Workshop Manual

Audi A3 Limousine China 2014 ➤
Audi A3 Sportback China 2014 ➤

4-cylinder direct injection engine (1.8 ltr. 4-valve TFSI - generation III, China)									
Engine ID	CUF A								

Edition 08.2016

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List of Workshop Manual Repair Groups

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15 - Cylinder head, valve gear
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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

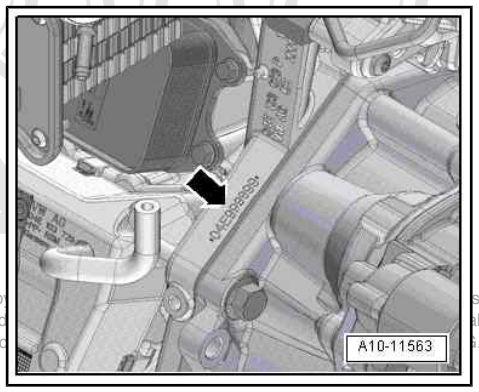
1 Identification

(ARL004863; Edition 08.2016)

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

1.1 Engine identification number/engine data

Engine number



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

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Note

- *The 4-character engine code can be found on the type plate (in versions for some countries only) and on the vehicle data sticker and the engine control unit.*
- *Fitting locations of the type plate (certain countries only) and the vehicle data sticker ⇒ Maintenance ; Booklet 821 .*

Engine data

⇒ Technical data for petrol engines; Rep. gr. 00 ; Overview of engines

2 Safety precautions

⇒ “2.1 Safety precautions when working on the fuel supply system”, page 2

⇒ “2.2 Safety precautions when working on vehicles with start/stop system”, page 2

⇒ “2.3 Safety precautions when using testers and measuring instruments during a road test”, page 2

⇒ “2.5 Safety precautions when working on the ignition system”, page 3

⇒ “2.4 Safety precautions when working on the cooling system”, page 3

2.1 Safety precautions when working on the fuel supply system

Risk of injury - fuel system operates under high pressure

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

Before opening the fuel system:

– Put on safety goggles.

– Put on protective gloves.

– Release pressure (wrap clean cloth around connection and open connection carefully).

Risk of fire due to escaping fuel

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

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

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

Risk of injury - engine may start unexpectedly

On vehicles with the start/stop system activated, the engine may start unexpectedly. A message in the instrument cluster indicates whether the start/stop system is activated.

– Deactivate start/stop system by switching off ignition.

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

Risk of injury if test equipment is not secured

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

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

Or

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

2.4 Safety precautions when working on the cooling system

Risk of scalding as hot coolant can escape

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

– Put on protective gloves.

– Put on safety goggles.

– Release pressure (cover filler cap on coolant expansion tank with a cloth and open carefully).

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2.5 Safety precautions when working on the ignition system

Risk of injury due to electric shock

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

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

Risk of damage to components

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

– Switch off ignition before connecting/disconnecting electrical wiring.

– Switch off ignition before cleaning engine.

3 Repair instructions

⇒ “3.1 Rules for cleanliness”, page 4

⇒ “3.2 Foreign particles in engine”, page 4

⇒ “3.3 Contact corrosion”, page 4

⇒ “3.4 Routing and attachment of pipes, hoses and wiring”, page 5

⇒ “3.5 Installing radiators and condensers”, page 5

⇒ “3.6 Checking vacuum system”, page 5

3.1 Rules for cleanliness

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

- Carefully clean connection points and the surrounding area with engine cleaner or brake cleaner and dry thoroughly before opening.
- Immediately seal open lines and connections with clean plugs, for example from engine bung set - VAS 6122- .
- Place removed parts on a clean surface and cover them. Use only lint-free cloths.
- Carefully cover or seal open components if repairs cannot be carried out immediately.
- Only install clean components; replacement parts should only be unpacked immediately prior to installation. Do not use parts that have been previously unpacked and stored away loose (e.g. in toolboxes, etc.).
- When the system is open, do not work with compressed air and do not move the vehicle.
- Make sure that no fuel runs onto the fuel hoses. Should this occur, the fuel hoses must be cleaned again immediately.
- 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.

Note

If the turbocharger has suffered mechanical damage
⇒ page 236

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 .

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

3.4 Routing and attachment of pipes, hoses and wiring

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

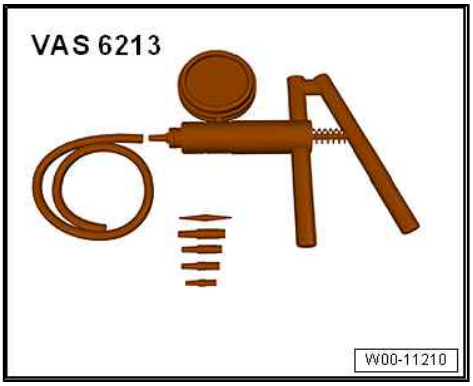
3.5 Installing radiators and condensers

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

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 a fault is stored in the event memory, check all vacuum lines leading to the corresponding component, and also check the remaining vacuum lines leading to other components.

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

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

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10 – Removing and installing engine

1 Removing and installing engine

⇒ “1.1 Removing engine”, page 7

⇒ “1.2 Separating engine and gearbox”, page 20

⇒ “1.3 Securing engine to engine and gearbox support”, page 29

⇒ “1.4 Installing engine”, page 31

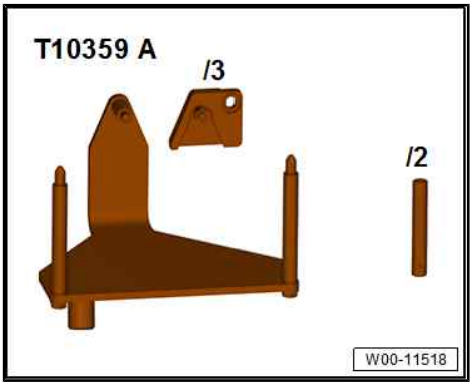
1.1 Removing engine

Special tools and workshop equipment required

- Engine and gearbox jack - VAS 6931-

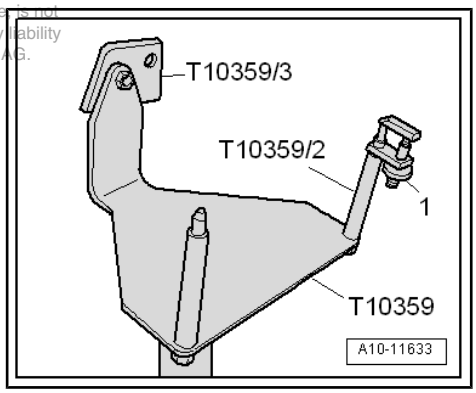


- Engine bracket - T10359 A-



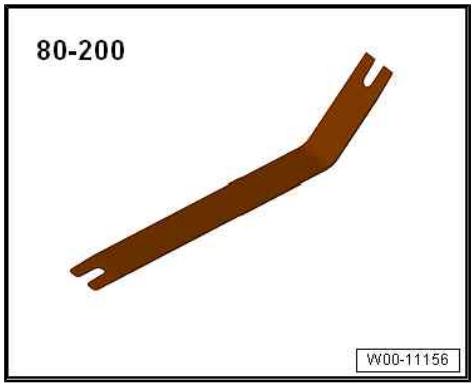
- Pin - T10359/2-
- Adapter - T10359/3-

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- Locking element -1- included with gearbox support - 3282-

- Removal lever - 80 - 200-



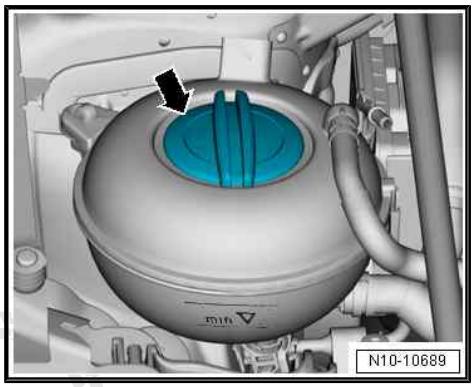
- Safety goggles
- Protective gloves
- Stepladder

Procedure

WARNING

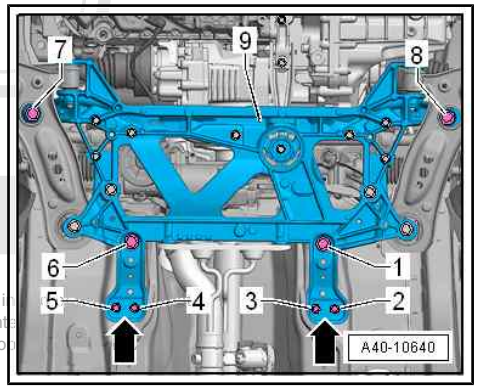
Hot steam/hot coolant can escape - risk of scalding.

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



– Open filler cap -arrow- on coolant expansion tank.

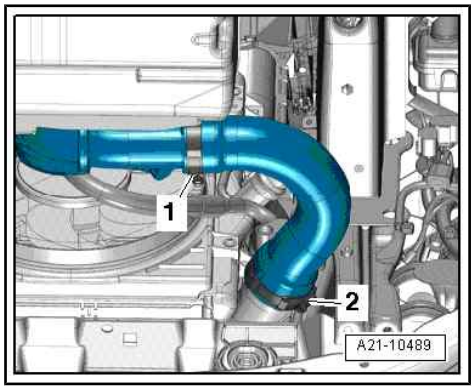
– Remove subframe -9- without steering rack ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Removing and installing subframe without steering rack .



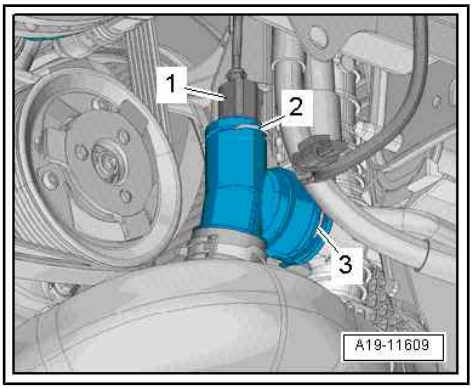
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– Release hose clips -1, 2- and detach air hose.

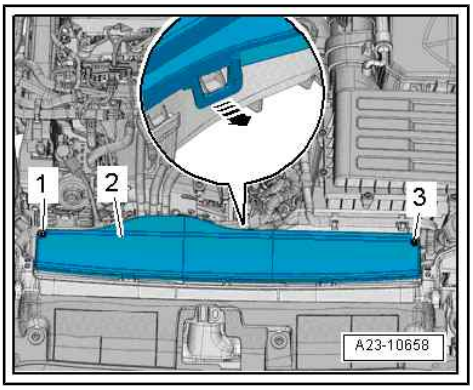
– Seal off open lines and connections with clean plugs from engine bung set - VAS 6122- .



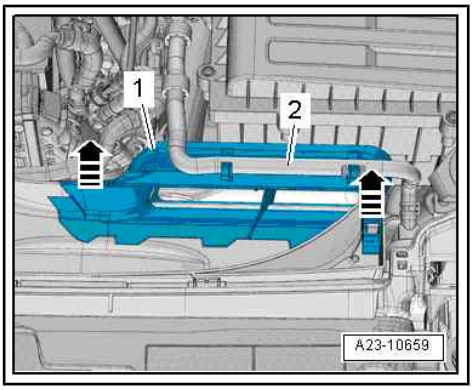
– Unplug electrical connector -1-.
– Place drip tray for workshop hoist - VAS 6208- underneath.



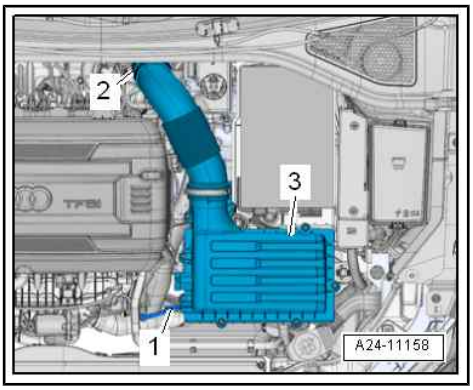
– Lift retaining clip -3-, disconnect coolant hose (bottom right) from radiator and drain off coolant.
– Remove engine cover panel ⇒ page 50 .
– Remove bolts -1, 3-.
– Release fastener -arrow- and remove cover -2-.



– Move coolant hose -2- clear.
– Release fasteners -arrows- and detach air duct (top section) -1-.

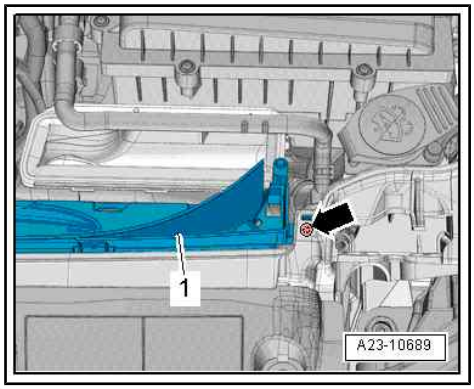


– Disconnect vacuum hose -1-.
– Release hose clip -2- and detach air hose.
– Detach air cleaner housing -3-.

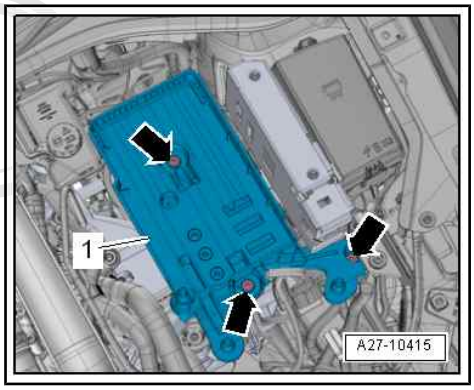


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– Remove bolt -arrow- on both sides.
– Unclip air duct (bottom section) -1- and detach.

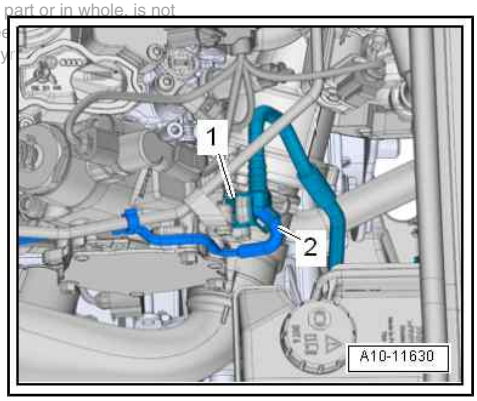


– Remove battery tray -1- ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery tray .



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– Disconnect vacuum hose -2-.
– Press release tabs on vacuum hose -1- and detach hose from vacuum pump.

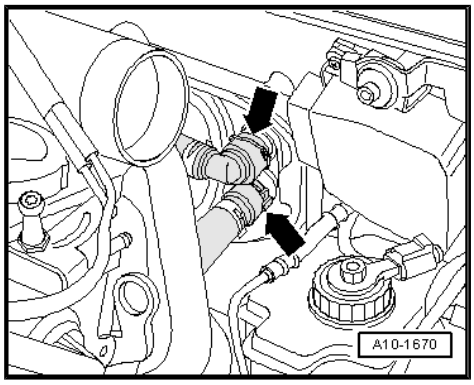


Vehicles without auxiliary heater:

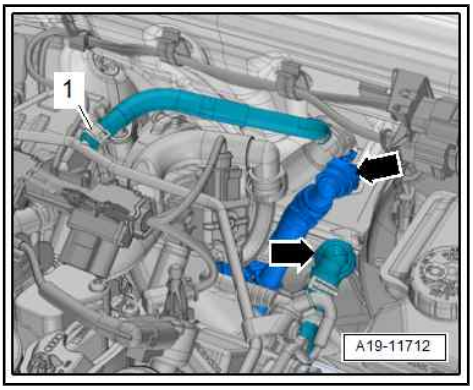
Note

Place a cloth underneath to catch escaping coolant.

– Lift retaining clips -arrows- and disconnect coolant hoses from heat exchanger for heater.
– Guide coolant hoses downwards and drain off coolant.



Vehicles with auxiliary heater:

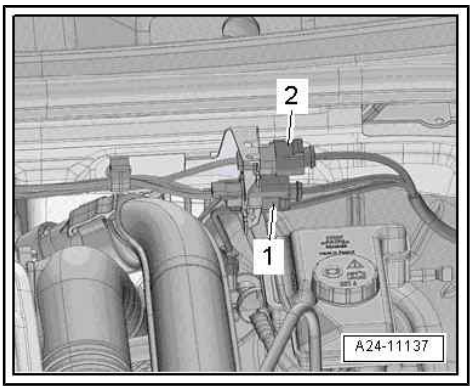


Note

Place a cloth underneath to catch escaping coolant.

– Release hose clip -1-, lift retaining clips -arrows- and disconnect coolant hoses.

Continued for all vehicles:

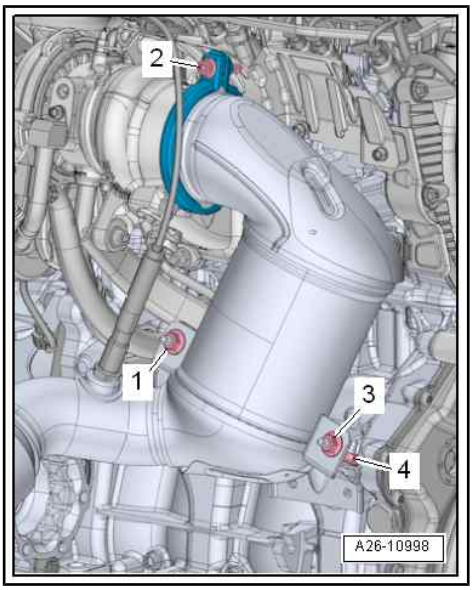


– Detach electrical connectors -1, 2- from bracket, unplug connectors and move electrical wiring clear.

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– Unscrew bolt -2- and remove screw-type clip.

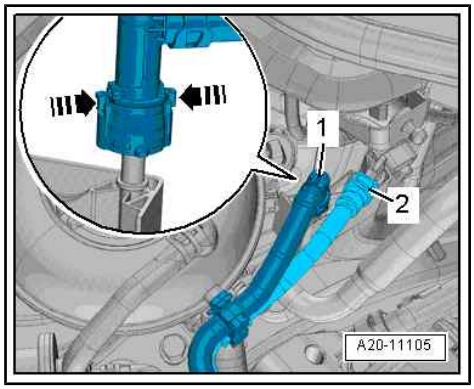
– Remove nuts -1 and 3-.



Note

- *For illustration purposes, the installation position is shown with the engine removed.*
- *Disregard -item 4-.*

– First press hose connector -1- downwards, and then press release tabs -arrows-.



WARNING

The fuel system is pressurised.

Risk of injury as fuel may spray out.

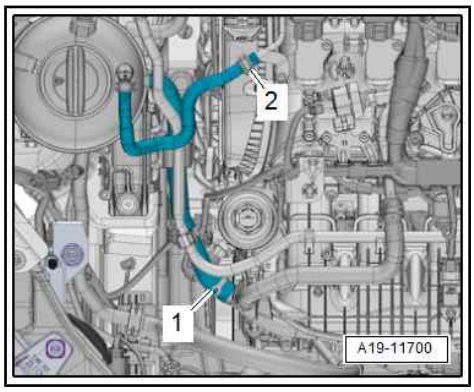
- *Put on safety goggles.*
- *Put on protective gloves.*
- *Release pressure (wrap clean cloth around connection and open connection carefully).*

– Pull off hose connector while keeping release tabs depressed and move hose clear.

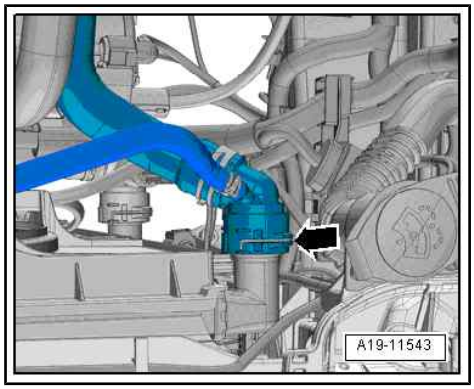
– Press release tab on hose -2- for activated charcoal filter.

– Disconnect hose and move it clear.

– Release hose clips -1, 2- and disconnect coolant hoses.



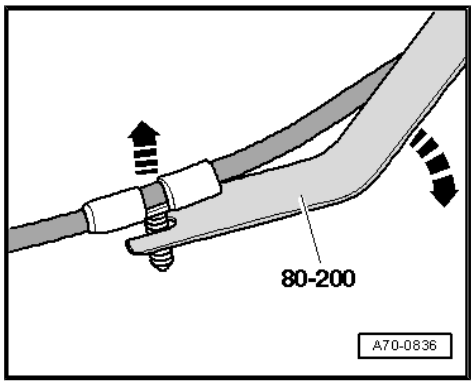
– Lift retaining clip -arrow- and disconnect coolant hose (top left) from radiator.



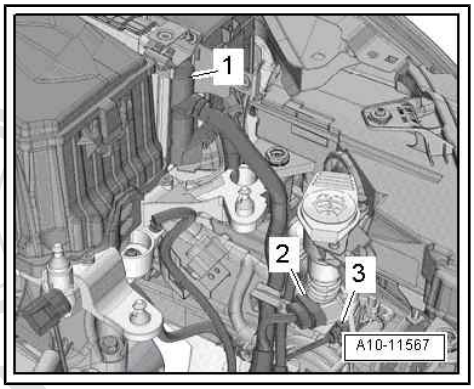
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Note

Use removal lever - 80 - 200- to lever out the wiring clips when performing the next work steps.

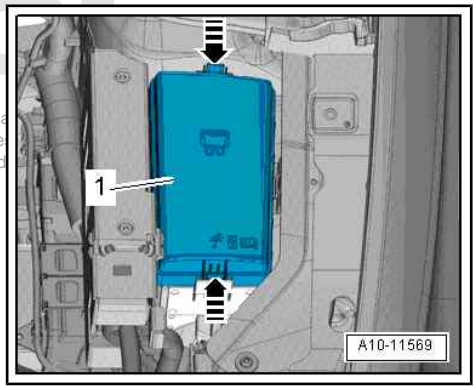


– Unplug electrical connector -1- at engine control unit - J623- ⇒ page 282 .
– Detach electrical connectors -2 and 3- from bracket and unplug.
– Move electrical wiring clear.

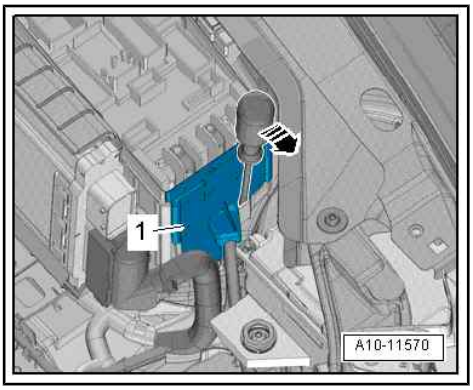


– Release catches -arrows- and detach cover -1- for electronics box in engine compartment.

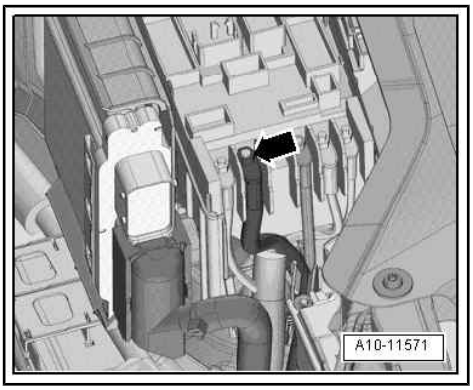
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– Release catch using a screwdriver -arrow- and detach cover -1- for electronics box in engine compartment upwards.



– Remove nut -arrow-, detach electrical wiring and move clear.

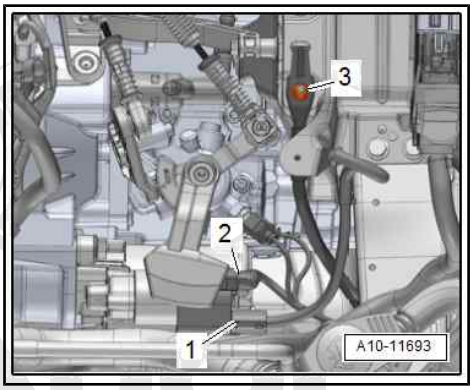


Vehicles with manual gearbox:

– Unplug electrical connector -2-.

– Push back cover -1- for positive battery terminal and unscrew positive wire from starter solenoid switch.

– Remove nut -3- and detach earth wire.



Note

The earth connection may be secured at the starter bolt, depending on the vehicle version.

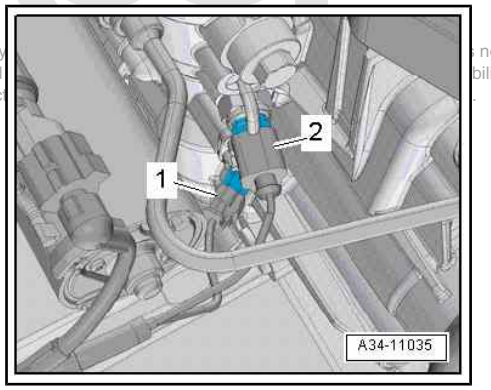
– Unplug electrical connectors on gearbox (front left):

1 - For gearbox neutral position sender - G701-

2 - For reversing light switch - F4-

– Detach gear selector cable and gate selector cable from gearbox, remove cable support bracket and place to one side with selector cables attached ⇒ Rep. gr. 34 ; Selector mechanism; Removing and installing selector mechanism .

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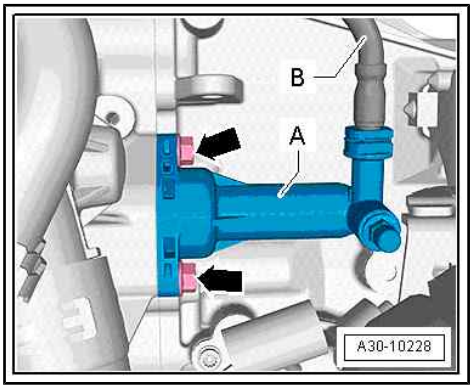
Vehicles with manual gearbox 02S:

– Remove clutch slave cylinder -A- and place to one side with pipe/hose assembly attached ⇒ Rep. gr. 30 ; Clutch mechanism; Removing and installing clutch slave cylinder .

Caution

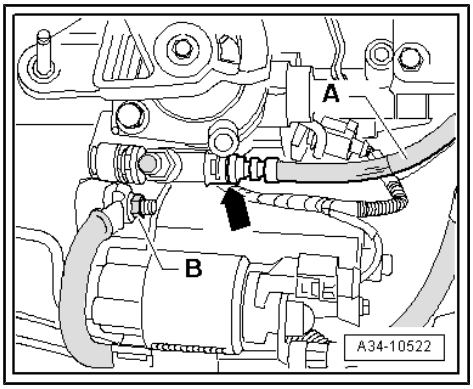
Avoid damage to clutch slave cylinder.

- ***Do not operate clutch pedal after clutch slave cylinder has been removed from gearbox together with pipe/hose assembly.***



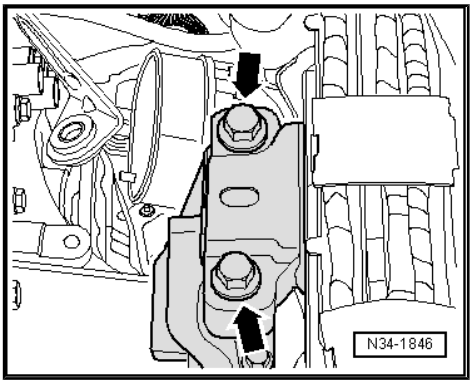
Vehicles with manual gearbox 02Q:

– Detach pipe/hose assembly -A- from bleeder connection ⇒ Rep. gr. 30 ; Clutch mechanism; Removing and installing lines for clutch hydraulics .



Vehicles with manual gearbox 02S/02Q:

– Loosen bolts -arrows- for gearbox mounting approx. 2 turns.

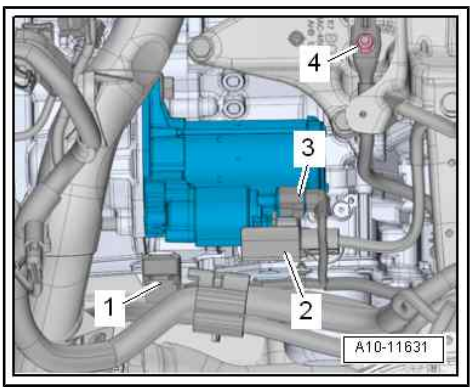


Vehicles with dual clutch gearbox 0CW:

– Unplug electrical connector -3-.

– Push back cover -2- for positive battery terminal and unscrew positive wire from starter solenoid switch.

– Remove nut -4- and detach earth wire.



Caution

Risk of damage to control unit (mechatronic unit) by static discharge.

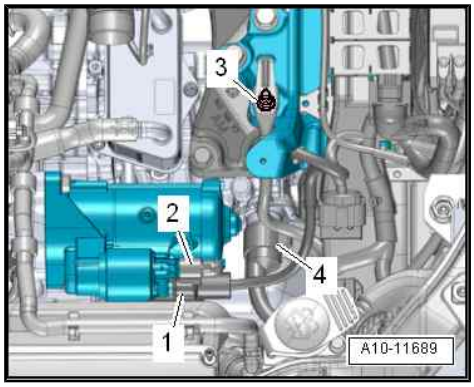
- *Do NOT touch connector contacts in gearbox connector with your hands.*

– Touch vehicle earth with bare hands to eliminate any static charge.

– Unplug electrical connector -1- for mechatronic unit for dual clutch gearbox - J743- .

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Vehicles with dual clutch gearbox 0D9:



– Detach selector lever cable from gearbox and pull it out of cable support bracket ⇒ Rep. gr. 34 ; Selector mechanism; Removing and installing selector mechanism .

– Unplug electrical connector -2-.

– Push back cover -1- for positive battery terminal and unscrew positive wire from starter solenoid switch.

– Remove nut -3- and detach earth wire.

Note

The earth connection may be secured at the starter bolt, depending on the vehicle version.

Caution

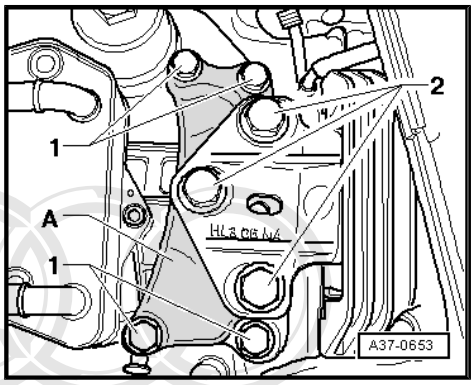
Risk of damage to control unit (mechatronic unit) by static discharge.

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

– Touch vehicle earth with bare hands to eliminate any static charge.

– Turn retainer catch anti-clockwise and unplug electrical connector -4- for mechatronic unit for dual clutch gearbox - J743- .

– Loosen bolts -2- for gearbox mounting approx. 2 turns.

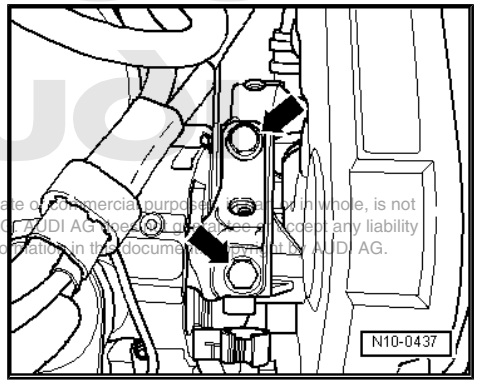


Note

Disregard -items 1, A-.

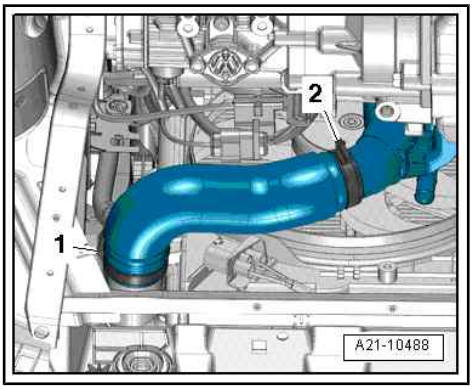
Continued for all vehicles:

– Unscrew bolts -arrows- for engine mounting approx. 2 turns.



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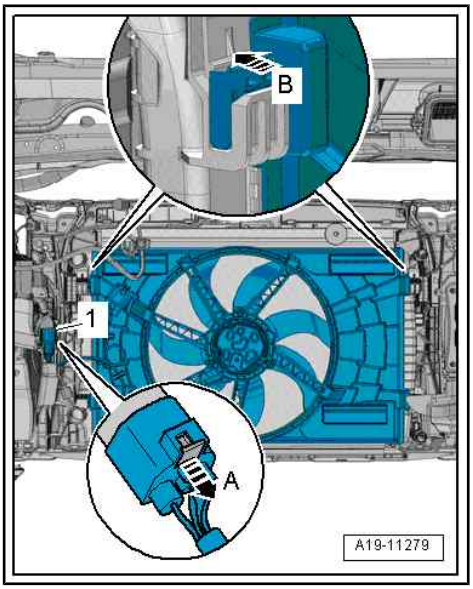
– Release hose clip -1- and detach air hose from charge air cooler.



Note

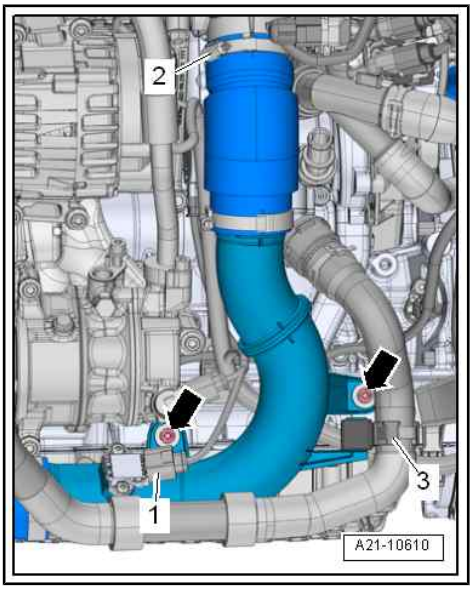
Disregard -item 2-.

– Unplug electrical connector -1- for radiator fan.
– To do so, push retainer in direction of -arrow A- and press release catch down.
– Press locking tabs on left and right sides of radiator cowl simultaneously -arrow B- and detach radiator cowl downwards from radiator.



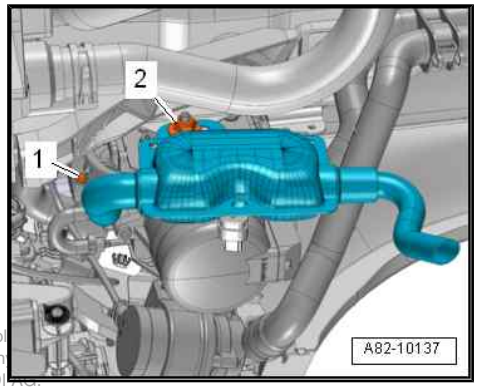
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– Release hose clip -2-.
– Move coolant hose -3- clear.
– Remove bolts -arrows-.
– Unplug electrical connector -1- from charge pressure sender - G31- .
– Detach air pipe (right-side).



Vehicles with auxiliary heater:

– Open clip -1-, unscrew bolt -2- and detach silencer for auxiliary heater.



Continued for all vehicles:

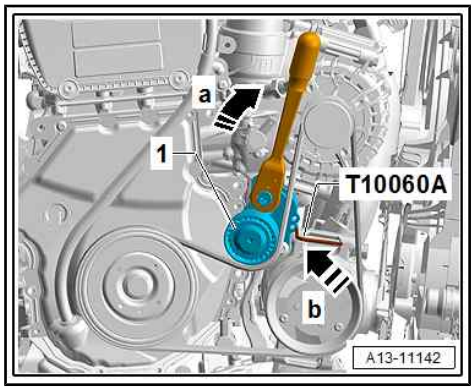
– If poly V-belt is to be re-installed, mark direction of rotation of poly V-belt with chalk or felt-tip pen for re-installation.

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– To slacken poly V-belt turn tensioner -1- in direction of -arrow a-.

– Use locking pin - T10060 A- to lock tensioner -1- in direction of -arrow b-.

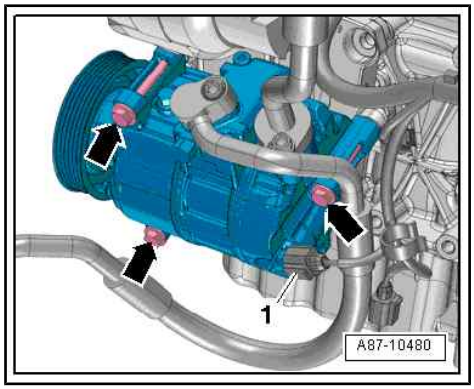
– Take off poly V-belt.



– Unplug electrical connector -1- on air conditioner compressor regulating valve - N280- .

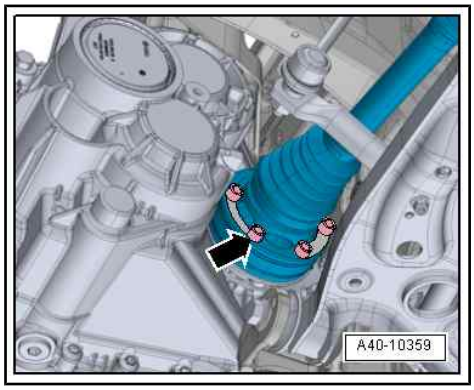
– Remove bolts -arrows-.

– Detach air conditioner compressor from bracket (refrigerant hoses remain connected) and tie up to right side.



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

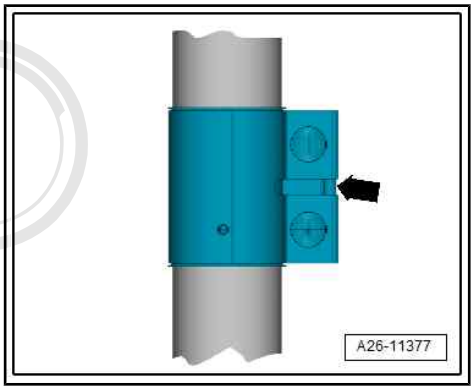
– Tie up drive shafts to rear.



Note

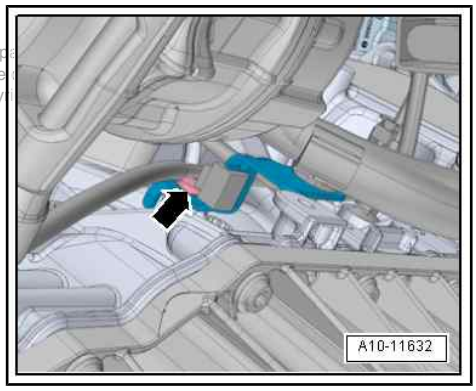
Take care not to damage the surface coating of the drive shaft.

– Loosen clamp -arrow- and push towards rear.
– Detach catalytic converter with front exhaust pipe.

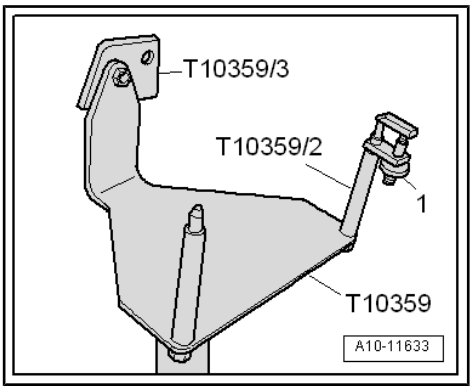


– Remove bolt -arrow- and push bracket for electrical wiring harness to one side.

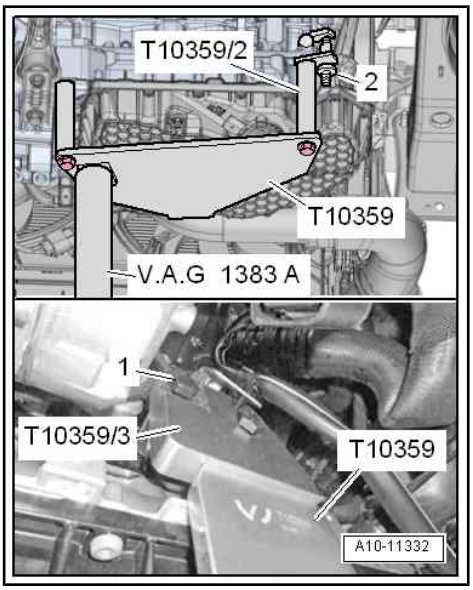
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– Secure adapter -T10359/3- to engine support - T10359- , as shown in illustration.
– Use locking element -1- from gearbox support - T10359/2- to secure pin -3282- to engine support.



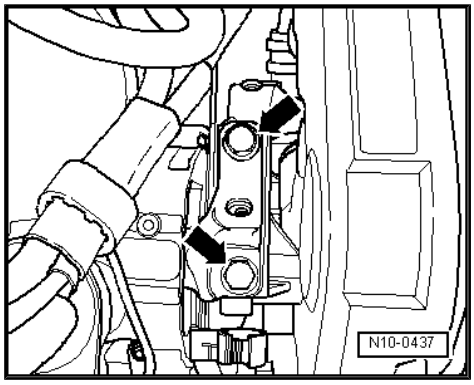
– Use bolt -1- to fix engine support - T10359- with 20 Nm to cylinder block and secure with locking element -1- from gearbox support - 3282- .
– Insert engine and gearbox jack - V.A.G 1383 A- in engine support -T10359- and raise engine/gearbox assembly slightly.



Note

To unscrew bolts for assembly mounting use stepladder - VAS 5085- .

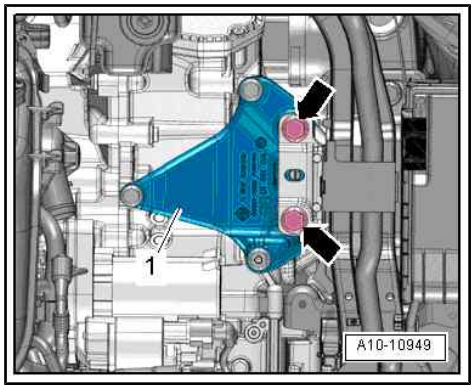
– Remove bolts -arrows- for engine mounting.



Note

The illustration shows a vehicle with dual clutch gearbox 0CW.

– Remove bolts -arrows- securing gearbox mounting.



Note

2 or 3 bolts depending on gearbox

Caution

Danger of damage to vacuum lines or electrical wiring and to engine compartment.

- ***Check that all vacuum lines and electrical wiring between engine, gearbox and body have been detached.***
- ***Carefully guide engine/gearbox assembly out of engine compartment when lowering.***

– Lower engine/gearbox assembly.

1.2 Separating engine and gearbox

⇒ “1.2.1 Separating engine and gearbox - vehicles with manual gearbox 02S”, page 20

⇒ “1.2.2 Separating engine and gearbox - vehicles with manual gearbox 02Q”, page 22

⇒ “1.2.3 Separating engine and gearbox - dual clutch gearbox 0CW”, page 24

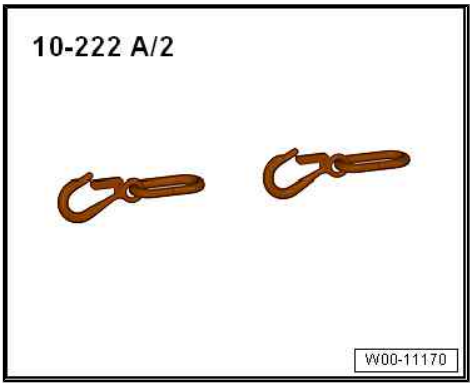
⇒ “1.2.4 Separating engine and gearbox - vehicles with dual clutch gearbox 0DE”, page 26

1.2.1 Separating engine and gearbox - vehicles with manual gearbox 02S

Special tools and workshop equipment required

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♦ Hooks - 10 - 222 A /2-



♦ Workshop hoist - VAS 6100-

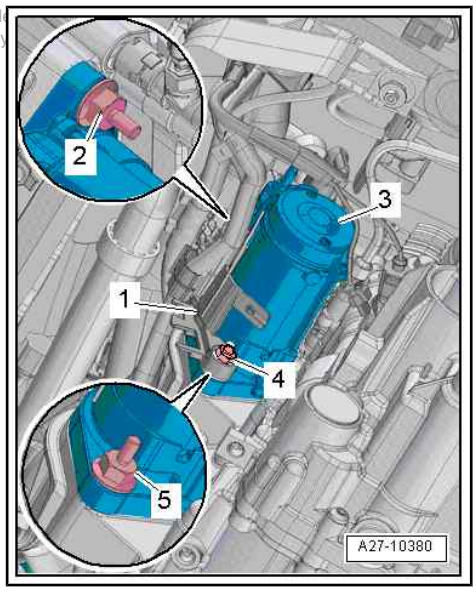


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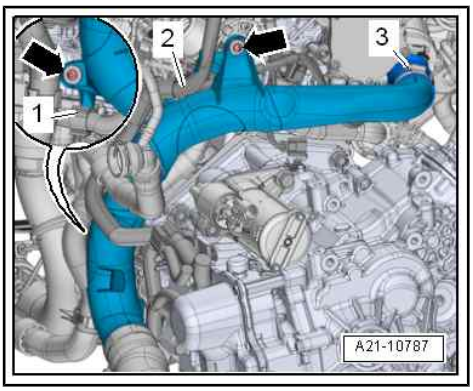
Procedure

- Engine/gearbox assembly removed and attached to engine bracket - T10359- .

– Remove starter ⇒ Electrical system; Rep. gr. 27 ; Starter; Removing and installing starter .



– Move electrical wiring harnesses -1, 2- clear at air pipe.
– Unfasten screw-type clip -3-.
– Unscrew bolts -arrows- and detach air pipe.

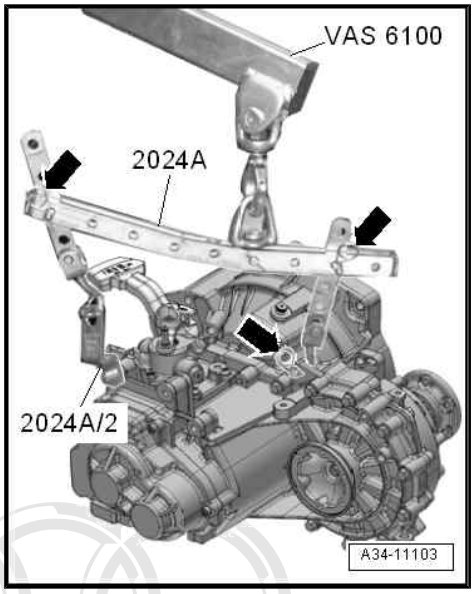


Note

Disregard -item 3-.

– If fitted, detach gearbox support from gearbox.

– Attach gearbox to workshop hoist - 2024 A- using lifting tackle - VAS 6100- , as shown in illustration.



Note

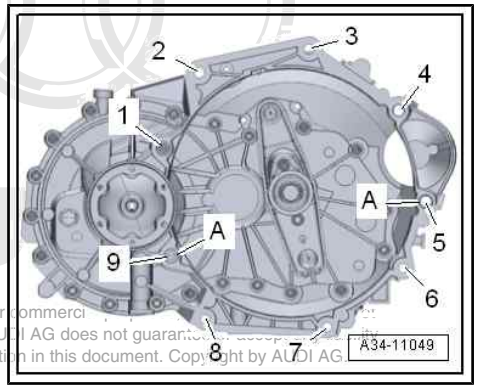
To adjust to the centre of gravity of the assembly, the perforated rails of the support hooks must be positioned as shown.

WARNING

Accident risk from loose components of lifting tackle.

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

– Remove bolts -1, 2, 3, 6, 7, 8, 9- securing gearbox to engine.



Note

Disregard -items 4 and 5- and -A-.

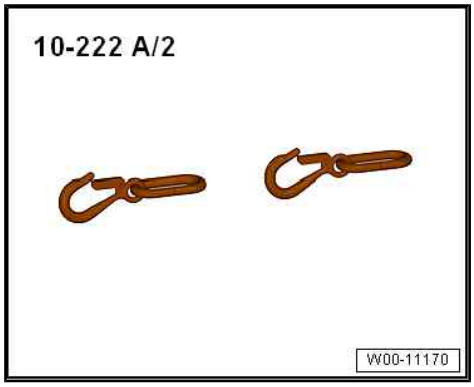
– Detach gearbox from engine.

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1.2.2 Separating engine and gearbox - vehicles with manual gearbox 02Q

Special tools and workshop equipment required

- Hooks - 10 - 222 A /2-



♦ Workshop hoist - VAS 6100-



♦ Lifting tackle - T40013-

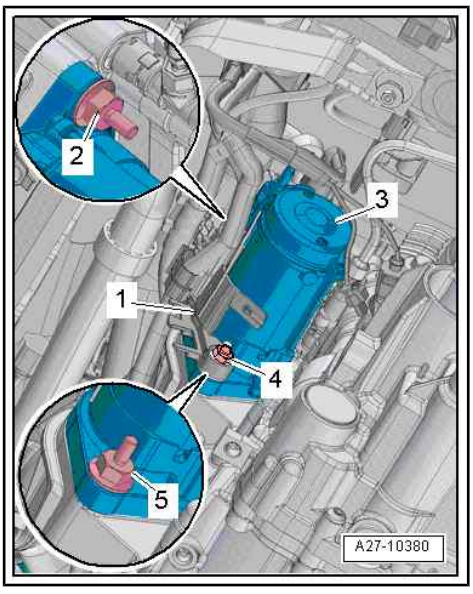


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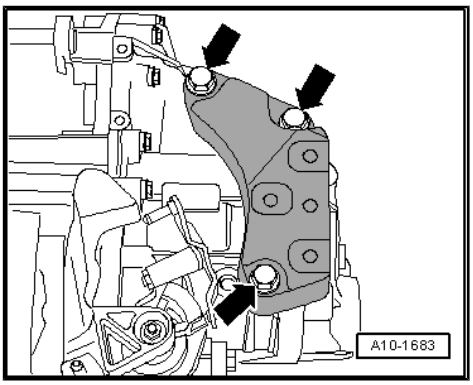
Procedure

- Engine/gearbox assembly removed and attached to engine bracket - T10497- .

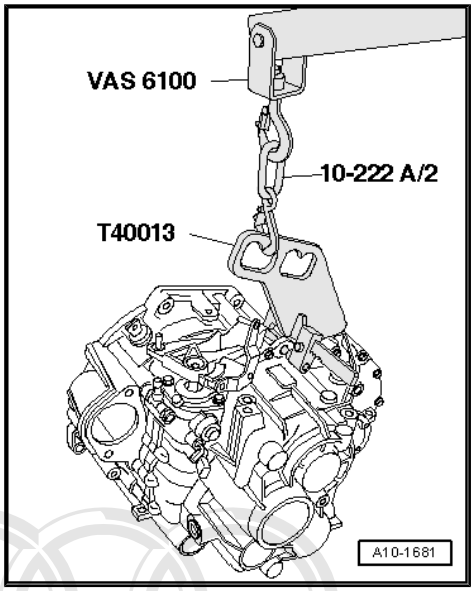
– Remove starter ⇒ Electrical system; Rep. gr. 27 ; Starter; Removing and installing starter .



– Unscrew bolts -arrows- and detach gearbox support.



– Attach lifting tackle - T40013- to gearbox and close lock.
– Attach workshop hoist - VAS 6100- with hooks - 10 - 222 A / 2- to the lifting tackle.

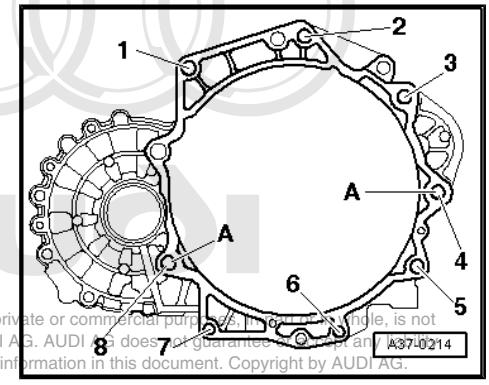


– Remove bolts -1, 2, 5, 6, 7, 8- securing gearbox to engine.

Note

Disregard -items 3 and 4- and -A-.

– Detach gearbox from engine (pay attention to intermediate plate).

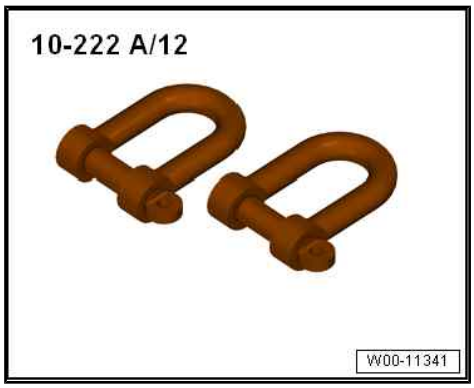


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1.2.3 Separating engine and gearbox - dual clutch gearbox 0CW

Special tools and workshop equipment required

- Shackle - 10 - 222 A /12-



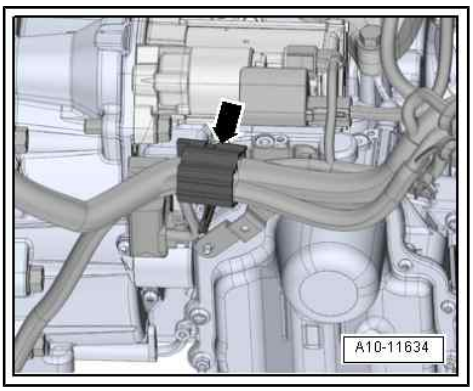
♦ Workshop hoist - VAS 6100-



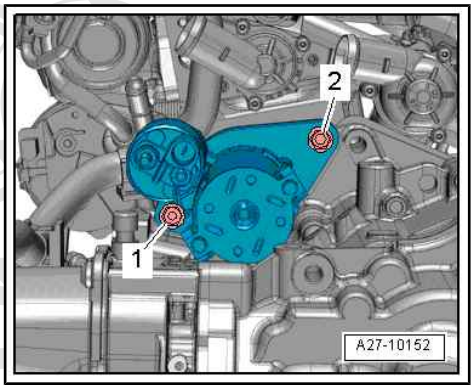
Procedure

- Engine/gearbox assembly removed and attached to engine bracket - T10359- .

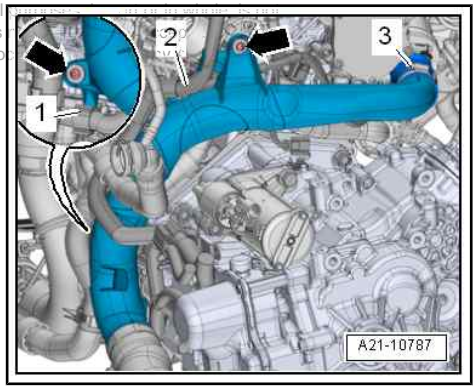
– Move electrical wiring clear at retainer -arrow-.



– Unscrew bolts -1 and 2- and detach starter from gearbox.



– Move electrical wiring harnesses -1, 2- clear at air pipe.
– Unfasten screw-type clip -3-.
– Unscrew bolts -arrows- and detach air pipe.

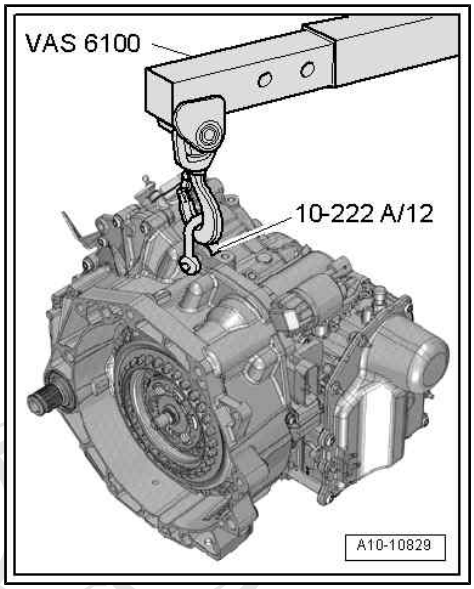


Note

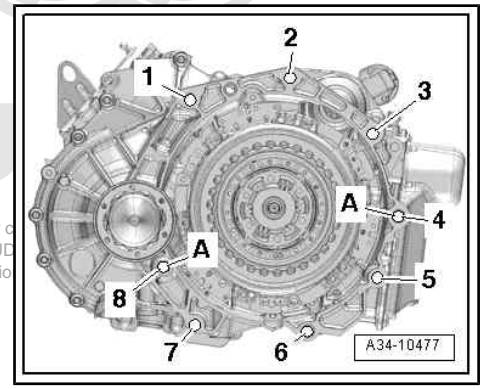
Disregard -item 3-.

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– Secure gearbox to workshop hoist - 10 - 222 A /12- using shackle - VAS 6100- .



– Remove bolts -1 ... 8- securing gearbox to engine.



Note

Disregard -item A-.

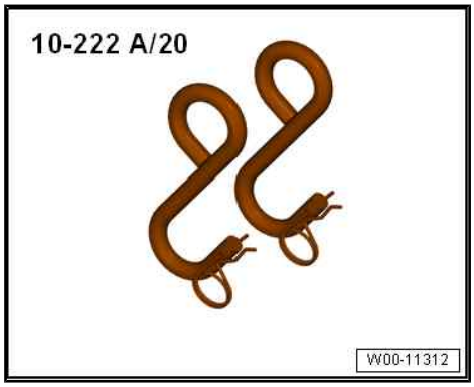
– Detach gearbox from engine.

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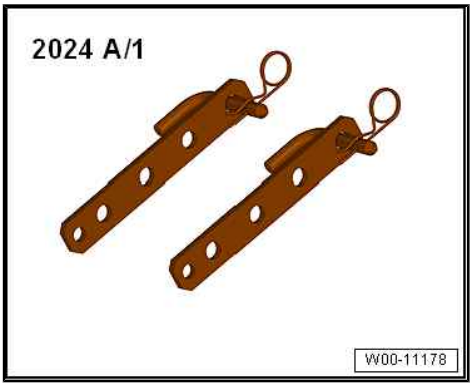
1.2.4 Separating engine and gearbox - vehicles with dual clutch gearbox 0DE

Special tools and workshop equipment required

♦ Adapter - 10 - 222 A /20-



♦ Hook -2024 A /1- of lifting tackle - 2024 A-

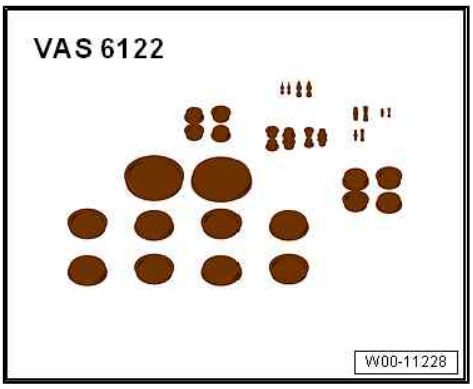


♦ Workshop hoist - VAS 6100-



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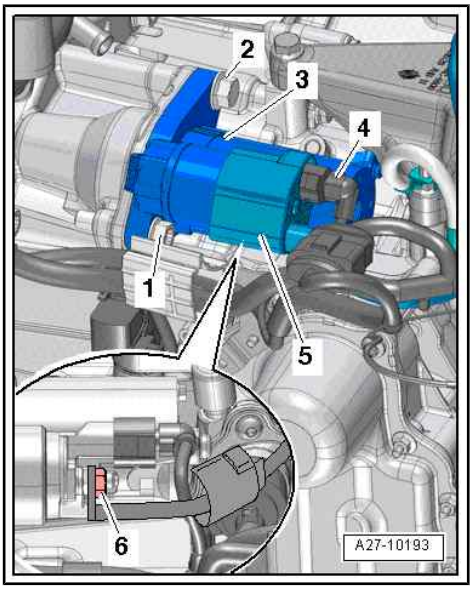
♦ Engine bung set - VAS 6122-



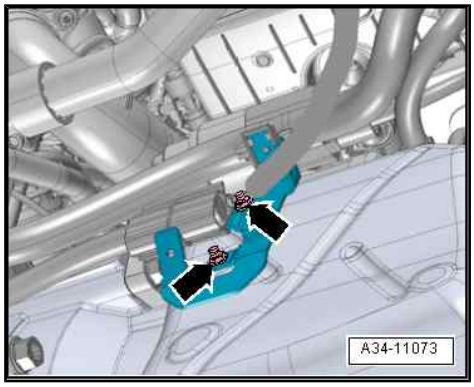
Procedure

- Engine/gearbox assembly removed and attached to engine bracket - T10497- .

– Remove starter ⇒ Electrical system; Rep. gr. 27 ; Starter; Removing and installing starter .



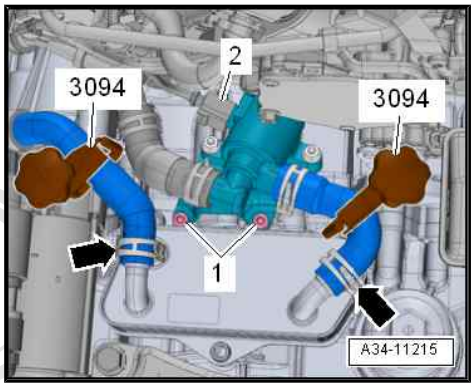
– Remove nuts -arrows- and detach bracket at front of oil pan.



Note

The studs are welded on to the front of the oil pan.

– Unplug electrical connector -2-.



Note

Place a cloth underneath to catch escaping coolant.

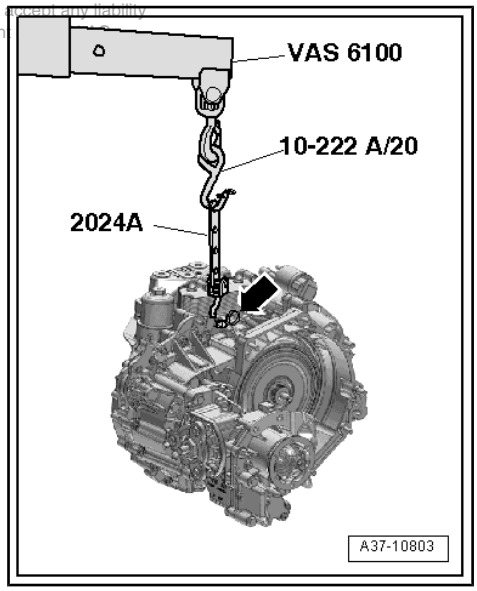
– Release hose clips -arrows- and detach coolant hoses from gear oil cooler.
– Remove bolts -1- and move coolant valve for gearbox - N488- clear to one side.
– Seal off open lines and connections with clean plugs from engine bung set - VAS 6122- .

Note

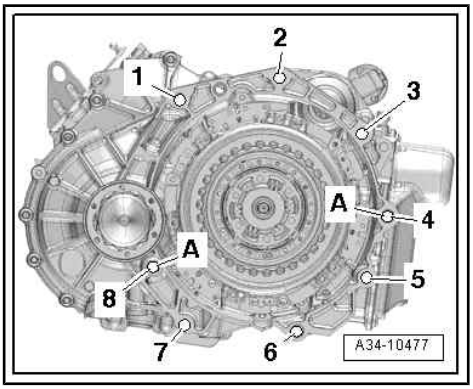
Ignore -3094- .

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– Engage hook of lifting tackle - 2024 A- in gearbox lifting eye and secure with locking pin -arrow-.
– Attach workshop hoist - VAS 6100- to hook -10 - 222 A /20- using adapter - 2024 A /1- .



– Remove bolts -1 ... 8- securing gearbox to engine.



Note

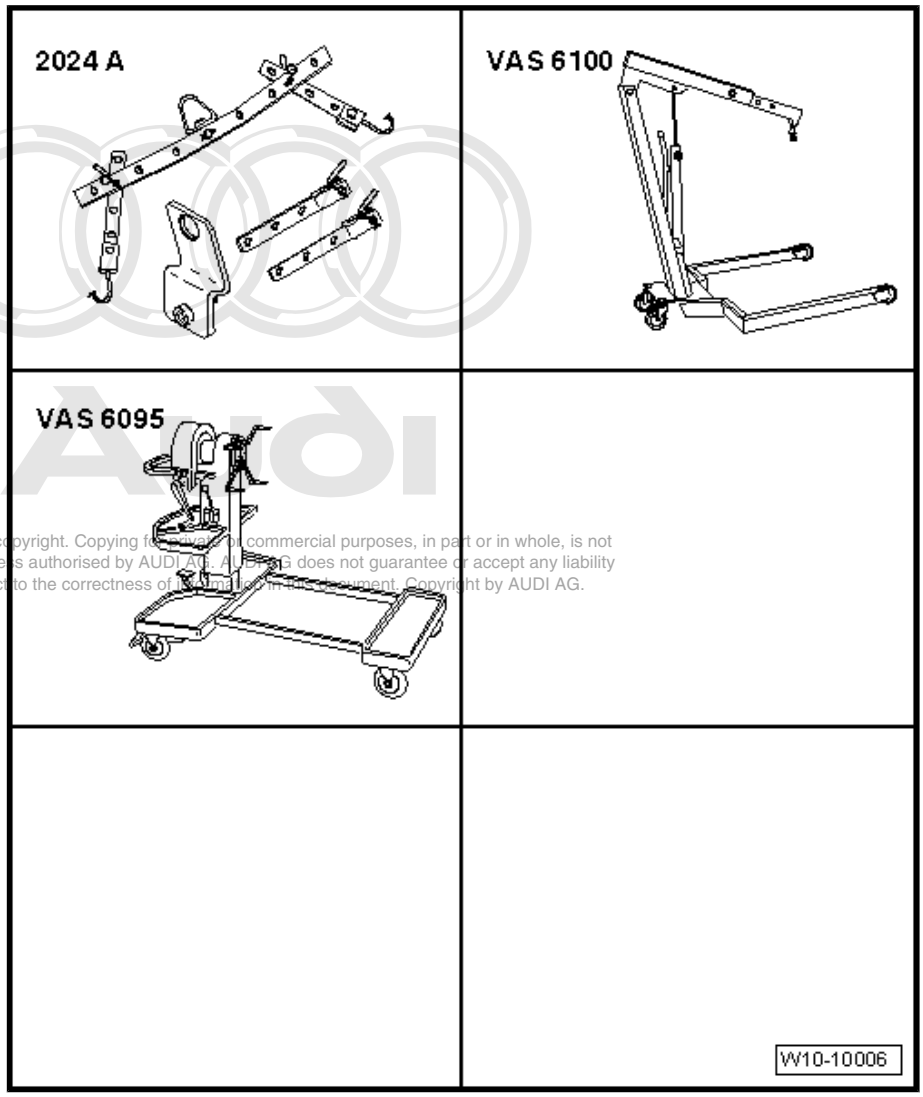
Disregard -item A-.

– Detach gearbox from engine.

1.3 Securing engine to engine and gearbox support

Special tools and workshop equipment required

- Lifting tackle - 2024 A-
- Workshop hoist - VAS 6100-
- Engine and gearbox support - VAS 6095-

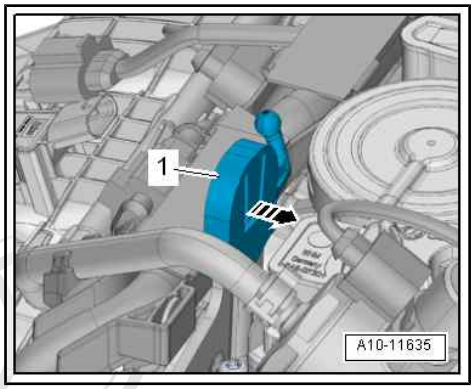


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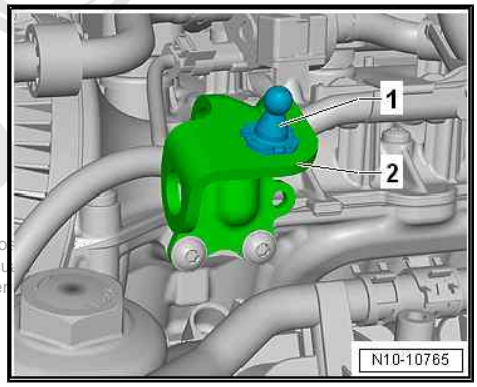
Procedure

- Gearbox detached from engine ⇒ page 20 .

– Release catch -arrow- and pull off mounting (left-side) -1- for engine cover panel.

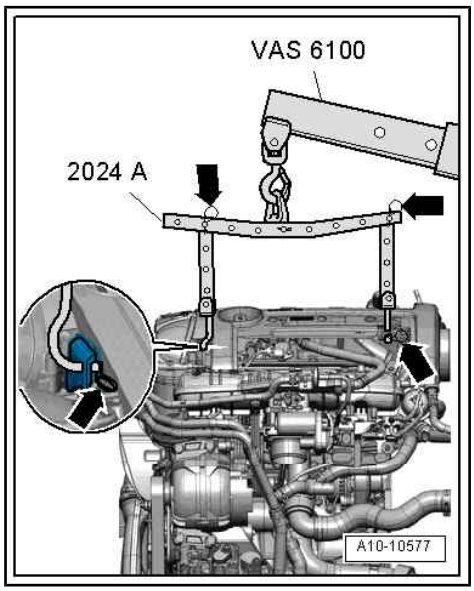


– Unclip mounting (right-side) -1- for engine cover panel.



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– Engage lifting tackle - 2024 A- on engine and workshop hoist - VAS 6100- .



Note

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

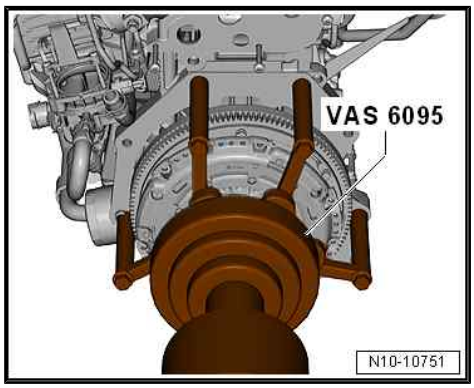
WARNING

Accident risk from loose components of lifting tackle.

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

– Lift engine off engine and gearbox jack - V.A.G 1383 A- using workshop hoist - VAS 6100- .

– Secure engine to engine and gearbox support - VAS 6095- (gearbox end) as shown in illustration.



1.4 Installing engine

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 degreased parts.*
- *Tolerance for tightening torques: ± 15 %.*

Component		Nm
Bolts/nuts	M6	10
	M7	15
	M8	20
	M10	40
	M12	65

- Assembly mountings
  ⇒ “2.1 Exploded view - assembly mountings”, page 35
- 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

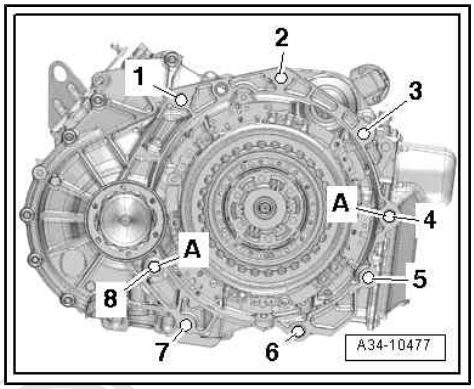
- *Renew bolts tightened with specified tightening angle.*
- *Renew self-locking nuts and bolts as well as seals, gaskets and O-rings.*
- *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- *Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .*
- *Re-install all cable ties in the same locations when installing.*

– Install intermediate plate ⇒ page 64 .

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Note

The illustration shows a vehicle with a dual clutch gearbox.



– If not already fitted, install dowel sleeves -A- for centring engine and gearbox in cylinder block.

Vehicles with manual gearbox:

– Renew needle bearing in crankshaft if fitted ⇒ page 71 .

– Renew clutch release bearing if worn ⇒ Rep. gr. 30 ; Clutch mechanism; Exploded view - clutch release mechanism .

– Lubricate splines of gearbox input shaft lightly with grease ⇒ Electronic parts catalogue (ETKA) .

– Make sure that clutch plate is properly centred.

Vehicles with dual clutch gearbox:

– Install needle bearing if not fitted in crankshaft ⇒ page 71 .

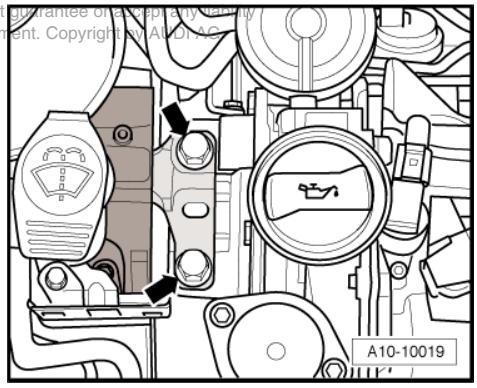
– Secure gearbox to engine.

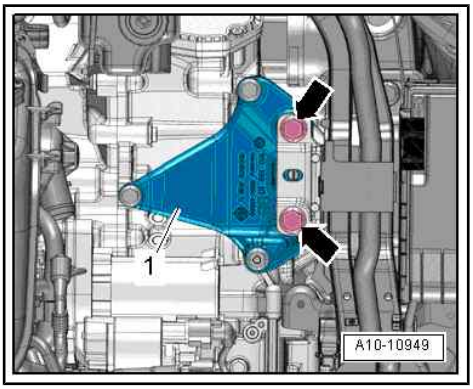
– Install starter ⇒ Electrical system; Rep. gr. 27 ; Starter; Removing and installing starter .

– Guide engine/gearbox assembly into body.

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– Initially screw in bolts -arrows- for engine mounting by hand until they make contact.





Note

The illustration shows a vehicle with dual clutch gearbox 0CW.

– Initially screw in bolts -arrows- for gearbox mounting -1- by hand until they make contact.

Note

The bolts are tightened to final torque only after adjusting the assembly mountings ⇒ page 35 .

– Remove engine bracket - T10359- from engine.

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

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Vehicles with manual gearbox:

– Install cables with cable support bracket ⇒ Rep. gr. 34 ; Selector mechanism; Exploded view - selector cables .

Vehicles with manual gearbox 02S:

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

Vehicles with manual gearbox 02Q:

– Attach pipe/hose assembly to bleeder connection ⇒ Rep. gr. 30 ; Clutch mechanism; Removing and installing lines for clutch hydraulics .

Vehicles with dual clutch gearbox:

– Install and adjust selector lever cable ⇒ Rep. gr. 34 ; Selector mechanism; Exploded view - selector mechanism .

Continued for all vehicles:

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

– Install poly V-belt ⇒ page 53 .

– Adjust assembly mountings ⇒ page 47 .

– Install battery tray ⇒ Electrical system; Rep. gr. 27 ; Battery; Exploded view - battery .

– Electrical connections and routing ⇒ Electrical system; Rep. gr. 97 ; Relay carriers, fuse carriers, electronics boxes; Overview of fitting locations - relay carriers, fuse carriers, electronics boxes and ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.

– Install air cleaner housing ⇒ page 264 .

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

– Install engine cover panel ⇒ page 50 .

– Check oil level ⇒ Maintenance ; Booklet 821 .

Caution

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

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

– Connect coolant hoses with plug-in connectors to heat exchanger for heater ⇒ page 231 .

– Fill up with coolant ⇒ page 200 .

Note

Do not reuse coolant.

– Install subframe ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Removing and installing subframe without steering rack .

– After renewing engine, chain elongation must be adapted. To do so, select `01 - Chain elongation adaption diagnosis` in `Guided Functions` mode of ⇒ Vehicle diagnostic tester.

– After renewing engine, misfire adaptions must be reset. To do so, select `01 - Reset adaptions misfires` in `Guided Functions` mode of ⇒ Vehicle diagnostic tester.

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2 Assembly mountings

⇒ “2.1 Exploded view - assembly mountings”, page 35

⇒ “2.2 Removing and installing engine mountings”, page 38

⇒ “2.3 Removing and installing gearbox mounting”, page 42

⇒ “2.4 Removing and installing pendulum support”, page 44

⇒ “2.5 Supporting engine in installation position”, page 45

⇒ “2.6 Adjusting assembly mountings”, page 47

⇒ “2.7 Checking adjustment of assembly mountings (engine/ gearbox mountings)”, page 49

2.1 Exploded view - assembly mountings

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⇒ “2.1.1 Exploded view - assembly mountings, vehicles with manual gearbox 02S”, page 35

⇒ “2.1.2 Exploded view - assembly mountings, vehicles with manual gearbox 02Q or dual clutch gearbox 0CW/0D9”, page 37

2.1.1 Exploded view - assembly mountings, vehicles with manual gearbox 02S

1 - Engine support
- ❑ Removing and installing ⇒ page 62

2 - Bolt
- ❑ Renew after removing
- ❑ Tightening torque and sequence ⇒ page 36

3 - Engine mounting
- ❑ With support arm
- ❑ Removing and installing ⇒ page 38

4 - Bolt
- ❑ Renew after removing
- ❑ 40 Nm +90°

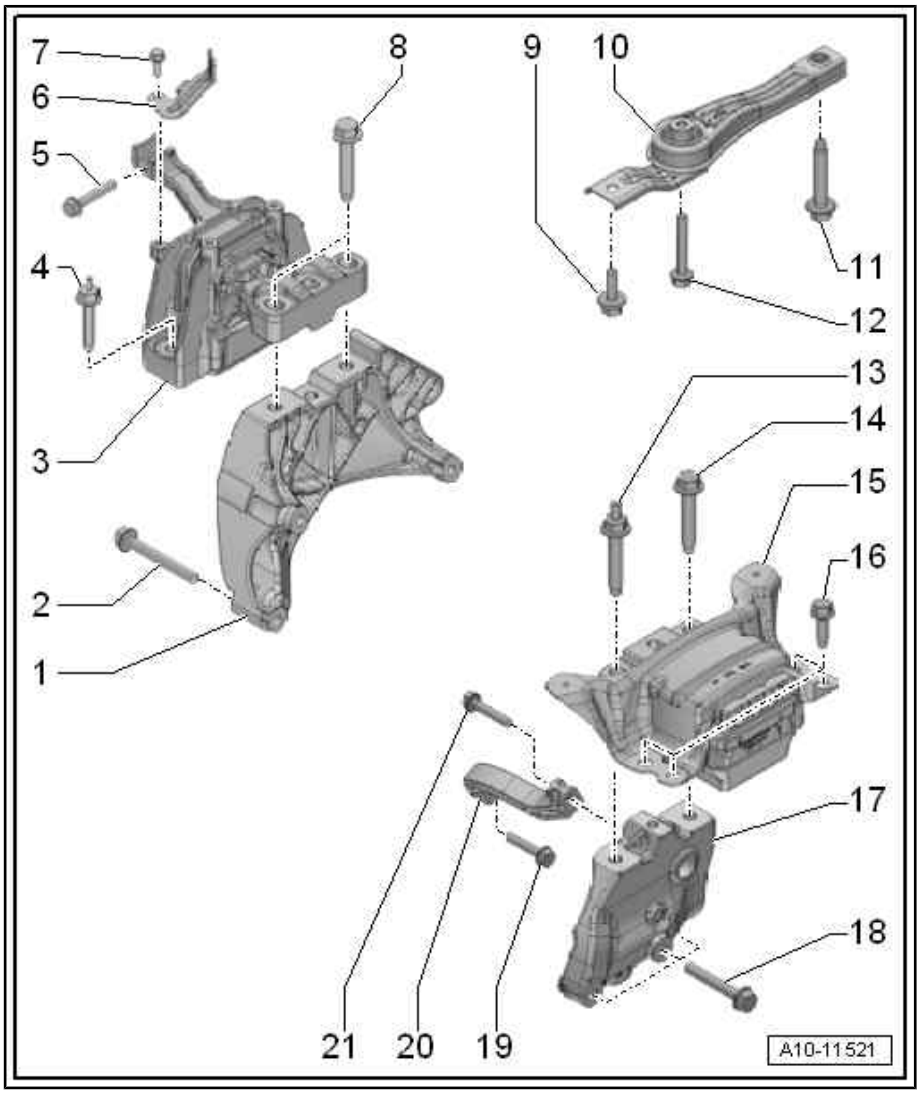
5 - Bolt
- ❑ Renew after removing
- ❑ 20 Nm +90°

6 - Bracket
- ❑ For non-return valve for coolant

7 - Bolt
- ❑ 8 Nm

8 - Bolt
- ❑ Renew after removing
- ❑ 60 Nm +90°

9 - Bolt
- ❑ Renew after removing
- ❑ Tightening torque and sequence ⇒ page 37



10 - Pendulum support

- ❑ Removing and installing ⇒ page 44

11 - Bolt

- ❑ Renew after removing
- ❑ Tightening torque and sequence ⇒ page 37

12 - Bolt

- ❑ Renew after removing
- ❑ Tightening torque and sequence ⇒ page 37

13 - Bolt

- ❑ Renew
- ❑ 60 Nm +90°

14 - Bolt

- ❑ Renew
- ❑ 60 Nm +90°

15 - Gearbox mounting

- ❑ With support arm
- ❑ Removing and installing ⇒ page 42

16 - Bolt

- ❑ Renew after removing
- ❑ 50 Nm +90°

17 - Gearbox support

18 - Bolt

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

19 - Bolt

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

20 - Support

21 - Bolt

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

Engine support - tightening torque and sequence

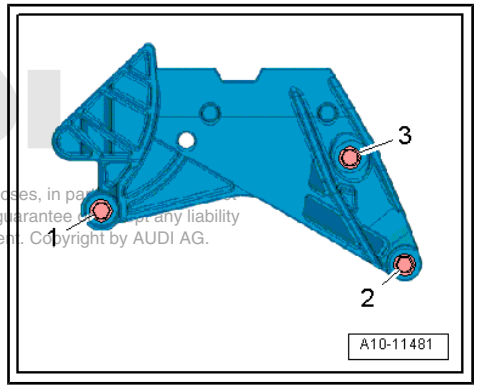
Note

Renew bolts tightened with specified tightening angle.

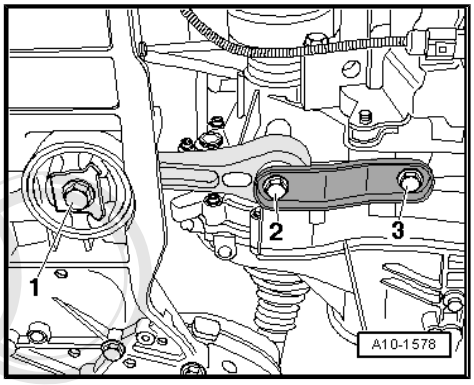
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– Tighten bolts in stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1	-1 … 3-	7 Nm
2	-1 … 3-	40 Nm
3	-1 … 3-	Turn 90° further



Installing pendulum support



Note

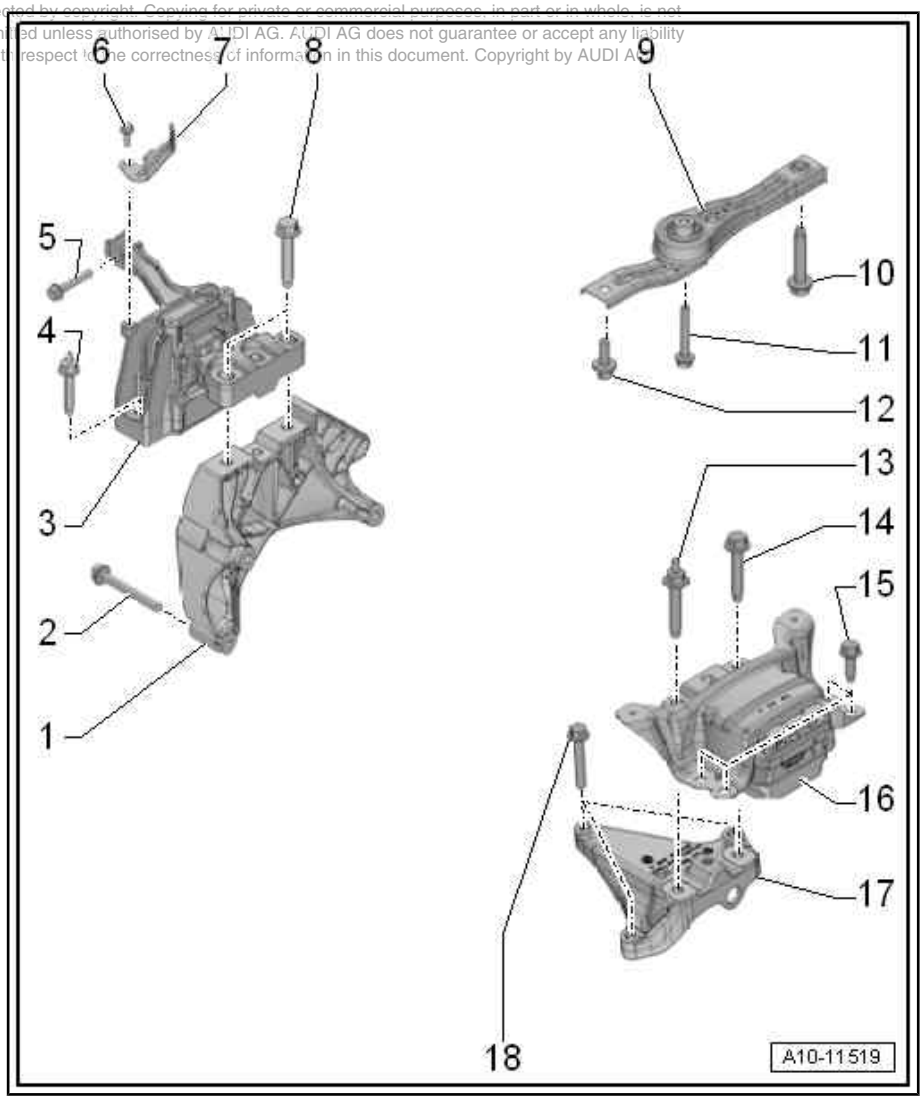
Renew bolts tightened with specified tightening angle.

– Tighten bolts in stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1	-2, 3-	50 Nm
2	-1-	130 Nm
3	-1 … 3-	Turn 90° further

2.1.2 Exploded view - assembly mountings, vehicles with manual gearbox 02Q or dual clutch gearbox 0CW/0D9

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1 - Engine support
- ❑ Removing and installing ⇒ page 62

2 - Bolt
- ❑ Renew after removing
- ❑ Tightening torque and sequence ⇒ page 36

3 - Engine mounting
- ❑ With support arm
- ❑ Removing and installing ⇒ page 38

4 - Bolt
- ❑ Renew after removing
- ❑ 40 Nm +90°

5 - Bolt
- ❑ Renew after removing
- ❑ 20 Nm +90°

6 - Bolt
- ❑ 8 Nm

7 - Bracket

8 - Bolt
- ❑ Renew after removing
- ❑ 60 Nm +90°

9 - Pendulum support
- ❑ Different versions available; for allocation refer to ⇒ Electronic parts catalogue
- ❑ Removing and installing ⇒ page 44

10 - Bolt
- ❑ Renew after removing
- ❑ Tightening torque and sequence ⇒ page 37

11 - Bolt

- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 37

12 - Bolt

- ❑ Renew after removing
- ❑ Tightening torque and sequence ⇒ page 37

13 - Bolt

- ❑ Renew after removing
- ❑ 60 Nm +90°

14 - Bolt

- ❑ Renew after removing
- ❑ 60 Nm +90°

15 - Bolt

- ❑ Renew after removing
- ❑ 50 Nm +90°

16 - Gearbox mounting

- ❑ With support arm
- ❑ Removing and installing ⇒ page 42

17 - Gearbox support

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

18 - Bolt

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

2.2 Removing and installing engine mountings

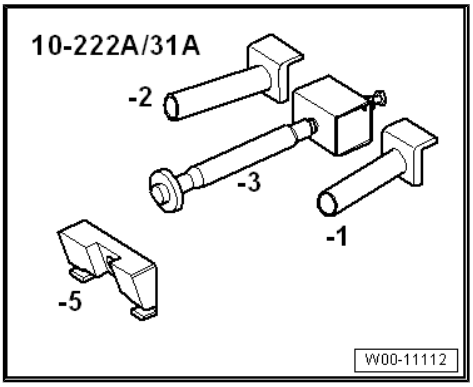
Special tools and workshop equipment required

♦ Support bracket - 10 - 222 A-

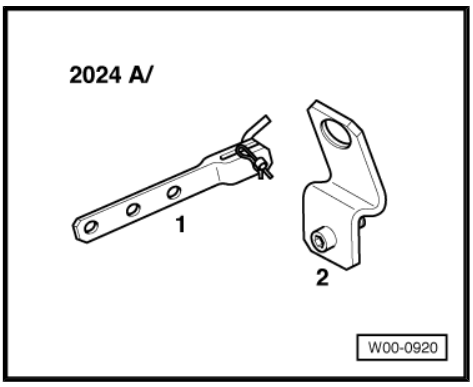


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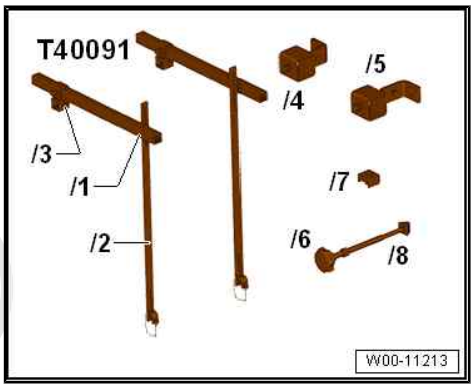
- Support bracket - 10 - 222 A /31-



- Lug -2024 A/2- from lifting tackle - 2024 A-



- Engine support basic set - T40091-



- -T40093/3-5- from engine support supplementary set - T40093-



- Flange nut M10 or nut M10 with washer

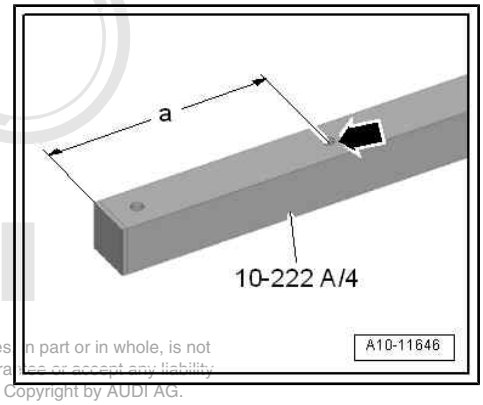
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Preparing tool

– If adapter -10 - 222 A /4- does not yet have hole (marked with -arrow-), hole must now be drilled into adapter.

• Dimension -a- = 225 mm

• Hole ∅ = 12.5 mm

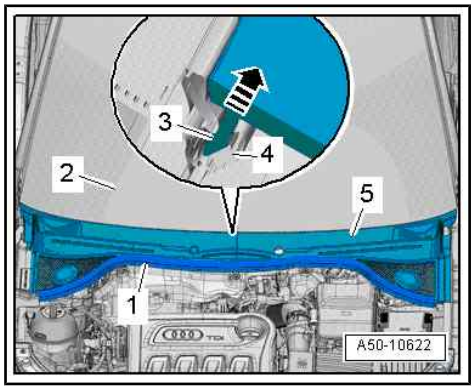


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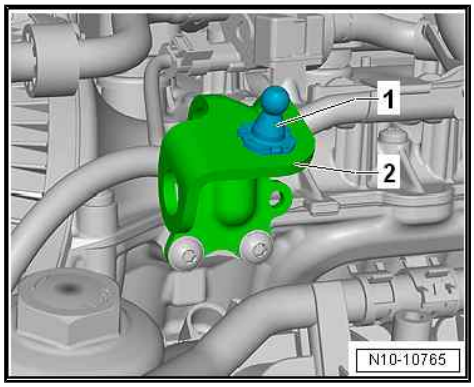
Removing

– Remove plenum chamber cover -5- ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .

– Remove engine cover panel ⇒ page 50 .



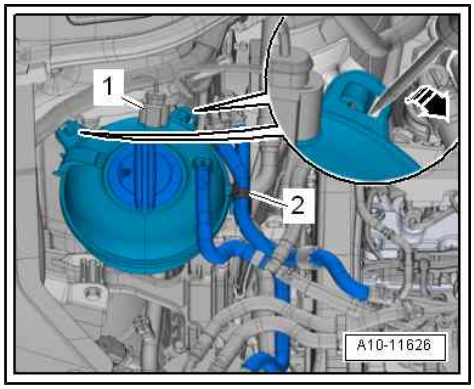
– Unclip mounting (right-side) -1- for engine cover panel from bracket -2-.



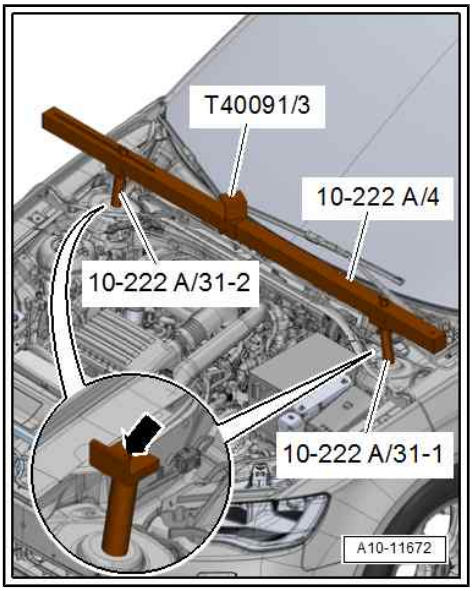
– Unplug electrical connector -1-.

– Move clear hose -2- from activated charcoal filter.

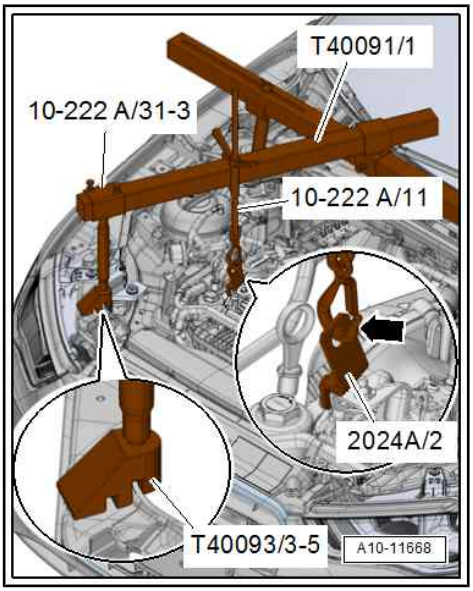
– Using a screwdriver, release fasteners -arrow- and move coolant expansion tank to one side.



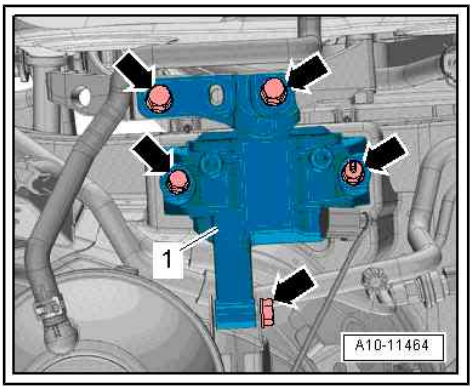
– Detach cover caps on bolted connections for suspension struts (front).
– Position -10 - 222 A /31-1- and -10 - 222 A /31-2- on mountings for suspension struts.
• The projections -arrow- point in direction of travel.
– Fit adapter -10 - 222 A /4- with -T40091/3- , as shown in illustration.



– Secure lug -2024 A/2- to right engine lifting eye using flange nut M10 or nut M10 with washer.
– Set up further tools on right side of engine compartment as shown in illustration.
– Attach hook of spindle - 10 - 222 A /11- to engine lifting eye (right-side).
– Tighten spindle slightly to take up weight of engine/gearbox assembly; do not lift.



– Remove bolts -arrows- and detach engine mounting -1-.



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Installing

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

– Check adjustment of assembly mountings (engine/gearbox mountings) ⇒ page 49 .
– 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 .

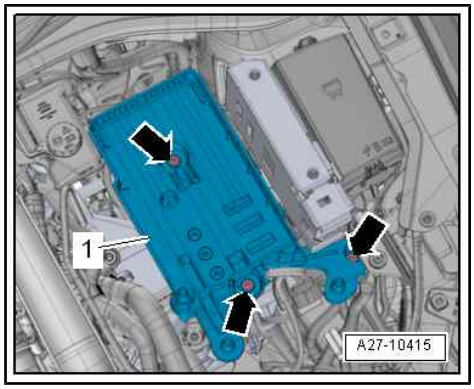
Tightening torques

♦ ⇒ “2.1 Exploded view - assembly mountings”, page 35

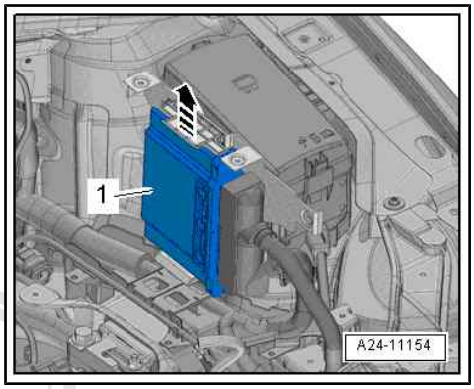
2.3 Removing and installing gearbox mounting

Removing

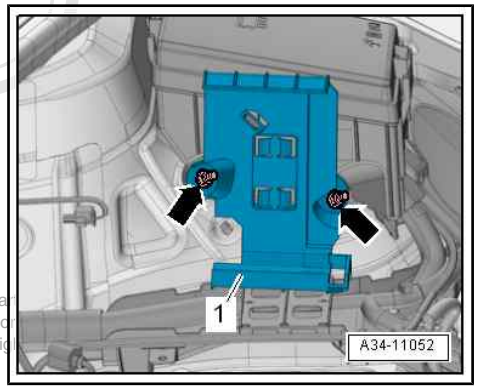
– Remove battery tray -1- ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery tray .



– Take engine control unit - J623- out of bracket ⇒ page 282 .



– Remove nuts -arrows- and detach bracket -1-.

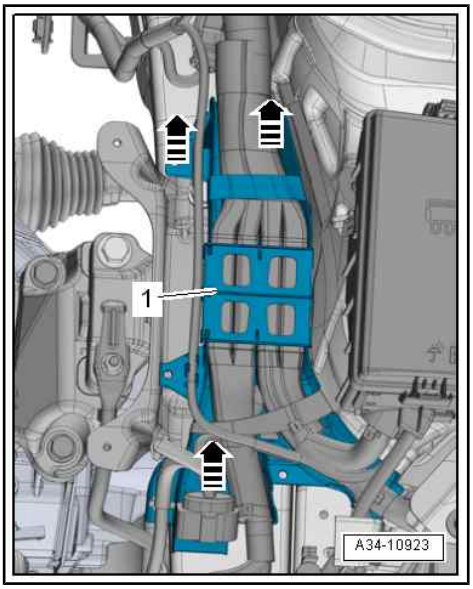


Note

Different types of brackets are fitted depending on version.

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– Unclip wire guide -1- upwards -arrows- and push slightly to one side.

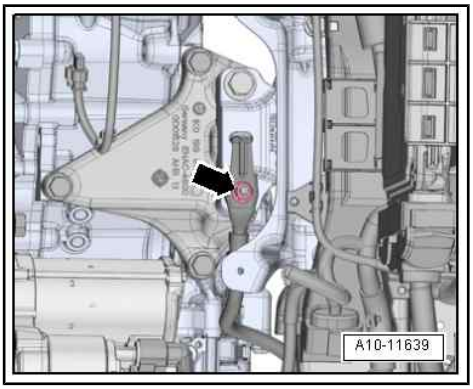


Note

The illustration shows a vehicle with dual clutch gearbox 0CW.

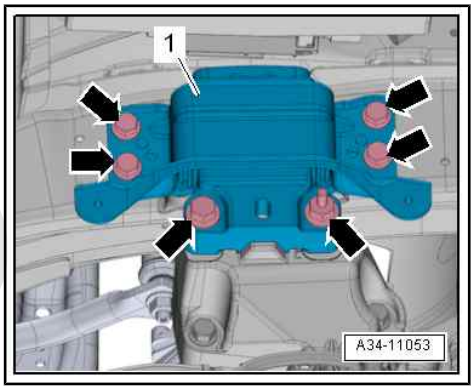
– If fitted, remove nut -arrow- and move earth wire clear.

– Support engine in installation position ⇒ page 45 .



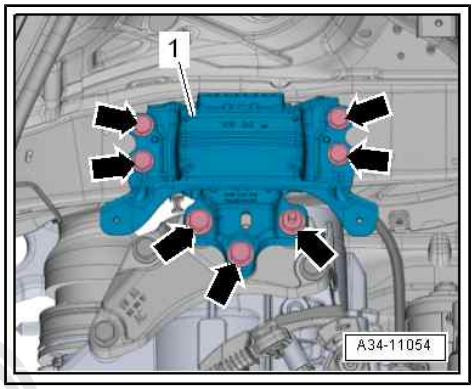
– Remove bolts -arrows- and detach gearbox mounting.

♦ Gearbox mounting -1- for manual gearbox 02S/dual clutch gearbox 0CW



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- Gearbox mounting -1- for manual gearbox 02Q/dual clutch gearbox 0D9



Installing

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

Note

Renew bolts tightened with specified tightening angle.

– Tighten gearbox mounting on longitudinal member.

Caution

Bolts must be fitted straight to avoid damage to threads in gearbox support.

- ***Gearbox support and support arm of gearbox mounting must be perfectly parallel to each other before screwing in bolts. If necessary, lift gearbox at rear using trolley jack.***
- ***Only remove support bracket - 10 - 222 A- when bolts on assembly mounting have been tightened to specified torque.***

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– Lift gearbox with spindle of support bracket until gearbox support makes contact with support arm of gearbox mounting.

– Check adjustment of assembly mountings (engine/gearbox mountings) ⇒ page 49 .

– Detach support bracket - 10 - 222 A- from engine.

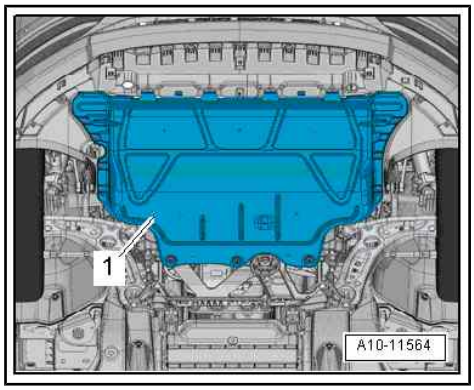
Tightening torques

- ⇒ “2.1 Exploded view - assembly mountings”, page 35
- ⇒ Electrical system; Rep. gr. 27 ; Battery; Exploded view - battery

2.4 Removing and installing pendulum support

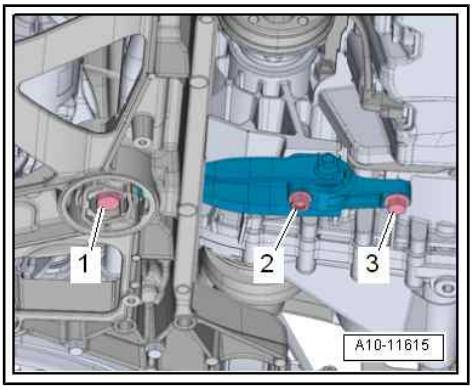
Removing

– Remove noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .



Note

The illustration shows a vehicle with dual clutch gearbox 0D9.



– Remove bolts -1, 2, 3- and remove pendulum support.

Installing

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

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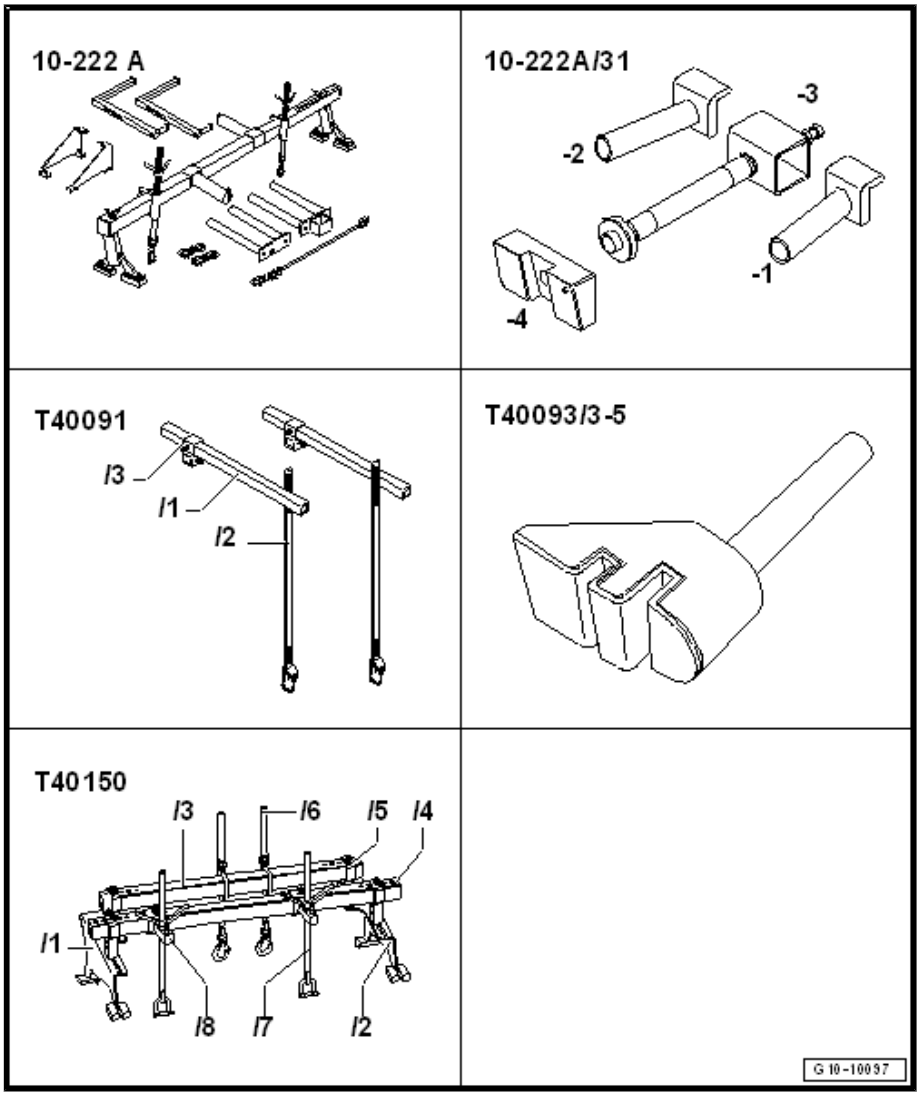
Tightening torques

- ⇒ Fig. ""Installing pendulum support"" , page 37 .
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

2.5 Supporting engine in installation position

Special tools and workshop equipment required

- Support bracket - 10 - 222 A-
- Support bracket - 10 - 222 A /31-
- -T40091/3- from engine support basic set - T40091-
- -T40093/3-5- from engine support supplementary set - T40093-
- -T40150/4- from support bracket - T40150-

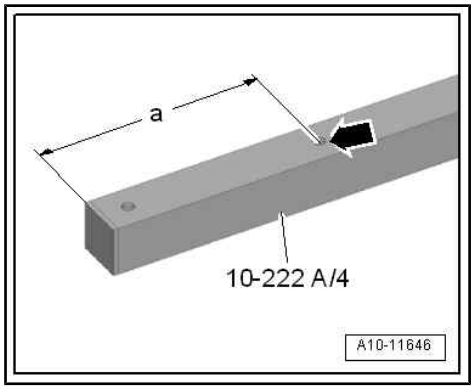


Preparing tool

– If adapter -10 - 222 A /4- does not yet have hole (marked with -arrow-), hole must now be drilled into adapter.

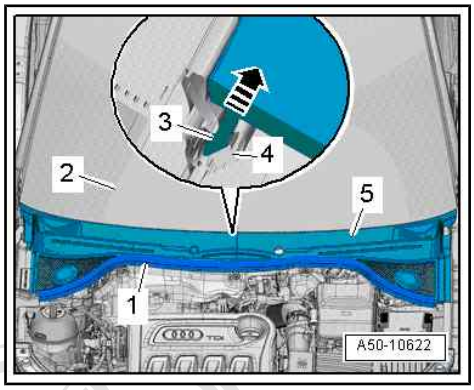
• Dimension -a- = 225 mm

• Hole ∅ = 12.5 mm



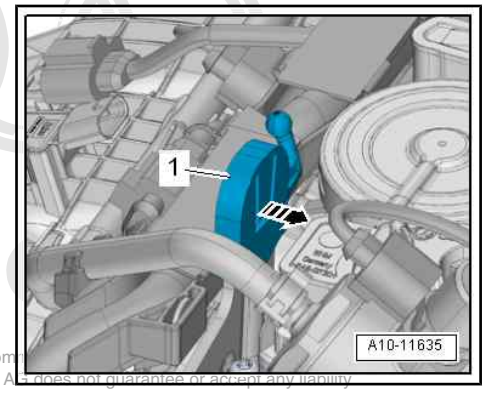
Procedure

– Remove plenum chamber cover -5- ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .



– Remove engine cover panel ⇒ page 50 .

– Release catch -arrow- and pull off mounting -1- for engine cover panel.



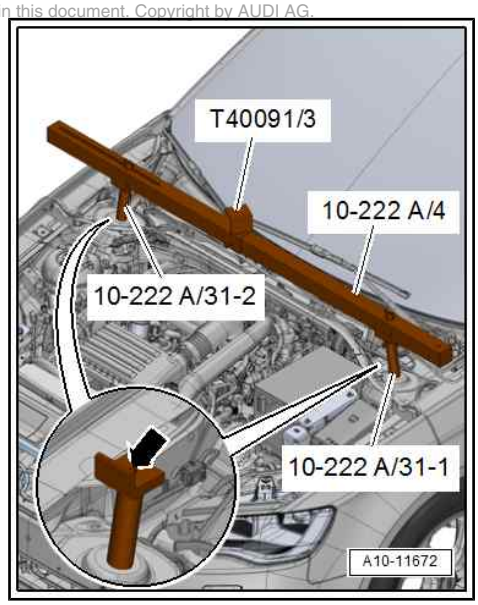
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– Detach cover caps on bolted connections for suspension struts (front).

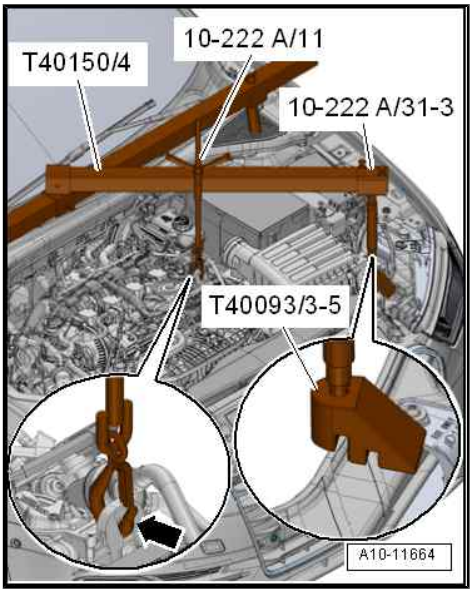
– Position -10 - 222 A /31-1- and -10 - 222 A /31-2- on mountings for suspension struts.

• The projections -arrow- point in direction of travel.

– Fit adapter -10 - 222 A /4- with -T40091/3- , as shown in illustration.



– Set up further tools on left side of engine compartment as shown in illustration.
– Attach hook of spindles - 10 - 222 A /11- to engine lifting eye (left-side) -arrow-.
– Tighten spindle slightly to take up weight of engine/gearbox assembly; do not lift.



Assembling

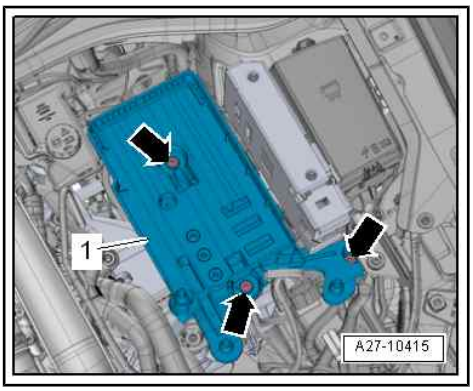
Installation is carried out in the reverse order; note the following:

– Install plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .
– Install engine cover panel ⇒ page 50 .

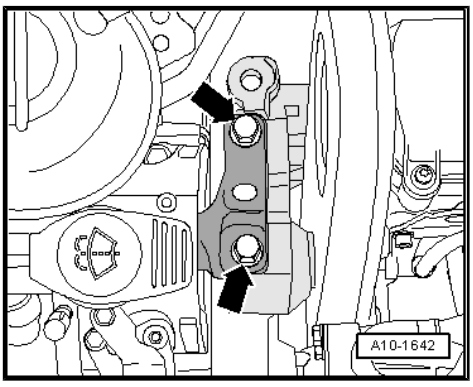
2.6 Adjusting assembly mountings

Procedure

– Remove battery tray -1- ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery tray .
– Support engine in installation position ⇒ page 45 .



– Remove bolts -arrows- for engine mounting one by one and renew (if they were not renewed when installing engine).
– Initially fit bolts hand-tight.

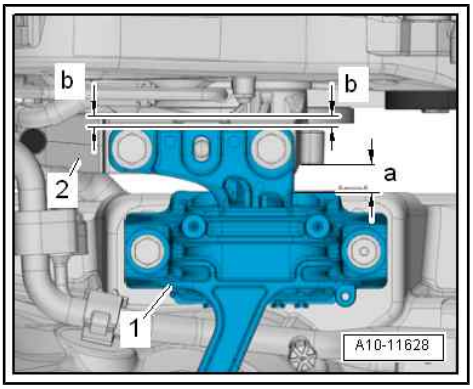


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– Using assembly lever, adjust engine/gearbox assembly until specifications listed below are attained:

- There must be a distance of -a- = 10 mm between engine support -2- and engine mounting -1-.
- Side surface of the engine support casting should be located parallel to support arm of engine mounting.
- Distance -b- = distance -b-.

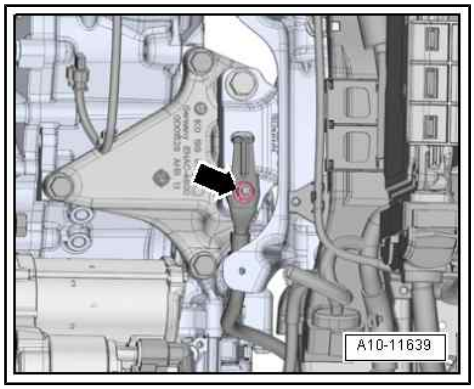
– Tighten bolts for engine mounting.



Note

The illustration shows a vehicle with dual clutch gearbox 0CW.

– Remove nut -arrow- and move earth wire clear.

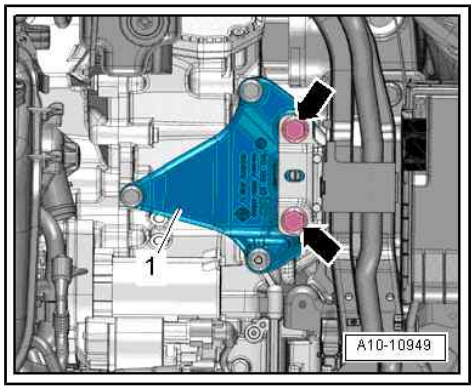


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Note

The illustration shows a gearbox mounting with two bolts.

– Remove bolts -arrows- for gearbox mounting -1- one by one and renew (if they were not renewed when installing engine).
– Initially fit bolts hand-tight.

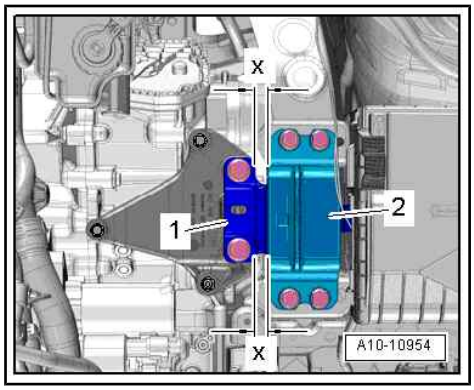


Note

The illustration shows a vehicle with a dual clutch gearbox.

– Ensure that edges of support arm (on gearbox side) -1- and gearbox mounting -2- are parallel.
• Dimension -x- = dimension -x-.
– Tighten bolts for gearbox mounting.

Install in reverse sequence.



Tightening torques

♦ ⇒ “2.1 Exploded view - assembly mountings”, page 35

♦ ⇒ Electrical system; Rep. gr. 27 ; Battery; Exploded view - battery

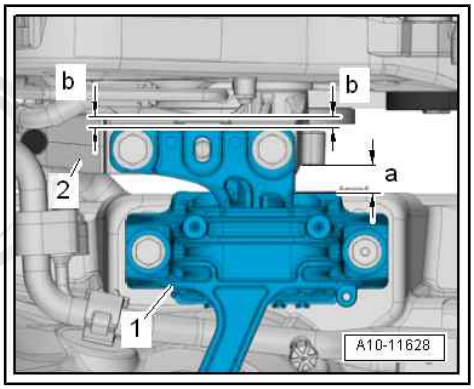
2.7 Checking adjustment of assembly mountings (engine/gearbox mountings)

Procedure

The following specifications must be obtained:

- There must be a distance of -a- = 10 mm between engine support -2- and engine mounting -1-.
- Side surface of the engine support casting should be located parallel to support arm of engine mounting.
- Distance -b- = distance -b-.

– If the distance measured is too large or small, the assembly mountings must be adjusted ⇒ page 47 .



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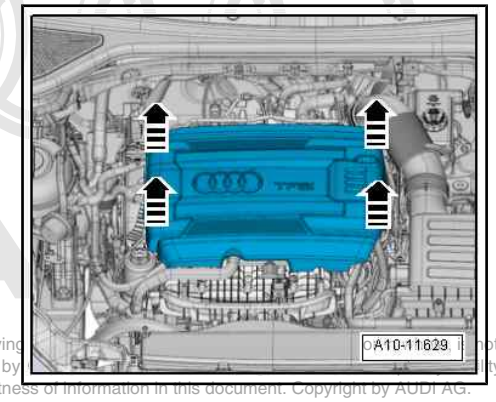
3 Engine cover panel

⇒ “3.1 Removing and installing engine cover panel”, page 50

3.1 Removing and installing engine cover panel

Removing

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



Installing

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

– Position engine cover panel, paying attention to oil filler neck and dipstick.

– Press engine cover panel into rubber grommets first on left side, then on right side.

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13 – Crankshaft group

1 Cylinder block (pulley end)

⇒ "1.1 Exploded view - cylinder block (pulley end)", page 51

⇒ "1.2 Removing and installing poly V-belt", page 53

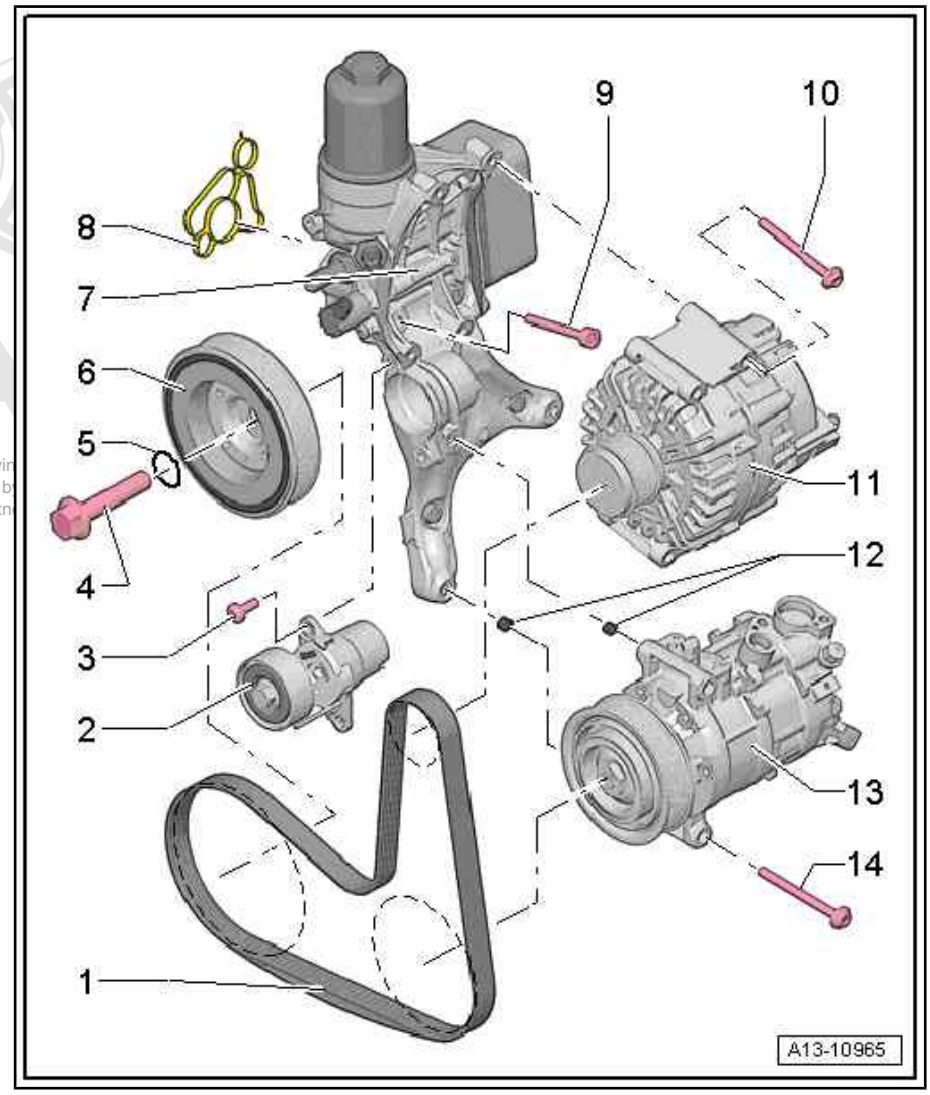
⇒ "1.3 Removing and installing tensioner for poly V-belt", page 54

⇒ "1.4 Removing and installing vibration damper", page 54

⇒ "1.5 Removing and installing bracket for ancillaries", page 60

⇒ "1.6 Removing and installing engine support", page 62

1.1 Exploded view - cylinder block (pulley end)



1 - Poly V-belt

- ❑ Check for wear
- ❑ Do not kink
- ❑ Routing of poly V-belt ⇒ page 52
- ❑ Removing and installing ⇒ page 53
- ❑ When installing, make sure it is properly seated on pulleys.

2 - Tensioner for poly V-belt

- ❑ Lock in position with locking pin - T10060 A- .
- ❑ Removing and installing ⇒ page 54

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3 - Bolt

- ❑ Renew after removing
- ❑ 8 Nm +45°

4 - Bolt

- ❑ Use counterhold tool - T10355- when loosening and tightening
- ❑ Lubricate O-ring with oil
- ❑ Renew after removing
- ❑ 150 Nm + turn 90° further

5 - O-ring

- ❑ Not available as replacement part; supplied together with bolt

6 - Vibration damper

- ❑ With poly V-belt pulley
- ❑ Removing and installing ⇒ page 54

7 - Bracket for ancillaries

- ❑ With oil filter and engine oil cooler
- ❑ Removing and installing bracket for ancillaries ⇒ page 60

- ❑ Removing and installing engine oil cooler ⇒ page 180

8 - Gasket

- ❑ Renew after removing

9 - Bolt

- ❑ Renew after removing
- ❑ Tightening torque and sequence ⇒ page 52

10 - Bolt

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

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11 - Alternator

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

12 - Dowel sleeves

- ❑ For air conditioner compressor

13 - Air conditioner compressor

- ❑ Do not unscrew or disconnect refrigerant hoses or pipes
- ❑ Exploded view ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Exploded view - air conditioner compressor drive unit

14 - Bolt

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

Bracket for ancillaries - tightening torque and tightening sequence

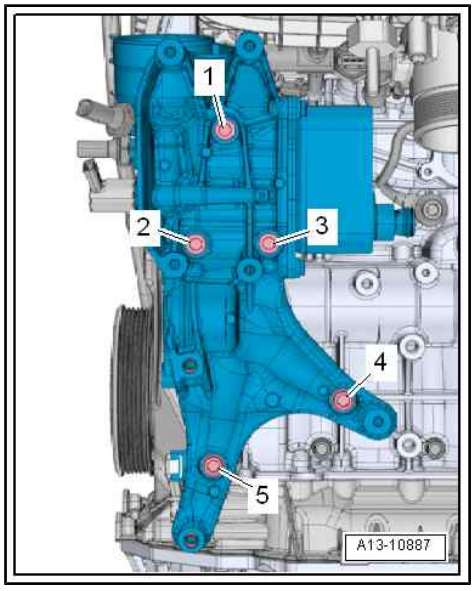
– Fit bracket for ancillaries (first tighten bolt -4- by hand).

Note

Renew bolts tightened with specified tightening angle.

– Tighten new bolts in the sequence -1- to -5- in 3 stages as follows:

Stage	Bolts	Tightening torque/angle specification
1	-1- to -5-	Tighten hand-tight
2	-1- to -5-	Tighten to 20 Nm
3	-1- to -5-	Turn 90° further



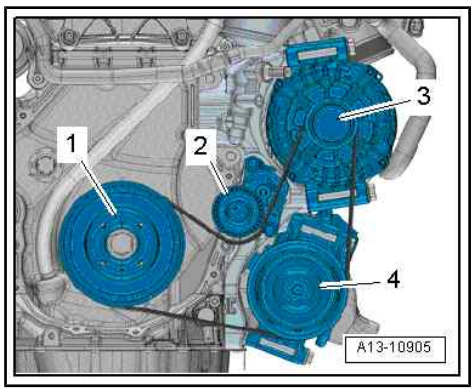
Routing of poly V-belt

1 - Vibration damper

2 - Tensioner for poly V-belt

3 - Alternator

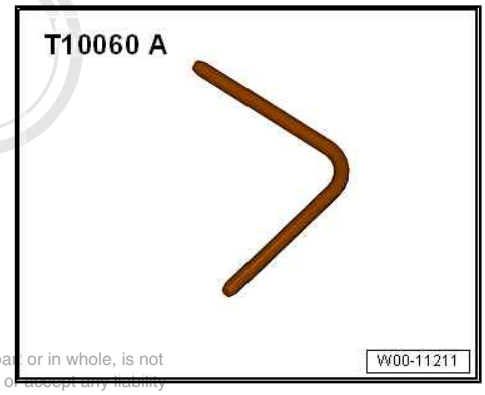
4 - Air conditioner compressor



1.2 Removing and installing poly V-belt

Special tools and workshop equipment required

- Locking pin - T10060 A-



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Removing

Caution

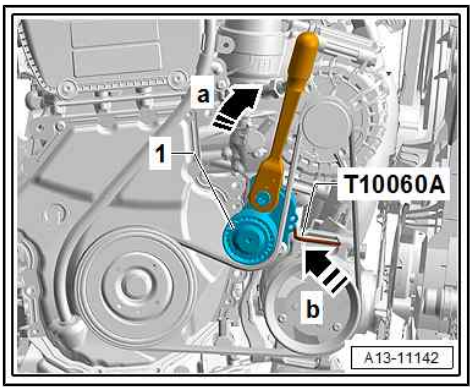
Wrong direction of rotation for a used poly V-belt can lead to irreparable damage.

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

– To slacken poly V-belt turn tensioner -1- in direction of -arrow a-.

– Use locking pin - T10060 A- to lock tensioner -1- in direction of -arrow b-.

– Take off poly V-belt.



Installing

– Pay attention to direction of rotation if re-installing the used poly V-belt.

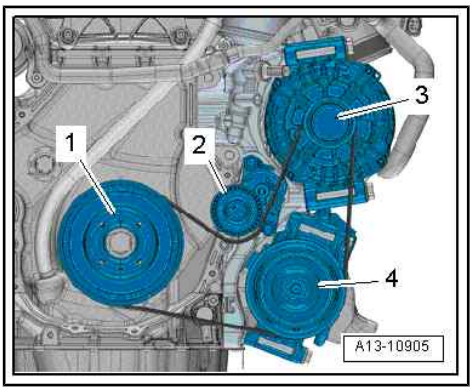
– Fit poly V-belt as shown in illustration.

1 - Vibration damper

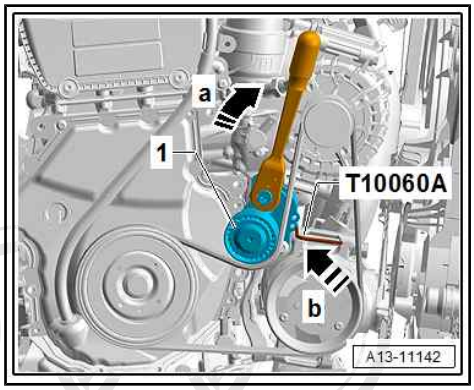
2 - Tensioner for poly V-belt

3 - Alternator

4 - Air conditioner compressor



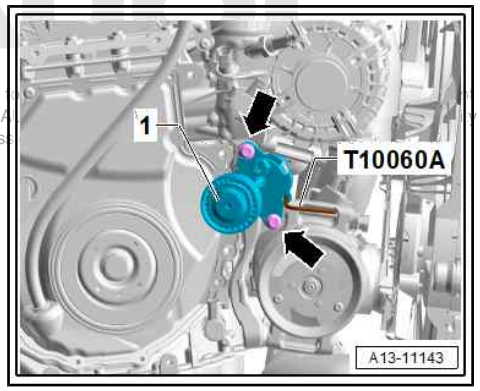
– Turn tensioner in direction of -arrow a- and remove locking pin - T10060 A- .
– Release tensioner.
– Check that poly V-belt is properly seated.
– Start engine and check that poly V-belt runs properly.



1.3 Removing and installing tensioner for poly V-belt

Removing

– Remove poly V-belt
⇒ “1.2 Removing and installing poly V-belt”, page 53 .
– Remove bolts -arrows- and take off tensioner -1- for poly V-belt from bracket for ancillaries.



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Installing

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

– Install poly V-belt
⇒ “1.2 Removing and installing poly V-belt”, page 53 .

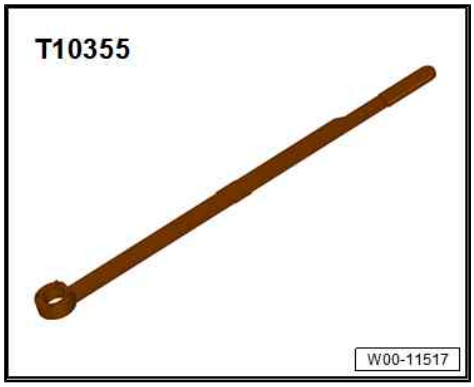
Tightening torques

♦ ⇒ “1.1 Exploded view - cylinder block (pulley end)”, page 51

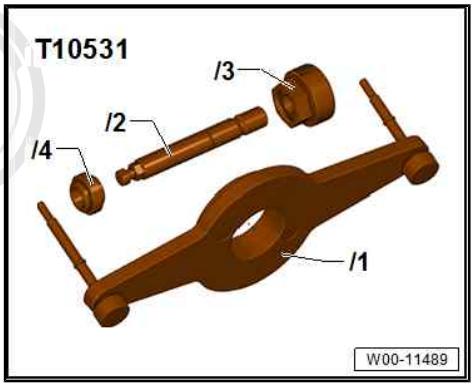
1.4 Removing and installing vibration damper

Special tools and workshop equipment required

♦ Counterhold tool - T10355-



- Assembly tool - T10531-



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Components of assembly tool - T10531-:

- Bracket - T10531/1-
- Retaining bolt - T10531/2-
- Turning-over tool - T10531/3-
- Flange nut - T10531/4-

Removing

– Remove noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

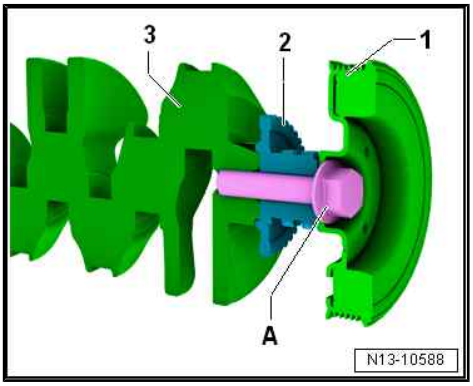
– Remove wheel housing liner (front right) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Removing and installing wheel housing liner (front) .

– Remove poly V-belt
⇒ “1.2 Removing and installing poly V-belt”, page 53 .

– Remove locking pin - T10060 A- from tensioner for poly V-belt.

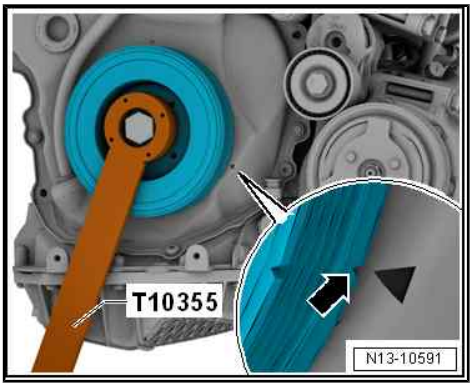
Note

The securing bolt for the vibration damper -A- secures the vibration damper -1-, timing chain sprocket -2- and crankshaft -3- to each other. Before removing vibration damper, secure chain sprocket to crankshaft as described below.



– Turn vibration damper to “TDC” position -arrow- using counterhold tool - T10355- .

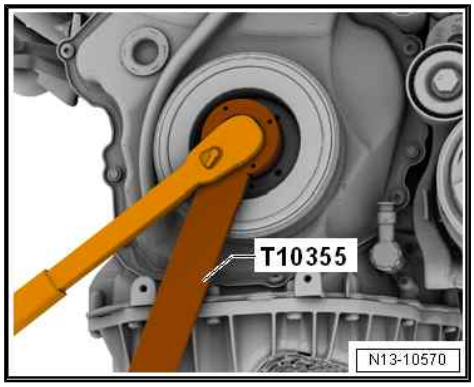
- Notch on vibration damper must align with arrow marking on cover for timing chains (bottom).
- Marking on cover must be in »4 o'clock position«.



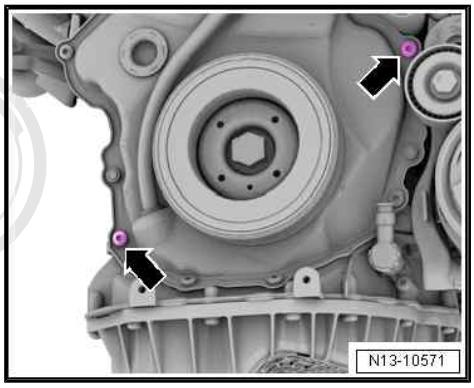
Caution

Do not loosen securing bolt for vibration damper by more than a half turn at this stage.

– Loosen bolt for vibration damper by approx. a half turn using counterhold tool - T10355- .
– If vibration damper has been rotated out of position, correct TDC position.

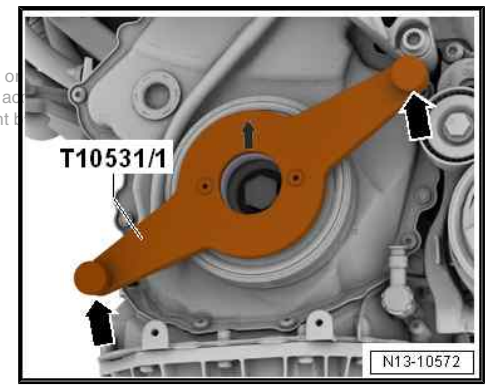


– Remove bolts -arrows- (as illustrated) from timing chain cover. These bolts must be renewed.



– Apply support - T10531/1- (as illustrated) to vibration damper and secure hand-tight with knurled screws -arrows-.
– Remove bolt for vibration damper completely.

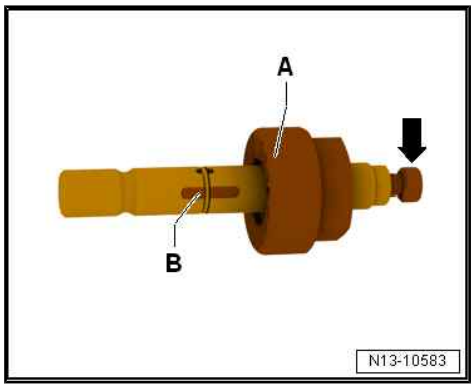
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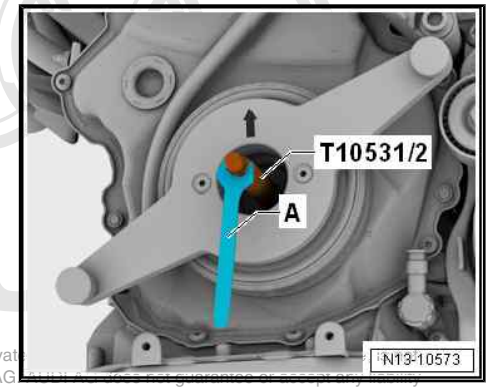
– Check whether turning-over tool -A- slides easily over clamps -B-. Turn tensioning bolt -arrow- if necessary.

Note

Do not turn the tensioning bolt from this stage onwards; otherwise the clamping pin - T10531/2- will get stuck when it is screwed into the crankshaft.

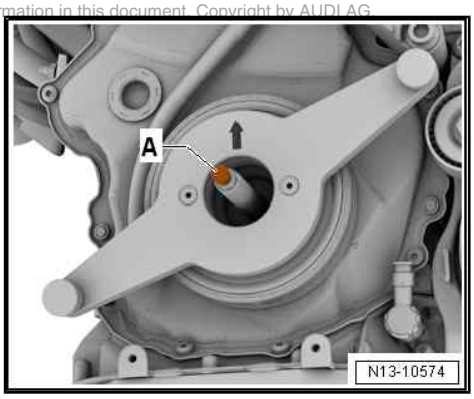


– Screw clamping pin - T10531/2- into crankshaft and hand-tighten with open-end spanner, 12 mm -A-.

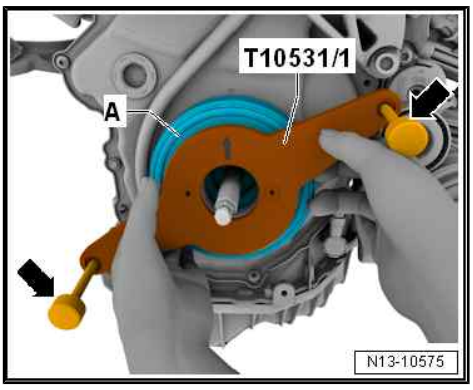


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– Hand-tighten tensioning bolt -A- to secure chain sprocket to crankshaft.



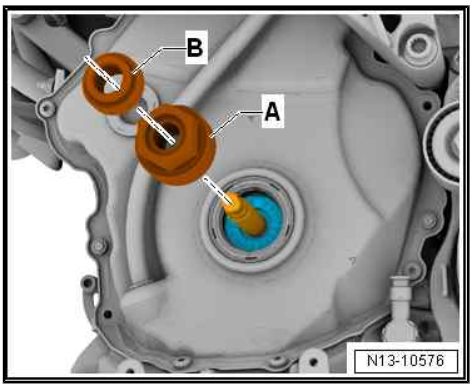
– Remove knurled screws -arrows-. Detach support - T10531/1- and vibration damper -A-.



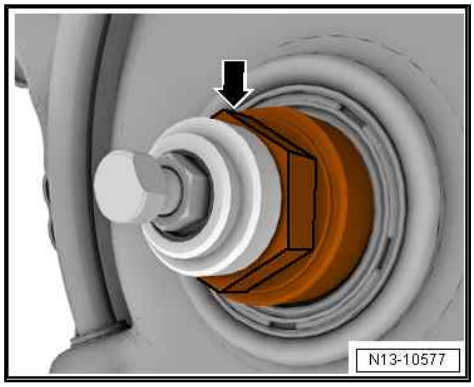
To rotate crankshaft without vibration damper:

– Fit turning-over tool -A- onto clamping pin (pay attention to tooth-shaped profile on chain sprocket). In TDC position, flat surface of tool faces upwards.

– Tighten turning-over tool with flange nut -B-.

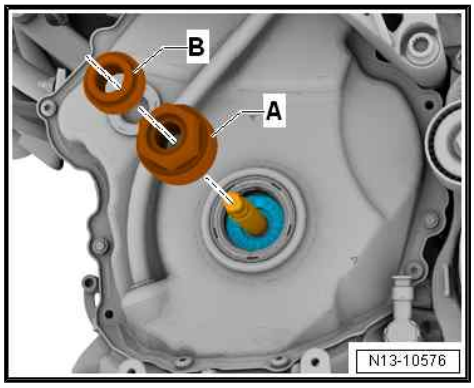


– Crankshaft can now be rotated at hexagon flats -arrow-.

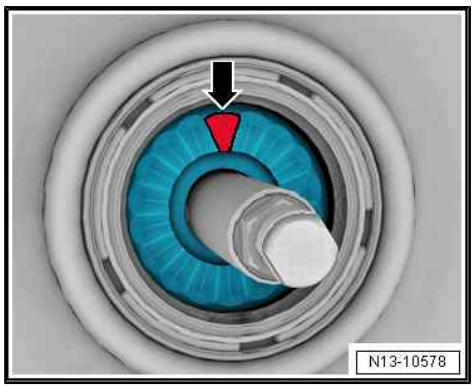


Installing:

– If necessary, detach flange nut -B- and turning-over tool -A- from clamping pin.



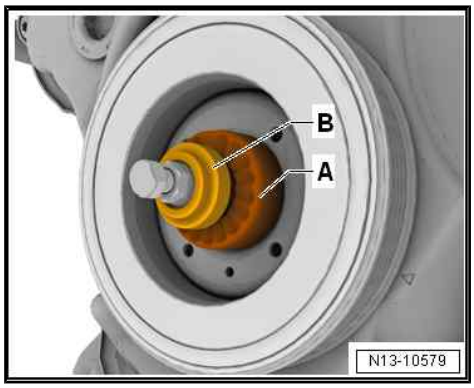
– Fit vibration damper in TDC position (pay attention to tooth-shaped profile -arrow- on chain sprocket).



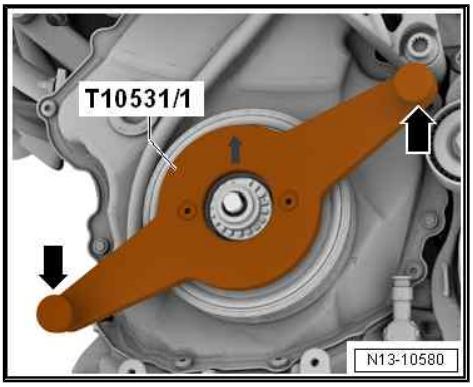
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– Fit turning-over tool -A- onto clamping pin so that hexagon flats face towards vibration damper.

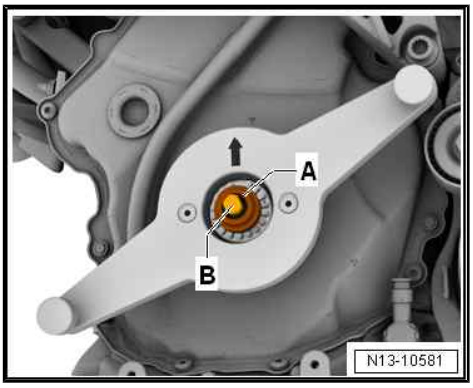
– Screw flange nut -B- on while moving vibration damper back and forth slightly to check whether vibration damper is seated correctly in tooth-shaped profile. Tighten flange nut until vibration damper can no longer be rotated.



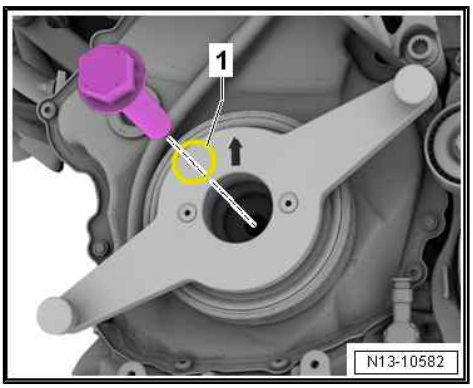
– Apply support - T10531/1- (as illustrated) to vibration damper and secure hand-tight with knurled screws -arrows-.



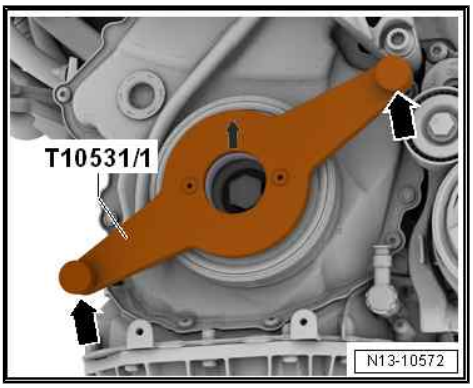
– Unscrew flange nut -A- and loosen tensioning bolt -B-.
– Unscrew clamping pin and remove with turning-over tool .



– Screw in new bolt for vibration damper with lubricated O-ring -1- hand-tight.

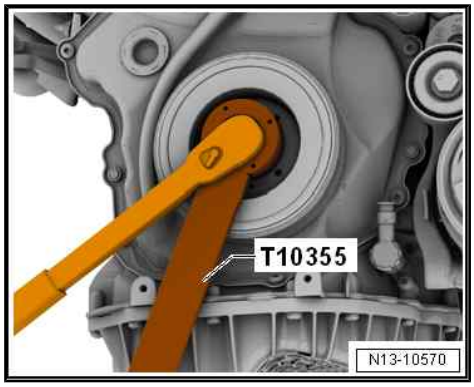


– Remove knurled screws -arrows- and detach support - T10531/1- .

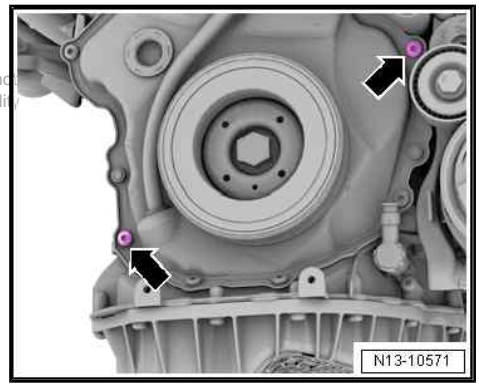


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– Tighten bolt for vibration damper using counterhold tool - T10355- .



– Screw in new securing bolts -arrows-.



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

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– Install poly V-belt ⇒ page 53 .

Tightening torques

- ⇒ “1.1 Exploded view - cylinder block (pulley end)”, page 51
- Securing bolts for timing chain cover (bottom section) ⇒ Item 16 (page 90)

1.5 Removing and installing bracket for ancillaries

Special tools and workshop equipment required

- Drip tray for workshop hoist - VAS 6208-



Removing

– Drain coolant ⇒ “1.3 Draining and filling cooling system”, page 198 .

– Remove alternator ⇒ Electrical system; Rep. gr. 27 ; Alternator; Removing and installing alternator .

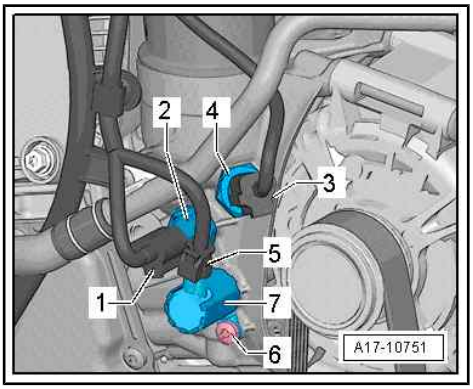
– Unplug electrical connectors:

1 - For oil pressure switch - F22- -item 2-

3 - For oil pressure switch for reduced oil pressure - F378- -item 4-

5 - For piston cooling jet control valve - N522- -item 7-

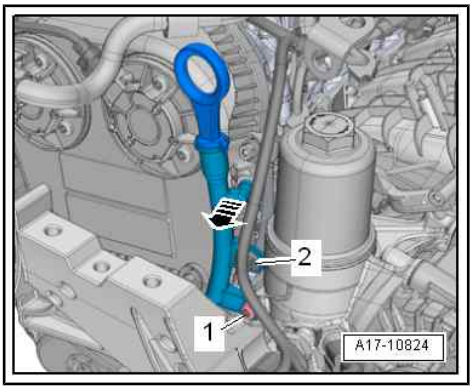
– Remove oil filter element ⇒ Maintenance ; Booklet 821 .



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– Remove bolt -1- for dipstick guide tube.

– Unclip guide tube from timing chain cover (top) in direction of -arrow-.



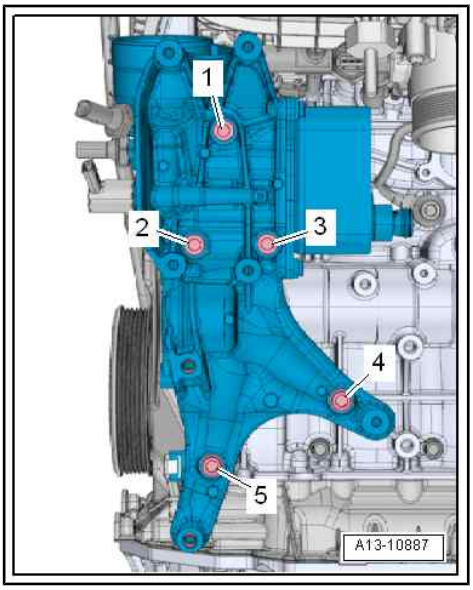
Note

Disregard -item 2-.

– Move electrical wiring harness clear.

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

– Unscrew bolts -1 ... 5- and detach bracket for ancillaries from coolant pump housing.



Installing

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

Note

- *Renew bolts tightened with specified tightening angle.*
- *Renew O-rings and gaskets.*

– Moisten new O-rings -4- with coolant.

– Fit connecting piece -2- into engine oil cooler -1-.

– Push bracket for ancillaries -3- onto connection.

– Fit and tighten bolts
⇒ Fig. ""Bracket for ancillaries - tightening torque and tightening sequence"" , page 52 .

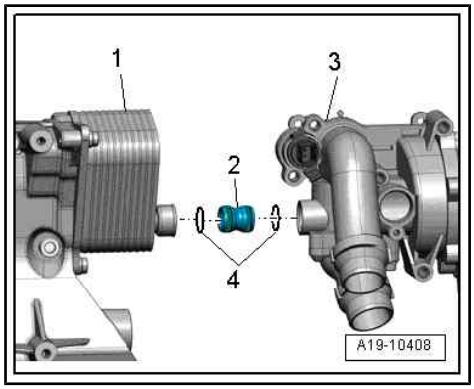
– Install air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Exploded view - air conditioner compressor drive unit .

– Install alternator ⇒ Electrical system; Rep. gr. 27 ; Alternator; Removing and installing alternator .

– Install poly V-belt
⇒ "1.2 Removing and installing poly V-belt", page 53 .

– Fill up with coolant ⇒ page 200 .

– Install oil filter and check oil level ⇒ Maintenance ; Booklet 821 .



Tightening torques

- ⇒ "1.1 Exploded view - cylinder block (pulley end)", page 51
- ⇒ "1.1 Exploded view - timing chain cover", page 89

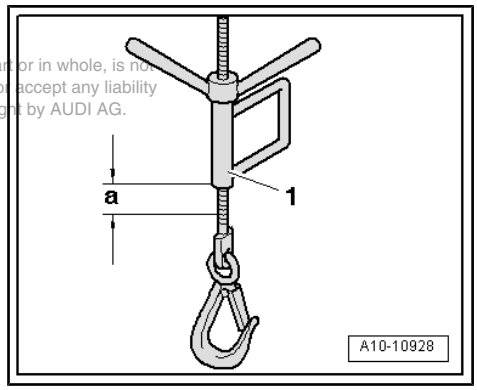
1.6 Removing and installing engine support

Removing

– Remove engine mounting
⇒ "2.2 Removing and installing engine mountings", page 38 .

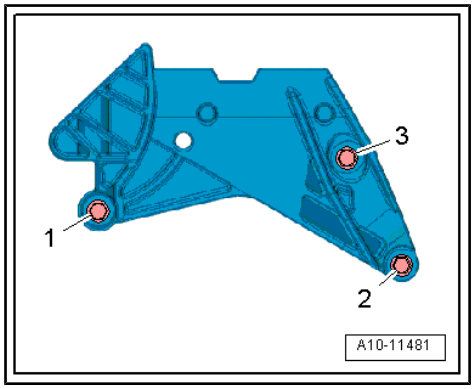
– Using spindle - 10 - 222 A /11- -item 1-, raise engine through distance -a-.

• Distance -a- = approx. 30 mm.



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– Unscrew bolts -1, 2 and 3- and detach engine support.



Installing

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

– Install engine mountings
⇒ "2.2 Removing and installing engine mountings", page 38 .

Tightening torques

- ⇒ "2.1 Exploded view - assembly mountings", page 35
- ⇒ Fig. ""Engine support - tightening torque and sequence"" , page 36

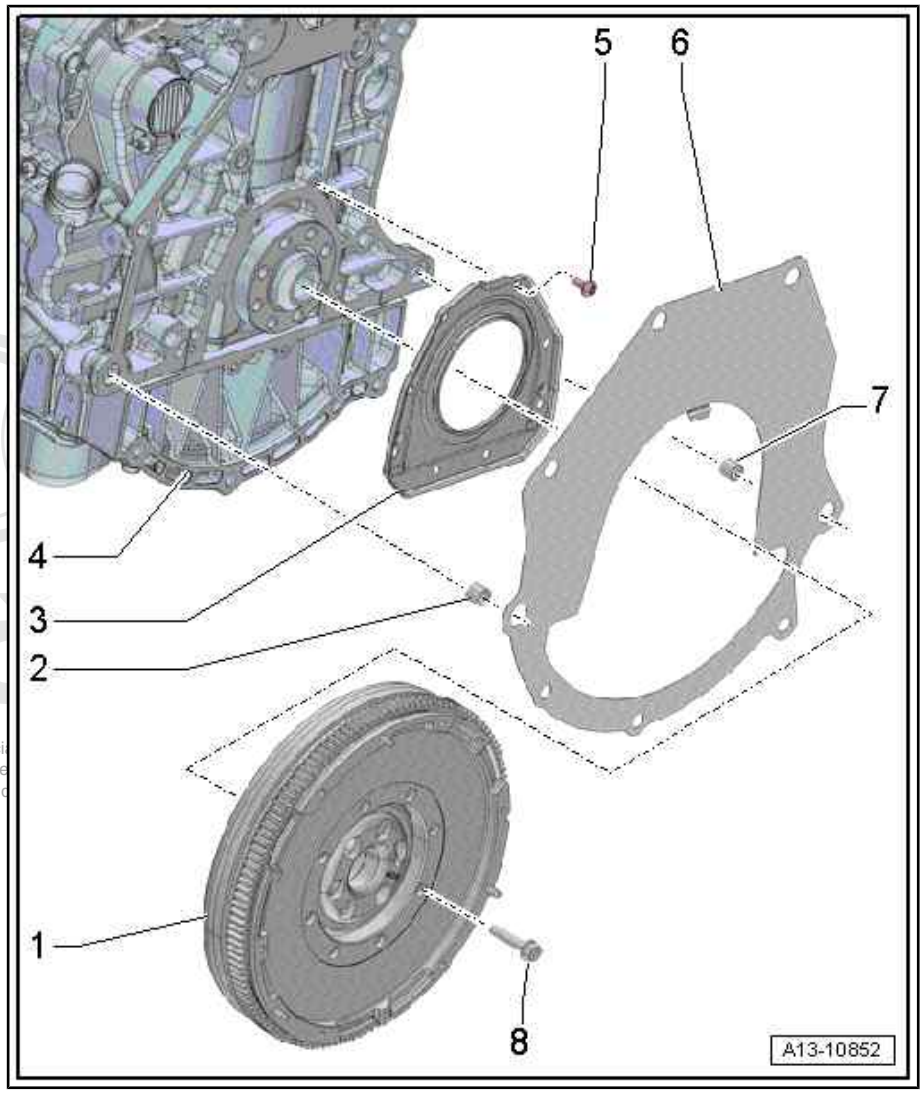
2 Cylinder block (gearbox end)

⇒ "2.1 Exploded view - cylinder block (gearbox end)", page 63

⇒ "2.2 Removing and installing flywheel", page 64

⇒ "2.3 Removing and installing sealing flange (gearbox end)", page 65

2.1 Exploded view - cylinder block (gearbox end)



1 - Flywheel

- ❑ Removing and installing ⇒ page 64
- ❑ Can only be installed in one position. Holes are off-set.

2 - Dowel sleeve

3 - Sealing flange (gearbox end)

- ❑ With oil seal
- ❑ Renew after removing
- ❑ Do not lubricate oil seal
- ❑ Removing and installing ⇒ page 65
- ❑ Before installing, remove oil residue from crankshaft journal with a clean cloth.
- ❑ Guide sleeve is not to be removed until sealing flange has been slipped onto crankshaft journal

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4 - Cylinder block

5 - Bolt

- ❑ Tightening torque and sequence ⇒ page 64

6 - Intermediate plate

- ❑ Version fitted in vehicle may differ from illustration
- ❑ Must be positioned on dowel sleeves
- ❑ Do not damage/bend when assembling
- ❑ Is fitted onto sealing flange ⇒ page 64

7 - Dowel sleeve

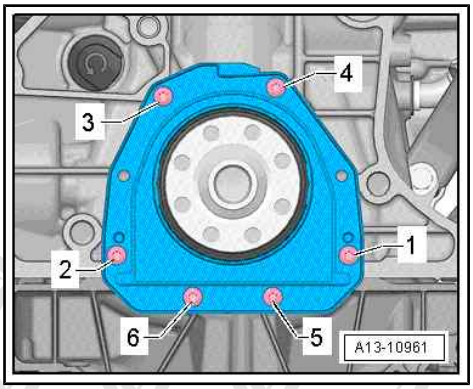
8 - Bolt

- ❑ For dual-mass flywheel
- ❑ Renew after removing
- ❑ 60 Nm +90°

Sealing flange (gearbox end) - tightening torque and sequence

– Tighten new bolts in stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1	-1 … 6-	Screw in by hand until contact is made
2	-1 … 6-	9 Nm

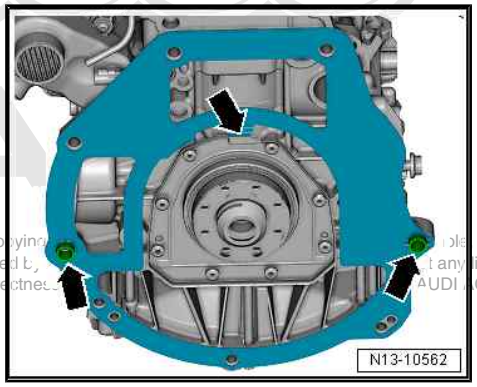


Note

Only 6 bolts are fitted; 2 bolt holes remain free.

Installing intermediate plate

– Fit intermediate plate on sealing flange and push onto dowel sleeves -arrows-.

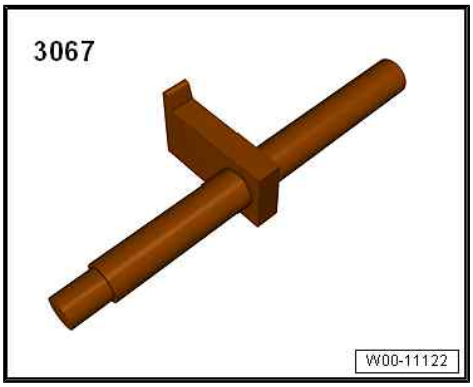


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2.2 Removing and installing flywheel

Special tools and workshop equipment required

- Counterhold tool - 3067-



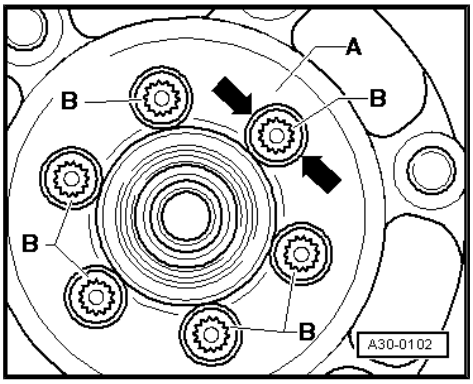
Removing

- Gearbox removed

Caution

Risk of serious damage to flywheel.

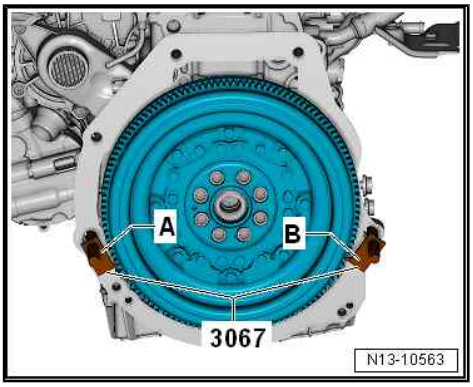
- *Remove bolts -B- using normal hand tools (do not use pneumatic wrench or impact driver, etc.).*
- *When removing the bolts, make sure that the bolt heads do not come into contact with the flywheel.*
- *Rotate the flywheel -A- so that the bolts -B- align centrally with the holes -arrows-.*



– Insert counterhold tool - 3067- in hole on cylinder block -B-.
– Loosen and remove flywheel bolts.

Installing

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



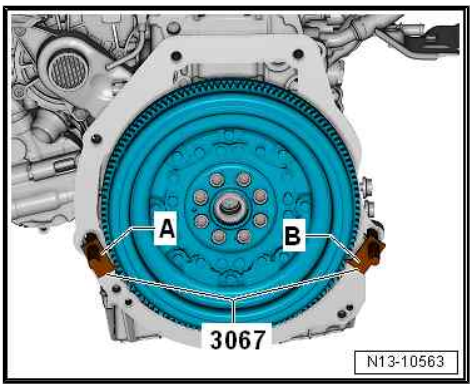
Note

Renew bolts tightened with specified tightening angle.

– Insert counterhold - 3067- in hole on cylinder block -A-.

Tightening torques

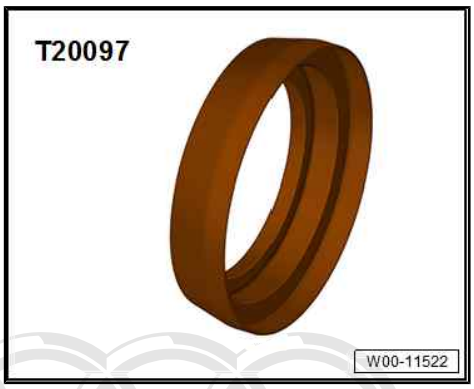
♦ ⇒ “2.1 Exploded view - cylinder block (gearbox end)”, page 63



2.3 Removing and installing sealing flange (gearbox end)

Special tools and workshop equipment required

♦ Assembly sleeve - T20097-



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

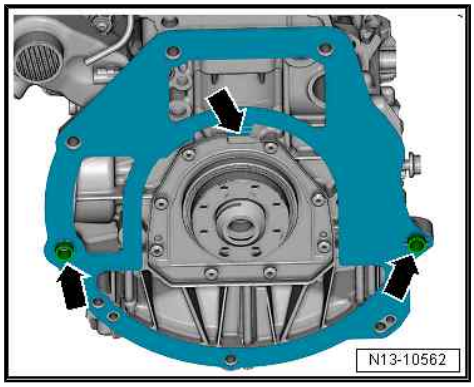
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Removing

- Gearbox removed

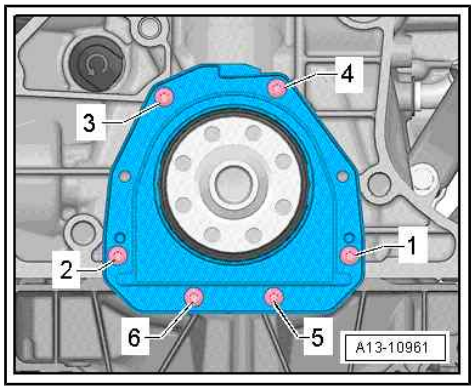
– Remove flywheel ⇒ page 64 .

– Detach intermediate plate at sealing flange and dowel sleeves -arrows-.



– Remove bolts -1 ... 6-.

– Release sealing flange from bonded joint.



Installing

Caution

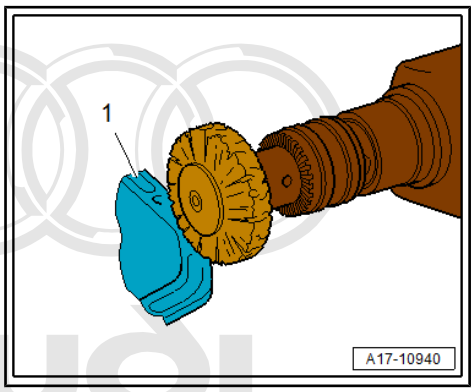
Make sure sealant residue does not enter lubrication system.

- *Place a clean cloth over the exposed section of the sump.*

WARNING

Risk of eye injury.

- *Put on safety goggles.*



– Remove sealant remaining on cylinder block -1- with flat scraper or rotating plastic brush.

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

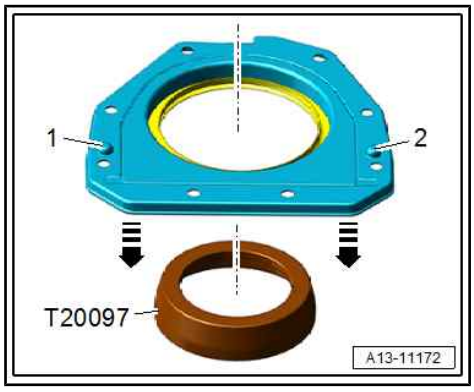
- Do not oil or grease sealing lip of oil seal in sealing flange.
- The preparations below are necessary to prevent damage to the oil seal in the sealing flange.
- Sealing lip of oil seal in sealing flange must be folded back prior to installation.

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– Use assembly sleeve - T20097- to fold back sealing lip of oil seal in sealing flange as follows:

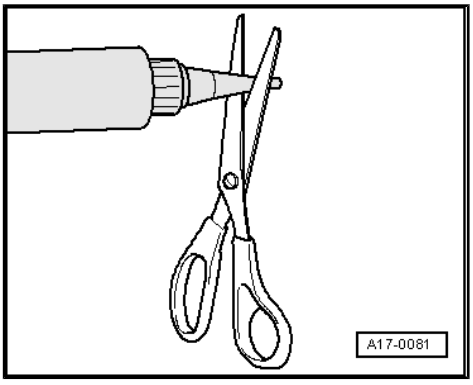
- Smaller diameter side of assembly sleeve must face oil seal.
- Centring collar -1- and -2- of sealing flange must face upwards.

– Slide sealing flange onto assembly sleeve -arrows- and allow it to rest for five minutes.



- Note expiry date of sealant.

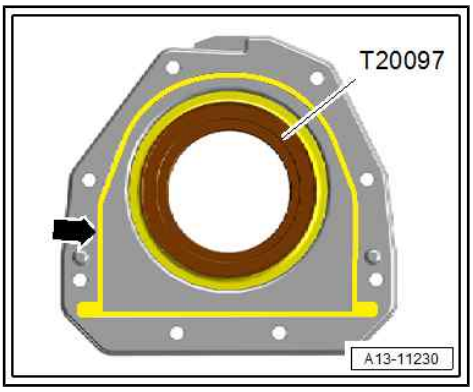
– Cut off nozzle of tube at front marking (nozzle ∅ approx. 2 mm).



Caution

Make sure lubrication system is not clogged by excess sealant.

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



– Apply a bead of sealant -arrow- onto clean sealing surface of sealing flange, as shown.

– Remove assembly sleeve - T20097- .

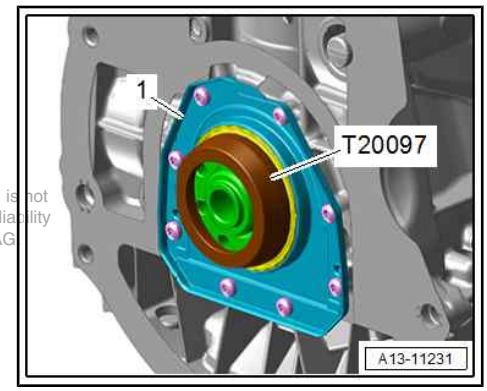
- Thickness of sealant bead: 2 ... 3 mm
- The sealing flange must be installed within 5 minutes after applying sealant.

– Position assembly sleeve - T20097- on crankshaft journal.

– Use assembly sleeve to bring sealing flange -1- carefully into installation position (pay attention to centring collar on left and right).

– Secure sealing flange with bolts.

- After installing sealing flange, wait about 30 minutes for sealant to dry. Then (and only then) fill the engine with engine oil.



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

– Install flywheel ⇒ page 64 .

– Check oil level ⇒ page 171 .

Tightening torques

- ⇒ Fig. ""Sealing flange (gearbox end) - tightening torque and sequence"" , page 64
- ⇒ "2.1 Exploded view - cylinder block (gearbox end)", page 63

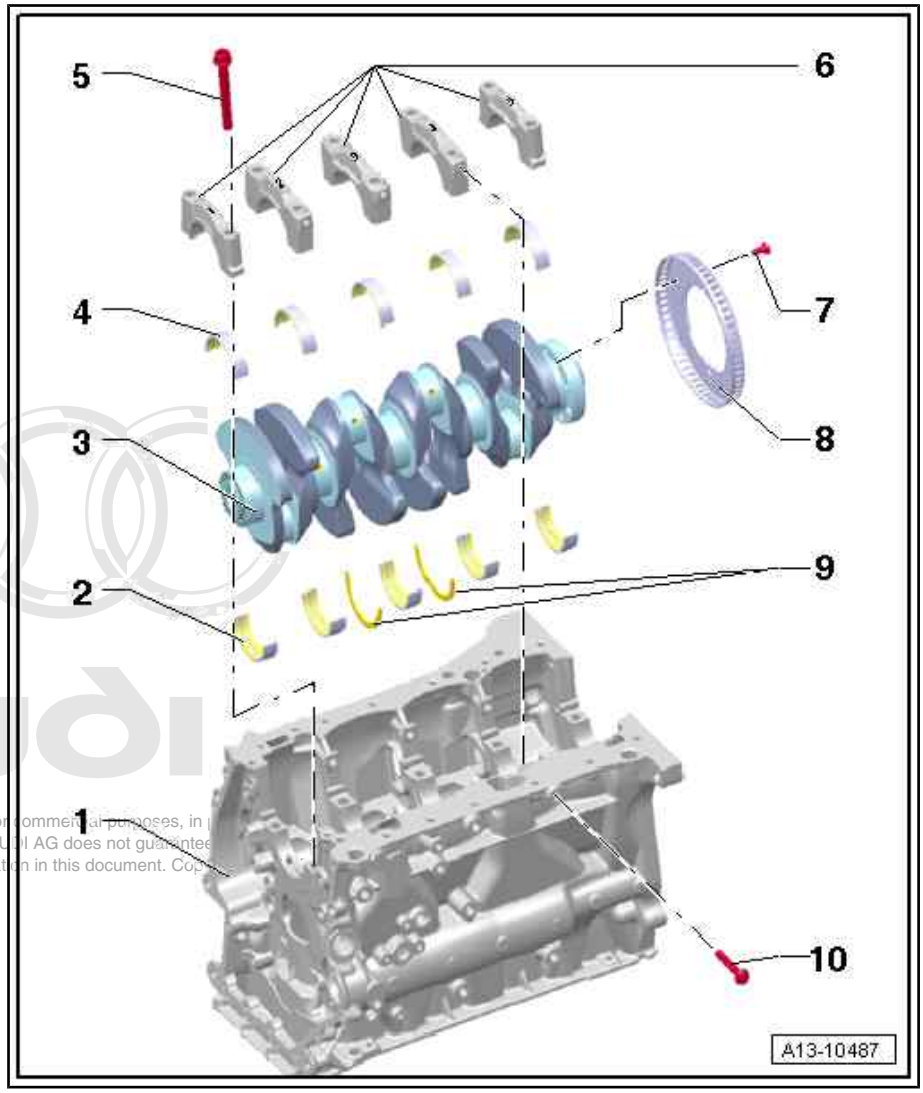
3 Crankshaft

⇒ “3.1 Exploded view - crankshaft”, page 68
⇒ “3.2 Crankshaft dimensions”, page 69
⇒ “3.3 Allocation of main bearing shells”, page 70
⇒ “3.4 Renewing needle bearing in crankshaft”, page 71
⇒ “3.5 Measuring axial clearance of crankshaft”, page 73
⇒ “3.6 Measuring radial clearance of crankshaft”, page 74
⇒ “3.7 Removing and installing sender wheel”, page 75

3.1 Exploded view - crankshaft

Note

When carrying out repairs, secure engine to assembly stand with engine and gearbox support - VAS 6095- ⇒ page 29 .



1 - Cylinder block

2 - Bearing shell for cylinder block

- ❑ With oil groove
- ❑ Renew used bearing shells
- ❑ Classification of crankshaft bearing shells ⇒ page 70

3 - Crankshaft

- ❑ After removing, place it down so that the sender wheel ⇒ Item 8 (page 69) does not become damaged
- ❑ If crankshaft is renewed, new bearing shells must be assigned to bearing caps ⇒ page 70
- ❑ Axial clearance ⇒ page 73
- ❑ Radial clearance ⇒ page 74
- ❑ Do not rotate the crankshaft when checking the radial clearance
- ❑ Crankshaft dimensions ⇒ page 69

4 - Bearing shell for bearing cap

- ❑ Without oil groove
- ❑ Renew used bearing shells
- ❑ Classification of crankshaft bearing shells ⇒ page 70

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5 - Bolt

- ❑ Renew after removing
- ❑ Use old bolts when measuring radial clearance
- ❑ Tightening sequence ⇒ page 69

6 - Bearing caps

- ❑ Bearing cap 1: Pulley end
- ❑ Bearing shell retaining lugs (cylinder block/bearing cap) must be on the same side

7 - Bolt

- ❑ Sender wheel must be renewed if bolts are loosened ⇒ page 75
- ❑ Renew after removing
- ❑ 10 Nm + turn 90° further

8 - Sender wheel

- ❑ For engine speed sender - G28-
- ❑ Can only be installed in one position. Holes are off-set.
- ❑ Sender wheel must be renewed if bolts are loosened
- ❑ Removing and installing ⇒ page 75

9 - Thrust washers

- ❑ For bearing No. 3

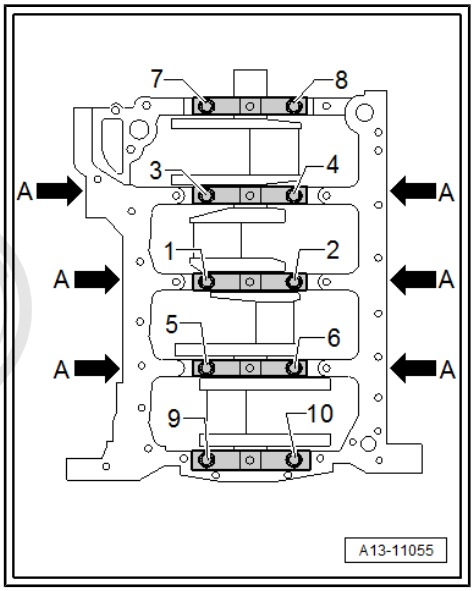
10 - Bolt

- ❑ Renew after removing
- ❑ Tightening sequence ⇒ page 69

Crankshaft - tightening sequence

– Tighten crankshaft bolts in the sequence given below:

Stage	Bolts/tightening sequence	Tightening torque/angle specification
1	-1- to -10- and -arrows A-	Hand-tighten
2	-1- to -10-	Initially tighten to 65 Nm.
3	-1- to -10-	Use rigid wrench to turn 90° further
4	-Arrows A-	Initially tighten to 20 Nm.
5	-Arrows A-	Use rigid wrench to turn 90° further



3.2 Crankshaft dimensions

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(in mm)

Honing dimension 1)	Crankshaft main bearing journal ∅	Conrod journal ∅
Basic dimension	58.00	47.80

1) There is currently no provision for machining used crankshafts.

3.3 Allocation of main bearing shells

Bearing shells of the correct thickness are allocated to the cylinder block at the factory. Coloured dots are used to identify the thickness of the bearing shells.

Letter codes on lower sealing surface or end of cylinder block indicate which bearing shell is to be fitted in cylinder block (top bearing shell) at each location.

Letter codes on crankshaft indicate which bearing shell is to be fitted in bearing cap (bottom bearing shell).

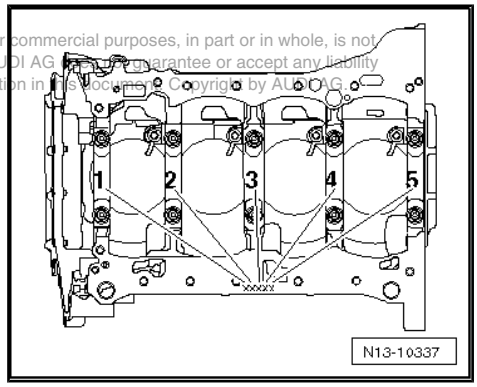
The first letter stands for bearing cap 1, the second letter for bearing cap 2, etc.

Marking on bearing shell for cylinder block

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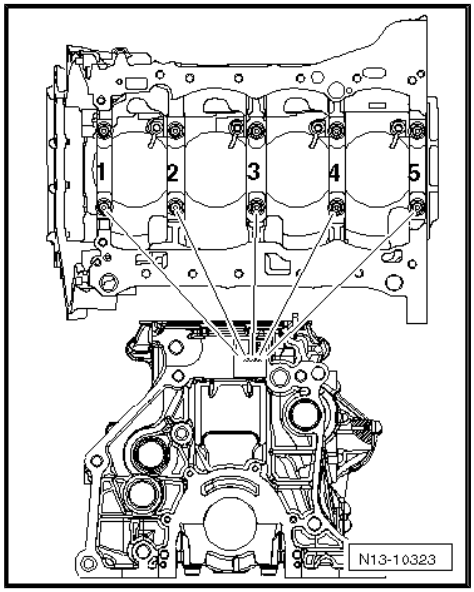
Note

Markings on cylinder block are applied either onto sealing surface for sump or gearbox end of cylinder block.



Marking on cylinder block refers to top bearing shell (bearing shell for cylinder block).

– Note down letters and select appropriate colour from the table.

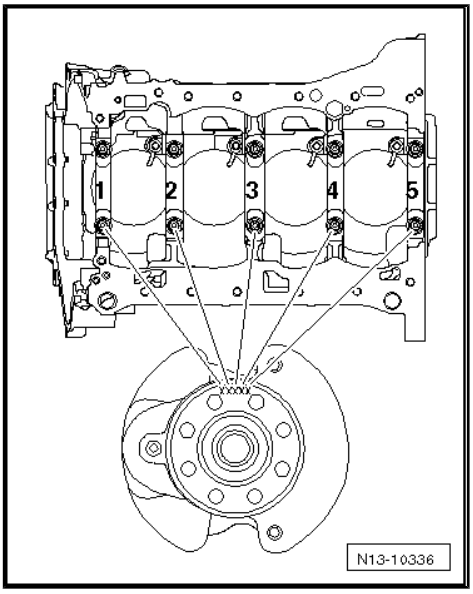


Marking on bearing shell for bearing cap

Marking on crankshaft refers to bottom bearing shell (bearing shell for bearing cap).

– Note down letters and select colour coding to be fitted from the table.

S	=	Black
R	=	Red
G	=	Yellow
B	=	Blue
W	=	White



3.4 Renewing needle bearing in crankshaft

Special tools and workshop equipment required

♦ Counter-support, e.g. Kukko - 22/1-



♦ Internal puller, e.g. Kukko - 21/2-



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♦ Drift - VW 207 C-



Important:

- The needle bearing -arrow- must always be renewed if the engine is separated from the gearbox.
- The front edges of the internal puller must not be chipped.

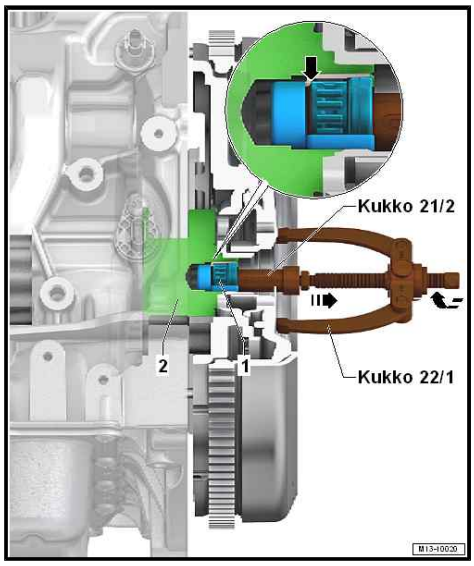


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Extracting needle bearing

– Pull needle bearing -1- out of crankshaft -2- using commercially available internal puller (e.g. Kukko - 21/2-) and counter-support (e.g. Kukko - 22/1-).

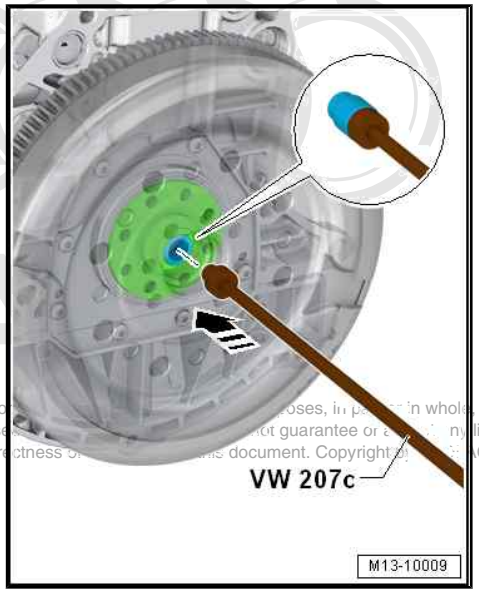
– Internal puller must be positioned behind needle roller -arrow-.



Installing

– Clean bearing seat in crankshaft and grease lightly.

– Drive needle bearing into crankshaft with drift - VW 207 C- until it reaches installation depth.



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Installation depth: dimension -a- = 2.0 mm



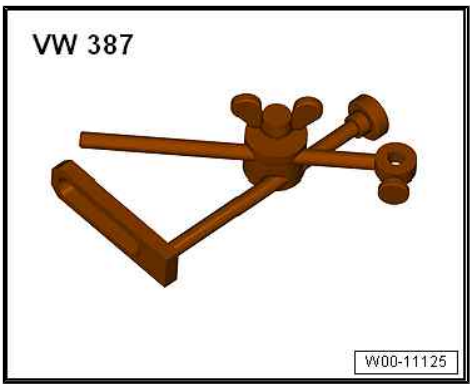
Note

Renew needle bearing if you drive it in too far (needle bearing is damaged when it is pulled out again).

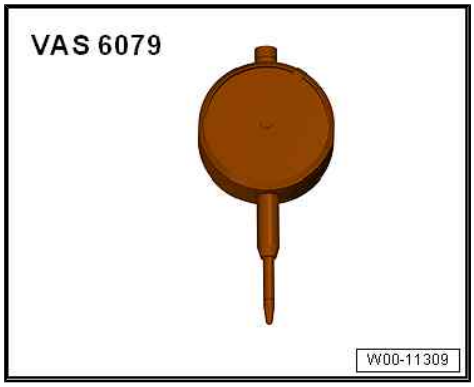
3.5 Measuring axial clearance of crankshaft

Special tools and workshop equipment required

♦ Universal dial gauge bracket - VW 387-



♦ Dial gauge - VAS 6079-

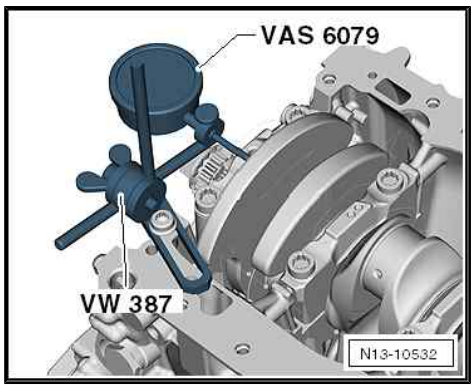


Procedure

– Bolt dial gauge - VAS 6079- with universal dial gauge bracket - VW 387- onto cylinder block and set it against crank web with a preload of approx. 2 mm.

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

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



Axial clearance:

- New: 0.070 ... 0.231 mm.
- Wear limit: 0.30 mm.

3.6 Measuring radial clearance of crankshaft

Special tools and workshop equipment required

♦ Plastigage

Procedure

Note

♦ *Renew used bearing shells.*

♦ *Bearing shells worn down to nickel layer must be renewed.*

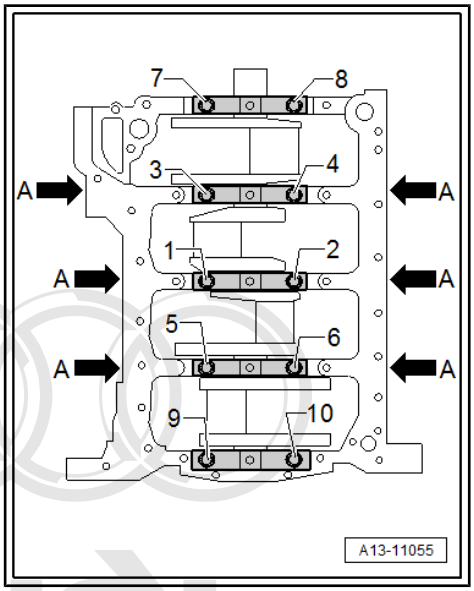
– Remove crankshaft bearing caps and clean bearing caps and journals.

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

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

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– Fit crankshaft bearing caps and secure with old bolts -1 ... 10- ⇒ page 69 without rotating crankshaft.



Note

Disregard bolts indicated by -arrows A-.

– Remove crankshaft bearing caps again.

– Compare width of Plastigage with measurement scale.

Radial clearance:

- New: 0.017 ... 0.037 mm.
- Wear limit: 0.15 mm.

– When carrying out final assembly, renew bolts.

3.7 Removing and installing sender wheel

– Remove engine ⇒ page 7 .

– Remove sealing flange (gearbox end) ⇒ page 65 .

– Remove sump (top section) ⇒ page 174 .

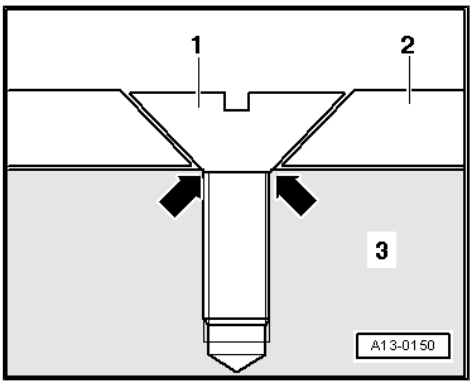
– Remove timing chain for balance shafts ⇒ page 121 .

– Unbolt conrod bearing caps.

– Remove crankshaft bearing caps.

– Remove crankshaft and unbolt sender wheel.

– Always renew sender wheel -2- after loosening bolts -1-.



Note

- *If the countersunk bolts are tightened a second time, the seats for the bolt heads in the sender wheel will be deformed to such an extent that the bolt heads make contact with the crankshaft -3- -arrows- and the sender wheel beneath the bolts will be loose.*
- *Sender wheel can only be installed in one position. Holes are off-set.*

– After renewing sender wheel, misfire adaptions must be reset. To do so, select `01 - Reset adaptions misfires` in `Guided Functions` mode of ⇒ Vehicle diagnostic tester.

Tightening torques

- ⇒ “3.1 Exploded view - crankshaft”, page 68

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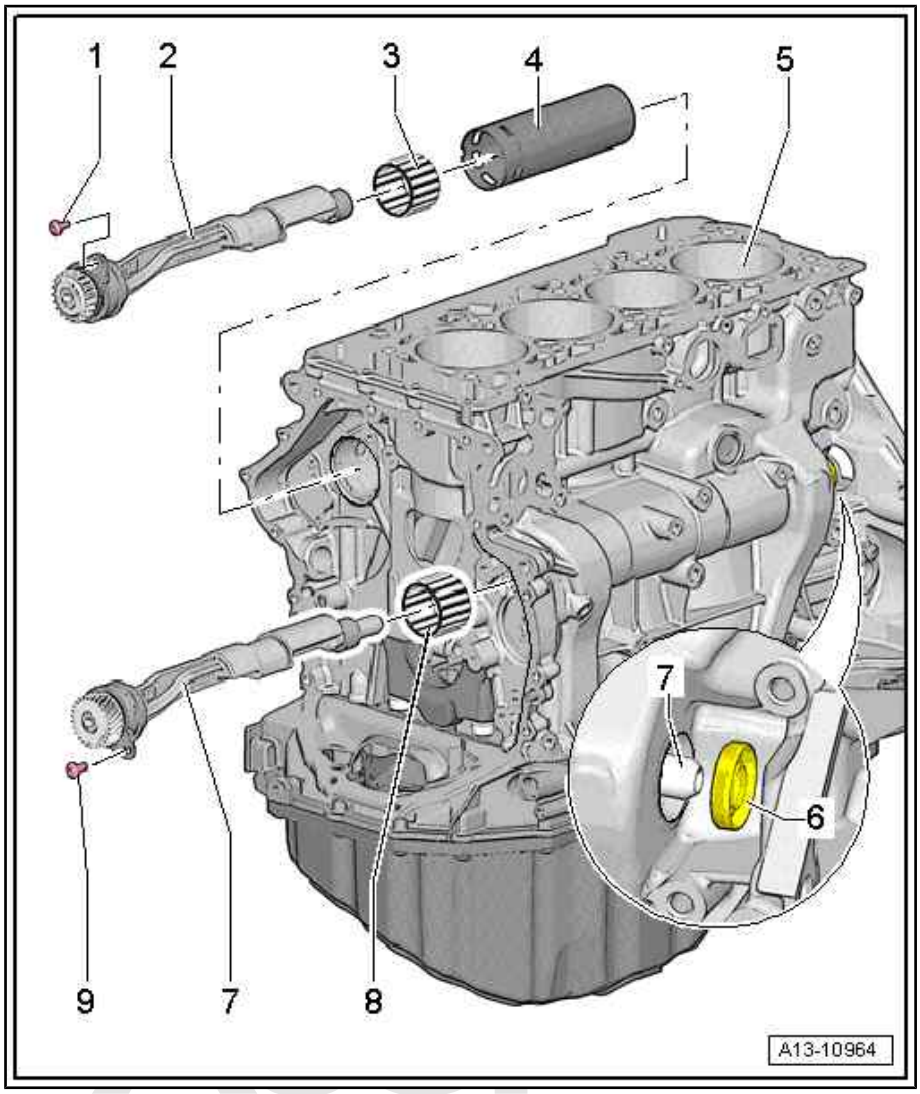
4 Balance shaft

⇒ “4.1 Exploded view - balance shaft”, page 76

⇒ “4.2 Removing and installing balance shaft”, page 77

⇒ “4.3 Renewing oil seal for balance shaft (inlet side)”, page 81

4.1 Exploded view - balance shaft



1 - Bolt

- ❑ Renew after removing
- ❑ 4 Nm + turn +45° further

2 - Balance shaft

- ❑ Exhaust side
- ❑ Always renew after removal
- ❑ Always renew both sides together ⇒ “4.2.2 Removing and installing balance shaft (exhaust side)”, page 79

3 - Needle bearing

- ❑ Always renew if balance shaft is removed
- ❑ New bearing must have same colour as old one
- ❑ Lubricate bearing with engine oil

4 - Tube for balance shaft

- ❑ Installation position ⇒ page 77

5 - Cylinder block

6 - Oil seal for balance shaft (inlet side)

- ❑ Renewing ⇒ page 81

7 - Balance shaft

- ❑ Inlet side
- ❑ Always renew after removal
- ❑ Always renew both sides together ⇒ “4.2.1 Removing and installing balance shaft (inlet side)”, page 77

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8 - Needle bearing

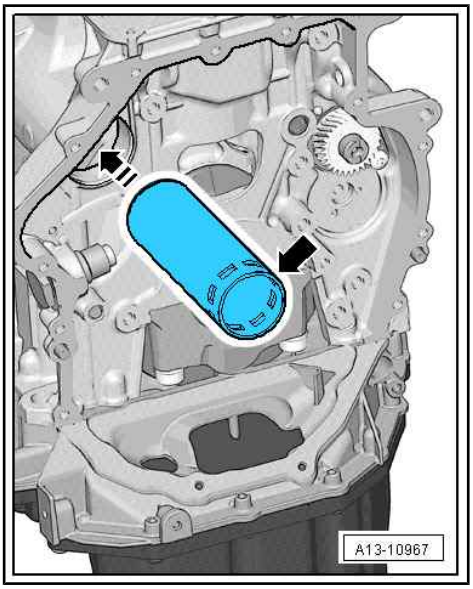
- ❑ Always renew if balance shaft is removed
- ❑ New bearing must have same colour as old one
- ❑ Lubricate bearing with engine oil

9 - Bolt

- ❑ Renew after removing
- ❑ 4 Nm + turn +45° further

Tube for balance shaft - installation position

The openings -arrow- must face chain side.



4.2 Removing and installing balance shaft

⇒ "4.2.1 Removing and installing balance shaft (inlet side)", page 77

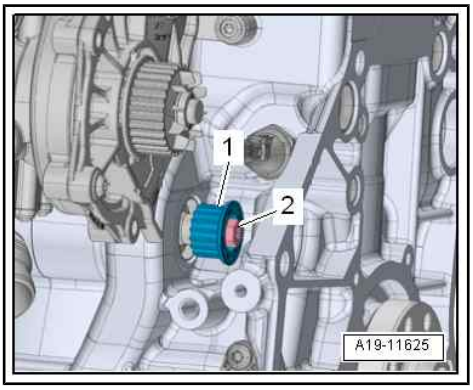
⇒ "4.2.2 Removing and installing balance shaft (exhaust side)", page 79

4.2.1 Removing and installing balance shaft (inlet side)

Always renew balance shaft and needle bearing following removal. Install a new needle bearing with the same colour coding.

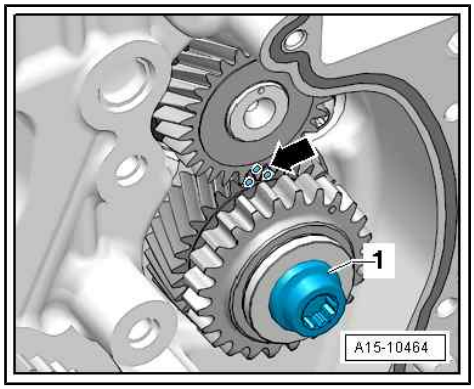
Removing

- Engine removed
- – Remove toothed belt for coolant pump ⇒ page 216 .
- – Remove timing chain cover (top) ⇒ page 92 .
- – Remove timing chain cover (bottom) ⇒ page 93 .
- – Remove camshaft timing chain ⇒ page 108 .
- – Remove drive chain for balance shafts ⇒ page 121 .
- – Remove bolt -2-.
- – Detach drive sprocket -1- for toothed belt for coolant pump.

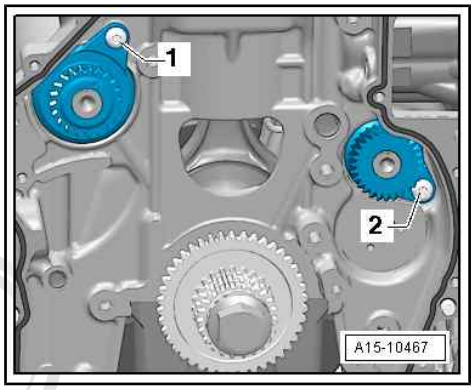


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– Remove idler gear -1-.

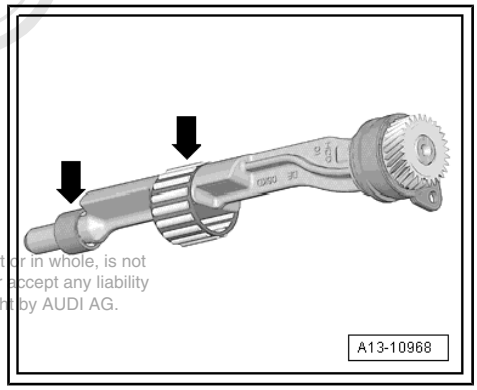


– Remove bolt -2- securing balance shaft (inlet side) and pull out balance shaft.



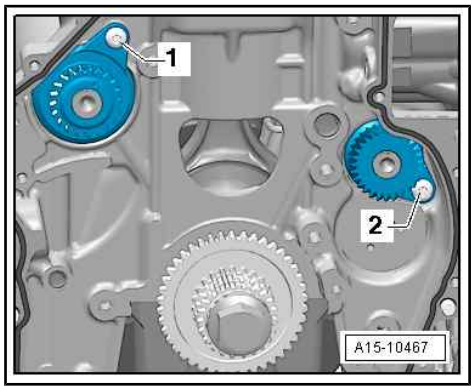
Installing

– Lubricate balance shaft bearings -arrows- with engine oil.



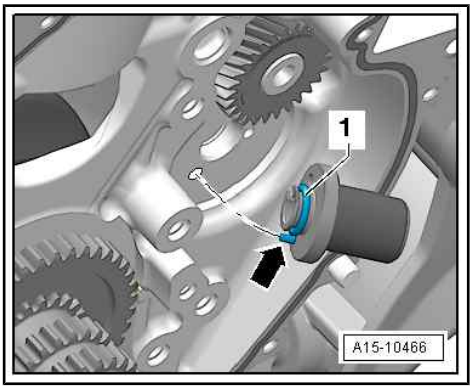
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– Install balance shaft (inlet side) and tighten bolt -2-.



– Renew O-ring -1- and lubricate with engine oil.

– Lubricate bearing mounting with engine oil and install; dowel pin -arrow- for bearing mounting must engage in bore in cylinder block.



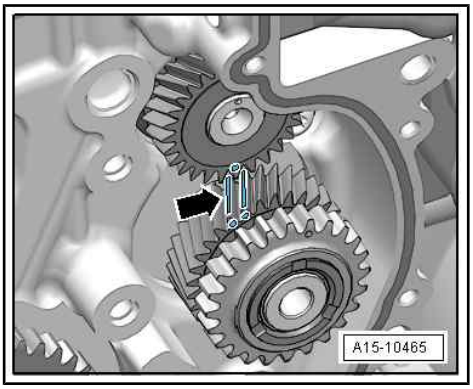
Caution

Always renew idler gear. If this is not done, there is no backlash, which causes engine damage.

The new idler gear has a special lubricant coating which wears off after a short running period and thus automatically creates the specified backlash.

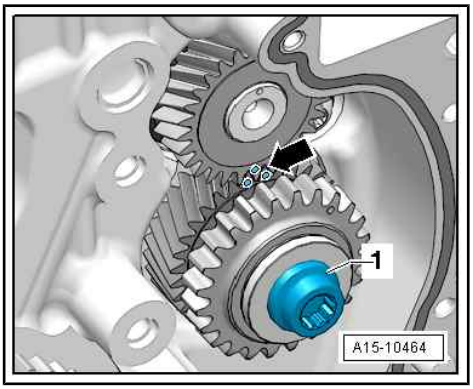
– Mark faces of gear teeth of idler gear with paint marker -arrow-.

– Insert idler gear; marking on balance shaft must be positioned between markings on faces of gear teeth.



– Tighten bolt -1- for idler gear: tightening sequence ⇒ page 104 .

– Check markings on idler gear/balance shaft -arrow-.



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The remaining installation steps are carried out in the reverse sequence. Note the following points:

– Install drive chain for balance shafts ⇒ page 121 .

– Install camshaft timing chain ⇒ page 108 .

– Install timing chain cover (bottom) ⇒ page 93 .

– Install timing chain cover (top) ⇒ page 92 .

– Renew oil seal for balance shaft (inlet side) ⇒ page 81 .

– Install toothed belt for coolant pump ⇒ page 216 .

Tightening torques

◆ ⇒ “4.1 Exploded view - balance shaft”, page 76

4.2.2 Removing and installing balance shaft (exhaust side)

Always renew balance shaft and needle bearing following removal. Install a new needle bearing with the same colour coding.

Removing

• Engine removed

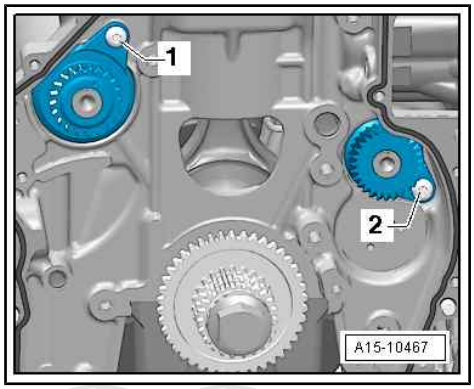
– Remove timing chain cover (top) ⇒ page 92 .

– Remove timing chain cover (bottom) ⇒ page 93 .

– Remove camshaft timing chain ⇒ page 108 .

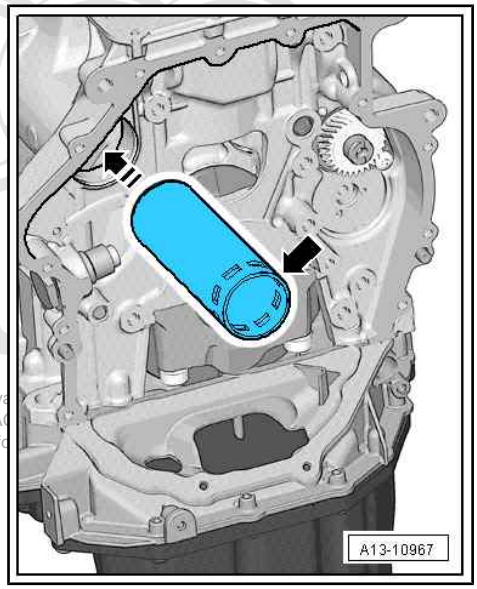
– Remove drive chain for balance shafts ⇒ page 121 .

– Remove bolt -1- securing balance shaft (exhaust side) and pull out balance shaft.



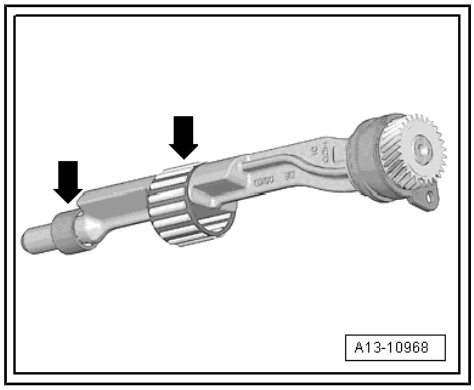
Installing

– Check installation position of tube for balance shaft; openings -arrow- must face chain side.



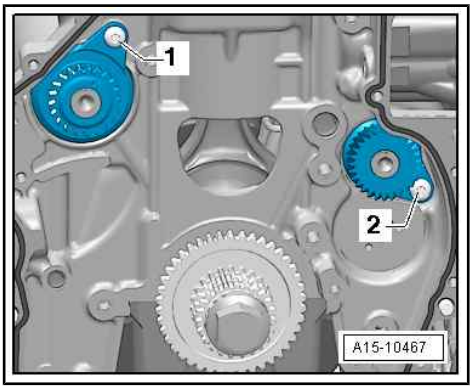
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– Lubricate balance shaft bearings -arrows- with engine oil.



– Install balance shaft (exhaust side).

– Make sure that balance shaft is in full contact with crankcase before tightening bolt -1-.



Note

Insert tube for balance shaft again if balance shaft does not make full surface contact.

Further assembly is basically carried out in reverse order of dismantling. When doing so, note the following:

– Install drive chain for balance shafts ⇒ page 121 .

– Install camshaft timing chain ⇒ page 108 .

– Install timing chain cover (bottom) ⇒ page 93 .

– Install timing chain cover (top) ⇒ page 92 .

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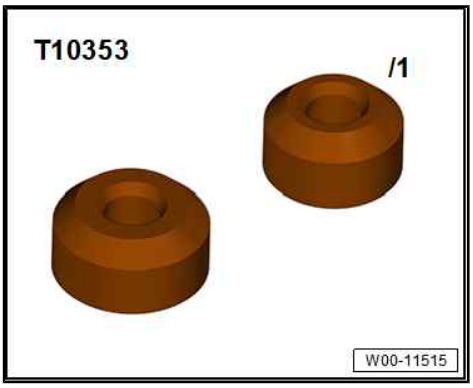
Tightening torques

♦ ⇒ “4.1 Exploded view - balance shaft”, page 76

4.3 Renewing oil seal for balance shaft (inlet side)

Special tools and workshop equipment required

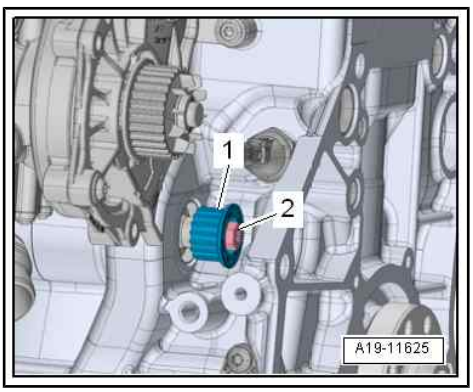
♦ Thrust piece - T10353/1-



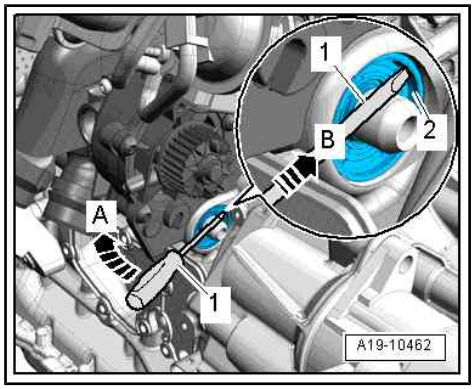
Procedure

– Remove toothed belt for coolant pump ⇒ page 216 .

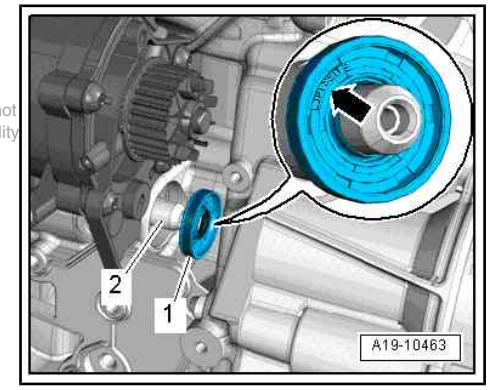
– Unscrew bolt -2- and detach drive sprocket -1- for toothed belt for coolant pump.



– Press screwdriver -1- firmly onto section -2- of oil seal -arrow B-.
– Lever out oil seal -arrow A-.
– Clean contact surface and sealing surface.



– Lubricate sealing surface of balance shaft -2- with gear oil.
– Slide oil seal -1- onto balance shaft -2-.
• The marking “Luftseite” (“Outside”) -arrow- should be legible from the outside.

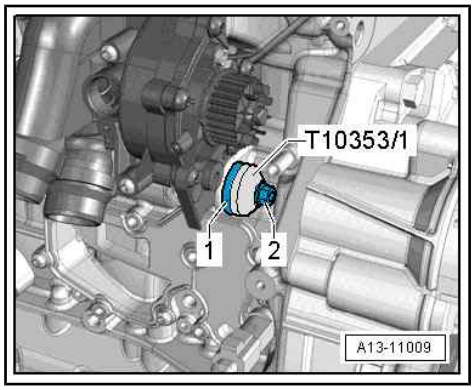


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Caution

Risk of damage to thread.

♦ *The drive sprocket bolt has a left-hand thread.*



– Apply thrust piece - T10353/1- to oil seal -1- and press into cylinder block as far as stop using bolt -2- (take care not to tilt oil seal).
– Install toothed belt for coolant pump ⇒ page 216 .
– Fill up with coolant ⇒ page 200 .

5 Pistons and conrods

⇒ “5.1 Exploded view - pistons and conrods”, page 83

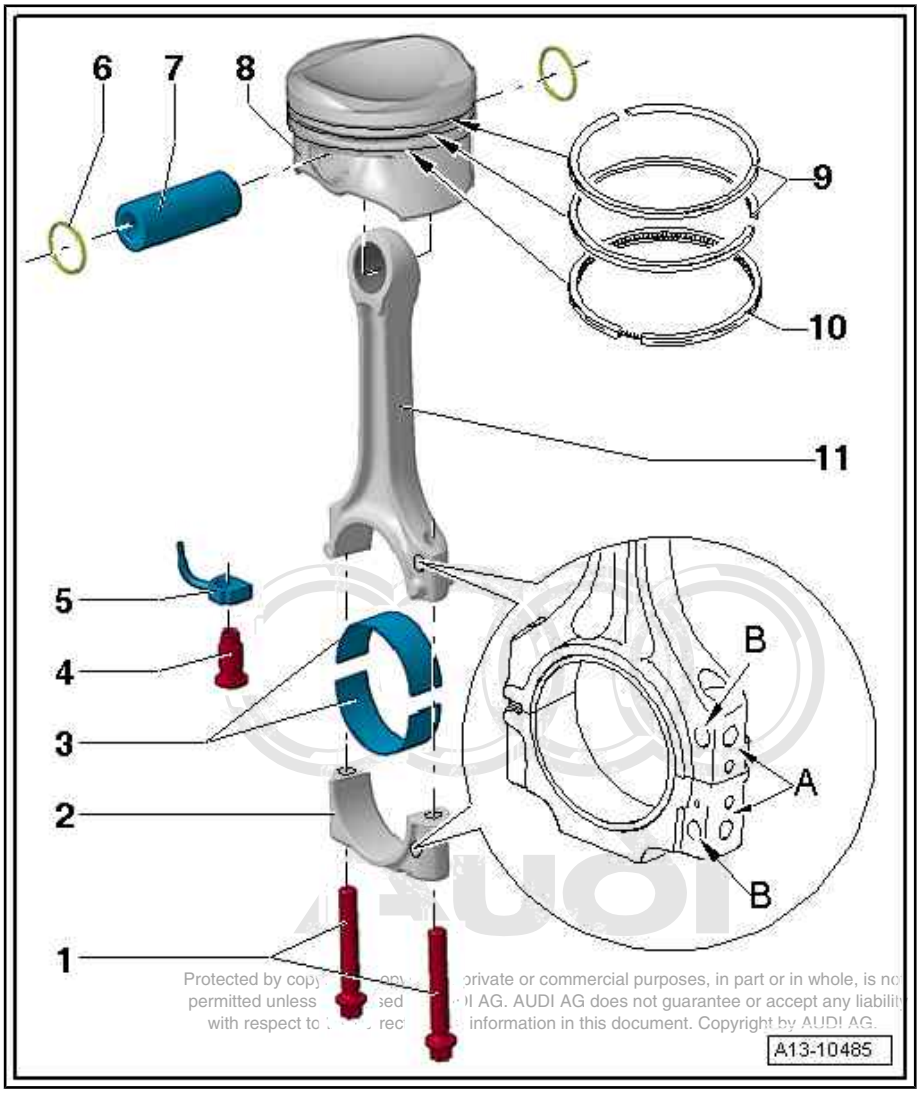
⇒ “5.2 Removing and installing pistons”, page 84

⇒ “5.3 Checking pistons and cylinder bores”, page 86

⇒ “5.4 Separating parts of new conrod”, page 87

⇒ “5.5 Checking radial clearance of conrod bearings”, page 88

5.1 Exploded view - pistons and conrods



1 - Conrod bolts

- ❑ Renew after removing
- ❑ Use old bolts when measuring radial clearance
- ❑ 45 Nm + turn 90° further

2 - Conrod bearing cap

- ❑ Note installation position
- ❑ Due to the cracking method used to separate the bearing cap from the conrod in manufacture, the caps only fit in one position and only on the appropriate conrod
- ❑ Mark cylinder allocation -A-
- ❑ Installation position: Marking -B- faces towards pulley end
- ❑ Separating parts of new conrod ⇒ page 87

3 - Bearing shells

- ❑ Installation position ⇒ page 84
- ❑ Renew used bearing shells
- ❑ Axial clearance when new: 0.10 ... 0.35 mm; wear limit: 0.40 mm
- ❑ Check radial clearance with Plastigage - (new): 0.02 ... 0.06 mm; wear limit: 0.09 mm. Do not turn crankshaft when measuring radial clearance

4 - Pressure relief valve

- ❑ 27 Nm

5 - Oil spray jet

- ❑ For piston cooling

6 - Circlip

- ❑ Renew after removing

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7 - Piston pin

- ❑ Lubricate before installing

8 - Piston

- ❑ Removing and installing ⇒ page 84
- ❑ Mark installation position and cylinder number
- ❑ Arrow on piston crown points to pulley end
- ❑ Checking pistons and cylinder bores ⇒ page 86

9 - Compression rings

- ❑ Use piston ring pliers (commercially available) to remove and install
- ❑ Offset gaps by 120°
- ❑ Installation position: “TOP” or “R” must face towards piston crown
- ❑ Checking ring gap ⇒ page 86
- ❑ Checking ring-to-groove clearance ⇒ page 86

10 - Oil scraper ring

- ❑ 2 parts
- ❑ Install with gap offset by 120° to next compression ring
- ❑ “TOP” or “R” must face towards piston crown
- ❑ Checking ring gap ⇒ page 86
- ❑ Ring-to-groove clearance cannot be checked

11 - Conrod

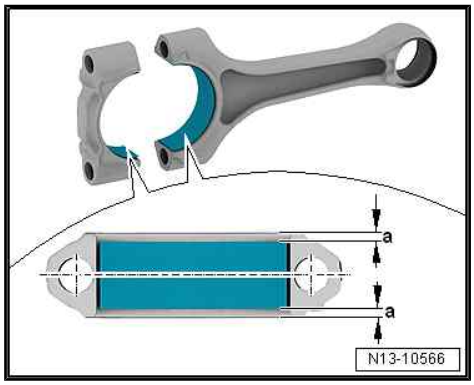
- ❑ Only renew as a complete set
- ❑ Mark cylinder allocation -A-
- ❑ Installation position: Marking -B- faces towards pulley end
- ❑ Separating parts of new conrod ⇒ page 87
- ❑ Measuring radial clearance ⇒ page 88

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Installation position of bearing shell

– Position bearing shells in centre of conrod and conrod bearing cap when fitting.

Dimension -a- must be identical on both sides.



5.2 Removing and installing pistons

Special tools and workshop equipment required

- Drift - VW 222 A-



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- Piston ring clamp (commercially available)

Removing

– Secure engine to engine and gearbox support - VAS 6095- ⇒ page 29 .

– Remove cylinder head ⇒ page 128 .

– Remove sump (top section) ⇒ page 174 .

– Mark installation position and cylinder number of piston.

– Mark installation position and cylinder number of conrod ⇒ Item 11 (page 84) .

– Remove conrod bearing cap and pull out piston and conrod upwards.

Note

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

– Take circlip out of piston pin boss.

– Use drift - VW 222 A- to drive out piston pin.

Installing

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

Note

- *Renew bolts tightened with specified tightening angle.*
- *Arrow on piston crown points to pulley end.*
- *Piston ring gaps should be spaced at 120°.*

– Oil running surfaces of bearing shells.

– Install piston using commercially available piston ring clamp; note installation position ⇒ Item 8 (page 84) .

– Install conrod bearing cap; note installation position ⇒ Item 2 (page 83) .

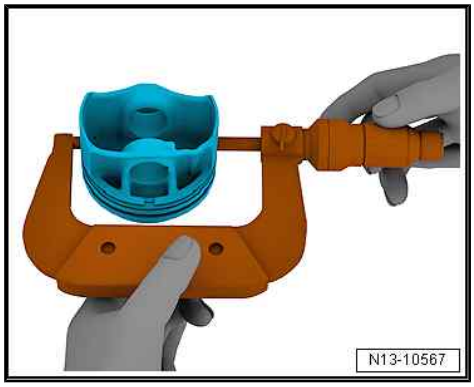
– Install cylinder head ⇒ page 128 .

– Install sump (upper section) ⇒ page 174 .

Tightening torques

- ⇒ “5.1 Exploded view - pistons and conrods”, page 83

5.3 Checking pistons and cylinder bores



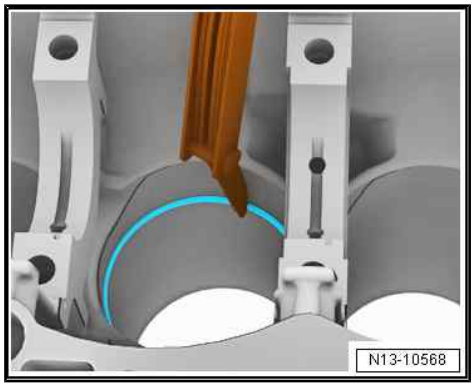
Checking piston

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

♦ Difference between actual and nominal diameter: not more than 0.04 mm.

		Piston ∅
Basic dimension	mm	82.420 [1]

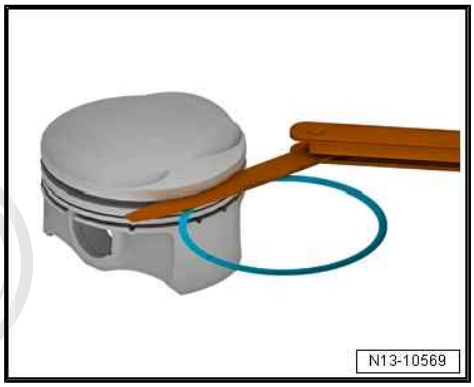
• [1] Dimensions not including graphite coating (thickness 0.02 mm). The graphite coating will wear down in service.



Checking piston ring gap

– Insert piston ring at right angle to cylinder wall from above and push down into lower cylinder opening approx. 15 mm from bottom of cylinder. Use a piston without rings to push ring into bore.

Piston ring Dimensions in mm	New	Wear limit
1st compression ring	0.30 ... 0.40	0.80
2nd compression ring	0.40 … 0.50	0.80
Oil scraper ring	0.20 ... 0.40	0.80

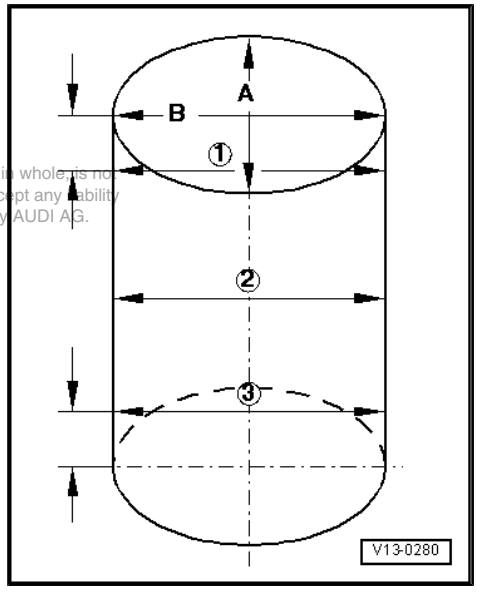


Checking ring-to-groove clearance

– Clean groove in piston before checking clearance.

Piston ring Dimensions in mm	New	Wear limit
1st compression ring	0.06 … 0.09	0.20
2nd compression ring	0.03 … 0.06	0.15
Oil scraper rings	Cannot be measured	

Checking cylinder bore



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Special tools and workshop equipment required

- Cylinder gauge - VAS 6078-

Caution

Machining (reboring, honing, grinding) cylinder bore with workshop equipment is not permitted. The surface of the cylinder bore is damaged by machining.

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

- Difference between actual and nominal diameter: not more than 0.08 mm.

		Cylinder bore ∅
Basic dimension	mm	82.51

Note

Measuring the cylinder bores must not be done when the cylinder block is mounted to the engine and gearbox stand - VAS 6095- , as incorrect measurements may result.

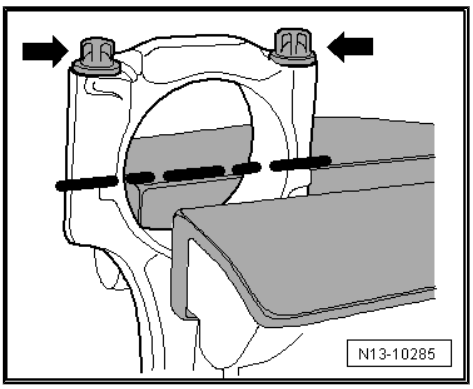
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5.4 Separating parts of new conrod

It is possible that the two parts of a new conrod are not completely separated as intended. If it is not possible to take off the conrod bearing cap by hand, proceed as follows:

– Mark allocation of conrod ⇒ Item 11 (page 84) to cylinder.

– Clamp the conrod lightly in a vice using aluminium jaw covers as shown in illustration.

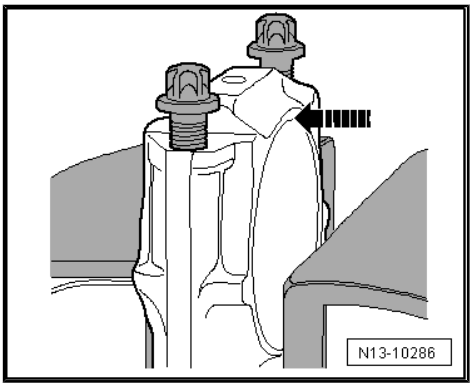


Note

- *To avoid any risk of damage, the conrod should only be clamped lightly.*
- *The conrod is clamped in position below the dotted line.*

– Unscrew the two bolts -arrows- approx. 5 turns.

– Using a plastic hammer, carefully knock conrod bearing cap loose in direction of -arrow-.



5.5 Checking radial clearance of conrod bearings

Special tools and workshop equipment required

- Plastigage

Procedure

– Remove conrod bearing cap.

– Clean bearing cap and bearing journal.

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

– Fit conrod bearing cap and secure with old bolts ⇒ Item 1 (page 83) without rotating crankshaft.

– Remove conrod bearing cap again.

– Compare width of Plastigage with measurement scale.

Radial clearance:

- New: 0.02 ... 0.06 mm.
- Wear limit: 0.09 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 89

⇒ “1.2 Removing and installing camshaft control valve 1 N205 and exhaust camshaft control valve 1 N318 ”, page 92

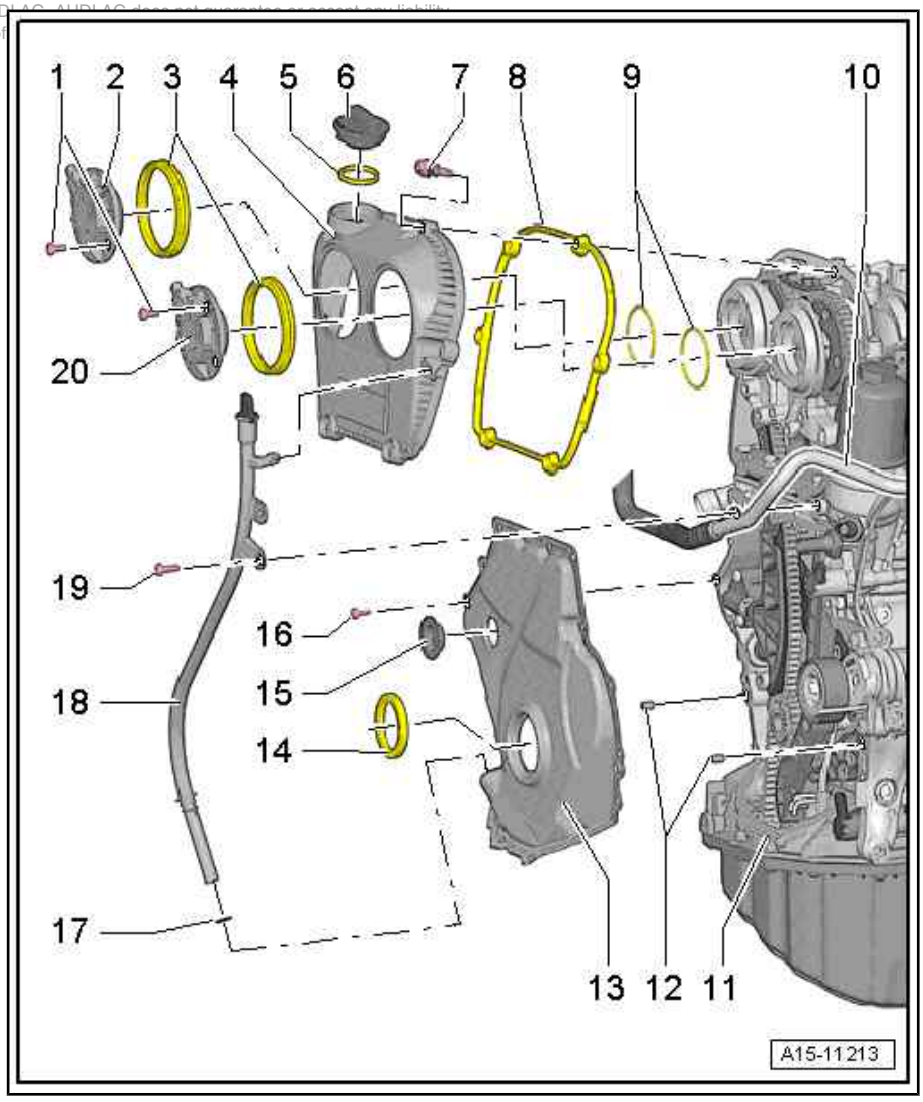
⇒ “1.3 Removing and installing timing chain cover (top)”, page 92

⇒ “1.4 Removing and installing timing chain cover (bottom)”, page 93

⇒ “1.5 Renewing oil seal for vibration damper”, page 97

1.1 Exploded view - timing chain cover

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1 - Bolt

- ❑ Renew
- ❑ Aluminium bolts: 4 Nm + turn 45° further
- ❑ Steel bolts: 9 Nm

2 - Exhaust camshaft control valve 1 - N318-

- ❑ Removing and installing ⇒ page 92
- ❑ Renew O-ring ⇒ Item 9 (page 89)

3 - Oil seals

- ❑ Renew

4 - Timing chain cover (top)

- ❑ Removing and installing ⇒ page 92

5 - Gasket

- ❑ Renew if damaged

6 - Sealing cap

7 - Bolt

- ❑ Tightening sequence ⇒ page 90

8 - Gasket

- ❑ Renew if damaged

9 - O-ring

- ❑ Renew
- ❑ Lubricate lightly with engine oil

10 - Not fitted

11 - Engine

12 - Dowel pins

- ❑ For centring cover

13 - Timing chain cover (bottom)

- ❑ With oil seal

- ❑ The timing chain cover is bent out of shape when it is removed because of the adhesive strength of the sealant; it must therefore always be renewed after removal
- ❑ Renewing ⇒ page 93

14 - Oil seal

- ❑ For vibration damper
- ❑ Renewing ⇒ page 97

15 - Sealing plug

- ❑ Renew

16 - Bolt

- ❑ Renew
- ❑ Tightening sequence with 15 bolts ⇒ page 91
- ❑ Tightening sequence with 8 bolts ⇒ page 91

17 - O-ring

- ❑ Renew
- ❑ Lubricate before installing

18 - Guide tube for oil dipstick

19 - Bolt

- ❑ 9 Nm

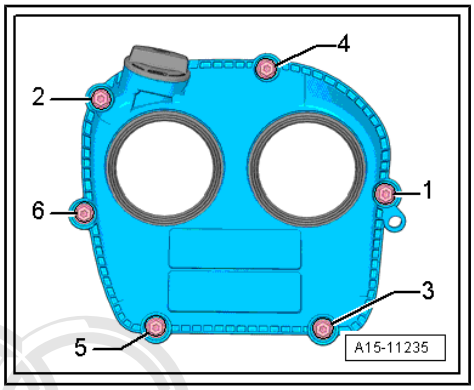
20 - Camshaft control valve 1 - N205-

- ❑ Removing and installing ⇒ page 92
- ❑ Renew O-ring ⇒ Item 9 (page 89)

Timing chain cover (top) - tightening sequence

– Tighten bolts -1- to -6- in the sequence shown:

Stage	Bolts/tightening sequence	Tightening torque/angle specification
1	-1- to -6-	Screw in until contact is made
2	-1- to -6-	Tighten to 9 Nm

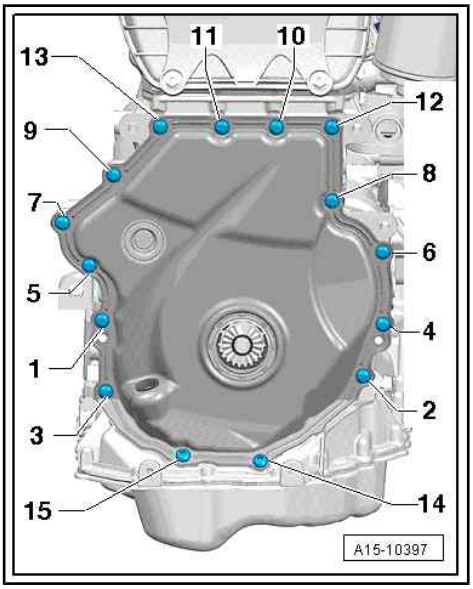


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Timing chain cover (bottom), tightening sequence with 15 bolts

– Tighten bolts -1- to -15- in three stages in the sequence shown:

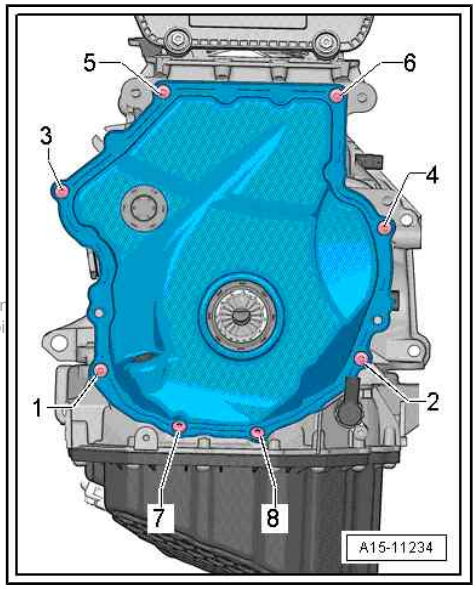
Stage	Bolts/tightening sequence	Steel bolts	Aluminium bolts
1	-1- to -15-	Tighten to 8 Nm	4 Nm
2	-1, 2, 4, 5- and -7 … 15-	Turn 45° further	Turn 45° further
3	-3- and -6-	Only tighten to final tightening angle after installing the vibration damper.	Only tighten to final tightening angle after installing the vibration damper.



Timing chain cover (bottom), tightening sequence with 8 bolts

– Tighten bolts -1- to -8- in three stages in the sequence shown:

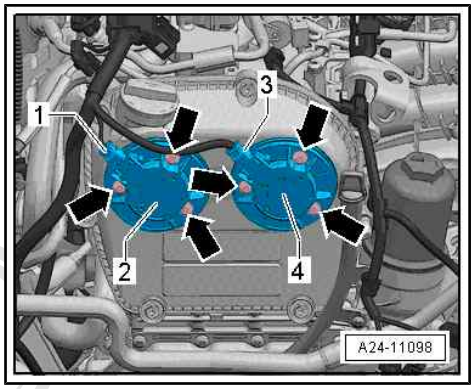
Stage	Bolts/tightening sequence	Steel bolts	Aluminium bolts
1	-1- to -8-	Tighten to 8 Nm	4 Nm
2	-2 … 3- and -5 … 8-	Turn 45° further	Turn 45° further
3	-1- and -4-	Only tighten to final tightening angle after installing the vibration damper.	Only tighten to final tightening angle after installing the vibration damper.



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1.2 Removing and installing camshaft control valve 1 - N205- and exhaust camshaft control valve 1 - N318-

Removing



– Unplug connector -1- from exhaust camshaft control valve 1 - N318- and connector -3- from camshaft control valve 1 - N205- .

– Unscrew bolts -arrows- and remove camshaft control valve 1 - N205- -item 4- and exhaust camshaft control valve 1 - N318- -item 2-.

Installing

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

Note

Renew O-rings.

– Lubricate sealing surfaces of oil seals to inlet camshaft control valve 1 - N205- / exhaust camshaft control valve 1 - N318- with engine oil.

Tightening torques

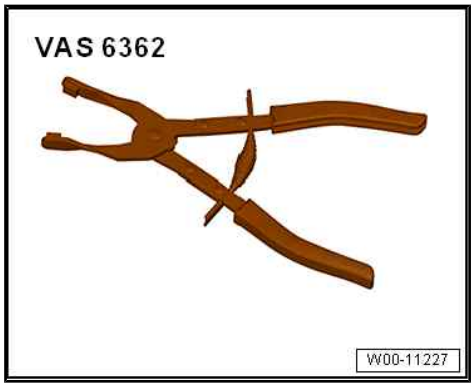
◆ ⇒ “1.1 Exploded view - timing chain cover”, page 89

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1.3 Removing and installing timing chain cover (top)

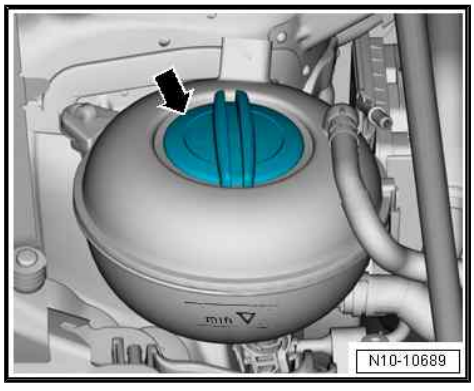
Special tools and workshop equipment required

◆ Hose clip pliers - VAS 6362-



◆ Sealant ⇒ Electronic parts catalogue

Removing



• Engine cold.

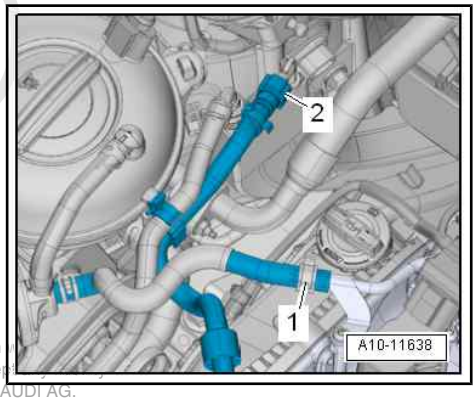
– Open filler cap -arrow- on coolant expansion tank briefly to relieve residual pressure in cooling system.

– Remove engine cover panel ⇒ page 50 .

– Release hose clip -1-, disconnect coolant hose and push towards right.

– Disconnect hose -2- for activated charcoal filter (press release tab on hose) and move hose clear.

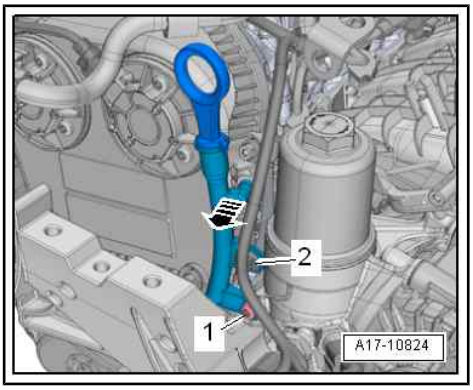
– Remove inlet camshaft control valve 1 - N205- / exhaust camshaft control valve 1 - N318- ⇒ page 92 .



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– Remove bolt -1- for dipstick guide tube.

– Unclip guide tube for oil dipstick from timing chain cover (top) -arrow-.

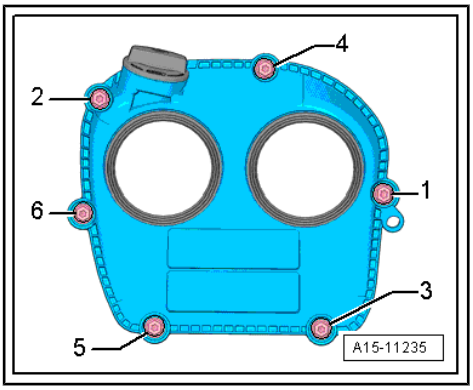


Note

Disregard -item 2-.

– Unscrew bolts -1 to 6- and remove timing chain cover (top).

– Remove bolts -3, 5- if necessary.



Installing

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

- Renew gasket and oil seals.

– Install timing chain cover (top); tightening sequence ⇒ page 90 .

– Install camshaft control valve 1 - N205- and exhaust camshaft control valve 1 - N318- ⇒ page 92 .

– Install engine cover panel ⇒ page 50 .

Tightening torques

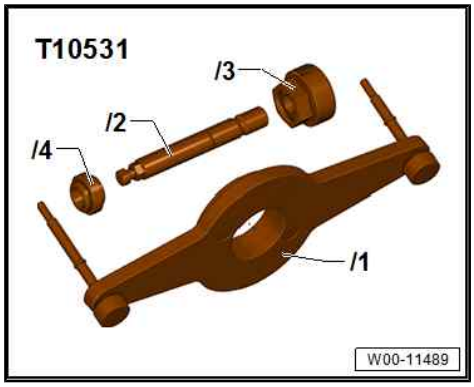
♦ ⇒ “1.1 Exploded view - timing chain cover”, page 89

1.4 Removing and installing timing chain cover (bottom)

Note

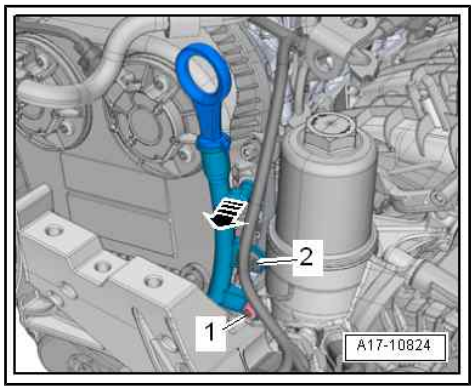
The timing chain cover is bent out of shape when it is removed because of the adhesive strength of the sealant; it must therefore always be renewed.

Assembly tool - T10531-



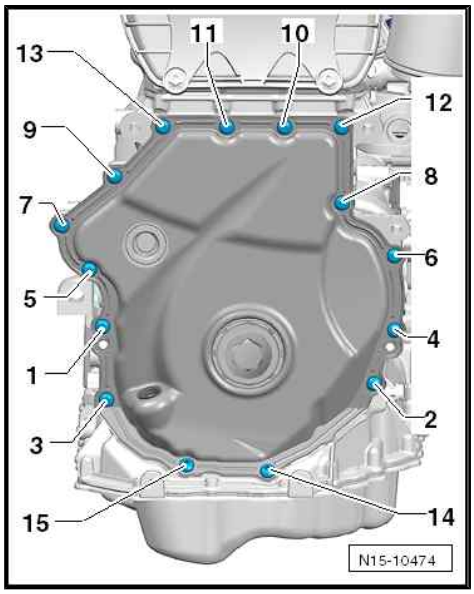
Removing

- Remove front wheel housing liner (right-side) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Removing and installing wheel housing liner (front) .
- Remove engine support ⇒ page 62 .
- Remove vibration damper ⇒ page 54 .
- Drain engine oil ⇒ Maintenance ; Booklet ; Engine oil: draining; Renewing oil filter and filling up engine oil .
- Remove valve for oil pressure control - N428- ⇒ page 187 .
- Remove tensioner for poly V-belt ⇒ page 54 .



- Move retaining clip -2- for electrical wiring harness clear.
- Remove bolt -1-.
- Unclip guide tube for oil dipstick from timing chain cover (top) -arrow-.
- Pull guide tube for oil dipstick out of timing chain cover.

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- Remove bolts -1...15-.

Note

Some versions may have only 8 bolts.

- Prise off timing chain cover (bottom).

Installing

Note

- *Note expiry date of silicone sealant.*
- *Silicone sealant ⇒ Electronic parts catalogue (ETKA) .*
- *The cover must be installed within 5 minutes after applying the silicone sealant.*
- *Renew bolts.*
- *Renew oil seal and O-ring.*

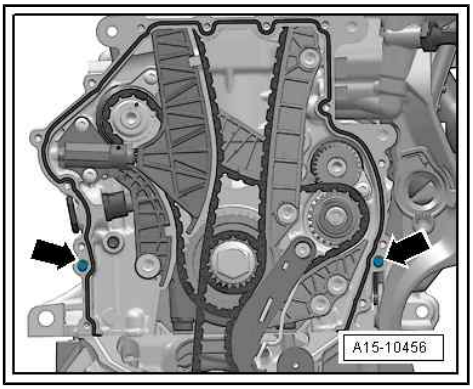
Caution

Protect lubrication system against contamination.

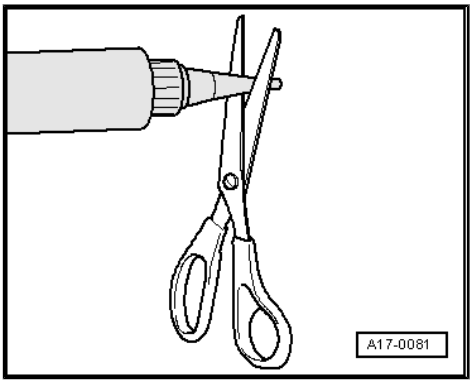
- ***Cover exposed parts of the engine.***

- Remove sealant remaining on cylinder block with flat scraper.
- Clean surfaces; they must be free of oil and grease.

– Check that both dowel pins are fitted in cover -arrows-.



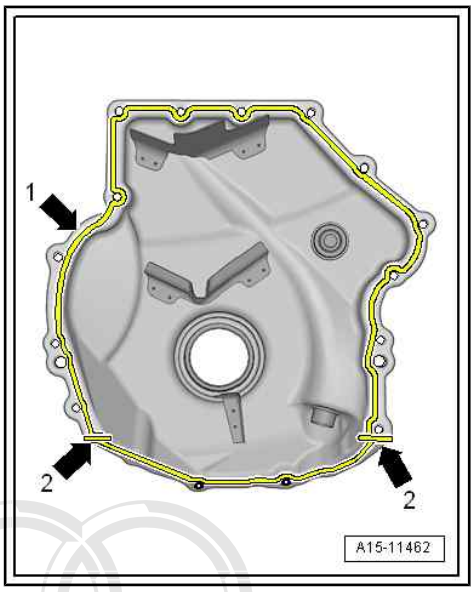
– Cut off nozzle of tube at front marking (∅ of nozzle approx. 3 mm).



Cover with 15 bolts

– Apply silicone sealant onto clean sealing surface -arrow 1- and onto edges -arrow 2- of new cover, as illustrated.

♦ Thickness of sealant bead: 2 ... 3 mm.



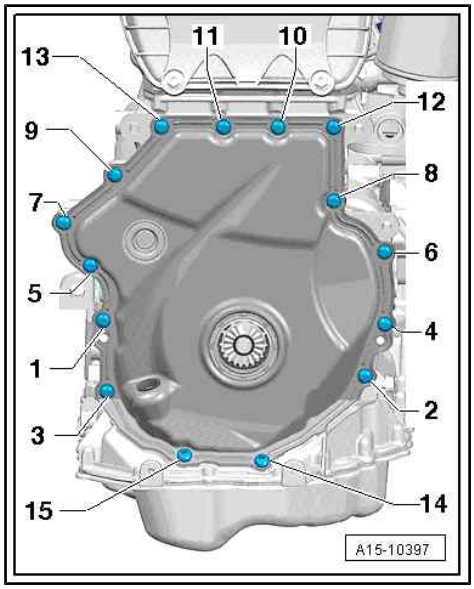
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– Immediately fit cover and tighten bolts.

Note

Only tighten bolts -3- and -6- to final tightening angle after installing the vibration damper. The bolts must be unscrewed again to install the vibration damper.

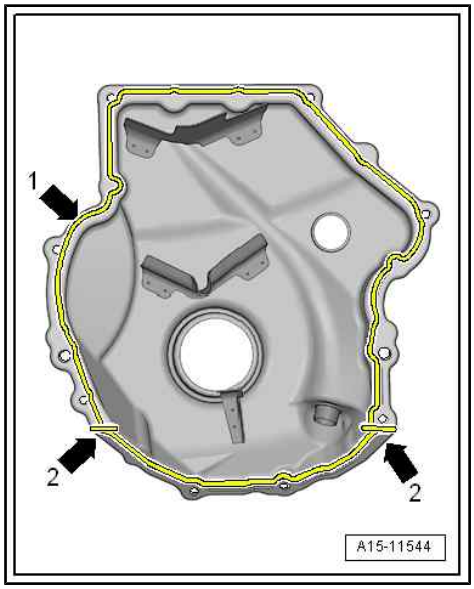
– Tighten bolts -1 to 15- in the sequence shown
⇒ “1.1 Exploded view - timing chain cover”, page 89 .



Cover with 8 bolts

– Apply silicone sealant onto clean sealing surface -arrow 1- and onto edges -arrow 2- of new cover, as illustrated.

♦ Thickness of sealant bead: 2 ... 3 mm.



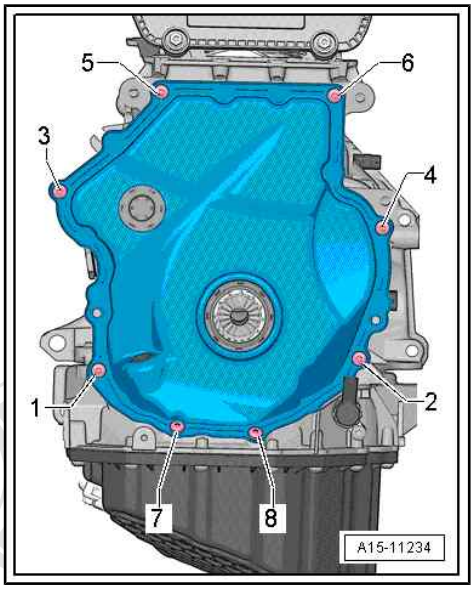
Note

♦ *The cover must be installed within 5 minutes after applying the silicone sealant.*

♦ *The bead of sealant must not be thicker than specified, otherwise excess sealant can enter the sump and obstruct the strainer in the oil intake pipe.*

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– Immediately fit cover and tighten bolts.



Note

Only tighten bolts -1- and -4- to final tightening angle after installing the vibration damper. The bolts must be unscrewed again to install the vibration damper.

– Tighten bolts -1 to 8- in the sequence shown ⇒ page 89 .

All vehicles (continued)

– Install vibration damper ⇒ page 54 .
– Install valve for oil pressure control - N428- ⇒ page 187 .
– Install poly V-belt tensioner ⇒ page 60 .
– Install poly V-belt ⇒ page 53 .
– Install front wheel housing liner (right-side) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Removing and installing front wheel housing liner .

Note

After fitting cover, let sealant dry for approx. 30 minutes. Then (and only then) fill the engine with engine oil.

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– Fill up engine oil and check oil level ⇒ Maintenance ; Booklet ; Engine oil: draining; Renewing oil filter and filling up engine oil .

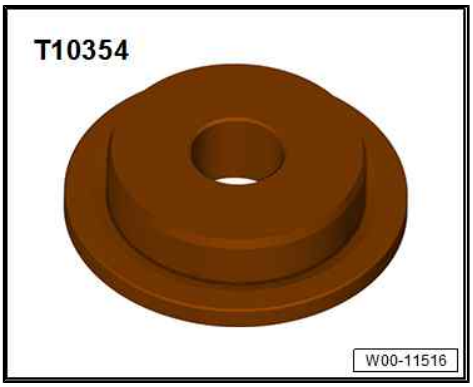
Tightening torques

- ⇒ “1.1 Exploded view - timing chain cover”, page 89
- ⇒ Fig. ““Engine support - tightening torque and sequence”“ , page 36
- ⇒ “2.1 Exploded view - assembly mountings”, page 35

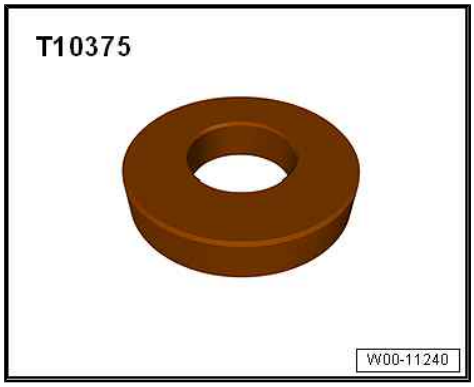
1.5 Renewing oil seal for vibration damper

Special tools and workshop equipment required

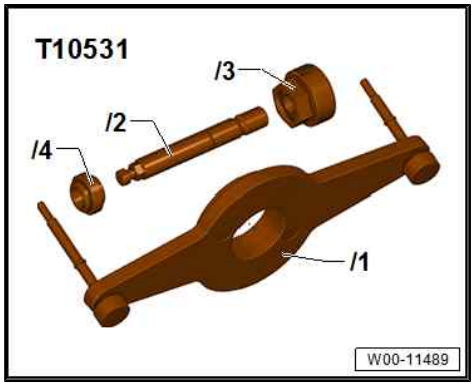
- Thrust piece - T10354-



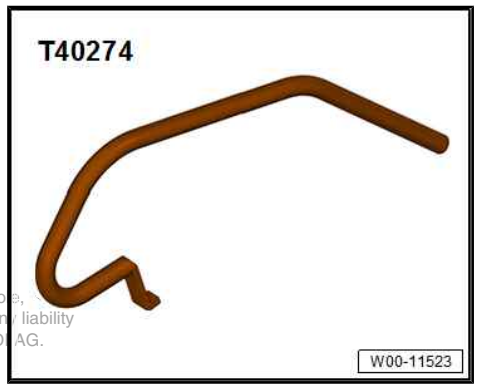
- Thrust pad - T10375-



- Flange nut - 10531/4- from assembly tool - T10531-



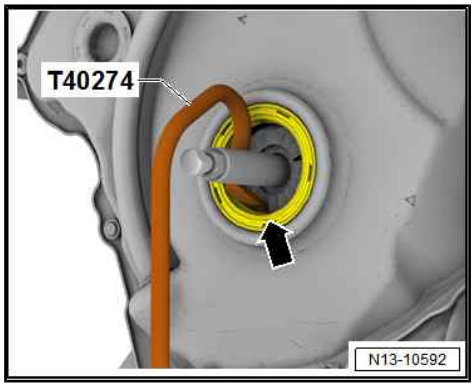
- Extractor hook - T40274-



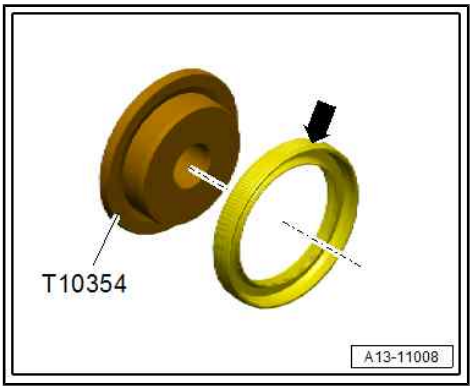
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Removing

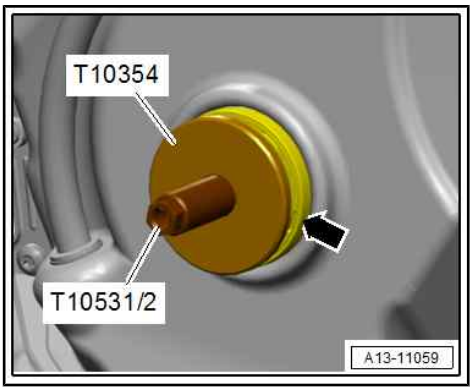
– Remove vibration damper ⇒ page 54 .



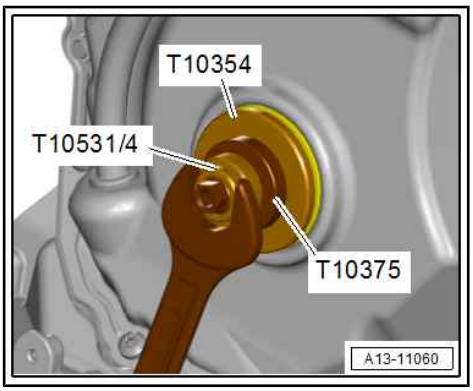
– Pry out oil seal -arrow- using extractor hook - T40274- .
– Clean contact surface and sealing surface.
– Fit oil seal -arrow- onto thrust piece - T10354- .
• Closed side of oil seal faces thrust piece - T10354- .



– Slide oil seal -arrow- with thrust piece - T10354- onto clamping pin - T10531/2- and position on timing chain cover (bottom).



– Also fit thrust pad - T10375- and tighten flange nut - 10531/4- .
– Drive oil seal in as far as stop using thrust piece - T10354- .



Note

♦ *Renew bolt for vibration damper.*
♦ *Renew O-ring.*

– Install vibration damper ⇒ page 54 .

Tightening torques

♦ ⇒ “1.1 Exploded view - cylinder block (pulley end)”, page 51

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2 Chain drive

⇒ “2.1 Exploded view - camshaft timing chains”, page 100

⇒ “2.2 Exploded view - drive chain for balance shaft”, page 102

⇒ “2.3 Removing and installing bearing saddle”, page 104

⇒ “2.4 Removing and installing camshaft timing chain”, page 108

⇒ “2.5 Removing and installing drive chain for balance shaft”, page 121

⇒ “2.6 Checking valve timing”, page 121

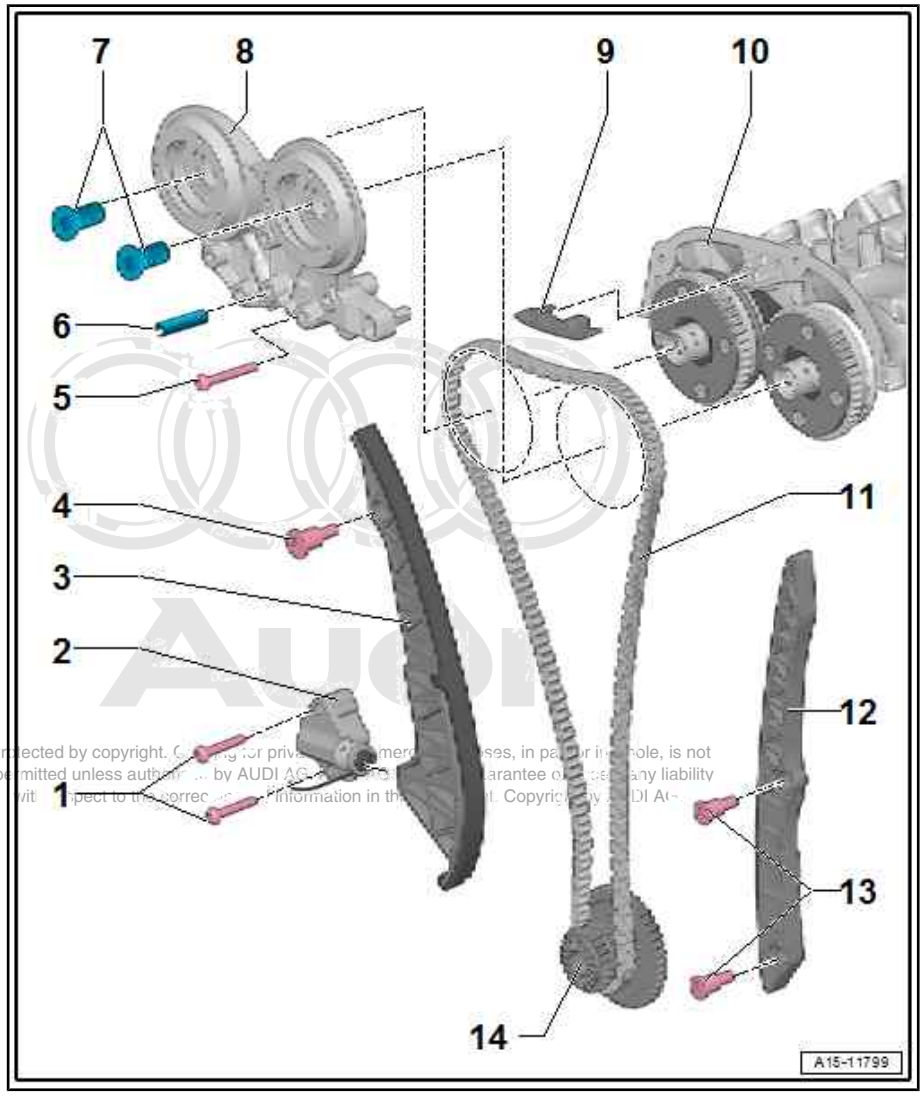
⇒ “2.7 Checking chain elongation”, page 124

2.1 Exploded view - camshaft timing chains

Note

- *After working on chain drive, learnt values must be adapted in engine control unit. To do so, switch on ignition and select following menu options on vehicle diagnostic tester :*
- `01 - Engine electronics`
- `Guided Functions`
- `01 - Adaptions after repairs on chain drive`

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1 - Bolt

- ❑ Renew
- ❑ 4 Nm +90°

2 - Chain tensioner

- ❑ Exerts spring pressure
- ❑ Before removing, lock in place using locking tool - T40267-

3 - Tensioning rail for timing chain

4 - Guide pin

- ❑ 20 Nm

5 - Bolt

- ❑ Renew
- ❑ Tightening sequence ⇒ page 102

6 - Spring pin

- ❑ Not fitted on all bearing saddle versions

7 - Timing valves

- ❑ Left-hand thread
- ❑ Remove with assembly tool - T10352/2-
- ❑ 35 Nm

8 - Bearing saddle

- ❑ Removing and installing ⇒ page 104

9 - Guide rail for camshaft timing chain

10 - Camshaft housing

11 - Camshaft timing chain

- ❑ Before removing, mark running direction with paint

12 - Guide rail for camshaft timing chain

13 - Guide pin

- ❑ 20 Nm

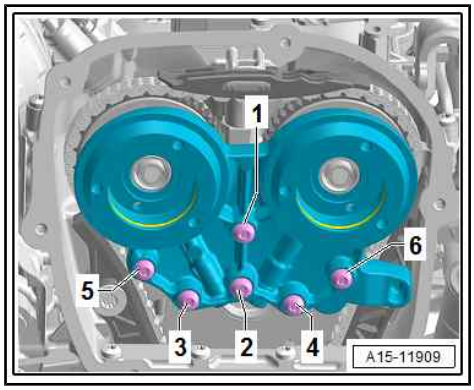
14 - Three-part chain sprocket assembly

- ❑ Crankshaft
- ❑ Installation position ⇒ page 102

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Bearing saddle - tightening torque and sequence

– Tighten bolts in stages in the sequence shown:



For steel bolts

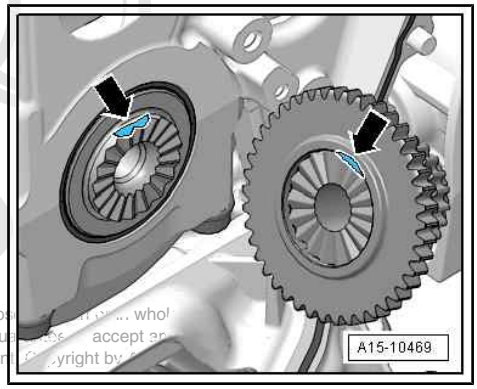
Stage	Bolts	Tightening torque/angle specification
1.	-1 … 6-	Screw in by hand until contact is made
2.	-1 … 6-	9 Nm

For aluminium bolts

Stage	Bolts	Tightening torque/angle specification
1.	-1 … 6-	Screw in by hand until contact is made
2.	-1 … 6-	Pre-tighten to 4 Nm
3.	-1 … 6-	Turn 180° further

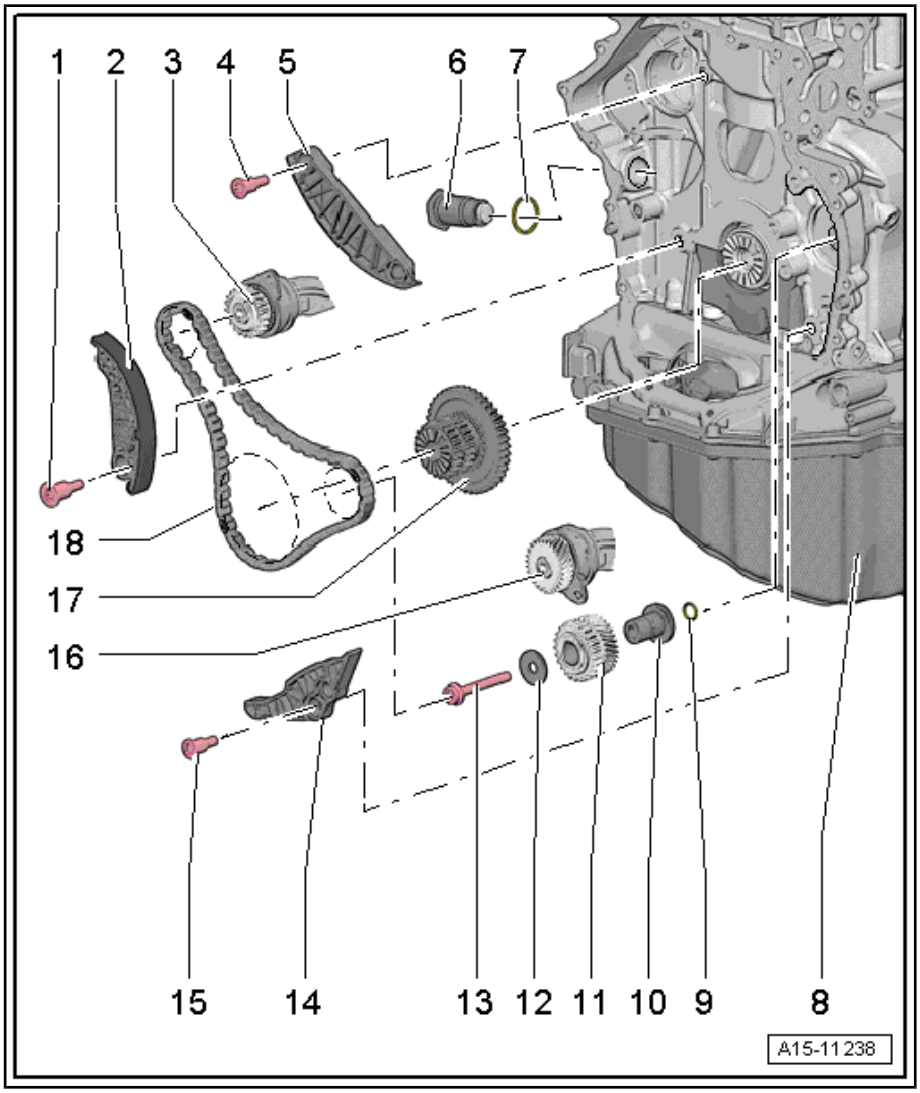
Three-part chain sprocket assembly - installation position

• The two sections -arrows- must be aligned.



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2.2 Exploded view - drive chain for balance shaft



1 - Guide pin
- ❑ 20 Nm

2 - Tensioning rail
- ❑ For timing chain

3 - Balance shaft
- ❑ Exhaust side
- ❑ Always renew after removal
- ❑ Renewing ⇒ page 79

4 - Guide pin
- ❑ 20 Nm

5 - Guide rail
- ❑ For timing chain

6 - Chain tensioner
- ❑ Apply locking fluid when installing; refer to ⇒ Electronic parts catalogue
- ❑ 85 Nm

7 - Seal

8 - Cylinder block

9 - O-ring
- ❑ Lubricate lightly with engine oil

10 - Bearing mounting
- ❑ Lubricate with engine oil
- ❑ Installation position ⇒ page 104

11 - Idler gear
- ❑ If bolt ⇒ Item 13 (page 103) has been loosened, idler gear must be renewed

12 - Thrust washer

13 - Bolt
- ❑ Renew after removing
- ❑ If bolt has been loosened, idler gear ⇒ Item 11 (page 103) must be renewed
- ❑ Tightening sequence ⇒ page 104

14 - Guide rail
- ❑ For balance shaft timing chain

15 - Guide pin
- ❑ 20 Nm

16 - Balance shaft
- ❑ Inlet side
- ❑ Always renew after removal
- ❑ Renewing ⇒ page 77

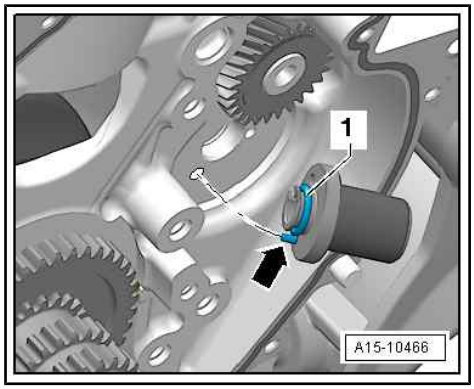
17 - Three-part chain sprocket assembly
- ❑ Installation position ⇒ page 102

18 - Drive chain for balance shafts
- ❑ Removing ⇒ page 121

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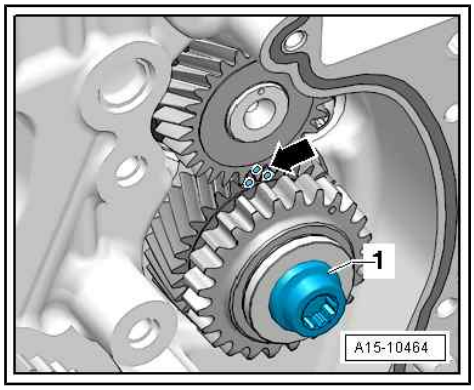
Bearing mounting - installation position

- Renew O-ring -1- and lubricate with oil.
- Dowel pin -arrow- for bearing mounting must engage in bore in cylinder block.
- Lubricate bearing mounting.



Idler gear - tightening sequence

> **Caution**
>
> *Always renew idler gear. If this is not done, there is no backlash, which causes engine damage.*
>
> *The new idler gear has a special lubricant coating which wears off after a short running period and thus automatically creates the specified backlash.*



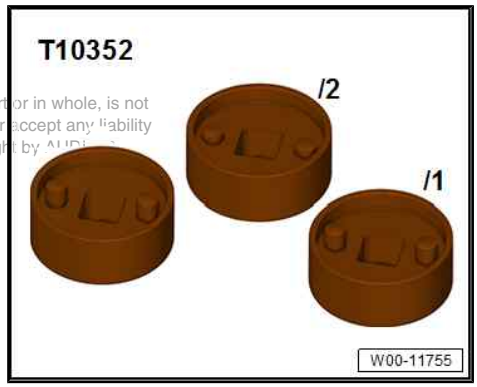
Tightening torque - idler gear -1-

Stage	Tightening torque
1	Pre-tighten to 10 Nm
2	Turn idler gear; there should be no play. Otherwise loosen bolt and tighten again.
3	25 Nm
4	Turn 90° further

2.3 Removing and installing bearing saddle

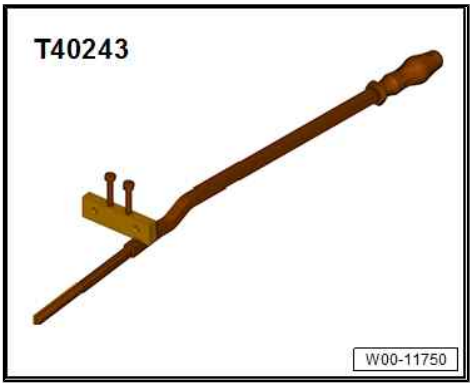
Special tools and workshop equipment required

♦ Assembly tool - T10352-

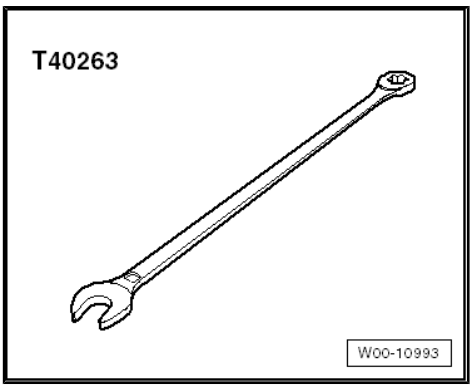


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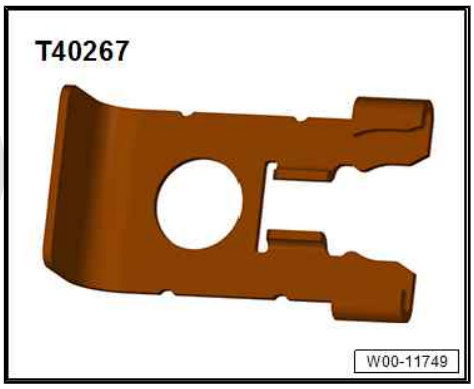
- Lever - T40243-



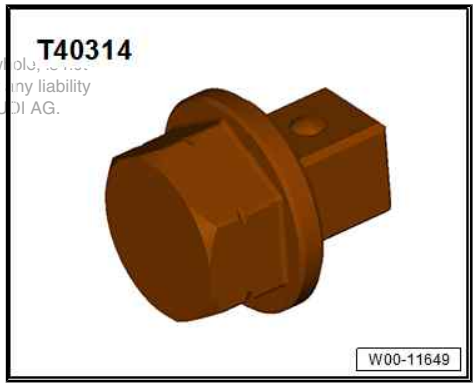
- Wrench, 21 mm - T40263-



- Locking tool - T40267-



- Adapter - T40314-



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Removing

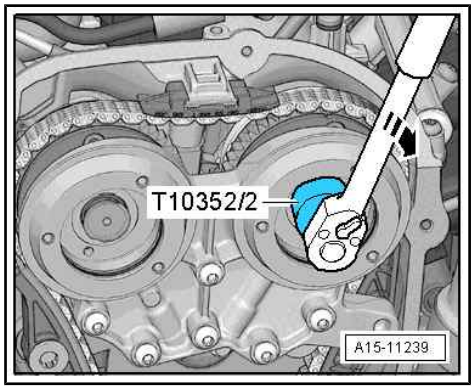
– Remove timing chain cover (top) ⇒ page 92 .

Caution

Risk of damage to thread.

- *The timing valves have a left-hand thread.*

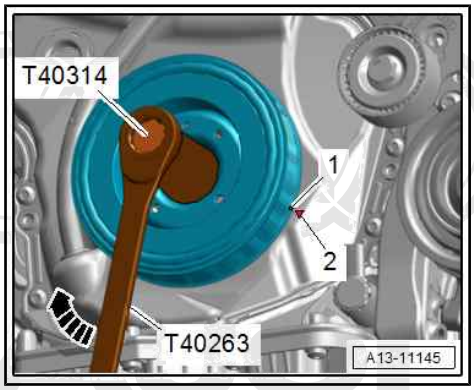
– Turn assembly tool - T10352/2- in direction of -arrow- to remove timing valve (left and right sides).



– To do so, counterhold with wrench, 21 mm - T40263- , adapter - T40314- and socket, 24 mm.

Note

Disregard -items 1, 2 and arrow-.

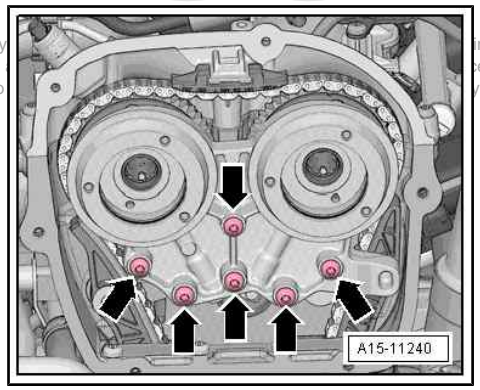


– Remove bolts -arrows-.

WARNING

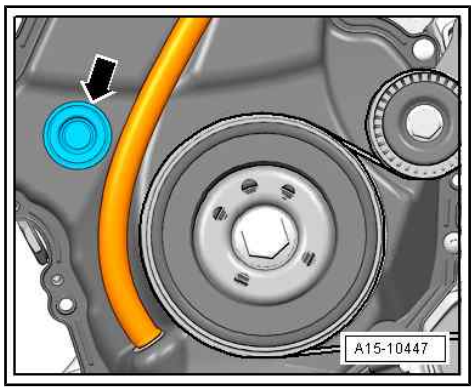
Risk of damage to bearing saddle.

- *Detach bearing saddle carefully without tilting it.*



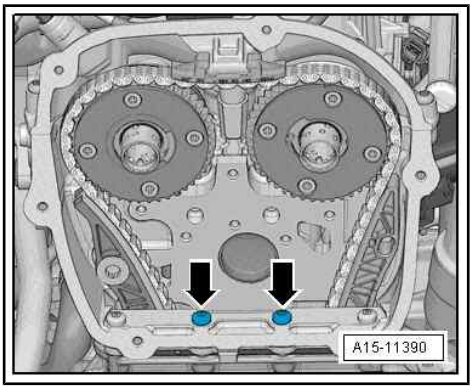
– Detach bearing saddle.

– Remove sealing plug -arrow-.

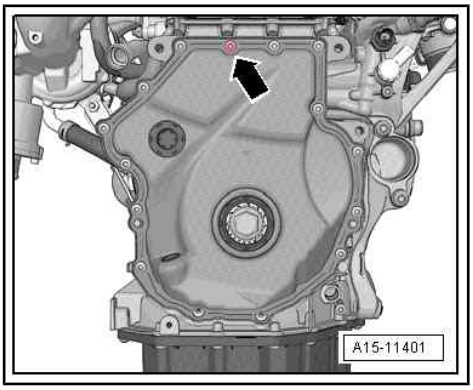


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– Remove bolts -arrows-.



– Remove bolt -arrow-.

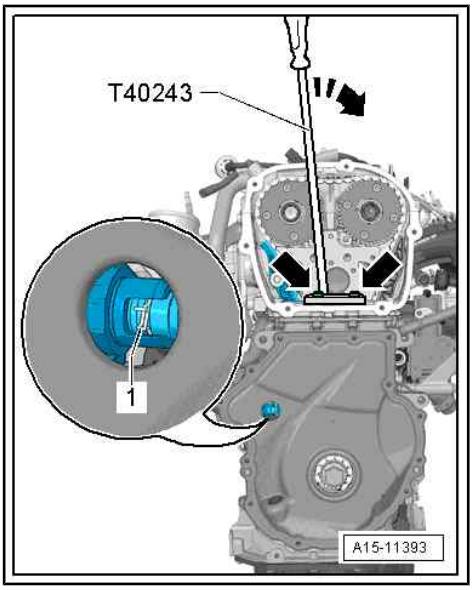


– Bolt lever - T40243- onto cylinder head -bottom arrows-.

Note

A second mechanic is required for the following steps.

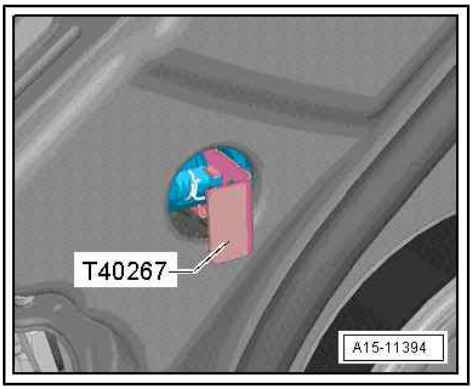
– Compress and hold circlip -1- for chain tensioner.
– Push lever - T40243- slowly in direction of -arrow- and hold in place.
• This will press the chain tensioner back.



Note

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

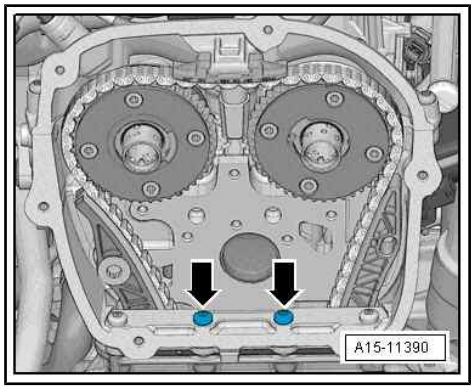
– Lock chain tensioner with locking tool - T40267- .
– Remove lever - T40243- .



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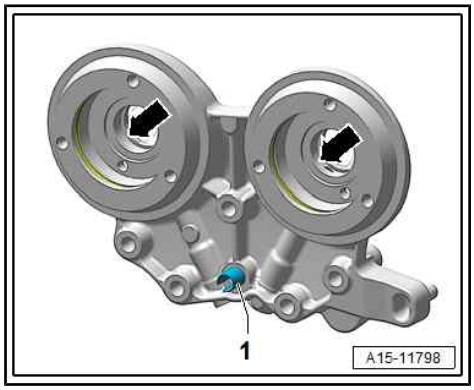
Installing

– Fit and tighten bolts -arrows-. Tightening torque ⇒ Item 4 (page 126)



– Lubricate holes -arrows- with engine oil.

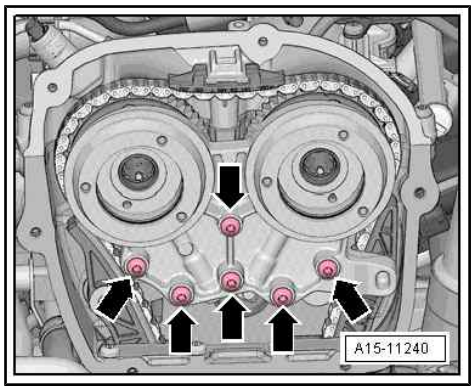
– Check whether clamping sleeve -1- is fitted.



WARNING

Risk of damage to bearing saddle.

- *Carefully attach bearing saddle without tilting it.*

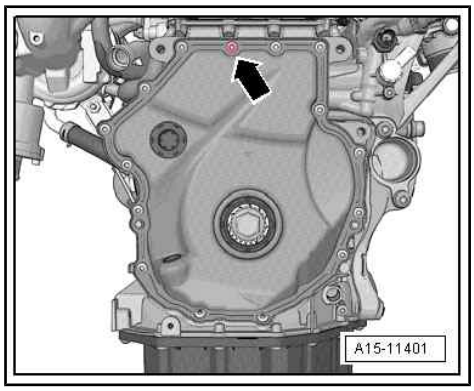


– Fit bearing saddle and screw in bolts -arrows- by hand until they make contact.

– Remove locking tool - T40267- .

– Tighten bolts for bearing saddle ⇒ page 102 .

– Screw in bolt -arrow-.



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

– Install timing chain cover (top) ⇒ page 92 .

Tightening torques

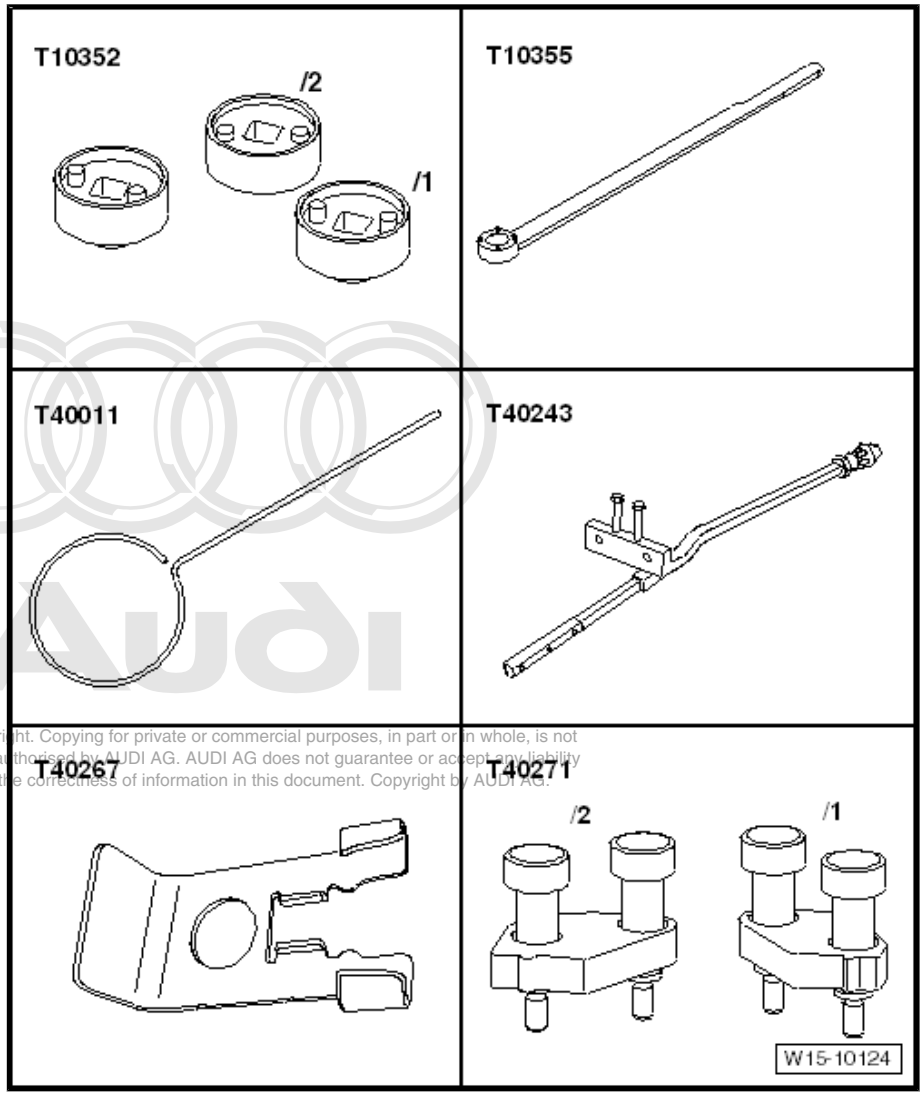
- ⇒ Fig. ""Bearing saddle - tightening torque and sequence"" page 102
- ⇒ "2.1 Exploded view - camshaft timing chains", page 100
- ⇒ "3.1 Exploded view - cylinder head", page 126

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2.4 Removing and installing camshaft timing chain

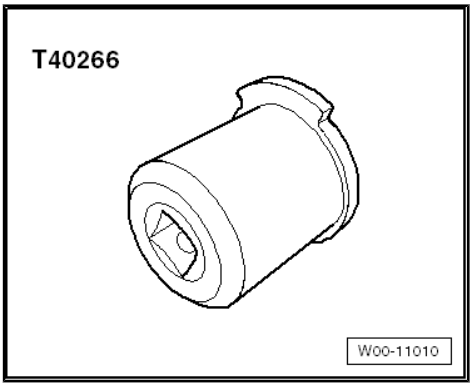
Special tools and workshop equipment required

- Removal tool - T10352-
- Counterhold tool - T10355-
- Locking pin - T40011-
- Assembly lever - T40243-
- Locking tool - T40267-
- Camshaft clamp - T40271-

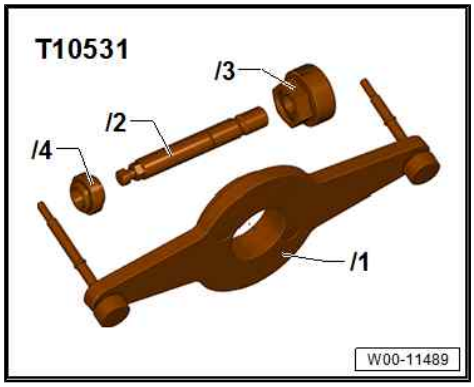


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- Assembly tool - T40266-



- Assembly tool - T10531-



Components of assembly tool - T10531- :

- Bracket - T10531/1-
- Clamping pin - T10531/2-
- Turning-over tool - T10531/3-
- Flange nut - T10531/4-

Removing

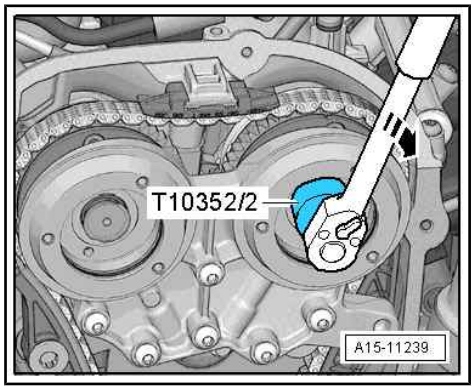
– Remove timing chain cover (top) ⇒ page 92 .

– Remove noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

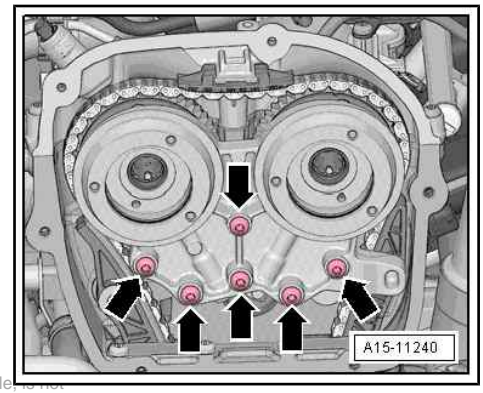
Caution

The timing valves have a left-hand thread.

– Turn assembly tool -T10352/2- in direction of -arrow- to remove timing valves (left and right).



– Remove bolts -arrows- and detach bearing saddle.

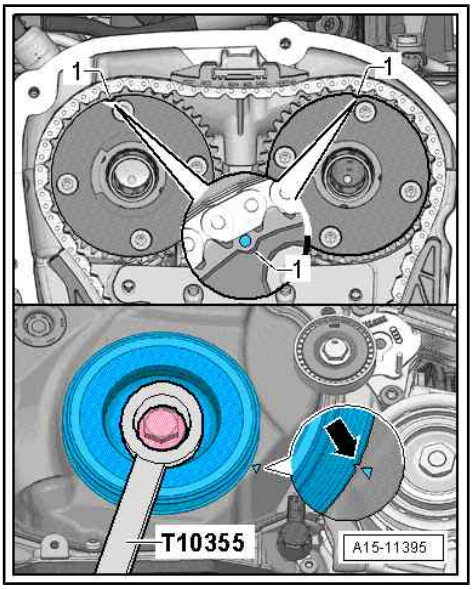


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– Turn vibration damper to “TDC” position using counterhold tool - T10355- .

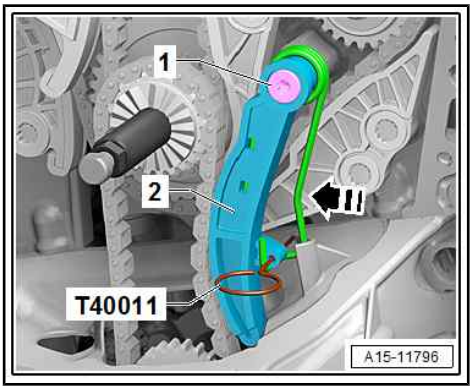
- Notch on vibration damper and marking on cover for timing chains (bottom) must be aligned -arrow-.
- The markings -1- on the camshafts must face upwards.

– Remove timing chain cover (bottom) ⇒ page 93 .

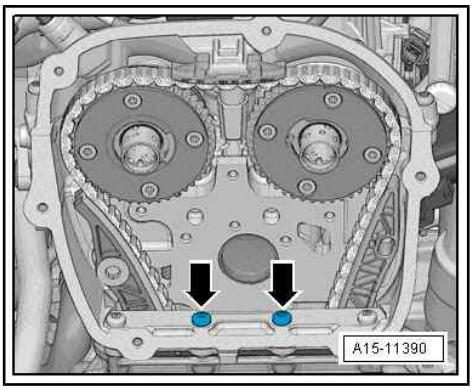


– Press retainer for oil pump chain tensioner in direction of -arrow- and lock in place using locking pin - T40011- .

– Unscrew bolt -1- and remove chain tensioner -2-.

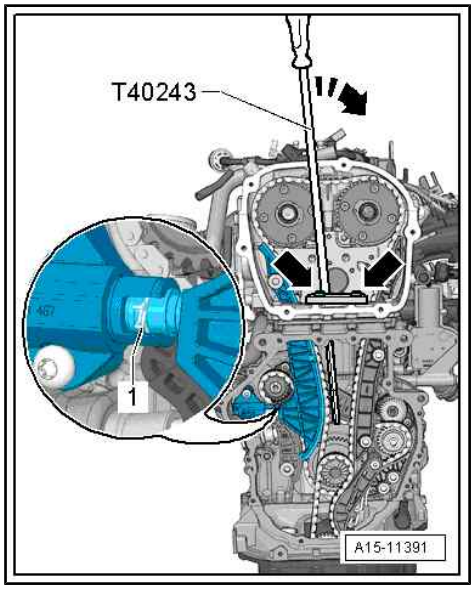


– Remove bolts -arrows-.



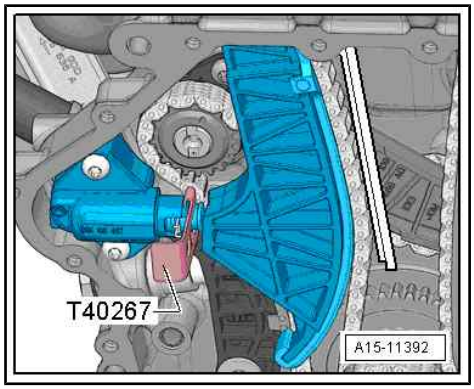
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– Screw in assembly lever - T40243- -arrows-.
– Compress and hold circlip -1- for chain tensioner.
– Push assembly lever - T40243- slowly in direction of -arrow- and hold in place.

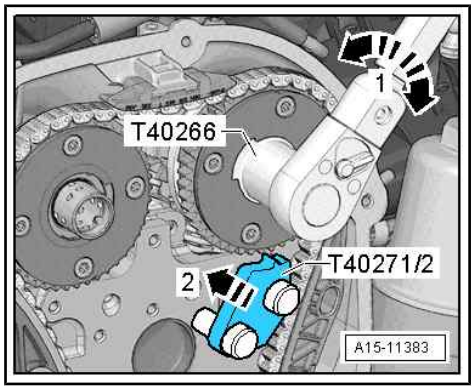


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– Hold chain tensioner in position with locking tool - T40267- .
– Remove assembly lever - T40243- .



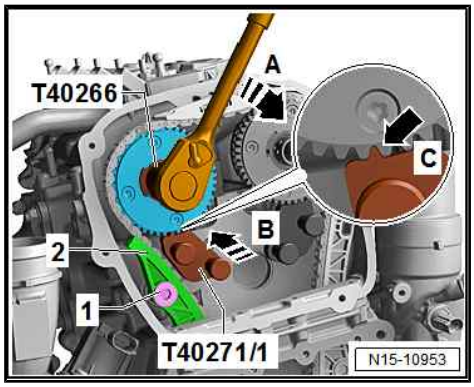
– Bolt camshaft clamp - T40271/2- onto cylinder head and slide into teeth on chain sprocket in direction of -arrow 2-; if necessary, use assembly tool - T40266- to turn inlet camshaft in direction of -arrow 1-.



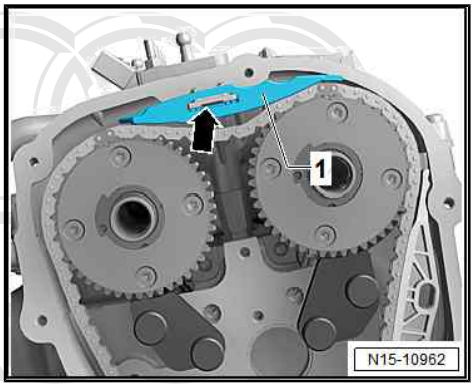
– Bolt camshaft clamp - T40271/1- onto cylinder head.

A second mechanic is required for the following step.

– Turn exhaust camshaft in direction of -arrow A- using assembly tool - T40266- and hold in place. Remove bolt -1- and guide tensioning rail -2- downwards.
– Continue turning exhaust camshaft clockwise -arrow A- until camshaft clamp - T40271/1- can be pressed into teeth -C- on chain sprocket in direction of -arrow B-.

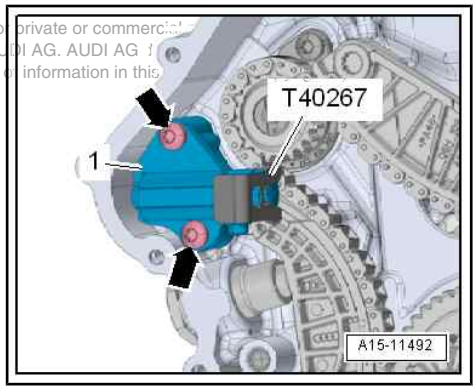


– Use screwdriver to release catch -arrow- and press off guide rail -1- towards front.

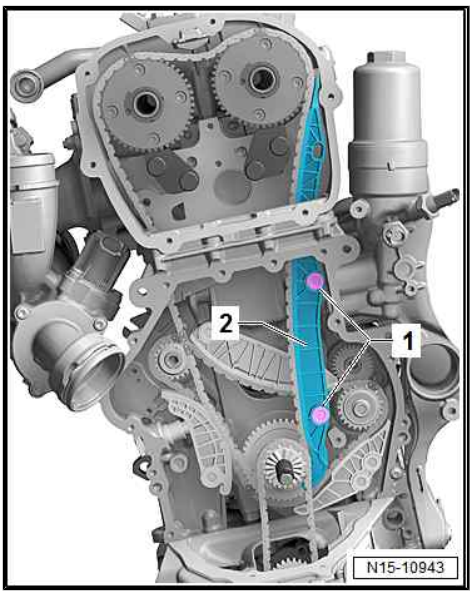


– Unscrew bolts -arrows- and remove chain tensioner -1-.

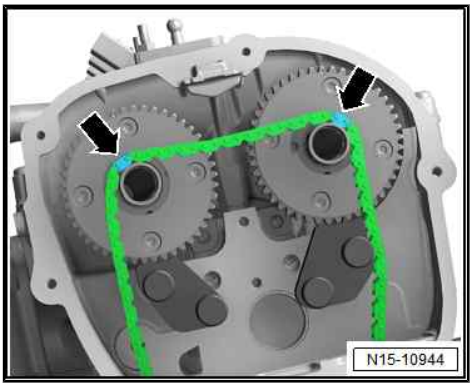
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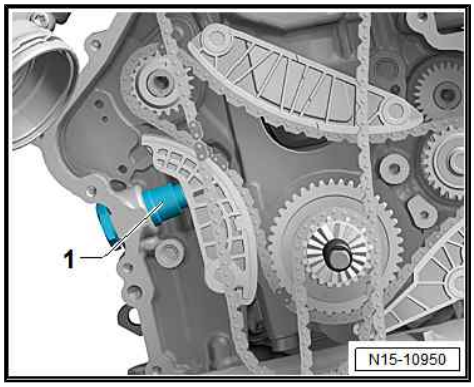
– Unscrew bolts -1- and remove guide rail -2-.



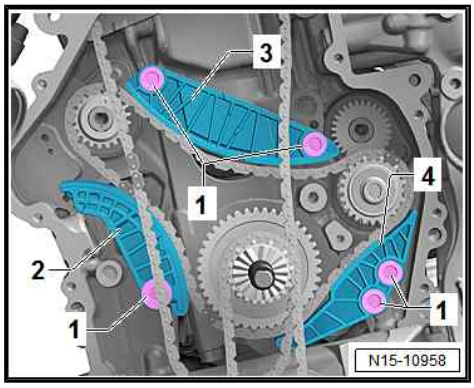
– Remove camshaft timing chain from camshaft sprockets and place onto camshaft journals -arrows-.



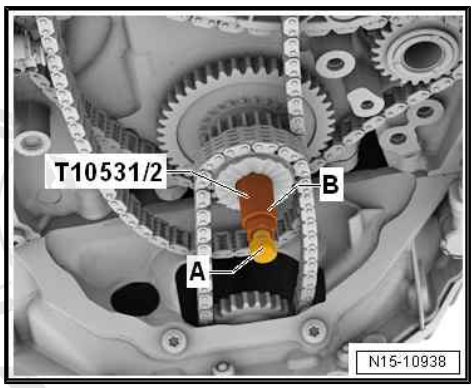
– Remove chain tensioner -1- for balance shaft timing chain.



– Remove bolts -1-. Remove tensioning rail -2- and guide rails -3- and -4-.

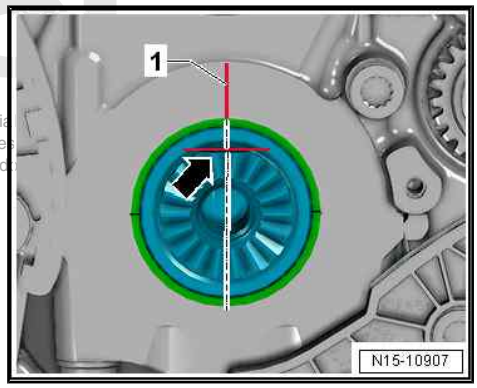


– Loosen tensioning bolt -A- and remove clamping pin -B-.
– Remove three-part chain sprocket assembly; to do so, remove oil pump chain.
– Detach camshaft timing chain and drive chain for balance shaft.



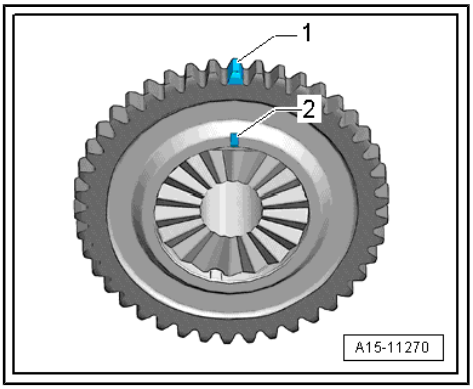
Installing

– Check TDC position of crankshaft; flat surface of crankshaft -arrow- must be horizontal.
– Use a waterproof pen to mark cylinder block -1-.

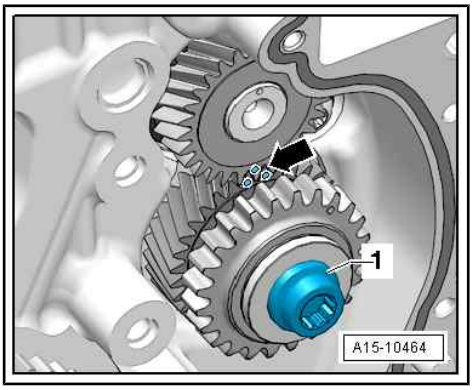


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– Mark tooth -1- of three-part chain sprocket adjacent to marking -2- using waterproof pen.



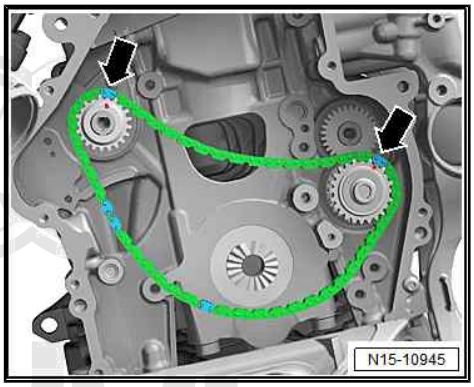
– Turn idler gear/balance shaft to markings -arrow- (do not slacken bolt -1-).



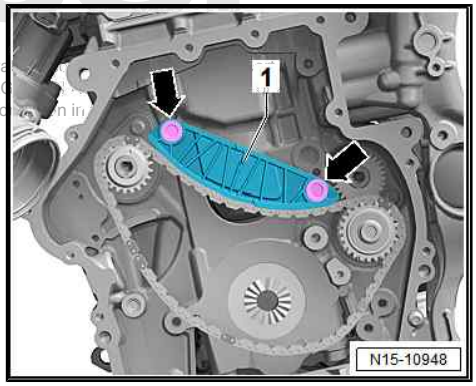
Note

- *The links with coloured markings must be positioned at the markings on the chain sprockets.*
- *There is no need to note the position of any other coloured links.*

– Fit drive chain for balance shafts; links with coloured markings -arrows- must be positioned at markings on chain sprockets.

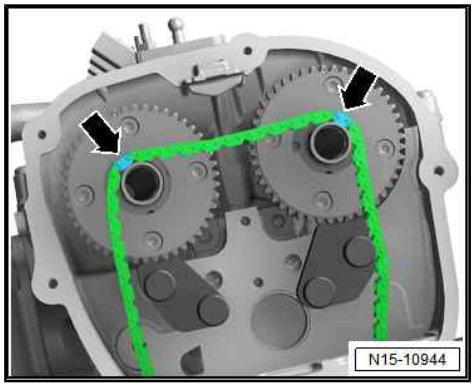


– Install guide rail -1- and tighten bolts -arrows-.

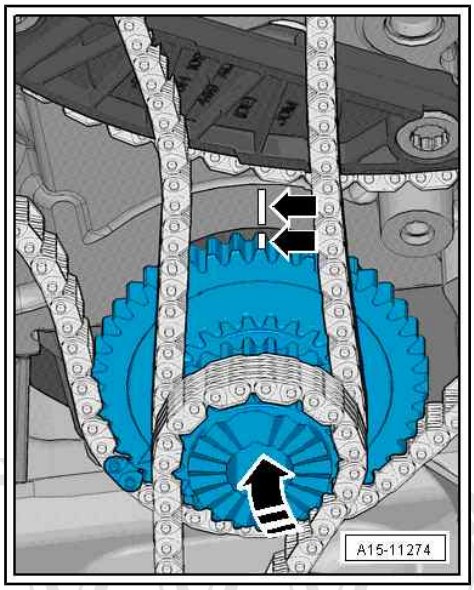


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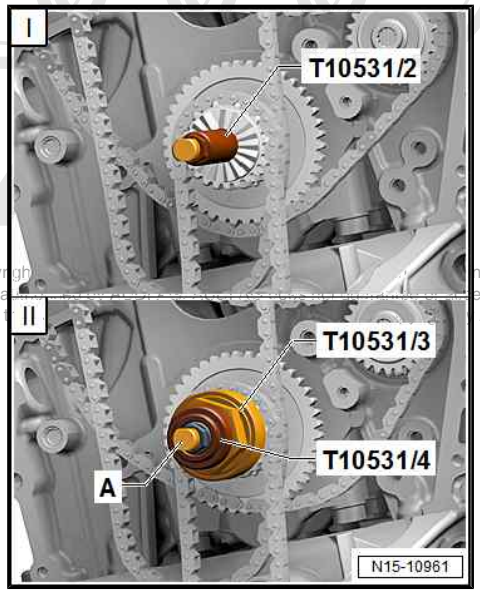
– Fit camshaft timing chain so that coloured markings -arrows- are positioned on camshaft journals.



– Fit oil pump chain onto three-part chain sprocket assembly.
– Swivel three-part chain sprocket assembly towards engine in direction of -arrow- and secure on crankshaft. The marks -arrows- must align.

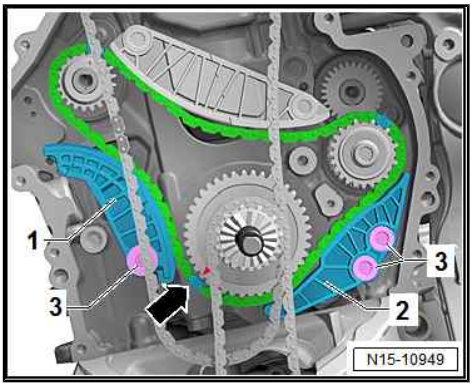


1. Screw clamping pin - T10531/2- into crankshaft and hand-tighten.
2. Attach turning-over tool - T10531/3- . Screw on flange nut - T10531/4- and hand-tighten. Move turning-over tool back and forth slightly using open-end spanner, 32 mm; at the same time, tighten flange nut until chain sprocket is firmly seated on teeth of crankshaft. Now (and not before) tighten tensioning bolt -A-.

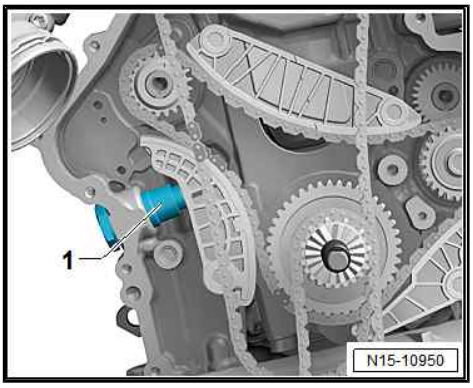


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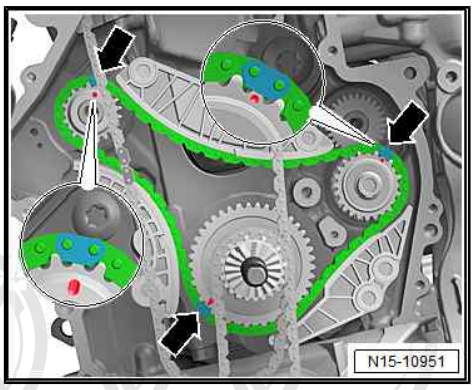
– Position link of drive chain for balance shafts with coloured marking -arrow- at marking on three-part chain sprocket assembly. Install tensioning rail -1- and guide rail -2-. Tighten bolts -3-.



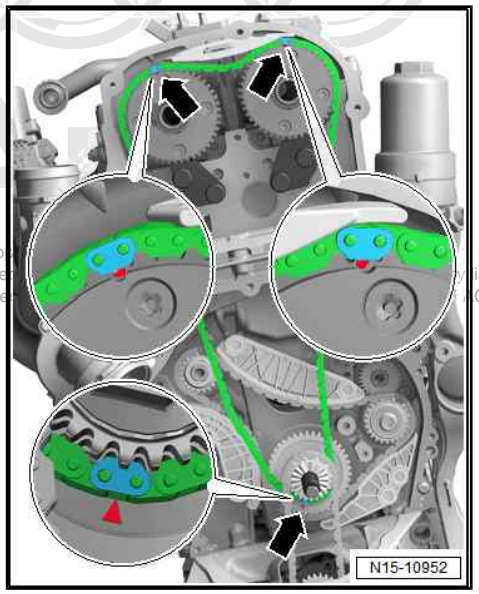
– Install chain tensioner -1-.



– Check setting again; links with coloured markings -arrows- must be positioned at markings on chain sprockets.

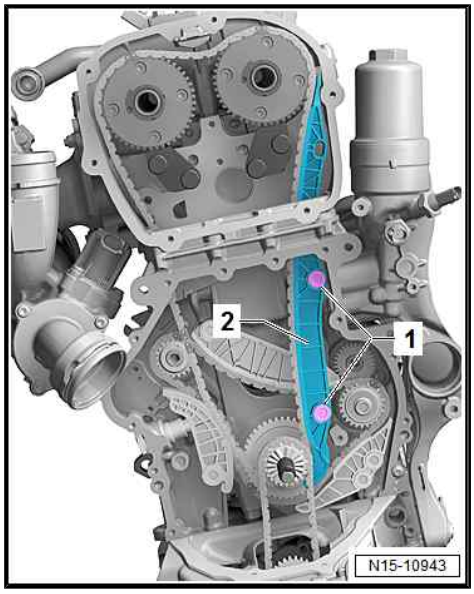


– Fit camshaft timing chain onto inlet camshaft, exhaust camshaft and crankshaft. Position links with coloured markings -arrows- at markings on chain sprockets.

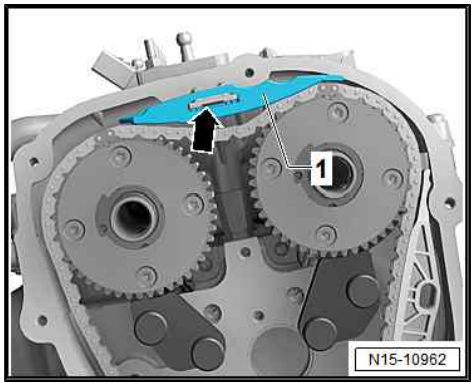


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– Install guide rail -2- and tighten bolts -1-.



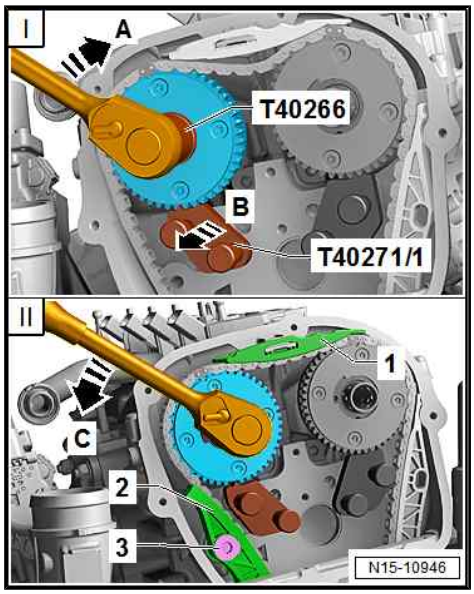
– Install top guide rail -1-.



A second mechanic is required for the following step.

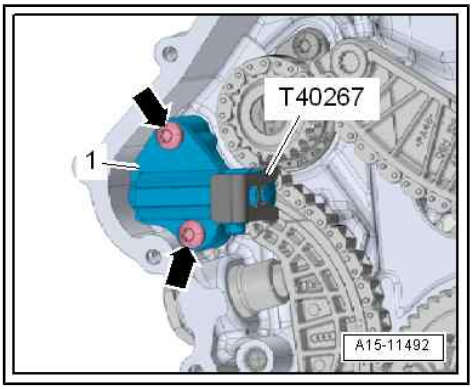
– Use assembly tool - T40266- to turn exhaust camshaft slightly in direction of -arrow A- and slide camshaft clamp - T40271/1- out of teeth on chain sprocket in direction of -arrow B-.

– Release camshaft in direction of -arrow C- until timing chain is in contact with guide rail -1-. Hold camshaft in this position, install tensioning rail -2- and tighten bolt -3-.



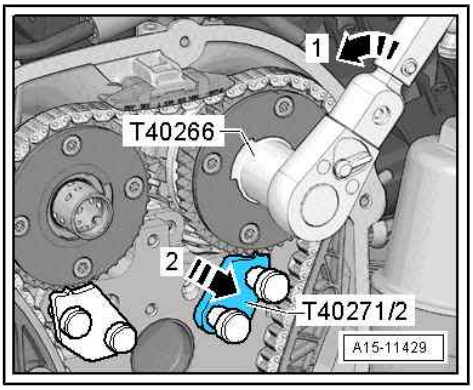
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– Install chain tensioner -1- and tighten bolts -arrows-.

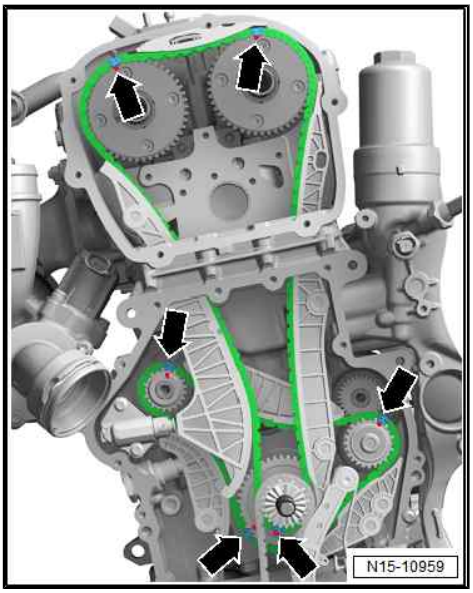


– Turn inlet camshaft in direction of -arrow 1- with assembly tool - T40266- , slide camshaft clamp - T40271/2- out of teeth on chain sprocket in direction of -arrow 2- and release camshaft.

– Remove camshaft clamp - T40271/2- .

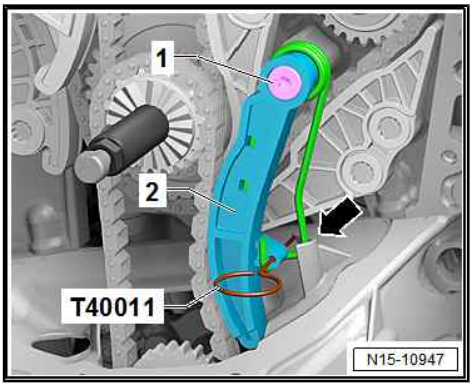


– Check setting; links with coloured markings -arrows- must be positioned at markings on chain sprockets.

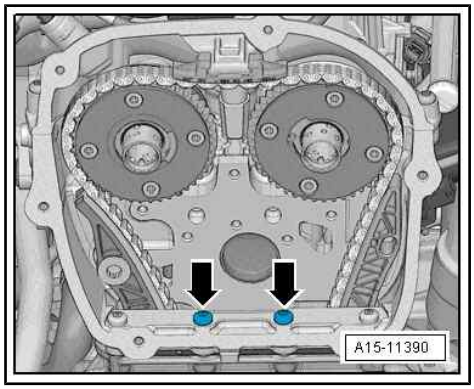


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– Install chain tensioner -2- and tighten bolt -1-. Remove locking pin - T40011- ; support wire must come into contact with opening -arrow- on sump (top section).



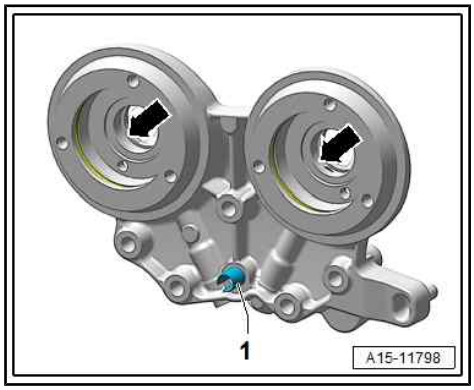
– Fit and tighten bolts -arrows-. Tightening torque
⇒ Item 4 (page 126)



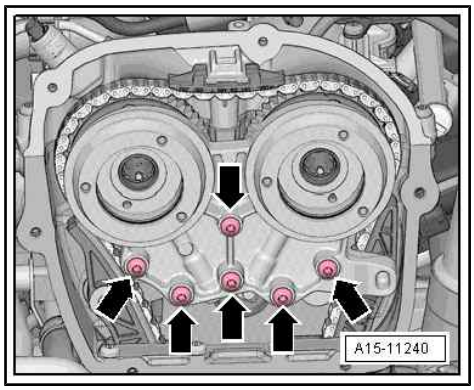
– Lubricate holes -arrows- with engine oil.

Note

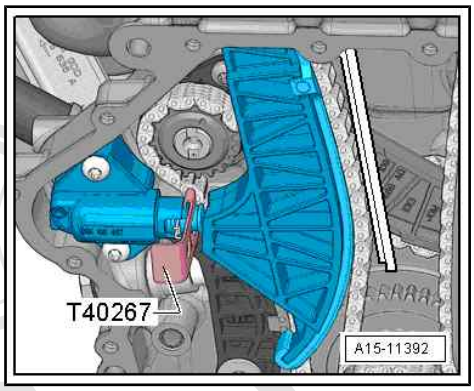
Spring pin -1- is not fitted on all bearing saddles.



– Attach bearing saddle and screw in bolts -arrows- hand-tight.



– Remove locking tool - T40267- .
– Tighten bolts for bearing saddle ⇒ Item 5 (page 101) .
– Install timing valves ⇒ Item 7 (page 101) .
– Turn engine two rotations in direction of engine rotation.



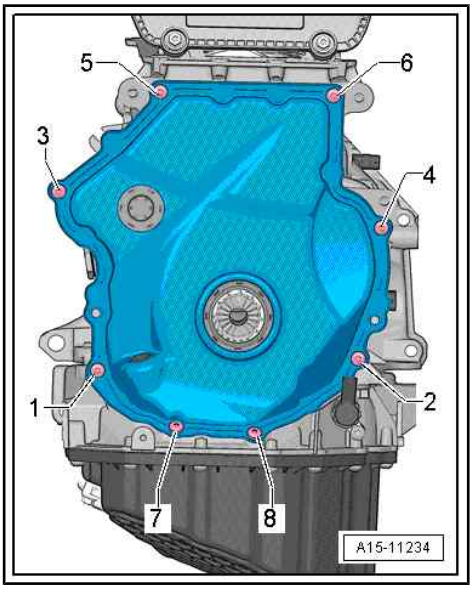
Note

Due to the ratio, the timing chain links with coloured markings are no longer aligned after the engine has been turned.

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

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– Detach turning-over tool and install timing chain cover (bottom) ⇒ page 93 .



Note

Only tighten bolts -1- and -4- to final tightening angle after installing the vibration damper. The bolts must be unscrewed again to install the vibration damper.

– Install vibration damper ⇒ page 54 .
– Install timing chain cover (top) ⇒ page 92 .
– Install poly V-belt tensioner ⇒ page 54 .
– Install poly V-belt ⇒ page 53 .
– Install washer fluid reservoir ⇒ Electrical system; Rep. gr. 92 ; Windscreen washer system; Exploded view - windscreen washer system .
– After working on chain drive, learnt values must be adapted in engine control unit. To do so, switch on ignition and select following menu options on vehicle diagnostic tester :

♦ `01 - Engine electronics`
♦ `Guided Functions`
♦ `01 - Adaptions after repairs on chain drive`

Tightening torques

♦ ⇒ “2.1 Exploded view - camshaft timing chains”, page 100
♦ ⇒ “2.2 Exploded view - drive chain for balance shaft”, page 102
♦ ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

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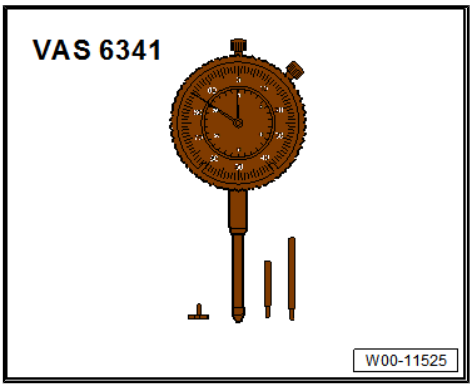
2.5 Removing and installing drive chain for balance shaft

The procedure “Removing and installing drive chain for balance shaft” can be found in the chapter “Removing and installing camshaft timing chain” ⇒ page 108 .

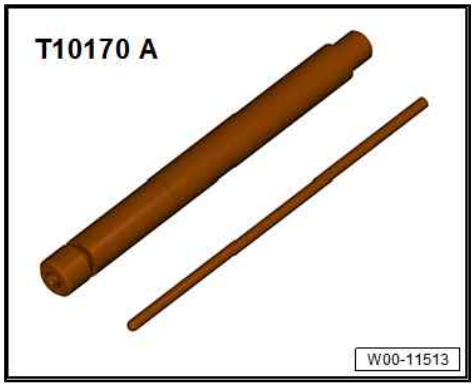
2.6 Checking valve timing

Special tools and workshop equipment required

♦ Dial gauge set, 4-part - VAS 6341-



- Adapter for dial gauge - T10170 A-



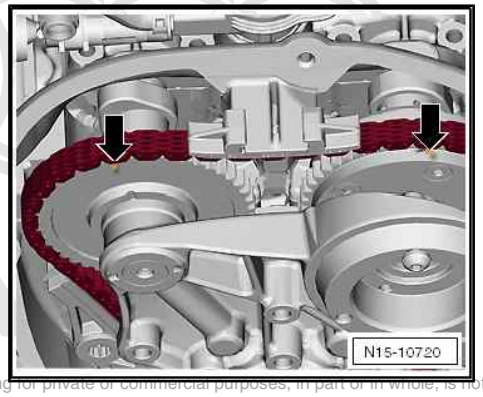
Procedure

– Remove timing chain cover (top) ⇒ page 92 .

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

– Using 24 mm socket or counterhold tool - T10355- , turn crankshaft via vibration damper in normal direction of rotation until markings -arrows- are almost at top.

– Remove spark plug on cylinder 1.

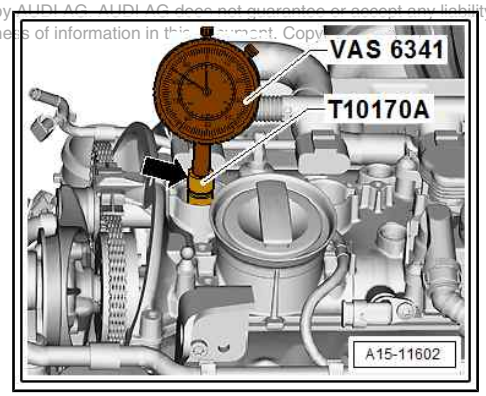


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– Screw dial gauge adapter - T10170 A- into spark plug thread as far as stop.

– Insert dial gauge from dial gauge set, 4-part - VAS 6341- with extension - T10170A/1- as far as stop and secure with locking nut -arrow-.

– Turn crankshaft slowly in normal direction of engine rotation until needle in dial gauge has reached maximum position. When needle has moved to maximum position (i.e. turning point in dial gauge), piston is at »TDC«.

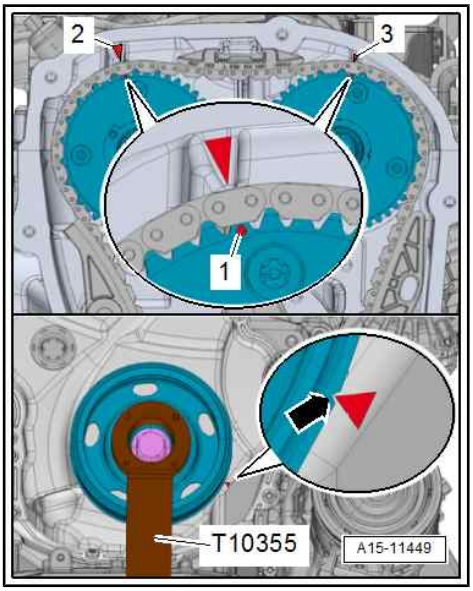


Note

- *To turn the vibration damper, use a ratchet with 24 mm socket or counterhold tool - T10355- .*
- *If the crankshaft has been turned beyond the “TDC” position, it must again be turned two rotations in normal direction of engine rotation. Do not turn engine in opposite direction to normal rotation.*

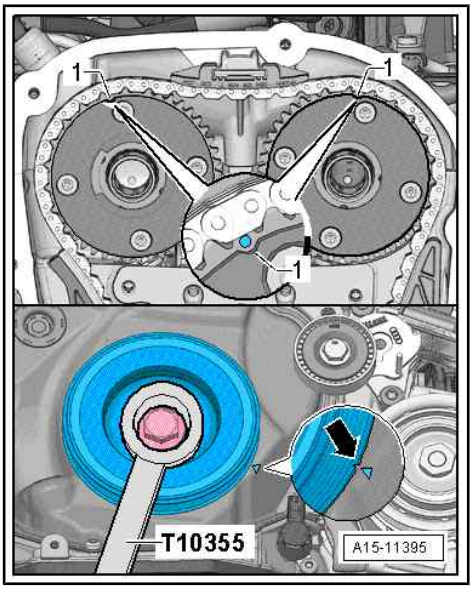
With markings on cylinder head

- Notch on vibration damper must align with arrow marking on timing chain cover (bottom) -arrow-.
- Markings -1- on camshaft chain sprockets must be aligned with markings -2 and 3- on cylinder head.



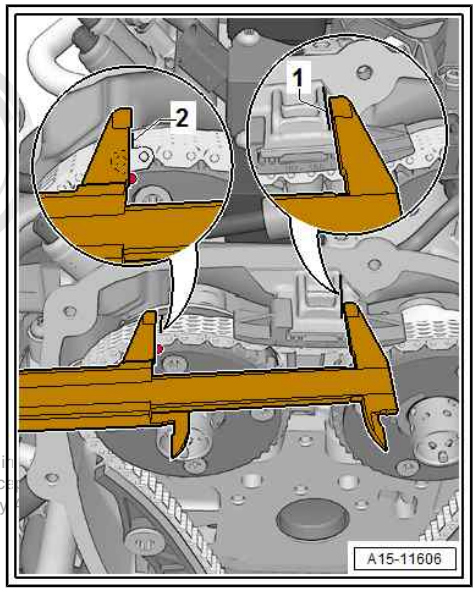
Without markings on cylinder head

- Notch on vibration damper and marking on cover for timing chains (bottom) must be aligned -arrow-.
- The markings -1- on the camshaft chain sprockets must face upwards.



– Measure distance from edge -1- to marking -2- on exhaust camshaft chain sprocket.

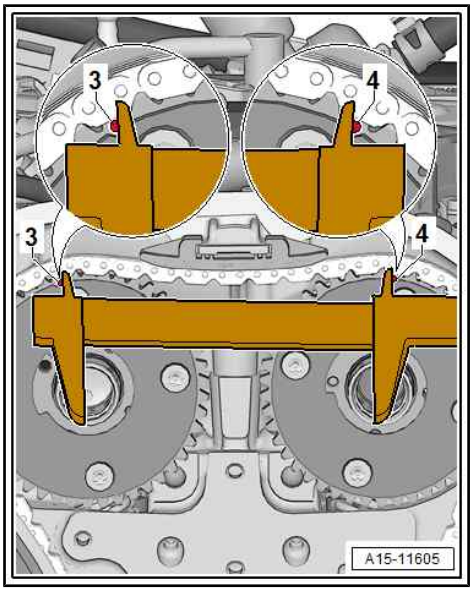
- Specification: 74 ... 77 mm



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– If specification is obtained, measure distance between marking on exhaust camshaft chain sprocket -3- and marking on inlet camshaft chain sprocket -4-.

• Specification: 124 ... 127 mm



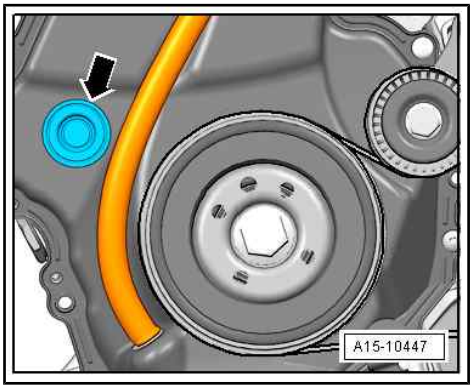
Note

If the timing chain is one tooth out of position, this results in a deviation of approx. 6 mm from specification. The timing chain must be refitted if it is not in the correct position.

2.7 Checking chain elongation

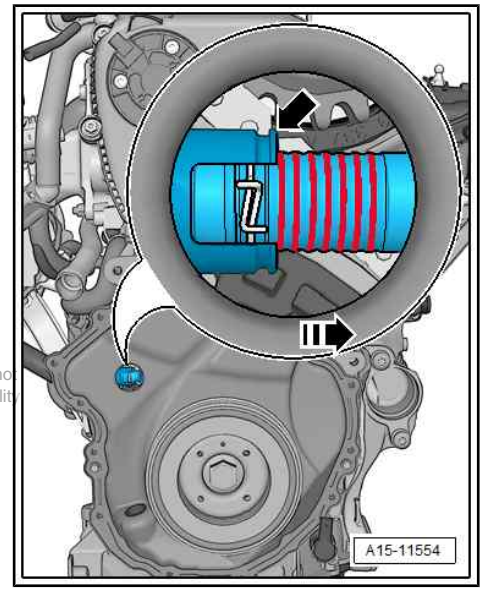
– Remove wheel housing liner (front right) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Removing and installing wheel housing liner (front) .

– Remove sealing plug -arrow-.



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– Turn vibration damper in direction of engine rotation until piston of chain tensioner has extended as far as it will go in direction of -arrow-.
– Count visible teeth of piston.



Note

Visible teeth are all teeth to the right of the chain tensioner housing -arrow-.

♦ If six or fewer teeth are visible: Adapt chain elongation. To do so, select `01 - Chain elongation adaption diagnosis` in `Guided Functions` mode of ⇒ Vehicle diagnostic tester and delete event memory.

♦ If seven or more teeth are visible: Renew camshaft timing chain ⇒ page 108 .

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Note

The timing chain must not be replaced if six or fewer teeth are visible.

Tightening torques

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

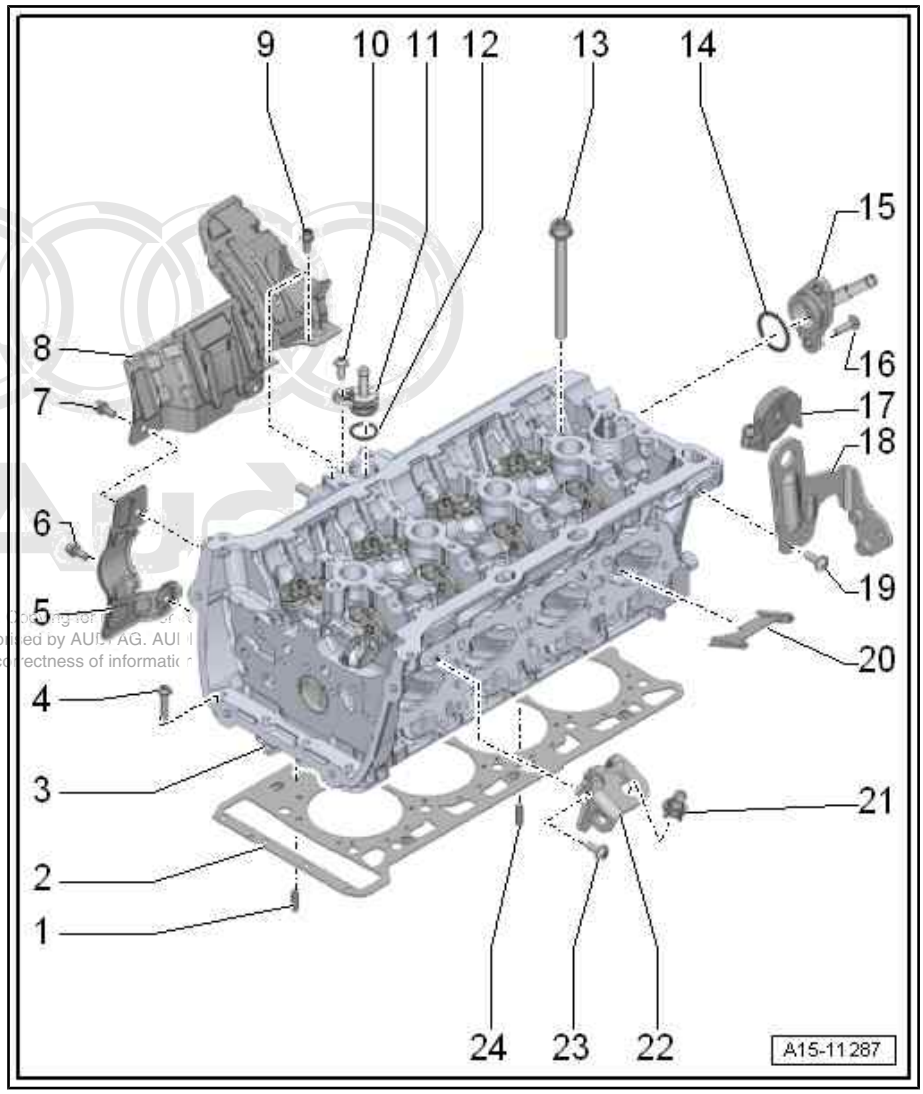
3 Cylinder head

⇒ “3.1 Exploded view - cylinder head”, page 126

⇒ “3.2 Removing and installing cylinder head”, page 128

⇒ “3.3 Checking compression”, page 136

3.1 Exploded view - cylinder head



1 - Dowel pin

2 - Cylinder head gasket

- ❑ Renew
- ❑ Note installation position: part number must face cylinder head

3 - Cylinder head

- ❑ Removing and installing ⇒ page 128
- ❑ Checking for distortion ⇒ page 128

4 - Bolt

- ❑ Renew after removing
- ❑ Note procedure when loosening ⇒ page 127
- ❑ Note procedure when tightening ⇒ page 127

5 - Heat shield

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6 - Bolt

- ❑ 9 Nm

7 - Bolt

- ❑ 9 Nm

8 - Heat shield

9 - Bolt

- ❑ 9 Nm

10 - Bolt

- ❑ 9 Nm

11 - Connection

- ❑ For coolant hose

12 - O-ring

- ❑ Renew after removing
- ❑ Lubricate with coolant

13 - Cylinder head bolt

- ❑ Renew after removing
- ❑ Note procedure when loosening ⇒ page 127
- ❑ Note procedure when tightening ⇒ page 127

14 - O-ring

- ❑ Renew after removing
- ❑ Lubricate with coolant

15 - Connection

- ❑ For coolant hose

16 - Bolt

- ❑ 9 Nm

17 - Mounting

- ❑ For engine cover panel

18 - Engine lifting eye

19 - Bolt

- ❑ Renew after removing
- ❑ 8 Nm +90°

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20 - Separating plate

21 - Ball stud

- ❑ For engine cover panel

22 - Engine lifting eye

23 - Bolt

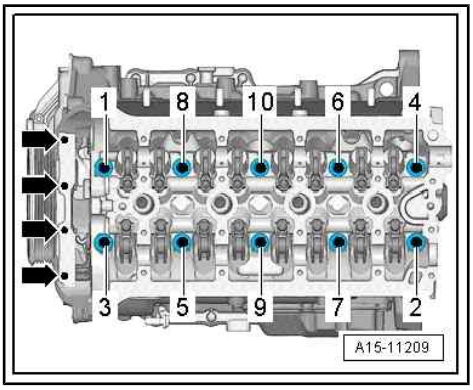
- ❑ Renew after removing
- ❑ 8 Nm +90°

24 - Dowel pin

Slackening cylinder head bolts

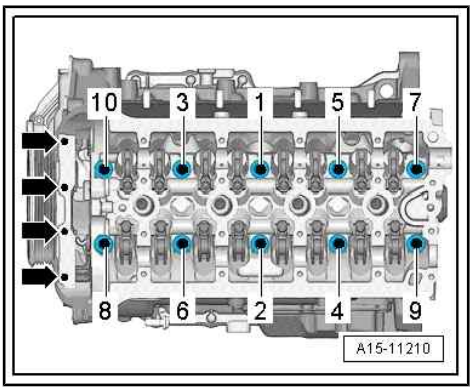
– Remove bolts -arrows-.

– Slacken cylinder head bolts in the sequence -1 ... 10-.



Tightening sequence for cylinder head

– Tighten cylinder head bolts in the sequence -1 ... 10- as follows:

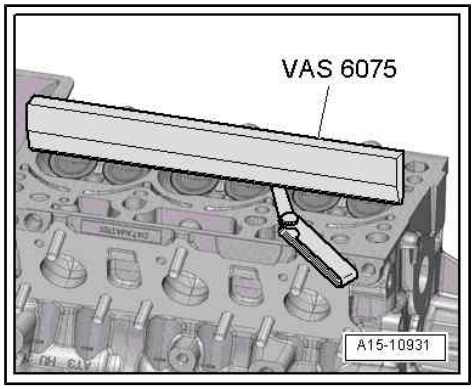


Stage	Bolts/tightening sequence	Tightening torque/angle specification
1	-1- to -10-	Pre-tighten to 40 Nm
2	-1- to -10-	Use rigid wrench to turn 90° further.
3	-1- to -10-	Use rigid wrench to turn 90° further.
4	Bolts -arrows-	Pre-tighten to 8 Nm
5	Bolts -arrows-	Use rigid wrench to turn 90° further

Checking cylinder head for distortion

– Use straight edge 500 mm - VAS 6075- and feeler gauge to measure cylinder head for distortion at several points.

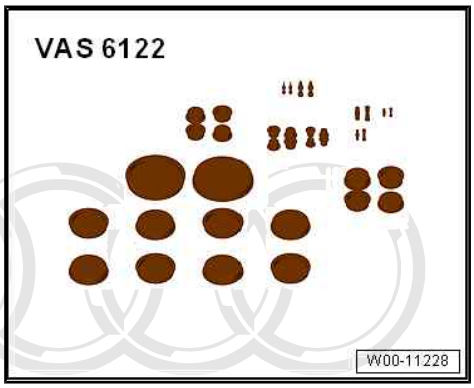
♦ Max. permissible distortion: 0.05 mm



3.2 Removing and installing cylinder head

Special tools and workshop equipment required

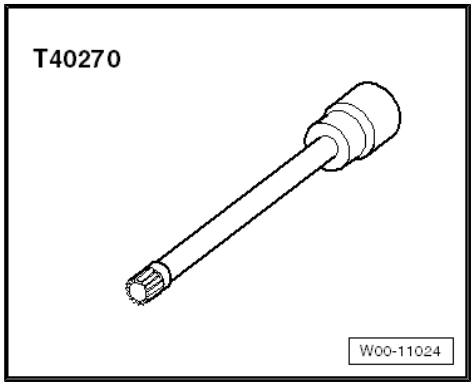
♦ Engine bung set - VAS 6122-



♦ Special wrench (Polydrive) - T10070-



♦ Bit XZN 12 - T40270-



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Removing

Note

- *Fit cable ties in the original positions when installing.*
- *All open inlet and exhaust ports must be sealed with suitable plugs (e.g. from engine bung set - VAS 6122-).*

– Drain coolant
⇒ “1.3 Draining and filling cooling system”, page 198 .

– Remove camshafts
⇒ “4.2 Removing and installing camshaft”, page 143 .

Re-install engine mounting and engine support if removed previously; re-use old bolts.

- ⇒ “1.6 Removing and installing engine support”, page 62
- ⇒ “2.2 Removing and installing engine mountings”, page 38

– Remove engine support bracket.

Caution

Risk of damage to valves and piston crowns.

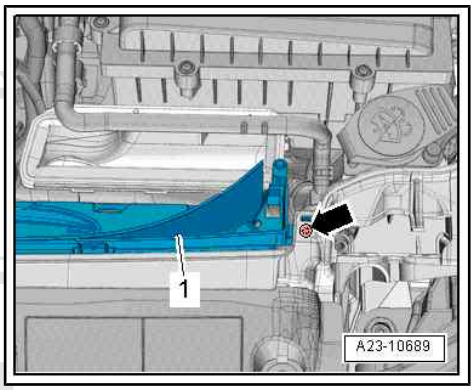
- ***Do not turn the crankshaft after the camshafts have been removed.***

– Remove front exhaust pipe with catalytic converter
⇒ “2.2 Removing and installing catalytic converter”, page 302 .

– Remove Lambda probe - G39-
⇒ “8.2.1 Removing and installing Lambda probe G39 ”, page 293 .

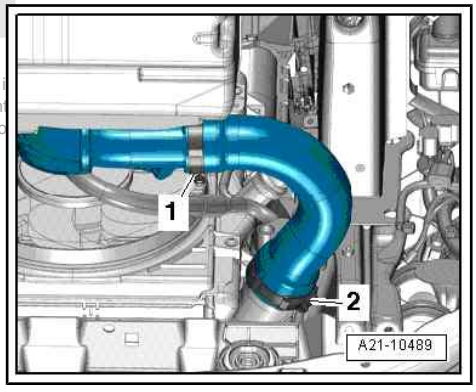
– Remove bolt -arrow- on both sides.

– Unclip air duct (bottom section) -1- and detach.



– Release hose clip -2- and detach air hose from charge air cooler.

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

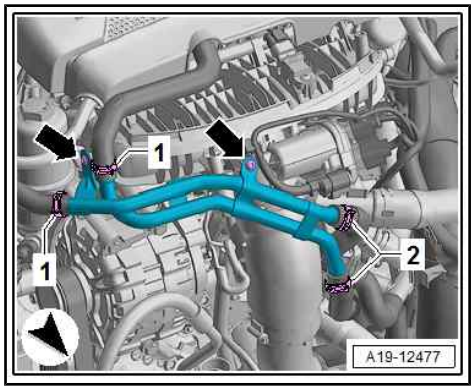


Note

Disregard -item 1-.

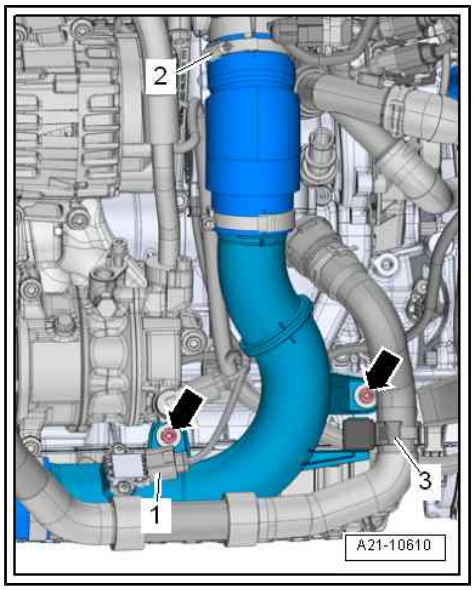
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– Release hose clips -item 1, 2- and disconnect coolant hoses.
– Remove bolts -arrows- for coolant pipe (front) and detach coolant pipe.

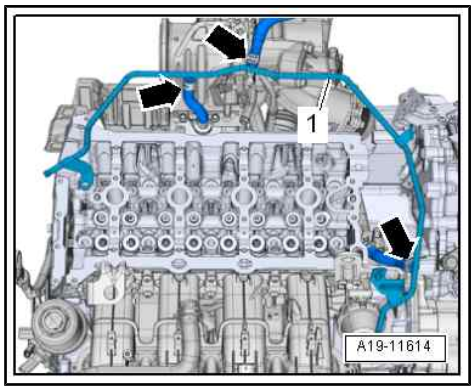


– Release hose clip -2-.
– Move coolant hose -3- clear.
– Remove bolts -arrows-.
– Unplug electrical connector -1- from charge pressure sender - G31- .
– Detach air pipe (right-side).

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– Release hose clips -arrows- and disconnect coolant hoses.
– Swivel coolant line -1- to side.

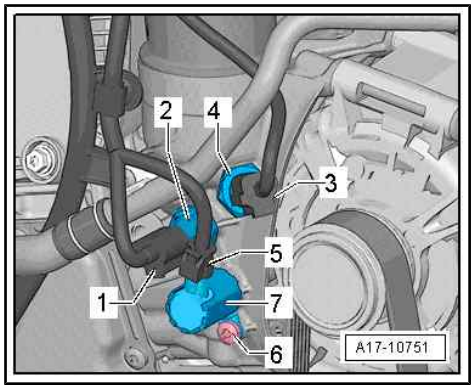


– Unplug electrical connectors:

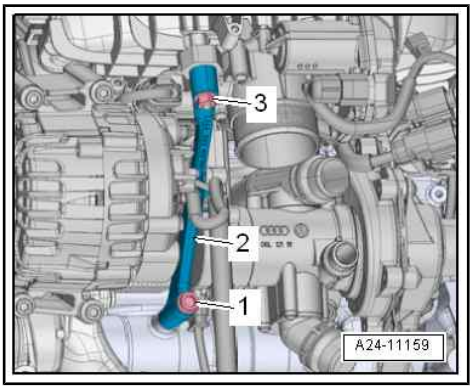
1 - For oil pressure switch - F22-

2 - For oil pressure switch for reduced oil pressure - F378-

5 - For piston cooling jet control valve - N522-



– Unscrew bolt -1- and nut -3- and remove bracket -2- for intake manifold.



– Unplug electrical connectors:

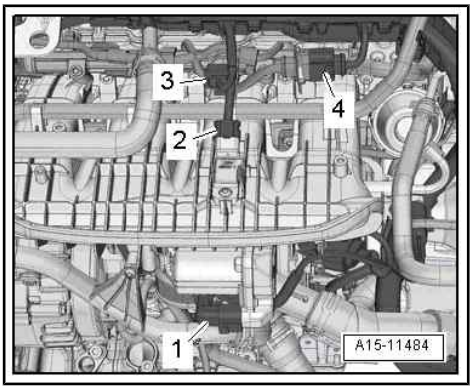
1 - For throttle valve module - J338-

2 - For intake air temperature sender - G42- / intake manifold pressure sender - G71-

3 - For fuel pressure sender - G247-

4 - Not fitted

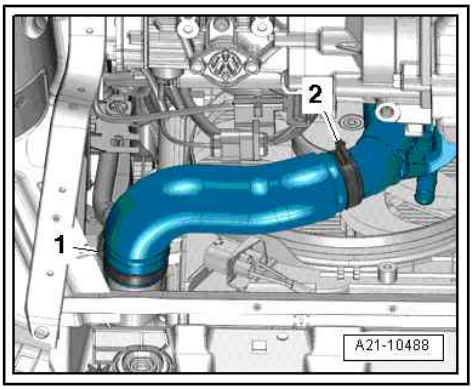
– Move electrical wiring harness clear and press to one side.



– Release hose clip -1- and detach air hose from charge air cooler.

Note

Disregard -item 2-.

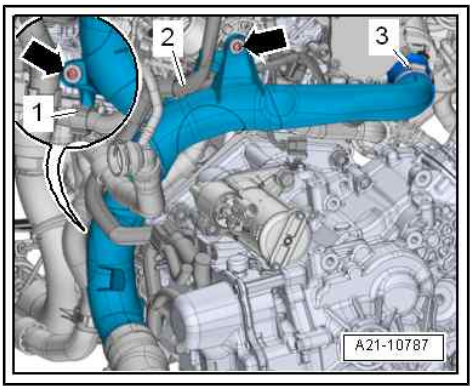


– Move electrical wiring harnesses -1- and -2- clear at air pipe.

– Unfasten screw-type clip -3-.

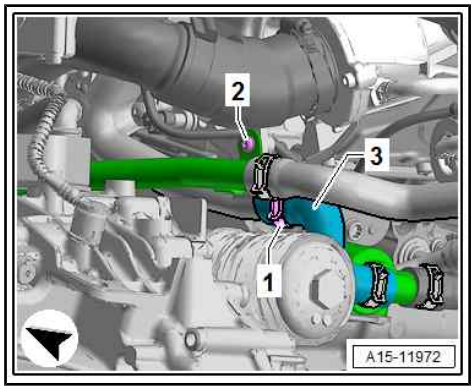
– Remove bolts -arrows-.

– Remove charge air hose and air pipe downwards.

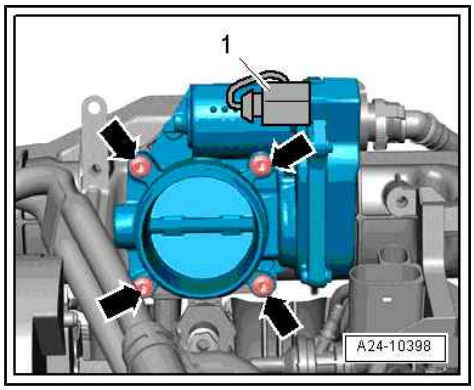


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– Remove bolt -2-.
– Release hose clip -1- and detach coolant hose -3-.

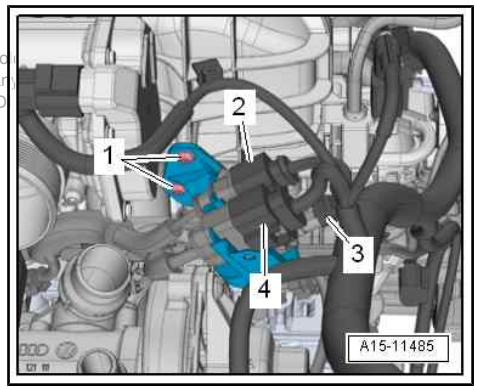


– Unplug electrical connector -1- from throttle valve module - J338- .
– Unscrew bolts -arrows- on throttle valve module - J338- from underneath and detach throttle valve module - J338- .



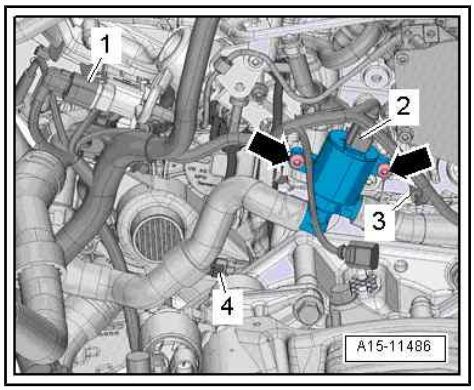
– Unplug electrical connectors -2, 4-.
– Remove bolts -item 1-.
– Remove electrical connector -3- for knock sensor 1 - G61- from bracket and unplug connector.

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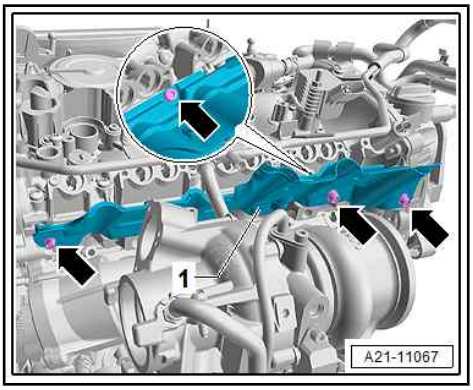


– Unplug electrical connectors and move wiring clear:

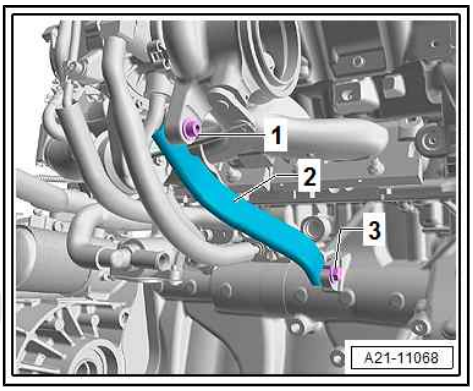
1 - For intake manifold flap valve - N316-
2 - Not fitted
3 - For coolant temperature sender - G62-
4 - For stage 3 oil pressure switch - F447-



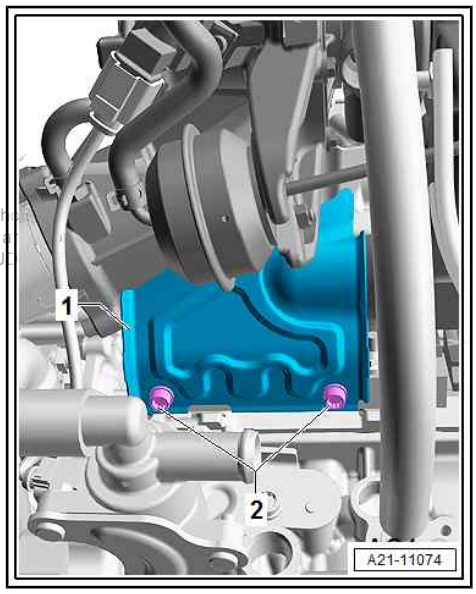
– Remove bolts -arrows- and detach heat shield -1-.



– Remove bolt -1- and loosen bolt -3-.
– Remove bracket -2- for turbocharger.
– Remove heat shield for drive shaft (right-side) ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing heat shield for drive shaft .

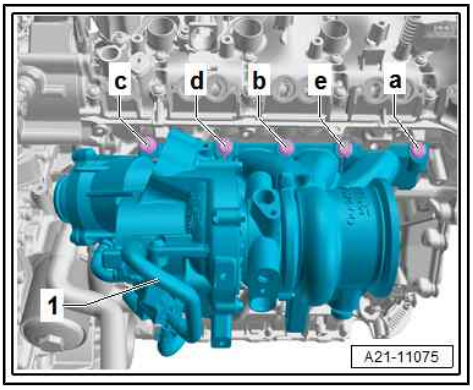


– Remove bolts -2- and detach heat shield -1-.



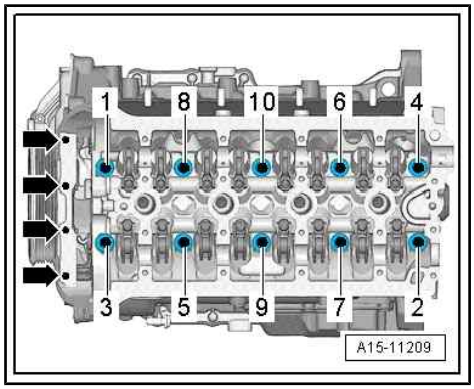
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– Unscrew nuts -a- to -e-.
– Detach turbocharger -1- from cylinder head and tie up to rear.



– Remove bolts -arrows-.

– Use special wrench, long reach - T10070- / bit XZN 12 - T40270- to remove cylinder head bolts in the sequence -1 ... 10-.



Note

- *Make sure all hoses/pipes and wiring on component are disconnected.*
- *Make sure tensioning rail and guide rail are not damaged when lifting off cylinder head.*

– Take off cylinder head.

– Place cylinder head onto 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.*

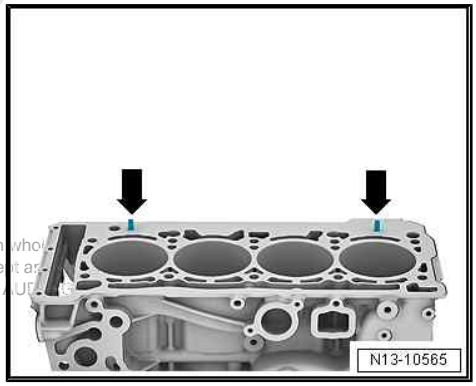
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Note

- *Renew bolts tightened with specified tightening angle.*
- *Renew seals, gaskets and self-locking nuts.*
- *Hose connections and air pipes and hoses must be free of oil and grease before assembly.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue ETKA .*
- *Spray screw sections of used screw-type clips with rust remover before fitting*

– Place cylinder head gasket in position.

- Note position of centring pins in cylinder block -arrows-.
- Note installation position of cylinder head gasket. Part No. should be legible from inlet side.



WARNING

Make sure that components are not damaged by the timing chain when rotating the crankshaft.

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– If crankshaft has been rotated: set piston of cylinder 1 to top dead centre and then turn crankshaft back slightly. Take care not to damage timing chain when doing so.

– Fit cylinder head.

– Insert and hand-tighten cylinder head bolts.

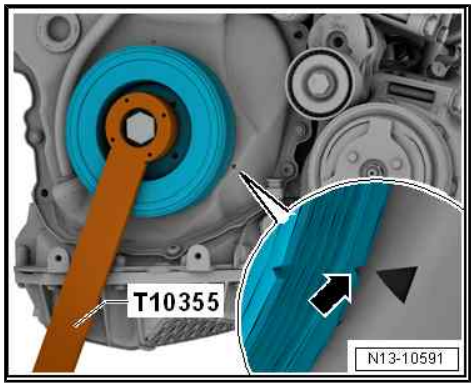
– Tightening sequence for cylinder head ⇒ page 127

Note

Cylinder head bolts do not have to be torqued down again later after repair work.

– Turn vibration damper to “TDC” position using counterhold tool - T10355- .

• Notch on vibration damper and marking on cover for timing chains (bottom) must be aligned -arrow-.



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

– Install camshafts ⇒ page 143 .

– Change engine oil ⇒ Maintenance ; Booklet 821 .

– Fill cooling system with fresh coolant ⇒ page 198 .

– Install front exhaust pipe with catalytic converter ⇒ page 302 .

WARNING

Never use battery charging equipment for boost starting. There is danger of damaging the vehicle's control units.

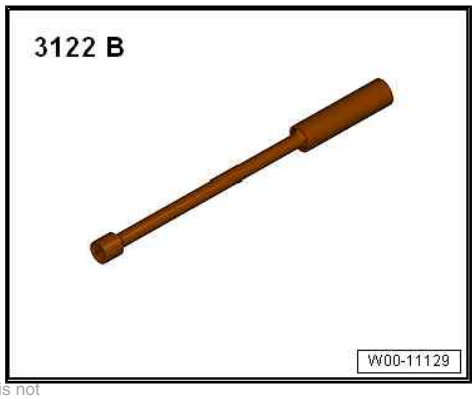
Tightening torques

- ⇒ “3.1 Exploded view - cylinder head”, page 126
- ⇒ “4.1 Exploded view - intake manifold”, page 265
- ⇒ “3.1 Exploded view - coolant pipes”, page 226
- ⇒ “1.1 Exploded view - turbocharger”, page 236
- ⇒ “1.1 Exploded view - silencers”, page 295
- ⇒ Electrical system; Rep. gr. 97 ; Relay carriers, fuse carriers, electronics boxes; Overview of fitting locations - relay carriers, fuse carriers, electronics boxes
- ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing heat shield for drive shaft

3.3 Checking compression

Special tools and workshop equipment required

- Spark plug spanner - 3122 B-

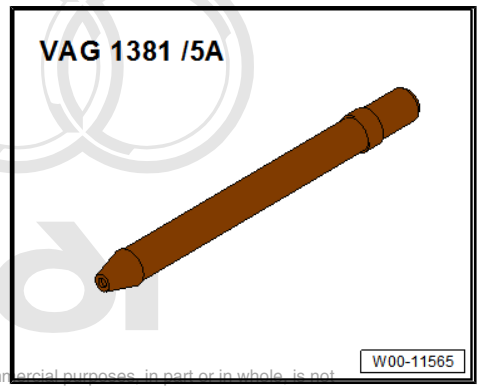


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- Compression tester - V.A.G 1763-



- Adapter - V.A.G 1381/5A-



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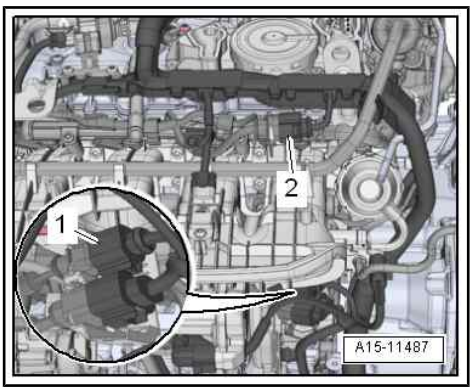
Test sequence

Note

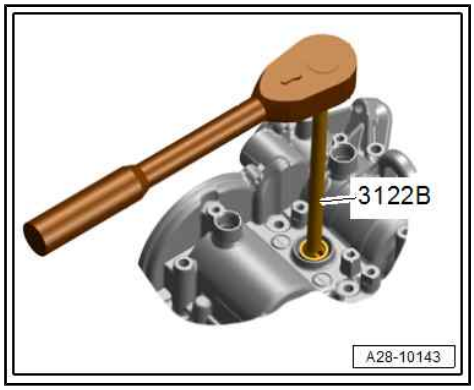
- *Engine oil temperature at least 30 °C*
- *Battery voltage at least 12.7 V*

– Remove engine cover panel ⇒ page 50 .
– Remove ignition coils ⇒ page 306 .
– Unplug electrical connectors:

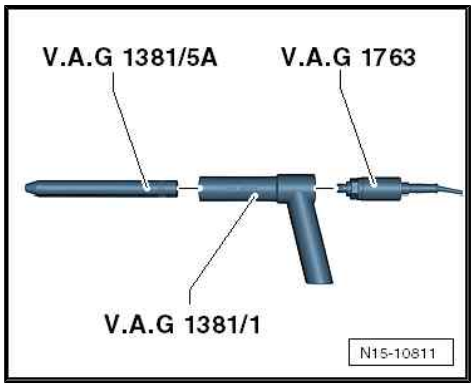
1 - For injectors -N30- … -N33-
2 - For injectors 2 -N532- … -N535-



– Remove spark plugs with spark plug spanner - 3122 B- .



– Check compression pressure with compression tester - V.A.G 1763- , adapter - V.A.G 1381/1- and adapter - V.A.G 1381/5A- .



Note

Using the compression tester ⇒ Operating instructions .

– Operate starter until pressure reading on tester no longer rises.

Compression pressure	bar
When new	11.0 … 14.0
Wear limit	7.0
Maximum difference between cylinders	3.0

– Install spark plugs ⇒ Maintenance ; Booklet 821 .

– Install ignition coils ⇒ page 306 .

Note

Faults will have been stored in the memory because connectors have been unplugged. After performing measurement, interrogate and erase event memory.

– Switch on the ignition and select the following menu options on the vehicle diagnostic tester :

– Erase any entries in event memory resulting from testing ⇒ Vehicle diagnostic tester, `Guided Functions`, `Interrogate event memory`, then `Generate readiness code`.

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4 Valve gear

⇒ “4.1 Exploded view - valve gear”, page 139

⇒ “4.2 Removing and installing camshaft”, page 143

⇒ “4.3 Installing ball for slider”, page 155

⇒ “4.4 Removing and installing valve stem oil seals”, page 156

4.1 Exploded view - valve gear

Note

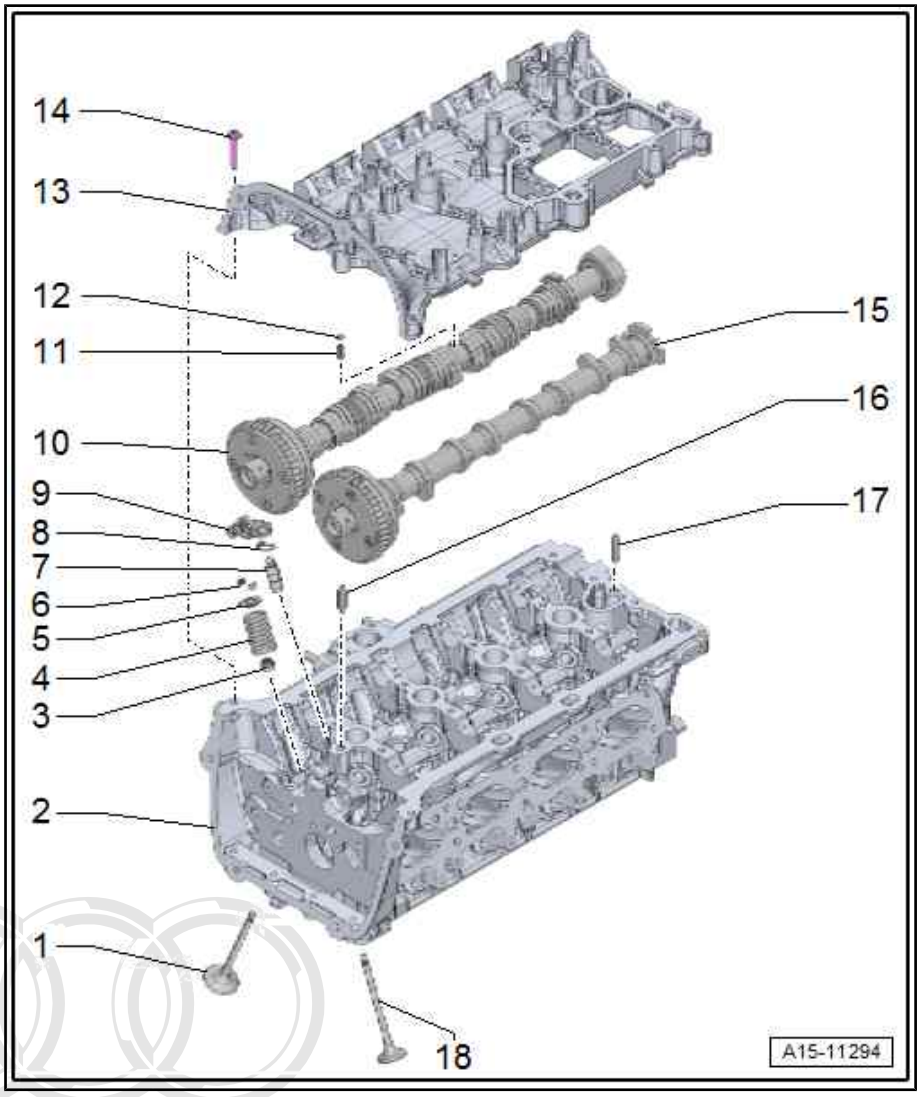
- *Cylinder head and cylinder head cover must be renewed together.*
- *After installing camshafts, wait for approx. 30 minutes before starting engine. The hydraulic compensation elements must settle (otherwise valves will strike pistons).*
- *After working on the valve gear, turn the engine carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.*
- *Renew gaskets and seals.*

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After removal of camshafts, chain elongation must be adapted. To do so, select `01 - Chain elongation adaption diagnosis` in `Guided Functions` mode of ⇒ Vehicle diagnostic tester.

Part I

Part II ⇒ page 141



1 - Exhaust valve

- ❑ Do not machine, only grinding-in is permitted
- ❑ Valve dimensions ⇒ page 167
- ❑ Checking valve guides ⇒ page 166

2 - Cylinder head

3 - Valve stem oil seal

- ❑ Renewing ⇒ page 156

4 - Valve spring

5 - Valve spring plate

6 - Valve cotters

7 - Hydraulic compensation element

- ❑ Do not interchange
- ❑ Lubricate contact surface

8 - Securing clip

- ❑ For hydraulic compensation element

9 - Roller rocker finger

- ❑ Removing and installing ⇒ page 143
- ❑ Mark installation position for re-installation
- ❑ Check roller bearings for ease of movement

10 - Exhaust camshaft

- ❑ Removing and installing ⇒ page 143
- ❑ Check radial clearance with Plastigage (roller rocker fingers removed)
- ❑ Radial clearance: 0.024 ... 0.066 mm
- ❑ Runout: max. 0.04 mm

11 - Spring

- ❑ Not available as replacement part

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12 - Ball

- ❑ For slider
- ❑ Installing ⇒ page 155

13 - Cylinder head cover

- ❑ With integrated camshaft bearings
- ❑ Clean sealing surface; machining not permitted
- ❑ Removing ⇒ “4.2 Removing and installing camshaft”, page 143

14 - Bolt

- ❑ Renew after removing
- ❑ Slackening ⇒ page 141
- ❑ Tightening sequence ⇒ page 141

15 - Inlet camshaft

- ❑ Removing and installing ⇒ page 143
- ❑ Check radial clearance with Plastigage (roller rocker fingers removed)

- ❑ Radial clearance: 0.024 ... 0.066 mm
- ❑ Runout: max. 0.04 mm

16 - Dowel pin

17 - Dowel pin

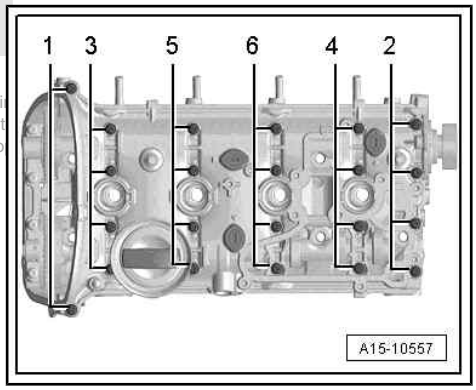
18 - Inlet valve

- ❑ Do not machine, only grinding-in is permitted
- ❑ Valve dimensions ⇒ page 167
- ❑ Checking valve guides ⇒ page 166

Loosening cylinder head cover

– Loosen cylinder head cover bolts in the sequence -1 ... 6-.

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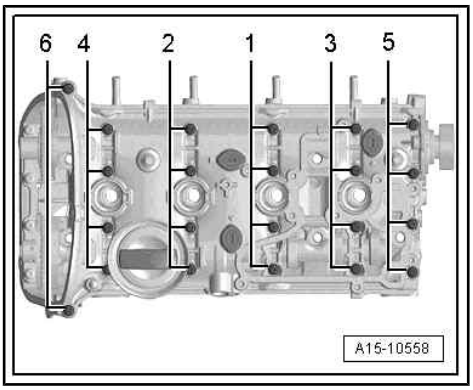


Tightening sequence for cylinder head cover

– Renew bolts after removing.

– Tighten bolts in stages in the sequence shown:

Stage	Bolts/tightening sequence	Tightening torques
1	-1 … 6-	Screw in hand-tight in several stages
2	-1 … 6-	8 Nm
3	-1 … 6-	Turn 90° further

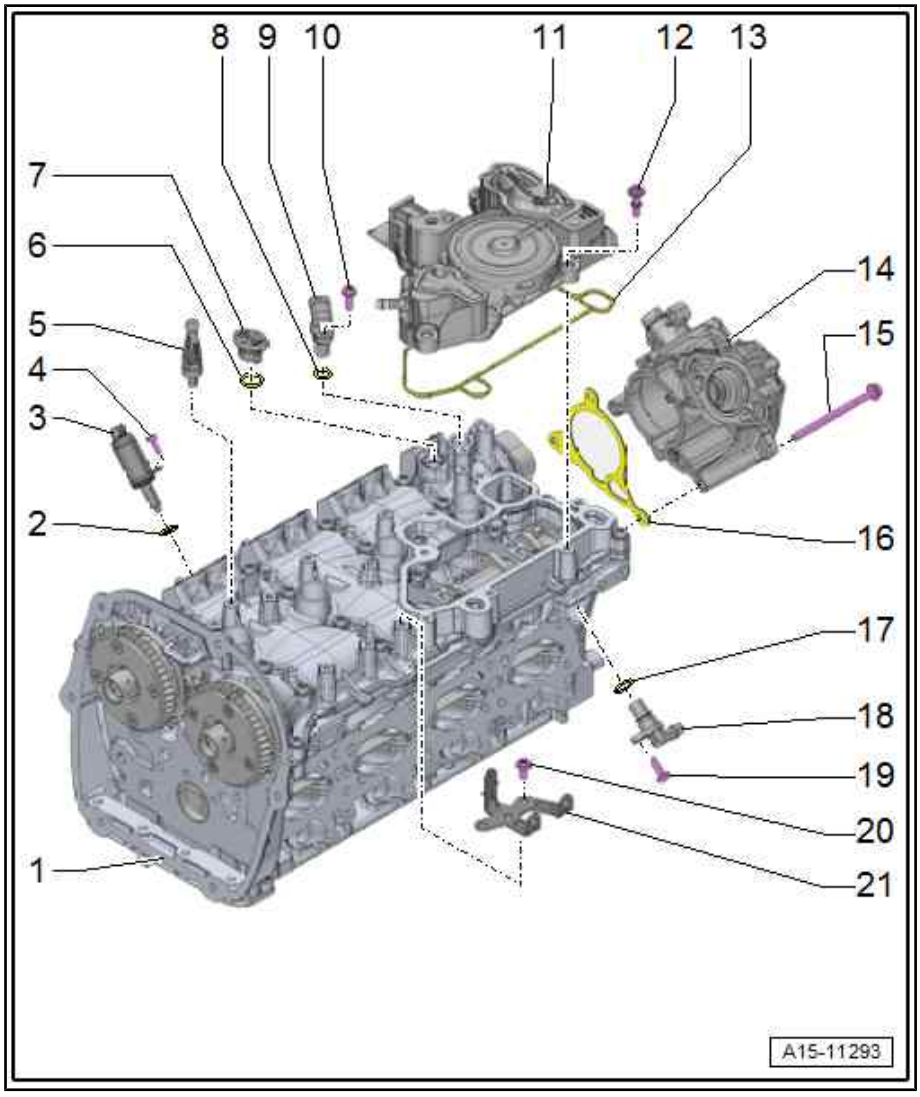


Note

Take care to keep cylinder head cover straight.

Part II

Part I ⇒ page 139



1 - Cylinder head

2 - O-ring

- ❑ Check for damage
- ❑ Not available as a replacement part, supplied together with actuator for camshaft adjustment

3 - Actuator for camshaft adjustment

4 - Bolt

- ❑ 5 Nm

5 - Ball stud

- ❑ For engine cover panel
- ❑ 9 Nm

6 - O-ring

- ❑ Renew after removing
- ❑ Lubricate lightly with engine oil

7 - Sealing plug

8 - O-ring

- ❑ Renew after removing
- ❑ Lubricate lightly with engine oil

9 - Hall sender 3 - G300-

- ❑ Exploded view ⇒ page 305

10 - Bolt

- ❑ Tightening torque ⇒ page 305

11 - Oil separator

- ❑ Removing and installing ⇒ page 184

12 - Bolt

- ❑ Tightening torque and sequence ⇒ page 183

13 - Seal

- ❑ Renew after removing

14 - Vacuum pump

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

15 - Bolt

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

16 - Gasket

- ❑ Renew if damaged

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17 - O-ring

- ❑ Renew after removing
- ❑ Lubricate lightly with engine oil

18 - Hall sender - G40-

- ❑ Exploded view ⇒ page 305

19 - Bolt

- ❑ Tightening torque ⇒ page 305

20 - Bolt

- ❑ 9 Nm

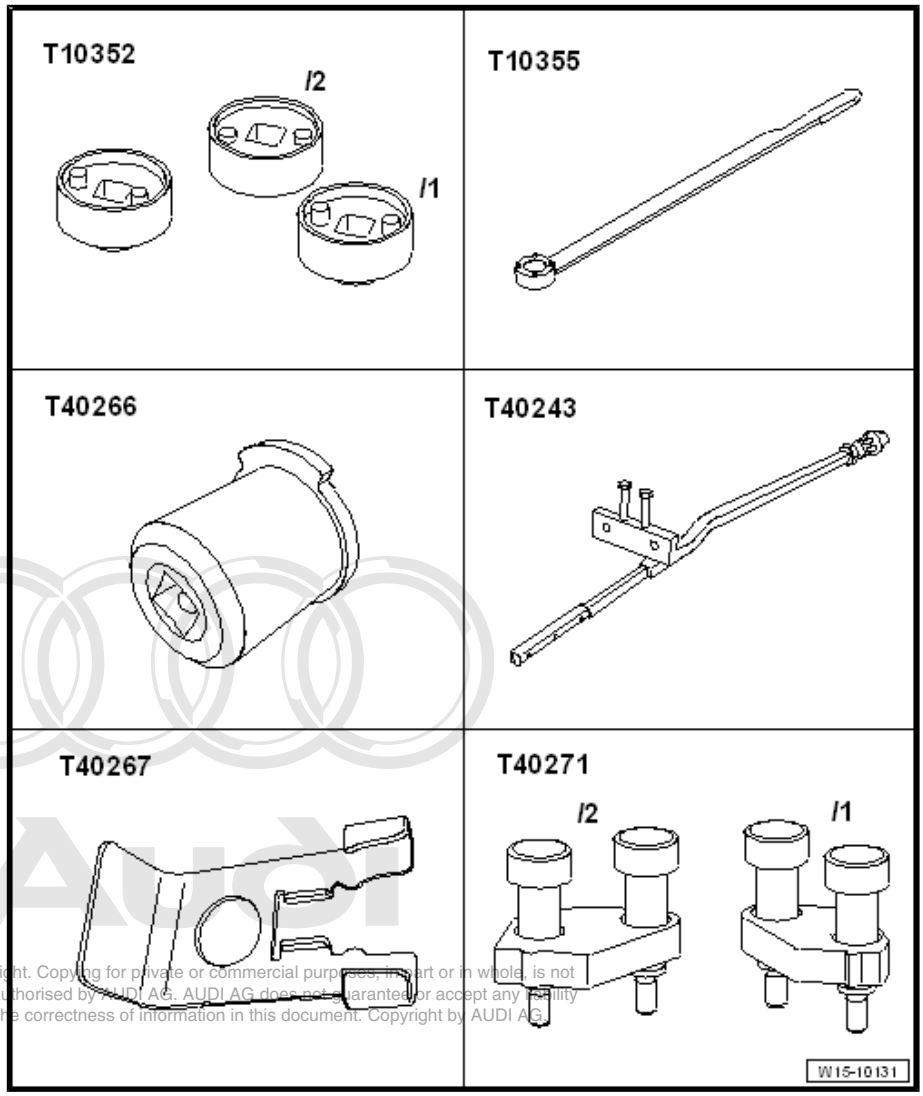
21 - Bracket

- ❑ For activated charcoal filter solenoid valve 1 - N80-

4.2 Removing and installing camshaft

Special tools and workshop equipment required

- ♦ Assembly tool - T10352-
- ♦ Counterhold tool - T10355-
- ♦ Assembly lever - T40243-
- ♦ Locking tool - T40267-
- ♦ Camshaft clamp - T40271-
- ♦ Assembly tool - T40266-
- ♦ Sealant - D 154 103 A1-



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Removing

Note

- *Sealing surfaces at bottom of cylinder head cover and top of cylinder head must not be machined.*
- *The camshaft bearings are integrated into the cylinder head and cylinder head cover. The timing chain must be slackened before removing the cylinder head cover.*
- *Secure cable ties in the same locations when installing.*

– Remove air cleaner housing ⇒ page 264 .

– Remove coolant pipe (top) ⇒ page 228 .

– Remove ignition coils ⇒ page 306 .

– Unplug electrical connectors:

1 - For turbocharger air recirculation valve - N249-

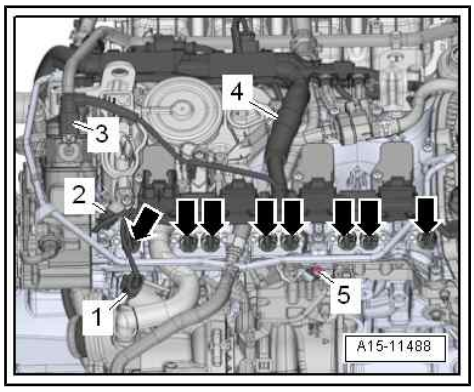
2 - For Hall sender 3 - G300-

3 - For fuel pressure regulating valve - N276-

– Unplug electrical connectors -arrows- at actuators for camshaft adjustment.

– Remove bolt -5- and move earth wire clear.

– Move electrical wiring harness clear at clip -4- and swivel it forwards.

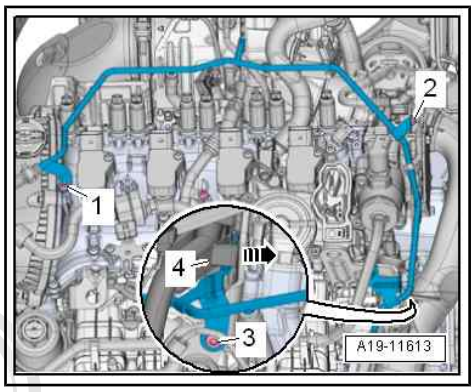


– Release fasteners -arrow-, detach wiring duct upwards from bracket and press forwards.

Caution

Avoid damage to coolant pipe.

- ***Do not attempt to bend coolant pipe to a different shape.***



– Remove bolts -1, 2, 3- and carefully swivel coolant line towards rear slightly.

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– Unplug electrical connector -1- at activated charcoal filter solenoid valve 1 - N80- .

– Press release tabs on crankcase breather hose -2- and detach hose.

– Remove bolts -arrows- and detach crankcase breather system.

– Remove high-pressure pump ⇒ page 289 .

– Remove vacuum pump ⇒ Brake system; Rep. gr. 47 ; Vacuum system; Exploded view - vacuum pump .

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– Support engine in installation position ⇒ page 45 .

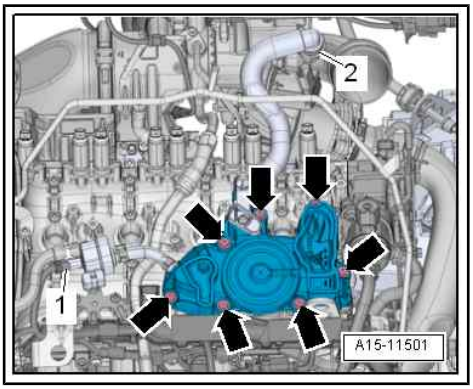
– Remove engine mounting ⇒ page 38 .

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

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

– Remove engine support ⇒ page 62 .

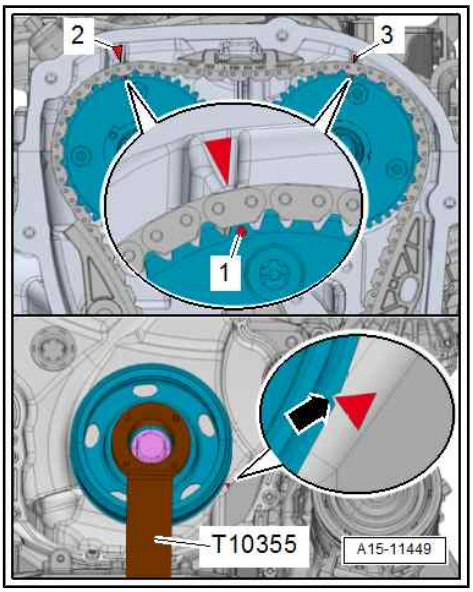
– Remove timing chain cover (top) ⇒ page 92 .



– Turn vibration damper to “TDC” position using counterhold tool - T10355- .

- Markings -1- on camshaft chain sprockets must be aligned with markings -2- and -3-.
- Notch on vibration damper and marking -arrow- on cover for timing chains (bottom) must be aligned.

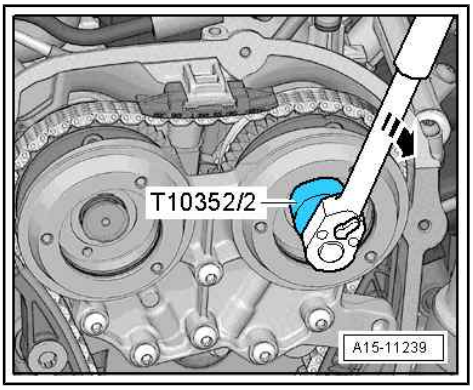
– Remove timing chain cover (bottom) ⇒ page 93 .



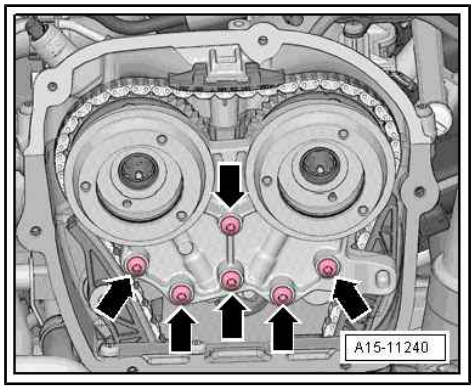
Caution

The timing valves have a left-hand thread.

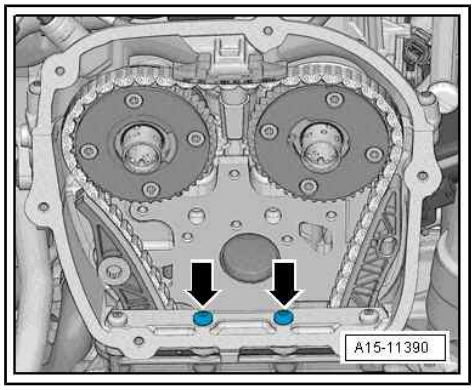
– Turn assembly tool - T10352/2- in direction of -arrow- to remove timing valves (left and right).



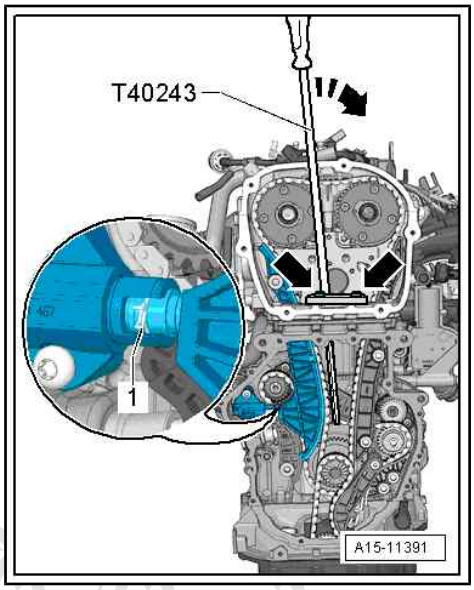
– Remove bolts -arrows- and detach bearing saddle.



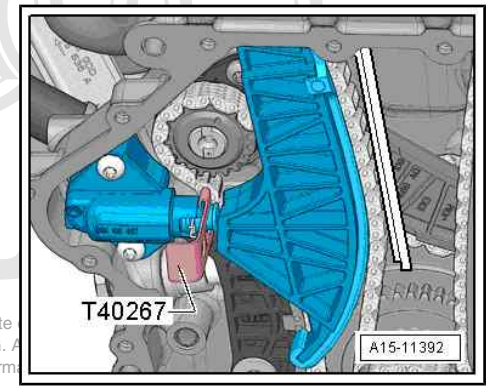
– Remove bolts -arrows-.



– Screw in assembly lever - T40243- -arrows-.
– Compress and hold circlip -1- for chain tensioner.
– Push assembly lever - T40243- slowly in direction of -arrow- and hold in place.

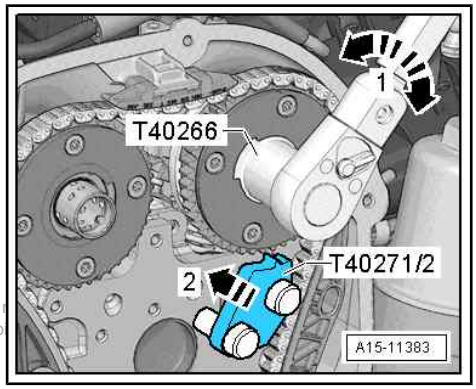


– Hold chain tensioner in position with locking tool - T40267- .
– Remove assembly lever - T40243- .



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– Bolt camshaft clamp - T40271/2- onto cylinder head and slide it into teeth of chain sprocket in direction of -arrow 2-. If necessary, rotate inlet camshaft using assembly tool - T40266- -1-.



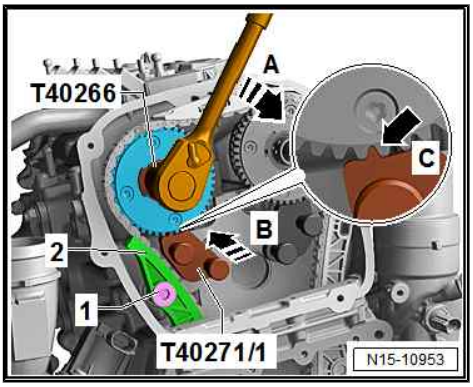
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– Bolt camshaft clamp - T40271/1- onto cylinder head.

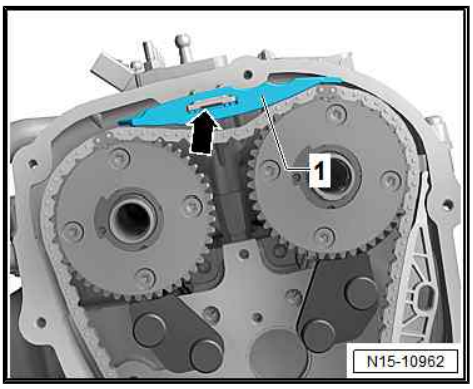
A second mechanic is required for the following step.

– Turn exhaust camshaft in direction of -arrow A- using assembly tool - T40266- and hold in place. Remove bolt -1- and guide tensioning rail -2- downwards. Continue turning camshaft clockwise -arrow A- until camshaft clamp - T40271/1- can be pressed into teeth on chain sprocket -arrow B-.

– Check installation position -C- of camshaft clamp - T40271/1- .

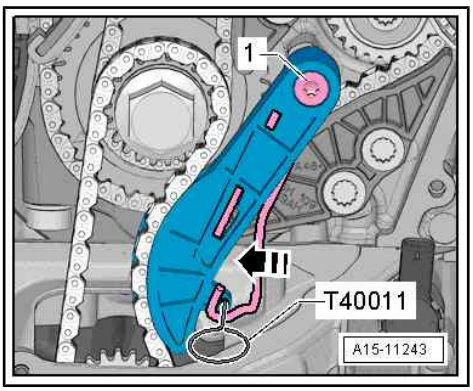


– Use screwdriver to release catch -arrow- and press off guide rail -1- towards front.



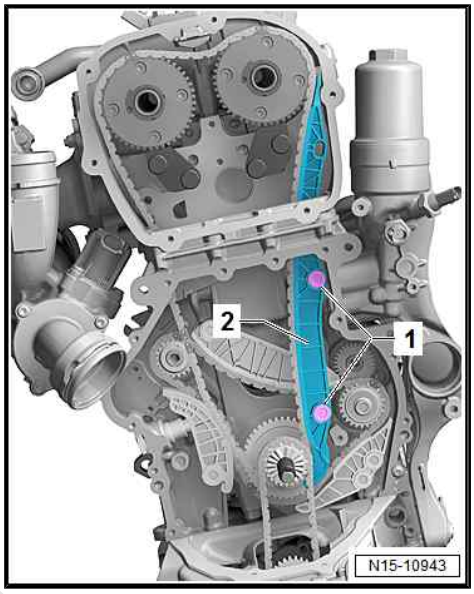
– Press retainer for oil pump chain tensioner in direction of -arrow- and lock in place using locking pin - T40011- .

– Unscrew bolt -1- and remove chain tensioner.

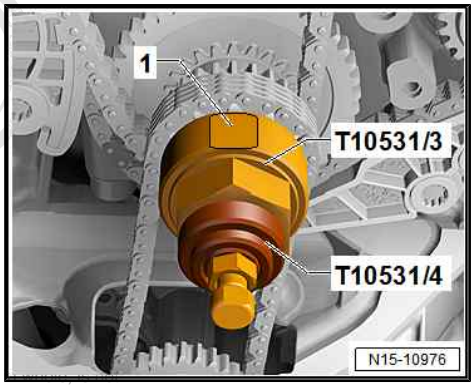


– Unscrew bolts -1- and remove guide rail -2-.

– Detach camshaft timing chain from sprockets and guide it downwards.

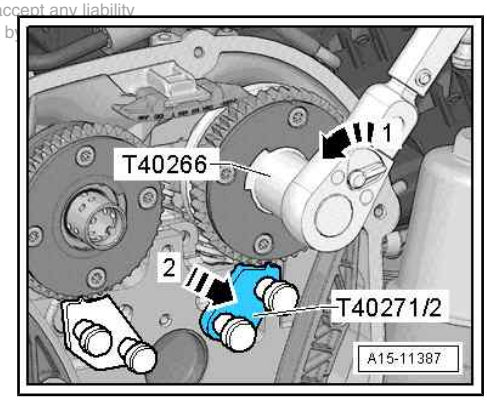


– Attach turning-over tool - T10531/3- . In “TDC” position, flat surface -1- is positioned at top (facing cylinder head). Screw on flange nut - T10531/4- . Turn crankshaft anti-clockwise out of “TDC” position using open-end spanner, 32 mm.

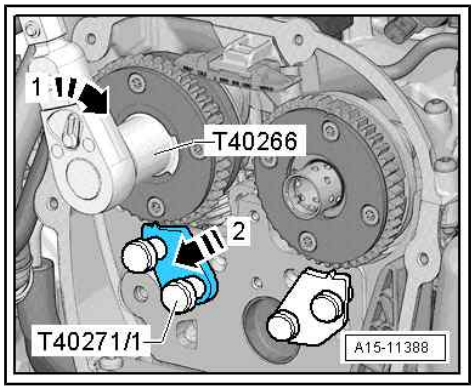


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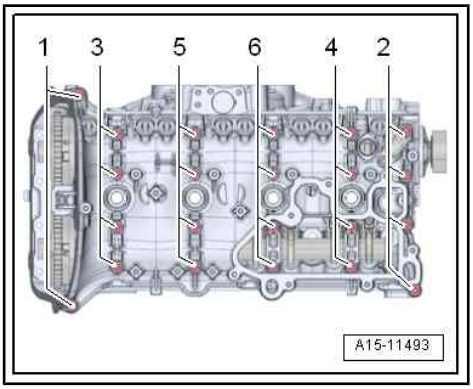
– Turn inlet camshaft in direction of -arrow 1- with assembly tool - T40266- , slide camshaft clamp - T40271/2- out of teeth on chain sprocket in direction of -arrow 2- and move camshaft into rest position.



– Turn exhaust camshaft in direction of -arrow 1- with assembly tool - T40266- , slide camshaft clamp - T40271/1- out of teeth on chain sprocket in direction of -arrow 2- and move camshaft into rest position.



– Remove cylinder head cover bolts in the sequence -1 ... 6-.



– Detach cylinder head cover.

– Detach camshafts and cover exposed parts of engine.

Installing camshafts

Note

- *The sealing surfaces must be free of oil and grease.*
- *Ensure that all roller rocker fingers make contact with the ends of the valve stems correctly.*

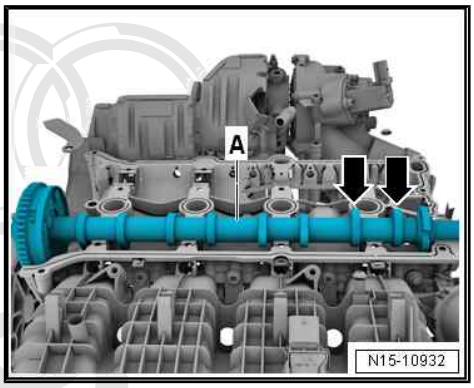
– If crankshaft has been rotated: set piston of cylinder 1 to top dead centre and then turn crankshaft back slightly.

– Remove sealant residue from groove in cylinder head cover and from sealing surfaces.

– Sealing surfaces must be free of oil and grease.

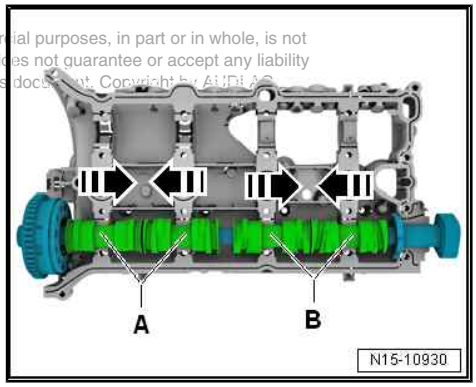
– Oil running surfaces of both camshafts.

– Fit inlet camshaft -A- in cylinder head. Rotate cams of cylinder 4 -arrows- so that they face upwards.

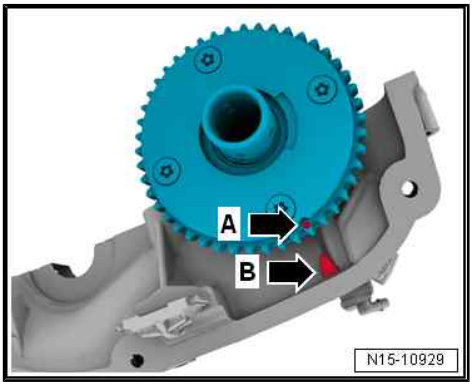


– Fit exhaust camshaft in cylinder head cover, as shown in illustration. Pairs of cams -A- and -B- must be pushed together.

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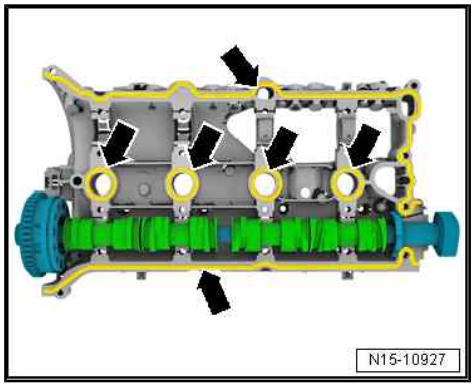
– Rotate exhaust camshaft until markings -A- and -B- are aligned.



– Apply sealant onto clean sealing surface -arrows- of cylinder head cover, as shown in illustration.

♦ Thickness of sealant bead: 2 ... 3 mm.

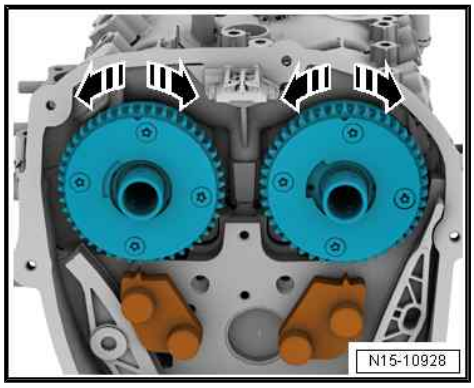
– Hold camshaft in position and place cylinder head cover on cylinder head with camshaft fitted.



– Press lightly on cylinder head cover with your hand and rotate camshafts slightly until cylinder head cover comes into contact with cylinder head such that it is free of tension.

– Renew bolts for cylinder head cover.

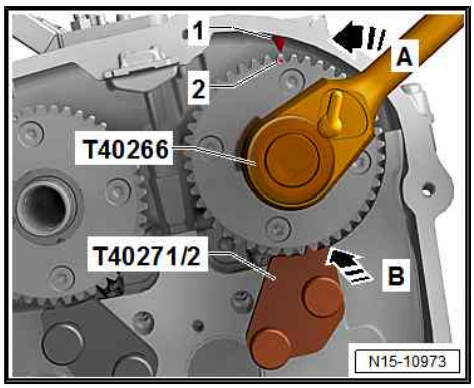
– Tighten bolts in several stages; tightening sequence ⇒ page 141 .



Note

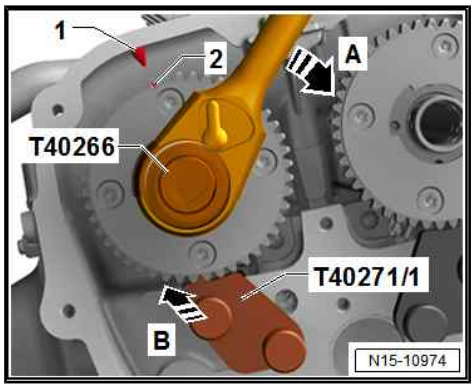
Take care to keep cylinder head cover straight.

– Turn inlet camshaft in direction of -arrow A- using assembly tool - T40266- until markings -1- and -2- are aligned. Slide camshaft clamp - T40271/2- into teeth of chain sprocket in direction of -arrow B-.

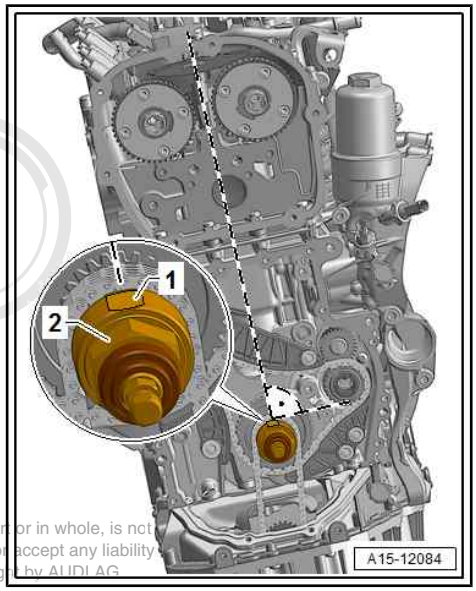


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– Turn exhaust camshaft in direction of -arrow A- using assembly tool - T40266- until markings -1- and -2- are aligned. Slide camshaft clamp - T40271/1- into teeth of chain sprocket in direction of -arrow B-. Marking -2- is offset slightly to the right.



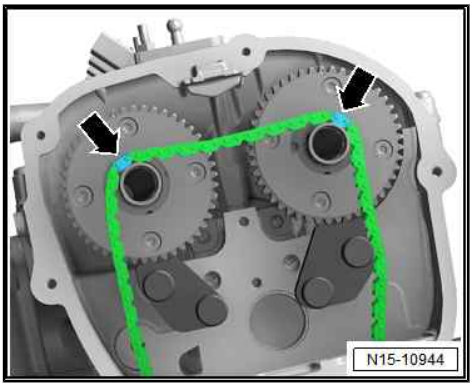
– Turn crankshaft at hexagon flats -2- into “TDC” position. In “TDC” position, flat surface -1- is positioned at top (facing cylinder head).



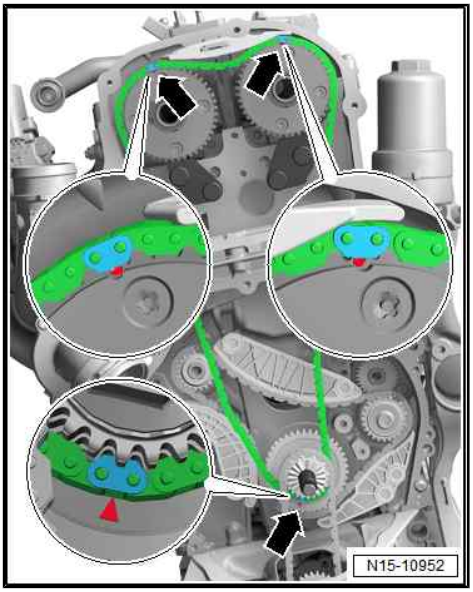
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Installing camshaft timing chain

– Fit camshaft timing chain so that coloured markings -arrows- are positioned on camshaft journals.

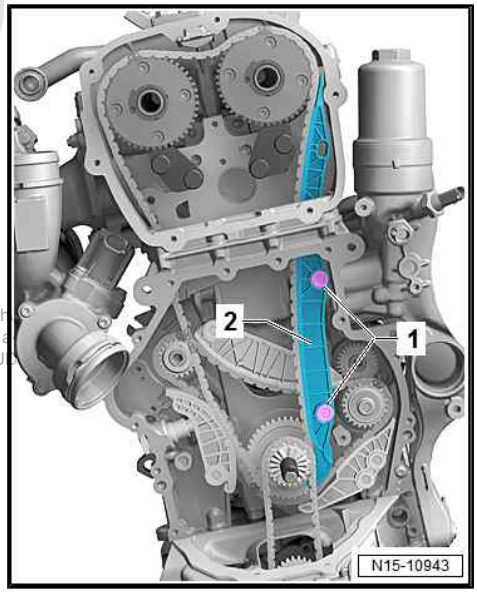


– Fit camshaft timing chain onto inlet camshaft, exhaust camshaft and crankshaft. Position links with coloured markings -arrows- at markings on chain sprockets.

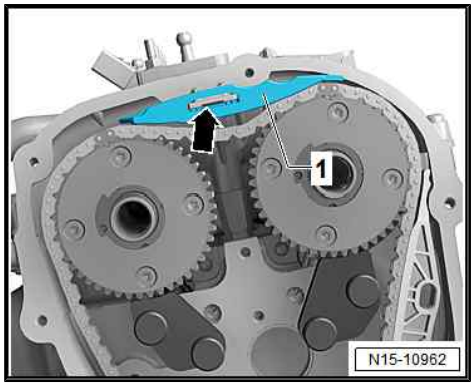


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– Install guide rail -2- and tighten bolts -1-.



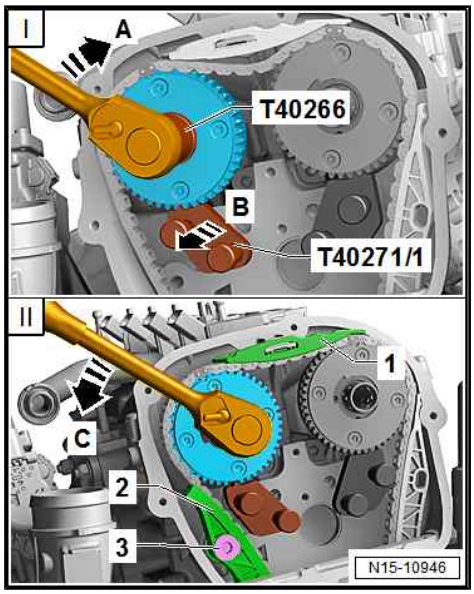
– Install top guide rail -1-.



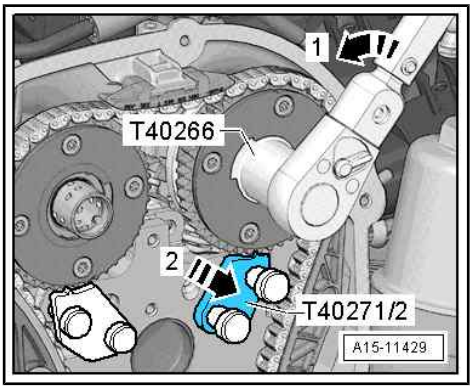
A second mechanic is required for the following step.

I - Use assembly tool - T40266- to turn exhaust camshaft slightly in direction of -arrow A- and slide camshaft clamp - T40271/1- out of teeth on chain sprocket in direction of -arrow B-.

II - Release camshaft in direction of -arrow C- until timing chain is in contact with guide rail -1-. Hold camshaft in this position, install tensioning rail -2- and tighten bolt -3-. Then release camshaft.

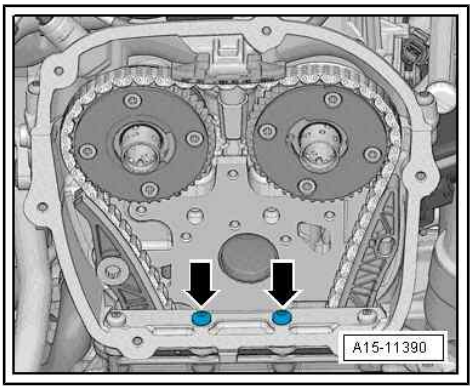


– Use assembly tool - T40266- to turn inlet camshaft in direction of -arrow 1- until it is possible to slide camshaft clamp - T40271/2- out of teeth on chain sprocket in direction of -arrow 2-. Then release camshaft.



– Remove camshaft clamps - T40271/1- and -T40271/2- .

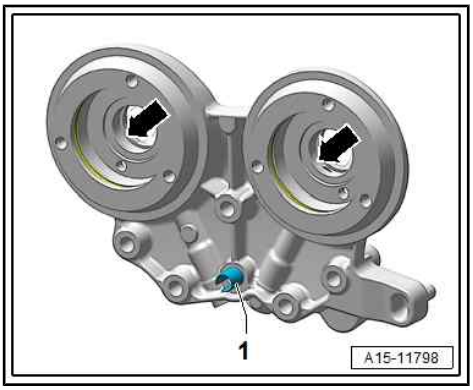
– Fit and tighten bolts -arrows-. Tightening torque ⇒ Item 4 (page 126)



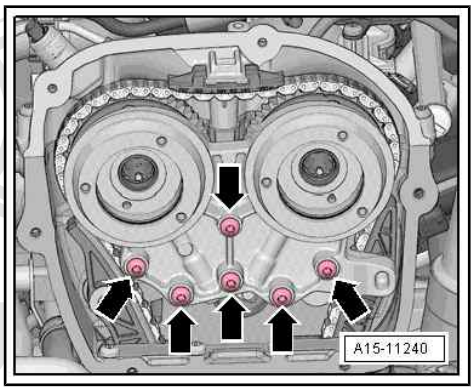
– Lubricate holes -arrows- with engine oil.

Note

Spring pin -1- is not fitted on all bearing saddles.

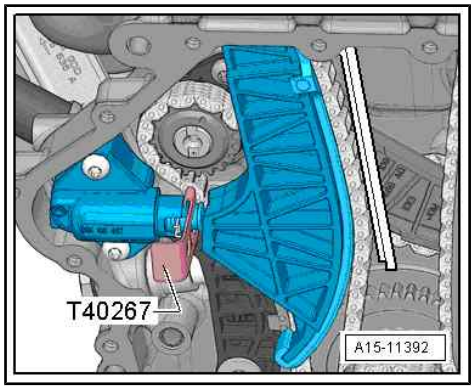


– Attach bearing saddle and screw in bolts -arrows- hand-tight.

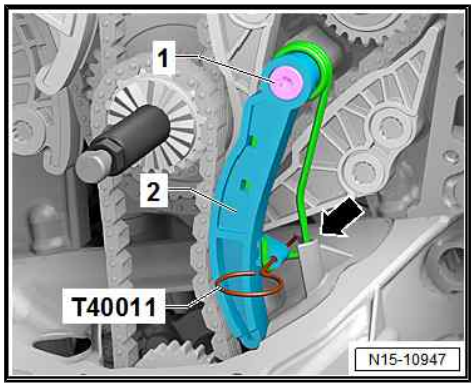


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– Remove locking tool - T40267- .
– Tighten bolts for bearing saddle ⇒ Item 5 (page 101) .



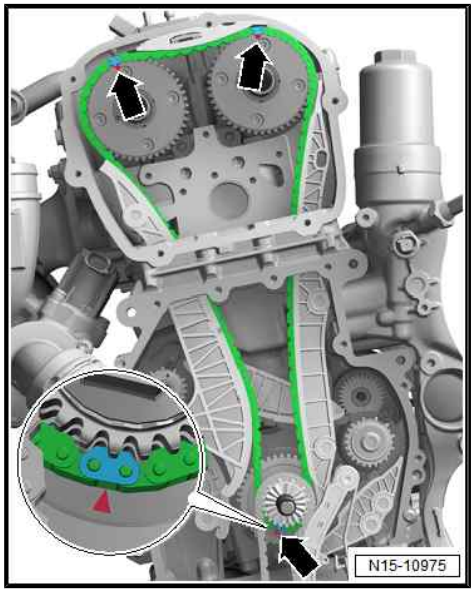
– Install chain tensioner -2-. Support wire must come into contact with opening -arrow- on sump (top section). Tighten bolt -1- and remove locking pin - T40011- .



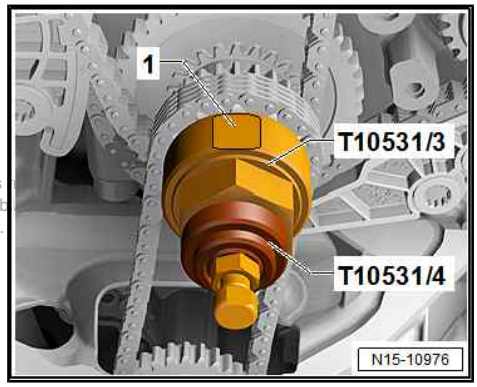
– Check setting; links with coloured markings -arrows- must be positioned at markings on chain sprockets.
– Install timing valves ⇒ Item 7 (page 101) .
– Turn engine two rotations in direction of engine rotation.

Note

Due to the ratio, the timing chain links with coloured markings are no longer aligned after the engine has been turned.



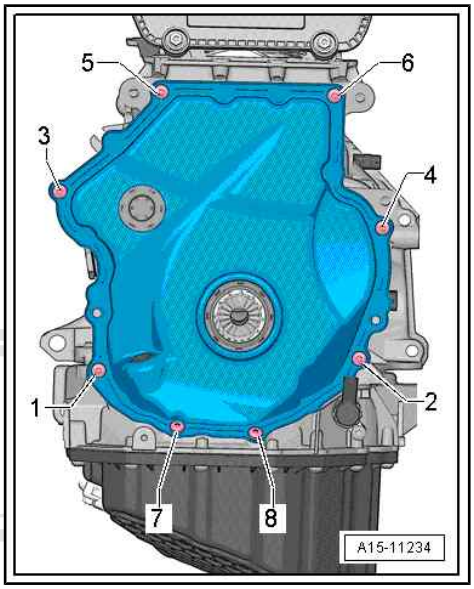
– Unscrew flange nut - T10531/4- and remove turning-over tool - T10531/3- .
– Install timing chain cover (bottom) ⇒ page 93 .



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Note

Only tighten bolts -1- and -4- to final tightening angle after installing the vibration damper. The bolts must be unscrewed again to install the vibration damper.



- Install vibration damper ⇒ page 54 .
- Install timing chain cover (top) ⇒ page 92 .
- Install poly V-belt tensioner ⇒ page 54 .
- Install poly V-belt ⇒ page 53 .
- Install vacuum pump ⇒ Brake system; Rep. gr. 47 ; Vacuum system; Exploded view - vacuum pump .
- Install high-pressure pump ⇒ page 289 .
- Install washer fluid reservoir ⇒ Electrical system; Rep. gr. 92 ; Windscreen washer system; Exploded view - windscreen washer system .

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

- After working on chain drive, learnt values must be adapted in engine control unit. To do so, switch on ignition and select following menu options on vehicle diagnostic tester.

◆ `01 - Engine electronics`

◆ `Guided Functions`

◆ `01 - Adaptions after repairs on chain drive`

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Tightening torques

◆ ⇒ “2.1 Exploded view - camshaft timing chains”, page 100

◆ ⇒ “2.2 Exploded view - drive chain for balance shaft”, page 102

◆ ⇒ “4.1 Exploded view - valve gear”, page 139

◆ ⇒ “3.1 Exploded view - air cleaner housing”, page 263

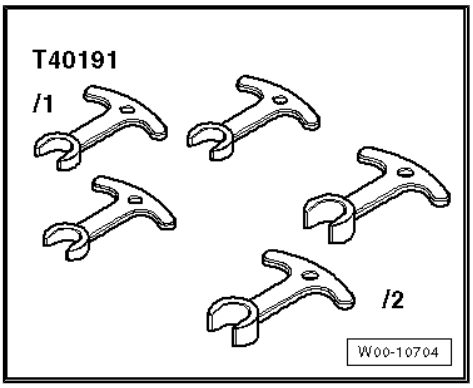
◆ ⇒ “7.1 Exploded view - high-pressure pump”, page 288

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

4.3 Installing ball for slider

Special tools and workshop equipment required

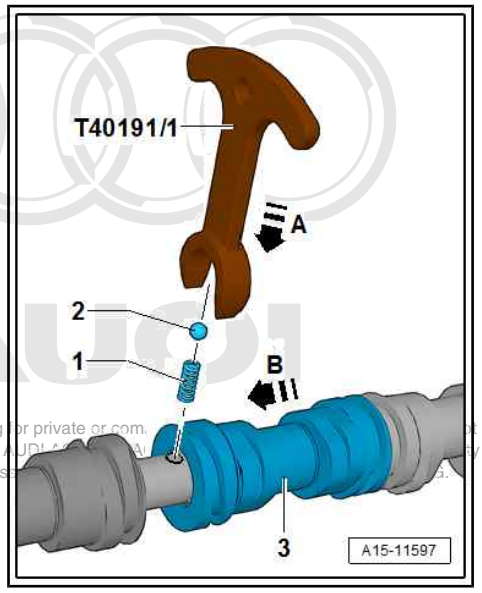
◆ Spacers - T40191-



Installing

> **WARNING**
>
> *Ball may spring out - risk of eye injury.*
>
> ♦ *Put on safety goggles.*

– Insert spring -1- in camshaft.
– Place ball -2- on spring in camshaft.
– Push ball and spring downwards in direction of -arrow A- with spacer - T40191/1- and hold in place.
– Push slider -3- in direction of -arrow B-.



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4.4 Removing and installing valve stem oil seals

⇒ “4.4.1 Removing and installing valve stem oil seals (cylinder head installed)”, page 156

⇒ “4.4.2 Removing and installing valve stem oil seals (cylinder head removed)”, page 161

4.4.1 Removing and installing valve stem oil seals (cylinder head installed)

Special tools and workshop equipment required

♦ Spark plug spanner - 3122B-



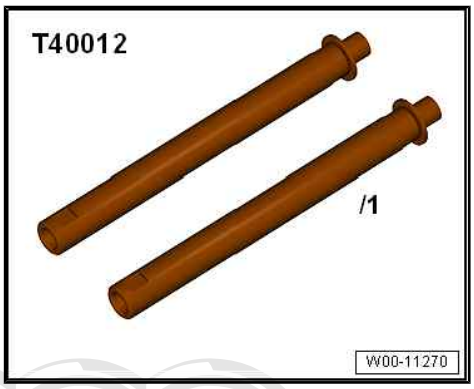
♦ Valve stem seal puller - 3364-



♦ Valve stem seal fitting tool - 3365-



♦ Adapter - T40012-



♦ Removal and installation device for valve cotters - VAS 5161 A-



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♦ Guide plate for 2.0 ltr. and 3.0 ltr. FSI engine - VAS 5161/19C-

♦ Assembly sleeve ⇒ Electronic parts catalogue

Removing valve stem oil seals

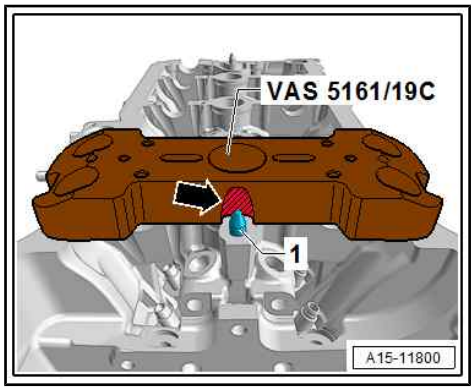
– Remove camshafts ⇒ page 143 .

– Mark original positions of roller rocker fingers and hydraulic compensation elements for re-installation.
– Remove roller rocker fingers together with hydraulic compensation elements and put down on a clean surface.
– Remove spark plugs with spark plug spanner - 3122 B- .

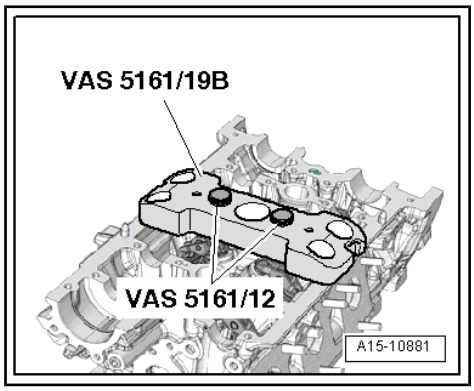
Machining guide plate

Check whether there is a recess -arrow-.

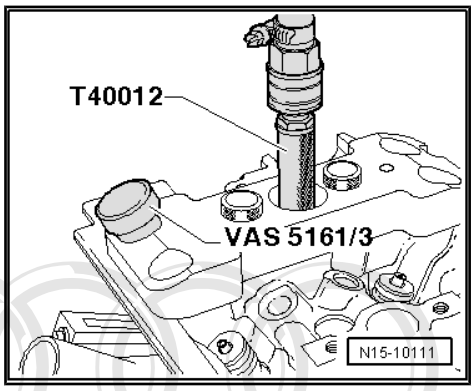
– Machine guide plate for 2.0 ltr. and 3.0 ltr. FSI engine - VAS 5161/19C- -arrow- so that guide plate rests on cylinder head and guide pin -1- does not make contact.



– Secure guide plate for 2.0 ltr. and 3.0 ltr. FSI engine - VAS 5161/19C- to cylinder head with knurled screws - VAS 5161/12- as shown.
– Set piston of appropriate cylinder to “bottom dead centre”.

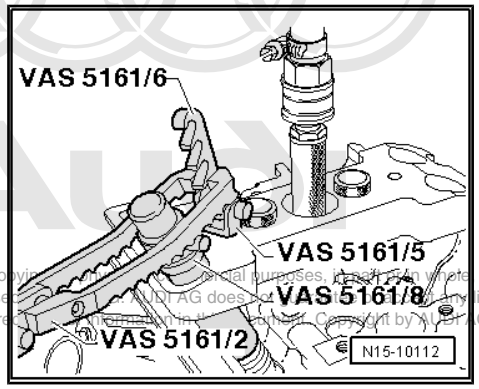


– Screw adapter - T40012- into spark plug thread.
– Connect to compressed air supply of at least 6 bar.
– Knock loose sticking valve cotters using punch - VAS 5161/3- and a plastic-headed hammer.



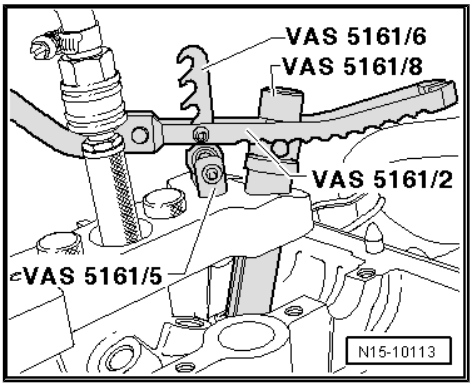
For inlet side

– Screw snap-in device - VAS 5161/6- with engaging fork - VAS 5161/5- into centre thread on guide plate for 2.0 ltr. and 3.0 ltr. FSI engine - VAS 5161/19C- .
– Insert assembly cartridge - VAS 5161/8- into guide plate for 2.0 ltr. and 3.0 ltr. FSI engine - VAS 5161/19C- .
– Engage pressure fork - VAS 5161/2- on snap-in device - VAS 5161/6- .

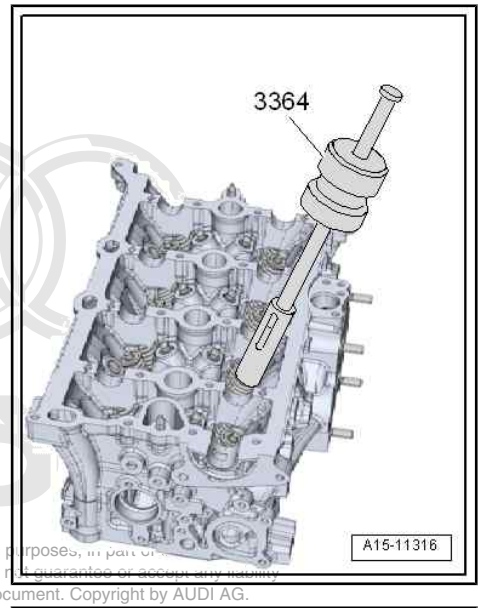


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For exhaust side

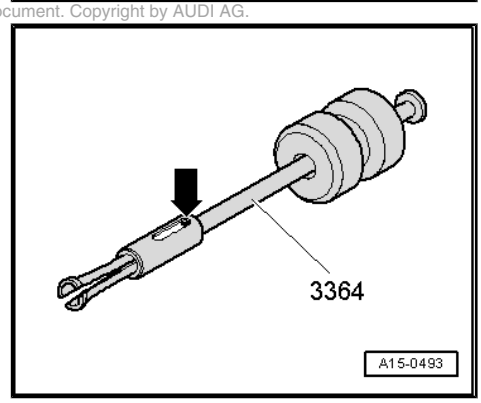


- Screw snap-in device - VAS 5161/6- with engaging fork - VAS 5161/5- into outer thread on guide plate for 2.0 ltr. and 3.0 ltr. FSI engine - VAS 5161/19C- .
- Press down assembly cartridge - VAS 5161/8- and at the same time, turn knurled screw of assembly cartridge - VAS 5161/8- clockwise until tips 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 - VAS 5161/2- .
- Take out assembly cartridge - VAS 5161/8- .

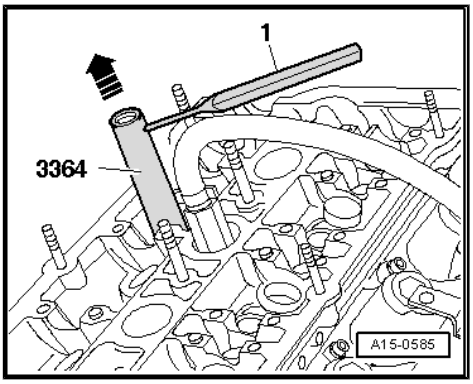


- Pull off valve stem oil seal with valve stem seal puller - 3364- .

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- If valve stem seal puller - 3364- cannot be used on account of restricted space, knock out pin -arrow- with a punch and remove the impact extractor attachment.



- Position lower part of valve stem seal puller - 3364- on valve stem oil seal.
- Insert a punch -1- through hole in lower section of puller.
- Apply assembly lever to puller and pull out valve stem oil seal -arrow-.

- To avoid damaging new valve stem oil seal -4- during installation, fit assembly sleeve -item 3- onto valve stem -2-.

– Lightly oil sealing lip of valve stem oil seal.

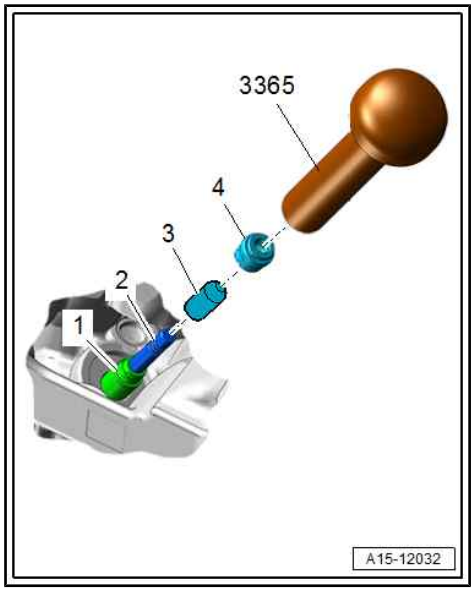
– Slide valve stem oil seal onto plastic sleeve.

– Carefully press valve stem oil seal onto valve guide using valve stem seal fitting tool - 3365- .

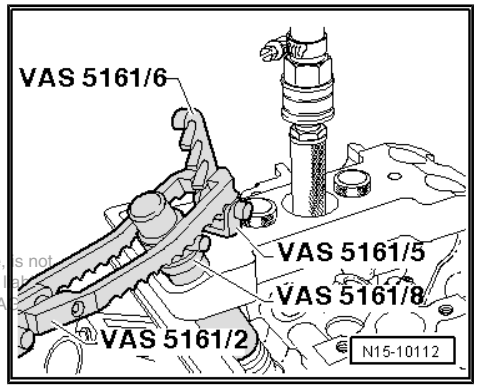
– Take out plastic sleeve.

– Insert valve spring and valve spring plate.

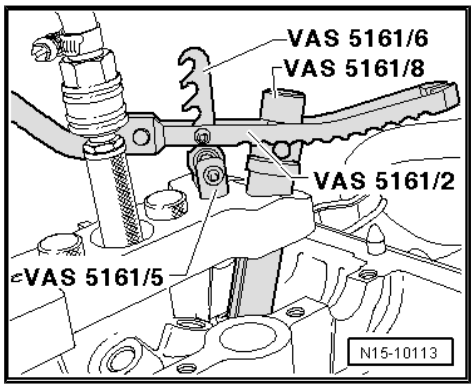
– Set up removal and installation device for valve cotters - VAS 5161 A- as shown.



Inlet side



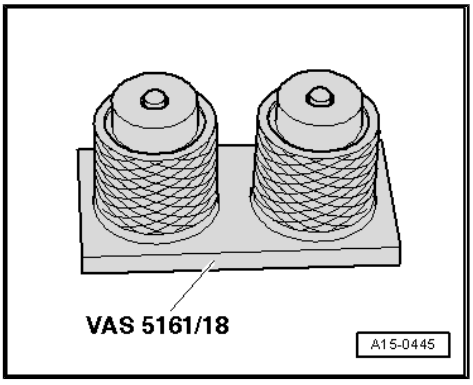
Exhaust side



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Note

- *If valve cotters have been removed from assembly cartridge, they must first be inserted in insertion device - VAS 5161/18- .*
- *Press assembly cartridge -VAS 5161/8- onto insertion device from above and pick up valve cotters.*



– Use pressure fork - VAS 5161/8- to press down assembly cartridge - VAS 5161/2- , then turn knurled screw of assembly cartridge back and forth while pulling upwards.

– Release pressure fork - VAS 5161/2- with knurled screw in pulled position.

– Detach removal and installation device for valve cotters - VAS 5161 A- .

The remaining installation steps are carried out in the reverse sequence. Note the following points:

– Install camshafts ⇒ page 143 .

4.4.2 Removing and installing valve stem oil seals (cylinder head removed)

Special tools and workshop equipment required

- Valve stem seal puller - 3364-



- Valve stem seal fitting tool - 3365-

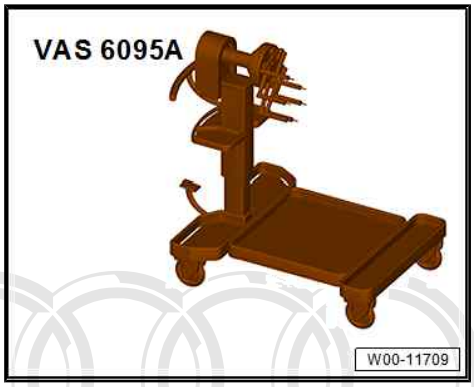


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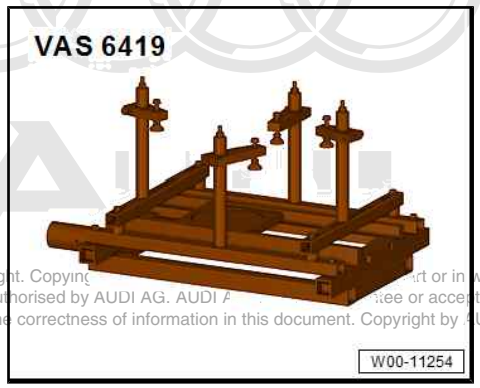
- Removal and installation device for valve cotters - VAS 5161 A-



- Guide plate for 2.0 ltr. and 3.0 ltr. FSI engine - VAS 5161/19C-
- Engine and gearbox support - VAS 6095A-



- Cylinder head tensioning device - VAS 6419-



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- Assembly sleeve ⇒ Electronic parts catalogue

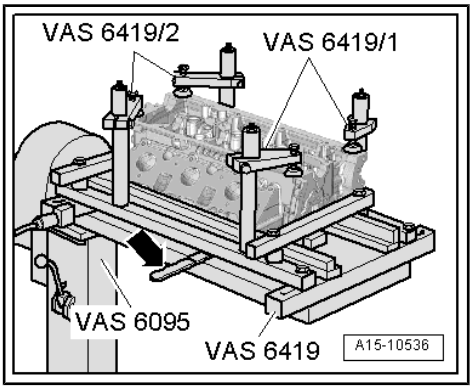
Removing valve stem oil seals

– Remove camshafts ⇒ page 143 .

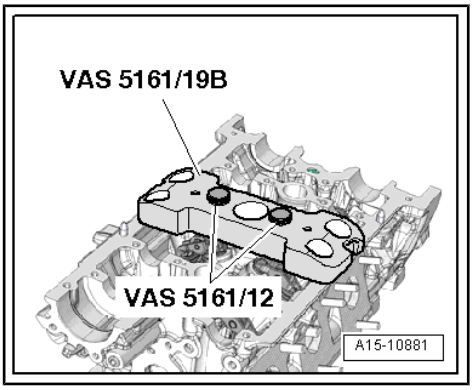
– Mark original positions of roller rocker fingers and hydraulic compensation elements for re-installation.

– Remove roller rocker fingers together with hydraulic compensation elements and put down on a clean surface.

– Insert cylinder head tensioning device - VAS 6419- into engine and gearbox support - VAS 6095- .
– Secure cylinder head in cylinder head tensioning device, as shown in illustration.
– Connect cylinder head tensioning device to compressed air.
– Using lever -arrow-, slide air pad under combustion chamber where valve stem oil seal is to be removed.
– Apply just enough compressed air to bring air pad into contact with valve heads.

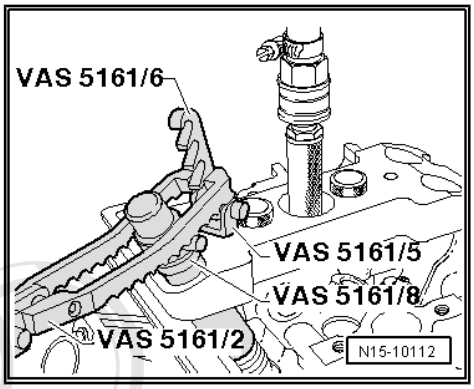


– Secure guide plate for 2.0 ltr. and 3.0 ltr. FSI engine - VAS 5161/19C- to cylinder head with knurled screws - VAS 5161/12- as shown.
– Insert drift -VAS 5161/3- into guide plate and use plastic-headed hammer to release sticking valve cotters.



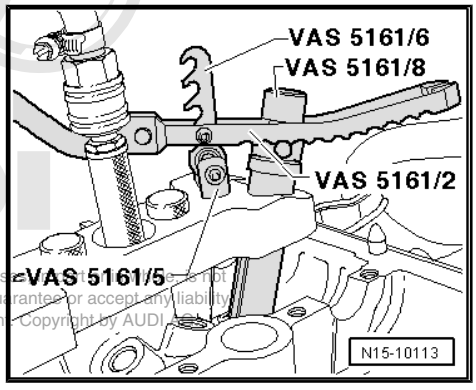
For inlet side

– Screw snap-in device - VAS 5161/6- with engaging fork - VAS 5161/5- into centre thread on guide plate for 2.0 ltr. and 3.0 ltr. FSI engine - VAS 5161/19C- .
– Insert assembly cartridge - VAS 5161/8- into guide plate for 2.0 ltr. and 3.0 ltr. FSI engine - VAS 5161/19C- .
– Engage pressure fork - VAS 5161/2- on snap-in device - VAS 5161/6- .



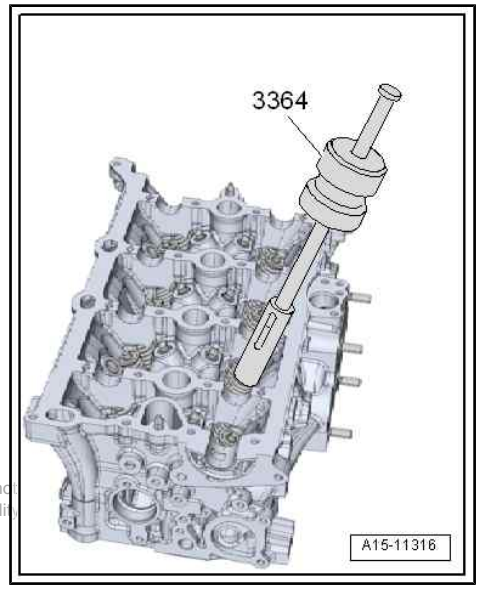
For exhaust side

– Screw snap-in device - VAS 5161/6- with engaging fork - VAS 5161/5- into outer thread on guide plate for 2.0 ltr. and 3.0 ltr. FSI engine - VAS 5161/19C- .
– Press down assembly cartridge - VAS 5161/8- and at the same time, turn knurled screw of assembly cartridge - VAS 5161/8- 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 - VAS 5161/2- .
– Take out assembly cartridge - VAS 5161/8- .



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– Pull off valve stem oil seal with valve stem seal puller - 3364- .



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• To avoid damaging new valve stem oil seal -4- during installation, fit assembly sleeve -item 3- onto valve stem -2-.

– Lightly oil sealing lip of valve stem oil seal.

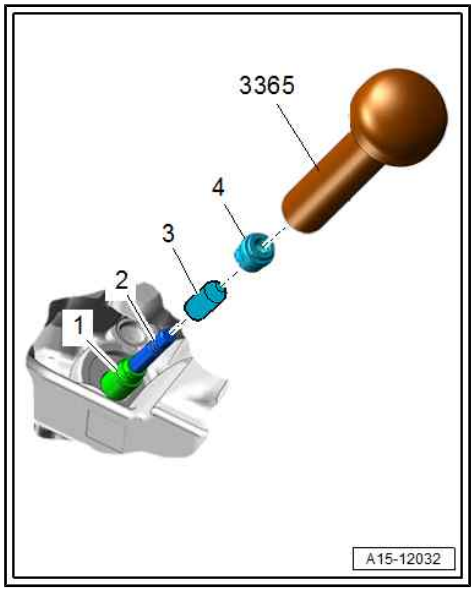
– Slide valve stem oil seal onto plastic sleeve.

– Carefully press valve stem oil seal onto valve guide using valve stem seal fitting tool - 3365- .

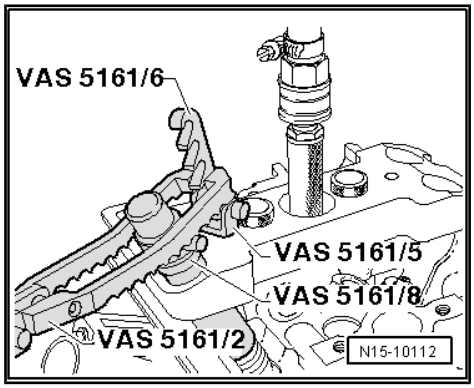
– Take off plastic sleeve.

– Insert valve spring and valve spring plate.

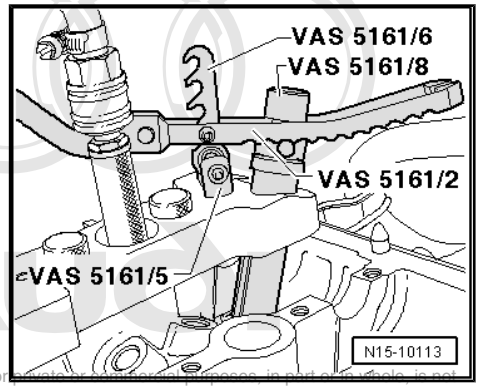
– Set up removal and installation device for valve cotters - VAS 5161 A- as shown.



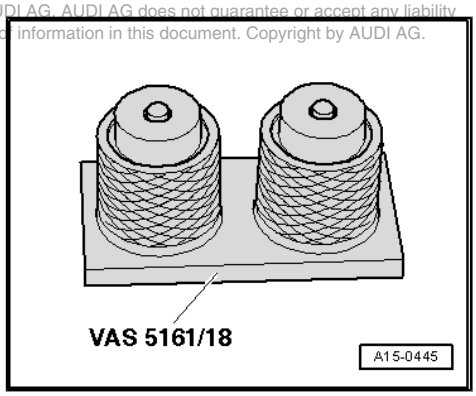
Inlet side



Exhaust side



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Note

- *If valve cotters have been removed from assembly cartridge, they must first be inserted in insertion device - VAS 5161/18- .*
- *Press assembly cartridge -VAS 5161/8- onto insertion device from above and pick up valve cotters.*

– Use pressure fork - VAS 5161/8- to press down assembly cartridge - VAS 5161/2- , then turn knurled screw of assembly cartridge back and forth while pulling upwards.

– Release pressure fork - VAS 5161/2- with knurled screw in pulled position.

– Detach removal and installation device for valve cotters - VAS 5161 A- .

Further assembly is basically carried out in reverse order of dismantling. When doing so, note the following:

– Install camshafts ⇒ page 143 .

5 Inlet and exhaust valves

⇒ “5.1 Checking valve guides”, page 166

⇒ “5.2 Checking valves”, page 167

⇒ “5.3 Valve dimensions”, page 167

5.1 Checking valve guides

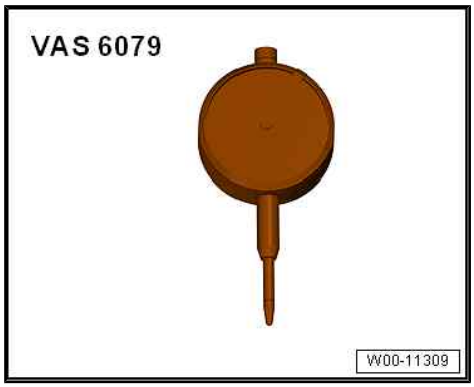
Special tools and workshop equipment required

- Universal dial gauge bracket - VW 387-



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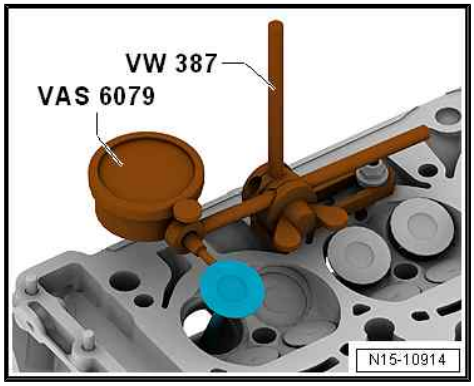
- Dial gauge - VAS 6079-



Test sequence

– Insert valve into guide. End of valve stem must be flush with guide. Only insert inlet valve into inlet valve guide and exhaust valve into exhaust valve guide, as the stem diameters are different.

– Measure the amount of sideways play.



Wear limit

Inlet valve guide	Exhaust valve guide
0.60 mm	0.60 mm

Note

- *If the wear limit is exceeded, repeat the measurement with new valves. Renew cylinder head if wear limit is still exceeded.*
- *If the valve has to be renewed as part of a repair, use a new valve for the measurement.*

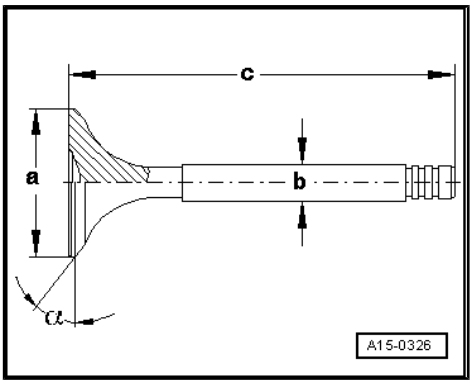
5.2 Checking valves

– Visually inspect for scoring on valve stems and valve seat surfaces.

– Renew valve if scoring is clearly visible.

5.3 Valve dimensions

Valve dimensions



Note

Inlet and exhaust valves must not be machined. Only grinding-in is permitted.

Dimension		Inlet valve	Exhaust valve
∅ a	mm	33.85 + 0.10	28.0 + 0.1
∅ b	mm	5.98 + 0.01	5.96 + 0.01
c	mm	104.0 + 0.2	101.9 + 0.2
α	∠°	45	45

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17 – Lubrication

1 Sump/oil pump

⇒ “1.1 Exploded view - sump/oil pump”, page 168

⇒ “1.2 Engine oil”, page 171

⇒ “1.3 Removing and installing sump (bottom section)”, page 171

⇒ “1.4 Removing and installing sump (top section)”, page 174

⇒ “1.5 Removing and installing oil pump”, page 177

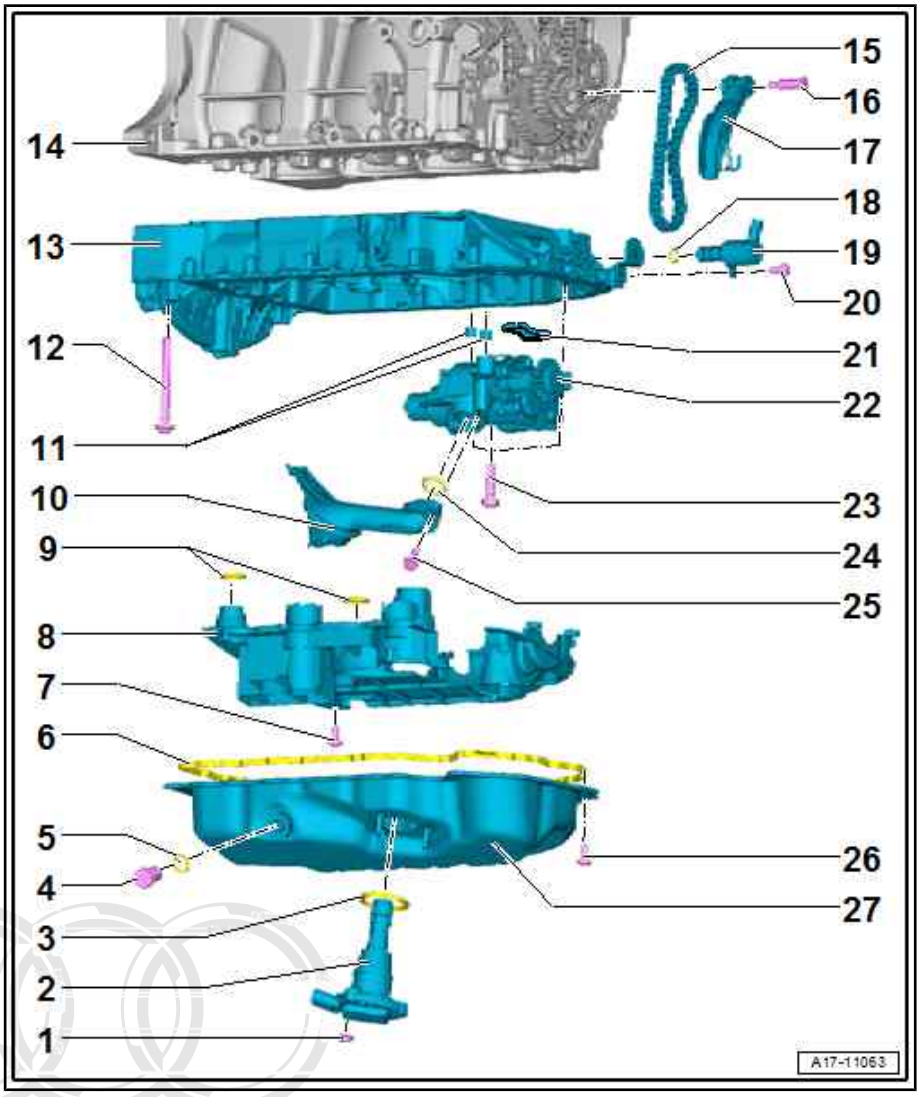
⇒ “1.6 Removing and installing oil level and oil temperature sender G266 ”, page 179

1.1 Exploded view - sump/oil pump

Note

If large quantities of metal shavings or other particles are found in the engine oil when repairing the engine (possibly caused by partial seizure of crankshaft and conrod bearings), clean the oil passages thoroughly and renew the engine oil cooler to prevent further damage occurring later.

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1 - Nut

- ❑ 9 Nm

2 - Oil level and oil temperature sender - G266-

- ❑ Removing and installing ⇒ page 179

3 - O-ring

- ❑ Renew after removing
- ❑ Lubricate lightly with engine oil

4 - Oil drain plug or sealing plug

- ❑ Oil drain plug for sheet-metal version of sump (bottom section)
- ❑ Oil drain plug: 30 Nm
- ❑ Sealing plug for plastic version of sump (bottom section)
- ❑ Turn sealing plug as far as stop using a flat-bladed screwdriver or a coin

5 - Seal/O-ring

- ❑ Allocation ⇒ Electronic parts catalogue
- ❑ Renew after removing

6 - Seal/sealing fluid

- ❑ Allocation ⇒ Electronic parts catalogue

7 - Bolt

- ❑ For baffle plate and oil intake pipe
- ❑ Renew after removing
- ❑ 4 Nm + 45°

8 - Baffle plate

- ❑ Renew after removing

9 - O-rings

- ❑ Renew
- ❑ Lubricate lightly with engine oil

10 - Oil intake pipe

- ❑ Clean strainer if dirty

11 - Centring sleeve

- ❑ 2x

12 - Bolt

- ❑ Renew after removing
- ❑ Tightening sequence ⇒ page 171

13 - Sump (top section)

- ❑ Removing and installing ⇒ page 174

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14 - Cylinder block

15 - Drive chain for oil pump

- ❑ Mark direction of rotation before removing

16 - Bolt

- ❑ 9 Nm

17 - Chain tensioner

18 - O-ring

- ❑ Renew after removing
- ❑ Lubricate lightly with engine oil

19 - Valve for oil pressure control - N428-

- ❑ Removing and installing ⇒ page 187

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20 - Bolt

- ❑ Renew after removing
- ❑ Tightening torque ⇒ Item 1 (page 186)

21 - Oil strainer

22 - Oil pump

- ❑ Removing and installing ⇒ page 177

23 - Bolt

- ❑ Renew after removing
- ❑ 8 Nm +90°

24 - O-ring

- ❑ Renew after removing
- ❑ Lubricate lightly with engine oil

25 - Bolt

- ❑ Renew after removing
- ❑ 4 Nm + 45°

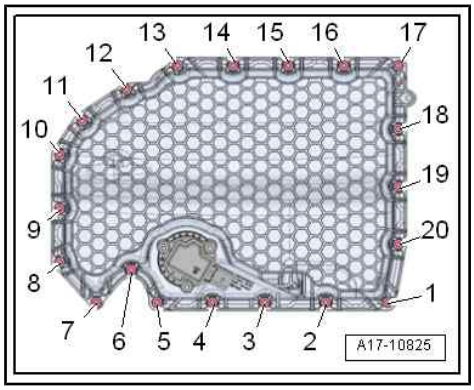
26 - Bolt

- ❑ Renew after removing
- ❑ Tightening sequence for sump (bottom section), plastic version ⇒ page 170
- ❑ Tightening sequence for sump (bottom section), sheet-metal version ⇒ page 171

27 - Sump (bottom section)

- ❑ Sheet metal or plastic ⇒ Electronic parts catalogue
- ❑ Removing and installing ⇒ page 171

Tightening sequence for sump (bottom section), plastic version



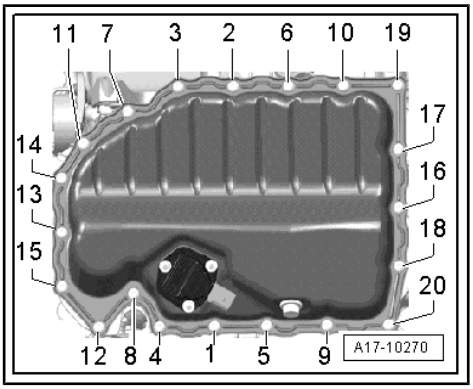
Note

Renew bolts tightened with specified tightening angle.

– Tighten bolts -1- to -20- in two stages in the sequence shown:

Stage	Bolts/tightening sequence	Tightening torque
1	-1- to -20-	Tighten to 8 Nm
2	-1- to -20-	Turn 90° further

Tightening sequence for sump (bottom section), sheet-metal version



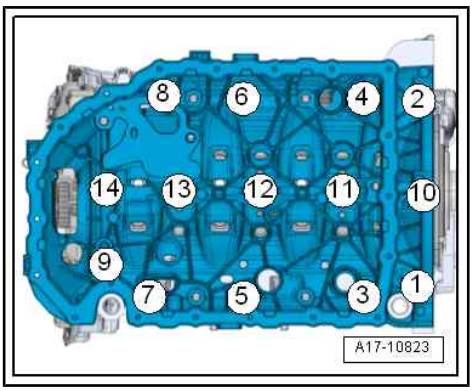
Note

Renew bolts tightened with specified tightening angle.

– Tighten bolts -1- to -20- in two stages in the sequence shown:

Stage	Bolts/tightening sequence	Tightening torque
1	-1- to -20-	Tighten to 8 Nm
2	-1- to -20-	Turn 45° further

Tightening sequence for sump (top section)



Note

Renew bolts tightened with specified tightening angle.

– Tighten bolts -1- to -14- in the sequence shown:

Stage	Bolts/tightening sequence	Tightening torque
1	-1- to -14-	Tighten to 8 Nm
2	-1- and -2-	Turn 180° further
3	-3- to -9-	Turn 45° further
4	-10-	Turn 180° further
5	-11- to -14-	Turn 90° further

1.2 Engine oil

Refer to ⇒ Maintenance tables for viscosity grades, oil specifications and engine oil capacity.

1.3 Removing and installing sump (bottom section)

⇒ "1.3.1 Removing and installing sump (bottom section, plastic version)", page 171

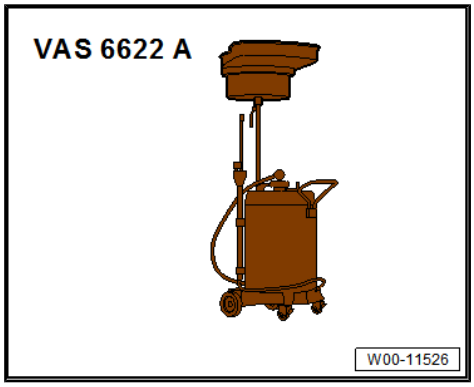
⇒ "1.3.2 Removing and installing sump (bottom section, sheet metal version)", page 173

1.3.1 Removing and installing sump (bottom section, plastic version)

Special tools and workshop equipment required

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



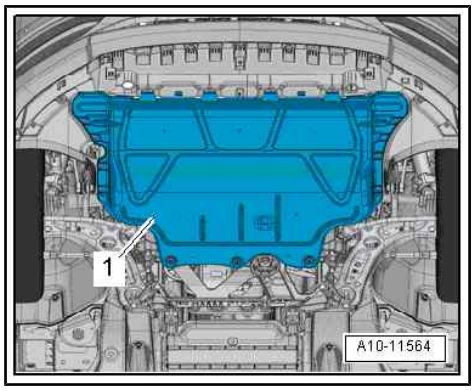
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- Electric drill with plastic brush
- Safety goggles
- Silicone sealant ⇒ Electronic parts catalogue (ETKA)

Removing

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

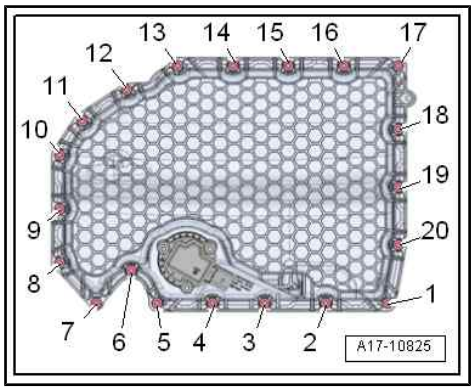
– Place used oil collection and extraction unit - VAS 6622A- below engine and drain off engine oil.



Note

Please observe requirements for disposal.

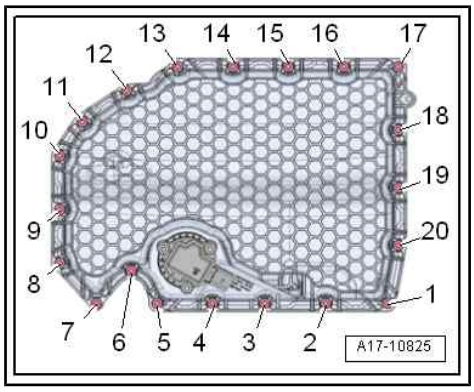
– Unscrew bolts -1 ... 20- and remove sump.



Installing

– Tighten new bolts -1- to -20- in two stages in the sequence shown:

– Fill up engine oil and check oil level ⇒ Maintenance ; Booklet ; Engine oil: draining; Renewing oil filter and filling up engine oil .



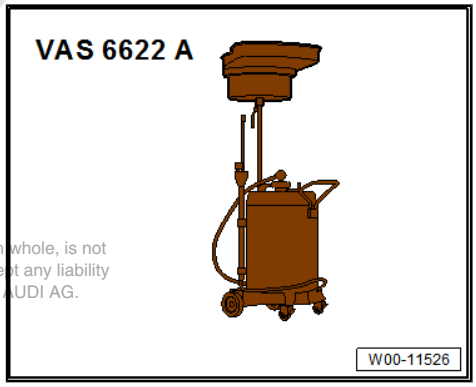
Tightening torques

- ⇒ “1.1 Exploded view - sump/oil pump”, page 168

1.3.2 Removing and installing sump (bottom section, sheet metal version)

Special tools and workshop equipment required

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



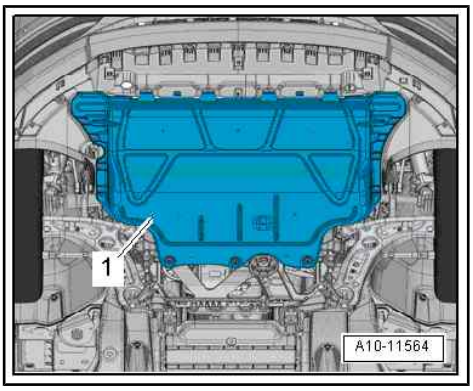
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- Electric drill with plastic brush
- Safety goggles
- Silicone sealant ⇒ Electronic parts catalogue (ETKA)

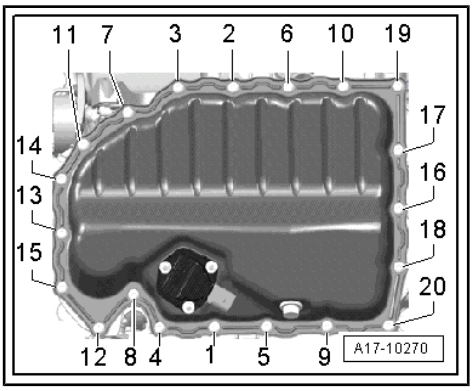
Removing

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

– Place used oil collection and extraction unit - VAS 6622A- below engine and drain off engine oil.



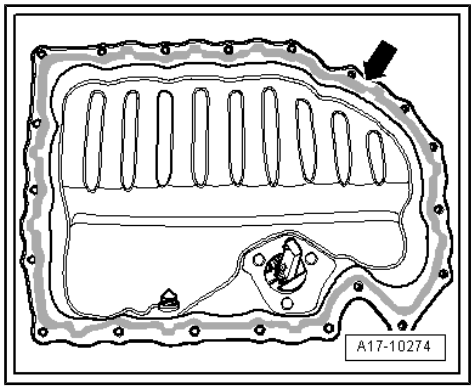
– Unscrew bolts -1 ... 20- and remove sump.



Installing

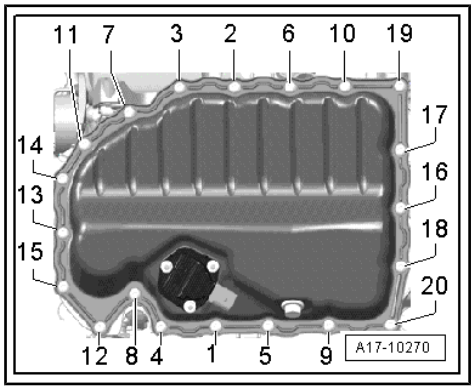
– Remove any sealant residue and clean sealing surfaces.

– Apply bead of silicone sealant onto sealing surface of sump (bottom section), as illustrated.



– Tighten new bolts -1- to -20- in two stages in the sequence shown:

– Fill up engine oil and check oil level ⇒ Maintenance ; Booklet ; Engine oil: draining; Renewing oil filter and filling up engine oil .



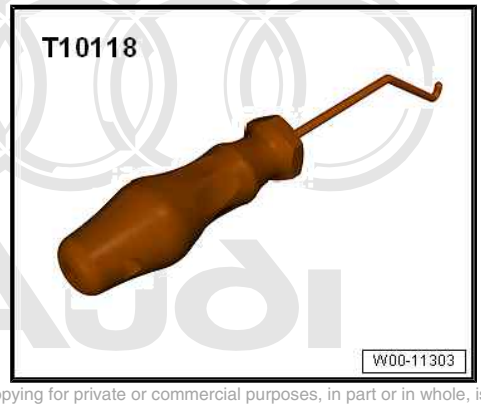
Tightening torques

♦ ⇒ “1.1 Exploded view - sump/oil pump”, page 168

1.4 Removing and installing sump (top section)

Special tools and workshop equipment required

♦ Assembly tool - T10118-



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♦ Locking tool - T40265-



♦ Electric drill with plastic brush

♦ Safety goggles

♦ Silicone sealant ⇒ Electronic parts catalogue (ETKA)

Removing

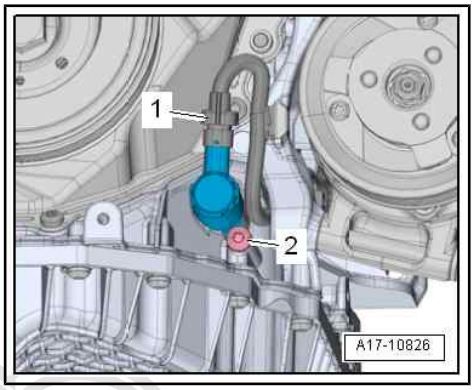
• Gearbox removed

– Remove sump (bottom section) ⇒ page 171 .

– Remove sealing flange (gearbox end) ⇒ page 65 .

– Remove oil pump ⇒ page 177 .

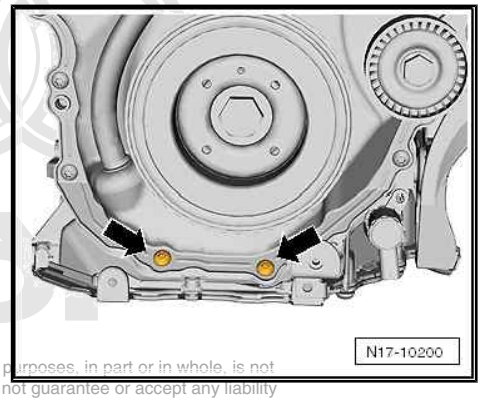
– Unplug electrical connector -1-.



Note

Disregard -item 2-.

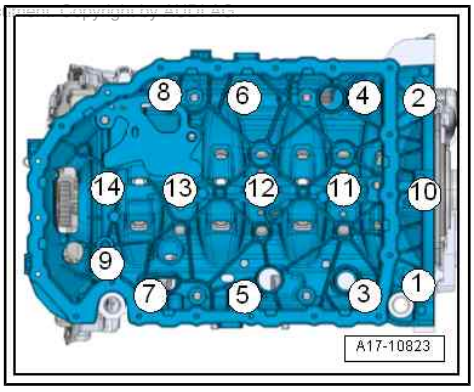
– Remove bolts -arrows-.



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– Remove bolts -1 to 14- and detach sump (top section).

– Lever off sump (top section) at gearbox end first. Take care timing chain cover is not bent when levering off.



Installing

Note

♦ *Note expiry date of silicone sealant.*

♦ *The sump (top section) must be installed within 5 minutes after applying the silicone sealant.*

♦ *Renew bolts tightened with specified tightening angle.*

♦ *Renew seals, gaskets and self-locking nuts.*

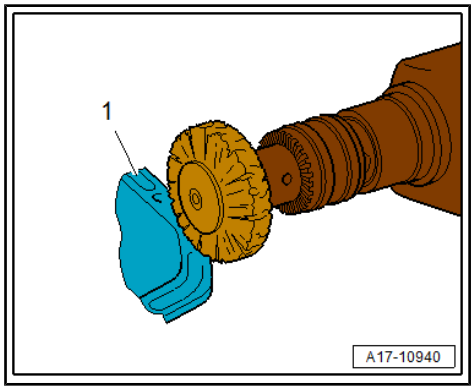
– Remove sealant remaining on cylinder block with flat scraper.

WARNING

Risk of eye injury.

♦ ***Put on safety goggles.***

– Remove sealant residue on sump (top section) using rotating plastic brush or similar.



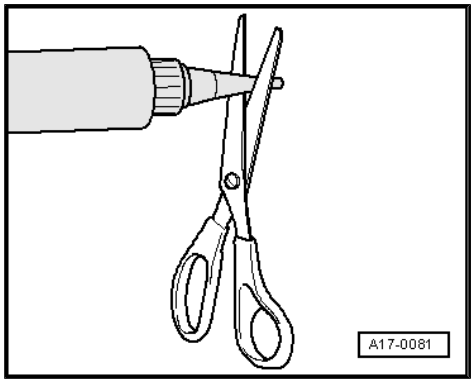
Note

Check whether timing chain cover is deformed. For this purpose, first fit sump (top section) without sealant and determine gap between cover and sump (top section). If the cover is deformed and cannot be straightened, renew cover after installing sump (top section).

– Sealing surfaces must be free of oil and grease.

– Check oil passages in sump (top section) and in crankcase for dirt.

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

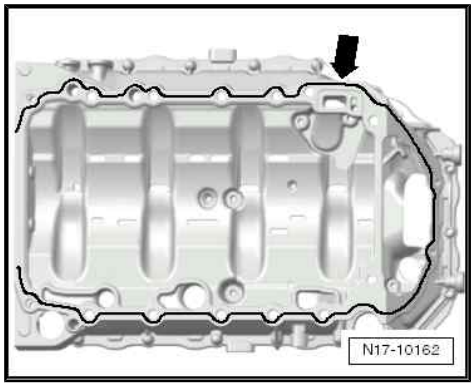


Note

Make sure lubrication system is not clogged by excess sealant. The bead of sealant must not be thicker than specified.

– Apply silicone sealant onto clean sealing surface of sump (top section) as illustrated -arrow-.

- Thickness of sealant bead: 2 ... 3 mm



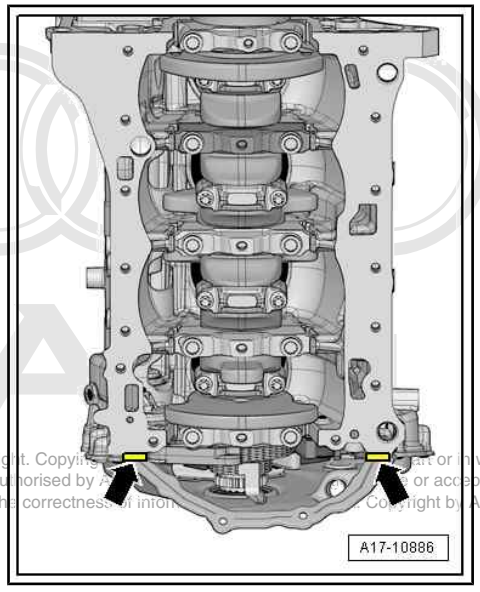
– Apply silicone sealant between cylinder block and timing chain cover (bottom), as illustrated -arrows-.

Note

- *The sump (top section) must be installed within 5 minutes after applying the silicone sealant.*
- *The bead of sealant must not be thicker than specified, otherwise excess sealant can enter the sump and obstruct the strainer in the oil intake pipe.*

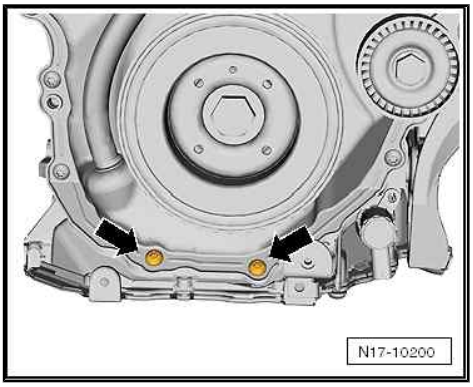
- Sump (top section) and crankcase must be flush at gearbox end.

– Immediately fit sump (top section) and tighten bolts, tightening torque ⇒ page 171 .



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– Fit bolts -arrows-. Tightening torques ⇒ Item 16 (page 90)
– Install sealing flange (gearbox end) ⇒ page 65 .
– Install oil pump ⇒ page 177 .
– Fit new baffle plate and secure in position.
– Install sump (bottom section) ⇒ page 171 .



Further assembly is basically carried out in reverse order of dismantling.

– Install washer fluid reservoir ⇒ Electrical system; Rep. gr. 92 ; Windscreen washer system; Exploded view - windscreen washer system .
– Fill with engine oil and check oil level ⇒ Maintenance ; Booklet 821 .

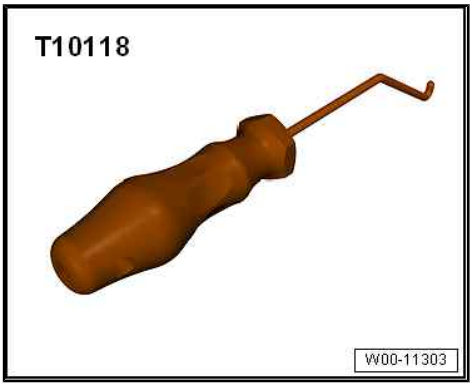
Tightening torques

♦ ⇒ “1.1 Exploded view - sump/oil pump”, page 168

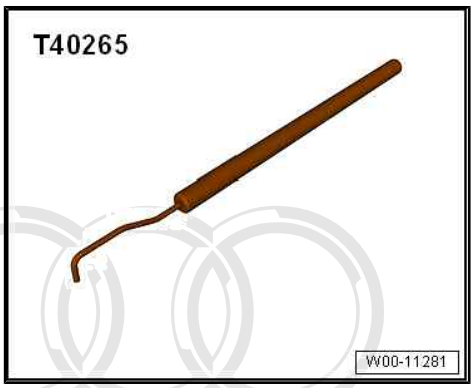
1.5 Removing and installing oil pump

Special tools and workshop equipment required

♦ Assembly tool - T10118-



♦ Locking tool - T40265-

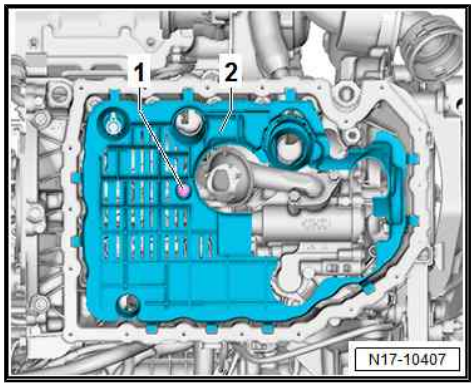


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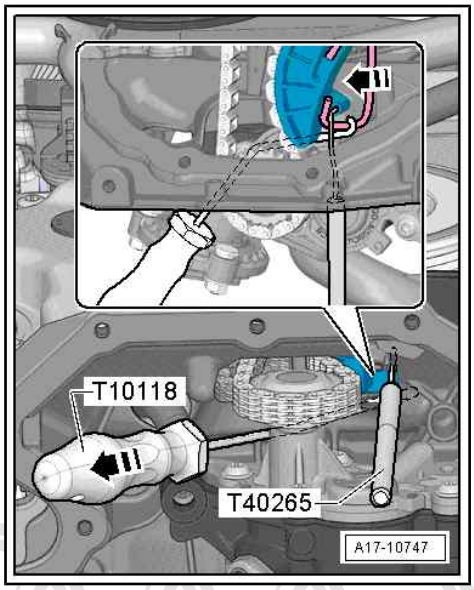
Removing

– Remove sump (bottom section) ⇒ page 171 .

– Remove bolt -arrow- and detach baffle plate.



– Using assembly tool - T10118- , pull spring of chain tensioner in direction of -arrow- and secure with locking tool - T40265- .



– Remove bolts -arrows- and detach oil pump.

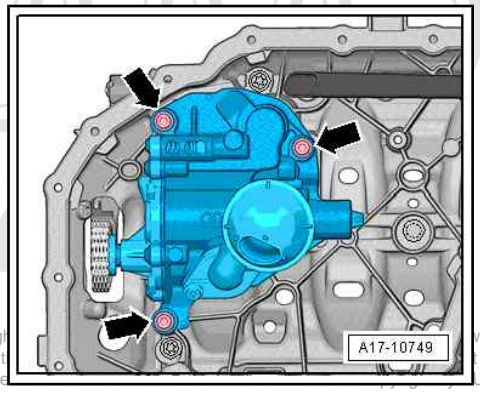
Installing

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

– Check that both centring sleeves are fitted in oil pump.

– Before installing oil pump, check strainer in oil intake pipe and oil passages in sump (top section) for dirt.

– Guide oil pump sprocket into drive chain and install oil pump.



Caution

Risk of irreparable damage to engine.

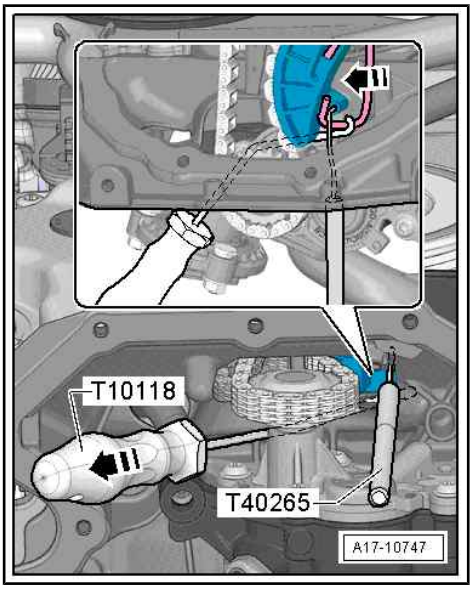
- *The following step must be performed to ensure that spring of chain tensioner returns to installation position:*

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– Using assembly tool - T10118- , pull spring of chain tensioner in direction of -arrow- and remove locking tool - T40265- .
– Fit O-ring ⇒ Item 9 (page 169) onto new baffle plate and lubricate with engine oil.
– Fit new baffle plate and secure in position.
– Install sump (bottom section) ⇒ page 171 .
– Fill with engine oil and check oil level ⇒ Maintenance ; Booklet 821 .

Tightening torques

◆ ⇒ “1.1 Exploded view - sump/oil pump”, page 168



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1.6 Removing and installing oil level and oil temperature sender - G266-

Removing

• Engine oil drained ⇒ Maintenance ; Booklet 821
– Unplug electrical connector -3-.
– Remove nuts -1- and detach oil level and oil temperature sender - G266- -item 4-.

Installing

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

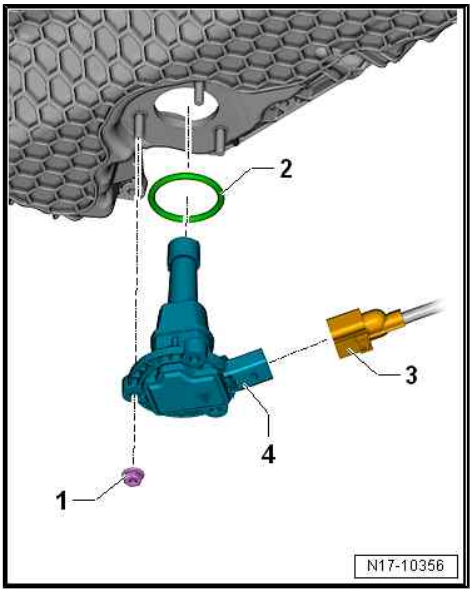
Note

Renew seal -2-.

– Fill with engine oil and check oil level ⇒ Maintenance ; Booklet 821 .

Tightening torques

◆ ⇒ “1.1 Exploded view - sump/oil pump”, page 168



2 Engine oil cooler

⇒ “2.1 Exploded view - engine oil cooler”, page 180

⇒ “2.2 Removing and installing engine oil cooler”, page 180

⇒ “2.3 Removing and installing mechanical switching valve”, page 182

2.1 Exploded view - engine oil cooler

1 - Bracket for ancillaries
- ❑ Removing and installing ⇒ page 60

2 - Gasket
- ❑ Renew after removing

3 - O-rings
- ❑ Renew after removing
- ❑ Lubricate lightly with engine oil

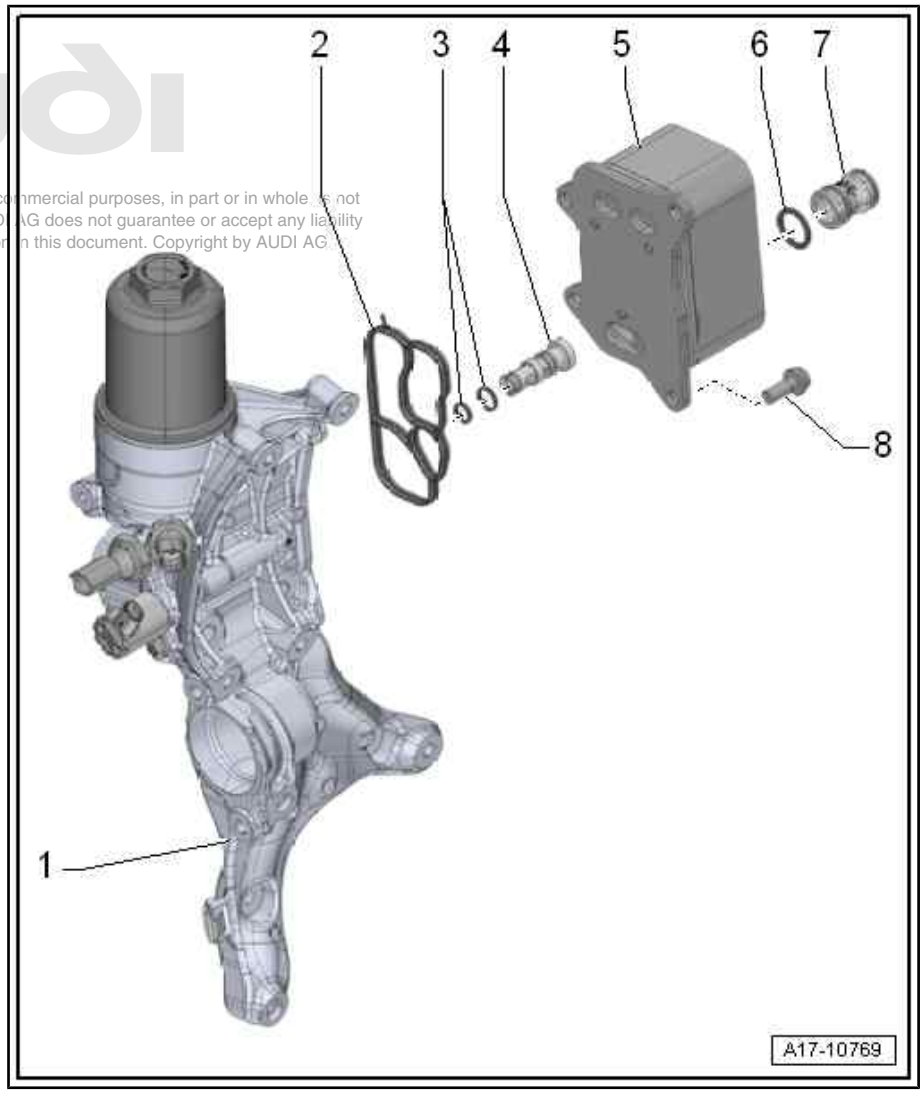
4 - Mechanical switching valve
- ❑ Renewing ⇒ page 182

5 - Engine oil cooler
- ❑ See note ⇒ page 168
- ❑ Removing and installing ⇒ page 180

6 - Seal
- ❑ Renew after removing
- ❑ Lubricate with coolant

7 - Connection

8 - Bolt
- ❑ Renew after removing
- ❑ 8 Nm +45°



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2.2 Removing and installing engine oil cooler

Special tools and workshop equipment required

♦ Drip tray for workshop hoist - VAS 6208-

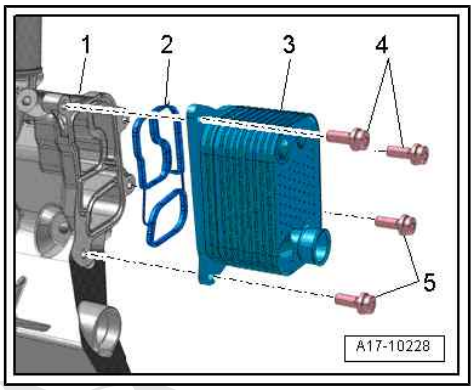


Removing

– Drain coolant ⇒ page 198 .

– Remove bracket for ancillaries ⇒ page 60 .

– Unscrew bolts -4 and 5- and remove engine oil cooler -3- together with seal -2-.



Installing

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

Note

♦ *Renew gaskets and seals.*

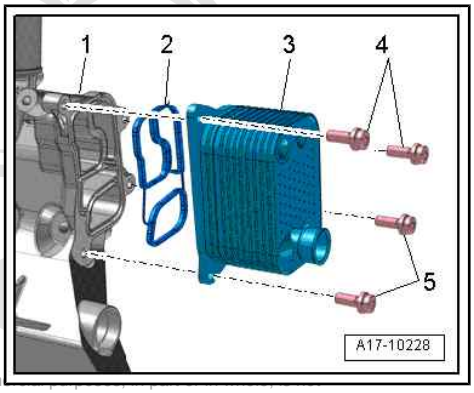
♦ *Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .*

– Install engine oil cooler -3- with new seal -2-.

– Install bracket for ancillaries ⇒ page 60 .

– Fill up with coolant ⇒ page 200 .

– Fill with engine oil and check oil level ⇒ Maintenance ; Booklet 821 .

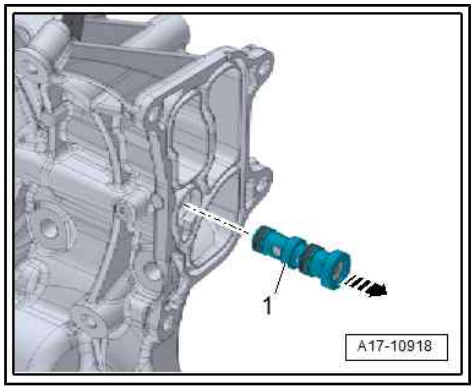


Tightening torques

♦ ⇒ “2.1 Exploded view - engine oil cooler”, page 180

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2.3 Removing and installing mechanical switching valve



Removing

– Remove engine oil cooler ⇒ page 180 .

– Take mechanical switching valve -1- out of bracket for ancillaries -arrow-.

Installing

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

Note

- *Renew gaskets and seals.*
- *Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .*

– Lightly lubricate O-rings of mechanical switching valve with engine oil and install.

– Install engine oil cooler ⇒ page 180 .

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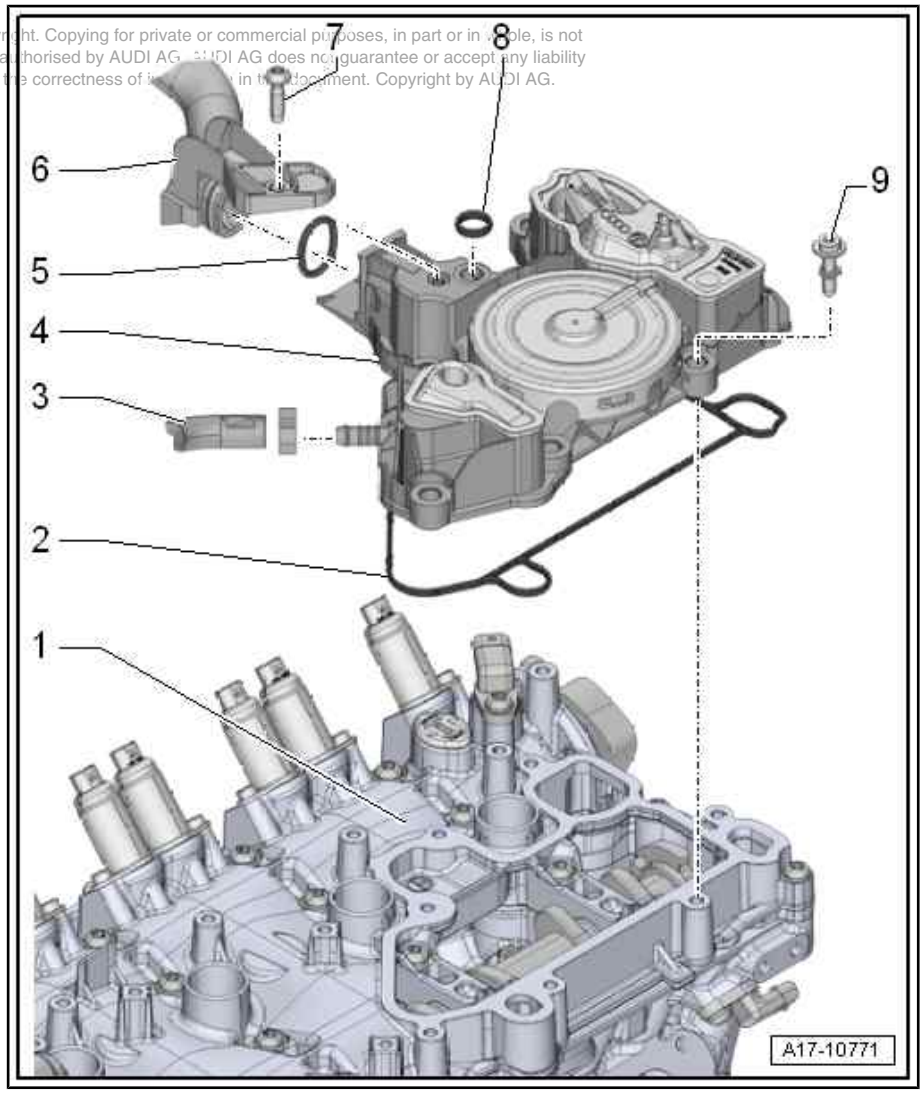
3 Crankcase breather

⇒ "3.1 Exploded view - crankcase breather system", page 183

⇒ "3.2 Removing and installing oil separator", page 184

3.1 Exploded view - crankcase breather system

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1 - Cylinder head cover

2 - Gasket

- ❑ Renew after removing

3 - Hose

- ❑ To activated charcoal filter solenoid valve 1 -N80-

4 - Oil separator

- ❑ Removing and installing ⇒ page 184

5 - Seal

- ❑ Renew after removing

6 - Hose

- ❑ For crankcase breather
- ❑ To turbocharger

7 - Bolt

- ❑ Thread-forming
- ❑ Fit and screw the bolt in by hand so that it screws itself into the old thread
- ❑ 4 Nm

8 - Seal

- ❑ Renew after removing

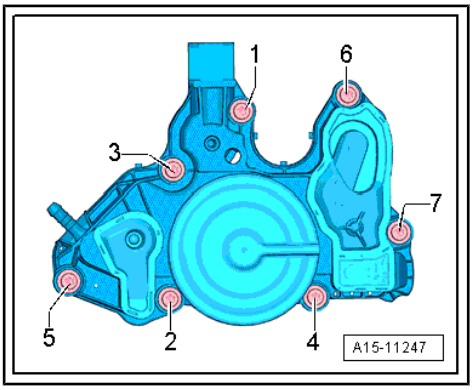
9 - Bolt

- ❑ Thread-forming
- ❑ Fit and screw the bolt in by hand so that it screws itself into the old thread
- ❑ Tightening torque and sequence ⇒ page 183

Tightening sequence - oil separator

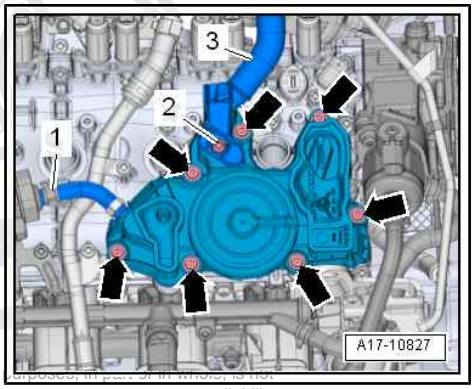
– Fit bolts in the sequence -1- to -7-.

Bolts/tightening sequence	Tightening torque
-1- to -7-	9 Nm



3.2 Removing and installing oil separator

Removing



– Release electrical connectors at ignition coils and unplug from ignition coils simultaneously.
– Remove bolts for ignition coils “3, 4” and pull out ignition coils.
– Release hose clip -1- and detach hose from activated charcoal filter solenoid valve 1 - N80- .
– Remove bolt -2- and detach crankcase breather hose -3- from oil separator.
– Remove bolts -arrows- and detach oil separator.

Installing

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

Note

- *Renew gasket and seals.*
- *Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .*

Tightening torques

- ⇒ “3.1 Exploded view - crankcase breather system”, page 183

4 Oil filter/oil pressure switches

⇒ “4.1 Exploded view - oil filter”, page 185

⇒ “4.2 Exploded view - oil pressure switches/oil pressure control”, page 186

⇒ “4.3 Removing and installing piston cooling jet control valve N522 ”, page 187

⇒ “4.4 Removing and installing valve for oil pressure control N428 ”, page 187

⇒ “4.5 Removing and installing oil pressure switch F22 ”, page 188

⇒ “4.6 Removing and installing oil pressure switch for reduced oil pressure F378 ”, page 189

⇒ “4.7 Removing and installing stage 3 oil pressure switch F447 ”, page 190

⇒ “4.8 Checking oil pressure”, page 192

4.1 Exploded view - oil filter

1 - Bracket for ancillaries
- ❑ Removing and installing ⇒ page 60

2 - Seal
- ❑ Renew after removing

3 - Oil filter
- ❑ Removing and installing ⇒ Maintenance ; Booklet 821

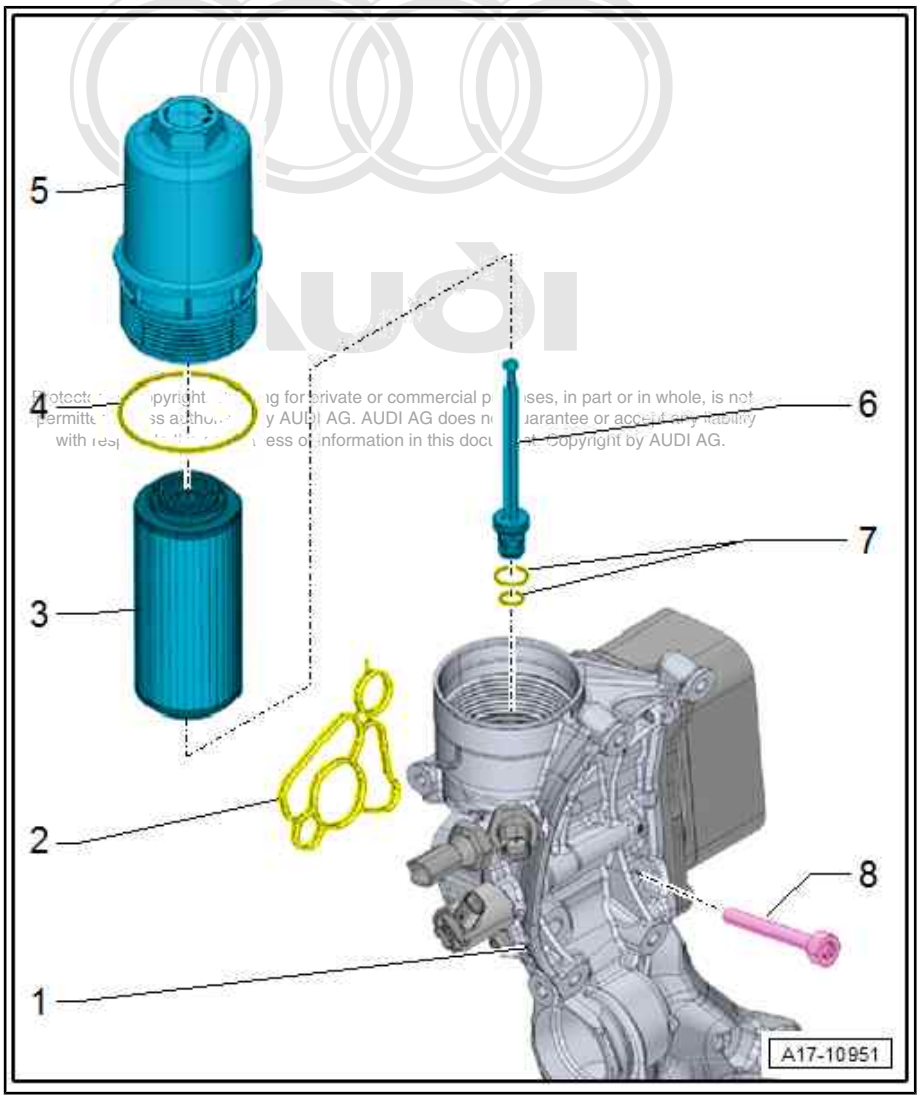
4 - O-ring
- ❑ Renew after removing
- ❑ Lubricate lightly with engine oil

5 - Oil filter housing
- ❑ 25 Nm

6 - Oil drain connection

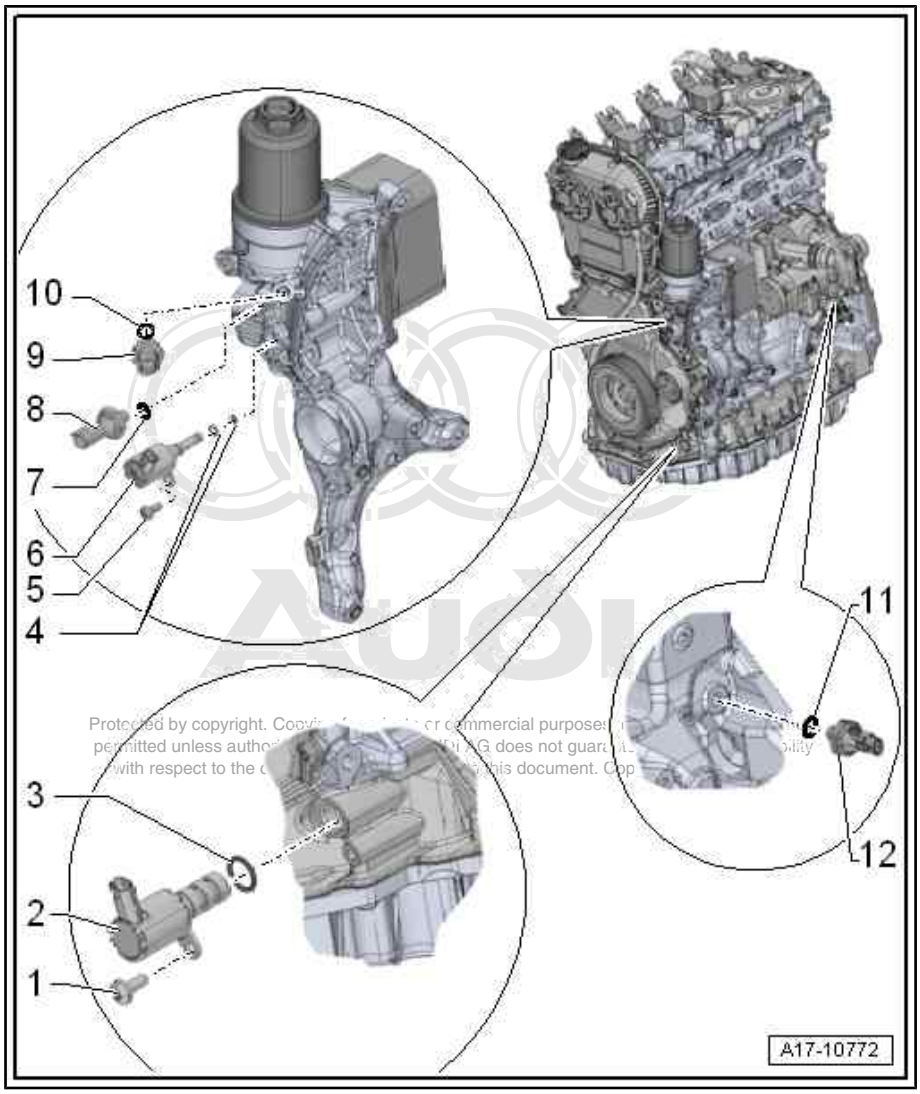
7 - O-rings
- ❑ Not available as replacement part, supplied together with ⇒ Item 6 (page 185)

8 - Bolt
- ❑ Tightening torque and sequence ⇒ page 52



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4.2 Exploded view - oil pressure switches/oil pressure control



1 - Bolt
- ❑ Renew after removing
- ❑ 4 Nm +90°

2 - Valve for oil pressure control - N428-
- ❑ Removing and installing ⇒ page 187

3 - O-ring
- ❑ Renew after removing
- ❑ Lubricate lightly with engine oil

4 - O-rings
- ❑ Renew after removing
- ❑ Lubricate lightly with engine oil

5 - Bolt
- ❑ Renew after removing
- ❑ 4 Nm +45°

6 - Piston cooling jet control valve - N522-
- ❑ Removing and installing ⇒ page 187

7 - Seal
- ❑ Renew after removing

8 - Oil pressure switch - F22-
- ❑ Blue or grey insulation
- ❑ Checking ⇒ Vehicle diagnostic tester
- ❑ Removing and installing ⇒ page 188
- ❑ 20 Nm

9 - Oil pressure switch for reduced oil pressure - F378-
- ❑ Brown insulation
- ❑ Checking ⇒ Vehicle diagnostic tester
- ❑ Removing and installing ⇒ page 189
- ❑ 20 Nm

10 - Seal
- ❑ Renew after removing

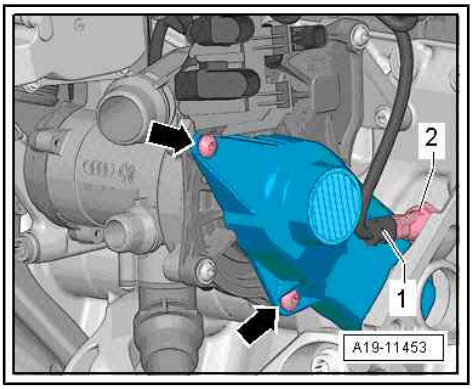
11 - Seal
- ❑ Renew after removing

12 - Stage 3 oil pressure switch - F447-
- ❑ Checking ⇒ Vehicle diagnostic tester
- ❑ Removing and installing ⇒ page 190
- ❑ Installation position ⇒ page 187
- ❑ 20 Nm

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Installation position stage 3 oil pressure switch - F447-

2 - Stage 3 oil pressure switch - F447-



4.3 Removing and installing piston cooling jet control valve - N522-

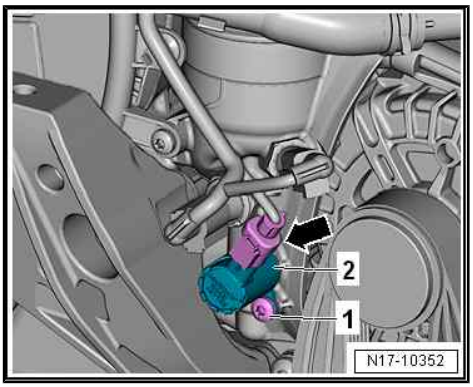
Removing

Note

Place a cloth under bracket for ancillaries to catch escaping engine oil.

– Unplug electrical connector -arrow- at piston cooling jet control valve - N522- .

– Unscrew bolt -1- and remove piston cooling jet control valve - N522- -2-.



Installing

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

Note

- *Renew O-rings.*
- *Fit the new piston cooling jet control valve - N522- into the connection immediately to avoid loss of oil.*

– Check oil level ⇒ Maintenance ; Booklet 821 .

Tightening torques

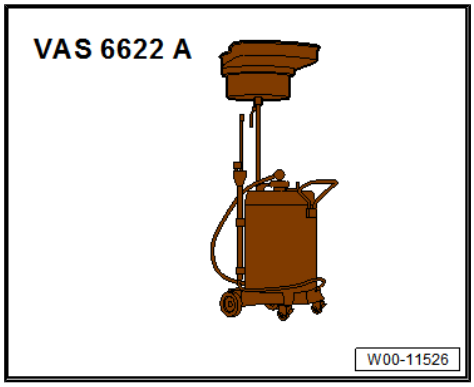
- ⇒ “4.2 Exploded view - oil pressure switches/oil pressure control”, page 186

4.4 Removing and installing valve for oil pressure control - N428-

Special tools and workshop equipment required

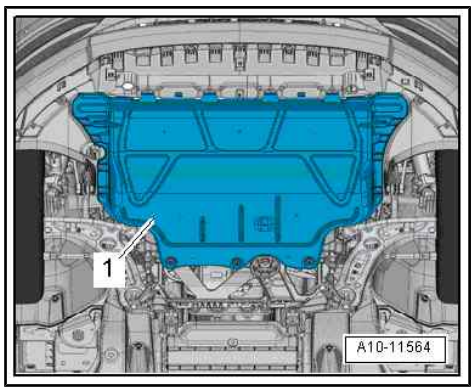
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- Used oil collection and extraction unit - VAS 6622A-



Removing

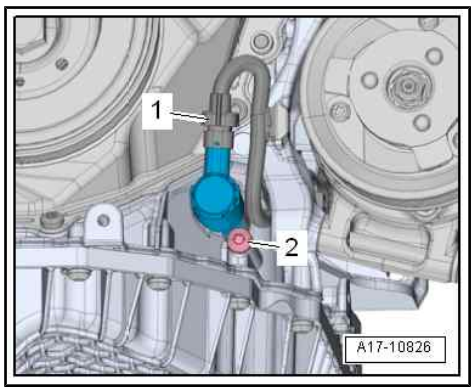
– Remove noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .



– Position used oil collection and extraction unit - VAS 6622A- below engine.

– Unplug electrical connector -1-.

– Unscrew bolt -2- and remove valve for oil pressure control - N428- .



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Installing

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

Note

Renew O-ring.

Tightening torques

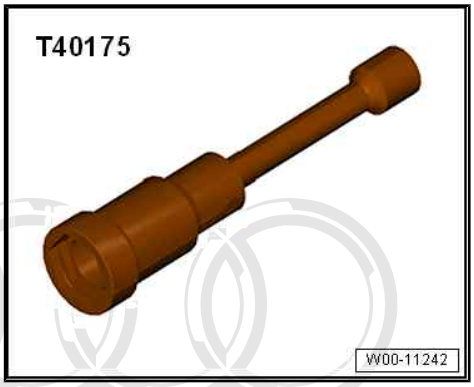
- ⇒ “4.2 Exploded view - oil pressure switches/oil pressure control”, page 186
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

4.5 Removing and installing oil pressure switch - F22-

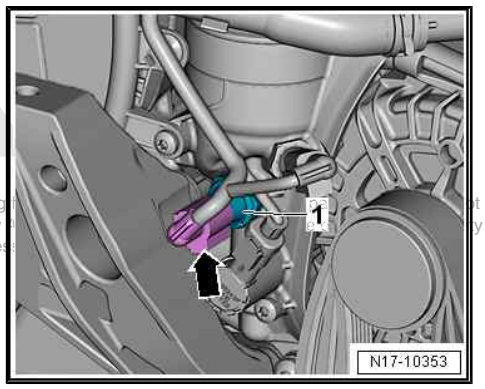
Removing

Special tools and workshop equipment required

♦ Articulated wrench, 24 mm - T40175-



Removing



Note

♦ *Place a cloth under bracket for ancillaries to catch escaping engine oil.*

♦ *Always renew seal after unscrewing oil pressure switch.*

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– Unplug electrical connector -arrow- on oil pressure switch - F22- .

– Remove oil pressure switch - F22- -1-.

Installing

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

Note

Screw oil pressure switch - F22- into hole immediately to avoid loss of oil.

– Check oil level ⇒ Maintenance ; Booklet ; Engine oil: draining; Renewing oil filter and filling up engine oil .

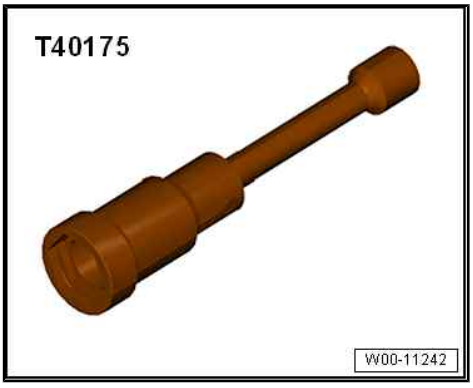
Tightening torques

♦ ⇒ “4.2 Exploded view - oil pressure switches/oil pressure control”, page 186

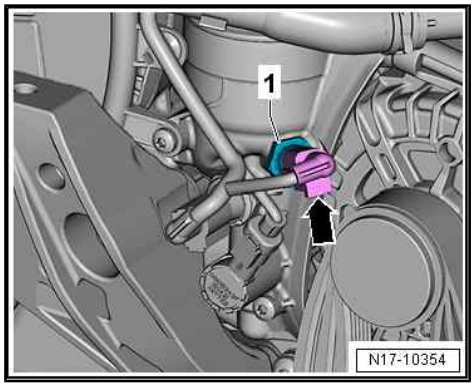
4.6 Removing and installing oil pressure switch for reduced oil pressure - F378-

Special tools and workshop equipment required

♦ Articulated wrench, 24 mm - T40175-



Removing



Note

- *Place a cloth under bracket for ancillaries to catch escaping engine oil.*
- *Always renew seal after unscrewing oil pressure switch.*

– Unplug electrical connector -arrow- at oil pressure switch for reduced oil pressure - F378- .

– Unscrew oil pressure switch for reduced oil pressure -1-.

Installing

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

Note

Screw oil pressure switch for reduced oil pressure - F378- immediately into hole to avoid loss of oil.

– Check oil level ⇒ Maintenance ; Booklet ; Engine oil: draining; Renewing oil filter and filling up engine oil .

Tightening torques

- ⇒ “4.2 Exploded view - oil pressure switches/oil pressure control”, page 186

4.7 Removing and installing stage 3 oil pressure switch - F447-

Special tools and workshop equipment required

- Articulated wrench, 24 mm - T40175-



Note

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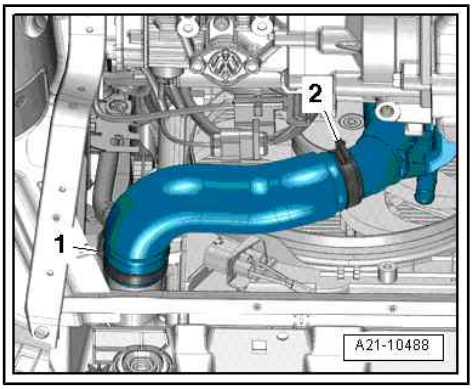
Always renew seal after unscrewing oil pressure switch.

Removing

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

– Remove air cleaner housing ⇒ page 264 .

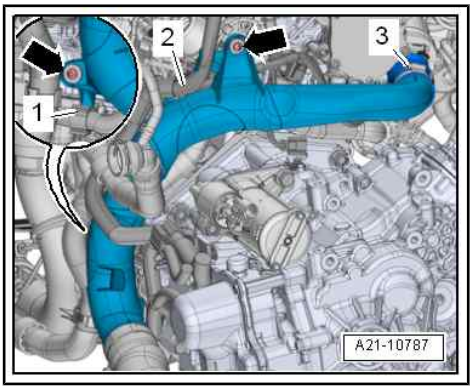
– Release hose clip -1- and detach air hose from charge air cooler.



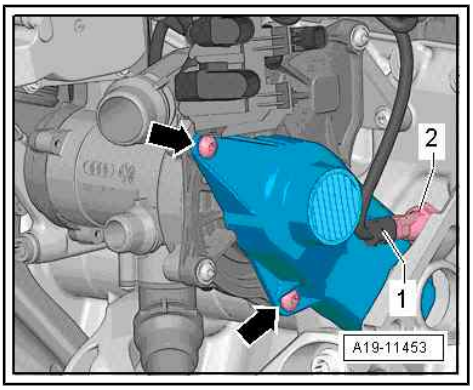
Note

Disregard -item 2-.

– Move electrical wiring harnesses -1- and -2- clear at air pipe.
– Unfasten screw-type clip -3-.
– Remove bolts -arrows-.
– Release hose clip and remove charge air hose with air pipe downwards.



– Unplug electrical connector -1- on stage 3 oil pressure switch - F447- .
– Remove bolts -arrows- and detach toothed belt cover.



Note

Place a cloth underneath to catch escaping engine oil.

– Use articulated wrench, 24 mm - F447- to unscrew stage 3 oil pressure switch - T40175- -item 2-.

Installing

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

Note

- *Renew seal.*
- *Screw stage 3 oil pressure switch - F447- into hole immediately to avoid loss of oil.*

– Check oil level ⇒ Maintenance ; Booklet ; Engine oil: draining; Renewing oil filter and filling up engine oil .

Tightening torques

- ⇒ “4.2 Exploded view - oil pressure switches/oil pressure control”, page 186
- ⇒ “3.1 Exploded view - air cleaner housing”, page 263
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

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4.8 Checking oil pressure

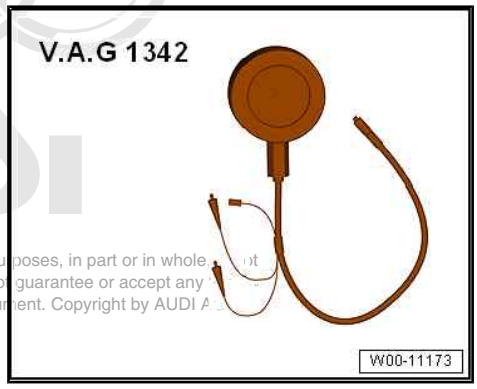
⇒ “4.8.1 Checking engine oil pressure”, page 192

⇒ “4.8.2 Checking oil pressure for piston cavity oil jets”, page 194

4.8.1 Checking engine oil pressure

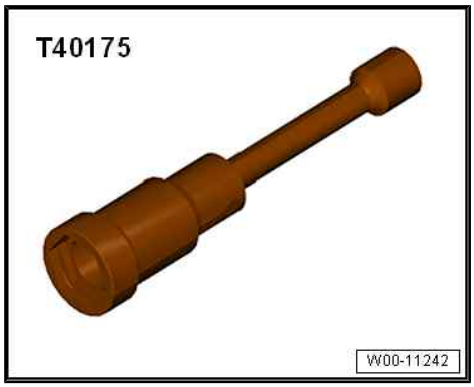
Special tools and workshop equipment required

- Oil pressure tester - V.A.G 1342-



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- Articulated wrench, 24 mm - T40175-



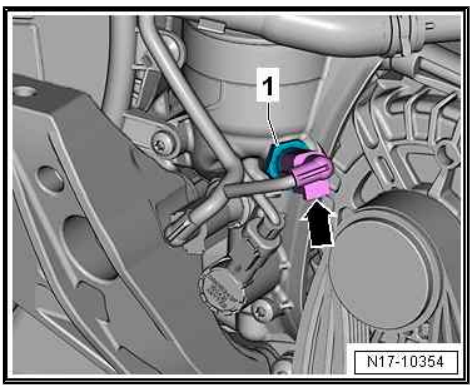
Test requirements

- Oil level OK
- Engine oil temperature at least 80°C (radiator fan must have run once).

Note

- *The oil pump is regulated and has two pressure stages. The pressure stages are tested one after the other.*
- *During the running-in period or when the engine is in emergency running mode, the oil pump only operates in the higher pressure stage.*
- *The oil pressure is dependent on the engine oil temperature. The mean value should be reached at an engine oil temperature of around 80 °C.*
- *After new parts have been installed (engine/short engine, cylinder head or turbocharger), the oil pressure must be regulated to the higher pressure stage for approx. 1000 km. This compensates for the higher friction when running in new parts, and ensures the best means of removing particles of residue worn off during the running-in process. Connect vehicle diagnostic tester, switch on ignition and select following menu options:*
- `01 - Engine electronics`
- `Guided Functions`
- `Activate oil pressure control/running-in function`

Test sequence



– Unplug electrical connector -arrow- at oil pressure switch for reduced oil pressure - F378- .
– Place a cloth under bracket for ancillaries to catch escaping engine oil.
– Unscrew oil pressure switch for reduced oil pressure -1-.
– Screw oil pressure tester - V.A.G 1342- into oil filter bracket in place of oil pressure switch.
– Screw oil pressure switch for reduced oil pressure - F378- into oil pressure tester and plug in electrical connector.
– Connect oil pressure tester to earth.
– Start engine and check oil pressure at specified engine speeds.

• Oil pressure at idling speed: 0.85 ... 1.6 bar
• Oil pressure at 2000 rpm: 1.2 ... 1.6 bar
• Oil pressure at 3700 rpm: 1.2 ... 1.6 bar

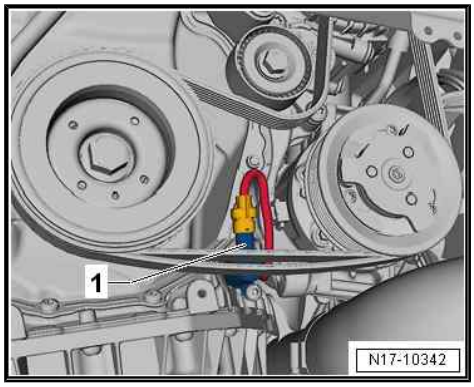
– Switch off engine.
– Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .

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– Unplug connector -1- from valve for oil pressure control - N428- . Unfasten wire and route downwards so that it does not come into contact with belt drive. When connector is unplugged, oil pump operates in the higher pressure stage.

– Start engine and check oil pressure at specified engine speeds.

- Oil pressure at idling speed: 0.85 ... 4.0 bar
- Oil pressure at 2000 rpm: 2.0 ... 4.0 bar
- Oil pressure at 3700 rpm: 3.0 ... 4.0 bar



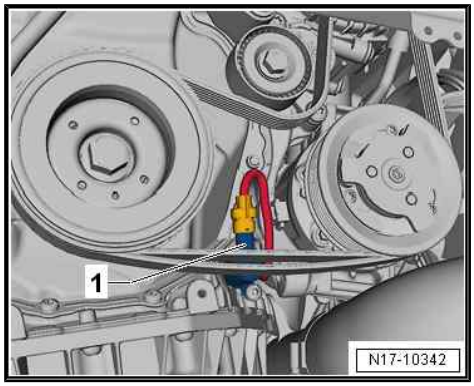
Assembling

– Install oil pressure switch.

– Plug in connector -1- at valve for oil pressure control - N428- . Route wire carefully.

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

– Interrogate event memory of engine control unit and erase all entries.



Tightening torques

♦ ⇒ “4.2 Exploded view - oil pressure switches/oil pressure control”, page 186

4.8.2 Checking oil pressure for piston cavity oil jets

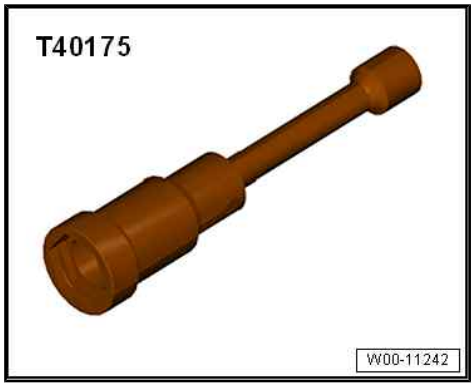
Special tools and workshop equipment required

♦ Oil pressure tester - V.A.G 1342-

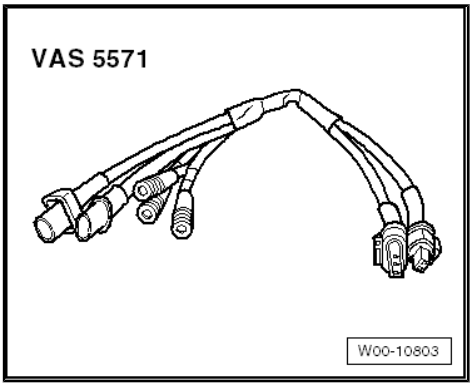


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♦ Articulated wrench, 24 mm - T40175-



◆ Test instrument adapter - VAS 5571-



Test requirements

- Oil level OK
- Engine oil temperature at least 80°C (radiator fan must have run once).

Test sequence

– Remove stage 3 oil pressure switch - F447- ⇒ page 190 .

– Screw stage 3 oil pressure switch - F447- into oil pressure tester - V.A.G 1342- .

– Screw in oil pressure tester - V.A.G 1342- in place of oil pressure switch.

– Connect test instrument adapter/DSO (2-pin) - VAS 5571- to oil pressure switch.

– Plug electrical connector for stage 3 oil pressure switch - F447- into test instrument adapter/DSO (2-pin) - VAS 5571- .

– Check oil pressure: `Stage 3 oil pressure switch F447` in Guided Fault Finding mode of ⇒ Vehicle diagnostic tester.

Assembling

– Install oil pressure switch.

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Tightening torques

◆ ⇒ “4.2 Exploded view - oil pressure switches/oil pressure control”, page 186

19 – Cooling

1 Cooling system/coolant

⇒ “1.1 Connection diagram - coolant hoses”, page 196

⇒ “1.2 Checking cooling system for leaks”, page 197

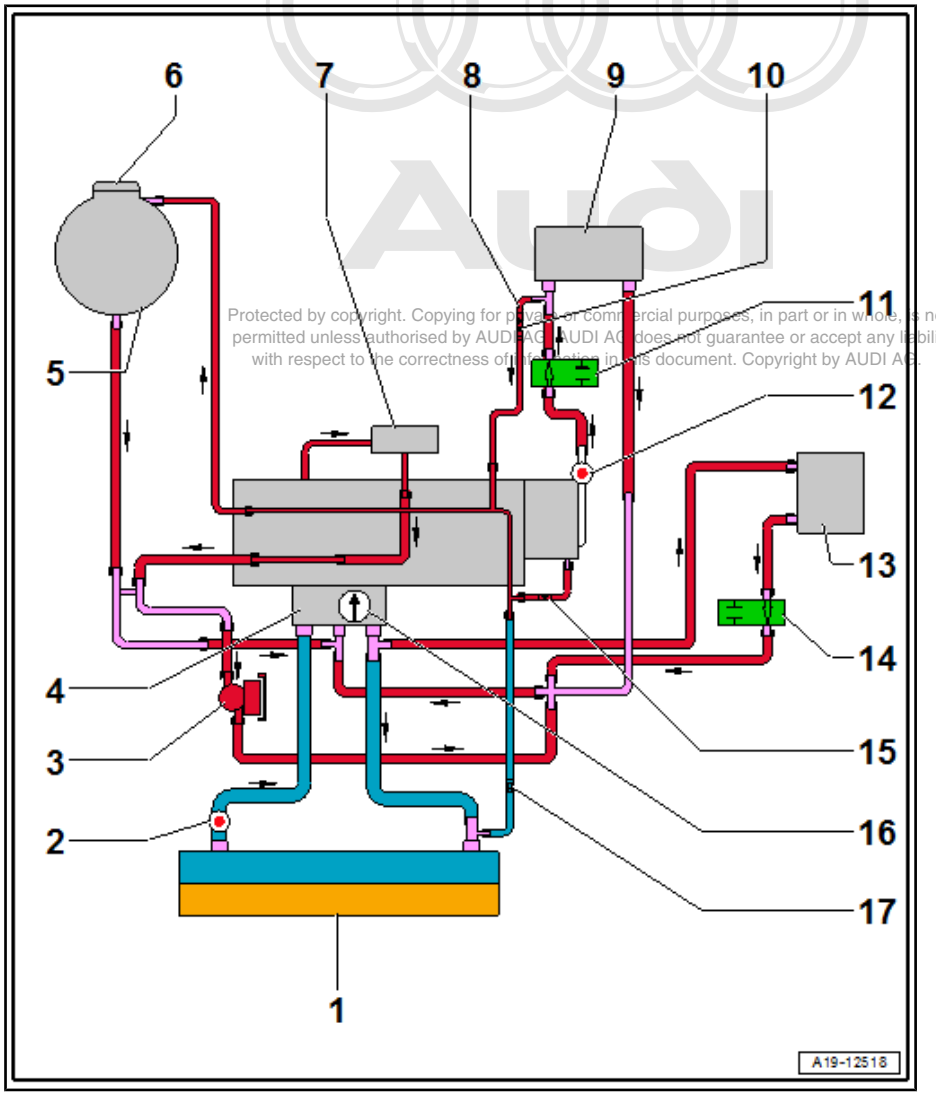
⇒ “1.3 Draining and filling cooling system”, page 198

1.1 Connection diagram - coolant hoses

Note

- *Red = Small coolant circuit.*
- *Blue = Large coolant circuit.*
- *Arrows show direction of coolant flow.*

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1 - Radiator

- ❑ If renewed, refill system with fresh coolant

2 - Radiator outlet coolant temperature sender - G83-

3 - Continued coolant circulation pump - V51-

4 - Actuator for engine temperature regulation - N493-

5 - Coolant expansion tank

6 - Filler cap for expansion tank

- ❑ Checking pressure relief valve ⇒ page 198

7 - Turbocharger

8 - Restrictor

9 - Heat exchanger for heater

- ❑ If renewed, refill system with fresh coolant

10 - Non-return valve

11 - Coolant shut-off valve - N82-

12 - Coolant temperature sender - G62-

13 - Auxiliary radiator

- ❑ For gear oil coolant circuit

14 - Coolant valve for gearbox - N488-

15 - Restrictor

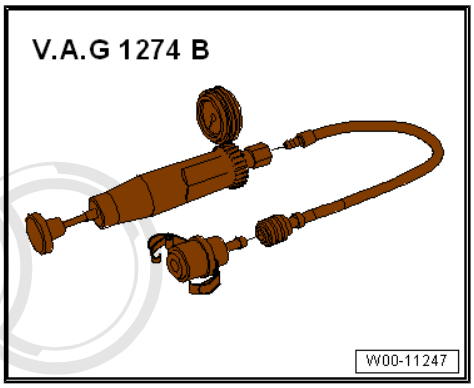
16 - Coolant pump

17 - Non-return valve

1.2 Checking cooling system for leaks

Special tools and workshop equipment required

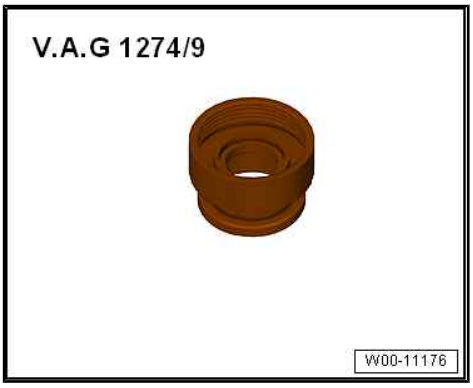
- Cooling system tester - V.A.G 1274 B-



- Adapter for cooling system tester - V.A.G 1274/8-



- Adapter for cooling system tester - V.A.G 1274/9-



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Procedure

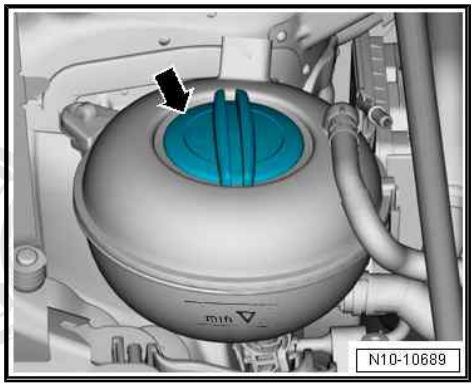
- Engine must be warm.

WARNING

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

Danger of scalding skin and other parts of the body.

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



– Open filler cap -arrow- on coolant expansion tank.

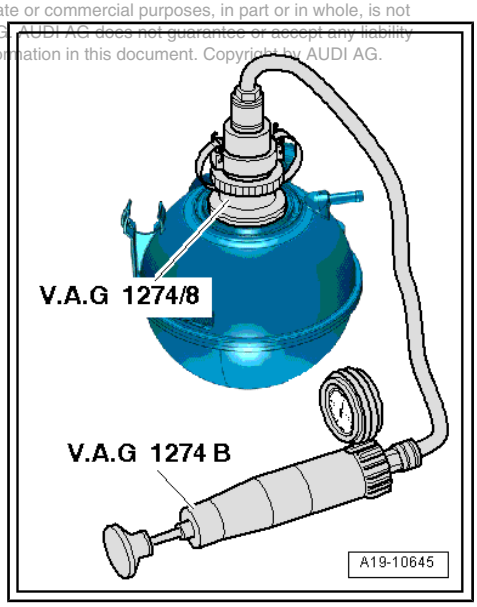
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– Fit cooling system tester - V.A.G 1274 B- with adapter -V.A.G 1274/8- onto coolant expansion tank.

– 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.

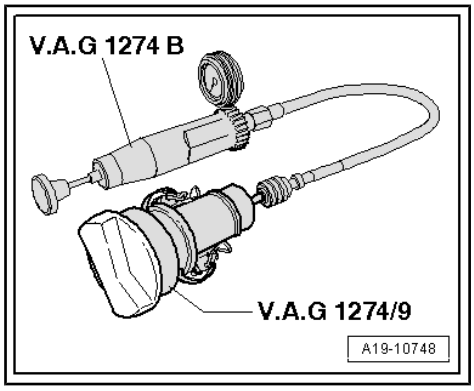
– Build up pressure with hand pump on cooling system tester.

Blue filler cap

- The pressure relief valve should open at a pressure of 1.4 ... 1.6 bar.

Black filler cap

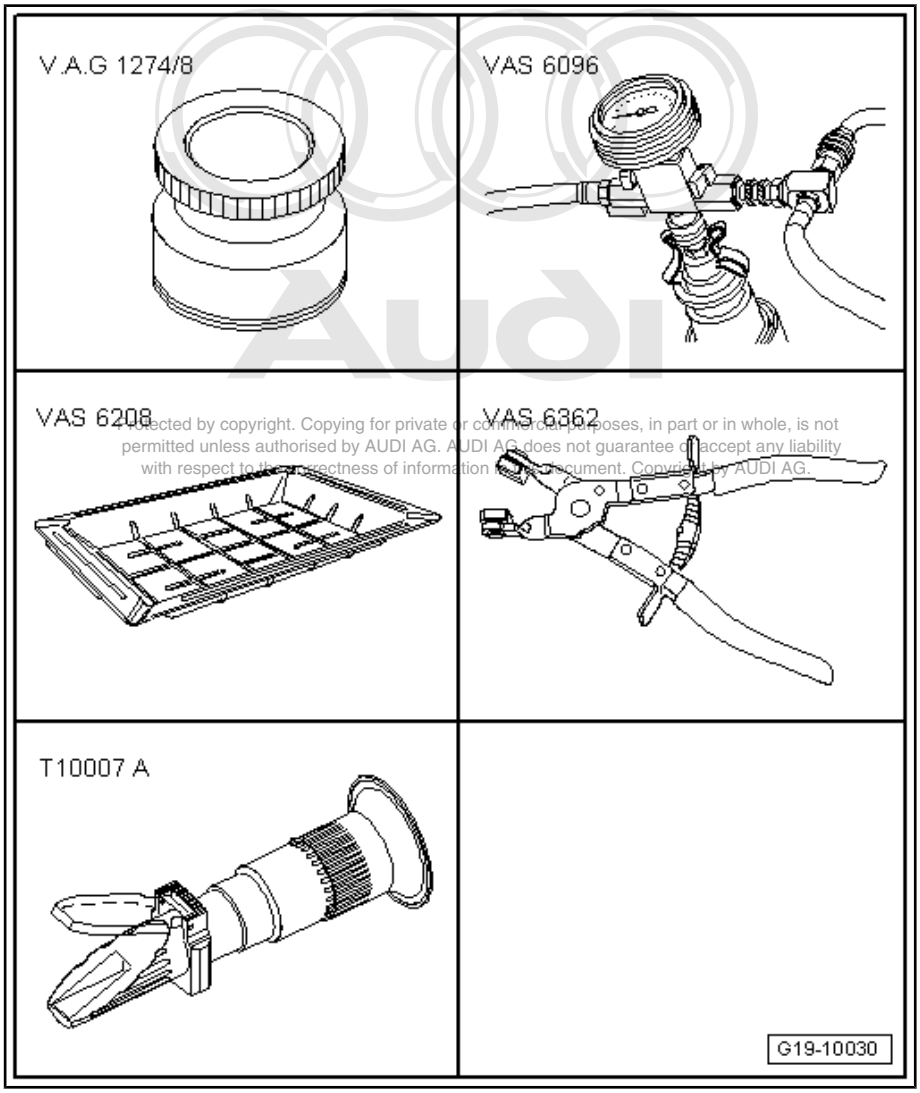
- The pressure relief valve should open at a pressure of 1.6 ... 1.8 bar.



1.3 Draining and filling cooling system

Special tools and workshop equipment required

- Adapter for cooling system tester - V.A.G 1274/8-
- Hose clip pliers - V.A.G 1921-
- Cooling system charge unit - VAS 6096-
- Drip tray for workshop hoist - VAS 6208-
- Refractometer - T10007 A-



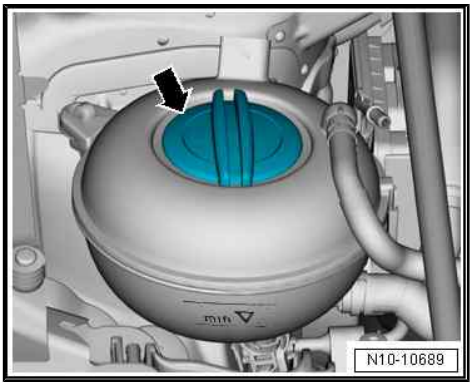
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Draining

WARNING

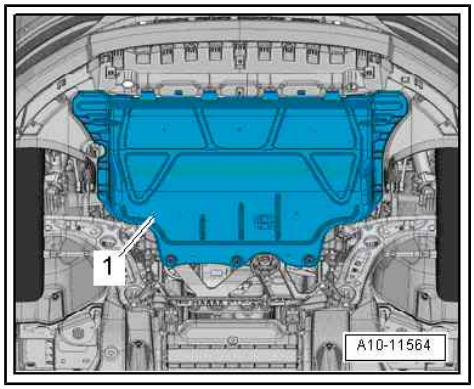
Hot steam/hot coolant can escape - risk of scalding.

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

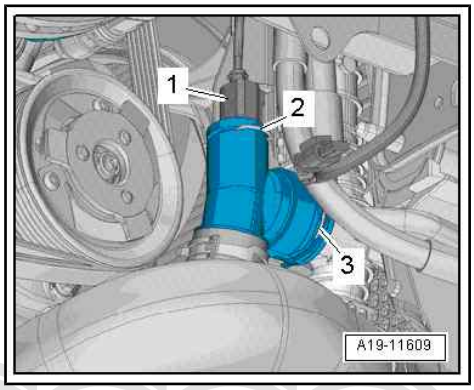


– Open filler cap -arrow- on coolant expansion tank.

– Remove noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .



– Place drip tray for workshop hoist - VAS 6208- underneath.
– Lift retaining clip -3-, disconnect coolant hose (bottom right) from radiator and drain off coolant.



Note

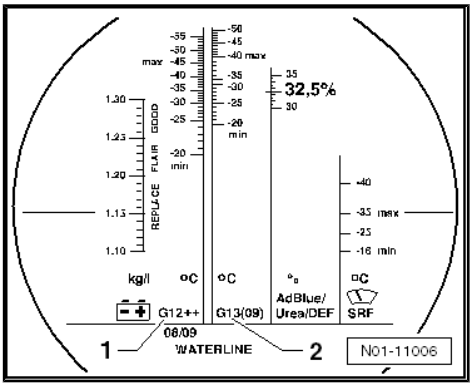
Disregard items -1 and 2-.

Filling

Caution

To ensure optimal corrosion protection, only distilled water may be mixed with coolant additives.

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Note

- *The effectiveness of the coolant is greatly influenced by the quality of the water with which it is mixed. Because water may contain different substances depending on the country or even the region, the water quality to be used for cooling systems has been specified. Distilled water meets all the requirements and is therefore recommended for use when topping up or filling up with coolant.*
- *Use only coolant additives listed in the ⇒ Electronic parts catalogue (ETKA) . If you use other coolant additives, this can significantly impair in particular the corrosion protection effect. The resulting damage could lead to loss of coolant and consequently to serious engine damage.*
- *Coolant with the recommended mixture ratio prevents frost and corrosion damage and stops scaling. At the same time it raises the boiling point of the fluid in the system. For this reason the cooling system must be filled all year round with the correct coolant additive.*
- *Because of its high boiling point, the coolant improves engine reliability under heavy loads, particularly in countries with tropical climates.*
- *The refractometer - T10007A- MUST be used to determine the current level of frost protection.*
- *The mixture must guarantee frost protection down to at least -25 °C (in countries with arctic climate: down to -36 °C). The amount of antifreeze should only be increased if greater frost protection is required in very cold climates. This must only be down to -48 °C, however, as otherwise the cooling efficiency of the coolant is impaired.*
- *The coolant concentration must not be reduced by adding water even in warmer seasons and in warmer countries. Frost protection must be provided to at least -25 °C.*
- *Read off the level of frost protection on the scale for the relevant coolant additive.*
- *The temperature indicated on the refractometer - T10007A- corresponds to the temperature at which the first ice crystals can form in the coolant.*
- *Do not reuse coolant.*
- *Only use water/coolant additive as a lubricant for coolant hoses.*

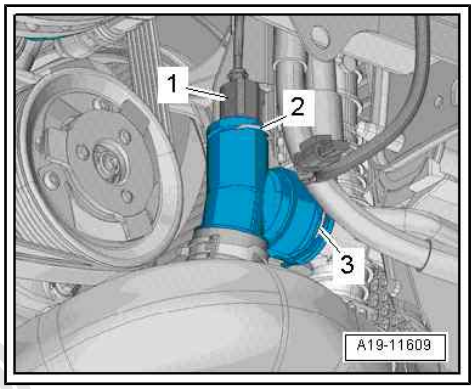
Recommended mixture ratio for coolant

- Coolant (40 %) and distilled water (60 %) for frost protection to -25 °C
- Coolant (50 %) and distilled water (50 %) for frost protection to -36 °C
- Coolant ⇒ Electronic parts catalogue (ETKA)

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Procedure

– Connect coolant hose with plug-in connector -3- to radiator at bottom right ⇒ page 231 .

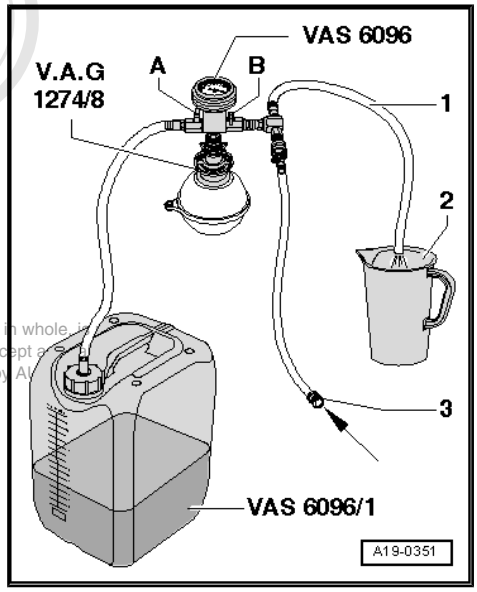


– Fill reservoir of cooling system charge unit - VAS 6096- with 10 litres of premixed coolant (according to recommended ratio). For recommended ratio, refer to ⇒ page 201 .

– Fit adapter for cooling system tester - V.A.G 1274/8- onto coolant expansion tank.

– Fit cooling system charge unit - VAS 6096- onto adapter for cooling system tester - V.A.G 1274/8- .

– Run vent hose -1- into a small container -2-.



Note

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The vented air draws along a small amount of coolant, which must be collected.

– Close both valves -A- and -B- (turn lever at right angles to direction of flow).

– Connect hose -3- to compressed air.

• Pressure: 7 ... 10 bar.

– Open valves in coolant circuit; select `01 - Coolant circuit bleeding routine` in `Guided Functions` ⇒ vehicle diagnostic tester .

– Open valve -B- by setting lever in direction of flow.

• The suction jet pump generates a partial vacuum in the cooling system; the needle on the gauge should move into the green zone.

– Also briefly open valve -A- (turn lever in direction of flow) so that hose on reservoir of cooling system charge unit - VAS 6096- can fill with coolant.

– Close valve -A- again.

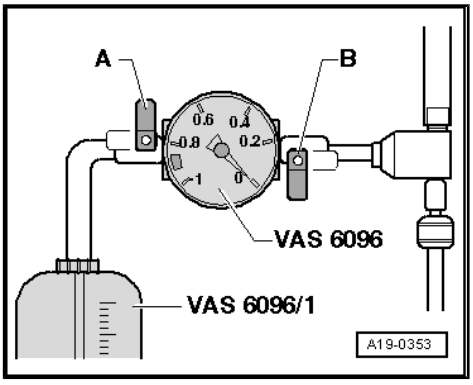
– Leave valve -B- open for another 2 minutes.

• The suction jet pump continues to generate a partial vacuum in the cooling system; the needle on the gauge should remain in the green zone.

– Close valve -B-.

• The needle on the gauge should stop in the green zone. The vacuum level in the cooling system is then sufficient for subsequent filling.

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Note

♦ *If the needle does not reach the green zone, repeat the process.*

♦ *Check cooling system for leaks if the vacuum is not maintained.*

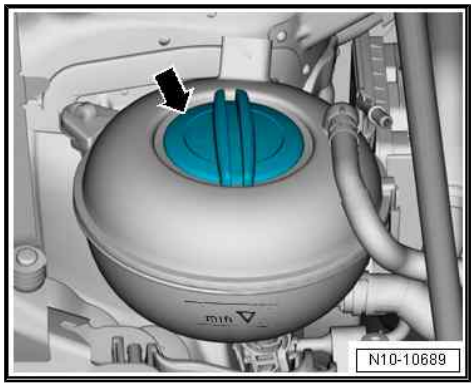
– Detach compressed air hose.

– Open valve -A-.

• The vacuum in the cooling system causes the coolant to be drawn out of the reservoir of the cooling system charge unit - VAS 6096- ; the cooling system is then filled.

– Detach cooling system charge unit - VAS 6096- from coolant expansion tank.

– Top up coolant to “max” mark.



Note

Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.

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

– On vehicles with auxiliary heater, switch heater on (for about 30 seconds) and then off again.

– Set temperature to “HI”.

– Switch off air conditioner compressor (press AC button).

• LED in button should not light up.

– Start engine and run for 2 minutes (maximum) at approx. 1500 rpm.

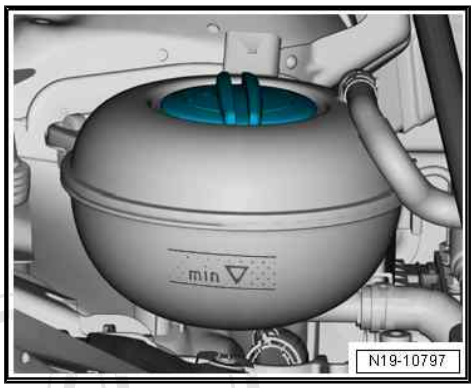
– Top up coolant to overflow hole on expansion tank with engine running.

– Close filler cap on coolant expansion tank (make sure it engages).

– Allow engine to run at idling speed until both large coolant hoses at radiator become warm.

– Switch off ignition and allow engine to cool down.

– Check coolant level.



• The coolant level must be between the “min” and “max” markings when the engine is cold.

• The coolant level can be at the “max” marking when the engine is warm.

– Top up with coolant again if necessary.

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2 Coolant pump/thermostat assembly

⇒ “2.1 Exploded view - coolant pump/thermostat”, page 205

⇒ “2.2 Exploded view - continued coolant circulation pump V51 ”, page 207

⇒ “2.3 Exploded view - coolant valves”, page 209

⇒ “2.4 Exploded view - coolant temperature senders”, page 210

⇒ “2.5 Removing and installing continued coolant circulation pump V51 ”, page 210

⇒ “2.6 Removing and installing coolant pump”, page 213

⇒ “2.7 Removing and installing toothed belt for coolant pump”, page 216

⇒ “2.8 Removing and installing thermostat housing”, page 218

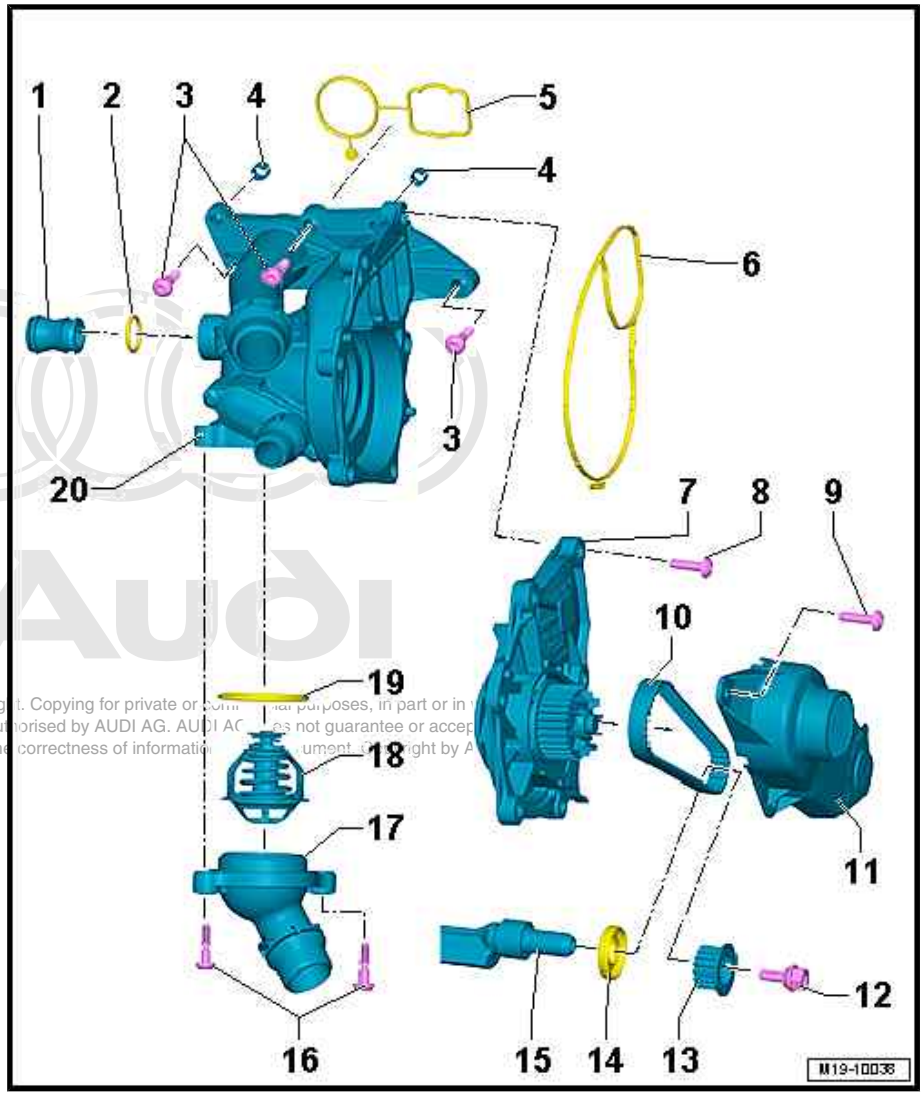
⇒ “2.9 Removing and installing coolant temperature sender G62 ”, page 220

⇒ “2.10 Removing and installing radiator outlet coolant temperature sender G83 ”, page 221

⇒ “2.11 Removing and installing coolant valves”, page 222

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2.1 Exploded view - coolant pump/thermostat



1 - Connection

2 - O-ring

- ❑ Renew after removing
- ❑ Lubricate with coolant

3 - Bolt

- ❑ Tightening torque and sequence ⇒ page 207

4 - Centring pin

5 - Gasket

- ❑ Renew after removing

6 - Gasket

- ❑ Renew after removing

7 - Coolant pump

- ❑ Removing and installing
- ❑ New coolant pump: remove protective cap

8 - Bolt

- ❑ Tightening sequence ⇒ page 207

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9 - Bolt

- ❑ 9 Nm

10 - Toothed belt

- ❑ For coolant pump
- ❑ Removing and installing

11 - Toothed belt cover

12 - Bolt

- ❑ Left-hand thread
- ❑ Renew after removing
- ❑ 10 Nm +90°

13 - Toothed belt drive sprocket

- ❑ Note installation position

14 - Oil seal for balance shaft (inlet side)

- ❑

15 - Balance shaft

16 - Bolt

- ❑ 9 Nm

17 - Connection

18 - Thermostat

- ❑ Removing and installing ⇒ page 207

19 - O-ring

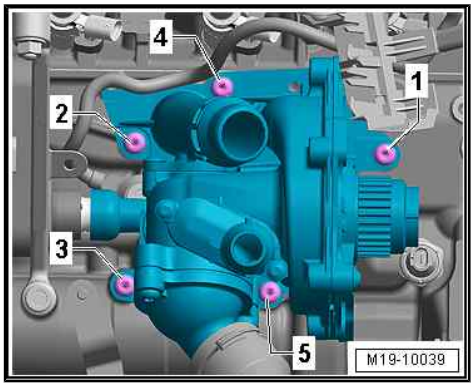
- ❑ Renew after removing

20 - Thermostat housing

- ❑ Removing and installing

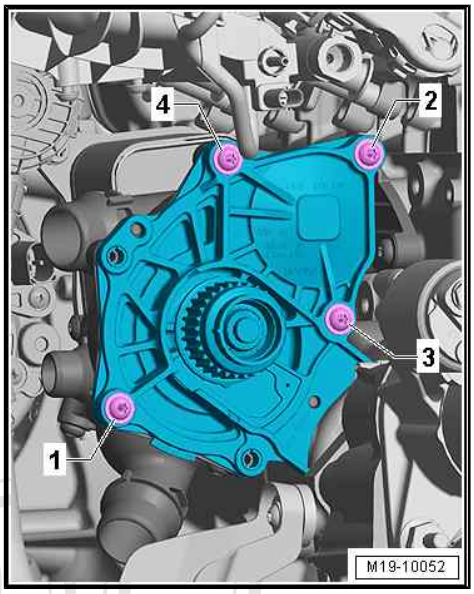
Thermostat - tightening torque and sequence

Tightening sequence	Tightening torque
-1- to -5-	9 Nm



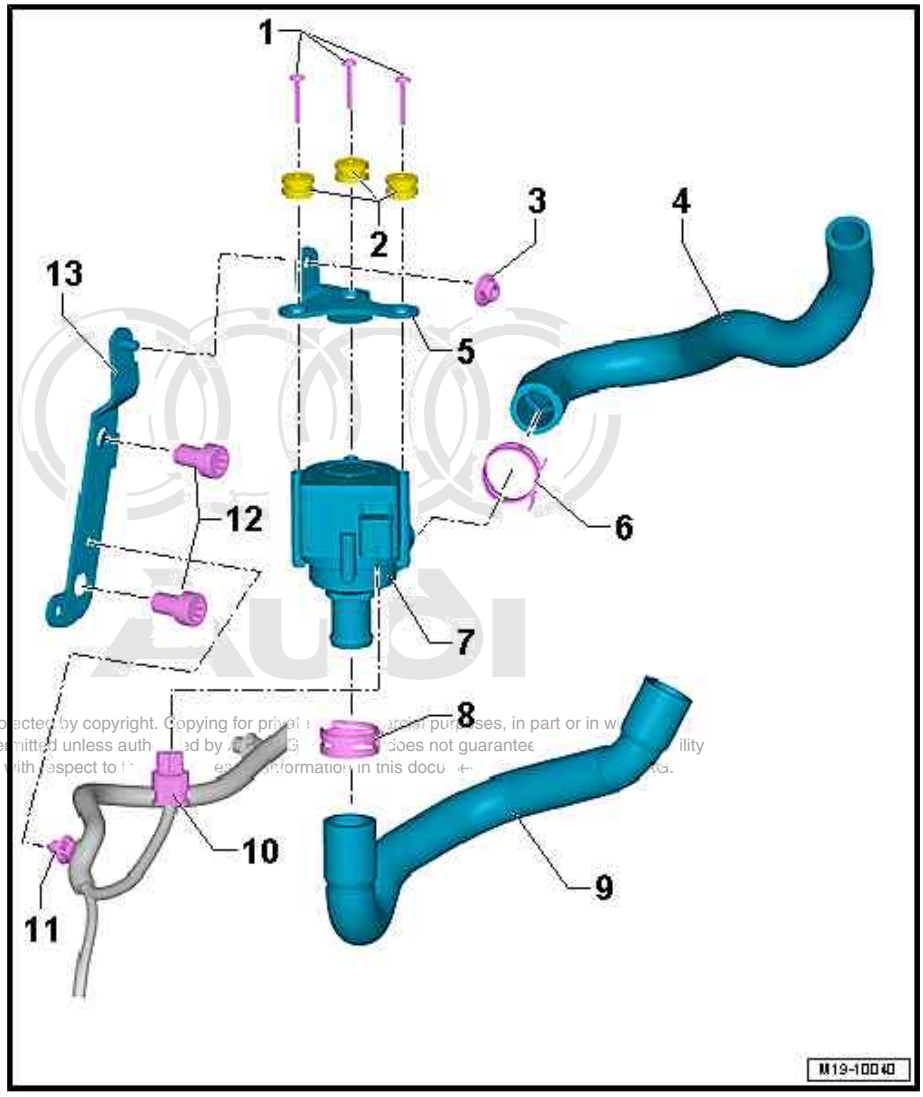
Coolant pump - tightening torque and sequence

Tightening sequence	Tightening torque
-1- to -4-	9 Nm



2.2 Exploded view - continued coolant circulation pump - V51-

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1 - Bolt
- ❑ 5 Nm

2 - Plastic bush

3 - Nut
- ❑ 9 Nm

4 - Coolant hose

5 - Bracket
- ❑ For continued coolant circulation pump - V51-

6 - Spring-type clip

7 - Continued coolant circulation pump - V51-
- ❑ With bracket
- ❑ Removing and installing ⇒ “2.5 Removing and installing continued coolant circulation pump V51 ”, page 210

8 - Spring-type clip

9 - Coolant hose

10 - Electrical connector
- ❑ Clipped onto bracket

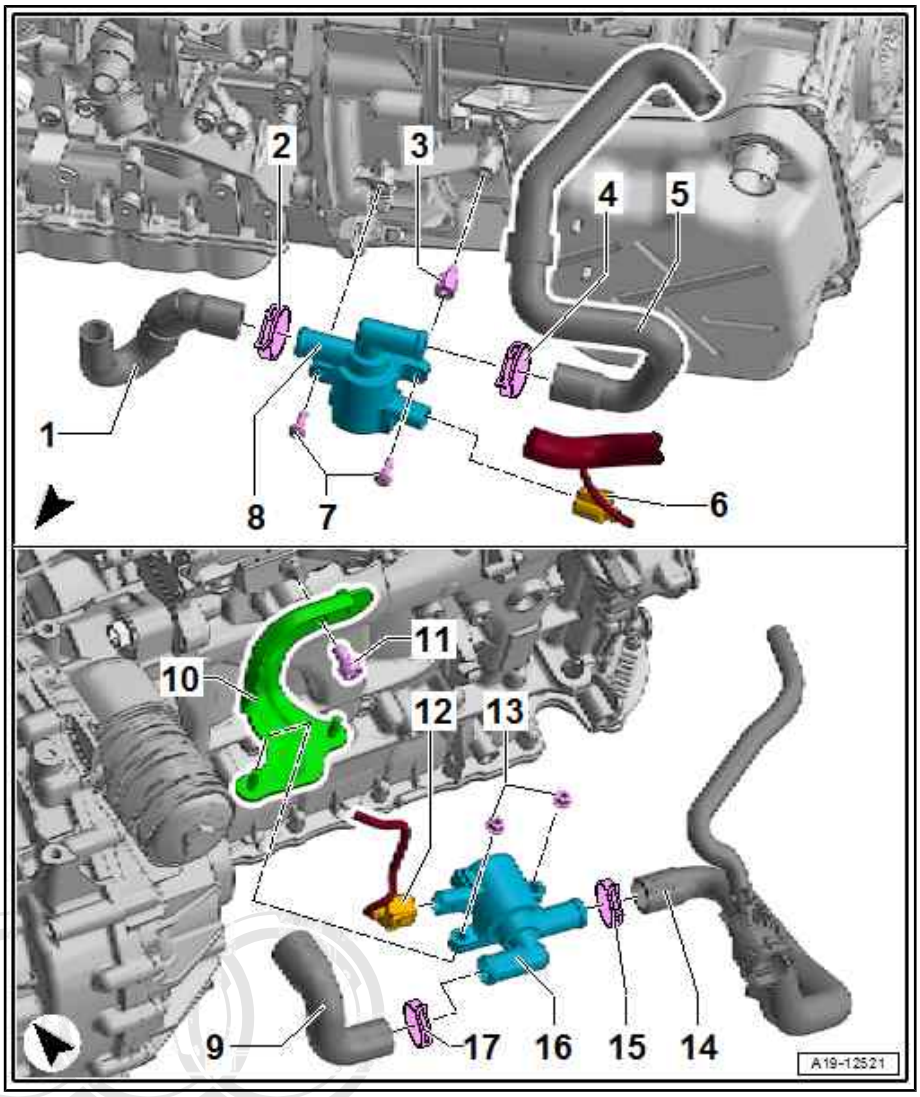
11 - Clip

12 - Bolt
- ❑ 20 Nm

13 - Bracket
- ❑ Continued coolant circulation pump - V51- to engine
- ❑ Must be removed before engine can be removed
- ❑ Bottom attachment point is used for mounting engine bracket

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2.3 Exploded view - coolant valves



1 - Coolant hose

2 - Spring-type clip

3 - Spacer pin

- ❑ 9 Nm

4 - Spring-type clip

5 - Coolant hose

6 - Connector

7 - Bolt

- ❑ 9 Nm

8 - Coolant valve for gearbox - N488-

- ❑ Removing and installing ⇒ “2.11.1 Removing and installing coolant valve for gearbox N488 ”, page 222

9 - Coolant hose

10 - Bracket

11 - Bolt

- ❑ 20 Nm

12 - Connector

13 - Nut

- ❑ 9 Nm

14 - Coolant hose

15 - Spring-type clip

16 - Coolant shut-off valve - N82-

- ❑ Removing and installing ⇒ “2.11.2 Removing and installing coolant shut-off valve N82 ”, page 224

17 - Spring-type clip

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2.4 Exploded view - coolant temperature senders

1 - Retaining clip

- ❑ Check for firm attachment

2 - O-ring

- ❑ Renew after removing

3 - Radiator outlet coolant temperature sender - G83-

- ❑ Removing and installing ⇒ “2.10 Removing and installing radiator outlet coolant temperature sender G83 ”, page 221

4 - Electrical connector

- ❑ On coolant temperature sender - G62-

5 - Coolant temperature sender - G62-

- ❑ Removing and installing ⇒ “2.9 Removing and installing coolant temperature sender G62 ”, page 220

6 - O-ring

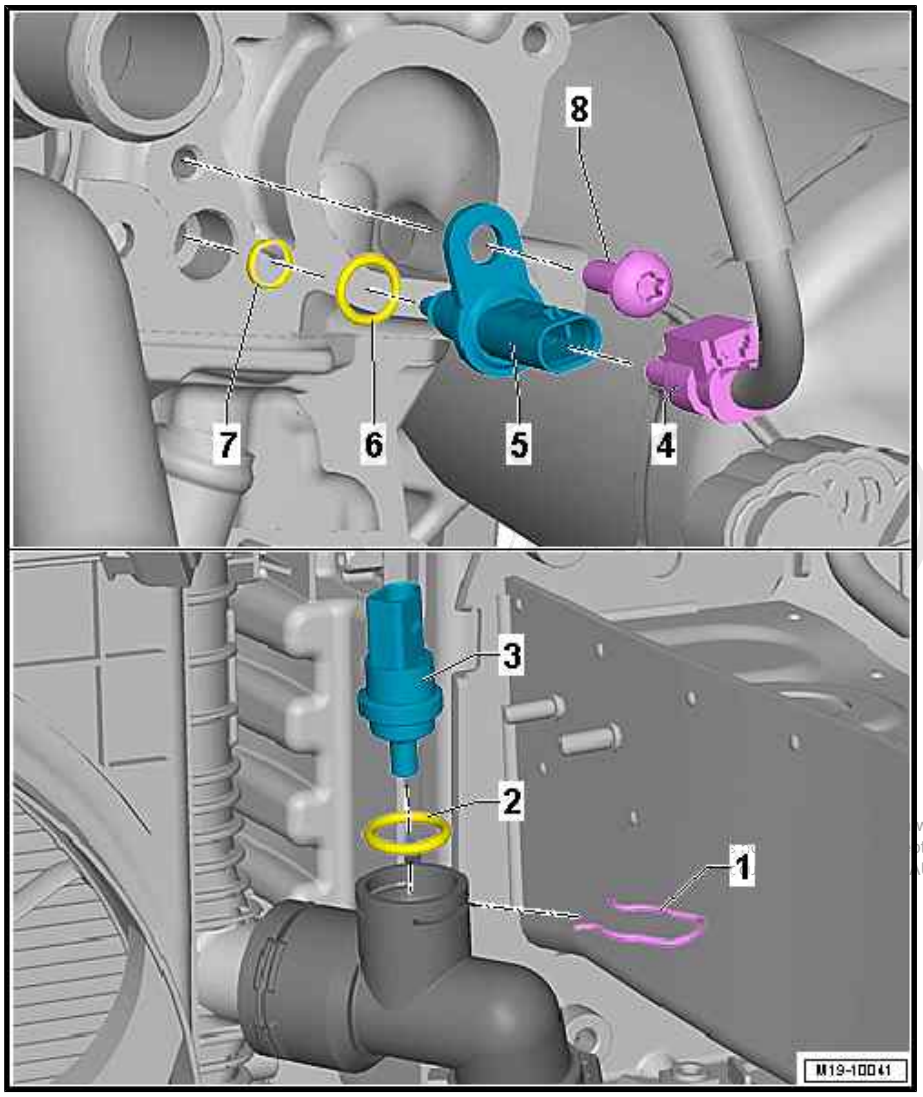
- ❑ Renew after removing
- ❑ Lubricate with coolant

7 - O-ring

- ❑ Renew after removing
- ❑ Lubricate with coolant

8 - Bolt

- ❑ Renew after removing
- ❑ 4 Nm +45°

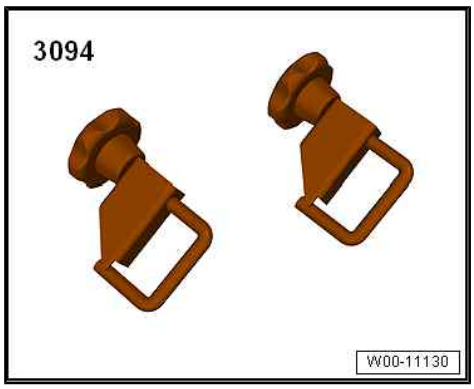


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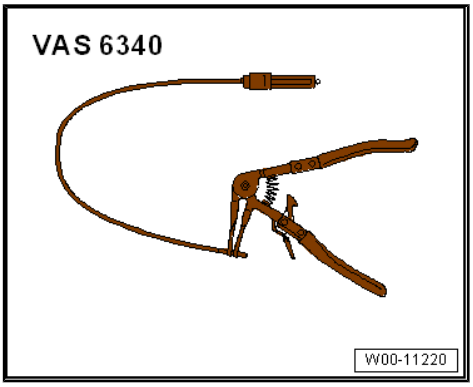
2.5 Removing and installing continued coolant circulation pump - V51-

Special tools and workshop equipment required

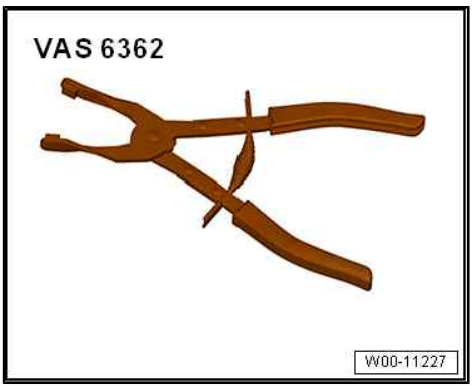
- ♦ Hose clamps, up to 25 mm - 3094-



- Hose clip pliers - VAS 6340-



- Hose clip pliers - VAS 6362-



Removing

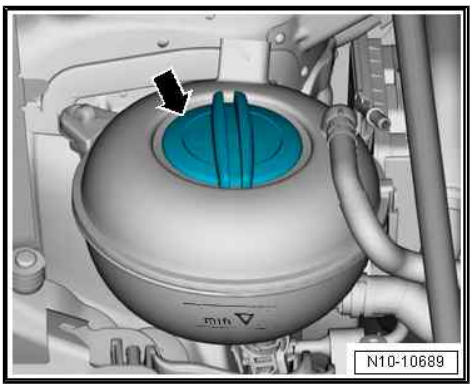
Note

Re-install all heat insulation sleeves in the same locations when installing.

WARNING

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

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

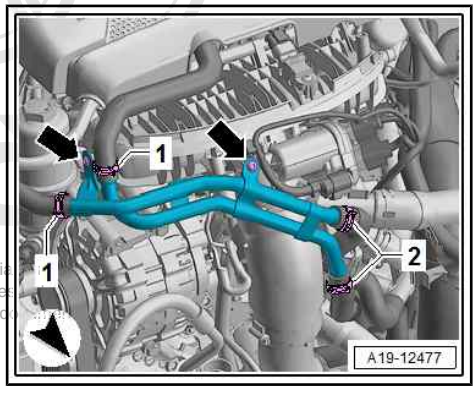


– Open filler cap -arrow- on coolant expansion tank.

Remove bolts -arrows- and detach coolant pipe.

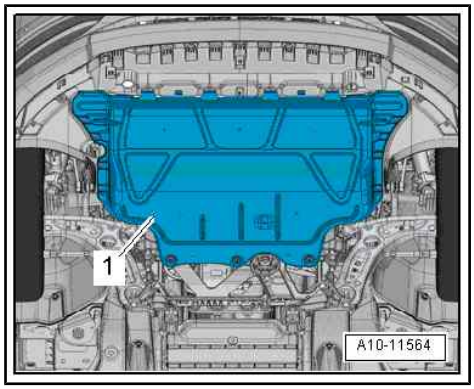
Note

Disregard -1- and -item 2-.



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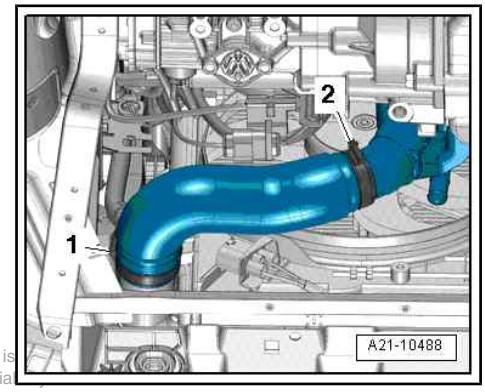
– Remove noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .



– Release hose clip -1- and detach air hose from charge air cooler.

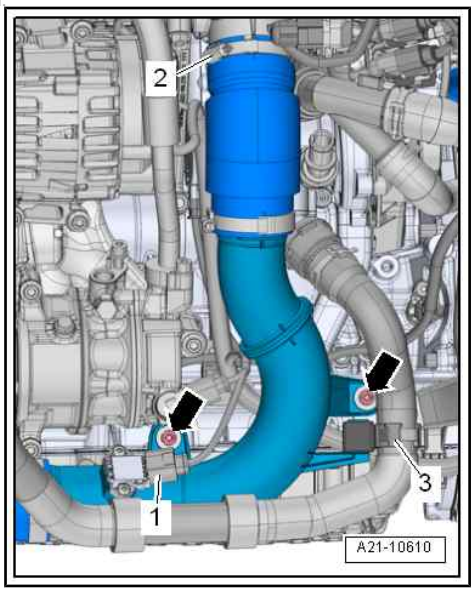
Note

Disregard -item 2-.



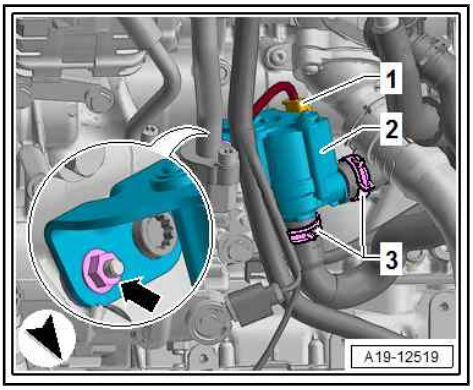
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– Release hose clip -2-.
– Move coolant hose -3- clear.
– Remove bolts -arrows-.
– Unplug electrical connector -1- from charge pressure sender - G31- .
– Detach air pipe (right-side).



– Unplug electrical connector -1-.

– Use hose clamps up to 25 mm - V51- to clamp off coolant hoses at continued coolant circulation pump - 3094- .



Note

Place a cloth underneath to catch escaping coolant.

– Release hose clips -3- and disconnect coolant hoses.

– Remove nut -arrow- and detach continued coolant circulation pump - V51- from bracket.

Installing

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

Note

Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .

– Check coolant level ⇒ page 204 .

Tightening torques

- ⇒ “2.2 Exploded view - continued coolant circulation pump V51 ”, page 207
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation
- ⇒ “3.1 Exploded view - coolant pipes”, page 226
- ⇒ “2.1 Exploded view - charge air system”, page 245

2.6 Removing and installing coolant pump

Special tools and workshop equipment required

- Drip tray for workshop hoist - VAS 6208-

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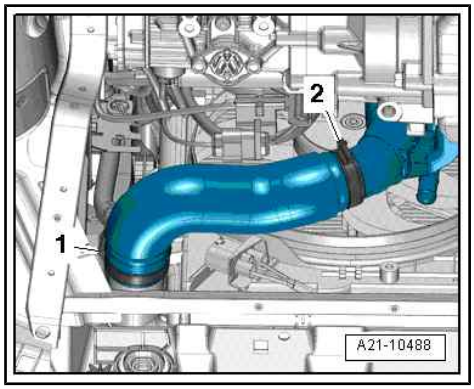


Removing

– Drain coolant ⇒ page 198 .

– Remove air cleaner housing ⇒ page 264 .

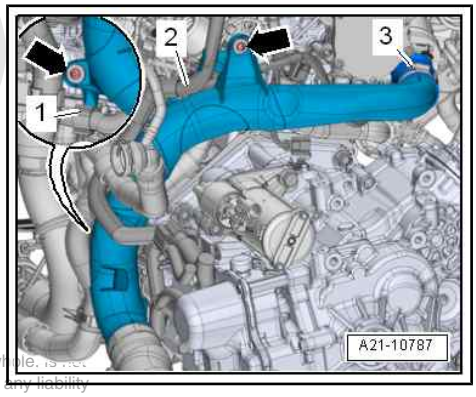
– Release hose clip -1- and detach air hose from charge air cooler.



Note

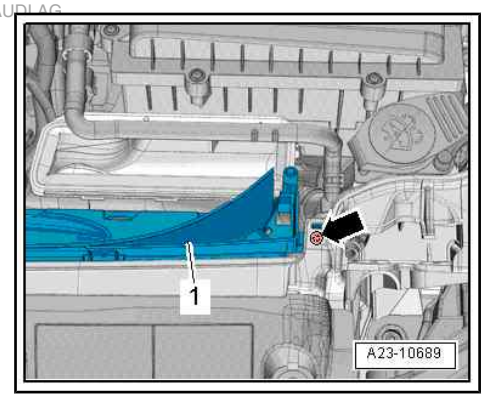
Disregard -item 2-.

– Move electrical wiring harnesses -1- and -2- clear at air pipe.
– Unfasten screw-type clip -3-.
– Remove bolts -arrows-.
– Release hose clip -arrow- and remove charge air hose -A- with air pipe downwards.

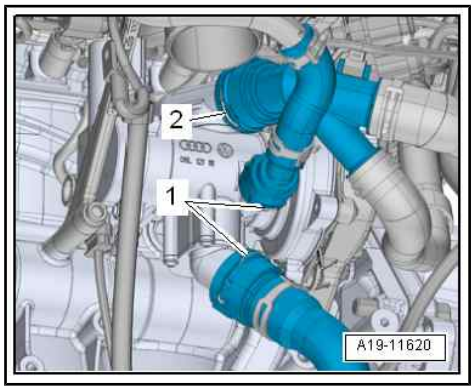


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– Remove bolt -arrow- on both sides.
– Unclip air duct (bottom section) -1- and detach.
– Remove throttle valve module - J338-
⇒ “4.3 Removing and installing throttle valve module J338 ”, page 270 .
– Place drip tray for workshop hoist - VAS 6208- underneath.



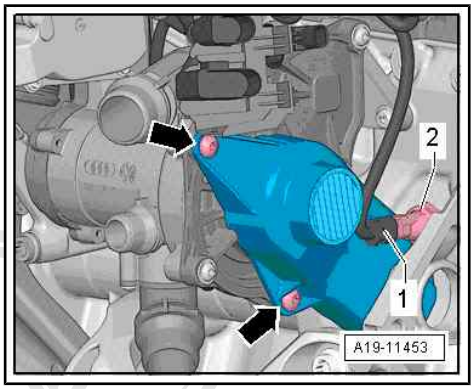
– Lift retaining clip -2-, detach coolant connection and press to side.



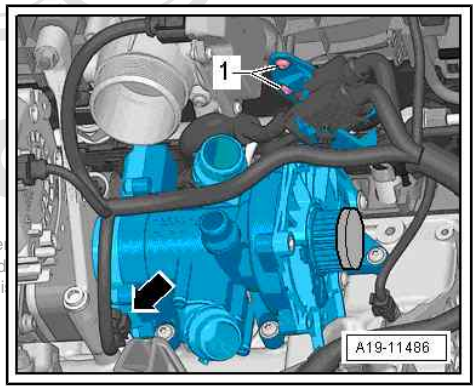
Note

Disregard -item 1-.

– Unplug electrical connector -1- on stage 3 oil pressure switch - F447- -item 2-.
– Remove bolts -arrows- and detach toothed belt cover.



– Remove bolts -1-.

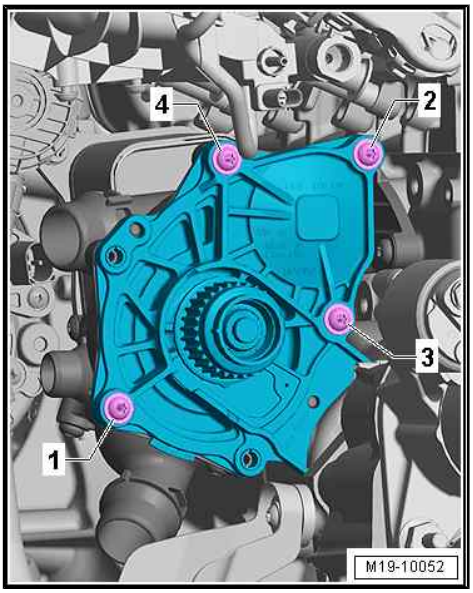


Note

Disregard -arrow-.

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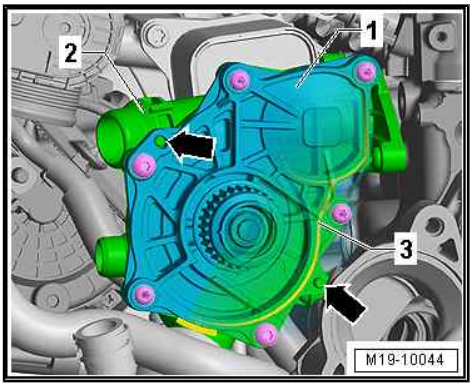
– Loosen bolts -1 … 4- and detach toothed belt from coolant pump.
– Remove bolts -1 … 4- and detach coolant pump from actuator for engine temperature regulation - N493- .



Installing

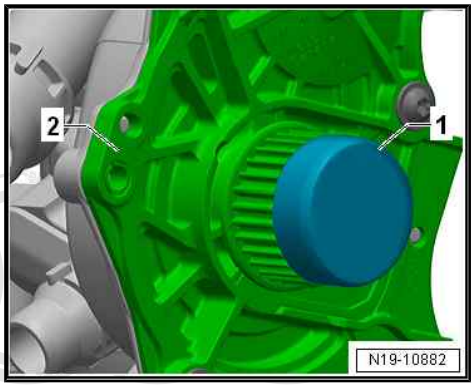
Installation is carried out in the reverse order; note the following:

– Position coolant pump and fit toothed belt.
– Check that centring elements -arrows- and gasket -3- are seated correctly.
– Tighten coolant pump bolts ⇒ page 207 .



– After fitting new coolant pump -2-, remove protective cap -1- from drive sprocket.

– Fill up with coolant ⇒ page 200 .



Tightening torques

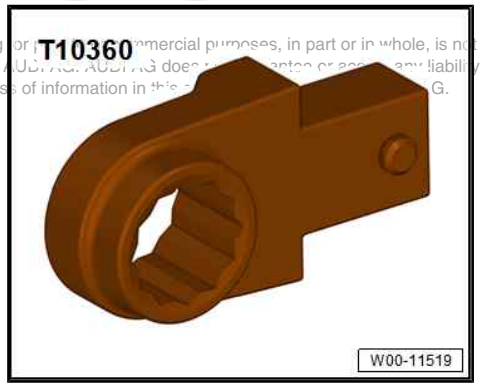
- ⇒ “2.1 Exploded view - coolant pump/thermostat”, page 205
- ⇒ “3.1 Exploded view - air cleaner housing”, page 263
- ⇒ “4.1 Exploded view - intake manifold”, page 265

2.7 Removing and installing toothed belt for coolant pump

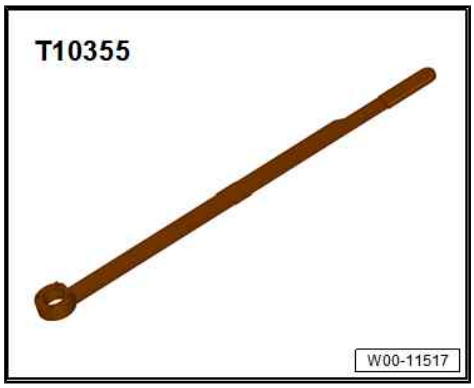
Special tools and workshop equipment required

- Tool insert - T10360-

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- Counterhold tool - T10355-

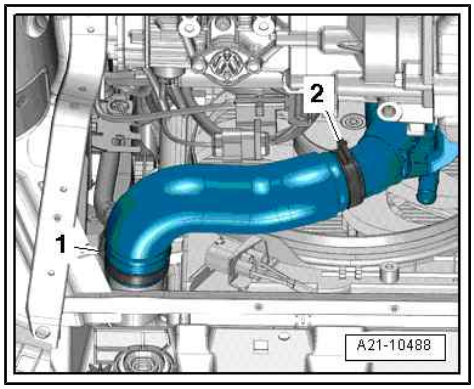


Removing

– Drain coolant ⇒ page 198 .

– Remove air cleaner housing ⇒ page 264 .

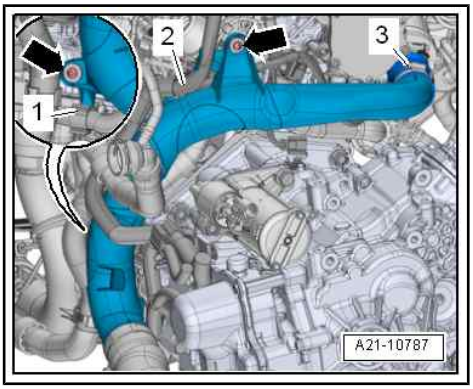
– Release hose clip -1- and detach air hose from charge air cooler.



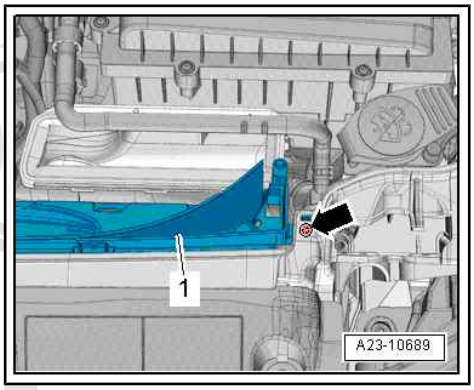
Note

Disregard -item 2-.

– Move electrical wiring harnesses -1- and -2- clear at air pipe.
– Unfasten screw-type clip -3-.
– Remove bolts -arrows-.
– Release hose clip -arrow- and remove charge air hose -A- with air pipe downwards.



– Remove bolt -arrow- on both sides.
– Unclip air duct (bottom section) -1- and detach.

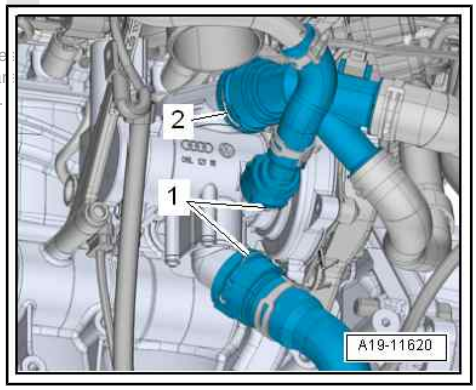


– Lift retaining clip -2-, detach coolant connection and press to side.

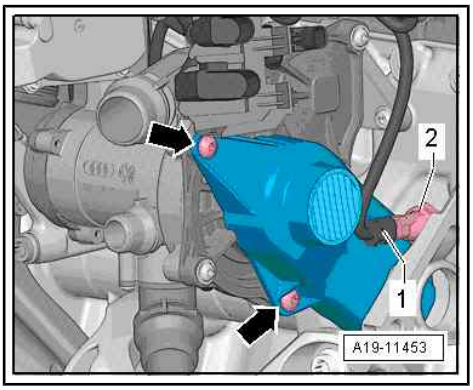
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Note

Disregard -item 1-.



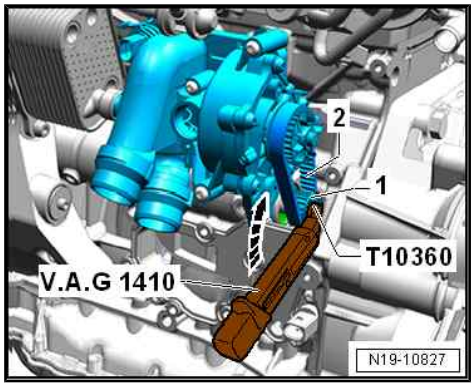
– Unplug electrical connector -1- on stage 3 oil pressure switch - F447- -item 2-.
– Remove bolts -arrows- and detach toothed belt cover.



Caution

Risk of damage to thread.

- *The drive sprocket bolt has a left-hand thread.*



– Use torque wrench - V.A.G 1410- and insert tool - T10360- to loosen bolt on coolant pump drive sprocket -1- and unscrew three turns (counterhold at vibration damper).

– Remove toothed belt -2-.

Installing

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

– Renew bolt for drive sprocket.

– Installation position of drive sprocket: Collar on drive sprocket faces gearbox.

– Fit toothed belt and tighten securing bolt.

– Fill up with coolant ⇒ page 200 .

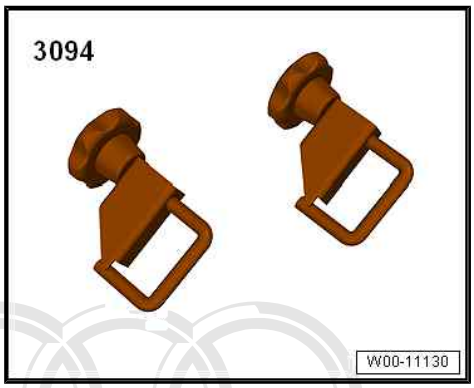
Tightening torques

- ⇒ “2.1 Exploded view - coolant pump/thermostat”, page 205
- ⇒ “3.1 Exploded view - air cleaner housing”, page 263

2.8 Removing and installing thermostat housing

Special tools and workshop equipment required

- Hose clamps, up to 25 mm - 3094-



- Hose clip pliers - VAS 6362-



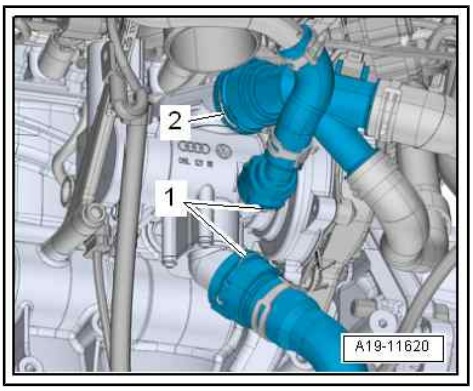
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Removing

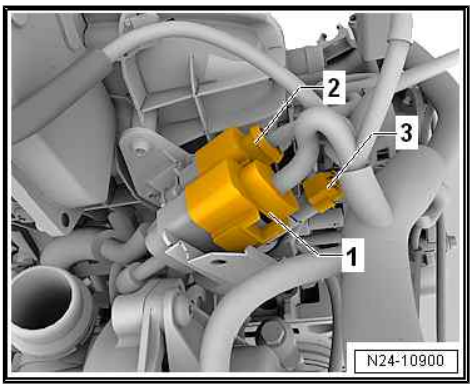
– Remove engine cover panel ⇒ page 50 .

– Remove coolant pump ⇒ page 213 .

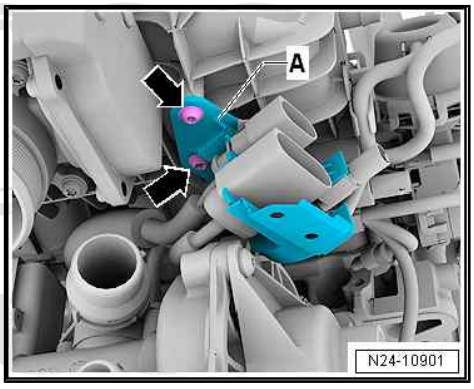
– Lift retaining clips -1- and -2- and disconnect coolant hoses.



– Unplug electrical connectors -1, 2 and 3- beneath exhaust manifold.

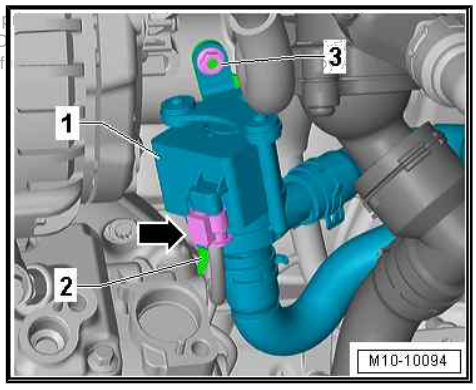


– Remove bolts -arrows- securing bracket -A-.



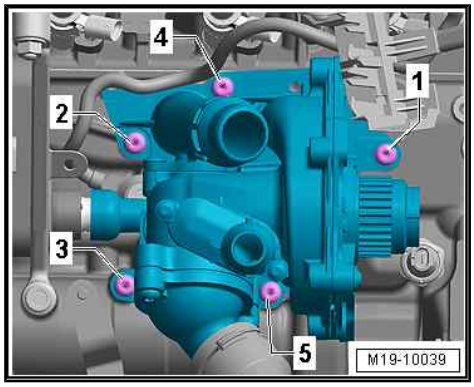
– Unplug electrical connector -arrow- from continued circulation coolant pump - V51- -1-.

– Remove nut -3- and detach continued coolant circulation pump - V51- -1- from bracket -2-.



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– Push wiring for alternator to the side and unscrew bolt -3- from thermostat housing.
– Remove remaining bolts -1- to -5-.
– Detach thermostat housing from centring pins and pull housing off engine oil cooler.

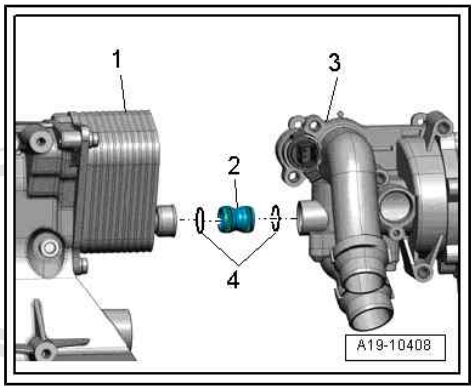


Installing

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

- Renew seals and O-rings.

– Lubricate O-rings -4- with coolant, for coolant refer to ⇒ Electronic parts catalogue .
– Check whether the two centring pins are fitted in the cylinder block; install if necessary.
– Fit connecting piece -2- into engine oil cooler -1-.
– Push thermostat housing -3- onto connecting piece and centring pins in cylinder block.

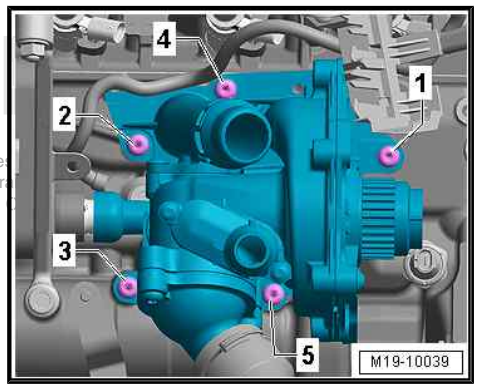


– Tighten bolts for thermostat housing ⇒ page 207 .

Note

Detach protective cap -arrow- if a new coolant pump has been fitted.

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– Install coolant pump ⇒ page 213 .
– Secure continued coolant circulation pump - V51- again.
– Fill up with coolant ⇒ page 200 .

Tightening torques

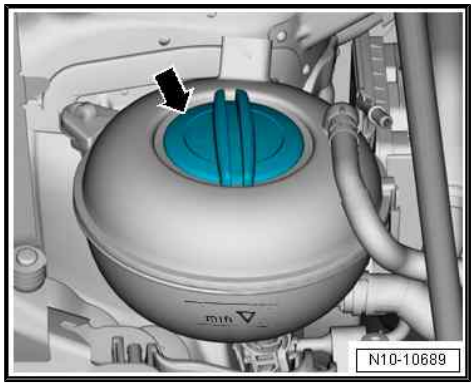
- ⇒ “2.1 Exploded view - coolant pump/thermostat”, page 205 .
- ⇒ “4.3 Removing and installing throttle valve module J338 ”, page 270

2.9 Removing and installing coolant temperature sender - G62-

Removing

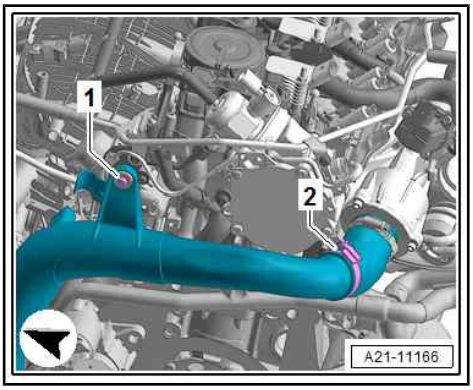
- Engine cold.

– 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 air cleaner housing ⇒ page 264 .

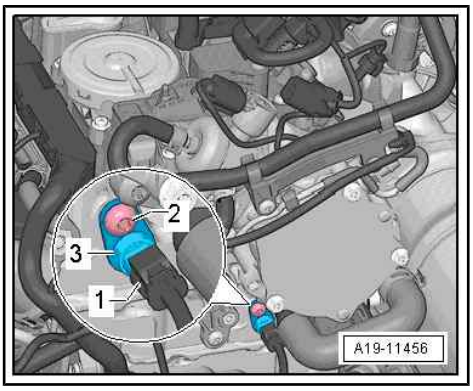


– Release hose clip -2-.

– Remove bolt -1- and press air pipe (left-side) towards left slightly.



– Unplug electrical connector -1-.



Note

- *Place a cloth underneath to catch escaping coolant.*
- *Insert new coolant temperature sender - G62- into connection immediately to avoid loss of coolant.*

– Remove bolt -2- and detach coolant temperature sender - G62- -item 3-.

Installing

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

Note

Renew O-ring.

– Check coolant level ⇒ page 200 .

Tightening torques

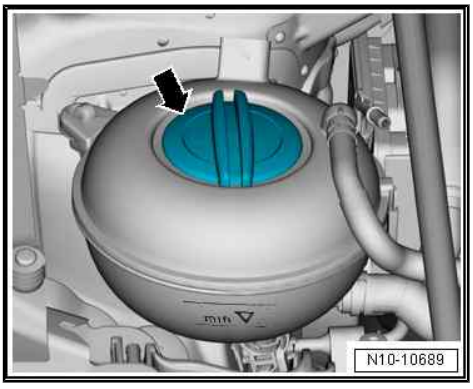
- ⇒ “2.4 Exploded view - coolant temperature senders”, page 210
- ⇒ “3.1 Exploded view - air cleaner housing”, page 263

2.10 Removing and installing radiator outlet coolant temperature sender - G83-

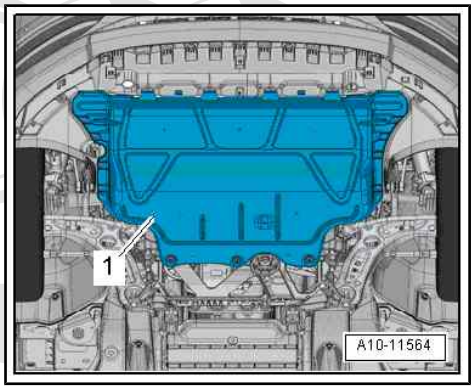
Removing

- 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).

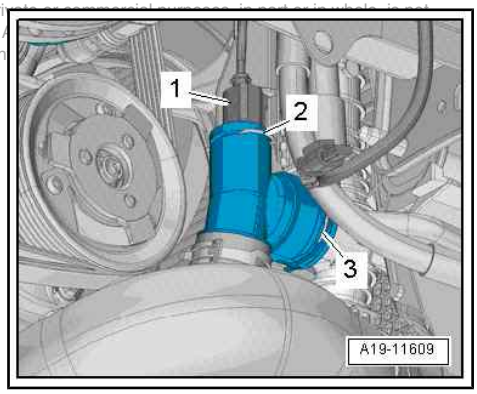


– Remove noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .



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– Unplug electrical connector -1-.
– Pull out retaining clip -2- and remove radiator outlet coolant temperature sender - G83- -3-.



Note

- *Place a cloth underneath to catch escaping coolant.*
- *Insert new radiator outlet coolant temperature sender - G83- into connection immediately to avoid loss of coolant.*

Installing

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

Note

Renew O-ring.

– Check coolant level ⇒ page 200 .

Tightening torques

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

2.11 Removing and installing coolant valves

⇒ "2.11.1 Removing and installing coolant valve for gearbox N488 ", page 222

⇒ "2.11.2 Removing and installing coolant shut-off valve N82 ", page 224

2.11.1 Removing and installing coolant valve for gearbox - N488-

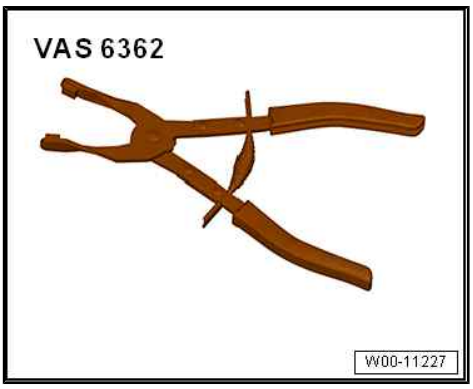
Special tools and workshop equipment required

♦ Hose clamps, up to 25 mm - 3094-



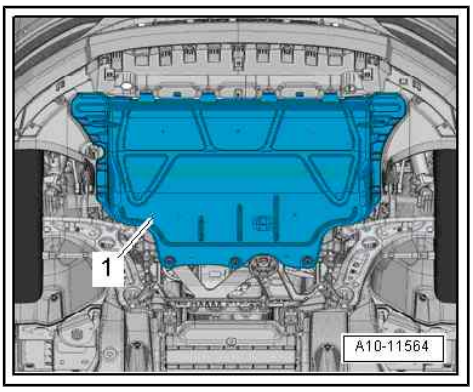
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♦ Hose clip pliers - VAS 6362-

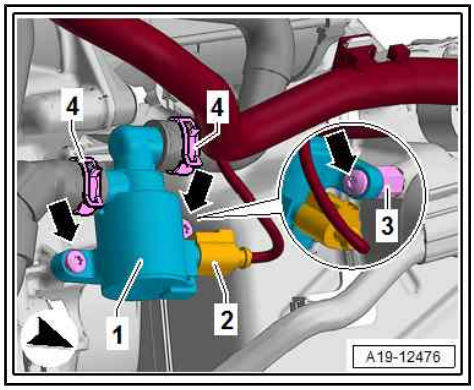


Removing

– Remove noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .



– Unplug electrical connector -2-.
– Use hose clamps, up to 25 mm - N488- to clamp off coolant hoses on coolant valve for gearbox - 3094- .



Note

Place a cloth underneath to catch escaping coolant.

– Release hose clips -4- and disconnect coolant hoses.
– Counterhold nut -3- and unscrew bolt -arrows-.
– Take off coolant valve for gearbox - N488- .

Installing

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

Note

Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .

– Check coolant level ⇒ page 204 .

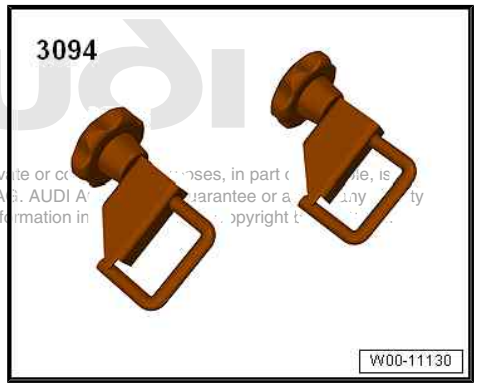
Tightening torques

♦ ⇒ “2.3 Exploded view - coolant valves”, page 209
♦ ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

2.11.2 Removing and installing coolant shut-off valve - N82-

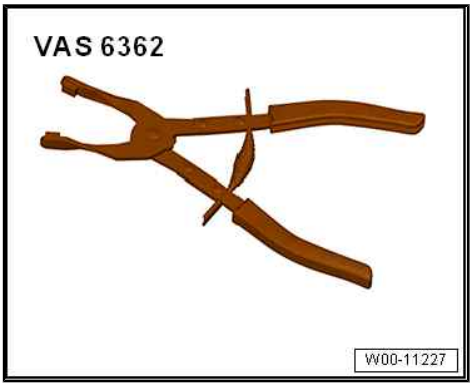
Special tools and workshop equipment required

♦ Hose clamps, up to 25 mm - 3094-



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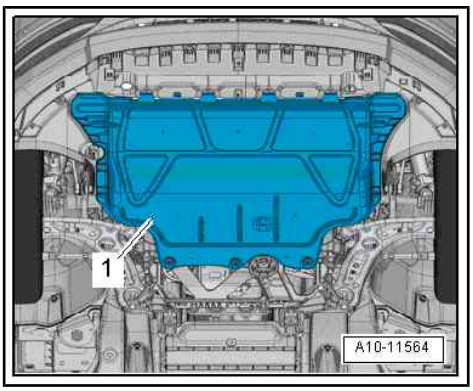
♦ Hose clip pliers - VAS 6362-



Removing

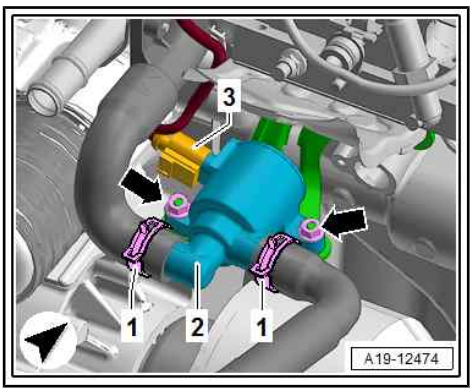
– Remove noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

– Remove heat shield for drive shaft ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing heat shield for drive shaft .



– Unplug electrical connector -3-.

– Use hose clamps, up to 25 mm - N82- to clamp off coolant hoses on coolant shut-off valve - 3094- .



Note

Place a cloth underneath to catch escaping coolant.

– Release hose clips -1- and disconnect coolant hoses.

– Unscrew bolt -arrows- and detach coolant shut-off valve - N82- .

Installing

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

Note

Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .

– Check coolant level ⇒ page 204 .

Tightening torques

♦ ⇒ “2.3 Exploded view - coolant valves”, page 209

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

♦ ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing heat shield for drive shaft

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3 Coolant pipes

⇒ “3.1 Exploded view - coolant pipes”, page 226

⇒ “3.2 Removing and installing coolant pipes”, page 226

3.1 Exploded view - coolant pipes

1 - Coolant pipe (front)
- ❑ Removing and installing ⇒ page 226

2 - Bolts
- ❑ 6 Nm

3 - Bolt
- ❑ 6 Nm

4 - Coolant pipe (top)
- ❑ Removing and installing ⇒ page 228

5 - Bolts
- ❑ 9 Nm

6 - Bolt
- ❑ 9 Nm

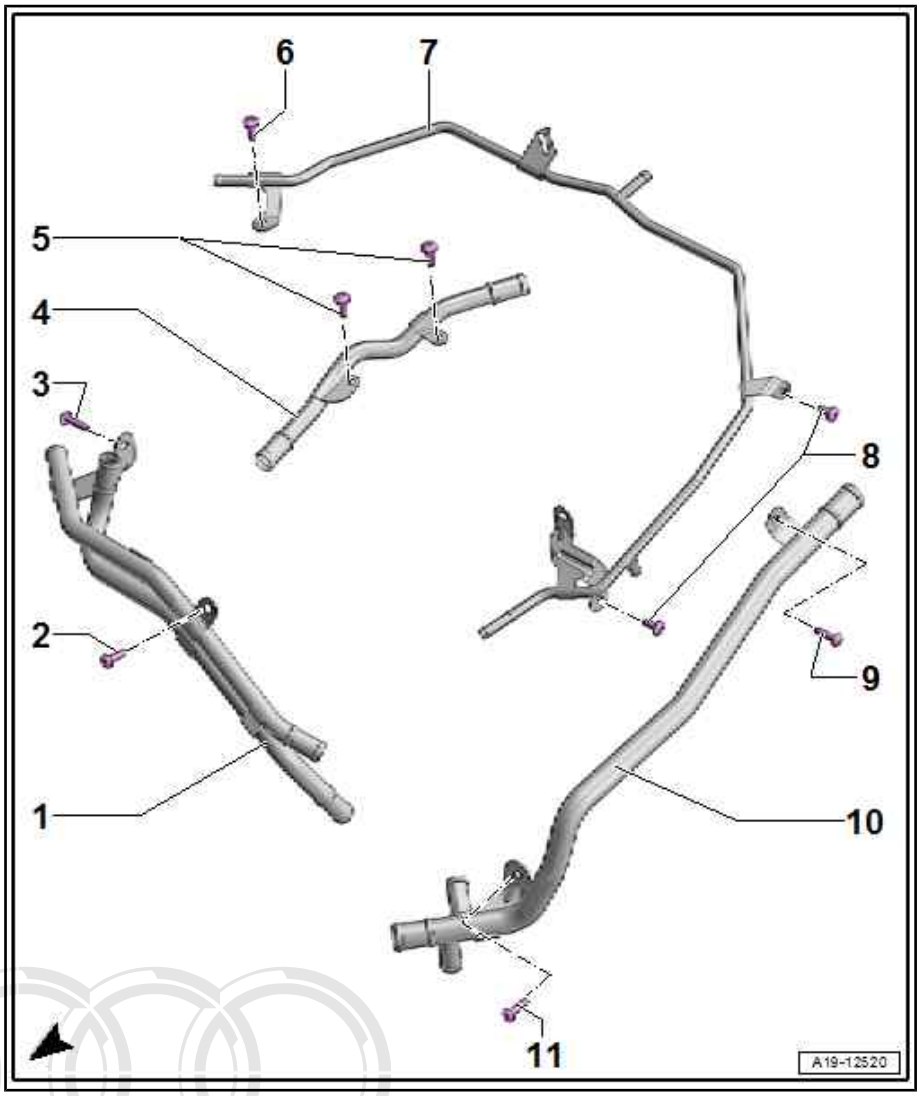
7 - Coolant pipe

8 - Bolts
- ❑ 9 Nm

9 - Bolt
- ❑ 9 Nm

10 - Coolant pipe

11 - Bolt
- ❑ 5 Nm



3.2 Removing and installing coolant pipes

⇒ “3.2.1 Removing and installing coolant pipe (front)”, page 226

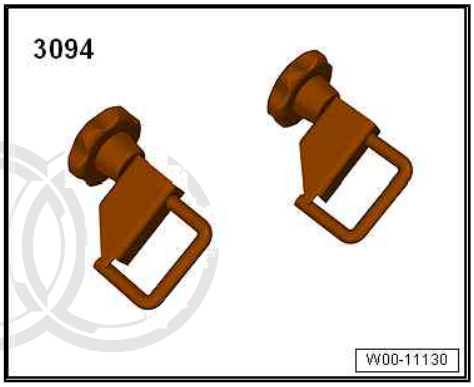
⇒ “3.2.2 Removing and installing coolant pipe (top)”, page 228

3.2.1 Removing and installing coolant pipe (front)

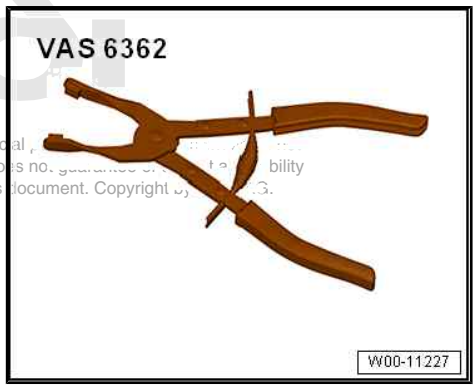
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Special tools and workshop equipment required

♦ Hose clamps, up to 25 mm - 3094-



♦ Hose clip pliers - VAS 6362-

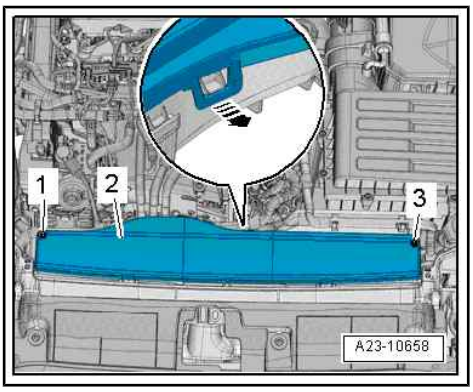


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Removing

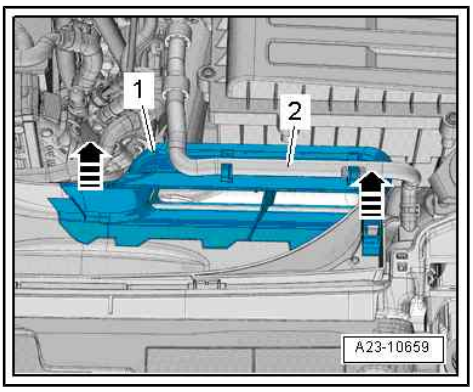
– Remove bolts -1, 3-.

– Release fastener -arrow- and remove cover -2-.

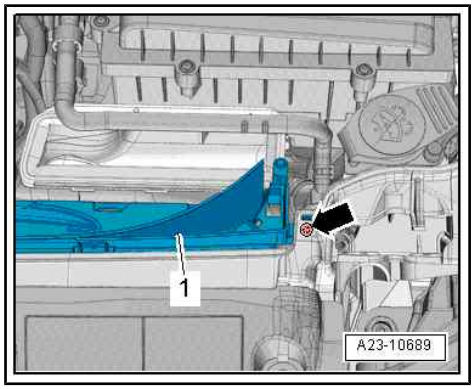


– Move coolant hose -2- clear.

– Release fasteners -arrows- and detach air duct (top section) -1-.



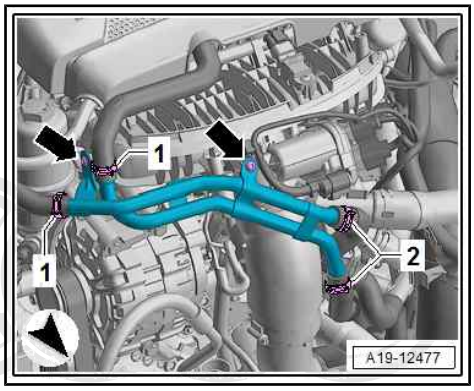
– Remove bolt -arrow- on both sides.
– Unclip air duct (bottom section) -1- and detach.



Note

Place a cloth underneath to catch escaping coolant.

– Clamp off coolant hoses -1, 2- with hose clamps up to 25 mm - 3094- .
– Release hose clips and detach coolant hoses.
– Unscrew bolts -arrows- and remove coolant pipe (front).



Installing

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

Note

Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .

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– Check coolant level ⇒ page 204 .

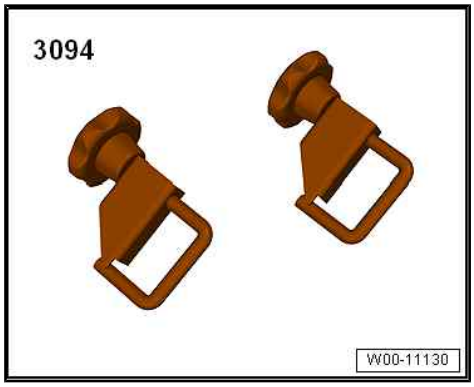
Tightening torques

♦ ⇒ “3.1 Exploded view - coolant pipes”, page 226

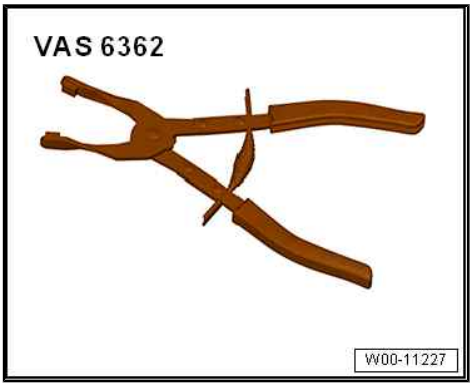
3.2.2 Removing and installing coolant pipe (top)

Special tools and workshop equipment required

♦ Hose clamps, up to 25 mm - 3094-



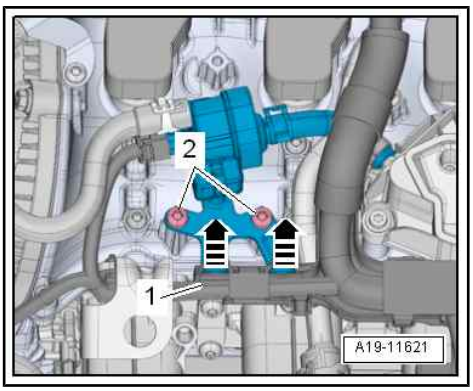
♦ Hose clip pliers - VAS 6362-



Removing

– Remove ignition coil with output stage for cylinder “3” ⇒ page 306 .

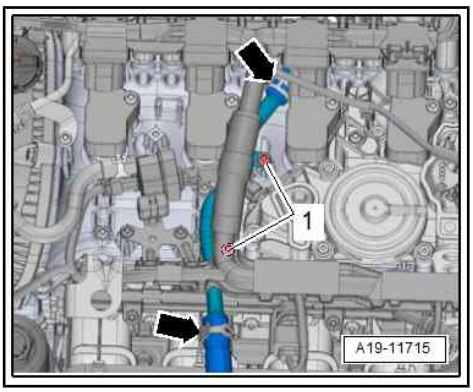
– Release fasteners -arrows- and detach wiring duct -1- from bracket.



– Clamp off coolant hoses -arrows- with hose clamps up to 25 mm - 3094- .

– Release hose clips and detach coolant hoses.

– Unscrew bolts -1- and remove coolant pipe (top).



Installing

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

Note

Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .

– Check coolant level ⇒ page 204 .

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Tightening torques

♦ ⇒ “3.1 Exploded view - coolant pipes”, page 226

4 Radiator/radiator fans

⇒ “4.1 Exploded view - radiator/radiator fan(s)”, page 230

⇒ “4.2 Exploded view - radiator cowl and radiator fans”, page 231

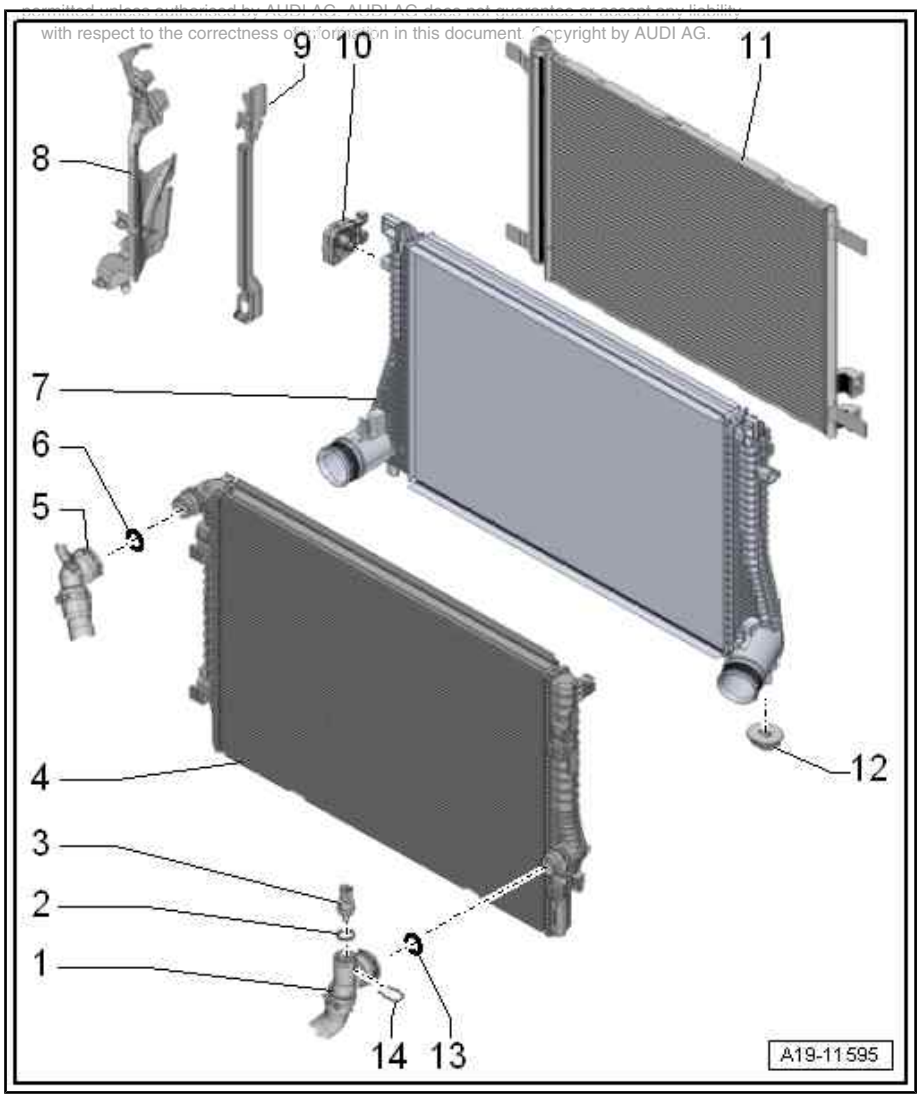
⇒ “4.3 Removing and installing radiator”, page 232

⇒ “4.4 Removing and installing radiator cowl”, page 234

⇒ “4.5 Removing and installing radiator fan V7 ”, page 235

4.1 Exploded view - radiator/radiator fan(s)

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1 - Coolant hose

- ❑ Lift retaining clip to detach
- ❑ Connecting ⇒ page 231

2 - O-ring

- ❑ Renew after removing
- ❑ Lubricate with coolant

3 - Radiator outlet coolant temperature sender - G83-

- ❑ Removing and installing ⇒ page 221

4 - Radiator

- ❑ Removing and installing ⇒ page 232
- ❑ If renewed, refill system with fresh coolant

5 - Coolant hose

- ❑ Lift retaining clip to detach
- ❑ Connecting ⇒ page 231

6 - O-ring

- ❑ Renew after removing
- ❑ Lubricate with coolant

7 - Charge air cooler

- ❑ Removing and installing ⇒ page 232

8 - Air duct

9 - Air duct

10 - Rubber mounting

- ❑ For radiator

11 - Condenser

- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit; Removing and installing condenser

12 - Rubber bush

- ❑ For charge air cooler

13 - O-ring

- ❑ Renew after removing

❑ Lubricate with coolant

14 - Retaining clip

❑ For radiator outlet coolant temperature sender - G83-

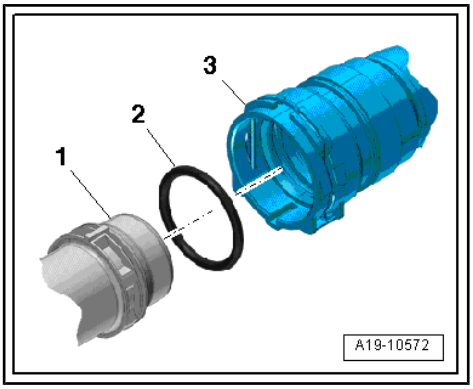
Connecting coolant hose with plug-in connector

– Remove old O-ring -2- from coolant hose -3-.

– Lubricate new O-ring with coolant and fit O-ring in coolant hose.

– Press coolant hose onto coolant pipe -1- until it engages with a click.

– Press coolant hose in again and then pull to check that plug-in connector is correctly engaged.



4.2 Exploded view - radiator cowl and radiator fans

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1 - Bolt

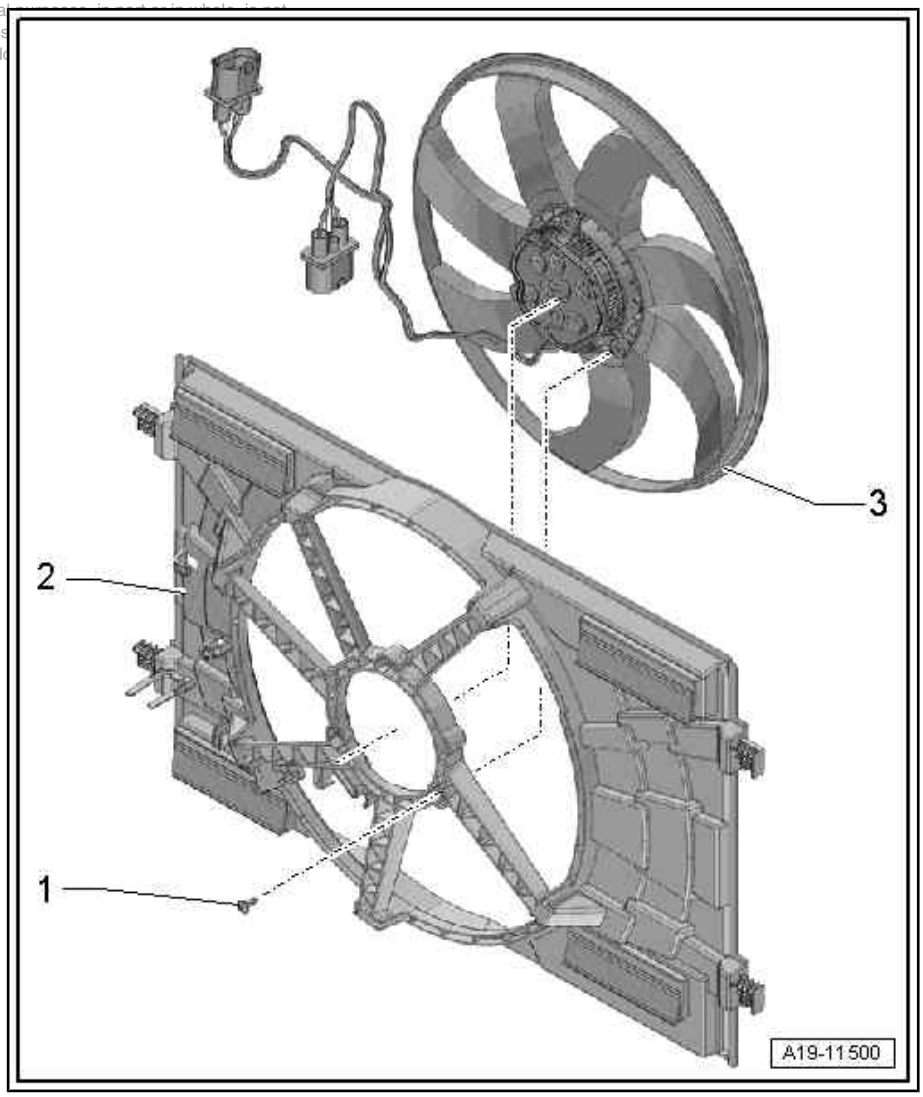
❑ 5 Nm

2 - Radiator cowl

❑ Removing and installing ⇒ page 234

3 - Radiator fan - V7-

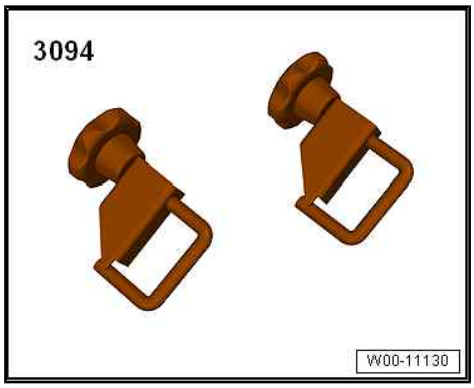
❑ Removing and installing ⇒ page 235



4.3 Removing and installing radiator

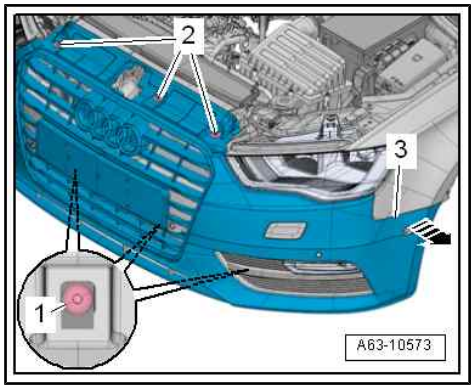
Special tools and workshop equipment required

- Hose clamps, up to 25 mm - 3094-

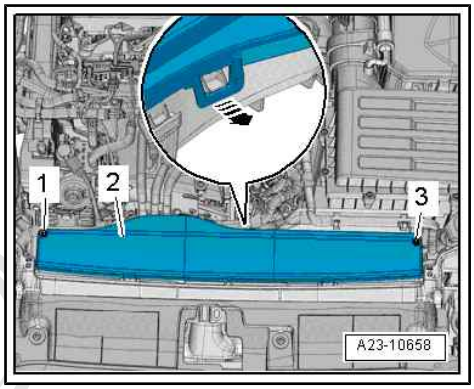


Removing

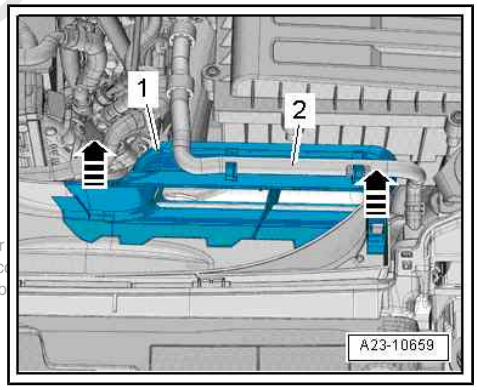
- Drain coolant ⇒ page 198 .
- Remove air cleaner housing ⇒ page 264 .
- Remove radiator cowl ⇒ page 234 .
- Remove bumper cover (front) ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing bumper cover .



- Remove bolts -1, 3-.
- Release fastener -arrow- and remove cover -2-.

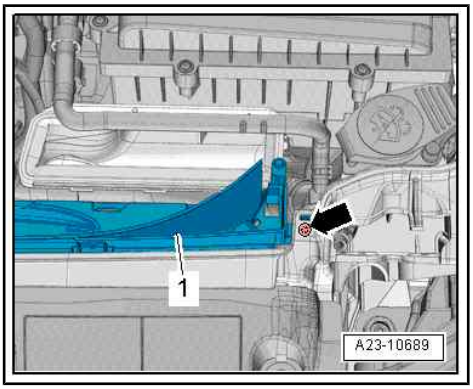


- Move coolant hose -2- clear.
- Release fasteners -arrows- and detach air duct (top section) -1-.

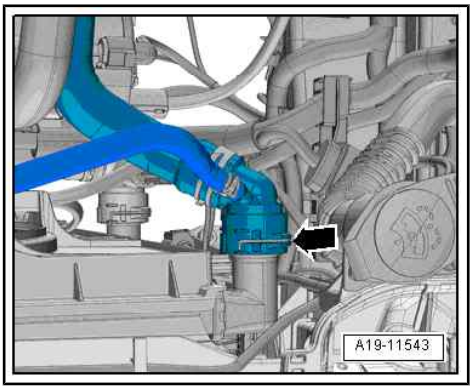


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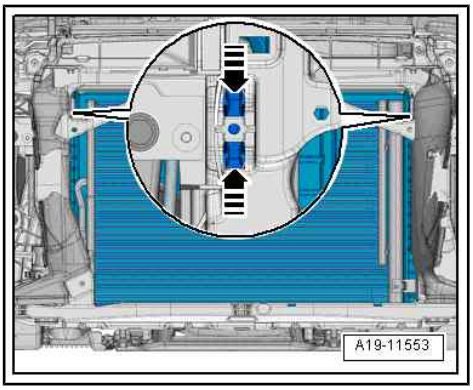
– Remove bolt -arrow- on both sides.
– Unclip air duct (bottom section) -1- and detach.



– Lift retaining clip -arrow- and disconnect coolant hose (top left) from radiator.

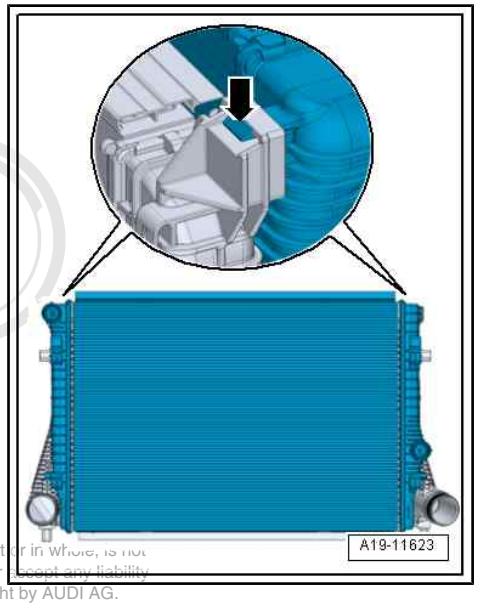


– Press catches on both sides -arrows- and push radiator (top) slightly towards rear.



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– Press locking tabs on left and right sides of radiator simultaneously -arrow- and detach radiator from charge air cooler.



– Secure charge air cooler.

Installing

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

Note

- *If there are slight impressions on the fins, refer to ⇒ page 5 .*
- *Renew O-rings.*

– Install bumper cover (front) ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing bumper cover .

– Install radiator cowl ⇒ page 234 .

– Connect coolant hose with plug-in connector ⇒ page 231 .

– Fill up with coolant ⇒ page 204 .

– Install air cleaner housing ⇒ page 264 .

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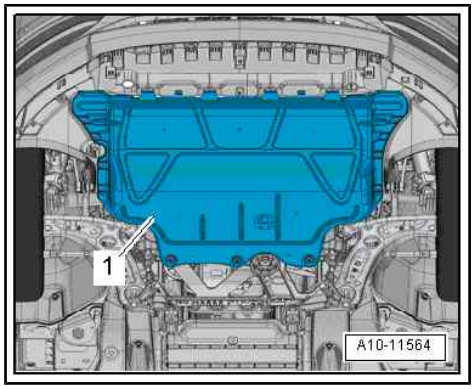
Tightening torques

- ⇒ “4.1 Exploded view - radiator/radiator fan(s)”, page 230
- ⇒ “4.2 Exploded view - radiator cowl and radiator fans”, page 231

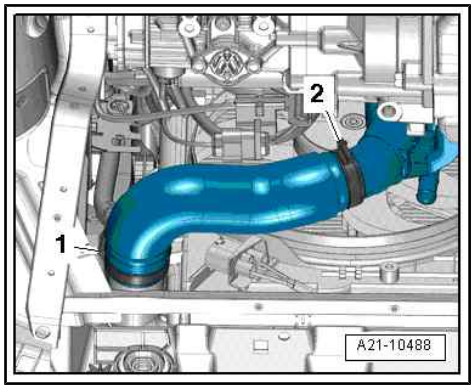
4.4 Removing and installing radiator cowl

Removing

– Remove noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .



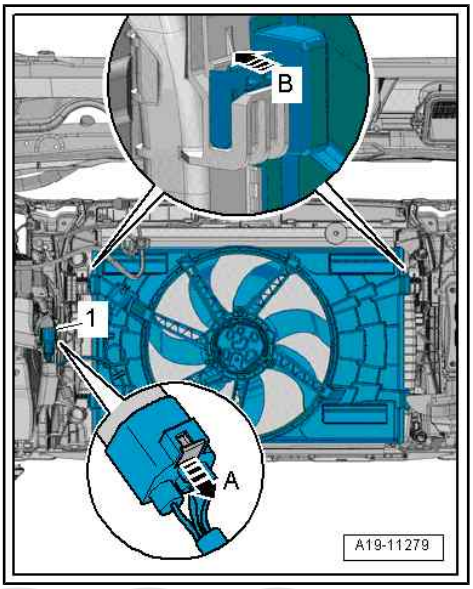
– Release hose clips -1, 2- and remove air hose.



WARNING

Risk of injury as the radiator fan(s) may start up automatically.

- *Unplug electrical connectors before starting to work in the area of radiator cowl.*



– Unplug electrical connector -1- for radiator fan (push retainer in direction of -arrow A- and press release catch down).

– Press locking tabs on left and right sides of radiator cowl simultaneously -arrow B-, lift radiator cowl off radiator and remove from below.

Installing

Install in reverse sequence.

Tightening torques

- ⇒ “4.2 Exploded view - radiator cowl and radiator fans”, page 231
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

4.5 Removing and installing radiator fan - V7-

WARNING

Risk of injury as the radiator fan(s) may start up automatically.

- *Unplug electrical connectors before starting to work in the area of radiator cowl.*

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Removing

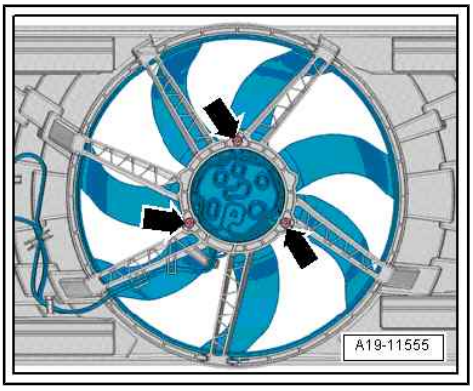
Note

Reinstall all cable ties in the same locations when installing.

– Remove radiator cowl ⇒ page 234 .

– Unplug electrical connector.

– Unscrew bolts -arrows- and remove radiator fan - V7- .



Installing

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

– Install radiator cowl ⇒ page 234 .

Tightening torques

- ⇒ “4.2 Exploded view - radiator cowl and radiator fans”, page 231

21 – Turbocharging/supercharging

1 Turbocharger

⇒ “1.1 Exploded view - turbocharger”, page 236

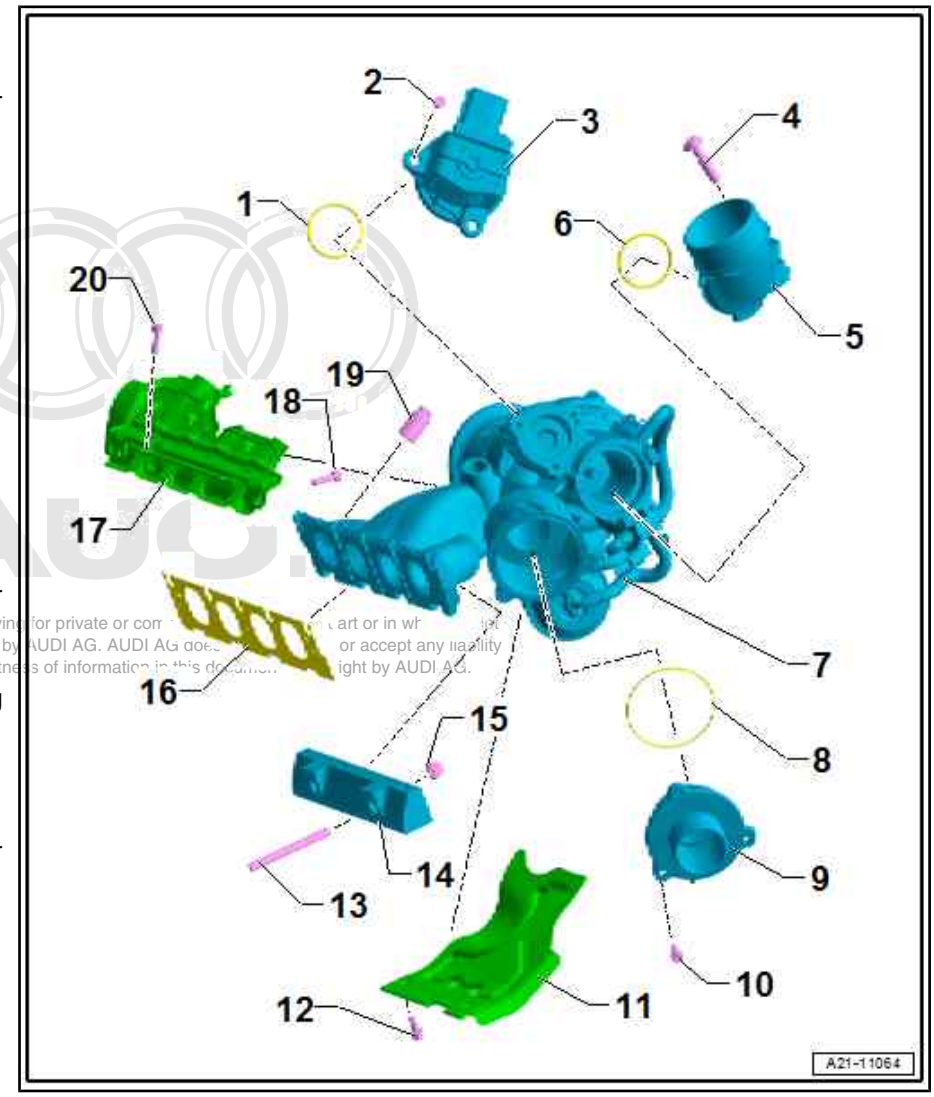
⇒ “1.2 Removing and installing turbocharger”, page 239

1.1 Exploded view - turbocharger

Exploded view - turbocharger, part I ⇒ page 236

Exploded view - turbocharger, part II ⇒ page 237

Exploded view - turbocharger, part I



1 - O-ring
- ❑ Renew after removing
- ❑ Lubricate lightly with engine oil

2 - Bolt
- ❑ 7 Nm

3 - Turbocharger air recirculation valve - N249-
- ❑ Installation position ⇒ page 239

4 - Bolt
- ❑ 9 Nm

5 - Connection

6 - O-ring
- ❑ Renew after removing
- ❑ Lubricate lightly with engine oil

7 - Turbocharger
- ❑ Removing and installing ⇒ page 239

8 - O-ring
- ❑ Renew after removing
- ❑ Lubricate lightly with engine oil

9 - Connection

10 - Bolt
- ❑ 9 Nm

11 - Heat shield

12 - Bolt
- ❑ 9 Nm

13 - Stud

14 - Tensioner

15 - Nut
- ❑ Renew after removing
- ❑ 30 Nm

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16 - Exhaust manifold gasket

- ❑ Removing and installing ⇒ page 239
- ❑ Renew after removing

17 - Heat shield

- ❑

18 - Bolt

- ❑ 9 Nm

19 - Nut

- ❑ Renew after removing
- ❑ Tightening sequence and tightening torque ⇒ page 237

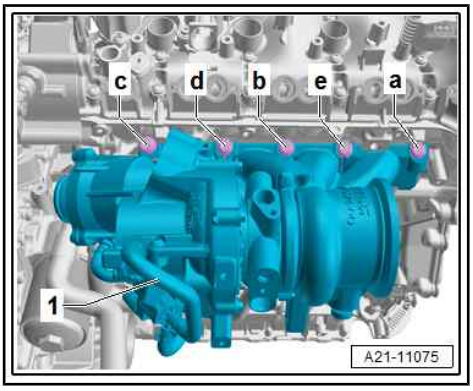
20 - Bolt

- ❑ 9 Nm

Turbocharger - tightening sequence and torque

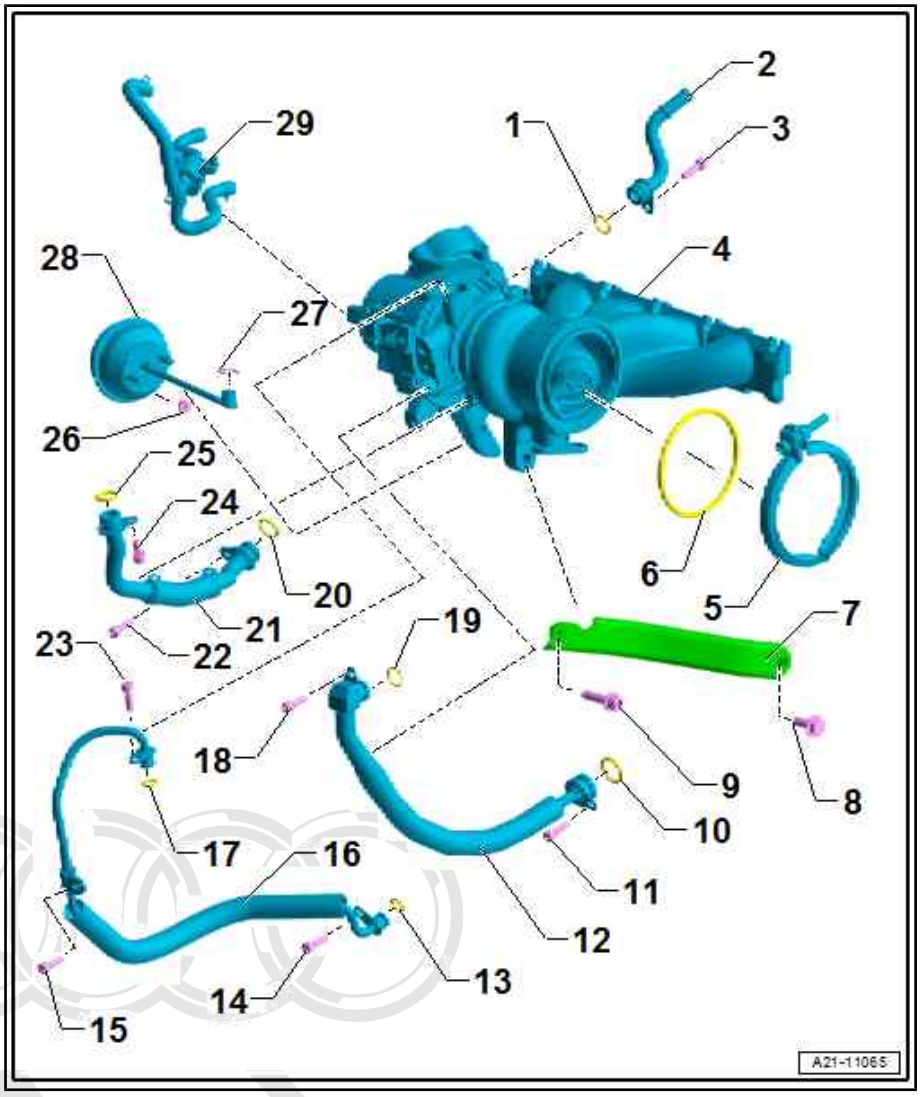
– Tighten bolts in the sequence -a- to -e-.

Stage	Nuts/tightening sequence	Tightening torque/angle specification
1	-a- to -e-	Start thread by hand
2	-a- to -e-	5 Nm
3	-a- to -e-	12 Nm
4	-a- to -e-	16 Nm
5	-a- to -e-	25 Nm



Exploded view - turbocharger, part II

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1 - O-ring
- ❑ Renew after removing
- ❑ Lubricate with coolant

2 - Coolant pipe

3 - Bolt
- ❑ 9 Nm

4 - Turbocharger
- ❑ Removing and installing ⇒ page 239

5 - V-band clamp
- ❑ Renew after removing
- ❑ 15 Nm

6 - O-ring
- ❑ Renew after removing
- ❑ Lubricate lightly with engine oil

7 - Bracket

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

9 - Bolt
- ❑ 30 Nm

10 - O-ring
- ❑ Renew after removing
- ❑ Lubricate with coolant

11 - Bolt
- ❑ 9 Nm

12 - Coolant pipe

13 - O-ring
- ❑ Renew after removing
- ❑ Lubricate lightly with engine oil

14 - Bolt
- ❑ 9 Nm

15 - Bolt
- ❑ 9 Nm

16 - Oil supply line

17 - O-ring
- ❑ Renew after removing
- ❑ Lubricate lightly with engine oil

18 - Bolt
- ❑ 9 Nm

19 - O-ring
- ❑ Renew after removing
- ❑ Lubricate with coolant

20 - O-ring
- ❑ Renew after removing

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- ❑ Lubricate lightly with engine oil

21 - Oil return line

22 - Bolt

- ❑ 9 Nm

23 - Bolt

- ❑ 9 Nm

24 - Bolt

- ❑ 9 Nm

25 - O-ring

- ❑ Renew after removing
- ❑ Lubricate lightly with engine oil

26 - Nut

- ❑ 10 Nm

27 - Retaining clip

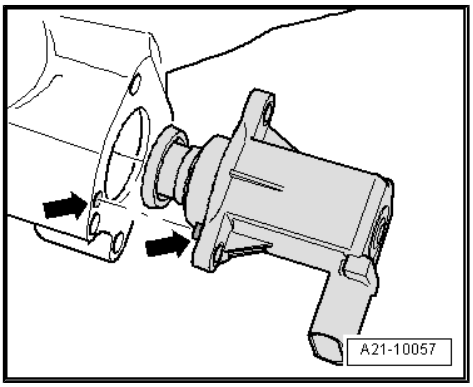
- ❑ Renew after removing

28 - Vacuum unit for turbocharger

29 - Charge pressure control solenoid valve - N75-

Fitting location of turbocharger air recirculation valve - N249-

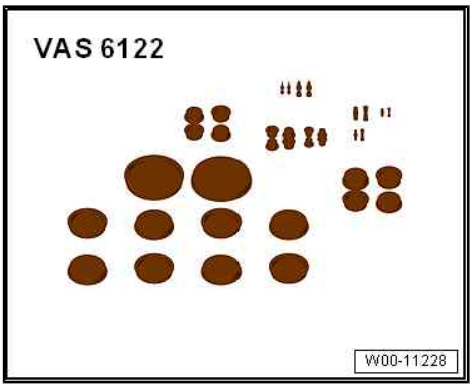
– Note installation position -arrows-.



1.2 Removing and installing turbocharger

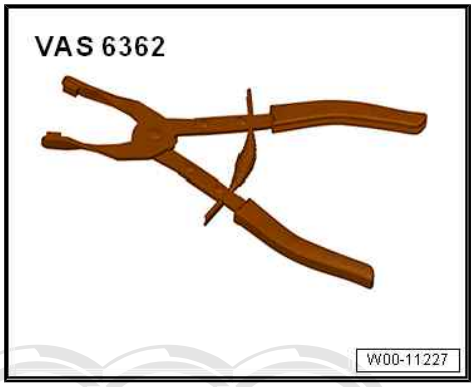
Special tools and workshop equipment required

♦ Engine bung set - VAS 6122-



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♦ Hose clip pliers - VAS 6362-



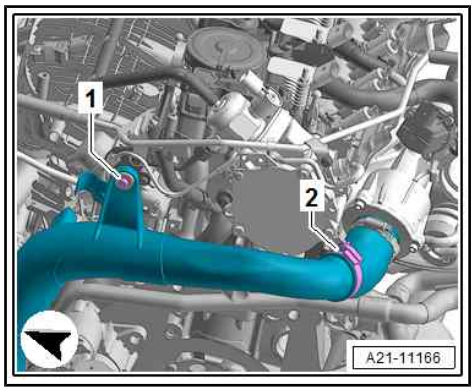
♦ Tensioning strap - T10038-



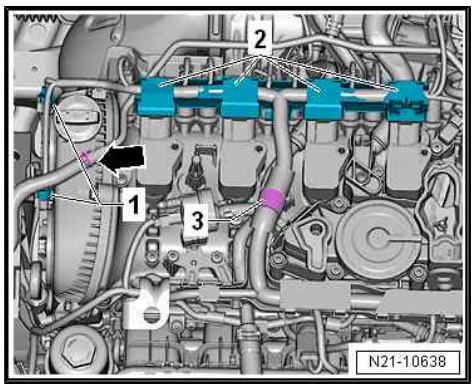
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Removing

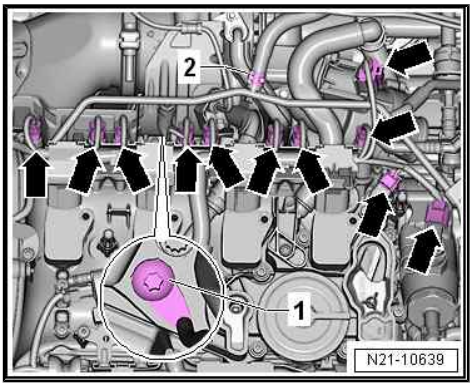
– Drain coolant ⇒ page 198 .
– Remove front exhaust pipe with catalytic converter ⇒ page 302 .
– Remove air cleaner housing with air pipe leading to turbocharger ⇒ page 264 .
– Release hose clip -2-.
– Unscrew bolt -1- and detach air pipe from turbocharger.



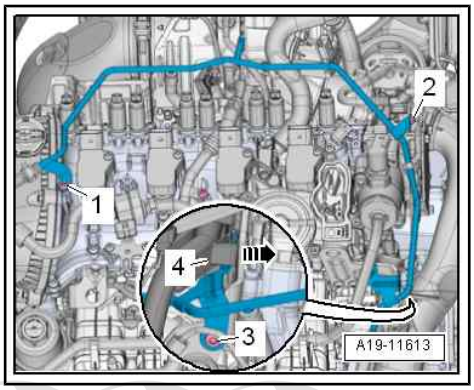
– Disconnect coolant hose -arrow-.
– Unplug connectors -1- and -2-. Release retainer -3-



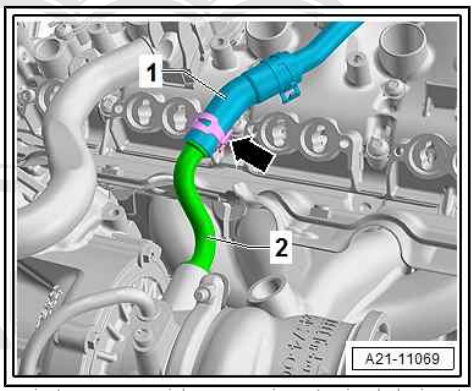
– If fitted, unscrew bolt -1- for earth wire. Disconnect coolant hose -2-.
– Unplug connectors -arrows-.



– Release fastener -arrow- and detach wiring duct -4- upwards from bracket.
– Remove bolts -1, 2 and 3-. Swivel coolant pipe to side.

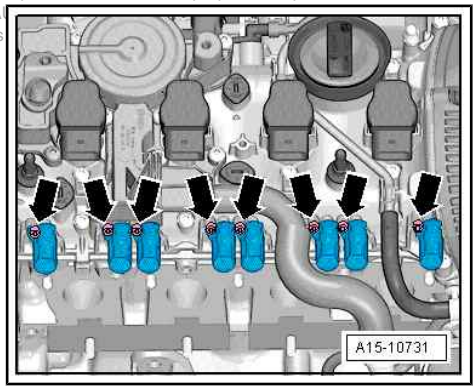


– Release hose clip -arrow- and disconnect coolant hose -1- from coolant line -2-.
– Remove Lambda probe - G39- ⇒ page 293 .

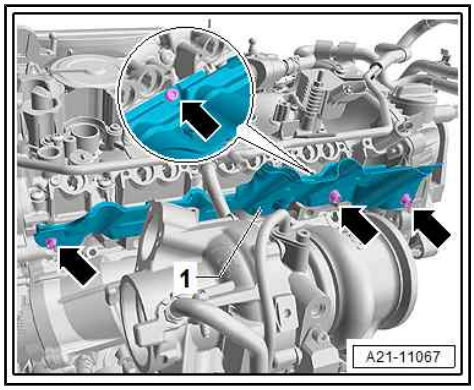


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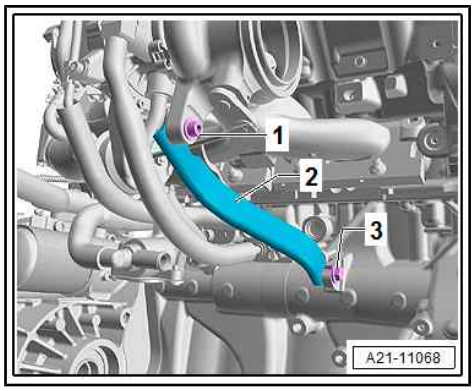
– Remove actuators for camshaft adjustment -arrows-.



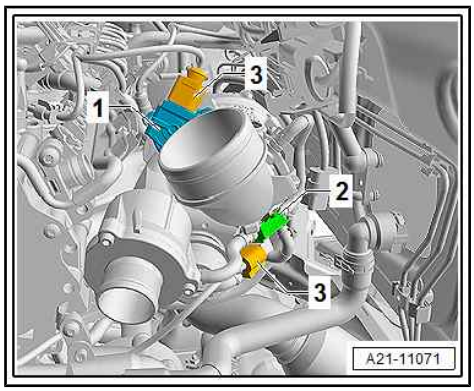
– Remove bolts -arrows- and detach heat shield -1-.



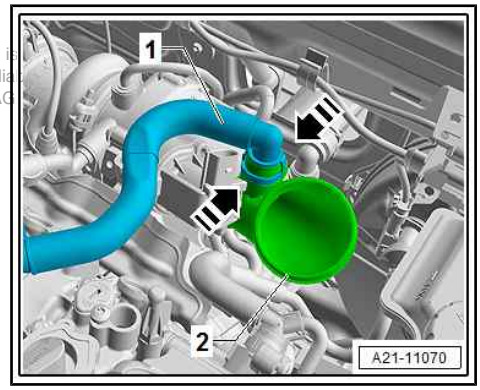
– Remove bolt -1- and loosen bolt -3-.
– Remove bracket -2- for turbocharger.



– Unplug electrical connectors -3- from turbocharger air recirculation valve - N249- -1- and charge pressure control solenoid valve - N75- -2-.

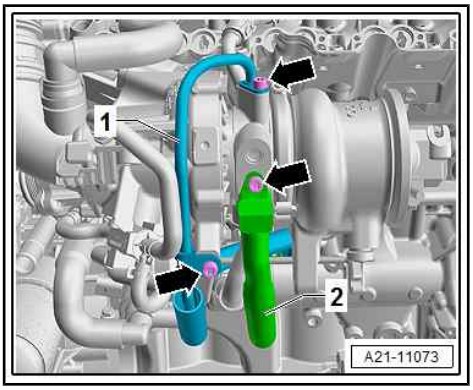


– Press release tabs -arrows- on crankcase breather pipe -1- and disconnect pipe from intake connecting pipe -2-.

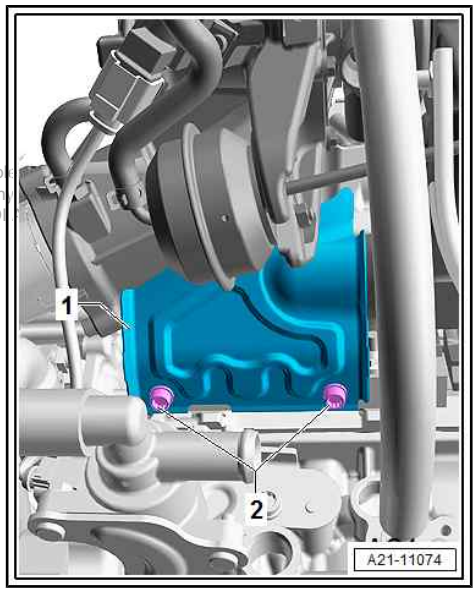


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– Unscrew bolts -arrows- and detach oil supply line -1- and coolant line -2-.



– Remove bolts -2- and detach heat shield -1-.

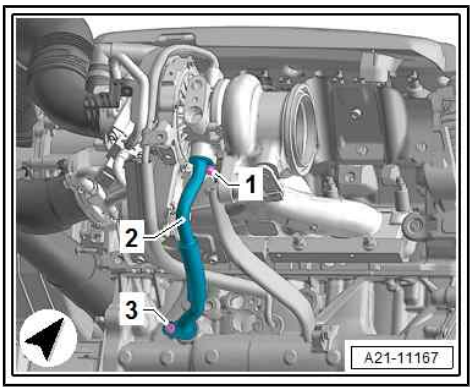


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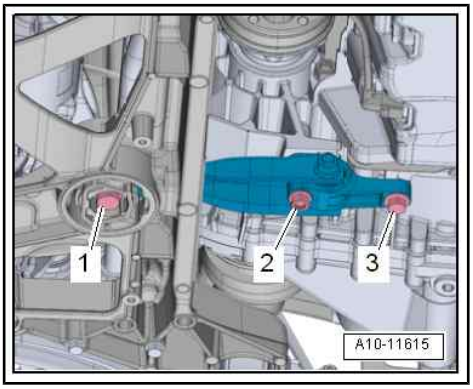
– Unscrew bolts -1- and -3- and detach oil return line -2-.

Note

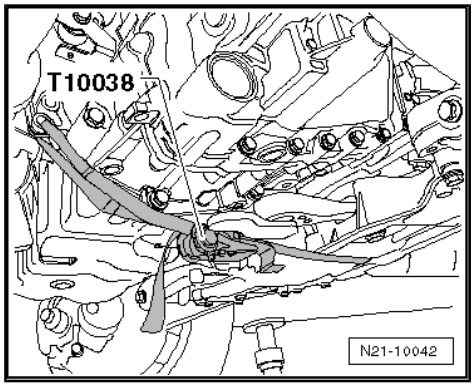
The following step is necessary to create a bit more space between the cylinder head and the bulkhead.



– Remove bolts -1, 2, 3- and remove pendulum support.

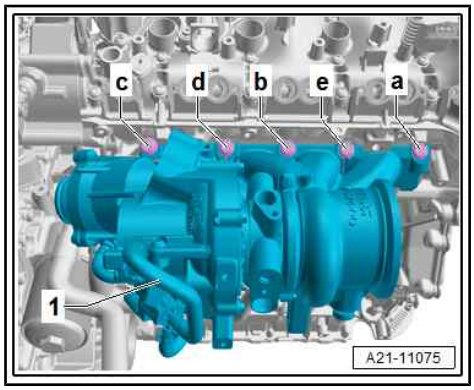


– Pull engine approx. 20 mm towards rear using tensioning strap - T10038- .



– Unscrew nuts -a- to -e-.

– Detach turbocharger -1- from cylinder head and lift it out.



Installing

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

Note

- *Renew gaskets, seals, O-rings and self-locking nuts.*
- *Lubricate studs for turbocharger with high-temperature paste. For high-temperature paste refer to ⇒ Electronic parts catalogue (ETKA) .*
- *Fill turbocharger with engine oil at connection for oil supply line.*
- *Hose connections and charge air system hoses must be free of oil and grease prior to fitting.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue ETKA .*

– Install front exhaust pipe with catalytic converter ⇒ page 302 .

– Align the exhaust system so it is free of stress ⇒ page 298 .

– Fill up with coolant ⇒ page 200 .

– Check oil level.

Note

After installing turbocharger, allow engine to idle for approx. 1 minute and do not rev up immediately to ensure turbocharger is supplied with oil.

Tightening torques

- ⇒ “1.1 Exploded view - turbocharger”, page 236
- ⇒ “3.1 Exploded view - air cleaner housing”, page 263
- ⇒ “8.1 Exploded view - Lambda probe”, page 292

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2 Charge air system

⇒ "2.1 Exploded view - charge air system", page 245

⇒ "2.2 Removing and installing charge air cooler", page 246

⇒ "2.3 Removing and installing charge pressure sender G31 ", page 247

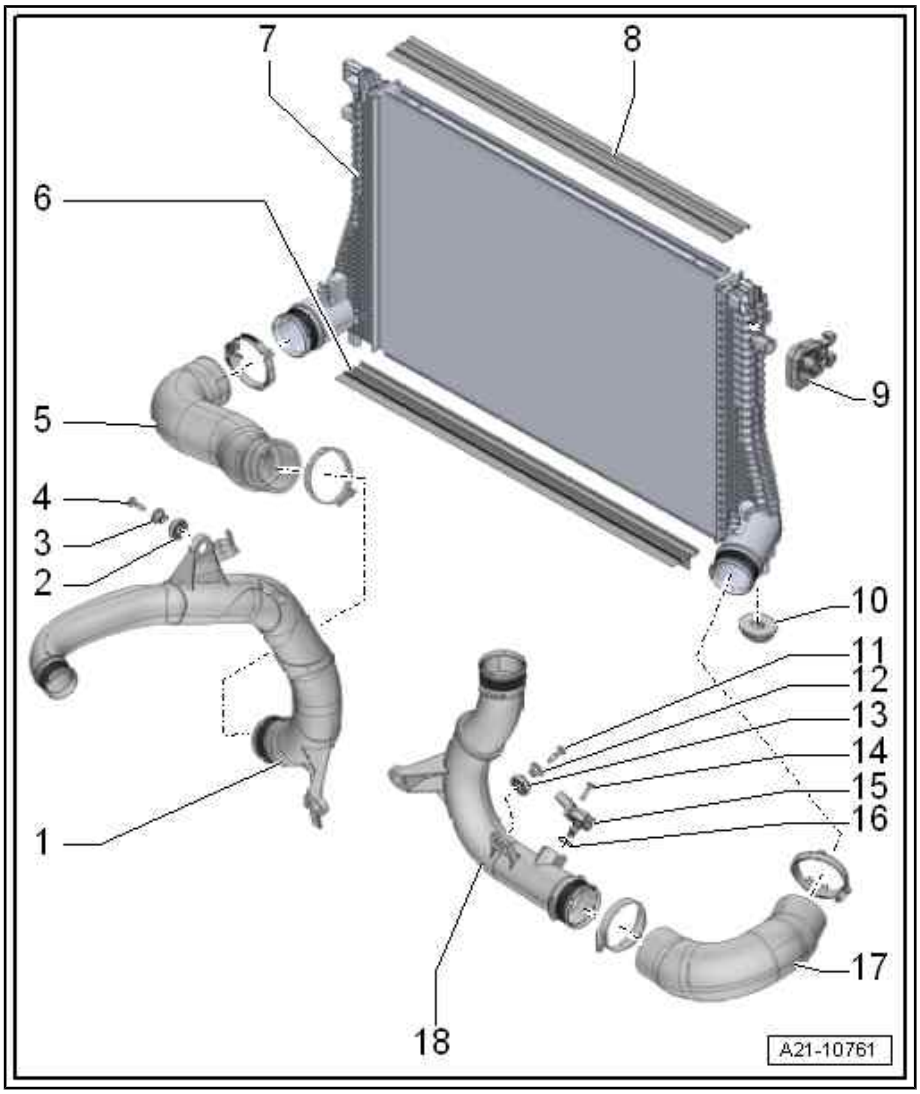
⇒ "2.4 Checking charge air system for leaks", page 248

2.1 Exploded view - charge air system

Note

- *Check that all air pipes, air hoses and vacuum lines are correctly fitted and that there are no leaks before carrying out tests or repairs.*
- *Observe rules for cleanliness ⇒ page 4 .*

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1 - Air pipe

2 - Grommet

3 - Spacer sleeve

4 - Bolt

- ❑ 7 Nm

5 - Air hose

- ❑ Installing ⇒ page 246

6 - Air duct

7 - Charge air cooler

- ❑ Removing and installing ⇒ page 246

8 - Air duct

9 - Rubber mounting

- ❑ For charge air cooler

10 - Rubber bush

- ❑ For charge air cooler

11 - Bolt

- ❑ 7 Nm

12 - Spacer sleeve

13 - Grommet

14 - Bolt

- ❑ 5 Nm

15 - Charge pressure sender - G31-

- ❑ Removing and installing ⇒ page 247

16 - O-ring

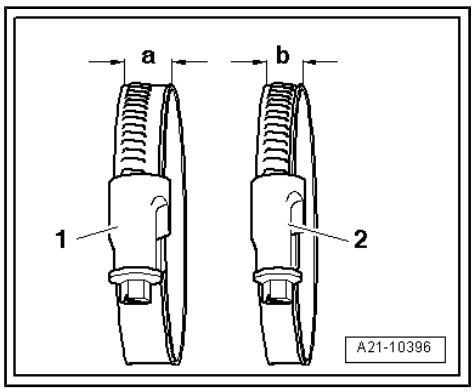
- ❑ Renew after removing

17 - Air hose

- ❑ Installing ⇒ page 246

18 - Air pipe

Installing air ducts with hose clips



Note

- *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- *Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .*
- *To ensure that the charge air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.*

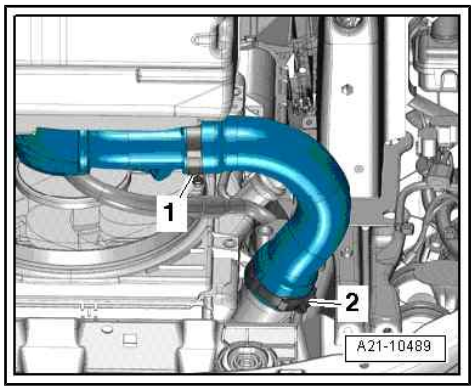
Tightening torque

Hose clips	Tightening torque
1. Hose clip with width -a- = 13 mm	5.5 Nm
2. Hose clip with width -b- = 9 mm	3 Nm

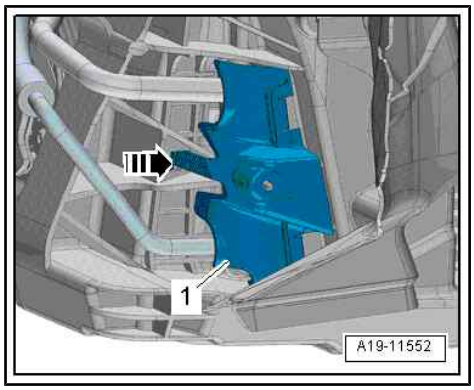
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2.2 Removing and installing charge air cooler

Removing

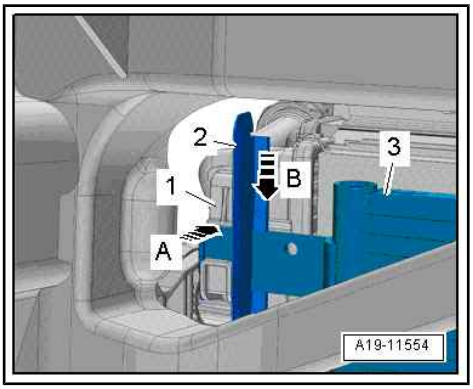


– Remove radiator ⇒ page 232 .
– Release hose clips -1, 2- and remove air hose.
– Seal off open lines and connections with clean plugs from engine bung set - VAS 6122- .



– Release fasteners and detach cover -1- towards front.

– Unclip air duct -2- downwards on both sides -arrow B-.
– Release catches on both sides -arrow A- and disengage condenser -3- from charge air cooler -1-.
– Tie up condenser to lock carrier.
– Detach charge air cooler.



Installing

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

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Note

- *If there are slight impressions on the fins, refer to ⇒ page 5 .*
- *Hose connections and hoses for charge air system must be free of oil and grease prior to fitting.*
- *Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .*
- *To ensure that the charge air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.*

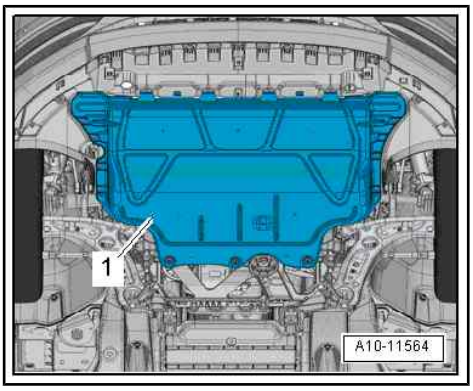
Tightening torques:

- ⇒ “2.1 Exploded view - charge air system”, page 245

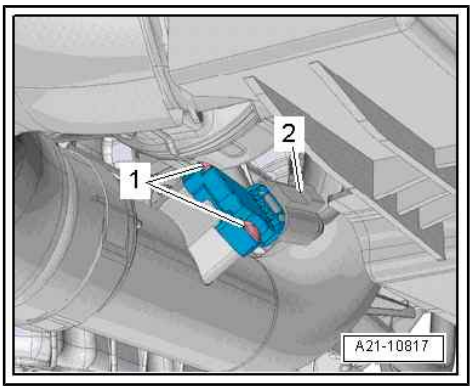
2.3 Removing and installing charge pressure sender - G31-

Removing

– Remove noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .



– Unplug electrical connector -2-.
– Remove bolts -1- and pull charge pressure sender - G31- out of air pipe.



Installing

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

Note

Renew O-ring.

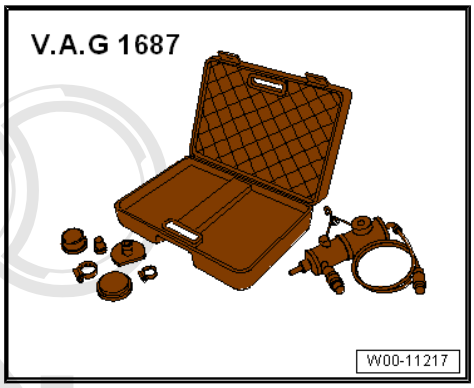
Tightening torques

- ⇒ “2.1 Exploded view - charge air system”, page 245
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

2.4 Checking charge air system for leaks

Special tools and workshop equipment required

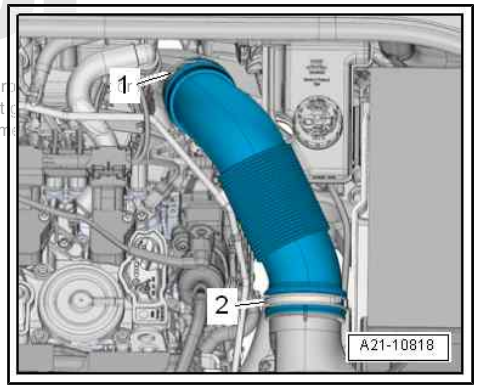
- Charge air system tester - V.A.G 1687-



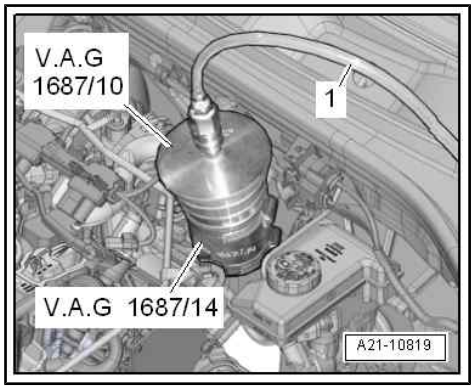
Procedure

– Loosen hose clips -1, 2- and remove air pipe.

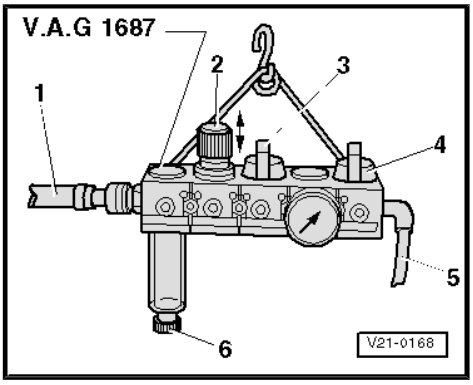
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– Connect adapter - V.A.G 1687/10- with -V.A.G 1687/14- to turbocharger.
– Connect charge air system tester - V.A.G 1687- to adapter.



Prepare charge air system tester - V.A.G 1687- as follows:



– Unscrew pressure control valve -2- completely and close valves -3- and -4-.

Note

Make sure knob is pulled out before turning pressure control valve -2-.

– Using a commercially available connection piece, connect charge air system tester - V.A.G 1687- to compressed air -1-.

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Note

If there is water in sight glass, remove drain plug -6- and drain water.

– Open valve -3-.

Caution

Risk of damage if pressure is set too high.

- ***The pressure must not exceed 0.5 bar.***

– Adjust pressure to 0.5 bar via pressure control valve -2-.

– Open valve -4- and wait until test system is pressurised. If necessary, adjust pressure to 0.5 bar again.

– Check charge air system for audible leaks or leaks that can be felt with the hand; apply commercially available leak detecting spray or use ultrasonic tester - V.A.G 1842- .

Note

- *A small amount of air escapes through the valves and enters the engine. Therefore it is not possible to perform a pressure retention test.*
- *Operation of ultrasonic tester - V.A.G 1842- ⇒ Operating instructions .*
- *Release pressure in test circuit by detaching hose coupling from adapter before removing adapter.*

Assembling

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

– Install air duct with screw-type clip ⇒ page 263 .

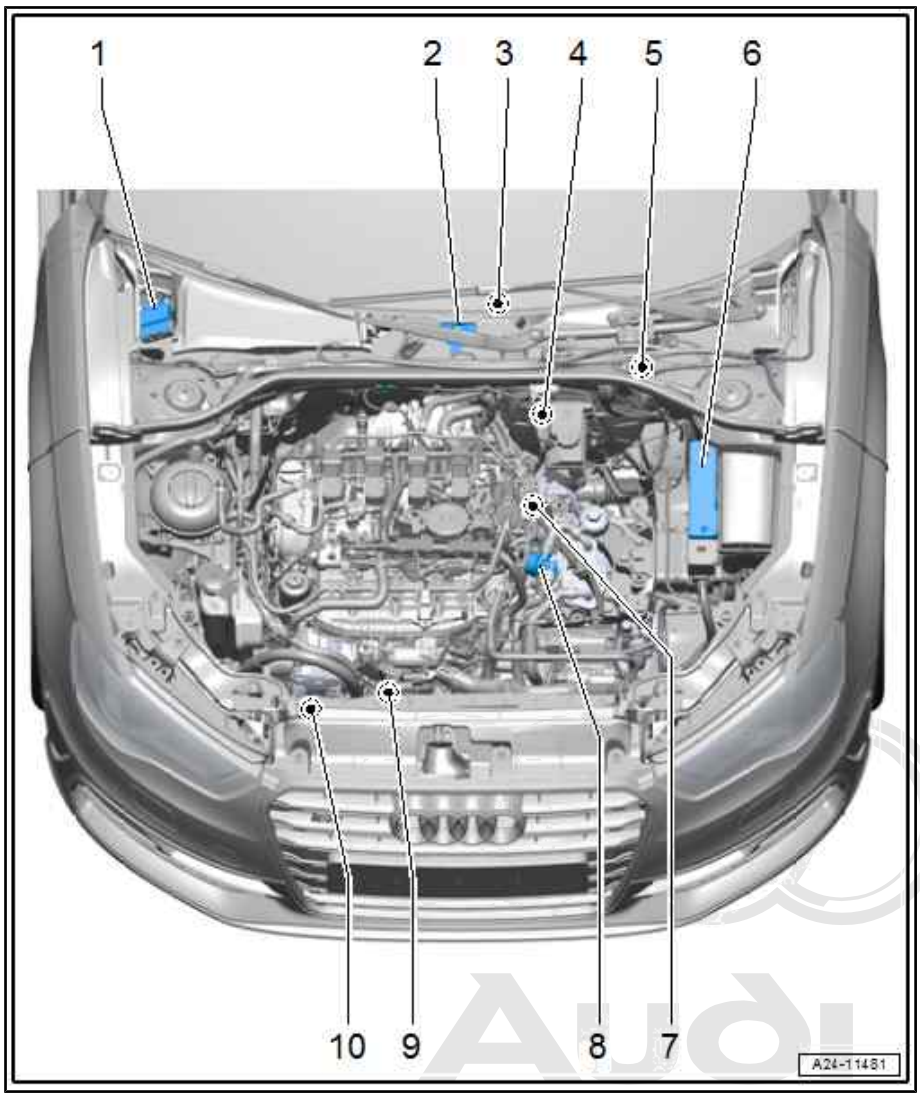
24 – Mixture preparation - injection

1 Injection system

⇒ "1.1 Overview of fitting locations - injection system", page 250

1.1 Overview of fitting locations - injection system

Overview of fitting locations - engine compartment



1 - Control unit for structure-borne sound - J869-

- ❑ Exploded view ⇒ page 275

2 - Actuator for structure-borne sound - R214-

- ❑ Exploded view ⇒ page 275

3 - Accelerator position sender - G79- and accelerator position sender 2 - G185-

- ❑ Fitting location ⇒ page 254

4 - Brake light switch - F- / brake pedal switch - F63-

- ❑ Fitting location ⇒ page 254

5 - Clutch position sender - G476-

- ❑ Only fitted on vehicles with manual gearbox
- ❑ Fitting location ⇒ page 254

6 - Engine control unit - J623-

- ❑ Removing and installing ⇒ page 282

7 - Coolant shut-off valve - N82-

- ❑ Not fitted

8 - Coolant valve for gearbox - N488-

9 - Charge pressure sender - G31-

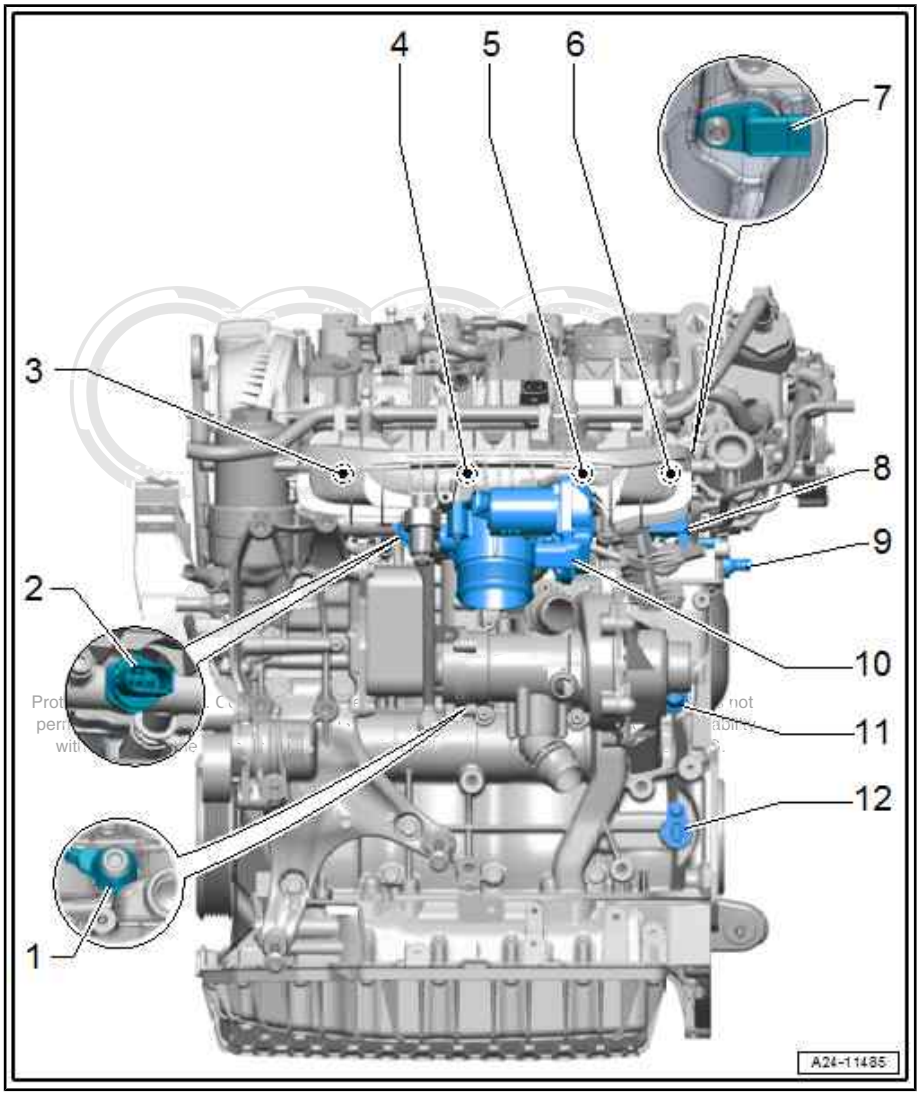
- ❑ Fitting location ⇒ page 255
- ❑ Exploded view ⇒ page 245

10 - Radiator outlet coolant temperature sender - G83-

- ❑ Fitting location ⇒ page 255
- ❑ Exploded view ⇒ page 210

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Overview of fitting locations - engine (view from front)



1 - Knock sensor 1 - G61-

- ❑ Exploded view ⇒ page 305

2 - Fuel pressure sender - G247-

- ❑ Exploded view ⇒ page 256

3 - Injector, cylinder 1 - N30-

- ❑ Fitting location ⇒ page 255
- ❑ Exploded view ⇒ page 256

4 - Injector, cylinder 2 - N31-

- ❑ Fitting location ⇒ page 255
- ❑ Exploded view ⇒ page 256

5 - Injector, cylinder 3 - N32-

- ❑ Fitting location ⇒ page 255
- ❑ Exploded view ⇒ page 256

6 - Injector, cylinder 4 - N33-

- ❑ Fitting location ⇒ page 255
- ❑ Exploded view ⇒ page 256

7 - Hall sender - G40-

- ❑ Exploded view ⇒ page 305

8 - Intake manifold flap valve - N316-

- ❑ Exploded view ⇒ page 265

9 - Coolant temperature sender - G62-

- ❑ Exploded view ⇒ page 210

10 - Throttle valve module - J338-

- ❑ With throttle valve drive for electric throttle - G186- , throttle valve drive angle sender - G187- and throttle valve drive angle sender 2 - G188-

11 - Stage 3 oil pressure switch - F447-

- ❑ Exploded view ⇒ page 186

12 - Engine speed sender - G28-

- ❑ Exploded view ⇒ page 305

Overview of fitting locations - engine (view from right side)

1 - Lambda probe after catalytic converter - G130- with Lambda probe 1 heater after catalytic converter - Z29-

- ❑ Exploded view ⇒ page 292

2 - Lambda probe - G39- with Lambda probe heater - Z19-

- ❑ Exploded view ⇒ page 292

3 - Exhaust camshaft control valve 1 - N318-

4 - Camshaft control valve 1 - N205-

5 - Oil pressure switch - F22-

- ❑ Exploded view ⇒ page 186

6 - Oil pressure switch for reduced oil pressure - F378-

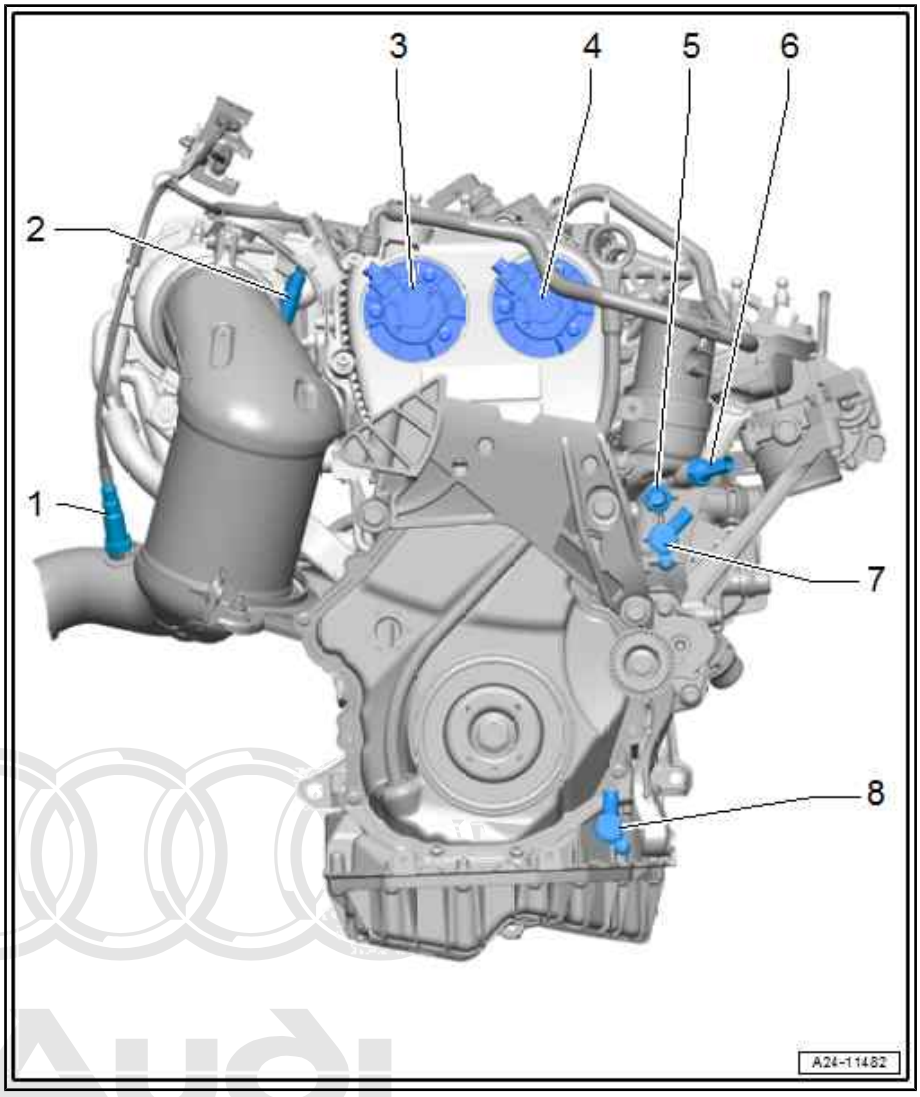
- ❑ Exploded view ⇒ page 186

7 - Piston cooling jet control valve - N522-

- ❑ Exploded view ⇒ page 186

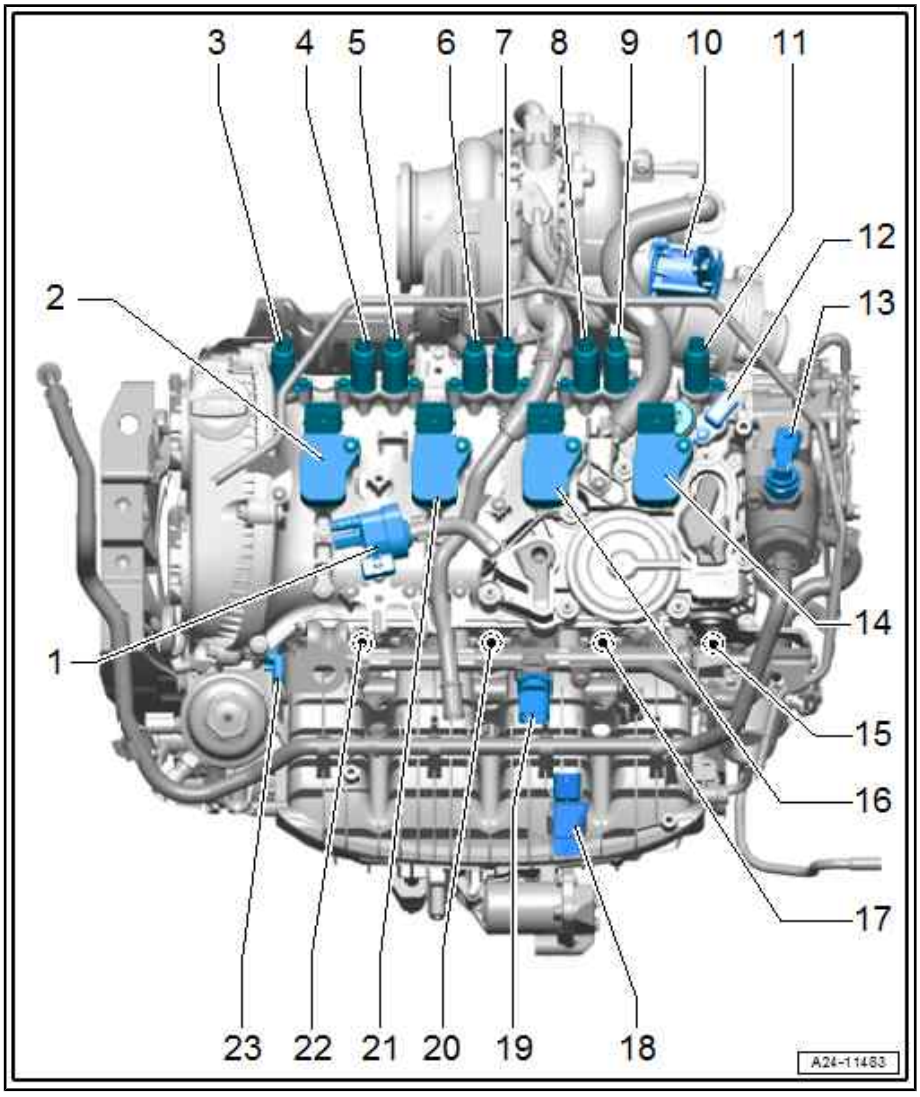
8 - Valve for oil pressure control - N428-

- ❑ Exploded view ⇒ page 186



Overview of fitting locations - engine (view from above)

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1 - Activated charcoal filter solenoid valve 1 - N80-

2 - Ignition coil 1 with output stage - N70-

- ❑ Exploded view ⇒ page 305

3 - Actuator 1 for camshaft adjustment - F366-

4 - Actuator 2 for camshaft adjustment - F367-

5 - Actuator 3 for camshaft adjustment - F368-

6 - Actuator 4 for camshaft adjustment - F369-

7 - Actuator 5 for camshaft adjustment - F370-

8 - Actuator 6 for camshaft adjustment - F371-

9 - Actuator 7 for camshaft adjustment - F372-

10 - Turbocharger air recirculation valve - N249-

- ❑ Exploded view ⇒ page 236

11 - Actuator 8 for camshaft adjustment - F373-

12 - Hall sender 3 - G300-

- ❑ Exploded view ⇒ page 305

13 - Fuel metering valve - N290- or fuel pressure regulating valve - N276-

- ❑ Fuel metering valve - N290- or fuel pressure regulating valve - N276- may be fitted, depending on version
- ❑ Integrated in high-pressure pump

14 - Ignition coil 4 with output stage - N292-

- ❑ Exploded view ⇒ page 305

15 - Injector 2, cylinder 4 - N535-

- ❑ Not fitted

16 - Ignition coil 3 with output stage - N291-

- ❑ Exploded view ⇒ page 305

17 - Injector 2, cylinder 3 - N534-

- ❑ Not fitted

18 - Intake air temperature sender - G42- / intake manifold pressure sender - G71-

- ❑ Exploded view ⇒ page 265

19 - Fuel pressure sender for low pressure - G410-

- ❑ Not fitted

20 - Injector 2, cylinder 2 - N533-

- ❑ Not fitted

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21 - Ignition coil 2 with output stage - N127-

22 - Injector 2, cylinder 1 - N532-

- ❑ Not fitted

23 - Intake manifold flap potentiometer - G336-

- ❑ Exploded view ⇒ page 265

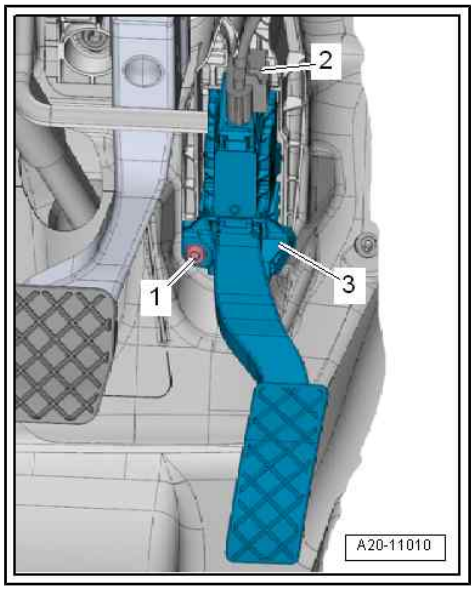
Fitting location of accelerator position sender - G79- / accelerator position sender 2 - G185-

2 - Electrical connector for accelerator pedal module

Note

The accelerator position sender - G79- and accelerator position sender 2 - G185- are integrated in the accelerator pedal module and cannot be renewed individually.

Removing and installing ⇒ Rep. gr. 20 ; Accelerator mechanism; Exploded view - accelerator pedal module



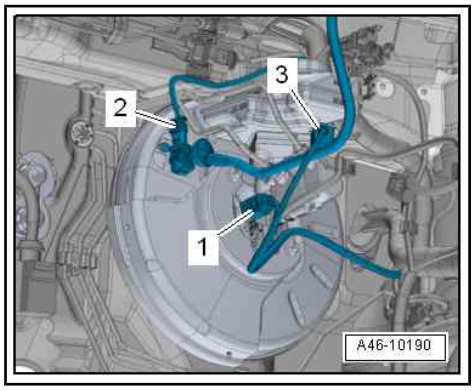
Fitting location of brake light switch - F- / brake pedal switch - F63- and vacuum sender - G608-

1 - Brake light switch - F- / brake pedal switch - F63-

2 - Vacuum sender - G608-

♦ On brake servo in engine compartment

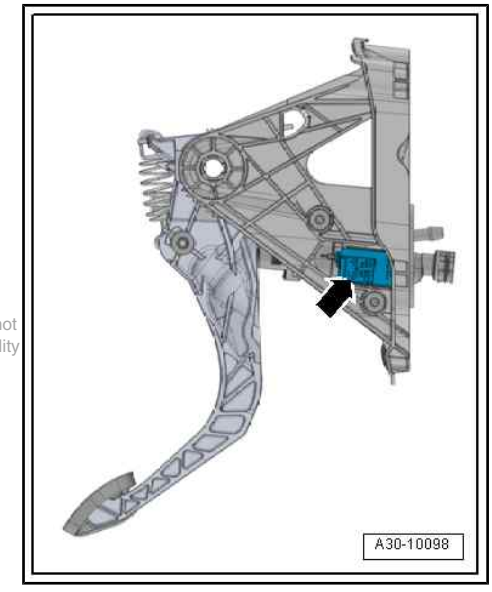
Removing and installing brake light switch - F- / brake pedal switch - F63- ⇒ Brake system; Rep. gr. 45 ; Overview of fitting locations; Overview of fitting locations - ABS/ESP .



Fitting location of clutch position sender - G476- -2-

- On mounting bracket for clutch pedal -arrow-

Removing and installing ⇒ Rep. gr. 30 ; Clutch mechanism; Removing and installing clutch position sender - G476-



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Fitting locations of injectors

1 - Injector, cylinder 1 - N30-

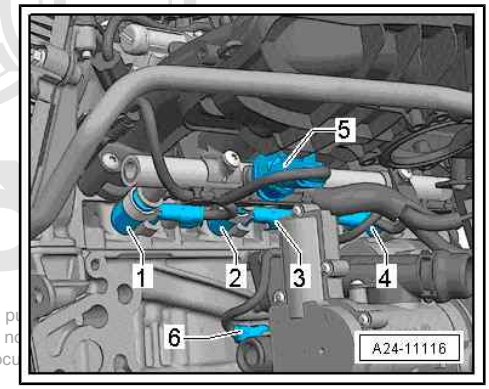
2 - Injector, cylinder 2 - N31-

3 - Injector, cylinder 3 - N32-

4 - Injector, cylinder 4 - N33-

5 - Fuel pressure sender - G247-

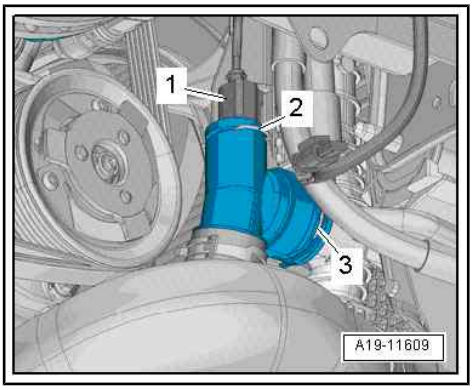
6 - Knock sensor 1 - G61-



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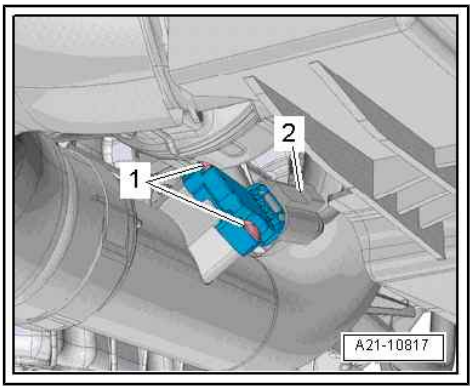
Fitting location of radiator outlet coolant temperature sender - G83-

- -Item 3- in coolant hose (bottom right)



Fitting location of charge pressure sender - G31-

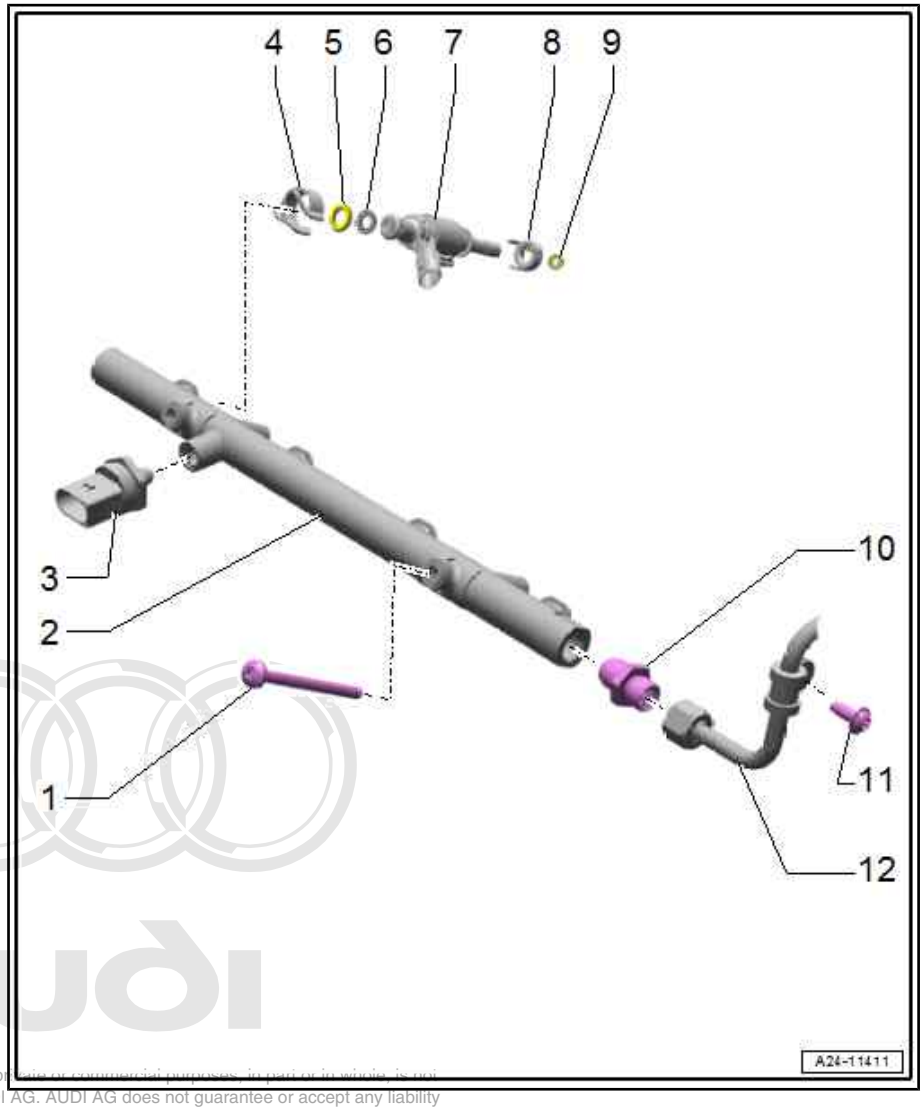
- In air pipe (front) on engine



2 Injectors

⇒ “2.1 Exploded view - fuel rail with injectors”, page 256
⇒ “2.2 Removing and installing fuel rail”, page 257
⇒ “2.3 Removing and installing injectors”, page 258
⇒ “2.4 Renewing seals on injector”, page 260
⇒ “2.5 Cleaning injectors”, page 261

2.1 Exploded view - fuel rail with injectors



1 - Bolt
- ❑ 9 Nm

2 - Fuel rail
- ❑ Removing and installing ⇒ page 257

3 - Fuel pressure sender - G247-
- ❑ Lubricate taper lightly with clean engine oil; do not lubricate thread
- ❑ Removing and installing ⇒ page 276
- ❑ 22 Nm

4 - Support ring
- ❑ Renew after removing

5 - O-ring
- ❑ Renew after removing

6 - Spacer ring
- ❑ Renew after removing

7 - Injector
- ❑ Ensure correct installation position.
- ❑ Removing and installing ⇒ page 258

8 - Sealing element

9 - Combustion chamber ring seal
- ❑ Renewing after injector has been removed ⇒ page 258

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10 - Connecting piece
- ❑ For high-pressure pipe on fuel rail
- ❑ Renew after removing
- ❑ Lubricate threads lightly with clean engine oil
- ❑ 40 Nm

11 - Bolt
- ❑ 5 Nm

12 - High-pressure pipe
- ❑ Lubricate ball lightly with clean engine oil

❑ 20 Nm

2.2 Removing and installing fuel rail

Removing

Note

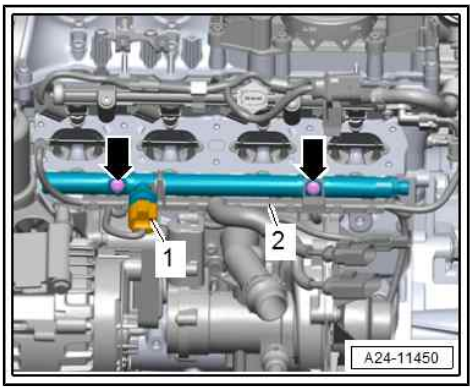
Re-install all cable ties in the same locations when installing.

– Remove intake manifold ⇒ page 266 .

– Unplug electrical connector -1- at fuel pressure sender - G247- .

– Remove bolts -arrows-.

– Move wiring duct -2- clear of fuel rail and detach fuel rail from injectors.



Note

Unplug electrical connectors of any injectors that remained lodged in fuel rail.

Installing

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

– Install intake manifold ⇒ page 266 .

Tightening torques

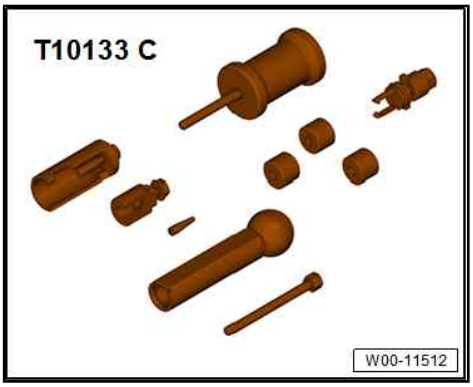
◆ ⇒ “2.1 Exploded view - fuel rail with injectors”, page 256

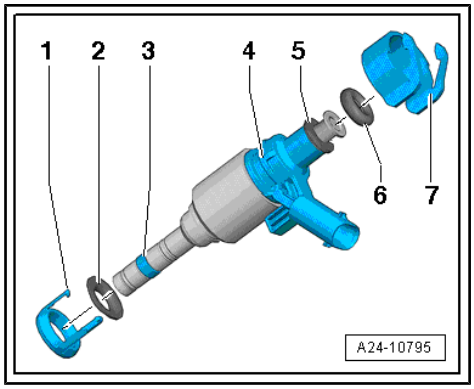
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2.3 Removing and installing injectors

Special tools and workshop equipment required

- Tool set for FSI engines - T10133 C-





Exploded view - injector

1 - Intermediate ring (renew)

2 - Retainer (renew)

3 - Combustion chamber ring seal (teflon ring seal) - renew; when fitting, do not grease ring or use any other lubricant.

4 - Injector

5 - Spacer ring (renew)

6 - O-ring - renew (apply thin coating of clean engine oil prior to installation)

7 - Support ring - renew (via this support ring, fuel rail exerts force which secures injector in cylinder head)

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Removing

Note

Injectors must only be installed when the engine is cold.

– Remove intake manifold ⇒ page 266 .

– Remove fuel rail ⇒ page 257 .

Removing injectors (from fuel rail)

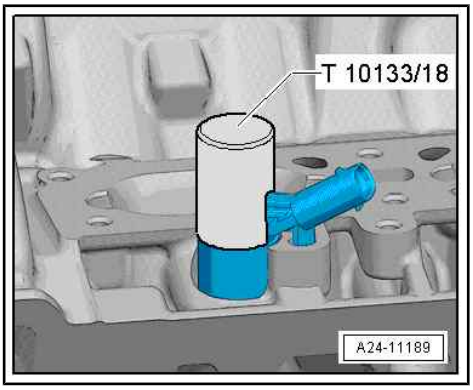
Carefully pull injectors out of fuel rail.

Removing injectors (from cylinder head)

– Cover open inlet ports with a clean cloth.

– Unplug electrical connector on injector that is to be removed.

– Slide sleeve -T10133/18- over injector.

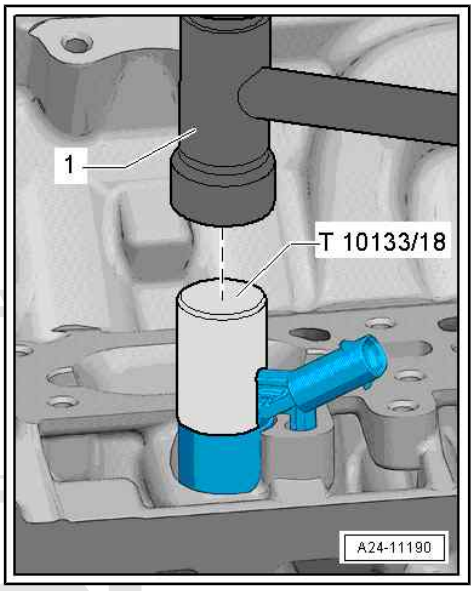


– Carefully knock against stop sleeve several times to loosen injector.

Note

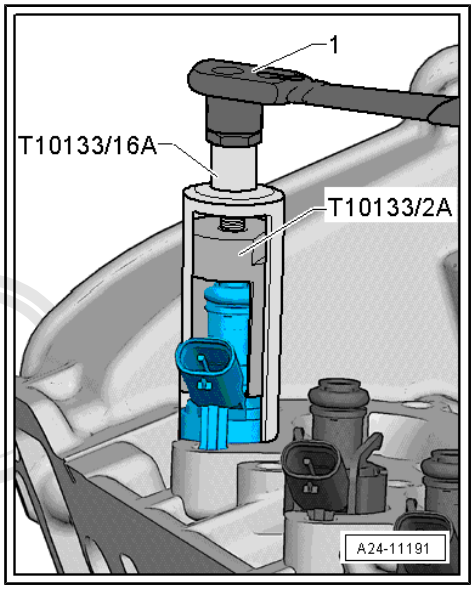
Use a torque wrench to pull out injector.

– Set torque wrench to 5 Nm.



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– Fit puller -T10133/2A- into groove on injector.
– Then fit guide 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 tool and repeat procedure using stop sleeve to loosen injector.



Note

- *Observe correct torque to avoid irreparable damage to injector.*
- *Always renew combustion chamber ring seal before re-installing injector ⇒ page 260 .*

– Renew combustion chamber ring seal and install injector ⇒ page 260 .

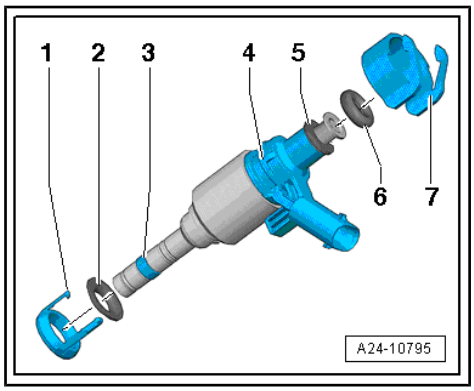
2.4 Renewing seals on injector

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Note

- *The following procedure is for the combustion chamber ring seal (teflon seal)*
- *Always the renew combustion chamber ring seal before re-installing the injector.*

– Carefully remove old combustion chamber ring seal -3- using suitable tools (e.g. cut open seal using a razor blade, or prise open seal with small screwdriver and then pull off forwards). It is important to ensure that the groove and the continuous ridge in the bottom of the groove are not damaged.

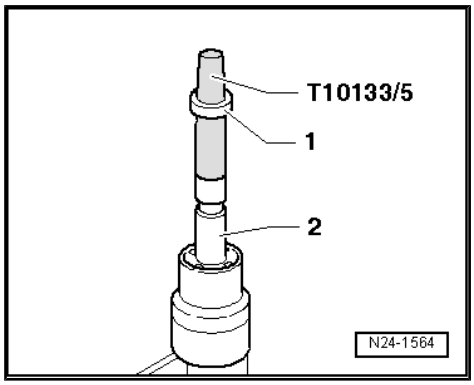


Note

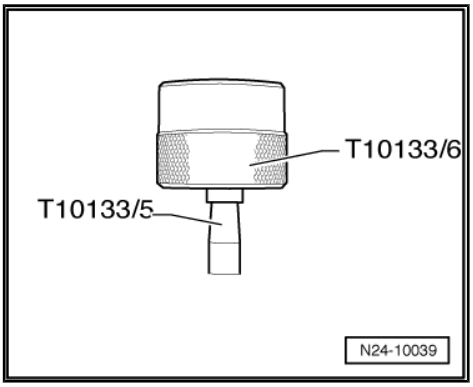
The injector must be renewed if the groove is damaged.

– Before new combustion chamber ring seal is fitted, any combustion residue must be removed from ring groove and injector stem using a clean cloth.

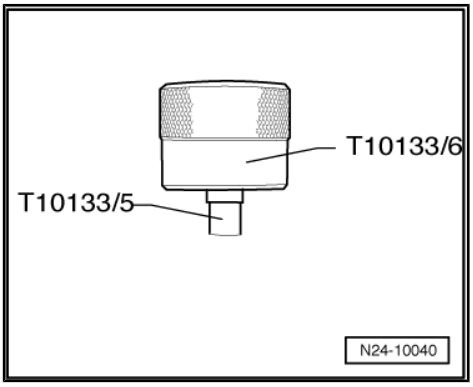
– Fit assembly cone -T10133/5- with new combustion chamber ring seal -1- onto injector -2-.



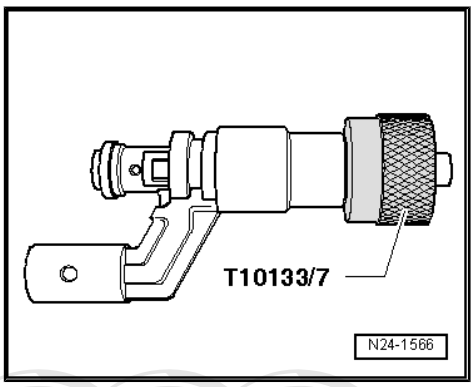
– Using assembly sleeve -T10133/6- , push combustion chamber ring seal onto assembly cone -T10133/5- as far as it will go.



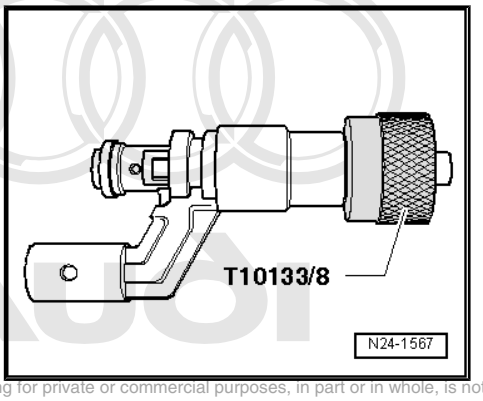
– Turn round assembly sleeve - T10133/6- and push combustion chamber ring seal up to end of assembly cone - T10133/5- .
– Remove assembly cone - T10133/5- and push combustion chamber ring seal into sealing ring groove using assembly sleeve - T10133/6- .



– 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.
– Renew O-ring on injector (apply thin coating of clean engine oil prior to installation).



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2.5 Cleaning injectors

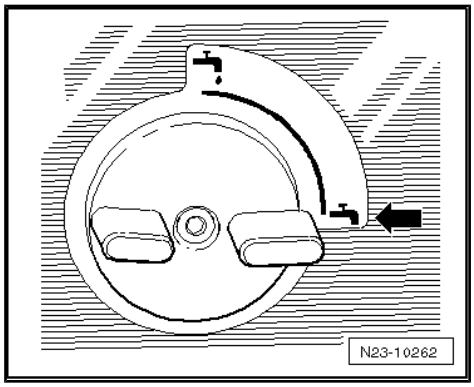
Special tools and workshop equipment required

- Ultrasonic cleaning unit - VAS 6418-
- Mounting for fuel injectors - VAS 6418/1-
- Cleaning fluid - VAS 6418/2-

Cleaning

– Close drain tap -arrow- on ultrasonic cleaning unit - VAS 6418- (located on right side of housing).

– Fill ultrasonic unit with 2,120 ml of water which has been allowed to settle for a few minutes and cleaning fluid - VAS 6418/2- .

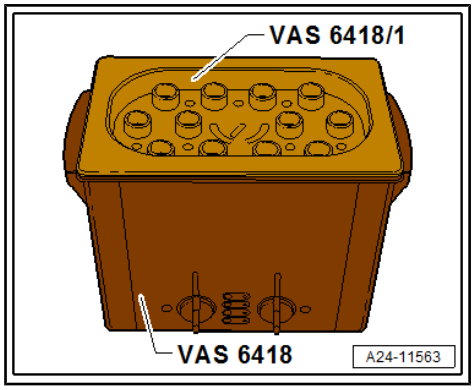


Mixture ratio for cleaning fluid

- 2,100 ml of tap water which has been allowed to settle for a few minutes and 20 ml of cleaning fluid - VAS 6418/2-

– Remove injectors ⇒ page 258 .

– Place mounting plate for injection modules - VAS 6418/1- on top of cleaning unit.



WARNING

It is important to read the safety notes in the operating instructions before switching on the ultrasonic cleaning unit - VAS 6418- .

The ideal fluid level is approx. 1-4 mm above the base of the mounting plate. The ultrasonic cleaning unit - VAS 6418- can be damaged if the fluid level is too low.

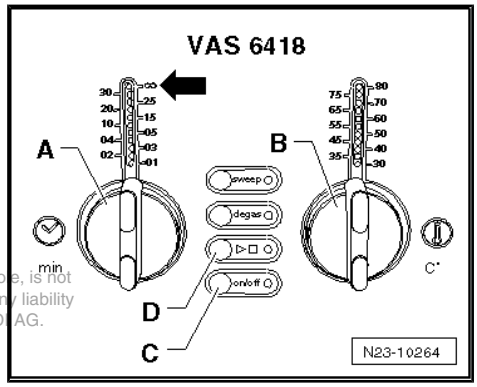
– Insert injectors all the way into guides of mounting plate for injection modules - VAS 6418/1- .

– Switch on cleaning unit by pressing on/off button -C-.

– Select a cleaning time of 30 minutes with rotary control -A-.

– Set rotary control -B- to a temperature of 50°C.

– Press ▶ button -D- to start cleaning procedure.



Note

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- *The temperature-controlled cleaning process is now started. While the fluid is being heated, the ultrasound is activated at intervals in order to circulate the cleaning solution. The ultrasound is activated continuously when the preselected temperature is reached.*
- *The actual cleaning process commences when the temperature reaches at least 50 °C and must last for at least 30 minutes.*

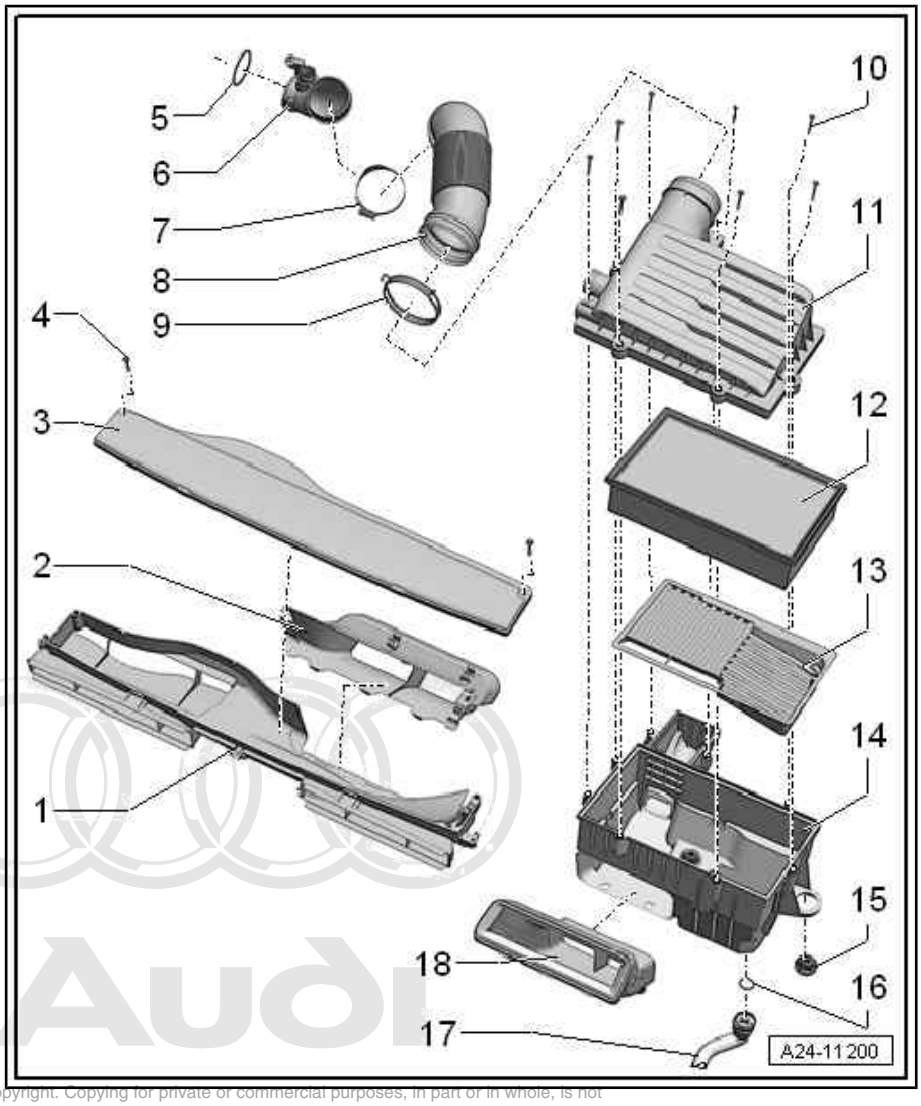
– Install injectors with new combustion chamber seals ⇒ page 260 .

3 Air cleaner

⇒ “3.1 Exploded view - air cleaner housing”, page 263

⇒ “3.2 Removing and installing air cleaner housing”, page 264

3.1 Exploded view - air cleaner housing



1 - Air duct (bottom section)
- ❑ On lock carrier

2 - Air duct (top section)
- ❑ On lock carrier

3 - Cover
- ❑ For air duct

4 - Bolt
- ❑ 2 Nm

5 - Seal

6 - Air hose

7 - Screw-type clip

8 - Air hose

9 - Spring-type clip

10 - Bolts
- ❑ 1.5 Nm

11 - Air cleaner (top section)
- ❑ Remove any salt residue, dirt and leaves

12 - Air filter element
- ❑ Use genuine air filter element ⇒ Electronic parts catalogue
- ❑ Change intervals ⇒ Maintenance tables
- ❑ Removing and installing ⇒ Maintenance ; Booklet 821

13 - Insert
- ❑ For air cleaner (bottom section)

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14 - Air cleaner (bottom section)
- ❑ Remove any salt residue, dirt and leaves

15 - Rubber buffer

16 - O-ring
- ❑ Renew if damaged

17 - Water drain hose
- ❑ With valve
- ❑ Clean

18 - Air duct
- ❑ On air cleaner (bottom section)

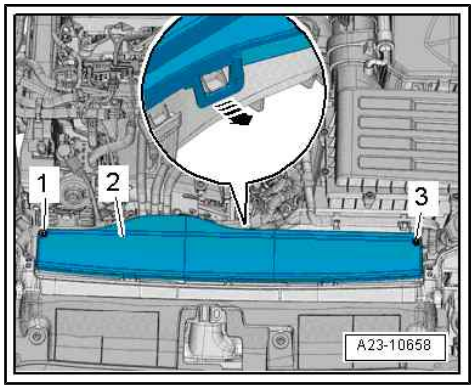
3.2 Removing and installing air cleaner housing

Removing

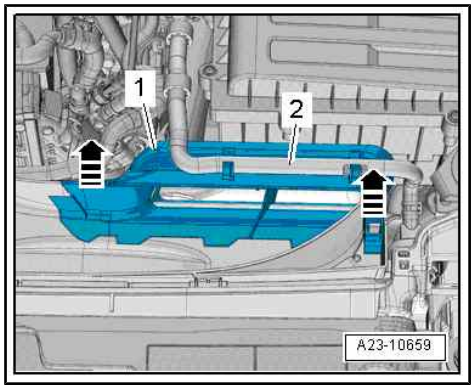
– Remove bolts -1, 3-.

– Release catch -arrow- and detach cover -2-.

– Move coolant hose -2- clear.



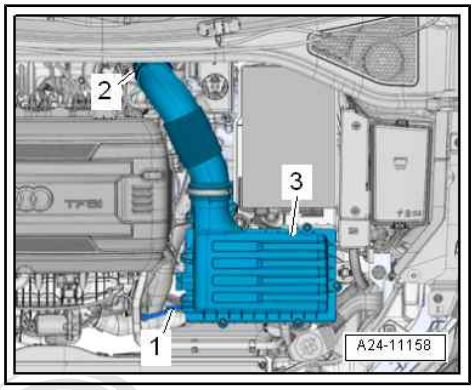
– Release fasteners -arrows- and detach air guide (top section) -1-.



– Disconnect vacuum hose -1-.

– Release hose clip -2- and detach air hose.

– Detach air cleaner housing -3- from retaining pins and remove.



Installing

Note

- *Use a silicone-free lubricant when installing the air hose.*
- *Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .*

– Check for salt residue, dirt and leaves in air hose (engine intake side).

– Check for dirt in intake duct leading to air filter element.

– Install air cleaner housing.

Note

The water drain hose must be routed straight downwards without kinks.

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4 Intake manifold

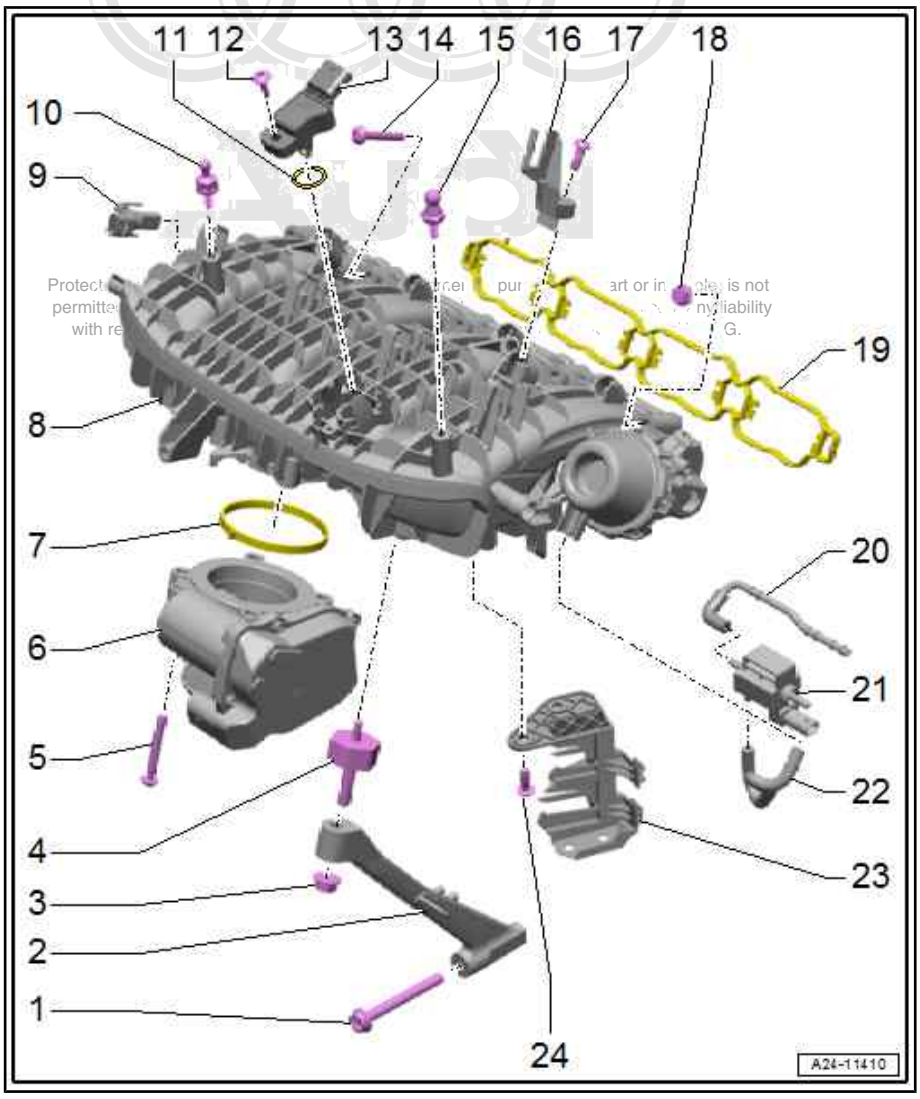
⇒ “4.1 Exploded view - intake manifold”, page 265

⇒ “4.2 Removing and installing intake manifold”, page 266

⇒ “4.3 Removing and installing throttle valve module J338 ”, page 270

⇒ “4.4 Cleaning throttle valve module J338 ”, page 273

4.1 Exploded view - intake manifold



1 - Bolt

- ❑ 20 Nm

2 - Support for intake manifold

3 - Nut

- ❑ 10 Nm

4 - Bonded rubber bush

- ❑ 5 Nm

5 - Bolt

- ❑ 7 Nm

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-
- ❑ Throttle valve module - J338- must be re-adapted to engine control unit - J623- after removal and installation or if it has been renewed. Refer to “Guided Functions” (use vehicle diagnostic tester)

7 - Seal

- ❑ Renew after removing

8 - Intake manifold

- ❑ Removing and installing ⇒ page 266

9 - Intake manifold flap potentiometer - G336-

10 - Ball stud

- ❑ For engine cover panel
- ❑ 5 Nm

11 - O-ring

- ❑ Renew after removing

12 - Bolt

- ❑ 1.5 Nm

13 - Intake manifold sender - GX9-

- ❑ Comprises intake air temperature sender - G42- and intake manifold pressure sender - G71-
- ❑ Removing and installing ⇒ page 281

14 - Bolt

- ❑ Tighten in several stages and in diagonal sequence
- ❑ 9 Nm

15 - Ball stud

- ❑ For engine cover panel
- ❑ 5 Nm

16 - Bracket

- ❑ For electrical connector

17 - Bolt

- ❑ 5 Nm

18 - Nut

- ❑ Tighten in several stages and in diagonal sequence
- ❑ 9 Nm

19 - Gasket

- ❑ Renew after removing

20 - Vacuum hose

21 - Intake manifold flap valve - N316-

22 - Vacuum hose

23 - Bracket

- ❑ For electrical connectors

24 - Bolt

- ❑ 5 Nm

4.2 Removing and installing intake manifold

Note

After intake manifold has been removed and re-installed, intake manifold flap potentiometer - G336- must be adapted to engine control unit - J623- .

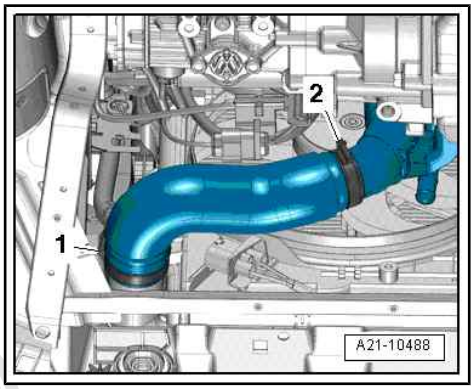
Removing

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– Remove air cleaner housing ⇒ page 264

– Remove throttle valve module - J338- ⇒ page 270 .

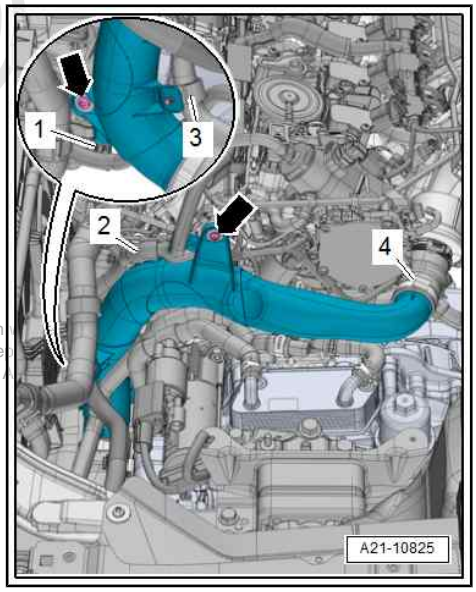
– Release hose clip -1- and detach air hose from charge air cooler.



Note

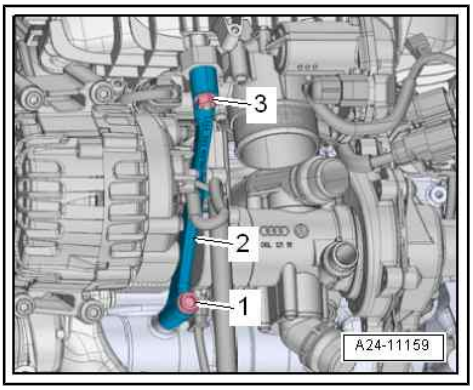
Disregard -item 2-.

– Move coolant hose -3- clear.
– Move electrical wiring harnesses -1, 2- clear at air pipe.
– Unfasten screw-type clip -4-.
– Remove bolts -arrows- and press air pipe towards left slightly.



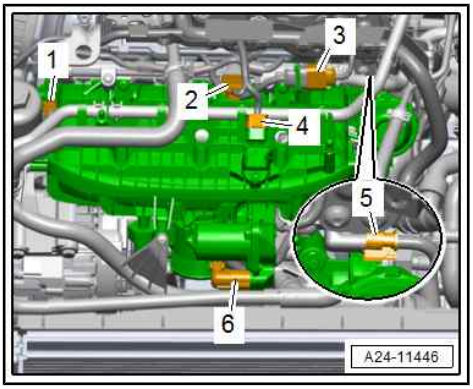
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– Move electrical wiring harness clear.
– Unscrew nut -3- and bolt -1- and remove support -2- for intake manifold.

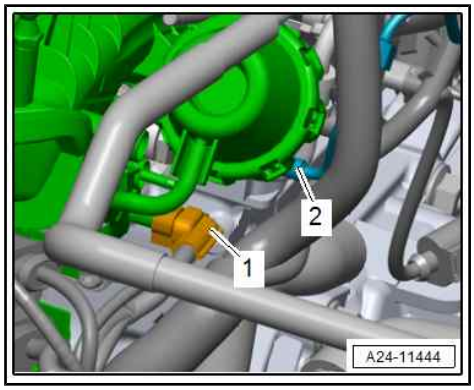


– Unplug electrical connectors and move wiring clear:

1 - For intake manifold flap potentiometer - G336-
2 - Not fitted
3 - Not fitted
4 - For intake air temperature sender - G42-
5 - Ignore
6 - Ignore



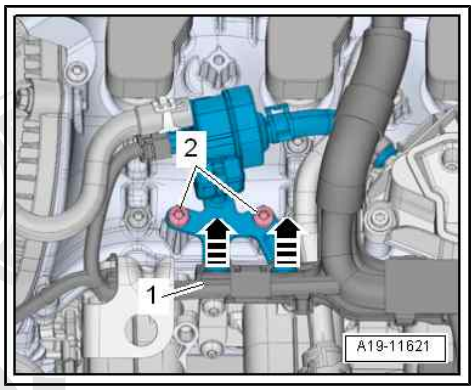
– Unplug electrical connector -1- at intake manifold flap valve - N316- .
– Disconnect vacuum hose -2-.



– Release fasteners -arrows- and detach wiring duct -1- from bracket.

Note

Disregard -item 2-.

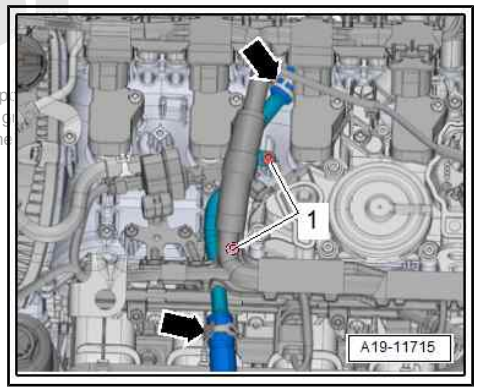


– Remove bolts -1- for coolant pipe (top).

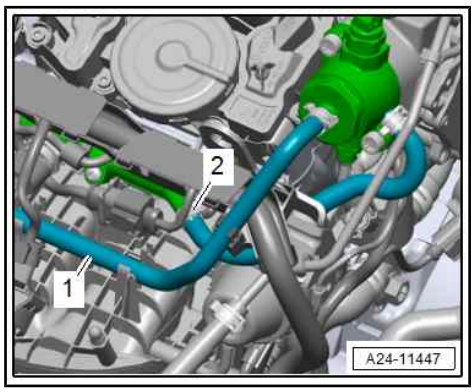
Note

Disregard -arrows-.

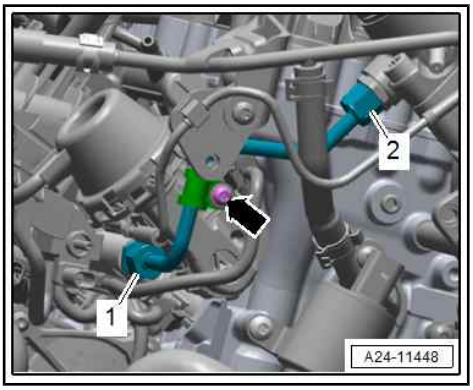
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– Move fuel hose -1- clear at intake manifold.



– Release hose clip -2- and detach fuel hose.



WARNING

The fuel system is pressurised.

Risk of injury as fuel may spray out.

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

– Unscrew bolt -arrow- and union nuts -1, 2-.

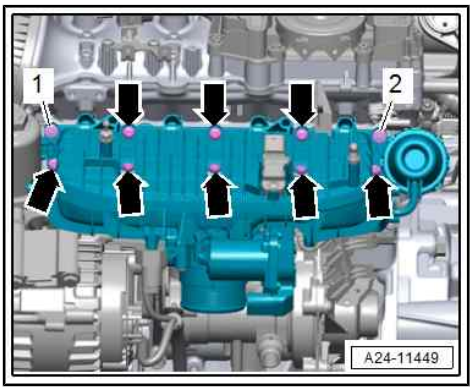
– Detach high-pressure pipe.

Note

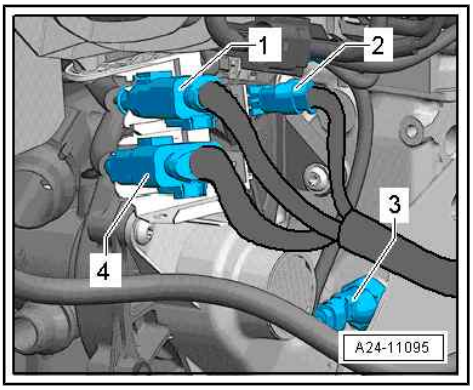
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- *Use a clean cloth to catch escaping fuel.*
- *Close off open connections with clean caps. Make sure no dirt gets into the fuel system.*

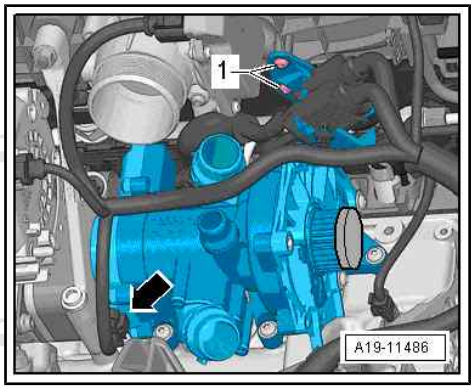
– Remove bolts -arrows- and nuts -1, 2-.



– Detach electrical connectors -1, 4- from bracket.



– Remove bolts -1-.

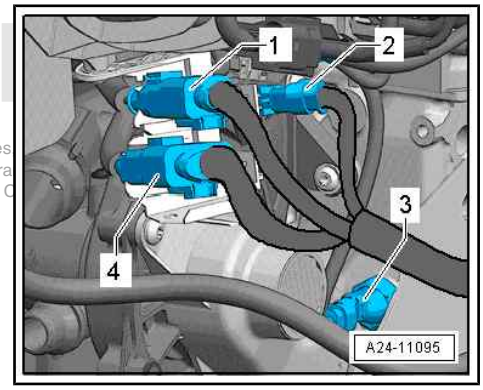


– Unclip electrical connector -2- from bracket. If necessary, unplug electrical connector.
– Detach intake manifold.

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Note

Disregard -item 3-.



Note

Block off intake ports with a clean cloth.

Installing

Note

Renew gasket.

– Fit intake manifold onto studs (top left and top right) on cylinder head.
– Install air duct with screw-type clip ⇒ “3.1 Exploded view - air cleaner housing”, page 263 .
– Install throttle valve module - J338- ⇒ “4.3 Removing and installing throttle valve module J338 ”, page 270 .
– The remaining installation steps are carried out in the reverse sequence.

Tightening torques

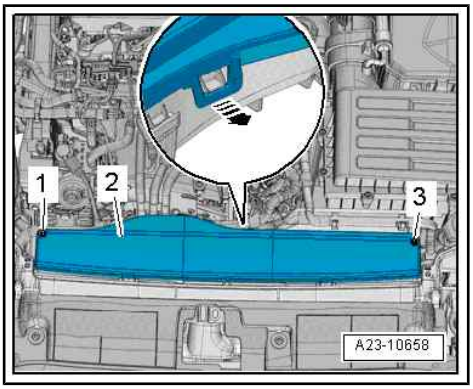
- ⇒ “4.1 Exploded view - intake manifold”, page 265
- ⇒ “3.1 Exploded view - coolant pipes”, page 226
- ⇒ “3.1 Exploded view - air cleaner housing”, page 263

4.3 Removing and installing throttle valve module - J338-

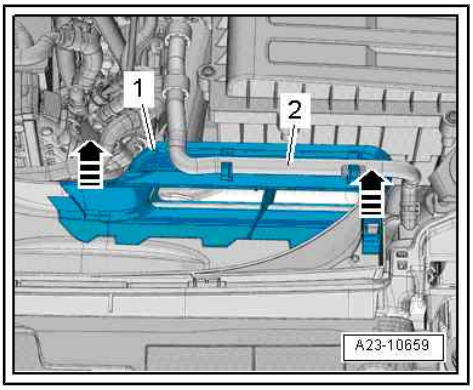
Removing

– Remove engine cover panel ⇒ page 50 .

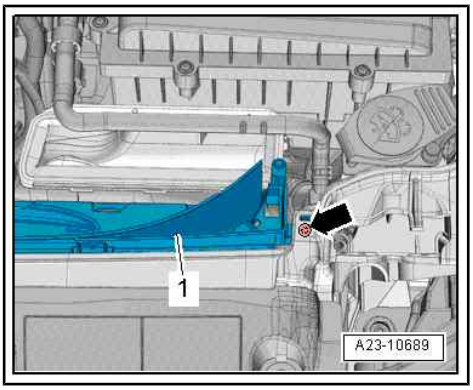
– Remove bolts -1, 3-.
– Release fastener -arrow- and remove cover -2-.



– Move coolant hose -2- clear.
– Release fasteners -arrows- and detach air duct (top section) -1-.

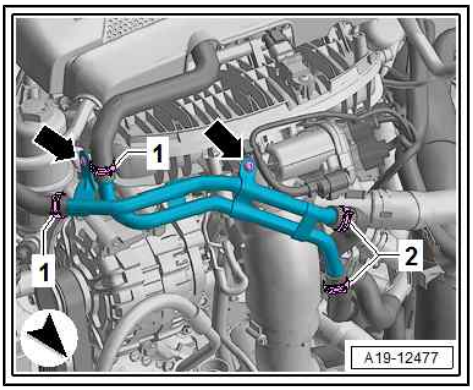


– Remove bolt -arrow- on both sides.
– Unclip air duct (bottom section) -1- and detach.



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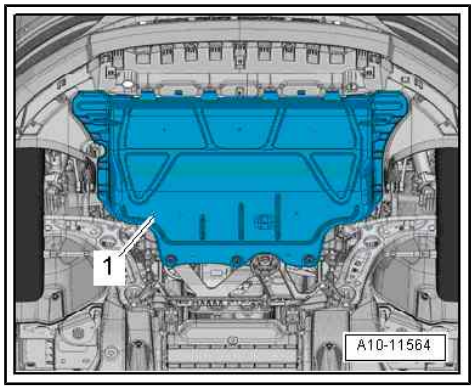
Remove bolts -arrows- and detach coolant pipe.



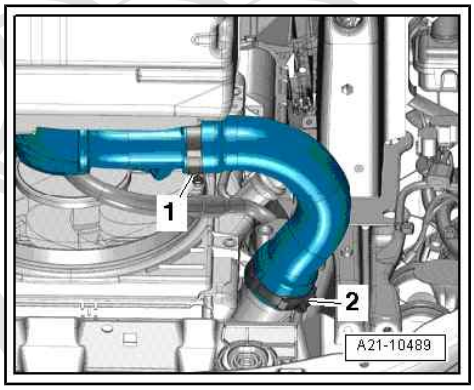
Note

Disregard -1- and -item 2-.

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



– Release hose clip -2- and detach air hose from charge air cooler.

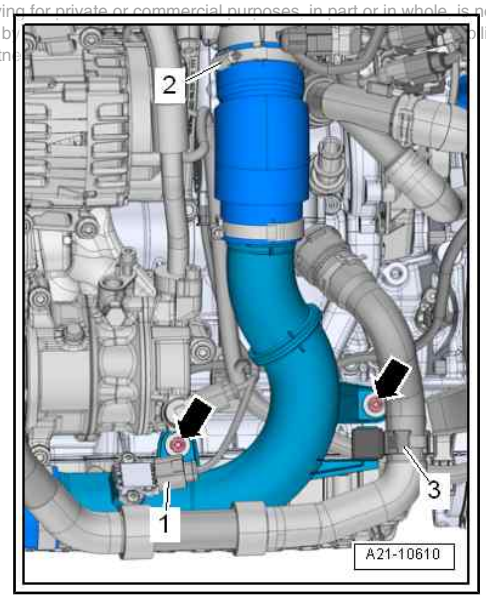


Note

Disregard -item 1-.

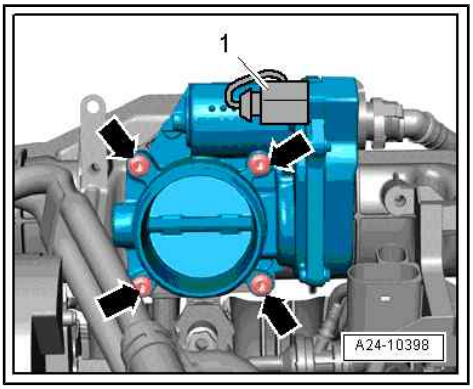
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lity

– Release hose clip -2-.
– Move coolant hose -3- clear.
– Remove bolts -arrows-.
– Unplug electrical connector -1- from charge pressure sender - G31- .
– Detach air pipe (right-side).



– Unplug electrical connector -1- from throttle valve module - J338- .

– Unscrew bolts -arrows- on throttle valve module - J338- from underneath and detach throttle valve module - J338- .



Installing

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

– Clean sealing surface for seal.

– Renew seal.

– After throttle valve module - J338- has been renewed, it must be adapted to engine control unit - J623- ⇒ Vehicle diagnostic tester.

Tightening torques

- ⇒ “4.1 Exploded view - intake manifold”, page 265
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation
- ⇒ “3.1 Exploded view - coolant pipes”, page 226
- ⇒ “2.1 Exploded view - charge air system”, page 245
- ⇒ “3.1 Exploded view - air cleaner housing”, page 263

4.4 Cleaning throttle valve module - J338-

Note

- *Carbon deposits and dirt in the limit stop can lead to incorrect adaption values.*
- *Take care not to scratch the throttle valve housing when cleaning it.*

Special tools and workshop equipment required

- Acetone (commercially available)
- Brush

– Remove throttle valve module - J338- ⇒ page 270 .

– Open throttle valve by hand and lock it in open position with a wedge (plastic or wood) -arrow-.



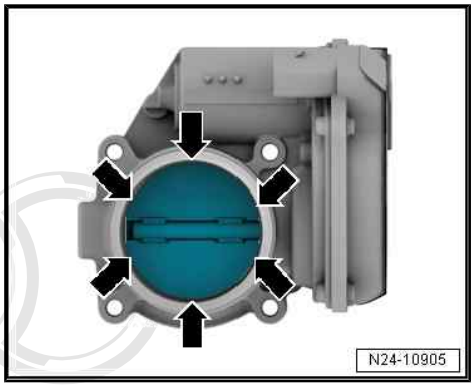
WARNING

Acetone is highly flammable.

- ***Please observe all accident prevention regulations and safety precautions when handling flammable liquids.***
- ***Do not use compressed air when cleaning the throttle valve.***
- ***Wear safety goggles and protective clothing to avoid any contact with skin and risk of injury.***

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- Clean throttle valve housing thoroughly, especially around the points -arrows- where the throttle valve closes, using commercially available acetone and a small brush.
- Wipe out throttle valve housing with a lint-free cloth.
- Allow acetone to flash off completely.
- Install throttle valve module - J338- ⇒ page 270 .
- Erase learnt values and adapt engine control unit - J623- to throttle valve module - J338- . Use a vehicle diagnostic tester .



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5 Senders and sensors

⇒ “5.1 Exploded view - actuator for structure-borne sound and control unit for structure-borne sound”, page 275

⇒ “5.2 Removing and installing control unit for structure-borne sound J869 and actuator for structure-borne sound R214 ”, page 276

⇒ “5.3 Removing and installing fuel pressure sender G247 ”, page 276

⇒ “5.4 Checking fuel pressure sender G247 ”, page 279

⇒ “5.5 Removing and installing intake air temperature sender G42 / intake manifold pressure sender G71 ”, page 281

5.1 Exploded view - actuator for structure-borne sound and control unit for structure-borne sound

1 - Mounting bracket

- ❑ For control unit for structure-borne sound - J869-

2 - Control unit for structure-borne sound - J869-

- ❑ Removing and installing ⇒ page 276

3 - Electrical connector

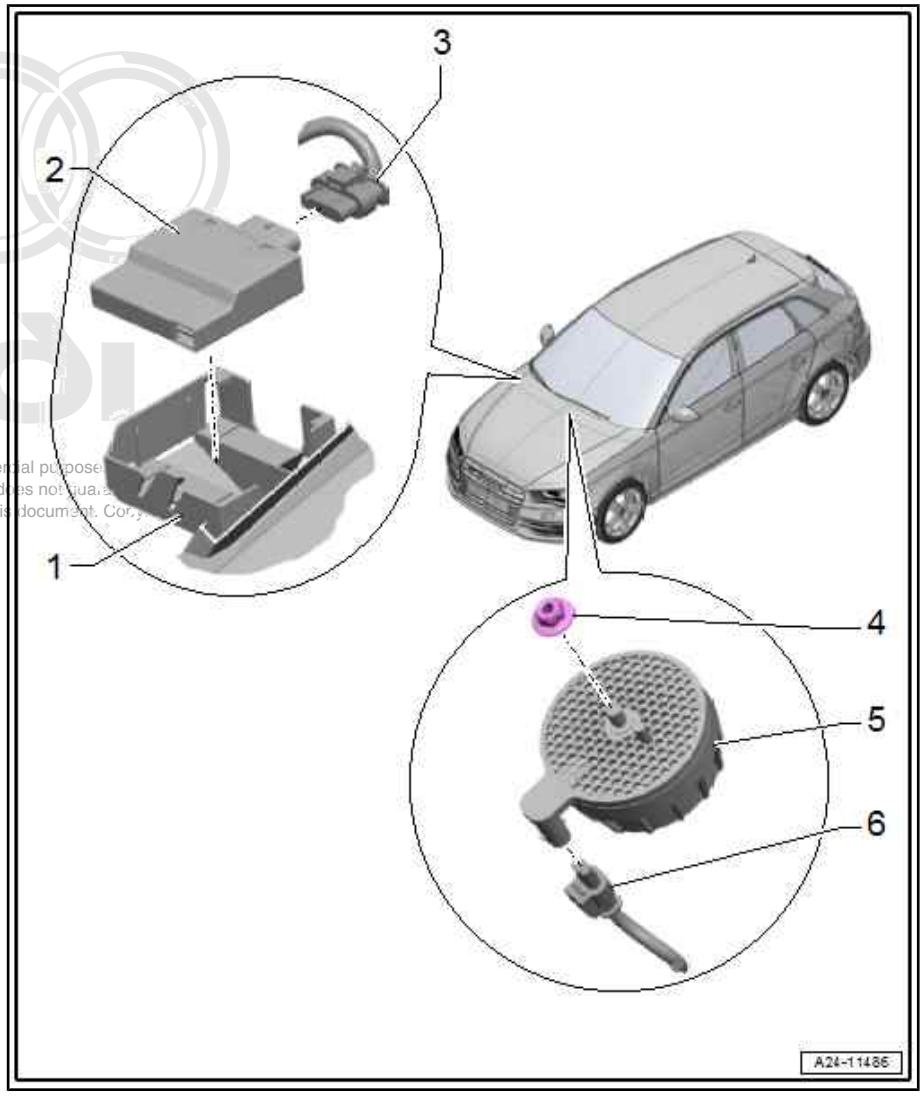
4 - Nut

- ❑ 5 Nm

5 - Actuator for structure-borne sound - R214-

- ❑ Removing and installing ⇒ page 276

6 - Electrical connector

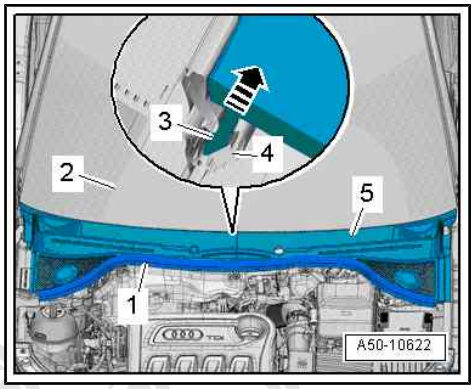


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5.2 Removing and installing control unit for structure-borne sound - J869- and actuator for structure-borne sound - R214-

Removing

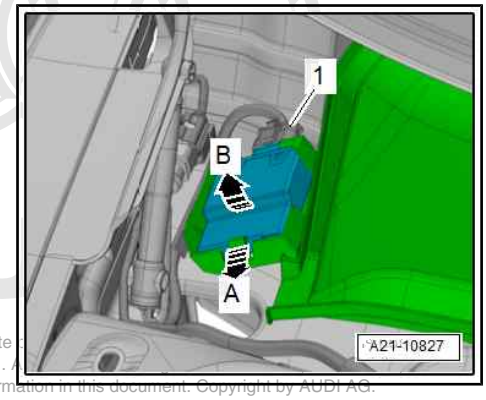
– Remove plenum chamber cover -5- ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .



Control unit for structure-borne sound - J869- :

– Unplug electrical connector -1-.

– Release fastener -arrow A- and detach control unit for structure-borne sound - J869- from bracket -arrow B-.

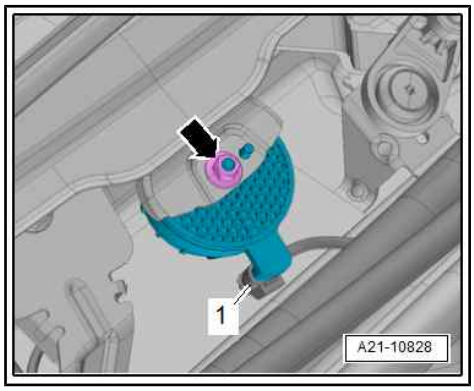


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Actuator for structure-borne sound - R214- :

– Remove nut -arrow-.

– Detach actuator for structure-borne sound - R214- and disconnect electrical connector -1-.



Installing

Install in reverse sequence.

Tightening torques

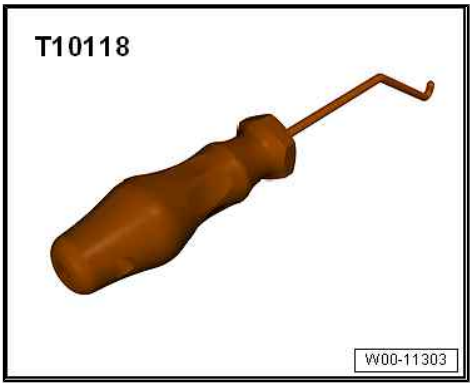
◆ ⇒ “5.1 Exploded view - actuator for structure-borne sound and control unit for structure-borne sound”, page 275

5.3 Removing and installing fuel pressure sender - G247-

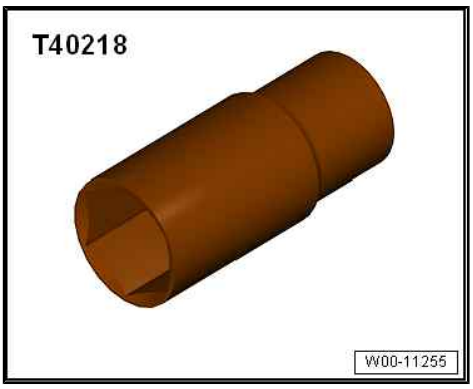
If the fuel pressure sender - G247- fails, the fuel pressure regulating valve - N276- is switched off, the electric fuel pump is fully activated and the engine is operated with the fuel pressure which remains. This will reduce engine torque considerably.

Special tools and workshop equipment required

♦ Assembly tool - T10118-



♦ Socket (27 mm) - T40218- or commercially available socket (27 mm)

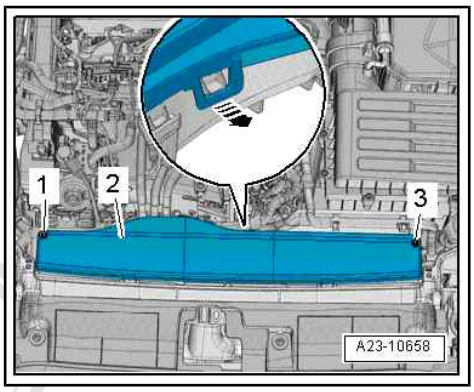


Removing

– Remove engine cover panel ⇒ page 50 .

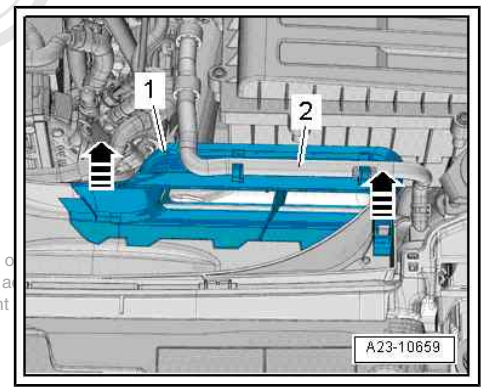
– Remove bolts -1, 3-.

– Release fastener -arrow- and remove cover -2-.



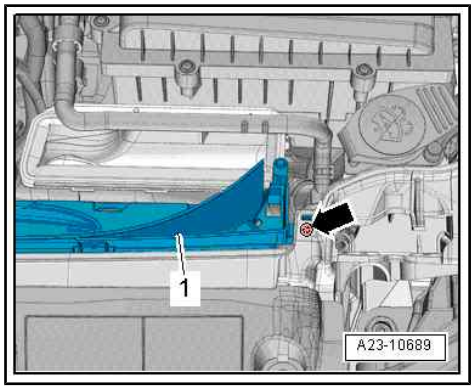
– Move coolant hose -2- clear.

– Release fasteners -arrows- and detach air duct (top section) -1-.



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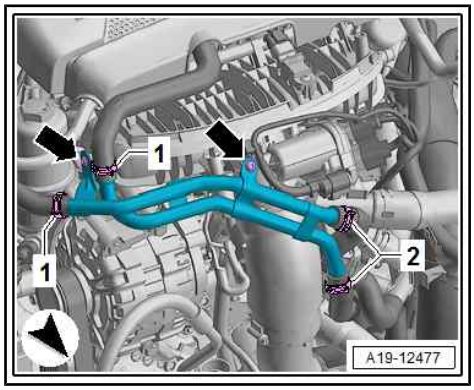
– Remove bolt -arrow- on both sides.
– Unclip air duct (bottom section) -1- and detach.



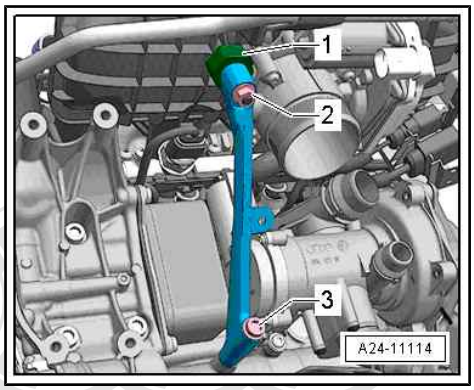
– Remove bolts -arrows- at coolant pipe (front).

Note

Disregard items -1 and 2-.

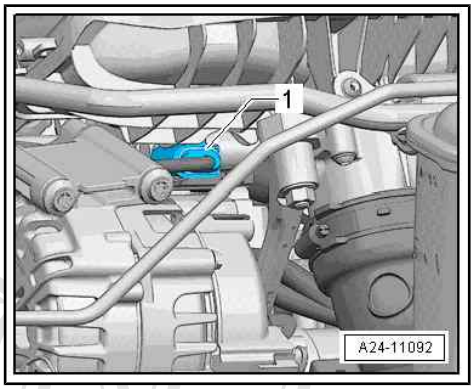


– Move electrical wiring harness clear.
– Remove intake manifold support; to do so, unscrew nut -2- and bolt -3-.
– Remove rubber bush -1- for intake manifold support.



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– Release connector on fuel pressure sender - G247- -1- using assembly tool - T10118- .



WARNING

The fuel system is pressurised.

Risk of injury as fuel may spray out.

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

– Unscrew fuel pressure sender - G247- -1- using socket, 27 mm - T40218- .

Installing

Install in reverse sequence.

Tightening torques

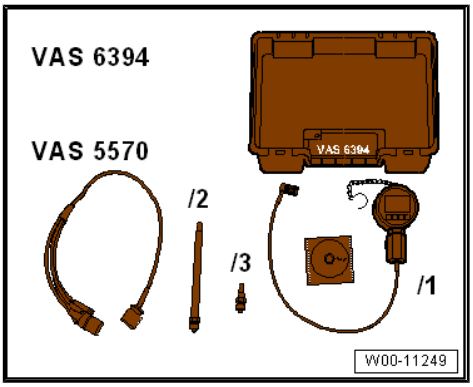
- ⇒ “2.1 Exploded view - fuel rail with injectors”, page 256
- ⇒ “3.1 Exploded view - coolant pipes”, page 226

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5.4 Checking fuel pressure sender - G247-

Special tools and workshop equipment required

- Test instrument adapter - VAS 5570-



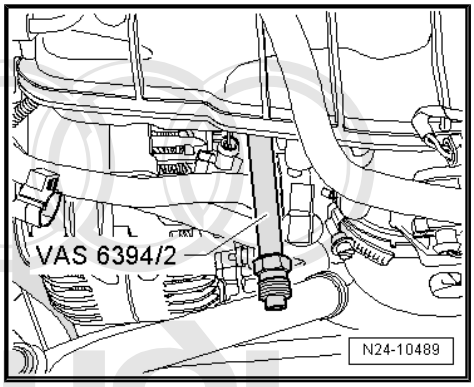
- Pressure sensor tester - VAS 6394-
- Adapter - VAS 6394/2-
- Torque wrench - V.A.G 1331-
- Vehicle diagnostic tester

Procedure:

– Remove engine cover panel ⇒ page 50 .

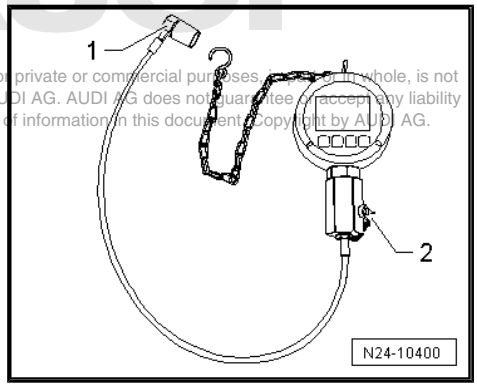
– Remove fuel pressure sender - G247- ⇒ page 276 .

– Screw in adapter - G247- in place of fuel pressure sender - VAS 6394/2- and tighten adapter with the same torque as that specified for fuel pressure sender - G247- .



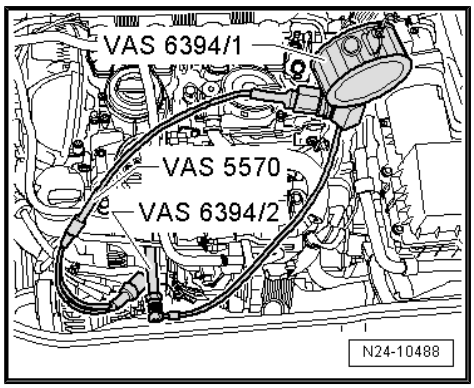
– Unscrew plug -2- on pressure gauge - VAS 6394/1- and screw removed fuel pressure sender - G247- into opening. Tighten to torque specified for fuel pressure sender.

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– Use test instrument adapter - VAS 5570- to make electrical connection between vehicle and fuel pressure sender - G247- .
– Connect ⇒ Vehicle diagnostic tester.
– Switch on ignition.
– Select “Engine electronics” in vehicle self-diagnosis.
– Select “Measured values”.
– Select “Fuel pressure” from list.

The display zone shows the actual pressure value being transmitted to the engine control unit by the fuel pressure sender - G247- .

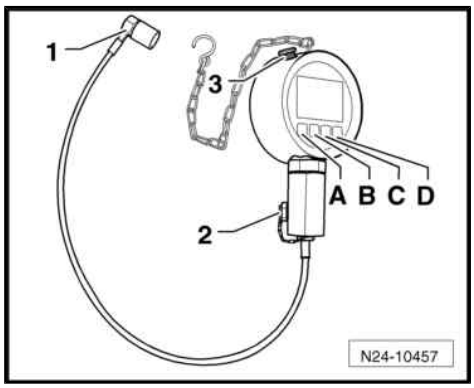


– Switch on pressure gauge - VAS 6394/1- by pressing button -A- once briefly.

Note

You can press and hold button -A- for 2 seconds to switch on the illumination for 20 seconds.

Pressure gauge - VAS 6394/1- should indicate 0 bar. If this is not the case, press button -C- once briefly to zero the tester.



– Connect pressure gauge - VAS 6394/1- to adapter - VAS 6394/2- .

– Start engine.

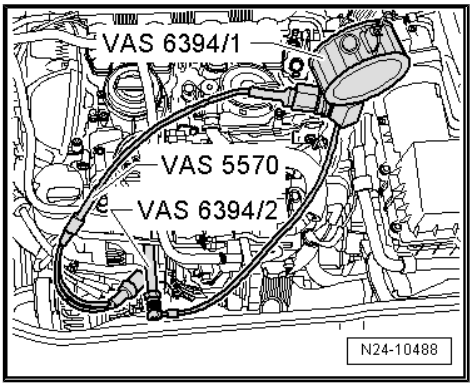
– Compare the pressure indicated by pressure gauge - VAS 6394/1- with the actual pressure value on ⇒ Vehicle diagnostic tester.

• The pressure readings must not deviate by more than 5 bar.

– If the deviation is more than 5 bar, test a new fuel pressure sender - G247- .

– Screw a new fuel pressure sender - G247- into pressure gauge - VAS 6394/1- .

– Repeat the test with the new fuel pressure sender - G247- and compare the two pressure values.



If the two values still do not agree:

– Check the electrical connection between the fuel pressure sender - G247- and the engine control unit; refer to ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.

If the values agree:

– Install new fuel pressure sender - G247- ⇒ page 276 .

Tightening torques

◆ ⇒ “2.1 Exploded view - fuel rail with injectors”, page 256

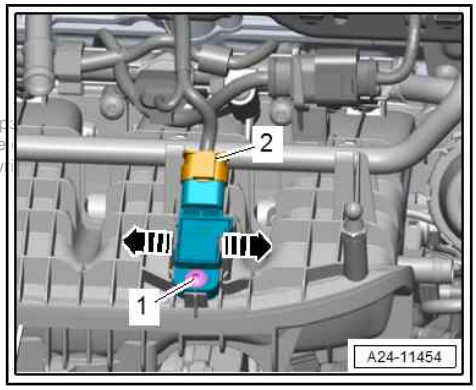
5.5 Removing and installing intake air temperature sender - G42- / intake manifold pressure sender - G71-

Removing

– Unplug electrical connector -2-.

– Remove bolt -1-.

– Release catches -arrows- and detach intake air temperature sender - G42- / intake manifold pressure sender - G71- from intake manifold.



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Installing

Install in reverse sequence.

Tightening torques

◆ ⇒ “4.1 Exploded view - intake manifold”, page 265

6 Engine control unit

⇒ “6.1 Removing and installing engine control unit J623 ”, page 282

6.1 Removing and installing engine control unit - J623-

⇒ “6.1.1 Checking wiring and components with isolator box, 198-pin VAS 6606 ”, page 282

⇒ “6.1.2 Removing and installing engine control unit J623 without protective housing”, page 283

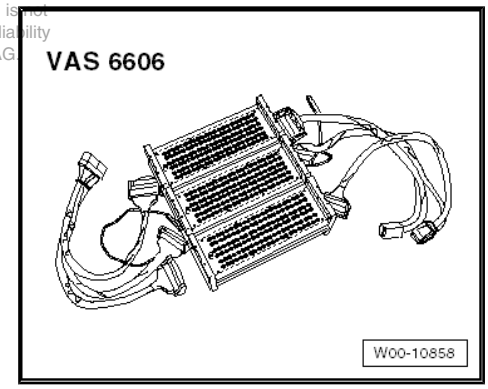
⇒ “6.1.3 Removing and installing engine control unit J623 with protective housing”, page 284

6.1.1 Checking wiring and components with isolator box, 198-pin - VAS 6606-

Special tools and workshop equipment required

- Isolator box, 198-pin - VAS 6606/1-1-
- Isolator box, 198-pin - VAS 6606/1-2-
- Isolator box, 198-pin - VAS 6606/1-3-
- Sheets -VAS 6606/1-1-
- Sheets -VAS 6606/2-1-
- Sheets -VAS 6606/3-1-
- Test adapter - VAS 6606/7-1- and test adapter - VAS 6606/7-2-

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Note

- *Always make sure that the cables are properly connected.*
- *Do not use damaged or worn tools and accessories.*
- *Observe instructions in the operating manual.*

– Connect both test adapter - VAS 6606/7-1- and test adapter - VAS 6606/7-2- to the three isolater boxes -VAS 6606- .

– Use the following sheets:

- -VAS 6606/1-1- for isolator box, 198-pin - VAS 6606/1-1-
- -VAS 6606/2-1- for isolator box, 198-pin - VAS 6606/1-2-
- -VAS 6606/3-1- for isolator box, 198-pin - VAS 6606/1-3-

Note

Make sure that all plug-in bridges are inserted completely in all isolator boxes.

– Connect earth strap to an isolator box and to an earth point on the vehicle.
– Remove engine control unit ⇒ page 282 .
– Connect engine control unit to test adapter - VAS 6606/7-1- .
– Connect wiring harness from vehicle to test adapter - VAS 6606/7-2- .

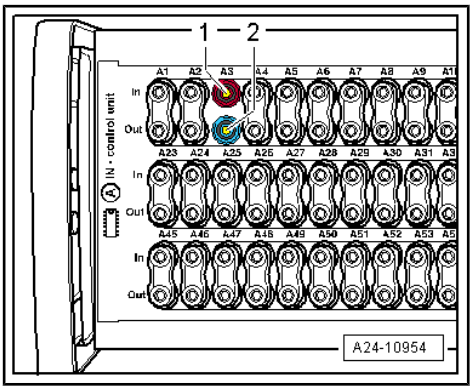
The connection on the engine control unit consists of a large and a small connector.

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The large connector has 105 pins and is assigned to the sheets for the isolator box marked “A 1 to A 105”.

The small connector has 91 pins and is assigned to the sheets for the isolator box marked “B 1 to B 91”.

When a push-in bridge is pulled out, the corresponding wiring connection is disconnected.



Note

- *The “In” contact -1- (red socket) leads to the engine control unit.*
- *The “Out” contact -2- (blue socket) leads to the wiring harness.*

– Carry out test as described in appropriate repair procedures.

Installing engine control unit

Installation is performed in the reverse sequence.

– It is important that the protective housing is re-fitted on the engine control unit (if fitted previously).
– Clean threaded holes for shear bolts to remove any residue from locking fluid. This can be done using a thread tap.
– Always use new shear bolts.

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 event memories must be rectified so that all event memory entries can be erased.

6.1.2 Removing and installing engine control unit - J623- without protective housing

Special tools and workshop equipment required

- Vehicle diagnostic tester

Removing

– Before removing the engine control unit, the adaption values for the chain length must be read out of the engine control unit.

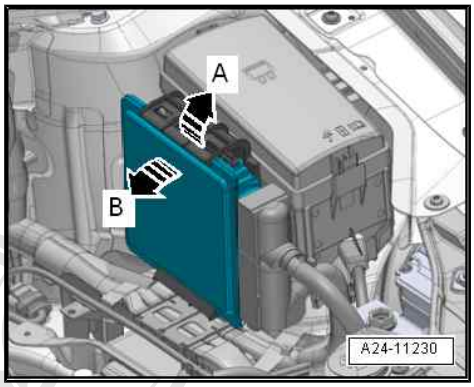
– Activate engine control unit using ⇒ Vehicle diagnostic tester in `Guided Functions` mode, function `Replace engine control unit`.

– Switch off ignition and take out ignition key.

– Remove battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery .

– Release retainer -arrow A- and take out engine control unit - J623- -arrow B-.

– Release and unplug connectors for engine control unit - J623- .



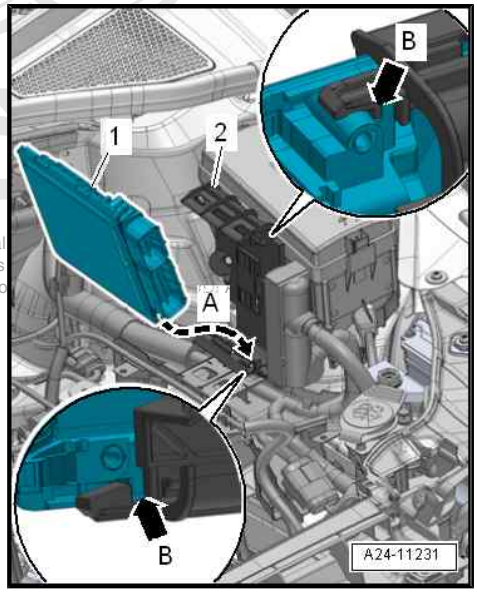
Installing

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

– Insert engine control unit - J623- bottom edge first into bracket -arrow A- and lock at top edge.

• Lugs on engine control unit must engage in notches at top and bottom of bracket -arrows B-.

– Install battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery .



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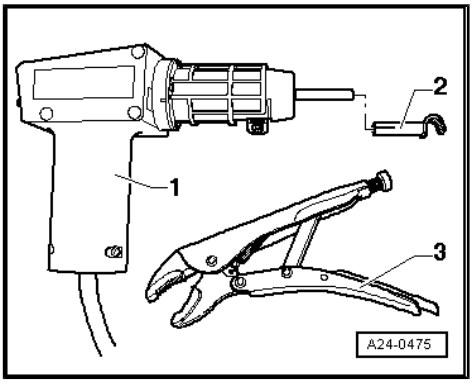
After installing a new engine control unit, the following operation must be performed:

– Activate engine control unit using ⇒ Vehicle diagnostic tester in `Guided Functions` mode, function `Replace engine control unit`.

6.1.3 Removing and installing engine control unit - J623- with protective housing

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 grinder (commercially available)
- Vehicle diagnostic tester

Removing

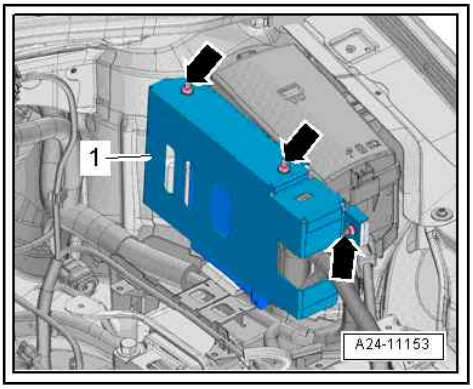
– Before removing the engine control unit, the adaption values for the chain length must be read out of the engine control unit.

– Activate engine control unit using ⇒ Vehicle diagnostic tester in `Guided Functions` mode, function `Replace engine control unit`.

– Switch off ignition and take out ignition key.

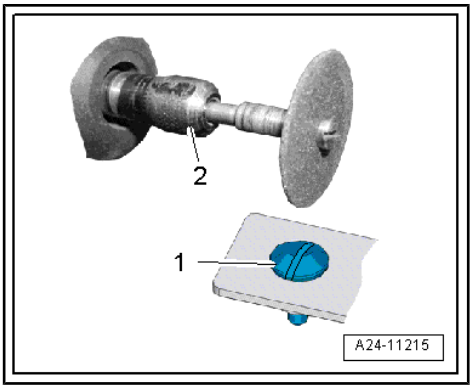
– Remove battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery .

To remove protective housing -1-, unscrew shear bolts -arrows- as follows:



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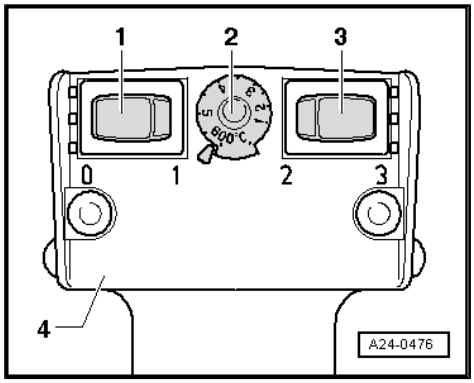
– Make groove (for a screwdriver) in head of shear bolt -1- using a small grinder -2-.



Note

The threads of the shear bolts are secured with locking fluid. To unscrew these bolts, the threads must therefore be heated with the hot air blower.

– 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.

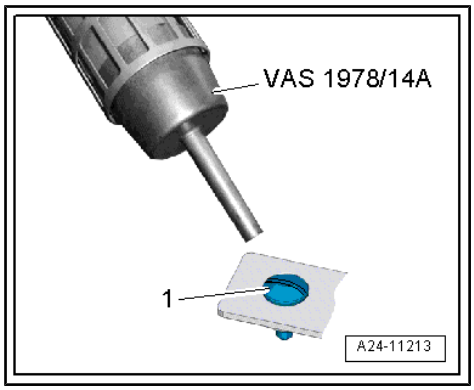


WARNING

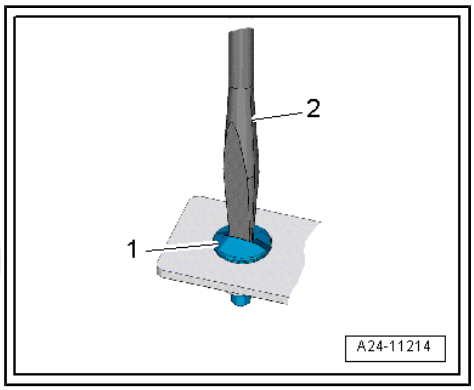
Risk of burns from hot air blower.

- ***Parts of the protective housing will become very hot as a result of heating the threads. It is also important to ensure that only the thread is heated and none of the surrounding components (cover these if necessary).***

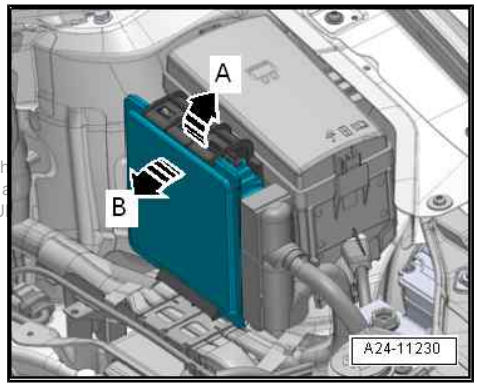
– Heat head of shear bolt -1- for approx. 20 to 30 seconds.



– Unscrew shear bolt -1- using screwdriver -2-.
– Detach protective housing from engine control unit - J623- .



– Release retainer -arrow A- and take out engine control unit - J623- -arrow B-.
– Release and unplug connectors for engine control unit - J623- .



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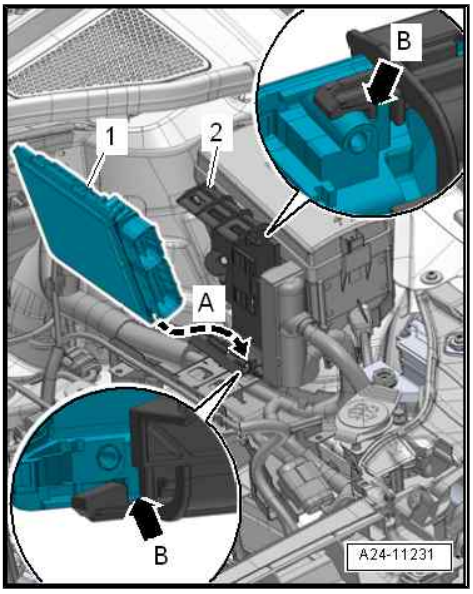
Installing

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

- Insert engine control unit - J623- bottom edge first into bracket -arrow A- and lock at top edge.
- Make sure you fit protective housing back on 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 battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery .

After installing a new engine control unit, the following operation must be performed:

- Activate engine control unit using ⇒ Vehicle diagnostic tester in `Guided Functions` mode, function `Replace engine control unit`.



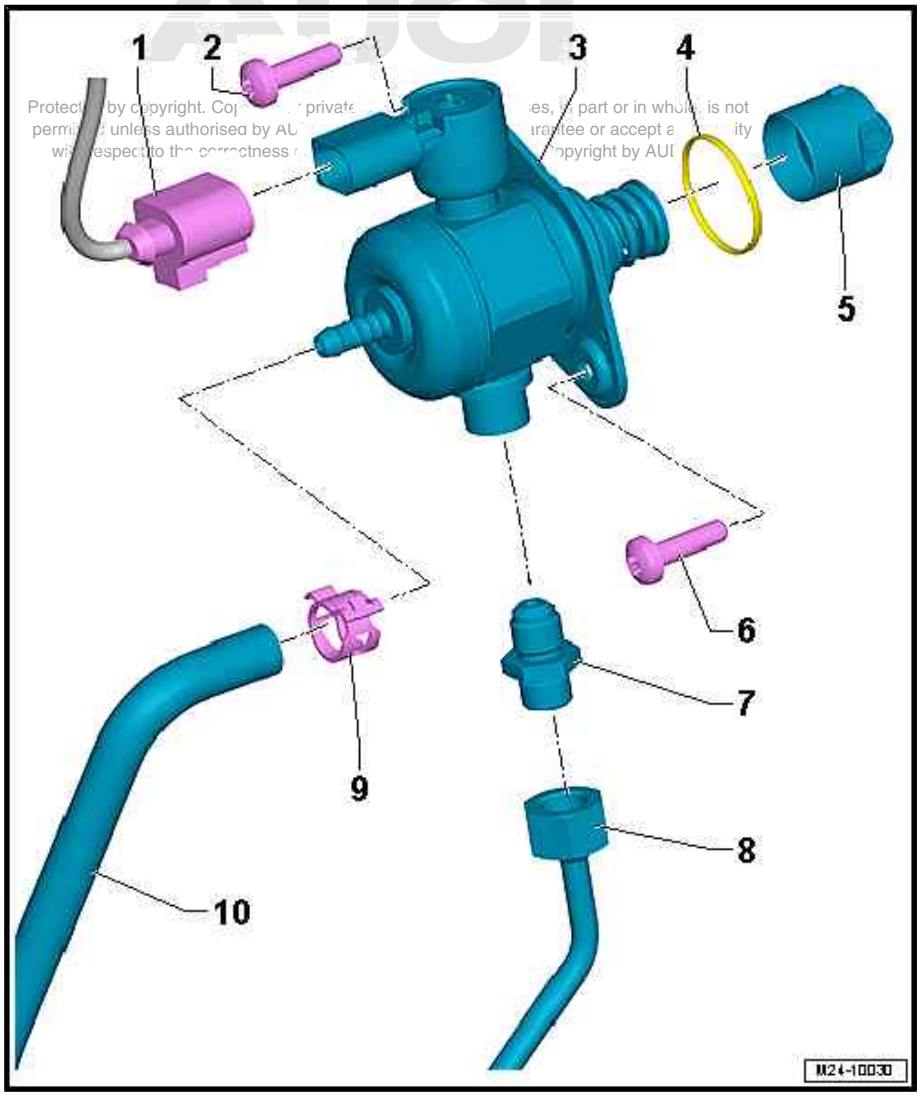
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7 High-pressure pump

⇒ “7.1 Exploded view - high-pressure pump”, page 288

⇒ “7.2 Removing and installing high-pressure pump”, page 289

7.1 Exploded view - high-pressure pump



1 - Electrical connector

- For fuel pressure regulating valve - N276-

2 - Bolt

- M6; renew
- Tightening torque and sequence ⇒ page 289

3 - High-pressure pump

- An electric fuel pump (fitted in fuel tank) supplies fuel to the mechanical high-pressure pump
- Observe rules for cleanliness when installing ⇒ page 4
- Fuel lines must be free of tension when installed.
- Depending on version, with fuel metering valve - N290- or fuel pressure regulating valve - N276- (do not loosen)
- Removing and installing ⇒ page 289

4 - O-ring

- Renew if damaged
- Lubricate lightly with engine oil

5 - Roller tappet

- May remain lodged in vacuum pump when high-pressure pump is

removed

6 - Bolt

- ❑ M6; renew
- ❑ Tightening torque and sequence ⇒ page 289

7 - Connecting piece

- ❑ For high-pressure pipe
- ❑ Counterhold when loosening union nut
- ❑ Must always be renewed once loosened
- ❑ 40 Nm

8 - Fuel supply line

- ❑ To fuel rail for injectors
- ❑ Lightly lubricate ball of fuel supply line with engine oil
- ❑ Fuel supply line must be free of tension when installed.
- ❑ 27 Nm

9 - Spring-type clip

- ❑ Renew

10 - Fuel supply line

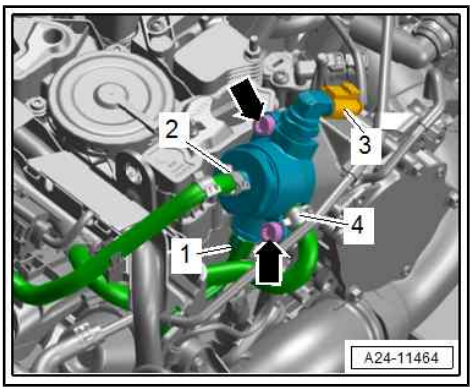
- ❑ From fuel tank

High-pressure pump - tightening torque and sequence

To prevent flange of high-pressure pump from being deformed during installation, fit high-pressure pump as follows:

– Tighten bolts in stages as follows:

Stage	Bolts	Tightening torque
1.	-arrows-	Screw in by hand until contact is made
2.	-arrows-	Tighten one turn alternately until flange of high-pressure pump makes contact with vacuum pump
3.	-arrows-	M6 bolt: 8 Nm + 90°; renew bolts after removal M8 bolt: 20 Nm



7.2 Removing and installing high-pressure pump

Note

- ♦ *The high-pressure pump must only be removed when the engine is cold.*
- ♦ *When installing the high-pressure fuel pump, it is essential to ensure that no dirt particles enter the fuel system.*
- ♦ *Use a cloth to catch escaping fuel.*
- ♦ *Check O-ring on high-pressure fuel pump and renew if damaged.*
- ♦ *Lubricate high-pressure fuel pipes lightly with engine oil and always ensure that pipes are free of tension when tightening the connections.*

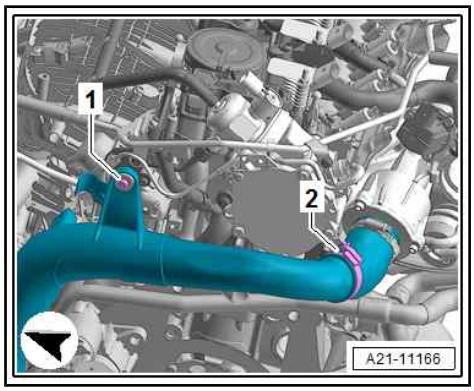
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Removing

– Remove engine cover panel ⇒ page 50 .

– Remove air cleaner housing ⇒ page 264 .

– Remove bolt -1- and press air pipe to one side.



Note

Disregard item -2-.

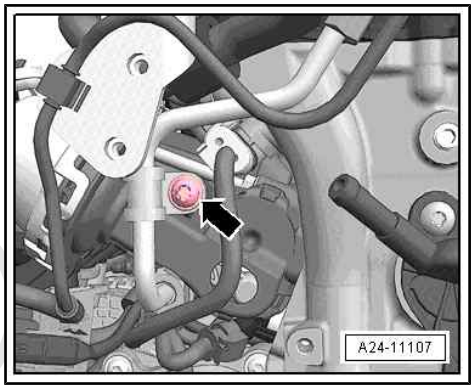
– Unscrew retaining clip -arrow-.

WARNING

The fuel system is pressurised.

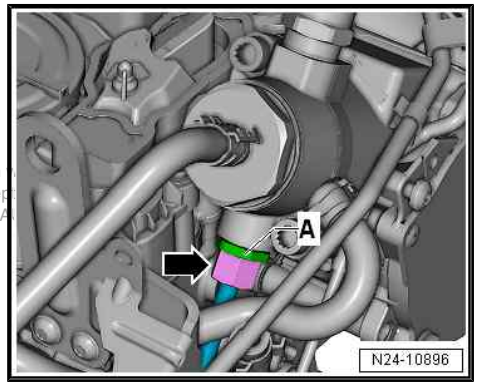
Risk of injury as fuel may spray out.

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

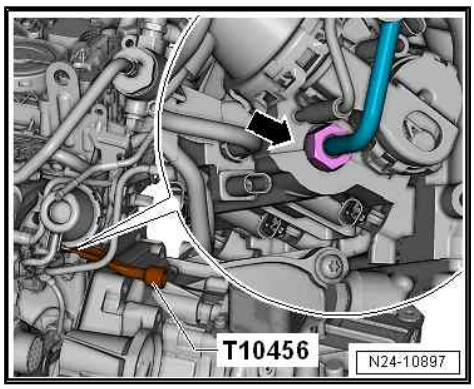


– Counterhold at hexagon flats -A- and loosen union nut -arrow- on high-pressure pump. Remove high-pressure pipe.

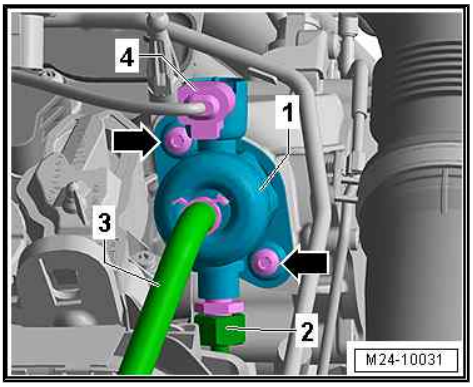
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– Loosen union nut on fuel rail using socket, 17 mm - T10456- and remove high-pressure pipe.

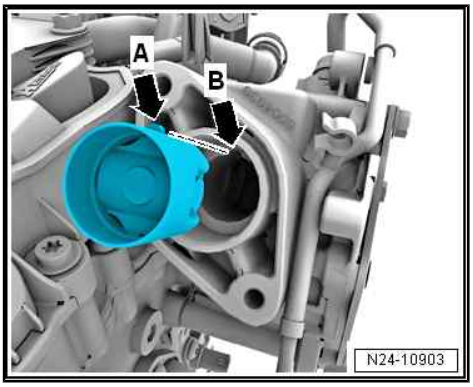


– Unplug electrical connector -4- on fuel pressure regulating valve - N276- .
– Detach fuel line -3- from high-pressure pump.
– Remove the two bolts -arrows-.
– Carefully pull out high-pressure pump -1-. It is possible that the roller tappet may remain lodged in the vacuum pump.



Installing

– Renew O-ring for high-pressure pump.
– Before fitting, check roller tappet for damage and renew if necessary.
– Fit roller tappet in vacuum pump as shown.



Note

- *The roller tappet must be positioned at the lowest point when installing the high-pressure pump.*
- *Renew connecting piece for high-pressure pipe ⇒ Item 7 (page 289) after loosening.*

– Turn crankshaft until roller tappet is positioned at lowest point.
– Fit high-pressure pump in vacuum pump.
– Tighten bolts in stages ⇒ page 289 .

Note

The high-pressure pump can be damaged if it is tightened too much on one side (keep it straight).

– Fit both fuel lines and secure with spring-type clips.
– Tighten union nut on high-pressure pipe hand-tight initially. Position high-pressure pipe so it is free of stress and tighten union nut.

Note

Check fuel system for leaks.

Tightening torques

- ⇒ “7.1 Exploded view - high-pressure pump”, page 288

⇒ Fig. ““High-pressure pump - tightening torque and sequence”“ , page 289

⇒ “2.1 Exploded view - charge air system”, page 245

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8 Lambda probe

⇒ “8.1 Exploded view - Lambda probe”, page 292

⇒ “8.2 Removing and installing Lambda probe”, page 293

8.1 Exploded view - Lambda probe

Note

- *New Lambda probes are coated with an assembly paste. The paste must not get into the slots on the Lambda probe body.*
- *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the Lambda probe body. For high-temperature paste refer to ⇒ Electronic parts catalogue*
- *The electrical wiring of the lambda probe must be secured at the original locations when installing. The wiring must NOT come into contact with the exhaust pipe.*

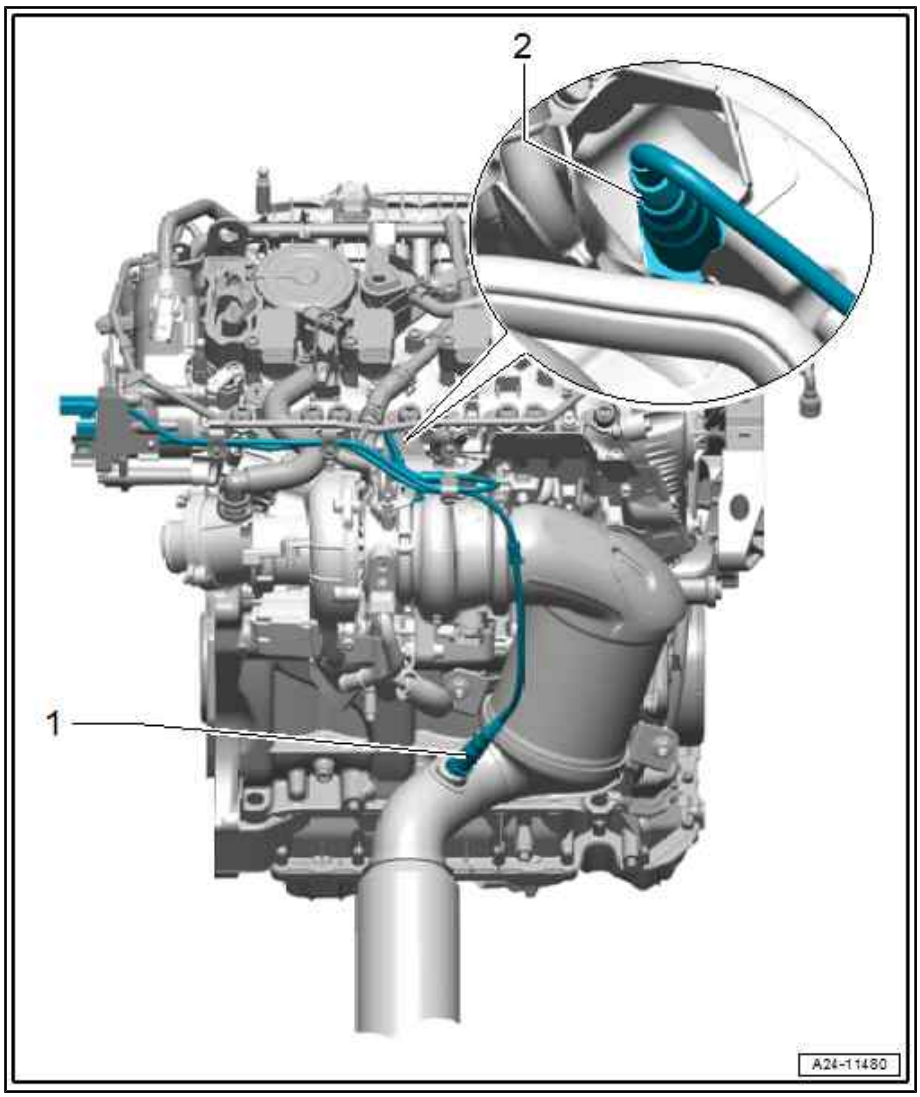
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1 - Lambda probe after catalytic converter - G130-

- ❑ With Lambda probe 1 heater after catalytic converter - Z29-
- ❑ Removing and installing ⇒ page 294
- ❑ 55 Nm

2 - Lambda probe - G39-

- ❑ With Lambda probe heater - Z19-
- ❑ Removing and installing ⇒ page 293
- ❑ 55 Nm



8.2 Removing and installing Lambda probe

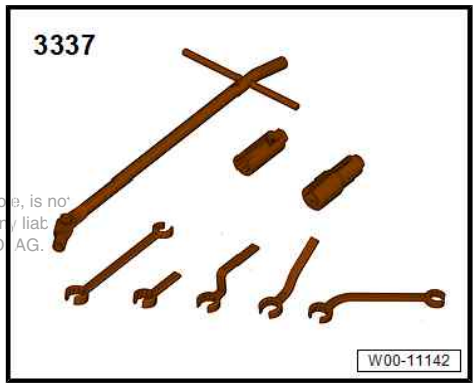
⇒ “8.2.1 Removing and installing Lambda probe G39 ”, page 293

⇒ “8.2.2 Removing and installing Lambda probe after catalytic converter G130 ”, page 294

8.2.1 Removing and installing Lambda probe - G39-

Special tools and workshop equipment required

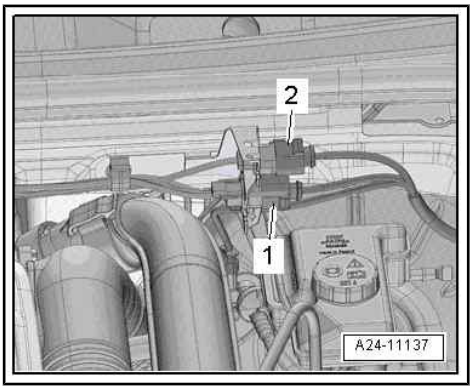
- Lambda probe open ring spanner set - 3337-



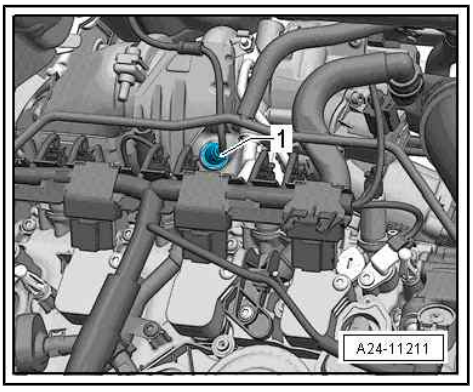
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Removing

– Unplug electrical connector -2- for Lambda probe - G39- .



– Unscrew Lambda probe - G39- -1- using a tool from Lambda probe open ring spanner set - 3337- .



Installing

When installing, note the following:

Note

- *New Lambda probes are coated with an assembly paste. The paste must not get into the slots on the Lambda probe body.*
- *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the Lambda probe body. For high-temperature paste refer to ⇒ Parts catalogue .*
- *The electrical wiring of the lambda probe must be secured at the original locations when installing. The wiring must NOT come into contact with the exhaust pipe.*

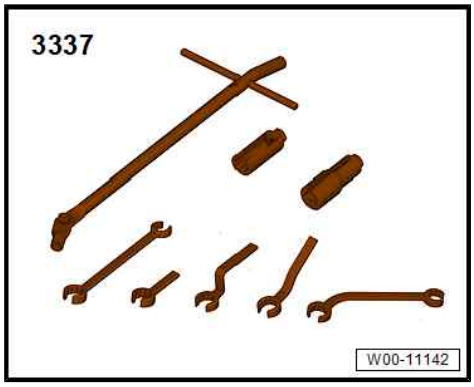
Tightening torques

- ⇒ “8.1 Exploded view - Lambda probe”, page 292

8.2.2 Removing and installing Lambda probe after catalytic converter - G130-

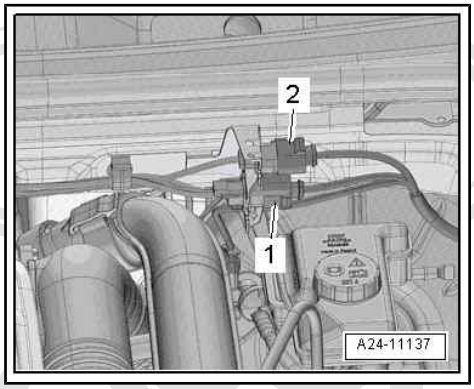
Special tools and workshop equipment required

- Lambda probe open ring spanner set - 3337-



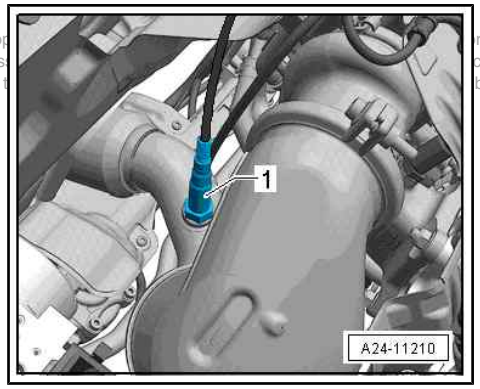
Removing

– Unplug electrical connector -1- for Lambda probe after catalytic converter - G130- .



– Unscrew Lambda probe after catalytic converter - G130- -1- using a tool from Lambda probe open ring spanner set - 3337- .

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Installing

When installing, note the following:

Note

- *New Lambda probes are coated with an assembly paste. The paste must not get into the slots on the Lambda probe body.*
- *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the Lambda probe body. For high-temperature paste refer to ⇒ Parts catalogue .*
- *The electrical wiring of the lambda probe must be secured at the original locations when installing. The wiring must NOT come into contact with the exhaust pipe.*

Tightening torques

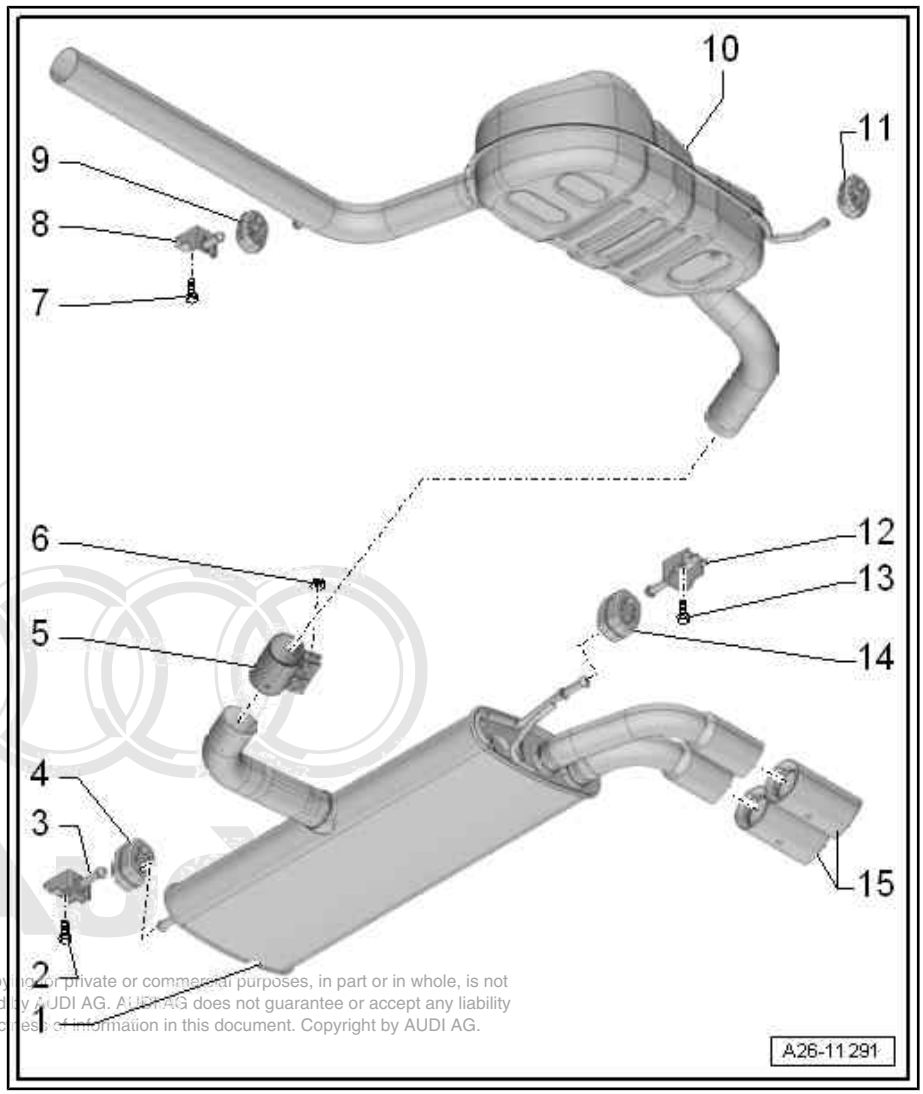
- ⇒ “8.1 Exploded view - Lambda probe”, page 292

26 – Exhaust system

1 Exhaust pipes/silencers

⇒ “1.1 Exploded view - silencers”, page 295
⇒ “1.2 Separating exhaust pipes/silencers”, page 296
⇒ “1.3 Removing and installing silencers”, page 297
⇒ “1.4 Stress-free alignment of exhaust system”, page 298
⇒ “1.5 Checking exhaust system for leaks”, page 299
⇒ “1.6 Installation position of clamp”, page 299

1.1 Exploded view - silencers



1 - Rear silencer
- ❑ Combined in one unit with rear silencer as original equipment. Can be renewed individually for repair purposes
- ❑ Removing and installing ⇒ page 297
- ❑ Cutting point ⇒ page 296
- ❑ Align exhaust system so it is free of stress ⇒ page 298

2 - Bolt
- ❑ 20 Nm

3 - Bracket

4 - Rubber mounting
- ❑ Renew if damaged

5 - Clamp (rear)
- ❑ Before tightening, align exhaust system so it is free of stress ⇒ page 298
- ❑ Installation position ⇒ page 296
- ❑ Tighten bolted connections evenly

6 - Nut
- ❑ 20 Nm

7 - Bolt
- ❑ 20 Nm

8 - Bracket

9 - Rubber mounting
- ❑ Renew if damaged

10 - Centre silencer
- ❑ Combined in one unit with rear silencer as original equipment. Can be renewed individually for repair purposes

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- ❑ Removing and installing ⇒ page 297
- ❑ Cutting point ⇒ page 296
- ❑ Align exhaust system so it is free of stress ⇒ page 298

11 - Rubber mounting

- ❑ Renew if damaged

12 - Bracket

13 - Bolt

- ❑ 20 Nm

14 - Rubber mounting

- ❑ Renew if damaged

15 - Trim

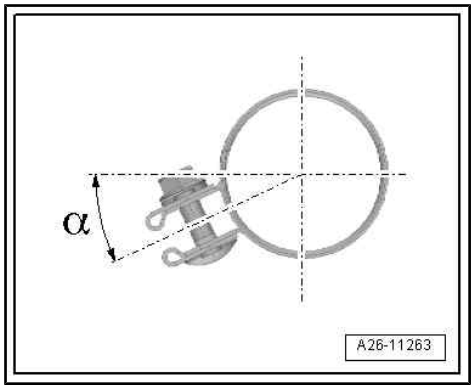
- ❑ For tailpipes

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Installation position of rear clamp

– Fit clamp in position shown.

- Angle -α- = approx. 20°
- Bolt connections face to rear.
- Nuts facing upwards

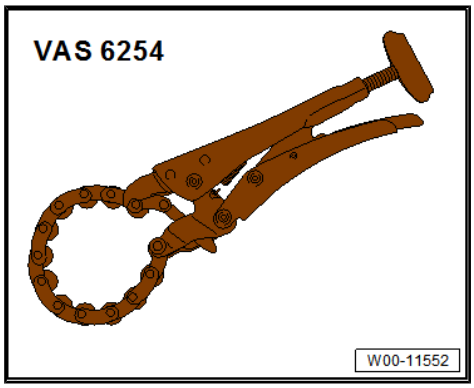


1.2 Separating exhaust pipes/silencers

- ♦ The connecting pipe can be cut through at the cutting location in order to renew the centre and rear silencers separately.
- ♦ The cutting point is marked by an indentation on the circumference of the exhaust pipe.

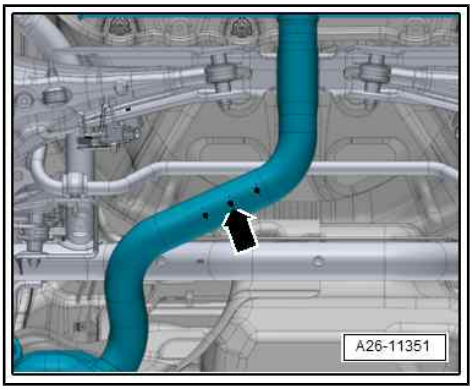
Special tools and workshop equipment required

- ♦ Chain pipe cutter - VAS 6254-



Procedure

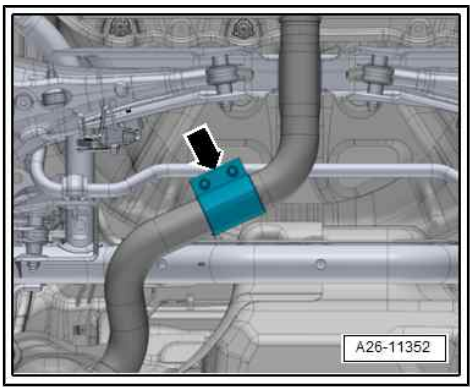
– Cut through exhaust pipe at right angles at the position marked -arrow- using chain-type pipe cutter - VAS 6254-



– When installing, position centre of clamp -arrow- over cutting location.

– Fit rear clamp ⇒ page 296 .

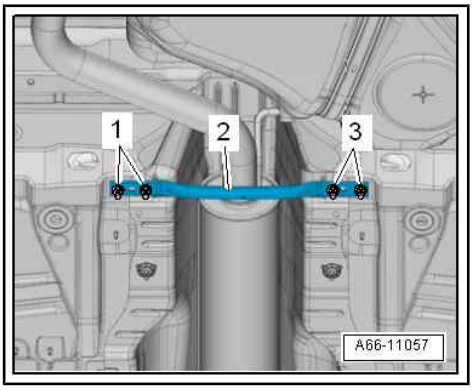
– Align the exhaust system so it is free of stress ⇒ page 298 .



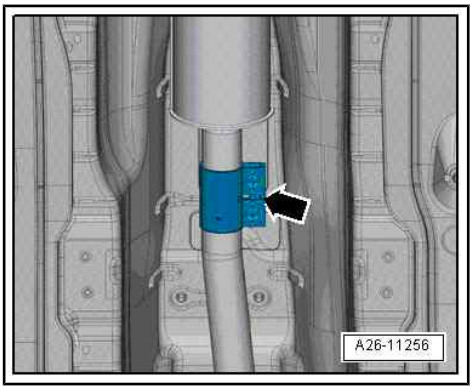
1.3 Removing and installing silencers

Removing

– Remove tunnel cross-piece (rear) -2- ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim; Exploded view - underbody trim .

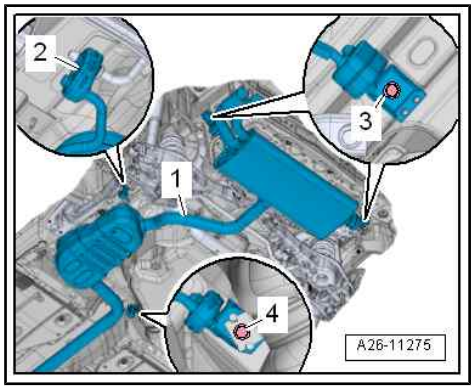


– Loosen clamp -arrow- and push towards rear.



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– Disengage mounting -2- at exhaust system (rear).



WARNING

Risk of accident caused by weight of silencers.

- *A second mechanic is required for removal of the rear silencer.*

– Remove bolt -3- (left and right) and bolt -4- and detach silencers -1-.

Installing

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

– Align the exhaust system so it is free of stress ⇒ page 298 .

Tightening torques

- ⇒ “1.1 Exploded view - silencers”, page 295
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim; Exploded view - underbody trim

1.4 Stress-free alignment of exhaust system

⇒ “1.4.1 Stress-free alignment of exhaust system”, page 298

⇒ “1.4.2 Aligning tailpipes”, page 299

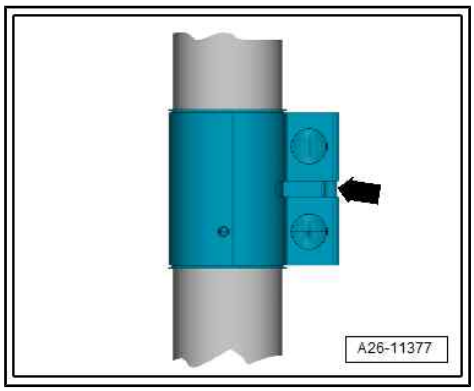
1.4.1 Stress-free alignment of exhaust system

Procedure

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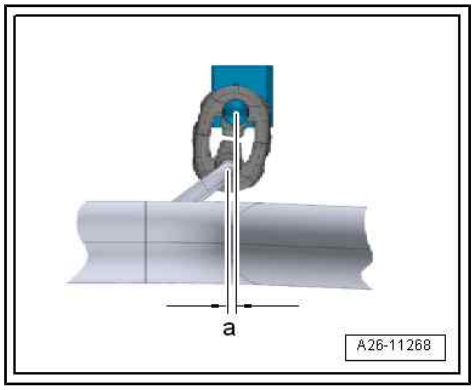
• The exhaust system must be aligned when it is cool.

– Loosen bolt connections for front clamp -arrow-.



– Push exhaust system towards front of vehicle until preloading at mounting for exhaust pipe -a- = 5 mm.

– Fit front clamp ⇒ page 302 .



Tightening torques

- ⇒ “1.1 Exploded view - silencers”, page 295

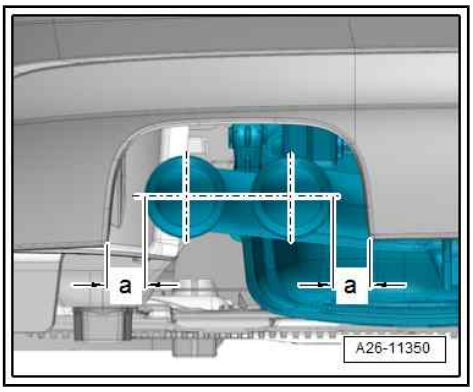
1.4.2 Aligning tailpipes

Procedure

– Adjust rear silencer so that there is an even distance between bumper cut-out and tailpipes.

• -a- = -a-

– Unfasten rear silencer mounting to align tailpipes.



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 plug).

– Listen for noise at the connection points of cylinder head/exhaust manifold, turbocharger/front exhaust pipe etc. to locate any leaks.

– Rectify any leaks that are found.

1.6 Installation position of clamp

Note

Gradual introduction of clamps comprising one continuous piece.

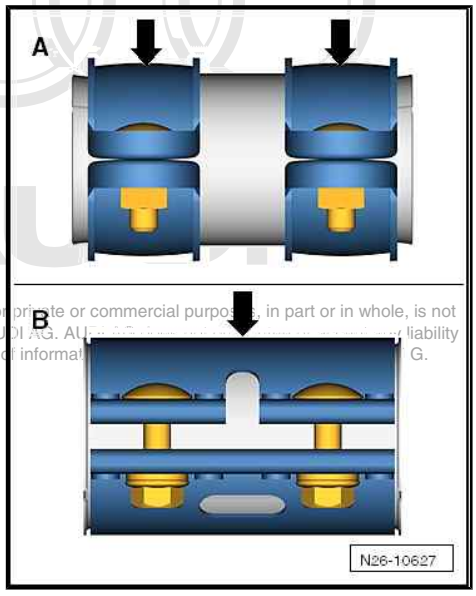
Installation dimension of clamp

Clamp -A- (comprising two separate clamps)

Installation dimension -a- = 5 mm (for front clamp only)

Clamp -B- (comprising one continuous clamp)

Installation dimension -a- = 8.5 mm (for front clamp only)



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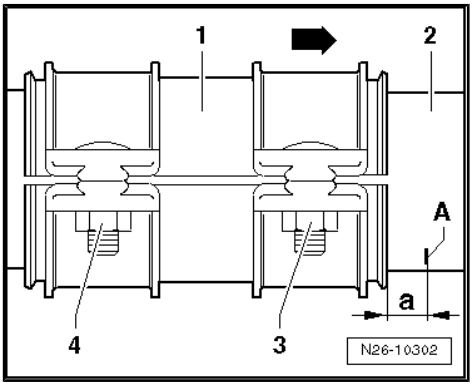
Installation dimension -a- for vehicles with marking on front exhaust pipe

1 - Clamp

2 - Front exhaust pipe

a - Installation dimension

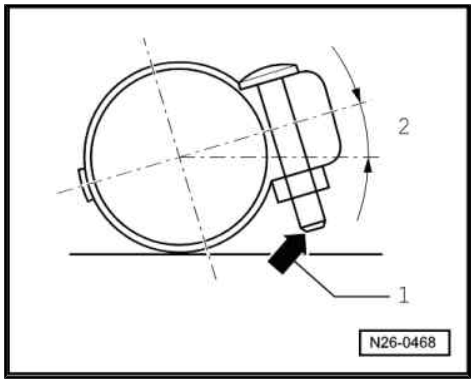
A - Marking



Installation position of front clamp

– Install clamp so that end of bolt -arrow- does not protrude below bottom of clamp.

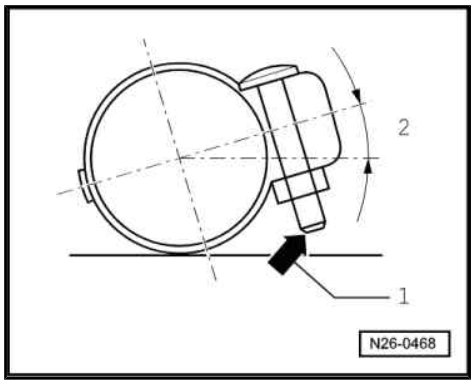
• Bolt connection faces right



Installation position of rear clamp

– Install clamp so that end of bolt -arrow- does not protrude below bottom of clamp.

• Bolt connection faces to rear



Tightening torques

◆ ⇒ “1.1 Exploded view - silencers”, page 295

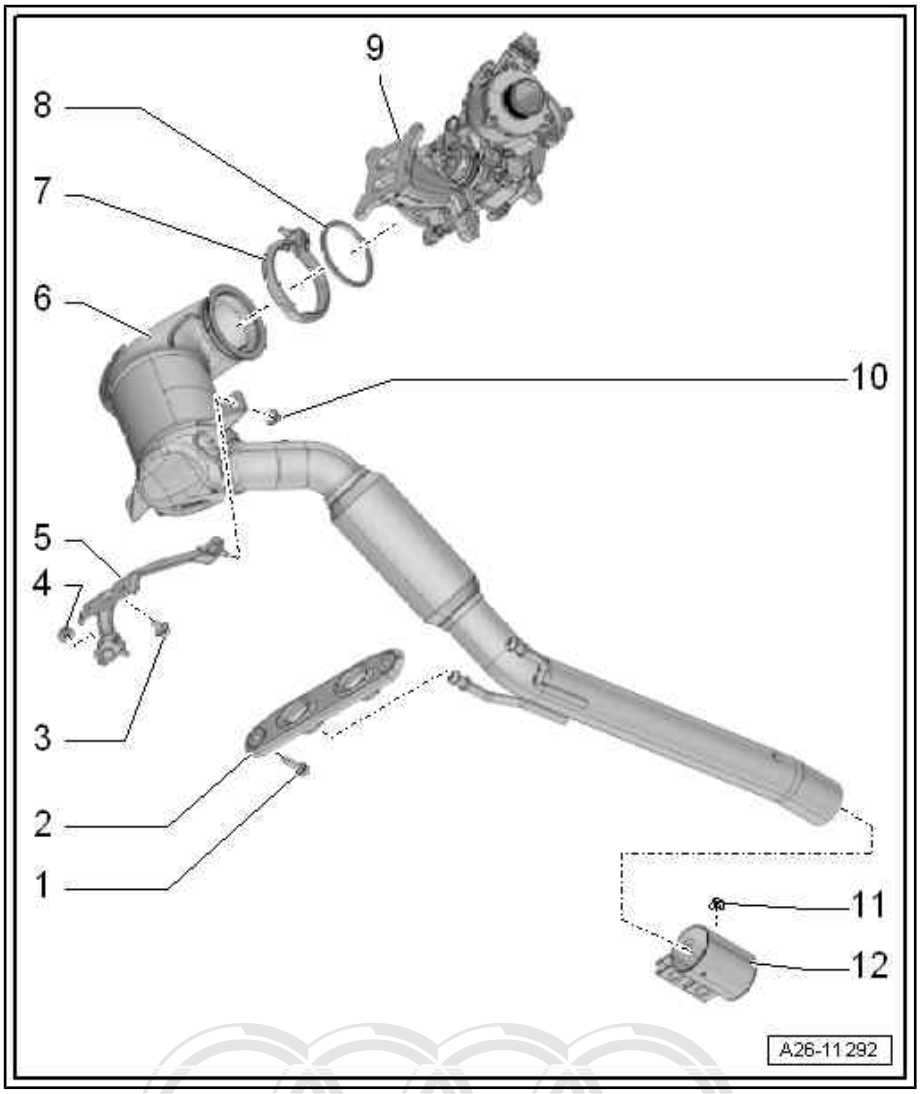
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2 Emission control system

⇒ "2.1 Exploded view - emission control system", page 301

⇒ "2.2 Removing and installing catalytic converter", page 302

2.1 Exploded view - emission control system



1 - Bolt

- ❑ 20 Nm

2 - Bracket

- ❑ Renew if damaged

3 - Bolt

Tightening torque and sequence ⇒ page 302

4 - Nut

Tightening torque and sequence ⇒ page 302

5 - Bracket

- ❑ For catalytic converter

6 - Catalytic converter

- ❑ With front exhaust pipe
- ❑ Protect catalytic converter from damage by knocks and impact
- ❑ Removing and installing ⇒ page 302
- ❑ Align exhaust system so it is free of stress ⇒ page 298

7 - Screw-type clip

- ❑ Renew after removing
- ❑ Installation position ⇒ page 302
- ❑ Tightening torque and sequence ⇒ page 302

8 - Seal

- ❑ Renew after removing

9 - Turbocharger

- ❑ Removing and installing ⇒ page 236

10 - Nut

Tightening torque and sequence ⇒ page 302

11 - Nut

- ❑ 23 Nm

12 - Clamp (front)

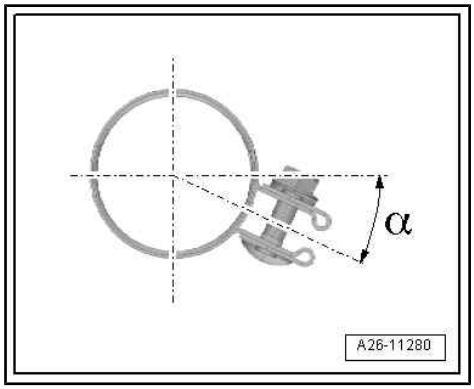
- ❑ Before tightening, align exhaust system so it is free of stress ⇒ page 298
- ❑ Installation position ⇒ page 302
- ❑ Tighten bolted connections evenly

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Installation position of front clamp

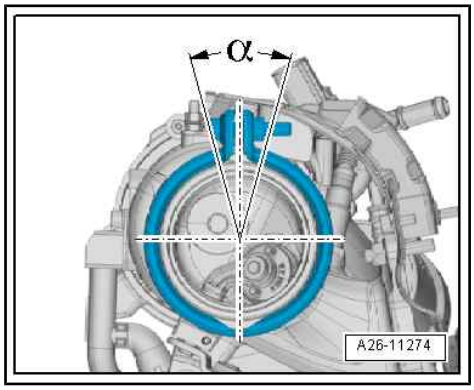
– Fit clamp in position shown.

- Angle -α- = approx. 20°
- Bolted connection facing towards right
- Nuts facing upwards



Installation position of screw-type clip for catalytic converter

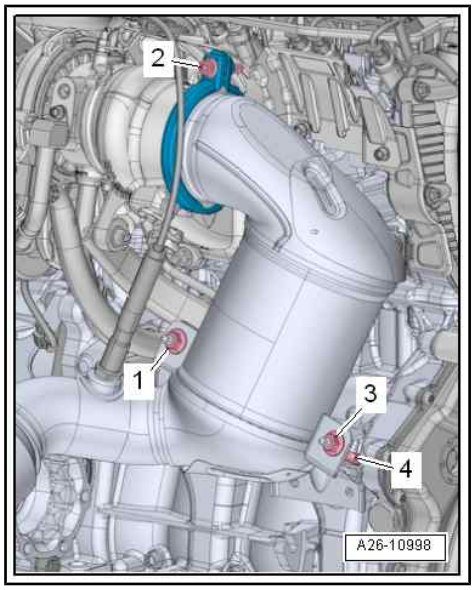
- Angle -α- = 30°



Catalytic converter - tightening torque and sequence

– Tighten bolted connections in stages in the sequence shown:

Stage	Screw-type clip/ nuts	Tightening torque
1	-1, 3, 4-	Screw in by hand until contact is made • It must still be possible to move catalytic converter and bracket
2	-2-	Tighten screw-type clip to 15 Nm
3	-1, 3, 4-	Tighten to 20 Nm



2.2 Removing and installing catalytic converter

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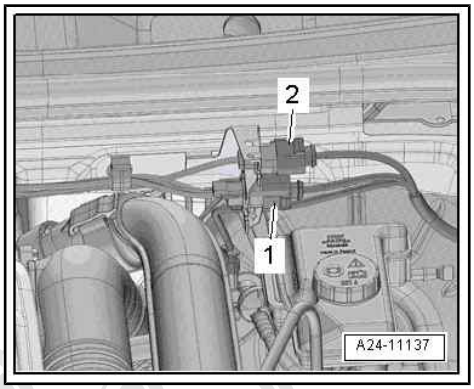
Note

The catalytic converter is removed together with the front exhaust pipe.

Special tools and workshop equipment required

♦ High-temperature paste ⇒ Electronic parts catalogue

Removing



Note

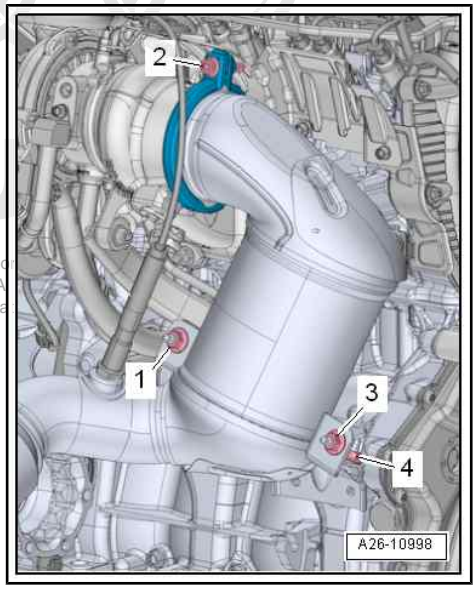
Re-install all cable ties in the same locations when installing.

– Detach electrical connector -2- from bracket and unplug.
– Move electrical wiring clear.

Note

Disregard -item 1-.

– Unscrew bolt -2- and remove screw-type clip.
– Remove nuts -1 and 3-.

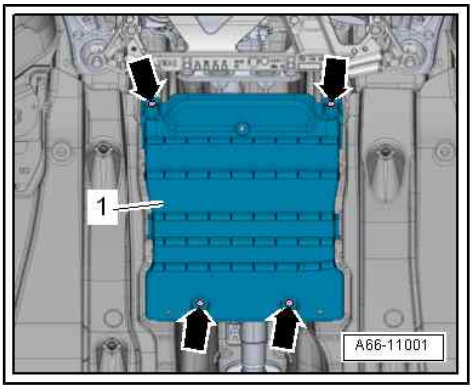


Note

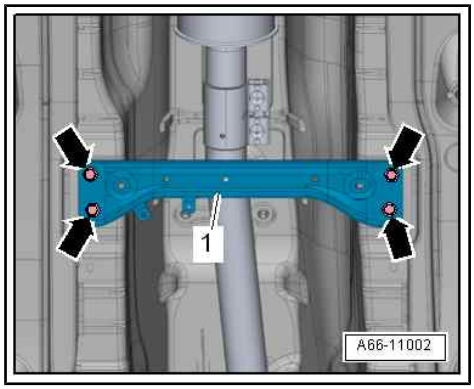
- *For illustration purposes, the installation position is shown with the engine removed.*
- *Disregard -item 4-.*

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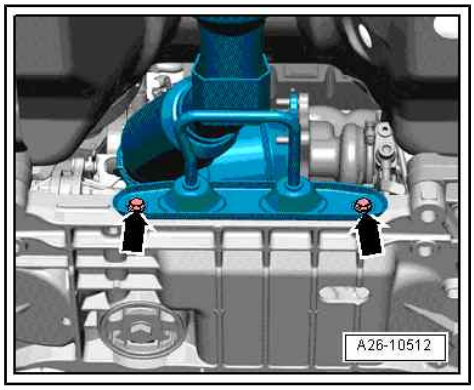
– If fitted, remove noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .



– Remove tunnel cross-piece (front) -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim; Removing and installing tunnel cross-piece .

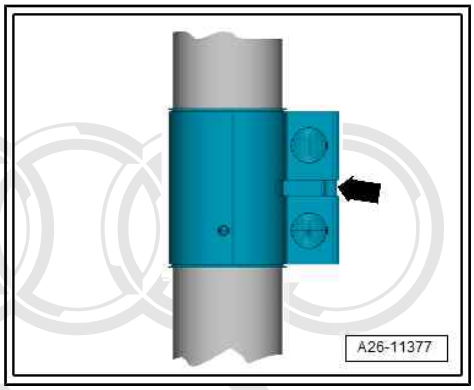


– Remove bolts -arrows-.



– Loosen clamp -arrow- and push towards rear.

– Detach catalytic converter with front exhaust pipe.



Installing

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

Note

- *Renew gaskets and self-locking nuts.*
- *Lubricate exhaust manifold studs with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .*

– Fit catalytic converter and attach screw-type clip loosely without tightening it.

– Tighten nuts and screw-type clip ⇒ page 302 .

– Align the exhaust system so it is free of stress ⇒ page 298.

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Tightening torques

- ⇒ “8.1 Exploded view - Lambda probe”, page 292
- ⇒ “2.1 Exploded view - emission control system”, page 301
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim; Exploded view - underbody trim
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

28 – Ignition system

1 Ignition system

⇒ “1.1 Exploded view - ignition system”, page 305

⇒ “1.2 Removing and installing ignition coils with output stages”, page 306

⇒ “1.3 Removing and installing knock sensor 1 G61 ”, page 308

⇒ “1.4 Removing and installing Hall senders”, page 309

⇒ “1.5 Removing and installing engine speed sender G28 ”, page 310

1.1 Exploded view - ignition system

1 - Bolt

- ❑ Renew
- ❑ The tightening torque influences the function of the knock sensor
- ❑ 8 Nm +90°

2 - Knock sensor 1 - G61-

- ❑ Fitting location: below intake manifold behind actuator for engine temperature regulation - N493-
- ❑ Removing and installing ⇒ page 308

3 - Spark plug

- ❑ Removing and installing ⇒ Maintenance ; Booklet 821
- ❑ 30 Nm

4 - Spark plug connectors

5 - Ignition coil with output stage

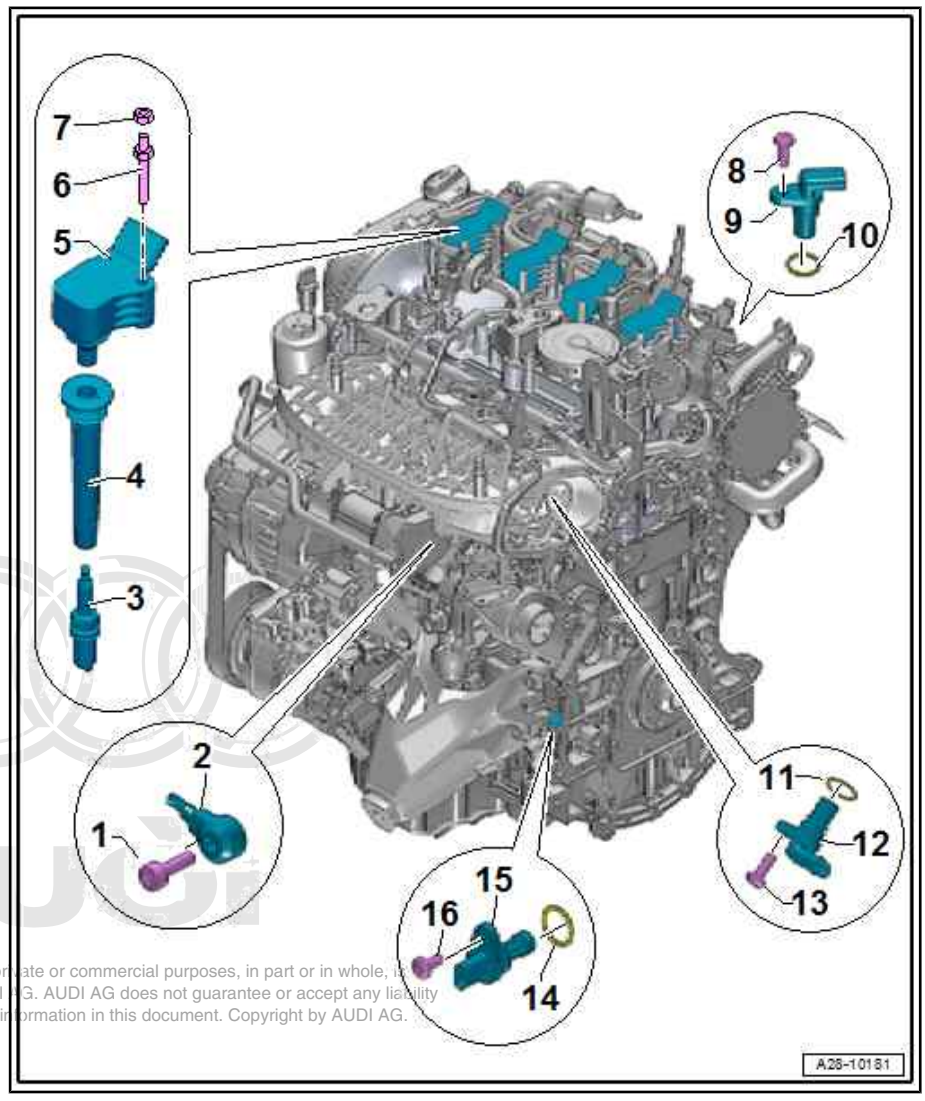
- ❑ Ignition coil 1 with output stage - N70-
- ❑ Ignition coil 2 with output stage - N127-
- ❑ Ignition coil 3 with output stage - N291-
- ❑ Ignition coil 4 with output stage - N292-
- ❑ Removing and installing ⇒ page 306

6 - Centre hex stud

- ❑ 10 Nm

7 - Nut

- ❑ 9 Nm



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8 - Bolt

- ❑ 10 Nm

9 - Hall sender 3 - G300-

- ❑ Removing and installing ⇒ page 309

10 - O-ring

- ❑ Renew

11 - O-ring

- ❑ Renew after removing

12 - Hall sender - G40-

- ❑ Removing and installing ⇒ page 309

13 - Bolt

- ❑ 10 Nm

14 - O-ring

- ❑ Renew if damaged

15 - Engine speed sender - G28-

- ❑ Removing and installing ⇒ page 310

16 - Bolt

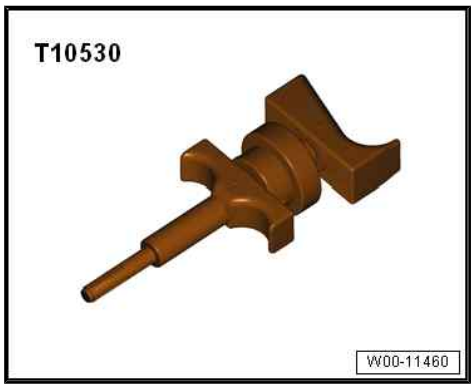
- ❑ Renew after removing
- ❑ 4 Nm +45°

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1.2 Removing and installing ignition coils with output stages

Special tools and workshop equipment required

- ♦ Puller - T10530-



Note

Ignition coils with output stages and spark plug connectors are available individually as replacement parts ⇒ Electronic parts catalogue (ETKA) .

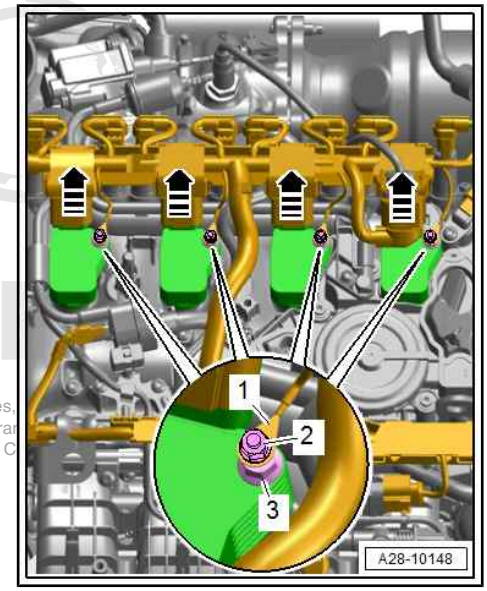
Removing

– Remove engine cover panel ⇒ page 50 .

– If fitted, remove nut -2- and move earth wire -1- clear.

– Release electrical connectors and detach simultaneously from ignition coils in direction of -arrows-.

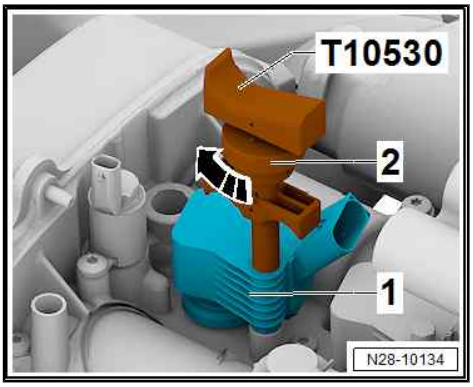
– Remove corresponding centre hex stud -3-.



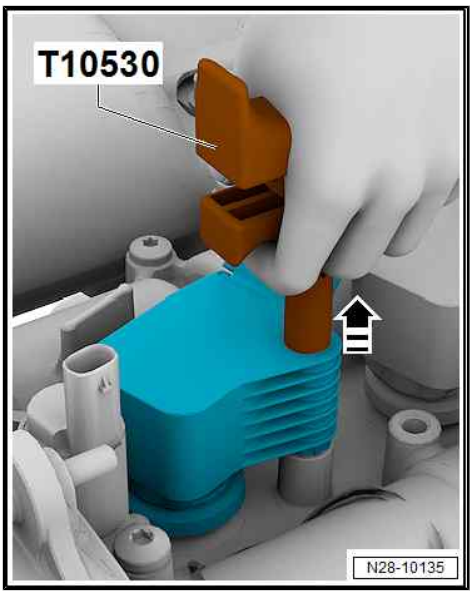
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– Insert puller - T10530- into hole -1- in ignition coil.

– Turn knurled nut -2- clockwise until puller is secured in place.

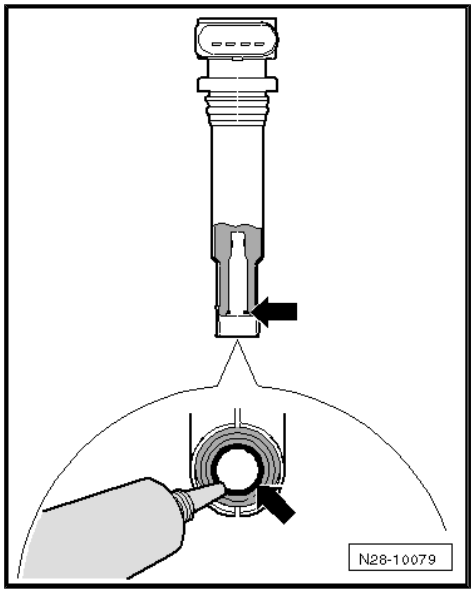


– Working vertically upwards, carefully pull ignition coil out with puller - T10530- .



Installing

– Apply a thin bead of silicone paste all around end of sealing hose of ignition coil with output stage -arrow-.



Silicone paste ⇒ Electronic parts catalogue (ETKA) .

– Press ignition coils onto spark plugs by hand evenly (do not use tools).

– Secure ignition coils.

– Remove engine cover panel ⇒ page 50 .

Tightening torques

◆ ⇒ “1.1 Exploded view - ignition system”, page 305

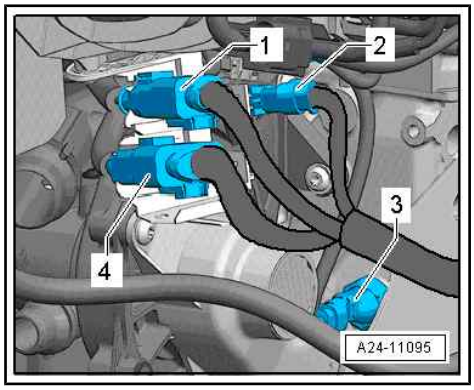
1.3 Removing and installing knock sensor 1 - G61-

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Removing

– Remove thermostat housing ⇒ page 218 .

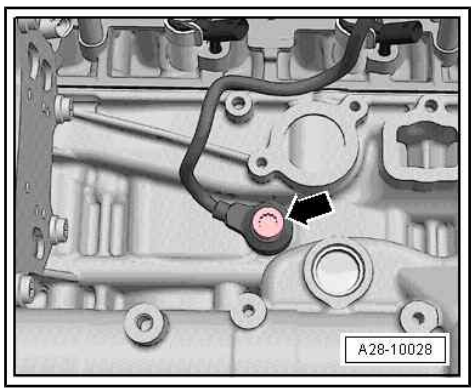
– Unplug electrical connector -2- and detach from bracket.



Note

Disregard -items 1, 3, 4-.

– Unscrew knock sensor 1 - G61- -arrow-.



Installing

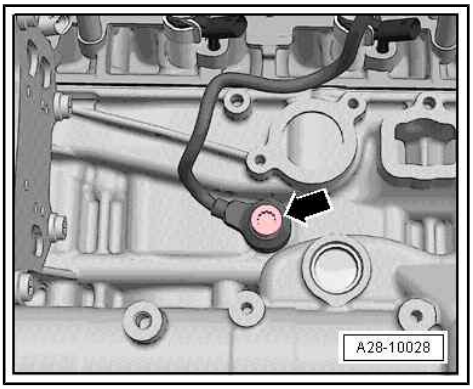
– Install in reverse sequence.

– Note installation position of knock sensor 1 - G61- .

Tightening torques

– Install thermostat housing ⇒ page 218 .

◆ ⇒ “1.1 Exploded view - ignition system”, page 305



1.4 Removing and installing Hall senders

⇒ “1.4.1 Removing and installing Hall sender G40 ”, page 309

⇒ “1.4.2 Removing and installing Hall sender 3 G300 ”, page 309

1.4.1 Removing and installing Hall sender - G40-

Removing

– Remove intake manifold ⇒ page 266 .

– Unplug electrical connector -1-.

– Unscrew bolt -arrow- and remove Hall sender.

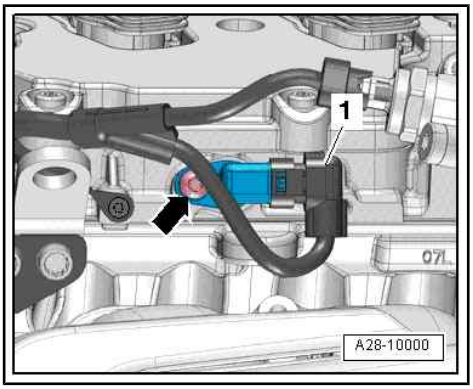
Installing

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

– Renew O-ring.

Tightening torques

◆ ⇒ “1.1 Exploded view - ignition system”, page 305



1.4.2 Removing and installing Hall sender 3 - G300-

Removing

– Remove engine cover panel ⇒ page 50 .

– Unplug electrical connector -1-.

– Unscrew bolt -2- and detach Hall sender.

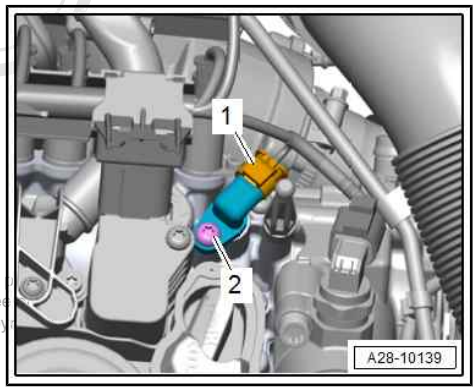
Installing

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

– Renew O-ring.

Tightening torques

◆ ⇒ “1.1 Exploded view - ignition system”, page 305



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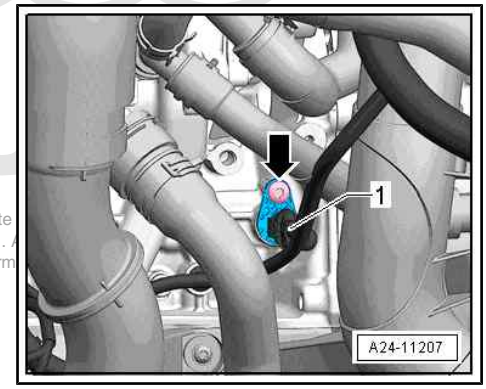
1.5 Removing and installing engine speed sender - G28-

Removing

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

– Unplug electrical connector -1- for engine speed sender - G28- -2-.

– Remove securing bolt -arrow-.



Installing

Install in reverse sequence.

Tightening torques

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◆ ⇒ “1.1 Exploded view - ignition system”, page 305

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