Workshop Manual

Audi A6 2011 ➤
Audi A6 China 2012 ➤
Audi A7 Sportback 2011 ➤

6-cylinder direct injection engine (2.5 ltr., 2.8 ltr. 4-valve)									
Engine ID	CHVA	CNYA	CNYB	CLXA	CLXB	CVPA			

Edition 11.2017

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Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions for working on motor vehicles must, as a matter of course, be observed.

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00 – Technical data

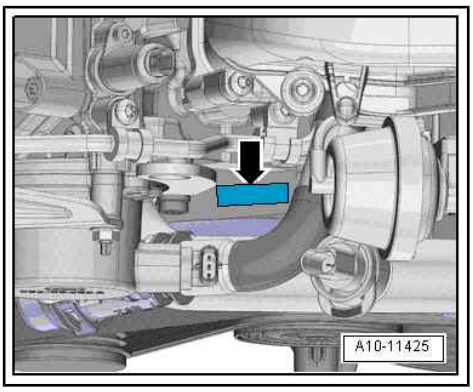
1 Identification

(ARL005489; Edition 11.2017)

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

1.1 Engine identification number/engine data

Engine number



Note

The engine cover panel (front) must be removed to make the engine number visible.

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

Note

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

Engine data

Code letters		CHVA	CLXA	CLXB
Capacity	ltr.	2.773	2.498	2.498
Power output	kW at rpm	150/5750 … 6800	140/5500	150/5500
Torque	Nm at rpm	280/3250 … 5000	250/3250 … 4750	250/3250 … 4750
Bore	∅ in mm	84.5	80.2	80.2
Stroke	mm	82.4	82.4	82.4
Compression ratio		12.0	12.3	12.3
RON	at least	95[1)]	95[1)]	95[1)]
Injection/ignition system		Simos	Simos	Simos
Firing order		1-4-3-6-2-5	1-4-3-6-2-5	1-4-3-6-2-5
Exhaust gas recirculation		no	no	no
Turbocharging/supercharging		no	no	no
Knock control		2 sensors	2 sensors	2 sensors
Charge air cooling		no	no	no

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Code letters	CHVA	CLXA	CLXB
Lambda control	2 probes before catalytic converter 2 probes after catalytic converter	2 probes before catalytic converter 2 probes after catalytic converter	2 probes before catalytic converter 2 probes after catalytic converter
Variable valve timing	Inlet Exhaust	Inlet Exhaust	Inlet Exhaust
Intake manifold change-over	yes	yes	yes
Secondary air system	yes	yes	yes
Valves per cylinder	4	4	4
• 1) Unleaded regular grade petrol (RON 91) can also be used, but this will result in a loss of power			

Code letters		CNYA	CNYB	CVPA
Capacity	ltr.	2.773	2.773	2.773
Power output	kW at rpm	150/5750 … 6800	162/5750 … 6800	162/5750 … 6800
Torque	Nm at rpm	280/3250 … 5000	280/3250 … 5000	280/3250 … 5000
Bore	∅ in mm	84.5	84.5	84.5
Stroke	mm	82.4	82.4	82.4
Compression ratio		12.0	12.0	12.0
RON	at least	95 1)	95 1)	95 1)
Injection/ignition system		Simos	Simos	Simos
Firing order		1-4-3-6-2-5	1-4-3-6-2-5	1-4-3-6-2-5
Exhaust gas recirculation		no	no	no
Turbocharging/supercharging		no	no	no
Knock control		2 sensors	2 sensors	2 sensors
Charge air cooling		no	no	no
Lambda control		2 probes before catalytic converter 2 probes after catalytic converter	2 probes before catalytic converter 2 probes after catalytic converter	2 probes before catalytic converter 2 probes after catalytic converter
Variable valve timing		Inlet Exhaust	Inlet Exhaust	Inlet Exhaust
Intake manifold change-over		yes	yes	yes
Secondary air system		yes	yes	yes
Valves per cylinder		4	4	4
• 1) Unleaded regular grade petrol (RON 91) can also be used, but this will result in a loss of power				

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2 Safety precautions

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

⇒ “2.2 Safety precautions when working on vehicles with start/stop system”, page 4

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

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

⇒ “2.5 Safety precautions when working on the cooling system”, page 5

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

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2.1 Safety precautions when working on the fuel supply system

Please note the following warnings when working on the fuel supply system:

WARNING

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

- *The fuel pressure in the high-pressure section of the injection system must be reduced to a residual pressure prior to opening the system; for the correct procedure see ⇒ “1.2 Reducing fuel pressure in high-pressure section”, page 282 .*
- *Wrap a clean cloth around the connection and carefully loosen the connection to allow the residual pressure to dissipate.*

Observe the following to prevent injuries to persons and damage to the injection and ignition system:

- ♦ Always switch off the ignition before connecting or disconnecting electrical wiring for the injection or ignition system or tester cables.
- ♦ Always switch off ignition before washing engine.
- – Erase any entries in event memory resulting from testing or installation:
- • Vehicle diagnostic tester must be connected.
- – Selecting operating mode.
- – Using Go To button and “Function/component selection” function, select the following in succession from tree:
- ♦ Drive train
- ♦ 01 - Self-diagnosis compatible systems
- ♦ Simos injection and ignition system
- ♦ Functions
- ♦ Readiness code

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 ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .*

WARNING

Escaping fuel can cause a risk.

- *The power supply for the fuel system pressurisation pump - G6- must be disconnected before opening the fuel system, since -G6- will be activated briefly when the driver's door is opened with the battery still connected.*
- *Disconnect power supply by removing fuse for fuel pump control unit - J538- /fuel delivery unit ⇒ Current flow diagrams, Electrical fault finding and Fitting locations, or disconnect battery.*

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

When performing repairs on vehicles with start/stop system, note the following:

WARNING

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

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

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

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

WARNING

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

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

- *The use of test equipment while driving causes distraction.*
- *There is an increased risk of injury if test equipment is not secured.*

◆ *Test equipment must always be secured on the rear seat with a strap and operated from the rear seat by a second person.*

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2.4 Safety precautions when working on the subframe

When working on the subframe note the following warnings:

Caution

Risk of damage to running gear components.

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

2.5 Safety precautions when working on the cooling system

When working on the cooling system note the following warnings:

WARNING

Risk of scalding due to hot steam and hot coolant.

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

Caution

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

- *The filler cap must engage positively and audibly when it is closed.*

2.6 Safety precautions when working on the ignition system

To prevent injuries to persons and/or irreparable damage to the fuel injection and ignition system, the following must be noted:

- Persons wearing a cardiac pacemaker must at all times maintain a safe distance from high-voltage components such as the ignition system and xenon headlights.
- Always switch off the ignition before connecting or disconnecting electrical wiring for the injection or ignition system or tester cables.
- Always switch off the ignition before cleaning the engine.
- Always switch off the ignition before connecting or disconnecting the battery, otherwise the engine control unit may be damaged.
- If you want to turn over the engine at cranking speed without actually starting it (e.g. compression test), first unplug the connectors from the ignition coils. In addition, remove fuse for fuel pump control unit - J538- ; for identification of fuses refer to ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.

– Erase any entries in event memory resulting from testing or installation:

• Vehicle diagnostic tester must be connected.

– Selecting operating mode.

– Using Go To button and “Function/component selection” function, select the following in succession from tree:

- Drive train
- 01 - Self-diagnosis compatible systems
- Simos injection and ignition system
- Functions
- Readiness code

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 ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .*

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3 Repair instructions

⇒ “3.1 Rules for cleanliness”, page 7

⇒ “3.2 Foreign particles in engine”, page 7

⇒ “3.3 Contact corrosion”, page 7

⇒ “3.4 Routing and attachment of pipes, hoses and wiring”, page 8

⇒ “3.5 Installing radiators and condensers”, page 8

⇒ “3.6 Checking vacuum system”, page 8

3.1 Rules for cleanliness

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

- Clean connections and surrounding area thoroughly with engine cleaner or brake cleaner and dry cleaned area before loosening.
- Immediately seal open lines and connections with clean plugs, for example from engine bung set - VAS 6122- .
- After removal, place parts on a clean surface and cover them. Only use lint-free cloths.
- Carefully cover or seal open components if repairs cannot be carried out immediately.
- Only install clean components; replacement parts should only be unpacked immediately prior to installation. Do not use parts that have been previously unpacked and stored away loose (e.g. in toolboxes, etc.).
- Do not work with compressed air when the system is open. If possible, do not move vehicle.
- Make sure that no fuel runs onto the fuel hoses. Should this occur, the fuel hoses must be cleaned again immediately.
- Protect unplugged electrical connectors against dirt and moisture and make sure connections are dry when attaching.

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3.2 Foreign particles in engine

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

3.3 Contact corrosion

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

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

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

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

Please note:

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

3.4 Routing and attachment of pipes, hoses and wiring

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

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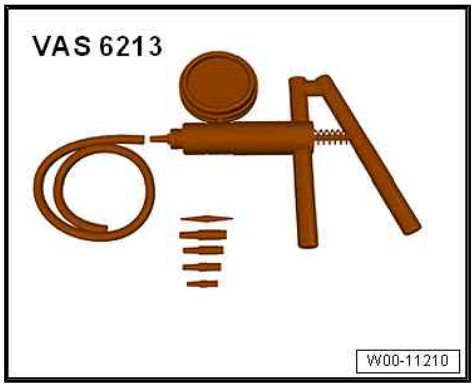
3.5 Installing radiators and condensers

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

3.6 Checking vacuum system

Special tools and workshop equipment required

- Hand vacuum pump - VAS 6213-



Procedure

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

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

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

– If an entry is stored in the event memory, check the vacuum lines leading to the corresponding component and also check the other vacuum lines leading to other components.

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

10 – Removing and installing engine

1 Removing and installing engine

⇒ “1.1 Removing engine”, page 9

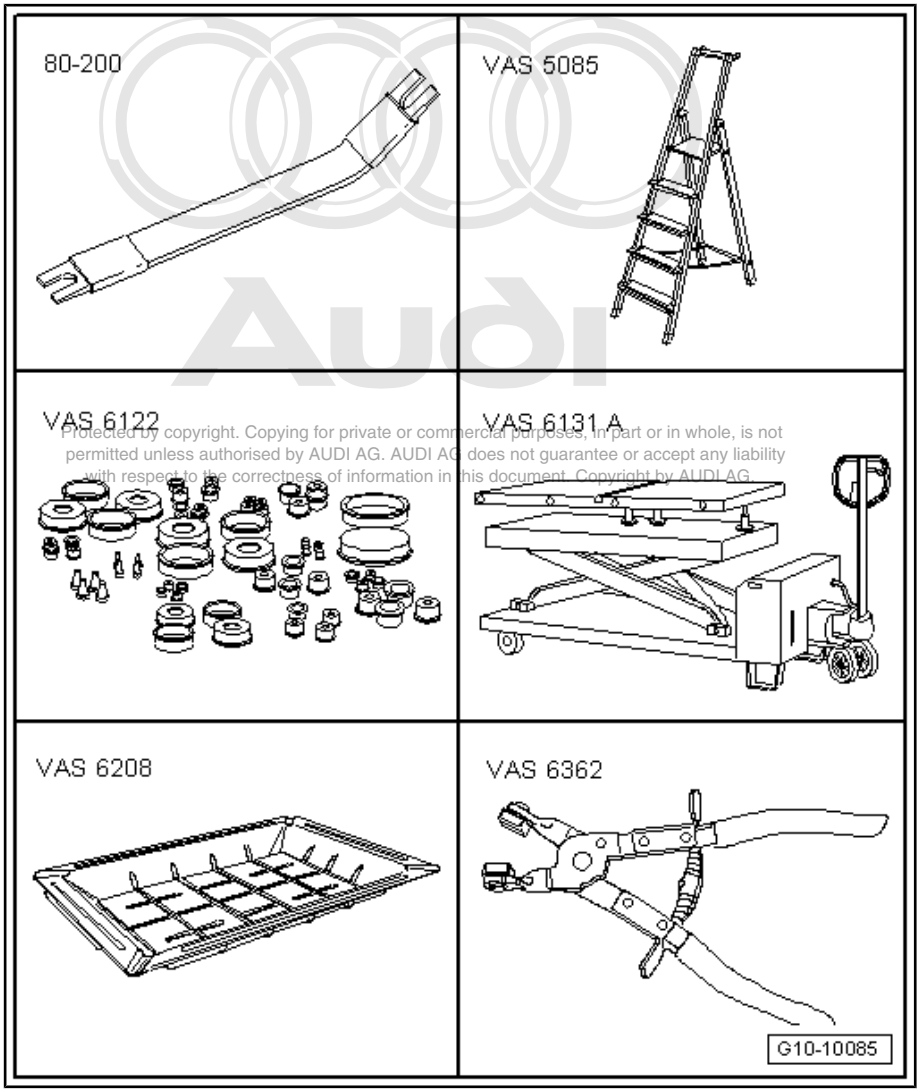
⇒ “1.2 Separating engine and gearbox”, page 26

⇒ “1.3 Securing engine to engine and gearbox support”, page 41

⇒ “1.4 Installing engine”, page 45

1.1 Removing engine

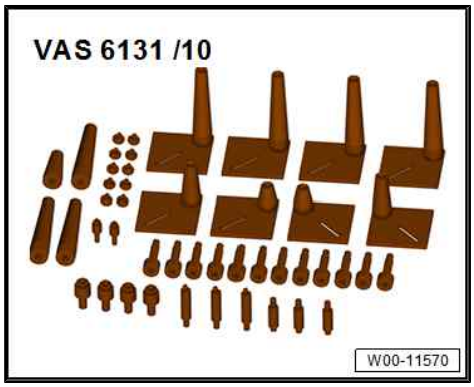
Special tools and workshop equipment required



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- Removal lever - 80 - 200-
- Stepladder - VAS 5085-
- Engine bung set - VAS 6122-
- Scissor-type assembly platform - VAS 6131 B-
- Drip tray for workshop hoist - VAS 6208-
- Hose clip pliers - VAS 6362-

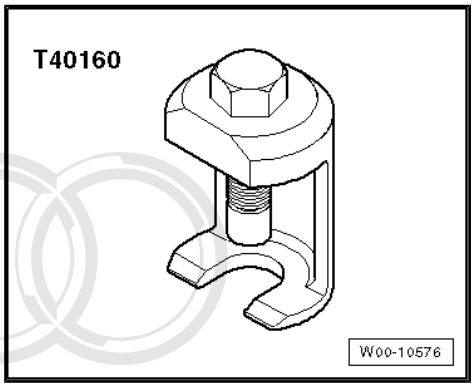
- Support set for Audi - VAS 6131/10-



- Supplementary set -VAS 6131/11-
- Supplementary set, Audi Q7 >2005 - VAS 6131/13-



- Puller - T40160- for vehicles with manual gearbox



Procedure

Note

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

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WARNING

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

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

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

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

– Reduce fuel pressure in high-pressure system ⇒ “1.2 Reducing fuel pressure in high-pressure section”, page 282 .

– Bring front wheels into straight-ahead position.

Caution

Risk of irreparable damage to electronic components.

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

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

– Discharge refrigerant system ⇒ Air conditioner with refrigerant R134a .

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

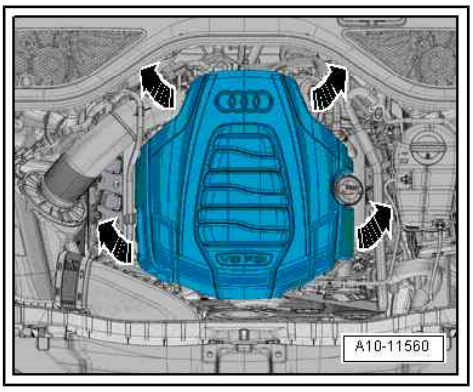
Vehicles with four-wheel drive:

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

Continued for all vehicles:

– Remove engine cover panel:

- Pull off cover panel (one-piece version) -arrows-.



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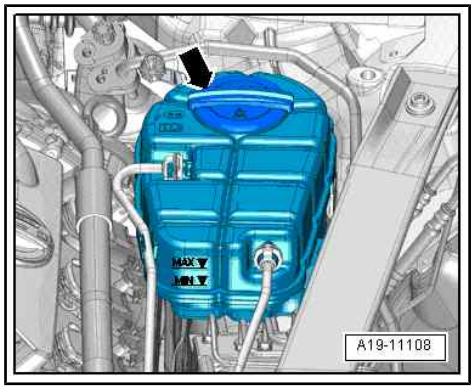
- Pull off both sections of cover panel (two-piece version) -arrows-.



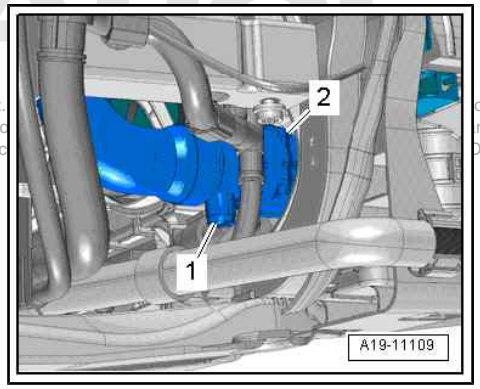
WARNING

Risk of scalding due to hot steam and hot coolant.

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



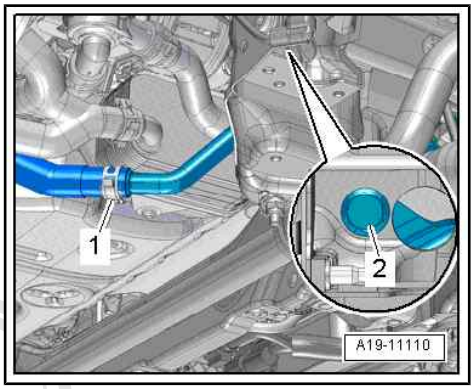
- Open filler cap -arrow- on coolant expansion tank.
- Remove both front wheels ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres .
- Remove wheel housing liners (front left and front right) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Removing and installing wheel housing liner (front) .
- Remove wheel spoilers (front) on both sides ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front) .
- Remove noise insulation panels ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .
- Place drip tray for workshop hoist - VAS 6208- beneath engine.
- Remove drain plug -1- and drain off coolant.
- Lift retaining clip -2- and disconnect coolant hose from radiator.



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Vehicles with multitronic gearbox 0AW (front-wheel drive) or 7-speed dual clutch gearbox 0B5:

– Release hose clip -1-, disconnect coolant hose from coolant pipe (bottom left) and drain off coolant.



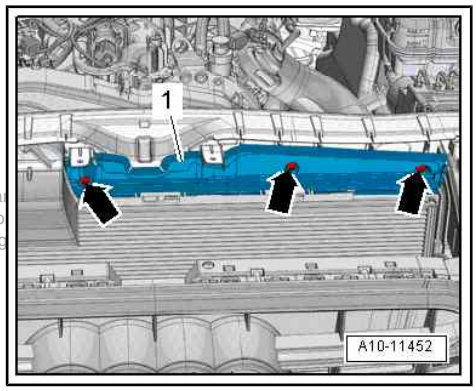
Note

- *Disregard -item 2-.*
- *The illustration shows the 2.8 ltr. engine.*

Continued for all vehicles:

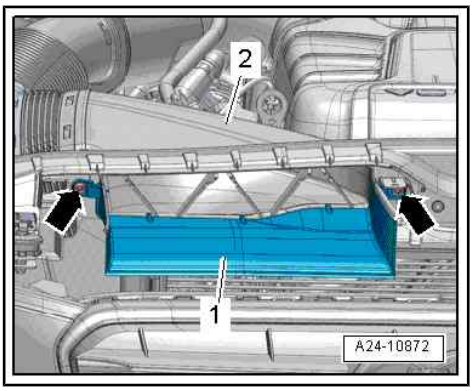
– Remove plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .

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



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



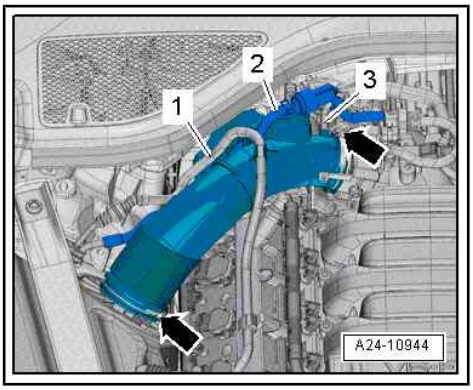
Note

Disregard -item 2-.

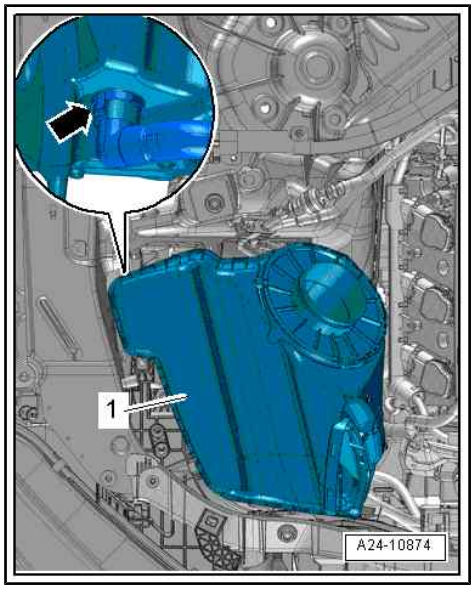
– Move fuel hose -1- and hose -2- from activated charcoal filter clear at air pipe.

– Detach vacuum hose -3- from connection on air pipe.

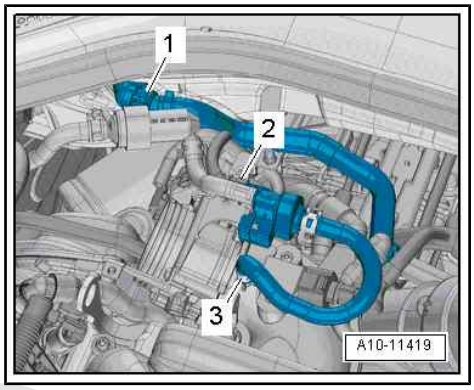
– Loosen hose clips -arrows- and detach air pipe.



– Lift off air cleaner housing -1-.
– Press release tabs and disconnect secondary air hose -arrow-.



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



WARNING

Risk of injury caused by fuel.

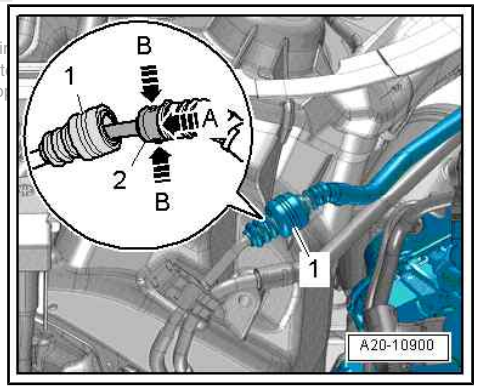
- *To allow the fuel pressure to dissipate, wrap a clean cloth around the connection and carefully loosen the connection before opening the fuel system.*

Caution

Take care to keep components clean.

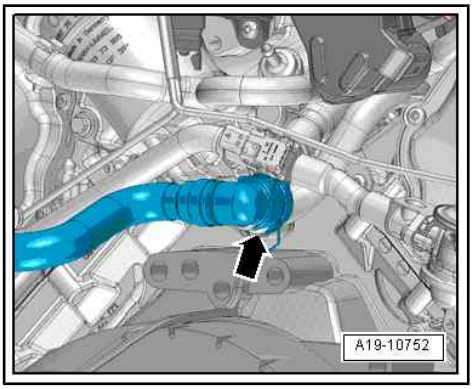
- *Observe rules for cleanliness when working on the fuel supply system ⇒ "3.1 Rules for cleanliness", page 7 .*

– Disconnect fuel line -2- ⇒ Fuel supply system; Rep. gr. 20 ; Plug-in connectors; Disconnecting plug-in connectors .
– Seal off open lines and connections with clean plugs from engine bung set - VAS 6122- .



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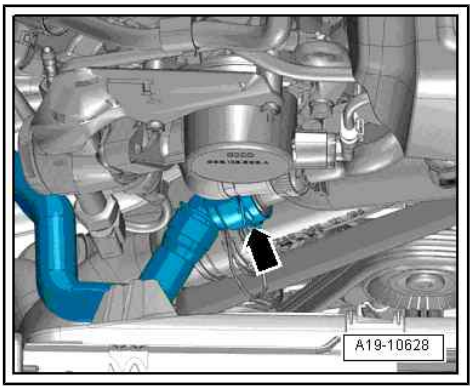
– Lift retaining clip -arrow- and detach coolant hose going to heat exchanger from rear of engine.



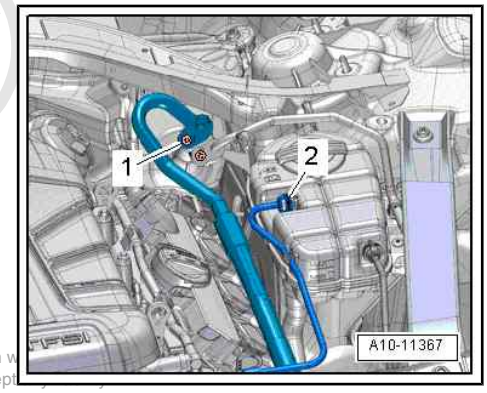
Note

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

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

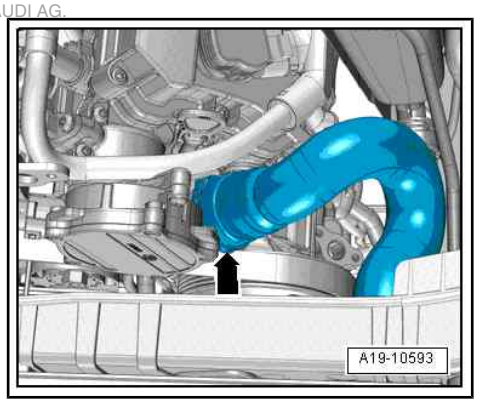


– Lift retaining clip -2- and disconnect coolant hose.
– Remove bolt -1- and move refrigerant line clear.



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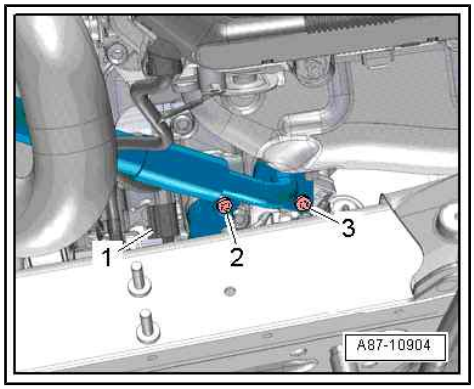
– Lift retaining clip -arrow-, detach coolant hose (left-side) from coolant pipe (front) and move coolant hose clear.



Caution

Danger of damage to refrigerant lines and hoses.

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



– Unscrew bolt -2- and remove refrigerant line from air conditioner compressor.

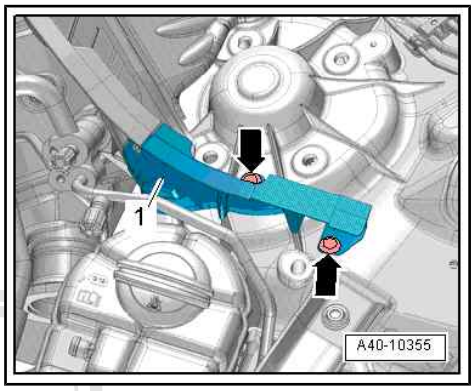
– Seal off open lines and connections with clean plugs from engine bung set - VAS 6122- .

Note

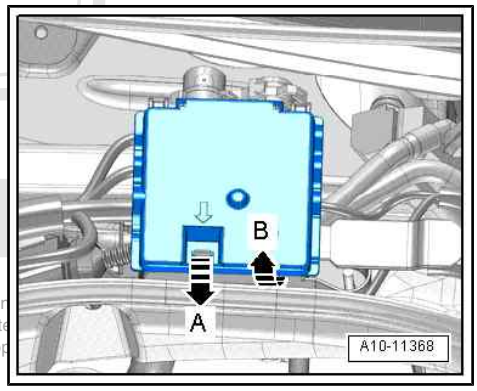
Disregard items -1 and 3-.

– Remove fasteners -arrows- on both sides and unclip cover -1-.

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



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

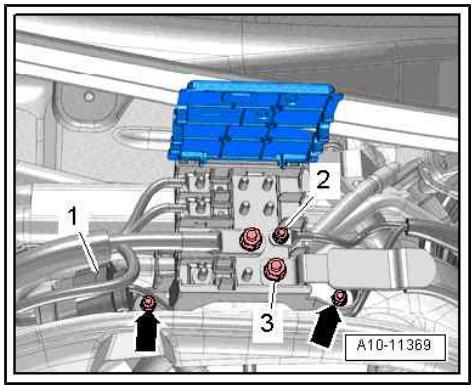


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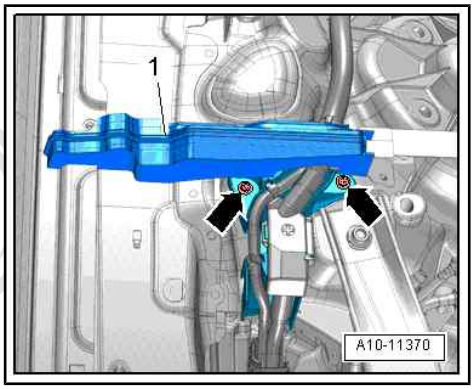
– Remove nuts -2 and 3- and move electrical wiring clear.

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

– Remove nuts -arrows- and detach terminal 30 wiring junction - TV2- from plenum chamber partition panel.

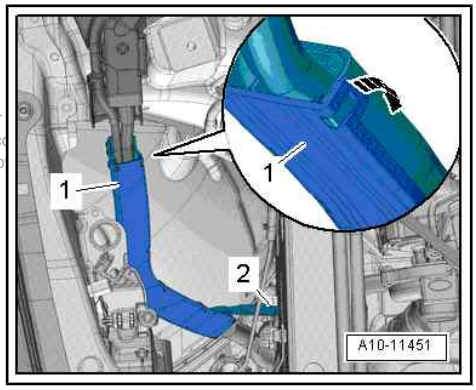


– Press foam wedge -1- to one side.
– Remove bolts -arrows-.

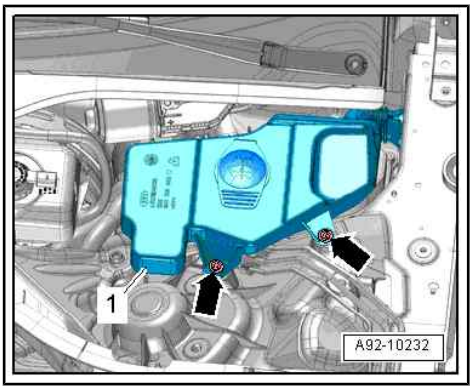


– Unscrew nut -2- on longitudinal member (right-side) and move earth cables clear.
– Release catches -arrow- to open wiring duct -1- and move electrical wiring harness clear.

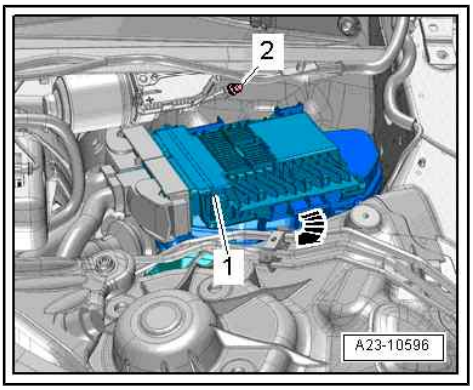
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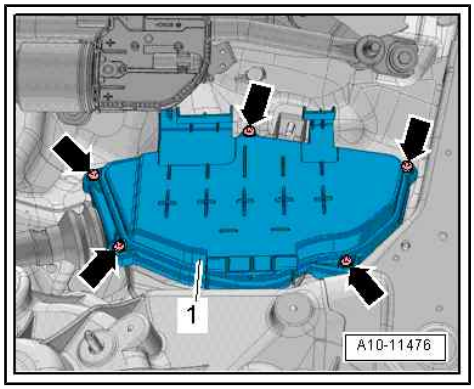
– Unscrew bolts -arrows- and pull filler neck -1- out of washer fluid reservoir and through opening in body to right side.



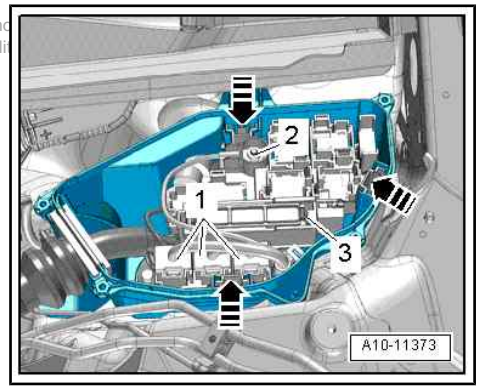
– Remove cap nut -2- and move earth wiring clear.
– Release fastener -arrow-, detach engine control unit - J623- -item 1- from bracket and swivel it to one side.



– Remove bolts -arrows- and detach cover -1- for electronics box in engine compartment.

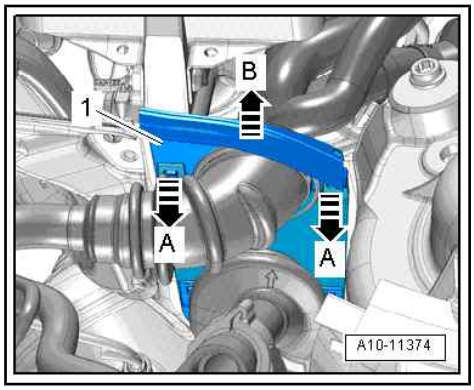


– Unplug electrical connectors -1- and unscrew nut -2- for electrical wiring.
– Release catches -arrows- and detach relay carrier with fuse holder -3-.
– Disengage engine wiring harness at electronics box in engine compartment and move clear.

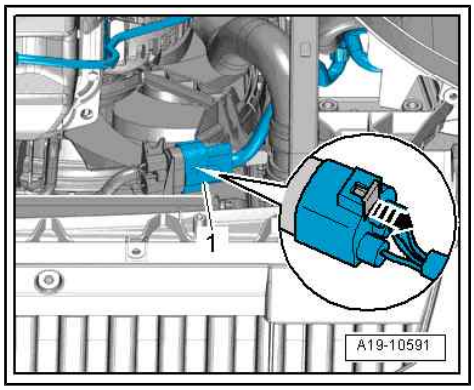


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– Release catches -arrows A- and lift off wiring protector -1- -arrow B-.
– Place wiring harness on engine and secure engine/motor control unit - J623- to prevent it from dropping.



– Take electrical connector -1- for radiator fan out of bracket and unplug connector (push retainer to the rear -arrow- and press down release catch).
– Move clear electrical wiring harness going to radiator fan control unit.



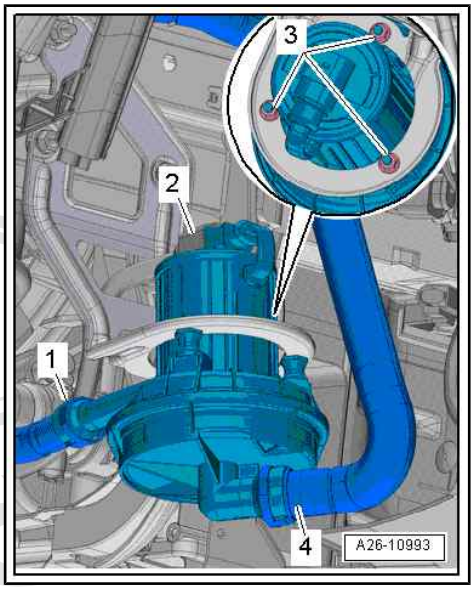
Vehicles with 2.5 ltr. engine:

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

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

Note

Disregard items -3 and 4-.



Vehicles with 2.8 ltr. engine:

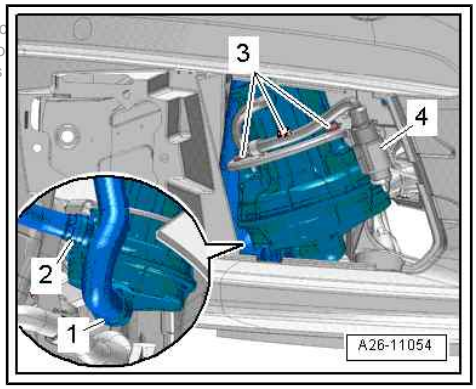
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– Unplug electrical connector -4- at secondary air pump motor -V101- and move electrical wiring clear.

– Press release tabs, disconnect secondary air hose -2- and move hose clear.

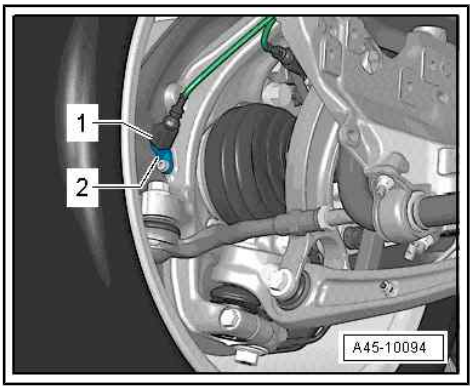
Note

Disregard items -1 and 3-.



Continued for all vehicles:

– Unplug electrical connector -1- at front wheel speed sensor -2- -G45- / -G47- on both sides.



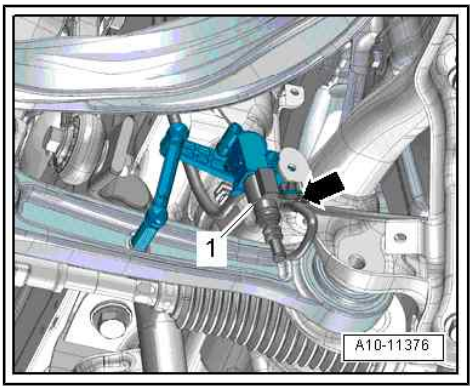
– If fitted, unplug electrical connector -1- at front vehicle level senders on both sides (-G78- and -G289-) and move electrical wiring clear -arrow-.

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

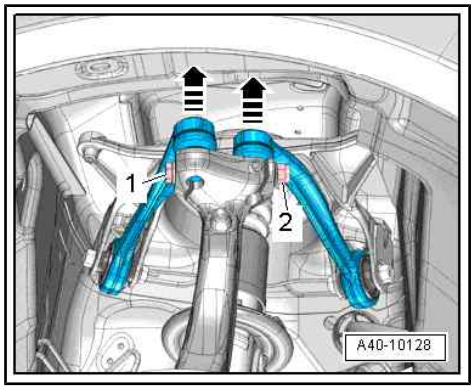
Caution

Risk of damage to brake pistons.

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



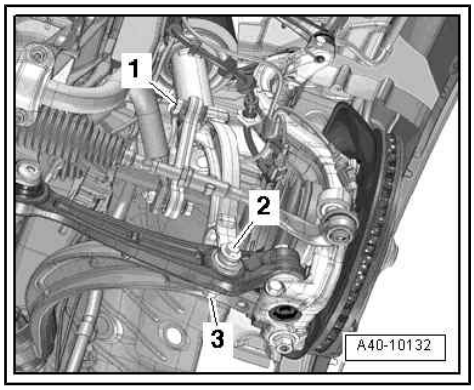
– Remove nut -2- and pull out bolt -1-.
– Pull upper suspension links upwards out of wheel bearing housing -arrows-.
– Repeat procedure on opposite side of vehicle.



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

Note

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

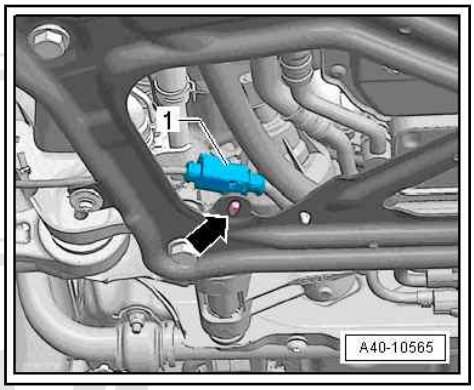


– Move clip clear -arrow-.
– Unplug electrical connector -1- and move wiring clear.
– Remove subframe cross brace ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Removing and installing subframe cross brace .

Caution

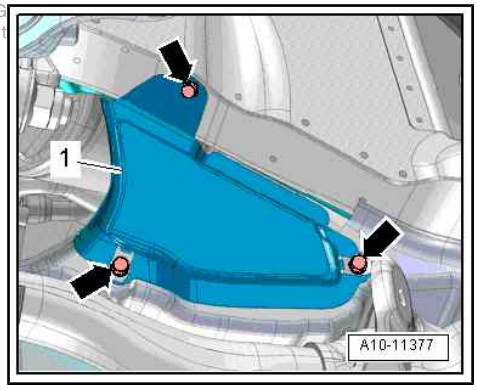
Risk of damage to running gear components.

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

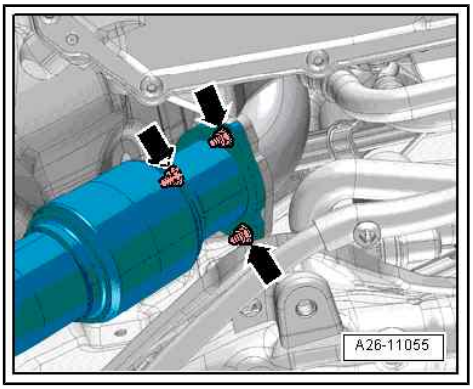


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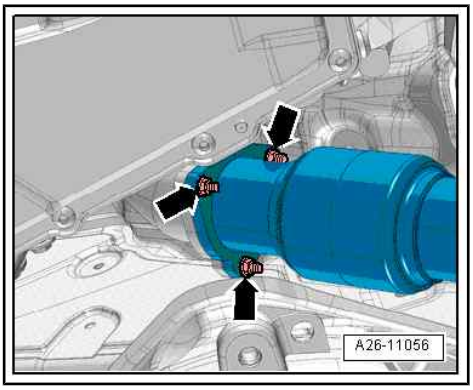
– Remove bolts -arrows- on both sides and detach heat shield -1- on subframe.



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



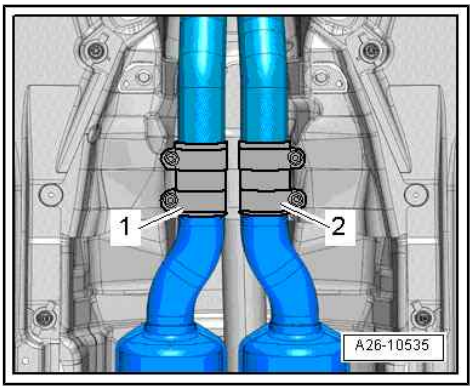
– Unscrew nuts -arrows- for front silencer (right-side).



Caution

Risk of damage to flexible joints in front silencer.

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

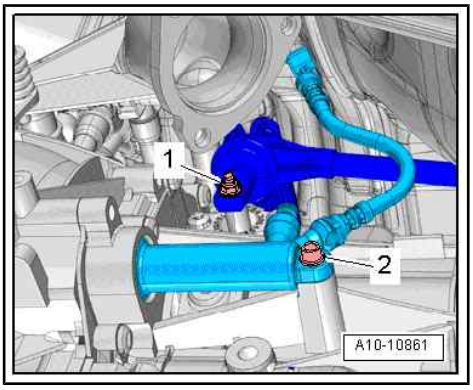


– Loosen and push back clamps -1, 2- and remove front silencers.

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

Vehicles with manual gearbox:

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



Caution

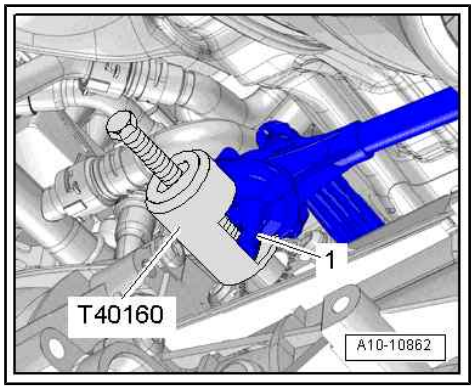
Risk of damage to clutch slave cylinder.

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

– Remove nut -1- for selector rod.

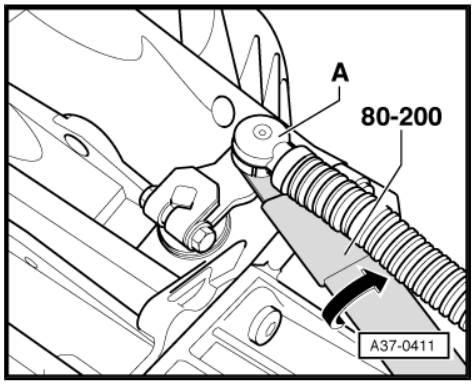
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– Apply puller - T40160- and pull off selector rod -1-.



Vehicles with multitronic gearbox 0AW (front-wheel drive):

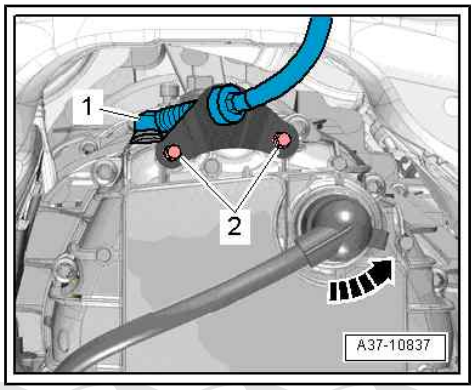
– Pry ball socket -A- of selector lever cable off gearbox selector lever -arrow- using removal lever - 80 - 200- .



– Remove bolts -2- for cable support bracket.

Note

- *Take care not to bend or kink selector lever cable.*
- *Disregard -item 1- and -arrow-.*

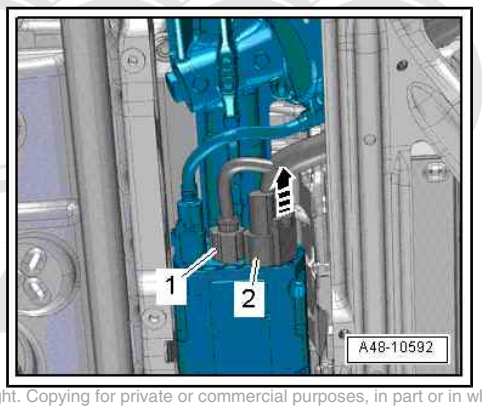


Continued for all vehicles:

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

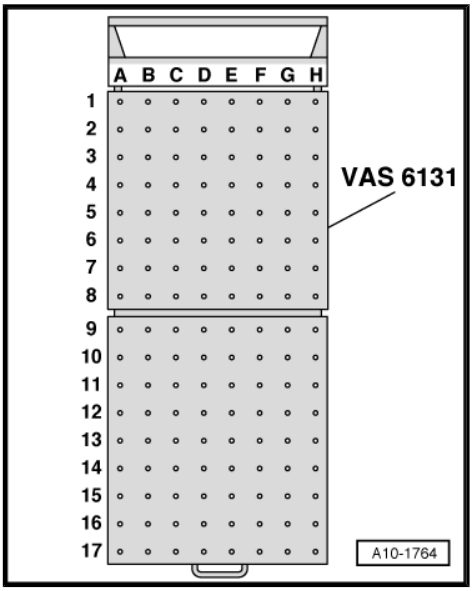
– Unplug electrical connector -1- at power steering control unit - J500- .

– Move electrical wiring harness clear.



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Set up the scissor-type assembly platform as follows:



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

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

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

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

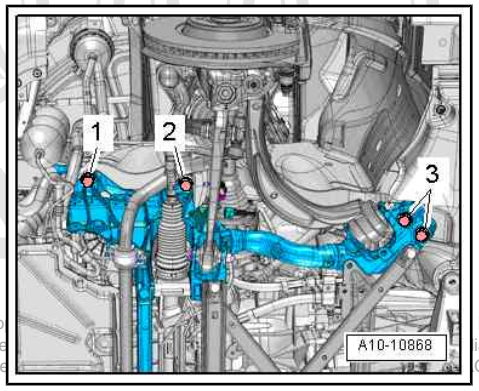
• Take note of spirit level (bubble gauge).

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

WARNING

Accident risk if subframe mountings are detached.

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

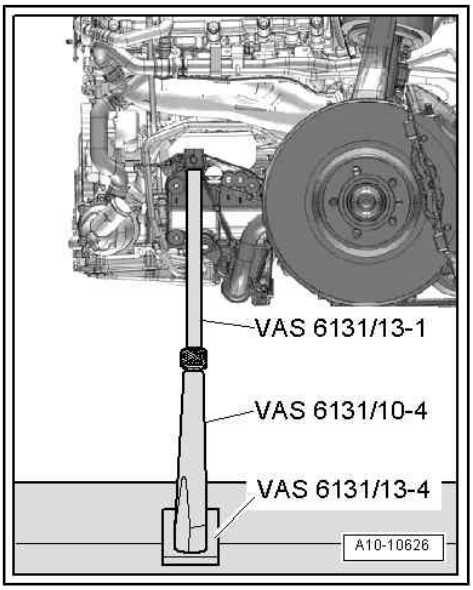


– Remove subframe bolts -1- on both sides.

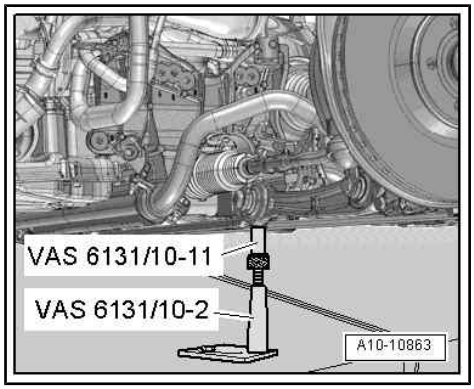
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– Position support elements from -VAS 6131/10- and -VAS 6131/13- at front left and right of subframe as shown.

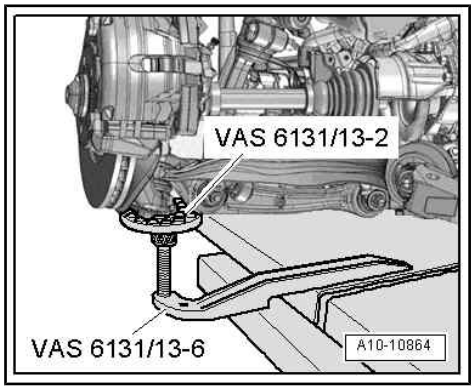
– Make sure that threaded spindles are screwed in completely.



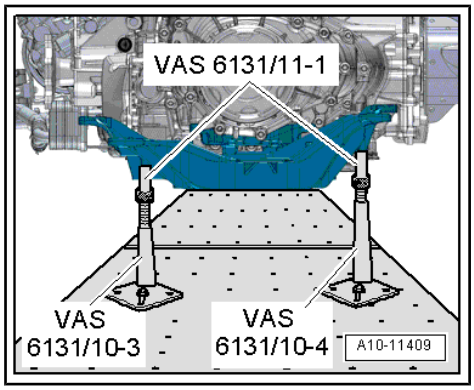
– Position support elements from -VAS 6131/10- (rear left and right) at front attachment points of subframe cross brace as shown.



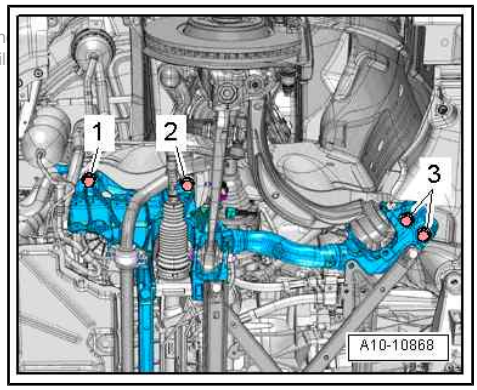
– Position support elements from -VAS 6131/13- under left and right wheel bearing housings as shown.



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

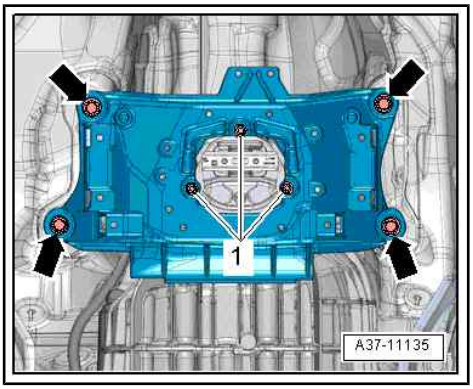


– Mark installation position of subframe and tunnel cross member on longitudinal members with felt-tip pen.
– Unscrew subframe bolts -2- and -3- on both sides in several stages and in diagonal sequence.



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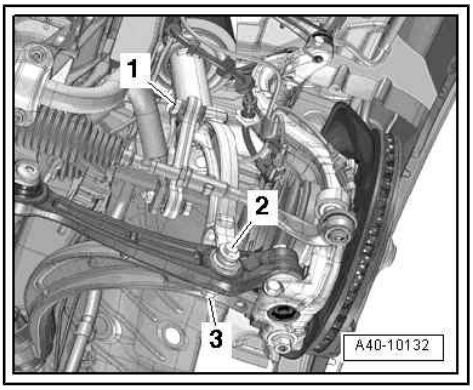
– Remove bolts -arrows- on tunnel cross member.



Note

The illustration shows the tunnel cross member for vehicles with front-wheel drive; it is similar on other vehicles.

– Remove bolt -2- on both sides.



Caution

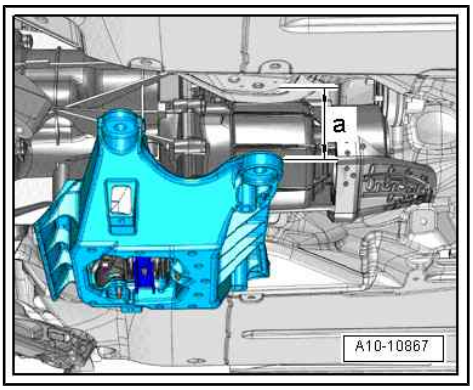
Danger of damage to hoses, pipes and wiring connections and to engine compartment.

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

Vehicles with manual gearbox or dual clutch gearbox 0B5:

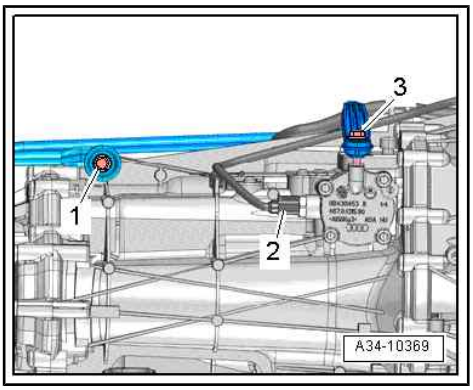
– Lower engine/gearbox assembly using scissor-type assembly platform - VAS 6131 B- initially only as far as distance -a-.

• Dimension -a- = 100 mm (maximum).



Vehicles with manual gearbox:

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

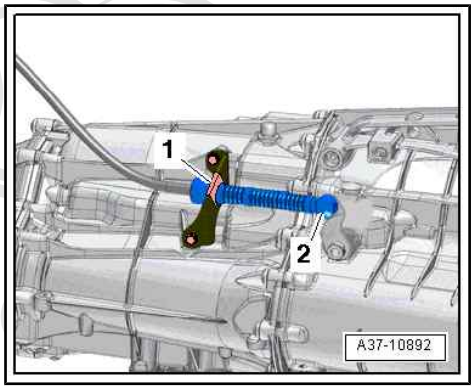


Note

Disregard -item 2-.

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Vehicles with dual clutch gearbox 0B5:



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

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

Note

Take care not to bend or kink selector lever cable.

Continued for all vehicles:

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– Lower engine/gearbox assembly.

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

1.2 Separating engine and gearbox

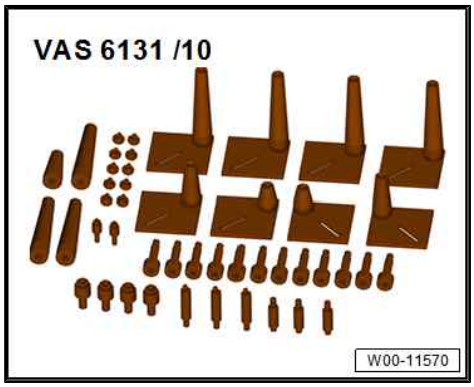
⇒ “1.2.1 Separating engine and gearbox - manual gearbox 0B1”, page 26

⇒ “1.2.2 Separating engine and gearbox - multitronic gearbox 0AW”, page 30

⇒ “1.2.3 Separating engine and gearbox - dual clutch gearbox 0B5”, page 36

1.2.1 Separating engine and gearbox - manual gearbox 0B1

Special tools and workshop equipment required

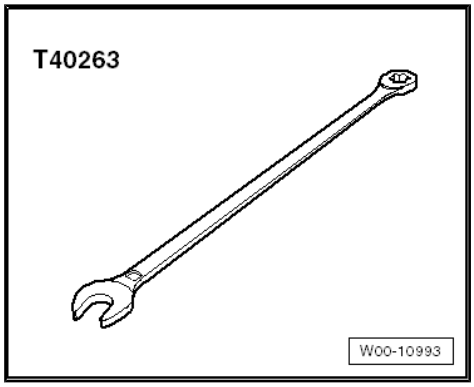


♦ Support set for Audi - VAS 6131/10-

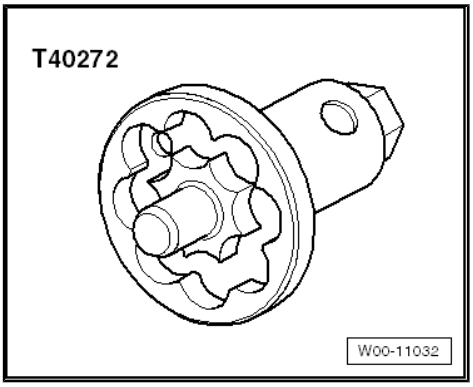
♦ Support -VAS 6131/13-7-

♦ Gearbox support - VAS 6131/14-

♦ Wrench, 21 mm - T40263-



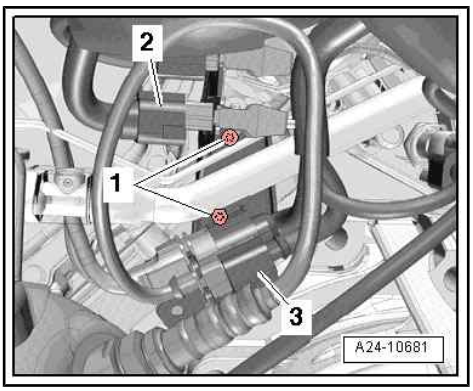
♦ Turning-over tool - -



Procedure

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

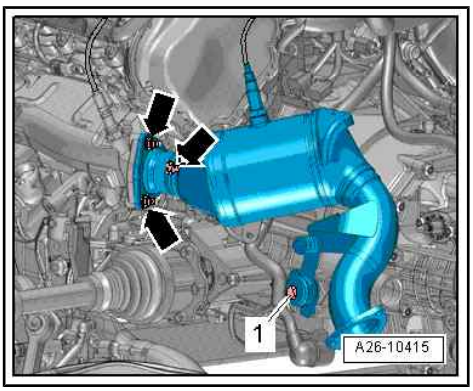
– Remove electrical connector -3- for Lambda probe 2 after catalytic converter - G131- from bracket and unplug connector.



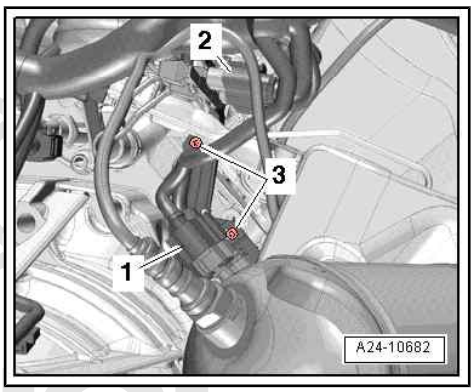
Note

Disregard items -1 and 2-.

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



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

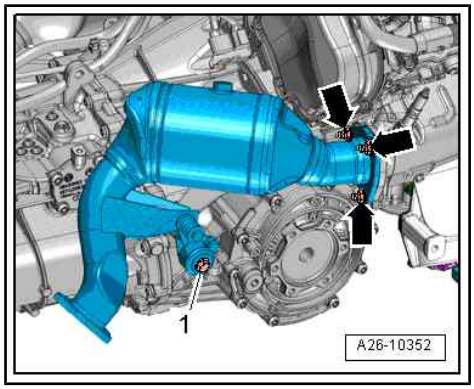


Note

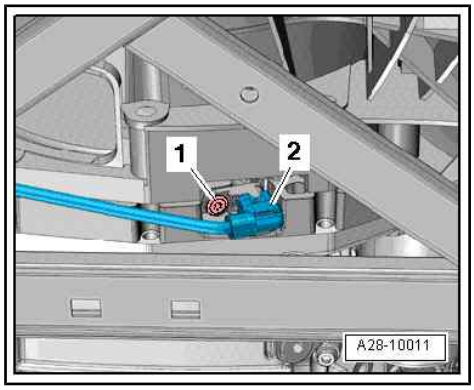
Disregard items -2 and 3-.

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



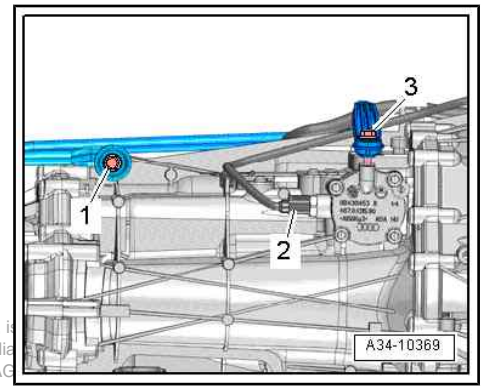
– Unplug electrical connector -2- at engine speed sender - G28- and move wiring clear.



Note

Disregard -item 1-.

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



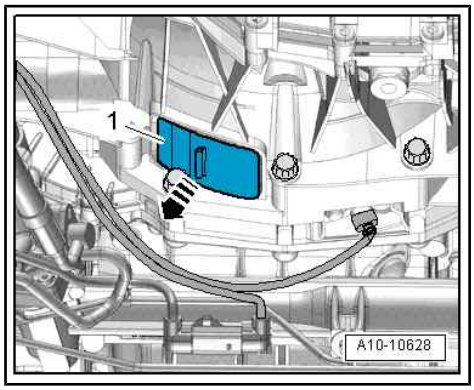
Note

Disregard items -1 and 3-.

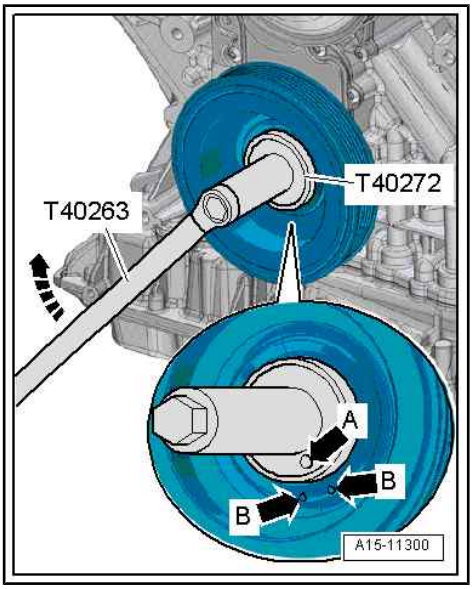
– Unbolt drive shafts (left and right) from gearbox flange shafts ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .

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



– Fit turning-over tool - T40272- onto wrench (21 mm) - T40263- .
– Position adapter on bolts of vibration damper.
• Hole -arrow A- on turning-over tool - T40272- must be positioned between markings -arrows B- on vibration damper.



Note

If necessary, remove radiator fan control unit.

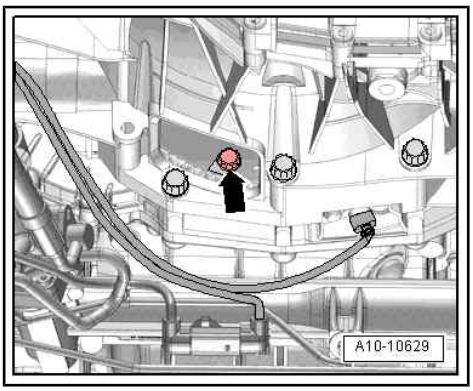
– Counterhold crankshaft using wrench (21 mm) - T40263- and turning-over tool - T40272- when loosening bolts for clutch module.

Note

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

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

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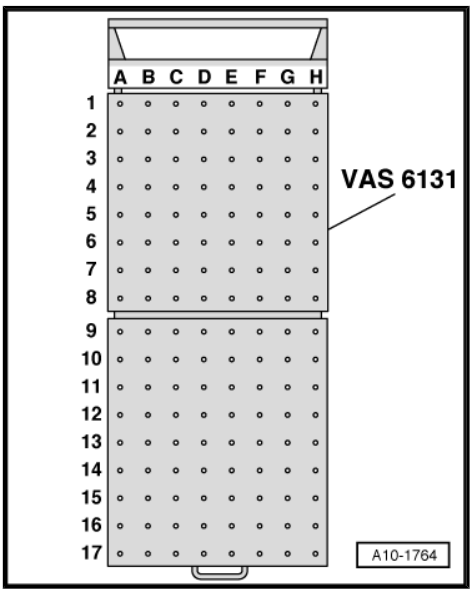


– Set up scissor-type assembly platform - VAS 6131 B- with support set for Audi - VAS 6131/10- , support -VAS 6131/13-7- and gearbox support - VAS 6131/14- as follows.

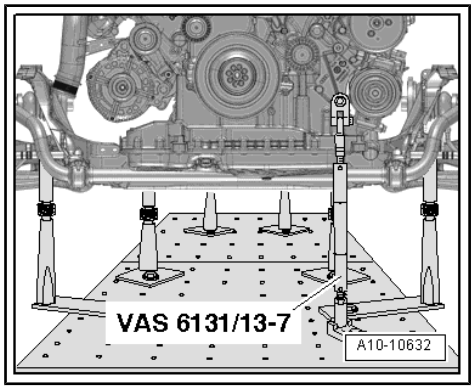
Note

The other support elements remain unchanged.

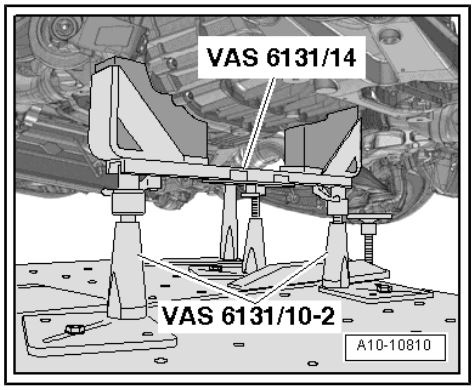
Platform coordinates	Parts from support set for Audi - VAS 6131/10- , support -VAS 6131/13-7- and gearbox support - VAS 6131/14-			
D2	/13-7			
B10	/10-1	/10-2	/10-5	/14
G10	/10-1	/10-2	/10-5	



– Secure support -VAS 6131/13-7- in threaded hole for poly V-belt tensioner at front left of engine with M8x35 bolt and washer (outside diameter 25 mm), as illustrated.
– Secure support -VAS 6131/13-7- to scissor-type assembly platform and tighten to 20 Nm.



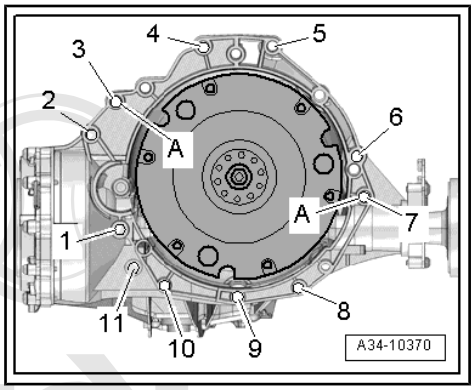
– Position support elements from -VAS 6131/10- and gearbox support - VAS 6131/14- at front of gearbox, as illustrated.
– Screw spindles on both sides upwards until gearbox support - VAS 6131/14- makes full contact with gearbox.
– Tighten base plates for support elements to 20 Nm on scissor-type assembly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



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

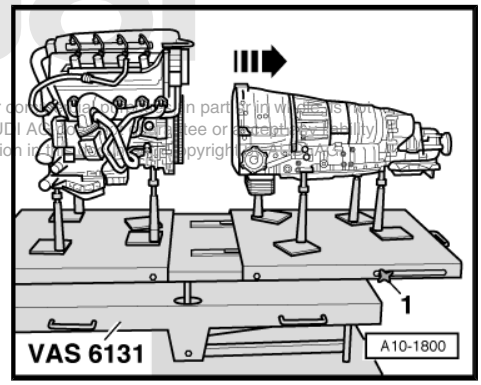
Note

Disregard -item A-.



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

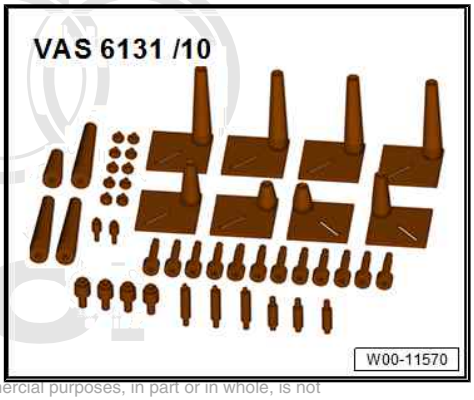
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1.2.2 Separating engine and gearbox - multi-tronic gearbox 0AW

Special tools and workshop equipment required

- Support set for Audi - VAS 6131/10-

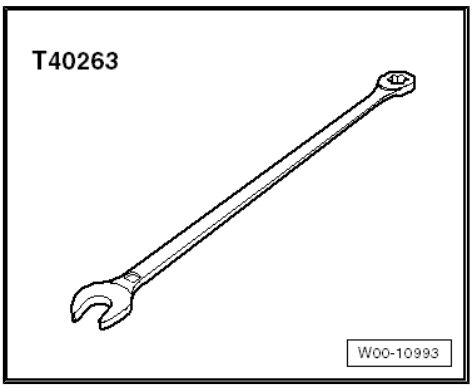


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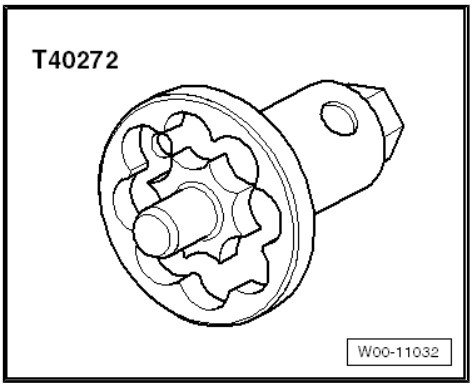
- Support -VAS 6131/13-7- from support set, Audi Q7 >2005 - VAS 6131/13-



- Gearbox support - VAS 6131/14-
- Wrench, 21 mm - T40263-



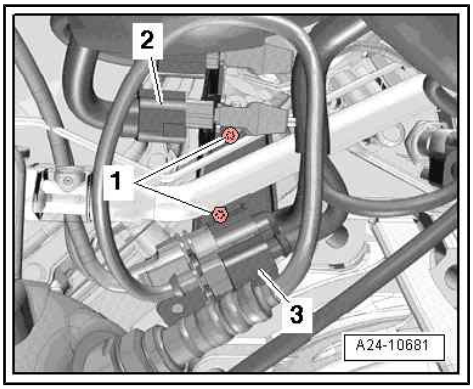
- Turning-over tool - T40272-



Procedure

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

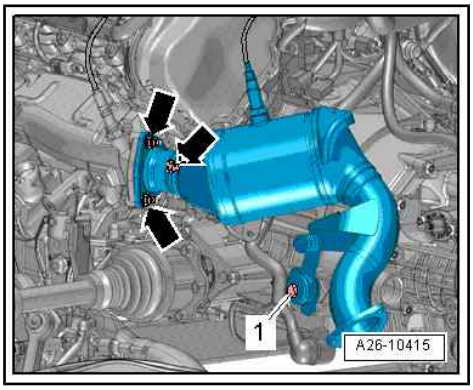
– Remove electrical connector -3- for Lambda probe 2 after catalytic converter - G131- from bracket and unplug connector.



Note

Disregard items -1 and 2-.

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

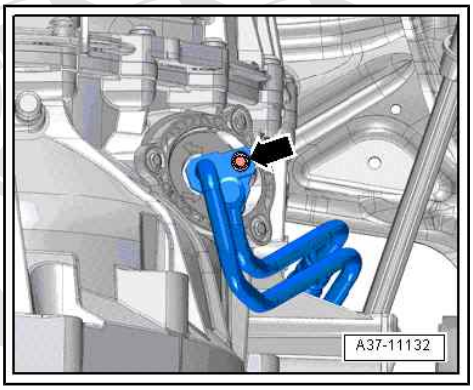


Note

Place a cloth underneath to catch escaping ATF.

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

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

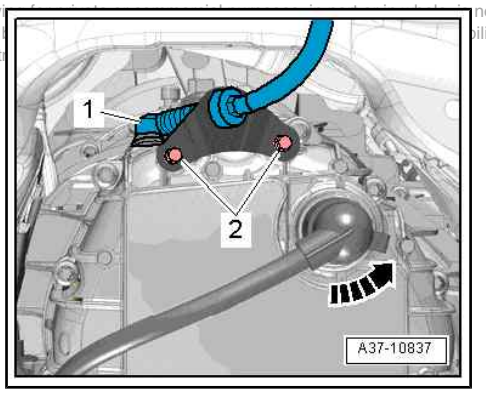


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Caution

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

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



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

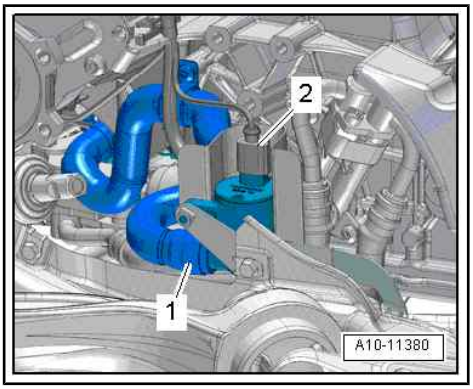
– Turn retainer catch anti-clockwise -arrow- and unplug electrical connector at gearbox.

– Move electrical wiring harness clear at gearbox.

Note

Disregard items -1 and 2-.

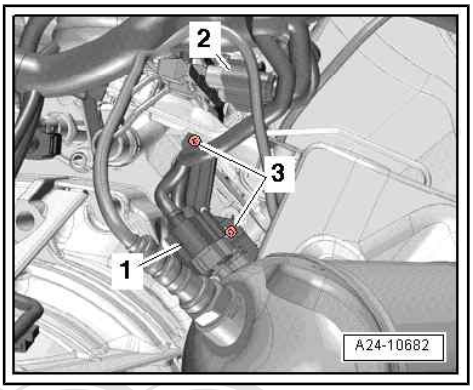
– Release hose clip -1- and detach coolant hose.



Note

Disregard -item 2-.

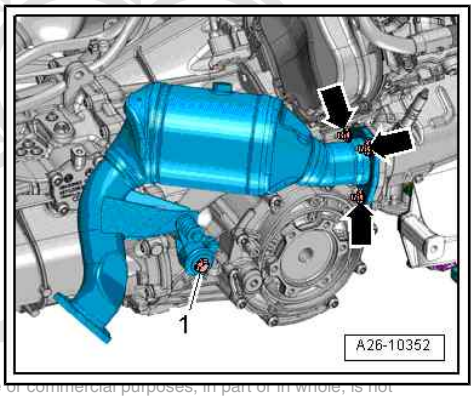
– Remove electrical connector -1- for Lambda probe after catalytic converter - G130- from bracket and unplug connector.



Note

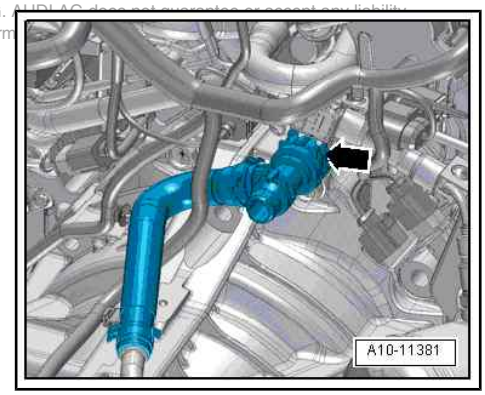
Disregard items -2 and 3-.

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

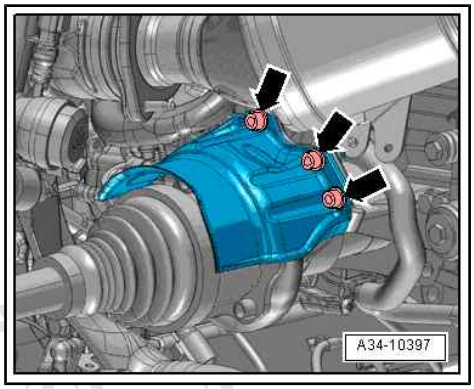


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– Lift retaining clip -arrow- and detach connection from coolant pipe (top).



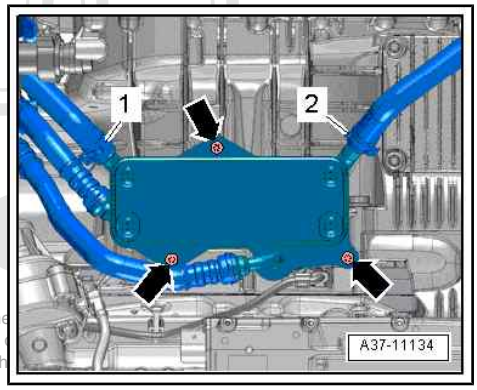
– Remove bolts -arrows- and detach heat shield for drive shaft (left-side).
– Unbolt drive shaft (left and right) from gearbox flange shafts ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .



Note

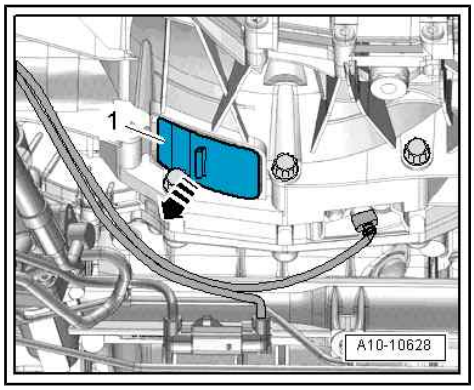
Place a cloth underneath to catch escaping coolant.

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



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

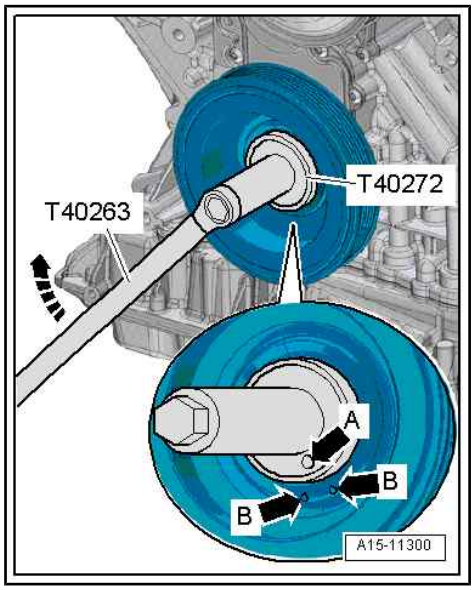


– Fit turning-over tool - T40272- onto wrench (21 mm) - T40263- .
– Position adapter on bolts of vibration damper.
• Hole -arrow A- on turning-over tool - T40272- must be positioned between markings -arrows B- on vibration damper.

Note

If necessary, remove radiator fan control unit.

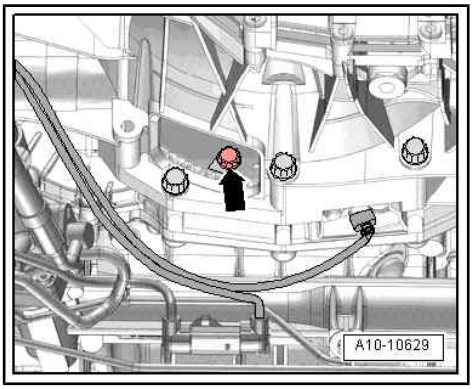
– Counterhold crankshaft using wrench (21 mm) - T40263- and turning-over tool - T40272- when loosening bolts for dual-mass flywheel.



Note

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

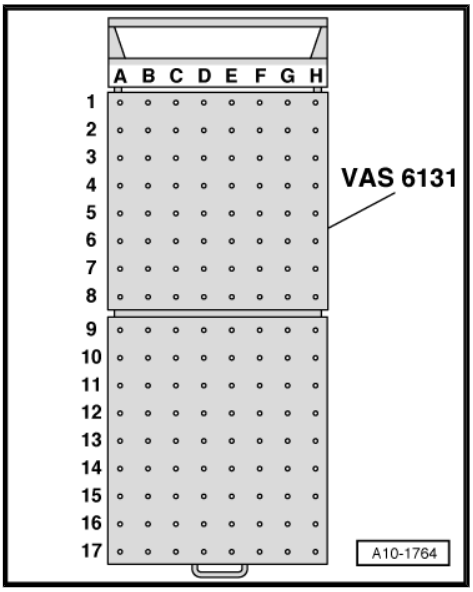
– Remove 6 bolts -arrow- for clutch module. Turn crankshaft each time by 60° in direction of engine rotation.



Note

Disregard items -2 and 3-.

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

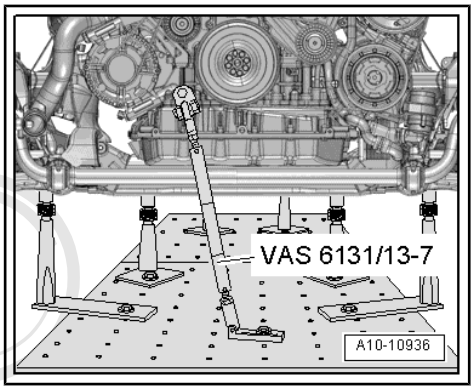


Note

The other support elements remain unchanged.

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

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



Note

If bore has no thread, tap hole.

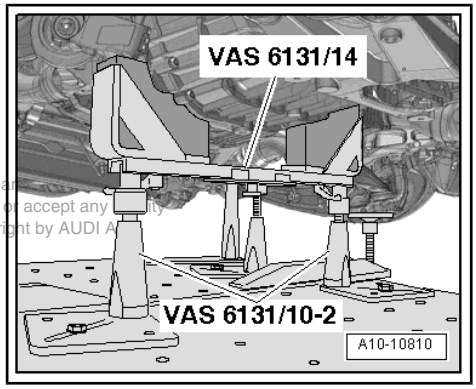
– Secure support -VAS 6131/13-7- to scissor-type assembly platform and tighten to 20 Nm.

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

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

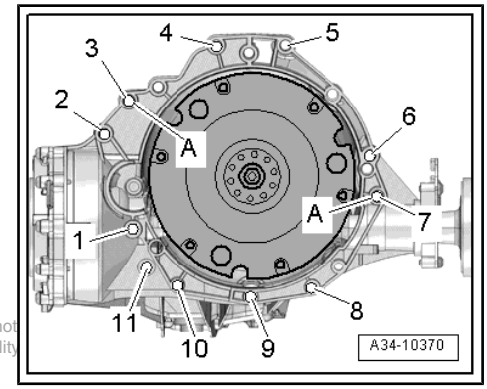
– Screw spindles upwards on both sides until mountings - VAS 6131/11-4- make full contact with gearbox.

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



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

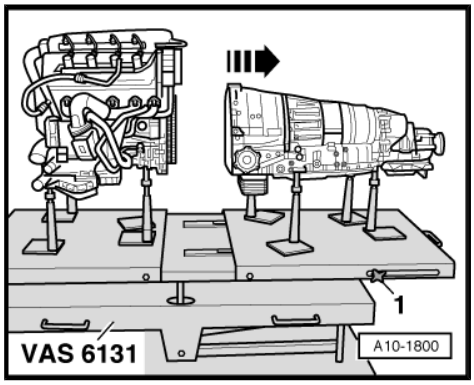


Note

Disregard -item A-.

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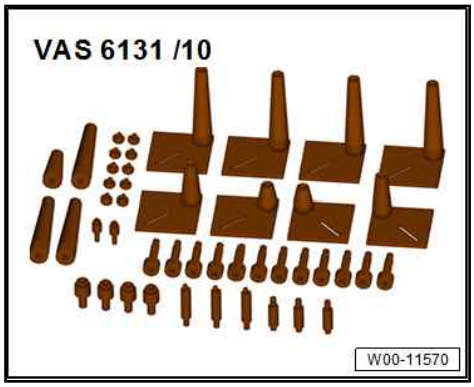
– Loosen clamping bolts -1- on sides of scissor-type assembly platform - VAS 6131 B- and pull rear section of platform together with gearbox towards rear -arrow-.



1.2.3 Separating engine and gearbox - dual clutch gearbox 0B5

Special tools and workshop equipment required

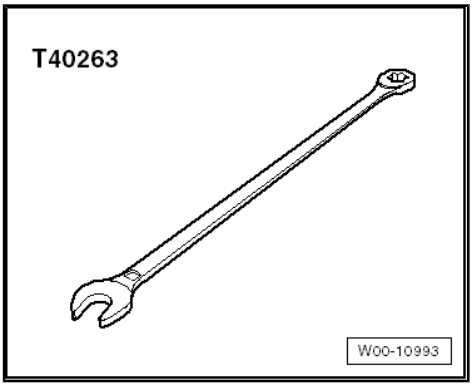
♦ Support set for Audi - VAS 6131/10-



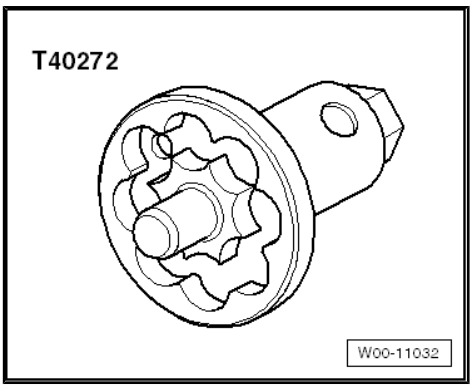
♦ Supplementary set -VAS 6131/11-
♦ Support -VAS 6131/13-7- from support set, Audi Q7 >2005 - VAS 6131/13-



♦ Wrench, 21 mm - T40263-



♦ Turning-over tool - T40272-

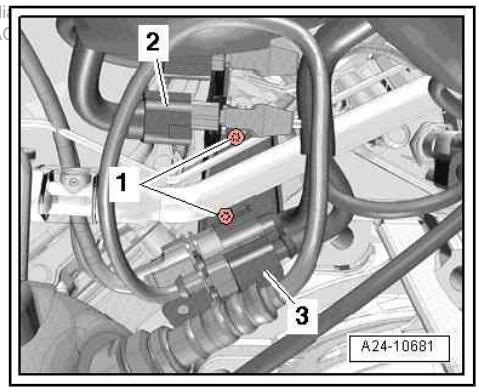


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Procedure

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

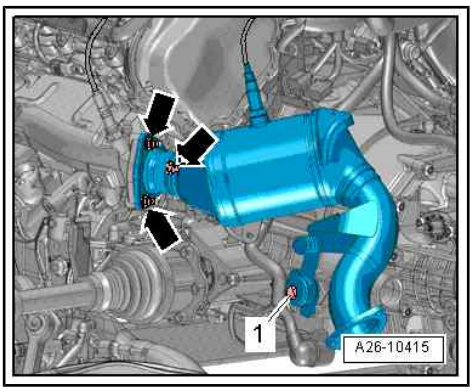
– Remove electrical connector -3- for Lambda probe 2 after catalytic converter - G131- from bracket and unplug connector.



Note

Disregard items -1 and 2-.

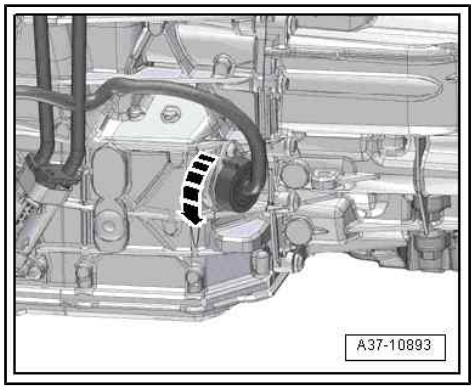
– Remove bolt -1- and nuts -arrows- and detach catalytic converter (left-side).



Caution

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

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



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

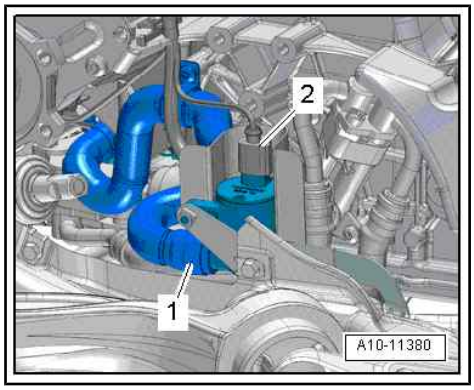
– Turn retainer catch anti-clockwise -arrow- and unplug electrical connector at gearbox.

– Move electrical wiring harness clear at gearbox.

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

Note

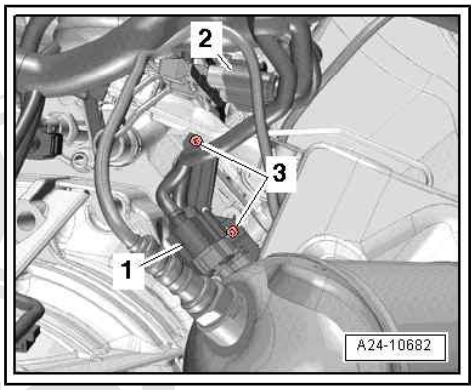
Disregard -item 2-.



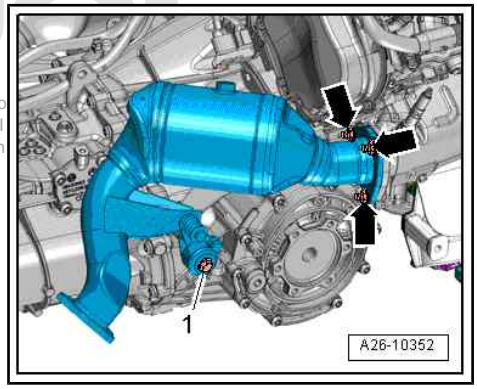
– Remove electrical connector -1- for Lambda probe after catalytic converter - G130- from bracket and unplug connector.

Note

Disregard items -2 and 3-.

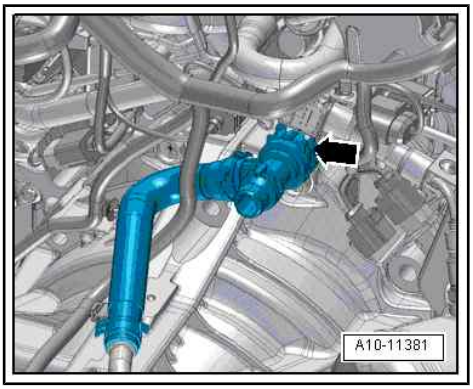


– Remove bolt -1- and nuts -arrows- and detach catalytic converter (right-side).

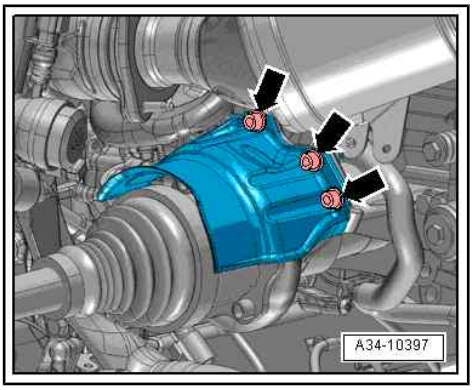


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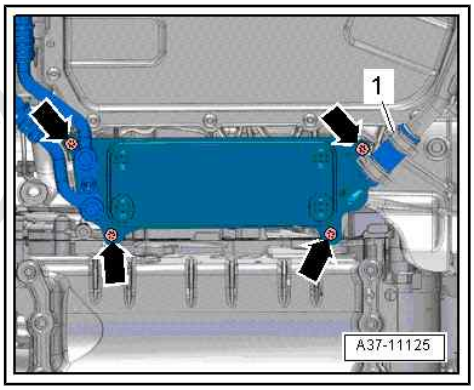
– Lift retaining clip -arrow- and detach connection from coolant pipe (top).



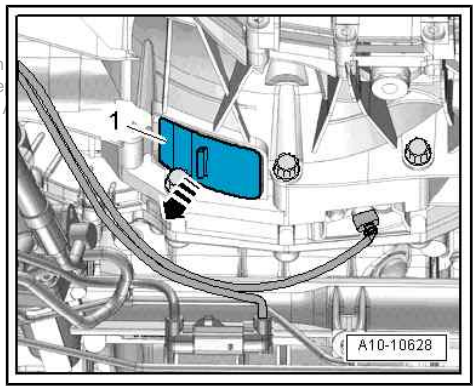
– Remove bolts -arrows- and detach heat shield for drive shaft (left-side).
– Unbolt drive shaft (left and right) from gearbox flange shafts ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .



– Remove bolts -arrows-.
– Release hose clip -1- and detach ATF cooler from coolant pipe on right side of gearbox.
– Swivel ATF cooler to the side.

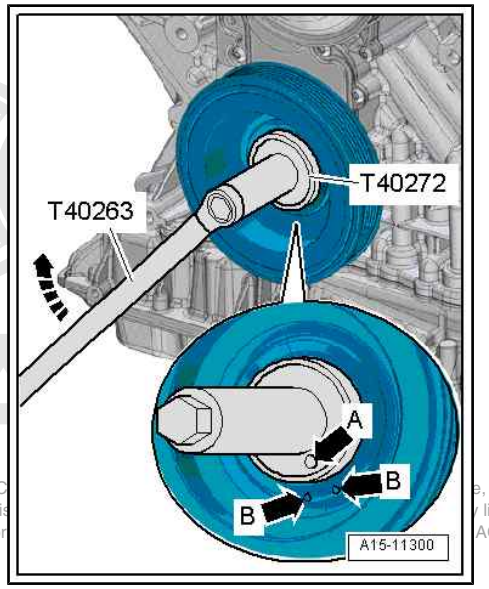


– Detach bottom cover -1- from gearbox -arrow-.



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– Fit turning-over tool - T40272- onto wrench (21 mm) - T40263- .
– Position adapter on bolts of vibration damper.
• Hole -arrow A- on turning-over tool - T40272- must be positioned between markings -arrows B- on vibration damper.



Note

If necessary, remove radiator fan control unit.

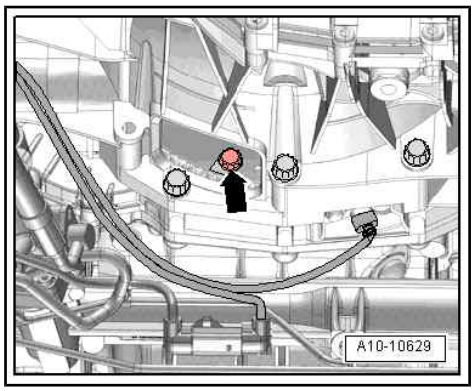
– Counterhold crankshaft using wrench (21 mm) - T40263- and turning-over tool - T40272- when loosening bolts for dual-mass flywheel.

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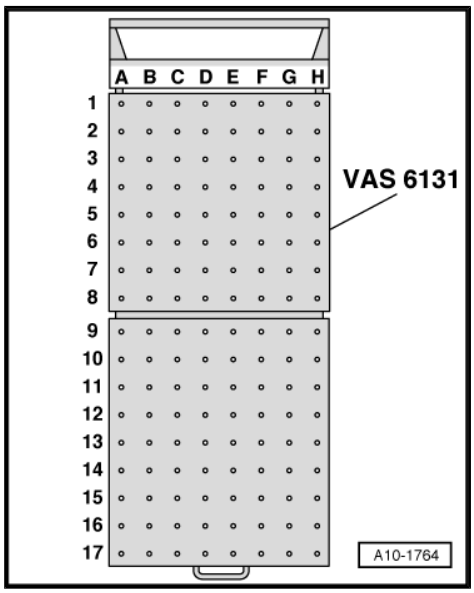
Note

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

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



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

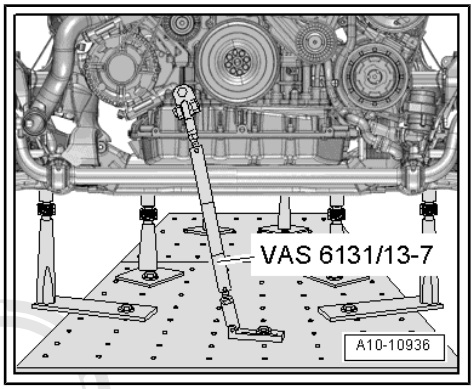


Note

The other support elements remain unchanged.

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

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



Note

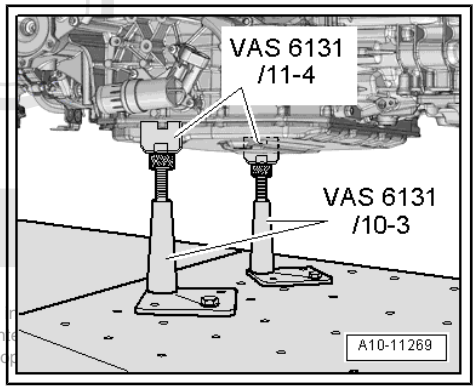
If bore has no thread, tap hole.

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

– Position support elements from -VAS 6131/10- and mountings -VAS 6131/11-4- at front of gearbox, as shown in illustration.

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

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

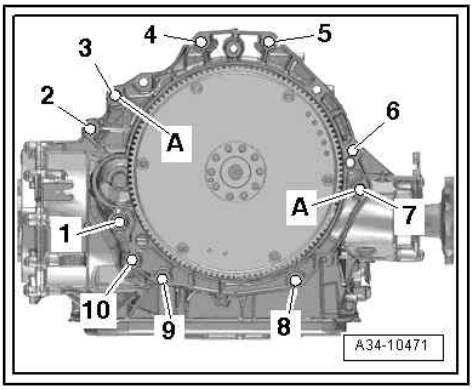


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– Remove bolts -1- and -2- for starter.

– Separate starter from gearbox and leave in position.

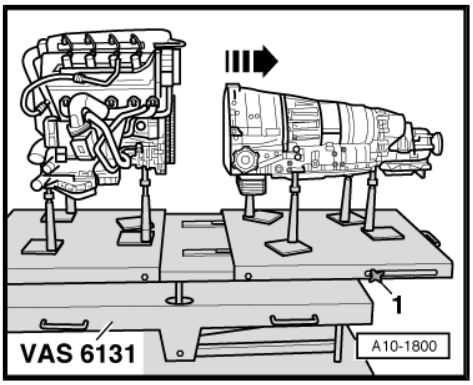
– Unscrew remaining bolts -3 ... 10- securing engine to gearbox.



Note

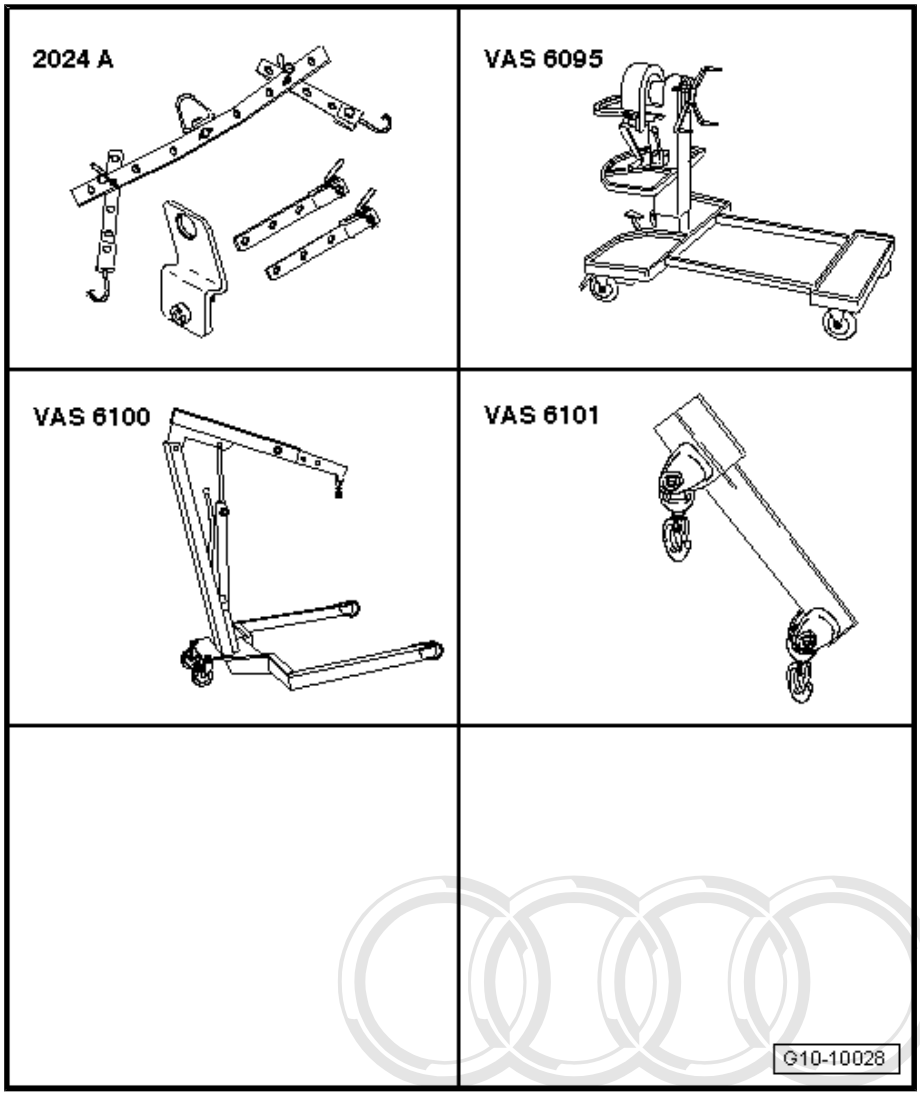
Disregard -item A-.

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



1.3 Securing engine to engine and gearbox support

Special tools and workshop equipment required



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

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Procedure

WARNING

Risk of accident!

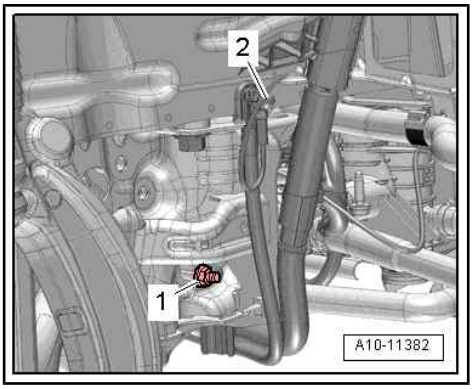
- ♦ *The engine can only be transported with the gearbox removed using the method described.*

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

– Detach poly V-belt from air conditioner compressor
⇒ “1.2 Removing and installing poly V-belt”, page 66 .

– Remove air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Detaching and attaching air conditioner compressor at bracket .

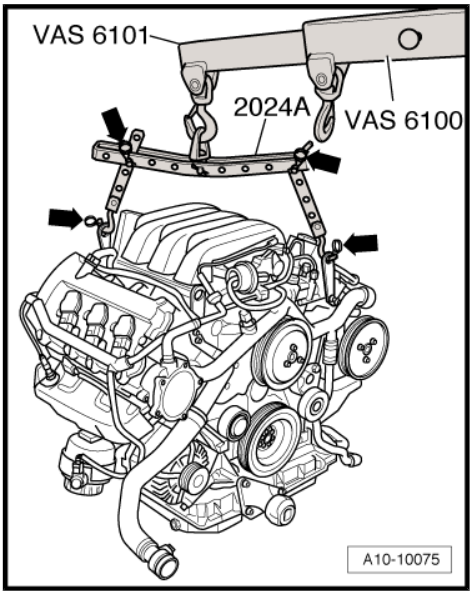
– Unscrew nut -1- and detach bracket with electrical wiring from subframe.



Note

Disregard -item 2-.

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



Note

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

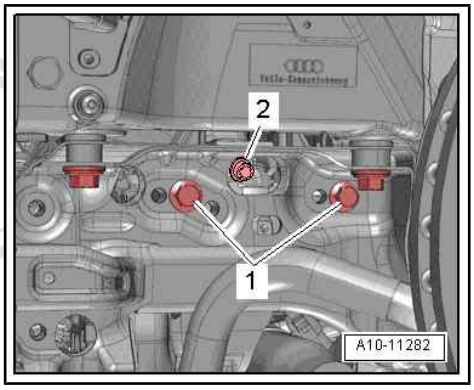
WARNING

Risk of accident.

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

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

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

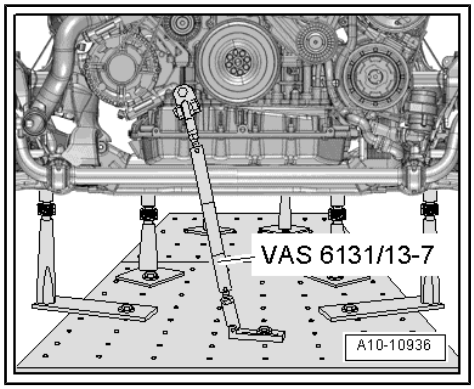


Note

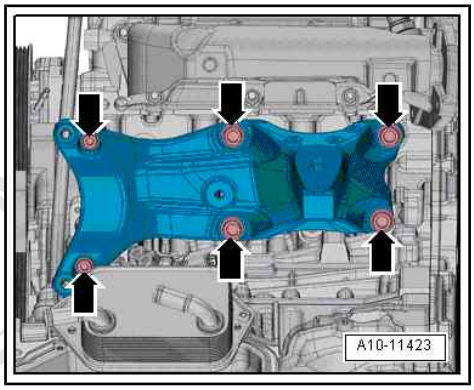
Disregard -item 1-.

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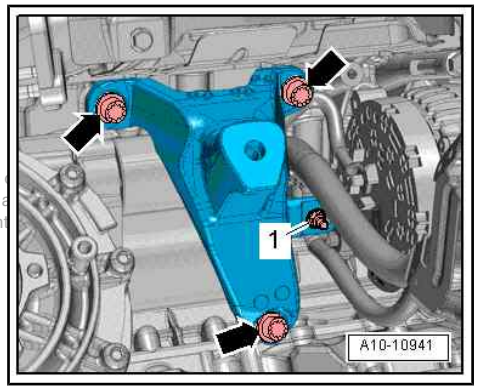
– Remove support -VAS 6131/13-7- from engine.
– Lift engine off engine cross member.



– Remove bolts -arrows- and detach engine support (left-side) with bracket for air conditioner compressor.

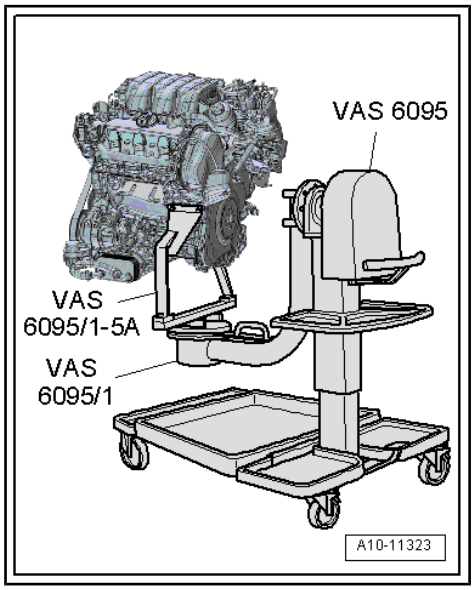


– Remove nut -1- and move earth wire clear at engine support.
– Unscrew bolts -arrows- and remove engine support (right-side).
– Tie up starter on engine.



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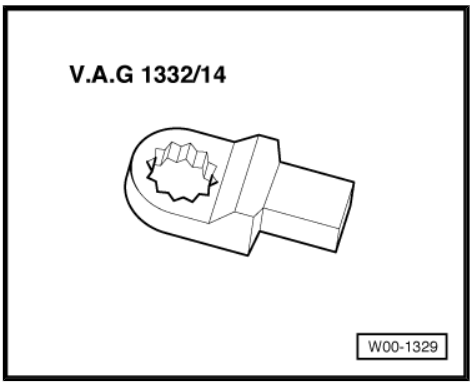
– Secure engine with universal mounting - VAS 6095/1- and support bracket for V6 FSI engine, Audi A6 - VAS 6095/1-5- to engine and gearbox support - VAS 6095- as shown in illustration and tighten to 40 Nm.



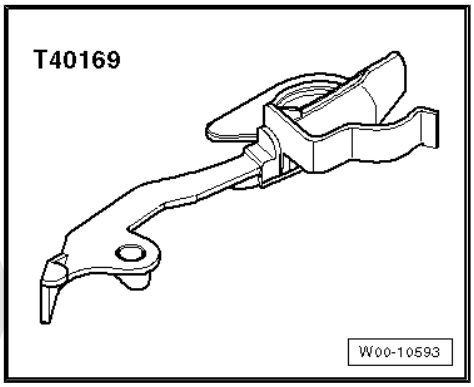
1.4 Installing engine

Special tools and workshop equipment required

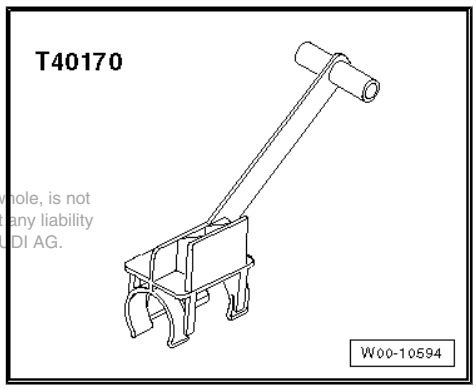
- Ring spanner insert AF 16 - V.A.G 1332/14-



- Assembly aid - T40169-



- Transport lock - T40170-



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Tightening torques

Note

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

Component		Nm
Bolts/nuts	M6	9
	M7	15

Component		Nm
	M8	20
	M10	40
	M12	65

- Assembly mountings
  ⇒ “2.1 Exploded view - assembly mountings”, page 52
- Engine to gearbox ⇒ Rep. gr. 34 ; Removing and installing gearbox; Tightening torques for gearbox / ⇒ Rep. gr. 37 ; Removing and installing gearbox; Tightening torques for gearbox

Procedure

Note

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

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

– Install engine supports and engine mountings
⇒ “2.1 Exploded view - assembly mountings”, page 52 .

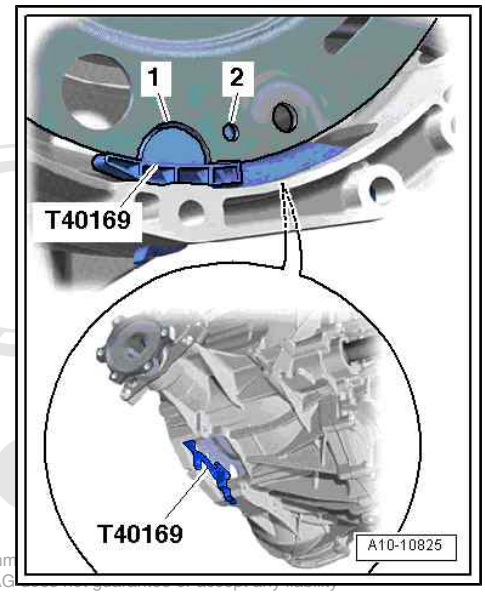
– Before installing gearbox, remove residue from threaded holes for engine/gearbox bolts in cylinder block using a thread tap.

– Check whether aluminium bolts securing engine to gearbox can be reused; if so, apply marking ⇒ Rep. gr. 34 ; Removing and installing gearbox; Tightening torques for gearbox / ⇒ Rep. gr. 37 ; Removing and installing gearbox; Tightening torques for gearbox .

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

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

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



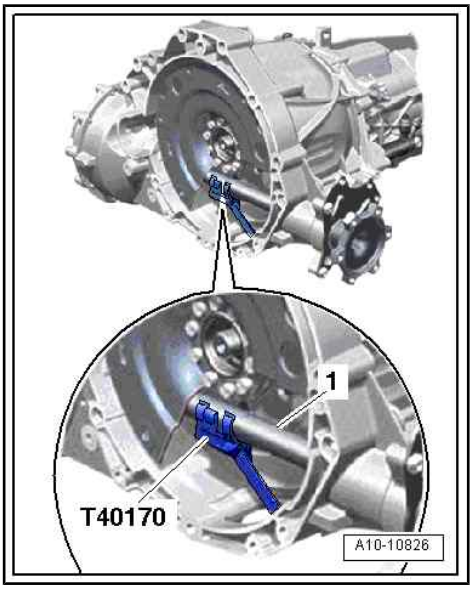
Note

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

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

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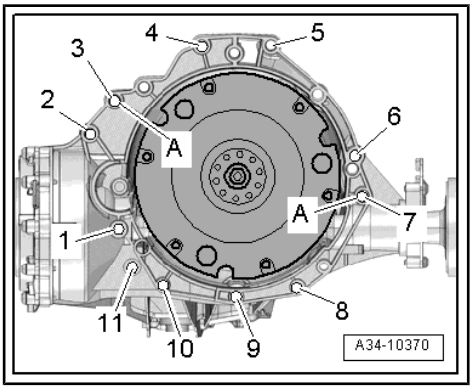
– Insert transport lock - T40170- into gearbox housing and dual-mass flywheel from below and clamp onto flange shaft -1-.



Vehicles with multitronic gearbox 0AW (front-wheel drive):

– 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 -1, 6 … 11-.



Vehicles with 7-speed dual clutch gearbox 0B5:

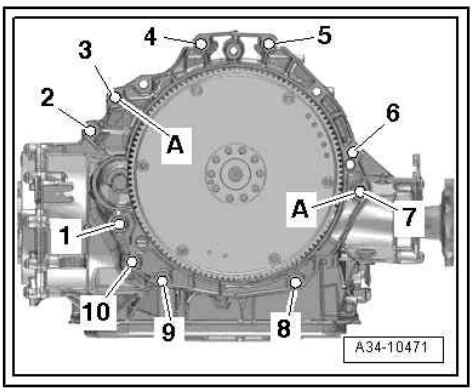
– Check whether dowel sleeves -A- for centring engine and gearbox are fitted in cylinder block; install missing dowel sleeves.

– Bring gearbox into position on engine and tighten bolts -1, 6 … 10-.

Continued for all vehicles:

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

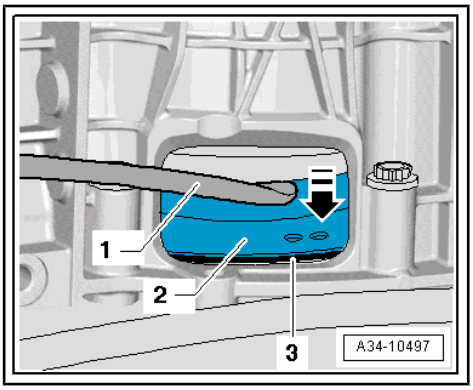
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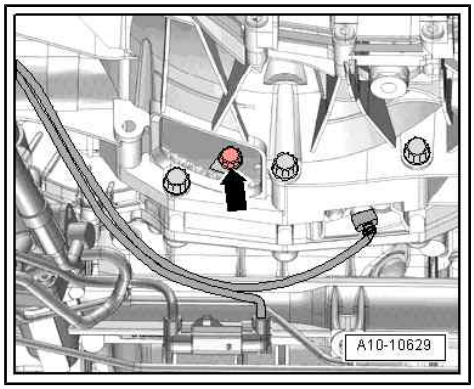
Note

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

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



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



Note

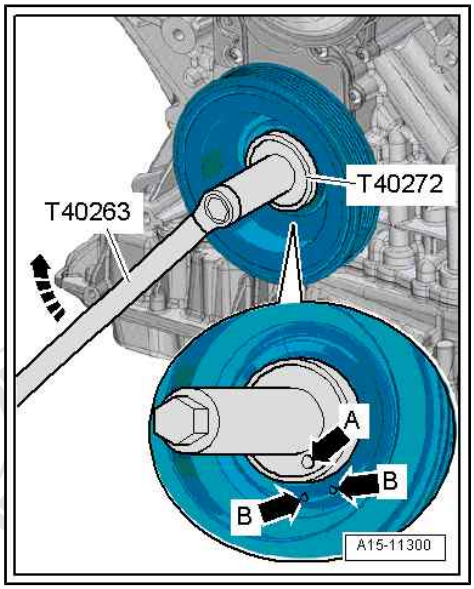
Use ring spanner insert AF 16 - V.A.G 1332/14- to tighten bolts.

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

– Fit turning-over tool - T40272- onto wrench (21 mm) - T40263- .

– Position adapter on bolts of vibration damper.

• Hole -arrow A- on turning-over tool - T40272- must be positioned between markings -arrows B- on vibration damper.



Note

If necessary, remove radiator fan control unit.

– Turn crankshaft 180° further in normal direction of engine rotation -arrow- with wrench (21 mm) - T40263- and turning-over tool - T40272- .

– Now tighten bolt accessible in this position to specified torque ⇒ Rep. gr. 30 ; Clutch; Exploded view - clutch module ; ⇒ Rep. gr. 30 ; Clutch; Exploded view - flywheel and dual clutch / ⇒ Rep. gr. 37 ; Removing and installing gearbox; Installing gearbox .

– Turn crankshaft by 60° each time and tighten remaining 5 bolts to specified torque ⇒ Rep. gr. 30 ; Clutch; Exploded view - clutch module ; ⇒ Rep. gr. 30 ; Clutch; Exploded view - flywheel and dual clutch / ⇒ Rep. gr. 37 ; Removing and installing gearbox; Installing gearbox .

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– Install ATF cooler ⇒ Rep. gr. 34 ; ATF circuit; Removing and installing ATF cooler / ⇒ Rep. gr. 37 ; ATF circuit; Removing and installing ATF cooler .

– Install drive shafts and heat shield for drive shaft ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Exploded view - drive shaft .

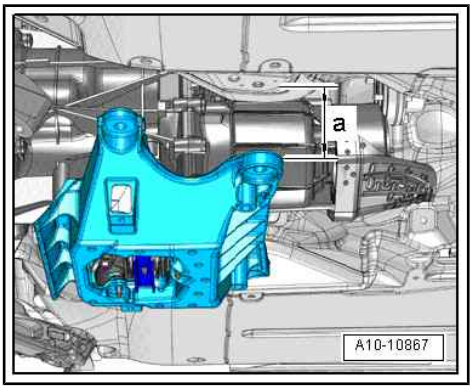
– Install ATF lines ⇒ Rep. gr. 37 ; ATF circuit; Removing and installing ATF lines .

– Install catalytic converters
⇒ “1.1 Exploded view - silencers”, page 333 .

Vehicles with multitronic gearbox 0AW (front-wheel drive):

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

Vehicles with dual clutch gearbox 0B5:



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

• Dimension -a- = min. 100 mm.

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

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

Continued for all vehicles:

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

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

WARNING

Risk of accident if bolted connections are loose.

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

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

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Vehicles with manual gearbox:

– Install selector rod and push rod ⇒ Rep. gr. 34 ; Selector mechanism; Exploded view - selector mechanism .

Vehicles with multitronic gearbox 0AW (front-wheel drive):

– Install selector lever cable and adjust it if necessary ⇒ Rep. gr. 37 ; Selector mechanism; Removing and installing selector lever cable .

Continued for all vehicles:

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

Note

- *Do not remove plugs or protective caps until you are ready to fit the relevant line.*
- *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *Fit all cable ties in the original positions when installing.*

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

- Install front silencers
  ⇒ “1.1 Exploded view - silencers”, page 333 .
- Install upper suspension links and suspension strut ⇒ Running gear, axles, steering; Rep. gr. 40 ; Suspension strut, upper links; Exploded view - suspension strut, upper links .
- Install subframe cross brace, anti-roll bar and heat shield ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Exploded view - subframe .
- Install brake calipers ⇒ Brake system; Rep. gr. 46 ; Front brakes; Removing and installing brake caliper .
- Install engine control unit
  ⇒ “8.2 Removing and installing engine/motor control unit J623 ”, page 330 .
- Install filler neck for washer fluid reservoir ⇒ Electrical system; Rep. gr. 92 ; Windscreen washer system; Exploded view - windscreen washer system .
- Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- Install electrical wiring, terminal 30 wiring junction 2 - TV22- and cover for electronics box in engine compartment ⇒ Electrical system; Rep. gr. 97 ; Relay carriers, fuse carriers, electronic boxes; Overview of fitting locations - relay carriers, fuse carriers, electronic boxes .
- Install body brace ⇒ Running gear, axles, steering; Rep. gr. 40 ; Suspension strut, upper links; Exploded view - suspension strut, upper links .
- Install refrigerant lines ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit; Exploded view - condenser .
- Observe steps required after re-connecting battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .

Caution

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

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

- Install air cleaner housing
  ⇒ “2.2 Removing and installing air cleaner housing”, page 285 .
- Install lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing attachments .
- Install plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .
- Install front longitudinal member (bottom) ⇒ General body repairs, exterior; Rep. gr. 50 ; Lock carrier; Exploded view - lock carrier .
- Fill with engine oil and check oil level ⇒ Maintenance ; Booklet 411 .
- Connect coolant hoses with plug-in connector
  ⇒ Fig. ““Connecting coolant hose with plug-in connector”“ , page 252 .

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Note

Do not reuse coolant.

- Fill up with coolant ⇒ page 223 .
- Charge refrigerant system ⇒ Air conditioner with refrigerant R134a .
- Install wheel housing liners ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front) .
- Fit front wheels ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres .
- Check wheel alignment ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheel alignment check; Wheel alignment procedure .

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WARNING

Risk of accident if bolted connections are loose.

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

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

2 Assembly mountings

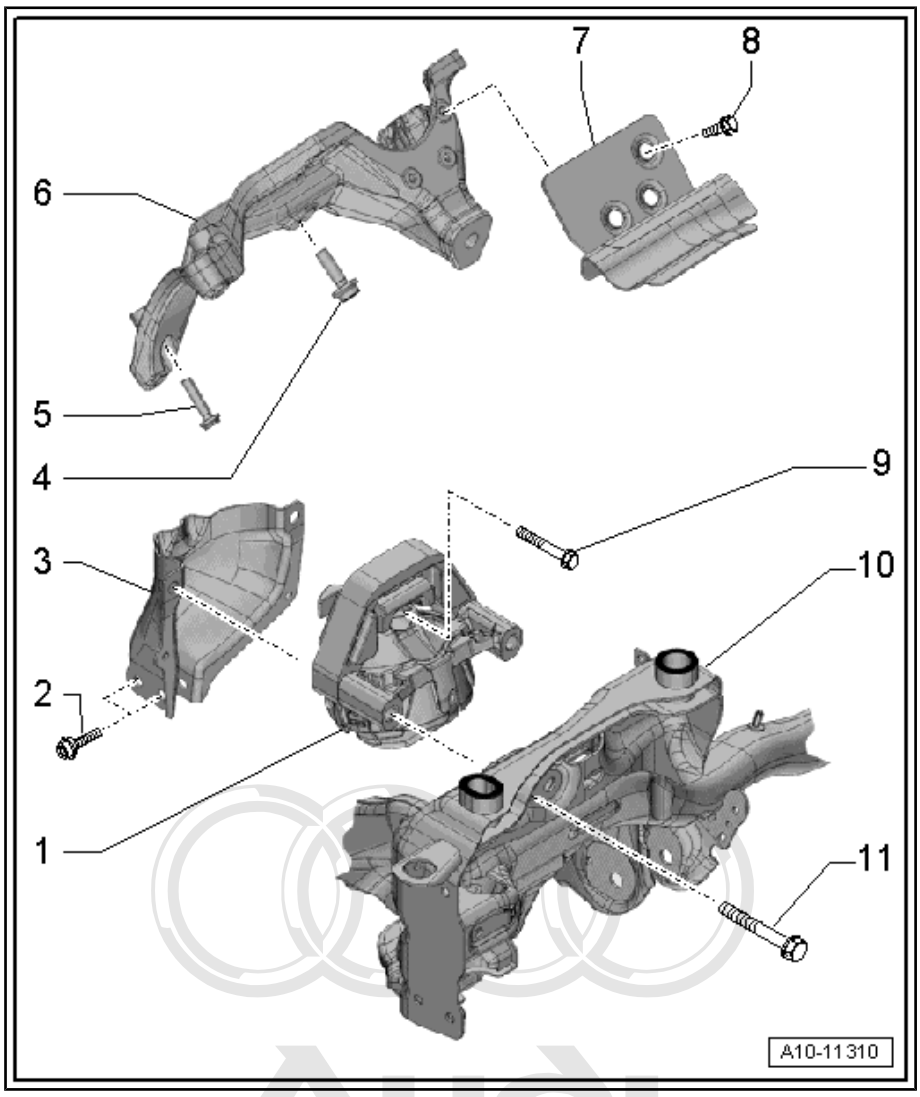
⇒ “2.1 Exploded view - assembly mountings”, page 52

⇒ “2.2 Removing and installing engine mountings”, page 55

⇒ “2.3 Removing and installing gearbox mounting”, page 61

2.1 Exploded view - assembly mountings

Engine mounting



1 - Engine mounting
- ❑ Removing and installing ⇒ “2.2 Removing and installing engine mountings”, page 55

2 - Bolt
- ❑ 20 Nm

3 - Bracket
- ❑ For engine mounting
- ❑ Renew retaining plate if engine mounting is defective

4 - Bolt
- ❑ 40 Nm

5 - Bolt
- ❑ 20 Nm

6 - Engine support
- ❑ Left-side: with bracket for air conditioner compressor

7 - Heat shield

8 - Bolt
- ❑ 10 Nm

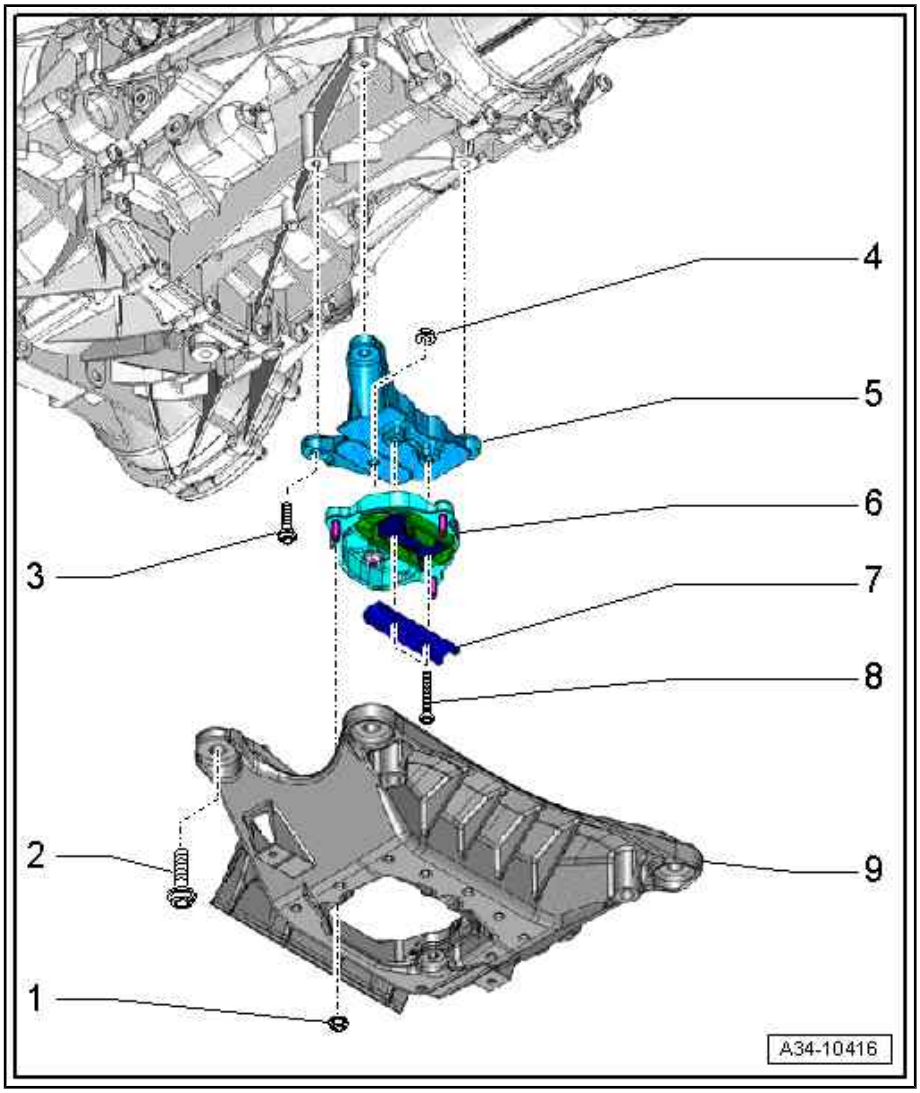
9 - Bolt
- ❑ Renew
- ❑ 90 Nm +90°

10 - Subframe

11 - Bolt
- ❑ 55 Nm

Gearbox mounting for manual gearbox 0B1

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1 - Nut

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

2 - Bolt

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

3 - Bolt

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

4 - Nut

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

5 - Gearbox support

- ❑ Removing and installing ⇒ “2.3.4 Removing and installing gearbox support with gearbox mounting - dual clutch gearbox 0B5”, page 62

6 - Gearbox mounting

- ❑ Removing and installing ⇒ “2.3.2 Removing and installing gearbox mounting - manual gearbox 0B1”, page 61

7 - Stop (bottom)

- ❑ For gearbox mounting

8 - Bolt

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

9 - Tunnel cross member

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

Gearbox mounting for multitronic gearbox 0AW

1 - Nut

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

2 - Bolt

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

3 - Bolt

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

4 - Nut

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

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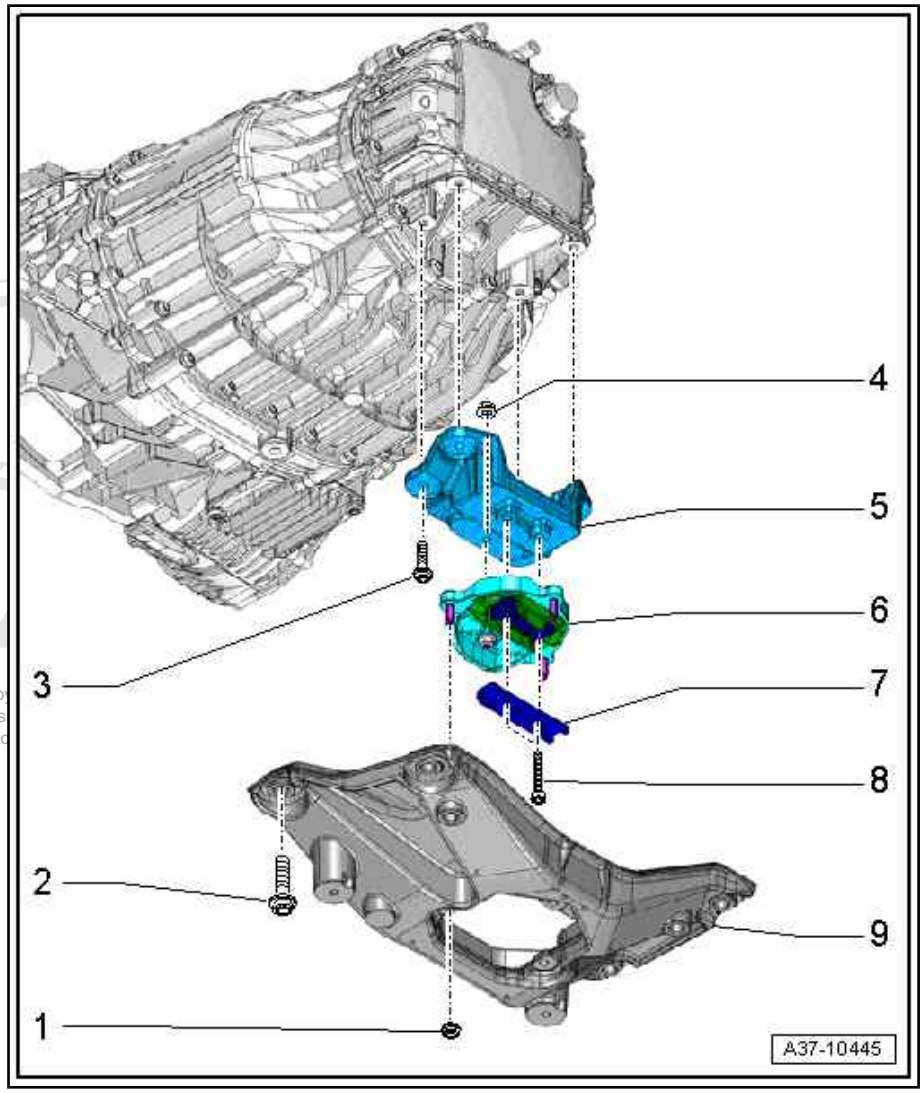
5 - Gearbox support

6 - Gearbox mounting

- ❑ Removing and installing ⇒ “2.3.3 Removing and installing gearbox mounting - multitronic gearbox 0AW”, page 62

7 - Stop (bottom)

- ❑ For gearbox mounting



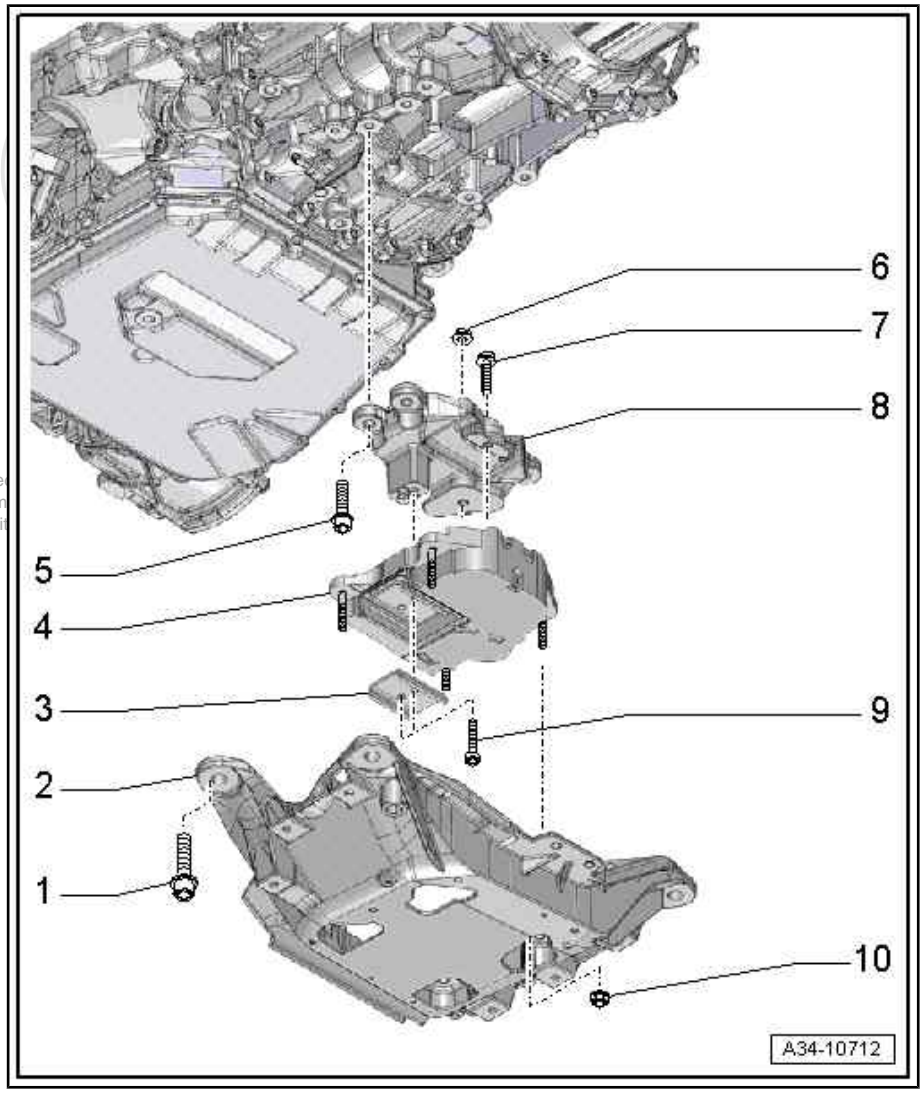
8 - Bolt

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

9 - Tunnel cross member

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

Gearbox mounting for dual clutch gearbox 0B5



1 - Bolt

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

2 - Tunnel cross member

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

3 - Stop

- ❑ For gearbox mounting

4 - Gearbox mounting

- ❑ Removing and installing ⇒ “2.3.5 Removing and installing gearbox mounting - dual clutch gearbox 0B5”, page 63

5 - Bolt

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

6 - Nut

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

7 - Bolt

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

8 - Gearbox support

- ❑ Removing and installing ⇒ “2.3.4 Removing and installing gearbox support with gearbox mounting - dual clutch gearbox 0B5”, page 62

9 - Bolt

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

10 - Nut

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

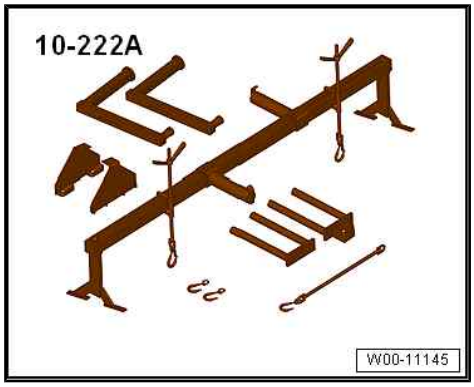
2.2 Removing and installing engine mountings

Note

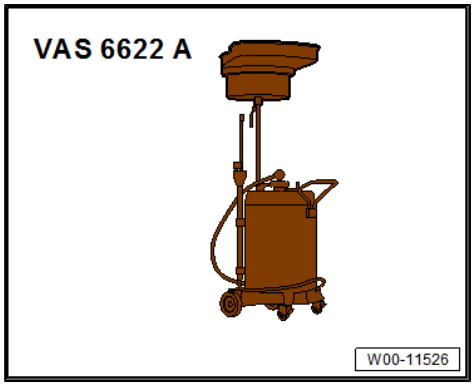
- ♦ *To avoid repeat repairs, proceed as follows if an engine mounting is defective:*
- ♦ *Renew engine mounting and corresponding bracket.*

Special tools and workshop equipment required

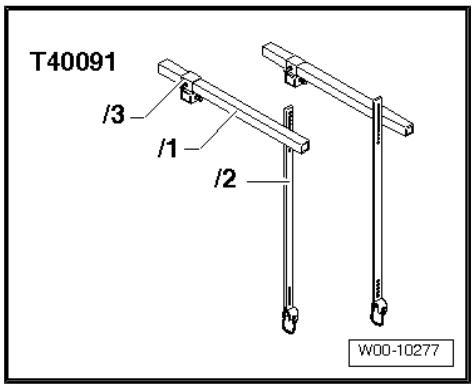
- Support bracket - 10-222A-



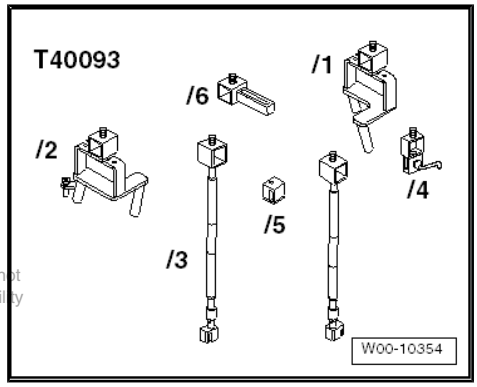
- Used oil collection and extraction unit - VAS 6622A-



- Engine support (basic set) - T40091-



- Engine support bracket (supplementary set) - T40093-

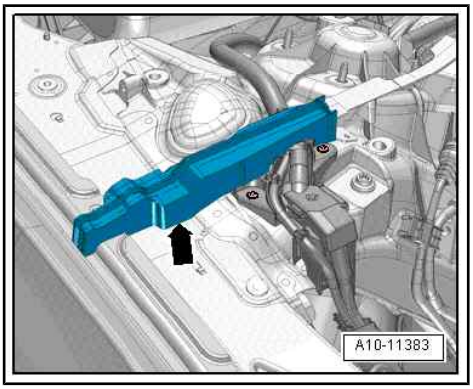


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Removing

– Pull off foam wedge -arrow- (left and right) upwards.

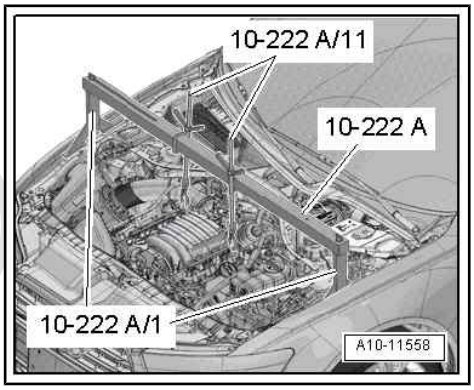
– Remove engine cover panel
⇒ “3.1 Removing and installing engine cover panel”, page 64 .



Engine mounting (left-side) - vehicles with 2.5 ltr. engine:

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

– Partly take up weight of engine with spindles.



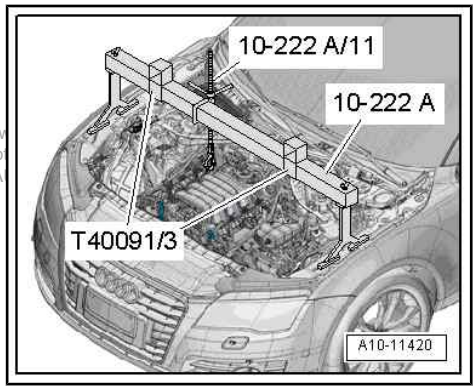
Engine mounting (left-side) - vehicles with 2.8 ltr. engine:

– Remove air cleaner housing ⇒ page 285 .

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

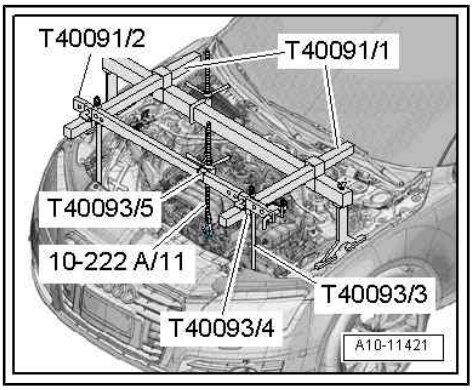
– Attach spindle - 10-222A/11- to engine lifting eye (right-side).

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– Attach further components of support bracket as shown in illustration. Position supports -T40093/3- on both sides on flanges of longitudinal members (left and right).

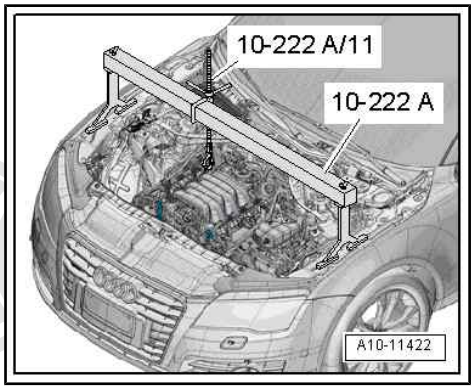
– Partly take up weight of engine with spindles.



Engine mounting (right-side):

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

– Partly take up weight of engine with spindle.



Continued for all vehicles:

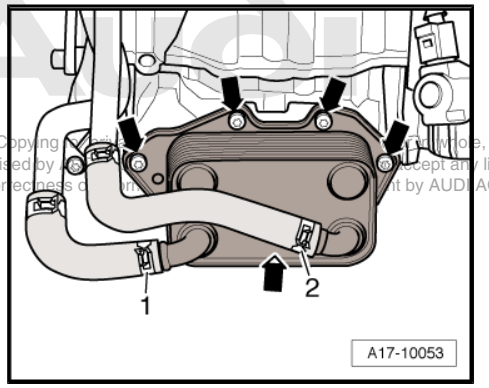
– Remove noise insulation panels ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

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

Engine mounting (left-side):

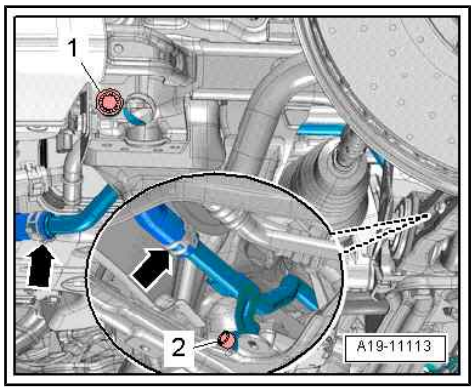
– Place used oil collection and extraction unit - VAS 6622A- underneath.

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



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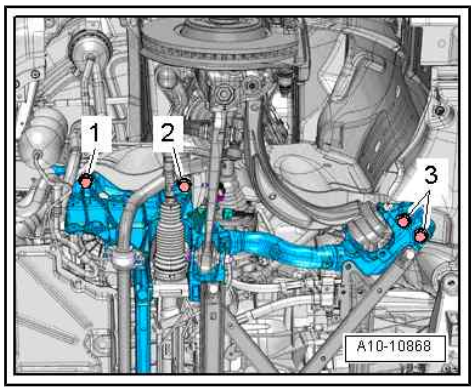
– Remove bolts -1 and 2- and press coolant pipe (bottom left) to the side.



Note

- *Disregard -arrows-.*
- *The illustration shows the 2.8 ltr. engine.*

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

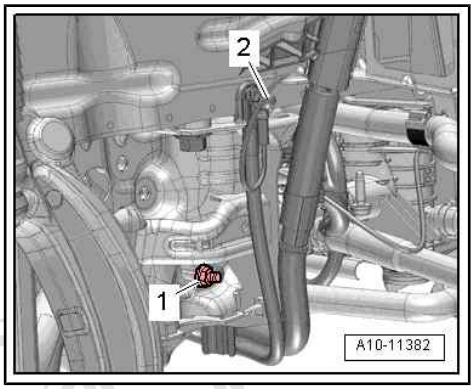


Note

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

Engine mounting (right-side):

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

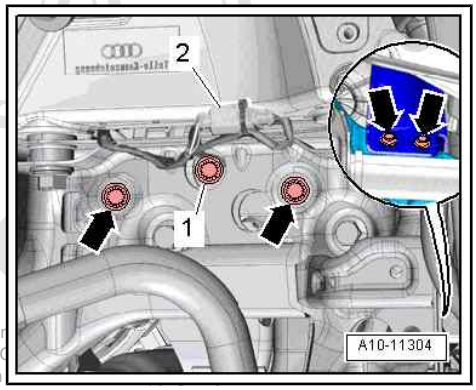


Note

Disregard -item 2-.

Both sides (continued):

– Remove bolts -1- and -arrows- and place relevant retaining plate to one side.



Note

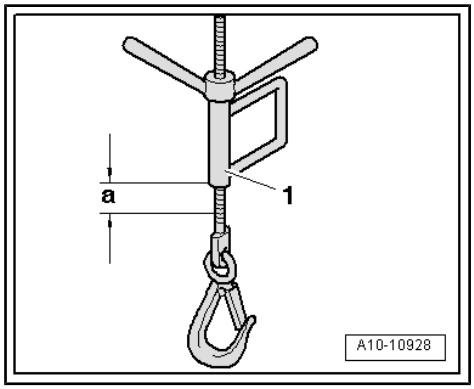
Disregard -item 2-.

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

• Distance -a- = approx. 20 mm.

– Detach engine mounting on relevant side.



Installing

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

Note

Renew the bolts tightened with specified tightening angle.

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

– Install engine oil cooler
⇒ “2.1 Removing and installing engine oil cooler”, page 203 .

– Install air cleaner housing
⇒ “2.2 Removing and installing air cleaner housing”, page 285 .

– Install engine cover panel
⇒ “3.1 Removing and installing engine cover panel”, page 64 .

Tightening torques

♦ ⇒ “2.1 Exploded view - assembly mountings”, page 52

♦ ⇒ “3.1 Exploded view - coolant pipes”, page 236

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

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

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

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2.3 Removing and installing gearbox mounting

⇒ “2.3.1 Removing and installing gearbox support with gearbox mounting - manual gearbox 0B1”, page 61

⇒ “2.3.2 Removing and installing gearbox mounting - manual gearbox 0B1”, page 61

⇒ “2.3.3 Removing and installing gearbox mounting - multitronic gearbox 0AW”, page 62

⇒ “2.3.4 Removing and installing gearbox support with gearbox mounting - dual clutch gearbox 0B5”, page 62

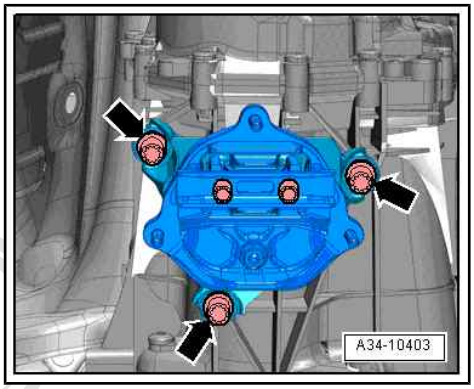
⇒ “2.3.5 Removing and installing gearbox mounting - dual clutch gearbox 0B5”, page 63

2.3.1 Removing and installing gearbox support with gearbox mounting - manual gearbox 0B1

Removing

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

– Remove bolts -arrows- and detach gearbox support and gearbox mounting from gearbox.



Installing

Installation is carried out in reverse sequence.

Tightening torques

♦ ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

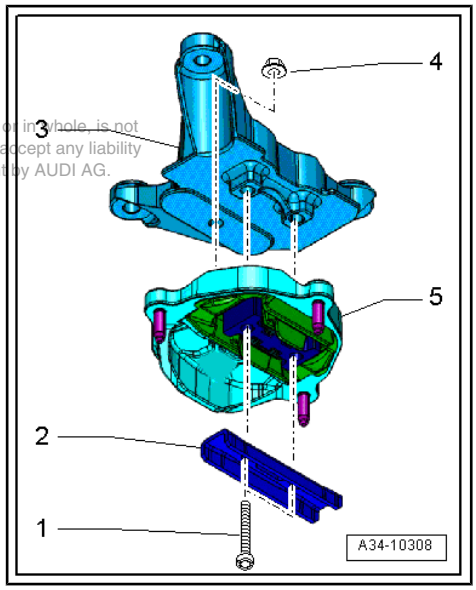
2.3.2 Removing and installing gearbox mounting - manual gearbox 0B1

Removing

– Remove gearbox support with gearbox mounting ⇒ “2.3.4 Removing and installing gearbox support with gearbox mounting - dual clutch gearbox 0B5”, page 62 .

– Unscrew bolts -1- and detach stop (bottom) -2- for gearbox mounting.

– Remove nut -4- and detach gearbox mounting -5- from gearbox support -3-.



Installing

– Position gearbox support -3- on gearbox mounting -5- and hand-tighten nut -4-.

– Secure stop (bottom) -2- with bolts -1-.

– Tighten nut -4-.

– Install gearbox support with gearbox mounting ⇒ “2.3.4 Removing and installing gearbox support with gearbox mounting - dual clutch gearbox 0B5”, page 62 .

Tightening torques

♦ ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

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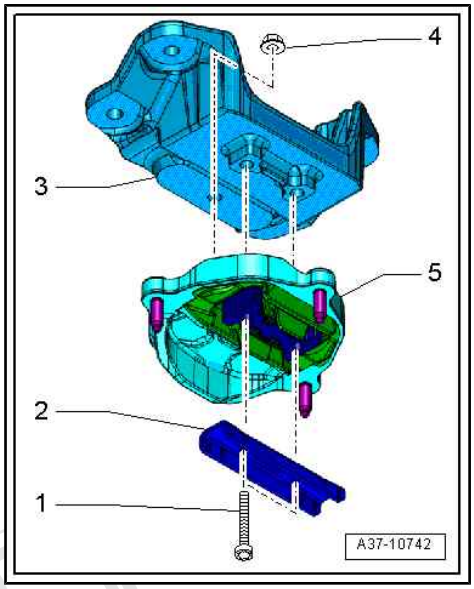
2.3.3 Removing and installing gearbox mounting - multitronic gearbox 0AW

Removing

– Remove tunnel cross-piece ⇒ Rep. gr. 37 ; Assembly mountings; Exploded view - assembly mountings .

– Unscrew bolts -1- and detach stop (bottom) -2- for gearbox mounting.

– Remove nut -4- and detach gearbox mounting -5- from gearbox support -3-.



Installing

Installation is carried out in reverse sequence.

Tightening torques

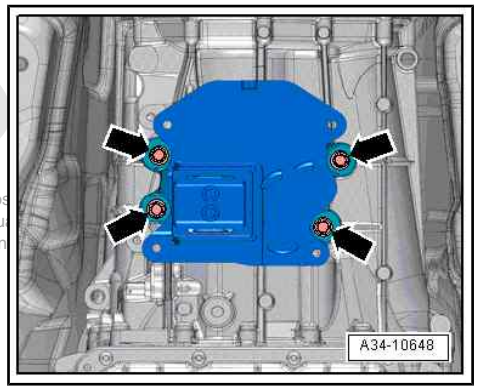
♦ ⇒ Rep. gr. 37 ; Assembly mountings; Exploded view - assembly mountings

2.3.4 Removing and installing gearbox support with gearbox mounting - dual clutch gearbox 0B5

Removing

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

– Remove bolts -arrows- and detach gearbox support and gearbox mounting from gearbox.



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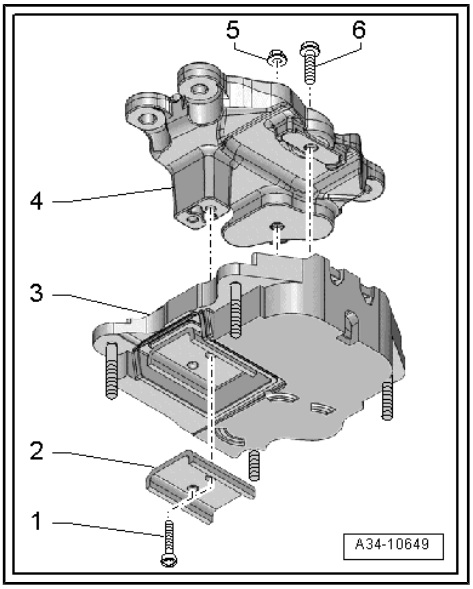
Installing

Installation is carried out in reverse sequence.

Tightening torques

♦ ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

2.3.5 Removing and installing gearbox mounting - dual clutch gearbox 0B5



Removing

– Remove gearbox support with gearbox mounting ⇒ page 62 .

– Unscrew bolt -1- and detach stop -2- for gearbox mounting.

– Remove nut -5- and bolt -6- and detach gearbox mounting -3- from gearbox support -4-.

Installing

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

– Position gearbox support -4- on gearbox mounting -3-.

– Hand-tighten nut -5- and bolt -6-.

– Tighten bolt -1- for stop -2-.

– Tighten nut -5- and bolt -6-.

– Install gearbox support with gearbox mounting ⇒ “2.3.4 Removing and installing gearbox support with gearbox mounting - dual clutch gearbox 0B5”, page 62 .

Tightening torques

♦ ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

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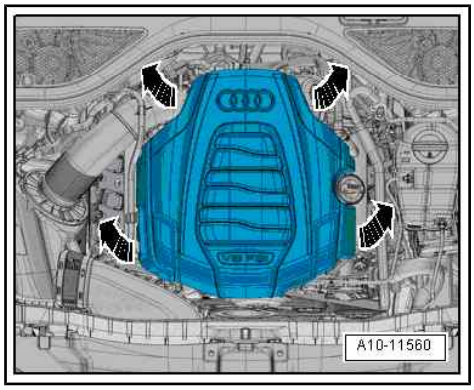
3 Engine cover panel

⇒ “3.1 Removing and installing engine cover panel”, page 64

3.1 Removing and installing engine cover panel

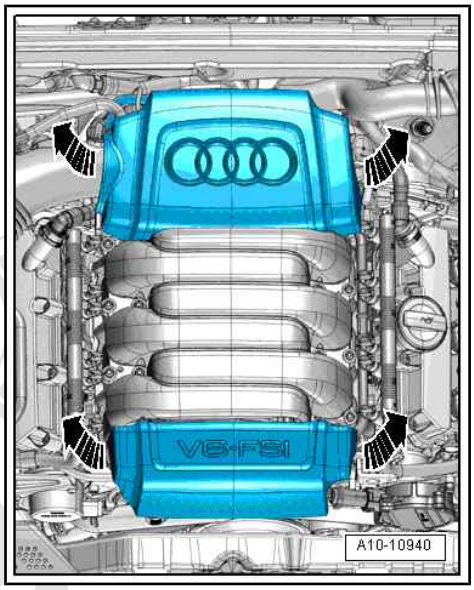
Removing

– Carefully pull engine cover panel off ball studs one after another -arrows-. Do not jerk engine cover panel away, and do not try to pull on one side only.



♦ One-piece version

♦ Two-piece version



Installing

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

– Observe oil filler neck when positioning engine cover panel (one-piece version).

– First press the engine cover panel (one-piece version) with both hands onto the ball studs at the rear and then onto the ball studs at the front.

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13 – Crankshaft group

1 Cylinder block (pulley end)

⇒ “1.1 Exploded view - poly V-belt drive”, page 65

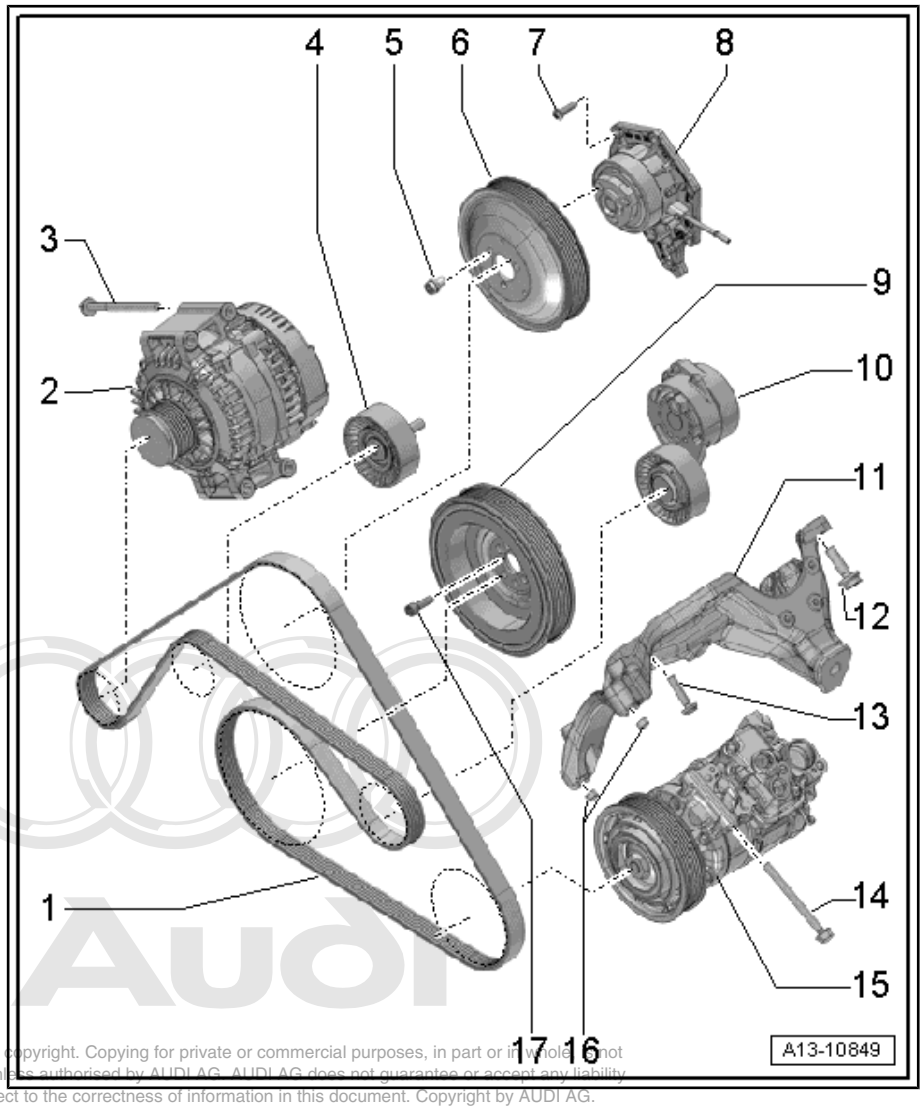
⇒ “1.2 Removing and installing poly V-belt”, page 66

⇒ “1.3 Removing and installing tensioner for poly V-belt”, page 68

⇒ “1.4 Removing and installing vibration damper”, page 68

⇒ “1.5 Removing and installing sealing flange (pulley end)”, page 68

1.1 Exploded view - poly V-belt drive



1 - Poly V-belt

- ❑ Check for wear
- ❑ Before removing, mark direction of rotation with chalk or felt-tip pen
- ❑ Removing and installing ⇒ “1.2 Removing and installing poly V-belt”, page 66
- ❑ Do not kink
- ❑ When installing, make sure it is properly seated on pulleys

2 - Alternator

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

3 - Bolt

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

4 - Idler roller

- ❑ For poly V-belt
- ❑ 45 Nm

5 - Bolt

- ❑ Tightening torque ⇒ Item 1 (page 228)

6 - Poly V-belt pulley

- ❑ For coolant pump
- ❑ Removing and installing ⇒ “2.4 Removing and installing coolant pump”, page 231

7 - Bolt

- ❑ Tightening torque ⇒ Item 11 (page 229)

8 - Coolant pump

- ❑ Removing and installing ⇒ “2.4 Removing and installing coolant pump”, page 231

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9 - Vibration damper

- ❑ With poly V-belt pulley
- ❑ Can only be installed in one position
- ❑ Removing and installing ⇒ “1.4 Removing and installing vibration damper”, page 68

10 - Tensioner

- ❑ For poly V-belt
- ❑ Removing and installing ⇒ “1.3 Removing and installing tensioner for poly V-belt”, page 68
- ❑ 40 Nm

11 - Engine support (left-side)

- ❑ With bracket for air conditioner compressor

12 - Bolt

- ❑ Tightening torque ⇒ Item 4 (page 52)

13 - Bolt

- ❑ Tightening torque ⇒ Item 5 (page 52)

14 - Bolt

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

15 - Air conditioner compressor

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

16 - Dowel sleeves

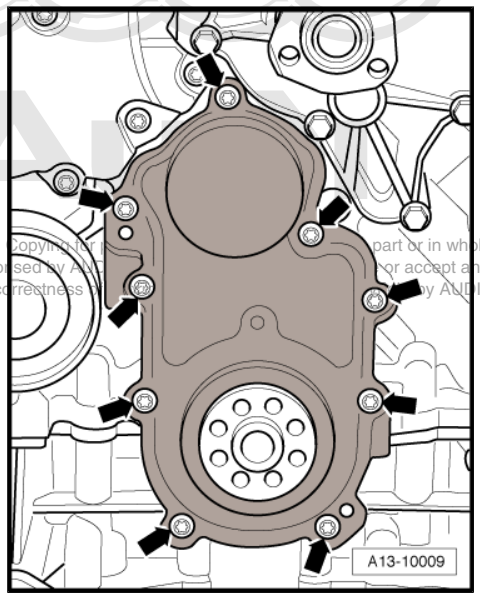
17 - Bolt

- ❑ Renew
- ❑ 20 Nm +90°

Sealing flange (pulley end) - tightening torque and sequence

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

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1.2 Removing and installing poly V-belt

Removing

– Remove engine cover panel (front) ⇒ “3.1 Removing and installing engine cover panel”, page 64 .

WARNING

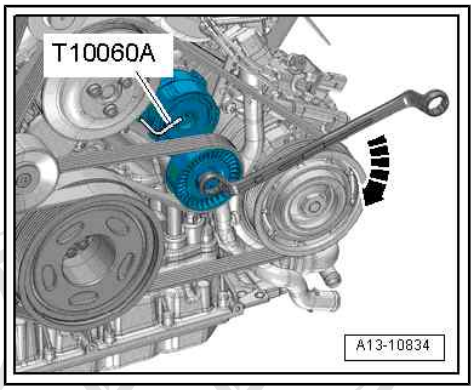
Risk of injury as the radiator fans may start up automatically.

- *Even when the ignition is switched off, the radiator fans can start up without warning due to accumulated heat in the engine compartment, etc.*

Caution

Wrong direction of rotation for a used poly V-belt can lead to irreparable damage.

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



– Move tensioner in clockwise direction -arrow- to slacken poly V-belt.

– Remove poly V-belt and release tensioner.

Note

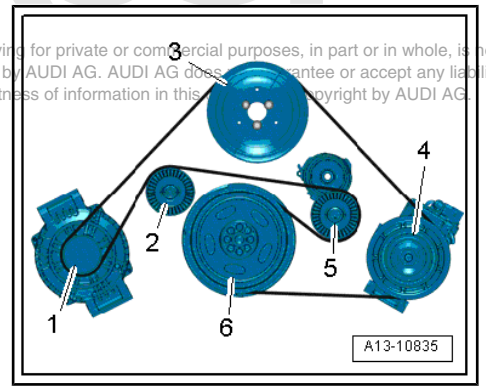
Ignore -T10060 A- .

Installing

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

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



1 - Alternator

2 - Idler roller

3 - Coolant pump

4 - Air conditioner compressor

5 - Poly V-belt tensioner

6 - Vibration damper

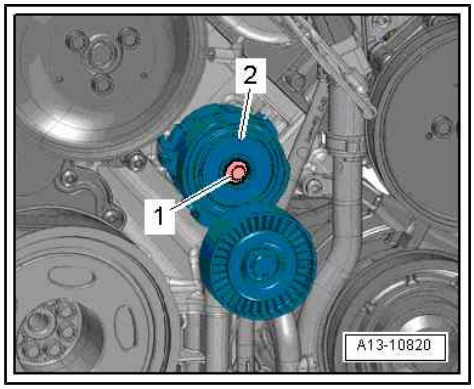
Note

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

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

– Install engine cover panel
⇒ “3.1 Removing and installing engine cover panel”, page 64 .

1.3 Removing and installing tensioner for poly V-belt



Removing

– Remove poly V-belt
⇒ “1.2 Removing and installing poly V-belt”, page 66 .

– If fitted, detach cover from tensioner.

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

Installing

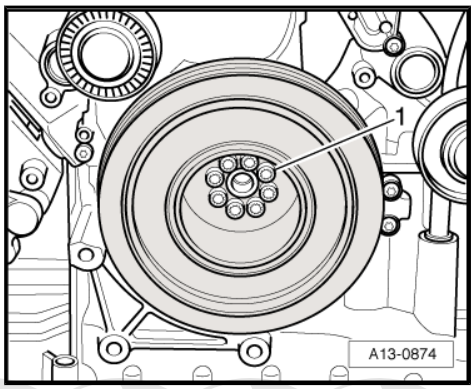
Installation is carried out in reverse order; note the following:

– Install poly V-belt
⇒ “1.2 Removing and installing poly V-belt”, page 66 .

Tightening torques

♦ ⇒ “1.1 Exploded view - poly V-belt drive”, page 65

1.4 Removing and installing vibration damper



Removing

– Remove poly V-belt
⇒ “1.2 Removing and installing poly V-belt”, page 66 .

– Unscrew bolts -1- and remove vibration damper.

Installing

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

Note

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

♦ *Can only be installed in one position.*

– Install poly V-belt
⇒ “1.2 Removing and installing poly V-belt”, page 66 .

Tightening torques

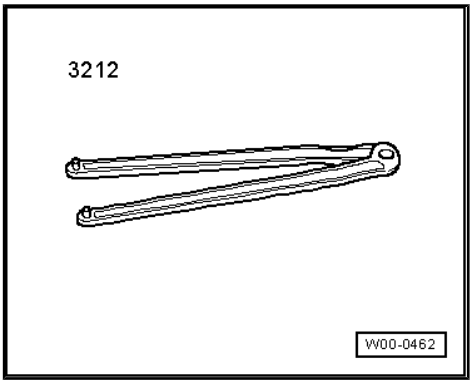
♦ ⇒ “1.1 Exploded view - poly V-belt drive”, page 65

1.5 Removing and installing sealing flange (pulley end)

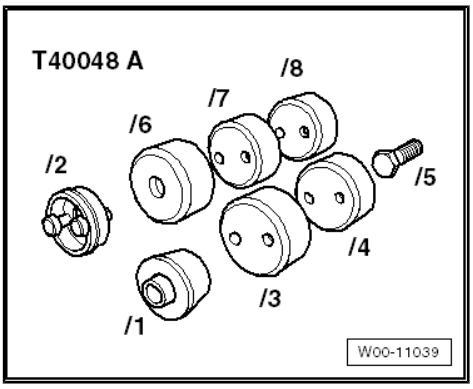
Special tools and workshop equipment required

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- Pin wrench - 3212-



- Assembly tool - T40048A-



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

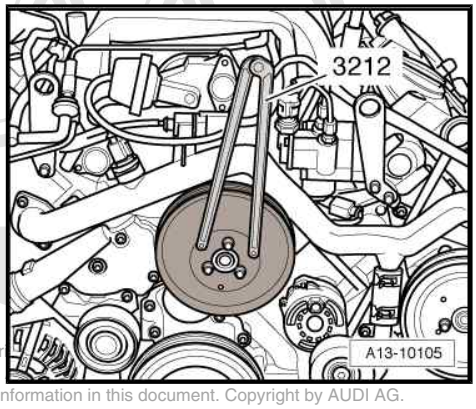
Procedure

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

– Remove vibration damper
⇒ “1.4 Removing and installing vibration damper”, page 68 .

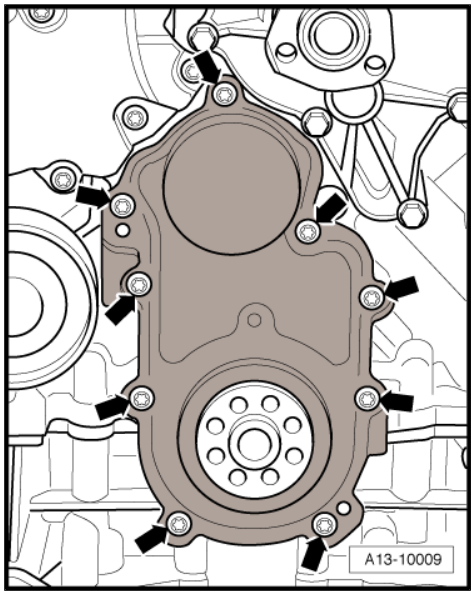
– Slacken bolts for coolant pump pulley (counterhold with pin wrench - 3212-).

– Remove bolts and take off poly V-belt pulley.



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



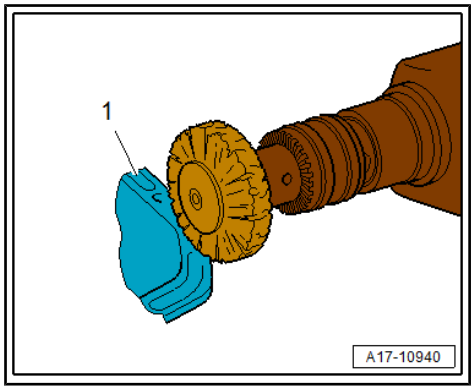
Note

Renew sealing flange (pulley end).

Caution

Protect lubrication system against contamination.

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



WARNING

Risk of eye injury.

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

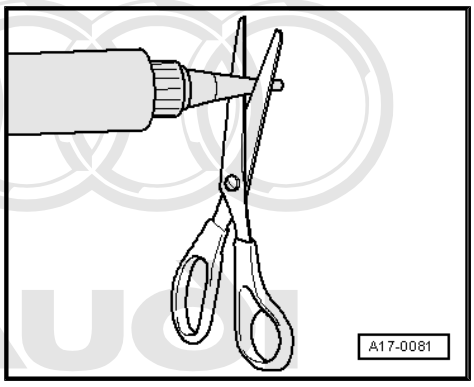
– Remove sealant residue from cylinder block and sump (top section) -1- using rotating plastic brush or similar.

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

Note

Note the use-by date of the sealant.

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

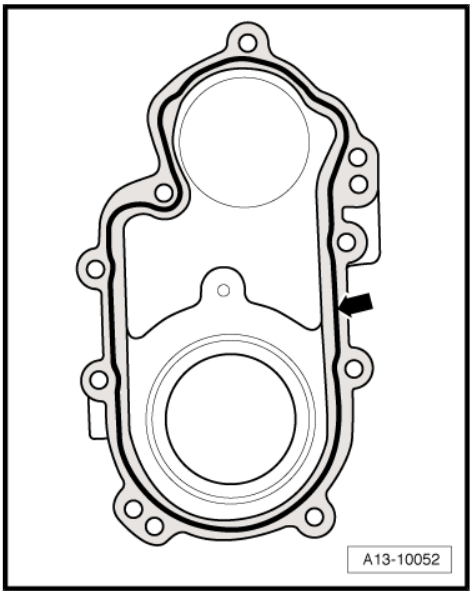


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Caution

Make sure lubrication system is not clogged by excess sealant.

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



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

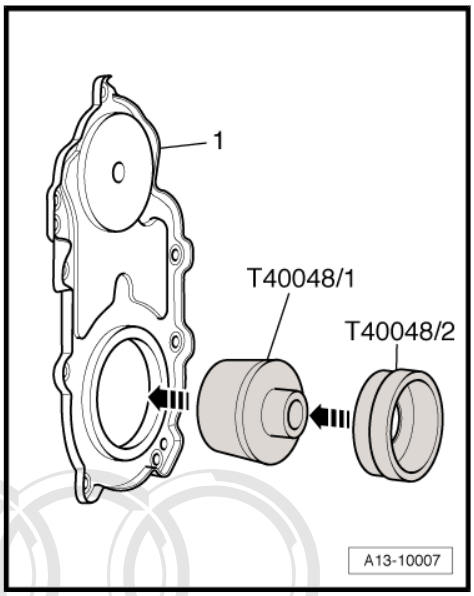
- The groove on the sealing surface must be completely filled with sealant.
- The bead of sealant must project 1.5 … 2.0 mm above the sealing surface.

Note

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

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

– Detach assembly aid.



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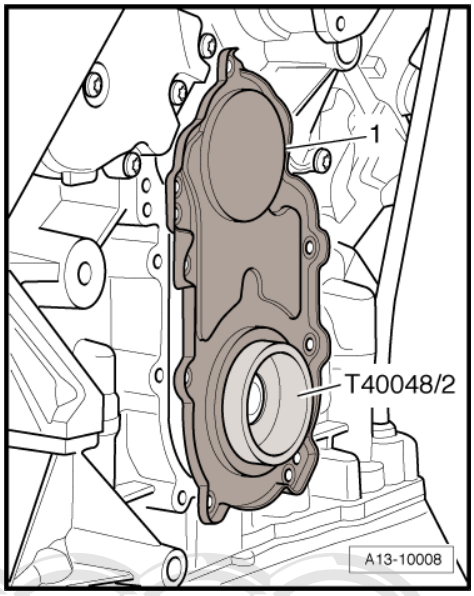
– First position sealing flange (with assembly sleeve -T40048/2- inserted) on crankshaft.
– Keep sealing flange straight while pushing it onto engine sealing surface. Then bolt on
⇒ Fig. ""Sealing flange (pulley end) - tightening torque and sequence"" , page 66 .

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

– Install poly V-belt pulley for coolant pump
⇒ "2.1 Exploded view - coolant pump/thermostat", page 228 .
– Install vibration damper
⇒ "1.4 Removing and installing vibration damper", page 68 .

Tightening torques

- ⇒ Fig. ""Sealing flange (pulley end) - tightening torque and sequence"" , page 66
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation



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2 Cylinder block (gearbox end)

⇒ “2.1 Exploded view - cylinder block (gearbox end)”, page 73
⇒ “2.2 Removing and installing drive plate”, page 74
⇒ “2.3 Removing and installing sender wheel”, page 75
⇒ “2.4 Checking sender wheel”, page 76
⇒ “2.5 Renewing crankshaft oil seal (gearbox end)”, page 77
⇒ “2.6 Renewing needle bearing in drive plate”, page 79

2.1 Exploded view - cylinder block (gearbox end)

Note

When performing assembly work, secure engine to engine and gearbox support - VAS 6095- ⇒ “1.3 Securing engine to engine and gearbox support”, page 41 .

1 - Drive plate

- ❑ With bearing flange
- ❑ Check running surface on bearing flange and holes for clutch module for cracks and scoring.
- ❑ Removing and installing ⇒ “2.2 Removing and installing drive plate”, page 74

2 - Bolt

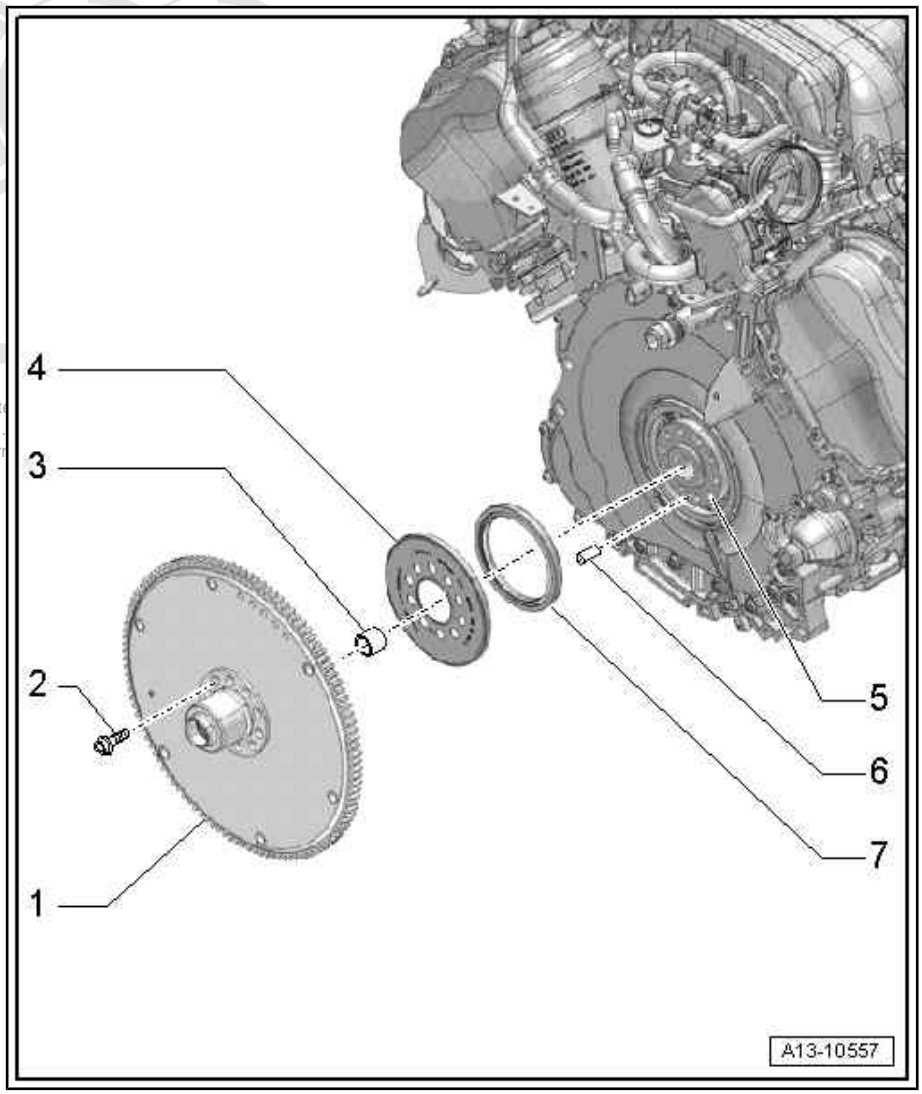
- ❑ Renew
- ❑ 60 Nm +90°

3 - Needle bearing

- ❑ For vehicles with manual gearbox or multitronic gearbox 0AW (front-wheel drive)
- ❑ Installation position: closed side towards engine
- ❑ Removing and installing ⇒ “2.6 Renewing needle bearing in drive plate”, page 79

4 - Sender wheel

- ❑ For engine speed sender - G28-



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Caution

Risk of magnetic fields causing irreparable damage to sender wheel.

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

If the drive plate/flywheel or the sender wheel itself has been removed or renewed, check that the sender wheel is operating correctly before installation
⇒ "2.4 Checking sender wheel", page 76 .

- ❑ Removing and installing ⇒ "2.3 Removing and installing sender wheel", page 75
- ❑ Checking ⇒ "2.4 Checking sender wheel", page 76

5 - Crankshaft

6 - Dowel pin

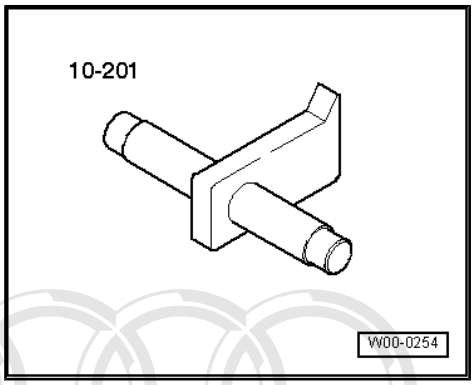
7 - Oil seal

- ❑ For crankshaft (gearbox end)
- ❑ Renewing ⇒ "2.5 Renewing crankshaft oil seal (gearbox end)", page 77

2.2 Removing and installing drive plate

Special tools and workshop equipment required

- ♦ Counterhold tool - 10-201-

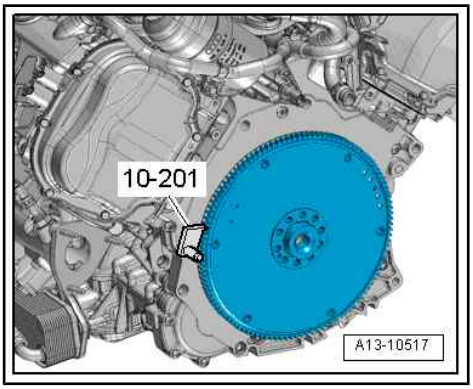


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Removing

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

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



Caution

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

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

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

Installing

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

Note

Renew the bolts tightened with specified tightening angle.

– Pay attention to dowel pin when installing drive plate.

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

Tightening torques

- ⇒ “2.1 Exploded view - cylinder block (gearbox end)”, page 73

2.3 Removing and installing sender wheel

Removing

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

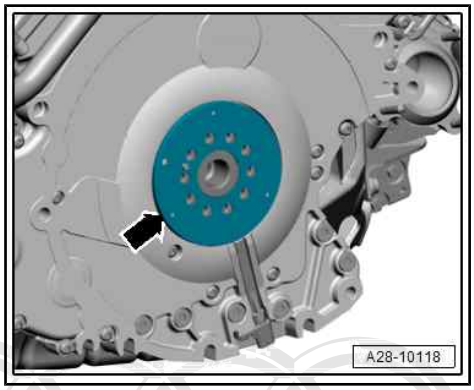
– Remove drive plate
⇒ “2.2 Removing and installing drive plate”, page 74 .

Caution

Risk of magnetic fields causing irreparable damage to sender wheel.

- ***The sender wheel must be kept away from magnets (e.g. base of torch, loudspeaker).***
- ***If the drive plate/flywheel or the sender wheel itself has been removed or renewed, check that the sender wheel is operating correctly before installation***
  ⇒ “2.4 Checking sender wheel”, page 76 .

– Detach sender wheel -arrow-.



Installing

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

– Install drive plate
⇒ “2.2 Removing and installing drive plate”, page 74 .

2.4 Checking sender wheel

Special tools and workshop equipment required

♦ Magnetic lens - T10473-



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Procedure

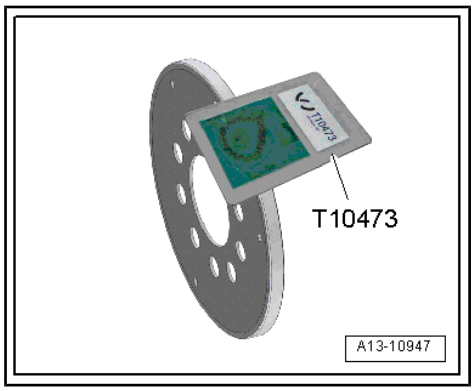
• Sender wheel removed

Caution

Risk of magnetic fields causing irreparable damage to sender wheel.

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

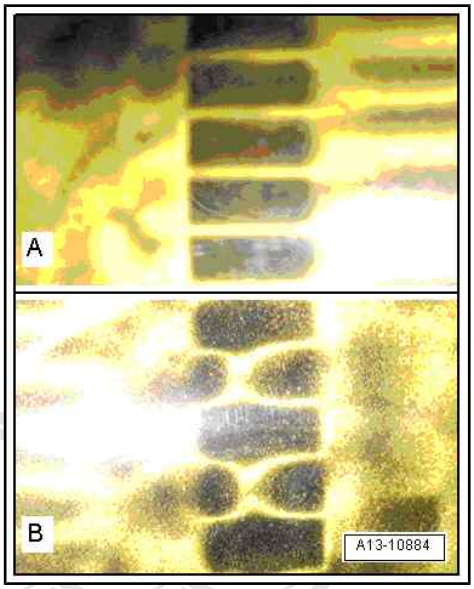
– Check whole circumference of sender wheel using magnetic lens - T10473- as shown in illustration.



Inspection image of sender wheel

A - Sender wheel OK

B - Sender wheel defective

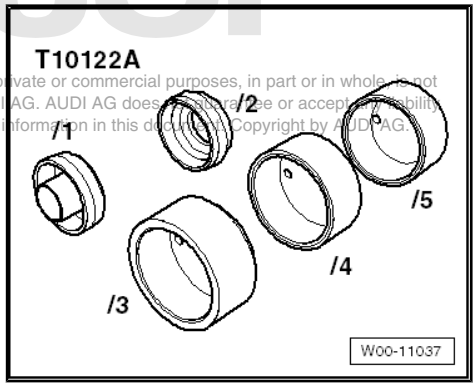


2.5 Renewing crankshaft oil seal (gearbox end)

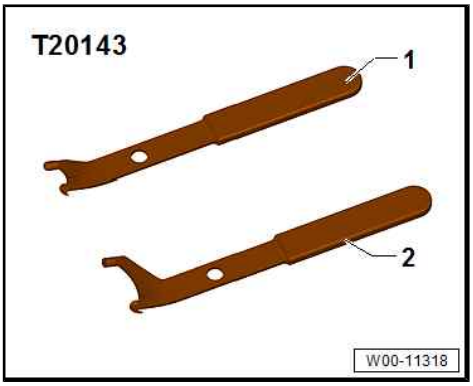
Special tools and workshop equipment required

- Fitting tool - T10122 A-

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



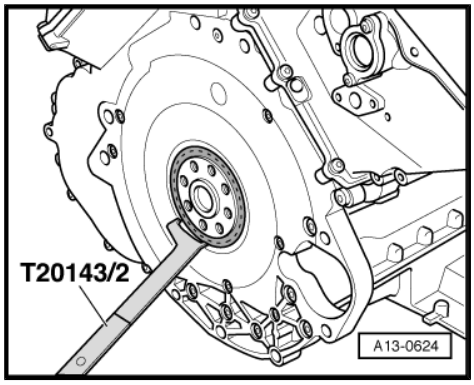
Procedure

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

– Remove drive plate
⇒ “2.2 Removing and installing drive plate”, page 74 .

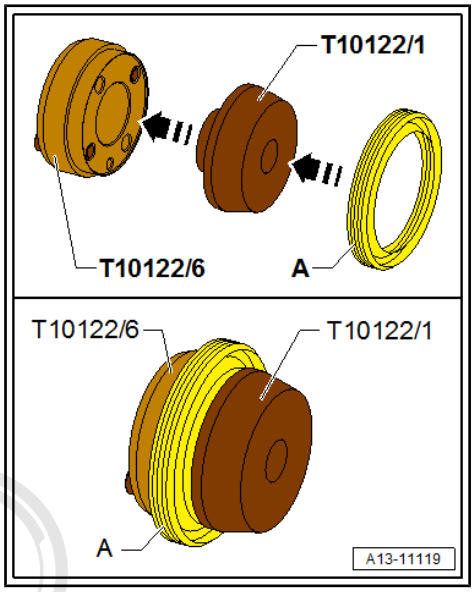
– Pry out oil seal using extractor tool -T20143/2- .

– Clean contact surface and sealing surface.



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

– Detach assembly aid -T10122/1- .



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

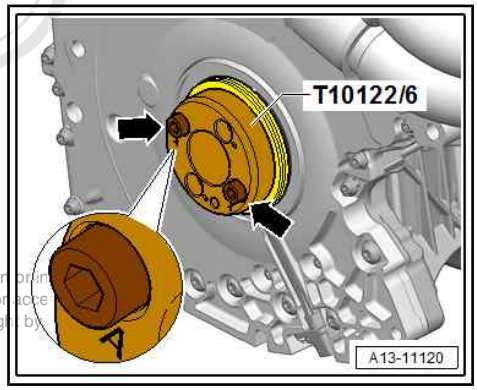
– Bolt guide piece to crankshaft through securing points -A- using bolts -arrows-.

Caution

Risk of leaks if installed incorrectly.

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

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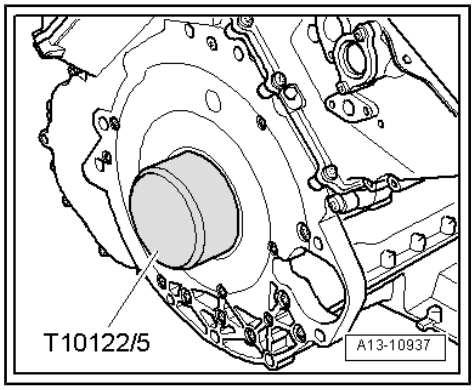
– Slide oil seal over guide piece - T10122/6- onto crankshaft by hand.

– Press in oil seal evenly all round using thrust piece - T10122/5- .

– Remove guide piece - T10122/6- .

– Check that oil seal and its sealing lip are correctly seated. If sealing lip is partially folded over, repeat procedure with a new oil seal.

– Install drive plate
⇒ “2.2 Removing and installing drive plate”, page 74 .



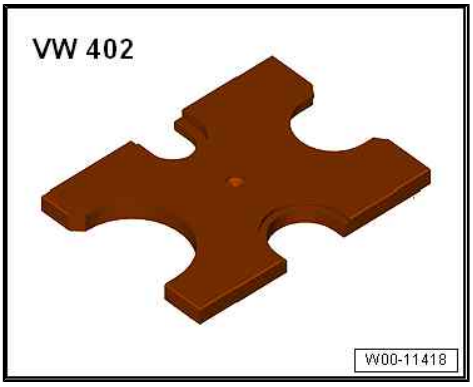
2.6 Renewing needle bearing in drive plate

Note

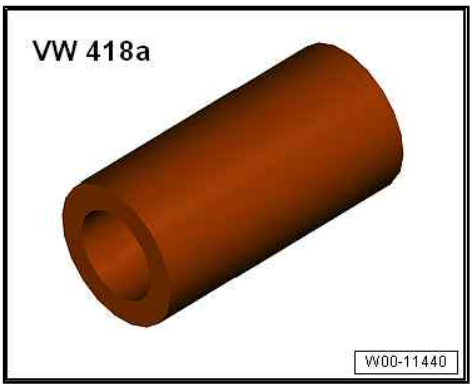
The needle bearing in the drive plate is only fitted in vehicles with manual gearbox or with multitronic gearbox 0AW.

Special tools and workshop equipment required

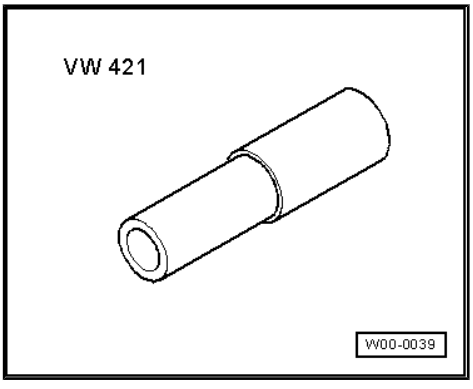
- Thrust plate - VW 402-



- Tube - VW 418 A-

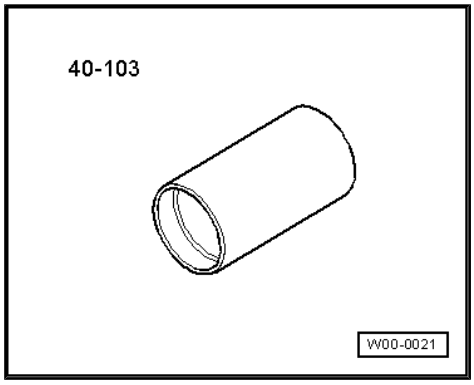


- Tube - VW 421-



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♦ Support - 40-103-



Procedure

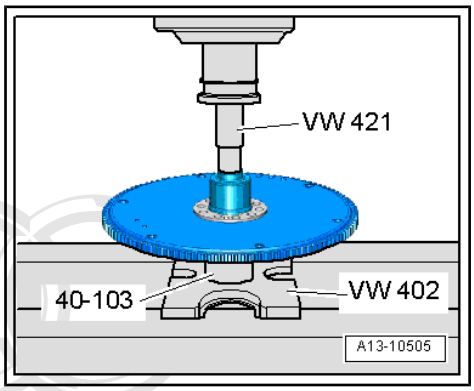
- Gearbox removed ⇒ Rep. gr. 34 ; Removing and installing gearbox; Removing gearbox or ⇒ Rep. gr. 37 ; Removing and installing gearbox; Removing gearbox .

– Remove drive plate
⇒ “2.2 Removing and installing drive plate”, page 74 .

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

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

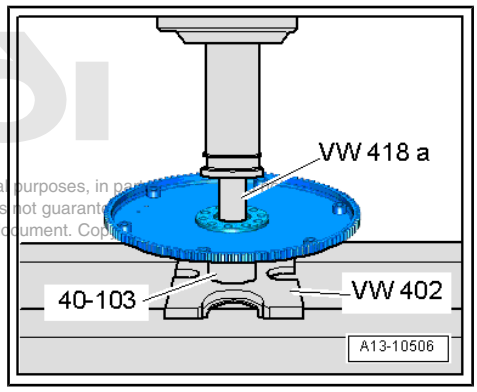
- Smaller diameter of tube -VW 421- faces drive plate.



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

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

– Install drive plate
⇒ “2.2 Removing and installing drive plate”, page 74 .



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3 Crankshaft

⇒ “3.1 Exploded view - crankshaft”, page 81

⇒ “3.2 Crankshaft dimensions”, page 85

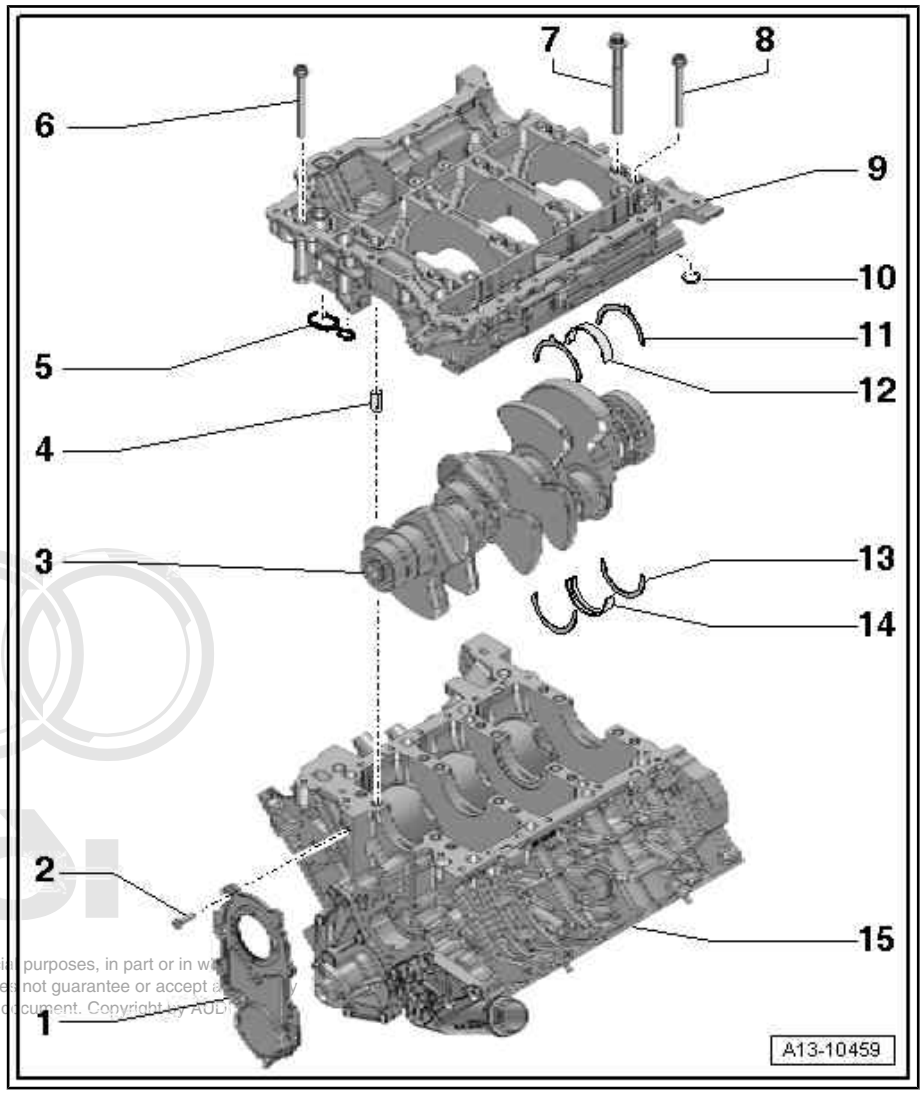
⇒ “3.3 Measuring axial clearance of crankshaft”, page 85

⇒ “3.4 Measuring radial clearance of crankshaft”, page 85

3.1 Exploded view - crankshaft

Note

When performing assembly work, secure engine to engine and gearbox support - VAS 6095- ⇒ “1.3 Securing engine to engine and gearbox support”, page 41 .



1 - Sealing flange (pulley end)

- ❑ Renewing ⇒ “1.5 Removing and installing sealing flange (pulley end)”, page 68

2 - Bolt

- ❑ Tightening torque and sequence ⇒ Fig. ““Sealing flange (pulley end) - tightening torque and sequence”“ , page 66

3 - Crankshaft

- ❑ Measuring axial clearance ⇒ “3.3 Measuring axial clearance of crankshaft”, page 85
- ❑ Measuring radial clearance ⇒ “3.4 Measuring radial clearance of crankshaft”, page 85
- ❑ Crankshaft dimensions ⇒ “3.2 Crankshaft dimensions”, page 85

4 - Dowel sleeve

- ❑ 4x
- ❑ Inserting in retaining frame ⇒ Fig. ““Applying sealant to retaining frame, position of dowel sleeves”“ , page 83

5 - Seal

- ❑ Renew

6 - Bolt

- ❑ For sealing surfaces: retaining frame to cylinder block
- ❑ Differing bolt lengths and bolt heads
- ❑ Renew
- ❑ Tightening torque and sequence ⇒ Fig. ““Installing retaining frame”“ , page 84

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7 - Bolt

- ❑ Long, large collar
- ❑ For retaining frame (inner row)
- ❑ Renew
- ❑ Tightening torque and sequence ⇒ Fig. ""Installing retaining frame"" , page 84

8 - Bolt

- ❑ Short, small collar
- ❑ For retaining frame (outer row)
- ❑ Renew
- ❑ Tightening torque and sequence ⇒ Fig. ""Installing retaining frame"" , page 84

9 - Retaining frame

- ❑ With valve for oil pressure control - N428- ⇒ Fig. "" Valve for oil pressure control -N428- "" , page 83
- ❑ To remove, detach guide rail ⇒ Item 1 (page 111) for drive chain for valve gear
- ❑ Applying sealant ⇒ Fig. ""Applying sealant to retaining frame, position of dowel sleeves"" , page 83
- ❑ Removing and installing valve for oil pressure control - N428-
  ⇒ "4.6 Removing and installing valve for oil pressure control N428 ", page 214

10 - Seal

- ❑ Renew

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11 - Thrust washer

Only fitted on 3rd crankshaft bearing

- ❑ Installation position: oil groove faces outwards
- ❑ Make sure it engages in retaining frame

12 - Bearing shell

- ❑ For retaining frame (without oil groove)
- ❑ Renew used bearing shells
- ❑ Note installation position
- ❑ Install new bearing shells for retaining frame with correct coloured markings
  ⇒ Fig. ""Matching crankshaft bearing shells to bearings in retaining frame"" , page 84

13 - Thrust washer

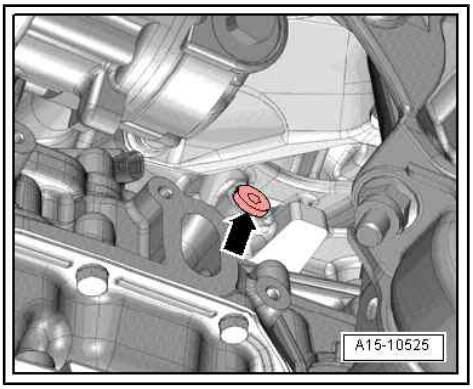
- ❑ Only fitted on 3rd crankshaft bearing
- ❑ Installation position: oil groove faces outwards
- ❑ Make sure it engages in retaining frame

14 - Bearing shell

- ❑ For cylinder block (with oil groove)
- ❑ Renew used bearing shells
- ❑ Note installation position
- ❑ Install new bearing shells for the cylinder block with the correct coloured markings
  ⇒ Fig. ""Matching crankshaft bearing shells to bearings in cylinder block"" , page 84

15 - Cylinder block

Plug for “TDC” marking - tightening torque

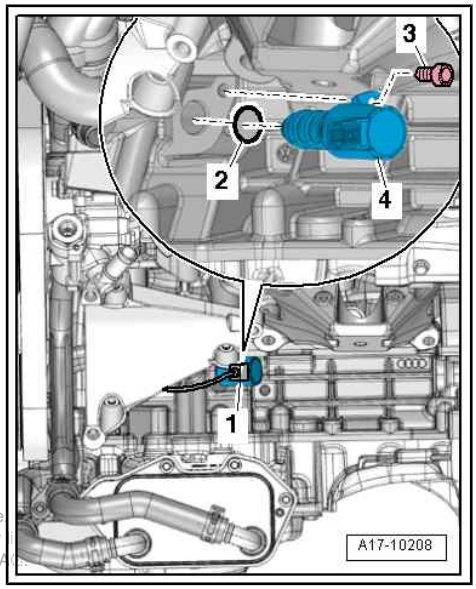


Note

Fit new O-ring.

– Tighten plug -arrow- to 14 Nm.

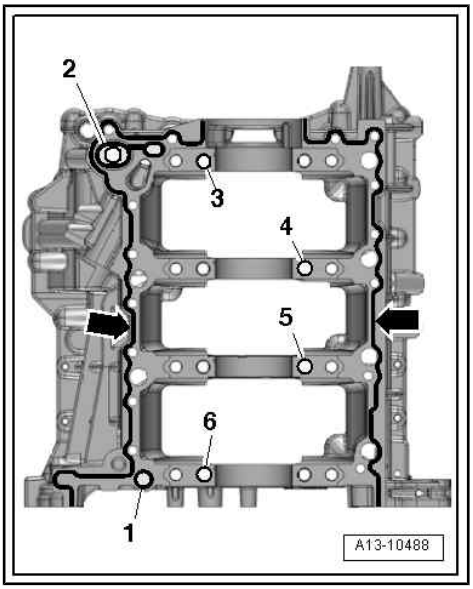
Valve for oil pressure control - N428-



1 - Electrical connector
2 - O-ring - renew
3 - Bolt, 9 Nm
4 - Valve for oil pressure control - N428-

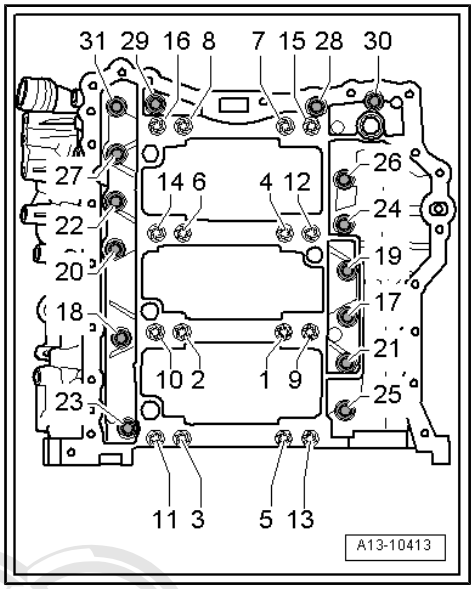
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Applying sealant to retaining frame, position of dowel sleeves



– Clean surfaces; they must be free of oil and grease.
– Apply sealant beads -arrows- onto clean sealing surfaces of retaining frame as shown in illustration.
• The groove on the sealing surface must be completely filled with sealant.
• The beads of sealant must project 1.5 … 2.0 mm above the sealing surface.
– Fit seals -1- and -2-.
– Check that dowel sleeves -3 ... 6- are inserted in retaining frame at positions shown in illustration.

Installing retaining frame



Note

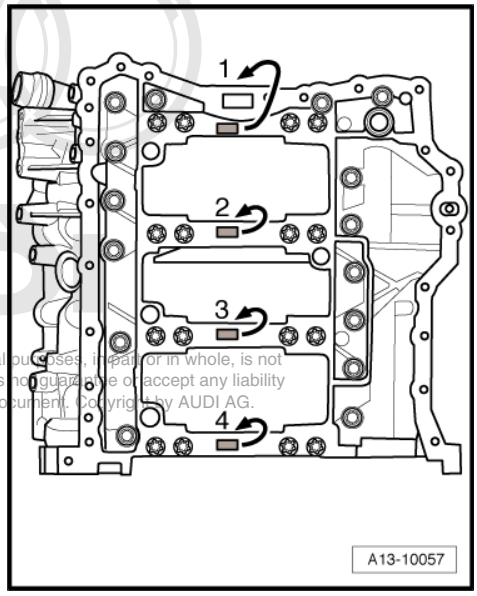
Renew the bolts tightened with specified tightening angle.

– Install long bolts in inner row on retaining frame.

– Tighten bolts in stages in the sequence shown:

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

Matching crankshaft bearing shells to bearings in cylinder block

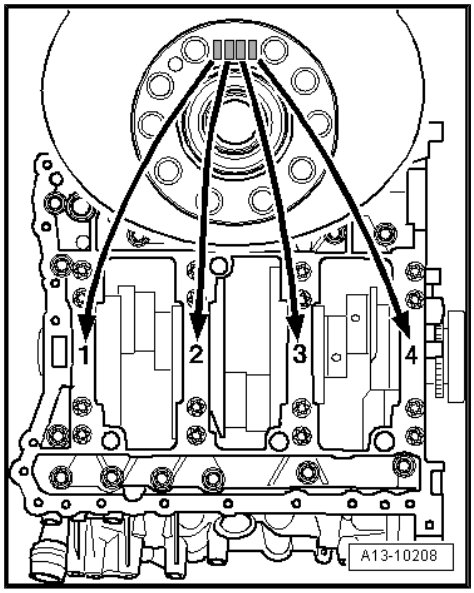


- Bearing shells of the correct thickness are matched to the bearings in the cylinder block at the factory. Coloured dots on the side of the bearing shells are used to identify the bearing shell thickness.
- The allocation of the bearing shells to the bearing positions in the cylinder block is indicated by a code letter at the relevant bearing on the retaining frame.

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

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Matching crankshaft bearing shells to bearings in retaining frame



- Bearing shells of the correct thickness are matched to the bearings in the retaining frame at the factory. Coloured dots on the side of the bearing shells are used to identify the bearing shell thickness.
- The allocation of the bearing shells to the bearing positions in the retaining frame is indicated by a sequence of letters on the flywheel flange on the crankshaft. The first letter in the sequence stands for bearing “1”, the second letter for bearing “2”, etc.

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

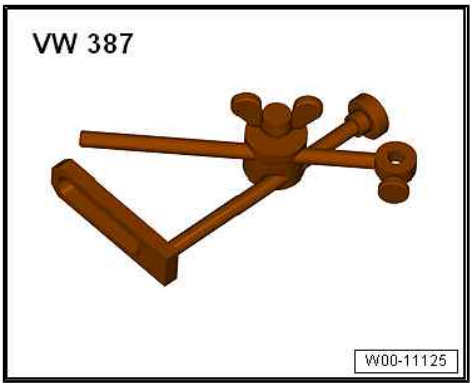
3.2 Crankshaft dimensions

Honing dimension	Main bearing journal ∅ mm	Conrod journal ∅ mm
Basic dimension	58.000 – 0.022 – 0.042	54.000 – 0.022 – 0.042

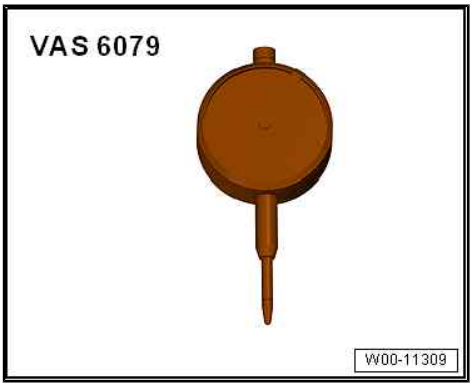
3.3 Measuring axial clearance of crankshaft

Special tools and workshop equipment required

- Universal dial gauge bracket - VW 387-

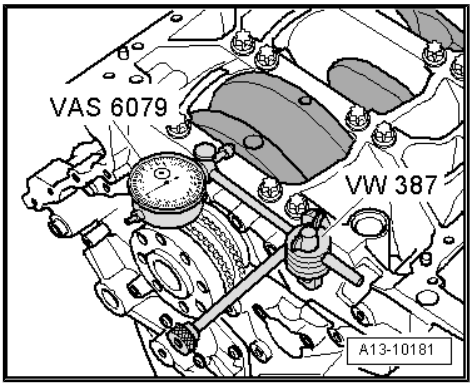


- Dial gauge - VAS 6079-



Procedure

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



– Apply dial gauge to crank web.

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

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

• Axial clearance: 0.15 ... 0.25 mm

3.4 Measuring radial clearance of crankshaft

Special tools and workshop equipment required

- Plastigauge

Procedure

– Remove retaining frame and clean bearing journals.

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

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

– Fit retaining frame, secure with old bolts and tighten to final torque ⇒ page 81 without rotating crankshaft.

– Remove retaining frame again.

– Compare width of Plastigauge with measurement scale.

Radial clearance:

• New: 0.015 ... 0.055 mm.

• Wear limit: 0.080 mm.

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4 Balance shaft

⇒ “4.1 Exploded view - balance shaft”, page 87

⇒ “4.2 Removing and installing balance shaft”, page 87

4.1 Exploded view - balance shaft

1 - Balance shaft

- ❑ Removing and installing ⇒ “4.2 Removing and installing balance shaft”, page 87

2 - Bolt

- ❑ 60 Nm

3 - Balance weight (gearbox end)

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

4 - Bearing plate

5 - Bolt

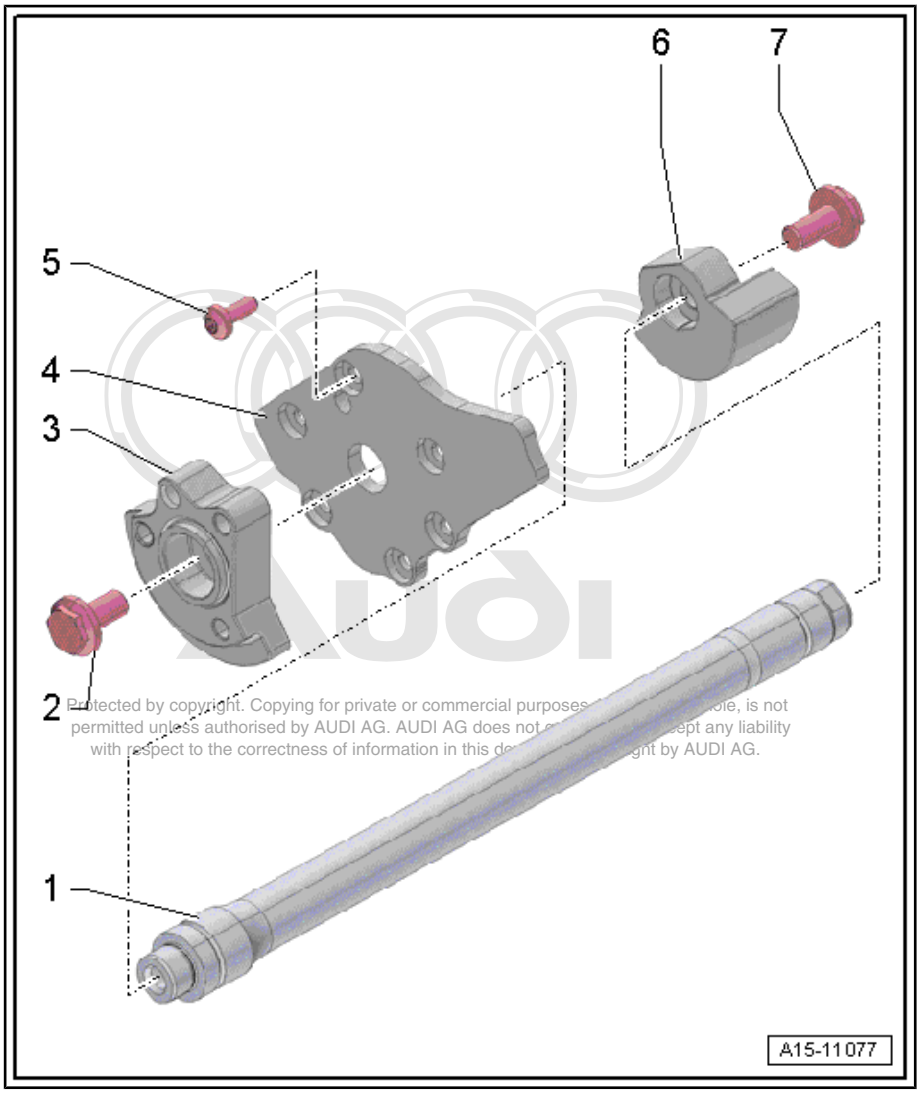
- ❑ 13 Nm

6 - Balance weight (pulley end)

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

7 - Bolt

- ❑ 60 Nm

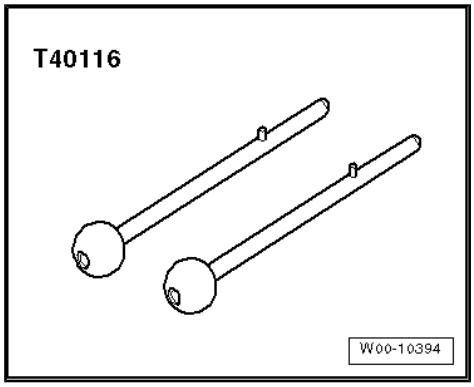


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4.2 Removing and installing balance shaft

Special tools and workshop equipment required

♦ Locating pins - T40116-



Removing

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

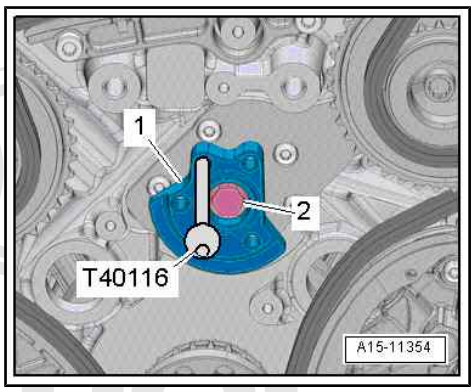
– Remove sealing flange (pulley end) ⇒ “1.5 Removing and installing sealing flange (pulley end)”, page 68 .

– Remove timing chain cover (bottom) ⇒ “1.2.2 Removing and installing timing chain cover (bottom)”, page 102 .

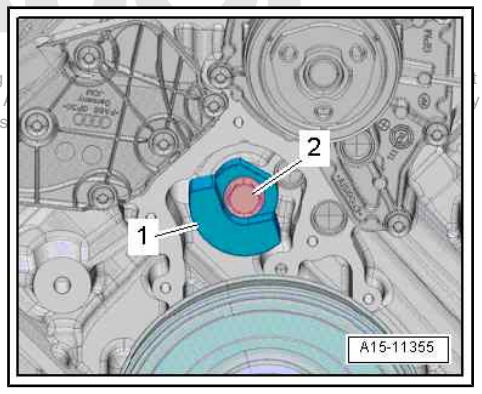
– Remove drive chain for auxiliary drives ⇒ “2.7 Removing and installing drive chain for balance shaft and oil pump”, page 127 .

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

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

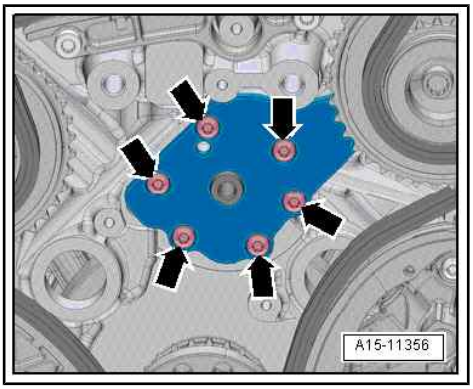


– Unscrew bolt -2- (counterhold balance weight -1- with a suitable pin) and detach balance weight at front of engine from balance shaft.



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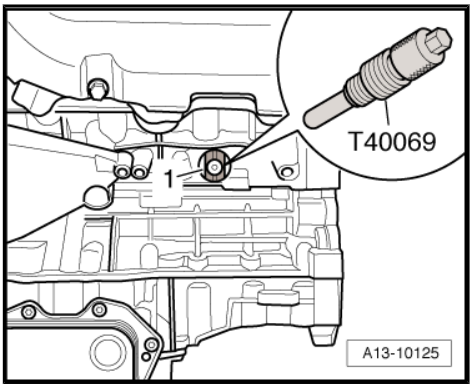
– Unscrew bolts -arrows- and detach bearing plate for balance shaft at rear of engine.
– Pull balance shaft to rear out of cylinder block.



Installing

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

- Crankshaft -1- locked in “TDC” position with locking pin - T40069- .



Note

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

– Install drive chain for auxiliary drives
⇒ “2.7 Removing and installing drive chain for balance shaft and oil pump”, page 127 .
– Install timing chain cover (bottom)
⇒ “1.2.2 Removing and installing timing chain cover (bottom)”, page 102 .
– Install sealing flange (pulley end)
⇒ “1.5 Removing and installing sealing flange (pulley end)”, page 68 .

Tightening torques

◆ ⇒ “4.1 Exploded view - balance shaft”, page 87

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5 Pistons and conrods

⇒ “5.1 Exploded view - pistons and conrods”, page 90

⇒ “5.2 Removing and installing pistons”, page 92

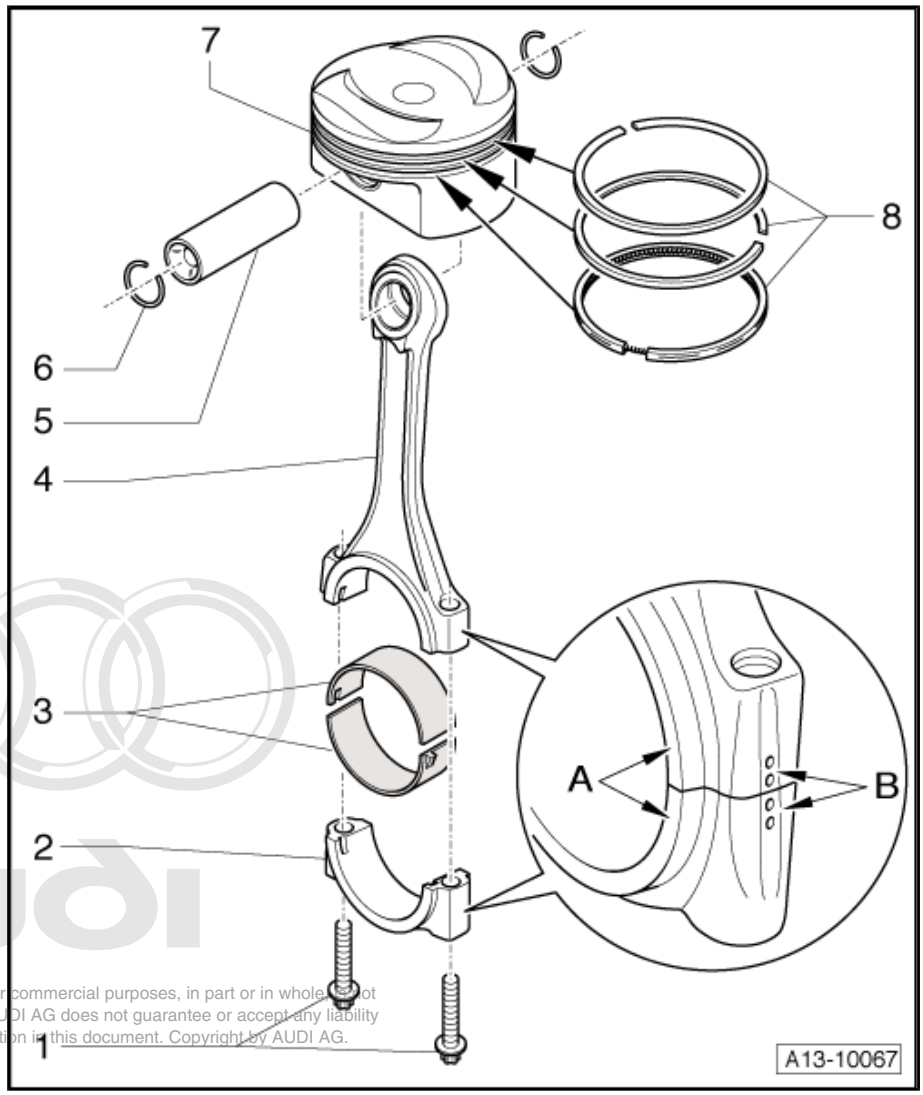
⇒ “5.3 Checking pistons and cylinder bores”, page 93

⇒ “5.4 Checking radial clearance of conrod bearings”, page 94

5.1 Exploded view - pistons and conrods

Note

- *All bearing and running surfaces must be oiled before assembling.*
- *Oil spray jet for piston cooling ⇒ Fig. ““Oil spray jet for piston cooling”“ , page 92 .*



1 - Bolts

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

2 - Conrod bearing cap

- ❑ Mark cylinder and conrod allocation in colour -B- ⇒ Fig. ““Marking conrods”“ , page 91
- ❑ Note when fitting bearing cap: the wide contact shoulder -A- must point towards same side on conrod and conrod bearing cap
- ❑ Installation position of conrod pairs ⇒ Fig. ““Conrod installation position”“ , page 92

3 - Bearing shells

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

4 - Conrod

- ❑ Only renew as a complete set
- ❑ Mark cylinder and conrod bearing cap allocation in colour ⇒ Fig. ““Marking conrods”“ , page 91

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- ❑ Installation position of conrod pairs ⇒ Fig. ""Conrod installation position"" , page 92
- ❑ Axial clearance for each conrod pair (when new): 0.20 … 0.45 mm
- ❑ Measuring radial clearance ⇒ "5.4 Checking radial clearance of conrod bearings", page 94

5 - Piston pin

- ❑ Removing and installing ⇒ "5.2 Removing and installing pistons", page 92

6 - Circlip

- ❑ Renew

7 - Piston

- ❑ Note cylinder bank allocation markings ⇒ Fig. ""Installation position of pistons"" , page 91
- ❑ Mark installation position and cylinder number ⇒ Fig. ""Installation position of pistons"" , page 91
- ❑ Removing and installing ⇒ "5.2 Removing and installing pistons", page 92
- ❑ Renew piston if cracking is visible on piston crown or piston skirt
- ❑ Checking pistons and cylinder bores ⇒ "5.3 Checking pistons and cylinder bores", page 93

8 - Piston rings

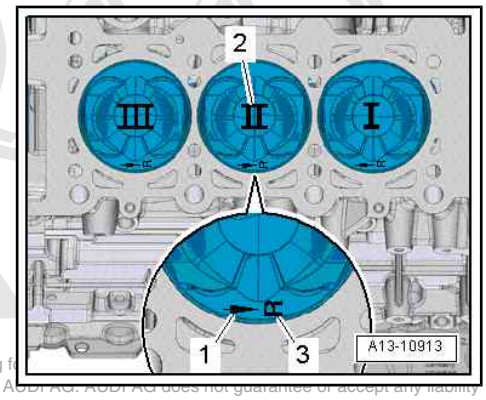
- ❑ Measuring ring gap ⇒ Fig. ""Measuring piston ring gap"" , page 94
- ❑ Measuring ring-to-groove clearance ⇒ Fig. ""Measuring ring-to-groove clearance"" , page 94
- ❑ Use piston ring pliers (commercially available) to remove and install
- ❑ Installation position: marking "TOP" or side with lettering faces towards piston crown
- ❑ Offset gaps by 120°

Installation position of pistons

Caution

Do not damage the coating of the piston crown.

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



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Installation position:

1 - Arrows on piston crowns point to pulley end.

2 - Markings must be made indicating cylinder allocation

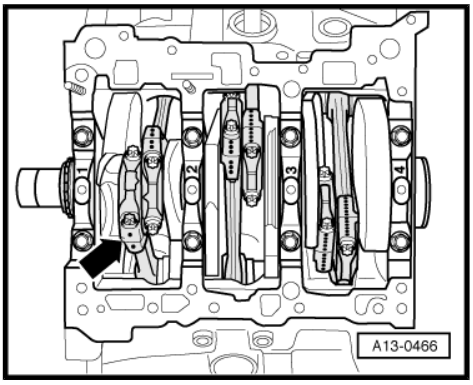
3 - Cylinder allocation markings: "R" = right, "L" = left

Marking conrods

Note

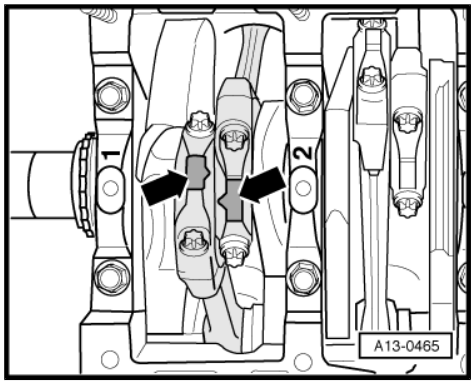
Only renew conrods as a complete set.

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



Conrod installation position

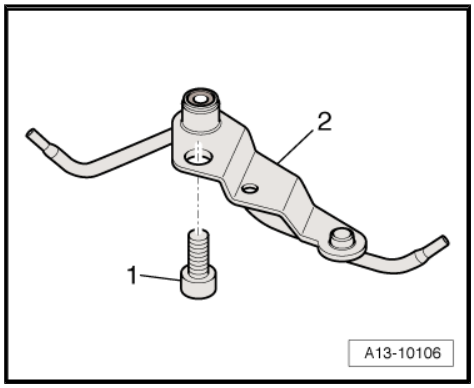
- The cast lugs -arrows- on the ground surfaces of the conrod pairs “1 and 2”, “3 and 4”, and “5 and 6” must face each other.



Oil spray jet for piston cooling

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

2 - Oil spray jet with spray nozzle valve



Caution

Risk of damage to oil spray jets.

- *Do not bend oil spray jets.*
- *Always renew bent oil spray jets.*

5.2 Removing and installing pistons

Special tools and workshop equipment required

- Drift - VW 222 A-



- Piston ring clamp, commercially available

Removing

- Engine secured to engine and gearbox support - VAS 6095- ⇒ “1.3 Securing engine to engine and gearbox support”, page 41

– Remove cylinder head ⇒ “3.2 Removing and installing cylinder head”, page 136

– Remove sump (top section) ⇒ “1.4 Removing and installing sump (top section)”, page 199 .

– Mark installation position and matching of conrod bearing caps to cylinder and to conrods for re-installation ⇒ Fig. ““Marking conrods”“ , page 91 .

– Unbolt conrod bearing caps.

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– Pull out pistons upwards with conrods.

Note

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

– Take circlip out of piston pin boss.
– Use drift - VW 222 A- to drive out piston pin.

Installing

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

Note

Renew the bolts tightened with specified tightening angle.

– Oil running surfaces of bearing shells.
– Install pistons using piston ring clamp.

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Installation position:

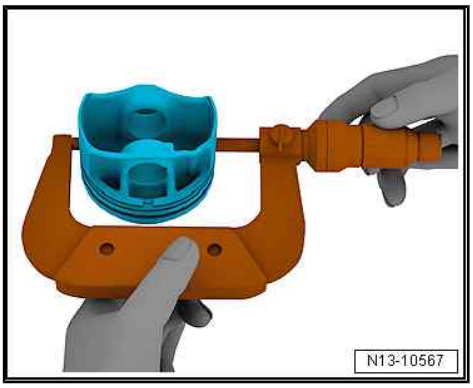
- Pistons ⇒ Fig. ""Installation position of pistons"" , page 91
- Conrods ⇒ Fig. ""Conrod installation position"" , page 92

– Install conrod bearing caps according to markings.
– Install sump (upper section)
⇒ "1.4 Removing and installing sump (top section)", page 199 .
– Install cylinder head
⇒ "3.2.1 Removing and installing cylinder head - camshafts with assembly clearance feature", page 136 .

Tightening torques

◆ ⇒ "5.1 Exploded view - pistons and conrods", page 90

5.3 Checking pistons and cylinder bores



Checking piston

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

- Maximum deviation from nominal dimension: 0.03 mm.

Piston ∅ mm		
	2.5 ltr. engine	**2.8 ltr. engine**
Nominal dimension	80.185[1)]	84.49[1)]

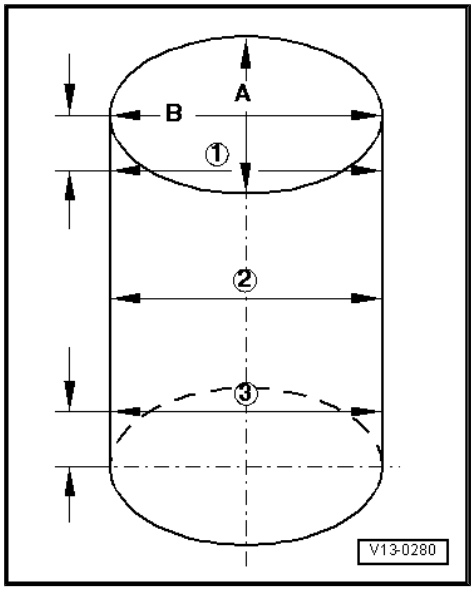
- [1)] Dimensions including coating (thickness approx. 0.02 mm). The coating will wear down in service.

Measuring cylinder bore

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

• Maximum deviation from nominal dimension: 0.08 mm.

Cylinder bore ∅ mm		
	2.5 ltr. engine	**2.8 ltr. engine**
Nominal dimension	80.210[1)]	84.51[1)]
• [1)] Measure at 50 mm into cylinder bore.		

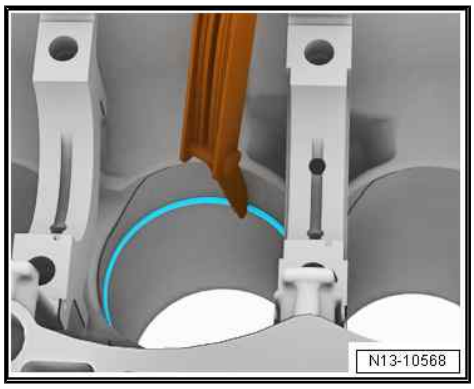


Measuring piston ring gap

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

– To do so, use a piston without rings.

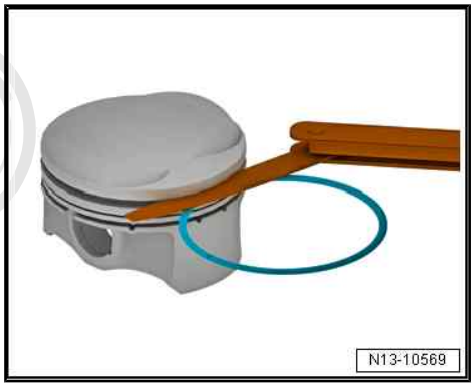
Piston ring	new mm	Wear limit mm
1st compression ring	0.20 … 0.35	0.80
2nd compression ring	0.5 … 0.7	1.0
Oil scraper ring	0.2 … 0.4	0.8



Measuring ring-to-groove clearance

– Clean groove in piston before checking clearance.

Piston ring	new mm	Wear limit mm
Compression rings	0.02 … 0.08	0.20
Oil scraper ring	0.02 … 0.08	0.15



5.4 Checking radial clearance of conrod bearings

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Special tools and workshop equipment required

♦ Plastigauge

Procedure

– Remove conrod bearing cap.

– Clean bearing cap and bearing journal.

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

– Fit conrod bearing cap and tighten with old bolts ⇒ Item 1 (page 90) . Do not rotate crankshaft.
– Remove conrod bearing cap again.
– Compare width of Plastigauge with measurement scale.

Radial clearance:

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

– Renew conrod bolts.

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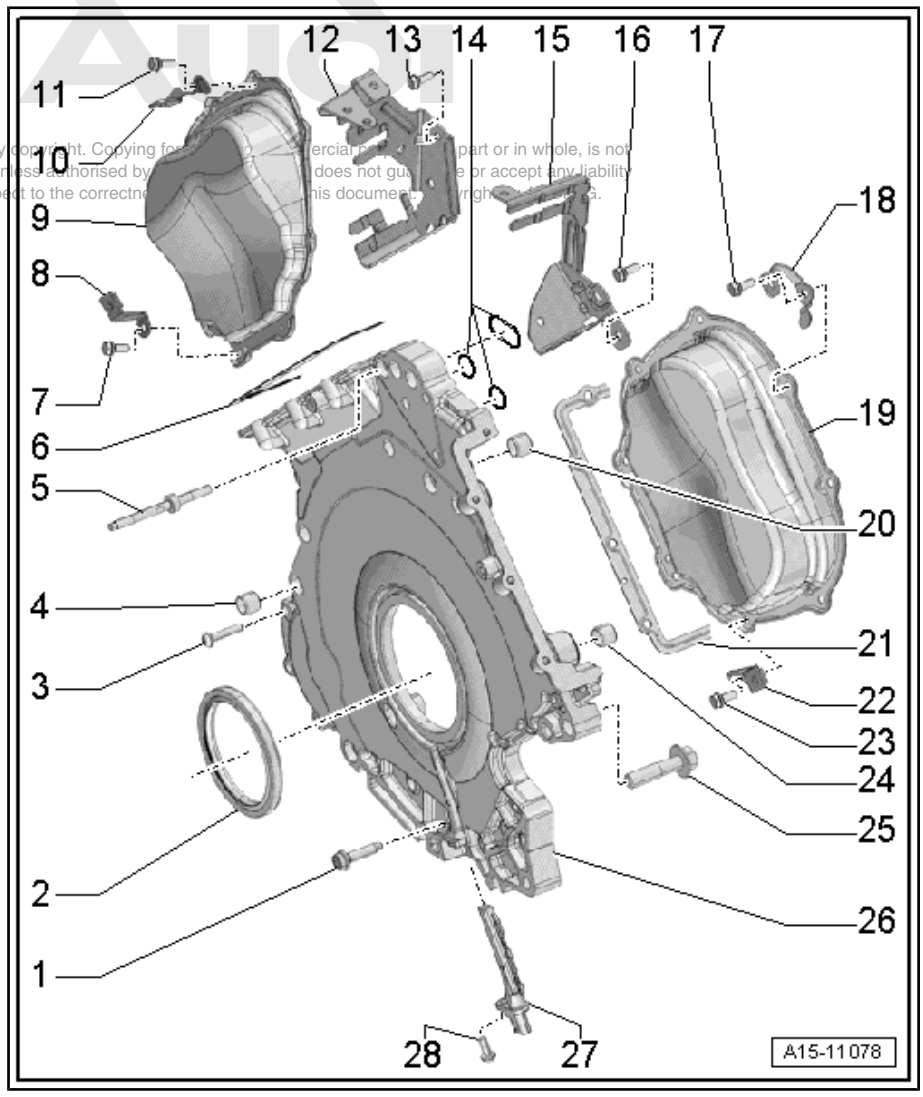
15 – Cylinder head, valve gear

1 Timing chain cover

⇒ “1.1 Exploded view - timing chain cover”, page 96

⇒ “1.2 Removing and installing timing chain cover”, page 99

1.1 Exploded view - timing chain cover



1 - Bolt

- ❑ Tightening torque and sequence
  ⇒ Fig. ““Timing chain cover (bottom) - tightening torque and sequence”“ , page 98

2 - Oil seal

- ❑ For crankshaft (gearbox end)
- ❑ Renewing
  ⇒ “2.5 Renewing crankshaft oil seal (gearbox end)”, page 77

3 - Bolt

- ❑ Tightening torque and sequence
  ⇒ Fig. ““Timing chain cover (bottom) - tightening torque and sequence”“ , page 98

4 - Dowel sleeve

- ❑ 2x

5 - Threaded pin

- ❑ Tightening torque
  ⇒ Item 13 (page 209)

6 - Cylinder head gasket (left-side)

7 - Bolt

- ❑ Renew
- ❑ Tightening torque and sequence
  ⇒ Fig. ““Timing chain cover (left-side) - tightening torque and sequence”“ , page 98

8 - Bracket

- ❑ For heat shield

9 - Timing chain cover (left-side)

- ❑ Removing and installing
  ⇒ “1.2.1 Removing and installing timing chain covers (left and right)”, page 99

10 - Bracket

- ❑ For wiring harness

11 - Bolt

- ❑ Renew

- ❑ Tightening torque and sequence
  ⇒ Fig. ““Timing chain cover (left-side) - tightening torque and sequence”“ , page 98

12 - Bracket

- ❑ For electrical connectors for Lambda probes (left-side)

13 - Bolt

- ❑ Tightening torque and sequence
  ⇒ Fig. ““Timing chain cover (left-side) - tightening torque and sequence”“ , page 98

14 - Gaskets

- ❑ Renew

15 - Bracket

- ❑ For electrical connectors for Lambda probes (right-side)

16 - Bolt

- ❑ Tightening torque and sequence
  ⇒ Fig. ““Timing chain cover (left-side) - tightening torque and sequence”“ , page 98

17 - Bolt

- ❑ Tightening torque and sequence
  ⇒ Fig. ““Timing chain cover (right-side) - tightening torque and sequence”“ , page 98

18 - Bracket

- ❑ For electrical connectors

19 - Timing chain cover (right-side)

- ❑ Removing and installing
  ⇒ “1.2.1 Removing and installing timing chain covers (left and right)”, page 99

20 - Sleeve

- ❑ Prevents sealant from entering bolted connection between engine and gearbox
- ❑ Installation instructions ⇒ page 106

21 - Cylinder head gasket (right-side)

22 - Bracket

- ❑ For heat shield

23 - Bolt

- ❑ Renew
- ❑ Tightening torque and sequence
  ⇒ Fig. ““Timing chain cover (right-side) - tightening torque and sequence”“ , page 98

24 - Dowel sleeve

- ❑ 2x

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25 - Bolt

- ❑ Tightening torque and sequence
  ⇒ Fig. ““Timing chain cover (bottom) - tightening torque and sequence”“ , page 98

26 - Timing chain cover (bottom)

- ❑ Removing and installing ⇒ “1.2.2 Removing and installing timing chain cover (bottom)”, page 102

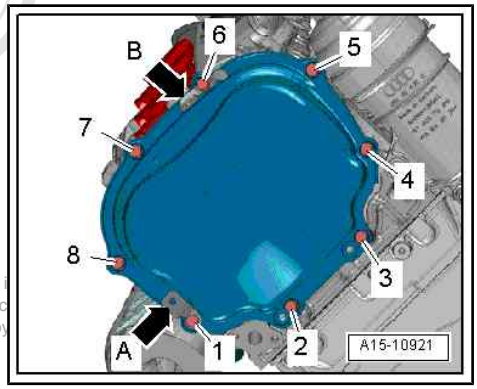
27 - Engine speed sender - G28-

- ❑ Removing and installing ⇒ “1.6 Removing and installing engine speed sender G28 ”, page 381

28 - Bolt

- ❑ Tightening torque ⇒ “1.1 Exploded view - ignition system”, page 371

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



Note

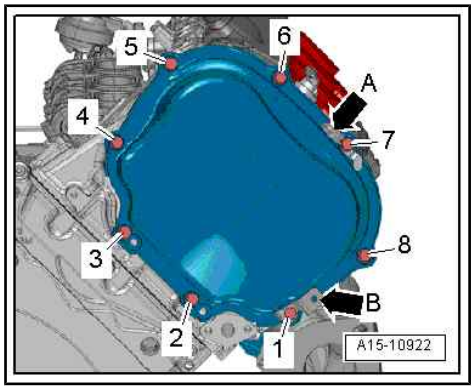
- *Renew the bolts tightened with specified tightening angle.*
- *The brackets -arrows A and B- are secured together with the timing chain cover (left-side).*

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– Tighten bolts in 2 stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1.	-1 … 8-	5 Nm
2.	-1 … 8-	Turn 90° further

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



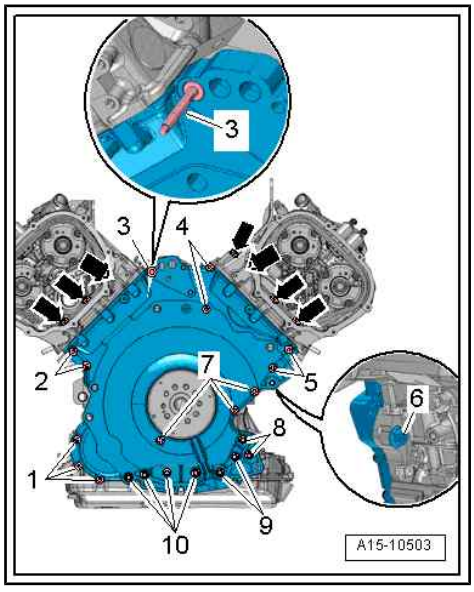
Note

- *Renew the bolts tightened with specified tightening angle.*
- *The brackets -arrows A and B- are secured together with the timing chain cover (right-side).*

– Tighten bolts in 2 stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1.	-1 … 8-	5 Nm
2.	-1 … 8-	Turn 90° further

Timing chain cover (bottom) - tightening torque and sequence



Note

Renew the bolts tightened with specified tightening angle.

– Tighten bolts in stages as follows:

Stage	Bolts	Tightening torque/angle specification
1.	-arrows-	3 Nm
2.	-1 … 10-	3 Nm in diagonal sequence
3.	-1, 2, 4, 5, 7-	Turn 90° further
4.	-arrows-	9 Nm
5.	-8, 9, 10-	8 Nm
6.	-8, 9, 10-	Turn 90° further
7.	-3-	16 Nm
8.	-6-	20 Nm
9.	-6-	Turn 180° further

1.2 Removing and installing timing chain cover

⇒ “1.2.1 Removing and installing timing chain covers (left and right)”, page 99

⇒ “1.2.2 Removing and installing timing chain cover (bottom)”, page 102

1.2.1 Removing and installing timing chain covers (left and right)

Special tools and workshop equipment required

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

Removing

Note

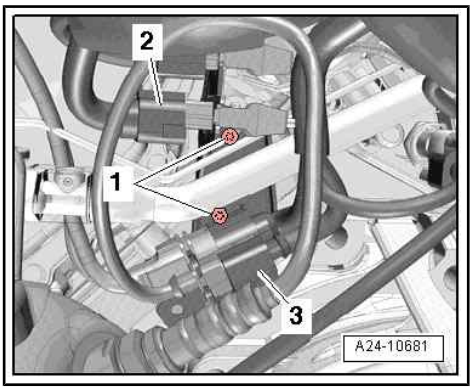
Fit all cable ties in the original positions when installing.

– Remove engine cover panel (rear) ⇒ “3.1 Removing and installing engine cover panel”, page 64 .

Timing chain cover (left-side):

– Remove combination valve for secondary air (left-side) ⇒ “3.4.1 Removing and installing combination valve (left-side)”, page 358 .

– Remove bolts -1- and move bracket with electrical connectors to one side.

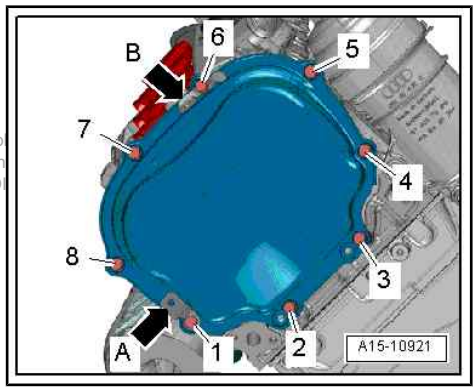


Note

Disregard items -2 and 3-.

– Unscrew bolts -1 ... 8- and detach brackets -arrows A, B-.

– Carefully release timing chain cover (left-side) from bonded joint and detach.



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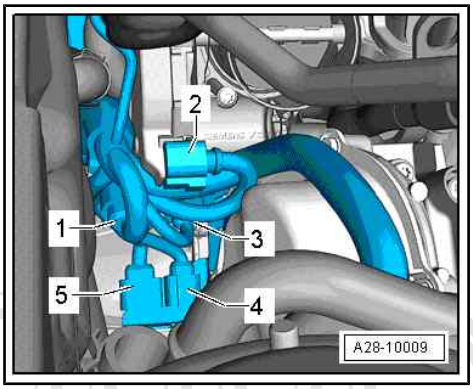
Timing chain cover (right-side):

– Remove combination valve for secondary air (right-side) ⇒ “3.4.2 Removing and installing combination valve (right-side)”, page 360 .

– Unplug electrical connectors and move wiring clear:

4 - For Lambda probe - G39-

5 - For Lambda probe after catalytic converter - G130-



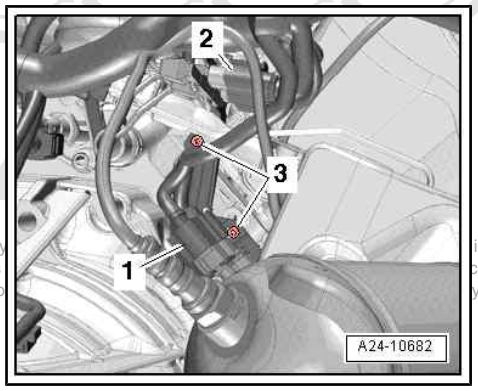
Note

Disregard -items 1, 2 and 3-.

– Remove bolts -3- and move bracket with electrical connectors to one side.

Note

Disregard items -1 and 2-.



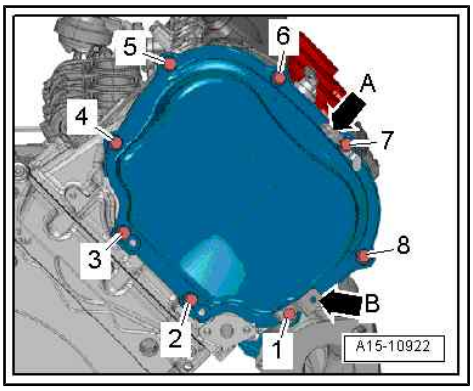
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– Move wiring harness clear at timing chain cover (right-side).

– Unscrew bolts -1 ... 8- and detach brackets -arrows A, B-.

– Carefully release timing chain cover (right-side) from bonded joint and detach.

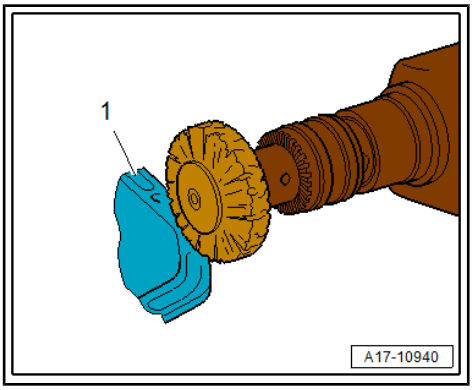
Installing



Note

- *Renew the bolts tightened with specified tightening angle.*
- *Fit new O-rings.*

– Remove old sealant from sealing surfaces.



Caution

Protect lubrication system against contamination.

- *Cover exposed parts of the engine.*

WARNING

Risk of eye injury.

- *Put on safety goggles.*

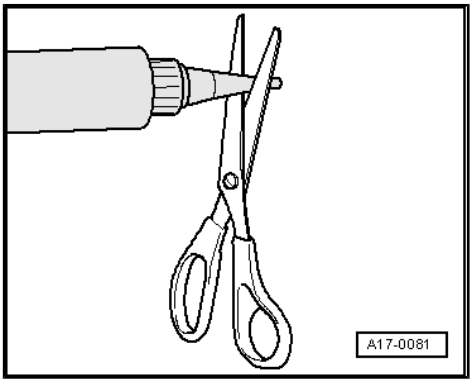
– Remove remaining sealant on timing chain covers -1-, cylinder block and cylinder head using rotating plastic brush or similar.

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

Note

Note the use-by date of the sealant.

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

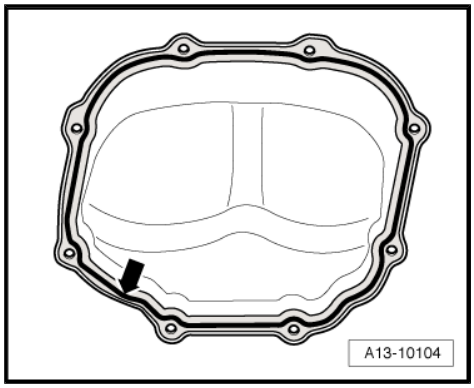


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Caution

Make sure lubrication system is not clogged by excess sealant.

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



– Apply sealant bead -arrow- onto clean sealing surface of timing chain cover as shown in illustration.

- Width of sealant bead: 2.5 mm.

Note

The timing chain covers must be installed within 5 minutes after applying sealant.

– Install timing chain cover (left-side) and tighten bolts ⇒ Fig. ""Timing chain cover (left-side) - tightening torque and sequence"" , page 98 .

– Install timing chain cover (right-side) and tighten bolts ⇒ Fig. ""Timing chain cover (right-side) - tightening torque and sequence"" , page 98 .

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

– Install combination valve for secondary air system: left-side ⇒ "3.4.1 Removing and installing combination valve (left-side)", page 358 , right-side ⇒ "3.4.2 Removing and installing combination valve (right-side)", page 360 .

– Install engine cover panel ⇒ "3.1 Removing and installing engine cover panel", page 64 .

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Tightening torques

- ⇒ Fig. ""Timing chain cover (left-side) - tightening torque and sequence"" , page 98
- ⇒ Fig. ""Timing chain cover (right-side) - tightening torque and sequence"" , page 98

1.2.2 Removing and installing timing chain cover (bottom)

Special tools and workshop equipment required

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

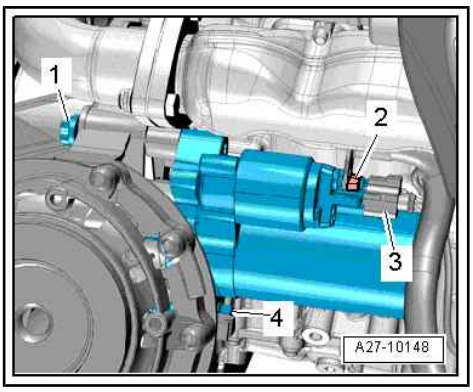
Removing

- Gearbox removed ⇒ Rep. gr. 34 ; Removing and installing gearbox; Removing gearbox or ⇒ Rep. gr. 37 ; Removing and installing gearbox; Removing gearbox .
- Engine oil drained ⇒ Maintenance ; Booklet 411

Note

Fit all cable ties in the original positions when installing.

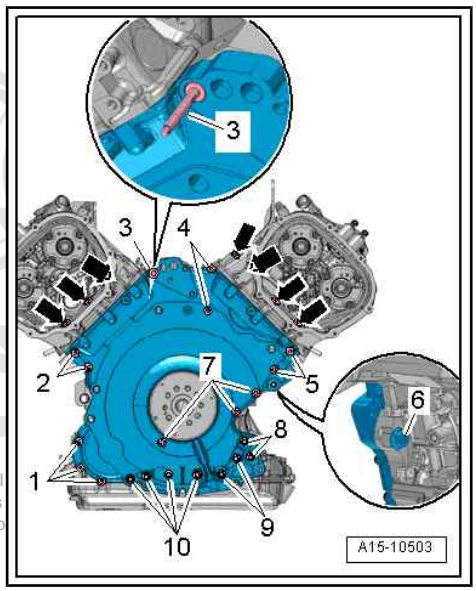
- Remove drive plate
  ⇒ “2.2 Removing and installing drive plate”, page 74 .
- Remove timing chain covers (left and right)
  ⇒ “1.2.1 Removing and installing timing chain covers (left and right)”, page 99 .
- Remove oil filter housing
  ⇒ “4.5 Removing and installing oil filter housing”, page 212 .
- Unplug electrical connector -3- at starter (push retainer to the rear and press down release catch).
- Remove nut -2- for electrical wiring and detach starter.



Note

Disregard items -1 and 4-.

- Remove bolts -arrows-.
- Slacken bolts -1 ... 10- in diagonal sequence and remove.
- Carefully release timing chain cover (bottom) from bonded joint and remove cover.
- Press crankshaft oil seal (gearbox end) out of timing chain cover (bottom).



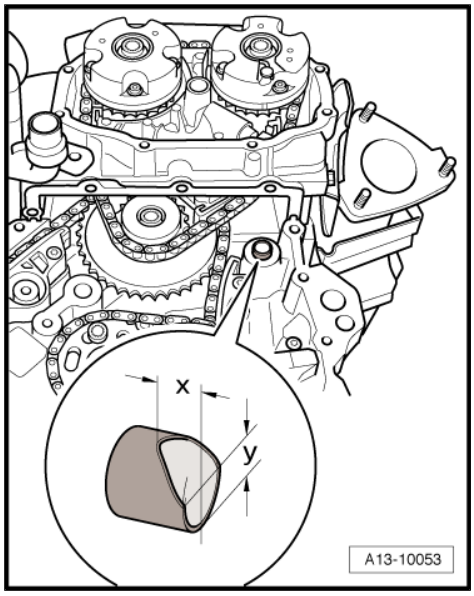
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Installing

Note

Renew the bolts tightened with specified tightening angle.

– Pull dowel sleeve at top right out of cylinder block.
– Bevel the dowel sleeve with a file, as illustrated.
• Dimension -x- = 6.5 mm.
• Dimension -y- = 8 mm.
– Fit dowel sleeve on cylinder block in such a way that the bevelled side points upwards.



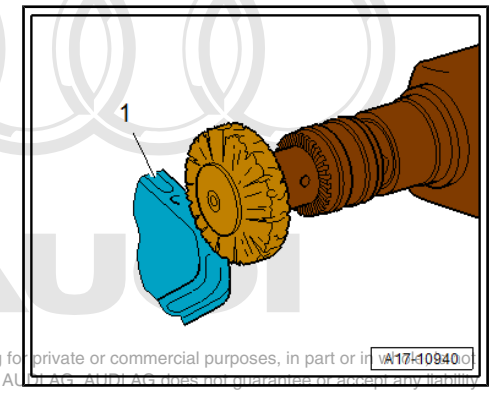
Note

Bevelling the dowel sleeve makes it easier to fit the timing chain cover (bottom) with the cylinder head installed.

Caution

Protect lubrication system against contamination.

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



WARNING

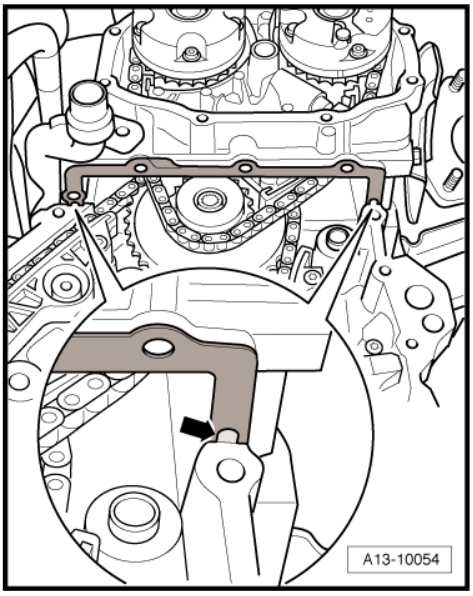
Risk of eye injury.

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

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– Remove remaining sealant on timing chain cover -1-, cylinder block and cylinder head using rotating plastic brush or similar.
– Clean surfaces; they must be free of oil and grease.
– Before installing gearbox, remove residue from threaded holes for engine/gearbox bolts in cylinder block using a thread tap.

– Clean old sealant from holes -arrow- in cylinder head gaskets.



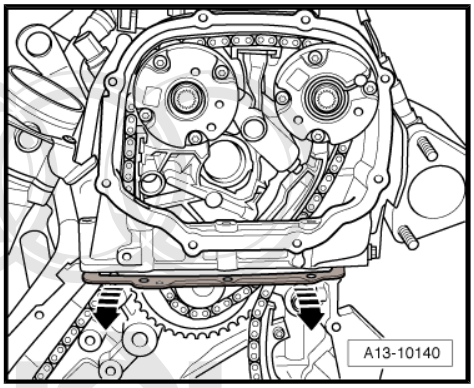
Note

With the cylinder head installed the holes in the cylinder head gasket are only half visible.

Caution

Avoid damage to cylinder head gasket.

- ***Only bend the ends of the cylinder head gaskets slightly and do not kink.***



Note

If the cylinder head gasket has been bent and kinked it must be renewed.

– Carefully bend the ends of the cylinder head gaskets down very slightly -arrows-, just far enough to be able to clean the upper sealing surface on the cylinder head gasket and cylinder head.

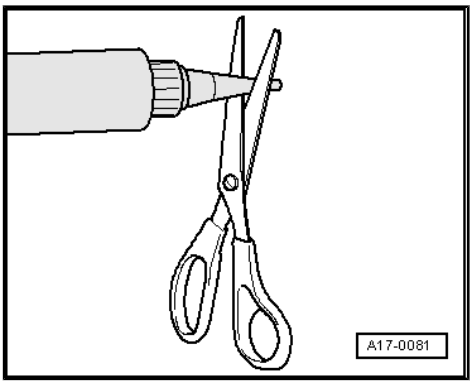
– Clean cylinder head gaskets (top and bottom); they must be free of oil and grease.

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Note

Note the use-by date of the sealant.

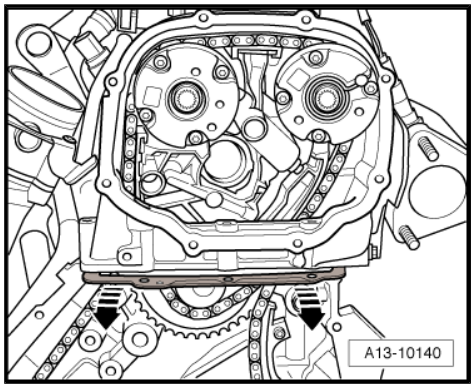
– Cut off nozzle of tube at front marking (nozzle ∅ approx. 2 mm).



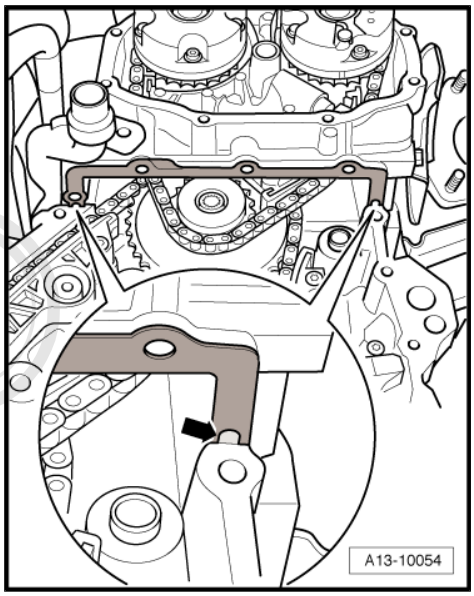
Note

The sealant must be applied at several points on the engine as described below.

– Apply a small amount of sealant to sealing surfaces of cylinder head gaskets (top and bottom). To do so, you again have to bend cylinder head gaskets down very slightly -arrows-.
– Use a flat object (e.g. a feeler gauge) to apply sealant to the area between cylinder head and gasket.



– Clean holes -arrow- in cylinder head gaskets and fill them with sealant.

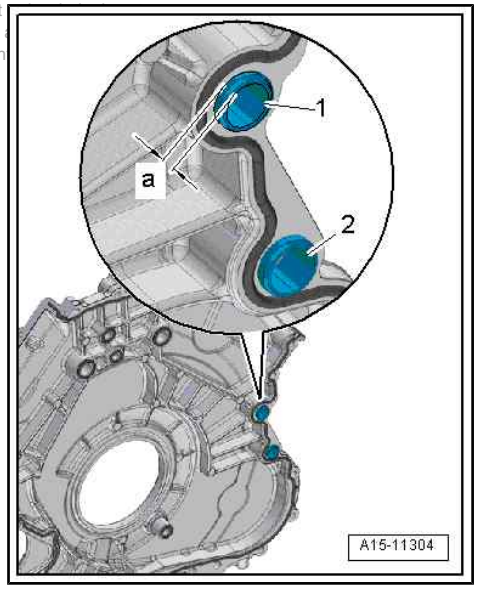


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Caution

Risk of sealant entering hole for gearbox bolt.

- *Appropriate sleeve -1- ⇒ Electronic parts catalogue must be fitted before installing timing chain cover (bottom).*
- *Projection of sleeve -a- = 3 mm above the sealing surface.*



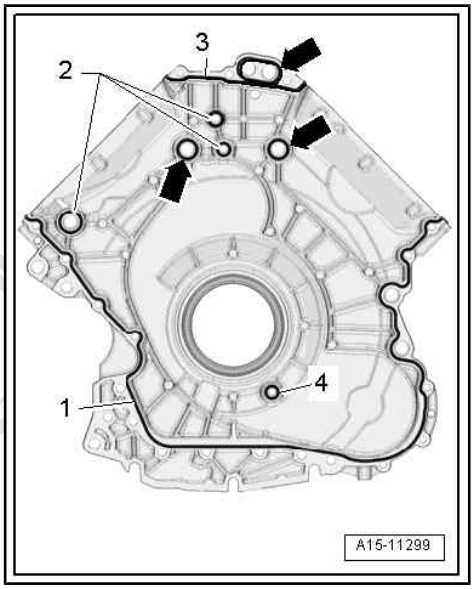
Note

Sleeves -1- and -2- have different diameters and are not interchangeable.

Caution

Make sure lubrication system is not clogged by excess sealant.

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



– Apply sealant beads -1 ... 4- onto the clean sealing surfaces of the timing chain cover (bottom) as illustrated.

- The groove on the sealing surface must be completely filled with sealant.
- The beads of sealant must project 1.5 … 2.0 mm above the sealing surface.
- Apply sealant -2- in a continuous bead as shown in illustration (although groove is not continuous).

Note

The timing chain cover must be installed within 5 minutes after applying sealant.

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– Insert seals -arrows- in grooves on timing chain cover (bottom).

– Fit timing chain cover (bottom), guiding it towards the sealing surface on cylinder block and cylinder head at an angle and from below.

– Take care not to damage the cylinder head gaskets when fitting the cover.

– Tighten bolts for timing chain cover (bottom)
⇒ Fig. ""Timing chain cover (bottom) - tightening torque and sequence"" , page 98 .

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

– Install crankshaft oil seal (gearbox end)
⇒ "2.5 Renewing crankshaft oil seal (gearbox end)", page 77 .

– Install oil filter housing
⇒ "4.5 Removing and installing oil filter housing", page 212 .

– Install timing chain covers (left and right)
⇒ "1.2.1 Removing and installing timing chain covers (left and right)", page 99 .

– Install drive plate
⇒ "2.2 Removing and installing drive plate", page 74 .

– Fill with engine oil and check oil level ⇒ Maintenance ; Booklet 411 .

Tightening torques

- ⇒ Fig. ""Timing chain cover (bottom) - tightening torque and sequence"" , page 98
- ⇒ Electrical system; Rep. gr. 27 ; Starter; Exploded view - starter

2 Chain drive

⇒ “2.1 Exploded view - camshaft timing chains”, page 108

⇒ “2.2 Exploded view - drive chain for valve gear”, page 111

⇒ “2.3 Exploded view - drive chain for balance shaft and oil pump”, page 113

⇒ “2.4 Removing camshaft timing chain from camshafts”, page 114

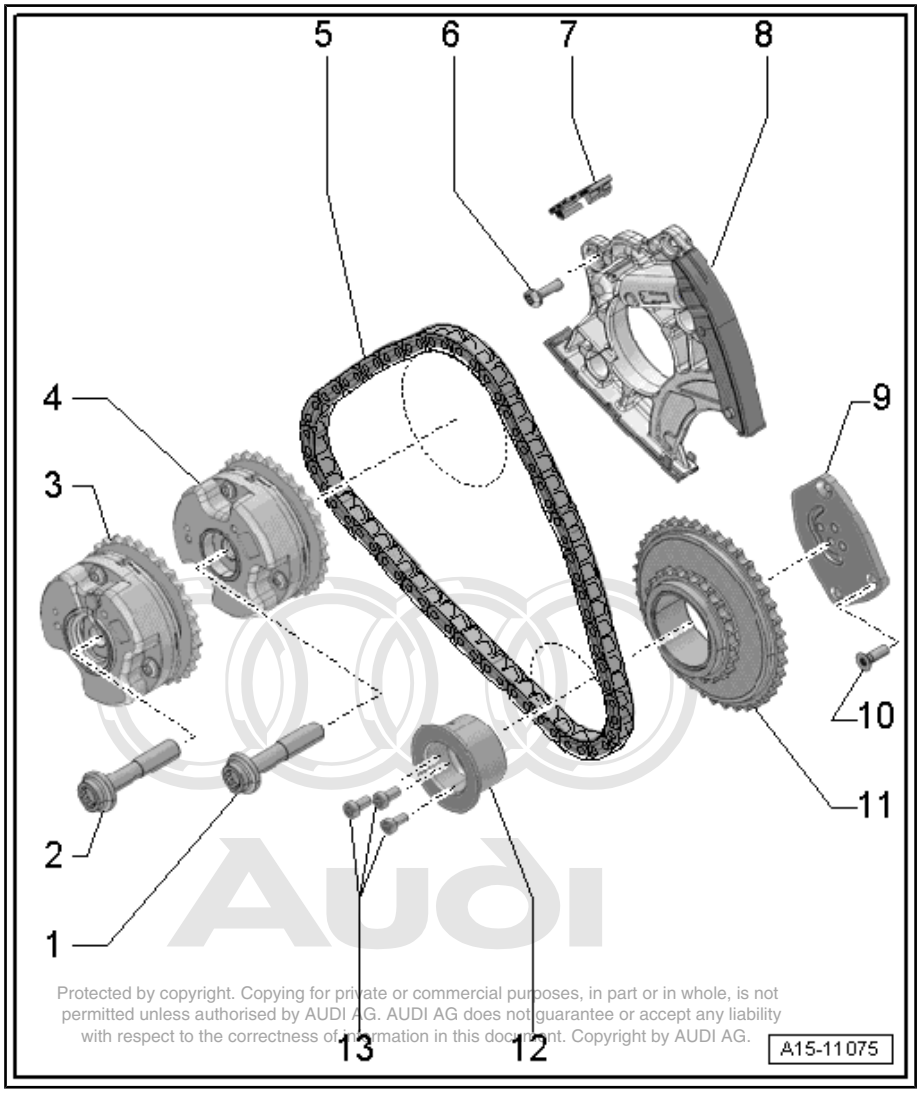
⇒ “2.5 Removing and installing camshaft timing chain”, page 124

⇒ “2.6 Removing and installing drive chain for valve gear”, page 125

⇒ “2.7 Removing and installing drive chain for balance shaft and oil pump”, page 127

2.1 Exploded view - camshaft timing chains

Camshaft timing chain (left-side)



1 - Bolt
- ❑ Renew
- ❑ 80 Nm +90°

2 - Bolt
- ❑ Renew
- ❑ 80 Nm +90°

3 - Camshaft adjuster
- ❑ For exhaust camshaft
- ❑ Identification: “EX”
- ❑ Removing and installing ⇒ “2.4 Removing camshaft timing chain from camshafts”, page 114

4 - Camshaft adjuster
- ❑ For inlet camshaft
- ❑ Identification: “IN”
- ❑ Removing and installing ⇒ “2.4 Removing camshaft timing chain from camshafts”, page 114

5 - Camshaft timing chain (left-side)
- ❑ Mark direction of rotation for re-installation with a paint marker
- ❑ Removing from camshafts ⇒ “2.4 Removing camshaft timing chain from camshafts”, page 114
- ❑ Removing and installing ⇒ “2.4 Removing camshaft timing chain from camshafts”, page 114

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6 - Bolt
- ❑ 9 Nm

7 - Slide

8 - Chain tensioner
- ❑ For camshaft timing chain (left-side)
- ❑ Removing and installing ⇒ “2.4 Removing camshaft timing chain from camshafts”, page 114

9 - Bearing plate
- ❑ For drive chain sprocket

10 - Bolt
- ❑ Tightening torque ⇒ Item 7 (page 111)

11 - Drive chain sprocket
- ❑ For camshaft timing chain (left-side)

12 - Bearing mounting
- ❑ For drive chain sprocket for camshaft timing chain (left-side)

13 - Bolts
- ❑ Tightening torque ⇒ Item 4 (page 111)

Camshaft timing chain (right-side)

1 - Bolt
- ❑ Renew
- ❑ 80 Nm +90°

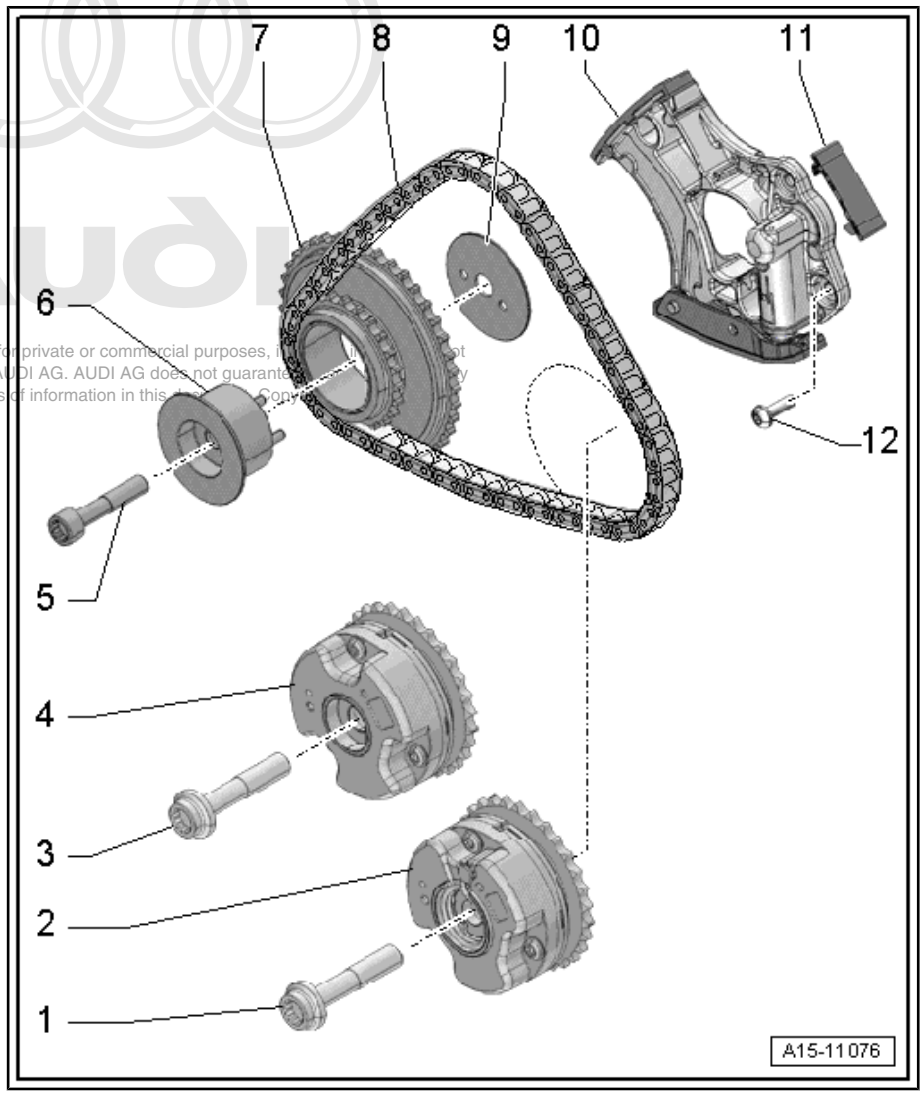
2 - Camshaft adjuster
- ❑ For exhaust camshaft
- ❑ Identification: “EX”
- ❑ Removing and installing ⇒ “2.4 Removing camshaft timing chain from camshafts”, page 114

3 - Bolt
- ❑ Renew
- ❑ 80 Nm +90°

4 - Camshaft adjuster
- ❑ For inlet camshaft
- ❑ Identification: “IN”
- ❑ Removing and installing ⇒ “2.4 Removing camshaft timing chain from camshafts”, page 114

5 - Bolt
- ❑ Tightening torque ⇒ Item 3 (page 111)

6 - Bearing mounting
- ❑ For drive chain sprocket for camshaft timing chain (right-side)
- ❑ Asymmetric version
- ❑ Installation position ⇒ Fig. ““Installation position: bearing mounting



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for drive sprocket for camshaft timing chain (right-side)"" , page 112

7 - Drive chain sprocket

- ❑ For camshaft timing chain (right-side)
- ❑ Installation position
  ⇒ Fig. ""Installation position: bearing mounting for drive sprocket for camshaft timing chain (right-side)"" , page 112

8 - Camshaft timing chain (right-side)

- ❑ Mark direction of rotation for re-installation with a paint marker
- ❑ Removing from camshafts ⇒ "2.4 Removing camshaft timing chain from camshafts", page 114
- ❑ Removing and installing ⇒ "2.5 Removing and installing camshaft timing chain", page 124

9 - Thrust washer

- ❑ For drive chain sprocket for camshaft timing chain (right-side)
- ❑ Asymmetric version
- ❑ Installation position
  ⇒ Fig. ""Installation position: bearing mounting for drive sprocket for camshaft timing chain (right-side)"" , page 112

10 - Chain tensioner

- ❑ For camshaft timing chain (right-side)
- ❑ Removing and installing ⇒ "2.4 Removing camshaft timing chain from camshafts", page 114

11 - Slide

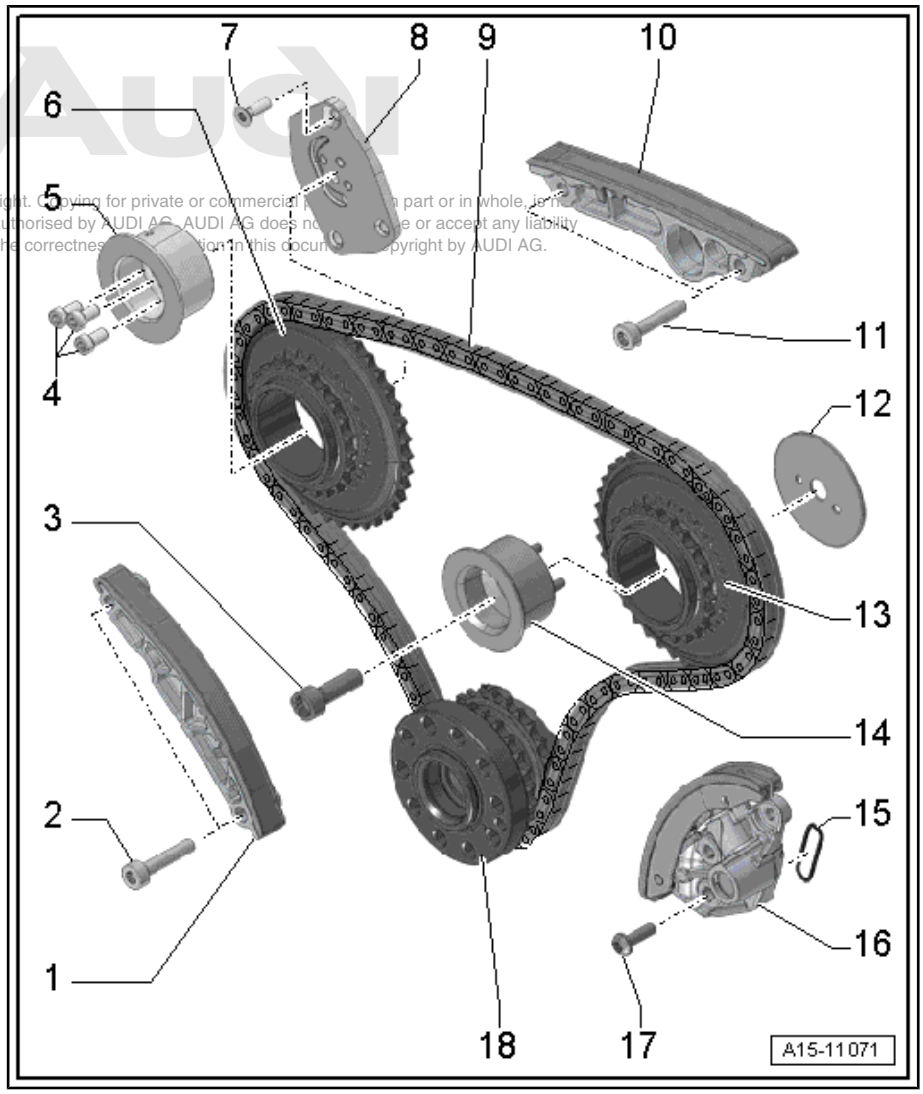
12 - Bolt

- ❑ 9 Nm

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2.2 Exploded view - drive chain for valve gear

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1 - Guide rail

2 - Bolt
- ❑ Renew
- ❑ 10 Nm +90°

3 - Bolt
- ❑ Renew
- ❑ 30 Nm +90°

4 - Bolts
- ❑ Renew
- ❑ 5 Nm +90°

5 - Bearing mounting
- ❑ For drive chain sprocket for camshaft timing chain (left-side)

6 - Drive chain sprocket
- ❑ For camshaft timing chain (left-side)

7 - Bolt
- ❑ Renew
- ❑ 8 Nm +45°

8 - Bearing plate
- ❑ For drive chain sprocket for camshaft timing chain (left-side)
- ❑ Asymmetric version

9 - Drive chain
- ❑ For timing drive
- ❑ Before removing, mark running direction with paint
- ❑ Removing and installing ⇒ “2.6 Removing and installing drive chain for valve gear”, page 125

10 - Guide rail

11 - Bolt
- ❑ Renew
- ❑ 10 Nm +90°

12 - Thrust washer
- ❑ Asymmetric version
- ❑ Installation position
⇒ Fig. ““Installation position: bearing mounting for drive sprocket for camshaft timing chain (right-side)”“ , page 112

13 - Drive chain sprocket
- ❑ For camshaft timing chain (right-side)

14 - Bearing mounting
- ❑ For drive chain sprocket for camshaft timing chain (right-side)
- ❑ Asymmetric version
- ❑ Installation position
⇒ Fig. ““Installation position: bearing mounting for drive sprocket for camshaft timing chain (right-side)”“ , page 112

15 - Seal

- ❑ Renew

16 - Chain tensioner

17 - Bolt

- ❑ 9 Nm

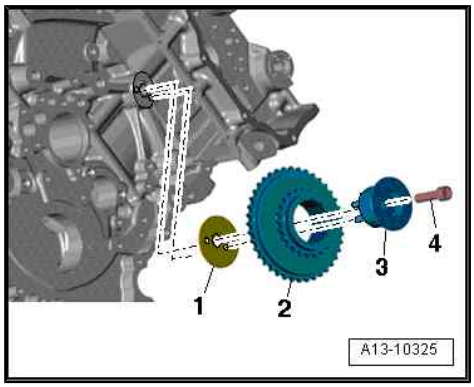
18 - Crankshaft

Installation position: bearing mounting for drive sprocket for camshaft timing chain (right-side)

- Dowel pins in bearing mounting -3- for drive sprocket for camshaft timing chain (right-side) must engage in drillings in thrust washer -1- and in cylinder block drillings.

2 - Drive sprocket for camshaft timing chain (right-side)

4 - Bolt



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2.3 Exploded view - drive chain for balance shaft and oil pump

1 - Crankshaft

2 - Drive chain

- ❑ For auxiliary drives
- ❑ Mark direction of rotation for re-installation with a paint marker
- ❑ Removing and installing ⇒ “2.7 Removing and installing drive chain for balance shaft and oil pump”, page 127

3 - Drive chain sprocket

- ❑ For oil pump
- ❑ Installation position: Side with lettering faces engine

4 - Bolt

- ❑ Renew
- ❑ 30 Nm +90°

5 - Compression spring

6 - Bolt

- ❑ Renew
- ❑ 15 Nm +90°

7 - Chain sprocket for balance shaft

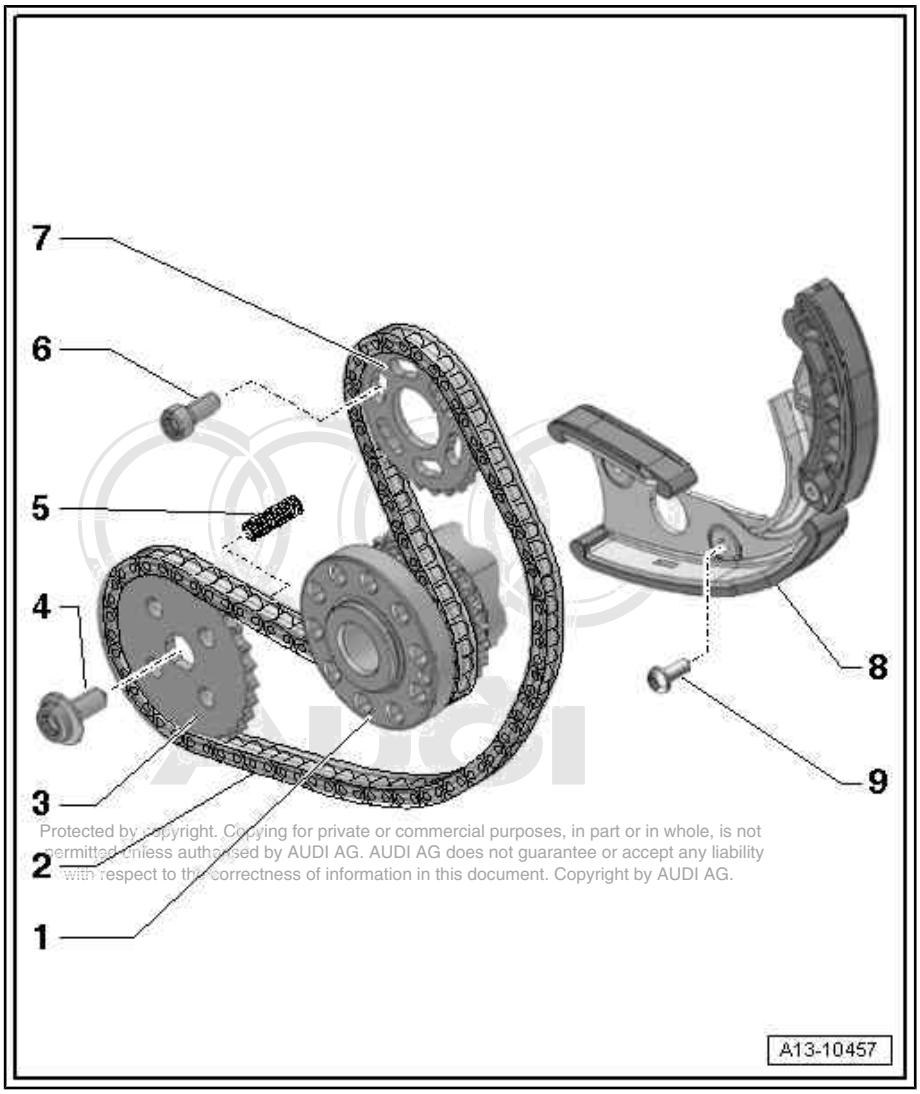
- ❑ Installation position: Side with lettering faces gearbox

8 - Chain tensioner

- ❑ With guide rail

9 - Bolt

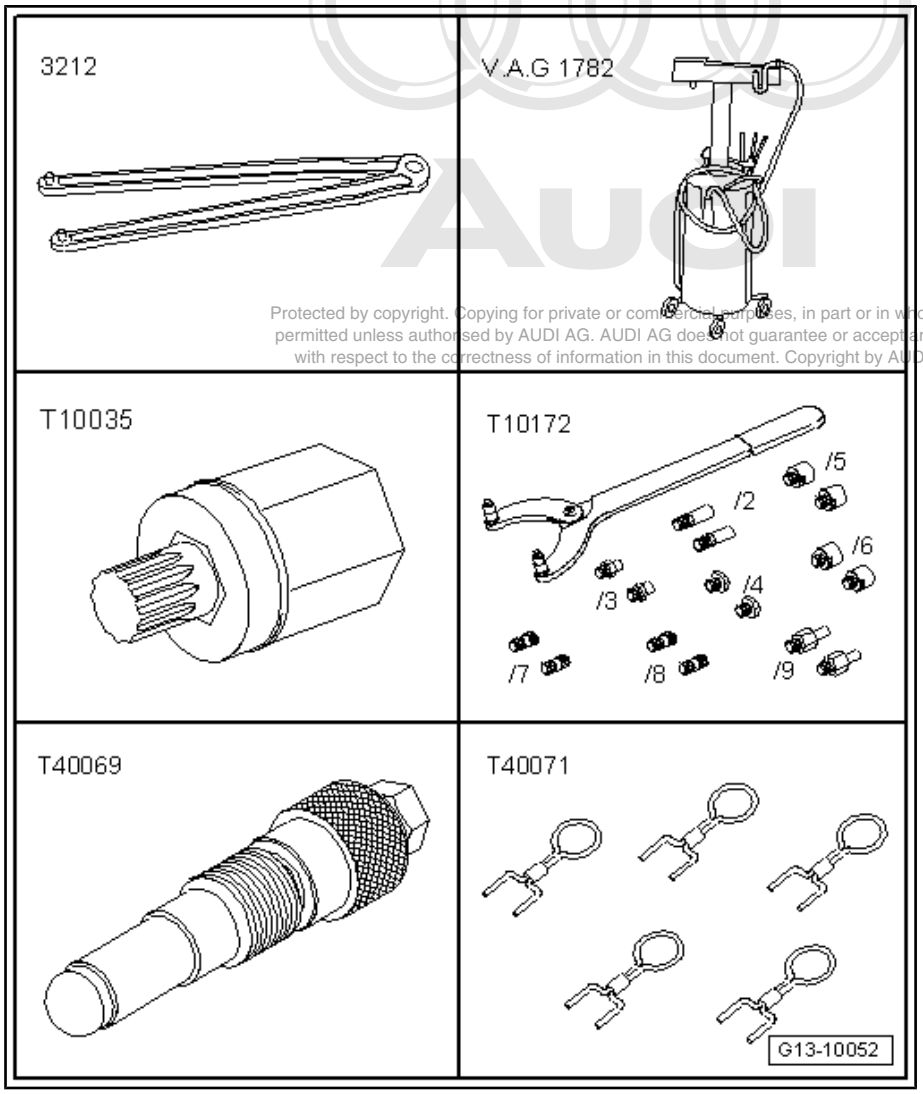
- ❑ Renew
- ❑ 10 Nm +45°



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2.4 Removing camshaft timing chain from camshafts

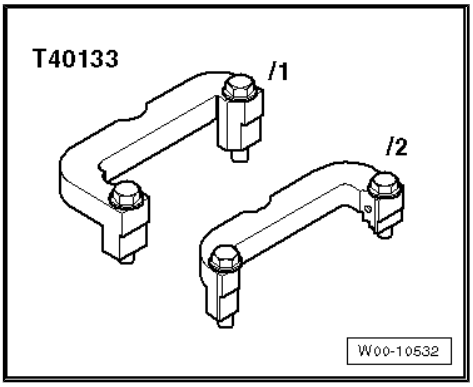
Special tools and workshop equipment required



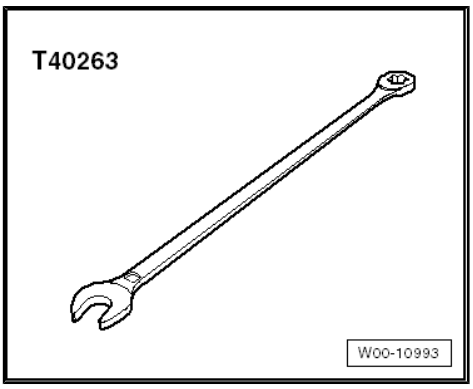
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- Pin wrench - 3212-
- Used oil collection and extraction unit - VAS 6622A- or -V.A.G 1782-
- Socket - T10035-
- Counterhold tool - T10172- with -T10172/2-
- Locking bolt - T40069-
- 2x Locking pin - T40071-

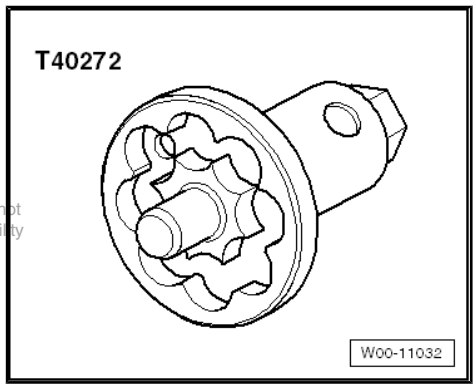
- 2x Camshaft clamp - T40133-



- Wrench, 21 mm - T40263-



- Turning-over tool - T40272-



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Removing

WARNING

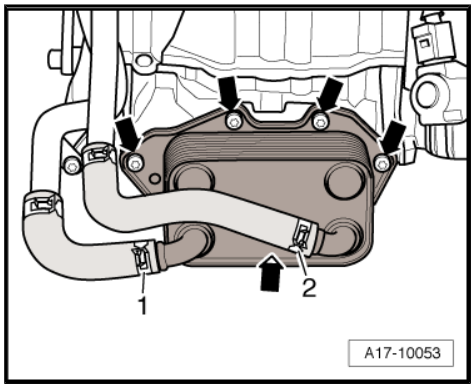
Risk of injury as the radiator fans may start up automatically.

- ***Even when the ignition is switched off, the radiator fans can start up without warning due to accumulated heat in the engine compartment, etc.***

Note

- *In the following procedure the camshaft timing chains remain on the engine.*
- *Even when working on one cylinder head only, the procedure must still be carried out on both cylinder banks.*

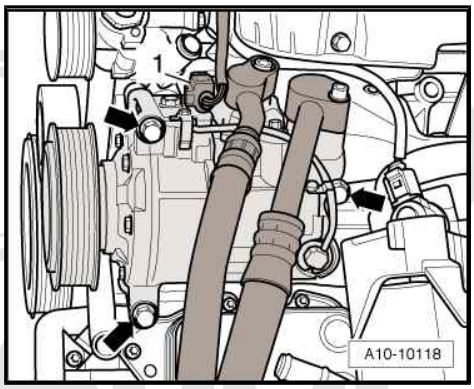
– Remove timing chain covers (left and right)
⇒ “1.2.1 Removing and installing timing chain covers (left and right)”, page 99 .
– Remove cylinder head cover (left and right)
⇒ “3.3 Removing and installing cylinder head cover”, page 161 .
– Remove noise insulation panels ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .
– Detach poly V-belt from tensioner
⇒ “1.2 Removing and installing poly V-belt”, page 66 .
– Place used oil collection and extraction unit - VAS 6622A- underneath.
– Remove bolts -arrows- and tie up engine oil cooler to one side with coolant hoses -1, 2- attached.



WARNING

Risk of injury caused by refrigerant.

- *The air conditioner refrigerant circuit must not be opened.*



– Remove bolts -arrows- for air conditioner compressor.

Caution

Danger of damage to refrigerant lines and hoses.

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

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– Detach air conditioner compressor from bracket and tie up on longitudinal member (left-side) with lines/wiring connected.

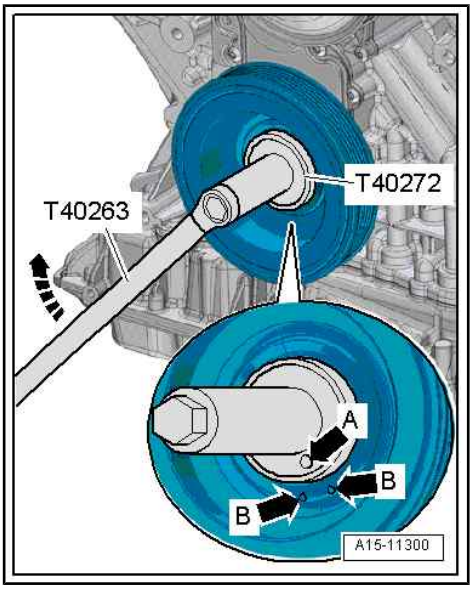
Note

Disregard -item 1-.

– Fit turning-over tool - T40272- onto wrench (21 mm) - T40263- .

– Position adapter on bolts of vibration damper.

• Hole -arrow A- on turning-over tool - T40272- must be positioned between markings -arrows B- on vibration damper.

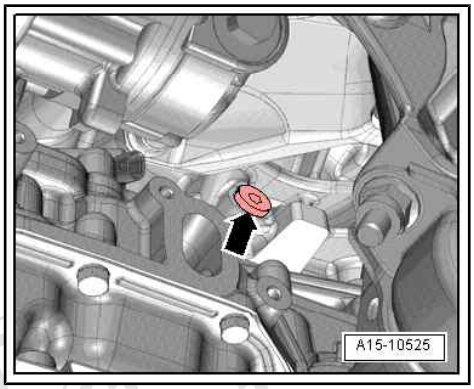


Note

If necessary, remove radiator fan control unit.

– Turn crankshaft to TDC in normal direction of engine rotation -arrow- using wrench (21 mm) - T40263- and turning-over tool - T40272- .

– Unscrew plug -arrow- for “TDC” marking from cylinder block.

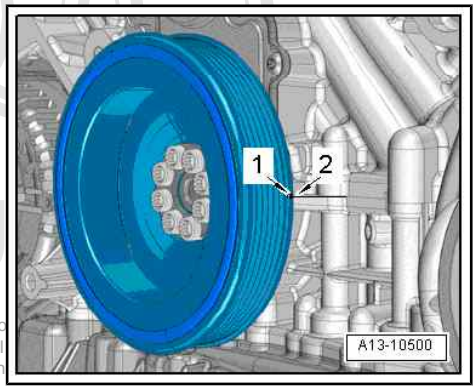


Note

♦ *The bore provided for locking the crankshaft is difficult to see when the engine is installed.*

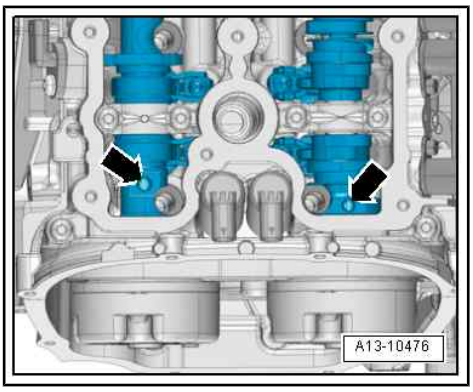
♦ *Therefore, turn the engine until the small notch -1- on the vibration damper is in line with the housing joint -2- between the cylinder block and the retaining frame on the left side (as seen in direction of travel). This makes it easier to screw in locking pin - T40069- .*

♦ *The marking on the vibration damper is only a visual aid. The exact “TDC” position can only be obtained by screwing in the locking pin - T40069- .*

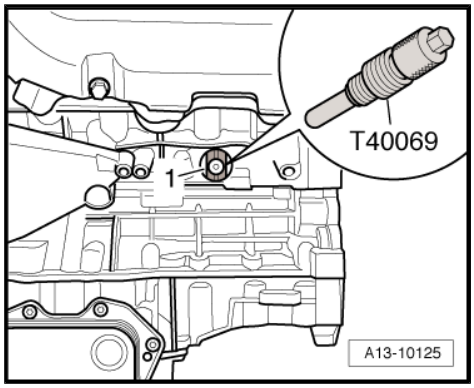


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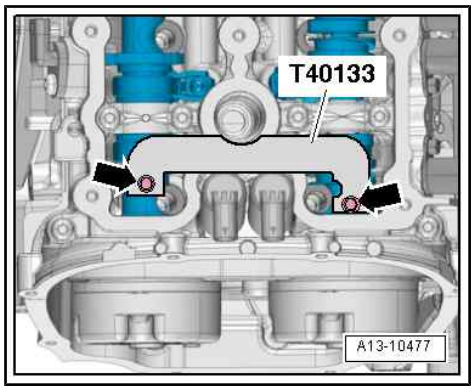
• The threaded holes -arrows- in the camshafts must face upwards.



– Screw locking pin - T40069- into bore (tightening torque: 20 Nm); if necessary, turn crankshaft backwards and forwards slightly to fully centralise locking pin.



– Fit camshaft clamps - T40133- onto both cylinder heads and tighten bolts -arrows- to 25 Nm.

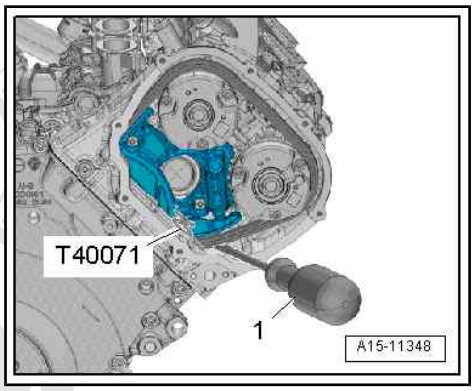


Note

The illustration shows the left-side cylinder head.

Cylinder bank 1 (right-side):

– Press guide rail of chain tensioner for camshaft timing chain (right-side) inwards as far as the stop using a screwdriver -1-. Then lock chain tensioner by inserting locking pin - T40071- .

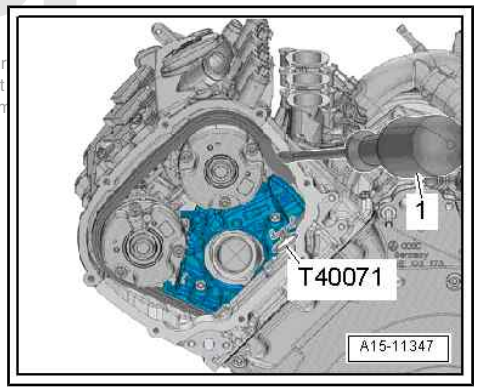


Note

The chain tensioner is oil-damped and can therefore only be compressed slowly by applying constant pressure.

Cylinder bank 2 (left-side):

– Press guide rail of chain tensioner for camshaft timing chain (left-side) inwards as far as the stop using a screwdriver -1-. Then lock chain tensioner by inserting locking pin - T40071- .



Note

The chain tensioner is oil-damped and can therefore only be compressed slowly by applying constant pressure.

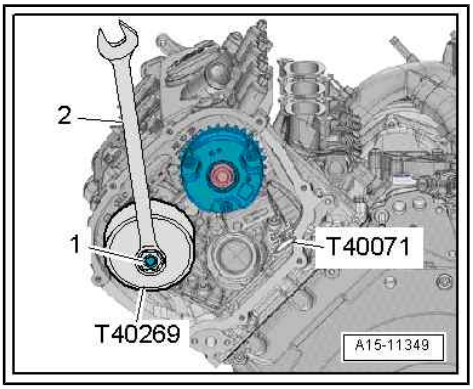
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Continued for both cylinder banks:

Caution

Risk of damage to camshafts.

- *Do NOT use camshaft clamp - T40133- to counterhold when loosening camshaft adjuster bolt.*



– Apply socket -T40269- to counterhold at corresponding camshaft adjuster and loosen bolt -1-.

– Mark position of camshaft adjusters with paint for re-installation.

Caution

Risk of irreparable damage to engine.

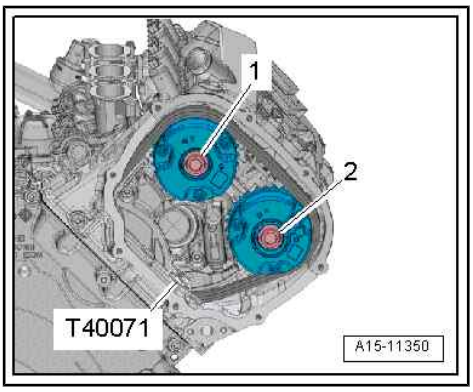
- *Block off the opening in the valve timing housing with a clean cloth to prevent small items from dropping into the engine.*

– Mark position of camshaft adjusters with paint for re-installation.

Cylinder bank 1 (right-side):

– Unscrew bolts -1 and 2- and detach both camshaft adjusters.

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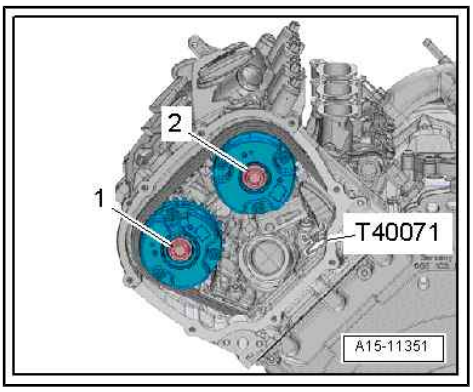
Cylinder bank 2 (left-side):

– Unscrew bolts -1 and 2- and detach both camshaft adjusters.

Installing

Note

- *Renew the bolts tightened with specified tightening angle.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

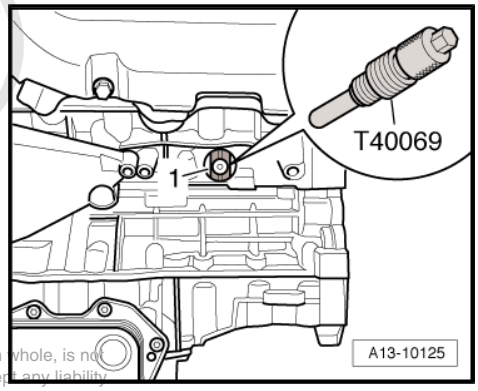


Caution

Risk of damage to valves and piston crowns.

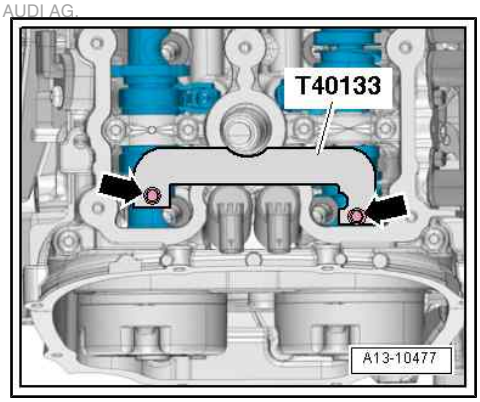
- *The crankshaft must not be at "TDC" at any cylinder when the camshafts are turned.*

- Drive chain for valve gear installed
  ⇒ “2.6 Removing and installing drive chain for valve gear”, page 125
- Crankshaft locked in “TDC” position with locking pin - T40069- .



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- Camshaft clamps - T40133- installed on both cylinder heads and tightened to 25 Nm -arrows-.



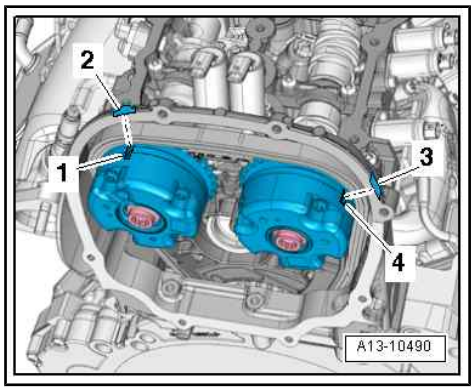
Note

The illustration shows the left-side cylinder head.

Caution

Risk of damage to engine.

- ***When performing the following steps, make sure to fit camshaft adjusters so that the grooves -1- and -4- are aligned with the adjustment areas (ground surfaces) -2- and -3-.***



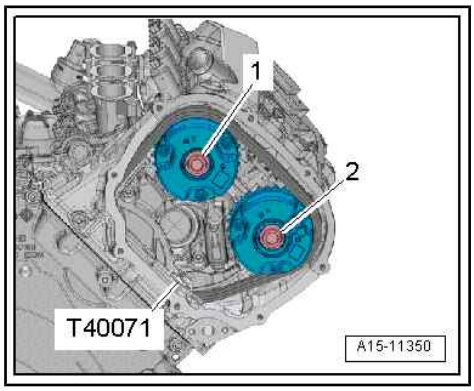
Cylinder bank 1 (right-side):

– Fit camshaft adjusters according to marks applied during removal.

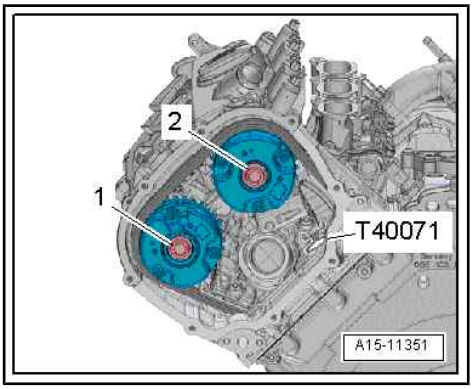
– Fit timing chain onto drive chain sprocket and camshaft adjusters and fit bolts -1 and 2- without tightening.

- It should just be possible to turn both camshaft adjusters on the camshaft without axial movement.

– Remove locking pin - T40071- .



Cylinder bank 2 (left-side):



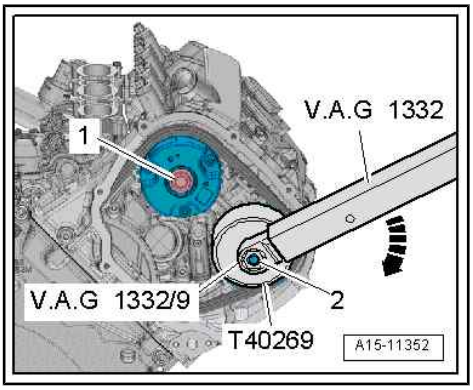
– Fit camshaft adjusters according to marks applied during removal.

– Fit timing chain onto drive chain sprocket and camshaft adjusters and fit bolts -1 and 2- without tightening.

• It should just be possible to turn both camshaft adjusters on the camshaft without axial movement.

– Remove locking pin - T40071- .

Cylinder bank 1 (right-side):



– Fit socket -T40269- onto camshaft adjuster of exhaust camshaft.

– Apply torque wrench - V.A.G 1332- with open ring spanner insert - V.A.G 1332/9- to socket -T40269- .

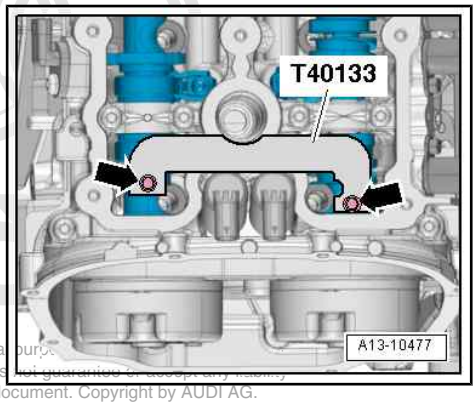
– Have a second mechanic apply a torque of 40 Nm to camshaft adjuster in direction of -arrow-.

– Tighten bolts as follows while keeping camshaft adjuster under tension:

Stage	Bolt	Tightening torque
1.	-1-	At camshaft: 60 Nm
1.	-2-	At camshaft: 60 Nm

– Remove socket -T40269- .

– Remove camshaft clamp - T40133- -arrows-.

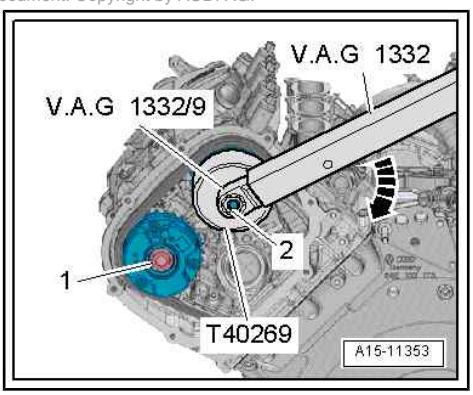


Note

The illustration shows the cylinder head on the left side.

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Cylinder bank 2 (left-side):



– Fit socket -T40269- onto camshaft adjuster of inlet camshaft.

– Apply torque wrench - V.A.G 1332- with open ring spanner insert - V.A.G 1332/9- to socket -T40269- .

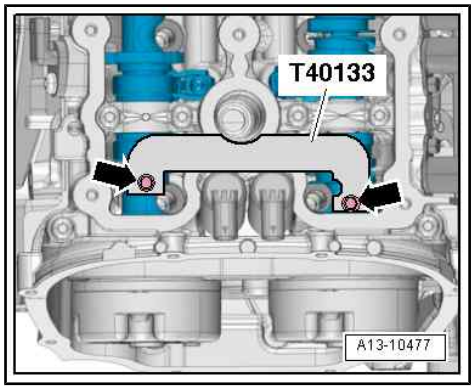
– Have a second mechanic apply a torque of 40 Nm to camshaft adjuster in direction of -arrow-.

– Tighten bolts as follows while keeping camshaft adjuster under tension:

Stage	Bolt	Tightening torque
1.	-1-	At camshaft: 60 Nm
1.	-2-	At camshaft: 60 Nm

– Remove socket -T40269- .

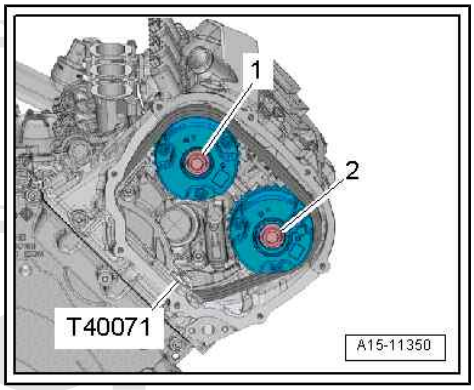
– Remove camshaft clamp - T40133- -arrows-.



Cylinder bank 1 (right-side):

– Tighten camshaft adjuster bolts on cylinder head (right-side) as follows:

Stage	Bolt	Tightening torque
2.	-1-	Tighten on camshaft to final tightening torque ⇒ Item 3 (page 109)
2.	-2-	Tighten on camshaft to final tightening torque ⇒ Item 1 (page 109)

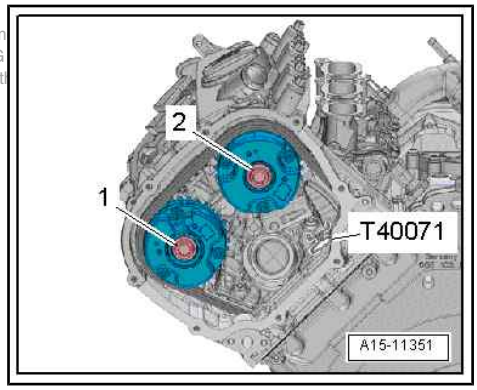


Cylinder bank 2 (left-side):

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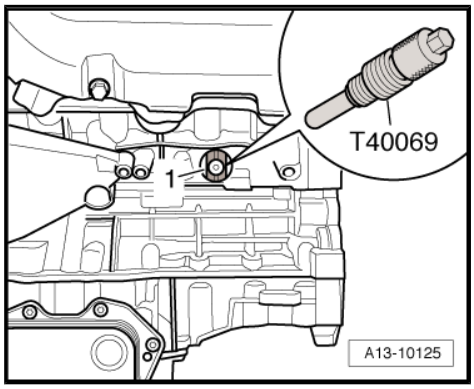
– Tighten camshaft adjuster bolts on cylinder head (left-side) as follows:

Stage	Bolt	Tightening torque
2.	-1-	Tighten on camshaft to final tightening torque ⇒ Item 2 (page 108)
2.	-2-	Tighten on camshaft to final tightening torque ⇒ Item 1 (page 108)

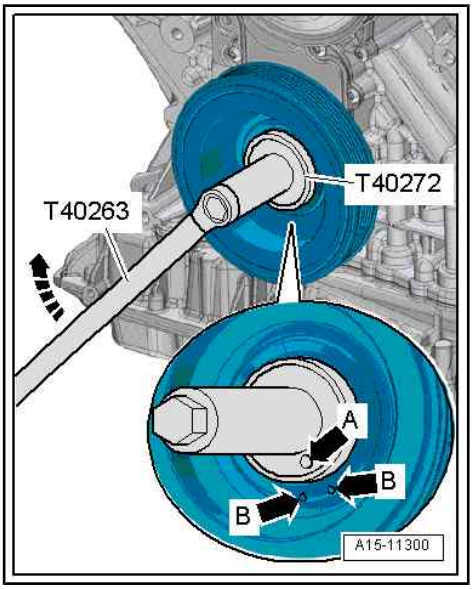


Continued for both cylinder banks:

– Remove locking pin - T40069- .



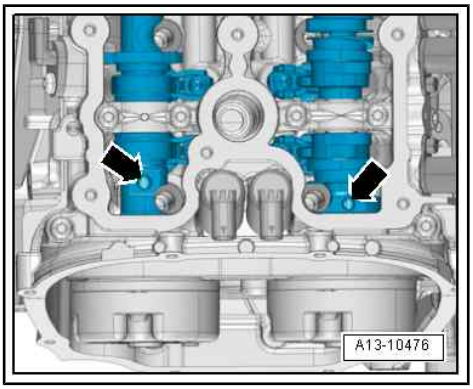
– Turn crankshaft two rotations back to TDC in normal direction of engine rotation -arrow- using wrench (21 mm) - T40263- and turning-over tool - T40272- .



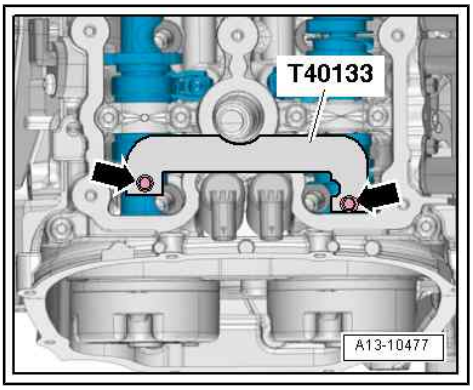
Note

If you turn the crankshaft beyond “TDC” by mistake, turn it back approx. 30° and set to “TDC” again.

• The threaded holes -arrows- in the camshafts must face upwards.



– Fit camshaft clamps - T40133- onto both cylinder heads and tighten bolts -arrows- to 25 Nm.



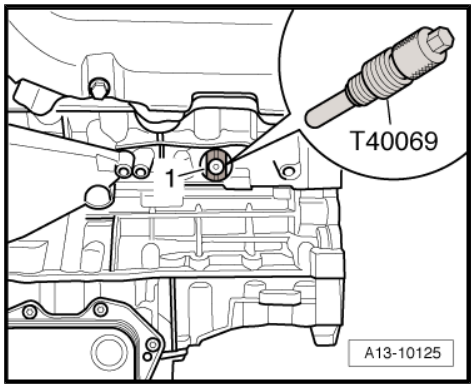
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– Screw the locking pin - T40069- directly into the hole.

• The locking pin - T40069- must engage in the locating hole in crankshaft -1-. If it does not, reset valve timing.

– Remove camshaft clamps from both cylinder heads.

– Remove locking pin - T40069- .



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

– Install engine oil cooler
⇒ “2.1 Removing and installing engine oil cooler”, page 203 .

– Install poly V-belt
⇒ “1.2 Removing and installing poly V-belt”, page 66 .

– Install cylinder head covers
⇒ “3.3 Removing and installing cylinder head cover”, page 161 .

– Install timing chain covers (left and right)
⇒ “1.2.1 Removing and installing timing chain covers (left and right)”, page 99 .

Tightening torques

♦ ⇒ “2.1 Exploded view - camshaft timing chains”, page 108

♦ ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Exploded view - air conditioner compressor drive unit

♦ ⇒ Fig. ““Plug for TDC marking - tightening torque””, page 83

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

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2.5 Removing and installing camshaft timing chain

Removing

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

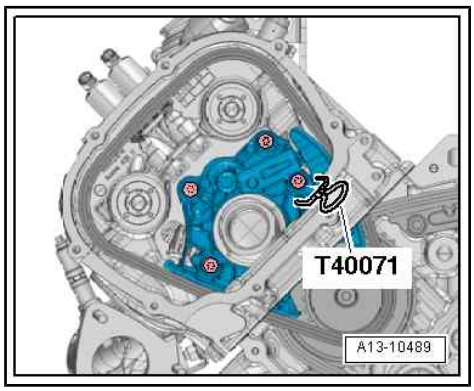
– Remove timing chain cover (bottom)
⇒ “1.2.2 Removing and installing timing chain cover (bottom)”, page 102 .

– Remove timing chains from camshafts
⇒ “2.4 Removing camshaft timing chain from camshafts”, page 114 .

Caution

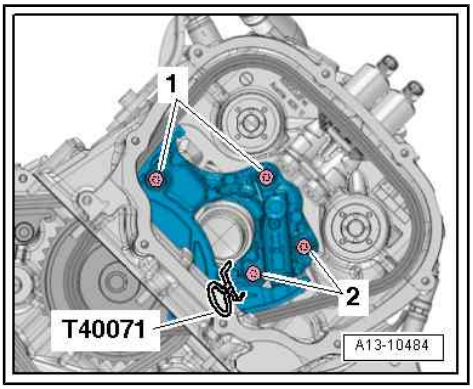
If a used timing chain rotates in the opposite direction when it is refitted, this can cause breakage.

♦ *Mark running direction of timing chains (left and right) with paint for re-installation. Do not attempt to mark the timing chain with a centre punch or by making a notch or similar.*



– Remove locking pin - T40071- and detach camshaft timing chain (left-side).

– Remove bolts -1- and -2- and take off chain tensioner (right-side).



Installing

Note

- *Note the correct installation position if the tensioning element has been removed from the chain tensioner: drilling in base of housing faces chain tensioner and piston faces tensioner rail.*
- *Renew the bolts tightened with specified tightening angle.*

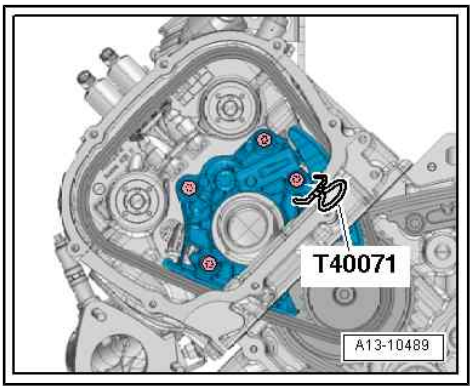
Caution

Risk of damage to valves and piston crowns.

- ***The crankshaft must not be at "TDC" at any cylinder when the camshafts are turned.***

– Position timing chain (left-side) as shown in the illustration (according to marks applied during removal).

– Press down guide rail of chain tensioner for timing chain (left-side) and lock chain tensioner by inserting locking pin -T40071- .



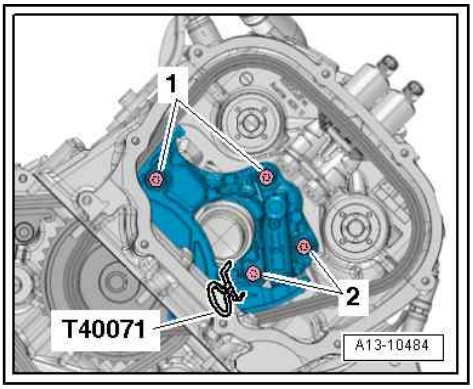
Note

Disregard -arrow-.

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– Fit chain tensioner on cylinder head (right-side) and position timing chain.

– Tighten bolts -1- and -2-.



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

– Fit timing chains on camshafts
⇒ "2.4 Removing camshaft timing chain from camshafts", page 114 .

– Install timing chain cover (bottom)
⇒ "1.2.2 Removing and installing timing chain cover (bottom)", page 102 .

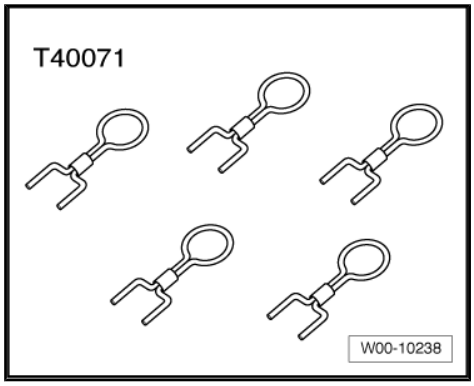
Tightening torques

- ⇒ "2.1 Exploded view - camshaft timing chains", page 108

2.6 Removing and installing drive chain for valve gear

Special tools and workshop equipment required

♦ Locking pin - T40071-



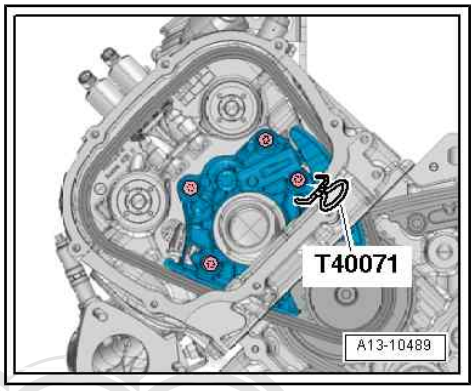
Removing

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

– Remove timing chains
⇒ “2.5 Removing and installing camshaft timing chain”, page 124 .

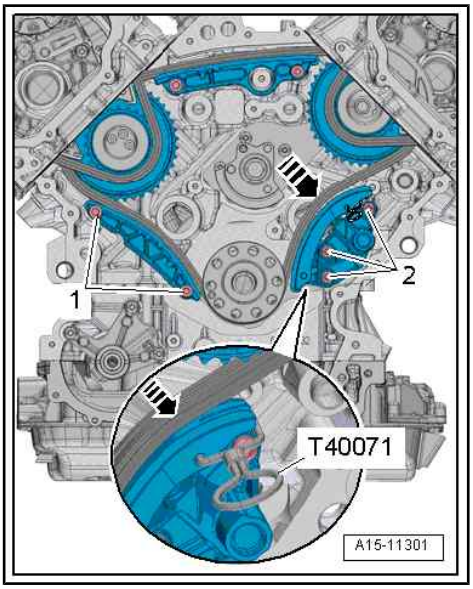
– Remove drive chain for auxiliary drives
⇒ “2.7 Removing and installing drive chain for balance shaft and oil pump”, page 127 .

– Remove chain tensioner for camshaft timing chain (left-side).



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– Press guide rail of chain tensioner for drive chain in direction of -arrow- and lock chain tensioner by inserting locking pin - T40071- .



Caution

If a used drive chain rotates in the opposite direction when it is refitted, this can cause breakage.

- ***Mark running direction of drive chain with paint for re-installation. Do not attempt to mark the drive chain with a centre punch or by making a notch or similar.***

– Unscrew bolts -1- and remove guide rail.

– Remove bolts -2- and take off chain tensioner.

– Detach drive chain for valve gear.

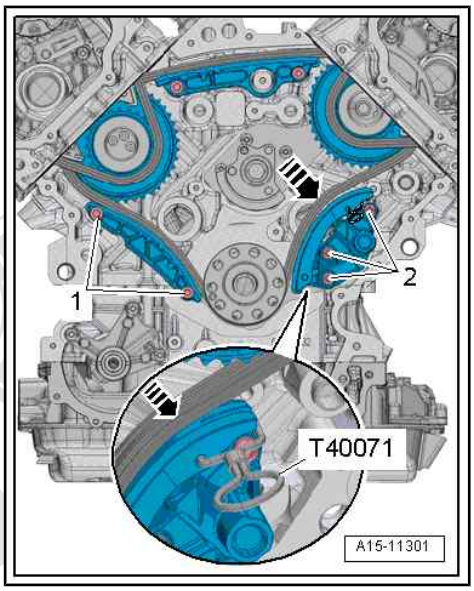
Installing

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

Note

Renew the bolts tightened with specified tightening angle.

– Position drive chain for valve gear onto drive chain sprockets (according to marks applied during removal).



– Install guide rail and tighten bolts -1-.

– Install chain tensioner and tighten bolts -2-.

– Press guide rail of chain tensioner for drive chain in direction of -arrow- and remove locking pin - T40071- .

– Install drive chain for auxiliary drives
⇒ “2.7 Removing and installing drive chain for balance shaft and oil pump”, page 127 .

– Install camshaft timing chains
⇒ “2.5 Removing and installing camshaft timing chain”, page 124 .

– Install timing chain cover (bottom)
⇒ “1.2.2 Removing and installing timing chain cover (bottom)”, page 102 .

Tightening torques

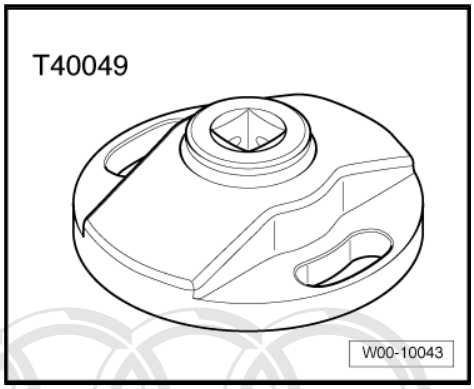
- ⇒ “2.2 Exploded view - drive chain for valve gear”, page 111

2.7 Removing and installing drive chain for balance shaft and oil pump

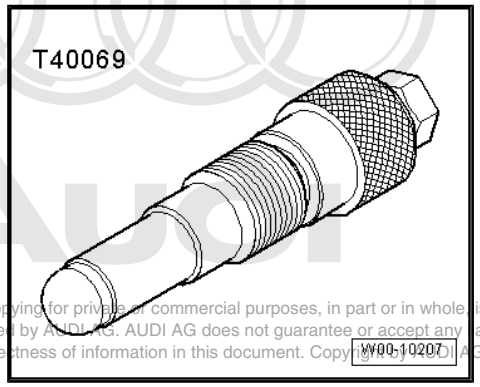
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Special tools and workshop equipment required

- Key - T40049-

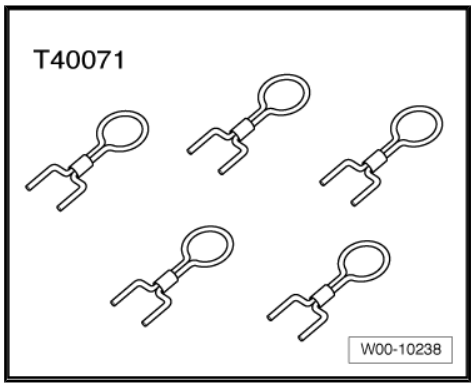


- Locking pin - T40069-

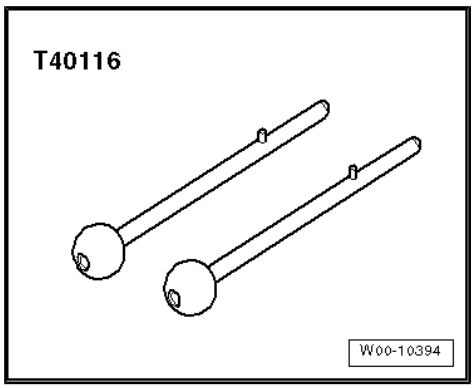


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- Locking pin - T40071-



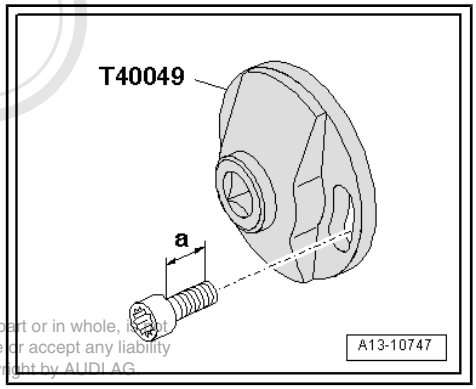
- Locating pins - T40116-



Removing

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

– Remove timing chain cover (bottom) ⇒ “1.2.2 Removing and installing timing chain cover (bottom)”, page 102 .



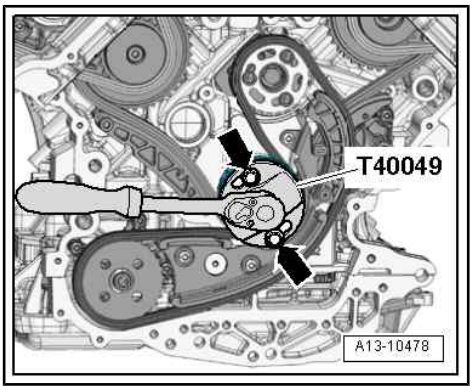
Caution

Risk of damage to drive chain if thread of bolt exceeds specified length.

- *Use bolts with a maximum thread length -a- of 22 mm to attach key -T40049- .*
- *If no suitable bolts are available, position suitable washer (s) under bolt head so that remaining thread length does not exceed 22 mm.*

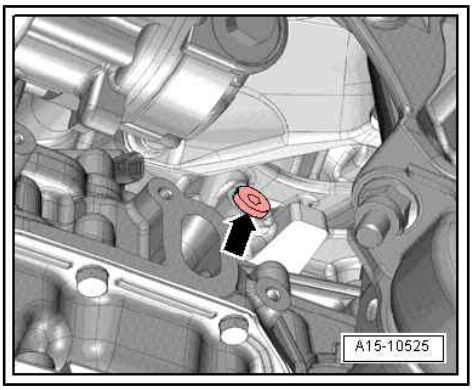
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– Attach key - T40049- at rear end of crankshaft using 2 bolts -arrows-.



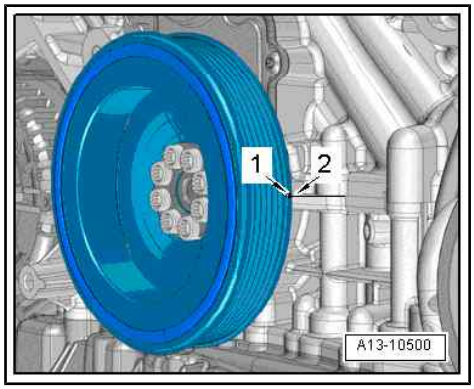
– Remove plug -arrow- for crankshaft “TDC” marking from cylinder block.

– Rotate crankshaft in normal direction of rotation to “TDC”.

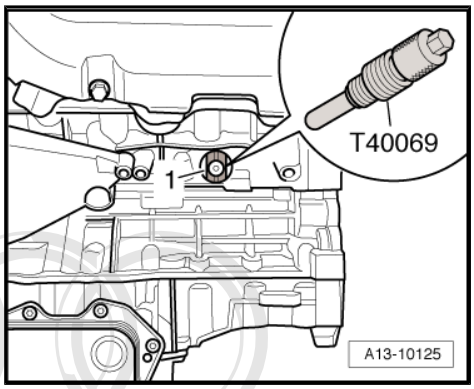


Note

- *The bore provided for locking the crankshaft is difficult to see when the engine is installed.*
- *Therefore, turn the engine until the small notch -1- on the vibration damper is in line with the housing joint -2- between the cylinder block and the retaining frame on the left side (as seen in direction of travel). This makes it easier to screw in locking pin - T40069- .*
- *The marking on the vibration damper is only a visual aid. The exact "TDC" position can only be obtained by screwing in the locking pin - T40069- .*



– Screw locking pin - T40069- into hole (20 Nm); if necessary, turn crankshaft -1- backwards and forwards slightly to fully centralise locking pin.

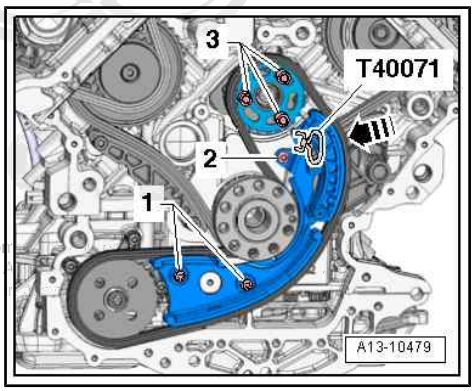


– Press guide rail of chain tensioner in direction of -arrow- and lock chain tensioner by inserting locking pin - T40071- .

Caution

If a used drive chain rotates in the opposite direction when it is refitted, this can cause breakage.

- ***Mark running direction of drive chain with paint for re-installation. Do not attempt to mark the drive chain with a centre punch or by making a notch or similar.***

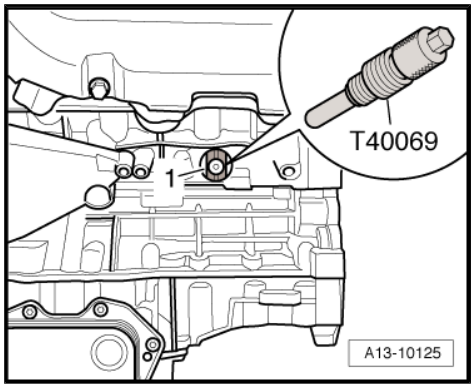


– Unscrew bolts -3- and detach chain sprocket from balance shaft.

– Remove bolts -1- and -2- and take off chain tensioner with chain.

Installing

• Crankshaft -1- locked in "TDC" position with locking pin - T40069- .



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– Install chain tensioner with chain and balance shaft sprocket.

– Lock balance shaft in “TDC” position using locating pin - T40116- .

• The elongated holes in the balance shaft sprocket must be aligned centrally over the threaded holes in the balance shaft. If necessary move chain one tooth further.

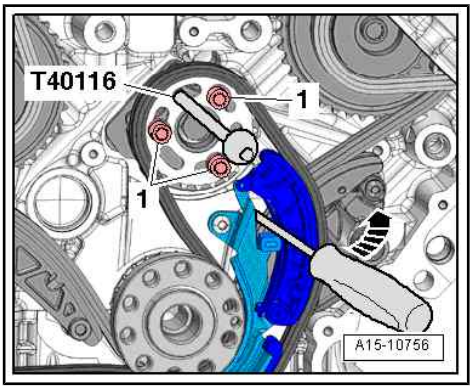
– Tighten bolts for chain tensioner.

– Fit bolts -1- for chain sprocket without tightening.

• It should just be possible to turn the sprocket on the balance shaft without axial movement.

– Pull out locking pin - T40071- to release chain tensioner.

– Press against guide rail of chain tensioner -arrow- using a screwdriver, and at the same time tighten bolts -1- securing chain sprocket.



– Pull locating pin -T40116- out of balance shaft.

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

– Install timing chain cover (bottom) ⇒ “1.2.2 Removing and installing timing chain cover (bottom)”, page 102 .

Tightening torques

◆ ⇒ “2.3 Exploded view - drive chain for balance shaft and oil pump”, page 113

◆ ⇒ Fig. ““Plug for TDC marking - tightening torque”“ , page 83

3 Cylinder head

⇒ “3.1 Exploded view - cylinder head”, page 132

⇒ “3.2 Removing and installing cylinder head”, page 136

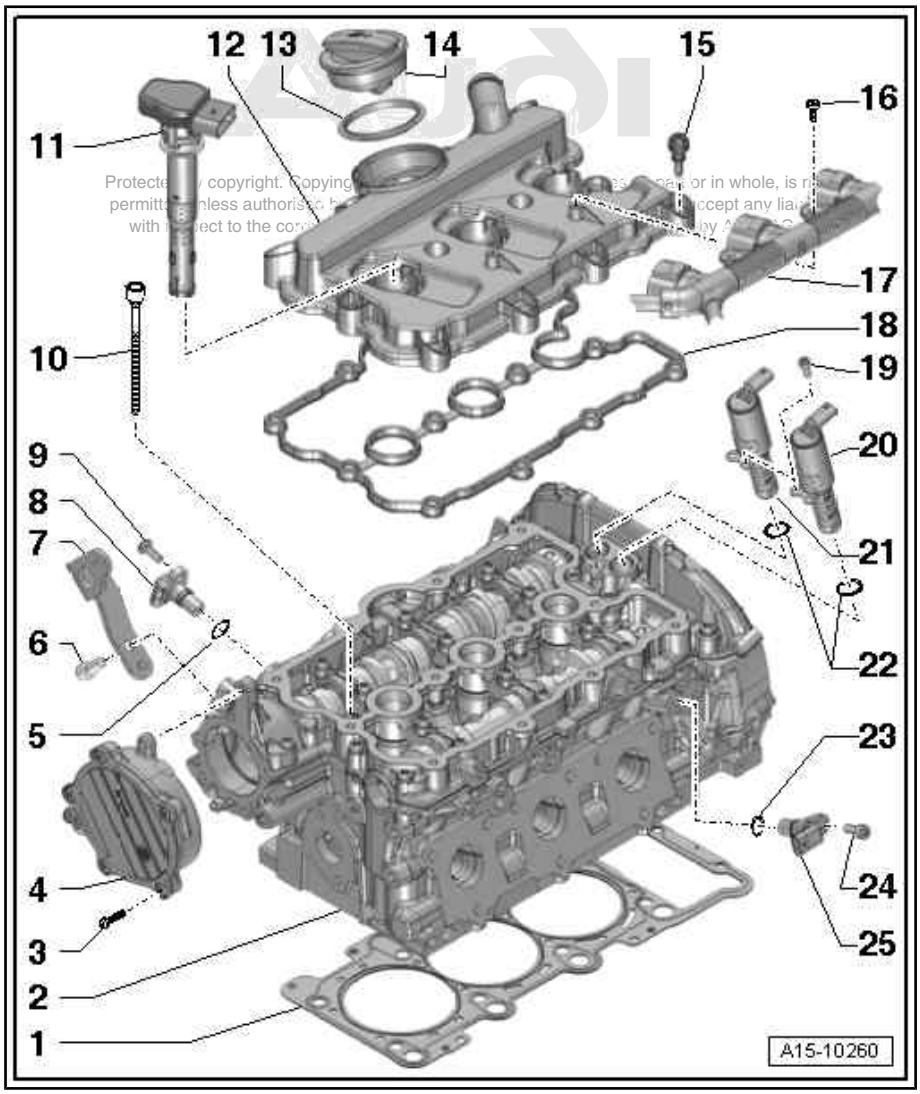
⇒ “3.3 Removing and installing cylinder head cover”, page 161

⇒ “3.4 Checking compression”, page 162

3.1 Exploded view - cylinder head

Note

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



1 - Cylinder head gasket

- ❑ Renewing ⇒ “3.2 Removing and installing cylinder head”, page 136
- ❑ Installation position: part number must face cylinder head
- ❑ If renewed, change coolant and engine oil

2 - Cylinder head

- ❑ Removing and installing ⇒ page 136
- ❑ ⇒ Fig. ““Camshafts with recesses for bolts”“ , page 135
- ❑ ⇒ Fig. ““Checking cylinder head for distortion”“ , page 134
- ❑ ⇒ Fig. ““Cylinder head machining limit”“ , page 135
- ❑ If renewed, change coolant and engine oil

3 - Bolt

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

4 - Vacuum pump

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

5 - O-ring

- ❑ Renew

6 - Bolt

- ❑ 20 Nm

7 - Engine lifting eye

8 - Hall sender for inlet camshaft

- ❑ Cylinder bank 1 (right-side): Hall sender - G40-
- ❑ Cylinder bank 2 (left-side): Hall sender 2 - G163-
- ❑ Removing and installing ⇒ “1.5 Removing and installing Hall senders”, page 380

9 - Bolt

- ❑ 9 Nm

10 - Bolt

- ❑ Renew
- ❑ Procedure for camshafts with assembly clearance feature
  ⇒ Fig. ““Camshafts with recesses for bolts”“ , page 135 :

- ♦ Loosening ⇒ page 141
- ♦ Tightening ⇒ page 149
- ♦ Tighten in three stages:

  40 Nm
  Turn 90° further
  Turn 90° further

- ❑ Procedure for camshafts without assembly clearance feature
  ⇒ Fig. ““Camshafts with recesses for bolts”“ , page 135 :

- ♦ Loosening ⇒ page 159
- ♦ Tightening
  ⇒ Fig. ““Cylinder head with camshafts without assembly clearance feature - tightening torque and sequence”“ , page 135

11 - Ignition coil

- ❑ Removing and installing ⇒ “1.3 Removing and installing ignition coils with output stages”, page 374

12 - Cylinder head cover

- ❑ Removing and installing ⇒ “3.3 Removing and installing cylinder head cover”, page 161

13 - Gasket

- ❑ Renew if damaged or leaking

14 - Filler cap

15 - Bolt

- ❑ Renew if gasket is damaged
- ❑ Tightening torque:

- ♦ ⇒ Fig. ““Cylinder head cover (left-side) - tightening torque and sequence”“ , page 134
- ♦ ⇒ Fig. ““Cylinder head cover (right-side) - tightening torque and sequence”“ , page 134

16 - Bolt

- ❑ Tightening torque ⇒ “1.1 Exploded view - ignition system”, page 371

17 - Connector rail

- ❑ For ignition coils

18 - Gasket for cylinder head cover

- ❑ Renew if damaged or leaking

19 - Bolt

- ❑ 5 Nm

20 - Solenoid valve for camshaft control (exhaust side)

- ❑ Cylinder bank 1 (right-side): exhaust camshaft control valve 1 - N318-
- ❑ Cylinder bank 2 (left-side): exhaust camshaft control valve 2 - N319-
- ❑ Removing and installing ⇒ “4.6 Removing and installing camshaft control valves”, page 178

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21 - Solenoid valve for camshaft control (inlet side)

- ❑ Cylinder bank 1 (right-side): camshaft control valve 1 - N205-
- ❑ Cylinder bank 2 (left-side): camshaft control valve 2 - N208-
- ❑ Removing and installing ⇒ “4.6 Removing and installing camshaft control valves”, page 178

22 - O-rings

- ❑ Renew

23 - O-ring

- ❑ Renew

24 - Bolt

- ❑ 9 Nm

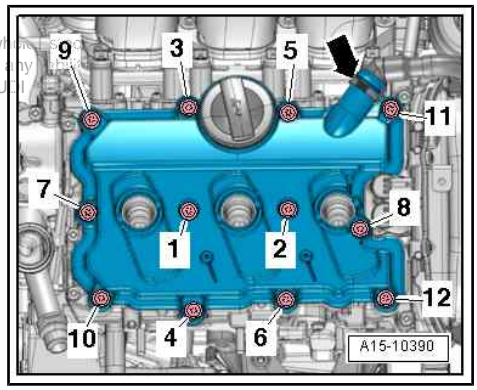
25 - Hall sender for exhaust camshaft

- ❑ Cylinder bank 1 (right-side): Hall sender 3 - G300-
- ❑ Cylinder bank 2 (left-side): Hall sender 4 - G301-
- ❑ Removing and installing ⇒ “1.5 Removing and installing Hall senders”, page 380

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

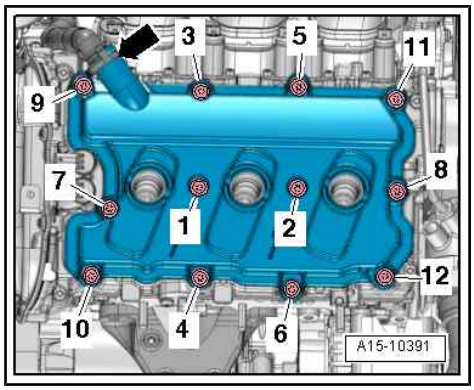
– Tighten bolts in the sequence -1 ... 12- to 9 Nm.

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

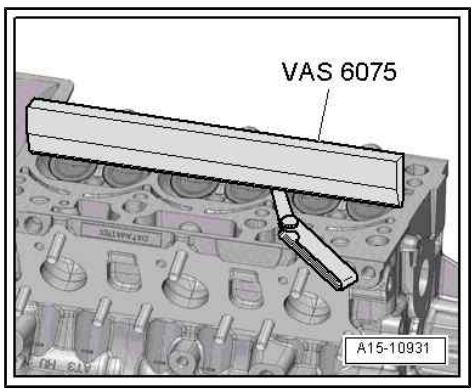
– Tighten bolts in the sequence -1 ... 12- to 9 Nm.



Checking cylinder head for distortion

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

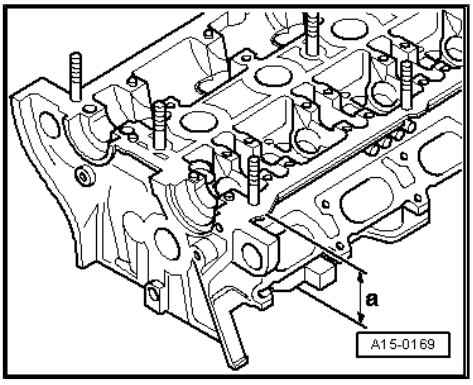
- Max. distortion: 0.05 mm.



Cylinder head machining limit

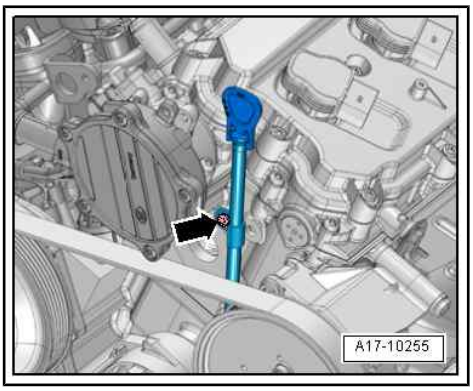
Machining of the cylinder head (surface grinding) is only permissible down to the minimum dimension -a-.

- Minimum dimension: -a- = 139.20 mm



Guide tube for oil dipstick - tightening torque

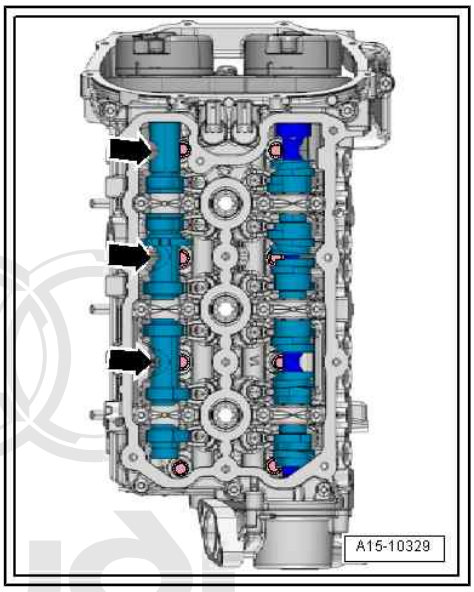
– Tighten bolt -arrow- to 9 Nm.



Camshafts with recesses for bolts

Note

- *Camshafts with assembly clearance feature have recesses at the points marked with -arrows-. The cylinder head can be removed and installed without performing any additional work.*
- *Camshafts with no assembly clearance feature do not have these recesses. The camshafts must be removed before you can remove and install the cylinder head.*



Cylinder head with camshafts without assembly clearance feature - tightening torque and sequence

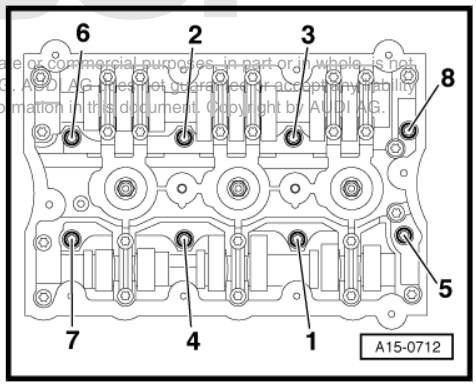
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Note

Renew the bolts tightened with specified tightening angle.

– Tighten bolts in stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1.	-1 … 8-	40 Nm
2.	-1 … 8-	Turn 90° further
3.	-1 … 8-	Turn 90° further



3.2 Removing and installing cylinder head

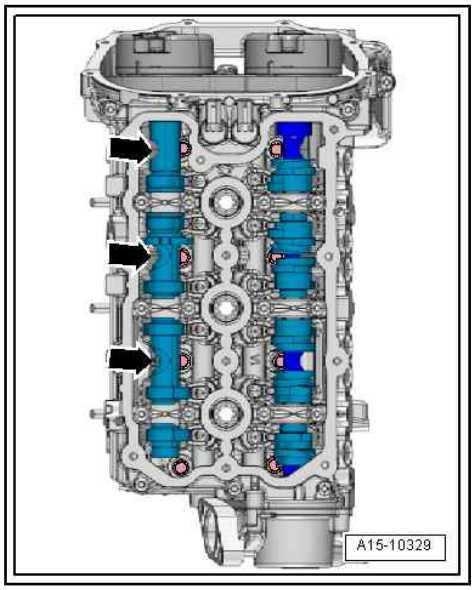
⇒ “3.2.1 Removing and installing cylinder head - camshafts with assembly clearance feature”, page 136

⇒ “3.2.2 Removing and installing cylinder head - camshafts without assembly clearance feature”, page 156

3.2.1 Removing and installing cylinder head - camshafts with assembly clearance feature

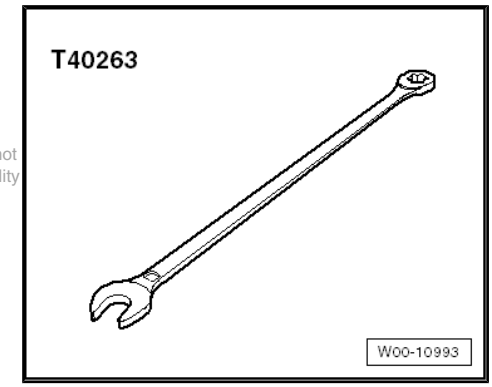
Note

Camshafts with assembly clearance feature have recesses at the points marked with -arrows-. The cylinder head can be removed and installed without performing any additional work.

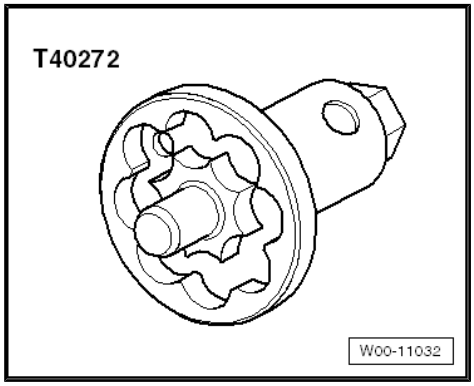


Special tools and workshop equipment required

- Wrench, 21 mm - T40263-



- Turning-over tool - T40272-



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Removing

- Engine in vehicle.

Note

- *The following chapter describes how to remove both cylinder heads together.*
- *If only one of the cylinder heads is to be removed, refer to the corresponding procedure described in this chapter.*
- *Fit all cable ties in the original positions when installing.*

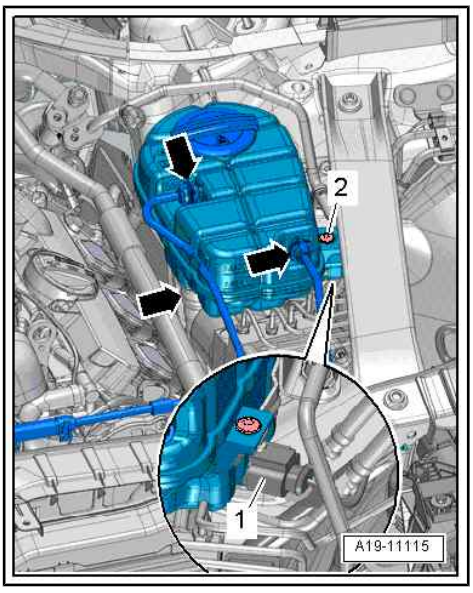
WARNING

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

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

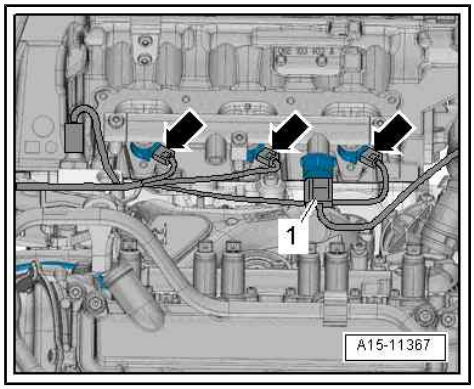
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– Reduce fuel pressure in high-pressure system
⇒ “1.2 Reducing fuel pressure in high-pressure section”, page 282 .
– Remove coolant pipe (top)
⇒ “3.2.4 Removing and installing coolant pipe (top)”, page 244 .
– Remove oil filter housing
⇒ “4.5 Removing and installing oil filter housing”, page 212 .
– Unplug electrical connector -1-.
– Remove bolt -2-.
– Lift retaining clips -arrows- and disconnect coolant hoses from coolant expansion tank. Remove coolant expansion tank.



Vehicles with 2.5 ltr. engine:

– Unplug electrical connectors at injectors -arrows- and at fuel pressure sender - G247- -item 1-.



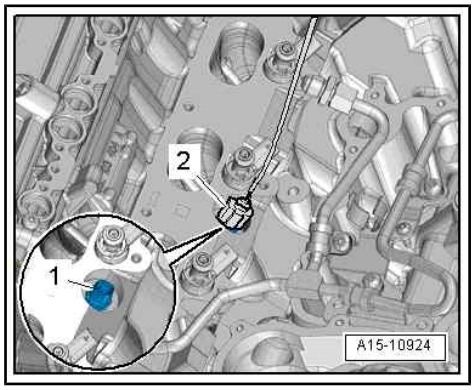
Vehicles with 2.8 ltr. engine:

– Remove intake manifold (bottom sections)
⇒ “3.5 Removing and installing intake manifold (bottom section)”, page 296 .

– Unplug electrical connectors at injectors.

Continued for all vehicles:

– Unplug electrical connector -2- at temperature sender for engine temperature regulation - G694- .



Note

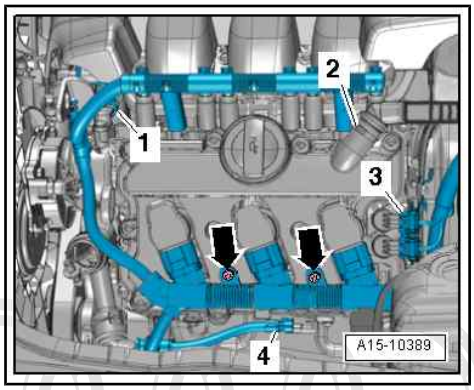
Disregard -item 1-.

– Unplug electrical connectors on cylinder head (left-side):

1 - For Hall sender 2 - G163-

3 - For inlet camshaft control valve 2 - N208- and exhaust camshaft control valve 2 - N319-

4 - Hall sender 4 - G301-



– Move electrical wiring harness to one side.

Note

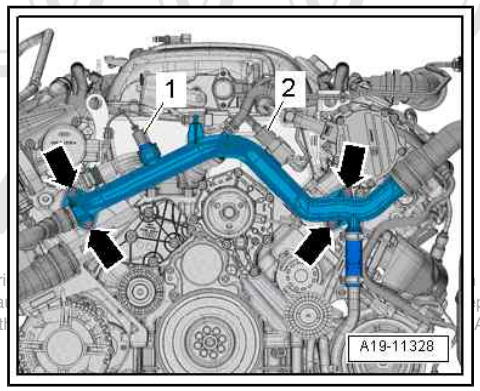
-Item 2- and -arrows- can be disregarded.

– Unplug electrical connectors at engine (front).

1 - For coolant temperature sender - G62-

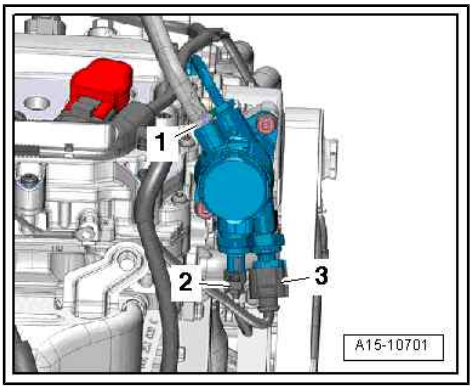
2 - For solenoid for coolant circuit - N492-

– Remove bolts -arrows- at coolant pipe (front).



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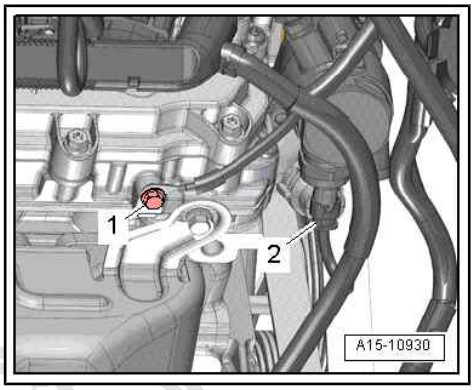
– Unscrew connection -1- and move fuel supply hose clear to one side.
– Unplug electrical connectors -2- and -3-.



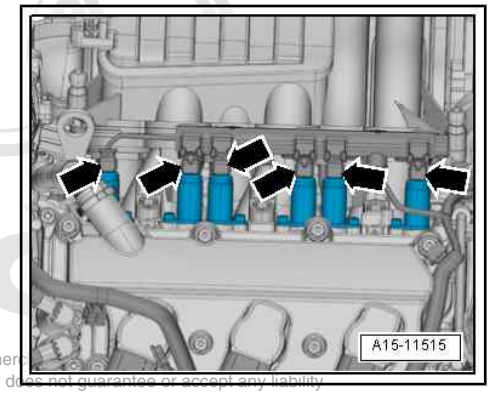
– Remove bolt -1- for earth wire on both sides.

Note

Disregard -item 2-.



– Unplug electrical connectors -arrows- (left and right) at cam actuators and move electrical wiring harness clear.



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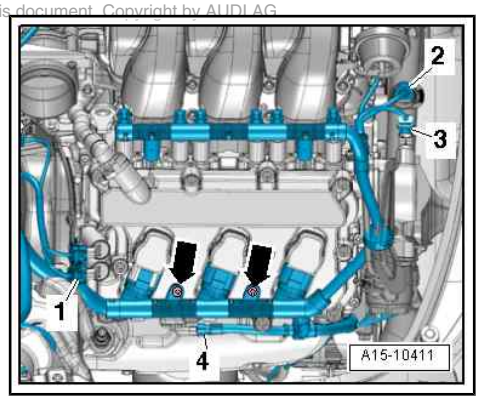
– Unplug electrical connectors on cylinder head (right-side):

1 - For inlet camshaft control valve 1 - N205- and exhaust camshaft control valve 1 - N318-

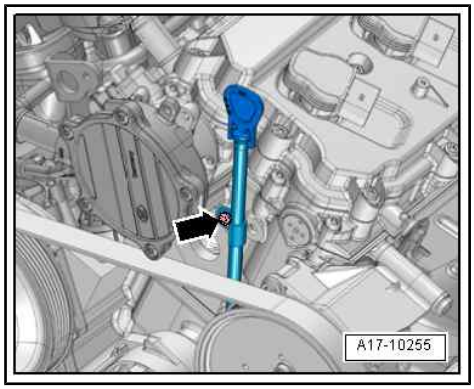
3 - For Hall sender - G40-

4 - For Hall sender 3 - G300-

– Move electrical wiring harness to one side.
– Remove cylinder head covers ⇒ page 161 .



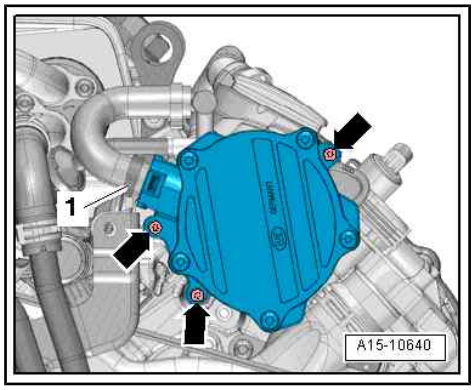
– Remove bolt -arrow- and pull out guide tube for oil dipstick.



– Release hose clip -1-, disconnect vacuum hose from vacuum pump and move vacuum hose clear.

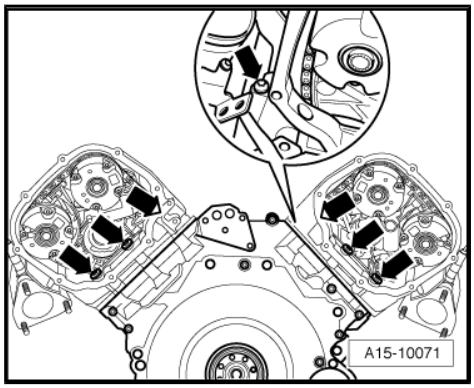
Note

Disregard -arrows-.



– Remove bolts -arrows- at rear of cylinder head.

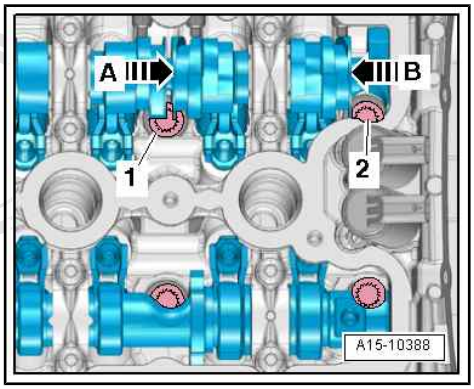
- Cylinder head (left-side): 3 bolts
- Cylinder head (right-side): 4 bolts



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Note

- *The cams on the inlet camshaft prevent access to some of the cylinder head bolts – in this example bolts -1- and -2-.*
- *Use a plastic wedge to press the slider on the camshaft in direction of -arrow A- to remove bolt -1-.*
- *Use a plastic wedge to press the slider on the camshaft in direction of -arrow B- to remove bolt -2-.*



Caution

Risk of damage.

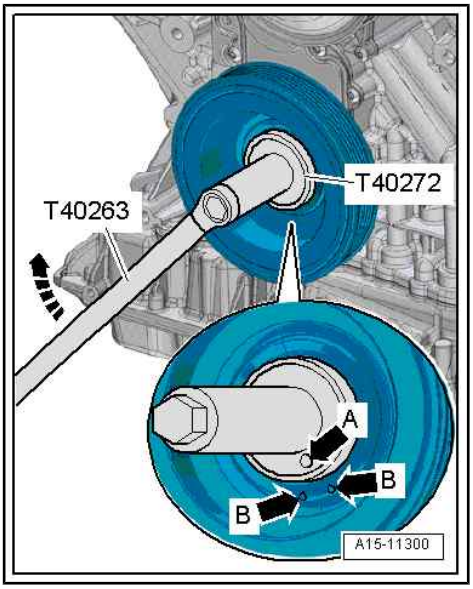
- ***Move the sliders only when the rocker fingers are not under load from the cams (i.e. when they are in contact only with the base circle of the cam). For this reason it is important to keep to sequence described in the following when loosening the cylinder head bolts.***

Risk of breakage

- ***Do not apply pressure to the thin webs when moving the sliders.***

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– Fit turning-over tool - T40272- onto wrench (21 mm) - T40263- .
– Position adapter on bolts of vibration damper.
• Hole -arrow A- on turning-over tool - T40272- must be positioned between markings -arrows B- on vibration damper.

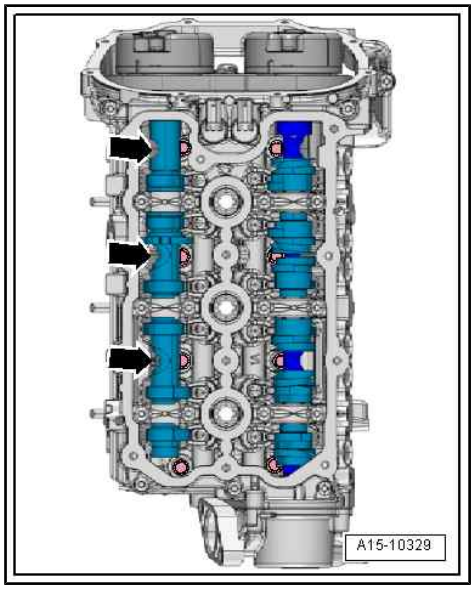


Note

If necessary, remove radiator fan control unit.

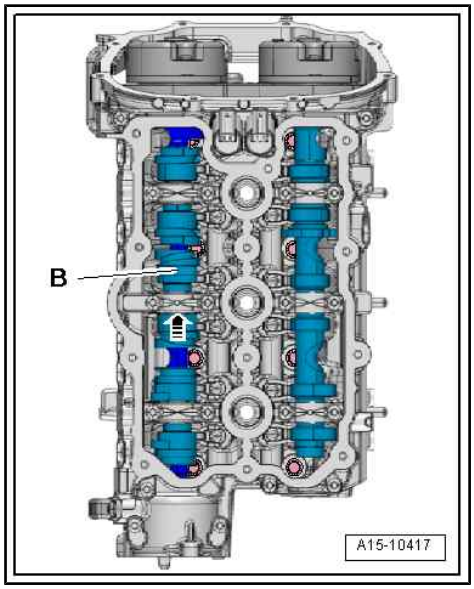
– Use wrench (21 mm) - T40263- and turning-over tool - T40272- to turn crankshaft in normal direction of engine rotation -arrow- until camshaft position shown in following illustration is attained.

- The recesses -arrows- on the exhaust camshaft must point towards the outside of the engine as shown in the illustration.



Cylinder head (left-side):

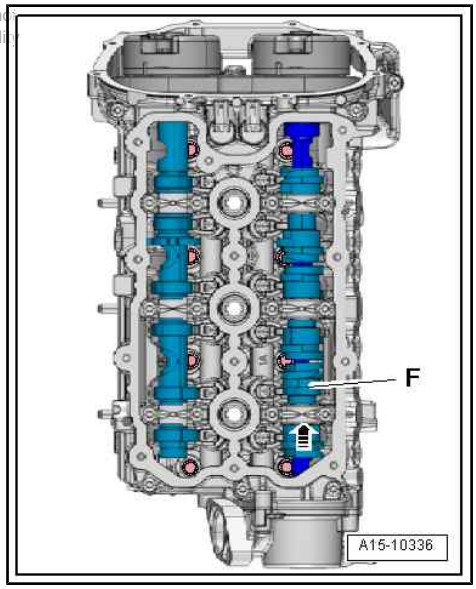
– Press slider -B- as far as stop in direction of -arrow- (slider should not be under load).



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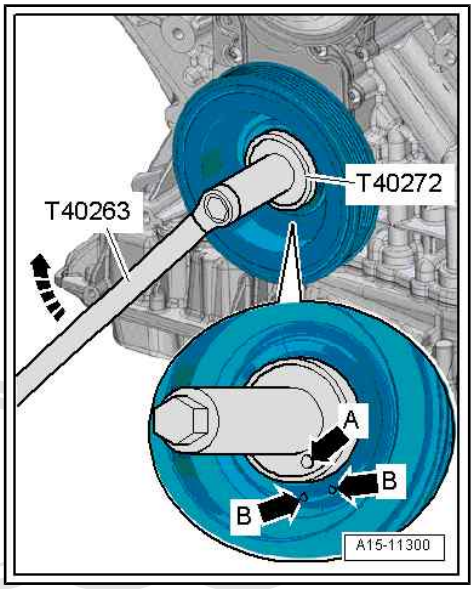
Cylinder head (right-side):

– Press slider -F- as far as stop in direction of -arrow- (slider should not be under load).

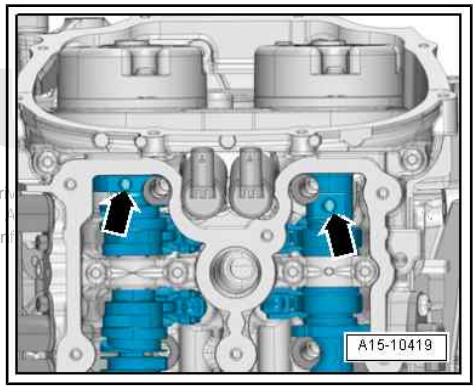


Continued for both cylinder heads:

– Turn crankshaft one complete rotation (360°) further in normal direction of engine rotation -arrow- using wrench (21 mm) - T40263- and turning-over tool - T40272- .



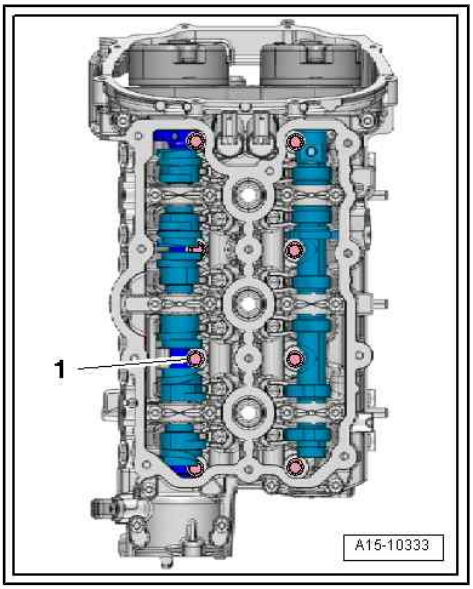
• The threaded holes -arrows- in the camshafts must face upwards.



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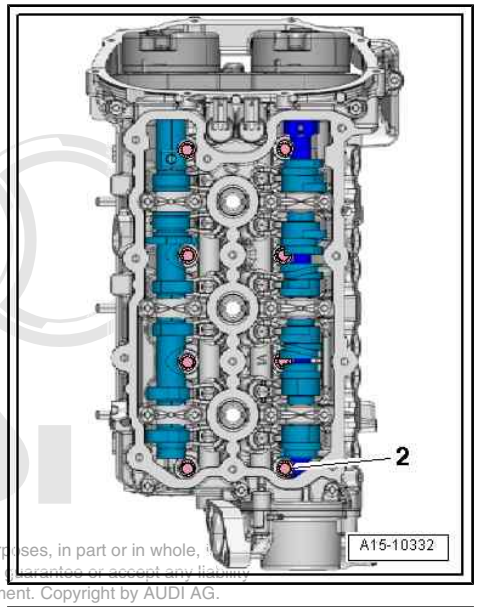
Cylinder head (left-side):

– Unscrew bolt -1- and remove.



Cylinder head (right-side):

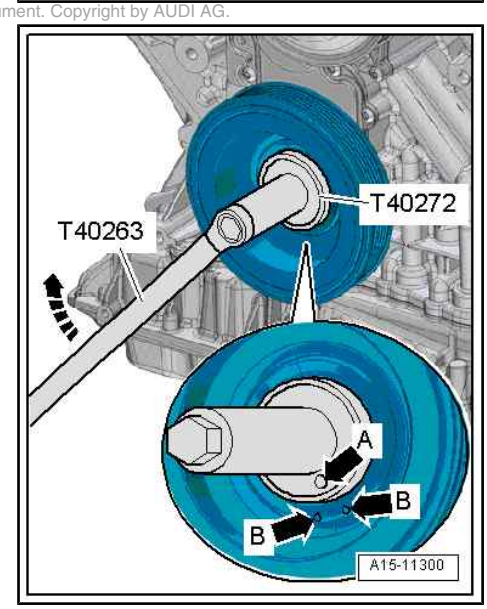
– Unscrew bolt -2- and remove.



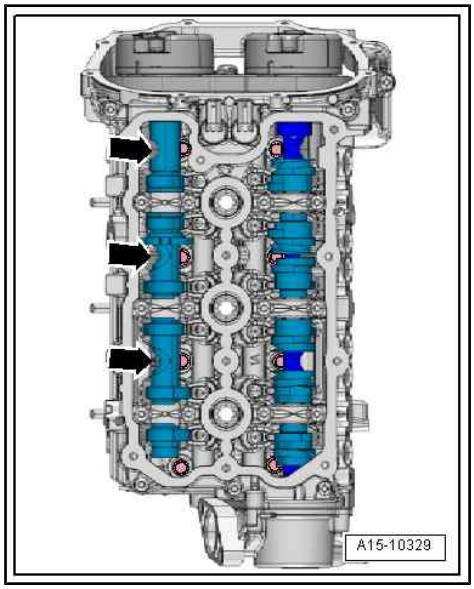
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Continued for both cylinder heads:

– Turn crankshaft one complete rotation (360°) further in normal direction of engine rotation -arrow- using wrench (21 mm) - T40263- and turning-over tool - T40272- .

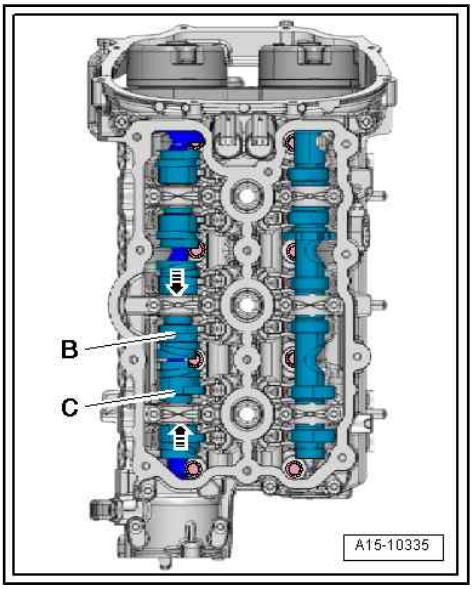


• The recesses -arrows- on the exhaust camshaft must point towards the outside of the engine.



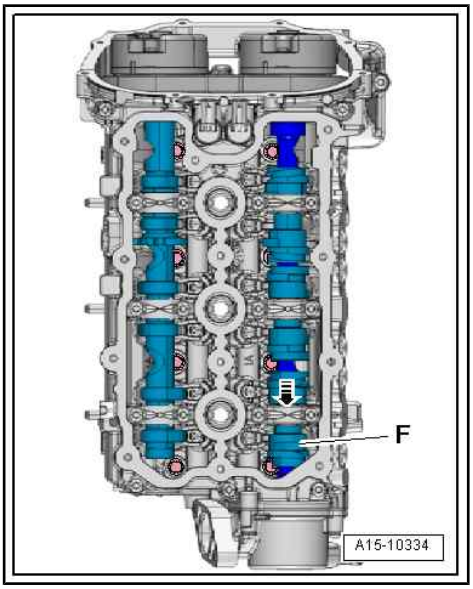
Cylinder head (left-side):

– Press sliders -B- and -C- as far as stop in direction of -arrow- (sliders should not be under load).



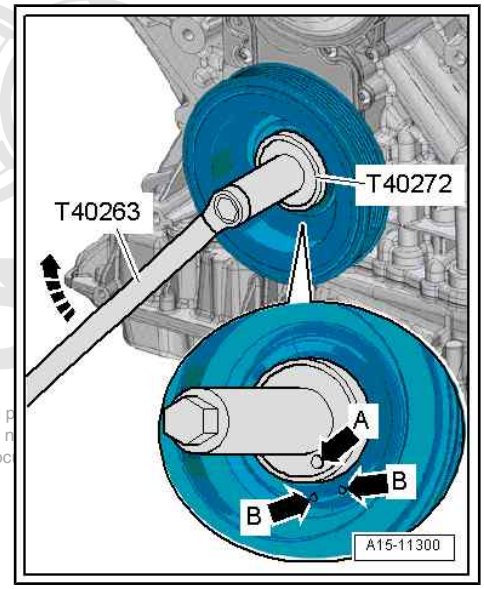
Cylinder head (right-side):

– Press slider -F- as far as stop in direction of -arrow- (slider should not be under load).



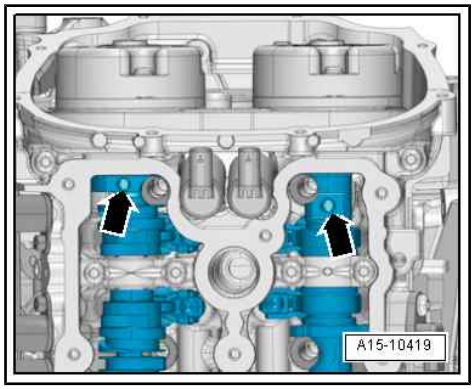
Continued for both cylinder heads:

– Turn crankshaft one complete rotation (360°) further in normal direction of engine rotation -arrow- using wrench (21 mm) - T40263- and turning-over tool - T40272- .



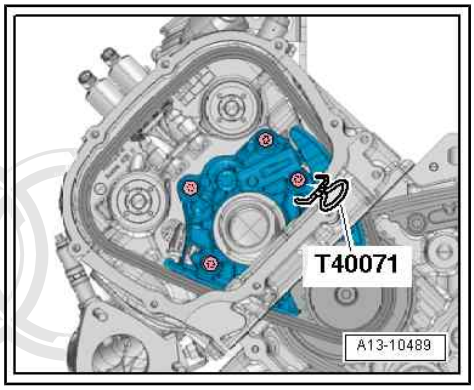
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- The threaded holes -arrows- in the camshafts must face upwards.

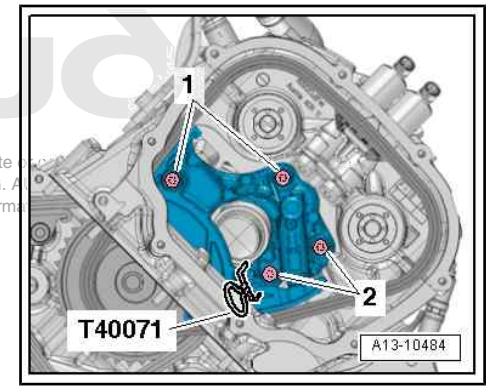


– Remove timing chains from camshafts
⇒ “2.4 Removing camshaft timing chain from camshafts”, page 114 .

– Remove locking pin - T40071- from cylinder head (left-side).



– Remove bolts -1- and -2- and detach chain tensioner from cylinder head (right-side).



Note

Locking pin - T40071- remains in place.

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Caution

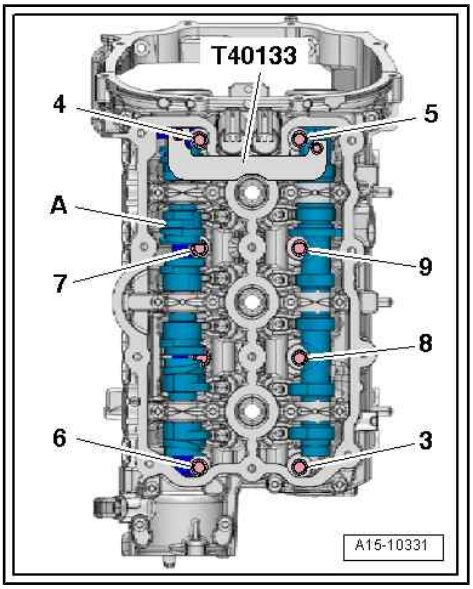
Risk of damage to valves and piston crowns.

- ***Do not turn crankshaft if one or both of the camshaft timing chains has been removed from the cylinder head(s).***

Cylinder head (left-side):

– Move slider -A- as required (slider should not be under load) and unscrew and remove bolts -3 ... 9-.

– Detach cylinder head and set it down on a soft surface (foam plastic).

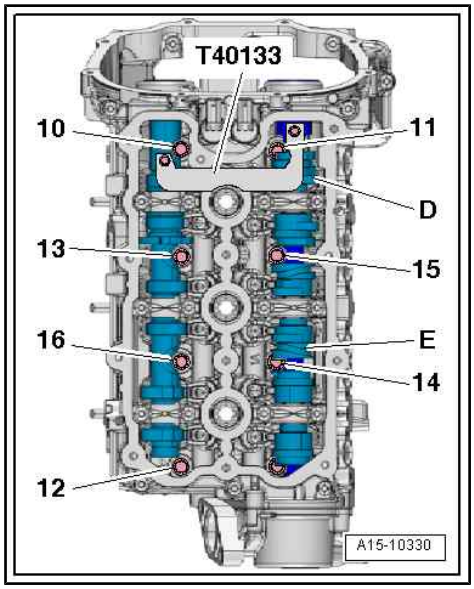


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Cylinder head (right-side):

– Move sliders -D- and -E- as required (sliders should not be under load) and unscrew and remove bolts -10 ... 16-.

– Detach cylinder head and set it down on a soft surface (foam plastic).



Installing

Caution

Risk of damage to sealing surfaces.

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

Risk of damage to cylinder block.

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

Ensure that cylinder head gasket seals properly:

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

Risk of damage to open valves.

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

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

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

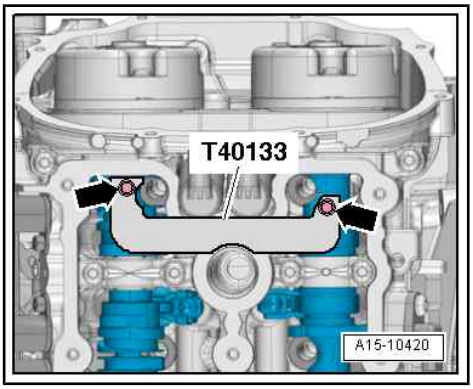
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Note

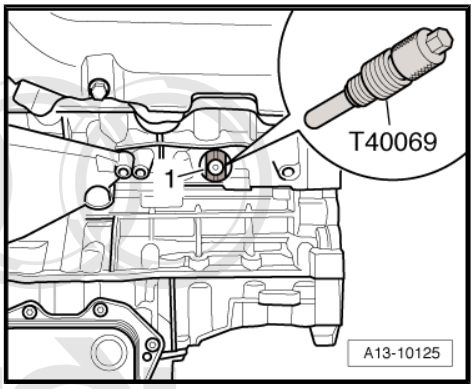
- *Renew the bolts tightened with specified tightening angle.*
- *Renew self-locking nuts as well as seals, gaskets and O-rings.*
- *Note the different sealants for sealing surfaces and cylinder head bolts.*
- *When installing an exchange cylinder head, the contact surfaces between the hydraulic compensation elements, roller rocker fingers and cams must be oiled before installing the cylinder head cover.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *After fitting a new cylinder head or cylinder head gasket, change the coolant and the engine oil.*

– Before fitting cylinder head set crankshaft and camshafts to “TDC”. To do so, fit camshaft clamps - T40133- to both cylinder heads and tighten to 25 Nm -arrows-.

• The camshaft clamp - T40133- is positioned correctly if the holes for the cylinder head bolts remain free.



• The locking pin - T40069- must be screwed into the crankshaft.

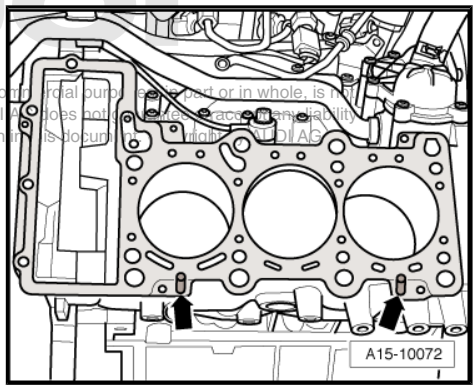


– Place cylinder head gasket in position.

• Note position of centring pins -arrows- in cylinder block.

• Installation position of cylinder head gasket: the word “oben” (top) or the part number should face towards the cylinder head.

– Fit cylinder head.

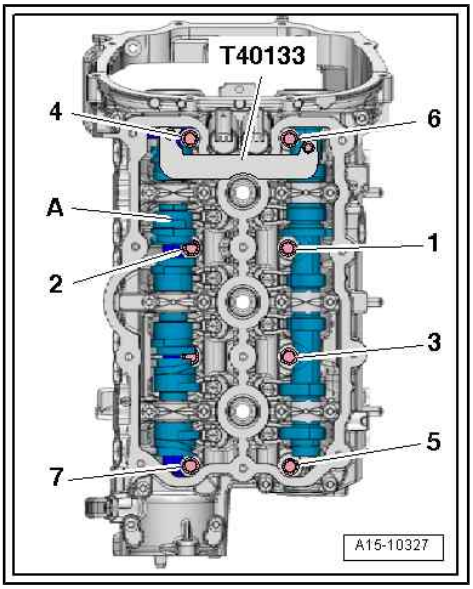


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Cylinder head (left-side):

– Move slider -A- as required (slider should not be under load) and fit bolts -1 ... 7-.

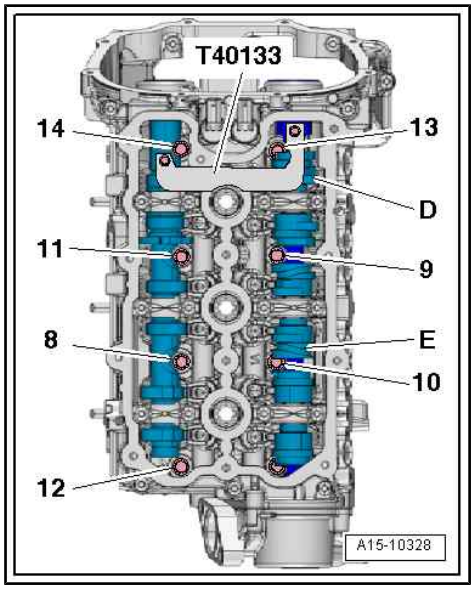
– Tighten bolts in the sequence -1 ... 7- in 3 stages
⇒ “3.1 Exploded view - cylinder head”, page 132 .



Cylinder head (right-side):

– Move sliders -D- and -E- as required (sliders should not be under load) and fit bolts -8 ... 14-.

– Tighten bolts in the sequence -8 ... 14- in 3 stages ⇒ “3.1 Exploded view - cylinder head”, page 132 .

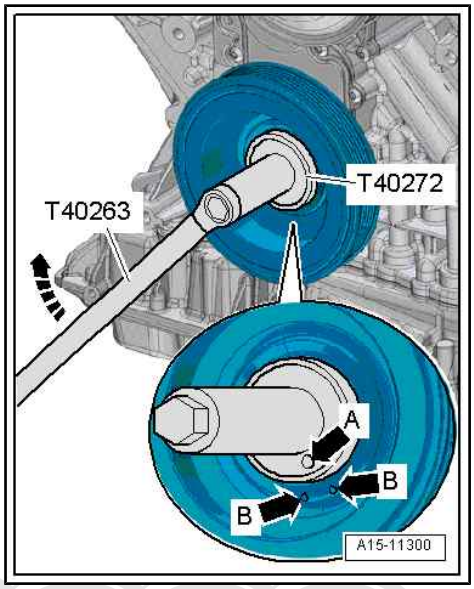


Continued for both cylinder heads:

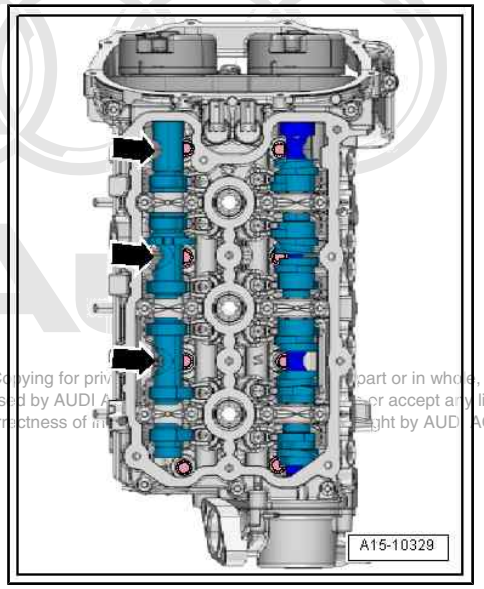
– Fit timing chains on camshafts ⇒ page 119 .

– Remove camshaft clamp - T40133- and locking pin - T40069- .

– Turn crankshaft one complete rotation (360°) further in normal direction of engine rotation -arrow- using wrench (21 mm) - T40263- and turning-over tool - T40272- .



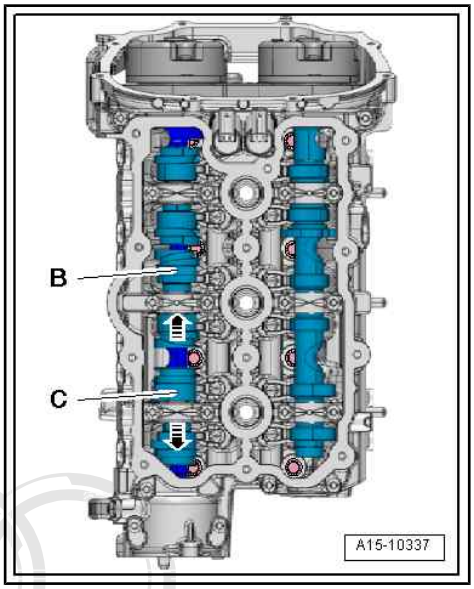
• The recesses -arrows- on the exhaust camshaft must point towards the outside of the engine.



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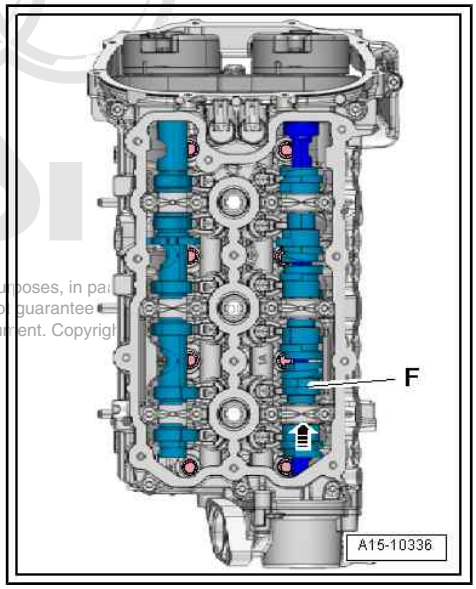
Cylinder head (left-side):

– Press sliders -B- and -C- as far as stop in direction of -arrow- (sliders should not be under load).



Cylinder head (right-side):

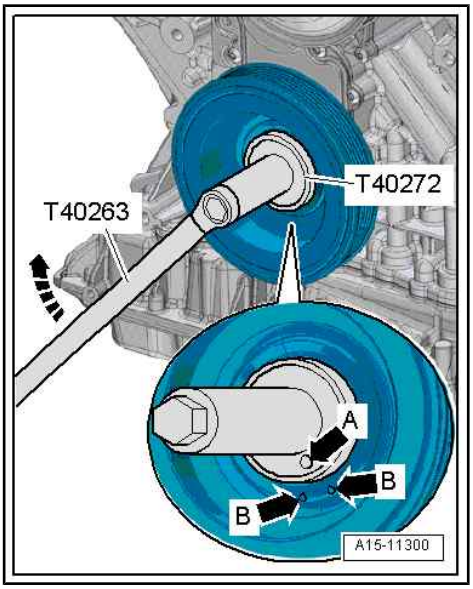
– Press slider -F- as far as stop in direction of -arrow- (slider should not be under load).



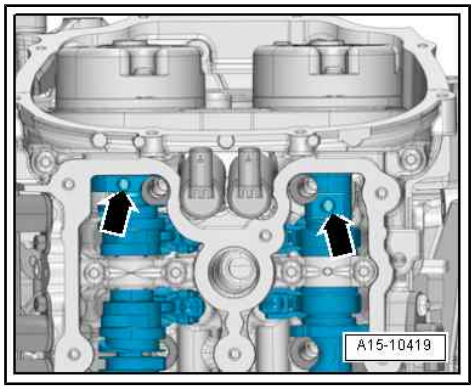
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Continued for both cylinder heads:

– Turn crankshaft one complete rotation (360°) further in normal direction of engine rotation -arrow- using wrench (21 mm) - T40263- and turning-over tool - T40272- .

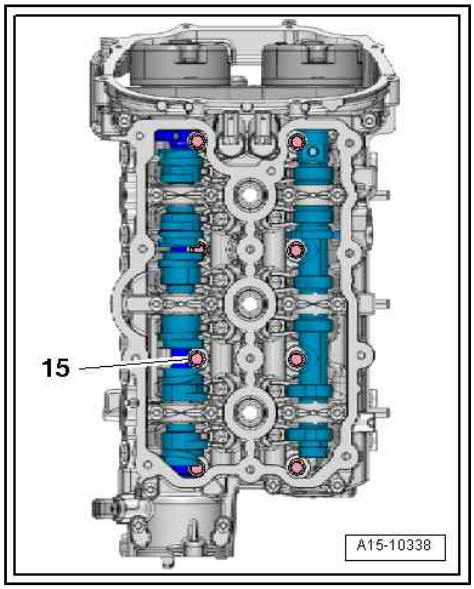


- The threaded holes -arrows- in the camshafts must face upwards.



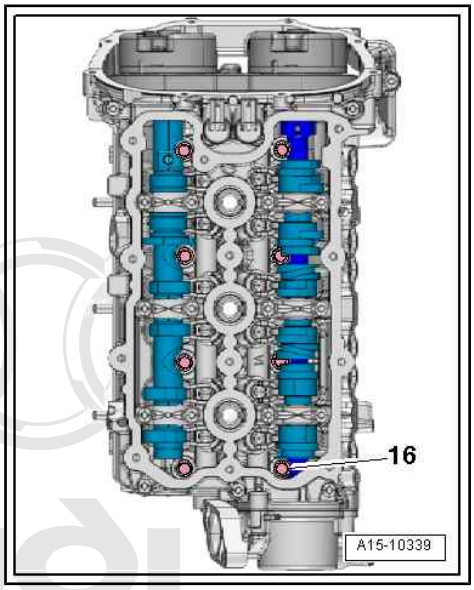
Cylinder head (left-side):

– Fit bolt -15- and tighten in three stages
⇒ “3.1 Exploded view - cylinder head”, page 132 .



Cylinder head (right-side):

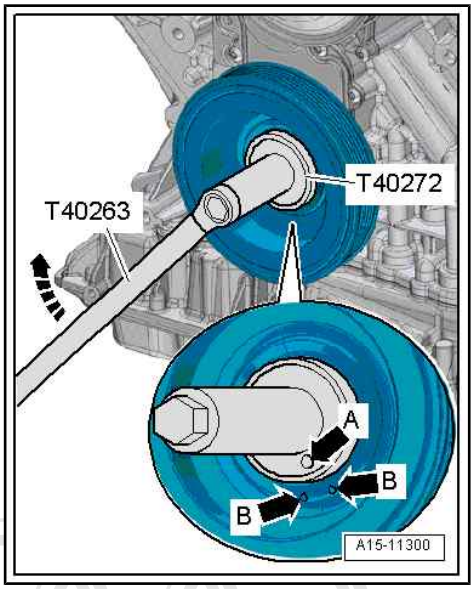
– Fit bolt -16- and tighten in three stages
⇒ “3.1 Exploded view - cylinder head”, page 132 .



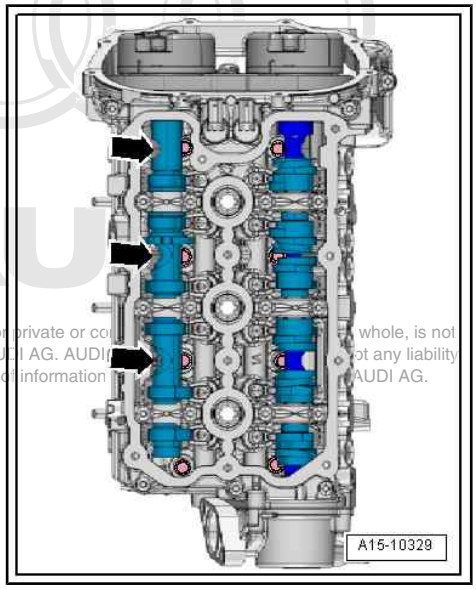
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Continued for both cylinder heads:

– Turn crankshaft one complete rotation (360°) further in normal direction of engine rotation -arrow- using wrench (21 mm) - T40263- and turning-over tool - T40272- .



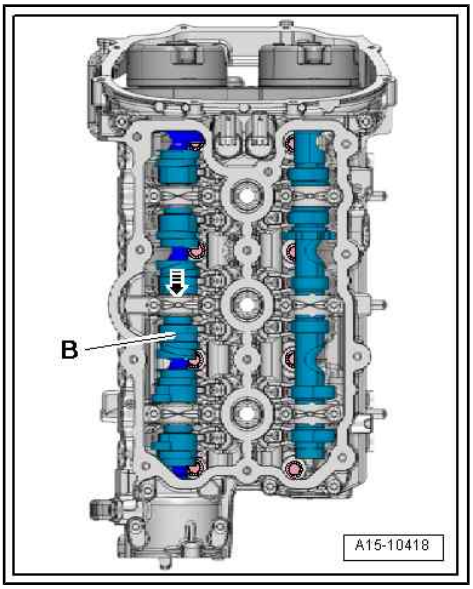
• The recesses -arrows- on the exhaust camshaft must point towards the outside of the engine.



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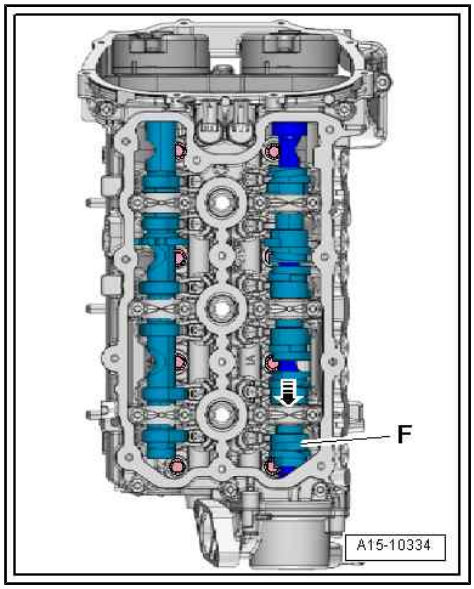
Cylinder head (left-side):

– Press slider -B- as far as stop in direction of -arrow- (slider should not be under load).



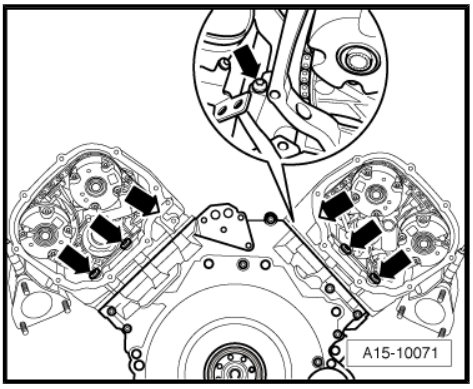
Cylinder head (right-side):

– Press slider -F- as far as stop in direction of -arrow- (slider should not be under load).



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Continued for both cylinder heads:



– Tighten bolts -arrows-.

♦ Cylinder head (left-side): 3 bolts

♦ Cylinder head (right-side): 4 bolts

Note

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

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

– Fit timing chains on camshafts ⇒ page 119 .

– Install cylinder head covers ⇒ “3.3 Removing and installing cylinder head cover”, page 161 .

– Install coolant pipe (front) ⇒ “3.2.3 Removing and installing coolant pipe (front)”, page 241 .

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

– Install intake manifold (bottom sections) ⇒ “3.5 Removing and installing intake manifold (bottom section)”, page 296 / install intake manifold ⇒ “3.3 Removing and installing intake manifold”, page 292 .

– Install oil filter housing ⇒ “4.5 Removing and installing oil filter housing”, page 212 .

– Install coolant pipe (top) ⇒ “3.2.4 Removing and installing coolant pipe (top)”, page 244 .

– Change engine oil ⇒ Maintenance ; Booklet 411 .

– Fill cooling system with fresh coolant ⇒ “1.3 Draining and filling cooling system”, page 221 .

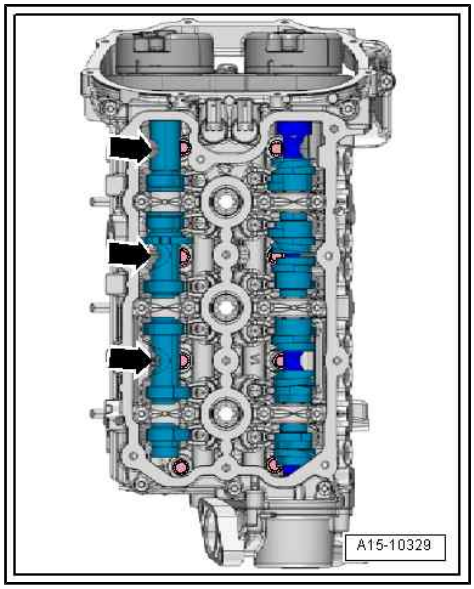
Tightening torques

♦ ⇒ “3.1 Exploded view - cylinder head”, page 132

♦ ⇒ Fig. ““Guide tube for oil dipstick - tightening torque”“ , page 135

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3.2.2 Removing and installing cylinder head - camshafts without assembly clearance feature



Note

Camshafts with no assembly clearance feature do not have recesses -arrows-. The camshafts must be removed before you can remove and install the cylinder head.

Removing

- Engine in vehicle.

Note

- *The following chapter describes how to remove both cylinder heads together.*
- *If only one of the cylinder heads is to be removed, refer to the corresponding procedure described in this chapter.*
- *Fit all cable ties in the original positions when installing.*

WARNING

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

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

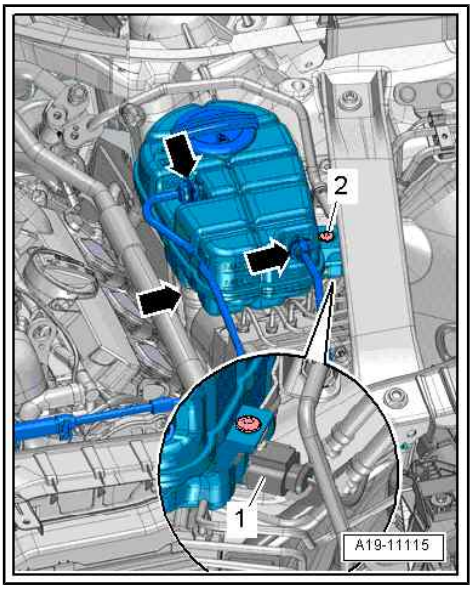
– Reduce fuel pressure in high-pressure system
⇒ “1.2 Reducing fuel pressure in high-pressure section”, page 282 .

– Remove coolant pipe (top)
⇒ “3.2.4 Removing and installing coolant pipe (top)”, page 244 .

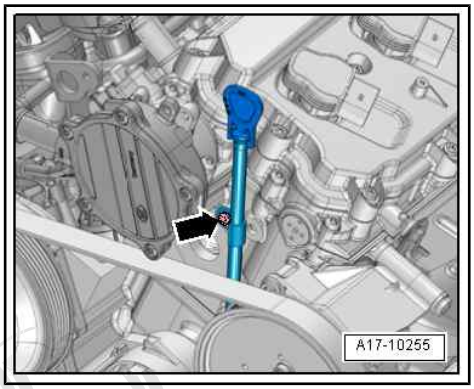
– Remove oil filter housing
⇒ “4.5 Removing and installing oil filter housing”, page 212 .

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– Unplug electrical connector -1-.
– Remove bolt -2-.
– Lift retaining clips -arrows- and disconnect coolant hoses from coolant expansion tank. Remove coolant expansion tank.



– Remove bolt -arrow- and pull out guide tube for oil dipstick.
– Remove intake manifold (bottom sections) ⇒ page 296 .
– Unplug electrical connectors at injectors.

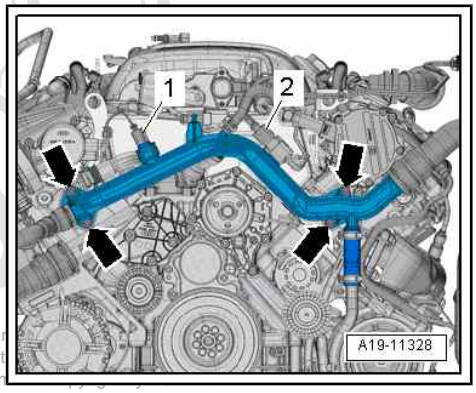


– Unplug electrical connectors at engine (front).

1 - For coolant temperature sender - G62-

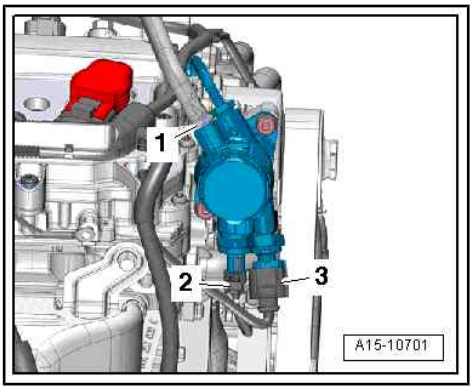
2 - For solenoid for coolant circuit - N492-

– Remove bolts -arrows- at coolant pipe (front).

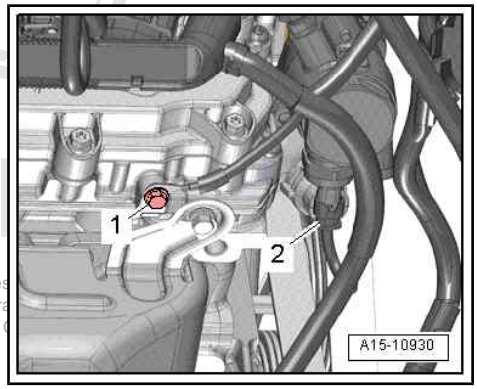


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– Unscrew connection -1- and move fuel supply hose clear to one side.
– Unplug electrical connectors -2- and -3-.



– Remove bolt -1- for earth wire on both sides.



Note

Disregard -item 2-.

– Remove camshafts
⇒ “4.4 Removing and installing camshaft”, page 170 .

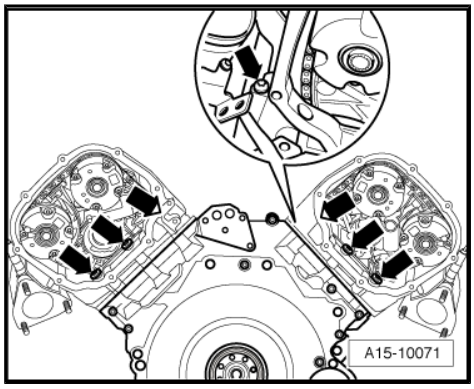
– Move electrical wiring harnesses clear to the side.

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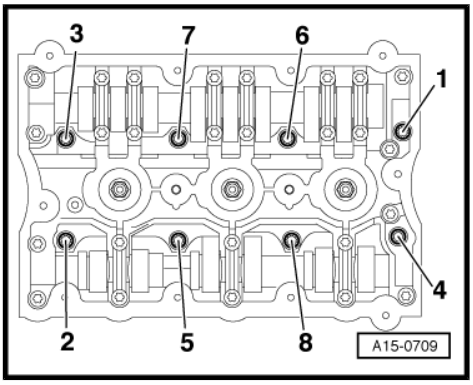
– Remove bolts -arrows- at rear of cylinder head.

♦ Cylinder head (left-side): 3 bolts

♦ Cylinder head (right-side): 4 bolts



– Slacken cylinder head bolts in the sequence -1 ... 8-.
– Detach cylinder head and set it down on a soft surface (foam plastic).



Installing

Caution

Risk of damage to sealing surfaces.

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

Risk of damage to cylinder block.

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

Ensure that cylinder head gasket seals properly:

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

Risk of damage to open valves.

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

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

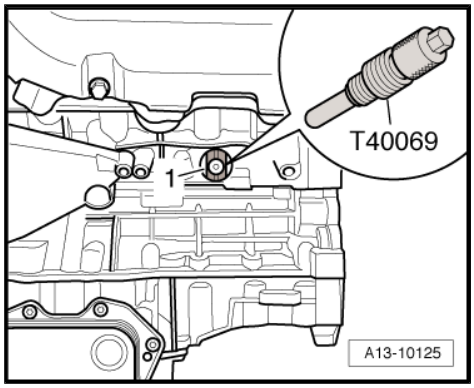
- *Turn the engine carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.*

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Note

- *Renew the bolts tightened with specified tightening angle.*
- *Renew self-locking nuts as well as seals, gaskets and O-rings.*
- *Note the different sealants for sealing surfaces and cylinder head bolts.*
- *When installing an exchange cylinder head, the contact surfaces between the hydraulic compensation elements, roller rocker fingers and cams must be oiled before installing the cylinder head cover.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *After fitting a new cylinder head or cylinder head gasket, change the coolant and the engine oil.*

- The locking pin - T40069- must be screwed into the crankshaft.



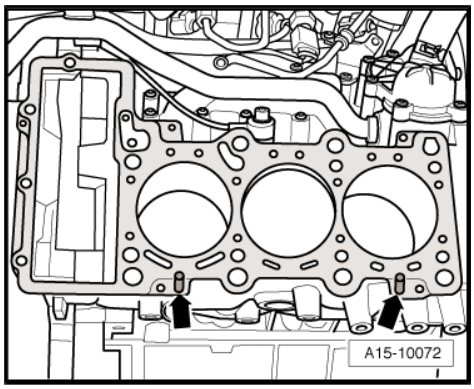
– Place cylinder head gasket in position.

- Note position of centring pins -arrows- in cylinder block.
- Installation position of cylinder head gasket: the word “oben” (top) or the part number should face towards the cylinder head.

– Fit cylinder head.

– Insert and hand-tighten cylinder head bolts.

– Tighten cylinder head bolts
⇒ Fig. ““Cylinder head with camshafts without assembly clearance feature - tightening torque and sequence”“ , page 135 .

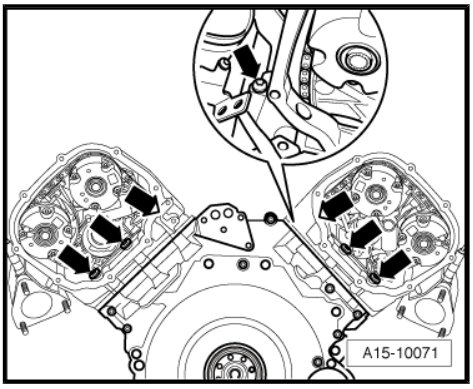


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– Tighten bolts -arrows-.

♦ Cylinder head (left-side): 3 bolts

♦ Cylinder head (right-side): 4 bolts



Note

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

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

– Install camshafts
⇒ “4.4 Removing and installing camshaft”, page 170 .

– Install cylinder head covers
⇒ “3.3 Removing and installing cylinder head cover”, page 161 .

– Install coolant pipe (front)
⇒ “3.2.3 Removing and installing coolant pipe (front)”, page 241 .

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

– Install intake manifold (bottom sections)
⇒ “3.5 Removing and installing intake manifold (bottom section)”, page 296 .

– Install oil filter housing
⇒ “4.5 Removing and installing oil filter housing”, page 212 .

– Install coolant pipe (top)
⇒ “3.2.4 Removing and installing coolant pipe (top)”, page 244 .

– Change engine oil ⇒ Maintenance ; Booklet 411 .

– Fill cooling system with fresh coolant
⇒ “1.3 Draining and filling cooling system”, page 221 .

Tightening torques

♦ ⇒ “3.1 Exploded view - cylinder head”, page 132

♦ ⇒ Fig. ““Guide tube for oil dipstick - tightening torque”“ , page 135

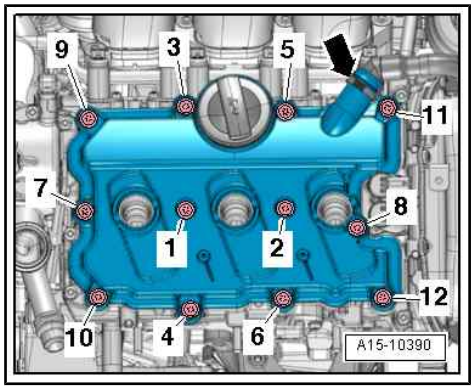
3.3 Removing and installing cylinder head cover

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Removing

– Remove ignition coils
⇒ “1.3 Removing and installing ignition coils with output stages”, page 374 .

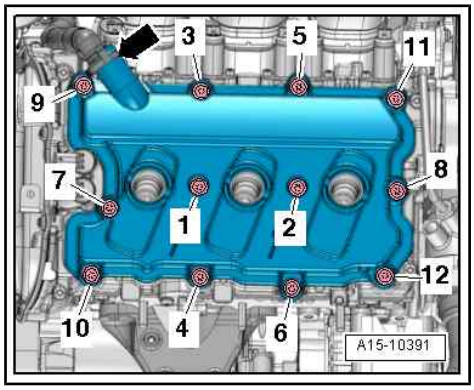
Cylinder head cover (left-side):



– Disconnect crankcase breather hose -arrow- by pressing release tabs.

– Remove bolts in the sequence -12 ... 1- and remove cylinder head cover (left-side).

Cylinder head cover (right-side):



– Remove air cleaner housing ⇒ “2.2 Removing and installing air cleaner housing”, page 285 .

– Disconnect crankcase breather hose -arrow- by pressing release tabs.

– Remove bolts in the sequence -12 ... 1- and remove cylinder head cover (right-side).

Installing

Installation is carried out in 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.*
- *Fit new O-rings.*

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

– Tighten bolts for cylinder head cover (left-side) ⇒ Fig. ““Cylinder head cover (left-side) - tightening torque and sequence”“ , page 134 .

– Tighten bolts for cylinder head cover (right-side) ⇒ Fig. ““Cylinder head cover (right-side) - tightening torque and sequence”“ , page 134 .

– Install air cleaner housing ⇒ “2.2 Removing and installing air cleaner housing”, page 285 .

– Install ignition coils ⇒ “1.3 Removing and installing ignition coils with output stages”, page 374 .

Tightening torques

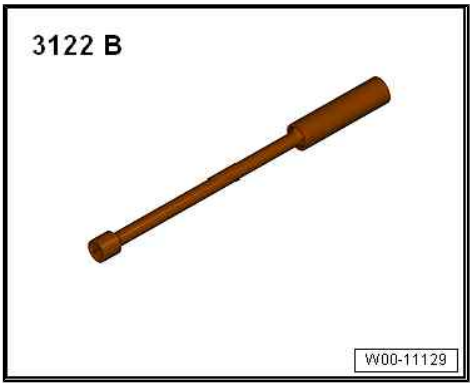
- ⇒ Fig. ““Cylinder head cover (left-side) - tightening torque and sequence”“ , page 134
- ⇒ Fig. ““Cylinder head cover (right-side) - tightening torque and sequence”“ , page 134

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3.4 Checking compression

Special tools and workshop equipment required

♦ Spark plug spanner - 3122 B-



♦ Compression tester - V.A.G 1763-

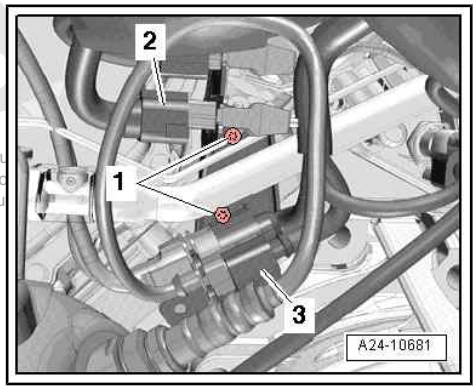


Procedure

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

– Remove all ignition coils
⇒ “1.3 Removing and installing ignition coils with output stages”, page 374 .

– Unplug electrical connector -2- for injectors at rear of cylinder head (left-side).

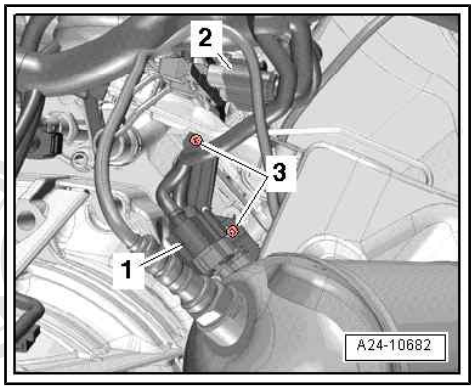


Note

Disregard items -1 and 3-.

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– Unplug electrical connector -2- for injectors at rear of cylinder head (right-side).



Note

Disregard items -1 and 3-.

– Unscrew spark plugs using spark plug socket - 3122 B- .

– Check compression pressure with compression tester - V.A.G 1763- .

Note

Using the compression tester ⇒ Operating instructions .

– Have a 2nd mechanic press down the accelerator pedal completely and at the same time operate the starter until the pressure on the tester display no longer increases.

– Repeat procedure on each cylinder.

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Compression pressure	bar
When new	14.5 … 21.0
Wear limit	14.0
Maximum difference between cylinders	3.0

Installing

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

– Install spark plugs ⇒ Maintenance ; Booklet 411 .

– Install ignition coils
⇒ “1.3 Removing and installing ignition coils with output stages”, page 374 .

– Erase any entries in event memory resulting from testing:

• Vehicle diagnostic tester must be connected.

– Selecting operating mode.

– Using Go To button and “Function/component selection” function, select the following in succession from tree:

♦ Drive train

♦ 01 - Self-diagnosis compatible systems

♦ Simos injection and ignition system

♦ Functions

♦ Readiness code

4 Valve gear

⇒ “4.1 Exploded view - valve gear”, page 165

⇒ “4.2 Measuring axial clearance of camshaft”, page 169

⇒ “4.3 Measuring radial clearance of camshaft”, page 170

⇒ “4.4 Removing and installing camshaft”, page 170

⇒ “4.5 Removing and installing cam actuators”, page 177

⇒ “4.6 Removing and installing camshaft control valves”, page 178

⇒ “4.7 Checking hydraulic compensation elements”, page 179

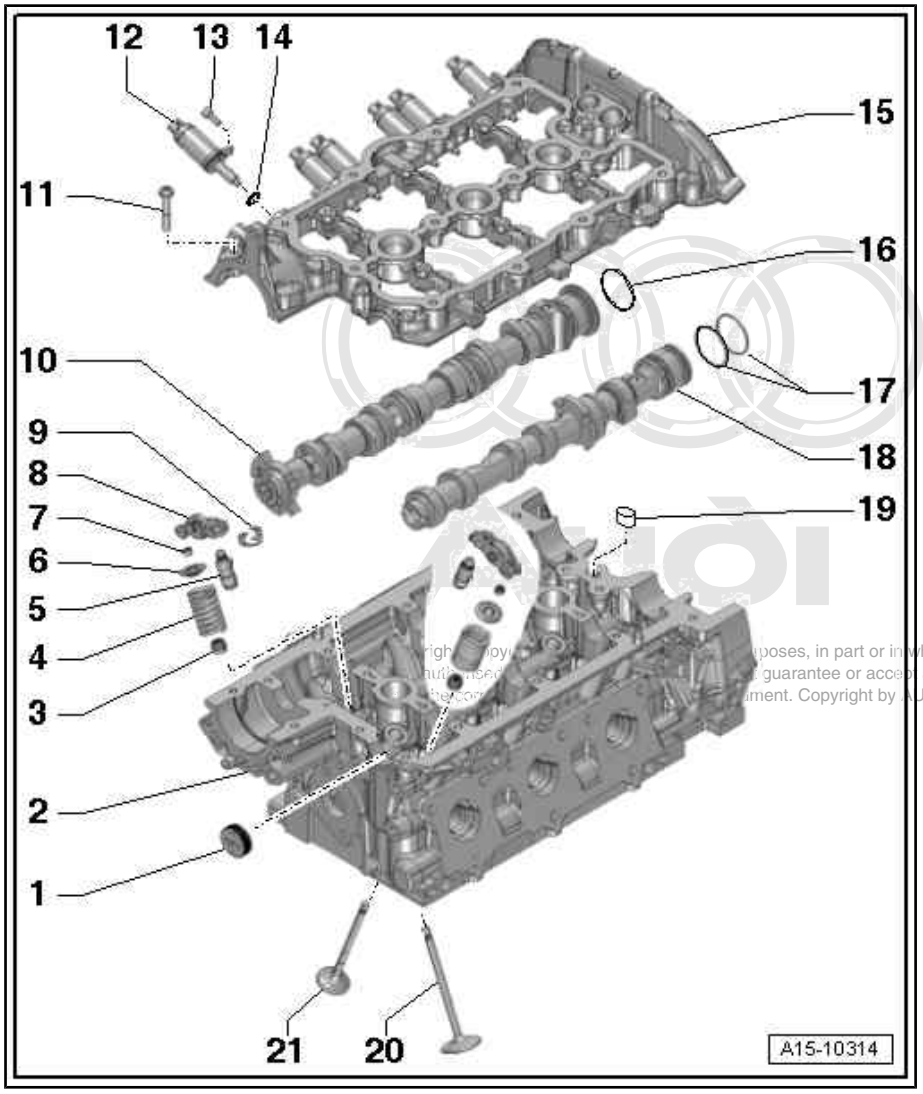
⇒ “4.8 Removing and installing valve stem oil seals”, page 181

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4.1 Exploded view - valve gear

Note

- *Cylinder heads which have cracks between the valve seats or between a valve seat insert and the spark plug thread can be re-installed without reducing service life, provided the cracks are only slight and do not exceed a maximum of 0.3 mm in width, and no more than the first 4 turns of the spark plug threads are cracked.*
- *Illustration shows the cylinder head for cylinder bank 2 (left-side).*



1 - Sealing plug

- ❑ Apply sealant when installing; refer to ⇒ Electronic parts catalogue

2 - Cylinder head

- ❑ Checking valve guides ⇒ “5.1 Checking valve guides”, page 190

3 - Valve stem oil seal

- ❑ Renewing with cylinder head installed ⇒ “4.8.1 Removing and installing valve stem oil seals (cylinder head installed)”, page 181
- ❑ Renewing with cylinder head removed ⇒ “4.8.2 Removing and installing valve stem oil seals (cylinder head removed)”, page 185

4 - Valve spring

- ❑ Installation position ⇒ Fig. ““Installation position of valve spring”“ , page 168

5 - Hydraulic compensation element

- ❑ Clipped into roller rocker finger -item 8-
- ❑ Checking ⇒ “4.7 Checking hydraulic compensation elements”, page 179
- ❑ Mark installation position for re-installation with a coloured pen
- ❑ Lubricate contact surfaces before installing

6 - Valve spring plate

7 - Valve cotters

8 - Roller rocker finger

- ❑ Mark installation position for re-installation
- ❑ Check roller bearings for ease of movement
- ❑ Lubricate contact surfaces before installing
- ❑ Allocation to cylinders ⇒ Fig. ““Allocation of roller rocker fingers to cylinders”“ , page 168
- ❑ Attach to hydraulic compensation element -item 5- using securing clip -item 9-

9 - Securing clip

- ❑ Not supplied separately
- ❑ Mark installation position for re-installation
- ❑ Check for firm attachment

10 - Inlet camshaft

- ❑ With 3 sliders
- ❑ Do not dismantle
- ❑ Measuring axial clearance ⇒ “4.2 Measuring axial clearance of camshaft”, page 169
- ❑ Removing and installing ⇒ “4.4 Removing and installing camshaft”, page 170

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- ❑ Measuring radial clearance ⇒ “4.3 Measuring radial clearance of camshaft”, page 170
- ❑ Runout: max. 0.04 mm

11 - Bolt

- ❑ Renew
- ❑ Tightening sequence:

◆ ⇒ Fig. ““Retaining frame for camshafts of cylinder head, bank 1 (right-side) - tightening torque and sequence”“ , page 168

◆ ⇒ Fig. ““Retaining frame for camshafts of cylinder head, bank 2 (left-side) - tightening torque and sequence”“ , page 169

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12 - Actuator

- ❑ For camshaft adjustment
- ❑ Removing and installing ⇒ “4.5 Removing and installing cam actuators”, page 177

13 - Bolt

- ❑ 5 Nm

14 - O-ring

- ❑ Renew

15 - Retaining frame

- ❑ With integrated camshaft bearings
- ❑ Removing and installing ⇒ “4.4 Removing and installing camshaft”, page 170

16 - Compression ring

17 - Rectangular section seals

18 - Exhaust camshaft

- ❑ Measuring axial clearance ⇒ “4.2 Measuring axial clearance of camshaft”, page 169
- ❑ Removing and installing ⇒ “4.4 Removing and installing camshaft”, page 170
- ❑ Measuring radial clearance ⇒ “4.3 Measuring radial clearance of camshaft”, page 170
- ❑ Runout: max. 0.04 mm

19 - Oil strainer

- ❑ Not fitted on all versions; for allocation refer to ⇒ Electronic parts catalogue

20 - Inlet valve

- ❑ Do not machine, only grinding-in is permitted
- ❑ Mark installation position for re-installation
- ❑ Valve dimensions ⇒ “5.3 Valve dimensions”, page 191
- ❑ Checking valve guides ⇒ “5.1 Checking valve guides”, page 190

21 - Exhaust valve

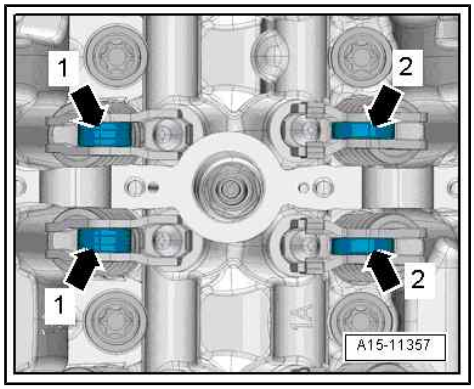
- ❑ Do not machine, only grinding-in is permitted
- ❑ Mark installation position for re-installation
- ❑ Valve dimensions ⇒ “5.3 Valve dimensions”, page 191
- ❑ Checking valve guides ⇒ “5.1 Checking valve guides”, page 190

Allocation of roller rocker fingers to cylinders

Caution

Risk of damage to engine.

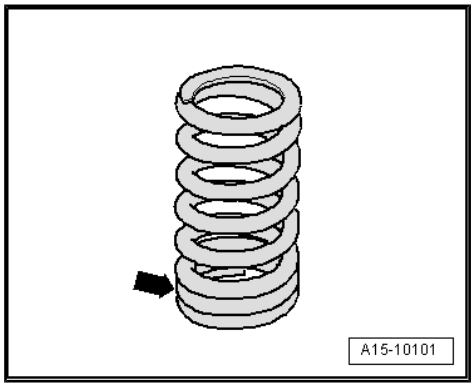
- *Note allocation of roller rocker fingers to cylinders*



- Roller rocker fingers with wide rollers -arrow 1- correspond to cylinders without cylinder shut-off.
- Roller rocker fingers with narrow rollers -arrow 2- correspond to cylinders with cylinder shut-off.

Installation position of valve spring

- Closely spaced spring coils -arrow- face towards cylinder head.



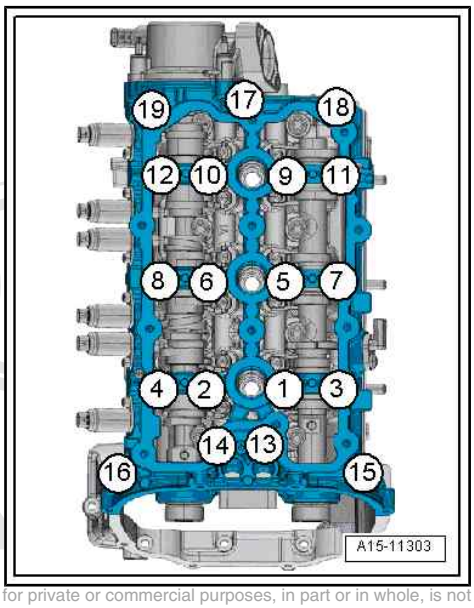
Retaining frame for camshafts of cylinder head, bank 1 (right-side) - tightening torque and sequence

Note

Renew the bolts tightened with specified tightening angle.

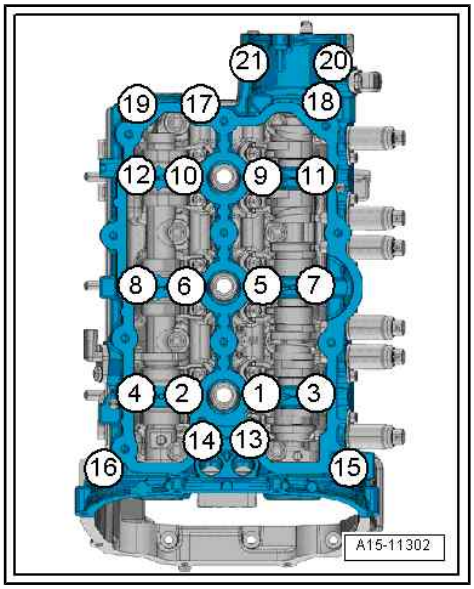
– Tighten bolts in 3 stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1.	-1 … 19-	Screw in by hand until contact is made • The retaining frame should make contact with the cylinder head over the full surface
2.	-1 … 19-	8 Nm
3.	-1 … 19-	Turn 90° further



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Retaining frame for camshafts of cylinder head, bank 2 (left-side) - tightening torque and sequence



Note

Renew the bolts tightened with specified tightening angle.

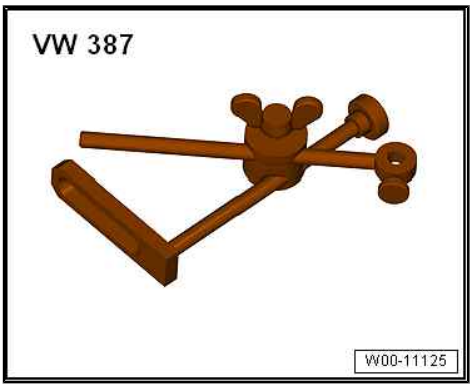
– Tighten bolts in 3 stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1.	-1 … 21-	Screw in by hand until contact is made • The retaining frame should make contact with the cylinder head over the full surface
2.	-1 … 21-	8 Nm
3.	-1 … 21-	Turn 90° further

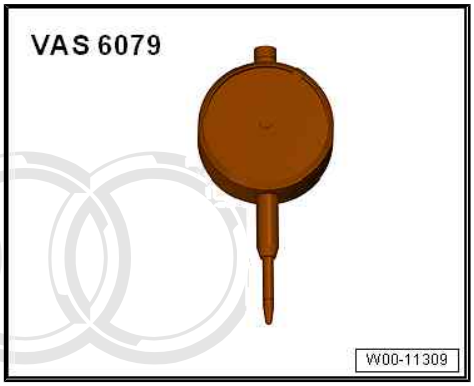
4.2 Measuring axial clearance of camshaft

Special tools and workshop equipment required

♦ Universal dial gauge bracket - VW 387-

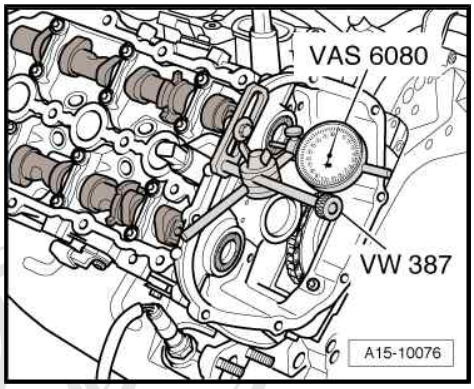


♦ Dial gauge - VAS 6079-



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Procedure



– Remove camshafts
⇒ “4.4 Removing and installing camshaft”, page 170 .
– For re-installation, mark original positions of roller rocker fingers, retaining clips and hydraulic compensation elements, remove and put down on a clean surface.
– Re-insert camshafts, install retaining frame ⇒ page 169 and tighten with old bolts to 8 Nm (do not turn further).
– Secure universal dial gauge bracket - VW 387- with dial gauge - VAS 6079- to cylinder head as shown in illustration.
– Press camshaft against dial gauge by hand.
– Set dial gauge to “0”.
– Press camshaft away from dial gauge and read off value:

Axial clearance:

- Inlet camshaft: 0.080 ... 0.165 mm
- Exhaust camshaft: 0.100 ... 0.191 mm

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4.3 Measuring radial clearance of camshaft

Special tools and workshop equipment required

♦ Plastigauge

Procedure

– Remove camshafts
⇒ “4.4 Removing and installing camshaft”, page 170 .
– Mark allocation of roller rocker fingers for re-installation.
– Carefully remove roller rocker fingers and place them on a clean surface.
– Clean bearings and bearing journals.
– Place a length of Plastigauge corresponding to the width of the bearing on the bearing journal or bearing shell to be measured.
- The Plastigauge must be positioned in the centre of the bearing.
– Re-insert camshafts, fit retaining frame and tighten with old bolts to 8 Nm (do not turn further) ⇒ page 169 without rotating camshafts.
– Remove retaining frame and camshafts again.
– Compare width of Plastigauge with measurement scale.

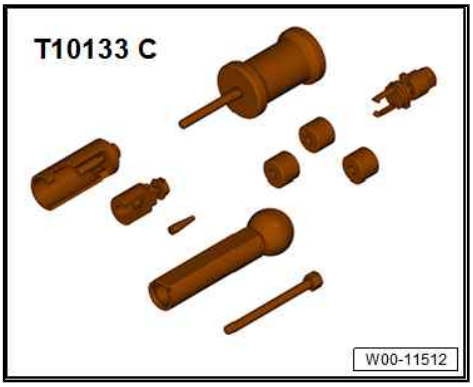
Radial clearance:

- 24 mm bearing ∅: 0.024 ... 0.066 mm
- 36 mm bearing ∅: 0.032 ... 0.078 mm

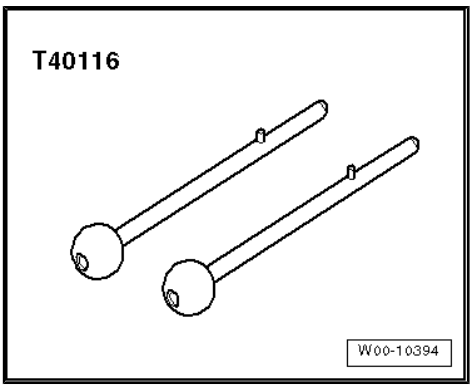
4.4 Removing and installing camshaft

Special tools and workshop equipment required

- Impact extractor attachment -T10133/3- from tool set for FSI engines - T10133 C-



- Locating pins - T40116-



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

Removing

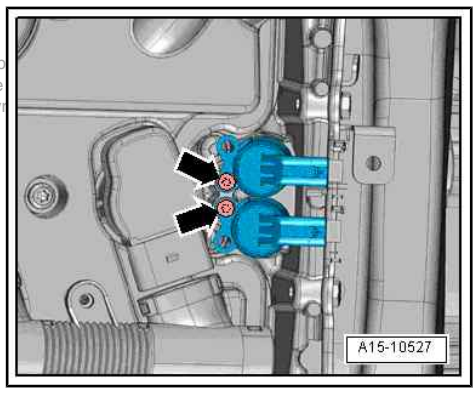
– Remove timing chains from camshafts ⇒ “2.4 Removing camshaft timing chain from camshafts”, page 114 .

– To remove camshafts in cylinder head (left-side), remove vacuum pump ⇒ Brake system; Rep. gr. 47 ; Vacuum system; Removing and installing vacuum pump .

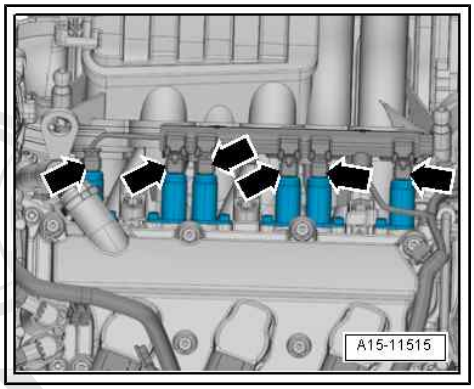
– To remove camshafts in cylinder head (right-side), first remove high-pressure pump and housing for high-pressure pump drive ⇒ “6.2 Removing and installing high-pressure pump”, page 314 .

– Remove bolts -arrows- and detach camshaft control valves concerned.

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– Unplug electrical connectors -arrows- (left and right) at cam actuators and move electrical wiring harness clear.

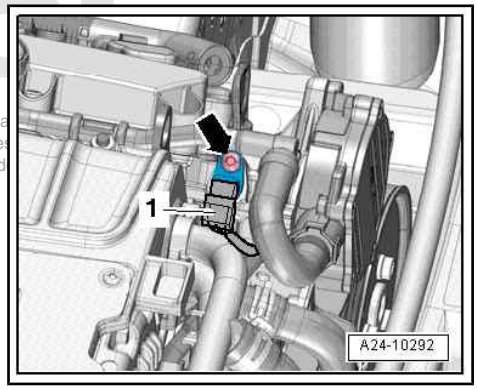


– Unplug electrical connector -1- at Hall sender.

Note

Disregard -arrow-.

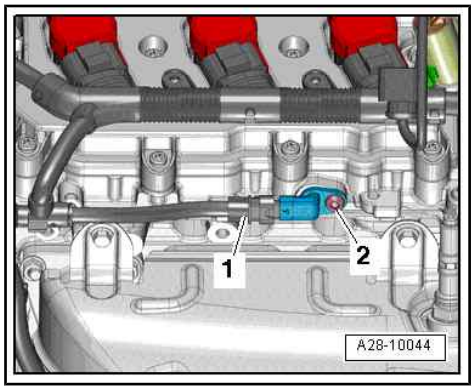
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– Unplug electrical connector -1- at Hall sender concerned.

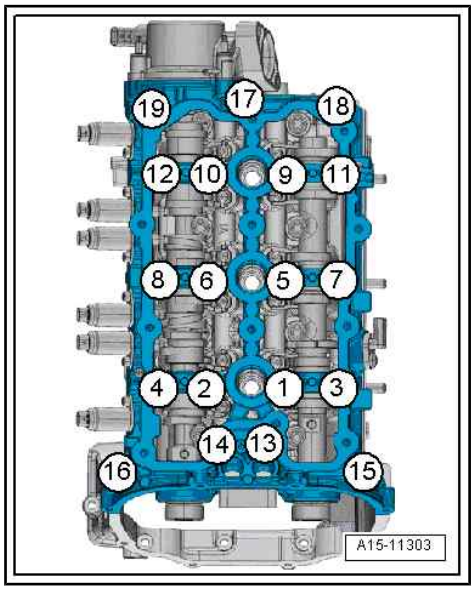
Note

Disregard -item 2-.



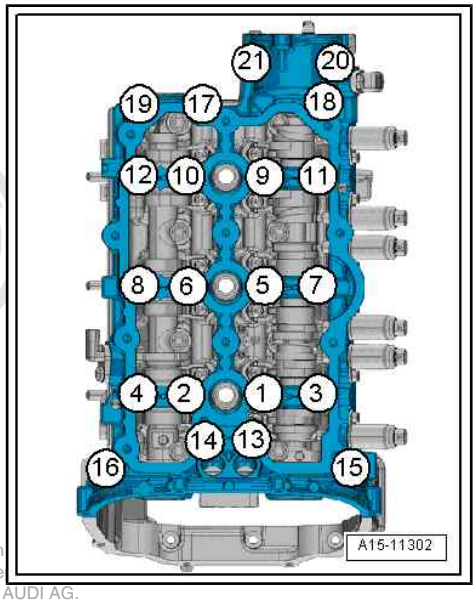
– Remove retaining frame:

♦ Cylinder head, bank 1 (right-side): Slacken bolts in the sequence -19 ... 1-.



♦ Cylinder head, bank 2 (left-side): Slacken bolts in the sequence -21 ... 1-.

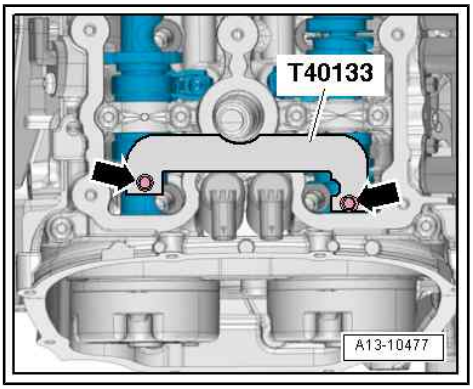
– Remove bolts, carefully release retaining frame from bonded joint and set it down on a soft surface on workbench.



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– Remove camshaft clamp - T40133- -arrows-.

– Mark and remove camshafts.

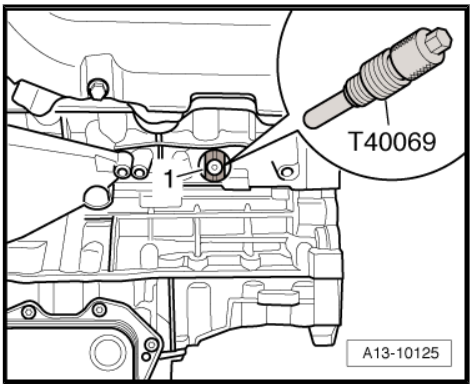


Installing

Note

Renew all seals and gaskets.

- Crankshaft -1- locked in “TDC” position with locking pin - T40069- .
- Hydraulic compensation elements and roller rocker fingers installed.



Caution

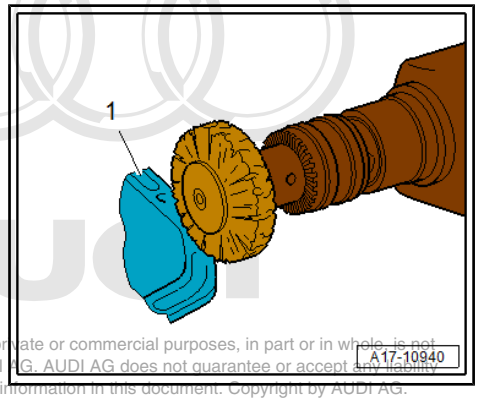
Protect lubrication system and bearings against contamination.

♦ *Cover exposed parts of the engine.*

WARNING

Risk of eye injury.

- *Put on safety goggles.*



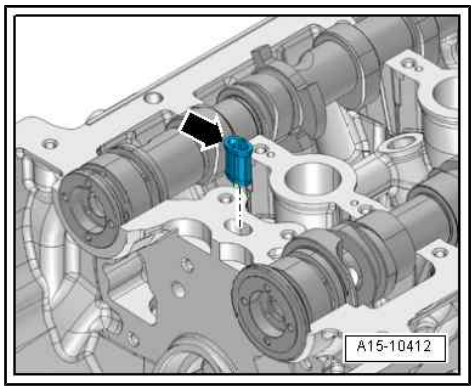
– Remove remaining sealant from cylinder head and retaining frame -1- using rotating plastic brush or similar.

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

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– Check strainer -arrow- for dirt and clean as necessary.

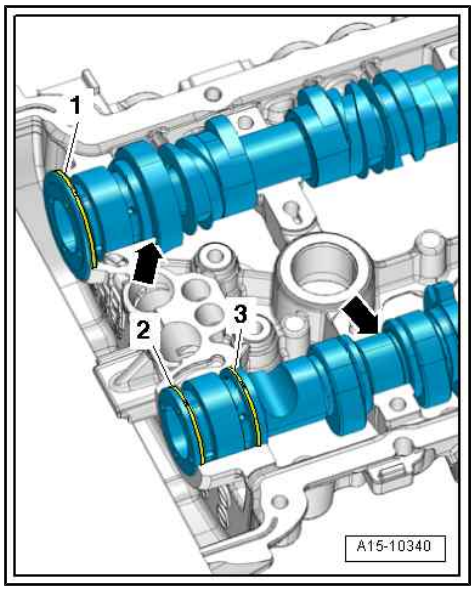
– Oil running surfaces of both camshafts.



– Fit camshafts in retaining frame.

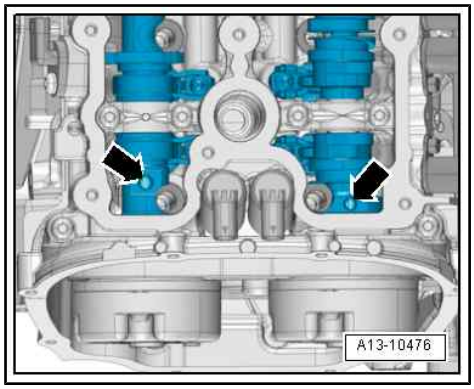
- Camshafts must be in correct position in axial bearings -arrows- in retaining frame.
- The ends of the rectangular section seals -1, 2, 3- must point up or down. The ends of the rectangular section seals must never point to the side.

– Turn retaining frame over with camshafts fitted, holding camshafts firmly in position.

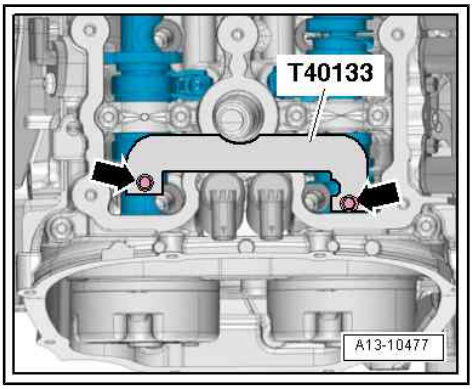


– Turn camshafts until threaded holes -arrows- point upwards.

– Check that camshafts are still in correct position in axial bearings in retaining frame.



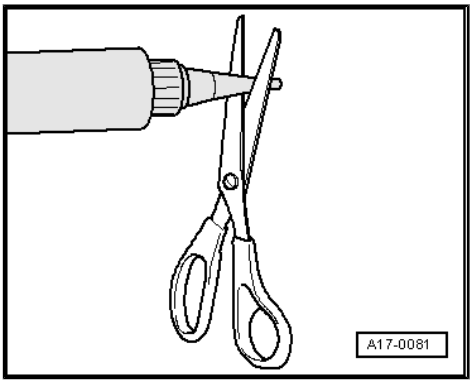
– Fit camshaft clamp - T40133- and tighten bolts -arrows- to 25 Nm.



Note

Note the use-by date of the sealant.

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



– Turn retaining frame upside down again.

Caution

Make sure lubrication system is not clogged by excess sealant.

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

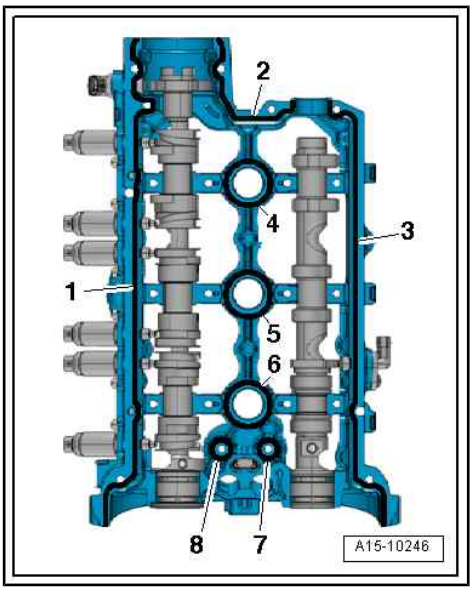
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– Apply beads of sealant -4 ... 8- onto clean sealing surfaces of retaining frame as shown in illustration.

- Width of sealant beads: 2.0 mm.

– Apply beads of sealant -1 ... 3- onto clean sealing surfaces of retaining frame as shown in illustration.

- Width of sealant beads: 2.5 mm.



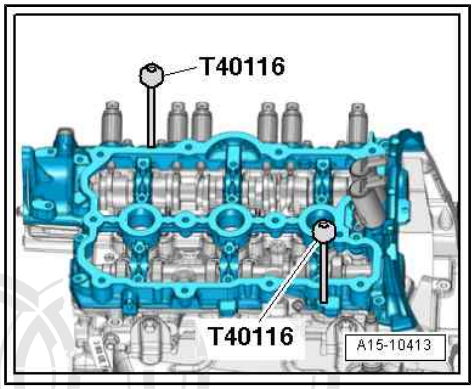
Note

The retaining frame must be installed within 5 minutes after applying the sealant.

– Fit retaining frame onto cylinder head.
– Insert locating pins -T40116- in retaining frame and cylinder head.
– Tighten bolts for retaining frame for camshafts:

◆ ⇒ Fig. ""Retaining frame for camshafts of cylinder head, bank 1 (right-side) - tightening torque and sequence"" , page 168

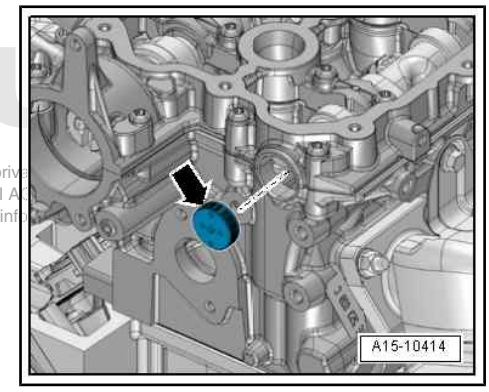
◆ ⇒ Fig. ""Retaining frame for camshafts of cylinder head, bank 2 (left-side) - tightening torque and sequence"" , page 169



Note

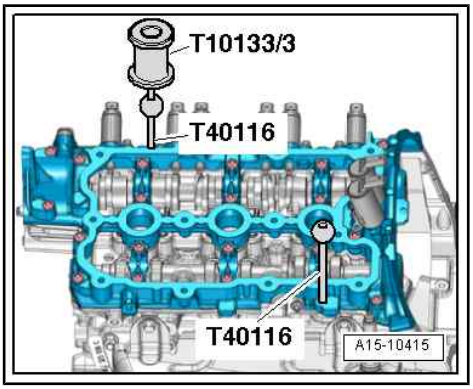
After installing the retaining frame, wait about 30 minutes for the sealant to dry.

– Clean bore for sealing plug in cylinder head; it must be free of oil and grease.
– Coat outer circumference of sealing plug -arrow- with sealant; for sealant refer to ⇒ Electronic parts catalogue .
– Drive in sealing plug until flush.



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– Use impact extractor attachment -T40116- to pull out locating pins -T10133/3- .



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

– Install camshaft control valves ⇒ “3.1 Exploded view - cylinder head”, page 132 .

– Install housing for high-pressure pump drive and high-pressure pump ⇒ “6.2 Removing and installing high-pressure pump”, page 314 .

– Install vacuum pump ⇒ Brake system; Rep. gr. 47 ; Vacuum system; Removing and installing vacuum pump .

– Fit timing chains on camshafts ⇒ “2.4 Removing camshaft timing chain from camshafts”, page 114 .

Caution

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

- ***The hydraulic tappets have to settle; wait for approx. 30 minutes after installing camshafts before starting engine.***
- ***Turn the engine carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.***

Tightening torques

- ⇒ “3.1 Exploded view - cylinder head”, page 132
- ⇒ Fig. ““Retaining frame for camshafts of cylinder head, bank 1 (right-side) - tightening torque and sequence”“ , page 168
- ⇒ Fig. ““Retaining frame for camshafts of cylinder head, bank 2 (left-side) - tightening torque and sequence”“ , page 169

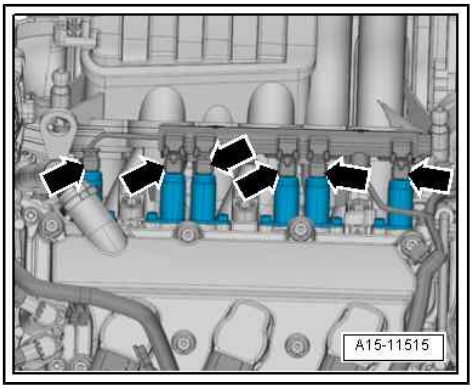
4.5 Removing and installing cam actuators

Removing

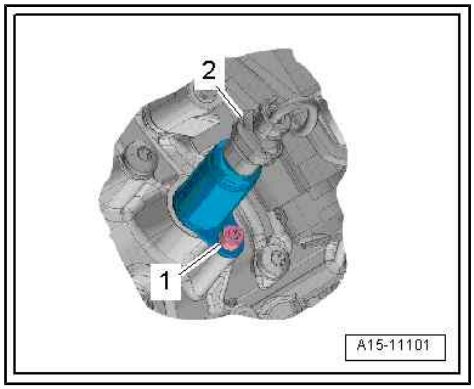
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– Remove engine cover panel ⇒ “3.1 Removing and installing engine cover panel”, page 64 .

– Unplug electrical connectors -arrows- (left and right) at cam actuators and move electrical wiring harness clear.



– Remove bolt -1- and pull off cam actuator.

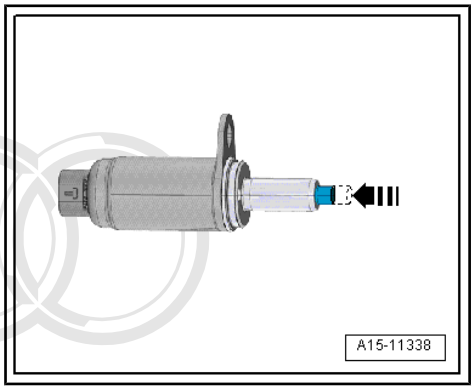


Note

Disregard -item 2-.

Installing

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



Note

Fit new O-rings.

Caution

Risk of damage to engine.

- ***Pins of all actuators for camshaft adjustment must be brought into installation position.***

– Press down pins of actuators for camshaft adjustment -arrow- by hand.

• Pins of all actuators must not be in extended position.

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Tightening torques

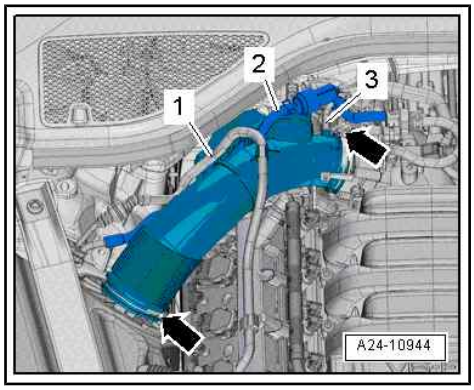
- ⇒ “4.1 Exploded view - valve gear”, page 165

4.6 Removing and installing camshaft control valves

Removing

– Remove engine cover panel (rear)
⇒ “3.1 Removing and installing engine cover panel”, page 64 .

Applies to cylinder bank 1 (right-side):

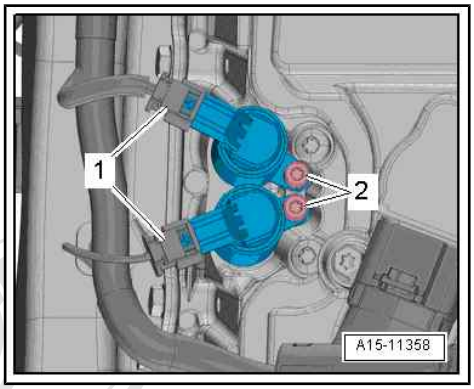


– Move clear fuel hose -1- and hose -2- leading to activated charcoal filter at air pipe.

– Detach vacuum hose -3- from connection on air pipe.

– Loosen hose clips -arrows- and detach air pipe.

All vehicles (continued)



– Unplug relevant electrical connector -1-.
– Unscrew bolt -2- and detach valve.

Installing

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

Note

- *Renew O-rings after removing.*
- *Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .*

– Install engine cover panel
⇒ “3.1 Removing and installing engine cover panel”, page 64 .

Tightening torques

- ⇒ “4.1 Exploded view - valve gear”, page 165
- ⇒ Fig. ““Installing air pipes and hoses with screw-type clips””, page 285

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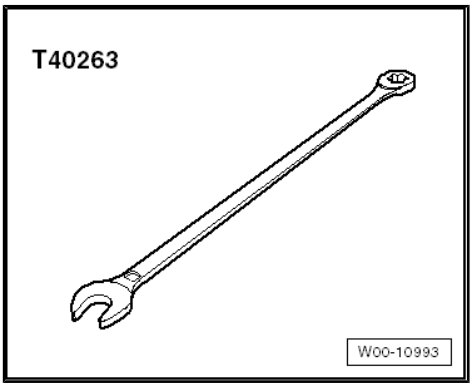
4.7 Checking hydraulic compensation elements

Note

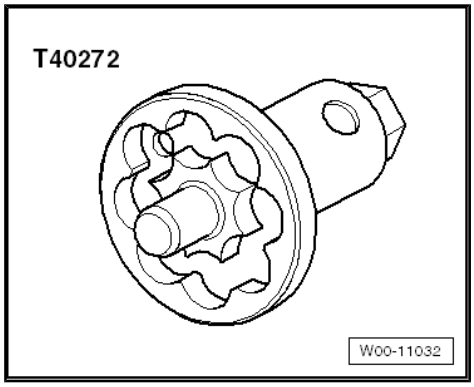
- *The hydraulic compensation elements cannot be serviced.*
- *Irregular valve noises when starting engine are normal.*

Special tools and workshop equipment required

- Feeler gauge
- Wrench, 21 mm - T40263-



♦ Turning-over tool - T40272-



Procedure

– Start engine and run until radiator fan has started up once.

– Increase engine speed to approx. 2500 rpm for 2 minutes (perform road test if necessary).

– If the compensation elements are still noisy, locate the defective compensation element as follows:

WARNING

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

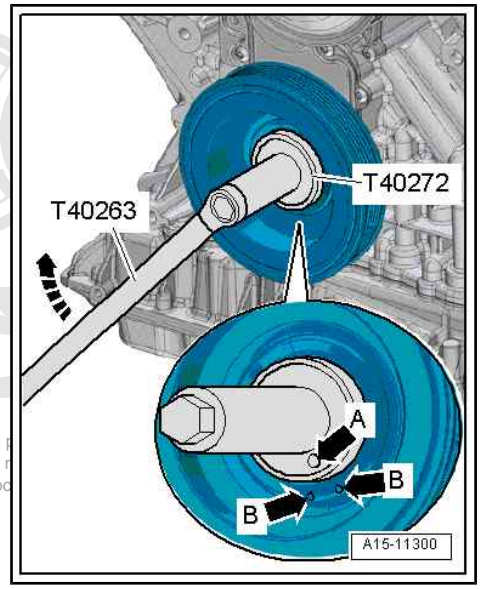
- ***Even when the ignition is switched off, the radiator fans can start up without warning due to accumulated heat in the engine compartment, etc.***

– Remove corresponding cylinder head cover
⇒ "3.3 Removing and installing cylinder head cover", page 161 .

– Fit turning-over tool - T40272- onto wrench (21 mm) - T40263- .

– Position adapter on bolts of vibration damper.

• Hole -arrow A- on turning-over tool - T40272- must be positioned between markings -arrows B- on vibration damper.



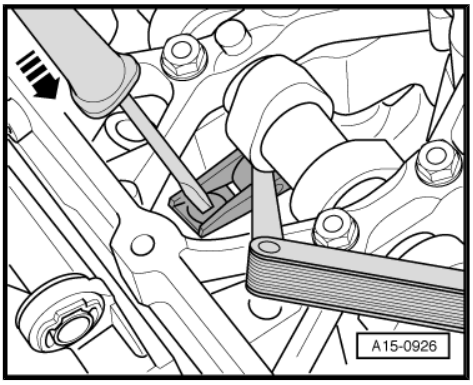
Note

If necessary, remove radiator fan control unit.

– Turn crankshaft with wrench (21 mm) - T40263- and turning-over tool - T40272- in normal direction of engine rotation -arrow- until cam of hydraulic compensation element to be checked is at top.

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– Press roller rocker finger down -arrow- to determine clearance between cam and roller rocker finger.
– If it is possible to insert a feeler gauge of 0.20 mm between cam and roller rocker finger, renew hydraulic compensation element
⇒ “4.4 Removing and installing camshaft”, page 170 .



Additional steps required

– Install cylinder head cover
⇒ “3.3 Removing and installing cylinder head cover”, page 161 .

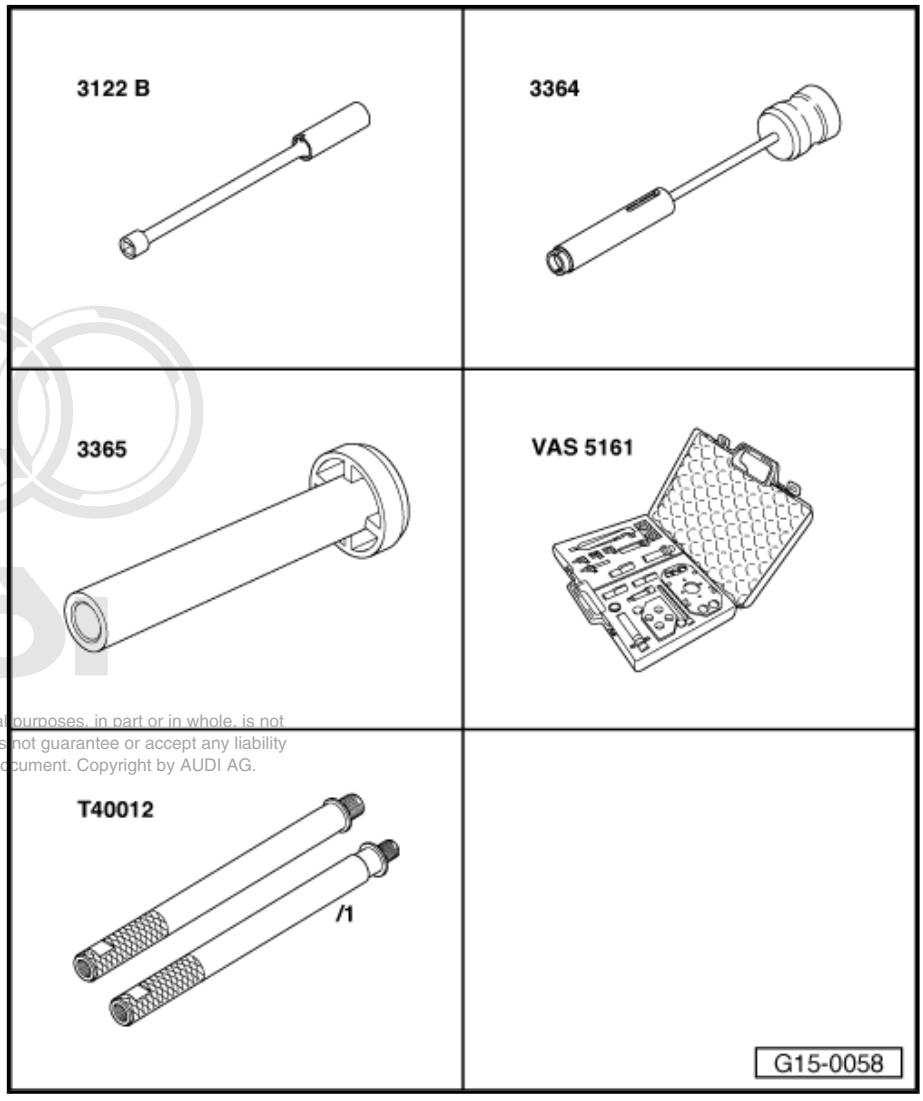
4.8 Removing and installing valve stem oil seals

⇒ “4.8.1 Removing and installing valve stem oil seals (cylinder head installed)”, page 181

⇒ “4.8.2 Removing and installing valve stem oil seals (cylinder head removed)”, page 185

4.8.1 Removing and installing valve stem oil seals (cylinder head installed)

Special tools and workshop equipment required



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- Spark plug spanner - 3122 B-
- Valve stem seal puller - 3364-
- Valve stem seal fitting tool - 3365-
- Removal and installation device for valve cotters - VAS 5161 A- with guide plate -VAS 5161/19C- , or substitute -VAS 5161/19B-
- Adapters - T40012-

Procedure

– Remove camshafts
⇒ “4.4 Removing and installing camshaft”, page 170 .

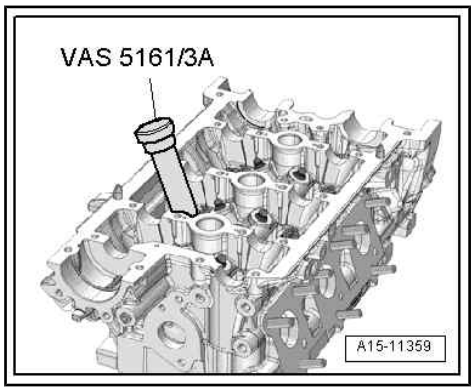
– Mark original positions of roller rocker fingers and hydraulic compensation elements for re-installation.

– Remove roller rocker fingers together with hydraulic compensation elements and put down on a clean surface.

– Unscrew spark plugs using spark plug socket - 3122 B- .

– Set piston of appropriate cylinder to “bottom dead centre”.

– Apply drift -VAS 5161/3A- to valve spring plate and use plastic-headed hammer to release sticking valve cotters.



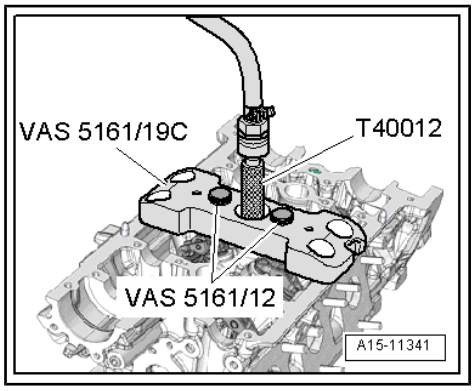
– Fit guide plate -VAS 5161/19C- from removal and installation device for valve cotters - VAS 5161 A- on cylinder head.

– Secure guide plate with knurled screws -VAS 5161/12- .

– Screw adapter - T40012- with seal hand-tight into the corresponding spark plug thread.

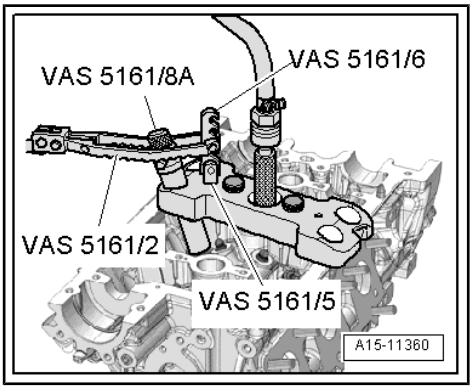
– Connect adapter to compressed air line using a commercially available connection piece and apply constant air pressure.

• Minimum pressure: 6 bar



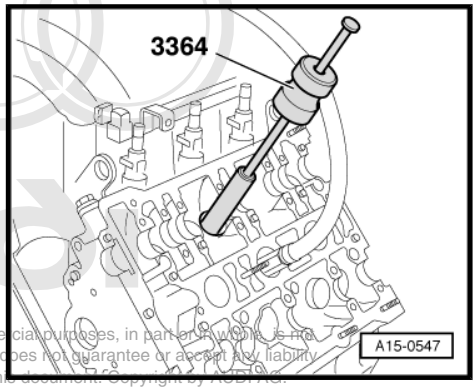
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– Screw snap-in device -VAS 5161/6- with engaging fork -VAS 5161/5- into guide plate.
– Insert assembly cartridge -VAS 5161/8A- in guide plate.
– Attach pressure fork -VAS 5161/2- to snap-in device and push assembly cartridge down.
– At the same time, turn knurled screw of assembly cartridge clockwise until tips engage in valve cotters.
– Move knurled screw back and forth slightly; the valve cotters are thus forced apart and taken up by the assembly cartridge.
– Release pressure fork.
– Take out assembly cartridge.
– Detach guide plate and turn to one side.



• The compressed air hose remains connected.

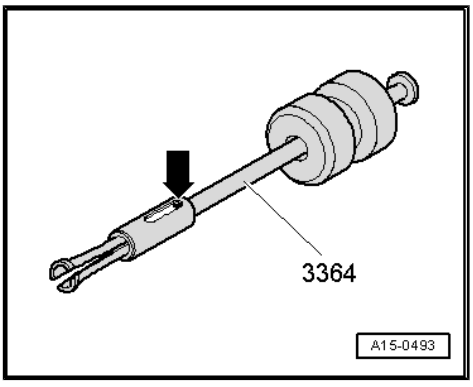
– Detach valve spring with valve spring plate.
– Pull off valve stem oil seal with valve stem seal puller - 3364- .



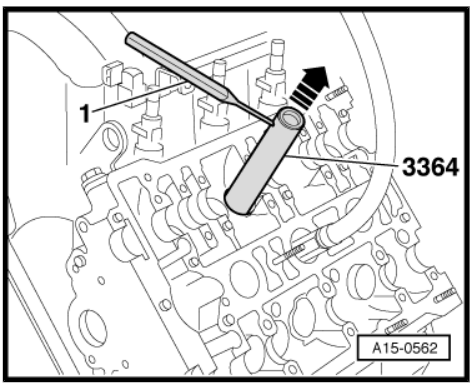
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If the puller -3364- cannot be used on some of the valve stem oil seals due to the confined space, proceed as follows:

– Knock out pin -arrow- of puller using a drift and remove impact extractor attachment.



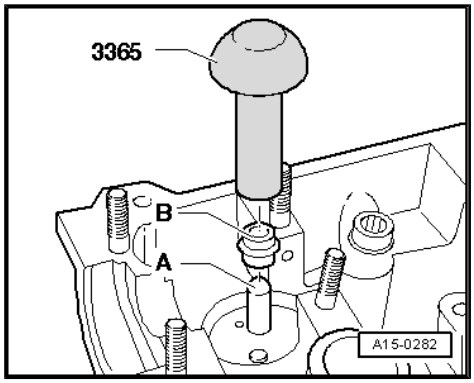
– Apply bottom section of puller -3364- to valve stem oil seal.
– Secure puller with a punch or roll-pin drift -1-, as shown in illustration.
– Apply assembly lever to puller and pull out valve stem oil seal -arrow-.



Caution

Make sure valve stem oil seals are not damaged when installing.

- *New valve stem oil seals -B- are supplied with plastic sleeve; fit plastic sleeve -A- onto valve stem.*



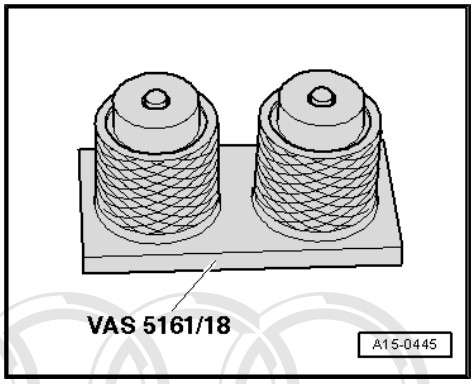
– Lightly oil sealing lip of valve stem oil seal.

– Slide valve stem oil seal onto plastic sleeve.

– Carefully press valve stem oil seal onto valve guide using valve stem seal fitting tool - 3365- .

– Take off plastic sleeve.

If valve cotters had been removed from assembly cartridge they must first be inserted in insertion device -VAS 5161/18- .



• Larger diameter of valve cotters faces upwards.

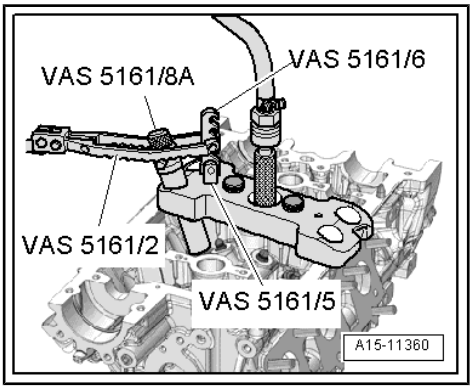
– Press assembly cartridge onto insertion device from above and pick up valve cotters.

– Insert valve spring and valve spring plate.

• Installation position of valve spring
⇒ Fig. ““Installation position of valve spring”“ , page 168 .

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– Secure guide plate -VAS 5161/19C- back onto cylinder head.
– Insert assembly cartridge in guide plate.
– Press down pressure fork and pull knurled screw upwards while turning screw in both directions - this will insert the valve cotters.
– Release pressure fork with knurled screw still in pulled position.
– Repeat procedure for each valve.



Installing

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

– Ensure that all roller rocker fingers make contact with the ends of the valve stems correctly and are clipped onto their respective hydraulic compensation elements.
– Install spark plugs ⇒ Maintenance ; Booklet 411 .
– Install camshafts
⇒ “4.4 Removing and installing camshaft”, page 170 .

Caution

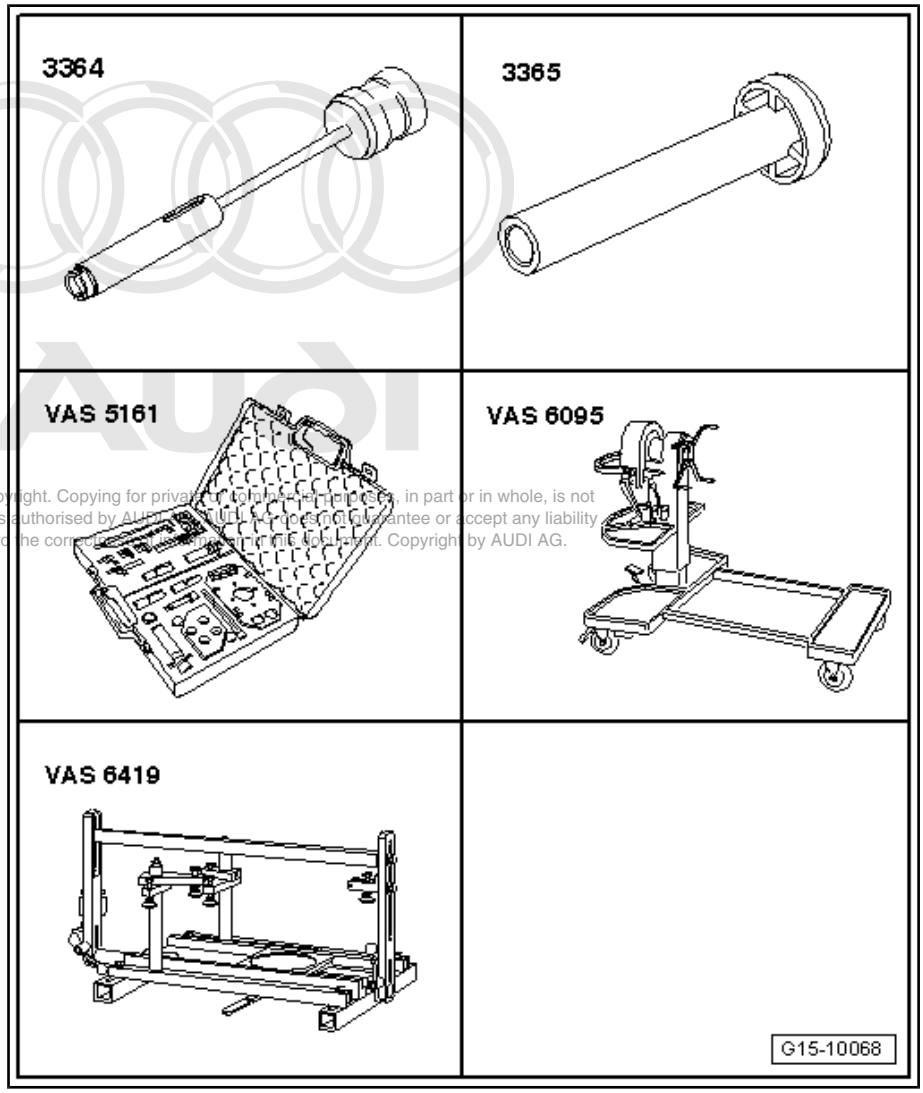
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Risk of damage to valves and piston crowns after working on valve gear.

- ***The hydraulic tappets have to settle; wait for approx. 30 minutes after installing camshafts before starting engine.***
- ***Turn the engine carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.***

4.8.2 Removing and installing valve stem oil seals (cylinder head removed)

Special tools and workshop equipment required



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- Valve stem seal puller - 3364-
- Valve stem seal fitting tool - 3365-
- Removal and installation device for valve cotters - VAS 5161 A- with guide plate -VAS 5161/19C- , or substitute -VAS 5161/19B-
- Engine and gearbox support - VAS 6095-
- Cylinder head tensioning device - VAS 6419-

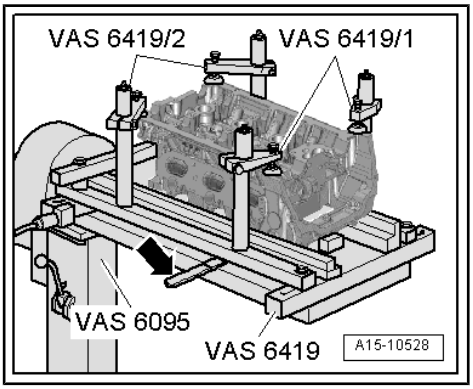
Procedure

– Remove camshafts
⇒ “4.4 Removing and installing camshaft”, page 170 .

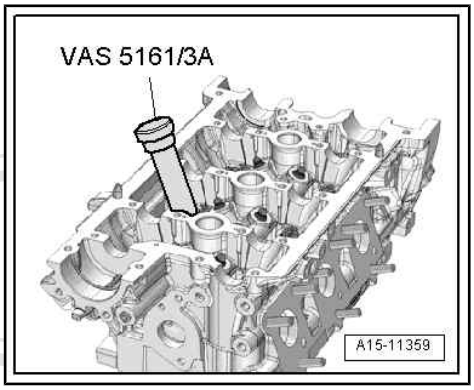
– Mark original positions of roller rocker fingers and hydraulic compensation elements for re-installation.

– Remove roller rocker fingers together with hydraulic compensation elements and put down on a clean surface.

– Insert cylinder head tensioning device - VAS 6419- into engine and gearbox support - VAS 6095- .
– Secure cylinder head in cylinder head tensioning device, as shown in illustration.
– Connect cylinder head tensioning device to compressed air supply.
– Using lever -arrow-, slide air pad under combustion chamber where valve stem oil seal is to be removed.
– Apply just enough compressed air to bring air pad into contact with valve heads.

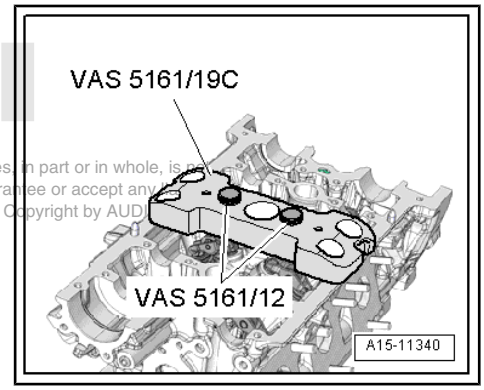


– Apply drift -VAS 5161/3A- to valve spring plate and use plastic-headed hammer to release sticking valve cotters.

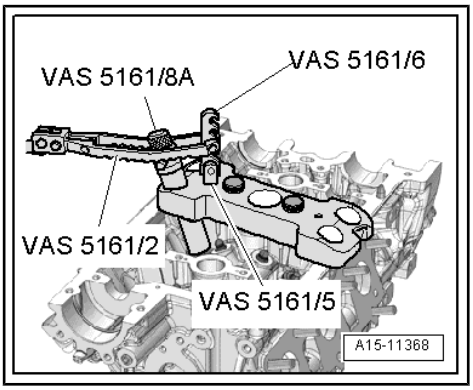


– Fit guide plate -VAS 5161/19C- onto cylinder head.
– Secure guide plate with knurled screws -VAS 5161/12- .

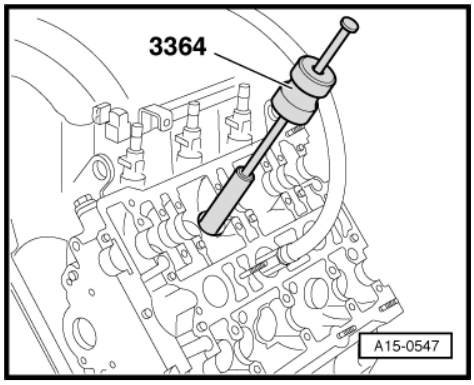
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– Screw snap-in device -VAS 5161/6- with engaging fork - VAS 5161/5- into guide plate.
– Insert assembly cartridge -VAS 5161/8A- in guide plate.
– Attach pressure fork -VAS 5161/2- to snap-in device and push assembly cartridge down.
– At the same time, turn knurled screw of assembly cartridge clockwise until tips engage in valve cotters.
– Move knurled screw back and forth slightly; the valve cotters are thus forced apart and taken up by the assembly cartridge.
– Release pressure fork.
– Take out assembly cartridge.
– Detach guide plate and turn to one side.
– Detach valve spring with valve spring plate.



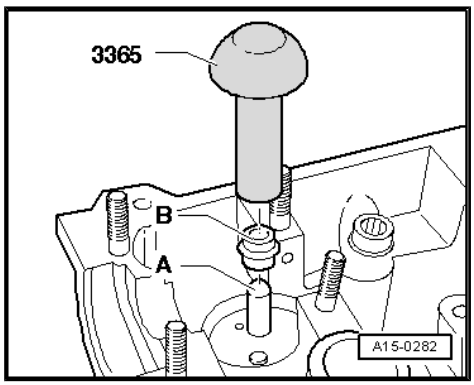
– Pull off valve stem oil seal with valve stem seal puller - 3364- .



Caution

Make sure valve stem oil seals are not damaged when installing.

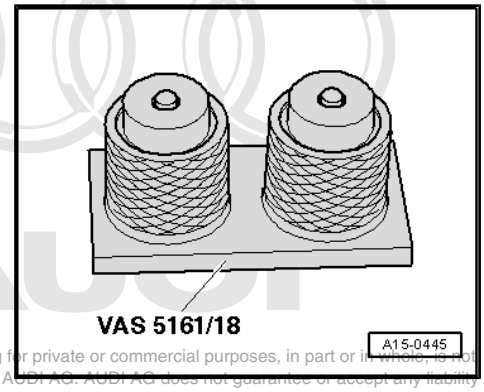
- *New valve stem oil seals -B- are supplied with plastic sleeve; fit plastic sleeve -A- onto valve stem.*



– Lightly oil sealing lip of valve stem oil seal.
– Slide valve stem oil seal onto plastic sleeve.
– Carefully press valve stem oil seal onto valve guide using valve stem seal fitting tool - 3365- .
– Take off plastic sleeve.

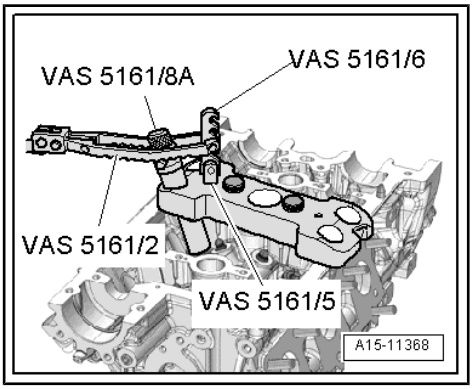
If valve cotters have been removed from assembly cartridge, they must first be inserted in insertion device -VAS 5161/18- .

• Larger diameter of valve cotters faces upwards.
– Press assembly cartridge onto insertion device from above and pick up valve cotters.
– Insert valve spring and valve spring plate.
• Installation position of valve spring
⇒ Fig. ""Installation position of valve spring"" , page 168 .



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– Secure guide plate -VAS 5161/19C- back onto cylinder head.
– Insert assembly cartridge in guide plate.
– Press down pressure fork and pull knurled screw upwards while turning screw in both directions - this will insert the valve cotters.
– Release pressure fork with knurled screw still in pulled position.
– Repeat procedure for each valve.



Installing

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

– Ensure that all roller rocker fingers make contact with the ends of the valve stems correctly and are clipped onto their respective hydraulic compensation elements.
– Install camshafts
⇒ “4.4 Removing and installing camshaft”, page 170 .

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5 Inlet and exhaust valves

⇒ “5.1 Checking valve guides”, page 190

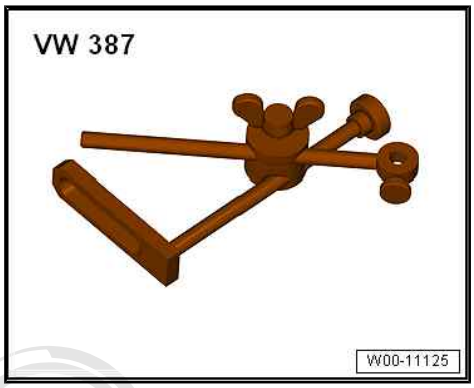
⇒ “5.2 Checking valves”, page 191

⇒ “5.3 Valve dimensions”, page 191

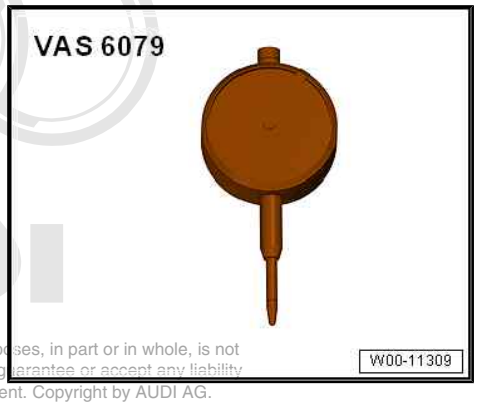
5.1 Checking valve guides

Special tools and workshop equipment required

- Universal dial gauge bracket - VW 387-



- Dial gauge - VAS 6079-



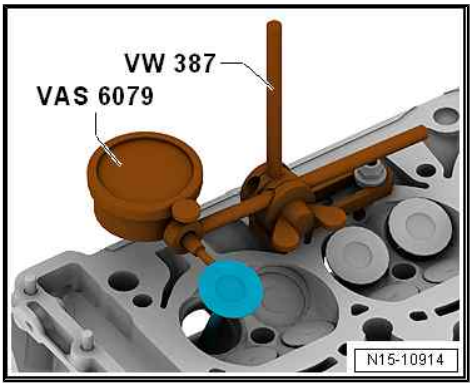
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Procedure

Note

- *If the valve has to be renewed as part of a repair, use a new valve for the measurement.*
- *Only insert inlet valve into inlet valve guide and exhaust valve into exhaust valve guide, as the stem diameters are different.*

– Secure dial gauge - VAS 6079- to cylinder head with universal dial gauge bracket - VW 387- as shown in illustration.
– Insert valve into guide.
• End of valve stem must be flush with valve guide.
– Measure the amount of sideways play.
• Wear limit: 0.8 mm.
– If the wear limit is exceeded, repeat the measurement with new valves.
– Renew cylinder head if wear limit is still exceeded.



Note

Valve guides cannot be renewed.

5.2 Checking valves

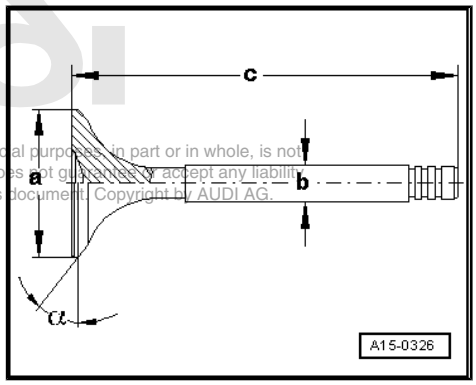
– Visually inspect for scoring on valve stems and contact surfaces.
– Renew valve if scoring is clearly visible.

5.3 Valve dimensions

Note

Inlet and exhaust valves must not be machined. Only grinding-in is permitted.

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Dimension		Inlet valve		Exhaust valve	
		2.5 ltr. engine	2.8 ltr. engine	2.5 ltr. engine	2.8 ltr. engine
∅ a	mm	32.35 ± 0.10	33.85 ± 0.10	28.0 ± 0.1	28.0 ± 0.1
∅ b	mm	5.98 ± 0.01	5.98 ± 0.01	5.96 ± 0.01	5.96 ± 0.01
c	mm	104.97 ± 0.20	103.97 ± 0.20	102.87 ± 0.20	101.87 ± 0.2
α	∠°	45	45	45	45

WARNING

- *Care must be taken when disposing of old sodium-cooled exhaust valves.*
- *The valves must be sawn in two with a metal saw between the centre of the stem and valve head. When doing so, the valves must not come into contact with water. After preparing the valves, throw a maximum of ten into a bucket of water. Then step away immediately, since a chemical reaction will occur in which the sodium filling burns.*
- *After performing these steps the valves can be disposed of in the normal way.*

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17 – Lubrication

1 Sump/oil pump

⇒ “1.1 Exploded view - sump/oil pump”, page 193

⇒ “1.2 Engine oil”, page 196

⇒ “1.3 Removing and installing sump (bottom section)”, page 196

⇒ “1.4 Removing and installing sump (top section)”, page 199

⇒ “1.5 Removing and installing oil pump”, page 202

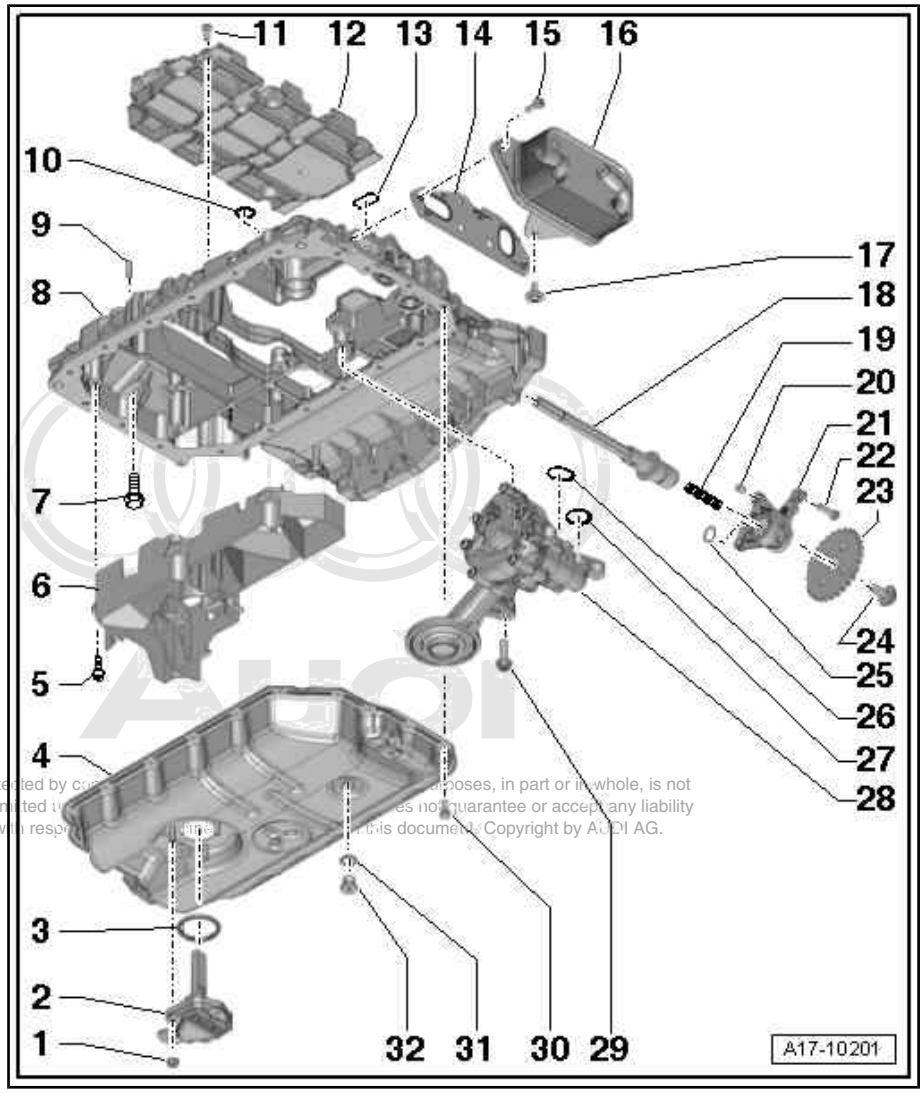
⇒ “1.6 Removing and installing oil level and oil temperature sender G266 ”, page 202

1.1 Exploded view - sump/oil pump

Note

- *If large quantities of metal shavings or abrasion are found when performing engine repairs, this may be an indication of damage to the crankshaft or conrod bearings. To prevent further damage, the following steps are required after completion of repair work: clean the oil passages carefully and renew the oil spray jets, engine oil cooler and oil filter.*
- *Oil spray jet for piston cooling ⇒ Fig. ““Oil spray jet for piston cooling”“ , page 92 .*

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1 - Nut

- ❑ 9 Nm

2 - Oil level and oil temperature sender - G266-

- ❑ Removing and installing ⇒ “1.6 Removing and installing oil level and oil temperature sender G266 ”, page 202

3 - Seal

- ❑ Renew

4 - Sump (bottom section)

- ❑ Removing and installing ⇒ “1.3 Removing and installing sump (bottom section)”, page 196

5 - Bolt

- ❑ Renew
- ❑ 3 Nm +90°

6 - Baffle plate (bottom)

7 - Bolt

- ❑ Tightening torque and sequence ⇒ Fig. ““Sump (top section) - tightening torque and sequence”“ , page 196

8 - Sump (top section)

- ❑ Removing and installing ⇒ “1.4 Removing and installing sump (top section)”, page 199

9 - Dowel sleeve

- ❑ 2x

10 - O-ring

- ❑ Renew
- ❑ Insert in retaining frame

11 - Bolt

- ❑ Renew
- ❑ Apply locking fluid when installing; refer to ⇒ Electronic parts catalogue
- ❑ 3 Nm +90°

12 - Baffle plate (top)

13 - Gasket

- ❑ Insert in retaining frame
- ❑ Renew

14 - Gasket

- ❑ Renew

15 - Bolt

- ❑ Renew
- ❑ 3 Nm +90°

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16 - Engine oil cooler
- ❑ With oil cooler bypass valve
- ❑ See note ⇒ page 193
- ❑ Removing and installing ⇒ “2.1 Removing and installing engine oil cooler”, page 203

17 - Bolt
- ❑ 9 Nm

18 - Drive shaft
- ❑ For oil pump

19 - Compression spring

20 - Distance sleeve
- ❑ 2x

21 - Bracket

22 - Bolt
- ❑ 9 Nm

23 - Chain sprocket
- ❑ For oil pump
- ❑ Can only be fitted in one position on drive shaft

24 - Bolt
- ❑ Renew
- ❑ To loosen and tighten, use pin wrench - 3212- to counterhold chain sprocket
- ❑ 30 Nm +90°

25 - O-ring
- ❑ Renew

26 - Gasket
- ❑ Renew

27 - O-ring
- ❑ Renew

28 - Oil pump
- ❑ Do not dismantle
- ❑ Removing and installing ⇒ “1.5 Removing and installing oil pump”, page 202

29 - Bolt
- ❑ 20 Nm

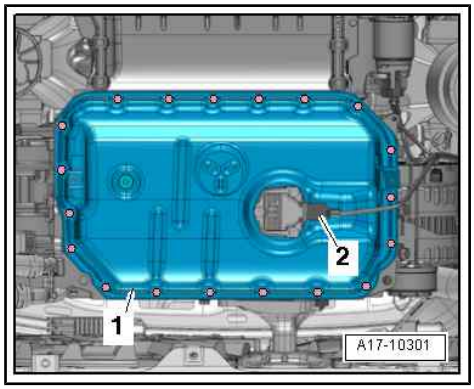
30 - Bolt
- ❑ Renew
- ❑ Tightening torque and sequence
  ⇒ Fig. ““Sump (bottom section) - tightening torque and sequence”“ , page 196

31 - Seal
- ❑ Renew

32 - Oil drain plug
- ❑ 30 Nm

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Sump (bottom section) - tightening torque and sequence



Note

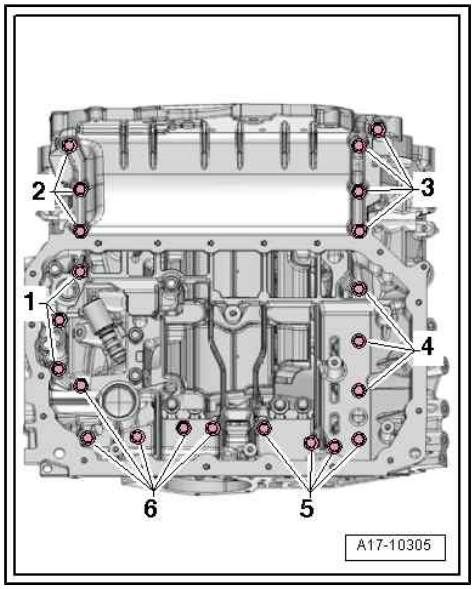
Renew the bolts tightened with specified tightening angle.

– Tighten bolts in 2 stages as follows:

Stage	Tightening torque/angle specification
1.	8 Nm in diagonal sequence
2.	Turn 90° further in diagonal sequence

Sump (top section) - tightening torque and sequence

– Tighten bolts to 20 Nm in the sequence shown.



Note

Depending on version, -item 3- comprises 3 or 4 bolts.

1.2 Engine oil

Refer to ⇒ Maintenance tables for engine oil capacity, oil specifications and viscosity grades.

Caution

Risk of damage to catalytic converter.

- ***The oil level must not be above the "MAX" mark on the dipstick.***

1.3 Removing and installing sump (bottom section)

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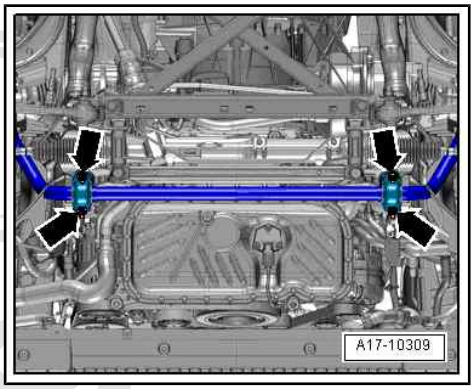
Special tools and workshop equipment required

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

Removing

- Engine oil drained ⇒ Maintenance ; Booklet 411

– Remove nuts -arrows- and lower anti-roll bar.

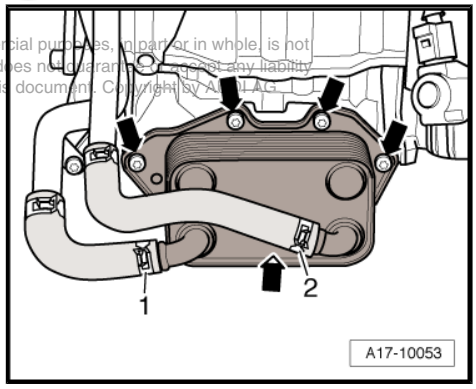


Note

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Lay a cloth under the engine oil cooler to catch escaping engine oil.

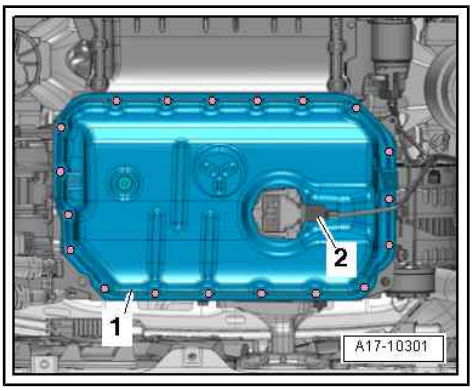
– Remove bolts -arrows- and tie up engine oil cooler to one side with coolant hoses -1- and -2- attached.



– Unplug electrical connector -2- at oil level and oil temperature sender - G266- and move electrical wiring clear.

– Remove bolts for sump (bottom section) -1-.

– Release sump (bottom section) from bonded joint, taking care not to bend sump.



Installing

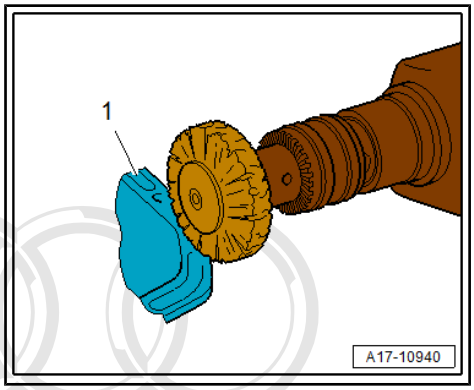
Note

- *Renew seals.*
- *The sump (bottom section) must be renewed if its coating is damaged or if it is bent.*

Caution

Protect lubrication system and bearings against contamination.

- *Cover exposed parts of the engine.*



WARNING

Risk of eye injury.

- *Put on safety goggles.*

– Remove remaining sealant on bottom section and top section of sump -1- with a rotating plastic brush or similar.

Note

Take care not to damage the coating on the sump (bottom section).

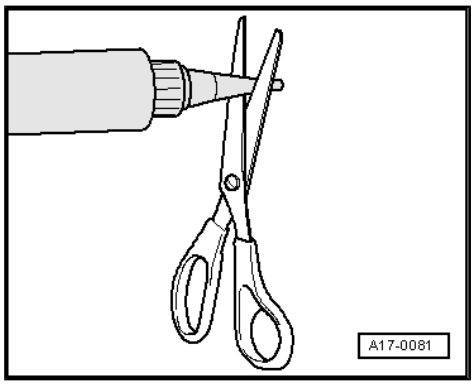
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– Clean surfaces; they must be free of oil and grease.

Note

Note the use-by date of the sealant.

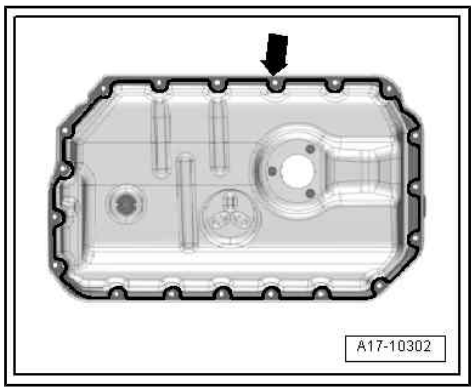
– Cut off nozzle of tube at front marking (nozzle ∅ approx. 1 mm).



Caution

Make sure lubrication system is not clogged by excess sealant.

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



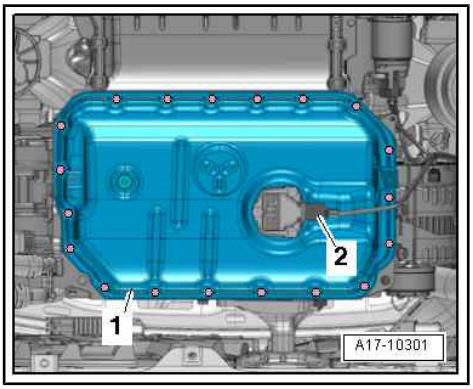
– Apply bead of sealant -arrow- onto clean sealing surface of sump (bottom section) as illustrated.

- Width of sealant bead: approx. 1.5 mm.

Note

The sump (bottom section) must be installed within 5 minutes after applying the sealant.

– Fit sump (bottom section) and tighten bolts
⇒ Fig. ""Sump (bottom section) - tightening torque and sequence"" , page 196 .



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

– Install engine oil cooler
⇒ "2.1 Removing and installing engine oil cooler", page 203 .

– Fill with engine oil and check oil level ⇒ Maintenance ; Booklet 411 .

Tightening torques

- ⇒ Fig. ""Sump (bottom section) - tightening torque and sequence"" , page 196
- Anti-roll bar ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Exploded view - subframe

1.4 Removing and installing sump (top section)

Special tools and workshop equipment required

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

Removing

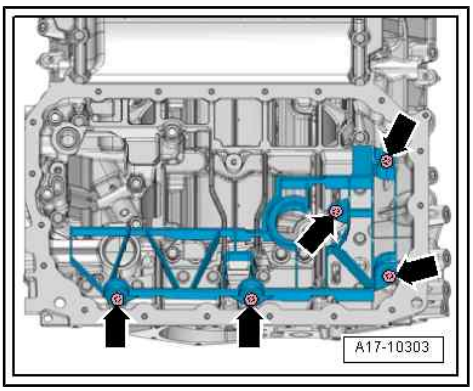
• Engine secured to engine and gearbox support - VAS 6095-
⇒ "1.3 Securing engine to engine and gearbox support", page 41

– Remove timing chain cover (bottom)
⇒ "1.2.2 Removing and installing timing chain cover (bottom)", page 102 .

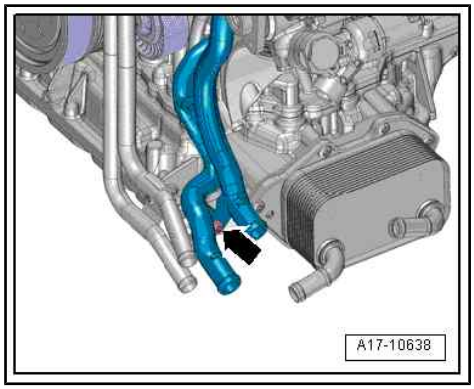
– Remove oil pump
⇒ "1.5 Removing and installing oil pump", page 202 .

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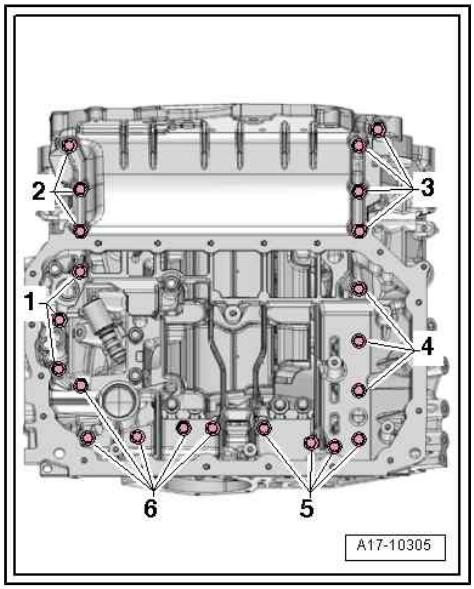
– Remove bolts -arrows- and detach baffle plate (bottom).



– Remove bolt -arrow- for coolant pipes (left-side).



– Remove bolts -1 ... 6- for sump (top section).



Note

Depending on version, -item 3- comprises 3 or 4 bolts.

– Carefully release sump (top section) from bonded joint and pry sump off dowel pins on cylinder block.

Installing

Note

Renew gasket and O-ring.

Caution

Protect lubrication system and bearings against contamination.

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

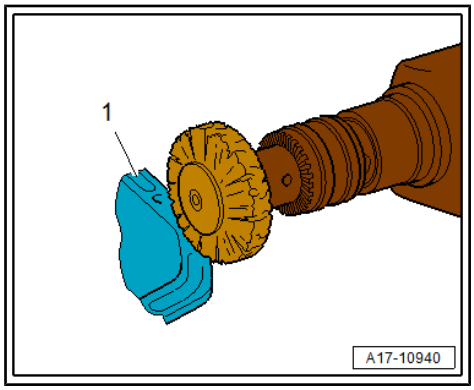
– Remove old sealant from grooves on sump (top section) and from sealing surfaces.

WARNING

Risk of eye injury.

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

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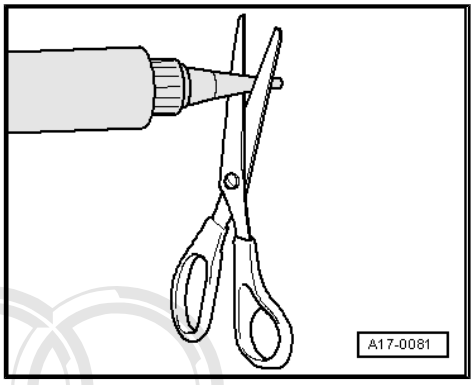
– Remove sealant residue from sump (top section) -1- and cylinder block using rotating plastic brush or similar.

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

Note

Note the use-by date of the sealant.

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



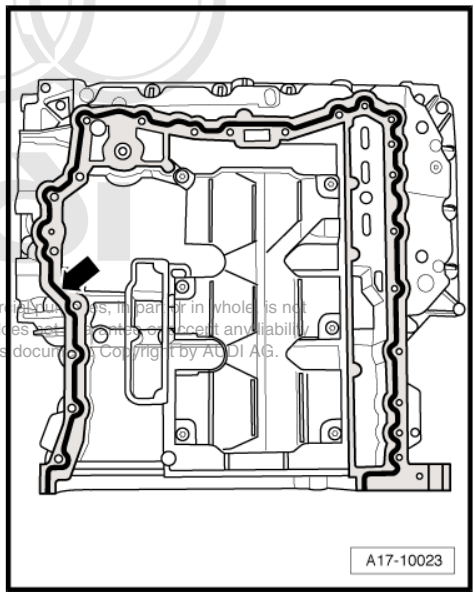
Caution

Make sure lubrication system is not clogged by excess sealant.

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

– Apply bead of sealant -arrow- onto clean sealing surface of sump (top section) as shown in illustration.

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



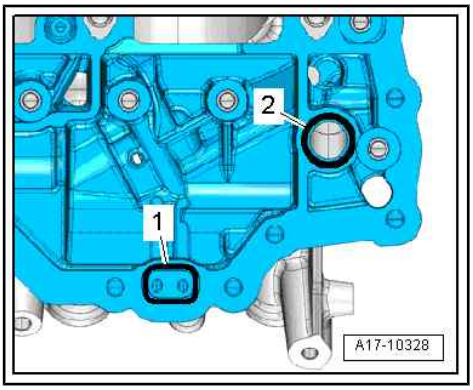
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Note

The sump (top section) must be installed within 5 minutes after applying the sealant.

– Fit seal -1- and O-ring -2- in retaining frame.

– Check that dowel sleeves are fitted, fit sump (top section) and tighten bolts
⇒ Fig. ""Sump (top section) - tightening torque and sequence"" , page 196 .



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

– Install coolant pipes (left-side)
⇒ "3.2.1 Removing and installing coolant pipes (left-side)", page 239 .

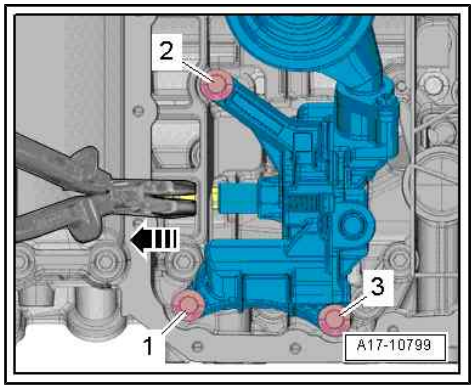
– Install oil pump
⇒ "1.5 Removing and installing oil pump", page 202 .

– Install timing chain cover (bottom)
⇒ "1.2.2 Removing and installing timing chain cover (bottom)", page 102 .

Tightening torques

- ⇒ "1.1 Exploded view - sump/oil pump", page 193
- ⇒ Fig. ""Sump (top section) - tightening torque and sequence"" , page 196

1.5 Removing and installing oil pump



Removing

– Remove sump (bottom section)
⇒ “1.3 Removing and installing sump (bottom section)”, page 196 .

– Remove bolts -1, 2, 3-.

– Using long-nose pliers, push drive shaft back slightly against spring pressure -arrow- and pull oil pump towards front off of drive shaft.

Installing

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

Note

Renew gasket and O-ring.

– Fit oil pump onto drive shaft and tighten bolts.

– Install sump (bottom section)
⇒ “1.3 Removing and installing sump (bottom section)”, page 196 .

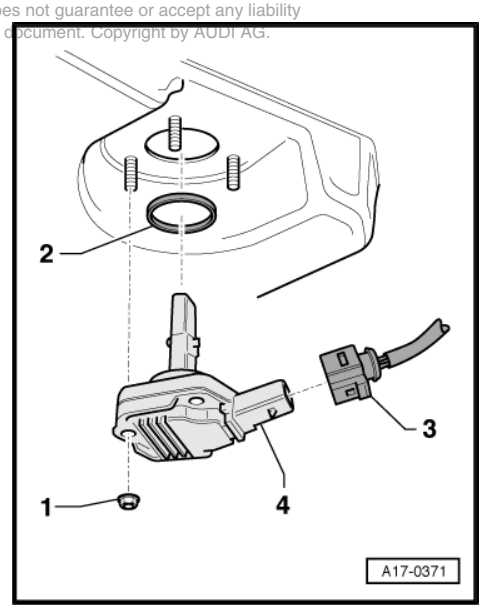
– Fill with engine oil and check oil level ⇒ Maintenance ; Booklet 411 .

Tightening torques

◆ ⇒ “1.1 Exploded view - sump/oil pump”, page 193

1.6 Removing and installing oil level and oil temperature sender - G266-

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Removing

• Engine oil drained ⇒ Maintenance ; Booklet 411

– Unplug electrical connector -3-.

– Remove nuts -1- and detach oil level and oil temperature sender - G266- -item 4-.

Installing

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

Note

Renew seal -2-.

– Fill with engine oil and check oil level ⇒ Maintenance ; Booklet 411 .

Tightening torques

◆ ⇒ “1.1 Exploded view - sump/oil pump”, page 193

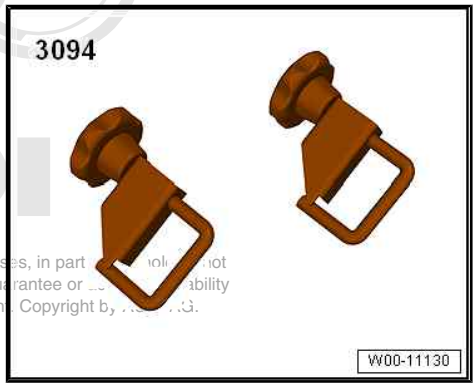
2 Engine oil cooler

⇒ “2.1 Removing and installing engine oil cooler”, page 203

2.1 Removing and installing engine oil cooler

Special tools and workshop equipment required

- Hose clamps, up to 25 mm - 3094-

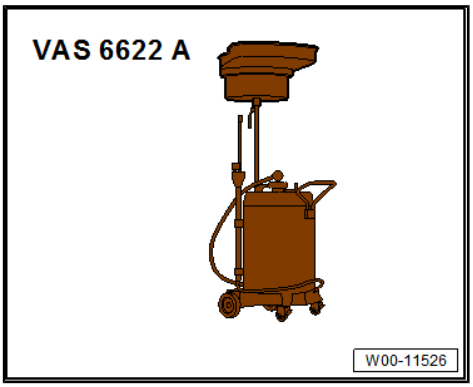


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- Drip tray for workshop hoist - VAS 6208-



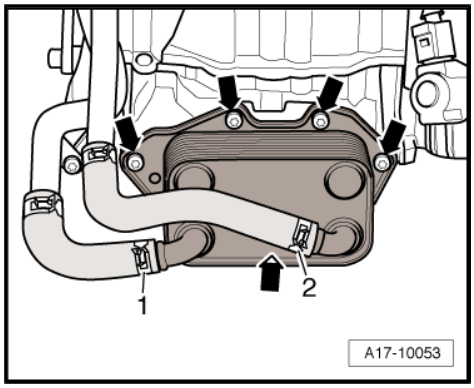
- Used oil collection and extraction unit - VAS 6622A-



Removing

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

– Place drip tray for workshop hoist - VAS 6208- beneath engine.
– Use hose clamps -3094- to clamp off coolant hoses -1- and -2-.
– Detach coolant hose -1- and, if necessary, -2- from engine oil cooler; release hose clip to do so.
– Place used oil collection and extraction unit - VAS 6622A- underneath.
– Unscrew bolts -arrows- and detach engine oil cooler.



Installing

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

Note

- *Renew gasket.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

– Check oil level ⇒ Maintenance ; Booklet 411 .

Note

Do not reuse coolant.

– Fill up with coolant ⇒ page 223 .

Tightening torques

- ⇒ “1.1 Exploded view - sump/oil pump”, page 193
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

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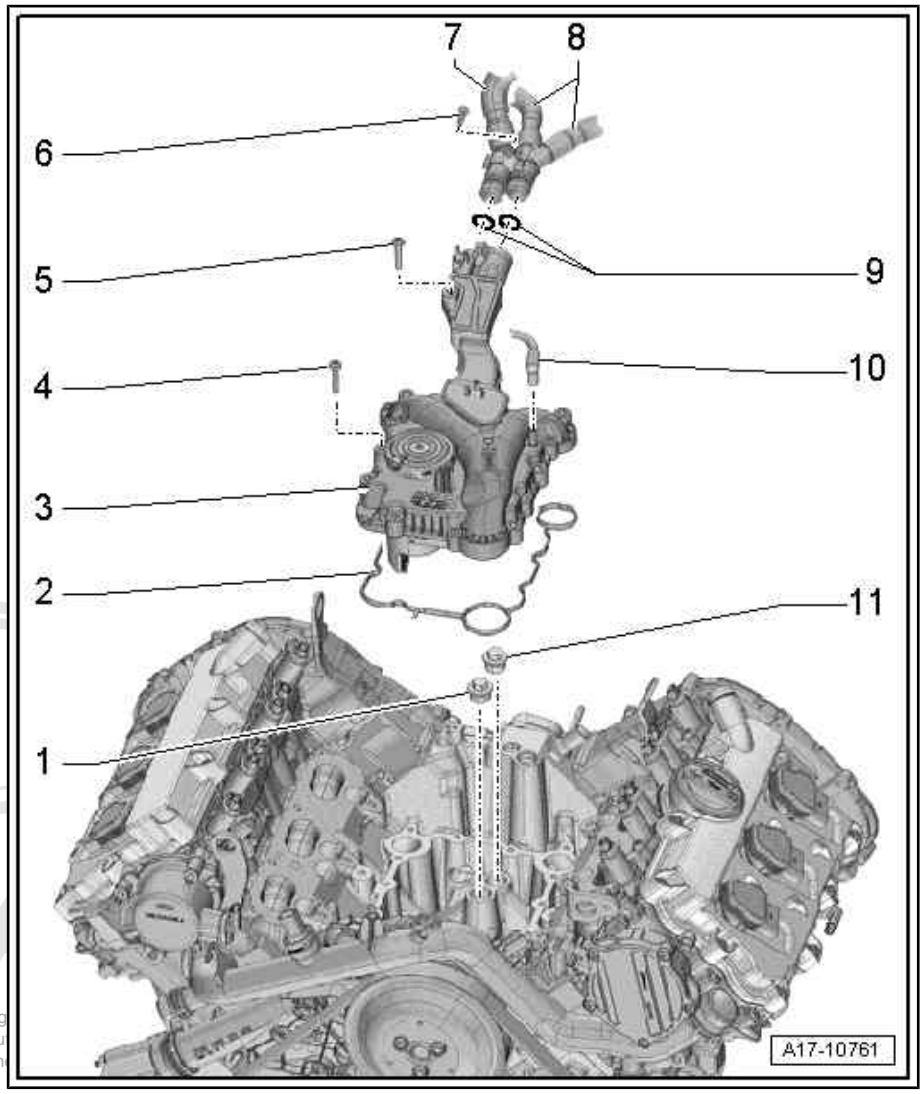
3 Crankcase breather

⇒ “3.1 Exploded view - crankcase breather system”, page 205

⇒ “3.2 Removing and installing crankcase breather hoses”, page 206

⇒ “3.3 Removing and installing oil separator”, page 206

3.1 Exploded view - crankcase breather system



1 - Plug
- ❑ 20 Nm

2 - Gasket
- ❑ Renew

3 - Cover with oil separator
- ❑ With connection for crankcase breather
- ❑ Removing and installing ⇒ “3.3 Removing and installing oil separator”, page 206

4 - Bolt
- ❑ 9 Nm

5 - Bolt
- ❑ 9 Nm

6 - Bolt
- ❑ 2.5 Nm

7 - Crankcase breather hose
- ❑ To intake manifold
- ❑ Removing and installing ⇒ “3.2 Removing and installing crankcase breather hoses”, page 206

8 - Crankcase breather hoses
- ❑ To cylinder head covers
- ❑ Removing and installing ⇒ “3.2 Removing and installing crankcase breather hoses”, page 206

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9 - O-rings
- ❑ Renew

10 - Crankcase breather hose
- ❑ To air pipe

11 - Plug
- ❑ 20 Nm

3.2 Removing and installing crankcase breather hoses

Removing

Note

Fit all cable ties in the original positions when installing.

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Vehicles with 2.5 ltr. engine:

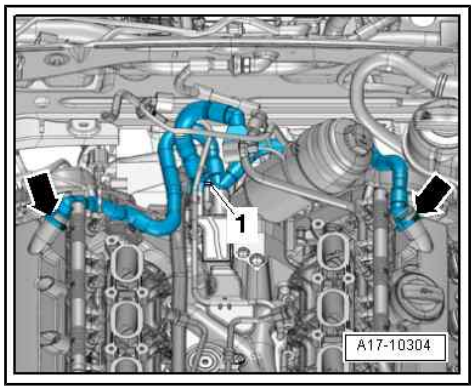
– Remove intake manifold
⇒ “3.3 Removing and installing intake manifold”, page 292 .

Vehicles with 2.8 ltr. engine:

– Remove intake manifold (top section)
⇒ “3.4 Removing and installing intake manifold (top section)”, page 294 .

Continued for all vehicles:

– Detach crankcase breather hoses -arrows- from cylinder head covers.



Note

On USA models, it is not possible to detach crankcase breather hoses from cylinder head covers without damaging hoses. Renew crankcase breather hoses after removal.

– Move crankcase breather hoses clear.

– Remove bolt -1- and detach connection with crankcase breather hoses.

Installing

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

Note

Renew gaskets and O-rings.

– Install intake manifold
⇒ “3.3 Removing and installing intake manifold”, page 292 /
install intake manifold (top section)
⇒ “3.4 Removing and installing intake manifold (top section)”, page 294 .

Tightening torques

♦ ⇒ “3.1 Exploded view - crankcase breather system”, page 205

3.3 Removing and installing oil separator

Removing

– Remove crankcase breather hoses
⇒ “3.2 Removing and installing crankcase breather hoses”, page 206 .

Vehicles with 2.8 ltr. engine:

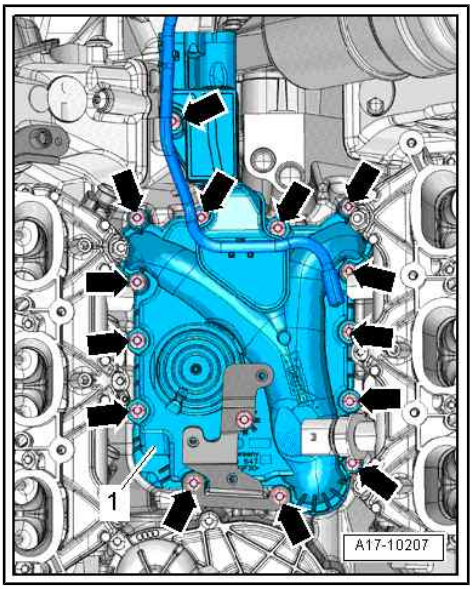
– Remove intake manifold (bottom section, left-side)
⇒ “3.5 Removing and installing intake manifold (bottom section)”, page 296 .

Continued for all vehicles:

– Remove coolant pipe (top)
⇒ “3.2.4 Removing and installing coolant pipe (top)”, page 244 .

– Remove bolts -arrows-.

– Detach bracket for high-pressure pipes and oil separator -1-.



Installing

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

Note

Renew gasket.

– Install coolant pipe (top)
⇒ “3.2.4 Removing and installing coolant pipe (top)”, page 244 .

– Install intake manifold (bottom section, left-side)
⇒ “3.5 Removing and installing intake manifold (bottom section)”, page 296 .

– Install crankcase breather hoses
⇒ “3.2 Removing and installing crankcase breather hoses”, page 206 .

Tightening torques

♦ ⇒ “3.1 Exploded view - crankcase breather system”, page 205

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4 Oil filter/oil pressure switches

⇒ “4.1 Exploded view - oil filter housing/oil pressure switches”, page 208

⇒ “4.2 Removing and installing oil pressure switch F22 ”, page 209

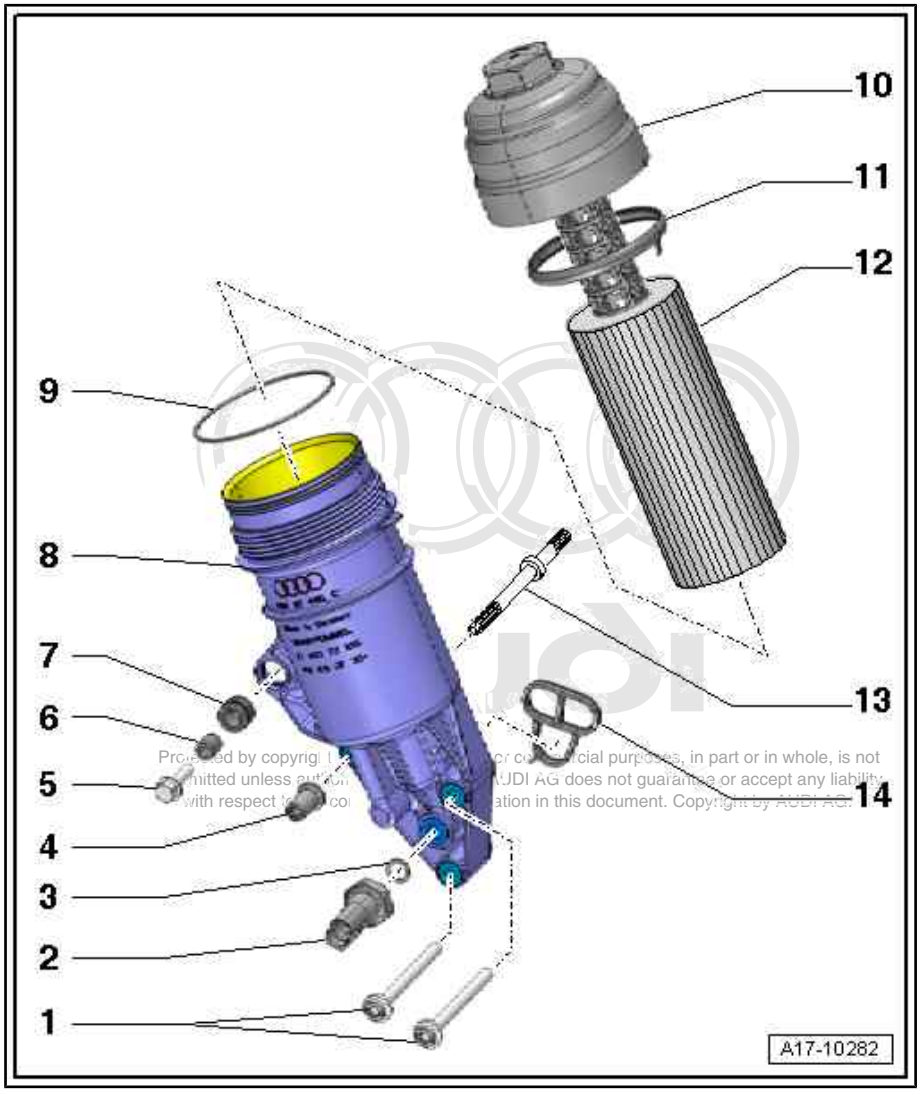
⇒ “4.3 Removing and installing oil pressure switch for reduced oil pressure F378 ”, page 210

⇒ “4.4 Checking oil pressure”, page 211

⇒ “4.5 Removing and installing oil filter housing”, page 212

⇒ “4.6 Removing and installing valve for oil pressure control N428 ”, page 214

4.1 Exploded view - oil filter housing/oil pressure switches



1 - Bolt
- ❑ 13 Nm

2 - Oil pressure switch - F22-
- ❑ Opening/closing pressure 2.5 ... 3.2 bar
- ❑ With grey insulation
- ❑ Check in Guided Fault Finding ⇒ Vehicle diagnostic tester
- ❑ Removing and installing ⇒ “4.2 Removing and installing oil pressure switch F22 ”, page 209
- ❑ 20 Nm

3 - Seal
- ❑ Renew

4 - Flange nut
- ❑ 13 Nm

5 - Bolt
- ❑ 9 Nm

6 - Distance sleeve

7 - Rubber grommet

8 - Oil filter housing
- ❑ With filter bypass valve
- ❑ With oil retention valve
- ❑ The oil retention valve cannot be renewed

9 - O-ring
- ❑ Renew
- ❑ Installing ⇒ Fig. ““Installing O-ring on oil filter housing”“ , page 209

10 - Filler cap
- ❑ 25 Nm

11 - Seal
- ❑ Renew

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❑ Removing and installing ⇒ Fig. ""Renewing seal on sealing cap"" , page 209

12 - Oil filter element

❑ Removing and installing ⇒ Maintenance ; Booklet 411

13 - Bolt

❑ 16 Nm

14 - Gasket

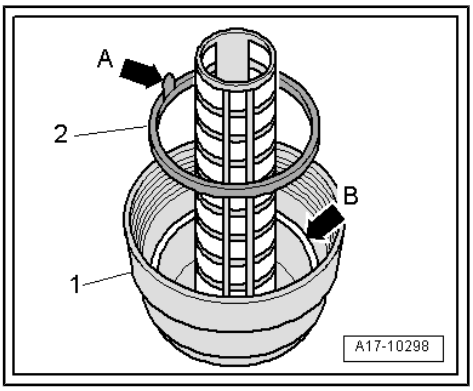
❑ Renew

Renewing seal on sealing cap

– Take hold of tab -arrow A- and pull seal -2- out of sealing cap -1-.

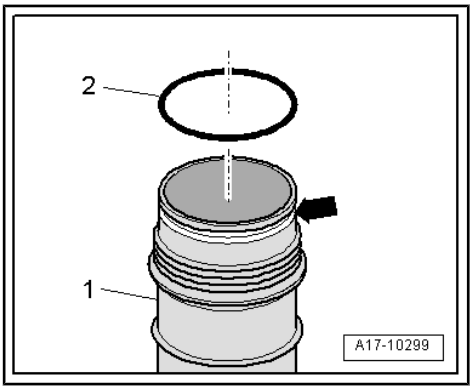
– Install new seal so that semi-circular profile fits in groove -arrow B- in sealing cap.

• Lug -arrow A- must point upwards.



Installing O-ring on oil filter housing

– Fit O-ring -2- in groove -arrow- on oil filter housing -1-.



Oil pressure switch for reduced oil pressure - F378-

1 - Oil pressure switch for reduced oil pressure - F378-

2 - Electrical connector

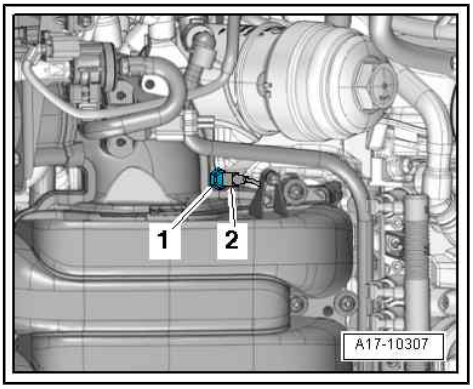
♦ Opening/closing pressure 0.75 ... 1.05 bar

♦ With grey insulation

♦ Check in Guided Fault Finding ⇒ Vehicle diagnostic tester

♦ Removing and installing ⇒ page 210

♦ 20 Nm



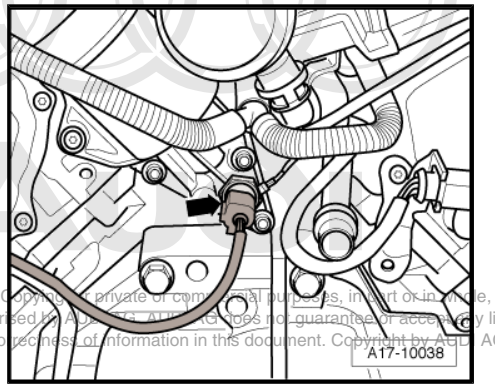
4.2 Removing and installing oil pressure switch - F22-

Removing

– Remove engine cover panel ⇒ "3.1 Removing and installing engine cover panel", page 64 .

Note

Place a cloth beneath the oil filter housing to catch escaping oil.



– Unplug electrical connector -arrow-.
– Unscrew oil pressure switch - F22- .

Installing

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

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Note

- *Renew seal.*
- *Fit the new oil pressure switch - F22- into the connection immediately to avoid loss of oil.*

– Check oil level ⇒ Maintenance ; Booklet 411 .

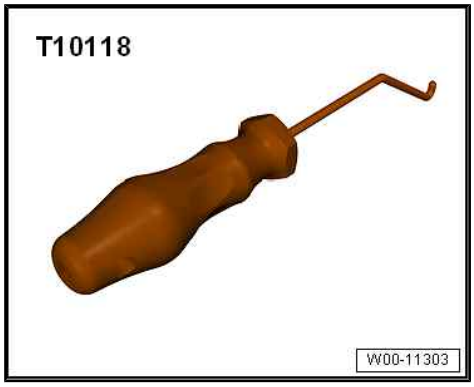
Tightening torques

- ⇒ “4.1 Exploded view - oil filter housing/oil pressure switches”, page 208

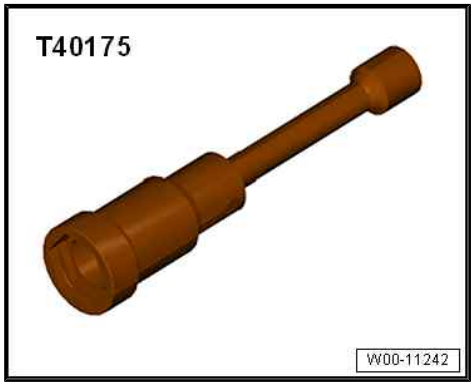
4.3 Removing and installing oil pressure switch for reduced oil pressure - F378-

Special tools and workshop equipment required

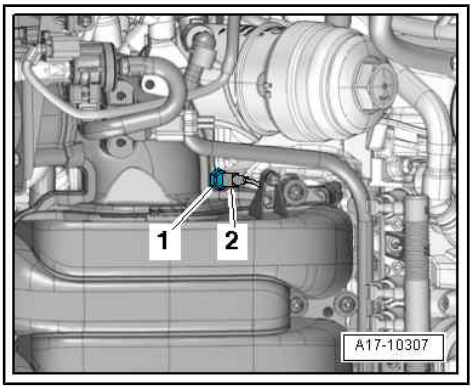
- Assembly tool - T10118-



- Articulated wrench, 24 mm - T40175-



Removing



– Remove engine cover panel (rear)
⇒ “3.1 Removing and installing engine cover panel”, page 64 .

– Press noise insulation to the side.

– Use assembly tool - T10118- to unplug electrical connector -2-.

– Use articulated wrench (24 mm) - T40175- to unscrew oil pressure switch for reduced oil pressure - F378- -item 1-.

Installing

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

Note

Renew seal.

– Install engine cover panel
⇒ “3.1 Removing and installing engine cover panel”, page 64 .

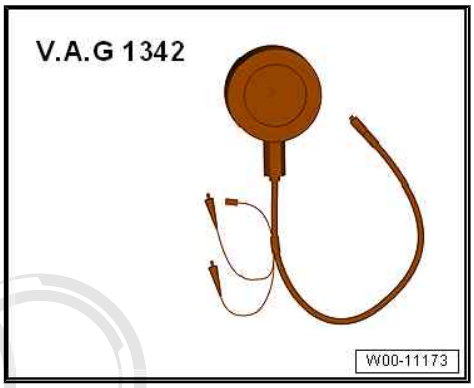
Tightening torques

◆ ⇒ Fig. “” Oil pressure switch for reduced oil pressure -F378- ”” , page 209

4.4 Checking oil pressure

Special tools and workshop equipment required

◆ Oil pressure tester - V.A.G 1342-



Procedure

• Oil level OK

• Engine oil temperature approx. 80 °C

– Remove oil pressure switch - F22-
⇒ “4.2 Removing and installing oil pressure switch F22 ”, page 209 .

– Connect oil pressure tester - V.A.G 1342- to bore for oil pressure switch.

– Screw oil pressure switch - F22- into oil pressure tester.

– Start engine.

• Minimum oil pressure at idling speed: 1.2 bar.

• Minimum oil pressure at 2000 rpm: 1.5 bar.

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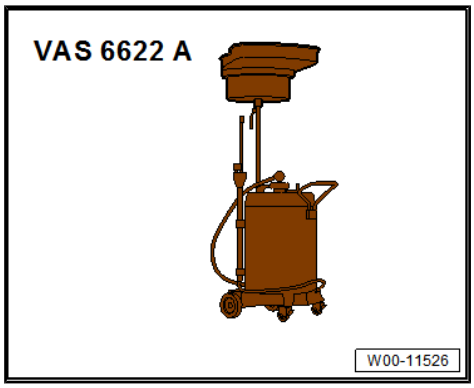
Installing

– Install oil pressure switch - F22-
⇒ “4.2 Removing and installing oil pressure switch F22 ”, page 209 .

4.5 Removing and installing oil filter housing

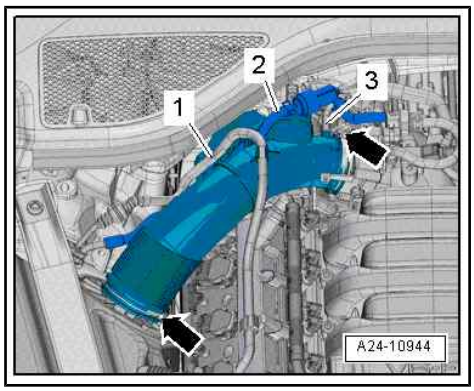
Special tools and workshop equipment required

♦ Used oil collection and extraction unit - VAS 6622A-

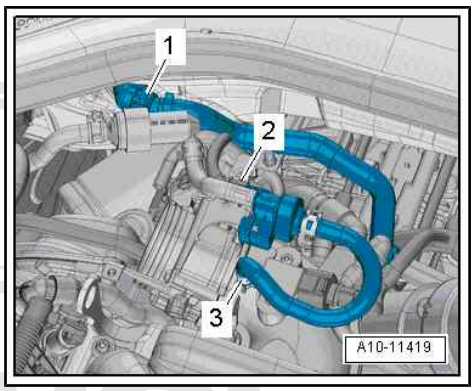


Removing

– Remove oil filter element ⇒ Maintenance ; Booklet 411 .
– Extract engine oil from oil filter housing using used oil collection and extraction unit - VAS 6622A- .
– Move fuel hose -1- and hose -2- from activated charcoal filter clear at air pipe.
– Detach vacuum hose -3- from connection on air pipe.
– Loosen hose clips -arrows- and detach air pipe.

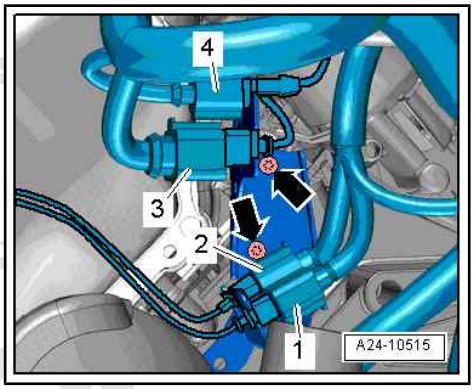


– Release hose clip -1- and disconnect vacuum hose from plenum chamber partition panel.
– Unplug electrical connector -2- at activated charcoal filter solenoid valve 1 - N80- and detach vacuum hose -3-.
– Detach activated charcoal filter solenoid valve 1 - N80- from bracket and move it clear to the side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



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– Detach electrical connectors -1 … 4- from bracket and move clear to side.
– Remove bolts -arrows- and bracket and move bracket clear.

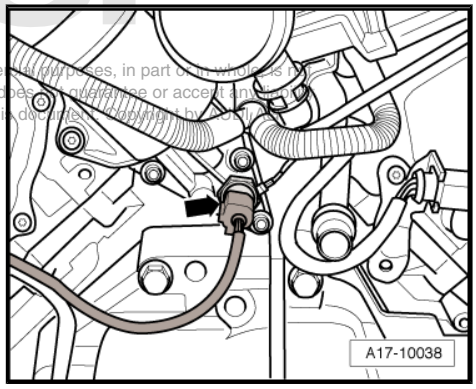


Note

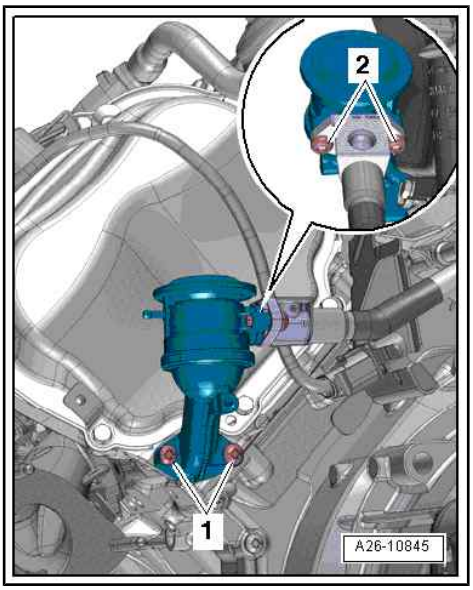
Place a cloth beneath the oil filter housing to catch escaping oil.

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– Unplug electrical connector -arrow- on oil pressure switch - F22- .



– Remove bolts -2- and push secondary air hose to rear.

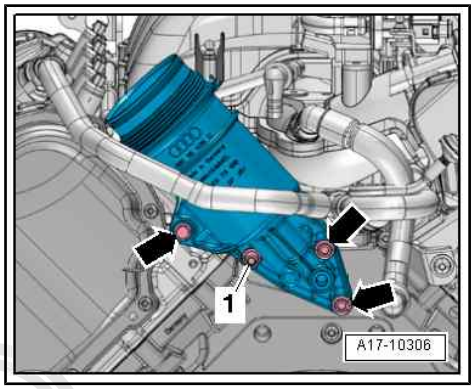


Note

Disregard -item 1-.

– Remove bolts -arrows-.

– Remove nut -1- and threaded pin, and detach oil filter housing.



Installing

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

Note

Renew seals, gasket and O-ring.

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

– Install oil filter element, fill up with engine oil and check oil level ⇒ Maintenance ; Booklet 411 .

Tightening torques

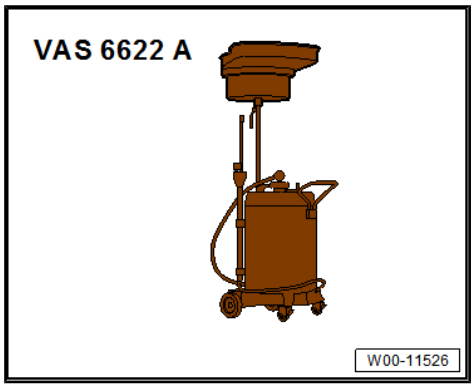
- ⇒ “4.1 Exploded view - oil filter housing/oil pressure switches”, page 208
- ⇒ “3.1 Exploded view - secondary air system”, page 352
- ⇒ Fig. ““Installing air pipes and hoses with screw-type clips”“ , page 285

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4.6 Removing and installing valve for oil pressure control - N428-

Special tools and workshop equipment required

- Used oil collection and extraction unit - VAS 6622A-

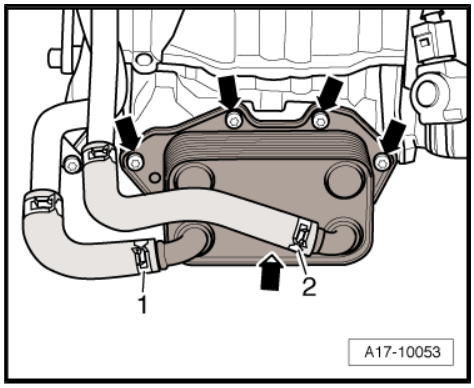


Removing

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

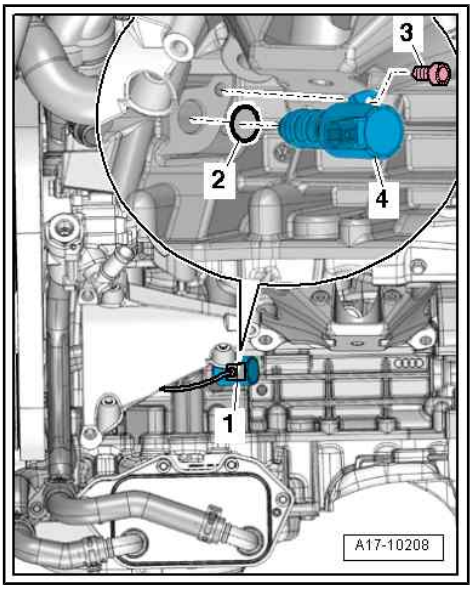
– Place used oil collection and extraction unit - VAS 6622A- underneath.

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



– Unplug electrical connector -1-.

– Remove bolt -3- and detach valve for oil pressure control - N428- -item 4-.



Installing

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

Note

Fit new O-ring -2-.

– Install engine oil cooler
⇒ “2.1 Removing and installing engine oil cooler”, page 203 .

Tightening torques

- ⇒ Fig. “” Valve for oil pressure control -N428- ”“ , page 83
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

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19 – Cooling

1 Cooling system/coolant

⇒ “1.1 Connection diagram - coolant hoses”, page 216

⇒ “1.2 Checking cooling system for leaks”, page 220

⇒ “1.3 Draining and filling cooling system”, page 221

1.1 Connection diagram - coolant hoses

⇒ “1.1.1 Connection diagram - coolant hoses, vehicles without auxiliary heater”, page 216

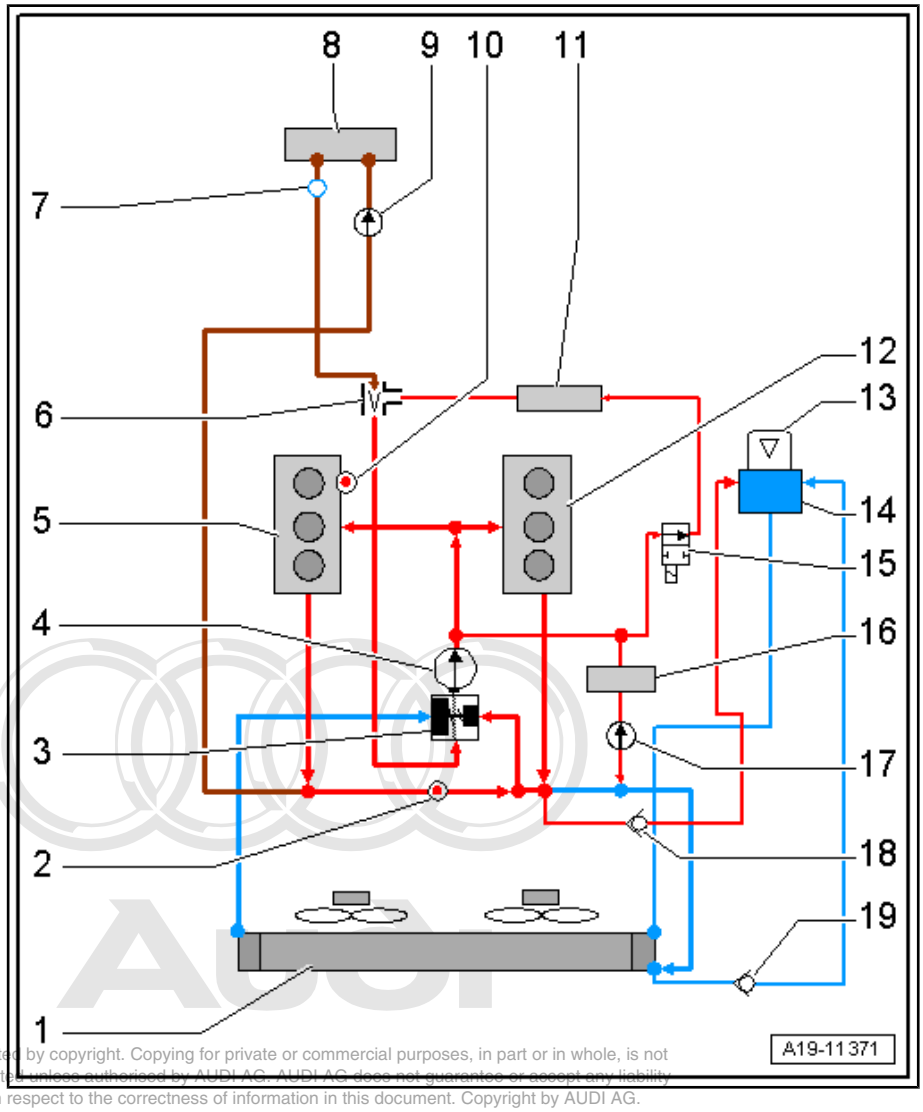
⇒ “1.1.2 Connection diagram - coolant hoses, vehicles with auxiliary heater”, page 218

1.1.1 Connection diagram - coolant hoses, vehicles without auxiliary heater

Note

- *Blue = Large coolant circuit.*
- *Red = Small coolant circuit.*
- *Brown = Heating circuit.*
- *Arrows show direction of coolant flow.*

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1 - Radiator

2 - Coolant temperature sender - G62-

3 - Thermostat

4 - Coolant pump

5 - Cylinder head

- ❑ Cylinder bank 1 (right-side)

6 - Suction-jet pump

- ❑ For vehicles with multitronic gearbox 0AW (front-wheel drive) or 7-speed dual clutch gearbox 0B5
- ❑ Colour of housing: grey

7 - Bleeder screw

8 - Heat exchanger for heater

- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Front air conditioning unit; Removing and installing heat exchanger

9 - Coolant circulation pump - V50-

- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Coolant circuit; Overview of fitting locations - coolant circuit

10 - Temperature sender for engine temperature regulation - G694-

11 - ATF cooler

- ❑ For vehicles with multitronic gearbox 0AW (front-wheel drive) or 7-speed dual clutch gearbox 0B5
- ❑ Removing and installing ⇒ Rep. gr. 34 ; ATF circuit; Removing and installing ATF cooler /⇒ Rep. gr. 37 ; ATF circuit; Removing and installing ATF cooler .

12 - Cylinder head

- ❑ Cylinder bank 2 (left-side)

13 - Filler cap

- ❑ Checking pressure relief valve ⇒ page 221

14 - Coolant expansion tank

15 - Gearbox oil cooling valve - N509-

- ❑ For vehicles with multitronic gearbox 0AW (front-wheel drive) or 7-speed dual clutch gearbox 0B5

16 - Engine oil cooler

17 - Continued coolant circulation pump - V51-

- ❑ On vehicles for hot countries only

18 - Non-return valve

- ❑ Located in coolant hose

19 - Non-return valve

- ❑ Located in coolant hose

1.1.2 Connection diagram - coolant hoses, vehicles with auxiliary heater

Note

- ♦ *Blue = Large coolant circuit.*
- ♦ *Red = Small coolant circuit.*
- ♦ *Brown = Heating circuit.*
- ♦ *Arrows show direction of coolant flow.*

1 - Radiator

2 - Coolant temperature sender - G62-

3 - Thermostat

4 - Auxiliary heater

- ❑ With circulation pump - V55-
- ❑ Removing and installing ⇒ Auxiliary/supplementary heater; Rep. gr. 82 ; Auxiliary/supplementary heater; Removing and installing auxiliary/supplementary heater

5 - Coolant pump

6 - Cylinder head

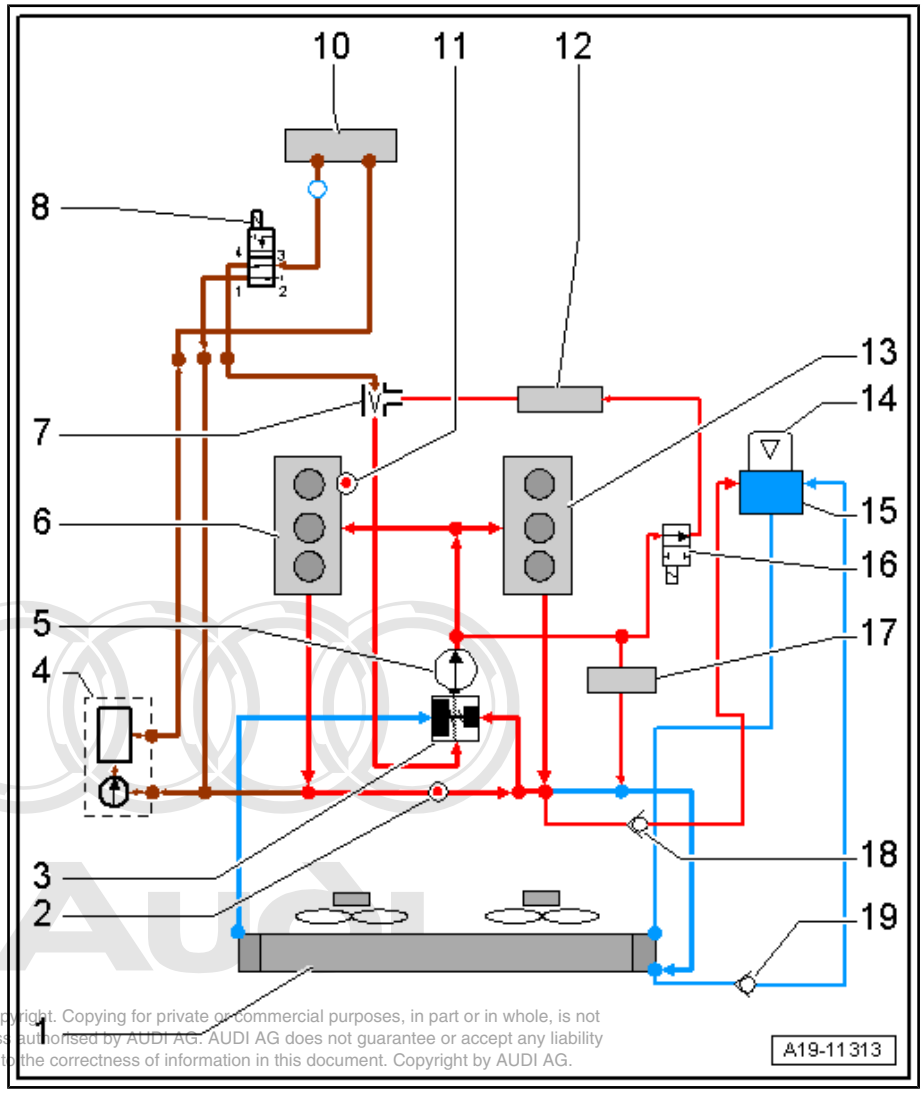
- ❑ Cylinder bank 1 (right-side)

7 - Suction-jet pump

- ❑ For vehicles with multitronic gearbox 0AW (front-wheel drive) or 7-speed dual clutch gearbox 0B5
- ❑ Colour of housing: grey

8 - Heater coolant shut-off valve - N279-

- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Coolant circuit; Overview of fitting locations - coolant circuit



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9 - Bleeder screw

10 - Heat exchanger for heater

- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Front air conditioning unit; Removing and installing heat exchanger

11 - Temperature sender for engine temperature regulation - G694-

12 - ATF cooler

- ❑ For vehicles with multitronic gearbox 0AW (front-wheel drive) or 7-speed dual clutch gearbox 0B5
- ❑ Removing and installing ⇒ Rep. gr. 34 ; ATF circuit; Removing and installing ATF cooler /⇒ Rep. gr. 37 ; ATF circuit; Removing and installing ATF cooler .

13 - Cylinder head

- ❑ Cylinder bank 2 (left-side)

14 - Filler cap

- ❑ Checking pressure relief valve ⇒ page 221

15 - Coolant expansion tank

16 - Gearbox oil cooling valve - N509-

- ❑ For vehicles with multitronic gearbox 0AW (front-wheel drive) or 7-speed dual clutch gearbox 0B5

17 - Engine oil cooler

18 - Non-return valve

- ❑ Located in coolant hose

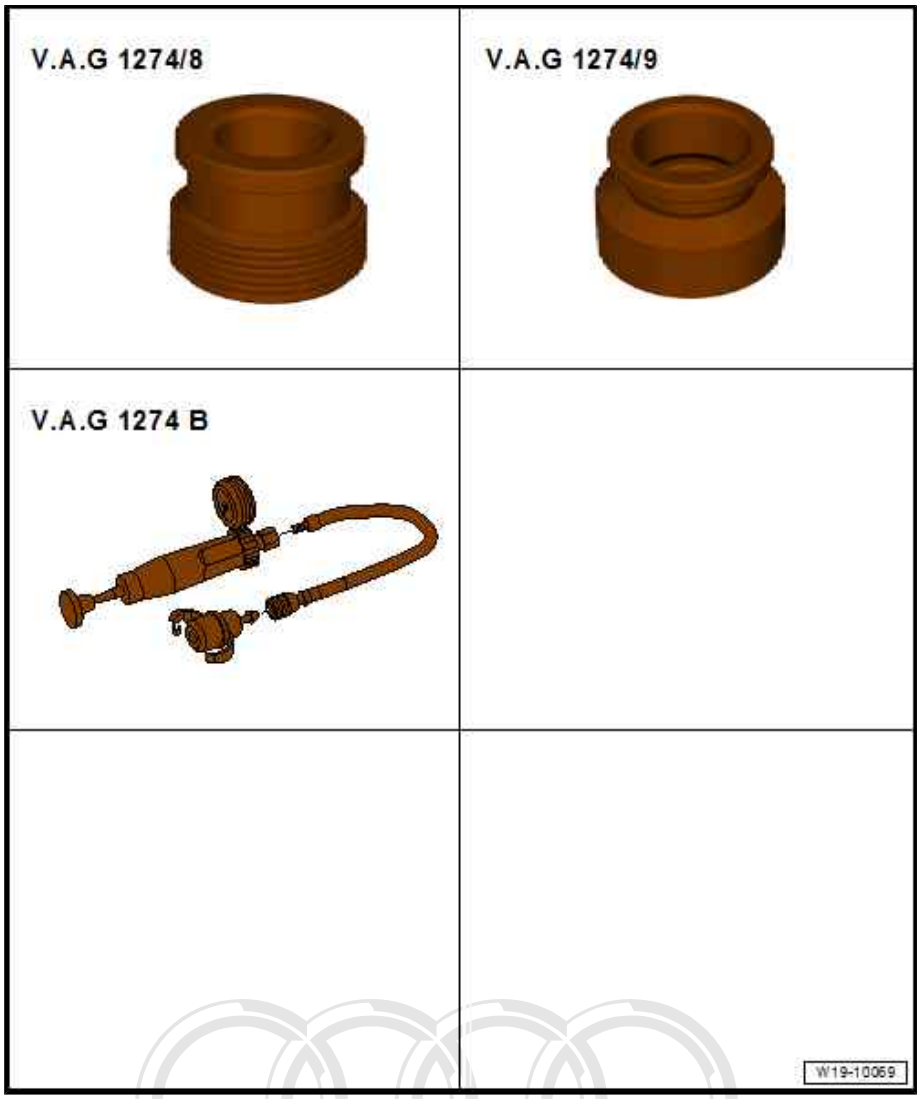
19 - Non-return valve

- ❑ Located in coolant hose

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1.2 Checking cooling system for leaks

Special tools and workshop equipment required



- Adapter for cooling system tester - V.A.G 1274/8-
- Adapter for cooling system tester - V.A.G 1274/9-
- Cooling system tester - V.A.G 1274 B-

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Procedure

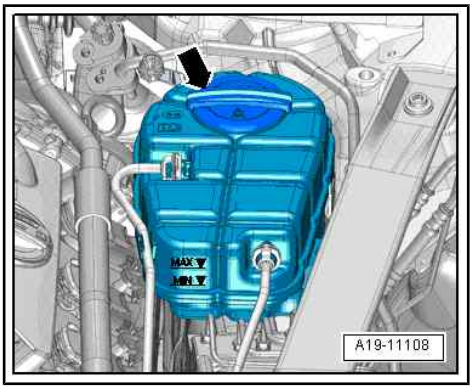
- Engine must be warm.

WARNING

The cooling system is under pressure when the engine is hot. Risk of scalding due to hot steam and hot coolant.

Danger of scalding skin and other parts of the body.

- *Put on protective gloves.*
- *Put on safety goggles.*
- *Cover filler cap on expansion tank with a cloth and open carefully to release pressure.*



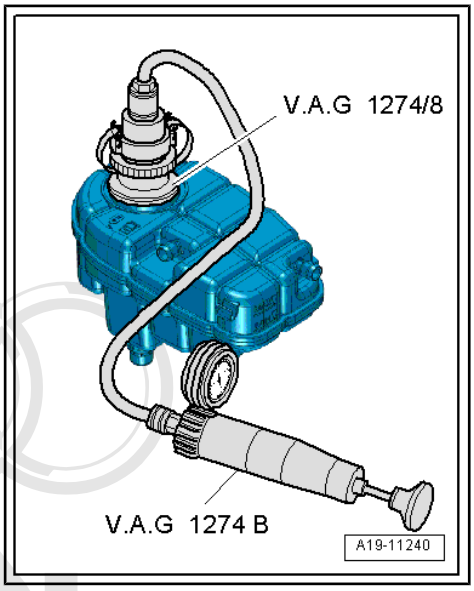
– Open filler cap -arrow- on coolant expansion tank.

– Fit cooling system tester - V.A.G 1274 B- with adapter - V.A.G 1274/8- onto coolant expansion tank.

– Using hand pump on cooling system tester, build up a pressure of approx. 1.5 bar.

- The pressure should not drop more than 0.2 bar within 10 minutes.

– If the pressure drops more than 0.2 bar, locate leak and eliminate fault.



Note

The drop in pressure of 0.2 bar within 10 minutes is caused by the decrease in coolant temperature. The colder the engine is, the less the pressure will fall. If necessary, check again when the engine is cold.

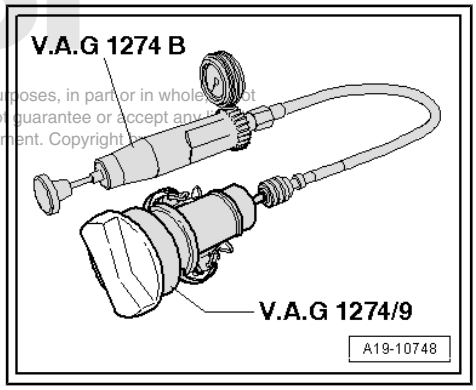
Checking pressure relief valve in filler cap

– Fit cooling system tester - V.A.G 1274 B- with adapter - V.A.G 1274/9- onto filler cap.

– Build up pressure with hand pump on cooling system tester.

- The pressure relief valve should open at a pressure of 1.4 ... 1.6 bar.

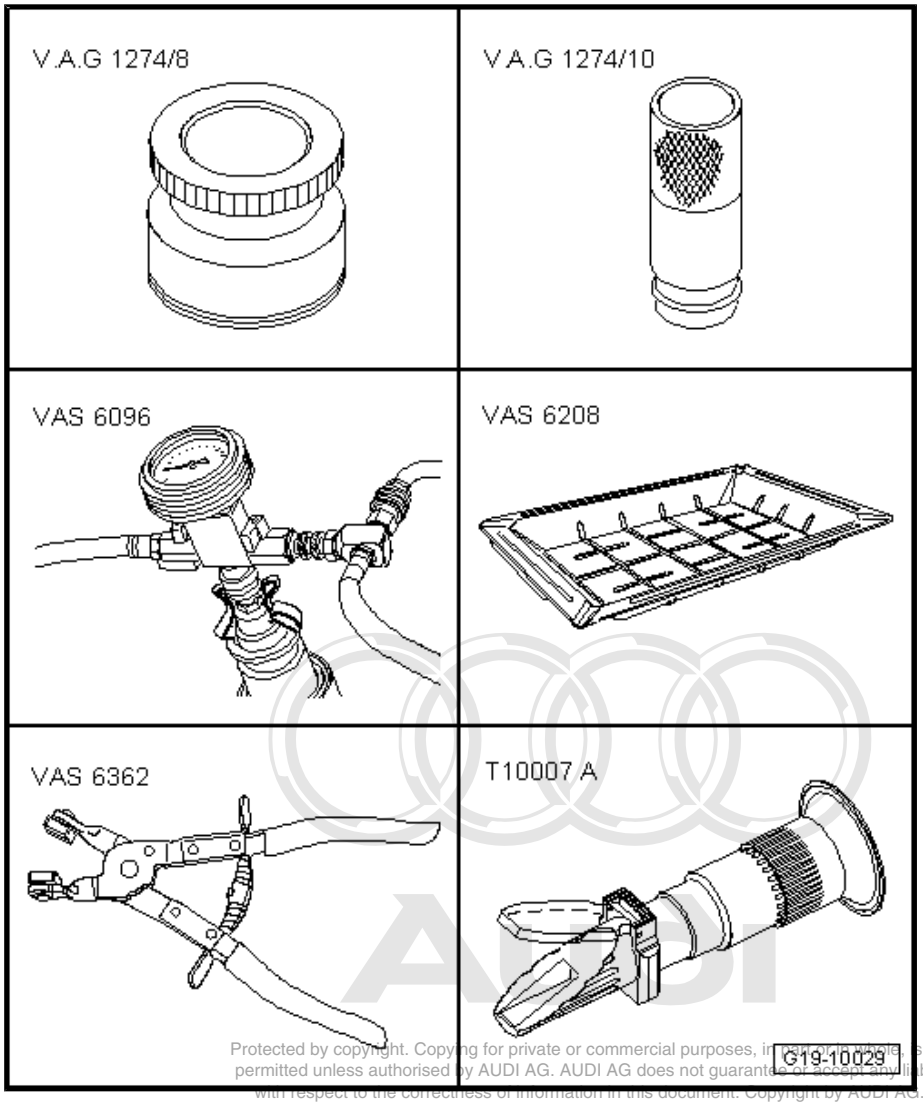
– Renew filler cap if pressure relief valve does not open as described.



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1.3 Draining and filling cooling system

Special tools and workshop equipment required



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- Adapter for cooling system tester - V.A.G 1274/8-
- Pipe for cooling system tester - V.A.G 1274/10-
- Cooling system charge unit - VAS 6096-
- Drip tray for workshop hoist - VAS 6208-
- Hose clip pliers - VAS 6362-
- Refractometer - T10007A-

Draining

WARNING

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

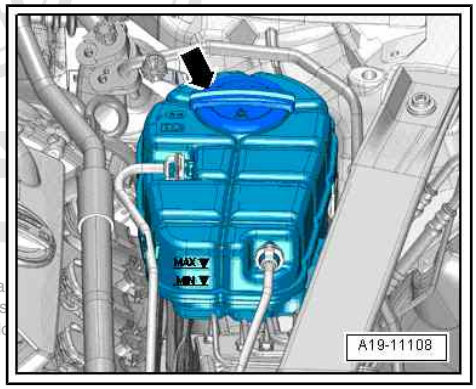
- ***Even when the ignition is switched off, the radiator fans can start up without warning due to accumulated heat in the engine compartment, etc.***

WARNING

Risk of scalding due to hot steam and hot coolant.

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

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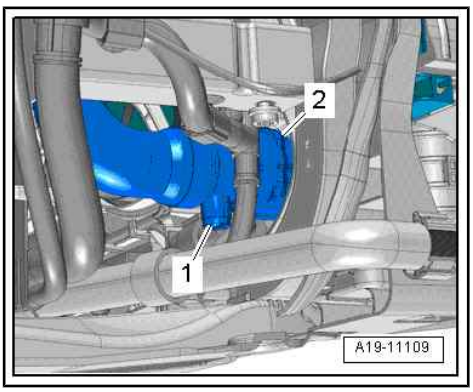


– Open filler cap -arrow- on coolant expansion tank.

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

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

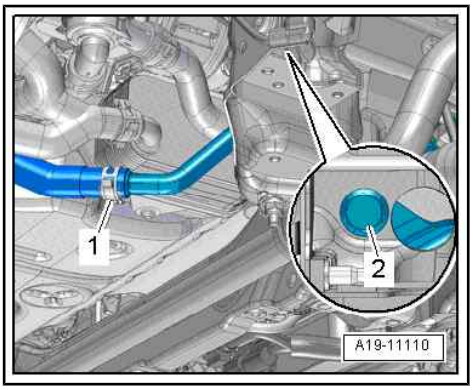
– Remove drain plug -1- and drain off coolant.



Note

Disregard -item 2-.

– Release hose clip -1-, disconnect coolant hose from coolant pipe (bottom left) and drain off coolant.



Note

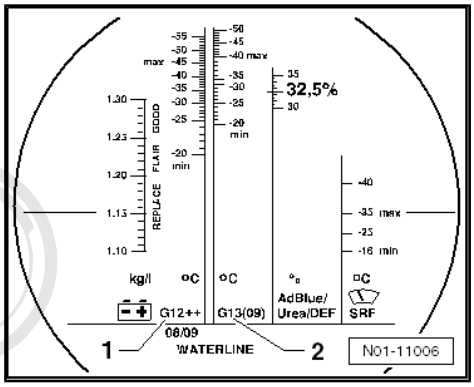
- *Disregard -item 2-.*
- *The illustration shows the 2.8 ltr. engine.*

Filling

- Ignition switched off.

Caution

To ensure optimal corrosion protection, only distilled water may be mixed with coolant additives.



Note

- *The effectiveness of the coolant is greatly influenced by the quality of the water with which it is mixed. Because water may contain different substances depending on the country or even the region, the water quality to be used for cooling systems has been specified. Distilled water meets all the requirements and is therefore recommended for use when topping up or filling up with coolant.*
- *Use only coolant additives listed in the ⇒ Electronic parts catalogue (ETKA) . If you use other coolant additives, this can significantly impair in particular the corrosion protection effect. The resulting damage could lead to loss of coolant and consequently to serious engine damage.*
- *Coolant with the recommended mixture ratio prevents frost and corrosion damage and stops scaling. At the same time it raises the boiling point of the fluid in the system. For this reason the cooling system must be filled all year round with the correct coolant additive.*
- *Because of its high boiling point, the coolant improves engine reliability under heavy loads, particularly in countries with tropical climates.*
- *The refractometer - T10007A- MUST be used to determine the current level of frost protection.*
- *The mixture must guarantee frost protection down to at least -25 °C (in countries with arctic climate: down to -36 °C). The amount of antifreeze should only be increased if greater frost protection is required in very cold climates. This must only be down to -48 °C, however, as otherwise the cooling efficiency of the coolant is impaired.*
- *The coolant concentration must not be reduced by adding water even in warmer seasons and in warmer countries. Frost protection must be provided to at least -25 °C.*
- *Read off the level of frost protection on the scale for the relevant coolant additive.*
- *The temperature indicated on the refractometer - T10007A- corresponds to the temperature at which the first ice crystals can form in the coolant.*
- *Do not reuse coolant.*
- *Only use water/coolant additive as a lubricant for coolant hoses.*

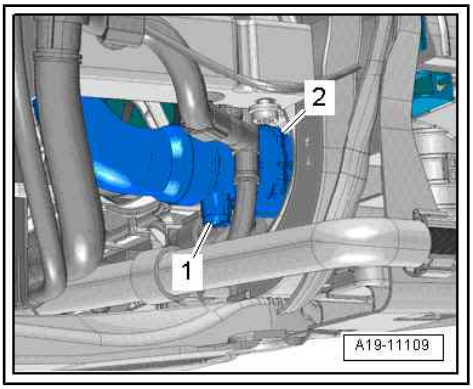
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Recommended mixture ratio for coolant

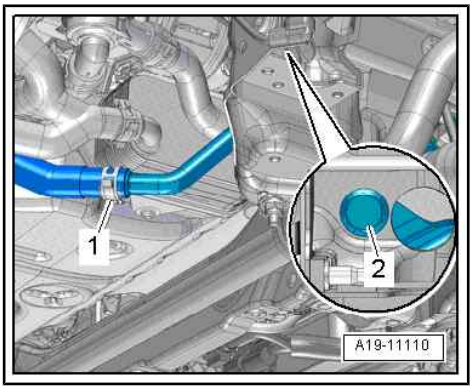
- Coolant (40 %) and water (60 %) for frost protection to -25 °C
- Coolant (50 %) and water (50 %) for frost protection to –36 °C
- Coolant ⇒ Electronic parts catalogue

Procedure

– Close drain plug -1-.



– Connect coolant hose to coolant pipe (bottom left) with hose clip -1-.



Note

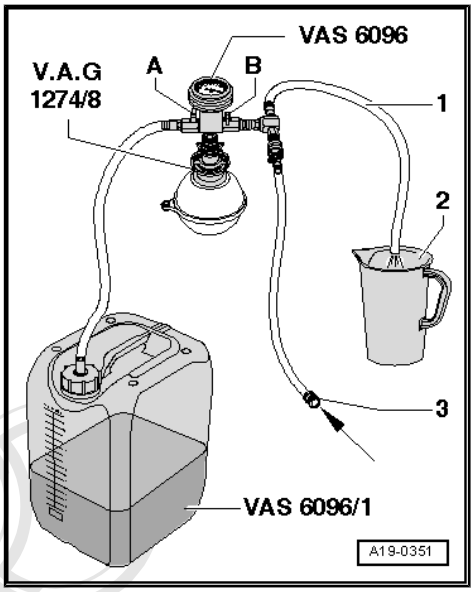
The illustration shows the 2.8 ltr. engine.

– Fill reservoir of cooling system charge unit - VAS 6096- with 12 litres of premixed coolant (according to recommended ratio ⇒ page 224).

– Fit adapter for cooling system tester - V.A.G 1274/8- onto coolant expansion tank.

– Attach cooling system charge unit - VAS 6096- to adapter - V.A.G 1274/8- .

– Run vent hose -1- into a small container -2-.



Note

The vented air draws along a small amount of coolant, which should be collected.

– Close both valves -A- and -B- (turn lever at right angles to direction of flow).

– Connect hose -3- to compressed air supply.

• Pressure: 7 ... 10 bar.

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– Open valve -B- by setting lever in direction of flow.

• The suction jet pump generates a 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.

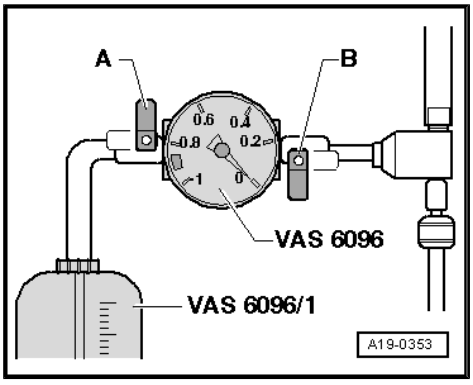
– Close valve -A- again.

– Leave valve -B- open for another 2 minutes.

• The suction jet pump will continue generating a vacuum in the cooling system. The needle on the gauge should remain in the green zone.

– Close valve -B-.

• The needle on the gauge should stop in the green zone. The vacuum level in the cooling system is then sufficient for subsequent filling.



Note

♦ *If the needle does not reach the green zone, repeat the process.*

♦ *Check cooling system for leaks if the vacuum is not maintained.*

– Detach compressed air hose.

– Open valve -A-.

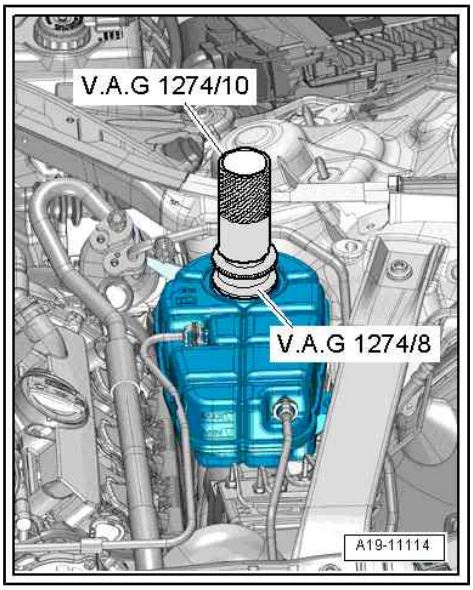
• The vacuum in the cooling system causes the coolant to be drawn out of the reservoir of the cooling system charge unit - VAS 6096- ; the cooling system is then filled.

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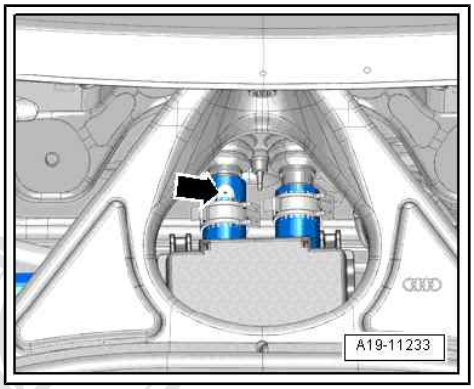
– Detach cooling system charge unit - VAS 6096- from adapter -V.A.G 1274/8- on coolant expansion tank.

– Attach pipe -V.A.G 1274/10- onto adapter -V.A.G 1274/8- .

– Fill up with coolant until pipe for cooling system tester is filled. If required, add further coolant when performing bleeding procedure.



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



Note

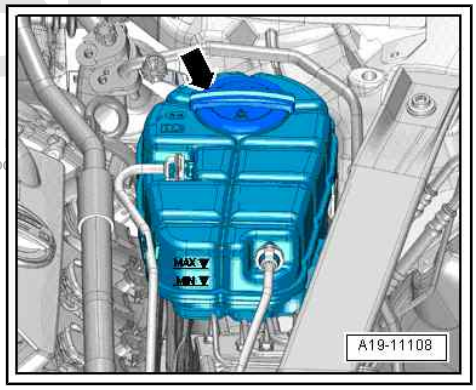
Place a cloth underneath to catch escaping coolant.

– Release coolant hose going to heat exchanger and pull back hose until coolant flows out at bleeder hole -arrow- in coolant hose.

– Push coolant hose back onto connection and secure with hose clip.

– On vehicles with auxiliary heater, switch heater on (for about 30 seconds) and then off again.

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



– Start engine.

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– Set temperature to “HI” for all zones and select lowest blower speed (= 0).

– Switch off air conditioner compressor (press AC button).

• LED in button should not light up.

– Run engine for 3 minutes at 2000 rpm.

– Allow engine to run at idling speed until both large coolant hoses at radiator become warm.

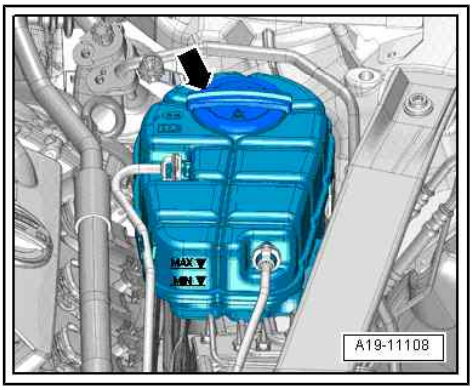
– Run engine for 2 minutes at 2000 rpm.

– Switch off ignition and allow engine to cool down.

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

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

– Check coolant level.



• The coolant level must be at the MAX marking when the engine is cold.

• The coolant level can be above the MAX marking when the engine is warm.

2 Coolant pump/thermostat assembly

⇒ “2.1 Exploded view - coolant pump/thermostat”, page 228

⇒ “2.2 Exploded view - electric coolant pump”, page 229

⇒ “2.3 Removing and installing electric coolant pump”, page 229

⇒ “2.4 Removing and installing coolant pump”, page 231

⇒ “2.5 Removing and installing thermostat”, page 232

⇒ “2.6 Removing and installing coolant temperature sender G62 ”, page 233

⇒ “2.7 Removing and installing temperature sender for engine temperature regulation G694 ”, page 234

⇒ “2.8 Removing and installing coolant valves”, page 235

2.1 Exploded view - coolant pump/thermostat

1 - Bolt
- ❑ 20 Nm

2 - Poly V-belt pulley
- ❑ For coolant pump

3 - Coolant pump
- ❑ With gasket
- ❑ Removing and installing ⇒ “2.4 Removing and installing coolant pump”, page 231

4 - Bolt
- ❑ 9 Nm

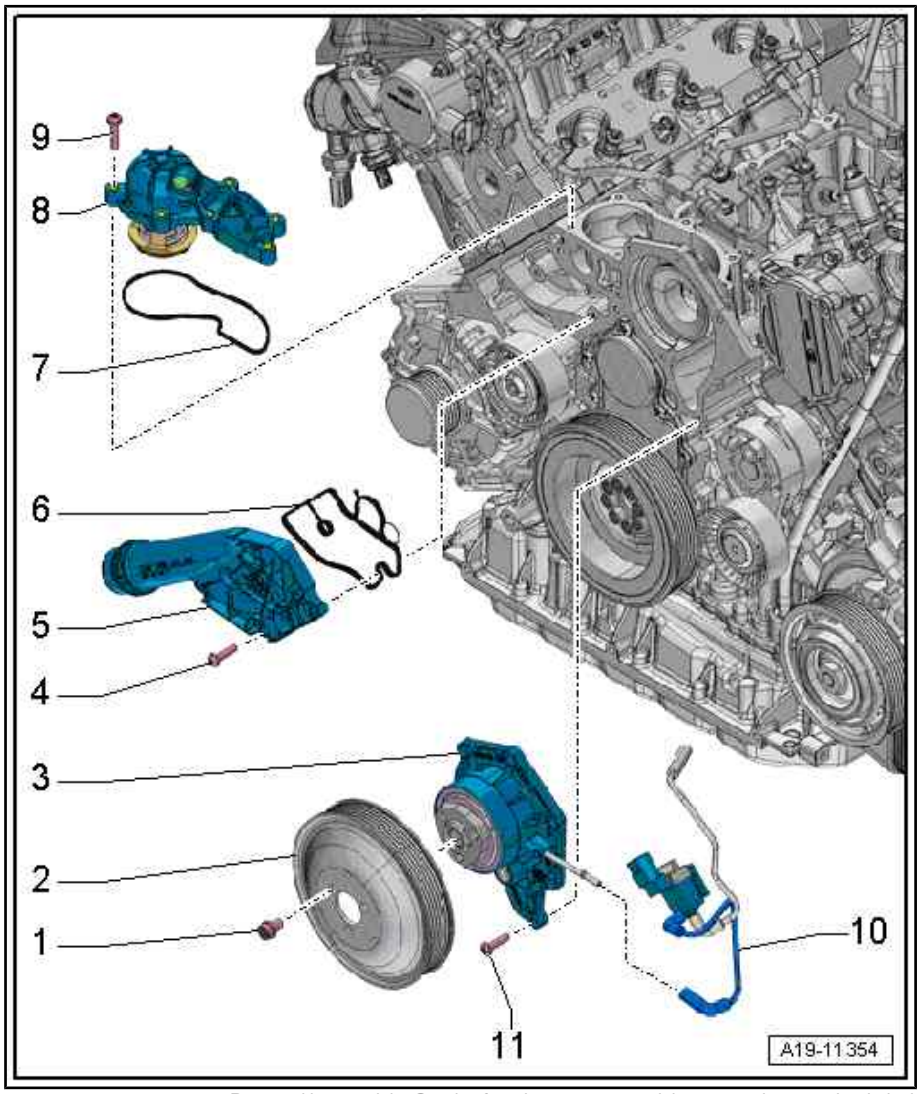
5 - Connection
- ❑ For coolant hose

6 - Gasket
- ❑ Renew

7 - Gasket
- ❑ Renew

8 - Thermostat
- ❑ Removing and installing ⇒ “2.5 Removing and installing thermostat”, page 232
- ❑ Starts to open at approx. 87 °C
- ❑ Fully open at approx. 102 °C
- ❑ Opening travel at least 8 mm

9 - Bolt
- ❑ 9 Nm



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10 - Solenoid for coolant circuit - N492-

11 - Bolt

- ❑ 9 Nm

2.2 Exploded view - electric coolant pump

1 - Coolant hose

2 - Bracket

3 - Bolts

- ❑ 9 Nm

4 - Coolant hose

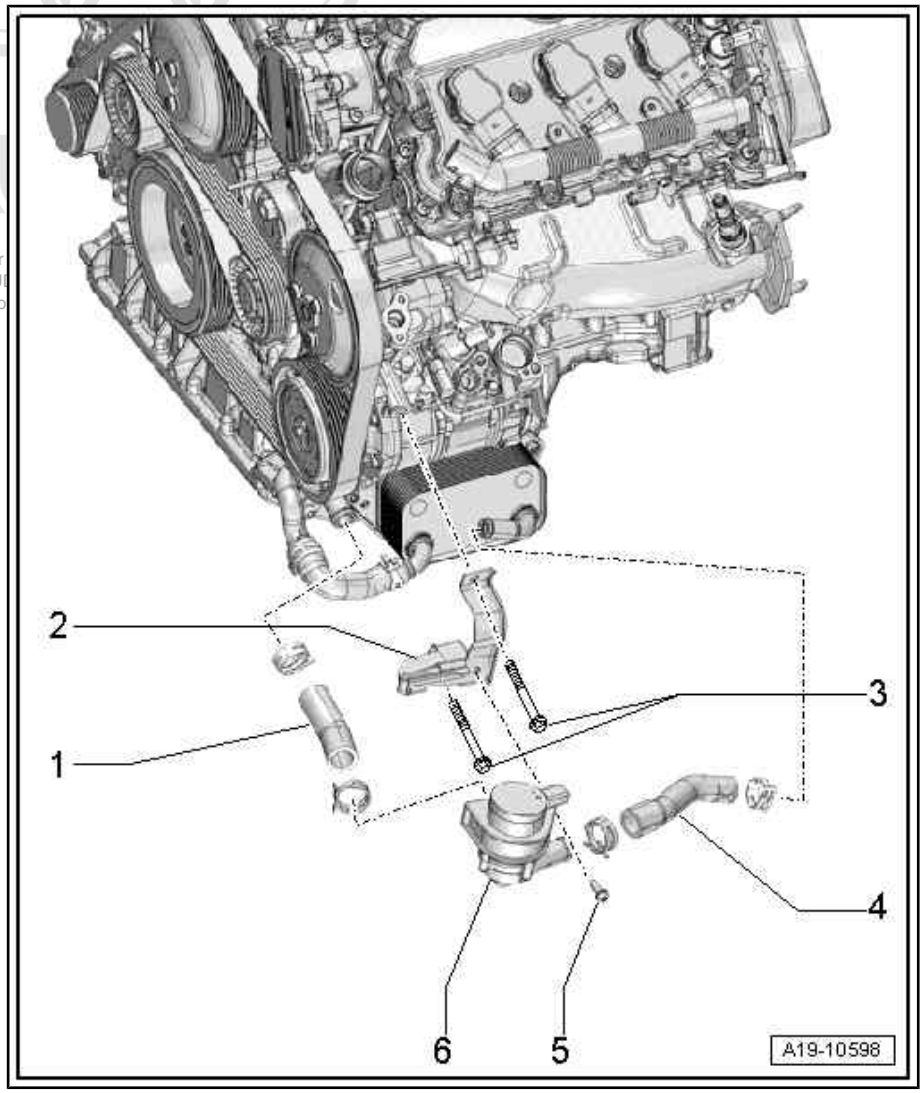
5 - Bolt

- ❑ 4 Nm

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6 - Continued coolant circulation pump - V51-

- ❑ Removing and installing ⇒ "2.3 Removing and installing electric coolant pump", page 229



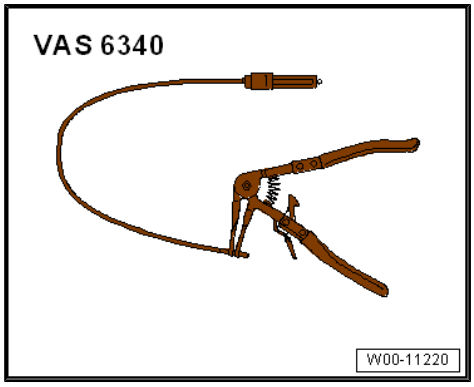
2.3 Removing and installing electric coolant pump

Special tools and workshop equipment required

- Drip tray for workshop hoist - VAS 6208-



- Hose clip pliers - VAS 6340-

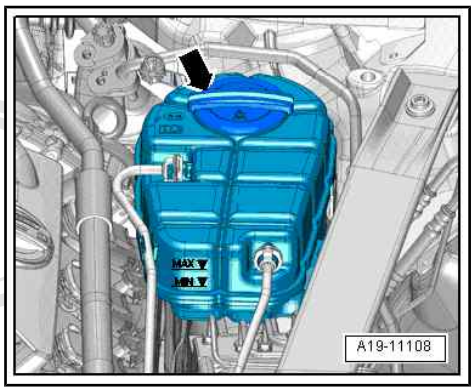


Removing

WARNING

Risk of scalding due to hot steam and hot coolant.

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

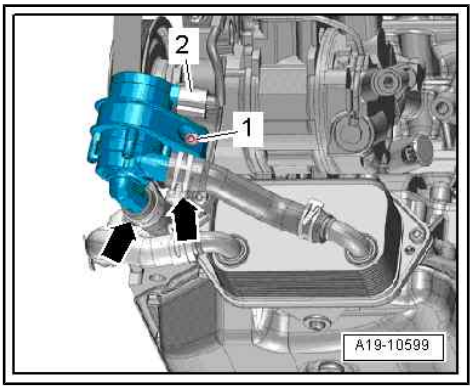


– Open filler cap -arrow- on coolant expansion tank.

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

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– Unplug electrical connector -2- and remove bolt -1-.



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

– Release hose clips -arrows- and disconnect continued coolant circulation pump - V51- from coolant hoses.

Installing

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

Note

- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *Do not reuse coolant.*

– Fill up with coolant ⇒ page 223 .

Tightening torques

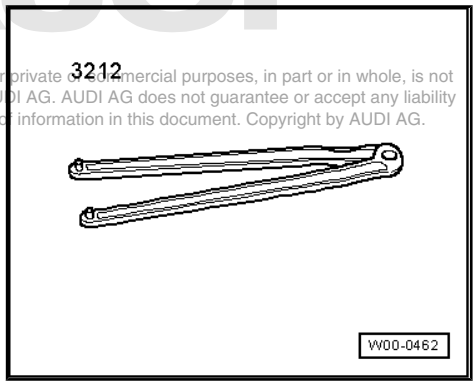
- ⇒ “2.2 Exploded view - electric coolant pump”, page 229
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

2.4 Removing and installing coolant pump

Special tools and workshop equipment required

- Pin wrench - 3212-

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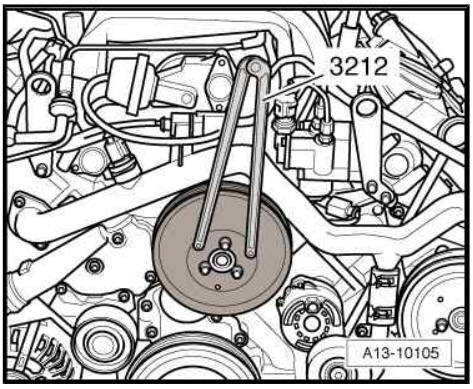
Removing

– Drain coolant
⇒ “1.3 Draining and filling cooling system”, page 221 .

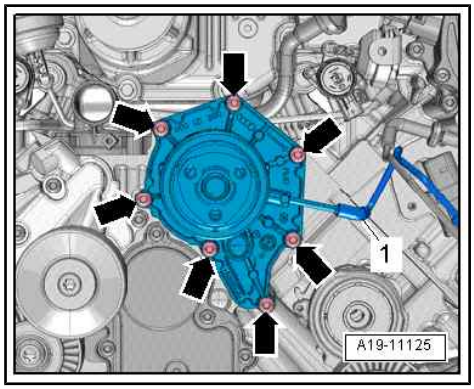
– Detach poly V-belt from coolant pump, but do not remove completely
⇒ “1.2 Removing and installing poly V-belt”, page 66 .

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

– Remove bolts and take off poly V-belt pulley.



– Disconnect vacuum hose -1-.



Note

Place a cloth underneath to catch escaping coolant.

– Remove bolts -arrows- for coolant pump and detach coolant pump to the side.

Installing

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

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

– Install poly V-belt
⇒ “1.2 Removing and installing poly V-belt”, page 66 .

Note

Do not reuse coolant.

– Fill up with coolant ⇒ page 223 .

Tightening torques

♦ ⇒ “2.1 Exploded view - coolant pump/thermostat”, page 228

2.5 Removing and installing thermostat

Removing

– Drain coolant
⇒ “1.3 Draining and filling cooling system”, page 221 .

Vehicles with 2.5 ltr. engine:

– Remove intake manifold
⇒ “3.3 Removing and installing intake manifold”, page 292 .

Vehicles with 2.8 ltr. engine:

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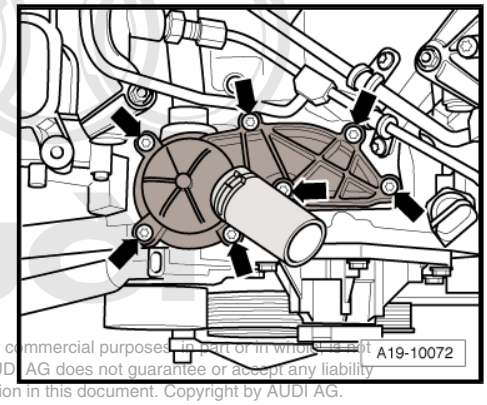
– Remove intake manifold (top section)
⇒ “3.4 Removing and installing intake manifold (top section)”, page 294 .

Continued for all vehicles:

– Remove coolant pipe (front)
⇒ “3.2.3 Removing and installing coolant pipe (front)”, page 241 .

– Remove bolts -arrows-.

– Detach coolant thermostat with hose connection.



Installing

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

Note

- *Renew seals and/or gaskets.*
- *When removing and installing the thermostat, make sure that the needle is fitted correctly (conical end fitted in wax expansion element of thermostat). If necessary, push thermostat needle as far as possible into wax expansion element.*

– Install coolant pipe (front)
⇒ “3.2.3 Removing and installing coolant pipe (front)”, page 241 .

– Install intake manifold
⇒ “3.3 Removing and installing intake manifold”, page 292 /
install intake manifold (top section)
⇒ “3.4 Removing and installing intake manifold (top section)”, page 294 .

Note

Do not reuse coolant.

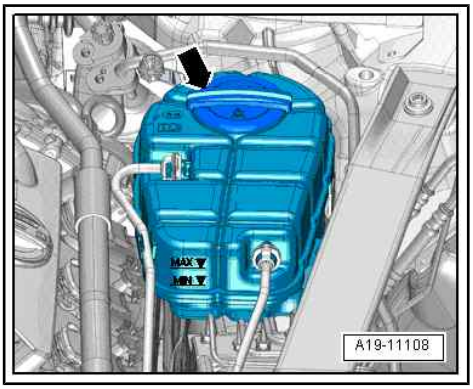
– Fill up with coolant ⇒ page 223 .

Tightening torques

- ⇒ “2.1 Exploded view - coolant pump/thermostat”, page 228

2.6 Removing and installing coolant temperature sender - G62-

Removing



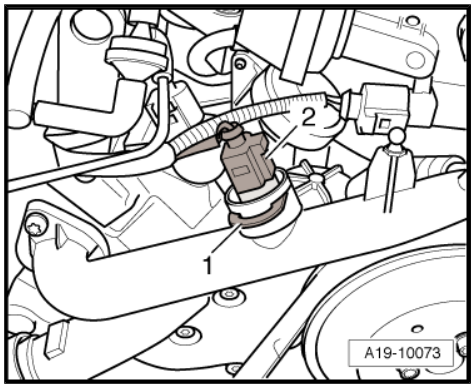
- Engine cold.

– To relieve residual pressure in cooling system, open filler cap -arrow- on coolant expansion tank briefly and then close cap again (it should click into place).

– Remove engine cover panel (front)
⇒ “3.1 Removing and installing engine cover panel”, page 64 .

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– Unplug electrical connector -2- at coolant temperature sender - G62- .



Note

Place a cloth underneath to catch escaping coolant.

– Pull off retaining clip -1- and detach coolant temperature sender - G62- .

Installing

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

Note

- *Fit new O-ring.*
- *Insert new coolant temperature sender - G62- immediately into connection to avoid loss of coolant.*

– Check coolant level ⇒ page 227 .

– Install engine cover panel ⇒ “3.1 Removing and installing engine cover panel”, page 64 .

2.7 Removing and installing temperature sender for engine temperature regulation - G694-

Removing

Vehicles with 2.5 ltr. engine:

– Remove fuel rail (right-side) ⇒ “4.2 Removing and installing fuel rail”, page 300 .

Vehicles with 2.8 ltr. engine:

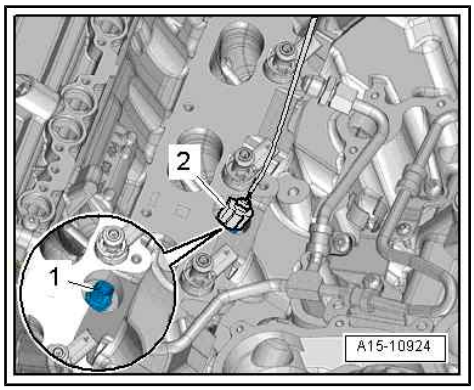
– Remove intake manifold (bottom section, right-side) ⇒ “3.5 Removing and installing intake manifold (bottom section)”, page 296 .

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Continued for all vehicles:

– Unplug electrical connector -2-.

– Unscrew temperature sender for engine temperature regulation - G694- -item 1-



Installing

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

– Install intake manifold (bottom section, right-side) ⇒ “3.5 Removing and installing intake manifold (bottom section)”, page 296 .

– Install fuel rail (right-side) ⇒ “4.2 Removing and installing fuel rail”, page 300 .

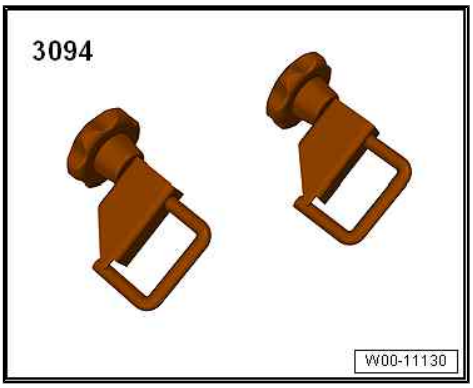
Tightening torques

- ⇒ Fig. “” Temperature sender for engine temperature regulation -G694- - tightening torque”” , page 238

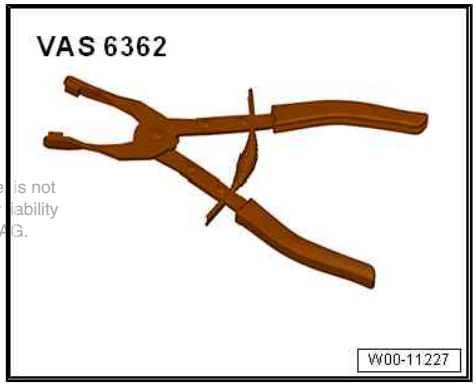
2.8 Removing and installing coolant valves

Special tools and workshop equipment required

- Hose clamps, up to 25 mm - 3094-



- Hose clip pliers - VAS 6362-



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Removing

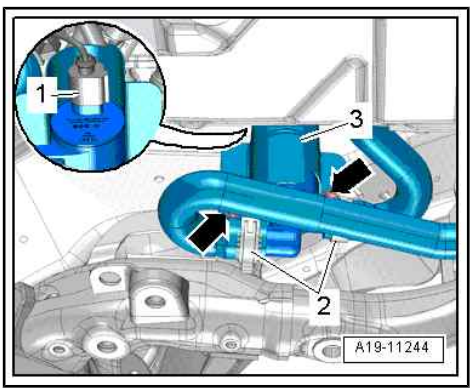
– Remove noise insulation (rear) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

– Remove bolts -arrows- and detach heat shield -3-.

– Unplug electrical connector -1-.

– Clamp off coolant hoses using hose clamps -3094- , release hose clips -2- and disconnect coolant hoses.

– Detach gearbox oil cooling valve - N509- .



Installing

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

Note

- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *Do not reuse coolant.*

– Fill up with coolant ⇒ page 223 .

Tightening torques

- ⇒ “3.1 Exploded view - coolant pipes”, page 236
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

3 Coolant pipes

⇒ “3.1 Exploded view - coolant pipes”, page 236

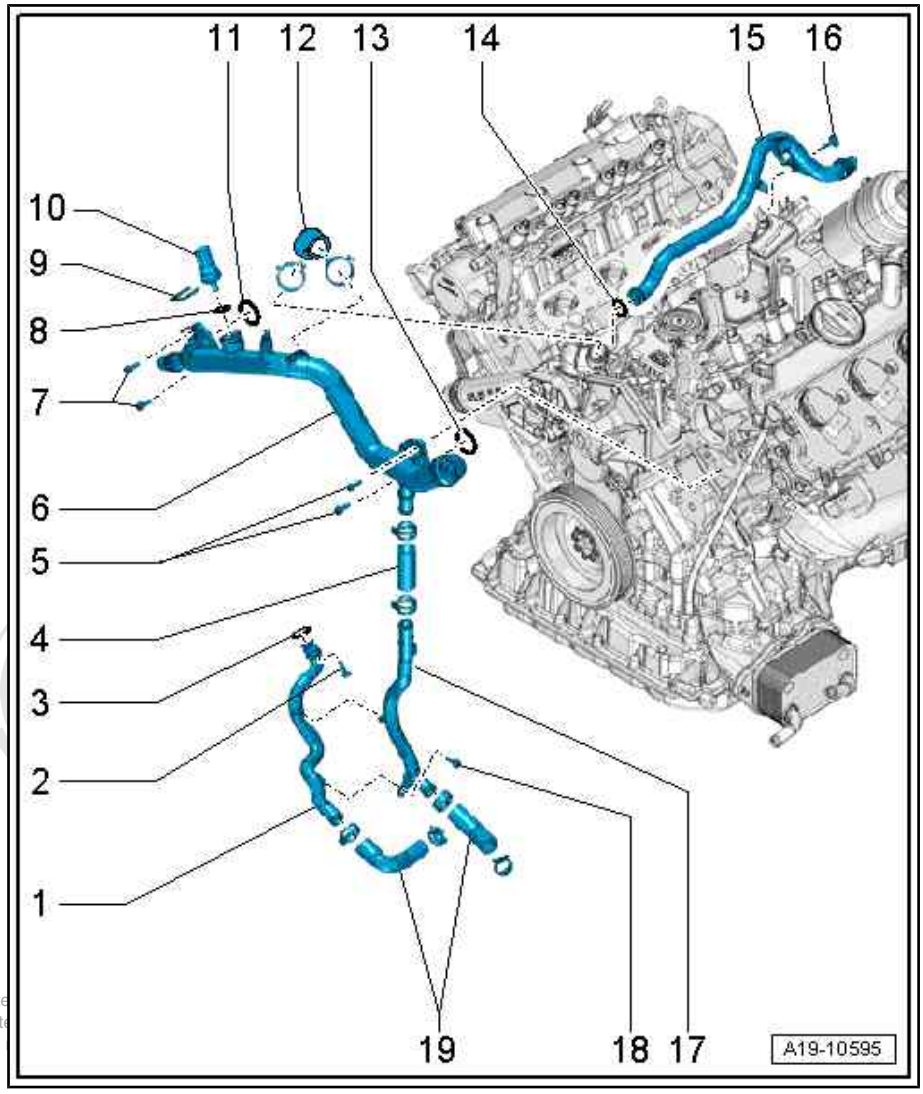
⇒ “3.2 Removing and installing coolant pipes”, page 239

3.1 Exploded view - coolant pipes

Note

The arrow markings on coolant pipes and on ends of hoses must align.

Coolant pipes on engine



1 - Coolant pipe (left-side)

- ❑ Remove and install together with -item 17- ⇒ “3.2.1 Removing and installing coolant pipes (left-side)”, page 239

2 - Bolt

- ❑ 9 Nm

3 - O-ring

- ❑ Renew

4 - Connecting hose

5 - Bolts

- ❑ 9 Nm

6 - Coolant pipe (front)

- ❑ Removing and installing ⇒ “3.2.3 Removing and installing coolant pipe (front)”, page 241

7 - Bolts

- ❑ 9 Nm

8 - O-ring

- ❑ Renew

9 - Retaining clip

10 - Coolant temperature sender - G62-

- ❑ Removing and installing ⇒ “2.6 Removing and installing coolant temperature sender G62 ”, page 233

11 - Seal

- ❑ Renew

12 - Coolant hose

13 - Seal

- ❑ Renew

14 - O-ring

- ❑ Renew

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15 - Coolant pipe (top)

- ❑ Removing and installing ⇒ “3.2.4 Removing and installing coolant pipe (top)”, page 244

16 - Bolt

- ❑ 9 Nm

17 - Coolant pipe (left-side)

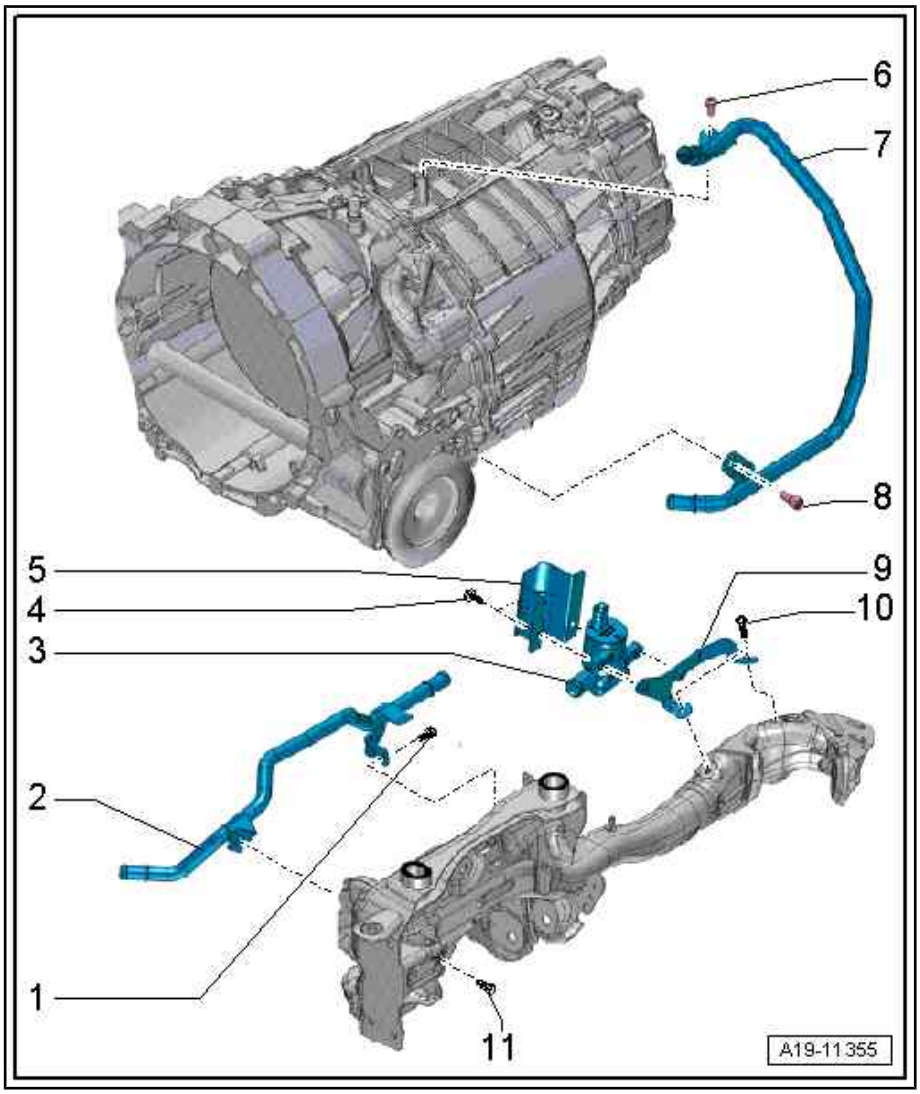
- ❑ Remove and install together with -item 1-
  ⇒ “3.2.1 Removing and installing coolant pipes (left-side)”, page 239

18 - Bolt

- ❑ 9 Nm

19 - Coolant hoses

Coolant pipes on multitronic gearbox 0AW (front-wheel drive)



1 - Bolt

- ❑ 22 Nm

2 - Coolant pipe (bottom left)

- ❑ Removing and installing
  ⇒ “3.2.2 Removing and installing coolant pipe (bottom left)”, page 240

3 - Gearbox oil cooling valve - N509-

- ❑ Removing and installing
  ⇒ “2.8 Removing and installing coolant valves”, page 235

4 - Bolt

- ❑ 9 Nm

5 - Heat shield

6 - Bolt

- ❑ 9 Nm

7 - Coolant pipe (left-side) on gearbox

- ❑ Removing and installing
  ⇒ “3.2.5 Removing and installing coolant pipe (left-side) on gearbox”, page 246

8 - Bolt

- ❑ 9 Nm

9 - Bracket

- ❑ For gearbox oil cooling valve - N509-

10 - Bolt

- ❑ 9 Nm

11 - Bolt

- ❑ 22 Nm

Coolant pipes to 7-speed dual clutch gearbox 0B5

1 - Bolt

- ❑ 22 Nm

2 - Coolant pipe (bottom left)

- ❑ Removing and installing ⇒ “3.2.2 Removing and installing coolant pipe (bottom left)”, page 240

3 - Gearbox oil cooling valve - N509-

- ❑ Removing and installing ⇒ “2.8 Removing and installing coolant valves”, page 235

4 - Bolt

- ❑ 9 Nm

5 - Heat shield

6 - Bolt

- ❑ 9 Nm

7 - Coolant pipe (right-side) on gearbox

- ❑ Removing and installing ⇒ “3.2.6 Removing and installing coolant pipe (right-side) on gearbox”, page 248

8 - Bolt

- ❑ 9 Nm

9 - Bracket

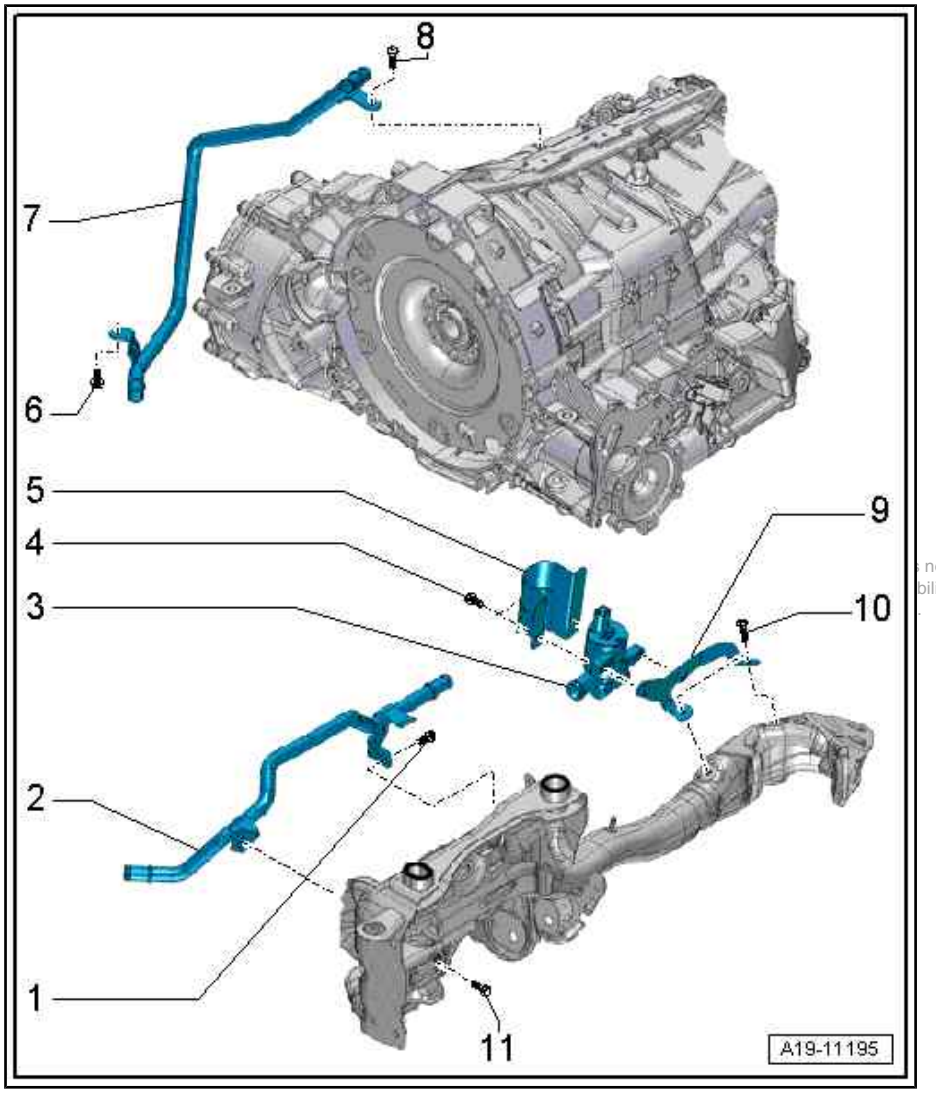
- ❑ For gearbox oil cooling valve - N509-

10 - Bolt

- ❑ 9 Nm

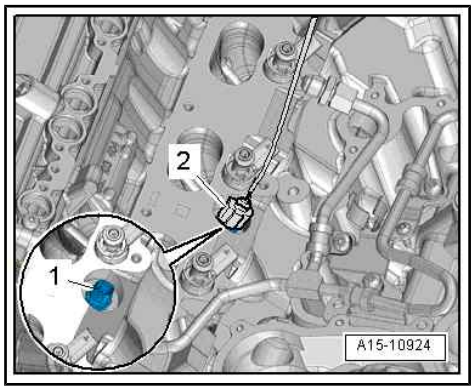
11 - Bolt

- ❑ 22 Nm



Temperature sender for engine temperature regulation - G694- - tightening torque

– Tighten temperature sender for engine temperature regulation - G694- -item 1- to 3 Nm.



3.2 Removing and installing coolant pipes

⇒ “3.2.1 Removing and installing coolant pipes (left-side)”, page 239

⇒ “3.2.2 Removing and installing coolant pipe (bottom left)”, page 240

⇒ “3.2.3 Removing and installing coolant pipe (front)”, page 241

⇒ “3.2.4 Removing and installing coolant pipe (top)”, page 244

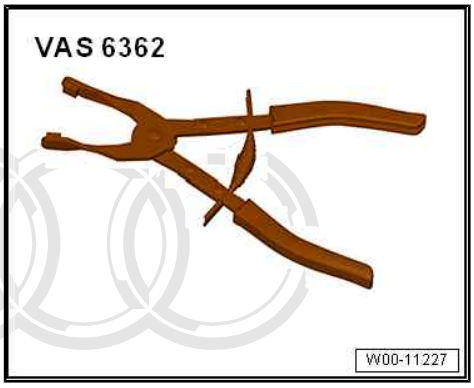
⇒ “3.2.5 Removing and installing coolant pipe (left-side) on gearbox”, page 246

⇒ “3.2.6 Removing and installing coolant pipe (right-side) on gearbox”, page 248

3.2.1 Removing and installing coolant pipes (left-side)

Special tools and workshop equipment required

- Hose clip pliers - VAS 6362-



Removing

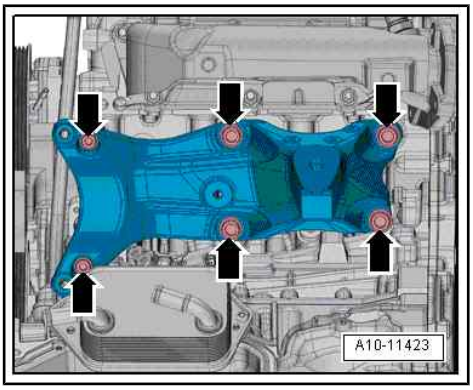
– Drain coolant
⇒ “1.3 Draining and filling cooling system”, page 221 .

– Detach poly V-belt from air conditioner compressor
⇒ “1.2 Removing and installing poly V-belt”, page 66 .

– Remove air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Detaching and attaching air conditioner compressor at bracket .

– Remove engine mounting (left-side)
⇒ “2.2 Removing and installing engine mountings”, page 55 .

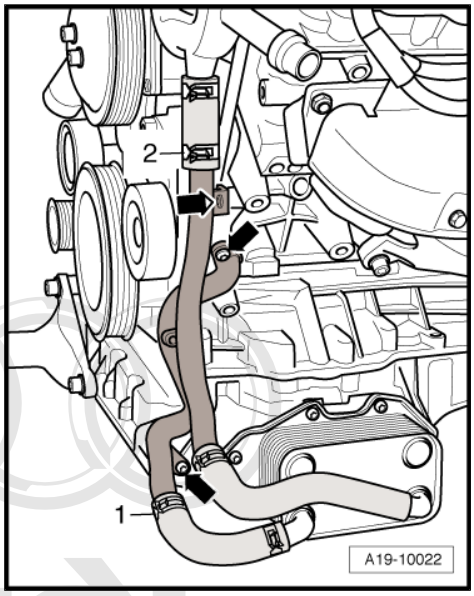
– Remove bolts -arrows- and detach engine support (left-side) with bracket for air conditioner compressor.



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– Remove bolts -arrows-.

– Release hose clips -1- and -2- and disconnect coolant hoses from coolant pipes.



Installing

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

Note

- *Fit new O-ring.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

– Clean and smoothen sealing surface for O-ring.

– Lubricate O-ring with coolant and slide onto coolant pipe.

– Install engine support (left-side) with bracket for air conditioner compressor and engine mounting (left-side) ⇒ “2.1 Exploded view - assembly mountings”, page 52 .

– Install poly V-belt ⇒ “1.2 Removing and installing poly V-belt”, page 66 .

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Note

Do not reuse coolant.

– Fill up with coolant ⇒ page 223 .

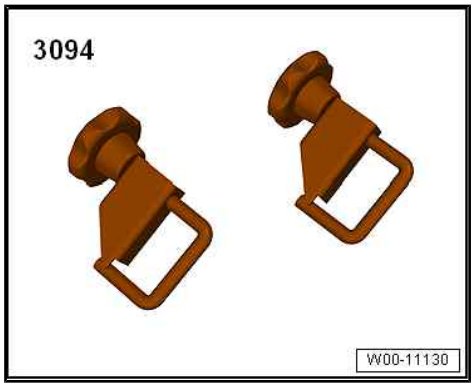
Tightening torques

- ⇒ “3.1 Exploded view - coolant pipes”, page 236
- ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Exploded view - air conditioner compressor drive unit

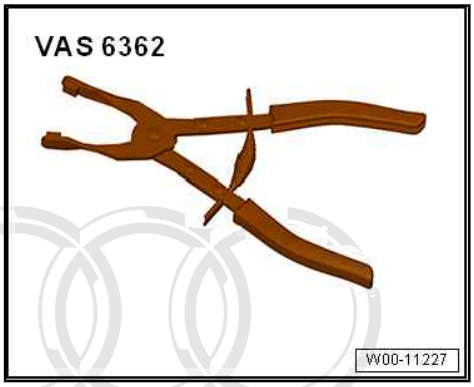
3.2.2 Removing and installing coolant pipe (bottom left)

Special tools and workshop equipment required

- Hose clamps, up to 25 mm - 3094-



♦ Hose clip pliers - VAS 6362-



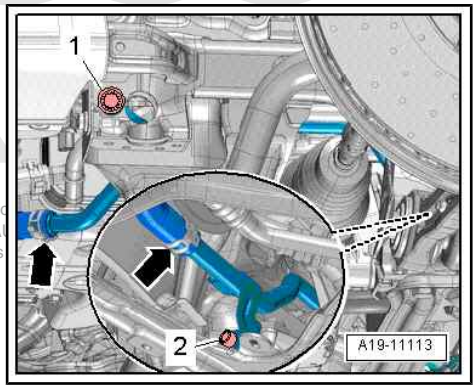
Removing

– Remove engine mounting (left-side)
⇒ “2.2 Removing and installing engine mountings”, page 55 .

Note

Place a cloth under coolant pipe to catch escaping coolant.

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– Clamp off coolant hoses using hose clamps -3094- , release hose clips -arrows- and disconnect coolant hoses from coolant pipe (bottom left).

– Detach coolant pipe (bottom left).

Note

♦ *Disregard items -1 and 2-.*

♦ *The illustration shows the 2.8 ltr. engine.*

Installing

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

Note

Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .

– Install engine mounting (left-side)
⇒ “2.2 Removing and installing engine mountings”, page 55 .

Note

Do not reuse coolant.

– Fill up with coolant ⇒ page 223 .

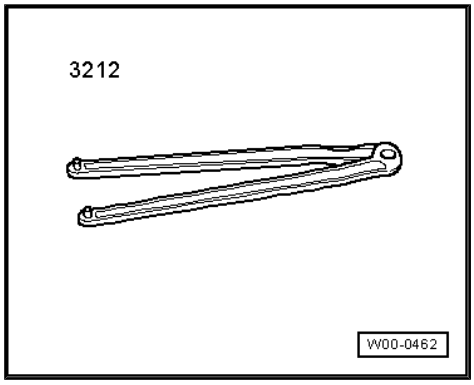
Tightening torques

♦ ⇒ “3.1 Exploded view - coolant pipes”, page 236

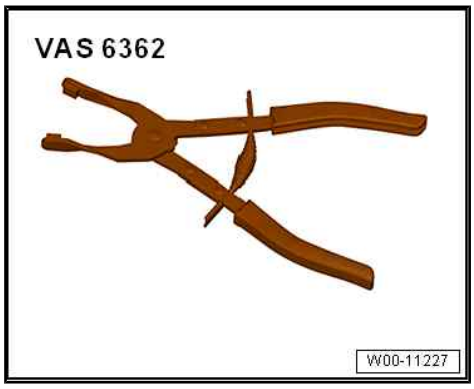
3.2.3 Removing and installing coolant pipe (front)

Special tools and workshop equipment required

♦ Pin wrench - 3212-



♦ Hose clip pliers - VAS 6362-

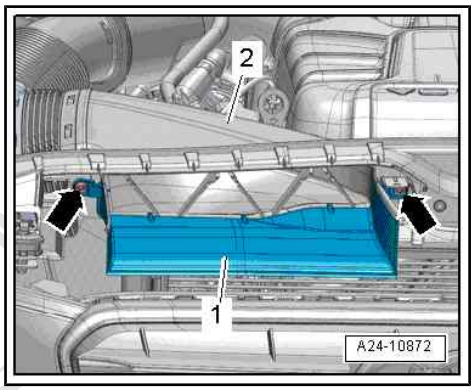


Removing

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

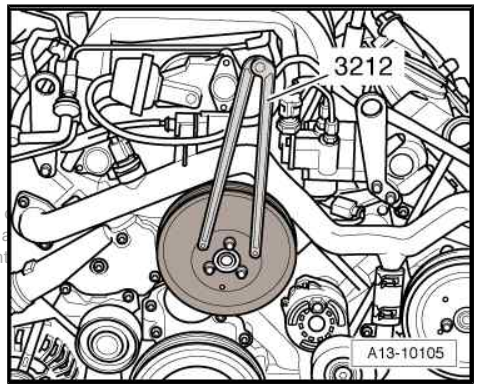
– Unscrew bolts -arrows- and detach air ducts -1- and -2-

– Detach poly V-belt from coolant pump, but do not remove completely
⇒ “1.2 Removing and installing poly V-belt”, page 66 .



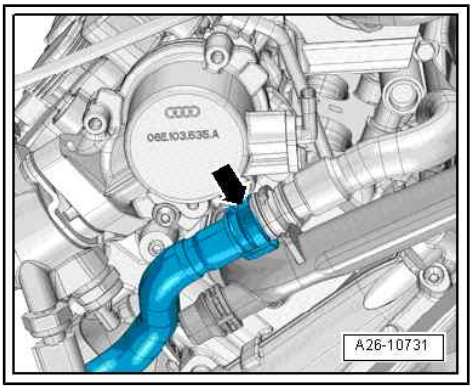
– Slacken bolts for coolant pump pulley (counterhold with pin wrench - 3212-).

– Remove bolts and take off poly V-belt pulley.

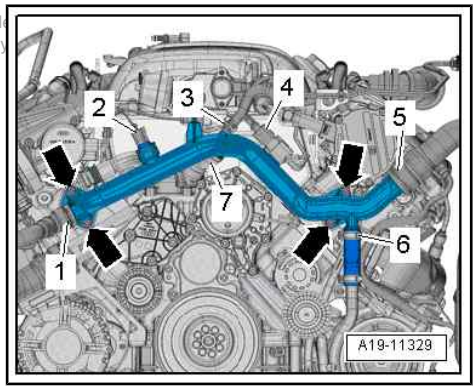


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– Press release tabs and detach secondary air hose -arrow- to front from bracket.



– Unclip solenoid for coolant circuit - N492- -item 4- from bracket.
– Unplug electrical connector -2- at coolant temperature sender - G62- .
– Lift retaining clips -1, 5-, release hose clips -3, 6, 7- and detach coolant hoses.
– Unscrew bolts -arrows- and remove coolant pipe (front).



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Installing

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

Note

- *Renew seals and O-rings.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

– Clean or smoothen sealing surfaces for seals and O-rings.
– Lubricate seals and O-rings with coolant and slide onto coolant pipe.
– Connect coolant hoses with plug-in connector ⇒ Fig. ""Connecting coolant hose with plug-in connector"" , page 252 .
– Install poly V-belt ⇒ "1.2 Removing and installing poly V-belt", page 66 .
– Install lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing attachments .

Note

Do not reuse coolant.

– Fill up with coolant ⇒ page 223 .

Tightening torques

- ⇒ "3.1 Exploded view - coolant pipes", page 236
- ⇒ "2.1 Exploded view - coolant pump/thermostat", page 228
- ⇒ "2.1 Exploded view - air cleaner housing", page 284

3.2.4 Removing and installing coolant pipe (top)

Removing

Note

Fit all cable ties in the original positions when installing.

– Drain coolant
⇒ “1.3 Draining and filling cooling system”, page 221 .

Vehicles with 2.5 ltr. engine:

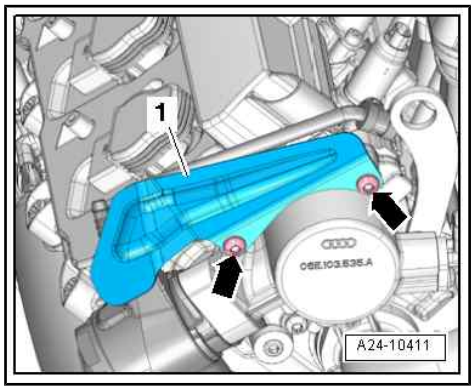
– Remove intake manifold
⇒ “3.3 Removing and installing intake manifold”, page 292 .

Vehicles with 2.8 ltr. engine:

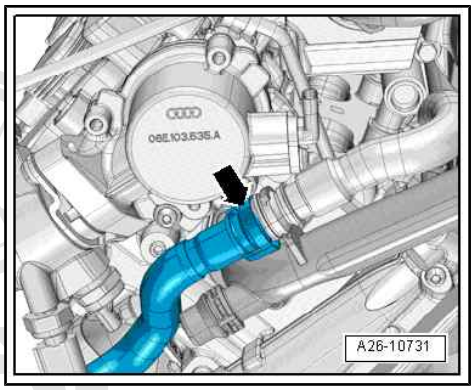
– Remove intake manifold (top section)
⇒ “3.4 Removing and installing intake manifold (top section)”, page 294 .

Continued for all vehicles:

– Remove bolts -arrows- and detach guard plate -1- for high-pressure pipe.



– Vehicles with secondary air system: press release tabs and detach secondary air hose -arrow- from bracket towards front.



WARNING

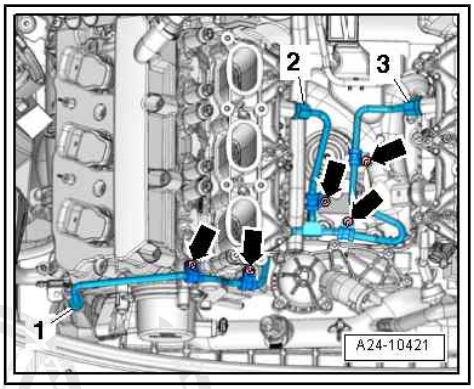
The fuel system operates at extremely high pressure. This can cause injury.

- ***The fuel pressure in the high-pressure section of the injection system must be reduced to a residual pressure prior to opening the system.***
- ***Wrap a clean cloth around the connection and carefully loosen the connection to allow the residual pressure to dissipate.***

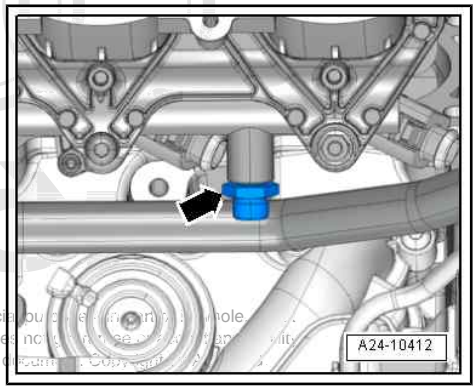
– Reduce fuel pressure in high-pressure system
⇒ “1.2 Reducing fuel pressure in high-pressure section”, page 282 .

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– Unscrew connection -1-.
– Unscrew union nuts -2- and -3- (counterhold connection).
– Unscrew bolts -arrows- on retaining clips and detach high-pressure pipe.



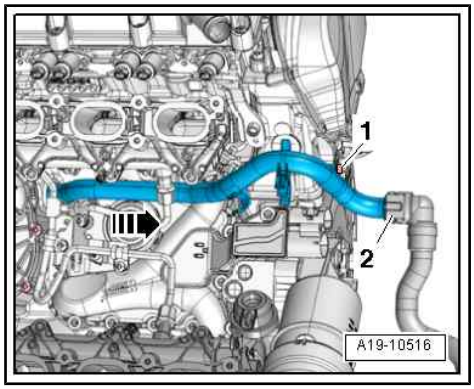
– Detach connection -arrow- for high-pressure pipe.



Note

The illustration shows the 2.8 ltr. engine.

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Note

Place a cloth under coolant pipe to catch escaping coolant.

– Detach coolant hose -2- from coolant pipe.

– Remove bolt -1- and pull coolant pipe rearwards out of cylinder block -arrow-.

Installing

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

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Note

Fit new O-rings.

– Clean and smoothen sealing surface for O-ring.

– Lubricate O-ring with coolant and slide onto coolant pipe.

– Install high-pressure pipe
⇒ “6.3 Removing and installing high-pressure pipe”, page 317 .

– Install intake manifold
⇒ “3.3 Removing and installing intake manifold”, page 292 /
install intake manifold (top section)
⇒ “3.4 Removing and installing intake manifold (top section)”, page 294 .

– Connect coolant hoses with plug-in connector
⇒ Fig. ““Connecting coolant hose with plug-in connector”“ , page 252 .

Note

Do not reuse coolant.

– Fill up with coolant ⇒ page 223 .

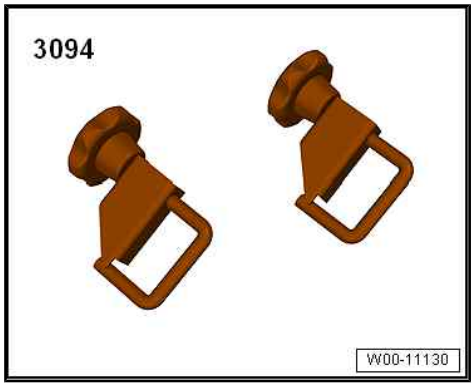
Tightening torques

♦ ⇒ “3.1 Exploded view - coolant pipes”, page 236

3.2.5 Removing and installing coolant pipe (left-side) on gearbox

Special tools and workshop equipment required

♦ Hose clamps, up to 25 mm - 3094-

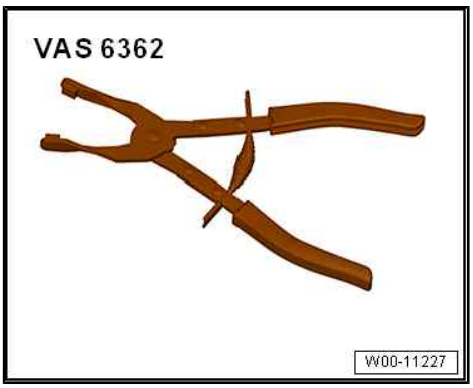


- Drip tray for workshop hoist - VAS 6208-



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- Hose clip pliers - VAS 6362-



Removing

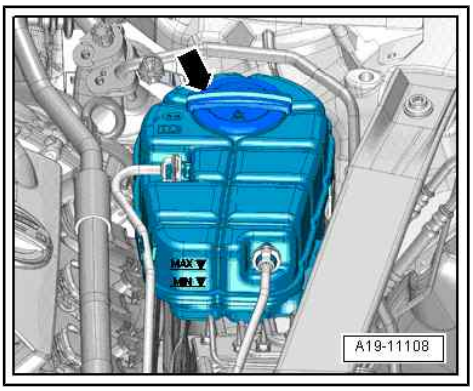
– Remove engine cover panel (rear)
⇒ “3.1 Removing and installing engine cover panel”, page 64 .

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

WARNING

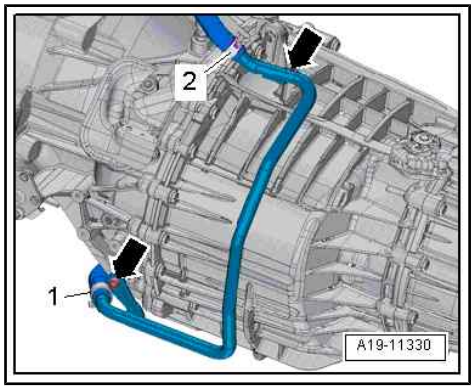
Risk of scalding due to hot steam and hot coolant.

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



– Open filler cap -arrow- on coolant expansion tank.

– Place drip tray for workshop hoist - VAS 6208- beneath engine.
– Clamp off coolant hoses using hose clamps -3094- , release hose clips -1, 2- and disconnect coolant hoses.
– Unscrew bolts -arrows- and remove coolant pipe.



Installing

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

Note

Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .

– Install engine cover panel ⇒ “3.1 Removing and installing engine cover panel”, page 64 .
– Check coolant level ⇒ page 223 .

Tightening torques

♦ ⇒ “3.1 Exploded view - coolant pipes”, page 236
♦ ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

3.2.6 Removing and installing coolant pipe (right-side) on gearbox

Special tools and workshop equipment required

♦ Hose clamps, up to 25 mm - 3094-

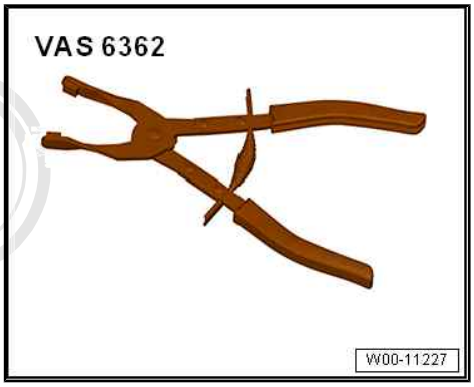
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♦ Drip tray for workshop hoist - VAS 6208-



♦ Hose clip pliers - VAS 6362-



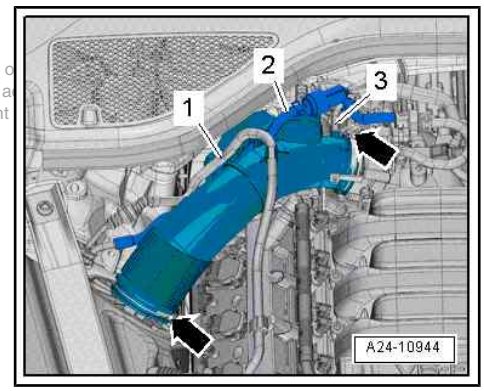
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Removing

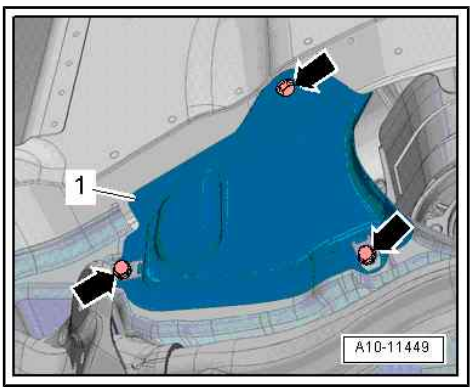
– Move fuel hose -1- and hose -2- from activated charcoal filter clear at air pipe.

– Detach vacuum hose -3- from connection on air pipe.

– Loosen hose clips -arrows- and detach air pipe.



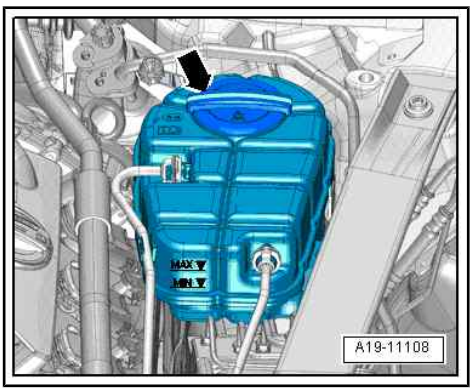
– Remove bolts -arrows- and detach heat shield (right-side) -1- on subframe.



WARNING

Risk of scalding due to hot steam and hot coolant.

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



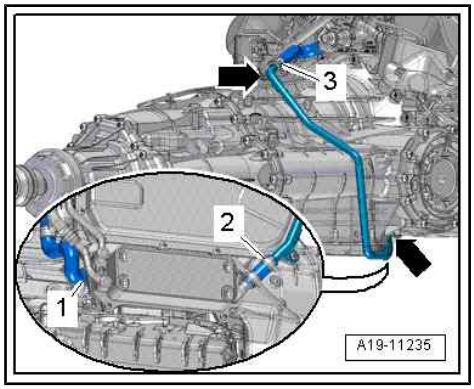
– Open filler cap -arrow- on coolant expansion tank.

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

– Place drip tray for workshop hoist - VAS 6208- under connection.

– Clamp off coolant hose -1- with hose clamp -3094- .

– Remove bolts -arrows-.
– Clamp off coolant hose -3- using hose clamp -3094- , release hose clip and disconnect coolant hose from coolant pipe on right side of gearbox.
– Release hose clip -2- and detach coolant pipe going to wheel housing (right-side).



Installing

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

Note

Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .

– Check coolant level ⇒ page 223 .

Tightening torques

- ⇒ “3.1 Exploded view - coolant pipes”, page 236
- ⇒ Fig. ““Installing air pipes and hoses with screw-type clips”“ , page 285
- Heat shield ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Exploded view - subframe
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

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4 Radiator/radiator fans

⇒ “4.1 Exploded view - radiator/radiator fans”, page 251

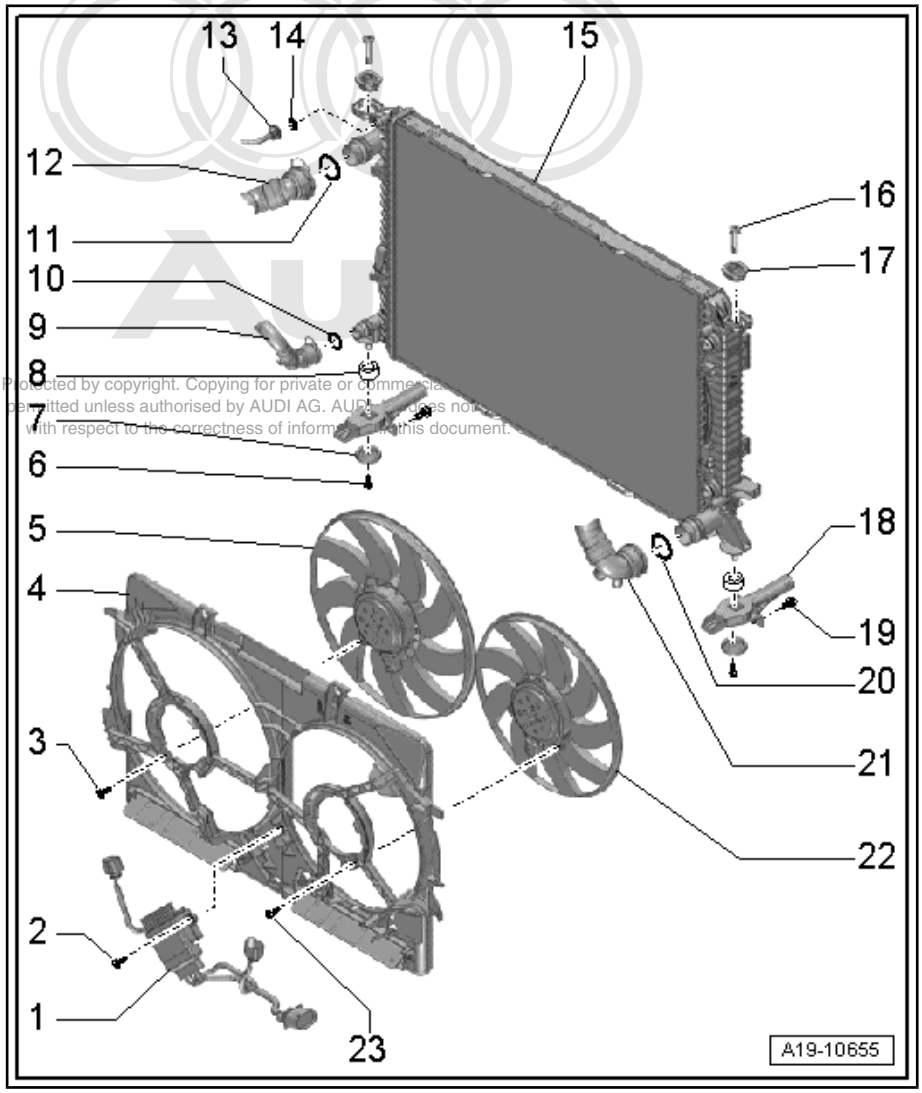
⇒ “4.2 Removing and installing radiator”, page 252

⇒ “4.3 Removing and installing radiator cowl”, page 257

⇒ “4.4 Removing and installing radiator fan V7 ”, page 263

⇒ “4.5 Removing and installing radiator fan control unit J293 ”, page 263

4.1 Exploded view - radiator/radiator fans



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1 - Radiator fan control unit - J293-

- ❑ Removing and installing ⇒ “4.5 Removing and installing radiator fan control unit J293 ”, page 263

2 - Bolt

- ❑ 4.5 Nm

3 - Bolt

- ❑ 5 Nm

4 - Radiator cowl

- ❑ Removing and installing ⇒ “4.3 Removing and installing radiator cowl”, page 257

5 - Radiator fan - V7-

- ❑ Removing and installing ⇒ “4.4 Removing and installing radiator fan V7 ”, page 263

6 - Bolt

- ❑ 3.5 Nm

7 - Support pad

8 - Rubber mounting

- ❑ For radiator

9 - Coolant hose

- ❑ Lift retaining clip to detach
- ❑ Connecting to radiator ⇒ Fig. ““Connecting coolant hose with plug-in connector”“ , page 252

10 - O-ring

- ❑ Renew

11 - O-ring

- ❑ Renew

12 - Coolant hose

- ❑ Lift retaining clip to detach
- ❑ Connecting to radiator ⇒ Fig. ““Connecting coolant hose with plug-in connector”“ , page 252

13 - Coolant hose

- ❑ To coolant expansion tank

14 - O-ring

- ❑ Renew

15 - Radiator

- ❑ Remove and install together with radiator cowl ⇒ “4.2 Removing and installing radiator”, page 252
- ❑ If renewed, refill system with fresh coolant

16 - Retaining pin

- ❑ Use screwdriver to release and pull off

17 - Rubber buffer

18 - Radiator bracket

19 - Bolt

- ❑ 4.5 Nm

20 - O-ring

- ❑ Renew

21 - Coolant hose

- ❑ Lift retaining clip to detach
- ❑ Connecting to radiator ⇒ Fig. ““Connecting coolant hose with plug-in connector”“ , page 252

22 - Radiator fan 2 - V177-

- ❑ Depending on equipment
- ❑ Removing and installing ⇒ “4.4 Removing and installing radiator fan V7 ”, page 263

23 - Bolt

- ❑ 5 Nm

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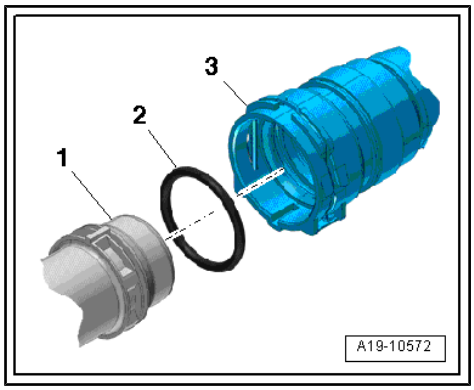
Connecting coolant hose with plug-in connector

– Remove old O-ring -2- from coolant hose -3-.

– Lightly lubricate new O-ring with coolant and fit O-ring in coolant hose.

– Press coolant hose onto connection -1- until it engages audibly.

– Press coolant hose in again and then pull to check that plug-in connector is correctly engaged.



4.2 Removing and installing radiator

Note

Radiator and radiator cowl can only be removed and installed together as one unit.

Special tools and workshop equipment required

♦ Drip tray for workshop hoist - VAS 6208-



♦ Hose clip pliers - VAS 6362-



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Removing

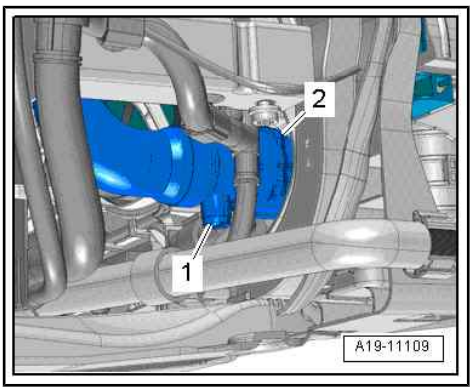
– Remove noise insulation (front) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

– Remove impact bar ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing impact bar .

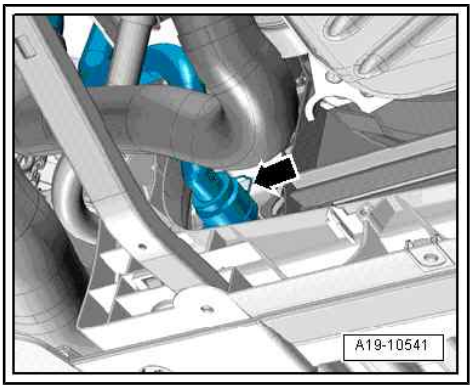
– Place drip tray for workshop hoist - VAS 6208- beneath engine.

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

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



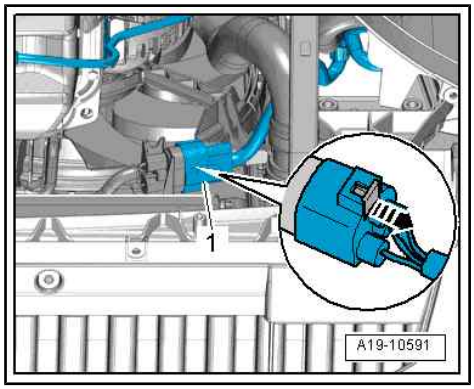
– Detach connection from radiator (lift retaining clip -arrow-).



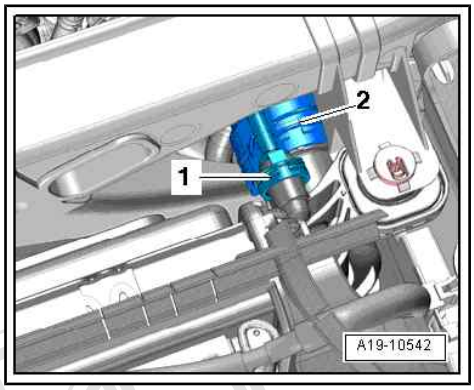
WARNING

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

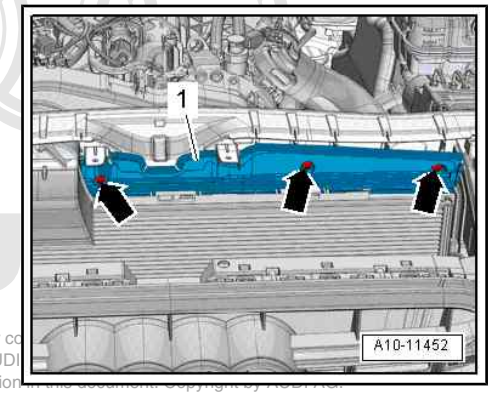
- *Unplug electrical connectors before starting to work in the area of radiator cowl.*



– Take electrical connector -1- for radiator fan out of bracket and unplug connector (push retainer to the rear -arrow- and press down release catch).



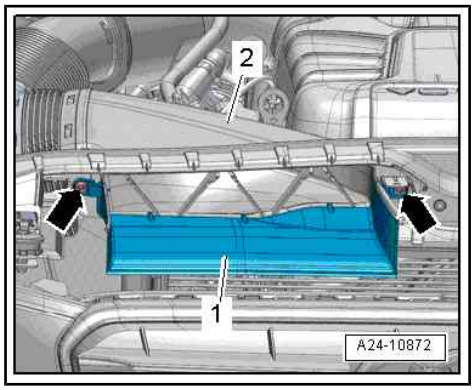
– Lift retaining clips -1- and -2- and detach connection from radiator.



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

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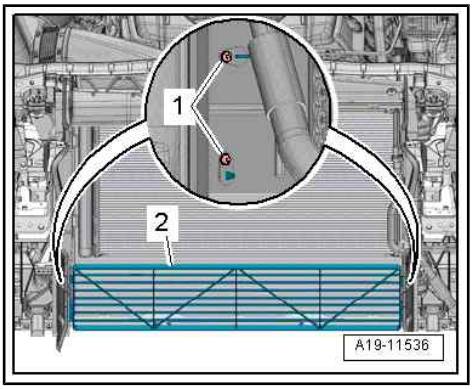
– Remove bolts -arrows- and detach air duct -1-.



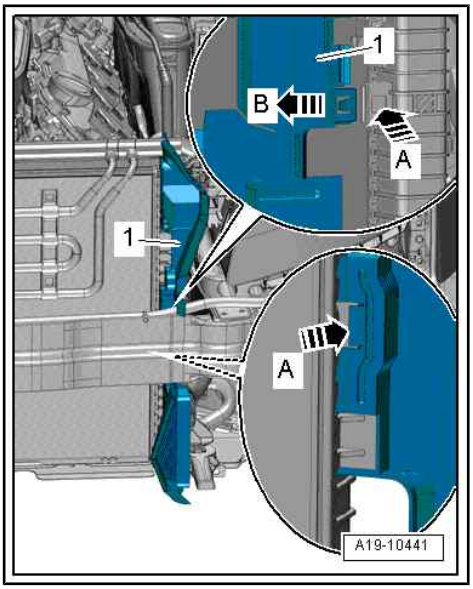
Note

Disregard -item 2-.

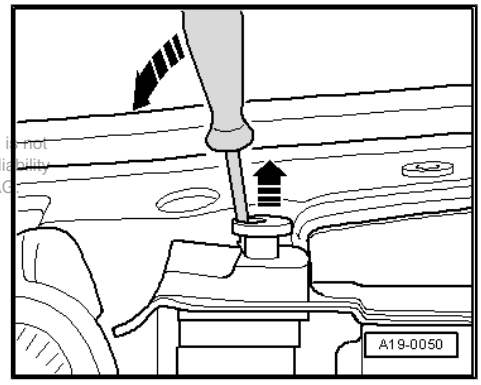
– For vehicles with frame -2-, unscrew bolts -1- and remove frame.



– Release catches -arrows A- and detach air duct -1- on left and right -arrow B-.



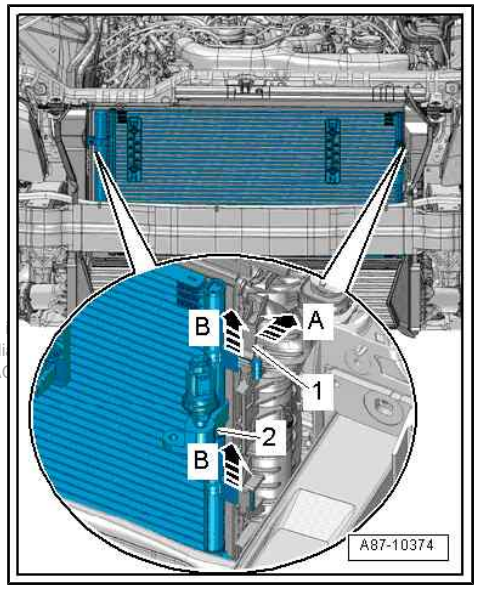
– Release retaining pins for radiator on both sides and pull out upwards -arrows-.



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Condenser with angled connection for refrigerant line:

– Have a second mechanic release retaining clips -1- in direction of -arrow A- and lift condenser -2- out of mountings on radiator -arrows B-.



Caution

Risk of damage to condenser, refrigerant lines and refrigerant hoses.

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

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– Pivot condenser forwards with pipes/hoses attached.

Condenser with straight connection for refrigerant line:

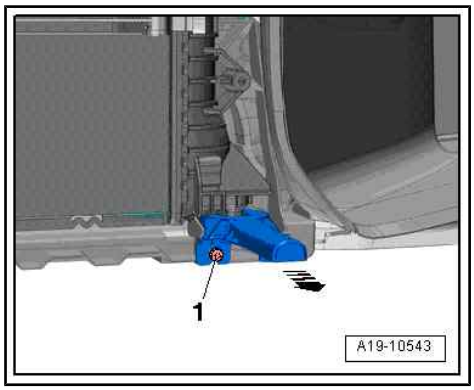
– Remove condenser ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit; Removing and installing condenser .

Continued for all vehicles:

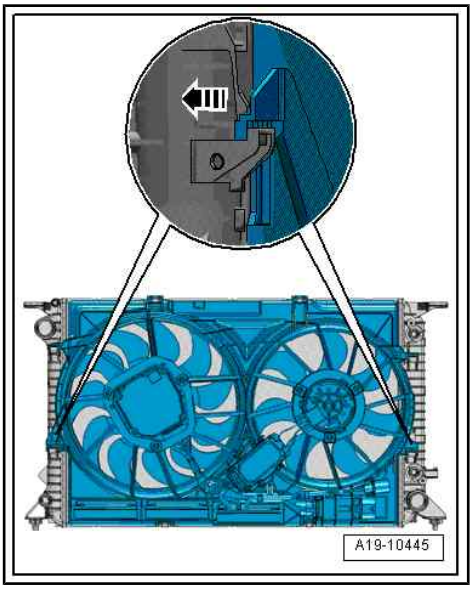
– Detach radiator.

– Remove bolts -1- on both sides and detach radiator bracket with radiator from lock carrier -arrow-.

– Slightly lower radiator.



– Press locking tabs on left and right sides of radiator cowl together -arrow- and lift radiator cowl off radiator.



Installing

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

Note

If there are slight impressions on the fins, refer to ⇒ "3.5 Installing radiators and condensers", page 8 .

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

– Connect coolant hoses with plug-in connector ⇒ Fig. ""Connecting coolant hose with plug-in connector"" , page 252 .

Note

Do not reuse coolant.

– Fill up with coolant ⇒ page 223 .

Tightening torques

- ⇒ "4.1 Exploded view - radiator/radiator fans", page 251
- ⇒ "2.1 Exploded view - air cleaner housing", page 284
- ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - impact bar
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

4.3 Removing and installing radiator cowl

⇒ "4.3.1 Removing and installing radiator cowl - Audi A6", page 257

⇒ "4.3.2 Removing and installing radiator cowl - Audi A7", page 260

4.3.1 Removing and installing radiator cowl - Audi A6

Special tools and workshop equipment required

- Drip tray for workshop hoist - VAS 6208-

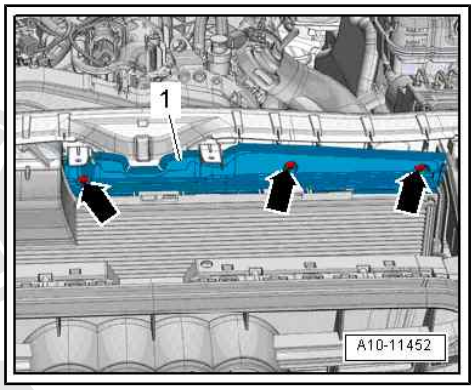


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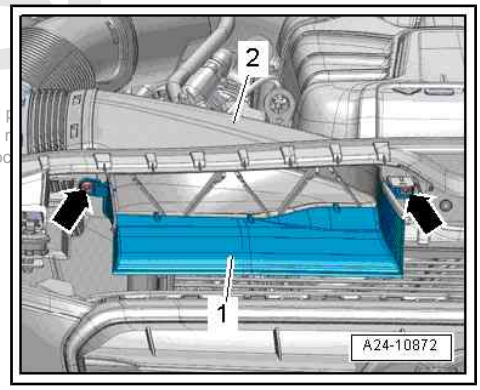
Removing

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

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



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



Note

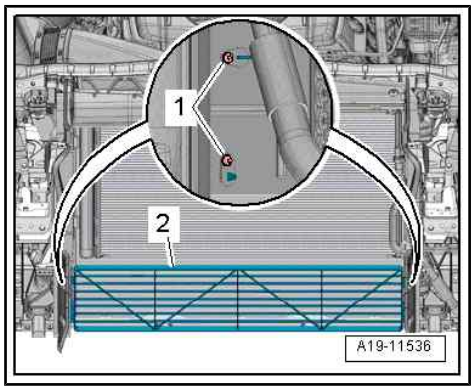
Disregard -item 2-.

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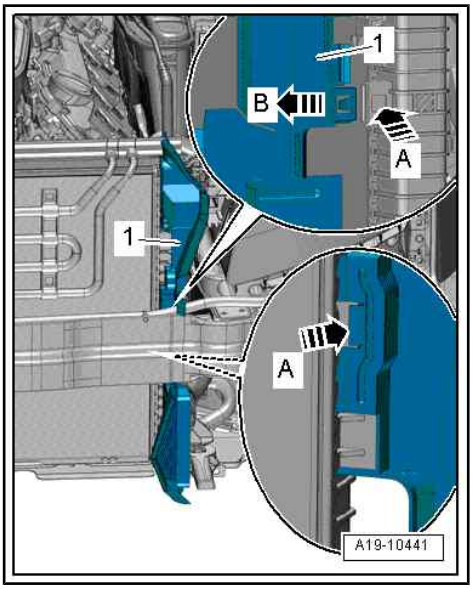
– Remove noise insulation (front) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

– Remove closure plate for bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing attachments .

– For vehicles with frame -2-, unscrew bolts -1- and remove frame.



– Release catches -arrows A- and swivel air duct -1- on left and right to centre of vehicle -arrow B-.

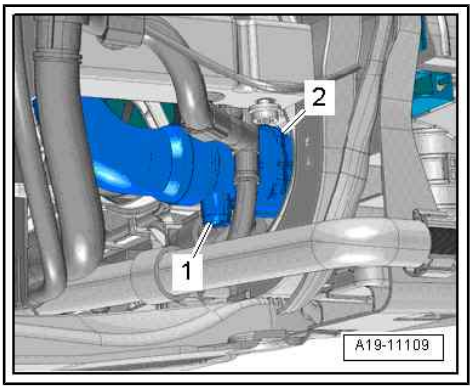


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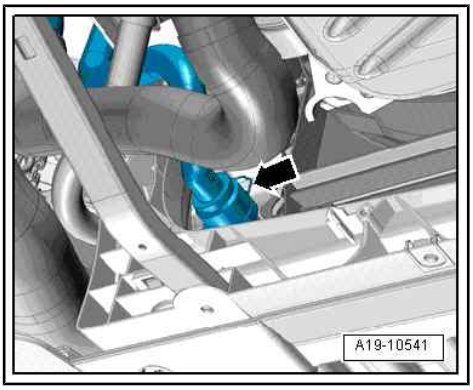
– Place drip tray for workshop hoist - VAS 6208- beneath engine.

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

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



– Detach connection from radiator (lift retaining clip -arrow-).

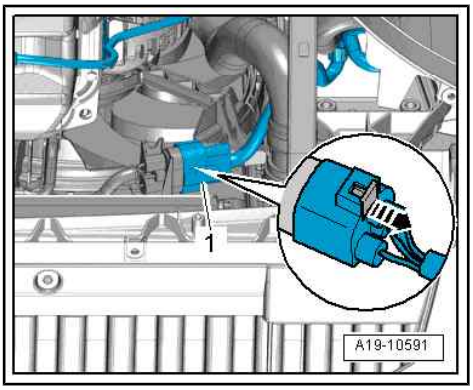


WARNING

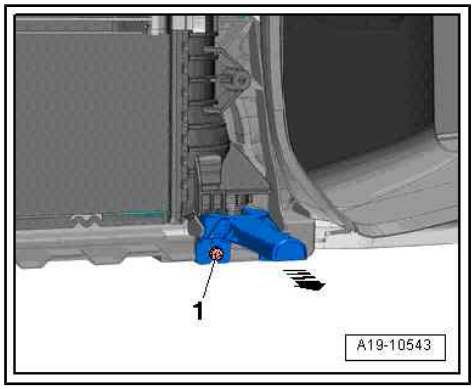
Risk of injury as the radiator fans may start up automatically.

- ***Unplug electrical connectors before starting to work in the area of radiator cowl.***

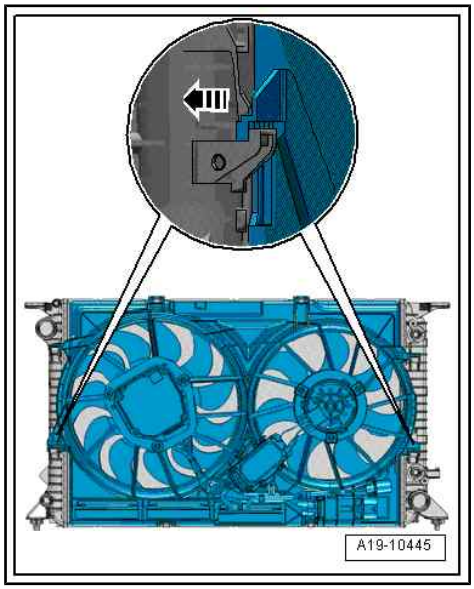
– Take electrical connector -1- for radiator fan out of bracket and unplug connector (push retainer to the rear -arrow- and press down release catch).



– Remove bolts -1- on both sides and detach radiator bracket with radiator from lock carrier -arrow-.
– Press radiator slightly towards front.



– Press locking tabs on left and right sides of radiator cowl simultaneously -arrow-, lift radiator cowl off radiator and remove from below.



Installing

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

– Connect coolant hose with plug-in connector ⇒ Fig. ""Connecting coolant hose with plug-in connector"" , page 252 .
– Install bumper cover, closure plate and lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .

Note

Do not reuse coolant.

– Fill up with coolant ⇒ page 223 .

Tightening torques

- ⇒ "4.1 Exploded view - radiator/radiator fans", page 251
- ⇒ "2.1 Exploded view - air cleaner housing", page 284
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

4.3.2 Removing and installing radiator cowl - Audi A7

Removing

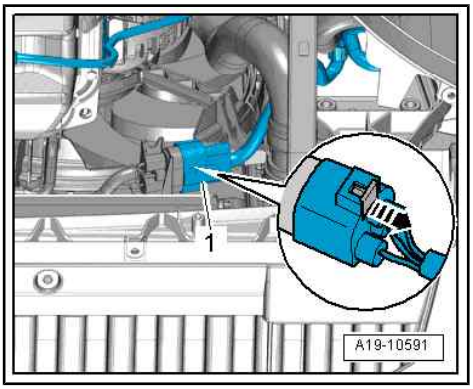
– Remove noise insulation (front) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

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WARNING

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

- *Unplug electrical connectors before starting to work in the area of radiator cowl.*

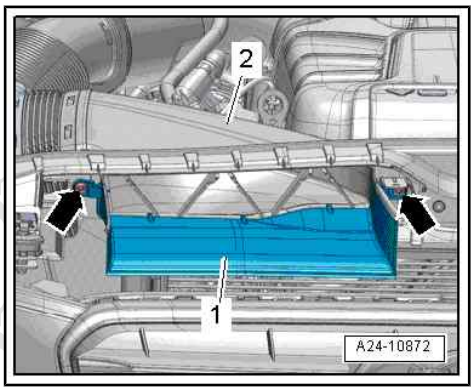


– Take electrical connector -1- for radiator fan out of bracket and unplug connector (push retainer to the rear -arrow- and press down release catch).

– Remove closure plate for bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing attachments .

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

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

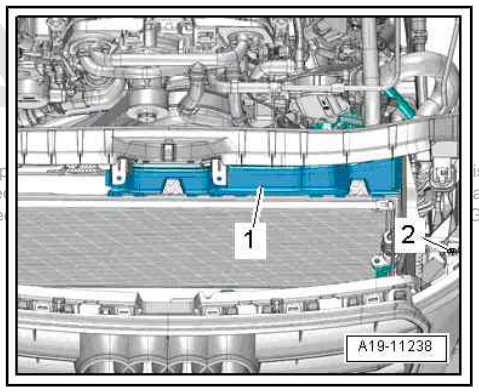


Note

Disregard -item 2-.

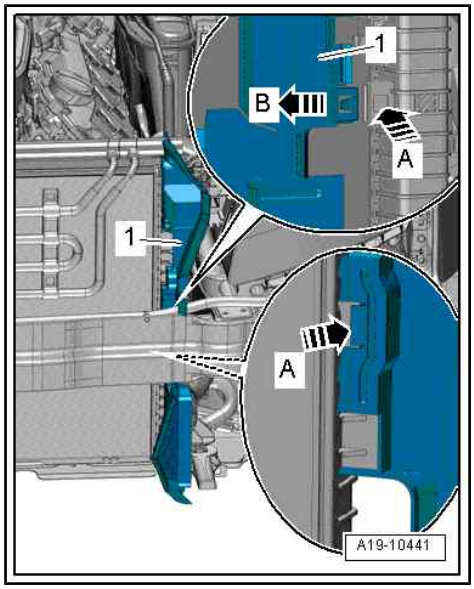
– Detach air duct -1-.

– Remove bolt -2- on both sides and press bumper cover forwards slightly.

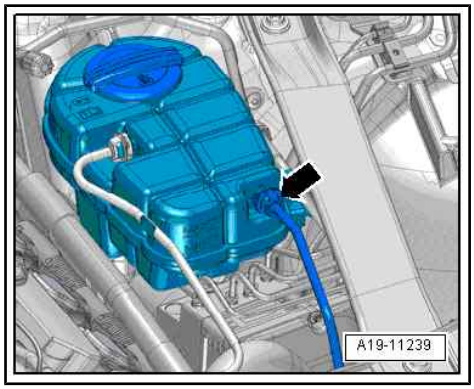


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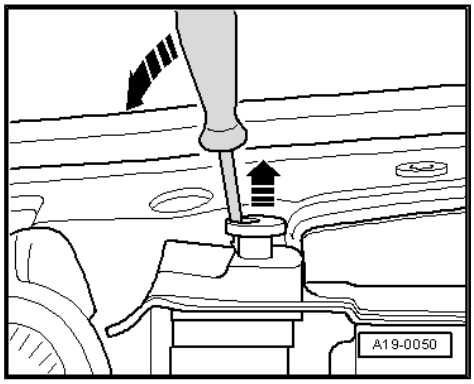
– Release catches -arrows A- and swivel air duct -1- on left and right to centre of vehicle -arrow B-.



– Lift retaining clip -arrow- and disconnect coolant hoses from coolant expansion tank.

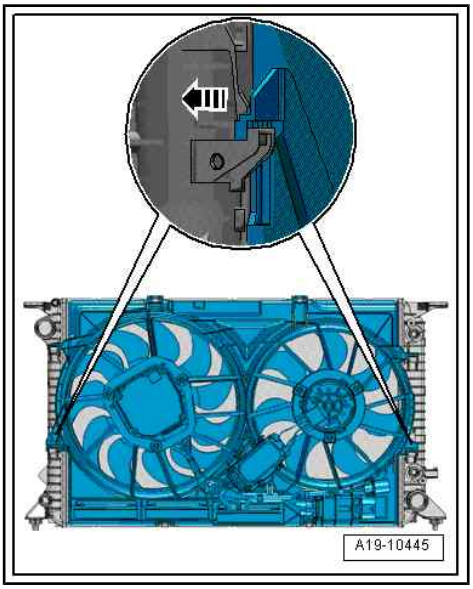


– Release retaining pins for radiator on both sides and pull out upwards -arrows-.
– Press radiator slightly towards front.



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– Press locking tabs on left and right sides of radiator cowl together -arrow- and lift radiator cowl off radiator.



Installing

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

– Connect coolant hose with plug-in connector ⇒ Fig. ""Connecting coolant hose with plug-in connector"" , page 252 .

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

Tightening torques

- ⇒ "4.1 Exploded view - radiator/radiator fans", page 251
- ⇒ "2.1 Exploded view - air cleaner housing", page 284
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

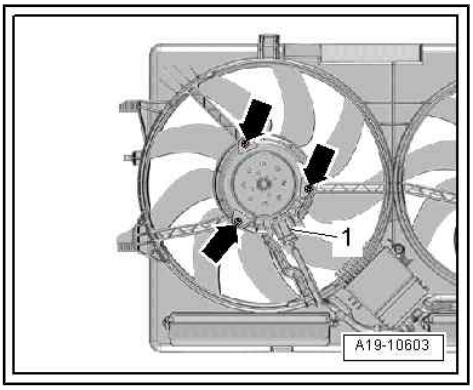
4.4 Removing and installing radiator fan - V7-

Removing

– Remove radiator cowl ⇒ "4.3 Removing and installing radiator cowl", page 257 .

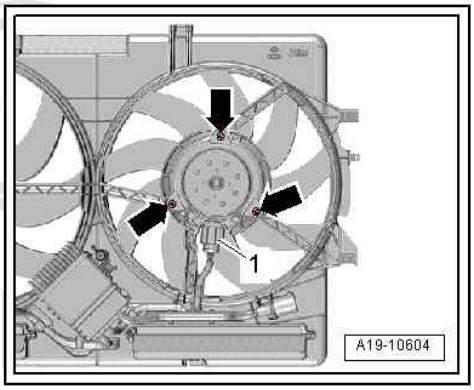
– Unplug electrical connector -1-.

– Remove bolts -arrows- and detach radiator fan - V7- (left-side).



– Unplug electrical connector -1-.

– Remove bolts -arrows- and detach radiator fan 2 - V177- (right-side).



Installing

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

– Install radiator cowl ⇒ "4.3 Removing and installing radiator cowl", page 257 .

Tightening torques

- ⇒ "4.1 Exploded view - radiator/radiator fans", page 251

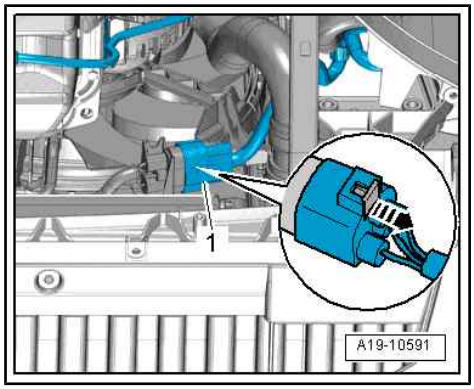
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4.5 Removing and installing radiator fan control unit - J293-

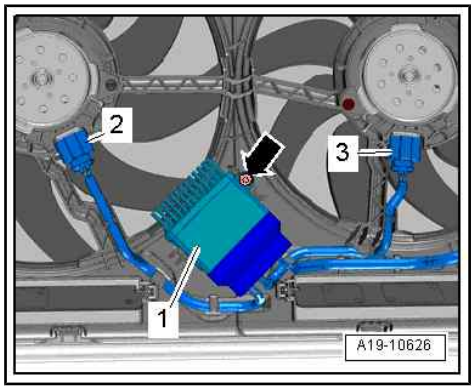
Removing

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

– Take electrical connector -1- for radiator fan out of bracket and unplug connector (push retainer to the rear -arrow- and press down release catch).
– Move clear electrical wiring harness going to radiator fan control unit.



– Unplug electrical connectors -2- and -3-.
– Unscrew bolt -arrow- and remove radiator fan control unit -1-.



Installing

Installation is carried out in reverse sequence.

Tightening torques

- ⇒ “4.1 Exploded view - radiator/radiator fans”, page 251
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

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24 – Mixture preparation - injection

1 Injection system

⇒ “1.1 Overview of fitting locations - injection system”, page 265

⇒ “1.2 Reducing fuel pressure in high-pressure section”, page 282

1.1 Overview of fitting locations - injection system

⇒ “1.1.1 Overview of fitting locations - injection system, vehicles with 2.5 ltr. engine”, page 265

⇒ “1.1.2 Overview of fitting locations - injection system, vehicles with 2.8 ltr. engine”, page 275

1.1.1 Overview of fitting locations - injection system, vehicles with 2.5 ltr. engine

Engine compartment (right-side)

1 - Secondary air pump motor - V101-

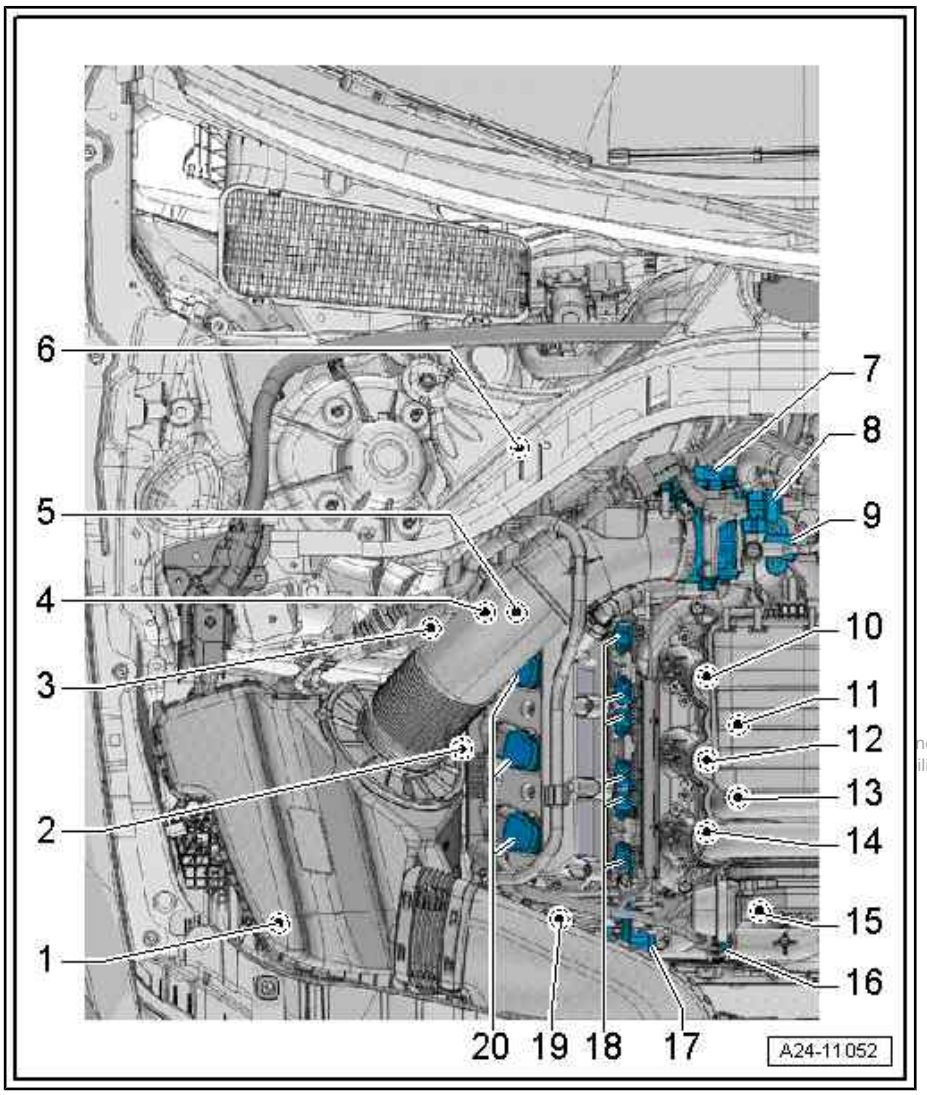
- ❑ Fitting location ⇒ Fig. ““Fitting location of secondary air pump motor -V101- ”“ , page 274
- ❑ Exploded view ⇒ “3.1 Exploded view - secondary air system”, page 352

2 - Hall sender 3 - G300-

- ❑ Fitting location ⇒ Fig. ““Fitting locations on cylinder bank 1 (right-side)”“ , page 271
- ❑ Exploded view ⇒ “1.1.1 Exploded view - ignition system, vehicles with 2.5 ltr. engine”, page 371

3 - Lambda probe - G39- with Lambda probe heater - Z19-

- ❑ Fitting location ⇒ Fig. ““Fitting location of Lambda probes on cylinder bank 1 (right-side)”“ , page 273
- ❑ Fitting location of electrical connector ⇒ Fig. ““Electrical connectors for Lambda probes on cylinder bank 1 (right-side)”“ , page 273
- ❑ Exploded view ⇒ “7.1 Exploded view - Lambda probes”, page 319



4 - Exhaust camshaft control valve 1 -N318-

- Fitting location ⇒ Fig. ""Fitting locations on cylinder bank 1 (right-side)"" , page 271
- Exploded view ⇒ "3.1 Exploded view - cylinder head", page 132

5 - Camshaft control valve 1 - N205-

- Fitting location ⇒ Fig. ""Fitting locations on cylinder bank 1 (right-side)"" , page 271
- Exploded view ⇒ "3.1 Exploded view - cylinder head", page 132

6 - Lambda probe after catalytic converter - G130- with Lambda probe 1 heater after catalytic converter - Z29-

- Fitting location ⇒ Fig. ""Fitting location of Lambda probes on cylinder bank 1 (right-side)"" , page 273
- Fitting location of connector
  ⇒ Fig. ""Electrical connectors for Lambda probes on cylinder bank 1 (right-side)"" , page 273
- Exploded view ⇒ "7.1 Exploded view - Lambda probes", page 319

7 - Throttle valve module - J338-

- Including throttle valve drive for electric throttle - G186- , throttle valve drive angle sender 1 for electric throttle - G187- and throttle valve drive angle sender 2 for electric throttle - G188-
- Fitting location ⇒ Fig. ""Fitting location: at rear of intake manifold"" , page 273

8 - Activated charcoal filter solenoid valve 1 - N80-

9 - Intake air temperature sender - G42- / intake manifold pressure sender - G71-

- Fitting location ⇒ Fig. ""Fitting location: at rear of intake manifold"" , page 273
- Exploded view ⇒ "3.1.1 Exploded view - intake manifold, vehicles with 2.5 ltr. engine", page 287

10 - Injector, cylinder 3 - N32-

- Fitting location ⇒ Fig. ""Fitting locations: components on inside of right cylinder bank 1"" , page 271
- Exploded view ⇒ "4.1 Exploded view - fuel rail with injectors", page 299

11 - Knock sensor 1 - G61-

- Fitting location ⇒ Fig. ""Fitting locations: components on inside of right cylinder bank 1"" , page 271
- Exploded view ⇒ "1.1.1 Exploded view - ignition system, vehicles with 2.5 ltr. engine", page 371

12 - Injector, cylinder 2 - N31-

- Fitting location ⇒ Fig. ""Fitting locations: components on inside of right cylinder bank 1"" , page 271
- Exploded view ⇒ "4.1 Exploded view - fuel rail with injectors", page 299

13 - Temperature sender for engine temperature regulation - G694-

- Fitting location ⇒ Fig. ""Fitting locations: components on inside of right cylinder bank 1"" , page 280
- Removing and installing
  ⇒ "2.7 Removing and installing temperature sender for engine temperature regulation G694 ", page 234

14 - Injector, cylinder 1 - N30-

- Fitting location ⇒ Fig. ""Fitting locations: components on inside of right cylinder bank 1"" , page 271
- Exploded view ⇒ "4.1 Exploded view - fuel rail with injectors", page 299

15 - Variable intake manifold change-over valve - N156-

- Fitting location ⇒ Fig. ""Fitting location: at front of engine"" , page 272

16 - Coolant temperature sender - G62-

- Fitting location ⇒ Fig. ""Fitting location: at front of engine"" , page 272
- Exploded view ⇒ "3.1 Exploded view - coolant pipes", page 236

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17 - Hall sender - G40-

- Fitting location ⇒ Fig. ""Fitting locations on cylinder bank 1 (right-side)"" , page 271
- Exploded view ⇒ "1.1.1 Exploded view - ignition system, vehicles with 2.5 ltr. engine", page 371

18 - Actuators for camshaft adjustment

- Actuator 1 for camshaft adjustment - F366-
- Actuator 2 for camshaft adjustment - F367-
- Actuator 3 for camshaft adjustment - F368-

- ❑ Actuator 4 for camshaft adjustment - F369-
- ❑ Actuator 5 for camshaft adjustment - F370-
- ❑ Actuator 6 for camshaft adjustment - F371-
- ❑ Fitting location ⇒ Fig. ""Fitting locations on cylinder bank 1 (right-side)"" , page 271

19 - High-pressure pump

- ❑ With fuel pressure sender, low pressure - G410- and fuel metering valve - N290-
- ❑ Fitting location ⇒ Fig. ""Fitting locations at high-pressure pump"" , page 272
- ❑ Exploded view ⇒ "6.1 Exploded view - high-pressure pump", page 312

20 - Ignition coils, cylinder bank 1

- ❑ Ignition coil 1 with output stage - N70-
- ❑ Ignition coil 2 with output stage - N127-
- ❑ Ignition coil 3 with output stage - N291-
- ❑ Exploded view ⇒ "1.1.1 Exploded view - ignition system, vehicles with 2.5 ltr. engine", page 371

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Engine compartment (left-side)

1 - Variable intake manifold position sender - G513-

- ❑ Fitting location ⇒ Fig. ""Fitting location: at front of engine"" , page 272

2 - Injector, cylinder 4 - N33-

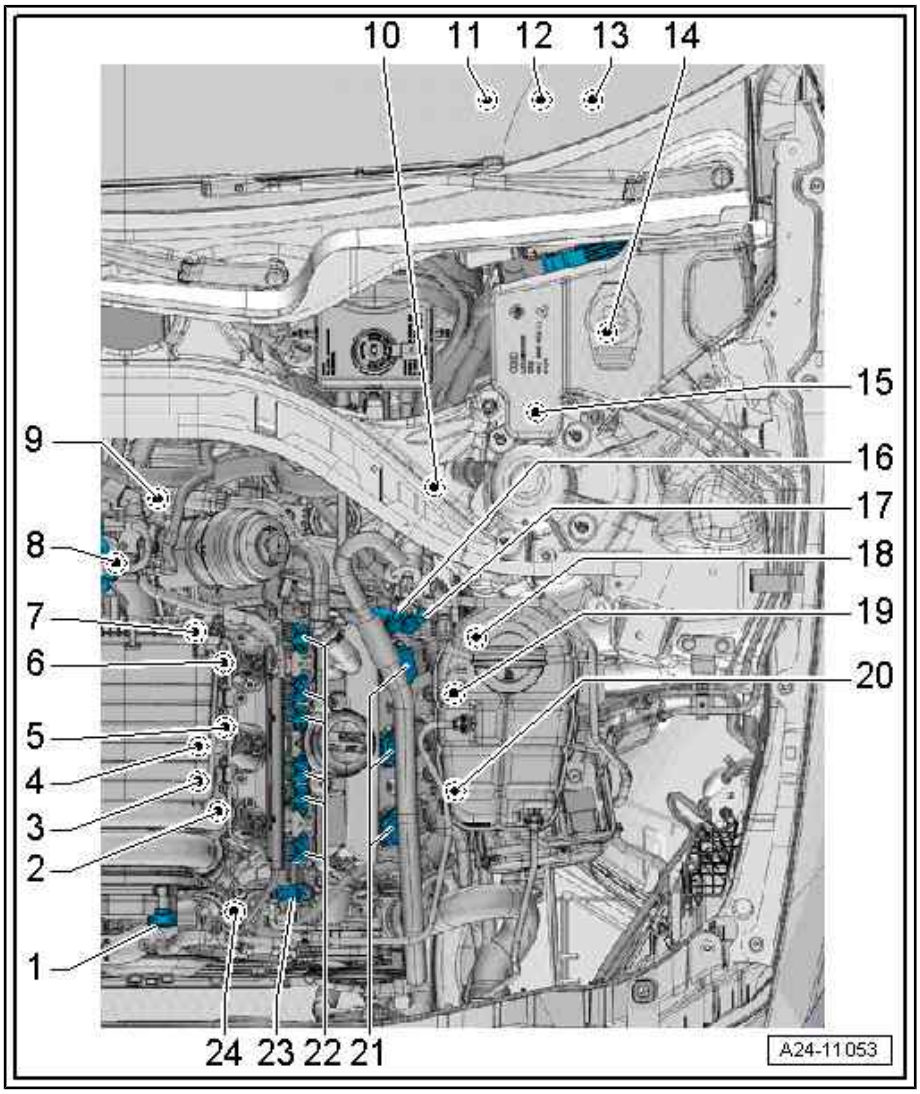
- ❑ Fitting location ⇒ Fig. ""Fitting locations: components on inside of left cylinder bank 2"" , page 271
- ❑ Exploded view ⇒ "4.1 Exploded view - fuel rail with injectors", page 299

3 - Fuel pressure sender - G247-

- ❑ Fitting location ⇒ Fig. ""Fitting locations: components on inside of left cylinder bank 2"" , page 271
- ❑ Exploded view ⇒ "4.1 Exploded view - fuel rail with injectors", page 299

4 - Knock sensor 2 - G66-

- ❑ Fitting location ⇒ Fig. ""Fitting locations: components on inside of left cylinder bank 2"" , page 271
- ❑ Fitting location of connector ⇒ Fig. ""Electrical connectors for Lambda probes on cylinder bank 2 (left-side)"" , page 274
- ❑ Exploded view ⇒ "1.1.1 Exploded view - ignition system, vehicles with 2.5 ltr. engine", page 371



5 - Injector, cylinder 5 - N83-

- Fitting location ⇒ Fig. ""Fitting locations: components on inside of left cylinder bank 2"" , page 271
- Exploded view ⇒ "4.1 Exploded view - fuel rail with injectors", page 299

6 - Injector, cylinder 6 - N84-

- Fitting location ⇒ Fig. ""Fitting locations: components on inside of left cylinder bank 2"" , page 271
- Exploded view ⇒ "4.1 Exploded view - fuel rail with injectors", page 299

7 - Oil pressure switch for reduced oil pressure - F378-

- Fitting location ⇒ Fig. ""Fitting locations: components on inside of left cylinder bank 2"" , page 271

8 - Engine speed sender - G28-

- Fitting location ⇒ Fig. ""Fitting location of engine speed sender -G28- "" , page 273
- Exploded view ⇒ "1.1.1 Exploded view - ignition system, vehicles with 2.5 ltr. engine", page 371

9 - Oil pressure switch - F22-

- Fitting location ⇒ Fig. ""Fitting location of oil pressure switch -F22- -A-"" , page 272
- Exploded view ⇒ "4.1 Exploded view - oil filter housing/oil pressure switches", page 208

10 - Lambda probe 2 after catalytic converter - G131- with Lambda probe 2 heater after catalytic converter - Z30-

- Fitting location ⇒ Fig. ""Fitting location of Lambda probes on cylinder bank 2 (left-side)"" , page 274
- Fitting location of electrical connector
  ⇒ Fig. ""Electrical connectors for Lambda probes on cylinder bank 2 (left-side)"" , page 274
- Exploded view ⇒ "7.1 Exploded view - Lambda probes", page 319

11 - Accelerator position sender - G79- / accelerator position sender 2 - G185-

- Fitting location
  ⇒ Fig. ""Fitting location of accelerator position sender -G79- / accelerator position sender 2 -G185- "" , page 270

12 - Brake light switch - F-

- Fitting location
  ⇒ Fig. ""Fitting locations of brake light switch -F- and clutch position sender -G476- "" , page 270

13 - Clutch position sender - G476-

- Only on vehicles with manual gearbox
- Fitting location
  ⇒ Fig. ""Fitting locations of brake light switch -F- and clutch position sender -G476- "" , page 270

14 - Engine control unit - J623-

- Fitting location ⇒ Fig. ""Fitting location of engine control unit -J623- "" , page 269
- Removing and installing ⇒ "8.2 Removing and installing engine/motor control unit J623 ", page 330

15 - Gearbox oil cooling valve - N509-

- Fitting location ⇒ Fig. ""Fitting location of gearbox oil cooling valve -N509- "" , page 274
- Exploded view ⇒ "3.1 Exploded view - coolant pipes", page 236

16 - Camshaft control valve 2 - N208-

- Fitting location ⇒ Fig. ""Fitting locations on cylinder bank 2 (left-side)"" , page 271
- Exploded view ⇒ "3.1 Exploded view - cylinder head", page 132

17 - Exhaust camshaft control valve 2 - N319-

- Fitting location ⇒ Fig. ""Fitting locations on cylinder bank 2 (left-side)"" , page 271
- Exploded view ⇒ "3.1 Exploded view - cylinder head", page 132

18 - Lambda probe 2 - G108- with Lambda probe heater 2 - Z28-

- Fitting location ⇒ Fig. ""Fitting location of Lambda probes on cylinder bank 2 (left-side)"" , page 274
- Fitting location of electrical connector
  ⇒ Fig. ""Electrical connectors for Lambda probes on cylinder bank 2 (left-side)"" , page 274
- Exploded view ⇒ "7.1 Exploded view - Lambda probes", page 319

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19 - Hall sender 4 - G301-

- ❑ Fitting location ⇒ Fig. ""Fitting locations on cylinder bank 2 (left-side)"" , page 271
- ❑ Exploded view ⇒ "1.1.1 Exploded view - ignition system, vehicles with 2.5 ltr. engine", page 371

20 - Valve for oil pressure control - N428-

- ❑ Fitting location ⇒ Fig. ""Fitting location of valve for oil pressure control -N428- "" , page 272
- ❑ Removing and installing ⇒ "4.6 Removing and installing valve for oil pressure control N428 ", page 214

21 - Ignition coils, cylinder bank 2

- ❑ Ignition coil 4 with output stage - N292-
- ❑ Ignition coil 5 with output stage - N323-
- ❑ Ignition coil 6 with output stage - N324-
- ❑ Exploded view ⇒ "1.1.1 Exploded view - ignition system, vehicles with 2.5 ltr. engine", page 371

22 - Actuators for camshaft adjustment

- ❑ Actuator 7 for camshaft adjustment - F372-
- ❑ Actuator 8 for camshaft adjustment - F373-
- ❑ Actuator 9 for camshaft adjustment - F374-
- ❑ Actuator 10 for camshaft adjustment - F375-
- ❑ Actuator 11 for camshaft adjustment - F376-
- ❑ Actuator 12 for camshaft adjustment - F377-
- ❑ Fitting location ⇒ Fig. ""Fitting locations on cylinder bank 2 (left-side)"" , page 271

23 - Hall sender 2 - G163-

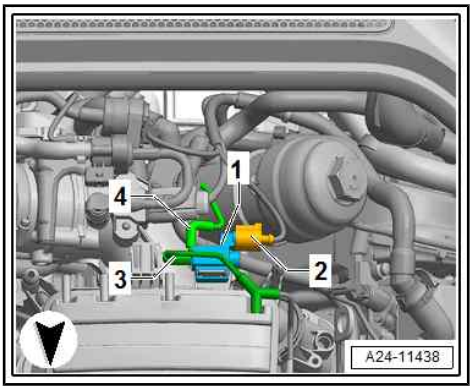
- ❑ Fitting location ⇒ Fig. ""Fitting locations on cylinder bank 2 (left-side)"" , page 271
- ❑ Exploded view ⇒ "1.1.1 Exploded view - ignition system, vehicles with 2.5 ltr. engine", page 371

24 - Coolant valve for cylinder head - N489-

- ❑ Fitting location ⇒ Fig. ""Fitting location at front of engine"" , page 272

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Fitting location of secondary air inlet valve - N112-



Note

Secondary air inlet valve - N112- is fitted on vehicles from model year 2013 onwards.

1 - Secondary air inlet valve - N112-

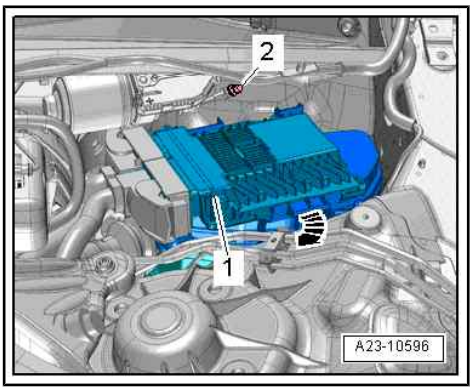
2 - Electrical connector

3 - Vacuum line to vacuum supply

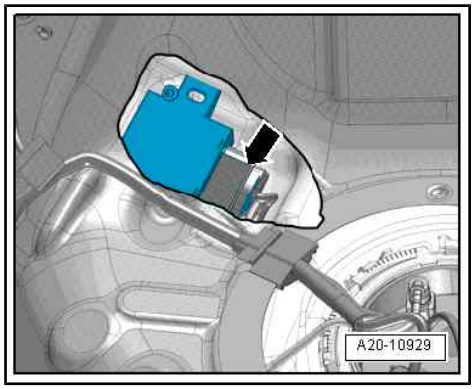
4 - Control pipe to combination valves for secondary air inlet

Fitting location of engine control unit - J623-

♦ In left electronics box in engine compartment



Fitting location of fuel pump control unit - J538-



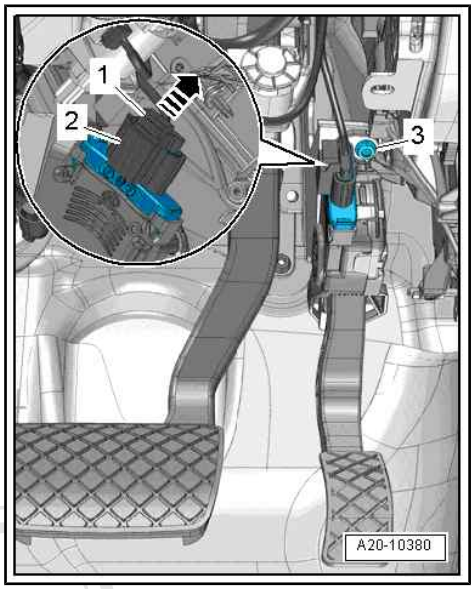
- Fuel pump control unit - J538- -arrow- is located between floor panel and fuel tank level with rear seat bench (right-side).

Note

For illustration purposes, the floor panel is cut open in the illustration.

Removing and installing ⇒ Fuel supply system; Rep. gr. 20 ; Fuel pump; Removing and installing fuel pump control unit - J538-

Fitting location of accelerator position sender - G79- / accelerator position sender 2 - G185-



- In accelerator pedal module

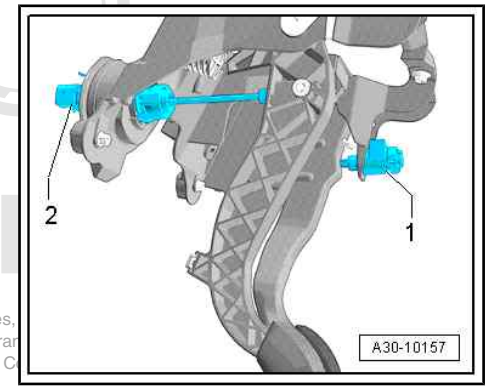
2 - Electrical connector

Note

The accelerator position sender - G79- and accelerator position sender 2 - G185- are integrated in the accelerator pedal module and cannot be renewed individually.

Removing and installing ⇒ Fuel supply system, diesel engines; Rep. gr. 20 ; Accelerator mechanism; Removing and installing accelerator pedal module with accelerator position sender -G79- / -G185- .

Fitting locations of brake light switch - F- and clutch position sender - G476-



1 - Brake light switch - F-

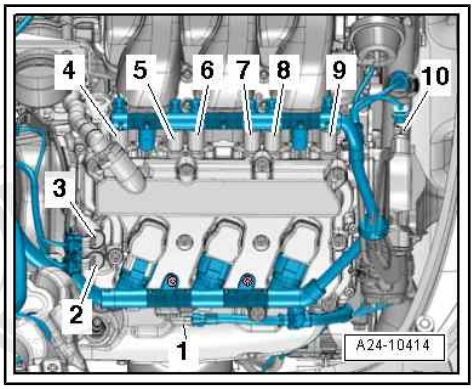
2 - Clutch position sender - G476- (vehicles with manual gearbox only)

Removing and installing brake light switch - F- ⇒ Brake system; Rep. gr. 45 ; Sensors; Removing and installing brake light switch

Removing and installing clutch position sender - G476- ⇒ Rep. gr. 30 ; Clutch mechanism; Removing and installing clutch master cylinder

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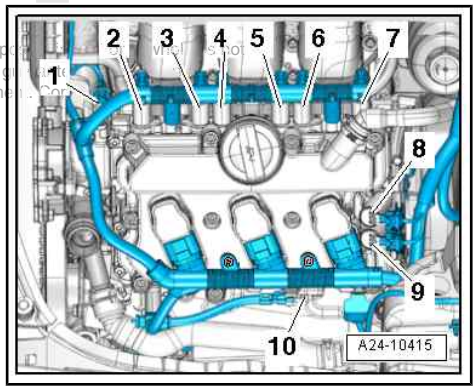
Fitting locations on cylinder bank 1 (right-side)



1 - Hall sender 3 - G300-
2 - Exhaust camshaft control valve 1 - N318-
3 - Camshaft control valve 1 - N205-
4 - Actuator 6 for camshaft adjustment - F371-
5 - Actuator 5 for camshaft adjustment - F370-
6 - Actuator 4 for camshaft adjustment - F369-
7 - Actuator 3 for camshaft adjustment - F368-
8 - Actuator 2 for camshaft adjustment - F367-
9 - Actuator 1 for camshaft adjustment - F366-
10 - Hall sender - G40-

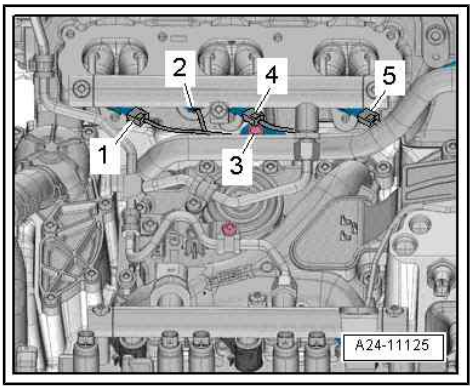
Fitting locations on cylinder bank 2 (left-side)

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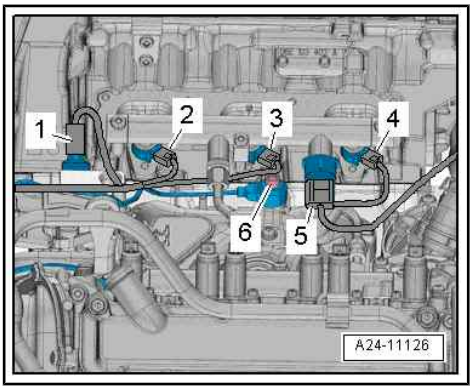
1 - Hall sender 2 - G163-
2 - Actuator 7 for camshaft adjustment - F372-
3 - Actuator 8 for camshaft adjustment - F373-
4 - Actuator 9 for camshaft adjustment - F374-
5 - Actuator 10 for camshaft adjustment - F375-
6 - Actuator 11 for camshaft adjustment - F376-
7 - Actuator 12 for camshaft adjustment - F377-
8 - Camshaft control valve 2 - N208-
9 - Exhaust camshaft control valve 2 - N319-
10 - Hall sender 4 - G301-

Fitting locations: components on inside of right cylinder bank 1



1 - Injector, cylinder 1 - N30-
2 - Temperature sender for engine temperature regulation - G694-
3 - Knock sensor 1 - G61-
4 - Injector, cylinder 2 - N31-
5 - Injector, cylinder 3 - N32-

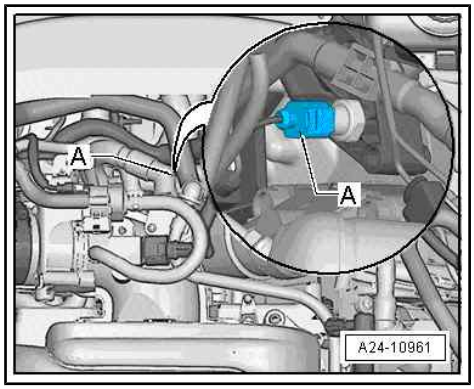
Fitting locations: components on inside of left cylinder bank 2



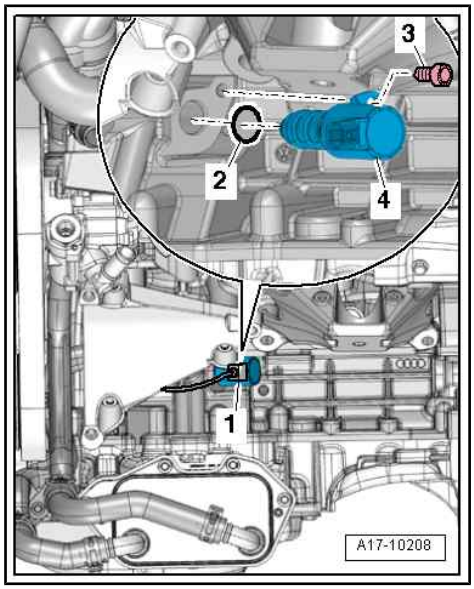
1 - Oil pressure switch for reduced oil pressure - F378-
2 - Injector, cylinder 6 - N84-
3 - Injector, cylinder 5 - N83-
4 - Injector, cylinder 4 - N33-
5 - Fuel pressure sender - G247-
6 - Knock sensor 2 - G66-

Fitting location of oil pressure switch - F22- -A-

The oil pressure switch - F22- is screwed into the oil filter flange



Fitting location of valve for oil pressure control - N428-



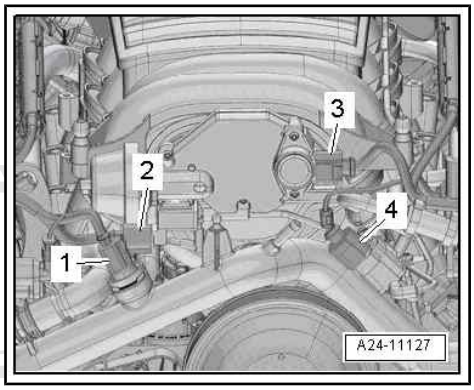
Fitting location: at front of engine

1 - Coolant temperature sender - G62-

2 - Variable intake manifold change-over valve - N156-

3 - Variable intake manifold position sender - G513-

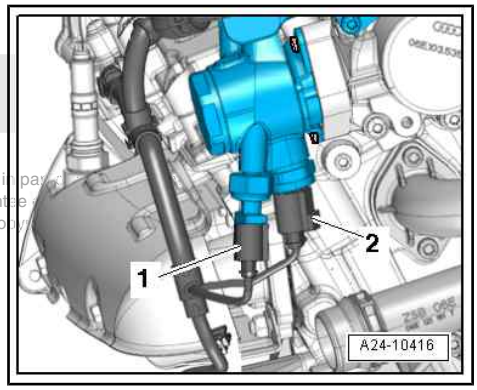
4 - Coolant valve for cylinder head - N489-



Fitting locations at high-pressure pump

1 - Fuel pressure sender for low pressure - G410-

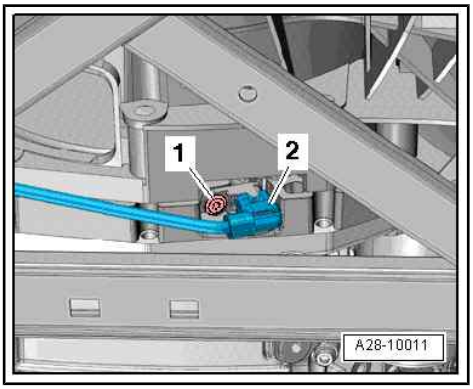
2 - Fuel metering valve - N290-



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Fitting location of engine speed sender - G28-

- Bolted into gearbox from below

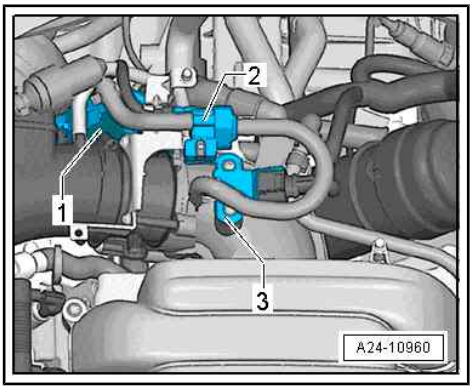


Fitting location: at rear of intake manifold

1 - Throttle valve module - J338-

2 - Activated charcoal filter solenoid valve 1 - N80-

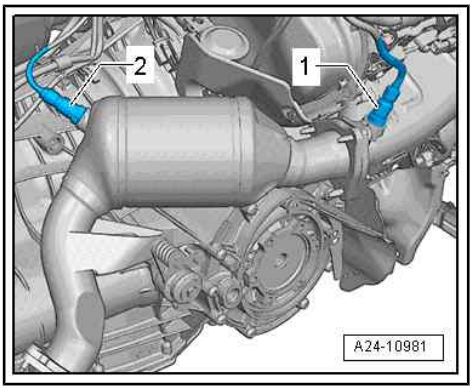
3 - Intake air temperature sender - G42- / intake manifold pressure sender - G71-



Fitting location of Lambda probes on cylinder bank 1 (right-side)

1 - Lambda probe - G39-

2 - Lambda probe after catalytic converter - G130-



Electrical connectors for Lambda probes on cylinder bank 1 (right-side)

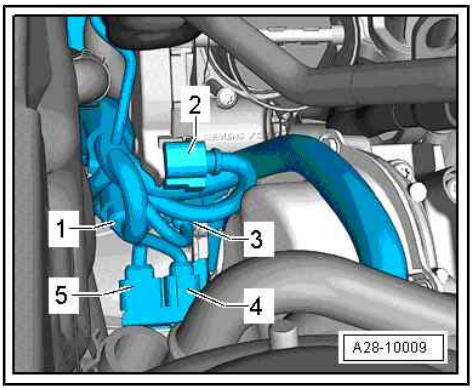
1 - For knock sensor 1 - G61-

2 - For throttle valve module - J338-

3 - For injectors

4 - For Lambda probe - G39-

5 - For Lambda probe after catalytic converter - G130-

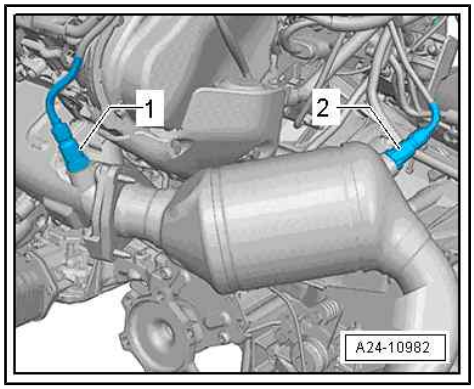


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Fitting location of Lambda probes on cylinder bank 2 (left-side)

1 - Lambda probe 2 - G108-

2 - Lambda probe 2 after catalytic converter - G131-



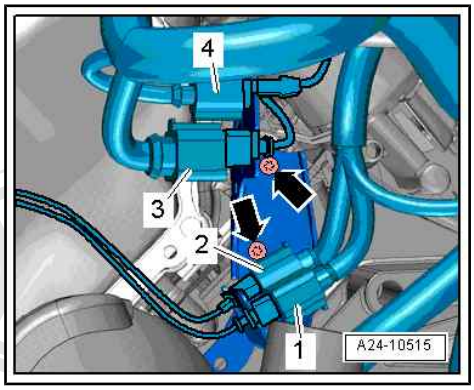
Electrical connectors for Lambda probes on cylinder bank 2 (left-side)

1 - For Lambda probe 2 - G131- (after catalytic converter)

2 - For Lambda probe 2 - G108-

3 - For injectors on cylinder bank 2, fuel pressure sender - G247- , oil pressure switch for reduced oil pressure - F378- and valve for oil pressure control - N428-

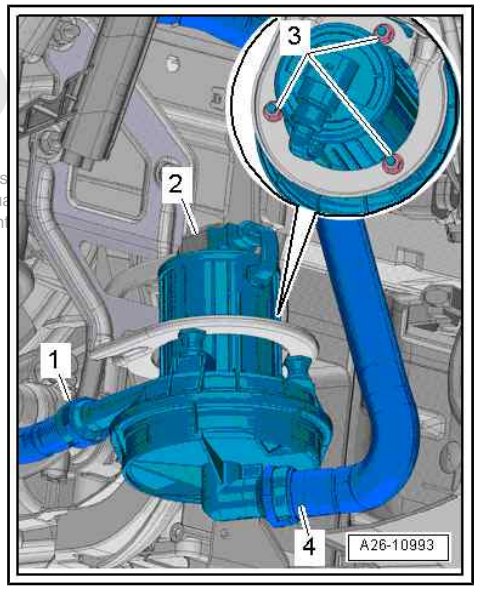
4 - For knock sensor 2 - G66-



Fitting location of secondary air pump motor - V101-

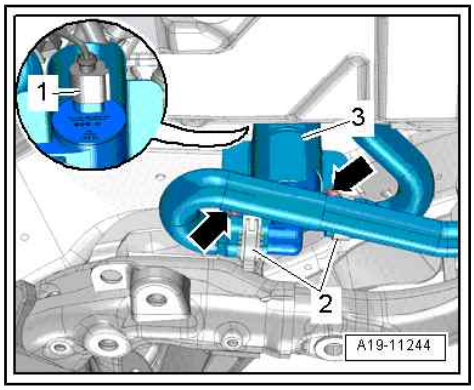
- At front right in engine compartment below longitudinal member

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Fitting location of gearbox oil cooling valve - N509-

- At left of subframe



1.1.2 Overview of fitting locations - injection system, vehicles with 2.8 ltr. engine

Engine compartment (right-side)

1 - Lambda probe - G39-

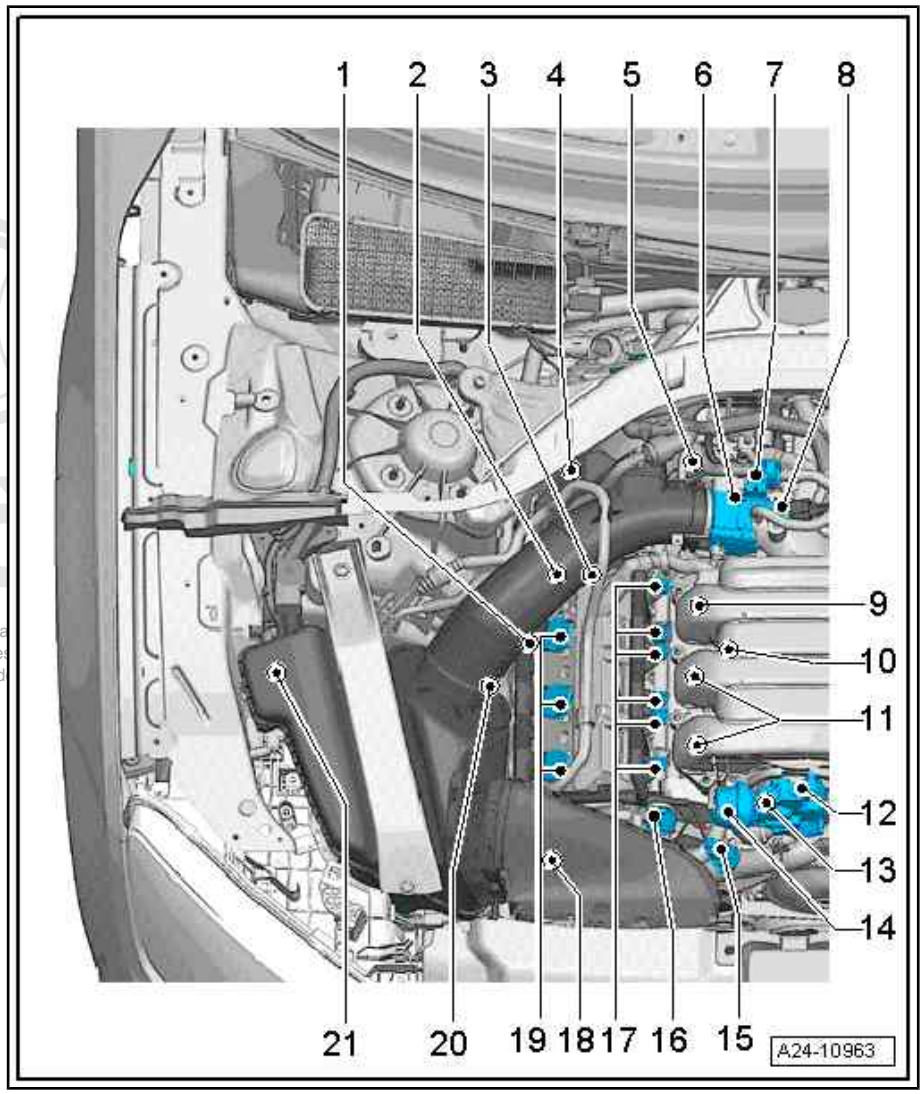
- ❑ Fitting location ⇒ Fig. ""Fitting location of Lambda probes on cylinder bank 1 (right-side)"" , page 273
- ❑ Fitting location of electrical connector ⇒ Fig. ""Electrical connectors on cylinder bank 1 (right-side)"" , page 282
- ❑ Exploded view ⇒ "7.1 Exploded view - Lambda probes", page 319

2 - Exhaust camshaft control valve 1 -N318-

- ❑ Fitting location ⇒ Fig. ""Fitting locations on cylinder bank 1 (right-side)"" , page 271
- ❑ Exploded view ⇒ "3.1 Exploded view - cylinder head", page 132

3 - Camshaft control valve 1 - N205-

- ❑ Fitting location ⇒ Fig. ""Fitting locations on cylinder bank 1 (right-side)"" , page 271
- ❑ Exploded view ⇒ "3.1 Exploded view - cylinder head",



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page 132

4 - Lambda probe after catalytic converter - G130-

- Fitting location ⇒ Fig. ""Fitting location of Lambda probes on cylinder bank 1 (right-side)"" , page 273
- Fitting location of connector ⇒ Fig. ""Electrical connectors on cylinder bank 1 (right-side)"" , page 282
- Exploded view ⇒ "7.1 Exploded view - Lambda probes", page 319

5 - Connectors

- For injectors, cylinder bank 1
- For temperature sender for engine temperature regulation - G694-
- For throttle valve module - J338-
- For knock sensor 1 - G61-
- For Lambda probe - G39-
- For Lambda probe after catalytic converter - G130-
- Fitting locations of connectors
  ⇒ Fig. ""Electrical connectors on cylinder bank 1 (right-side)"" , page 282

6 - Throttle valve module - J338-

- Including throttle valve drive for electric throttle - G186- , throttle valve drive angle sender 1 for electric throttle - G187- and throttle valve drive angle sender 2 for electric throttle - G188-
- Fitting location ⇒ Fig. ""Fitting location: at rear of intake manifold"" , page 273

7 - Activated charcoal filter solenoid valve 1 - N80-

8 - Intake air temperature sender - G42- / intake manifold pressure sender - G71-

- Fitting location ⇒ Fig. ""Fitting location: at rear of intake manifold"" , page 273

9 - Injector, cylinder 3 - N32-

- Fitting location ⇒ Fig. ""Fitting locations: components on inside of right cylinder bank 1"" , page 280
- Exploded view ⇒ "3.2 Exploded view - intake manifold (bottom section) with fuel rail", page 291

10 - Knock sensor 1 - G61-

- Fitting location ⇒ Fig. ""Fitting locations: components on inside of right cylinder bank 1"" , page 280
- Fitting location of electrical connector
  ⇒ Fig. ""Electrical connectors on cylinder bank 1 (right-side)"" , page 282
- Exploded view ⇒ "1.1.2 Exploded view - ignition system, vehicles with 2.8 ltr. engine", page 373

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11 - Injectors, cylinder bank 1

- Injector, cylinder 1 - N30-
- Injector, cylinder 2 - N31-
- Fitting location ⇒ Fig. ""Fitting locations: components on inside of right cylinder bank 1"" , page 280
- Exploded view ⇒ "3.2 Exploded view - intake manifold (bottom section) with fuel rail", page 291

12 - Variable intake manifold position sender - G513-

- Fitting location ⇒ Fig. ""Fitting location: at front of engine"" , page 281

13 - Variable intake manifold change-over valve - N156-

- Fitting location ⇒ Fig. ""Fitting location: at front of engine"" , page 281

14 - Actuator for intake manifold changeover

- Vacuum unit

15 - Coolant temperature sender - G62-

- Fitting location ⇒ Fig. ""Fitting location: at front of engine"" , page 281

16 - Hall sender - G40-

- Fitting location ⇒ Fig. ""Fitting locations on cylinder bank 1 (right-side)"" , page 271
- Exploded view ⇒ "1.1.2 Exploded view - ignition system, vehicles with 2.8 ltr. engine", page 373

17 - Actuators for camshaft adjustment

- ❑ Actuator 1 for camshaft adjustment - F366-
- ❑ Actuator 2 for camshaft adjustment - F367-
- ❑ Actuator 3 for camshaft adjustment - F368-
- ❑ Actuator 4 for camshaft adjustment - F369-
- ❑ Actuator 5 for camshaft adjustment - F370-
- ❑ Actuator 6 for camshaft adjustment - F371-
- ❑ Fitting location ⇒ Fig. ""Fitting locations on cylinder bank 1 (right-side)"" , page 271

18 - High-pressure pump

- ❑ With fuel pressure sender, low pressure - G410- and fuel metering valve - N290-
- ❑ Fitting location ⇒ Fig. ""Fitting locations at high-pressure pump"" , page 272
- ❑ Exploded view ⇒ "6.1 Exploded view - high-pressure pump", page 312

19 - Ignition coils, cylinder bank 1

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- ❑ Ignition coil 1 with output stage - N70-
- ❑ Ignition coil 2 with output stage - N127-
- ❑ Ignition coil 3 with output stage - N291-
- ❑ Exploded view ⇒ "1.1.2 Exploded view - ignition system, vehicles with 2.8 ltr. engine", page 373

20 - Hall sender 3 - G300-

- ❑ Fitting location ⇒ Fig. ""Fitting locations on cylinder bank 1 (right-side)"" , page 271
- ❑ Exploded view ⇒ "1.1.2 Exploded view - ignition system, vehicles with 2.8 ltr. engine", page 373

21 - Secondary air pump motor - V101-

- ❑ Exploded view ⇒ "3.1 Exploded view - secondary air system", page 352

Engine compartment (left-side)

1 - Bracket (left-side) for connectors

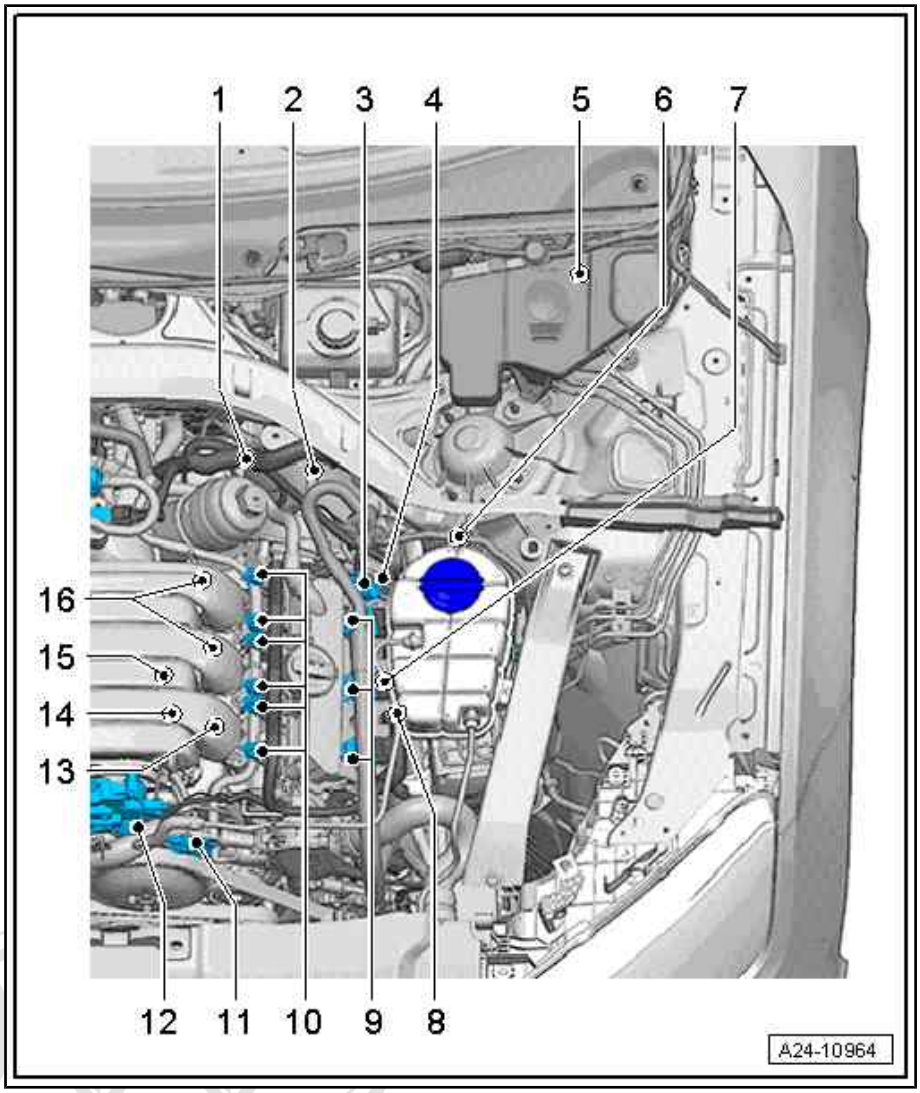
- For knock sensor 2 - G66-
- For injectors, cylinder bank 2
- For fuel pressure sender - G247-
- Fitting locations of connectors
⇒ Fig. ""Electrical connectors"" , page 281

2 - Lambda probe 2 after catalytic converter - G131-

- Fitting location
⇒ Fig. ""Fitting location of Lambda probes on cylinder bank 2 (left-side)"" , page 274
- Fitting location of electrical connector
⇒ Fig. ""Electrical connectors for Lambda probes on cylinder bank 2 (left-side)"" , page 274
- Exploded view
⇒ "7.1 Exploded view - Lambda probes", page 319

3 - Camshaft control valve 2 - N208-

- Fitting location
⇒ Fig. ""Fitting locations on cylinder bank 2 (left-



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side)"" , page 271

- ❑ Exploded view ⇒ "3.1 Exploded view - cylinder head", page 132

4 - Exhaust camshaft control valve 2 - N319-

- ❑ Fitting location ⇒ Fig. ""Fitting locations on cylinder bank 2 (left-side)"" , page 271
- ❑ Exploded view ⇒ "3.1 Exploded view - cylinder head", page 132

5 - Engine control unit - J623-

- ❑ Fitting location ⇒ Fig. ""Fitting location of engine control unit -J623- "" , page 269
- ❑ Removing and installing ⇒ "8.2 Removing and installing engine/motor control unit J623 ", page 330

6 - Lambda probe 2 - G108-

- ❑ Fitting location ⇒ Fig. ""Fitting location of Lambda probes on cylinder bank 2 (left-side)"" , page 274
- ❑ Fitting location of electrical connector ⇒ Fig. ""Electrical connectors for Lambda probes on cylinder bank 2 (left-side)"" , page 274
- ❑ Exploded view ⇒ "7.1 Exploded view - Lambda probes", page 319

7 - Hall sender 4 - G301-

- ❑ Fitting location ⇒ Fig. ""Fitting locations on cylinder bank 2 (left-side)"" , page 271
- ❑ Exploded view ⇒ "1.1.2 Exploded view - ignition system, vehicles with 2.8 ltr. engine", page 373

8 - Valve for oil pressure control - N428-

- ❑ Fitting location ⇒ Fig. ""Fitting location of valve for oil pressure control -N428- "" , page 272
- ❑ Removing and installing ⇒ "4.6 Removing and installing valve for oil pressure control N428 ", page 214

9 - Ignition coils, cylinder bank 2

- ❑ Ignition coil 4 with output stage - N292-
- ❑ Ignition coil 5 with output stage - N323-
- ❑ Ignition coil 6 with output stage - N324-
- ❑ Exploded view ⇒ "1.1.2 Exploded view - ignition system, vehicles with 2.8 ltr. engine", page 373

10 - Actuators for camshaft adjustment

- ❑ Actuator 7 for camshaft adjustment - F372-
- ❑ Actuator 8 for camshaft adjustment - F373-
- ❑ Actuator 9 for camshaft adjustment - F374-
- ❑ Actuator 10 for camshaft adjustment - F375-
- ❑ Actuator 11 for camshaft adjustment - F376-
- ❑ Actuator 12 for camshaft adjustment - F377-
- ❑ Fitting location ⇒ Fig. ""Fitting locations on cylinder bank 2 (left-side)"" , page 271

11 - Hall sender 2 - G163-

- ❑ Fitting location ⇒ Fig. ""Fitting locations on cylinder bank 2 (left-side)"" , page 271
- ❑ Exploded view ⇒ "1.1.2 Exploded view - ignition system, vehicles with 2.8 ltr. engine", page 373

12 - Variable intake manifold position sender - G513-

- ❑ Fitting location ⇒ Fig. ""Fitting location: at front of engine"" , page 281

13 - Injector, cylinder 4 - N33-

- ❑ Fitting location ⇒ Fig. ""Fitting locations: components on inside of left cylinder bank 2"" , page 281
- ❑ Exploded view ⇒ "3.2 Exploded view - intake manifold (bottom section) with fuel rail", page 291

14 - Fuel pressure sender - G247-

- ❑ Fitting location ⇒ Fig. ""Fitting locations: components on inside of left cylinder bank 2"" , page 281
- ❑ Exploded view ⇒ "3.2 Exploded view - intake manifold (bottom section) with fuel rail", page 291

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15 - Knock sensor 2 - G66-

- ❑ Fitting location ⇒ Fig. ""Fitting locations: components on inside of left cylinder bank 2"" , page 281
- ❑ Fitting location of connector ⇒ Fig. ""Electrical connectors"" , page 281
- ❑ Exploded view ⇒ "1.1.2 Exploded view - ignition system, vehicles with 2.8 ltr. engine", page 373

16 - Injectors, cylinder bank 2

- ❑ Injector, cylinder 5 - N83-
- ❑ Injector, cylinder 6 - N84-
- ❑ Fitting location ⇒ Fig. ""Fitting locations: components on inside of left cylinder bank 2"" , page 281
- ❑ Exploded view ⇒ "3.2 Exploded view - intake manifold (bottom section) with fuel rail", page 291

A - Engine speed sender - G28-

- ❑ Fitting location ⇒ Fig. ""Fitting location of engine speed sender -G28- "" , page 273
- ❑ Exploded view ⇒ "1.1.2 Exploded view - ignition system, vehicles with 2.8 ltr. engine", page 373

B - Fuel pump control unit - J538-

- ❑ Fitting location ⇒ Fig. ""Fitting location of fuel pump control unit -J538- "" , page 270

C - Accelerator position sender - G79- / accelerator position sender 2 - G185-

- ❑ Fitting location ⇒ Fig. ""Fitting location of accelerator position sender -G79- / accelerator position sender 2 -G185- "" , page 270

D - Brake light switch - F-

- ❑ Fitting location ⇒ Fig. ""Fitting locations of brake light switch -F- and clutch position sender -G476- "" , page 270

E - Clutch position sender - G476-

- ❑ Only fitted on vehicles with manual gearbox
- ❑ Fitting location ⇒ Fig. ""Fitting locations of brake light switch -F- and clutch position sender -G476- "" , page 270

F - Oil pressure switch - F22-

- ❑ Fitting location ⇒ Fig. ""Fitting location of oil pressure switch -F22- -A-"" , page 272
- ❑ Exploded view ⇒ "4.1 Exploded view - oil filter housing/oil pressure switches", page 208

G - Oil pressure switch for reduced oil pressure - F378-

- ❑ Fitting location ⇒ Fig. "" Oil pressure switch for reduced oil pressure -F378- "" , page 281

H - Relay and fuse holder in electronics box in plenum chamber (left-side)

- ❑ Fitting locations ⇒ Current flow diagrams, Electrical fault finding and Fitting locations

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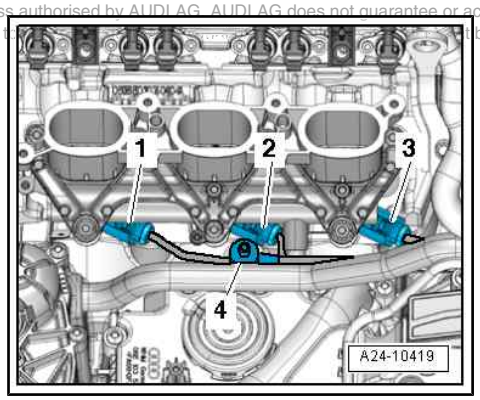
Fitting locations: components on inside of right cylinder bank 1

1 - Injector, cylinder 1 - N30-

2 - Injector, cylinder 2 - N31-

3 - Injector, cylinder 3 - N32-

4 - Knock sensor 1 - G61-



Fitting locations: components on inside of left cylinder bank 2

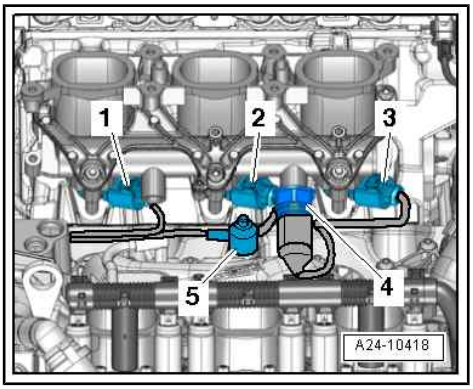
1 - Injector, cylinder 6 - N84-

2 - Injector, cylinder 5 - N83-

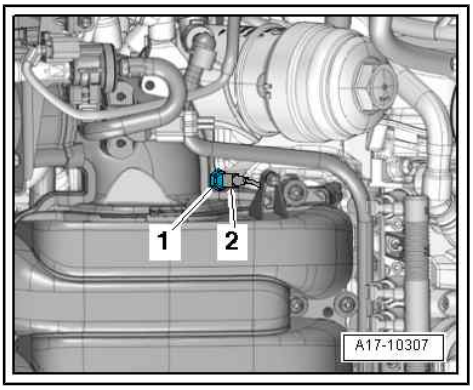
3 - Injector, cylinder 4 - N33-

4 - Fuel pressure sender - G247-

5 - Knock sensor 2 - G66-



Oil pressure switch for reduced oil pressure - F378-



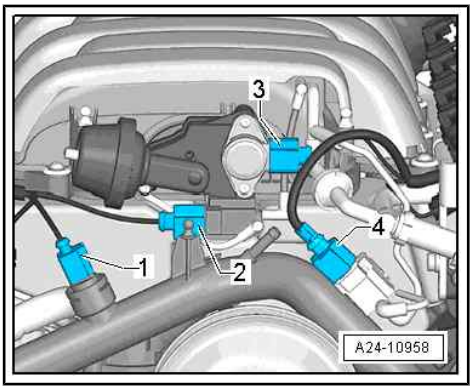
Fitting location: at front of engine

1 - Coolant temperature sender - G62-

2 - Variable intake manifold change-over valve - N156-

3 - Variable intake manifold position sender - G513-

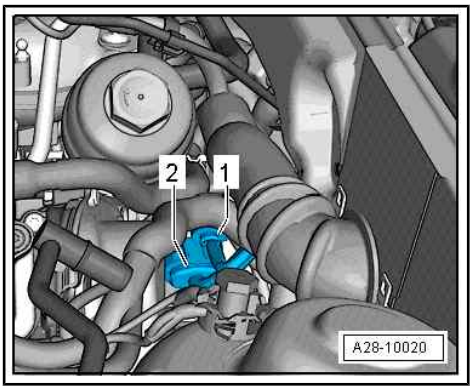
4 - Coolant valve for cylinder head - N489-



Electrical connectors

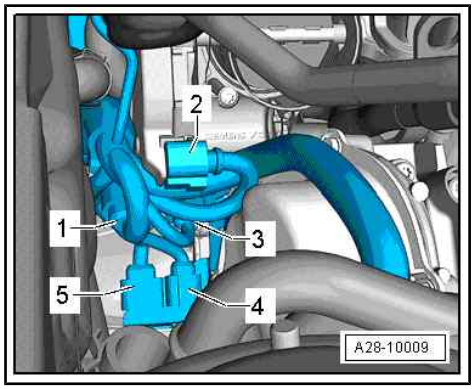
1 - Knock sensor 2 - G66-

2 - Injectors, cylinder bank 2, and for fuel pressure sender - G247-



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Electrical connectors on cylinder bank 1 (right-side)



1 - Injectors, cylinder bank 1

2 - Throttle valve module - J338- and temperature sender for engine temperature regulation - G694-

3 - Knock sensor 1 - G61-

4 - Lambda probe - G39-

5 - Lambda probe after catalytic converter - G130-

1.2 Reducing fuel pressure in high-pressure section

Special tools and workshop equipment required

- Vehicle diagnostic tester

WARNING

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

- *The injection system consists of a high-pressure section (maximum approx. 120 bar) and a low-pressure section (approx. 6 bar).*
- *The fuel pressure in the high-pressure section must be reduced to a residual pressure of approx. 7 bar prior to opening the system. The procedure is described below.*

Reducing fuel pressure in high-pressure section

– Connect a vehicle diagnostic tester .

– Start engine and run at idling speed.

– Select “Engine electronics” in vehicle self-diagnosis.

– Then select “Basic setting”.

– Select “Reducing fuel pressure in fuel rail” from the list.

– Then select “Measured values”.

– Select “Fuel pressure” from the list.

– To activate basic setting, perform Operating instructions function.

– Observe fuel pressure displayed on vehicle diagnostic tester .

• Fuel pressure will drop to a specified value.

– Switch off engine with pedals depressed.

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WARNING

There is a risk of injury: avoid skin contact with fuel.

- *Wear safety goggles and protective clothing when opening the fuel system.*
- *Before opening the high-pressure section of the fuel system, place a clean cloth around the connection to catch escaping fuel.*

– The high-pressure system must be opened »immediately« after reducing the fuel pressure; wrap a clean cloth around the connection. Catch the escaping fuel.

Note

The pressure will increase again due to the effect of residual heat if the high-pressure system is not opened immediately.

Final steps

– Erase event memory and generate readiness code in engine control unit in “Guided Functions” mode.

1.3 Checking fuel system for leaks

– Allow engine to run for several minutes at moderate rpm.

– Switch off ignition.

– Check complete fuel system for leaks.

– If leaks are found although the connections have been tightened to the correct torque, the relevant component must be renewed.

– Road-test vehicle and accelerate with full throttle at least once.

– Then check high-pressure system again for leaks.

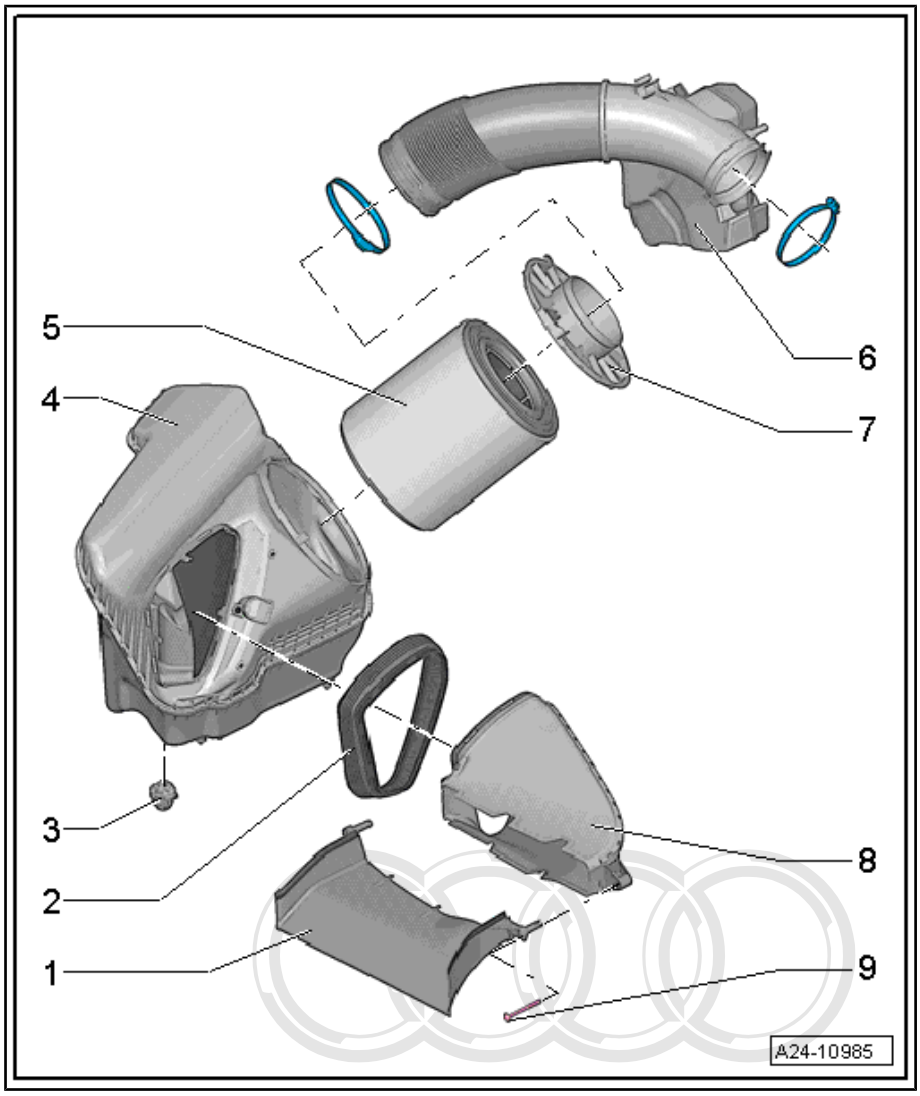
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2 Air cleaner

⇒ “2.1 Exploded view - air cleaner housing”, page 284

⇒ “2.2 Removing and installing air cleaner housing”, page 285

2.1 Exploded view - air cleaner housing



1 - Air duct

- ❑ Clean out salt deposits, dirt and leaves, etc.

2 - Sealing element

3 - Rubber grommet

- ❑ For air cleaner housing

4 - Air cleaner housing

- ❑ Clean out salt deposits, dirt and leaves, etc.
- ❑ Removing and installing ⇒ “2.2 Removing and installing air cleaner housing”, page 285

5 - Air filter element

- ❑ Use genuine air filter element ⇒ Electronic parts catalogue
- ❑ Change intervals ⇒ Maintenance tables
- ❑ Removing and installing ⇒ Maintenance ; Booklet 411

6 - Air pipe

- ❑ Tightening torque for hose clips ⇒ Fig. ““Installing air pipes and hoses with screw-type clips”“ , page 285

7 - Lid

- ❑ For air cleaner housing
- ❑ Remove any salt deposits or dirt
- ❑ Removing and installing ⇒ Maintenance ; Booklet 411

8 - Air duct

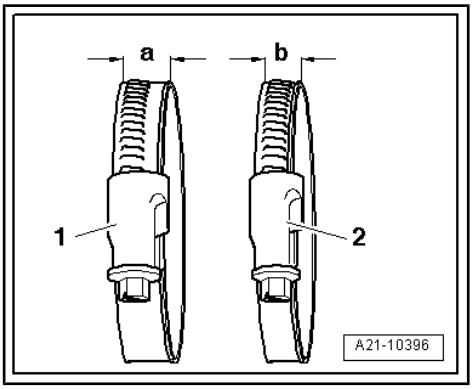
- ❑ Clean out salt deposits, dirt and leaves, etc.

9 - Bolt

- ❑ 1.5 Nm

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Installing air pipes and hoses with screw-type clips



Note

- *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *The screw sections of used screw-type clips must be sprayed with rust remover prior to fitting so that the air hoses can be attached securely to the hose connections.*

Tightening torque for

1 - Hose clip with width -a- = 13 mm: 5.5 Nm

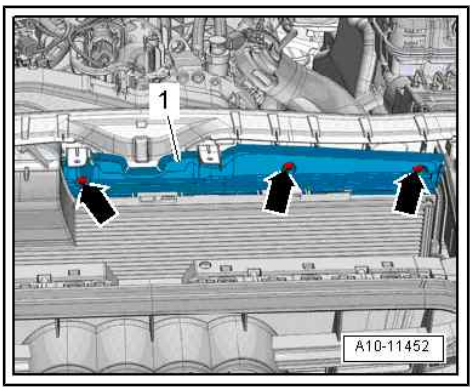
2 - Hose clip with width -b- = 9 mm: 3.4 Nm

2.2 Removing and installing air cleaner housing

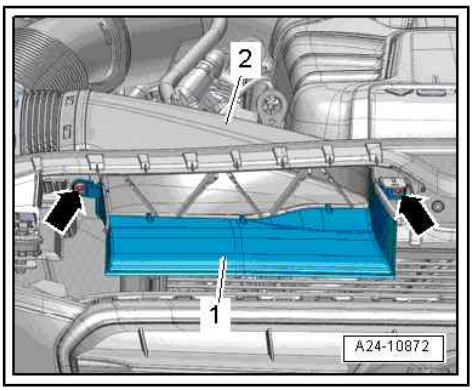
Removing

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

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



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



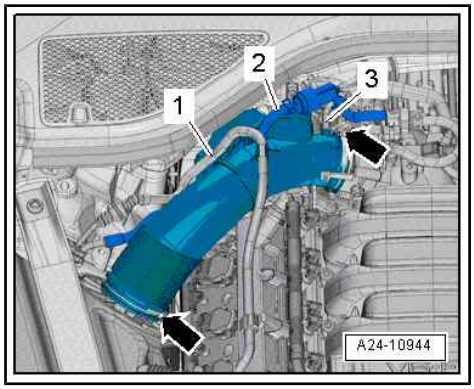
Note

Disregard -item 1-.

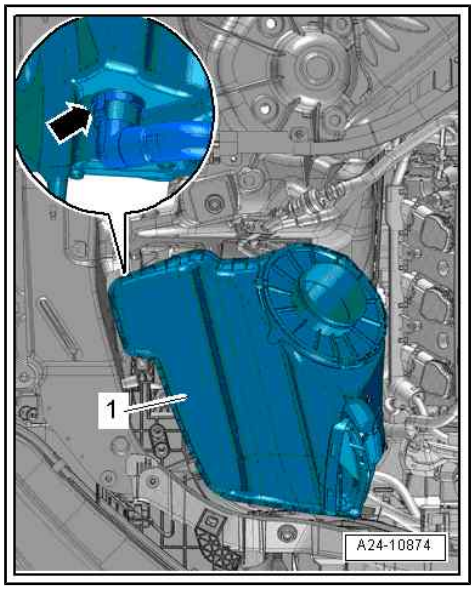
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– Remove engine cover panel (rear) ⇒ “3.1 Removing and installing engine cover panel”, page 64 .

– Move clear fuel hose -1- and hose -2- leading to activated charcoal filter at air pipe.
– Detach vacuum hose -3- from connection on air pipe.
– Loosen hose clips -arrows- and detach air pipe.



– Lift off air cleaner housing -1-.
– Press release tabs and disconnect secondary air hose -arrow-.



Installing

Note

- *The air cleaner housing must always be clean.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *When cleaning the air cleaner housing with compressed air, cover the critical components of the engine intake system such as intake pipes etc. with a clean cloth to avoid malfunctions.*

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

– Install lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing attachments .
– Install engine cover panel ⇒ “3.1 Removing and installing engine cover panel”, page 64 .

Tightening torques

- ⇒ “2.1 Exploded view - air cleaner housing”, page 284
- ⇒ Fig. ““Installing air pipes and hoses with screw-type clips”“, page 285

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3 Intake manifold

⇒ “3.1 Exploded view - intake manifold”, page 287

⇒ “3.2 Exploded view - intake manifold (bottom section) with fuel rail”, page 291

⇒ “3.3 Removing and installing intake manifold”, page 292

⇒ “3.4 Removing and installing intake manifold (top section)”, page 294

⇒ “3.5 Removing and installing intake manifold (bottom section)”, page 296

⇒ “3.6 Removing and installing throttle valve module J338 ”, page 298

3.1 Exploded view - intake manifold

⇒ “3.1.1 Exploded view - intake manifold, vehicles with 2.5 ltr. engine”, page 287

⇒ “3.1.2 Exploded view - intake manifold, vehicles with 2.8 ltr. engine”, page 289

3.1.1 Exploded view - intake manifold, vehicles with 2.5 ltr. engine

1 - Actuator for intake manifold change-over

2 - Bolt

- ❑ 2.5 Nm

3 - Variable intake manifold change-over valve - N156-

4 - Bolt

- ❑ 8 Nm

5 - Intake manifold

- ❑ Removing and installing ⇒ “3.3 Removing and installing intake manifold”, page 292

6 - Seal

- ❑ Renew

7 - Bolt

- ❑ 6 Nm

8 - Throttle valve module - J338-

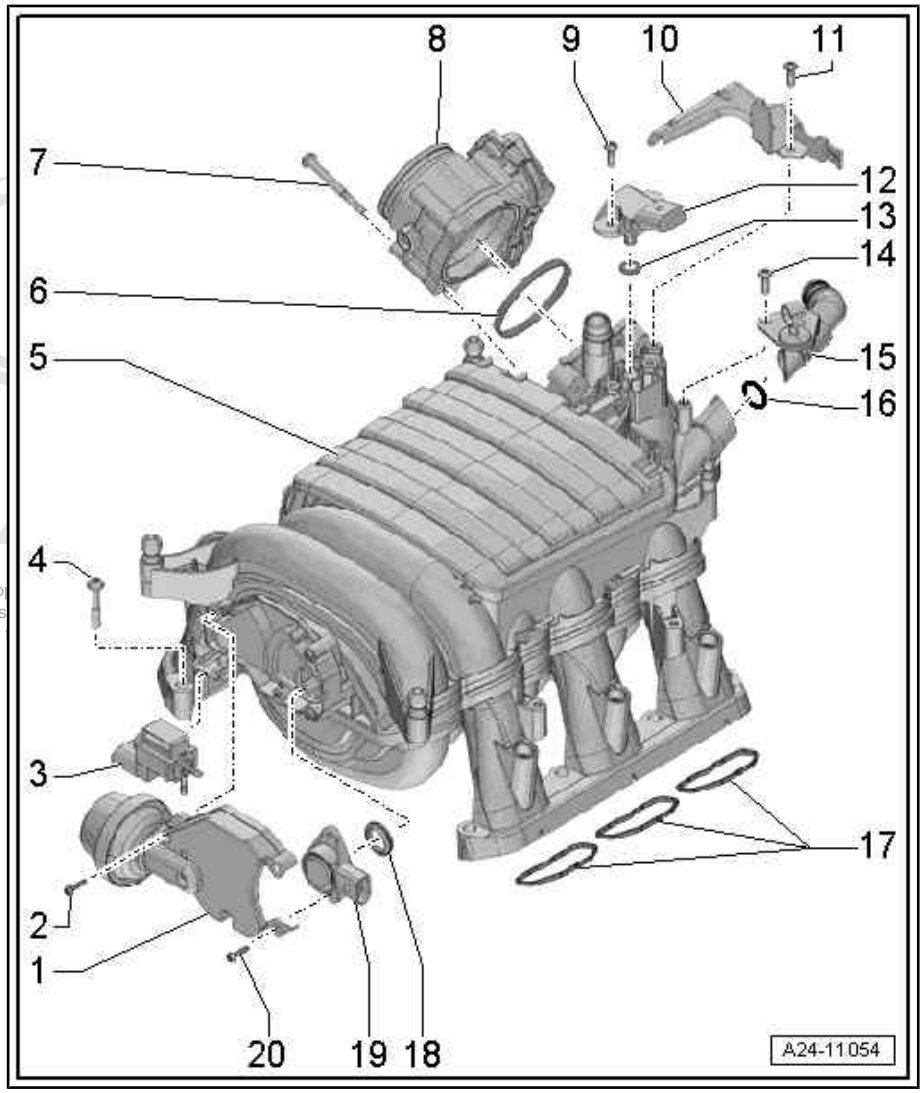
- ❑ Removing and installing ⇒ “3.6 Removing and installing throttle valve module J338 ”, page 298

9 - Bolt

- ❑ 3 Nm

10 - Bracket

- ❑ On vehicles from model year 2013 onwards, secondary air inlet valve - N112- is secured to



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with respect

bracket For fitting location refer to ⇒ page 288 .

11 - Bolt

- ❑ 6 Nm

12 - Intake air temperature sender - G42- / intake manifold pressure sender - G71-

13 - O-ring

- ❑ Renew

14 - Bolt

- ❑ 2.5 Nm

15 - Crankcase breather hose

16 - O-ring

- ❑ Renew

17 - Gaskets

- ❑ Renew

18 - Seal

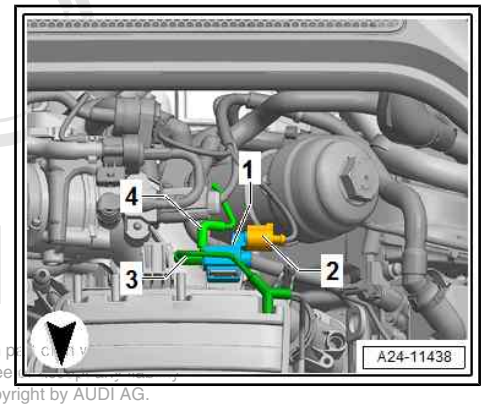
- ❑ Renew if damaged
- ❑ When renewing lever out with screwdriver
- ❑ Press in by hand

19 - Variable intake manifold position sender - G513-

20 - Bolt

- ❑ 2.5 Nm

Fitting location of secondary air inlet valve - N112-



Note

Secondary air inlet valve - N112- is fitted on vehicles from model year 2013 onwards.

1 - Secondary air inlet valve - N112-

2 - Electrical connector

3 - Vacuum line to vacuum supply

4 - Control pipe to combination valves for secondary air inlet

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3.1.2 Exploded view - intake manifold, vehicles with 2.8 ltr. engine

1 - Vacuum hose

2 - Variable intake manifold change-over valve - N156-

3 - Bolt

- ❑ For variable intake manifold position sender - G513-
- ❑ 2.5 Nm

4 - Bolt

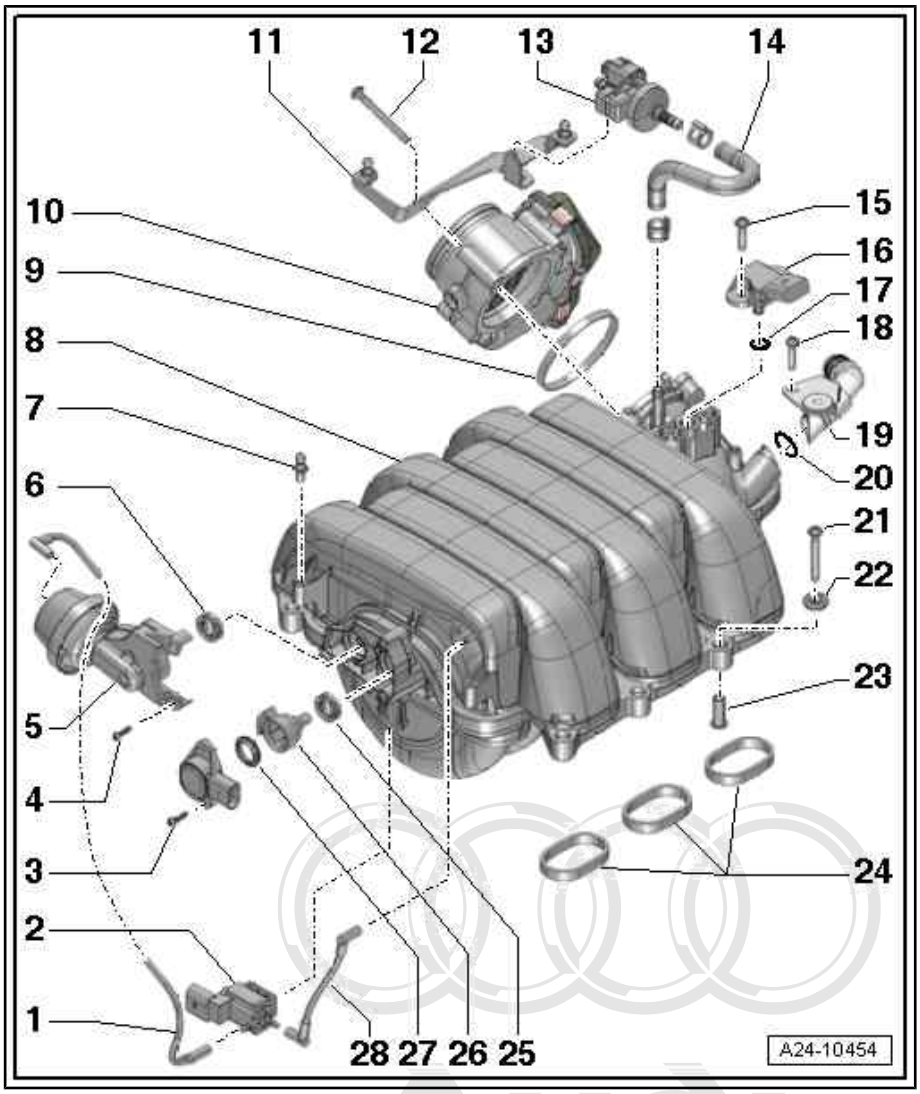
- ❑ 2.5 Nm

5 - Actuator for intake manifold change-over

- ❑ Installation position of toothed segments for intake manifold change-over
⇒ Fig. ""Installation position of toothed segments for intake manifold change-over"" , page 291
- ❑ Replacement part is supplied together with -item 26-

6 - Seal

- ❑ Renew if damaged
- ❑ When renewing lever



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out with screwdriver
- ❑ Press in by hand

7 - Ball stud
- ❑ 2.5 Nm

8 - Intake manifold (top section)
- ❑ Removing and installing ⇒ “3.4 Removing and installing intake manifold (top section)”, page 294

9 - Seal
- ❑ Renew

10 - Throttle valve module - J338-
- ❑ Removing and installing ⇒ “3.6 Removing and installing throttle valve module J338 ”, page 298

11 - Bracket

12 - Bolt
- ❑ 6 Nm

13 - Activated charcoal filter solenoid valve 1 - N80-

14 - Hose

15 - Bolt
- ❑ 3 Nm

16 - Intake air temperature sender - G42- / intake manifold pressure sender - G71-

17 - O-ring
- ❑ Renew

18 - Bolt
- ❑ 2.5 Nm

19 - Crankcase breather hose

20 - O-ring
- ❑ Renew

21 - Bolt
- ❑ 8 Nm

22 - Washer

23 - Distance sleeve

24 - Gaskets
- ❑ Renew

25 - Seal
- ❑ Renew if damaged
- ❑ When renewing lever out with screwdriver
- ❑ Press in by hand

26 - Lever with toothed segment

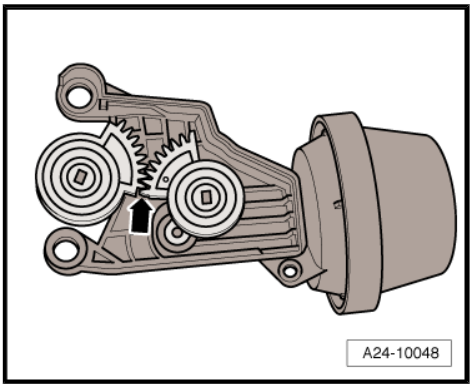
27 - Seal
- ❑ Renew if damaged
- ❑ When renewing lever out with screwdriver
- ❑ Press in by hand

28 - Vacuum hose

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Installation position of toothed segments for intake manifold change-over

- The lower edges of the toothed segments must be flush -arrow-.



3.2 Exploded view - intake manifold (bottom section) with fuel rail

1 - Intake manifold (bottom section)

- ❑ Removing and installing (left and right)
⇒ “3.5 Removing and installing intake manifold (bottom section)”, page 296

2 - Distance sleeve

3 - Fuel pressure sender - G247-

- ❑ Removing and installing
⇒ “5.1.2 Removing and installing fuel pressure sender G247 - vehicles with 2.8 ltr. engine”, page 311
- ❑ 20 Nm

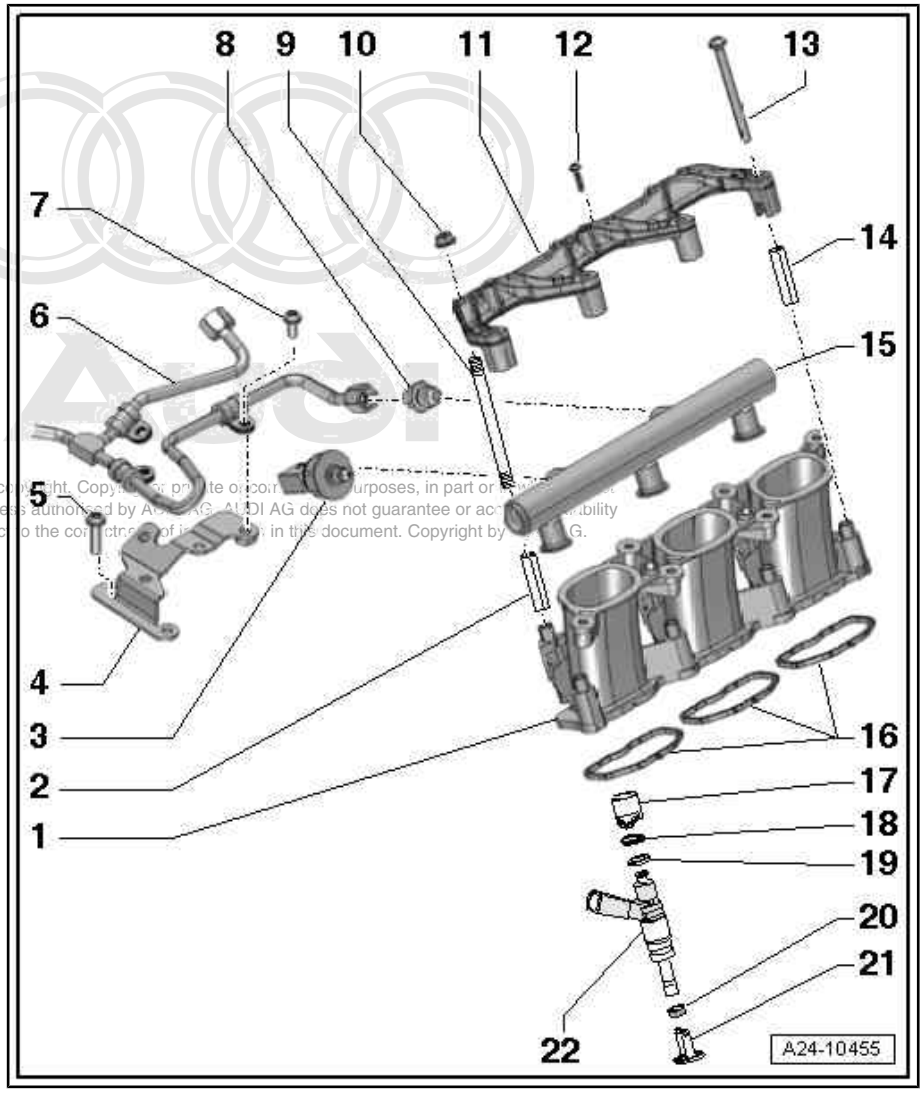
4 - Bracket

5 - Bolt

- ❑ 9 Nm

6 - High-pressure pipe

> **WARNING**
> *The fuel system operates at extremely high pressure. This can cause injury.*
> *The fuel pressure in the high-pressure section of the injection system must be reduced to a residual pressure prior to opening the system.*



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- ❑ Reducing fuel pressure in high-pressure system
⇒ “1.2 Reducing fuel pressure in high-pressure section”, page 282
- ❑ Do not alter shape
- ❑ Do NOT bend open retainer for fuel pipe
- ❑ If retainer has been bent open or fuel pipe has to be renewed, retainer must also be renewed
- ❑ 25 Nm

7 - Bolt

- ❑ 9 Nm

8 - Threaded connection

- ❑ 40 Nm
- ❑ Renew

9 - Stud

10 - Nut

- ❑ 9 Nm

11 - Retainer for fuel rail

12 - Bolt

- ❑ 2.5 Nm

13 - Bolt

- ❑ 9 Nm

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14 - Distance sleeve

15 - Fuel rail

16 - Gaskets

- ❑ Renew

17 - Support ring

- ❑ Make sure it is correctly seated
- ❑ Via this support ring, the fuel rail exerts the force which holds the injector in the cylinder head.

18 - O-ring

- ❑ Renew
- ❑ Lubricate lightly with clean engine oil

19 - Spacer ring

- ❑ Renew if damaged

20 - Combustion chamber ring seal

- ❑ Renewing ⇒ “4.3.2 Removing and installing injectors - vehicles with 2.8 ltr. engine”, page 305

21 - Radial compensation element

- ❑ Renew if damaged
- ❑ Clip onto support ring -item 17-

22 - Injector

Removing and installing ⇒ “4.3.2 Removing and installing injectors - vehicles with 2.8 ltr. engine”, page 305

3.3 Removing and installing intake manifold

Note

The description applies for vehicles with 2.5 ltr. engine.

Removing

Note

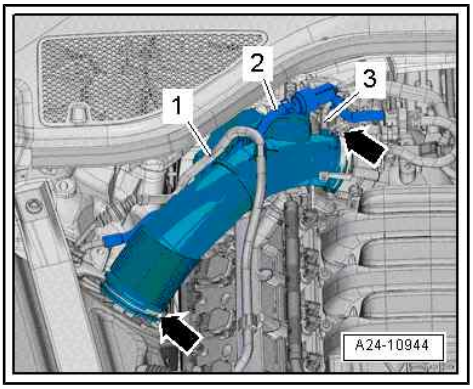
Fit all cable ties in the original positions when installing.

– Remove engine cover panel
⇒ “3.1 Removing and installing engine cover panel”, page 64 .

– Move clear fuel hose -1- and hose -2- leading to activated charcoal filter at air pipe.

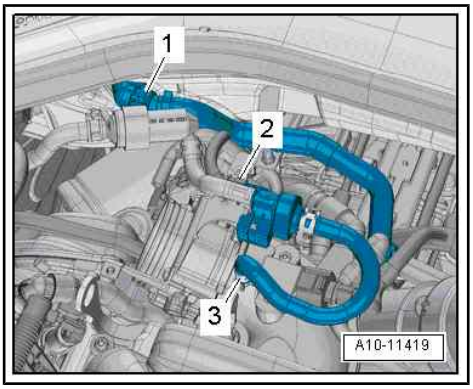
– Detach vacuum hose -3- from connection on air pipe.

– Loosen hose clips -arrows- and detach air pipe.



– Unplug electrical connector -2- at activated charcoal filter solenoid valve 1 - N80- and detach vacuum hose -3-.

– Detach activated charcoal filter solenoid valve 1 - N80- from bracket and move it clear to the side with hoses still attached.

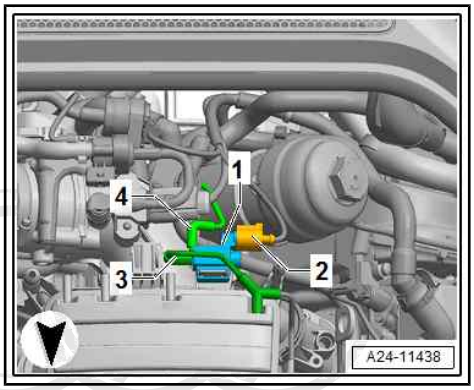


Note

Disregard -item 1-.

– If fitted, unplug electrical connector -2- and disconnect vacuum hoses -3- and -4-.

– Disengage secondary air inlet valve - N112- from bracket.

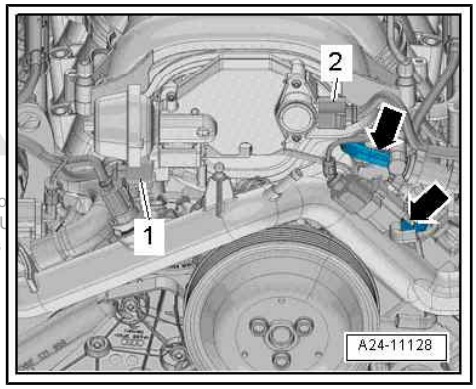


– Unplug electrical connectors at front of intake manifold.

1 - Variable intake manifold change-over valve - N156-

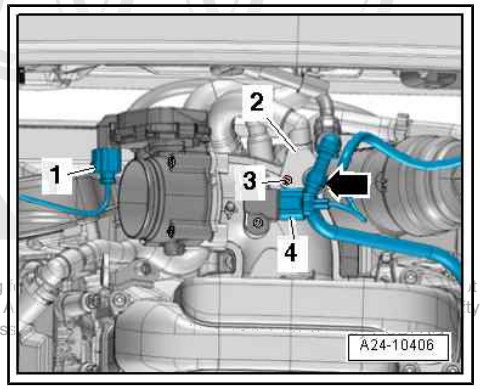
2 - Variable intake manifold position sender - G513-

– Move clear vacuum hoses -arrows-.



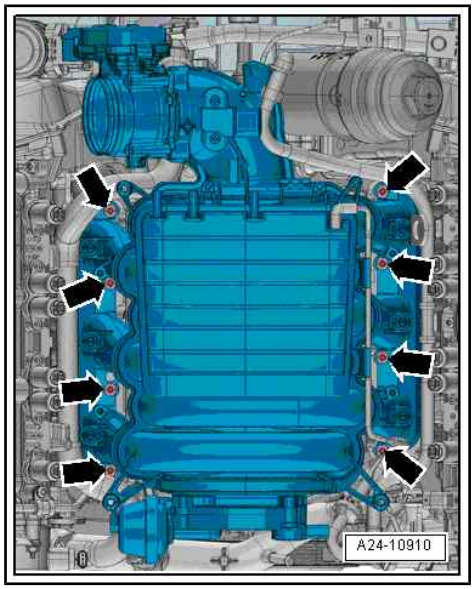
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– Move clear vacuum hose -arrow-.
– Move electrical wiring harness clear.
– Remove bolt -3-.
– Press retaining tab -2- up slightly and detach crankcase breather hose from intake manifold.



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– Remove bolts -arrows- and detach intake manifold.



Caution

Risk of irreparable damage to engine.

- ***Block off the openings in the cylinder heads with clean cloths to prevent small items from dropping through the intake ports into the engine.***

Installing

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

Note

- *Renew gaskets and O-rings.*
- *Fit all cable ties in the original positions when installing.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

Tightening torques

- ⇒ “3.1.1 Exploded view - intake manifold, vehicles with 2.5 ltr. engine”, page 287
- ⇒ Fig. ““Installing air pipes and hoses with screw-type clips”“ , page 285

3.4 Removing and installing intake manifold (top section)

Note

The description applies for vehicles with 2.8 ltr. engine.

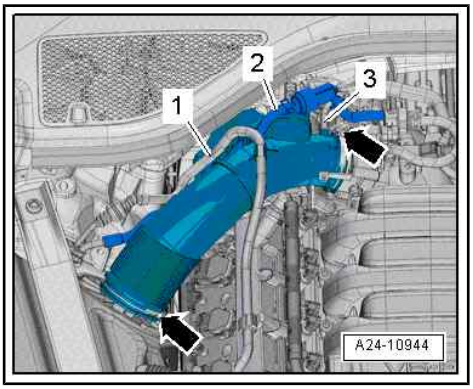
Removing

Note

Fit all cable ties in the original positions when installing.

– Remove engine cover panels
⇒ “3.1 Removing and installing engine cover panel”, page 64 .

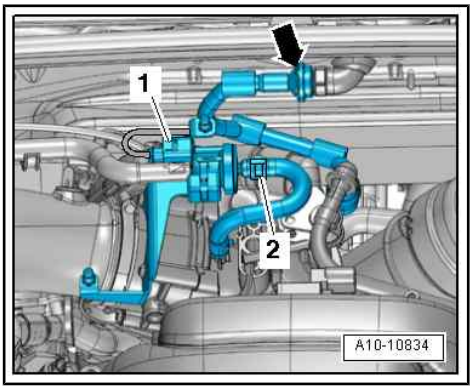
– Move clear fuel hose -1- and hose -2- leading to activated charcoal filter at air pipe.
– Detach vacuum hose -3- from connection on air pipe.
– Loosen hose clips -arrows- and detach air pipe.



– Detach vacuum hose -2-.

Note

Ignore -arrow-.



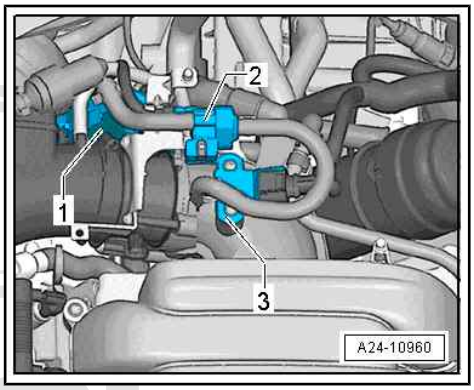
Unplug following electrical connectors:

1 - Throttle valve module - J338-

2 - Activated charcoal filter solenoid valve 1 - N80-

3 - Intake air temperature sender - G42- / intake manifold pressure sender - G71-

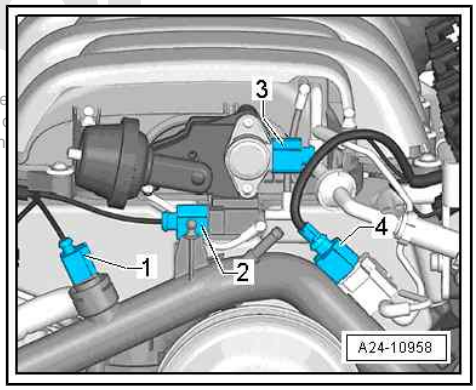
– Take activated charcoal filter solenoid valve 1 - N80- out of bracket and move to side with hose attached.



– Unplug electrical connectors at front of intake manifold.

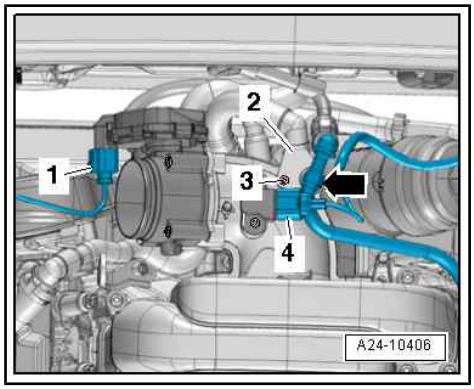
2 - Variable intake manifold change-over valve - N156-

3 - Variable intake manifold position sender - G513-

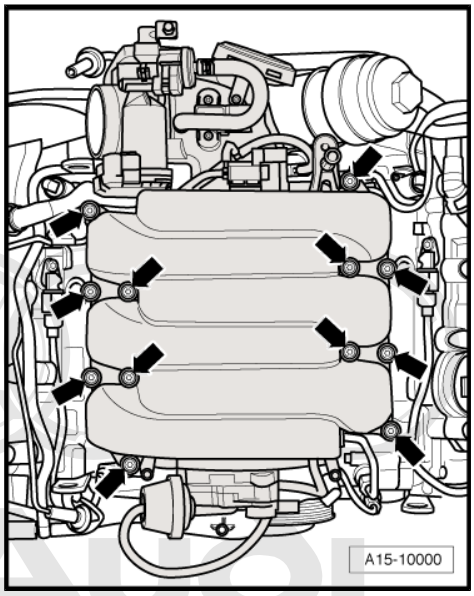


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– Move vacuum hose clear -arrow-.
– Move electrical wiring harness clear.
– Remove bolt -3-.
– Press retaining tab -2- up slightly and detach crankcase breather hose from intake manifold.



– Unscrew bolts -arrows- and remove intake manifold (top section).



Note

Seal intake ports on cylinder heads with clean cloths.

Installing

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

Note

- *Renew gaskets and O-rings.*
- *Fit all cable ties in the original positions when installing.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

Tightening torques

- ⇒ “3.1.2 Exploded view - intake manifold, vehicles with 2.8 ltr. engine”, page 289
- ⇒ Fig. ““Installing air pipes and hoses with screw-type clips”“ , page 285

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3.5 Removing and installing intake manifold (bottom section)

Note

- *The description applies for vehicles with 2.8 ltr. engine.*
- *The intake manifold (bottom section) and fuel rail are removed and installed together.*

Removing

Note

The following description shows the removal and installation of the bottom section of the intake manifold (left-side). The procedure for the other side is more or less identical.

WARNING

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

- *The fuel pressure in the high-pressure section of the injection system must be reduced to a residual pressure prior to opening the system*
  ⇒ "1.2 Reducing fuel pressure in high-pressure section", page 282 .
- *Wrap a clean cloth around the connection and carefully loosen the connection to allow the residual pressure to dissipate.*

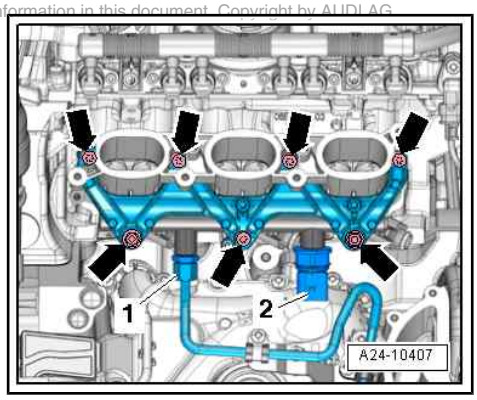
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– Remove intake manifold (top section) ⇒ page 294

– Unplug electrical connector at fuel pressure sender - G247- -item 2-.

– Remove union nut -1-.

– Unscrew bolts and nuts -arrows- and detach intake manifold (bottom section) with fuel rail.



Note

Seal intake ports on cylinder heads with clean cloths.

Installing

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

Note

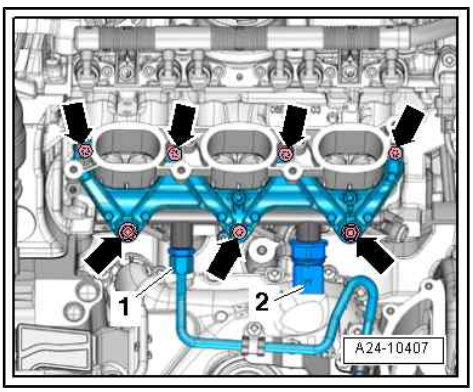
- *If an injector has been pulled out of the cylinder head, the teflon ring seal must be renewed.*
- *Renew gaskets and O-rings.*
- *Lubricate O-rings of injectors lightly with clean engine oil.*

– Press intake manifold (bottom section) with fuel rail evenly onto injectors.

– Tighten bolts and nuts -arrows- for intake manifold (bottom section) in diagonal sequence and in stages.

– Plug in electrical connector -2- at fuel pressure sender - G247- .

– Fit high-pressure pipe on fuel rail
⇒ Fig. ""Installing high-pressure pipe on fuel rail"" , page 318 .



Tightening torques

- ⇒ "3.2 Exploded view - intake manifold (bottom section) with fuel rail", page 291

3.6 Removing and installing throttle valve module - J338-

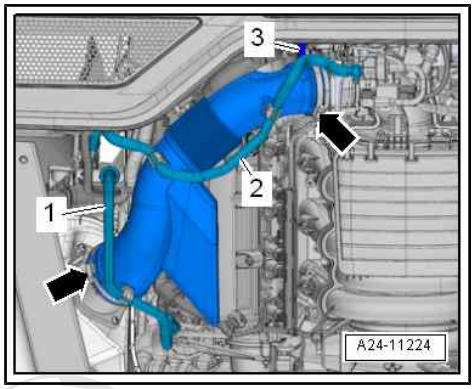
Removing

– Remove engine cover panel
⇒ “3.1 Removing and installing engine cover panel”, page 64 .

– Move clear fuel hose -1- and hose -2- leading to activated charcoal filter at air pipe.

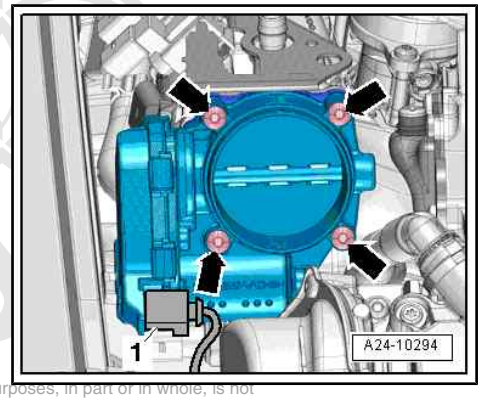
– Detach vacuum hose -3- from connection on air pipe.

– Release hose clips -arrows- and remove air pipe.



– Unplug electrical connector -1-.

– Remove bolts -arrows- and detach throttle valve module - J338- with intermediate flange.



Caution

Risk of irreparable damage to engine.

- *Block off the openings in the cylinder heads with clean cloths to prevent small items from dropping through the intake ports into the engine.*

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Installing

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

– Install engine cover panel
⇒ “3.1 Removing and installing engine cover panel”, page 64 .

Tightening torques

- ⇒ “3.1 Exploded view - intake manifold”, page 287

4 Injectors

⇒ “4.1 Exploded view - fuel rail with injectors”, page 299

⇒ “4.2 Removing and installing fuel rail”, page 300

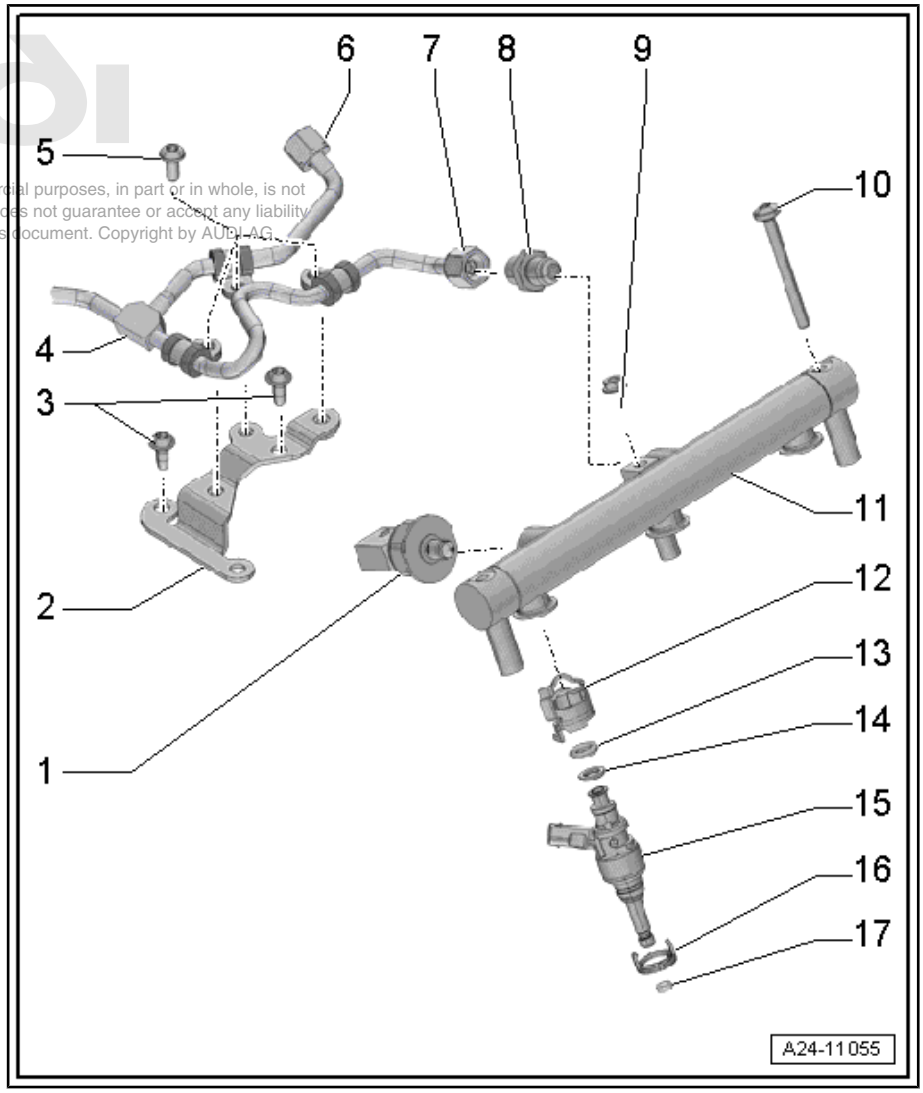
⇒ “4.3 Removing and installing injectors”, page 301

4.1 Exploded view - fuel rail with injectors

Note

This exploded view applies for vehicles with 2.5 ltr. engine.

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1 - Fuel pressure sender - G247-

- ❑ Removing and installing ⇒ “5.1.1 Removing and installing fuel pressure sender G247 - vehicles with 2.5 ltr. engine”, page 311
- ❑ 20 Nm

2 - Bracket

3 - Bolts

- ❑ 9 Nm

4 - High-pressure pipe

> **WARNING**
> *The fuel system operates at extremely high pressure. This can cause injury.*
> *The fuel pressure in the high-pressure section of the injection system must be reduced to a residual pressure prior to opening the system.*

- ❑ Reducing fuel pressure in high-pressure system ⇒ “1.2 Reducing fuel pressure in high-pressure section”, page 282
- ❑ Do not alter shape
- ❑ Do NOT bend open retainer for fuel pipe
- ❑ If retainer has been bent open or fuel pipe has to be renewed, retainer must also be renewed
- ❑ Tightening ⇒ Fig. ““Installing high-pressure pipe on fuel rail”“ , page 318

5 - Bolt

- ❑ 9 Nm

6 - Union nut

- ❑ Lubricate threads lightly with clean engine oil
- ❑ 25 Nm

7 - Union nut

- ❑ Lubricate threads lightly with clean engine oil
- ❑ 25 Nm

8 - Threaded connection

- ❑ 40 Nm
- ❑ Renew after removing

9 - Nut

- ❑ 9 Nm

10 - Bolt

- ❑ 9 Nm

11 - Fuel rail

12 - Support ring

- ❑ Make sure it is correctly seated
- ❑ Via this support ring, the fuel rail exerts the force which holds the injector in the cylinder head.

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13 - O-ring

- ❑ Renew
- ❑ Lubricate lightly with clean engine oil

14 - Spacer ring

- ❑ Renew if damaged

15 - Injector

Removing and installing ⇒ “4.3.2 Removing and installing injectors - vehicles with 2.8 ltr. engine”, page 305

16 - Sealing washer

17 - Combustion chamber ring seal

- ❑ Renewing ⇒ “4.3.1 Removing and installing injectors - vehicles with 2.5 ltr. engine”, page 301

4.2 Removing and installing fuel rail

Note

- *The description applies for vehicles with 2.5 ltr. engine.*
- *The following instructions describe the removal and installation procedures for the fuel rail on the left side. The procedure for the right side is similar.*

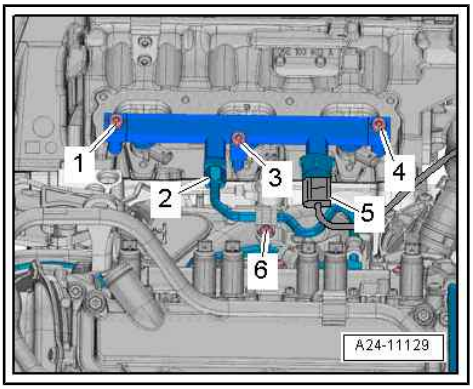
Removing

WARNING

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

- ***The fuel pressure in the high-pressure section of the injection system must be reduced to a residual pressure prior to opening the system ⇒ “1.2 Reducing fuel pressure in high-pressure section”, page 282 .***
- ***Wrap a clean cloth around the connection and carefully loosen the connection to allow the residual pressure to dissipate.***

– Remove intake manifold
⇒ “3.3 Removing and installing intake manifold”, page 292 .
– Unplug electrical connector at fuel pressure sender - G247- -item 5-.
– Remove union nut -2-.
– Remove bolts -1, 4 and 6- and nut -3- and detach fuel rail.



Installing

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

Note

- *If an injector has been pulled out of the cylinder head, the teflon ring seal must be renewed.*
- *Renew gaskets and O-rings.*
- *Lubricate O-rings of injectors lightly with clean engine oil.*

– Press fuel rail evenly onto injectors.
– Fit high-pressure pipe on fuel rail
⇒ Fig. ““Installing high-pressure pipe on fuel rail”“ , page 318 .
– Install intake manifold
⇒ “3.3 Removing and installing intake manifold”, page 292 .

Tightening torques

- ⇒ “4.1 Exploded view - fuel rail with injectors”, page 299

4.3 Removing and installing injectors

⇒ “4.3.1 Removing and installing injectors - vehicles with 2.5 ltr. engine”, page 301

⇒ “4.3.2 Removing and installing injectors - vehicles with 2.8 ltr. engine”, page 305

4.3.1 Removing and installing injectors - vehicles with 2.5 ltr. engine

Special tools and workshop equipment required

- Tool set for FSI engines - T10133 C-



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Removing

WARNING

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

- *The fuel pressure in the high-pressure section of the injection system must be reduced to a residual pressure prior to opening the system ⇒ "1.2 Reducing fuel pressure in high-pressure section", page 282 .*
- *Wrap a clean cloth around the connection and carefully loosen the connection to allow the residual pressure to dissipate.*

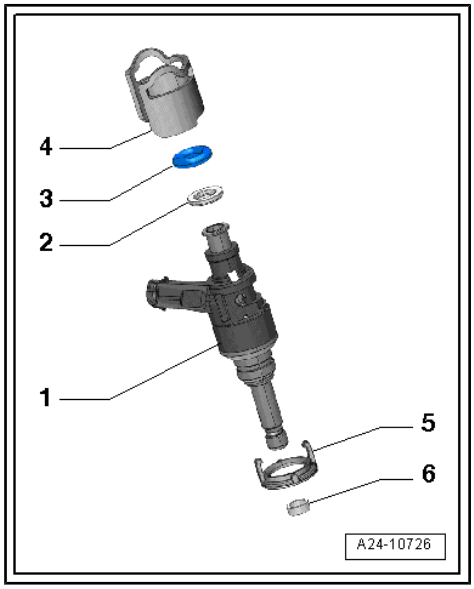
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– Remove intake manifold
⇒ "3.3 Removing and installing intake manifold", page 292 .

– Remove fuel rail
⇒ "4.2 Removing and installing fuel rail", page 300 .

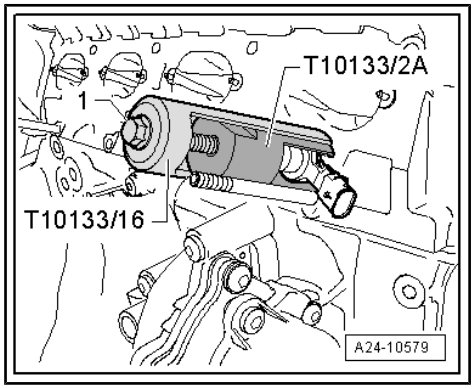
If injectors cannot be pulled out of cylinder head by hand, proceed as follows:

– Pull support ring -4- off injector -1-.

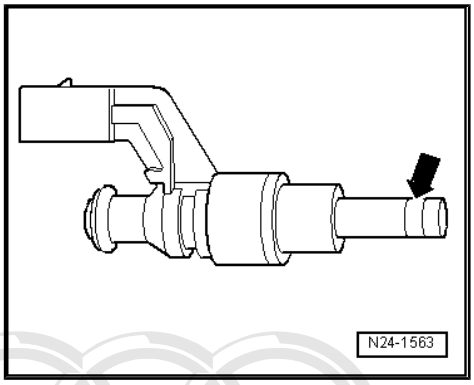


– Guide puller -T10133/2A- into groove on injector.

– Then attach removal tool -T10133/16- and pull out injector by turning bolt -1-.



– Carefully remove old combustion chamber ring seal -arrow-. To do so, cut open combustion chamber ring seal using knife or prise open with small screwdriver and then pull off forwards.



Note

Take care not to damage groove on injector. Injector must be renewed if groove is damaged.

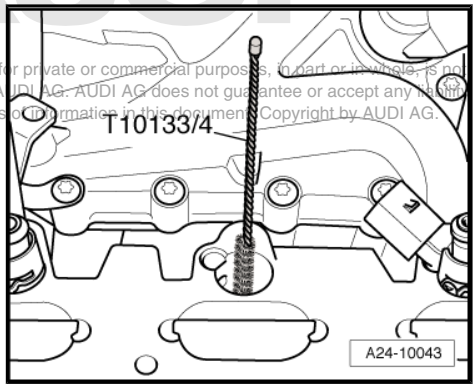
Installing

Note

- *Renew combustion chamber ring seals and O-rings.*
- *Renew spacer ring and radial compensation element if damaged.*
- *Lightly lubricate O-rings for injectors with clean engine oil.*
- *The injector pipes must be re-installed on the same cylinders.*

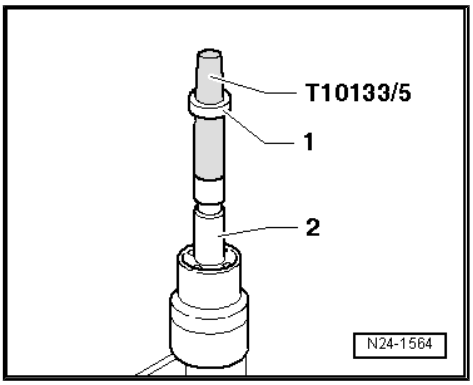
– Clean bore in cylinder head with nylon cylinder brush -T10133/4- .

– When re-installing an injector, clean any combustion residue off groove for combustion chamber ring seal and injector stem with a clean cloth.



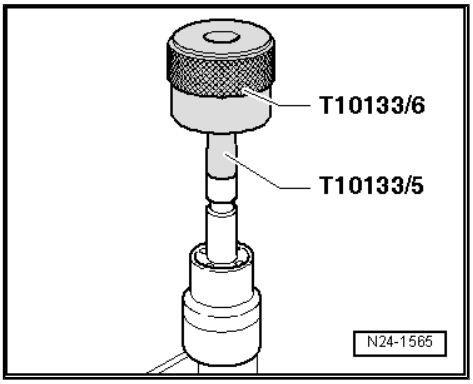
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– Fit assembly cone -T10133/5- with new combustion chamber ring seal -1- from repair kit onto injector -2-.



– Using assembly sleeve -T10133/6- , push combustion chamber ring seal onto assembly cone -T10133/5- as far as it will go.

– Turn round assembly sleeve -T10133/6- and slide combustion chamber ring seal into groove.

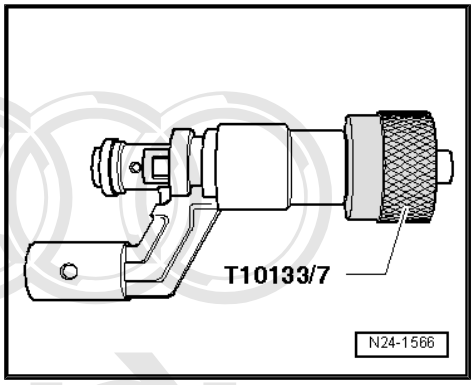


Note

The combustion chamber ring seal is widened when it is pushed onto the injector. After pushing it on, it therefore has to be compressed again. This is done in two stages, as described below.

– Push calibration sleeve -T10133/7- onto injector as far as it will go and simultaneously turn it slightly (approx. 180°).

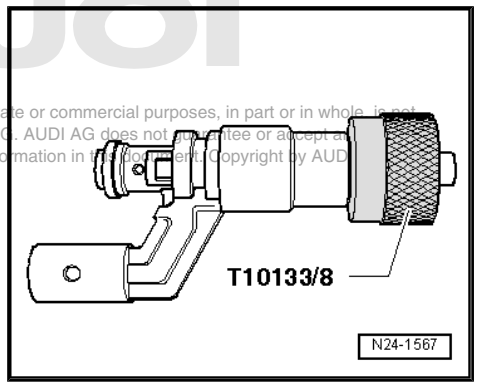
– Pull calibration sleeve -T10133/7- off again by turning it in the opposite direction.



– Push calibration sleeve -T10133/8- onto injector as far as it will go and simultaneously turn it slightly (approx. 180°).

– Pull calibration sleeve -T10133/8- off again by turning it in the opposite direction.

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– Fit parts from repair kit onto injector -1-:

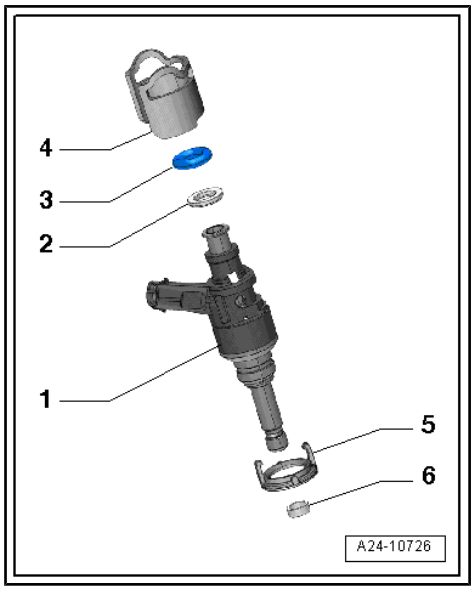
2 - Spacer ring

3 - O-ring

4 - Support ring

5 - Sealing washer

– To make it easier to install injector in fuel rail, lubricate new O-ring lightly with clean engine oil before installing it.



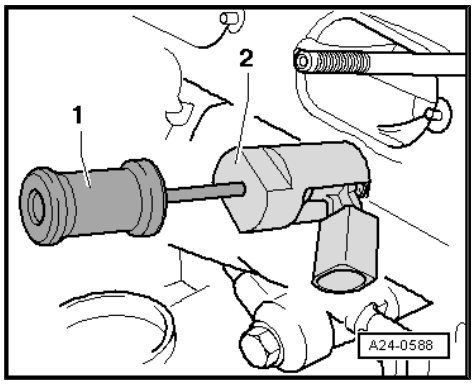
Note

The combustion chamber ring seal -6- must not be lubricated.

– Push injector by hand as far as it will go into aperture in cylinder head (do not use oil or grease). Ensure that the injector is properly seated in the cylinder head.

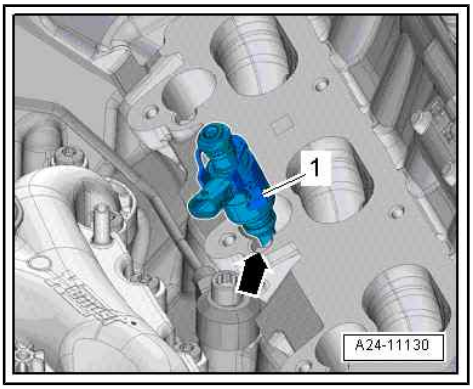
Note

- *It should be possible to insert injector easily. If necessary wait until the combustion chamber ring seal has contracted sufficiently.*
- *Note correct installation position and ensure that injectors are properly seated in cylinder head.*
- *If the injector cannot be pushed in by hand, use puller - T10133/2A- -2- with striker - T10133/3- to insert the injector.*



Installation position of support ring:

- Lug -1- on support ring must engage in recess -arrow- in cylinder head.



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

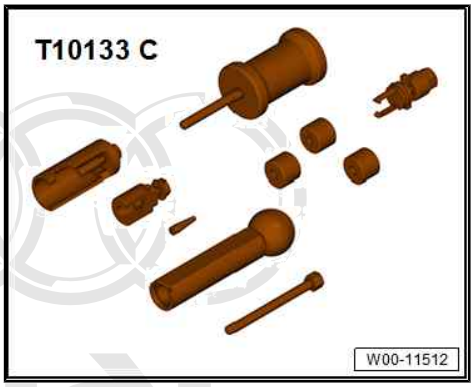
– Install fuel rail
⇒ “4.2 Removing and installing fuel rail”, page 300 .

– Install intake manifold
⇒ “3.3 Removing and installing intake manifold”, page 292 .

4.3.2 Removing and installing injectors - vehicles with 2.8 ltr. engine

Special tools and workshop equipment required

♦ Tool set for FSI engines - T10133 C-



Note

Special tool T10133/2 (puller) has been modified and now has the designation puller T10133/2 A . If you have not yet received the new tool you can make the modification yourself.

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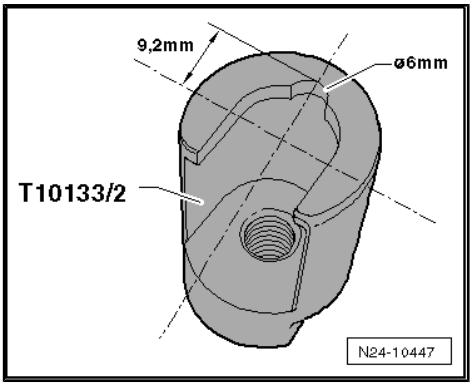
Modifying special tool T10133/2 (puller) to make it equivalent to puller T10133/2 A

Special tools and workshop equipment required

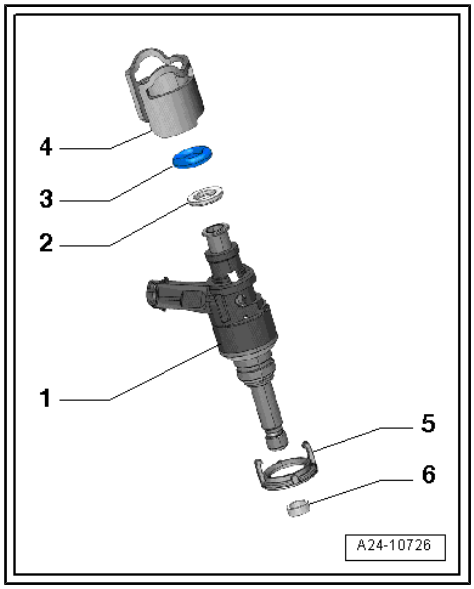
♦ Round file, approx. 6 mm

– File out a semi-circular recess as shown in the illustration. The recess allows the tool to be pushed further onto the injector so the contact surface is increased.

– For identification purposes, mark the modified tool with the letter “A” after the tool number.



Injector - exploded view



1 - Injector

2 - Spacer ring (renew if damaged)

3 - O-ring (renew; apply thin coating of clean engine oil prior to installation)

4 - Support ring (via the support ring the fuel rail exerts force which secures injector in cylinder head)

5 - Radial compensation element (renew if damaged)

6 - Combustion chamber ring seal (teflon ring seal) - renew; when fitting, do not grease ring or use any other lubricant.

Removing

WARNING

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

- ***The fuel pressure in the high-pressure section of the injection system must be reduced to a residual pressure prior to opening the system*** ***⇒ "1.2 Reducing fuel pressure in high-pressure section", page 282*** .
- ***Wrap a clean cloth around the connection and carefully loosen the connection to allow the residual pressure to dissipate.***

Note

Injectors must only be installed when engine is cold.

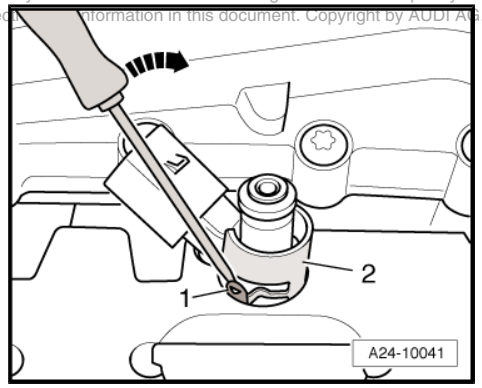
– Remove intake manifold (top section) ⇒ "3.4 Removing and installing intake manifold (top section)", page 294 .

– Remove intake manifold (bottom section) on relevant side ⇒ "3.5 Removing and installing intake manifold (bottom section)", page 296 .

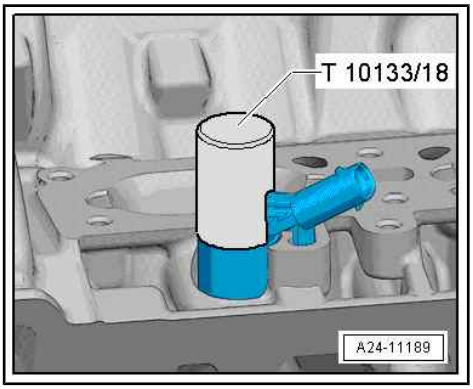
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If injectors cannot be pulled out of cylinder head by hand, proceed as follows:

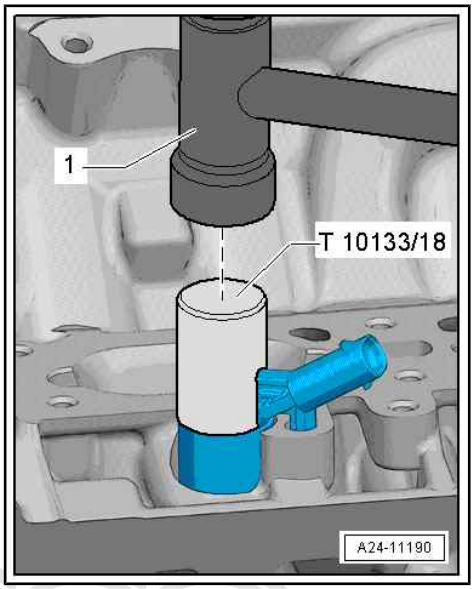
– Use a screwdriver to bend retainer tabs -1- of radial compensation element to side -arrow- and pull support ring -2- off injector.



– Slide stop sleeve -T10133/18- over injector.



– Carefully knock against stop sleeve several times to loosen injector.



Note

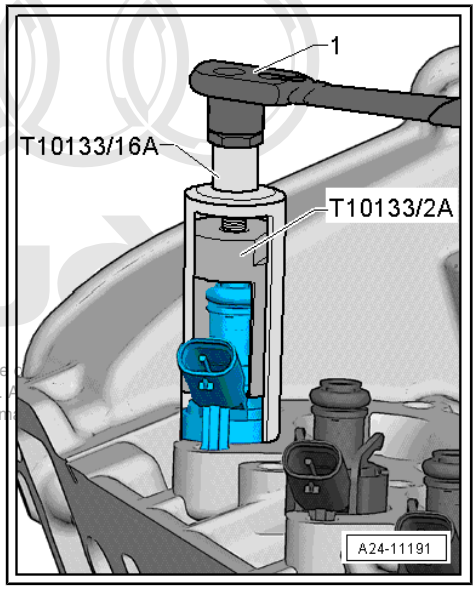
- *Use a torque wrench to pull out injector.*
- *Adjust torque wrench to 5 Nm.*

– Guide puller -T10133/2A- into groove on injector.

– Then apply puller T10133/16A .

– Pull out injector by turning bolt with torque wrench -1-.

– If injector does not come loose after limit torque of 5 Nm is reached, remove puller and repeat procedure using stop sleeve to loosen injector.

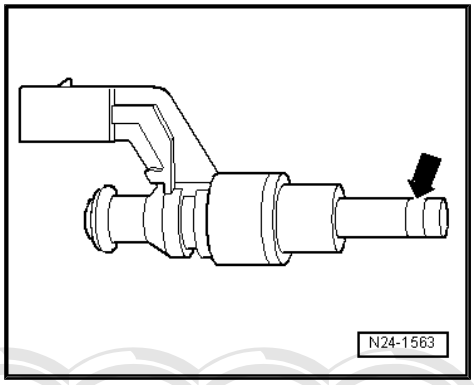


Note

- *Observe correct torque to avoid irreparable damage to injector.*
- *The combustion chamber ring seal must always be renewed prior to reinstalling the injector.*

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with respect to the correctness of

– Carefully remove old combustion chamber ring seal -arrow-. To do so, cut open combustion chamber ring seal using knife or prise open with small screwdriver and then pull off forwards.



Note

Take care not to damage groove on injector. Injector must be renewed if groove is damaged.

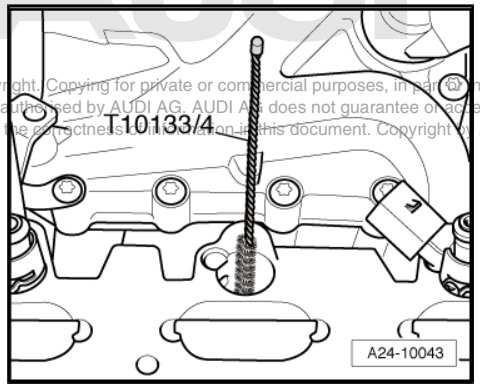
Installing

Note

- *Renew combustion chamber ring seals and O-rings.*
- *Renew spacer ring and radial compensation element if damaged.*
- *Lightly lubricate O-rings for injectors with clean engine oil.*
- *The injector pipes must be re-installed on the same cylinders.*

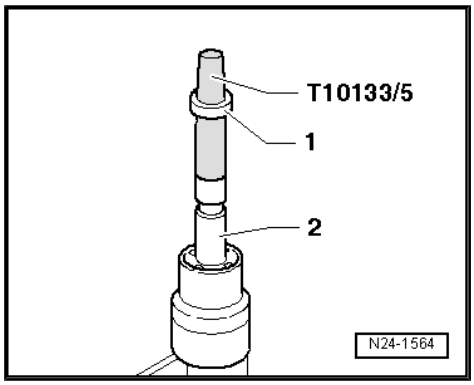
– Clean bore in cylinder head with nylon cylinder brush - T10133/4- .

– When re-installing an injector, clean any combustion residue off groove for combustion chamber ring seal and injector stem with a clean cloth.



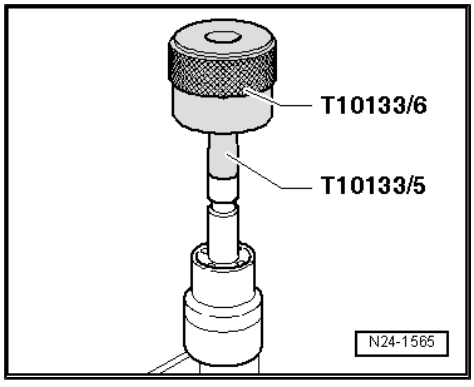
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– Fit assembly cone -T10133/5- with new combustion chamber ring seal -1- from repair kit onto injector -2-.



– Using assembly sleeve -T10133/6- , push combustion chamber ring seal onto assembly cone -T10133/5- as far as it will go.

– Turn round assembly sleeve -T10133/6- and slide combustion chamber ring seal into groove.

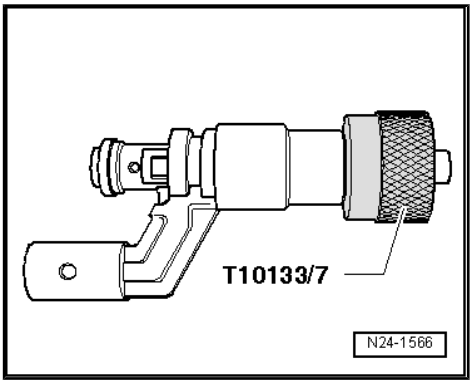


Note

The combustion chamber ring seal is widened when it is pushed onto the injector. After pushing it on, it therefore has to be compressed again. This is done in two stages, as described below.

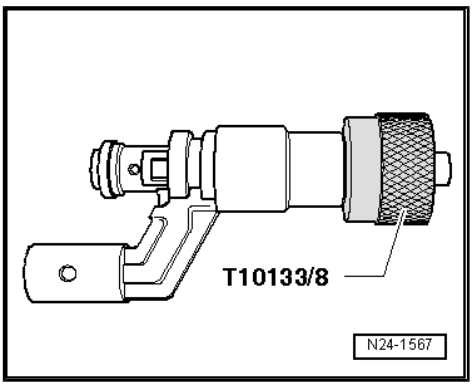
– Push calibration sleeve -T10133/7- onto injector as far as it will go and simultaneously turn it slightly (approx. 180°).

– Pull calibration sleeve -T10133/7- off again by turning it in the opposite direction.



– Push calibration sleeve -T10133/8- onto injector as far as it will go and simultaneously turn it slightly (approx. 180°).

– Pull calibration sleeve -T10133/8- off again by turning it in the opposite direction.



– Fit parts from repair kit onto injector -1-:

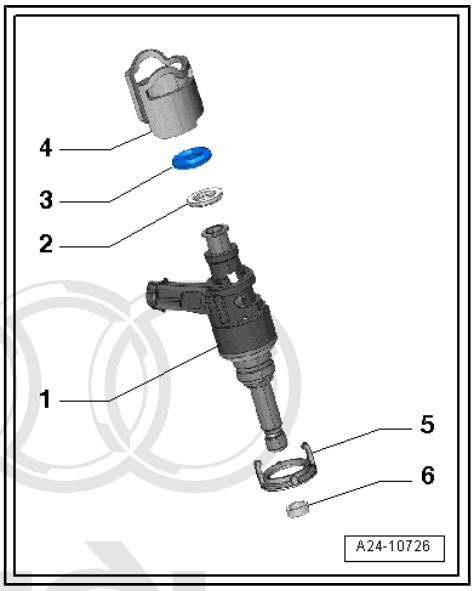
2 - Spacer ring

3 - O-ring

4 - Support ring

5 - Sealing washer

– To make it easier to install injector in fuel rail, lubricate new O-ring lightly with clean engine oil before installing it.

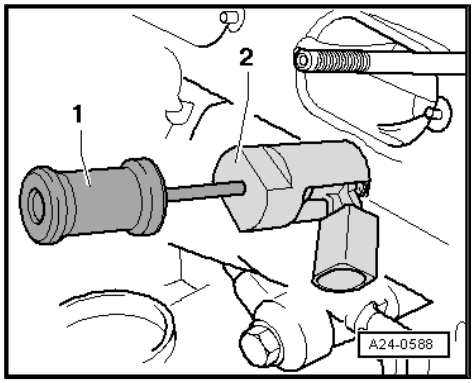


Note

The combustion chamber ring seal -6- must not be lubricated.

– Push injector by hand as far as it will go into aperture in cylinder head (do not use oil or grease). Ensure that the injector is properly seated in the cylinder head.

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Note

- *It should be possible to insert injector easily. If necessary wait until the combustion chamber ring seal has contracted sufficiently.*
- *Note correct installation position and ensure that injectors are properly seated in cylinder head.*
- *If the injector cannot be pushed in by hand, use puller - T10133/2A- -2- with striker - T10133/3- to insert the injector.*

- Electrical connector of injector must engage in recess in cylinder head.

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

– Install intake manifold (bottom section)
⇒ “3.5 Removing and installing intake manifold (bottom section)”, page 296 .

– Install intake manifold (top section)
⇒ “3.4 Removing and installing intake manifold (top section)”, page 294 .

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5 Senders and sensors

⇒ “5.1 Removing and installing fuel pressure sender G247 ”, page 311

5.1 Removing and installing fuel pressure sender - G247-

⇒ “5.1.1 Removing and installing fuel pressure sender G247 - vehicles with 2.5 ltr. engine”, page 311

⇒ “5.1.2 Removing and installing fuel pressure sender G247 - vehicles with 2.8 ltr. engine”, page 311

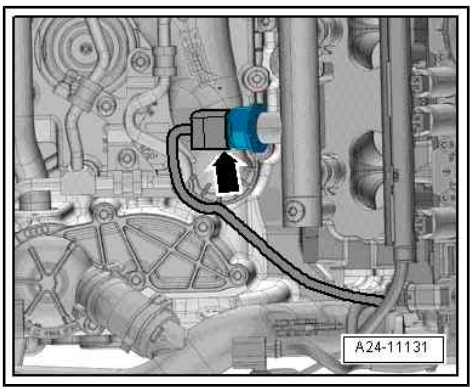
5.1.1 Removing and installing fuel pressure sender - G247- - vehicles with 2.5 ltr. engine

Removing

– Remove intake manifold
⇒ “3.3 Removing and installing intake manifold”, page 292 .

– Unplug electrical connector -arrow-.

– Unscrew fuel pressure sender - G247- .



Installing

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

– Install intake manifold
⇒ “3.3 Removing and installing intake manifold”, page 292 .

Tightening torques

◆ ⇒ “4.1 Exploded view - fuel rail with injectors”, page 299

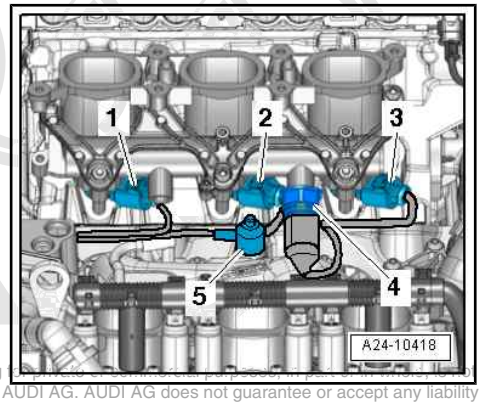
5.1.2 Removing and installing fuel pressure sender - G247- - vehicles with 2.8 ltr. engine

Removing

– Remove intake manifold (top section)
⇒ “3.4 Removing and installing intake manifold (top section)”, page 294 .

– Unplug electrical connector at fuel pressure sender - G247- -4-.

– Unscrew fuel pressure sender - G247- -4-.



Installing

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

– Install intake manifold (top section)
⇒ “3.4 Removing and installing intake manifold (top section)”, page 294 .

Tightening torques

◆ ⇒ “3.2 Exploded view - intake manifold (bottom section) with fuel rail”, page 291

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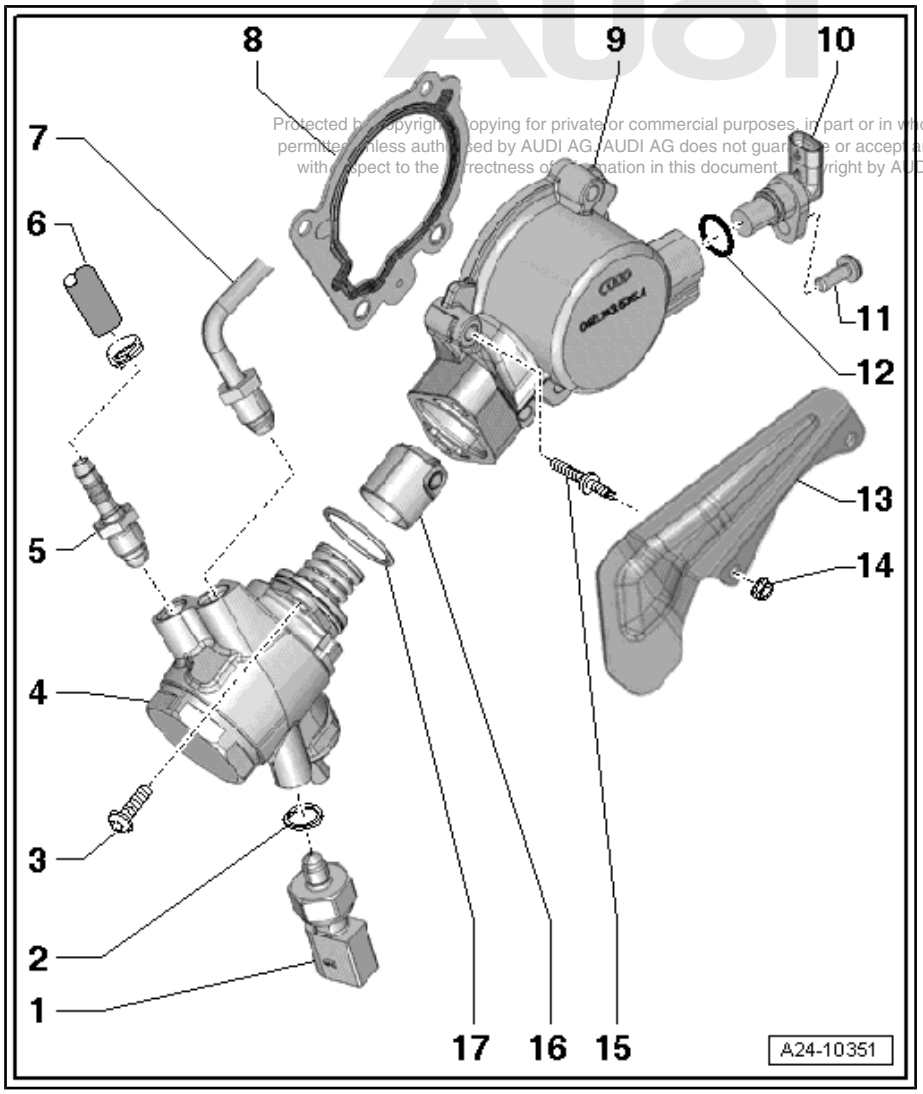
6 High-pressure pump

⇒ “6.1 Exploded view - high-pressure pump”, page 312

⇒ “6.2 Removing and installing high-pressure pump”, page 314

⇒ “6.3 Removing and installing high-pressure pipe”, page 317

6.1 Exploded view - high-pressure pump



1 - Fuel pressure sender for low pressure - G410-

- ❑ 15 Nm

2 - Not fitted

3 - Bolt

- ❑ Tightening torque and sequence ⇒ Fig. ““High-pressure pump - tightening torque and sequence”“ , page 313

4 - High-pressure pump

- ❑ With fuel metering valve - N290-
- ❑ Removing and installing ⇒ “6.2 Removing and installing high-pressure pump”, page 314
- ❑ Do not dismantle

5 - Threaded connection

- ❑ Connections must not be damaged
- ❑ 27 Nm

6 - Fuel supply hose

- ❑ Low-pressure section

7 - High-pressure pipe

> **WARNING**
> *The fuel system operates at extremely high pressure. This can cause injury.*
> *The fuel pressure in the high-pressure section of the injection system must be reduced to a residual pressure prior to opening the system*
> *⇒ “1.2 Reducing fuel pressure in high-pressure section”, page 282 .*

- ❑ Removing and installing ⇒ “6.3 Removing and installing high-pressure pipe”, page 317
- ❑ Do not alter shape
- ❑ Check for damage before re-installing
- ❑ Lubricate thread of union nut with clean engine oil
- ❑ 25 Nm

8 - Gasket

- ❑ Renew

9 - Housing

10 - Hall sender - G40-

- ❑ Removing and installing ⇒ “1.5 Removing and installing Hall senders”, page 380

11 - Bolt

- ❑ Tightening torque ⇒ “1.1 Exploded view - ignition system”, page 371

12 - O-ring

- ❑ Renew

13 - Protective plate

- ❑ For high-pressure pipe
- ❑ Different versions available
  ⇒ Fig. ““Guard plate for high-pressure pipe - tightening torque”“ , page 313 ; for allocation refer to ⇒ Electronic parts catalogue

14 - Nut

- ❑ 9 Nm

15 - Threaded pin

- ❑ 9 Nm

16 - Roller tappet

- ❑ Can only be installed in one position
- ❑ Lubricate lightly with clean engine oil before installing

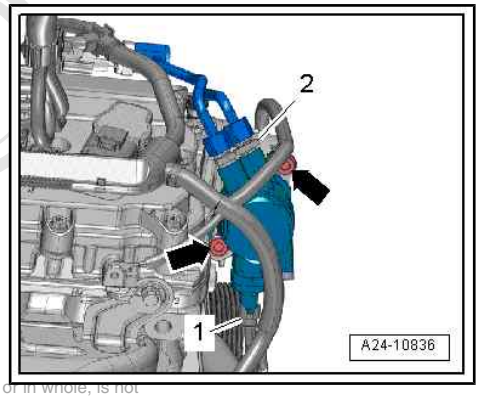
17 - O-ring

- ❑ Renew
- ❑ Lubricate lightly with clean engine oil before installing

High-pressure pump - tightening torque and sequence

– Tighten bolts in stages as follows:

Stage	Bolts	Tightening torque
1.	-arrows-	Screw in by hand until contact is made
2.	-arrows-	5 Nm
3.	-arrows-	Tighten in stages and alternately; final torque 20 Nm

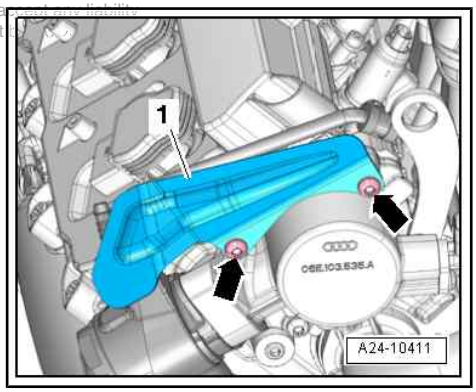


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Guard plate for high-pressure pipe - tightening torque

– Tighten bolts -arrows- securing guard plate -1-.

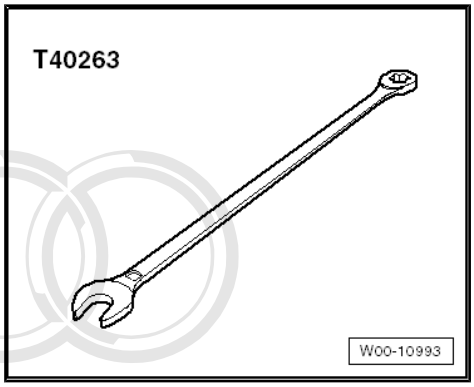
• Tightening torque: 9 Nm



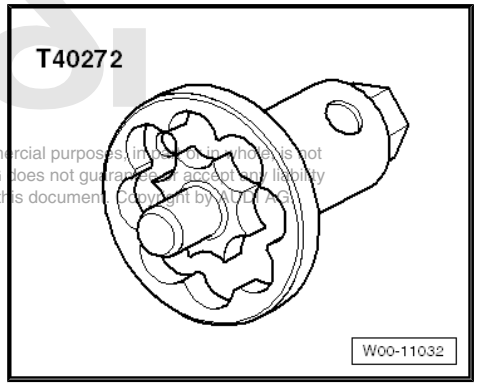
6.2 Removing and installing high-pressure pump

Special tools and workshop equipment required

- Wrench, 21 mm - T40263-



- Turning-over tool - T40272-



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Removing

WARNING

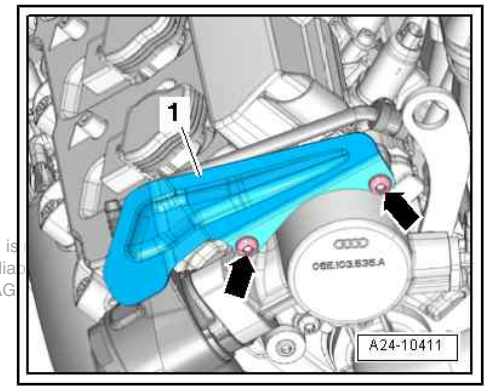
The fuel system operates at extremely high pressure. This can cause injury.

- *The fuel pressure in the high-pressure section of the injection system must be reduced to a residual pressure prior to opening the system* *⇒ "1.2 Reducing fuel pressure in high-pressure section", page 282* *.*
- *Wrap a clean cloth around the connection and carefully loosen the connection to allow the residual pressure to dissipate.*

Note

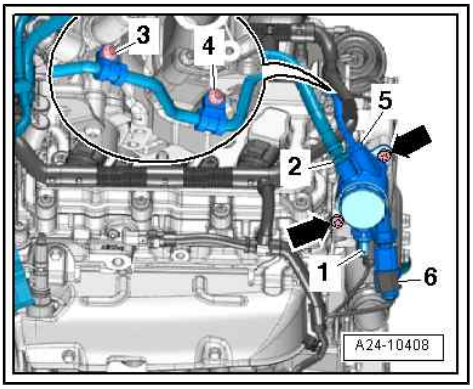
- *The high-pressure pump should only be removed and installed when the engine is cold.*
- *When installing the high-pressure fuel pump, it is essential to ensure that no dirt enters the fuel system.*
- *Use a cloth to catch escaping fuel.*
- *The O-ring must always be renewed.*

– Reduce fuel pressure in high-pressure system
⇒ “1.2 Reducing fuel pressure in high-pressure section”, page 282 .
– Remove air cleaner housing
⇒ “2.2 Removing and installing air cleaner housing”, page 285 .
– Unscrew nuts -arrows- and remove guard plate -1-.



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– Unplug electrical connectors -1- and -6-.
– Remove bolt -3- on retaining clip.
– Unscrew connections -2- and -5-.
– Remove bolts -arrows-.
– Carefully pull out high-pressure pump. It is possible that the roller tappet may remain lodged inside.



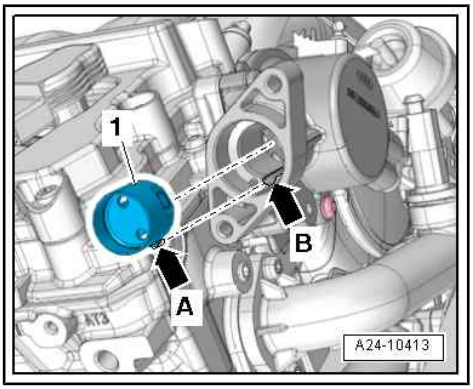
Note

- *Disregard -item 4-.*
- *Do not bend fuel pipes to a different shape.*
- *Do NOT bend open retaining clamps for fuel pipe.*
- *If one of the retaining clamps has been bent open or the fuel pipe has to be renewed, the retaining clamps must also be renewed.*

– Pull roller tappet -1- out of housing.

Installing

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



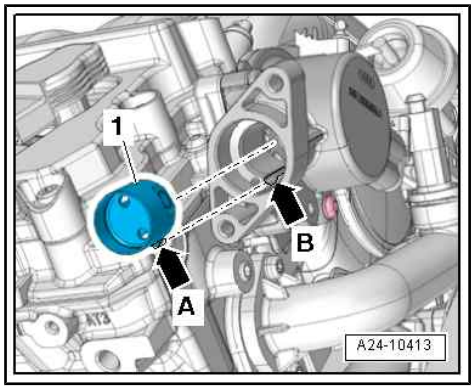
Note

- *The connections of the high-pressure pipe must not be damaged.*
- *Do not bend fuel pipes to a different shape.*
- *Do NOT bend open retaining clamps for fuel pipe.*
- *If one of the retaining clamps has been bent open or the fuel pipe has to be renewed, the retaining clamps must also be renewed.*

– Renew O-ring for high-pressure pump.

– Check roller tappet -1- for damage and renew if necessary.

– Lightly lubricate roller tappet with oil and insert it so that lug -arrow A- slides into guide notch -arrow B-.



Note

The roller tappet must be positioned at the lowest point when installing the high-pressure pump.

– Fit turning-over tool - T40272- onto wrench (21 mm) - T40263- .

– Position adapter on bolts of vibration damper.

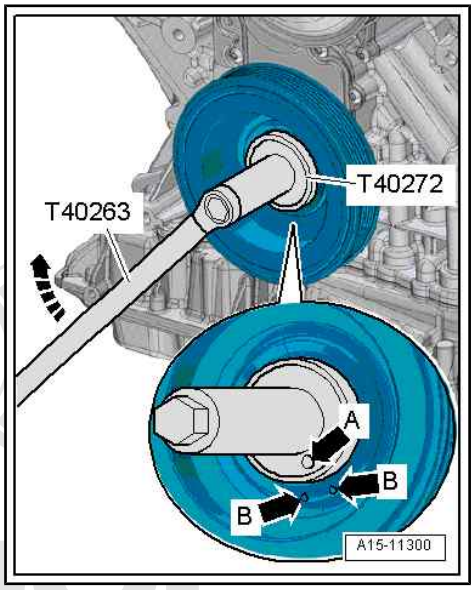
• Hole -arrow A- on turning-over tool - T40272- must be positioned between markings -arrows B- on vibration damper.

– Rotate crankshaft in direction of normal engine rotation -arrow- using wrench (21 mm) - T40263- and turning-over tool - T40272- , and at the same time press roller tappet into housing until it reaches lowest point.

– Only lift high-pressure pipe slightly to fit high-pressure pump.

– Insert high-pressure pump into housing.

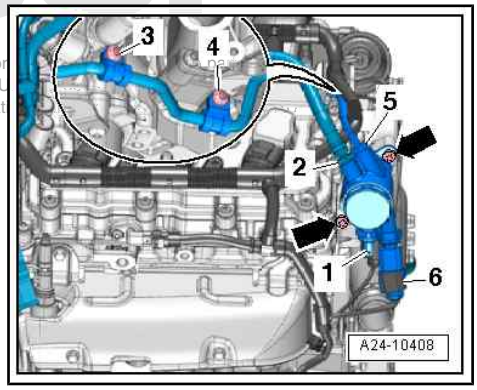
– Press high-pressure pump down by hand as far as possible onto stop.



– Hand-tighten the bolts -arrows- as far as the flange.

– Then initially tighten securing bolts alternately to 5 Nm (do not tilt high-pressure pump).

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Note

The high-pressure pump can be damaged if it is tightened too much on one side (keep it straight).

• Final tightening torque for securing bolts
⇒ “6.1 Exploded view - high-pressure pump”, page 312

– Tighten union nut -5- on fuel supply line hand-tight. Align so that parts are free of tension.

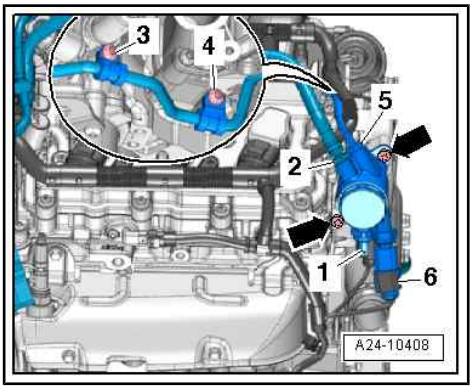
– Connect fuel supply hose -2- again.

– Tighten bolt -3- on retaining clip.
– Plug in electrical connectors -1- and -6-.

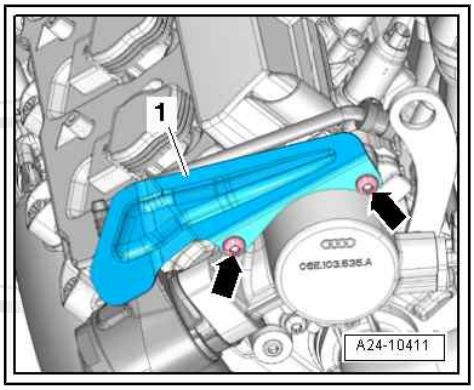
Note

Disregard -item 4-.

– Tighten high-pressure pipe to specified torque
⇒ Fig. ""Installing high-pressure pipe at high-pressure pump"" , page 318 .



– Install guard plate -1-.
– Install air cleaner housing
⇒ "2.2 Removing and installing air cleaner housing", page 285 .
– Check fuel system for leaks
⇒ "1.3 Checking fuel system for leaks", page 283 .

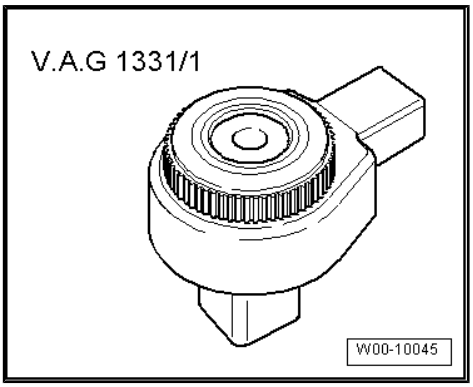


6.3 Removing and installing high-pressure pipe

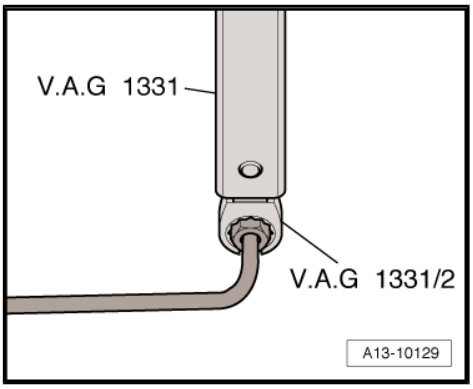
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Special tools and workshop equipment required

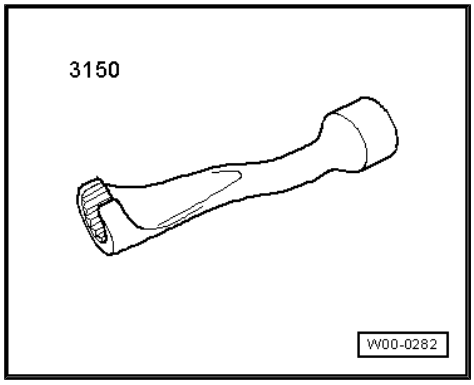
- Torque wrench - V.A.G 1331-
- Ratchet - V.A.G 1331/1-



- Tool insert (open-end ring spanner, 17 mm) -V.A.G 1331/2-



- Socket SW 14 - 3150- or flared ring spanner tool insert AF 14 - V.A.G 1331/8-



Procedure

Note

- *The connections of the high-pressure pipes must not be damaged.*
- *Do not bend the high-pressure pipes out of shape.*
- *Do NOT bend open retaining clamps for fuel pipe.*
- *If one of the retaining clamps has been bent open or the fuel pipe has to be renewed, the retaining clamps must also be renewed.*

– Lubricate threads of union nuts with clean engine oil.

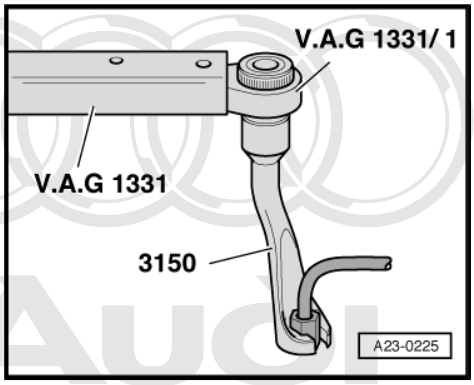
– Hand-tighten union nuts on high-pressure pipes (ensure that pipes are not under tension).

Installing high-pressure pipe at high-pressure pump

– Tighten union nut on high-pressure pipe hand-tight initially.

– Ensure that high-pressure pipe is not under tension.

– To tighten union of high-pressure pipe at high-pressure pump, use torque wrench - V.A.G 1331- with ratchet - V.A.G 1331/1- and socket, 14 mm - 3150- .



Installing high-pressure pipe on fuel rail

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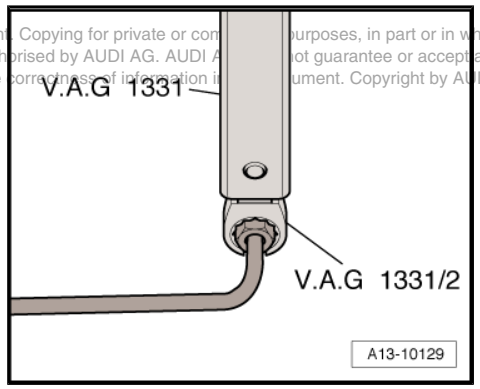
– Tighten union nut on high-pressure pipe hand-tight initially.

– Ensure that high-pressure pipe is not under tension.

– To tighten high-pressure pipe on fuel rail, use torque wrench - V.A.G 1331- with tool insert (open-end ring spanner, 17 mm) -V.A.G 1331/2- .

– Do not install retaining tabs until high-pressure pipes have been tightened.

– Check fuel system for leaks
⇒ “1.3 Checking fuel system for leaks”, page 283 .



Tightening torques

- ⇒ “4.1 Exploded view - fuel rail with injectors”, page 299
- ⇒ “6.1 Exploded view - high-pressure pump”, page 312

7 Lambda probes

⇒ “7.1 Exploded view - Lambda probes”, page 319

⇒ “7.2 Removing and installing Lambda probe”, page 320

7.1 Exploded view - Lambda probes

Note

- *New Lambda probes are coated with an assembly paste.*
- *In the case of a used Lambda probe, coat only the thread with high-temperature paste; refer to ⇒ Electronic parts catalogue for high-temperature paste.*
- *The assembly paste / high-temperature paste must not make contact with the slots on the Lambda probe body.*

1 - Lambda probe - G39-

- ❑ With Lambda probe heater - Z19-
- ❑ Removing and installing ⇒ “7.2.1 Removing and installing Lambda probe G39 ”, page 320
- ❑ 55 Nm

2 - Lambda probe after catalytic converter - G130-

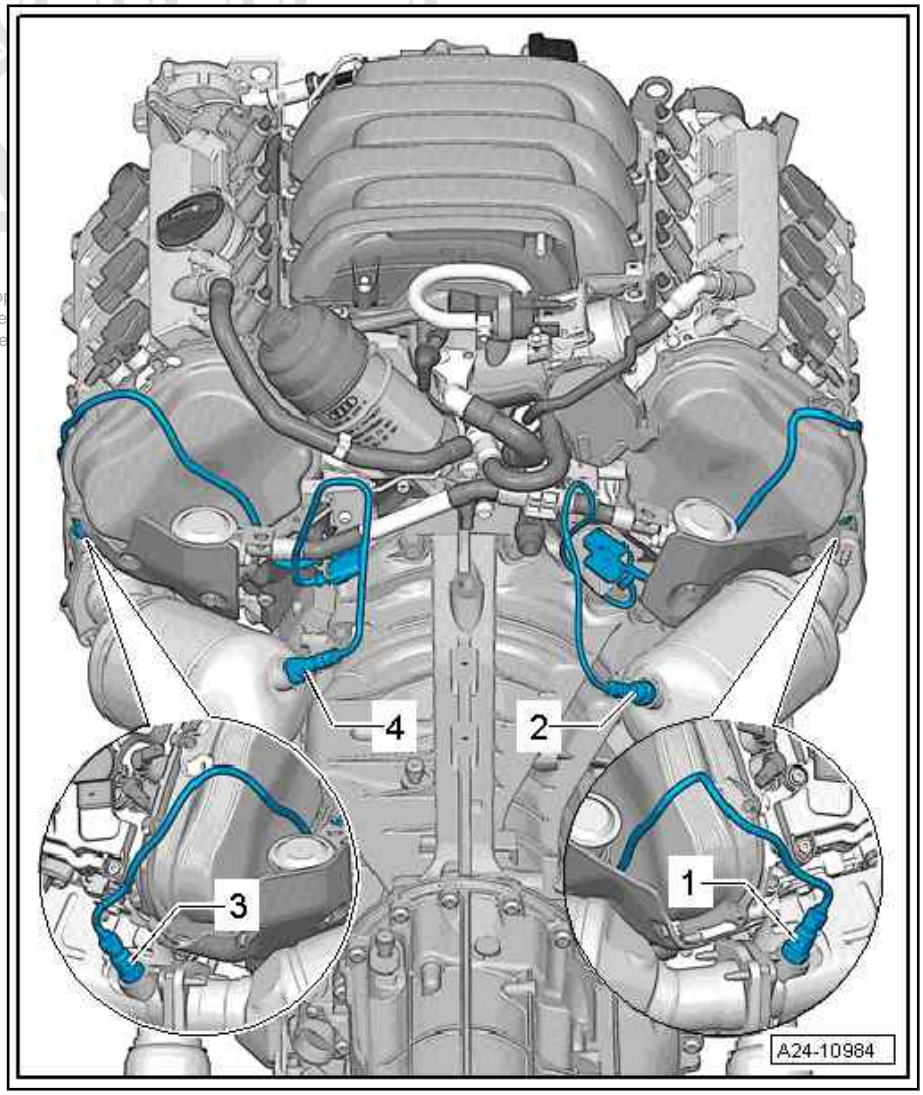
- ❑ With Lambda probe 1 heater after catalytic converter - Z29-
- ❑ Removing and installing ⇒ “7.2.3 Removing and installing Lambda probe after catalytic converter G130 ”, page 323
- ❑ 55 Nm

3 - Lambda probe 2 - G108-

- ❑ With Lambda probe heater 2 - Z28-
- ❑ Removing and installing ⇒ “7.2.2 Removing and installing Lambda probe 2 G108 ”, page 321
- ❑ 55 Nm

4 - Lambda probe 2 after catalytic converter - G131-

- ❑ With Lambda probe 2 heater after catalytic converter - Z30-
- ❑ Removing and installing ⇒ “7.2.2 Removing and installing Lambda probe 2 G108 ”, page 321
- ❑ 55 Nm



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7.2 Removing and installing Lambda probe

⇒ “7.2.1 Removing and installing Lambda probe G39 ”, page 320

⇒ “7.2.2 Removing and installing Lambda probe 2 G108 ”, page 321

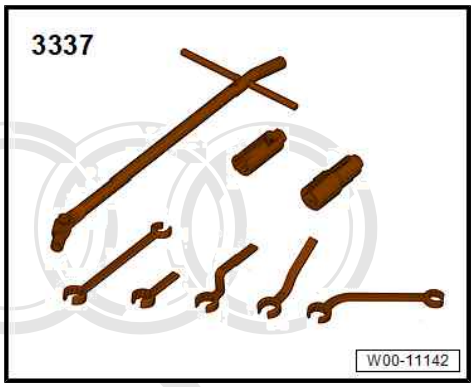
⇒ “7.2.3 Removing and installing Lambda probe after catalytic converter G130 ”, page 323

⇒ “7.2.4 Removing and installing Lambda probe 2 after catalytic converter G131 ”, page 325

7.2.1 Removing and installing Lambda probe - G39-

Special tools and workshop equipment required

- Lambda probe open ring spanner set - 3337-



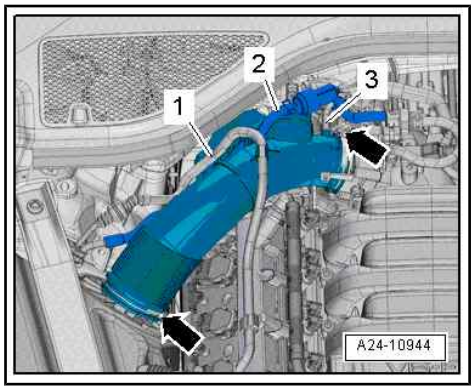
Removing

Note

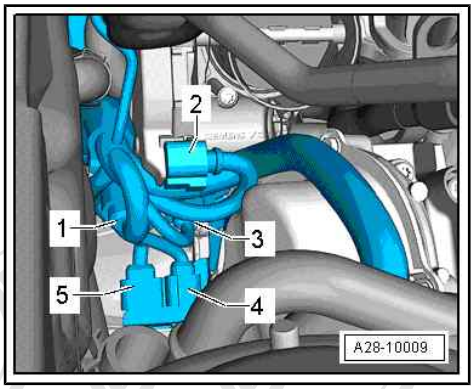
Fit all cable ties in the original positions when installing.

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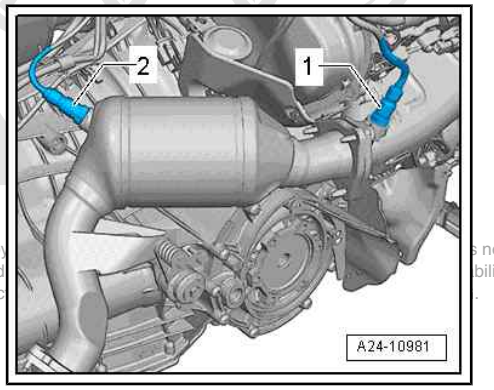
– Remove engine cover panel (rear) ⇒ “3.1 Removing and installing engine cover panel”, page 64 .
– Move fuel hose -1- and hose -2- from activated charcoal filter clear at air pipe.
– Detach vacuum hose -3- from connection on air pipe.
– Loosen hose clips -arrows- and detach air pipe.



– Unplug electrical connector -4- for Lambda probe - G39- .



– Unscrew Lambda probe - G39- -1- using tool from Lambda probe open ring spanner set - 3337- .



Note

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

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Installing

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

Note

- *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the Lambda probe body. High-temperature paste ⇒ Electronic parts catalogue*
- *When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*

– Install engine cover panel
⇒ “3.1 Removing and installing engine cover panel”, page 64 .

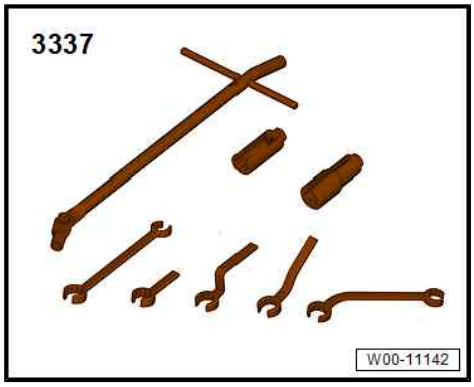
Tightening torques

- ⇒ “7.1 Exploded view - Lambda probes”, page 319
- ⇒ Fig. ““Installing air pipes and hoses with screw-type clips”“ , page 285

7.2.2 Removing and installing Lambda probe 2 - G108-

Special tools and workshop equipment required

♦ Lambda probe open ring spanner set - 3337-



Removing

Note

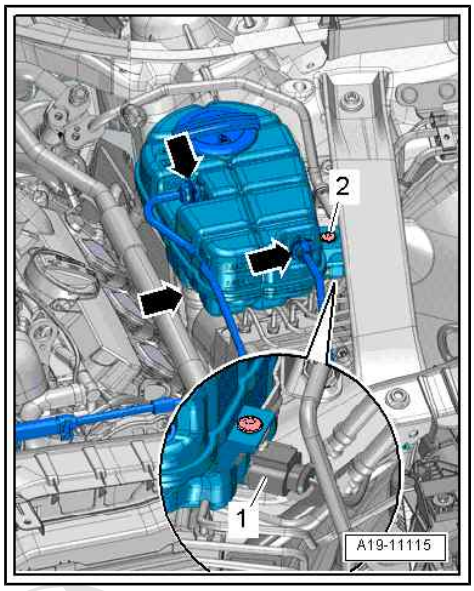
Fit all cable ties in the original positions when installing.

– Remove engine cover panel (rear)
⇒ “3.1 Removing and installing engine cover panel”, page 64 .

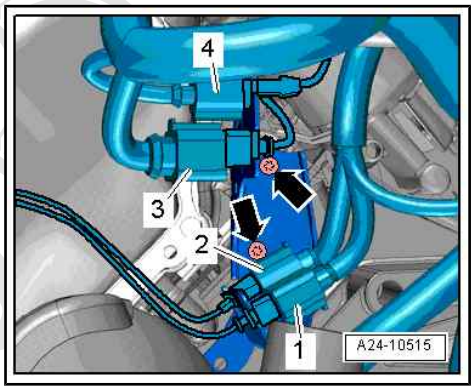
– Unplug electrical connector -1-.

– Remove bolt -2-.

– Push coolant expansion tank to one side with coolant hoses -arrows- attached.

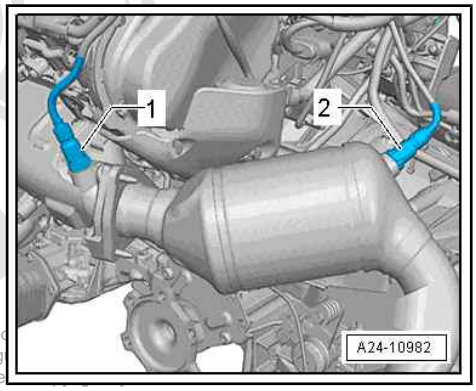


– Unplug electrical connector -2- for Lambda probe 2 - G108- .



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– Unscrew Lambda probe 2 - G108- -1- using tool from Lambda probe open ring spanner set - 3337- .



Note

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

Installing

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

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Note

- *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the Lambda probe body. High-temperature paste ⇒ Electronic parts catalogue*
- *When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*
- *Fit all cable ties in the original positions when installing.*

– Install engine cover panel
⇒ “3.1 Removing and installing engine cover panel”, page 64 .

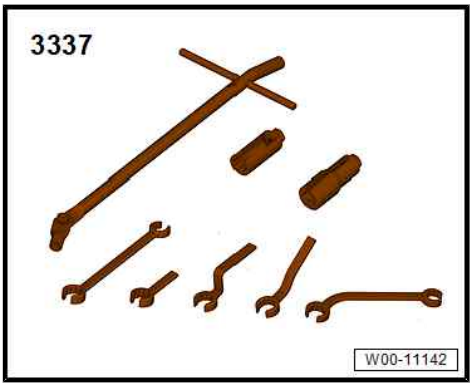
Tightening torques

- ⇒ “7.1 Exploded view - Lambda probes”, page 319

7.2.3 Removing and installing Lambda probe after catalytic converter - G130-

Special tools and workshop equipment required

- Lambda probe open ring spanner set - 3337-



Removing

Note

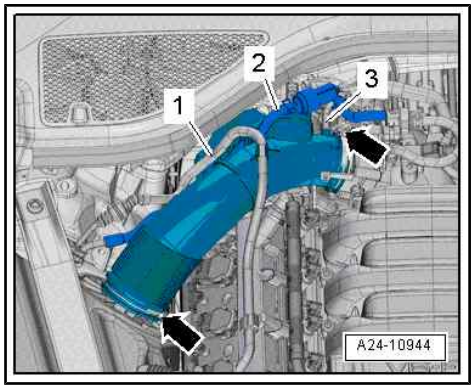
Fit all cable ties in the original positions when installing.

– Remove engine cover panel (rear)
⇒ “3.1 Removing and installing engine cover panel”, page 64 .

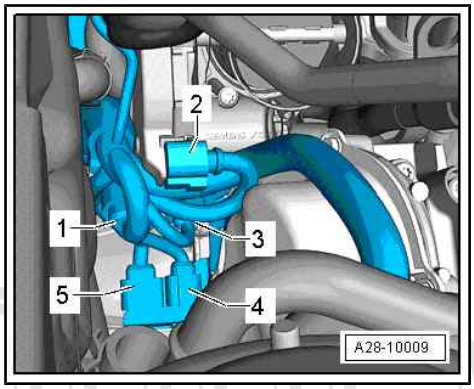
– Move clear fuel hose -1- and hose -2- leading to activated charcoal filter at air pipe.

– Detach vacuum hose -3- from connection on air pipe.

– Loosen hose clips -arrows- and detach air pipe.

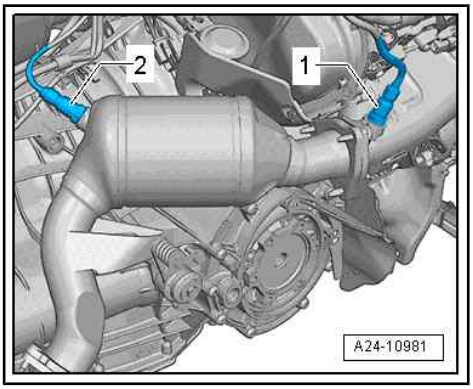


– Unplug electrical connector -5- for Lambda probe after catalytic converter - G130- .



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– Unscrew Lambda probe after catalytic converter - G130- -2- using tool from Lambda probe open ring spanner set - 3337- .



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:

Note

- *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the Lambda probe body. High-temperature paste ⇒ Electronic parts catalogue*
- *When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*

– Install engine cover panel
⇒ “3.1 Removing and installing engine cover panel”, page 64 .

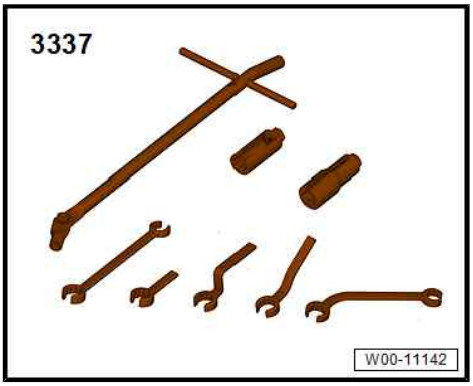
Tightening torques

- ⇒ “7.1 Exploded view - Lambda probes”, page 319
- ⇒ Fig. ““Installing air pipes and hoses with screw-type clips”“ , page 285

7.2.4 Removing and installing Lambda probe 2 after catalytic converter - G131-

Special tools and workshop equipment required

- Lambda probe open ring spanner set - 3337-



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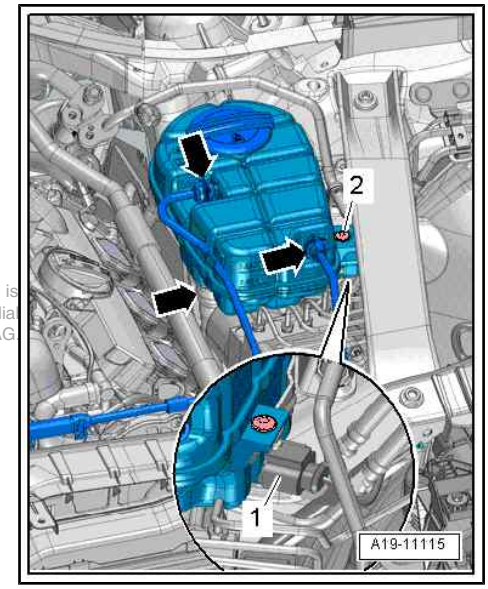
Removing

Note

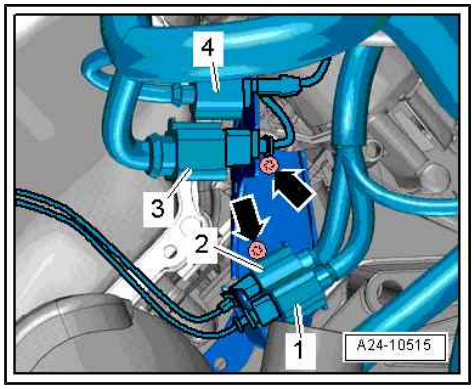
Fit all cable ties in the original positions when installing.

– Remove engine cover panel (rear)
⇒ “3.1 Removing and installing engine cover panel”, page 64 .
– Unplug electrical connector -1-.
– Remove bolt -2-.
– Push coolant expansion tank to one side with coolant hoses -arrows- attached.

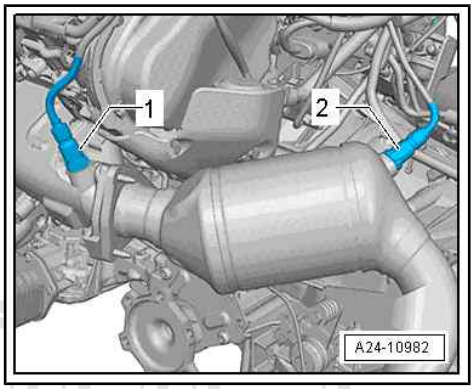
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– Unplug electrical connector -1- for Lambda probe 2 after catalytic converter - G131- .



– Unscrew Lambda probe 2 after catalytic converter - G131- -2- using tool from Lambda probe open ring spanner set - 3337- .



Note

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

Installing

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

Note

- *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the Lambda probe body. High-temperature paste ⇒ Electronic parts catalogue*
- *When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*

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– Install engine cover panel ⇒ “3.1 Removing and installing engine cover panel”, page 64 .

Tightening torques

- ⇒ “7.1 Exploded view - Lambda probes”, page 319

8 Engine control unit

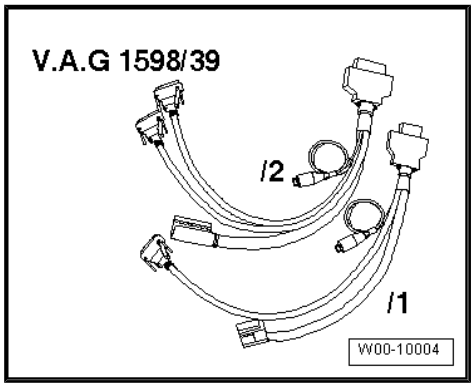
⇒ “8.1 Wiring and component check”, page 328

⇒ “8.2 Removing and installing engine/motor control unit J623 ”, page 330

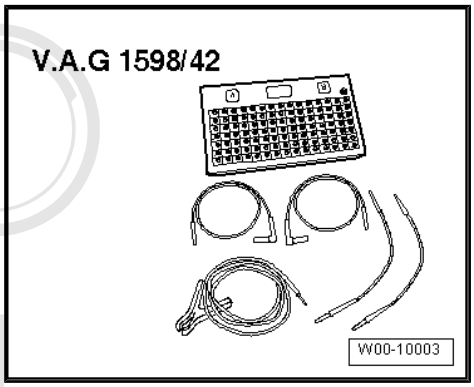
8.1 Wiring and component check

Special tools and workshop equipment required

- Adapter cable - V.A.G 1598/39-1-

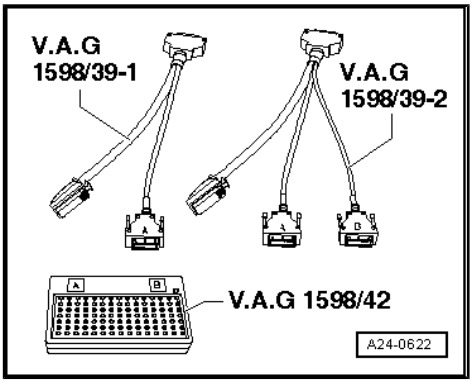


- Adapter cable - V.A.G 1598/39-2-
- Test box - V.A.G 1598/42-



- Vehicle diagnostic tester

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Note

- *The test box - V.A.G 1598/42- has 105 sockets. It can be connected to the engine control unit via 2 different adapter cables.*
- *The engine control unit is connected to the vehicle's wiring harness via two connectors, one of which has 60 pins, the other has 94 pins.*
- *To carry out tests on the 60-pin wiring harness connector, the adapter cable - V.A.G 1598/39-1- is connected to connector -A- on the test box. For components connected to 60-pin wiring harness connector ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.*
- *To carry out tests on the 94-pin wiring harness connector, the adapter cable - V.A.G 1598/39-2- must be connected to connectors -A- and -B- on the test box. For components connected to 94-pin wiring harness connector ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.*
- *The test box - V.A.G 1598/42- is designed so it can be connected both to the wiring harness for the engine control unit and to the engine control unit itself at the same time. The advantage of this is that the electronic engine control system remains fully functional when the test box is connected (for example, for measuring signals when the engine is running).*
- *Always use auxiliary measuring set - V.A.G 1527B- to connect test equipment (e.g. voltage tester - V.A.G 1526E- , hand-held multimeter - V.A.G 1594C- etc.).*

Caution

Risk of irreparable damage to electronic components.

- ***Select the appropriate measuring range before connecting the test leads and observe test requirements.***

– Remove engine control unit - J623-
⇒ "8.2 Removing and installing engine/motor control unit J623", page 330 .

– Connect test box - V.A.G 1598/42- to wiring harness connector. The earth clip on the test box must be connected to the negative battery terminal. The instructions for performing the individual tests indicate whether or not the engine control unit - J623- itself also needs to be connected to the test box.

– Carry out test as described in appropriate repair procedures.

Installing engine control unit

Installation is performed in the reverse sequence.

The procedure required after connecting the new engine control unit is described in the Guided Fault Finding or Guided Functions.

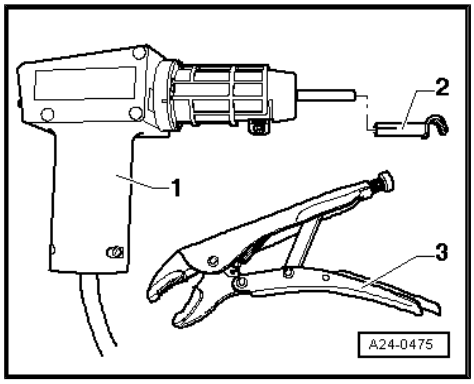
Note

After completion of the Guided Fault Finding routine, the tester will attempt to erase the event memories of all control units. If this is not successful, the remaining events saved in the memories must be dealt with so that all event memory entries can be erased.

8.2 Removing and installing engine/motor control unit - J623-

Special tools and workshop equipment required

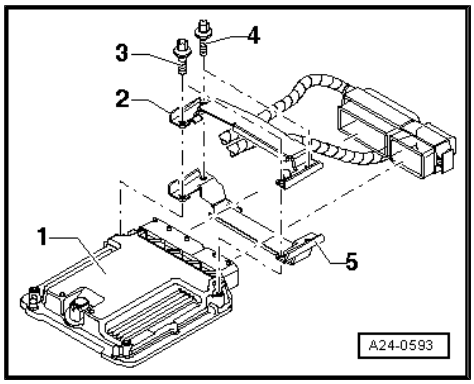
- Hot air blower - VAS 1978/14A- -item 1- with nozzle attachment -2- from wiring harness repair set - VAS 1978 B-



- Small, commercially available mole grips -3-

Note

- *Not every engine control unit is bolted to a protective housing. Whether a protective housing is fitted depends on the engine/gearbox combination.*
- *The engine control unit -1- is bolted to a protective casing -2 and 5-. To make it more difficult to unscrew the shear bolts -4- for locking plate -2-, their threads have been coated with locking fluid.*
- *The metal locking plate has to be removed before the connectors can be unplugged from the engine control unit (e.g. to connect the test box or renew the engine control unit).*



Removing

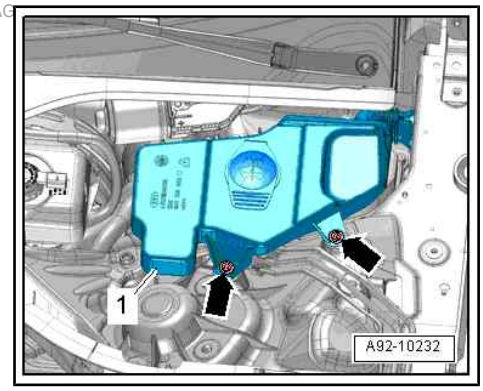
– When renewing engine control unit, select diagnosis object “Replace engine control unit” in “Guided Functions” mode of vehicle diagnostic tester .

– Switch off ignition and remove ignition key.

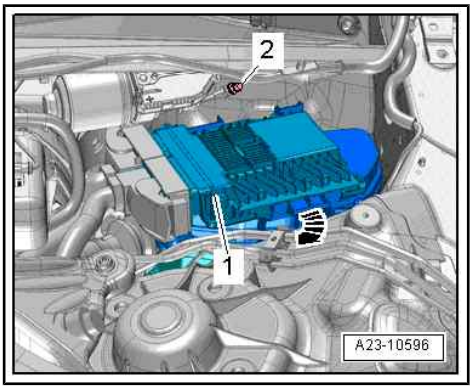
– Remove plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .

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



– Release catch -arrow- and detach engine control unit - J623- -item 1-.



Note

Disregard -item 2-.

Perform the following work steps if a protective housing is fitted:

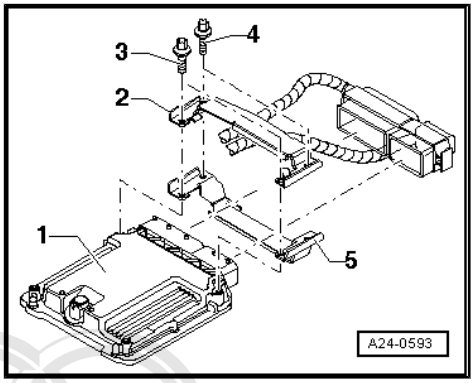
Caution

Wiring, connectors, insulation and control units can be burnt and damaged.

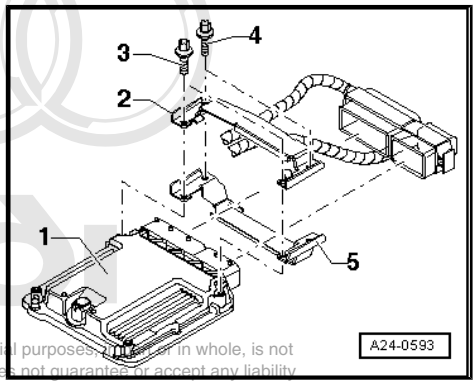
- ***Keep exactly to the following procedure. Observe the instructions for operating the hot air blower.***

To help prevent unauthorised access to the connectors on the engine control unit, the engine control unit -1- is bolted to a protective housing -5- by means of shear bolts -3 and 4- and a locking plate -2-.

The threads of the two shear bolts -4- which are not screwed into the engine control unit are secured with locking fluid. To unscrew these two bolts, the threads must therefore be heated with the hot air blower.

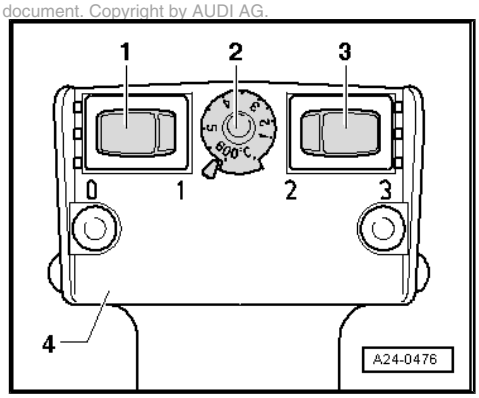


The threads of the two shear bolts -3- which are screwed into the engine control unit are not secured with locking fluid. Do not apply heat to the threads in the control unit housing; this is not necessary and would cause overheating of the control unit.



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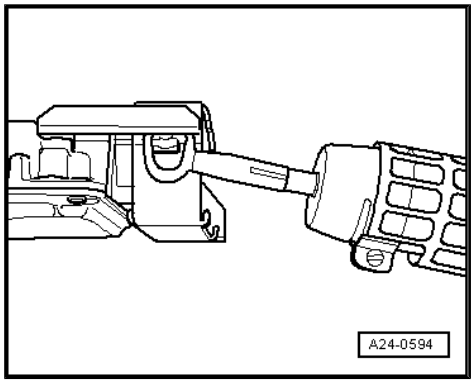
– Select settings on hot air blower as shown in illustration, i.e. set temperature potentiometer -2- to maximum heat output and two-stage air flow switch -3- to position 3.



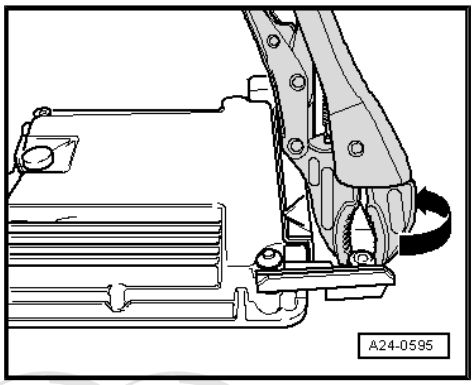
WARNING

The shear bolts and protective housing also become very hot when heating the threads of the locking mechanism. Take care to avoid burns. It is also important to ensure that only the thread is heated and none of the surrounding components if at all possible. These should be covered if necessary.

– Apply heat to the threads of the shear bolts on the connector side for approx. 25 to 30 seconds.
– Unscrew shear bolts using mole grips (see arrow in illustration).



– The two shear bolts screwed into the engine control unit do not need to be heated. They should be removed without being heated.
– Detach protective housing from control unit connectors.
– Release connectors on engine control unit and unplug connectors.



Installing

Installation is performed in the reverse sequence.

– After installation, the protective housing must be re-fitted on the engine control unit - J623- .
– Clean threaded holes for shear bolts to remove any residue from locking fluid. This can be done using a thread tap.
– Always use new shear bolts.
– Install filler neck for washer fluid reservoir ⇒ Electrical system; Rep. gr. 92 ; Windscreen washer system; Exploded view - windscreen washer system .
– Install plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .

After installing a new engine control unit, the following operation must be performed:

– Activate engine control unit via a vehicle diagnostic tester in “Guided Functions” mode, “Replace engine control unit”.

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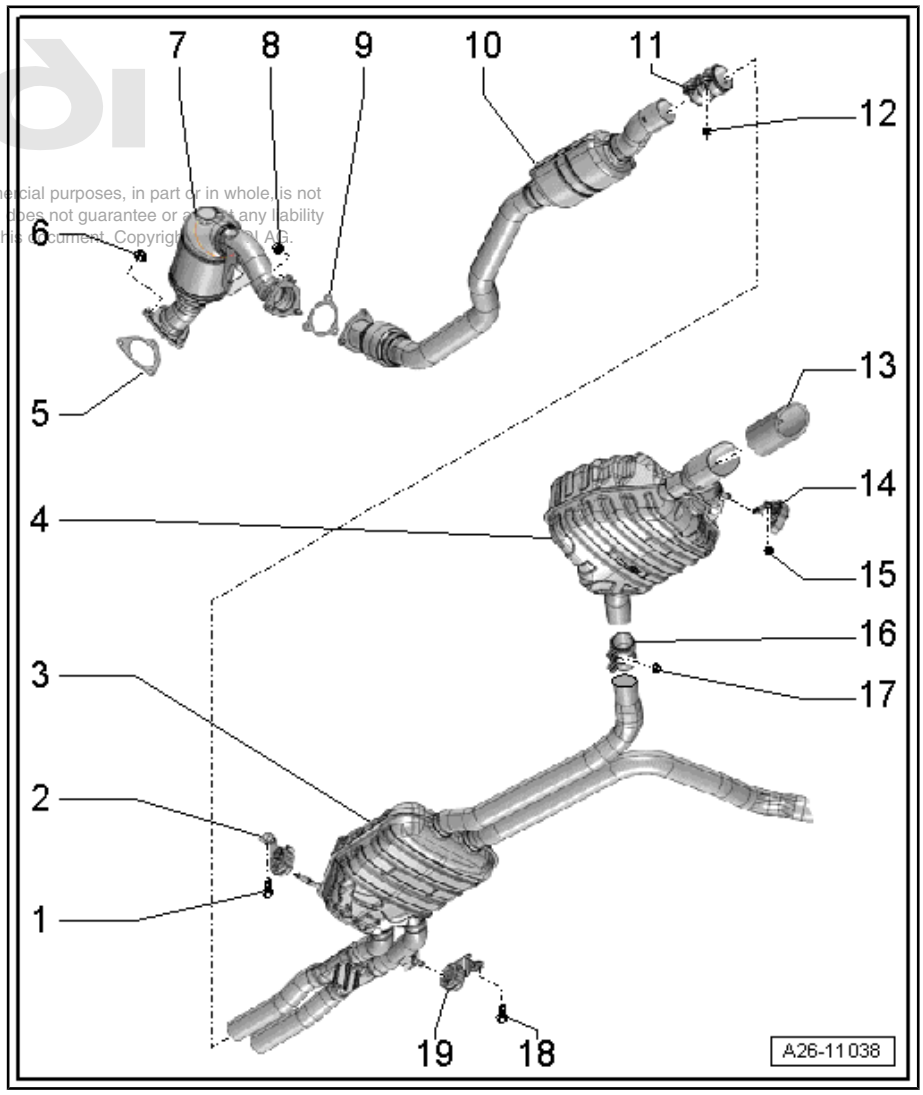
26 – Exhaust system

1 Exhaust pipes/silencers

⇒ “1.1 Exploded view - silencers”, page 333
⇒ “1.2 Separating exhaust pipes/silencers”, page 336
⇒ “1.3 Removing and installing front silencer”, page 338
⇒ “1.4 Stress-free alignment of exhaust system”, page 339
⇒ “1.5 Checking exhaust system for leaks”, page 340

1.1 Exploded view - silencers

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1 - Bolt

- ❑ 20 Nm

2 - Mounting

- ❑ Renew if damaged
- ❑ Check preload ⇒ “1.4 Stress-free alignment of exhaust system”, page 339

3 - Centre silencer

- ❑ Combined in one unit with rear silencers as original equipment. Can be renewed individually for repair purposes
- ❑ Remove diagonal struts prior to removal ⇒ Fig. ““Diagonal struts (Audi A7)”“ , page 336
- ❑ Cutting point ⇒ “1.2 Separating exhaust pipes/silencers”, page 336
- ❑ Align exhaust system so it is free of stress ⇒ “1.4 Stress-free alignment of exhaust system”, page 339

4 - Rear silencer

- ❑ Combined as one unit with centre silencer as original equipment
- ❑ Centre silencer and rear silencer can be renewed separately
- ❑ Remove diagonal struts prior to removal ⇒ Fig. ““Diagonal struts (Audi A7)”“ , page 336
- ❑ Cutting point: centre silencer / rear silencer ⇒ “1.2 Separating exhaust pipes/silencers”, page 336
- ❑ Align exhaust system so it is free of stress ⇒ “1.4 Stress-free alignment of exhaust system”, page 339

5 - Gasket

- ❑ Renew

6 - Nut

- ❑ 23 Nm

- ❑ Renew
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue

7 - Catalytic converter

- ❑ Protect against knocks and impact
- ❑ Removing and installing ⇒ “2.1 Removing and installing catalytic converters”, page 341
- ❑ Mounting components:

◆ Vehicles with multitronic gearbox 0AW (front-wheel drive)
⇒ Fig. ““Components of mountings for catalytic converter - vehicles with multitronic gearbox 0AW (front-wheel drive)”“ , page 335

◆ Vehicles with manual gearbox or 7-speed dual clutch gearbox 0B5
⇒ Fig. ““Components of mountings for catalytic converter - vehicles with manual gearbox or 7-speed dual clutch gearbox 0B5”“ , page 336

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8 - Nut

- ❑ 23 Nm
- ❑ Renew
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue

9 - Gasket

- ❑ Renew

10 - Front silencer

- ❑ With flexible joint; do not bend flexible joint more than 10° – otherwise it can be damaged
- ❑ Removing and installing ⇒ “1.3 Removing and installing front silencer”, page 338
- ❑ Align exhaust system so it is free of stress ⇒ “1.4 Stress-free alignment of exhaust system”, page 339

11 - Clamp (front)

- ❑ Installation position ⇒ Fig. ““Installation position of front clamps”“ , page 335
- ❑ Push onto front silencer as far as stop
- ❑ Before tightening, align exhaust system so it is free of stress
⇒ “1.4 Stress-free alignment of exhaust system”, page 339
- ❑ Tighten bolted connections evenly

12 - Nut

- ❑ 23 Nm

13 - Trim

- ❑ For tailpipe
- ❑ Slide onto tailpipe as far as stop

14 - Mounting

- ❑ Renew if damaged
- ❑ Check preload ⇒ “1.4 Stress-free alignment of exhaust system”, page 339

15 - Nut

- ❑ Renew
- ❑ 20 Nm

16 - Clamp (rear)

- ❑ For separate replacement of centre and rear silencers
- ❑ Installation position ⇒ Fig. ““Installation position of rear clamps”“ , page 335
- ❑ Before tightening, align exhaust system so it is free of stress
⇒ “1.4 Stress-free alignment of exhaust system”, page 339
- ❑ Tighten bolted connections evenly

17 - Nut

- ❑ 23 Nm

18 - Bolt

- ❑ 23 Nm

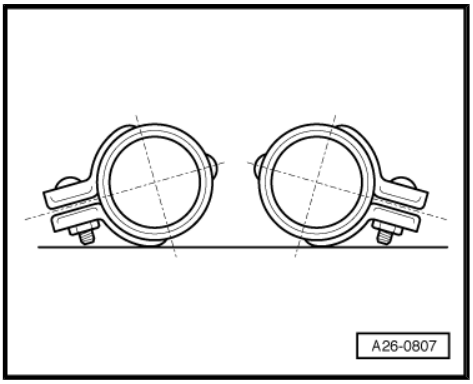
19 - Mounting

- ❑ Renew if damaged
- ❑ Check preload ⇒ “1.4 Stress-free alignment of exhaust system”, page 339

Installation position of front clamps

– Install clamps so that the bolt ends do not protrude beyond bottom of clamp.

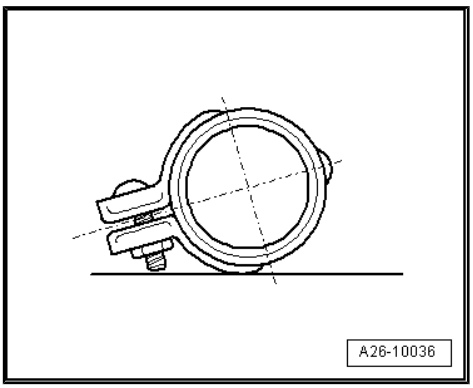
• Installation position: bolted connections face outwards.



Installation position of rear clamps

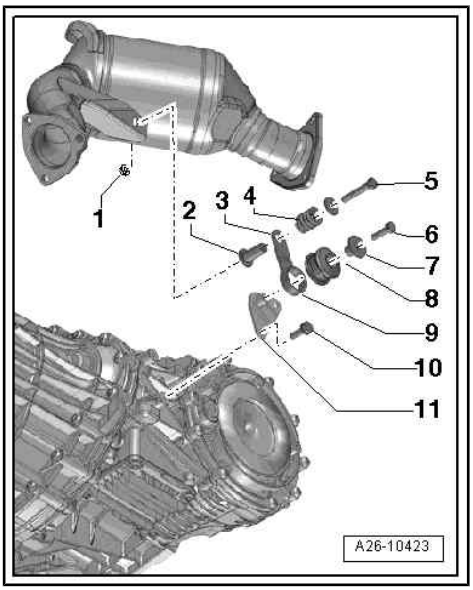
– Install clamps so that the bolt ends do not protrude beyond bottom of clamp.

• Installation position: bolted connections face forwards.



Components of mountings for catalytic converter - vehicles with multitronic gearbox 0AW (front-wheel drive)

1 - Nut, 23 Nm
2 - Spacer sleeve
3 - Compression spring
4 - Washer
5 - Bolt
6 - Bolt, 23 Nm
7 - Spacer sleeve
8 - Buffer
9 - Bracket
10 - Bolt, 23 Nm
11 - Bracket

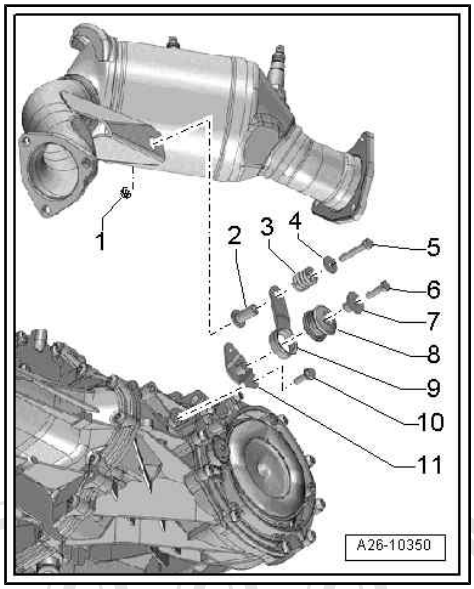


Note

The illustration shows the right-side mounting. The mountings (left-side) are symmetrically reversed.

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Components of mountings for catalytic converter - vehicles with manual gearbox or 7-speed dual clutch gearbox 0B5



1 - Nut, 23 Nm
2 - Spacer sleeve
3 - Compression spring
4 - Washer
5 - Bolt
6 - Bolt, 23 Nm
7 - Spacer sleeve
8 - Buffer
9 - Bracket
10 - Bolt, 23 Nm
11 - Bracket

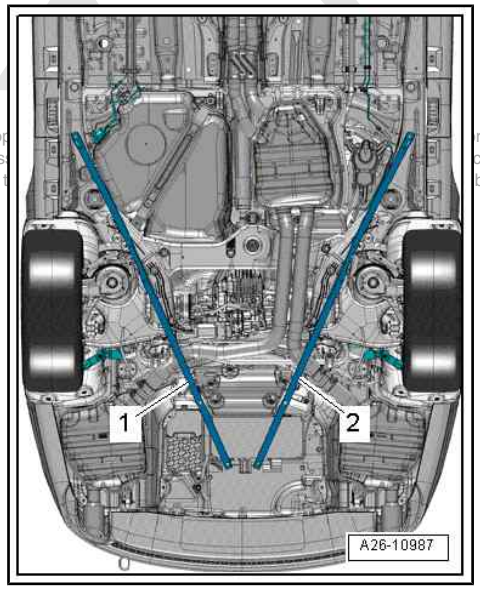
Note

The illustration shows the right-side mounting. The mountings (left-side) are symmetrically reversed.

Diagonal struts (Audi A7)

– Remove diagonal struts -1- and -2- when removing centre silencer and rear silencer unit.

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



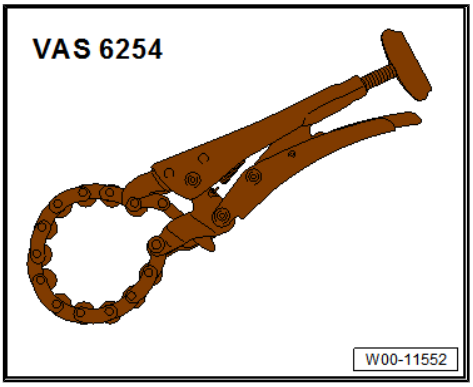
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1.2 Separating exhaust pipes/silencers

- The connecting pipe can be cut through at the cutting point in order to renew the centre or rear silencer separately.
- The cutting point is marked by an indentation on the circumference of the exhaust pipe.

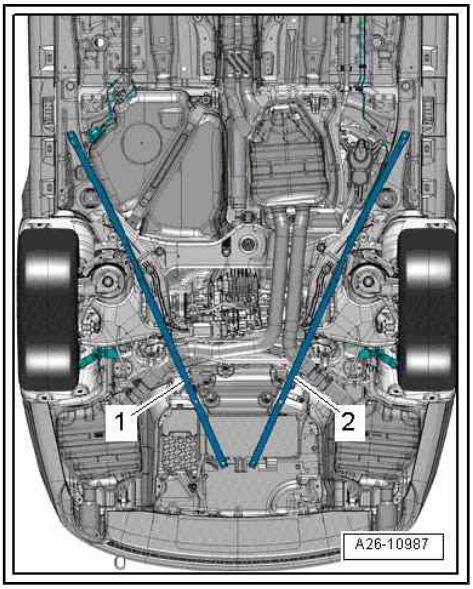
Special tools and workshop equipment required

♦ Chain pipe cutter - VAS 6254-

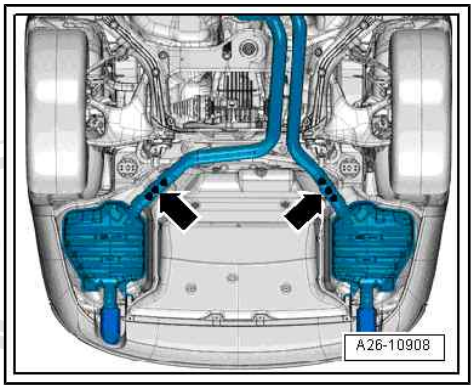


Procedure

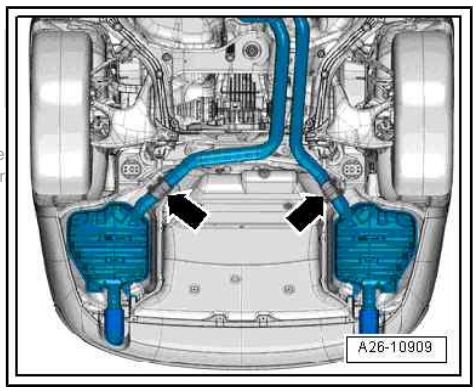
– Audi A7: Remove bolts on both sides and detach diagonal struts -1- and -2-.



– Cut through exhaust pipes at right angles at the positions marked -arrows- using chain pipe cutter - VAS 6254- .



– Position centre of clamps -arrows- over cutting location.

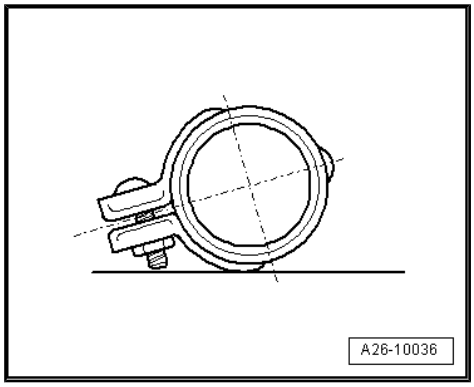


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– Install clamps so that the bolt ends do not protrude beyond bottom of clamp.

• Installation position: bolted connections face forwards.

– Align the exhaust system so it is free of stress ⇒ “1.4 Stress-free alignment of exhaust system”, page 339 .



Tightening torques

♦ ⇒ “1.1 Exploded view - silencers”, page 333

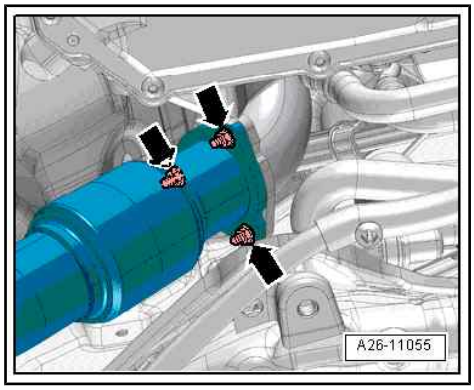
♦ Diagonal struts ⇒ Running gear, axles, steering; Rep. gr. 42 ; Subframe; Exploded view - subframe

1.3 Removing and installing front silencer

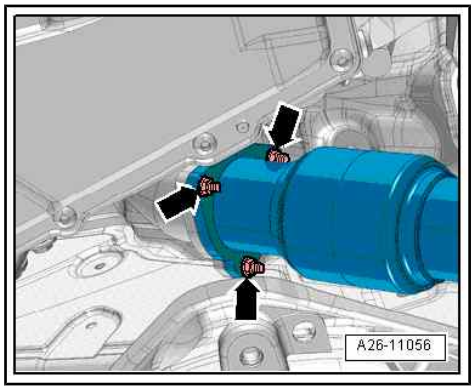
Removing

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

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



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

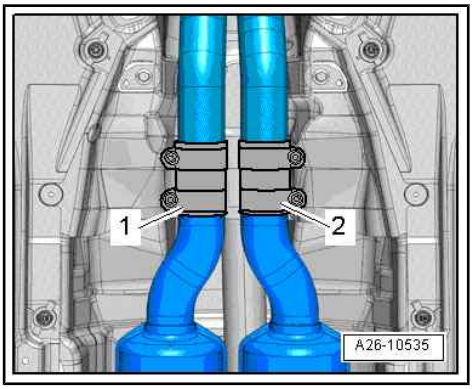


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Caution

Risk of damage to flexible joints in front silencer.

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



– Release and push back clamp -1- or -2- and detach relevant front silencer.

Installing

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

Note

- *Renew gaskets and self-locking nuts.*
- *Coat threads of nuts with high-temperature paste; for high temperature paste refer to ⇒ Electronic parts catalogue .*

– Align the exhaust system so it is free of stress ⇒ “1.4 Stress-free alignment of exhaust system”, page 339 .

Tightening torques

- ⇒ “1.1 Exploded view - silencers”, page 333
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

1.4 Stress-free alignment of exhaust system

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Procedure

- The exhaust system must be aligned when it is cool.

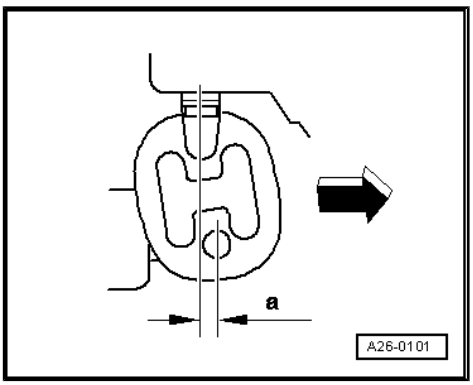
Vehicles without clamps between centre silencer and rear silencers

– Loosen bolted connections on front clamps.

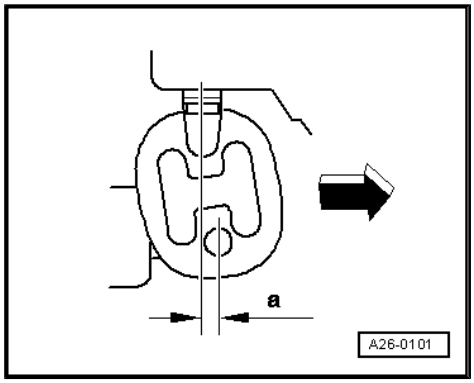
– Push exhaust system towards front of vehicle -arrow- until mountings in front of centre silencer are preloaded by -a- = 6 ... 10 mm.

– Tighten bolted connections on clamps evenly.

– Align tailpipes ⇒ page 340 .



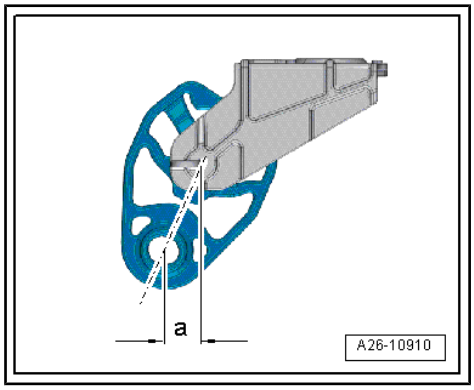
Vehicles with clamps between centre silencer and rear silencers



Note

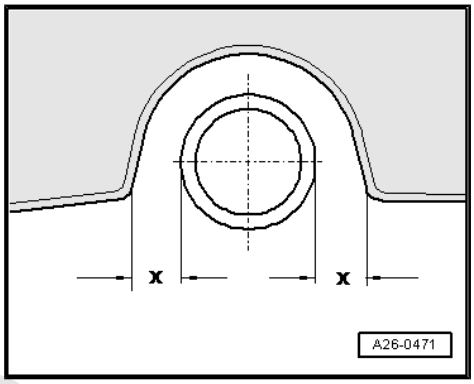
On a vehicle with clamps fitted between the centre silencer and rear silencers, it is also necessary to align the centre silencer.

– Loosen bolted connections on front and rear clamps.
– Push exhaust system towards front of vehicle -arrow- until mountings in front of centre silencer are preloaded by -a- = 6 ... 10 mm.
– Tighten bolted connections on front clamps evenly.



– Push rear section of exhaust system towards front of vehicle -arrow-, so that mountings (rear) for rear silencers are preloaded by -a- = 11 ... 15 mm.
– Align rear silencers so they are horizontal.
– Tighten bolted connections on rear clamps evenly.
– Align tailpipes ⇒ page 340 .

Aligning tailpipes



- Tightening torque
  ⇒ “1.1 Exploded view - silencers”, page 333

– Check clearance between tailpipes and bumper on both sides:

- Dimension -x- (left-side) = dimension -x- (right-side)

Tightening torques

◆ ⇒ “1.1 Exploded view - silencers”, page 333

1.5 Checking exhaust system for leaks

– Start the engine and run at idling speed.
– Plug tailpipes during leak test (e.g. with cloth or plugs).
– Listen for noise at connections between cylinder head/exhaust manifold, exhaust manifold/front exhaust pipe, etc. to locate any leaks.
– Rectify any leaks that are found.

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2 Emission control system

⇒ “2.1 Removing and installing catalytic converters”, page 341

2.1 Removing and installing catalytic converters

⇒ “2.1.1 Removing and installing catalytic converter (left-side) - vehicles with manual gearbox”, page 341

⇒ “2.1.2 Removing and installing catalytic converter (left-side) - vehicles with multitronic gearbox 0AW”, page 343

⇒ “2.1.3 Removing and installing catalytic converter (left-side) - vehicles with dual clutch gearbox 0B5”, page 343

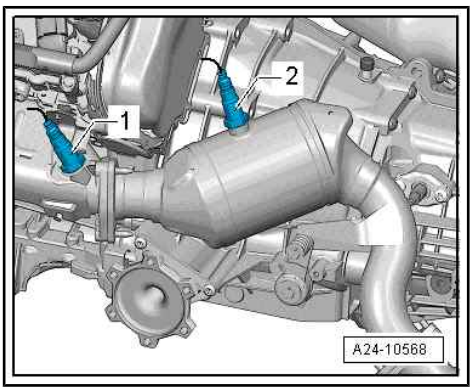
⇒ “2.1.4 Removing and installing catalytic converter (right-side) - vehicles with manual gearbox/multitronic gearbox 0AW”, page 347

⇒ “2.1.5 Removing and installing catalytic converter (right-side) - vehicles with dual clutch gearbox 0B5”, page 347

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2.1.1 Removing and installing catalytic converter (left-side) - vehicles with manual gearbox

Removing



Note

Fit all cable ties in the original positions when installing.

– Remove Lambda probe 2 after catalytic converter - G131- ⇒ “7.2.4 Removing and installing Lambda probe 2 after catalytic converter G131 ”, page 325 .

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

Caution

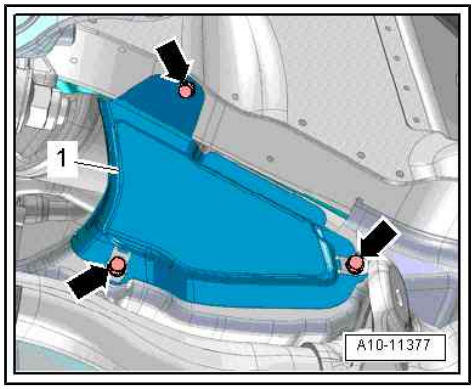
Risk of damage to running gear components.

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

– Remove front silencer (left-side) ⇒ “1.3 Removing and installing front silencer”, page 338 .

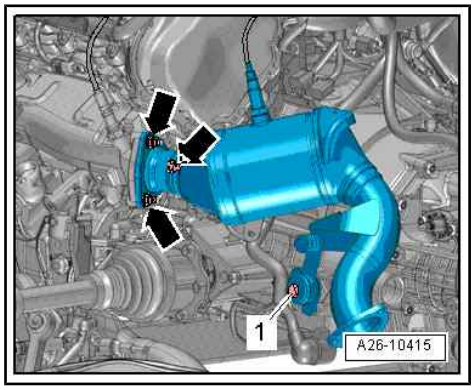
– Detach intermediate steering shaft from steering rack and move clear by sliding splines together ⇒ Running gear, axles, steering; Rep. gr. 48 ; Steering column; Removing and installing intermediate steering shaft .

– Remove bolts -arrows- and detach heat shield (left-side) -1- on subframe.



– Remove nuts -arrows- and bolt -1-.

– Detach catalytic converter (left-side).



Installing

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

Note

- *Renew gaskets and self-locking nuts.*
- *Coat threads of nuts with high-temperature paste; for high temperature paste refer to ⇒ Electronic parts catalogue .*

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

– Install front silencer
⇒ “1.3 Removing and installing front silencer”, page 338 .

– Install Lambda probe 2 after catalytic converter - G131-
⇒ “7.2.4 Removing and installing Lambda probe 2 after catalytic converter G131 ”, page 325 .

Tightening torques

- ⇒ “1.1 Exploded view - silencers”, page 333
- ⇒ Fig. ““Components of mountings for catalytic converter - vehicles with manual gearbox or 7-speed dual clutch gearbox 0B5”“ , page 336
- Subframe cross brace ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Exploded view - subframe

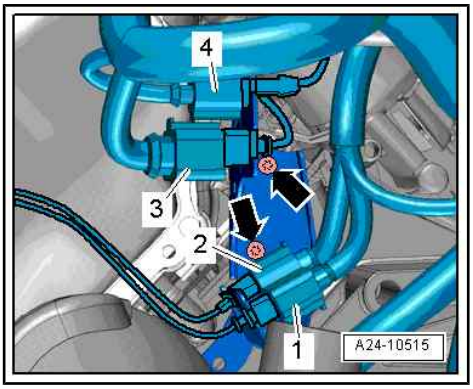
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2.1.2 Removing and installing catalytic converter (left-side) - vehicles with multitronic gearbox 0AW

Removing

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

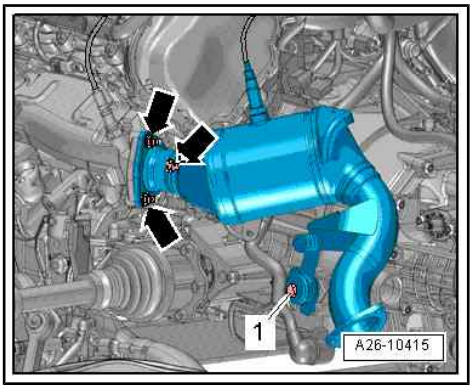
– Remove electrical connector -1- for Lambda probe 2 after catalytic converter - G131- from bracket and unplug connector.



Note

Disregard items -2, 3, 4- and -arrows-.

– Unscrew nuts -arrows- and detach catalytic converter (left-side).



Note

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

Installing

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

Note

- *Renew gaskets and self-locking nuts.*
- *Coat threads of nuts with high-temperature paste, for high temperature paste refer to ⇒ Electronic parts catalogue .*

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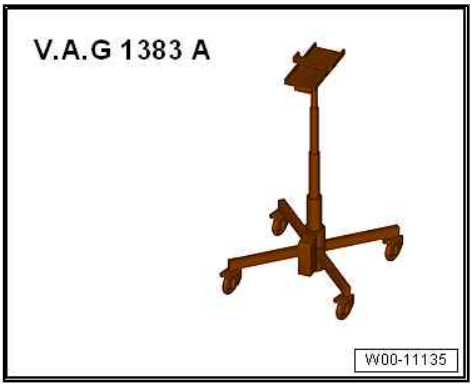
Tightening torques

- ⇒ “1.1 Exploded view - silencers”, page 333

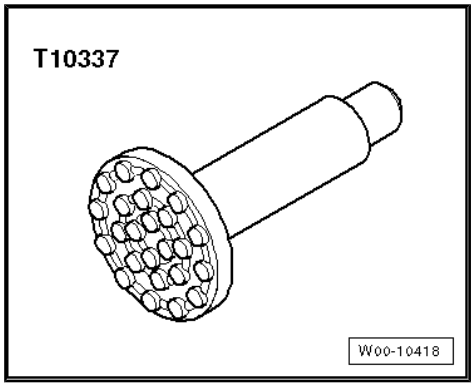
2.1.3 Removing and installing catalytic converter (left-side) - vehicles with dual clutch gearbox 0B5

Special tools and workshop equipment required

- Engine and gearbox jack - V.A.G 1383 A-



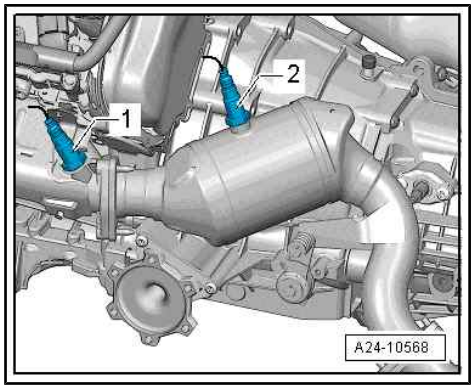
- Gearbox support - T10337-



Removing

Note

Fit all cable ties in the original positions when installing.



– Remove Lambda probe 2 after catalytic converter - G131- ⇒ “7.2.4 Removing and installing Lambda probe 2 after catalytic converter G131 ”, page 325 .

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

Caution

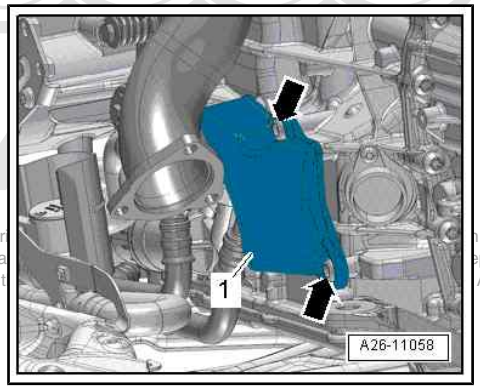
Risk of damage to running gear components.

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

– Remove front silencer (left-side) ⇒ “1.3 Removing and installing front silencer”, page 338 .

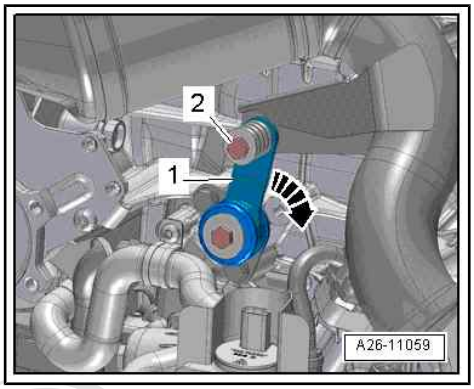
– Detach intermediate steering shaft from steering rack and move clear by sliding splines together ⇒ Running gear, axles, steering; Rep. gr. 48 ; Steering column; Removing and installing intermediate steering shaft .

– Unscrew bolts -arrows- and remove cover -1- from side of gearbox.

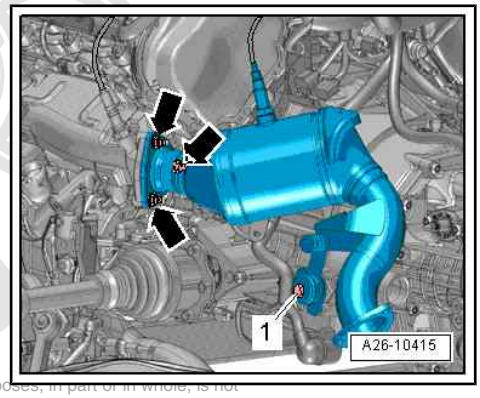


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– Loosen bolted connection -2- and swivel bracket -1- to rear -arrow-.



– Remove nuts -arrows-.



Note

Disregard -item 1-.

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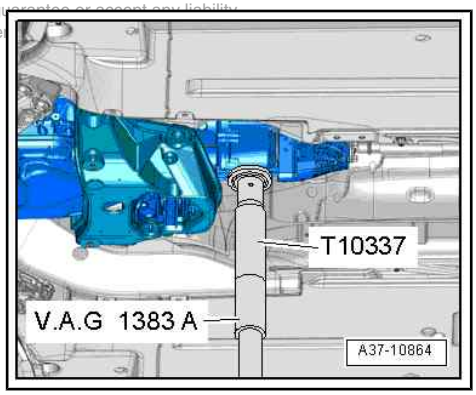
– Fit gearbox support - T10337- onto engine and gearbox jack - V.A.G 1383 A- and position underneath gearbox.

– Raise gearbox slightly using engine and gearbox jack.

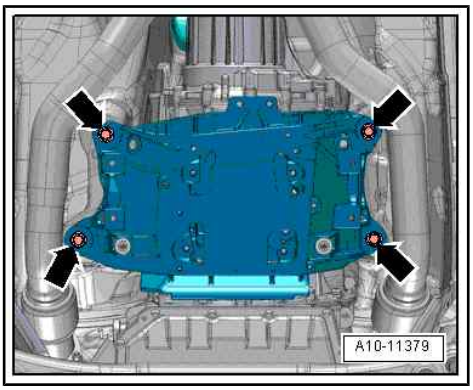
WARNING

Risk of accident.

- ***Engine and gearbox jack - V.A.G 1383 A- must remain in position when work is being carried out and must not be left unattended under the vehicle.***



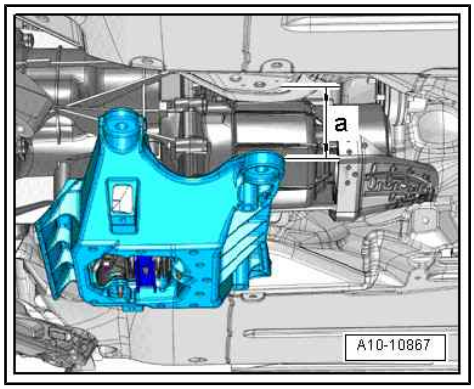
– Remove bolts -arrows- for tunnel cross member.



– Lower tunnel cross member as far as distance -a- using engine and gearbox jack - V.A.G 1383 A- .

• Distance -a- = 70 mm (maximum)

– Detach catalytic converter (left-side).



Installing

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

Note

- *Renew gaskets and self-locking nuts.*
- *Coat threads of nuts with high-temperature paste; for high temperature paste refer to ⇒ Electronic parts catalogue .*

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

– Install front silencer ⇒ page 338 .

– Install Lambda probe 2 after catalytic converter - G131- ⇒ “7.2.4 Removing and installing Lambda probe 2 after catalytic converter G131 ”, page 325 .

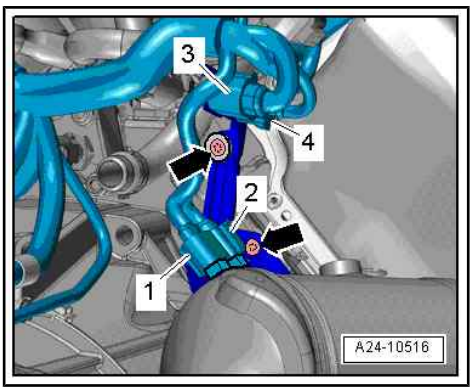
Tightening torques

- ⇒ “1.1 Exploded view - silencers”, page 333
- Subframe cross brace ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Exploded view - subframe
- Tunnel cross-piece ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings
- Cover on gearbox ⇒ Rep. gr. 34 ; ATF circuit; Exploded view - ATF circuit

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2.1.4 Removing and installing catalytic converter (right-side) - vehicles with manual gearbox/multitronic gearbox 0AW

Removing



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

– Take electrical connector -1- for Lambda probe after catalytic converter - G130- out of bracket, unplug and move clear.

Note

Disregard items -2, 3, 4- and -arrows-.

– Detach catalytic converter (right-side).

Installing

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

Note

- *Renew gaskets and self-locking nuts.*
- *Coat threads of nuts with high-temperature paste; for high temperature paste refer to ⇒ Electronic parts catalogue .*

Tightening torques

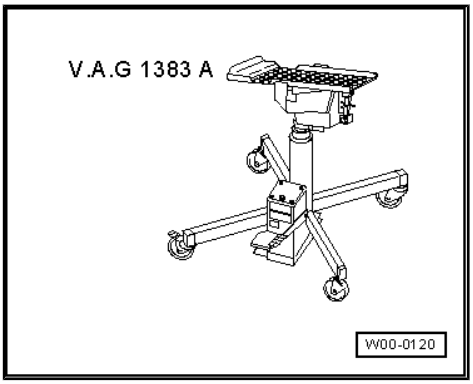
- ⇒ “1.1 Exploded view - silencers”, page 333

2.1.5 Removing and installing catalytic converter (right-side) - vehicles with dual clutch gearbox 0B5

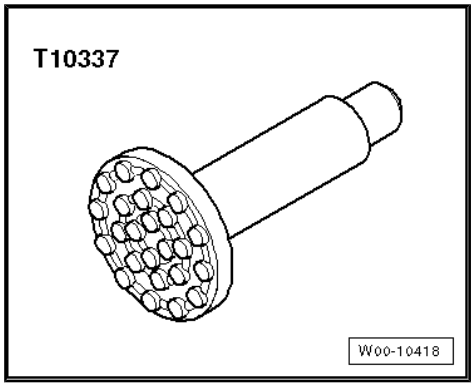
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Special tools and workshop equipment required

- Engine and gearbox jack - V.A.G 1383 A-



♦ Gearbox support - T10337-



Removing

Note

Fit all cable ties in the original positions when installing.

– Remove front silencer (right-side)
⇒ “1.3 Removing and installing front silencer”, page 338 .

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

Caution

Risk of damage to running gear components.

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

– Remove plenum chamber partition panel ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Exploded view - plenum chamber partition panel .

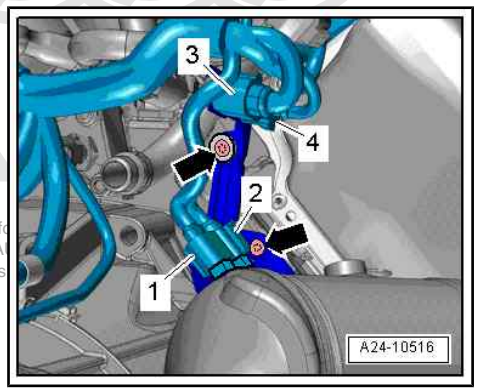
– Remove throttle valve module - J338-
⇒ “3.6 Removing and installing throttle valve module J338 ”, page 298 .

– Remove coolant pipe from right side of gearbox
⇒ “3.2.6 Removing and installing coolant pipe (right-side) on gearbox”, page 248 .

– Remove Lambda probe after catalytic converter - G130-
⇒ “7.2.3 Removing and installing Lambda probe after catalytic converter G130 ”, page 323 .

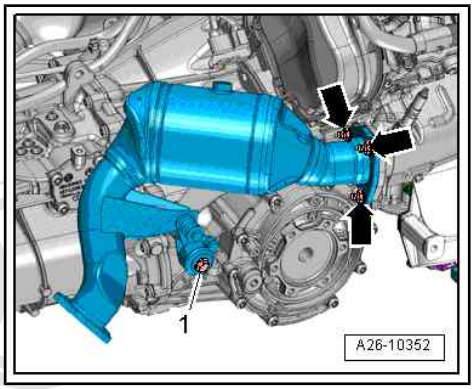
– Detach electrical connectors -1 ... 4- from bracket.

– Remove bolts -arrows- and detach bracket.

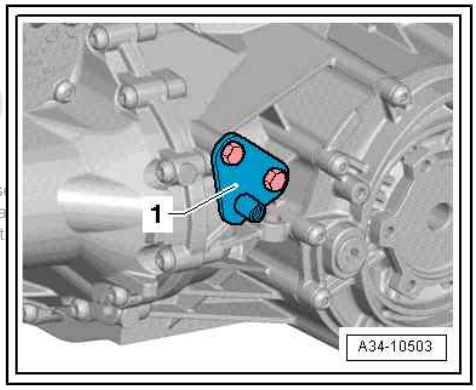


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– Remove nuts -arrows- and bolt -1- and move catalytic converter (right-side) towards rear.

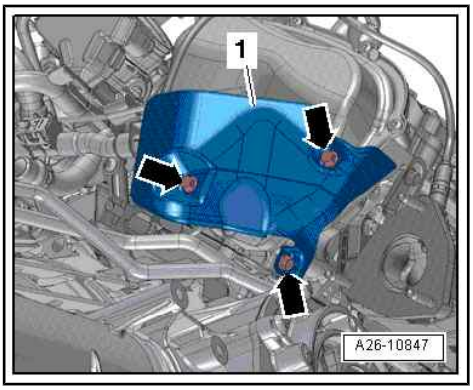


– Remove bolts and detach retainer -1- for bracket for exhaust system.



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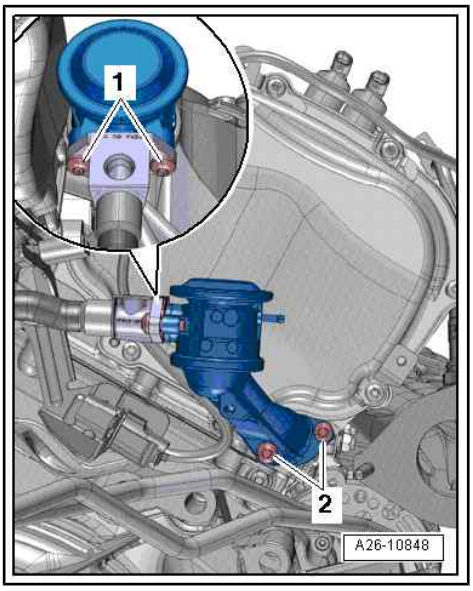
– Remove bolts -arrows- and detach heat shield.



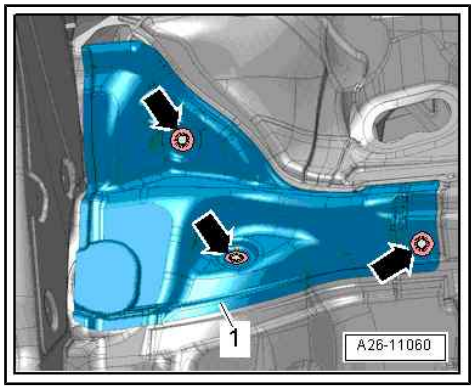
– Remove bolts -2-, detach combination valve (right-side) for secondary air system and press it to left side with secondary air hose connected.

Note

Disregard -item 1-.



– Release fasteners -arrows- and detach heat shield -1- for tunnel (top right).



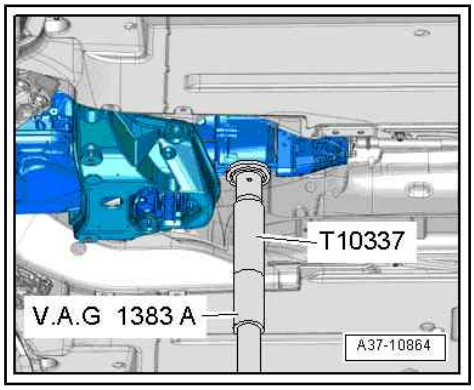
– Fit gearbox support - T10337- onto engine and gearbox jack - V.A.G 1383 A- and position underneath gearbox.

– Raise gearbox slightly using engine and gearbox jack.

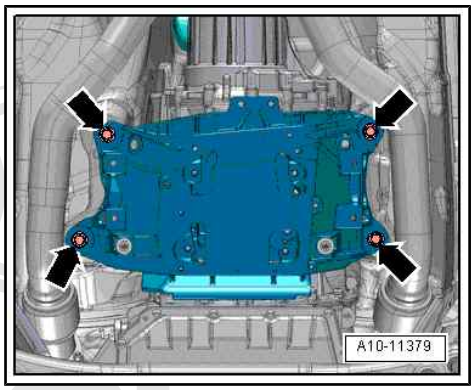
WARNING

Risk of accident.

- *Engine and gearbox jack - V.A.G 1383 A- must remain in position when work is being carried out and must not be left unattended under the vehicle.*



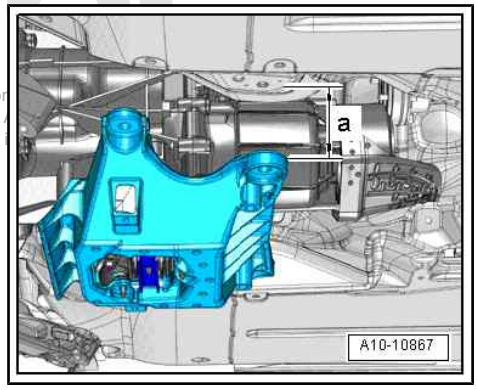
– Remove bolts -arrows- for tunnel cross member.



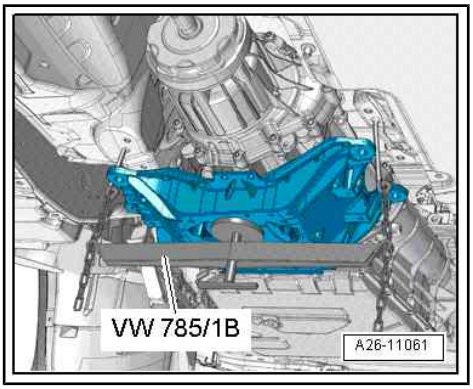
– Lower tunnel cross member as far as distance -a- using engine and gearbox jack - V.A.G 1383 A- .

• Distance -a- = 60 mm (maximum)

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– Secure gearbox in position using retaining tool - VW 785/1 B- , as shown in illustration.



– Lift off catalytic converter (right-side).

Installing

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

Note

- *Renew gaskets and self-locking nuts.*
- *Coat threads of nuts with high-temperature paste; for high temperature paste refer to ⇒ Electronic parts catalogue .*

– Install combination valve for secondary air (right-side) ⇒ “3.4.2 Removing and installing combination valve (right-side)”, page 360 .

– Install Lambda probe after catalytic converter - G130- ⇒ “7.2.3 Removing and installing Lambda probe after catalytic converter G130 ”, page 323 .

– Install coolant pipe (right-side) on gearbox ⇒ “3.2.5 Removing and installing coolant pipe (left-side) on gearbox”, page 246 .

– Install throttle valve module - J338- ⇒ “3.6 Removing and installing throttle valve module J338 ”, page 298 .

– Install plenum chamber partition panel ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Exploded view - plenum chamber partition panel .

Tightening torques

- ⇒ “1.1 Exploded view - silencers”, page 333
- ⇒ Fig. ““Components of mountings for catalytic converter - vehicles with manual gearbox or 7-speed dual clutch gearbox 0B5”“ , page 336
- Tunnel cross-piece ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Strips / trim panels / extensions; Exploded view - heat shield
- Subframe cross brace ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Exploded view - subframe

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3 Secondary air system

⇒ “3.1 Exploded view - secondary air system”, page 352

⇒ “3.2 Removing and installing secondary air pump motor V101 ”, page 353

⇒ “3.3 Checking combination valve for secondary air system”, page 355

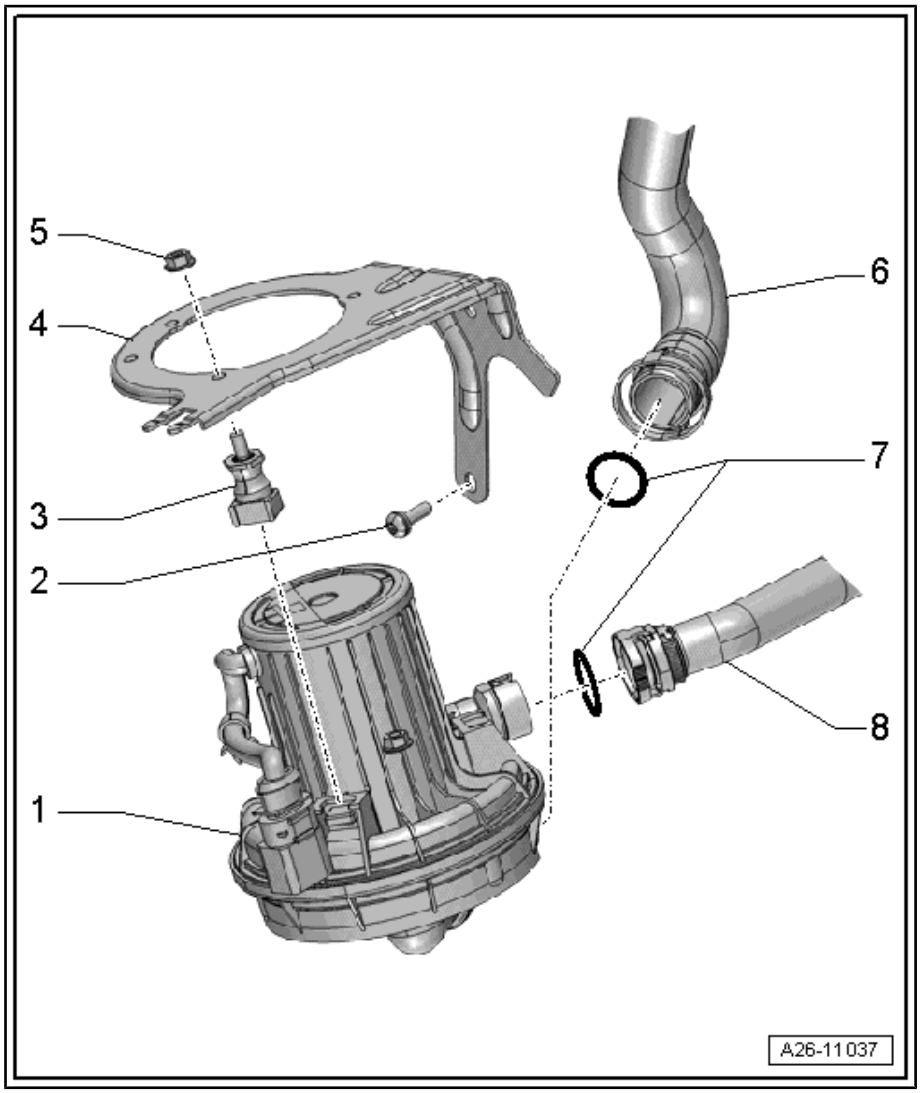
3.1 Exploded view - secondary air system

Secondary air pump motor - V101-

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Note

The illustration shows the version for the 2.8 ltr. engine.



1 - Secondary air pump motor - V101-

- Fitting location: At front right of engine compartment below longitudinal member
- Removing and installing ⇒ “3.2 Removing and installing secondary air pump motor V101 ”, page 353
- Check in `Guided Fault Finding` ⇒ Vehicle diagnostic tester

2 - Bolt

- 9 Nm

3 - Bonded rubber bush

- 3x

4 - Bracket

- For secondary air pump motor - V101-

5 - Nut

- 9 Nm

6 - Hose

- For secondary air
- From air cleaner

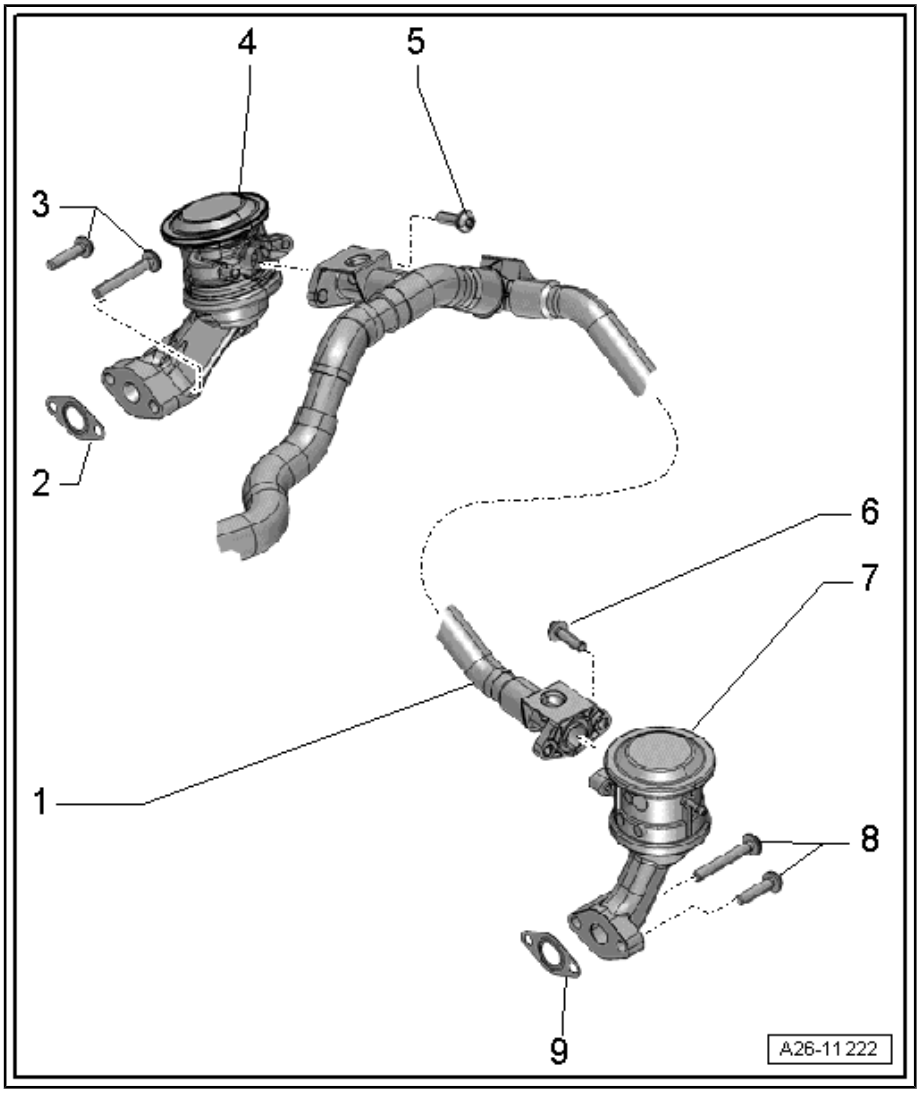
7 - O-rings

- Renew

8 - Hose

- For secondary air
- To combination valves for secondary air inlet

Combination valves for secondary air system



1 - Hose

- ❑ From secondary air pump motor - V101-

2 - Gasket

- ❑ Renew

3 - Bolts

- ❑ 9 Nm

4 - Combination valve for secondary air system (right-side)

- ❑ Check operation and check for leaks ⇒ “3.3 Checking combination valve for secondary air system”, page 355
- ❑ Removing and installing ⇒ “3.4.2 Removing and installing combination valve (right-side)”, page 360

5 - Bolt

- ❑ 9 Nm

6 - Bolt

- ❑ 9 Nm

7 - Combination valve for secondary air system (left-side)

- ❑ Check operation and check for leaks ⇒ “3.3 Checking combination valve for secondary air system”, page 355
- ❑ Removing and installing ⇒ “3.4.1 Removing and installing combination valve (left-side)”, page 358

8 - Bolts

- ❑ 9 Nm

9 - Gasket

- ❑ Renew

3.2 Removing and installing secondary air pump motor - V101-

Removing

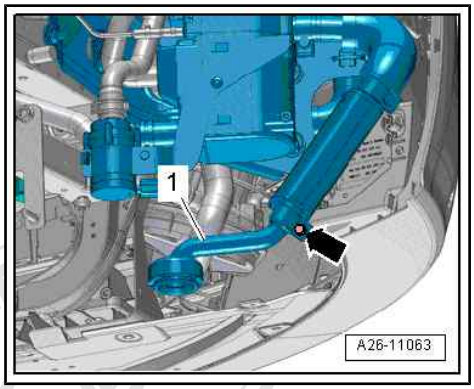
Note

Fit all cable ties in the original positions when installing.

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

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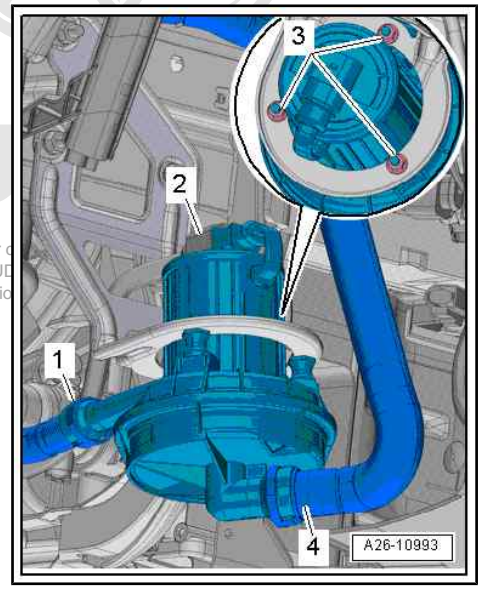
– Vehicles with auxiliary heater: Release clamp -arrow- and swivel exhaust pipe for auxiliary heater -1- to rear.
– Remove air intake grille (right-side) from bottom section of bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing attachments .



Vehicles with 2.5 ltr. engine:

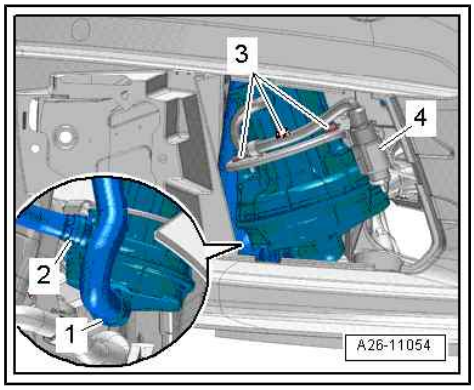
– Unplug electrical connector -2- at secondary air pump motor -V101- .
– Press release tabs and detach secondary air hoses -1- and -4-.
– Remove nuts -3- and detach secondary air pump.

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Vehicles with 2.8 ltr. engine:

– Unplug electrical connector -4- at secondary air pump motor -V101- .
– Press release tabs and detach secondary air hoses -1- and -2-.
– Remove nuts -3- and detach secondary air pump.



Installing

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

Note

Fit new O-rings.

– Install tailpipe for auxiliary heater ⇒ Auxiliary heater, supplementary heater; Rep. gr. 82 ; Auxiliary/supplementary heater; Removing and installing exhaust system .

Tightening torques

- ⇒ “3.1 Exploded view - secondary air system”, page 352
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front)

3.3 Checking combination valve for secondary air system

⇒ "3.3.1 Checking combination valve for secondary air system - vehicles up to model year 2013", page 355

⇒ "3.3.2 Checking combination valve for secondary air system - vehicles from model year 2013 onwards", page 356

3.3.1 Checking combination valve for secondary air system - vehicles up to model year 2013

Procedure

- No leaks in hose connections.

Combination valve for secondary air system (left-side):

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

Combination valve for secondary air system (right-side):

– Remove throttle valve module - J338- ⇒ "3.6 Removing and installing throttle valve module J338 ", page 298 .

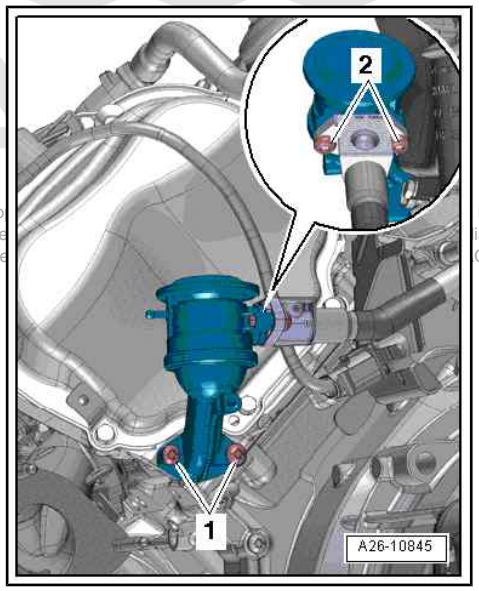
Both sides (continued):

– Remove bolts -2- and press secondary air hoses to side.

Note

Disregard -item 1-.

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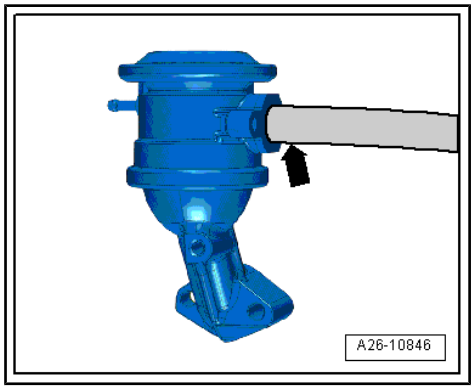
– Connect suitable hose -arrow- to combination valve for secondary air, as shown in illustration.

– Blow lightly into test hose with your mouth (do not use compressed air).

• The combination valve for secondary air system should be closed; it should not be possible to blow through the hose.

– Blow more firmly (i.e. with greater pressure) into test hose with your mouth (do not use compressed air).

• The combination valve for secondary air system should open; it should now be possible to blow through the hose.



Note

It is necessary to overcome slight initial resistance before it is possible to blow through the hose.

– Renew combination valve for secondary air system if you cannot determine the switching point: (left-side)
⇒ “3.4.1 Removing and installing combination valve (left-side)”, page 358 , (right-side)
⇒ “3.4.2 Removing and installing combination valve (right-side)”, page 360 .

Installing

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

Note

♦ *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*

♦ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

♦ *The screw sections of used screw-type clips must be sprayed with rust remover prior to fitting so that the air hoses can be attached securely to the hose connections.*

– Install throttle valve module - J338-
⇒ “3.6 Removing and installing throttle valve module J338 ”, page 298 .

Tightening torques

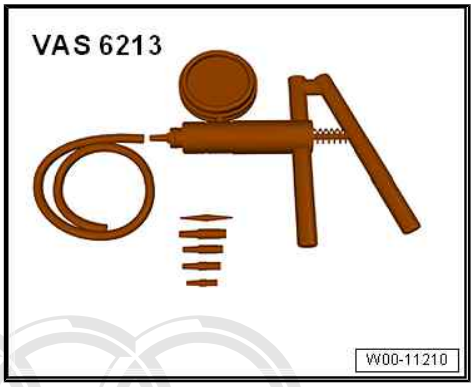
♦ Body brace ⇒ Running gear, axles, steering; Rep. gr. 40 ; Suspension strut, upper links; Exploded view - suspension strut, upper links

3.3.2 Checking combination valve for secondary air system - vehicles from model year 2013 onwards

Special tools and workshop equipment required

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♦ Hand vacuum pump - VAS 6213-



- Vacuum hoses and hose connections do not leak.
- Vacuum hoses are not clogged.

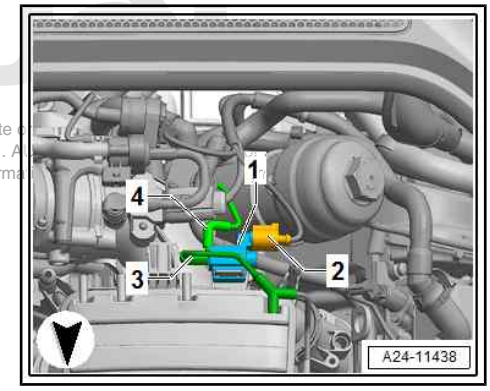
– Remove engine cover panels ⇒ “3.1 Removing and installing engine cover panel”, page 64 .

– Follow vacuum hose -4- downwards to Y-connector.

– Disconnect vacuum hose for combination valve being checked from Y-connector.

– Connect hand vacuum pump - VAS 6213- to vacuum hose of combination valve to be checked.

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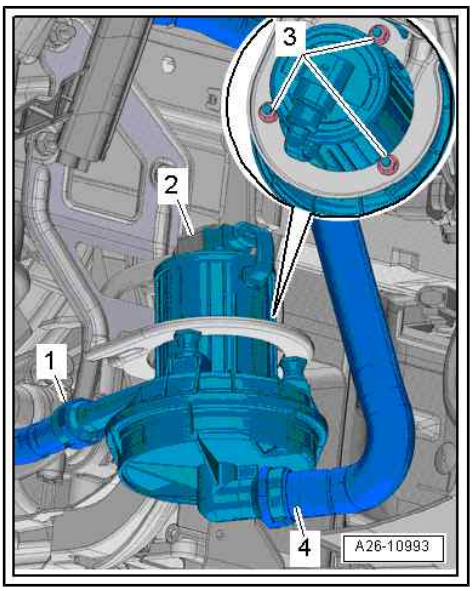


– Remove wheel spoiler (front right) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front) .

– Remove air intake grille (right-side) from bottom section of bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing attachments .

Vehicles with 2.5 ltr. engine:

– Press release tabs and detach secondary air hose -1- from secondary air pump motor - V101- .



Vehicles with 2.8 ltr. engine:

– Press release tabs and detach secondary air hose -2- from secondary air pump motor - V101- .

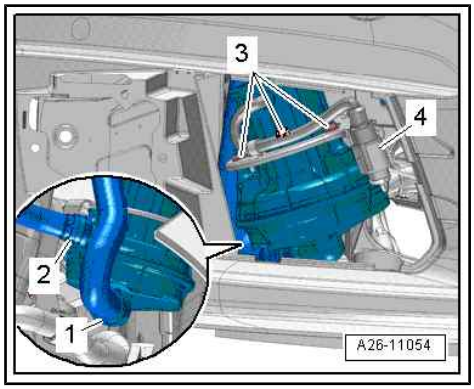
All vehicles (continued)

– Blow lightly into secondary air hose with your mouth (do not use compressed air). Fit auxiliary hose if secondary air hose is not long enough.

• The combination valves for secondary air should be closed; it should not be possible to blow through the hose.

– Operate hand vacuum pump.

• The combination valve should open; it should now be possible to blow through the hose.



Note

It is necessary to overcome slight initial resistance before it is possible to blow through the hose.

– Renew combination valve for secondary air system if it does not open: left-side
⇒ “3.4.1 Removing and installing combination valve (left-side)”, page 358 , right-side
⇒ “3.4.2 Removing and installing combination valve (right-side)”, page 360 .

3.4 Removing and installing combination valve

⇒ “3.4.1 Removing and installing combination valve (left-side)”, page 358

⇒ “3.4.2 Removing and installing combination valve (right-side)”, page 360

3.4.1 Removing and installing combination valve (left-side)

Removing

Note

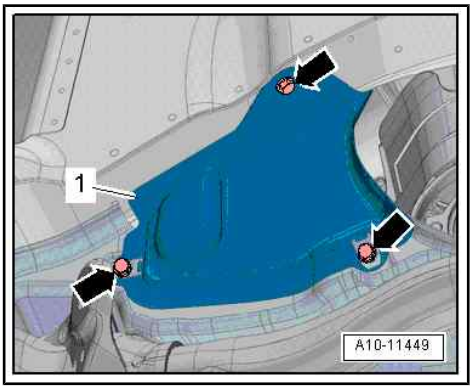
Fit all cable ties in the original positions when installing.

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

– Remove front silencer (left-side)
⇒ “1.3 Removing and installing front silencer”, page 338 .

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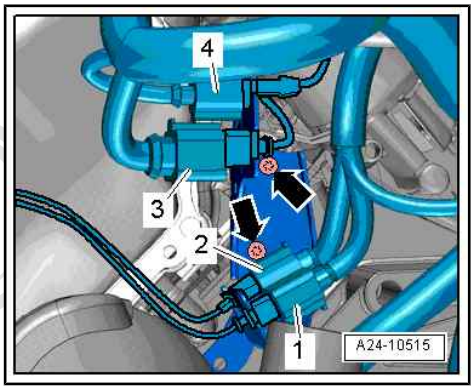
– Remove bolts -arrows- and detach heat shield (right-side) -1- on subframe.



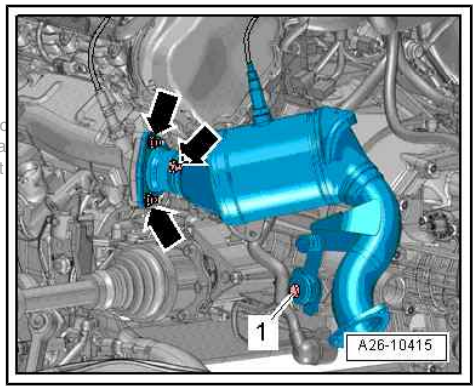
– Take electrical connector -1- for Lambda probe 2 after catalytic converter - G131- out of bracket, unplug and move clear.

Note

Disregard items -2, 3, 4- and -arrows-.

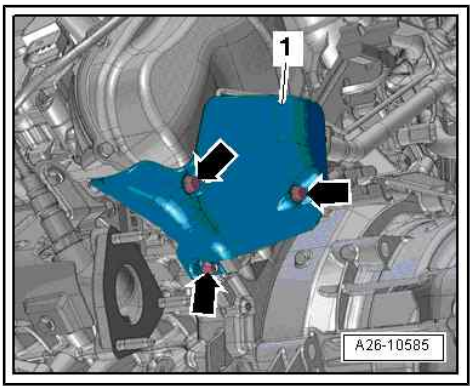


– Remove nuts -arrows- and bolt -1-, detach catalytic converter (left-side) from exhaust manifold and move to rear.

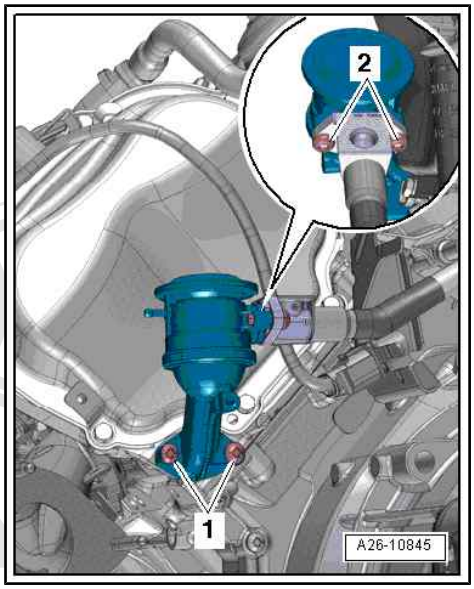


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– Remove bolts -arrows- and detach heat shield -1-.



– Unscrew bolts -1- and -2- and remove combination valve for secondary air system (left-side).



Installing

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

Note

Renew gasket.

– Install catalytic converter (left-side) and front silencer ⇒ “1.1 Exploded view - silencers”, page 333 .

Tightening torques

- Heat shield ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Exploded view - subframe
- Body brace ⇒ Running gear, axles, steering; Rep. gr. 40 ; Suspension strut, upper links; Exploded view - suspension strut, upper links
- ⇒ Fig. ““Guide tube for oil dipstick - tightening torque”“, page 135

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3.4.2 Removing and installing combination valve (right-side)

Removing

Note

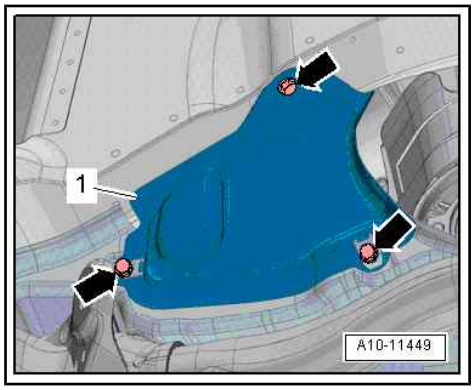
Fit all cable ties in the original positions when installing.

– Remove front silencer (right-side) ⇒ “1.3 Removing and installing front silencer”, page 338 .

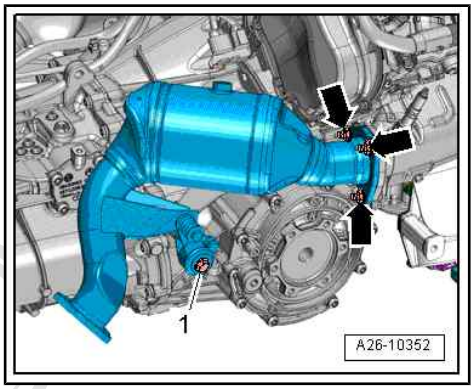
– Remove wheel housing liner (front right) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Removing and installing wheel housing liner (front) .

– Remove bolts -arrows- and detach heat shield (right-side) -1- on subframe.

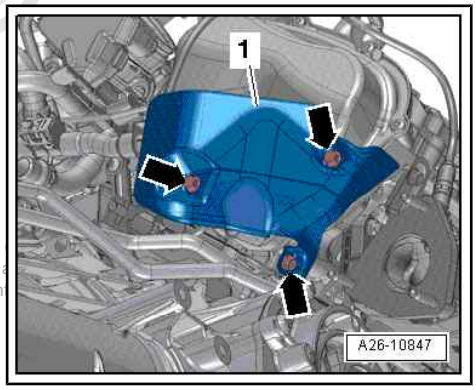
– Remove throttle valve module - J338- ⇒ “3.6 Removing and installing throttle valve module J338 ”, page 298 .



– Move clear electrical wiring for Lambda probe 2 after catalytic converter - G131- .
– Remove bolt -1- and nuts -arrows-, detach catalytic converter (right-side) from exhaust manifold and move to rear.

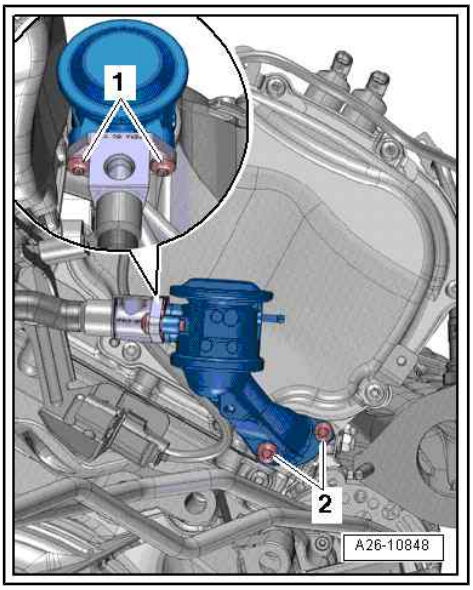


– If fitted, remove bolts -arrows- and detach heat shield -1-.



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– Remove bolts -2- and detach combination valve (right-side) for secondary air system and bolts -1- for secondary air hose.



Installing

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

Note

Renew gasket.

– Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
– Install throttle valve module - J338- ⇒ “3.6 Removing and installing throttle valve module J338 ”, page 298 .
– Install catalytic converter (right-side) and front silencer ⇒ “1.1 Exploded view - silencers”, page 333 .

Tightening torques

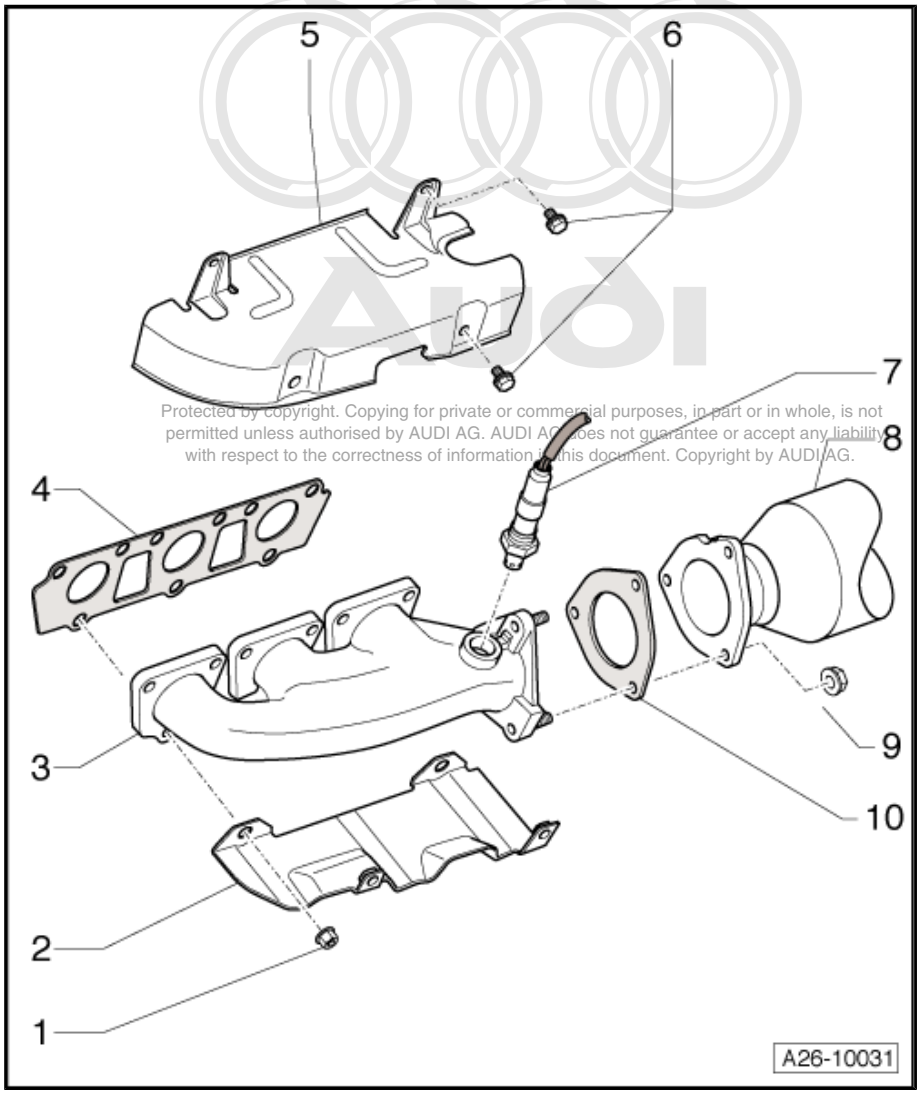
- ⇒ “3.1 Exploded view - secondary air system”, page 352
- Heat shield ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Exploded view - subframe
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front)

4 Exhaust manifolds

⇒ “4.1 Exploded view - exhaust manifolds”, page 362

⇒ “4.2 Removing and installing exhaust manifolds”, page 363

4.1 Exploded view - exhaust manifolds



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1 - Nut

- ❑ Renew
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ Tightening torque and tightening sequence: left-side ⇒ Fig. ““Exhaust manifold (left-side) - tightening torque and sequence”“ , page 363 ; right-side ⇒ Fig. ““Exhaust manifold (right-side) - tightening torque and sequence”“ , page 363

2 - Bracket for heat shield

3 - Exhaust manifold

- ❑ Removing and installing ⇒ “4.2 Removing and installing exhaust manifolds”, page 363

4 - Gasket

- ❑ Renew

5 - Heat shield

6 - Bolt

- ❑ 10 Nm

7 - Lambda probe before catalytic converter

- ❑ Cylinder bank 1 (right-side): Lambda probe - G39-
- ❑ Cylinder bank 2 (left-side): Lambda probe 2 - G108-
- ❑ Removing and installing ⇒ “7.2 Removing and installing Lambda probe”, page 320

8 - Catalytic converter

- ❑ Exploded view ⇒ “1.1 Exploded view - silencers”, page 333

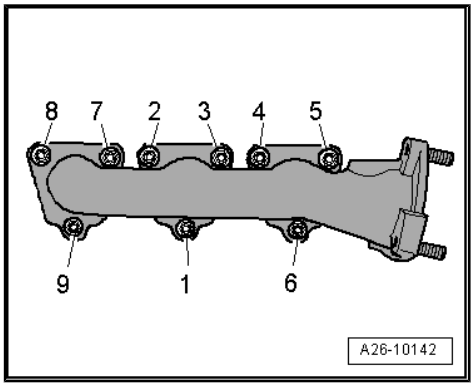
9 - Nut

- ❑ Renew
- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 23 Nm

10 - Gasket

- ❑ Renew

Exhaust manifold (left-side) - tightening torque and sequence



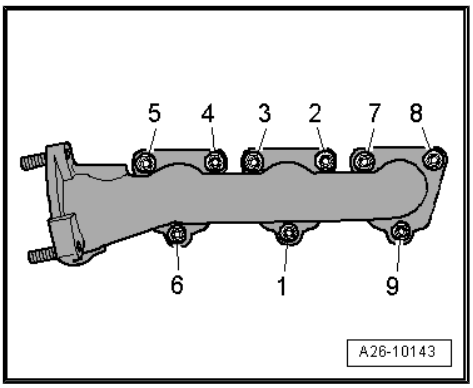
Note

- *Renew nuts.*
- *Coat threads of nuts with high-temperature paste; for high temperature paste refer to ⇒ Electronic parts catalogue .*

– Tighten nuts in 3 stages in the sequence shown:

Stage	Nuts	Tightening torque
1.	-1 … 9-	Screw in by hand until contact is made
2.	-1 … 9-	15 Nm
3.	-1 … 9-	25 Nm

Exhaust manifold (right-side) - tightening torque and sequence



Note

- *Renew nuts.*
- *Coat threads of nuts with high-temperature paste; for high temperature paste refer to ⇒ Electronic parts catalogue .*

– Tighten nuts in 3 stages in the sequence shown:

Stage	Nuts	Tightening torque
1.	-1 … 9-	Screw in by hand until contact is made
2.	-1 … 9-	15 Nm
3.	-1 … 9-	25 Nm

4.2 Removing and installing exhaust manifolds

⇒ “4.2.1 Removing and installing exhaust manifold (left-side)”, page 363

⇒ “4.2.2 Removing and installing exhaust manifold (right-side)”, page 367

4.2.1 Removing and installing exhaust manifold (left-side)

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Removing

Note

Fit all cable ties in the original positions when installing.

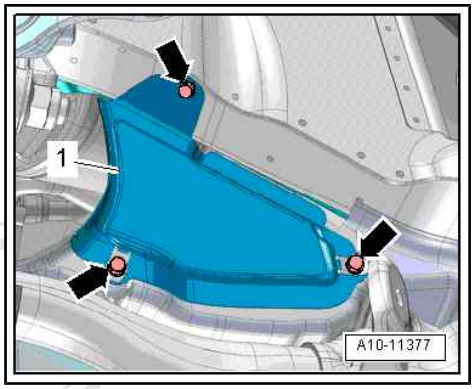
– Remove body brace ⇒ Running gear, axles, steering; Rep. gr. 40 ; Suspension strut, upper links; Removing and installing body brace .

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

– Detach poly V-belt from air conditioner compressor ⇒ “1.2 Removing and installing poly V-belt”, page 66 .

– Remove air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Detaching and attaching air conditioner compressor at bracket .

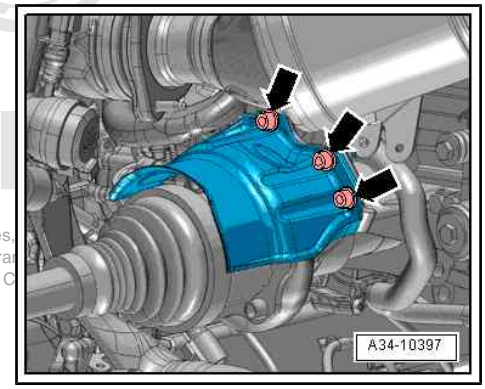
– Remove bolts -arrows- and detach heat shield (left-side) -1- on subframe.



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

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

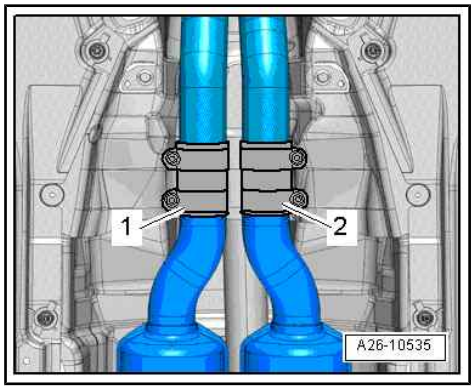
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Caution

Risk of damage to flexible joints in front silencer.

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

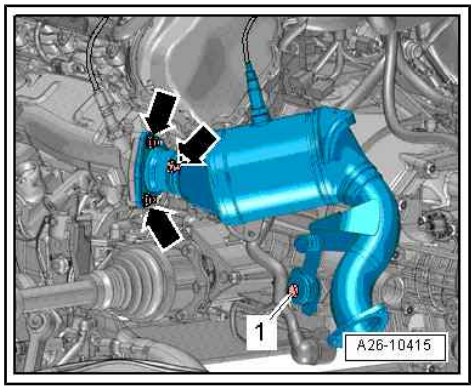


– Loosen and push back clamp -1- and tie up front silencer (left-side).

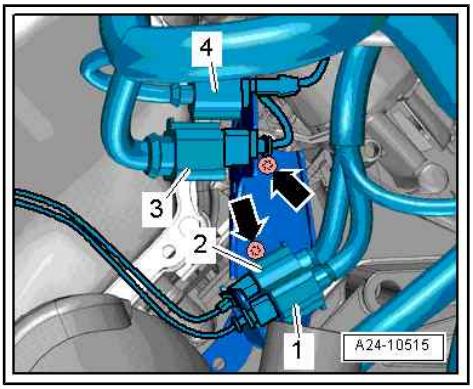
Note

Disregard -item 2-.

– Remove bolt -1- and nuts -arrows- and push catalytic converter (left-side) towards rear of vehicle.



– Take electrical connector -2- for Lambda probe 2 - G108- out of bracket, unplug and move wiring clear.

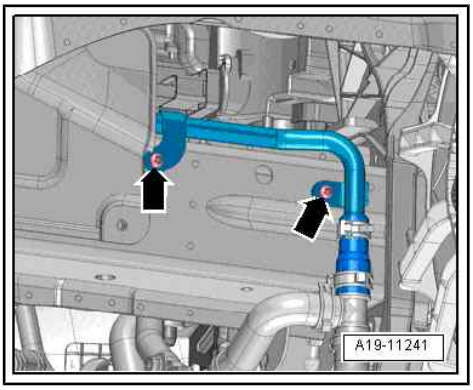


Note

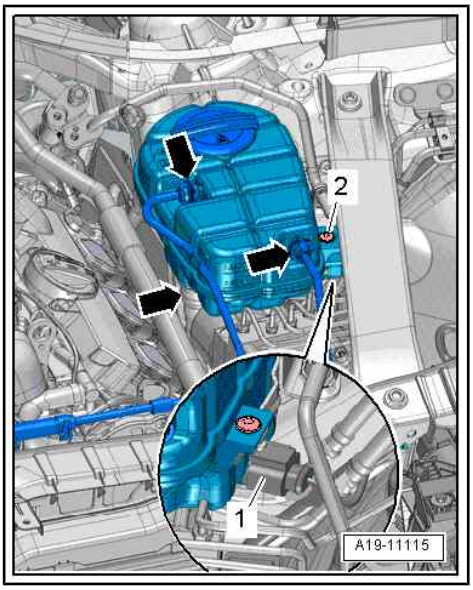
Disregard -items 1, 2, 3, 4- and -arrows-.

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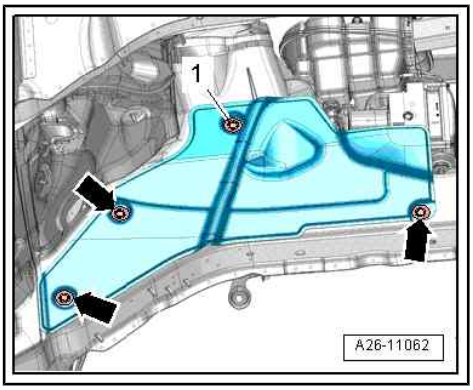
– Unscrew nuts -arrows- and move clear coolant pipe on longitudinal member.



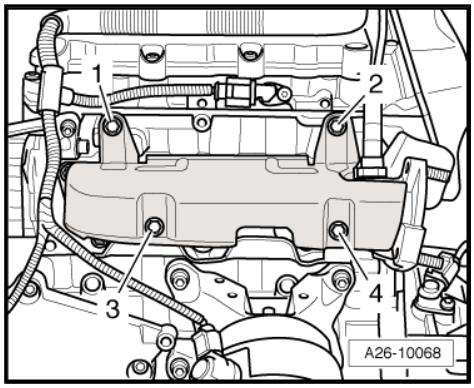
– Unplug electrical connector -1-.
– Remove bolt -2- and push coolant expansion tank to side with coolant hoses -arrows- connected.



– Release fasteners -1- and -arrows- and detach heat shield from longitudinal member (left-side).

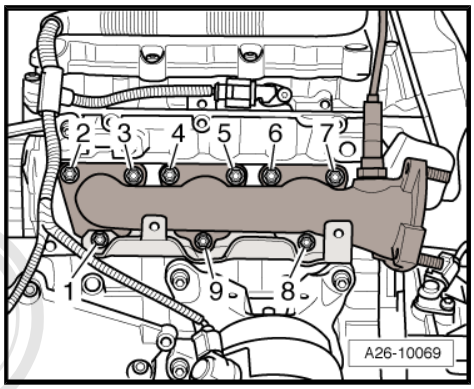


– Remove bolts -1 … 4- and detach heat shield.



– Remove nuts -1- and -8- and detach bracket for heat shield.

– Remove nuts -2 … 7- and -9- and detach exhaust manifold.



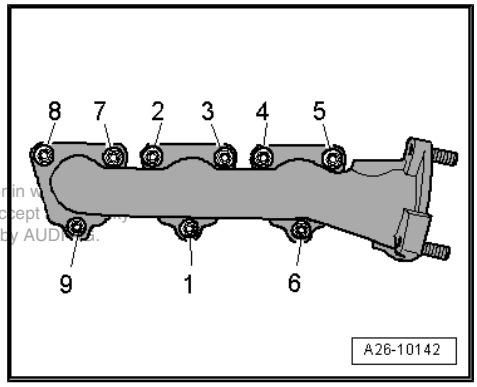
Installing

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

Note

- *Renew gasket and self-locking nuts.*
- *Coat threads of nuts with high-temperature paste; for high temperature paste refer to ⇒ Electronic parts catalogue .*

– Fit exhaust manifold with gasket for catalytic converter and tighten nuts
⇒ Fig. ""Exhaust manifold (left-side) - tightening torque and sequence"" , page 363 .



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

– Install catalytic converter (left-side)
⇒ "1.1 Exploded view - silencers", page 333 .

– Install poly V-belt
⇒ "1.2 Removing and installing poly V-belt", page 66 .

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Tightening torques

- ⇒ Fig. ""Exhaust manifold (left-side) - tightening torque and sequence"" , page 363
- ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Exploded view - drive shaft
- Body brace ⇒ Running gear, axles, steering; Rep. gr. 40 ; Suspension strut, upper links; Exploded view - suspension strut, upper links
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Strips / trim panels / extensions; Exploded view - heat shield
- Heat shield ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Exploded view - subframe
- ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Exploded view - air conditioner compressor drive unit
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

4.2.2 Removing and installing exhaust manifold (right-side)

Removing

Note

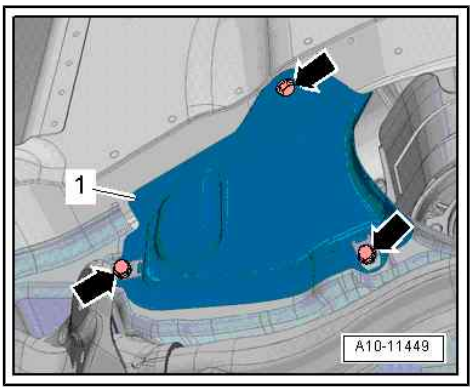
Fit all cable ties in the original positions when installing.

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

– Remove air cleaner housing
⇒ “2.2 Removing and installing air cleaner housing”, page 285 .

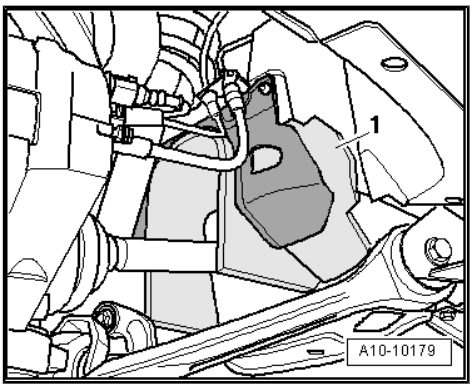
– Remove Lambda probe - G39-
⇒ “7.2.1 Removing and installing Lambda probe G39 ”, page 320 .

– Remove bolts -arrows- and detach heat shield (right-side) -1- on subframe.



– Remove front wheel (right-side) ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres .

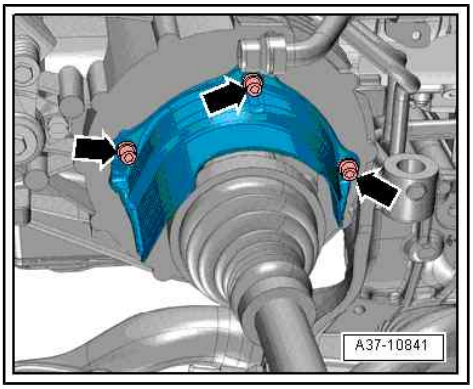
– Remove cover -1- for drive shaft in wheel housing (right-side).



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

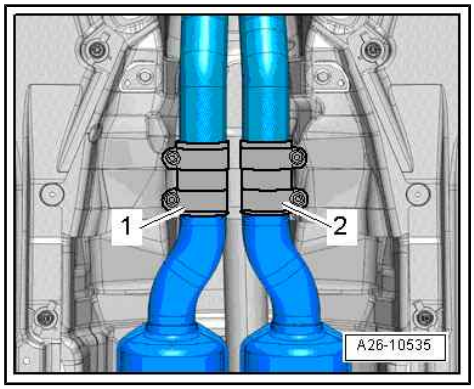
– Unbolt drive shaft (right-side) from gearbox flange shaft ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .



Caution

Risk of damage to flexible joints in front silencer.

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



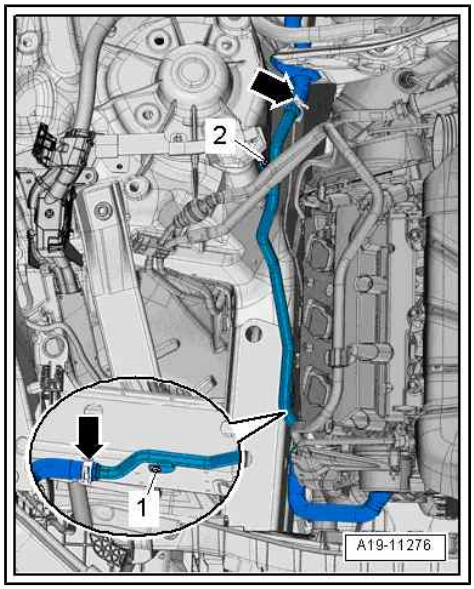
– Loosen and push back clamp -2- and tie up front silencer (right-side).

Note

Disregard -item 1-.

Vehicles without auxiliary heater:

– Unscrew bolts -1 and 2- and place coolant pipe on longitudinal member (right-side) to one side (coolant hoses remain connected).

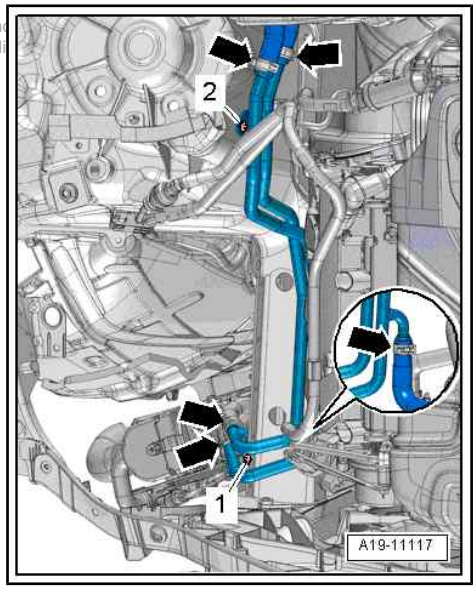


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Vehicles with auxiliary heater:

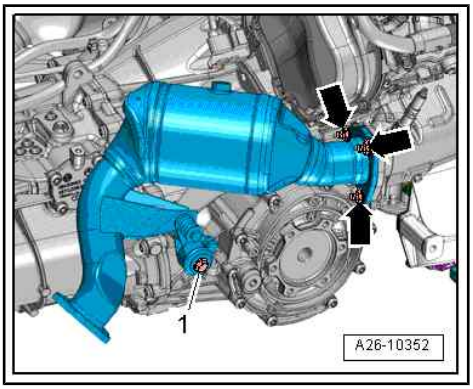
– Loosen nut -1- and remove bolt -2-.

– Release hose clips -arrows-, disconnect coolant hoses from coolant pipe at longitudinal member (right-side) and detach coolant pipe.



Continued for all vehicles:

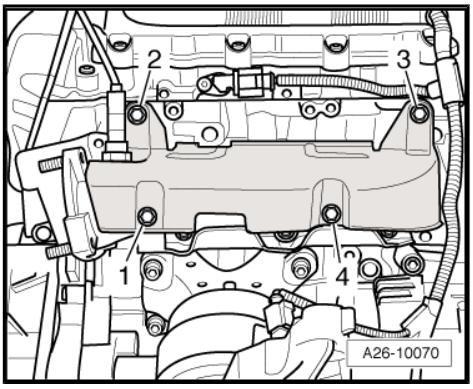
– Remove bolt -1- and nuts -arrows- and pull catalytic converter off exhaust manifold.



Note

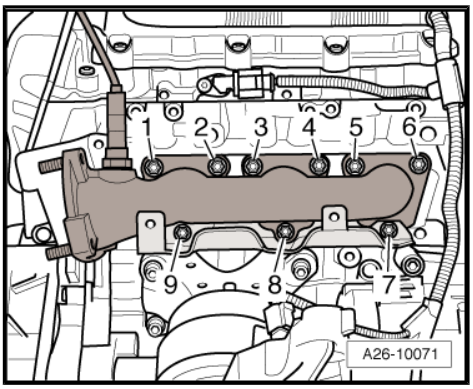
For illustration purposes, the installation position is shown with the engine removed.

– Remove bolts -1 … 4- and detach heat shield.



– Remove nuts -7- and -9- and detach bracket for heat shield.

– Remove nuts -1 … 6- and -8- and detach exhaust manifold.



Installing

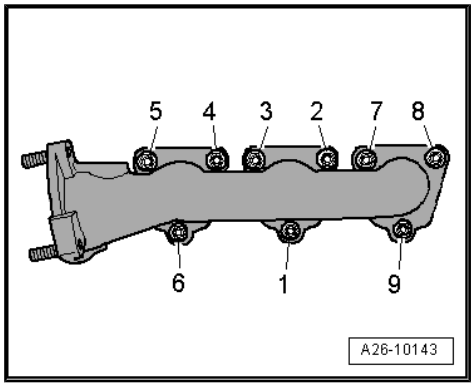
Installation is carried out in reverse order; note the following:

Note

- *Renew gaskets and self-locking nuts.*
- *Coat threads of nuts with high-temperature paste; for high temperature paste refer to ⇒ Electronic parts catalogue .*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

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– Fit exhaust manifold with gasket for catalytic converter and tighten nuts
⇒ Fig. ““Exhaust manifold (right-side) - tightening torque and sequence”“ , page 363 .
– Install catalytic converter (right-side)
⇒ “1.1 Exploded view - silencers”, page 333 .
– Install Lambda probe - G39-
⇒ “7.2.1 Removing and installing Lambda probe G39 ”, page 320 .
– Install air cleaner housing
⇒ “2.2 Removing and installing air cleaner housing”, page 285 .



Tightening torques

- ⇒ Fig. ““Exhaust manifold (right-side) - tightening torque and sequence”“ , page 363
- ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Exploded view - drive shaft
- Heat shield ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Exploded view - subframe
- ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

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28 – Ignition system

1 Ignition system

⇒ “1.1 Exploded view - ignition system”, page 371

⇒ “1.2 Test data, spark plugs”, page 374

⇒ “1.3 Removing and installing ignition coils with output stages”, page 374

⇒ “1.4 Removing and installing knock sensor”, page 376

⇒ “1.5 Removing and installing Hall senders”, page 380

⇒ “1.6 Removing and installing engine speed sender G28 ”, page 381

1.1 Exploded view - ignition system

⇒ “1.1.1 Exploded view - ignition system, vehicles with 2.5 ltr. engine”, page 371

⇒ “1.1.2 Exploded view - ignition system, vehicles with 2.8 ltr. engine”, page 373

1.1.1 Exploded view - ignition system, vehicles with 2.5 ltr. engine

1 - Bolt

- ❑ 9 Nm

2 - Hall sender

- ❑ Cylinder bank 1 (right-side)

- ♦ Inlet side: Hall sender - G40-
- ♦ Exhaust side: Hall sender 3 - G300-
  - ❑ Removing and installing ⇒ “1.5 Removing and installing Hall senders”, page 380

3 - O-ring

- ❑ Renew

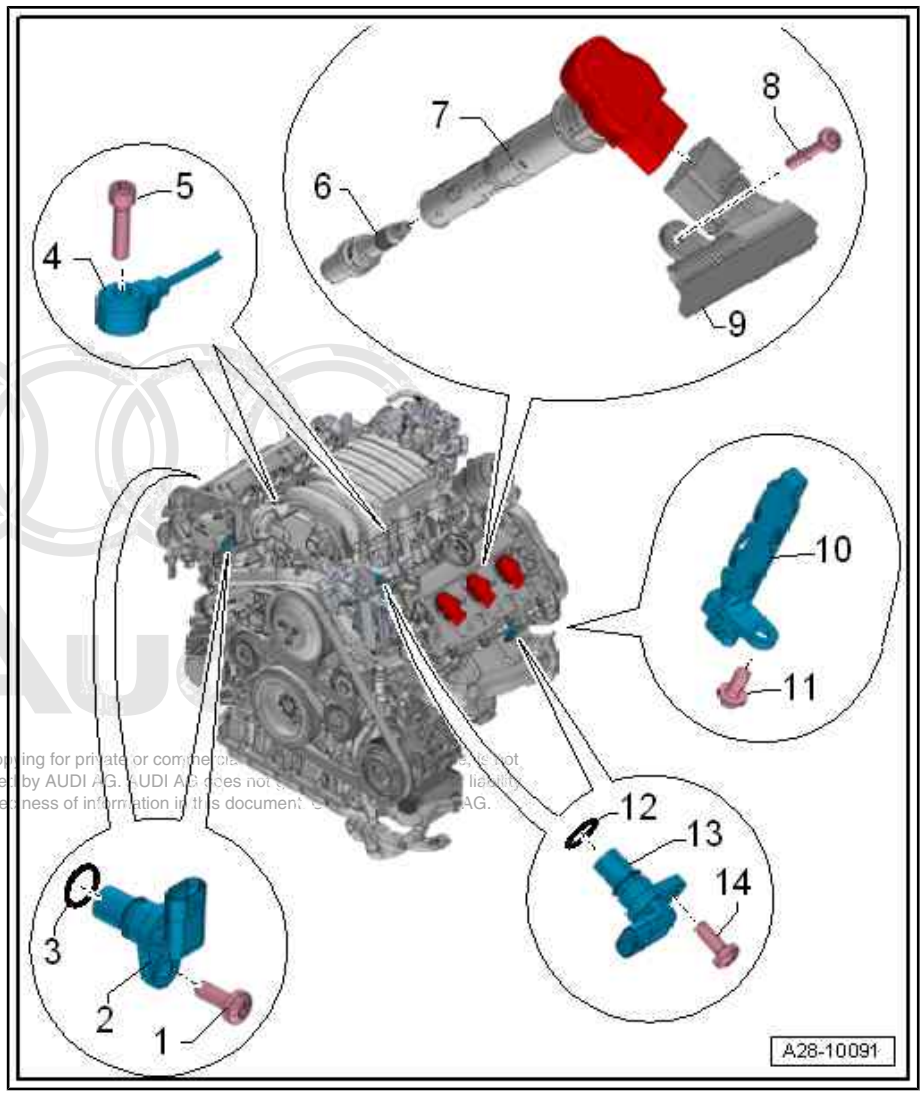
4 - Knock sensor

- ❑ Contact surfaces between knock sensor and cylinder block must be free of corrosion, oil and grease.

- ♦ Cylinder bank 1 (right-side): knock sensor 1 - G61-
- ♦ Cylinder bank 2 (left-side): knock sensor 2 - G66-
  - ❑ Removing and installing ⇒ “1.4 Removing and installing knock sensor”, page 376

5 - Bolt

- ❑ 25 Nm



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6 - Spark plug

- ❑ Remove and install with spark plug socket and extension - 3122 B- ⇒ Maintenance ; Booklet 411
- ❑ Change interval ⇒ Maintenance tables
- ❑ 30 Nm

7 - Ignition coil

- ❑ Ignition coil 1 with output stage - N70-
- ❑ Ignition coil 2 with output stage - N127-
- ❑ Ignition coil 3 with output stage - N291-
- ❑ Ignition coil 4 with output stage - N292-
- ❑ Ignition coil 5 with output stage - N323-
- ❑ Ignition coil 6 with output stage - N324-
- ❑ Removing and installing ⇒ “1.3 Removing and installing ignition coils with output stages”, page 374

8 - Bolt

- ❑ 5 Nm

9 - Electrical wiring harness

10 - Bolt

- ❑ 9 Nm

11 - Engine speed sender - G28-

- ❑ Removing and installing ⇒ “1.6 Removing and installing engine speed sender G28 ”, page 381

12 - O-ring

- ❑ Renew

13 - Hall sender

- ❑ Cylinder bank 2 (left-side)

♦ Inlet side: Hall sender 2 - G163-

♦ Exhaust side: Hall sender 4 - G301-

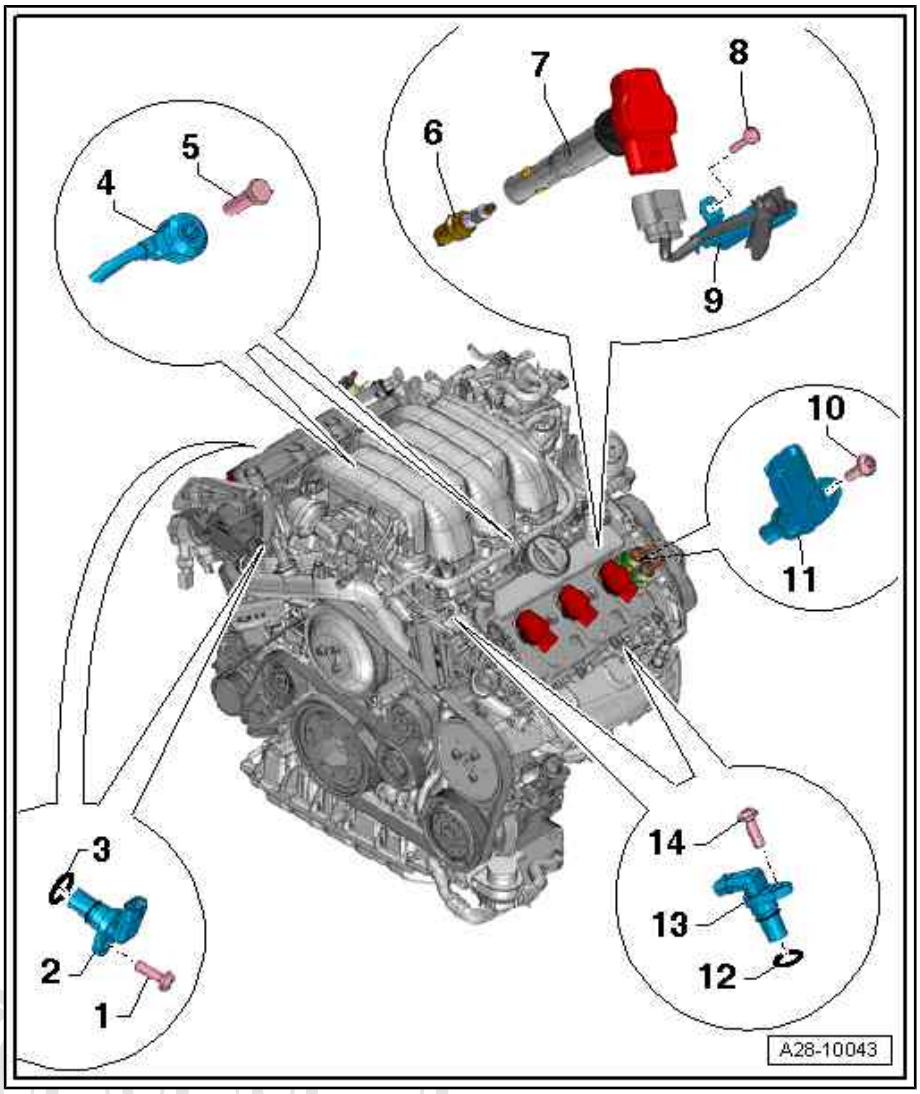
- ❑ Removing and installing ⇒ “1.5 Removing and installing Hall senders”, page 380

14 - Bolt

- ❑ 9 Nm

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1.1.2 Exploded view - ignition system, vehicles with 2.8 ltr. engine



1 - Bolt
- ❑ 9 Nm

2 - Hall sender
- ❑ Cylinder bank 1 (right-side)
- ❑ Inlet side: Hall sender - G40-
- ❑ Exhaust side: Hall sender 3 - G300-
- ❑ Removing and installing ⇒ “1.5 Removing and installing Hall senders”, page 380

3 - O-ring
- ❑ Renew

4 - Knock sensor
- ❑ Contact surfaces between knock sensor and cylinder block must be free of corrosion, oil and grease.
- ❑ Cylinder bank 1 (right-side): knock sensor 1 - G61-
- ❑ Cylinder bank 2 (left-side): knock sensor 2 - G66-
- ❑ Removing and installing ⇒ “1.4.3 Removing and installing knock sensors - vehicles with 2.8 ltr. engine”, page 378

5 - Bolt
- ❑ 25 Nm

6 - Spark plug
- ❑ Change interval ⇒ Maintenance tables
- ❑ Remove and install with spark plug socket and extension - 3122 B- ⇒ Maintenance ; Booklet 411
- ❑ 30 Nm

7 - Ignition coil
- ❑ Ignition coil 1 with output stage - N70-
- ❑ Ignition coil 2 with output stage - N127-
- ❑ Ignition coil 3 with output stage - N291-
- ❑ Ignition coil 4 with output stage - N292-
- ❑ Ignition coil 5 with output stage - N323-
- ❑ Ignition coil 6 with output stage - N324-
- ❑ Removing and installing ⇒ “1.3 Removing and installing ignition coils with output stages”, page 374
- ❑ Use puller - T40039- for removal

8 - Bolt
- ❑ 5 Nm

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9 - Electrical wiring harness

10 - Bolt

- ❑ 9 Nm

11 - Engine speed sender - G28-

- ❑ Removing and installing ⇒ “1.6 Removing and installing engine speed sender G28 ”, page 381

12 - O-ring

- ❑ Renew

13 - Hall sender

- ❑ Cylinder bank 2 (left-side)
- ❑ Inlet side: Hall sender 2 - G163-
- ❑ Exhaust side: Hall sender 4 - G301-
- ❑ Removing and installing ⇒ “1.5 Removing and installing Hall senders”, page 380

14 - Bolt

- ❑ 9 Nm

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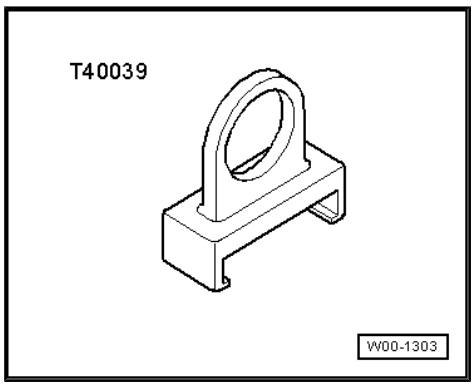
1.2 Test data, spark plugs

Engine data		2.5 ltr. / 2.8 ltr. / 4V FSI
Idling speed		Cannot be adjusted; regulated by idling speed stabilisation
Ignition timing		Not adjustable (determined by control unit)
Ignition system		Multi-coil system with 6 ignition coils (output stages integrated) connected directly to spark plugs via spark plug connectors
Spark plugs	Designations	⇒ Electronic parts catalogue
	Removing and installing Tightening torque	⇒ Maintenance ; Booklet 411
Firing order		1-4-3-6-2-5

1.3 Removing and installing ignition coils with output stages

Special tools and workshop equipment required

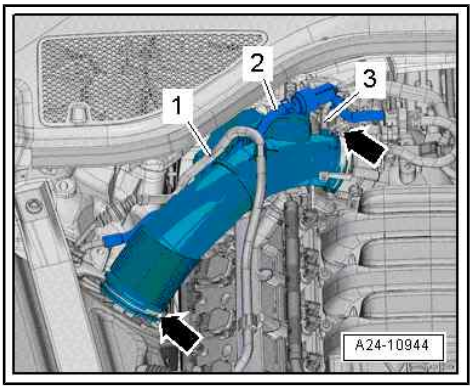
- ♦ Puller - T40039-



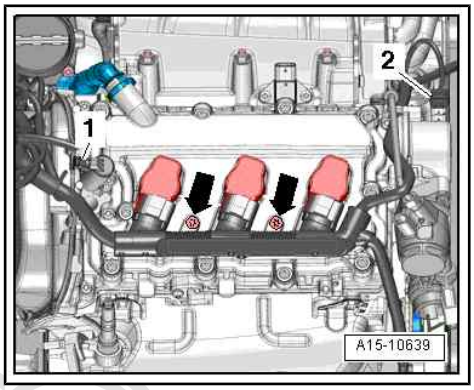
Removing

– Remove engine cover panel
⇒ “3.1 Removing and installing engine cover panel”, page 64 .

Cylinder bank 1 (right-side):



- Only remove air cleaner housing on ignition coil for cylinder 1 ⇒ “2.2 Removing and installing air cleaner housing”, page 285 .
- Move fuel line -1- and line -2- from activated charcoal filter clear at air cleaner housing and air pipe.
- Detach vacuum hose -3- from connection on air pipe.
- Loosen hose clips -arrows- and detach air pipe.

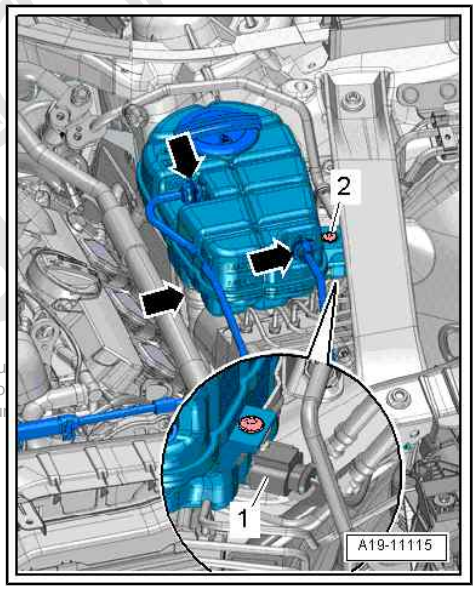


- Unscrew bolts -arrows- and unplug electrical connectors at ignition coils.
- Move electrical wiring harness down slightly.

Note

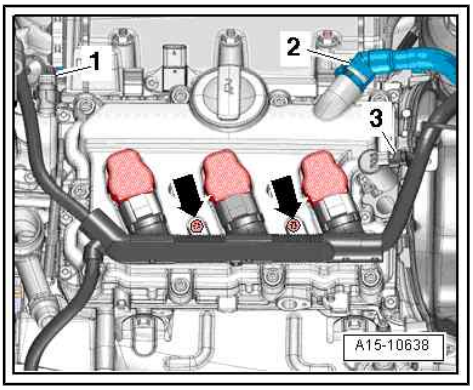
Disregard items -1 and 2-.

Cylinder bank 2 (left-side):



- Unplug electrical connector -1-.
- Remove bolt -2-.
- Push coolant expansion tank to one side with coolant hoses -arrows- attached.

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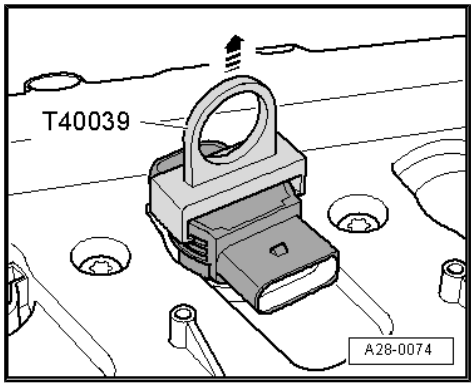
- Unscrew bolts -arrows- and unplug electrical connectors at ignition coils.
- Move electrical wiring harness down slightly.

Note

Disregard -items 1, 2, 3-.

Both sides (continued):

– Pull ignition coils out of spark plug holes using puller - T40039- .



Installing

– Fit all ignition coils loosely into spark plug holes.

– Align ignition coils with connectors and attach all connectors onto coils simultaneously.

– Push ignition coils evenly onto spark plugs by hand (do NOT attempt to knock in coils with any kind of tool).

The remaining installation steps are carried out in the reverse sequence.

Tightening torques

- ⇒ “1.1 Exploded view - ignition system”, page 371
- ⇒ Fig. ““Installing air pipes and hoses with screw-type clips”“ , page 285

1.4 Removing and installing knock sensor

⇒ “1.4.1 Removing and installing knock sensor 1 G61 - vehicles with 2.5 ltr. engine”, page 376

⇒ “1.4.2 Removing and installing knock sensor 2 G66 - vehicles with 2.5 ltr. engine”, page 377

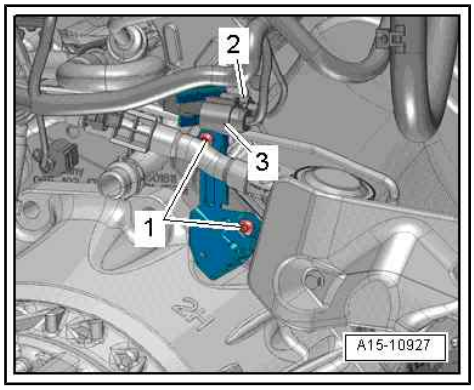
1.4.1 Removing and installing knock sensor 1 - G61- - vehicles with 2.5 ltr. engine

Removing

– Remove injector on cylinder 2
⇒ “4.3.1 Removing and installing injectors - vehicles with 2.5 ltr. engine”, page 301 .

– Take electrical connector -3- (cylinder bank 1) out of bracket.

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

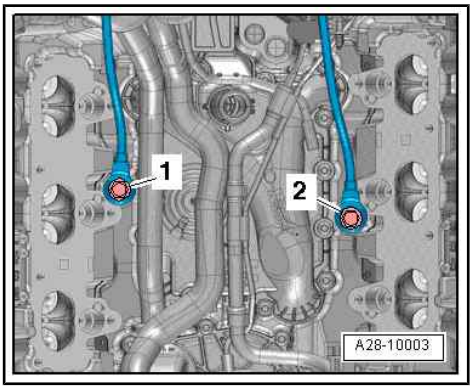


Note

Disregard -item 1-.

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– Unscrew bolt -1- for knock sensor 1 - G61- and detach knock sensor.



Note

Disregard -item 2-.

Installing

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

– Install injector
⇒ “4.3.1 Removing and installing injectors - vehicles with 2.5 ltr. engine”, page 301 .

Tightening torques

◆ ⇒ “1.1.1 Exploded view - ignition system, vehicles with 2.5 ltr. engine”, page 371

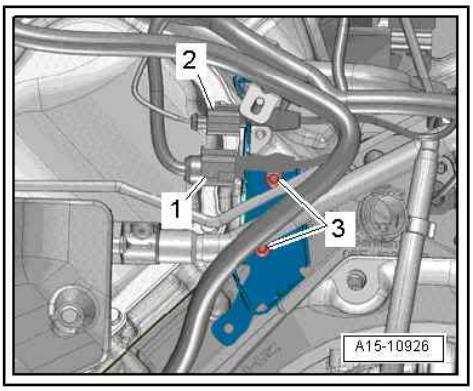
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1.4.2 Removing and installing knock sensor 2 - G66- - vehicles with 2.5 ltr. engine

Removing

– Remove injector on cylinder 5
⇒ “4.3.2 Removing and installing injectors - vehicles with 2.8 ltr. engine”, page 305 .

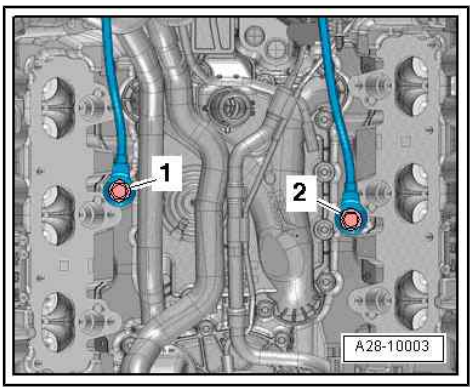
– Take electrical connector -2- (cylinder bank 2) for knock sensor 2 - G66- out of bracket and unplug connector.



Note

Disregard items -1 and 3-.

– Unscrew bolt -2- for knock sensor 2 - G66- and detach knock sensor.



Note

Disregard -item 1-.

Installing

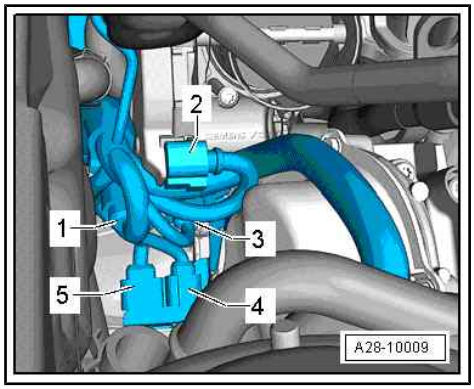
Installation is carried out in reverse order; note the following:

– Install injector
⇒ “4.3.2 Removing and installing injectors - vehicles with 2.8 ltr. engine”, page 305 .

Tightening torques

◆ ⇒ “1.1.1 Exploded view - ignition system, vehicles with 2.5 ltr. engine”, page 371

1.4.3 Removing and installing knock sensors - vehicles with 2.8 ltr. engine



Electrical connectors

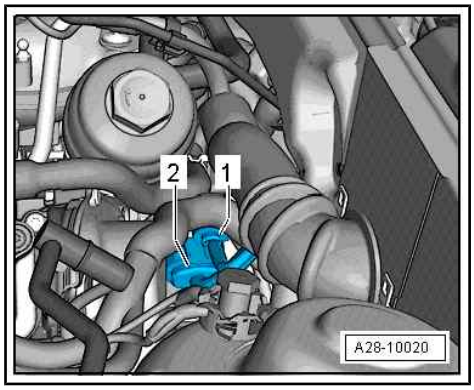
1 - To injectors on cylinder bank 1

2 - Throttle valve module - J338-

3 - Knock sensor 1 - G61-

4 - Lambda probe - G39-

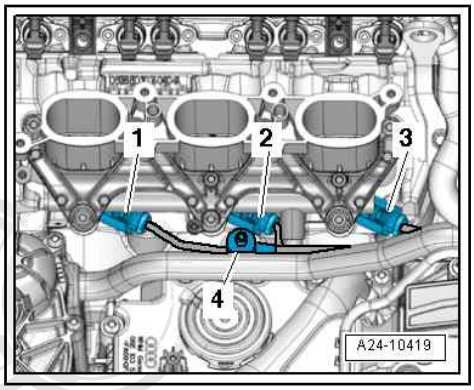
5 - Lambda probe after catalytic converter - G130-



Electrical connectors

1 - Knock sensor 2 - G66-

2 - Injectors, cylinder bank 2, and for fuel pressure sender - G247-

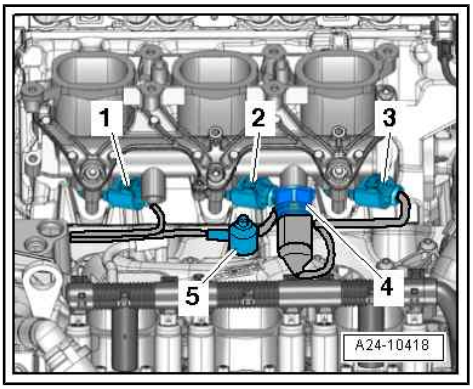


Knock sensor for cylinder bank (right-side)

4 - Knock sensor 1 - G61-

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Knock sensor for cylinder bank (left-side)



5 - Knock sensor 2 - G66-

Removing

WARNING

- *The fuel system operates under high pressure. The pressure in the high-pressure part of the injection system must be reduced to a residual pressure prior to opening the system*
  ⇒ "1.2 Reducing fuel pressure in high-pressure section", page 282 .
- *A clean cloth must then be wrapped around the connection and the residual pressure dissipated by carefully loosening the connection.*
- *Observe notes on procedure for disconnecting the battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .*

– Remove intake manifold (top section)
⇒ "3.4 Removing and installing intake manifold (top section)", page 294 .

– Remove relevant intake manifold (bottom section) with fuel rail
⇒ "3.5 Removing and installing intake manifold (bottom section)", page 296 .

Note

To reach the bolt on knock sensor 1 - G61- -4- you must first remove injector 2. To reach the bolt on knock sensor 2 - G66- -4- you must first remove injector 5.

– Remove bolt from corresponding knock sensor.

Installing

– Re-install whichever knock sensor was removed.

Note

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The tightening torque influences the function of the knock sensor.

- Tightening torque: refer to exploded view of ignition system.

– Install relevant intake manifold (bottom section) with fuel rail
⇒ "3.5 Removing and installing intake manifold (bottom section)", page 296 .

– Install intake manifold
⇒ "3.3 Removing and installing intake manifold", page 292 .

Tightening torques

- ⇒ "1.1.2 Exploded view - ignition system, vehicles with 2.8 ltr. engine", page 373

1.5 Removing and installing Hall senders

⇒ “1.5.1 Removing and installing Hall senders G40 / G163 ”, page 380

⇒ “1.5.2 Removing and installing Hall senders G300 / G301 ”, page 380

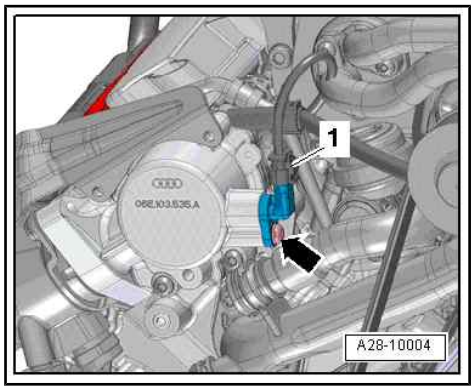
1.5.1 Removing and installing Hall senders - G40- / -G163-

Removing

– Remove engine cover panel ⇒ “3.1 Removing and installing engine cover panel”, page 64 .

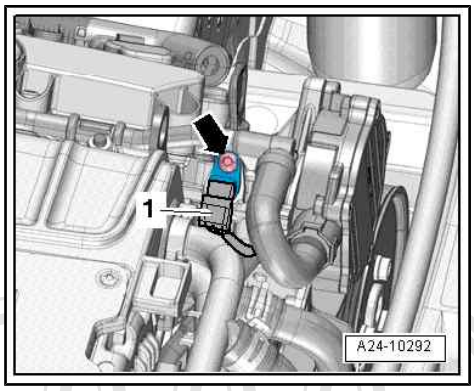
– Unplug electrical connector -1- (cylinder bank 1).

– Unscrew bolt -arrow- and remove Hall sender - G40- .



– Unplug electrical connector -1- (cylinder bank 2).

– Remove bolt -arrow- and detach Hall sender 2 - G163- .



Installing

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

Note

Fit new O-rings.

Tightening torques

◆ ⇒ “1.1 Exploded view - ignition system”, page 371

1.5.2 Removing and installing Hall senders - G300- / -G301-

Removing

Cylinder bank 1 (right-side):

– Remove air cleaner housing ⇒ “2.2 Removing and installing air cleaner housing”, page 285 .

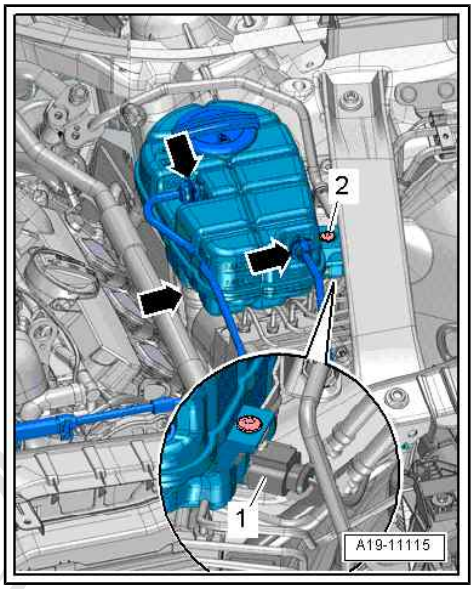
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Cylinder bank 2 (left-side):

– Unplug electrical connector -1-.

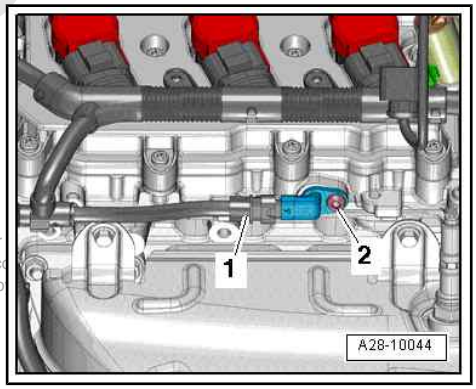
– Remove bolt -2-.

– Push coolant expansion tank to one side with coolant hoses -arrows- attached.



Both sides (continued):

– Unscrew bolt -2- and detach Hall sender.



Note

The illustration shows Hall sender 4 - G301- on cylinder bank 2 (left-side). The other Hall senders are similar.

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Installing

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

Note

Fit new O-rings.

– Install air cleaner housing
⇒ “2.2 Removing and installing air cleaner housing”, page 285 .

Tightening torques

♦ ⇒ “1.1 Exploded view - ignition system”, page 371

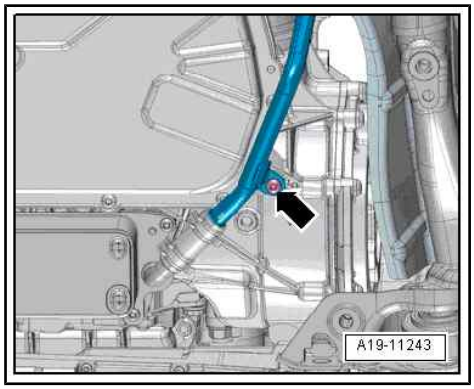
1.6 Removing and installing engine speed sender - G28-

Removing

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

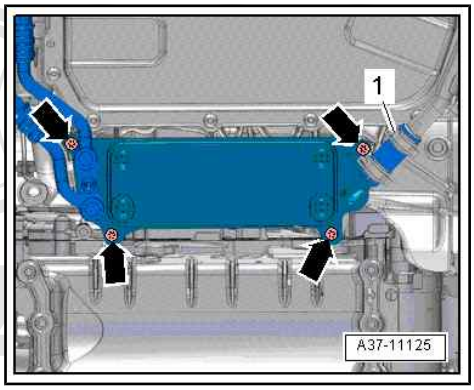
Vehicles with dual clutch gearbox 0B5:

– Remove bolt -arrow- for coolant pipe on gearbox (right-side).



Vehicles with ATF cooler:

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



Note

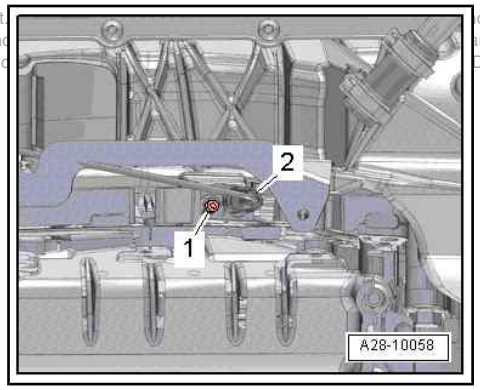
Disregard -item 1-.

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Continued for all vehicles:

– Unplug electrical connector -2-.

– Unscrew bolt -1- and pull out engine speed sender - G28- .



Installing

Installation is carried out in reverse sequence.

Tightening torques

- ⇒ “1.1 Exploded view - ignition system”, page 371
- ⇒ “3.1 Exploded view - coolant pipes”, page 236
- ⇒ Rep. gr. 34 ; ATF circuit; Exploded view - ATF circuit / ⇒ Rep. gr. 37 ; ATF circuit; Exploded view - ATF circuit
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation