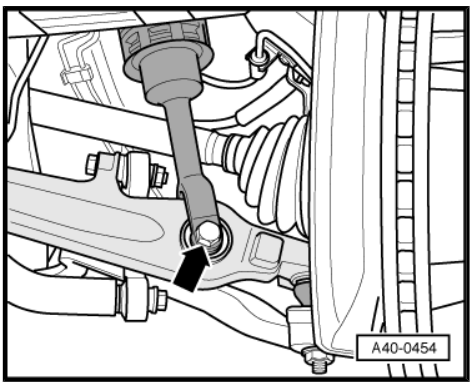
- ***Support wheel bearing housing.***

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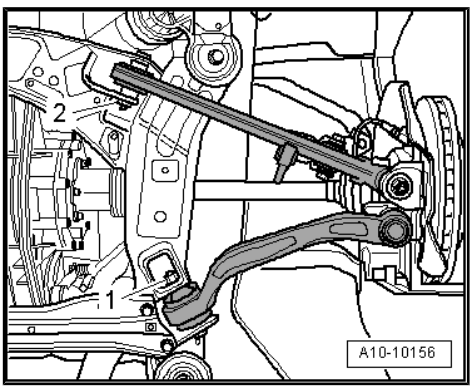
– Tie up wheel bearing housing with tensioning strap - T10038- as shown on illustration.



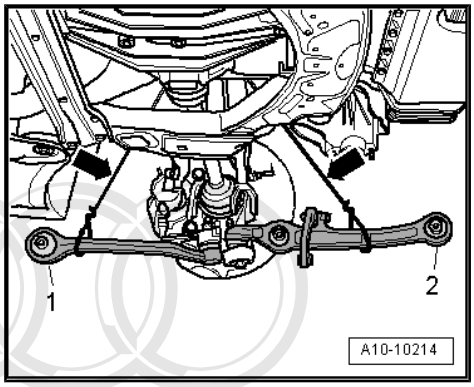
– Remove bolt -arrow- and detach suspension strut from track control link.



– Remove nut -1- for guide link and nut -2- for track control link at subframe, remove bolts.



– Pivot guide link -1- and track control link -2- outwards.



Caution

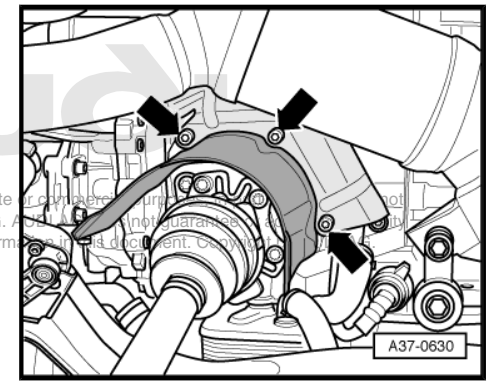
Risk of damage if guide link and track control link are allowed to drop without support.

- *Tie up guide link and track control link to wheel bearing housing -arrows- as shown in illustration.*

– Move clear electrical wiring harness at heat shield for drive shaft (left-side).

– Remove bolts -arrows- and detach heat shield for drive shaft (left-side).

– Detach drive shaft from flange shaft of gearbox.



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Caution

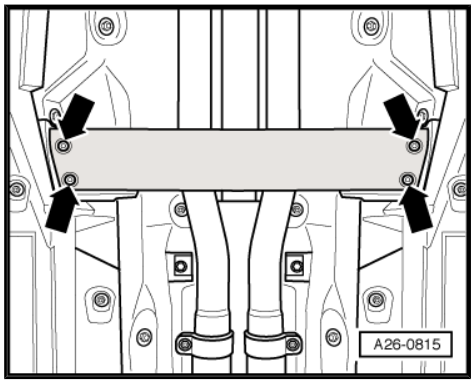
Danger of damage to brake hose.

- *Take care when detaching drive shaft.*

– Pivot wheel bearing housing outwards and detach drive shaft.

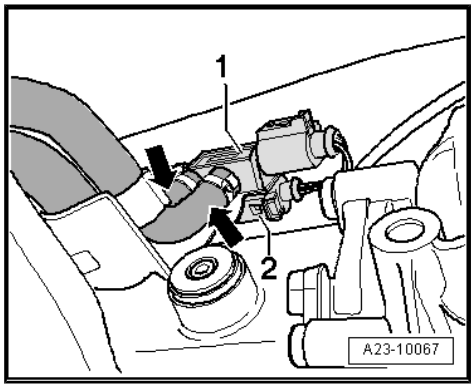
– Perform the same work steps on the other side of the vehicle.

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



– Detach electrical connector for exhaust gas temperature sender 4 - G648- -item 2- from bracket and unplug.

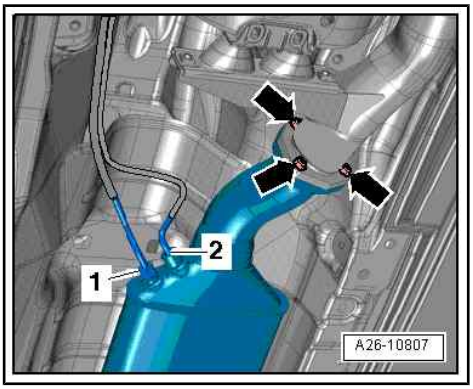
– Move electrical wiring clear.



Note

Ignore items marked -1- and -arrows-.

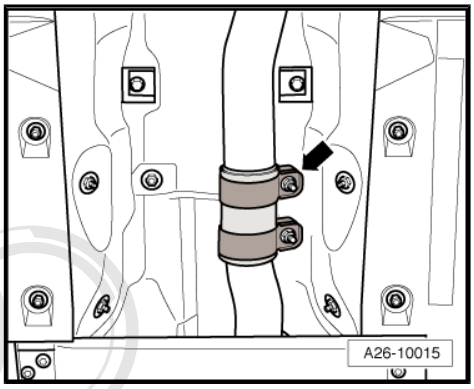
– Remove nuts -arrows-.
– Unscrew pressure pipe -1- from particulate filter.



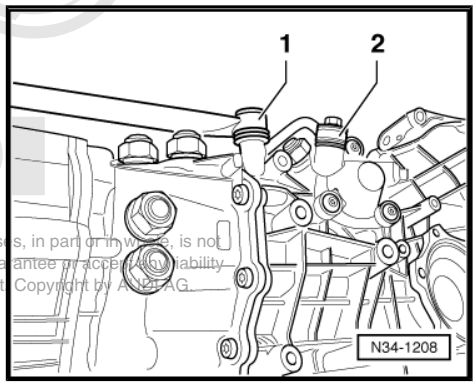
Note

Disregard -item 2-.

– Disconnect exhaust system at clamp -arrow-.
– Detach particulate filter.

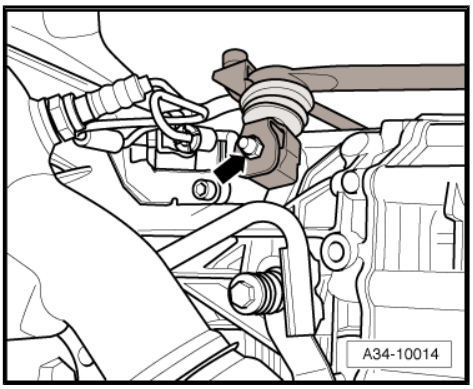


– Unbolt push rod -1- and connecting rod for selector rod -2-.

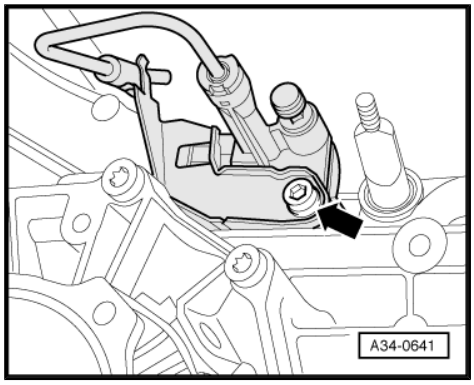


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– Remove nut -arrow- and detach gearbox selector lever from selector shaft.



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



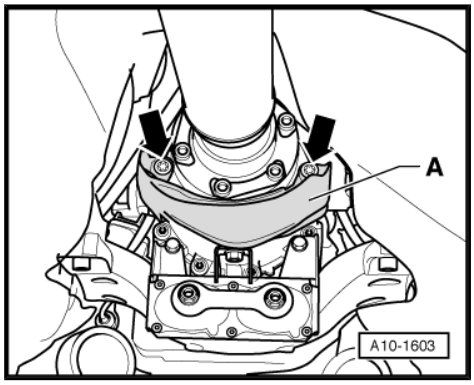
Caution

Avoid damage to clutch slave cylinder.

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

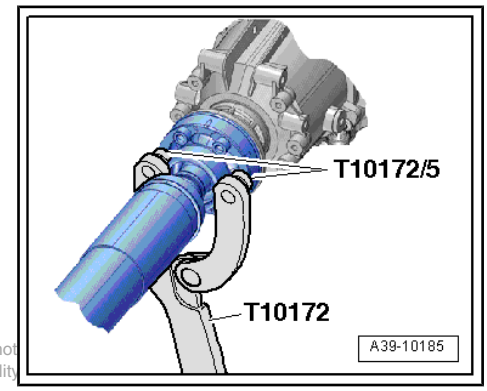
Vehicles with four-wheel drive:

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



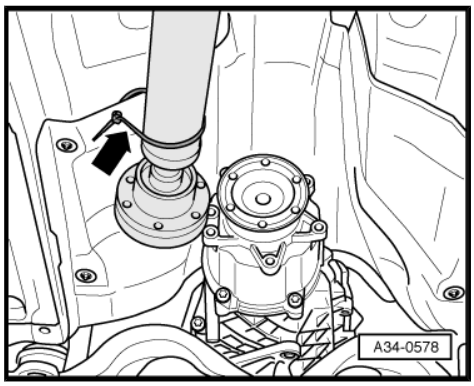
– Remove bolts connecting propshaft to gearbox (use counterhold tool - T10172- with -T10172/5-).

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



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– Tie propshaft up to side of heat shield -arrow-.

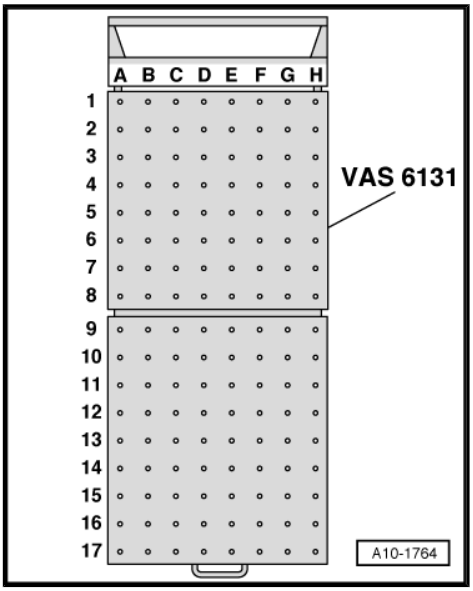


Set up the scissor-type assembly platform as follows:

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

Platform coordinates	Parts from support set for Audi - VAS 6131/10-			
B3	/10-1	/10-4	/10-5	/10-11
F3	/10-1	/10-4	/10-5	/10-11
B10	/10-1	/10-2	/10-5	/10-8
G10	/10-1	/10-2	/10-5	/10-8
E13	/10-1	/10-3	/10-5	/10-6
C15	/10-1	/10-3	/10-5	/10-6

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

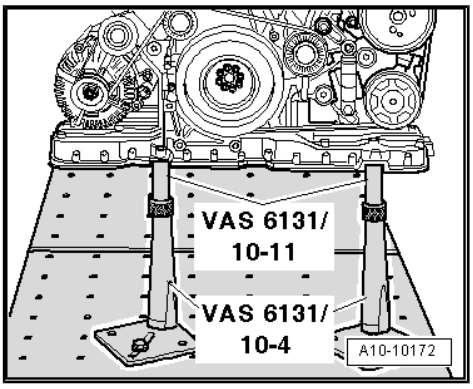
– Position scissor-type assembly platform - VAS 6131 A- horizontally.

• Take note of spirit level (bubble gauge).

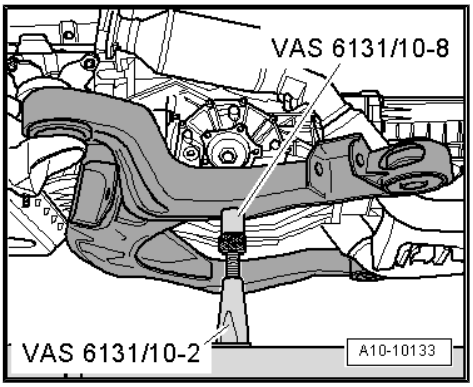
– Position scissor-type assembly platform - VAS 6131 A- below engine/gearbox assembly.

– Position the support elements from -VAS 6131/10- at front of engine, as shown in illustration.

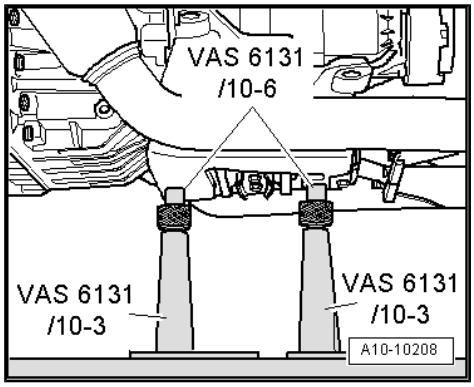
– Make sure that threaded spindles are screwed in completely.



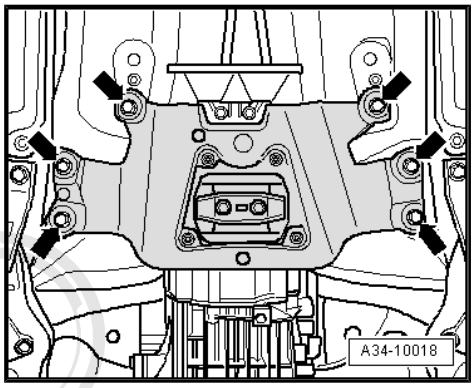
– Position the support elements from -VAS 6131/10- at left and right of subframe, as shown in illustration.



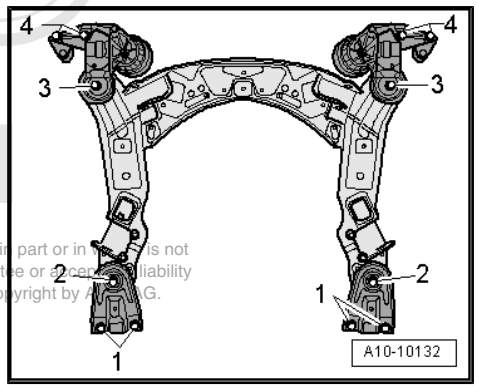
– Position the support elements from -VAS 6131/10- at rear of tunnel cross member, as shown in illustration.
– Turn all spindles for support elements upwards until all locating lugs make contact with mounting points.
– Tighten base plates for support elements to 20 Nm on scissor-type assembly platform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



– Remove bolts -arrows- for tunnel cross member.



– Remove bolts -1-.
– Mark installation position of subframe and both consoles for engine mountings on longitudinal members with felt-tip pen.
– Remove bolts -2, 3, 4- in diagonal sequence and in stages.



Caution

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

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

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

1.2 Separating engine from manual gearbox

Special tools and workshop equipment required

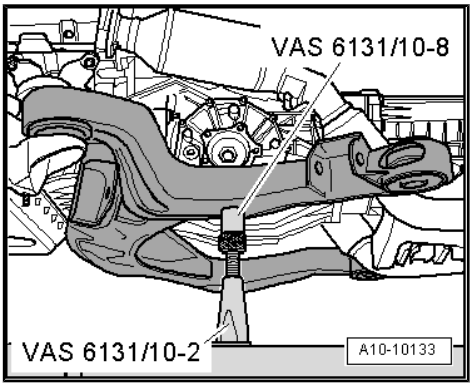
- Support set for Audi - VAS 6131/10- , supplementary set - VAS 6131/11- and -VAS 6131/12-

Procedure

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

– Screw down spindles of support elements (left and right) at subframe as far as possible.

– Remove locating lugs from spindles.

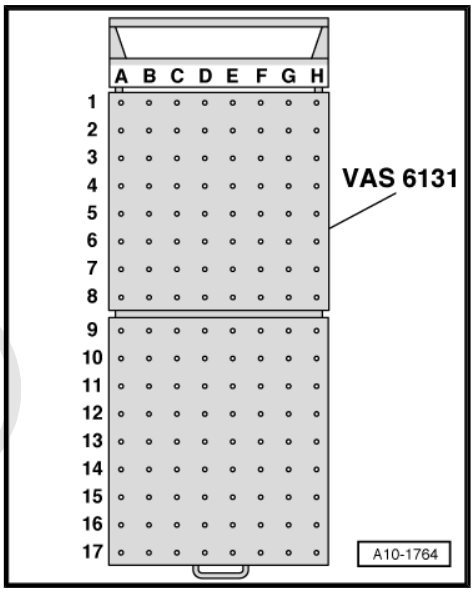


Note

A second mechanic is required for removing the subframe.

– Take out subframe to the side.

– Set up scissor-type assembly platform - VAS 6131 A- with support set for Audi - VAS 6131/10- and supplementary set - VAS 6131/11- and -VAS 6131/12- as follows:

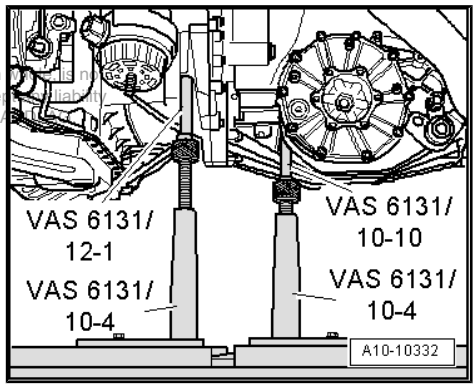


Platform coordinates	Parts of support set for Audi - VAS 6131/10- , support set -VAS 6131/11- and supplementary set - VAS 6131/12-			
B3 1)	/10-1	/10-4	/10-5	/10-11
F3 1)	/10-1	/10-4	/10-5	/10-11
B7	/10-1	/10-4	/10-5	/12-1
F7	/10-1	/10-4	/10-5	/10-12
C10	/10-1	/10-4	/10-5	/10-10
F10	/10-1	/10-4	/10-5	/11-3
E13 1)	/10-1	/10-3	/10-5	/10-6
C15 1)	/10-1	/10-3	/10-5	/10-6

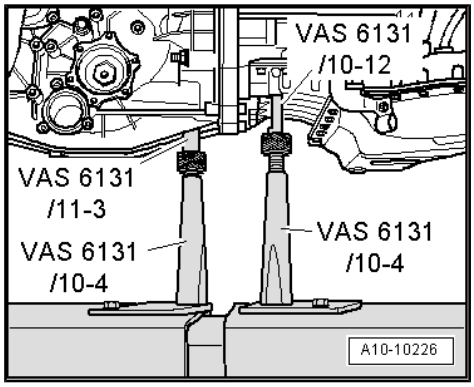
• 1) Support elements remain unchanged.

– Position support elements from -VAS 6131/10- on left side of engine/gearbox assembly, as shown in illustration.

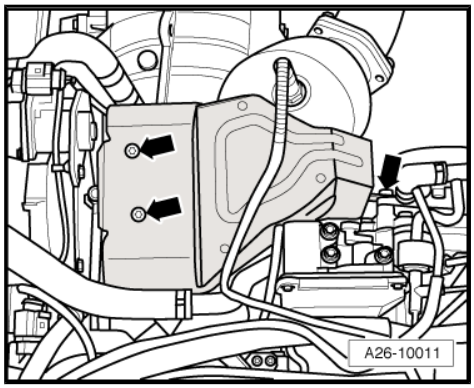
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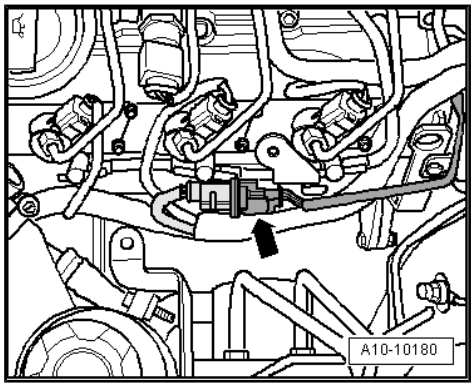
– Position support elements from -VAS 6131/10- on right side of engine/gearbox assembly, as shown in illustration.
– Turn spindles for support elements upwards until all locating lugs make contact with mounting points.
– Screw spindles on both sides upwards until gearbox support - VAS 6131/14- makes full contact with gearbox.
– Tighten base plates for support elements to 20 Nm on scissor-type assembly platform - VAS 6131 A- .



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



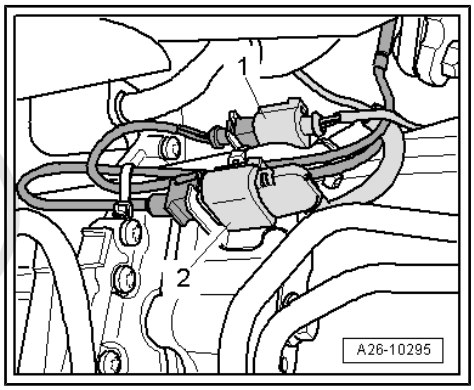
– Remove electrical connector -arrow- for Lambda probe - G39- from bracket and unplug connector.
– Move clear electrical wiring for Lambda probe.



– Detach electrical connectors from bracket at front left of gearbox and unplug:

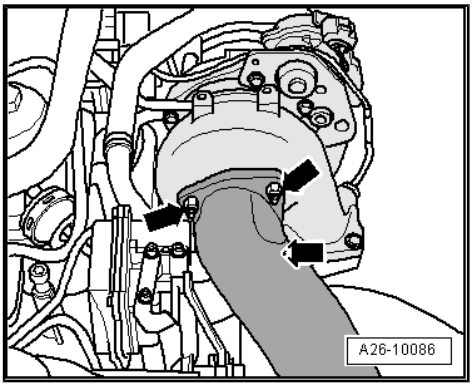
1 - For exhaust gas temperature sender 3 - G495-
2 - For engine speed sender - G28-

– Move electrical wiring clear.

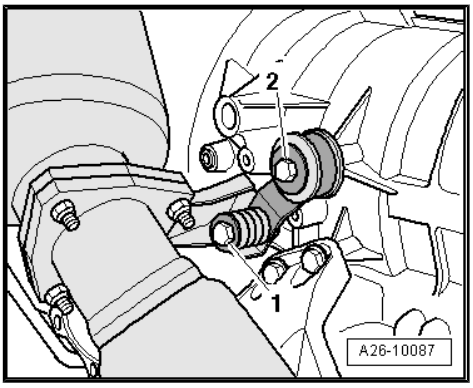


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– Remove nuts -arrows- securing starter catalytic converter to turbocharger.



– Remove bolt -1- at bracket for starter catalytic converter.



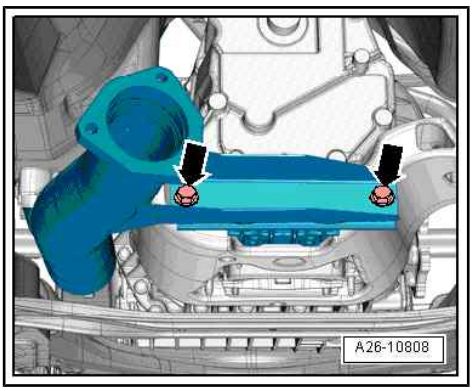
Note

Disregard -item 2-.

Caution

Risk of damage to flexible joints in front silencer.

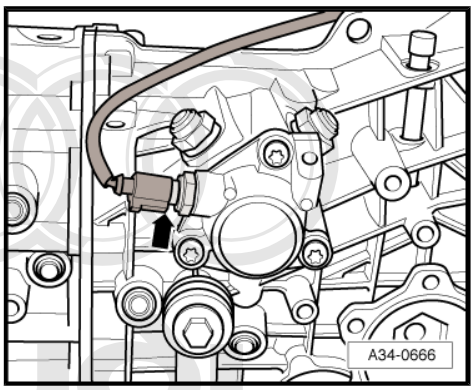
- ***Do NOT bend the flexible joints in the front silencer more than 10°.***



– Remove bolts -arrows- securing bracket for front exhaust pipe.

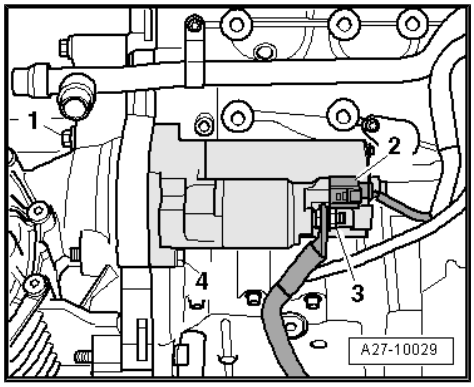
– Detach starter catalytic converter and front exhaust pipe.

– Unplug electrical connector -arrow- for reversing light switch - F4- and move electrical wire clear.

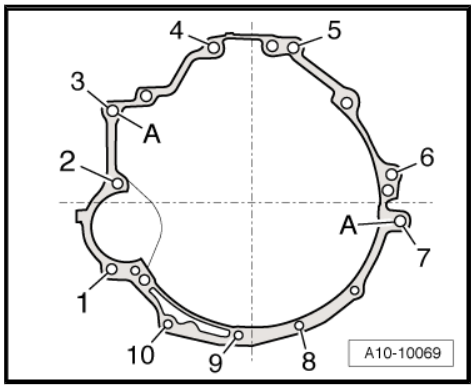


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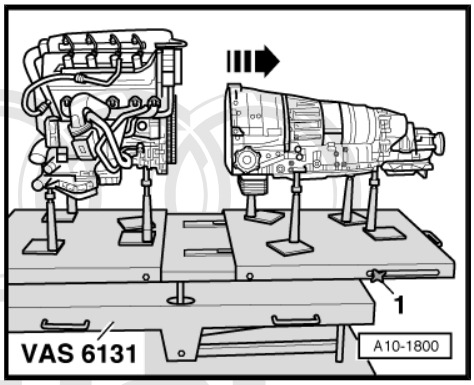
– Remove nut -3- for battery positive cable.
– Unplug electrical connector -2-.
– Unscrew bolts -1- and -4- and remove starter.



– Remove bolts -3 ... 10- securing gearbox to engine.



– 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 Installing engine

Tightening torques

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Note

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

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

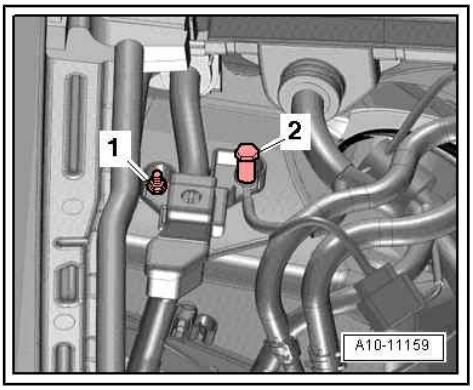
Component	Nm
M12	65

Assembly mountings ⇒ page 101

Positive terminal and earth stud

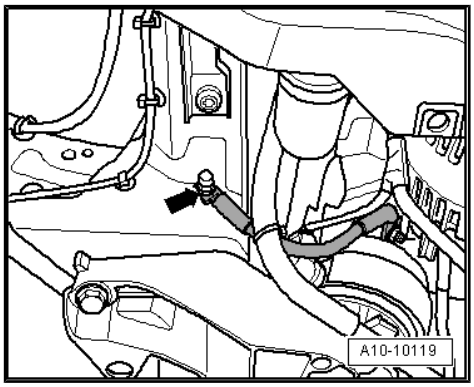
– Tighten nut -1- for positive terminal to 20 Nm.

– Tighten earth stud -2- to 9 Nm.



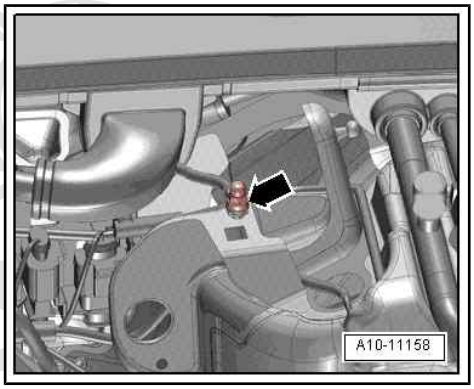
Earth connection on longitudinal member (right-side)

– Tighten nut -1- to 15 Nm.



Earth connection to suspension turret (left-side)

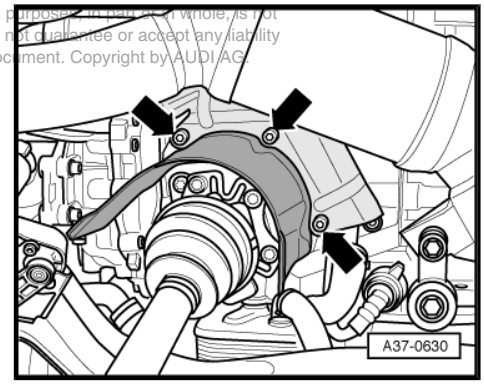
– Tighten nut -arrow- to 9 Nm.



Heat shield for drive shaft

– Tighten bolts -arrows- to 23 Nm.

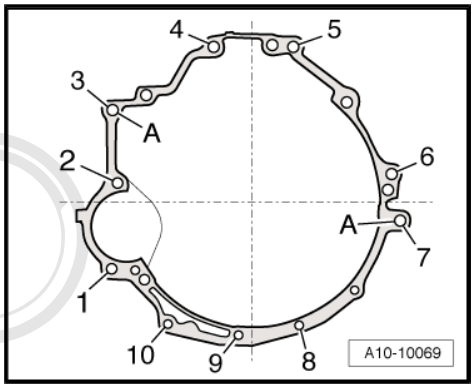
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Engine to manual gearbox

Item	Bolt	Nm
1	M10x80	65 1)
2	M10x100	65 1)
3	M12x100	65
4, 5	M12x110	65
6, 7	M12x120	65
8, 9, 10	M10x80	45
A	Dowel sleeves for centralising	

• 1) Property class 10.9.



Procedure

Note

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- *Renew the bolts tightened with specified tightening angle.*
- *Renew self-locking nuts and bolts as well as seals, gaskets and O-rings.*
- *The threaded holes in the flange shaft for the propshaft on the gearbox must be cleaned of remaining locking fluid with a thread tap before assembling.*
- *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.*
- *Fit all cable ties in the original positions when installing.*

– When fitting a new clutch plate together with a used pressure plate (self-adjusting clutch), the adjuster ring in the pressure plate has to be reset by turning it back as far as it will go. If this is not done, the pressure plate will operate with reduced clamping force, causing clutch slip ⇒ Rep. gr. 30 .

Note

- *If the clutch plate is not being replaced, it is not necessary to reset the adjuster ring.*
- *New self-adjusting pressure plates are already pre-set accordingly, and do not have to be reset.*

– Clean input shaft splines and (in the case of used clutch plates) the hub splines. Remove corrosion and apply only a very thin coating of grease for clutch plate splines - G 000 100- to the splines. Do not lubricate guide sleeve.

– Make sure that clutch plate is properly centred (if necessary).

– Check clutch release bearing for wear and make sure that plastic ring is securely seated; renew clutch release bearing if necessary ⇒ Rep. gr. 30 .

– A needle bearing must be fitted in the crankshaft on vehicles with manual gearbox; install needle bearing if not already fitted ⇒ page 132 .

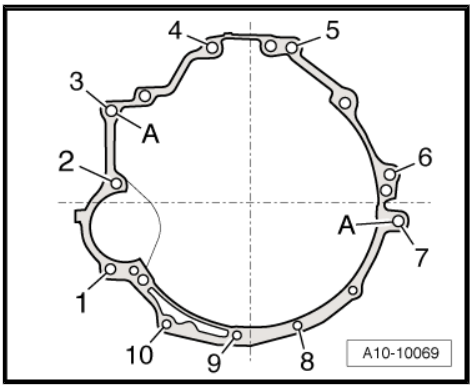
– Check whether dowel sleeves -A- for centring engine and gearbox are fitted in cylinder block; install missing dowel sleeves.

– Press intermediate plate between engine and gearbox onto dowel sleeves.

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

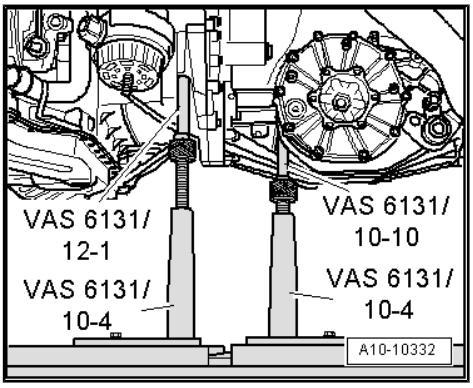
– Install starter catalytic converter with front exhaust pipe ⇒ page 330 .

– Install starter ⇒ Electrical system; Rep. gr. 27 .



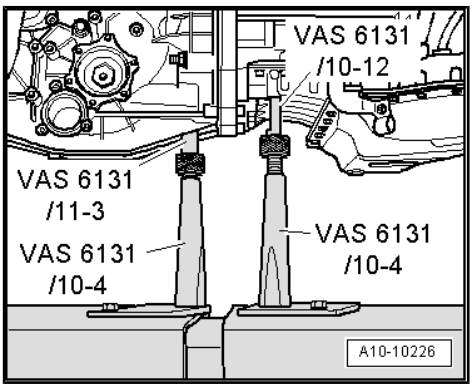
– Screw down spindles of support elements on left side of engine/gearbox assembly.

– Unscrew base plates for support elements (left-side) from scissor-type assembly platform - VAS 6131 A- .



– Screw down spindles of support elements on right side of engine/gearbox assembly.

– Unscrew base plates for support elements (right-side) from scissor-type assembly platform - VAS 6131 A- .



Note

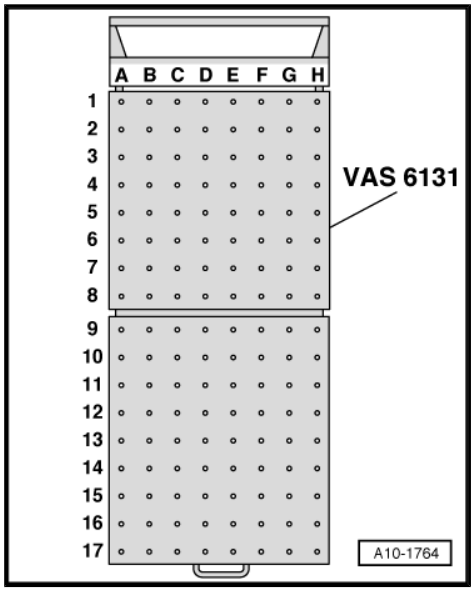
The mounting points for engine (front), gearbox and tunnel cross member remain unchanged.

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

Platform coordinates	Parts from support set for Audi - VAS 6131/10-			
B3 1)	/10-1	/10-4	/10-5	/10-11
F3 1)	/10-1	/10-4	/10-5	/10-11
B10	/10-1	/10-2	/10-5	/10-8 2)
G10	/10-1	/10-2	/10-5	/10-8 2)
E13 1)	/10-1	/10-3	/10-5	/10-6
C15 1)	/10-1	/10-3	/10-5	/10-6

- 1) Support elements remain unchanged.
- 2) Secure support elements only after installing the subframe.



Note

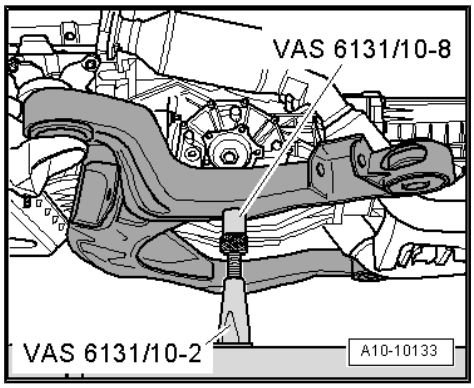
A second mechanic is required for positioning the subframe on the support elements.

– Fit subframe on both support elements -VAS 6131/10-8- .

– Screw up spindles of support elements on both sides.

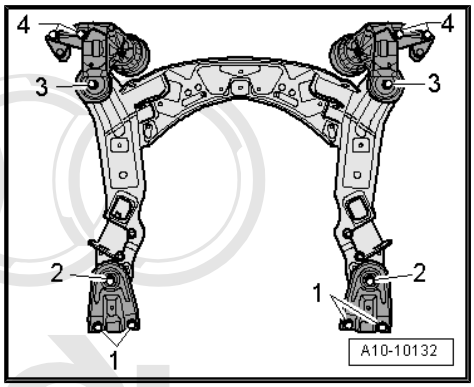
– Tighten base plates for support elements to 20 Nm on scissor-type assembly platform - VAS 6131 A- .

– Guide engine/gearbox assembly together with subframe into body from below using scissor-type assembly platform - VAS 6131 A- .



– Align subframe and consoles for engine mounting on longitudinal members according to markings made before removal.

– Tighten bolts for subframe and consoles for engine mountings only to specified torque (do not turn further); the bolts are only fully tightened after performing the wheel alignment check ⇒ Rep. gr. 40 .



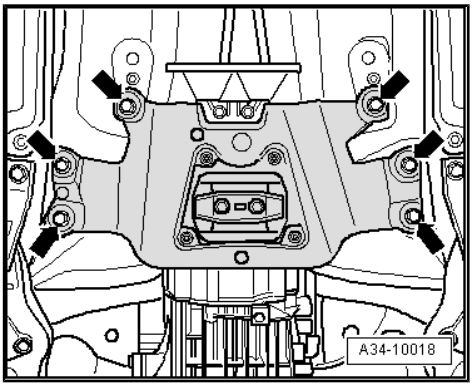
WARNING

Risk of accident because of loose bolt connections.

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

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– Tighten bolts for tunnel cross member ⇒ Rep. gr. 34 .

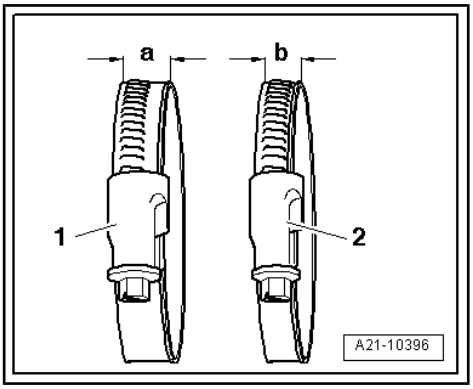


Remaining installation steps are carried out in reverse sequence; note the following:

– Install clutch slave cylinder ⇒ Rep. gr. 30 .
– Fit selector rod to gearbox ⇒ Rep. gr. 34 .
– Vehicles with four-wheel drive: install propshaft ⇒ Rear final drive 01R; Rep. gr. 39 , ⇒ Rear final drive 0AR; Rep. gr. 39 , ⇒ Rear final drive 08V; Rep. gr. 39 .
– Install particulate filter ⇒ page 330 .
– Align the exhaust system so it is free of stress ⇒ page 359 .
– Install drive shafts, guide links, track control links, anti-roll bar, coupling rod and suspension struts ⇒ Rep. gr. 40 .
– Install heat shield for drive shaft ⇒ page 33 .
– Install covers for drive shafts ⇒ Rep. gr. 66 .
– Install front cross piece ⇒ Rep. gr. 50 .
– Install refrigerant lines ⇒ Rep. gr. 87 .
– Install hydraulic line ⇒ Rep. gr. 48 .
– Install throttle valve module - J338- and engine control unit ⇒ Rep. gr. 23 .
– Install torque reaction support ⇒ page 110 .
– Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations, ⇒ Electrical system; Rep. gr. 97 , ⇒ page 33 , ⇒ page 33 , ⇒ page 33 .
– Install cover for electronics box in plenum chamber ⇒ Electrical system; Rep. gr. 97 .
– Install fuel filter ⇒ Rep. gr. 20 .
– Install air cleaner housing ⇒ Rep. gr. 23 .

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– Install air hoses with screw-type clips ⇒ page 326 .
– Observe notes on procedure for connecting the battery ⇒ Electrical system; Rep. gr. 27 .



Caution

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

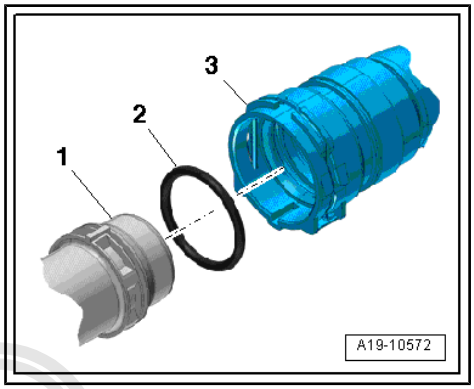
- ***Never use battery charging equipment for boost starting.***

– Install and adjust wiper arms ⇒ Electrical system; Rep. gr. 92 .
– Install body brace ⇒ Rep. gr. 40 .
– Check oil level ⇒ Maintenance ; Booklet 405 .
– Fill up hydraulic fluid for power steering ⇒ Rep. gr. 48 .

Note

The power steering pump must not be run when dry.

– Connect coolant hoses with plug-in connector ⇒ page 295 .
– Charge refrigerant system ⇒ Air conditioner with refrigerant R134a .
– Fill up with coolant ⇒ page 266 .



Note

- *If radiator, heat exchanger, cylinder head, cylinder head gasket or cylinder block have been renewed, do not re-use old coolant.*
- *Contaminated or dirty coolant must not be used again.*

– Align subframe and both consoles for engine mountings ⇒ Rep. gr. 40 .
– Fit front wheels ⇒ Wheels and tyres; Rep. gr. 44 .
– Perform wheel alignment check ⇒ Rep. gr. 44 .

WARNING

Risk of accident because of loose bolt connections.

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

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– Check fuel system for leaks ⇒ page 7 .
– Install noise insulation panels ⇒ Rep. gr. 50 .

2 Removing and installing engine - vehicles with multitronic gearbox

Overview

- ⇒ “2.1 Removing engine”, page 39
- ⇒ “2.2 Separating engine from multitronic gearbox”, page 56
- ⇒ “2.3 Installing engine”, page 60

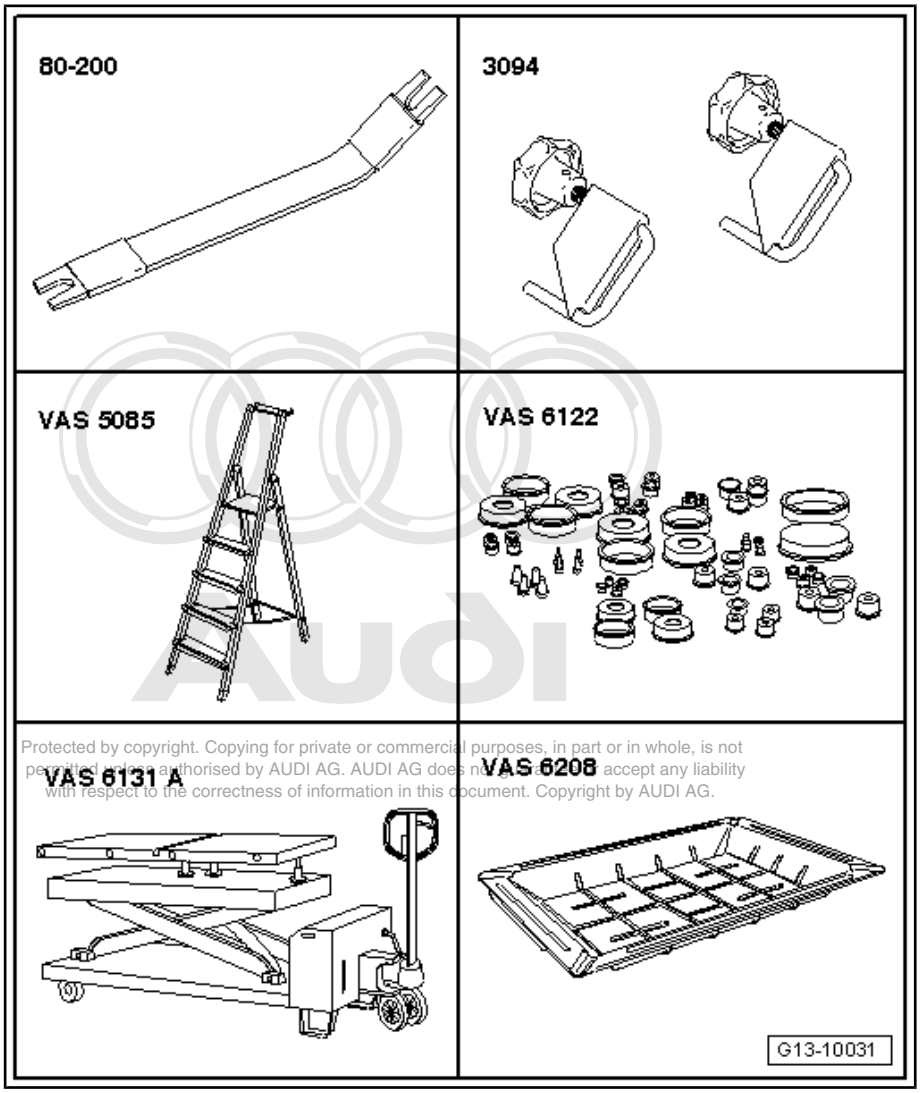
Note

- *The engine is removed from underneath together with the gearbox and subframe (with lock carrier installed).*
- *All cable ties which are released or cut open when removing must be fitted in the same position when installing.*
- *Collect drained coolant in a clean container for re-use or disposal.*

2.1 Removing engine

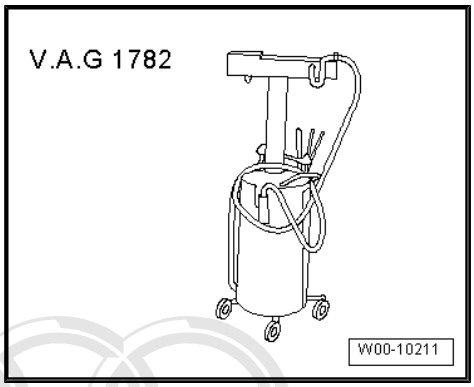
Special tools and workshop equipment required

- Removal lever - 80 - 200-
- Hose clamps, up to 25 mm - 3094-
- Stepladder - VAS 5085-
- Engine bung set - VAS 6122-
- Scissor-type assembly platform - VAS 6131 A- with support set for Audi - VAS 6131/10- and supplementary set -VAS 6131/11-
- Drip tray for workshop hoist - VAS 6208-

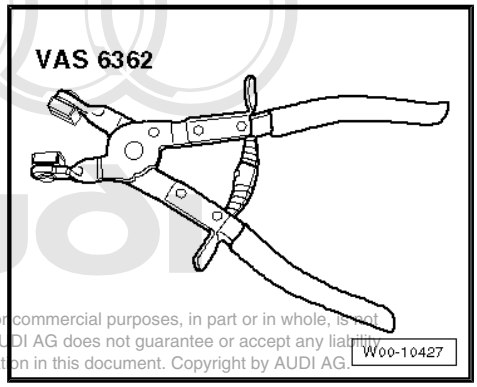


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- Used oil collection and extraction unit - V.A.G 1782-

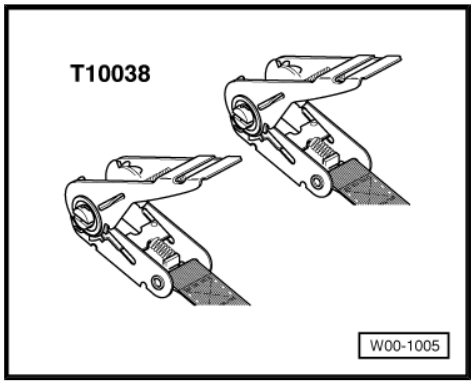


- Hose clip pliers - VAS 6362-



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- Tensioning strap - T10038-



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.*

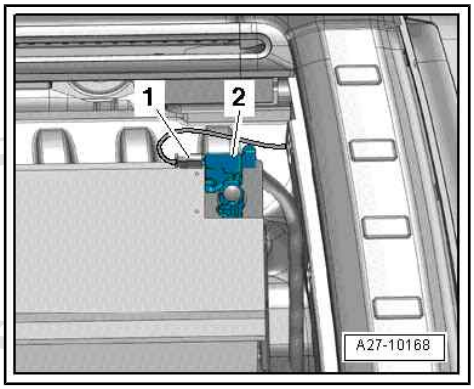
Caution

Electronic components are susceptible to damage.

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

– Switch off ignition.

– Disconnect earth wire -2- from battery terminal ⇒ Electrical system; Rep. gr. 27 .
– Discharge refrigerant system ⇒ Air conditioner with refrigerant R134a .
– Extract hydraulic fluid for power steering from reservoir using used oil collection and extraction unit - V.A.G 1782- .



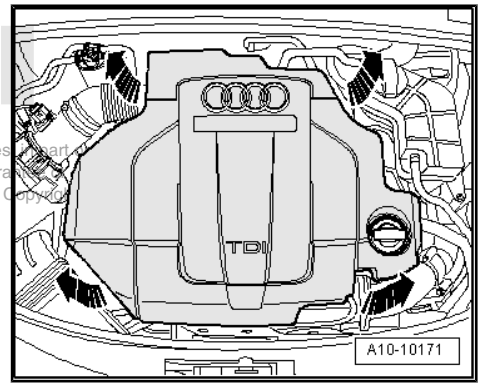
– Carefully pull engine cover panel off four retaining pins one after the other -arrows-.

WARNING

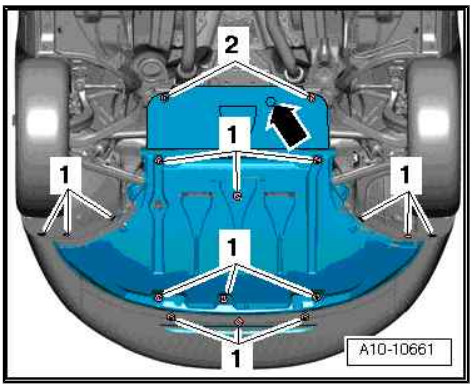
Hot steam/hot coolant can escape - risk of scalding.

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

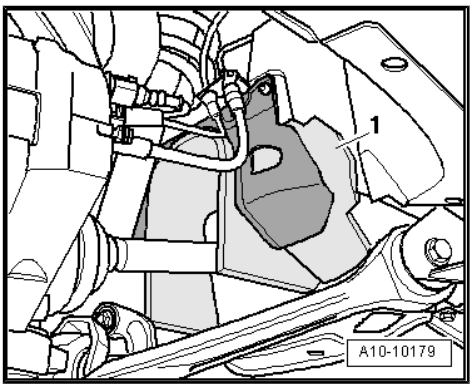
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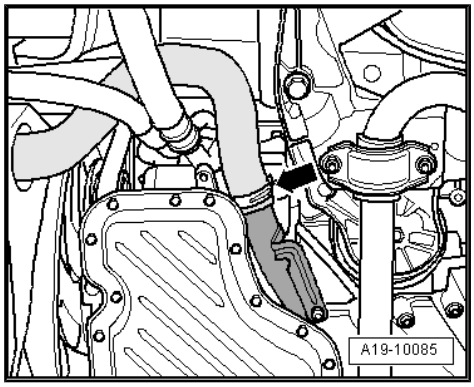
– Open filler cap on coolant expansion tank.
– Remove both front wheels ⇒ Wheels and tyres; Rep. gr. 44 .
– Remove front and rear noise insulation ⇒ Rep. gr. 50 .



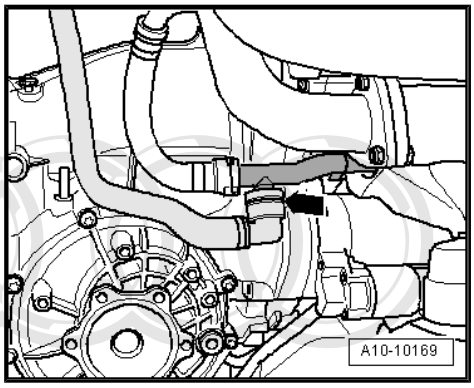
– Remove cover -1- for drive shaft in wheel housing (left and right).



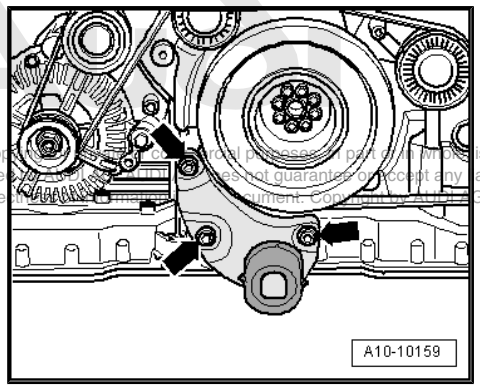
– Place drip tray for workshop hoist - VAS 6208- beneath engine.
– Release hose clip -arrow-, disconnect coolant hose from coolant pipe (left-side) and drain off coolant.



– Lift retaining clip -arrow- to disconnect coolant hose from coolant pipe (right-side) and drain off remaining coolant.

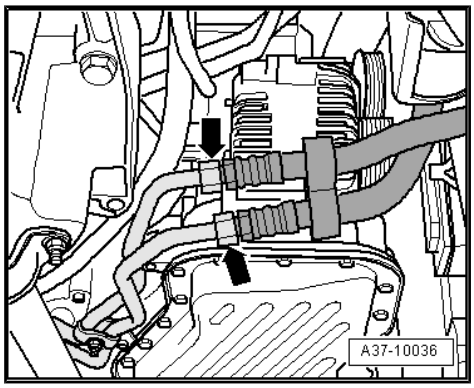


– Unscrew bolts -arrows- and detach torque reaction support from engine.



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

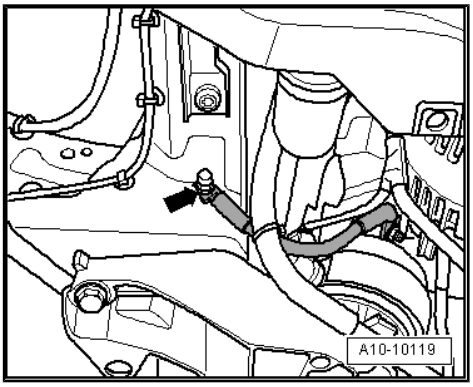


Note

Observe rules for cleanliness when working on multitronic gearbox ⇒ Rep. gr. 00 .

– Disconnect ATF lines -arrows- on right side of engine.
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .

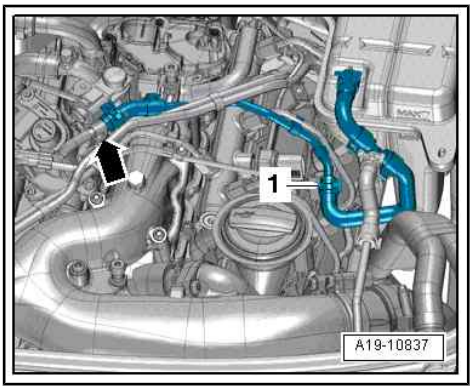
– Unscrew nut -arrow- on longitudinal member (right-side) and move earth wire clear.



– Disconnect coolant hose -1-.

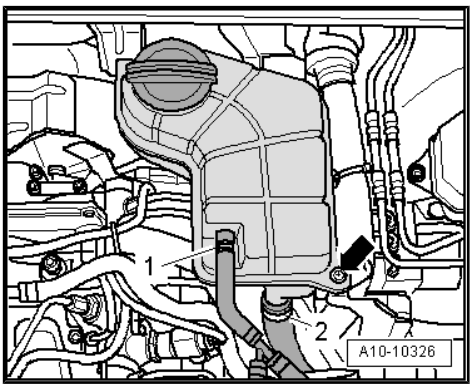
Note

Disregard -arrow-.



– Remove bolt -arrow-.

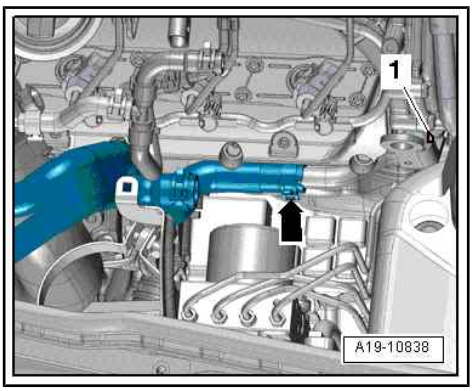
– Unplug electrical connector for coolant shortage indicator switch - F66- at bottom of expansion tank and move expansion tank to one side with coolant hoses -1- and -2- attached.



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

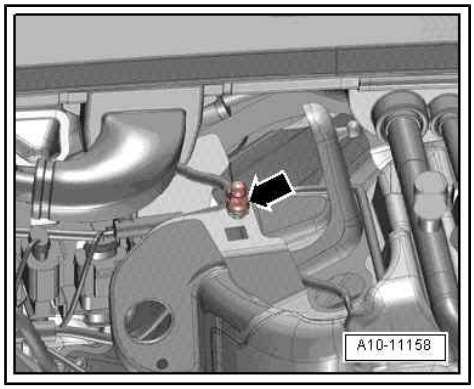
Note

Disregard -item 1-.

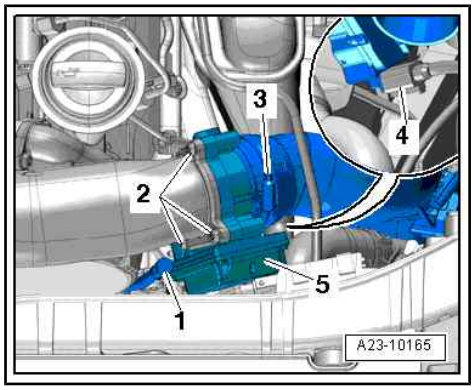


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– Unscrew nut -arrow- on suspension turret (left-side) and move earth wire clear.



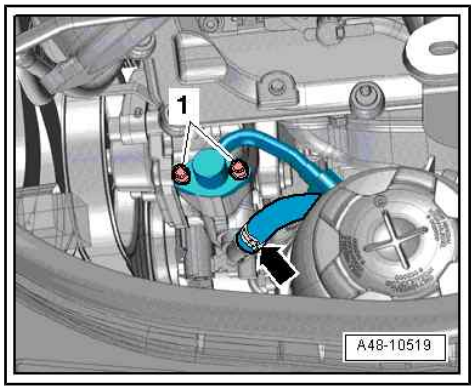
– Pull out oil dipstick -1-.
– Release hose clip -3- and detach air hose.
– Unplug electrical connector -4-.
– Remove bolts -2- and detach throttle valve module - J338- -item 5-.



Note

Lay a cloth under the hydraulic lines to catch escaping hydraulic fluid.

– Clamp off hydraulic hose -arrow- with hose clamp -3094- and detach.
– Remove bolts -1- and lay hydraulic line aside on top of longitudinal member.
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .

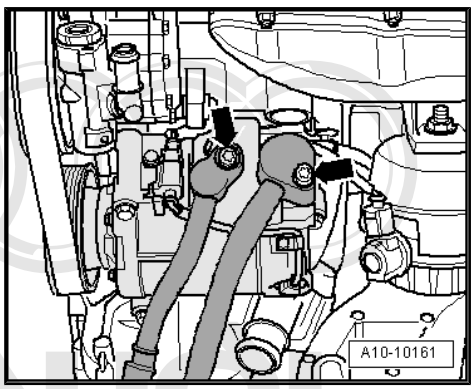


Caution

Danger of damage to refrigerant lines and hoses.

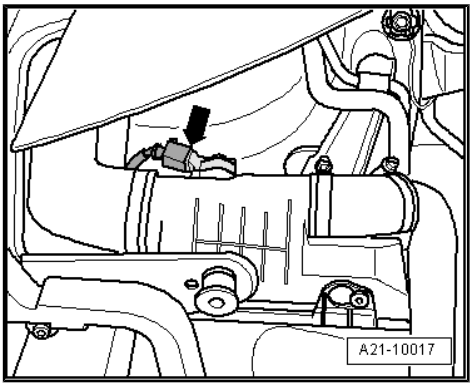
- ***Do NOT stretch, kink or bend refrigerant lines and hoses.***

– 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- .



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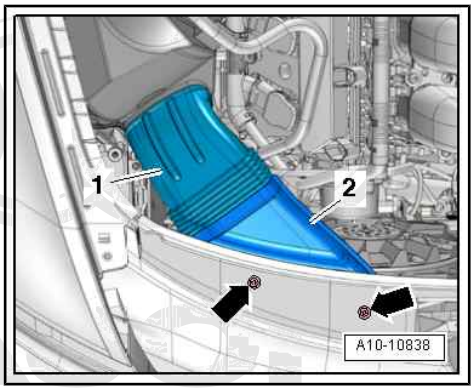
– Unplug electrical connector -arrow- for charge pressure sender - G31- at charge air cooler (left-side).



Note

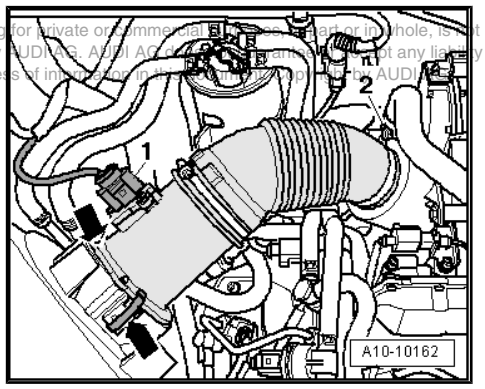
For illustration purposes, the installation position is shown with the headlight removed.

– Remove bolts -arrows-, detach air ducts -1- and -2-.

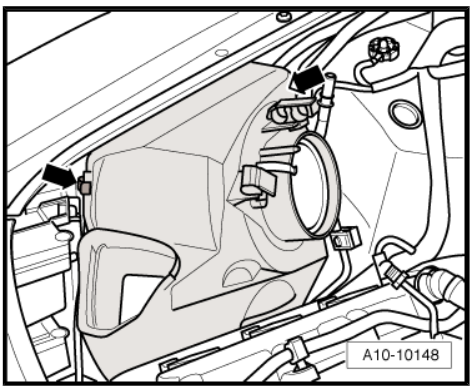


– Unplug electrical connector -1- from air mass meter - G70-
– Remove air hose. To do so, release hose clip -2- and clamps -arrows-.

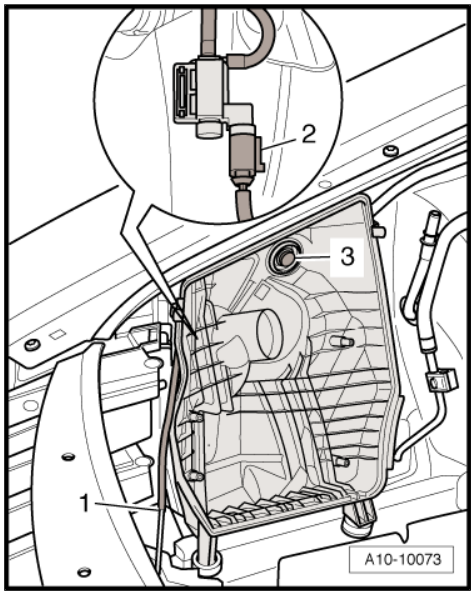
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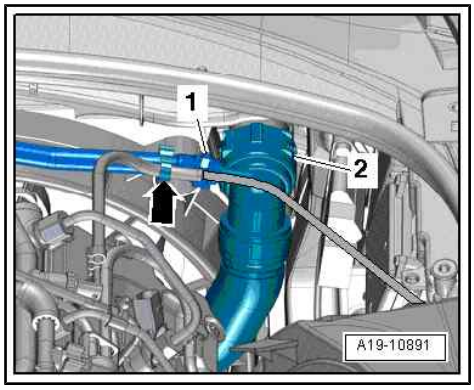
– Release clamps -arrows- and detach air cleaner (top section).



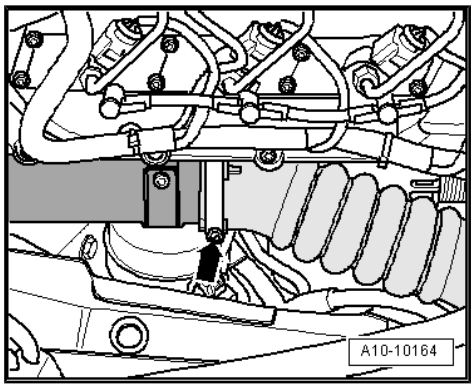
– Disconnect vacuum line -1-.
– Pull pin out of fastener -3-.
– Detach air cleaner (bottom section) and disconnect electrical connector -2- for air filter bypass flap valve - N275- on reverse side of air cleaner.



– Release hose clip -1- and detach coolant hose.
– Move vacuum hose clear -arrow-.
– Lift retaining clip -2- and disconnect coolant hose (top right) from radiator.

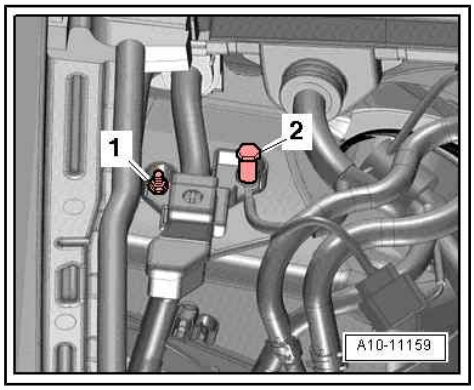


– Release hose clip -arrow- and detach air hose from air pipe.



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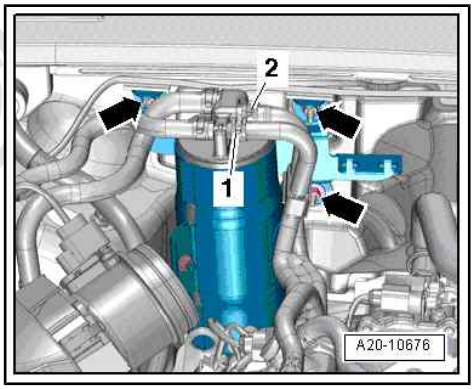
– Remove nut -1- on remote positive terminal.
– Remove earth stud -2-.
– Move clear electrical wiring to turbocharger 1 control motor - V280- .



Caution

Take care to keep components clean.

- *Rules for cleanliness when working on the injection system ⇒ page 7 .*



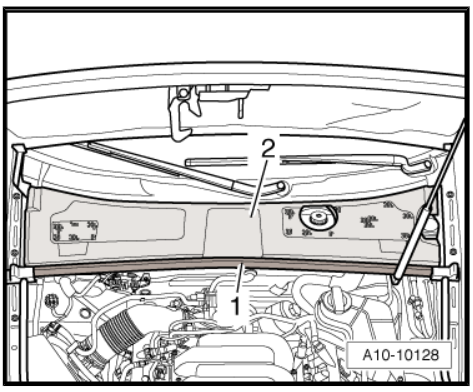
– Release hose clips and detach return hose -1- and supply hose -2- from fuel filter.

– Unscrew nuts -arrows- and move bracket with fuel filter to one side.

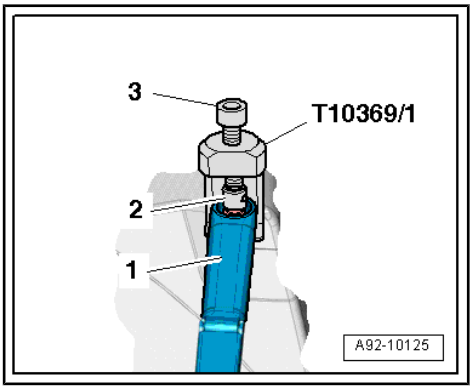
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– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .

– Pull off seal -1- and remove plenum chamber cover -2-.



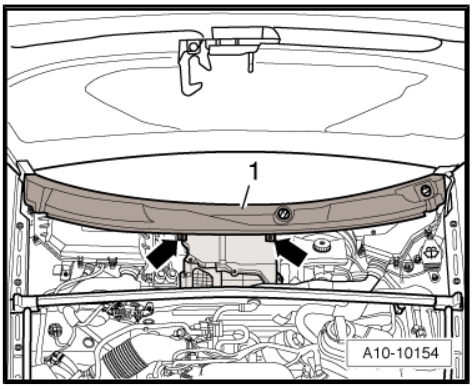
– Remove wiper arms ⇒ Electrical system; Rep. gr. 92 .



Caution

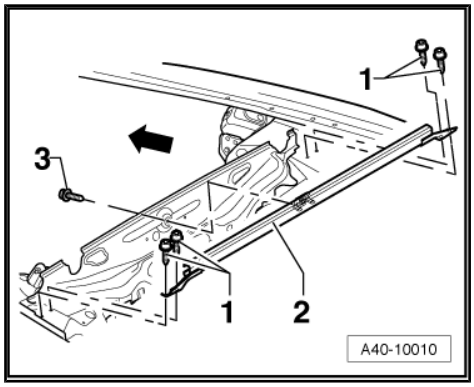
Risk of damage to cowl panel trim.

- *To avoid cracking the cowl panel trim -1- during removal, apply a small amount of soap solution to the joint between the windscreen and the cowl panel trim and pull the trim vertically up out of the windscreen surround, starting from the edge of the windscreen.*

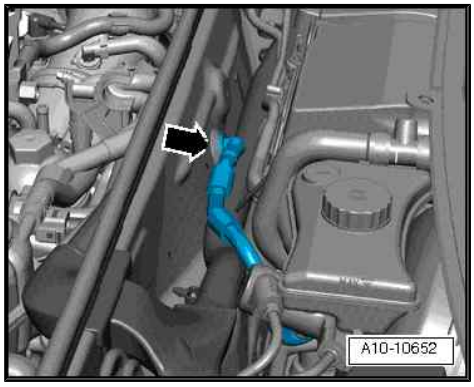


– Unscrew bolts -arrows- and pull cowl panel trim off windscreen.

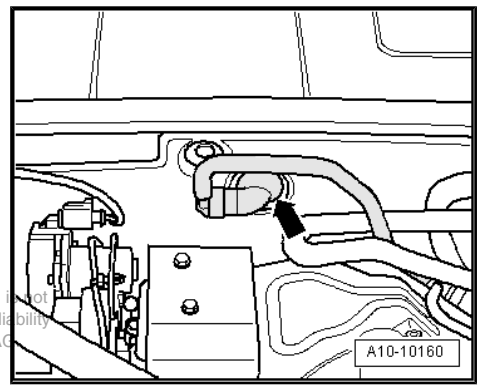
– If fitted, remove bolts -1- and -3- and detach body brace -2-.



– Detach vacuum line -arrow- going to brake servo at plenum chamber partition panel.

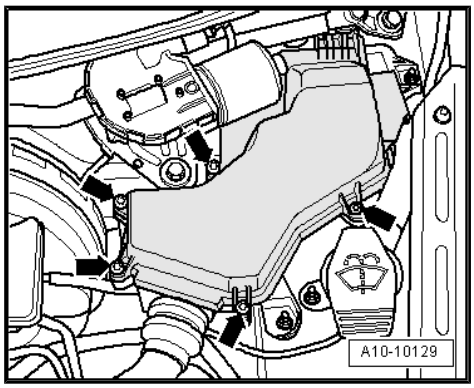


– Detach vacuum hose -arrow- going to brake servo at plenum chamber partition panel.

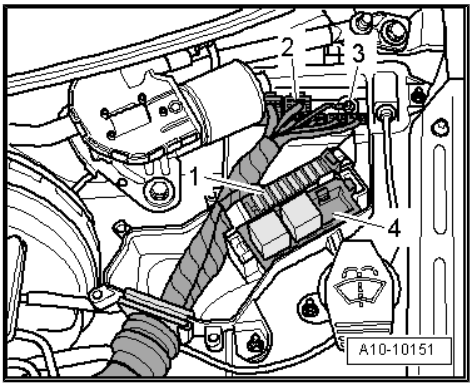


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– Remove bolts -arrows- and detach cover for electronics box in engine compartment (left-side).



– Release fasteners, pull off fuse holder -1- and then 3-position relay carrier -4- upwards.
– Unscrew wiring -3-.
– Unplug three front electrical connectors -2- at rear of connector console.
– Disengage engine wiring harness at electronics box and move clear.

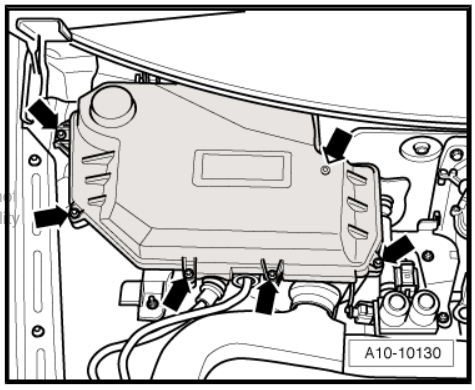


WARNING

Risk of burns at the pump valve unit for the heating system (left-side in front of electronics box).

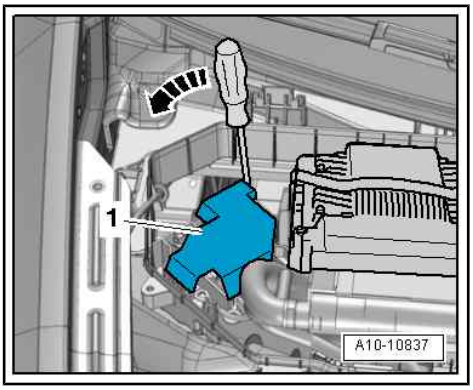
- ***Wear protective gloves when working near the pump valve unit for the heating system.***

Audi
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– Remove bolts -arrows- and detach cover for electronics box in engine compartment (right-side).

– Open cover -1- with screwdriver -arrow- and detach.

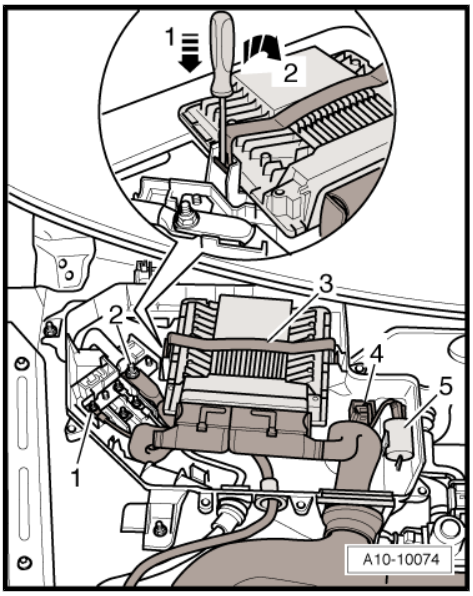


– Use screwdriver -arrows 1, 2- to carefully lever off retaining strap -3- and remove engine control unit from electronics box.

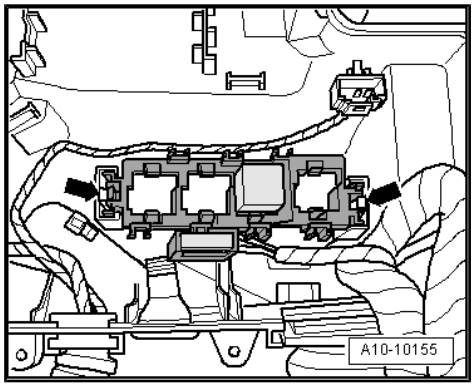
Note

The engine control unit remains connected to the wiring harness.

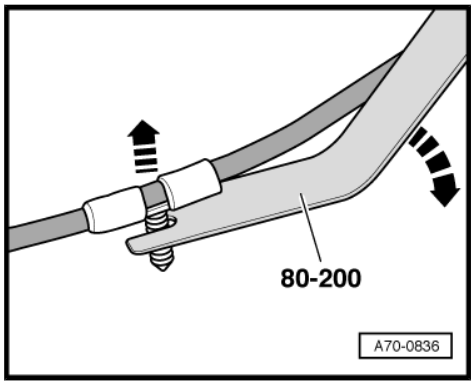
– Unclip suppressor capacitor -5- and take out of retainer in electronics box.
– Unplug electrical connector -4- at rear of connector console.
– Unscrew electrical wiring -1- and -2-.



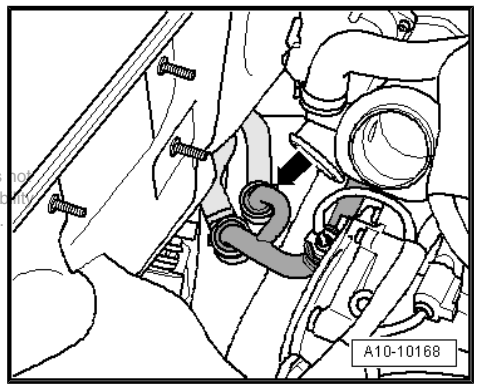
– Release catches -arrows- and detach relay carrier from electronics box in engine compartment (right-side).



– Use removal lever - 80 - 200- to release electrical wiring up to the alternator.
– Place both wiring harnesses on engine and secure engine control unit to prevent it from dropping.



– Detach coolant hose -arrow- leading to heat exchanger at rear of engine.

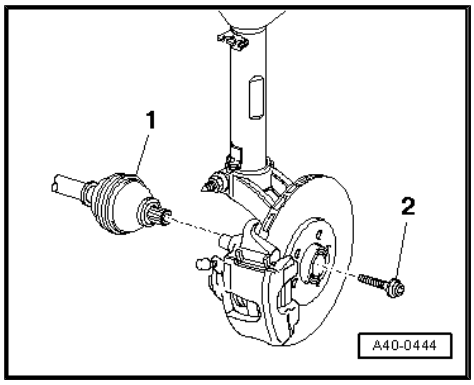


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Caution

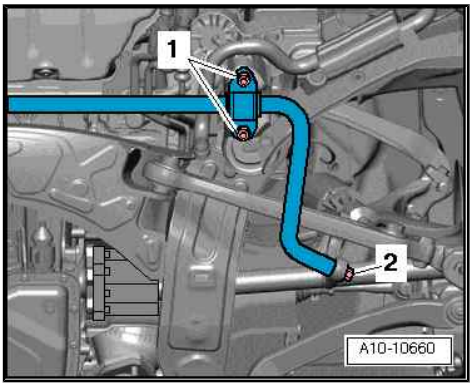
Risk of injury and risk of damage to brake discs and wheel bearings.

- *When slackening the flange bolt securing the drive shaft, the vehicle must not be standing on its wheels.*
- *Secure brake discs by screwing in two wheel bolts.*

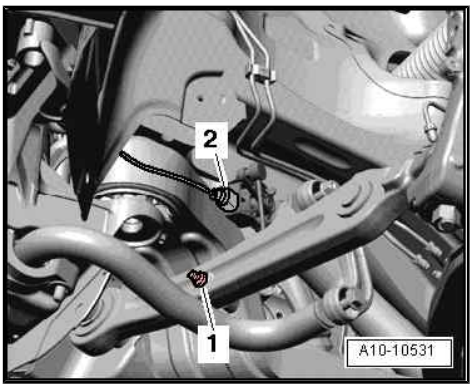


– Have a 2nd mechanic press the brake pedal.
– Unscrew flange bolt -2- at drive shaft -1- (left and right).

– Unscrew nuts -1- on both sides evenly.
– Unscrew bolts -2- on both sides and remove anti-roll bar.



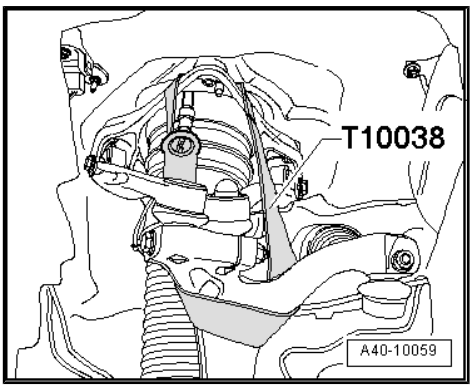
– Unplug electrical connector -2- at front left vehicle level sender - G78- .
– Remove nut -1- and detach coupling rod from track control link.



Caution

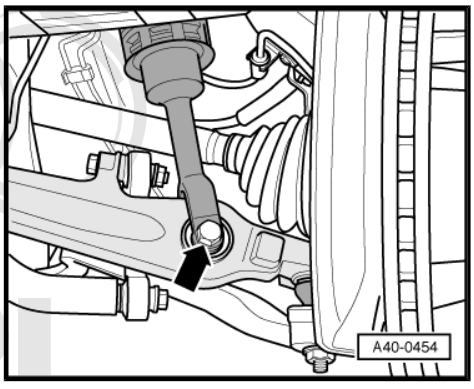
Danger of damage to the swivel joints of the upper links.

- *Support wheel bearing housing.*



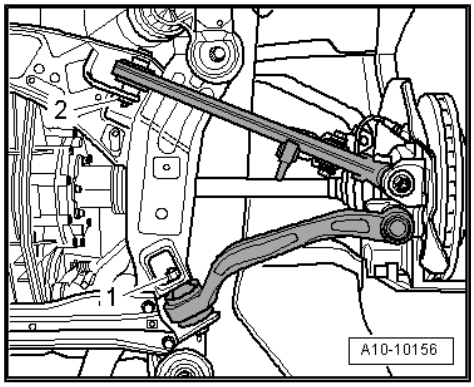
– Tie up wheel bearing housing with tensioning strap - T10038- as shown on illustration.

– Remove bolt -arrow- and detach suspension strut from track control link.



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– Remove nut -1- for guide link and nut -2- for track control link at subframe, remove bolts.

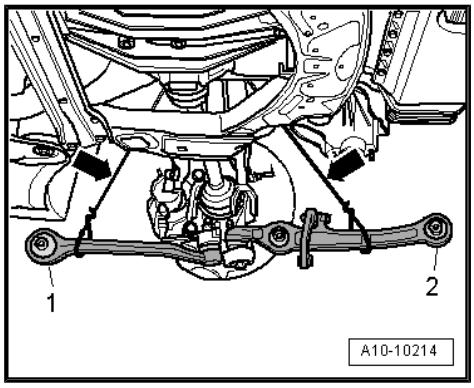


– Pivot guide link -1- and track control link -2- outwards.

Caution

Risk of damage if guide link and track control link are allowed to drop without support.

- *Tie up guide link and track control link to wheel bearing housing -arrows- as shown in illustration.*



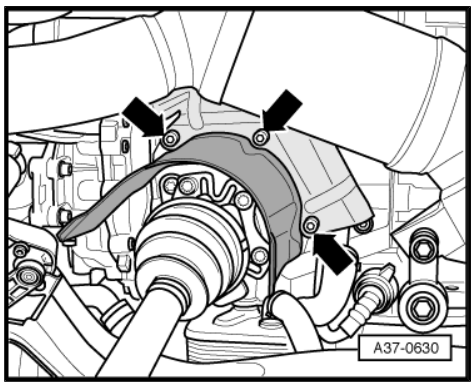
– Remove bolts -arrows- and detach heat shield for drive shaft (left-side).

– Detach drive shaft from flange shaft of gearbox.

Caution

Danger of damage to brake hose.

- *Take care when detaching drive shaft.*

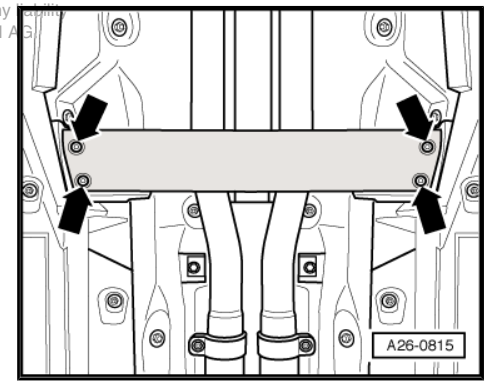


– Pivot wheel bearing housing outwards and detach drive shaft.

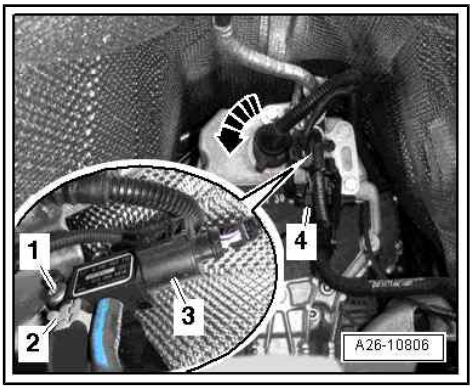
– Perform the same work steps on the other side of the vehicle.

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



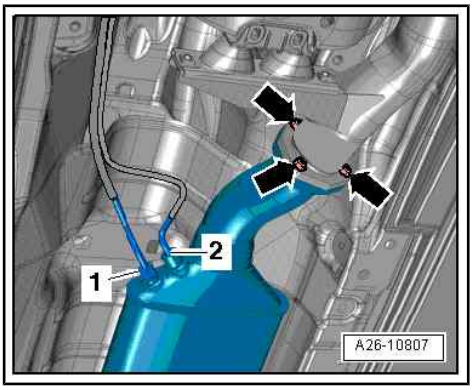
– Unplug electrical connectors -3- for exhaust gas pressure sensor 1 - G450- and -4- for exhaust gas temperature sender 4 - G648- at rear of gearbox.
– Remove bolt -1- and move clear exhaust gas pressure sensor 1 - G450- .



Note

Disregard -item 2- and -arrow-.

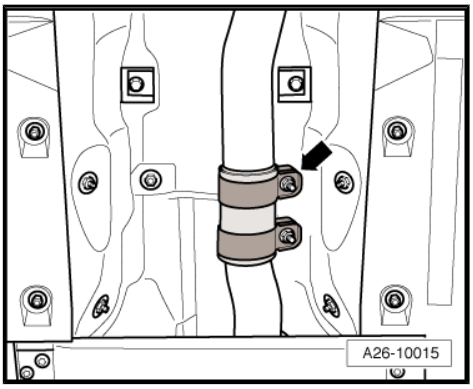
– Remove nuts -arrows-.



Note

Disregard -items 1, 2-.

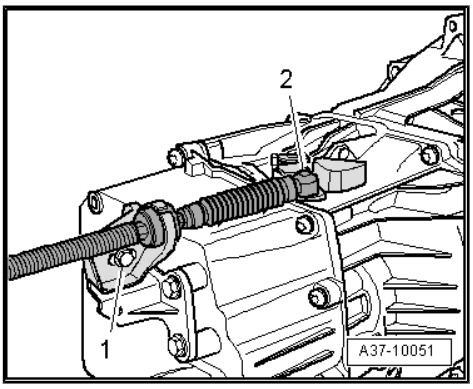
– Disconnect exhaust system at clamp -arrow-.
– Detach particulate filter.



Note

Mark installation position of support bracket for selector lever cable.

– Remove bolt -1- for cable support bracket.

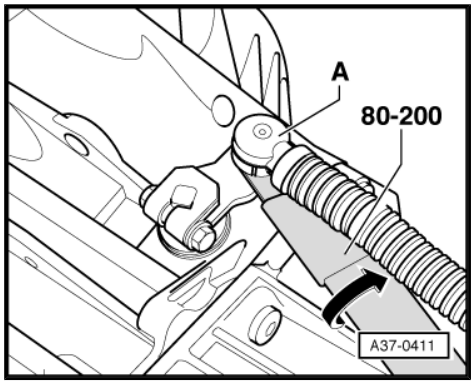


Note

Disregard -item 2-.

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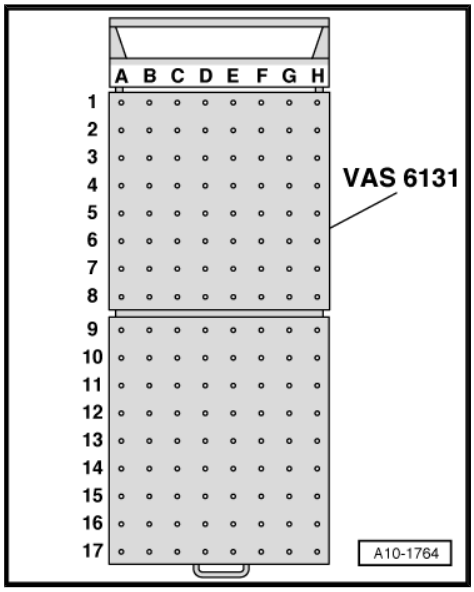
– Pry ball socket -A- of selector lever cable off selector shaft lever in direction of -arrow- using removal lever - 80 - 200- .



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 6131/11- as follows:

Platform coordinates	Parts of support set for Audi - VAS 6131/10- and supplementary set -VAS 6131/11-			
B3	/10-1	/10-4	/10-5	/10-11
F3	/10-1	/10-4	/10-5	/10-11
B10	/10-1	/10-2	/10-5	/10-8
G10	/10-1	/10-2	/10-5	/10-8
C14	/10-1	/10-3	/10-5	/10-12
F14	/10-1	/10-3	/10-5	/11-2



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

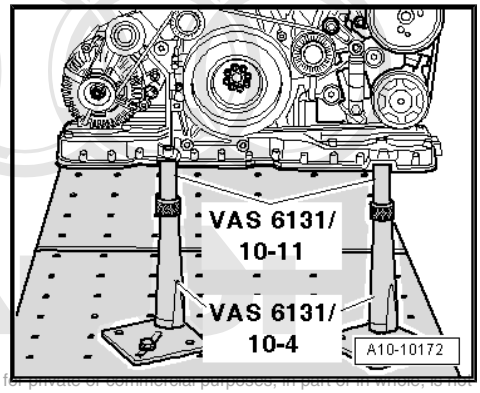
– Position scissor-type assembly platform - VAS 6131 A- horizontally.

• Take note of spirit level (bubble gauge).

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

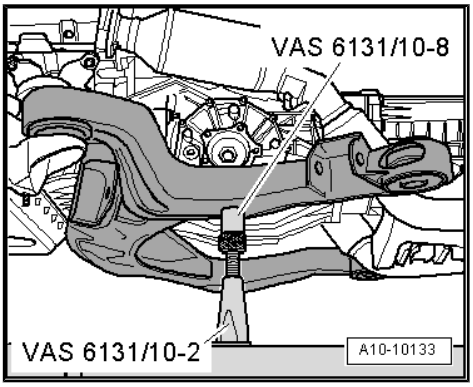
– Position the support elements from -VAS 6131/10- at front of engine, as shown in illustration.

– Make sure that threaded spindles are screwed in completely.

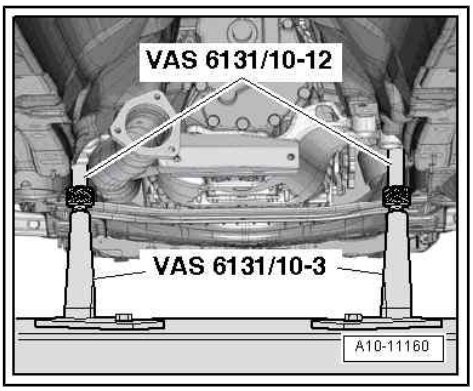


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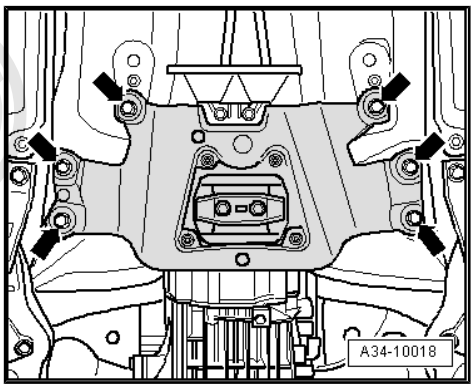
– Position the support elements from -VAS 6131/10- at left and right of subframe, as shown in illustration.



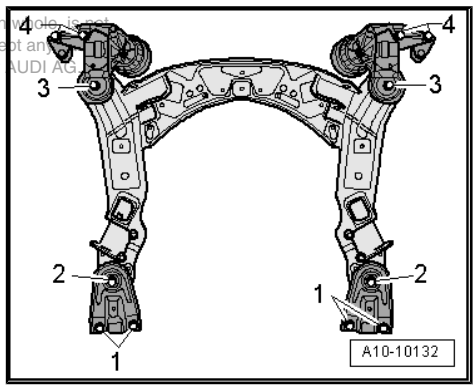
– Position support elements from -VAS 6131/10- and -VAS 6131/11- at rear of tunnel cross member, as shown in illustration.
– Turn all spindles for support elements upwards until all locating lugs make contact with mounting points.
– Tighten base plates for support elements to 20 Nm on scissor-type assembly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



– Remove bolts -arrows- for tunnel cross member.



– Remove bolts -1-.
– Mark installation position of subframe and both consoles for engine mountings on longitudinal members with felt-tip pen.
– Remove bolts -2, 3, 4- in diagonal sequence and in stages.



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Caution

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

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

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

2.2 Separating engine from multitronic gearbox

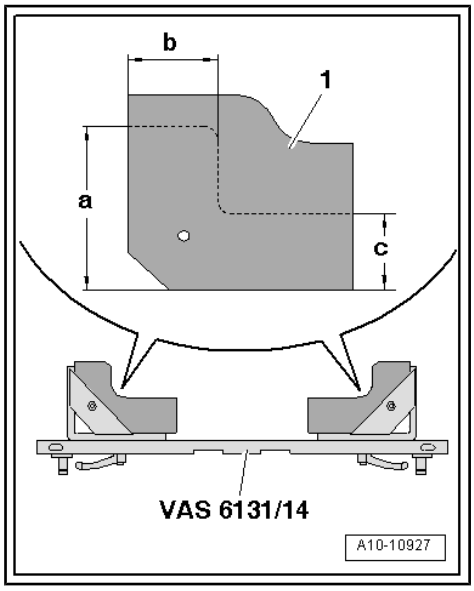
Special tools and workshop equipment required

- Support set for Audi - VAS 6131/10- , supplementary set - VAS 6131/11- and -VAS 6131/12-
- Gearbox support - VAS 6131/14-

Setting up gearbox support - VAS 6131/14- :

– Cut foam plastic insert according to the dimensions given.

- Dimension -a- = 20 mm
- Distance -b- = 55 mm.
- Distance -c- = 55 mm.



Note

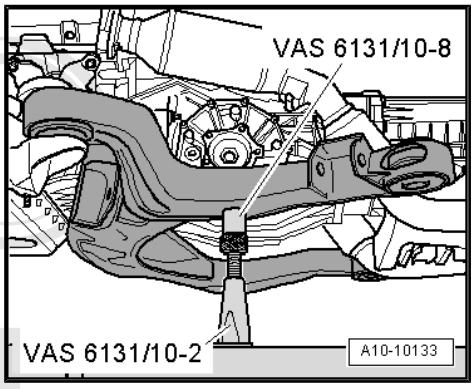
Order a new foam plastic insert to be kept in stock as a replacement part when required.

Procedure

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

– Screw down spindles of support elements (left and right) at subframe as far as possible.

– Remove locating lugs from spindles.



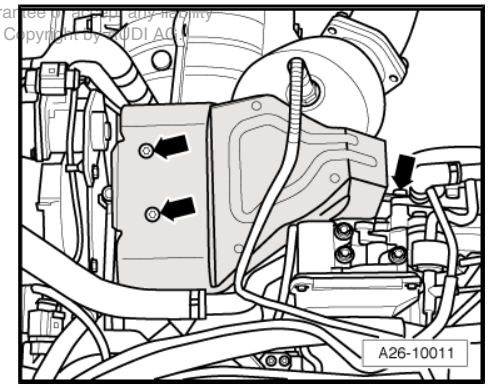
Note

A second mechanic is required for removing the subframe.

– Take out subframe to the side.

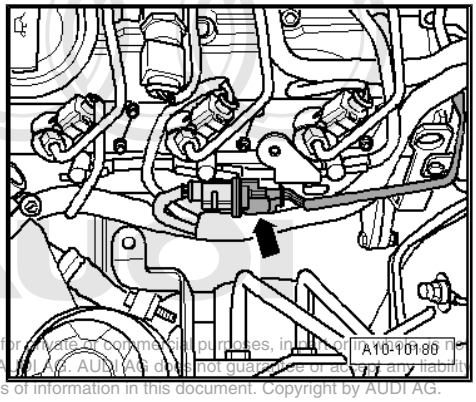
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– Remove bolts -arrows- and detach heat shield for turbocharger.



– Remove electrical connector -arrow- for Lambda probe - G39- from bracket and unplug connector.

– Move clear electrical wiring for Lambda probe.



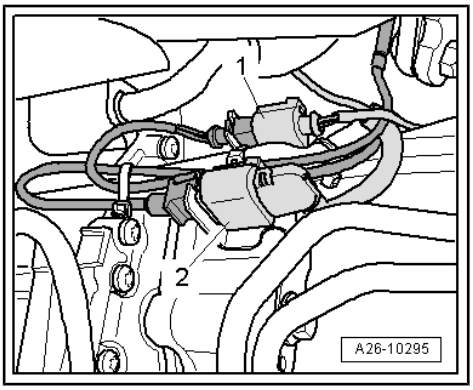
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– Detach electrical connectors from bracket at front left of gearbox and unplug:

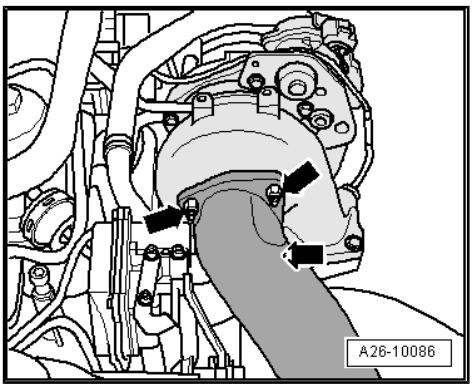
1 - For exhaust gas temperature sender 3 - G495-

2 - For engine speed sender - G28-

– Move electrical wiring clear.



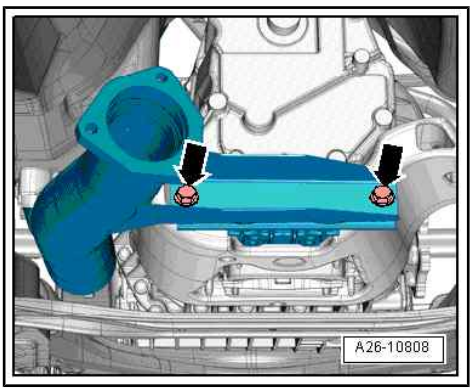
– Remove nuts -arrows- securing starter catalytic converter to turbocharger.



Caution

Risk of damage to flexible joint in front exhaust pipe.

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



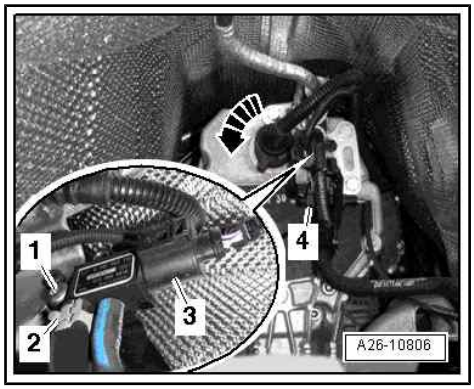
– Remove bolts -arrows- securing bracket for front exhaust pipe.

– Detach starter catalytic converter and front exhaust pipe.

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 rear of gearbox.

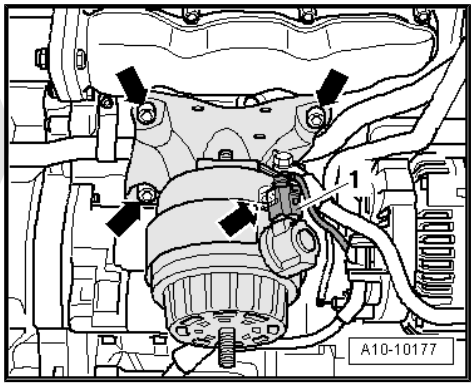
Note

Disregard items -1 ... 4-.

– Unplug electrical connector -1- for right electrohydraulic engine mounting solenoid valve - N145- .

– Move electrical wiring clear at console for engine mounting.

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



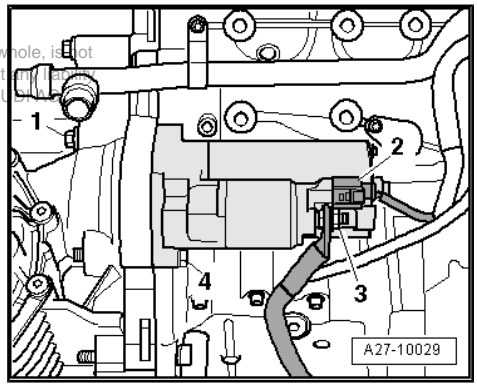
Note

For illustration purposes, the installation position is shown without console for engine mounting.

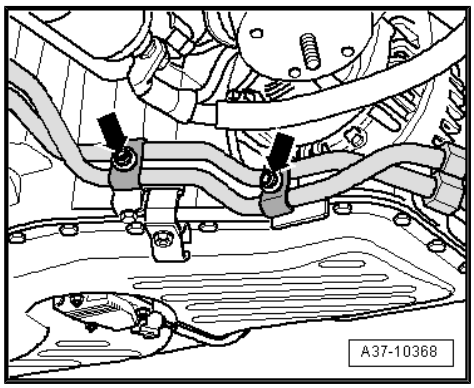
– Remove nut -3- for battery positive cable.

– Unplug electrical connector -2-.

– Unscrew bolts -1- and -4- and remove starter.



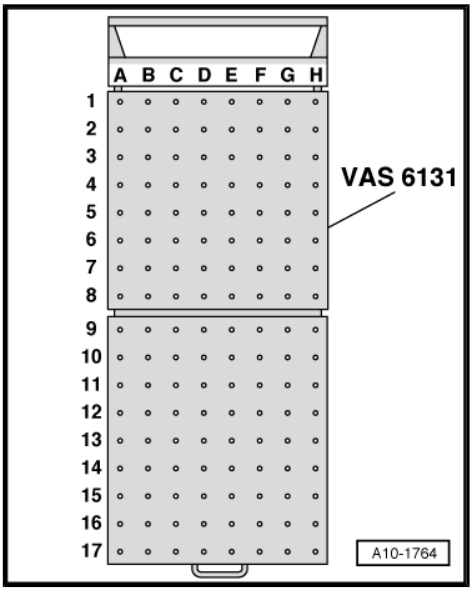
– Remove bolts -arrows- on bracket for ATF lines.



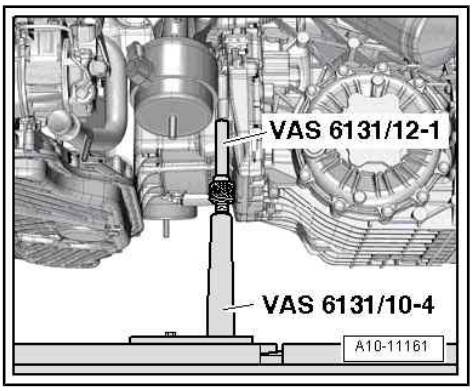
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– Set up scissor-type assembly platform - VAS 6131 A- with support set for Audi - VAS 6131/10- and gearbox support - VAS 6131/14- as follows:

Platform coordinates	Parts of support set for Audi - VAS 6131/10- , support set -VAS 6131/11- and supplementary set - VAS 6131/12-			
B3 1)	/10-1	/10-4	/10-5	/10-11
F3 1)	/10-1	/10-4	/10-5	/10-11
B7	/10-1	/10-4	/10-5	/12-1
F7	/10-1	/10-4	/10-5	/11-2
G10	/10-1	/10-2	/10-5	/14
C11	/10-1	/10-2	/10-5	
G14 1)	/10-1	/10-4	/10-5	/10-12
D15 1)	/10-1	/10-4	/10-5	/11-2
• 1) Support elements remain unchanged.				

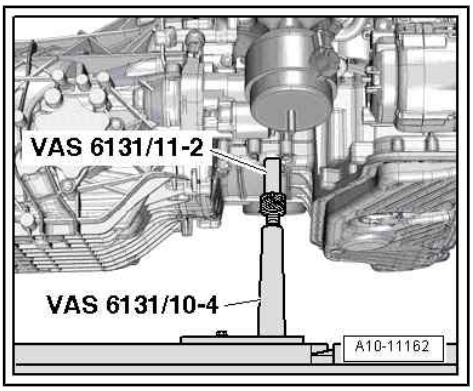


– Position the support elements from -VAS 6131/10- at left of engine, as shown in illustration.



– Position the support elements from -VAS 6131/10- at right of engine, as shown in illustration.

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

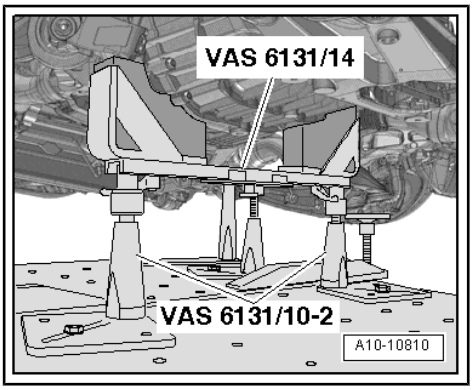


– Position support elements from -VAS 6131/10- and gearbox support - VAS 6131/14- at front of gearbox, as illustrated.

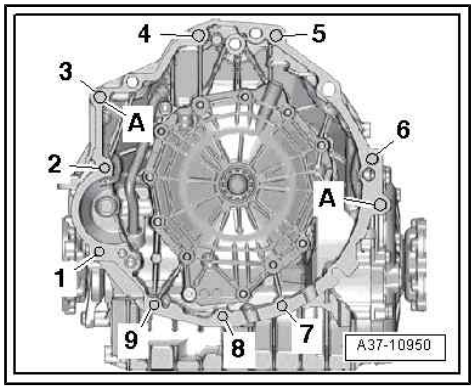
– Screw spindles on both sides upwards until gearbox support -VAS 6131/14- makes full contact with gearbox.

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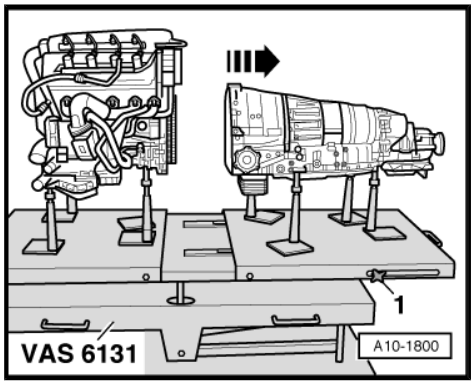
– Tighten base plates for support elements to 20 Nm on scissor-type assembly platform - VAS 6131 A- .



– Remove bolts -3 ... 9- securing gearbox to engine.



– 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-.



2.3 Installing engine

Tightening torques

Note

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

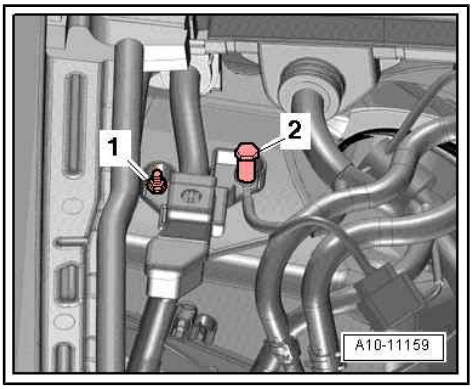
Component		Nm
Bolts/nuts	M6	9
	M7	15
	M8	20
	M10	40
	M12	65

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Assembly mountings ⇒ page 101

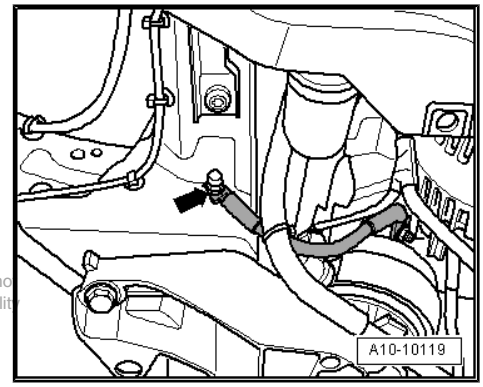
Positive terminal and earth stud

– Tighten nut -1- for positive terminal to 20 Nm.
– Tighten earth stud -2- to 9 Nm.



Earth connection on longitudinal member (right-side)

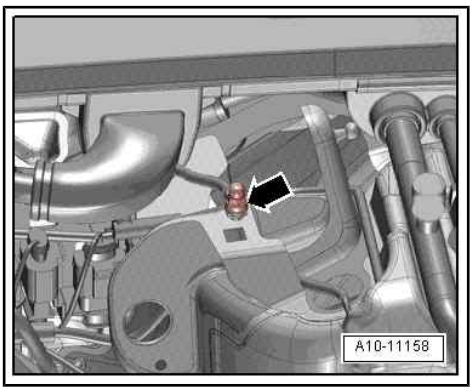
– Tighten nut -1- to 15 Nm.



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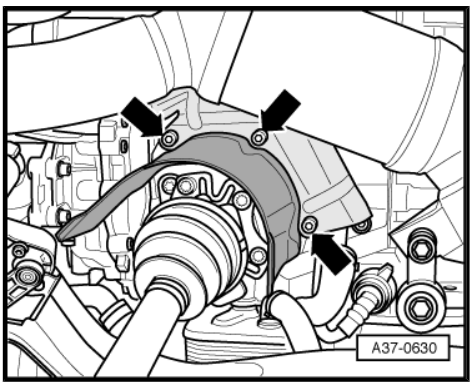
Earth connection to suspension turret (left-side)

– Tighten nut -arrow- to 9 Nm.



Heat shield for drive shaft

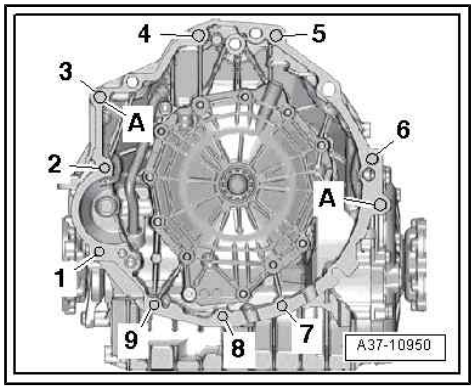
– Tighten bolts -arrows- to 23 Nm.



Engine to multitronic gearbox

Item	Bolt	Nm
1 [1)]	M10x80	65
2 [1)]	M10x90	65
3, 4	M12x95	65
5	M12x110	65
6	M12x125	65
7, 8, 9	M10x70	45
A	Dowel sleeves for centralising	

• [1)] Also secures starter; property class 10.9



Procedure

Note

- *Renew the bolts tightened with specified tightening angle.*
- *Renew self-locking nuts and bolts as well as seals, gaskets and O-rings.*
- *Hose connections and air pipes 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.*
- *Fit all cable ties in the original positions when installing.*

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

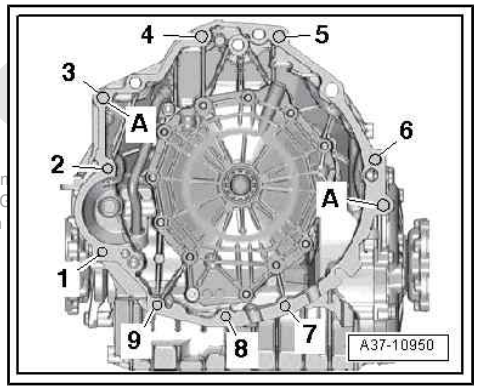
– Bring gearbox into position on engine and tighten bolts -3 … 9-.

– Secure ATF lines ⇒ Rep. gr. 37 .

– Install starter ⇒ Electrical system; Rep. gr. 27 .

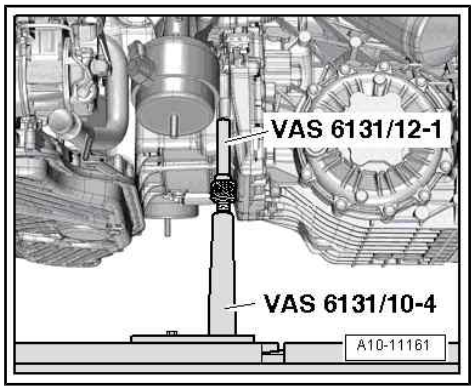
– Install engine mounting with engine supports ⇒ page 101 .

– Install starter catalytic converter with front exhaust pipe ⇒ page 330 .



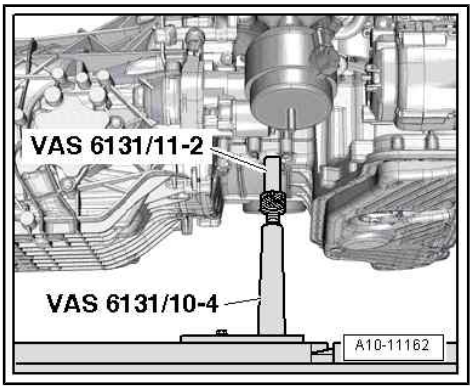
– Screw spindle for support element at left of engine downwards.

– Unscrew base plate for support element (left-side) from scissor-type assembly platform - VAS 6131 A- .

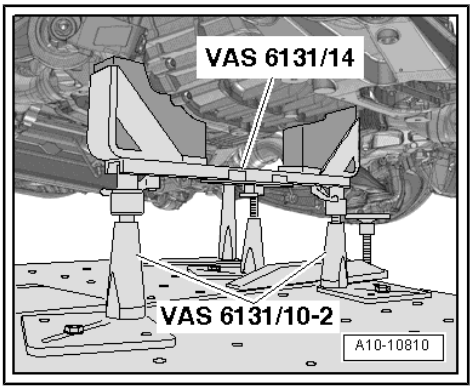


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– Screw spindle for support element at right of engine downwards.
– Unscrew base plate for support element (right-side) from scissor-type assembly platform - VAS 6131 A- .



– Screw down spindles of support elements on front of gearbox.
– Unscrew base plates for support elements from scissor-type assembly platform - VAS 6131 A- .



Note

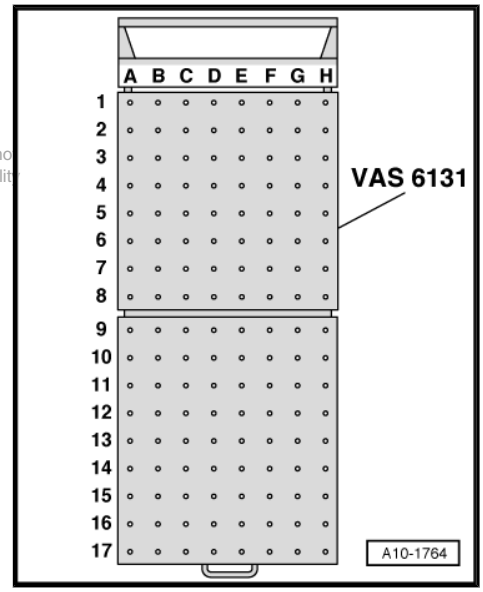
The mounting points for engine (front), gearbox and tunnel cross member remain unchanged.

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

Platform coordinates	Parts from support set for Audi - VAS 6131/10-			
B3 1)	/10-1	/10-4	/10-5	/10-11
F3 1)	/10-1	/10-4	/10-5	/10-11
B10	/10-1	/10-2	/10-5	/10-8 2)
G10	/10-1	/10-2	/10-5	/10-8 2)
C14 1)	/10-1	/10-3	/10-5	/10-12
F14 1)	/10-1	/10-3	/10-5	/11-2

- 1) Support elements remain unchanged.
- 2) Secure support elements only after installing the subframe.

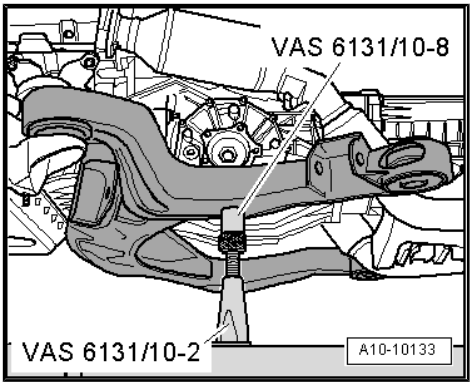
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Note

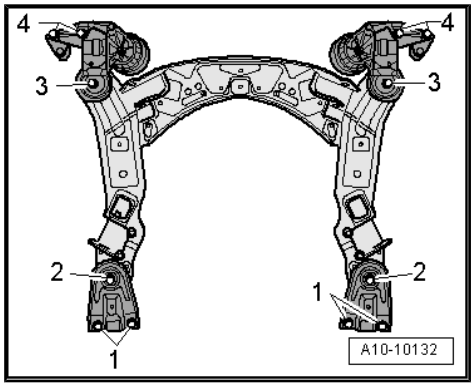
A second mechanic is required for positioning the subframe on the support elements.

– Fit subframe on both support elements -VAS 6131/10-8- .
– Screw up spindles of support elements on both sides.
– Tighten base plates for support elements to 20 Nm on scissor-type assembly platform - VAS 6131 A- .
– Guide engine/gearbox assembly together with subframe into body from below using scissor-type assembly platform - VAS 6131 A- .



– Align subframe and consoles for engine mounting on longitudinal members according to markings made before removal.

– Tighten bolts for subframe and consoles for engine mountings only to specified torque (do not turn further); the bolts are only fully tightened after performing the wheel alignment check ⇒ Rep. gr. 40 .

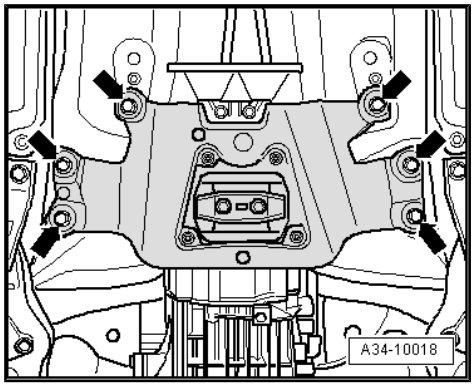


WARNING

Risk of accident because of loose bolt connections.

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

– Tighten bolts for tunnel cross member ⇒ Rep. gr. 37 .



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

– Install selector lever cable and check adjustment ⇒ Rep. gr. 37 .

– Install particulate filter ⇒ page 330 .

– Align the exhaust system so it is free of stress ⇒ page 359 .

– Install drive shafts, guide links, track control links, anti-roll bar, coupling rod and suspension struts ⇒ Rep. gr. 40 .

– Install heat shield for drive shaft ⇒ page 61 .

– Install covers for drive shafts ⇒ Rep. gr. 66 .

– Install front cross piece ⇒ Rep. gr. 50 .

– Install refrigerant lines ⇒ Rep. gr. 87 .

– Install hydraulic line ⇒ Rep. gr. 48 .

– Install throttle valve module - J338- and engine control unit ⇒ Rep. gr. 23 .

– Install torque reaction support ⇒ page 110 .

– Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations, ⇒ Electrical system; Rep. gr. 97 , ⇒ page 61 , ⇒ page 61 , ⇒ page 61 .

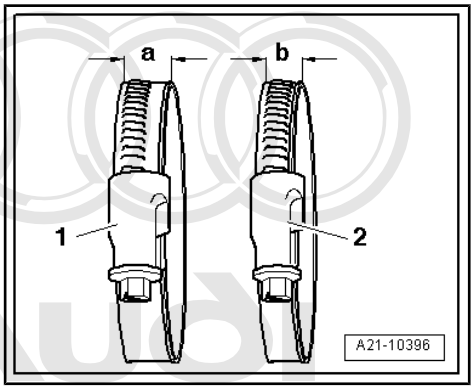
– Install cover for electronics box in plenum chamber ⇒ Electrical system; Rep. gr. 97 .

– Install fuel filter ⇒ Rep. gr. 20 .

– Install air cleaner housing ⇒ Rep. gr. 23 .

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– Install air hoses with screw-type clips ⇒ page 326 .
– Observe notes on procedure for connecting the battery ⇒ Electrical system; Rep. gr. 27 .



Caution

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

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

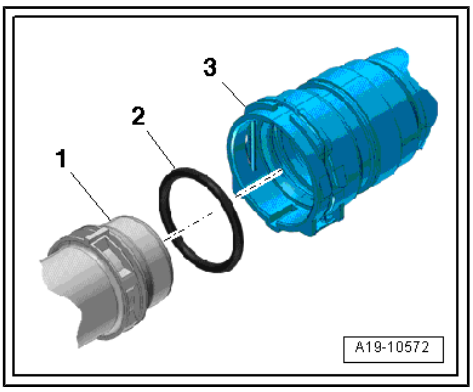
– Install and adjust wiper arms ⇒ Electrical system; Rep. gr. 92 .
– Install body brace ⇒ Rep. gr. 40 .
– Check oil level ⇒ Maintenance ; Booklet 405 .
– Fill up hydraulic fluid for power steering ⇒ Rep. gr. 48 .

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Note

The power steering pump must not be run when dry.

– Connect coolant hoses with plug-in connector ⇒ page 295 .
– Charge refrigerant system ⇒ Air conditioner with refrigerant R134a .
– Fill up with coolant ⇒ page 266 .



Note

- *If radiator, heat exchanger, cylinder head, cylinder head gasket or cylinder block have been renewed, do not re-use old coolant.*
- *Contaminated or dirty coolant must not be used again.*

– Check ATF level ⇒ Rep. gr. 37 .
– Align subframe and both consoles for engine mountings ⇒ Rep. gr. 40 .
– Fit front wheels ⇒ Wheels and tyres; Rep. gr. 44 .
– Perform wheel alignment check ⇒ Rep. gr. 44 .

WARNING

Risk of accident because of loose bolt connections.

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

– Check fuel system for leaks ⇒ page 7 .
– Install noise insulation panels ⇒ Rep. gr. 50 .

3 Removing and installing engine - vehicles with automatic gearbox

Overview

- ⇒ “3.1 Removing engine”, page 66
- ⇒ “3.2 Separating engine and automatic gearbox”, page 84
- ⇒ “3.3 Installing engine”, page 91

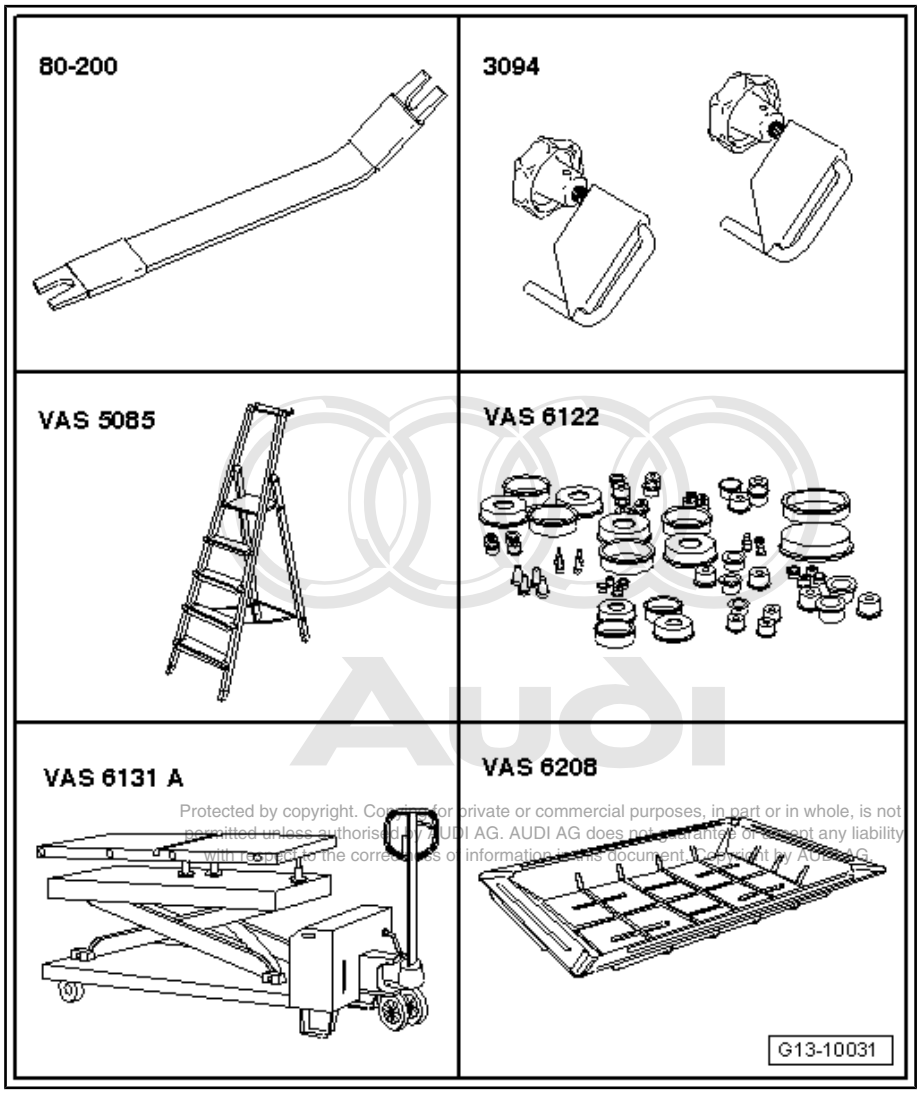
Note

- *The engine is removed from underneath together with the gearbox and subframe (with lock carrier installed).*
- *All cable ties which are released or cut open when removing must be fitted in the same position when installing.*
- *Collect drained coolant in a clean container for re-use or disposal.*

3.1 Removing engine

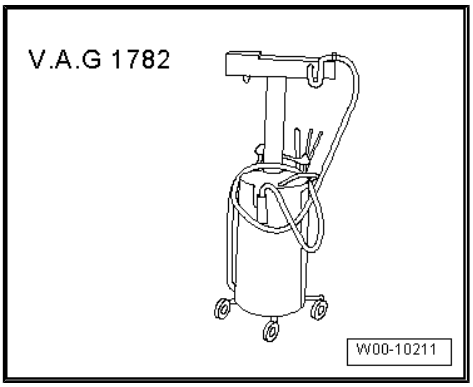
Special tools and workshop equipment required

- Removal lever - 80 - 200-
- Hose clamps, up to 25 mm - 3094-
- Stepladder - VAS 5085-
- Engine bung set - VAS 6122-
- Scissor-type assembly platform - VAS 6131 A- with support set for Audi - VAS 6131/10-
- Drip tray for workshop hoist - VAS 6208-

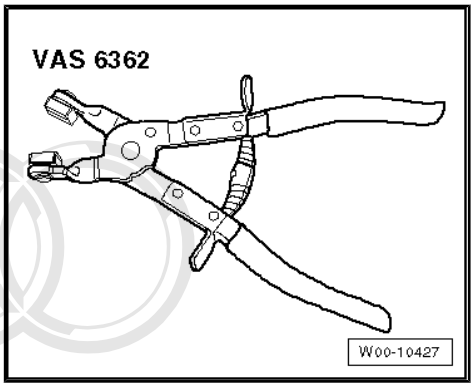


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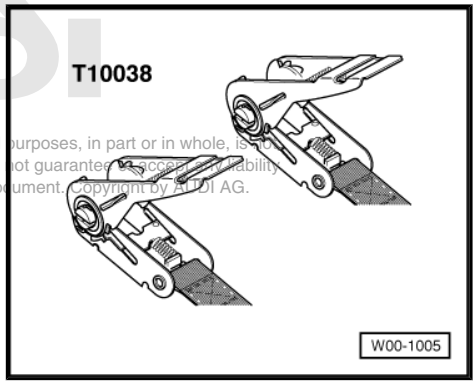
- Used oil collection and extraction unit - V.A.G 1782-



- Hose clip pliers - VAS 6362-

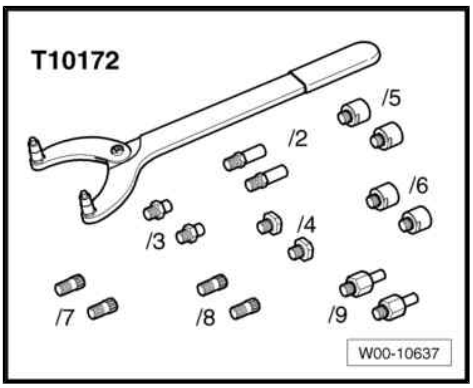


- Tensioning strap - T10038-



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



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.*

Caution

Electronic components are susceptible to damage.

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

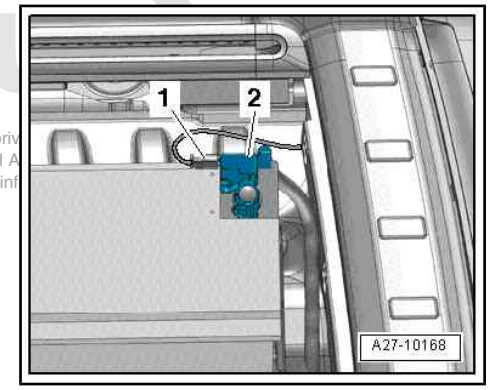
– Switch off ignition.

– Disconnect earth wire -2- from battery terminal ⇒ Electrical system; Rep. gr. 27 .

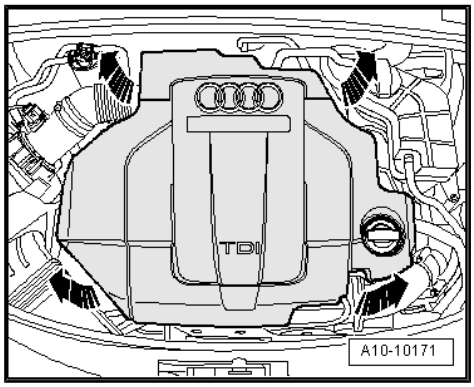
– Discharge refrigerant system ⇒ Air conditioner with refrigerant R134a .

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

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– Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



WARNING

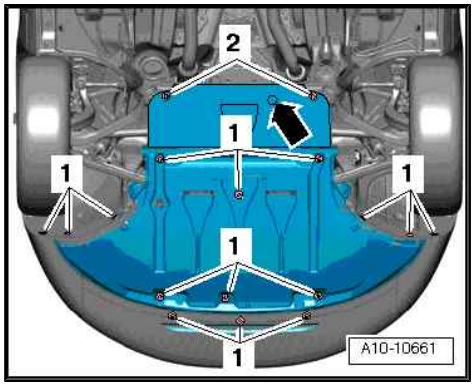
Hot steam/hot coolant can escape - risk of scalding.

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

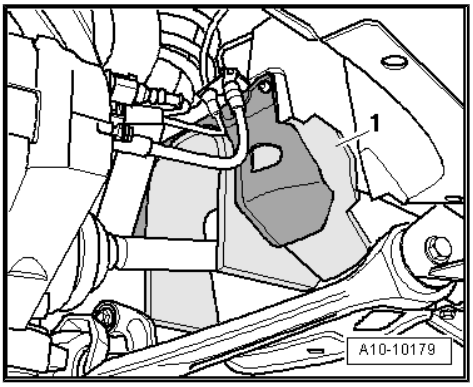
– Open filler cap on coolant expansion tank.

– Remove both front wheels ⇒ Wheels and tyres; Rep. gr. 44 .

– Remove front and rear noise insulation ⇒ Rep. gr. 50 .

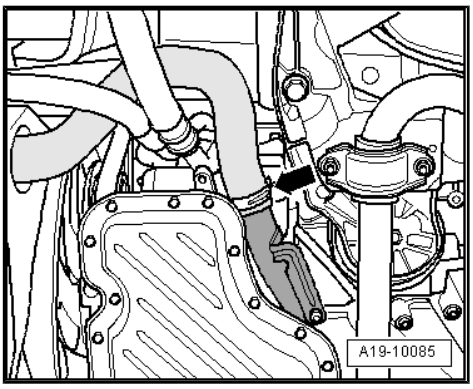


– Remove cover -1- for drive shaft in wheel housing (left and right).

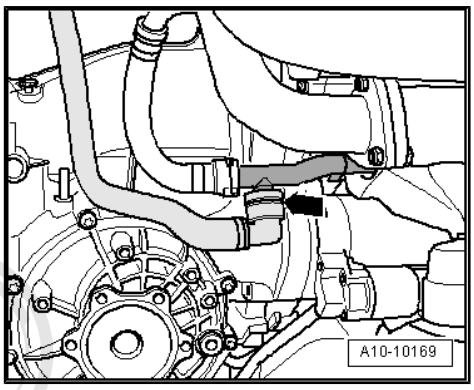


– Place drip tray for workshop hoist - VAS 6208- beneath engine.

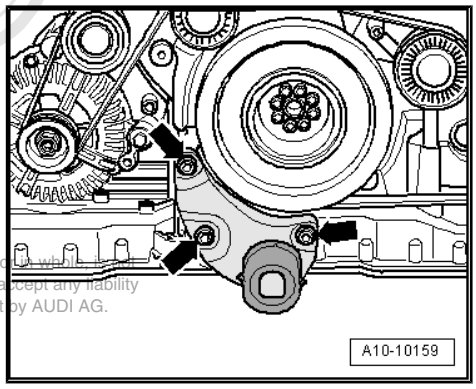
– Release hose clip -arrow-, disconnect coolant hose from coolant pipe (left-side) and drain off coolant.



– Lift retaining clip -arrow- to disconnect coolant hose from coolant pipe (right-side) and drain off remaining coolant.

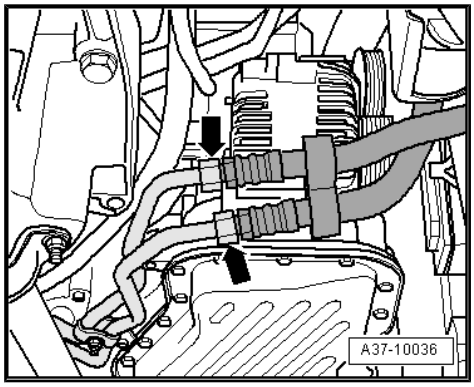


– Unscrew bolts -arrows- and detach torque reaction support from engine.



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



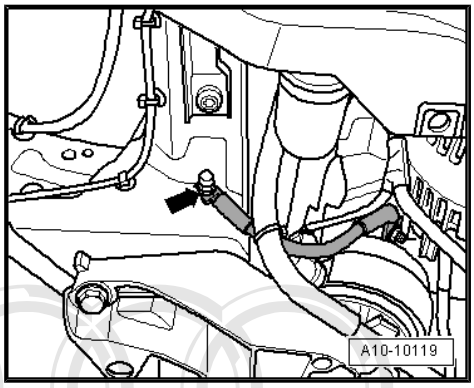
Note

Observe rules for cleanliness when working on automatic gearbox ⇒ Rep. gr. 00 .

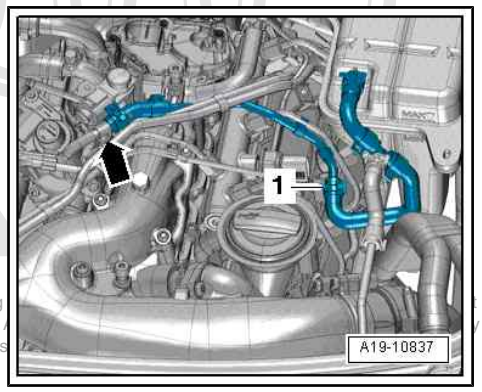
– Disconnect ATF lines -arrows- on right side of engine.

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

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



– Disconnect coolant hose -1-.



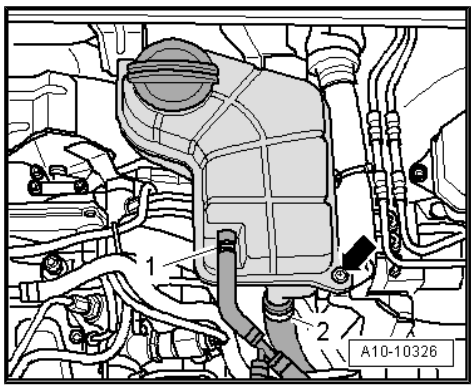
Note

Disregard -arrow-.

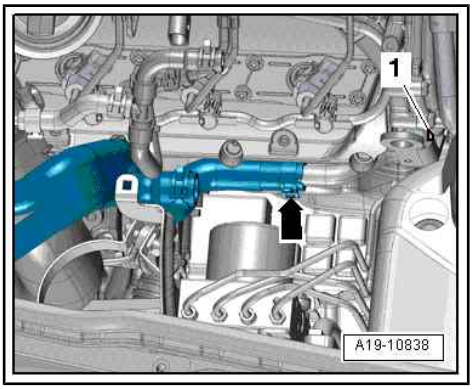
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– Remove bolt -arrow-.

– 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.



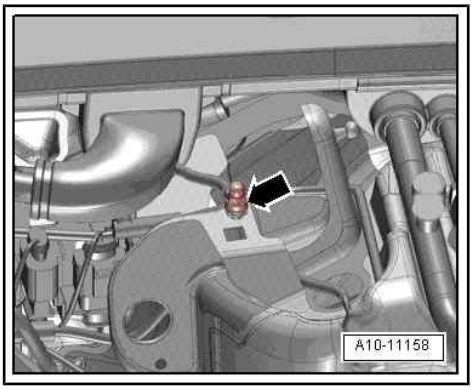
– Release hose clip -arrow- and detach coolant hose.



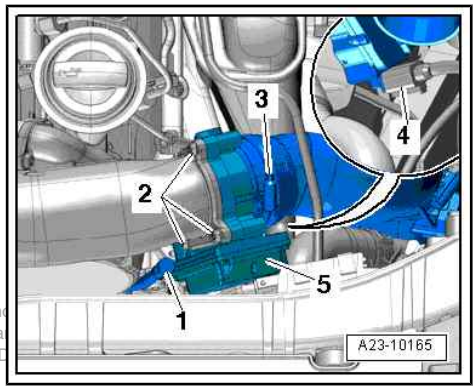
Note

Disregard -item 1-.

– Unscrew nut -arrow- on suspension turret (left-side) and move earth wire clear.



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

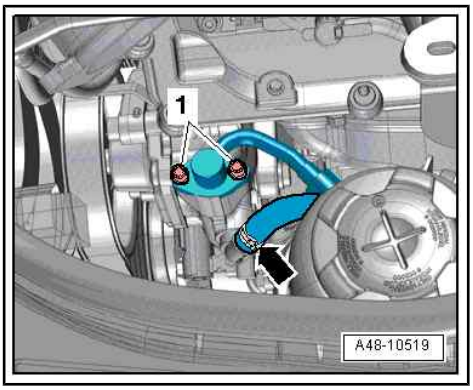


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Note

Lay a cloth under the hydraulic lines to catch escaping hydraulic fluid.

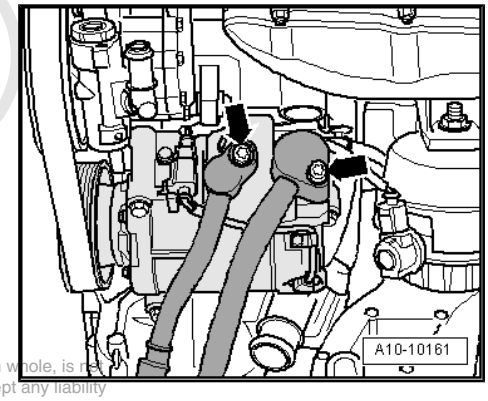
– Clamp off hydraulic hose -arrow- with hose clamp -3094- and detach.
– Remove bolts -1- and lay hydraulic line aside on top of longitudinal member.
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .



Caution

Danger of damage to refrigerant lines and hoses.

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

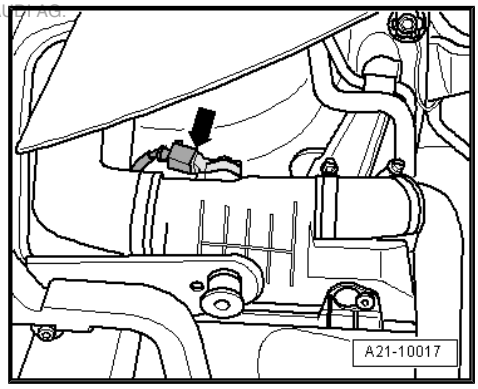


– Remove bolts -arrows- and disconnect refrigerant lines from A/C compressor.

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

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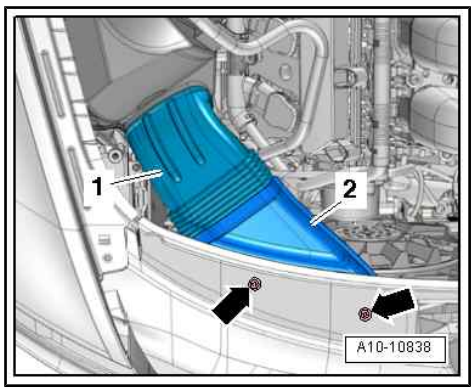
– Unplug electrical connector -arrow- for charge pressure sender - G31- at charge air cooler (left-side).



Note

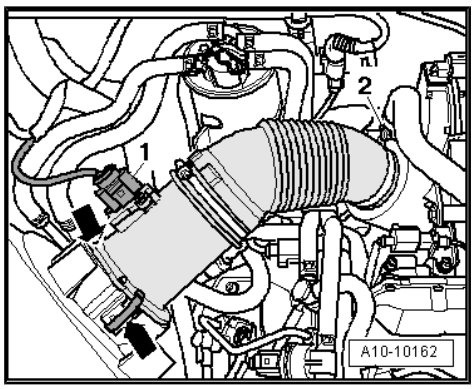
For illustration purposes, the installation position is shown with the headlight removed.

– Remove bolts -arrows-, detach air ducts -1- and -2-.

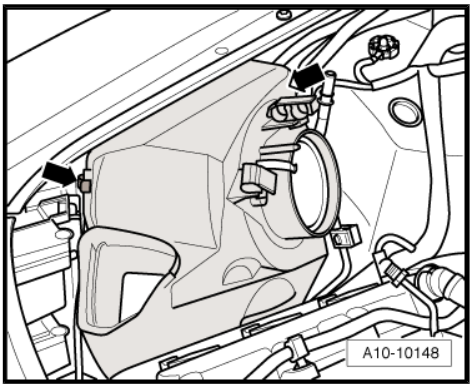


– Unplug electrical connector -1- from air mass meter - G70- .

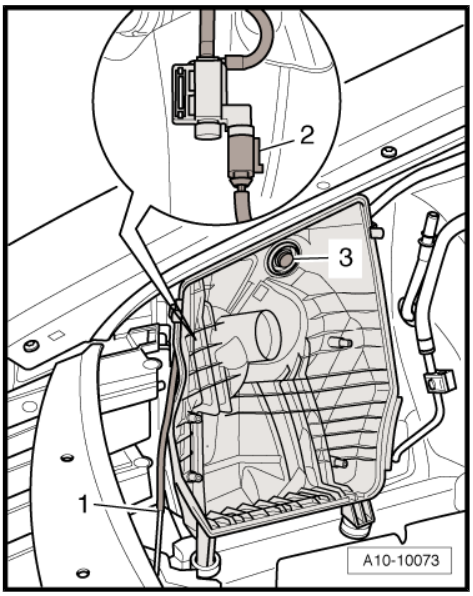
– Remove air hose. To do so, release hose clip -2- and clamps -arrows-.



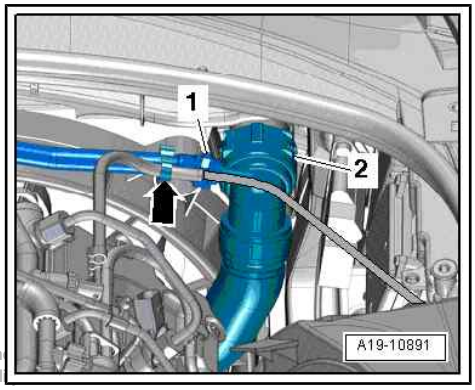
– Release clamps -arrows- and detach air cleaner (top section).



– Disconnect vacuum line -1-.
– Pull pin out of fastener -3-.
– Detach air cleaner (bottom section) and disconnect electrical connector -2- for air filter bypass flap valve - N275- on reverse side of air cleaner.

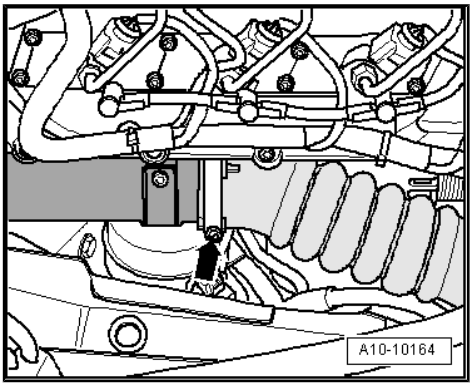


– Release hose clip -1- and detach coolant hose.
– Move vacuum hose clear -arrow-.
– Lift retaining clip -2- and disconnect coolant hose (top right) from radiator.

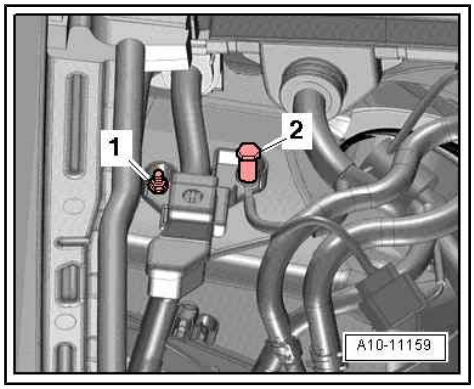


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– Release hose clip -arrow- and detach air hose from air pipe.



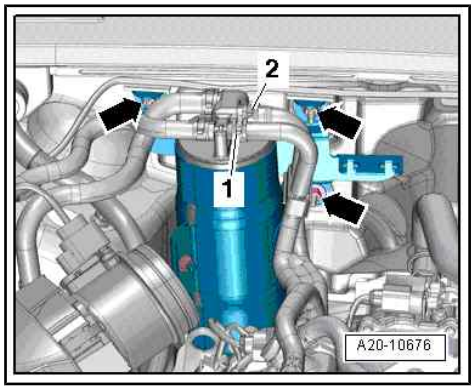
– Remove nut -1- on remote positive terminal.
– Remove earth stud -2-.
– Move clear electrical wiring to turbocharger 1 control motor - V280- .



Caution

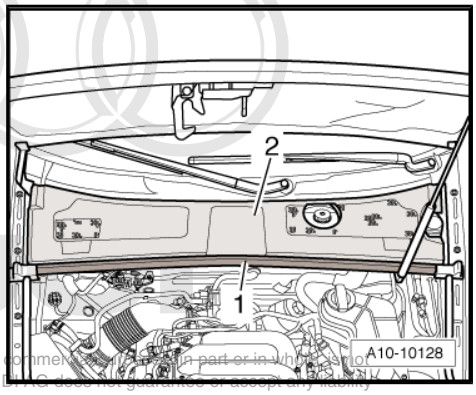
Take care to keep components clean.

- *Rules for cleanliness when working on the injection system ⇒ page 7 .*



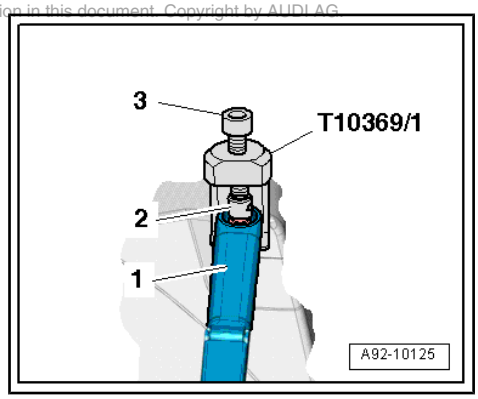
– Release hose clips and detach return hose -1- and supply hose -2- from fuel filter.
– Unscrew nuts -arrows- and move bracket with fuel filter to one side.
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .

– Pull off seal -1- and remove plenum chamber cover -2-.



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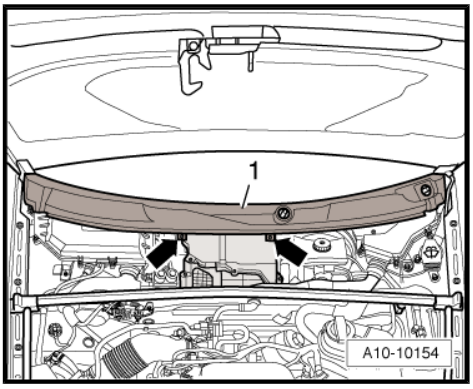
– Remove wiper arms ⇒ Electrical system; Rep. gr. 92 .



Caution

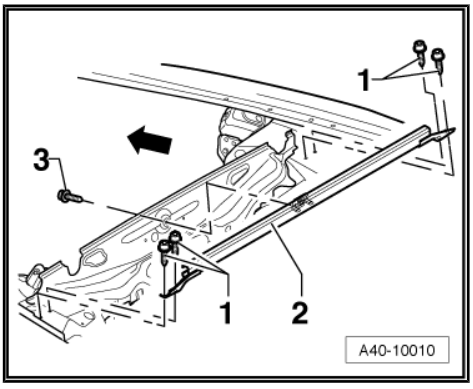
Risk of damage to cowl panel trim.

- *To avoid cracking the cowl panel trim -1- during removal, apply a small amount of soap solution to the joint between the windscreen and the cowl panel trim and pull the trim vertically up out of the windscreen surround, starting from the edge of the windscreen.*



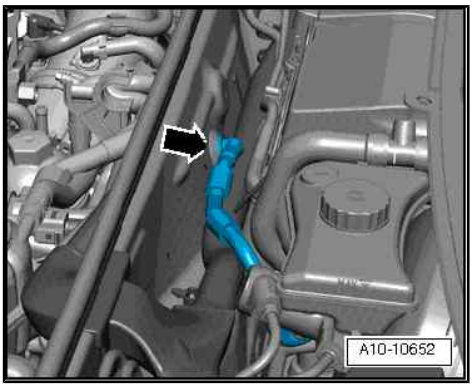
– Unscrew bolts -arrows- and pull cowl panel trim off windscreen.

– If fitted, remove bolts -1- and -3- and detach body brace -2-.

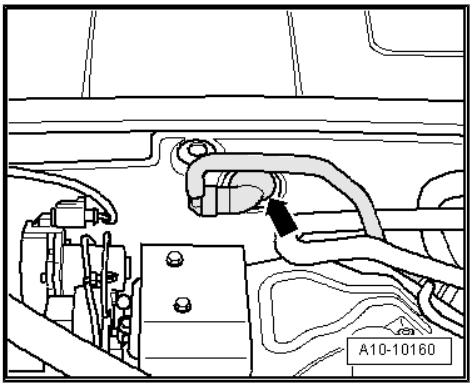


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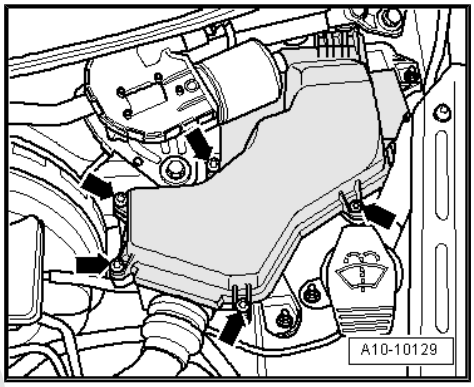
– Detach vacuum line -arrow- going to brake servo at plenum chamber partition panel.



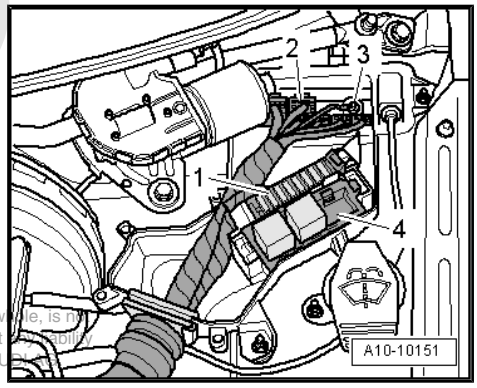
– Detach vacuum hose -arrow- going to brake servo at plenum chamber partition panel.



– Remove bolts -arrows- and detach cover for electronics box in engine compartment (left-side).



– Release fasteners, pull off fuse holder -1- and then 3-position relay carrier -4- upwards.
– Unscrew wiring -3-.
– Unplug three front electrical connectors -2- at rear of connector console.
– Disengage engine wiring harness at electronics box and move clear.

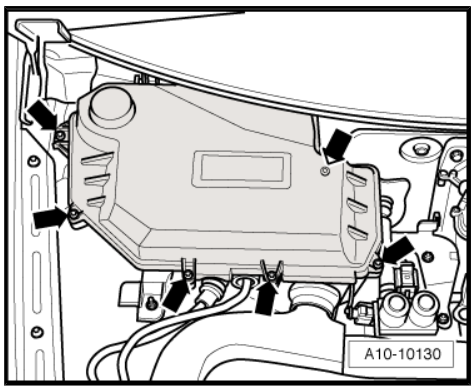


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WARNING

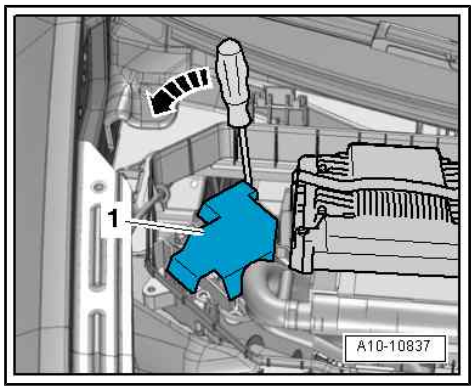
Risk of burns at the pump valve unit for the heating system (left-side in front of electronics box).

- ***Wear protective gloves when working near the pump valve unit for the heating system.***



– Remove bolts -arrows- and detach cover for electronics box in engine compartment (right-side).

– Open cover -1- with screwdriver -arrow- and detach.

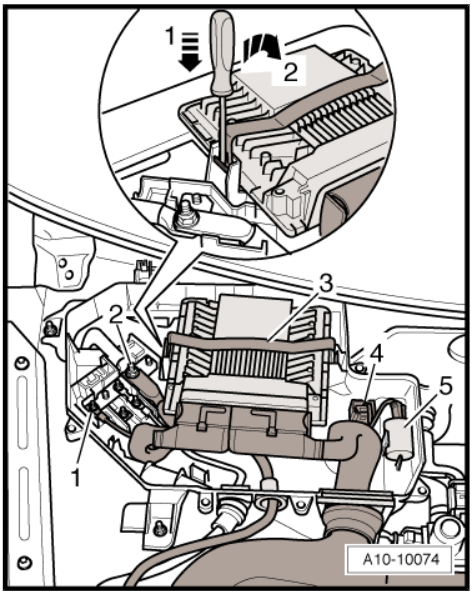


– Use screwdriver -arrows 1, 2- to carefully lever off retaining strap -3- and remove engine control unit from electronics box.

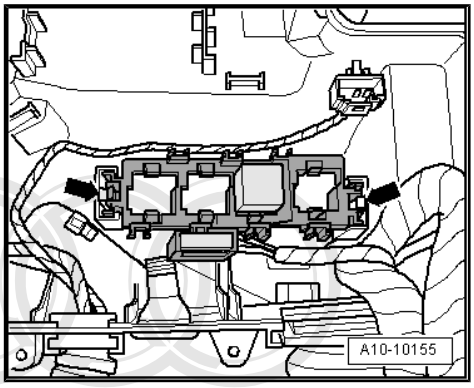
Note

The engine control unit remains connected to the wiring harness.

– Unclip suppressor capacitor -5- and take out of retainer in electronics box.
– Unplug electrical connector -4- at rear of connector console.
– Unscrew electrical wiring -1- and -2-.

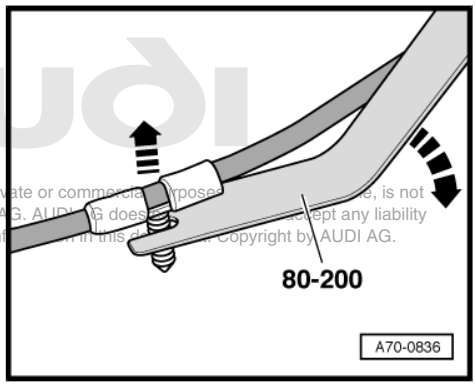


– Release catches -arrows- and detach relay carrier from electronics box in engine compartment (right-side).

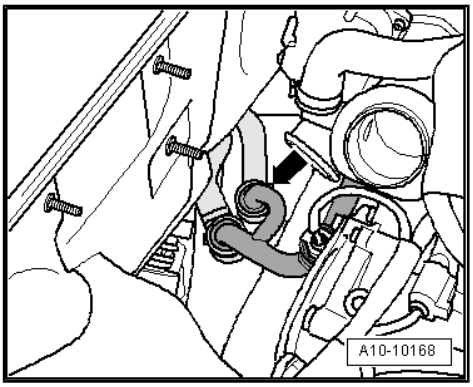


– Use removal lever - 80 - 200- to release electrical wiring up to the alternator.
– Place both wiring harnesses on engine and secure engine control unit to prevent it from dropping.

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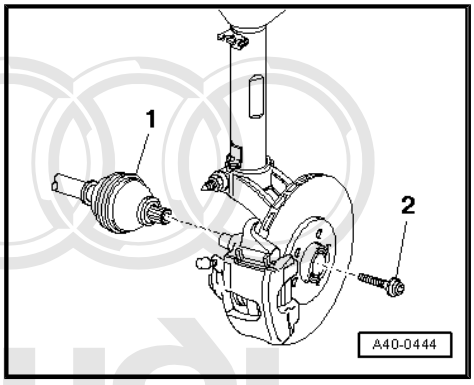
– Detach coolant hose -arrow- leading to heat exchanger at rear of engine.



Caution

Risk of injury and risk of damage to brake discs and wheel bearings.

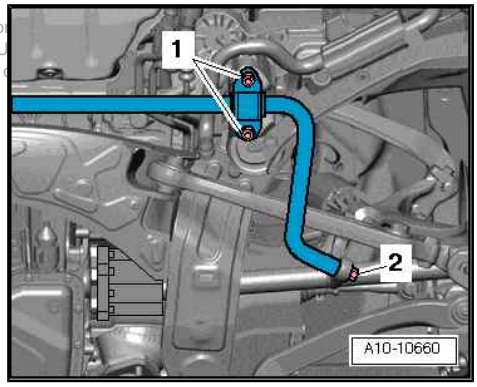
- *When slackening the flange bolt securing the drive shaft, the vehicle must not be standing on its wheels.*
- *Secure brake discs by screwing in two wheel bolts.*



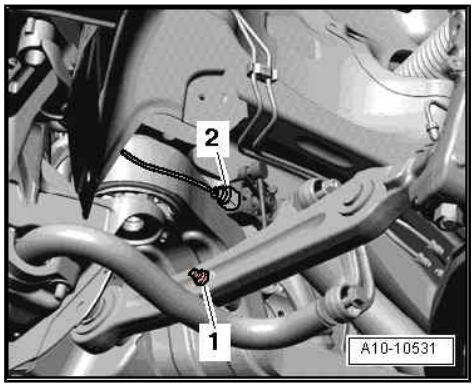
– Have a 2nd mechanic press the brake pedal.
– Unscrew flange bolt -2- at drive shaft -1- (left and right).

– Unscrew nut -1- (left and right) evenly.
– Unscrew bolt -2- (left and right) and remove anti-roll bar.

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– Unplug electrical connector -2- at front left vehicle level sender - G78- .
– Remove nut -1- and detach coupling rod from track control link.

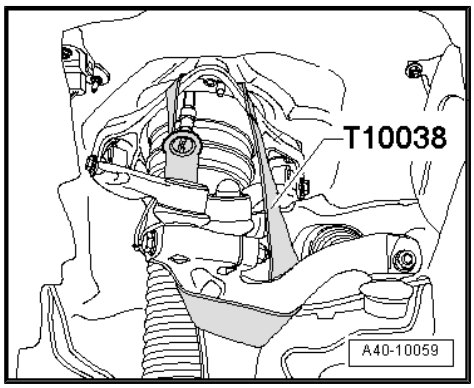


Caution

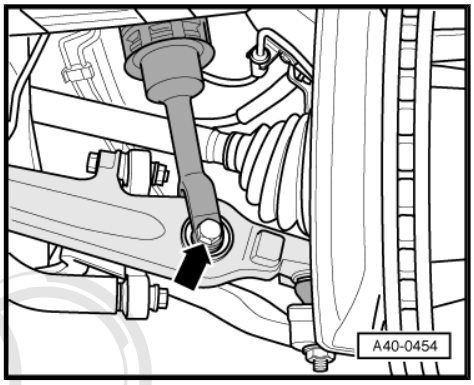
Danger of damage to the swivel joints of the upper links.

- *Support wheel bearing housing.*

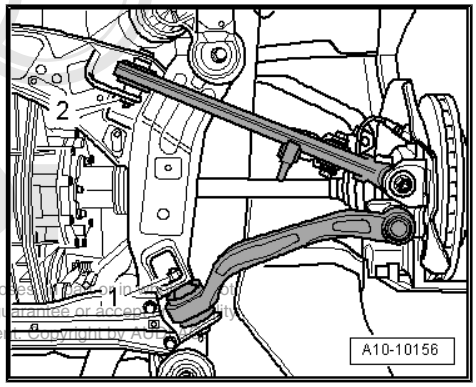
– Tie up wheel bearing housing with tensioning strap - T10038- as shown on illustration.



– Remove bolt -arrow- and detach suspension strut from track control link.



– Remove nut -1- for guide link and nut -2- for track control link at subframe, remove bolts.



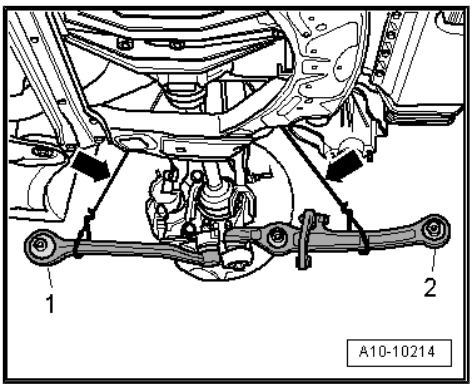
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– Pivot guide link -1- and track control link -2- outwards.

Caution

Risk of damage if guide link and track control link are allowed to drop without support.

- *Tie up guide link and track control link to wheel bearing housing -arrows- as shown in illustration.*

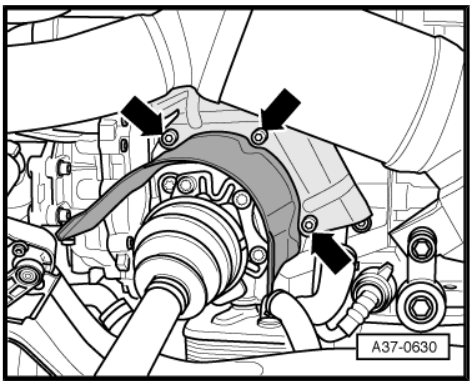


– Move clear electrical wiring harness at heat shield for drive shaft (left-side).
– Remove bolts -arrows- and detach heat shield for drive shaft (left-side).
– Detach drive shaft from flange shaft of gearbox.

Caution

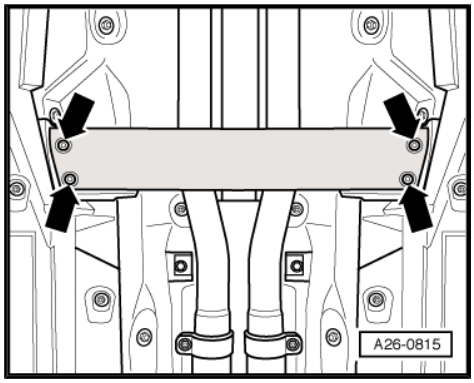
Danger of damage to brake hose.

- *Take care when detaching drive shaft.*



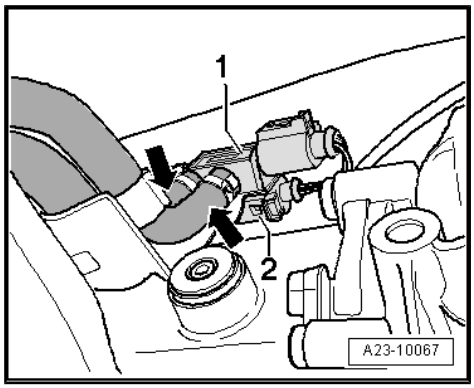
– Pivot wheel bearing housing outwards and detach drive shaft.
– Perform the same work steps on the other side of the vehicle.

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



– Unplug electrical connector for exhaust gas temperature sender 4 - G648- -item 2-.

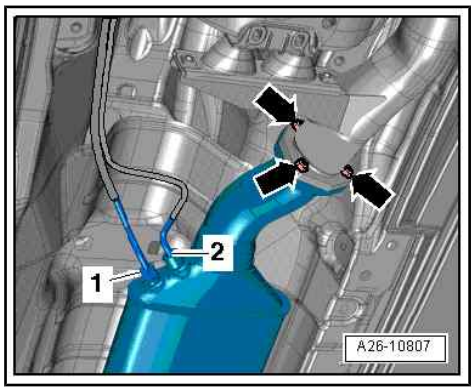
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Note

Ignore items marked -1- and -arrows-.

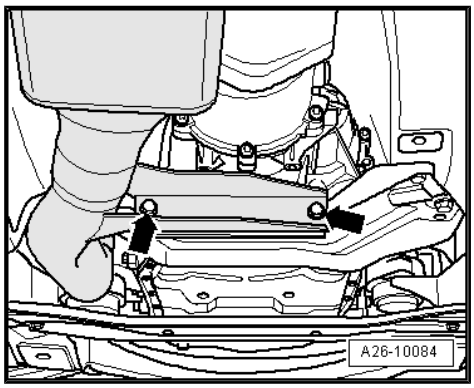
– Remove nuts -arrows-.
– Unscrew pressure pipe -1- from particulate filter.



Note

Disregard -item 2-.

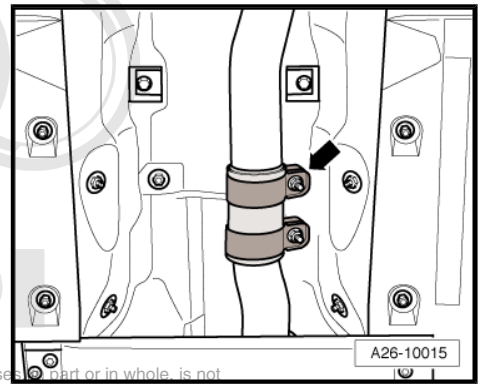
– Remove bolts -arrows-.



Caution

Risk of damage to flexible joint in front exhaust pipe.

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

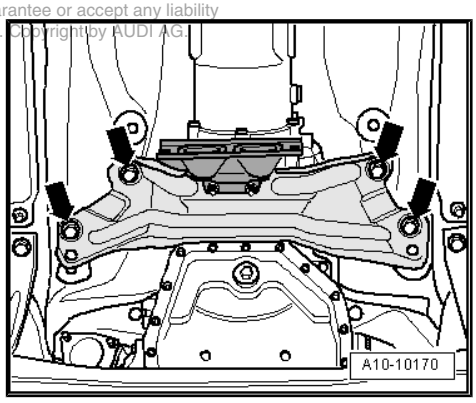


– Disconnect exhaust system at clamp -arrow-.

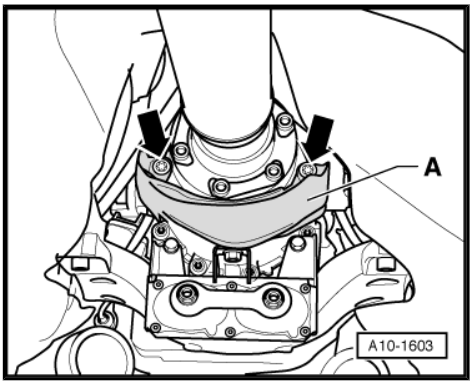
– Detach particulate filter.

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– Remove bolts -arrows- and detach tunnel cross member with bracket for particulate filer.

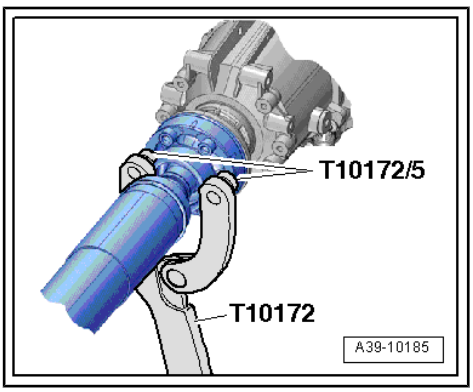


– Remove bolts -arrows- and detach heat shield -A- for propshaft.

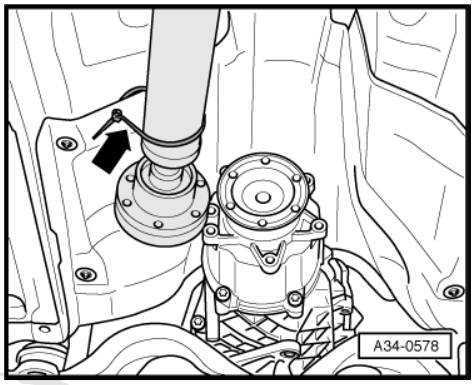


– Remove bolts connecting propshaft to gearbox (use counter-hold tool - T10172- with -T10172/5-).

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



– Tie propshaft up to side of heat shield -arrow-.

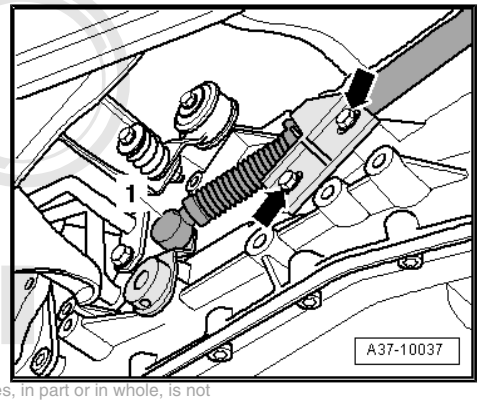


Note

Mark installation position of support bracket for selector lever cable.

– Remove bolts -arrows- for cable support bracket.

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

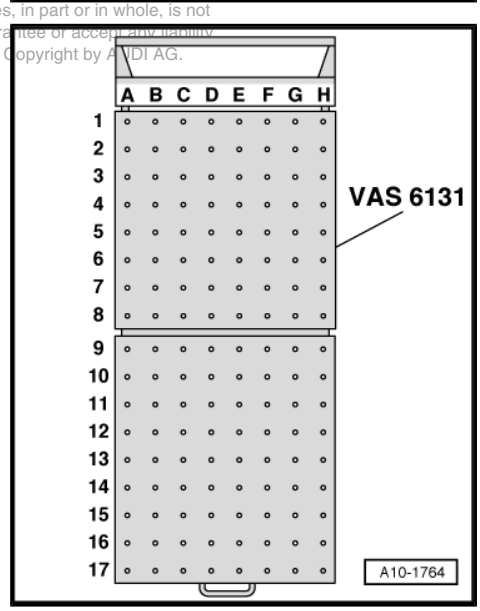


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Set up the scissor-type assembly platform as follows:

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

Platform coordinates	Parts from support set for Audi - VAS 6131/10-			
B3	/10-1	/10-4	/10-5	/10-11
F3	/10-1	/10-4	/10-5	/10-11
B10	/10-1	/10-2	/10-5	/10-8
G10	/10-1	/10-2	/10-5	/10-8
G14	/10-1	/10-4	/10-5	/10-12
D15	/10-1	/10-4	/10-5	/10-13



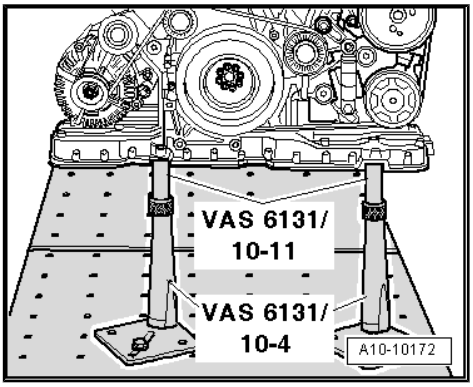
– Initially hand-tighten the support elements on the scissor-type assembly platform.

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

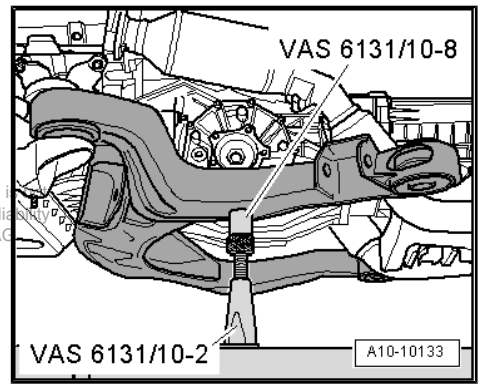
• Take note of spirit level (bubble gauge).

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

– Position the support elements from -VAS 6131/10- at front of engine, as shown in illustration.
– Make sure that threaded spindles are screwed in completely.

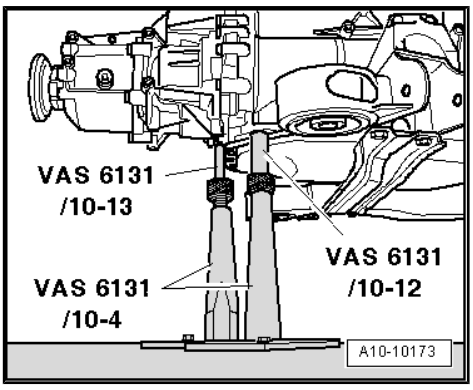


– Position the support elements from -VAS 6131/10- at left and right of subframe, as shown in illustration.

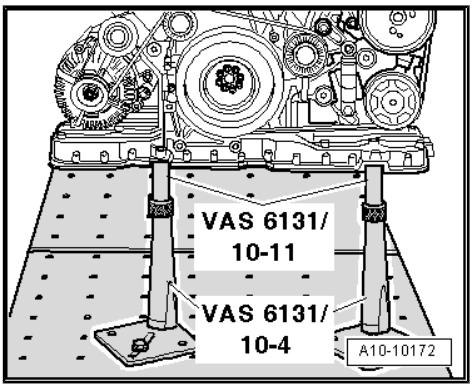


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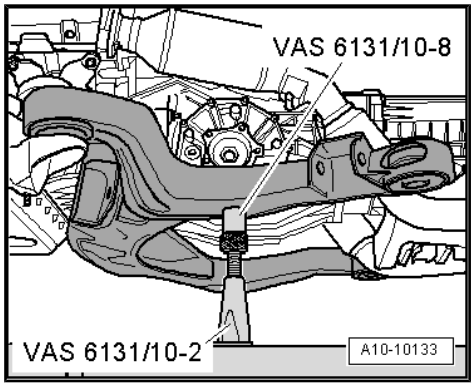
– Position support elements from -VAS 6131/10- at rear of gearbox, as shown in illustration.
– Turn all spindles for support elements upwards until all locating lugs make contact with mounting points.
– Tighten base plates for support elements to 20 Nm on scissor-type assembly platform - VAS 6131 A-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



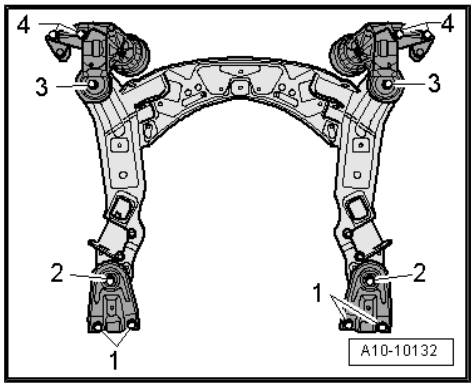
– Screw both front spindles (at engine) 8 turns upwards.



– Screw both rear spindles (at subframe) 4 turns upwards.



– Remove bolts -1-.
– Mark installation position of subframe and both consoles for engine mountings on longitudinal members with felt-tip pen.
– Remove bolts -2, 3, 4- in diagonal sequence and in stages.



Caution

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

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

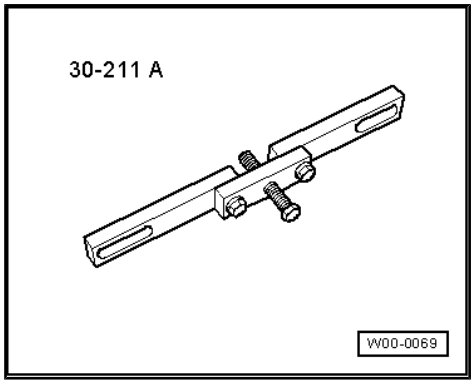
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– Carefully lower engine/gearbox assembly.
– Pull out scissor-type assembly platform - VAS 6131 A- with engine/gearbox assembly from underneath vehicle.

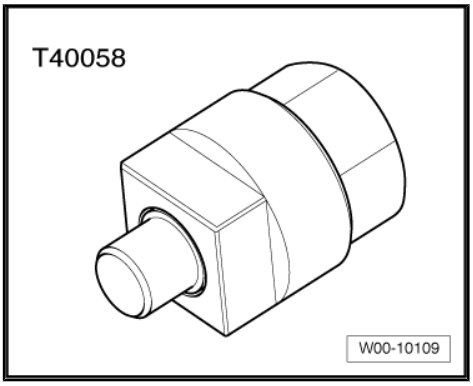
3.2 Separating engine and automatic gearbox

Special tools and workshop equipment required

- Support set for Audi - VAS 6131/10- , supplementary set - VAS 6131/11- and -VAS 6131/12-
- Support bridge - 30 - 211 A-



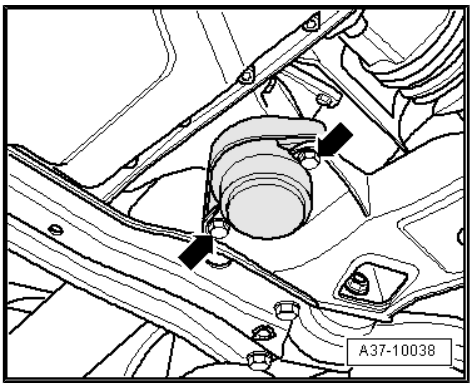
♦ Adapter - T40058-



Procedure

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

– Remove bottom bolts -arrows- for gearbox mounting (left and right).



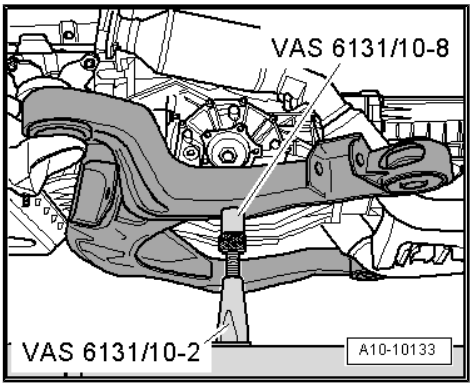
– Screw down spindles of support elements (left and right) at subframe as far as possible.

– Remove locating lugs from spindles.

Note

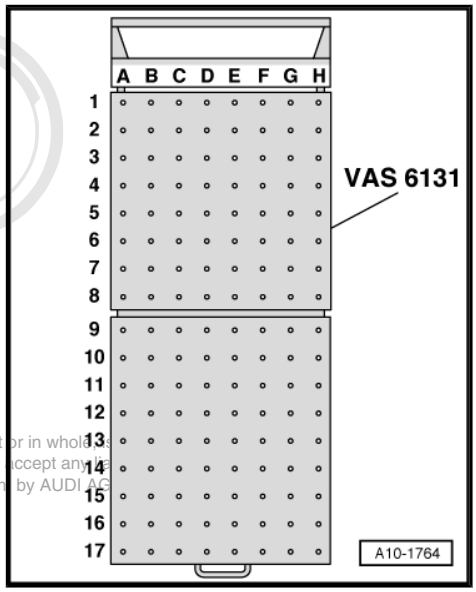
A second mechanic is required for removing the subframe.

– Take out subframe to the side.



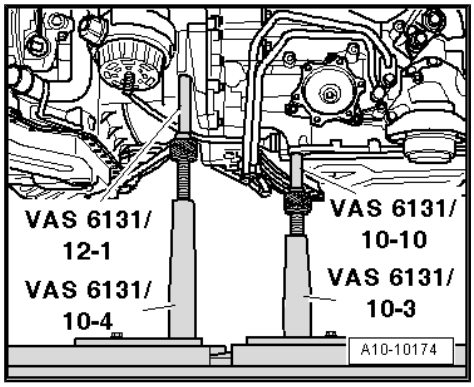
– Set up scissor-type assembly platform - VAS 6131 A- with support set for Audi - VAS 6131/10- and supplementary set - VAS 6131/11- and -VAS 6131/12- as follows:

Platform coordinates	Parts of support set for Audi - VAS 6131/10- , support set -VAS 6131/11- and supplementary set - VAS 6131/12-			
B3 1)	/10-1	/10-4	/10-5	/10-11
F3 1)	/10-1	/10-4	/10-5	/10-11
B7	/10-1	/10-4	/10-5	/12-1
F7	/10-1	/10-4	/10-5	/11-2
B10	/10-1	/10-3	/10-5	/10-10
G10	/10-1	/10-3	/10-5	/11-3
G14 1)	/10-1	/10-4	/10-5	/10-12
D15 1)	/10-1	/10-4	/10-5	/10-13
• 1) Support elements remain unchanged.				

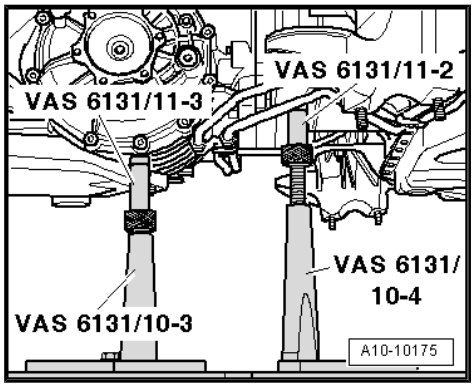


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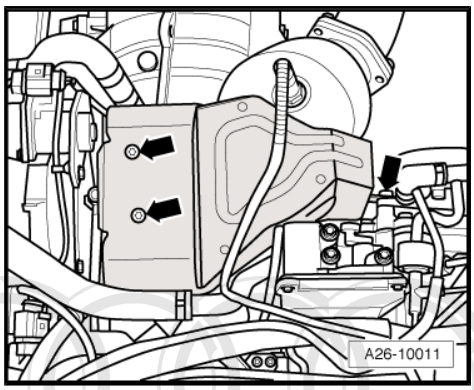
– Position the support elements from -VAS 6131/10- and -VAS 6131/12- at left of engine/gearbox assembly as shown in illustration.



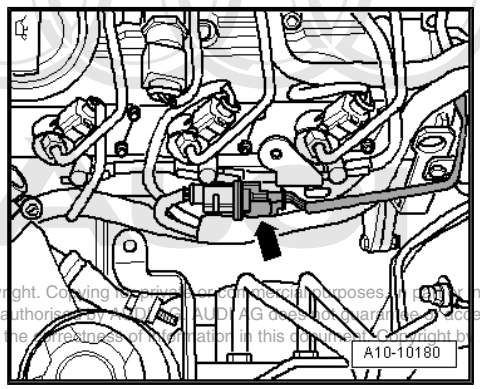
– Position the support elements from -VAS 6131/10- and -VAS 6131/11- at right of engine/gearbox assembly as shown in illustration.
– Turn spindles for support elements upwards until all locating lugs make contact with mounting points.
– Tighten base plates for support elements to 20 Nm on scissor-type assembly platform - VAS 6131 A- .



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



– Remove electrical connector -arrow- for Lambda probe - G39- from bracket and unplug connector.
– Move clear electrical wiring for Lambda probe.



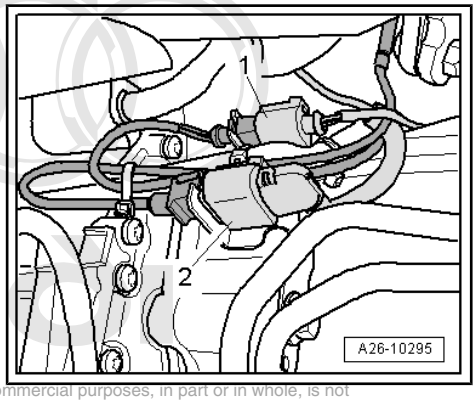
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– Detach electrical connectors from bracket at front left of gearbox and unplug:

1 - For exhaust gas temperature sender 3 - G495-

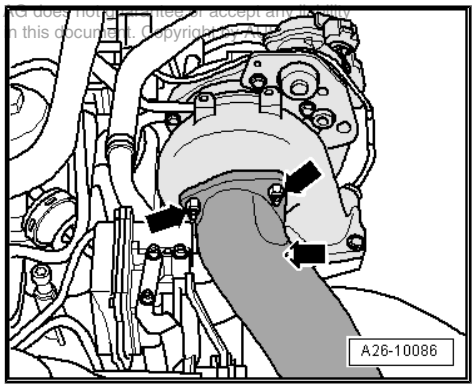
2 - For engine speed sender - G28-

– Move electrical wiring clear.



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– Remove nuts -arrows- securing starter catalytic converter to turbocharger.

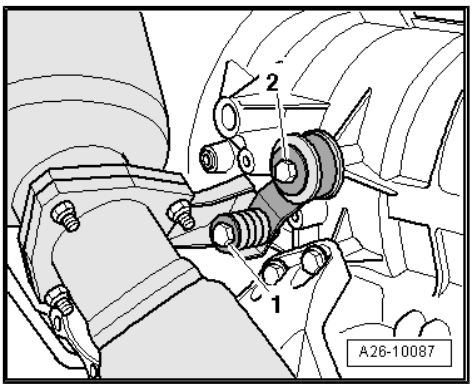


– Remove bolt -1- at bracket for starter catalytic converter.

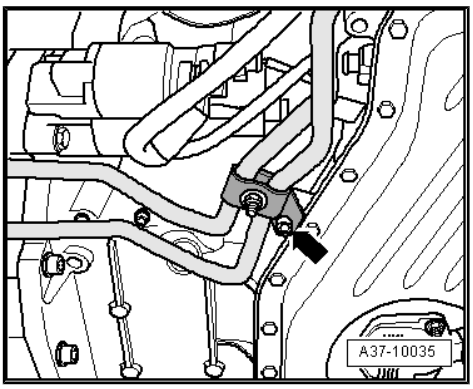
Note

Disregard -item 2-.

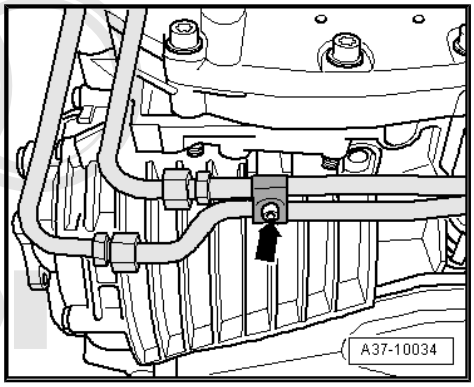
– Detach starter catalytic converter and front exhaust pipe.



– Remove bolt -arrow- securing bracket for ATF lines on sump (top section).



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



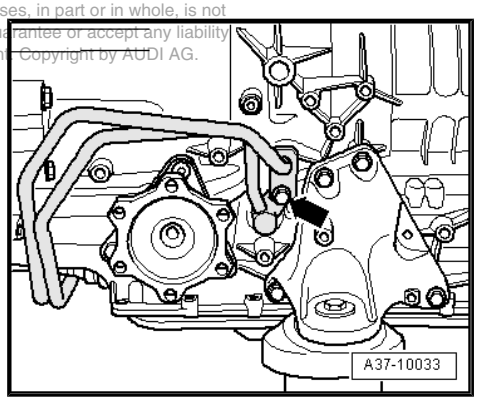
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Note

- *Observe rules for cleanliness when working on automatic gearbox ⇒ Rep. gr. 00 .*
- *Lay a cloth under the ATF lines to catch escaping ATF fluid.*

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

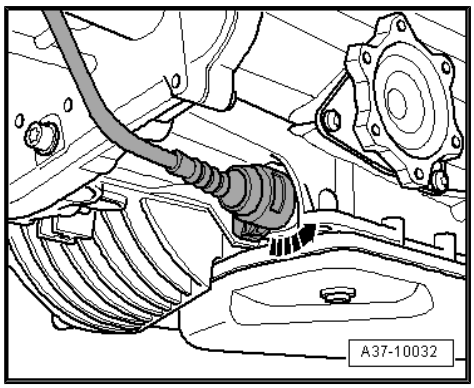
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .



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.***



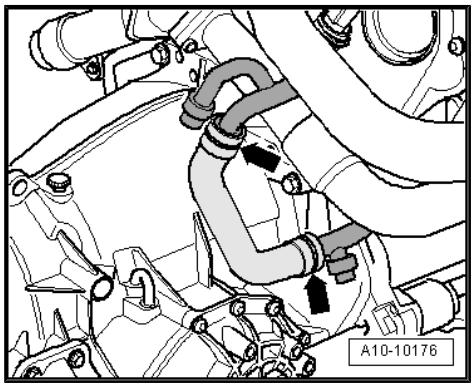
– Touch gearbox housing with your hand (without wearing gloves) to eliminate static charge.

– Turn retainer catch anti-clockwise -arrow- and unplug electrical connector on left of gearbox.

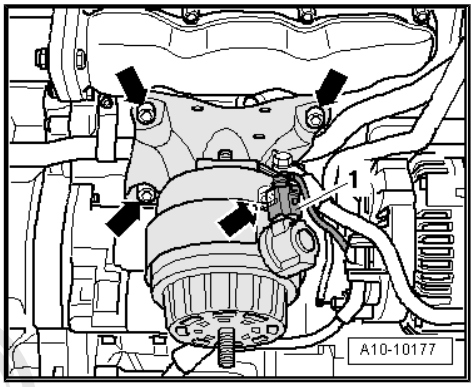
Note

Lay a cloth under the connection to catch escaping coolant.

– Lift retaining clips -arrows- and disconnect coolant hose.



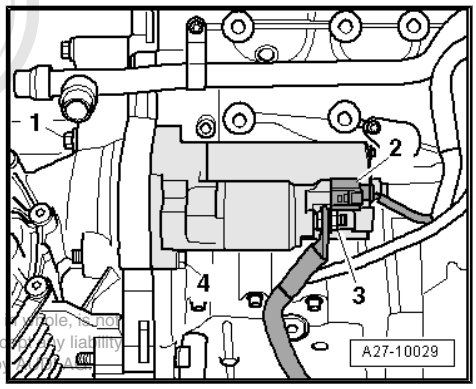
– Unplug electrical connector -1- for right electrohydraulic engine mounting solenoid valve - N145- .
– Move electrical wiring clear at console for engine mounting.
– Unscrew bolts -arrows- and remove engine support (right-side).



Note

For illustration purposes, the installation position is shown without console for engine mounting.

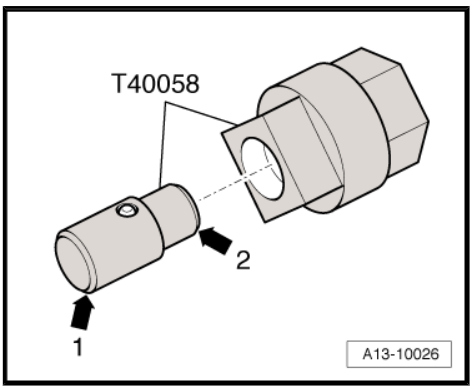
– Remove nut -3- for battery positive cable.
– Unplug electrical connector -2-.
– Unscrew bolts -1- and -4- and remove starter.



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

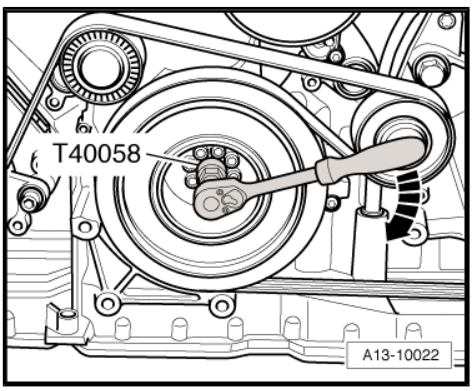
• The larger-diameter section -arrow 1- faces towards the engine.
• The smaller-diameter section -arrow 2- faces the adapter.



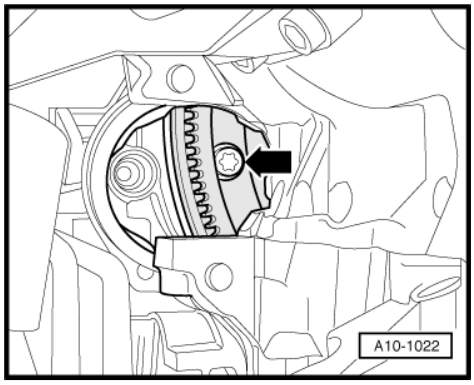
– Counterhold crankshaft using adapter - T40058- when slackening bolts for torque converter.

Note

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

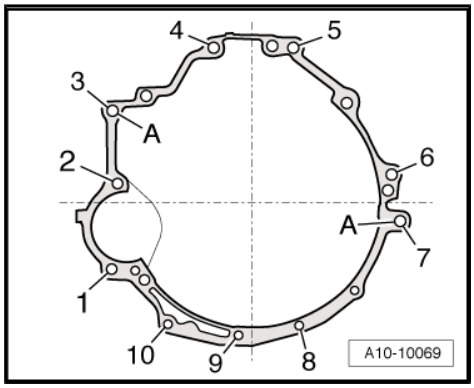


– Remove 3 bolts -arrow- for torque converter through opening for starter (turn crankshaft 120° each time).

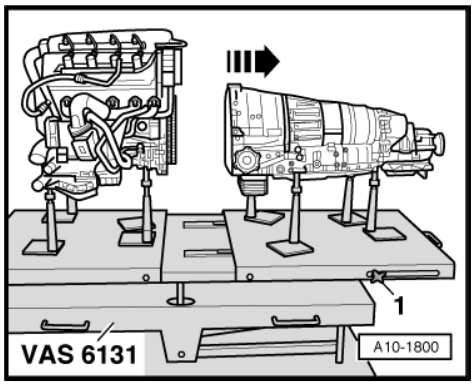


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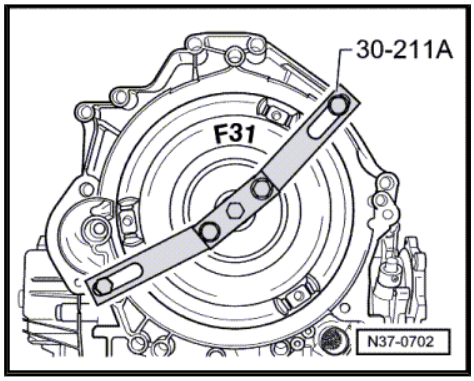
– Remove bolts -3 ... 10- securing gearbox to engine.



– 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-.



– Secure the torque converter in the gearbox using support bridge - 30 - 211 A- to prevent it falling out.



3.3 Installing engine

Tightening torques

Note

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

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

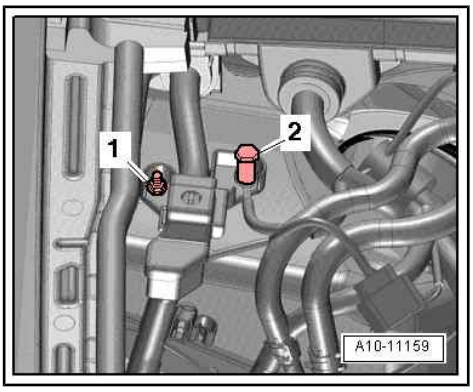
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Assembly mountings ⇒ page 101

Positive terminal and earth stud

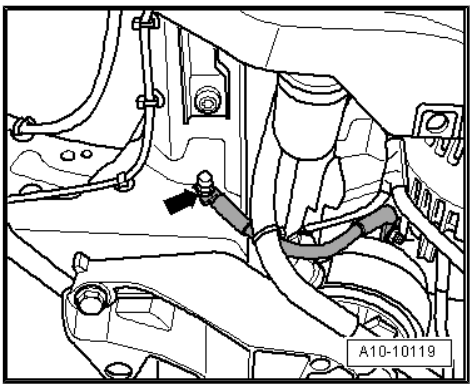
– Tighten nut -1- for positive terminal to 20 Nm.

– Tighten earth stud -2- to 9 Nm.



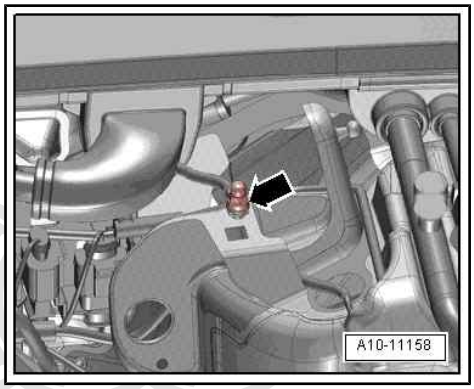
Earth connection on longitudinal member (right-side)

– Tighten nut -1- to 15 Nm.



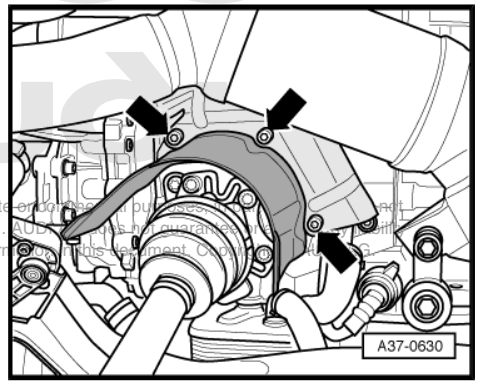
Earth connection to suspension turret (left-side)

– Tighten nut -arrow- to 9 Nm.



Heat shield for drive shaft

– Tighten bolts -arrows- to 23 Nm.

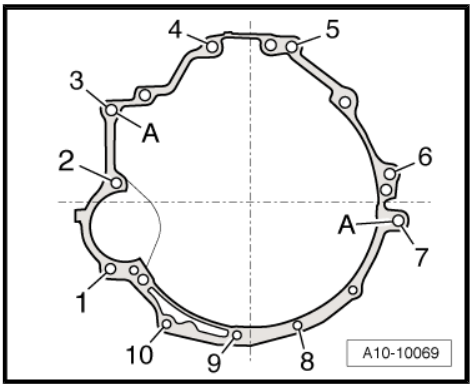


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Engine to automatic gearbox

Item	Bolt	Nm
1 [1]	M10x80	65
2 [1]	M10x100	65
3	M12x100	65
4, 5	M12x110	65
6, 7	M12x120	65
8, 9, 10	M10x80	45
A	Dowel sleeves for centralising	

• [1] Also secures starter; property class 10.9



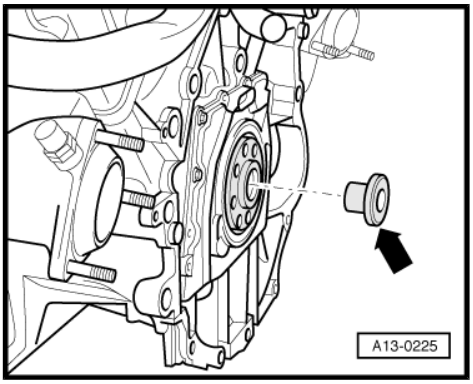
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Procedure

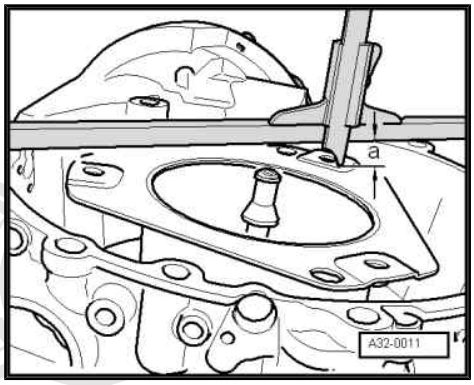
Note

- *Renew the bolts tightened with specified tightening angle.*
- *Renew self-locking nuts and bolts as well as seals, gaskets and O-rings.*
- *To secure torque converter on drive plate, use only new bolts of the correct type (same as original equipment) as specified in ⇒ Electronic parts catalogue .*
- *The threaded holes in the flange shaft for the propshaft on the gearbox must be cleaned of remaining locking fluid with a thread tap before assembling.*
- *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.*
- *Fit all cable ties in the original positions when installing.*

– Before installing an exchange engine in a vehicle with automatic gearbox, check whether the centralising bush -arrow- for the torque converter is fitted at the rear of the crankshaft.



Checking installation depth of torque converter

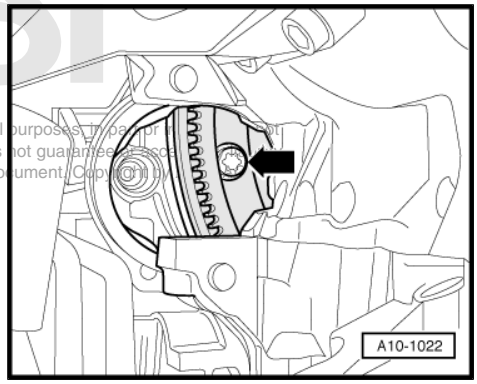


Caution

Risk of damage to drive lug of ATF pump if torque converter is installed incorrectly.

- ***Check installation depth of torque converter.***

- If the torque converter has been correctly installed, the distance -a- between the contact surfaces at the threaded holes in the torque converter and the joint surface on the torque converter bellhousing for automatic gearbox 09L is at least 19 mm.



– Before bringing engine and gearbox together, turn torque converter and drive plate on engine so that the holes for one securing bolt are in line with the opening for the starter motor -arrow-.

– Press intermediate plate between engine and gearbox onto dowel sleeves.

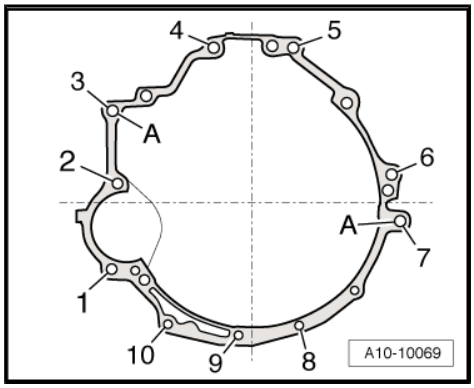
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Caution

Risk of damage to gearbox if torque converter is installed incorrectly.

- ***Before and during tightening of bolts securing engine to gearbox, continually check that the torque converter behind the drive plate can be turned.***
- ***If the torque converter cannot be turned, the drive lugs of the ATF pump and consequently the gearbox will be damaged when the bolts are finally tightened.***

– Tighten bolts securing torque converter ⇒ Rep. gr. 37 .



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

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

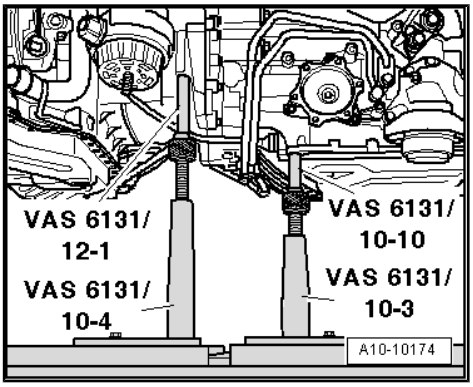
– Secure ATF lines ⇒ Rep. gr. 37 .

– Install starter ⇒ Electrical system; Rep. gr. 27 .

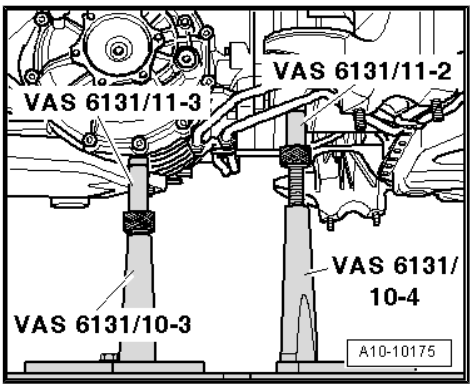
– Install engine mounting with engine support ⇒ page 101 .

– Install starter catalytic converter ⇒ page 348 .

– Screw down spindles of support elements on left side of engine/gearbox assembly.
– Unscrew base plates for support elements (left-side) from scissor-type assembly platform - VAS 6131 A- .



– Screw down spindles of support elements on right side of engine/gearbox assembly.
– Unscrew base plates for support elements (right-side) from scissor-type assembly platform - VAS 6131 A- .



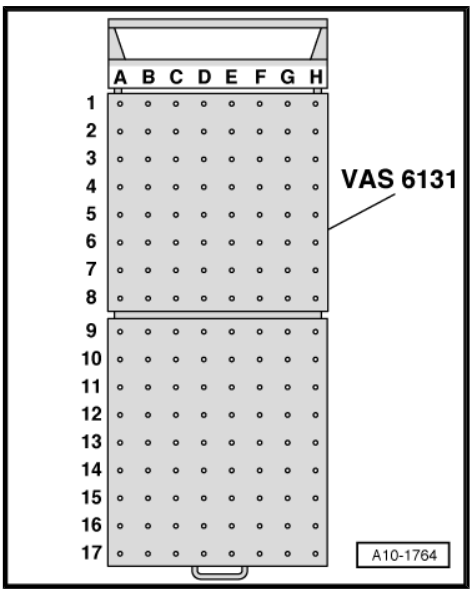
Note

The mounting points for engine (front) and gearbox (rear) remain unchanged.

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

Platform coordinates	Parts from support set for Audi - VAS 6131/10-			
B3 1)	/10-1	/10-4	/10-5	/10-11
F3 1)	/10-1	/10-4	/10-5	/10-11
B10	/10-1	/10-2	/10-5	/10-8 2)
G10	/10-1	/10-2	/10-5	/10-8 2)
G14 1)	/10-1	/10-4	/10-5	/10-12
D15 1)	/10-1	/10-4	/10-5	/10-13

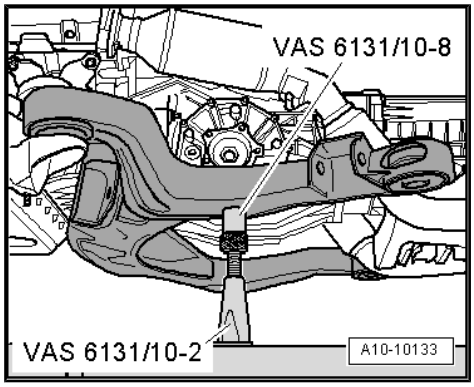
- 1) Support elements remain unchanged.
- 2) Secure support elements only after installing the subframe.



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Note

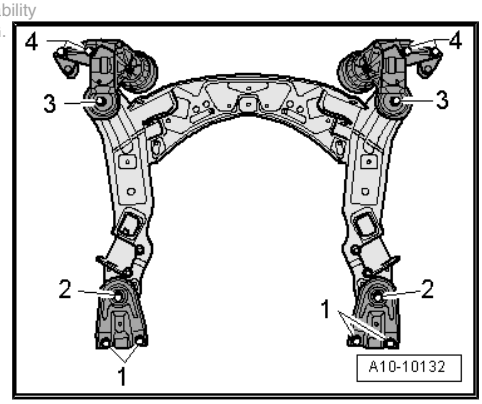
A second mechanic is required for positioning the subframe on the support elements.



- Fit subframe on both support elements -VAS 6131/10-8- .
- Install gearbox mounting ⇒ Rep. gr. 37 .
- Screw up spindles of support elements on both sides.
- Tighten base plates for support elements to 20 Nm on scissor-type assembly platform - VAS 6131 A- .
- Guide engine/gearbox assembly together with subframe into body from below using scissor-type assembly platform - VAS 6131 A- .

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- Align subframe and consoles for engine mounting on longitudinal members according to markings made before removal.
- Tighten bolts for subframe and consoles for engine mountings only to specified torque (do not turn further); the bolts are only fully tightened after performing the wheel alignment check ⇒ Rep. gr. 40 .

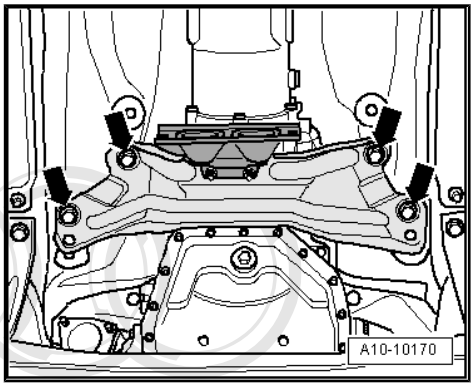


WARNING

Risk of accident because of loose bolt connections.

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

– Install tunnel cross member ⇒ Rep. gr. 37 .

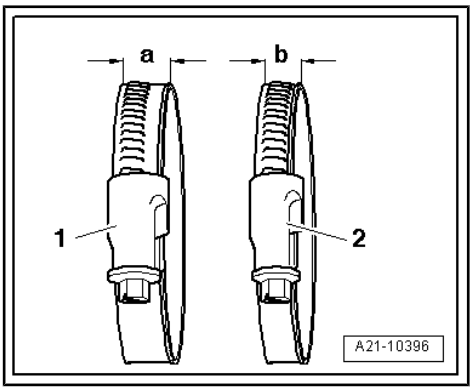


Remaining installation steps are carried out in reverse sequence; note the following:

– Install selector lever cable and check adjustment ⇒ Rep. gr. 37 .
– Install propshaft ⇒ Rear final drive 01R; Rep. gr. 39 , ⇒ Rear final drive 0AR; Rep. gr. 39 , ⇒ Rear final drive 08V; Rep. gr. 39 .
– Install particulate filter ⇒ page 342 .
– Align the exhaust system so it is free of stress ⇒ page 359 .
– Install drive shafts, guide links, track control links, anti-roll bar, coupling rod and suspension struts ⇒ Rep. gr. 40 .
– Install heat shield for drive shaft ⇒ page 92 .
– Install covers for drive shafts ⇒ Rep. gr. 66 .
– Install front cross piece ⇒ Rep. gr. 50 .
– Install refrigerant lines ⇒ Rep. gr. 87 .
– Install hydraulic line ⇒ Rep. gr. 48 .
– Install throttle valve module - J338- and engine control unit ⇒ Rep. gr. 23 .
– Install torque reaction support ⇒ page 110 .
– Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations, ⇒ Electrical system; Rep. gr. 97 , ⇒ page 91 , ⇒ page 91 , ⇒ page 92 .
– Install cover for electronics box in plenum chamber ⇒ Electrical system; Rep. gr. 97 .
– Install fuel filter ⇒ Rep. gr. 20 .
– Install air cleaner housing ⇒ Rep. gr. 23 .

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– Install air hoses with screw-type clips ⇒ page 326 .
– Observe notes on procedure for connecting the battery ⇒ Electrical system; Rep. gr. 27 .



Caution

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

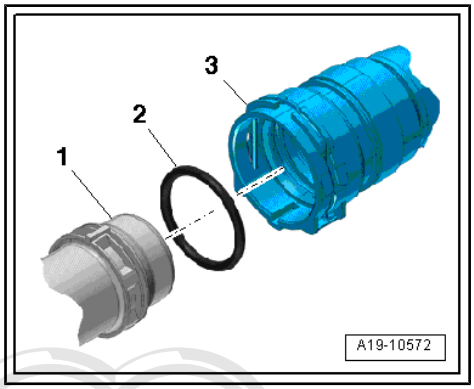
- ***Never use battery charging equipment for boost starting.***

– Install and adjust wiper arms ⇒ Electrical system; Rep. gr. 92 .
– Install body brace ⇒ Rep. gr. 40 .
– Check oil level ⇒ Maintenance ; Booklet 405 .
– Fill up hydraulic fluid for power steering ⇒ Rep. gr. 48 .

Note

The power steering pump must not be run when dry.

– Connect coolant hoses with plug-in connector ⇒ page 295 .
– Charge refrigerant system ⇒ Air conditioner with refrigerant R134a .
– Fill up with coolant ⇒ page 266 .



Note

- *If radiator, heat exchanger, cylinder head, cylinder head gasket or cylinder block have been renewed, do not re-use old coolant.*
- *Contaminated or dirty coolant must not be used again.*

– Check ATF level ⇒ Rep. gr. 37 .
– Align subframe and both consoles for engine mountings ⇒ Rep. gr. 40 .
– Fit front wheels ⇒ Wheels and tyres; Rep. gr. 44 .
– Perform wheel alignment check ⇒ Rep. gr. 44 .

WARNING

Risk of accident because of loose bolt connections.

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

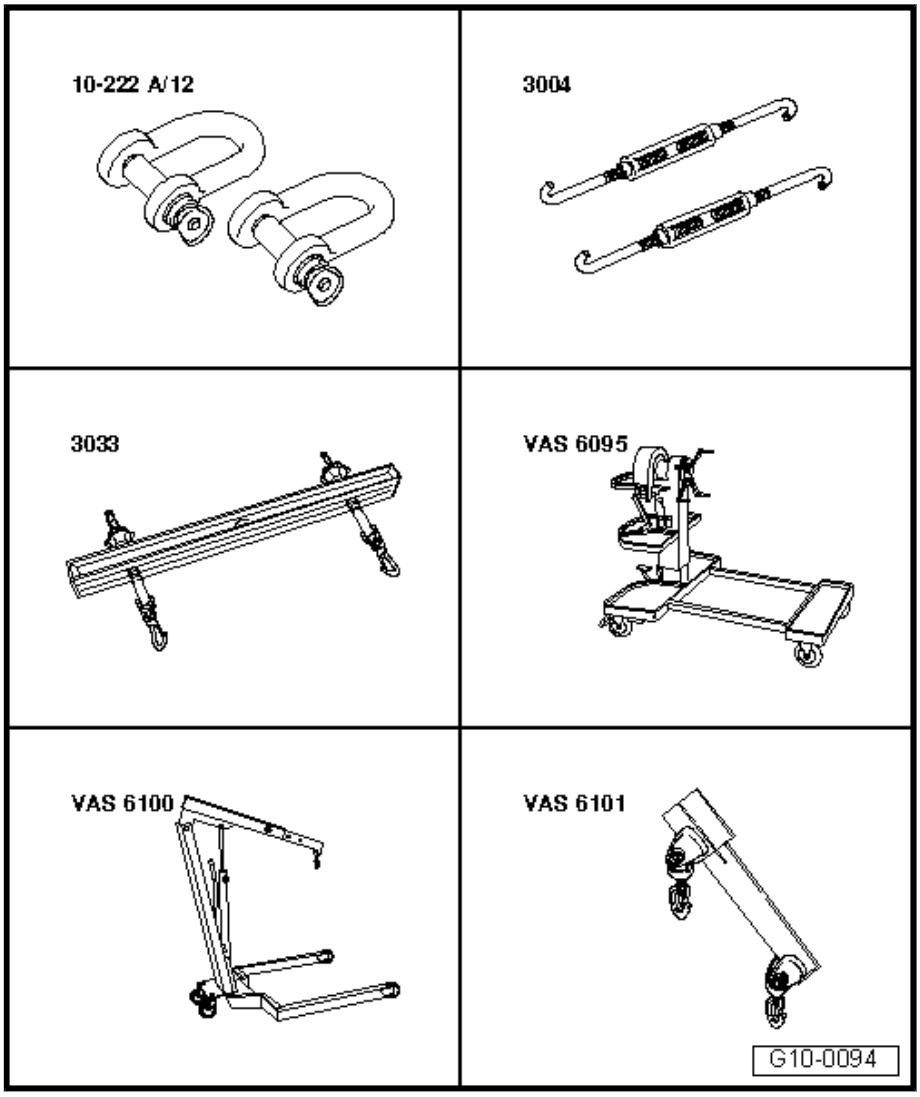
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– Check fuel system for leaks ⇒ page 7 .
– Install noise insulation panels ⇒ Rep. gr. 50 .

4 Securing engine to engine and gearbox support

Special tools and workshop equipment required

- Shackle - 10 - 222 A /12-
- Hook - 3004-
- Lifting tackle - 3033-
- Engine and gearbox support - VAS 6095- with bracket for V6 TDI engine - VAS 6095/1-4-
- Workshop hoist - VAS 6100-
- Lift arm extension (workshop hoist) - VAS 6101-



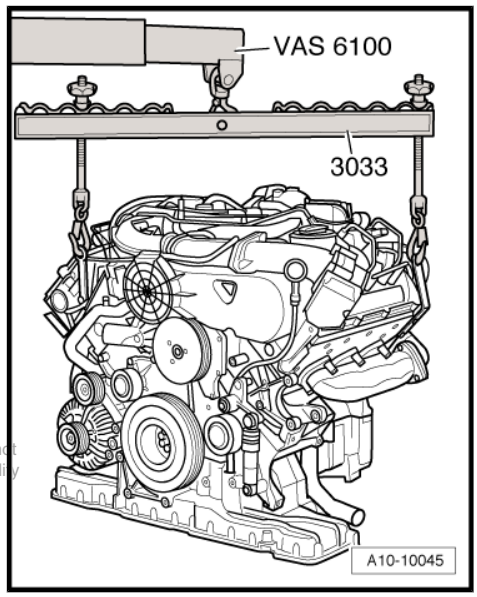
Procedure

- Engine separated from gearbox.

Note

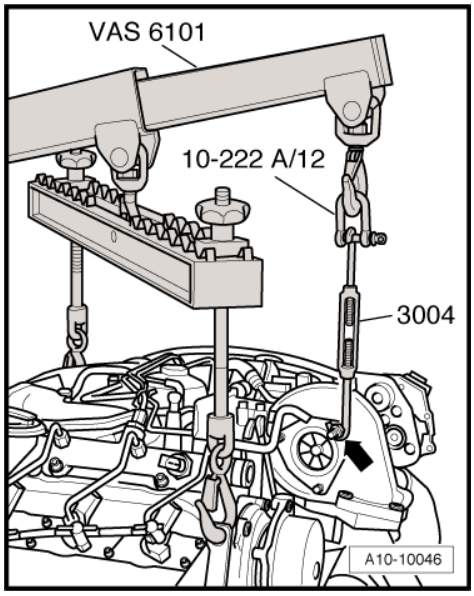
Only for scissor-type assembly platform - VAS 6131- : for better accessibility with workshop hoist - VAS 6100- it is advisable to remove the sliding bar from scissor-type assembly platform - VAS 6131- .

– Attach lifting tackle - 3033- to workshop hoist - VAS 6100- , as shown in illustration.

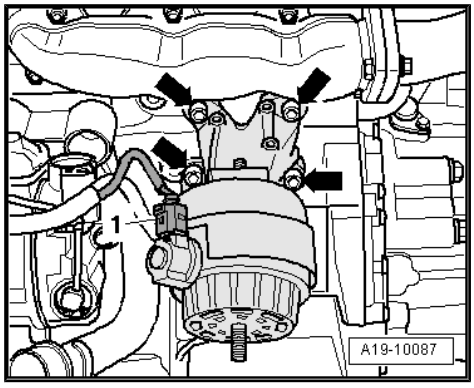


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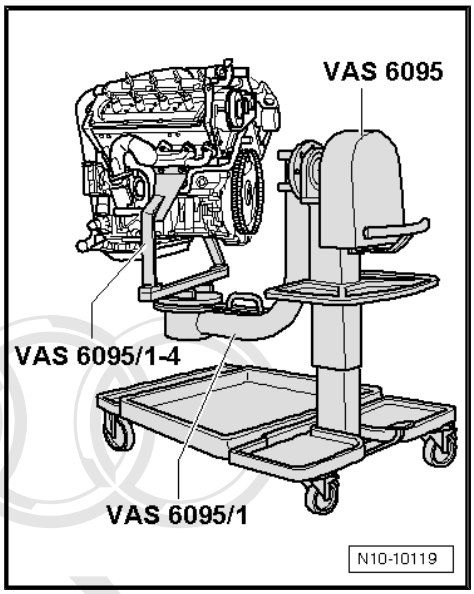
– Screw a nut -arrow- approx. 4 turns onto threaded pin on turbocharger.
– Attach lift arm extension/workshop hoist - VAS 6101- with shackle - VAS 6100- and hook - 10 - 222 A /12- to workshop hoist - 3004- and apply hook onto threaded pin.
– Tension hook - 3004- so that engine is taken up horizontally.
– Lift engine off support elements on scissor-type assembly platform -VAS 6131 A- .



– Unplug electrical connector -1- on left electrohydraulic engine mounting solenoid valve - N144- .
– Unscrew bolts -arrows- and remove engine support (left-side).



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



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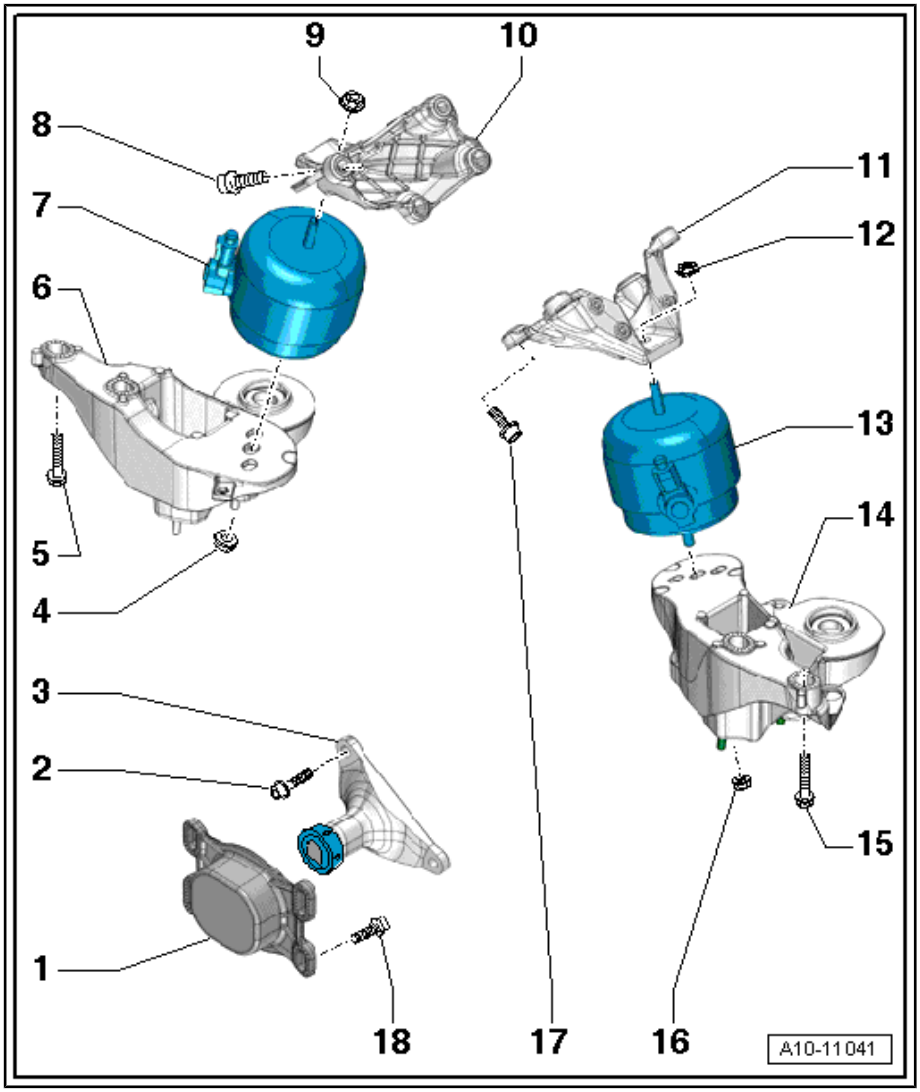
5 Assembly mountings

Overview

- ⇒ “5.1 Assembly mountings - exploded view”, page 101
- ⇒ “5.2 Removing and installing engine mounting (left-side)”, page 102
- ⇒ “5.3 Removing and installing engine mounting (right-side)”, page 106
- ⇒ “5.4 Removing and installing torque reaction support”, page 110

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5.1 Assembly mountings - exploded view



1 - Stop for torque reaction support

- ❑ Installation instructions ⇒ “5.4 Removing and installing torque reaction support”, page 110

2 - Bolt

- ❑ 40 Nm

3 - Torque reaction support

- ❑ Removing and installing ⇒ page 110

4 - Nut

- ❑ 40 Nm

5 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 40

6 - Console for engine mounting (right-side)

7 - Engine mounting (right-side)

- ❑ With right electrohydraulic engine mounting solenoid valve - N145-
- ❑ Removing and installing ⇒ page 106

8 - Bolt

- ❑ 40 Nm

9 - Nut

- ❑ 40 Nm

10 - Engine support (right-side)

- ❑ Removing and installing ⇒ “5.3 Removing and installing engine mounting (right-side)”, page 106

11 - Engine support (left-side)

- ❑ Removing and installing ⇒ “5.2 Removing and installing engine mounting (left-side)”, page 102

12 - Nut

- ❑ 40 Nm

13 - Engine mounting (left-side)

- ❑ Left electrohydraulic engine mounting solenoid valve - N144-

- ❑ Removing and installing ⇒ page 102

14 - Console for engine mounting (left-side)

15 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 40

16 - Nut

- ❑ 40 Nm

17 - Bolt

- ❑ 40 Nm

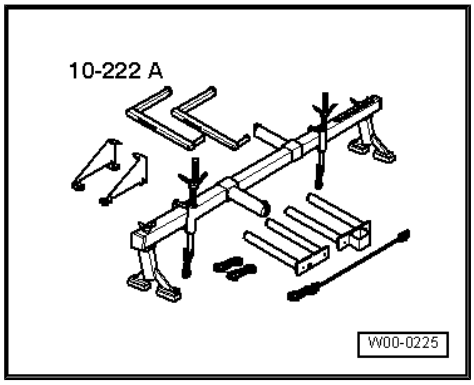
18 - Bolt

- ❑ 40 Nm

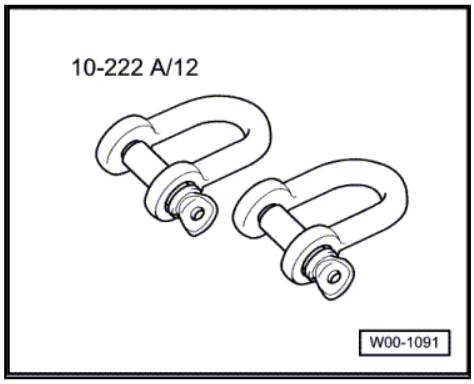
5.2 Removing and installing engine mounting (left-side)

Special tools and workshop equipment required

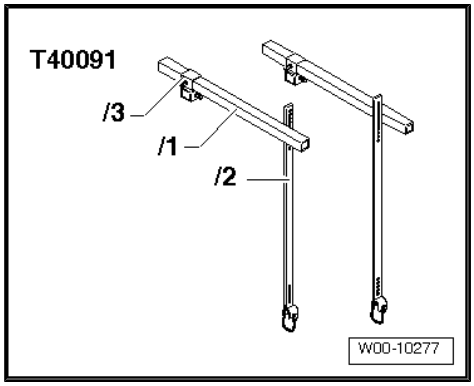
- ♦ Support bracket - 10 - 222 A-



- ♦ Shackle - 10 - 222 A /12-

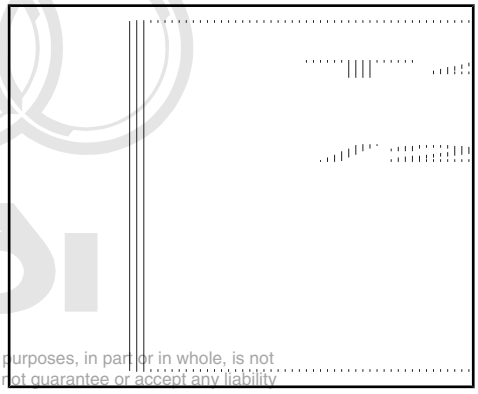


- ♦ Engine support bracket (basic set) - T40091-



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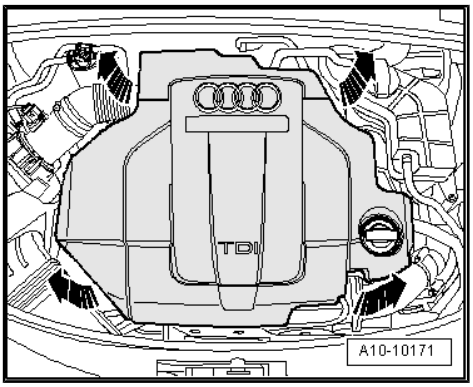
♦ Engine support bracket (supplementary set) - T40093-



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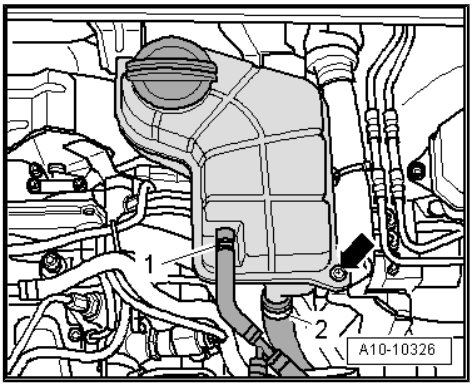
Removing

– Carefully pull engine cover panel off four retaining pins one after the other -arrows-.

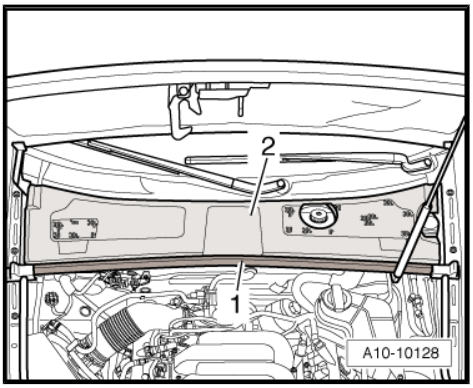


– Remove bolt -arrow-.

– 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.

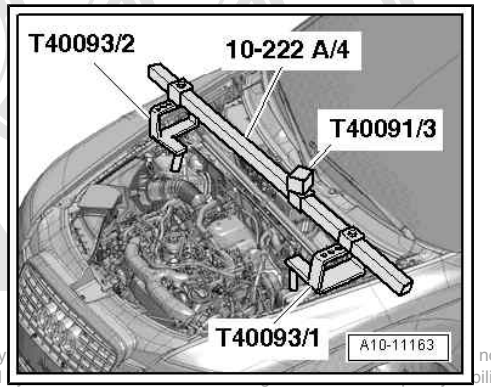


– Pull off seal -1- and remove plenum chamber cover -2-.



– Set up adapter - 10 - 222 A /4- with connecting piece - T40091/3- and supports -T40093/1- and -T40093/2- on suspension turrets as illustrated.

• Supports are marked for left and right side of vehicle.



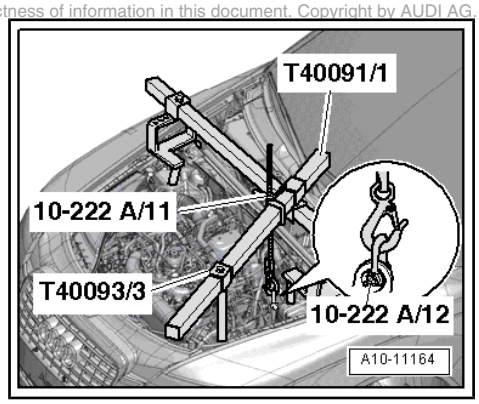
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– Attach further components of support bracket - 10 - 222 A- , - T40091- and -T40093- as shown in illustration. Position support -T40093/3- onto flange of longitudinal member (left-side).

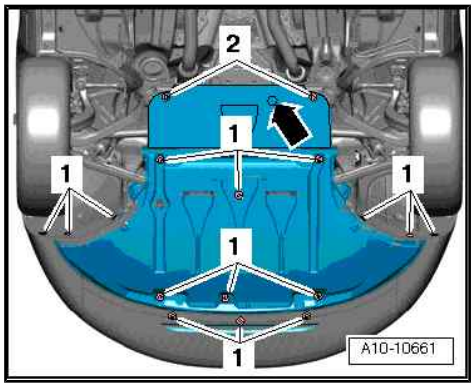
– Engage hook - 10 - 222 A /10- at engine lifting eye (left and right).

– Additionally attach shackle - 10 - 222 A /12- at engine lifting eye (left-side).

– Take up weight of engine with spindle.



– Remove front and rear noise insulation ⇒ Rep. gr. 50 .

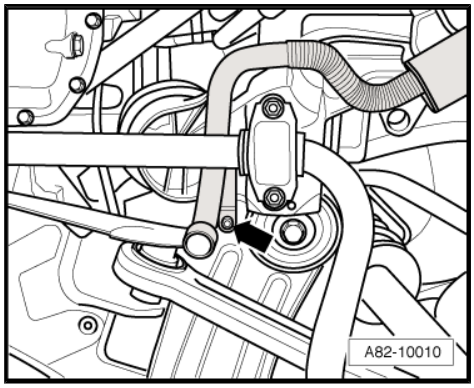


Vehicles with auxiliary heater:

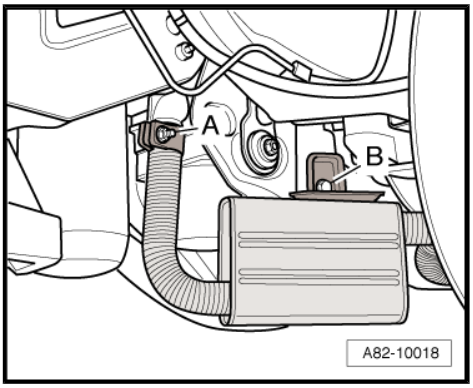
– Remove front wheel (left-side) ⇒ Wheels and tyres; Rep. gr. 44 .

– Remove front left wheel housing liner ⇒ Rep. gr. 66 .

– Remove bolt -arrow- for corrugated exhaust pipe.



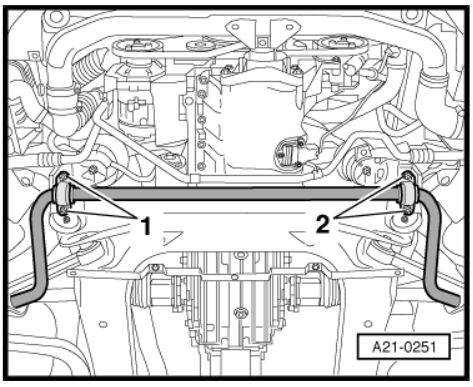
– Slacken nut -A- on clamp for corrugated exhaust pipe.
– Remove bolt -B- and detach exhaust silencer with corrugated exhaust pipes.



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All vehicles (continued):

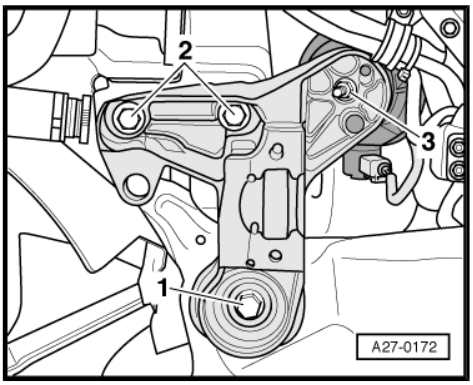
– Remove bolts -1- and -2- for anti-roll bar mounting on both sides and slightly lower anti-roll bar.



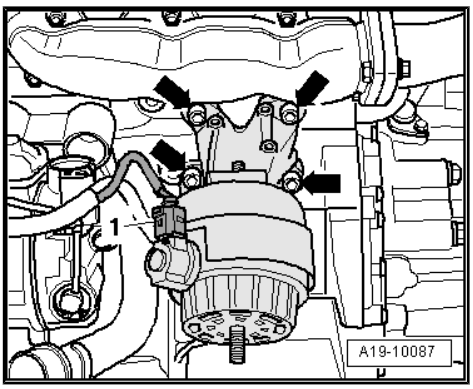
– Remove nut -3-.
– Remove bolts -1- and -2- and take off console for engine mounting (left-side).

Note

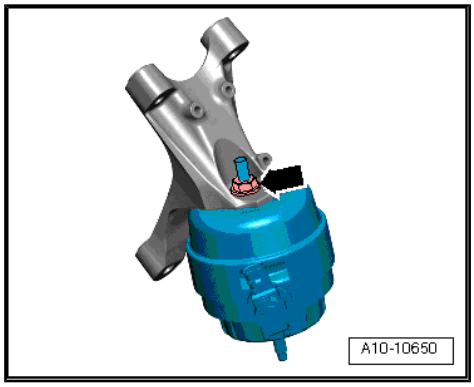
The procedure is illustrated for the console for engine mounting (right-side).



– Unplug electrical connector -1- on left electrohydraulic engine mounting solenoid valve - N144- .
– Remove bolts -arrows- and detach engine support with engine mounting.



– Remove nut -arrow- and detach engine mounting from engine support.



Installing

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

- Tightening torques
  ⇒ “5.1 Assembly mountings - exploded view”, page 101

Note

♦ *Renew the bolts tightened with specified tightening angle.*

♦ *Fit all cable ties in the original positions when installing.*

– Install subframe and anti-roll bar ⇒ Rep. gr. 40 .

– On vehicles with auxiliary heater: install exhaust silencer with corrugated exhaust pipes ⇒ Rep. gr. 82 .

– Install front wheel housing liner ⇒ Rep. gr. 66 .

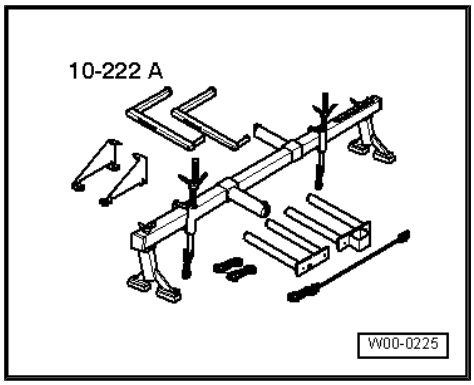
– Fit front wheel ⇒ Wheels and tyres; Rep. gr. 44 .

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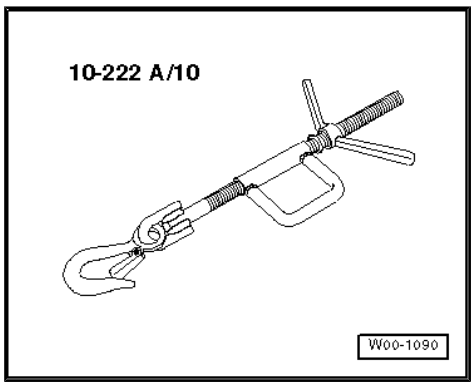
5.3 Removing and installing engine mounting (right-side)

Special tools and workshop equipment required

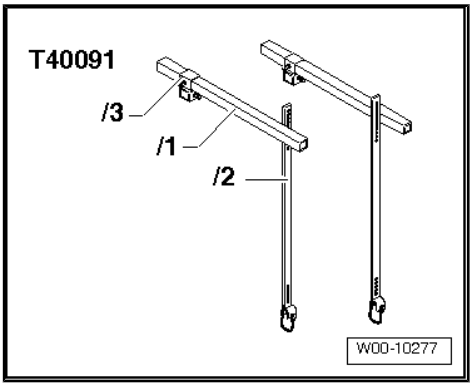
♦ Support bracket - 10 - 222 A-



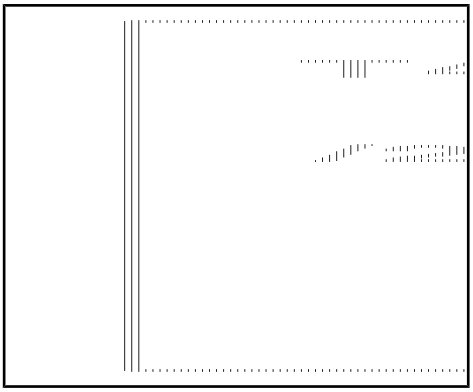
♦ Hook - 10 - 222 A /10-



♦ Engine support bracket (basic set) - T40091-



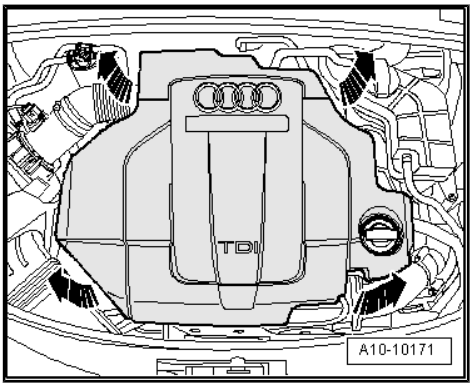
♦ Engine support bracket (supplementary set) - T40093-



Removing

– Carefully pull engine cover panel off four retaining pins one after the other -arrows-.

– Remove air cleaner housing ⇒ Rep. gr. 23 .



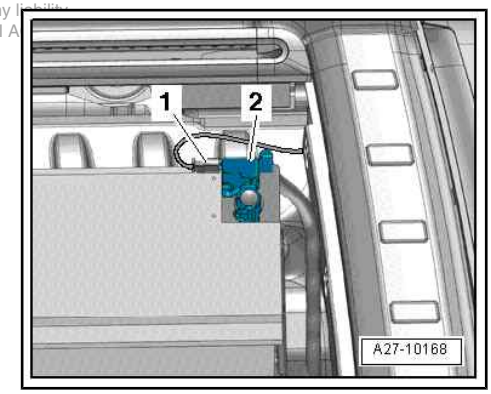
Caution

To prevent irreparable damage to the electronic components when disconnecting the battery:

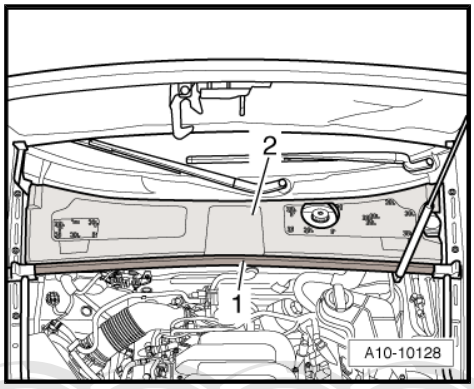
♦ ***Observe notes on procedure for disconnecting the battery.***

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– Disconnect battery ⇒ Electrical system; Rep. gr. 27 .

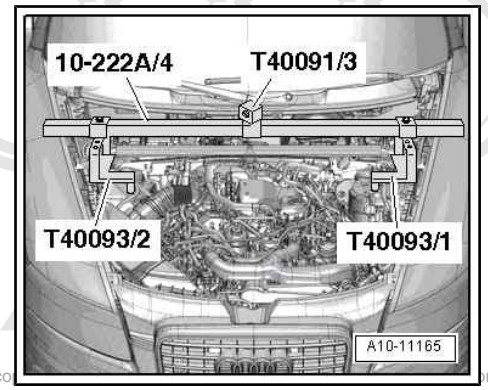


– Pull off seal -1- and remove plenum chamber cover -2-.



– Set up adapter - 10 - 222 A /4- with connecting piece - T40091/3- and supports -T40093/1- and -T40093/2- on suspension turrets.

• Supports are marked for left and right side of vehicle.

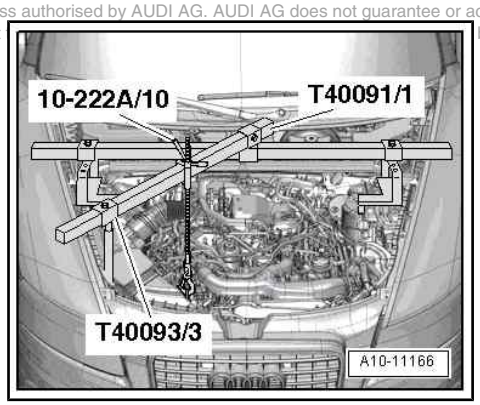


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– Attach further components of support bracket - 10 - 222 A-, - T40091- and -T40093- as shown in illustration. Position support -T40093/3- onto flange of longitudinal member.

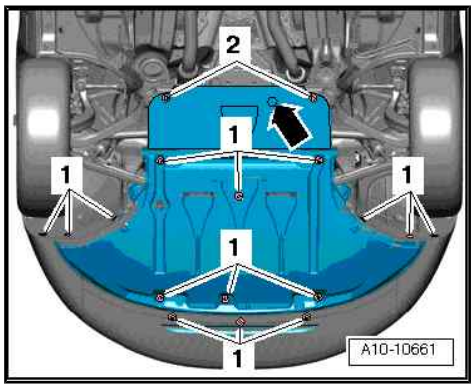
– Engage hook - 10 - 222 A /10- at engine lifting eye (left-side).

– Take up weight of engine with spindle.

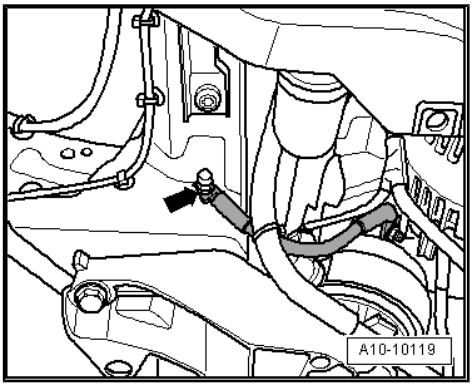


– Remove front wheel (right-side) ⇒ Wheels and tyres; Rep. gr. 44 .

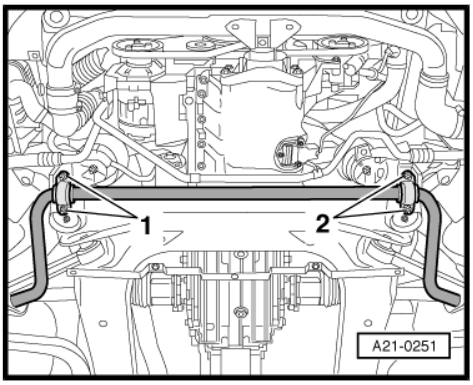
– Remove front and rear noise insulation ⇒ Rep. gr. 50 .



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

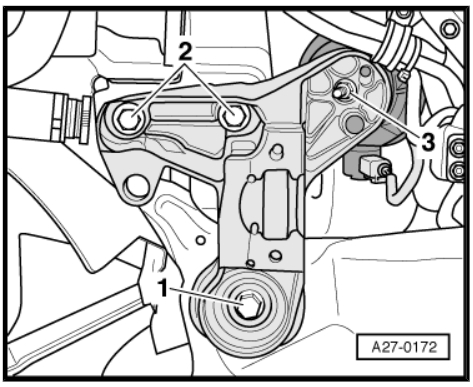


– Remove nuts -1- and -2- for anti-roll bar mounting on both sides and slightly lower anti-roll bar.

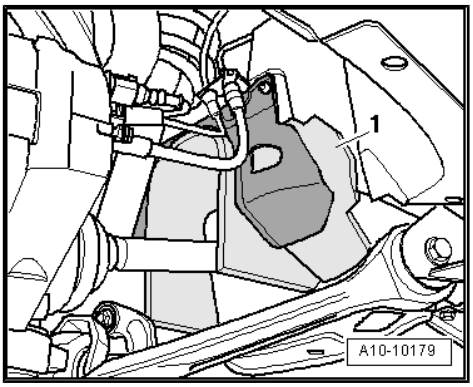


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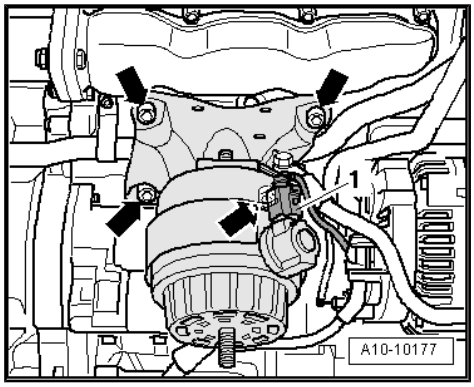
– Remove nut -3-.
– Remove bolts -1- and -2- and take off console for engine mounting (right-side).



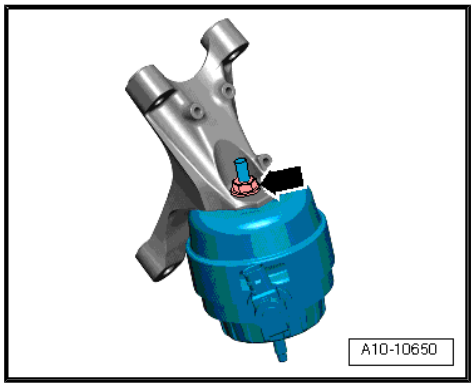
– Remove cover -1- for drive shaft in wheel housing (right-side).



– Unplug electrical connector -1- on right electrohydraulic engine mounting solenoid valve - N145- .
– Remove bolts -arrows- and detach engine support with engine mounting.



– Remove nut -arrow- and detach engine mounting from engine support.



Installing

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

- Tightening torques
⇒ “5.1 Assembly mountings - exploded view”, page 101

Note

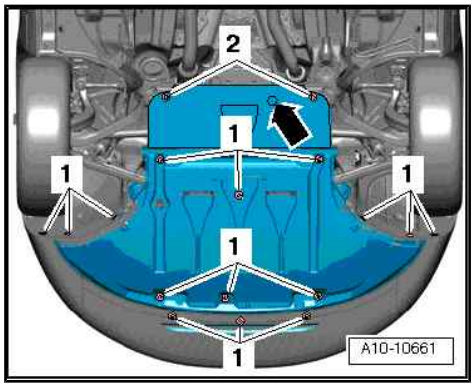
- *Renew the bolts tightened with specified tightening angle.*
- *Fit all cable ties in the original positions when installing.*

– Install subframe and anti-roll bar ⇒ Rep. gr. 40 .
– Tighten earth connection on longitudinal member (right-side) ⇒ page 33 .
– Install cover for drive shaft ⇒ Rep. gr. 66 .
– Fit front wheel ⇒ Wheels and tyres; Rep. gr. 44 .
– Install air cleaner housing ⇒ Rep. gr. 23 .
– Observe notes on procedure for connecting the battery ⇒ Electrical system; Rep. gr. 27 .

5.4 Removing and installing torque reaction support

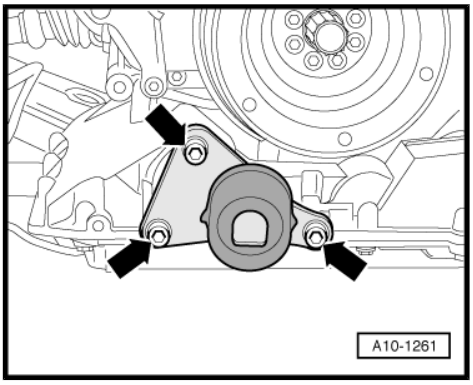
Removing

– Remove front and rear noise insulation ⇒ Rep. gr. 50 .



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– Unscrew bolts -arrows- and detach torque reaction support from engine.



Installing

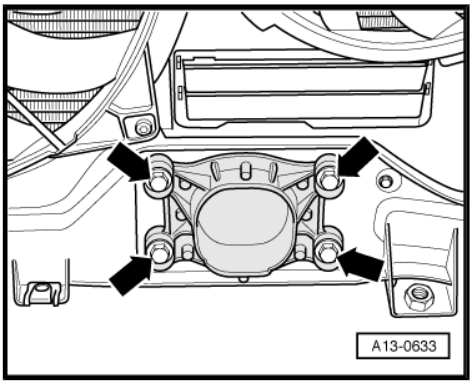
Installation is carried out in the reverse order; note the following:

- Tightening torques
  ⇒ “5.1 Assembly mountings - exploded view”, page 101

– Loosen bolts -arrows-.

– Allow stop for torque reaction support to rest on rubber buffer for torque reaction support under its own weight, and tighten bolts.

– Install noise insulation panels ⇒ Rep. gr. 50 .



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13 – Crankshaft group

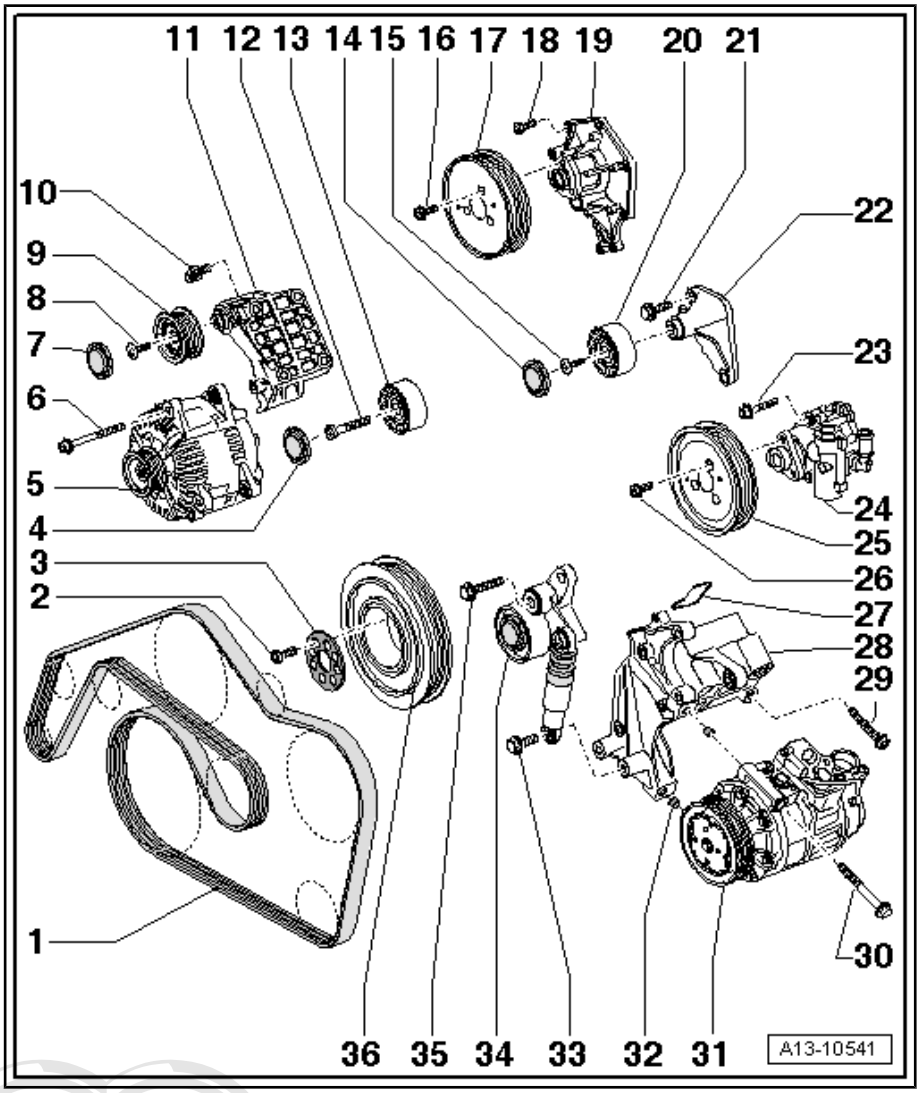
1 Cylinder block (pulley end)

Overview

- ⇒ “1.1 Poly V-belt drive - exploded view”, page 112
- ⇒ “1.2 Removing and installing poly V-belt”, page 115
- ⇒ “1.3 Removing and installing tensioner for poly V-belt”, page 117
- ⇒ “1.4 Removing and installing idler roller for poly V-belt”, page 118
- ⇒ “1.5 Removing and installing vibration damper with poly V-belt pulley”, page 120
- ⇒ “1.6 Removing and installing bracket for ancillaries”, page 120
- ⇒ “1.7 Oil seal and sealing flange (pulley end) - exploded view”, page 122
- ⇒ “1.8 Renewing crankshaft oil seal (pulley end)”, page 123
- ⇒ “1.9 Removing and installing sealing flange (pulley end)”, page 124

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1.1 Poly V-belt drive - exploded view



1 - Poly V-belt

- ❑ Check for wear
- ❑ Before removing, mark direction of rotation with chalk or felt-tip pen
- ❑ Removing and installing ⇒ page 115
- ❑ Do not kink
- ❑ When installing, make sure it is properly seated on pulleys

2 - Bolt

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

3 - Shim

- ❑ Renew

4 - Cover for idler roller (right-side)

5 - Alternator

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

6 - Bolt

- ❑ Tightening torque ⇒ Electrical system; Rep. gr. 27

7 - Cover for idler roller

8 - Bolt

- ❑ 23 Nm

9 - Idler roller for poly V-belt

- ❑ On bracket for alternator
- ❑ Note installation position

10 - Bolt

- ❑ Tightening torque and sequence ⇒ page 115

11 - Bracket for alternator and idler roller

12 - Bolt

- ❑ 23 Nm

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

- ❑ Note installation position

14 - Cover for idler roller (left-side)

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15 - Bolt

- ❑ 23 Nm

16 - Bolt

- ❑ Tightening torque ⇒ Item 1 (page 274)

17 - Poly V-belt pulley for coolant pump

- ❑ Removing and installing ⇒ “2.2 Removing and installing coolant pump”, page 275

18 - Bolt

- ❑ Tightening torque and sequence ⇒ page 275

19 - Coolant pump

- ❑ Removing and installing ⇒ page 275

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

- ❑ Removing and installing ⇒ page 118

21 - Bolt

- ❑ 23 Nm

22 - Bracket for idler roller

23 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 48

24 - Power steering pump

- ❑ Removing and installing ⇒ Rep. gr. 48

25 - Poly V-belt pulley for power steering pump

- ❑ Removing and installing ⇒ Rep. gr. 48

26 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 48

27 - Gasket

- ❑ Renew

28 - Bracket for ancillaries

- ❑ Removing and installing ⇒ page 120

29 - Bolt

- ❑ 40 Nm

30 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 87

31 - Air conditioner compressor

- ❑ Do not unscrew or disconnect refrigerant hoses or pipes
- ❑ Removing and installing ⇒ Rep. gr. 87
- ❑ When installing check dowel sleeves -item 32-

32 - Dowel sleeve

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

33 - Bolt

- ❑ 23 Nm

34 - Poly V-belt tensioner

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

- ❑ Removing and installing ⇒ page 117

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35 - Bolt

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

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

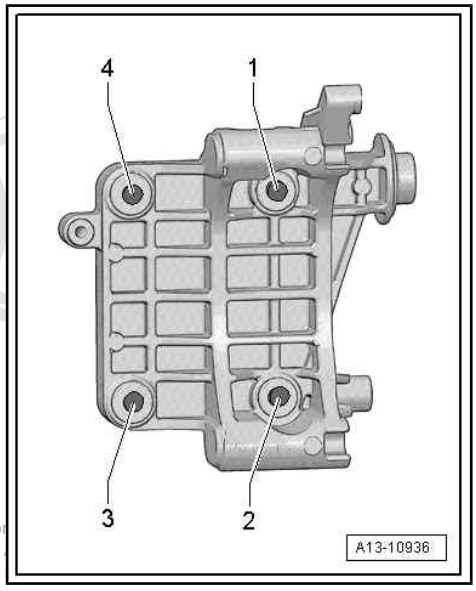
36 - Vibration damper with poly V-belt pulley

- ❑ Removing and installing ⇒ page 120

Bracket for alternator and idler roller - tightening torque and sequence

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

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

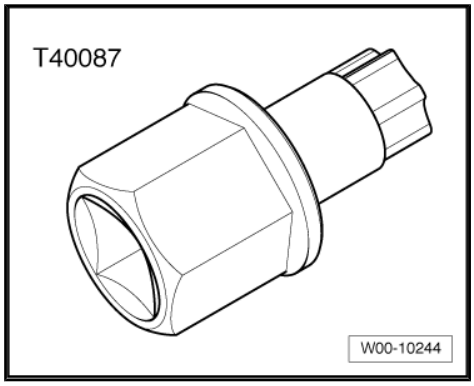


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1.2 Removing and installing poly V-belt

Special tools and workshop equipment required

♦ Socket Torx T 60 - T40087-



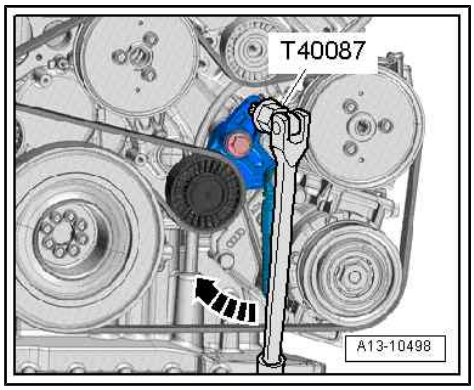
Removing

– Remove torque reaction support ⇒ page 110 .

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.***



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

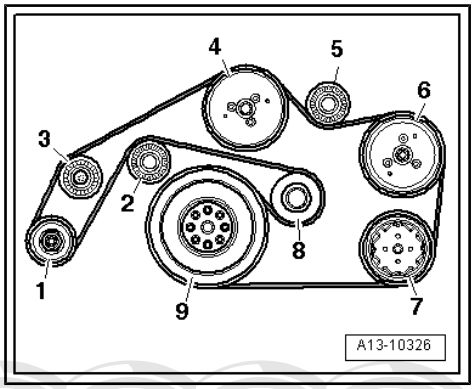
– Remove poly V-belt and release tensioner.

Installing

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

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

1 - Alternator
2 - Idler roller (right-side)
3 - Idler roller on bracket for alternator
4 - Coolant pump
5 - Idler roller (left-side)
6 - Power steering pump
7 - Air conditioner compressor
8 - Poly V-belt tensioner
9 - Vibration damper



Note

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

– Install torque reaction support ⇒ page 110 .

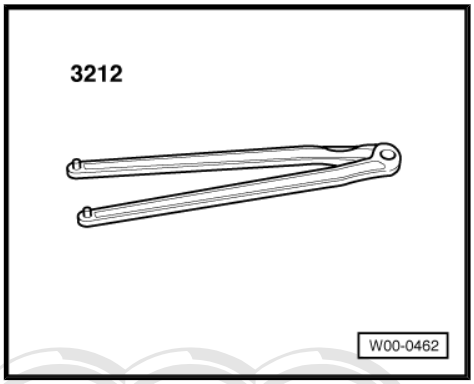
– Start engine and check that belt runs properly.

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1.3 Removing and installing tensioner for poly V-belt

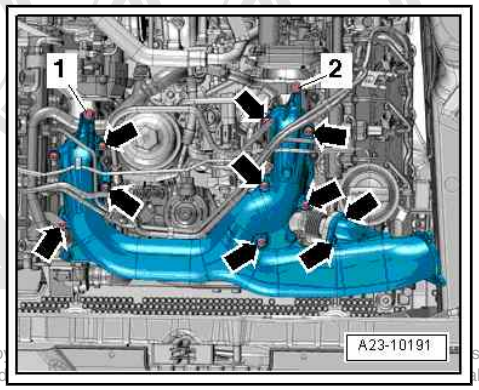
Special tools and workshop equipment required

- Pin wrench - 3212-



Removing

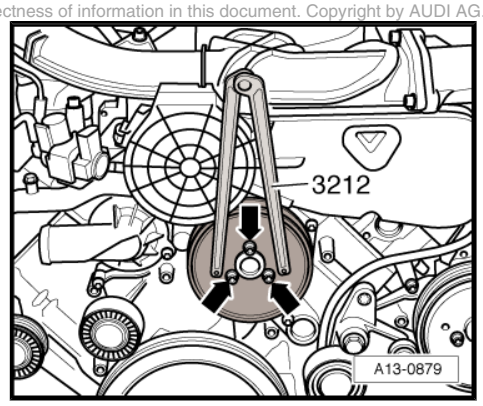
– Remove intake manifold (top section) ⇒ Rep. gr. 23 .



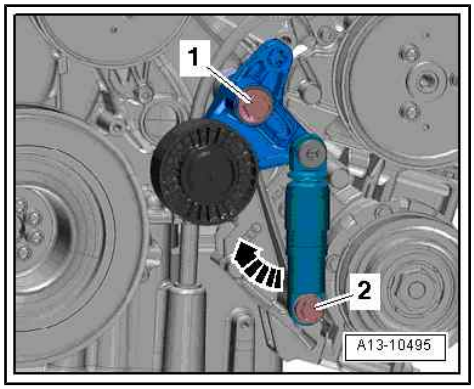
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– Remove poly V-belt ⇒ page 115 .

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



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



Note

Disregard -arrow-.

Installing

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

- Tightening torque
  ⇒ “1.1 Poly V-belt drive - exploded view”, page 112

– Install poly V-belt pulley for coolant pump ⇒ page 274 .

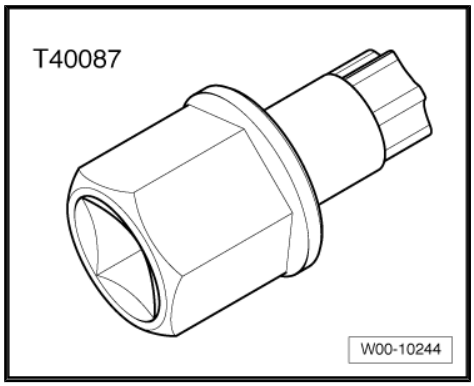
– Install poly V-belt ⇒ page 115 .

– Install intake manifold (top section) ⇒ Rep. gr. 23 .

1.4 Removing and installing idler roller for poly V-belt

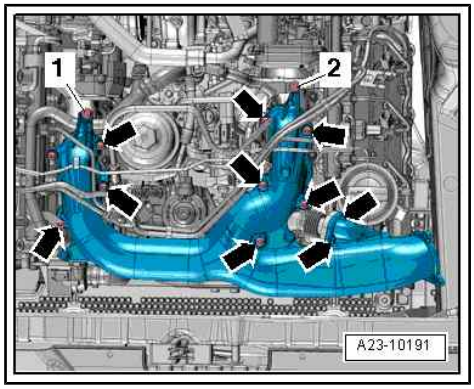
Special tools and workshop equipment required

♦ Socket Torx T 60 - T40087-



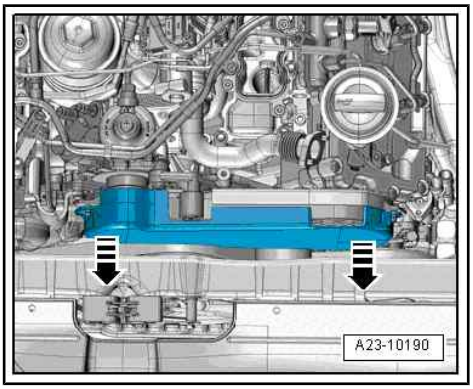
Removing

– Remove intake manifold (top section) ⇒ Rep. gr. 23 .



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– Pivot toothed belt cover forwards -arrows- and disengage retaining pegs on bottom side of toothed belt cover.

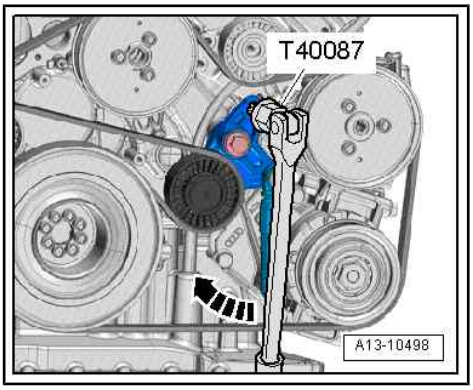


Caution

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

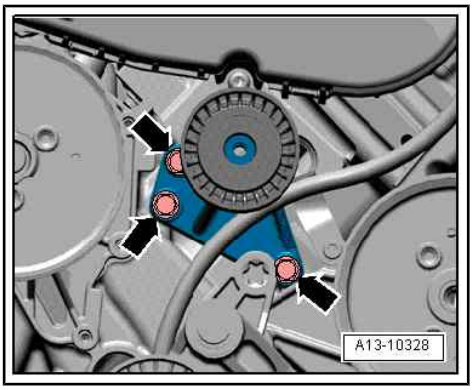
- ***Before removing, mark direction of rotation of poly V-belt with chalk or felt-tip pen for re-installation.***

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



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

– Remove bolts -arrows- and remove idler roller from cylinder block.



Installing

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

- Tightening torque
  ⇒ “1.1 Poly V-belt drive - exploded view”, page 112

– Install poly V-belt ⇒ page 115.

– Install intake manifold (top section) ⇒ Rep. gr. 23 .

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1.5 Removing and installing vibration damper with poly V-belt pulley

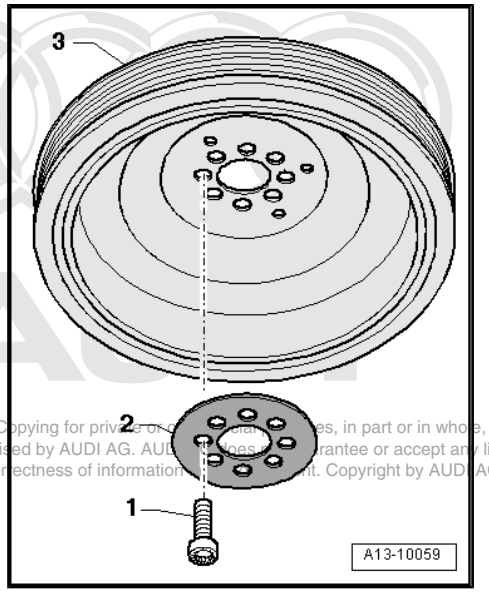
Removing

– Remove torque reaction support ⇒ page 110 .

– Slacken off bolts -1- on vibration damper (counterhold with ring spanner on nut for poly V-belt pulley for alternator).

– Remove poly V-belt ⇒ page 115 .

– Remove bolts and detach shim -2- and vibration damper -3- with poly V-belt pulley.



Installing

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

- Tightening torque
  ⇒ “1.1 Poly V-belt drive - exploded view”, page 112

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Note

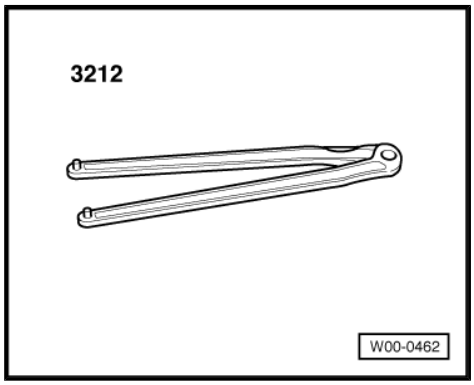
Renew shim -2- and bolts -1- for vibration damper.

– Install poly V-belt ⇒ page 115 .

1.6 Removing and installing bracket for ancillaries

Special tools and workshop equipment required

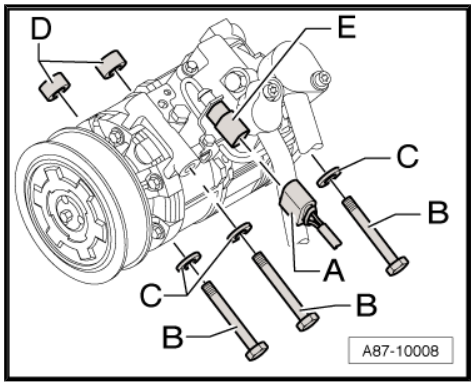
♦ Pin wrench - 3212-



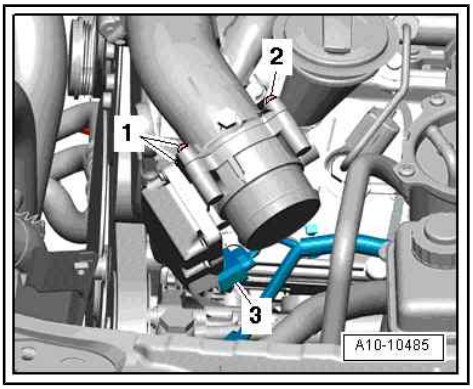
Removing

– Drain coolant ⇒ page 265 .

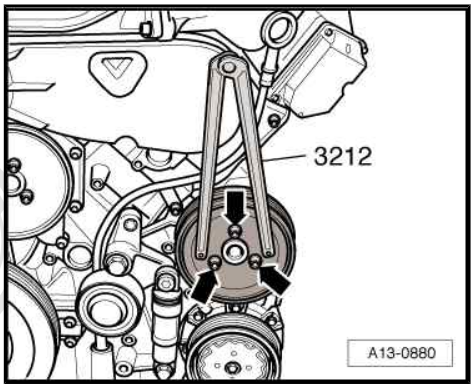
– Remove air conditioner compressor ⇒ Rep. gr. 87 .



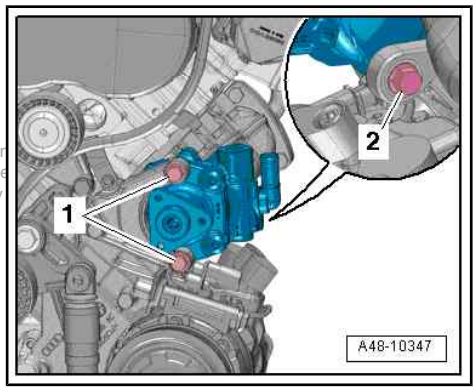
– Unplug electrical connector -3-.
– Remove bolts -1- and -2- and detach throttle valve module - J338- from intake connecting pipe.



– Remove bolts -arrows- and detach poly V-belt pulley for power-steering pump (counterhold with pin wrench - 3212-).

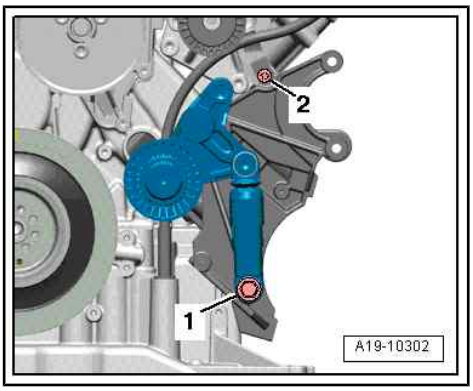


– Remove bolts -1- and -2-.
– Detach power steering pump and tie up.

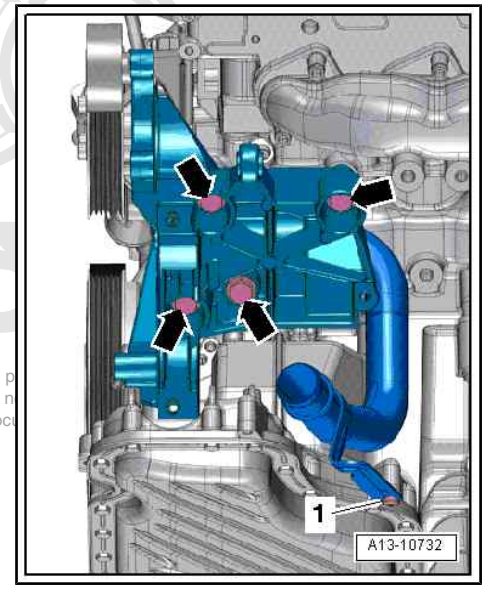


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– Remove bolt -2- for dipstick guide tube.
– Remove bolt -1- for poly V-belt tensioner.



– Remove bolts -1- and -arrows- and detach bracket for ancillaries.



Installing

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

- Tightening torque
  ⇒ “1.1 Poly V-belt drive - exploded view”, page 112

– Install coolant pipe (left-side) ⇒ page 281 .

– Install poly V-belt tensioner ⇒ page 117 .

– Install dipstick guide tube ⇒ page 245 .

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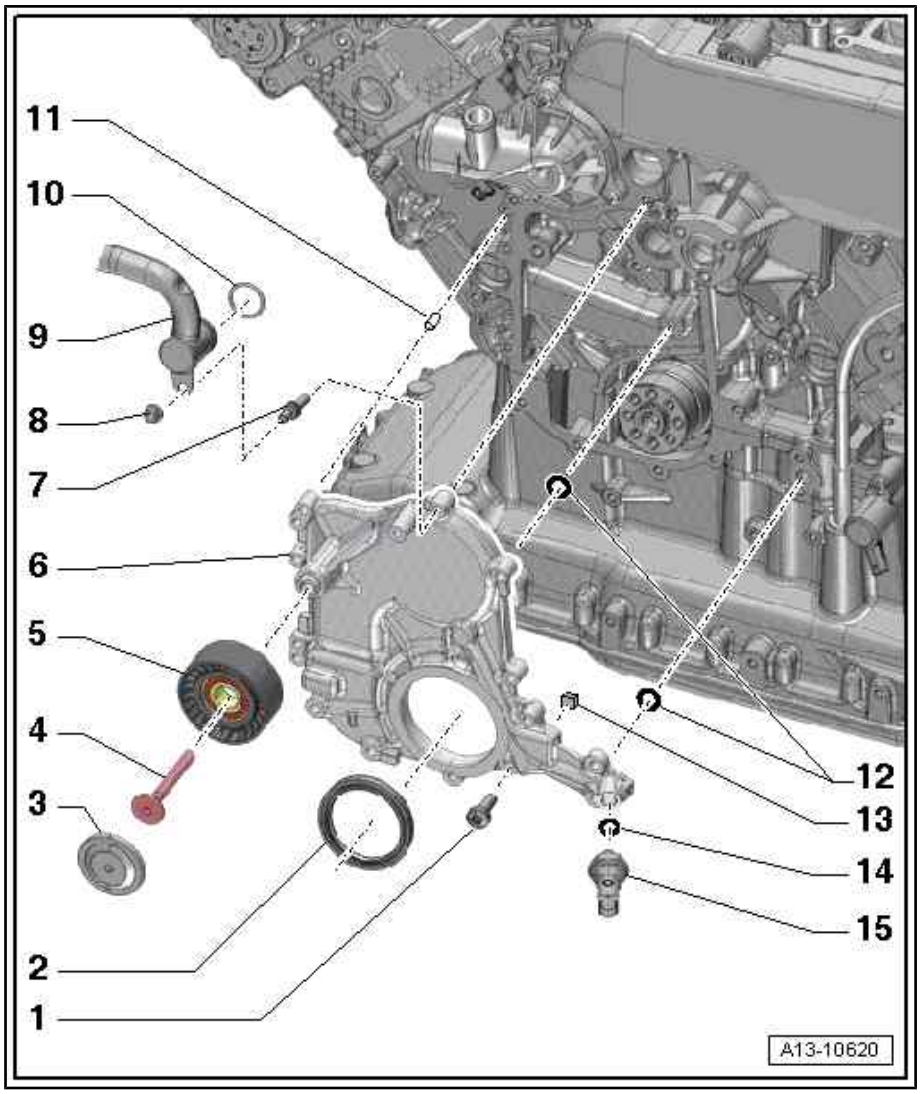
– Install power steering pump ⇒ Rep. gr. 48 .

– Install throttle valve module - J338- ⇒ Rep. gr. 23 .

– Install air conditioner compressor ⇒ Rep. gr. 87 .

– Fill up with coolant ⇒ page 266 .

1.7 Oil seal and sealing flange (pulley end) - exploded view



1 - Bolt
- ❑ Tightening torque and sequence ⇒ page 123

2 - Oil seal for crankshaft (pulley end)
- ❑ Renewing ⇒ page 123

3 - Cover for idler roller (right-side)

4 - Bolt
- ❑ Tightening torque ⇒ Item 12 (page 113)

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

6 - Sealing flange (pulley end)
- ❑ Removing and installing ⇒ page 124

7 - Centre hex stud
- ❑ 9 Nm

8 - Nut
- ❑ Tightening torque ⇒ Item 2 (page 282)

9 - Coolant pipe (right-side)
- ❑ Removing and installing ⇒ page 288

10 - O-ring
- ❑ Renew

11 - Dowel pins
- ❑ 2x

12 - O-rings

- ❑ Renew

13 - Sealing element

- ❑ 2x
- ❑ Renew

14 - Seal

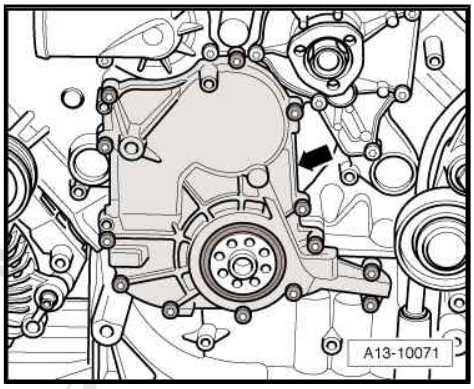
- ❑ Renew

15 - Oil pressure switch - F22-

- ❑ Removing and installing ⇒ page 257
- ❑ Tightening torque ⇒ Item 17 (page 246)

Sealing flange (pulley end) - tightening torque and sequence

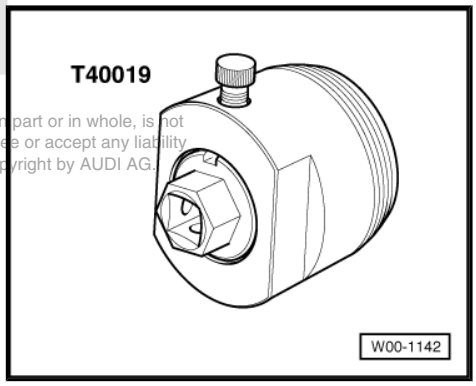
– Tighten bolts for sealing flange (pulley end) -arrow- in diagonal sequence and in stages to 9 Nm.



1.8 Renewing crankshaft oil seal (pulley end)

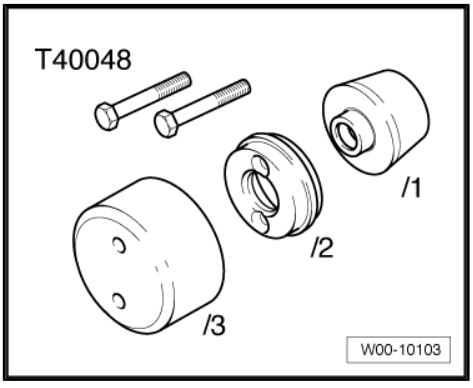
Special tools and workshop equipment required

♦ Oil seal extractor - T40019-



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



♦ Bolts M8x55 mm (2x)

Procedure

– Remove vibration damper with poly V-belt pulley ⇒ page 120 .

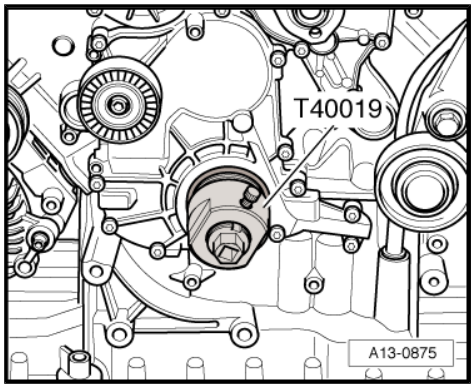
– Adjust inner part of oil seal extractor -T40019- so it is flush with the outer part and lock in position with knurled screw.

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

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

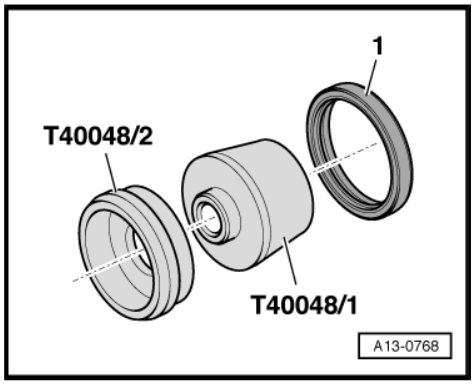
– Clamp flats of oil seal extractor in vice and use pliers to remove oil seal.

– Clean contact surface and sealing surface.

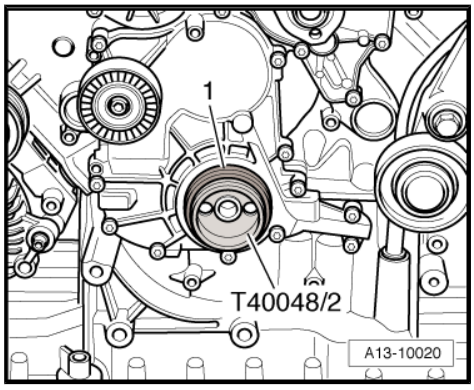


– Fit assembly aid -T40048/1- onto assembly sleeve -T40048/2- and slide oil seal -1- onto assembly sleeve.

– Detach assembly aid.



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



Note

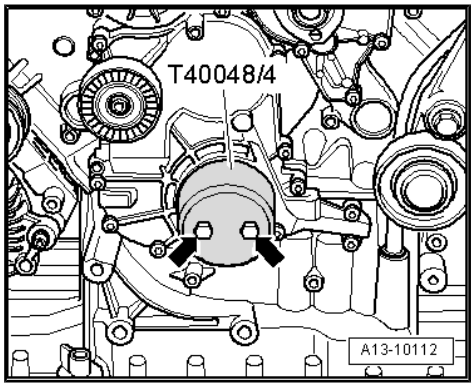
Leave assembly sleeve -T40048/2- in position on crankshaft when pressing in seal.

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– Apply press sleeve -T40048/4- to crankshaft using M8×55 mm bolts -arrows-.

– Initially screw in bolts by hand until they make contact.

– Tighten bolts alternately, $^{1}/_{2}$ turn at a time, to press in oil seal onto stop.



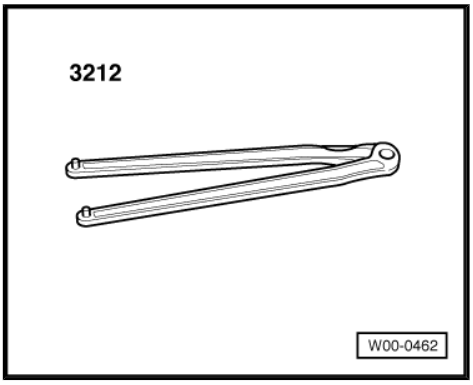
Remaining installation steps are carried out in reverse sequence; note the following:

– Install vibration damper with poly V-belt pulley ⇒ page 120 .

1.9 Removing and installing sealing flange (pulley end)

Special tools and workshop equipment required

♦ Pin wrench - 3212-



♦ Electric drill with plastic brush

♦ Safety goggles

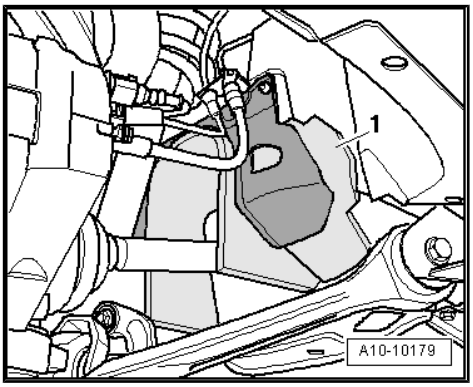
♦ Sealant ⇒ Electronic parts catalogue

Removing

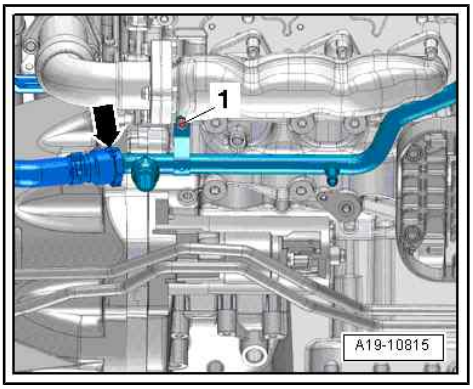
– Remove thermostat with hose connection ⇒ page 276 .

– Remove vibration damper with poly V-belt pulley ⇒ page 120 .

– Remove cover -1- for drive shaft in wheel housing (right-side).



– Remove bolt -1-.

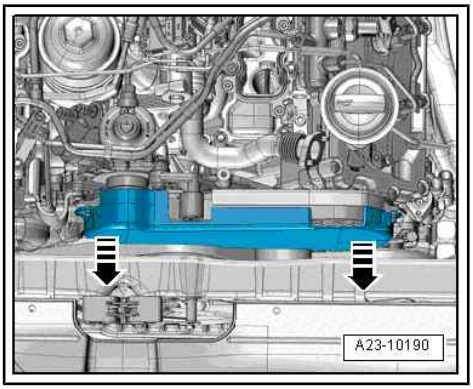


Note

Disregard -arrow-.

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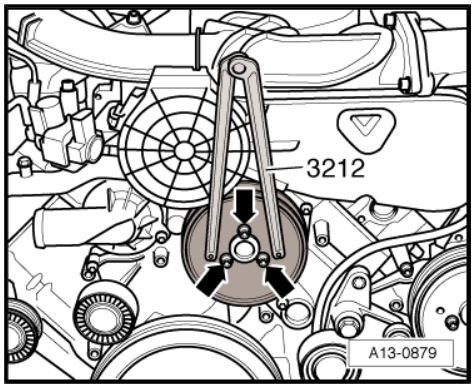
– Pivot toothed belt cover forwards -arrows- and disengage retaining pegs on bottom side of toothed belt cover.



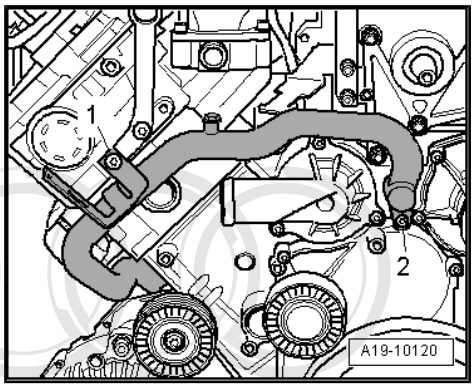
Note

For illustration purposes, the toothed belt cover is shown with the top section of the intake manifold removed.

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

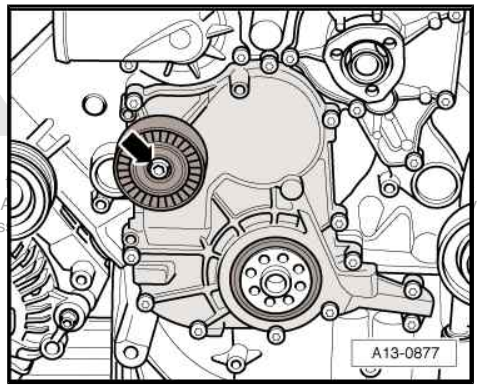


– Remove bolt -1- and nut -2-.
– Pull coolant pipe (right-side) towards front out of cylinder block and push to one side.

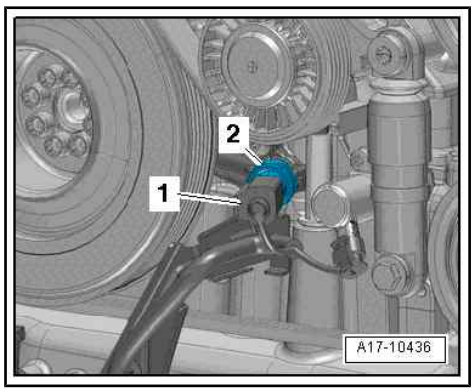


– Pry cover off idler roller for poly V-belt.
– Remove bolt -arrow- and detach idler roller from sealing flange (pulley end).

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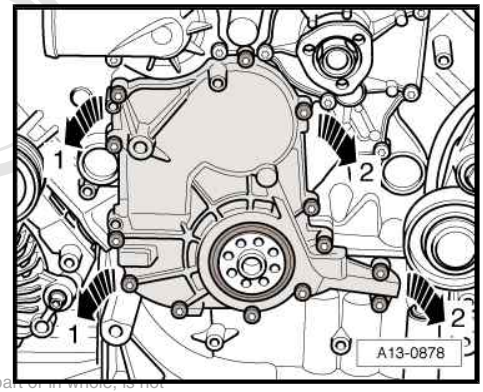
– Unplug electrical connector -1- for oil pressure switch - F22- -item 2-.



– Remove bolts.

– Pull off sealing flange (pulley end): right-side first -arrows 1-, then left-side -arrows 2-.

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



Installing

- Tightening torques
⇒ “1.7 Oil seal and sealing flange (pulley end) - exploded view”, page 122

Note

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- *Renew sealing elements, O-rings and crankshaft oil seal.*
- *Fit all cable ties in the original positions when installing.*

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

Caution

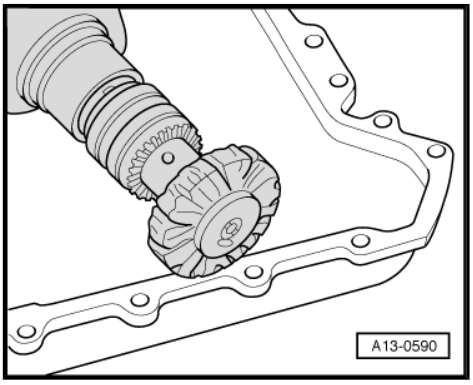
Protect lubrication system against contamination.

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

WARNING

Risk of eye injury.

- ***Wear safety goggles.***



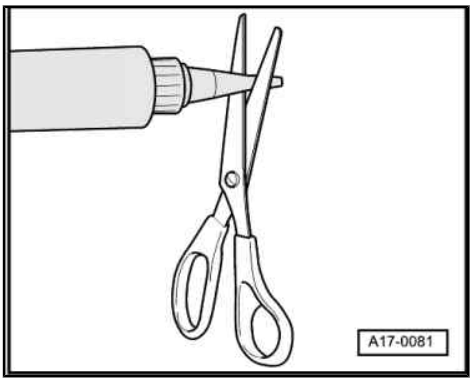
– Remove remaining sealant on sealing flange and cylinder block/top section of sump using rotating plastic brush or similar.

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

Note

Note the use-by date of the sealant.

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



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

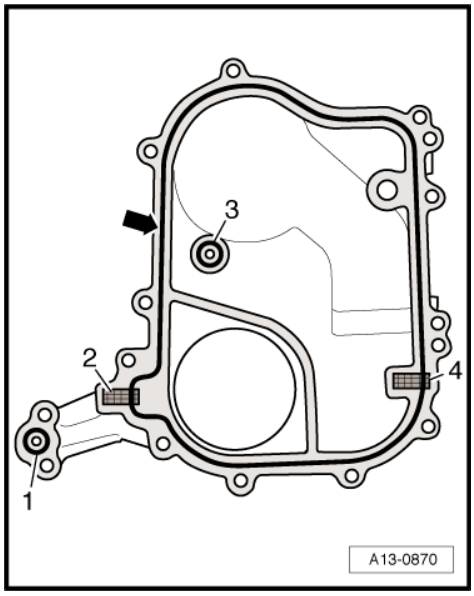
Caution

Make sure lubrication system is not clogged by excess sealant.

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

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

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

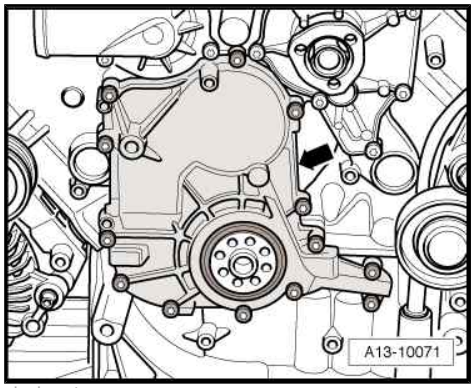


Note

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

– Tighten sealing flange bolts (pulley end) ⇒ page 123 .

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



– Install crankshaft oil seal (pulley end) ⇒ page 123 .
– Install coolant pipe (right-side) ⇒ page 288 .
– Install cover for drive shaft ⇒ Rep. gr. 66 .
– Install poly V-belt pulley for coolant pump ⇒ page 274 .
– Install vibration damper with poly V-belt pulley ⇒ page 120 .
– Install thermostat with hose connection ⇒ page 276 .

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2 Cylinder block (gearbox end)

Overview

- ⇒ “2.1 Dual-mass flywheel on vehicles with manual gearbox - exploded view”, page 129
- ⇒ “2.2 Removing and installing dual-mass flywheel”, page 130
- ⇒ “2.3 Extracting and driving in needle bearing for dual-mass flywheel”, page 132
- ⇒ “2.4 Flywheel and damper unit on vehicles with multitronic gearbox - exploded view”, page 133
- ⇒ “2.5 Removing and installing damper unit”, page 133
- ⇒ “2.6 Removing and installing flywheel”, page 134
- ⇒ “2.7 Drive plate on vehicles with automatic gearbox - exploded view”, page 135
- ⇒ “2.8 Removing and installing drive plate”, page 136
- ⇒ “2.9 Renewing crankshaft oil seal (gearbox end)”, page 137

2.1 Dual-mass flywheel on vehicles with manual gearbox - exploded view

Note

Servicing clutch ⇒ Rep. gr. 30

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1 - Dual-mass flywheel

- ❑ Removing and installing ⇒ page 130

2 - Bolt

- ❑ Renew
- ❑ 60 Nm + 90°

3 - Needle bearing

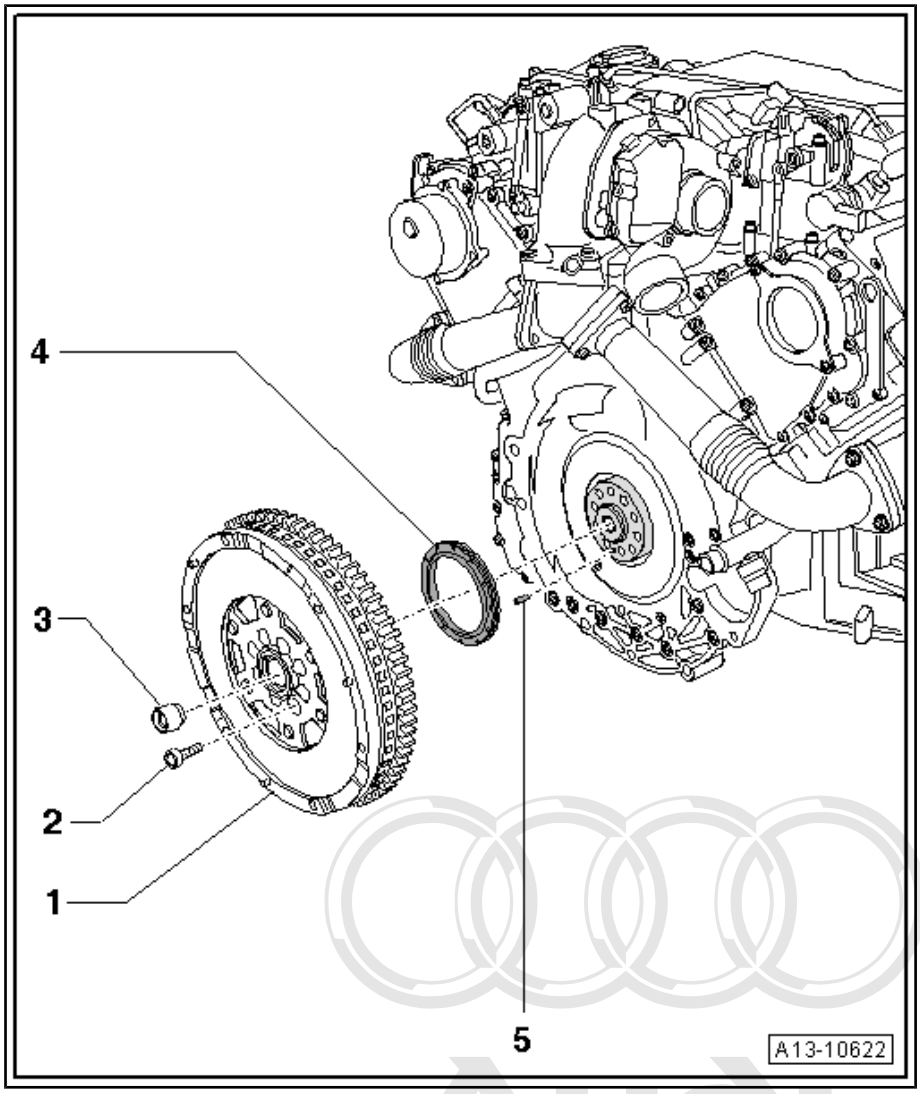
- ❑ Extracting and driving in ⇒ page 132

4 - Crankshaft oil seal (gearbox end)

- ❑ Renewing ⇒ page 137

5 - Dowel pin

- ❑ Allocation ⇒ Electronic parts catalogue

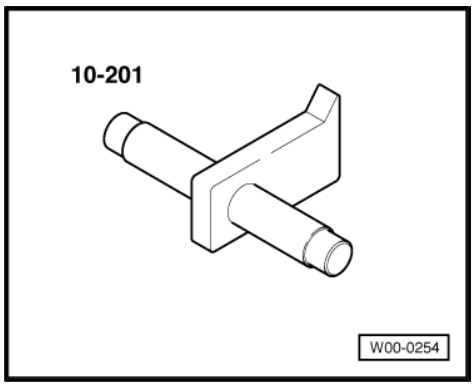


2.2 Removing and installing dual-mass flywheel

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Special tools and workshop equipment required

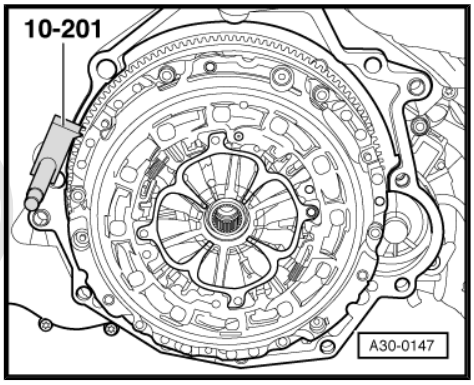
- ♦ Counterhold tool - 10 - 201-



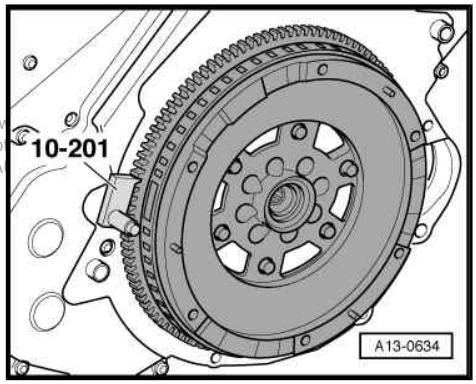
Removing

- Gearbox removed.

– Remove clutch pressure plate ⇒ Rep. gr. 30 .



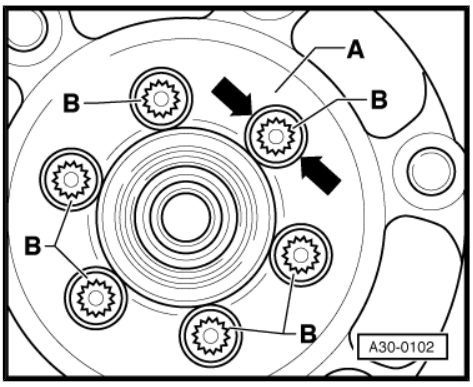
– Insert counterhold tool - 10 - 201- to slacken bolts.



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Note

To prevent damage to the dual-mass flywheel when removing, the bolts -B- must not be removed with an impact wrench or similar. The bolts may only be removed by hand using conventional tools.



– Rotate the dual-mass flywheel -A- so that the bolts align centrally with the holes -arrows-.

– When unscrewing the bolts, make sure that the bolt heads do not come into contact with the dual-mass flywheel; the flywheel will otherwise be damaged as the bolts are screwed out.

Installing

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

- Tightening torque
⇒ “2.1 Dual-mass flywheel on vehicles with manual gearbox - exploded view”, page 129

Note

- *Renew bolts for dual-mass flywheel.*
- *A needle bearing is fitted in the dual-mass flywheel; knock in the needle bearing when fitting a new flywheel ⇒ page 132 .*

– Pay attention to dowel pin when installing dual-mass flywheel.

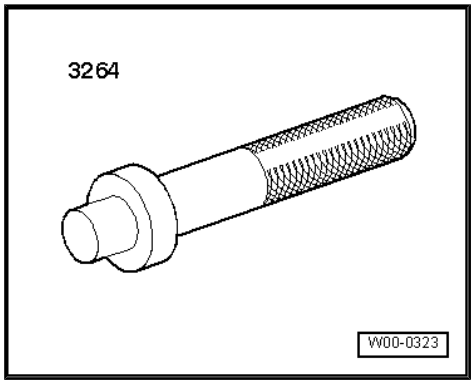
– Fit counterhold tool - 10 - 201- the other way round to tighten bolts.

– Install clutch pressure plate ⇒ Rep. gr. 30 .

2.3 Extracting and driving in needle bearing for dual-mass flywheel

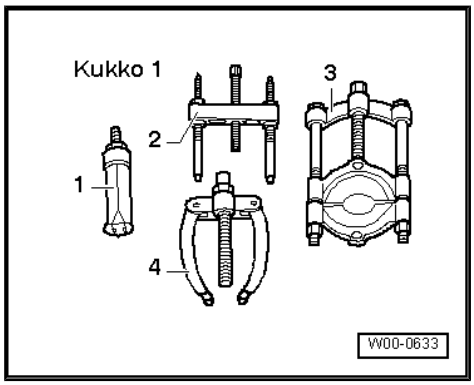
Special tools and workshop equipment required

- Punch - 3264-



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- -1- Internal puller Kukko 21/1

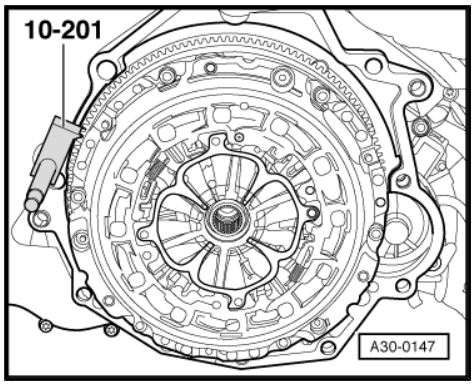


- -4- Counter-support Kukko 22/1

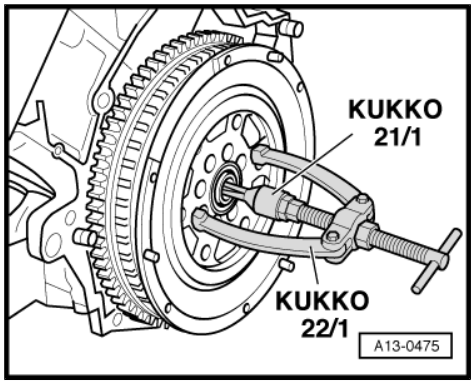
Procedure

- Gearbox removed.

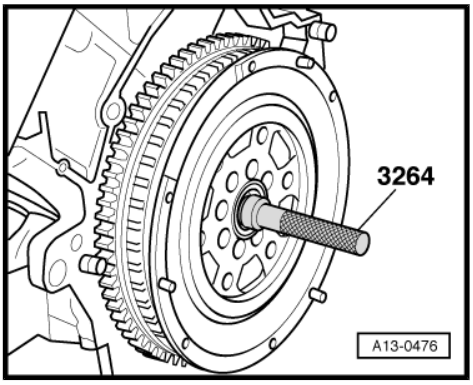
– Remove clutch pressure plate ⇒ Rep. gr. 30 .



– Remove needle bearing using internal puller Kukko 21/1 and counter-support Kukko 22/1.



– Drive needle bearing into dual-mass flywheel as far as stop using punch - 3264- .
– Install clutch pressure plate ⇒ Rep. gr. 30 .



2.4 Flywheel and damper unit on vehicles with multitronic gearbox - exploded view

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1 - Damper unit
- ❑ Removing and installing ⇒ page 133

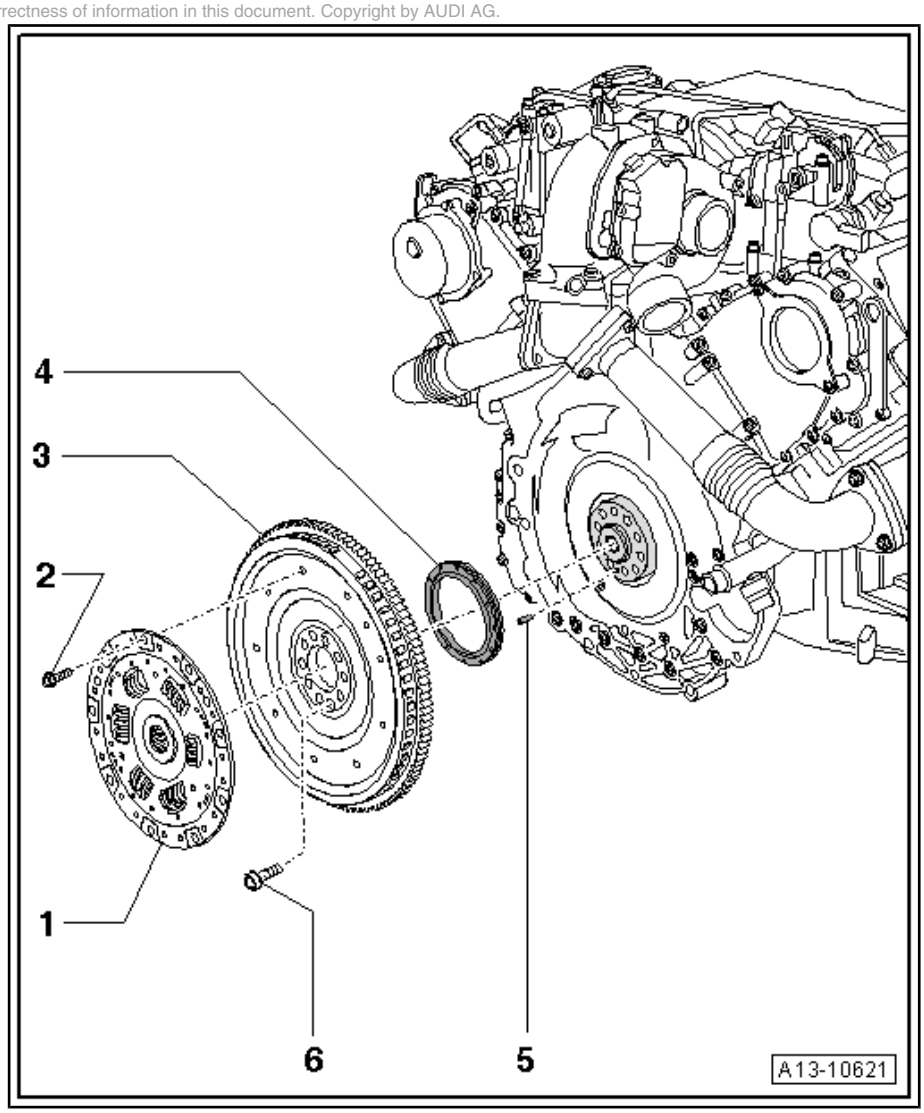
2 - Bolt
- ❑ Screw in by hand until they make contact and tighten in diagonal sequence
- ❑ 22 Nm

3 - Flywheel
- ❑ Removing and installing ⇒ page 134

4 - Crankshaft oil seal (gearbox end)
- ❑ Renewing ⇒ page 137

5 - Dowel pin
- ❑ Allocation ⇒ Electronic parts catalogue

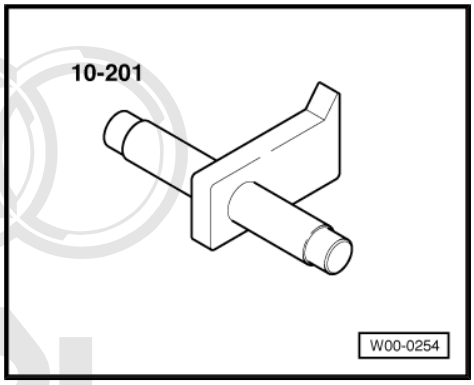
6 - Bolt
- ❑ Renew
- ❑ 60 Nm + 90°



2.5 Removing and installing damper unit

Special tools and workshop equipment required

♦ Counterhold tool - 10 - 201-

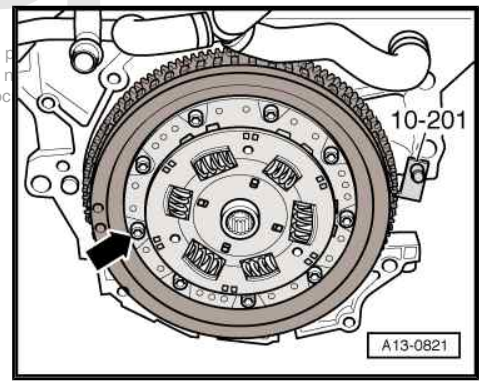


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Removing

- Gearbox removed.

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

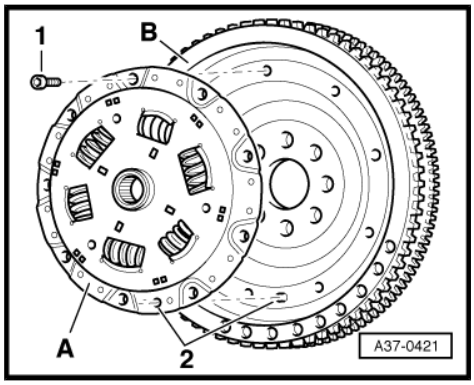


– Remove bolts -1- and detach damper unit -A- from flywheel -B-.

Installing

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

- Tightening torque
  ⇒ “2.4 Flywheel and damper unit on vehicles with multitronic gearbox - exploded view”, page 133



Note

Allocate damper unit according to gearbox code ⇒ Electronic parts catalogue .

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

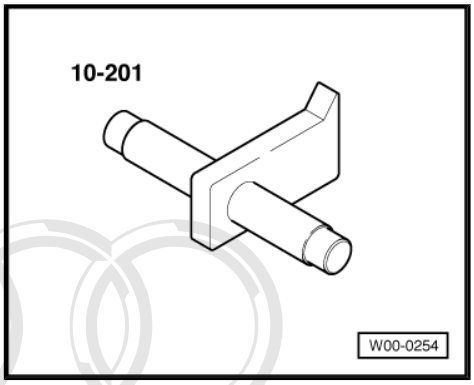
– Align damper unit -A- on flywheel -B-.

- The installation markings -2- must align.

2.6 Removing and installing flywheel

Special tools and workshop equipment required

♦ Counterhold tool - 10 - 201-



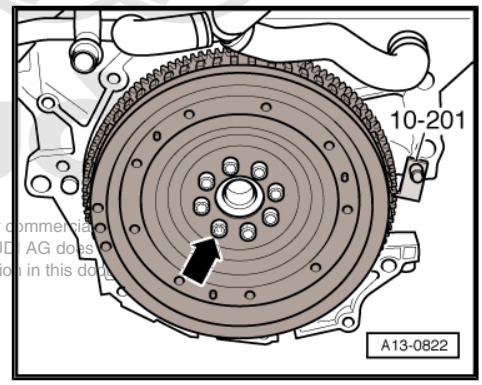
Removing

- Gearbox removed.

– Remove damper unit ⇒ page 133 .

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

– Remove bolts -arrow- and remove flywheel.



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Installing

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

- Tightening torque
  ⇒ “2.4 Flywheel and damper unit on vehicles with multitronic gearbox - exploded view”, page 133

Note

Renew bolts for flywheel.

– Pay attention to dowel pin when installing flywheel.

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

– Install damper unit ⇒ page 133 .

2.7 Drive plate on vehicles with automatic gearbox - exploded view

1 - Drive plate

- ❑ Removing and installing ⇒ page 136

2 - Washer

3 - Bolt

- ❑ Renew
- ❑ 30 Nm + 90°

4 - Dowel pin

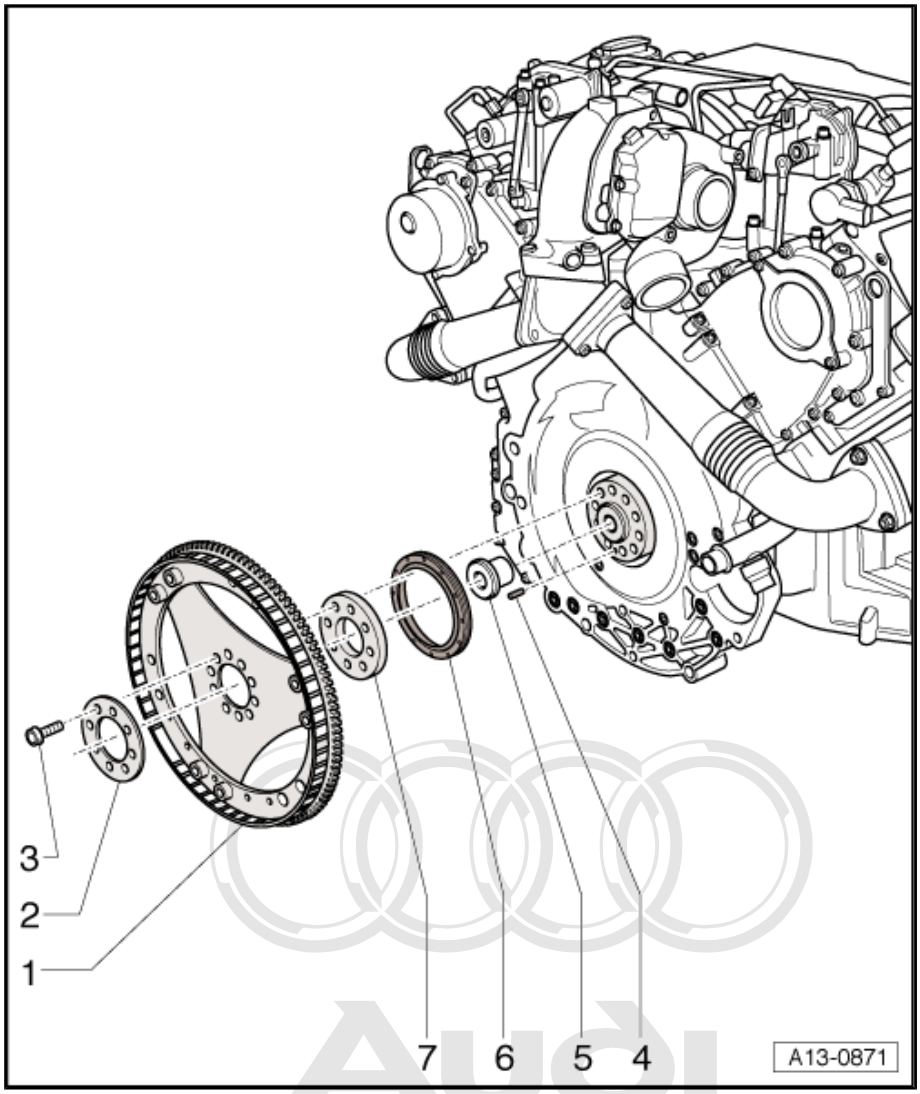
5 - Centring sleeve for torque converter

- ❑ Drive into crankshaft

6 - Crankshaft oil seal (gearbox end)

- ❑ Renewing ⇒ page 137

7 - Shim

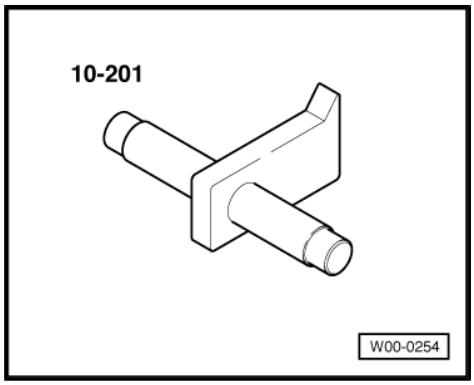


2.8 Removing and installing drive plate

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Special tools and workshop equipment required

- ♦ Counterhold tool - 10 - 201-

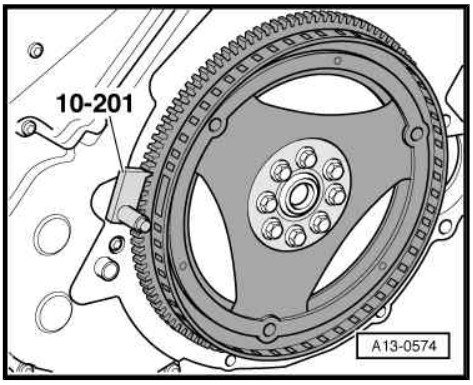


Removing

- Gearbox removed.

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

– Remove bolts, detach washer and drive plate with shim located behind.



Installing

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

- Tightening torque
⇒ “2.7 Drive plate on vehicles with automatic gearbox - exploded view”, page 135

Note

♦ *Renew bolts for drive plate.*

♦ *For information on the required thickness of the shim ⇒ Item 7 (page 136) and the washer ⇒ Item 2 (page 136) to be fitted, refer to the ⇒ Electronic parts catalogue.*

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– Fit shim on crankshaft.

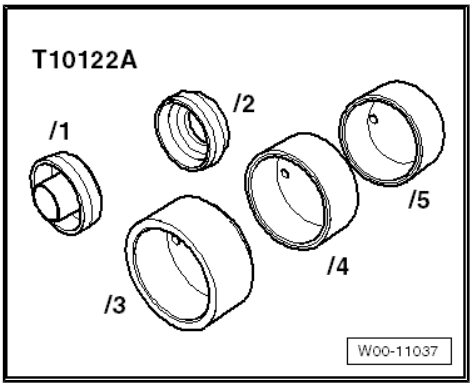
– Pay attention to dowel pin when installing drive plate with washer.

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

2.9 Renewing crankshaft oil seal (gearbox end)

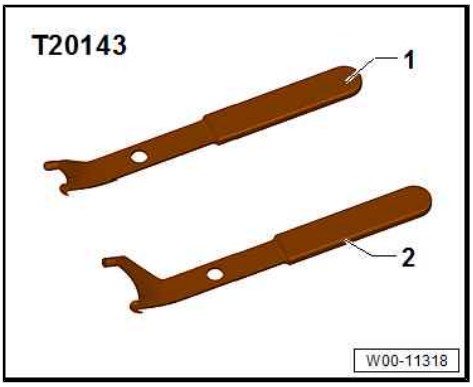
Special tools and workshop equipment required

♦ Fitting tool - T10122 A-



♦ Guide piece - T10122/6-

♦ Extractor tool - T20143/2-



Procedure

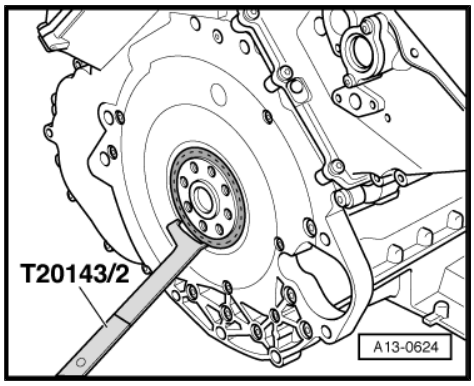
- Gearbox removed.

– Remove dual-mass flywheel on vehicles with manual gearbox ⇒ page 130 .

– Remove flywheel on vehicles with multitronic gearbox ⇒ page 134 .

– Remove drive plate on vehicles with automatic gearbox ⇒ page 136 .

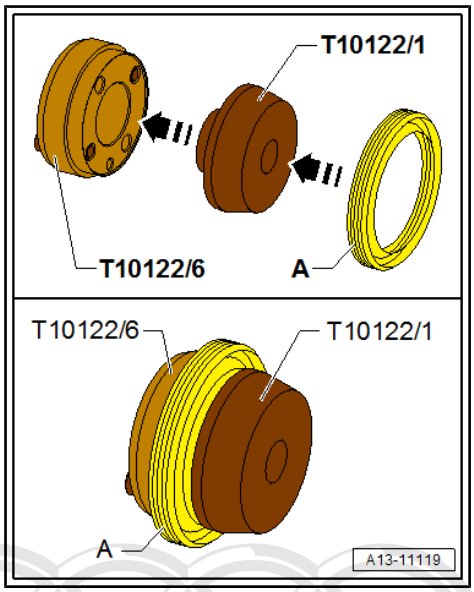
– Pry out oil seal using extractor tool -T20143/2- .



– Clean contact surface and sealing surface.

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

– Detach assembly aid -T10122/1- .



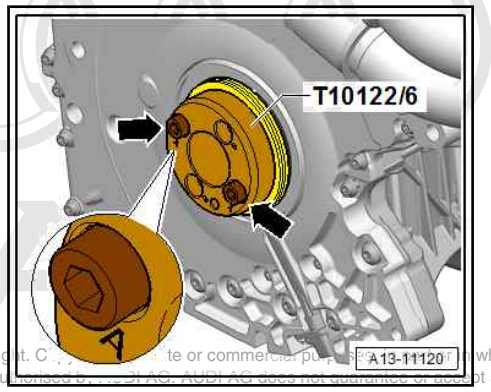
– Fit guide piece - T10122/6- onto crankshaft.

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

Caution

Risk of leaks if installed incorrectly.

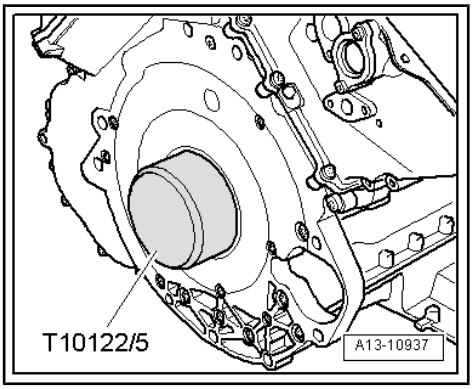
- ***Slide oil seal onto crankshaft by hand to prevent sealing lip on oil seal from folding over.***



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

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– Press in oil seal uniformly until flush all round using press sleeve -T10122/5- .
– Remove guide piece - T10122/6- .
– Check that oil seal and its sealing lip are correctly seated. If sealing lip is partially folded over, repeat procedure with a new oil seal.
– Install dual-mass flywheel on vehicles with manual gearbox ⇒ page 130 .
– Install flywheel on vehicles with multitronic gearbox ⇒ page 134 .
– Install drive plate on vehicles with automatic gearbox ⇒ page 136 .



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3 Crankshaft

Overview

- ⇒ “3.1 Crankshaft - exploded view”, page 140
- ⇒ “3.2 Crankshaft dimensions”, page 142
- ⇒ “3.3 Measuring axial clearance of crankshaft”, page 142
- ⇒ “3.4 Measuring radial clearance of crankshaft”, page 143

Note

When performing assembly work, secure engine to engine and gearbox support - VAS 6095- ⇒ page 99 .

3.1 Crankshaft - exploded view

1 - Crankshaft
- ❑ Measuring axial clearance ⇒ page 142
- ❑ Measuring radial clearance ⇒ page 143
- ❑ Crankshaft dimensions ⇒ page 142

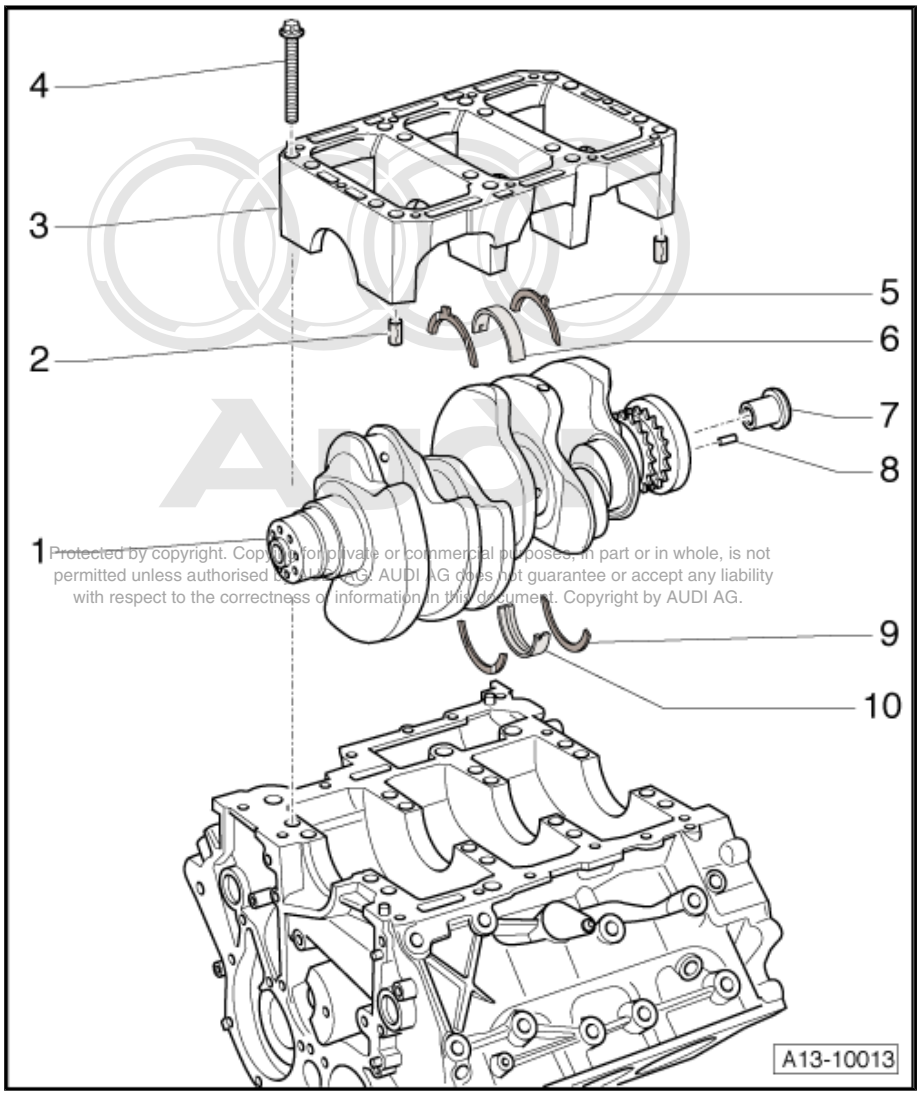
2 - Dowel sleeve
- ❑ 2x
- ❑ Insert in cylinder block

3 - Retaining frame
- ❑ Installing ⇒ page 141

4 - Bolt
- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 141

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

6 - Bearing shell
- ❑ For retaining frame
- ❑ Renew used bearing shells
- ❑ Install new bearing shells for retaining frame with correct coloured markings ⇒ page 142



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7 - Centring sleeve for torque converter
- ❑ Drive into crankshaft

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

9 - Thrust washer

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

10 - Bearing shell

- ❑ For cylinder block (with oil groove)
- ❑ Renew used bearing shells
- ❑ Install new bearing shells for the cylinder block with the correct coloured markings ⇒ page 141

Retaining frame - tightening torque and sequence

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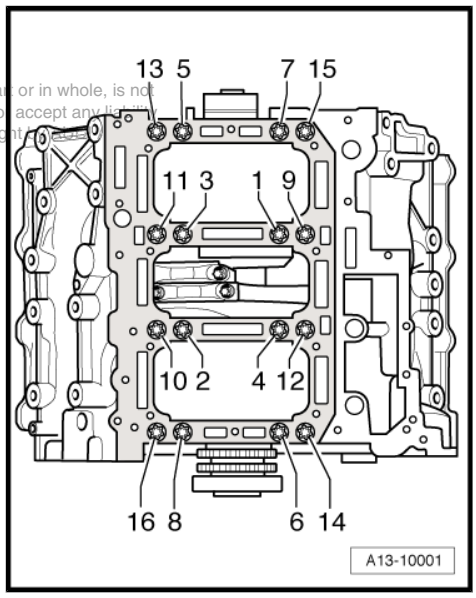
Note

Renew bolts for retaining frame.

– Insert two dowel sleeves in cylinder block.

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

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



Allocation of crankshaft bearing shells for cylinder block

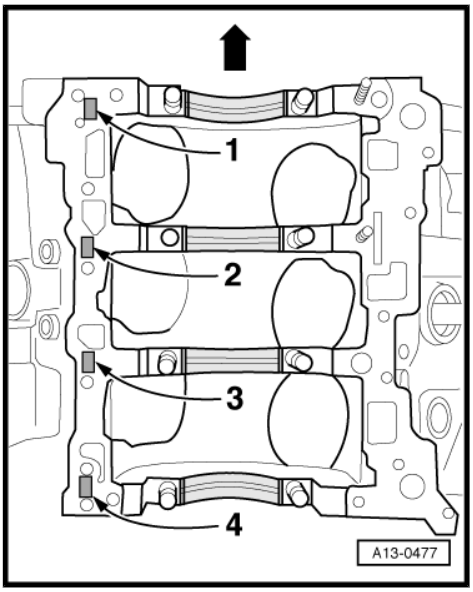
Bearing shells of the correct thickness are matched to the bearings in the cylinder block at the factory. Coloured dots on the bearing shells are used to identify the bearing shell thickness.

Note

The -arrow- points to pulley end.

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

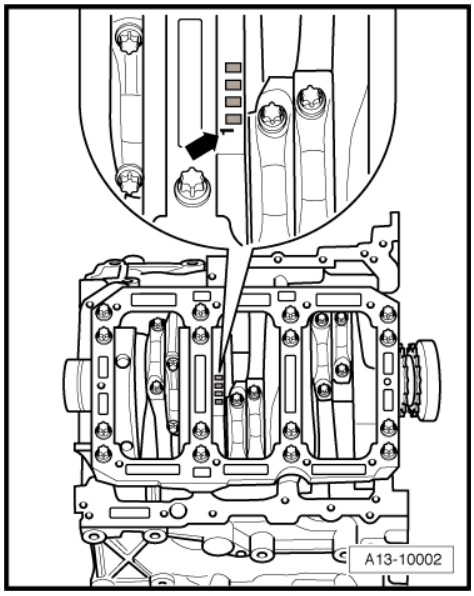
Letter on cylinder block	Colour coding of bearing
R =	Red
G =	Yellow
B =	Blue



Allocation of crankshaft bearing shells for retaining frame

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

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



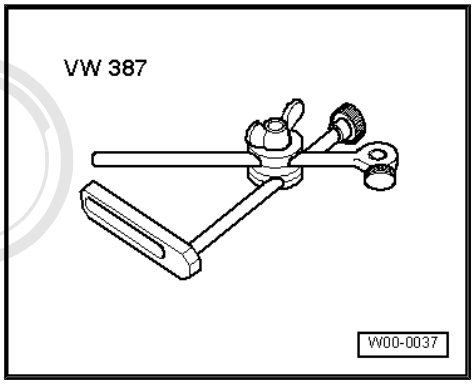
3.2 Crankshaft dimensions

Honing dimension	Main bearing journal Ø mm	Conrod journal Ø mm
Basic dimension	65.00 – 0.022 – 0.042	60.00 – 0.022 – 0.042

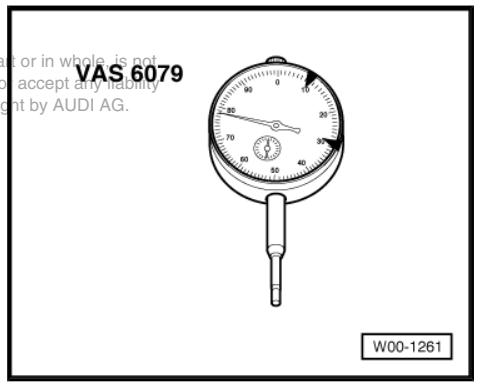
3.3 Measuring axial clearance of crankshaft

Special tools and workshop equipment required

- Universal dial gauge bracket - VW 387-

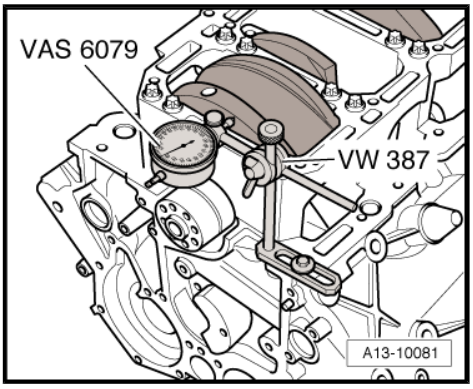


- Dial gauge - VAS 6079-



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Procedure



– Bolt dial gauge with universal dial gauge bracket - VW 387- onto cylinder block and apply gauge against crank web.

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

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

Axial clearance:

- New: 0.090 ... 0.215 mm.
- Wear limit: 0.280 mm.

3.4 Measuring radial clearance of crankshaft

Special tools and workshop equipment required

♦ 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 and secure with old bolts ⇒ page 141 without rotating crankshaft.

– Remove retaining frame again.

– Compare width of Plastigage with measurement scale.

Radial clearance:

- New: 0.018 ... 0.045 mm.
- Wear limit: 0.100 mm.

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4 Pistons and conrods

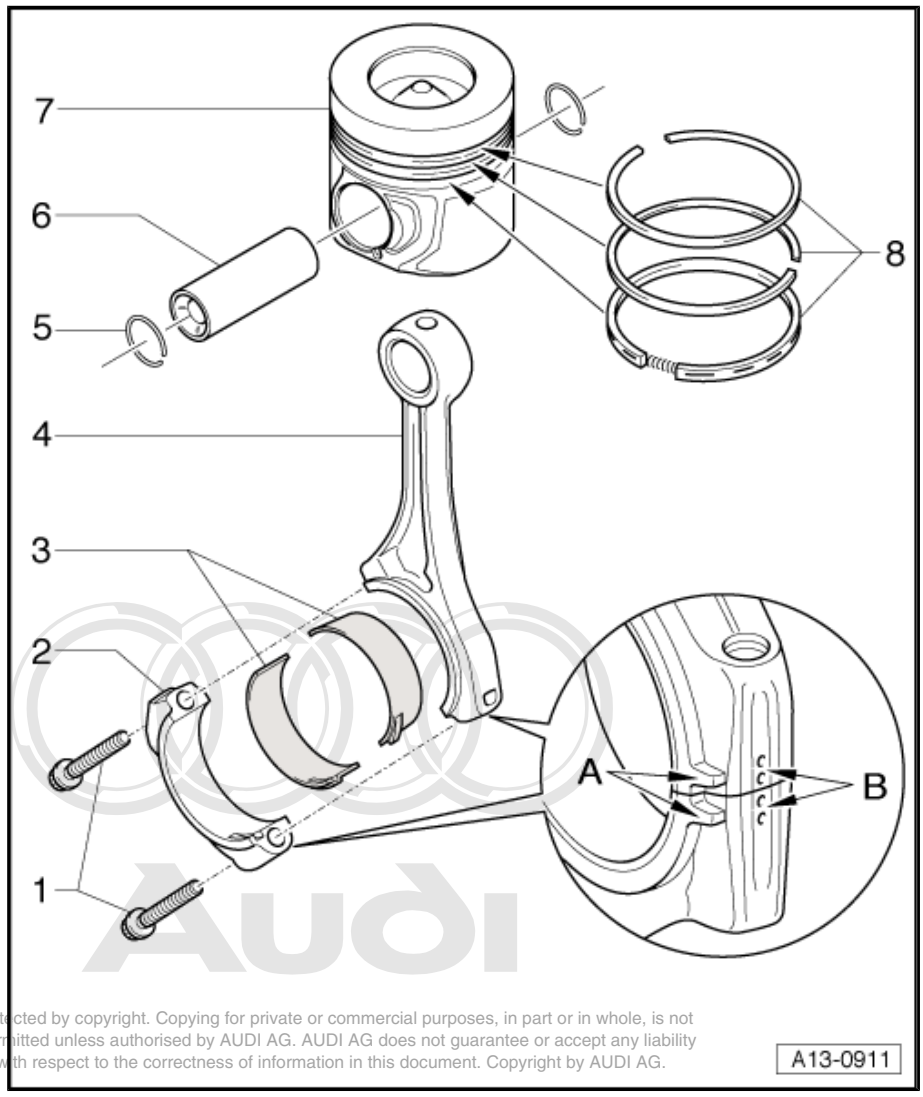
Overview

- ⇒ “4.1 Pistons and conrods - exploded view”, page 144
- ⇒ “4.2 Checking piston projection at TDC”, page 147
- ⇒ “4.3 Piston and cylinder dimensions”, page 149
- ⇒ “4.4 Measuring radial clearance of conrods”, page 149

Note

Oil spray jet for piston cooling ⇒ page 145 .

4.1 Pistons and conrods - exploded view



1 - Bolts

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

2 - Conrod bearing cap

- ❑ Mark installation position for re-installation
- ❑ Mark cylinder allocation in colour -B- ⇒ page 146
- ❑ Installation position: Note position of lugs on casting -A-

3 - Bearing shells

- ❑ Note installation position
- ❑ Renew used bearing shells

4 - Conrod

- ❑ Only renew as a complete set
- ❑ Mark cylinder allocation in colour -B- ⇒ page 146
- ❑ Installation position: Note position of lugs on casting -A- and ⇒ page 147
- ❑ Axial clearance for each conrod pair (when new): 0.20 … 0.44 mm
- ❑ Measuring radial clearance ⇒ page 149

5 - Circlip

- ❑ Renew

6 - Piston pin

- ❑ If difficult to remove, heat piston to approx. 60 °C

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- ❑ Remove and install using drift - VW 222 A-

7 - Piston

- ❑ Mark installation position and cylinder number ⇒ page 146
- ❑ Renew piston if cracking is visible on piston crown or piston skirt
- ❑ Checking ⇒ page 146
- ❑ Install using piston ring clamp
- ❑ Piston and cylinder dimensions ⇒ page 149
- ❑ Measuring cylinder bore ⇒ page 146
- ❑ Measuring piston projection at “TDC” ⇒ page 147

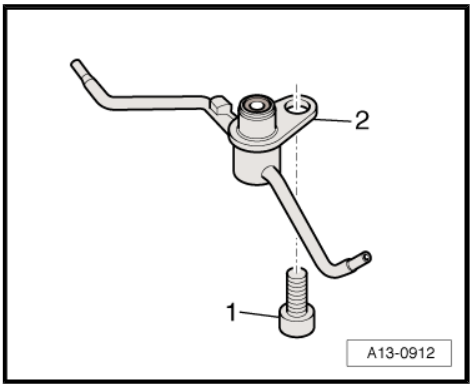
8 - Piston rings

- ❑ Offset gaps by 120°
- ❑ Use piston ring pliers to remove and install
- ❑ “TOP” must face towards piston crown
- ❑ Measuring ring gap ⇒ page 145
- ❑ Measuring ring-to-groove clearance ⇒ page 145

Oil spray jet for piston cooling

1 - Bolt, 9 Nm

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



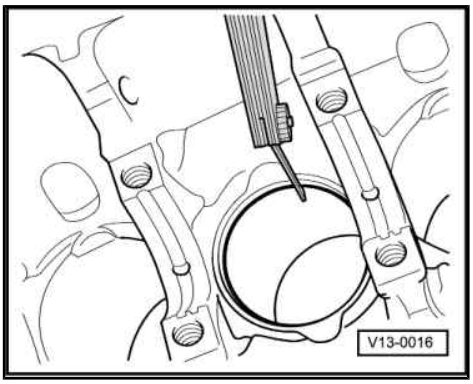
Note

- ♦ *Take care not to bend oil spray jets.*
- ♦ *Always renew bent oil spray jets.*

Measuring piston ring gap

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

– To do so, use a piston without rings.

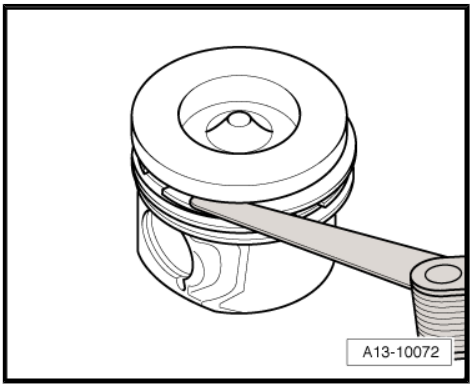


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Piston ring	new mm	Wear limit mm
1st compression ring	0.25 … 0.38	0.80
2nd compression ring	0.70 … 0.90	1.30
Oil scraper ring	Max. 0.40	0.70

Measuring ring-to-groove clearance

– Clean groove in piston before checking clearance.



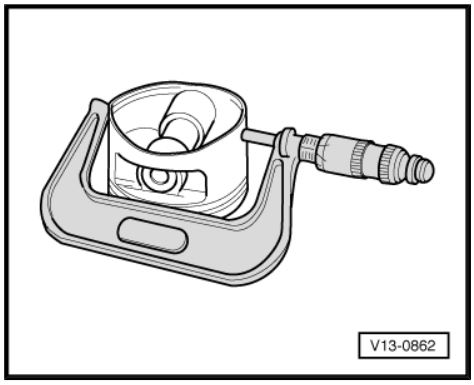
Piston ring	new mm	Wear limit mm
1st compression ring	0.120 … 0.160	0.175
2nd compression ring	0.020 … 0.090	0.115
Oil scraper ring	0.020… 0.090	0.115

Checking piston

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

• Maximum deviation from nominal dimension: 0.05 mm.

Nominal dimension
⇒ “4.3 Piston and cylinder dimensions”, page 149 .

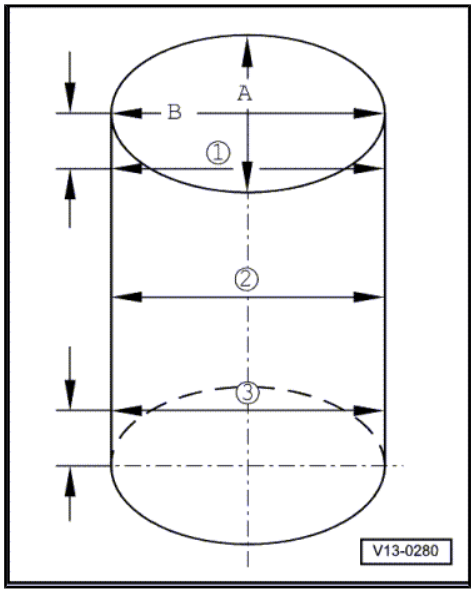


Checking cylinder bore

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

• Maximum deviation from nominal dimension: 0.08 mm.

Nominal dimension
⇒ “4.3 Piston and cylinder dimensions”, page 149 .

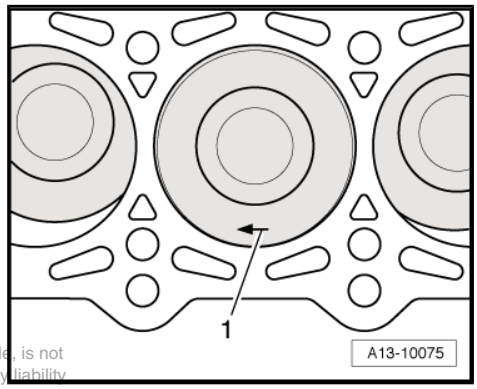


Installation position of pistons

Caution

Do not damage the coating of the piston crown.

- *If you intend to reinstall used pistons, mark the cylinder number on the piston crown using paint. Do not mark piston crown by means of centre punch, notch or the like.*



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

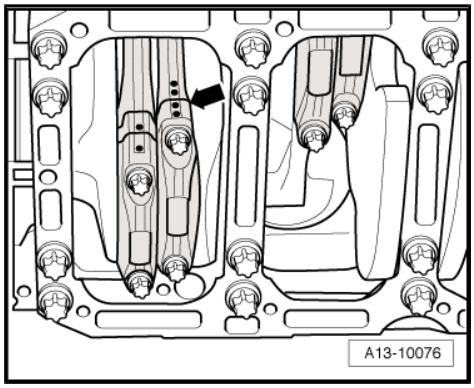
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Marking conrods

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

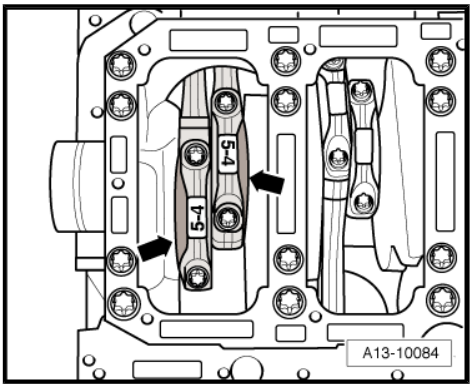
Note

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



Installation position of conrods

- Installation position: the larger contact shoulder on the conrod -arrows- faces towards the adjacent main bearing.



Note

The illustration shows the first conrod pair.

4.2 Checking piston projection at TDC

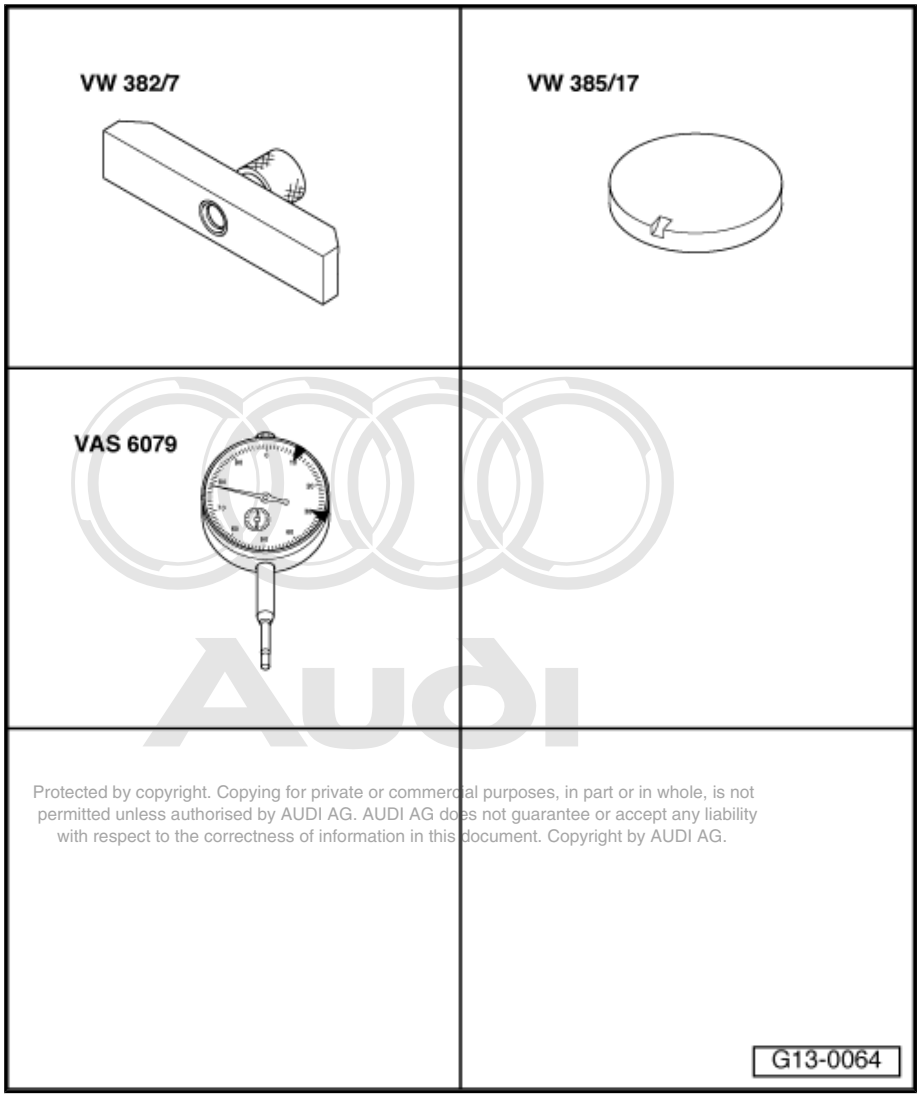
Note

- *Piston projection at TDC must be measured when installing new pistons or a short engine. Depending upon piston projection, install the corresponding cylinder head gasket according to the table below:*
- *If the measured values for piston projection are not the same for all pistons, use the highest value to determine the correct gasket size.*
- *The cylinder head gasket must be determined separately for each cylinder bank.*

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Special tools and workshop equipment required

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



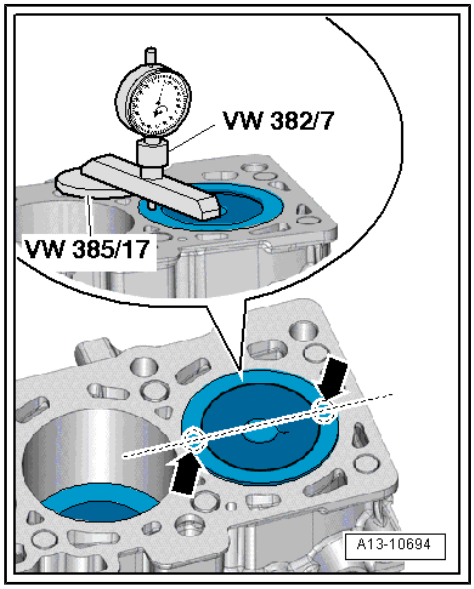
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Procedure

– Secure dial gauge - VAS 6079- with measuring bridge - VW 382/7- and measuring plate -VW 385/17- to cylinder block.

– Measure projection at each piston at both locations marked with -arrows- (seen in longitudinal direction of engine: at front and rear of piston).

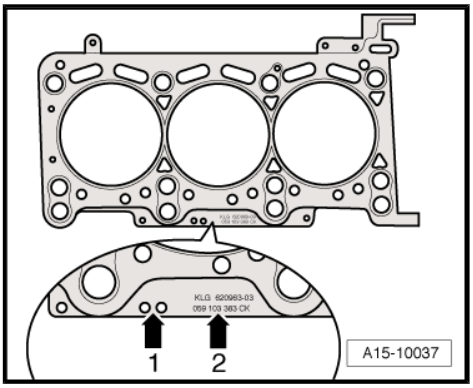
Piston projection above top surface of cylinder block	Identification (No. of holes)
0.39 … 0.49 mm	1
0.49 … 0.54 mm	2
0.54 … 0.65 mm	3



Identification of cylinder head gasket

1 - Holes

2 - Part number



Note

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

4.3 Piston and cylinder dimensions

Honing dimension	Piston Ø mm	Cylinder bore Ø mm
Basic dimension	82.939 … 82.951 1)	83.006 … 83.014
Repair oversize	82.979 … 82.991 1)	83.046 … 83.054

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

4.4 Measuring radial clearance of conrods

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 and secure with old bolts ⇒ Item 1 (page 144) without rotating crankshaft.

– Remove conrod bearing cap again.

– Compare width of Plastigage with measurement scale.

Radial clearance:

- New: 0.015 ... 0.062 mm.
- Wear limit: 0.12 mm.

– Renew conrod bolts.

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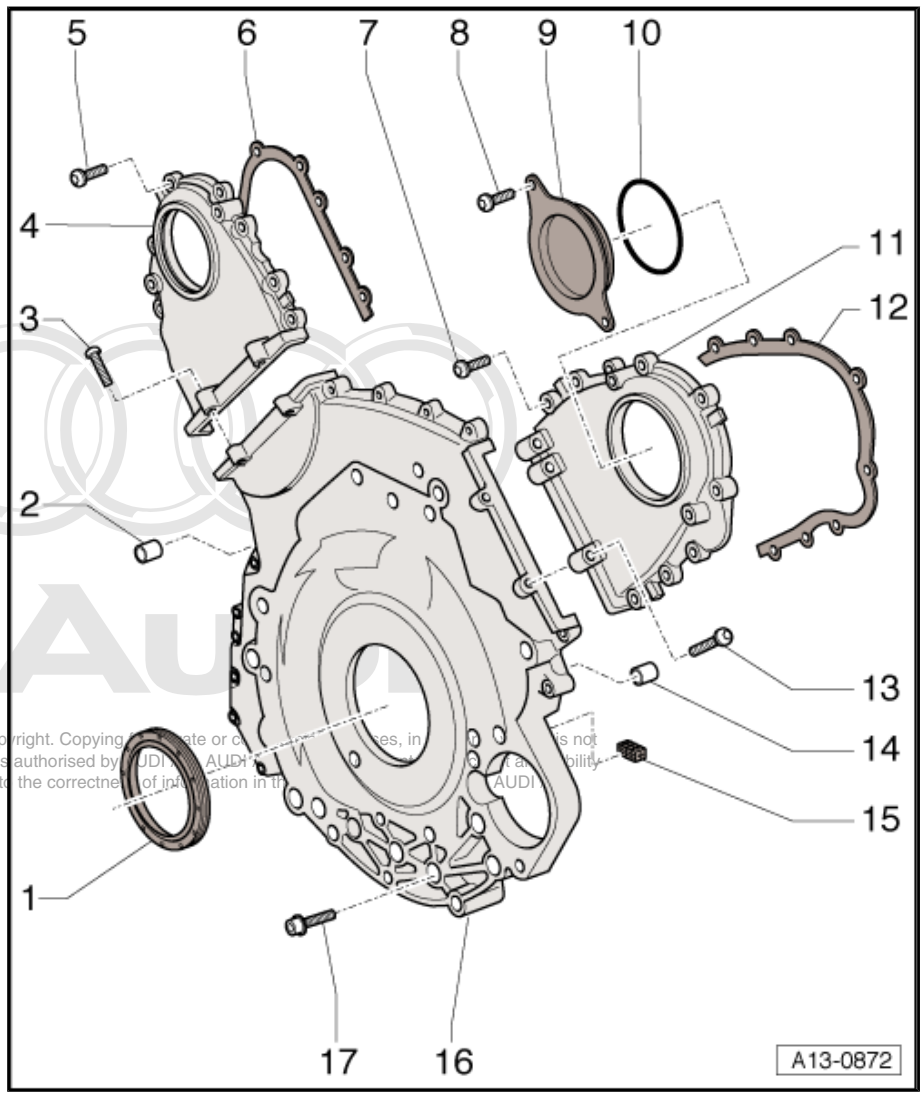
15 – Cylinder head, valve gear

1 Timing chain covers

Overview

- ⇒ “1.1 Timing chain covers - exploded view”, page 150
- ⇒ “1.2 Removing and installing timing chain cover (left-side)”, page 152
- ⇒ “1.3 Removing and installing timing chain cover (right-side)”, page 153
- ⇒ “1.4 Removing and installing timing chain cover (bottom)”, page 155

1.1 Timing chain covers - exploded view



1 - Crankshaft oil seal (gearbox end)
- ❑ Removing and installing ⇒ page 137

2 - Dowel sleeve
- ❑ 2x

3 - Bolt
- ❑ Tightening torque and sequence ⇒ page 151

4 - Timing chain cover (left-side)
- ❑ Removing and installing ⇒ page 152

5 - Bolt
- ❑ Tightening torque and sequence ⇒ page 151

6 - Gasket
- ❑ Renew

7 - Bolt
- ❑ Tightening torque and sequence ⇒ page 151

8 - Bolt
- ❑ 9 Nm

9 - Cover plate

10 - O-ring
- ❑ Renew

11 - Timing chain cover (right-side)
- ❑ Removing and installing ⇒ page 153

12 - Gasket
- ❑ Renew

13 - Bolt
- ❑ Tightening torque and sequence ⇒ page 151

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14 - Dowel sleeve

- ❑ 2x

15 - Sealing element

- ❑ 2x

16 - Timing chain cover (bottom)

- ❑ Removing and installing ⇒ page 155

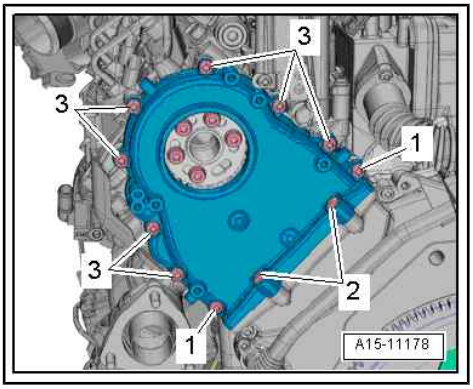
17 - Bolt

- ❑ Tightening torque and sequence ⇒ page 151

Timing chain cover (left-side) - tightening torque and sequence

– Tighten bolts in 4 stages as follows:

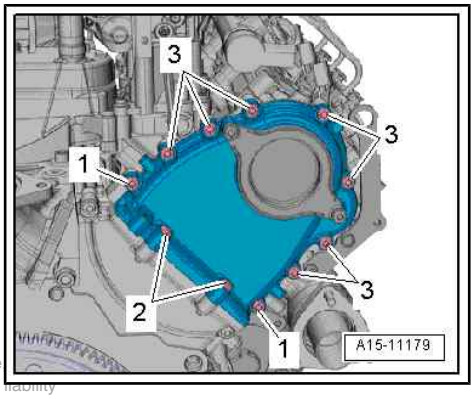
Stage	Bolts	Tightening torque/angle specification
1.	-1-	3 Nm
2.	-2-	9 Nm
3.	-1-	9 Nm
4.	-3-	9 Nm in diagonal sequence



Timing chain cover (right-side) - tightening torque and sequence

– Tighten bolts in 4 stages as follows:

Stage	Bolts	Tightening torque/angle specification
1.	-1-	3 Nm
2.	-2-	9 Nm
3.	-1-	9 Nm
4.	-3-	9 Nm in diagonal sequence

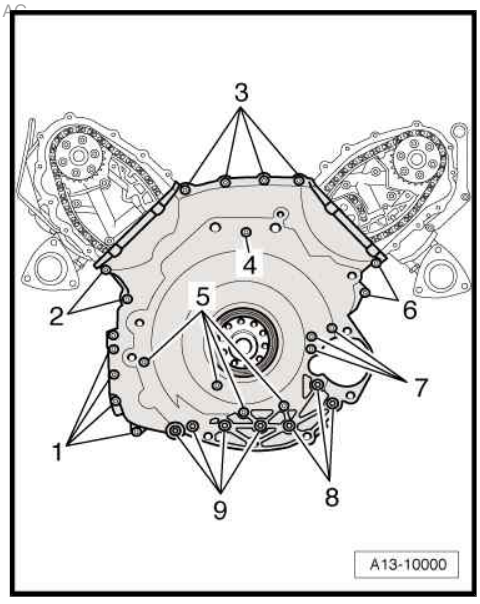


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Timing chain cover (bottom) - tightening torque and sequence

– Tighten bolts in 3 stages as follows:

Stage	Bolts	Tightening torque/angle specification
1.	-1 … 9-	5 Nm in diagonal sequence starting from inside and working outwards
2.	-1 … 7-	9 Nm in diagonal sequence starting from inside and working outwards
3.	-8, 9-	23 Nm

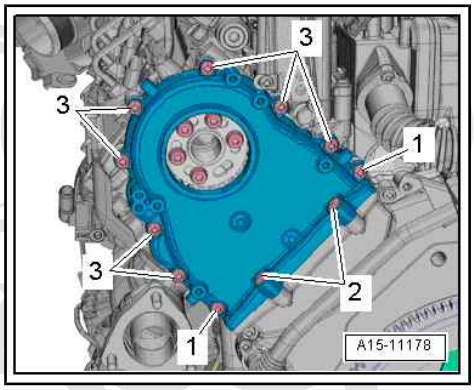


1.2 Removing and installing timing chain cover (left-side)

Special tools and workshop equipment required

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

Removing



– Remove vacuum pump ⇒ Rep. gr. 47 .
– Remove intermediate pipe (left-side) ⇒ page 364
– Remove coolant pipe (top left) ⇒ page 287 .
– Loosen bolts in the sequence -3 ... 1-.
– Carefully release timing chain cover (left-side) from bonded joint and detach.

Installing

– Remove old sealant from groove on timing chain cover and from sealing surfaces.

Caution

Protect lubrication system against contamination.

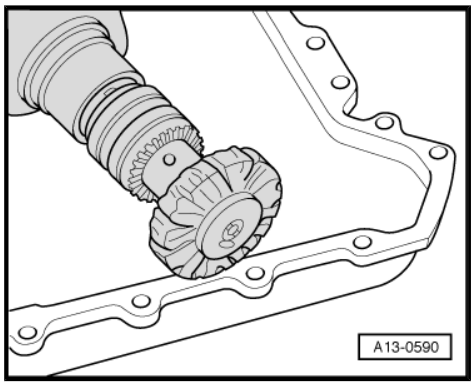
- *Cover exposed parts of the engine.*

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WARNING

Risk of eye injury.

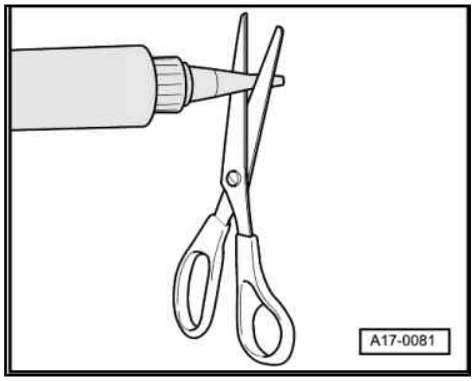
- *Wear safety goggles.*



– Remove remaining sealant on timing chain cover and cylinder head using rotating plastic brush or similar.
– Clean sealing surfaces; they must be free of oil and grease.

Note

Note the use-by date of the sealant.

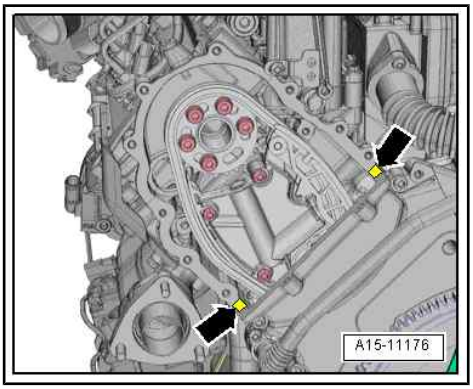


– Cut off nozzle of tube at front marking (nozzle ∅ approx. 1.5 mm).

Caution

Make sure lubrication system is not clogged by excess sealant.

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

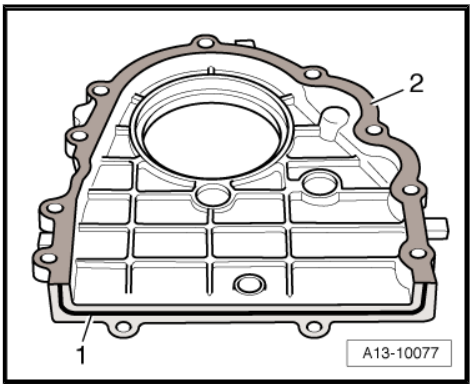


– Apply a bead of sealant (∅ 3 mm) at each joint between cylinder head and timing chain cover (bottom) -arrow-, as shown in illustration.

– Apply bead of sealant onto clean sealing surface of timing chain cover (left-side) as illustrated.

- The groove -1- on the sealing surface must be completely filled with sealant.
- The bead of sealant must project 1.5 … 2.0 mm above the sealing surface.

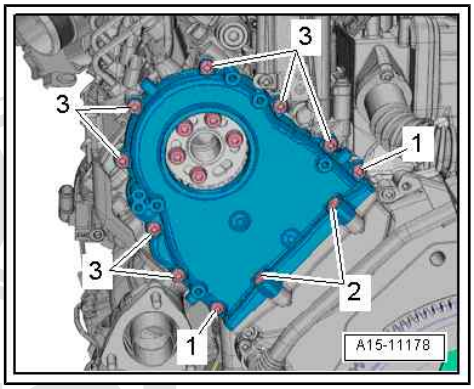
– Fit gasket -2-.



Note

The timing chain cover must be installed within 5 minutes after applying the sealant.

– Install timing chain cover (left-side) and tighten bolts ⇒ page 151 .



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

– Install coolant pipe (top left) ⇒ page 287 .

– Install intermediate pipe (left-side) ⇒ page 364 .

– Install vacuum pump ⇒ Rep. gr. 47 .

1.3 Removing and installing timing chain cover (right-side)

Special tools and workshop equipment required

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

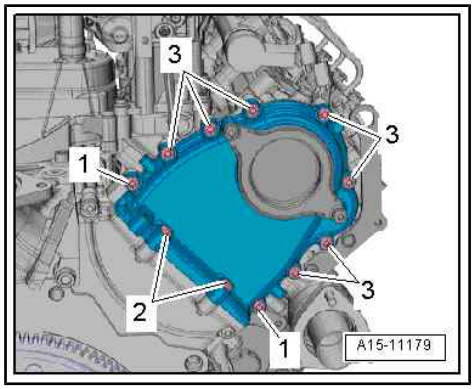
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Removing

– Remove rear coolant pipe (right-side) ⇒ page 291 .

– Loosen bolts in the sequence -3 ... 1-.

– Carefully release timing chain cover (left-side) from bonded joint and detach.



Installing

– Remove old sealant from groove on timing chain cover and from sealing surfaces.

Caution

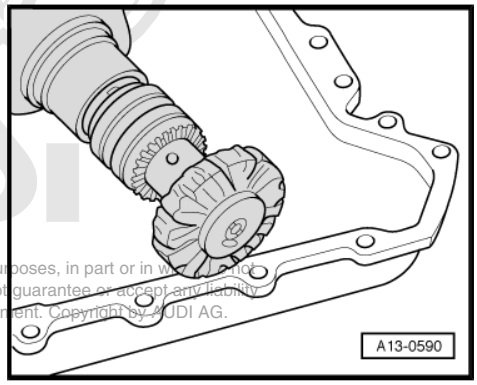
Protect lubrication system against contamination.

- *Cover exposed parts of the engine.*

WARNING

Risk of eye injury.

- *Wear safety goggles.*



– Remove remaining sealant on timing chain cover and cylinder head using rotating plastic brush or similar.

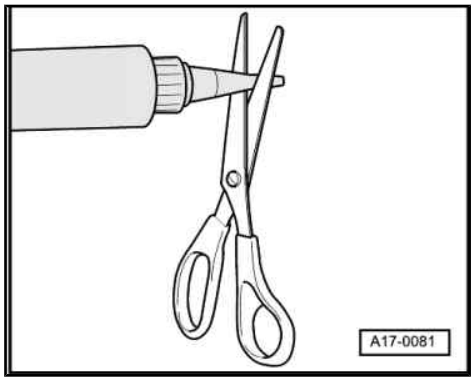
– Clean sealing surfaces; they must be free of oil and grease.

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Note

Note the use-by date of the sealant.

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

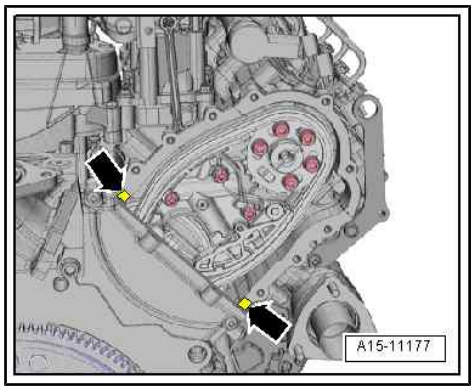


Caution

Make sure lubrication system is not clogged by excess sealant.

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

– Apply a bead of sealant (∅ 3 mm) at each joint between cylinder head and timing chain cover (bottom) -arrow-, as shown in illustration.

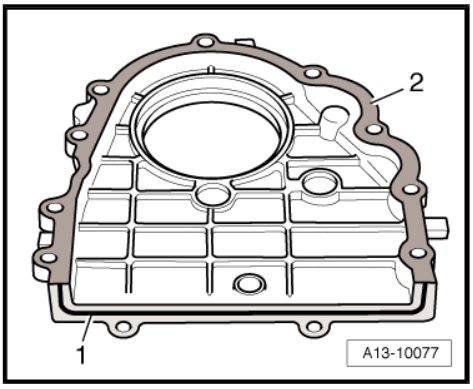


– Apply bead of sealant onto clean sealing surface of timing chain cover (right-side) as illustrated.

• The groove -1- on the sealing surface must be completely filled with sealant.

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

– Fit gasket -2-.



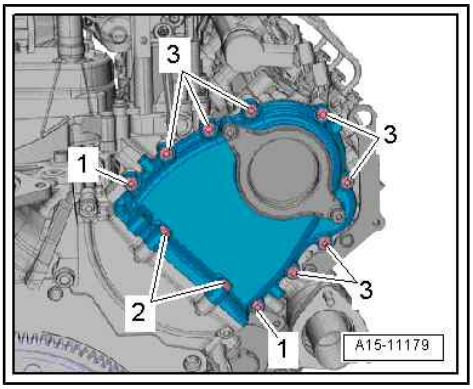
Note

The timing chain cover must be installed within 5 minutes after applying the sealant.

– Install timing chain cover (right-side) and tighten bolts ⇒ page 151 .

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

– Install coolant pipe (rear right) ⇒ page 291 .



1.4 Removing and installing timing chain cover (bottom)

Special tools and workshop equipment required

♦ Electric drill with plastic brush attachment

♦ Safety goggles

♦ Sealant ⇒ Electronic parts catalogue

Removing

• Gearbox removed.

– Remove dual-mass flywheel on vehicles with manual gearbox ⇒ page 130 .

– Remove flywheel on vehicles with multitronic gearbox ⇒ page 134 .

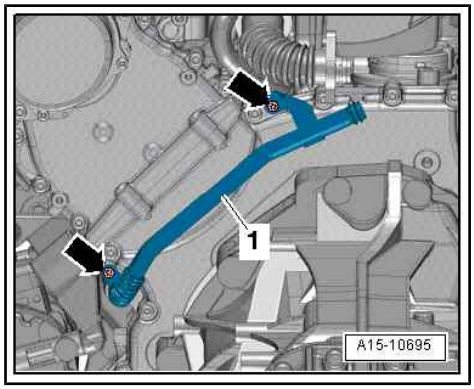
– Remove drive plate on vehicles with automatic gearbox ⇒ page 136 .

– Remove intermediate pipe with intermediate flange: left-side ⇒ page 364 ; right-side ⇒ page 366 and ⇒ page 312 .

– Remove timing chain covers: left-side ⇒ page 152 , right-side ⇒ page 153 .

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– Remove bolts -arrows- and detach oil return pipe -1- from cylinder block.



Note

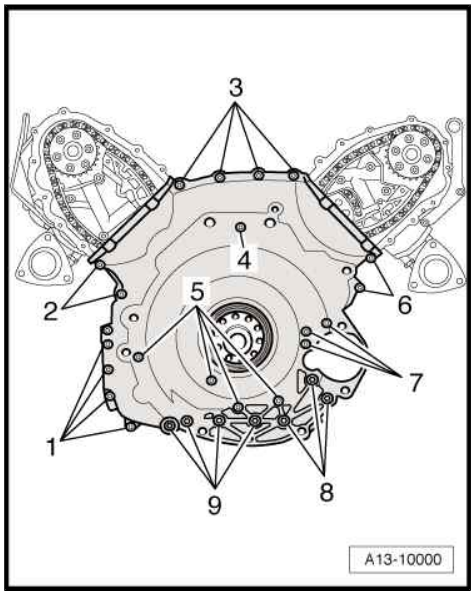
Place a cloth underneath to catch escaping engine oil.

– Unscrew bolts -1 ... 9- and remove timing chain cover (bottom).

– Press crankshaft oil seal (gearbox end) out of timing chain cover (bottom).

Installing

– Remove old sealant from grooves on timing chain cover and from sealing surfaces.



Caution

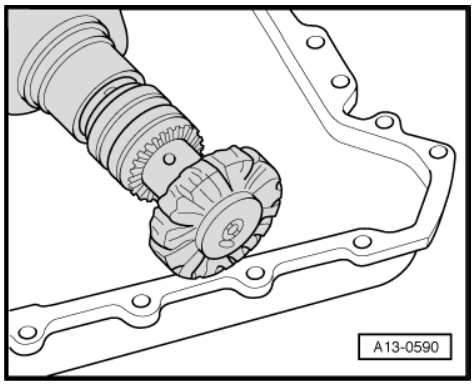
Protect lubrication system against contamination.

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

WARNING

Risk of eye injury.

- ***Wear safety goggles.***



– Remove remaining sealant on timing chain cover (bottom) and cylinder block using rotating plastic brush or similar.

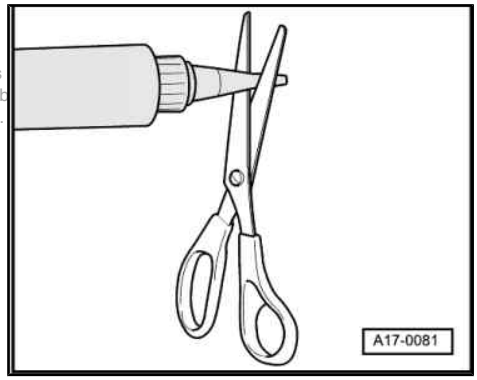
– Clean sealing surfaces; they must be free of oil and grease.

Note

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Note the use-by date of the sealant.

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

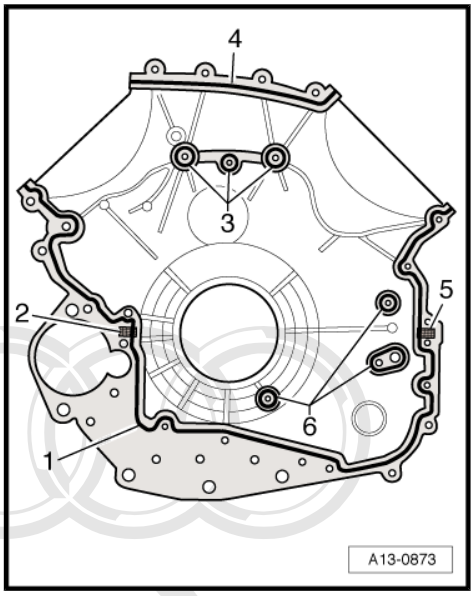


– Fit sealing elements -2- and -5-.

Caution

Make sure lubrication system is not clogged by excess sealant.

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



– Apply sealant beads -1- and -4- onto clean sealing surface of timing chain cover (bottom) as illustrated.

- The grooves on the sealing surfaces must be completely filled with sealant.
- The bead of sealant must project 1.5 … 2.0 mm above the sealing surface.
- The beads of sealant around drillings -3- and -6- must be 1.5 … 2.0 mm thick.

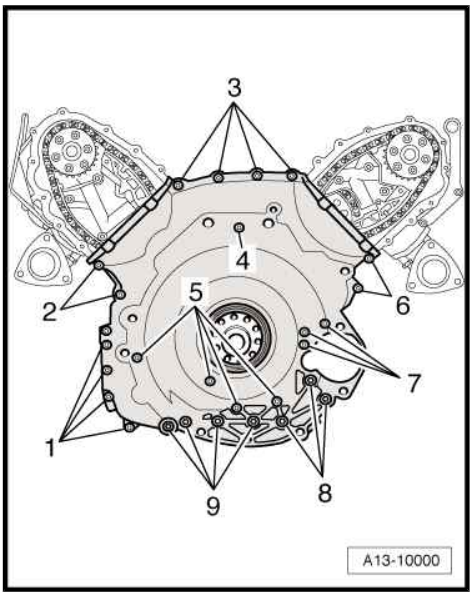
Note

The timing chain cover must be installed within 5 minutes after applying the sealant.

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– Check that dowel sleeves are fitted in cylinder block; insert if necessary.

– Install timing chain cover (bottom) and tighten bolts ⇒ page 151 .



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

– Install bottom section of oil return line ⇒ page 303 .

– Install timing chain covers: left-side ⇒ page 152 , right-side ⇒ page 153 .

– Install intermediate pipe with intermediate flange: left-side ⇒ page 364 ; right-side ⇒ page 366 and ⇒ page 312 .

– Install dual-mass flywheel on vehicles with manual gearbox ⇒ page 130 .

– Install flywheel on vehicles with multitronic gearbox ⇒ page 134 .

– Install drive plate on vehicles with automatic gearbox ⇒ page 136 .

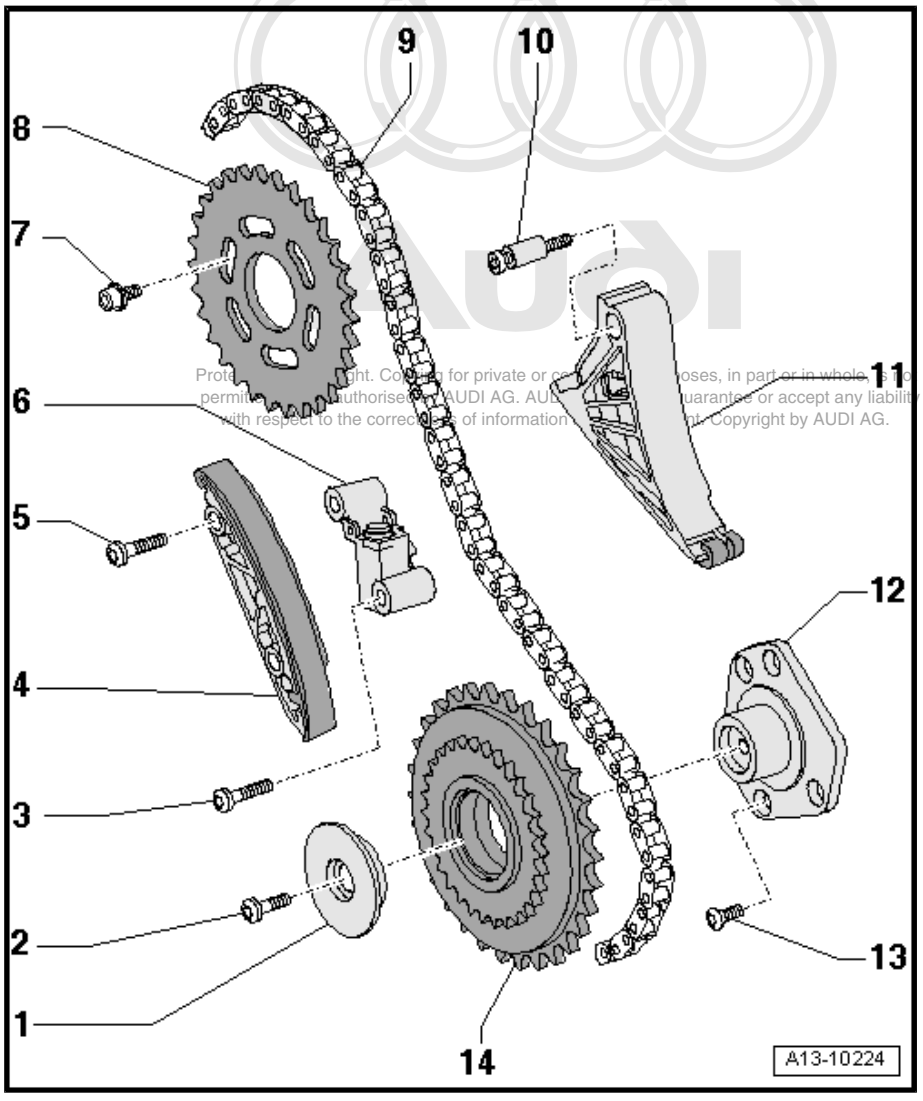
2 Chain drive

Overview

- ⇒ “2.1 Camshaft timing chains - exploded view”, page 158
- ⇒ “2.2 Removing timing chains from camshafts”, page 160
- ⇒ “2.3 Removing and installing camshaft timing chains”, page 168
- ⇒ “2.4 Drive chain for valve gear - exploded view”, page 176
- ⇒ “2.5 Removing and installing drive chain for valve gear”, page 178
- ⇒ “2.6 Drive chain for auxiliary drives - exploded view”, page 179
- ⇒ “2.7 Removing and installing drive chain for auxiliary drives”, page 180
- ⇒ “2.8 Balance shaft - exploded view”, page 183
- ⇒ “2.9 Removing and installing balance shaft”, page 183

2.1 Camshaft timing chains - exploded view

Camshaft timing chain (left-side)



1 - Thrust washer
- ❑ For drive chain sprocket

2 - Bolt
- ❑ Tightening torque ⇒ Item 4 (page 177)

3 - Bolt
- ❑ Renew
- ❑ 5 Nm + 90°

4 - Guide rail
- ❑ Note installation position

5 - Bolt
- ❑ Renew
- ❑ 5 Nm + 90°

6 - Chain tensioner
- ❑ For camshaft timing chain (left-side)

7 - Bolt
- ❑ 23 Nm

8 - Camshaft chain sprocket
- ❑ For inlet camshaft
- ❑ Installation position: Side with lettering faces front

9 - Camshaft timing chain (left-side)
- ❑ Removing from camshafts ⇒ page 160
- ❑ Before removing, mark running direction with

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paint
- ❑ Removing and installing ⇒ page 168

10 - Bolt
- ❑ With sleeve
- ❑ Renew
- ❑ 5 Nm + 90°

11 - Tensioning rail

12 - Bearing bracket
- ❑ For drive chain sprocket

13 - Bolt
- ❑ Tightening torque ⇒ Item 10 (page 177)

14 - Drive chain sprocket
- ❑ For camshaft timing chain (left-side)

Camshaft timing chain (right-side)

1 - Bolt
- ❑ Tightening torque ⇒ Item 2 (page 177)

2 - Bearing mounting
- ❑ For drive chain sprocket

3 - Camshaft timing chain (right-side)
- ❑ Removing from camshafts ⇒ page 160
- ❑ Before removing, mark running direction with paint
- ❑ Removing and installing ⇒ page 168

4 - Camshaft chain sprocket
- ❑ For inlet camshaft
- ❑ Installation position: Side with lettering faces front

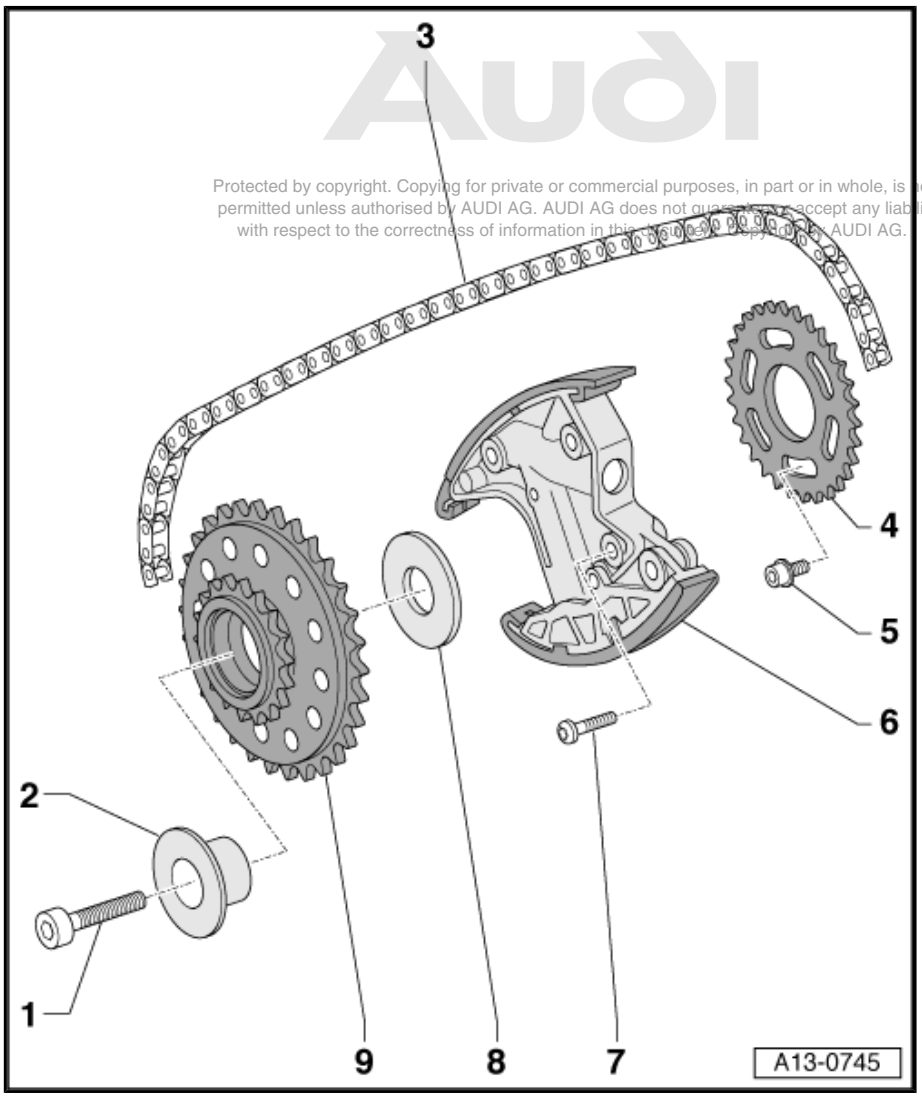
5 - Bolt
- ❑ 23 Nm

6 - Chain tensioner
- ❑ For camshaft timing chain (right-side)

7 - Bolt
- ❑ Renew
- ❑ 5 Nm + 90°

8 - Thrust washer
- ❑ For drive chain sprocket

9 - Drive chain sprocket
- ❑ For camshaft timing chain (right-side)

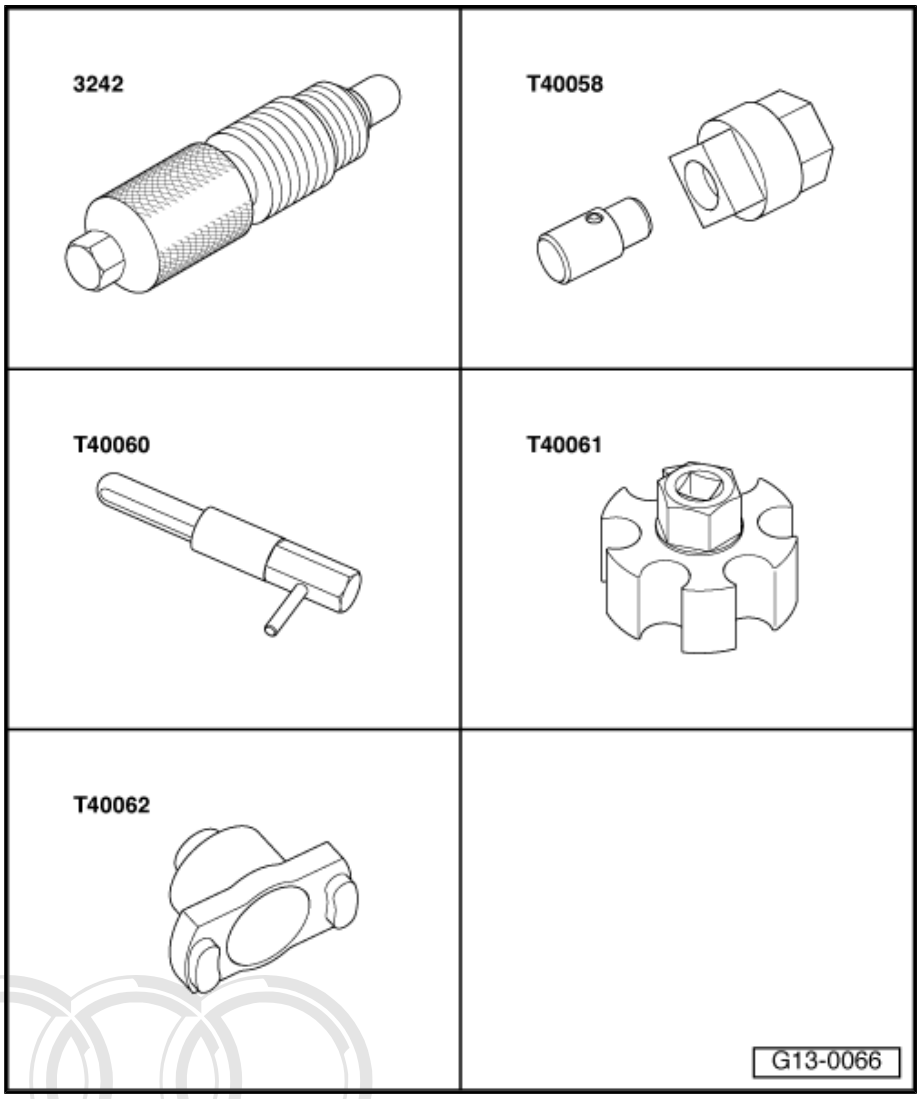


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2.2 Removing timing chains from camshafts

Special tools and workshop equipment required

- Locking pin - 3242-
- Adapter - T40058-
- 2x Adjustment pin - T40060-
- Adapter - T40061-
- Adapter - T40062-
- Drill bit 3.3 mm ∅ (2x)



Removing

- Engine and gearbox in vehicle

Note

When working on one cylinder head only, it is not necessary to remove the timing chain cover on the opposite cylinder head as well.

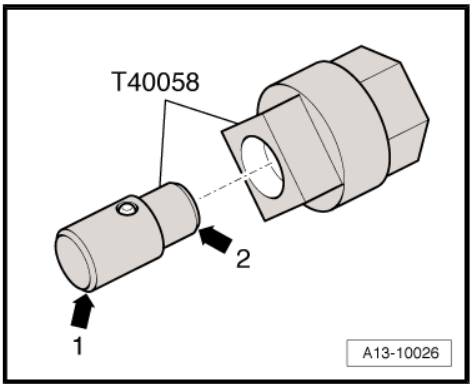
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– Remove timing chain cover: left-side ⇒ page 152 , right-side ⇒ page 153 .

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

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

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



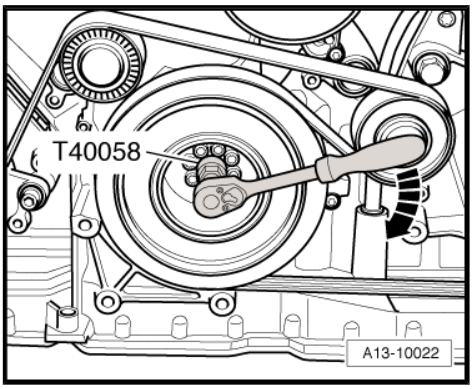
Caution

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Irreparable damage can be caused if the camshaft timing chains slip.

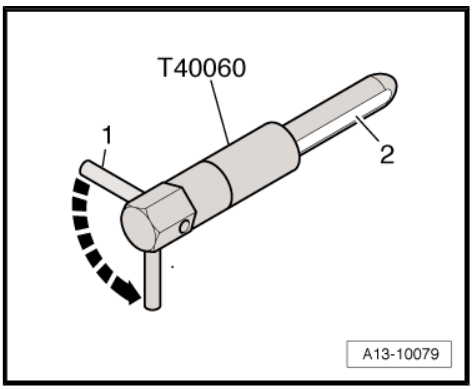
- ***Turn crankshaft only in direction of engine rotation -arrow-.***

– Use adapter - T40058- to turn crankshaft to “TDC” position.



Note

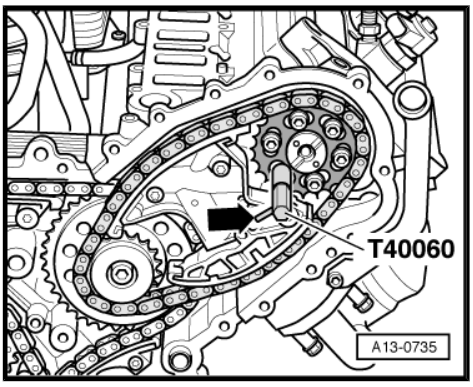
- *The adjustment pin - T40060- has a flat -2- which makes it easier to insert when the locating bores in the camshaft and cylinder head are not exactly in line.*
- *The adjustment pin is inserted initially so that the side pin -1- is perpendicular to the imaginary line between the adjustment pin and the centre of the camshaft.*
- *To obtain the correct “TDC” position, the side pin -1- must then be turned 90° -arrow- so it is in line with the imaginary line between the adjustment pin and the centre of the camshaft.*



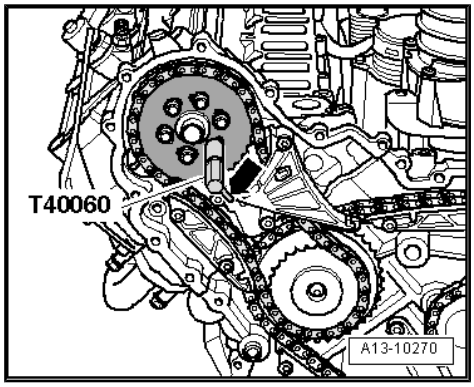
– Check that camshafts on both cylinder heads are positioned at “TDC”.

• It should be possible to lock the camshafts with the adjustment pins - T40060- .

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



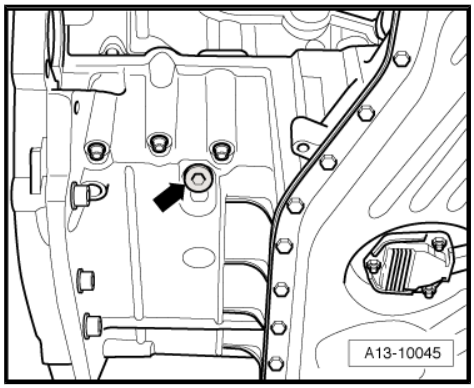
- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft on cylinder bank 2 (left-side).



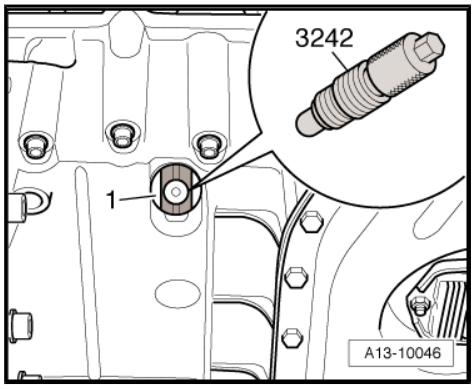
Note

Place a cloth beneath the sump (top section) to catch escaping oil.

– Use extended hexagon socket wrench with ball head and unscrew plug -arrow- for “TDC” marking from sump (top section).



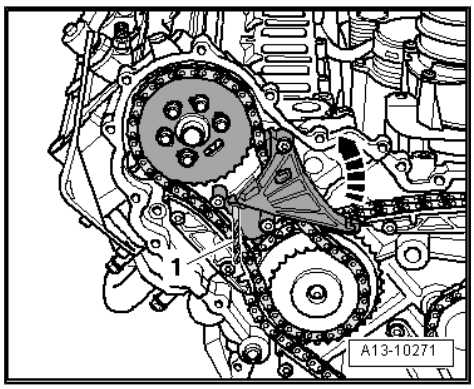
– Screw locking pin - 3242- into hole (20 Nm); if necessary, turn crankshaft -1- backwards and forwards slightly to fully centralise locking pin.



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– Wrap insulating tape around tip and shaft of 3.3 mm ∅ drill bit to avoid cutting yourself.

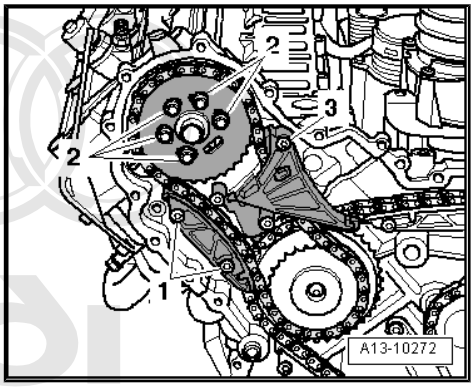
– Press tensioning rail of camshaft timing chain tensioner (left-side) in direction of -arrow- and lock chain tensioner by inserting 3.3 mm ∅ drill bit -item 1-.



Caution

Risk of irreparable damage to engine.

- *Block off the opening in the valve timing housing with a clean cloth to prevent small items from dropping into the engine.*



– Unscrew bolt -3- and remove tensioning rail.

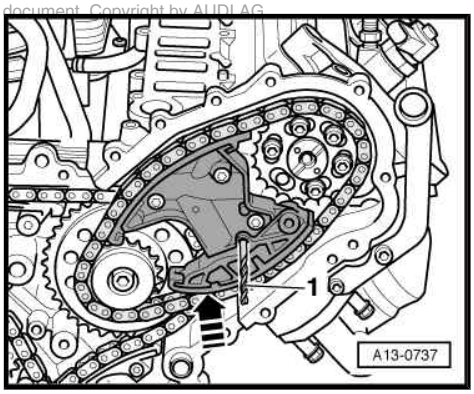
– Remove bolts -1- for guide rail and -2- for camshaft chain sprocket.

– Detach camshaft chain sprocket and guide rail.

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– Wrap insulating tape around tip and shaft of 3.3 mm ∅ drill bit to avoid cutting yourself.

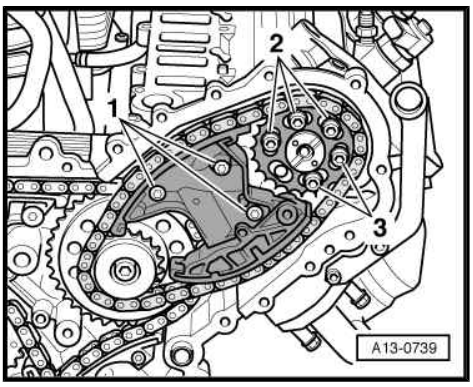
– Press guide rail of camshaft timing chain tensioner (right-side) in direction of -arrow- and lock chain tensioner by inserting 3.3 mm ∅ drill bit -item 1-.



Caution

Risk of irreparable damage to engine.

- *Block off the opening in the valve timing housing with a clean cloth to prevent small items from dropping into the engine.*

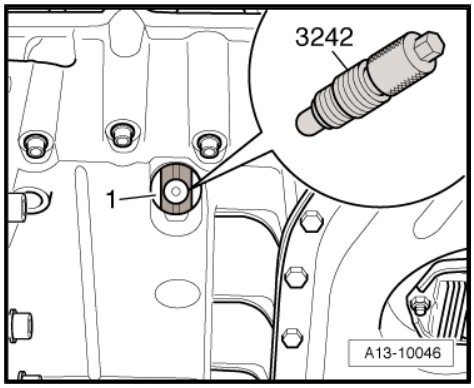


– Remove bolts -1- for chain tensioner and bolts -2- and -3- for camshaft chain sprocket.

– Detach camshaft chain sprocket and chain tensioner (right-side).

Installing

- Tightening torques
  ⇒ “2.1 Camshaft timing chains - exploded view”, page 158
- Crankshaft -1- locked in “TDC” position with locking pin - 3242- .



Note

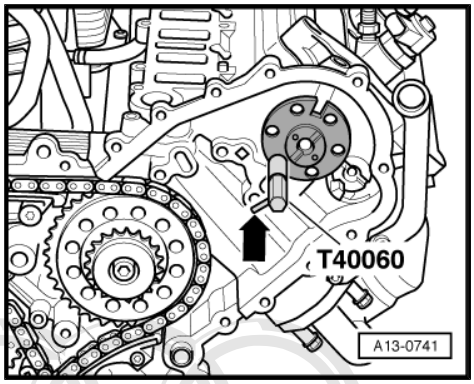
Renew the bolts tightened with specified tightening angle.

Caution

Avoid damage to valves and piston crowns.

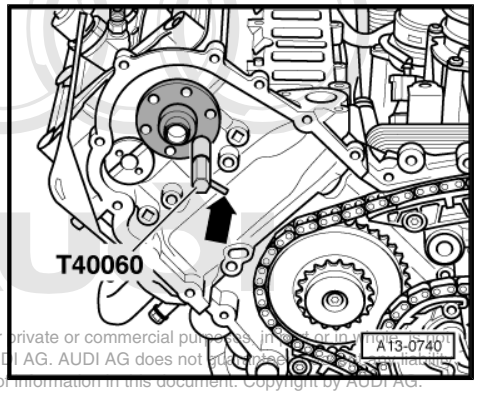
- ***The crankshaft must not be at “TDC” at any cylinder when the camshafts are turned.***

– Check that camshafts on both cylinder heads are positioned at “TDC”.
- It should be possible to lock the camshafts with the adjustment pins - T40060- .
- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft on cylinder bank 1 (right-side).



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

– Remove adjustment pin - T40060- from both camshafts.

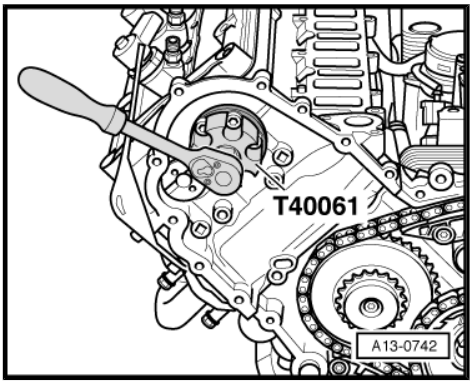


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Caution

Avoid damage to valves and piston crowns.

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



Note

If the pins cannot be inserted in the camshafts, the camshafts can be turned slightly using adapter - T40061- . To do so, screw securing bolts for camshaft sprocket into camshaft.

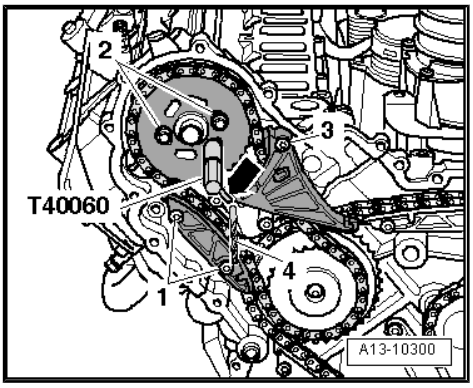
– Install camshaft timing chain (left-side) with camshaft chain sprocket, guide rail and tensioning rail.

• The elongated holes in the camshaft chain sprocket must be aligned centrally over the threaded holes in the camshaft.

– Tighten bolts -1- and -3- for guide rail and tensioning rail.

– Fit both bolts -2- for camshaft chain sprocket without tightening.

• It should just be possible to turn the sprocket on the camshaft without axial movement.



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– Use adjustment pin - T40060- to lock camshaft (left-side).

• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.

– Pull drill bit -4- out of locating hole, this releases the chain tensioner (left-side).

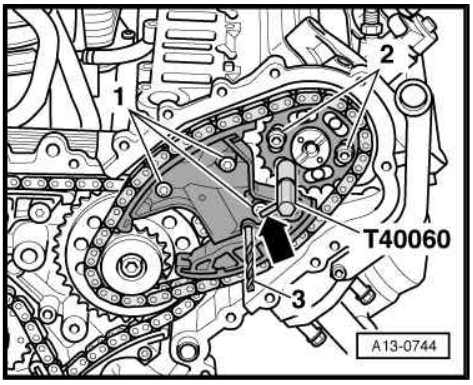
– Install camshaft timing chain (right-side) with camshaft chain sprocket and chain tensioner.

• The elongated holes in the camshaft chain sprocket must be aligned centrally over the threaded holes in the camshaft.

– Tighten bolts -1- for chain tensioner.

– Fit both bolts -2- for camshaft chain sprocket without tightening.

• It should just be possible to turn the sprocket on the camshaft without axial movement.

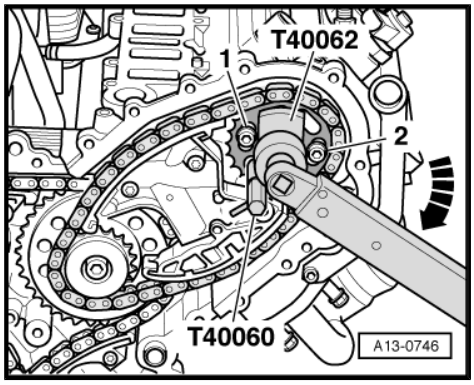


– Use adjustment pin - T40060- to lock camshaft (right-side).

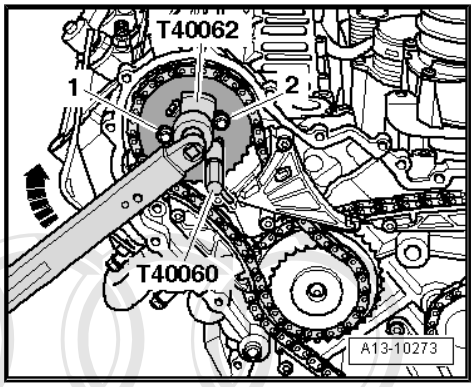
• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.

– Pull drill bit -3- out of locating hole, this releases the chain tensioner (right-side).

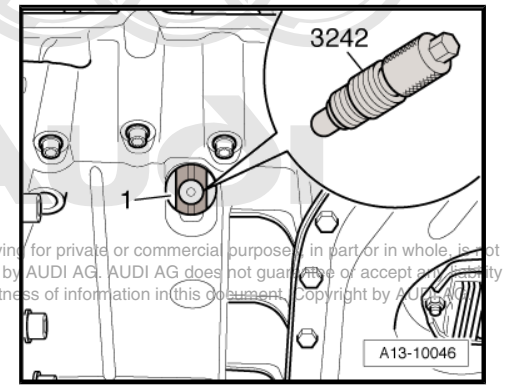
– Apply a torque of 20 Nm to camshaft sprocket (right-side) in direction of -arrow- using a torque wrench and adapter - T40062- and maintain this torque.
– Tighten bolts -1- and -2-.
– Remove adapter - T40062- and adjustment pin - T40060- .
– Tighten remaining bolts for camshaft sprocket (right-side).



– Apply a torque of 15 Nm to camshaft sprocket (left-side) in direction of -arrow- using a torque wrench and adapter - T40062- and maintain this torque.
– Tighten bolts -1- and -2-.
– Remove adapter - T40062- and adjustment pin - T40060- .
– Tighten remaining bolts for camshaft sprocket (left-side).



– Remove locking pin - 3242- .



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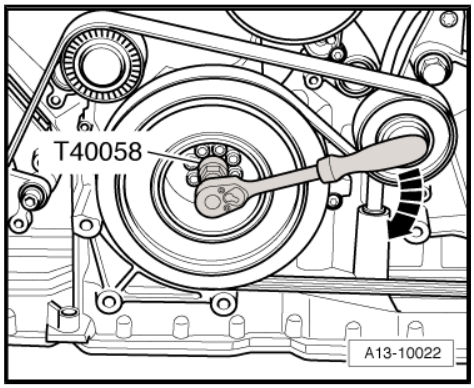
Checking valve timing

Caution

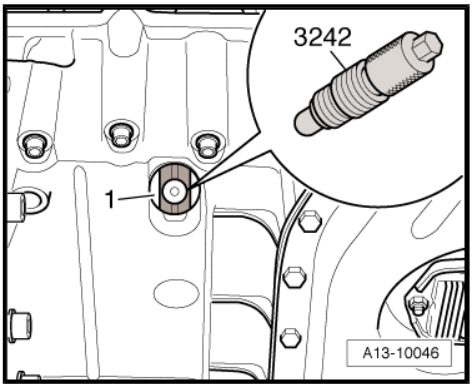
Irreparable damage can be caused if the camshaft timing chains slip.

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

– Turn crankshaft two rotations until it is again positioned just before “TDC”.



– While turning in this direction, lock crankshaft -1- with locking pin - 3242- . Tighten locking pin to 20 Nm.



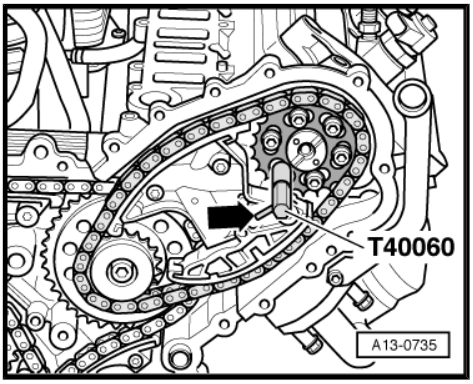
Caution

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

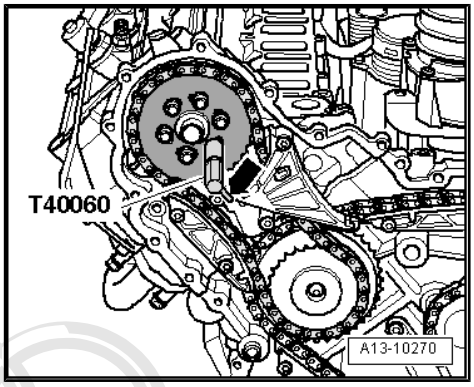
- *If crankshaft has been turned past "TDC" position, turn crankshaft two further rotations until it is again positioned just before "TDC". Then turn further in the same direction and lock crankshaft with locking pin - 3242- .*

– Check that camshafts on both cylinder heads are positioned at "TDC".

- It should be possible to lock the camshafts with the adjustment pins - T40060- .
- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft on cylinder bank 1 (right-side).

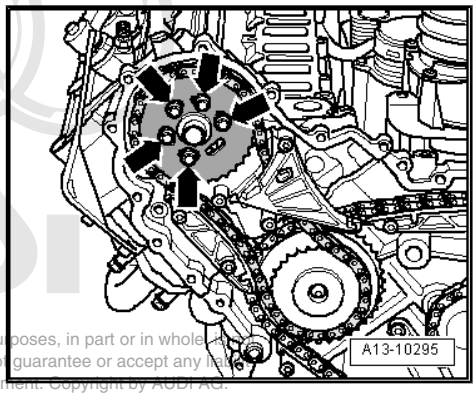


- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft on cylinder bank 2 (left-side).



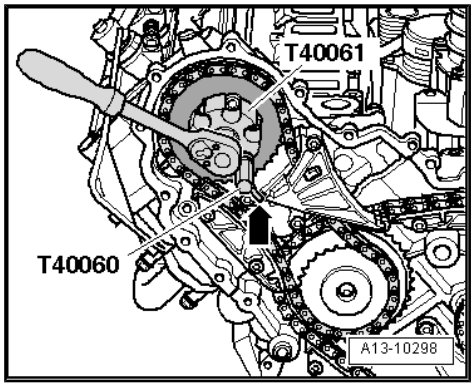
Adjusting valve timing

– If the pin cannot be inserted in one of the camshafts, loosen all bolts -arrows- of relevant camshaft chain sprocket approx. 1 turn.



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– Apply adapter - T40061- to the heads of the loosened bolts.
– Turn camshaft slightly backwards and forwards with adapter - T40061- until adjustment pin - T40060- can be inserted.
• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.
– With adapter - T40061- and adjustment pin - T40060- still in position, tighten bolts on camshaft sprocket to approx. 5 Nm.
– Remove adjustment pin - T40060- and adapter - T40061- .
– Tighten bolts for camshaft chain sprocket to final torque.
– Repeat procedure on other cylinder bank if necessary.
– Remove locking pin - 3242- .
– Check valve timing once again ⇒ page 166 .



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

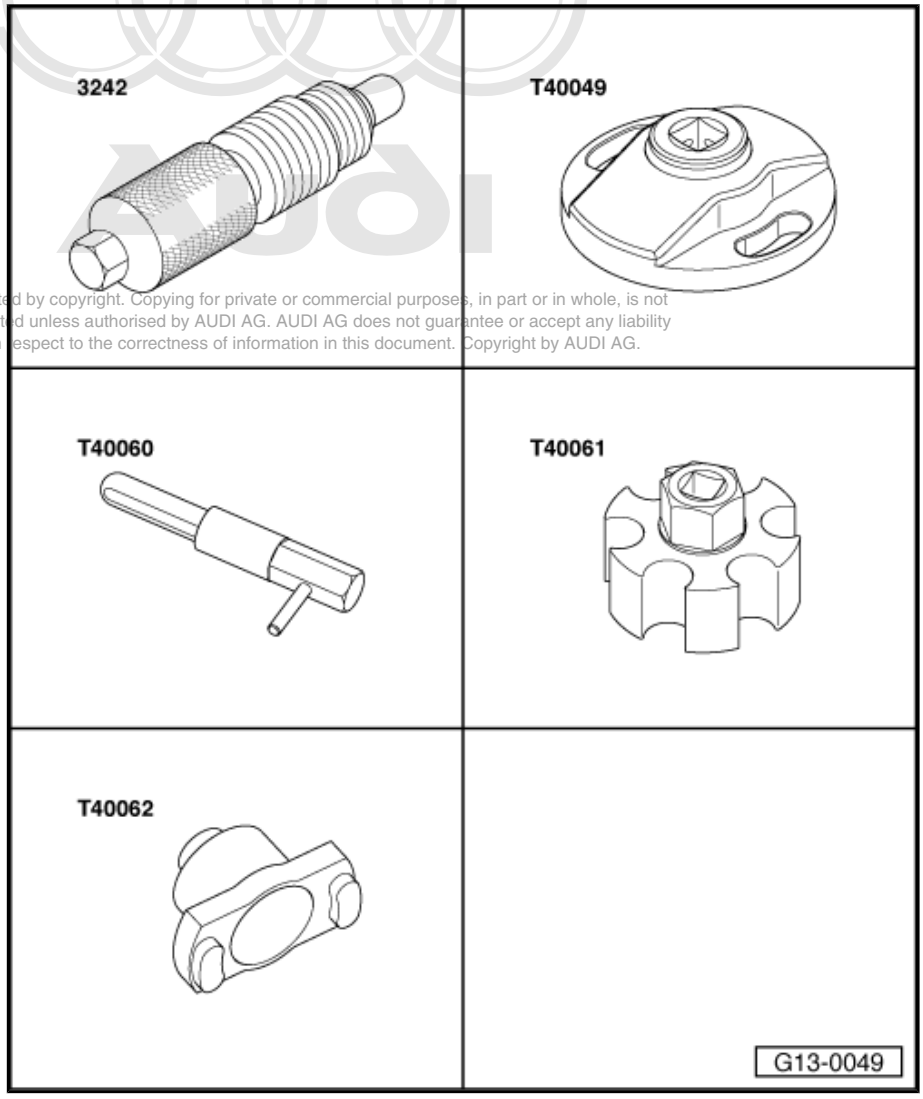
– Tighten plug for “TDC” drilling in sump (top section) ⇒ page 245 .
– Install timing chain cover: left-side ⇒ page 152 , right-side ⇒ page 153 .

2.3 Removing and installing camshaft timing chains

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Special tools and workshop equipment required

- Locking pin - 3242-
- Special wrench - T40049-
- 2x Adjustment pin - T40060-
- Adapter - T40061-
- Adapter - T40062-
- Drill bit 3.3 mm ∅ (2x)



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Removing

- Gearbox removed.

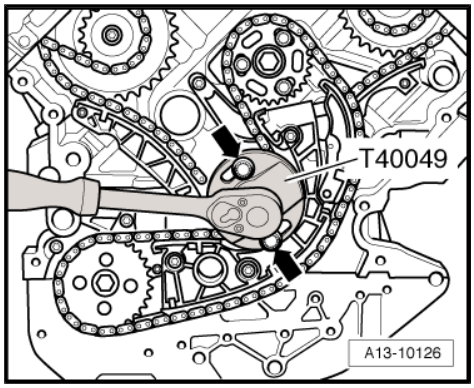
Caution

Avoid damage to valves and piston crowns.

- *The crankshaft and camshafts must only be turned with the chain drive mechanism fully installed.*

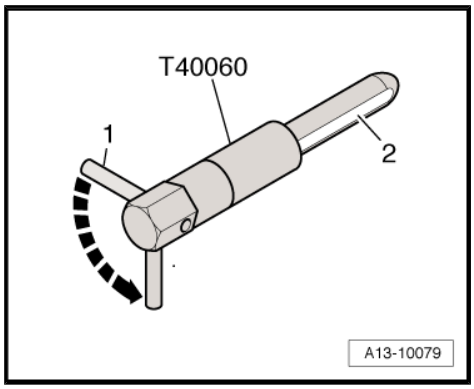
– Remove timing chain cover (bottom) ⇒ page 155 .

– Attach special wrench - T40049- at rear end of crankshaft using two old securing bolts -arrows- for drive plate.



Note

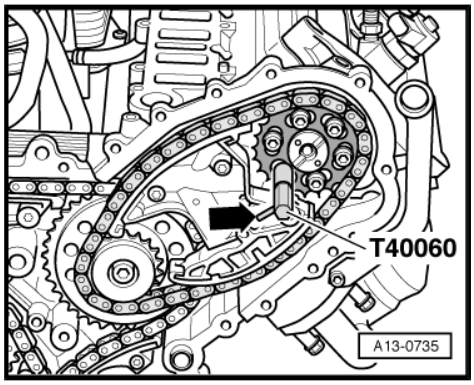
- *The adjustment pin - T40060- has a flat -2- which makes it easier to insert when the locating bores in the camshaft and cylinder head are not exactly in line.*
- *The adjustment pin is inserted initially so that the side pin -1- is perpendicular to the imaginary line between the adjustment pin and the centre of the camshaft.*
- *To obtain the correct "TDC" position, the side pin -1- must then be turned 90° -arrow- so it is in line with the imaginary line between the adjustment pin and the centre of the camshaft.*



Caution

Irreparable damage can be caused if the camshaft timing chains slip.

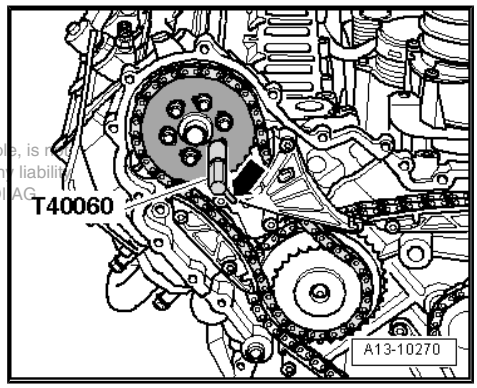
- ***Turn crankshaft only in direction of engine rotation.***



– Use special wrench - T40049- to turn crankshaft to "TDC" position:

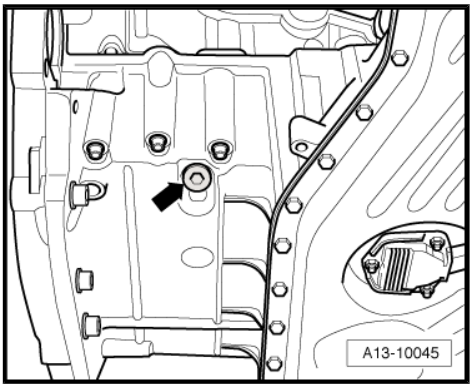
– Check that camshafts on both cylinder heads are positioned at "TDC".

- It should be possible to lock the camshafts with the adjustment pins - T40060- .
- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft on cylinder bank 1 (right-side).
- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft on cylinder bank 2 (left-side).

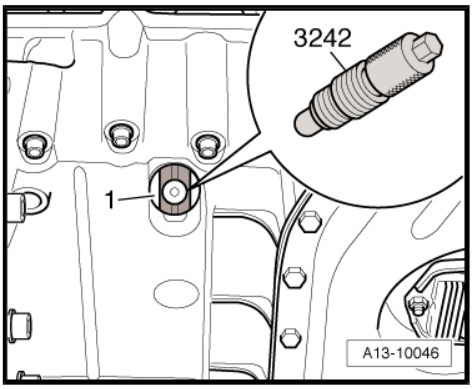


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– Use extended hexagon socket wrench with ball head and unscrew plug -arrow- for “TDC” marking from sump (top section).

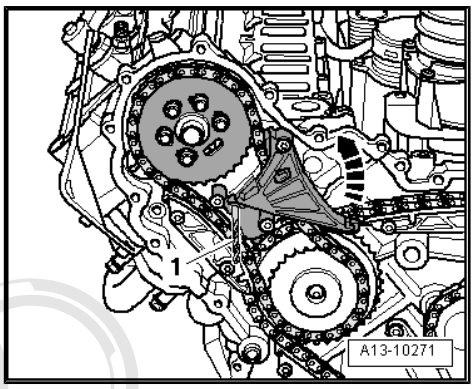


– Screw locking pin - 3242- into hole (20 Nm); if necessary, turn crankshaft -1- backwards and forwards slightly to fully centralise locking pin.



– Wrap insulating tape around tip and shaft of 3.3 mm ∅ drill bit to avoid cutting yourself.

– Press tensioning rail of camshaft timing chain tensioner (left-side) in direction of -arrow- and lock chain tensioner by inserting 3.3 mm ∅ drill bit -item 1-.



Caution

If a used timing chain rotates in the opposite direction when it is refitted, this can cause breakage.

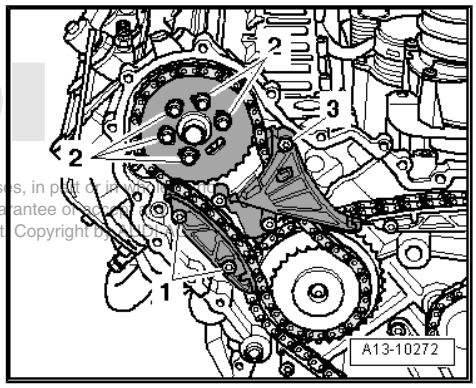
- ***Mark running direction of timing chain with coloured arrows for re-installation.***

– Remove adjustment pin - T40060- from both camshafts.

– Unscrew bolt -3- and remove tensioning rail.

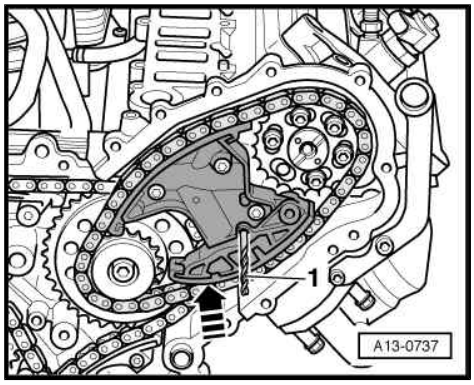
– Remove bolts -1- for guide rail and -2- for camshaft chain sprocket.

– Detach camshaft chain sprocket, guide rail and camshaft timing chain (left-side).



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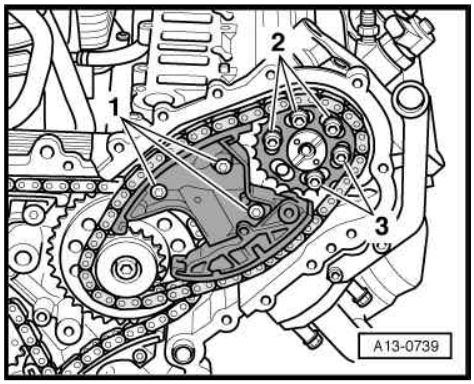
– Wrap insulating tape around tip and shaft of 3.3 mm ∅ drill bit to avoid cutting yourself.
– Press guide rail of camshaft timing chain tensioner (right-side) in direction of -arrow- and lock chain tensioner by inserting 3.3 mm ∅ drill bit -item 1-.



Caution

If a used timing chain rotates in the opposite direction when it is refitted, this can cause breakage.

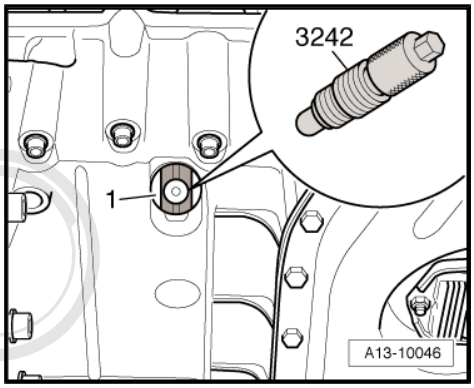
- *Mark running direction of timing chain with coloured arrows for re-installation.*



– Remove bolts -1- for chain tensioner and bolts -2- and -3- for camshaft chain sprocket.
– Detach camshaft chain sprocket, chain tensioner and camshaft timing chain (right-side).

Installing

- Tightening torques
⇒ “2.1 Camshaft timing chains - exploded view”, page 158
- Crankshaft -1- locked in “TDC” position with locking pin -3242- .
- Drive chain for valve gear installed ⇒ page 178



Note

Renew the bolts tightened with specified tightening angle.

Caution

Avoid damage to valves and piston crowns.

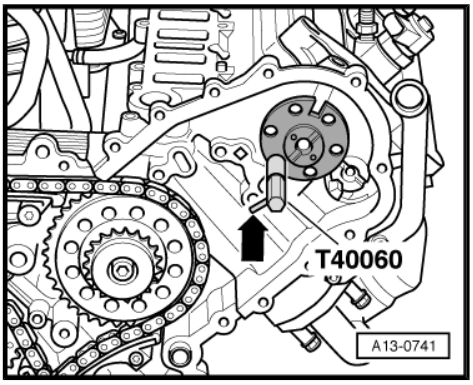
- *The crankshaft must not be at “TDC” at any cylinder when the camshafts are turned.*

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– Check that camshafts on both cylinder heads are positioned at “TDC”.

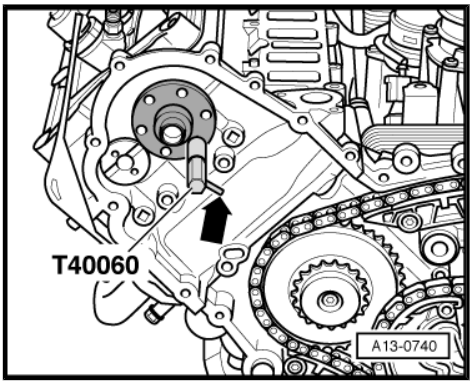
• It should be possible to lock the camshafts with the adjustment pins - T40060- .

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



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

– Remove adjustment pin - T40060- from both camshafts.

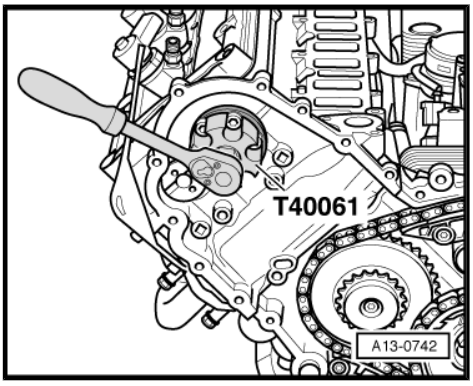


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Caution

Avoid damage to valves and piston crowns.

- *The crankshaft must not be at “TDC” at any cylinder when the camshafts are turned.*



Note

If the pins cannot be inserted in the camshafts, the camshafts can be turned slightly using adapter - T40061- . To do so, screw securing bolts for camshaft sprocket into camshaft.

– Install camshaft timing chain (left-side) with camshaft chain sprocket, guide rail and tensioning rail.

• The elongated holes in the camshaft chain sprocket must be aligned centrally over the threaded holes in the camshaft.

– Tighten bolts -1- and -3- for guide rail and tensioning rail.

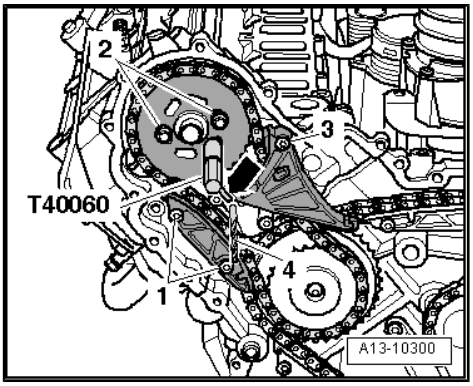
– Fit both bolts -2- for camshaft chain sprocket without tightening.

• It should just be possible to turn the sprocket on the camshaft without axial movement.

– Use adjustment pin - T40060- to lock camshaft (left-side).

• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.

– Pull drill bit -4- out of locating hole, this releases the chain tensioner (left-side).



– Install camshaft timing chain (right-side) with camshaft chain sprocket and chain tensioner.

• The elongated holes in the camshaft chain sprocket must be aligned centrally over the threaded holes in the camshaft.

– Tighten bolts -1- for chain tensioner.

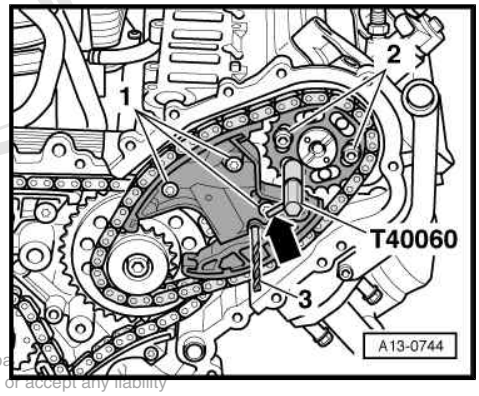
– Fit both bolts -2- for camshaft chain sprocket without tightening.

• It should just be possible to turn the sprocket on the camshaft without axial movement.

– Use adjustment pin - T40060- to lock camshaft (right-side).

• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.

– Pull drill bit -3- out of locating hole, this releases the chain tensioner (right-side).



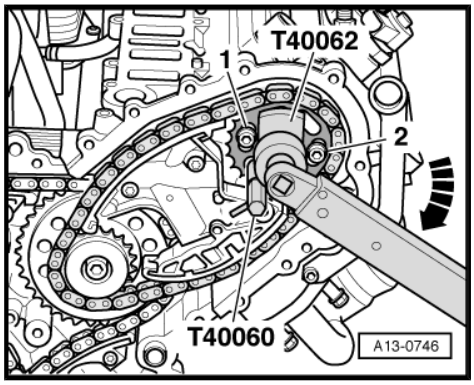
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– Apply a torque of 20 Nm to camshaft sprocket (right-side) in direction of -arrow- using a torque wrench and adapter - T40062- and maintain this torque.

– Tighten bolts -1- and -2-.

– Remove adapter - T40062- and adjustment pin - T40060- .

– Tighten remaining bolts for camshaft sprocket (right-side).

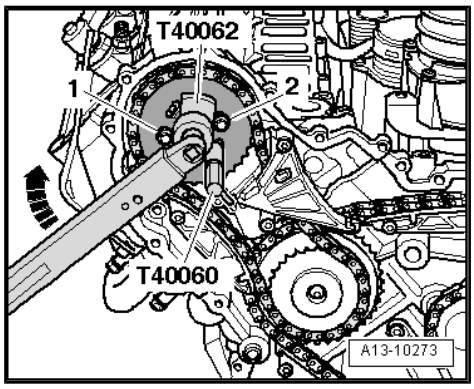


– Apply a torque of 15 Nm to camshaft sprocket (left-side) in direction of -arrow- using a torque wrench and adapter - T40062- and maintain this torque.

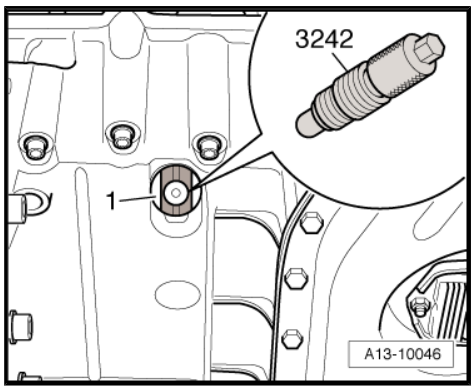
– Tighten bolts -1- and -2-.

– Remove adapter - T40062- and adjustment pin - T40060- .

– Tighten remaining bolts for camshaft sprocket (left-side).



– Remove locking pin - 3242- .

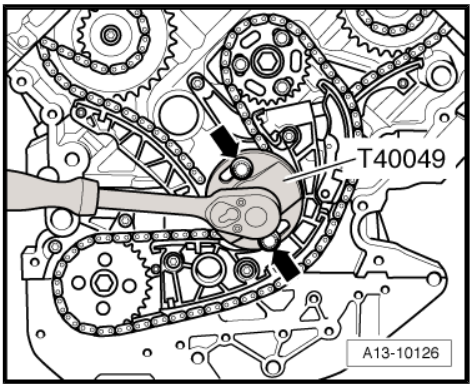


Checking valve timing

Caution

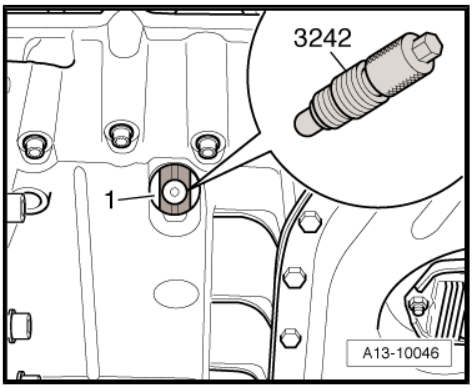
Irreparable damage can be caused if the camshaft timing chains slip.

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



– Turn crankshaft two rotations using special wrench - T40049- until it is again positioned just before “TDC”.

– While turning in this direction, lock crankshaft -1- with locking pin - 3242- . Tighten locking pin to 20 Nm.



Caution

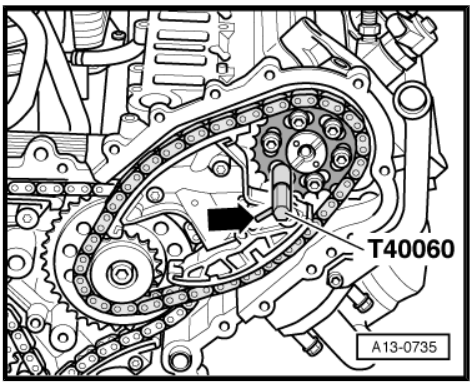
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The crankshaft must be exactly in “TDC” position to ensure accurate valve timing adjustment.

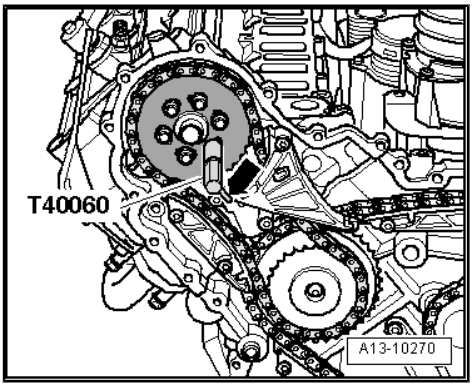
- *If crankshaft has been turned past “TDC” position, turn crankshaft two further rotations until it is again positioned just before “TDC”. Then turn further in the same direction and lock crankshaft with locking pin - 3242- .*

– Check that camshafts on both cylinder heads are positioned at “TDC”.

- It should be possible to lock the camshafts with the adjustment pins - T40060- .
- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft on cylinder bank 1 (right-side).

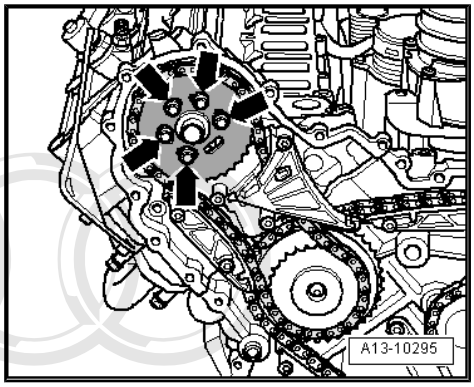


- The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft on cylinder bank 2 (left-side).



Adjusting valve timing

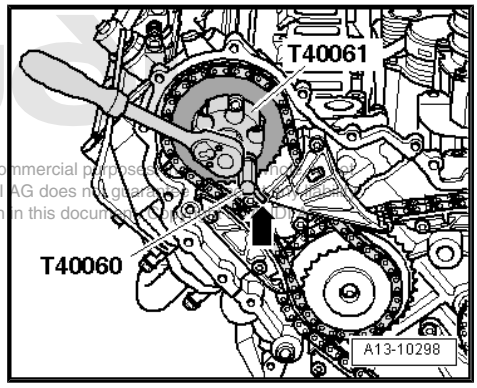
– If the pin cannot be inserted in one of the camshafts, loosen all bolts -arrows- of relevant camshaft chain sprocket approx. 1 turn.



– Apply adapter - T40061- to the heads of the loosened bolts.

– Turn camshaft slightly backwards and forwards with adapter - T40061- until adjustment pin - T40060- can be inserted.

• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.



Audi
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– With adapter - T40061- and adjustment pin - T40060- still in position, tighten bolts on camshaft sprocket to approx. 5 Nm.

– Remove adjustment pin - T40060- and adapter - T40061- .

– Tighten bolts for camshaft chain sprocket to final torque.

– Repeat procedure on other cylinder bank if necessary.

– Remove locking pin - 3242- .

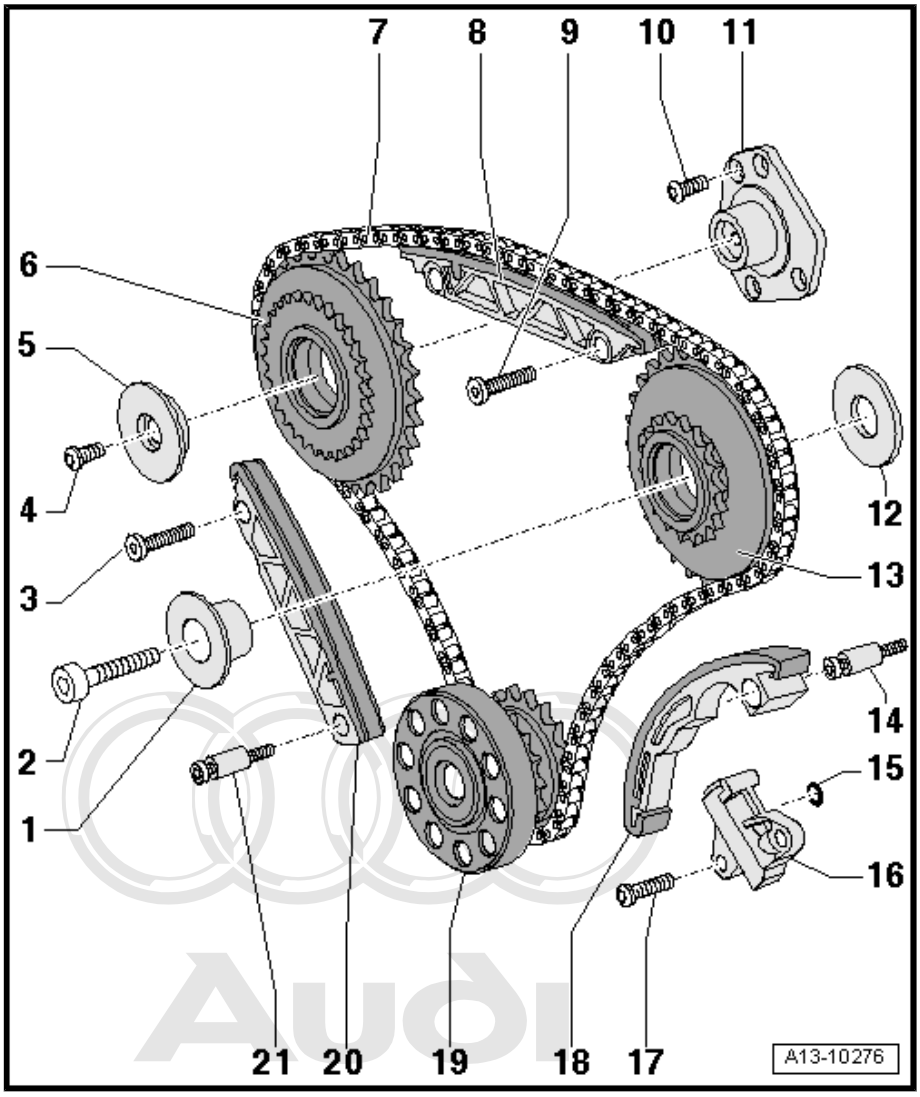
– Check valve timing once again ⇒ page 175 .

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

– Tighten plug for “TDC” drilling in sump (top section) ⇒ page 245 .

– Install timing chain cover (bottom) ⇒ page 155 .

2.4 Drive chain for valve gear - exploded view



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1 - Bearing mounting for drive sprocket

2 - Bolt

- ❑ 45 Nm

3 - Bolt

- ❑ Renew
- ❑ 5 Nm + 90°

4 - Bolt

- ❑ Renew
- ❑ 5 Nm + 90°

5 - Thrust washer for drive sprocket

6 - Drive sprocket for timing chain (left-side)

7 - Drive chain for valve gear

- ❑ Before removing, mark running direction with paint
- ❑ Removing and installing ⇒ page 178

8 - Guide rail

- ❑ Note installation position

9 - Bolt

- ❑ Renew
- ❑ 5 Nm + 90°

10 - Bolt

- ❑ Renew
- ❑ 5 Nm + 90°

11 - Bearing bracket for drive sprocket

12 - Thrust washer

13 - Drive sprocket for timing chain (right-side)

14 - Mounting pin

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

15 - O-ring

- ❑ Renew

16 - Chain tensioner

17 - Bolt

- ❑ 12 Nm

18 - Tensioning rail

19 - Crankshaft

- ❑ With chain sprockets

20 - Guide rail

21 - Mounting pin

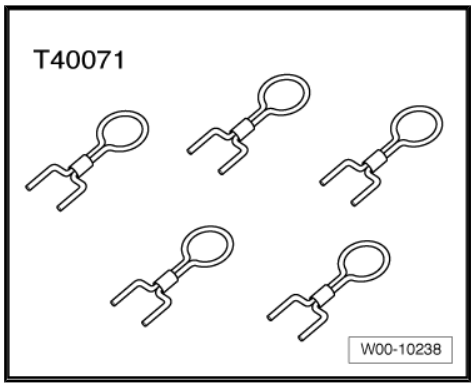
- ❑ Apply locking fluid when installing; refer to ⇒ Electronic parts catalogue

❑ 12 Nm

2.5 Removing and installing drive chain for valve gear

Special tools and workshop equipment required

♦ Locking pin - T40071-



♦ Drill bit, ∅ 3.3 mm

Removing

- Gearbox removed.

– Remove timing chains ⇒ page 168 .

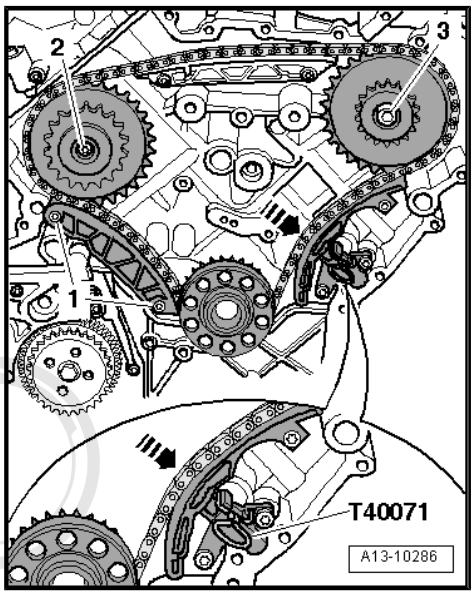
– Remove drive chain for auxiliary drives ⇒ page 180 .

– Press tensioning rail of drive chain tensioner in direction of -arrow- and lock chain tensioner by inserting locking pin - T40071- .

Caution

If a used drive chain rotates in the opposite direction when it is refitted, this can cause breakage.

♦ *Mark running direction of drive chain with coloured arrows for re-installation.*



– Unscrew bolts -1- and remove guide rail.

– Remove bolts -2- and -3- and detach chain sprockets with drive chain.

Installing

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

- Tightening torques
⇒ “2.4 Drive chain for valve gear - exploded view”, page 176

– Install drive chain for auxiliary drives ⇒ page 180 .

– Install camshaft timing chains ⇒ page 168 .

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2.6 Drive chain for auxiliary drives - exploded view

1 - Drive chain for auxiliary drives
- ❑ Removing and installing ⇒ page 180

2 - Drive chain sprocket for oil pump
- ❑ Installation position: Side with lettering faces engine

3 - Bolt
- ❑ Tightening torque ⇒ Item 11 (page 241)

4 - Thrust washer

5 - Compression spring

6 - Crankshaft

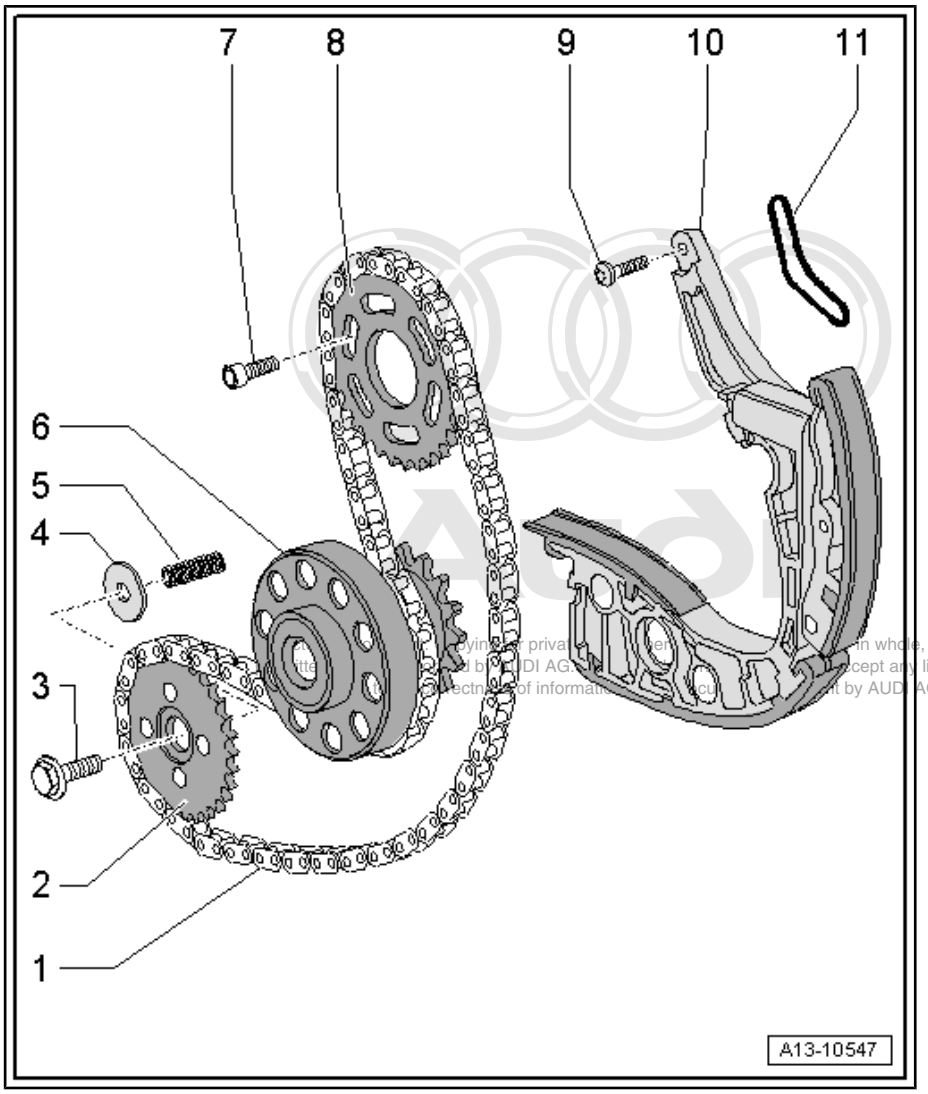
7 - Bolt
- ❑ 23 Nm

8 - Chain sprocket for balance shaft
- ❑ Installation position: Side with lettering faces gearbox

9 - Bolt
- ❑ 9 Nm

10 - Chain tensioner
- ❑ With guide rail

11 - Seal
- ❑ Renew

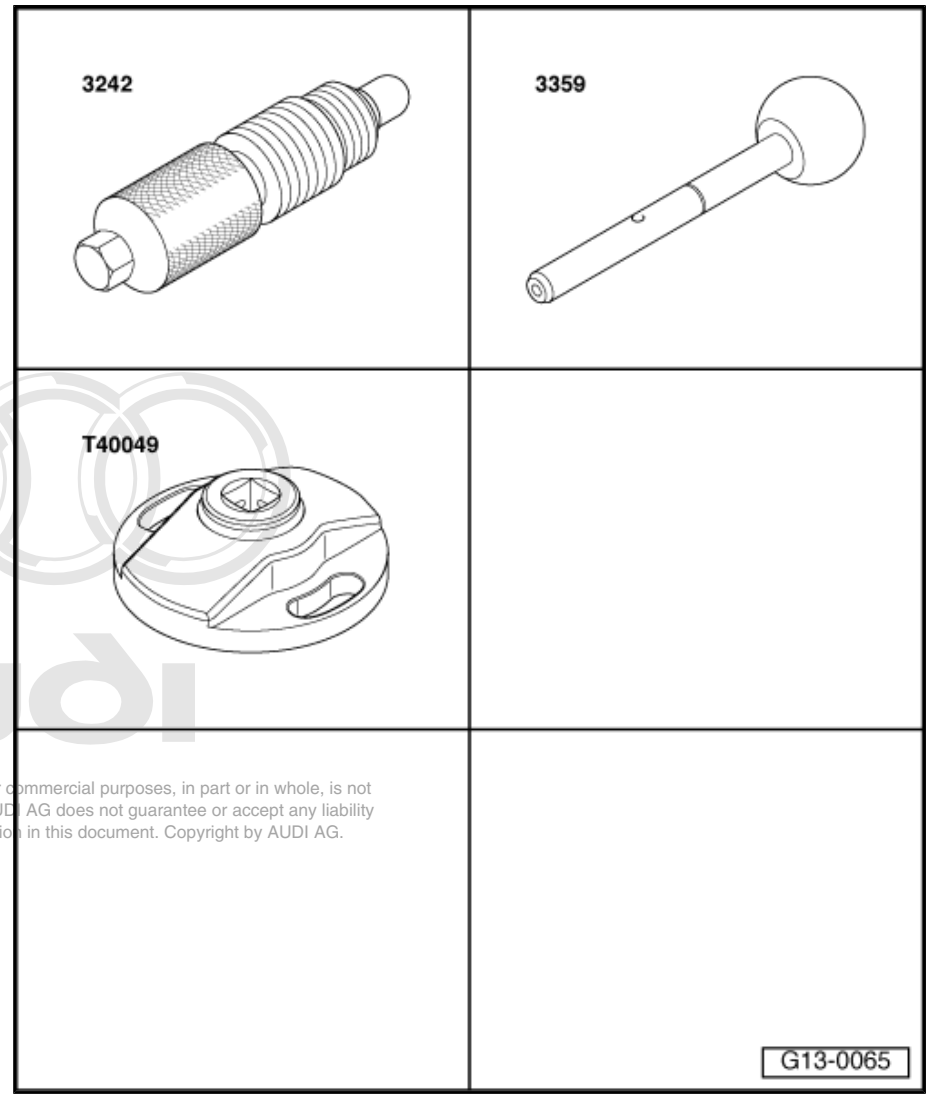


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2.7 Removing and installing drive chain for auxiliary drives

Special tools and workshop equipment required

- Locking pin - 3242-
- Diesel injection pump locking pin - 3359-
- Special wrench - T40049-
- Drill bit, ∅ 3.3 mm



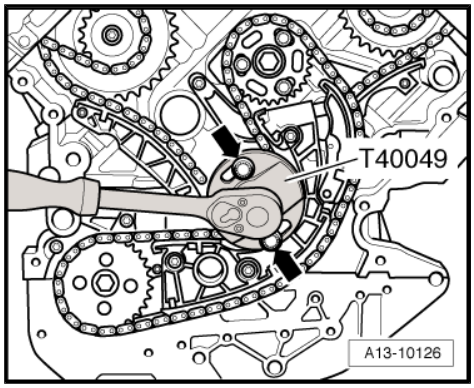
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Removing

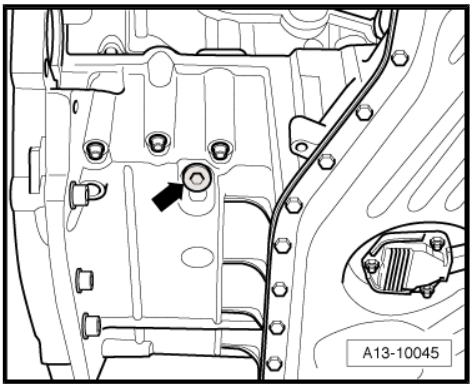
- Gearbox removed.

– Remove timing chain cover (bottom) ⇒ page 155 .

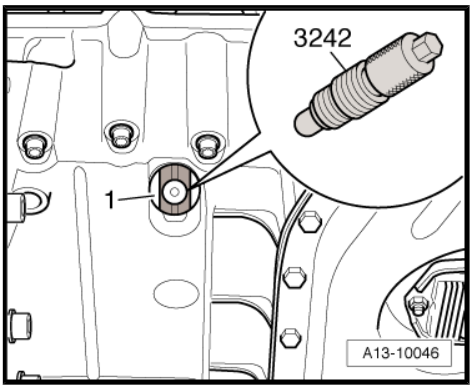
– Attach special wrench - T40049- at rear end of crankshaft using two old securing bolts -arrows- for drive plate.



– Use extended hexagon socket wrench with ball head and unscrew plug -arrow- for “TDC” marking from sump (top section).



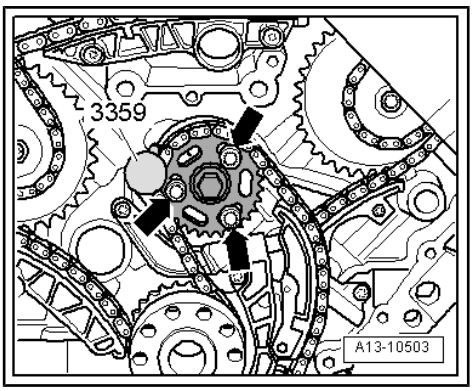
– Screw locking pin - 3242- into hole (20 Nm); if necessary, turn crankshaft -1- backwards and forwards slightly to fully centralise locking pin.



Caution

If a used drive chain for auxiliary drives rotates in the opposite direction when it is refitted, this can cause breakage.

- ***Mark running direction of drive chain for auxiliary drives with coloured arrows for re-installation.***

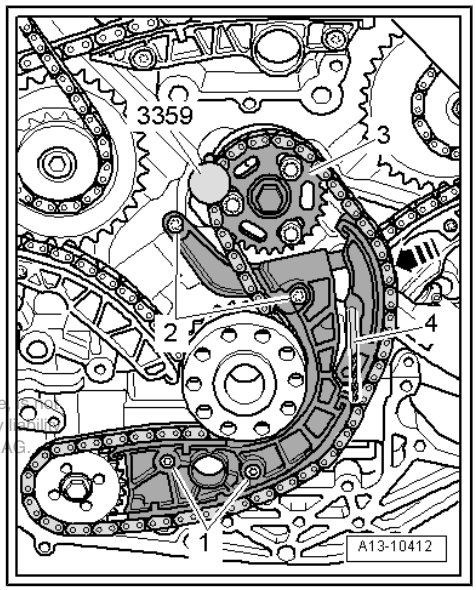


– Lock balance shaft at rear of engine with diesel injection pump locking pin - 3359- and loosen bolts -arrows- for balance shaft sprocket.

– Wrap insulating tape around tip and shaft of 3.3 mm ∅ drill bit to avoid cutting yourself.

– Press guide rail of chain tensioner in direction of -arrow- and lock chain tensioner by inserting 3.3 mm ∅ drill bit -item 4-.

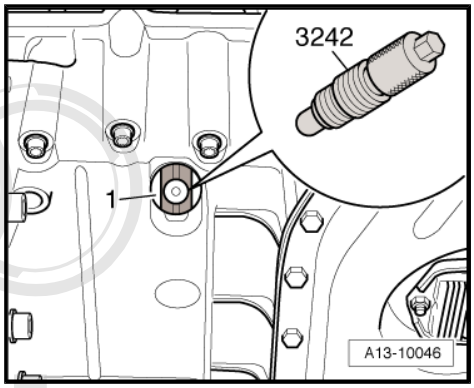
– Remove bolts -1- and -2- and take out chain tensioner, balance shaft sprocket -3- and chain.



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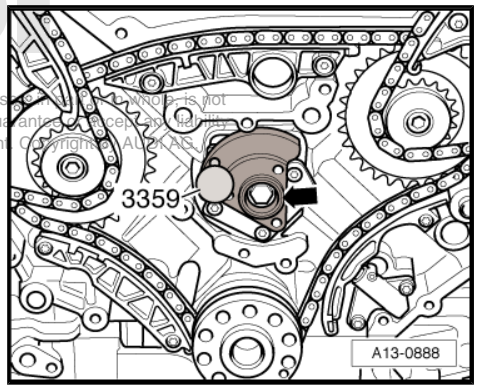
Installing

- Tightening torques
  ⇒ “2.6 Drive chain for auxiliary drives - exploded view”, page 179
- Crankshaft -1- locked in “TDC” position with locking pin - 3242- .



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

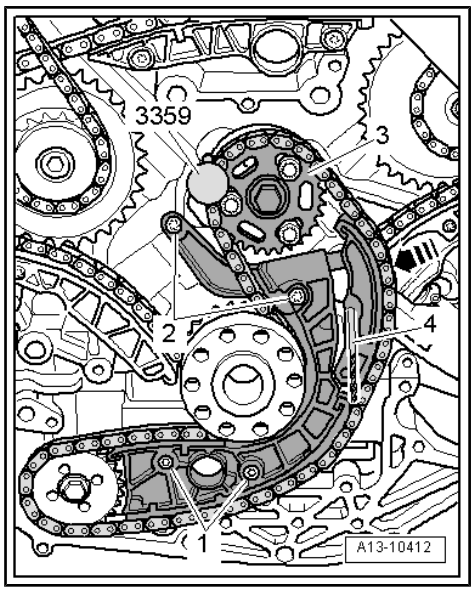
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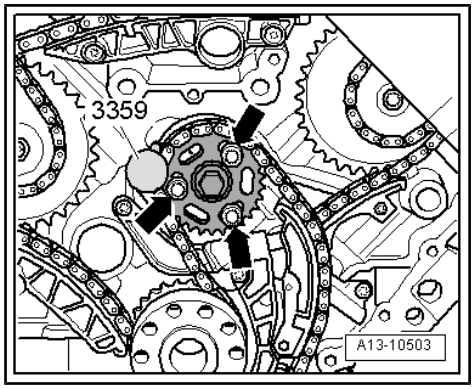
– Install chain tensioner with chain and balance shaft sprocket.
- The elongated holes in the sprocket -3- must be aligned centrally over the threaded holes in the balance shaft.
– Tighten bolts -1- and -2- for chain tensioner.

Note

Disregard -item 4- and -arrow-.



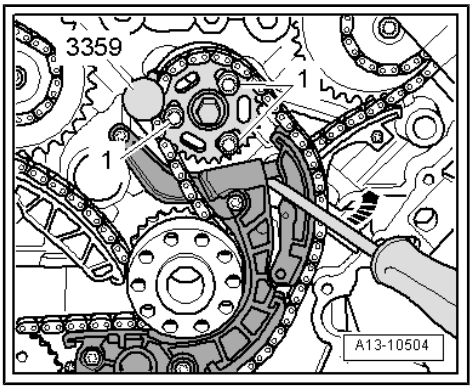
– Fit bolts -arrows- for chain sprocket without tightening.
- It should just be possible to turn the sprocket on the balance shaft without axial movement.



– Pull drill bit out of locating hole, this releases the chain tensioner.
– Press against guide rail of chain tensioner in direction of -arrow- using a screwdriver, and at the same time tighten bolts -1- securing chain sprocket.
– Remove diesel injection pump locking pin - 3359- .

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

– Install timing chain cover (bottom) ⇒ page 155 .



2.8 Balance shaft - exploded view

1 - Sleeve bearing

2 - Bolt

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

3 - Balance weight (gearbox end)

4 - Bolt

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

5 - Bearing plate

6 - Balance weight (pulley end)

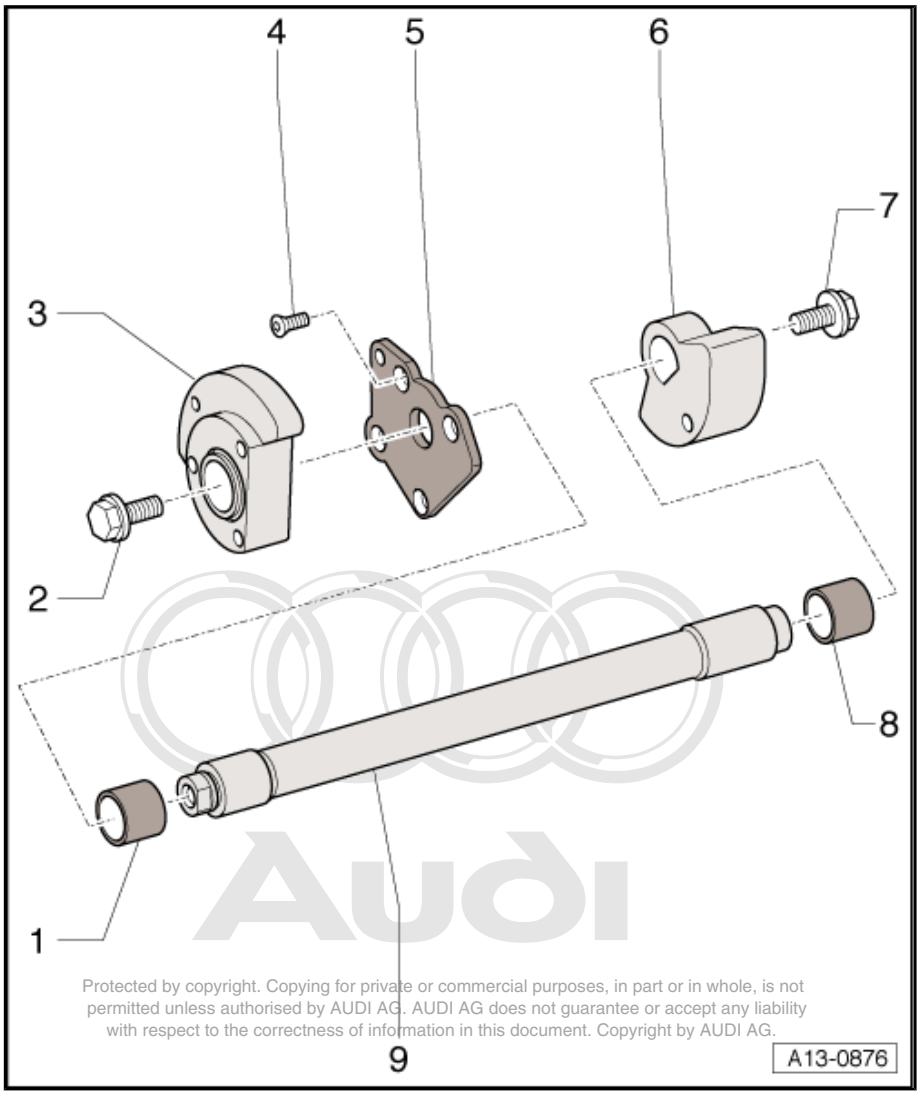
7 - Bolt

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

8 - Sleeve bearing

9 - Balance shaft

- ❑ Removing and installing ⇒ page 183

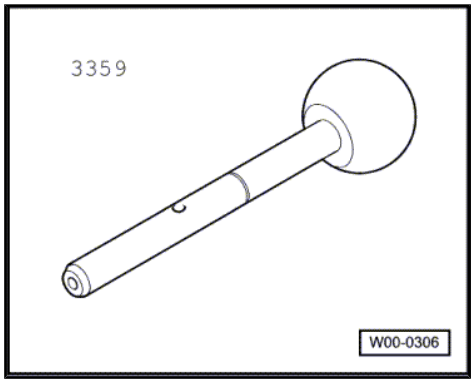


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2.9 Removing and installing balance shaft

Special tools and workshop equipment required

♦ Diesel injection pump locking pin - 3359-



Removing

- Gearbox removed.

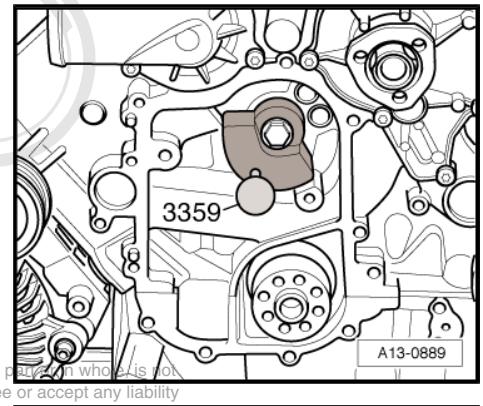
– Remove sealing flange (pulley end) ⇒ page 124 .

– Remove timing chain cover (bottom) ⇒ page 155 .

– Remove drive chain for auxiliary drives ⇒ page 180 .

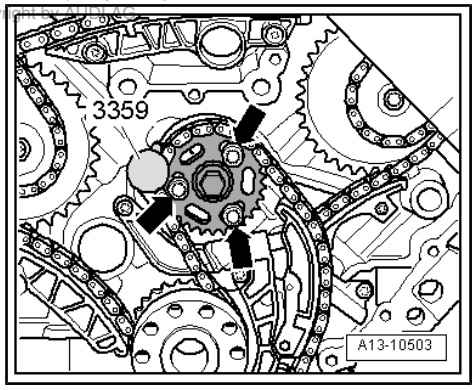
– Lock balance shaft at front of engine with diesel injection pump locking pin - 3359- .

– Remove bolt and detach balance weight from balance shaft.

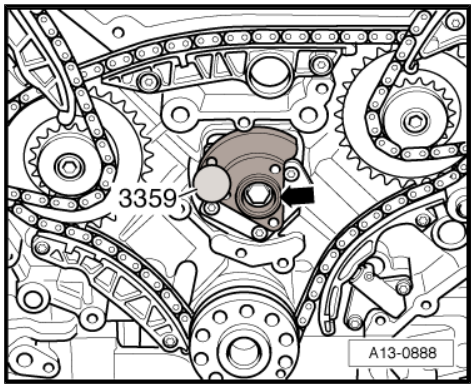


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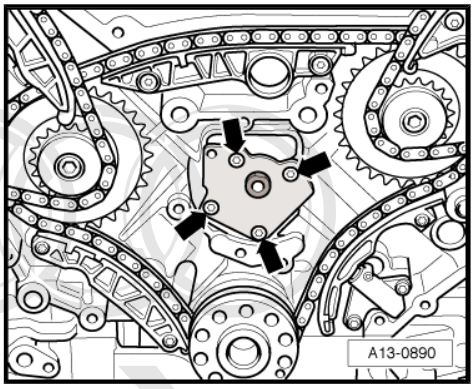
– Remove bolts -arrows- at rear of engine and detach chain sprocket from balance shaft.



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



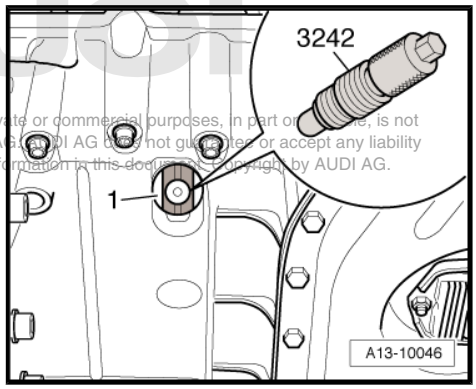
– Remove bolts -arrows- and detach bearing plate for balance shaft.
– Pull balance shaft out of cylinder block.



Installing

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

- Tightening torques
  ⇒ “2.8 Balance shaft - exploded view”, page 183
- Crankshaft -1- locked in “TDC” position with locking pin -3242- .



– Install drive chain for auxiliary drives ⇒ page 180 .
– Install timing chain cover (bottom) ⇒ page 155 .
– Install sealing flange (pulley end) ⇒ page 124 .

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3 Cylinder head

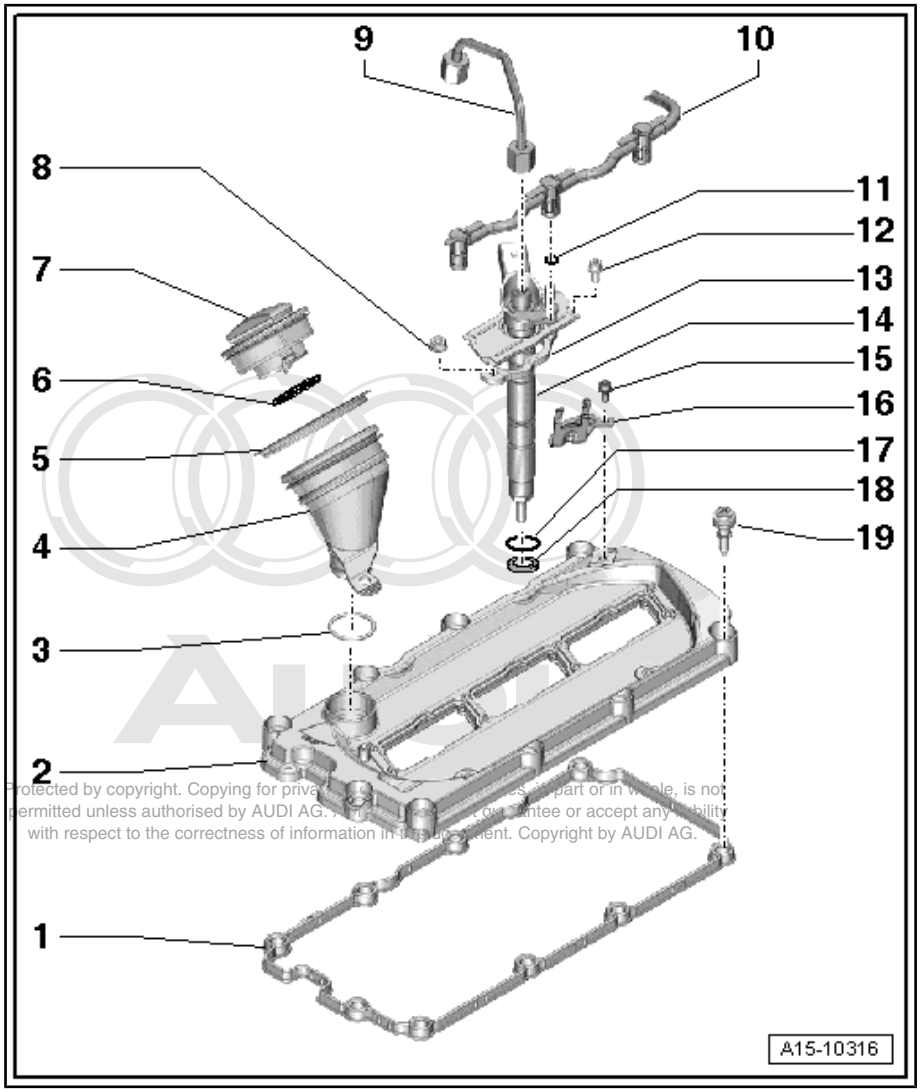
Overview

- ⇒ “3.1 Cylinder head cover - exploded view”, page 186
- ⇒ “3.2 Removing and installing cylinder head cover (left-side)”, page 187
- ⇒ “3.3 Removing and installing cylinder head cover (right-side)”, page 190
- ⇒ “3.4 Cylinder head - exploded view”, page 193
- ⇒ “3.5 Removing and installing cylinder head”, page 195
- ⇒ “3.6 Checking compression”, page 206

3.1 Cylinder head cover - exploded view

Note

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



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

2 - Cylinder head cover
- ❑ Removing and installing: left-side ⇒ page 187 , right-side ⇒ page 190

3 - O-ring
- ❑ Renew

4 - Oil filler neck
- ❑ To remove: Lift tab, turn oil filler neck anti-clockwise and take out

5 - Seal

6 - Seal
- ❑ Renew if damaged or leaking

7 - Filler cap

8 - Nut
- ❑ Tightening torque ⇒ Rep. gr. 23

9 - High-pressure pipe
- ❑ Observe rules for cleanliness ⇒ page 7
- ❑ Removing and installing ⇒ Rep. gr. 23
- ❑ Do not alter shape

10 - Fuel return line
- ❑ Observe rules for cleanliness ⇒ page 7

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11 - O-ring

- ❑ Renew

12 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 23

13 - Clamping piece

14 - Injector

- ❑ Observe rules for cleanliness ⇒ page 7
- ❑ Removing and installing ⇒ Rep. gr. 23

15 - Bolt

- ❑ 5 Nm

16 - Bracket

Cylinder head cover (left-side)

- ❑ For electrical connector for Lambda probe - G39-

Cylinder head cover (right-side)

- ❑ For pressure retention valve

17 - O-ring

- ❑ Renew

18 - Copper seal

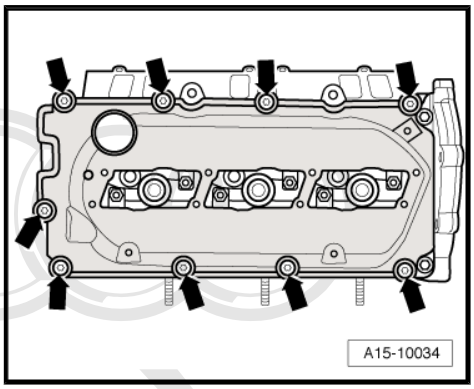
- ❑ Renew

19 - Bolt

- ❑ With seal
- ❑ Renew bolt if seal is damaged or leaking
- ❑ Tightening torque and sequence ⇒ page 187

Cylinder head cover - tightening torque and sequence

– Tighten bolts -arrows- for cylinder head cover in diagonal sequence and in stages to 9 Nm.

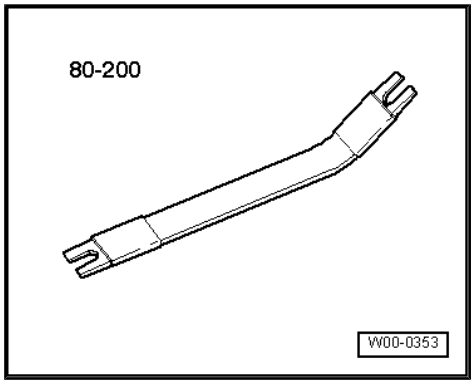


3.2 Removing and installing cylinder head cover (left-side)

Special tools and workshop equipment required

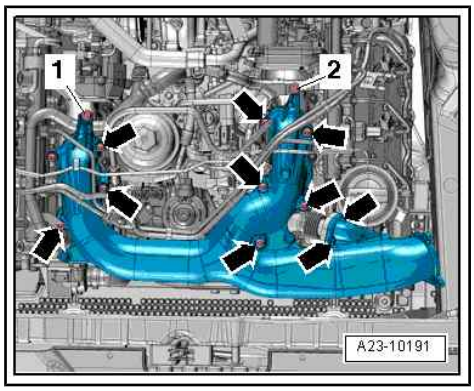
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♦ Removal lever - 80 - 200-



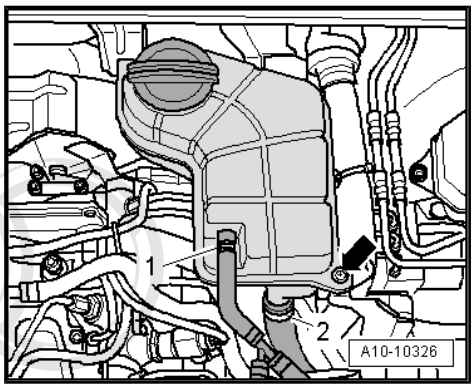
Removing

– Remove intake manifold (top section) ⇒ Rep. gr. 23 .

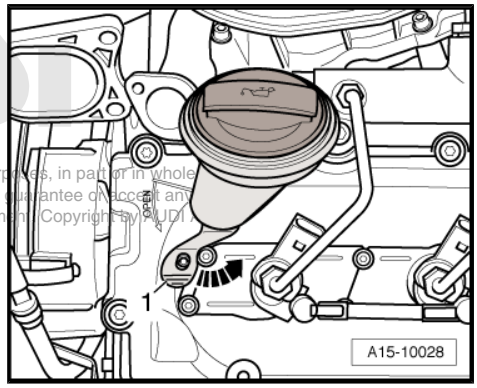


– Remove bolt -arrow-.

– 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.

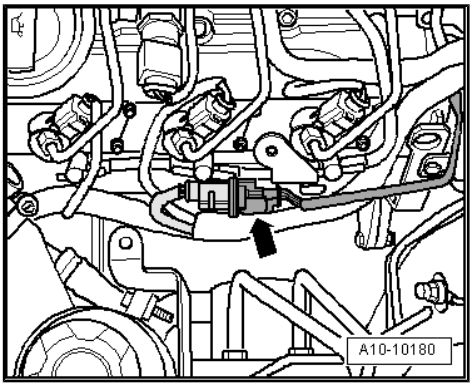


– Remove oil filler neck. To do so, lift tab -1- and turn oil filler neck anti-clockwise -arrow-.

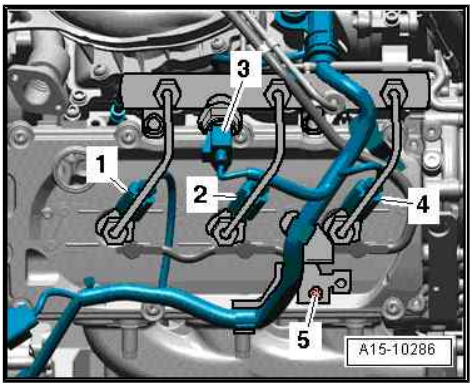


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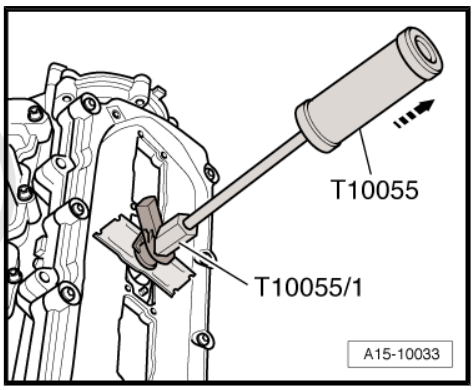
– Remove electrical connector -arrow- for Lambda probe - G39- from bracket and unplug connector.
– Move clear electrical wiring for Lambda probe.
– Unscrew bolts and detach bracket for electrical connector.



– Unscrew bolt -5- and detach bracket for electrical connector.
– Unplug electrical connectors -1 ... 4- at fuel rail and at injectors.
– Use removal lever - 80 - 200- and move wiring harness clear.



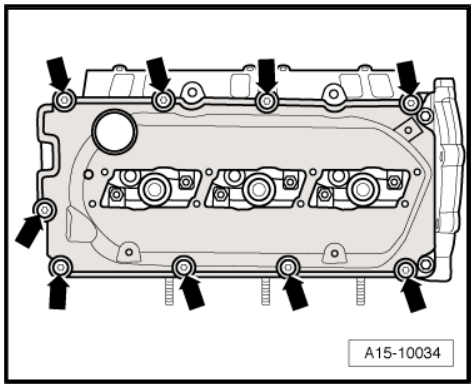
– Remove injectors ⇒ Rep. gr. 23 .



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– Loosen bolts -arrows- on cylinder head cover in diagonal sequence.

– Remove bolts and take off cylinder head cover.



Installing

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

Note

- *Fit new O-ring.*
- *Renew gasket for cylinder head cover if damaged.*
- *Renew bolts for cylinder head cover if seals on bolts are damaged.*
- *Fit cable ties in the original positions when installing.*

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

– Tighten cylinder head cover bolts ⇒ page 187 .

– Install injectors and intake manifold (top section) ⇒ Rep. gr. 23 .

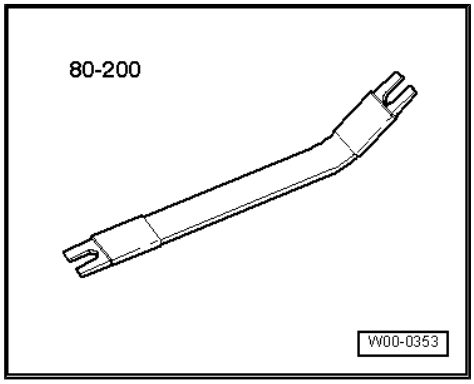
– Check fuel system for leaks ⇒ page 7 .

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

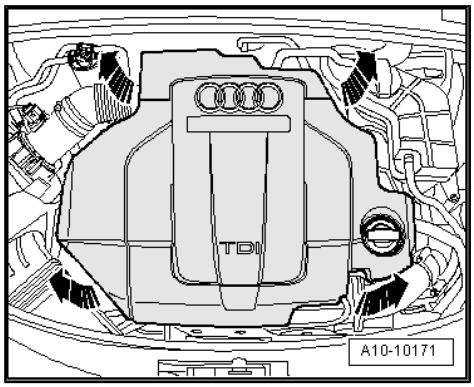
Special tools and workshop equipment required

- Removal lever - 80 - 200-

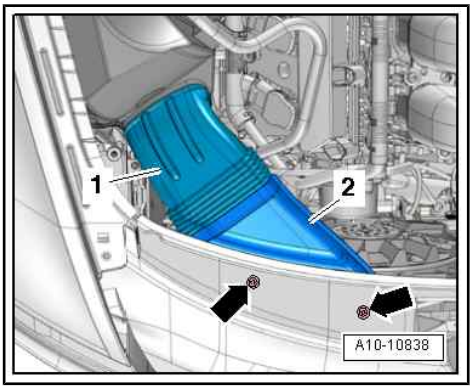


Removing

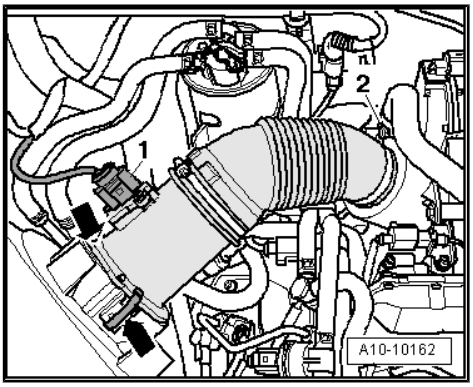
– Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



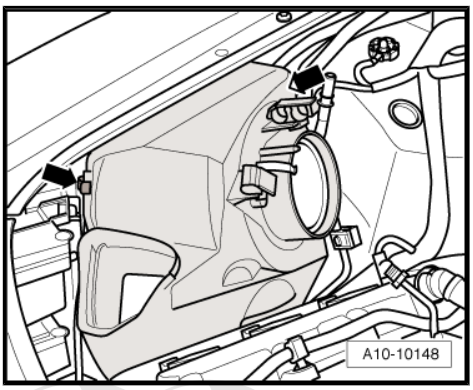
– Remove bolts -arrows-, detach air ducts -1- and -2-.



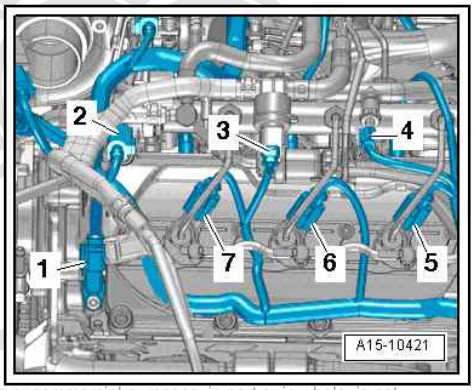
– Unplug electrical connector -1- from air mass meter - G70- .
– Remove air hose. To do so, release hose clip -2- and clamps -arrows-.



– Release clamps -arrows- and detach air cleaner (top section).

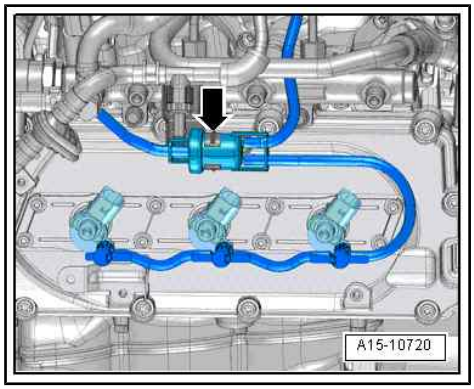


– Unplug electrical connector at glow plug for cylinder “1”.
– Unplug electrical connectors -1 ... 7- and use removal lever - 80 - 200- to move electrical wiring clear.

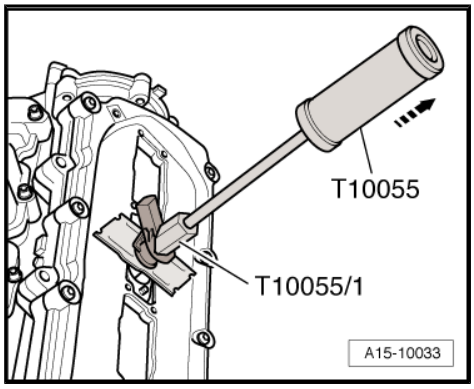


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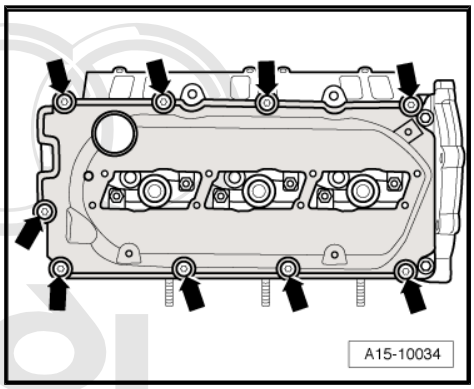
– Remove pressure retention valve -arrow- from retainer and move clear to one side with fuel hoses connected.
– Unbolt bracket for pressure retention valve.



– Remove injectors ⇒ Rep. gr. 23 .



– Loosen bolts -arrows- on cylinder head cover in diagonal sequence.
– Remove bolts and take off cylinder head cover.



Installing

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

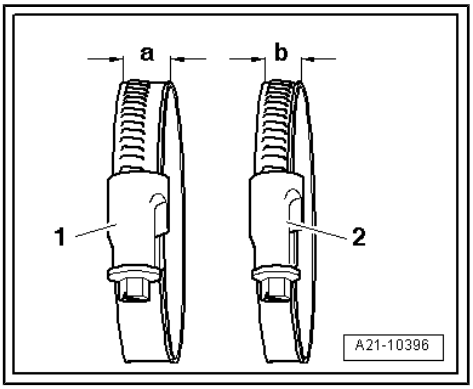
Note

- *Renew gasket for cylinder head cover if damaged.*
- *Renew bolts for cylinder head cover if seals on bolts are damaged.*
- *Hose connections and air pipes 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 .*
- *Fit cable ties in the original positions when installing.*

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– Clean sealing surfaces; they must be free of oil and grease.
– Tighten cylinder head cover bolts ⇒ page 187 .
– Install injectors and air cleaner (top section) ⇒ Rep. gr. 23 .

– Install air hoses with screw-type clips ⇒ page 326 .
– Check fuel system for leaks ⇒ page 7 .



3.4 Cylinder head - exploded view

Note

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

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1 - Cylinder head gasket
- ❑ Renewing ⇒ "3.5 Removing and installing cylinder head", page 195
- ❑ Identification ⇒ page 194
- ❑ Installation position: Part No. faces towards cylinder head
- ❑ If renewed, change coolant and engine oil

2 - Bolt
- ❑ Tightening torque ⇒ Rep. gr. 23

3 - Bolt
- ❑ Tightening torque ⇒ Rep. gr. 23

4 - Toothed belt drive sprocket for high-pressure pump
- ❑ Removing and installing ⇒ Rep. gr. 23

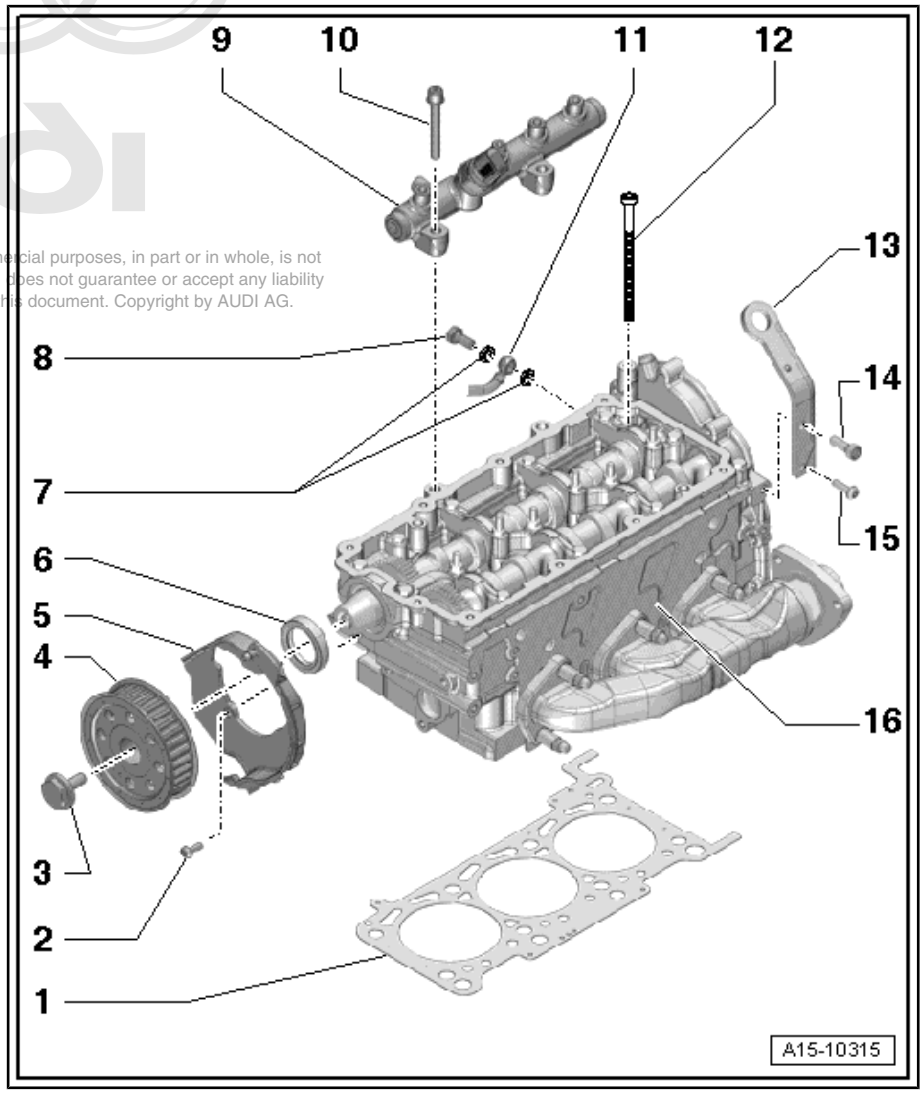
5 - Toothed belt cover (rear)

6 - Camshaft oil seal
- ❑ Renewing ⇒ page 213

7 - Seals
- ❑ Renew

8 - Banjo bolt
- ❑ Tightening torque ⇒ Item 2 (page 283)

9 - Fuel rail
- ❑ Observe rules for cleanliness ⇒ page 7
- ❑ Removing and installing ⇒ Rep. gr. 23



10 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 23

11 - Coolant pipe

12 - Bolt

- ❑ Correct sequence when slackening ⇒ page 201
- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 195

13 - Engine lifting eye

14 - Bolt M8

- ❑ 23 Nm

15 - Bolt M6

- ❑ 9 Nm

16 - Cylinder head

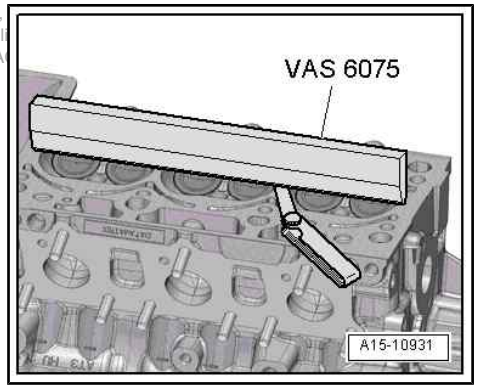
- ❑ Removing and installing ⇒ page 195
- ❑ After removal, the cylinder head must not be put down on the gasket side with the glow plugs still installed, because the glow plugs project slightly beyond the gasket surface
- ❑ Checking for distortion ⇒ page 194
- ❑ Cylinder heads must not be reworked on TDI engines
- ❑ If renewed, change coolant and engine oil

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Checking cylinder head for distortion

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

• Max. permissible distortion: 0.1 mm.



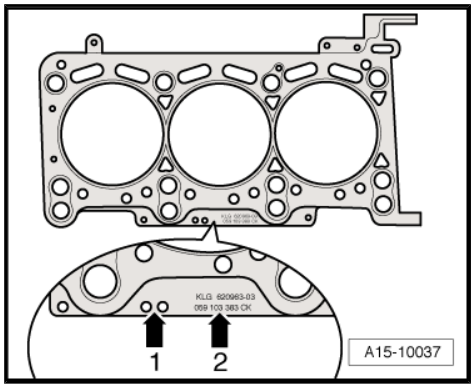
Identification of cylinder head gasket

1 - Holes

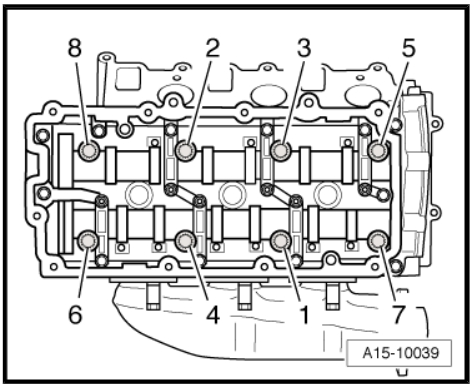
2 - Part number

Note

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



Cylinder head - tightening torque and sequence



Note

Renew the cylinder head bolts.

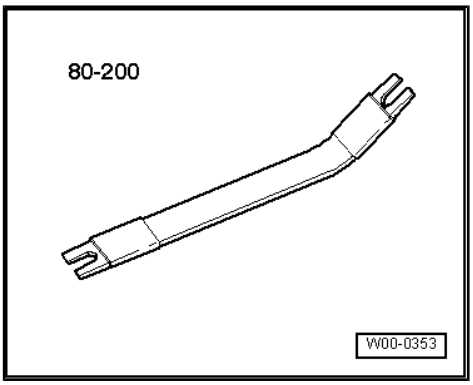
– Tighten bolts in the sequence -1 ... 8- in 5 stages as follows:

1. Screw in by hand until contact is made.
2. Tighten to 35 Nm.
3. Tighten to 60 Nm.
4. Turn 90° further.
5. Turn 90° further.

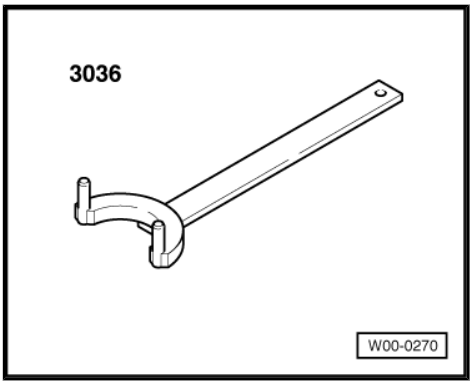
3.5 Removing and installing cylinder head

Special tools and workshop equipment required

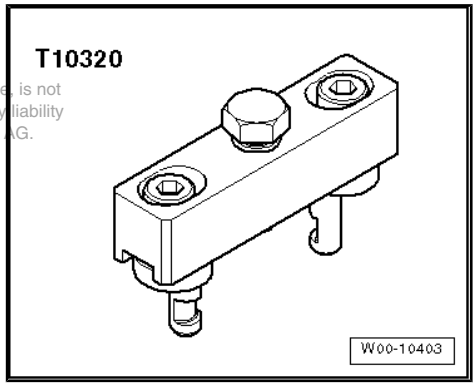
♦ Removal lever - 80 - 200-



♦ Counterhold tool - 3036-



♦ Puller - T10320-



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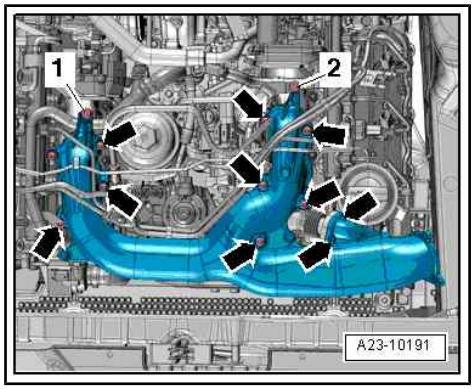
Removing

– Drain coolant ⇒ page 265 .

– Remove timing chain from camshaft on relevant side ⇒ page 160 .

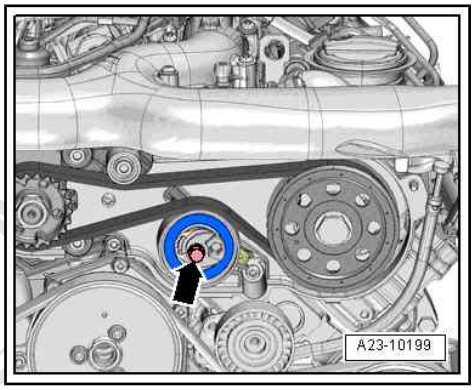
– Remove intake manifold (top section) ⇒ Rep. gr. 23 .

– Remove relevant cylinder head cover: left-side ⇒ page 187 ; right-side ⇒ page 190 .

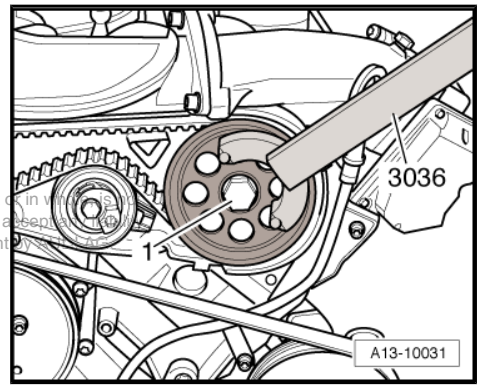


Cylinder head (left-side):

– Remove toothed belt for high-pressure pump and toothed belt tensioner ⇒ Rep. gr. 23 .

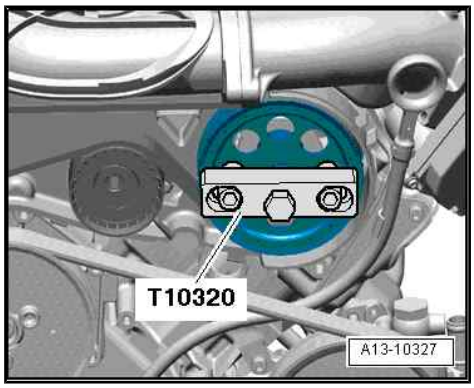


– Loosen bolt -1- for toothed belt drive sprocket approx. 2 turns using counterhold tool - 3036- .

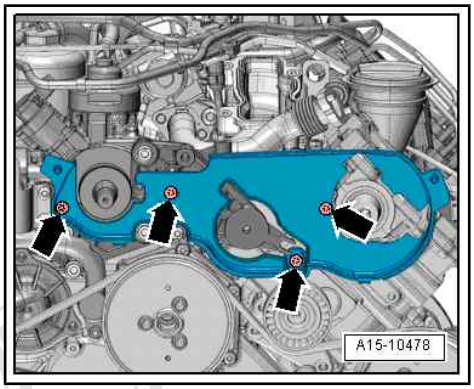


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– Remove toothed belt drive sprocket using puller - T10320- .



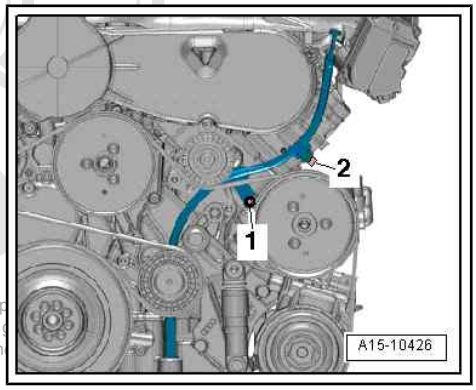
– Remove bolts -arrows-; toothed belt cover (rear) remains in installation position.



– Remove bolt -2- for dipstick guide tube.

Note

Disregard -item 1-.

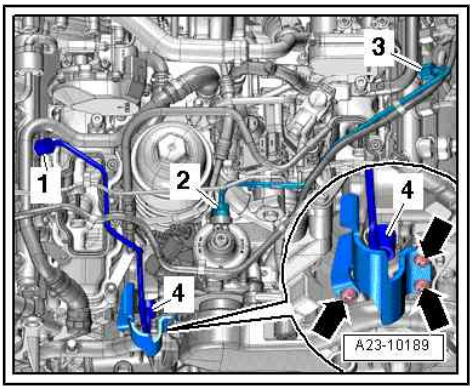


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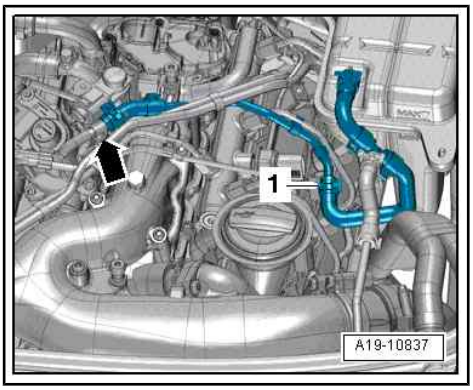
– Remove union nuts -2- and -3-, move high-pressure pipe clear and remove.

Note

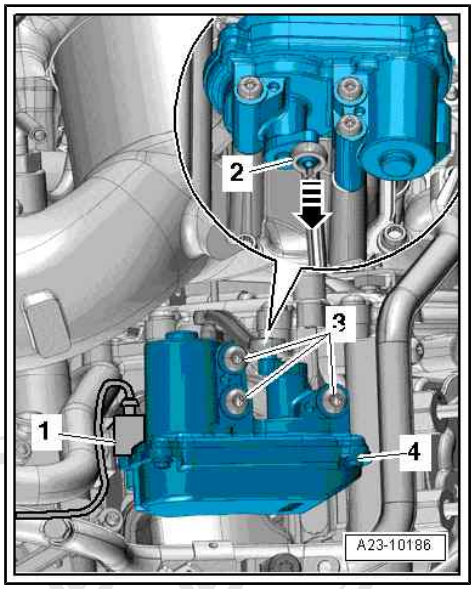
Disregard items marked -1, 4- and -arrows-.



– Disconnect coolant hose -1-.
– Detach T-piece from coolant hose -arrow-.



– Unplug electrical connector -1- at intake manifold flap motor 2 - V275- -item 4-.

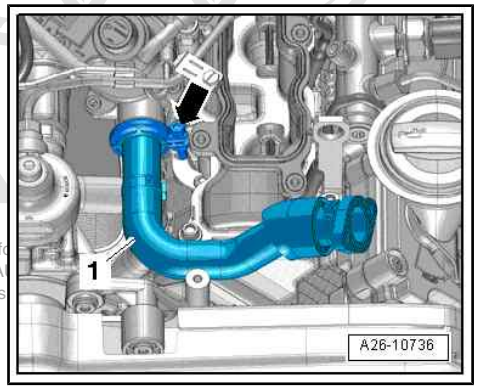


Note

Disregard -items 2, 3- and -arrow-.

– Unplug electrical connectors at glow plugs for cylinders 4, 5 and 6.

– Release clamp -arrow- and detach exhaust gas recirculation pipe -1-.



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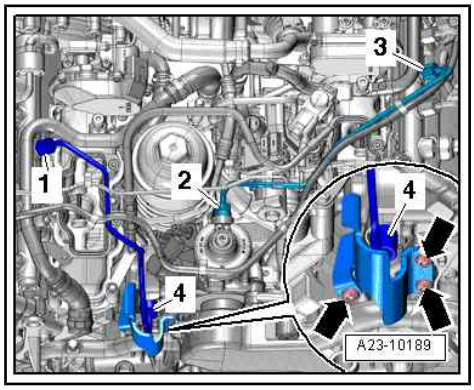
Cylinder head (right-side):

– Remove intermediate pipe (right-side) ⇒ page 366 .

– Remove coolant pipe (top right) ⇒ page 291 .

– Unscrew bolts -arrows- and remove protective plate for high-pressure pipe.

– Remove union nuts -1- and -4-, move high-pressure pipe clear and remove.

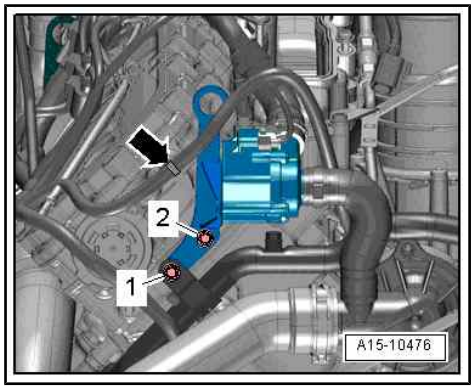


Note

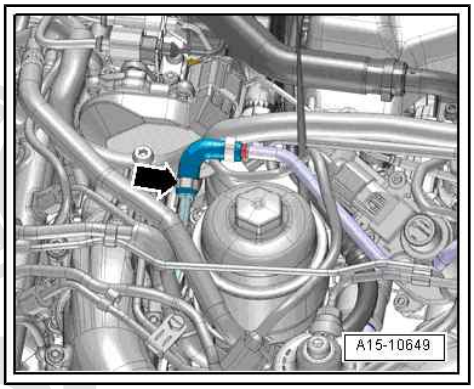
Disregard -items 2, 3-.

– Remove bolts -1- and -2- for engine lifting eye.

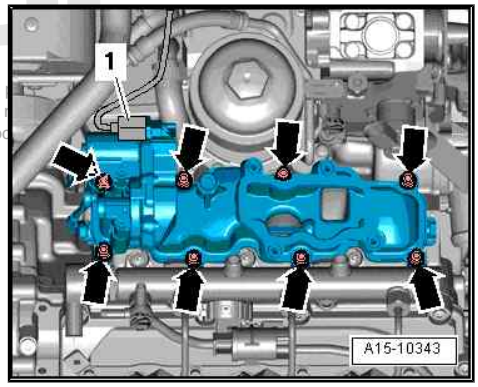
– Use removal lever - 80 - 200- and move wiring harness clear -arrow-.



– Release hose clip -arrow- and detach coolant line.
– Unplug electrical connectors at glow plugs for cylinder 3.



– Unplug electrical connector -1- at intake manifold flap motor - V157- .

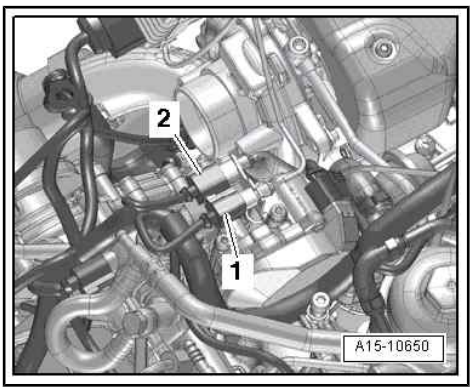


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Note

Disregard -arrows-.

– Detach electrical connector -2- (orange) for exhaust gas recirculation temperature sensor - G98- from bracket and unplug.
– Take electrical connector -1- (black) for exhaust gas temperature sender 1 - G235- out of bracket and unplug.



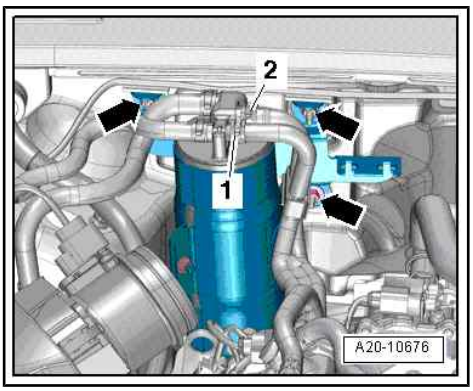
Note

Place a cloth below the connection to catch escaping fuel.

Caution

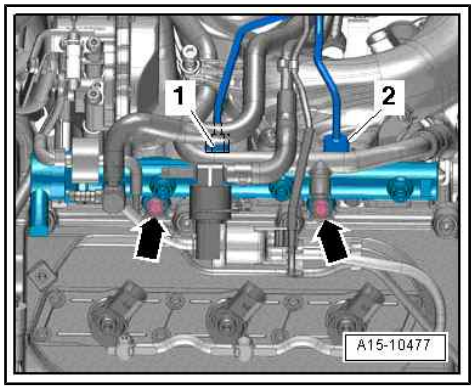
Protect fuel system against contamination.

- ***Rules for cleanliness when working on the injection system*** ⇒ page 7 .



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

– Remove bolts -arrows- and move fuel rail to one side (fuel hoses remain connected).



Note

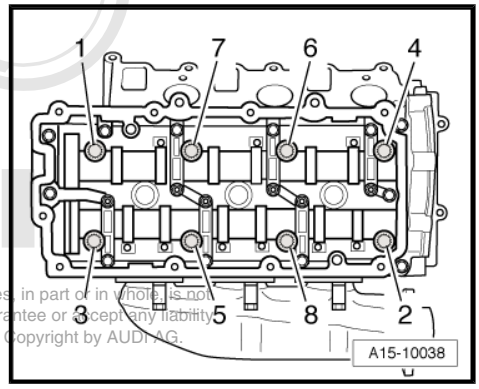
Disregard -items 1, 2-.

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Both sides (continued):

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

– Remove bolts and carefully take off cylinder head.



Caution

Risk of damage to glow plugs when putting down cylinder head.

- *After removal, the cylinder head must not be put down on the gasket side with the glow plugs still installed, because the glow plugs project slightly beyond the gasket surface.*

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Installing

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

- Tightening torques
⇒ “3.4 Cylinder head - exploded view”, page 193

Caution

Avoid 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.*

Avoid damage to cylinder block.

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

Risk of leaks at cylinder head gasket.

- *Carefully remove any sealant residue from the cylinder head and cylinder block. Ensure that no long scores or scratches are made on the surfaces.*
- *Carefully remove any remaining emery and abrasive material.*
- *Do not remove new cylinder head gasket from packaging until it is ready to be fitted.*
- *Handle the cylinder head gasket very carefully to prevent damage to the silicone coating or the indented area of the gasket.*

Avoid 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.*

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

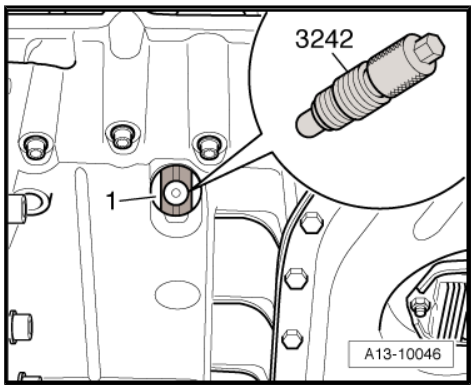
- *Turn the engine carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.*

Note

- *Renew the bolts tightened with specified tightening angle.*
- *Renew self-locking nuts as well as seals, gaskets and O-rings.*
- *Cylinder heads must not be reworked on TDI engines.*
- *When installing an exchange cylinder head with camshafts fitted, the contact surfaces between the hydraulic compensation elements, roller rocker fingers and cams must be oiled.*
- *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 .*
- *After fitting a new cylinder head or cylinder head gasket, change the engine oil and coolant.*

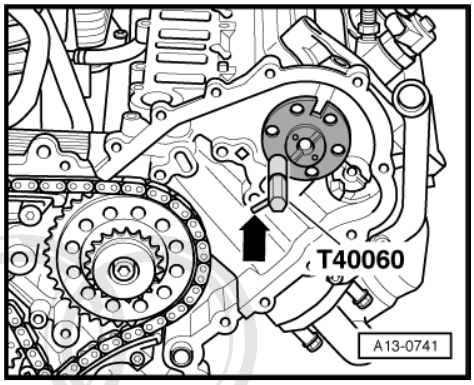
– Before installing cylinder head, set crankshaft and camshafts to “TDC”:

• Locking pin - 3242- must be screwed in with crankshaft at “TDC” position -1-.



• The camshafts on both cylinder heads must be locked with adjustment pins - T40060- .

• The side pin -arrow- on the adjustment pin - T40060- must be in line with the imaginary line between the adjustment pin and the centre of the camshaft.

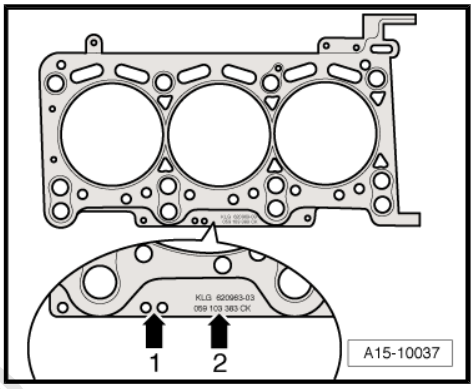


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– Note cylinder head gasket identification:

1 - Holes

2 - Part number



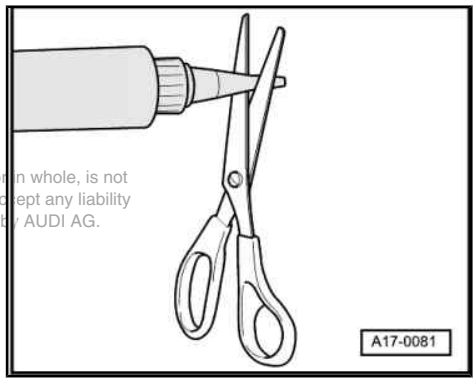
Note

- *If the cylinder head gasket or cylinder head have been replaced, select the new cylinder head gasket according to the number of holes on the old gasket.*
- *If parts of the crankshaft drive have been renewed, the new cylinder head gasket must be selected by measuring the piston projection at "TDC" ⇒ page 147 .*
- *The gaskets for the left and right cylinder heads have different shapes and cannot be interchanged.*

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

Note

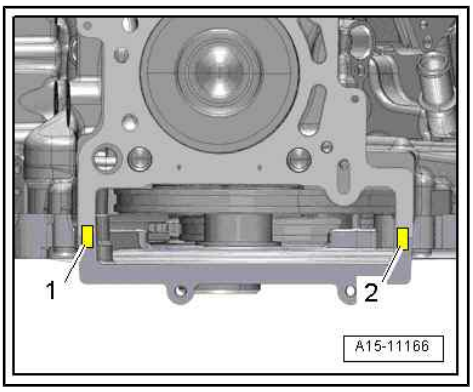
- *Note the use-by date of the sealant.*
- *Cut off nozzle of tube at front marking (nozzle ∅ approx. 5 mm).*
- *After applying sealant, components must be installed and secured within 15 minutes.*



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Cylinder head (left-side):

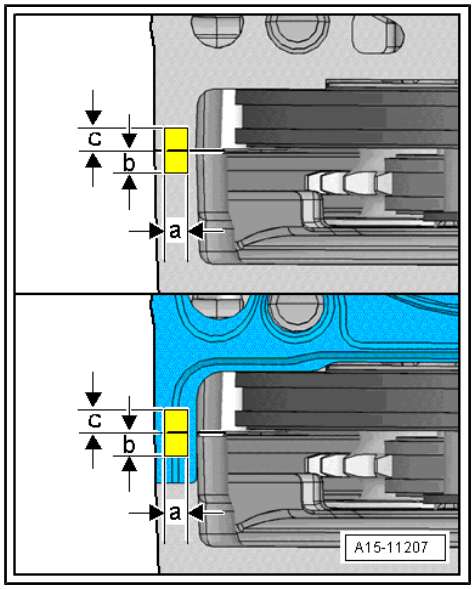
– Apply sealant beads -1- and -2- onto clean sealing surface of cylinder block and timing chain cover (bottom) as illustrated.



– Apply sealant according to dimensions given.

- a = 7 mm
- b = 7 mm
- c = 7 mm

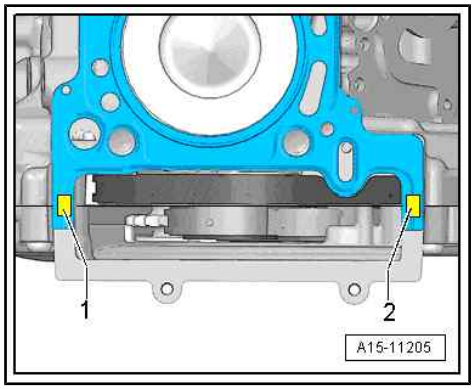
– Place cylinder head gasket in position.



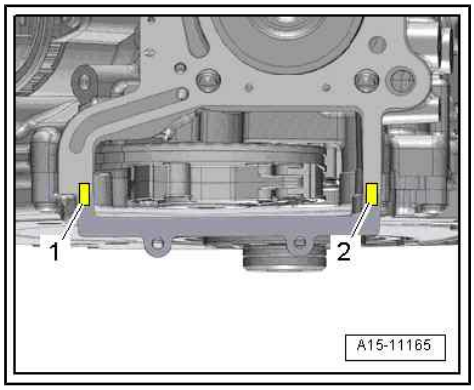
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– Apply sealant beads -1- and -2- onto cylinder head gasket as shown in illustration.

Cylinder head (right-side):



– Apply sealant beads -1- and -2- onto clean sealing surface of cylinder block and timing chain cover (bottom) as illustrated.



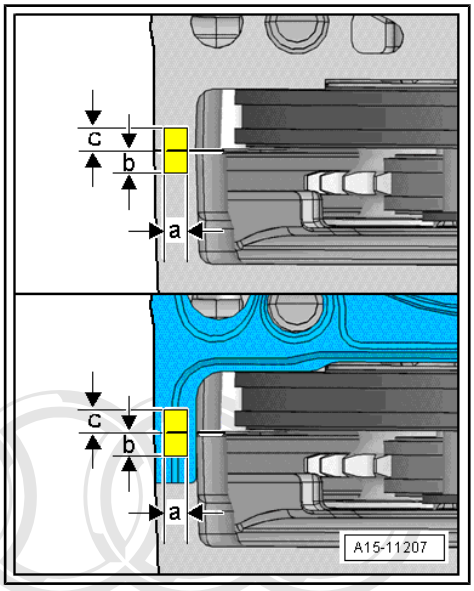
– Apply sealant according to dimensions given.

• a = 7 mm

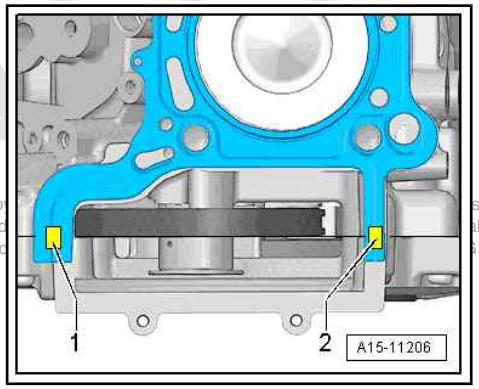
• b = 7 mm

• c = 7 mm

– Place cylinder head gasket in position.



– Apply sealant beads -1- and -2- onto cylinder head gasket as shown in illustration.



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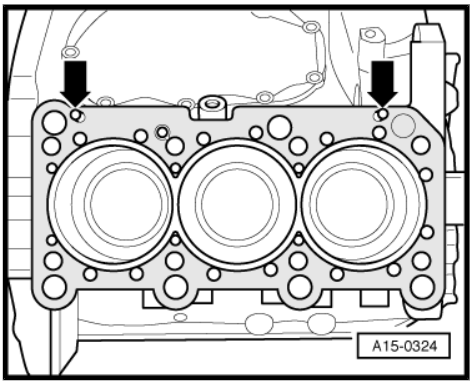
Both sides (continued):

– Check whether the two dowel sleeves -arrows- are fitted in the cylinder block; install if necessary.

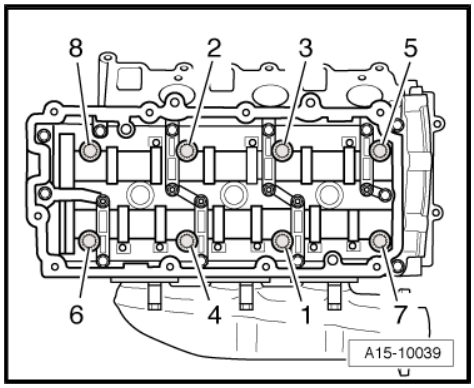
– Place cylinder head gasket in position.

• Installation position of cylinder head gasket: the word “oben” (top) or the part number should face towards the cylinder head.

– Fit cylinder head.



– Tighten cylinder head bolts ⇒ page 195 .



Note

Cylinder head bolts do not have to be torqued down again.

Cylinder head (left-side):

– Install exhaust gas recirculation pipe ⇒ page 374 .
– Install dipstick guide tube ⇒ page 245 .
– Install toothed belt cover (rear), toothed belt tensioning roller and toothed belt for high-pressure pump ⇒ Rep. gr. 23 .

Cylinder head (right-side):

– Install fuel rail ⇒ Rep. gr. 23 .
– Install coolant pipe (top right) ⇒ page 291 .
– Install intermediate pipe (right-side) ⇒ page 366 .

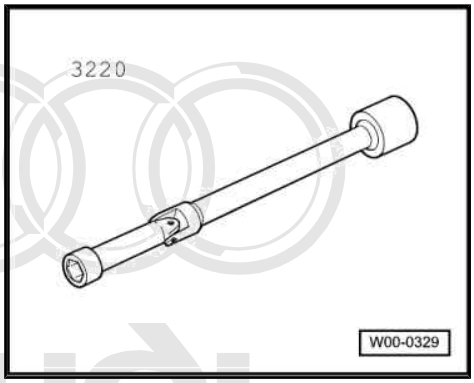
Both sides (continued):

– Install high-pressure pipes ⇒ Rep. gr. 23 .
– Install cylinder head cover: left-side ⇒ page 187 ; right-side ⇒ page 190 .
– Install intake manifold (top section) ⇒ Rep. gr. 23 .
– Install camshaft timing chains ⇒ page 164 .
– Change engine oil ⇒ Maintenance ; Booklet 405 .
– Fill cooling system with fresh coolant ⇒ page 266 .
– Check fuel system for leaks ⇒ page 7 .

3.6 Checking compression

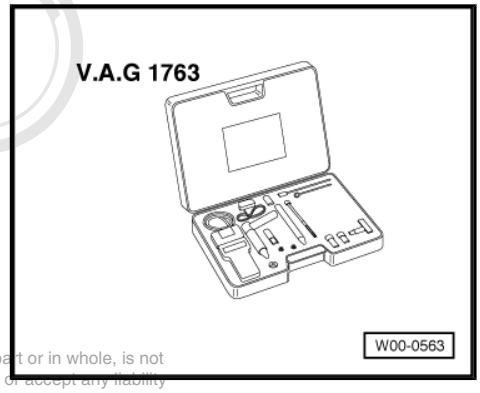
Special tools and workshop equipment required

♦ U/J extension and socket, 10 mm - 3220-



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



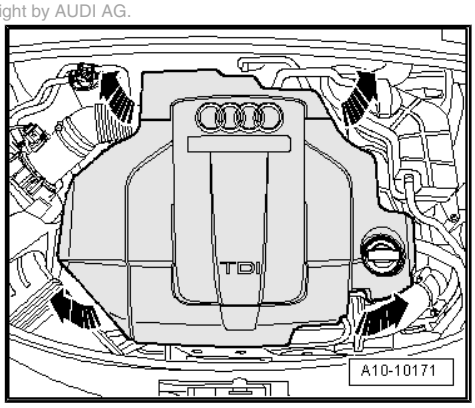
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Procedure

- Engine oil temperature approx. 80 °C
- Battery voltage at least 12.5 V.

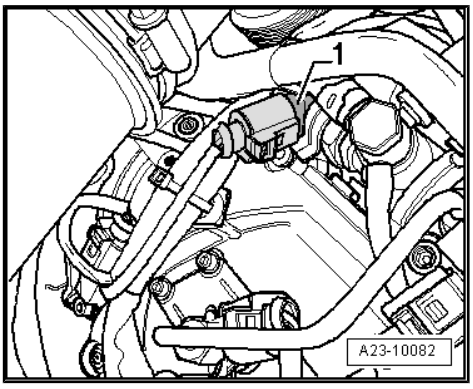
– Carefully pull engine cover panel off four retaining pins one after the other -arrows-.

– Unplug electrical connectors on all glow plugs.

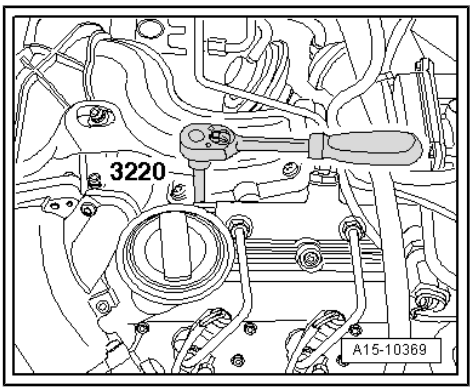


– Unplug electrical connector at fuel pressure regulating valve - N276- -item 1- at fuel rail (cylinder bank 1, right-side).

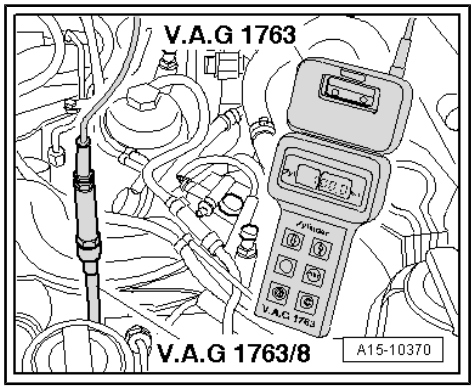
– Briefly start engine to relieve fuel pressure in fuel rail.



– Remove all glow plugs ⇒ Rep. gr. 28 .



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



Note

Using the compression tester ⇒ Operating instructions .

– Have a second mechanic operate starter until tester shows no further pressure increase.
– Repeat procedure on each cylinder.

Compression pressure	bar
When new	28 … 33
Wear limit	21
Maximum difference between cylinders	5

Assembling

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

– Install glow plugs ⇒ Rep. gr. 28 .
– Faults are stored in engine control unit because electrical connectors were unplugged and the engine was started: “Interrogate event memory” in “Vehicle self-diagnosis” ⇒ Vehicle diagnostic tester.

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4 Valve gear

Overview

- ⇒ “4.1 Valve gear - exploded view”, page 209
- ⇒ “4.2 Measuring axial clearance of camshafts”, page 211
- ⇒ “4.3 Measuring radial clearance of camshafts”, page 212
- ⇒ “4.4 Renewing camshaft oil seal”, page 213
- ⇒ “4.5 Removing and installing camshafts - cylinder head (left-side)”, page 215
- ⇒ “4.7 Checking hydraulic valve compensation elements”, page 229
- ⇒ “4.8 Renewing valve stem oil seals with cylinder head installed”, page 231
- ⇒ “4.9 Renewing valve stem oil seals with cylinder head removed”, page 234
- ⇒ “4.10 Valve dimensions”, page 237
- ⇒ “4.11 Machining valve seats”, page 238
- ⇒ “4.12 Checking valve guides”, page 238
- ⇒ “4.13 Checking valves”, page 239

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Caution

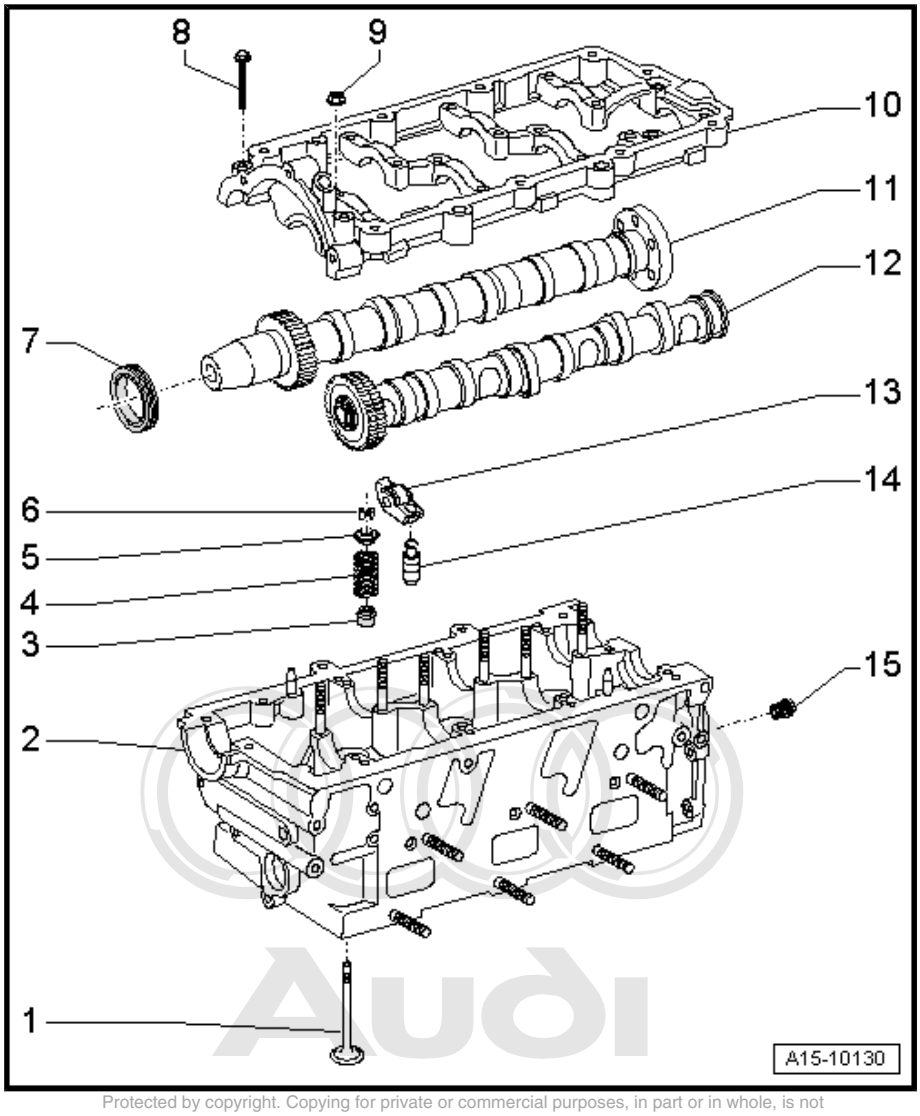
Avoid damage to valves and piston crowns after working on valve gear.

- *The hydraulic tappets have to settle; wait for approx. 30 minutes after installing camshafts before starting engine.*
- *Turn the engine carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.*

4.1 Valve gear - exploded view

Note

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



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1 - Valve

- ❑ Must not be machined; only grinding-in is permissible
- ❑ Mark installation position for re-installation
- ❑ Checking ⇒ page 239
- ❑ Valve dimensions ⇒ page 237

2 - Cylinder head

- ❑ Checking valve guides ⇒ page 238
- ❑ Valve seats may not be machined due to the very small tolerances

3 - Valve stem oil seal

- ❑ Renewing: with cylinder head installed ⇒ page 231 , with cylinder head removed ⇒ page 234

4 - Valve spring

5 - Valve spring plate

6 - Valve cotters

7 - Camshaft oil seal

- ❑ Renewing ⇒ page 213

8 - Bolt

- ❑ Tightening torque and tightening sequence: cylinder head (left-side) ⇒ page 211 , cylinder head (right-side) ⇒ page 211

9 - Nut

- ❑ Tightening torque and tightening sequence: cylinder head (left-side) ⇒ page 211 , cylinder head (right-side) ⇒ page 211

10 - Retaining frame

- ❑ With integrated camshaft bearings
- ❑ Removing and installing: cylinder head (left-side) ⇒ page 215 , cylinder head (right-side) ⇒ page 222

11 - Inlet camshaft

- ❑ Removing and installing: cylinder head (left-side) ⇒ page 215 , cylinder head (right-side) ⇒ page 222
- ❑ Measuring axial clearance ⇒ page 211
- ❑ Measuring radial clearance ⇒ page 212
- ❑ Runout: max. 0.01 mm

12 - Exhaust camshaft

- ❑ Removing and installing: cylinder head (left-side) ⇒ page 215 , cylinder head (right-side) ⇒ page 222
- ❑ Measuring axial clearance ⇒ page 211
- ❑ Measuring radial clearance ⇒ page 212
- ❑ Runout: max. 0.01 mm

13 - Roller rocker finger

- ❑ Removing and installing: cylinder head (left-side) ⇒ page 215 , cylinder head (right-side) ⇒ page 222
- ❑ Mark installation position for re-installation

- ❑ Check roller bearings for ease of movement
- ❑ Lubricate contact surfaces before installing

14 - Hydraulic valve compensation element

- ❑ Mark installation position for re-installation
- ❑ Checking ⇒ page 229
- ❑ Lubricate contact surfaces before installing

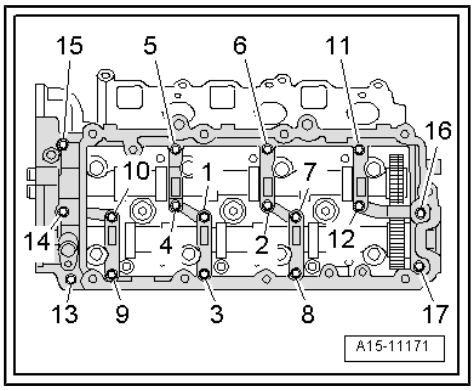
15 - Pressure limiting valve 1.0 bar

- ❑ For lubricating points in cylinder head
- ❑ 25 Nm

Retaining frame on cylinder head (right-side) - tightening torque and sequence

– Tighten bolts and nuts in 2 stages in the sequence shown:

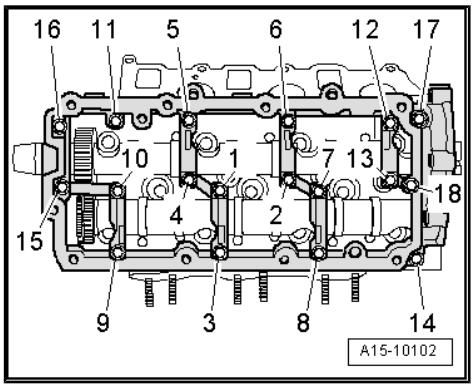
Stage	Bolts/nuts	Tightening torque
1.	-1 … 17-	Screw in by hand until contact is made • The retaining frame should make contact with the cylinder head over the full surface
2.	-1 … 17-	9 Nm



Retaining frame on cylinder head (left-side) - tightening torque and sequence

– Tighten bolts and nuts in 2 stages in the sequence shown:

Stage	Bolts/nuts	Tightening torque
1.	-1 … 18-	Screw in by hand until contact is made • The retaining frame should make contact with the cylinder head over the full surface
2.	-1 … 18-	9 Nm

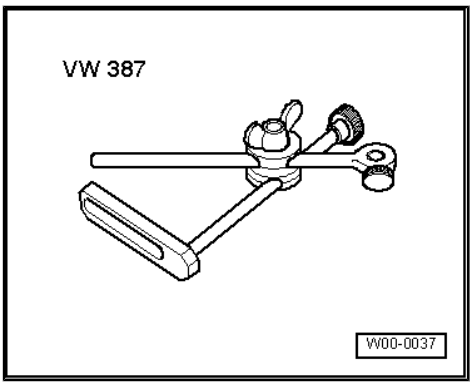


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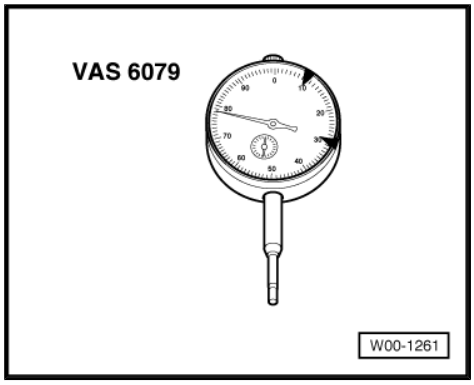
4.2 Measuring axial clearance of camshafts

Special tools and workshop equipment required

♦ Universal dial gauge bracket - VW 387-



♦ Dial gauge - VAS 6079-



Procedure

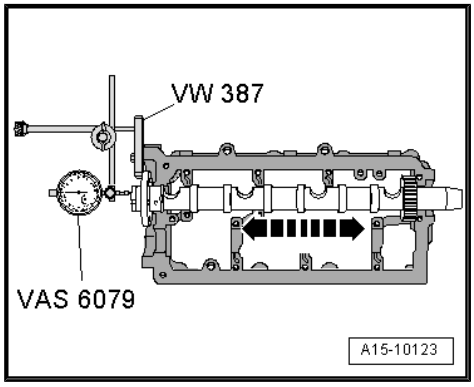
– Removing retaining frame: cylinder head (left-side) ⇒ page 215 , cylinder head (right-side) ⇒ page 222 .

– Secure dial gauge - VAS 6079- to cylinder head with universal dial gauge bracket - VW 387- as shown in the following illustrations.

– Measure axial clearance of inlet camshaft -arrows-.

• Specification: 0.03 … 0.08 mm.

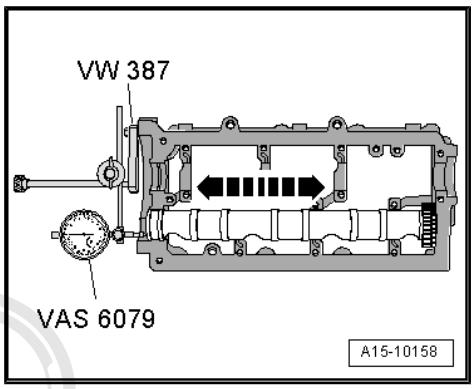
• Wear limit: 0.12 mm.



– Measure axial clearance of exhaust camshaft -arrows-.

• Specification: 0.03 … 0.08 mm.

• Wear limit: 0.12 mm.



4.3 Measuring radial clearance of camshafts

Special tools and workshop equipment required

♦ Plastigage

Procedure

– Remove roller rocker fingers: cylinder head (left-side) ⇒ page 215 , cylinder head (right-side) ⇒ page 222 .

– Clean bearing and bearing journal.

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

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- The Plastigage must be positioned in the centre of the bearing.

– Re-insert camshafts, fit bearing cap and secure with old bolts without rotating camshafts.

♦ Bearing cap, cylinder bank 1 (right-side) - tightening torque and sequence ⇒ page 211

♦ Bearing cap, cylinder bank 2 (left-side) - tightening torque and sequence ⇒ page 211

– Remove retaining frame and camshafts again.

– Compare width of Plastigage with measurement scale.

Radial clearance:

- New: 0.035 ... 0.085 mm.
- Wear limit: 0.100 mm.

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4.4 Renewing camshaft oil seal

Special tools and workshop equipment required

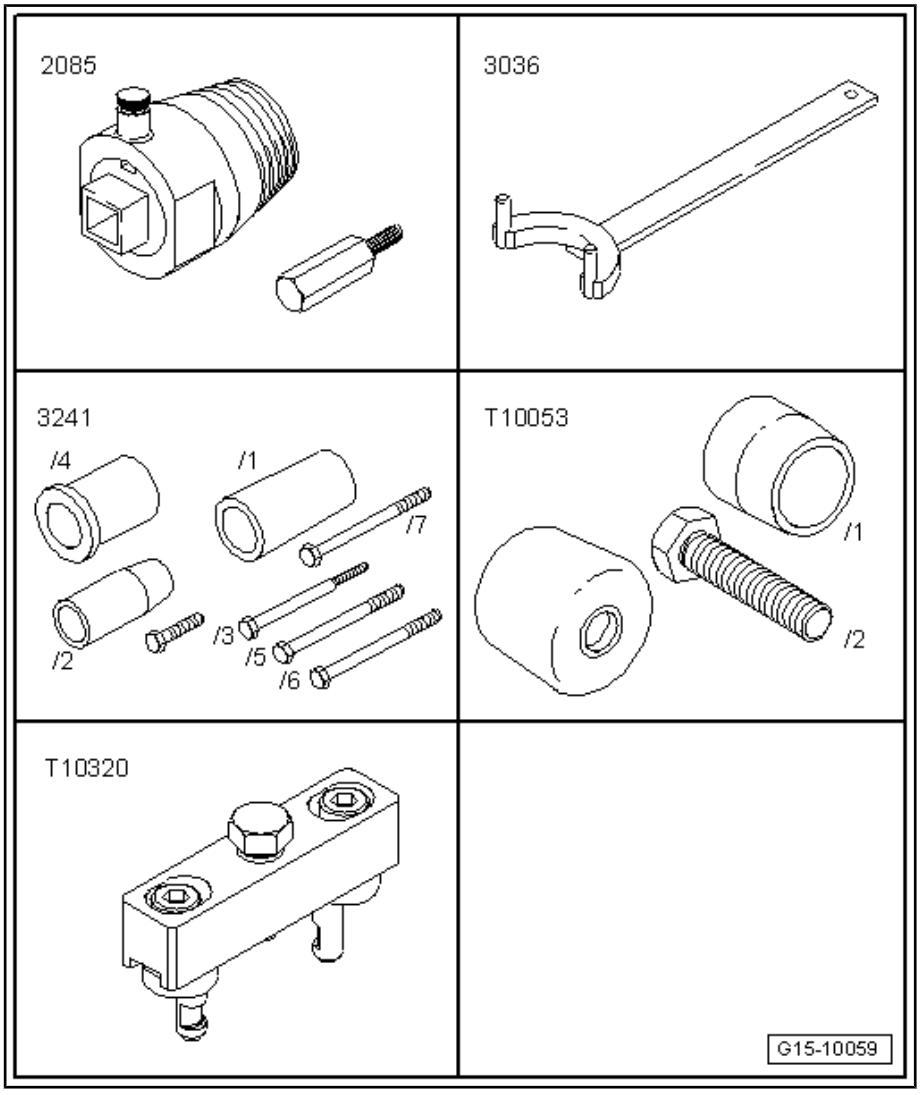
♦ Oil seal extractor - 2085-

♦ Counterhold tool - 3036-

♦ Hexagon bolt M10 x 1.25 x 40, (from fitting sleeves - 3241-)

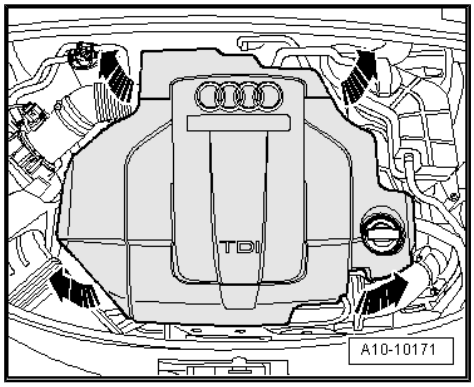
♦ Assembly tool - T10053-

♦ Puller - T10320-

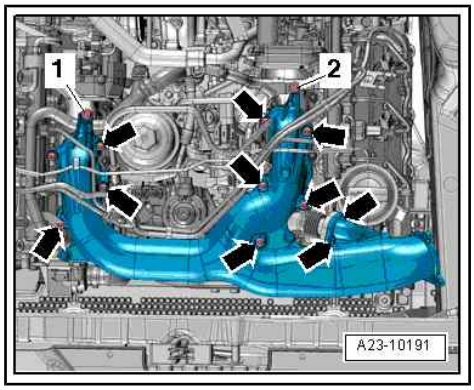


Procedure

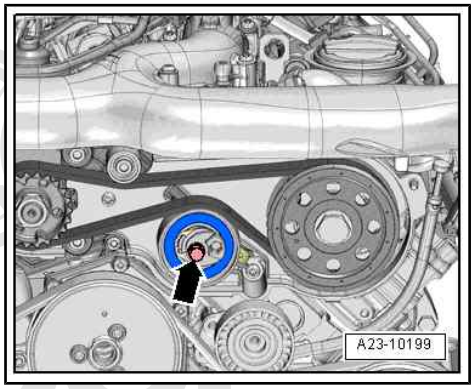
– Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



– Remove intake manifold (top section) ⇒ Rep. gr. 23 .

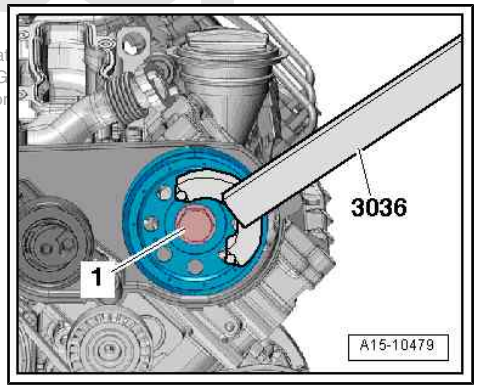


– Remove toothed belt for high-pressure pump ⇒ Rep. gr. 23 .

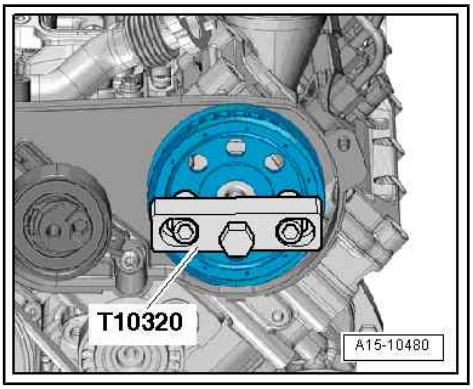


– Loosen bolt -1- for toothed belt drive sprocket approx. 2 turns using counterhold tool - 3036- .

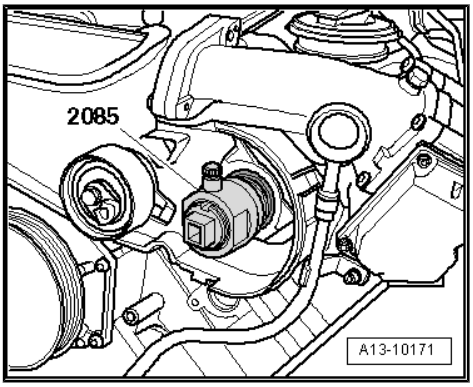
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– Remove toothed belt drive sprocket using puller - T10320- .



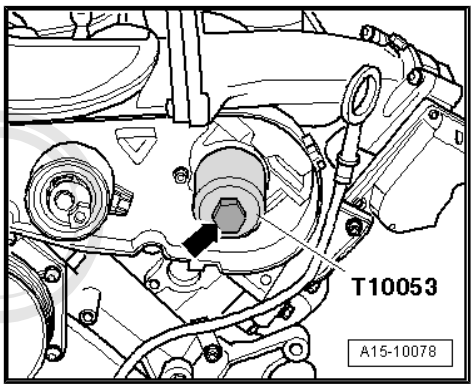
– Unscrew inner section of oil seal extractor -2085- 3 turns out of outer section and lock inner section with knurled screw.
– Lubricate threaded head of oil seal extractor, place it in position and screw it into oil seal as far as possible (applying firm pressure).
– Loosen knurled screw and turn inner section against camshaft until oil seal is pulled out.
– Clamp flats of oil seal extractor in vice and use pliers to remove oil seal.
– Clean contact surface and sealing surface.



– Press in new oil seal as far as stop using press sleeve from - T10053- and hexagon bolt M10 x 1.25 x 40 -arrow-, (from fitting sleeves - 3241-).

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

– Install toothed belt for high-pressure pump and intake manifold (top section) ⇒ Rep. gr. 23 .

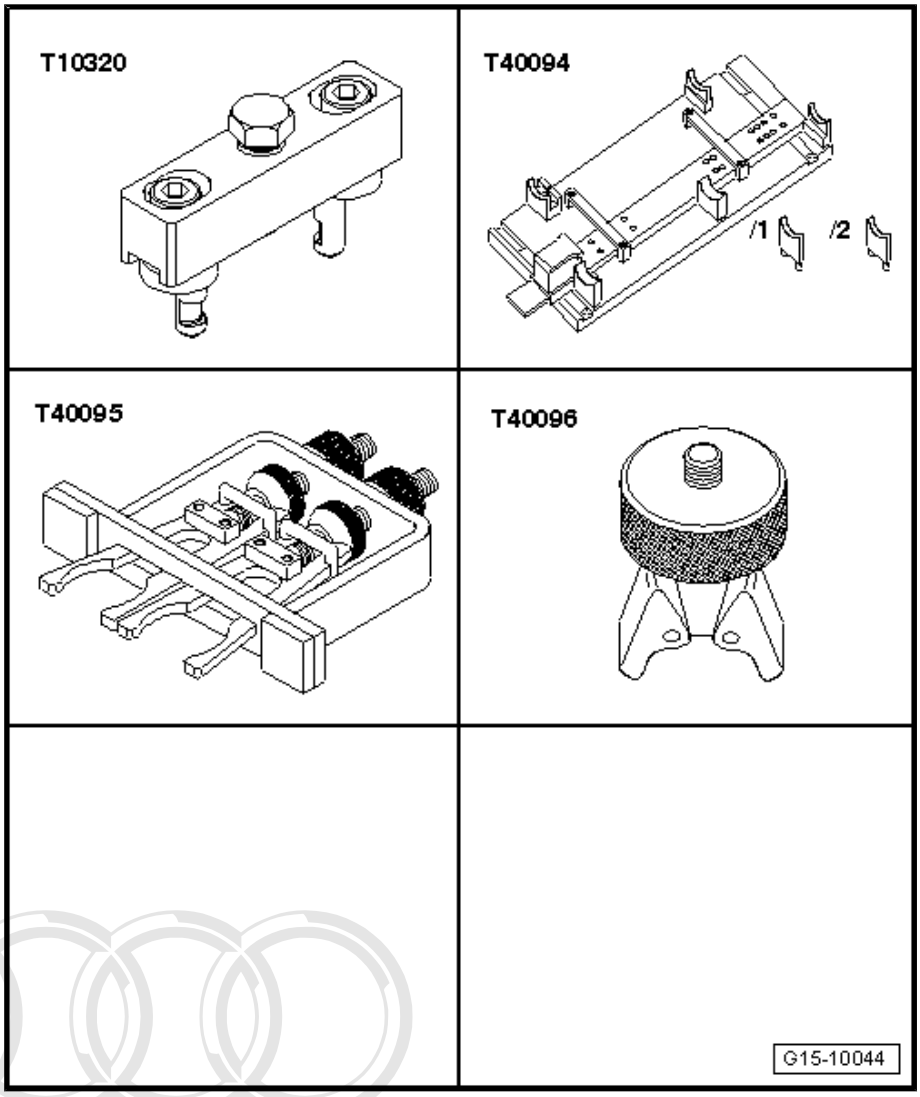


4.5 Removing and installing camshafts - cylinder head (left-side)

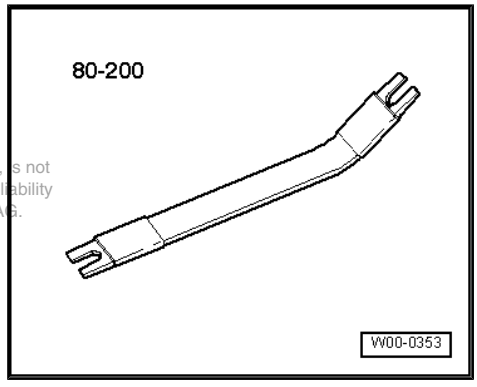
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Special tools and workshop equipment required

- Puller - T10320-
- Camshaft fitting tool - T40094-
- Camshaft fitting tool - T40095-
- Camshaft fitting tool - T40096-

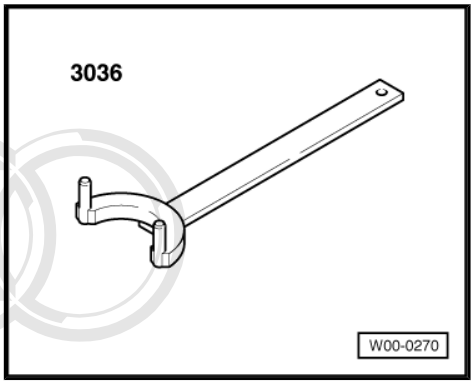


- Removal lever - 80 - 200-



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- Counterhold tool - 3036-



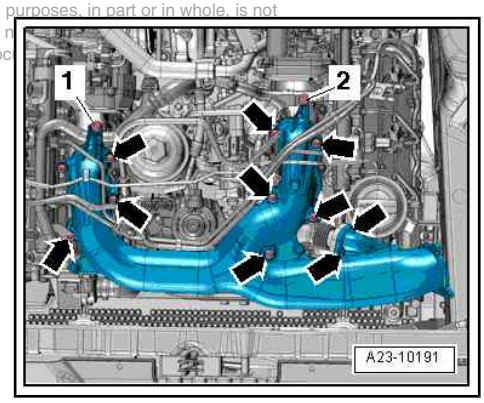
- Electric drill with plastic brush
- Safety goggles
- Sealant ⇒ Electronic parts catalogue

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Removing

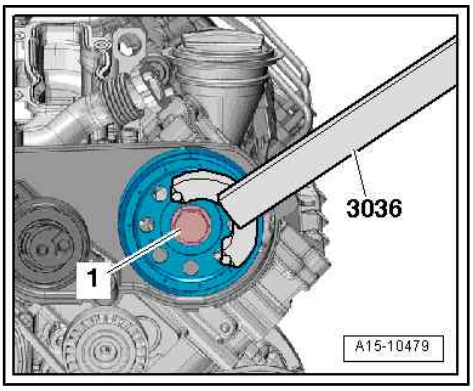
– Remove timing chain (left-side) from camshaft ⇒ page 160 .

– Remove intake manifold (top section) ⇒ Rep. gr. 23 .



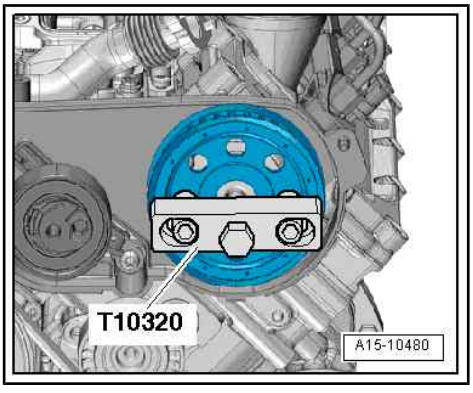
– Remove toothed belt for high-pressure pump ⇒ Rep. gr. 23 .

– Loosen bolt -1- for toothed belt drive sprocket approx. 2 turns using counterhold tool - 3036- .



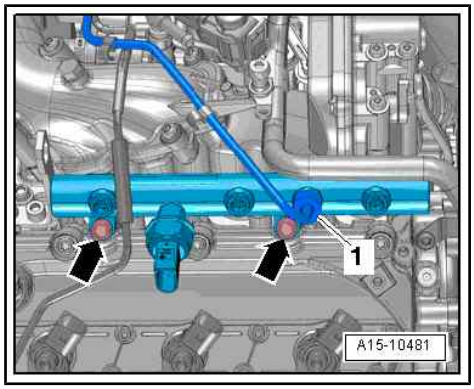
– Remove toothed belt drive sprocket using puller - T10320- .

– Remove cylinder head cover (left-side) ⇒ page 187 .

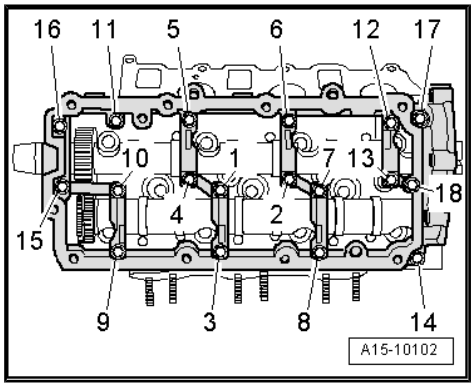


– Remove union nut -1- for high-pressure pipe.

– Remove bolts -arrows- and remove fuel rail from cylinder head (left-side).



– Slacken retaining frame bolts and nuts in the sequence -18 ... 1-.



Note

Make sure you do not damage roller rocker fingers and compensation elements when removing camshafts.

– Carefully detach retaining frame and camshafts.

Installing

- Tightening torques
⇒ “3.4 Cylinder head - exploded view”, page 193

Note

Renew sealing cap (front) on cylinder head (right-side).

Caution

Make sure axial bearings in retaining frame are not damaged.

- ***The camshafts MUST be installed using the camshaft fitting tool - T40094- as described in the following.***

Protect lubrication system against contamination.

- ***Cover exposed parts of the cylinder head.***

WARNING

Risk of eye injury.

- ***Wear safety goggles.***

– Remove remaining sealant from cylinder head and retaining frame using rotating plastic brush or similar.

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

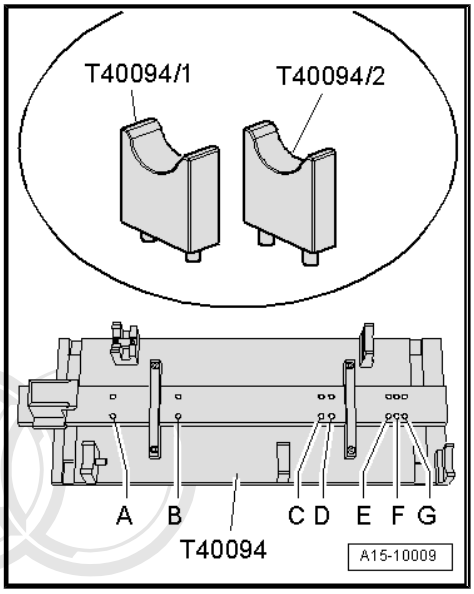
– Oil running surfaces of both camshafts.

Audi
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Set up camshaft fitting tool - T40094- as follows:

– Insert support -T40094/2- in position -A-.

– Insert support -T40094/1- in position -D-.

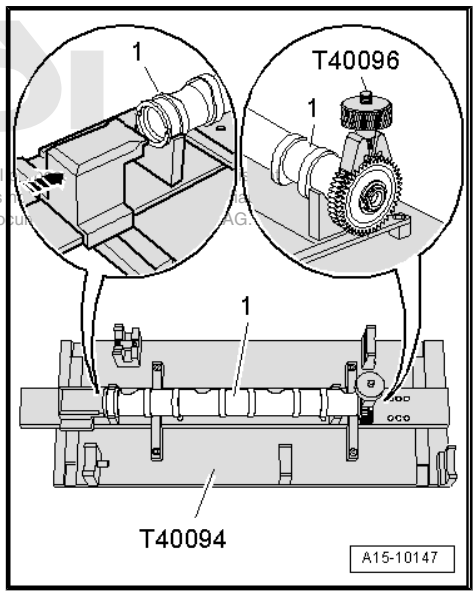


– Place exhaust camshaft -1- in supports -T40094/1- and -T40094/2- .

– Turn exhaust camshaft in such a way that it can be locked in “TDC” position using locking device -arrow-.

– Place camshaft fitting tool - T40096- on teeth of exhaust camshaft in such a way that the two arms of the tool engage on the two halves of the gear (one in each half, as shown in illustration).

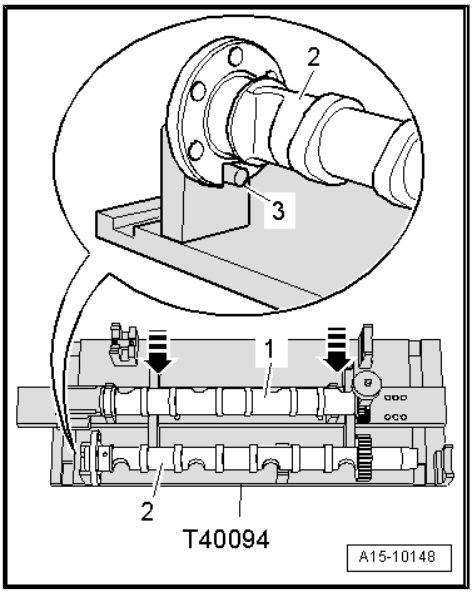
– Tighten the clamping tool using the knurled wheel so that the faces of the gear teeth are in alignment.



– Place inlet camshaft -2- in camshaft fitting tool - T40094- .

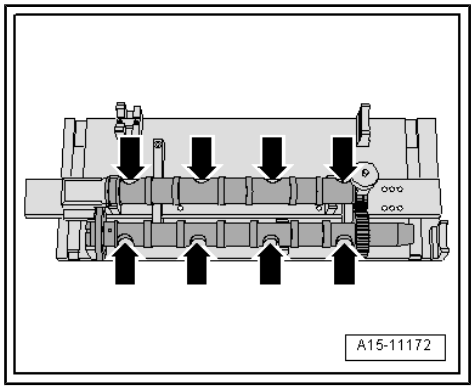
• The locating pin -3- must engage in the slot on the inlet camshaft.

– Slide exhaust camshaft -1- towards inlet camshaft -arrows- until gear teeth engage.



– Check that camshafts are in correct position:

• Recesses -arrows- on both camshafts must point outwards.

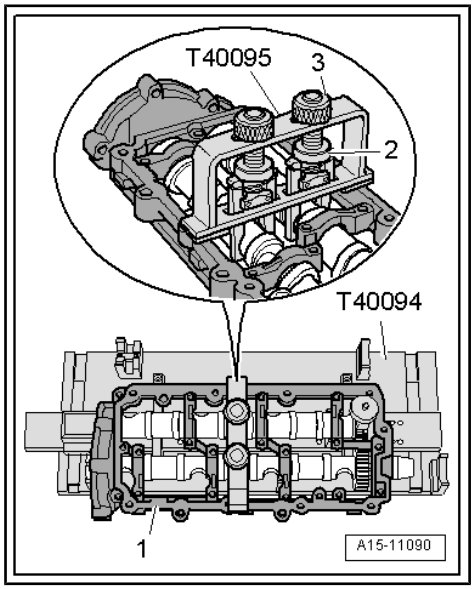


– Fit retaining frame -1- on both camshafts.

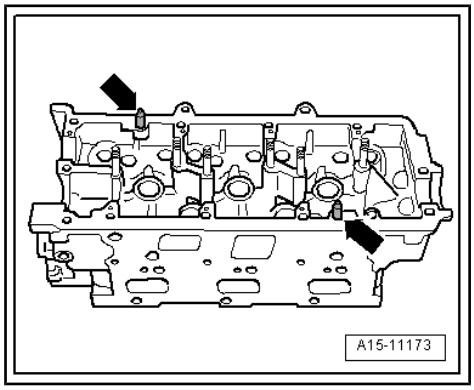
• All camshaft bearings must be seated on the camshafts.

– Attach camshaft fitting tool - T40095- to camshafts (align arms of bracket as required and tighten knurled nuts -2-).

– Apply tension to camshafts by tightening the knurled nuts -3- upwards.



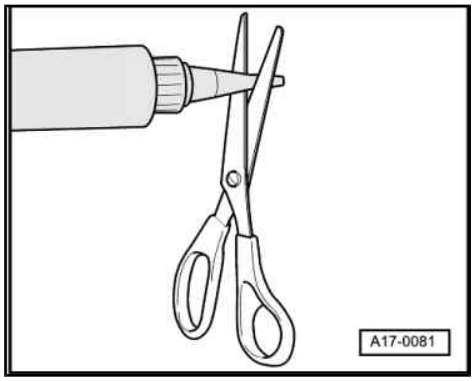
– Check if dowel pins -arrows- are fitted in cylinder head. Install missing dowel pins.



Note

Note the use-by date of the sealant.

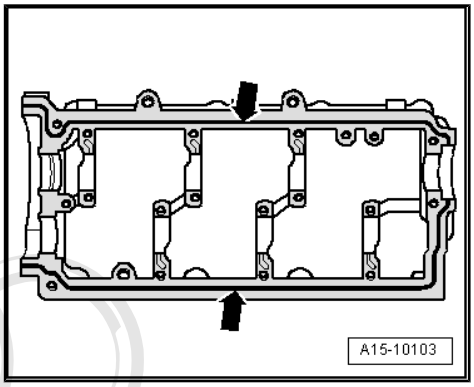
– Cut off nozzle of tube at front marking (nozzle ∅ approx. 1.5 mm).



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Note

For illustration purposes, the retaining frame is shown without the camshafts.



– Turn retaining frame upside down.

Caution

Make sure lubrication system is not clogged by excess sealant.

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

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

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

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Note

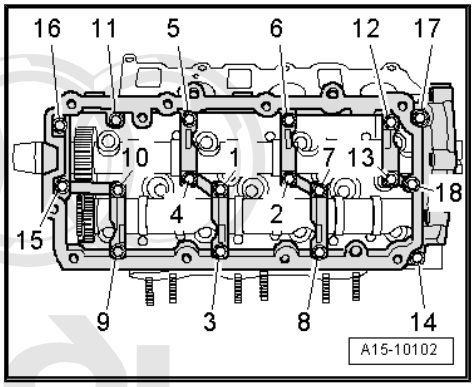
The retaining frame must be installed within 5 minutes after applying the sealant.

Caution

Risk of damage to engine.

- ***Ensure that all roller rocker fingers contact the valve ends and compensation elements correctly.***

– Fit retaining frame together with both camshafts and camshaft fitting tool - T40095- onto cylinder head.
– Tighten bolts for retaining frame ⇒ page 211 .
– Remove camshaft fitting tool - T40095- and -T40096- .



Note

After installing the retaining frame, wait about 30 minutes for the sealant to dry.

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

– Install cylinder head cover (left-side) ⇒ page 187 .
– Renew camshaft oil seal ⇒ page 213 .
– Install toothed belt for high-pressure pump ⇒ Rep. gr. 23 .
– Install intake manifold (top section) ⇒ Rep. gr. 23 .
– Install camshaft timing chain ⇒ page 164 .

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Caution

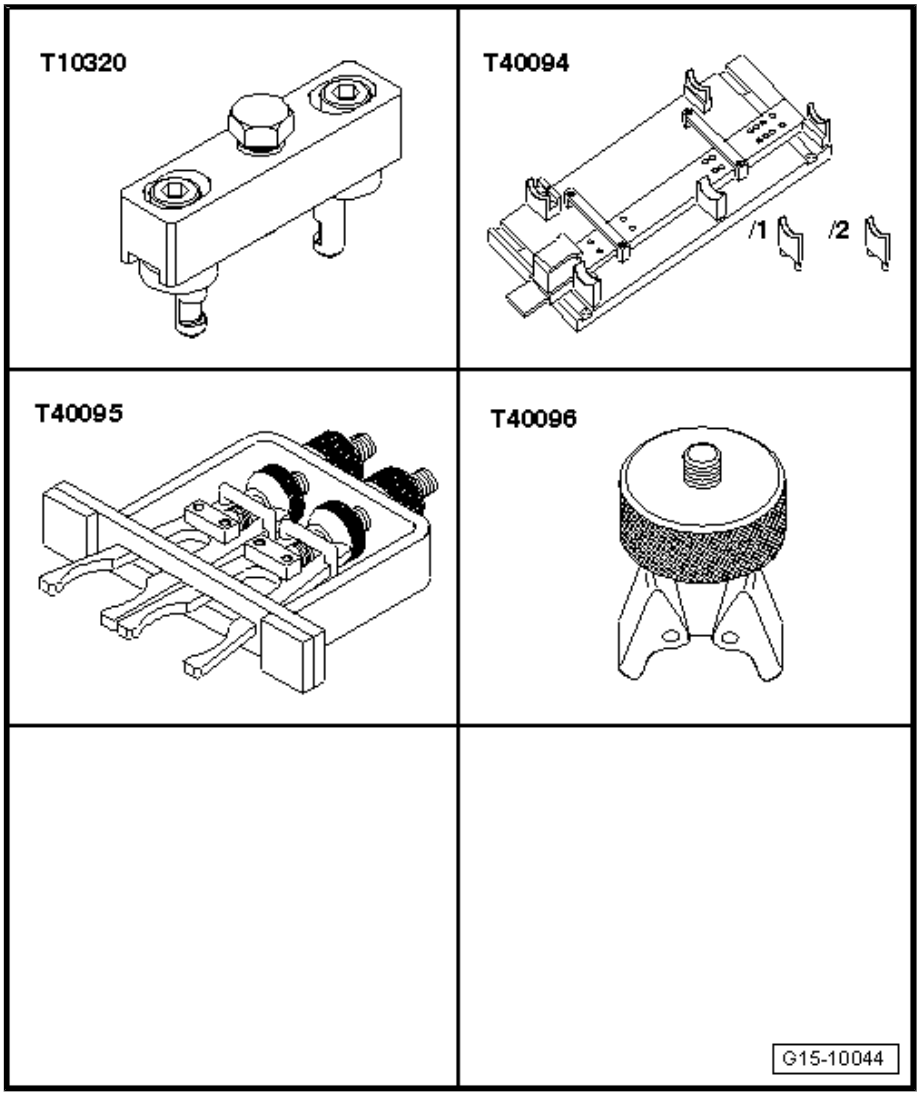
Avoid damage to valves and piston crowns after working on valve gear.

- ***The hydraulic tappets have to settle; wait for approx. 30 minutes after installing camshafts before starting engine.***
- ***Turn the engine carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.***

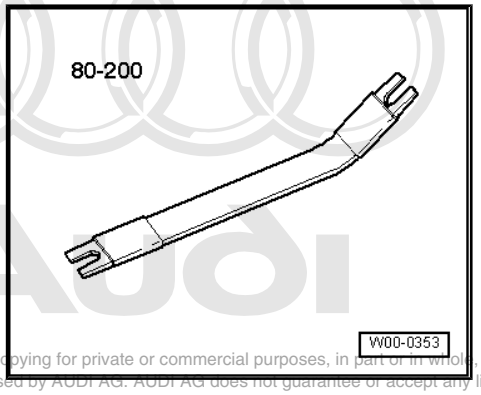
4.6 Removing and installing camshafts - cylinder head (right-side)

Special tools and workshop equipment required

- Puller - T10320-
- Camshaft fitting tool - T40094-
- Camshaft fitting tool - T40095-
- Camshaft fitting tool - T40096-

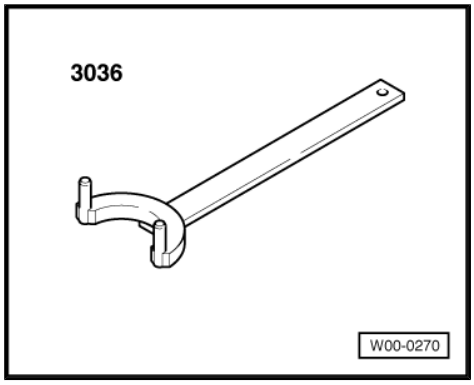


- Removal lever - 80 - 200-



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- Counterhold tool - 3036-



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

Removing

– Remove timing chain (right-side) from camshaft ⇒ page 160 .

– Remove cylinder head cover (right-side) ⇒ page 190 .

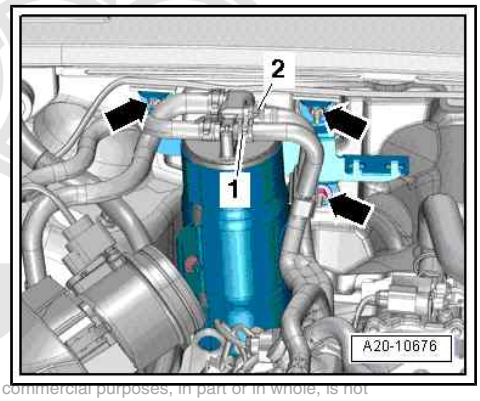
Note

Place a cloth below the connection to catch escaping fuel.

Caution

Protect fuel system against contamination.

- ***Rules for cleanliness when working on the injection system ⇒ page 7 .***

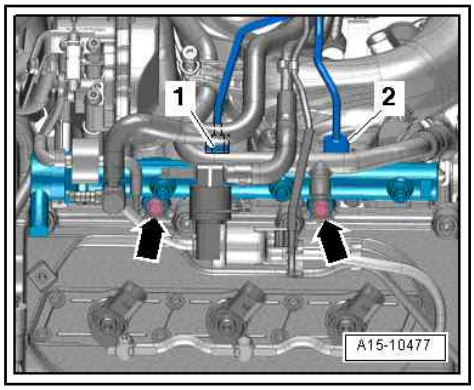


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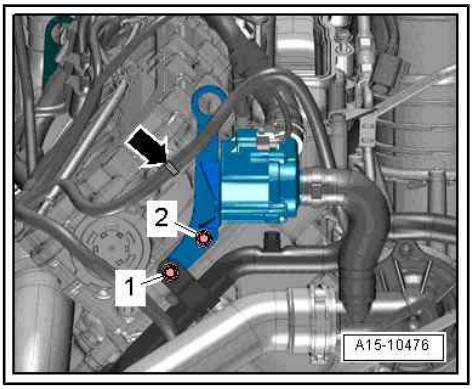
– Disconnect fuel return hose -1- and fuel supply hose -2-.

– Unscrew union nuts -1- and -2-.

– Remove bolts -arrows- and move fuel rail to one side (fuel hoses remain connected).



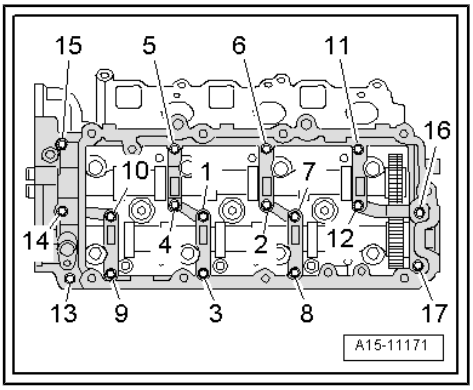
– Use removal lever - 80 - 200- to move electrical wiring harness clear -arrow-.



Note

Disregard -items 1, 2-.

– Slacken retaining frame bolts and nuts in the sequence -17 ... 1-.



Note

Make sure you do not damage roller rocker fingers and compensation elements when removing camshafts.

– Carefully detach retaining frame and camshafts.

Installing

- Tightening torques
⇒ “3.4 Cylinder head - exploded view”, page 193

Note

Renew sealing cap (front) on cylinder head (right-side).

Caution

Make sure axial bearings in retaining frame are not damaged.

- ***The camshafts MUST be installed using the camshaft fitting tool - T40094- as described in the following.***

Protect lubrication system against contamination.

- ***Cover exposed parts of the cylinder head.***

WARNING

Risk of eye injury.

- ***Wear safety goggles.***

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– Remove remaining sealant from cylinder head and retaining frame using rotating plastic brush or similar.

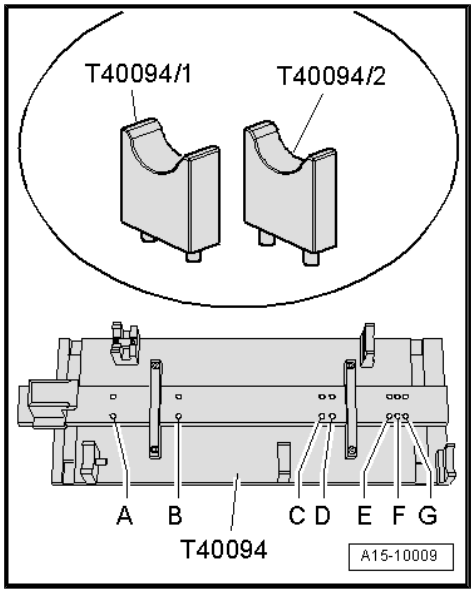
– Clean sealing surfaces; they must be free of oil and grease.

– Oil running surfaces of both camshafts.

Set up camshaft fitting tool - T40094- as follows:

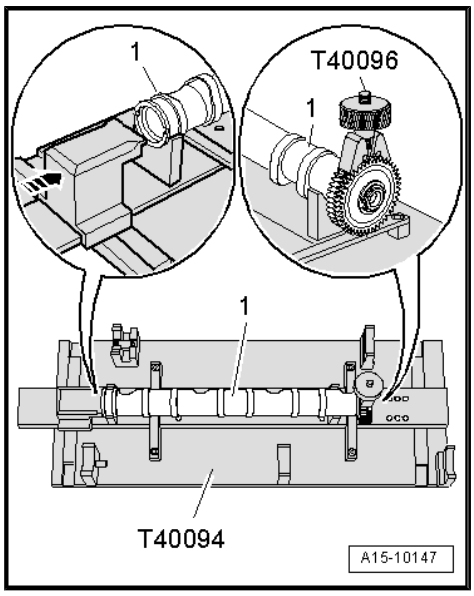
– Insert support -T40094/2- in position -B-.

– Insert support -T40094/1- in position -C-.



– Place exhaust camshaft -1- in supports -T40094/1- and -T40094/2- .

– Turn exhaust camshaft in such a way that it can be locked in “TDC” position using locking device -arrow-.



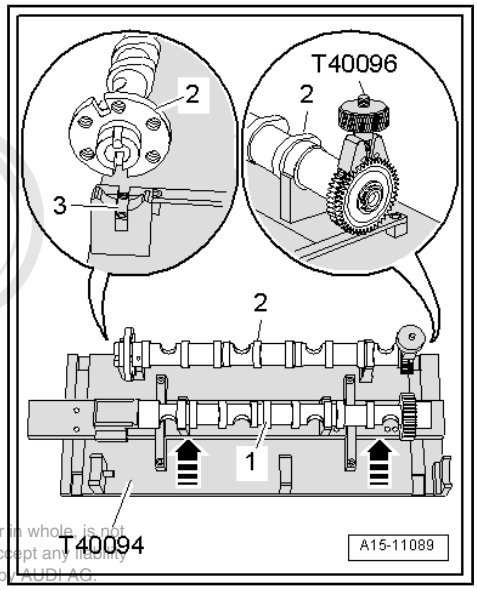
– Place inlet camshaft -2- in camshaft fitting tool - T40094- .

• The locating bar -3- must engage in the groove on the inlet camshaft.

– Place camshaft fitting tool - T40096- on teeth of inlet camshaft in such a way that the two arms of the tool engage on the two halves of the gear (one in each half, as shown in illustration).

– Tighten the clamping tool using the knurled wheel so that the faces of the gear teeth are in alignment.

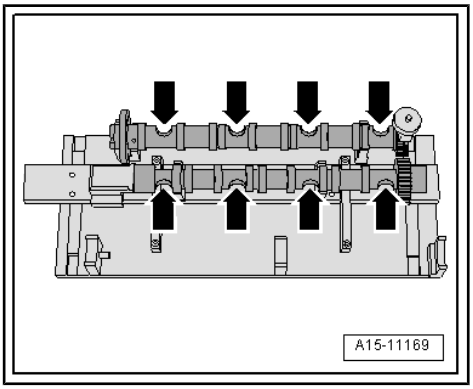
– Slide exhaust camshaft -1- towards inlet camshaft -arrows- until gear teeth engage.



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– Check that camshafts are in correct position:

• Recesses -arrows- on both camshafts must point outwards.



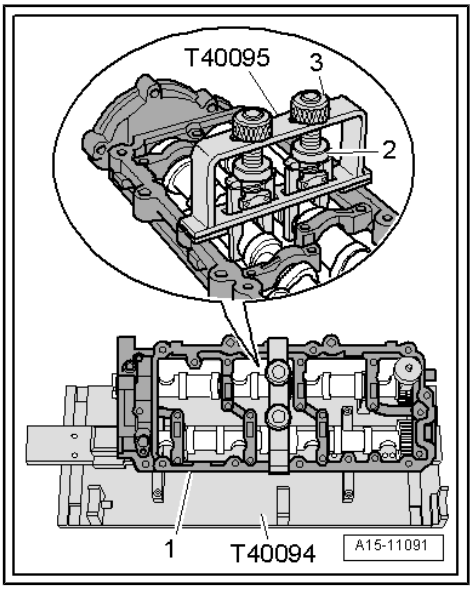
– Fit retaining frame -1- on both camshafts.

• All camshaft bearings must be seated on the camshafts.

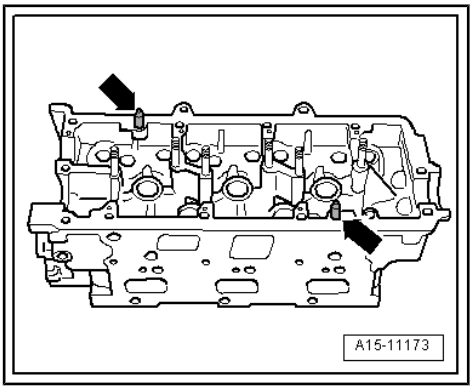
– Attach camshaft fitting tool - T40095- to camshafts (align arms of bracket as required and tighten knurled nuts -2-).

– Apply tension to camshafts by tightening the knurled nuts -3- upwards.

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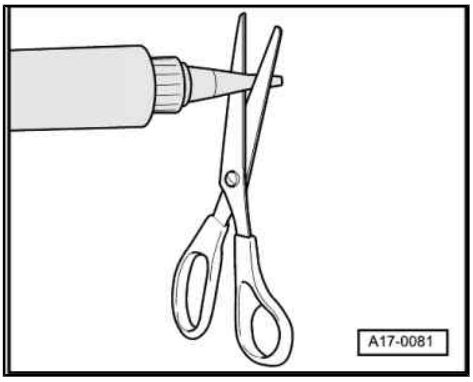
– Check if dowel pins -arrows- are fitted in cylinder head. Install missing dowel pins.

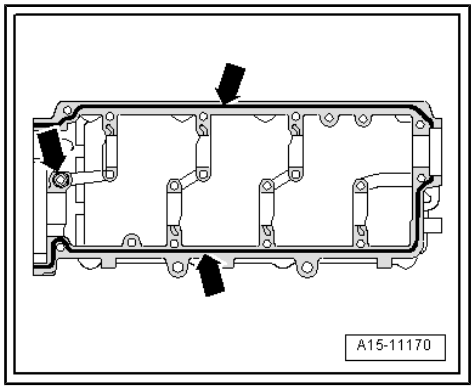


Note

Note the use-by date of the sealant.

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





Note

For illustration purposes, the retaining frame is shown without the camshafts.

– Turn retaining frame upside down.

Caution

Make sure lubrication system is not clogged by excess sealant.

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

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

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

Note

The retaining frame must be installed within 5 minutes after applying the sealant.

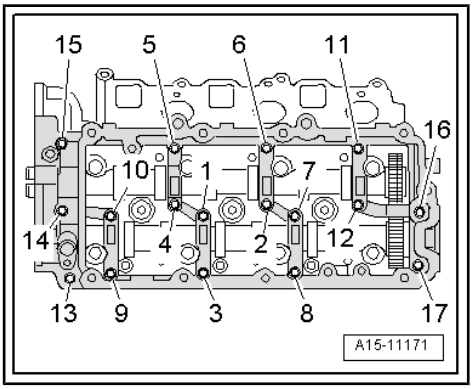
Caution

Risk of damage to engine.

- ***Ensure that all roller rocker fingers contact the valve ends and compensation elements correctly.***

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– Fit retaining frame together with both camshafts and camshaft fitting tool - T40095- onto cylinder head.
– Tighten bolts for retaining frame ⇒ page 211 .
– Remove camshaft fitting tool - T40095- and -T40096- .



Note

After installing the retaining frame, wait about 30 minutes for the sealant to dry.

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

– Install cylinder head cover (right-side) ⇒ page 190 .
– Use suitable drift to drive in new sealing cap until flush.
– Install camshaft timing chain ⇒ page 164 .

Caution

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

- ***The hydraulic tappets have to settle; wait for approx. 30 minutes after installing camshafts before starting engine.***
- ***Turn the engine carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.***

4.7 Checking hydraulic valve compensation elements

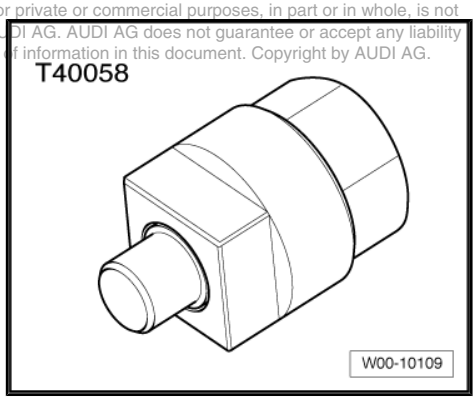
Note

- *Hydraulic valve compensation elements cannot be serviced.*
- *Irregular valve noises when starting engine are normal.*

Special tools and workshop equipment required

- Adapter - T40058- for vehicles with multitronic gearbox or automatic gearbox

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- Feeler gauge

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:

– Remove cylinder head cover: left-side ⇒ page 187 ; right-side ⇒ page 190 .

– Turn crankshaft in direction of engine rotation -arrow- until cam of compensation element to be tested is facing upwards.

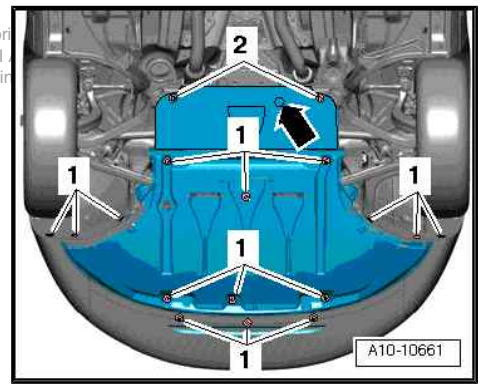
Vehicles with manual gearbox:

– Push vehicle forwards with 4th gear engaged and ignition switched off.

Vehicles with multitronic or automatic gearbox:

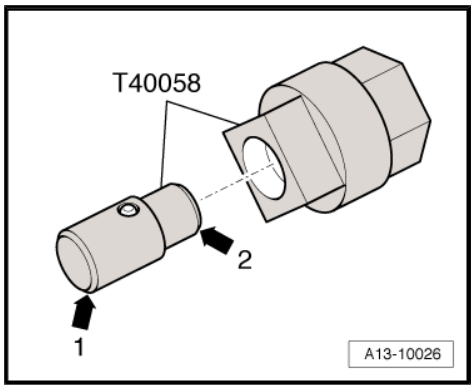
– Remove front and rear noise insulation ⇒ Rep. gr. 50 .

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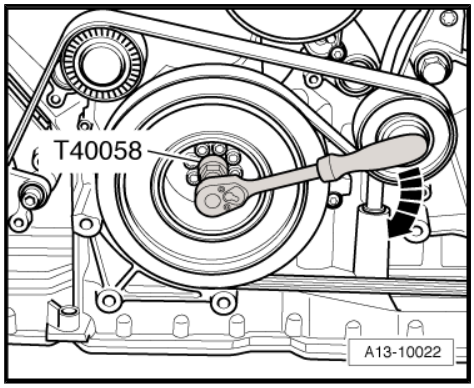


– Insert guide pin of adapter -T40058- as follows:

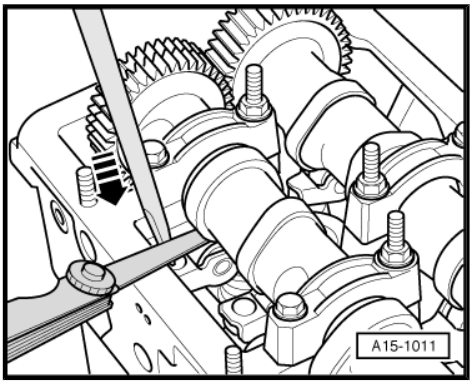
- The larger-diameter section -arrow 1- faces towards the engine.
- The smaller-diameter section -arrow 2- faces the adapter.



– Turn crankshaft with adapter - T40058- in direction of engine rotation -arrow- until cam of compensation element to be tested is at top.



– 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 compensation element ⇒ page 215 .



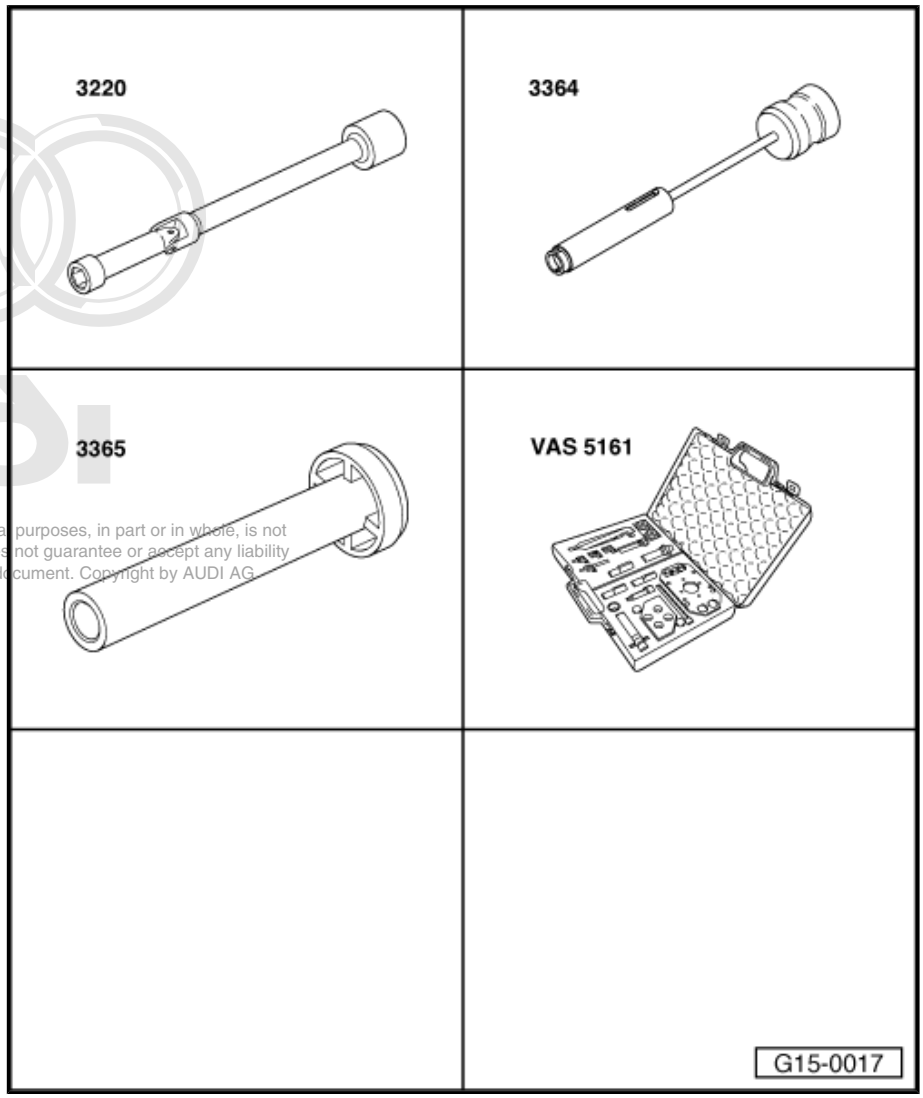
Additional steps required

– Install cylinder head cover: left-side ⇒ page 187 ; right-side ⇒ page 190 .
– Install noise insulation panels ⇒ Rep. gr. 50 .

4.8 Renewing valve stem oil seals with cylinder head installed

Special tools and workshop equipment required

- U/J extension and socket, 10 mm - 3220-
- Valve stem seal puller - 3364-
- Valve stem seal fitting tool - 3365-
- Removal and installation device for valve cotters - VAS 5161 A- with knurled spacer ring -VAS 5161/23-1- and guide plate -VAS 5161/23-



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Procedure

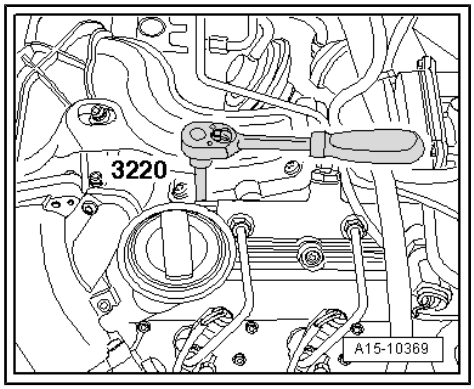
– Remove all glow plugs ⇒ Rep. gr. 28 .

– Removing camshafts: cylinder head (left-side) ⇒ page 215 , cylinder head (right-side) ⇒ page 222 .

– Mark original positions of roller rocker fingers and hydraulic compensation elements for reinstallation.

– Remove roller rocker fingers together with hydraulic compensation elements and put down on a clean surface.

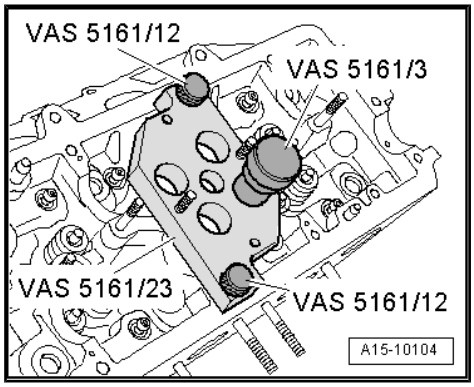
– Set piston of appropriate cylinder to “bottom dead centre”.



– Fit guide plate -VAS 5161/23- onto cylinder head.

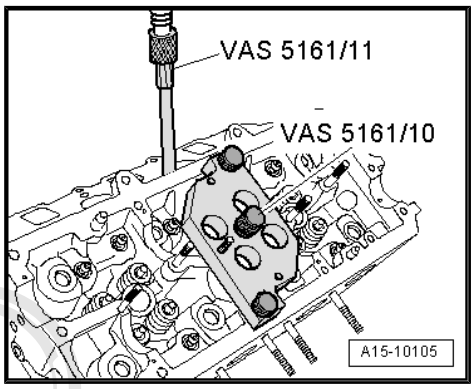
– Secure guide plate with knurled screws -VAS 5161/12- .

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



– Screw sealing pin -VAS 5161/10- into guide plate.

– Screw adapter -VAS 5161/11- hand-tight into corresponding glow plug thread.



– Screw snap-in device -VAS 5161/6- with engaging fork -VAS 5161/5- into guide plate.

– Slide knurled spacer ring -VAS 5161/23-1- onto assembly cartridge -VAS 5161/8- .

– Connect adapter to compressed air line using a commercially available connection piece, and apply constant air pressure.

• Minimum pressure: 6 bar

– Attach pressure fork -VAS 5161/2- to snap-in device and push assembly cartridge down.

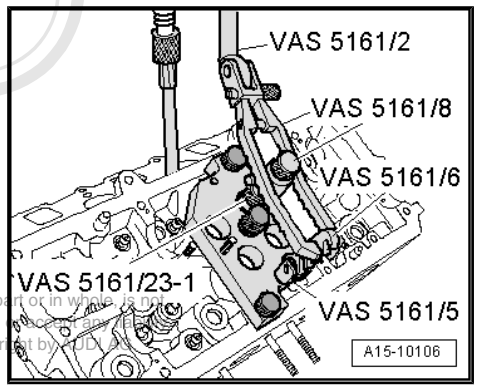
– At the same time, turn knurled screw of assembly cartridge clockwise until tips engage in valve cotters.

– Move knurled screw back and forth slightly; the valve cotters are thus forced apart and taken up by the assembly cartridge.

– Release pressure fork.

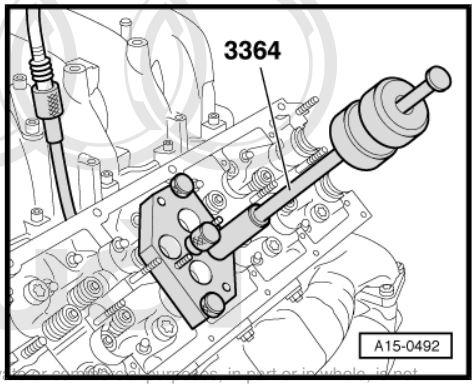
– Take off assembly cartridge with knurled spacer ring.

– Detach valve spring with valve spring plate.



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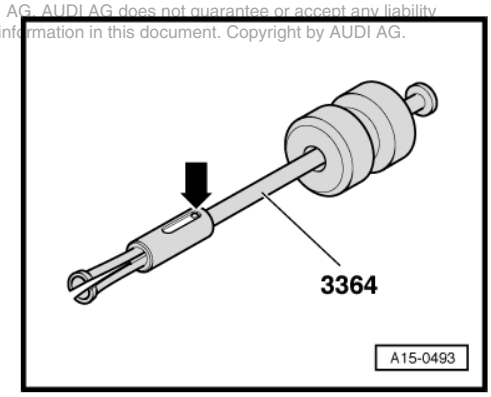
– Pull off valve stem oil seal with valve stem seal puller - 3364- .



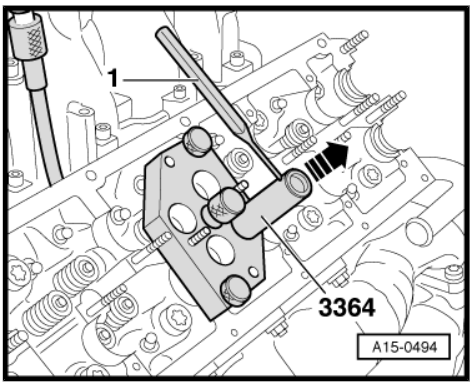
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If the puller cannot be used on some of the valve stem oil seals due to the confined space, proceed as follows:

– Knock out pin -arrow- of puller using a drift and remove impact extractor attachment.



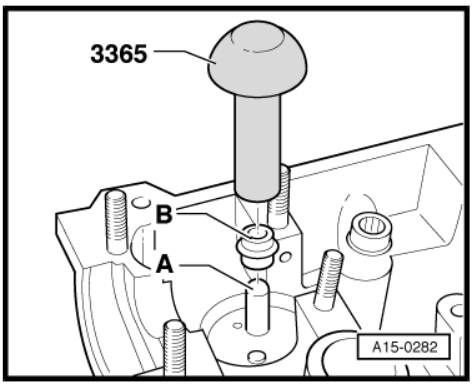
– Apply bottom section of puller -3364- to valve stem oil seal.
– Secure puller with a punch or roll-pin drift -1-, as shown in illustration.
– Apply assembly lever to puller and pull out valve stem oil seal -arrow-.



Caution

Make sure valve stem oil seals are not damaged when installing.

- ***New valve stem oil seals -B- are supplied with plastic sleeve; fit plastic sleeve -A- onto valve stem.***



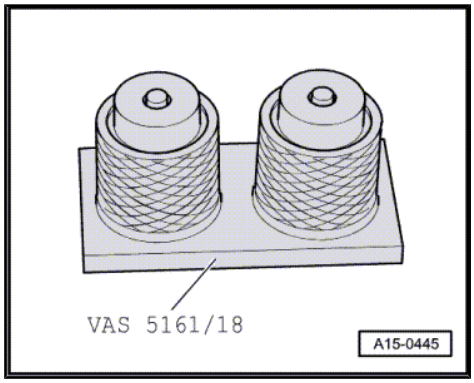
– Lightly oil sealing lip of valve stem oil seal.
– Slide valve stem oil seal onto plastic sleeve.
– Carefully press valve stem oil seal onto valve guide using valve stem seal fitting tool - 3365- .
– Take off plastic sleeve.

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

- Larger diameter of valve cotters faces upwards.

– Insert valve spring and valve spring plate.

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

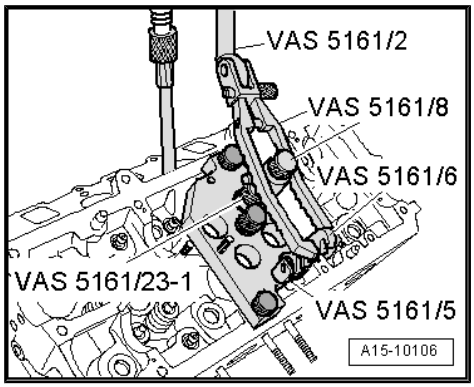


– Insert assembly cartridge in guide plate -VAS 5161/23- again.

– Press down pressure fork and pull knurled screw upwards while turning screw in both directions - this will insert the valve cotters.

– Release pressure fork with knurled screw still in pulled position.

– Repeat procedure for each valve.



Assembling

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

– Installing camshafts: cylinder head (left-side) ⇒ page 215 , cylinder head (right-side) ⇒ page 222 .

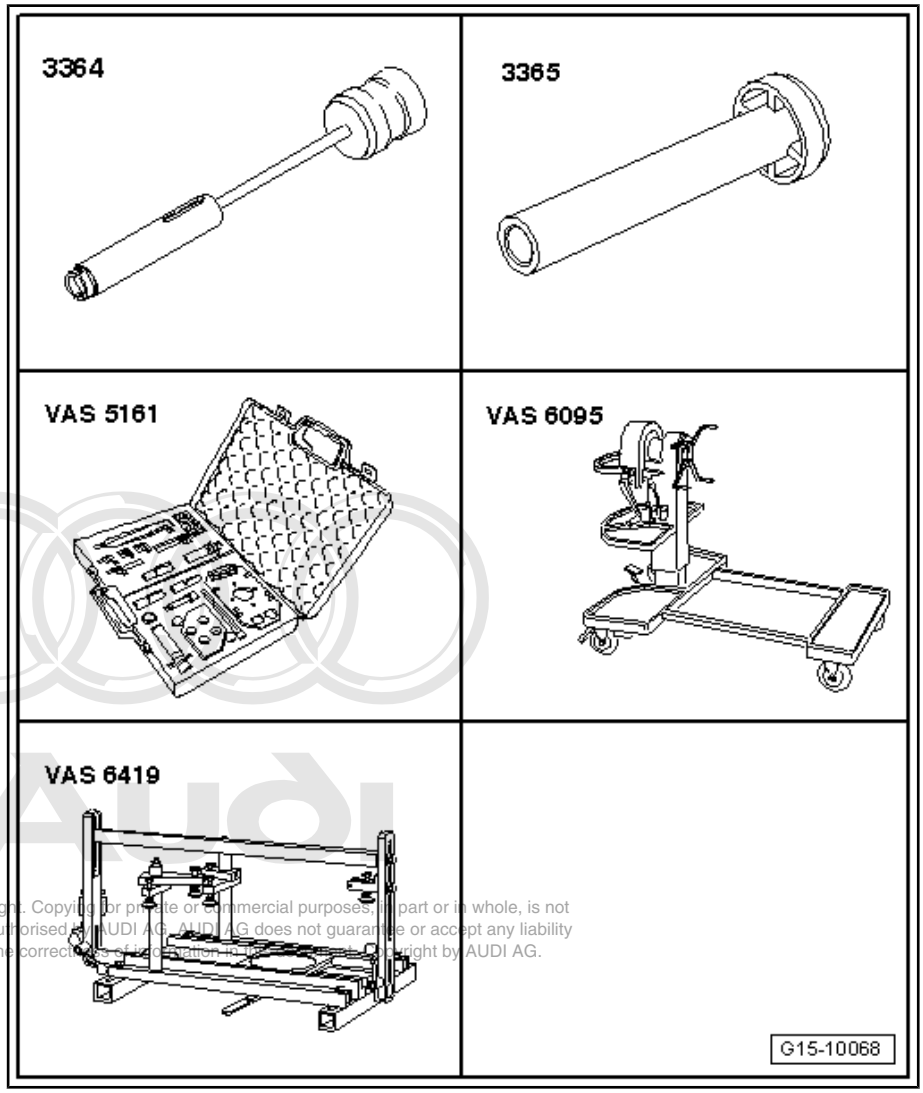
– Install glow plugs ⇒ Rep. gr. 28 .

4.9 Renewing valve stem oil seals with cylinder head removed

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Special tools and workshop equipment required

- Valve stem seal puller - 3364-
- Valve stem seal fitting tool - 3365-
- Removal and installation device for valve cotters - VAS 5161 A- with drift - VAS 5161/3 A- , assembly cartridge -VAS 5161/8 A- and guide plate -VAS 5161/29-
- Engine and gearbox support - VAS 6095-
- Cylinder head tensioning device - VAS 6419-



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Procedure

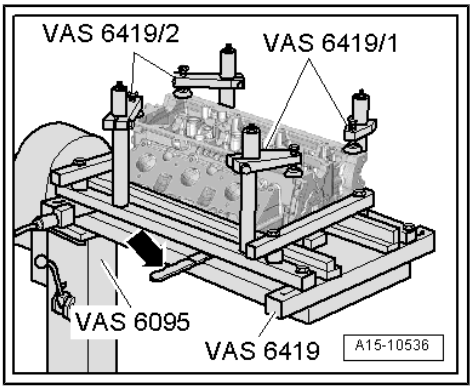
– Removing camshafts: cylinder head (left-side) ⇒ page 215 , cylinder head (right-side) ⇒ page 222 .

– Mark original positions of roller rocker fingers and hydraulic compensation elements for reinstallation.

– 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.

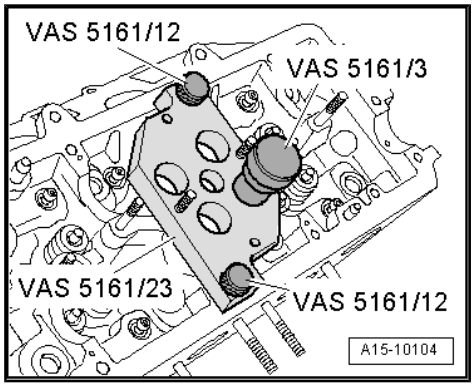


– Connect cylinder head tensioning device to compressed air.

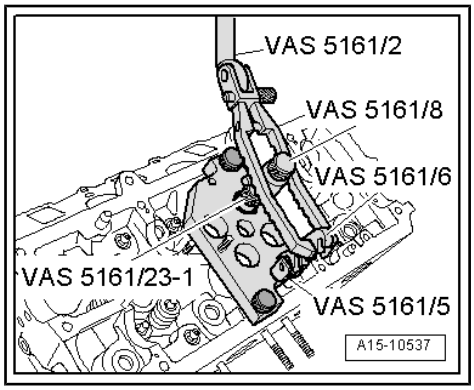
– Using lever -arrow-, slide air pad under combustion chamber where valve stem oil seal is to be removed.

– Apply just enough compressed air to bring air pad into contact with valve heads.

– Fit guide plate -VAS 5161/23- onto cylinder head.
– Secure guide plate with knurled screws -VAS 5161/12- .
– Insert drift -VAS 5161/3- into guide plate and use plastic-headed hammer to release sticking valve cotters.

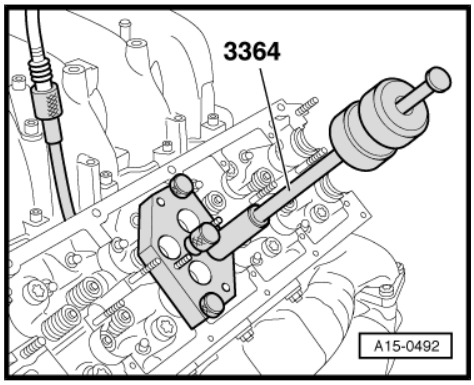


– Screw snap-in device -VAS 5161/6- with engaging fork -VAS 5161/5- into guide plate.
– Slide knurled spacer ring -VAS 5161/23-1- onto assembly cartridge -VAS 5161/8- .
– Attach pressure fork -VAS 5161/2- to snap-in device and push assembly cartridge down.
– At the same time, turn knurled screw of assembly cartridge clockwise until tips engage in valve cotters.
– Move knurled screw back and forth slightly; the valve cotters are thus forced apart and taken up by the assembly cartridge.
– Release pressure fork.
– Take off assembly cartridge with knurled spacer ring.
– Detach valve spring with valve spring plate.



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

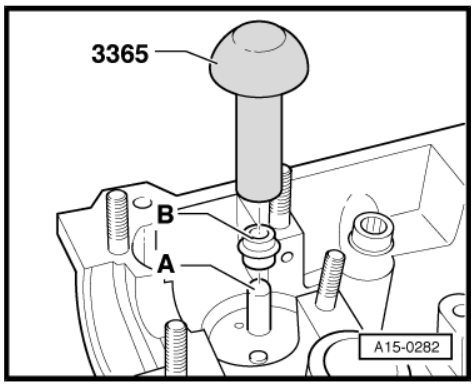
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Caution

Make sure valve stem oil seals are not damaged when installing.

- *New valve stem oil seals -B- are supplied with plastic sleeve; fit plastic sleeve -A- onto valve stem.*



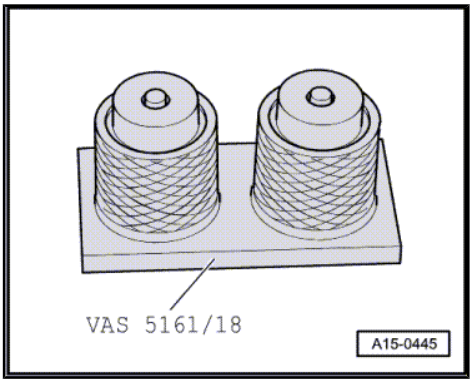
– Lightly oil sealing lip of valve stem oil seal.
– Slide valve stem oil seal onto plastic sleeve.
– Carefully press valve stem oil seal onto valve guide using valve stem seal fitting tool - 3365- .
– Take off plastic sleeve.

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

- Larger diameter of valve cotters faces upwards.

– Insert valve spring and valve spring plate.

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

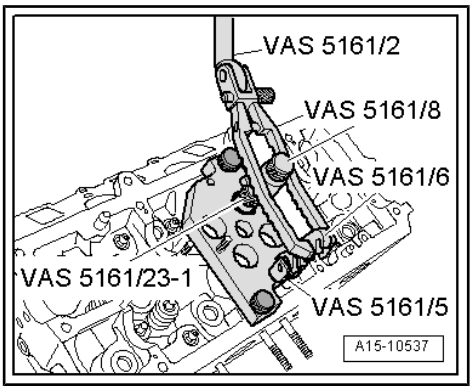


– Insert assembly cartridge in guide plate -VAS 5161/23- again.

– Press down pressure fork and pull knurled screw upwards while turning screw in both directions - this will insert the valve cotters.

– Release pressure fork with knurled screw still in pulled position.

– Repeat procedure for each valve.



Assembling

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

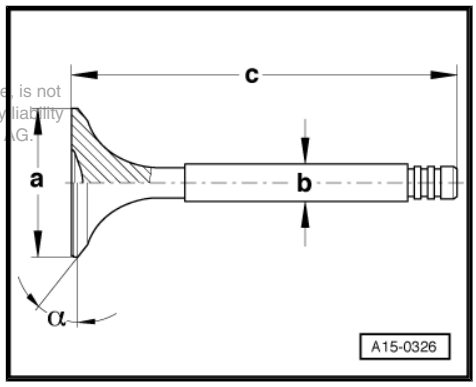
– Installing camshafts: cylinder head (left-side) ⇒ page 215 , cylinder head (right-side) ⇒ page 222 .

4.10 Valve dimensions

Note

Inlet and exhaust valves must not be machined. Only grinding-in is permitted.

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Dimension		Inlet valve	Exhaust valve
∅ a	mm	28.60 … 28.80	26.70 … 26.90
∅ b	mm	5.968 … 5.982	5.958 … 5.972
c	mm	97.25 … 97.45	97.35 … 97.55
α	∠°	45° 10'	45° 10'

WARNING

Care must be taken when disposing of old sodium-cooled exhaust valves - risk of injury.

- ***The valves must be sawn in two with a metal saw between the centre of the stem and valve head. When doing so, the valves must not come into contact with water.***
- ***Then throw a maximum of ten valves into a bucket of water and step away immediately.***
- ***A sudden chemical reaction will occur upon contact with water in which the sodium filling burns.***
- ***After performing these steps the valves can be disposed of in the normal way.***

4.11 Machining valve seats

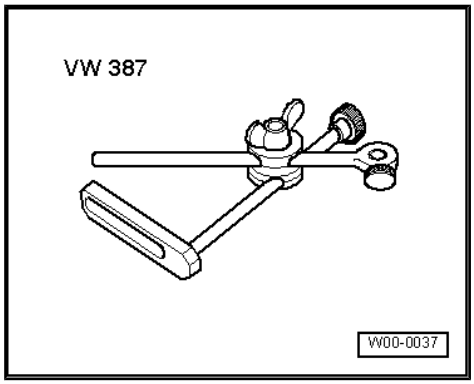
Note

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

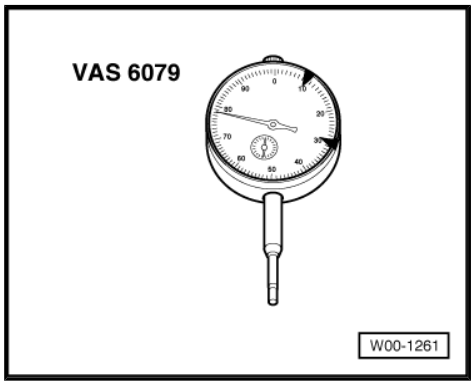
4.12 Checking valve guides

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 guide and exhaust valve into exhaust guide, as the stem diameters are different.*

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– Insert valve into guide.

• End of valve stem must be flush with valve guide.

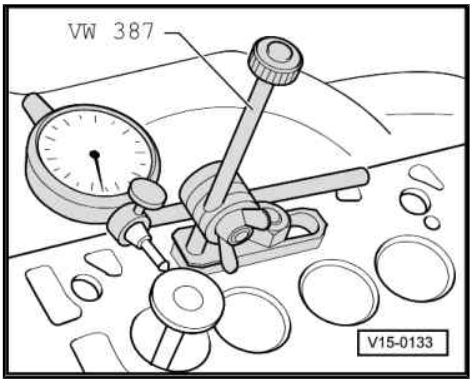
– Secure dial gauge - VAS 6079- to cylinder head with universal dial gauge bracket - VW 387- as shown in illustration.

– Measure the amount of sideways play.

• Wear limit: 1.0 mm.

– If the wear limit is exceeded, repeat the measurement with new valves.

– Renew cylinder head if wear limit is still exceeded.



Note

Valve guides cannot be renewed.

4.13 Checking valves

– Visually inspect for scoring on valve stems and valve seat surfaces.

– Renew valve if scoring is clearly visible.

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17 – Lubrication

1 Oil pump, sump (bottom section), sump (top section)

Overview

- ⇒ “1.1 Oil pump, sump (bottom section) - exploded view”, page 240
- ⇒ “1.2 Removing and installing oil level and oil temperature sender G266 ”, page 242
- ⇒ “1.3 Removing and installing sump (bottom section)”, page 243
- ⇒ “1.4 Removing and installing oil pump”, page 244

Caution

Risk of damage to catalytic converter.

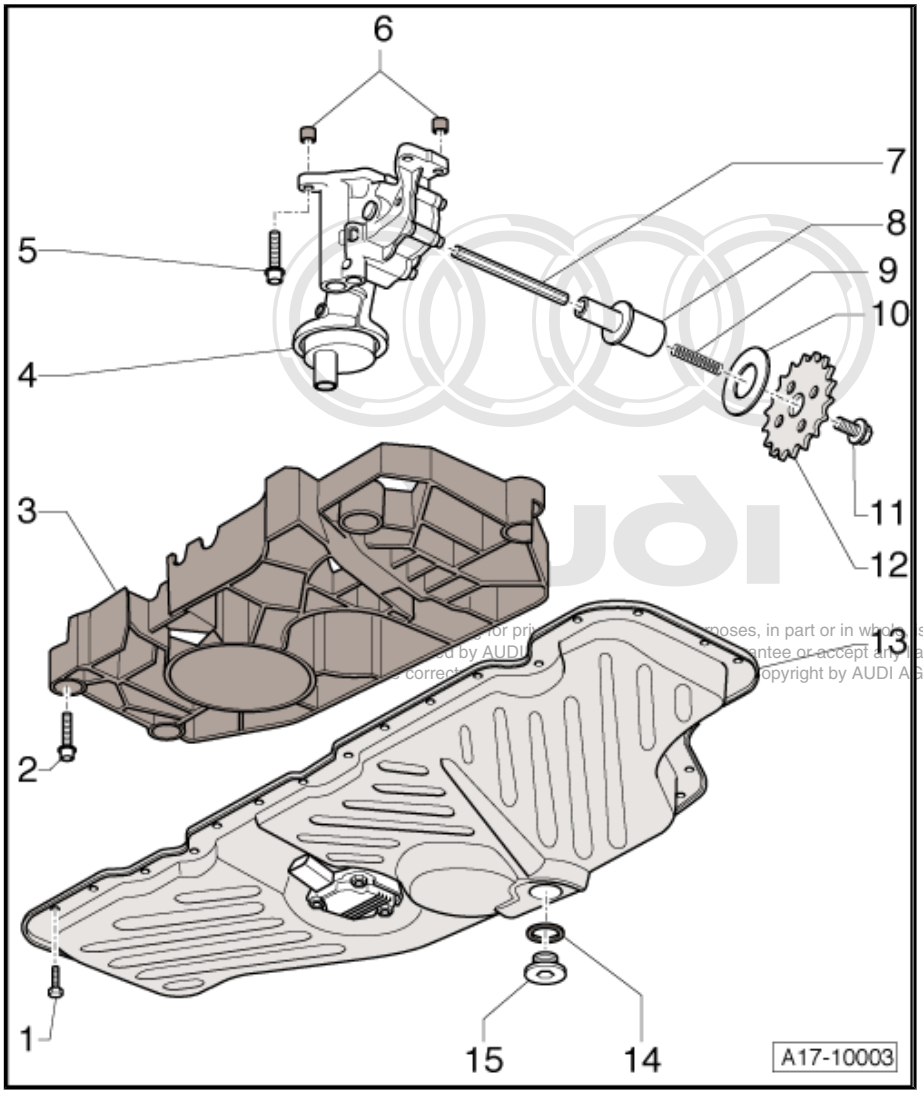
- ***The oil level must not be above the “MAX” mark on the dipstick.***

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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.*
- *Refer to ⇒ Maintenance tables for engine oil capacity, oil specifications and viscosity grades.*
- *Oil spray jet for piston cooling ⇒ page 145 .*

1.1 Oil pump, sump (bottom section) - exploded view



1 - Bolt

- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 242

2 - Bolt

- ❑ Renew
- ❑ 8 Nm + 90°

3 - Baffle plate

- ❑ Version fitted in vehicle may differ from illustration

4 - Oil pump

- ❑ Do not dismantle
- ❑ With pressure relief valve for cold condition (11 bar) and pressure control valve (3.5 bar)
- ❑ Removing and installing ⇒ page 244

5 - Bolt

- ❑ 23 Nm

6 - Dowel sleeves

7 - Oil pump drive shaft

8 - Coupling

9 - Compression spring

10 - Thrust washer

11 - Bolt

- ❑ To loosen, use pin wrench - 3212- to counterhold chain sprocket
- ❑ 60 Nm
- ❑ If bolt cannot be tightened to torque, remove sump (bottom section) with baffle plate and counterhold oil pump drive shaft using an open-end spanner.

12 - Chain sprocket for oil pump

- ❑ Installation position: Side with lettering faces engine

13 - Sump (bottom section)

- ❑ Removing and installing ⇒ page 243
- ❑ With oil level and oil temperature sender - G266-
- ❑ Removing and installing oil level and oil temperature sender - G266- ⇒ page 242

14 - Seal

- ❑ Renew

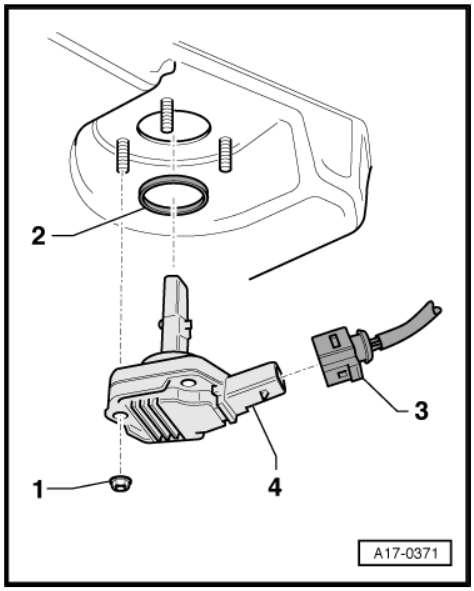
15 - Oil drain plug

- ❑ 30 Nm

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Oil level and oil temperature sender - G266- - tightening torque

– Tighten nuts -1- to 9 Nm.



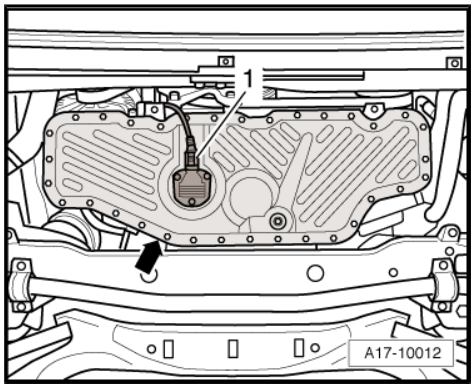
Sump (bottom section) - tightening torque and sequence

Note

Renew bolts securing sump (bottom section) -arrow-.

– Tighten bolts in 3 stages and in diagonal sequence as follows:

1. Initially tighten to 5 Nm.
2. Tighten to 8 Nm.
3. Turn 90° further.



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

Removing

– Drain off engine oil ⇒ Maintenance ; Booklet 405 .

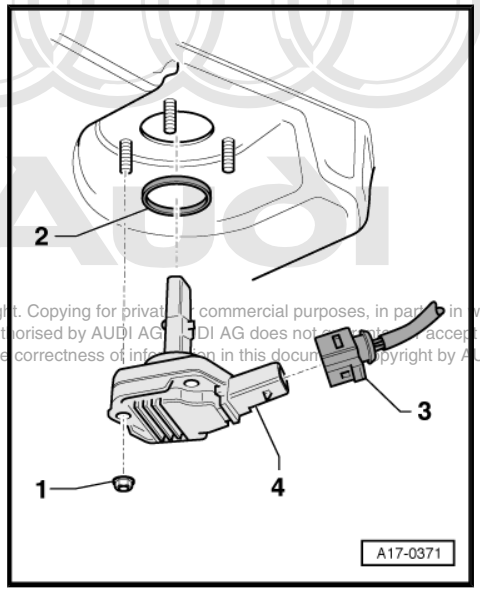
– Unplug electrical connector -3-.

– Remove nuts -1- and detach oil level and oil temperature sender - G266- -item 4-.

Installing

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

- Tightening torque
⇒ Fig. “ Oil level and oil temperature sender -G266- - tightening torque” , page 242



Note

Renew seal -2-.

– Fill with engine oil and check oil level ⇒ Maintenance ; Booklet 405 .

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1.3 Removing and installing sump (bottom section)

Special tools and workshop equipment required

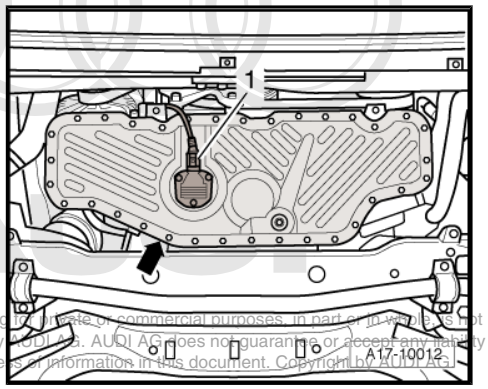
- Electric drill with plastic brush attachment
- Safety goggles
- Sealant ⇒ Electronic parts catalogue

Removing

– Drain off engine oil ⇒ Maintenance ; Booklet 405 .

– Unplug electrical connector at oil level and oil temperature sender - G266- -item 1-.

– Remove bolts and carefully release sump (bottom section) -arrow- from bonded joint.



Installing

• Tightening torque
⇒ Fig. ""Sump (bottom section) - tightening torque and sequence"" , page 242

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Caution

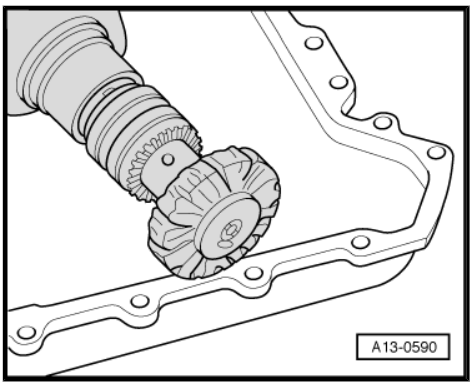
Protect lubrication system and bearings against contamination.

- *Cover exposed parts of the engine.*

WARNING

Risk of eye injury.

- *Wear safety goggles.*



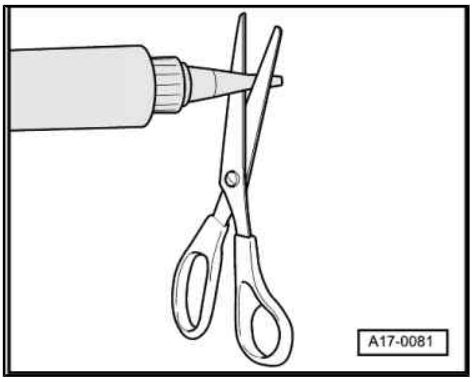
– Remove remaining sealant on bottom and top sections of sump with a rotating plastic brush or similar.

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

Note

Note the use-by date of the sealant.

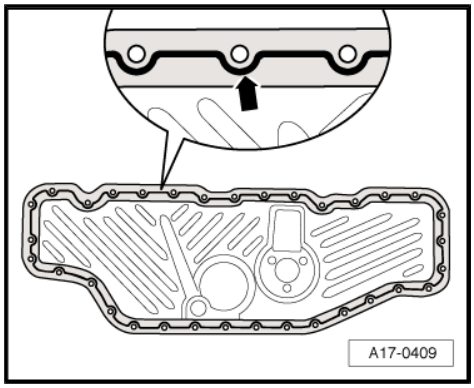
– Cut off nozzle of tube at front marking (nozzle ∅ approx. 1.5 mm).



Caution

Make sure lubrication system is not clogged by excess sealant.

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



– Apply bead of sealant -arrow- onto clean sealing surface of sump (bottom section) as shown in illustration.

• Width of sealant bead: 2 mm.

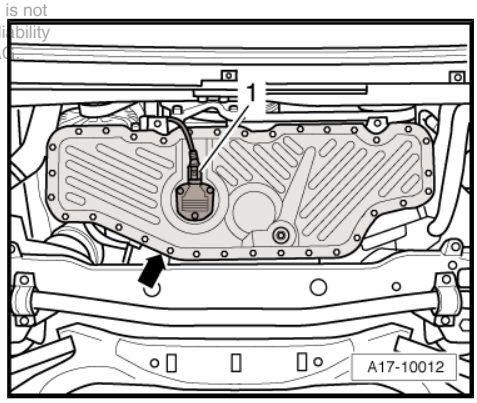
Note

The sump (bottom section) must be installed within 5 minutes after applying the sealant.

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– Fit sump (bottom section) and tighten bolts ⇒ page 242.

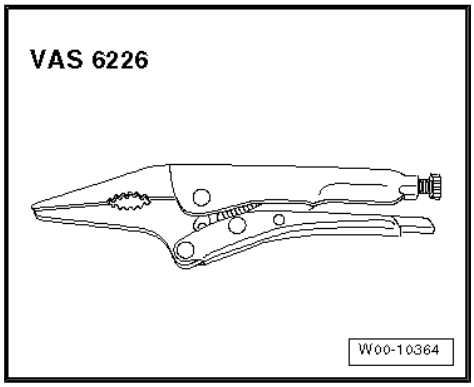
– Fill with engine oil and check oil level ⇒ Maintenance ; Booklet 405 .



1.4 Removing and installing oil pump

Special tools and workshop equipment required

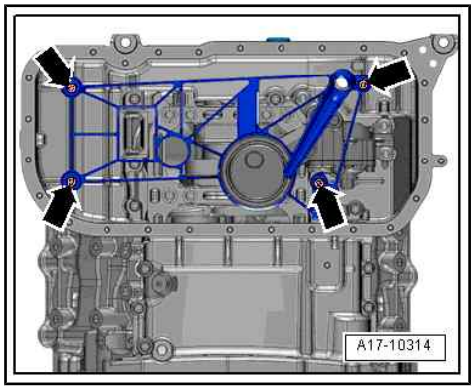
♦ Long-nose grip pliers - VAS 6226-



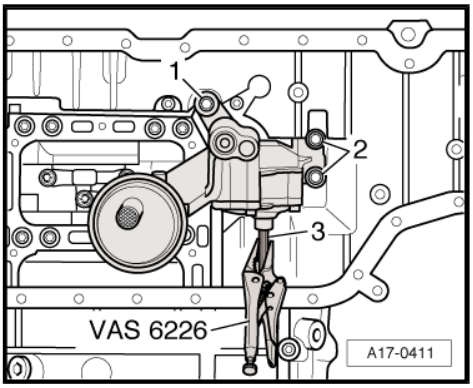
Removing

– Remove sump (bottom section) ⇒ page 243 .

– Remove bolts -arrows- and detach baffle plate.



– Remove bolts -1- and -2-.
– Hold oil pump drive shaft -3- firmly with long-nose grip pliers - VAS 6226- and push shaft back against spring pressure.
– Remove oil pump.



Note

Oil pump drive shaft remains in position.

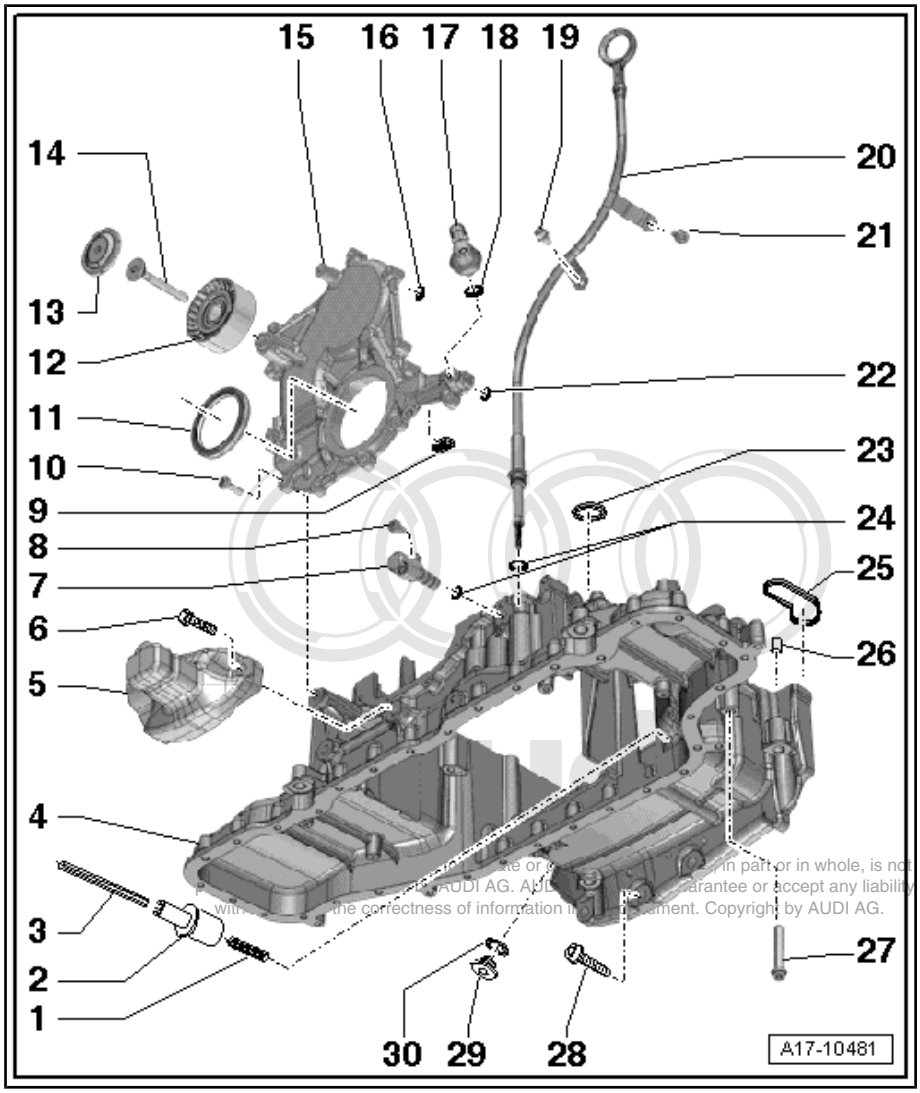
Installing

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

- Tightening torques
  ⇒ "1.1 Oil pump, sump (bottom section) - exploded view", page 240
– Check that the two dowel sleeves are fitted in oil pump; insert if necessary.
– Install sump (bottom section) ⇒ page 243 .
– Fill with engine oil and check oil level ⇒ Maintenance ; Booklet 405 .

1.5 Sump (top section) - exploded view

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1 - Compression spring

2 - Coupling

3 - Oil pump drive shaft

4 - Sump (top section)

- ❑ Removing and installing ⇒ page 248

5 - Torque reaction support

6 - Bolt

- ❑ Tightening torque ⇒ Item 2 (page 101)

7 - Valve for oil pressure control - N428-

- ❑ Removing and installing ⇒ page 247

8 - Bolt

- ❑ 9 Nm

9 - Sealing element

- ❑ 2x
- ❑ Renew

10 - Bolt

- ❑ Tightening torque and sequence ⇒ page 247

11 - Oil seal for crankshaft (pulley end)

- ❑ Renewing ⇒ page 123

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

- ❑ Note installation position

13 - Cover for idler roller

14 - Bolt

- ❑ Tightening torque ⇒ Item 12 (page 113)

15 - Sealing flange (pulley end)

- ❑ Removing and installing ⇒ page 124

16 - O-ring

- ❑ Renew

17 - Oil pressure switch - F22-

- ❑ Opening/closing pressure 2.0 ... 2.5 bar
- ❑ Green insulation
- ❑ Checking in “Guided Fault Finding” ⇒ Vehicle diagnostic tester
- ❑ Removing and installing ⇒ page 257
- ❑ 20 Nm

18 - Seal

- ❑ Renew

19 - Bolt

- ❑ 9 Nm

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20 - Guide tube for oil dipstick

21 - Bolt

- ❑ 9 Nm

22 - O-ring

- ❑ Renew

23 - Seal

- ❑ Renew

24 - O-rings

- ❑ Renew

25 - Seal

- ❑ Renew

26 - Dowel sleeve

- ❑ 2x

27 - Bolt

- ❑ Tightening torque and sequence ⇒ page 247

28 - Bolt

- ❑ Engine/gearbox connection

29 - Plug for “TDC” marking

- ❑ Use extended hexagon socket wrench with ball head to unscrew or tighten plug
- ❑ 35 Nm

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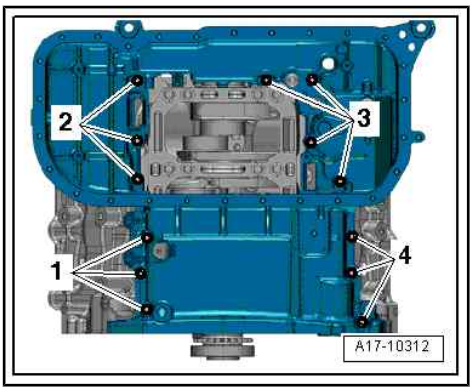
30 - Seal

- ❑ Renew

Sump (top section) - tightening torque and sequence

– Tighten bolts -1 ... 4- for sump (top section) in 2 stages and in diagonal sequence as follows:

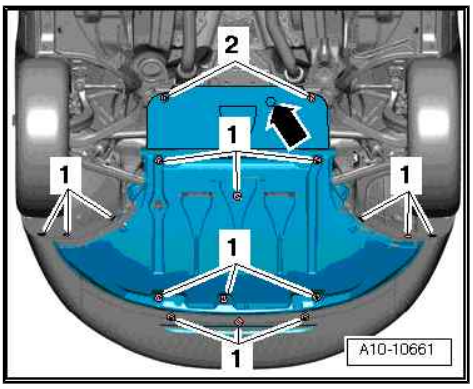
1. Initially tighten to 5 Nm.
2. Tighten to 15 Nm.



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

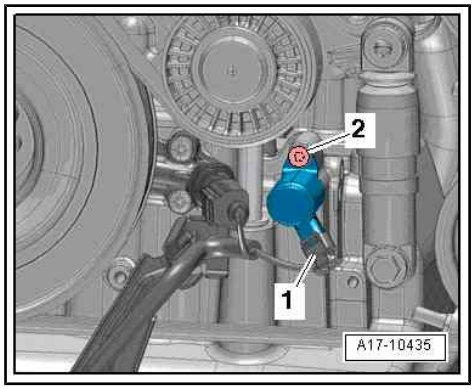
Removing

– Remove front and rear noise insulation ⇒ Rep. gr. 50 .



– Unplug electrical connector -1-.

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



Installing

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

- Tightening torque
  ⇒ “1.5 Sump (top section) - exploded view”, page 245

Note

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- ♦ *Fit new O-ring.*
- ♦ *Fit cable ties in the original positions when installing.*

– Install noise insulation panels ⇒ Rep. gr. 50 .

1.7 Removing and installing sump (top section)

Special tools and workshop equipment required

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

Removing

- Engine removed and secured to engine and gearbox support
  ⇒ page 99
- Engine oil drained ⇒ Maintenance ; Booklet 405

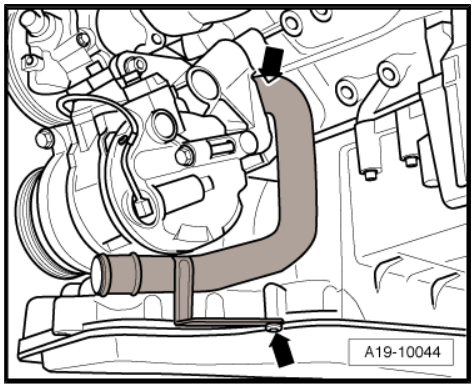
– Remove timing chain cover (bottom) ⇒ page 155 .

– Remove drive chain for auxiliary drives ⇒ page 180 .

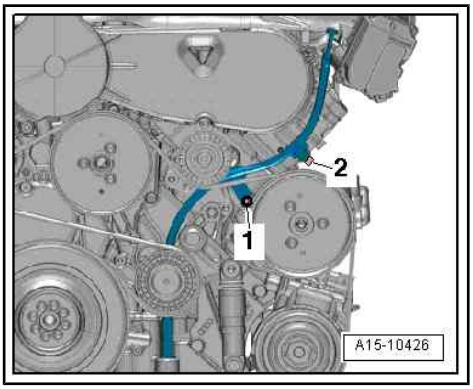
– Remove sealing flange (pulley end) ⇒ page 124 .

– Remove oil pump ⇒ page 244 .

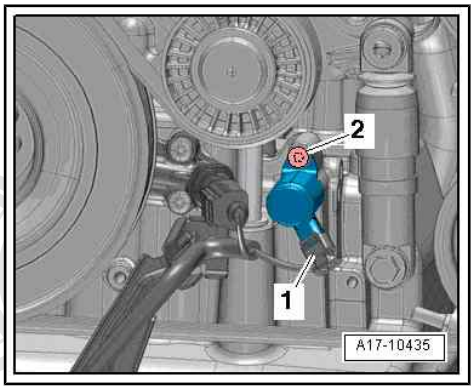
– Remove bolts -arrows- and detach coolant pipe (left-side).



– Remove bolts -1- and -2- and detach guide tube for oil dipstick.



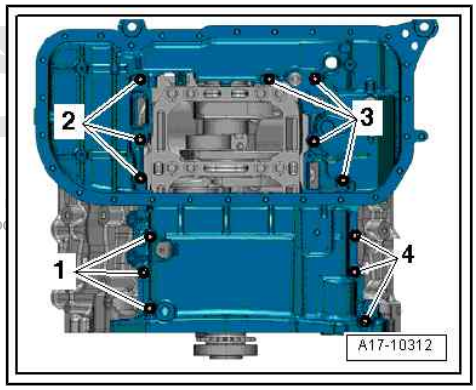
– Unplug electrical connector -1-.



Note

Disregard -item 2-.

– Remove bolts -1 ... 4- for sump (top section).
– Carefully release sump (top section) from bonded joint and pry sump off dowel pins on cylinder block.



Installing

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Note

Renew gaskets, seals and O-rings.

Caution

Protect lubrication system against contamination.

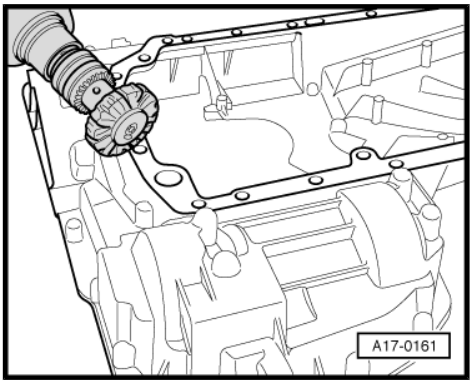
- ***Cover exposed parts of the engine.***

WARNING

Risk of eye injury.

- ***Wear safety goggles.***

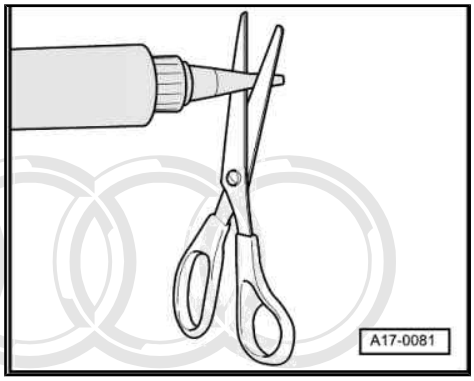
– Remove sealant residue from sump (top section) and cylinder block using rotating plastic brush or similar.
– Clean sealing surfaces; they must be free of oil and grease.



Note

Note the use-by date of the sealant.

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

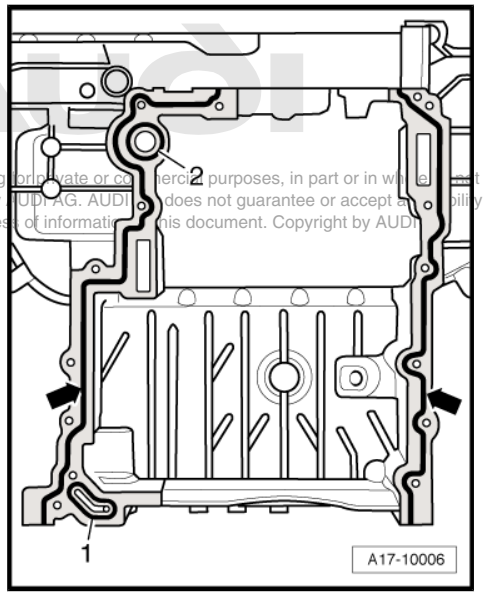


– Fit seals -1- and -2- in sump (top section).

Caution

Make sure lubrication system is not clogged by excess sealant.

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



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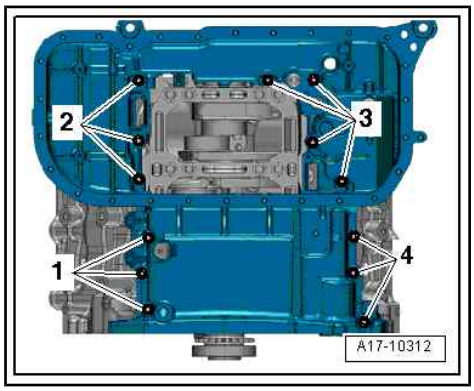
– Apply beads of sealant -arrows- onto clean sealing surface of sump (top section) as shown in illustration.

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

Note

The sump (top section) must be installed within 5 minutes after applying the sealant.

– Check that dowel pins are fitted, fit sump (top section) and tighten bolts ⇒ page 247 .



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

Note

Fit cable ties in the original positions when installing.

– Install dipstick guide tube ⇒ page 245 .
– Install coolant pipe (left-side) ⇒ page 285 .
– Install oil pump ⇒ page 244 .
– Install sealing flange (pulley end) ⇒ page 124 .
– Install drive chain for auxiliary drives ⇒ page 180 .
– Install timing chain cover (bottom) ⇒ page 155 .

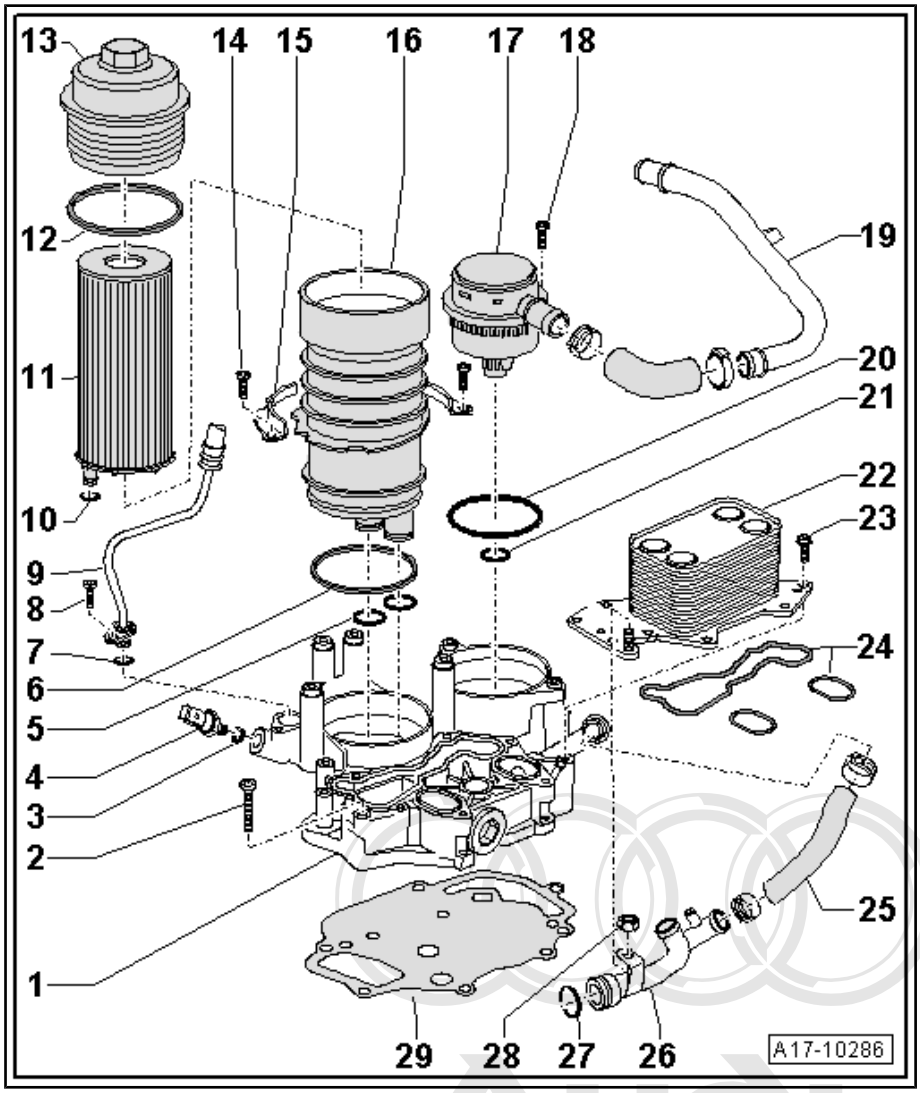
2 Engine oil cooler, oil filter housing, oil pressure switch

Overview

- ⇒ “2.1 Engine oil cooler, pressure control valve and oil filter housing - exploded view”, page 251
- ⇒ “2.2 Removing and installing engine oil cooler”, page 253
- ⇒ “2.3 Removing and installing oil filter housing”, page 254
- ⇒ “2.4 Removing and installing pressure control valve for crankcase breather system”, page 255
- ⇒ “2.5 Removing and installing mounting plate for engine oil cooler, pressure control valve for crankcase breather system and oil filter housing”, page 256
- ⇒ “2.6 Checking oil pressure switch F22 / oil pressure switch for reduced oil pressure F378 ”, page 256
- ⇒ “2.7 Removing and installing oil pressure switch F22 ”, page 257
- ⇒ “2.8 Removing and installing oil pressure switch for reduced oil pressure F378 ”, page 257
- ⇒ “2.9 Checking oil pressure”, page 258
- ⇒ “2.10 Engine oil”, page 259
- ⇒ “2.11 Checking oil level”, page 260

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2.1 Engine oil cooler, pressure control valve and oil filter housing - exploded view



1 - Mounting plate

- For engine oil cooler, pressure control valve for crankcase breather system, oil filter housing
- Removing and installing ⇒ page 256

2 - Bolt

- 9 Nm

3 - Seal

- Renew

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

- Opening/closing pressure 0.75 ... 1.05 bar
- Grey insulation
- Checking in “Guided Fault Finding” ⇒ Vehicle diagnostic tester
- Removing and installing ⇒ page 257
- 20 Nm

5 - O-rings

- Renew

6 - Seal

- Renew

7 - O-ring

- Renew

8 - Bolt

- 9 Nm

9 - Oil supply line

- To turbocharger

10 - O-ring

- Renew

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11 - Oil filter element

- Removing and installing ⇒ Maintenance ; Booklet 405

12 - Seal

- Renew

13 - Sealing cap

- 35 Nm

14 - Bolt

- 9 Nm

15 - Retaining clip

- For oil filter housing

16 - Oil filter housing

- Removing and installing ⇒ page 254
- With oil filter bypass valve, 2.0 … 3.0 bar (pressure differential upstream/downstream of filter)

17 - Pressure control valve for crankcase breather system

- Removing and installing ⇒ page 255

18 - Bolt
- ❑ 9 Nm

19 - Crankcase breather pipe

20 - O-ring
- ❑ Renew

21 - O-ring
- ❑ Renew

22 - Engine oil cooler
- ❑ See note ⇒ page 240
- ❑ Removing and installing ⇒ page 253
- ❑ With oil cooler bypass valve, 2.0 … 3.0 bar (pressure differential upstream/downstream of engine oil cooler)

23 - Bolt
- ❑ 9 Nm

24 - Gaskets
- ❑ Renew

25 - Coolant hose

26 - Coolant pipe (top)
- ❑ Removing and installing ⇒ page 293

27 - O-ring
- ❑ Renew

28 - Nut
- ❑ Tightening torque ⇒ Item 25 (page 283)

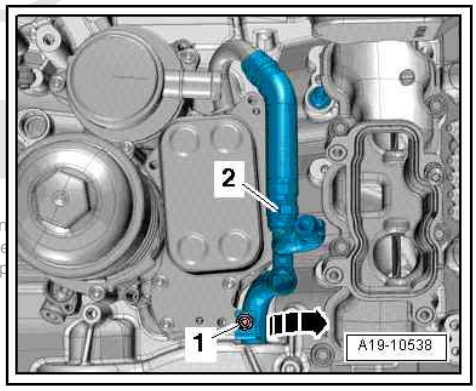
29 - Gasket
- ❑ Renew

2.2 Removing and installing engine oil cooler

Removing

– Remove exhaust gas recirculation cooler ⇒ page 376 .

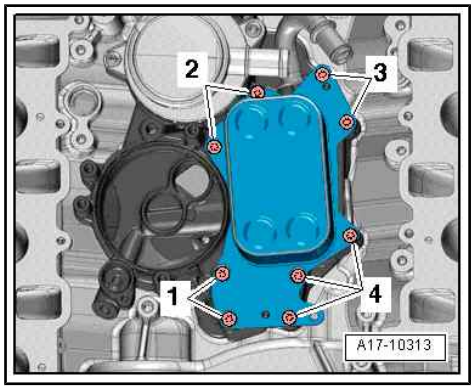
– Remove nut -1- and turn coolant pipe (top) slightly in direction of -arrow-.



Note

Disregard -item 2-.

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Note

Spread out rags round engine oil cooler to catch escaping engine oil.

– Unscrew bolts -1 ... 4- and detach engine oil cooler.

Note

For illustration purposes, the installation position is shown with the coolant pipe (top) removed.

Installing

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

- Tightening torque
  ⇒ "2.1 Engine oil cooler, pressure control valve and oil filter housing - exploded view", page 251

Note

To ensure top coolant pipe is free of leaks, remove top coolant pipe and renew O-ring ⇒ page 293 .

– Install coolant pipe (top) ⇒ page 293 .
– Install exhaust gas recirculation cooler ⇒ page 376 .
– Change engine oil ⇒ Maintenance ; Booklet 405 .

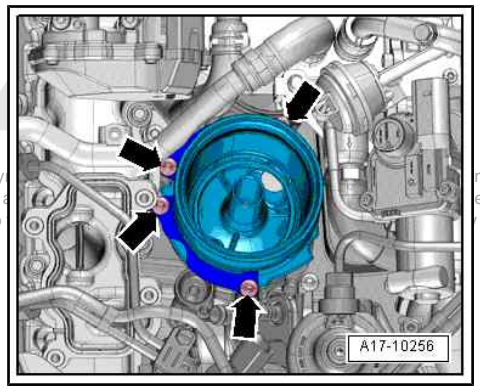
2.3 Removing and installing oil filter housing

Special tools and workshop equipment required

♦ Magnetic fitting tool

Removing

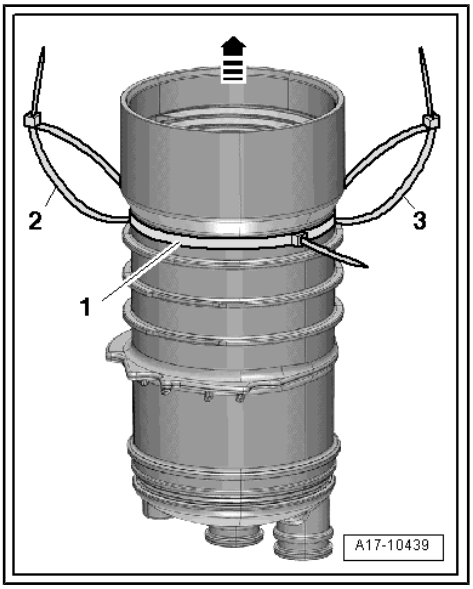
– Remove exhaust gas recirculation control motor - V338- ⇒ page 375 .
– Remove oil filter element ⇒ Maintenance ; Booklet 405 .
– Remove bolts -arrows- and use magnetic fitting tool to detach retaining clip.



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– Tie two cable ties -2- and -3- into loops and secure them in upper groove on oil filter housing with a third cable tie -1-.

– Lift off oil filter housing with cable ties -arrow-.



Installing

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

- Tightening torque
  ⇒ "2.1 Engine oil cooler, pressure control valve and oil filter housing - exploded view", page 251

Note

- *Renew gaskets, seals and O-rings.*
- *Use magnetic fitting tool to fit retaining clip for oil filter housing and bolts.*

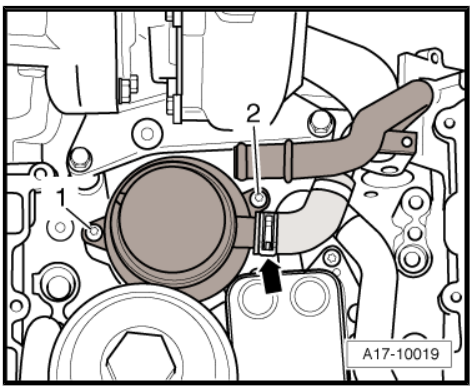
– Install exhaust gas recirculation control motor - V338- ⇒ page 375 .

– Install oil filter element ⇒ Maintenance ; Booklet 405 .

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2.4 Removing and installing pressure control valve for crankcase breather system

Removing



– Remove exhaust gas recirculation cooler ⇒ page 376 .

– Open hose clip -arrow- and detach hose from pressure control valve for crankcase breather system.

– Unscrew bolts -1- and -2- and remove pressure control valve for crankcase breather system.

Installing

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

- Tightening torque
  ⇒ "2.1 Engine oil cooler, pressure control valve and oil filter housing - exploded view", page 251

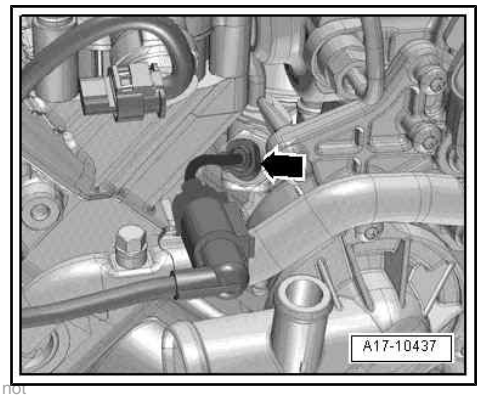
Note

- *Fit new O-rings.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

– Install exhaust gas recirculation cooler ⇒ page 376 .

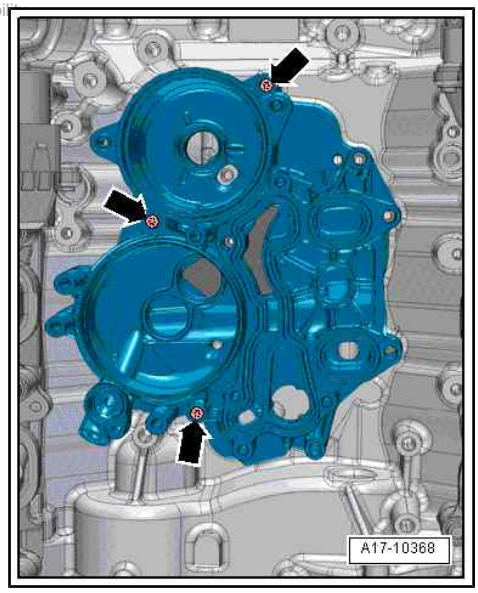
2.5 Removing and installing mounting plate for engine oil cooler, pressure control valve for crankcase breather system and oil filter housing

Removing



– Remove coolant pipe (top) ⇒ page 293 .
– Remove pressure control valve for crankcase breather system ⇒ page 255 .
– Unplug electrical connector -arrow- at oil pressure switch for reduced oil pressure - F378- .

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– Remove bolts -arrows-.
– Remove mounting plate for engine oil cooler, pressure control valve for crankcase breather system and oil filter housing.

Installing

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

- Tightening torque ⇒ “2.1 Engine oil cooler, pressure control valve and oil filter housing - exploded view”, page 251

Note

Renew gaskets, seals and O-rings.

– Tighten securing bolts for mounting plate, working from inside to outside.
– Install pressure control valve for crankcase breather system ⇒ page 255 .
– Install coolant pipe (top) ⇒ page 293 .
– Change engine oil ⇒ Maintenance ; Booklet 405 .

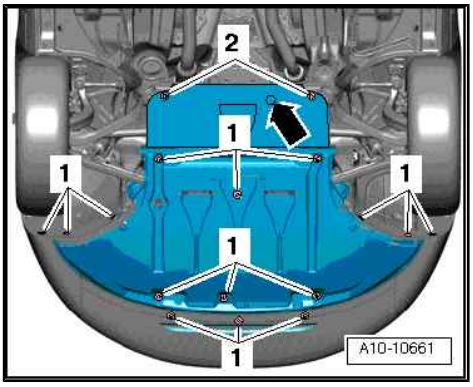
2.6 Checking oil pressure switch - F22- / oil pressure switch for reduced oil pressure - F378-

Checking oil pressure switch - F22- / oil pressure switch for reduced oil pressure - F378- in “Guided Fault Finding” ⇒ Vehicle diagnostic tester.

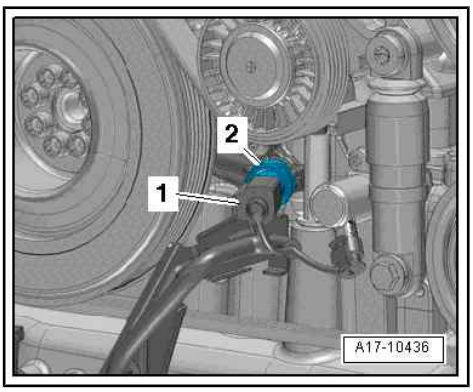
2.7 Removing and installing oil pressure switch - F22-

Removing

– Remove front and rear noise insulation ⇒ Rep. gr. 50 .



– Unplug electrical connector -1-.



Note

Place a cloth underneath to catch escaping engine oil.

– Remove oil pressure switch - F22- -item 2-.

Installing

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

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- Tightening torque
⇒ "1.5 Sump (top section) - exploded view", page 245

Note

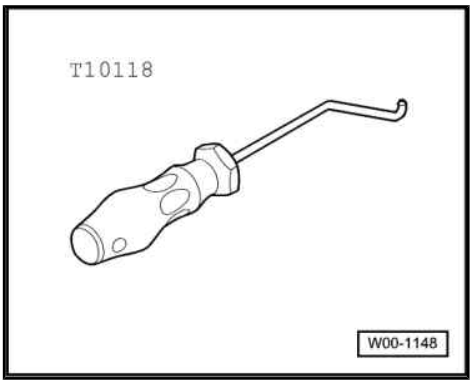
- *Renew seal.*
- *Fit cable ties in the original positions when installing.*

– Install noise insulation panels ⇒ Rep. gr. 50 .

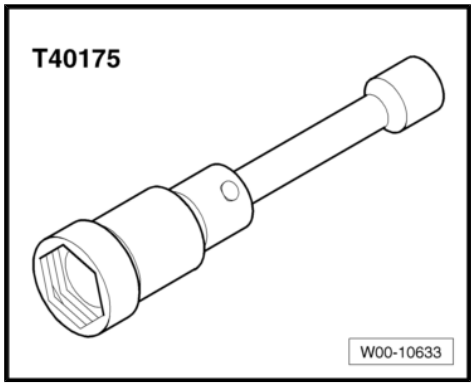
2.8 Removing and installing oil pressure switch for reduced oil pressure - F378-

Special tools and workshop equipment required

- Assembly tool - T10118-



♦ Articulated wrench, 24 mm - T40175-

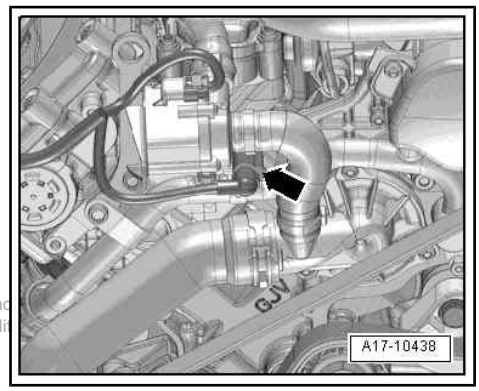


Removing

– Remove pump for exhaust gas recirculation cooler - V400- ⇒ page 279 .

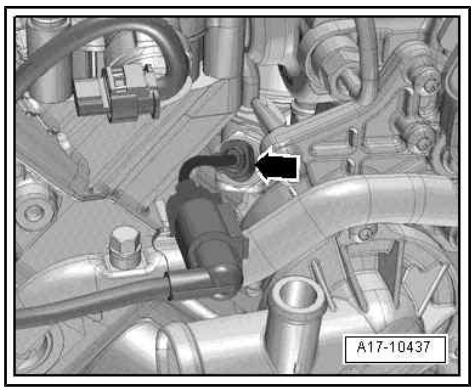
– Take electrical connector -arrow- for oil pressure switch for reduced oil pressure - F378- out of bracket.

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– Use assembly tool - T10118- to unplug electrical connector -arrow-.

– Use articulated wrench, 24 mm - T40175- to remove oil pressure switch for reduced oil pressure - F378- .



Installing

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

- Tightening torque
⇒ “2.1 Engine oil cooler, pressure control valve and oil filter housing - exploded view”, page 251

Note

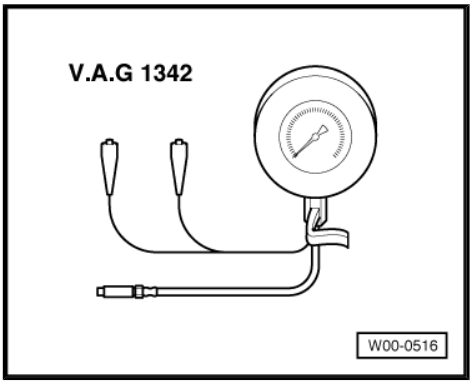
Renew seal.

– Install pump for exhaust gas recirculation cooler - V400- ⇒ page 279 .

2.9 Checking oil pressure

Special tools and workshop equipment required

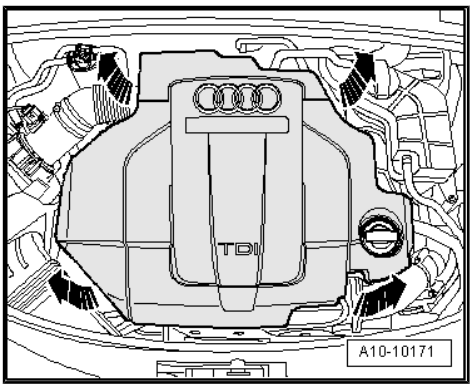
♦ Oil pressure tester - V.A.G 1342- with adapter -V.A.G 1342/21-



Procedure

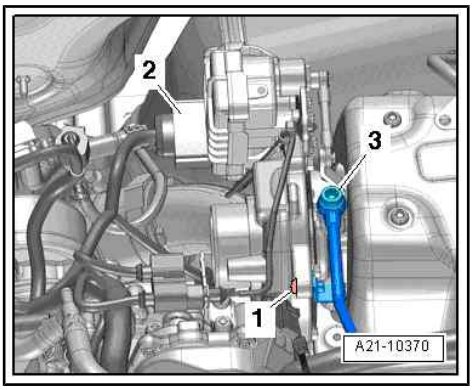
- Oil level OK
- Engine oil temperature approx. 80 °C

– Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



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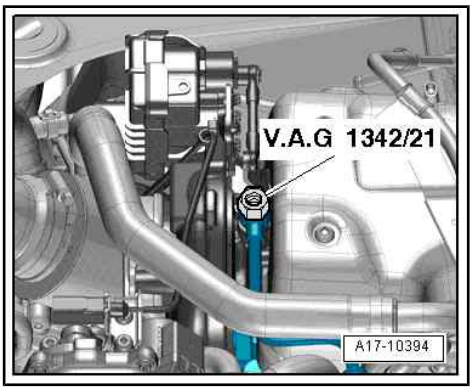
– Remove bolt -1- and banjo bolt -3- for oil supply line at turbocharger.



Note

Disregard -item 2-.

– Fit adapter -V.A.G 1342/21- with new seals to turbocharger as shown in illustration.



– Connect oil pressure tester - V.A.G 1342- to -V.A.G 1342/21- .
– Screw a used oil pressure switch into threaded hole on oil pressure tester - V.A.G 1342- to seal hole.
– Start engine.
- Minimum oil pressure at idling speed: 0.8 bar.
- Minimum oil pressure at 2000 rpm: 1.5 bar.

Assembling

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

– Remove adapter -V.A.G 1342/21- and install oil supply line for turbocharger ⇒ page 303 .

2.10 Engine oil

Refer to ⇒ Maintenance tables for engine oil capacity, oil specifications and viscosity grades.

2.11 Checking oil level

Check oil level ⇒ Maintenance ; Booklet 405 .

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19 – Cooling

1 Cooling system

Overview

- ⇒ “1.1 Connection diagram - coolant hoses”, page 261
- ⇒ “1.2 Draining and filling cooling system”, page 265
- ⇒ “1.3 Checking cooling system for leaks”, page 271

WARNING

Hot steam/hot coolant can escape - risk of scalding.

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

Note

- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *The arrow markings on coolant pipes and on ends of hoses must align.*

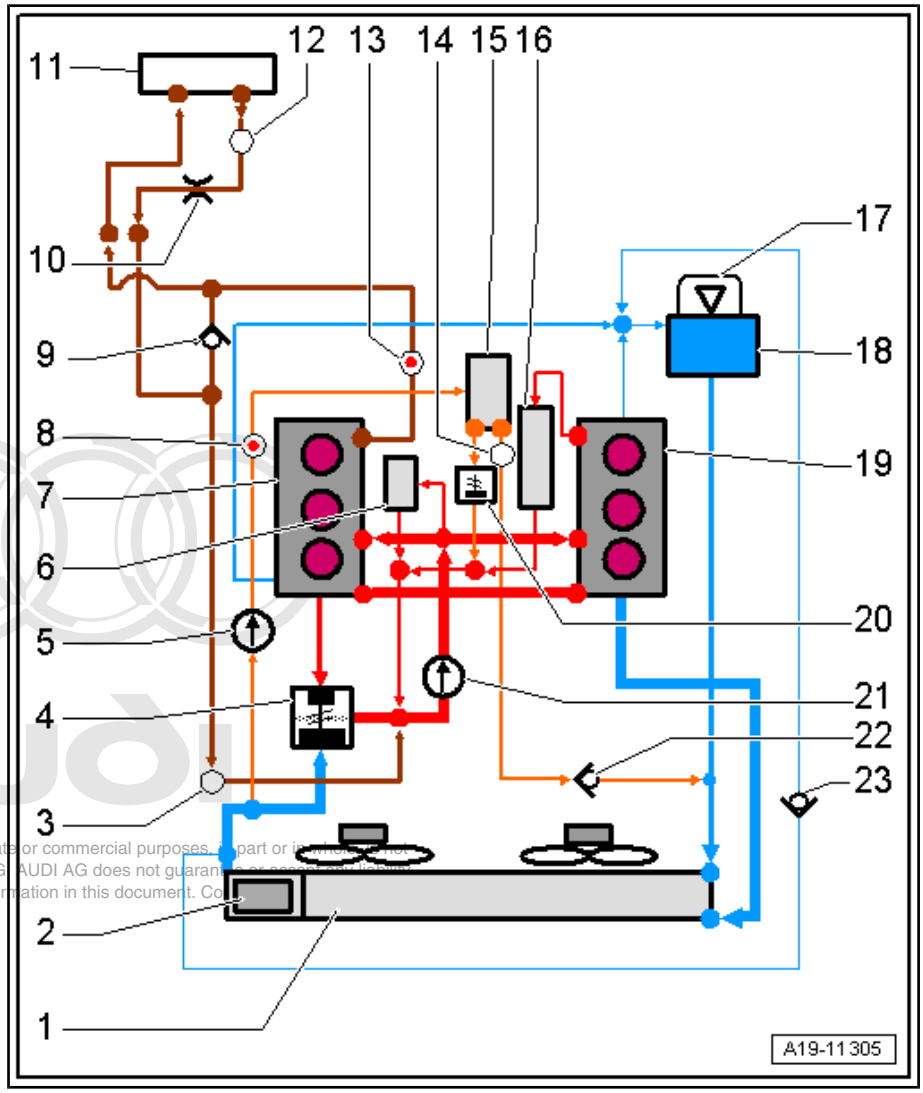
1.1 Connection diagram - coolant hoses

Vehicles without auxiliary heater

Note

- *Blue = Large coolant circuit.*
- *Red = Small coolant circuit.*
- *Orange = Coolant circuit for exhaust gas recirculation.*
- *Brown = Heating circuit.*

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1 - Radiator

- ❑ If renewed, refill system with fresh coolant

2 - ATF cooler

- ❑ Integrated into radiator
- ❑ On vehicles with multi-tronic or automatic gear-box

3 - Bleeder screw

4 - Thermostat

5 - Pump for exhaust gas re-circulation cooler - V400-

6 - Engine oil cooler

7 - Cylinder head, bank 1 (right-side)

- ❑ If renewed, refill system with fresh coolant

8 - Radiator outlet coolant temperature sender - G83-

9 - Non-return valve

- ❑ Arrow indicates direction of flow

10 - Restrictor

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11 - Heat exchanger for heater

- ❑ With pump-valve unit ⇒ Rep. gr. 87
- ❑ Removing and installing ⇒ Rep. gr. 87
- ❑ If renewed, refill system with fresh coolant

12 - Bleeder hole

13 - Coolant temperature sender - G62-

14 - Bleeder screw

15 - Exhaust gas recirculation cooler

- ❑ Removing and installing ⇒ page 376
- ❑ If renewed, refill system with fresh coolant

16 - Changeover flap for exhaust gas recirculation

17 - Filler cap for expansion tank

- ❑ Checking pressure relief valve ⇒ page 273

18 - Coolant expansion tank

19 - Cylinder head, bank 2 (left-side)

- ❑ If renewed, refill system with fresh coolant

20 - Thermostat housing for exhaust gas recirculation

- ❑ With control motor for exhaust gas recirculation

21 - Coolant pump

22 - Non-return valve

- ❑ Arrow indicates direction of flow

23 - Non-return valve

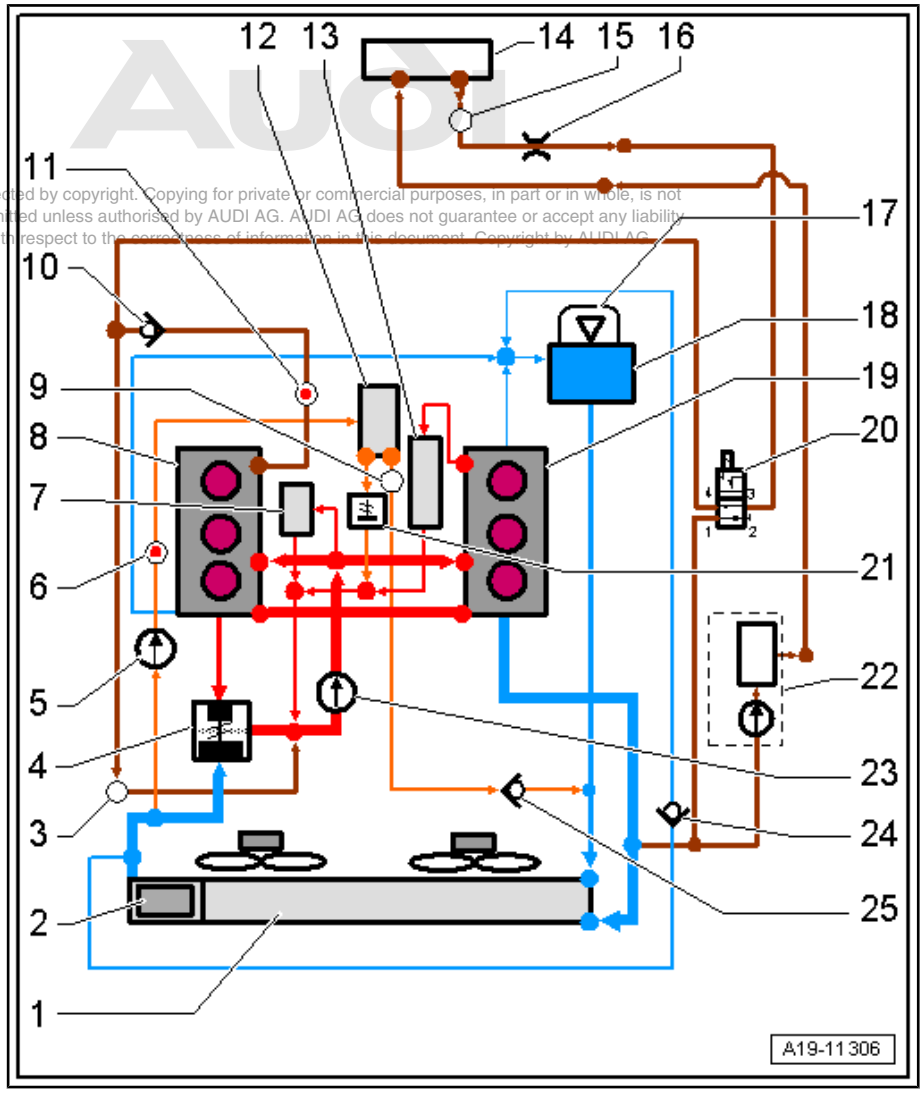
- ❑ Arrow indicates direction of flow

Vehicles with auxiliary heater

Note

- ♦ *Blue = Large coolant circuit.*
- ♦ *Red = Small coolant circuit.*
- ♦ *Orange = Coolant circuit for exhaust gas recirculation.*
- ♦ *Brown = Heating circuit.*

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1 - Radiator

- ❑ If renewed, refill system with fresh coolant

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- ❑ Integrated into radiator
- ❑ On vehicles with multi-tronic or automatic gear-box

3 - Bleeder screw

4 - Thermostat

5 - Pump for exhaust gas re-circulation cooler - V400-

6 - Radiator outlet coolant tem-perature sender - G83-

7 - Engine oil cooler

8 - Cylinder head, bank 1 (right-side)

- ❑ If renewed, refill system with fresh coolant

9 - Bleeder screw

10 - Non-return valve

- ❑ Arrow indicates direc-tion of flow

11 - Coolant temperature sender - G62-

12 - Exhaust gas recirculation cooler

- ❑ Removing and installing ⇒ page 376
- ❑ If renewed, refill system with fresh coolant

13 - Changeover flap for exhaust gas recirculation

14 - Heat exchanger for heater

- ❑ With pump-valve unit ⇒ Rep. gr. 87
- ❑ Removing and installing ⇒ Rep. gr. 87
- ❑ If renewed, refill system with fresh coolant

15 - Bleeder hole

16 - Restrictor

17 - Filler cap for expansion tank

- ❑ Checking pressure relief valve in filler cap ⇒ page 273

18 - Coolant expansion tank

19 - Cylinder head, bank 2 (left-side)

- ❑ If renewed, refill system with fresh coolant

20 - Heater coolant shut-off valve - N279-

- ❑ Removing and installing ⇒ Rep. gr. 87

21 - Thermostat housing for exhaust gas recirculation

- ❑ With control motor for exhaust gas recirculation

22 - Auxiliary heater

23 - Coolant pump

24 - Non-return valve

- ❑ Arrow indicates direction of flow

25 - Non-return valve

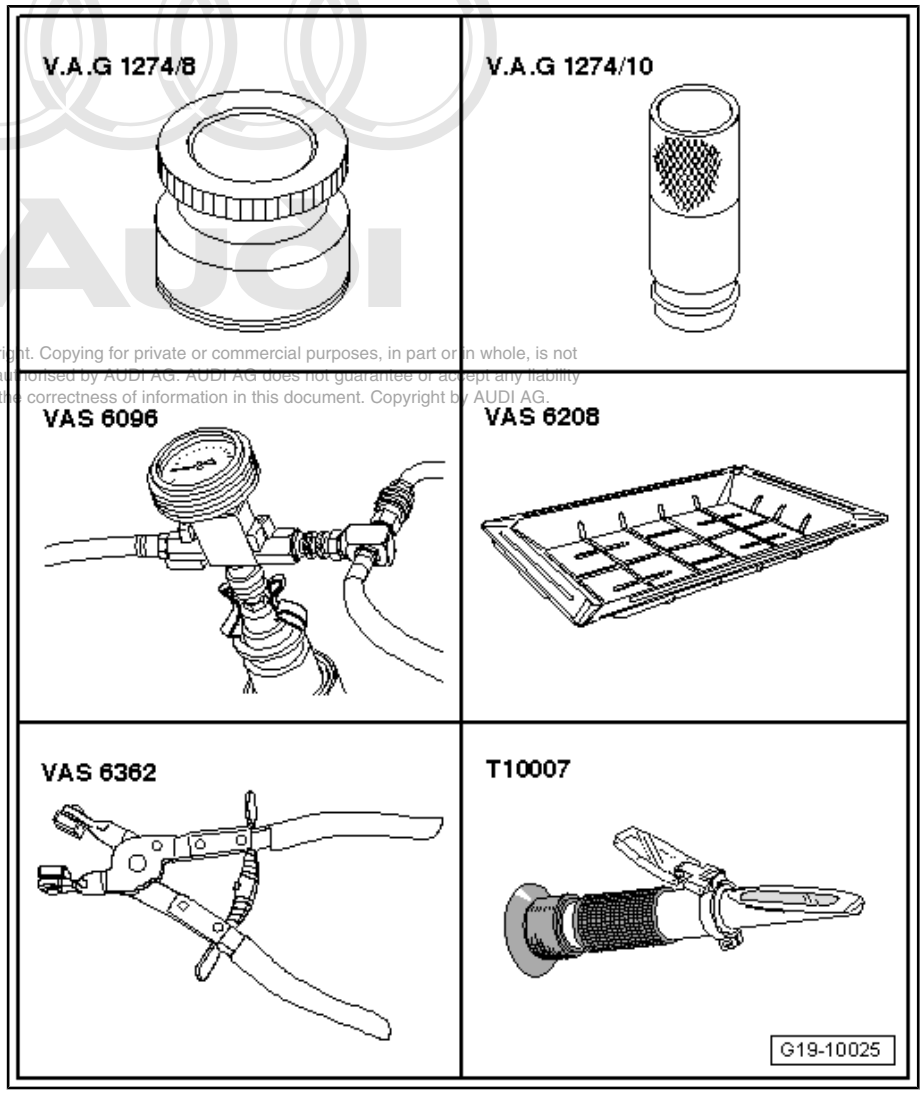
- ❑ Arrow indicates direction of flow

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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-



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Draining

Note

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

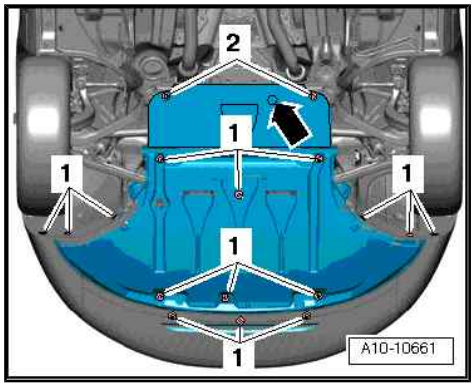
WARNING

Hot steam/hot coolant can escape - risk of scalding.

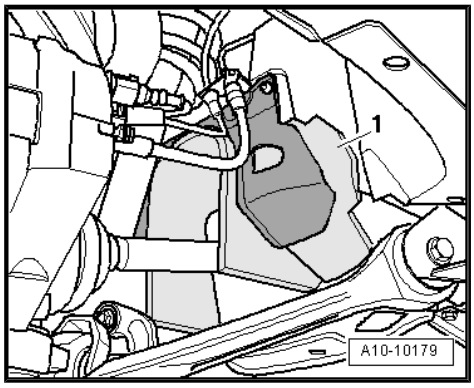
- ***The cooling system is under pressure when the engine is hot.***
- ***To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.***

– Open filler cap on coolant expansion tank.

– Remove front and rear noise insulation ⇒ Rep. gr. 50 .



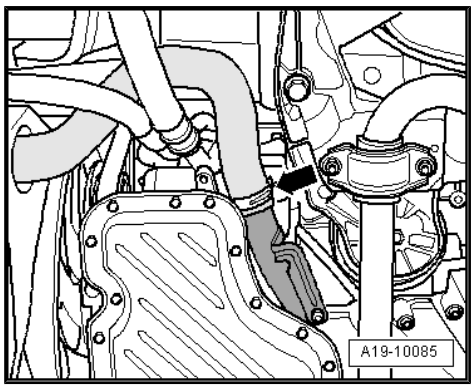
– Remove cover -1- for drive shaft in wheel housing (right-side).



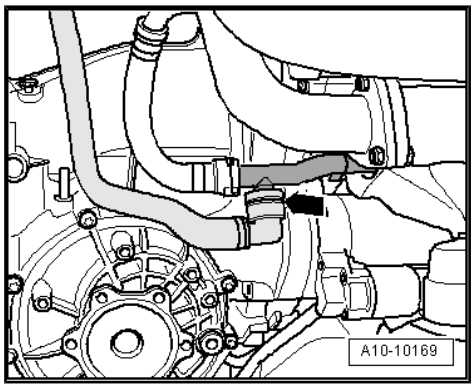
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– Place drip tray for workshop hoist - VAS 6208- beneath engine.

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

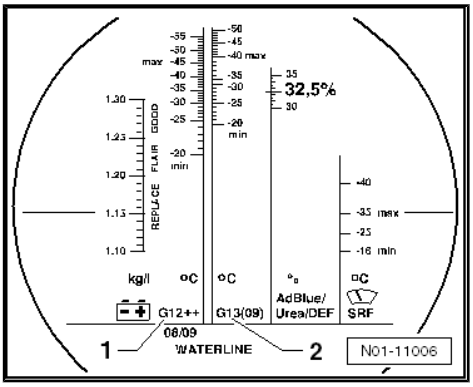


– Lift retaining clip -arrow- to disconnect coolant hose from coolant pipe (right-side) and drain off remaining coolant.



Filling

- Ignition off.
- Tightening torque
  ⇒ “3.1 Coolant pipes - exploded view”, page 281



Note

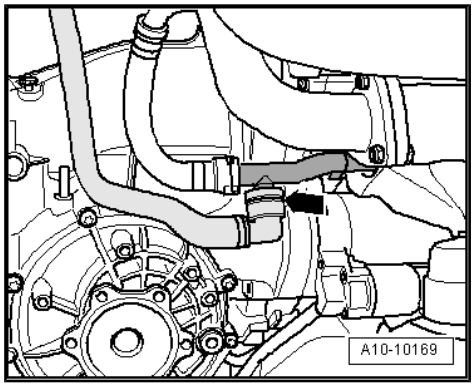
- *The effectiveness of the coolant is greatly influenced by the quality of the water with which it is mixed. Because water may contain different substances depending on the country or even the region, the water quality to be used for cooling systems has been specified. Distilled water meets all the 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.*

Recommended mixture ratio for coolant

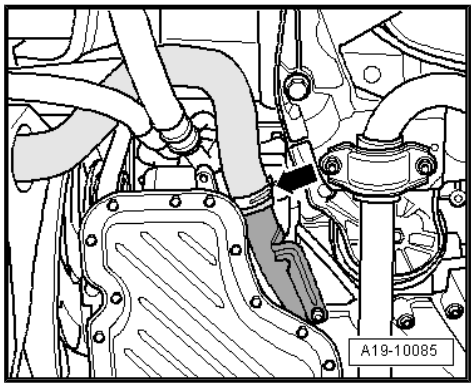
- Coolant (40 %) and water (60 %) for frost protection to –25 ° C
- Coolant (50 %) and water (50 %) for frost protection to -36 °C
- Coolant ⇒ Electronic parts catalogue

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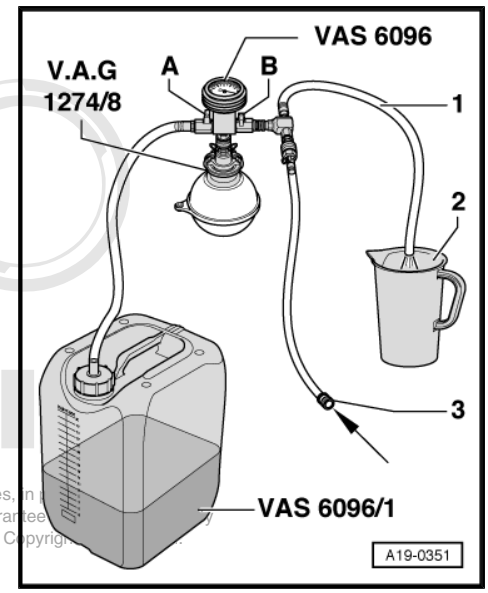
– Connect coolant hose with plug-in connector to coolant pipe (right-side) ⇒ page 295 .



– Connect coolant hose -arrow- to coolant pipe (left-side).



– Fill reservoir of cooling system charge unit -VAS 6096- with at least 12 litres of premixed coolant (according to recommended ratio):
– Fit adapter for cooling system tester - V.A.G 1274/8- onto coolant expansion tank.
– Attach cooling system charge unit - VAS 6096- to adapter - V.A.G 1274/8- .
– Run vent hose -1- into a small container -2-.



Note

The vented air draws along a small amount of coolant, which should be collected.

– Close both valves -A- and -B- (turn lever at right angles to direction of flow).
– Connect hose -3- to compressed air.
• Pressure: 6 ... 10 bar.

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– Open valve -B- by setting lever in direction of flow.

• The suction jet pump generates a partial vacuum in the cooling system; the needle on the gauge should move into the green zone.

– Also briefly open valve -A- (turn lever in direction of flow) so that hose on reservoir of -VAS 6096- can fill with coolant.

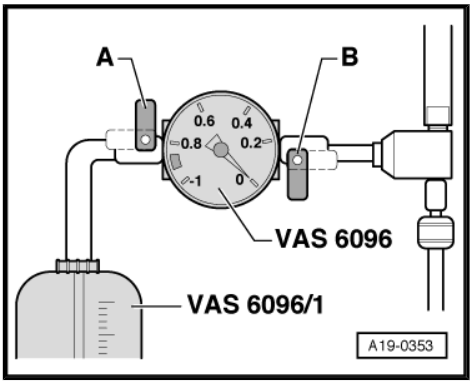
– Close valve -A- again.

– Leave valve -B- open for another 2 minutes.

• The suction jet pump continues to generate a partial vacuum in the cooling system; the needle on the gauge should remain in the green zone.

– Close valve -B-.

• The needle on the gauge should stop in the green zone. The vacuum level in the cooling system is then sufficient for subsequent filling.



Note

♦ *If the needle does not reach the green zone, repeat the process.*

♦ *Check cooling system for leaks if the vacuum is not maintained.*

– Detach compressed air hose.

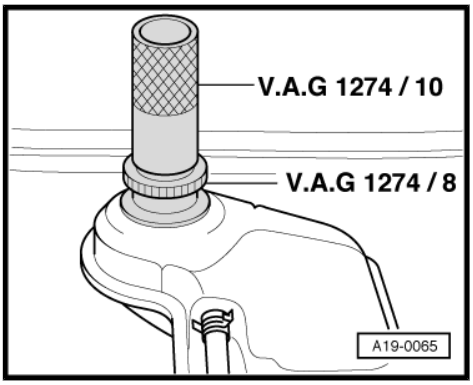
– Open valve -A-.

• The vacuum in the cooling system causes the coolant to be drawn out of the reservoir of -VAS 6096- ; the cooling system is then filled.

– Detach cooling system charge unit - VAS 6096- from adapter -V.A.G 1274/8- on coolant expansion tank.

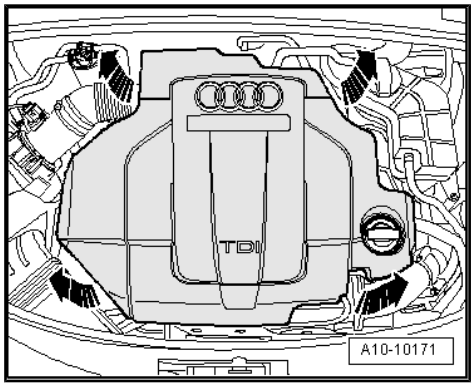
– Attach pipe -V.A.G 1274/10- onto adapter -V.A.G 1274/8- .

– Attach pipe -V.A.G 1274/10- onto adapter -V.A.G 1274/8- .

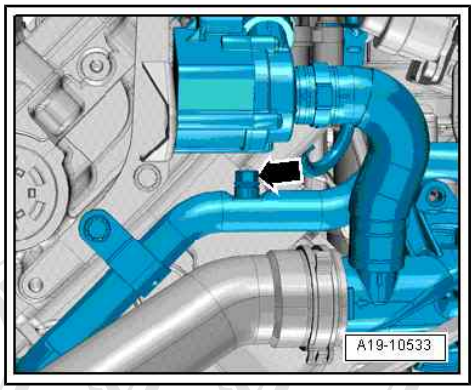


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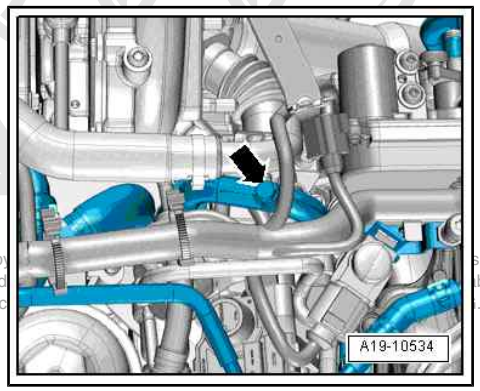
– Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



– Open bleeder screw -arrow- at coolant pipe (front) until coolant flows out.
– Close bleeder screw.

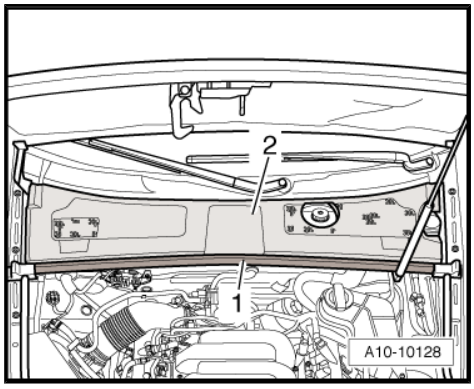


– Open bleeder screw -arrow- at coolant pipe (rear) until coolant flows out.
– Close bleeder screw.

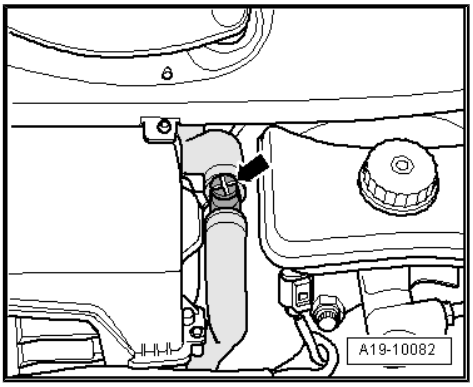


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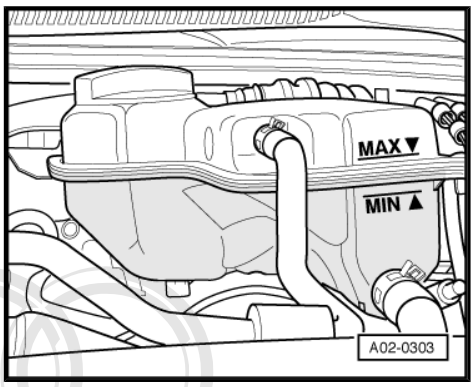
– Pull off seal -1- and remove plenum chamber cover -2-.



– Open bleeder screw -arrow- until coolant flows out at bleeder hole in coolant hose.
– Close bleeder screw.
– On vehicles with auxiliary heater, switch heater on (for about 30 seconds) and then off again.
– Close filler cap on coolant expansion tank (make sure it engages).
– Start engine.
– Set temperature to “HI” for all zones and select lowest possible blower speed (= 0).
– Switch off air conditioner compressor (press AC button).
• LED in button should not light up.
– Run engine for 3 minutes at 2000 rpm.
– Allow engine to run at idling speed until both large coolant hoses at radiator become warm.
– Run engine for 1 minute at 2000 rpm.
– Switch off ignition and allow engine to cool down.
– Install cover for drive shaft ⇒ Rep. gr. 66 .
– Install noise insulation panels ⇒ Rep. gr. 50 .



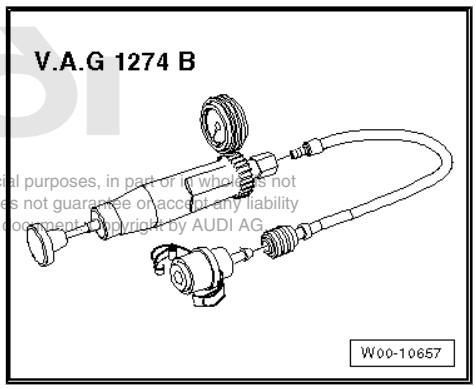
– Check coolant level.
• The coolant level must be at the “MAX” marking when the engine is cold.
• The coolant level can be above the “MAX” marking when the engine is warm.



1.3 Checking cooling system for leaks

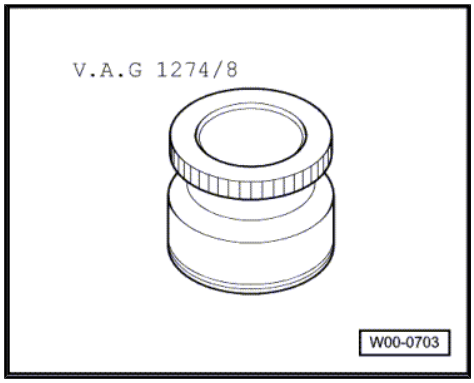
Special tools and workshop equipment required

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

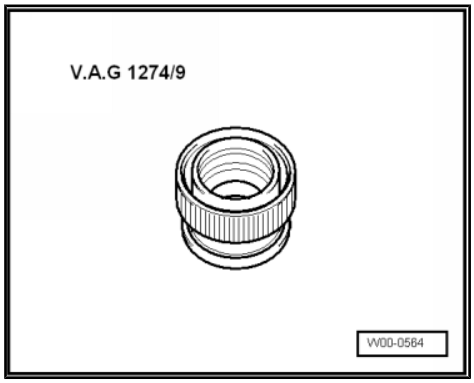


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♦ Adapter for cooling system tester - V.A.G 1274/8-



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



Procedure

- Engine must be warm.

WARNING

Hot steam/hot coolant can escape - risk of scalding.

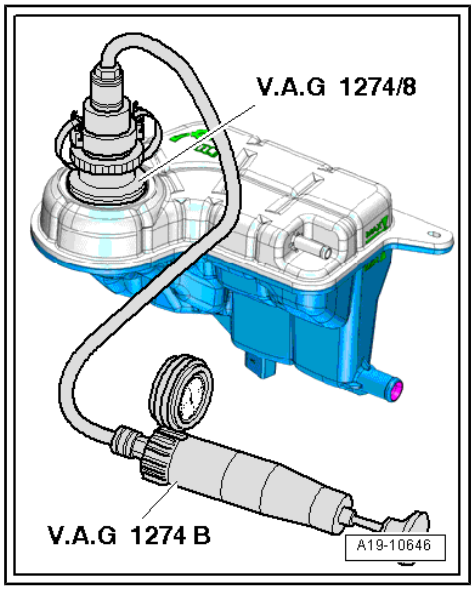
- *The cooling system is under pressure when the engine is hot.*
- *To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.*

– Open filler cap on coolant expansion tank.

– 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. 1.0 bar.

– If this pressure is not maintained, locate and rectify leaks.



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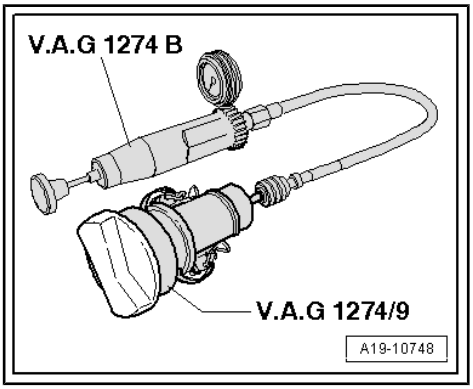
Checking pressure relief valve in filler cap

– 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.



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2 Coolant pumps and thermostat

Overview

- ⇒ “2.1 Coolant pump and thermostat - exploded view”, page 274
- ⇒ “2.2 Removing and installing coolant pump”, page 275
- ⇒ “2.3 Removing and installing thermostat with hose connection”, page 276
- ⇒ “2.4 Pump for exhaust gas recirculation cooler V400 - exploded view”, page 278
- ⇒ “2.5 Removing and installing pump for exhaust gas recirculation cooler V400 ”, page 279

2.1 Coolant pump and thermostat - exploded view

1 - Bolt
- ❑ 23 Nm

2 - Bolt
- ❑ 9 Nm

3 - Coolant hose
- ❑ To radiator (bottom right)

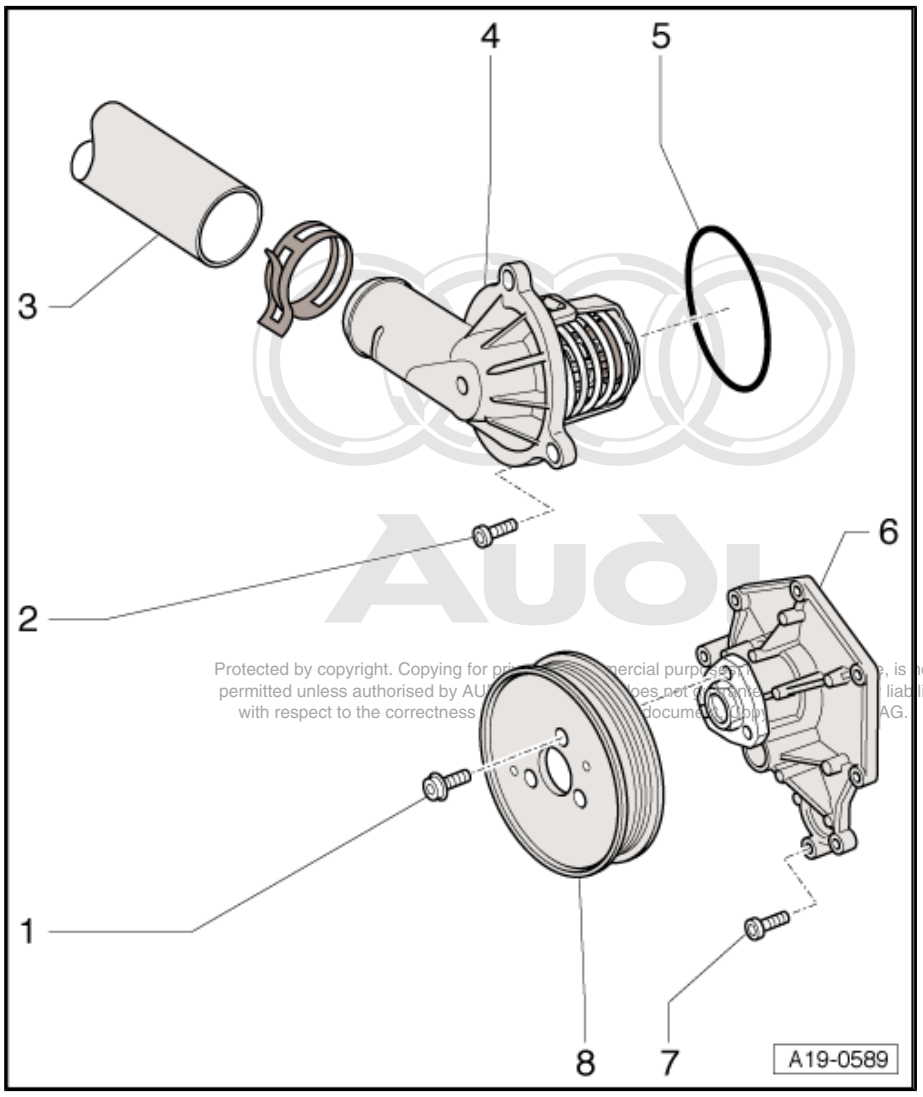
4 - Hose connection with thermostat
- ❑ Removing and installing ⇒ page 276

5 - Seal
- ❑ Renew

6 - Coolant pump
- ❑ Removing and installing ⇒ page 275

7 - Bolt
- ❑ Tightening torque and sequence ⇒ page 275

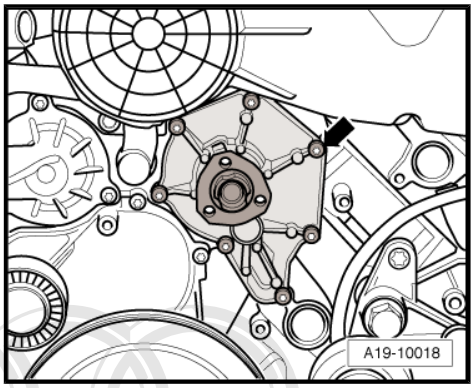
8 - Poly V-belt pulley for coolant pump
- ❑ Installation position: marking “vorne” (front) faces in direction of travel



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Coolant pump - tightening torque and sequence

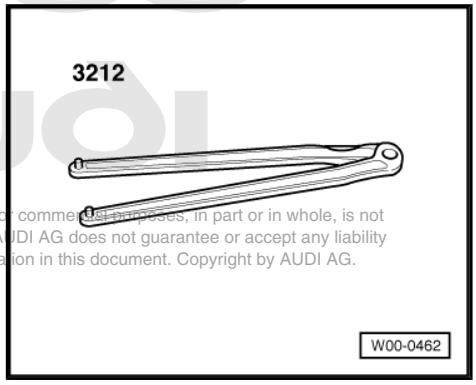
– Tighten bolts -arrow- for coolant pump in diagonal sequence and in stages to 9 Nm.



2.2 Removing and installing coolant pump

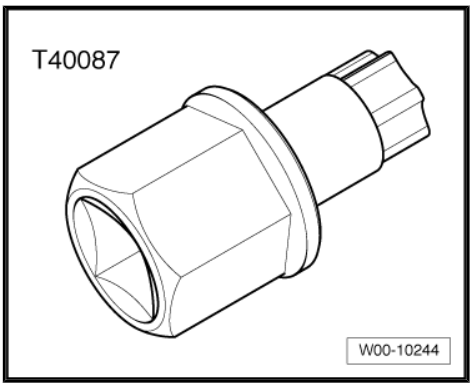
Special tools and workshop equipment required

♦ Pin wrench - 3212-



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♦ Socket Torx T 60 - T40087-



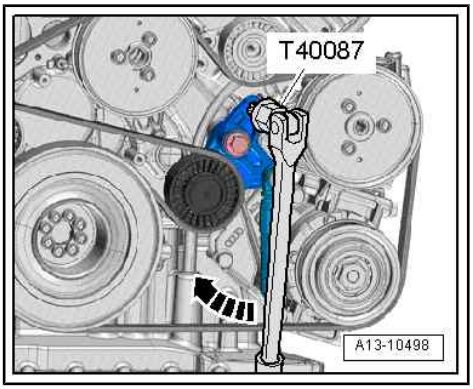
Removing

– Drain coolant ⇒ page 265 .

Caution

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

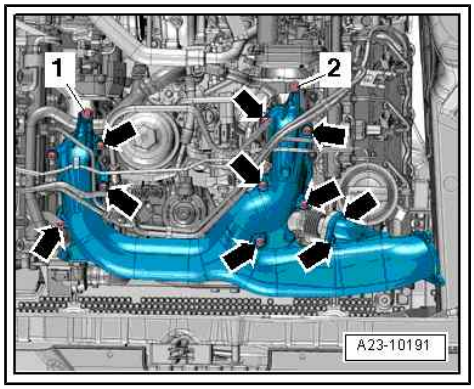
- *Before removing, mark direction of rotation of poly V-belt with chalk or felt-tip pen for re-installation.*



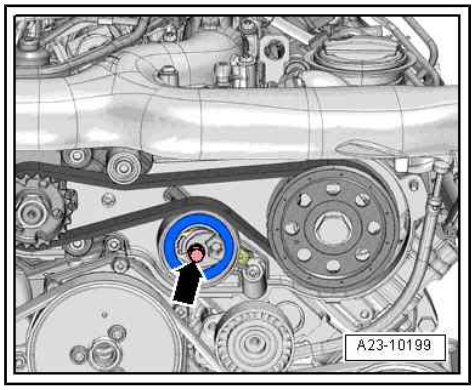
– Slacken poly V-belt by turning tensioner in clockwise direction -arrow- using socket Torx T 60 - T40087- .

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

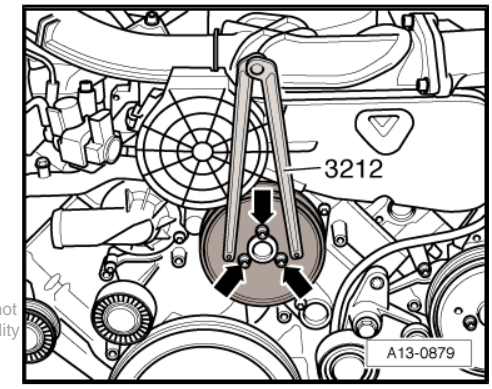
– Remove intake manifold (top section) ⇒ Rep. gr. 23 .



– Remove toothed belt for high-pressure pump ⇒ Rep. gr. 23 .

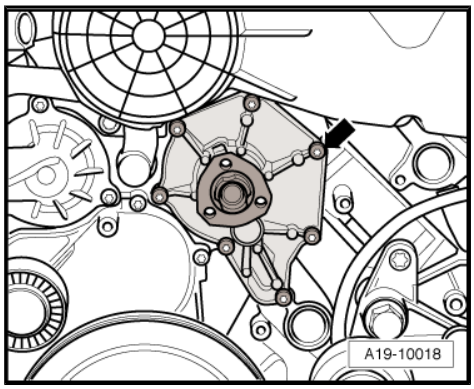


– Remove bolts -arrows- and detach poly V-belt pulley for coolant pump (counterhold with pin wrench - 3212-).



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– Remove bolts and detach coolant pump -arrow-.



Installing

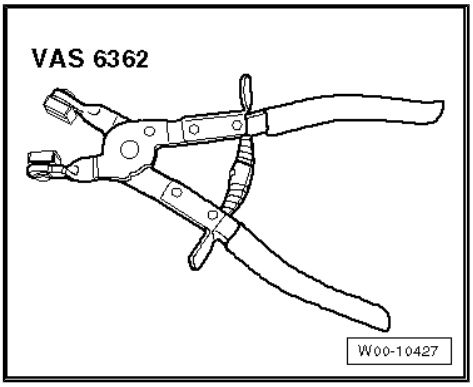
Installation is carried out in the reverse order; note the following:

– Clean sealing surface.
– Tighten coolant pump bolts ⇒ page 275 .
– Install poly V-belt ⇒ page 115 .
– Install toothed belt for high-pressure pump and intake manifold (top section) ⇒ Rep. gr. 23 .
– Fill up with coolant ⇒ page 266 .

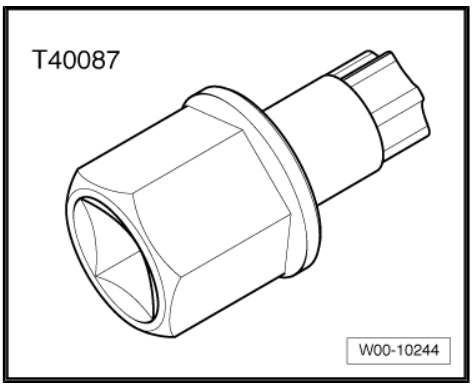
2.3 Removing and installing thermostat with hose connection

Special tools and workshop equipment required

♦ Hose clip pliers - VAS 6362-



♦ Socket Torx T 60 - T40087-



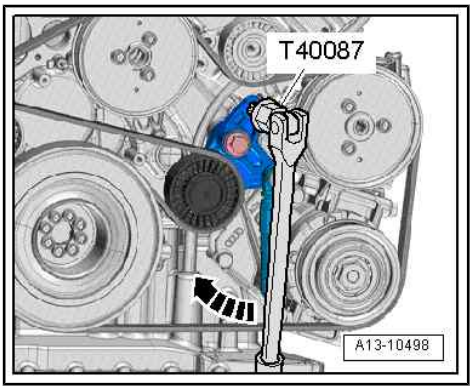
Removing

– Drain coolant ⇒ page 265 .

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.***



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

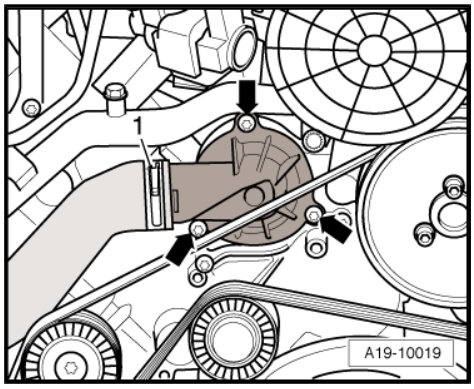
– Remove poly V-belt from tensioner and release tensioner.

– Remove pump for exhaust gas recirculation cooler - V400- ⇒ page 279 .

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

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– Unscrew bolts -arrows- and remove connection with thermostat.



Installing

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

- Tightening torque
  ⇒ “2.1 Coolant pump and thermostat - exploded view”, page 274

Note

- *Fit new O-ring.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

– Clean sealing surface.

– Install pump for exhaust gas recirculation cooler - V400- ⇒ page 279 .

– Install poly V-belt ⇒ page 115 .

– Fill up with coolant ⇒ page 266 .

2.4 Pump for exhaust gas recirculation cooler - V400- - exploded view

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1 - Coolant hose

- ❑ To thermostat

2 - Pump for exhaust gas recirculation cooler - V400-

- ❑ Removing and installing ⇒ page 279

3 - Bolt

- ❑ Tightening torque ⇒ Item 14 (page 194)

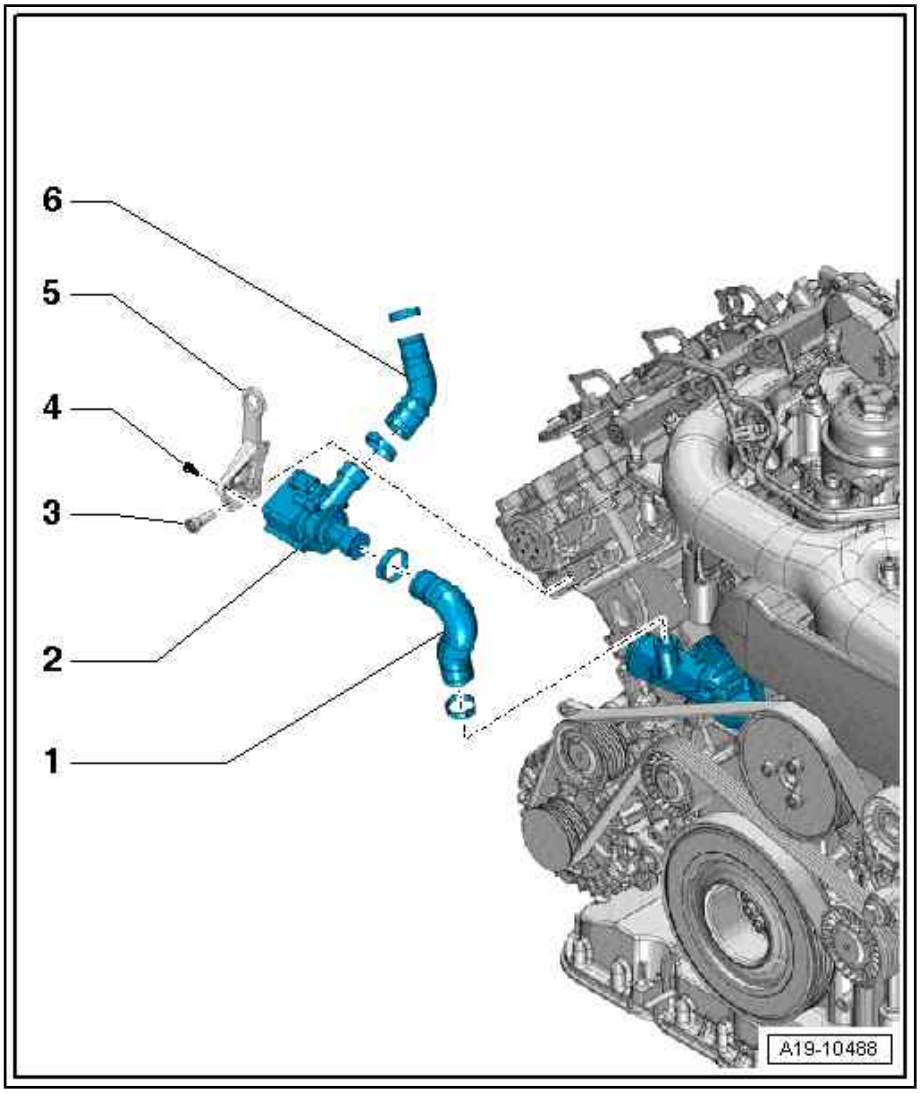
4 - Bolt

- ❑ 2.7 Nm

5 - Engine lifting eye

6 - Coolant hose

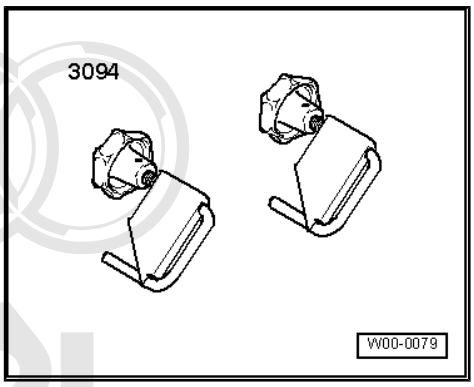
- ❑ To exhaust gas recirculation cooler



2.5 Removing and installing pump for exhaust gas recirculation cooler - V400-

Special tools and workshop equipment required

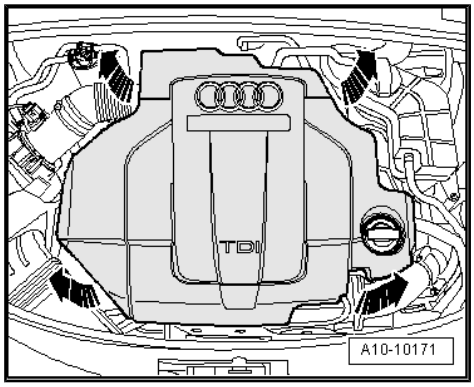
- ♦ Hose clamps, up to 25 mm - 3094-



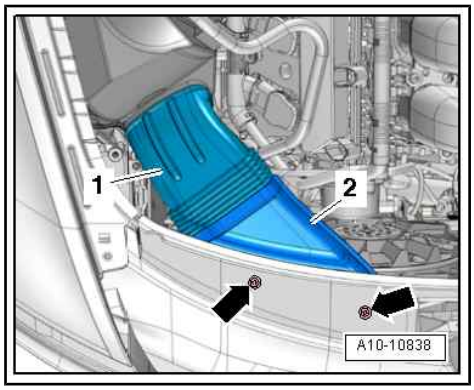
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Removing

– Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



– Remove bolts -arrows-, detach air ducts -1- and -2-.

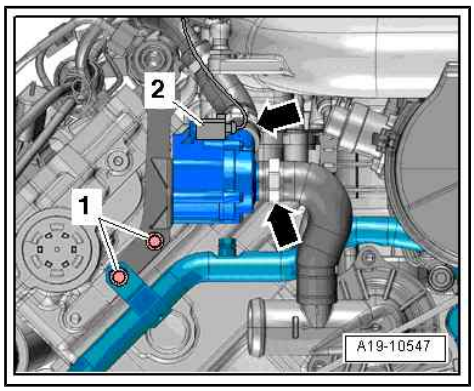


– Unplug electrical connector -2-.

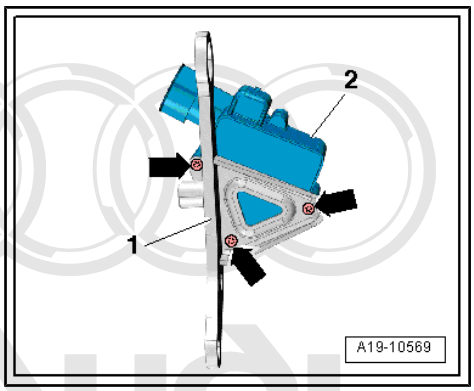
– Remove bolts -1-.

– Clamp off coolant hoses -arrows- with hose clamps -3094- and detach from pump for exhaust gas recirculation cooler - V400- .

– Detach pump for exhaust gas recirculation cooler - V400- - together with engine lifting eye.



– Unscrew bolts -arrows- and remove pump for exhaust gas re-circulation cooler - V400- -item 2- from engine lifting eye -1-.



Installing

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

- Tightening torques
  ⇒ “2.4 Pump for exhaust gas recirculation cooler V400 - exploded view”, page 278 and
  ⇒ “3.1 Coolant pipes - exploded view”, page 281

Note

Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .

– Install air ducts ⇒ Rep. gr. 23 .

– Check coolant level ⇒ page 271 .

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3 Coolant pipes

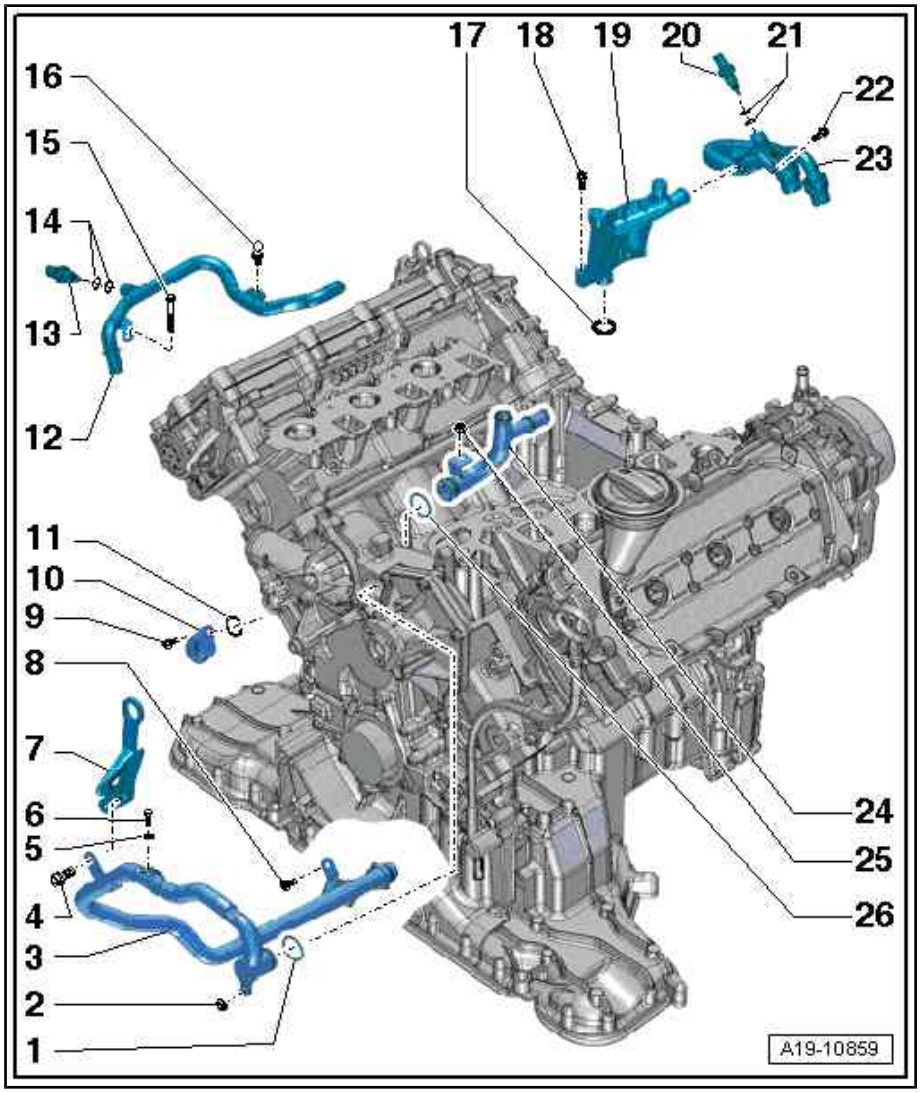
Overview

- ⇒ “3.1 Coolant pipes - exploded view”, page 281
- ⇒ “3.2 Removing and installing coolant temperature sender G62 ”, page 284
- ⇒ “3.3 Removing and installing radiator outlet coolant temperature sender G83 ”, page 285
- ⇒ “3.4 Removing and installing coolant pipe (left-side)”, page 285
- ⇒ “3.5 Removing and installing coolant pipe (top left)”, page 287
- ⇒ “3.6 Removing and installing coolant pipe (right-side)”, page 288
- ⇒ “3.7 Removing and installing coolant pipe (top right)”, page 291
- ⇒ “3.8 Removing and installing coolant pipe (rear right)”, page 291
- ⇒ “3.9 Removing and installing coolant pipe (top)”, page 293

3.1 Coolant pipes - exploded view

Part 1

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1 - O-ring
- ❑ Renew

2 - Nut
- ❑ 9 Nm

3 - Coolant pipe (right-side)
- ❑ Removing and installing ⇒ page 288
- ❑ Connecting coolant hose with plug-in connector ⇒ page 295

4 - Bolt
- ❑ 23 Nm

5 - Seal
- ❑ Renew

6 - Bleeder screw
- ❑ 9 Nm

7 - Engine lifting eye

8 - Bolt
- ❑ 9 Nm

9 - Bolt
- ❑ 9 Nm

10 - Sealing plug

11 - O-ring
- ❑ Renew

12 - Coolant pipe (top right)
- ❑ Removing and installing ⇒ page 291

13 - Radiator outlet coolant temperature sender - G83-
- ❑ Removing and installing ⇒ page 285

14 - O-rings
- ❑ Renew

15 - Bolt
- ❑ Tightening torque ⇒ Rep. gr. 23

16 - Mounting pin for engine cover panel
- ❑ Tightening torque ⇒ Rep. gr. 23

17 - O-ring
- ❑ Renew

18 - Bolt
- ❑ 9 Nm

19 - Connection

20 - Coolant temperature sender - G62-
- ❑ Removing and installing ⇒ page 284
- ❑ 2 Nm

21 - O-rings
- ❑ Renew

22 - Bolt
- ❑ 9 Nm

23 - Coolant pipe (rear right)
- ❑ Removing and installing ⇒ page 291

24 - Coolant pipe (top)
- ❑ Removing and installing ⇒ page 293

25 - Nut
- ❑ 9 Nm

26 - O-ring
- ❑ Renew

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Part 2

1 - Seals
- ❑ Renew

2 - Banjo bolt
- ❑ 15.5 Nm

3 - Bolt
- ❑ 9 Nm

4 - Coolant pipe
- ❑ To cylinder heads

5 - Bleeder screw
- ❑ 9 Nm

6 - Seal
- ❑ Renew

7 - Mounting pin for engine cover panel
- ❑ Tightening torque ⇒ Rep. gr. 23

8 - Bolt
- ❑ 9 Nm

9 - Coolant pipe (top left)
- ❑ Removing and installing ⇒ page 287

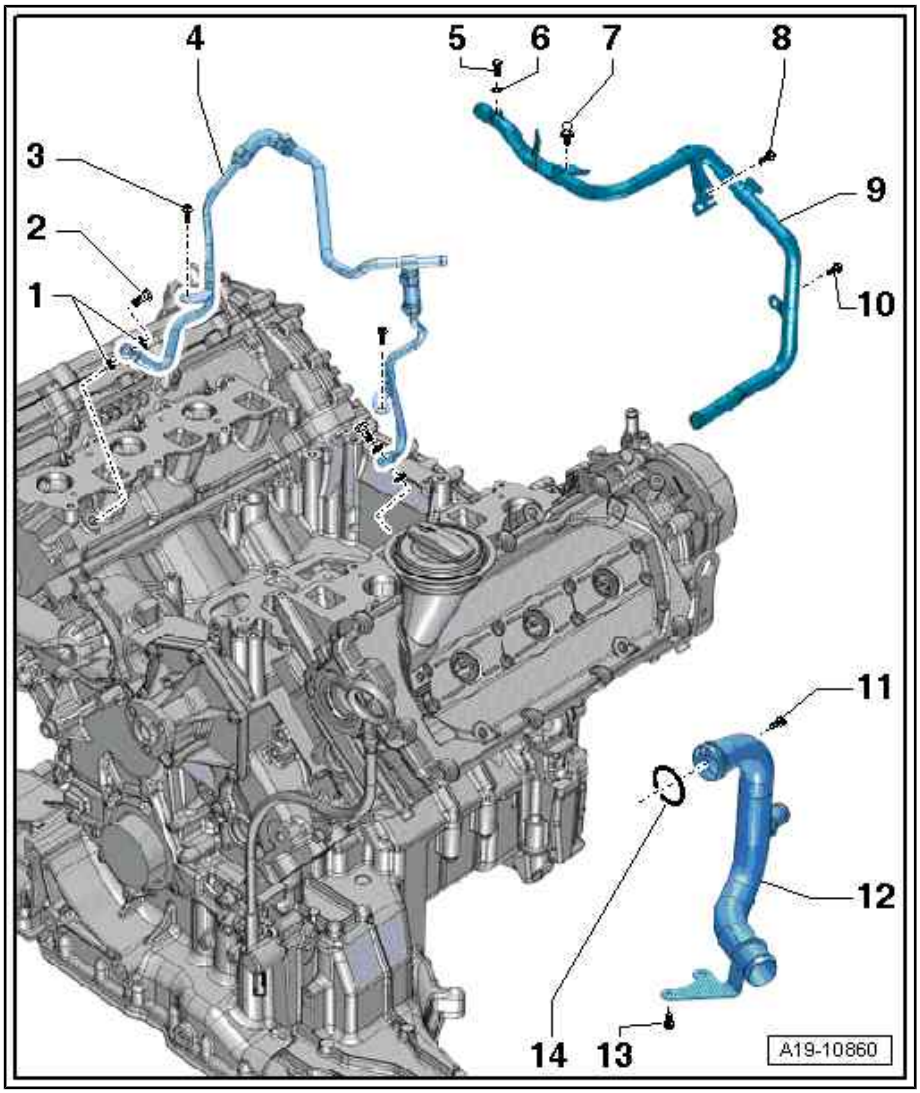
10 - Bolt
- ❑ 9 Nm

11 - Bolt
- ❑ 9 Nm

12 - Coolant pipe (left-side)
- ❑ Removing and installing ⇒ page 285

13 - Bolt
- ❑ 9 Nm

14 - O-ring
- ❑ Renew



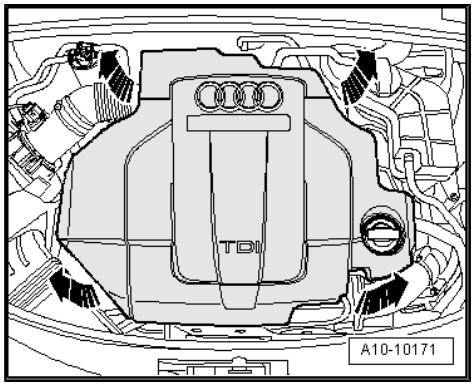
3.2 Removing and installing coolant temperature sender - G62-

Removing

- Engine cold.

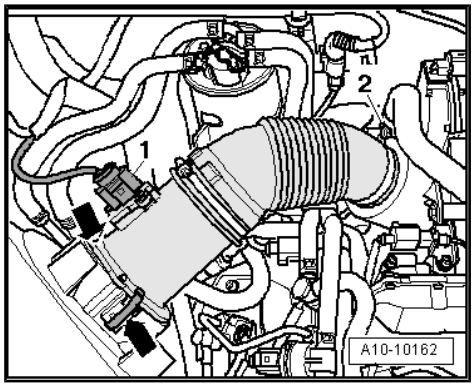
– Open filler cap on coolant expansion tank briefly to allow residual pressure in cooling system to dissipate and close cap (make sure it engages).

– Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



– Unplug electrical connector -1- from air mass meter - G70- .

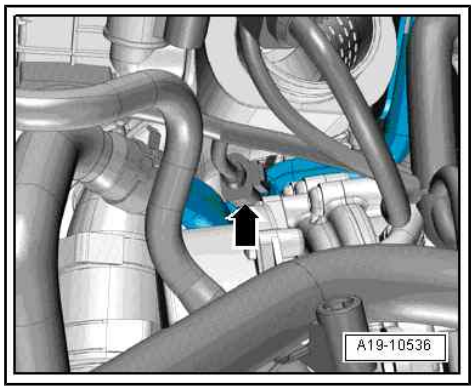
– Remove air hose. To do so, release hose clip -2- and clamps -arrows-.



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– Unplug electrical connector -arrow-.

– Remove coolant temperature sender - G62- .



Installing

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

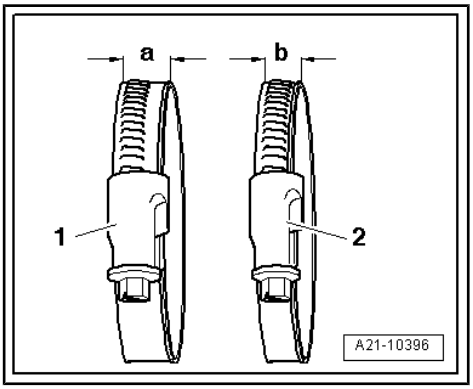
- Tightening torque
⇒ “3.1 Coolant pipes - exploded view”, page 281

Note

- *Fit new O-rings.*
- *To avoid loss of coolant, screw new coolant temperature sender - G62- into connection immediately.*
- *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 .*

– Install air hoses with screw-type clips ⇒ page 326 .

– Check coolant level ⇒ page 271 .



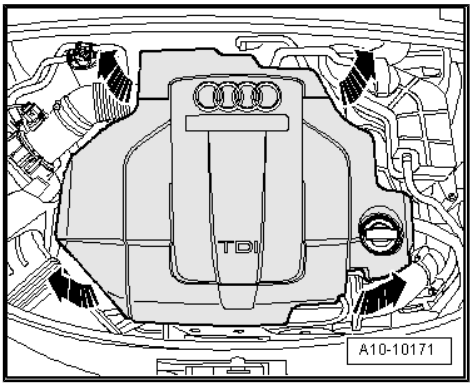
3.3 Removing and installing radiator outlet coolant temperature sender - G83-

Removing

• Engine cold.

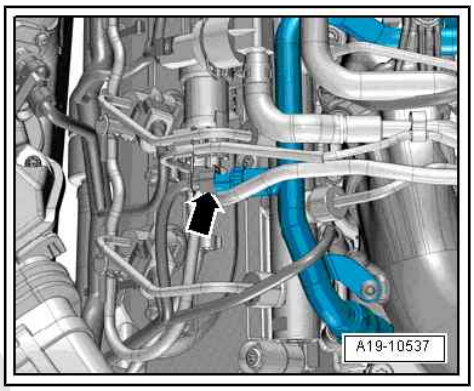
– Open filler cap on coolant expansion tank briefly to allow residual pressure in cooling system to dissipate and close cap (make sure it engages).

– Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



– Unplug electrical connector -arrow- at radiator outlet coolant temperature sender - G83- .

– Unscrew radiator outlet coolant temperature sender - G83- .



Installing

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

• Tightening torque
⇒ “3.1 Coolant pipes - exploded view”, page 281

Note

♦ *Fit new O-rings.*

♦ *To avoid loss of coolant, screw new radiator outlet coolant temperature sender - G83- into connection immediately.*

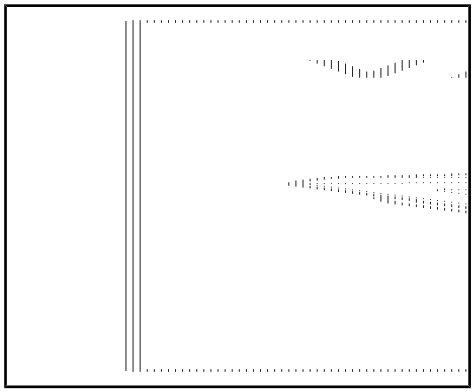
– Check coolant level ⇒ page 271 .

3.4 Removing and installing coolant pipe (left-side)

Special tools and workshop equipment required

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- Drip tray for workshop hoist - VAS 6208-



Removing

WARNING

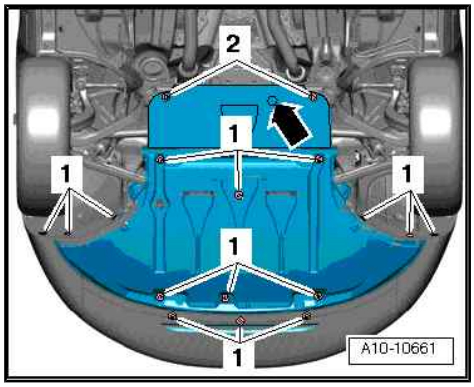
Hot steam/hot coolant can escape - risk of scalding.

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

– Open filler cap on coolant expansion tank.

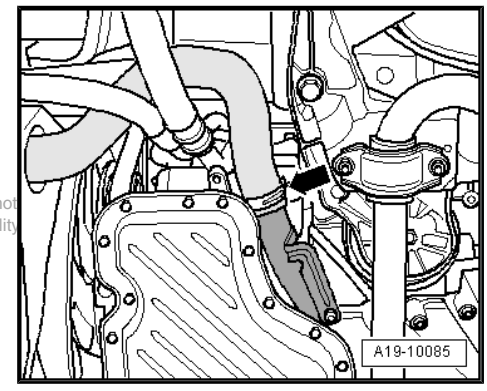
– Remove front wheel (left-side) ⇒ Wheels and tyres; Rep. gr. 44 .

– Remove front and rear noise insulation ⇒ Rep. gr. 50 .



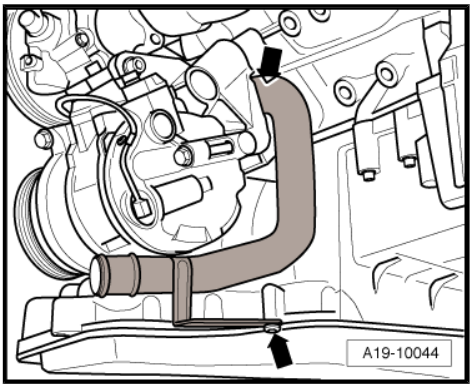
– Place drip tray for workshop hoist - VAS 6208- beneath engine.

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



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– Remove bolts -arrows- and detach coolant pipe (left-side).



Note

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

Installing

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

- Tightening torques
  ⇒ "3.1 Coolant pipes - exploded view", page 281

Note

- *Fit new O-ring.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

– Clean and smoothen sealing surface for O-ring.

– Lubricate O-ring with coolant and slide onto coolant pipe.

– Fit front wheel ⇒ Wheels and tyres; Rep. gr. 44 .

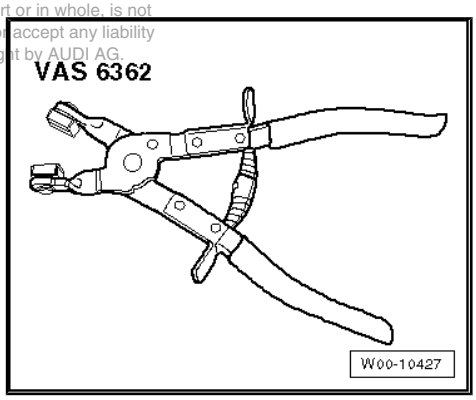
– Fill up with coolant ⇒ page 266 .

3.5 Removing and installing coolant pipe (top left)

Special tools and workshop equipment required

- Hose clip pliers - VAS 6362-

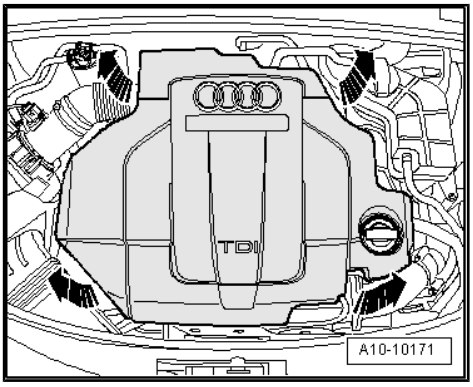
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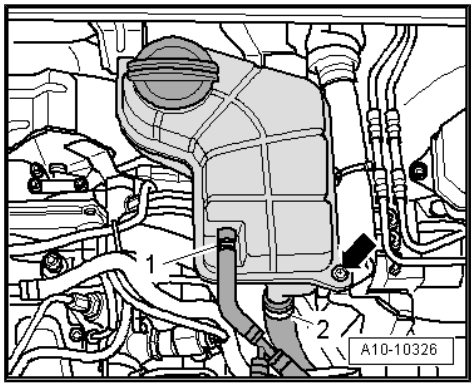
Removing

– Drain coolant ⇒ page 265 .

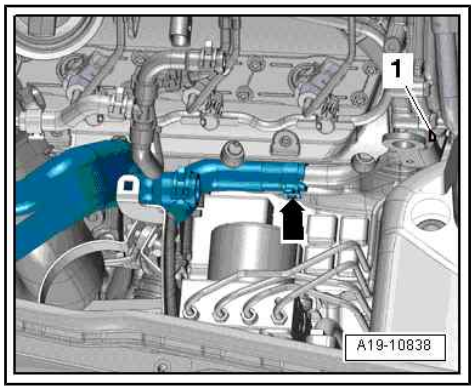
– Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



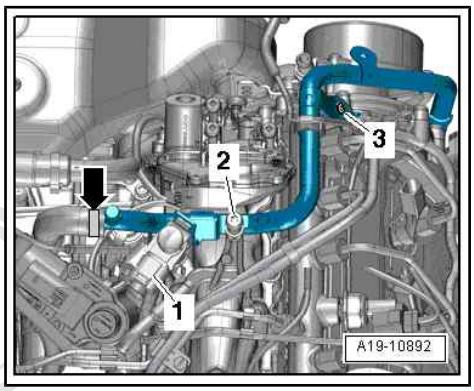
– Remove bolt -arrow-.
– Unplug electrical connector for coolant shortage indicator switch - F66- at bottom of expansion tank and move expansion tank to one side with coolant hoses -1- and -2- attached.



– Release hose clip -arrow- and detach coolant hose.
– Remove bolt -1-.



– Detach change-over valve for exhaust gas recirculation cooler - N345- -item 1- from bracket.
– Remove bolt -3- and ball stud -2-.
– Move electrical wiring harness clear at coolant pipe (rear left).
– Clamp off coolant hoses using hose clamps -3094- , release hose clip -arrow- and disconnect hoses.
– Detach coolant pipe (top left).



Installing

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

- Tightening torque
⇒ “3.1 Coolant pipes - exploded view”, page 281

Note

Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .

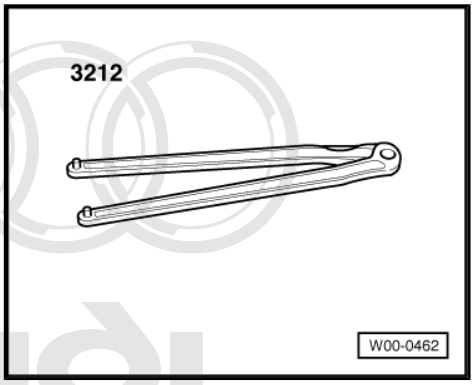
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– Fill up with coolant ⇒ page 266 .

3.6 Removing and installing coolant pipe (right-side)

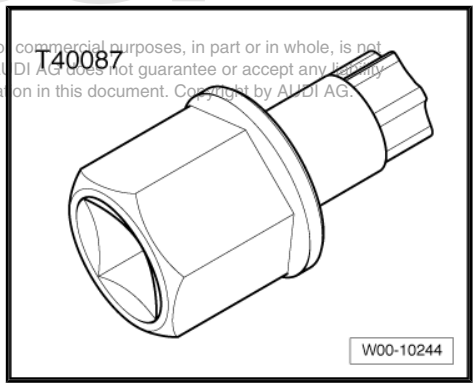
Special tools and workshop equipment required

♦ Pin wrench - 3212-



♦ Socket Torx T 60 - T40087-

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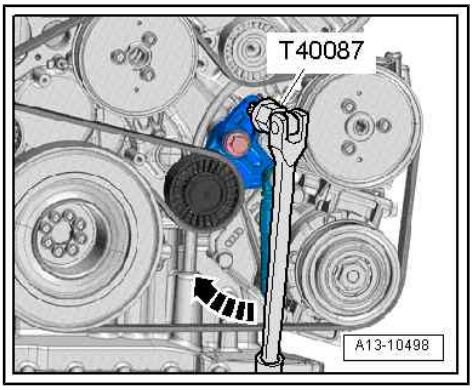
Removing

– Drain coolant ⇒ page 265 .

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.***



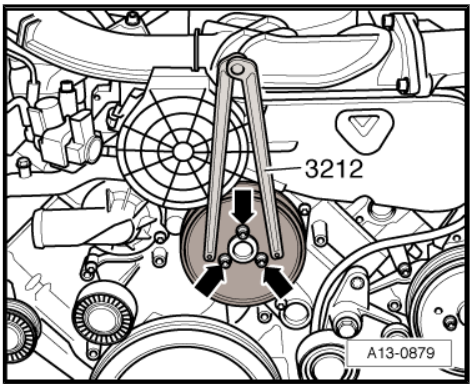
– Slacken poly V-belt by turning tensioner in clockwise direction -arrow- using socket Torx T 60 - T40087- .

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

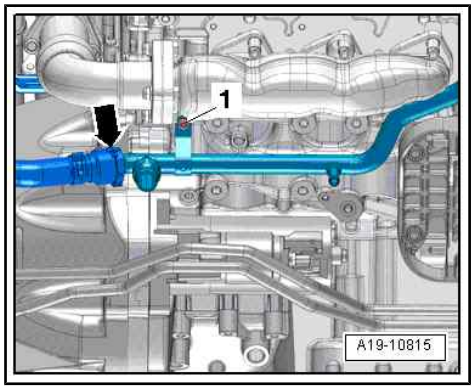
– Remove pump for exhaust gas recirculation cooler - V400- ⇒ page 279 .

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

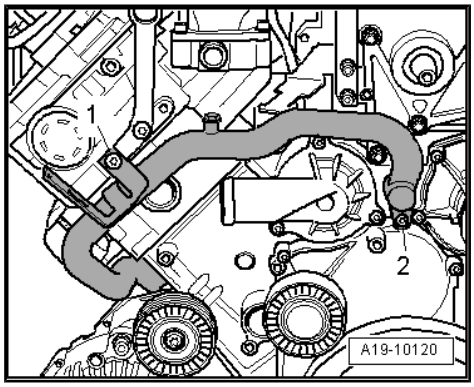
– Remove engine mounting (right-side) ⇒ page 106 .



– Move electrical wiring at coolant pipe (right-side) clear.
– Remove bolt -1-.
– Lift retaining clip -arrow- and detach coolant hose from coolant pipe (right-side).



– Remove nut -2-.
– Pull coolant pipe (right-side) forwards out of cylinder block and detach.



Note

Disregard -item 1-.

Installing

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

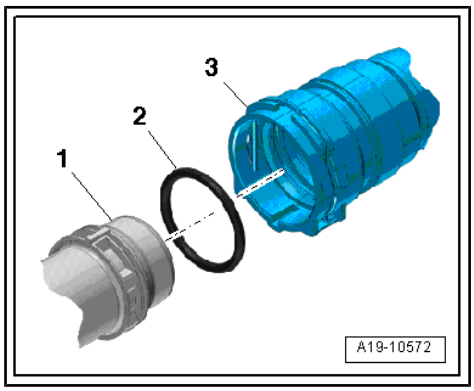
- Tightening torque
  ⇒ “3.1 Coolant pipes - exploded view”, page 281

Note

◆ *Fit new O-rings.*
◆ *Fit all cable ties in the original positions when installing.*

– Before installing, clean and smoothen sealing surface for O-ring.
– Lubricate new O-ring with coolant and slide onto coolant pipe.

– Connect coolant hose with plug-in connector to coolant pipe ⇒ page 295 .
– Install engine mounting (right-side) ⇒ page 106 .
– Install poly V-belt pulley for coolant pump ⇒ page 274 .
– Install pump for exhaust gas recirculation cooler - V400- ⇒ page 279 .
– Install poly V-belt ⇒ page 115 .
– Fill up with coolant ⇒ page 266 .



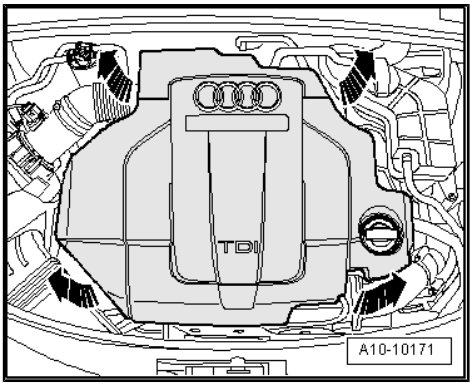
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3.7 Removing and installing coolant pipe (top right)

Removing

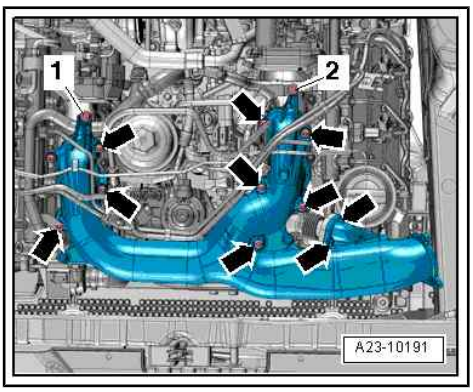
– Drain coolant ⇒ page 265 .

– Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



– Remove intake manifold (top section) ⇒ Rep. gr. 23 .

– Unplug electrical connectors at glow plugs for cylinders “1” and “2”.

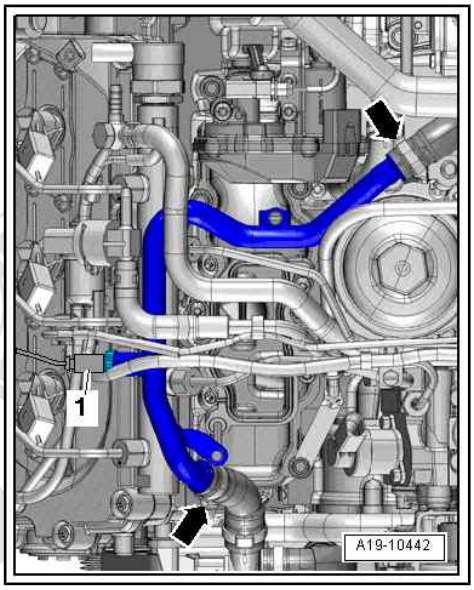


– Move electrical wiring harness on coolant pipe (top right) clear.

– Unplug electrical connector -1- at radiator outlet coolant temperature sender - G83- .

– Open hose clips -arrows- and detach coolant hoses from coolant pipe (top right).

– Detach coolant pipe (top right).



Installing

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

- Tightening torque
  ⇒ “3.1 Coolant pipes - exploded view”, page 281

Note

Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .

– Install intake manifold (top section) ⇒ Rep. gr. 23 .

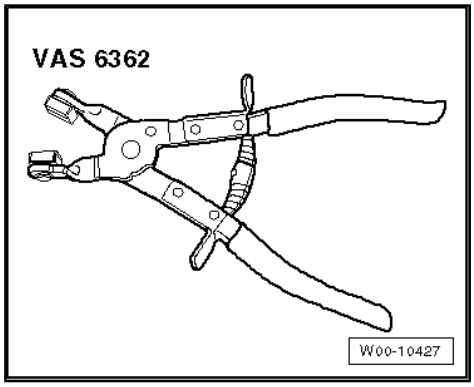
– Fill up with coolant ⇒ page 266 .

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3.8 Removing and installing coolant pipe (rear right)

Special tools and workshop equipment required

♦ Hose clip pliers - VAS 6362-



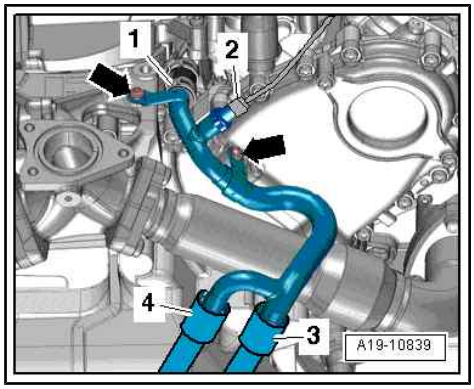
Removing

– Drain coolant ⇒ page 265 .

– Remove turbocharger ⇒ page 305 .

– Unscrew bolts -arrows- and unplug electrical connector -2- for coolant temperature sender - G62- .

– Open hose clip -1-, lift retaining clips -3, 4- and detach coolant pipe (rear right) from coolant hoses.



Installing

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

- Tightening torque
  ⇒ “3.1 Coolant pipes - exploded view”, page 281

Note

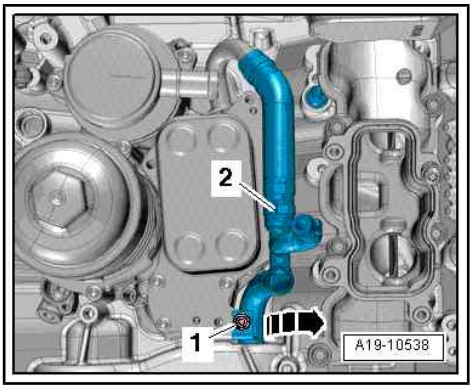
Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .

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– Install turbocharger ⇒ page 305 .

– Fill up with coolant ⇒ page 266 .

3.9 Removing and installing coolant pipe (top)



Removing

– Remove engine oil cooler ⇒ page 253 .

– Release hose clip -2- and detach coolant hose.

Note

Disregard -item 1- and -arrow-.

– Pull top coolant pipe out of cylinder block.

Installing

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

- Tightening torque
  ⇒ “3.1 Coolant pipes - exploded view”, page 281

Note

♦ *Fit new O-ring.*

♦ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

– Clean and smoothen sealing surface for O-ring.

– Lubricate O-ring with coolant and slide onto coolant pipe.

– Install engine oil cooler ⇒ page 253 .

– Fill up with coolant ⇒ page 266 .

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4 Radiator and radiator fans

Overview

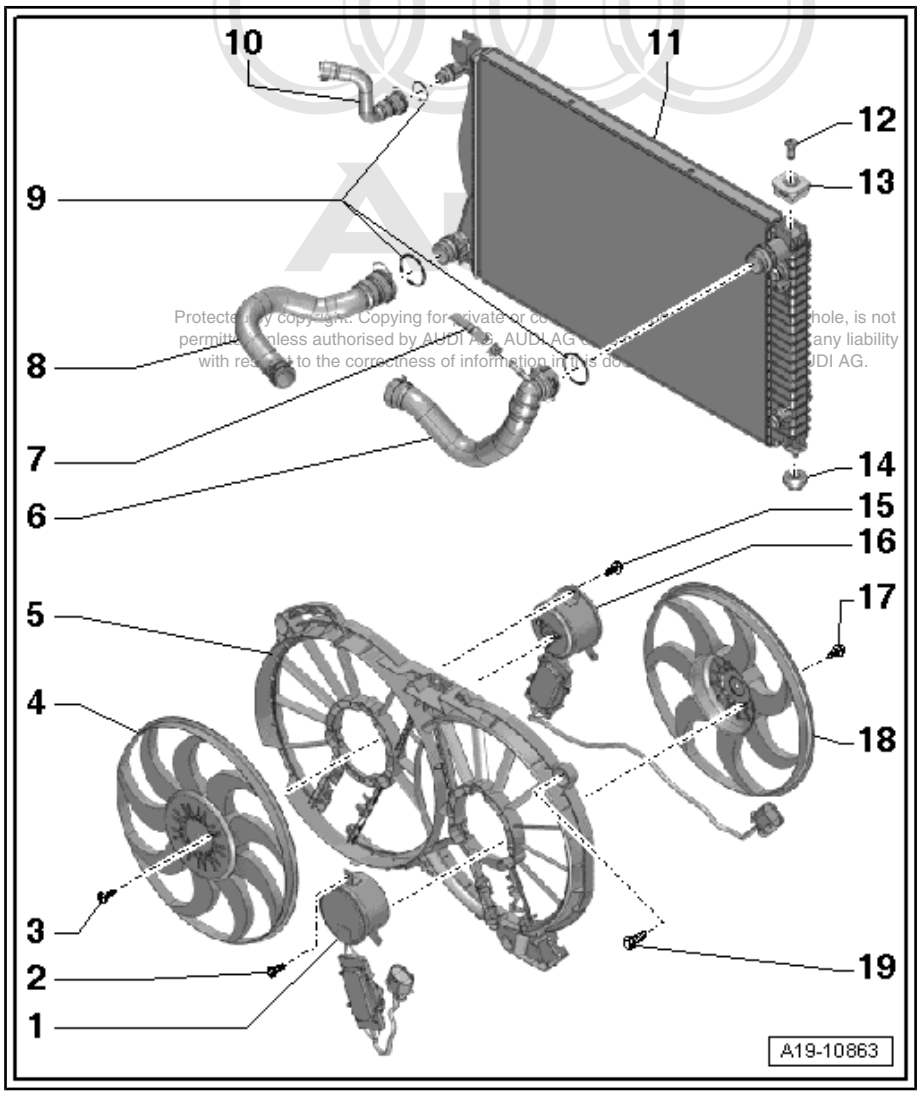
- ⇒ “4.1 Radiator and radiator fans - exploded view”, page 294
- ⇒ “4.2 Removing and installing radiator”, page 295
- ⇒ “4.3 Removing and installing radiator cowl”, page 300
- ⇒ “4.4 Removing and installing radiator fans V7 / V177 ”, page 301

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.*

4.1 Radiator and radiator fans - exploded view



1 - Radiator fan 2 - V177-
- ❑ With radiator fan control unit 2 - J671-
- ❑ Removing and installing ⇒ page 301

2 - Bolt
- ❑ 5 Nm

3 - Bolt
- ❑ 3.5 Nm

4 - Fan wheel
- ❑ Not supplied separately

5 - Radiator cowl
- ❑ Removing and installing ⇒ page 300

6 - Coolant hose
- ❑ Lift retaining clip to detach
- ❑ Connecting to radiator ⇒ page 295

7 - Vent hose

8 - Coolant hose
- ❑ Lift retaining clip to detach
- ❑ Connecting to radiator ⇒ page 295

9 - O-rings
- ❑ Renew

10 - Coolant hose
- ❑ Lift retaining clip to detach
- ❑ Connecting to radiator ⇒ page 295

11 - Radiator

- ❑ Removing and installing ⇒ page 295
- ❑ If renewed, change coolant in entire system

12 - Retaining pin

13 - Rubber buffer

- ❑ Use screwdriver to release and pull off

14 - Rubber bush

15 - Bolt

- ❑ 5 Nm

16 - Radiator fan - V7-

- ❑ With radiator fan control unit - J293-
- ❑ Removing and installing ⇒ page 301

17 - Bolt

- ❑ 3.5 Nm

18 - Fan wheel

- ❑ Not supplied separately

19 - Bolt

- ❑ 2 Nm

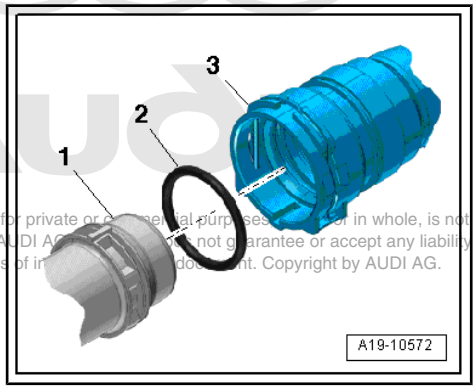
Connecting coolant hose with plug-in connector

– Remove old O-ring -2- from coolant hose -3-.

– Lightly lubricate new O-ring with coolant and fit O-ring in coolant hose.

– Press coolant hose onto connection -1- until it engages audibly.

– Press coolant hose in again and then pull to check that plug-in connector is correctly engaged.

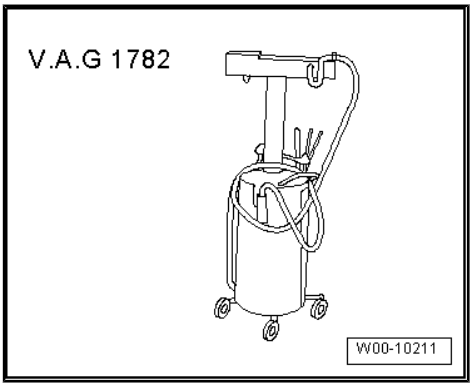


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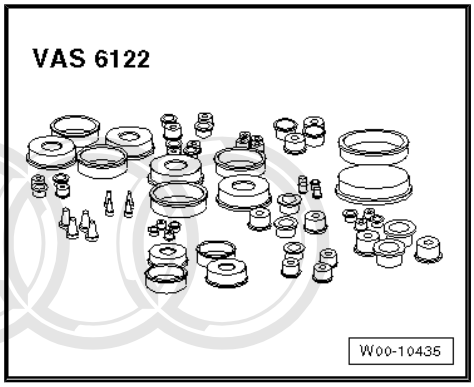
4.2 Removing and installing radiator

Special tools and workshop equipment required

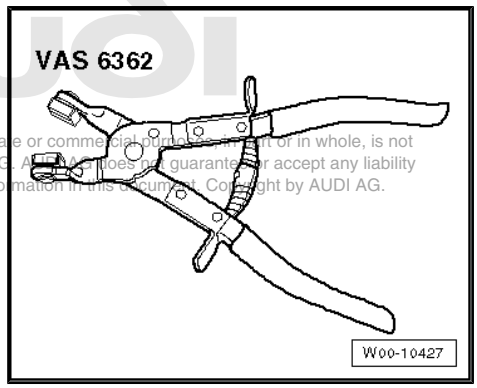
♦ Used oil collection and extraction unit - V.A.G 1782-



♦ Engine bung set - VAS 6122-

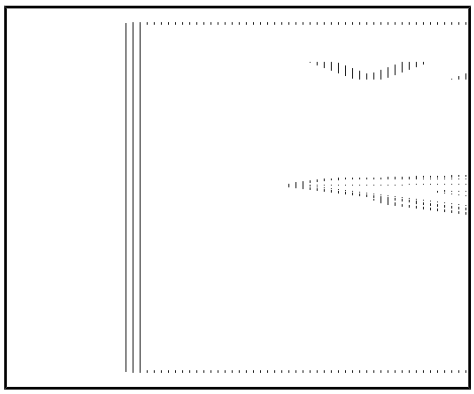


♦ Hose clip pliers - VAS 6362-



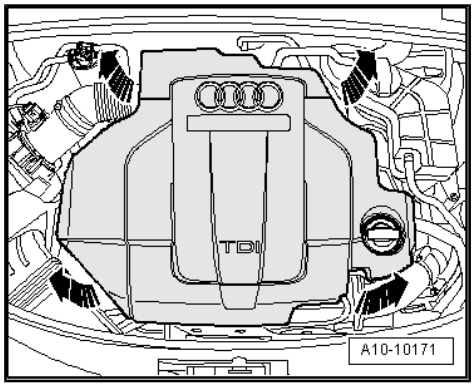
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♦ Drip tray for workshop hoist - VAS 6208-



Removing

– Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



WARNING

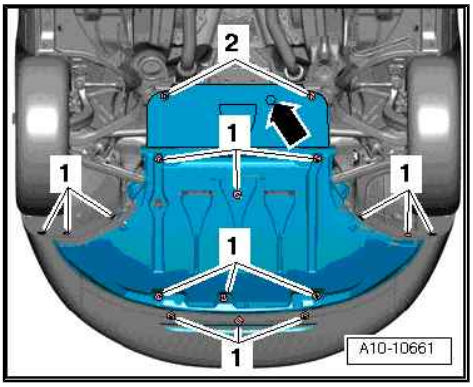
Hot steam/hot coolant can escape - risk of scalding.

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

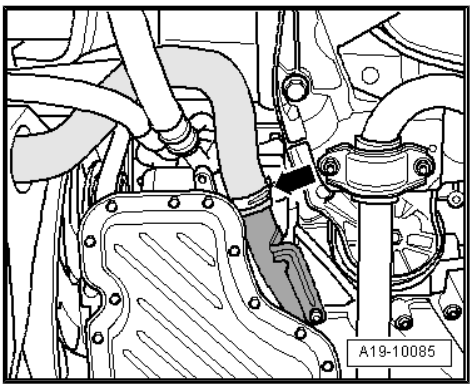
– Open filler cap on coolant expansion tank.

– Remove bumper cover (front) ⇒ Rep. gr. 63 .

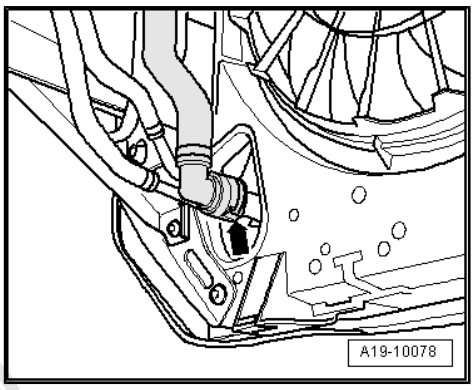
– Remove front and rear noise insulation ⇒ Rep. gr. 50 .



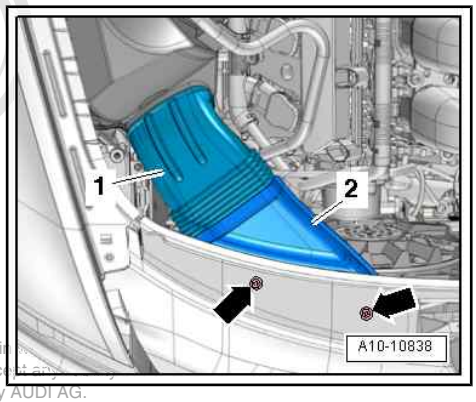
– Place drip tray for workshop hoist - VAS 6208- beneath engine.
– Release hose clip -arrow-, disconnect coolant hose from coolant pipe (left-side) and drain off coolant.



– Lift retaining clip -arrow- and disconnect coolant hose (bottom left) from radiator.

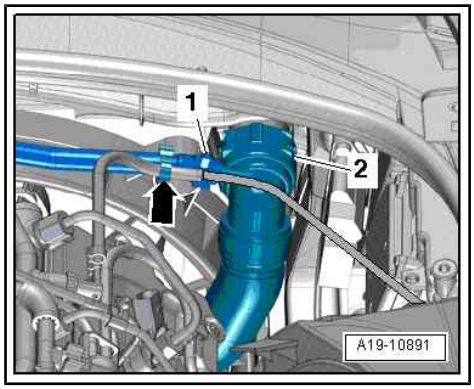


– Remove bolts -arrows-, detach air ducts -1- and -2-.



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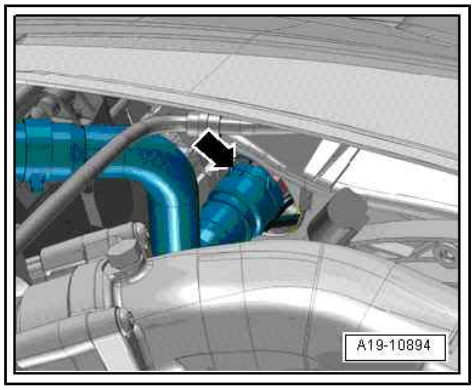
– Lift retaining clip -1- and disconnect coolant hose (top right) from radiator.



Note

Disregard -item 2- and -arrow-.

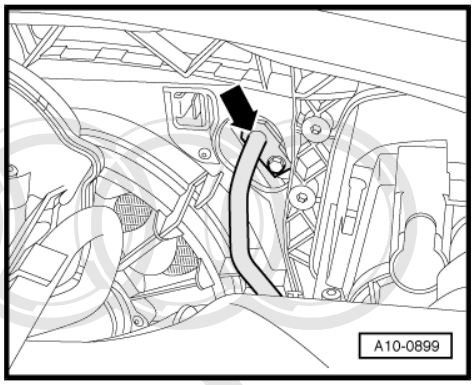
– Lift retaining clip -arrow- and disconnect coolant hose (front left) from radiator.



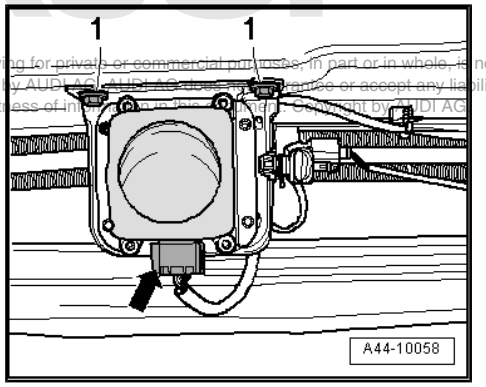
Note

Observe rules for cleanliness when working on multitronic or automatic gearbox ⇒ Rep. gr. 00 .

– Place used oil collection and extraction unit - V.A.G 1782- underneath.
– Unscrew bolts and detach ATF line (top) -arrow- and ATF line (bottom) from radiator.
– Tie ATF lines up onto longitudinal member.
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .



– On vehicles with adaptive cruise control, unplug electrical connector -arrow- at adaptive cruise control unit - J428- .

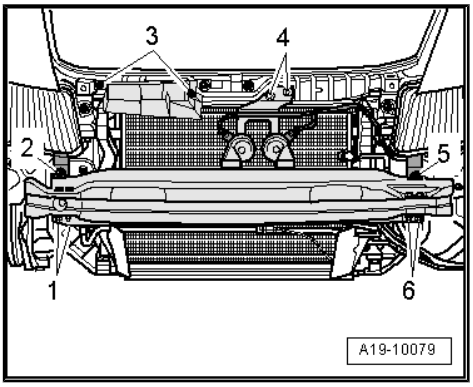


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Note

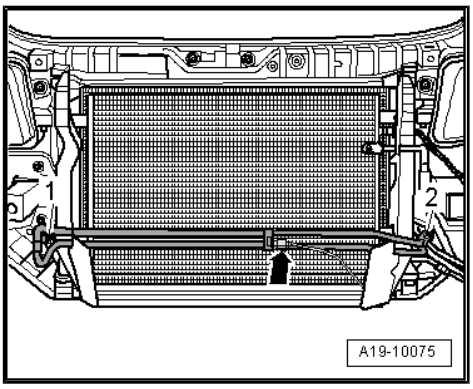
Disregard -item 1-.

– Unscrew bolts -3- and remove air duct.
– Unscrew bolts -4- and detach bracket for horns; the wiring remains connected.
– Unscrew bolts -2- and -5- and remove brackets for headlights.
– Remove nuts -1- and -6- and detach bumper.



– Unclip ambient temperature sensor - G17- -arrow- from bracket.
– Unscrew bolts -1- and -2- for power steering cooling pipe; the hydraulic hoses remain attached.
– Unbolt air ducts on left and right sides of radiator.

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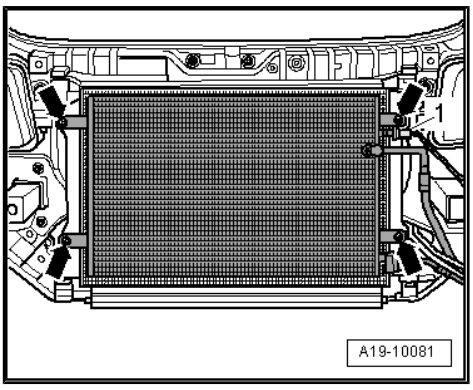


– Unplug electrical connector -1-.
– Remove bolts -arrows-.

Caution

Make sure that condenser and refrigerant pipes and hoses are not damaged.

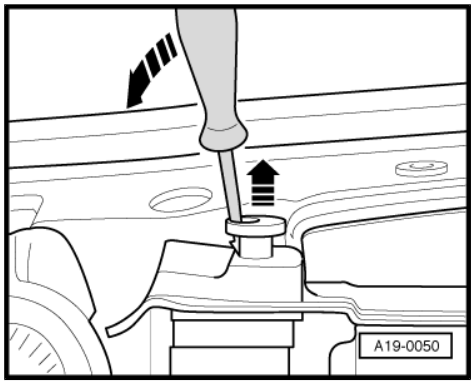
- ***Do NOT stretch, kink or bend refrigerant lines and hoses.***



– Pivot condenser downwards with pipes/hoses attached.

– Release two retaining pins for radiator and pull out upwards -arrows-.

– Swivel radiator forwards and lift off.



Installing

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

- Tightening torque
  ⇒ “4.1 Radiator and radiator fans - exploded view”, page 294

Note

- *If there are slight impressions on the fins, refer to ⇒ page 8 .*
- *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 .*

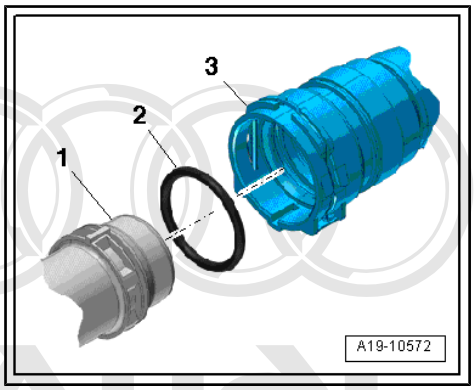
– Secure ATF lines ⇒ Rep. gr. 37 .

– Install bumper (front) and bumper cover ⇒ Rep. gr. 63 .

– Install air ducts ⇒ Rep. gr. 23 .

– Connect coolant hoses with plug-in connectors to radiator ⇒ page 295 .

– Fill up with coolant ⇒ page 266 .



Note

The coolant in the entire system must be changed if the radiator is renewed.

– Check ATF level ⇒ Rep. gr. 37 .

– Perform adjustment after re-installing adaptive cruise control unit -J428- ⇒ Rep. gr. 44 .

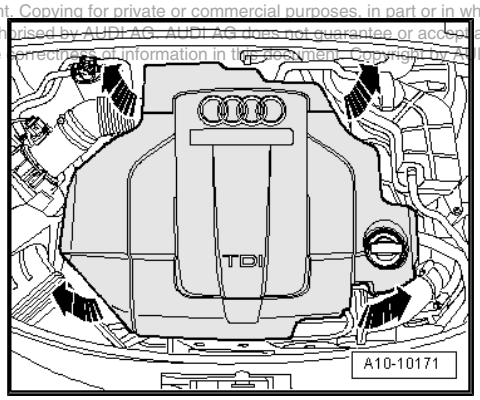
4.3 Removing and installing radiator cowl

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Removing

– Carefully pull engine cover panel off four retaining pins one after the other -arrows-.

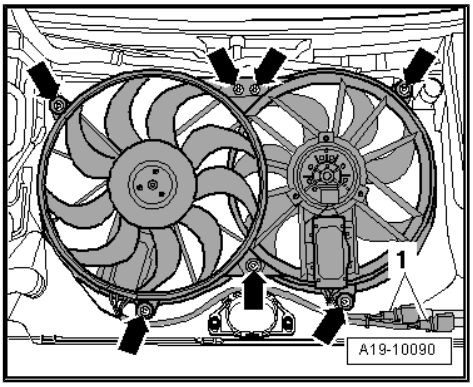
– Move lock carrier to service position ⇒ Rep. gr. 50 .



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- for radiator fans.

– Remove bolts -arrows- and lift out radiator cowl.

Installing

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

- Tightening torque
  ⇒ “4.1 Radiator and radiator fans - exploded view”, page 294

Note

- *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.*

– Install lock carrier with attachments ⇒ Rep. gr. 50 .

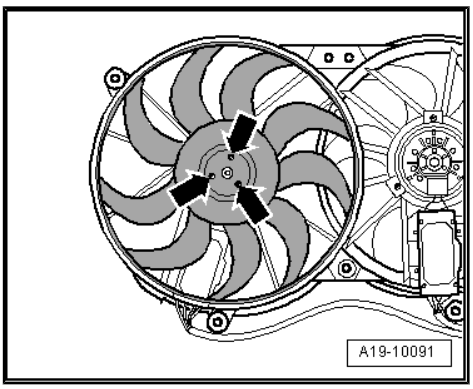
4.4 Removing and installing radiator fans - V7- / -V177-

Removing

– Remove radiator cowl ⇒ page 300 .

– Remove bolts -arrows-.

– Detach fan wheel.

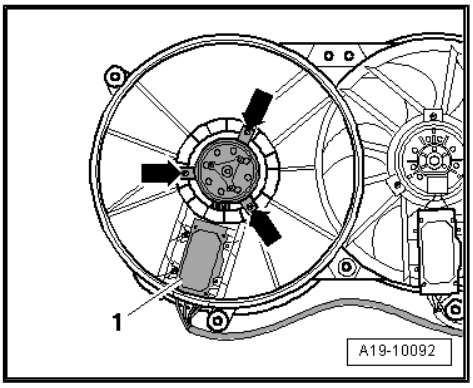


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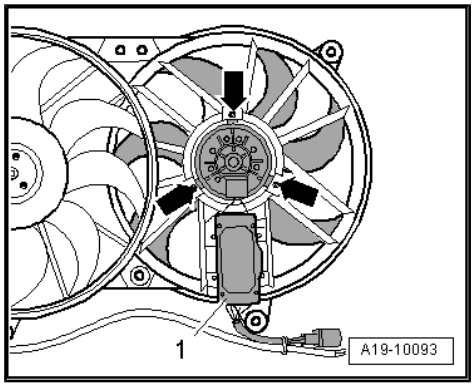
Radiator fan - V7- (left-side):

– Remove bolts -arrows-.

– Unclip radiator fan control unit - J293- -item 1- from radiator cowl and detach radiator fan - V7- with control unit.



Radiator fan 2 - V177- (right-side):



– Remove bolts -arrows-.

– Unclip radiator fan control unit 2 - J671- -item 1- from radiator cowl and detach radiator fan 2 - V177- with control unit.

Installing

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

- Tightening torque
  ⇒ "4.1 Radiator and radiator fans - exploded view", page 294

Note

Fit all cable ties in the original positions when installing.

– Install radiator cowl ⇒ page 300 .

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21 – Turbocharging/supercharging

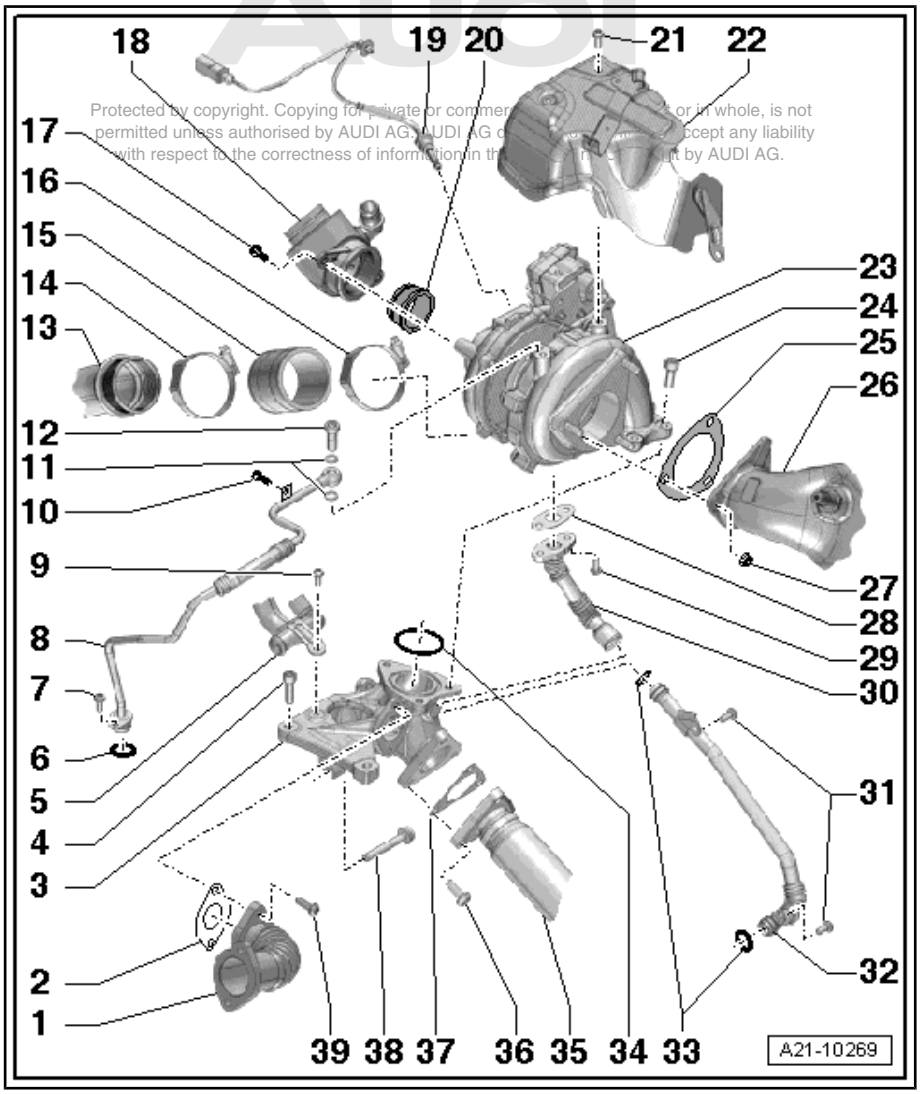
1 Turbocharger

Overview

- ⇒ “1.1 Turbocharger - exploded view”, page 303
- ⇒ “1.2 Removing and installing turbocharger”, page 305
- ⇒ “1.3 Removing and installing intermediate flange”, page 312
- ⇒ “1.4 Removing and installing turbocharger 1 control unit J724 ”, page 312

– Observe rules for cleanliness ⇒ page 7 .

1.1 Turbocharger - exploded view



1 - Connecting pipe for exhaust gas recirculation
- ❑ Exploded view ⇒ page 374

2 - Gasket
- ❑ Renew

3 - Intermediate flange
- ❑ Removing and installing ⇒ page 312

4 - Bolt
- ❑ 25 Nm

5 - Coolant pipe (rear right)
- ❑ Exploded view ⇒ page 281

6 - O-ring
- ❑ Renew

7 - Bolt
- ❑ Tightening torque and sequence ⇒ page 305

8 - Oil supply line
- ❑ From cylinder block

9 - Bolt
- ❑ Tightening torque ⇒ Item 22 (page 283)

10 - Bolt
- ❑ Tightening torque and sequence ⇒ page 305

11 - Seals
- ❑ Renew

12 - Banjo bolt
- ❑ Tightening torque and sequence ⇒ page 305

13 - Air pipe (right-side)
- ❑ Must be free of oil or grease when installing

14 - Hose clip

- ❑ Reinforced
- ❑ Tightening torque ⇒ page 326

15 - Air hose

- ❑ From turbocharger to air pipe (right-side)
- ❑ Must be free of oil or grease when installing

16 - Hose clip

- ❑ Reinforced
- ❑ Tightening torque ⇒ page 326

17 - Bolt

- ❑ 9 Nm

18 - Connecting piece for air intake hose

- ❑ From air mass meter - G70- to turbocharger
- ❑ Must be free of oil or grease when installing

19 - Exhaust gas temperature sender 1 - G235-

- ❑ Removing and installing ⇒ page 369

20 - Seal

- ❑ Renew if damaged

21 - Bolt

- ❑ 9 Nm

22 - Heat shield for turbocharger

23 - Turbocharger

- ❑ Removing and installing ⇒ page 305

24 - Bolt

- ❑ Renew
- ❑ Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 30 Nm + 90°

25 - Gasket

- ❑ Renew

26 - Particulate filter

- ❑ Exploded view: vehicles with front-wheel drive ⇒ page 330 , vehicles with four-wheel drive ⇒ page 342 .

27 - Nut

- ❑ Tightening torque ⇒ Item 11 (page 332)

28 - Gasket

- ❑ Renew

29 - Bolt

- ❑ Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ Initially tighten to 7 Nm.
- ❑ 9 Nm

30 - Top section of oil return line

- ❑ From turbocharger

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31 - Bolts

- ❑ 9 Nm

32 - Bottom section of oil return line

- ❑ To cylinder block

33 - O-rings

- ❑ Renew

34 - Seal

- ❑ Renew

35 - Intermediate pipe

- ❑ Exploded view ⇒ page 362

36 - Bolt

- ❑ Tightening torque ⇒ Item 5 (page 363)

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37 - Gasket

- ❑ Renew

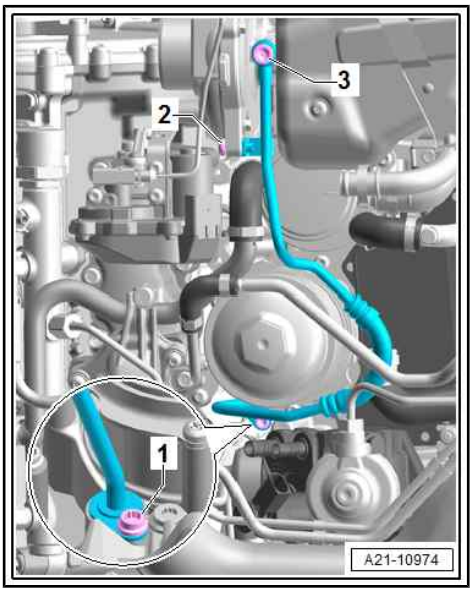
38 - Bolt

- ❑ 25 Nm

39 - Bolt

- ❑ 5 Nm + 90°

Oil supply line - tightening torque and sequence



Note

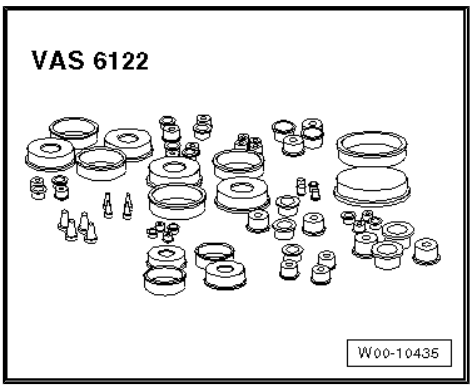
When tightening bolts -2 and 3-, ensure that the oil supply line and bracket are not subjected to torsional or bending stress.

- Fit bolt -1- on mounting plate for engine oil cooler and tighten to 9 Nm.
- Fit bolt -3- on turbocharger.
- Fit bolt -2- for oil supply line bracket and hand-tighten.
- Tighten bolt -3- on turbocharger to 15 Nm.
- Tighten bolt -2- for oil supply line bracket to 9 Nm.

1.2 Removing and installing turbocharger

Special tools and workshop equipment required

♦ Engine bung set - VAS 6122-



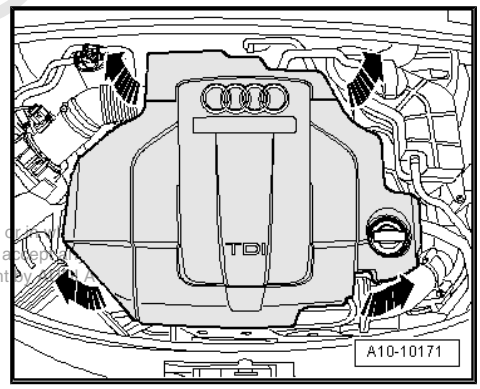
Removing

Caution

If the turbocharger has suffered mechanical damage (e.g. damaged compressor wheel), it is not sufficient merely to fit a new turbocharger. The following work must be performed in order to avoid further damage:

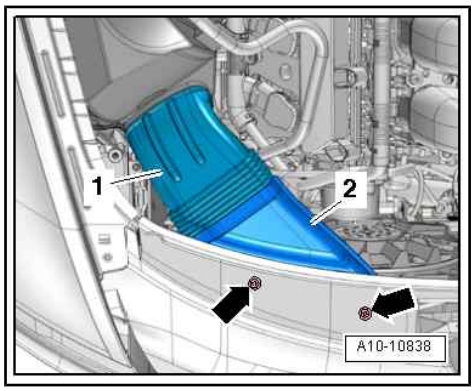
- *Check air cleaner housing, air filter element and air hoses for dirt and foreign particles.*
- *Check the entire charge air system (including the charge air cooler) for foreign matter.*
- *If foreign matter is found in the charge air system, clean all relevant ducts and hoses and renew charge air cooler if necessary.*

– Carefully pull engine cover panel off four retaining pins one after the other -arrows-.

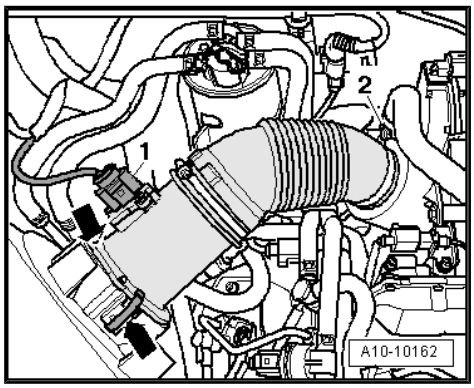


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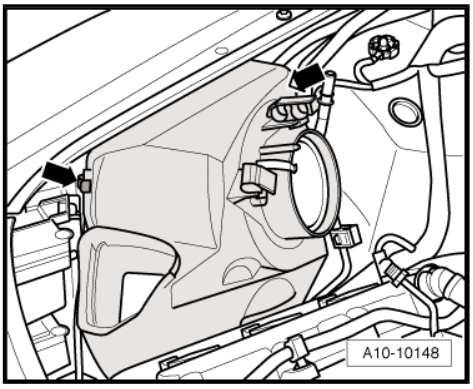
– Remove bolts -arrows-, detach air ducts -1- and -2-.



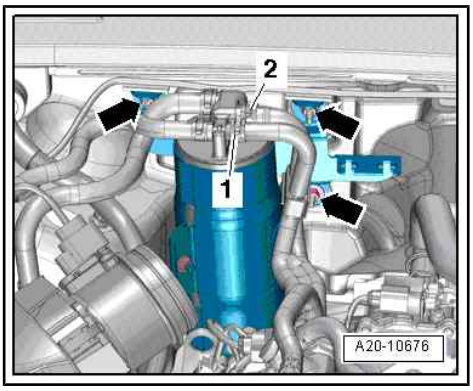
– Unplug electrical connector -1- from air mass meter - G70- .
– Remove air hose. To do so, release hose clip -2- and clamps -arrows-.



– Release clamps -arrows- and detach air cleaner (top section).



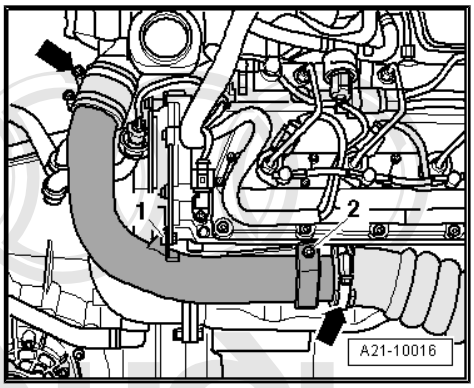
– Move electrical wiring clear at bracket for fuel filter.
– Remove bolts -arrows- and push fuel filter to side with hoses -1- and -2- attached.



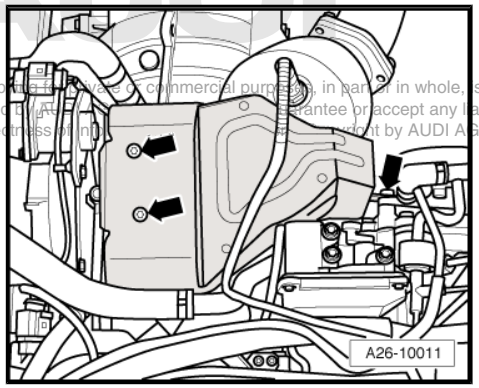
– Remove bolts -1- and -2-.
– Release hose clip -top arrow- and detach air pipe from air hose.

Note

Disregard -bottom arrow-.



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

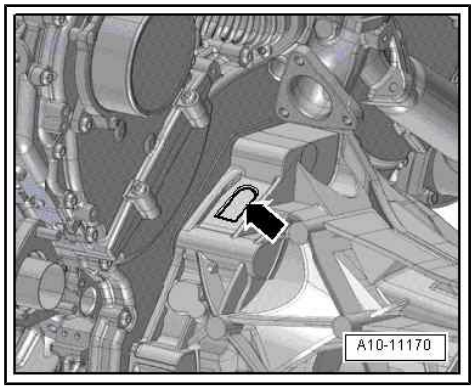


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Caution

Risk of serious damage to gearbox.

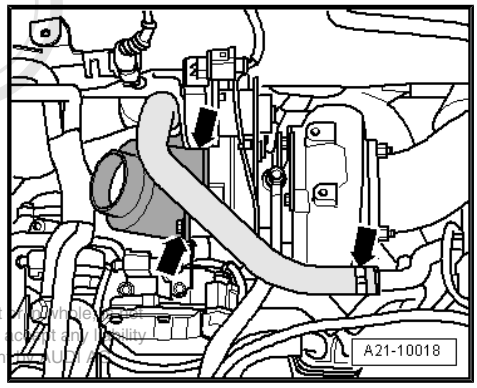
- *Block off the opening in the gearbox with a clean cloth to prevent small items from dropping into the opening -arrow-.*



Note

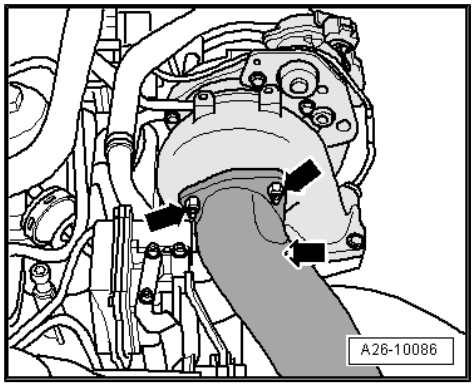
For illustration purposes, the installation position is shown with the intermediate pipe removed.

– Unbolt air intake connection -left arrows- and move it aside with air intake hose connected -right arrow-.



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– Move clear electrical wiring for Lambda probe - G39- .
– Remove nuts -arrows- securing starter catalytic converter to turbocharger and pull starter catalytic converter to the side.

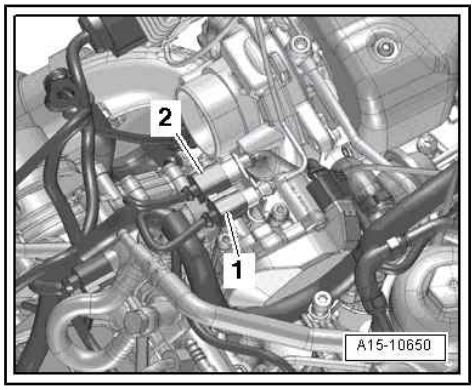


Vehicles with 3.0 ltr. engine:

– Unplug electrical connector -1- (black) for exhaust gas temperature sender 1 - G235- .

Note

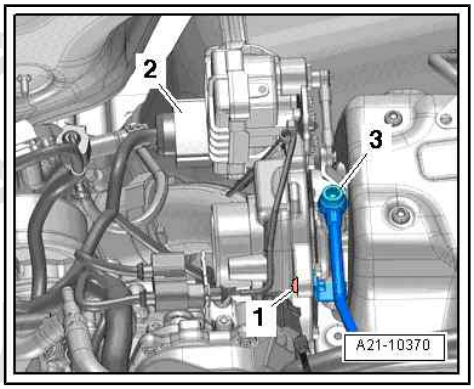
Disregard -item 2-.



All vehicles (continued):

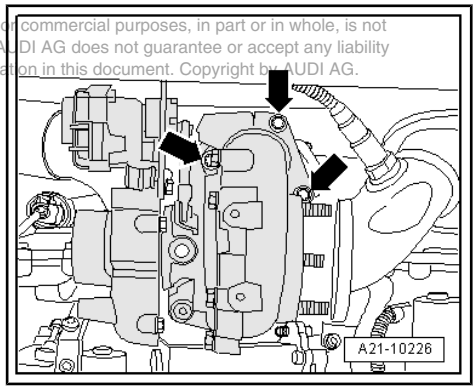
– Unplug electrical connector-2- at turbocharger 1 control motor - V280- .

– Remove bolt -1- and banjo bolt -3- for oil supply line at turbocharger.



– Remove bolts -arrows- for turbocharger.

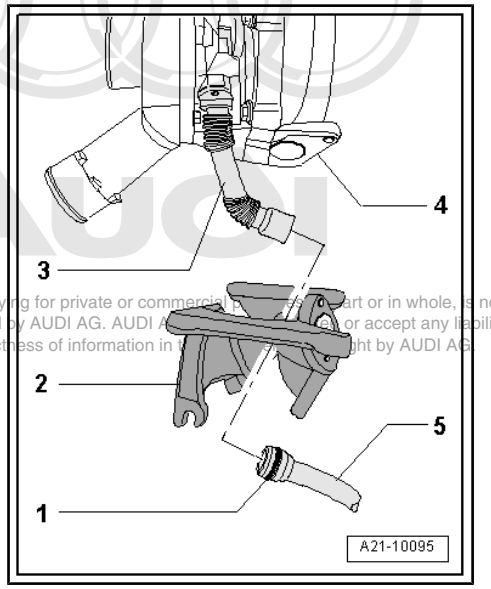
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Caution

Make sure that the two pipes of the oil return line are not damaged/bent.

- ***The top section of the oil return line -3- is secured to the turbocharger and must be detached carefully from the bottom section of the oil return line -5-.***
- ***To avoid bending the two pipes of the oil return line, move the turbocharger -4- slightly backwards and forwards while pulling it off upwards and towards one side.***



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1 - O-ring

2 - Intermediate flange

– Remove turbocharger.

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

Note

After removing the turbocharger, do not put it down so it rests on the top section of the oil return line – this could cause damage.

Installing

- Tightening torques
⇒ “1.1 Turbocharger - exploded view”, page 303

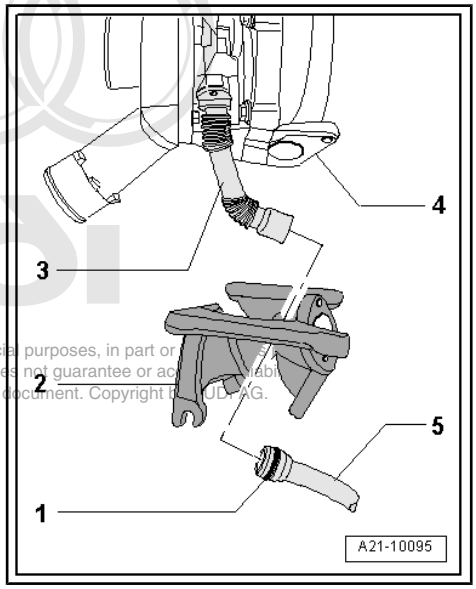
Note

- *Renew gaskets, seals and O-rings.*
- *Fill turbocharger with engine oil at connection for oil supply line.*
- *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 .*
- *After installing the turbocharger, allow the engine to idle for approx. 1 minute without pressing the accelerator to ensure that the turbocharger is supplied with oil.*

– Fit new O-ring -1- on bottom section of oil return line -5-.

– Lightly lubricate O-ring and internal sealing surface of top section of oil return line -3- with oil.

– When fitting turbocharger -4-, guide top section of oil return line -3- through intermediate flange -2- and towards bottom section of oil return line -5-.



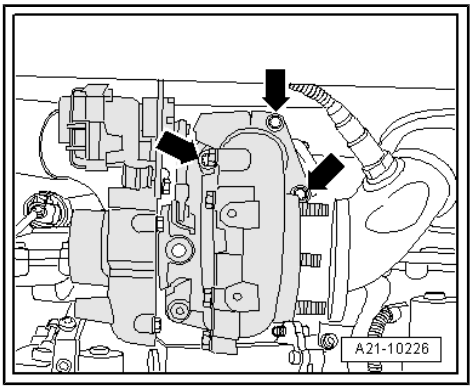
Caution

Make sure O-ring is not damaged.

- ***Carefully push top section -3- of oil return line onto bottom section -5- of oil return line.***

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– Secure turbocharger -arrows-.



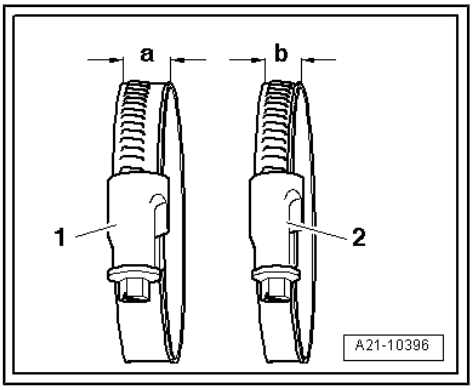
Remaining installation steps are carried out in reverse sequence; note the following:

– Install air pipe ⇒ page 326 .

– Install fuel filter ⇒ Rep. gr. 20 .

– Install top section of air cleaner ⇒ Rep. gr. 23 .

– Install air hoses with screw-type clips ⇒ page 326 .

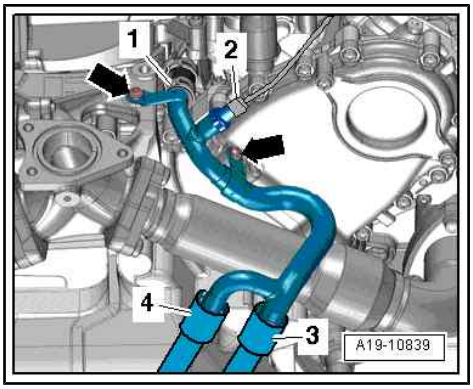


1.3 Removing and installing intermediate flange

Removing

– Remove turbocharger ⇒ page 305 .

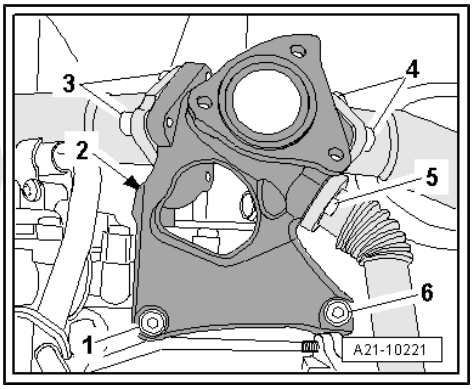
– Remove bolts -arrows-.



Note

Disregard items -1 ... 4-.

– Remove bolts -3- (3x), -4- (3x), -5- (2x) and -1, 2 and 6- and take off intermediate flange.



Installing

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

- Tightening torques
  ⇒ “1.1 Turbocharger - exploded view”, page 303

Note

Renew seals and/or gaskets.

– Install turbocharger ⇒ page 305 .

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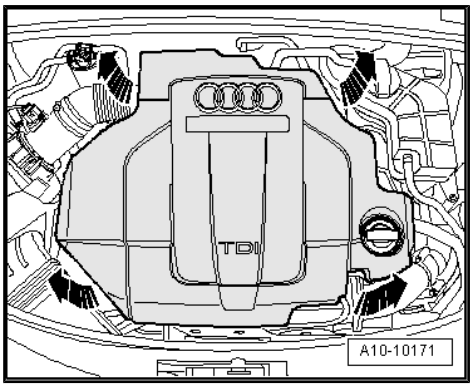
1.4 Removing and installing turbocharger 1 control unit - J724-

Special tools and workshop equipment required

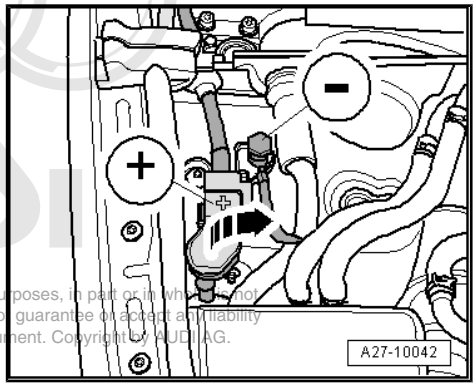
- Tester for E-positioner - VAS 6395-
- Connection lead - VAS 6395/2-
- Stop plate - VAS 6395/5-

Removing

– Remove engine cover panel -arrows-.



– Connect tester for E-positioner - VAS 6395- to positive terminal “+” and negative terminal “–” with connection lead - VAS 6395/2- .

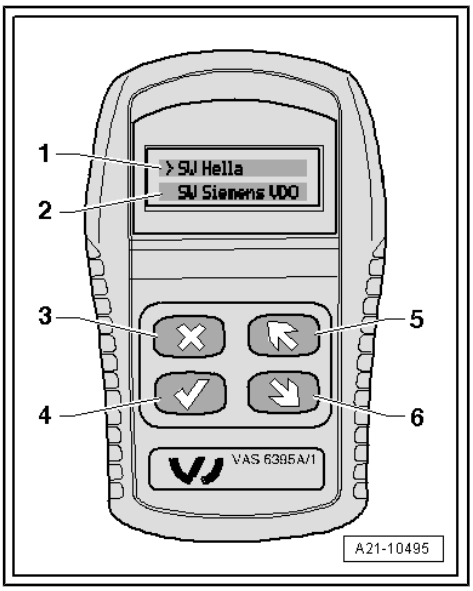


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Procedure for tester for E-positioner - VAS 6395A/1- :

– Select software version with buttons [↑] -item 5- and [↓] -item 6-.

– To confirm software version, press [V] button -item 4-.



Note

In this example, software version Hella -item 1- is selected.

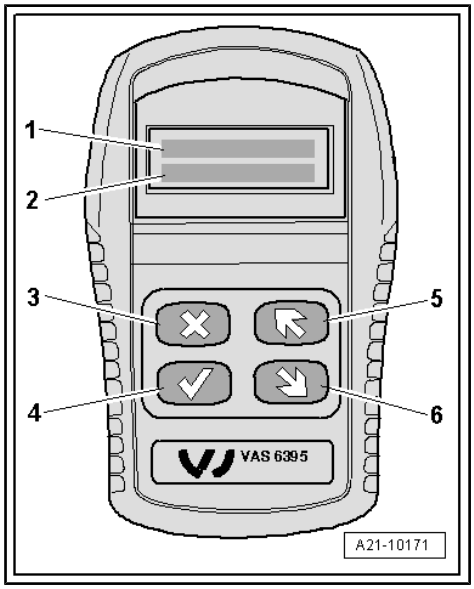
Procedure for tester for E-positioner - VAS 6395/1- :

Checking software version of tester for E-positioner - VAS 6395/1- :

Caution

Risk of damage to turbocharger 1 control unit - J724- .

- ***Before continuing, check whether the correct software version is loaded in the tester for E-positioner - VAS 6395/1- . To do so, proceed as follows:***



Display on -VAS 6395/1- (2 seconds after connecting to power supply) if correct software version is loaded:

1 - > 1. START

2 - 2. NEXT [>]

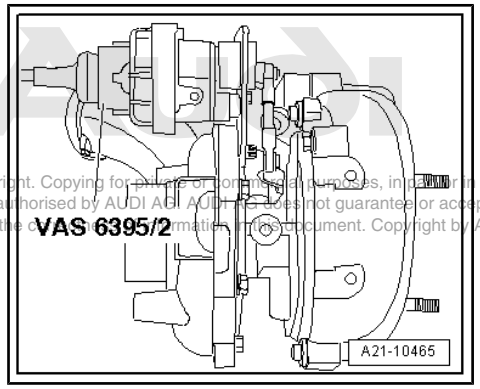
Note

- *If the following appears on the display, an incorrect software version has been loaded:*
- *1. >TEST*
- *2. LEARN*
- *If this is the case, download the correct software version from the "Audi ServiceNet" under "Workshop Equipment".*

Continued for both testers for E-positioner :

– Unplug electrical connector for turbocharger 1 control unit - J724- .

– Connect connection lead - VAS 6395/2- to turbocharger 1 control unit - J724- and to tester for E-positioner - VAS 6395- .



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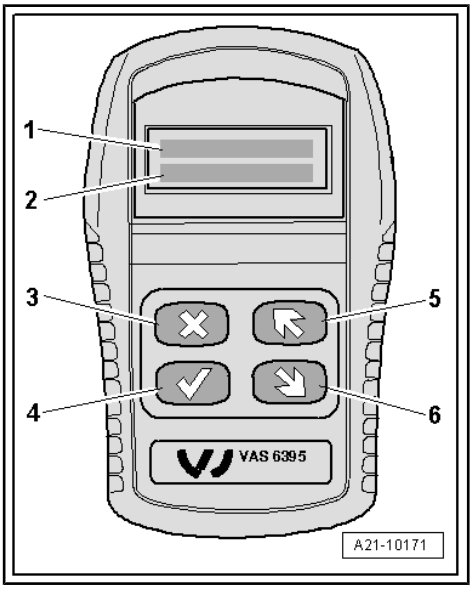
Display on -VAS 6395- :

1 - > 1. START

2 - 2. NEXT [>]

– To continue, press V button -item 4-.

• The tester for E-positioner - VAS 6395- runs through the adjustment range of the turbocharger 1 control unit - J724- and checks whether the end positions are reached; display indicates “CHECK”.



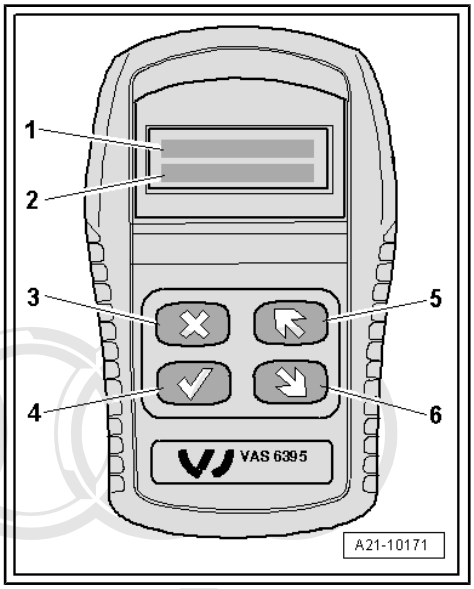
Display on -VAS 6395- :

1 -

2 - [OK]

Note

- *If the display indicates “[OK]”, the adjustment range of the turbocharger 1 control unit - J724- is OK.*
- *If the display shows “FAULT [OK]”, tap gently several times on the housing of turbocharger 1 control unit - J724- with the handle of a screwdriver and repeat the check by pressing V button -item 4-.*

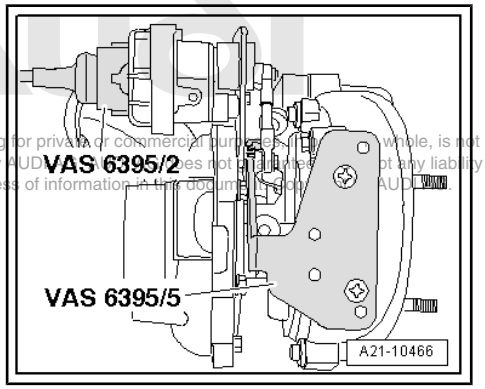


– Secure stop plate - VAS 6395/5- with countersunk bolts supplied with and screwed into stop plate (8 Nm).

Caution

Measurement errors due to incorrect attachment of stop plate - VAS 6395/5- .

- ***The stop plate should only be bolted on using the countersunk bolts supplied with the stop plate.***
- ***The stop plate must not be loosened until the work sequence has been completed.***



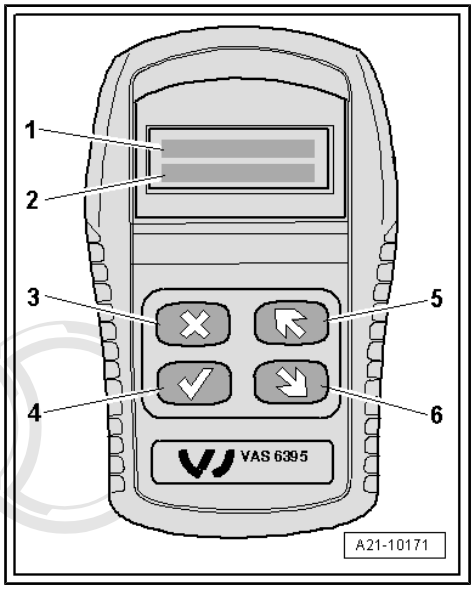
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– To continue, press [V] button -item 4-.

• The turbocharger 1 control unit - J724- moves back and forth between the stops several times to determine the voltage value.

• Then the turbocharger 1 control unit - J724- moves into installation position.

– While the voltage value is being determined, keep tapping gently on the housing of turbocharger 1 control unit - J724- until the display indicates the following:



Display on -VAS 6395- :

1 - X.XXX V

2 - [↑][↓][OK]

– Note voltage value.

• Specification: 3.3 ... 3.7 V

Note

If the display indicates "FAULT [OK]" or the voltage is less than 3.3 V or greater than 3.7 V, unplug the tester for E-positioner - VAS 6395- and repeat the complete procedure ⇒ *page 314* .

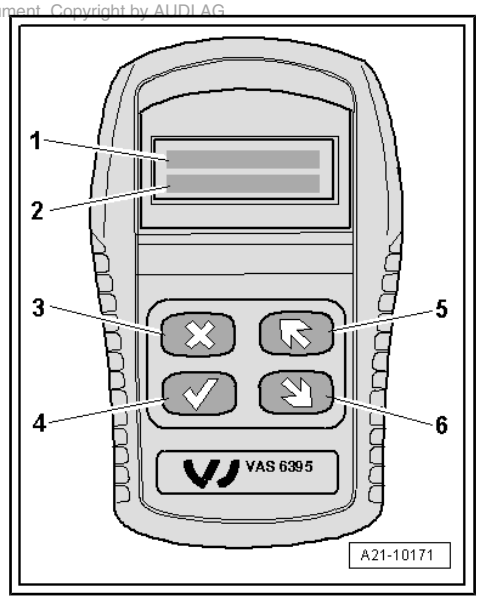
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Display on -VAS 6395- :

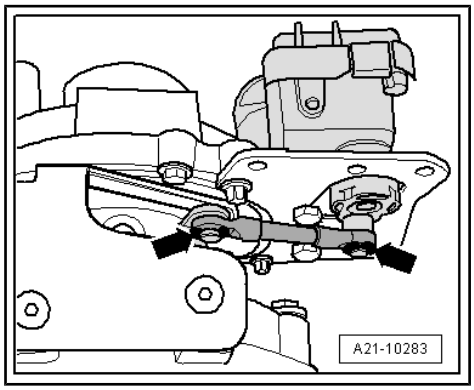
1 - X.XXX V

2 - [↑][↓][OK]

– By pressing buttons [↑] -item 5- and [↓] -item 6-, adjust turbocharger 1 control unit - J724- so that coupling rod can be accessed easily for removal.



– Unclip circlips -arrows- and dispose of them, detach coupling rod.

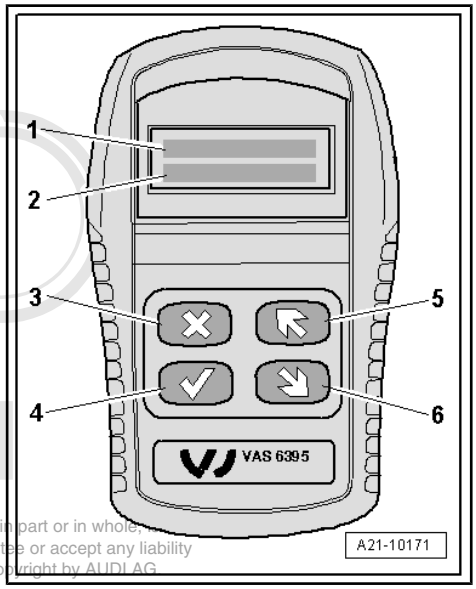


Display on -VAS 6395- :

1 - X.XXX V

2 - [↑][↓][OK]

– By pressing buttons [↑] -item 5- and [↓] -item 6-, adjust turbocharger 1 control unit - J724- so that bolts for -J724- can be accessed easily.

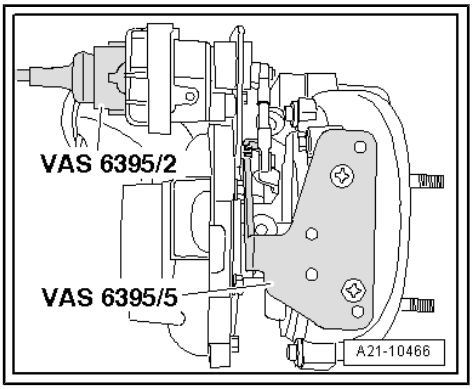


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– Disconnect connection lead - VAS 6395/2- from turbocharger 1 control unit - J724- .

Caution

Tester for E-positioner - VAS 6395- should remain connected to power supply.

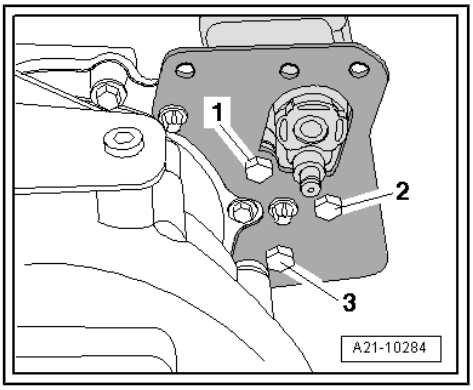


– Remove bolts -1, 2, 3- and dispose of them.

– Remove old turbocharger 1 control unit - J724- and dispose of it.

Caution

Check that the three insulating washers are fitted between turbocharger 1 control unit - J724- and the bracket.



– Install new turbocharger 1 control unit - J724- in reverse sequence of removal.

– Fit new bolts as follows:

1 - M6x15 with tapered shank

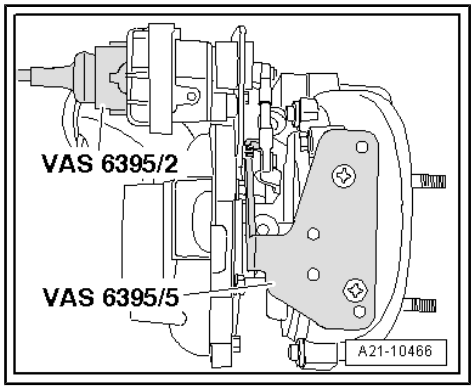
2 - M6x15 with tapered shank

3 - M6x15

– Initially hand-tighten bolts.

• Turbocharger 1 control unit - J724- must rest on retaining plate so there is no play; it must still be possible to move control unit by hand.

– Connect connection lead - VAS 6395/2- to new turbocharger 1 control unit - J724- .



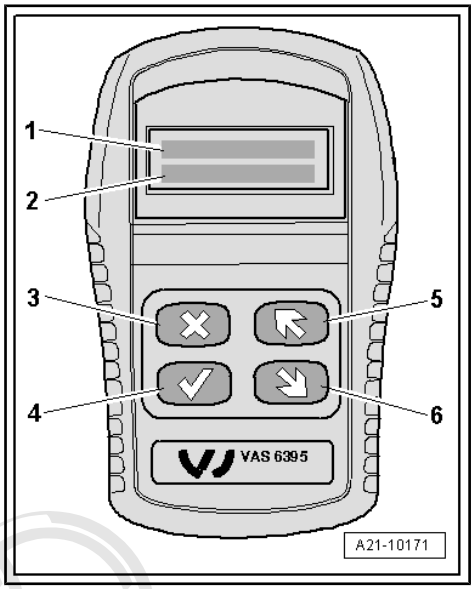
– To continue, press [V] button -item 4-.

Display on -VAS 6395- :

1 - > 1. START

2 - 2. NEXT [>]

– Select menu item “NEXT” with [↓] button -item 6-.



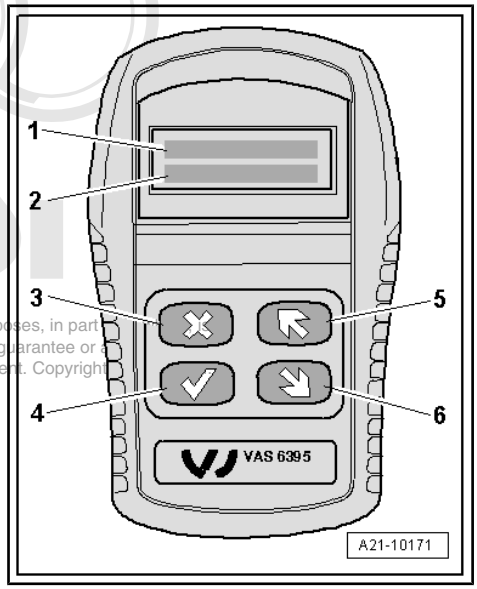
– To continue, press [V] button -item 4-.

• The tester for E-positioner - VAS 6395- runs through the adjustment range of the turbocharger 1 control unit - J724- and checks whether the end positions are reached; display indicates “CHECK”.

Display on -VAS 6395- :

1 - X.XXX V

2 - [OK]



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Note

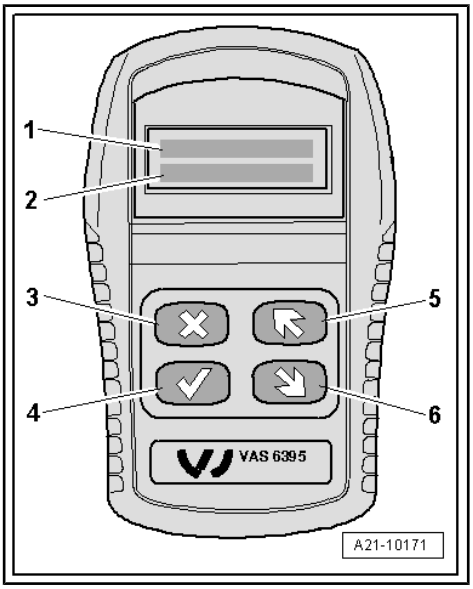
If the display indicates “FAULT”, the new turbocharger 1 control unit - J724- must be renewed for a second time.

– To continue, press V button -item 4-.

Display on -VAS 6395- :

1 -

2 - [OK]



– To continue, press V button -item 4-.

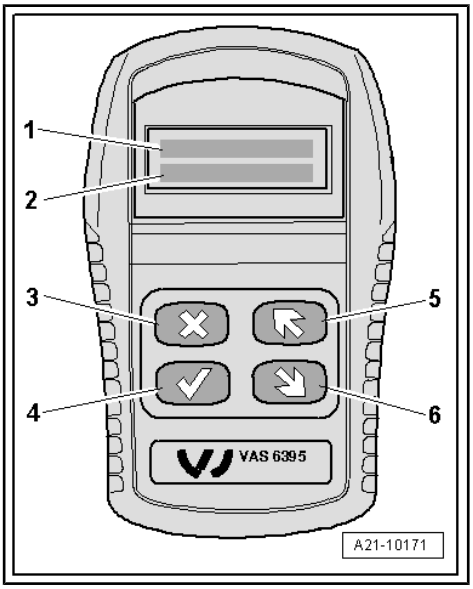
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Display on -VAS 6395- :

1 - X.XXX V (voltage determined with first measurement)

2 - [OK]

• Turbocharger 1 control unit - J724- moves into installation position.

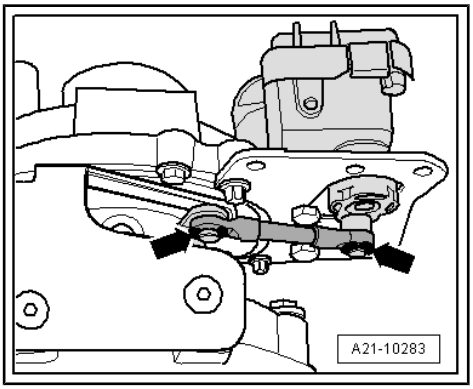


– Insert coupling rod.

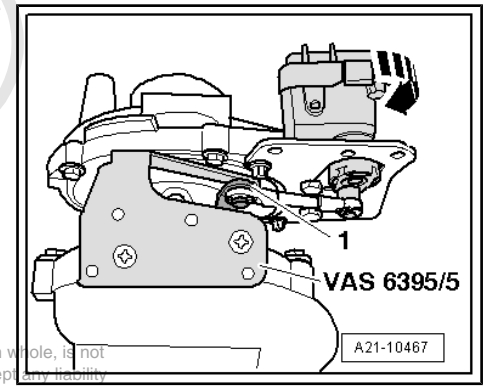
• Installation position: The thicker eyelet is fitted onto the shaft of turbocharger 1 control unit - J724- .

– Fit circlips -arrows-.

• The circlips must engage audibly.

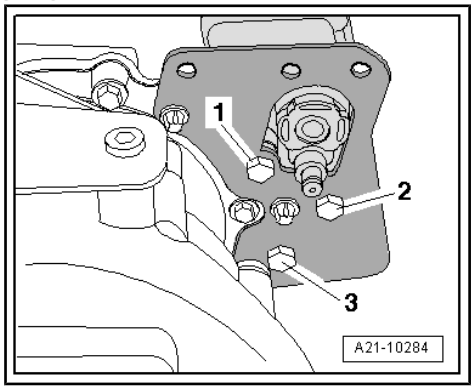


– Press turbocharger 1 control unit - J724- towards the rear without applying force -arrow- until lever -1- rests lightly on stop plate - VAS 6395/5- .
– Hold -J724- in this position.



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– Tighten bolts -1, 2, 3- to 5 Nm.

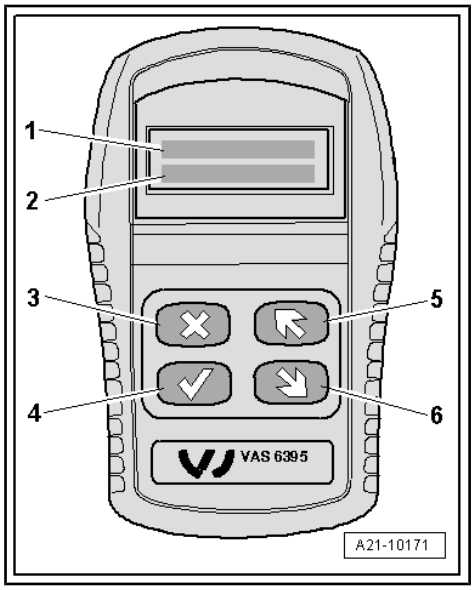


– To continue, press V button -item 4-.
• Turbocharger 1 control unit - J724- moves back and forth between the stops several times and is adjusted to the voltage value determined with the first measurement.

Display on -VAS 6395- :

1 - X.XXX V

2 - [OK]



Note

♦ *If [OK] is indicated on display, terminate adjustment* *⇒ page 322* .

♦ *If "CHECK" is indicated on display, proceed as follows.*

Procedure if display indicates “CHECK”:

Display on -VAS 6395- :

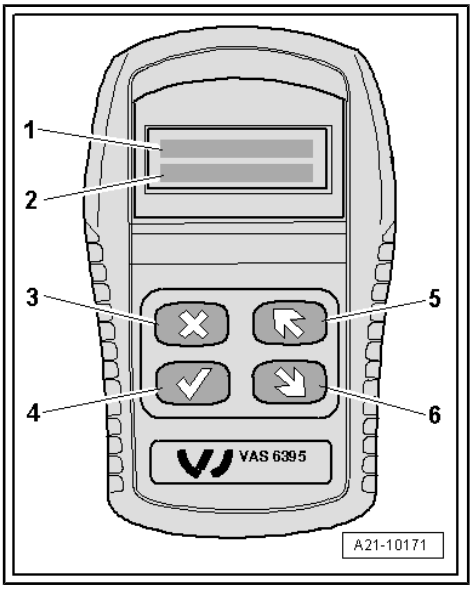
1 - [<<<]

2 - CHECK

or

1 - [>>>]

2 - CHECK

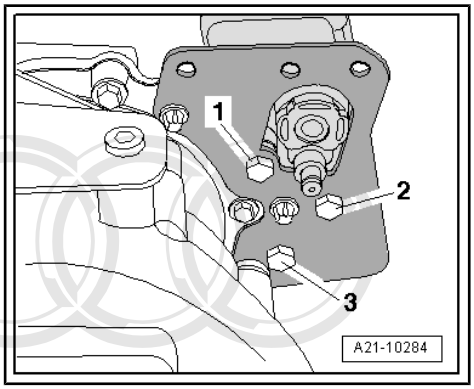


– Loosen bolts -1, 2, 3- until turbocharger 1 control unit - J724- can just be moved by applying light force in the direction stated:

• If display indicates [<<<], move -J724- slightly in direction of travel.

• If display indicates [>>>], move -J724- slightly towards rear of vehicle.

– Tighten bolts -1, 2, 3- to 5 Nm.



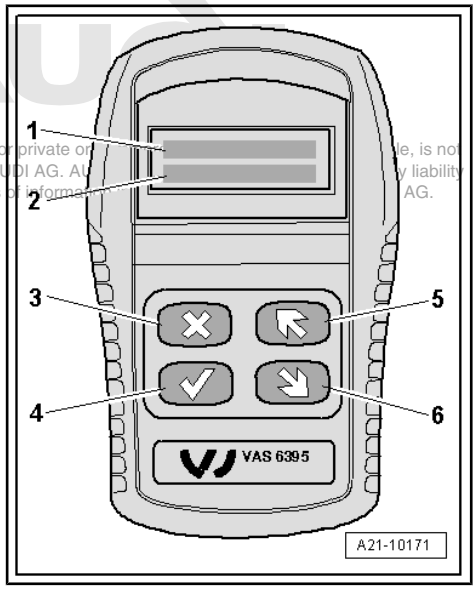
– To continue, press V button -item 4-.

• Turbocharger 1 control unit - J724- again moves back and forth between the stops several times and is adjusted to the voltage value determined with the first measurement.

Display on -VAS 6395- :

1 - X.XXX V (voltage determined with first measurement)

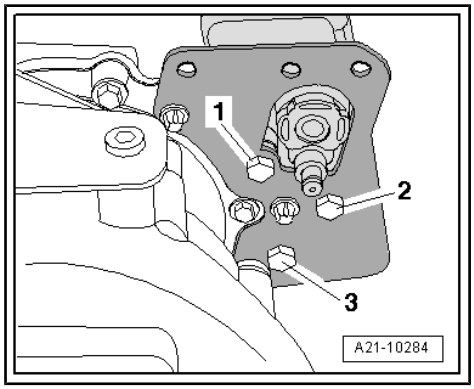
2 - [OK]



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Terminating adjustment:

– Tighten bolts -1, 2, 3- to 10 Nm.

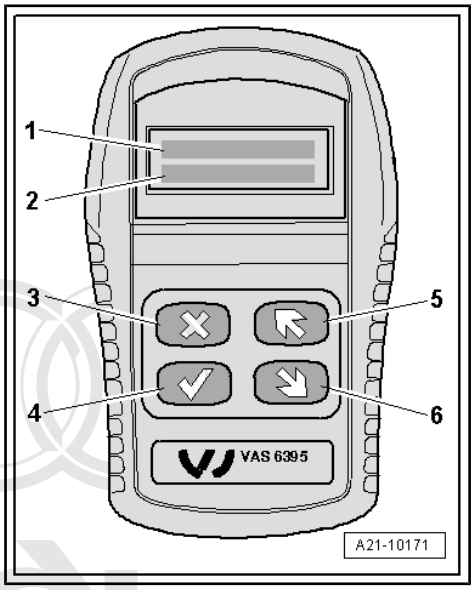


– To continue, press V button -item 4-.

Display on -VAS 6395- :

1 - X.XXX V

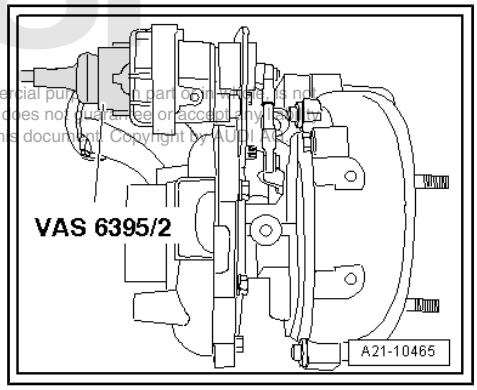
2 - [OK]



– Remove stop plate - VAS 6395/5- .

– Secure electrical wiring with retaining clip -1-.

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– To continue, press [V] button -item 4-.

• Turbocharger 1 control unit - J724- moves to end positions.

Note

If the display indicates "FAULT", the new turbocharger 1 control unit - J724- must be renewed *⇒ page 317* *.*

Display on -VAS 6395- :

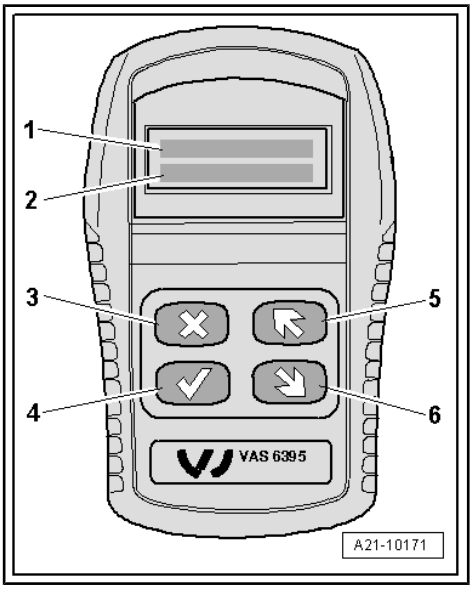
1 -

2 - [OK]

• Adjustment is completed.

– Unplug electrical connectors for tester for E-positioner - VAS 6395- .

Assemble in reverse order.



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2 Charge air cooling

Overview

- ⇒ “2.1 Charge air cooler - exploded view”, page 324
- ⇒ “2.2 Removing and installing charge air cooler”, page 326
- ⇒ “2.3 Removing and installing charge pressure sender G31 - vehicles without auxiliary heater”, page 328
- ⇒ “2.4 Removing and installing charge pressure sender G31 - vehicles with auxiliary heater”, page 329

– Observe rules for cleanliness ⇒ page 7 .

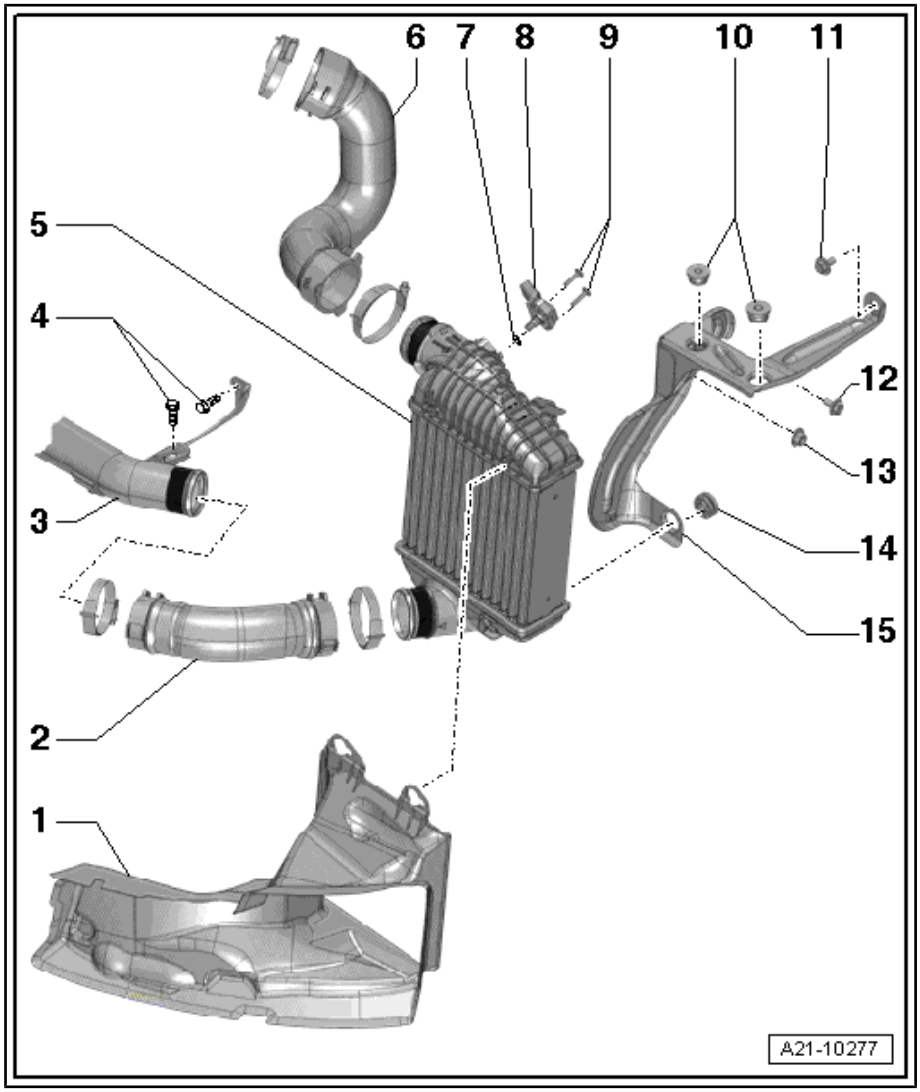
2.1 Charge air cooler - exploded view

Note

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The illustrations show the left-side charge air cooler.

Vehicles with 2.7 ltr. engine



1 - Air duct

2 - Air hose
- ❑ To charge air cooler
- ❑ Must be free of oil or grease when installing

3 - Front air pipe
- ❑ Must be free of oil or grease when installing

4 - Bolts
- ❑ 9 Nm

5 - Charge air cooler
- ❑ Removing and installing ⇒ page 326

6 - Air hose
- ❑ To intake manifold
- ❑ Must be free of oil or grease when installing

7 - O-ring
- ❑ Renew

8 - Charge pressure sender - G31-
- ❑ Removing and installing: vehicles without auxiliary heater ⇒ page 328 , vehicles with auxiliary heater ⇒ page 329 .

9 - Bolts
- ❑ 5 Nm

10 - Retainer

11 - Bolt
- ❑ 22 Nm

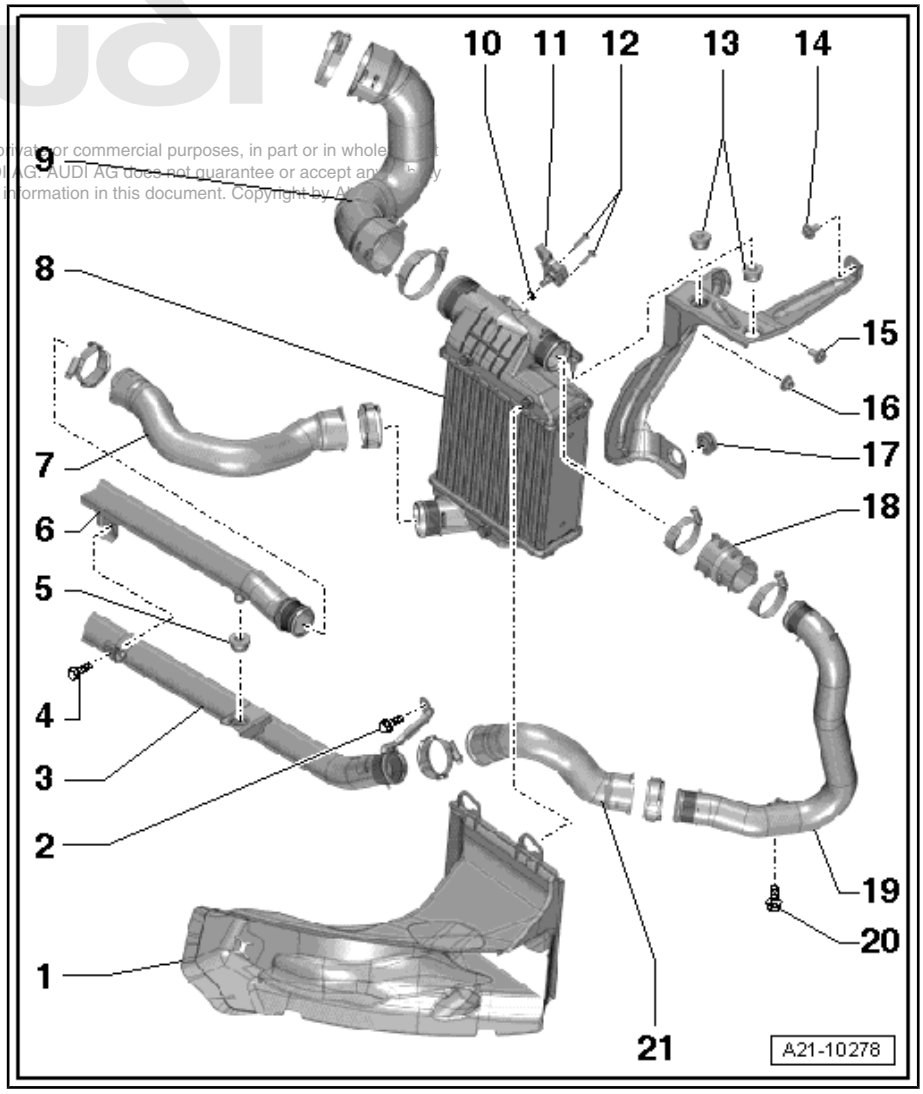
12 - Bolt
- ❑ 22 Nm

13 - Nut
- ❑ 22 Nm

14 - Grommet

15 - Bracket

Vehicles with 3.0 ltr. engine



1 - Air duct

2 - Bolt
- ❑ 9 Nm

3 - Air pipe (bottom front)
- ❑ Must be free of oil or grease when installing

4 - Bolt
- ❑ 9 Nm

5 - Rubber bush
- ❑ Renew if damaged

6 - Air pipe (top front)
- ❑ Must be free of oil or grease when installing

7 - Air hose
- ❑ To charge air cooler
- ❑ Must be free of oil or grease when installing

8 - Charge air cooler
- ❑ Removing and installing ⇒ page 326

9 - Air hose
- ❑ To intake manifold
- ❑ Must be free of oil or grease when installing

10 - O-ring
- ❑ Renew

11 - Charge pressure sender - G31-
- ❑ Removing and installing ⇒ page 328

12 - Bolts
- ❑ 5 Nm

13 - Retainer

14 - Bolt
- ❑ 22 Nm

15 - Bolt
- ❑ 22 Nm

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16 - Nut

- ❑ 22 Nm

17 - Grommet

18 - Air hose

- ❑ Must be free of oil or grease when installing

19 - Air pipe

- ❑ Must be free of oil or grease when installing

20 - Bolt

- ❑ 9 Nm

21 - Air hose

- ❑ Must be free of oil or grease when installing

Installing air hoses with screw-type clips

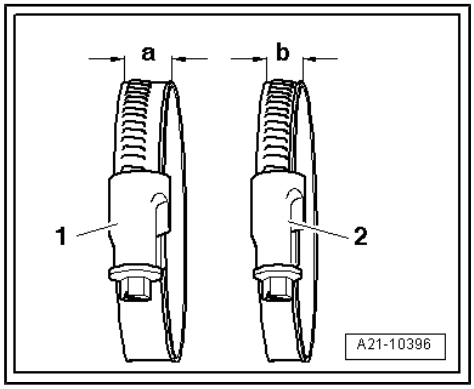
Note

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.

Tightening torque for

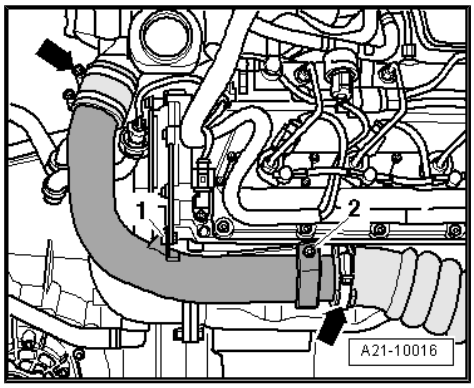
1 - Hose clip -a- = 13 mm wide: 5.5 Nm

2 - Hose clip -b- = 9 mm wide: 3 Nm



Air pipe - tightening torque

– Tighten bolts -1- and -2- to 9 Nm.



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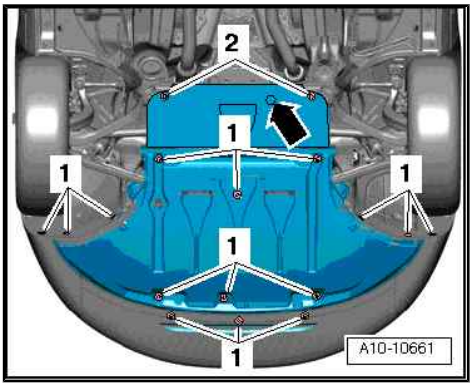
2.2 Removing and installing charge air cooler

Removing

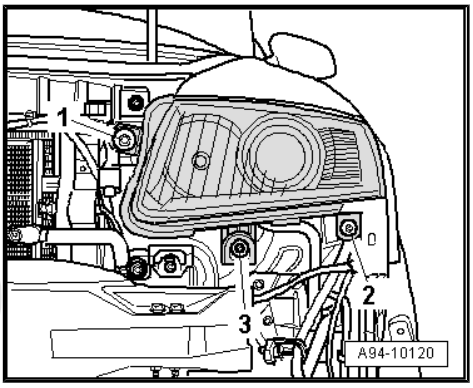
Note

The following description shows the removal and installation of the left-side charge air cooler.

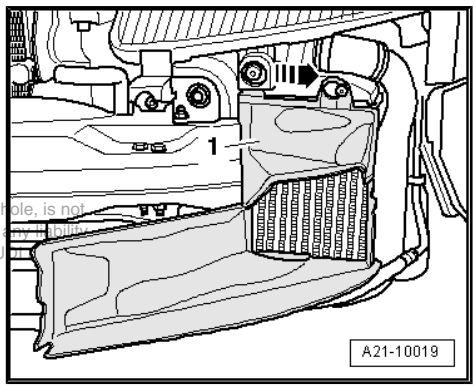
– Remove front wheel (left-side) ⇒ Wheels and tyres; Rep. gr. 44 .
– Remove front and rear noise insulation ⇒ Rep. gr. 50 .
– Remove front left wheel housing liner ⇒ Rep. gr. 66 .



– Remove headlight (left-side) ⇒ Rep. gr. 94 .



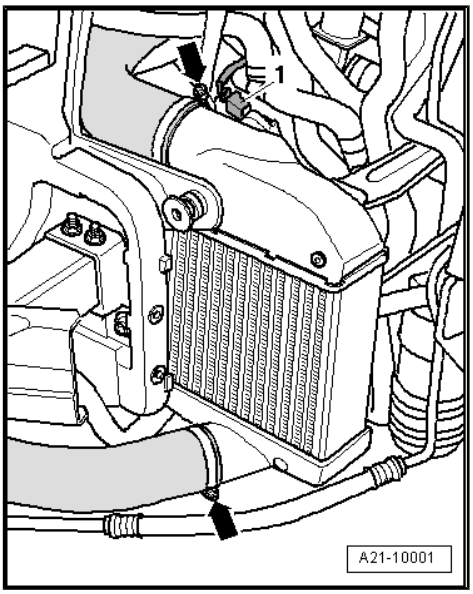
– Remove air duct -1- for charge air cooler -arrow-.



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Vehicles with 2.7 ltr. engine:

– Unplug electrical connector -1- for charge pressure sender - G31- .
– Release hose clips -arrows- and detach air hoses.



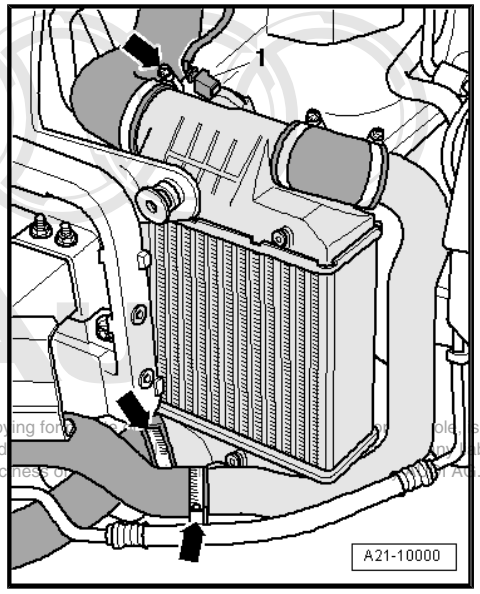
Vehicles with 3.0 ltr. engine:

– Unplug electrical connector -1- for charge pressure sender - G31- .

– Release hose clips -arrows- and detach air hoses.

All vehicles (continued):

– Grasp bottom edge of charge air cooler, pull it forwards and disengage upwards.



Installing

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

- Tightening torque
  ⇒ “2.1 Charge air cooler - exploded view”, page 324

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Note

- *If there are slight impressions on the fins, refer to ⇒ page 8 .*
- *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 .*

– Install headlights ⇒ Rep. gr. 94 .

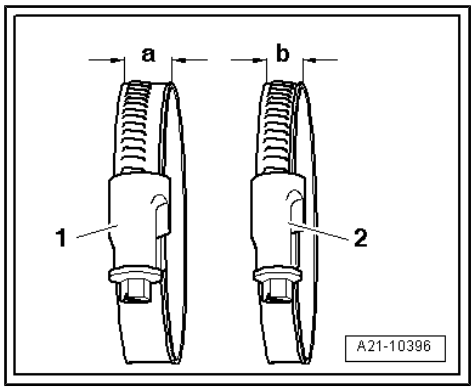
– Install air hoses with screw-type clips ⇒ page 326 .

– Install front wheel housing liner ⇒ Rep. gr. 66 .

– Install noise insulation panels ⇒ Rep. gr. 50 .

– Fit front wheel ⇒ Wheels and tyres; Rep. gr. 44 .

– Check headlight setting ⇒ Maintenance ; Booklet 405

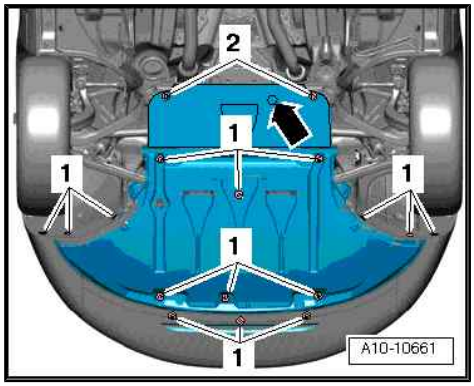


2.3 Removing and installing charge pressure sender - G31- - vehicles without auxiliary heater

Removing

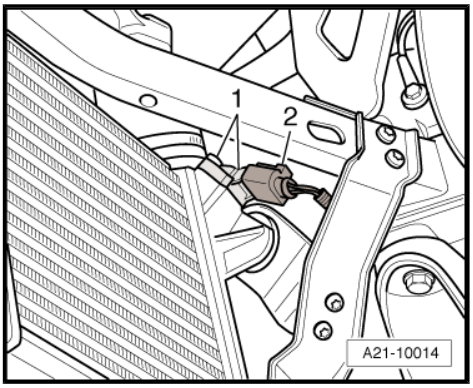
– Remove front and rear noise insulation ⇒ Rep. gr. 50 .

– Remove front left wheel housing liner ⇒ Rep. gr. 66 .



– Unplug electrical connector -2-.

– Remove bolts -1- and pull charge pressure sender - G31- out of charge air cooler.



Installing

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

- Tightening torque
  ⇒ “2.1 Charge air cooler - exploded view”, page 324

Note

Fit new O-ring.

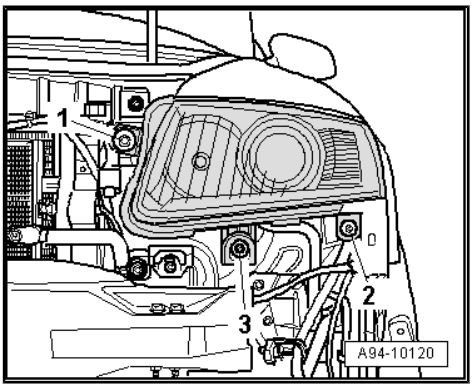
– Install front wheel housing liner ⇒ Rep. gr. 66 .

– Install noise insulation panels ⇒ Rep. gr. 50 .

2.4 Removing and installing charge pressure sender - G31- - vehicles with auxiliary heater

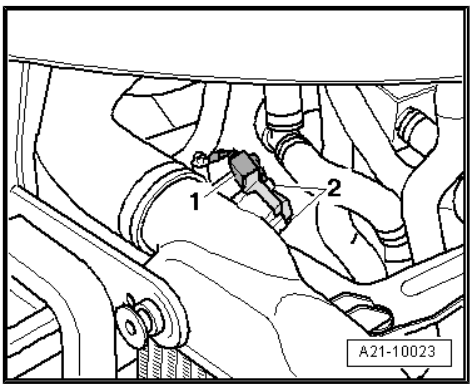
Removing

– Remove headlight (left-side) ⇒ Electrical system; Rep. gr. 94 .



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– Unplug electrical connector -1- at charge pressure sender - G31- .



– Remove bolts -2- and pull charge pressure sender - G31- out of charge air cooler.

Installing

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

- Tightening torque
  ⇒ “2.1 Charge air cooler - exploded view”, page 324

Note

Fit new O-ring.

– Install headlights ⇒ Electrical system; Rep. gr. 94 .

– Check headlight setting ⇒ Maintenance ; Booklet 405

26 – Exhaust system

1 Silencers - vehicles with front-wheel drive

Note

After working on the exhaust system, ensure that the system is not under stress and that it has sufficient clearance from the body. If necessary, loosen clamps and align silencers and exhaust pipes so that sufficient clearance is maintained to the body at all points and the mountings are evenly loaded.

Overview

- ⇒ “1.1 Silencers - exploded view”, page 330
- ⇒ “1.2 Removing and installing starter catalytic converter - vehicles with manual gearbox”, page 334
- ⇒ “1.3 Removing and installing starter catalytic converter - vehicles with multitronic gearbox”, page 336
- ⇒ “1.4 Removing and installing front exhaust pipe”, page 338
- ⇒ “1.5 Removing and installing particulate filter”, page 339
- ⇒ “1.6 Separating Y-pipe and rear silencers”, page 340

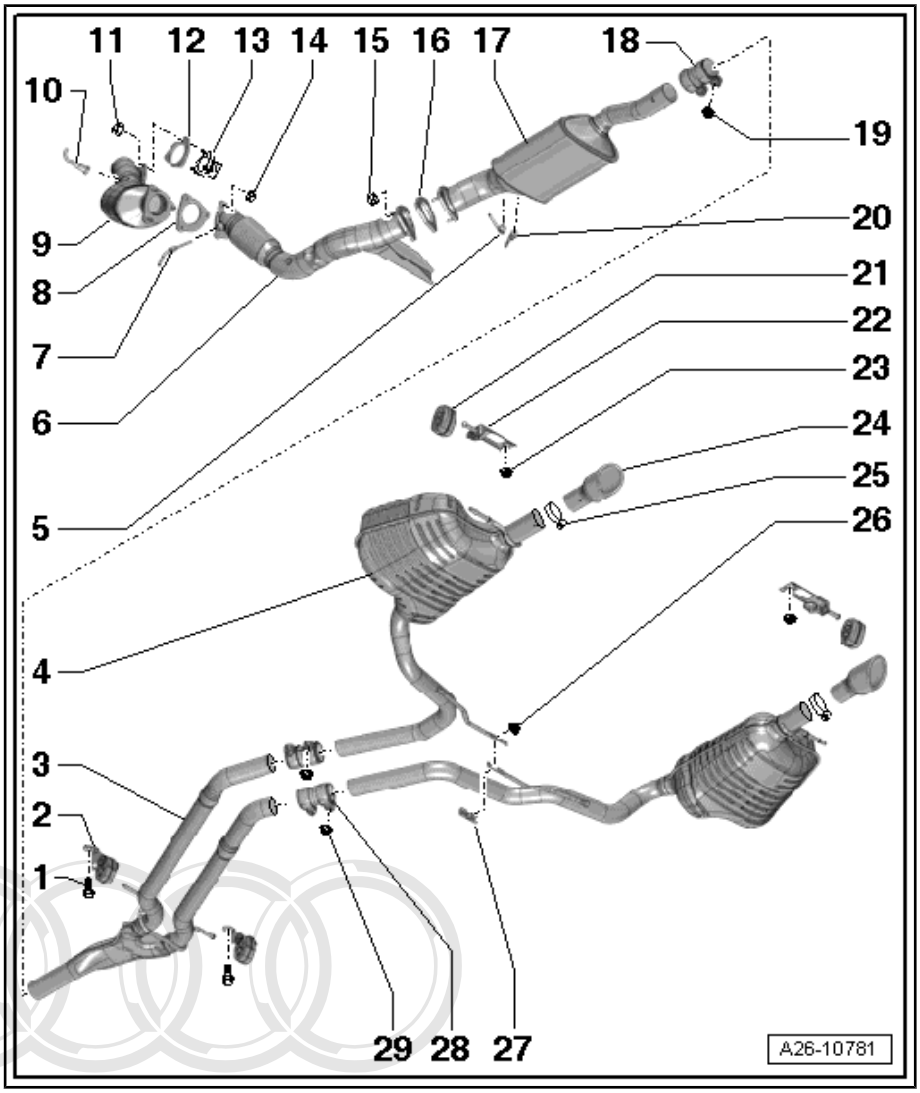
1.1 Silencers - exploded view

WARNING

Working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system***
  ⇒ “3.4 Safety precautions when working on the exhaust system”, page 5 .

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1 - Bolt

- ❑ 23 Nm

2 - Mounting

- ❑ Renew if damaged

3 - Y-pipe

- ❑ Combined in one unit with rear silencers as original equipment. Can be renewed individually for repair purposes
- ❑ Cutting point ⇒ page 340
- ❑ Align exhaust system so it is free of stress ⇒ page 359

4 - Rear silencer with tailpipe

- ❑ Combined with Y-pipe in one unit as original equipment
- ❑ Y-pipe, rear silencer and tailpipe can be renewed separately as required
- ❑ Cutting point: Y-pipe / rear silencer ⇒ page 340
- ❑ Cutting point: rear silencer / tailpipe ⇒ page 359
- ❑ Align exhaust system so it is free of stress ⇒ page 359

5 - Exhaust gas temperature sender 4 - G648-

- ❑ Exploded view ⇒ page 367

6 - Front exhaust pipe

- ❑ With flexible joint
- ❑ Do not bend flexible joint more than 10° – otherwise it can be damaged
- ❑ Protect against knocks and impact
- ❑ Removing and installing ⇒ page 338
- ❑ Mounting components ⇒ page 333
- ❑ Align exhaust system so it is free of stress ⇒ page 359

7 - Exhaust gas temperature sender 3 - G495-

- ❑ Exploded view ⇒ page 367

8 - Gasket

- ❑ Renew

9 - Starter catalytic converter

- ❑ Removing and installing: vehicles with manual gearbox ⇒ page 334 ; vehicles with multitronic gearbox ⇒ page 336
- ❑ Mounting components ⇒ page 333
- ❑ Align exhaust system so it is free of stress ⇒ page 359

10 - Lambda probe - G39-

- ❑ Removing and installing ⇒ Rep. gr. 23

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11 - Nut

- ❑ Renew
- ❑ Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 23 Nm

12 - Gasket

- ❑ Renew

13 - Turbocharger

14 - Nut

- ❑ Renew
- ❑ 23 Nm

15 - Nut

- ❑ Renew
- ❑ 23 Nm

16 - Gasket

- ❑ Renew

17 - Particulate filter

- ❑ Removing and installing ⇒ page 339
- ❑ After renewing particulate filter, perform “Adaption” in “Guided Functions” ⇒ Vehicle diagnostic tester.

18 - Clamp (front)

- ❑ Installation position ⇒ page 333
- ❑ Before tightening, align exhaust system so it is free of stress ⇒ page 359
- ❑ Tighten bolted connections evenly

19 - Nut

- ❑ 23 Nm

20 - Pressure line

- ❑ For exhaust gas pressure sensor 1 - G450-
- ❑ Tighten union nut to 45 Nm

21 - Rubber mounting

- ❑ Renew if damaged
- ❑ Check preload ⇒ page 359

22 - Mounting

23 - Nut

- ❑ 23 Nm

24 - Tailpipe

- ❑ Renewing ⇒ page 359

25 - Clip

26 - Nut

- ❑ 23 Nm

27 - Retainer

28 - Clamp (rear)

- ❑ For separate replacement of Y-pipe and rear silencers
- ❑ Before tightening, align exhaust system so it is free of stress ⇒ page 359
- ❑ Installation position ⇒ page 333
- ❑ Tighten bolted connections evenly

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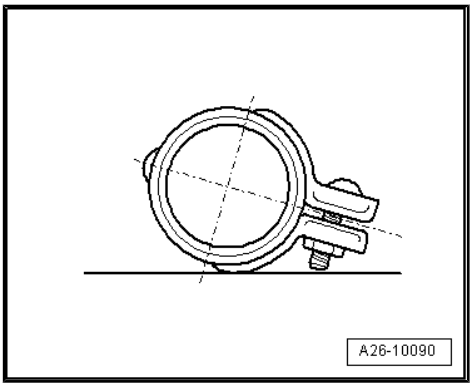
29 - Nut

❑ 23 Nm

Installation position of front clamp

– Install clamp so that ends of bolts do not protrude beyond bottom of clamp.

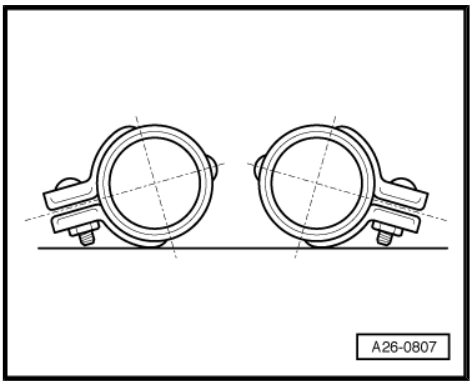
• Bolt connection faces to right.



Installation position of rear clamps

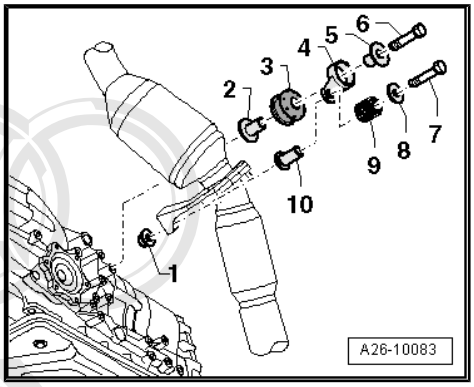
– Install clamps so that the bolt ends do not protrude beyond bottom of clamp.

• Bolt connections face outwards.



Components of mountings for starter catalytic converter - vehicles with manual gearbox

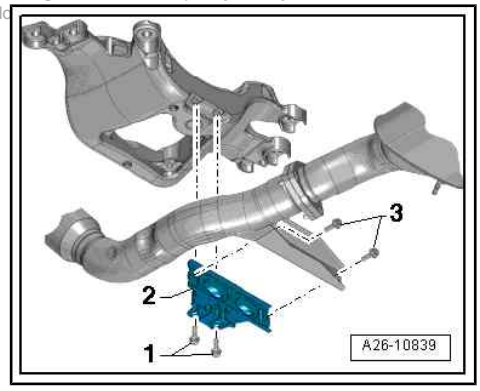
1 - Nut, 23 Nm
2 - Spacer sleeve
3 - Buffer
4 - Bracket
5 - Spacer sleeve
6 - Bolt, 23 Nm
7 - Bolt
8 - Washer
9 - Compression spring
10 - Spacer sleeve



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Components of bracket for front exhaust pipe

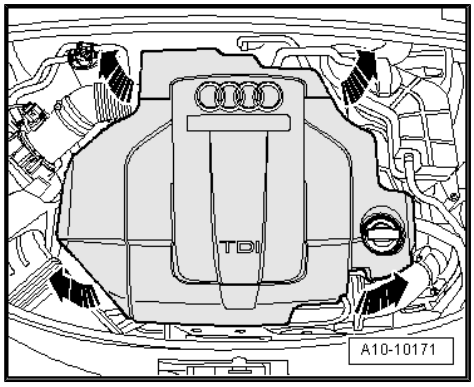
1 - Bolts, 23 Nm
2 - Bracket
3 - Bolts, 23 Nm



1.2 Removing and installing starter catalytic converter - vehicles with manual gearbox

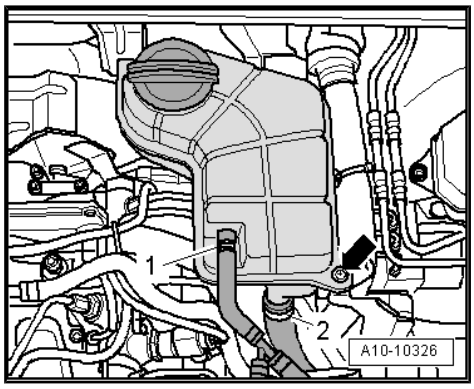
Removing

– Carefully pull engine cover panel off four retaining pins one after the other -arrows-.

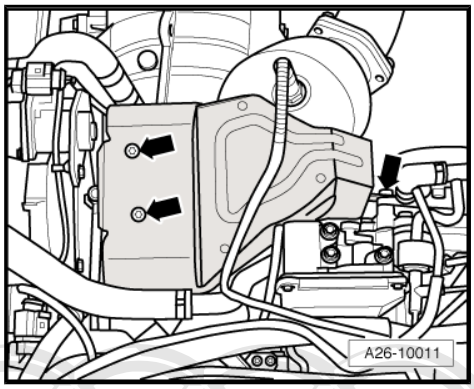


– Remove bolt -arrow-.

– 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.

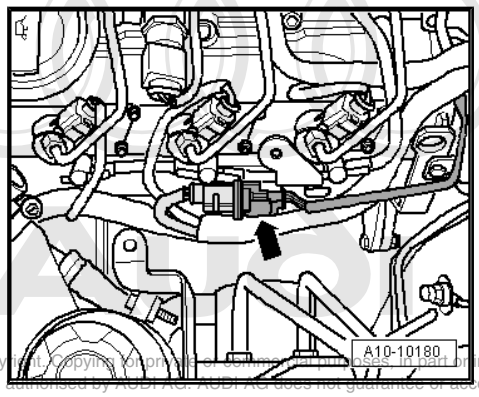


– Remove bolts -arrows- and detach heat shield for turbocharger.



– Remove electrical connector -arrow- for Lambda probe - G39- from bracket and unplug connector.

– Move clear electrical wiring for Lambda probe.



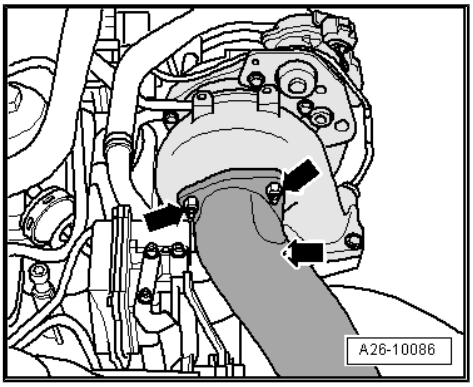
WARNING

Working on all parts of the exhaust system:

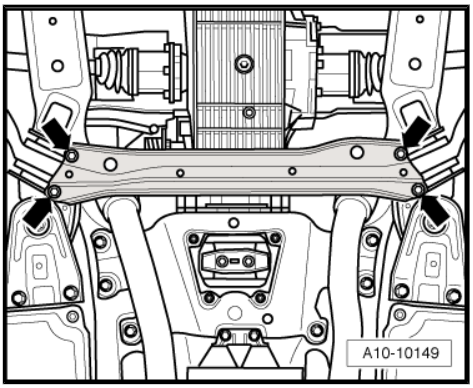
- *Observe safety precautions when working on the exhaust system*
  ⇒ "3.4 Safety precautions when working on the exhaust system", page 5 .

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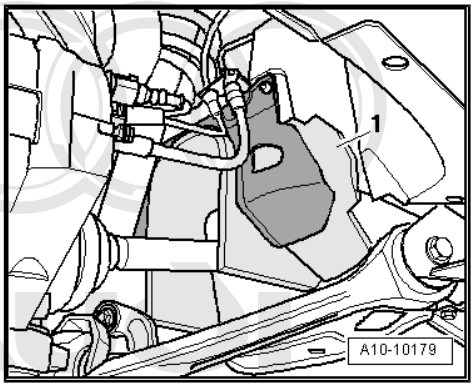
– Remove nuts -arrows- securing starter catalytic converter to turbocharger and detach starter catalytic converter.



– Remove bolts -arrows- and detach cross piece from subframe.
– Remove front exhaust pipe ⇒ page 338 .

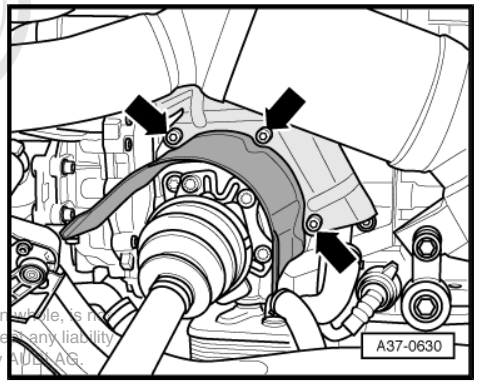


– Remove cover -1- for drive shaft in wheel housing (left-side).



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– Move clear electrical wiring harness at heat shield for drive shaft (left-side).
– Remove bolts -arrows- and detach heat shield for drive shaft (left-side).
– Remove starter catalytic converter.



Installing

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

- Tightening torques
  ⇒ "2.1 Silencers - exploded view", page 342

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Note

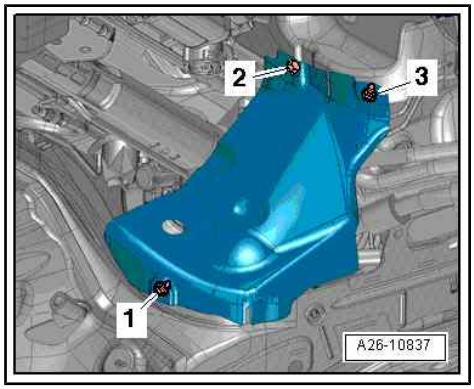
♦ *Renew gaskets and self-locking nuts.*
♦ *Fit all cable ties in the original positions when installing.*

– Install front exhaust pipe ⇒ page 338 .
– Install cross piece ⇒ Rep. gr. 40 .
– Install heat shield for drive shaft ⇒ page 33 .
– Install cover for drive shaft ⇒ Rep. gr. 66 .
– Align the exhaust system so it is free of stress ⇒ page 359 .
– Install heat shield for turbocharger ⇒ page 303 .

1.3 Removing and installing starter catalytic converter - vehicles with multitronic gearbox

Removing

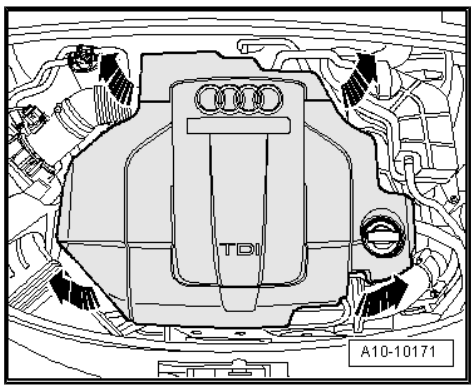
– Remove front exhaust pipe ⇒ page 338 .
– Remove nuts (accessible from below) -1- for heat shield.



Note

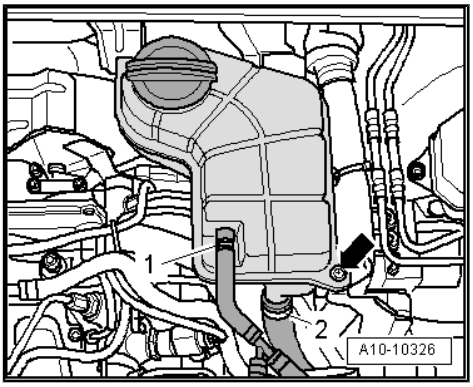
Bolt -2- and nut -3- are removed at a later stage.

– Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



– 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.



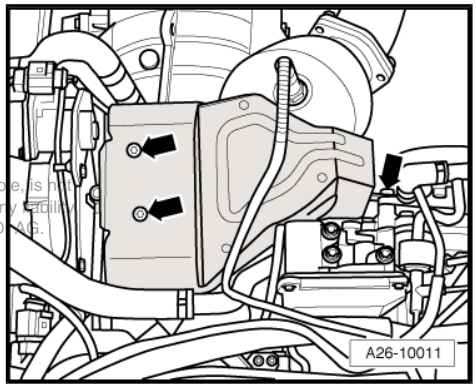
WARNING

Working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system*
  ⇒ "3.4 Safety precautions when working on the exhaust system", page 5 .

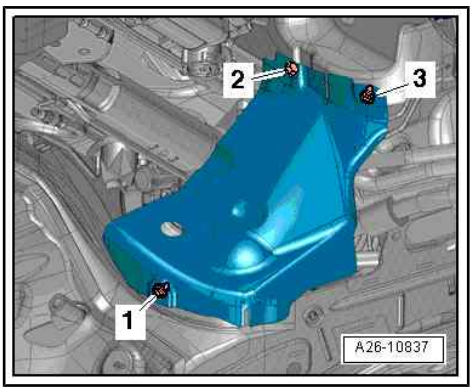
– Remove bolts -arrows- and detach heat shield for turbocharger.

– Remove vacuum pump ⇒ Rep. gr. 47 .



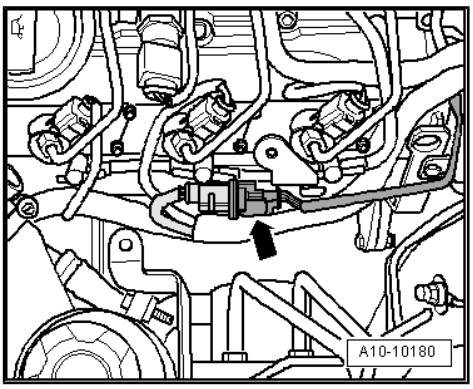
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– Unscrew bolt -2- and nut -3- and remove heat shield.

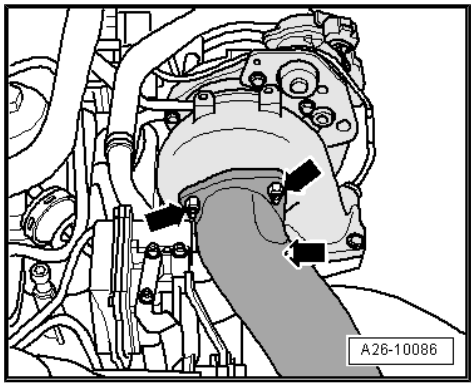


– Remove electrical connector -arrow- for Lambda probe - G39- from bracket and unplug connector.

– Move clear electrical wiring for Lambda probe.



– Remove nuts -arrows- securing starter catalytic converter to turbocharger and lift off starter catalytic converter.



Installing

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

- Tightening torques
  ⇒ “2.1 Silencers - exploded view”, page 342

Note

- *Renew gaskets and self-locking nuts.*
- *Fit all cable ties in the original positions when installing.*

– Install heat shield ⇒ Rep. gr. 50 .
– Install vacuum pump ⇒ Rep. gr. 47 .
– Install heat shield for turbocharger ⇒ page 303 .
– Install front exhaust pipe ⇒ page 338 .
– Align the exhaust system so it is free of stress ⇒ page 359 .

1.4 Removing and installing front exhaust pipe

Removing

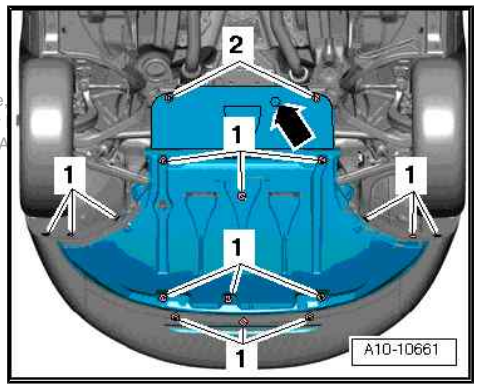
– Remove front and rear noise insulation ⇒ Rep. gr. 50 .

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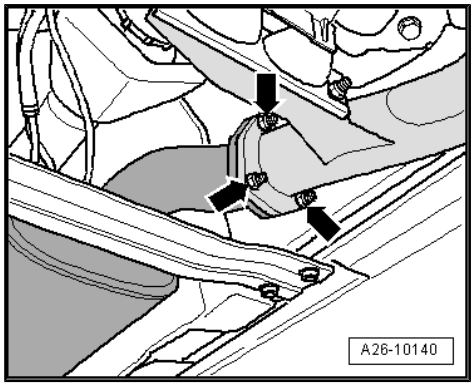
WARNING

Working on all parts of the exhaust system:

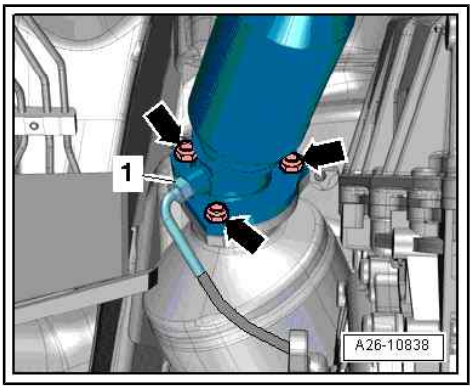
- ***Observe safety precautions when working on the exhaust system***
  ⇒ “3.4 Safety precautions when working on the exhaust system”, page 5 .



– Remove nuts -arrows-, push particulate filter to rear and place onto cross piece.



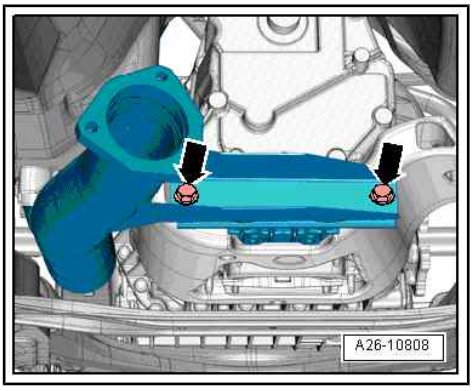
– Remove exhaust gas temperature sender 3 - G495- -item 1-.
– Remove nuts -arrows-.



Caution

Risk of damage to flexible joints in front exhaust pipe

- *Do not bend flexible joints in front exhaust pipe more than 10°.*



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

Installing

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

- Tightening torques
  ⇒ "2.1 Silencers - exploded view", page 342

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Note

Renew gaskets and self-locking nuts.

– Install exhaust gas temperature sender 3 - G495-
  ⇒ page 370 .
– Align the exhaust system so it is free of stress ⇒ page 359 .
– Install noise insulation panels ⇒ Rep. gr. 50 .

1.5 Removing and installing particulate filter

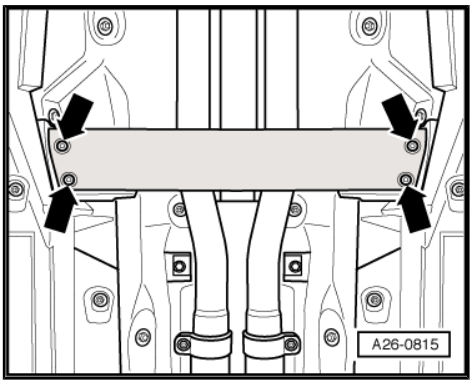
Removing

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

WARNING

Working on all parts of the exhaust system:

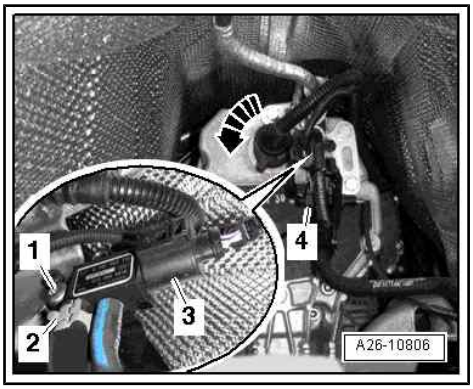
- *Observe safety precautions when working on the exhaust system*
  ⇒ "3.4 Safety precautions when working on the exhaust system", page 5 .



Vehicles with multitronic gearbox:

– Unplug electrical connectors -3- for exhaust gas pressure sensor 1 - G450- and -4- for exhaust gas temperature sender 4 - G648- at rear of gearbox.

– Remove bolt -1- and move clear exhaust gas pressure sensor 1 - G450- .



Note

Disregard -item 2- and -arrow-.

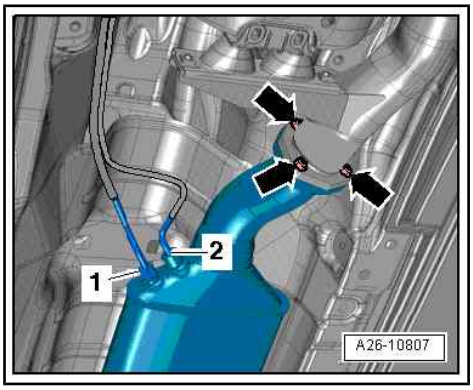
Vehicles with manual gearbox:

– Unscrew pressure pipe -1- from particulate filter.

– Remove exhaust gas temperature sender 4 - G648- -item 2-.

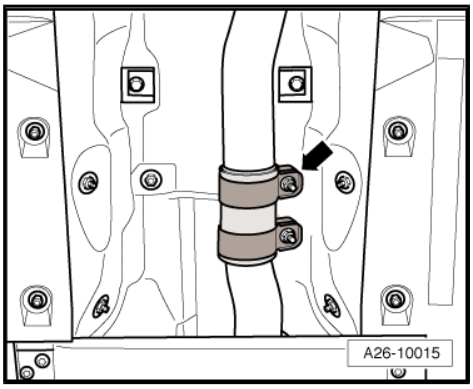
All vehicles (continued):

– Remove nuts -arrows-.



– Disconnect exhaust system at clamp -arrow-.

– Detach particulate filter.



Installing

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

- Tightening torques
  ⇒ “2.1 Silencers - exploded view”, page 342

Note

Renew gaskets and self-locking nuts.

– Align the exhaust system so it is free of stress ⇒ page 359 .

– Install front cross piece ⇒ Rep. gr. 50 .

– After renewing particulate filter, perform “Adaption” in “Guided Functions” ⇒ Vehicle diagnostic tester.

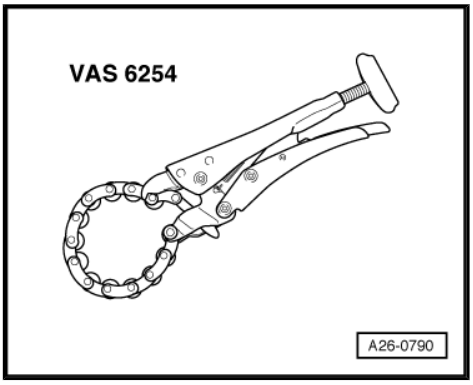
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1.6 Separating Y-pipe and rear silencers

- The connecting pipe can be cut through at the point marked in order to renew the Y-pipe or rear silencer(s) separately.
- The cutting point is marked by an indentation on the circumference of the exhaust pipe.

Special tools and workshop equipment required

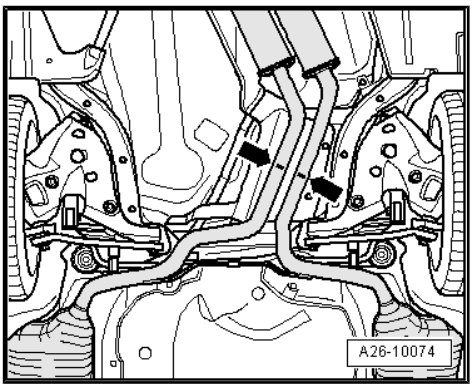
♦ Chain pipe cutter - VAS 6254-



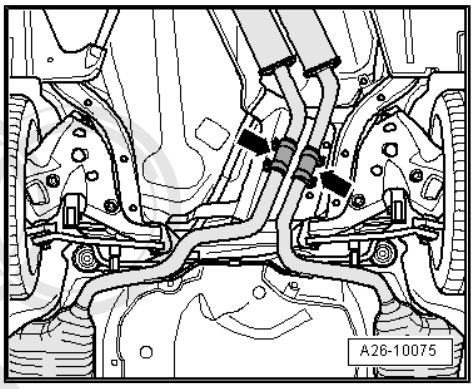
Procedure

- Tightening torque
  ⇒ “2.1 Silencers - exploded view”, page 342

– Cut through exhaust pipes at right angle at position marked by-arrows- using chain-type pipe cutter - VAS 6254- .



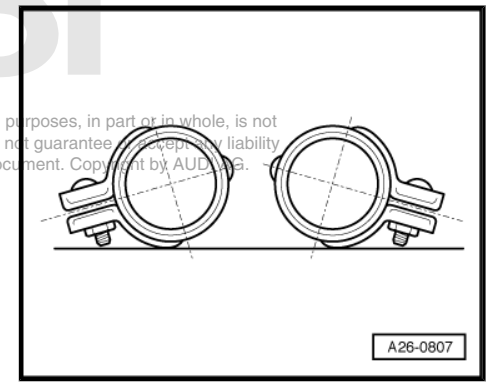
– When installing, position centre of clamps -arrows- over cutting location.



– Install clamps so that the bolt ends do not protrude beyond bottom of clamp.

- Bolt connections face outwards.

– Align the exhaust system so it is free of stress ⇒ page 359



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2 Silencers - vehicles with four-wheel drive

Overview

- ⇒ “2.1 Silencers - exploded view”, page 342
- ⇒ “2.2 Removing and installing starter catalytic converter - vehicles with manual gearbox”, page 346
- ⇒ “2.3 Removing and installing starter catalytic converter - vehicles with automatic gearbox”, page 348
- ⇒ “2.4 Removing and installing front exhaust pipe - vehicles with manual gearbox”, page 352
- ⇒ “2.5 Removing and installing front exhaust pipe - vehicles with automatic gearbox”, page 353
- ⇒ “2.6 Removing and installing particulate filter”, page 356
- ⇒ “2.7 Separating Y-pipe and rear silencers”, page 357

Note

After working on the exhaust system, ensure that the system is not under stress and that it has sufficient clearance from the body. If necessary, loosen clamps and align silencers and exhaust pipes so that sufficient clearance is maintained to the body at all points and the mountings are evenly loaded.

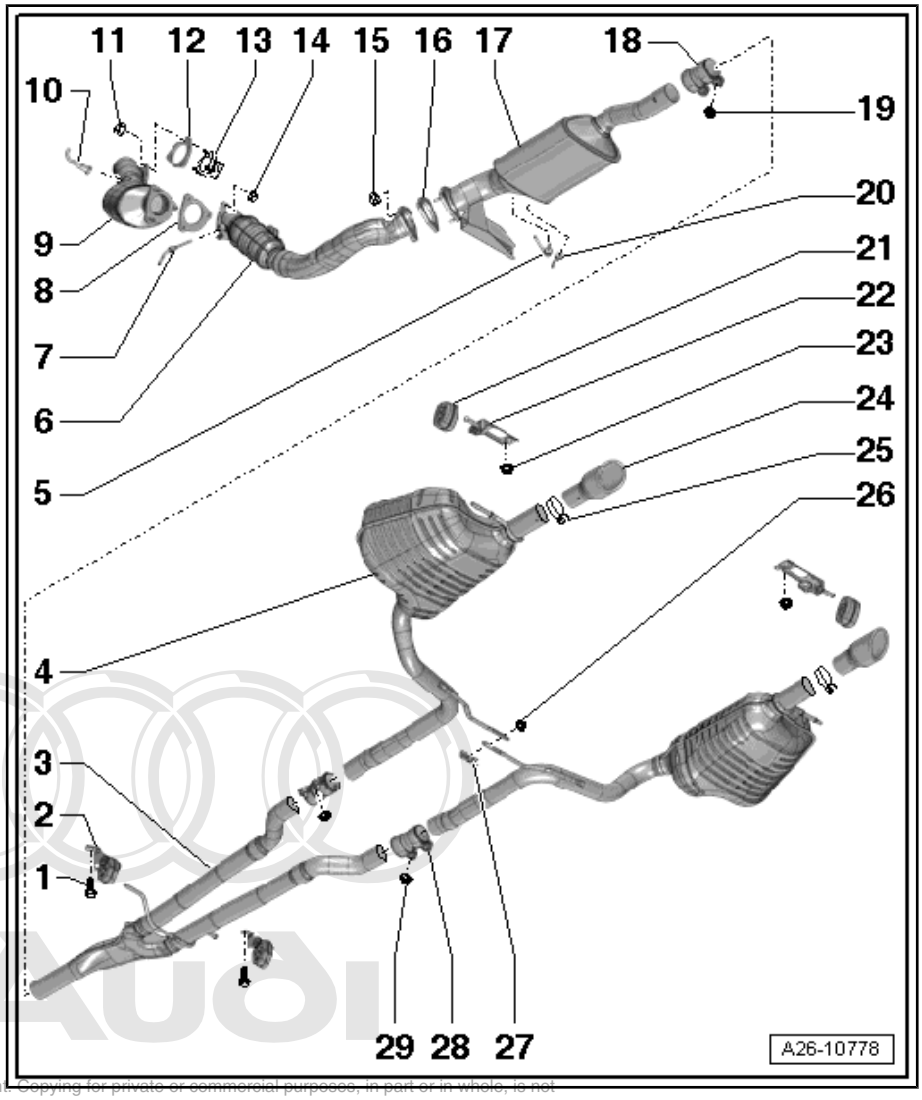
2.1 Silencers - exploded view

WARNING

Working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system***
  ⇒ “3.4 Safety precautions when working on the exhaust system”, page 5 .

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1 - Bolt

- ❑ 23 Nm

2 - Mounting

- ❑ Renew if damaged

3 - Y-pipe

- ❑ Combined in one unit with rear silencers as original equipment. Can be renewed individually for repair purposes
- ❑ Cutting point: Y-pipe / rear silencer ⇒ page 357
- ❑ Align exhaust system so it is free of stress ⇒ page 359

4 - Rear silencer with tailpipe

- ❑ Combined with Y-pipe in one unit as original equipment
- ❑ Y-pipe, rear silencer and tailpipe can be renewed separately as required
- ❑ Cutting point: Y-pipe / rear silencer ⇒ page 357
- ❑ Cutting point: rear silencer / tailpipe ⇒ page 359
- ❑ Align exhaust system so it is free of stress ⇒ page 359

5 - Exhaust gas temperature sender 4 - G648-

- ❑ Exploded view ⇒ page 367

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6 - Front exhaust pipe

- ❑ With flexible joint
- ❑ Do not bend flexible joint more than 10° – otherwise it can be damaged
- ❑ Protect against knocks and impact
- ❑ Removing and installing: vehicles with manual gearbox ⇒ page 352 ; vehicles with automatic gearbox ⇒ page 353
- ❑ Mounting components ⇒ page 345
- ❑ Align exhaust system so it is free of stress ⇒ page 359

7 - Exhaust gas temperature sender 3 - G495-

- ❑ Exploded view ⇒ page 367

8 - Gasket

- ❑ Renew

9 - Starter catalytic converter

- ❑ Removing and installing: vehicles with manual gearbox ⇒ page 346 ; vehicles with automatic gearbox ⇒ page 348
- ❑ Stress-free alignment of exhaust system

10 - Lambda probe - G39-

- ❑ Removing and installing ⇒ Rep. gr. 23

11 - Nut
- ❑ Renew
- ❑ Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 23 Nm

12 - Gasket
- ❑ Renew

13 - Turbocharger

14 - Nut
- ❑ Renew
- ❑ 23 Nm

15 - Nut
- ❑ Renew
- ❑ 23 Nm

16 - Gasket
- ❑ Renew

17 - Particulate filter
- ❑ Removing and installing ⇒ page 356
- ❑ Mounting components ⇒ page 345
- ❑ After renewing particulate filter, perform “Adaption” in “Guided Functions” ⇒ Vehicle diagnostic tester.

18 - Clamp (front)
- ❑ Installation position ⇒ page 345
- ❑ Before tightening, align exhaust system so it is free of stress ⇒ page 359
- ❑ Tighten bolted connections evenly

19 - Nut
- ❑ 23 Nm

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20 - Pressure line
- ❑ For exhaust gas pressure sensor 1 - G450-
- ❑ Tighten union nut to 45 Nm

21 - Rubber mounting
- ❑ Renew if damaged
- ❑ Check preload ⇒ page 359

22 - Mounting

23 - Nut
- ❑ 23 Nm

24 - Tailpipe
- ❑ Renewing ⇒ page 359

25 - Clip

26 - Nut
- ❑ 23 Nm

27 - Retainer

28 - Clamp (rear)
- ❑ For separate replacement of Y-pipe and rear silencers
- ❑ Before tightening, align exhaust system so it is free of stress ⇒ page 359
- ❑ Installation position ⇒ page 345
- ❑ Tighten bolted connections evenly

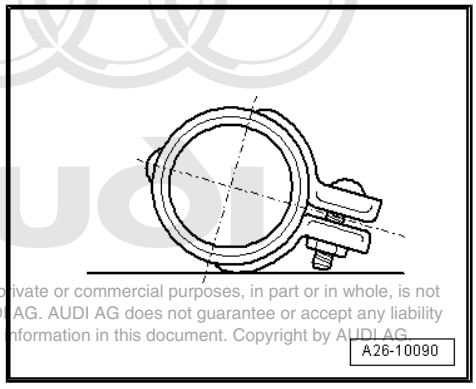
29 - Nut

❑ 23 Nm

Installation position of front clamp

– Install clamp so that ends of bolts do not protrude beyond bottom of clamp.

• Bolt connection faces to right.

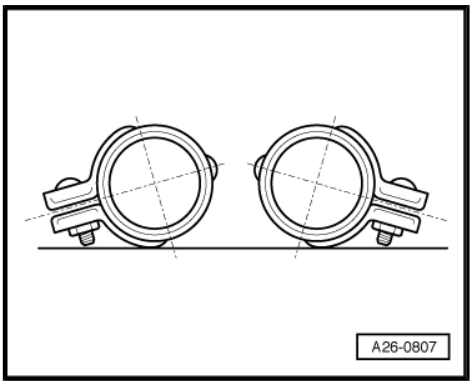


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Installation position of rear clamps

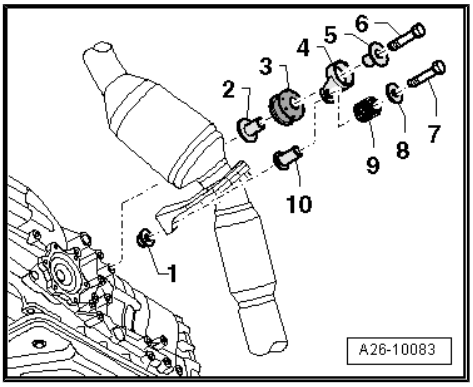
– Install clamps so that the bolt ends do not protrude beyond bottom of clamp.

• Bolt connections face outwards.



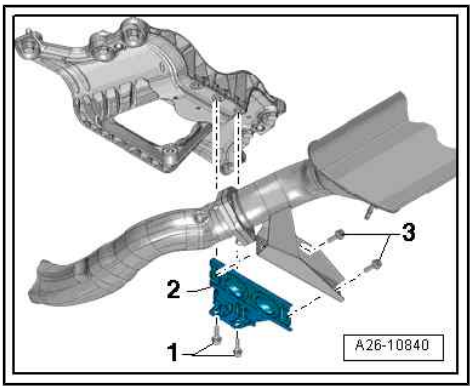
Components of mountings for front exhaust pipe

1 - Nut, 23 Nm
2 - Spacer sleeve
3 - Buffer
4 - Bracket
5 - Spacer sleeve
6 - Bolt, 23 Nm
7 - Bolt
8 - Washer
9 - Compression spring
10 - Spacer sleeve



Components of mounting for catalytic converter - vehicles with automatic gearbox

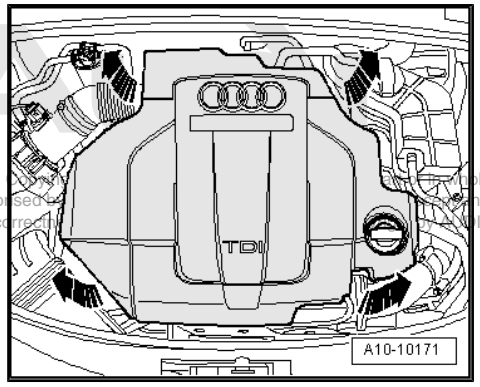
1 - Bolts, 23 Nm
2 - Bracket
3 - Bolts, 23 Nm



2.2 Removing and installing starter catalytic converter - vehicles with manual gearbox

Removing

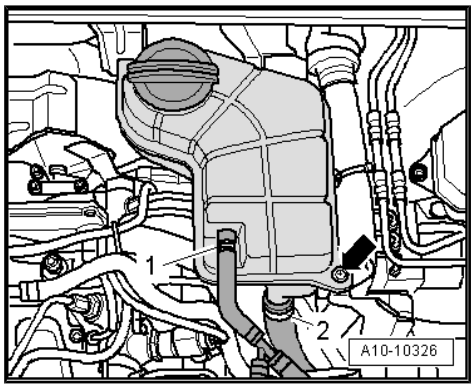
– Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



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– 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.

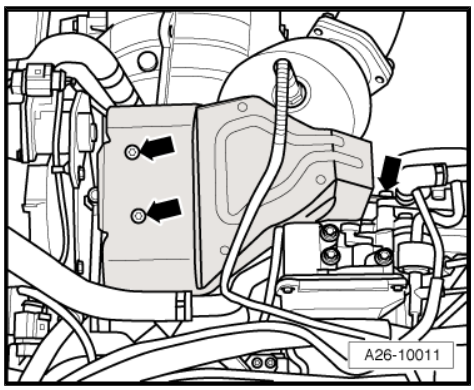


WARNING

Working on all parts of the exhaust system:

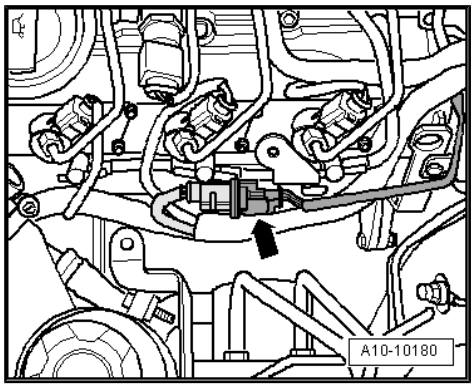
- *Observe safety precautions when working on the exhaust system*
  ⇒ "3.4 Safety precautions when working on the exhaust system", page 5 .

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



– Remove electrical connector -arrow- for Lambda probe - G39- from bracket and unplug connector.

– Move clear electrical wiring for Lambda probe.

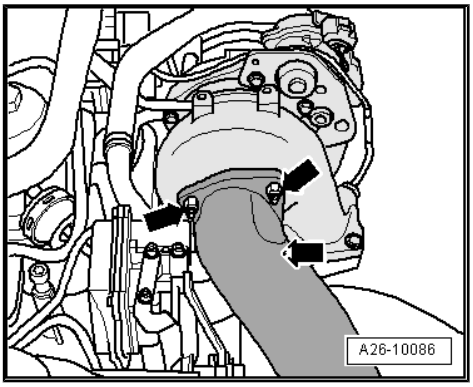


WARNING

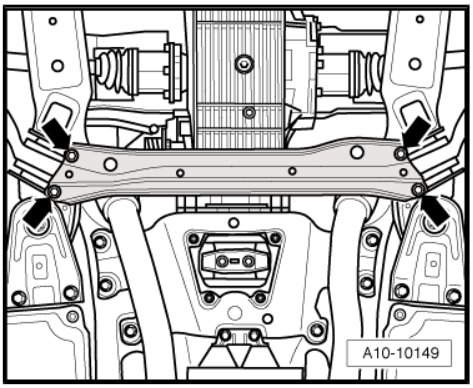
Working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system*
  ⇒ "3.4 Safety precautions when working on the exhaust system", page 5 .

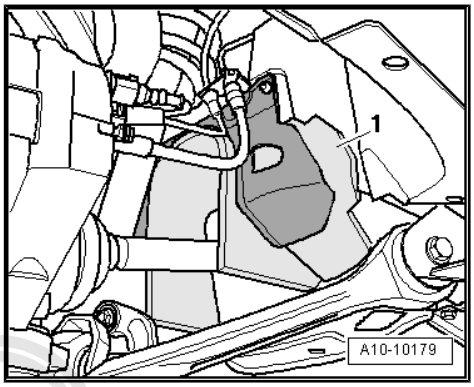
– Remove nuts -arrows- securing starter catalytic converter to turbocharger and detach starter catalytic converter.



– Remove bolts -arrows- and detach cross piece from subframe.
– Remove front exhaust pipe ⇒ page 352 .

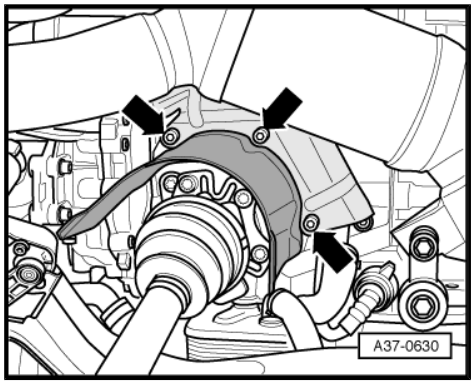


– Remove cover -1- for drive shaft in wheel housing (left-side).



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– Move clear electrical wiring harness at heat shield for drive shaft (left-side).
– Remove bolts -arrows- and detach heat shield for drive shaft (left-side).
– Remove starter catalytic converter.



Installing

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

- Tightening torques
⇒ “2.1 Silencers - exploded view”, page 342

Note

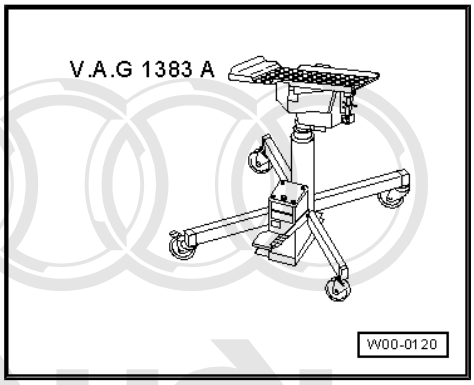
♦ *Renew gaskets and self-locking nuts.*
♦ *Fit all cable ties in the original positions when installing.*

– Install front exhaust pipe ⇒ page 352 .
– Align the exhaust system so it is free of stress ⇒ page 359 .
– Install heat shield for drive shaft ⇒ page 33 .
– Install cover for drive shaft ⇒ Rep. gr. 66 .
– Install cross piece ⇒ Rep. gr. 40 .
– Install heat shield for turbocharger ⇒ page 303 .

2.3 Removing and installing starter catalytic converter - vehicles with automatic gearbox

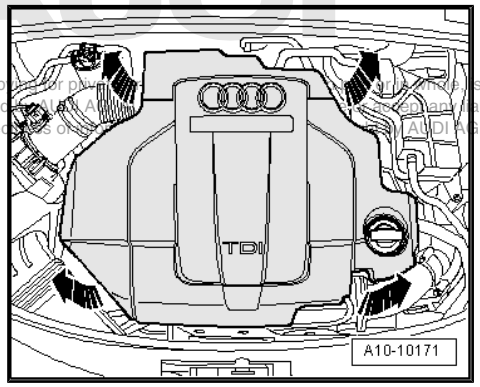
Special tools and workshop equipment required

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



Removing

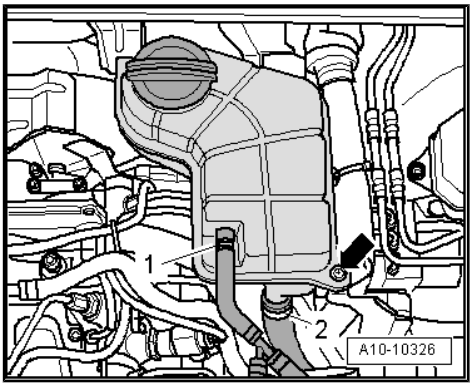
– Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



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– 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.

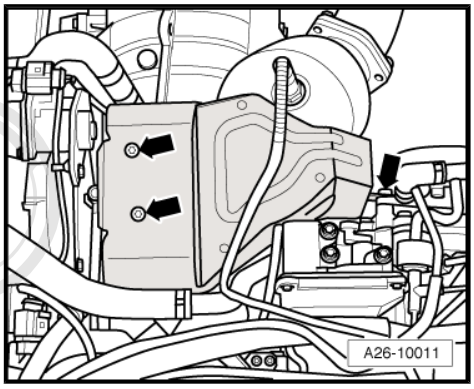


WARNING

Working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system*
  ⇒ "3.4 Safety precautions when working on the exhaust system", page 5 .

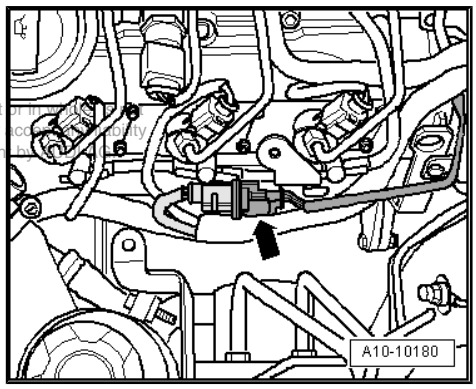
– Remove bolts -arrows- and detach heat shield for turbocharger.



– Remove electrical connector -arrow- for Lambda probe - G39- from bracket and unplug connector.

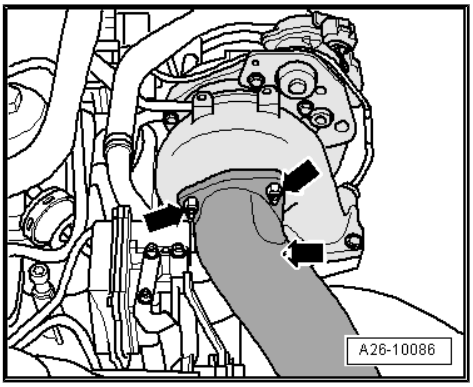
– Move clear electrical wiring for Lambda probe.

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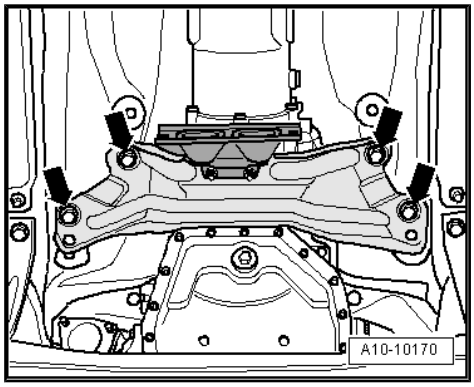


– Remove nuts -arrows- securing starter catalytic converter to turbocharger and detach starter catalytic converter.

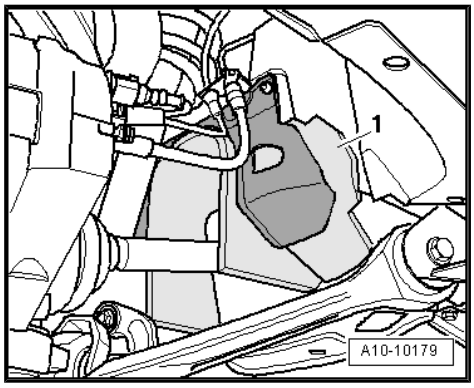
– Remove front exhaust pipe ⇒ page 353 .



– Remove bolts -arrows- and detach tunnel cross member with bracket for particulate filer.

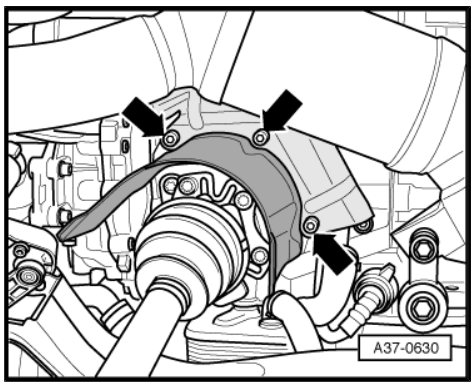


– Remove cover -1- for drive shaft in wheel housing (left-side).



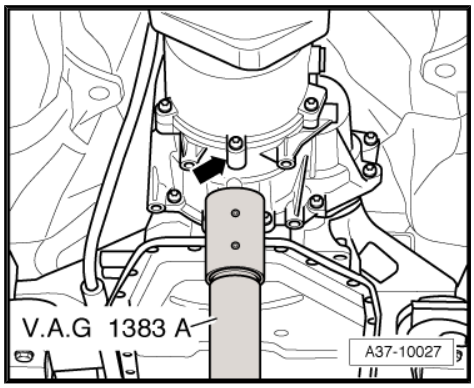
– Move clear electrical wiring harness at heat shield for drive shaft (left-side).

– Remove bolts -arrows- and detach heat shield for drive shaft (left-side).

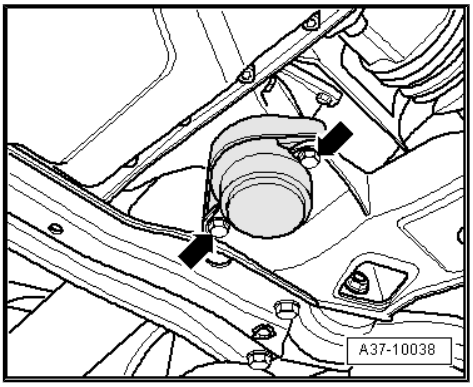


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– Apply lifting column of engine and gearbox jack -V.A.G 1383 A- at centre of gearbox housing casting -arrow- and support gearbox from below.

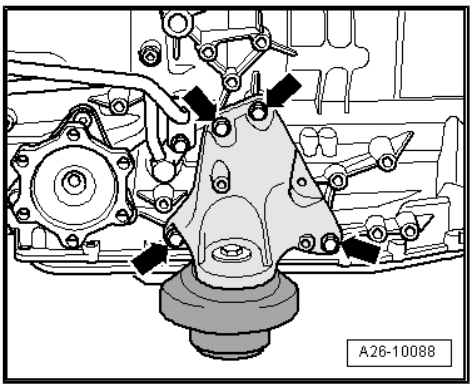


– Remove bottom bolts -arrows- securing gearbox mounting (left-side).



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– Remove bolts -arrows- and detach gearbox support with gearbox mounting.

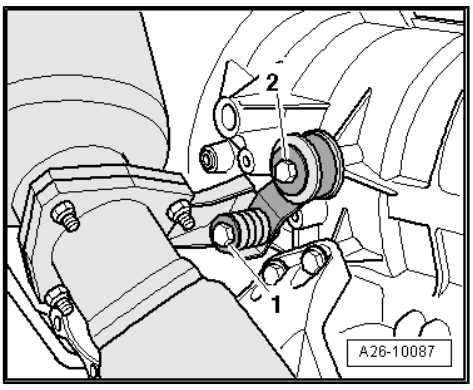


Note

For illustration purposes, the installation position is shown with the gearbox removed.

– Lower gearbox slightly using engine and gearbox jack - V.A.G 1383 A- .

– Unscrew bolt -1- and remove starter catalytic converter.



Note

Disregard -item 2-.

Installing

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

- Tightening torques
  ⇒ “2.1 Silencers - exploded view”, page 342

Note

- *Renew gaskets and self-locking nuts.*
- *Fit all cable ties in the original positions when installing.*

– Install gearbox support with gearbox mounting and tunnel cross member ⇒ Rep. gr. 37 .

– Install front exhaust pipe ⇒ page 353 .

– Align the exhaust system so it is free of stress ⇒ page 359 .

– Install heat shield for drive shaft ⇒ page 92 .

– Install cover for drive shaft ⇒ Rep. gr. 66 .

– Install heat shield for turbocharger ⇒ page 303 .

2.4 Removing and installing front exhaust pipe - vehicles with manual gearbox

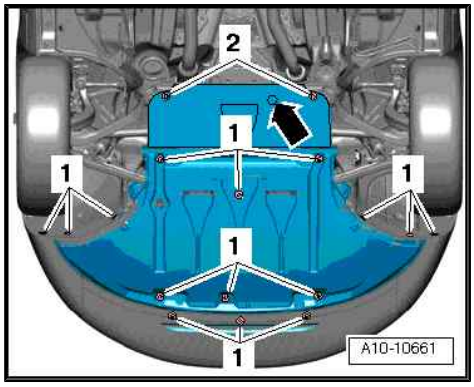
Removing

– Remove front and rear noise insulation ⇒ Rep. gr. 50 .

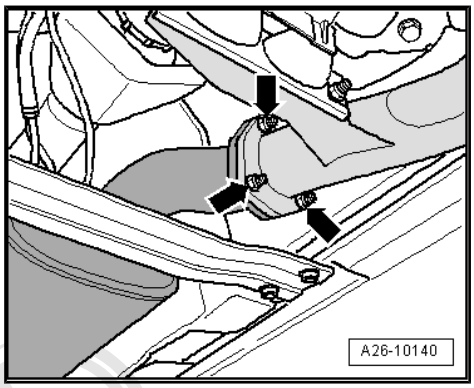
WARNING

Working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system*
  ⇒ "3.4 Safety precautions when working on the exhaust system", page 5 .

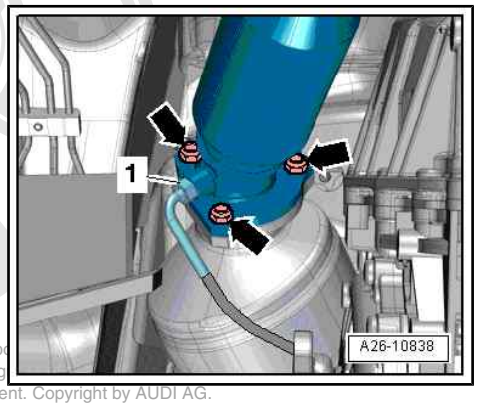


– Remove nuts -arrows-, push particulate filter to rear and place onto cross piece.



– Remove exhaust gas temperature sender 3 - G495- -item 1-.

– Remove nuts -arrows-.

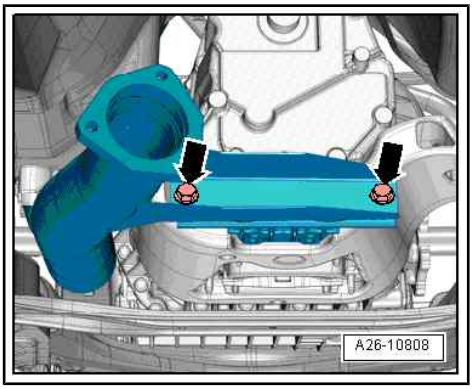


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Caution

Risk of damage to flexible joints in front exhaust pipe

- *Do not bend flexible joints in front exhaust pipe more than 10°.*



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

Installing

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

- Tightening torques
  ⇒ "2.1 Silencers - exploded view", page 342

Note

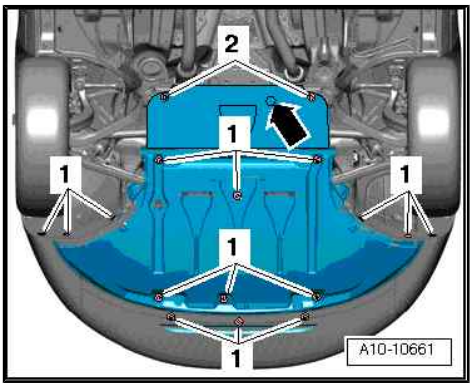
Renew gaskets and self-locking nuts.

– Install exhaust gas temperature sender 3 - G495-
  ⇒ page 370 .
– Align the exhaust system so it is free of stress ⇒ page 359 .
– Install noise insulation panels ⇒ Rep. gr. 50 .

2.5 Removing and installing front exhaust pipe - vehicles with automatic gearbox

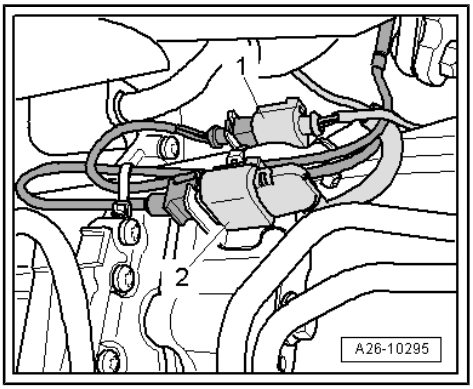
Removing

– Remove front wheel (left-side) ⇒ Wheels and tyres; Rep. gr. 44 .
– Remove front and rear noise insulation ⇒ Rep. gr. 50 .



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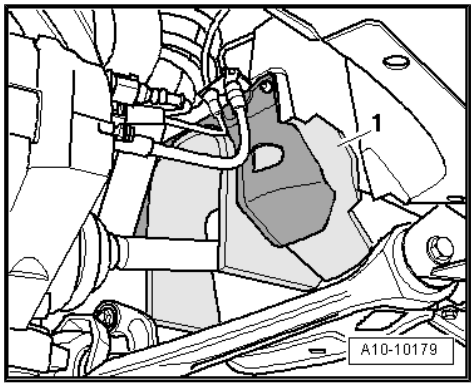
– Take electrical connector -1- for exhaust gas temperature sender 3 - G495- out of bracket at front left of gearbox and unplug.
– Move electrical wiring clear.



Note

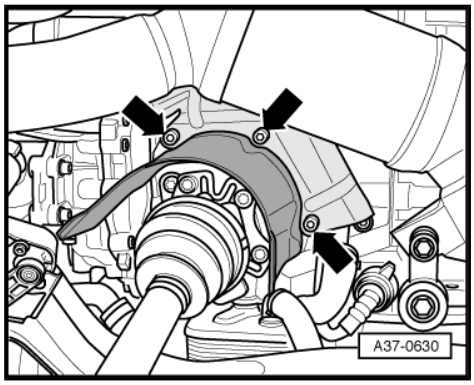
Disregard -item 2-.

– Remove cover -1- for drive shaft in wheel housing (left-side).



– Move clear electrical wiring harness at heat shield for drive shaft (left-side).

– Remove bolts -arrows- and detach heat shield for drive shaft (left-side).

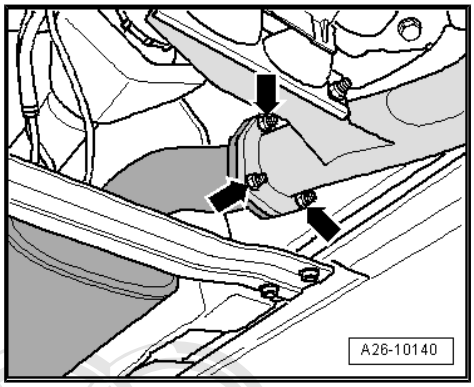


WARNING

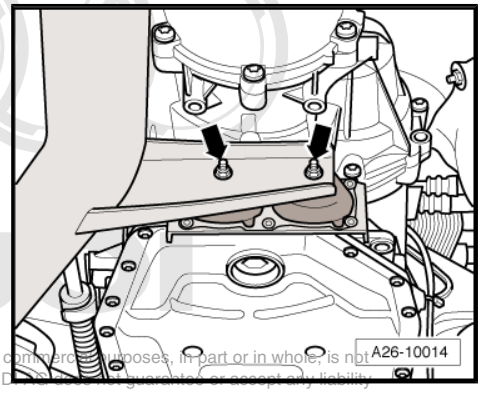
Working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system***
  ⇒ "3.4 Safety precautions when working on the exhaust system", page 5 .

– Remove nuts -arrows-, push particulate filter to rear and place onto cross piece.

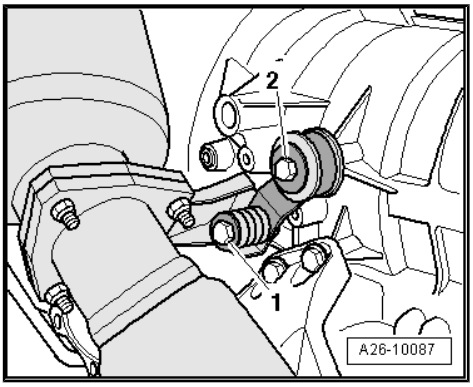


– Unscrew nuts -arrows- securing bracket for particulate filter.



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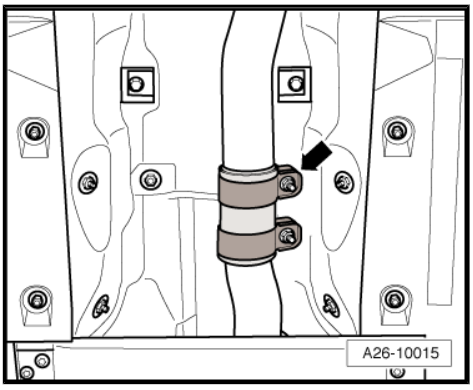
– Unscrew bolts -1- and -2- and remove bracket for front exhaust pipe.



Caution

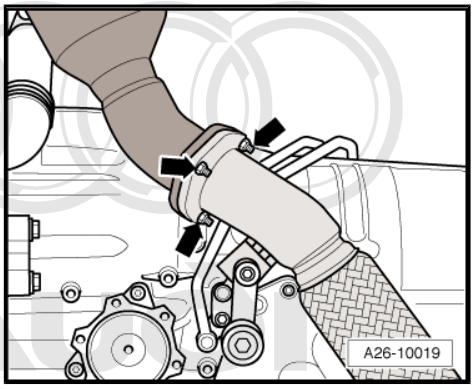
Risk of damage to flexible joints in front exhaust pipe

- ***Do not bend flexible joints in front exhaust pipe more than 10°.***



– Disconnect exhaust system at clamp -arrow- and push clamp to front.

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



Installing

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

- Tightening torques
  ⇒ "2.1 Silencers - exploded view", page 342

Note

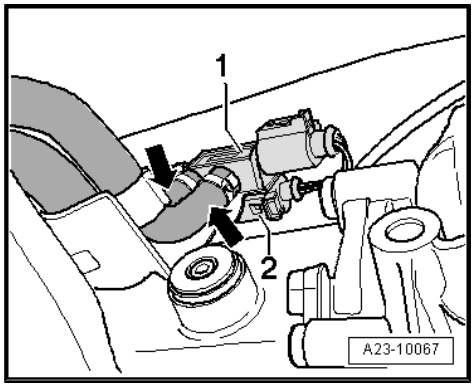
- *Renew gaskets and self-locking nuts.*
- *Fit all cable ties in the original positions when installing.*

– Align the exhaust system so it is free of stress ⇒ page 359.
– Install heat shield for drive shaft ⇒ page 92 .
– Install cover for drive shaft ⇒ Rep. gr. 66 .
– Install noise insulation panels ⇒ Rep. gr. 50 .
– Fit front wheel ⇒ Wheels and tyres; Rep. gr. 44 .

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2.6 Removing and installing particulate filter

Removing



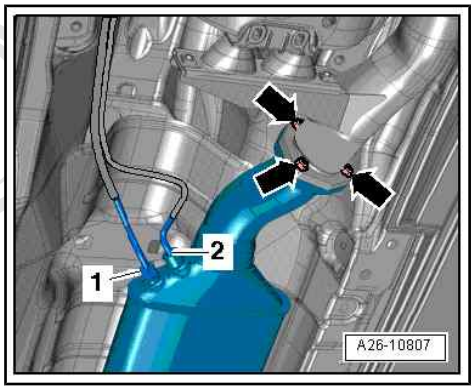
– Detach electrical connector -2- from bracket at right of gearbox and unplug.

– Move electrical wiring clear.

WARNING

Working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system***
  ⇒ "3.4 Safety precautions when working on the exhaust system", page 5 .

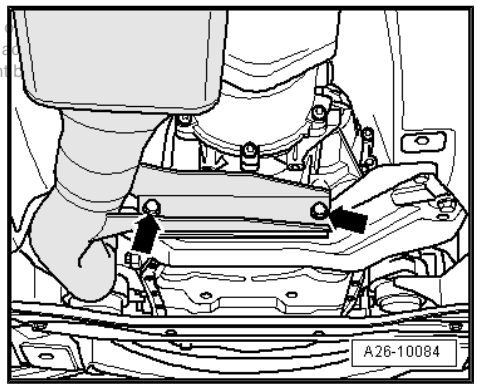


– Remove nuts -arrows-.

– Unscrew pressure pipe -1- from particulate filter.

Note

Disregard -item 2-.



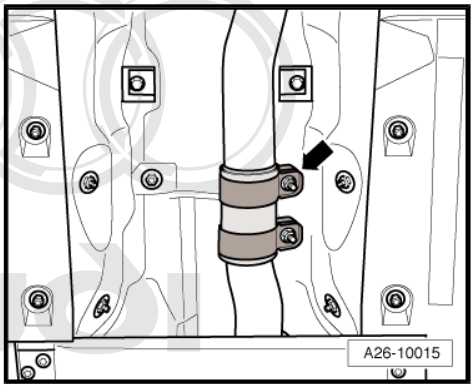
– Remove bolts -arrows-.

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Caution

Risk of damage to flexible joints in front exhaust pipe

- *Do not bend flexible joints in front exhaust pipe more than 10°.*



– Disconnect exhaust system at clamp -arrow- and push clamp to front.

– Detach particulate filter.

Installing

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

Note

- *Renew gaskets and self-locking nuts.*
- *Fit all cable ties in the original positions when installing.*

– Align the exhaust system so it is free of stress ⇒ page 359 .

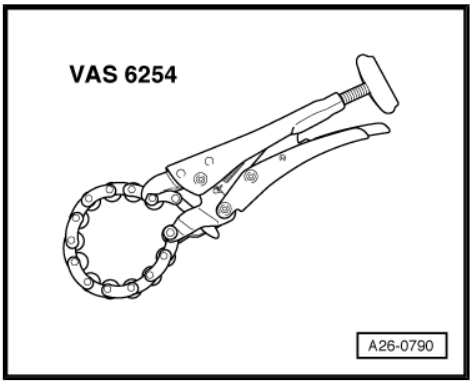
– After renewing particulate filter, perform “Adaption” in “Guided Functions” ⇒ Vehicle diagnostic tester.

2.7 Separating Y-pipe and rear silencers

- The connecting pipe can be cut through at the point marked in order to renew the Y-pipe or rear silencer(s) separately.
- The cutting point is marked by an indentation on the circumference of the exhaust pipe.

Special tools and workshop equipment required

- Chain pipe cutter - VAS 6254-



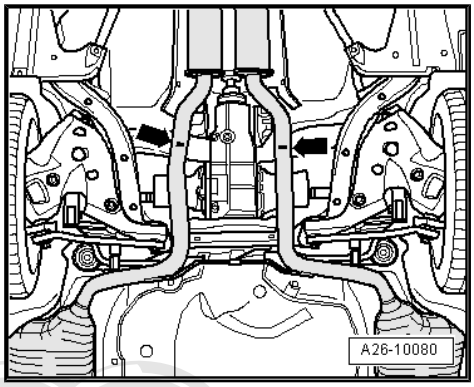
Procedure

WARNING

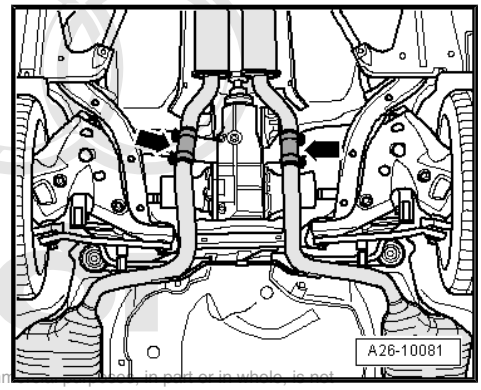
Working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system*
  ⇒ “3.4 Safety precautions when working on the exhaust system”, page 5 .

– Cut through exhaust pipes at right angle at position marked by-arrows- using chain-type pipe cutter - VAS 6254- .

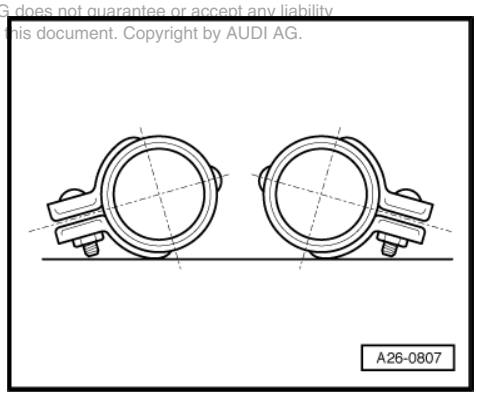


– When installing, position centre of clamps -arrows- over cutting location.



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– Install clamps so that the bolt ends do not protrude beyond bottom of clamp.



• Bolt connections face outwards.

– Align the exhaust system so it is free of stress ⇒ page 359 .

3 Exhaust system

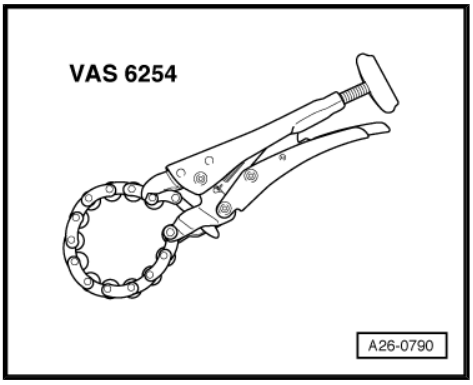
Overview

- ⇒ “3.1 Renewing tailpipe”, page 359
- ⇒ “3.2 Stress-free alignment of exhaust system”, page 359
- ⇒ “3.3 Aligning tailpipes”, page 360
- ⇒ “3.4 Checking exhaust system for leaks”, page 361

3.1 Renewing tailpipe

Special tools and workshop equipment required

- Chain pipe cutter - VAS 6254-



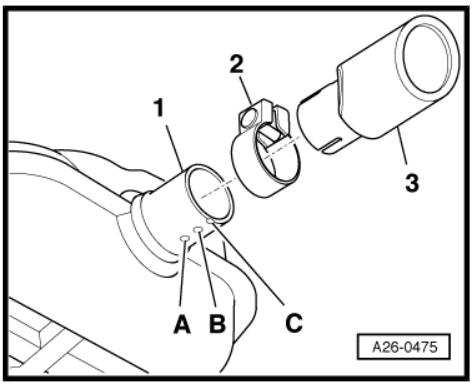
Procedure

- Tightening torques
  ⇒ “1.1 Silencers - exploded view”, page 330 and
  ⇒ “2.1 Silencers - exploded view”, page 342

– Cut through tailpipe -3- at a right angle at cutting point -C- using chain pipe cutter - VAS 6254- .

– Push new tailpipe onto rear silencer -1- as far as marking -A-. Slot on tailpipe should align with marking -B-.

– Fit clamp -2-.



3.2 Stress-free alignment of exhaust system

Procedure

- The exhaust system must be aligned when it is cool.
- Tightening torques
  ⇒ “1.1 Silencers - exploded view”, page 330 and
  ⇒ “2.1 Silencers - exploded view”, page 342

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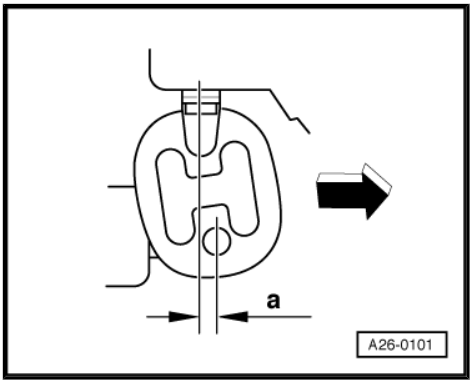
Vehicles without clamps between Y-pipe and rear silencer

– Loosen bolt connections on front clamp.

– Push exhaust system towards front of vehicle -arrow- so that rear mountings for rear silencers are preloaded by -a- = 5 ... 9 mm.

– Tighten bolt connections on clamp evenly.

– Align tailpipes ⇒ page 360 .

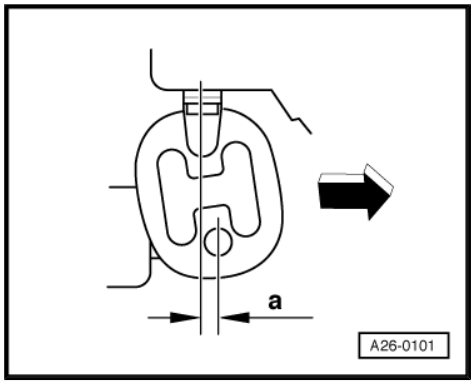


Vehicles with clamps between Y-pipe and rear silencers

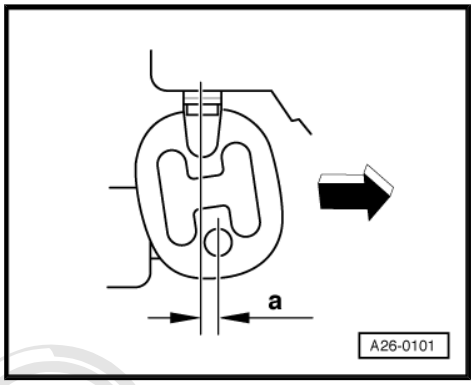
Note

On a vehicle with clamps fitted between Y-pipe and rear silencers, it is also necessary to align the Y-pipe.

– Loosen bolt connections on front and rear clamps.
– Push front section of exhaust system towards front of vehicle -arrow-, so that mountings for Y-pipe are preloaded by -a- = 5 ... 9 mm.
– Tighten bolt connections on front clamp evenly.



– Push rear section of exhaust system towards front of vehicle -arrow-, so that mountings (rear) for rear silencers are preloaded by -a- = 5 ... 9 mm.
– Align rear silencers so they are horizontal.
– Tighten bolt connections on rear clamps evenly.
– Align tailpipes ⇒ page 360 .



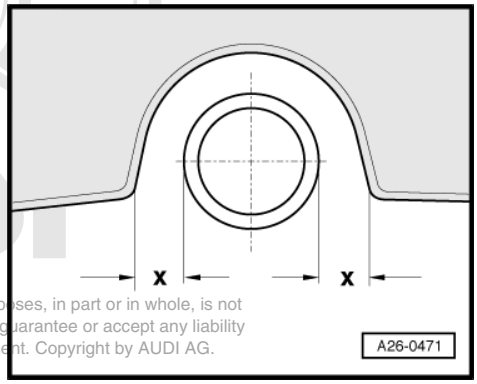
3.3 Aligning tailpipes

Procedure

- Tightening torques
  ⇒ “1.1 Silencers - exploded view”, page 330 and
  ⇒ “2.1 Silencers - exploded view”, page 342

– Check clearance between tailpipes and bumper on both sides:

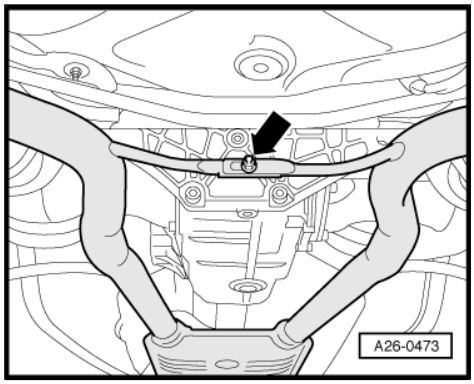
- Dimension -x- (left-side) = dimension -x- (right-side)



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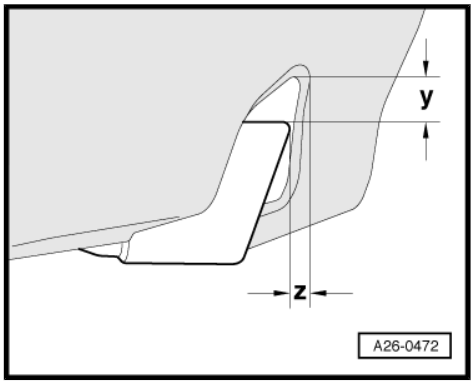
If necessary, correct dimension -x- as follows:

– Loosen connection -arrow- on strut between exhaust pipes.
– Adjust the distance between the rear silencers.
– Tighten connection.



– Check distances -y- and -z- between tailpipes and bumper:

Exhaust system	Exhaust system on S-line models
• Dimension -y- = 23.9 ± 2.3 mm	• Dimension -y- = 23.6 ± 2.3 mm
• Dimension -z- = 15.3 ± 2.5 mm.	• Dimension -z- = 11.7 ± 2.5 mm.



– If necessary, check whether the exhaust system is aligned free of stress ⇒ page 359 .

3.4 Checking exhaust system for leaks

Procedure

– Start the engine and run at idling speed.

– Plug tailpipes for duration of leak test (e.g. with cloths or plugs).

– Listen for leaks at joints between cylinder head/exhaust manifold, exhaust manifold/intermediate pipe, intermediate pipe/intermediate flange, intermediate flange/turbocharger, etc.

– Rectify any leaks that are found.

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4 Exhaust manifolds and intermediate pipes

Overview

- ⇒ “4.1 Exhaust manifolds and intermediate pipes - exploded view”, page 362
- ⇒ “4.2 Removing and installing exhaust manifold (left-side)”, page 364
- ⇒ “4.3 Removing and installing exhaust manifold (right-side)”, page 364
- ⇒ “4.4 Removing and installing intermediate pipe (left-side)”, page 364
- ⇒ “4.5 Removing and installing intermediate pipe (right-side)”, page 366

4.1 Exhaust manifolds and intermediate pipes - exploded view

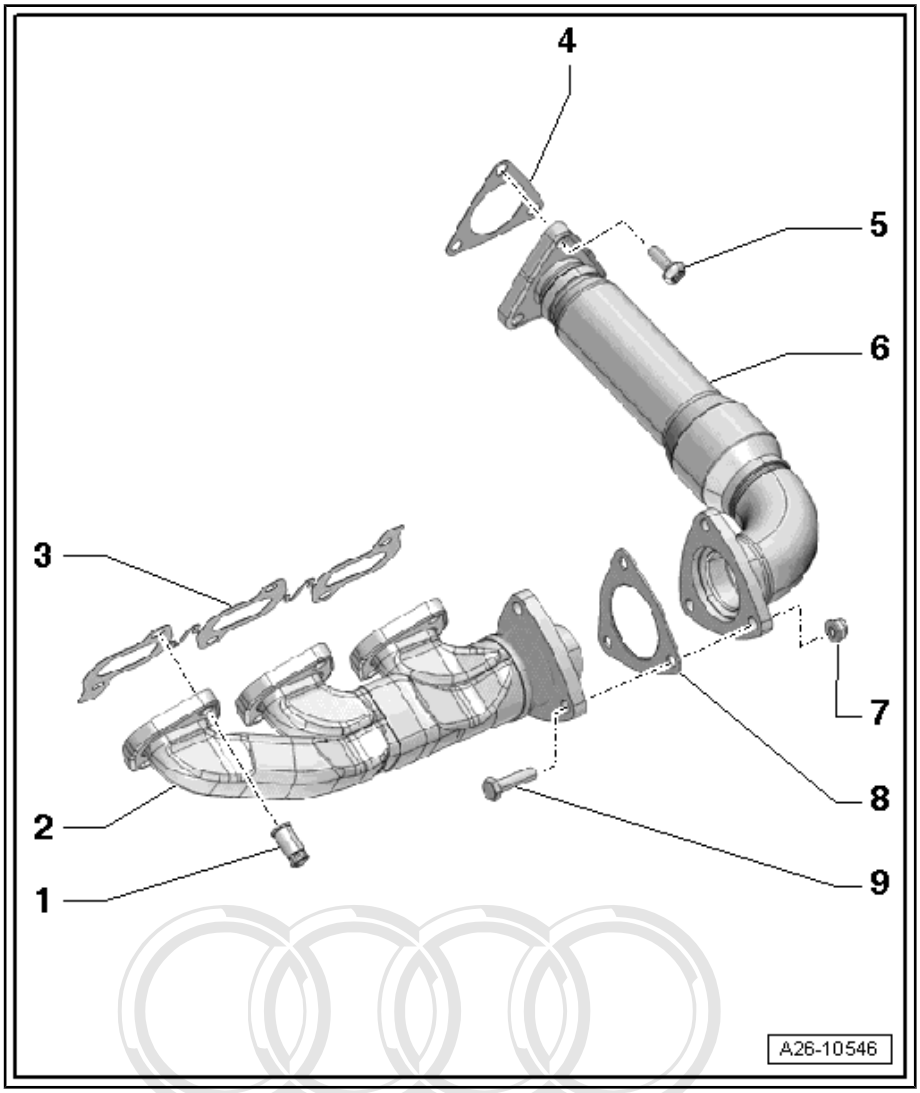
Note

The diagram shows the exhaust manifold with intermediate pipe on cylinder bank 2 (left-side).

WARNING

Working on all parts of the exhaust system:

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1 - Nut

- ❑ Renew
- ❑ Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 25 Nm

2 - Exhaust manifold

- ❑ Removing and installing: left-side ⇒ page 364 , right-side ⇒ page 364

3 - Gasket

- ❑ Renew

4 - Gasket

- ❑ Renew

5 - Bolt

- ❑ Renew
- ❑ Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 30 Nm + turn 90° further

6 - Intermediate pipe

- ❑ Removing and installing: left-side ⇒ page 364 , right-side ⇒ page 366

7 - Nut

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

8 - Gasket

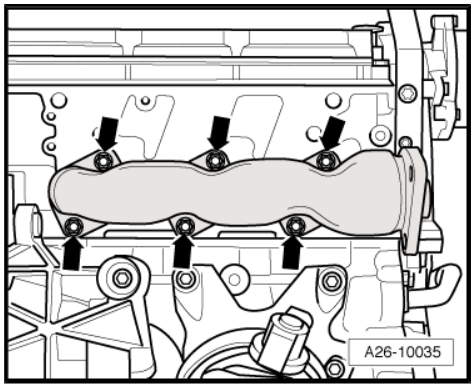
- ❑ Renew

9 - Bolt

- ❑ Renew
- ❑ Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue

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4.2 Removing and installing exhaust manifold (left-side)



Removing

– Remove intermediate pipe (left-side) ⇒ page 364

– Remove nuts -arrows- and detach exhaust manifold.

Installing

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

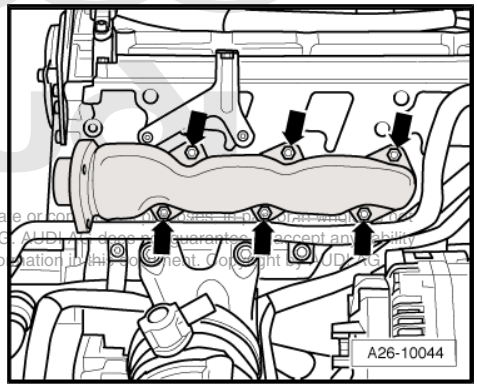
- Tightening torque ⇒ “4.1 Exhaust manifolds and intermediate pipes - exploded view”, page 362

Note

Renew gaskets and self-locking nuts.

– Install intermediate pipe (left-side) ⇒ page 364 .

4.3 Removing and installing exhaust manifold (right-side)



Removing

– Remove intermediate pipe (right-side) ⇒ page 366 .

– Remove nuts -arrows- and detach exhaust manifold.

Installing

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

- Tightening torque ⇒ “4.1 Exhaust manifolds and intermediate pipes - exploded view”, page 362

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Note

Renew gaskets and self-locking nuts.

– Install intermediate pipe (right-side) ⇒ page 366 .

4.4 Removing and installing intermediate pipe (left-side)

Removing

– Remove throttle valve module - J338- ⇒ Rep. gr. 23 .

– Remove starter catalytic converter:

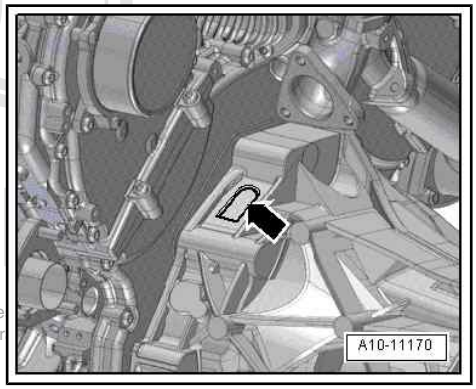
♦ Vehicles with front-wheel drive: manual gearbox ⇒ page 334 , multitronic gearbox ⇒ page 336 .

♦ Vehicles with four-wheel drive: manual gearbox ⇒ page 346 , automatic gearbox ⇒ page 348 .

Caution

Risk of serious damage to gearbox.

- *Block off the opening in the gearbox with a clean cloth to prevent small items from dropping into the opening -arrow-.*



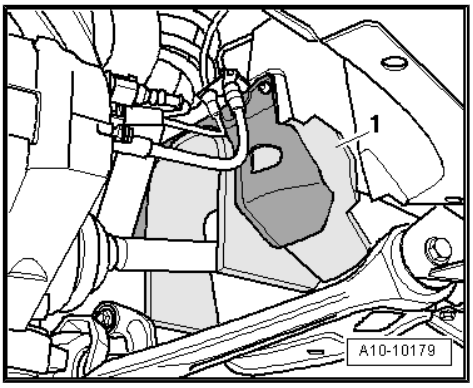
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Note

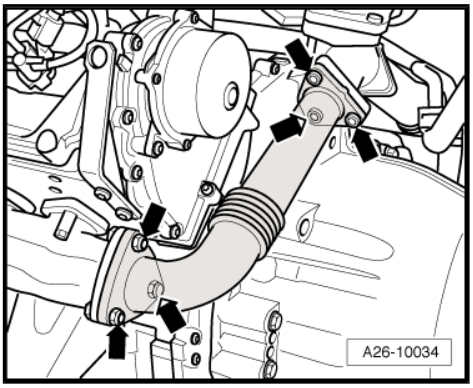
For illustration purposes, the installation position is shown with the intermediate pipe removed.

– Remove cover -1- for drive shaft in wheel housing (left-side).

– Detach drive shaft (left-side) from flange shaft of gearbox.



– Remove bolts and nuts -arrows- and detach intermediate pipe (left-side).



Installing

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

- Tightening torque
  ⇒ “4.1 Exhaust manifolds and intermediate pipes - exploded view”, page 362

Note

Renew seals, gaskets, O-rings and self-locking nuts.

– Secure drive shaft (left-side) to flange shaft of gearbox ⇒ Rep. gr. 40 .

– Install cover for drive shaft ⇒ Rep. gr. 66 .

– Install starter catalytic converter:

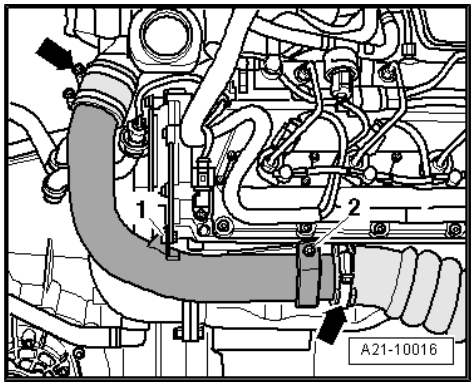
♦ Vehicles with front-wheel drive: manual gearbox ⇒ page 334 , multitronic gearbox ⇒ page 336 .

♦ Vehicles with four-wheel drive: manual gearbox ⇒ page 346 , automatic gearbox ⇒ page 348 .

– Install throttle valve module - J338- ⇒ Rep. gr. 23 .

4.5 Removing and installing intermediate pipe (right-side)

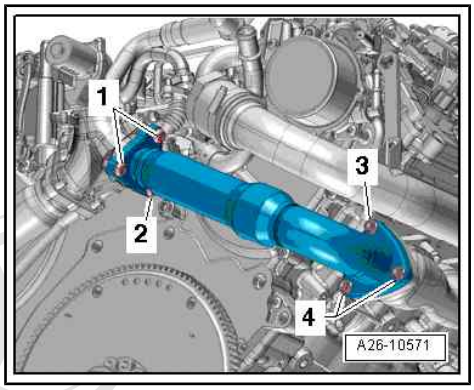
Removing



– Remove air cleaner housing ⇒ Rep. gr. 23 .
– Remove rear coolant pipe (right-side) ⇒ page 291 .
– Release hose clip -right arrow-, detach air pipe and remove air hose.

Note

-Items 1, 2- and -arrow- are already slackened.



– Remove bolts -1, 2- and nuts -3, 4-, detach intermediate pipe (right-side).

Note

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

Installing

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

- Tightening torque ⇒ “4.1 Exhaust manifolds and intermediate pipes - exploded view”, page 362

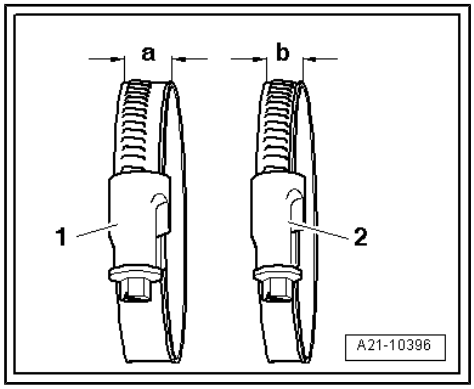
Note

- *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 .*

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– Install coolant pipe (rear right) ⇒ page 291 .
– Install air cleaner housing ⇒ Rep. gr. 23 .

– Install air hoses with screw-type clips ⇒ page 326 .



5 Exhaust gas temperature control

Overview

- ⇒ “5.1 Exhaust gas temperature senders - exploded view”, page 367
- ⇒ “5.2 Removing and installing exhaust gas temperature sender 1 G235 ”, page 369
- ⇒ “5.3 Removing and installing exhaust gas temperature sender 3 G495 ”, page 370
- ⇒ “5.4 Removing and installing exhaust gas temperature sender 4 G648 - vehicles with manual gearbox and automatic gearbox”, page 372
- ⇒ “5.5 Removing and installing exhaust gas temperature sender 4 G648 - vehicles with multitronic gearbox”, page 373

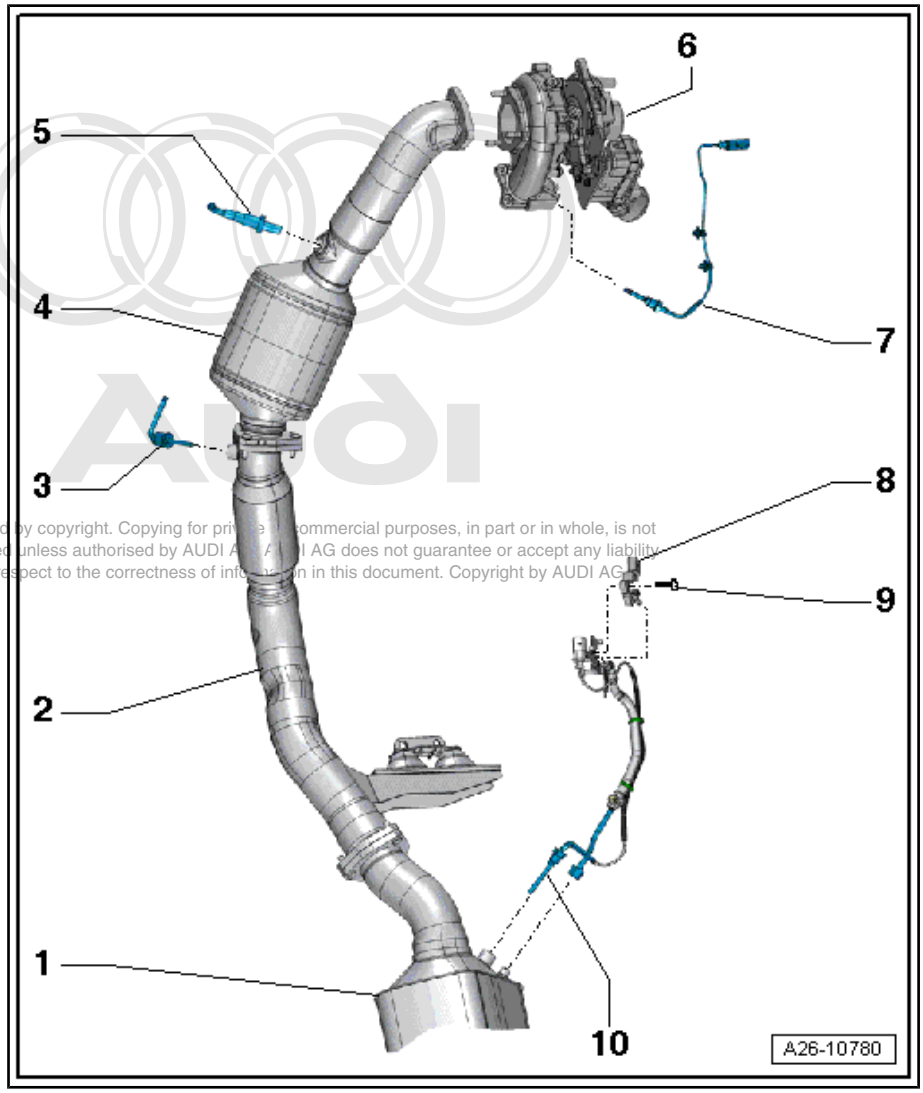
5.1 Exhaust gas temperature senders - exploded view

WARNING

Working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system*
  ⇒ “3.4 Safety precautions when working on the exhaust system”, page 5 .

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1 - Particulate filter

2 - Front exhaust pipe

3 - Exhaust gas temperature sender 3 - G495-

- ❑ Removing and installing ⇒ page 370
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 45 Nm

4 - Starter catalytic converter

5 - Lambda probe - G39- with Lambda probe heater - Z19-

- ❑ Removing and installing ⇒ Rep. gr. 23

6 - Turbocharger

7 - Exhaust gas temperature sender 1 - G235-

- ❑ Only on vehicles with 3.0 ltr. engine
- ❑ Removing and installing ⇒ page 369
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 45 Nm

8 - Exhaust gas pressure sensor 1 - G450-

- ❑ Removing and installing ⇒ Rep. gr. 23

9 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 23

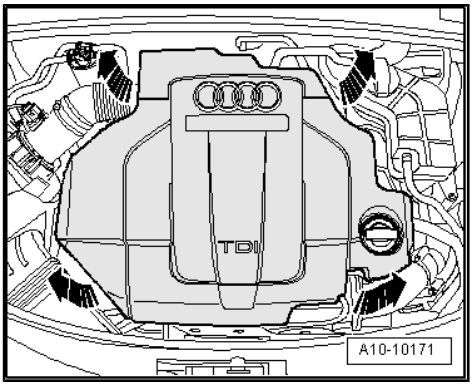
10 - Exhaust gas temperature sender 4 - G648-

- ❑ Removing and installing: vehicles with manual gearbox and automatic gearbox ⇒ page 372 ; vehicles with multitronic gearbox ⇒ page 373 .
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue

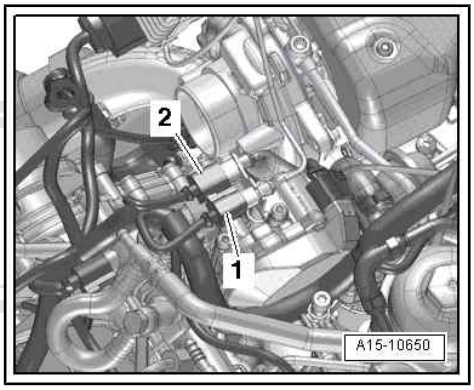
5.2 Removing and installing exhaust gas temperature sender 1 - G235-

Removing

– Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



– Unplug electrical connector -1- (black) for exhaust gas temperature sender 1 - G235- .

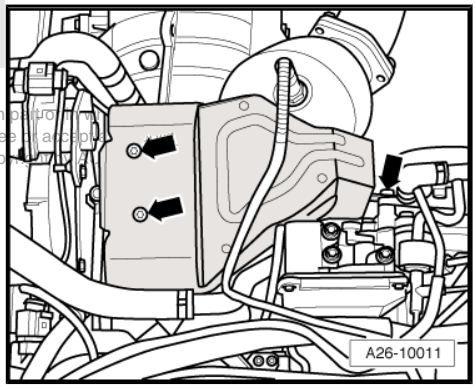


WARNING

Working on all parts of the exhaust system:

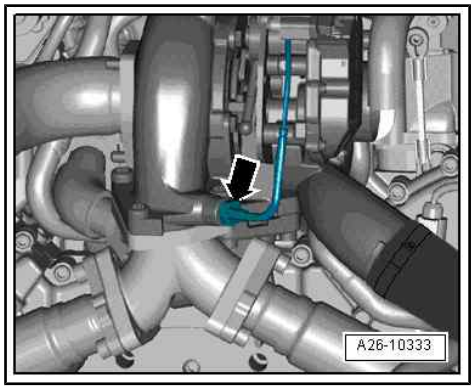
- *Observe safety precautions when working on the exhaust system*
  ⇒ "3.4 Safety precautions when working on the exhaust system", page 5 .

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



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– Unscrew exhaust gas temperature sender 1 - G235- -arrow-.



Note

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

Installing

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

- Tightening torque
  ⇒ “5.1 Exhaust gas temperature senders - exploded view”, page 367

Note

Fit all cable ties in the original positions when installing.

– Coat thread of exhaust gas temperature sender with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .

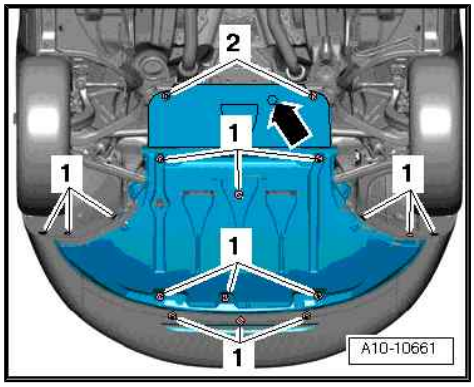
- Installation position: connection on exhaust gas temperature sender 1 - G235- faces upwards.

– Install heat shield for turbocharger ⇒ page 303 .

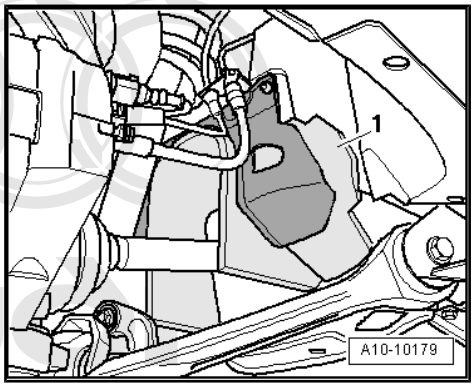
5.3 Removing and installing exhaust gas temperature sender 3 - G495-

Removing

– Remove rear noise insulation ⇒ Rep. gr. 50 .

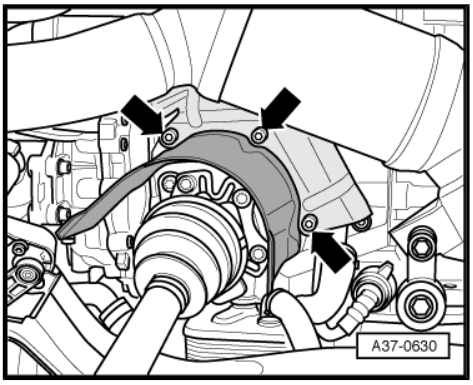


– Remove cover -1- for drive shaft in wheel housing (left-side).

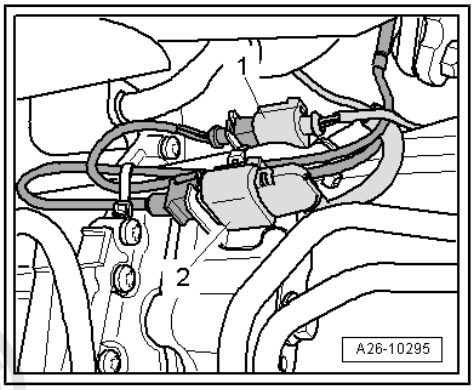


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– If fitted, move clear electrical wiring harness at heat shield for drive shaft (left-side).
– Remove bolts -arrows- and detach heat shield for drive shaft (left-side).



– Take electrical connector -1- for exhaust gas temperature sender 3 - G495- out of bracket at front left of gearbox and unplug.
– Move electrical wiring clear.



Note

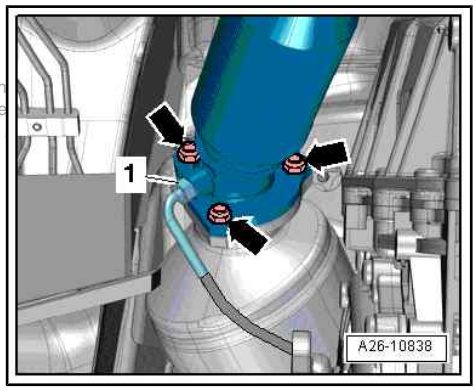
Disregard -item 2-.

WARNING

Working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system***
  ⇒ "3.4 Safety precautions when working on the exhaust system", page 5 .

– Remove exhaust gas temperature sender 3 - G495- -item 1-.



Note

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Disregard -arrows-.

Installing

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

- Tightening torque
  ⇒ "5.1 Exhaust gas temperature senders - exploded view", page 367

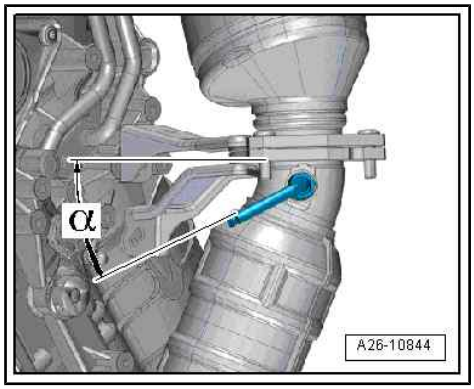
Note

Fit all cable ties in the original positions when installing.

– Coat thread of exhaust gas temperature sender with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .

– Observe correct installation position:

• Exhaust gas temperature sender 3 - G495- must be installed at an angle of -α- = 25 ± 5° to flange of front exhaust pipe.



– Install heat shield for drive shaft ⇒ page 33 .

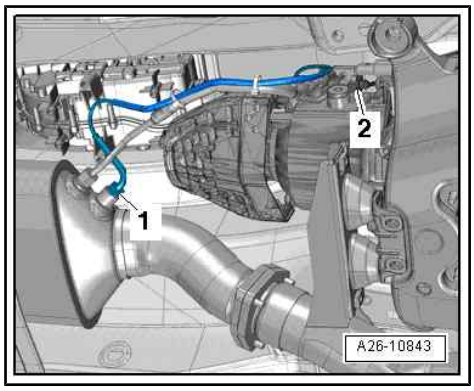
– Install cover for drive shaft ⇒ Rep. gr. 66 .

– Install noise insulation panels ⇒ Rep. gr. 50 .

5.4 Removing and installing exhaust gas temperature sender 4 - G648- - vehicles with manual gearbox and automatic gearbox

Removing

– Unplug electrical connector -2- for exhaust gas temperature sender 4 - G648- at rear right of gearbox.



WARNING

Working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system***
  ⇒ "3.4 Safety precautions when working on the exhaust system", page 5 .

– Remove exhaust gas temperature sender 4 - G648- -item 1-.

Installing

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

• Tightening torque
⇒ "5.1 Exhaust gas temperature senders - exploded view", page 367

Note

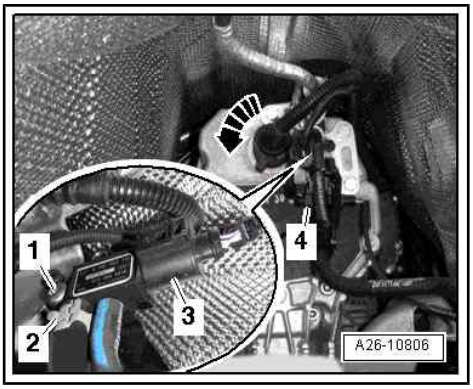
Fit all cable ties in the original positions when installing.

– Coat thread of exhaust gas temperature sender with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .

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5.5 Removing and installing exhaust gas temperature sender 4 - G648- - vehicles with multitronic gearbox

Removing



– Unplug electrical connector -4- for exhaust gas temperature sender 4 - G648- at rear of gearbox.

– Move electrical wiring clear.

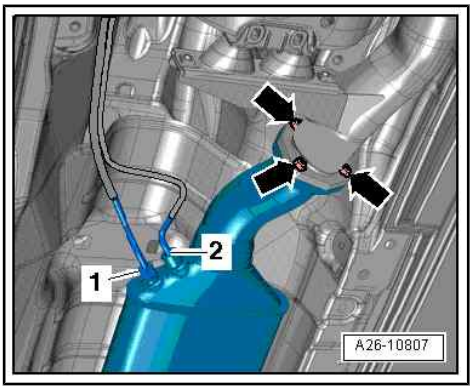
Note

Disregard -items 1, 2, 3- and -arrow-.

WARNING

Working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system***
  ⇒ "3.4 Safety precautions when working on the exhaust system", page 5 .



– Remove exhaust gas temperature sender 4 - G648- -item 2-.

Note

Ignore items marked -1- and -arrows-.

Installing

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

- Tightening torque
  ⇒ "5.1 Exhaust gas temperature senders - exploded view", page 367

Note

Fit all cable ties in the original positions when installing.

– Coat thread of exhaust gas temperature sender with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .

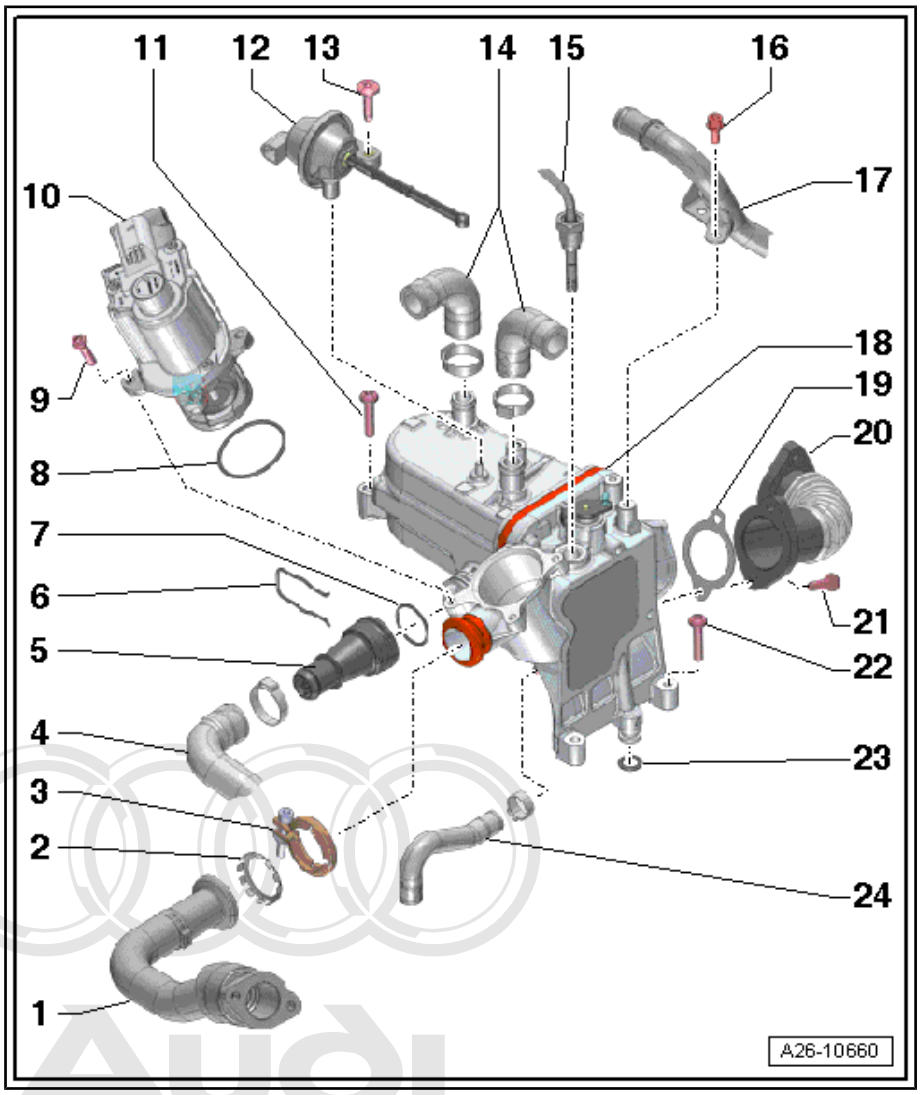
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6 Exhaust gas recirculation

Overview

- ⇒ “6.1 Exhaust gas recirculation system - exploded view”, page 374
- ⇒ “6.2 Removing and installing exhaust gas recirculation control motor V338 ”, page 375
- ⇒ “6.3 Removing and installing exhaust gas recirculation cooler”, page 376
- ⇒ “6.4 Removing and installing exhaust gas recirculation temperature sensor G98 ”, page 379

6.1 Exhaust gas recirculation system - exploded view



1 - Pipe for exhaust gas recirculation

2 - Sealing element

- ❑ Renew

3 - Clamp

- ❑ Installation position: as illustrated
- ❑ 9 Nm

4 - Coolant hose

5 - Connection with thermostat for exhaust gas recirculation

6 - Retaining clip

7 - O-ring

- ❑ Renew

8 - O-ring

- ❑ Renew

9 - Bolt

- ❑ 9 Nm

10 - Exhaust gas recirculation control motor - V338-

- ❑ With exhaust gas recirculation potentiometer - G212-
- ❑ Removing and installing ⇒ page 375

11 - Bolt

- ❑ 9 Nm

12 - Vacuum unit for exhaust gas recirculation changeover function

13 - Bolt

- ❑ 9 Nm

14 - Coolant hoses

15 - Exhaust gas recirculation temperature sensor - G98-

- ❑ Removing and installing ⇒ page 379
- ❑ 35 Nm for aluminium exhaust gas recirculation cooler

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- ❑ 45 Nm for steel exhaust gas recirculation cooler

16 - Bolt

- ❑ 9 Nm

17 - Crankcase breather pipe

18 - Exhaust gas recirculation cooler

- ❑ With change-over flap for exhaust gas recirculation cooler
- ❑ Removing and installing ⇒ page 376

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19 - Gasket

- ❑ Renew

20 - Pipe for exhaust gas recirculation

21 - Bolt

- ❑ 9 Nm

22 - Bolt

- ❑ 9 Nm

23 - O-ring

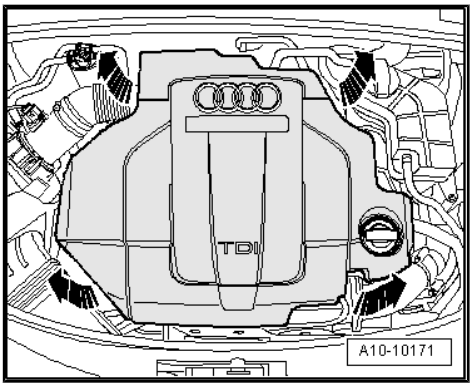
- ❑ Renew

24 - Coolant hose

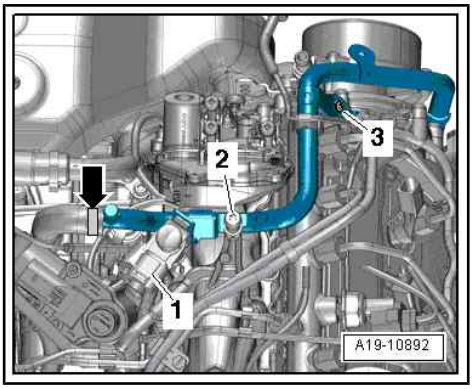
6.2 Removing and installing exhaust gas recirculation control motor - V338-

Removing

– Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



– Detach change-over valve for exhaust gas recirculation cooler - N345- -item 1- from bracket.

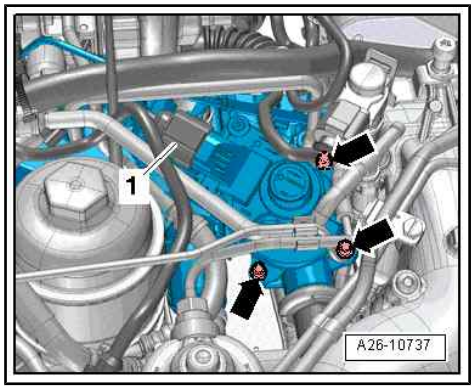


Note

Disregard -items 2, 3- and -arrow-.

– Unplug electrical connector -1-.

– Remove bolts -arrows- and detach exhaust gas recirculation control motor - V338- .



Installing

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

- Tightening torque
  ⇒ "6.1 Exhaust gas recirculation system - exploded view", page 374

Note

Fit new O-ring.

6.3 Removing and installing exhaust gas re-circulation cooler

Removing

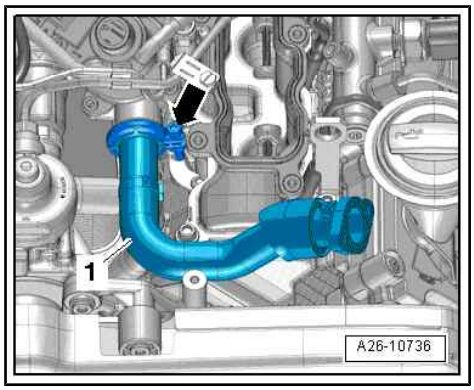
– Drain coolant ⇒ page 265 .

– Remove coolant pipe (top left) ⇒ page 287 .

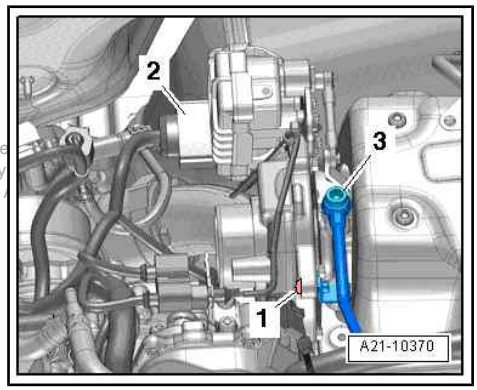
– Remove coolant pipe (top right) ⇒ page 291 .

– Remove oil filter housing ⇒ page 254 .

– Release clamp -arrow- and detach exhaust gas recirculation pipe -1-.



– Remove bolt -1- and banjo bolt -3- and move oil supply line clear to one side.

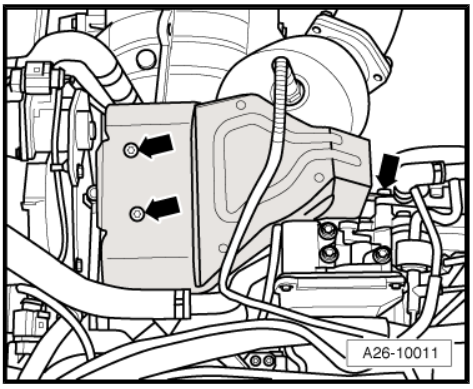


Note

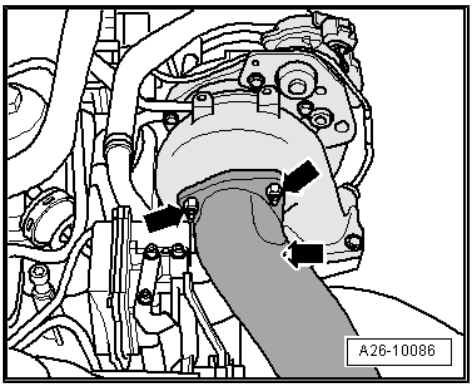
Disregard -item 2-.

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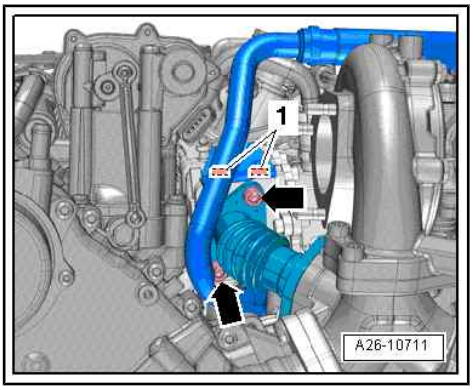
– Remove bolts -arrows- and detach heat shield for turbocharger.



– Remove nuts -arrows- securing starter catalytic converter to turbocharger, detach starter catalytic converter and press to rear.

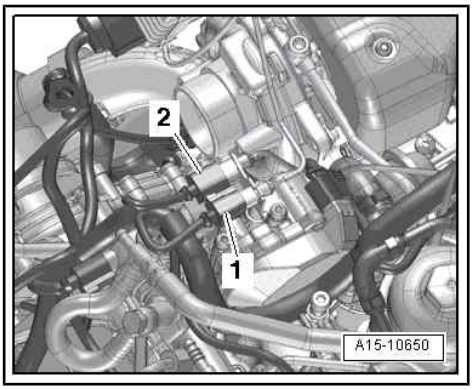


– Remove bolts -1- and -arrows-.



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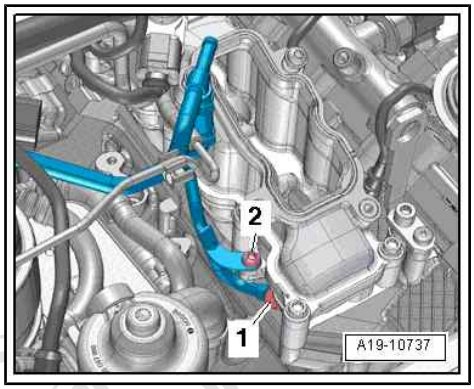
– Detach electrical connector -2- (orange) for exhaust gas recirculation temperature sensor -G98- from bracket and unplug.



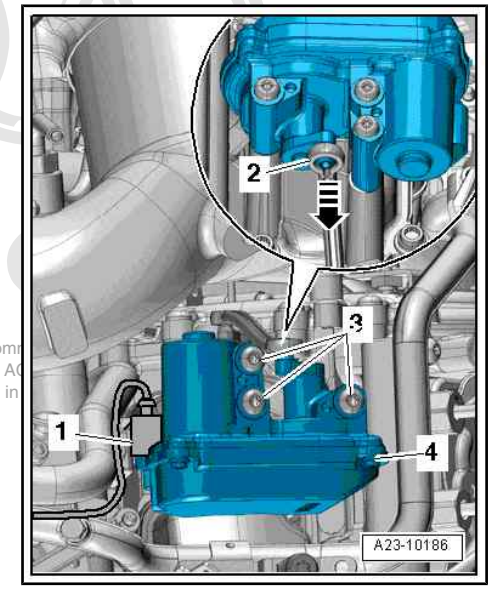
Note

Disregard -item 1-.

– Remove banjo bolt -1- and bolt -2- and move coolant pipe clear to one side.

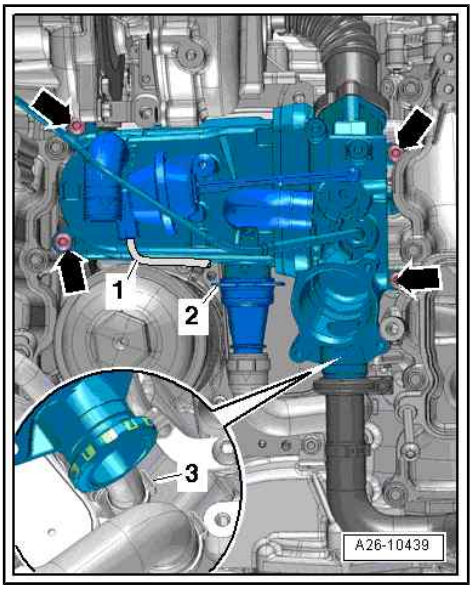


– Unplug electrical connector -1-.
– Carefully press linkage -2- off ball stud -arrow-.
– Remove bolts -3- and detach intake manifold flap motor 2 - V275- -item 4-.
– Perform the same work steps on the other side of the vehicle.



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– Disconnect vacuum hose -1-.
– Lift retaining clip -2- and disconnect coolant hose.
– Release hose clip -3- and detach coolant hose.
– Remove bolts -arrows- and lift off exhaust gas recirculation cooler from cylinder block.



Installing

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

- Tightening torque
  ⇒ "6.1 Exhaust gas recirculation system - exploded view", page 374

Note

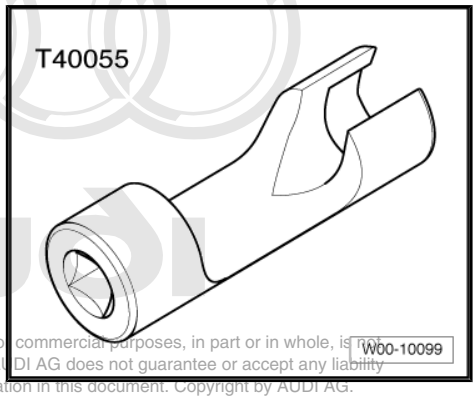
♦ *Renew gaskets and O-rings.*
♦ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

– Install intake manifold flap motors ⇒ Rep. gr. 23 .
– Install coolant pipe ⇒ page 281 .
– Install oil filter housing ⇒ page 254 .
– Install coolant pipe (top right) ⇒ page 291 .
– Install coolant pipe (top left) ⇒ page 287 .
– Install starter catalytic converter:
♦ Vehicles with front-wheel drive: manual gearbox ⇒ page 334 , multitronic gearbox ⇒ page 336 .
♦ Vehicles with four-wheel drive: manual gearbox ⇒ page 346 , automatic gearbox ⇒ page 348 .
– Fill up with coolant ⇒ page 266 .

6.4 Removing and installing exhaust gas recirculation temperature sensor - G98-

Special tools and workshop equipment required

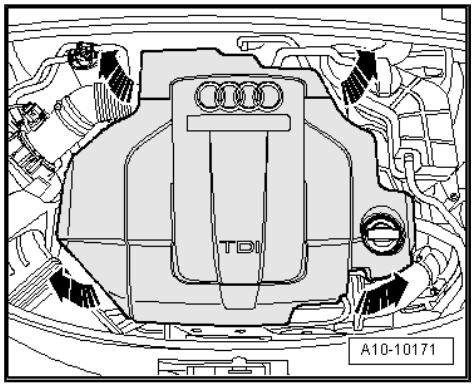
♦ Socket - T40055-



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Removing

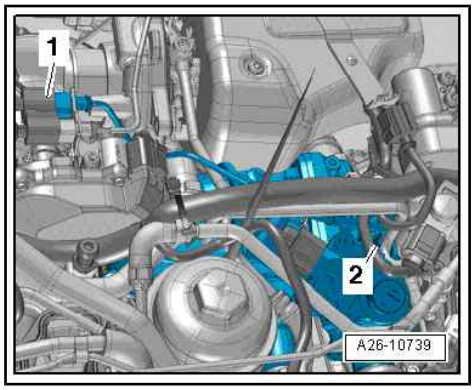
– Carefully pull engine cover panel off four retaining pins one after the other -arrows-.



– Detach electrical connector -2- (orange) for exhaust gas recirculation temperature sensor - G98- from bracket and unplug.

– Move electrical wiring clear.

– Use socket - T40055- to unscrew exhaust gas recirculation temperature sensor - G98- -item 1-.



Installing

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

- Tightening torque
⇒ “6.1 Exhaust gas recirculation system - exploded view”, page 374

Note

Fit all cable ties in the original positions when installing.

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