Workshop Manual

Audi Q3 2012 ➤
Audi Q3 China 2013 ➤

4-cylinder direct injection engine (1.8 ltr., 2.0 ltr. 4V TFSI, generation II)									
Engine ID	CCZC	CPSA	CGMA	CRHA	CCTA				

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List of Workshop Manual Repair Groups

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

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00 – Technical data

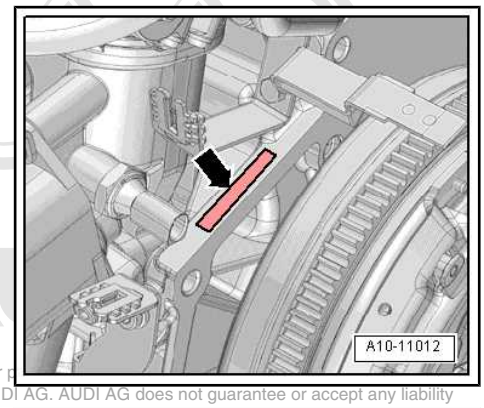
1 Identification

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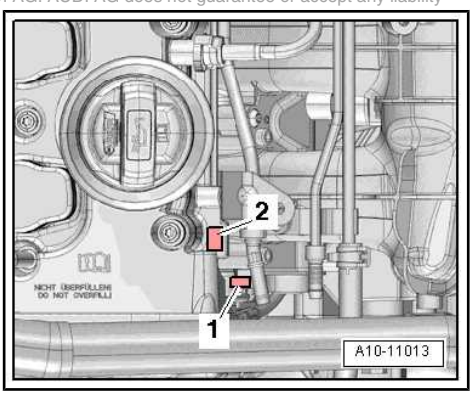
⇒ “1.1 Engine identification number/engine data”, page 1

1.1 Engine identification number/engine data

Engine number



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- The engine number (“engine code” and “serial number”) is located on the left side at the joint between engine and gearbox -arrow-.
- The engine code letters are also stamped onto the right side of the cylinder head -2- and the cylinder block -1-.
- There is also a sticker with “engine code” and “serial number” attached to the toothed belt cover.
- Engine codes starting with the letter “C” have four letters (previously three letters).
- The first 3 characters of the engine code stand for the engine capacity and the mechanical construction and design. They are stamped onto the cylinder block together with the serial number.
- The 4th character indicates the power output and torque of the engine and is determined by the engine control unit.

Note

- *The four-letter engine code is found on the type plate (country specific version), vehicle data sticker and engine control unit.*
- *Fitting locations of the type plate (certain countries only) and the vehicle data sticker ⇒ Maintenance ; Booklet 820 .*

For engine data refer to ⇒ Technical data for 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 working on the subframe”, page 3

⇒ “2.4 Safety precautions when using testers and measuring instruments during a road test”, page 3

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

⇒ “2.6 Safety precautions when working on the cooling system”, page 4

2.1 Safety precautions when working on the fuel supply system

Risk of injury - fuel system operates under high pressure

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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.

2.3 Safety precautions when working on the subframe

Please note the following warnings when working on the subframe:

Caution

Risk of damage to running gear components.

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

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

Risk of injury if test equipment is not secured

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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.

2.5 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.

2.6 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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3 Repair instructions

⇒ “3.1 Rules for cleanliness”, page 5

⇒ “3.2 Foreign particles in engine”, page 5

⇒ “3.3 Contact corrosion”, page 5

⇒ “3.4 Routing and attachment of pipes, hoses and wiring”, page 6

⇒ “3.5 Installing radiators and condensers”, page 6

⇒ “3.6 Checking vacuum system”, page 6

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3.1 Rules for cleanliness

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

- 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 not been stored in their packing (e.g. in tool boxes etc.).
- When the system is open, do not work with compressed air and do not move the vehicle.
- Make sure that no fuel runs onto the fuel hoses. Should this occur, the fuel hoses must be cleaned again immediately.
- Protect unplugged electrical connectors against dirt and moisture and make sure connections are dry when attaching.

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 .

Please note:

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

3.4 Routing and attachment of pipes, hoses and wiring

- Mark fuel lines, 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-

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Procedure

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

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

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

– If a fault is stored in the event memory, check 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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10 – Removing and installing engine

1 Removing and installing engine

⇒ “1.1 Removing engine”, page 8

⇒ “1.2 Separating engine and gearbox”, page 25

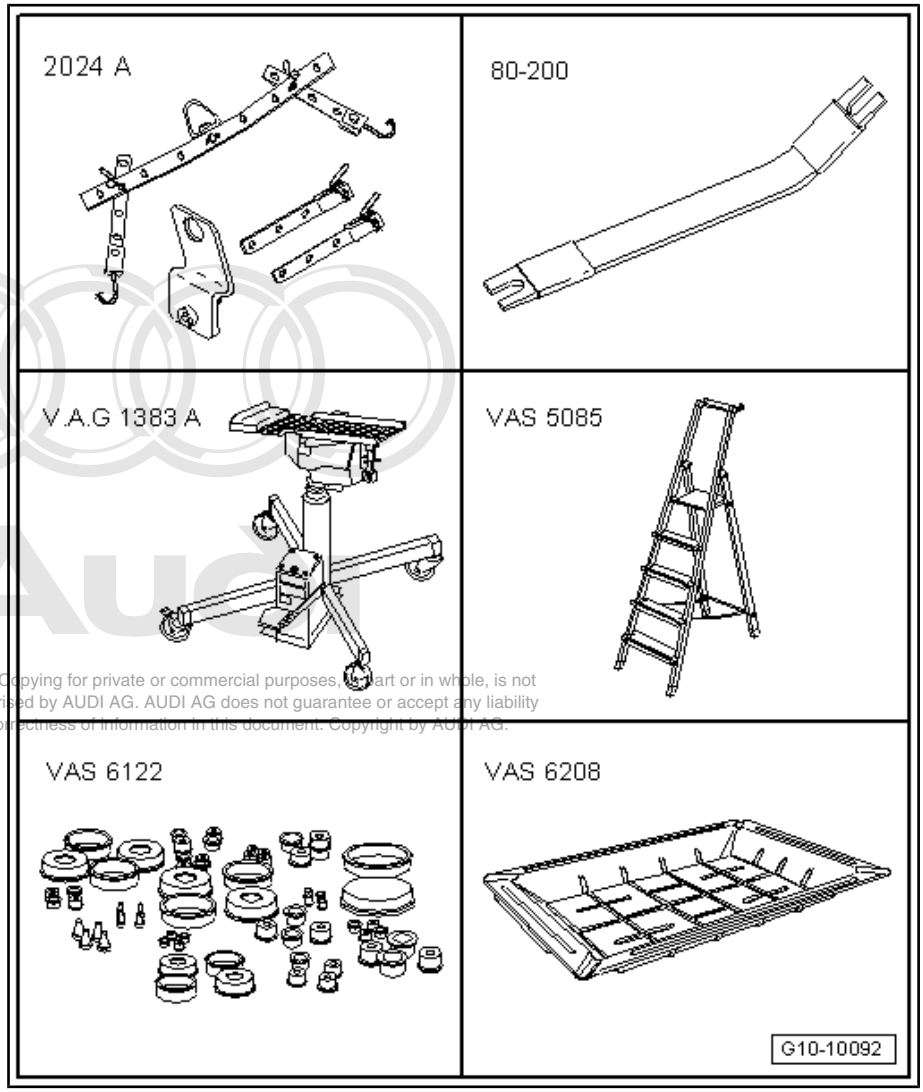
⇒ “1.3 Securing engine to engine and gearbox support”, page 32

⇒ “1.4 Installing engine”, page 34

1.1 Removing engine

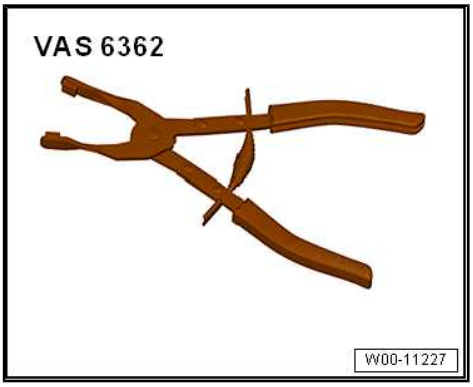
Special tools and workshop equipment required

- Extension -2024 A /1- for lifting tackle - 2024 A-
- Removal lever - 80-200-
- Engine and gearbox jack - V.A.G 1383 A-
- Stepladder - VAS 5085-
- Engine bung set - VAS 6122-
- Drip tray for workshop hoist - VAS 6208-

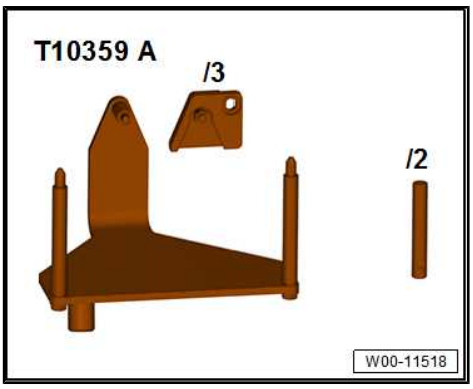


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- Hose clip pliers - VAS 6362-



- Engine bracket - T10359A-



- Safety goggles
- Protective gloves

Procedure

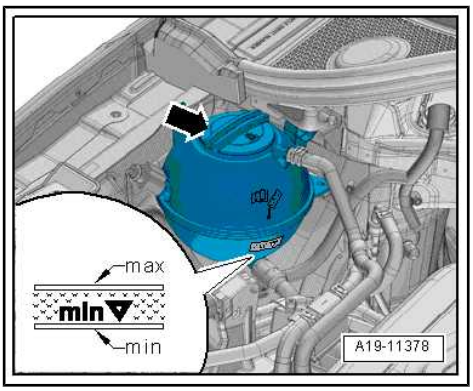
Note

- *The engine is removed from underneath together with the gearbox.*
- *Fit all cable ties in the original positions 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 coolant expansion tank with cloth and open carefully.***

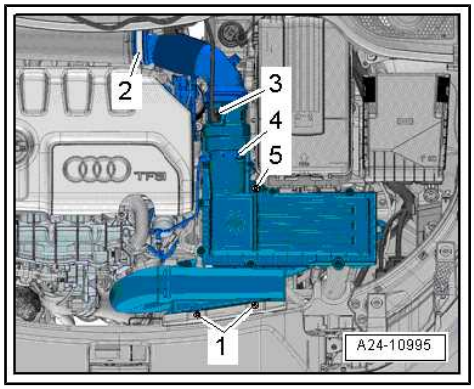


– Open filler cap -arrow- on coolant expansion tank.

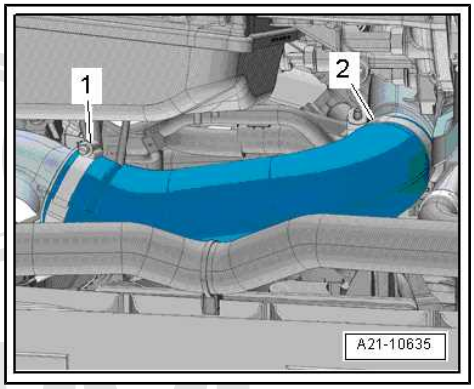
– Remove engine cover panel ⇒ page 46 .

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– Unplug electrical connector -3- at air mass meter - G70- .
– Detach hose -4-.
– Release hose clip -2- and detach air hose.
– Unscrew bolts -1 and 5- and detach air cleaner housing.
– Remove both front wheels ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres .
– Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .
– Remove wheel spoilers (left and right) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Removing and installing wheel housing liner (front) .

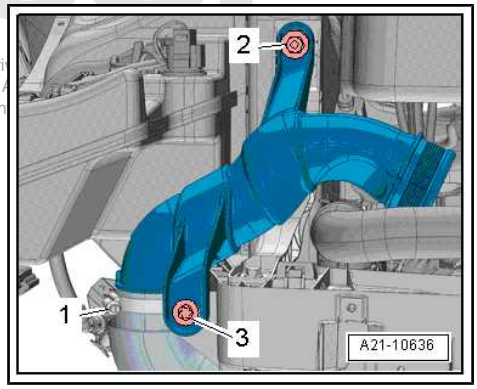


– Release hose clips -1 and 2- and remove air hose.
– Seal off open lines and connections with clean plugs from engine bung set - VAS 6122- .



– Remove nut -2- and bolt -3-.
– Release hose clip -1- and detach air pipe.
– Seal off open lines and connections with clean plugs from engine bung set - VAS 6122- .

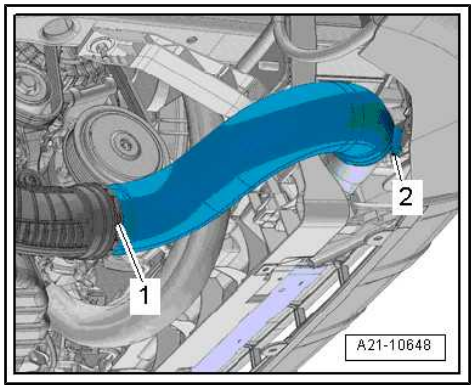
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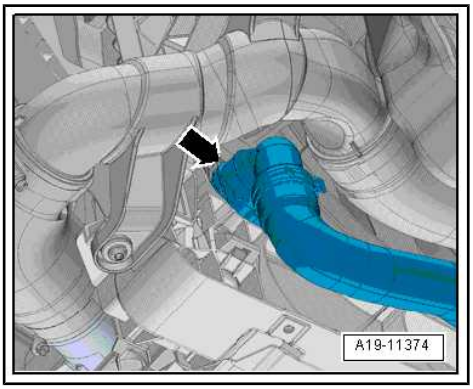
– Lift retaining clip -1- and disconnect air hose.
– Seal off open lines and connections with clean plugs from engine bung set - VAS 6122- .

Note

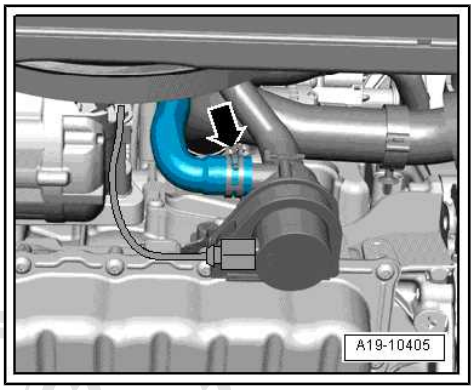
Disregard -item 2-.



– Place drip tray for workshop hoist - VAS 6208- beneath engine.
– Lift retaining clip -arrow-, disconnect coolant hose (bottom left) from radiator and drain off coolant.



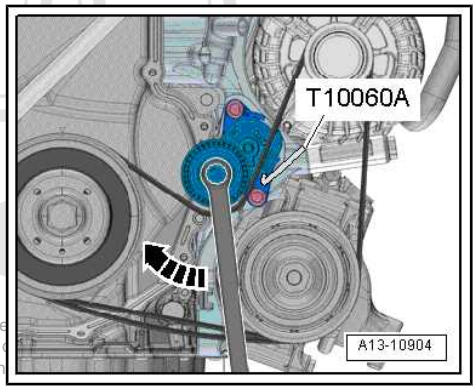
– Release hose clip -arrow-, disconnect coolant hose (bottom) leading to continued coolant circulation pump - V51- and drain off coolant.



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.*



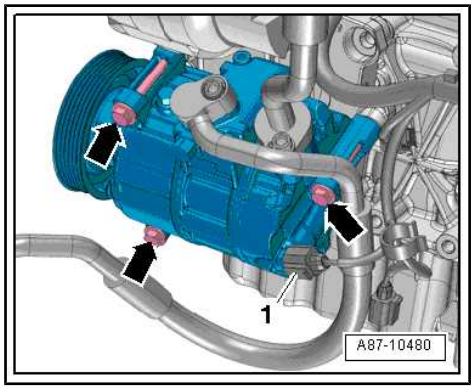
– To slacken poly V-belt, swivel tensioner in clockwise direction -arrow-, detach poly V-belt from pulley for air conditioner compressor and release tensioner.
– Take off poly V-belt.

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Note

Ignore -T10060 A- .

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



WARNING

Risk of injury caused by refrigerant.

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

– Remove bolts -arrows- for air conditioner compressor.

Caution

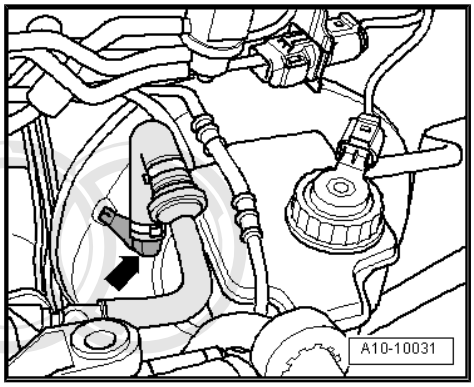
Risk of damage to air conditioner compressor and refrigerant pipes/hoses.

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

– Detach air conditioner compressor with refrigerant lines still connected and tie up to right side.

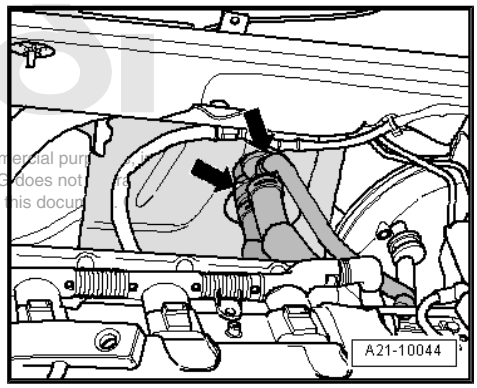
– Remove battery and battery tray ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery tray .

– Detach vacuum hose -arrow- from brake servo.



– Detach heat shield sleeve.

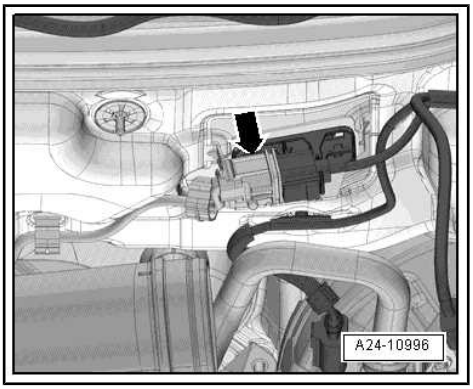
– Lift retaining clips -arrows- and disconnect coolant hoses from heat exchanger for heater.



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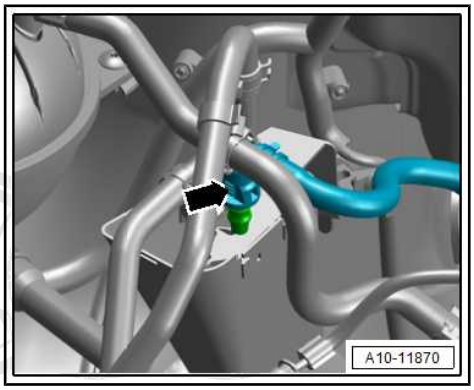
Vehicles with engine codes CCTA and CPSA:

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



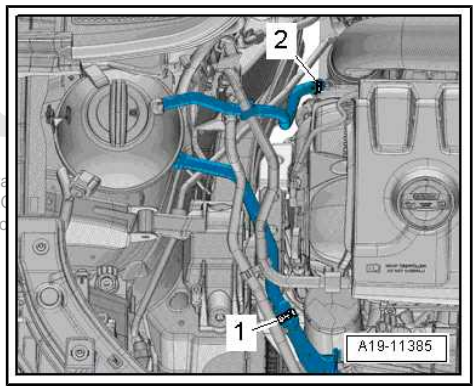
Vehicles with engine code CCTA:

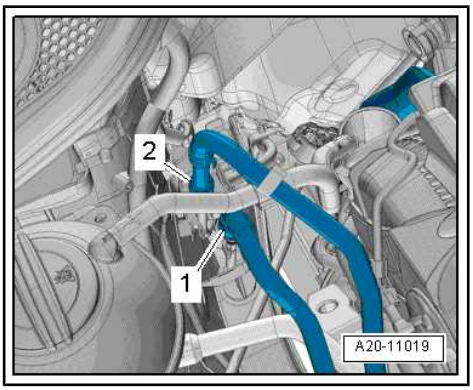
– Disconnect leak detection hose -arrow-.



Continued for all vehicles:

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





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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).

Caution

Take care to keep components clean.

- *Observe rules for cleanliness when working on the fuel supply system ⇒ page 5 .*

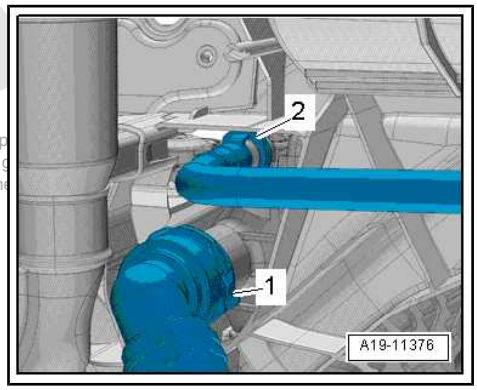
– Disconnect fuel hose -2- by pressing release ring.

– Press release tabs and disconnect hose -1- from activated charcoal filter.

– Lift retaining clips -1 and 2- and disconnect coolant hoses (top left) from radiator.

– Remove engine control unit - J623- ⇒ page 296 .

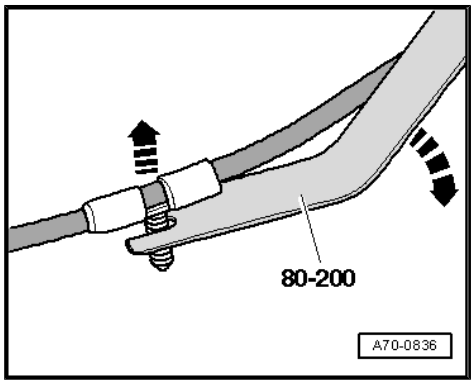
– Remove throttle valve module - J338- ⇒ page 267 .



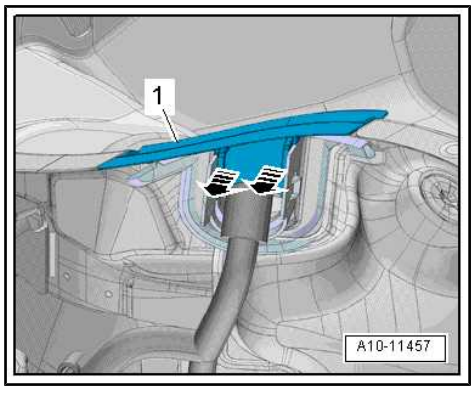
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Note

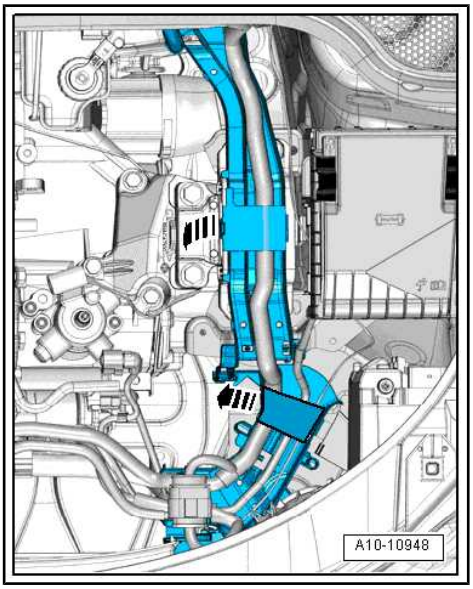
Use removal lever - 80-200- to lever out the wiring clips when performing the next work steps.



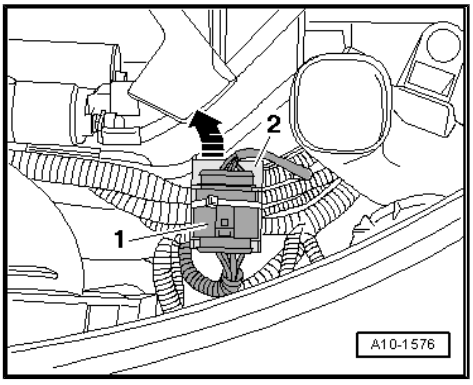
– Release wiring protector -1- for engine wiring harness -arrows- and lift off.



– Open retainers for wiring duct -arrows-.



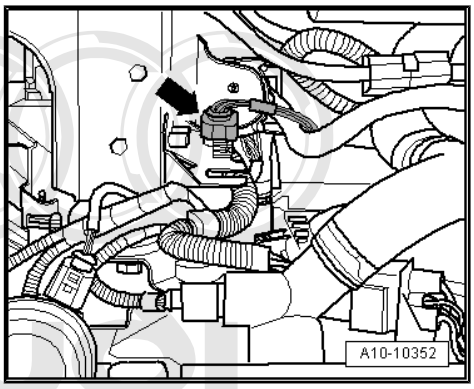
– Move clear and unplug electrical connector -1-.
– Open retainer -2- for wiring duct -arrow- (located underneath connector).
– Remove wiring harness for engine control unit from wiring duct and place on engine.



– Unplug electrical connector -arrow- at longitudinal member (bottom left).

Note

For illustration purposes, the installation position is shown from below.

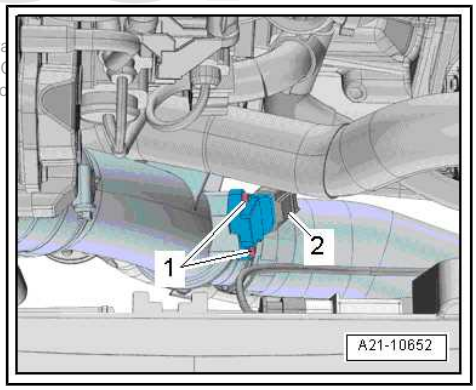


– Unplug electrical connector -2- at charge pressure sender - G31- and move wiring clear.

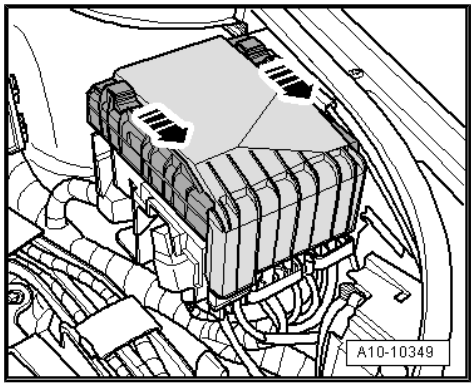
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Note

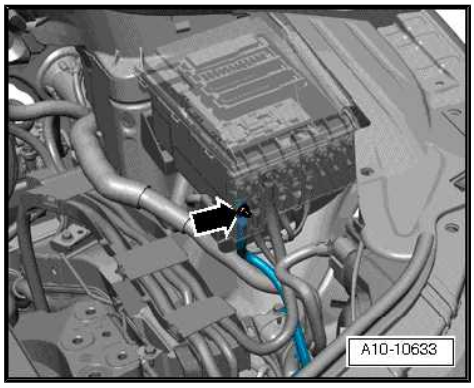
Disregard -item 1-.



– Slide the two clips in the direction of the -arrows- and remove cover from electronics box in engine compartment.

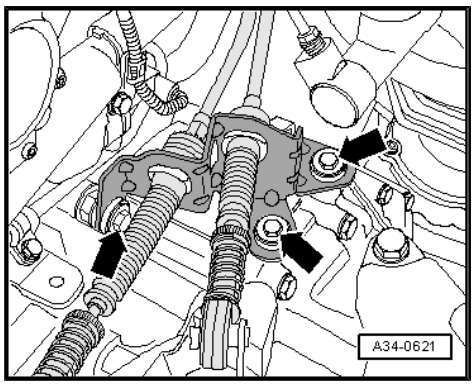


– Remove nut -arrow-, detach terminal 30 wire from electronics box in engine compartment and move it clear.



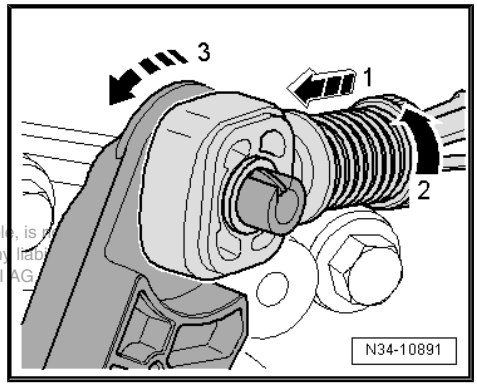
Vehicles with manual gearbox:

– Remove bolts -arrows-, detach cable support bracket and place to one side with selector cables attached.



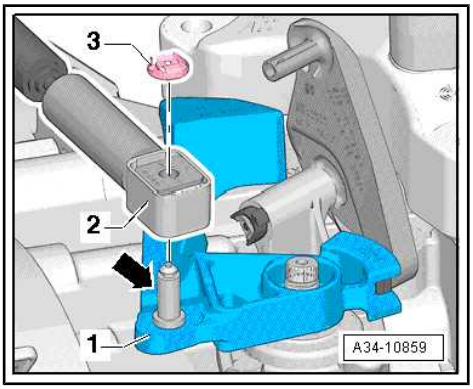
– Pull locking device forwards onto stop -arrow 1- and lock by turning anti-clockwise -arrow 2-.

– Press relay lever towards front -arrow 3-, take gate selector cable out of end-piece.

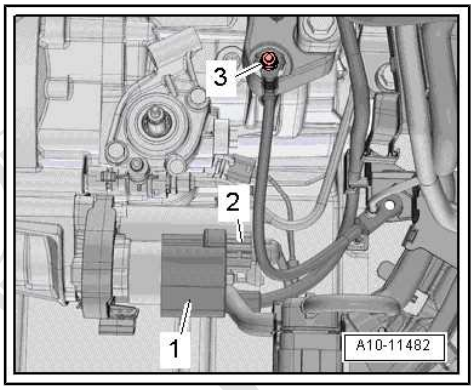


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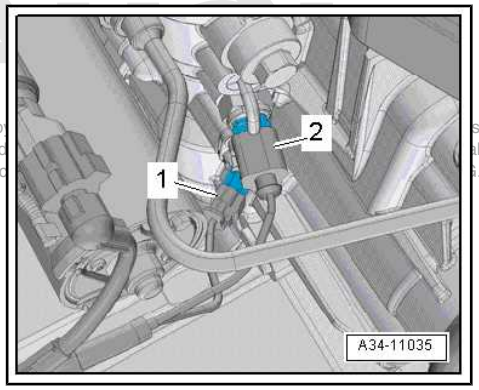
– Detach securing clip -3- for gear selector cable from gearbox selector lever -1- and pull cable -2- off pin -arrow-.



– 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.



– Unplug electrical connectors -1, 2-.



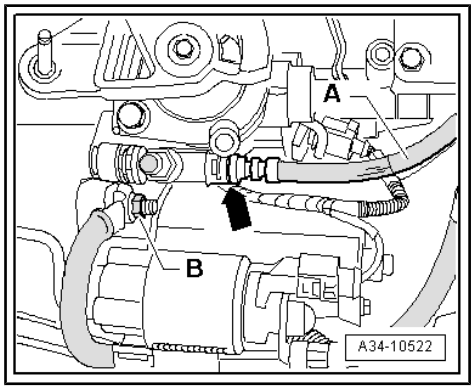
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Note

Make sure brake fluid does not come into contact with longitudinal member or gearbox when performing the following operations. If it does, clean affected area thoroughly.

– Place a lint-free cloth underneath bleeder connection.

– Pull out securing clip -arrow- as far as stop and disconnect pipe -A- from bleeder connection.



Note

Disregard -item B-.

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

Caution

Risk of contamination by escaping brake fluid.

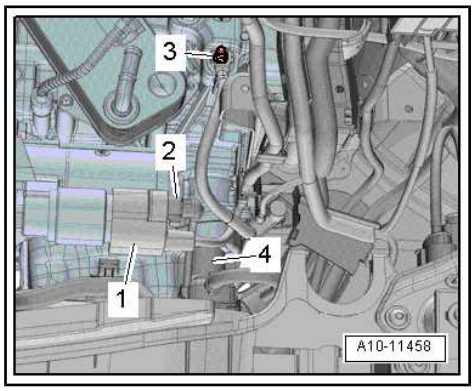
- ***Do not operate clutch pedal after detaching pipe from bleeder connection on clutch slave cylinder.***

Vehicles with dual clutch 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.



Caution

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

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

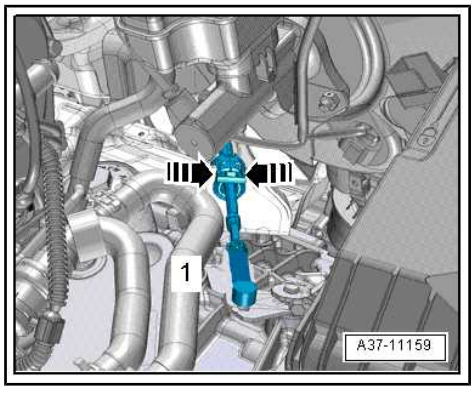
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– Touch vehicle earth with bare hands to eliminate any static charge.

– Turn retainer catch anti-clockwise and unplug electrical connector -4- at gearbox.

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

– Release fasteners -arrows- and move selector lever cable clear.

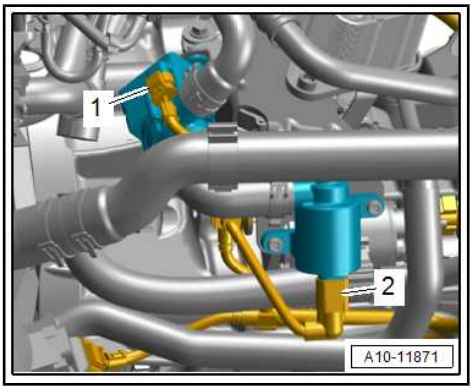


Note

Take care not to bend or kink selector lever cable.

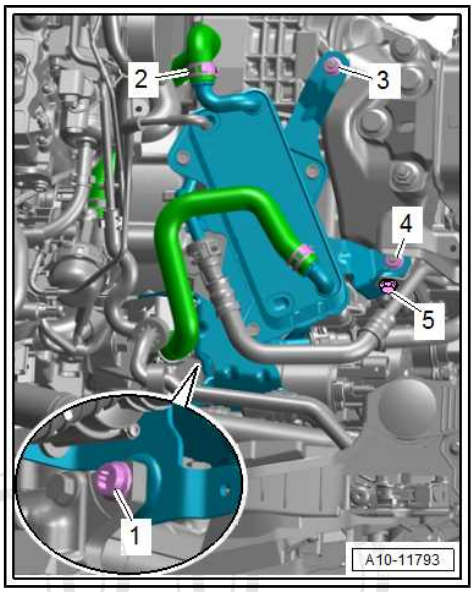
Vehicles with automatic gearbox:

– Unplug electrical connectors -1 and 2- and move electrical wiring clear.



– Release hose clip -2- and disconnect coolant hose.

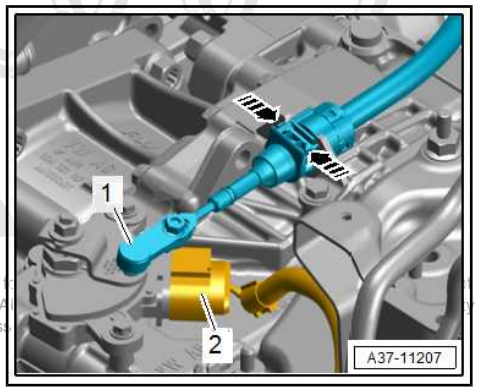
– Remove bolts -1, 5- and nuts -3, 4- and push bracket with ATF cooler slightly to one side.



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

– Release fasteners -arrows- and move selector lever cable clear.

– Unplug electrical connector -2-.

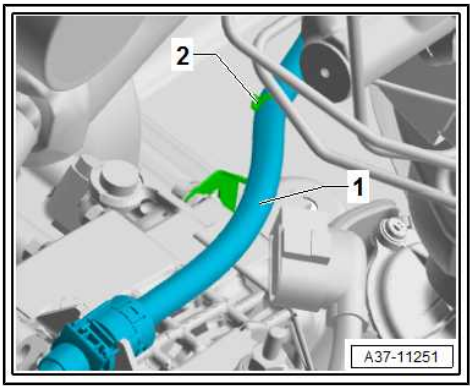


Note

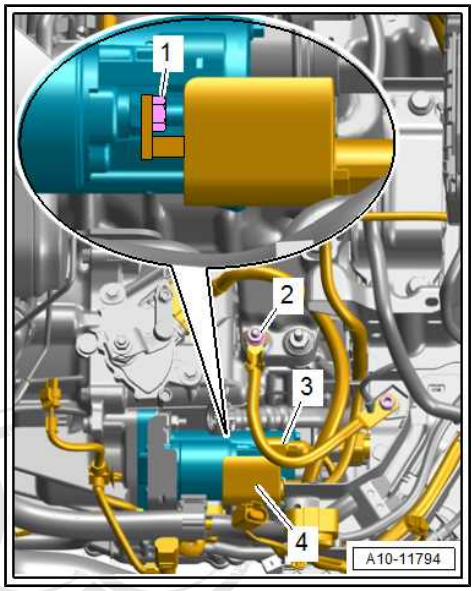
Take care not to bend or kink selector lever cable.

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– Press selector lever cable -1- out of bracket -2- on gearbox.



– Unplug electrical connector -3- (push retainer to the rear and press down release catch).
– Press off cap -4-.
– Unscrew terminal 30/B+ wire -1- from starter.
– Remove nut -2- and move earth wire clear.

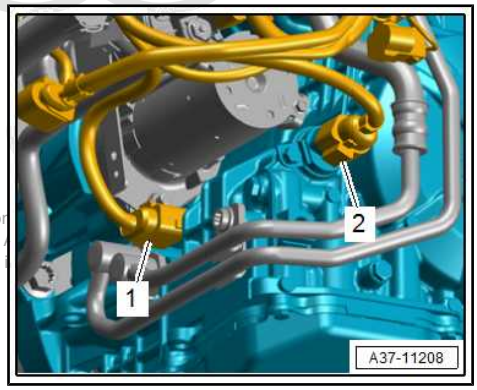


Caution

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

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

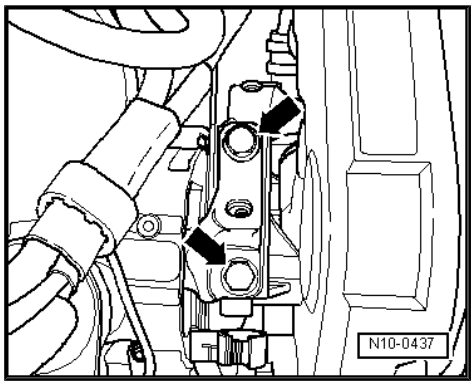
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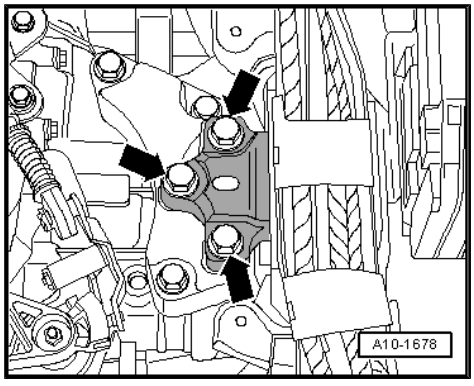
– Unplug electrical connectors -1, 2- on gearbox and move clear.
– Touch vehicle earth with bare hands to eliminate any static charge.

Continued for all vehicles:

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



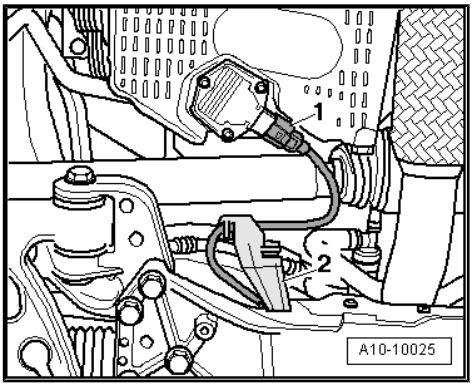
– Loosen bolts -arrows- at gearbox mounting approx. 2 turns.



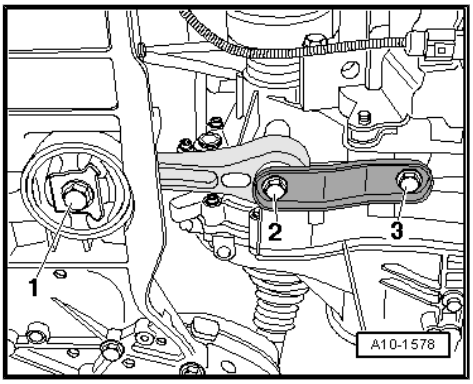
Note

The illustration shows the fitting location on a vehicle with a manual gearbox as an example.

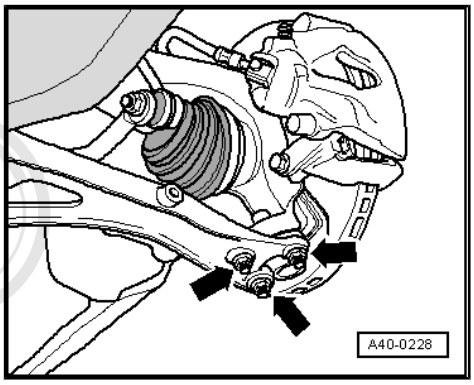
– Unplug electrical connector -1- at oil level and oil temperature sender - G266- .
– Unclip bracket -2- for wire to oil level and oil temperature sender - G266- from subframe.
– Remove nut for coupling rod at both ends of anti-roll bar ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Removing and installing coupling rod .



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



– Remove nuts -arrows- for swivel joint on both sides.
– If fitted, unscrew nut on bracket for front left vehicle level sender - G78- .
– Detach swivel joint from wishbone (both sides).
– Detach drive shaft (left and right) from gearbox ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .
– Tie up drive shaft (left-side).



Note

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

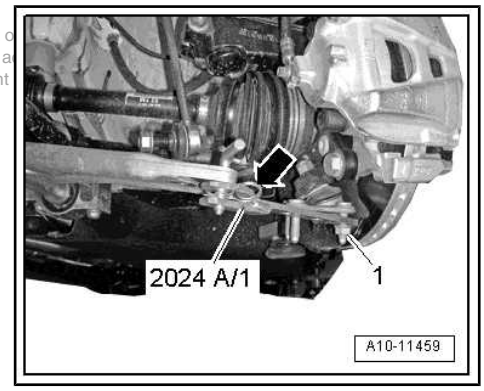
– Swing suspension strut (both sides) outwards and support with extension -2024 A /1- , as shown in illustration.

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WARNING

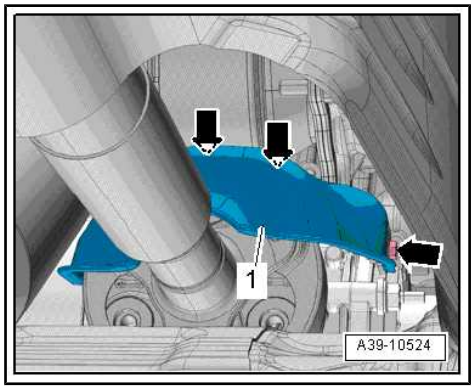
Accident risk from loose components of support bracket.

- ***Secure retaining pin and swivel joint with locking pin -arrow- and nut -1-.***



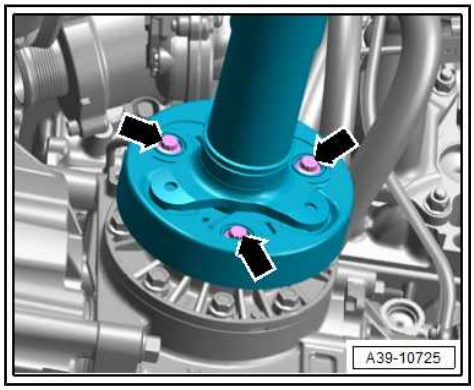
Vehicles with four-wheel drive:

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



– Mark position of flexible coupling and flange for bevel box in relation to each other for re-installation.

– Remove bolts -arrows- securing flexible coupling for propshaft to bevel box (counterhold using a suitable lever at triangular flange).

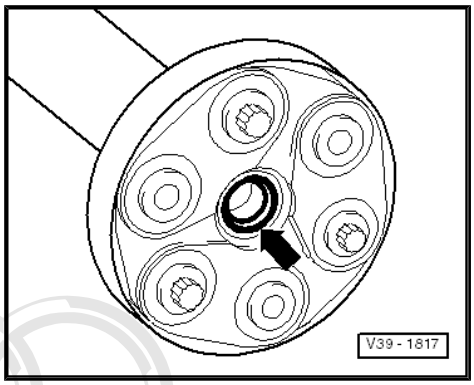


– Push engine/gearbox assembly forward slightly (towards front end) and pull propshaft off bevel box.

Caution

Make sure not to damage the oil seal -arrow- in the propshaft flange.

- ***Push the propshaft horizontally to the rear and towards the right side of vehicle as far as possible.***



Note

The propshaft must be renewed if the oil seal is damaged.

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Continued for all vehicles:

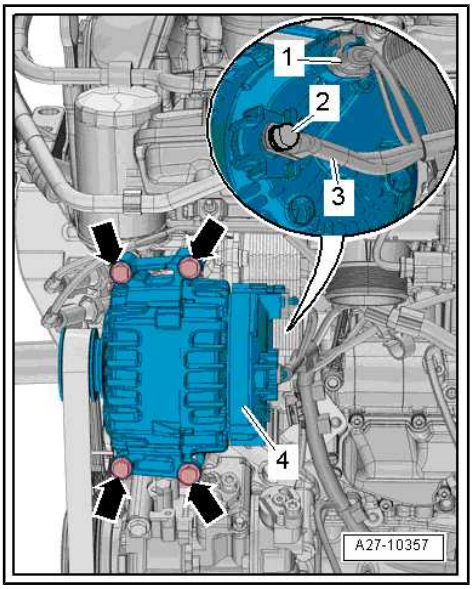
– Remove bolts -arrows-.

– Swivel alternator -4- towards right side of vehicle with electrical wiring connected.

– Unplug electrical connector -1-.

– Lever off protective cap -2- and remove nut for terminal 30/ B+ -item 3-.

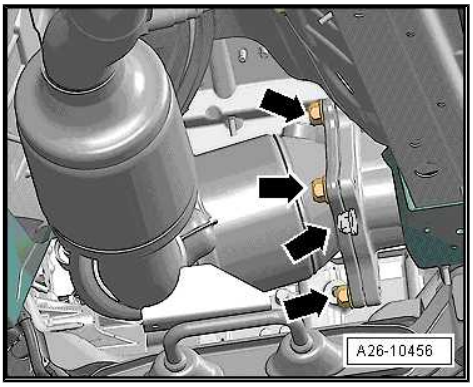
– Lift out alternator.



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– Remove nuts -arrows- securing front exhaust pipe with catalytic converter to turbocharger.

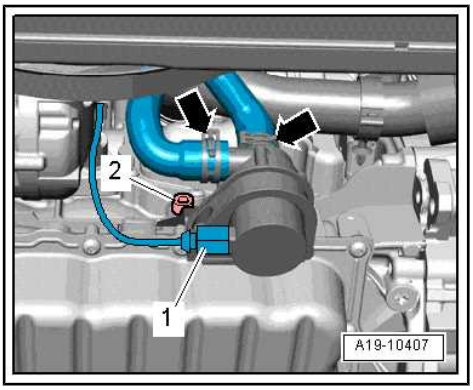
– Tie up catalytic converter to rear.



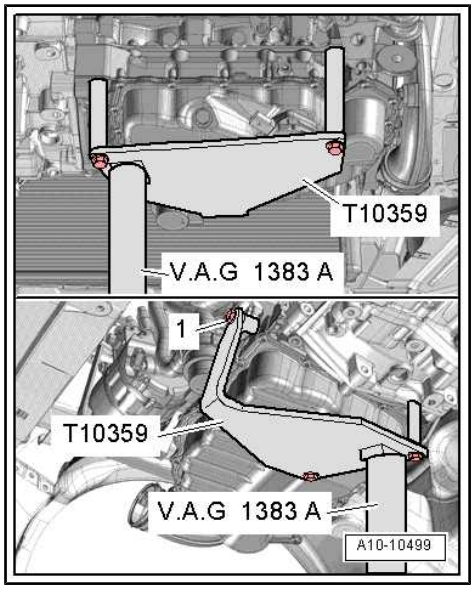
– Remove bolt -2- at bracket for continued coolant circulation pump - V51- .

Note

The continued circulation coolant pump - V51- remains installed.



– Secure engine support - T10359A- to cylinder block at threaded hole for continued coolant circulation pump - V51- with bolt -1- (tighten to 20 Nm).
– Insert engine and gearbox jack - V.A.G 1383 A- in engine bracket - T10359A- and raise engine/gearbox assembly slightly.

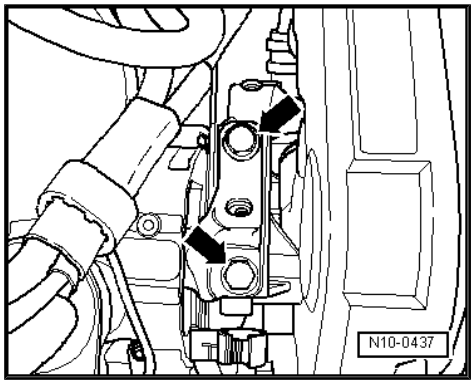


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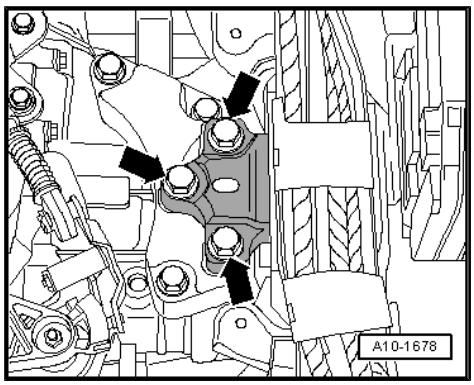
Note

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

– Remove bolts -arrows- securing engine mounting.



– Remove bolts -arrows- securing gearbox mounting.



Note

The illustration shows the fitting location on a vehicle with a manual gearbox as an example.

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, subframe and body have been detached.***
- ***Carefully guide out engine/gearbox assembly with subframe from engine compartment when lowering.***

– First lower engine/gearbox assembly only slightly.
– Then swing gearbox end of engine/gearbox assembly forwards and only then lower further.

1.2 Separating engine and gearbox

⇒ “1.2.1 Separating engine and gearbox - manual gearbox”, page 25

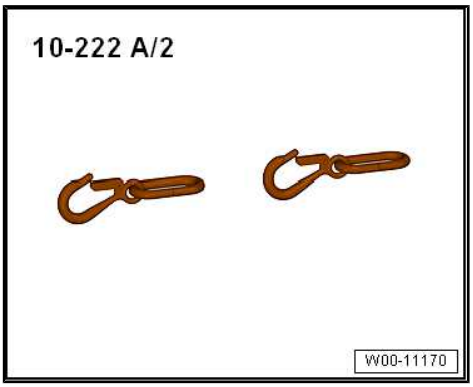
⇒ “1.2.2 Separating engine and gearbox - vehicles with dual clutch gearbox”, page 27

⇒ “1.2.3 Separating engine and gearbox - vehicles with automatic gearbox”, page 29

1.2.1 Separating engine and gearbox - manual gearbox

Special tools and workshop equipment required

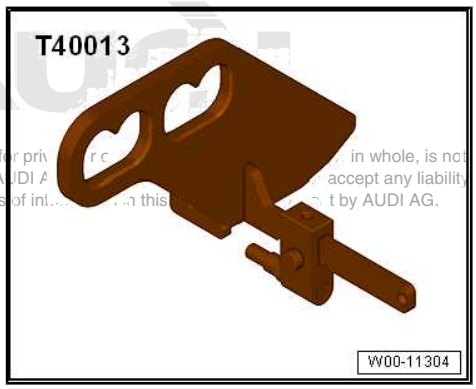
- Hooks - 10-222A/2-



- Workshop hoist - VAS 6100-



- Lifting tackle - T40013-



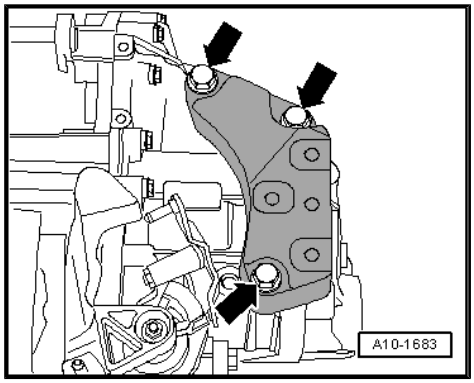
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Procedure

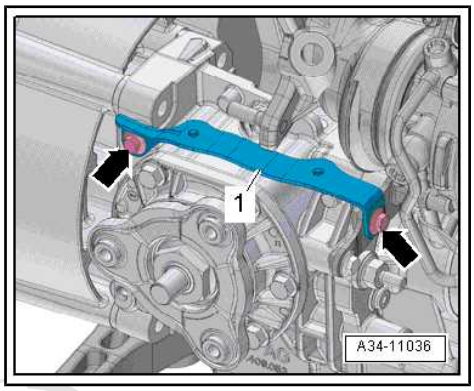
- Engine/gearbox assembly removed and attached to engine bracket - T10359A- .

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

– Unscrew bolts -arrows- and detach gearbox support.



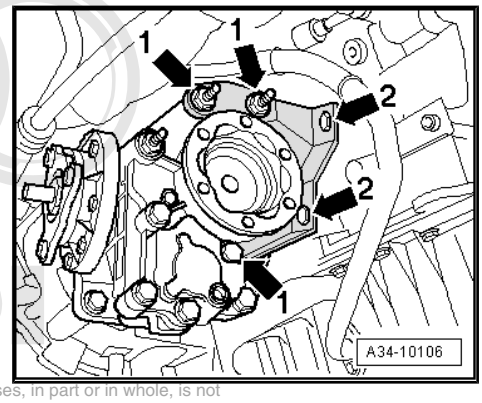
– Remove bolts -arrows- and detach bracket -1-.



– Remove bolts -arrows 1- securing bracket for bevel box.

Note

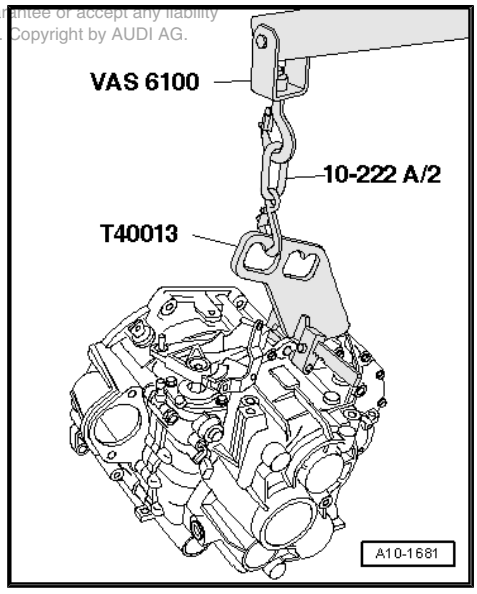
Disregard -arrows 2-.



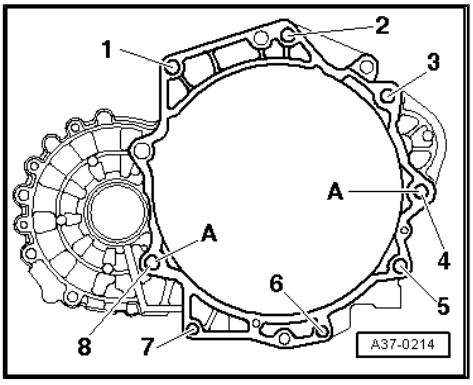
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– Attach lifting tackle - T40013- to gearbox and close lock.

– Attach workshop hoist - VAS 6100- with hooks - 10-222A/2- to the lifting tackle.



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



Note

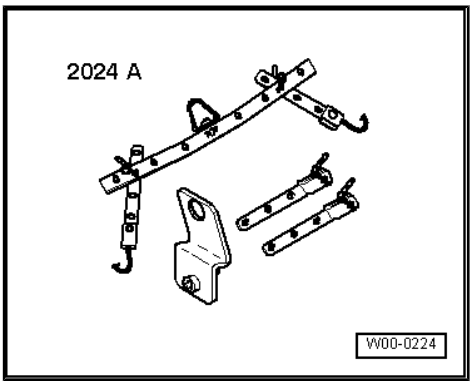
Disregard -items 3 and 4- and -A-.

– Detach gearbox from engine.

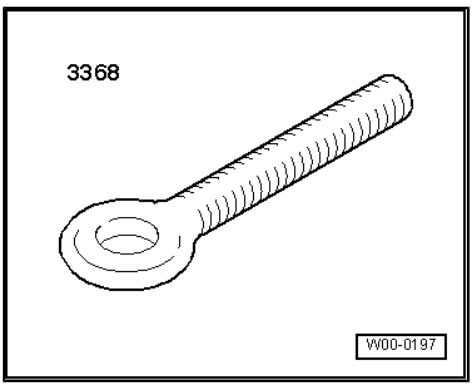
1.2.2 Separating engine and gearbox - vehicles with dual clutch gearbox

Special tools and workshop equipment required

♦ Lifting tackle - 2024 A-



♦ Eye-head bolt - 3368-

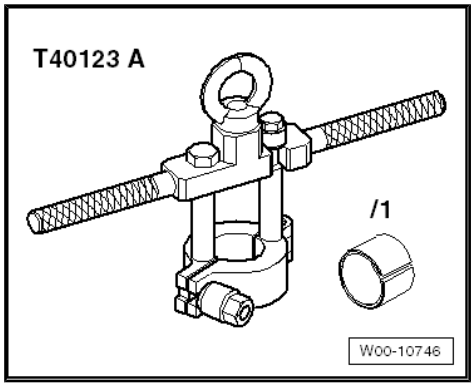


♦ Workshop hoist - VAS 6100-



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♦ Puller for ATF-supply - T40123 A-



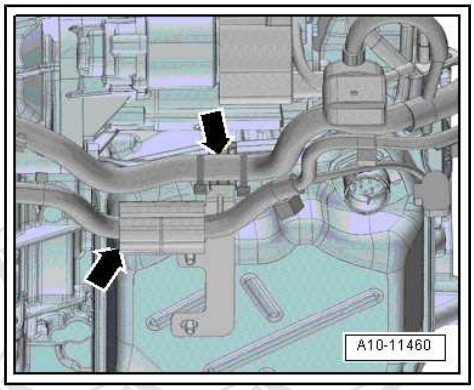
Procedure

- Engine/gearbox assembly removed and attached to engine bracket - T10359A- .

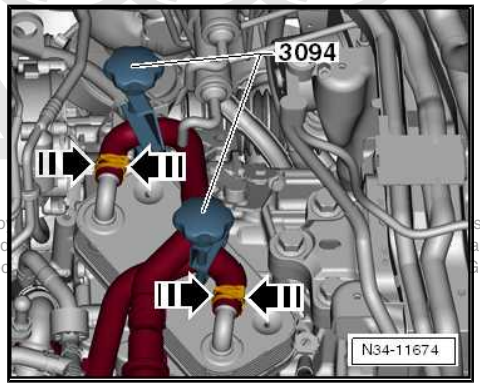
– Remove bevel box ⇒ Rep. gr. 34 ; Bevel box; Removing bevel box .

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

– Move electrical wiring harnesses clear -arrows-.



– Slacken hose clips -arrows- and detach coolant hoses from gear oil cooler.

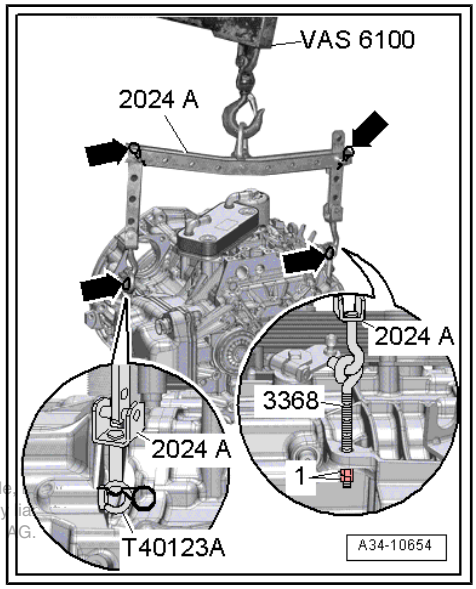


Note

Ignore -3094- .

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– Remove eye on puller for ATF-supply - T40123 A- and screw into lower threaded hole for starter bolt as far as stop.
– Secure eye-head bolt - 3368- to bore in gearbox housing with two lock nuts -1-.
– Attach lifting tackle - 2024 A- to both eyes and to workshop hoist - VAS 6100- as shown in illustration.



Note

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

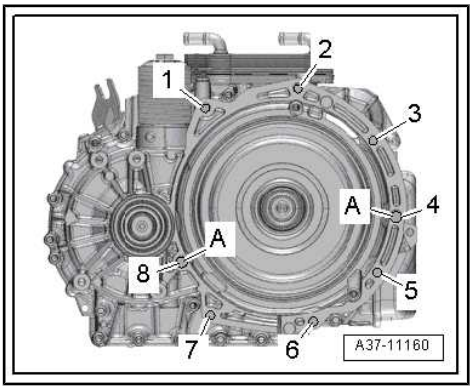
WARNING

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-.***

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



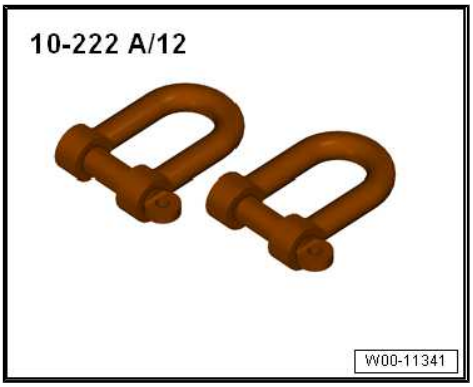
Note

Disregard -item A-.

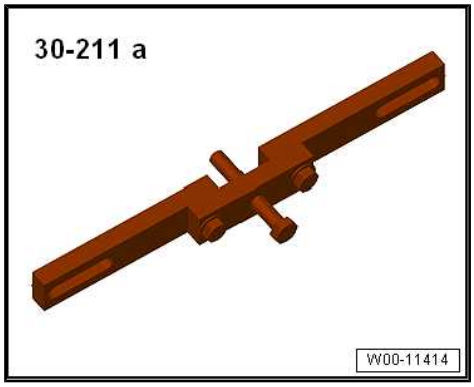
1.2.3 Separating engine and gearbox - vehicles with automatic gearbox

Special tools and workshop equipment required

- Shackle - 10-222A/12-



- Support bridge - 30-211A-

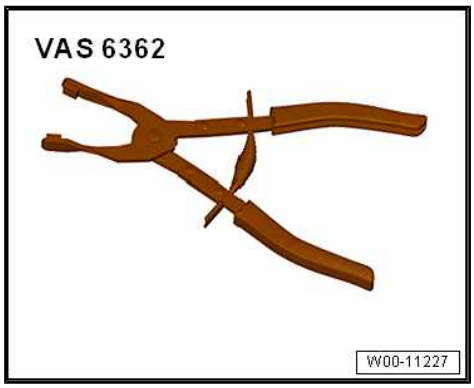


- Workshop hoist - VAS 6100-

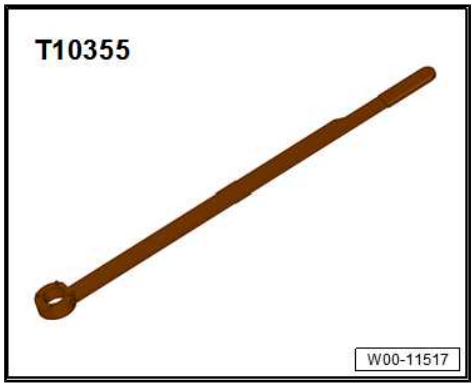


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- Hose clip pliers - VAS 6362-



- Counterhold tool - T10355-

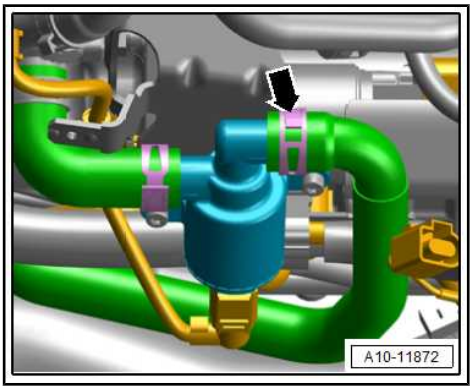


Procedure

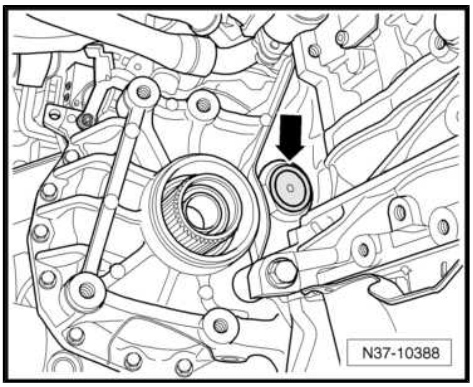
– Remove bevel box ⇒ Rep. gr. 37 ; Bevel box; Removing bevel box .

– Move electrical wiring clear at gearbox.

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

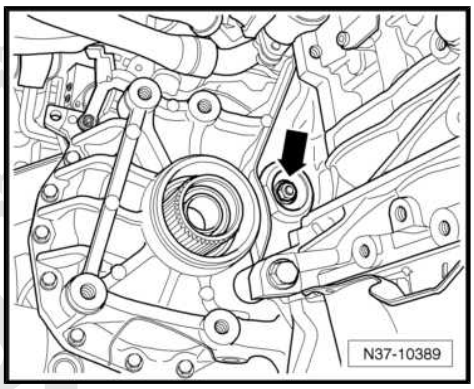


– Remove sealing plug -arrow-.



– Remove 6 nuts -arrow- for torque converter through opening (counterhold starter ring gear with a screwdriver).

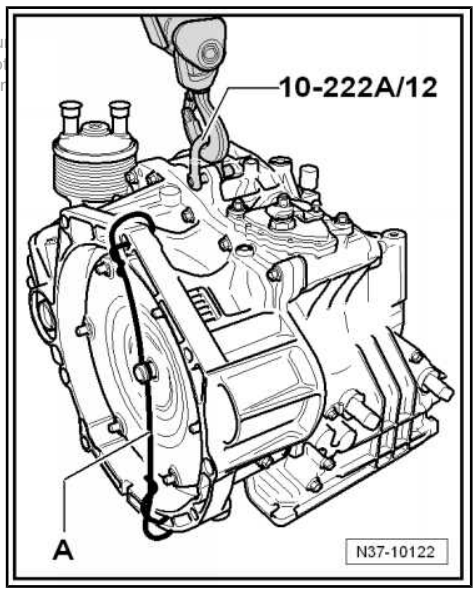
– To remove nuts one by one, turn vibration damper 60° further each time using counterhold tool - T10355- .



– Attach shackle - 10-222A/12- to gearbox.

– Hook workshop hoist - VAS 6100- into shackle - 10-222A/12- .

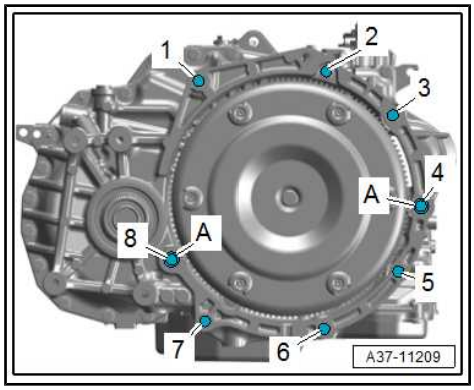
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Note

Disregard -item A-.

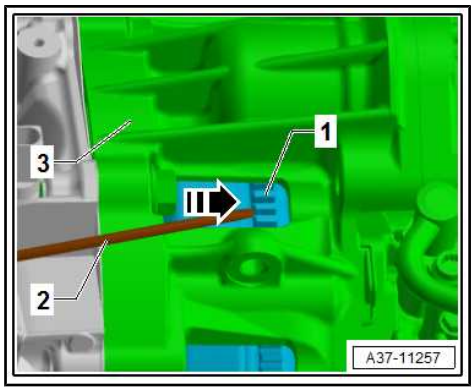
– Remove bolts -1 ... 8- securing gearbox to engine.



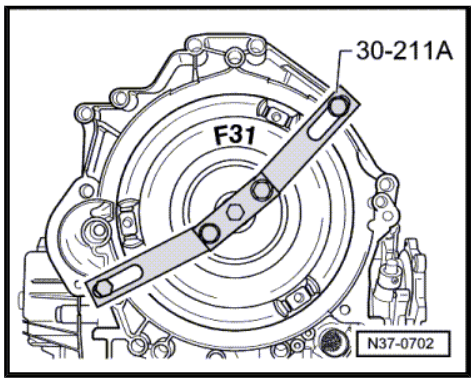
Note

Disregard -item A-.

– Separate gearbox -3- from engine (use a screwdriver -2- or similar to press torque converter -1- against gearbox -arrow-).



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

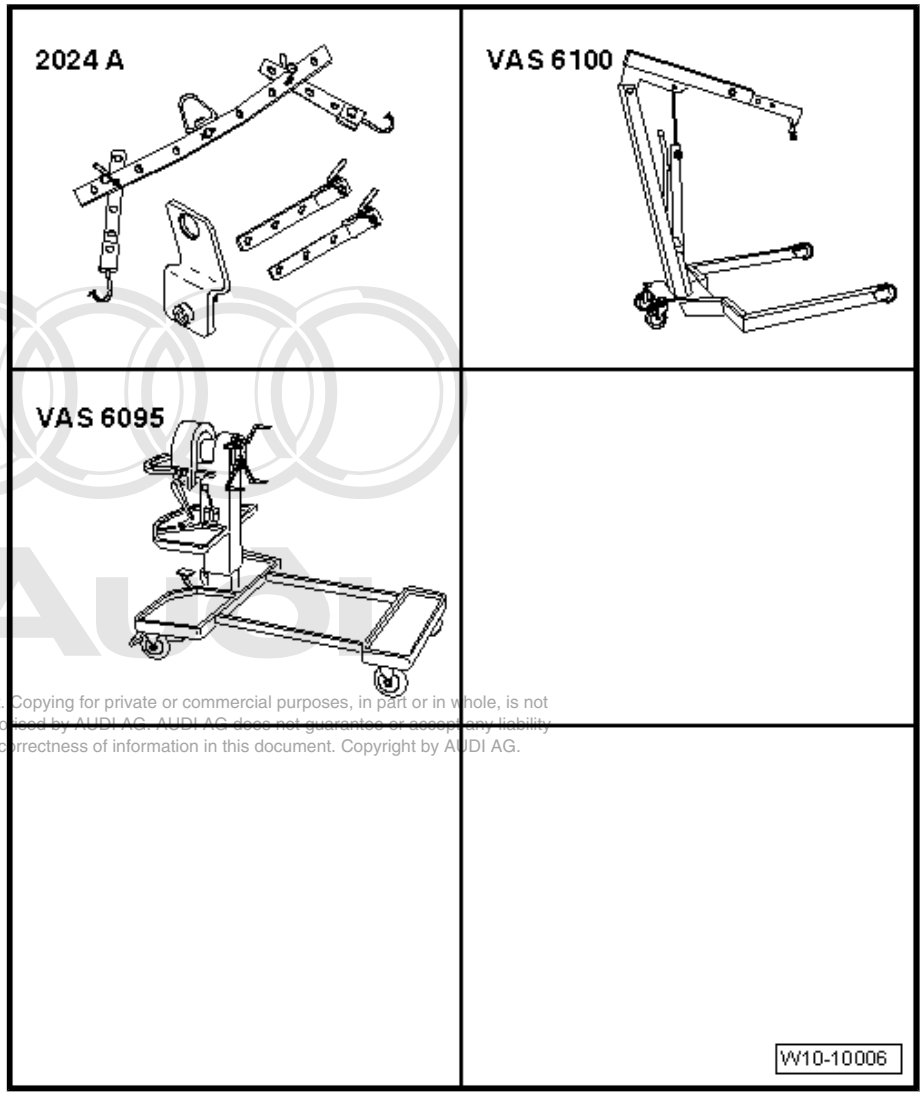


1.3 Securing engine to engine and gearbox support

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Special tools and workshop equipment required

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

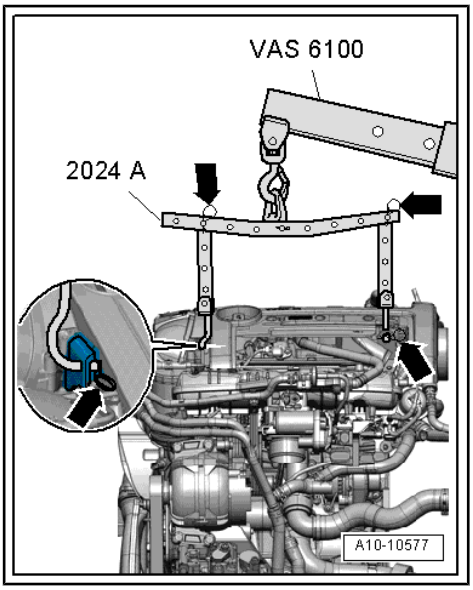


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Procedure

- Gearbox detached from engine ⇒ page 25 .

– Attach lifting tackle - 2024 A- to engine and workshop hoist - VAS 6100- as shown in illustration.



Note

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

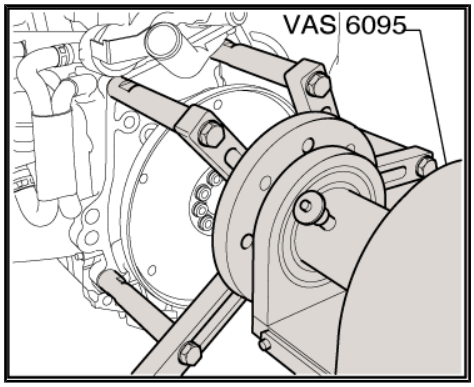
WARNING

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 bracket - T10359A- 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 %.*

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

- Assembly mountings
⇒ “2.1 Exploded view - assembly mountings”, page 38
- Securing manual gearbox or dual clutch gearbox to engine ⇒ Rep. gr. 34 ; Removing and installing gearbox; Tightening torques for gearbox
- Securing automatic gearbox to engine ⇒ Rep. gr. 37 ; Removing and installing gearbox; Tightening torques for gearbox

Procedure

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

- Engine/gearbox assembly attached to engine bracket - T10359A- .

Note

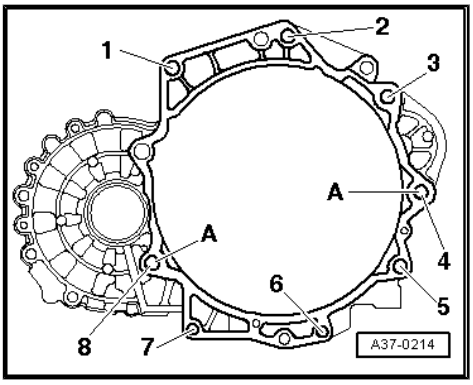
- *Renew the bolts tightened with specified tightening angle.*
- *Renew self-locking nuts and bolts as well as seals, gaskets and O-rings.*
- *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- *Fit all cable ties in the original positions when installing.*

– Install intermediate plate ⇒ page 61 .

Vehicles with manual gearbox:

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

– Remove needle bearing in crankshaft if fitted ⇒ page 70 .

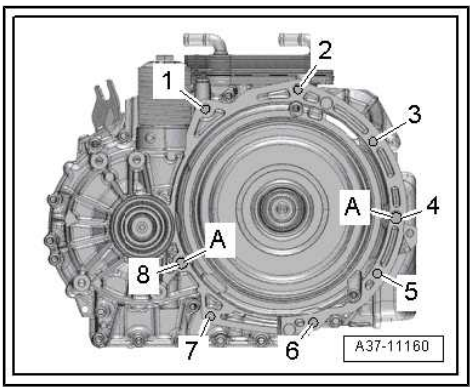


Vehicles with dual clutch gearbox:

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

– Install needle bearing if not fitted in crankshaft ⇒ page 70 .

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Vehicles with automatic gearbox:

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

– Remove needle bearing in crankshaft if fitted ⇒ page 70 .

Continued for all vehicles:

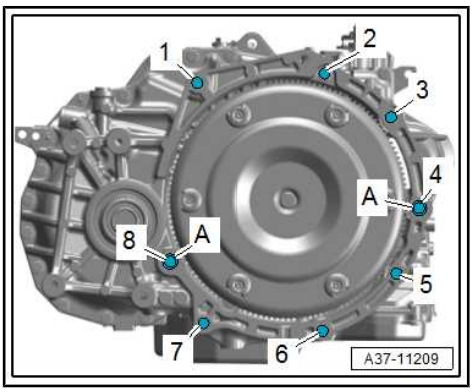
– Secure gearbox to engine.

– Install gearbox support ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings / ⇒ Rep. gr. 37 ; Assembly mountings; Exploded view - assembly mountings .

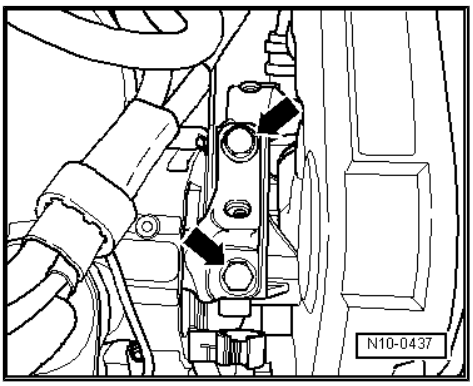
– Take up engine/gearbox assembly with engine bracket -T10359A- .

– Install bracket for bevel box ⇒ Rep. gr. 34 ; Bevel box; Installing bevel box / ⇒ Rep. gr. 37 ; Bevel box; Installing bevel box .

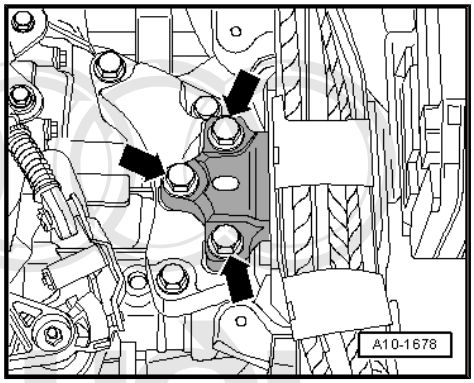
– Guide engine/gearbox assembly into body.



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



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



Note

- *The bolts are tightened to final torque only after adjusting the assembly mountings ⇒ page 44 .*
- *The illustration shows the fitting location on a vehicle with a manual gearbox as an example.*

– Remove engine bracket - T10359A- from engine.

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

– Install continued coolant circulation pump - V51- ⇒ page 203 .

– Install air pipe ⇒ page 247 .

– Install air ducts ⇒ page 248 .

Vehicles with manual gearbox:

– Connect pipe to bleeder connection on clutch slave cylinder and bleed clutch hydraulics ⇒ Rep. gr. 30 ; Clutch mechanism; Exploded view - clutch hydraulics .

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

Vehicles with 7-speed dual clutch gearbox:

– Install and adjust selector lever cable ⇒ Rep. gr. 34 ; Selector mechanism; Checking and adjusting selector lever cable .

Vehicles with automatic gearbox:

– Install and adjust selector lever cable ⇒ Rep. gr. 37 ; Selector mechanism; Checking and adjusting selector lever cable .

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

Continued for all vehicles:

– Install front exhaust pipe with catalytic converter ⇒ page 300 .

– Secure propshaft ⇒ Rep. gr. 39 ; Propshaft; Removing and installing propshaft .

– Install drive shafts ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .

– Install wishbones and swivel joints ⇒ Running gear, axles, steering; Rep. gr. 40 ; Lower wishbone, swivel joint; Exploded view - lower wishbone, swivel joint .

– Install coupling rod ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Exploded view - subframe .

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

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

– Install poly V-belt ⇒ page 49 .

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

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- Install throttle valve module - J338- ⇒ page 267 .
- Install engine control unit - J623- ⇒ page 296 .
- Connect coolant hoses with plug-in connector ⇒ page 225 .
- Install pendulum support ⇒ page 43 .
- Install wheel spoilers ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Removing and installing wheel housing liner (front) .
- Fit front wheels ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres .
- Adjust assembly mountings ⇒ page 44 .
- Install battery tray and battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery tray .
- Install and adjust wiper arms ⇒ Electrical system; Rep. gr. 92 ; Windscreen wiper system; Removing and installing wiper arms .
- Install air cleaner housing ⇒ page 259 .
- Check oil level ⇒ Maintenance ; Booklet 820 .

Caution

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

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

Note

Do not reuse coolant.

- Fill up with coolant ⇒ page 196 .
- Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .
- 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 38

⇒ “2.2 Supporting engine in installation position”, page 40

⇒ “2.3 Removing and installing engine mountings”, page 41

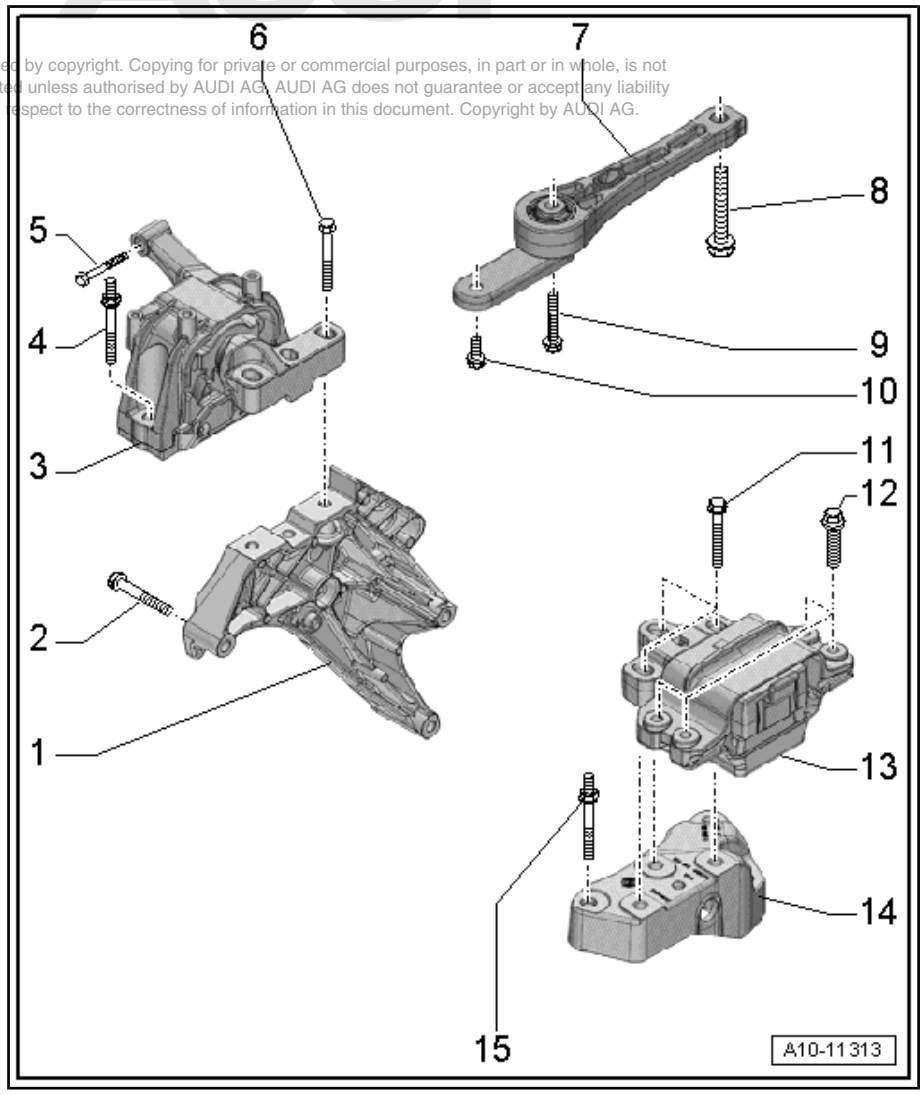
⇒ “2.4 Removing and installing gearbox mounting”, page 41

⇒ “2.5 Removing and installing pendulum support”, page 43

⇒ “2.6 Adjusting assembly mountings”, page 44

⇒ “2.7 Checking adjustment of assembly mountings (engine/ gearbox mountings)”, page 45

2.1 Exploded view - assembly mountings



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1 - Engine support

2 - Bolt

- ❑ Renew
- ❑ Tightening sequence ⇒ page 39

3 - Engine mounting

- ❑ With support arm
- ❑ Removing and installing ⇒ page 41

4 - Bolt

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

5 - Bolt

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

6 - Bolt

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

7 - Pendulum support

- ❑ Removing and installing ⇒ page 43

8 - Bolt

- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 39

9 - Bolt

- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 39

10 - Bolts

- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 39

11 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings / ⇒ Rep. gr. 37 ; Removing and installing gearbox; Tightening torques for gearbox

12 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings / ⇒ Rep. gr. 37 ; Removing and installing gearbox; Tightening torques for gearbox

13 - Gearbox mounting

- ❑ With support arm

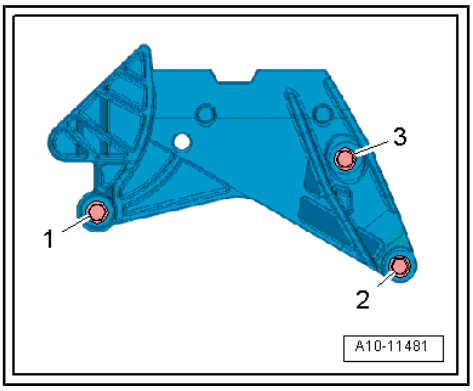
14 - Gearbox support

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

15 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings / ⇒ Rep. gr. 37 ; Removing and installing gearbox; Tightening torques for gearbox

Engine support - tightening sequence

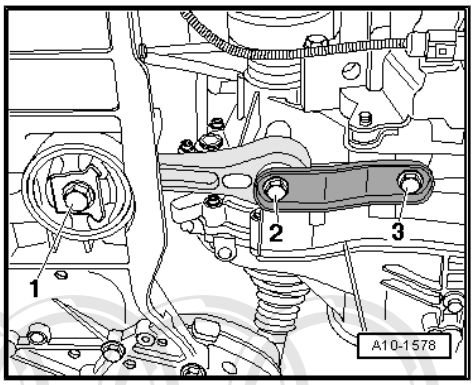


Note

Renew the bolts tightened with specified tightening angle.

– Tighten bolts -1 ... 3- in three stages in the sequence shown:
– 1. Tighten bolts to 7 Nm.
– 1. Tighten bolts to 40 Nm.
– 2. Turn bolts 180° further.

Installing pendulum support



Note

Renew the bolts tightened with specified tightening angle.

– Tighten bolts in 3 stages in the sequence shown:

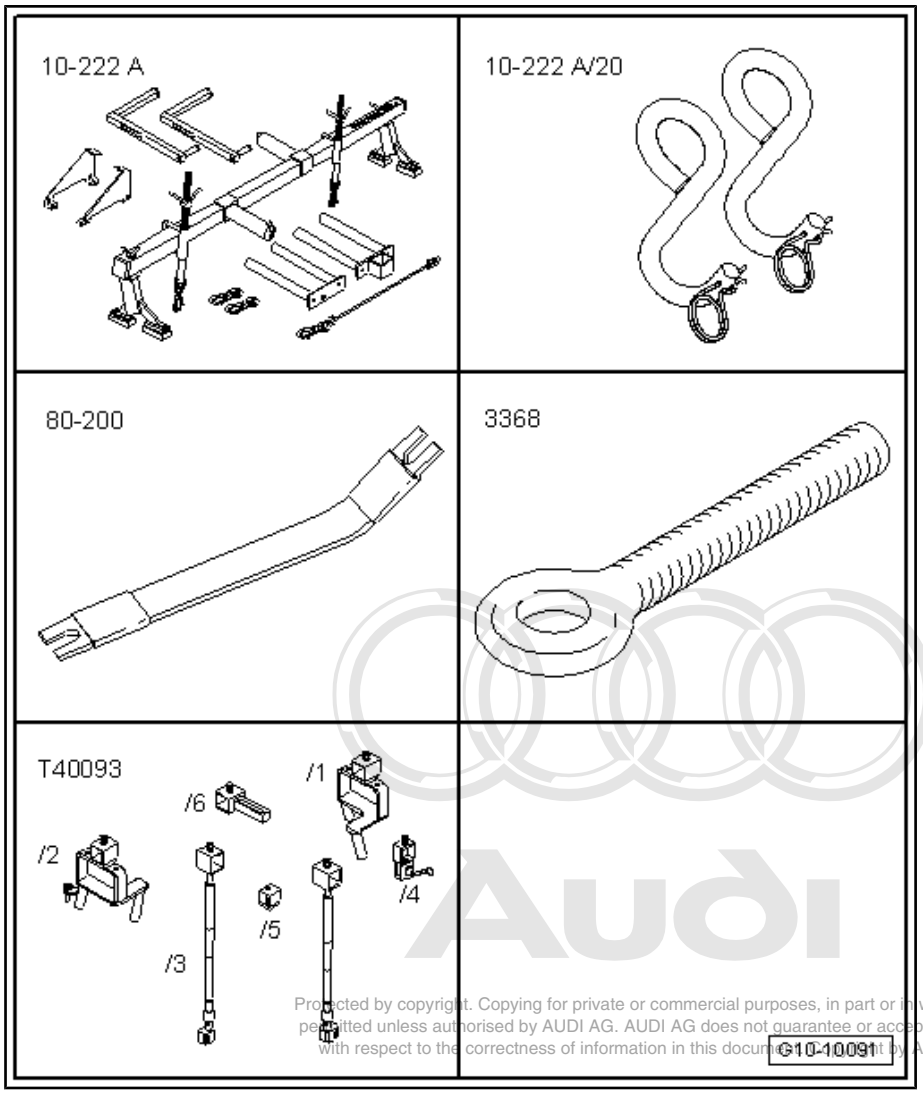
Stage	Bolts	Tightening torque/angle specification
1.	-2, 3-	50 Nm
2.	-1-	100 Nm
3.	-1 … 3-	Turn 90° further

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2.2 Supporting engine in installation position

Special tools and workshop equipment required

- Support bracket - 10-222A-
- Adapters - 10-222A/20-
- Removal lever - 80-200-
- Eye-head bolt - 3368-
- -T40093/6- from Engine support supplementary set - T40093-
- Flange nut M10 or nut with washer

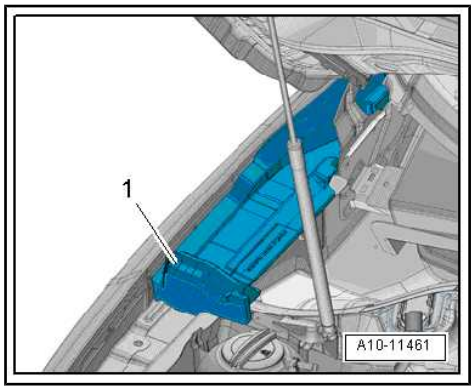


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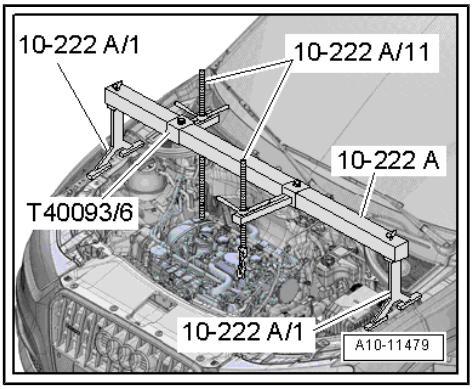
Procedure

– Remove engine cover panel ⇒ page 46 .

– Unclip sealing element -1- (left and right) using removal lever - 80-200- .



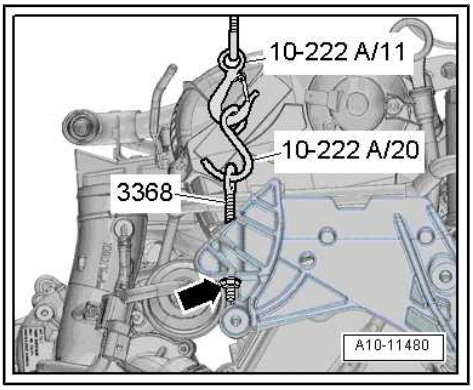
– Position support bracket - 10-222A- with spindles -10-222A/11- on longitudinal member for wheel housing (top) as shown in illustration.
– Attach hook of spindle to engine lifting eye (left-side).



WARNING

Risk of accident because of loose bolt connections.

- *Screw on flange nut or nut with washer -arrow- at least 6 turns to ensure that eye-head bolt - 3368- is properly secured.*

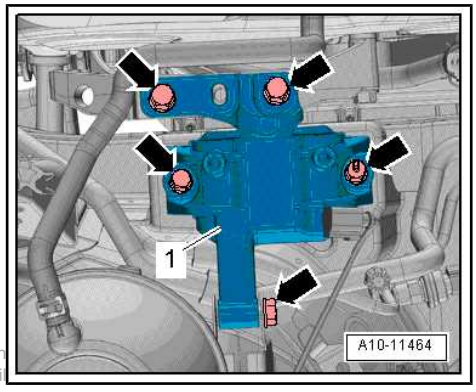


– Secure eye-head bolt - 3368- with flange nut M10 or nut with washer to engine support as shown in illustration.
– Hook spindle - 10-222A/11- onto eye-head bolt - 10-222A/20- (right-side) with adapter - 3368- .
– Take up weight of engine/gearbox assembly evenly with both spindles (do not raise assembly).

2.3 Removing and installing engine mountings

Removing

– Support engine in installation position ⇒ page 40 .
– Remove bolts -arrows- and detach engine mounting -1-.



Installing

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

– Check adjustment of assembly mountings (engine/gearbox mountings) ⇒ page 45 .

Tightening torques

- ⇒ “2.1 Exploded view - assembly mountings”, page 38

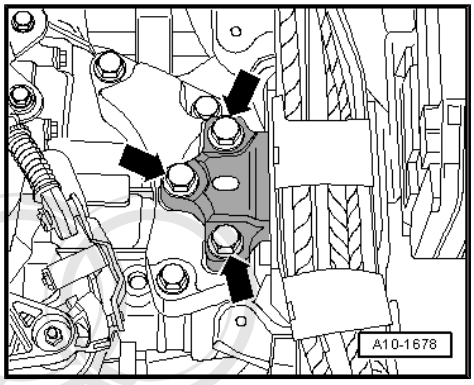
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2.4 Removing and installing gearbox mounting

Removing

– Remove air cleaner housing ⇒ page 259 .
– Support engine in installation position ⇒ page 40 .
– Remove battery and battery tray ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery tray .

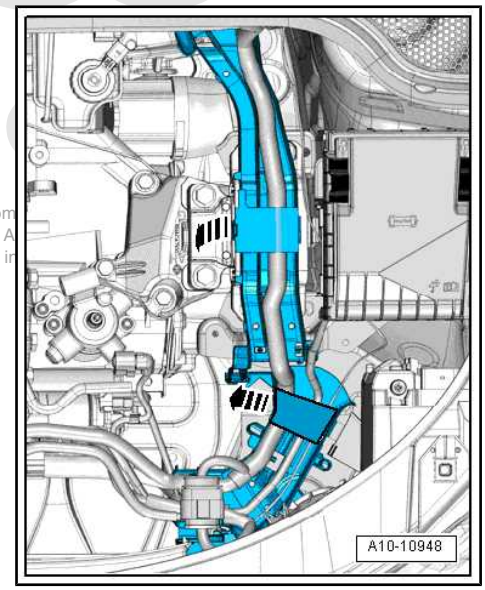
– Remove bolts -arrows-.



Note

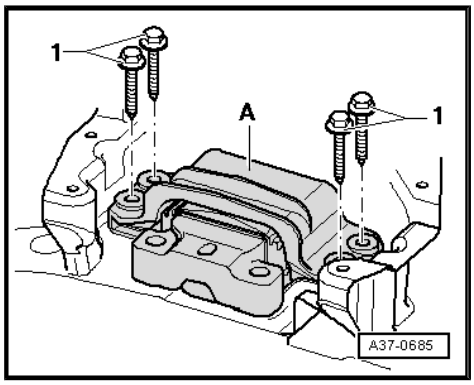
The illustration shows the fitting location on a vehicle with a manual gearbox as an example.

– Open retainers for wiring duct -arrows- and press electrical wiring to one side.
– Unclip wiring duct.



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with respect to the correctness of information in

– Unscrew bolts -1- and remove gearbox mounting -A-.



Installing

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

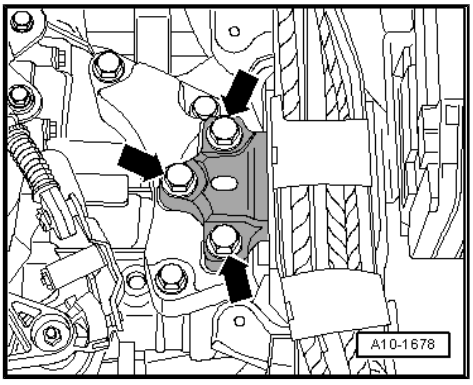
Note

Renew the bolts tightened with specified tightening angle.

– Tighten gearbox mounting -A- on longitudinal member.

Note

The illustration shows the fitting location on a vehicle with a manual gearbox as an example.



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 -arrows-. If necessary, lift gearbox at rear using trolley jack or engine and gearbox jack - V.A.G 1383 A- .***
- ***Only remove support bracket - 10-222A- when bolts on assembly mounting -arrows- 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 45 .

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

– Install battery tray and battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery tray .

– Install air cleaner housing ⇒ page 259 .

Tightening torques

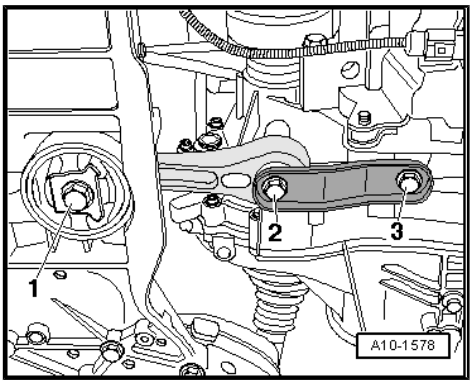
- ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings
- ⇒ Rep. gr. 37 ; Removing and installing gearbox; Tightening torques for gearbox

2.5 Removing and installing pendulum support

Removing

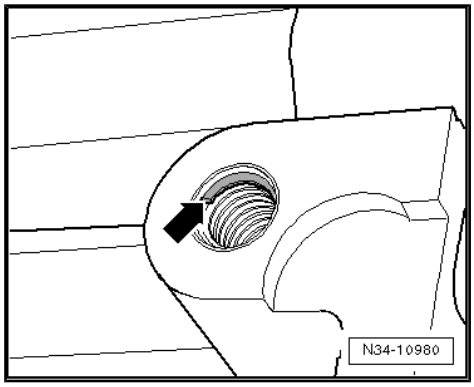
– Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

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



Installing

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



Note

- *Bolt holes for pendulum support are fitted with thread inserts (e.g. "Heli-Coil").*
- *Identification: Shoulder on first thread -arrow-.*

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

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Tightening torques

- ⇒ Fig. ""Installing pendulum support"" , page 39

2.6 Adjusting assembly mountings

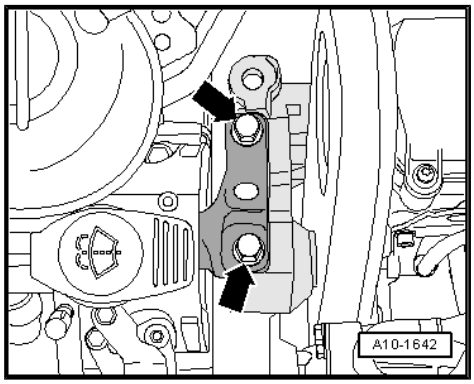
Procedure

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

– Support engine in installation position ⇒ page 40 .

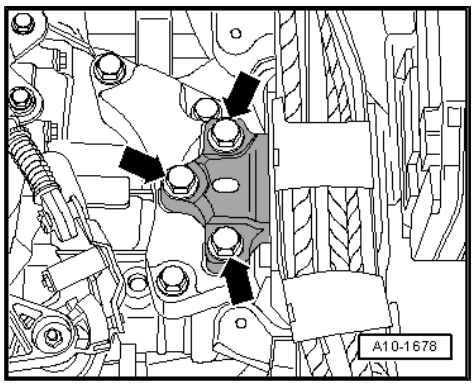
– Remove bolts -arrows- for engine mounting one by one and renew (if they were not renewed when installing engine).

– Initially fit bolts hand-tight.



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

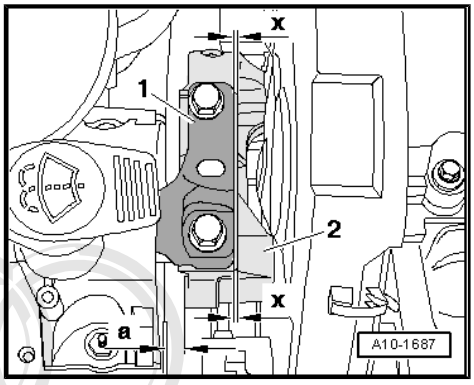
– Initially fit bolts hand-tight.



Note

The illustration shows the fitting location on a vehicle with a manual gearbox as an example.

– Using assembly lever, adjust engine/gearbox assembly between engine mounting and support arm -1- until specifications listed below are attained:

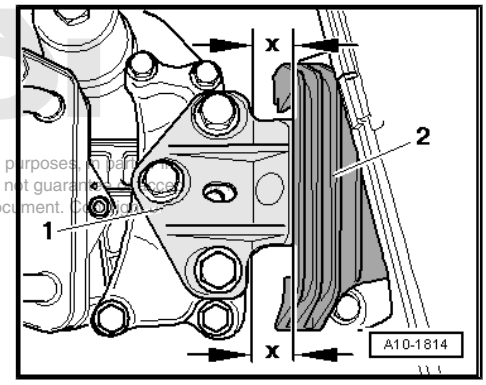


- There must be a distance of -a- = 13.5 mm between engine support -2- and longitudinal member (right-side).
- The side of the engine support casting -2- must be aligned parallel to the support arm -1- (distance -x- = distance -x-).

Note

Distance -a- = 13.5 mm can also be checked with a metal rod of suitable size, or similar.

– Tighten bolts for engine mounting.



– 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.

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

– Install battery tray and battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery tray .

Tightening torques

♦ ⇒ “2.1 Exploded view - assembly mountings”, page 38 .

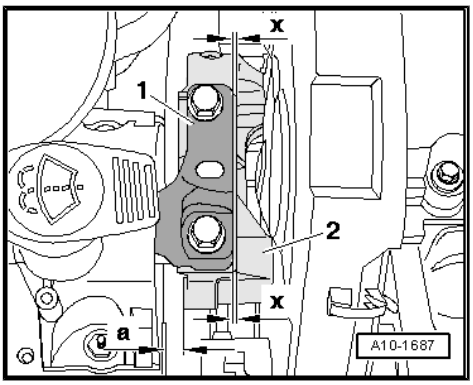
♦ ⇒ Rep. gr. 37 ; Removing and installing gearbox; Tightening torques for gearbox

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

Procedure

– Remove engine cover panel ⇒ page 46 .

The following specifications must be obtained:



- There must be a distance of -a- = 13.5 mm between engine support -2- and longitudinal member (right-side).
- The side of the engine support casting -2- must be aligned parallel to the support arm -1- (distance -x- = distance -x-).

Note

Distance -a- = 13.5 mm can also be checked with a metal rod of suitable size, or similar.

– If the distance measured is too large or small, the assembly mountings must be adjusted ⇒ page 44 .

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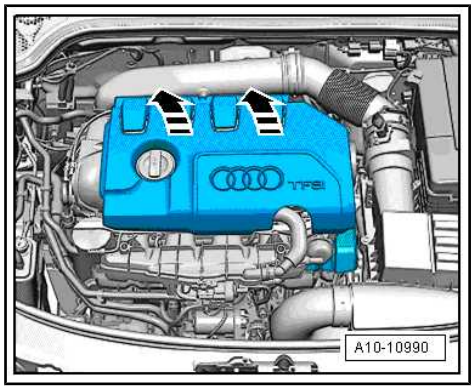
3 Engine cover panel

⇒ “3.1 Removing and installing engine cover panel”, page 46

3.1 Removing and installing engine cover panel

Removing

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



Installing

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

– When fitting engine cover panel, take care not to damage oil filler neck.

– First press engine cover panel onto rear ball studs and then onto front ball studs with both hands.

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13 – Crankshaft group

1 Cylinder block (pulley end)

⇒ “1.1 Exploded view - cylinder block (pulley end)”, page 47

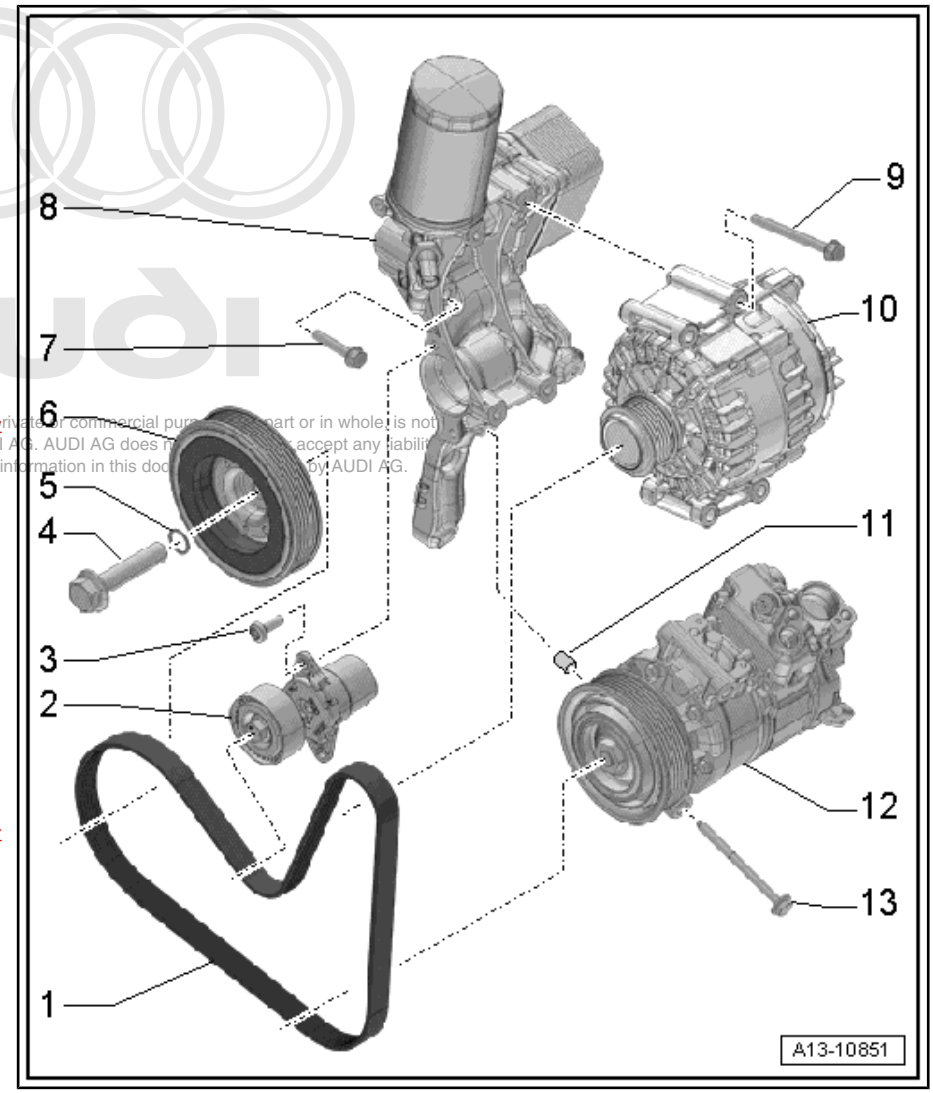
⇒ “1.2 Removing and installing poly V-belt”, page 49

⇒ “1.3 Removing and installing tensioner for poly V-belt”, page 50

⇒ “1.4 Removing and installing vibration damper”, page 50

⇒ “1.5 Removing and installing bracket for ancillaries”, page 57

1.1 Exploded view - cylinder block (pulley end)



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1 - Poly V-belt

- ❑ Check for wear
- ❑ Before removing, mark direction of rotation with chalk or felt-tip pen. If the belt runs in the opposite direction when it is refitted, this can cause breakage.
- ❑ Do not kink
- ❑ Routing of poly V-belt ⇒ page 48
- ❑ Removing and installing ⇒ “1.2 Removing and installing poly V-belt”, page 49
- ❑ When installing, make sure it is properly seated on pulleys.

2 - Tensioner for poly V-belt

- ❑ Pivot with open-end spanner to slacken poly V-belt
- ❑ Lock in position with locking pin - T10060A- .
- ❑ Removing and installing ⇒ “1.3 Removing and installing tensioner for poly V-belt”, page 50

3 - Bolt

- ❑ 40 Nm

4 - Bolt

- ❑ Renew
- ❑ Lubricate O-ring with oil
- ❑ 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 ⇒ “1.4 Removing and installing vibration damper”, page 50

7 - Bolt

- ❑ Tightening torque and sequence ⇒ page 49

8 - Bracket for ancillaries

- ❑ With oil filter and engine oil cooler
- ❑ Removing and installing bracket for ancillaries ⇒ “1.5 Removing and installing bracket for ancillaries”, page 57
- ❑ Removing and installing engine oil cooler ⇒ “2.2 Removing and installing engine oil cooler”, page 178

9 - Gasket

- ❑ Renew

10 - Bolt

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

11 - Alternator

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

12 - Air conditioner compressor

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

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13 - Dowel sleeve

- ❑ For air conditioner compressor

14 - Bolt

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

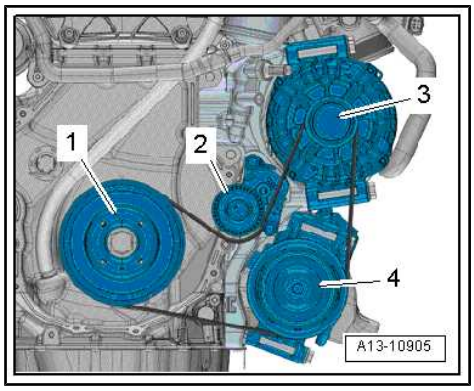
Routing of poly V-belt

1 - Vibration damper

2 - Tensioner for poly V-belt

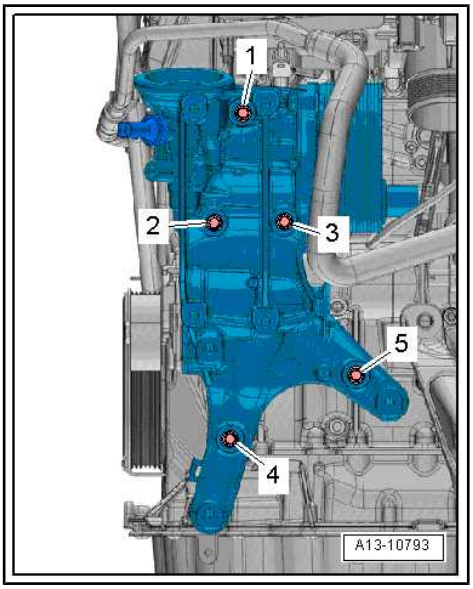
3 - Alternator

4 - Air conditioner compressor



Tightening sequence on bracket for ancillaries

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



Note

Renew the bolts tightened with specified tightening angle.

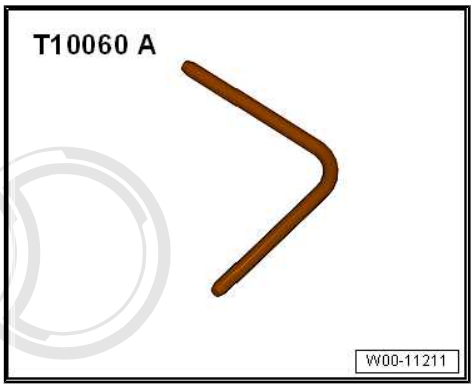
– Tighten bolts in the sequence -1 ... 5- in 3 stages as follows:

1. Tighten bolts hand tight.
2. Tighten bolts to 20 Nm.
3. Turn bolts 90° further.

1.2 Removing and installing poly V-belt

Special tools and workshop equipment required

♦ Locking pin - T10060 A-

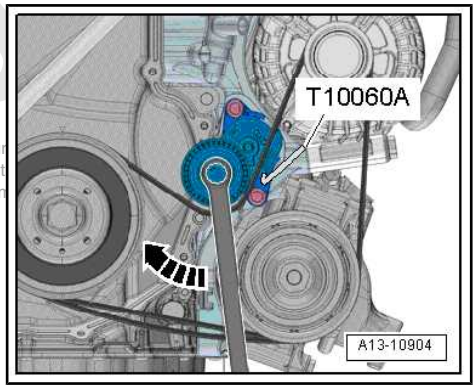


Removing

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.***



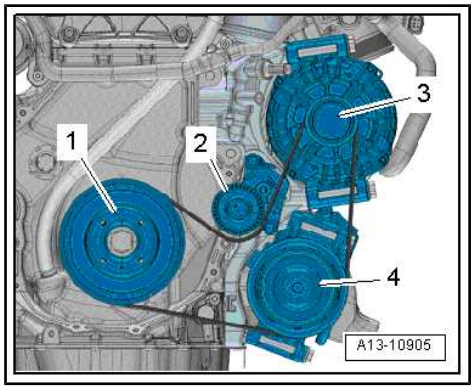
– To slacken poly V-belt turn tensioner in direction of -arrow-.
– Lock tensioner with locking pin - T10060 A- .
– Take off poly V-belt.

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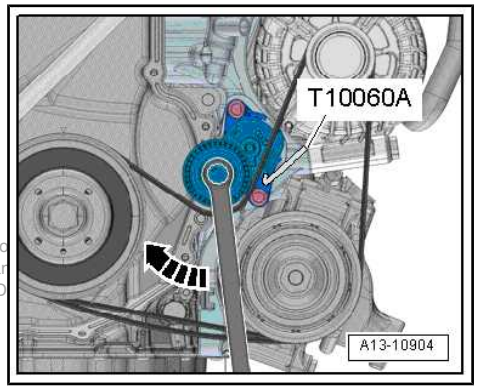
Installing

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

– Fit poly V-belt as shown in illustration.



– Turn tensioner in direction of -arrow- 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.

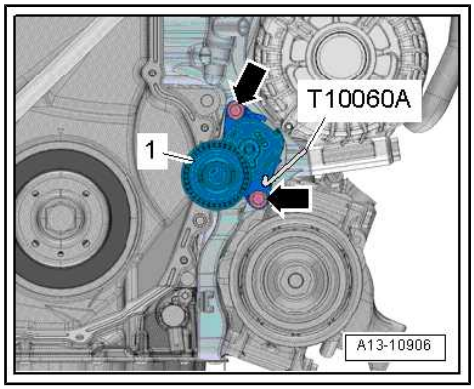


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1.3 Removing and installing tensioner for poly V-belt

Removing

– Detach poly V-belt from tensioner ⇒ “1.2 Removing and installing poly V-belt”, page 49 .
– Remove bolts -arrows- and take off tensioner -1- for poly V-belt from bracket for ancillaries.



Installing

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

– Install poly V-belt ⇒ page 49 .

Tightening torques

♦ ⇒ “1.1 Exploded view - cylinder block (pulley end)”, page 47

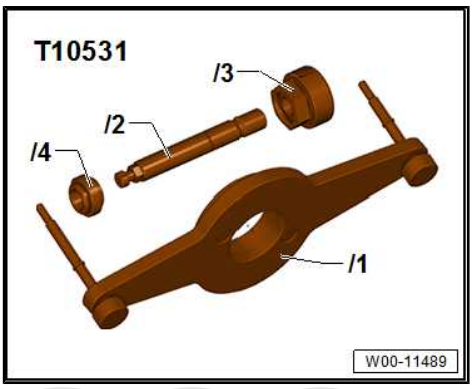
1.4 Removing and installing vibration damper

Special tools and workshop equipment required

- Counterhold tool - T10355-



- Assembly tool - T10531-

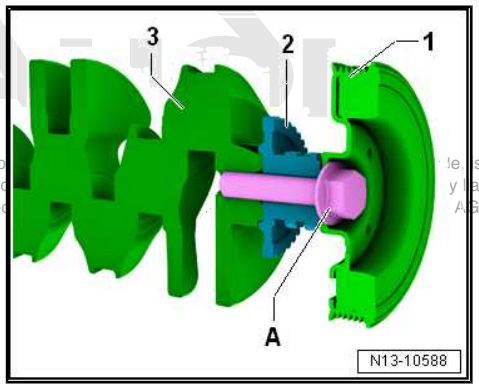


Components of assembly tool - T10531- :

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

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 the securing bolt, the timing chain sprocket must be secured to the crankshaft as described below.



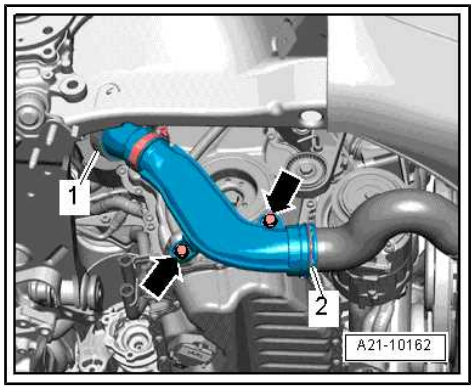
Removing

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

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

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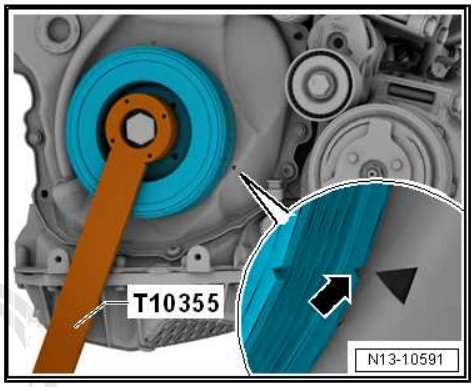
– Lift retaining clips -1 and 2- and disconnect air hoses.
– Unscrew bolts -arrows- and detach air pipe.
– Remove poly V-belt ⇒ page 49 .



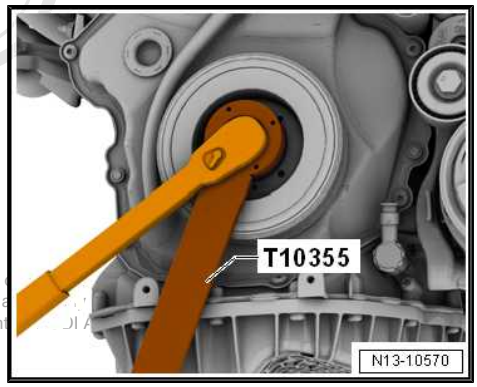
– Turn vibration damper to “TDC” position -arrow- using counterhold tool - T10355- .
• Notch on vibration damper must align with arrow marking on cover for timing chains (bottom).
• Marking on cover must be in »4 o'clock position«.

Caution

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

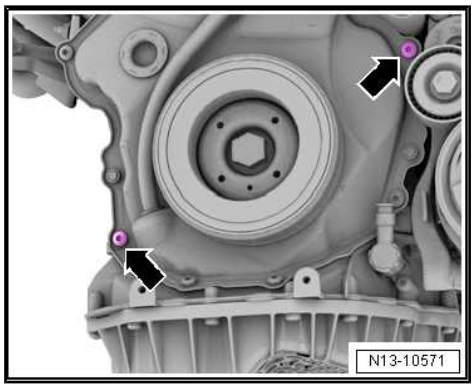


– Loosen bolt for vibration damper by approx. a half turn using counterhold tool - T10355- .
– If vibration damper has been twisted out of position, correct TDC position.

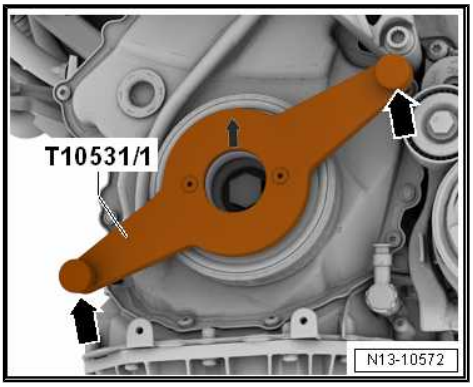


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– Remove bolts -arrows- (as illustrated) from timing chain cover. These bolts must be renewed.



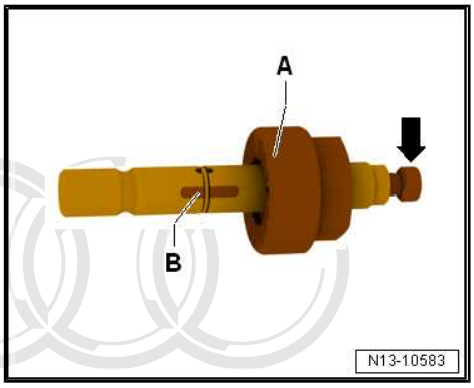
– Apply support - T10531/1- (as illustrated) to vibration damper and secure hand-tight with knurled screws -arrows-.
– Remove bolt for vibration damper completely.



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

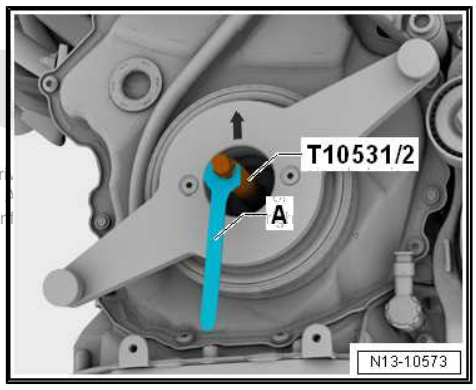
Note

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.

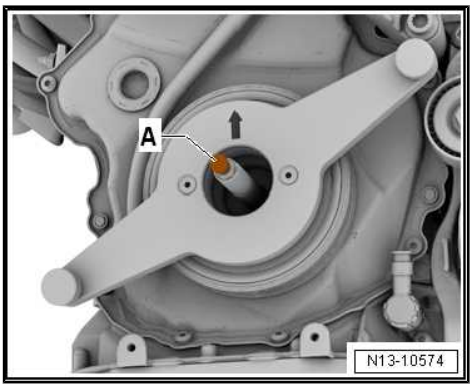


– Screw clamping pin - T10531/2- into crankshaft and hand-tighten with open-end spanner, 12 mm -A-.

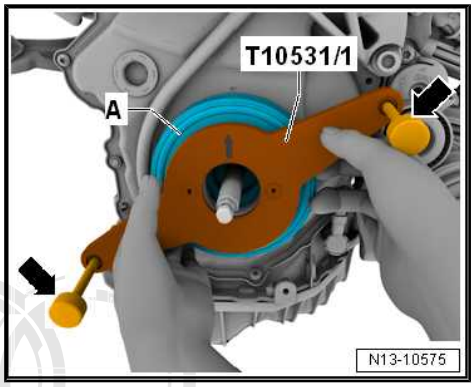
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– Hand-tighten tensioning bolt -A- to secure chain sprocket to crankshaft.



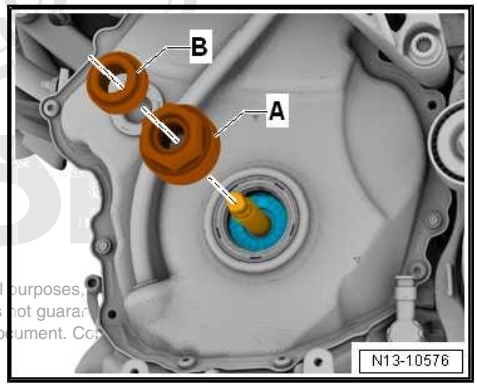
– Remove knurled screws -arrows-. Detach support - T10531/1- and vibration damper -A-.



If crankshaft needs to be rotated without vibration damper:

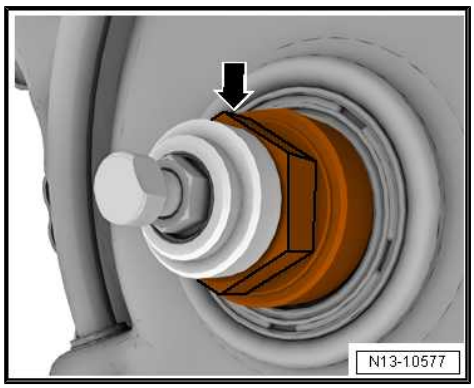
– Fit turning-over tool -A- onto clamping pin (pay attention to tooth-shaped profile on chain sprocket). In TDC position, flat surface of tool faces upwards.

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



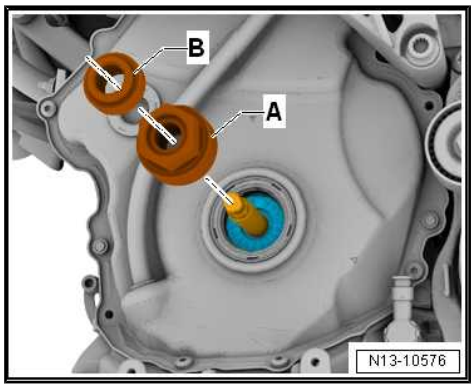
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– Crankshaft can now be rotated at hexagon flats -arrow-.

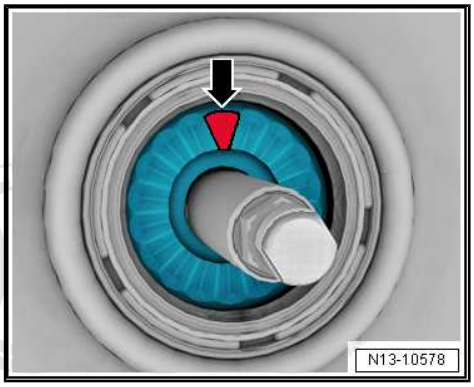


Installing vibration damper:

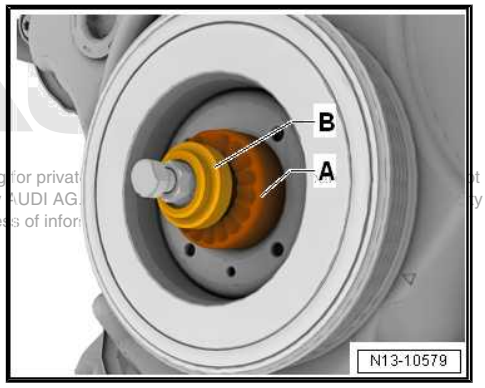
– If necessary, detach flange nut -B- and turning-over tool -A- from clamping pin.



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

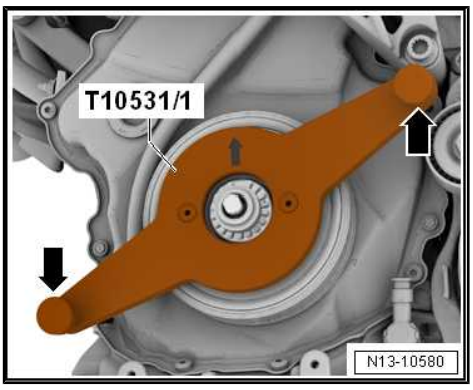


– Fit turning-over tool -A- onto clamping pin so that hexagon flats face towards vibration damper.
– Screw flange nut -B- on while moving vibration damper back and forth slightly to check whether vibration damper is seated correctly in tooth-shaped profile. Tighten flange nut until vibration damper can no longer be rotated.

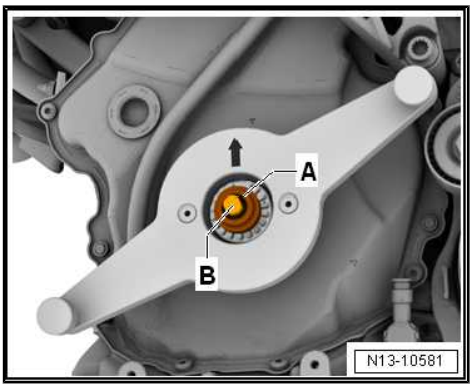


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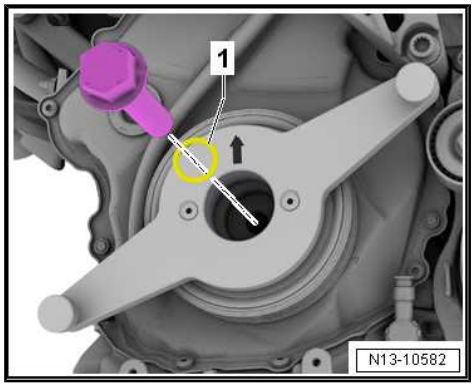
– Apply support - T10531/1- (as illustrated) to vibration damper and secure hand-tight with knurled screws -arrows-.



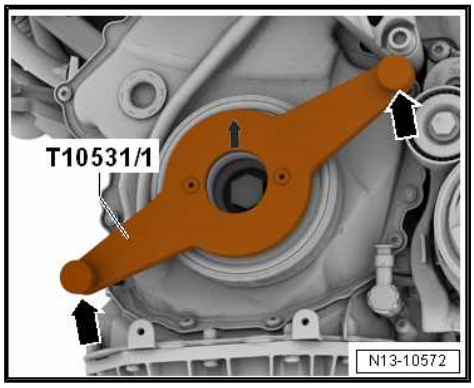
– Unscrew flange nut -A- and loosen tensioning bolt -B-.
– Unscrew clamping pin and remove with turning-over tool .



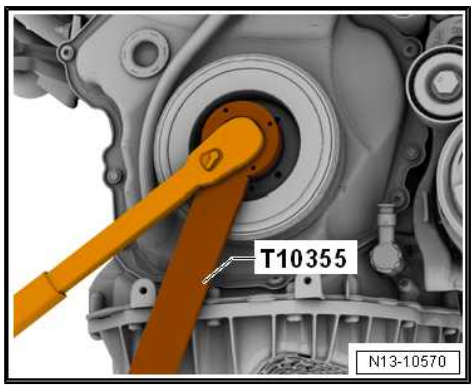
– Screw in new bolt for vibration damper with lubricated O-ring -1- hand-tight.



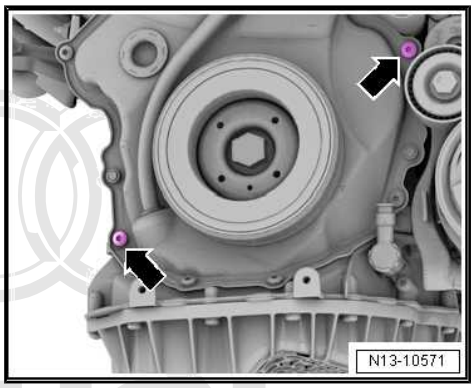
– Remove knurled screws -arrows- and detach support -T10531/1- .



– 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:

– Fit vibration damper (pay attention to shape of tooth -arrow-).
– Install poly V-belt ⇒ page 49 .
– Install wheel spoiler (right-side) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front) .
– Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .
– Install air duct ⇒ page 248 .

Tightening torques

- ⇒ “1.1 Exploded view - cylinder block (pulley end)”, page 47
- ⇒ “2.1 Exploded view - charge air system”, page 247

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1.5 Removing and installing bracket for ancillaries

Special tools and workshop equipment required

- Drip tray for workshop hoist - VAS 6208-



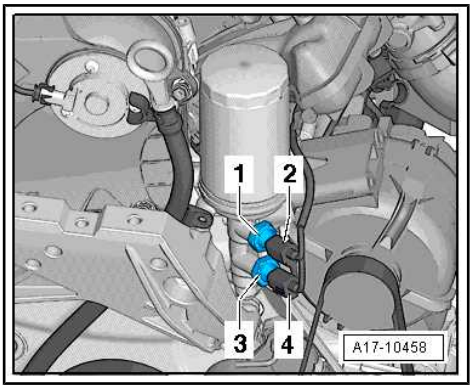
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Removing

– Unplug electrical connectors:

2 - For oil pressure switch for reduced oil pressure - F378- -item 1-

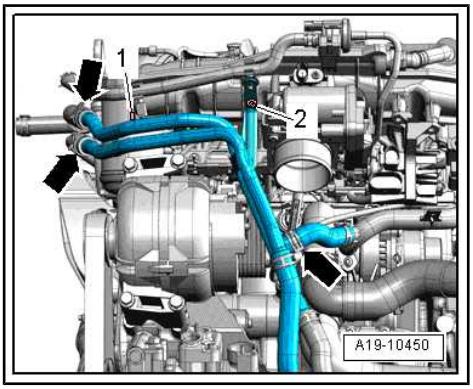
4 - For oil pressure switch - F22- -item 3-



– Take poly V-belt off alternator ⇒ “1.2 Removing and installing poly V-belt”, page 49 .

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

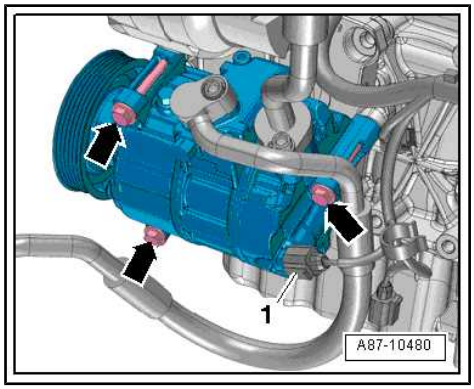
– Remove bolts -1- and -2- and press coolant pipes (front) to side.



Note

Disregard -arrows-.

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



WARNING

Risk of injury caused by refrigerant.

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

– Remove bolts -arrows- for air conditioner compressor.

Caution

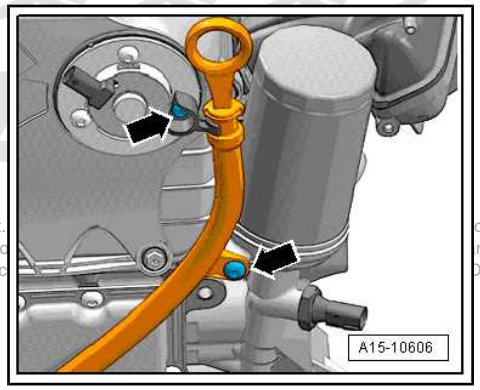
Risk of damage to air conditioner compressor and refrigerant pipes/hoses.

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

– Detach air conditioner compressor with refrigerant lines still connected and tie up to right side.

– Remove oil filter ⇒ Maintenance ; Booklet 820 .

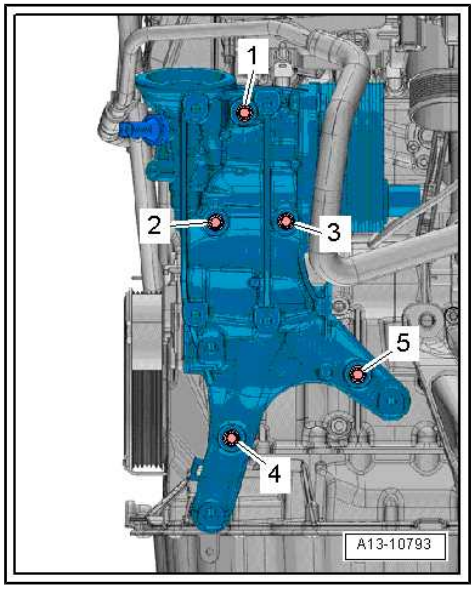
– Remove bolts -arrows- for dipstick guide tube.



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

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

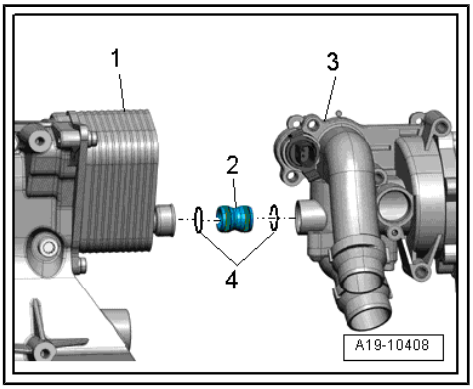


Installing

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

Note

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



- Lubricate O-rings -4- with coolant additive, for coolant additive refer to ⇒ Electronic parts catalogue .
- Insert connection -2- into coolant pump housing -3-.
- Push bracket for ancillaries -1- onto connection, fit bolts and tighten ⇒ page 49 .
- 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; Exploded view - alternator .
- Install poly V-belt ⇒ page 49 .

Note

Do not reuse coolant.

- Fill up with coolant ⇒ page 196 .
- Install oil filter and check oil level ⇒ Maintenance ; Booklet 820 .

Tightening torques

- ⇒ “1.1 Exploded view - cylinder block (pulley end)”, page 47
- ⇒ “1.1 Exploded view - timing chain cover”, page 90

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2 Cylinder block (gearbox end)

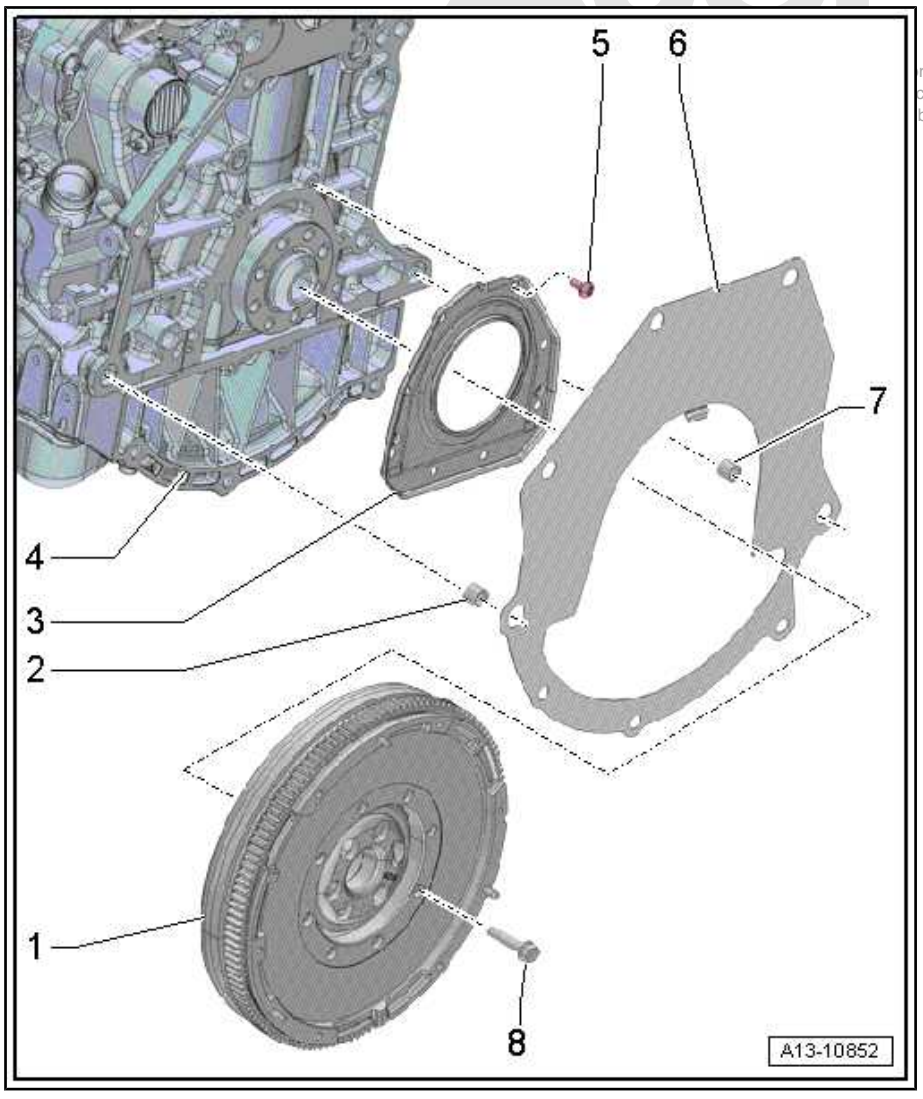
⇒ “2.1 Exploded view - cylinder block (gearbox end)”, page 60

⇒ “2.2 Removing and installing flywheel”, page 61

⇒ “2.3 Removing and installing drive plate”, page 63

⇒ “2.4 Removing and installing sealing flange (gearbox end)”, page 64

2.1 Exploded view - cylinder block (gearbox end)



1 - Dual-mass flywheel / drive plate

- ❑ Removing and installing dual-mass flywheel ⇒ “2.2 Removing and installing flywheel”, page 61
- ❑ Removing and installing drive plate ⇒ “2.3 Removing and installing drive plate”, page 63
- ❑ Installation position of drive plate: Collar faces engine
- ❑ Can only be installed in one position. Holes are off-set

2 - Dowel sleeve

3 - Sealing flange with oil seal

- ❑ Renew only as complete unit
- ❑ Removing and installing ⇒ “2.4 Removing and installing sealing flange (gearbox end)”, page 64
- ❑ Do not lubricate/grease sealing lip of oil seal
- ❑ 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

4 - Cylinder block

5 - Bolt

- ❑ Renew
- ❑ Tightening sequence with 8 bolts ⇒ page 61
- ❑ Tightening sequence with 6 bolts ⇒ page 61

6 - Intermediate plate

- ❑ Must be positioned on dowel sleeves
- ❑ Do not damage/bend when assembling
- ❑ Is fitted onto sealing flange ⇒ page 61

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ccept any liability
by AUDI AG.

7 - Dowel sleeve

8 - Bolt

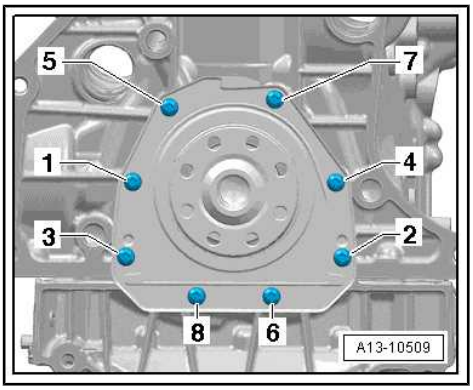
- ❑ For dual-mass flywheel/drive plate
- ❑ 60 Nm + turn 90° further
- ❑ Renew

Sealing flange (gearbox end) - tightening sequence with 8 bolts

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

– 1. Screw in bolts hand-tight.

– 2. Tighten bolts to 9 Nm.



Sealing flange (gearbox end) - tightening sequence with 6 bolts

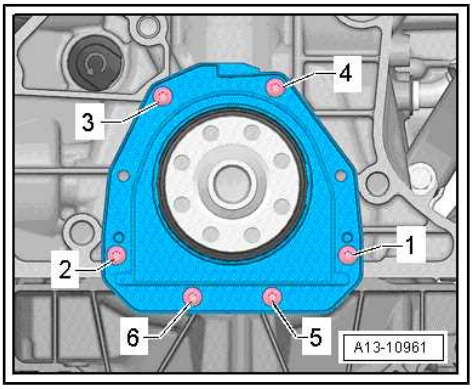
– Tighten new bolts -1 to 6- in the sequence shown:

– 1. Screw in bolts hand-tight.

– 2. Tighten bolts to 4 Nm + turn 45° further.

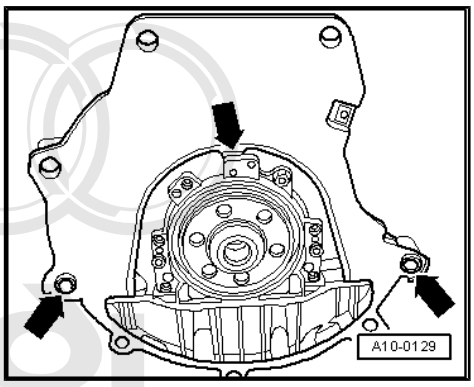
Note

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-.

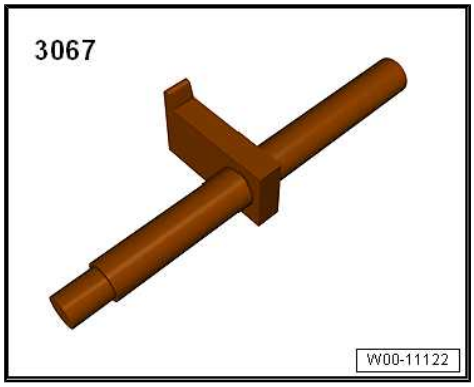


2.2 Removing and installing flywheel

Special tools and workshop equipment required

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- Counterhold tool - 3067-



Removing

Caution

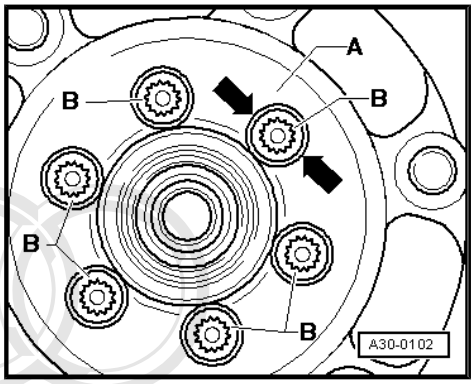
Risk of serious damage to flywheel.

- *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-.*

– Mark position of dual-mass flywheel in relation to engine.

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

– When unscrewing bolts -B-, ensure that none of the bolt heads come into contact with the dual-mass flywheel -arrows-. The flywheel will otherwise be damaged as the bolts are screwed out further.



– Insert counterhold tool - 3067- in hole on cylinder block -B-.

– Unbolt dual-mass flywheel.

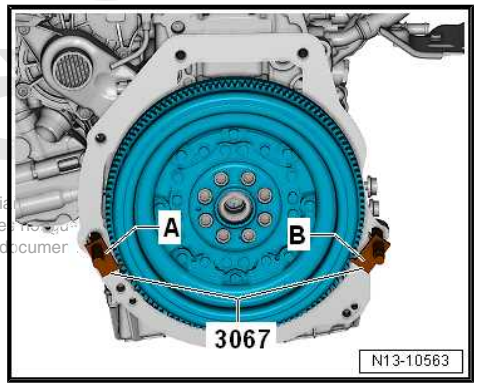
Installing

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

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Note

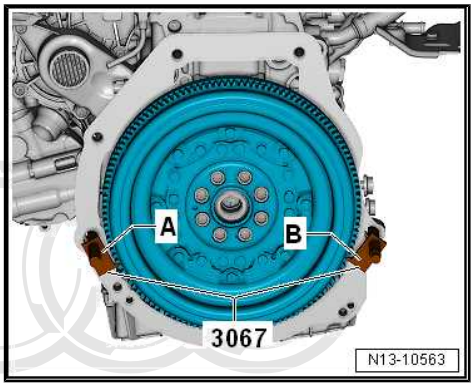
Renew the bolts tightened with specified tightening angle.



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

Tightening torques

♦ ⇒ “2.1 Exploded view - cylinder block (gearbox end)”, page 60

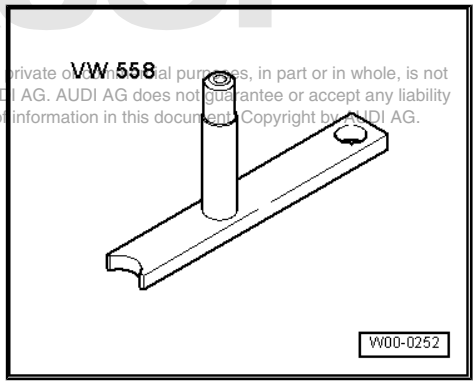


2.3 Removing and installing drive plate

Special tools and workshop equipment required

♦ Counterhold tool - VW 558-

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♦ Depth gauge

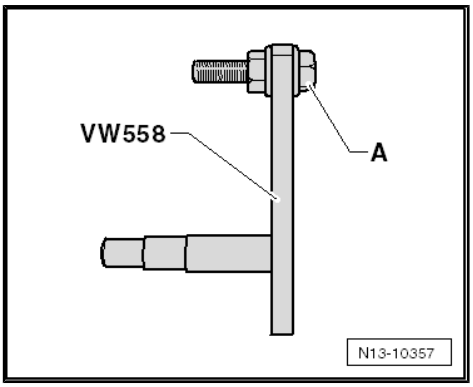
♦ M8×40 hexagon bolt and M18 hexagon nut

– Remove gearbox ⇒ Power transmission; Rep. gr. 37 ; Removing and installing gearbox .

Preparing adapter - VW 558- :

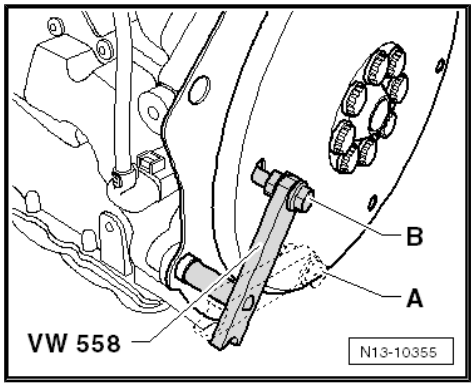
– Secure M8×40 hexagon bolt -A- to counterhold tool - VW 558- with a hexagon nut.

Loosening and tightening drive plate:



– Insert counterhold tool - VW 558- in cylinder block and drive plate as shown.

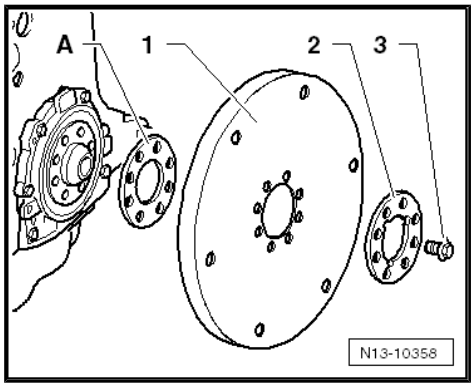
Position of counterhold tool: -A- when loosening; -B- when tightening



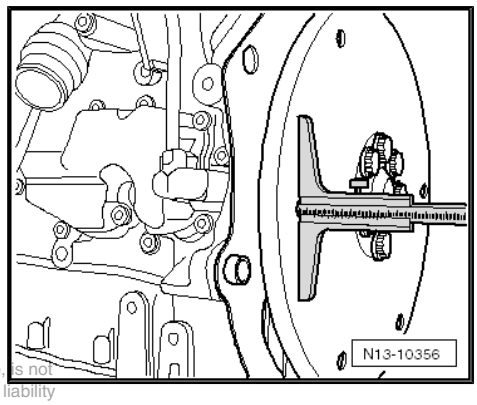
Installing drive plate:

– Initially fit drive plate without washer -A-.

– Fit used securing bolts -3- and tighten to 30 Nm.



– Check distance between drive plate and cylinder block at three locations and calculate mean value.



Note

Measurement is taken through the hole in the drive plate to the machined surface of the cylinder block. If you measure on the intermediate plate, allow for its thickness.

- Specification without intermediate plate: 19.5 … 21.1 mm
- Specification with intermediate plate: 18.8 … 20.4 mm

If specification is attained, renew and tighten all securing bolts.

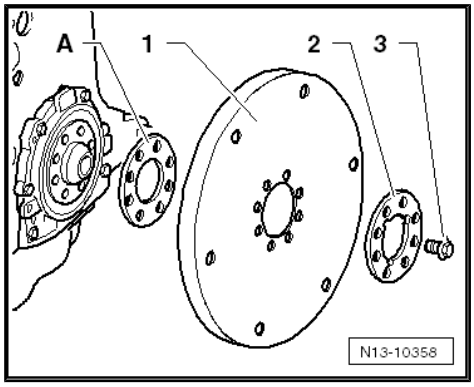
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If the value is below specification:

– Remove drive plate again and use shim -A-. Tighten bolts -3- to 30 Nm again.

– Repeat measurement. If specification is attained, renew and tighten all securing bolts.

- Tightening torque
⇒ “2.1 Exploded view - cylinder block (gearbox end)”, page 60



2.4 Removing and installing sealing flange (gearbox end)

Special tools and workshop equipment required

♦ Assembly sleeve - T20097-



♦ Electric drill with plastic brush attachment

♦ Safety goggles

♦ Sealant ⇒ Electronic parts catalogue

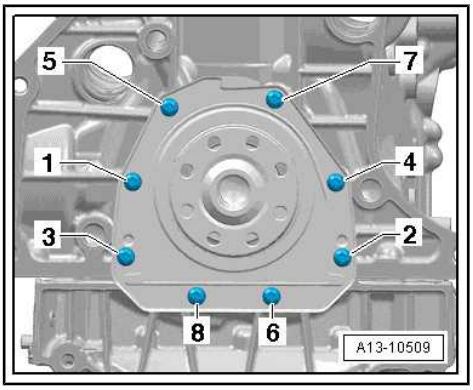
Removing

• Gearbox removed

– Remove dual-mass flywheel ⇒ "2.2 Removing and installing flywheel", page 61 or drive plate ⇒ "2.3 Removing and installing drive plate", page 63.

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– Remove bolts -1 ... 8-. (Some versions may only have six bolts.)



– Release sealing flange from bonded joint.

Installing

♦ Silicone sealant: ⇒ Electronic parts catalogue .

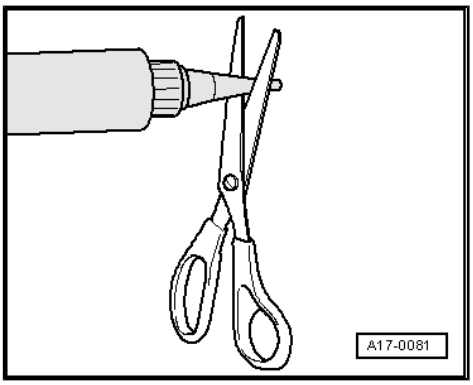
Note

♦ *Note the expiry date of the silicone sealant.*

♦ *The sealing flange must be installed within 5 minutes after applying silicone sealant.*

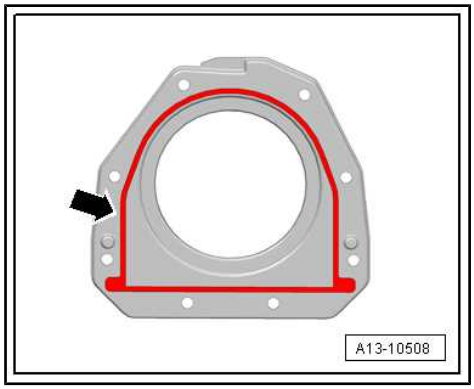
– Remove sealant remaining on cylinder block with flat scraper.

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



– Apply silicone sealant onto clean sealing surface of new cover, as illustrated.

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



Note

♦ *The sealing flange must be installed within 5 minutes after applying silicone sealant.*

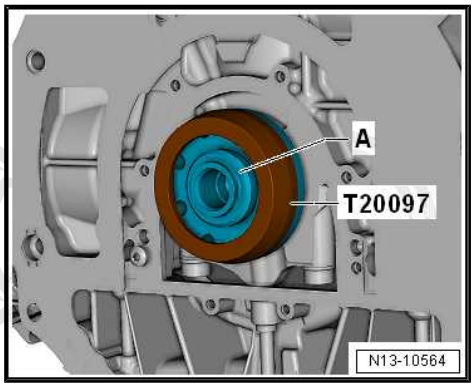
♦ *The bead of sealant must not be thicker than specified, otherwise excess sealant can enter the sump and obstruct the strainer in the oil intake pipe.*

– Fit guide sleeve - T20097- onto crankshaft journal -A-.

– Push sealing flange over guide sleeve - T20097- onto crankshaft journal and tighten bolts; tightening sequence:

♦ Cover with 8 bolts ⇒ page 61

♦ Cover with 6 bolts ⇒ page 61



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

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

– Install dual-mass flywheel
⇒ “2.2 Removing and installing flywheel”, page 61 .

– Install drive plate
⇒ “2.3 Removing and installing drive plate”, page 63 .

♦ ⇒ Fig. ““Sealing flange (gearbox end) - tightening sequence with 8 bolts”“ , page 61

♦ ⇒ Fig. ““Sealing flange (gearbox end) - tightening sequence with 8 bolts”“ , page 61

♦ ⇒ “2.1 Exploded view - cylinder block (gearbox end)”, page 60

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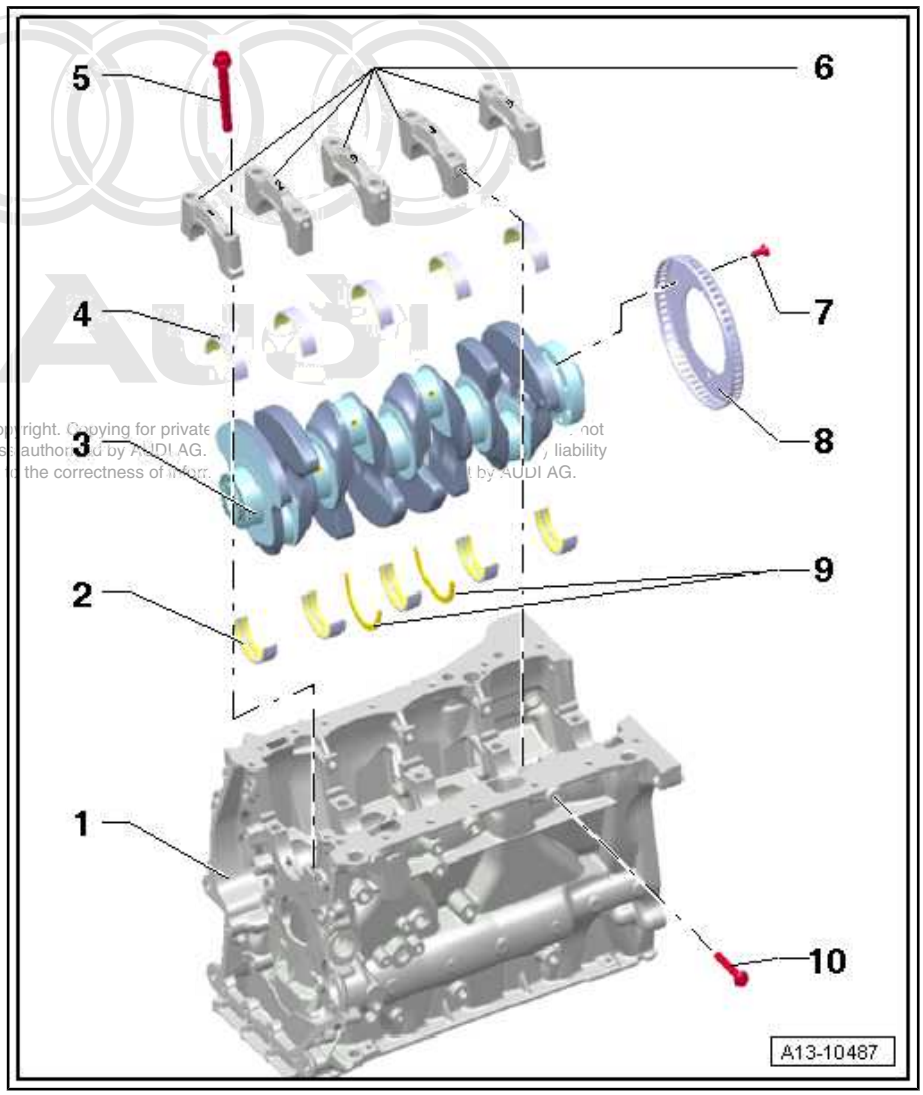
3 Crankshaft

⇒ “3.1 Exploded view - crankshaft”, page 67
⇒ “3.2 Crankshaft dimensions”, page 68
⇒ “3.3 Allocation of main bearing shells”, page 69
⇒ “3.4 Renewing needle bearing in crankshaft”, page 70
⇒ “3.5 Measuring axial clearance of crankshaft”, page 72
⇒ “3.6 Measuring radial clearance of crankshaft”, page 73
⇒ “3.7 Removing and installing sender wheel”, page 74

3.1 Exploded view - crankshaft

Note

Secure engine to repair stand using engine and gearbox support - VAS 6095- when dismantling/assembling engine ⇒ page 32 .



1 - Cylinder block

2 - Bearing shell for cylinder block

- ❑ With oil groove
- ❑ Renew used bearing shells
- ❑ Classification of crankshaft bearing shells ⇒ page 69

3 - Crankshaft

- ❑ For vehicles with 7-speed dual clutch gearbox and needle bearing
- ❑ Extracting and driving in needle bearing ⇒ page 70
- ❑ After removing, place it down so that the sender wheel -item 8- is not damaged and the crankshaft does not rest on the sender wheel
- ❑ If crankshaft is renewed, new bearing shells must be assigned to bearing caps ⇒ page 69
- ❑ Axial clearance ⇒ page 72
- ❑ Radial clearance ⇒ page 73
- ❑ Use old bolts when measuring radial clearance
- ❑ Crankshaft dimensions ⇒ page 68

4 - Bearing shell for bearing cap

- ❑ Without oil groove

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- ❑ Renew used bearing shells
- ❑ Classification of crankshaft bearing shells ⇒ page 69

5 - Bolt

- ❑ Renew
- ❑ Use old bolts when measuring radial clearance
- ❑ Tightening sequence ⇒ page 68

6 - Bearing caps

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

7 - Bolt

- ❑ 10 Nm + turn 90° further
- ❑ Renew
- ❑ Sender wheel must be renewed if bolts are loosened ⇒ page 74

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 74

9 - Thrust washers

- ❑ For bearing No. 3

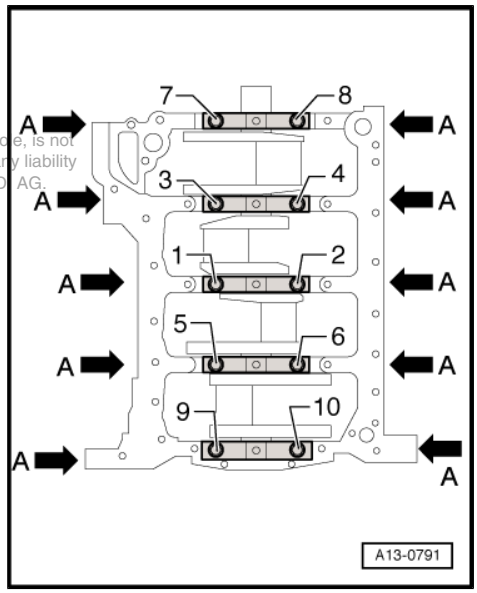
10 - Bolt

- ❑ Renew
- ❑ Tightening sequence ⇒ page 68

Crankshaft - tightening sequence

– Tighten crankshaft bolts in the sequence -1 ... 5- as follows:

1. Screw in bolts -1 ... 10- and -arrows A- hand-tight.
2. Initially tighten bolts -1 ... 10- to 65 Nm.
3. Turn bolts -1 ... 10- 90° further using a rigid wrench.
4. Initially tighten bolts -arrows A- to 20 Nm.
5. Turn bolts -arrows A- 90° further using a rigid wrench.



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3.2 Crankshaft dimensions

(in mm)

Honing dimension 1)	Crankshaft main bearing journal Ø	Conrod journal Ø
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.

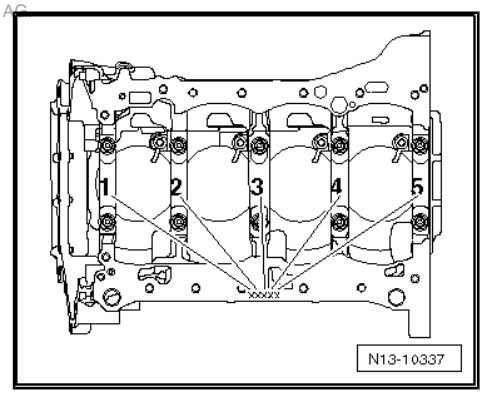
Letter codes on lower sealing surface or end of cylinder block indicate which bearing shell is to be fitted in cylinder block (top bearing shell) at each location.

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.

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Marking on bearing shell for cylinder block:

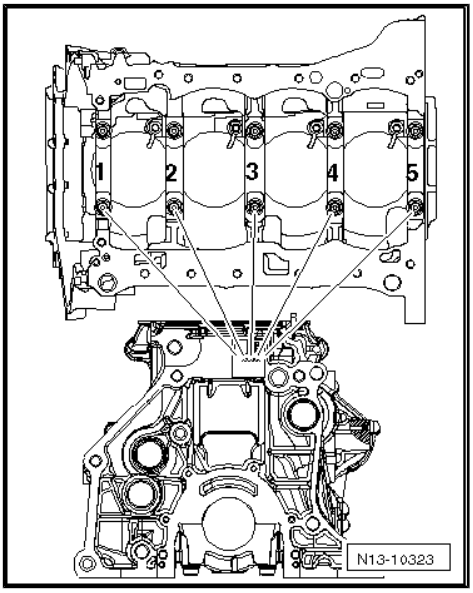


Note

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 refer to table for colour code to be fitted.

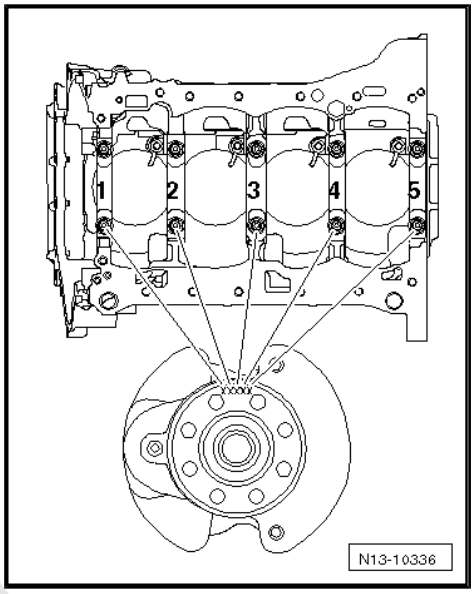


Marking on bearing shell for bearing cap:

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

– Note down letters and refer to table for colour code to be fitted.

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



3.4 Renewing needle bearing in crankshaft

Note

- *There should be no needle bearing fitted in the crankshaft on vehicles with manual or automatic gearbox.*
- *A needle bearing must be fitted in the crankshaft on vehicles with dual clutch gearbox ⇒ Electronic parts catalogue .*

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Special tools and workshop equipment required

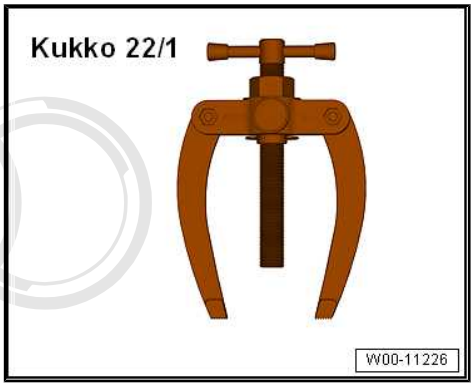
- Drift - VW 207 C-



- Kukko - 21/2-



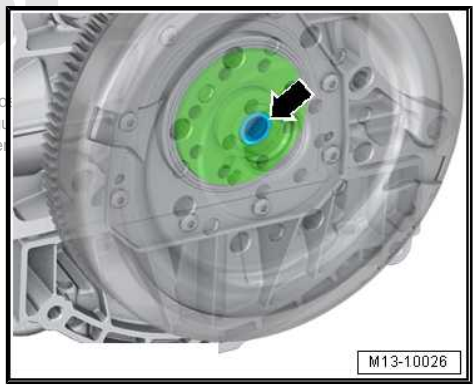
♦ Support - Kukko 22/1-



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Important

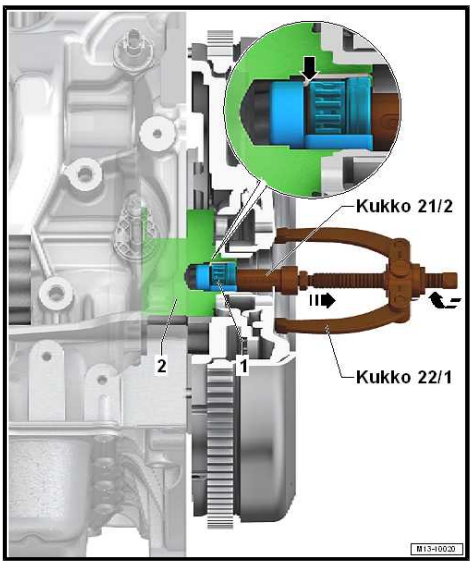
- The needle bearing -arrow- must always be renewed if the engine is separated from the gearbox.
- The front edges of the internal puller must not be chipped.



Removing

– 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-).

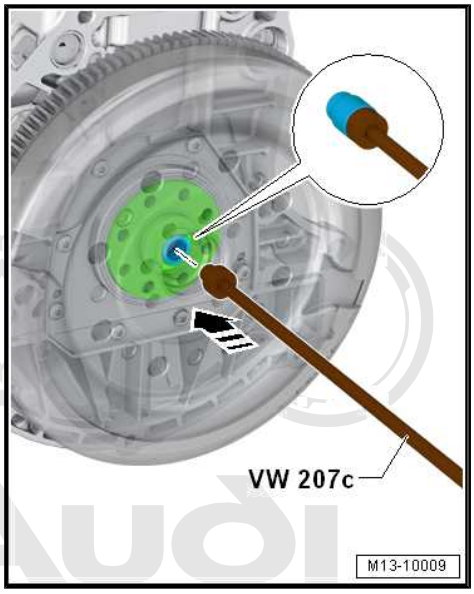
– Internal puller must be positioned behind needle roller -arrow-.



Installing

– Clean bearing seat in crankshaft and grease lightly.

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



• Installation depth: dimension -a- = 2.0 mm

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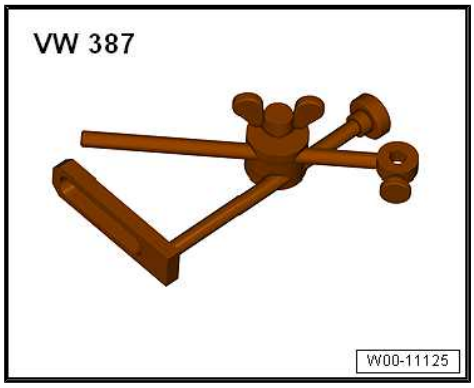
Note

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-



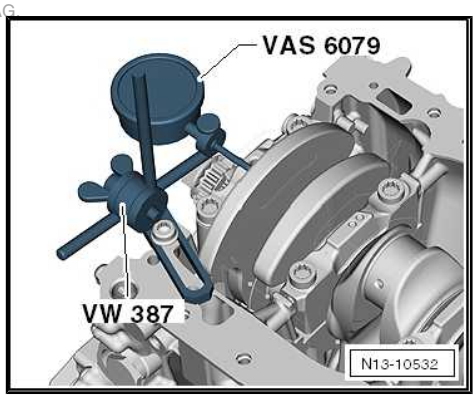
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Procedure

– Bolt dial gauge - VAS 6079- with universal dial gauge bracket - VW 387- onto cylinder block and set it against crank web.

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

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



Axial clearance:

- New: 0.07 ... 0.23 mm.
- Wear limit: 0.30 mm.

3.6 Measuring radial clearance of crankshaft

Special tools and workshop equipment required

♦ Plastigage

Procedure

Note

♦ *Do not interchange used bearings.*

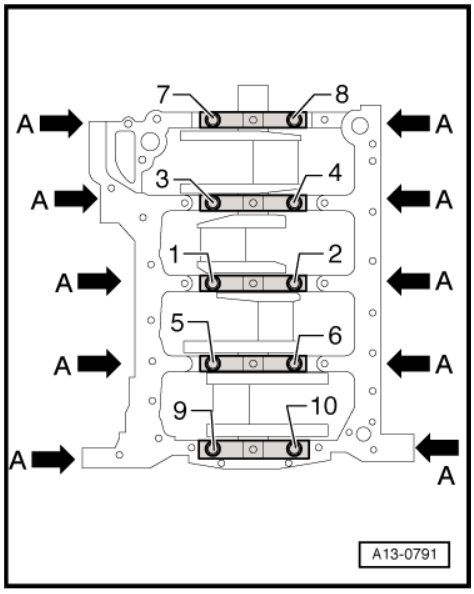
♦ *Bearing shells worn down to nickel layer must be renewed.*

– 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.

– Fit crankshaft bearing caps and secure with old bolts -1 ... 10- ⇒ page 68 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.

– Remove sealing flange (gearbox end) ⇒ page 64 .

– Remove sump (top section) ⇒ page 171 .

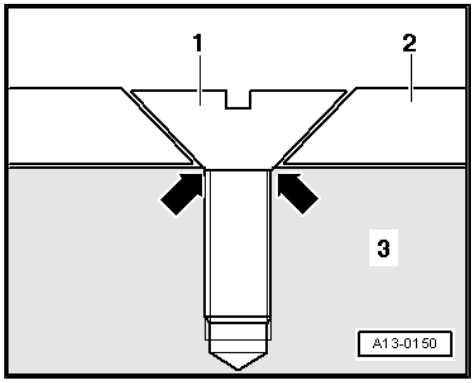
– Remove drive chain for balance shafts ⇒ page 118 .

– Unbolt conrod bearing caps.

– Remove crankshaft bearing caps.

– Remove crankshaft and unbolt sender wheel.

– Sender wheel -2- must always be renewed after slackening off 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 fitted in one position because holes are offset.*

– 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 67

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4 Balance shaft

⇒ “4.1 Exploded view - balance shaft”, page 75

⇒ “4.2 Removing and installing balance shaft”, page 76

⇒ “4.3 Renewing oil seal for balance shaft (inlet side)”, page 82

4.1 Exploded view - balance shaft

1 - Bolt
- ❑ Renew
- ❑ 9 Nm

2 - Balance shaft
- ❑ Inlet side
- ❑ Always renew after removal
- ❑ Lubricate bearing with engine oil
- ❑ Renewing ⇒ page 76

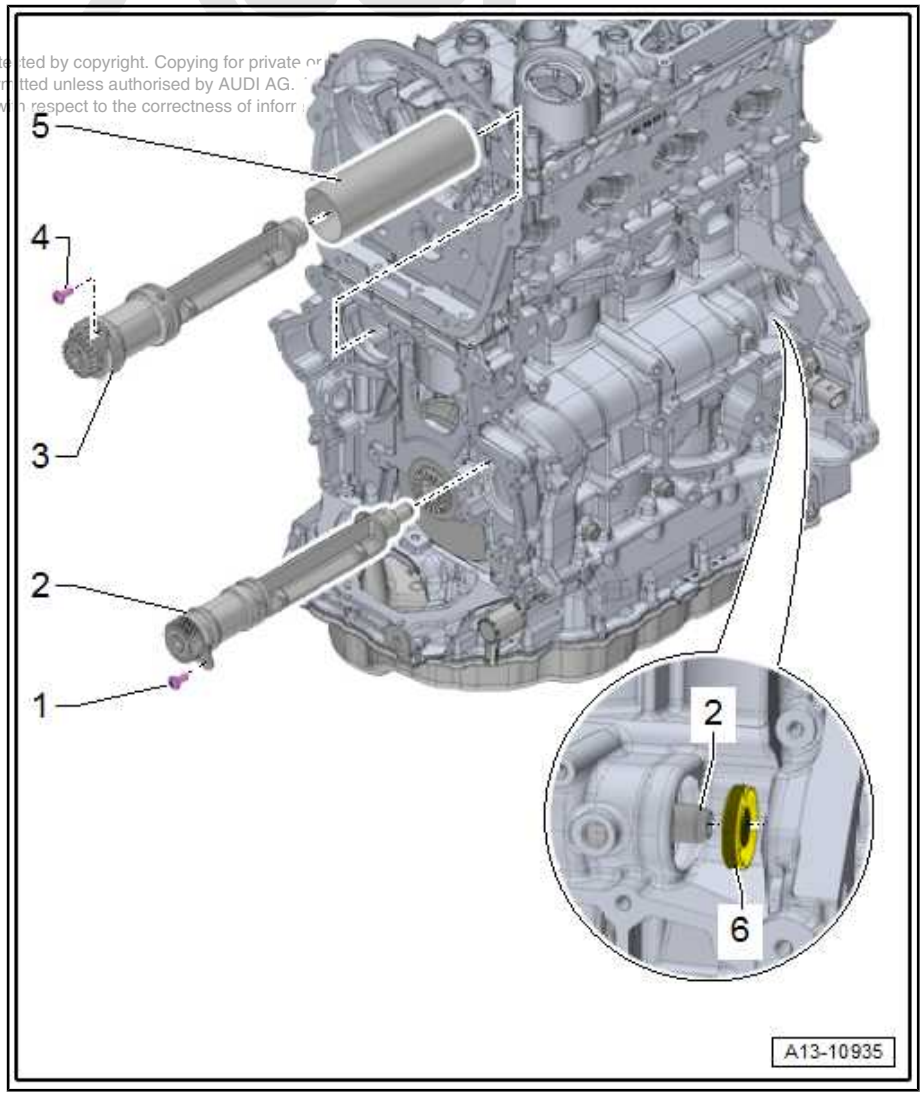
3 - Balance shaft
- ❑ Exhaust side
- ❑ Always renew after removal
- ❑ Lubricate bearing with engine oil
- ❑ Renewing ⇒ page 79

4 - Bolt
- ❑ Renew
- ❑ 9 Nm

5 - Tube for balance shaft
- ❑ Installation position ⇒ page 75

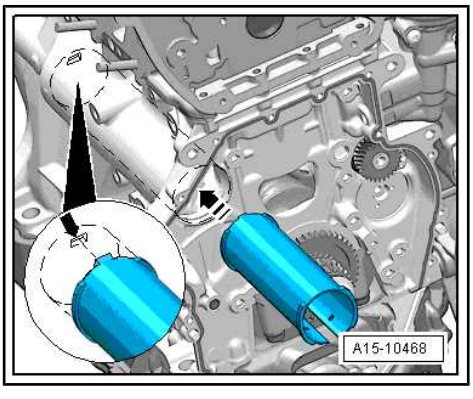
6 - Oil seal for coolant pump drive
- ❑ Renewing ⇒ page 82

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Tube for balance shaft - installation position

- Lug on tube for balance shaft must engage in slot -arrow-.



4.2 Removing and installing balance shaft

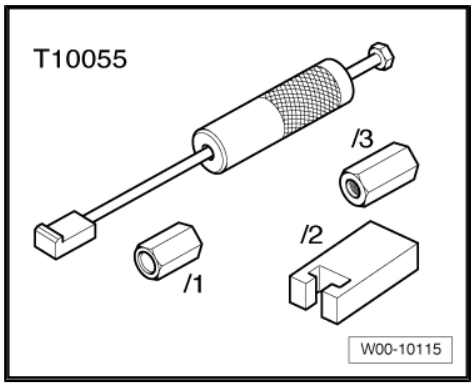
⇒ “4.2.1 Removing and installing balance shaft (inlet side)”, page 76

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

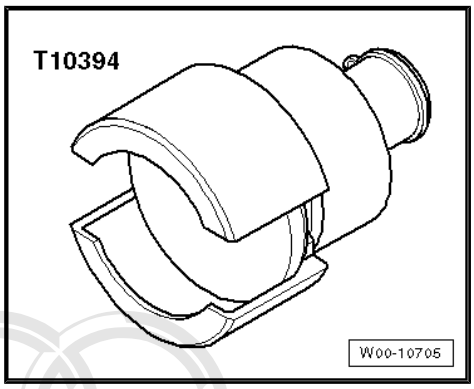
4.2.1 Removing and installing balance shaft (inlet side)

Special tools and workshop equipment required

- Puller - T10055-



- Puller - T10394-



Removing

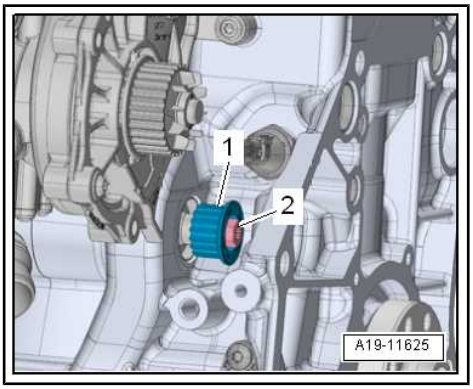
Note

Always renew balance shaft (inlet side) after removal.

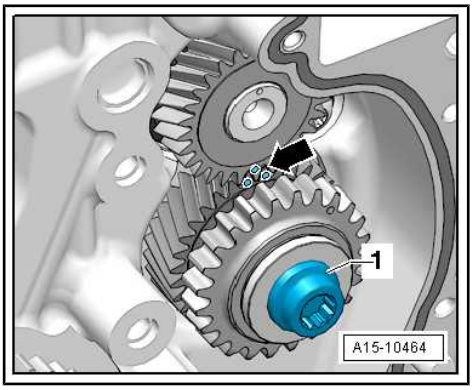
– Remove toothed belt for coolant pump ⇒ page 212 .
– Remove timing chain cover (top) ⇒ page 92 .
– Remove timing chain cover (bottom) ⇒ page 93 .
– Remove camshaft timing chain ⇒ page 107 .
– Remove drive chain for balance shafts ⇒ page 118 .

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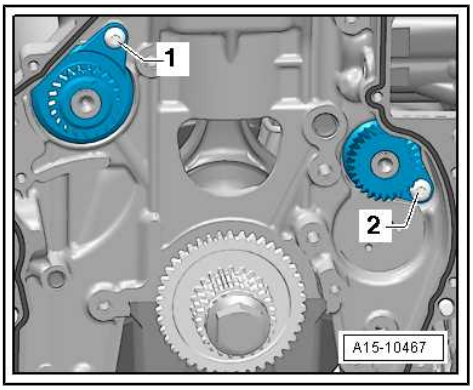
– Unscrew bolt -2- and detach drive sprocket -1- for toothed belt for coolant pump.



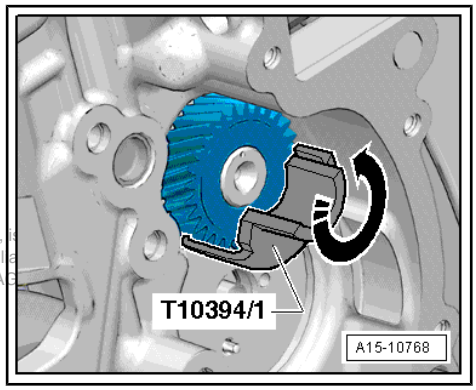
– Remove idler gear -1-.



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

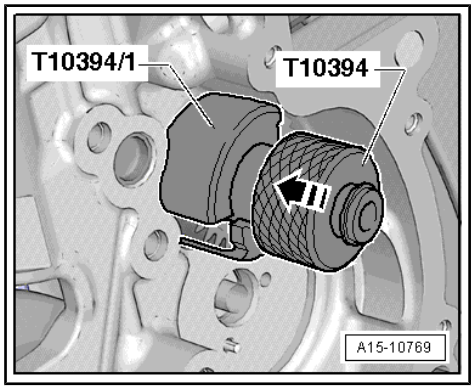


– Insert half shell - T10394/1- of puller - T10394- and turn upwards in direction of arrow.

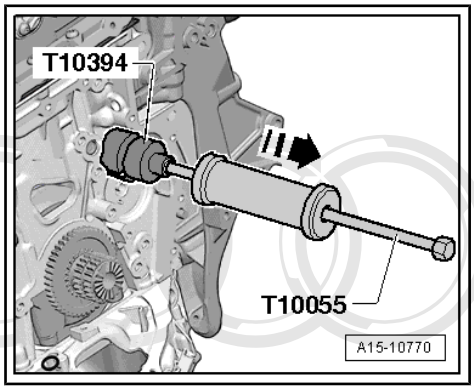


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– Insert puller - T10394- and press locking collar in direction of -arrow-.



– Screw puller - T10055- into puller - T10394- and knock out balance shaft in direction of -arrow-.



Installing

Note

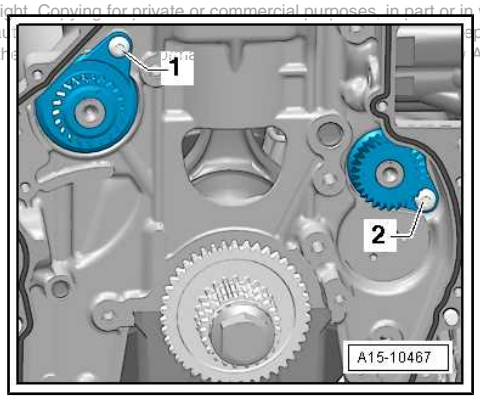
It might be necessary to cool the balance shaft before installing due to the minimal clearance between balance shaft and cylinder block. Check if it is possible to insert the balance shaft into the cylinder block without applying force. If this is not the case, the balance shaft must be cooled before installing.

– Put new balance shaft for 30 minutes into freezer compartment or spray with chilling agent (commercially available) if necessary.

– Lubricate balance shaft bearing with engine oil.

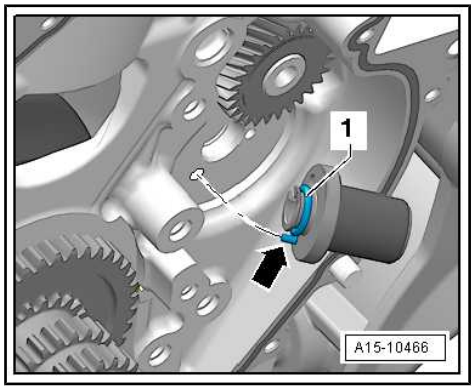
– Install new balance shaft (inlet side) and tighten bolt -2-.

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– 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.

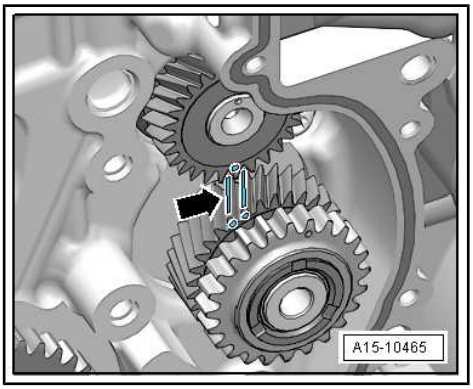


Caution

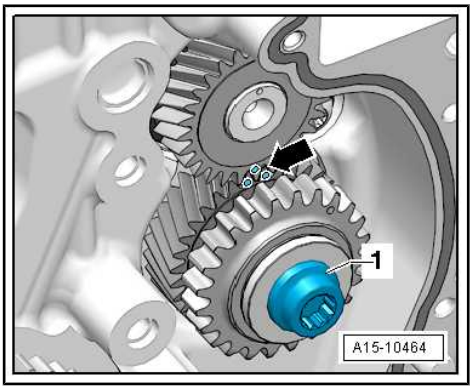
Always renew idler gear. If this is not done, there is no backlash, which causes engine damage.

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 102 .
– Check markings on idler gear/balance shaft -arrow-.



Further assembly is basically carried out in reverse order of dismantling. Note the following:

– Install drive chain for balance shafts ⇒ page 118 .
– Install camshaft timing chain ⇒ page 107 .
– Install timing chain cover (bottom) ⇒ page 93 .
– Install timing chain cover (top) ⇒ page 92 .
– Install poly V-belt tensioner ⇒ page 50 .
– Install poly V-belt ⇒ page 49 .
– Renew oil seal for coolant pump drive ⇒ page 82 .
– Install toothed belt for coolant pump ⇒ page 212 .

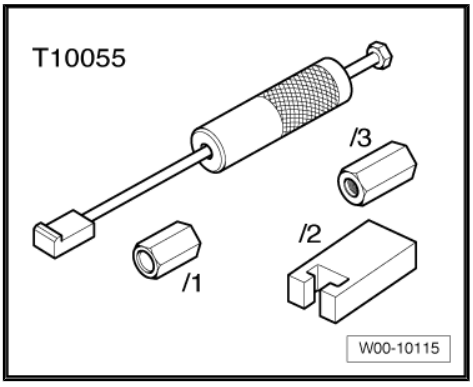
Tightening torques

- ⇒ “2.2 Exploded view - drive chain for balance shaft”, page 101
- ⇒ “4.1 Exploded view - balance shaft”, page 75

4.2.2 Removing and installing balance shaft (exhaust side)

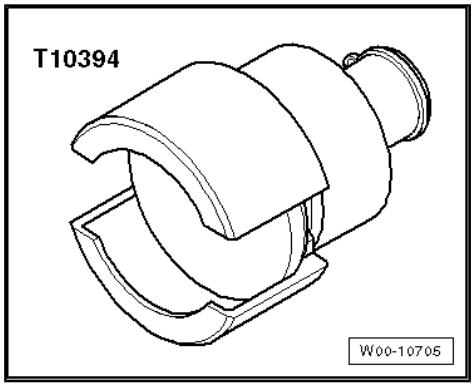
Special tools and workshop equipment required

- Puller - T10055-



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♦ Puller - T10394-

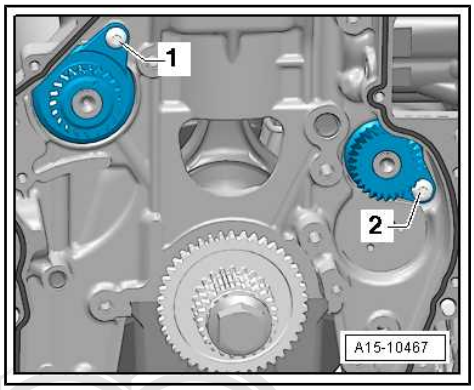


Removing

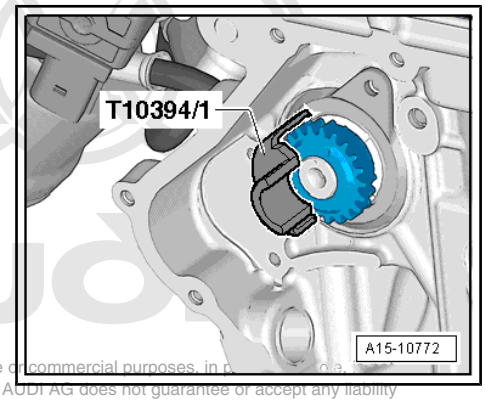
Note

Always renew balance shaft (exhaust side) after removal.

– Remove timing chain cover (top) ⇒ page 92 .
– Remove timing chain cover (bottom) ⇒ page 93 .
– Remove camshaft timing chain ⇒ page 107 .
– Remove drive chain for balance shafts ⇒ page 118 .
– Remove bolt -1- securing balance shaft (exhaust side).

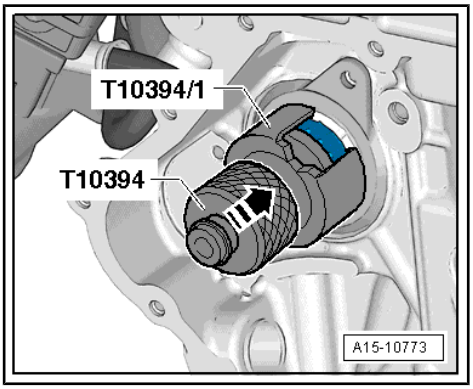


– Insert half shell -T10394/1- from puller - T10394- .



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– Insert puller - T10394- and press locking collar in direction of -arrow-.

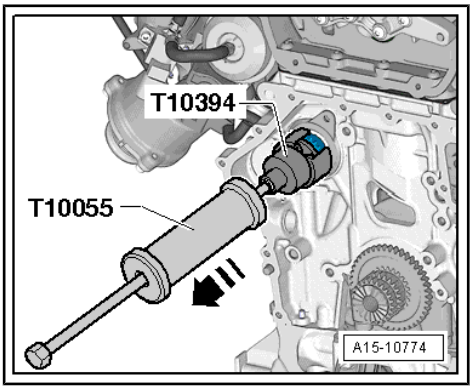


– Screw puller - T10055- into puller - T10394- and knock out balance shaft.

Installing

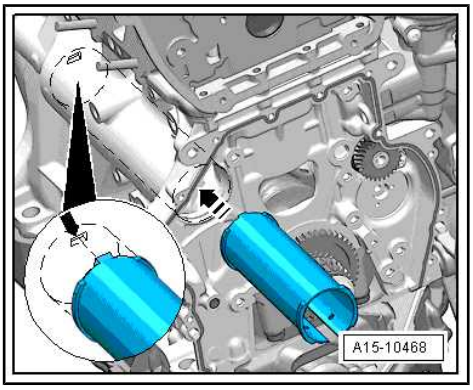
Note

It might be necessary to cool the balance shaft before installing due to the minimal clearance between balance shaft and cylinder block. Check if it is possible to insert the balance shaft into the cylinder block without applying force. If this is not the case, the balance shaft must be cooled before installing.



– Check installation position of tube for balance shaft -arrow-.

Lug -arrow- must engage in slot.

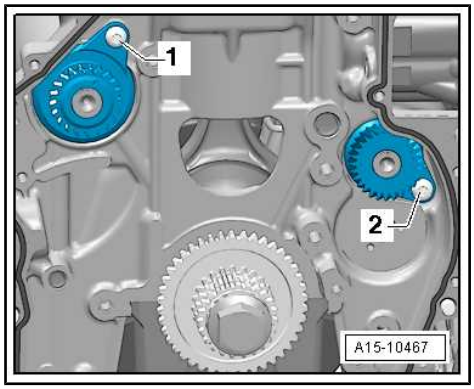


– Put new balance shaft for 30 minutes into freezer compartment or spray with chilling agent (commercially available) if necessary.

– Lubricate balance shaft bearing with engine oil.

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– Install new balance shaft (exhaust side).
– Make sure that balance shaft is in full contact with crankcase before tightening bolt -1-.



Note

Repeat insertion of tube for balance shaft if the balance shaft is not in full contact.

Further assembly is basically carried out in reverse order of dismantling. Note the following:

– Install drive chain for balance shafts ⇒ page 118 .
– Install camshaft timing chain ⇒ page 107 .
– Install timing chain cover (bottom) ⇒ page 93 .
– Install timing chain cover (top) ⇒ page 92 .
– Install poly V-belt tensioner ⇒ page 50 .
– Install poly V-belt ⇒ page 49 .

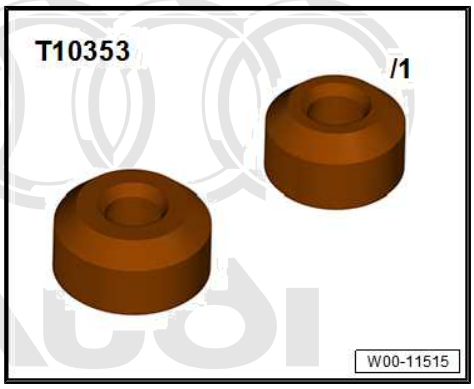
Tightening torques

- ⇒ “2.2 Exploded view - drive chain for balance shaft”, page 101
- ⇒ “4.1 Exploded view - balance shaft”, page 75

4.3 Renewing oil seal for balance shaft (inlet side)

Special tools and workshop equipment required

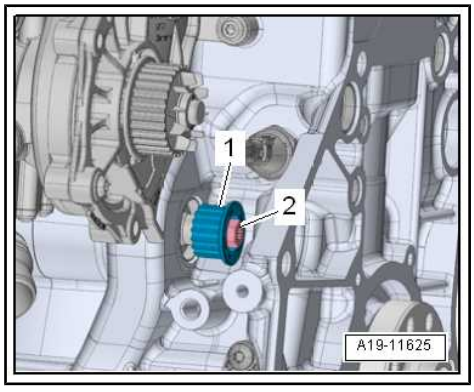
- Thrust piece - T10353-



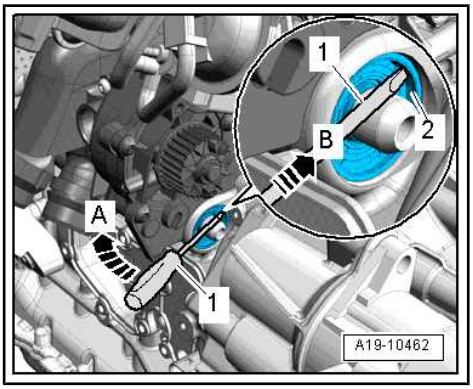
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Procedure

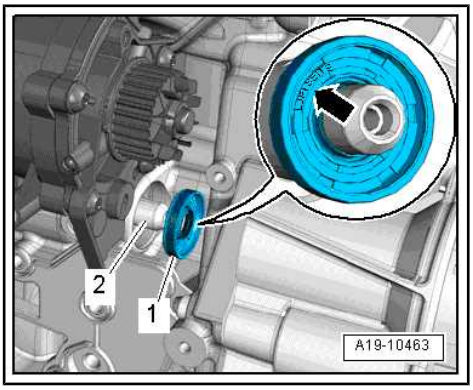
– Remove toothed belt for coolant pump ⇒ page 212 .
– Unscrew bolt -2- and detach drive sprocket -1- for toothed belt for coolant pump.



– 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.
– Fit oil seal -1- onto balance shaft.
• The marking “Luftseite” (“Outside”) -arrow- should be legible from the outside.

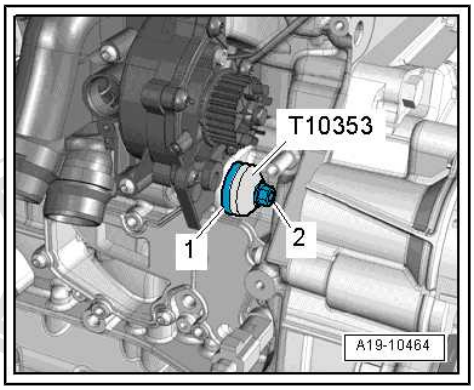


Caution

Risk of damage to thread.

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

– Apply thrust piece - T10353- 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 212 .



Note

Do not reuse coolant.

– Fill up with coolant ⇒ page 196 .

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5 Pistons and conrods

⇒ “5.1 Exploded view - pistons and conrods”, page 84

⇒ “5.2 Removing and installing pistons”, page 85

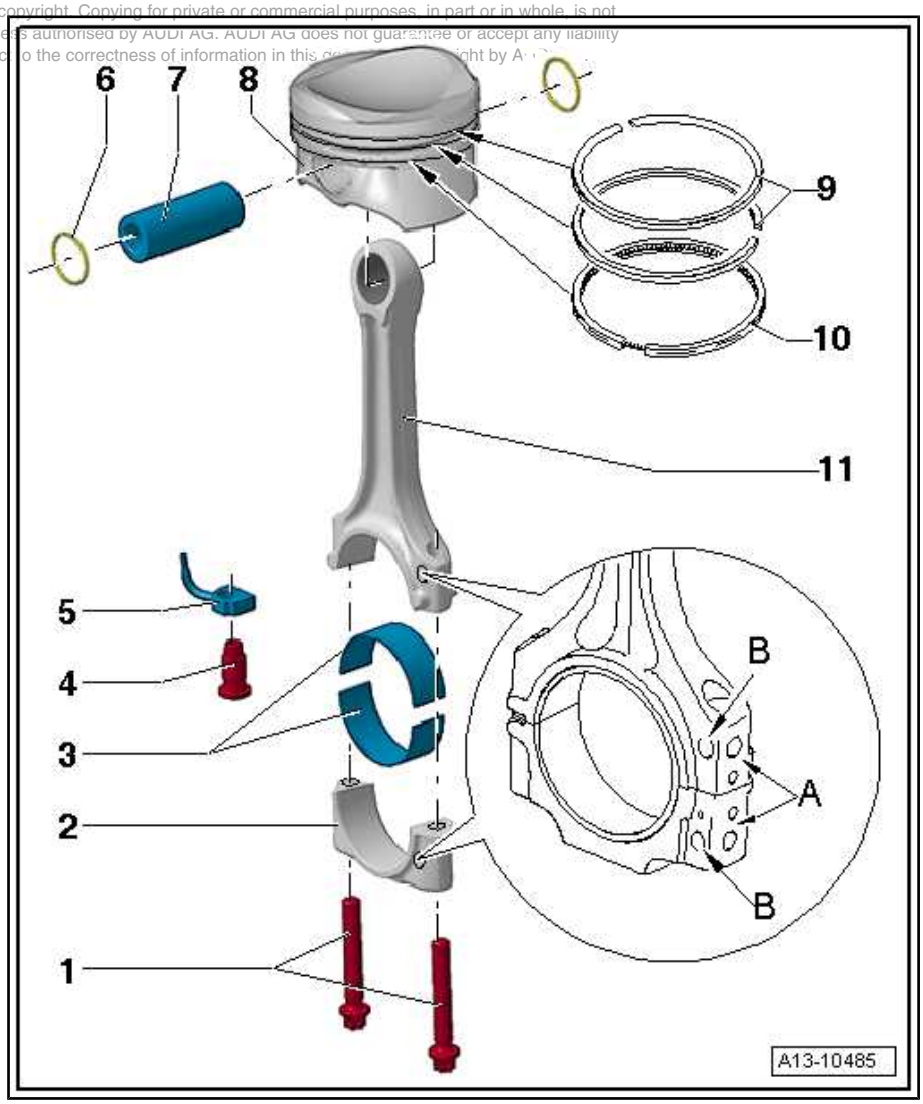
⇒ “5.3 Checking pistons and cylinder bores”, page 87

⇒ “5.4 Separating parts of new conrod”, page 88

⇒ “5.5 Checking radial clearance of conrod bearings”, page 89

5.1 Exploded view - pistons and conrods

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1 - Conrod bolts

- ❑ M8: 30 Nm + turn 90° further
- ❑ M9: 45 Nm + turn 90° further
- ❑ Renew
- ❑ Use old bolts when measuring radial clearance
- ❑ Lubricate threads and contact surface

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 88

3 - Bearing shells

- ❑ Installation position ⇒ page 85
- ❑ Renew used bearing shells
- ❑ Axial clearance when new: 0.10...0.35 mm; wear limit: 0.40 mm

4 - Pressure relief valve

- ❑ 27 Nm

5 - Oil spray jet

- ❑ For piston cooling

6 - Circlip

- ❑ Renew

7 - Piston pin

8 - Piston

- ❑ Removing and installing ⇒ page 85
- ❑ Mark installation position and cylinder number
- ❑ Arrow on piston crown points to pulley end
- ❑ Checking pistons and cylinder bores ⇒ page 87

9 - Compression rings

- ❑ Use piston ring pliers (commercially available) to remove and install
- ❑ Offset gaps by 120°
- ❑ Installation position: marking “TOP” or side with lettering faces towards piston crown
- ❑ Checking ring gap ⇒ page 87
- ❑ Checking ring-to-groove clearance ⇒ page 87

10 - Oil scraper ring

- ❑ 2 parts
- ❑ Offset gap of top steel element of piston ring by 120° to next compression ring
- ❑ “TOP” or “R” must face towards piston crown
- ❑ Offset gaps of individual parts of oil scraper ring.
- ❑ Checking ring gap ⇒ page 87
- ❑ Ring-to-groove clearance cannot be checked

11 - Conrod

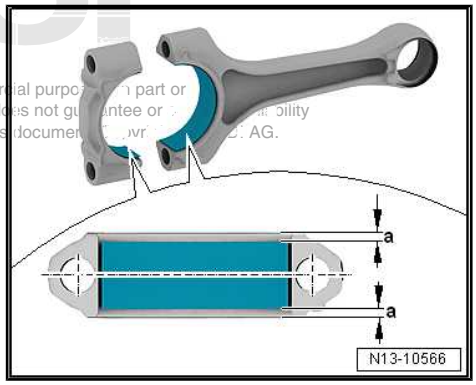
- ❑ Only renew as a complete set
- ❑ Mark cylinder allocation -A-
- ❑ Installation position: Marking -B- faces towards pulley end
- ❑ Separating parts of new conrod ⇒ page 88
- ❑ Measuring radial clearance ⇒ page 89

Installation position of bearing shell

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

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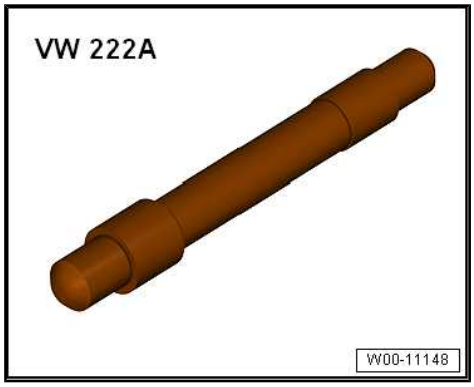
Dimension -a- must be identical on both sides.



5.2 Removing and installing pistons

Special tools and workshop equipment required

♦ Drift - VW 222 A-



♦ Piston ring clamp, commercially available

Removing

• Engine secured to engine and gearbox stand - VAS 6095- ⇒ page 32

– Remove cylinder head ⇒ page 126 .

– Remove sump (top section) ⇒ page 171 .

– Mark installation position and cylinder number of piston.

– Mark installation position and cylinder number of conrod ⇒ Item 11 (page 85) .

– 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

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♦ *Renew the 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 85) .

– Install conrod bearing cap; note installation position ⇒ Item 2 (page 84) .

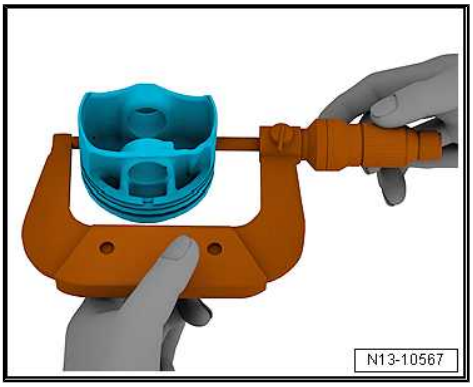
– Install cylinder head ⇒ page 126 .

– Install sump (upper section) ⇒ page 171 .

Tightening torques

♦ ⇒ “5.1 Exploded view - pistons and conrods”, page 84

5.3 Checking pistons and cylinder bores



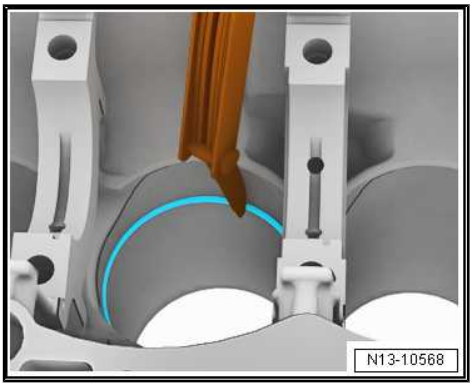
Checking piston

– 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 Ø
Basic dimension	mm	82.465 [1]

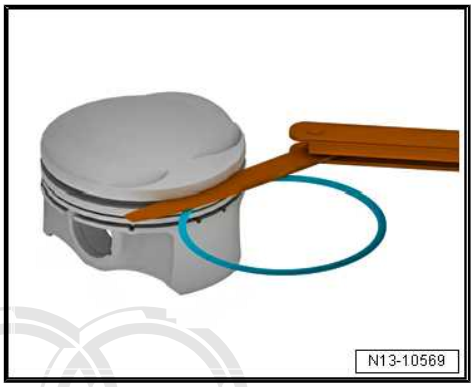
• [1] Dimensions not including graphite coating (thickness 0.02 mm). The graphite coating will wear down in service.



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
Compression ring	0.20...0.40	0.80
Oil scraper ring	0.25...0.50	0.80

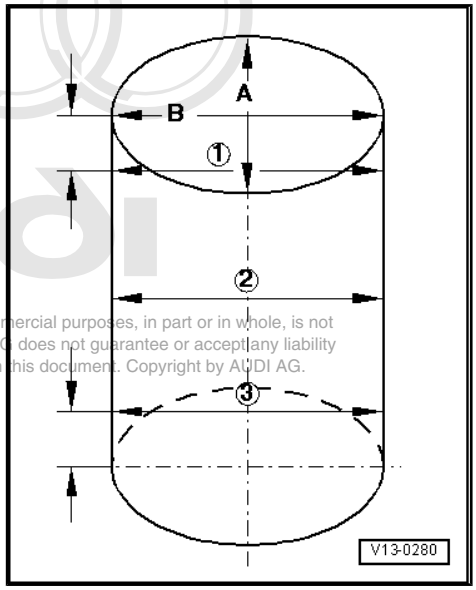


Checking ring-to-groove clearance

– 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.

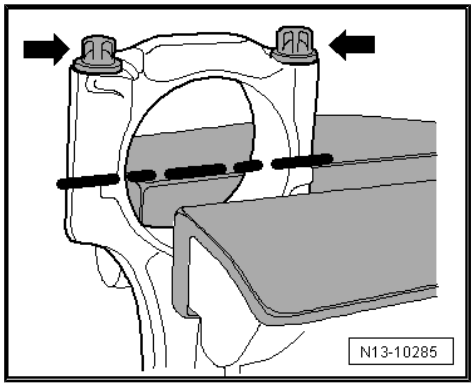
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5.4 Separating parts of new conrod

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 cylinder number of conrod ⇒ Item 11 (page 85) .

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

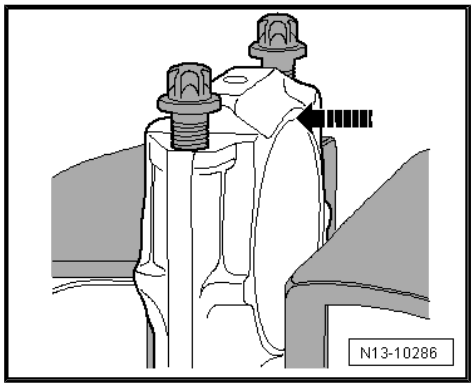


Note

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

Note

Use old bolts when measuring radial clearance.

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– 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 ⇒ Item 1 (page 84) and tighten 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.

– When carrying out final assembly, renew bolts.

15 – Cylinder head, valve gear

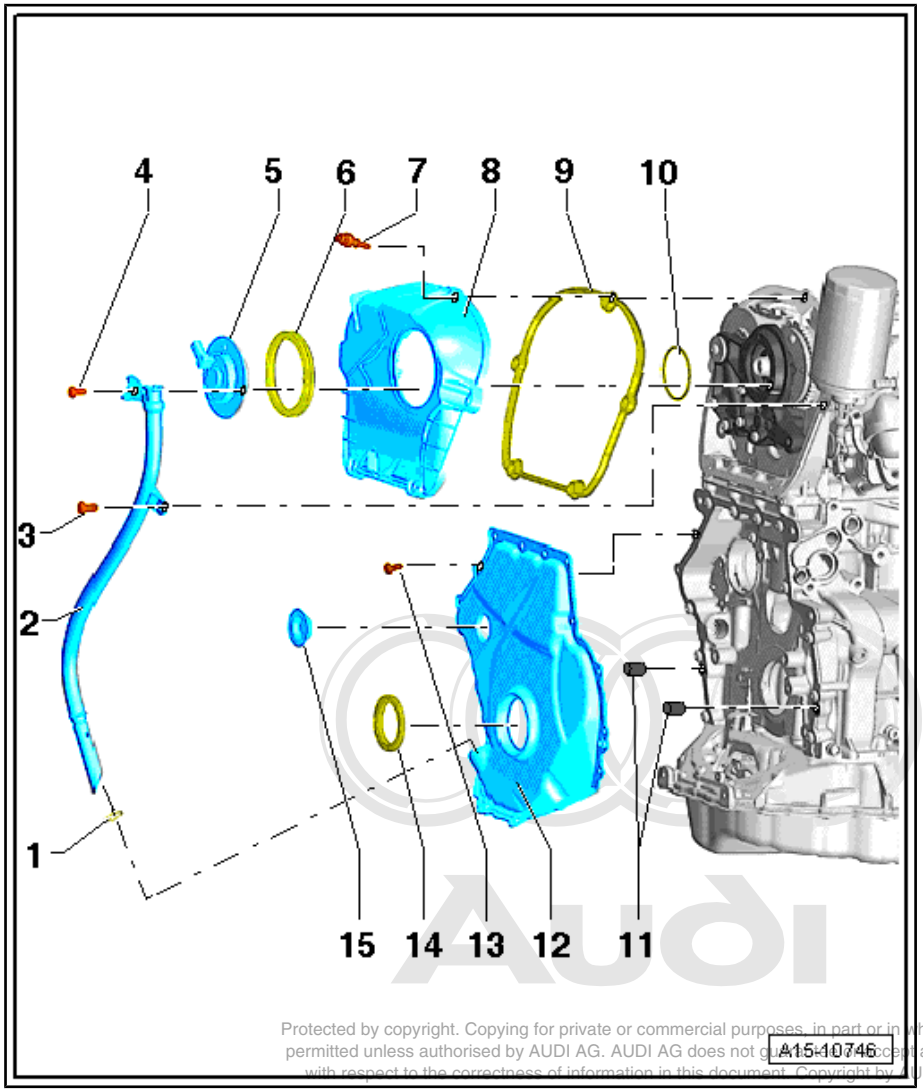
1 Timing chain cover

⇒ “1.1 Exploded view - timing chain cover”, page 90

⇒ “1.2 Removing and installing timing chain cover”, page 92

⇒ “1.3 Renewing oil seal for vibration damper”, page 97

1.1 Exploded view - timing chain cover



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1 - O-ring
- ❑ Renew
- ❑ Lubricate before installing

2 - Guide tube for oil dipstick

3 - Bolt
- ❑ 9 Nm

4 - Bolt
- ❑ 9 Nm

5 - Camshaft control valve 1 - N205-
- ❑ Removing and installing ⇒ page 153

6 - Oil seal
- ❑ Lubricate before installing
- ❑ Renew if damaged

7 - Bolt
- ❑ Tightening sequence ⇒ page 91

8 - Timing chain cover (top)
- ❑ Removing and installing ⇒ page 91

9 - Gasket
- ❑ Renew if damaged

10 - O-ring
- ❑ Renew
- ❑ Lubricate before installing

11 - Dowel pins
- ❑ For centring cover

12 - Timing chain cover (bottom)
- ❑ Renewing ⇒ page 93

13 - Bolt
- ❑ Renew
- ❑ Tightening sequence ⇒ page 91

14 - Oil seal
- ❑ For vibration damper

❑ Renewing ⇒ page 97

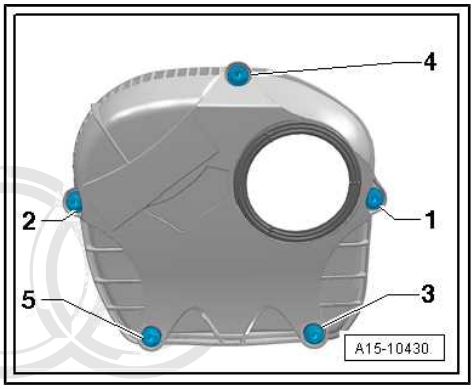
15 - Sealing plug

❑ Renew

Timing chain cover (top) - tightening sequence

– Tighten bolts -1 to 5- in the sequence shown:

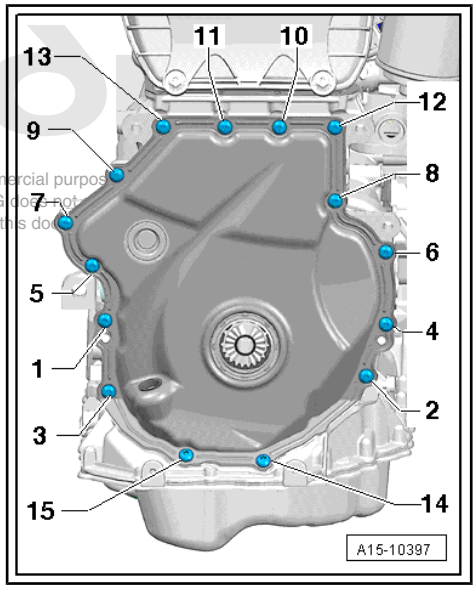
1. Tighten bolts to 9 Nm.



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

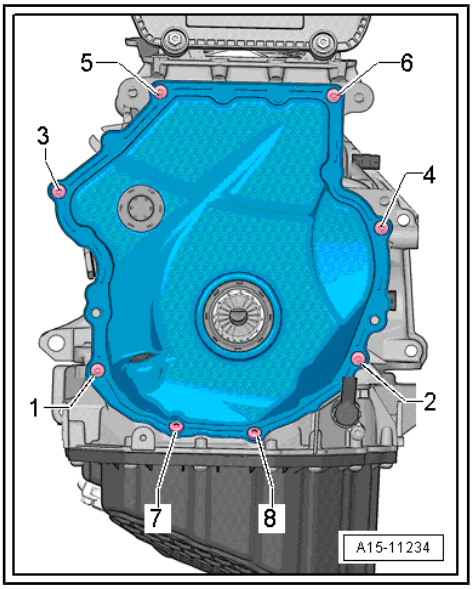
– Tighten bolts -1 to 15- in two stages in the sequence shown:
– 1. Tighten bolts to 8 Nm.
– 2. Turn bolts 45° further.

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

– Tighten bolts -1 to 8- in two stages in the sequence shown:
– 1. Tighten bolts to 4 Nm.
– 2. Turn bolts 45° further.



1.2 Removing and installing timing chain cover

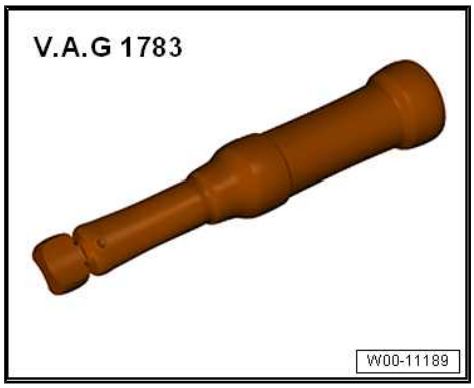
⇒ “1.2.1 Removing and installing timing chain cover (top)”, page 92

⇒ “1.2.2 Renewing timing chain cover (bottom)”, page 93

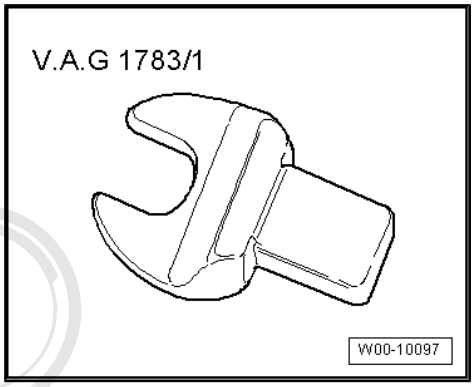
1.2.1 Removing and installing timing chain cover (top)

Special tools and workshop equipment required

- Torque wrench - V.A.G 1783-



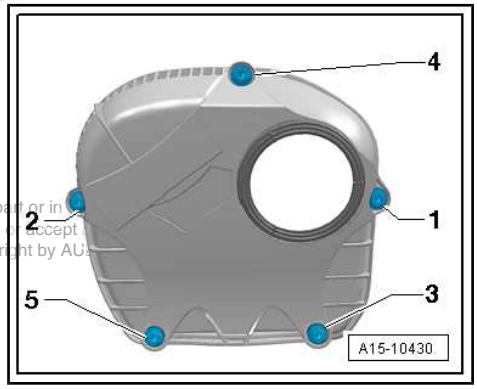
- Open-end spanner insert AF 10 - V.A.G 1783/1-



Removing

– Remove camshaft control valve 1 - N205- ⇒ page 153 .

– Unscrew bolts -1 to 5- and remove timing chain cover (top).



Installing

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

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Note

Renew O-ring.

– Lubricate oil seal and O-ring with engine oil.

– Install timing chain cover (top) using torque wrench - V.A.G 1783- and open-end spanner insert AF 10 - V.A.G 1783/1- , tightening sequence ⇒ page 91 .

– Install camshaft control valve 1 - N205- ⇒ page 153 .

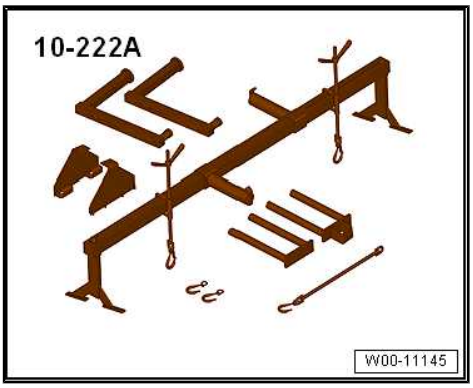
Tightening torques

- ⇒ “1.1 Exploded view - timing chain cover”, page 90

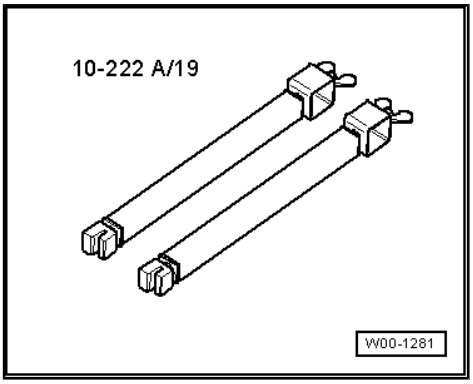
1.2.2 Renewing timing chain cover (bottom)

Special tools and workshop equipment required

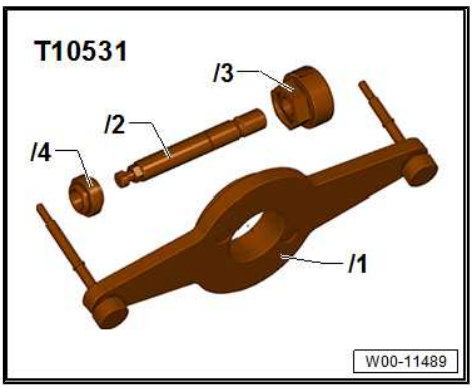
- Support bracket - 10-222A-



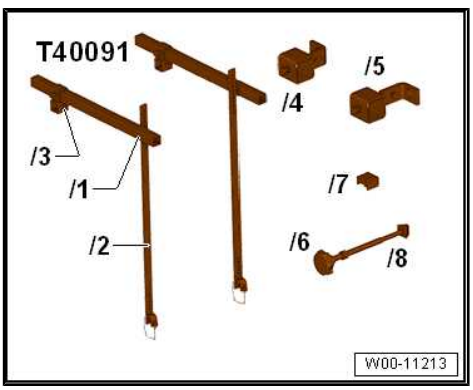
- Adapters - 10-222A/19-



- Assembly tool - T10531-



- Engine support basic set - T40091-

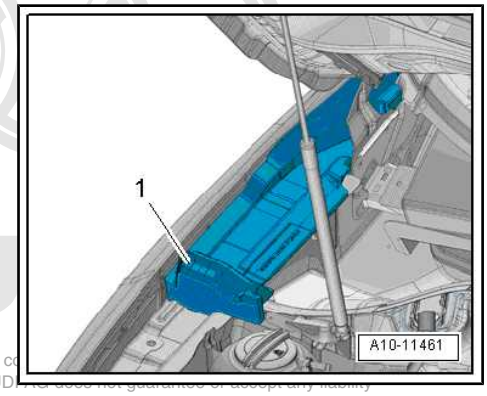


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Removing

– Remove engine cover panel ⇒ page 46 .

– Unclip sealing element -1- (left and right) using removal lever - 80-200- .



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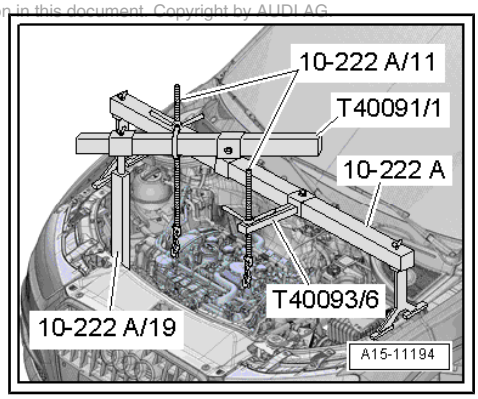
– Set up support bracket - 10-222A- on top edges of body flanges (left and right) and longitudinal member (right-side), as shown in illustration.

– Attach hook of spindle - 10-222A/11- to engine lifting eye and pre-tension spindle slightly.

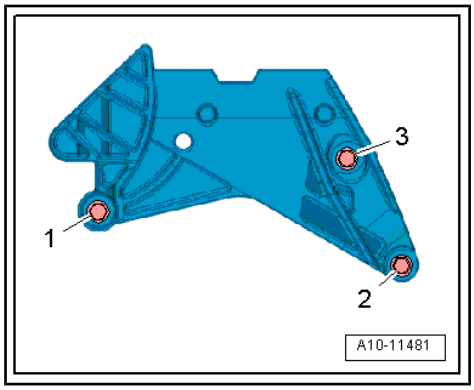
– Remove engine mounting ⇒ “2.3 Removing and installing engine mountings”, page 41 .

– Remove tensioner for poly V-belt ⇒ page 50 .

– Remove vibration damper ⇒ “1.4 Removing and installing vibration damper”, page 50 .



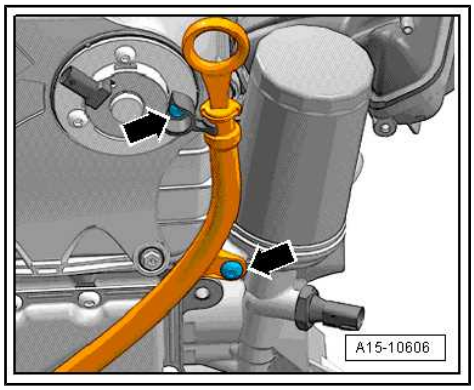
– Unscrew bolts -1 ... 3- and detach engine support.



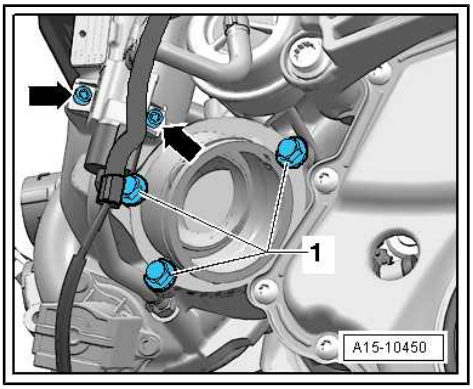
Note

If necessary, raise or lower engine slightly before detaching engine support.

– Remove bolts -arrows- and detach guide tube for oil dipstick from timing chain cover.

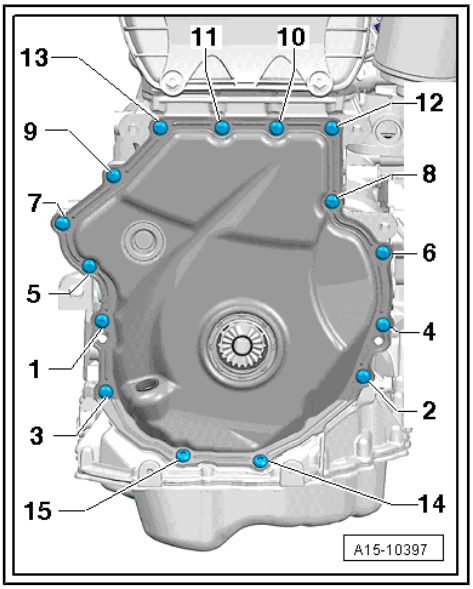


– Remove charge pressure control solenoid valve - N75- from turbocharger -arrows-.
– Remove connection for turbocharger -1-.



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– Remove bolts -1 ... 15-.



Note

Some versions have only 8 bolts.

– Prise off timing chain cover (bottom).

Installing

♦ Silicone sealant ⇒ Electronic parts catalogue

Note

♦ *Note expiry date of silicone sealant.*
♦ *The cover must be installed within 5 minutes after applying the silicone sealant.*
♦ *Renew timing chain cover (bottom).*
♦ *Renew the bolts tightened with specified tightening angle.*
♦ *Renew seals, gaskets and self-locking nuts.*

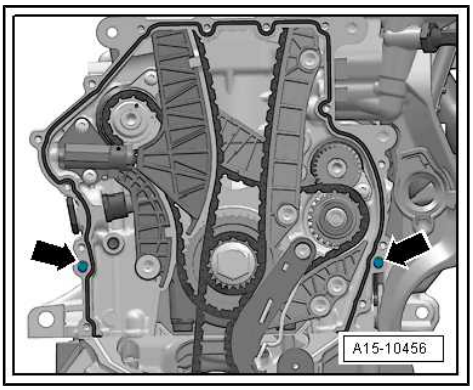
Caution

Protect lubrication system against contamination.

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

– Remove sealant remaining on cylinder block with flat scraper.

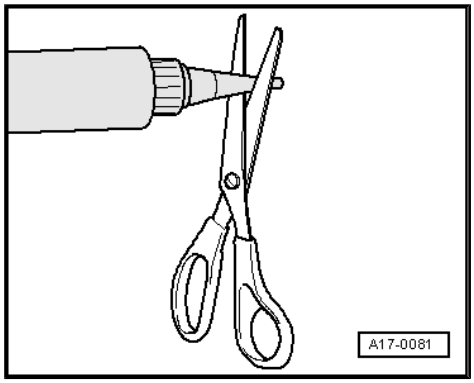
– Check that both dowel pins -arrows- for centring cover are fitted.



Note

Note the use-by date of the sealant.

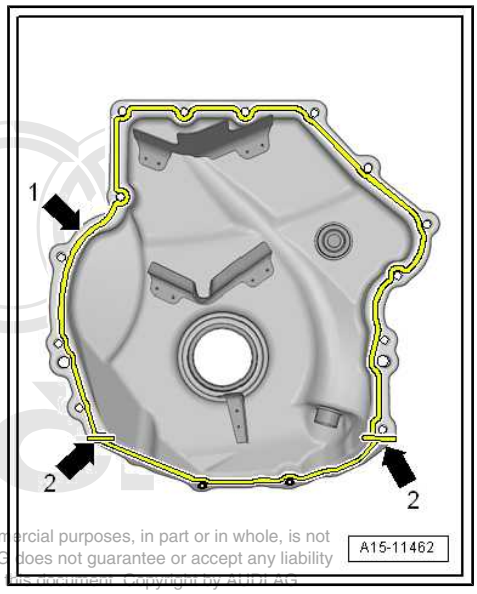
– Cut off nozzle of tube at front marking (nozzle ∅ approx. 2 mm).



Cover with 15 bolts

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

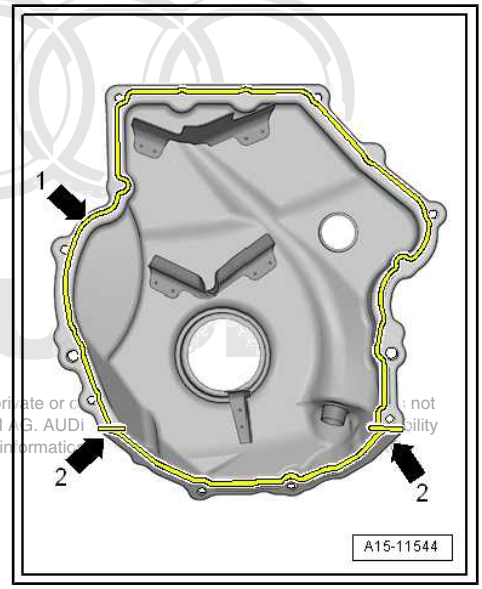
♦ Thickness of sealant bead: 2 ... 3 mm



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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 timing chain cover and tighten bolts:

♦ Cover with 15 bolts
⇒ Fig. ""Timing chain cover (bottom), tightening sequence with 15 bolts"" , page 91

♦ Cover with 8 bolts
⇒ Fig. ""Timing chain cover (bottom), tightening sequence with 8 bolts"" , page 91

Note

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

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

– Install vibration damper
⇒ "1.4 Removing and installing vibration damper", page 50 .

– Install poly V-belt tensioner
⇒ "1.3 Removing and installing tensioner for poly V-belt", page 50 .

– Install engine support and engine mounting
⇒ "2.1 Exploded view - assembly mountings", page 38 .

Tightening torques

♦ ⇒ "1.1 Exploded view - timing chain cover", page 90

♦ ⇒ "1.1 Exploded view - turbocharger", page 231

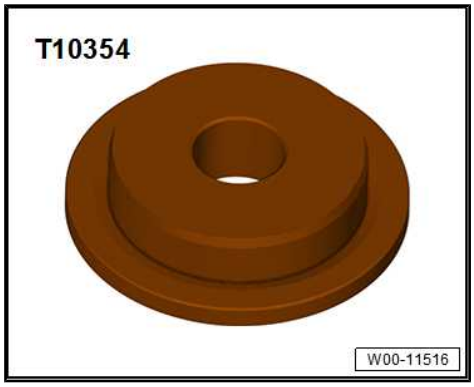
♦ ⇒ Fig. ""Engine support - tightening sequence"" , page 39

♦ ⇒ "2.1 Exploded view - assembly mountings", page 38

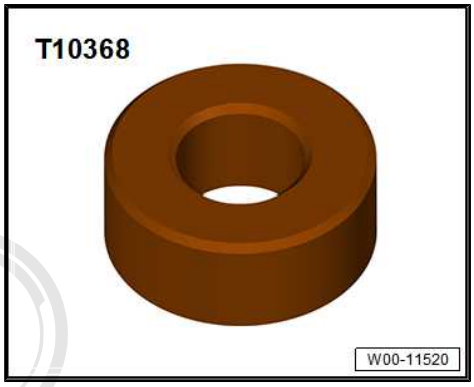
1.3 Renewing oil seal for vibration damper

Special tools and workshop equipment required

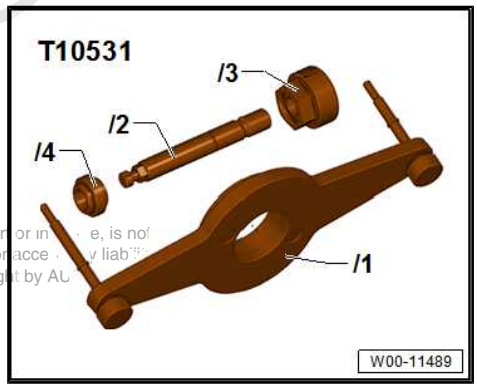
- Thrust piece - T10354-



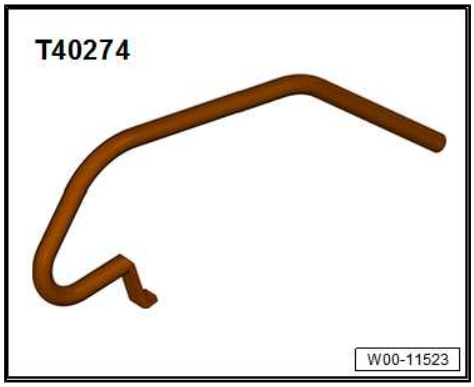
- Thrust piece - T10368-



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



- Extractor hook - T40274-

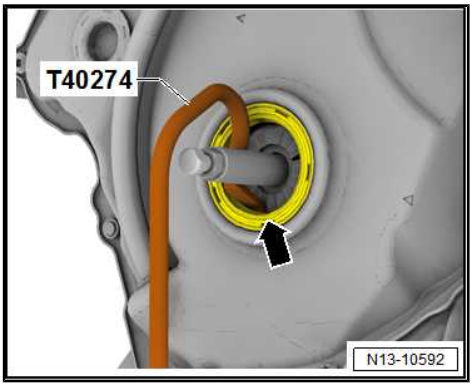


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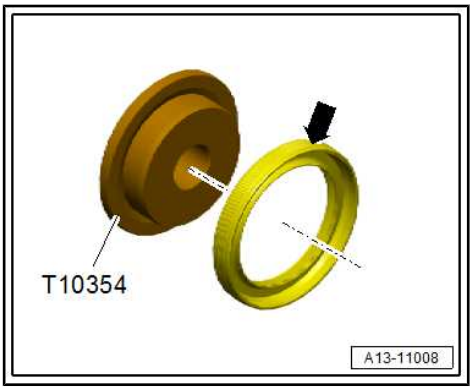
Removing

– Remove vibration damper
⇒ “1.4 Removing and installing vibration damper”, page 50 .

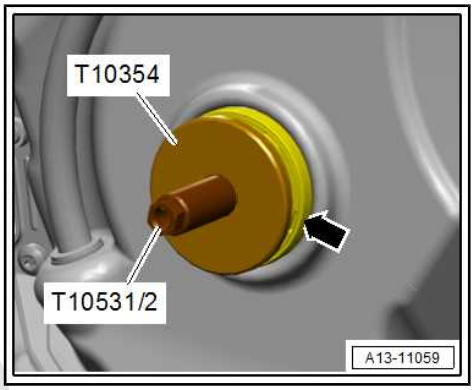
– Pry out oil seal -arrow- using extractor hook - T40274- .
– Clean contact surface and sealing surface.



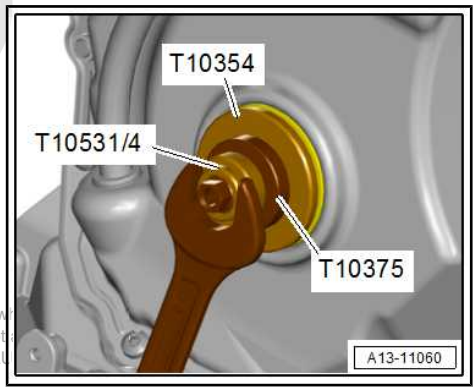
– Fit oil seal -arrow- onto thrust piece - T10354- .
• Closed side of oil seal faces thrust piece - T10354- .



– 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 with O-ring for vibration damper.

– Install vibration damper ⇒ page 50 .
– Install poly V-belt ⇒ page 49 .

Tightening torques

♦ ⇒ “1.1 Exploded view - cylinder block (pulley end)”, page 47

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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 101

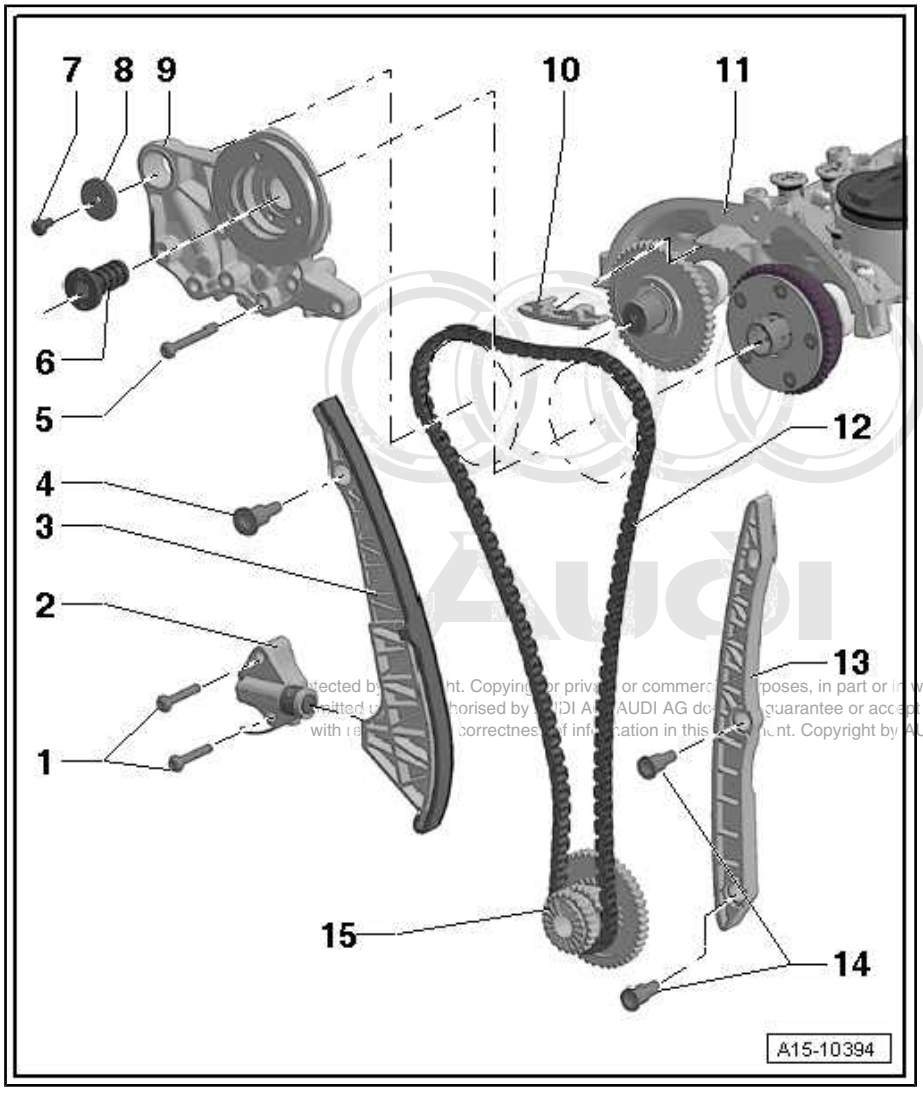
⇒ “2.3 Removing and installing bearing saddle”, page 102

⇒ “2.4 Removing and installing camshaft timing chain”, page 107

⇒ “2.5 Removing and installing drive chain for balance shaft”, page 118

⇒ “2.6 Checking valve timing”, page 120

2.1 Exploded view - camshaft timing chains



1 - Bolt
- ❑ 9 Nm

2 - Chain tensioner
- ❑ Exerts spring pressure
- ❑ Before removing, lock in place using locking pin - T40011-

3 - Tensioning rail for timing chain

4 - Guide pin
- ❑ 20 Nm

5 - Bolt
- ❑ 9 Nm

6 - Timing valve
- ❑ Left-hand thread
- ❑ 35 Nm
- ❑ Depending on version, use assembly tool - T10352- or assembly tool - T10352/1A- for removal

7 - Bolt
- ❑ Renew
- ❑ M6: 8 Nm + turn 90° further
- ❑ M8: 20 Nm + turn 90° further

8 - Washer

9 - Bearing saddle
- ❑ Removing and installing ⇒ page 102

10 - Guide rail for camshaft timing chain

11 - Camshaft housing

12 - Camshaft timing chain
- ❑ Before removing, mark running direction with paint
- ❑ Removing and installing ⇒ page 107

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13 - Guide rail for camshaft timing chain

14 - Guide pin

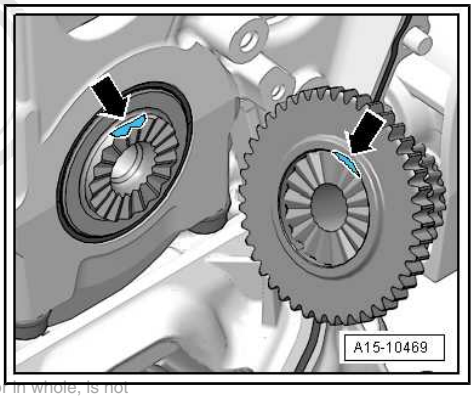
- ❑ 20 Nm

15 - Three-part chain sprocket assembly

- ❑ Crankshaft
- ❑ Installation position ⇒ page 101

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 - Guide rail

- ❑ For timing chain

3 - Timing chain

- ❑ Removing ⇒ page 118

4 - Guide pin

- ❑ 20 Nm

5 - Tensioning rail

- ❑ For drive chain for balance shafts

6 - Balance shaft

- ❑ Exhaust side
- ❑ Always renew after removal
- ❑ Lubricate bearing with engine oil
- ❑ Renewing ⇒ page 79

7 - Guide pin

- ❑ 20 Nm

8 - Guide rail

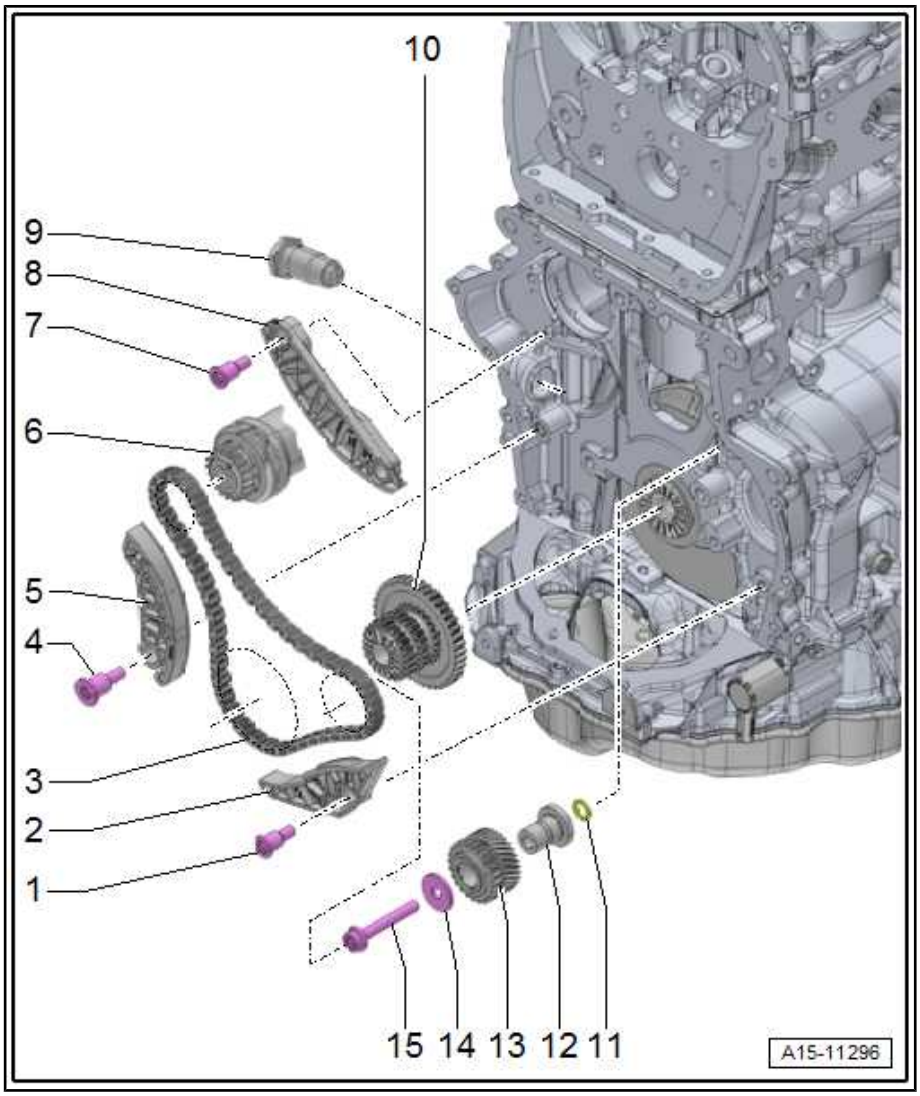
- ❑ For timing chain

9 - Chain tensioner

- ❑ 85 Nm
- ❑ Apply sealant to seal

10 - Three-part chain sprocket assembly

- ❑ Installation position



⇒ page 101

11 - O-ring

- ❑ Lubricate with engine oil

12 - Bearing mounting

- ❑ Lubricate with engine oil
- ❑ Installation position ⇒ page 102

13 - Idler gear

- ❑ If bolt ⇒ Item 15 (page 102) has been loosened, idler gear must be renewed

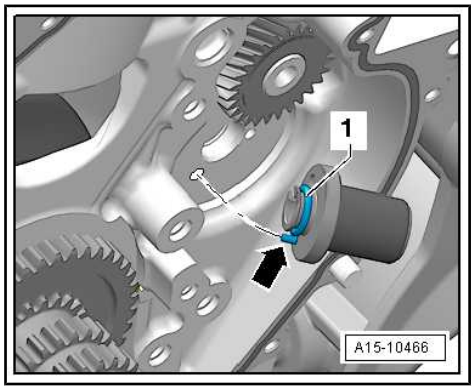
14 - Washer

15 - Bolt

- ❑ Renew
- ❑ If bolt has been loosened, idler gear ⇒ Item 13 (page 102) must be renewed
- ❑ Tightening sequence ⇒ page 102

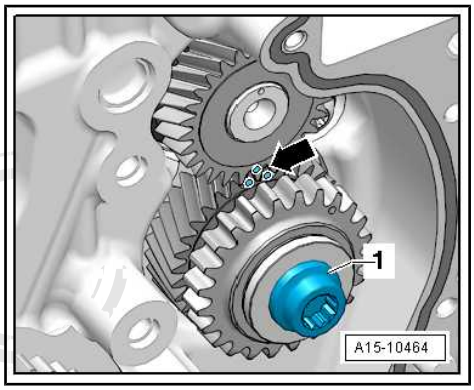
Bearing mounting - installation position

- 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.***



– Secure with new bolt as follows:

1. Tighten with torque wrench initially to 10 Nm.
2. Turn idler gear.

Idler gear must be without play; otherwise loosen bolt and tighten again.

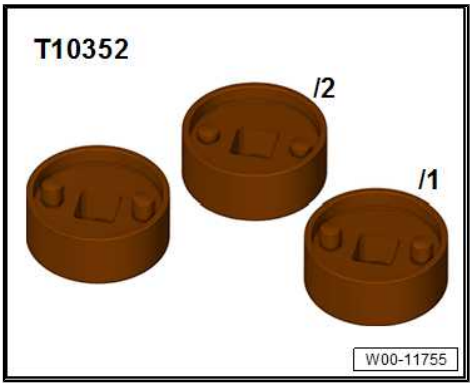
3. Tighten with torque wrench to 25 Nm.
4. Use rigid wrench to turn 90° further.

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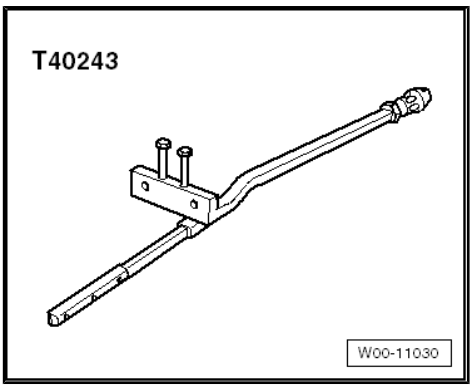
2.3 Removing and installing bearing saddle

Special tools and workshop equipment required

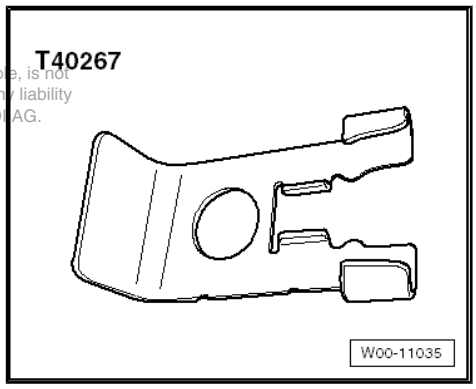
- Assembly tool - T10352-



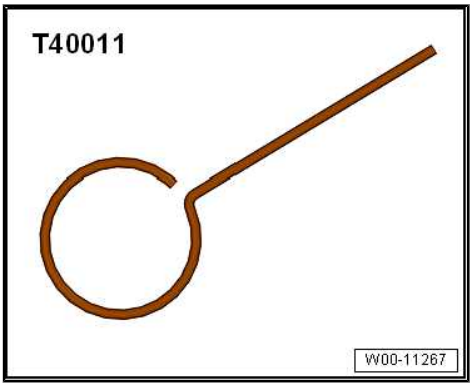
- Assembly lever - T40243-



- Locking tool - T40267-



- Locking pin - T40011-



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Removing

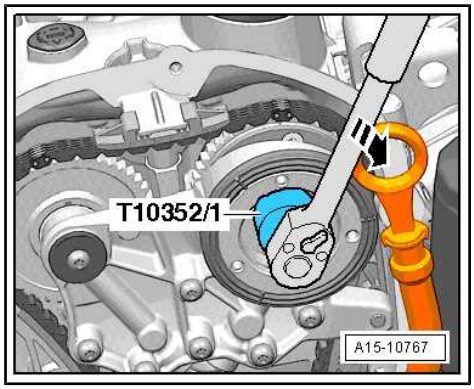
– Remove timing chain cover (top) ⇒ page 92 .

Caution

Risk of damage to thread.

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

– Depending on version, turn assembly tool - T10352- or assembly tool - T10352/1A- in direction of -arrow- to remove timing valve.



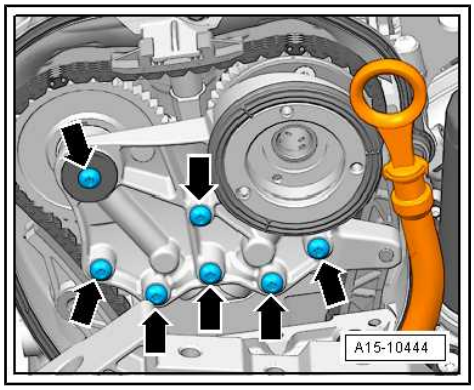
– Remove bolts -arrows-.

WARNING

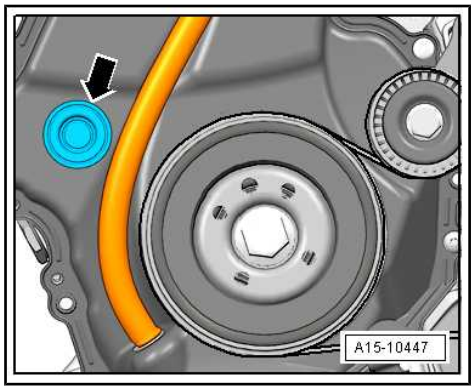
Risk of damage to bearing saddle.

- *Detach bearing saddle carefully without tilting it.*

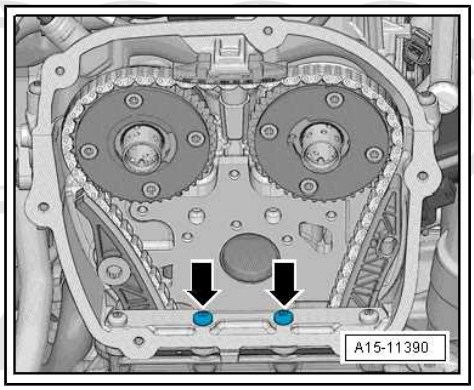
– Detach bearing saddle.



– Remove sealing plug -arrow-.

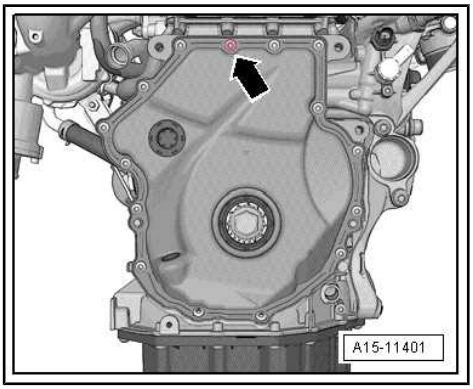


– Remove bolts -arrows-.



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– Remove bolt -arrow-.

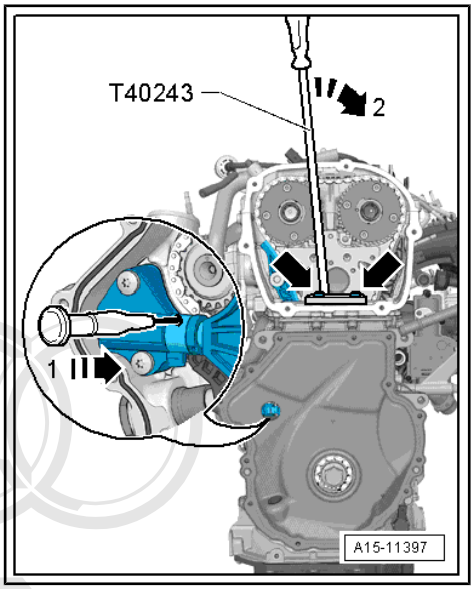


Depending on version, 2 different chain tensioners may be installed.

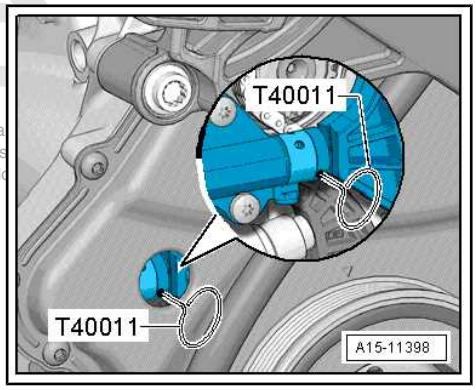
Version 1

– Screw in lever - T40243- -arrows-.

– Lift locking element for chain tensioner; to do so, insert scriber or suitable screwdriver in hole of chain tensioner in direction of -arrow 1-, press lever - T40243- slowly in direction of -arrow 2- and hold in place.



– Hold chain tensioner in position with locking pin - T40011- .

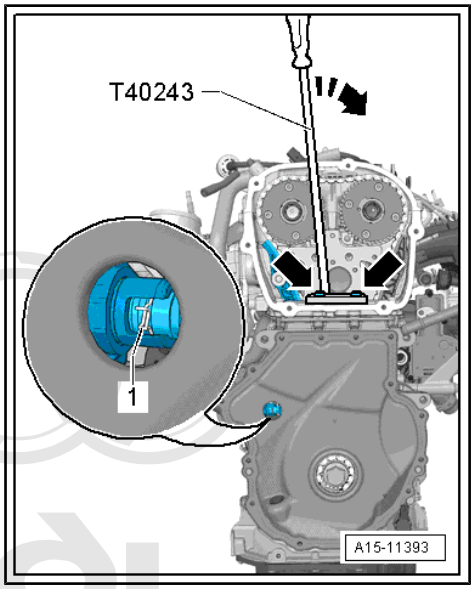


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Version 2

– Screw in lever - T40243- -arrows-.

– Compress circlip -1- for chain tensioner, press lever - T40243- slowly in direction of -arrow- and hold in place.

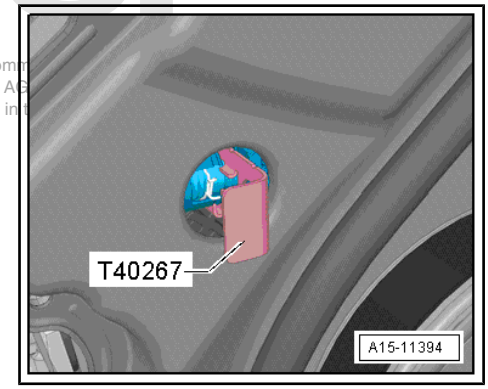


– Hold chain tensioner in position with locking tool - T40267- .

All versions

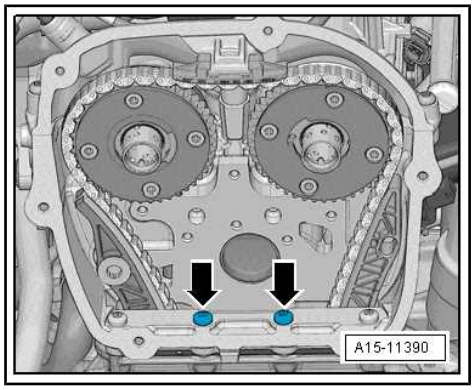
– Remove lever - T40243- .

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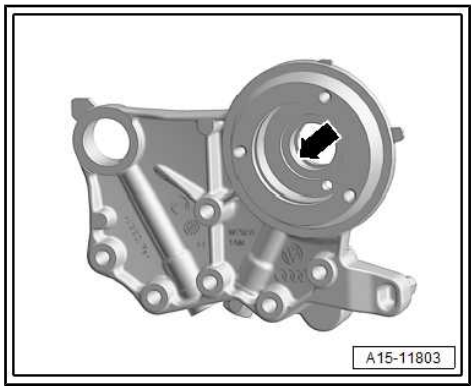


Installing

– Fit and tighten bolts -arrows-.



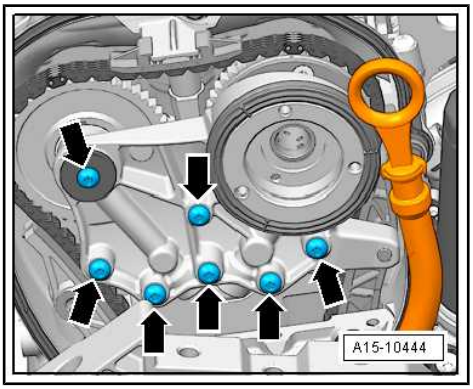
– Lubricate hole -arrow- with engine oil.



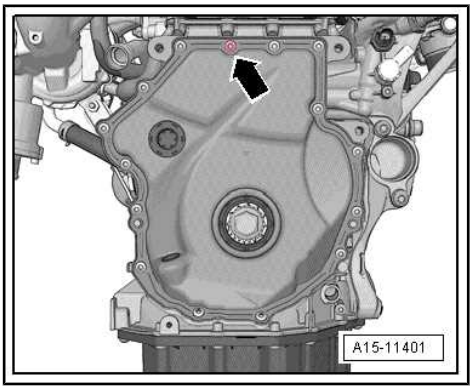
WARNING

Risk of damage to bearing saddle.

- *Carefully attach bearing saddle without tilting it.*



– Attach bearing saddle and screw in bolts -arrows- hand-tight.
– Depending on version, remove locking pin - T40011- or locking tool - T40267- .
– Tighten bolts -arrows- for bearing saddle ⇒ page 100 .



– Screw in bolt -arrow-.
– Install timing valve ⇒ Item 6 (page 100) .

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

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

Tightening torques

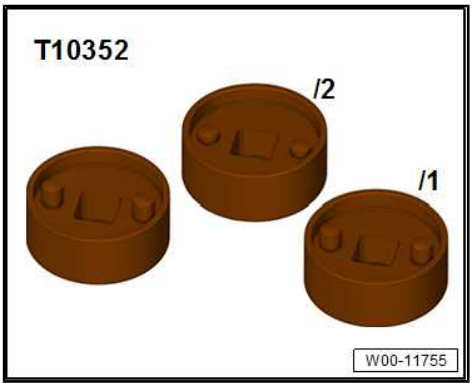
- ⇒ “2.1 Exploded view - camshaft timing chains”, page 100
- ⇒ “1.1 Exploded view - timing chain cover”, page 90
- ⇒ “3.1 Exploded view - cylinder head”, page 123

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2.4 Removing and installing camshaft timing chain

Special tools and workshop equipment required

- Removal tool - T10352-



- Counterhold tool - T10355-

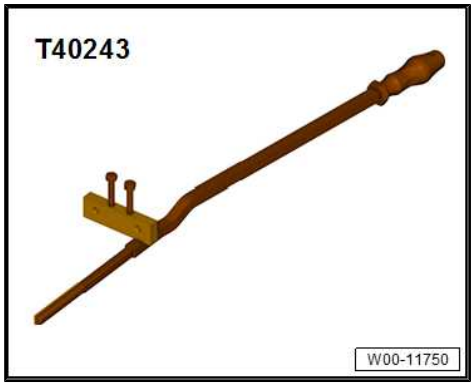


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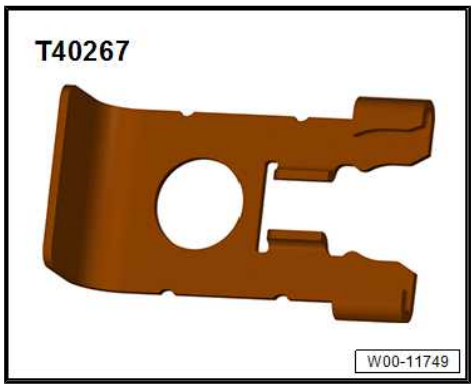
- Locking pin - T40011-



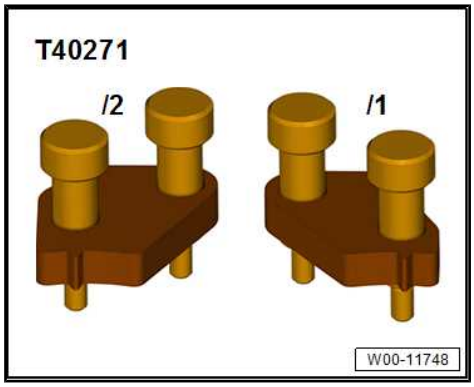
- Assembly lever - T40243-



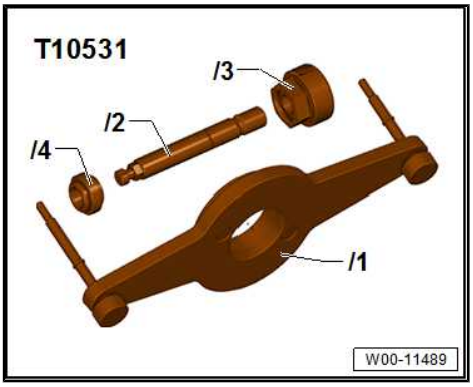
- Locking tool - T40267-



- Camshaft clamp - T40271-



- Assembly tool - T10531-



- Components of assembly tool - T10531- :
- Bracket - T10531/1-
- Clamping pin - T10531/2-
- Turning-over tool - T10531/3-
- Flange nut - T10531/4-

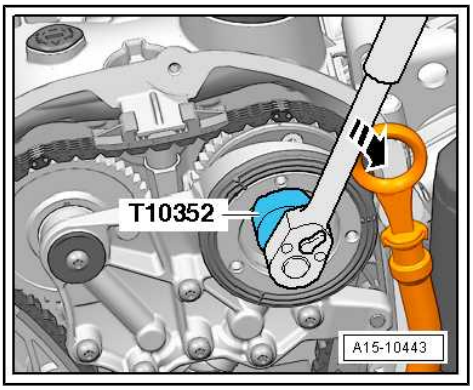
Removing

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

Caution

The timing valve has a left-hand thread.

– Depending on version, turn assembly tool - T10352- or assembly tool - T10352/1A- in direction of -arrow- to remove timing valve.

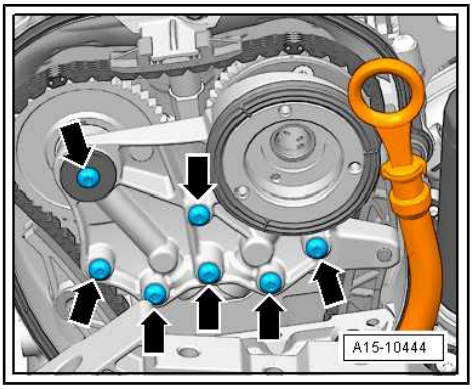


– Remove bolts -arrows-.

WARNING

Risk of damage to bearing saddle.

- *Detach bearing saddle carefully without tilting it.*



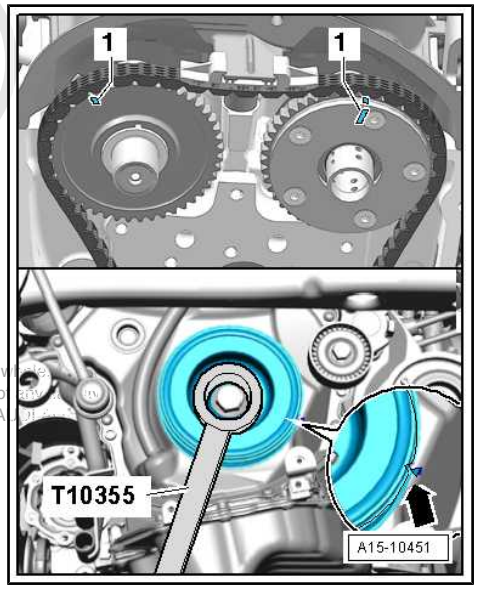
– Detach bearing saddle.

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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 .

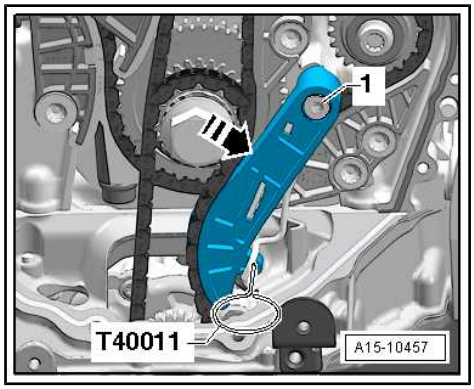


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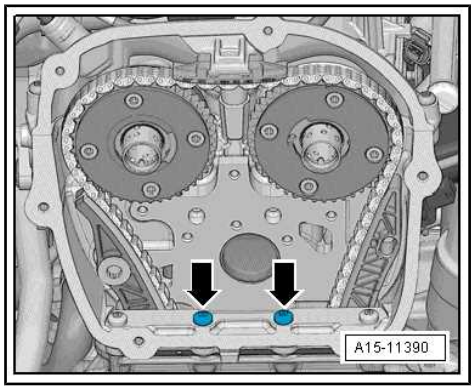
– Press oil pump chain tensioner in direction of -arrow- and lock in place using locking pin - T40011- .

– Remove oil pump chain tensioner -1-.

– Detach drive chain for oil pump.



– Remove bolts -arrows-.



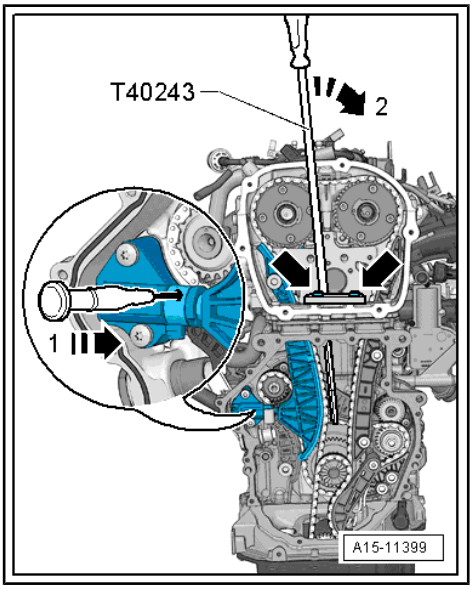
Depending on version, 2 different chain tensioners may be installed.

Version 1

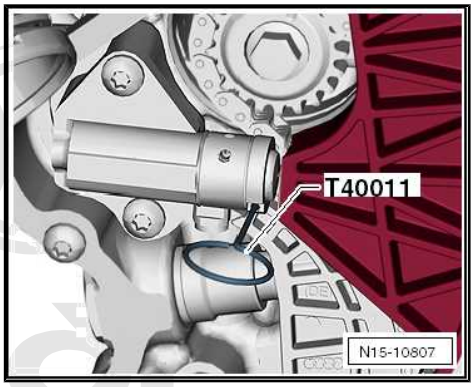
– Screw in assembly lever - T40243- -arrows-.

– Lift locking element for chain tensioner; to do so, insert scriber or suitable screwdriver in hole of chain tensioner in direction of -arrow 1- and hold in place.

– Push assembly lever - T40243- slowly in direction of -arrow 2- and hold in place.



– Hold chain tensioner in position with locking pin - T40011- .

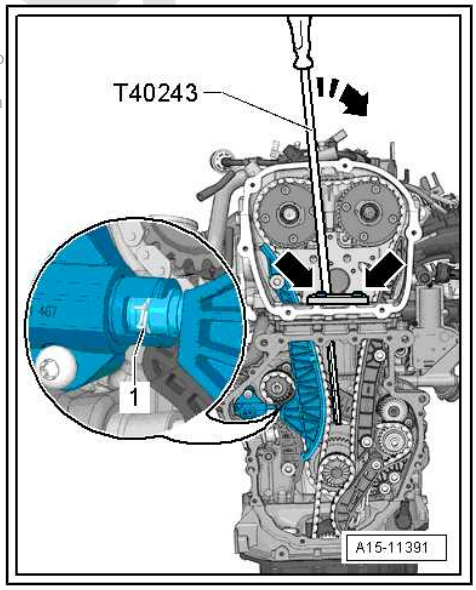


Version 2

– Screw in assembly lever - T40243- -arrows-.

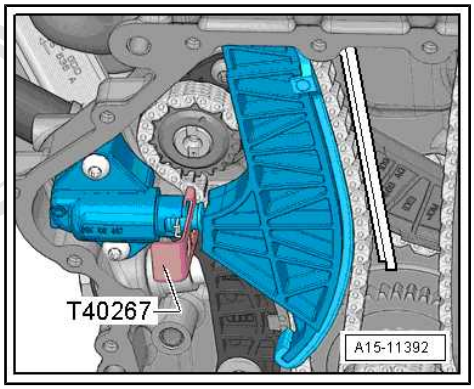
– Compress and hold circlip -1- for chain tensioner.

– 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- .

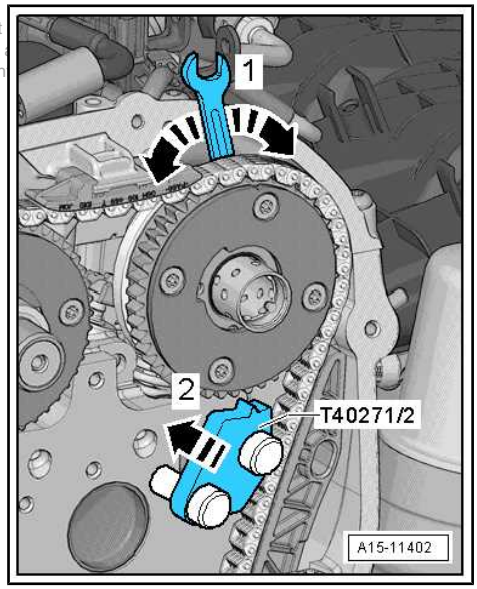


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All versions

– Remove assembly lever -T40243-.

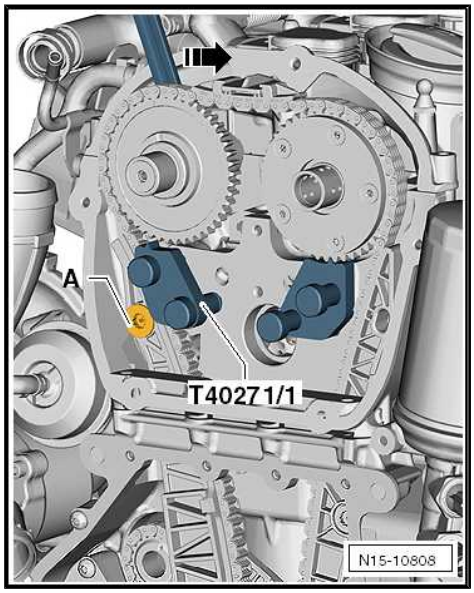
– Bolt camshaft clamp - T40271/2- onto cylinder head and slide into teeth on chain sprocket in direction of -arrow 2-; if necessary, use spanner to turn inlet camshaft in direction of -arrow 1-.



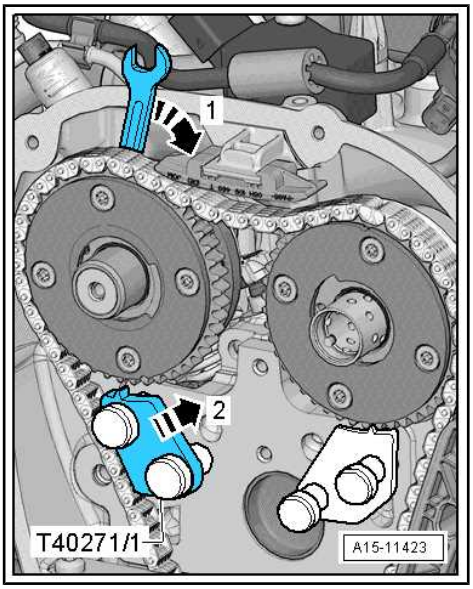
With assembly clearance feature

– Bolt camshaft clamp - T40271/1- onto cylinder head. Hold camshaft in position with an open-end spanner (press towards right side -arrow-).

– Remove bolt -A- and remove tensioning rail, while still holding camshaft in position.



– Slide camshaft clamp - T40271/1- into teeth of chain sprocket in direction of -arrow 2-. If necessary, turn exhaust camshaft further in clockwise direction -arrow 1- so that camshaft clamp can be inserted. Camshaft timing chain must hang loosely between sprockets.



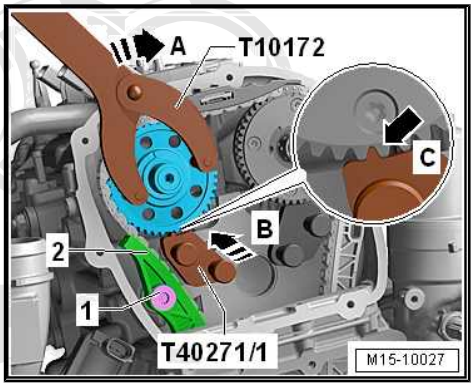
Without assembly clearance feature

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

A second mechanic is required for the following steps.

– Turn exhaust camshaft in direction of -arrow A- using counterhold tool - T10172 A- and hold in place. Remove bolt -1- and guide tensioning rail -2- downwards.

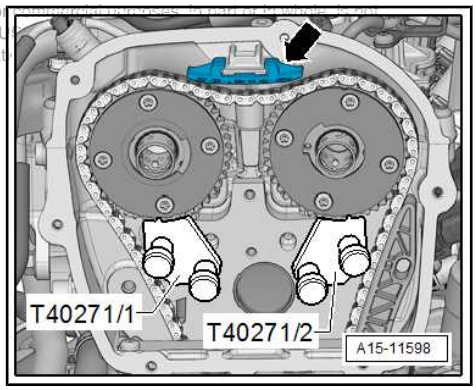
– Continue turning exhaust camshaft clockwise -arrow A- until camshaft clamp - T40271/1- can be pressed into teeth -C- on chain sprocket in direction of -arrow B-.



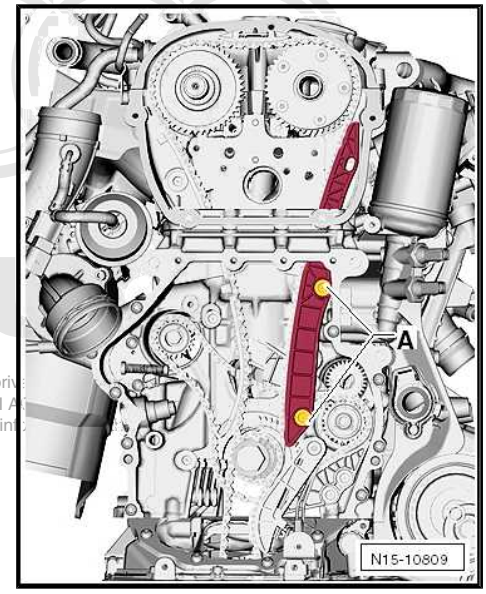
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All versions

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



– Unscrew bolts -A- and remove guide rail for camshaft timing chain.
– Remove timing chain.



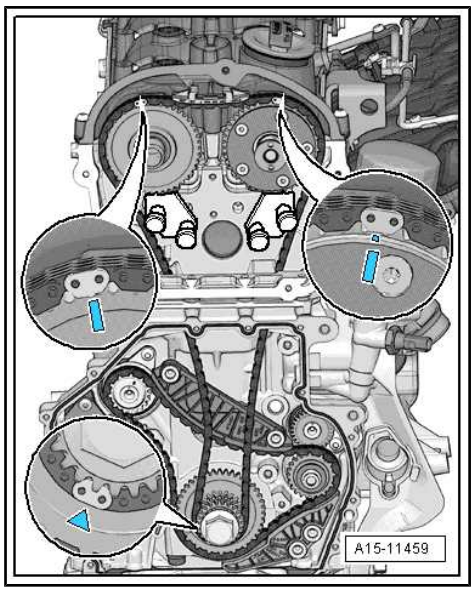
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Installing

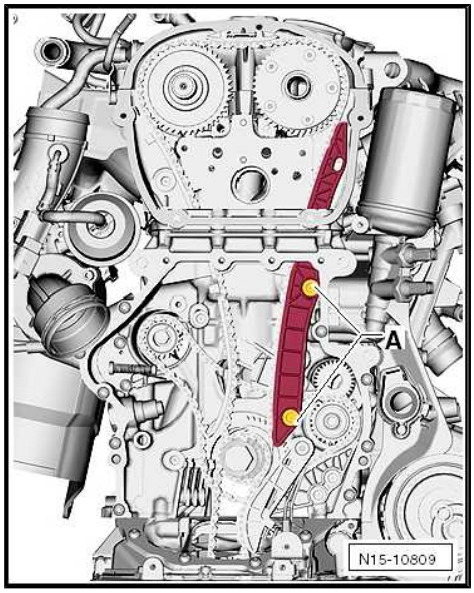
Note

The timing chain links with coloured markings must be positioned at the markings on the chain sprockets.

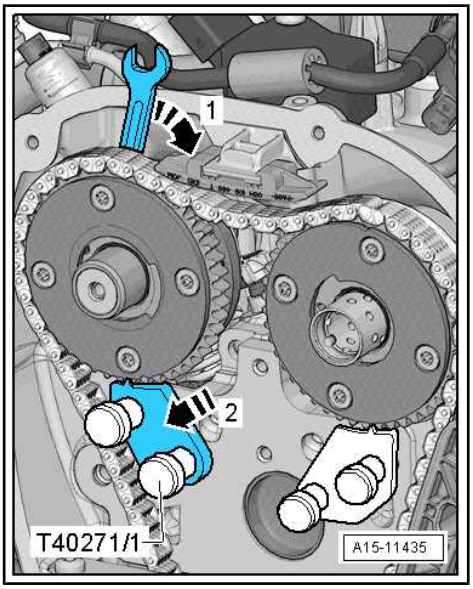
– Fit timing chain onto inlet camshaft.
– Fit timing chain onto exhaust camshaft.
– Fit timing chain onto crankshaft and hold in place.



– Fit guide rail for camshaft timing chain and tighten bolts -A-.



With assembly clearance feature



Note

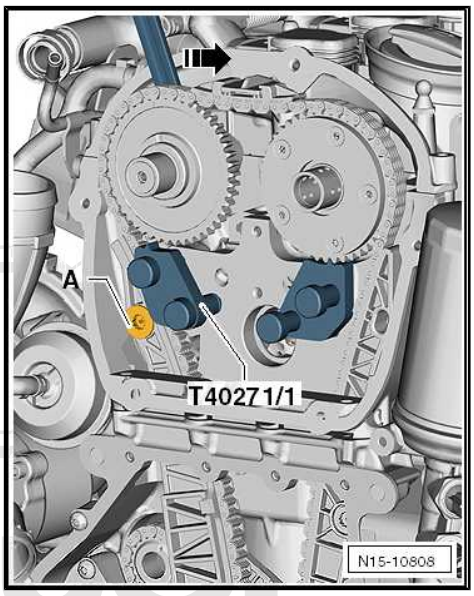
The exhaust camshaft must be held in position by a second mechanic.

– Turn exhaust camshaft slowly in direction of -arrow 1- until it is possible to pull camshaft clamp - T40271/1- out of teeth on chain sprocket.

– Carefully release camshaft until timing chain is in contact with upper guide rail. Hold camshaft in this position.

Caution

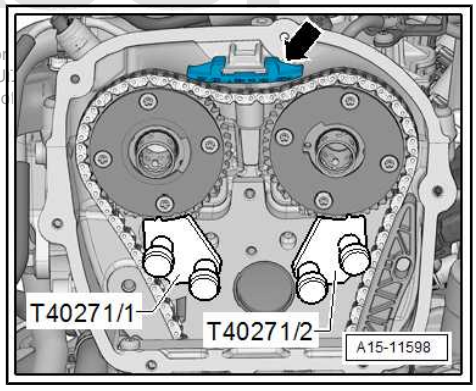
Before installing tensioning rail, it is important to make sure that the timing chain link with coloured marking still coincides with the chain sprocket marking.



– Keep holding camshaft in position and install tensioning rail for camshaft timing chain. Tighten bolt -A-.

– Remove camshaft clamp - T40271/1- .

– Install top guide rail -arrow-.



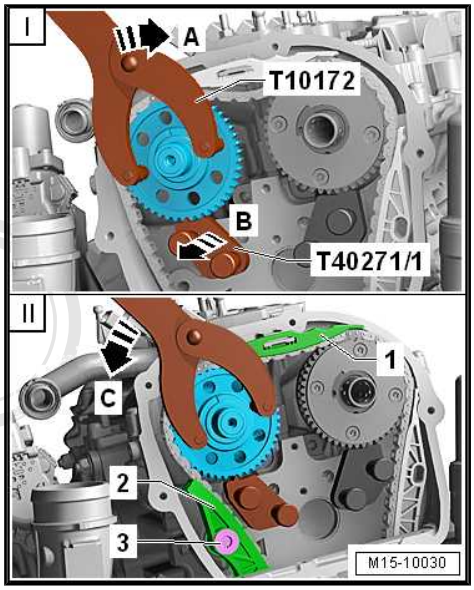
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Without assembly clearance feature

A second mechanic is required for the following step.

– Use counterhold tool - T10172 A- 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-.

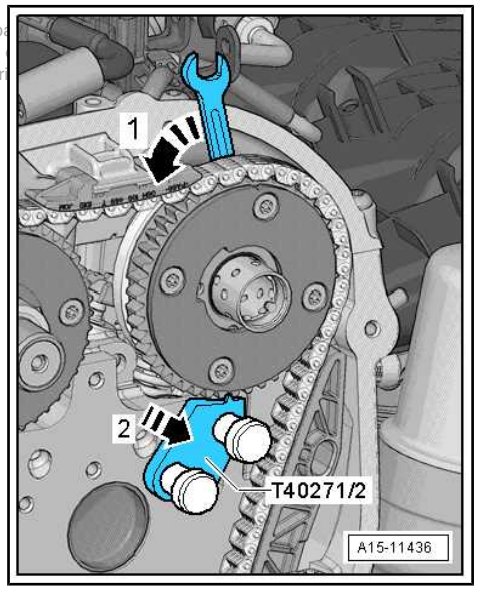


All versions

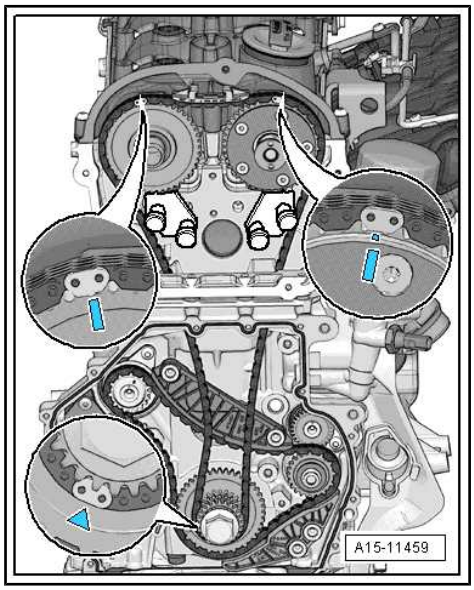
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– Turn inlet camshaft in direction of -arrow 1- and slide camshaft clamp - T40271/2- out of teeth on chain sprocket in direction of -arrow 2- and release camshaft.

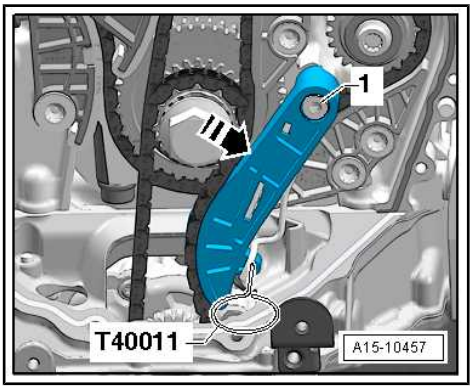
– Remove camshaft clamp - T40271/2- .



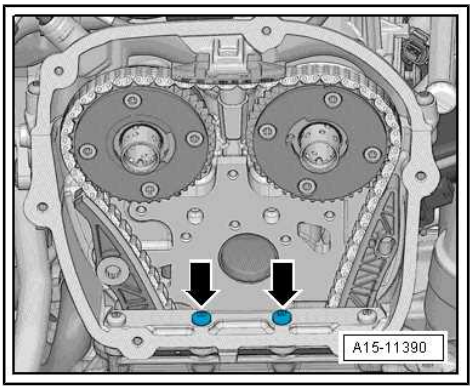
– Check that timing chain links with coloured markings are aligned with markings on chain sprockets.



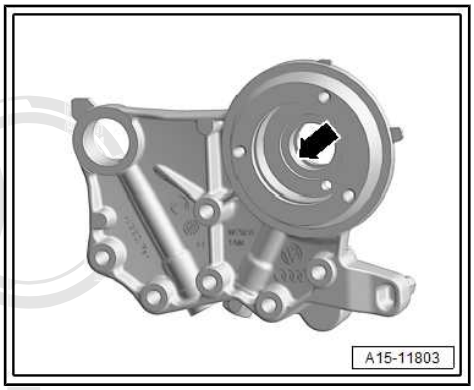
– Install drive chain for oil pump and chain tensioner. Tighten bolt -1- and remove locking pin - T40011- .



– Fit and tighten bolts -arrows-.



– Lubricate hole -arrow- with engine oil.

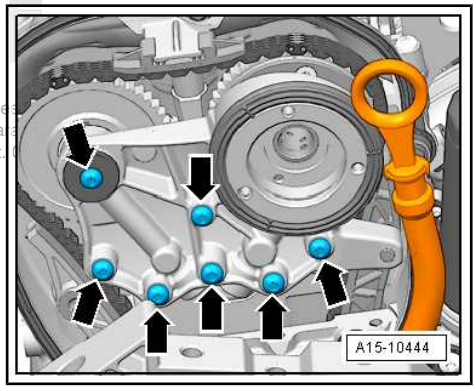


WARNING

Risk of damage to bearing saddle.

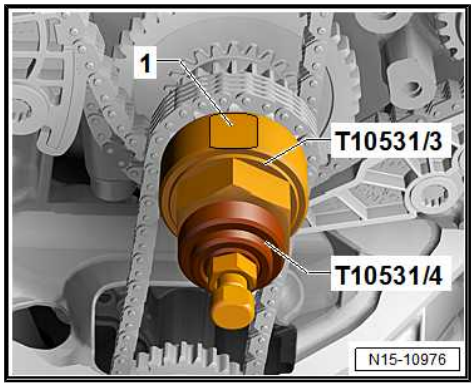
- ***Detach bearing saddle carefully without tilting it.***

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– Attach bearing saddle and screw in bolts -arrows- hand-tight.
– Depending on version, remove locking pin - T40011- or locking tool - T40267- .
– Tighten bolts -arrows- for bearing saddle ⇒ page 100 .
– Install timing valve ⇒ Item 6 (page 100) .

– Attach turning-over tool - T10531/3- . In “TDC” position, flat surface -1- faces upwards. Screw on flange nut - T10531/4- . Using open-end spanner (32 mm), turn crankshaft 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.

Further assembly is basically carried out in reverse order of dismantling. Note the following:

– Install timing chain cover (bottom) ⇒ page 93 .
– Install timing chain cover (top) ⇒ page 92 .
– Install poly V-belt tensioner ⇒ page 50 .
– Install poly V-belt ⇒ page 49 .
– Adjust assembly mountings ⇒ page 44 .

Tightening torques

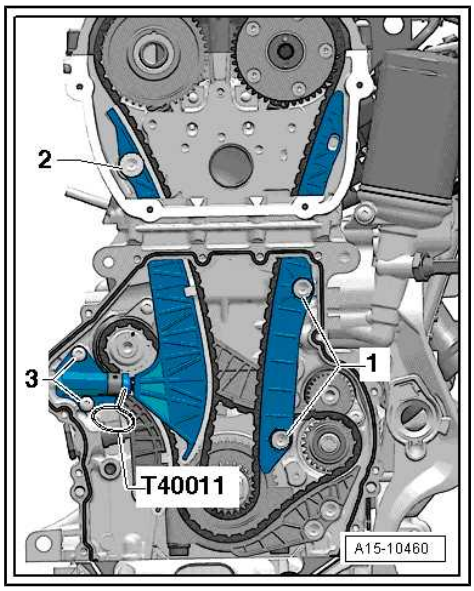
♦ ⇒ “2.1 Exploded view - camshaft timing chains”, page 100

2.5 Removing and installing drive chain for balance shaft

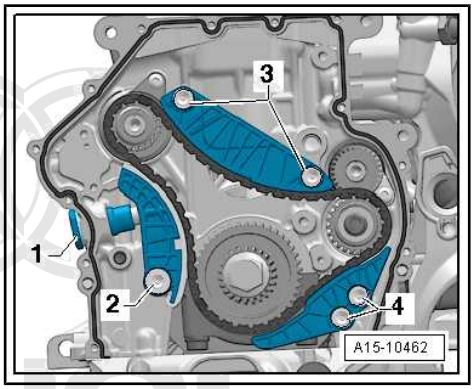
Removing

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– Remove timing chain cover (top) ⇒ page 92 .
– Remove timing chain cover (bottom) ⇒ page 93 .
– Remove camshaft timing chain ⇒ page 107 .
– Remove chain tensioner for camshaft timing chain -3-.



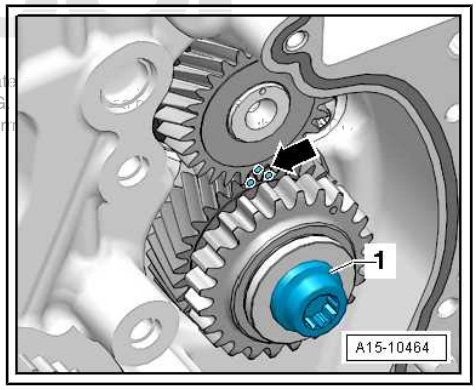
– Remove chain tensioner for drive chain for balance shafts -1-.
– Remove tensioning rail -2-.
– Remove guide rail -3-.
– Remove guide rail -4-.
– Remove timing chain.



Installing

– Turn idler gear/balance shaft to markings -arrow-.

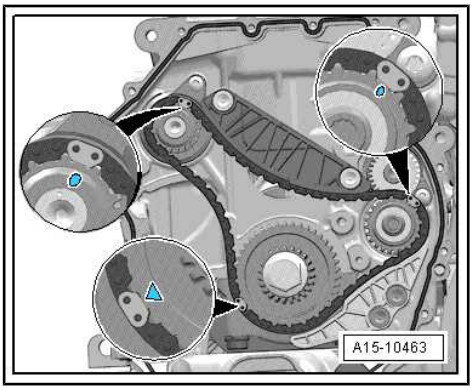
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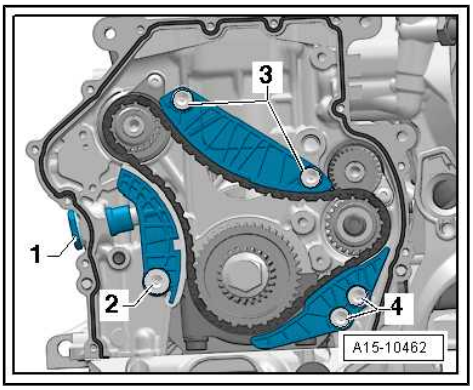
Note

The timing chain links with coloured markings must be positioned at the markings on the chain sprockets.

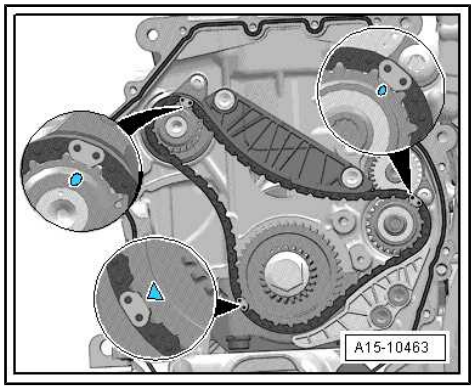
– Fit timing chain; the timing chain links with coloured markings must be positioned at the markings on the chain sprockets.



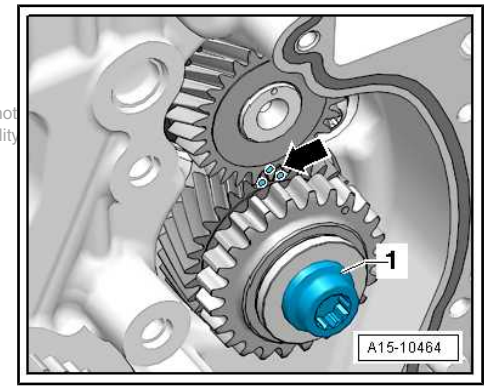
– Fit guide rail for timing chain and tighten bolts -4-.
– Fit guide rail for timing chain and tighten bolts -3-.
– Fit tensioning rail for timing chain and tighten bolt -2-.
– Apply sealant to seal of chain tensioner -1-; for sealant, refer to ⇒ Electronic parts catalogue (ETKA) .
– Screw in chain tensioner for timing chain -1-.



– Check adjustment again.



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



Note

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For illustration purposes, the markings on the idler gear/balance shaft are shown with the chain removed.

Further assembly is basically carried out in reverse order of dismantling. Note the following:

– Install camshaft timing chain ⇒ page 107 .
– Install timing chain cover (bottom) ⇒ page 93 .
– Install timing chain cover (top) ⇒ page 92 .
– Install poly V-belt tensioner ⇒ page 50 .
– Install poly V-belt ⇒ page 49 .

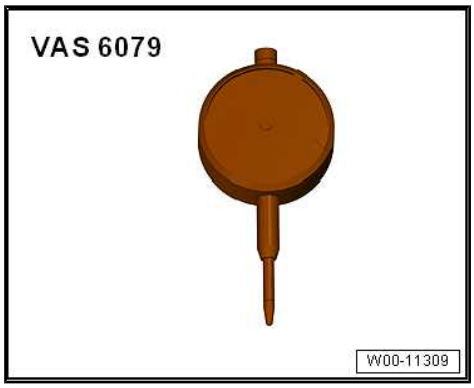
Tightening torques

♦ ⇒ “2.2 Exploded view - drive chain for balance shaft”, page 101

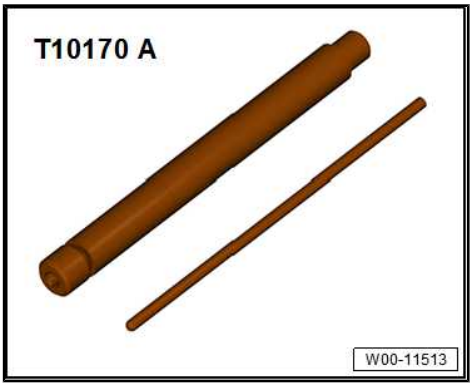
2.6 Checking valve timing

Special tools and workshop equipment required

♦ Dial gauge - VAS 6079-



♦ Adapter for dial gauge - T10170 A-



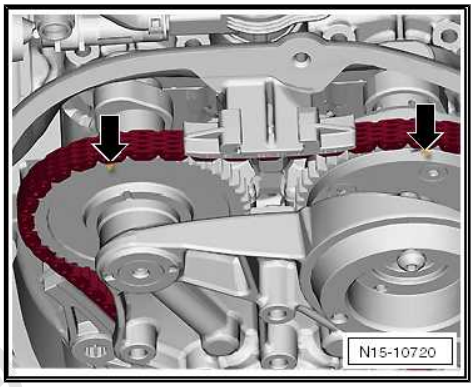
Procedure

– 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, turn crankshaft via vibration damper in normal direction of rotation until markings -arrows- are almost at top.

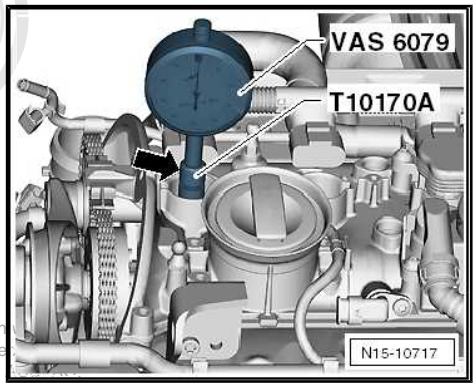
– Remove spark plug on cylinder 1.



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

– Insert dial gauge - VAS 6079- 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

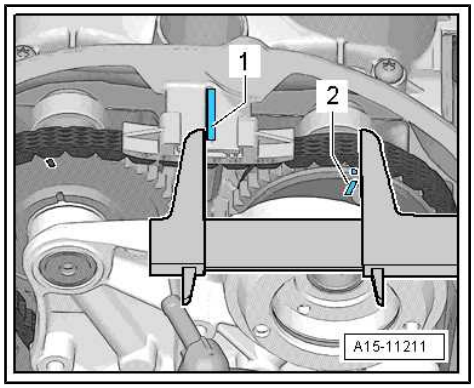
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♦ *To turn the vibration damper, use a ratchet with 24 mm socket.*

♦ *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.*

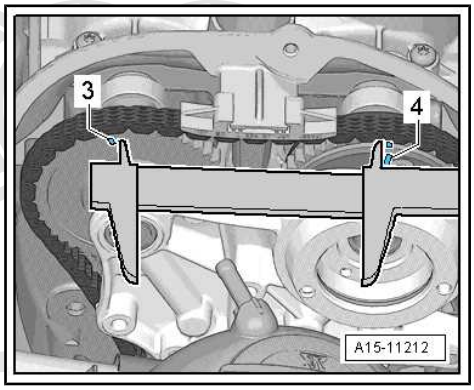
– Measure distance from left outer edge of rib -1- to marking -2- on inlet camshaft.

• Specification: 61 … 64 mm.



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

• Specification: 124 … 126 mm.

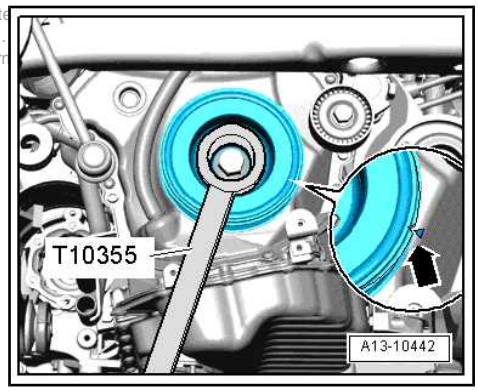


Note

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.

• Notch on vibration damper must align with arrow marking on timing chain cover (bottom) -arrow-.

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3 Cylinder head

⇒ “3.1 Exploded view - cylinder head”, page 123

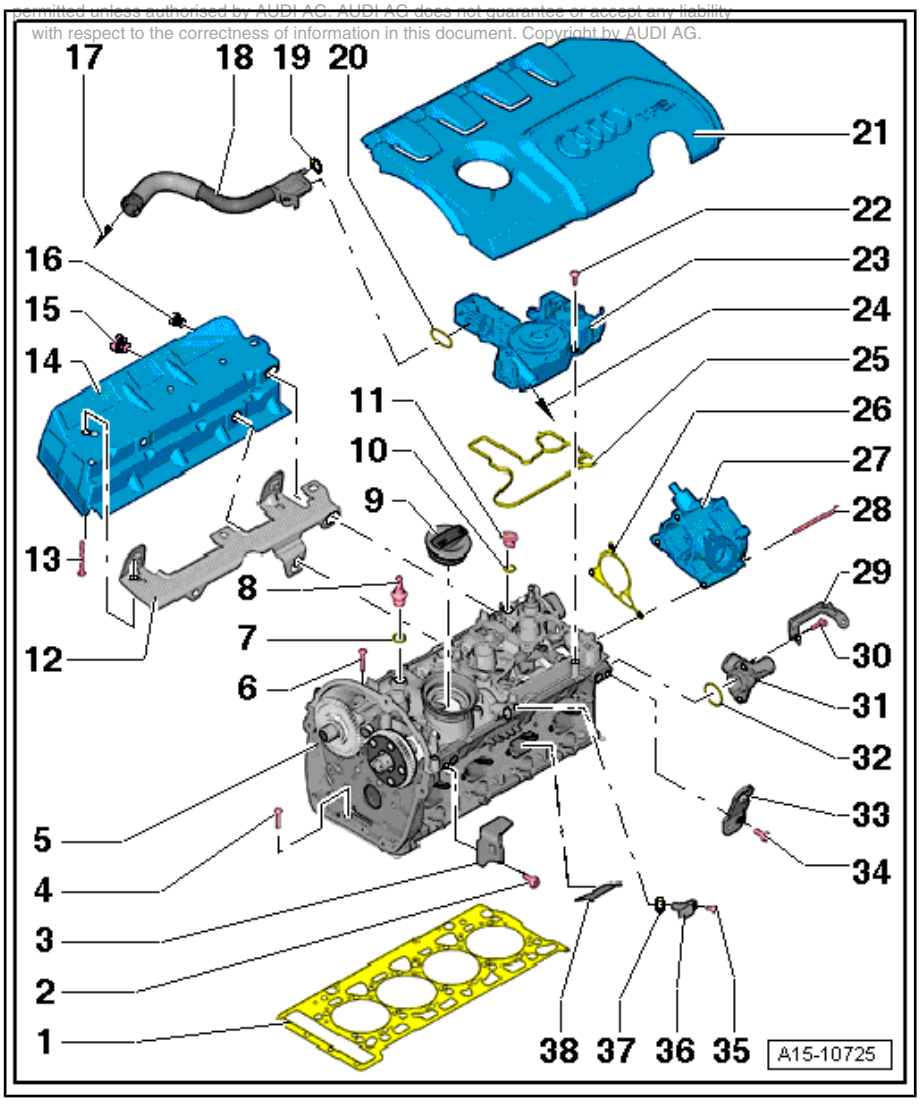
⇒ “3.2 Removing and installing cylinder head”, page 126

3.1 Exploded view - cylinder head

Note

- *Renew the cylinder head bolts.*
- *During assembly, renew oil seals and gaskets as well as self-locking nuts and bolts that are tightened by turning through to a specified angle.*
- *The plastic protectors fitted to protect the open valves must only be removed immediately before fitting the cylinder head.*
- *After fitting a new cylinder head or cylinder head gasket, change the engine oil and coolant.*

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

2 - Bolt
- ❑ 25 Nm

3 - Engine lifting eye

4 - Bolt
- ❑ Renew
- ❑ Note correct sequence when loosening ⇒ page 125
- ❑ Note correct sequence when tightening ⇒ page 125

5 - Cylinder head
- ❑ Removing and installing ⇒ page 126
- ❑ Checking for distortion ⇒ page 125

6 - Cylinder head bolt
- ❑ Renew
- ❑ Note correct sequence when loosening ⇒ page 125
- ❑ Note correct sequence when tightening ⇒ page 125

7 - O-ring
- ❑ Renew
- ❑ Lubricate with engine oil

8 - Sealing plug
- ❑ 5 Nm

- ❑ With ball head for engine cover panel

9 - Sealing cap
- ❑ With seal

10 - O-ring
- ❑ Renew
- ❑ Lubricate with engine oil

11 - Sealing plug

12 - Bracket

13 - Bolt
- ❑ 7 Nm

14 - Heat shield

15 - Bolt
- ❑ 20 Nm

16 - Bolt
- ❑ 20 Nm

17 - To intake manifold/turbocharger

18 - Breather pipe

19 - O-ring
- ❑ Not available as replacement part

20 - Seal
- ❑ Not available as replacement part

21 - Engine cover panel
- ❑ Removing and installing ⇒ page 46

22 - Bolt
- ❑ Tightening sequence ⇒ page 180

23 - Crankcase breather
- ❑ Note correct sequence when tightening ⇒ page 180
- ❑ Removing and installing ⇒ page 180

24 - To intake manifold

25 - Gasket
- ❑ Renew if damaged

26 - Gasket
- ❑ Renew if damaged

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

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

29 - Bracket

30 - Bolt
- ❑ 9 Nm

31 - Connection

32 - O-ring
- ❑ Renew
- ❑ Lubricate with coolant

33 - Engine lifting eye

34 - Bolt

- ❑ 25 Nm

35 - Bolt

- ❑ Tightening torque ⇒ Item 3 (page 306)

36 - Hall sender - G40-

37 - O-ring

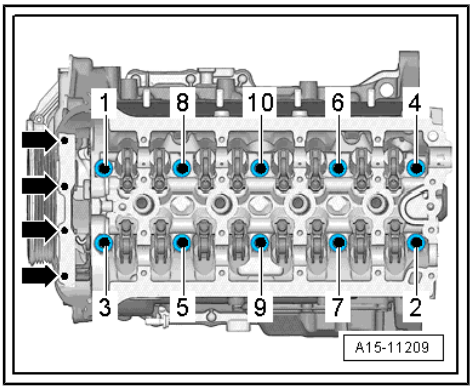
- ❑ Renew
- ❑ Lubricate with engine oil

38 - Separating plate

Slackening cylinder head bolts

– Remove bolts -arrows-.

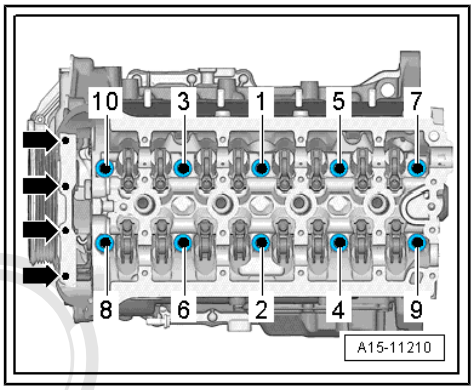
– Slacken cylinder head bolts in the sequence -1 ... 10-.



Tightening sequence for cylinder head

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

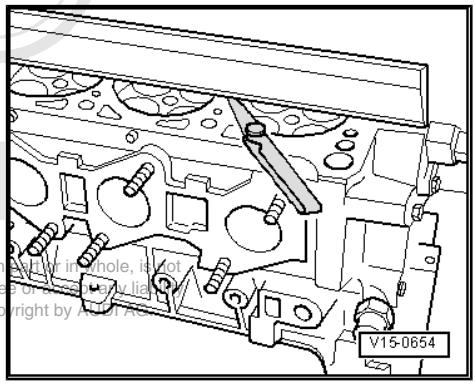
1. Tighten with torque wrench initially to 40 Nm.
2. Use rigid wrench to turn 90° further.
3. Use rigid wrench to turn 90° further.
4. Pre-tighten bolts -arrows- to 8 Nm.
5. Turn bolts -arrows- 90° further using a rigid wrench.



Checking cylinder head for distortion

– Use straight edge and feeler gauge to measure cylinder head for distortion at several points.

♦ Max. permissible distortion: 0.05 mm

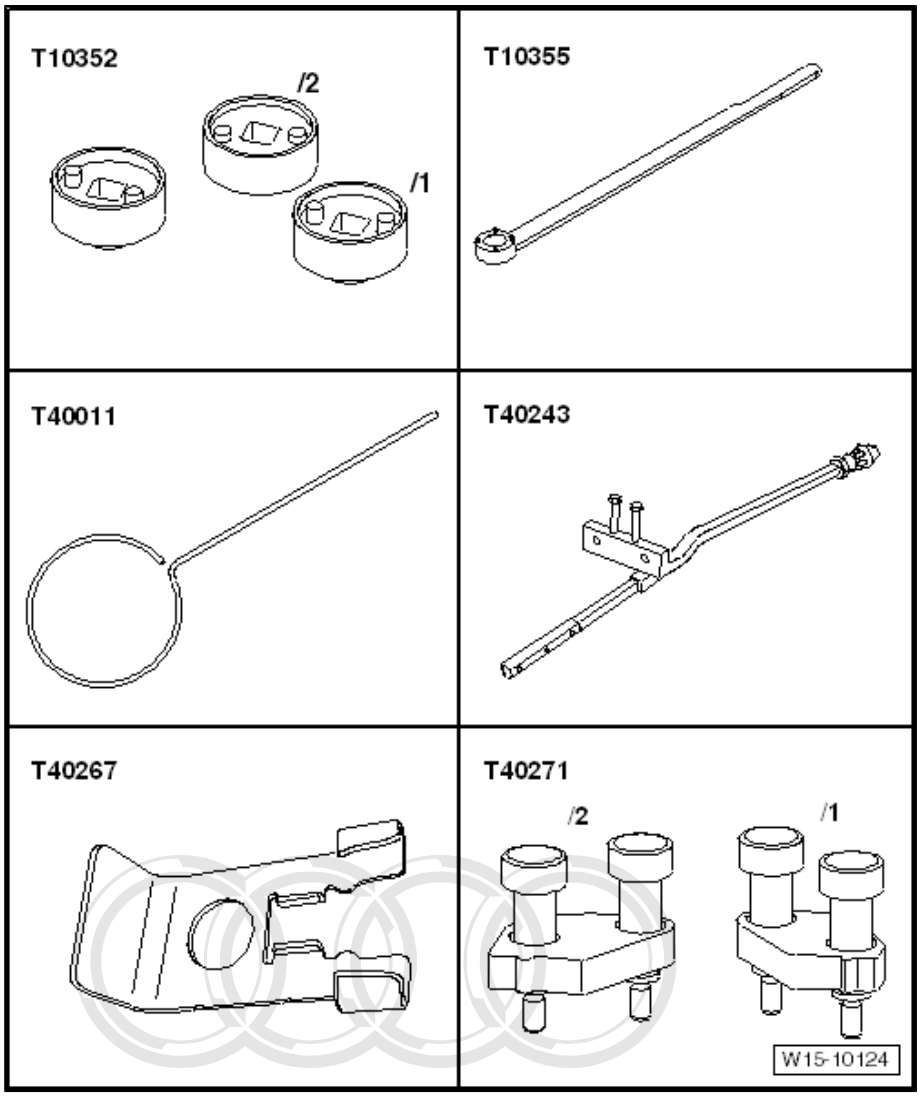


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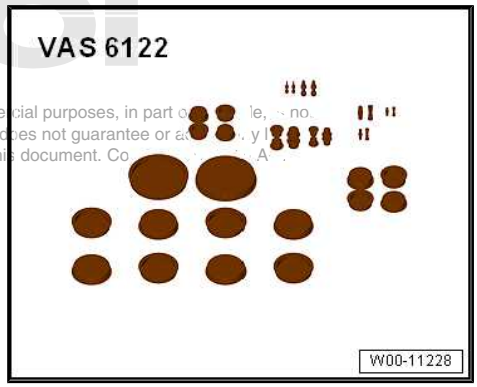
3.2 Removing and installing cylinder head

Special tools and workshop equipment required

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



- Engine bung set - VAS 6122-

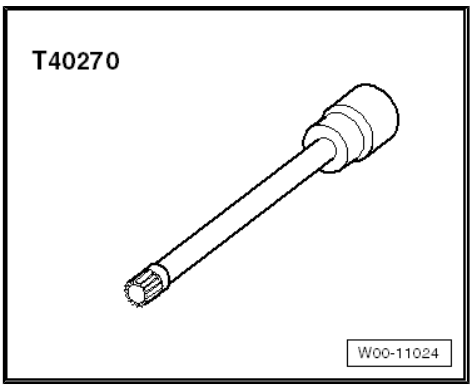


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♦ Special wrench (Polydrive) - T10070-



♦ Bit XZN 12 - T40270-



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-).*

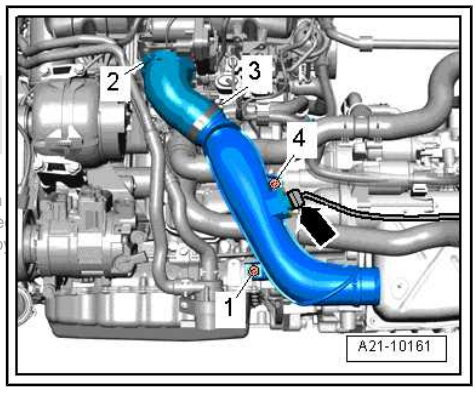
– Remove camshafts
⇒ “4.2 Removing and installing camshaft”, page 139 .

– Remove air cleaner housing ⇒ page 259 .

– Release hose clip -2-.

– Remove bolt -4-.

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



Note

Disregard -item 3-.

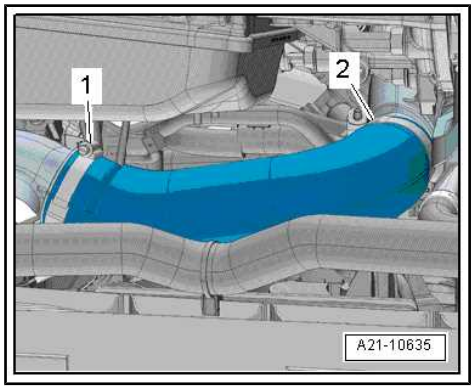
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– Remove front exhaust pipe with catalytic converter
⇒ page 300 .

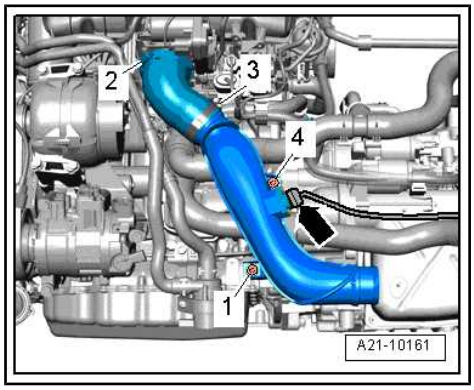
– Remove wheel spoiler (right-side) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Removing and installing wheel housing liner (front) .

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

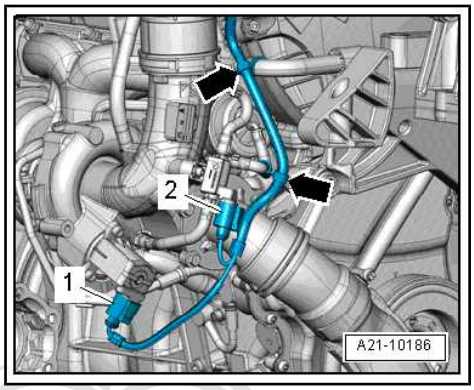
– Release hose clips -1 and 2- and remove air hose.



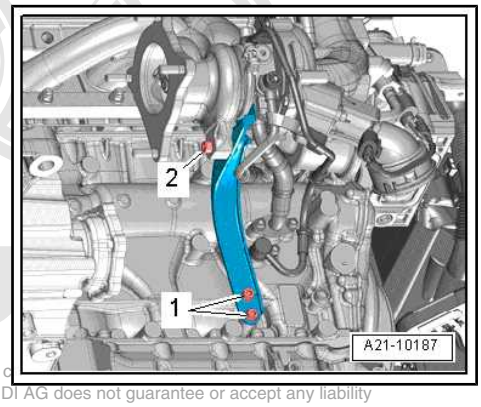
– Unscrew bolt -1- and detach air pipe downwards.
– Drain coolant ⇒ page 194 .



– Unplug electrical connectors -1 and 2- and move wiring clear -arrows-.

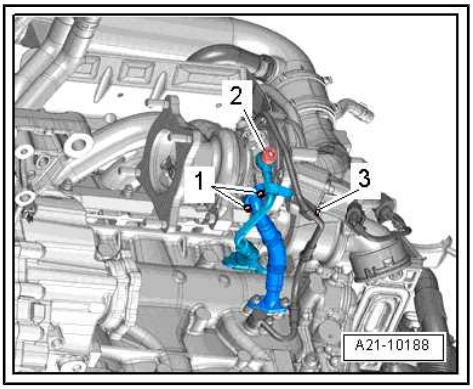


– Unscrew bolts -1 and 2- and detach support for turbocharger.



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– Remove banjo bolt -2- and move coolant pipe clear to one side.
– Remove bolt -1- at oil supply line and bolt -3- at oil return line.

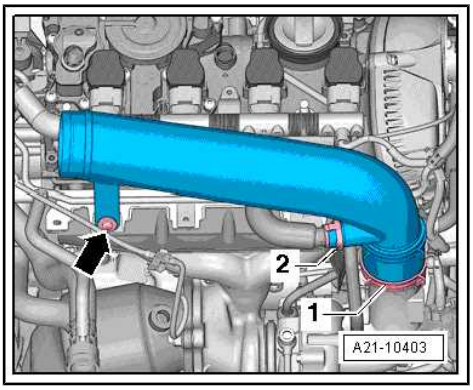


Note

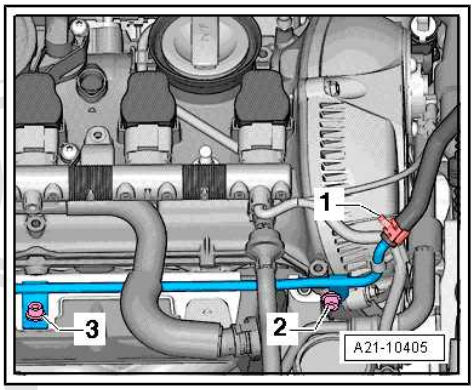
For illustration purposes, the installation position is shown with the engine removed.

– Disconnect coolant hoses on rear of cylinder head.

– Remove bolt -arrow-.
– Loosen hose clip -1- and remove air hose.
– Press release tabs and disconnect air hose -2-.

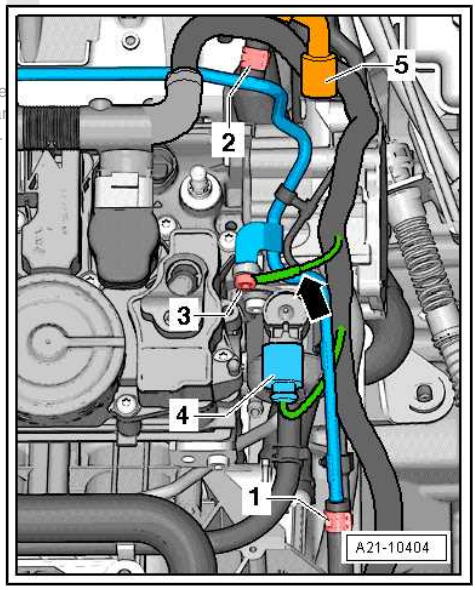


– Release hose clip -1- and detach coolant hose.
– Remove bolts -2, 3-.



– Release hose clips -1, 2- and disconnect coolant hoses.
– Unplug electrical connector -4- and move wiring harness clear.
– Unscrew bolt -3- and detach coolant line.

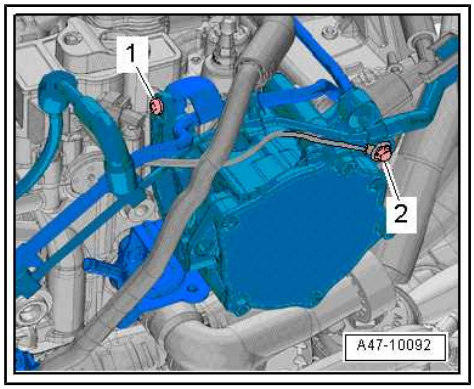
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Note

Disregard -arrow-.

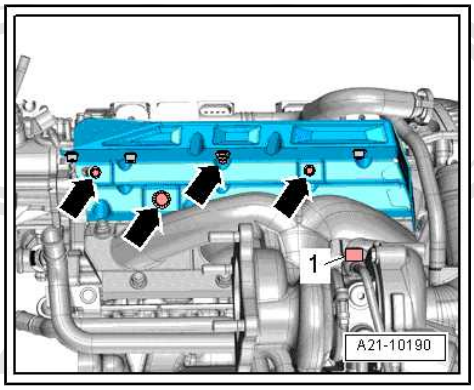
– Remove bolt -2- and move earth wire clear.



Note

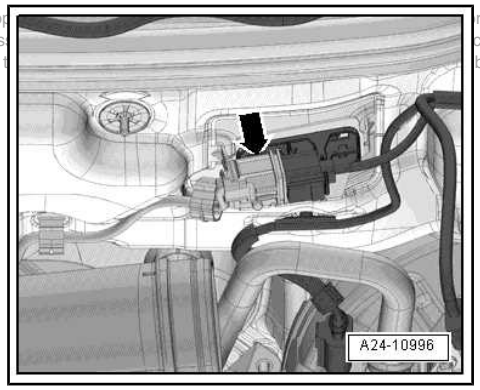
Disregard -item 1-.

– Remove bolts -arrows- and detach heat shield.
– Remove banjo bolt -1- and disconnect oil supply line from turbocharger.



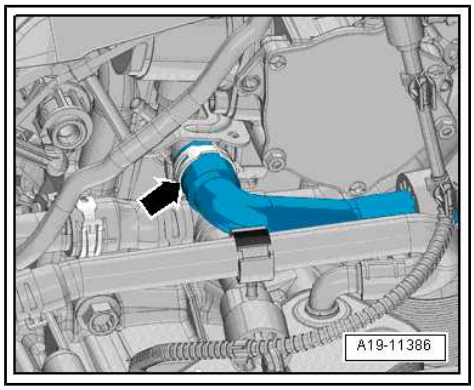
Vehicles with engine code CPSA:

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



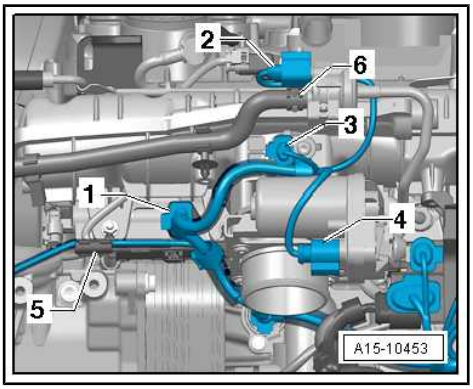
Continued for all vehicles:

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

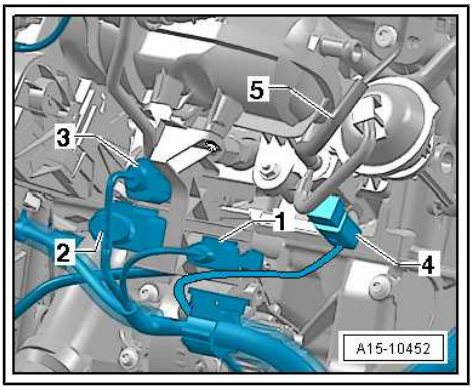


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– Unplug electrical connectors -1 ... 4-.
– Move electrical wiring -5- clear.
– Detach vacuum line -6- leading to activated charcoal filter.

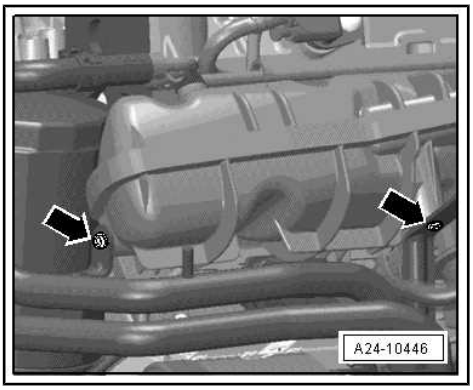


– Unplug electrical connectors -1- and remove from bracket.
– Unplug electrical connectors -2 ... 4-.
– Disconnect vacuum line -5- and move clear.

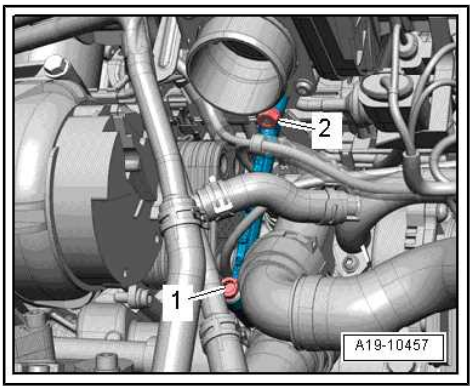


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– Unscrew bolts -arrows- and detach coolant lines (front) from intake manifold.



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



WARNING

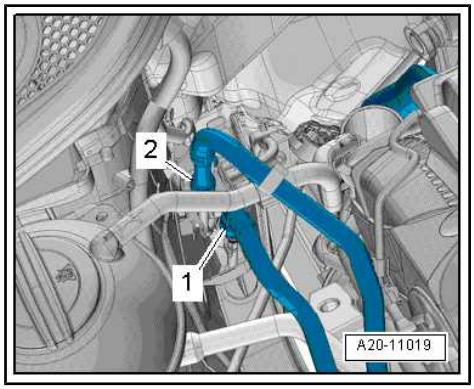
Risk of injury caused by fuel.

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

Caution

Protect fuel system against contamination.

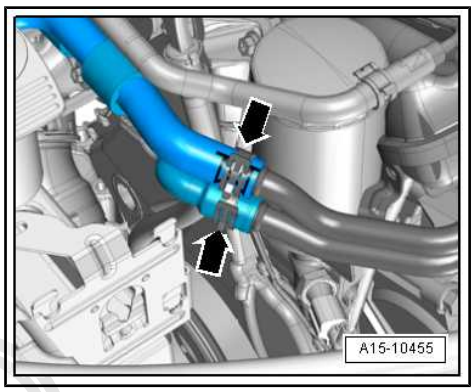
- *Rules for cleanliness when working on the injection system ⇒ page 5 .*



– Disconnect fuel hose -2- by pressing release ring.

– Press release tabs and disconnect hose -1- from activated charcoal filter.

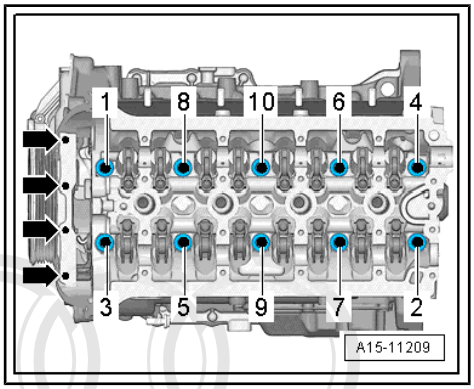
– Disconnect coolant hoses -arrows- and move clear.



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– Remove bolts -arrows-.

– Use special wrench (Polydrive) - 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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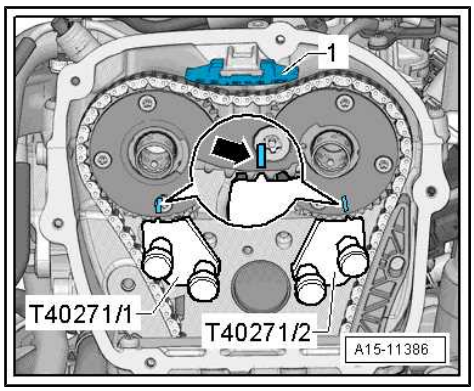
Note

- *Renew the bolts tightened with specified tightening angle.*
- *Renew self-locking nuts as well as seals, gaskets and O-rings.*
- *When installing an exchange cylinder head, the contact surfaces between the hydraulic compensation elements, roller rocker fingers and cams must be oiled before installing the camshaft housing.*
- *Hose connections and air pipes and hoses must be free of oil and grease before assembly.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *To ensure that the charge air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.*
- *After fitting a new cylinder head or cylinder head gasket, change the engine oil and the coolant in the entire cooling system.*

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If using a new cylinder head

– Mark camshaft chain sprockets relative to camshaft clamp - T40271/1- and camshaft clamp - T40271/2- -arrows-.

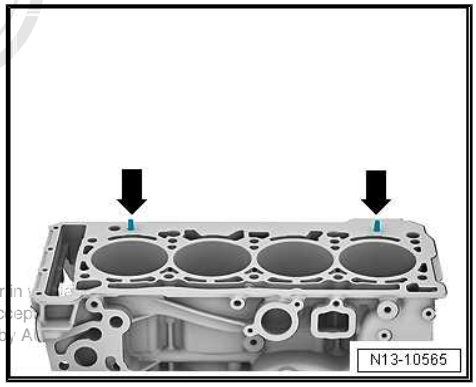


All vehicles:

– 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.



Caution

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

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– Fit cylinder head.

– Insert and hand-tighten cylinder head bolts.

– Tighten cylinder head bolts
⇒ Fig. ““Tightening sequence for cylinder head”“ , page 125 .

Note

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

– Install camshafts
⇒ “4.2 Removing and installing camshaft”, page 139 .

– Change engine oil ⇒ Maintenance ; Booklet 820 .

– Fill cooling system with fresh coolant ⇒ page 194 .

– Install front exhaust pipe with catalytic converter
⇒ page 300 .

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

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 123

3.3 Checking compression

Special tools and workshop equipment required

♦ Compression tester - V.A.G 1763-



Test sequence

Note

♦ *Engine oil temperature at least 30 °C*

♦ *Battery voltage at least 12.7 V*

– Remove engine cover panel ⇒ page 46 .

– Remove ignition coils with output stages ⇒ page 307 .

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

– Check compression pressure with compression tester - V.A.G 1763- and adapter - V.A.G 1763/6- .

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Note

Using the compression tester ⇒ Operating instructions .

– Have a second mechanic operate starter until tester shows no further pressure increase.

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

Compression pressure:

New pressure in bar	Wear limit in bar	Permissible difference between cylinders in bar
11.0 … 14.0	7.0	3.0 (maximum)

– Install spark plugs ⇒ Maintenance ; Booklet 820 .

– Install ignition coils with output stages ⇒ page 307 .

– Install engine cover panel ⇒ page 46 .

Note

Faults will have been stored in the memory because connectors have been unplugged. Interrogate and, if necessary, erase event memory after completing the check.

– Entries are stored in the event memory of the engine control unit because electrical connectors have been unplugged and the engine started: `Generate readiness code` in `Guided Functions` ⇒ Vehicle diagnostic tester.

4 Valve gear

⇒ “4.1 Exploded view - valve gear”, page 137

⇒ “4.2 Removing and installing camshaft”, page 139

⇒ “4.3 Removing and installing camshaft control valve 1 N205 ”, page 153

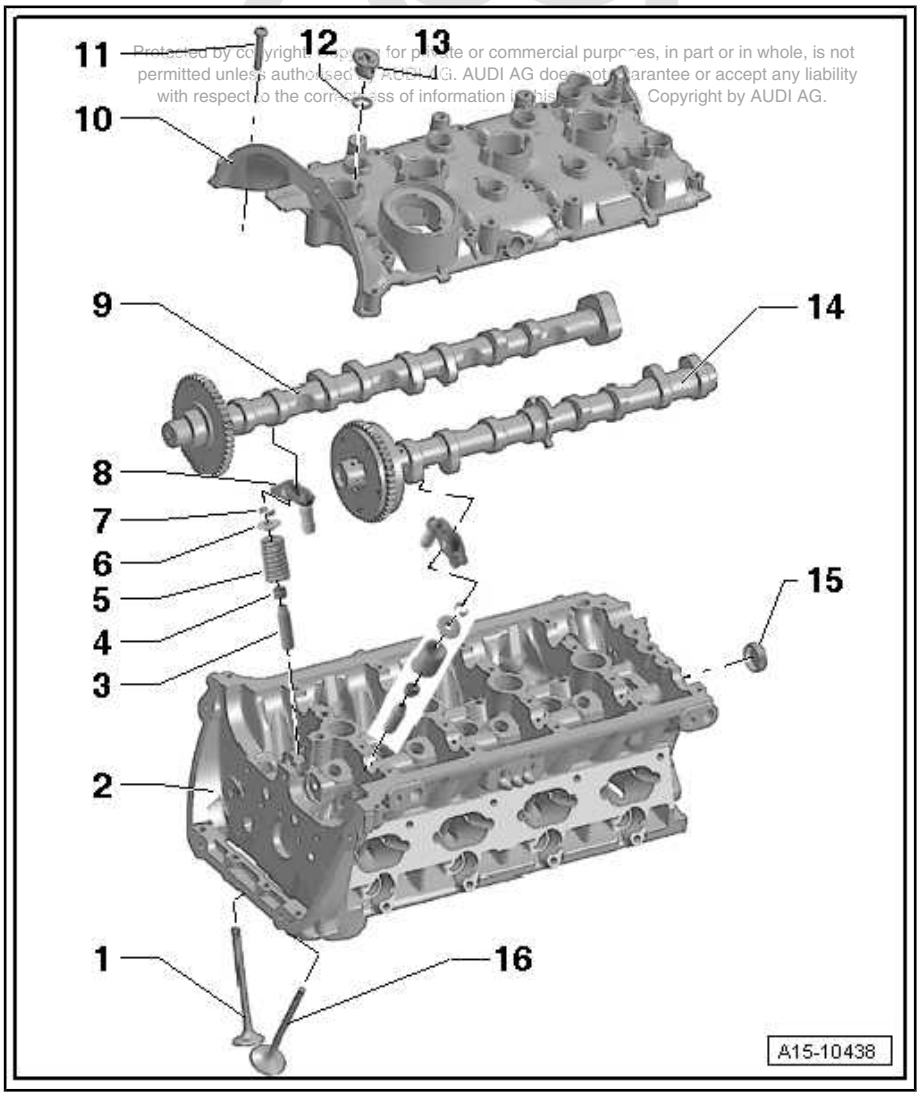
⇒ “4.4 Removing and installing valve stem oil seals”, page 154

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.*
- *Always fit new seals and gaskets.*

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1 - Exhaust valve

- ❑ Do not machine, only grinding-in is permitted
- ❑ Valve dimensions ⇒ page 163
- ❑ Checking valve guides ⇒ page 162

2 - Cylinder head

3 - Valve guide

- ❑ Checking ⇒ page 162

4 - Valve stem oil seal

- ❑ Renewing with cylinder head installed ⇒ page 154
- ❑ Renewing with cylinder head removed ⇒ page 158

5 - Valve spring

6 - Valve spring plate

7 - Valve cotters

8 - Hydraulic compensation element

- ❑ With roller rocker finger
- ❑ Do not interchange
- ❑ Lubricate contact surface

9 - Exhaust camshaft

- ❑ Removing and installing ⇒ page 139
- ❑ Check radial clearance with Plastigage (roller rocker fingers removed)

- ❑ Use old bolts when measuring radial clearance; tightening sequence ⇒ page 139
- ❑ When carrying out final assembly, renew bolts
- ❑ Radial clearance: 0.024 ... 0.066 mm
- ❑ Runout: max. 0.04 mm

10 - Cylinder head cover

- ❑ With integrated camshaft bearings
- ❑ Clean sealing surface; machining not permitted
- ❑ Remove old sealant residues

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11 - Bolt

- ❑ Renew
- ❑ Slackening ⇒ page 138
- ❑ Tightening torque and sequence ⇒ page 139

12 - O-ring

- ❑ Renew
- ❑ Lubricate with engine oil

13 - Sealing plug

14 - Inlet camshaft

- ❑ Removing and installing ⇒ page 139
- ❑ Check radial clearance with Plastigage (roller rocker fingers removed)
- ❑ Use old bolts when measuring radial clearance; tightening sequence ⇒ page 139
- ❑ When carrying out final assembly, renew bolts
- ❑ Radial clearance: 0.024 ... 0.066 mm
- ❑ Runout: max. 0.04 mm

15 - Sealing cap

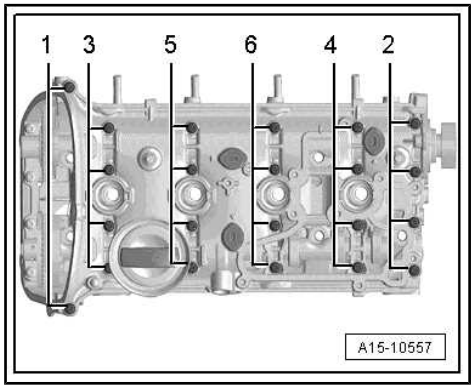
- ❑ Renew
- ❑ Removing sealing cap with cylinder head cover installed: pierce on one side with an awl and pry out
- ❑ Installing ⇒ page 149

16 - Inlet valve

- ❑ Do not machine, only grinding-in is permitted
- ❑ Valve dimensions ⇒ page 163
- ❑ Checking valve guides ⇒ page 162

Slackening cylinder head cover bolts

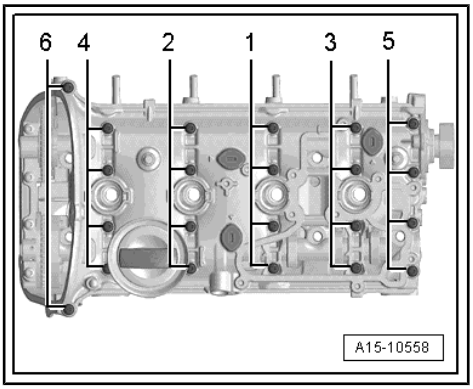
– Loosen cylinder head cover bolts in the sequence -1 ... 6-.



Tightening sequence for cylinder head cover

– Renew bolts.

1. Fit bolts in the sequence -1 ... 6- and hand-tighten in several stages.
2. Tighten bolts in the sequence -1 ... 6- to 8 Nm using torque wrench.
3. Turn 90° further in the sequence -1 ... 6- using a rigid wrench.



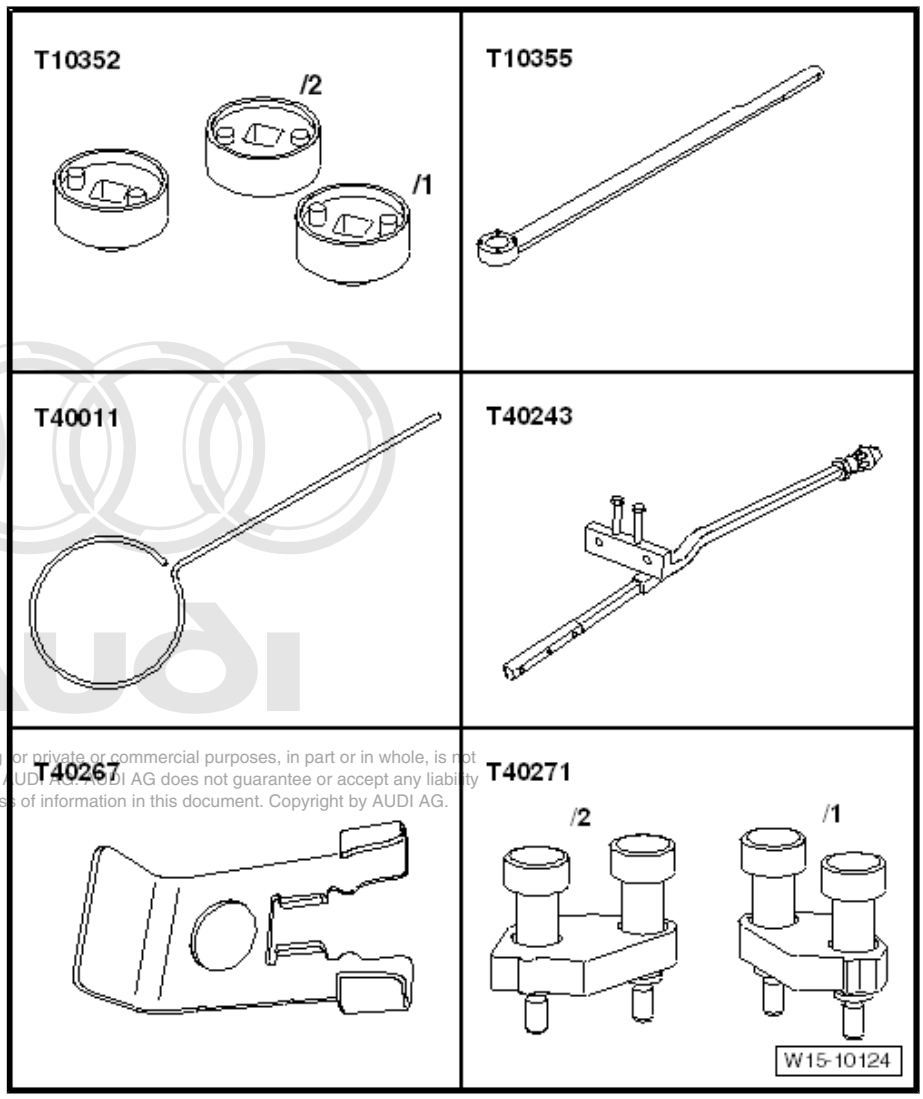
Note

Take care to keep cylinder head cover straight.

4.2 Removing and installing camshaft

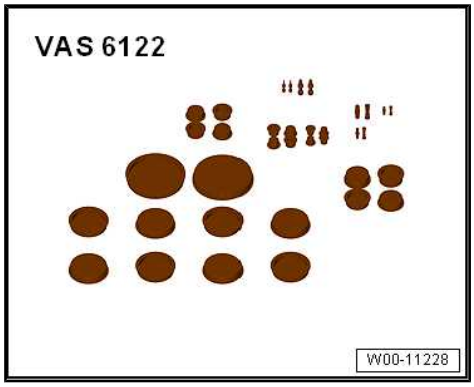
Special tools and workshop equipment required

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

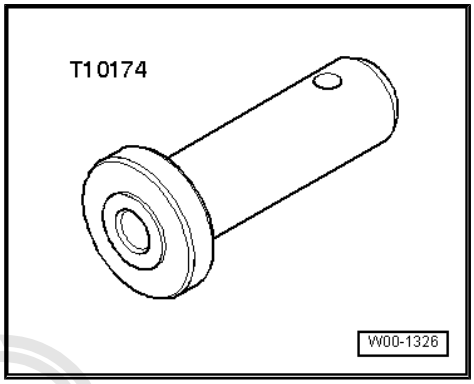


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- Engine bung set - VAS 6122-



- Thrust piece - T10174-



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.*
- *Renew sealing cap ⇒ Item 15 (page 138) if cylinder head cover has been detached.*
- *Fit cable ties in the original positions when installing.*

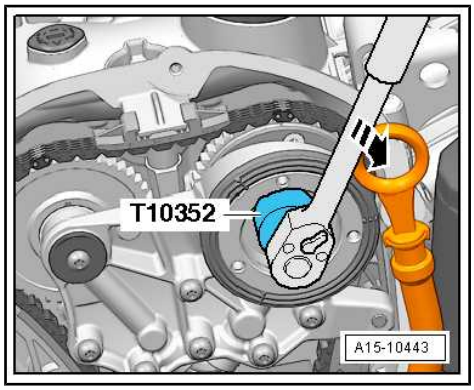
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– Remove engine cover panel ⇒ page 46 .
– Remove air cleaner housing ⇒ page 259 .
– Remove timing chain cover (top) ⇒ page 92 .
– Remove ignition coils with output stages ⇒ page 307 .

Caution

The timing valve has a left-hand thread.

– Depending on version, turn assembly tool - T10352- or assembly tool - T10352/1A- in direction of -arrow- to remove timing valve.

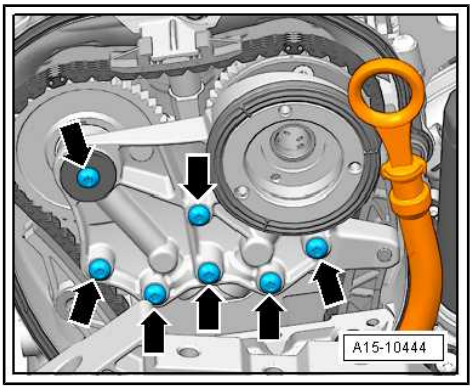


– Remove bolts -arrows-.

WARNING

Risk of damage to bearing saddle.

- ***Detach bearing saddle carefully without tilting it.***



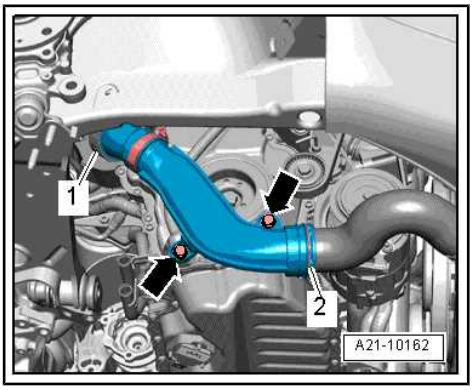
– Detach bearing saddle.

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

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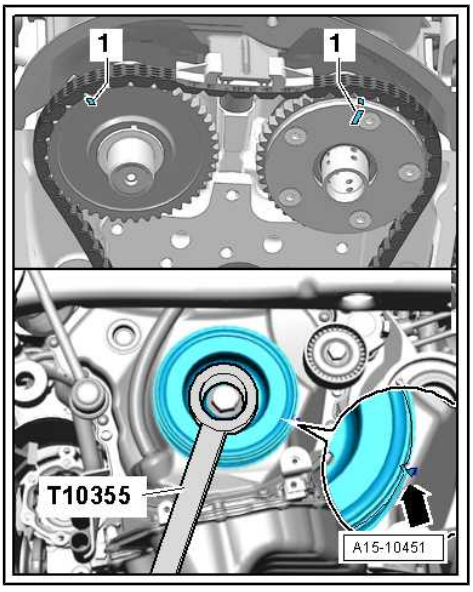
– Remove bolts -arrows-.

– Remove air pipe (lift clips -items 1 and 2-).



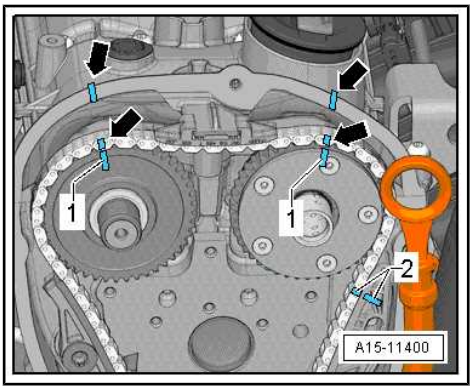
– Turn vibration damper to “TDC” position using counterhold tool - T10355- .

- 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.

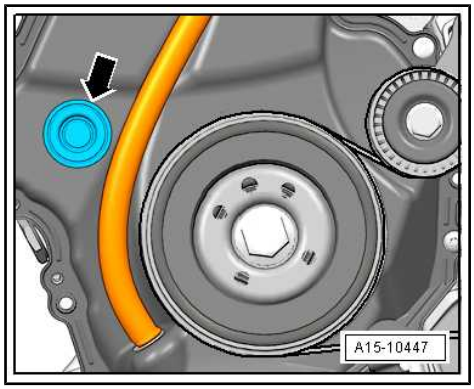


– Use a waterproof pen to mark camshaft timing chain and cylinder head -arrows- relative to markings on chain sprockets -1-.

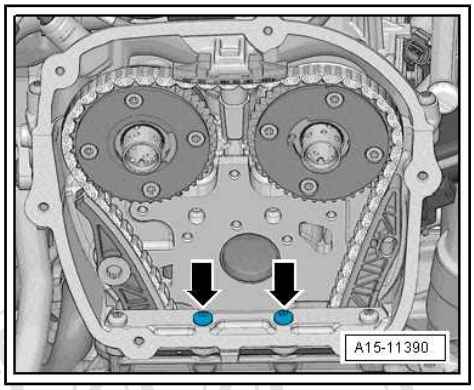
– Use a waterproof pen to mark camshaft timing chain relative to guide rail of timing chain -2- as well.



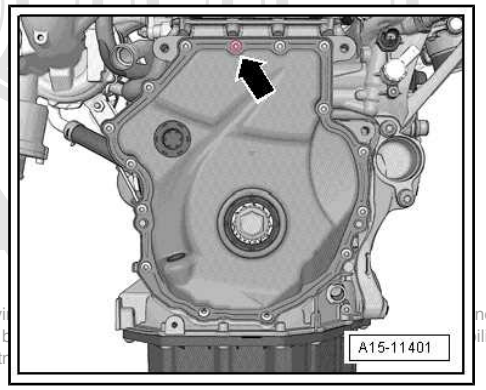
– Remove sealing plug -arrow-.



– Remove bolts -arrows-.



– If fitted, remove bolt -arrow-.



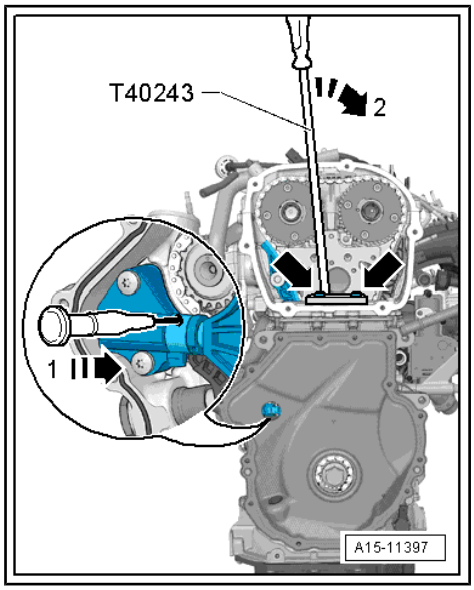
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Depending on version, 2 different chain tensioners may be installed.

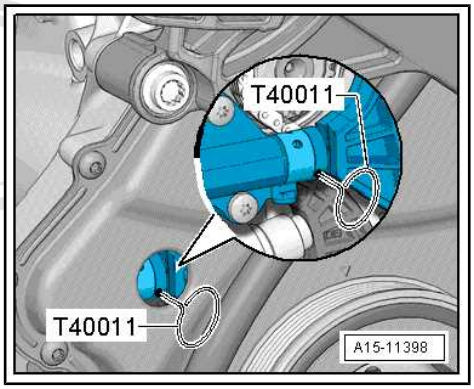
Version 1

– Screw in assembly lever - T40243- -arrows-.

– Lift locking element for chain tensioner; to do so, insert scriber or suitable screwdriver in hole of chain tensioner in direction of -arrow 1-, press assembly lever - T40243- slowly in direction of -arrow 2- and hold in place.



– Hold chain tensioner in position with locking pin - T40011- .

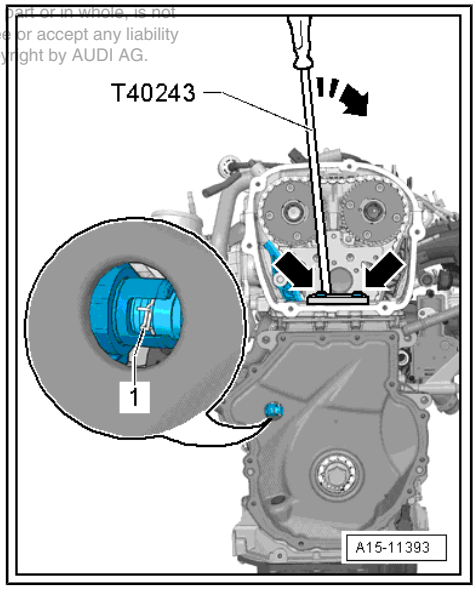


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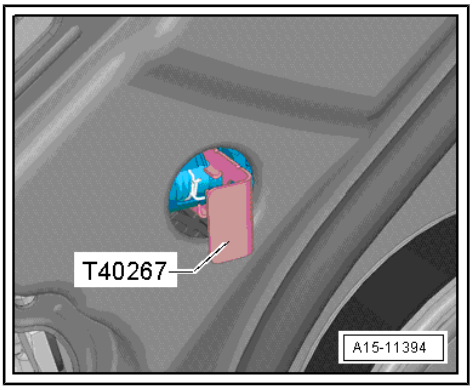
Version 2

– Screw in assembly lever - T40243- -arrows-.

– Compress circlip -1- for chain tensioner, press lever - T40243- slowly in direction of -arrow- and hold in place.



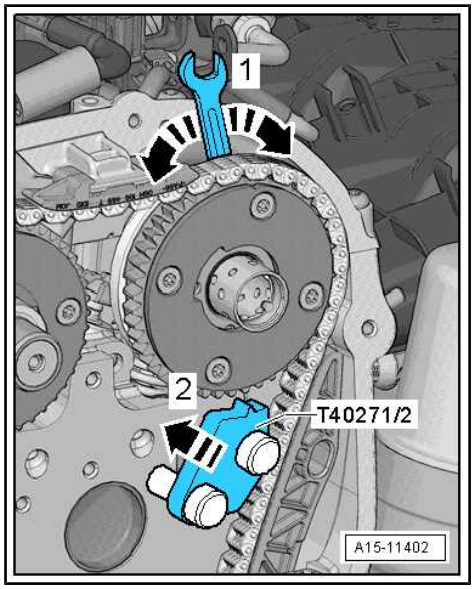
– Hold chain tensioner in position with locking tool - T40267- .



All versions

– Remove assembly lever - T40243- .

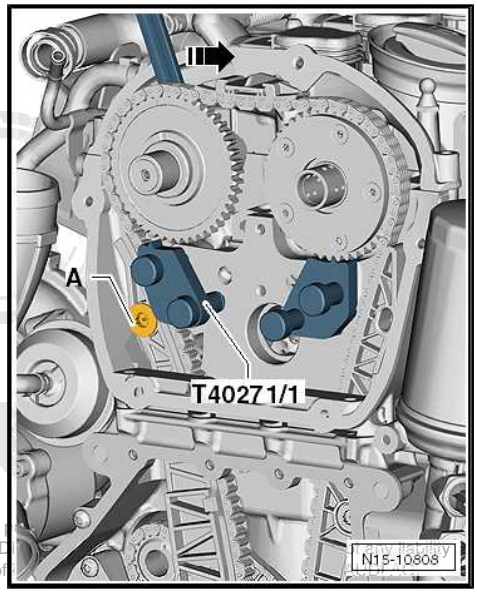
– Bolt camshaft clamp - T40271/2- onto cylinder head and slide into teeth on chain sprocket in direction of -arrow 2-; if necessary, use spanner to turn inlet camshaft in direction of -arrow 1-.



With assembly clearance feature

– Bolt camshaft clamp - T40271/1- onto cylinder head. Counterhold camshaft with an open-end spanner (press towards right side -arrow-).

– Remove bolt -A- and push tensioning rail downwards, while still counterholding camshaft.



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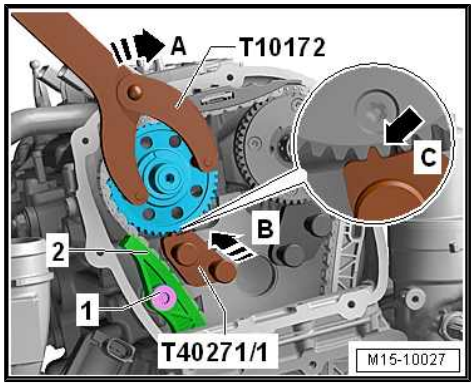
Without assembly clearance feature

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

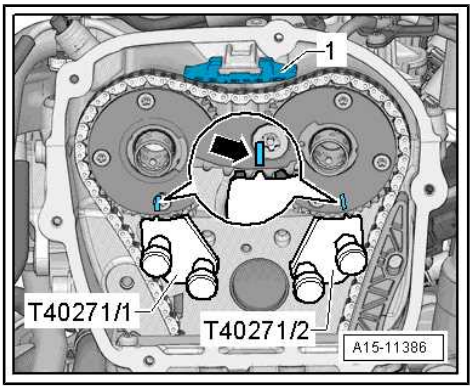
A second mechanic is required for the following steps.

– Turn exhaust camshaft in direction of -arrow A- using counterhold tool - T10172 A- 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-.



All versions



Note

- *Mark camshafts relative to camshaft clamp - T40271/1- and camshaft clamp - T40271/2- .*
- *If using new camshafts: Transfer markings made on old camshafts onto new camshafts.*
- *It will take much more time to install the new camshafts if the markings are not applied.*

– Mark camshaft chain sprockets relative to camshaft clamp - T40271/1- and camshaft clamp - T40271/2- -arrows-.

– Use screwdriver to release catch and press off top guide rail -1- forwards.

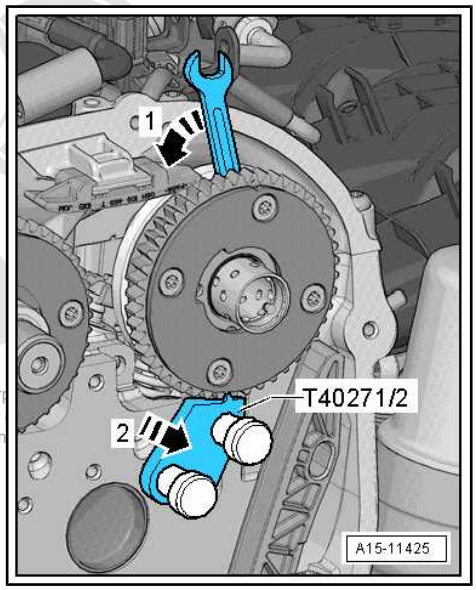
– Remove camshaft timing chain from camshaft sprockets.

Caution

Risk of damage to valves and piston crowns.

- ***Do not turn the crankshaft after the camshaft timing chain has been removed from the cylinder head.***

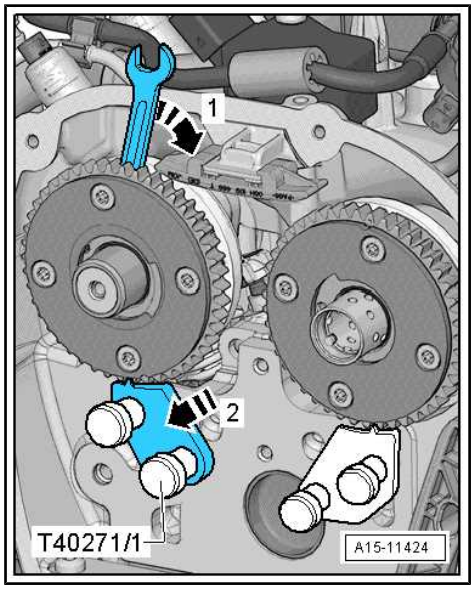
– Use spanner to turn inlet camshaft in direction of -arrow 1- and slide camshaft clamp - T40271/2- out of teeth on chain sprocket in direction of -arrow 2- and move camshaft into rest position.



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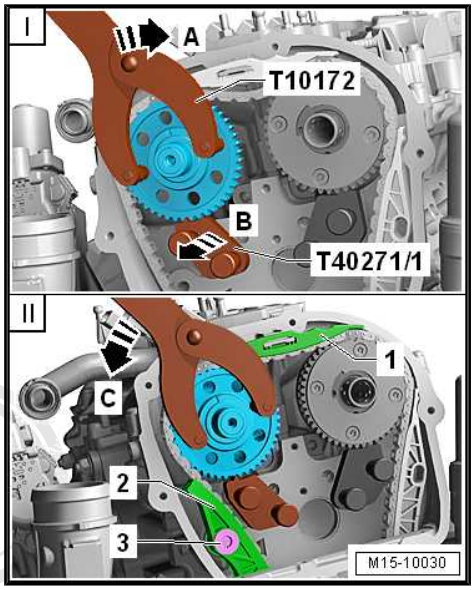
With assembly clearance feature

– Use spanner to turn exhaust camshaft in direction of -arrow 1- and slide camshaft clamp - T40271/1- out of teeth on chain sprocket in direction of -arrow 2- and move camshaft into rest position.



Without assembly clearance feature

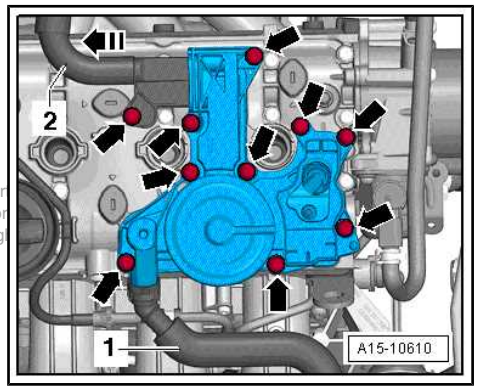
– Use counterhold tool - T10172 A- to turn exhaust camshaft slightly in direction of -arrow A- and slide camshaft clamp - T40271/1- out of teeth on chain sprocket in direction of -arrow B-.



All versions

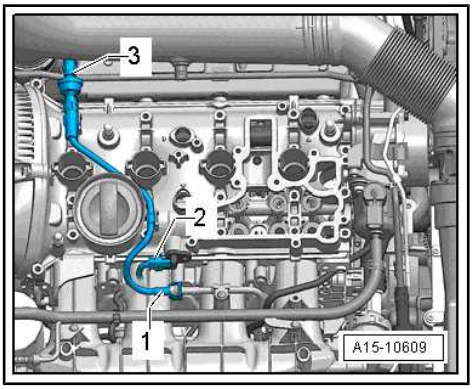
– Disconnect crankcase breather hose -1-.

– Remove bolts -arrows-, detach crankcase breather system and disconnect from crankcase breather hose -2- in direction of -arrow-.

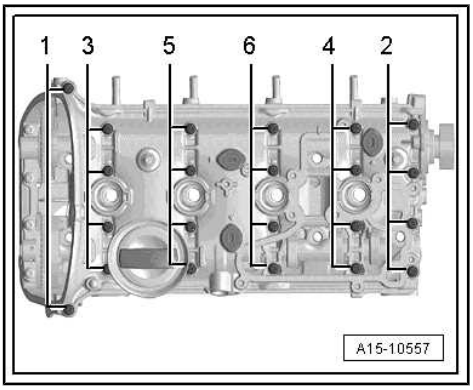


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– Detach lines -1 and 3-.
– Unplug electrical connector -2- from Hall sender - G40- .
– Remove high-pressure pump ⇒ page 287 .
– Remove vacuum pump ⇒ Brake system; Rep. gr. 47 ; Vacuum system; Removing and installing vacuum pump .



– Remove cylinder head cover bolts in the sequence -1 ... 6-.
– Detach cylinder head cover.
– Detach camshafts.



Caution

Protect lubrication system and bearings against contamination.

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

Installing

Note

- *The sealing surfaces must be free of oil and grease.*
- *Ensure that all roller rocker fingers contact the valve ends correctly.*
- *Silicone sealant ⇒ Electronic parts catalogue*
- *Note expiry date of silicone sealant.*
- *The cover must be installed within 5 minutes after applying the silicone sealant.*

– Remove sealant remaining on cylinder head with flat scraper.

WARNING

Risk of eye injury.

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

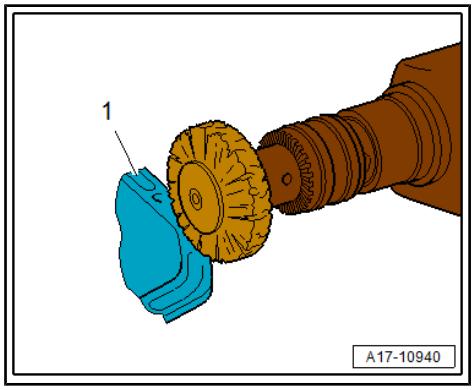
Caution

Protect lubrication system and bearings against contamination.

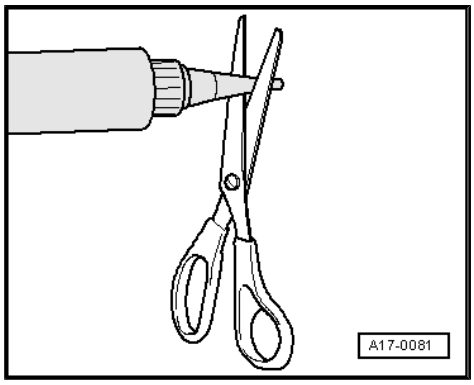
- ***Cover exposed parts of the engine.***

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– Remove remaining sealant in groove of cylinder head cover -1- and on sealing surfaces, e.g. using a rotating plastic brush.
– Clean surfaces; they must be free of oil and grease.



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

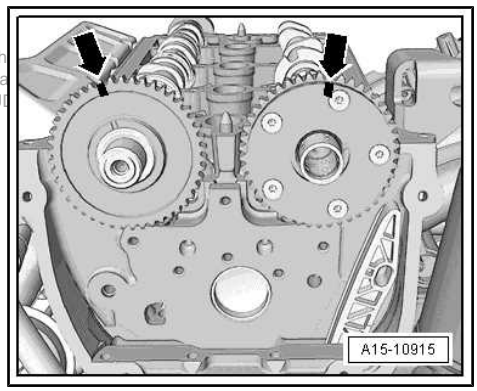


On new camshafts

– Transfer markings made on old camshafts onto new camshafts.

All vehicles:

– Oil running surfaces of both camshafts.
– Place camshafts in cylinder head; factory markings -arrows- must be positioned as shown in illustration.



Note

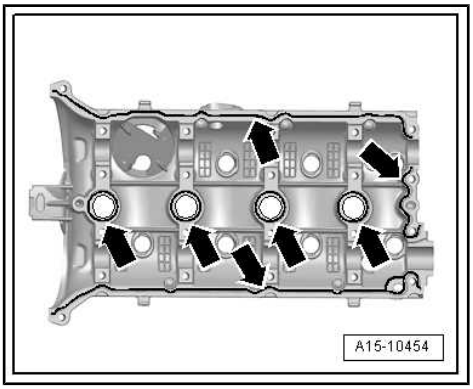
Disregard the markings you have made.

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– Renew bolts for cylinder head cover.

– Apply silicone sealant onto clean sealing surface of cylinder head cover, as illustrated -arrows-.

• Thickness of sealant beads: 2 ... 3 mm



Note

♦ *The cylinder head 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.*

♦ *Note the use-by date of the sealant.*

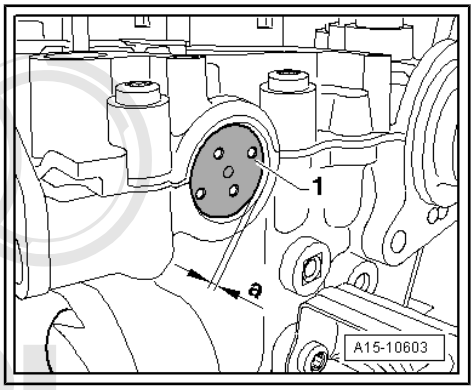
– Tighten bolts in several stages; tightening sequence ⇒ page 139 .

Note

Take care to keep cylinder head cover straight.

– Use thrust piece - T10174- to drive in sealing cap -1- (do not apply sealant).

• Installation depth -a- = 1 ... 2 mm



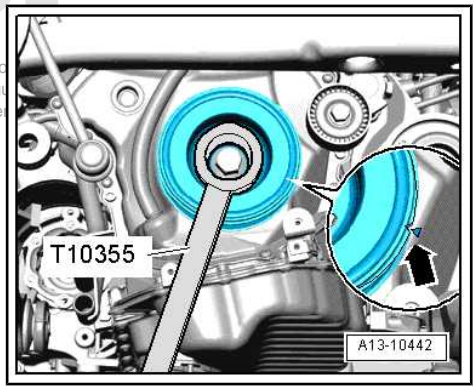
WARNING

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

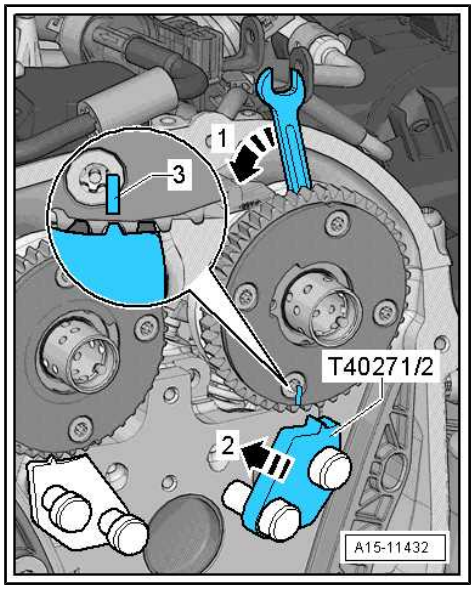
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– Turn vibration damper to “TDC” position -arrow- using counterhold tool - T10355- .

• Notch on vibration damper must align with arrow marking on cover for timing chains (bottom).

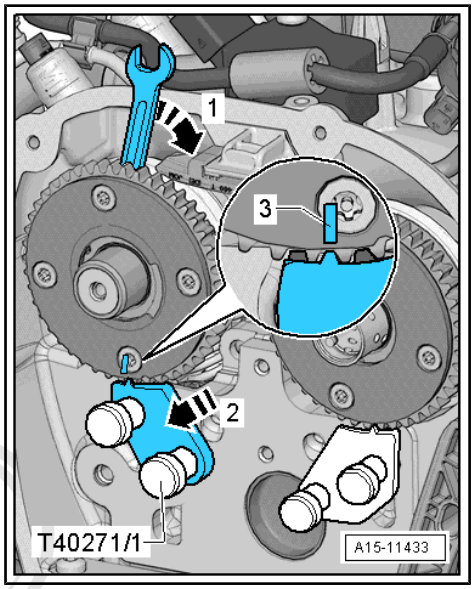


– Turn inlet camshaft in direction of -arrow 1- until marking -3- aligns with camshaft clamp - T40271/2- .
– Slide camshaft clamp - T40271/2- into teeth of chain sprocket in direction of -arrow 2-.



With assembly clearance feature

– Turn exhaust camshaft in direction of -arrow 1- until marking -3- aligns with camshaft clamp - T40271/1- .
– Slide camshaft clamp - T40271/1- into teeth of chain sprocket in direction of -arrow 2-.

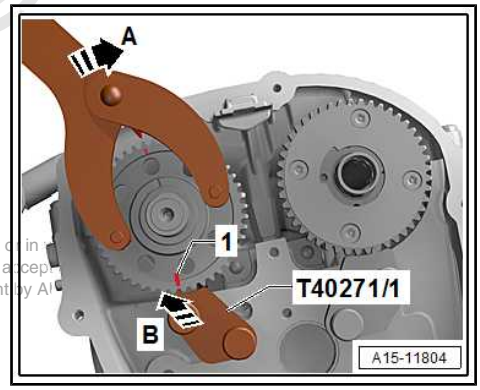


Without assembly clearance feature

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

A second mechanic is required for the following steps.

– Turn exhaust camshaft in direction of -arrow A- until marking -1- aligns with camshaft clamp - T40271/1- .
– Slide camshaft clamp - T40271/1- into teeth of chain sprocket in direction of -arrow B-.

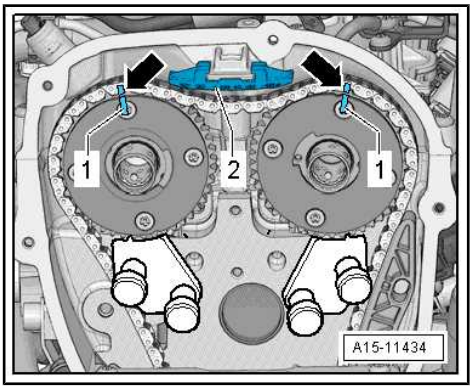


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All versions

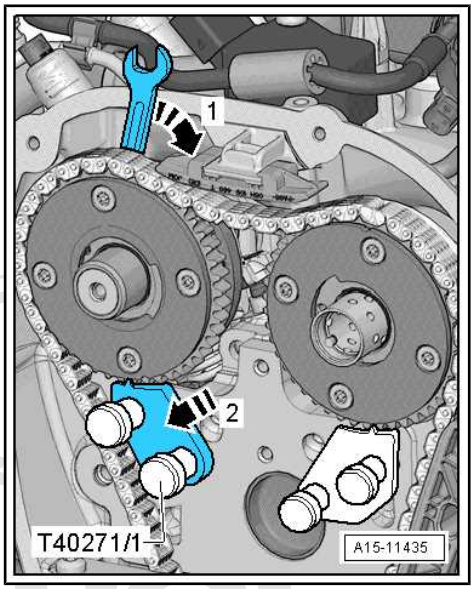
– Fit timing chain; to do so, position markings on chain links -arrows- at markings on chain sprockets -1-.

– Install top guide rail -2-.

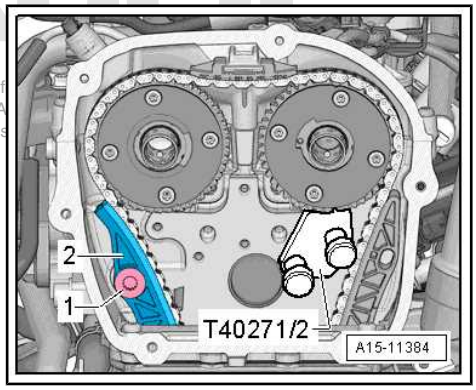


– Turn exhaust camshaft in direction of -arrow 1- and slide camshaft clamp - T40271/1- out of teeth on chain sprocket in direction of -arrow 2- and release camshaft.

– Remove camshaft clamp - T40271/1- .

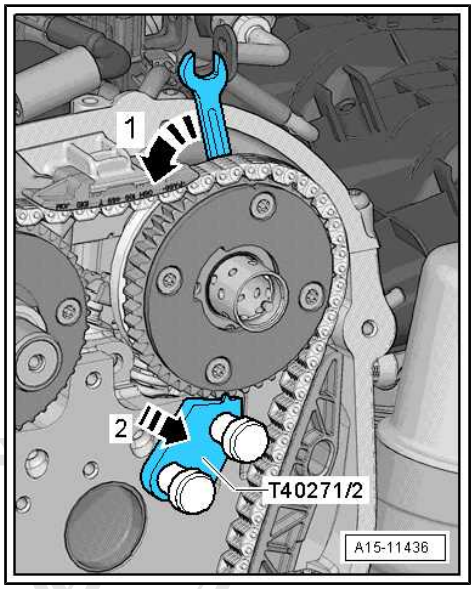


– Move guide rail -2- upwards and screw in bolt -1-.



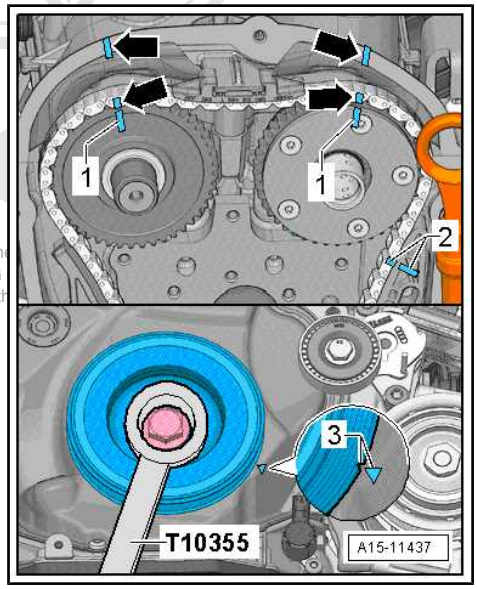
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– Turn inlet camshaft in direction of -arrow 1- and slide camshaft clamp - T40271/2- out of teeth on chain sprocket in direction of -arrow 2- and release camshaft.
– Remove camshaft clamp - T40271/2- .

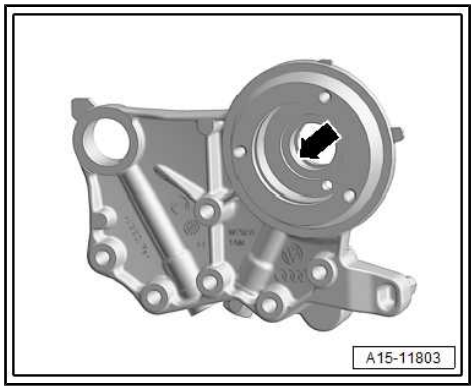


– Check valve timing; markings on camshaft timing chain and cylinder head -arrows- must align with markings on chain sprockets -1-.
– Markings on camshaft timing chain and on guide rail for camshaft timing chain -2- must be opposite one another.
– Notch on vibration damper must align with marking on cover for timing chain (bottom) -3-.

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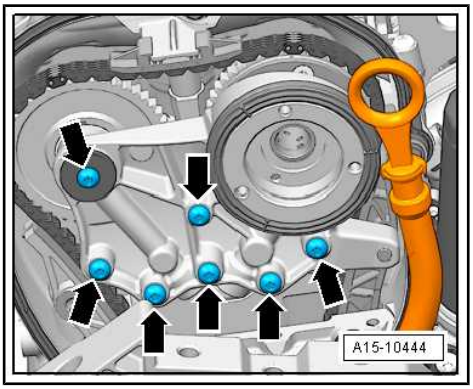
– Lubricate hole -arrow- with engine oil.



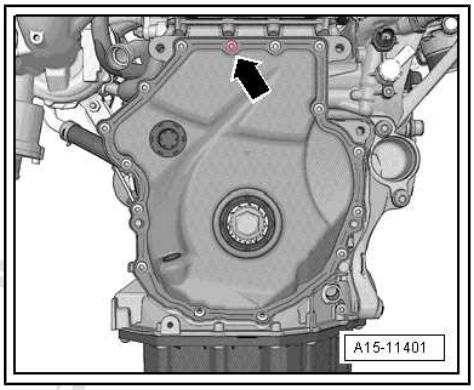
WARNING

Risk of damage to bearing saddle.

- *Detach bearing saddle carefully without tilting it.*



- Attach bearing saddle and screw in bolts -arrows- hand-tight.
- Depending on version, remove locking pin - T40011- or locking tool - T40267- .
- Tighten bolts -arrows- for bearing saddle ⇒ page 100 .



- Screw in bolt -arrow-.
- Install timing valve ⇒ Item 6 (page 100) .

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

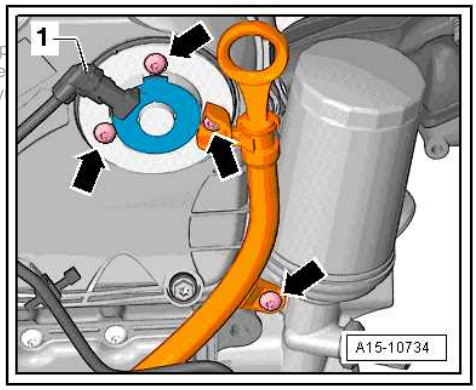
- Install vacuum pump ⇒ Brake system; Rep. gr. 47 ; Vacuum system; Removing and installing vacuum pump .
- Install high-pressure pump ⇒ page 287 .
- Install ignition coils with output stages ⇒ page 307 .
- Install timing chain cover (top) ⇒ page 92 .
- Install air cleaner housing ⇒ page 259 .

Tightening torques

- ⇒ “4.1 Exploded view - valve gear”, page 137

4.3 Removing and installing camshaft control valve 1 - N205-

Removing



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- Detach connector from camshaft control valve 1 - N205- -1-.
- Unscrew bolts -arrows- and remove camshaft control valve 1 - N205- .

Installing

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

Note

Renew O-ring.

- Lubricate oil seal and O-ring with engine oil.

Tightening torques

- ⇒ “1.1 Exploded view - timing chain cover”, page 90

4.4 Removing and installing valve stem oil seals

⇒ “4.4.1 Removing and installing valve stem oil seals (cylinder head installed)”, page 154

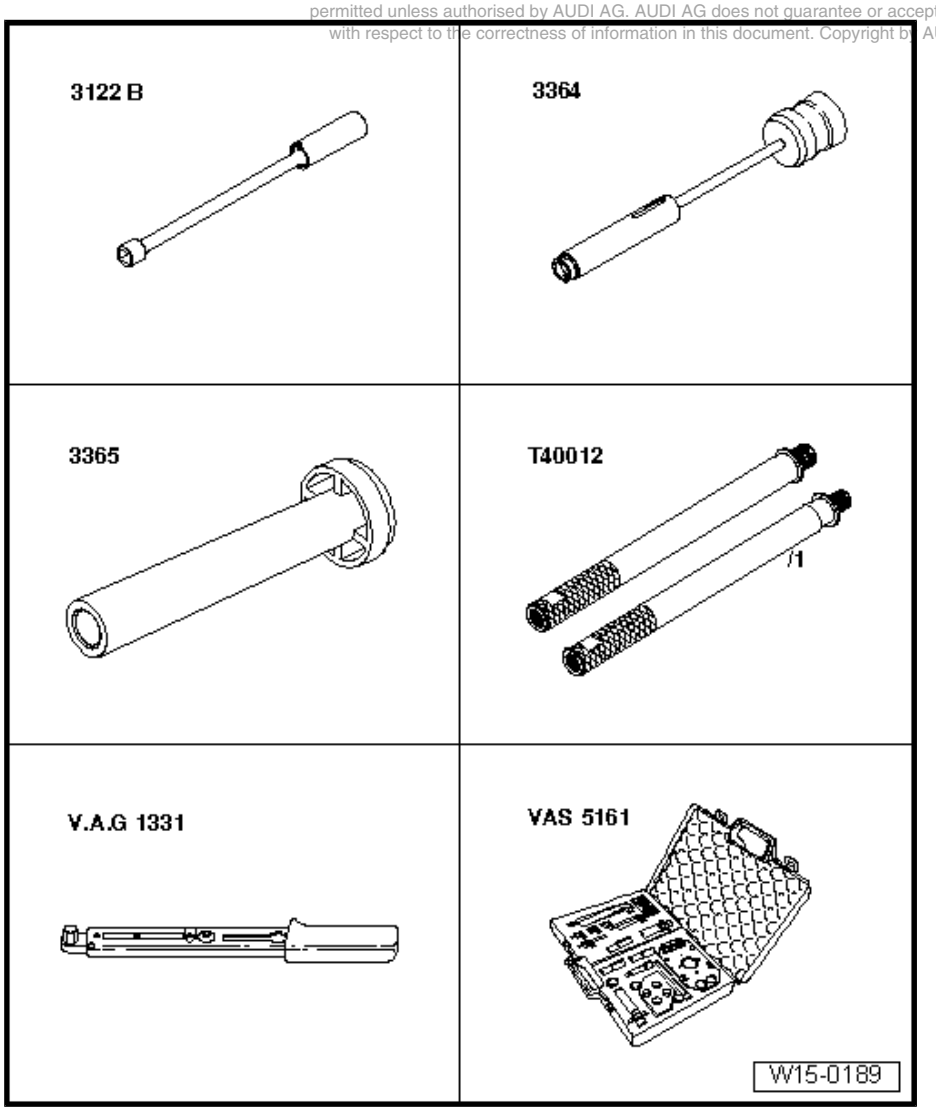
⇒ “4.4.2 Removing and installing valve stem oil seals (cylinder head removed)”, page 158

4.4.1 Removing and installing valve stem oil seals (cylinder head installed)

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Special tools and workshop equipment required

- Spark plug spanner - 3122 B-
- Valve stem seal puller - 3364-
- Valve stem seal fitting tool - 3365-
- Adapters - T40012-
- Torque wrench - V.A.G 1331-
- Removal and installation device for valve cotters - VAS 5161 A-
- Guide plate for 2.0 ltr. and 3.0 ltr. FSI engine - VAS 5161/19B-



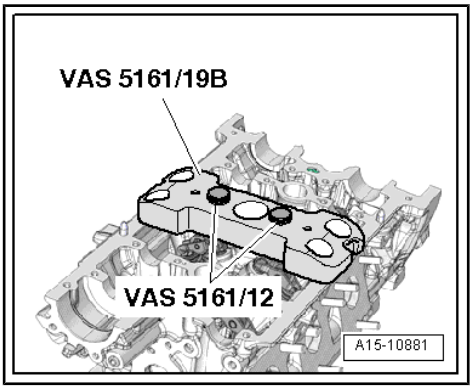
Removing valve stem oil seals

– Remove camshafts ⇒ page 139 .

– Carefully remove roller rocker fingers and place them on a clean surface. When doing so, make sure that roller rocker fingers are not interchanged.

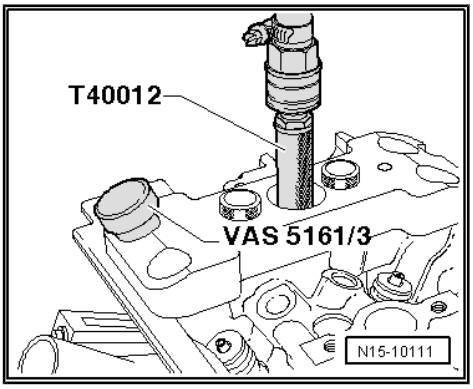
– Remove spark plugs with spark plug spanner - 3122 B- .

– Secure guide plate for 2.0 ltr. and 3.0 ltr. FSI engine - VAS 5161/19B- to cylinder head with knurled screws - VAS 5161/12- as shown.
– Set piston of appropriate cylinder to “bottom dead centre”.



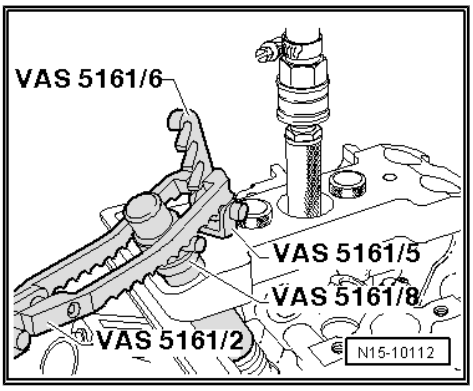
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– Screw adapter - T40012- into spark plug thread.
– Connect to compressed air supply of at least 6 bar.
– Knock loose sticking valve cotters using punch - VAS 5161/3- and a plastic-headed hammer.



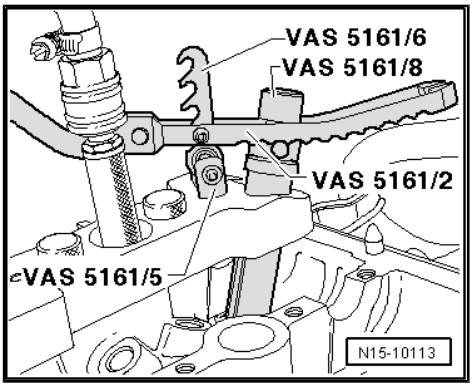
For inlet side

– 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 5161/19B- .
– Insert assembly cartridge - VAS 5161/8- into guide plate for 2.0 ltr. and 3.0 ltr. FSI engine - VAS 5161/19B- .
– Engage pressure fork - VAS 5161/2- on snap-in device - VAS 5161/6- .

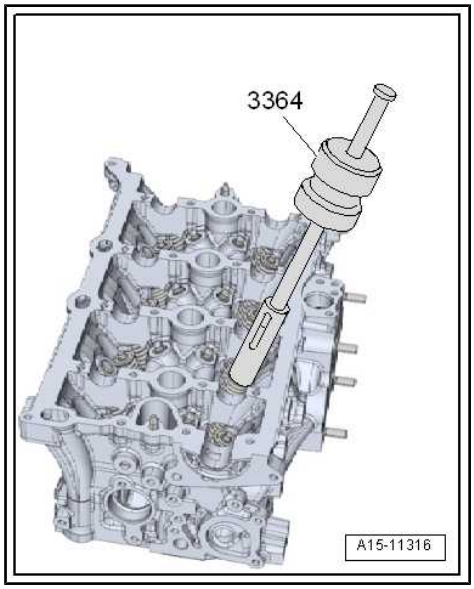


For exhaust side

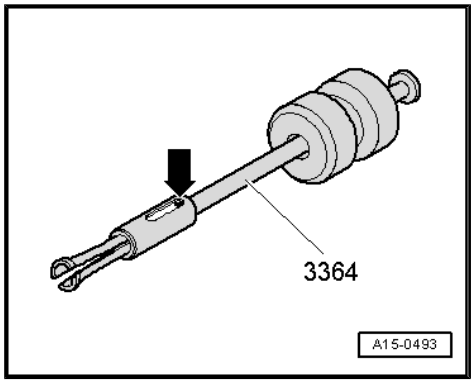
– Screw snap-in device - VAS 5161/6- with engaging fork - VAS 5161/5- into outer thread on guide plate for 2.0 ltr. and 3.0 ltr. FSI engine - VAS 5161/19B- .
– Press down assembly cartridge - VAS 5161/8- and at the same time, turn knurled screw of assembly cartridge - VAS 5161/8- clockwise until tips 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- .



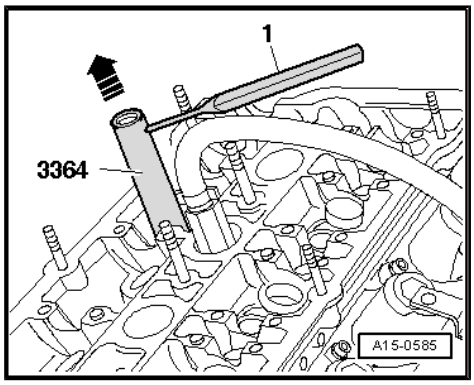
– Pull off valve stem oil seal with valve stem seal puller - 3364- .



– 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.

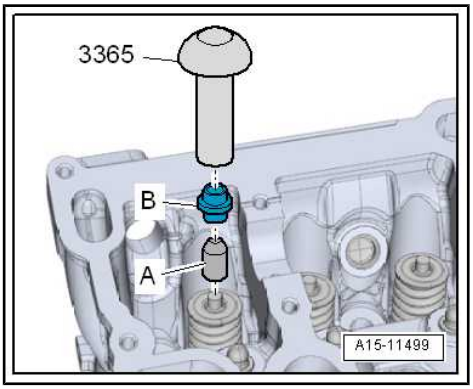


– Position lower part of valve stem seal puller - 3364- on valve stem oil seal.
– Insert a punch -1- through hole in lower section of puller.
– Apply assembly lever to puller and pull out valve stem oil seal -arrow-.



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Installing valve stem oil seals



Caution

Make sure valve stem oil seals are not damaged when installing.

- ***New valve stem oil seals -B- are supplied with plastic sleeve; fit plastic sleeve -A- onto valve stem.***

– To prevent damage to the new valve stem seals -B-, attach plastic sleeve -A- to valve stem.

– Lightly oil sealing lip of valve stem oil seal.

– Slide valve stem oil seal onto plastic sleeve.

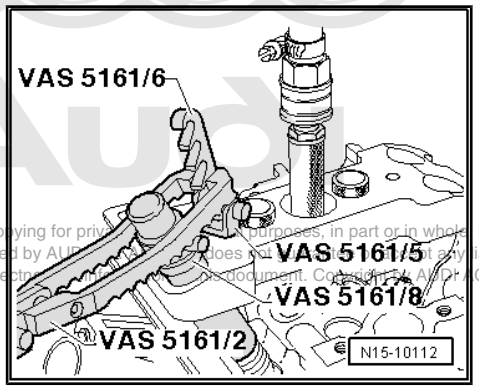
– Carefully press valve stem oil seal onto valve guide using valve stem seal fitting tool - 3365- .

– Remove plastic sleeve.

– Insert valve spring and valve spring plate.

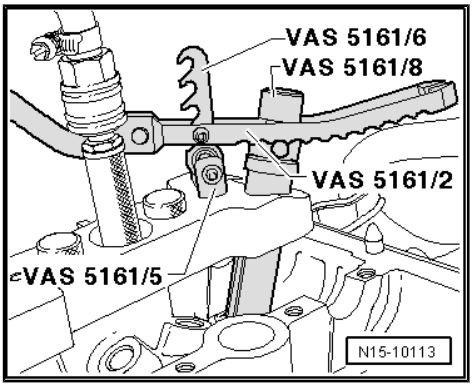
– Set up removal and installation device for valve cotters - VAS 5161- as shown.

For inlet side



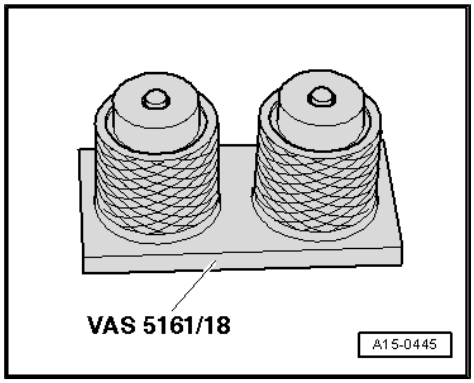
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For exhaust side



Note

- *If valve cotters have been removed from assembly cartridge, they need to be put into insertion device - VAS 5161/18- first.*
- *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- .

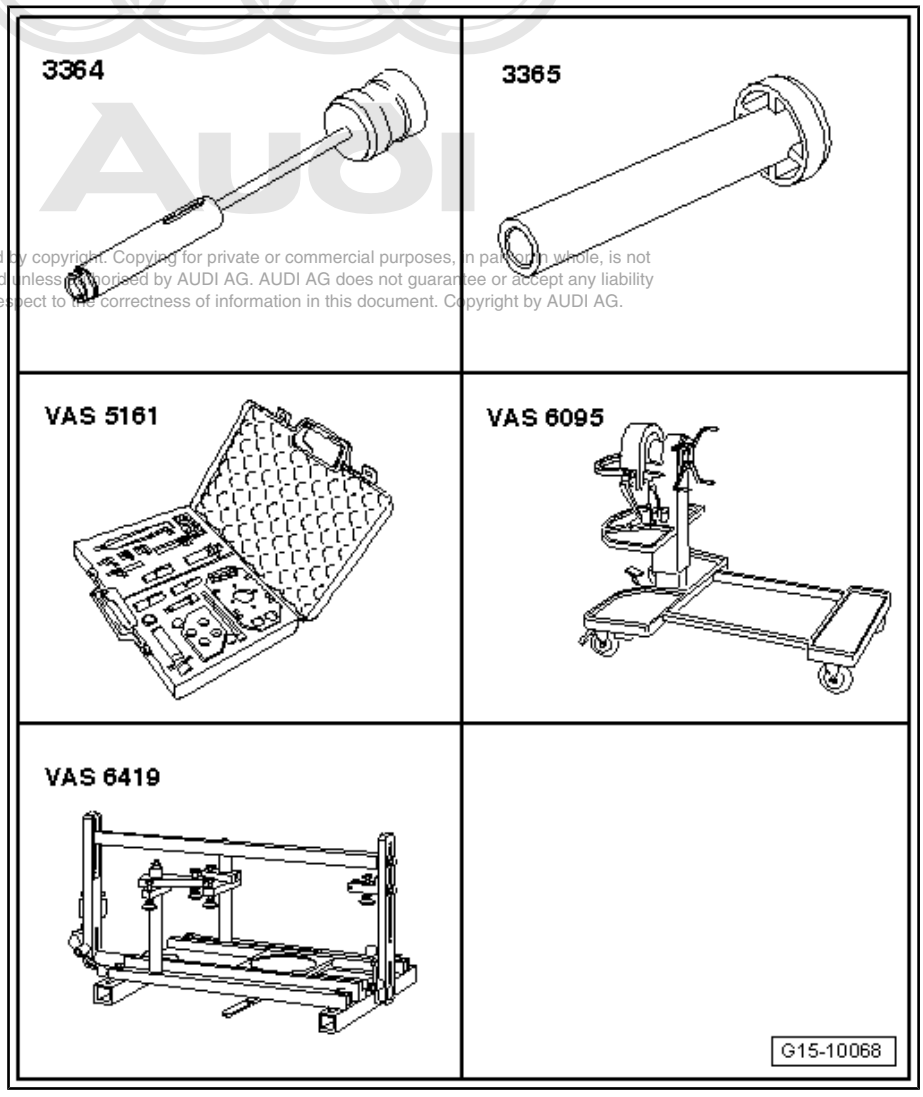
Further assembly is basically carried out in reverse order of dismantling.

– Install camshafts ⇒ page 139 .

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-
- Removal and installation device for valve cotters - VAS 5161-
- Guide plate for 2.0 ltr. and 3.0 ltr. FSI engine - VAS 5161/19B-
- Engine and gearbox support - VAS 6095-
- Cylinder head tensioning device - VAS 6419-



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Procedure

– Remove camshafts ⇒ page 139 .

– 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.

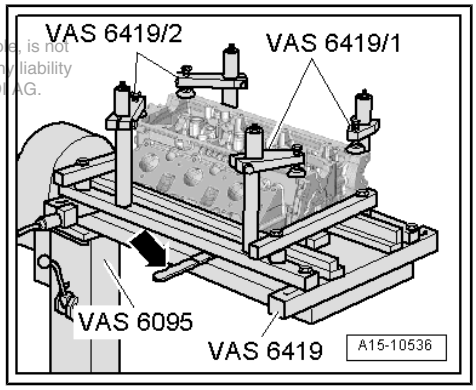
– Insert cylinder head tensioning device - VAS 6419- into engine and gearbox support - VAS 6095- .

– 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.

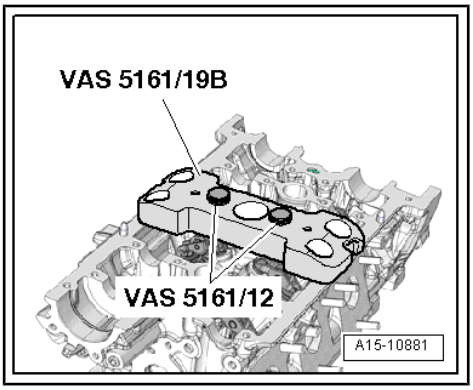
– Apply just enough compressed air to bring air pad into contact with valve heads.



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– Secure guide plate for 2.0 ltr. and 3.0 ltr. FSI engine - VAS 5161/19B- 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.

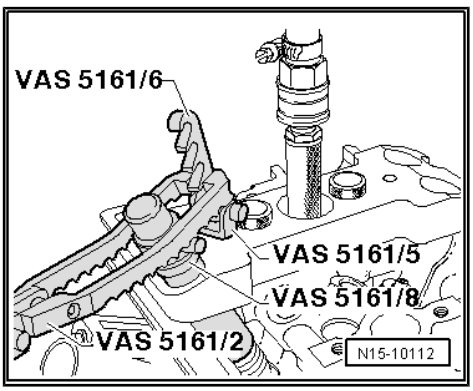


For inlet side

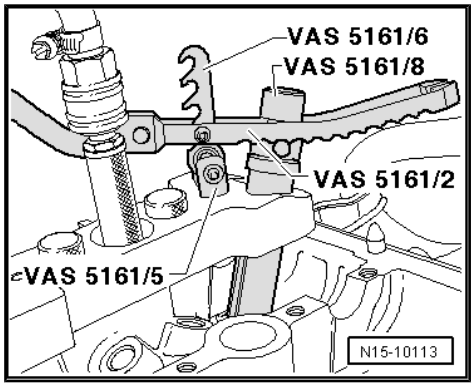
– Screw snap-in device - VAS 5161/6- with engaging fork - VAS 5161/5- into centre thread on guide plate for 2.0 ltr. and 3.0 ltr. FSI engine - VAS 5161/19B- .

– Insert assembly cartridge - VAS 5161/8- into guide plate for 2.0 ltr. and 3.0 ltr. FSI engine - VAS 5161/19B- .

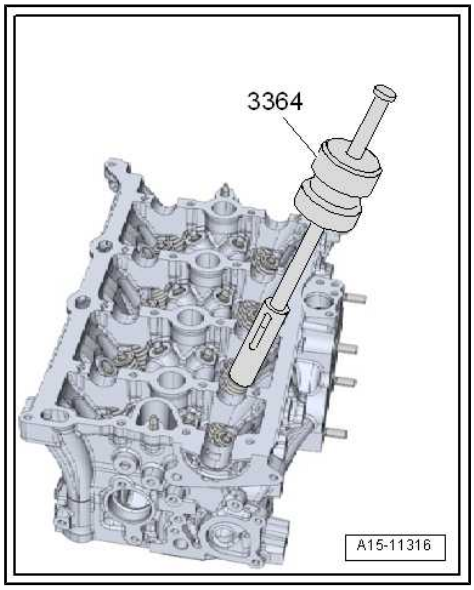
– Engage pressure fork - VAS 5161/2- on snap-in device - VAS 5161/6- .



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 5161/19B- .
- 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- .

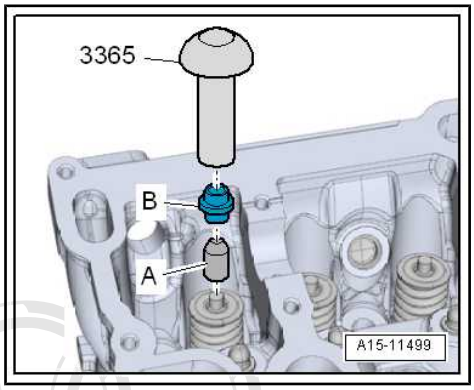


Installing valve stem oil seals

Caution

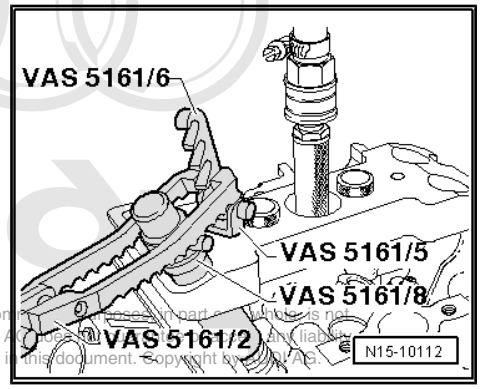
Make sure valve stem oil seals are not damaged when installing.

- ***New valve stem oil seals -B- are supplied with plastic sleeve; fit plastic sleeve -A- onto valve stem.***



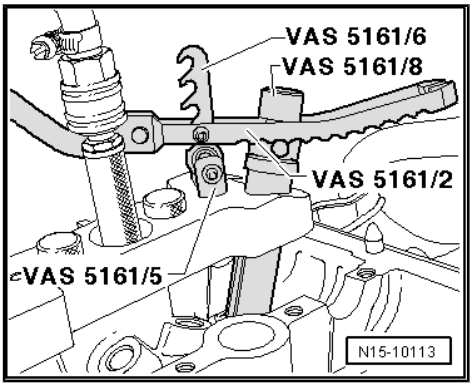
- Lightly oil sealing lip of valve stem oil seal.
- Slide valve stem oil seal onto plastic sleeve.
- Carefully press valve stem oil seal onto valve guide using valve stem seal fitting tool - 3365- .
- Take off plastic sleeve.
- Insert valve spring and valve spring plate.
- Set up removal and installation device for valve cotters - VAS 5161- as shown.

Inlet side



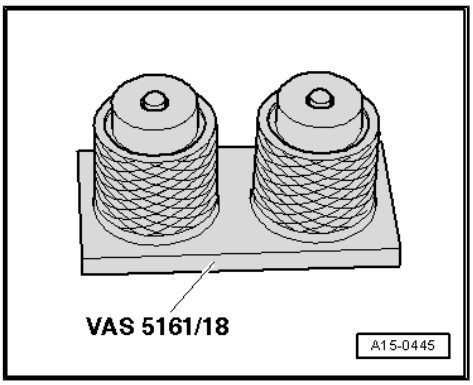
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Exhaust side



Note

- *If valve cotters have been removed from assembly cartridge, they need to be put into insertion device - VAS 5161/18- first.*
- *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- .

Further assembly is basically carried out in reverse order of dismantling. Note the following:

– Install camshafts ⇒ page 139 .

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5 Inlet and exhaust valves

⇒ “5.1 Checking valve guides”, page 162

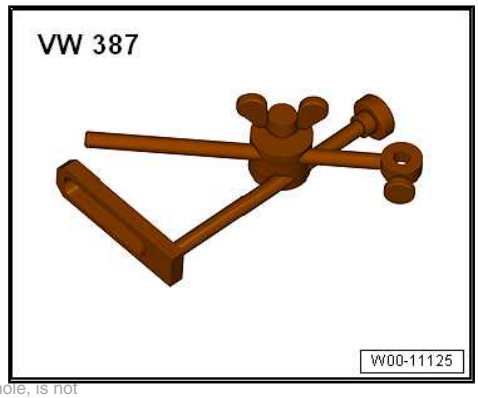
⇒ “5.2 Checking valves”, page 163

⇒ “5.3 Valve dimensions”, page 163

5.1 Checking valve guides

Special tools and workshop equipment required

- Universal dial gauge bracket - VW 387-

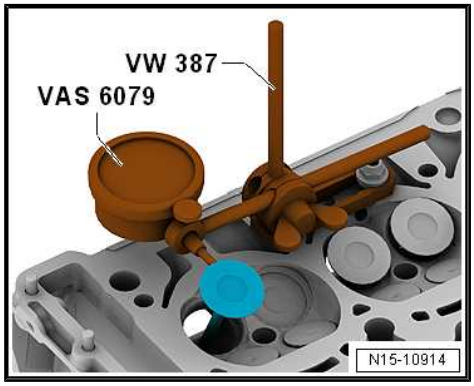


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- Dial gauge - VAS 6079-



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

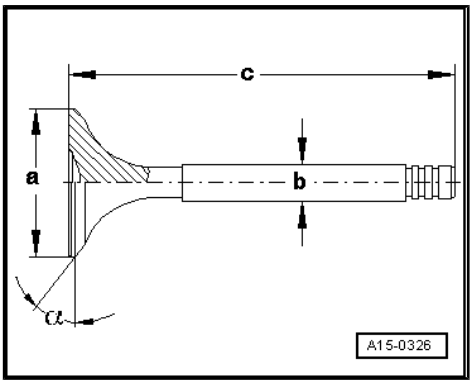
– Visually inspect for scoring on valve stems and valve seat surfaces.

– Renew valve if scoring is clearly visible.

5.3 Valve dimensions

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 164

⇒ “1.2 Engine oil”, page 166

⇒ “1.3 Removing and installing sump (bottom section)”, page 167

⇒ “1.4 Removing and installing oil pump”, page 169

⇒ “1.5 Removing and installing sump (top section)”, page 171

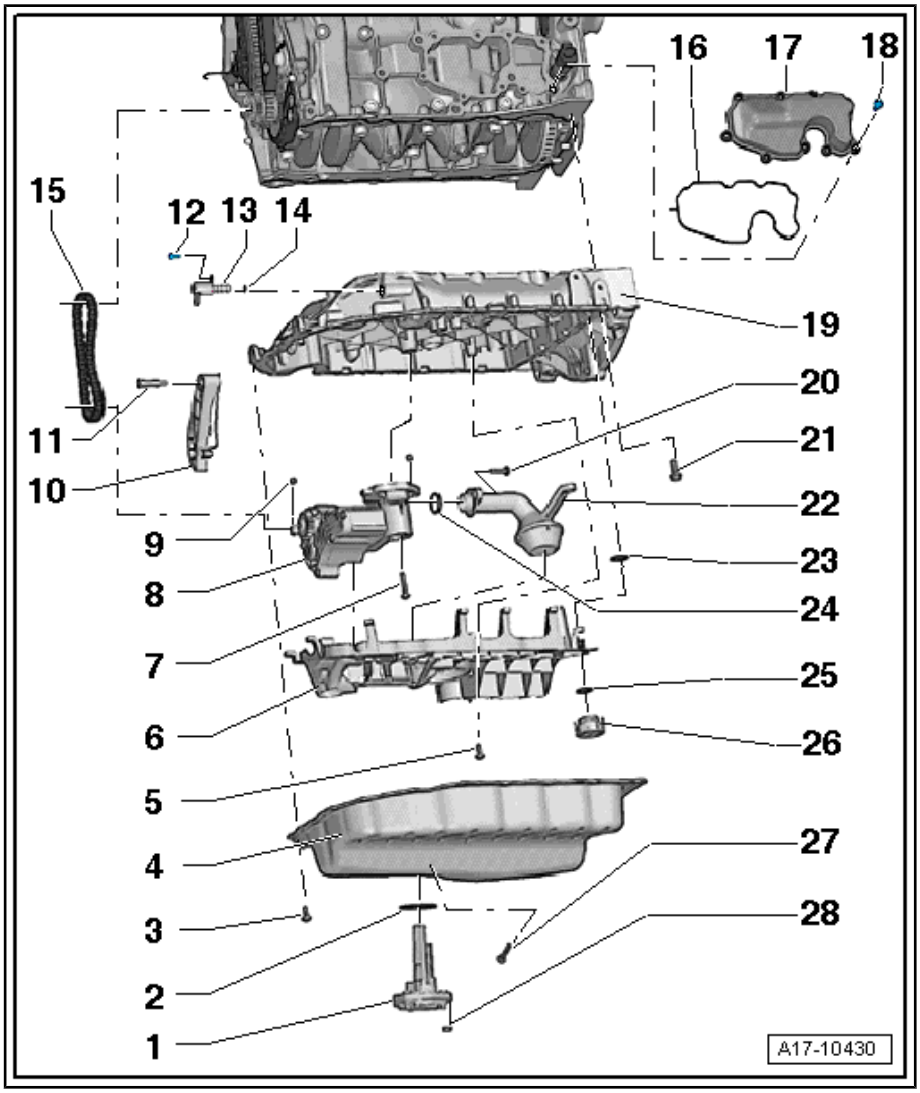
⇒ “1.6 Removing and installing oil level and oil temperature sender G266 ”, page 176

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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.



1 - Oil level and oil temperature sender - G266-

- ❑ Removing and installing ⇒ page 176

2 - Seal

- ❑ Renew

3 - Bolt

- ❑ Renew
- ❑ Tightening sequence ⇒ page 166

4 - Sump (bottom section)

- ❑ Removing and installing ⇒ page 167

5 - Bolt

- ❑ 9 Nm

6 - Baffle plate

- ❑ Always renew after removing

7 - Bolt

- ❑ M6: 9 Nm
- ❑ M8: 20 Nm

8 - Oil pump

- ❑ Removing and installing ⇒ page 169

9 - Dowel sleeve

10 - Chain tensioner

11 - Bolt

- ❑ 9 Nm

12 - Bolt

- ❑ Not fitted on engine code CCTA
- ❑ Tightening torque ⇒ Item 1 (page 183)

13 - Valve for oil pressure control - N428-

- ❑ Not fitted on engine code CCTA
- ❑ Removing and installing ⇒ page 185

14 - O-ring

- ❑ Not fitted on engine code CCTA
- ❑ Renew

15 - Drive chain

- ❑ For oil pump
- ❑ Before removing, mark running direction with paint

16 - Gasket

- ❑ Renew

17 - Coarse oil separator

- ❑ Removing and installing ⇒ page 180

18 - Bolt

- ❑ Tightening sequence ⇒ page 180

19 - Sump (top section)

- ❑ Removing and installing ⇒ page 171

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20 - Bolt

- ❑ 9 Nm

21 - Bolt

- ❑ Renew
- ❑ Tightening sequence ⇒ page 166

22 - Oil intake pipe

- ❑ Clean strainer if dirty

23 - O-ring

- ❑ Renew

24 - O-ring

- ❑ Renew

25 - O-ring

- ❑ Renew

26 - Non-return valve

27 - Oil drain plug

- ❑ Renew
- ❑ 30 Nm

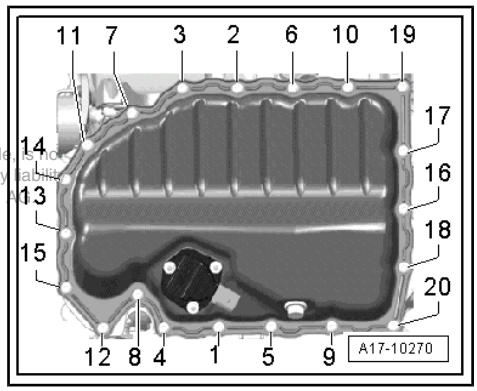
28 - Nut

- ❑ 9 Nm

Tightening sequence for sump (bottom section)

– Tighten bolts in the sequence -1 to 20- in 3 stages as follows:

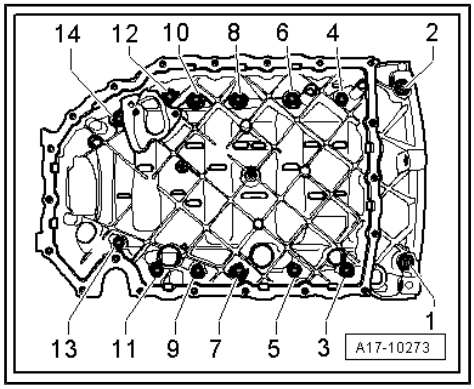
1. Tighten bolts hand tight.
2. Tighten bolts to 8 Nm.
3. Turn bolts 45° further.



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Tightening sequence for sump (top section)

– Tighten bolts in the sequence -1 to 14- in 3 stages as follows:



Note

Some versions have only 13 bolts.

1. Tighten bolts hand tight.
2. Tighten bolts to 15 Nm.
3. Turn bolts 90° further.

1.2 Engine oil

- Oil capacities, oil specifications and viscosity grades ⇒ Maintenance tables .
- Check oil level ⇒ Maintenance ; Booklet 820 .

Caution

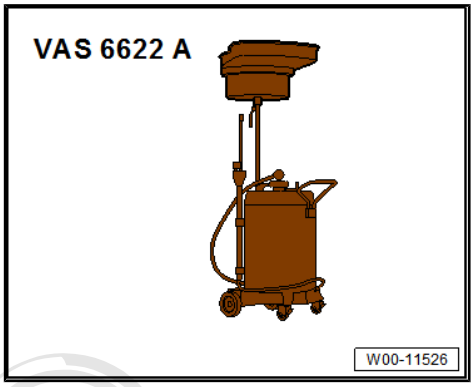
Risk of damage to catalytic converter.

- *The oil level must not be above the "MAX" mark on the dipstick.*

1.3 Removing and installing sump (bottom section)

Special tools and workshop equipment required

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

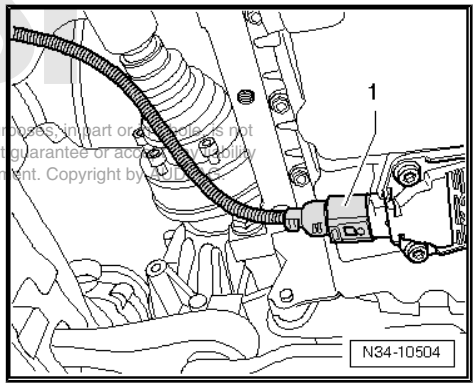


- Flat scraper
- Sealant remover
- Electric drill with plastic brush attachment
- Safety goggles
- Sealant ⇒ Electronic parts catalogue

Removing

– Drain off engine oil ⇒ Maintenance ; Booklet 820 .

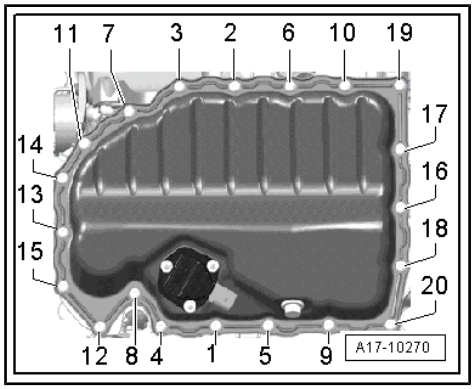
– Unplug electrical connector -1- at oil level and oil temperature sender - G266- .



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– Slacken and remove bolts in the sequence: -20 ... 1-.

– Take off sump: if necessary loosen it by striking lightly with a rubber hammer.



Installing

Caution

Protect lubrication system and bearings against contamination.

- *Cover exposed parts of the engine.*

- Silicone sealant ⇒ Electronic parts catalogue

Note

- *Note expiry date of silicone sealant.*
- *The sump must be installed within 5 minutes after applying the silicone sealant.*

– Spray sealing surface with sealant remover and wait for it to take effect.

– Remove sealant remaining on sump (top section) with flat scraper.

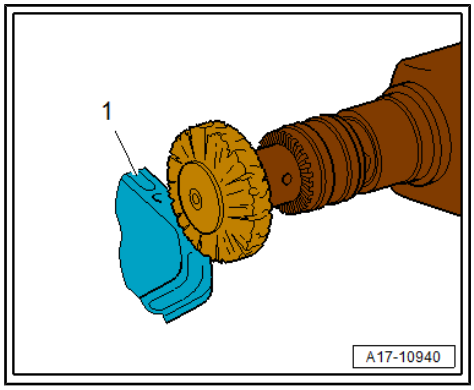
WARNING

Risk of eye injury.

- *Put on safety goggles.*

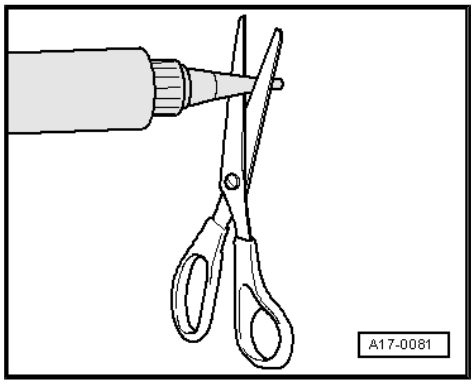
– Remove sealant residue on sump (bottom section) -1- using rotating plastic brush or similar.

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

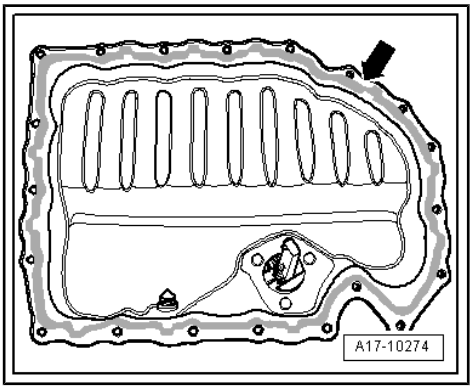


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– Cut off nozzle of tube at front marking (∅ of nozzle approx. 3 mm).



– Apply the bead of silicone sealant onto the clean sealing surface of the sump (bottom section), as illustrated.



Caution

Make sure lubrication system is not clogged by excess sealant.

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

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

Note

- *The sump 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.*

– Immediately fit sump (bottom section) and tighten bolts; tightening sequence ⇒ page 166 .

Note

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

– Fill with engine oil and check oil level ⇒ Maintenance ; Booklet 820 .

Further assembly is basically carried out in reverse order of dismantling.

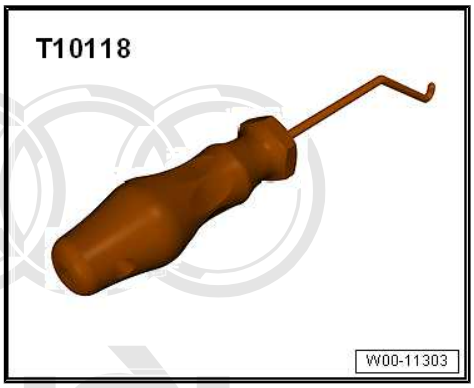
Tightening torques

- ⇒ “1.1 Exploded view - sump/oil pump”, page 164

1.4 Removing and installing oil pump

Special tools and workshop equipment required

- Assembly tool - T10118-



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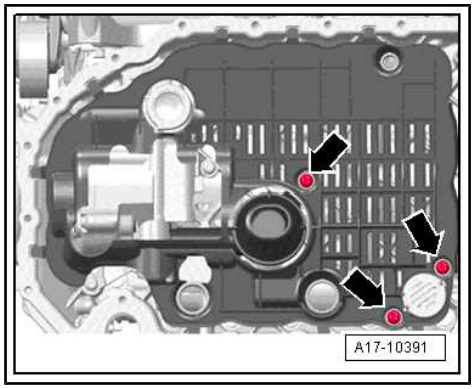
♦ Locking tool - T40265-



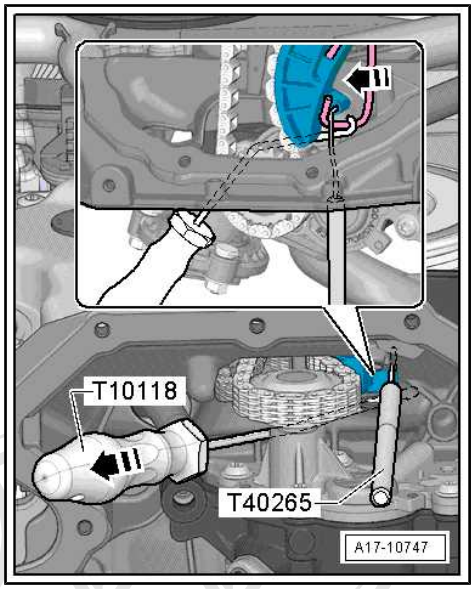
Removing

– Remove sump (bottom section) ⇒ page 167 .

– Remove bolts -arrows- and detach baffle plate.

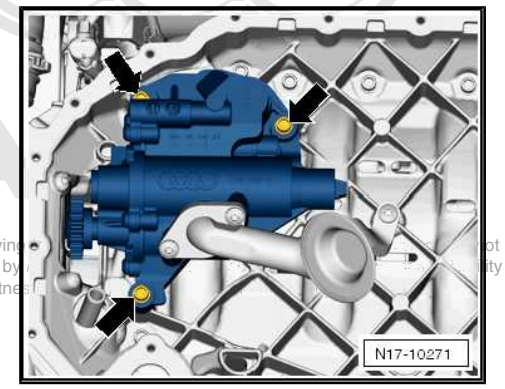


– Using assembly tool - T10118- , pull spring of chain tensioner in direction of -arrow- and secure with locking tool - T40265- .



Oil pump with 3 connection points

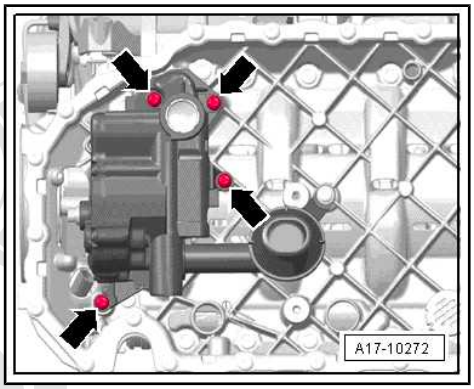
– Remove bolts -arrows- and detach oil pump.



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Oil pump with 4 connection points

– Remove bolts -arrows- and detach oil pump.



Installing

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

– Before installing oil pump, check strainer in oil intake pipe and oil passages in sump (top section) for dirt.

– Check that both centring sleeves are fitted in oil pump.

– Guide oil pump sprocket into drive chain and install oil pump.

Caution

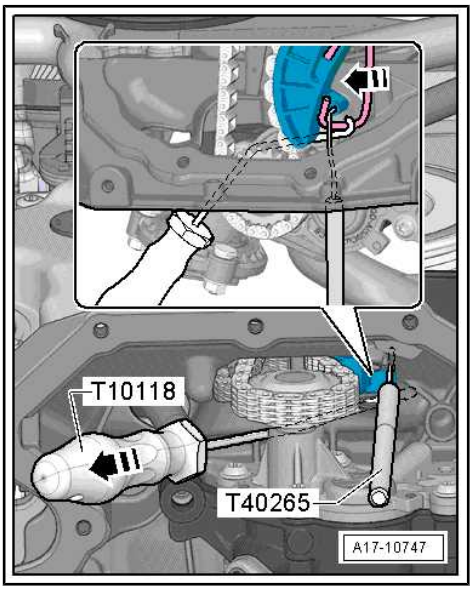
Risk of irreparable damage to engine.

- ***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 new baffle plate and secure in position.



Note

The plastic fins on the baffle plate are deformed permanently when tightening. The plastic fins make sure that the baffle plate rests on the contact surface without play and does not cause rattling noises. The baffle plate must therefore always be renewed.

– Install sump (bottom section) ⇒ page 167 .

– Fill with engine oil and check oil level ⇒ Maintenance ; Booklet 820 .

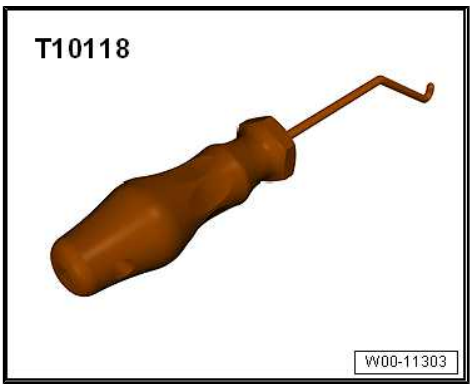
Tightening torques

- ⇒ “1.1 Exploded view - sump/oil pump”, page 164

1.5 Removing and installing sump (top section)

Special tools and workshop equipment required

- Assembly tool - T10118-



- Locking tool - T40265-



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

Removing

– Remove gearbox ⇒ Rep. gr. 34 ; Removing and installing gearbox; Removing gearbox .

– Remove oil pump ⇒ page 169 .

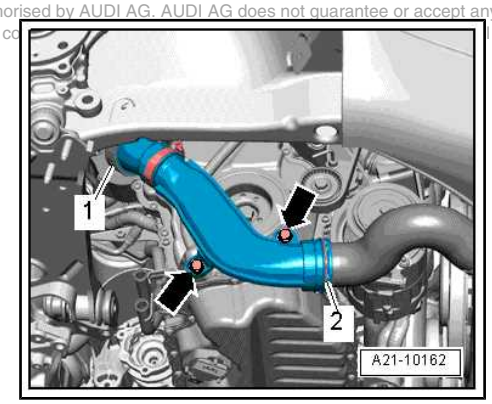
– Remove sealing flange (gearbox end) ⇒ page 64 .

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

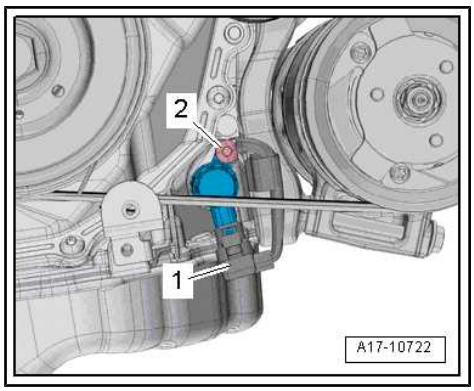
– Lift retaining clips -1 and 2- and disconnect air hoses.

– Unscrew bolts -arrows- and detach air pipe.

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– Unplug electrical connector -1- at valve for oil pressure control - N428- (not installed on all engine versions).

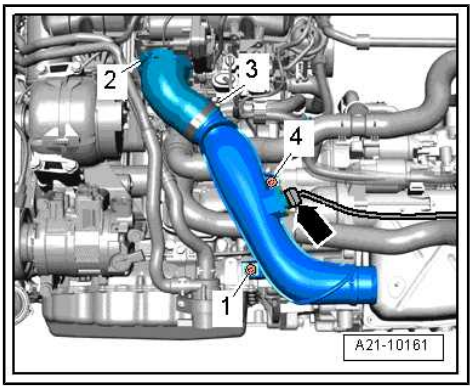


Note

Disregard -item 2-.

– Remove bolt -1-.

– Remove wiring retainer next to continued coolant circulation pump - V51- .

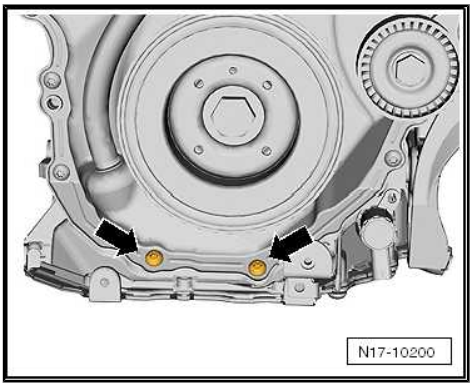


WARNING

Injury risk!

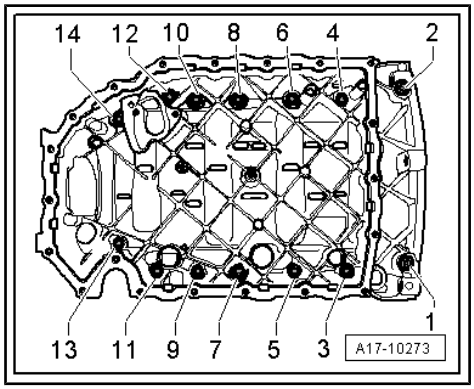
- *The chain tensioner spring for oil pump drive jumps from sump (top section) to timing chain cover (bottom) when detaching sump (top section). Do not reach between sump (top section) and timing chain cover (bottom) when removing sump (top section).*

– Remove bolts -arrows-.



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– Slacken and remove bolts in the sequence: -14 ... 1-.



Note

Some versions have only 13 bolts.

– Carefully release sump (top section) from bonded joint.

Caution

Risk of damage to timing chain cover.

- ***Lever off sump (top section) at gearbox end first. Do not bend timing chain cover when levering off.***

Installing

Note

- *Renew the bolts tightened with specified tightening angle.*
- *Renew seals, gaskets and self-locking nuts.*
- *Renew baffle plate.*

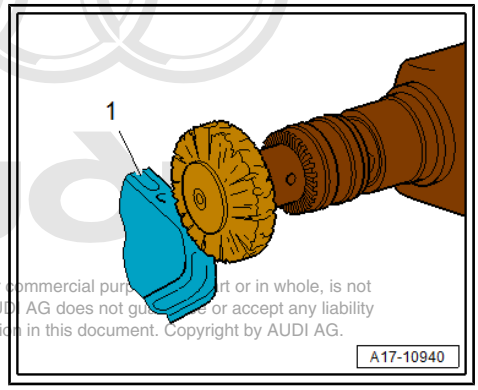
– Remove sealant remaining on cylinder block with flat scraper.

WARNING

Risk of eye injury.

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

– Use e.g. a rotating plastic brush to remove sealant residue on sump (top section) -1-.



Note

Check if 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).

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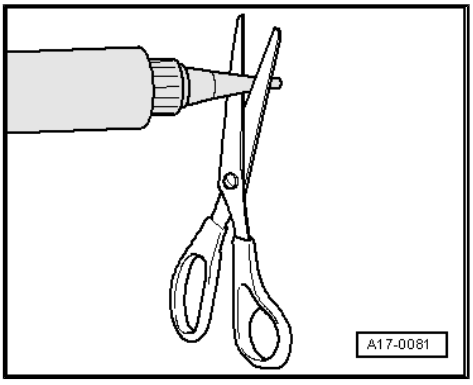
– Check oil passages in sump (top section) and in cylinder block for dirt.

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

Note

Note the use-by date of the sealant.

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

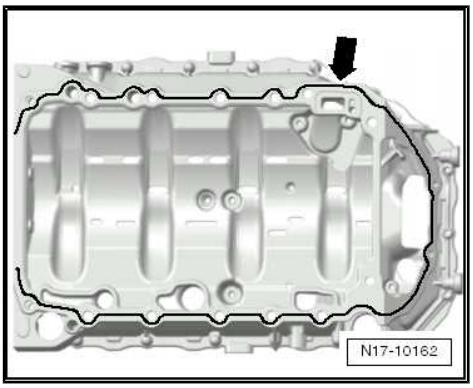


Caution

Make sure lubrication system is not clogged by excess sealant.

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

– Apply bead of sealant -arrow- onto clean sealing surface of sump (top section) as shown in illustration.



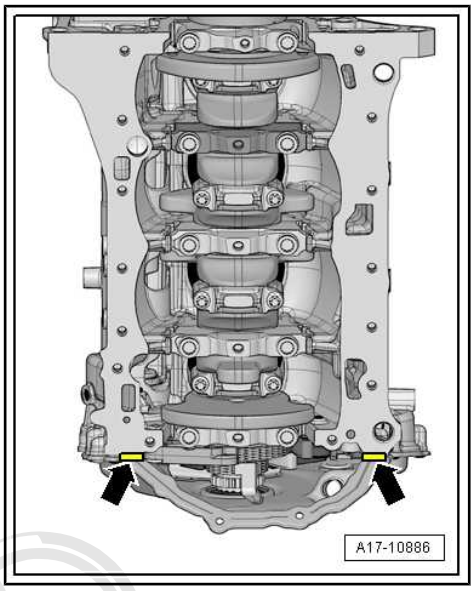
- Thickness of sealant bead: 2 ... 3 mm.
- Apply silicone sealant between cylinder block and timing chain cover (bottom), as illustrated -arrows-.

Note

The sump (top section) must be installed within 5 minutes after applying the sealant.

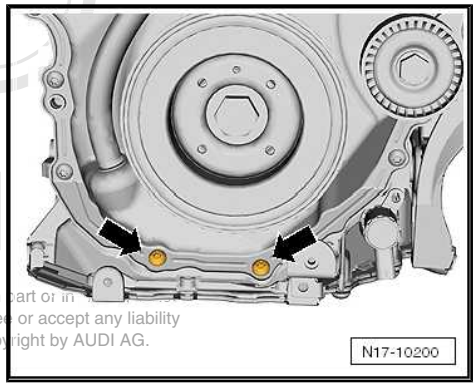
- Sump (top section) and crankcase must be flush at gearbox end.

– Immediately fit sump (top section) and tighten bolts, tightening torque ⇒ page 166 .



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– Tighten bolts -arrows-. Tightening torque ⇒ Item 13 (page 90)



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

– Install oil pump ⇒ page 169 .
– Fit new baffle plate and secure in position.
– Remove sump (bottom section) ⇒ page 167 .
– Install air ducts ⇒ page 248 .
– Install wheel spoiler (right-side) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front) .
– Install sealing flange ⇒ page 64 .
– Fill with engine oil and check oil level ⇒ Maintenance ; Booklet 820 .

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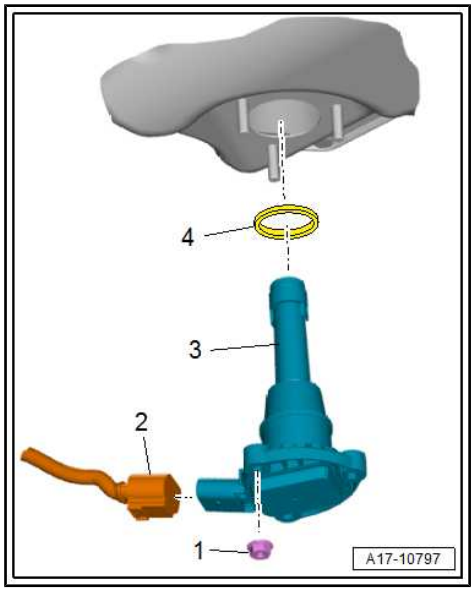
Tightening torques

- ⇒ “1.1 Exploded view - sump/oil pump”, page 164 .
- ⇒ “2.1 Exploded view - charge air system”, page 247 .

1.6 Removing and installing oil level and oil temperature sender - G266-

Removing

- Engine oil drained ⇒ Maintenance ; Booklet 820
– Unplug electrical connector -2-.
– Remove nuts -1- and detach oil level and oil temperature sender - G266- -item 3-.



Installing

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

Note

Renew seal -4-.

– Fill with engine oil and check oil level ⇒ Maintenance ; Booklet 820 .

Tightening torques

- ⇒ “1.1 Exploded view - sump/oil pump”, page 164

2 Engine oil cooler

⇒ "2.1 Exploded view - engine oil cooler", page 177

⇒ "2.2 Removing and installing engine oil cooler", page 178

2.1 Exploded view - engine oil cooler

1 - Bracket for ancillaries
- ❑ Removing and installing ⇒ page 57

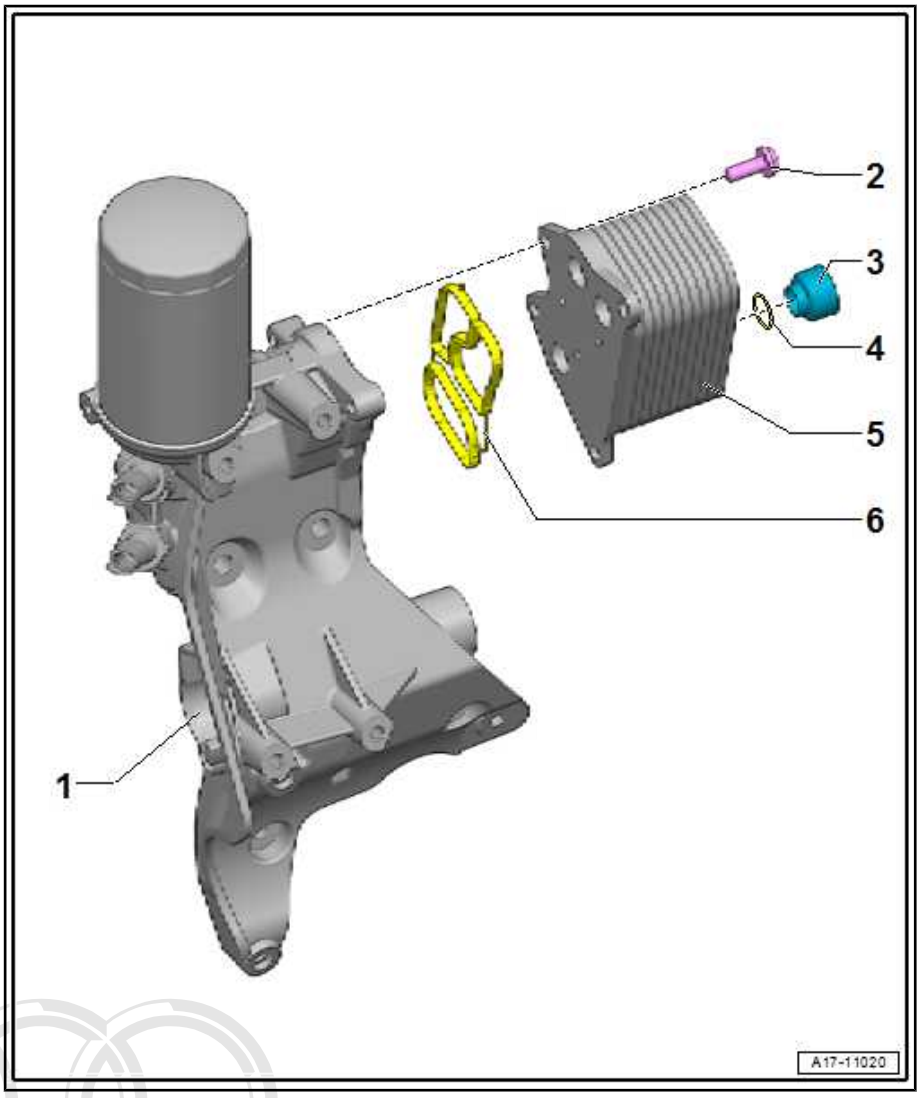
2 - Bolt
- ❑ Renew
- ❑ 8 Nm + 45°

3 - Connection

4 - Seal
- ❑ Renew
- ❑ Lubricate with coolant

5 - Engine oil cooler
- ❑ See note ⇒ page 164
- ❑ Removing and installing ⇒ page 178

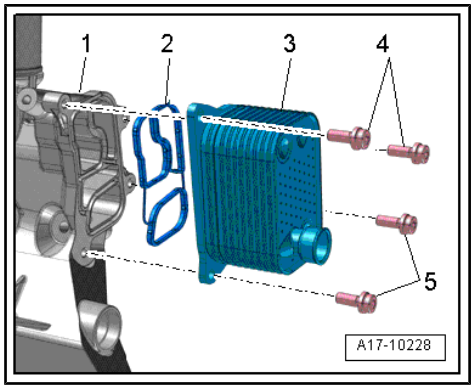
6 - Gasket
- ❑ Renew



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2.2 Removing and installing engine oil cooler

Removing



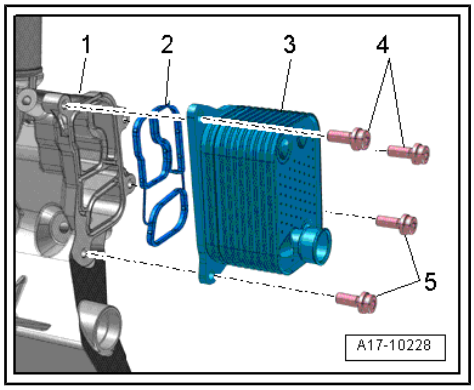
– Drain coolant ⇒ page 194 .
– Remove bracket for ancillaries ⇒ page 57 .
– Unscrew bolts -4 and 5- and remove engine oil cooler -3- together with seal -2-.

Installing

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

Note

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



– Install engine oil cooler -3- with new seal -2-.
– Install bracket for ancillaries ⇒ page 57 .

Note

Do not reuse coolant.

– Fill up with coolant ⇒ page 200 .
– Fill with engine oil and check oil level ⇒ Maintenance ; Booklet 820 .

Tightening torques

- ⇒ “2.1 Exploded view - engine oil cooler”, page 177
- ⇒ “4.2 Exploded view - oil pressure switches/oil pressure control”, page 183

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3 Crankcase breather

⇒ “3.1 Exploded view - crankcase breather system”, page 179

⇒ “3.2 Removing and installing crankcase breather system”, page 180

⇒ “3.3 Removing and installing oil separator”, page 180

3.1 Exploded view - crankcase breather system

1 - Breather pipe

2 - O-ring

- ❑ Not available as replacement part

3 - Seal

- ❑ Not available as replacement part

4 - Crankcase breather

- ❑ Note correct sequence when tightening ⇒ page 180
- ❑ Removing and installing ⇒ page 180

5 - Bolt

- ❑ Tightening sequence ⇒ page 180

6 - Gasket

- ❑ Renew if damaged

7 - Gasket

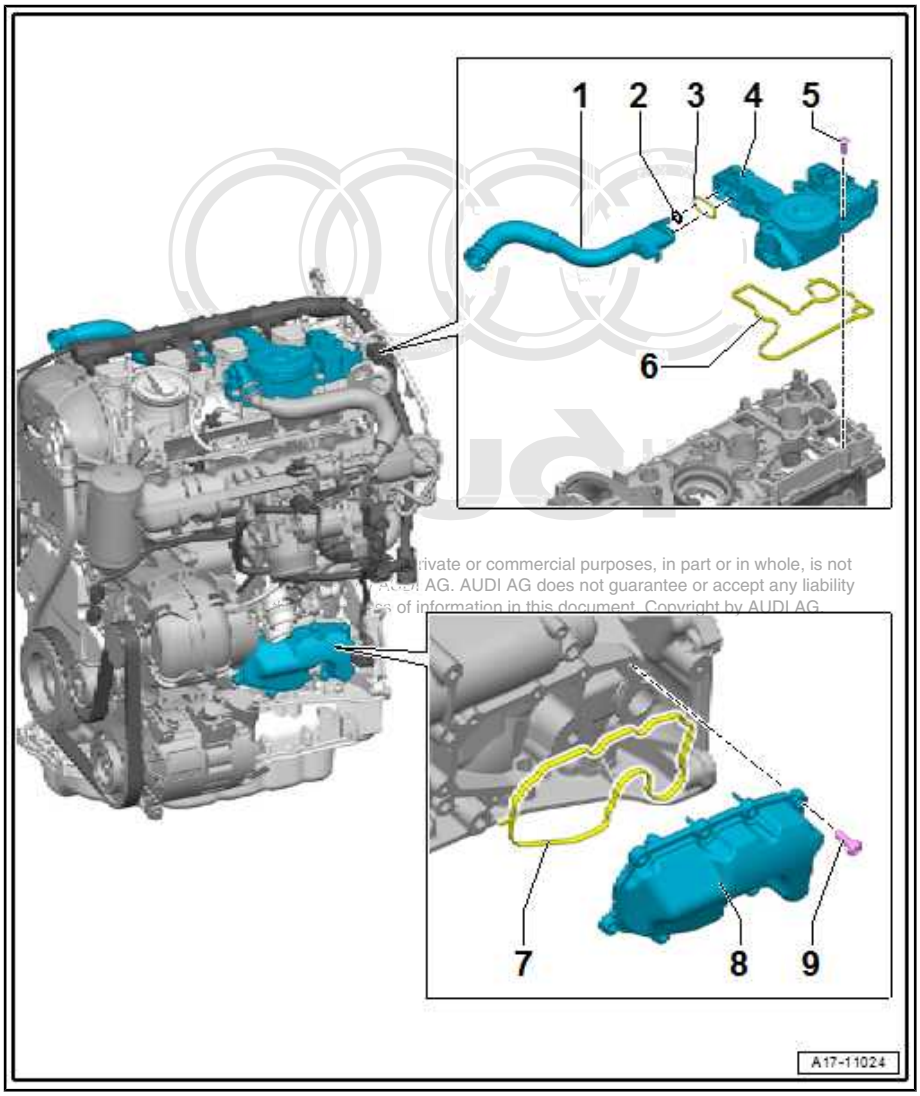
- ❑ Renew

8 - Coarse oil separator

- ❑ Removing and installing ⇒ page 180

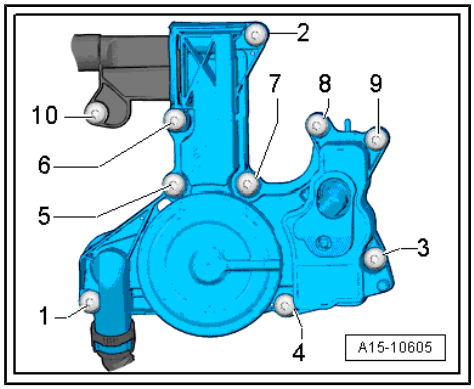
9 - Bolt

- ❑ Tightening sequence ⇒ page 180



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Crankcase breather system - tightening torque

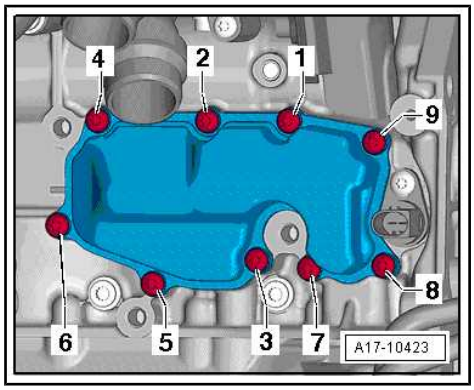


Note

- *The bolts are thread-forming bolts. When renewing the cylinder head, it is important that you use only genuine bolts since the cylinder head is supplied without threaded holes for attachment of the crankcase breather.*
- *Do NOT make threaded holes using a thread tap.*

– Tighten bolts for crankcase breather system in the sequence -1 ... 10- to 11 Nm.

Tightening sequence for coarse oil separator



– Tighten bolts in the sequence -1 ... 9- to 9 Nm.

3.2 Removing and installing crankcase breather system

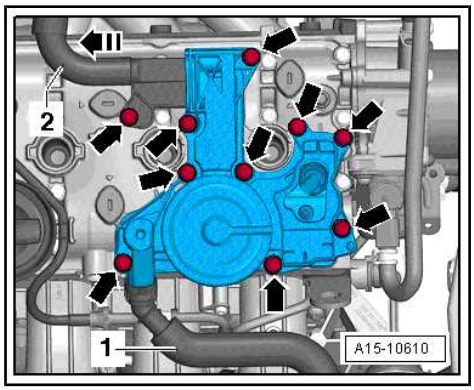
Removing

– Remove engine cover panel ⇒ page 46 .

– Remove ignition coils with output stage for cylinders 3 and 4 ⇒ page 307 .

– Disconnect crankcase breather hose -1-.

– Remove bolts -arrows-, detach crankcase breather system and disconnect from crankcase breather hose -2- in direction of -arrow-.



Installing

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

– Install ignition coils with output stage for cylinders 3 and 4 ⇒ page 307 .

Tightening torques

- ⇒ “3.1 Exploded view - crankcase breather system”, page 179

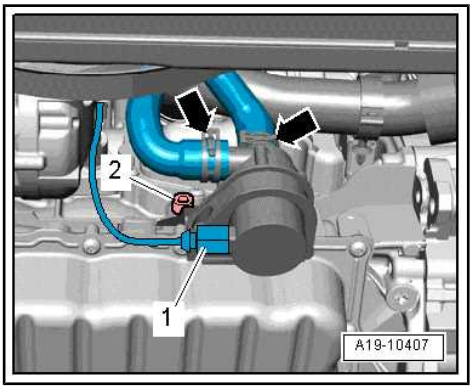
3.3 Removing and installing oil separator

Removing

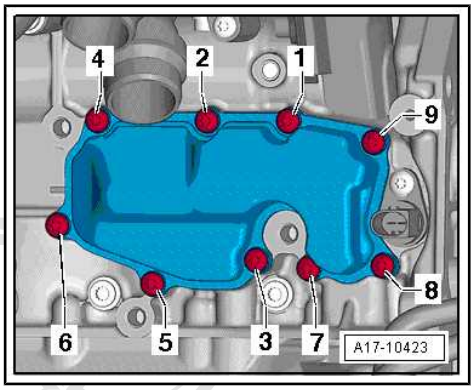
– Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

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– Remove bolt -2- and press continued coolant circulation pump - V51- to side.



– Loosen and remove bolts in the sequence: -9 ... 1- and detach coarse oil separator.



Installing

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

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

Tightening torques

- ⇒ Fig. ""Tightening sequence for coarse oil separator"" , page 180 .
- ⇒ "2.2 Exploded view - electric coolant pump", page 203 .

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4 Oil filter/oil pressure switches

⇒ “4.1 Exploded view - oil filter”, page 182

⇒ “4.2 Exploded view - oil pressure switches/oil pressure control”, page 183

⇒ “4.3 Removing and installing oil pressure switch F22 ”, page 184

⇒ “4.4 Removing and installing oil pressure switch for reduced oil pressure F378 ”, page 184

⇒ “4.5 Removing and installing valve for oil pressure control N428 ”, page 185

⇒ “4.6 Checking oil pressure (for all engine codes except CCTA)”, page 186

⇒ “4.7 Checking oil pressure and oil pressure switch F1 , engine code CCTA”, page 187

4.1 Exploded view - oil filter

1 - Bracket for ancillaries

- ❑ Removing and installing ⇒ page 57

2 - O-ring

- ❑ Not available as replacement part, supplied together with valve unit

3 - O-ring

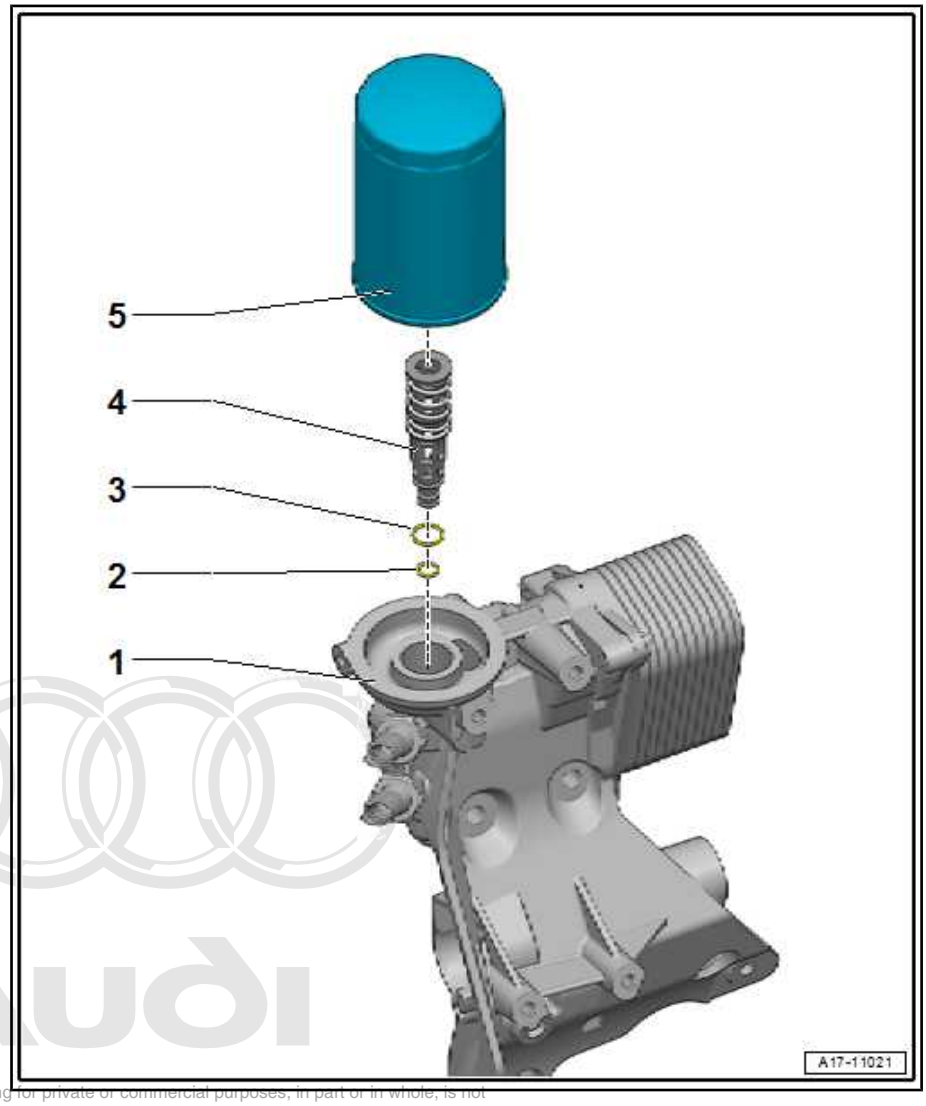
- ❑ Not available as replacement part, supplied together with valve unit

4 - Valve unit

- ❑ With O-rings

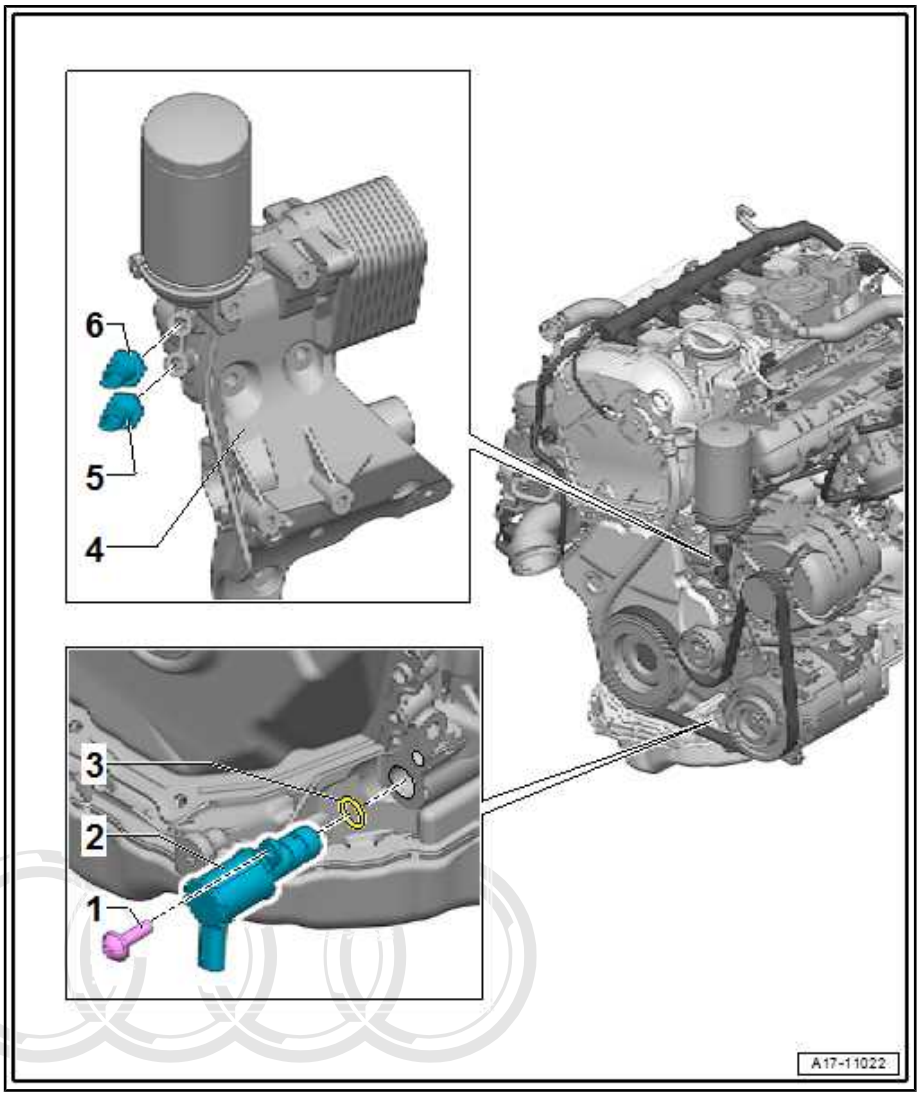
5 - Oil filter

- ❑ Removing and installing ⇒ Maintenance ; Booklet 820



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4.2 Exploded view - oil pressure switches/oil pressure control



1 - Bolt

- ❑ Not fitted on vehicles with engine code CCTA
- ❑ 9 Nm

2 - Valve for oil pressure control - N428-

- ❑ Not fitted on engine code CCTA
- ❑ Removing and installing ⇒ page 185

3 - O-ring

- ❑ Not fitted on engine code CCTA
- ❑ Renew

4 - Bracket for ancillaries

- ❑ Removing and installing ⇒ page 57

5 - Oil pressure switch

- ❑ Oil pressure switch - F22- (for all engine codes except CCTA)
- ♦ 2.15 … 2.95 bar
- ♦ Blue insulation
- ❑ Oil pressure switch - F1- (only for engine code CCTA)
- ♦ 1.2 … 1.6 bar
- ♦ Black insulation
- ❑ Removing and installing ⇒ page 184
- ❑ Check in `Guided Fault Finding` ⇒ Vehicle diagnostic tester
- ❑ 20 Nm

6 - Oil pressure switch for reduced oil pressure - F378-

- ❑ Not fitted on engine code CCTA
- ❑ 0.55 … 0.85 bar
- ❑ Brown insulation
- ❑ Removing and installing ⇒ page 184
- ❑ Check in `Guided Fault Finding` ⇒ Vehicle diagnostic tester
- ❑ 20 Nm

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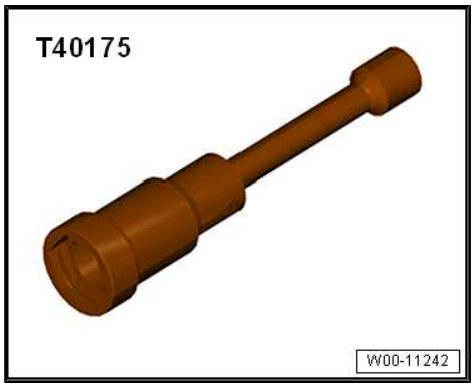
4.3 Removing and installing oil pressure switch - F22-

Note

The procedure is the same as for oil pressure switch - F1- for engine code CCTA.

Special tools and workshop equipment required

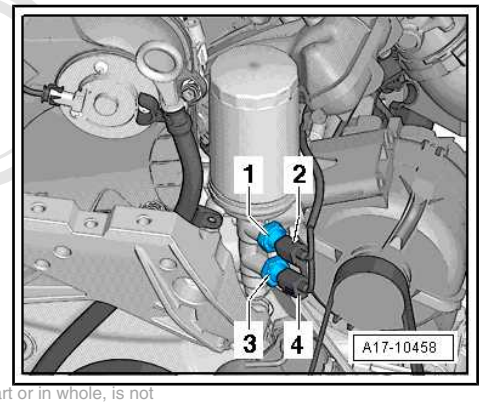
- Articulated wrench, 24 mm - T40175-



Removing

Note

Place a cloth underneath bracket for ancillaries to catch any escaping oil.



– Unplug electrical connector -4- on oil pressure switch - F22- .
– Remove oil pressure switch - F22- -3-.

Installing

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

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Note

- *Renew seal.*
- *Fit the new oil pressure switch - F22- into the connection immediately to avoid loss of oil.*

– Check oil level ⇒ Maintenance ; Booklet 820 .

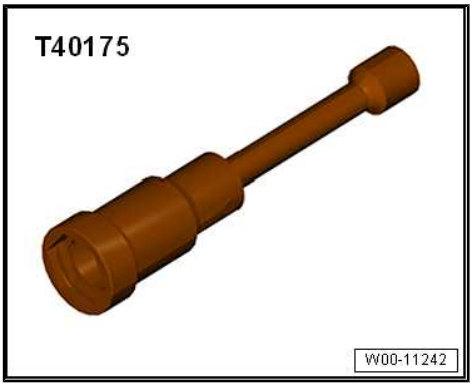
Tightening torques

- ⇒ “4.2 Exploded view - oil pressure switches/oil pressure control”, page 183

4.4 Removing and installing oil pressure switch for reduced oil pressure - F378-

Special tools and workshop equipment required

♦ Articulated wrench, 24 mm - T40175-



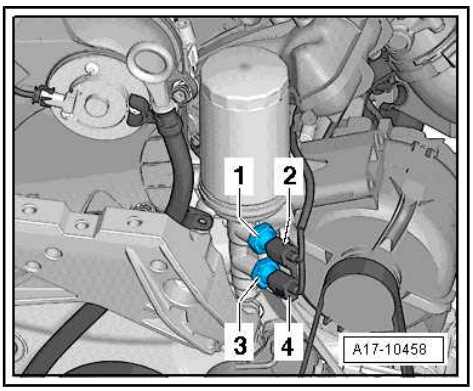
Removing

Note

Place a cloth underneath bracket for ancillaries to catch any escaping oil.

– Unplug electrical connector -2- at oil pressure switch for reduced oil pressure - F378- .

– Unscrew oil pressure switch for reduced oil pressure - F378- -1-.



Installing

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

Note

♦ *Renew seal.*

♦ *Fit the new oil pressure switch for reduced oil pressure - F378- into the connection immediately to avoid loss of oil.*

– Check oil level ⇒ Maintenance ; Booklet 820 .

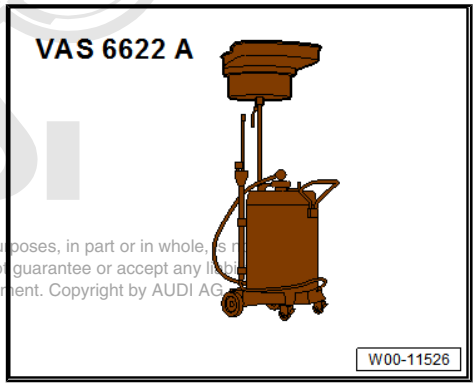
Tightening torques

♦ ⇒ “4.2 Exploded view - oil pressure switches/oil pressure control”, page 183

4.5 Removing and installing valve for oil pressure control - N428-

Special tools and workshop equipment required

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



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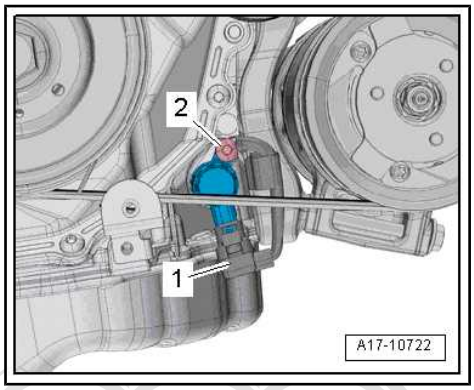
Removing

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

– Remove poly V-belt ⇒ page 49 .

– Unplug electrical connector -1-.

– Remove bolt -2- and detach valve for oil pressure control - N428- .



Installing

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

Note

Fit new O-ring.

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

– Install poly V-belt ⇒ page 49 .

Tightening torques

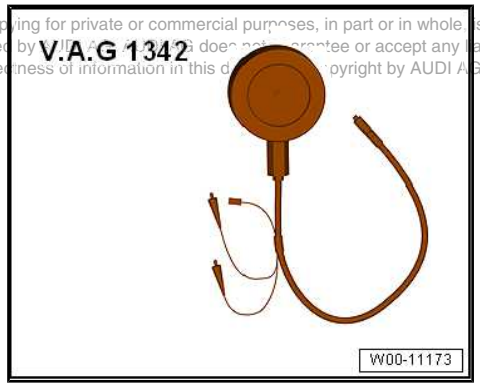
◆ ⇒ “1.1 Exploded view - sump/oil pump”, page 164

4.6 Checking oil pressure (for all engine codes except CCTA)

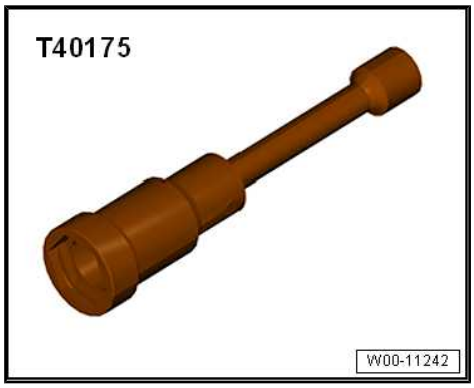
Special tools and workshop equipment required

◆ Oil pressure tester - V.A.G 1342-

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◆ Articulated wrench, 24 mm - T40175-



Test requirements

• Oil level OK; checking ⇒ Maintenance ; Booklet 820

- Engine oil temperature at least 80 °C (radiator fan must have run once).

Test sequence

Note

Place a cloth underneath bracket for ancillaries to catch any escaping oil.

– Unplug electrical connector -2- at oil pressure switch for reduced oil pressure - F378- .

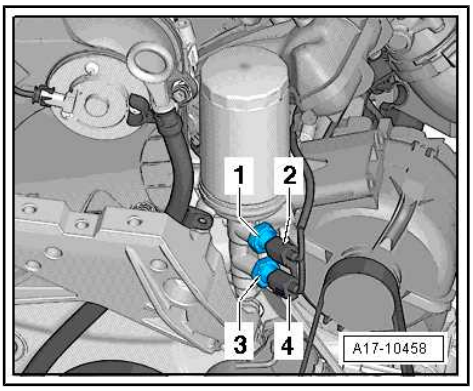
– Unscrew oil pressure switch for reduced oil pressure - F378- -1-.

– Screw oil pressure tester - V.A.G 1342- into oil filter bracket in place of oil pressure switch.

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– Screw oil pressure switch for reduced oil pressure - F378- into hole in oil pressure tester - V.A.G 1342- .

– Start engine.



- Oil pressure at idling speed: 1.2 ... 2.0 bar.
- Oil pressure at 2000 rpm: 1.6 ... 2.2 bar.
- Oil pressure at 3700 rpm: 3.0 ... 4.0 bar.

Note

During the running-in period, the oil pressure at 2000 rpm can be between 3.0 and 4.0 bar.

Assembling

– Install oil pressure switch for reduced oil pressure - F378- ⇒ page 184 .

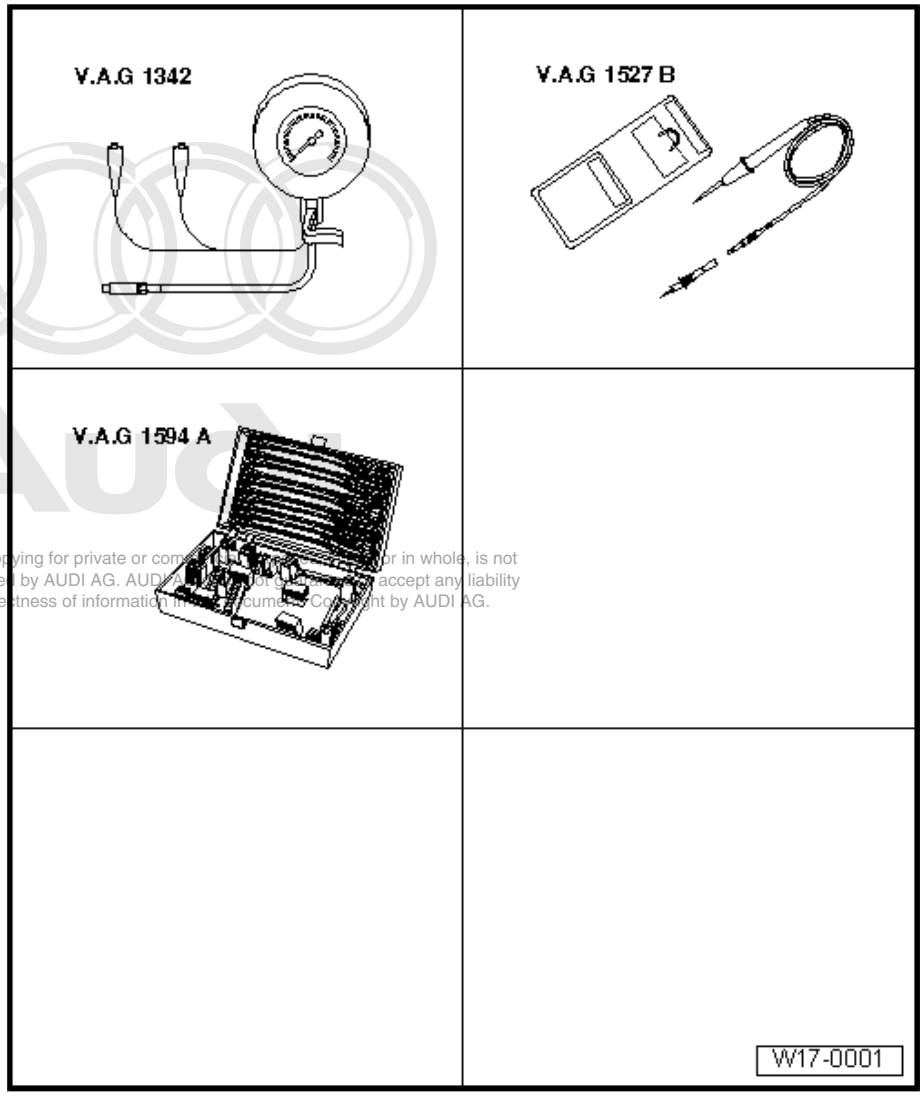
Tightening torques

◆ ⇒ “4.2 Exploded view - oil pressure switches/oil pressure control”, page 183

4.7 Checking oil pressure and oil pressure switch - F1- , engine code CCTA

Special tools and workshop equipment required

- Oil pressure tester - V.A.G 1342-
- Voltage tester - V.A.G 1527 B-
- Auxiliary measuring set - V.A.G 1594 C-



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Test requirements

- Oil level OK, checking ⇒ Maintenance ; Booklet 808 .
- Oil pressure warning lamp must light up for approx. 3 seconds when ignition is switched on.
- In vehicles with auto-check system, the “OK” display must light up (select symbol).
- Engine oil temperature at least 80 °C (radiator fan must have run once).

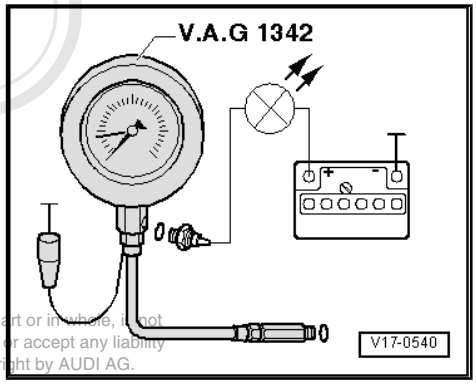
Note

Functional check and servicing the visual and acoustic oil pressure warning: Current flow diagrams ⇒ Vehicle diagnostic tester; “Function and component selection” .

Test sequence

- Tightening torques
  ⇒ “4.2 Exploded view - oil pressure switches/oil pressure control”, page 183

– Remove oil pressure switch - F1- and screw it into tester ⇒ “4.3 Removing and installing oil pressure switch F22 ”, page 184 .
– Screw tester into oil filter bracket in place of the oil pressure switch.
– Connect brown wire of tester to earth (–).
– Connect voltage tester - V.A.G 1527 B- with adapter leads from auxiliary measuring set - V.A.G 1594 C- to battery positive (+) and oil pressure switch - F1- . LED must not light up.
– If LED lights up, renew oil pressure switch - F1- .



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If the LED does not light up:

– Start engine and run at increased speed: at 1.2 ... 1.6 bar pressure the LED should light up; otherwise renew oil pressure switch - F1- . Increase engine speed further. At 2,000 rpm and an oil temperature of 80 °C the oil pressure should be between 2.0 ... 4.5 bar.

19 – Cooling

1 Cooling system/coolant

⇒ “1.1 Connection diagram - coolant hoses”, page 190

⇒ “1.2 Checking cooling system for leaks”, page 192

⇒ “1.3 Draining and filling cooling system”, page 194

1.1 Connection diagram - coolant hoses

⇒ “1.1.1 Connection diagram - coolant hoses, vehicles with manual gearbox”, page 190

⇒ “1.1.2 Connection diagram - coolant hoses, vehicles with dual clutch gearbox”, page 191

⇒ “1.1.3 Connection diagram - coolant hoses, vehicles with automatic gearbox”, page 192

1.1.1 Connection diagram - coolant hoses, vehicles with manual gearbox

1 - Radiator

2 - Continued coolant circulation pump - V51-

3 - Coolant pump

4 - Thermostat

5 - Engine oil cooler

6 - Cylinder head and cylinder block

7 - Turbocharger

8 - Coolant expansion tank

- ❑ With filler cap
- ❑ Checking pressure relief valve in filler cap ⇒ page 194

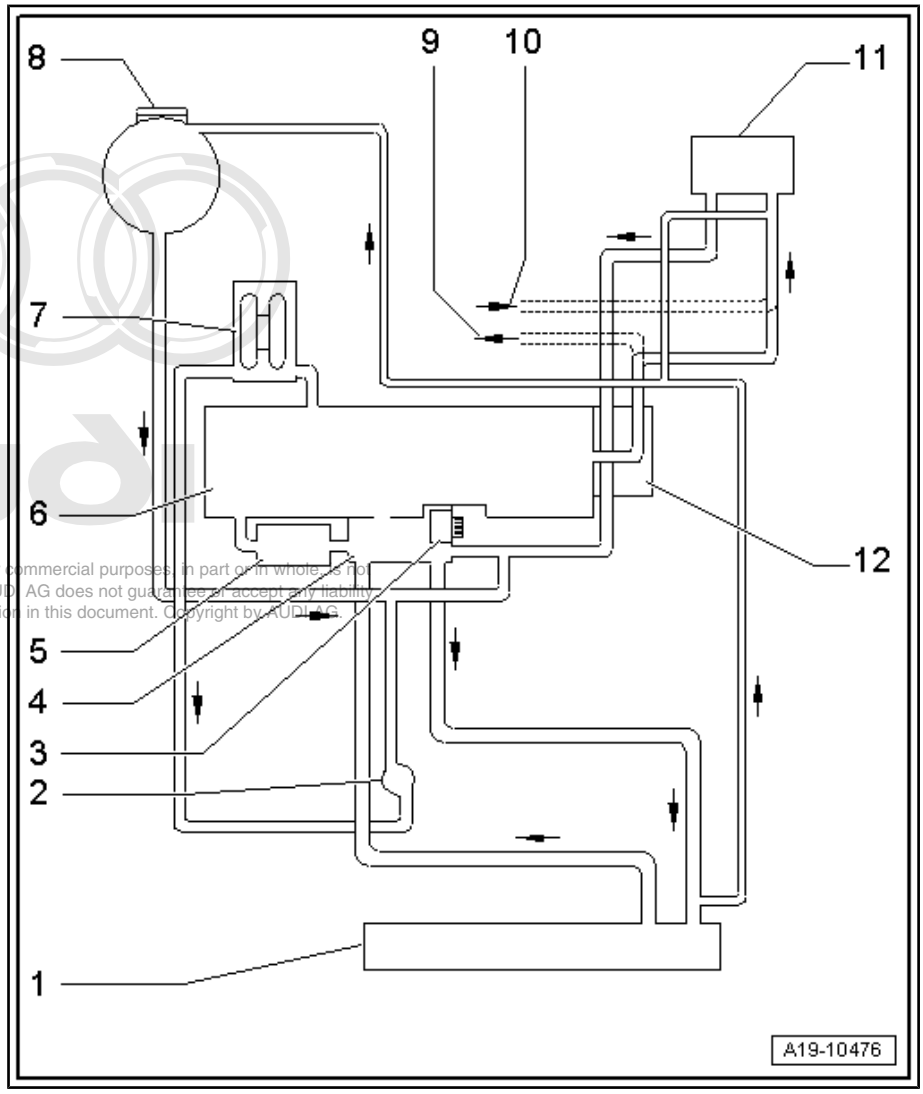
9 - Not fitted

10 - Not fitted

11 - Heat exchanger for heater

- ❑ If renewed, refill system with fresh coolant

12 - Coolant hose/pipe connection



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1.1.2 Connection diagram - coolant hoses, vehicles with dual clutch gearbox

1 - Radiator

2 - Continued coolant circulation pump - V51-

3 - Coolant pump

4 - Thermostat

5 - Engine oil cooler

- ❑ If renewed, refill system with fresh coolant

6 - Cylinder head and cylinder block

7 - Turbocharger

8 - Coolant expansion tank

- ❑ With filler cap
- ❑ Checking pressure relief valve in filler cap ⇒ page 194

9 - Not fitted

10 - Not fitted

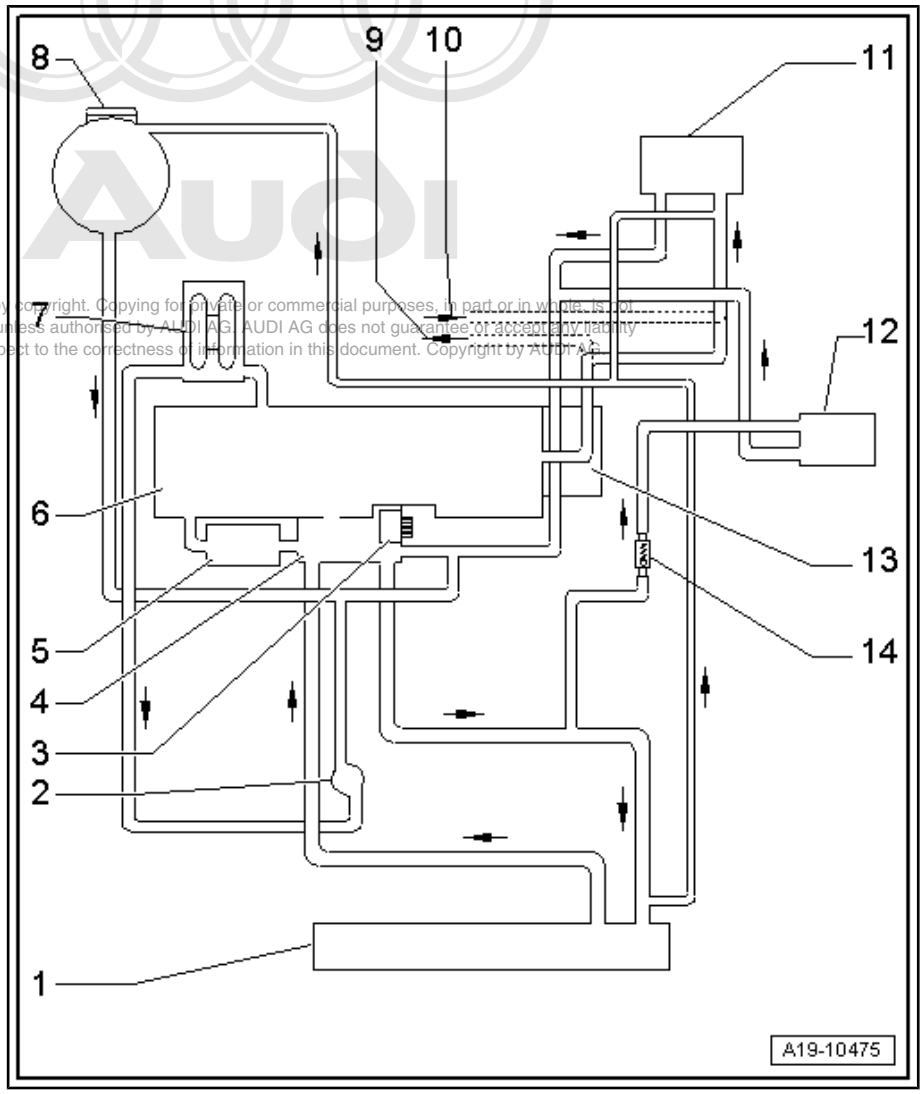
11 - Heat exchanger for heater

12 - Gear oil cooler

13 - Coolant hose/pipe connection

14 - Thermostat

- ❑ For gear oil cooler



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1.1.3 Connection diagram - coolant hoses, vehicles with automatic gearbox

1 - Radiator

2 - Continued coolant circulation pump - V51-

3 - Coolant pump

4 - Thermostat

5 - Engine oil cooler

6 - Cylinder head and cylinder block

7 - Turbocharger

8 - Coolant expansion tank

- ❑ With filler cap
- ❑ Checking pressure relief valve in filler cap ⇒ page 194

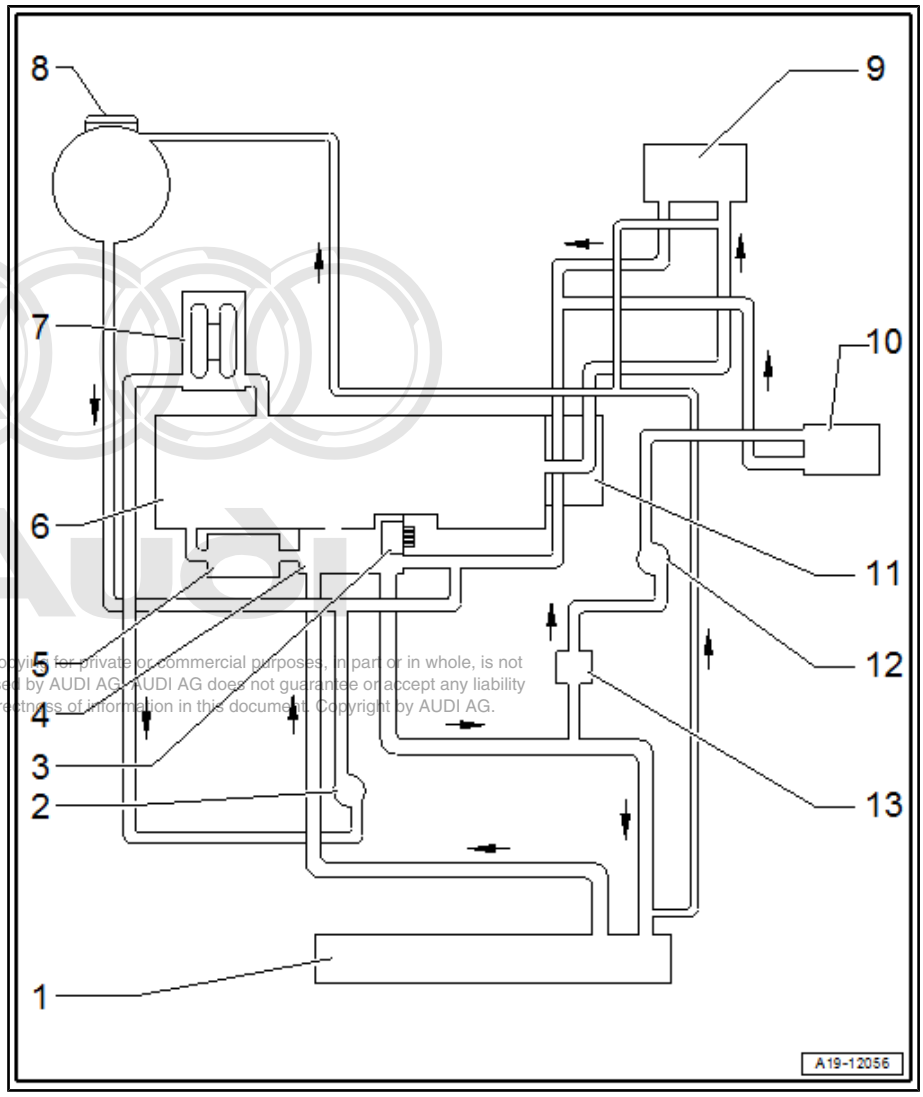
9 - Heat exchanger for heater

10 - ATF cooler

11 - Coolant hose/pipe connection

12 - Coolant circulation pump - V50-

13 - Coolant valve for gearbox - N488-

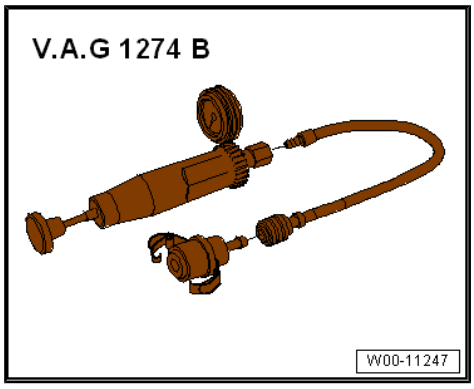


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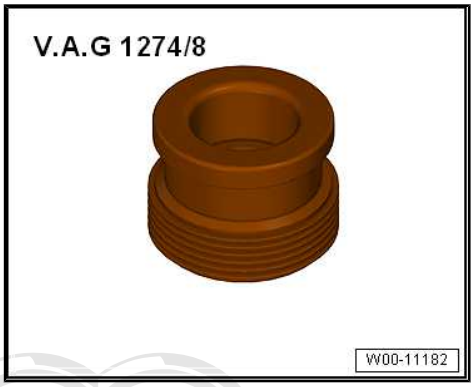
1.2 Checking cooling system for leaks

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

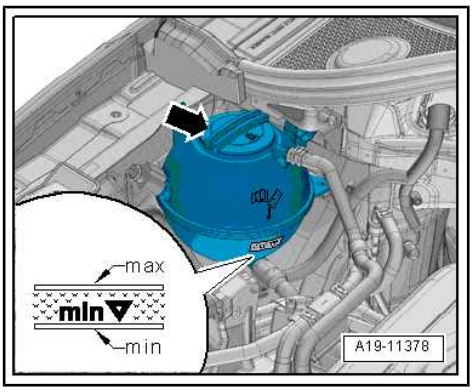
• Engine must be warm.

WARNING

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

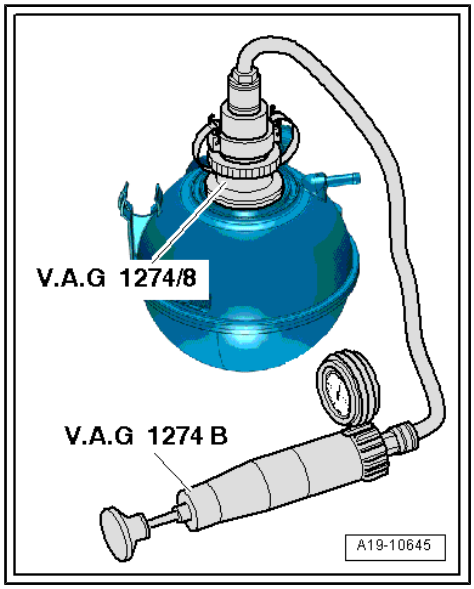
Danger of scalding skin and other parts of the body.

- ***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.

– 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

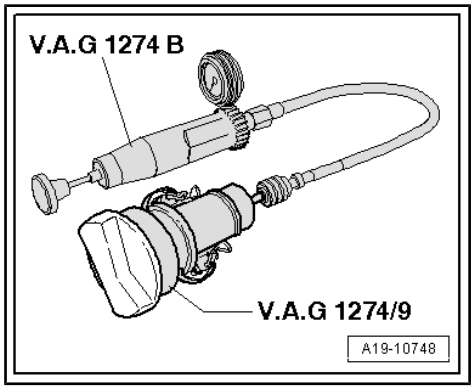
– Fit cooling system tester - V.A.G 1274 B- with adapter - V.A.G 1274/9- onto filler cap.
– Build up pressure with hand pump on cooling system tester.

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.

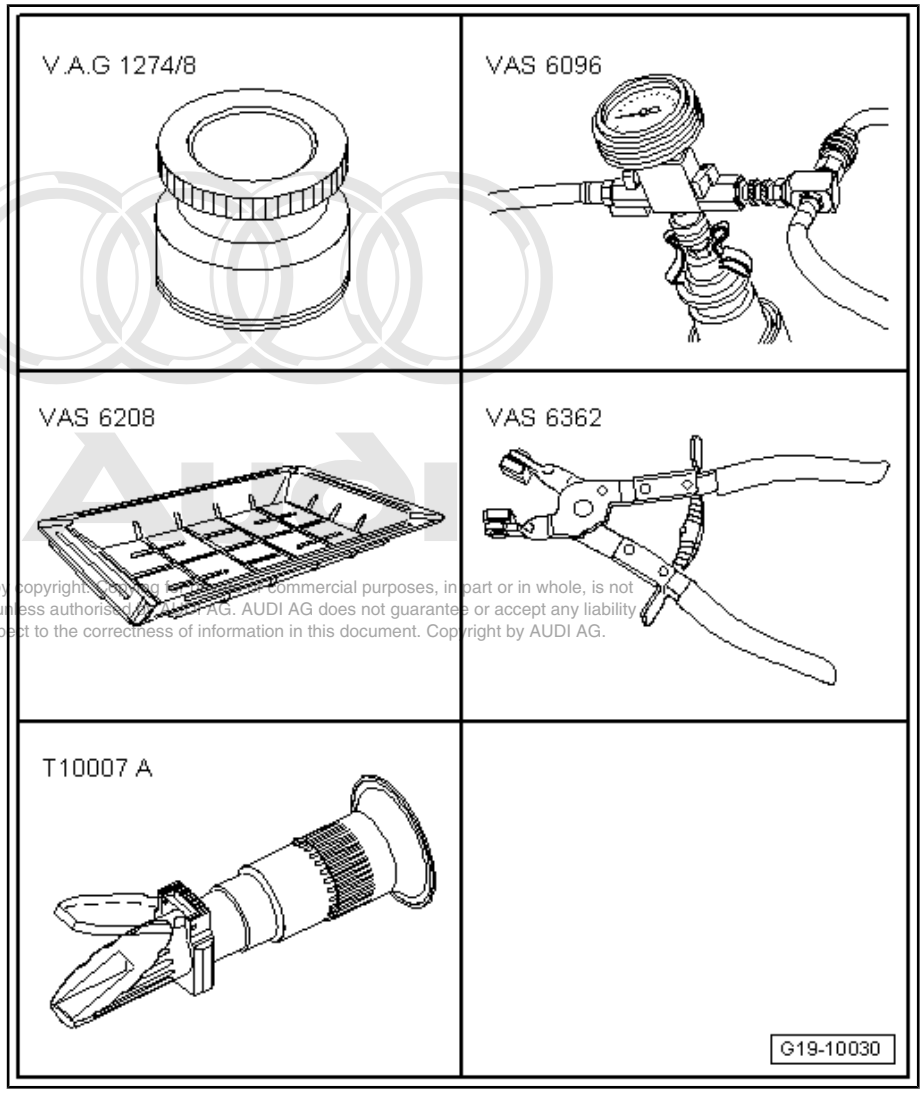


1.3 Draining and filling cooling system

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Special tools and workshop equipment required

- Adapter for cooling system tester - V.A.G 1274/8-
- Cooling system charge unit - VAS 6096-
- Drip tray for workshop hoist - VAS 6208-
- Hose clip pliers - VAS 6362-
- Refractometer - T10007 A-



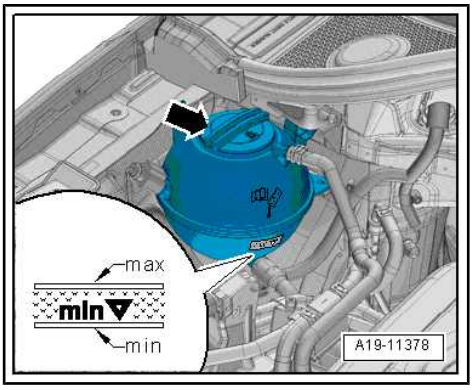
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Draining

WARNING

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

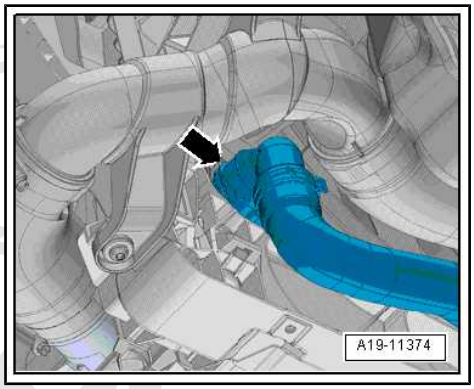
- *The cooling system is under pressure when the engine is hot.*
- *To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.*



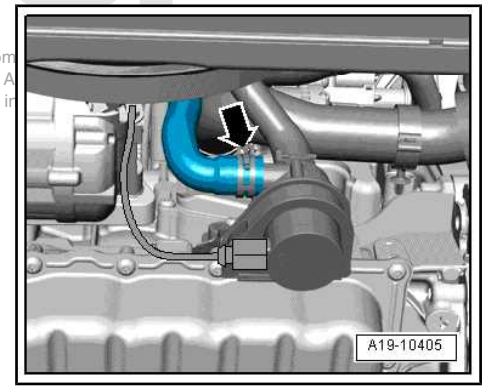
– Open filler cap -arrow- on coolant expansion tank.

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

– Place drip tray for workshop hoist - VAS 6208- beneath engine.
– Lift retaining clip -arrow-, disconnect coolant hose (bottom) from radiator and drain off coolant.



– Release hose clip -arrow-, disconnect coolant hose (bottom) leading to continued coolant circulation pump - V51- and drain off remaining coolant.

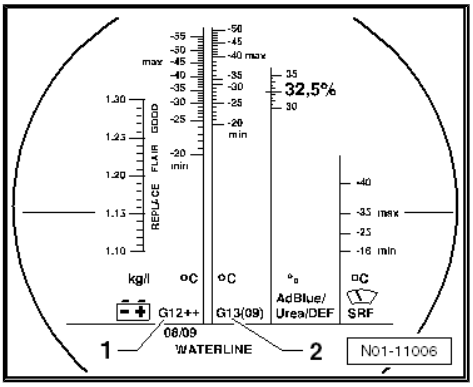


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Filling

Caution

To ensure optimal corrosion protection, only distilled water may be mixed with coolant additives.



Note

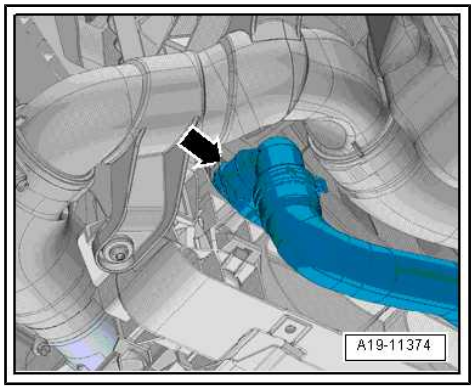
- *The effectiveness of the coolant is greatly influenced by the quality of the water with which it is mixed. Because water may contain different substances depending on the country or even the region, the water quality to be used for cooling systems has been specified. Distilled water meets all the requirements and is therefore recommended for use when topping up or filling up with coolant.*
- *Use only coolant additives listed in the ⇒ Electronic parts catalogue (ETKA) . If you use other coolant additives, this can significantly impair in particular the corrosion protection effect. The resulting damage could lead to loss of coolant and consequently to serious engine damage.*
- *Coolant with the recommended mixture ratio prevents frost and corrosion damage and stops scaling. At the same time it raises the boiling point of the fluid in the system. For this reason the cooling system must be filled all year round with the correct coolant additive.*
- *Because of its high boiling point, the coolant improves engine reliability under heavy loads, particularly in countries with tropical climates.*
- *The refractometer - T10007A- MUST be used to determine the current level of frost protection.*
- *The mixture must guarantee frost protection down to at least -25 °C (in countries with arctic climate: down to -36 °C). The amount of antifreeze should only be increased if greater frost protection is required in very cold climates. This must only be down to -48 °C, however, as otherwise the cooling efficiency of the coolant is impaired.*
- *The coolant concentration must not be reduced by adding water even in warmer seasons and in warmer countries. Frost protection must be provided to at least -25 °C.*
- *Read off the level of frost protection on the scale for the relevant coolant additive.*
- *The temperature indicated on the refractometer - T10007A- corresponds to the temperature at which the first ice crystals can form in the coolant.*
- *Do not reuse coolant.*
- *Only use water/coolant additive as a lubricant for coolant hoses.*

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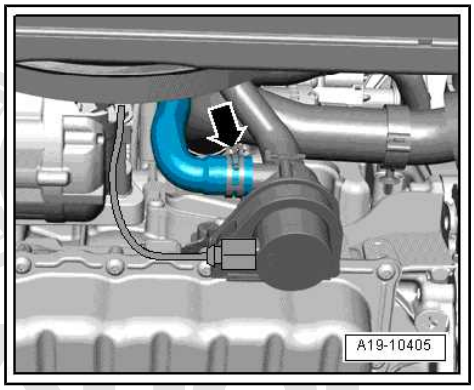
Recommended mixture ratio for coolant

- Coolant (40 %) and 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)

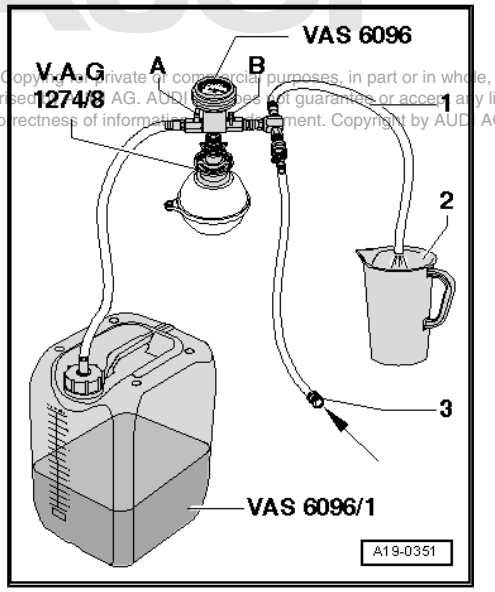
– Connect coolant hose with plug-in connector to radiator (bottom) ⇒ page 225 .



– Connect coolant hose (bottom) to continued coolant circulation pump - V51- -arrow-.



– Fill reservoir of cooling system charge unit - VAS 6096- with at least 10 litres of premixed coolant (according to recommended ratio). For recommended ratio, refer to ⇒ page 197.
– Fit adapter for cooling system tester - V.A.G 1274/8- onto coolant expansion tank.
– Attach cooling system charge unit - VAS 6096- to adapter - V.A.G 1274/8- .
– Run vent hose -1- into a small container -2-.



Note

The vented air draws along a small amount of coolant, which should be collected.

– Close both valves -A- and -B- (turn lever at right angles to direction of flow).
– Connect hose -3- to compressed air.
• Pressure: 7 ... 10 bar.

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– Open valve -B- by setting lever in direction of flow.

• The suction jet pump generates a partial vacuum in the cooling system; the needle on the gauge should move into the green zone.

– Also briefly open valve -A- (turn lever in direction of flow) so that hose on reservoir of cooling system charge unit - VAS 6096- can fill with coolant.

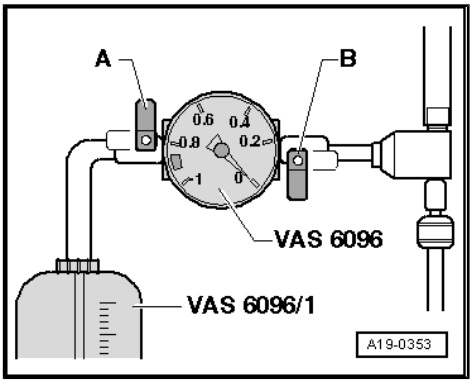
– Close valve -A- again.

– 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.



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.

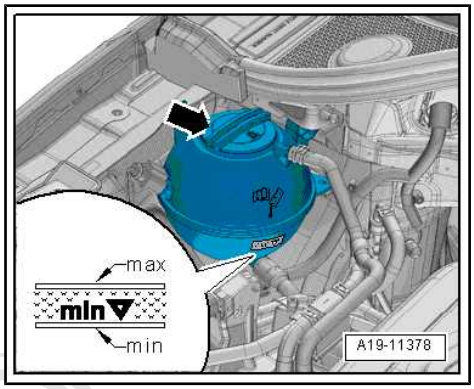
– Open valve -A-.

• 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.

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– 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.

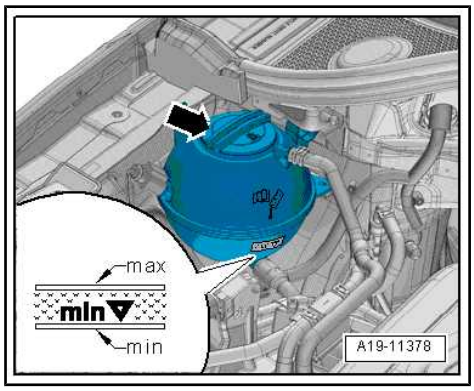
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WARNING

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

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

– 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.

2 Coolant pump/thermostat assembly

⇒ “2.1 Exploded view - coolant pump/thermostat”, page 201

⇒ “2.2 Exploded view - electric coolant pump”, page 203

⇒ “2.3 Removing and installing electric coolant pump”, page 204

⇒ “2.4 Removing and installing coolant pump”, page 207

⇒ “2.5 Removing and installing thermostat”, page 208

⇒ “2.6 Checking thermostat”, page 211

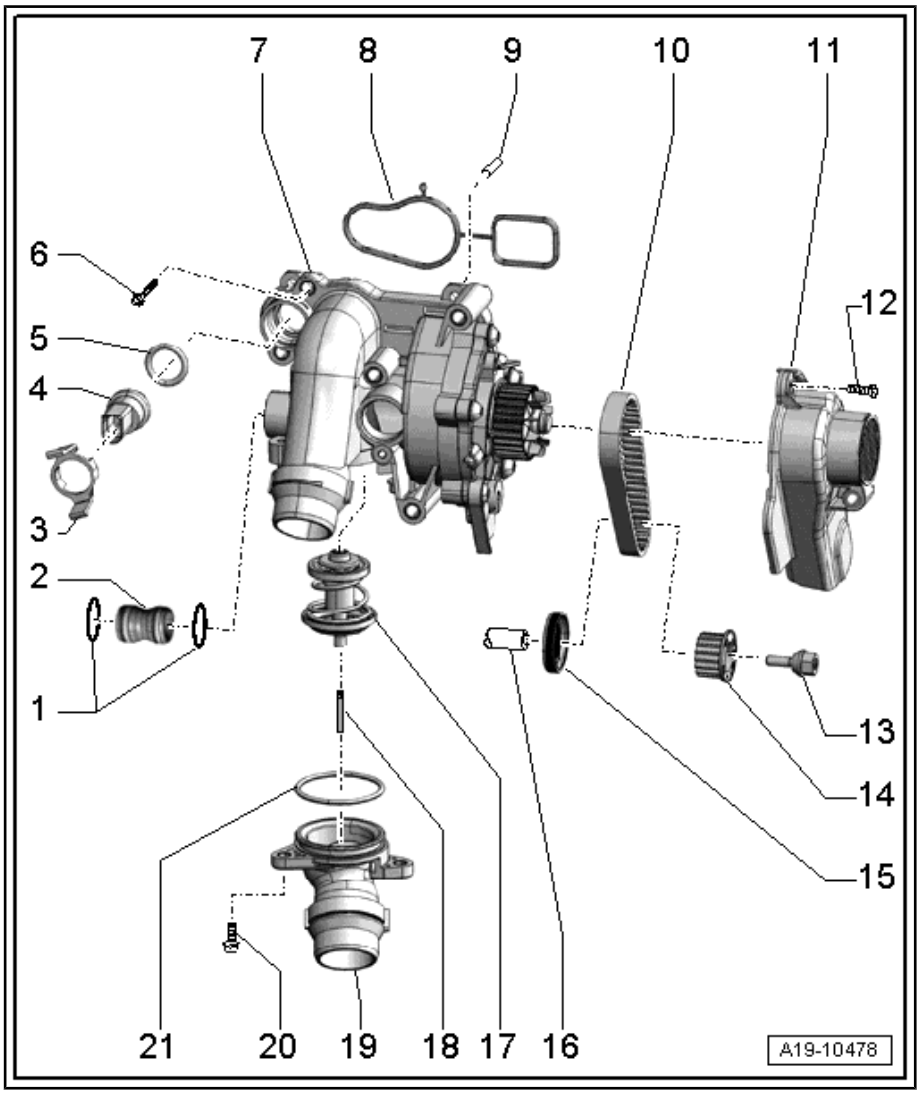
⇒ “2.7 Removing and installing toothed belt for coolant pump”, page 212

⇒ “2.8 Removing and installing coolant temperature sender G62 ”, page 213

⇒ “2.9 Removing and installing coolant valves”, page 216

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2.1 Exploded view - coolant pump/thermostat



1 - O-rings
- ❑ Renew

2 - Connection

3 - Retaining clip
- ❑ Check that it is securely seated

4 - Coolant temperature sender - G62-
- ❑ Removing and installing ⇒ page 213

5 - O-ring
- ❑ Renew

6 - Bolt
- ❑ Tightening torque and sequence ⇒ page 202

7 - Coolant pump
- ❑ Removing and installing ⇒ page 207
- ❑ New coolant pump: remove protective cap

8 - Gasket
- ❑ Renew

9 - Dowel pin
- ❑ 2x

10 - Toothed belt
- ❑ For coolant pump
- ❑ Removing and installing ⇒ page 212

11 - Toothed belt cover

12 - Bolt
- ❑ 9 Nm

13 - Bolt

- ❑ Left-hand thread
- ❑ Renew
- ❑ 10 Nm +90°

14 - Toothed belt drive sprocket

- ❑ Note installation position

15 - Oil seal

- ❑ For balance shaft (inlet side); renewing ⇒ page 82

16 - Balance shaft

17 - Thermostat

- ❑ Removing and installing ⇒ page 208
- ❑ Checking ⇒ page 211

18 - Dowel pin

19 - O-ring

- ❑ Renew

20 - Connection

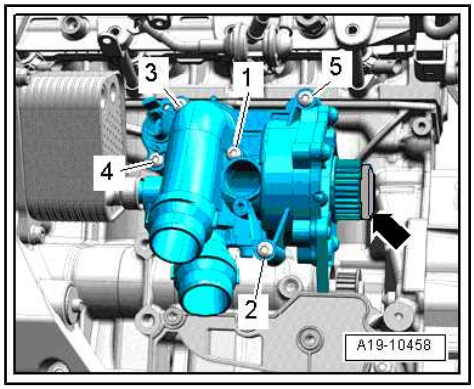
21 - Bolt

- ❑ 9 Nm

Coolant pump - tightening sequence

– Tighten bolts in the sequence -1 ... 5-.

• 9 Nm



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2.2 Exploded view - electric coolant pump

Coolant circulation pump - V50- , coolant valve for gearbox - -

1 - Coolant hose

2 - Bolt

- ❑ 9 Nm

3 - Coolant valve for gearbox - N488-

- ❑ Removing and installing ⇒ page 216

4 - Bolt

- ❑ 23 Nm

5 - Coolant hose

6 - Coolant circulation pump - V50-

- ❑ Removing and installing ⇒ page 204

7 - Coolant hose

8 - Grommet

9 - Spacer sleeve

10 - Bolt

- ❑ 1.5 Nm

11 - Bracket

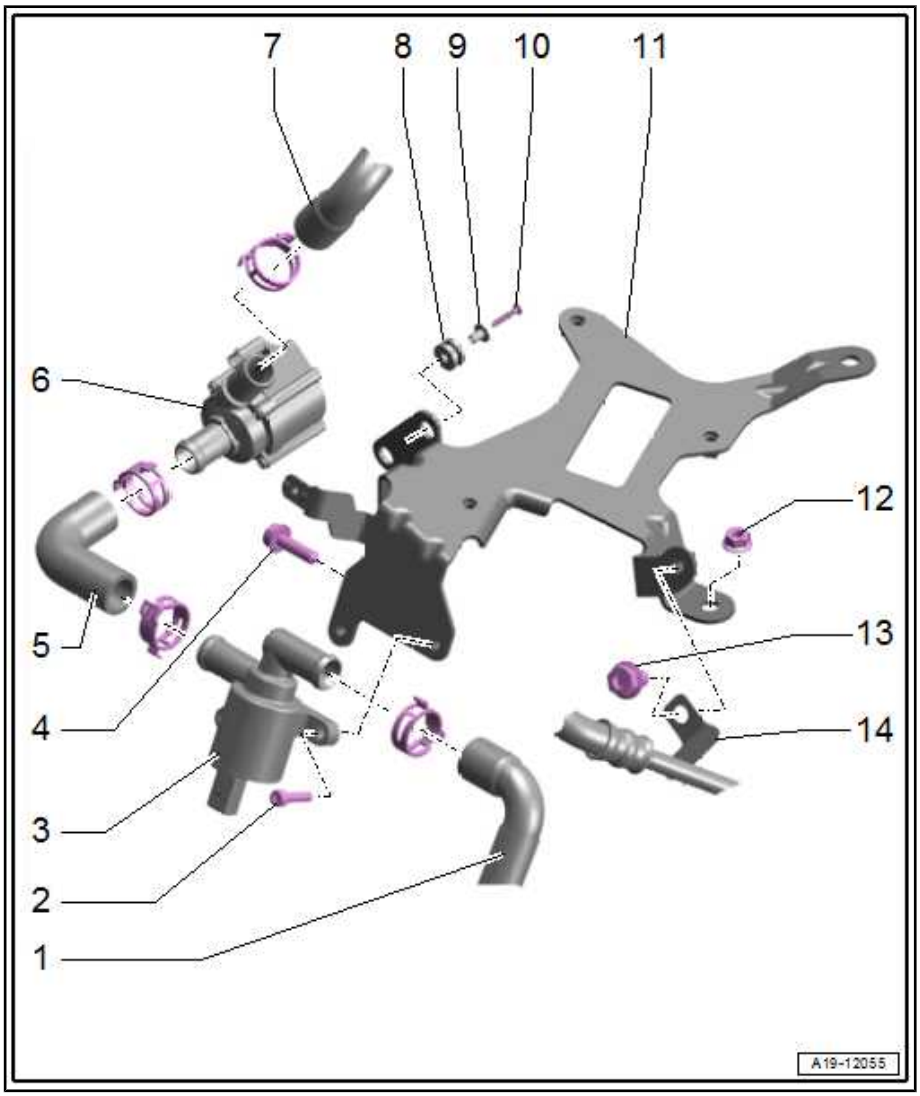
12 - Nut

- ❑ 23 Nm

13 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 37 ; ATF circuit; Exploded view - ATF circuit

14 - ATF line



Continued coolant circulation pump - V51-

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1 - Bracket

2 - Bolt

- ❑ 40 Nm

3 - Coolant hose

4 - Coolant hose

5 - Continued coolant circulation pump - V51-

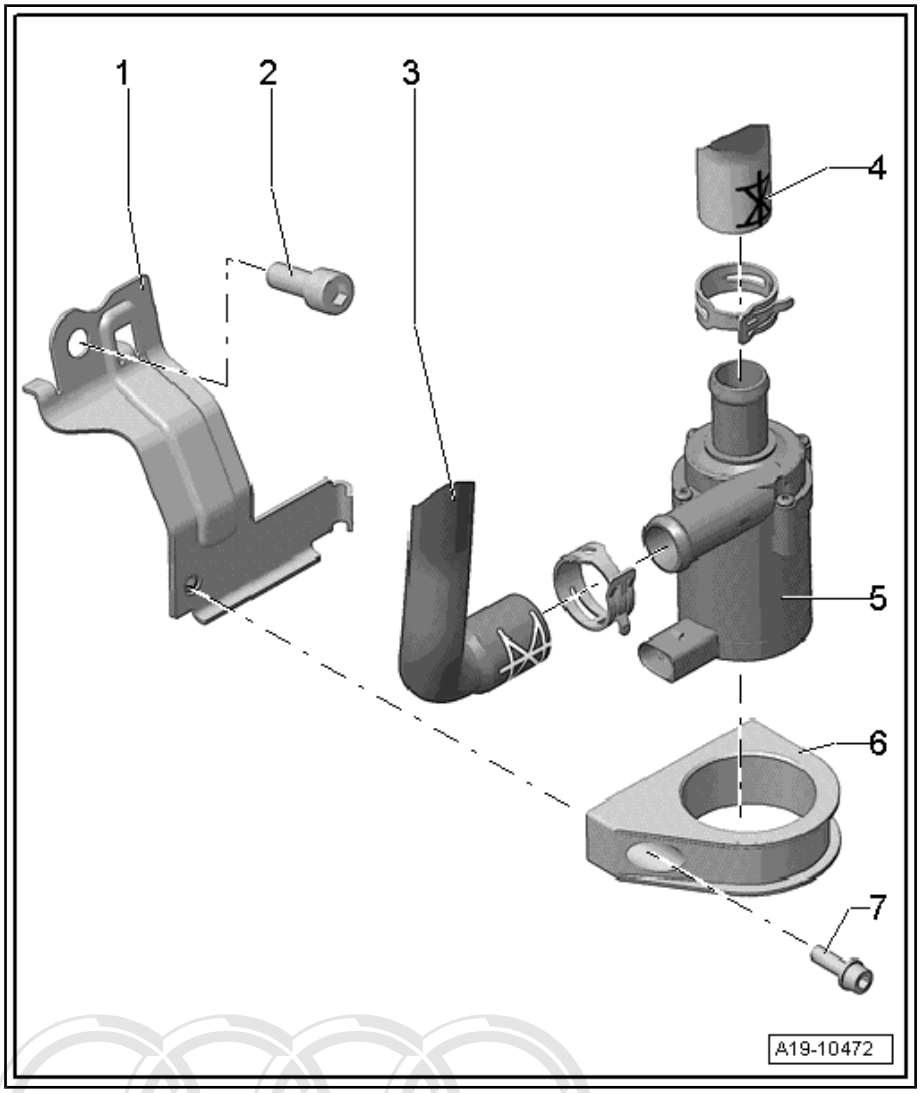
- ❑ Removing and installing ⇒ page 205

6 - Bracket

- ❑ For continued coolant circulation pump - V51-

7 - Bolt

- ❑ 8 Nm



2.3 Removing and installing electric coolant pump

⇒ “2.3.1 Removing and installing electric coolant circulation pump V50 ”, page 204

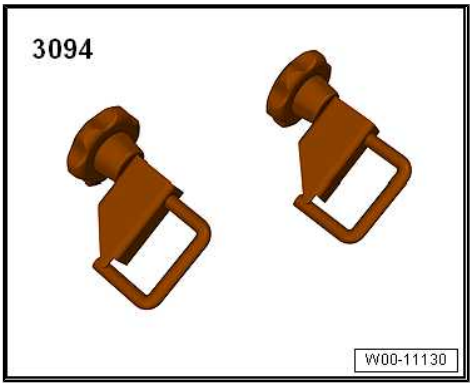
⇒ “2.3.2 Removing and installing electric continued coolant circulation pump V51 ”, page 205

2.3.1 Removing and installing electric coolant circulation pump - V50-

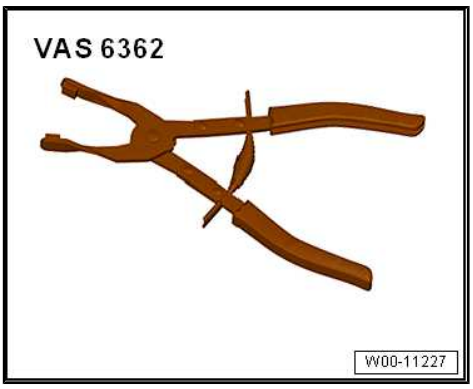
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Special tools and workshop equipment required

♦ Hose clamps, up to 25 mm - 3094-

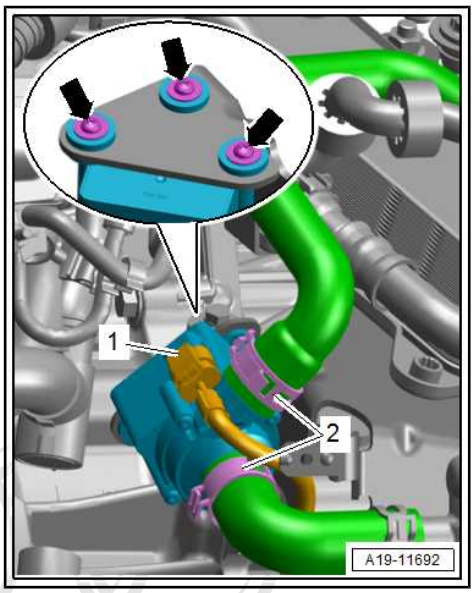


♦ Hose clip pliers - VAS 6362-



Removing

– Remove air cleaner housing ⇒ page 259 .
– Unplug electrical connector -1-.
– Clamp off coolant hoses using hose clamps up to 25 mm - 3094- , release hose clips -2- and disconnect hoses.
– Remove bolts -arrows- and detach coolant circulation pump - V50- .



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 .

– Install air cleaner housing ⇒ page 259 .
– Check coolant level ⇒ page 200 .

Tightening torques

♦ ⇒ “2.2 Exploded view - electric coolant pump”, page 203

2.3.2 Removing and installing electric continued coolant circulation pump - V51-

Special tools and workshop equipment required

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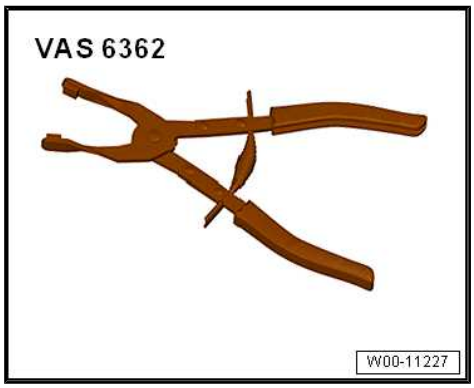
- Hose clamps, up to 25 mm - 3094-



- Drip tray for workshop hoist - VAS 6208-



- Hose clip pliers - VAS 6362-

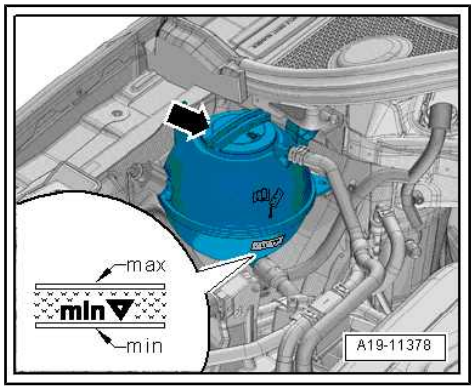


Removing

WARNING

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

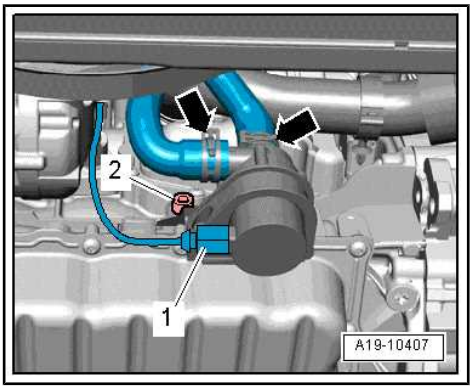
- ***The cooling system is under pressure when the engine is hot.***
- ***To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.***



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

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

– Unplug electrical connector -1-.
– Use hose clamps up to 25 mm - V51- to clamp off coolant hoses at continued coolant circulation pump - 3094- .
– Place drip tray for workshop hoist - VAS 6208- beneath engine.
– Release hose clips -arrows- and detach coolant hoses.
– Remove bolt -2- and detach continued coolant circulation pump - V51- .



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 200 .
– Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .

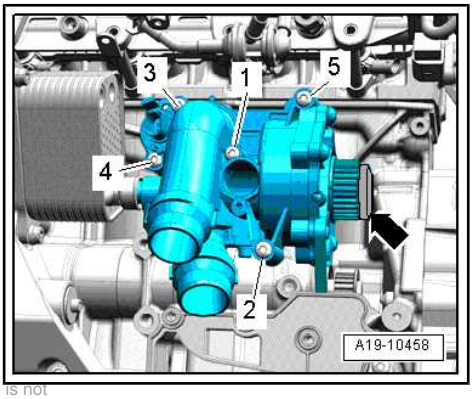
Tightening torques

♦ ⇒ “2.2 Exploded view - electric coolant pump”, page 203

2.4 Removing and installing coolant pump

Removing

– Remove toothed belt for coolant pump ⇒ page 212 .
– Remove coolant temperature sender - G62- ⇒ page 213 .
– Remove bonded rubber mounting for intake manifold support from intake manifold.
– Slacken and remove bolts in the sequence: -5 ... 1-.
– Detach coolant pump from dowel pins and pull pump off engine oil cooler.



Note

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Disregard -arrow-.

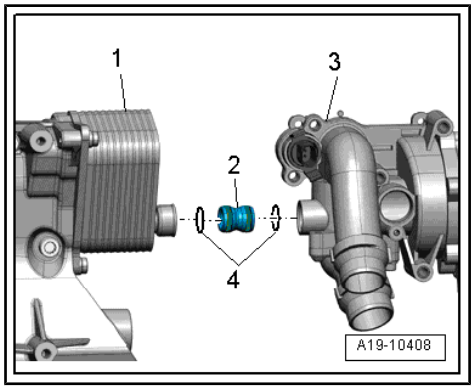
Installing

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

Note

Renew gaskets and O-rings.

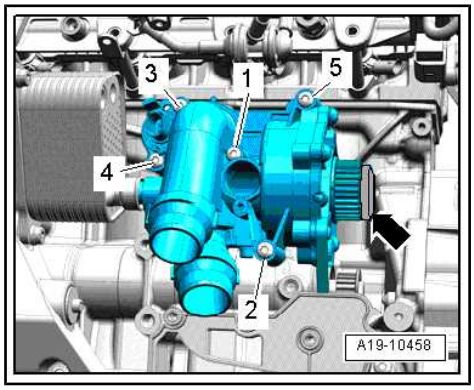
– Lubricate O-rings -4- with coolant, for coolant refer to ⇒ Electronic parts catalogue .
– Check whether the two dowel pins are fitted in cylinder block; install if necessary.
– Fit connecting piece -2- into engine oil cooler -1-.
– Push coolant pump -3- onto connecting piece and dowel pins in cylinder block.



– Tighten coolant pump bolts ⇒ page 202 .

Note

Detach protective cap -arrow- if a new coolant pump has been fitted.



– Install coolant temperature sender - G62- ⇒ page 213 .
– Install toothed belt for coolant pump ⇒ page 212 .

Note

Do not reuse coolant.

– Fill up with coolant ⇒ page 196 .

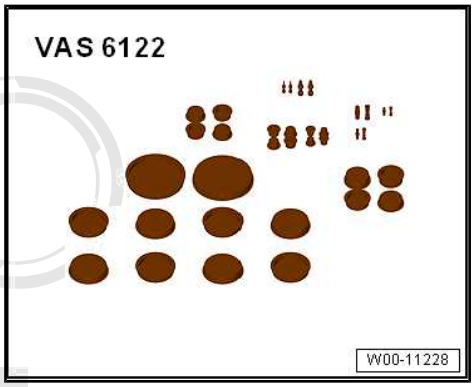
Tightening torques

- ⇒ “2.1 Exploded view - coolant pump/thermostat”, page 201
- ⇒ “3.1 Exploded view - coolant pipes”, page 218
- ⇒ “1.1 Exploded view - timing chain cover”, page 90

2.5 Removing and installing thermostat

Special tools and workshop equipment required

- Engine bung set - VAS 6122-



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♦ Socket - T10058-



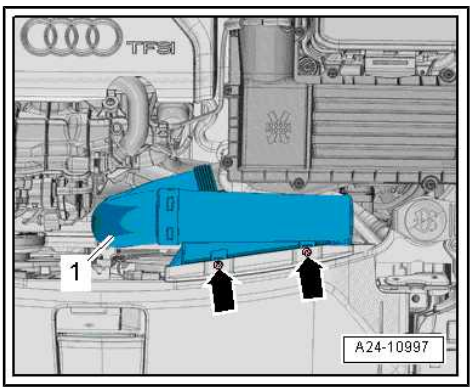
Audi

Removing

– Drain coolant ⇒ page 194 .

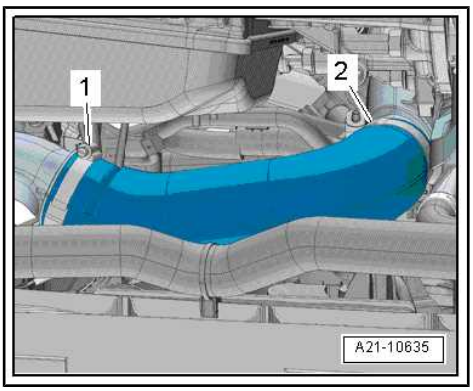
– Remove bolts -arrows- and detach air duct with air pipe -1-.

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– Release hose clips -1 and 2- and remove air hose.

– Seal open connection on charge air cooler with clean plug from engine bung set - VAS 6122- .

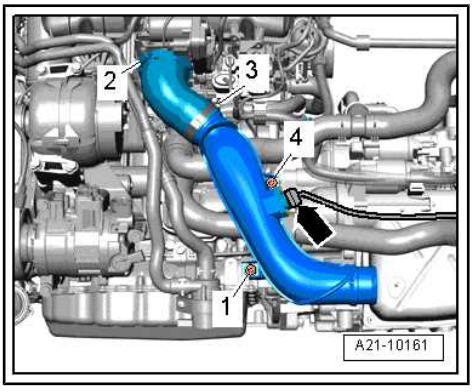


– Unplug electrical connector -arrow-.

– Release hose clip -2-.

– Remove bolt -4-.

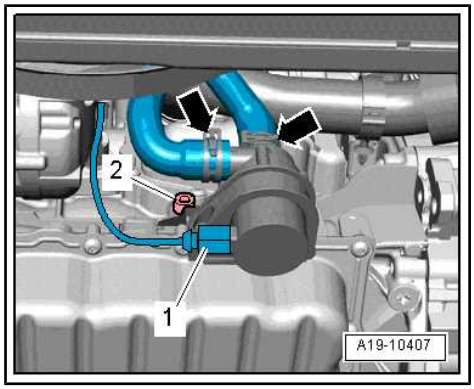
– Unscrew bolt -1- and detach air pipe downwards.



Note

Disregard -item 3-.

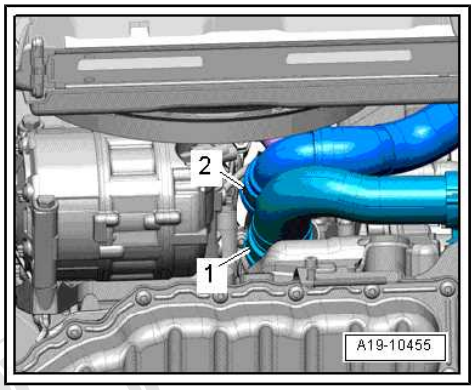
– Remove bolt -2- at bracket for continued coolant circulation pump - V51- .



Note

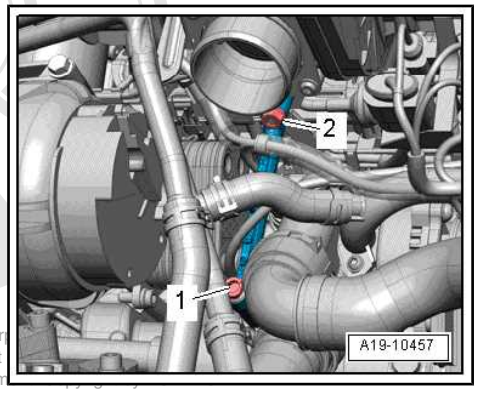
- *The continued circulation coolant pump - V51- remains installed.*
- *-Item 1- and -arrows- can be disregarded.*

– Lift retaining clips -1 and 2-, detach coolant hoses and move them clear to one side.



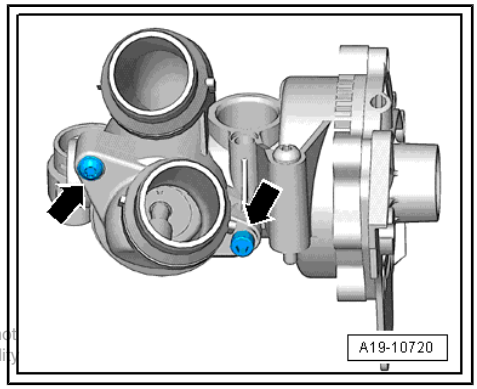
– Remove nut -2- and bolt -1- and swivel support for intake manifold slightly to right.

– Remove coarse oil separator ⇒ page 180 .



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– Unscrew bolts -arrows- and remove connection.



Note

Bolt on right side can be unscrewed using Allen key (long reach) - T10058- .

– Detach thermostat.

Installing

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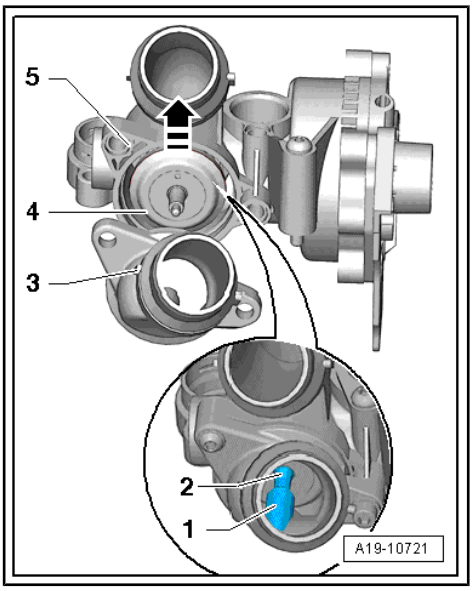
Installation is carried out in the reverse order; note the following:

Note

- *Renew gaskets and O-rings.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

– Clean sealing surface for O-ring.

– Coat O-ring with coolant additive; for coolant additive refer to ⇒ Electronic parts catalogue .



– Insert thermostat -4- in coolant pump housing -5- and swivel forwards slightly -arrow-.

– Fit connection -3- carefully (insert dowel pin -2- in guide -1-).

– Install coarse oil separator ⇒ page 180 .

– Install support for intake manifold ⇒ page 261 .

– Install air duct ⇒ page 259 .

Note

Do not reuse coolant.

– Fill up with coolant ⇒ page 196 .

Tightening torques

- ⇒ “2.1 Exploded view - coolant pump/thermostat”, page 201 .
- ⇒ “2.2 Exploded view - electric coolant pump”, page 203 .
- ⇒ “2.1 Exploded view - charge air system”, page 247 .
- ⇒ “2.2 Exploded view - hose connections for charge air system”, page 248 .

2.6 Checking thermostat

- Thermostat removed
  ⇒ “2.5 Removing and installing thermostat”, page 208

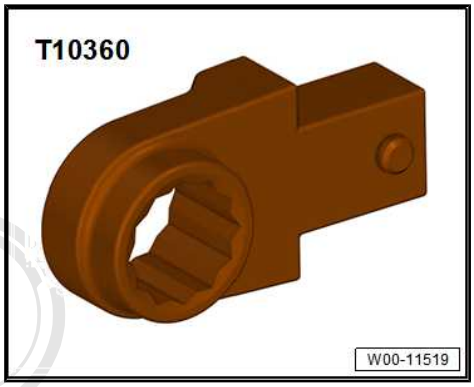
– Heat thermostat in water bath.

Starts to open	Fully open	Opening travel
approx. 95°	approx. 105° 1)	at least 8 mm
• 1) Cannot be checked		

2.7 Removing and installing toothed belt for coolant pump

Special tools and workshop equipment required

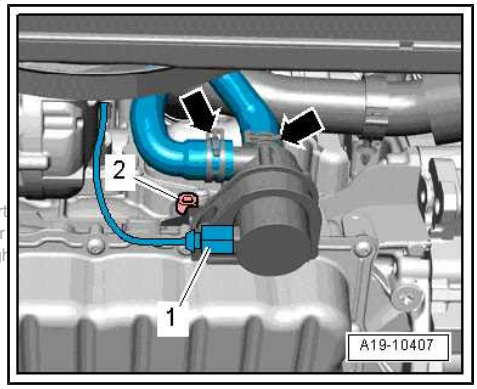
- Tool insert - T10360-



Removing

– Remove small coolant pipe ⇒ page 221 .

– Remove bolt -2- at bracket for continued coolant circulation pump - V51- .

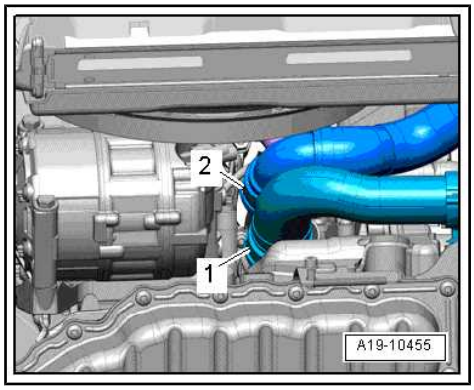


Note

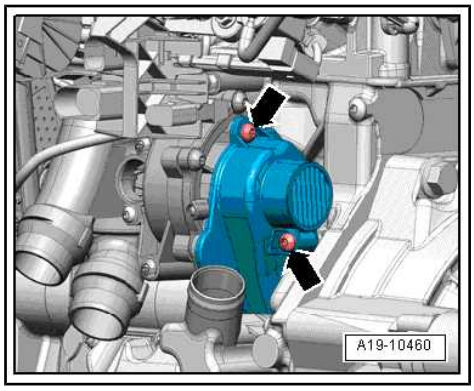
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- *The continued circulation coolant pump - V51- remains installed.*
- *-Item 1- and -arrows- can be disregarded.*

– Lift retaining clips -1 and 2-, detach coolant hoses and move them clear to one side.



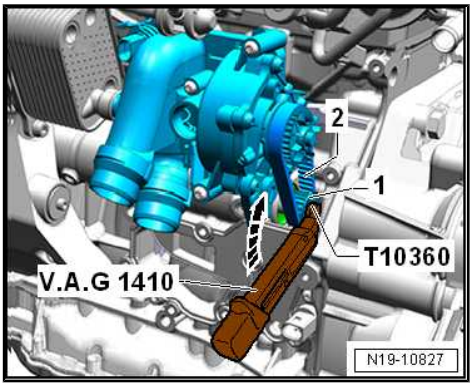
– Remove bolts -arrows- and detach toothed belt cover.



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- in a clockwise direction (direction of -arrow-) and unscrew three turns (counterhold at vibration damper).

– Remove toothed belt -2-.

Installing

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

Note

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- *Renew the bolts tightened with specified tightening angle.*
- *Renew gaskets and O-rings.*
- *Note installation position of toothed belt sprocket ⇒ Item 14 (page 202) .*

– Install small coolant pipe ⇒ page 221 .

Note

Do not reuse coolant.

– Fill up with coolant ⇒ page 196 .

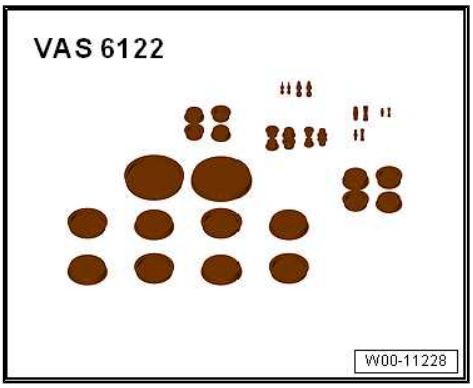
Tightening torques

- ⇒ “2.1 Exploded view - coolant pump/thermostat”, page 201
- ⇒ “2.2 Exploded view - electric coolant pump”, page 203

2.8 Removing and installing coolant temperature sender - G62-

Special tools and workshop equipment required

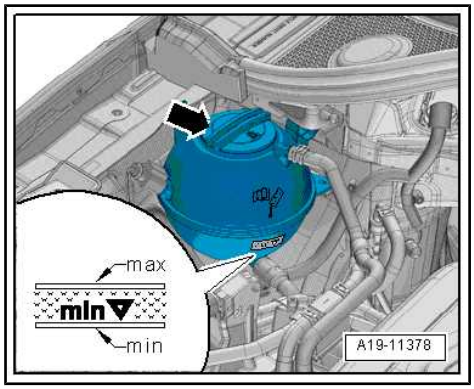
- Engine bung set - VAS 6122-



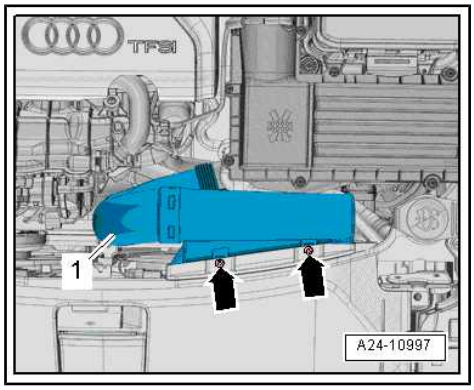
Removing

- 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).



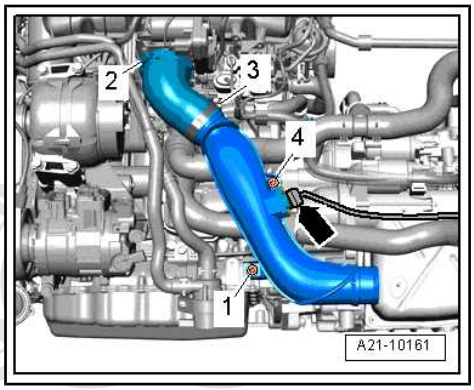
– Remove bolts -arrows- and detach air duct with air pipe -1-.



– Unplug electrical connector -arrow-.

– Release hose clip -2-.

– Remove bolt -4-.



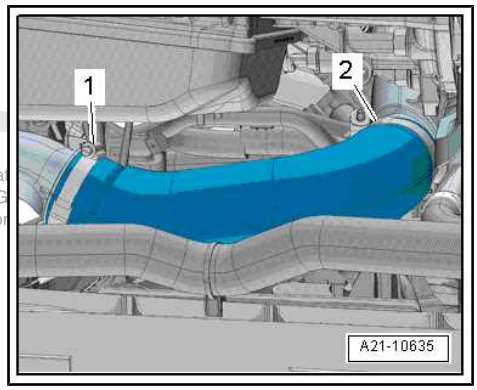
Note

Disregard -item 3-.

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

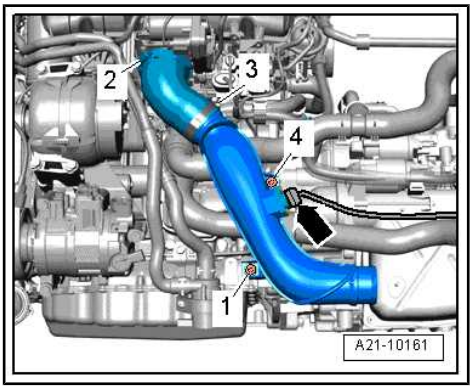
– Release hose clips -1 and 2- and remove air hose.

– Seal open connection on charge air cooler with clean plug from engine bung set - VAS 6122- .

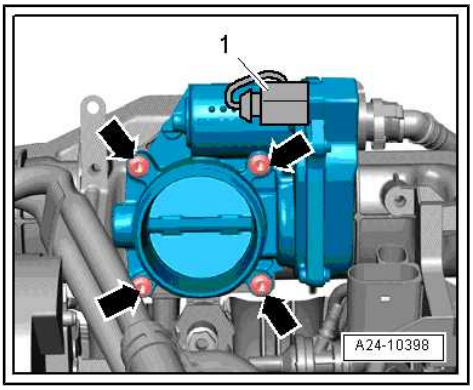


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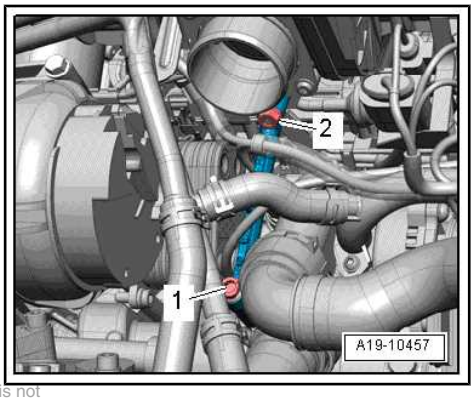
– Unscrew bolt -1- and detach air pipe downwards.



– Remove throttle valve module - J338- ⇒ page 267 .

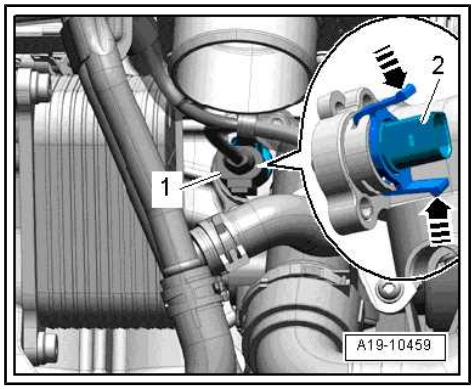


– Unscrew nut -2- and bolt -1- and remove support for intake manifold.



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– Unplug electrical connector -1-.



Note

Place a cloth underneath to catch escaping coolant.

– Detach retaining clip (press release tabs -arrows-).
– Detach coolant temperature sender - G62- -2-

Installing

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

Note

- *Fit new O-ring.*
- *Insert new coolant temperature sender - G62- immediately into connection to avoid loss of coolant.*

– Install support for intake manifold ⇒ page 261 .
– Install throttle valve module - J338- ⇒ page 267 .
– Install air duct ⇒ page 259 .
– Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .
– Check coolant level ⇒ page 200 .

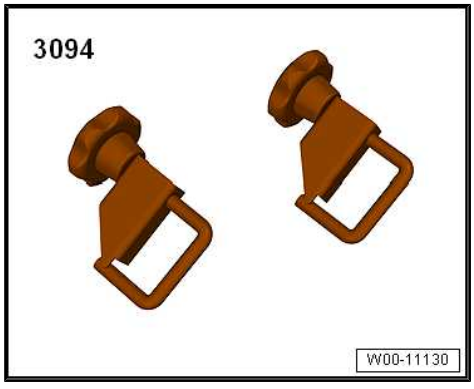
Tightening torques

- ⇒ “2.1 Exploded view - charge air system”, page 247
- ⇒ “2.2 Exploded view - hose connections for charge air system”, page 248

2.9 Removing and installing coolant valves

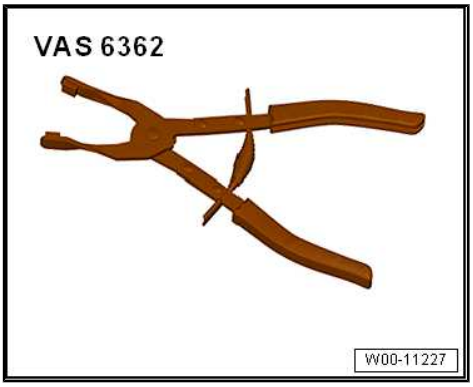
Special tools and workshop equipment required

- Hose clamps, up to 25 mm - 3094-



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♦ Hose clip pliers - VAS 6362-



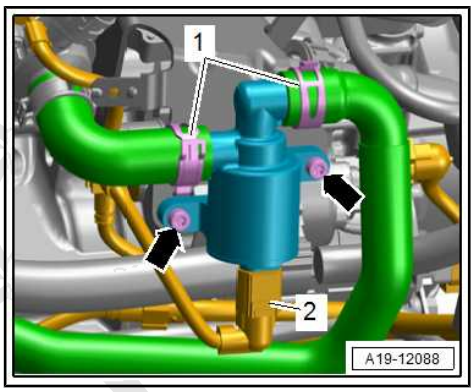
Removing

– Remove air cleaner housing ⇒ page 259 .

– Unplug electrical connector -2-.

– Clamp off coolant hoses using hose clamps up to 25 mm - 3094- , release hose clips -1- and disconnect hoses.

– Remove bolts -arrows- and detach coolant valve for gearbox - N488- .



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 200 .

Tightening torques

♦ ⇒ “2.2 Exploded view - electric coolant pump”, page 203

3 Coolant pipes

⇒ “3.1 Exploded view - coolant pipes”, page 218

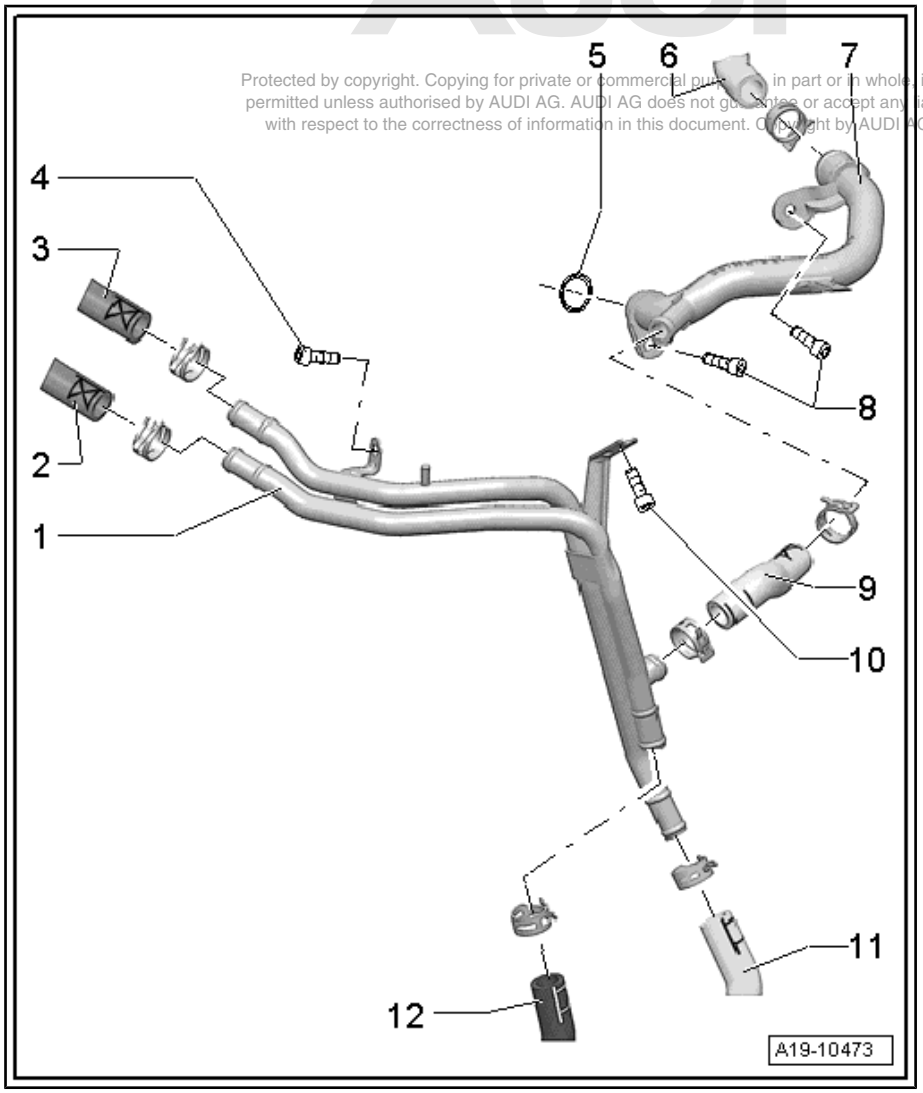
⇒ “3.2 Removing and installing coolant pipes”, page 219

3.1 Exploded view - coolant pipes

Note

The arrow markings on coolant pipes and on ends of hoses must align.

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1 - Coolant pipes (front)
- ❑ Removing and installing ⇒ page 219

2 - Coolant hose
- ❑ From turbocharger

3 - Coolant hose
- ❑ To coolant expansion tank

4 - Bolt
- ❑ 5 Nm

5 - O-ring
- ❑ Renew

6 - Coolant hose
- ❑ To heat exchanger for heater

7 - Small coolant pipe
- ❑ Removing and installing ⇒ page 221

8 - Bolts
- ❑ 9 Nm

9 - Coolant hose

10 - Bolt
- ❑ 5 Nm

11 - Coolant hose
- ❑ From continued coolant circulation pump - V51-

12 - Coolant hose
- ❑ To continued coolant circulation pump - V51-

3.2 Removing and installing coolant pipes

⇒ “3.2.1 Removing and installing coolant pipes (front)”, page 219

⇒ “3.2.2 Removing and installing small coolant pipe”, page 221

3.2.1 Removing and installing coolant pipes (front)

Special tools and workshop equipment required

- Hose clamps, up to 25 mm - 3094-

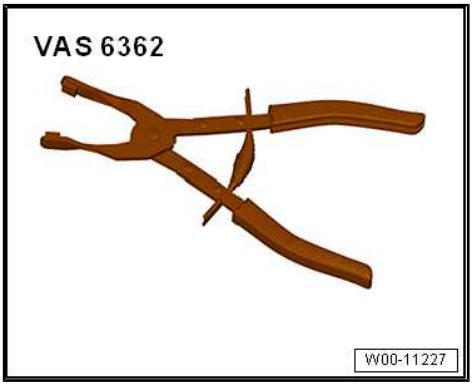


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- Drip tray for workshop hoist - VAS 6208-



- Hose clip pliers - VAS 6362-

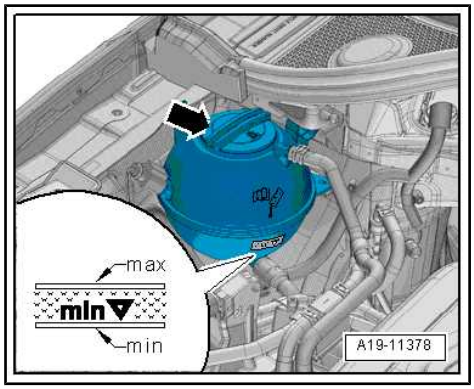


Removing

WARNING

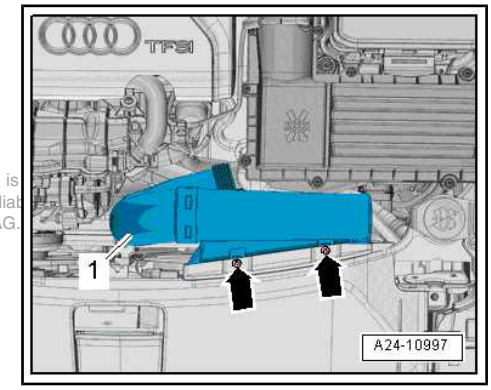
Hot steam/hot coolant can escape - risk of scalding.

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



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

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

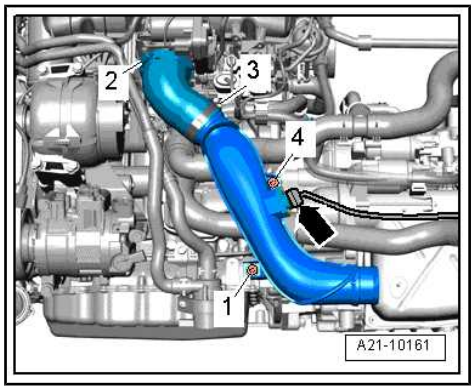


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– Release hose clip -2-.

– Remove bolt -4-.

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

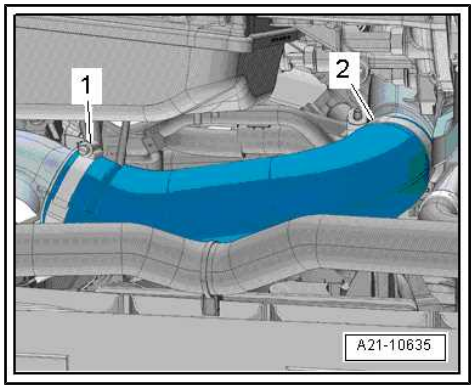


Note

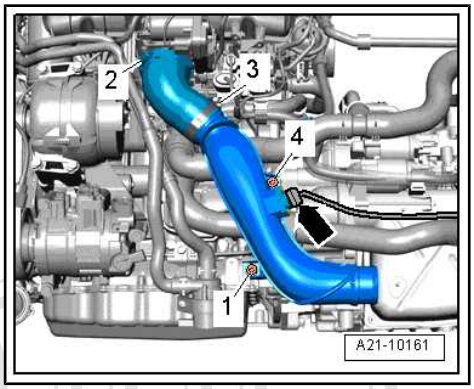
Disregard -item 3-.

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

– Loosen hose clips -1, 2- and remove air pipe.



– Unscrew bolt -1- and detach air pipe downwards.

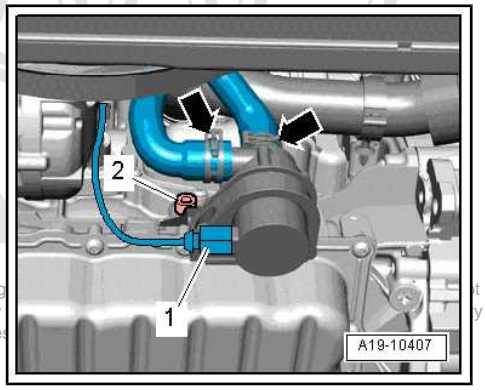


– Place drip tray for workshop hoist - VAS 6208- beneath engine.
– Release hose clips -arrows- and disconnect coolant hoses from continued coolant circulation pump - V51- .

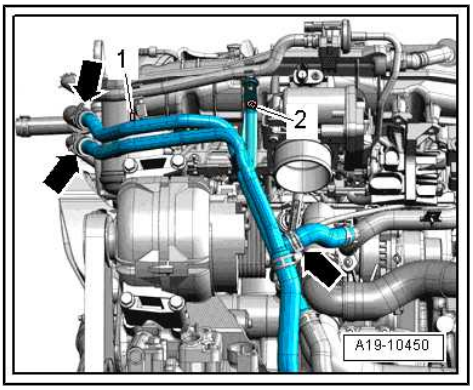
Note

Disregard items -1 and 2-.

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– Clamp off coolant hoses using hose clamps up to 25 mm - 3094- , release hose clips -arrows- and disconnect hoses.
– Remove bolts -1- and -2- and detach coolant pipes (front).



Installing

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

Note

- *Renew gaskets and O-rings.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

– Install air duct ⇒ page 259 .
– Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .

Note

Do not reuse coolant.

– Fill up with coolant ⇒ page 196 .

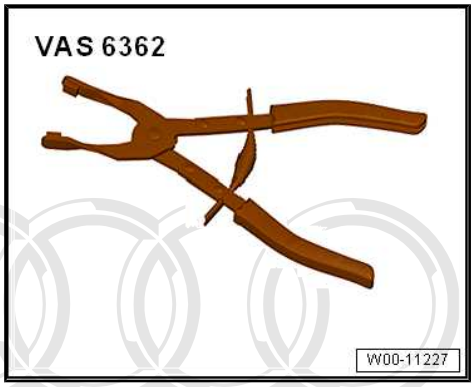
Tightening torques

- ⇒ “3.1 Exploded view - coolant pipes”, page 218
- ⇒ “2.1 Exploded view - charge air system”, page 247

3.2.2 Removing and installing small coolant pipe

Special tools and workshop equipment required

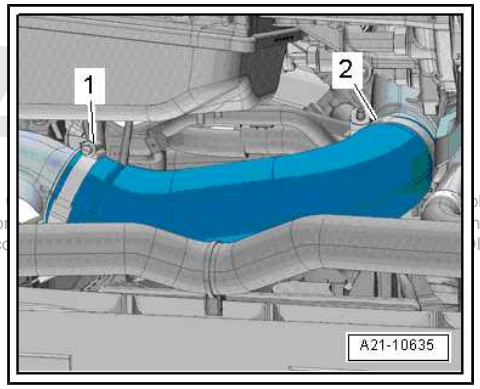
♦ Hose clip pliers - VAS 6362-



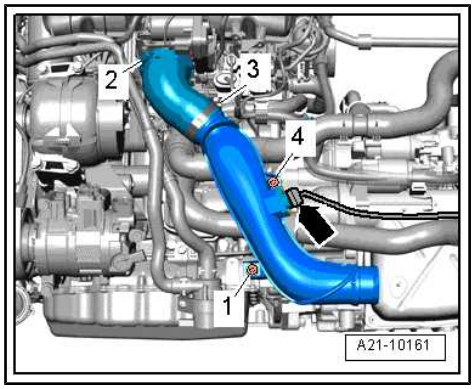
Removing

– Drain coolant ⇒ page 194 .
– Remove air cleaner housing ⇒ page 259 .
– Release hose clips -1 and 2- and remove air hose.

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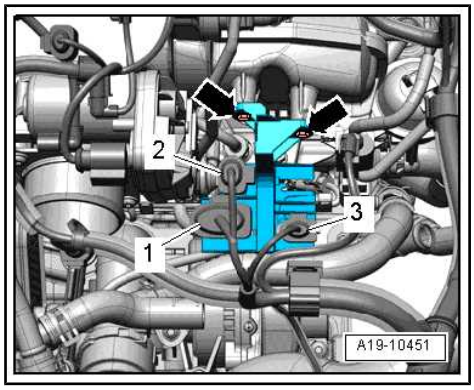
– Release hose clip -2-.
– Remove bolt -4-.
– Unplug electrical connector -arrow- and move wiring clear.
– Unscrew bolt -1- and detach air pipe downwards.



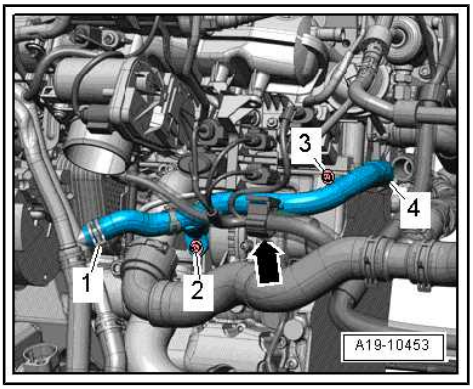
Note

Disregard -item 3-.

– Remove bolts -arrows- and detach electrical connectors -1 ... 3- from retainer.



– Move electrical wiring on small coolant pipe clear -arrow-.
– Release hose clip -1-, lift retaining clip -4- and detach coolant hoses.
– Unscrew bolts -2 and 3- and detach small coolant pipe.



Installing

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

Note

- *Fit new O-rings.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

– Connect coolant hose with plug-in connector ⇒ page 225 .
– Install air cleaner housing ⇒ page 259 .

Note

Do not reuse coolant.

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– Fill up with coolant ⇒ page 196 .

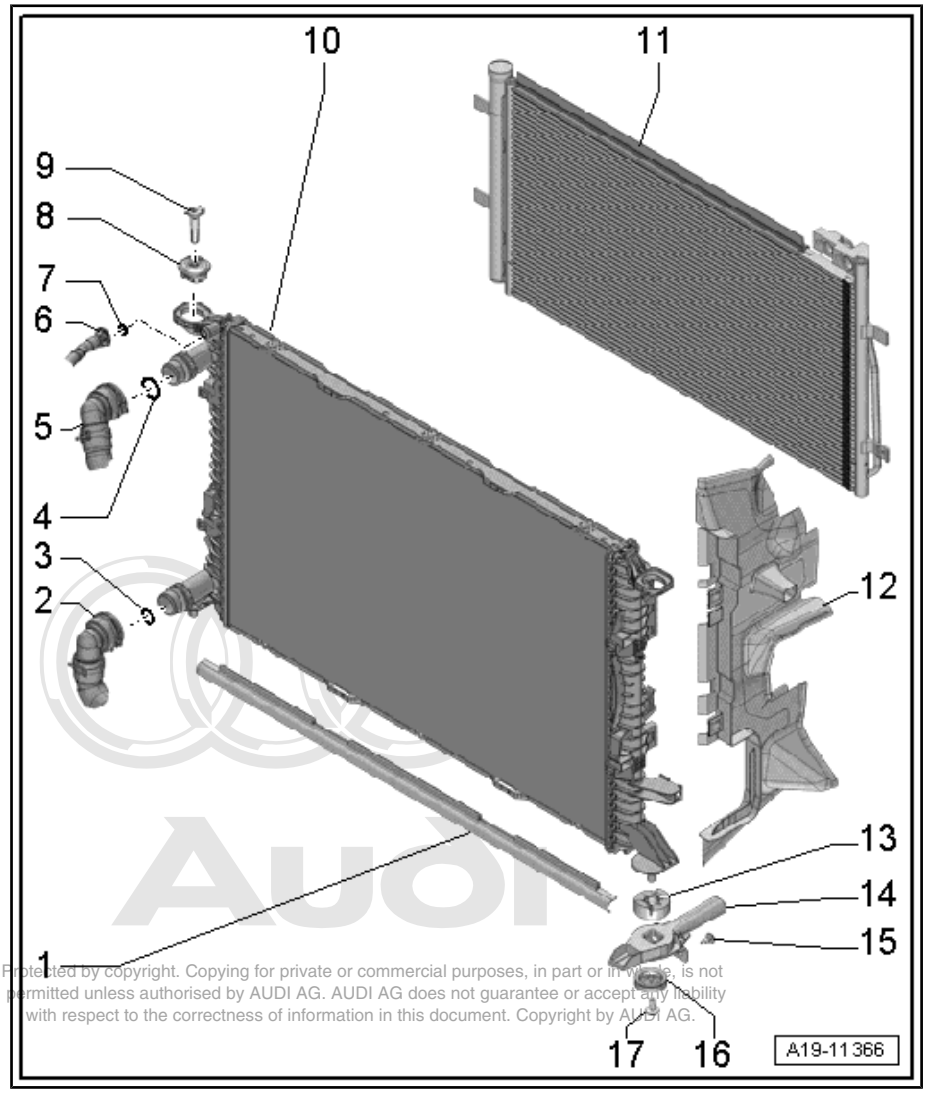
Tightening torques

- ⇒ “3.1 Exploded view - coolant pipes”, page 218
- ⇒ “2.1 Exploded view - charge air system”, page 247
- ⇒ “2.2 Exploded view - hose connections for charge air system”, page 248

4 Radiator/radiator fan

⇒ “4.1 Exploded view - radiator/radiator fan”, page 224
⇒ “4.2 Removing and installing radiator”, page 226
⇒ “4.3 Removing and installing radiator cowl”, page 228
⇒ “4.4 Removing and installing radiator fan V7 ”, page 229

4.1 Exploded view - radiator/radiator fan



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1 - Air duct

2 - Coolant hose (bottom)

- ❑ Lift retaining clip to detach
- ❑ Connecting to radiator ⇒ page 225

3 - O-ring

- ❑ Renew

4 - O-ring

- ❑ Renew

5 - Coolant hose (top)

- ❑ Lift retaining clip to detach
- ❑ Connecting to radiator ⇒ page 225

6 - Coolant hose

- ❑ To coolant expansion tank

7 - O-ring

- ❑ Renew

8 - Rubber bush

- ❑ For radiator

9 - Retaining pin

- ❑ Use screwdriver to release and pull off

10 - Radiator

- ❑ Remove and install together with radiator cowl ⇒ page 226
- ❑ If renewed, refill system with fresh coolant

11 - Condenser

- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit; Removing and installing condenser

12 - Air duct

13 - Rubber mounting

- ❑ For radiator

14 - Radiator bracket

15 - Bolt

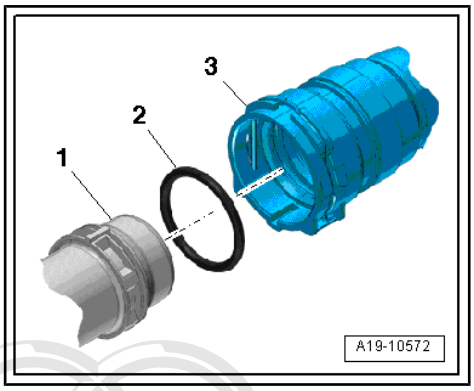
- ❑ 5 Nm

16 - Washer

17 - Bolt

❑ 4.5 Nm

Connecting coolant hose with plug-in connector



– Remove old O-ring -2- from coolant hose -3-.
– Lightly lubricate new O-ring with coolant and fit O-ring in coolant hose.
– Press coolant hose onto connection -1- until it engages audibly.
– Press coolant hose in again and then pull to check that plug-in connector is correctly engaged.

Radiator cowl and radiator fans

1 - Radiator fan control unit - J293-

❑ Removing and installing ⇒ page 230

2 - Bolt

❑ 4.5 Nm

3 - Bolt

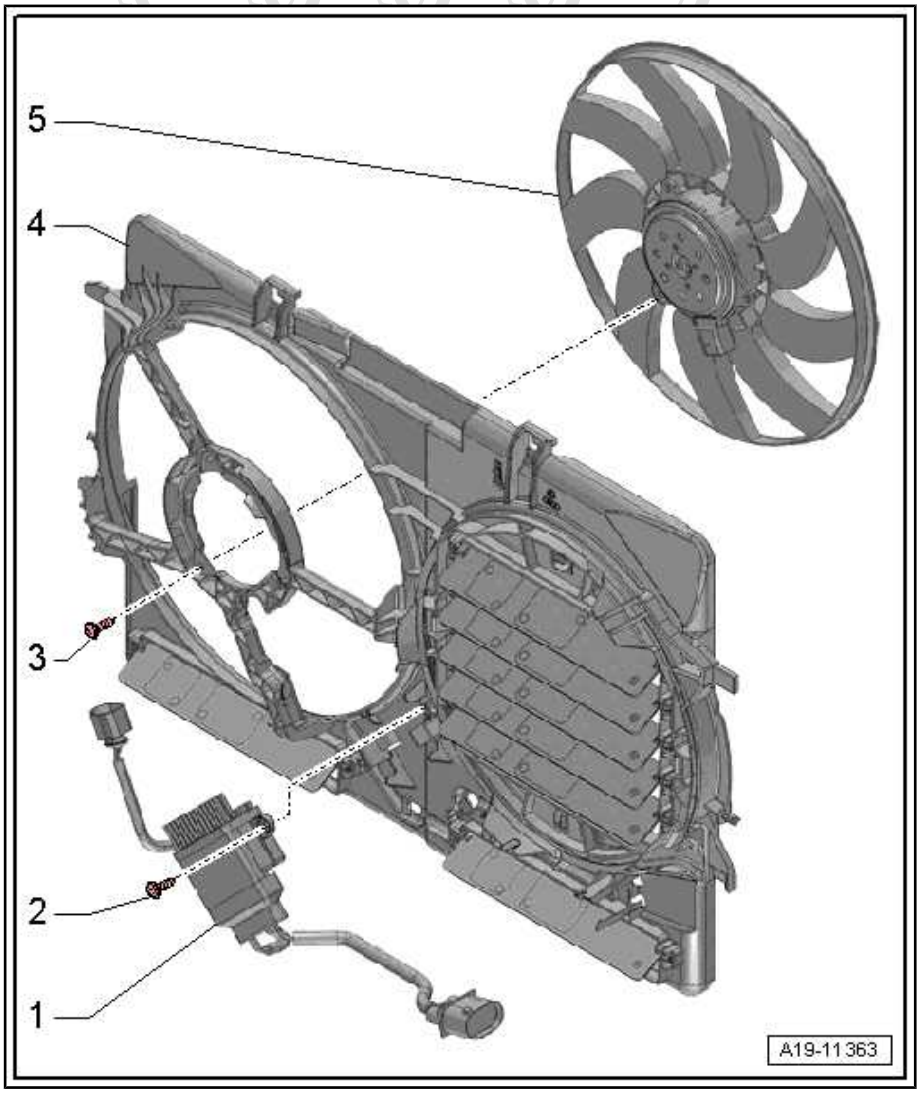
❑ 5 Nm

4 - Radiator cowl

❑ Removing and installing ⇒ page 228

5 - Radiator fan - V7-

❑ Removing and installing ⇒ page 229



4.2 Removing and installing radiator

Note

The radiator and radiator cowl can only be removed and installed together as one unit.

Special tools and workshop equipment required

- Drip tray for workshop hoist - VAS 6208-



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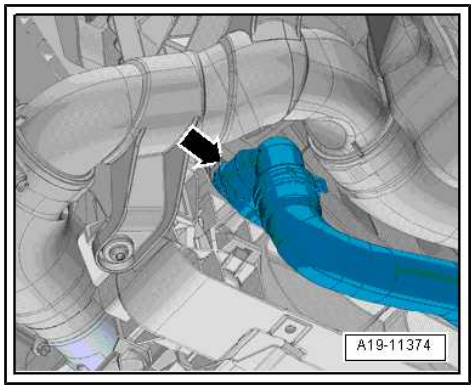
Removing

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

– Remove charge air cooler ⇒ page 249 .

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

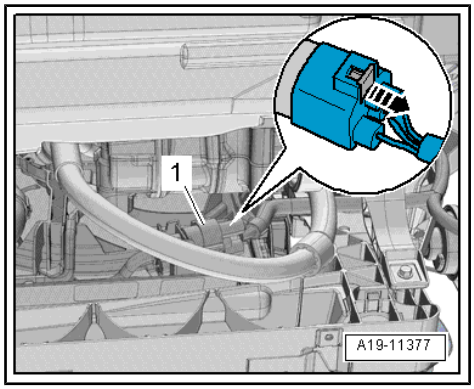
– Lift retaining clip -arrow-, disconnect coolant hose (bottom) from radiator and drain off coolant.



WARNING

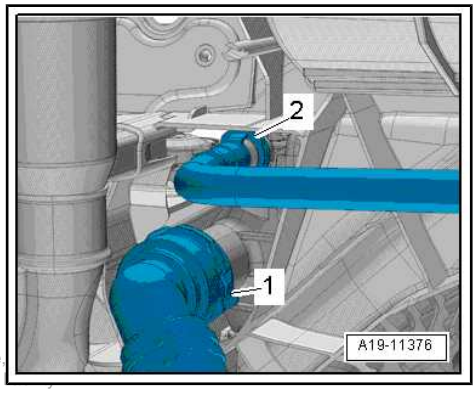
Risk of injury as the radiator fan(s) may start up automatically.

- ***Unplug electrical connectors before starting to work in the area of radiator cowl.***



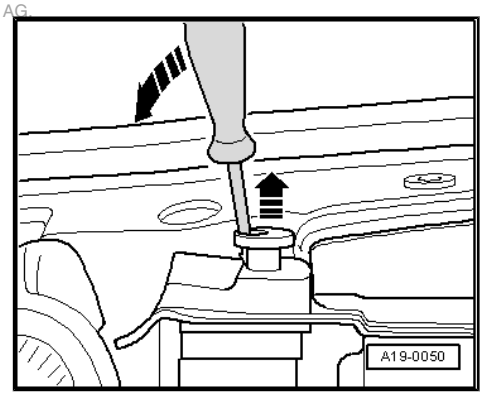
– Unplug electrical connector -1- for radiator fan (push retainer to the rear -arrow- and press down release catch).

– Lift retaining clips -1 and 2- and detach connection from radiator.



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– Release retaining pins for radiator on both sides and pull out upwards -arrows-.

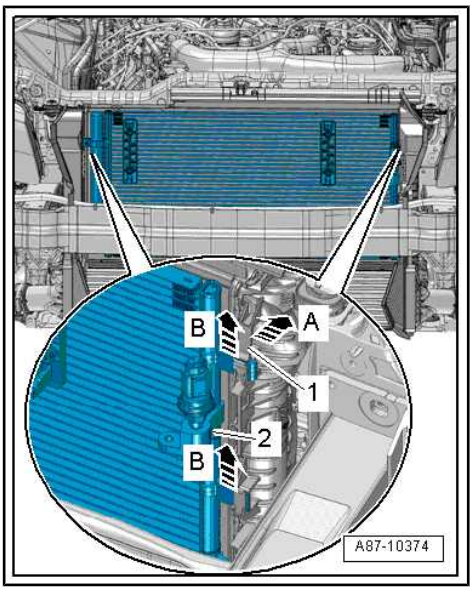


– Have a second mechanic release retaining clips -1- in direction of -arrow A- and lift condenser -2- out of mountings on radiator -arrows B-.

Caution

Risk of damage to condenser, refrigerant lines and refrigerant hoses.

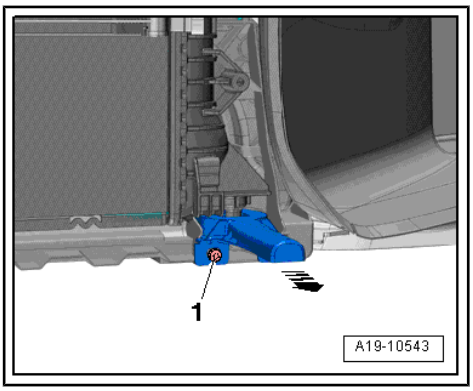
- ***Do NOT stretch, kink or bend refrigerant lines and hoses.***



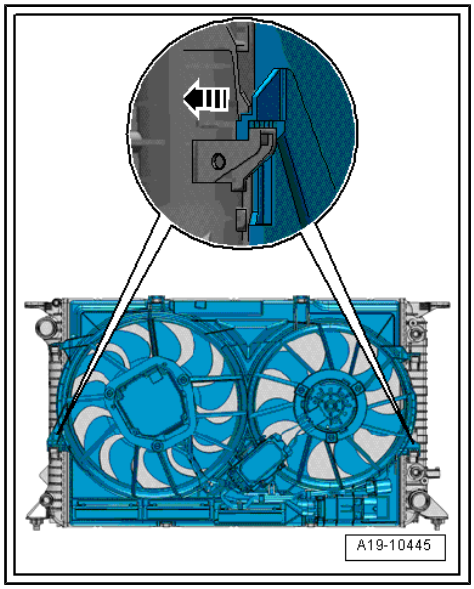
– Pivot condenser forwards with pipes/hoses attached.

– Remove bolts -1- on both sides and detach radiator bracket with radiator from lock carrier -arrow-.

– Detach radiator downwards.



– Press locking tabs on left and right sides of radiator cowl -arrow- and at the same time lift radiator cowl off radiator.



Installing

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

Note

If there are slight impressions on the fins, refer to ⇒ page 6 .

– Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
– Connect coolant hose with plug-in connector ⇒ page 225 .
– Install charge air cooler ⇒ page 249 .

Note

Do not reuse coolant.

– Fill up with coolant ⇒ page 200 .

Tightening torques

♦ ⇒ “4.1 Exploded view - radiator/radiator fan”, page 224

4.3 Removing and installing radiator cowl

Removing

– Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .
– Remove charge air cooler ⇒ page 249 .

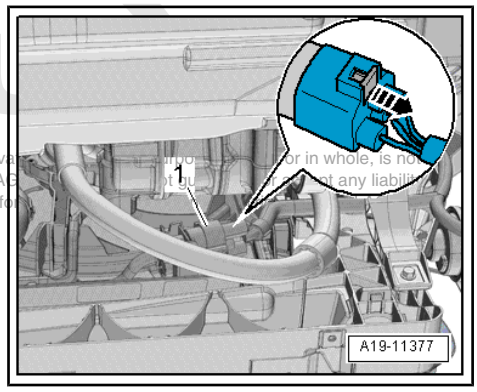
WARNING

Risk of injury as the radiator fan(s) may start up automatically.

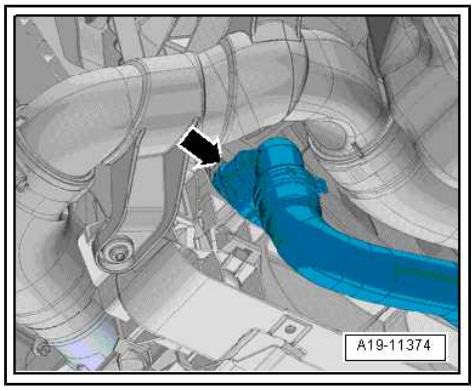
♦ ***Unplug electrical connectors before starting to work in the area of radiator cowl.***

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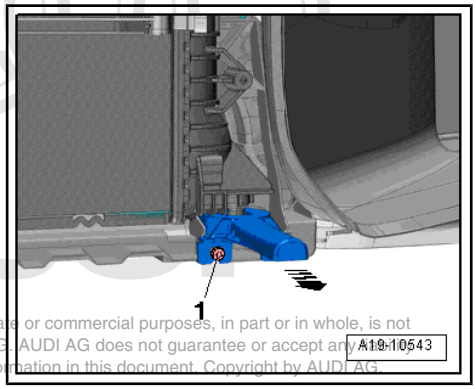
– Unplug electrical connector -1- for radiator fan (push retainer to the rear -arrow- and press down release catch).



– Place drip tray for workshop hoist - VAS 6208- beneath engine.
– Lift retaining clip -arrow-, disconnect coolant hose (bottom) from radiator and drain off coolant.

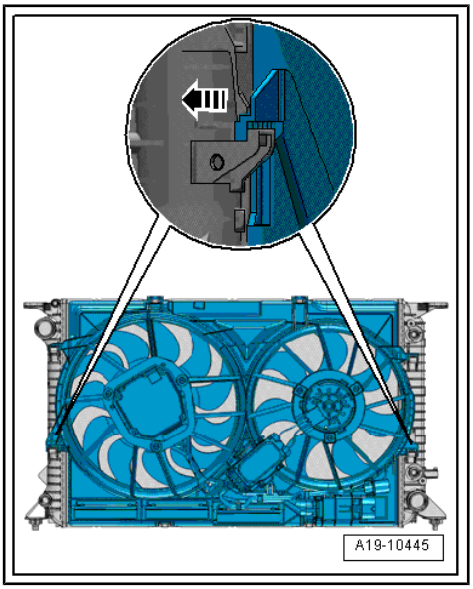


– Remove bolts -1- on both sides and detach radiator bracket with radiator from lock carrier -arrow-.



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– Press locking tabs on left and right sides of radiator cowl simultaneously -arrow- and detach radiator cowl downwards from radiator.



Installing

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

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

– Connect coolant hose with plug-in connector ⇒ page 225 .

– Install charge air cooler ⇒ page 249 .

Note

Do not reuse coolant.

– Fill up with coolant ⇒ page 200 .

Tightening torques

♦ ⇒ “4.1 Exploded view - radiator/radiator fan”, page 224

4.4 Removing and installing radiator fan - V7-

⇒ “4.4.1 Removing and installing radiator fan V7 ”, page 229

⇒ “4.4.2 Removing and installing radiator fan control unit J293 ”, page 230

4.4.1 Removing and installing radiator fan - V7-

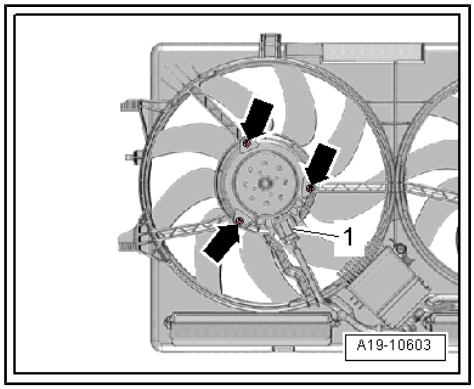
Removing

Note

Fit all cable ties in the original positions when installing.

– Remove radiator cowl ⇒ page 228 .

– Unplug electrical connector -1-.
– Unscrew bolts -arrows- and remove radiator fan - V7- .



Installing

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

– Install radiator cowl ⇒ page 228 .

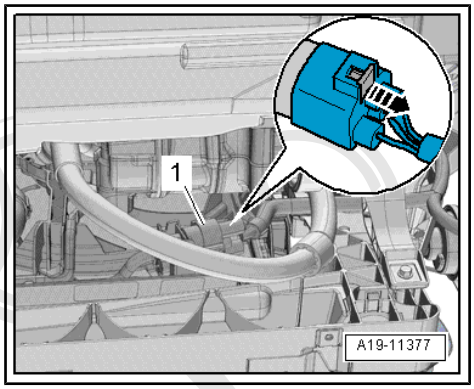
Tightening torques

◆ ⇒ “4.1 Exploded view - radiator/radiator fan”, page 224

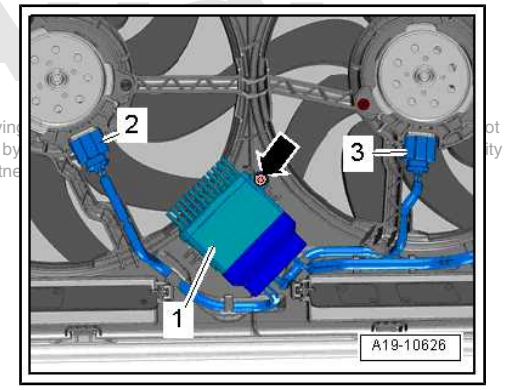
4.4.2 Removing and installing radiator fan control unit - J293-

Removing

– Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .
– Take electrical connector -1- for radiator fan out of bracket and unplug connector (push retainer to the rear -arrow- and press down release catch).
– Move electrical wiring harness going to radiator fan control unit clear.



– Unplug electrical connector -2-.
– Unscrew bolt -arrow- and remove radiator fan control unit -1-.



Note

Disregard -item 3-.

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Installing

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

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

Tightening torques

◆ ⇒ “4.1 Exploded view - radiator/radiator fan”, page 224

21 – Turbocharging/supercharging

1 Turbocharger

⇒ “1.1 Exploded view - turbocharger”, page 231

⇒ “1.2 Removing and installing turbocharger”, page 236

⇒ “1.3 Checking vacuum unit for turbocharger”, page 241

⇒ “1.4 Adjusting vacuum unit for turbocharger (1.8 ltr. engine only)”, page 242

⇒ “1.5 Renewing vacuum unit for turbocharger (1.8 ltr. engine only)”, page 246

1.1 Exploded view - turbocharger

Note

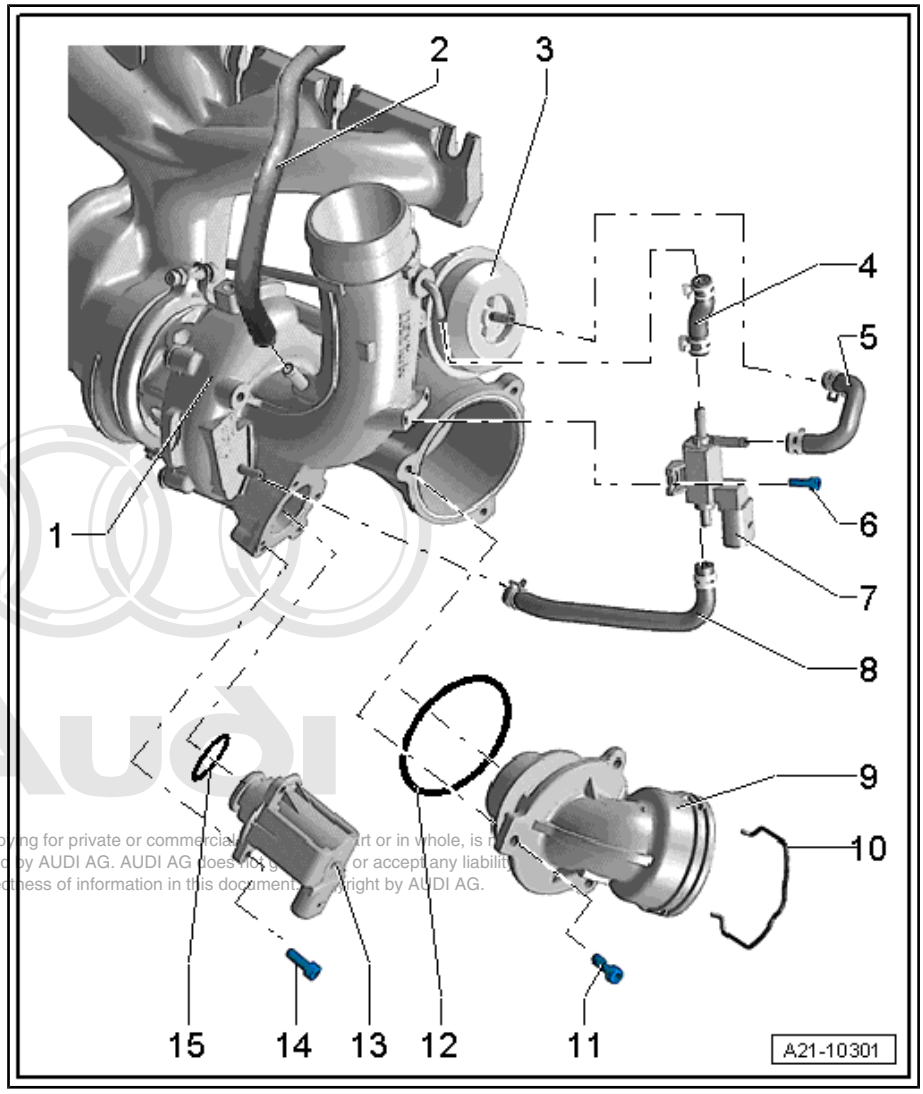
- *Hose connections and charge air system hoses must be free of oil and grease prior to fitting. However (applies only to plug-in connectors), the seal and the sealing surface of plug-in connectors should be lubricated lightly with oil ⇒ page 248 .*
- *Charge air system must be free of leaks.*
- *Observe rules for cleanliness ⇒ page 5 .*

Part I

Part II ⇒ page 232

Part III ⇒ page 233

Part IV ⇒ page 235



1 - Turbocharger

- ❑ Can only be renewed together with exhaust manifold and vacuum unit as one unit
- ❑ Removing and installing ⇒ page 236

2 - To activated charcoal filter

3 - Vacuum unit

- ❑ For turbocharger
- ❑ Can only be renewed together with turbocharger

4 - Hose

5 - Hose

6 - Bolt

- ❑ 3 Nm

7 - Charge pressure control solenoid valve - N75-

8 - Hose

9 - Connection

10 - Securing clip

11 - Bolt

- ❑ 9 Nm

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12 - O-ring

- ❑ Renew

13 - Turbocharger air recirculation valve - N249-

- ❑ Installation position ⇒ page 232

14 - Bolt

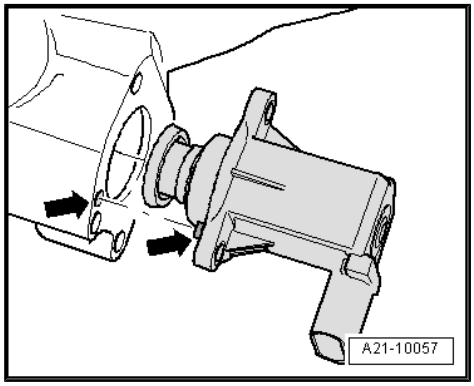
- ❑ 7 Nm

15 - O-ring

- ❑ Renew

Fitting location of turbocharger air recirculation valve - N249-

– Note installation position -arrows-.

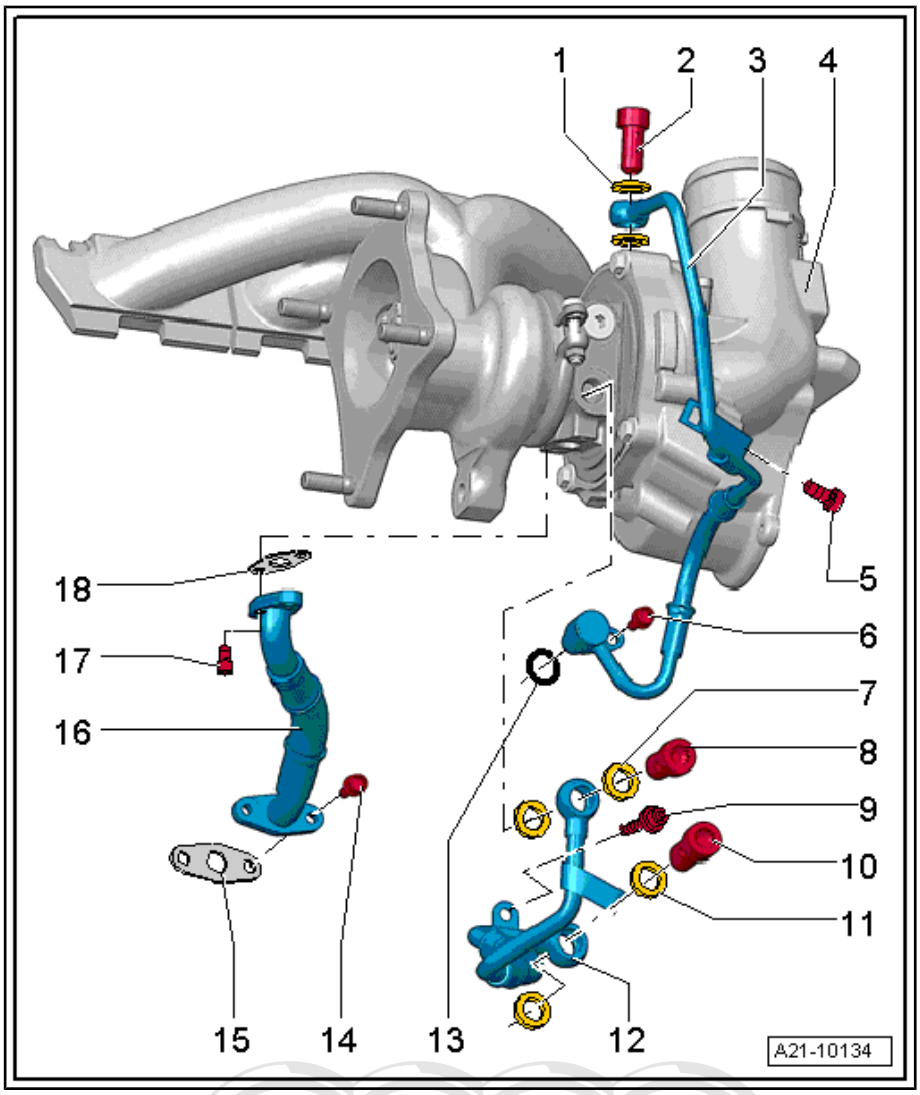


Part II

Part I ⇒ page 231

Part III ⇒ page 233

Part IV ⇒ page 235



1 - Seal
- ❑ Renew

2 - Banjo bolt
- ❑ 30 Nm

3 - Oil supply line

4 - Turbocharger
- ❑ Can only be renewed together with exhaust manifold and vacuum unit as one unit
- ❑ Removing and installing ⇒ page 236

5 - Bolt
- ❑ 9 Nm

6 - Bolt
- ❑ 9 Nm

7 - Seal
- ❑ Renew

8 - Banjo bolt
- ❑ 35 Nm

9 - Bolt
- ❑ 9 Nm

10 - Banjo bolt
- ❑ 35 Nm

11 - Seal
- ❑ Renew

12 - Coolant supply line

13 - O-ring
- ❑ Renew

14 - Bolt
- ❑ 9 Nm

15 - Gasket
- ❑ Renew

16 - Oil return line

17 - Bolt
- ❑ 9 Nm

18 - Gasket
- ❑ Renew

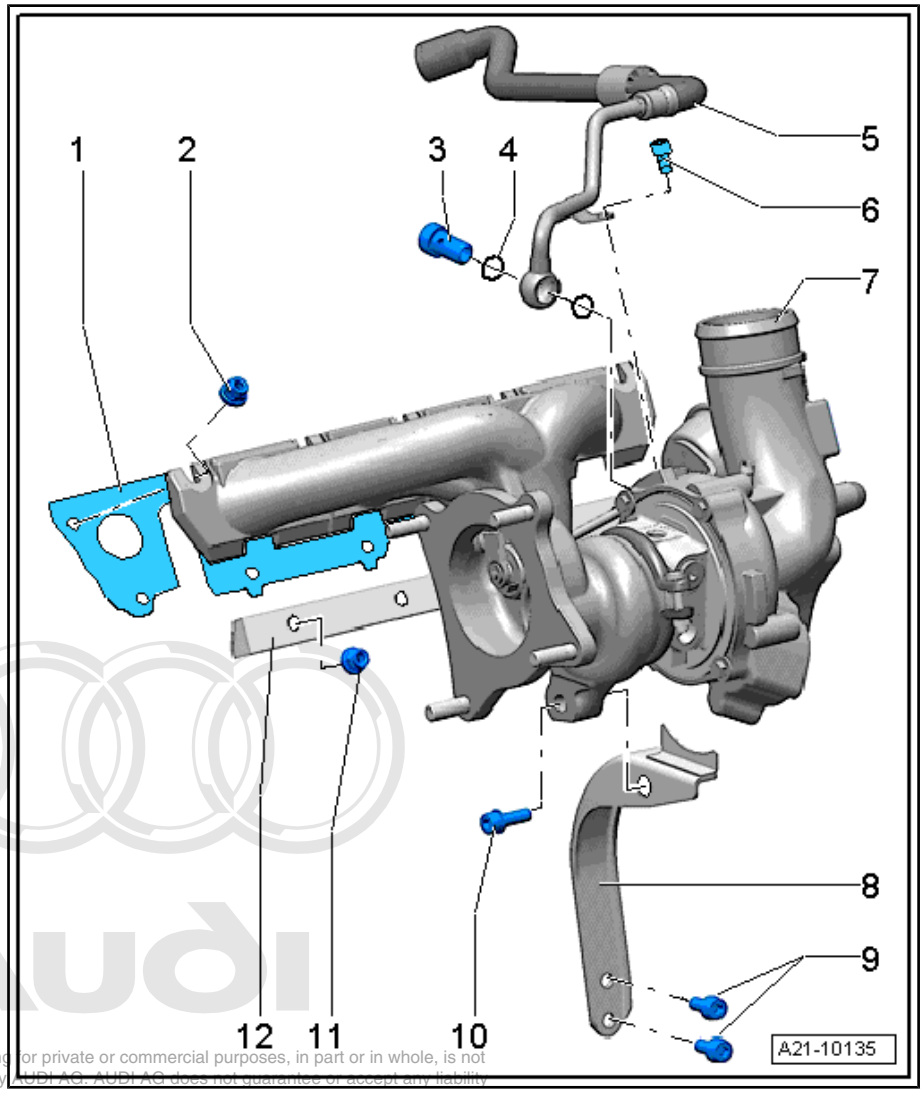
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Part III

Part I ⇒ page 231

Part II ⇒ page 232

Part IV ⇒ page 235



1 - Gasket

- ❑ Renew

2 - Nut

- ❑ Renew
- ❑ Lubricate exhaust manifold studs with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ Tightening torque and sequence ⇒ page 235

3 - Banjo bolt

- ❑ 35 Nm

4 - Seal

- ❑ Renew

5 - Coolant return line

6 - Bolt

- ❑ 9 Nm

7 - Turbocharger

- ❑ Can only be renewed together with exhaust manifold and vacuum unit as one unit
- ❑ Removing and installing ⇒ page 236

8 - Bracket

9 - Bolts

- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 30 Nm

10 - Bolt

- ❑ Coat thread with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 30 Nm

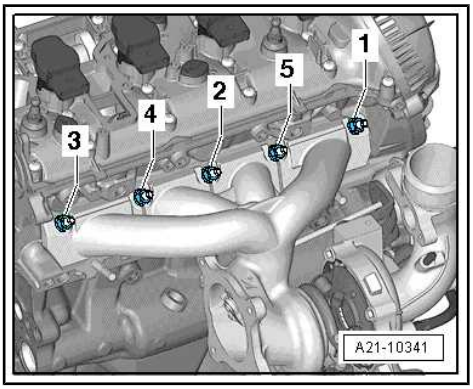
11 - Nut

- ❑ Do not open when removing turbocharger
- ❑ Renew
- ❑ 30 Nm
- ❑ Lubricate exhaust manifold studs with high-temperature paste. For high-temperature paste refer to ⇒ Electronic parts catalogue

12 - Fastening strip

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Turbocharger - tightening sequence



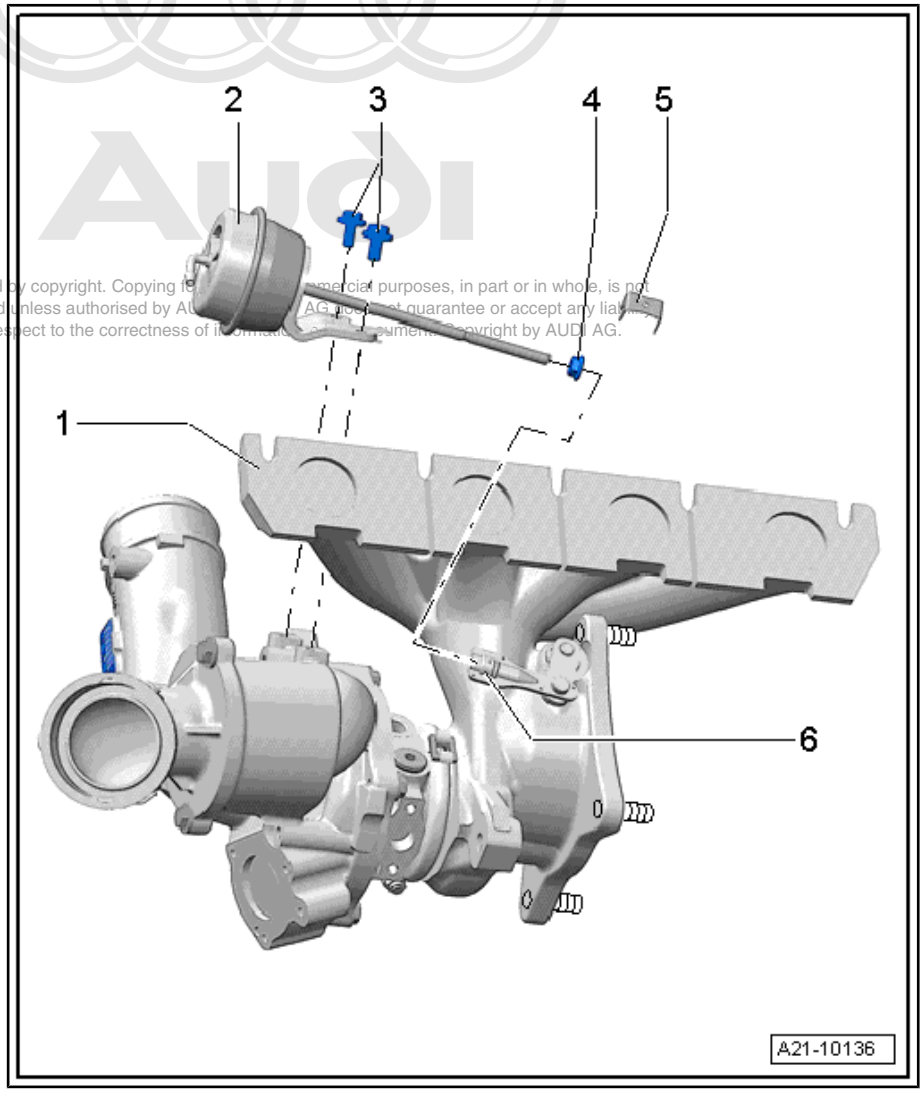
- Tighten nuts -1 to 5- in four stages as follows:
- 1. Tighten nuts to 5 Nm.
- 2. Tighten nuts to 12 Nm.
- 3. Tighten nuts to 16 Nm.
- 4. Tighten nuts to 25 Nm.

Part IV - only for 1.8 ltr. engine

Part I ⇒ page 231

Part II ⇒ page 232

Part III ⇒ page 233



1 - Turbocharger

- ❑ Can only be renewed together with exhaust manifold and vacuum unit as one unit
- ❑ Removing and installing ⇒ page 236

2 - Vacuum unit for turbocharger

- ❑ Checking ⇒ page 241
- ❑ Removing and installing ⇒ page 246
- ❑ Adjusting ⇒ page 242

3 - Bolt

- ❑ 10 Nm

4 - Nut

- ❑ 9 Nm
- ❑ Secure with sealant paint; for sealing paint refer to ⇒ Electronic parts catalogue

5 - Retaining clip

- ❑ Renew

6 - Knurled nut

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Further tightening torques

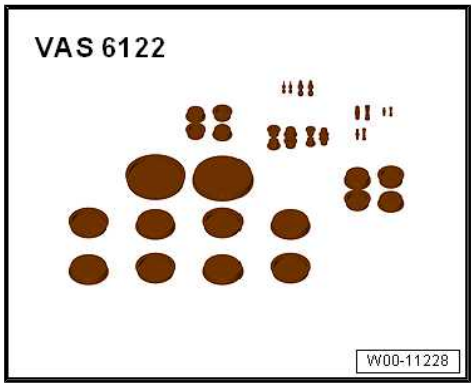
Component	Nm
Air pipe (right-side) to sump	10

Component	Nm
Air pipe to bracket	10

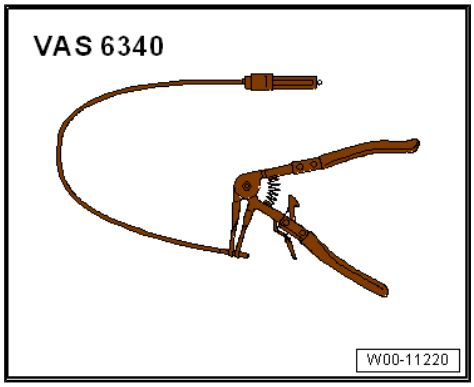
1.2 Removing and installing turbocharger

Special tools and workshop equipment required

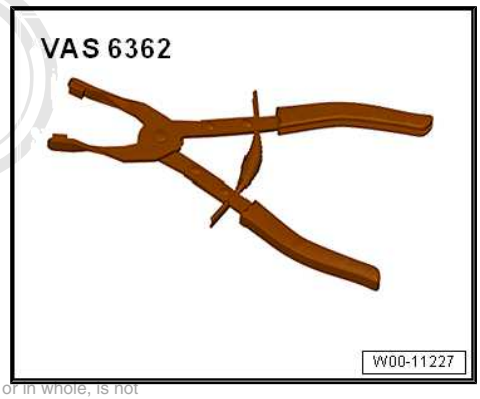
- Engine bung set - VAS 6122-



- Hose clip pliers - VAS 6340-



- Hose clip pliers - VAS 6362-



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Removing

Note

Observe rules for cleanliness ⇒ page 5 .

Caution

If the turbocharger has suffered mechanical damage (e.g. damaged compressor wheel), it is not sufficient merely to fit a new turbocharger. The following work must be performed in order to avoid further damage:

- ***Check air cleaner housing, air filter element and air hoses for dirt and foreign particles.***
- ***Check the entire charge air system (including the charge air cooler) for foreign matter.***
- ***If foreign matter is found in the charge air system, clean all relevant ducts and hoses and renew charge air cooler if necessary.***

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

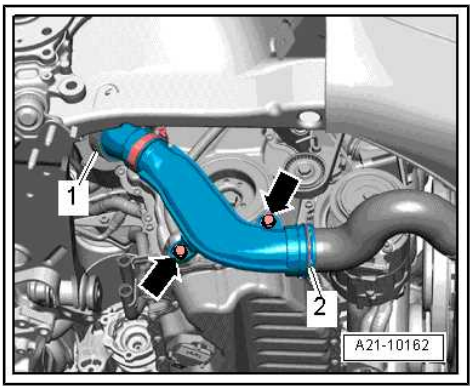
– Remove wheel spoiler (right-side) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Removing and installing wheel housing liner (front) .

– Drain coolant ⇒ page 194 .

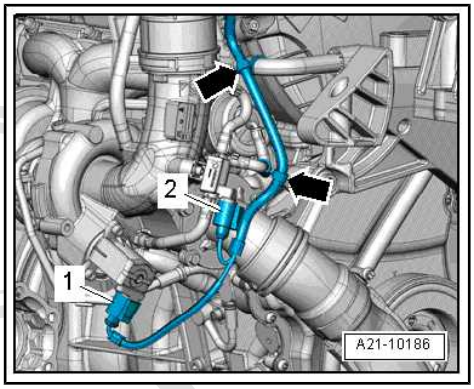
– Remove front exhaust pipe with catalytic converter ⇒ page 300 .

– Lift retaining clips -1 and 2- and disconnect air hoses.

– Unscrew bolts -arrows- and detach air pipe.

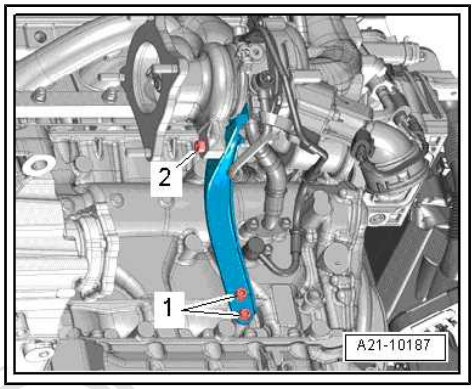


– Unplug electrical connectors -1 and 2- and move wiring clear -arrows-.

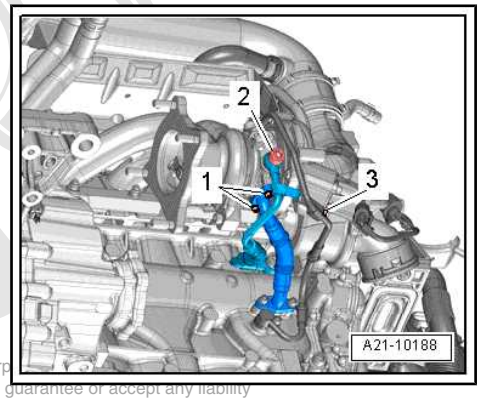


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– Unscrew bolts -1 and 2- and detach support for turbocharger.



– Remove banjo bolt -2- and move coolant pipe clear to one side.
– Remove bolt -1- at oil supply line and bolt -3- at oil return line.



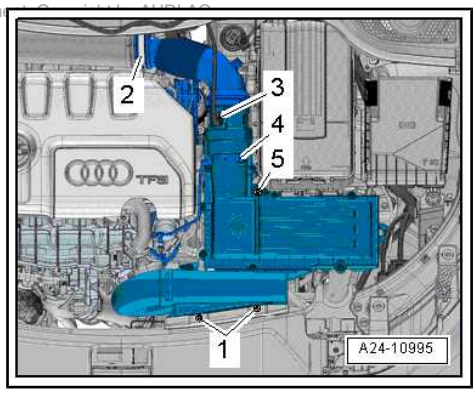
Note

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

– Remove engine cover panel ⇒ page 46 .

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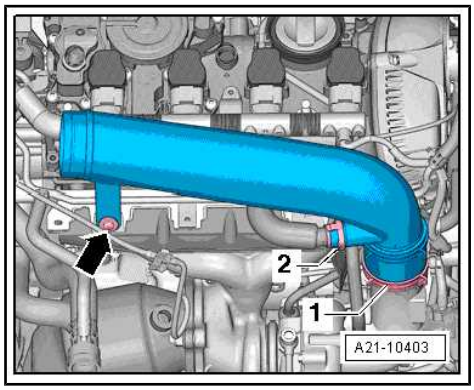
– Unplug electrical connector -3- at air mass meter - G70- .
– Detach hose -4-.
– Release hose clip -2- and detach air hose.
– Unscrew bolts -1 and 5- and detach air cleaner housing.



– Remove bolt -arrow-.
– Release hose clip -1- and detach air hose.
– Disconnect air hose -2- (press release tabs) and disconnect air pipe.

Vehicles with engine code CPSA:

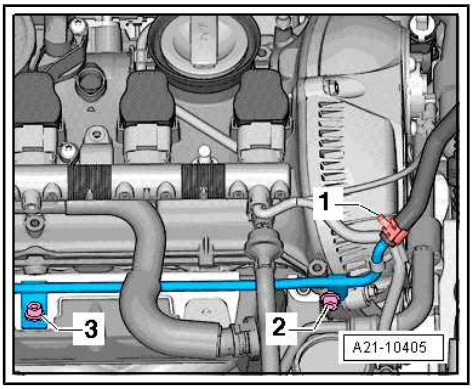
– Remove Lambda probe - G39- ⇒ page 290 .



Continued for all vehicles:

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

– Remove bolts -2, 3-.



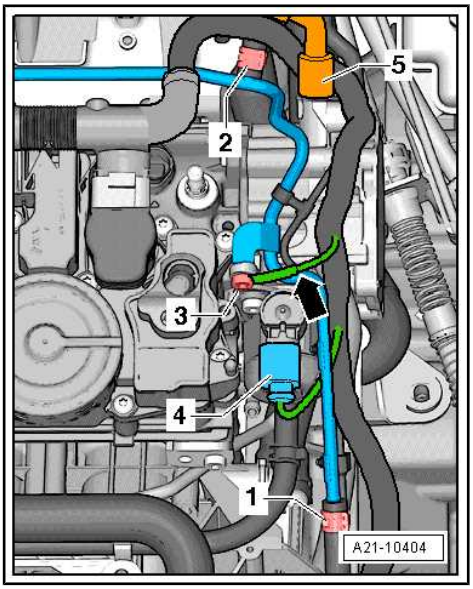
– Release hose clips -1, 2- and disconnect coolant hoses.

– Unplug electrical connector -4- and move wiring harness clear.

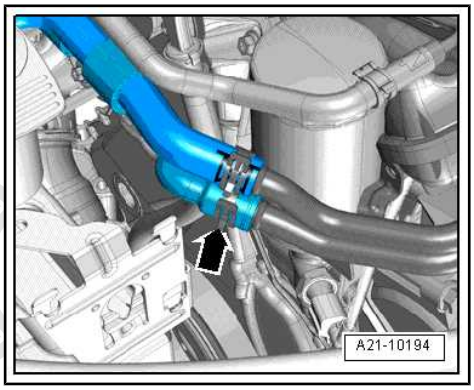
– Unscrew bolt -3- and detach coolant line.

Note

Disregard -items 4, 5- and -arrow-.

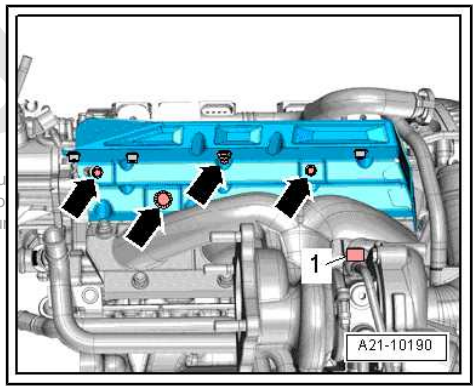


– Disconnect coolant hose -arrow- and move clear.



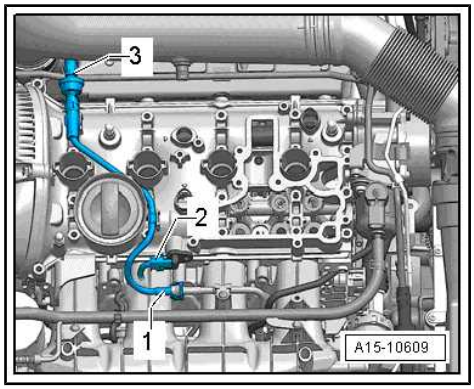
– Remove bolts -arrows- and detach heat shield.

– Remove banjo bolt -1- and disconnect oil supply line from turbocharger.

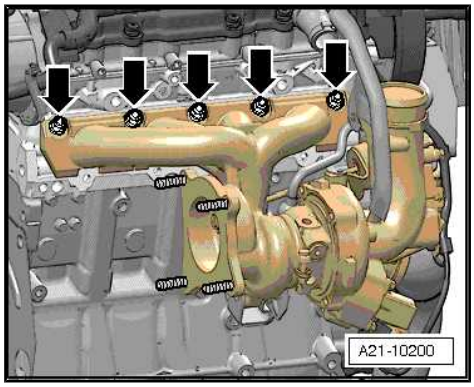


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– Disconnect vacuum line -3-.



– Remove nuts -arrows- and detach turbocharger with exhaust manifold from cylinder head.



Installing

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

Note

- *Renew seals, gaskets, O-rings and self-locking nuts.*
- *Fill turbocharger with engine oil at connection for oil supply line.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *After installing turbocharger, allow engine to idle for approx. 1 minute and do not rev up immediately to ensure turbocharger is supplied with oil.*

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

– Install Lambda probe - G39- ⇒ page 290 .

– Install air ducts ⇒ page 248 .

– Install front exhaust pipe with catalytic converter ⇒ page 300 .

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

Note

Do not reuse coolant.

– Fill up with coolant ⇒ page 200 .

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

Tightening torques

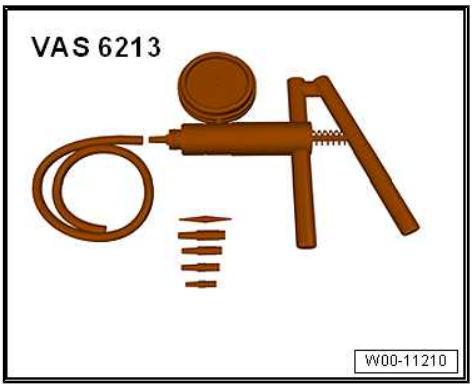
- ⇒ “1.1 Exploded view - turbocharger”, page 231
- ⇒ Fig. ““Turbocharger - tightening sequence”“ , page 235
- ⇒ “2.2 Exploded view - hose connections for charge air system”, page 248
- ⇒ “3.1 Exploded view - cylinder head”, page 123

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1.3 Checking vacuum unit for turbocharger

Special tools and workshop equipment required

- Hand vacuum pump - VAS 6213-



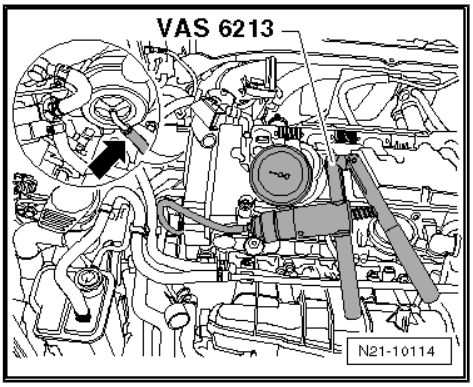
Test condition:

- Hose from turbocharger via charge pressure control solenoid valve - N75- to vacuum unit must not be blocked.
- Charge pressure control solenoid valve - N75- OK.

Procedure:

– Remove engine cover panel ⇒ page 46 .

– Connect hand vacuum pump - VAS 6213- to vacuum unit -arrow-.

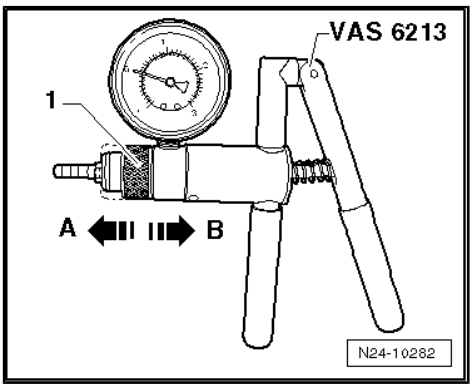


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– Move adjuster ring -1- on hand vacuum pump - VAS 6213- to position -B- to select “pressure”.

Caution

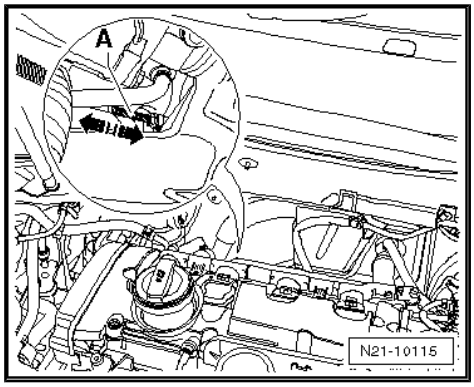
The pressure must not exceed 750 mbar. The vacuum unit could be damaged if the pressure is exceeded.



– Operate hand vacuum pump - VAS 6213- several times and at the same time observe linkage.

The linkage -A- should start to move at a pressure of approx. 300 mbar and be at its limit stop at a pressure of approx. 700 mbar.

The linkage should travel approx. 10 mm.



Note

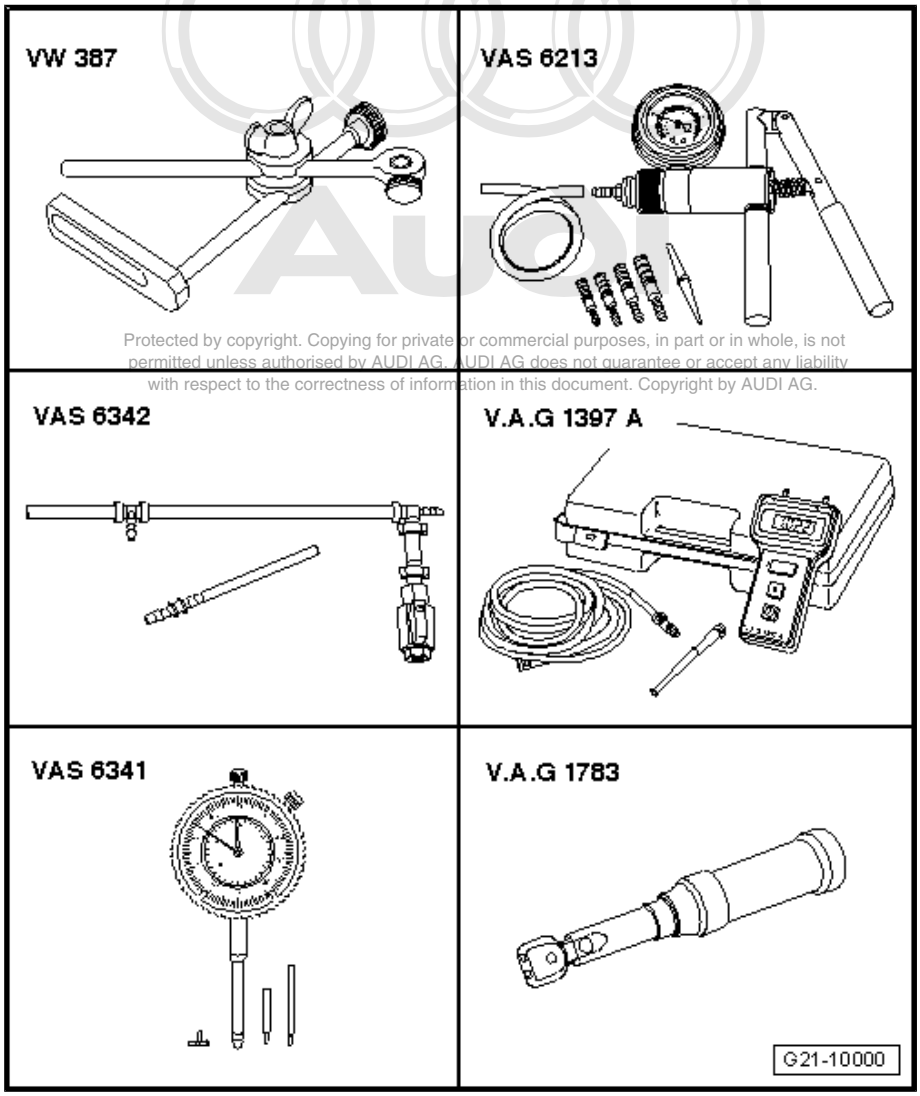
If it is not possible to build up pressure with hand vacuum pump - VAS 6213- or if the pressure drops again immediately, check hand vacuum pump - VAS 6213- and connecting hoses for leaks. If no fault is found: renew vacuum unit ⇒ page 246 .

1.4 Adjusting vacuum unit for turbocharger (1.8 ltr. engine only)

Turbocharger removed

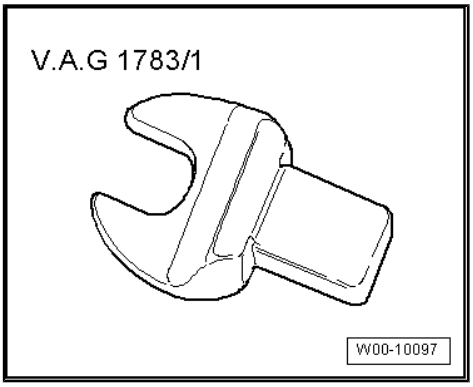
Special tools and workshop equipment required

- Universal dial gauge bracket - VW 387-
- Hand vacuum pump - VAS 6213-
- Pressure control valve - VAS 6342-
- Turbocharger tester - V.A.G 1397A-
- Dial gauge set, 4-part - VAS 6341-
- Torque wrench - V.A.G 1783-



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♦ Open-end spanner insert AF 10 - V.A.G 1783/1-

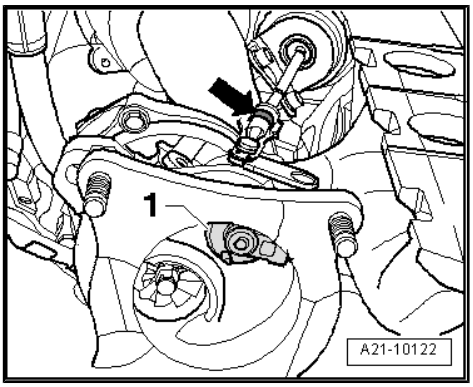


Adjusting

Note

It is only necessary to adjust the vacuum unit if the vacuum unit has been removed.

– Pre-adjust bypass flap -1- via nut -arrow- so that bypass flap can still just be turned by hand.



– Secure universal dial gauge bracket - VW 387- to turbocharger -arrow-.

Note

♦ *The dial gauge values (mm) listed here include the 1 mm pre-load that is initially set on the gauge.*

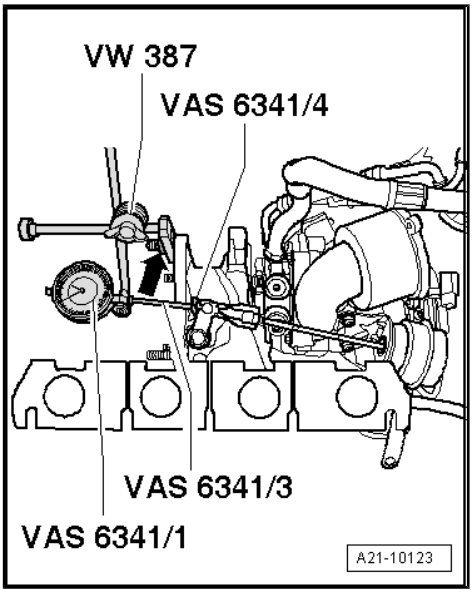
♦ *Dial gauge - VAS 6341/1- with dial gauge extension, 30 mm - VAS 6341/3- must align with linkage of vacuum unit.*

– Attach dial gauge - VAS 6341/1- with extension, 30 mm - VAS 6341/3- and flat probe - VAS 6341/4- to universal dial gauge bracket - VW 387- .

– Set dial gauge - VAS 6341/1- to 1 mm preload.

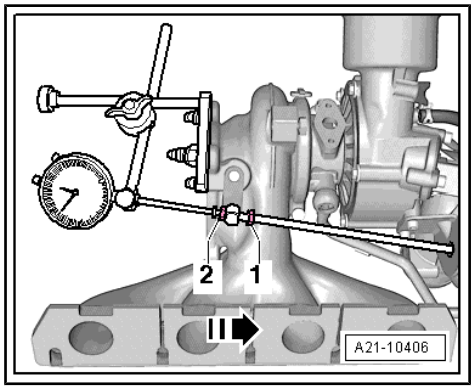
– Set scale of dial gauge - VAS 6341/1- to 0.

– Make sure that dial gauge can move freely.

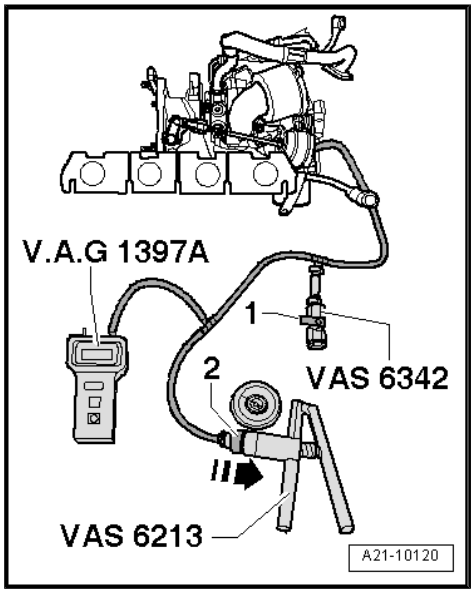


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– Turn nut -1- approx. 7 turns in direction of -arrow-.
– Turn nut -2- in direction of -arrow- until dial gauge displays 7 mm.
– Hand-tighten nut -1-.
– Set dial gauge - VAS 6341/1- to 1 mm preload.
– Set scale of dial gauge - VAS 6341/1- to 0.

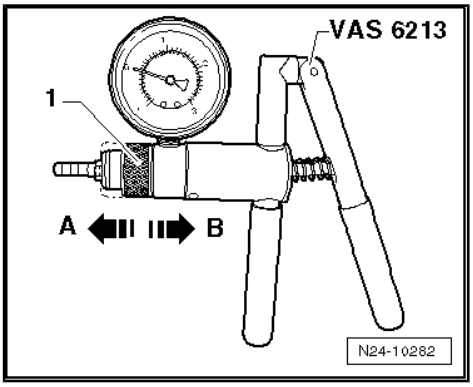


– Connect up hand vacuum pump - VAS 6213- , turbocharger tester - V.A.G 1397A- (connection II) and pressure control valve - VAS 6342- as shown in illustration.
– Switch on turbocharger tester - V.A.G 1397A- and set sliding switch to position II.
– Close pressure control valve - VAS 6342- at lever -1-.



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– Move adjuster ring -1- on hand vacuum pump - VAS 6213- to position -B- to select “pressure”.



Note

The following measurements must be performed in continuous sequence. Do not allow the pressure to drop to 0 between measurements.

– Operate hand vacuum pump - VAS 6213- until turbocharger tester - V.A.G 1397A- indicates 460 +/- 5 mbar.

Note

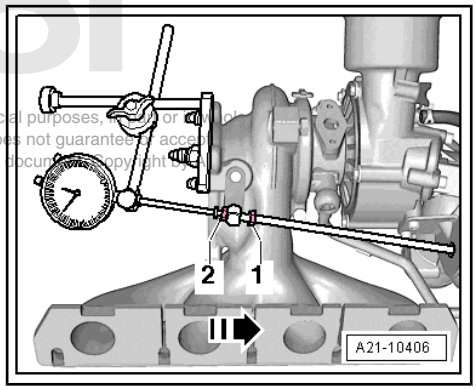
If value exceeds 460 +/-5 mbar, repeat entire measurement.

– Read off and note value indicated on dial gauge - VAS 6341/1- .
– Operate hand vacuum pump - VAS 6213- until turbocharger tester - V.A.G 1397A- indicates 650 to 700 mbar.
– Vent system via pressure control valve - VAS 6342- so that pressure reading drops to 460 +/- 5 mbar.

Note

If value does not reach 460 +/- 5 mbar, repeat entire measurement.

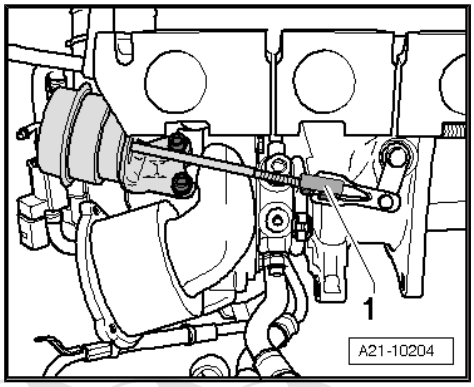
– Read off and note value indicated on dial gauge - VAS 6341/1- .
– Add values 1 and 2 together and divide by 2.
– The result (mean value) should be 5 +/- 0.5 mm.



– If value is higher, relieve pressure until it is 0 bar, loosen nut -1- and turn nut -2- half a turn in direction of arrow and hand-tighten nut -1-.
– Set dial gauge - VAS 6341/1- to 1 mm preload.
– Set scale of dial gauge - VAS 6341/1- to 0 and repeat measurement.
– If result (mean value) is 5 +/- 0.5 mm, tighten lock nut and repeat measurement.
– If result (mean value) is 5 +/- 0.5 mm, secure nuts with sealing paint. Sealing paint ⇒ Electronic parts catalogue .

Audi
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– Secure new locking plate -1- on linkage of vacuum unit.



Tightening torques

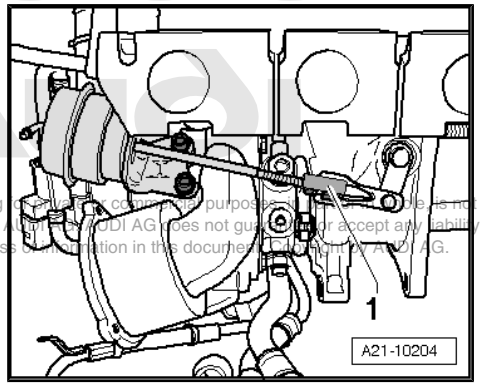
◆ ⇒ “1.1 Exploded view - turbocharger”, page 231

1.5 Renewing vacuum unit for turbocharger (1.8 ltr. engine only)

Removing

– Remove turbocharger ⇒ page 236 .

– Detach locking plate -1- on turbocharger linkage.

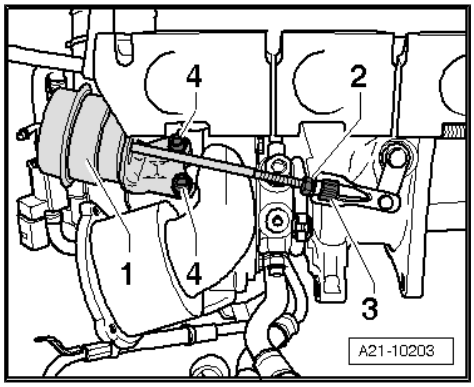


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– Loosen lock nut -2-.

– Detach linkage from turbocharger -3-.

– Remove bolts -4- and take out vacuum unit -1-.



Installing

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

– Adjust vacuum unit for turbocharger ⇒ page 242 .

– Install turbocharger ⇒ page 236 .

Tightening torques

◆ ⇒ “1.1 Exploded view - turbocharger”, page 231

2 Charge air system

⇒ “2.1 Exploded view - charge air system”, page 247

⇒ “2.2 Exploded view - hose connections for charge air system”, page 248

⇒ “2.3 Removing and installing charge air cooler”, page 249

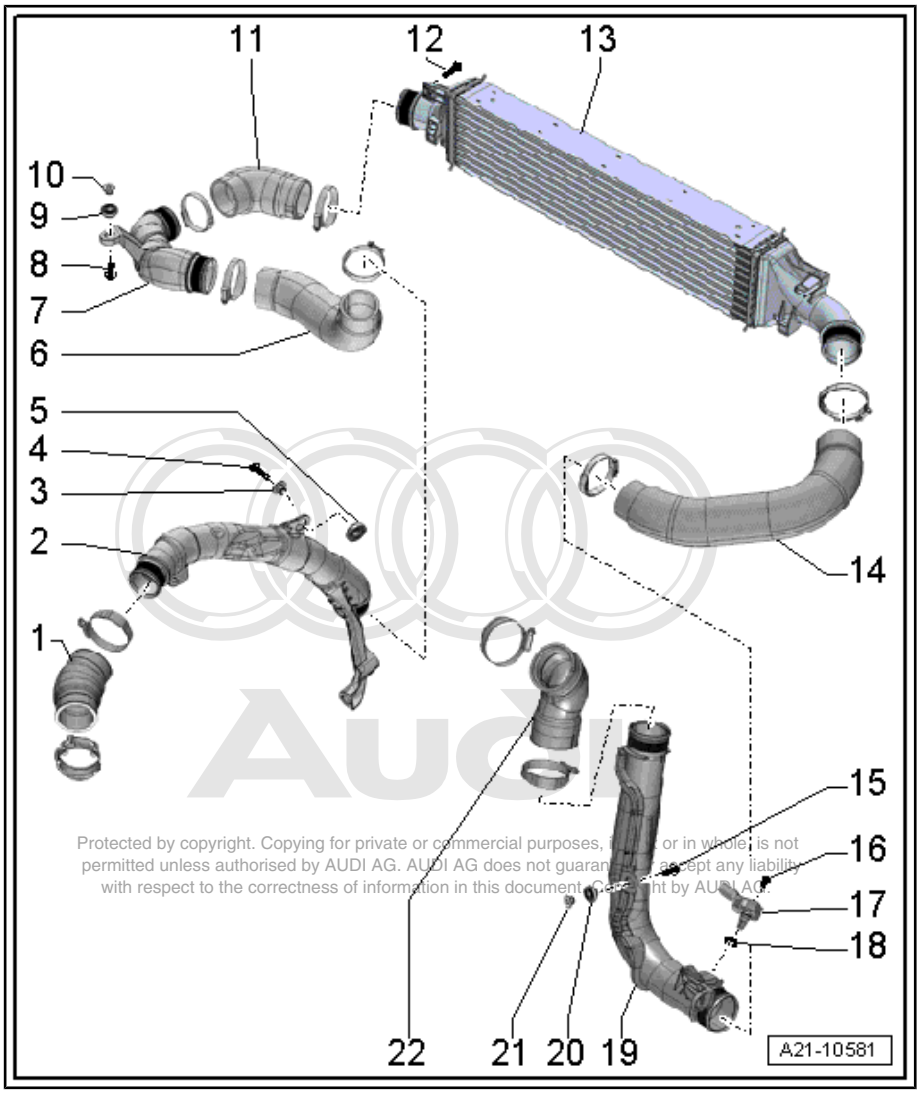
⇒ “2.4 Removing and installing charge pressure sender G31 ”, page 250

⇒ “2.5 Checking charge air system for leaks”, page 250

2.1 Exploded view - charge air system

Note

- *Check that all air pipes and hoses and vacuum lines are correctly fitted and that there are no leaks before carrying out tests or repairs.*
- *Observe rules for cleanliness ⇒ page 5 .*



1 - Air hose

2 - Air pipe (rear left)

3 - Spacer sleeve

4 - Bolt

- ❑ 9 Nm

5 - Grommet

- ❑ Renew if damaged

6 - Air hose

7 - Air pipe (front left)

8 - Bolt

- ❑ 9 Nm

9 - Grommet

- ❑ Renew if damaged

10 - Spacer sleeve

11 - Air hose

12 - Bolt

- ❑ 7 Nm

13 - Charge air cooler

- ❑ Removing and installing ⇒ page 249

14 - Air hose

15 - Bolt

- ❑ 9 Nm

16 - Bolt

- ❑ 5 Nm

17 - Charge pressure sender - G31-

- ❑ Removing and installing ⇒ page 250

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18 - O-ring

- ❑ Renew

19 - Air pipe (right-side)

20 - Grommet

- ❑ Renew if damaged

21 - Spacer sleeve

22 - Air hose

2.2 Exploded view - hose connections for charge air system

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With hose clips

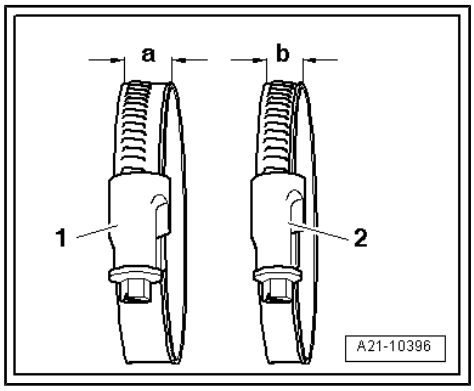
Note

- *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *The screw sections of used screw-type clips must be sprayed with rust remover prior to fitting so that the air hoses can be attached securely to the hose connections.*

Tightening torque for:

1 - Hose clip with width -a- = 13 mm: 5.5 Nm

2 - Hose clip with width -b- = 9 mm: 3 Nm



With plug-in connector

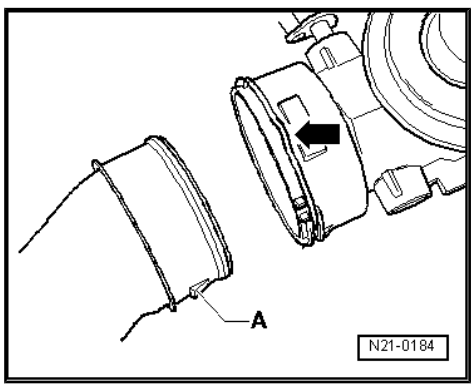
Caution

Make sure the retaining clip is not in the locked position when fitting air pipes/hoses with plug-in connectors; otherwise the seal can be damaged and will not seal off properly.

- ♦ *Note assembly instructions.*

Removing

– Release plug-in connector by pulling out retaining clip -arrow-. Disconnect air pipe (do not use tools of any kind).



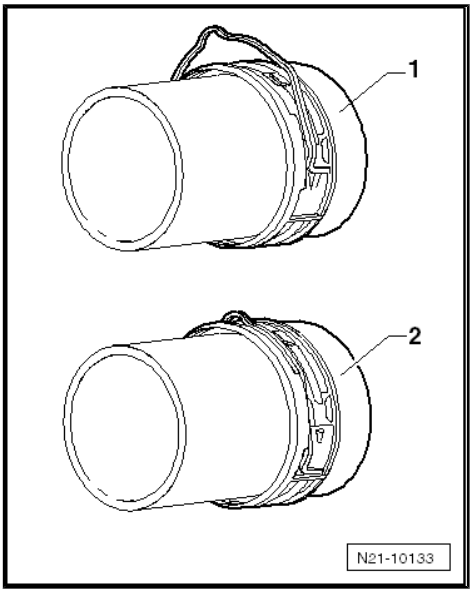
Installing

– Position seal in groove on air hose if seal is being renewed.

• Make sure the seal is correctly seated in the groove all round and that it is not twisted.

– Lubricate sealing surface and seal.

– Release retaining clip (position -1-).
– Push air pipe into plug-in connector as far as stop.
– Move retaining clip to locked position -2- and press air pipe down again.
– Then pull air pipe to check that it is fitted correctly and that plug-in connector is locked.

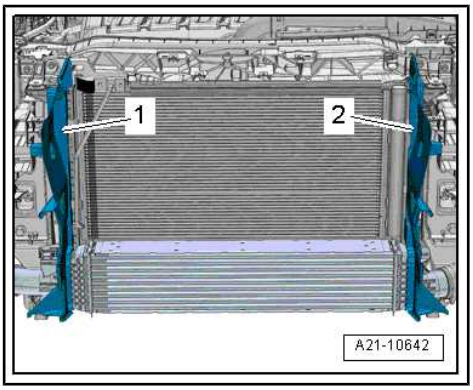


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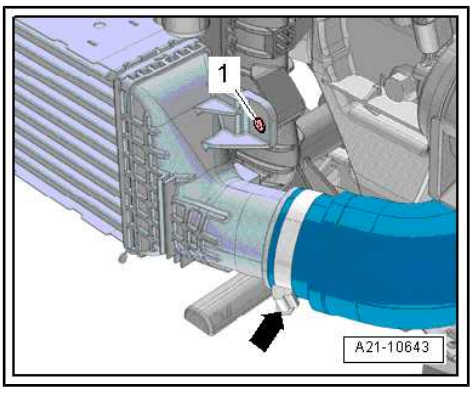
2.3 Removing and installing charge air cooler

Removing

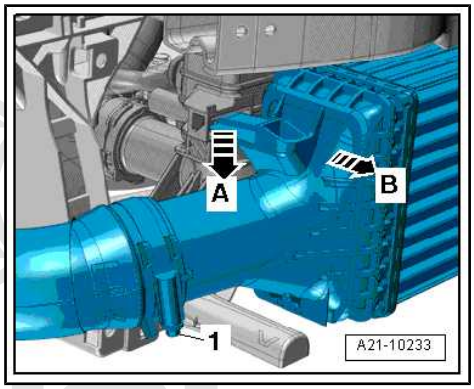
– Remove lock carrier cover and closure plate at bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing attachments .
– Unclip air ducts -1 and 2-.



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



– Release hose clip -1- and detach air hose from charge air cooler.
– Push catch down -arrow A- and move top of charge air cooler slightly in direction of -arrow B-.
– Disengage and detach charge air cooler upwards.



Installing

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

Note

If there are slight impressions on the fins, refer to ⇒ page 6 .

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

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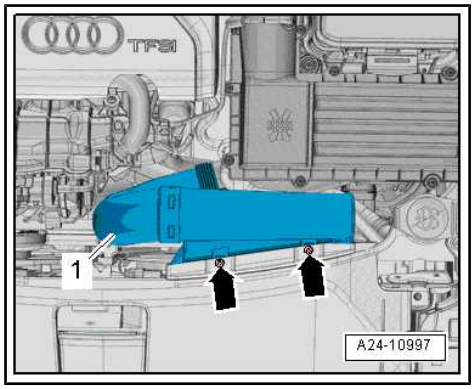
Tightening torques

- ⇒ “2.1 Exploded view - charge air system”, page 247
- ⇒ “2.2 Exploded view - hose connections for charge air system”, page 248

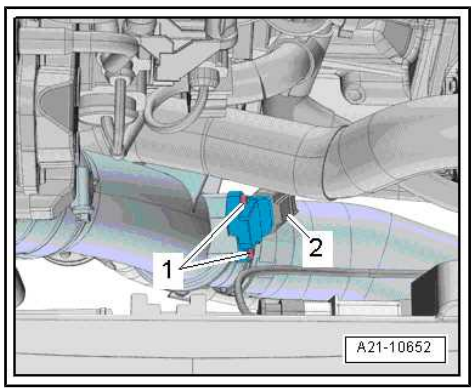
2.4 Removing and installing charge pressure sender - G31-

Removing

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



– Unplug electrical connector -2-.
– Unscrew 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

Fit new O-ring.

– Install air duct ⇒ page 259 .

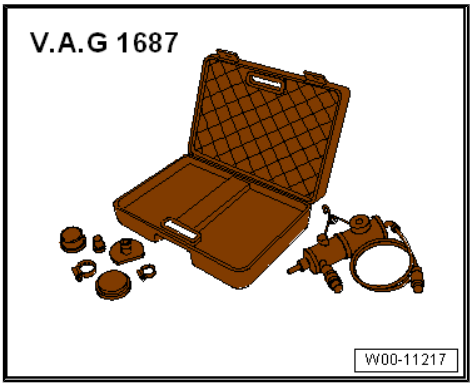
Tightening torques

- ⇒ “2.1 Exploded view - charge air system”, page 247

2.5 Checking charge air system for leaks

Special tools and workshop equipment required

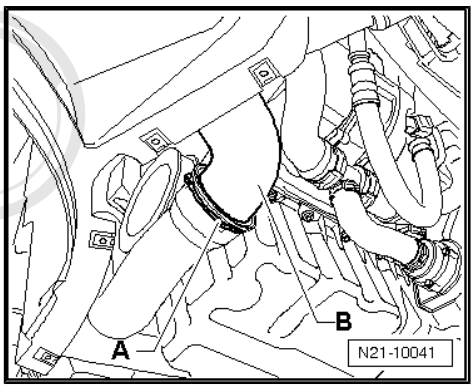
♦ Charge air system tester - V.A.G 1687- with end seal - V.A.G 1687/5-



Procedure

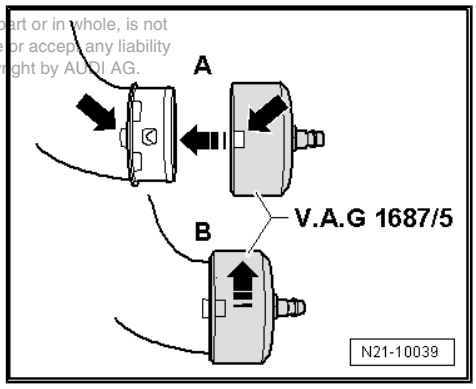
– Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

– Lift retaining clip -A- and detach air hose -B-.

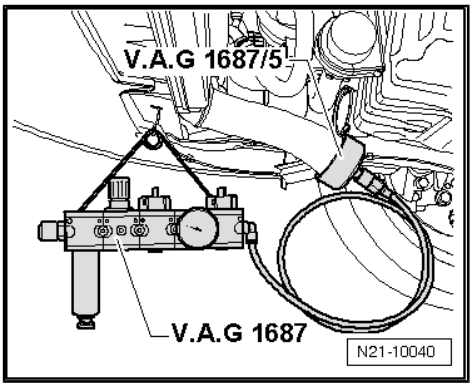


– Fit end seal - V.A.G 1687/5- onto air hose -A- and turn by approx. 90° -arrow B- to engage.

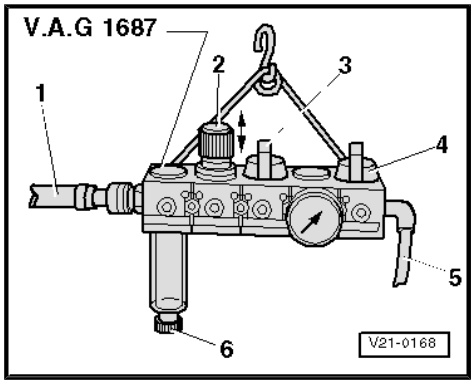
Audi
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– Connect hose of charge air system tester -V.A.G 1687- to end seal - V.A.G 1687/5- as shown on illustration.



Prepare charge air system tester - V.A.G 1687- as follows:



– Unscrew pressure control valve -2- completely and close valves -3- and -4-.

• Make sure knob is pulled out before turning pressure control valve -2-.

– Using a commercially available connection piece, connect charge air system tester - V.A.G 1687- to compressed air -1-.

Note

If there is water in sight glass, remove drain plug -6- and drain water.

– Open valve -3-.

Caution

Risk of damage if pressure is set too high.

- ***The pressure must not exceed 0.5 bar.***

– Adjust pressure to 0.5 bar via pressure control valve -2-.

– Open valve -4- and wait until test system is pressurised. If necessary, adjust pressure to 0.5 bar again.

– Check charge air system for audible leaks or leaks that can be felt with the hand; apply commercially available leak 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.*
- *For operation of ultrasonic tester -V.A.G 1842- , refer to ⇒ Operating instructions .*
- *Release pressure in test circuit by detaching hose coupling from adapter before removing adapter.*

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Assembling

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

Note

Renew gasket and O-rings.

– Install air ducts ⇒ page 248 .

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

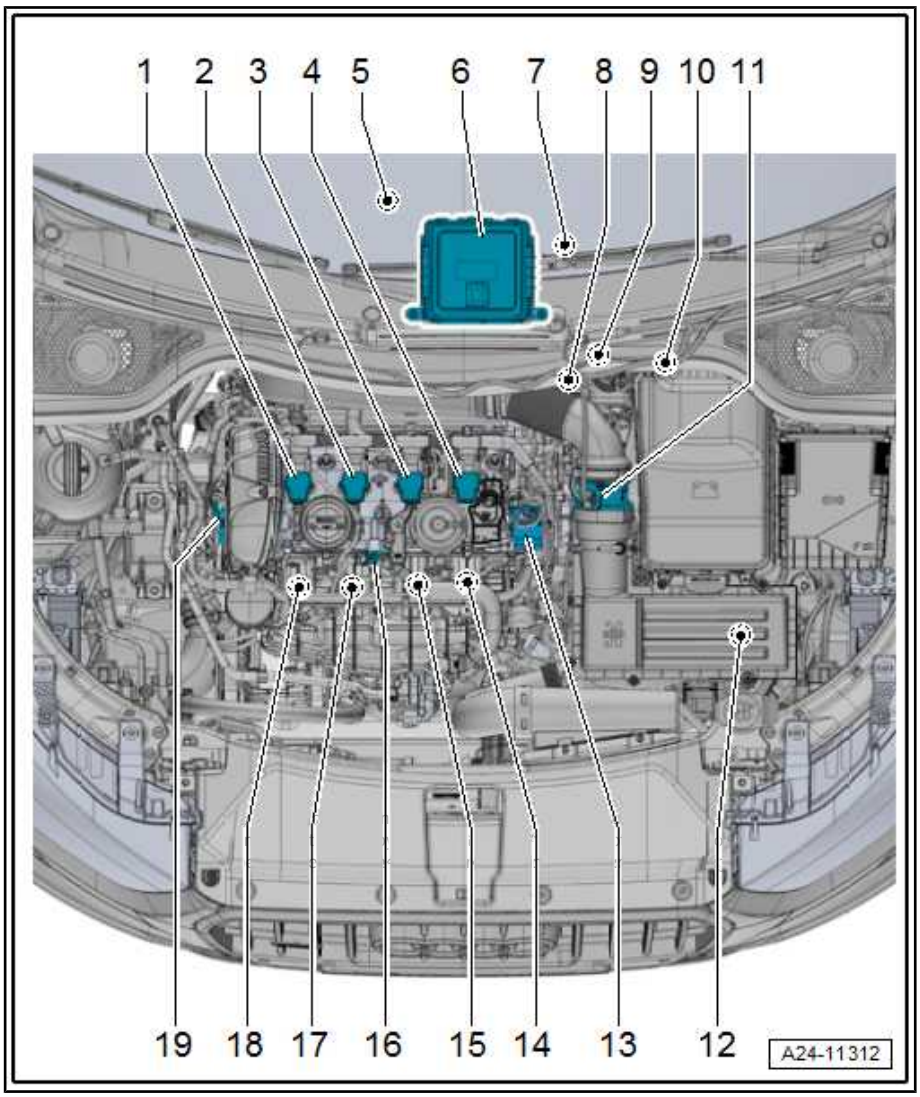
24 – Mixture preparation - injection

1 Injection system

⇒ "1.1 Overview of fitting locations - injection system", page 253

1.1 Overview of fitting locations - injection system

Overview of fitting locations - engine compartment



1 - Ignition coil 1 with output stage - N70-

- ❑ For cylinder 1
- ❑ Exploded view ⇒ page 306

2 - Ignition coil 2 with output stage - N127-

- ❑ For cylinder 2
- ❑ Exploded view ⇒ page 306

3 - Ignition coil 3 with output stage - N291-

- ❑ For cylinder 3
- ❑ Exploded view ⇒ page 306

4 - Ignition coil 4 with output stage - N292-

- ❑ For cylinder 4
- ❑ Exploded view ⇒ page 306

5 - Lambda probe after catalytic converter - G130- and Lambda probe heater 1 after catalytic converter - Z29-

- ❑ Exploded view ⇒ page 290

6 - Engine control unit - J623-

- ❑ Removing and installing ⇒ page 296

7 - Brake servo pressure sensor - G294-

- ❑ Fitting location ⇒ page 255

8 - Accelerator position sender - G79- and accelerator position sender 2 - G185-

- ❑ Fitting location ⇒ page 254
- ❑ Exploded view ⇒ Fuel supply system, petrol engines; Rep. gr. 20 ; Accelerator mechanism; Exploded view - accelerator pedal module

9 - Brake light switch - F- / brake pedal switch - F63-

- ❑ Fitting location ⇒ page 255
- ❑ Exploded view ⇒ Brake system; Rep. gr. 47 ; Brake servo/brake master cylinder; Exploded view - brake servo/brake master cylinder

10 - Clutch position sender - G476-

- ❑ Only fitted on vehicles with manual gearbox
- ❑ Fitting location ⇒ page 255
- ❑ Exploded view ⇒ Rep. gr. 30 ; Clutch mechanism; Exploded view - pedal cluster

11 - Air mass meter - G70-

- ❑ Exploded view ⇒ page 258

12 - Gearbox neutral position sender - G701-

- ❑ Fitting location ⇒ page 255

13 - High-pressure pump

- ❑ Depending on version, with fuel metering valve - N290- or fuel pressure regulating valve - N276-
- ❑ Exploded view ⇒ page 286

14 - Injector, cylinder 4 - N33-

- ❑ Exploded view ⇒ page 271

15 - Injector, cylinder 3 - N32-

- ❑ Exploded view ⇒ page 271

16 - Hall sender - G40-

- ❑ Exploded view ⇒ page 306

17 - Injector, cylinder 2 - N31-

- ❑ Exploded view ⇒ page 271

18 - Injector, cylinder 1 - N30-

- ❑ Exploded view ⇒ page 271

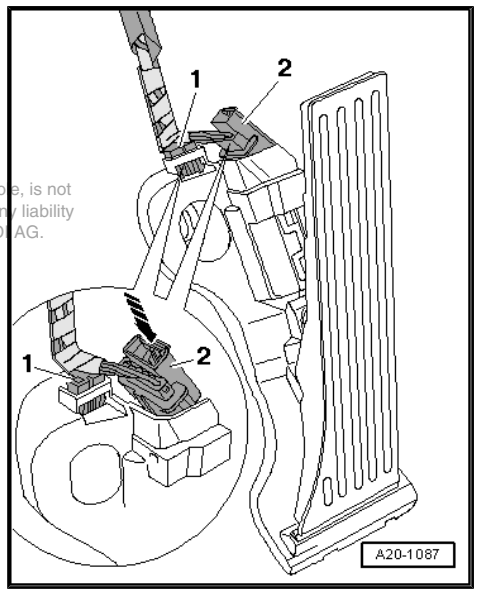
19 - Camshaft control valve 1 - N205-

- ❑ Exploded view ⇒ page 90

Fitting location of accelerator position sender - G79- / accelerator position sender 2 - G185-

- ♦ In accelerator pedal module

2 - Electrical connector for accelerator pedal module



Note

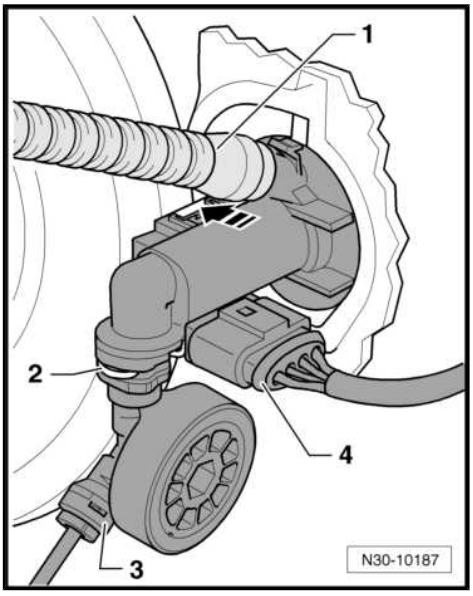
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The accelerator position sender - G79- and accelerator position sender 2 - G185- are integrated in the accelerator pedal module and cannot be renewed individually.

Fitting location of clutch position sender - G476-

♦ On clutch master cylinder -4-

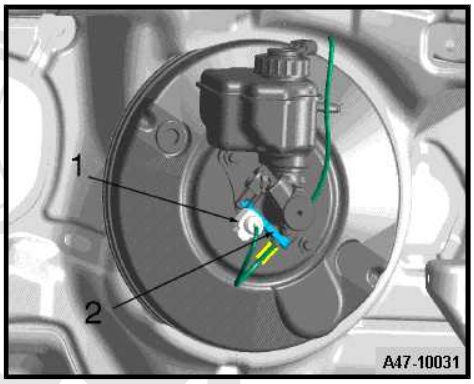
Integrated functions: clutch pedal switch for engine start - F194- and clutch pedal switch - F36-



Fitting location of brake light switch - F- / brake pedal switch - F63-

♦ On brake servo in engine compartment

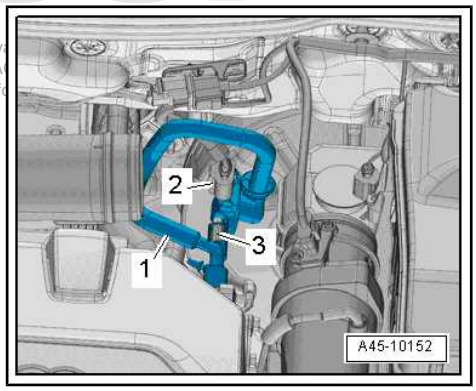
1 - Brake light switch - F- / brake pedal switch - F63-



Fitting location of brake servo pressure sensor - G294-

2 - Electrical connector for brake servo pressure sensor - G294-

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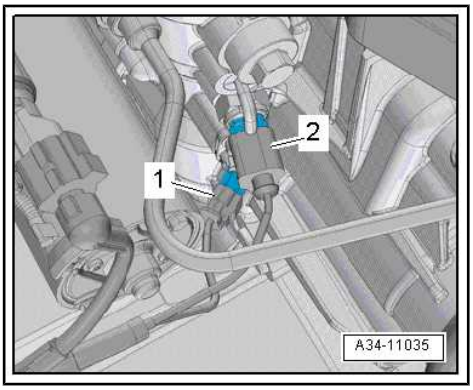


Fitting location of gearbox neutral position sender - G701-

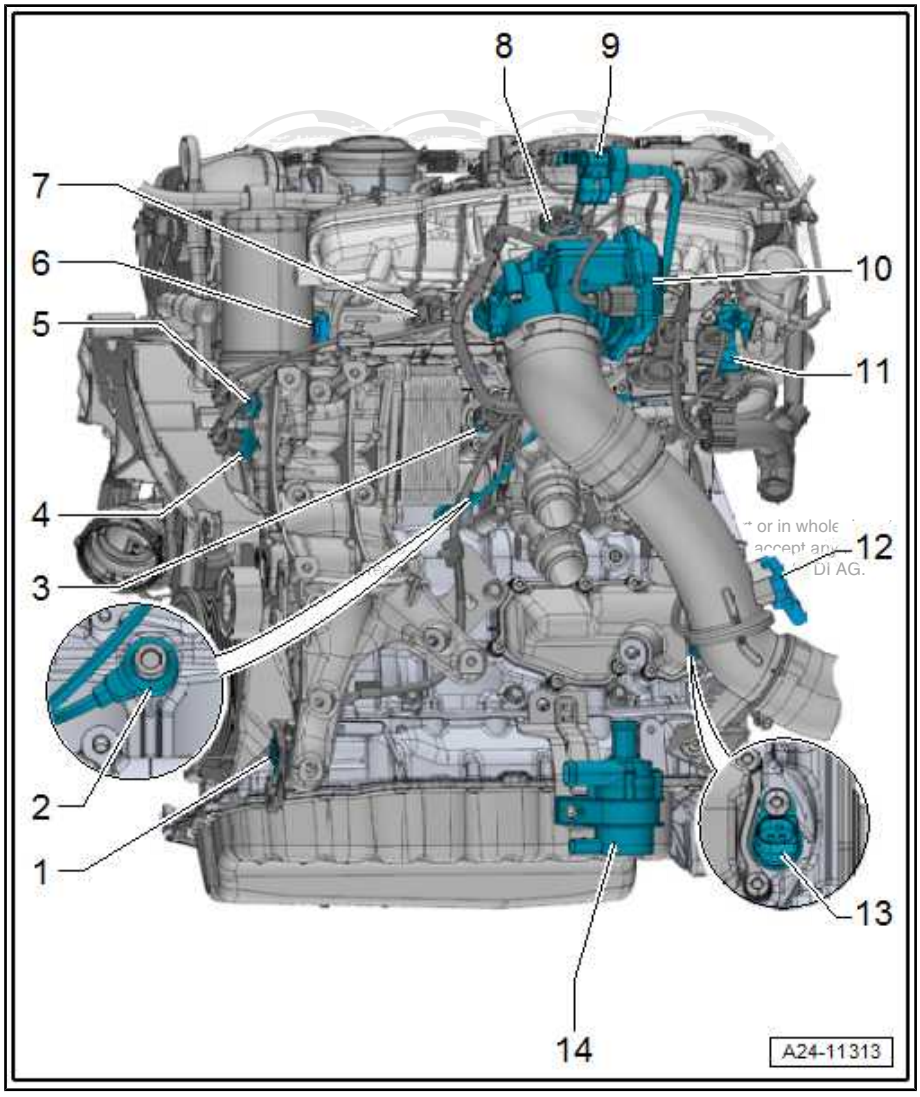
• On gearbox (front left)

1 - Electrical connector for gearbox neutral position sender - G701-

2 - Electrical connector for reversing light switch - F4-



Overview of fitting locations - engine (view from left side)



1 - Valve for oil pressure control - N428-

- ❑ Exploded view ⇒ page 164

2 - Knock sensor 1 - G61-

- ❑ Exploded view ⇒ page 306

3 - Coolant temperature sender - G62-

- ❑ Exploded view ⇒ page 201

4 - Oil pressure switch - F22-

- ❑ Exploded view ⇒ page 183

5 - Oil pressure switch for reduced oil pressure - F378-

- ❑ Exploded view ⇒ page 183

6 - Intake manifold flap potentiometer - G336-

- ❑ Exploded view ⇒ page 271

7 - Fuel pressure sender - G247-

- ❑ Exploded view ⇒ page 271

8 - Intake air temperature sender - G42-

- ❑ Exploded view ⇒ page 261

9 - Activated charcoal filter solenoid valve 1 - N80-

10 - 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-
- ❑ Exploded view ⇒ page 261

11 - Intake manifold flap valve - N316-

- ❑ Exploded view ⇒ page 261

12 - Charge pressure sender - G31-

- ❑ Exploded view ⇒ page 247

13 - Engine speed sender - G28-

- ❑ Exploded view ⇒ page 306

14 - Continued coolant circulation pump - V51-

- ❑ Exploded view ⇒ page 203

Overview of fitting locations - engine (view from right side)

1 - Lambda probe - G39- and Lambda probe heater - Z19-

- ❑ Exploded view
  ⇒ page 290

2 - Charge pressure control solenoid valve - N75-

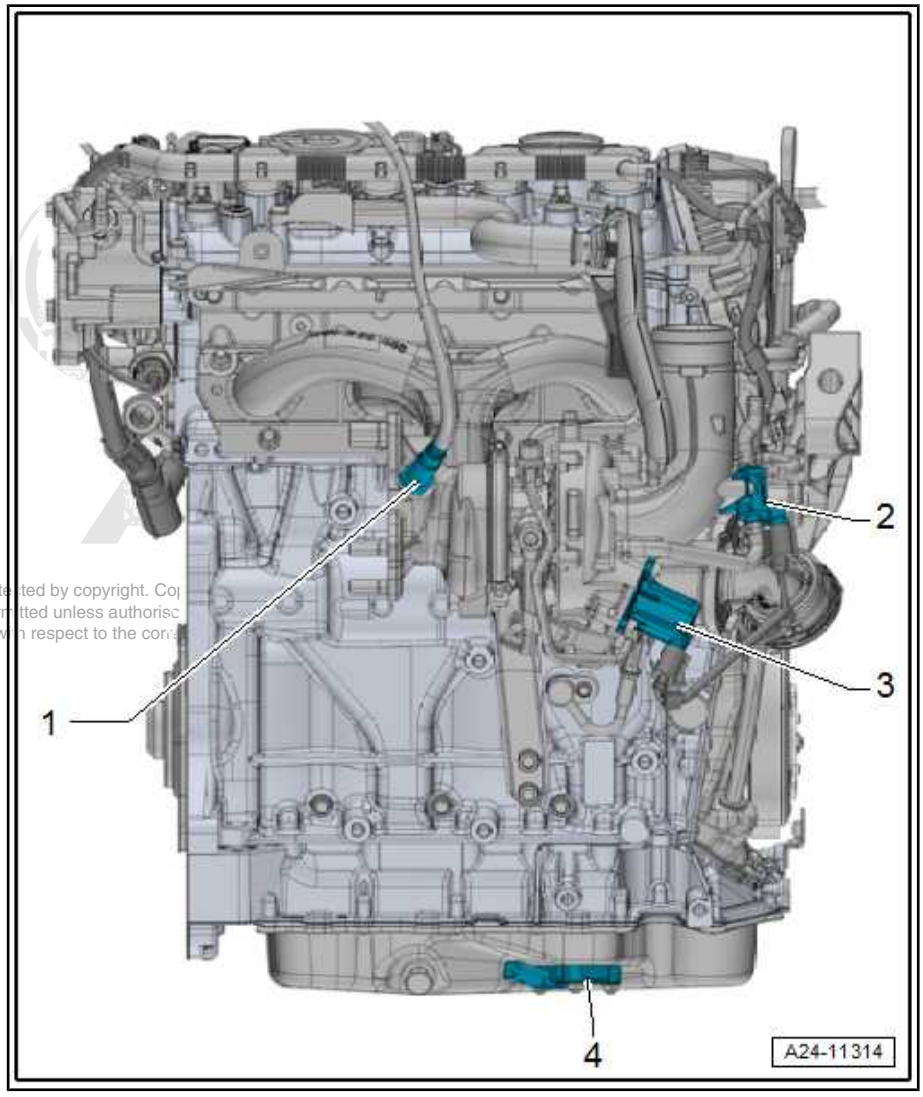
- ❑ Exploded view
  ⇒ page 231

3 - Turbocharger air recirculation valve - N249-

- ❑ Exploded view
  ⇒ page 231

4 - Oil level and oil temperature sender - G266-

- ❑ Exploded view
  ⇒ page 164



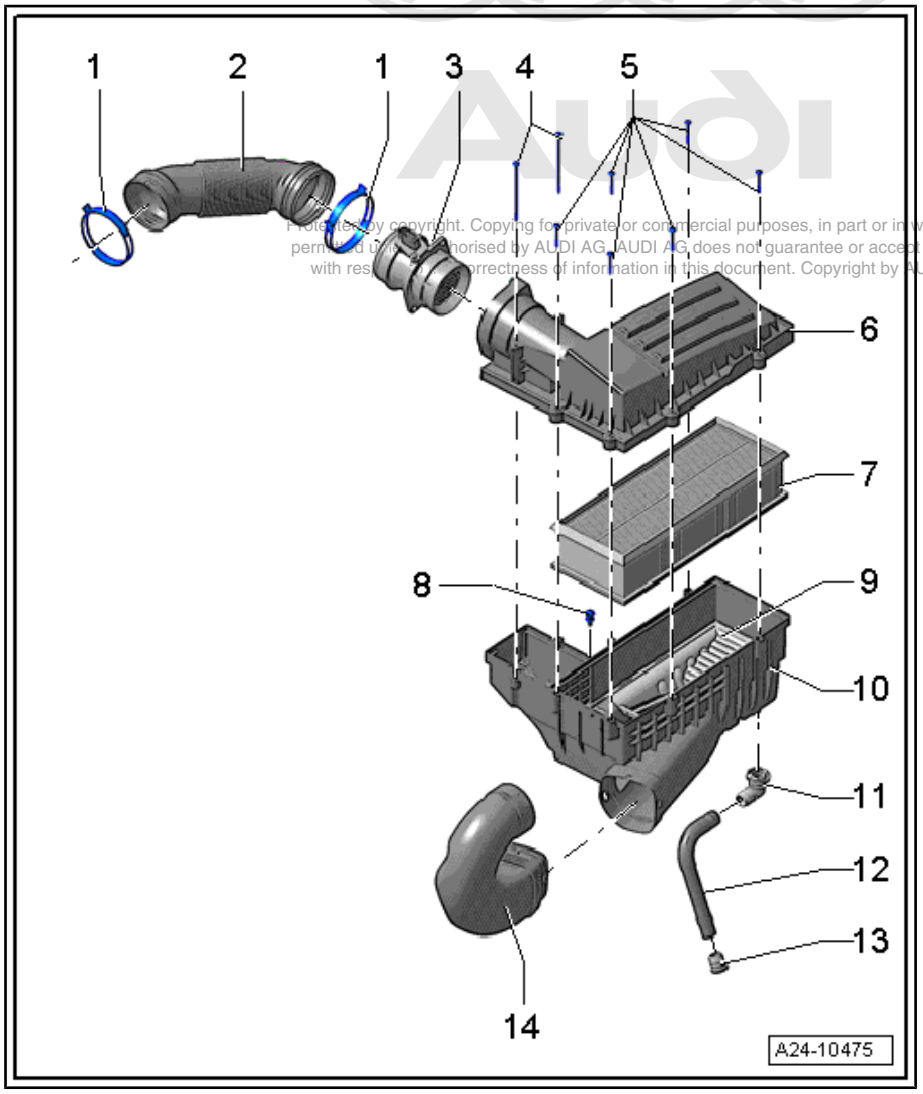
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2 Air cleaner

⇒ “2.1 Exploded view - air cleaner housing”, page 258

⇒ “2.2 Removing and installing air cleaner housing”, page 259

2.1 Exploded view - air cleaner housing



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1 - Spring-type clip

2 - Air hose

- To turbocharger
- Check air intake hose for dirt and leaves

3 - Air mass meter - G70-

- Removing and installing ⇒ page 279
- 1.5 Nm

4 - Bolts

- For air cleaner (top section)
- 1.5 Nm

5 - Bolts

- For air cleaner (top section)
- 1.5 Nm

6 - Air cleaner (top section)

- Clean any salt residue, leaves and dirt out of air cleaner (top section)

7 - Filter element

- Always use genuine part for air filter element
- Removing and installing ⇒ Maintenance ; Booklet 820
- Change intervals ⇒ Maintenance tables

8 - Bolt

- For air cleaner (bottom section)

9 - Snow screen

- Not installed in all vehicles

10 - Air cleaner (bottom section)

- Clean any salt residue, leaves and dirt out of air cleaner (bottom section)
- Removing and installing air cleaner housing ⇒ page 259

11 - Connection for water drain hose

- Clean connection

12 - Water drain hose

- Clean water drain hose

13 - Flutter valve

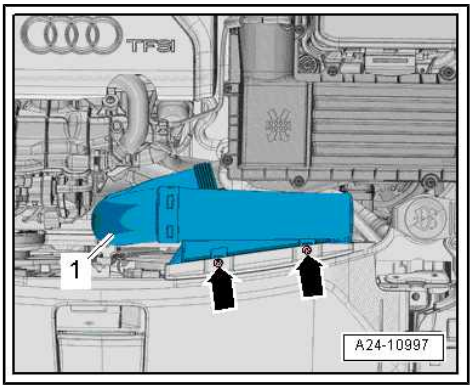
- Clean and re-install

14 - Intake air duct

- ❑ To lock carrier
- ❑ Clean any leaves and dirt out of intake air duct

Air duct at lock carrier - tightening torque

– Tighten bolts -arrows- to 1.5 Nm.



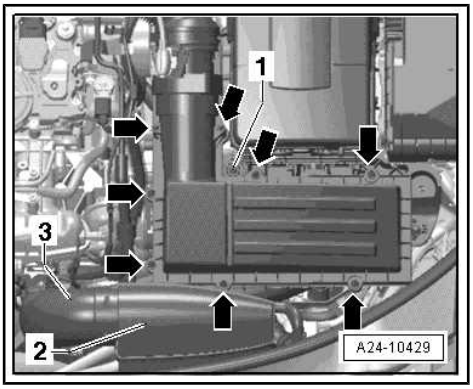
2.2 Removing and installing air cleaner housing

Removing

– Remove air duct leading from lock carrier to air cleaner housing -2 and 3-.

– Slacken bolt -1-.

– Carefully pull air cleaner (bottom section) upwards.

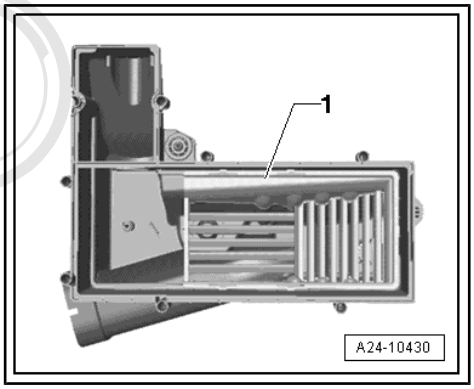


Installing

– Remove and clean snow screen -1-.

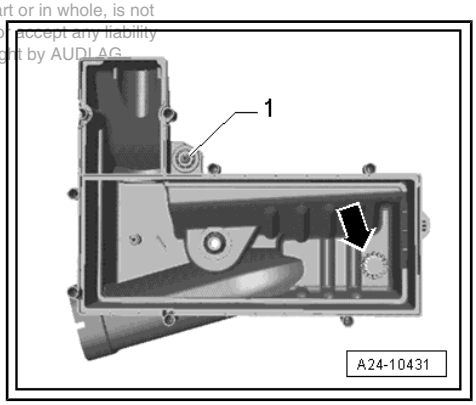
Note

The snow screen is not installed in all vehicles.

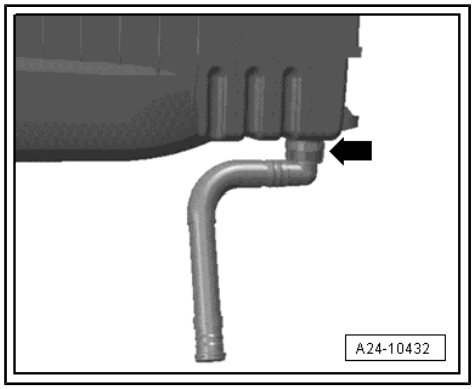


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– Clean water drain -arrow- and air cleaner (bottom section).



– Disconnect water drain hose -arrow- from air cleaner (bottom section) and clean any dirt and leaves out of connection and hose.
– When installing the air filter element, check that it is properly centred in the retainer in the bottom section of the air cleaner housing.
– Carefully fit top section of air cleaner onto bottom section, without applying any force. Make sure the top section of the air cleaner is fitted straight on the air filter element (note position of sealing lip on air filter element).



The remaining installation steps are carried out in the reverse sequence.

Tightening torques

◆ ⇒ “2.1 Exploded view - air cleaner housing”, page 258

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3 Intake manifold

⇒ “3.1 Exploded view - intake manifold”, page 261

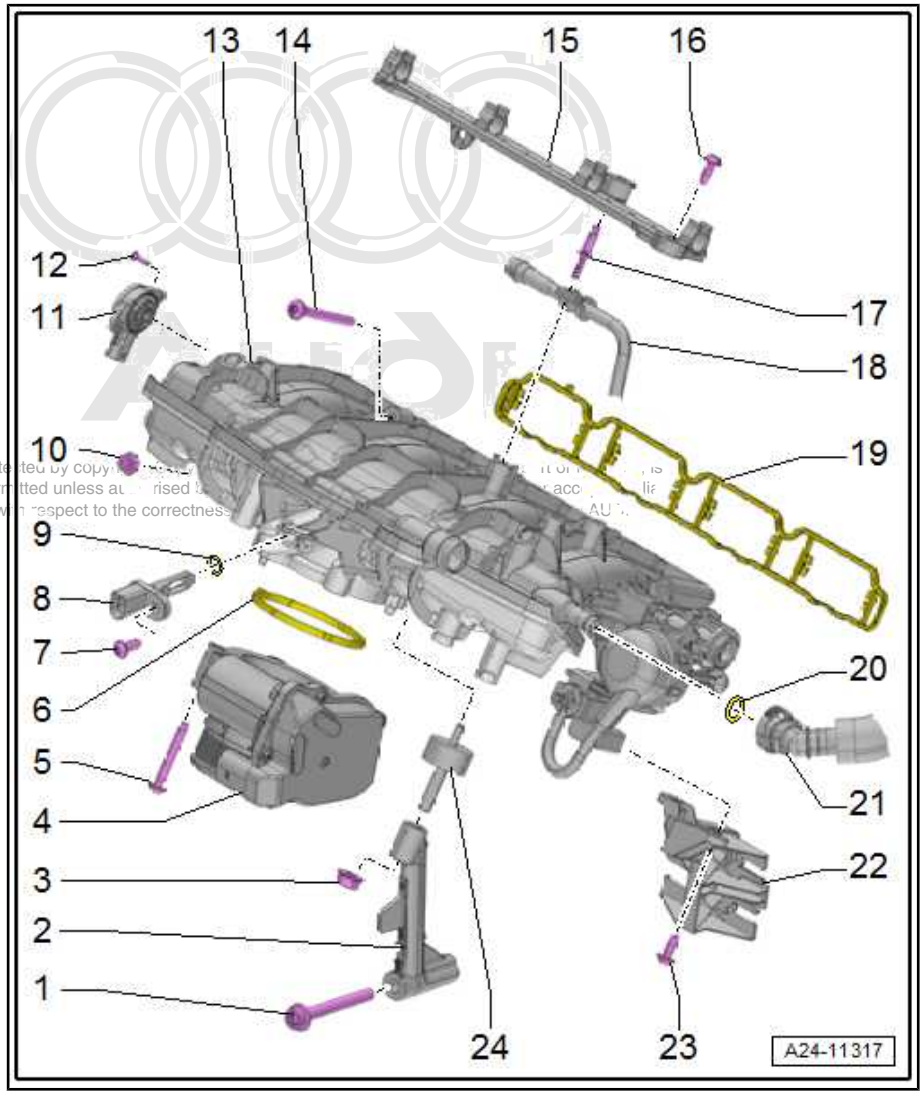
⇒ “3.2 Removing and installing intake manifold with fuel rail”, page 262

⇒ “3.3 Removing and installing throttle valve module J338 ”, page 267

⇒ “3.4 Cleaning throttle valve module”, page 268

⇒ “3.5 Checking intake manifold change-over function”, page 269

3.1 Exploded view - intake manifold



1 - Bolt

- ❑ 23 Nm

2 - Support for intake manifold

3 - Nut

- ❑ 10 Nm

4 - 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-
- ❑ Removing and installing ⇒ page 267
- ❑ Cleaning ⇒ page 268

5 - Bolt

- ❑ 10 Nm

6 - Seal

- ❑ Renew

7 - Bolt

- ❑ 9 Nm

8 - Intake air temperature sender - G42-

- ❑ Removing and installing ⇒ page 280

9 - O-ring

- ❑ Renew

10 - Nut

- ❑ Pre-tightening torque: 3 Nm
- ❑ Final tightening torque: 10 Nm

11 - Intake manifold flap potentiometer - G336-

12 - Bolt

- ❑ Thread-forming
- ❑ Fit and screw in bolt by hand so that it is screwed into old thread. Then tighten bolt to torque.
- ❑ 0.8 Nm

13 - Intake manifold

- ❑ Vacuum unit for air flow control flaps and intake manifold flap valve - N316-
- ❑ Removing and installing ⇒ page 262

14 - Bolt

- ❑ Pre-tightening torque: 3 Nm
- ❑ Final tightening torque: 10 Nm

15 - Retainer

- ❑ For fuel supply hose leading to high-pressure pump

16 - Bolt

- ❑ Thread-forming
- ❑ Fit and screw in bolt by hand so that it is screwed into old thread. Then tighten bolt to torque.
- ❑ 4 Nm

17 - Centre hex stud

- ❑ Thread-forming
- ❑ Fit and screw in bolt by hand so that it is screwed into old thread. Then tighten bolt to torque.
- ❑ 4 Nm

18 - Vacuum hose

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19 - Gasket

- ❑ Renew

20 - O-ring

- ❑ Renew

21 - Hose

- ❑ For crankcase breather

22 - Retainer

- ❑ For electrical connectors

23 - Bolt

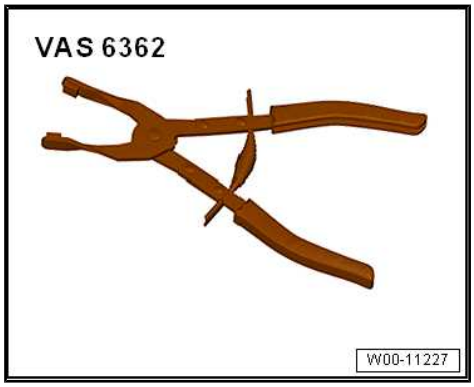
- ❑ Thread-forming
- ❑ Fit and screw in bolt by hand so that it is screwed into old thread. Then tighten bolt to torque.
- ❑ 4 Nm

24 - Bonded rubber bush

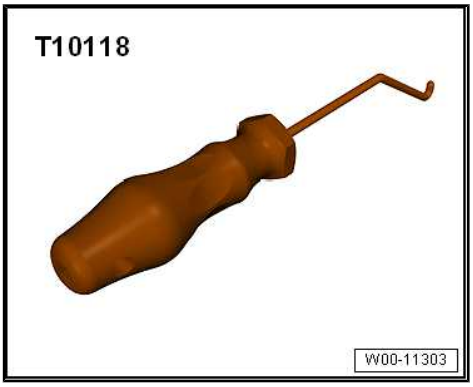
3.2 Removing and installing intake manifold with fuel rail

Special tools and workshop equipment required

- ♦ Hose clip pliers - VAS 6362-



♦ Assembly tool - T10118-



Removing

– Remove engine cover panel ⇒ page 46 .

– Clean joint between intake manifold and cylinder head.

– Remove air cleaner housing ⇒ page 259 .

– Disconnect vacuum line -arrow- leading to activated charcoal filter.

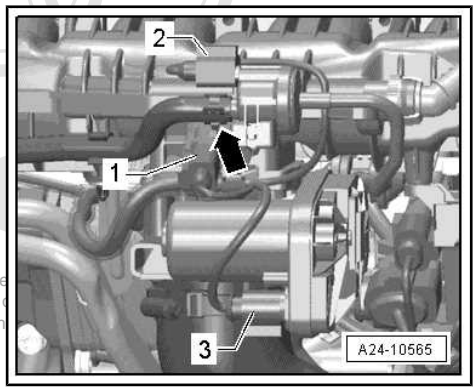
– Unplug the following electrical connectors:

1 - Intake air temperature sender - G42-

2 - Activated charcoal filter solenoid valve 1 - N80-

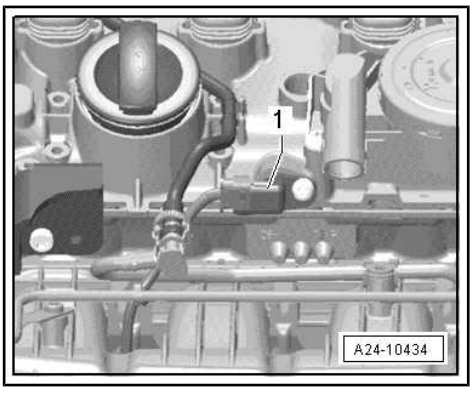
3 - Throttle valve module - J338-

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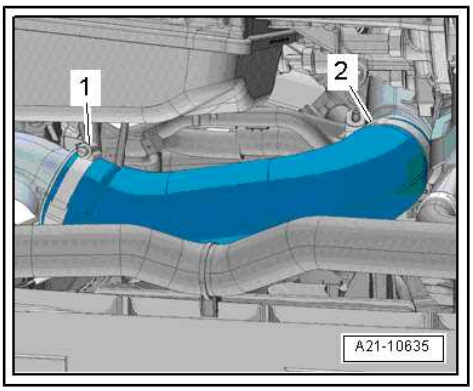


– Unplug electrical connector -1- at Hall sender - G40- .

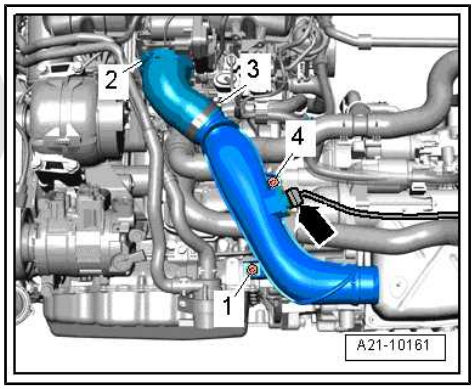
– Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .



– Release hose clips -1 and 2- and remove air hose.

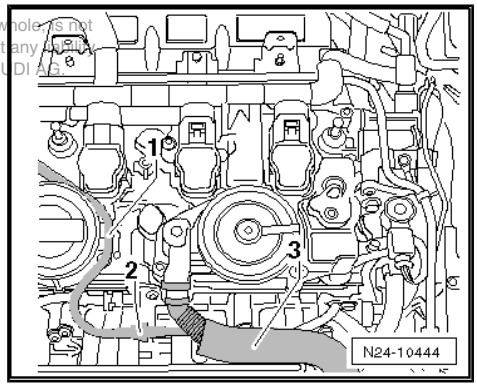


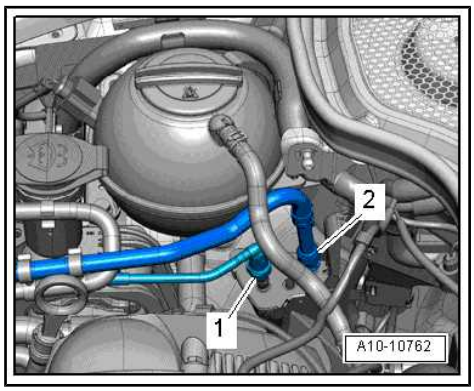
– Release hose clips -2- for air pipe.
– Unplug electrical connector -arrow-.
– Remove bolts -1 and 4- and pull air hose downwards off throttle valve module - J338- .
– Detach air pipe from below.



– Disconnect vacuum line -1- at position marked -2- and remove crankcase breather hose -3-.

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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).

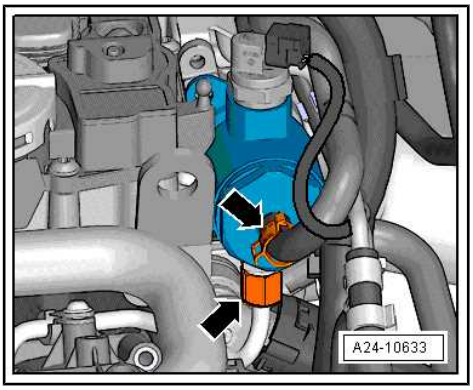
– Disconnect fuel supply hose -2- by pressing release ring.
– Move hose clear.

Note

- *The fuel system must not be under pressure.*
- *Use a clean cloth to catch escaping fuel.*

– Unfasten spring-type clip -top arrow- and disconnect fuel supply hose from high-pressure pump.

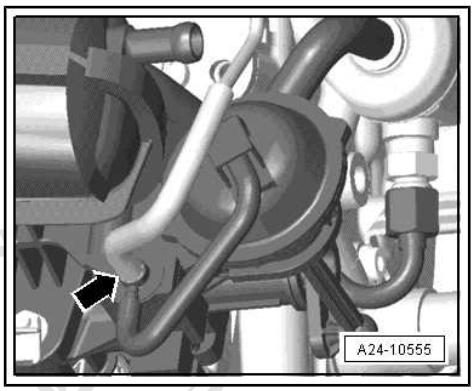
– Unscrew union nut for high-pressure fuel pipe -bottom arrow- at high-pressure pump.



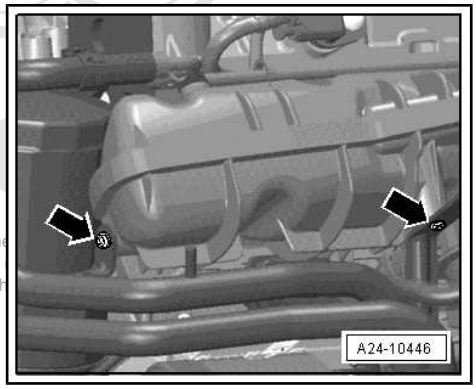
Note

Seal off open connections with clean caps. It is essential to ensure that no dirt enters the fuel system.

– Disconnect vacuum line -arrow- from intake manifold flap valve - N316- .

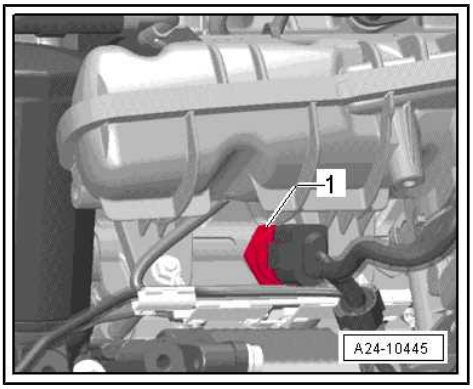


– Unscrew bolts -arrows- for coolant line from intake manifold.

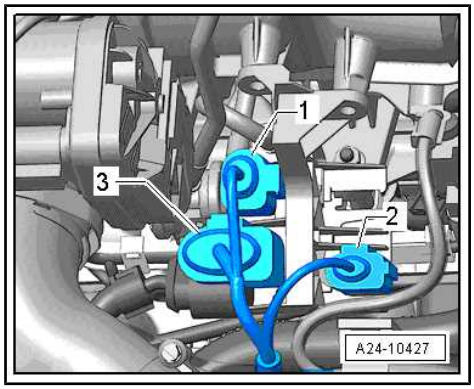


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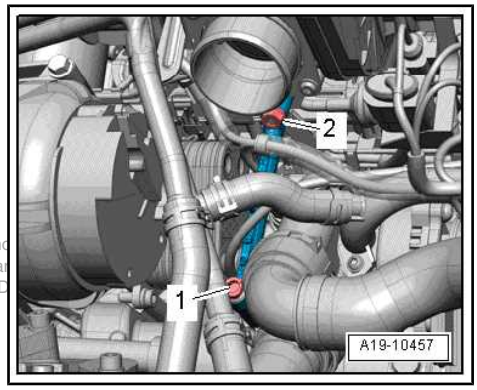
– Unplug electrical connector from fuel pressure sender - G247- -1-.



– Unplug electrical connectors -1-and -3- and detach them from retainer towards one side.

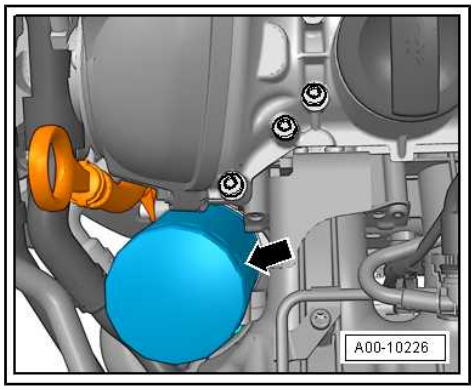


– Unscrew nut -2- and bolt -1- and remove support for intake manifold.

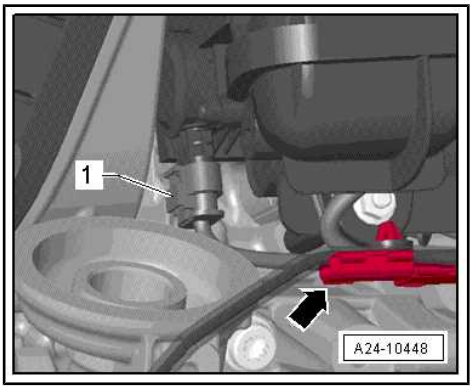


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– Remove oil filter ⇒ Maintenance ; Booklet 820 .



– Open cable retainer -arrow- and move wiring clear.
– Remove bolts from intake manifold.
– Carefully pull intake manifold and fuel rail slightly away from cylinder head.
– Unplug electrical connector -1- from intake manifold flap potentiometer - G336- and detach intake manifold.



Note

- *The injectors can remain in the fuel rail.*
- *Block off intake ports with a clean cloth.*

– Disconnect intake manifold from fuel rail ⇒ page 272 .

Installing

– Fit intake manifold onto studs (bottom left and bottom right) on cylinder head.

Note

Make sure that injectors are installed correctly.

The remaining installation steps are carried out in the reverse sequence.

– After installing intake manifold, perform “Adaption” of intake manifold flap potentiometer - G336- using the ⇒ Vehicle diagnostic tester, Guided Functions.

Tightening torques

- ⇒ “2.1 Exploded view - air cleaner housing”, page 258
- ⇒ “3.1 Exploded view - intake manifold”, page 261
- ⇒ “4.1 Exploded view - fuel rail with injectors”, page 271

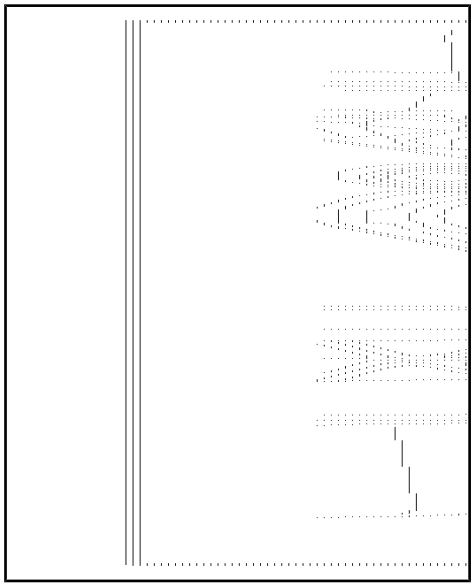
3.3 Removing and installing throttle valve module - J338-

Removing

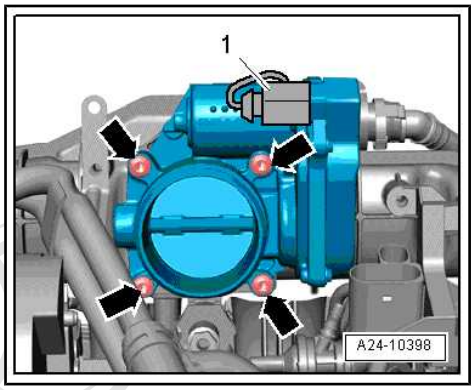
– Remove engine cover panel ⇒ page 46 .
– Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

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– Unscrew bolts and clips -arrows- and remove charge air pipe and hose from below.
– Unplug electrical connector -1- from throttle valve module - J338- .



– Remove bolts -arrows- for throttle valve module - J338- and detach throttle valve module - J338- .



Installing

Install in reverse sequence.

– Clean sealing surface for seal.
– Renew seal.
– Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .
– Install engine cover panel ⇒ page 46 .
– After renewing throttle valve module, perform “Adaption” in “Guided Functions” ⇒ Vehicle diagnostic tester.

Tightening torques

◆ ⇒ “3.1 Exploded view - intake manifold”, page 261

3.4 Cleaning throttle valve module

Procedure

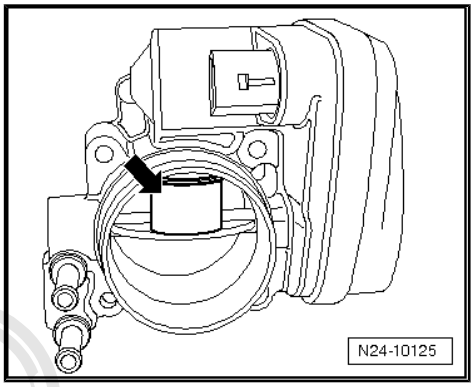
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Note

Take care not to scratch the throttle valve housing when cleaning it.

– Remove throttle valve module - J338- ⇒ page 267 .

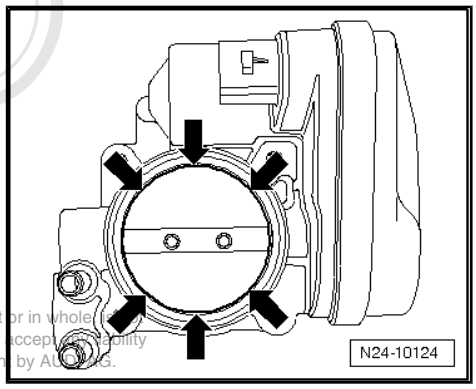
– Open throttle valve by hand and hold it in open position with a suitable object (plastic or wood) -arrow-.



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 possible injury and skin contact.

– Clean throttle valve housing thoroughly, especially around the points -arrows- where the throttle valve closes, using commercially available acetone and a small brush.
– Wipe out throttle valve housing with a lint-free cloth.
– Allow acetone to evaporate completely and re-install throttle valve module after cleaning.
– After installing throttle valve module, perform “Adaption” in “Guided Functions” ⇒ Vehicle diagnostic tester.



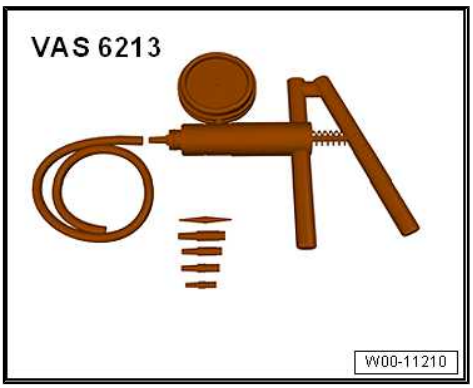
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3.5 Checking intake manifold change-over function

Only perform this test if there is a loss of engine torque (poor flexibility or lack of pulling power).

Special tools and workshop equipment required

♦ Hand vacuum pump - VAS 6213-



Test condition

♦ Intake manifold flap valve - N316- has been checked with vehicle diagnostic tester.

Perform the following steps if the intake manifold flap valve - N316- is OK.

– Remove engine cover panel ⇒ page 46 .
– Start engine and run at idling speed.
– Have a second mechanic rev up engine quickly (short burst of throttle) and observe vacuum unit for intake manifold change-over.

- The vacuum unit should pick up -arrow-.

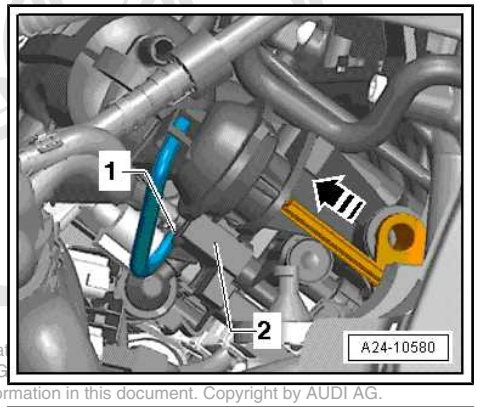
If the change-over does not operate as described:

– Check vacuum system for leaks.

– Check that change-over mechanism moves freely by moving linkage manually.

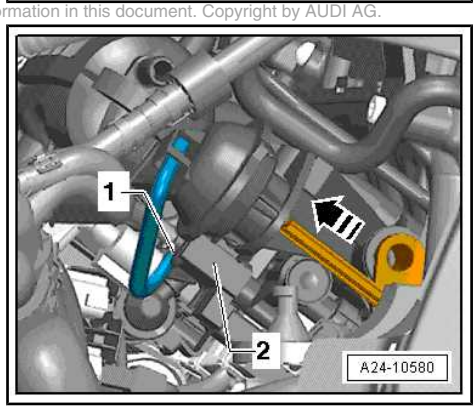
– Check that vacuum lines are connected correctly.

– Check vacuum hoses for porosity.

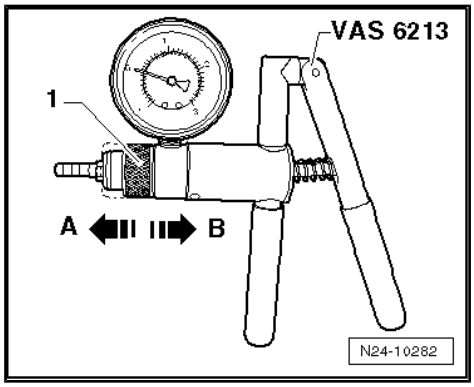


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– Disconnect vacuum hose -1- leading to vacuum unit for intake manifold flap valve - N316- at intake manifold flap valve - N316- -2-.



– Move adjuster ring -1- on hand vacuum pump - VAS 6213- to position -A- to select "vacuum".

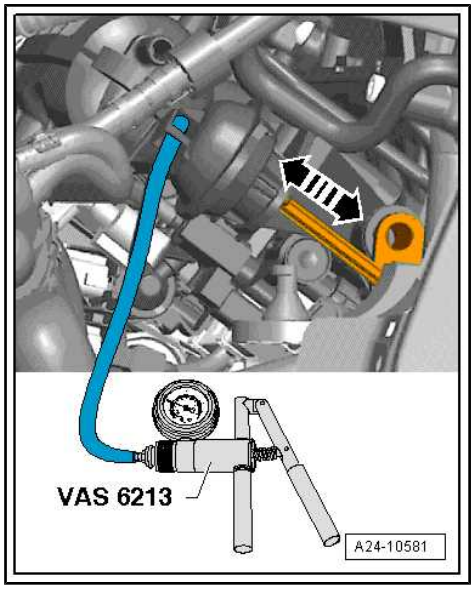


– Connect hand vacuum pump - VAS 6213- to vacuum unit for intake manifold flap valve - N316- .

– Operate hand vacuum pump - VAS 6213- several times.

The vacuum unit should move -arrows-.

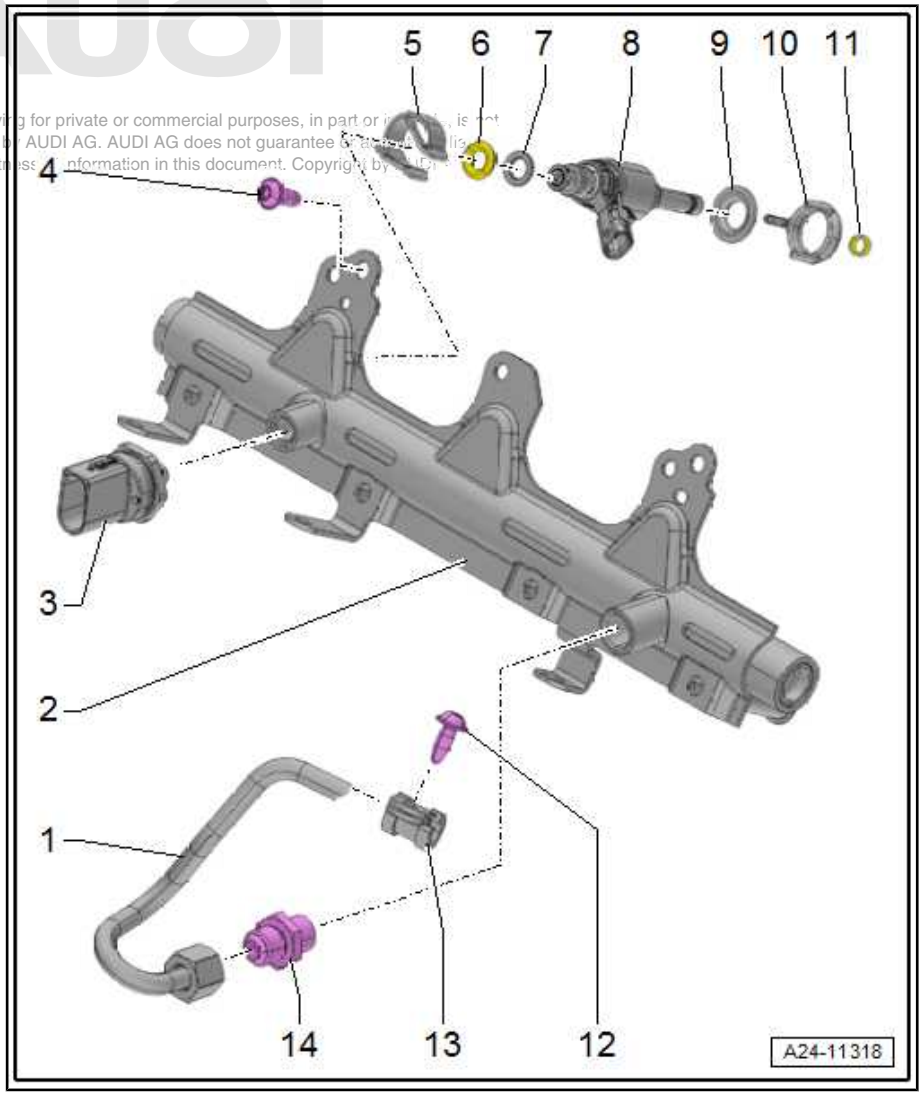
– If vacuum unit does not move, renew vacuum unit.



4 Injectors

⇒ “4.1 Exploded view - fuel rail with injectors”, page 271
⇒ “4.2 Removing and installing fuel rail”, page 272
⇒ “4.3 Removing and installing injectors”, page 272
⇒ “4.4 Cleaning injectors”, page 277

4.1 Exploded view - fuel rail with injectors



1 - High-pressure pipe

- ❑ Connections must not be damaged
- ❑ Do not alter shape
- ❑ Lubricate thread of union nut with clean engine oil
- ❑ Tighten union nut to 27 Nm

2 - Fuel rail

- ❑ Connections must not be damaged
- ❑ Removing and installing ⇒ page 262

3 - Fuel pressure sender - G247-

- ❑ Removing and installing ⇒ page 280
- ❑ Lubricate threads lightly with clean engine oil
- ❑ 27 Nm

4 - Bolt

- ❑ 5 Nm

5 - Support ring

- ❑ Make sure it is correctly seated
- ❑ Via this support ring, the fuel rail exerts the force which holds the injector in the cylinder head

6 - O-ring

- ❑ Renew
- ❑ Lubricate lightly with clean engine oil

7 - Spacer ring

- ❑ Renew if damaged

8 - Injector

- ❑ Different versions available; for allocation refer to ⇒ Electronic parts catalogue
- ❑ Ensure correct installation position.
- ❑ Removing and installing ⇒ page 272

9 - Sealing element

10 - Retainer

- ❑ For sealing element

11 - Combustion chamber ring seal

- ❑ Renewing ⇒ “4.3 Removing and installing injectors”, page 272

12 - Bolt

- ❑ 5 Nm

13 - Retaining clamp

- ❑ For high-pressure pipe

14 - Connecting piece

- ❑ For high-pressure pipe
- ❑ Counterhold when loosening union nut
- ❑ Renew after removing
- ❑ 40 Nm

4.2 Removing and installing fuel rail

After the fuel rail has been removed or renewed, intake manifold flap potentiometer - G336- must be adapted to engine control unit - J623- . See “Guided Functions”.

– Remove intake manifold ⇒ page 262 .

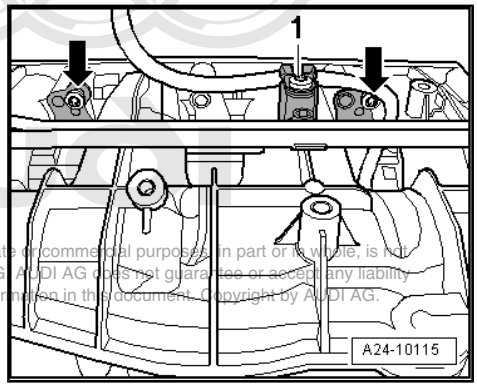
– Release hose clip -1-.

– Remove hoses from activated charcoal filter.

– Disconnect fuel line from fuel rail.

– Unscrew bolts -arrows- from fuel rail.

– Detach fuel rail from intake manifold.



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Installing

– Always renew both connecting pieces for fuel supply line.

– Connect and tighten fuel line.

– The remaining installation steps are carried out in the reverse sequence.

– Plug electrical connector back in.

– Install intake manifold ⇒ page 262 .

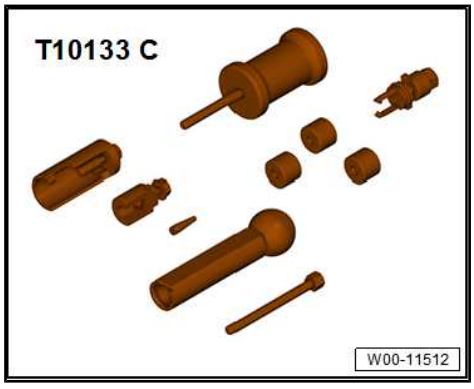
Tightening torques

♦ ⇒ “4.1 Exploded view - fuel rail with injectors”, page 271

4.3 Removing and installing injectors

Special tools and workshop equipment required

♦ Tool set for FSI engines - T10133-



Note

Special tool T10133/2 (puller) has been modified and now has the designation puller T10133/2 A . If you have not yet received the new tool you can make the modification yourself.

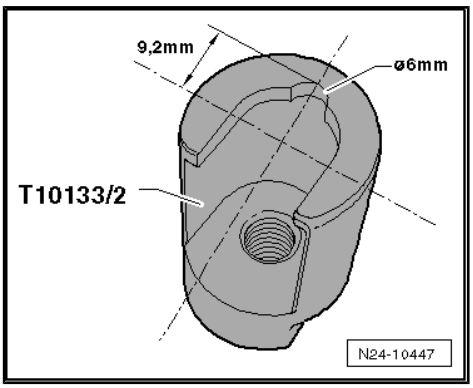
Modifying puller T10133/2 to make it equivalent to puller T10133/2 A

Special tools and workshop equipment required

- ♦ Round file, approx. 6 mm

– File out a semi-circular recess as shown in the illustration. The recess allows the tool to be pushed further onto the injector so the contact surface is increased.

– For identification purposes, mark the modified tool with the letter “A” after the tool number.



Removing

– Remove intake manifold and fuel rail ⇒ page 262 .

Note

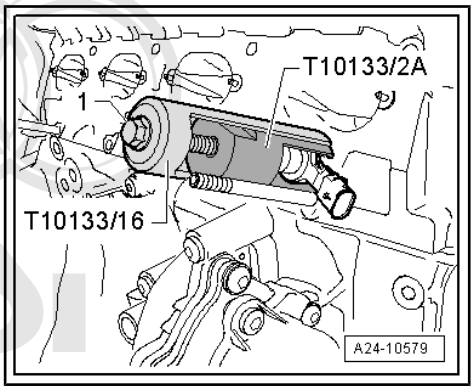
Carefully pull out any injectors that remain lodged in the fuel rail.

– Cover open inlet ports with a clean cloth.

– Unplug electrical connector on injector that is to be removed.

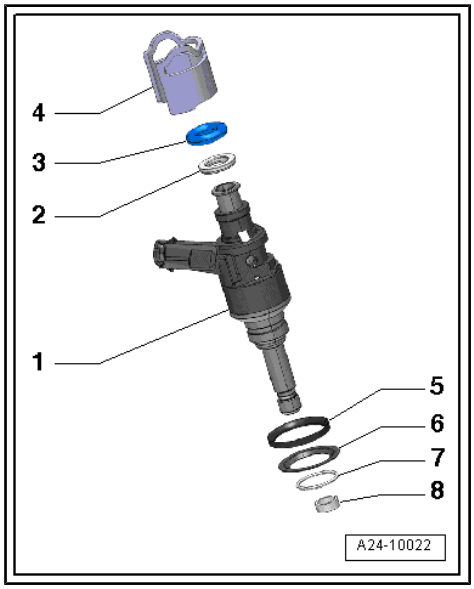
– Fit puller -T10133/2A- to groove on injector.

– Attach removal tool -T10133/16- and pull out injector by turning bolt -1-.



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Injector (old version)



1 - Injector

2 - Spacer ring - renew

3 - O-ring - renew (apply thin coating of clean engine oil prior to installation)

4 - Support ring - renew (via this support ring, fuel rail exerts force which secures injector in cylinder head)

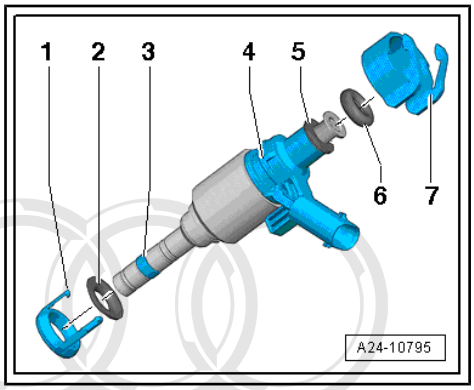
5 - Intermediate ring/retaining ring (top) - note installation position; renew if visibly damaged or worn (no longer available; replaced with an intermediate ring - see next illustration ⇒ page 274)

6 - Intermediate ring/retaining ring (bottom) - note installation position; renew if visibly damaged or worn (no longer available; replaced with an intermediate ring - see next illustration ⇒ page 274)

7 - Circlip - do not stretch (no longer available; replaced with a retaining ring - see next illustration ⇒ page 274)

8 - Combustion chamber ring seal (teflon ring seal) - renew; when fitting, do not grease ring or use any other lubricant. Carefully remove old combustion chamber ring seal. To do so, cut open combustion chamber ring seal using knife or prise open with small screwdriver and then pull off forwards. Take care not to damage groove on injector. Injector must be renewed if groove is damaged.

Injector (new version)



1 - Retaining ring - renew (combined as a unit with intermediate ring -2-)

2 - Intermediate ring - renew (combined as a unit with retaining ring -1-)

3 - Combustion chamber ring seal (teflon ring seal) - renew; when fitting, do not grease ring or use any other lubricant

4 - Injector

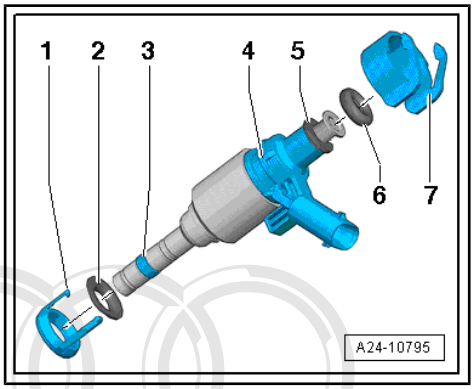
5 - Spacer ring - renew

6 - O-ring - renew (apply thin coating of clean engine oil prior to installation)

7 - Support ring - renew (via this support ring, fuel rail exerts force which secures injector in cylinder head)

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Dismantling injector



– Pull O-ring -6- and spacer ring -5- off injector -4-.

– Unclip sealing element -1-.

– Carefully remove old combustion chamber ring seal -3-. To do so, cut open combustion chamber ring seal using knife or prise open with small screwdriver and then pull off forwards.

Note

Take care not to damage groove on injector. Injector must be renewed if groove is damaged.

Installing

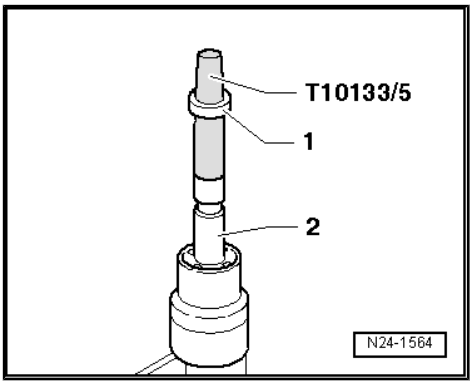
Note

- *Renew sealing element, combustion chamber ring seal and O-ring.*
- *Renew spacer ring if damaged.*
- *Lubricate O-rings of injectors lightly with clean engine oil.*

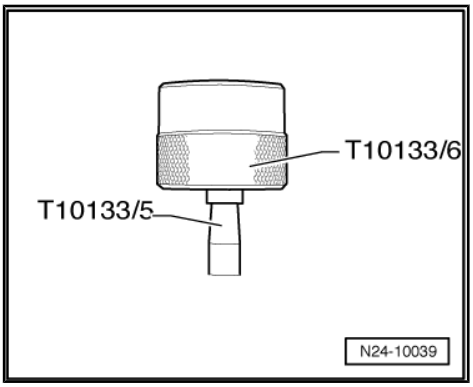
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– Before new combustion chamber ring seal is fitted, remove any combustion residue from ring groove and injector stem using a clean cloth.

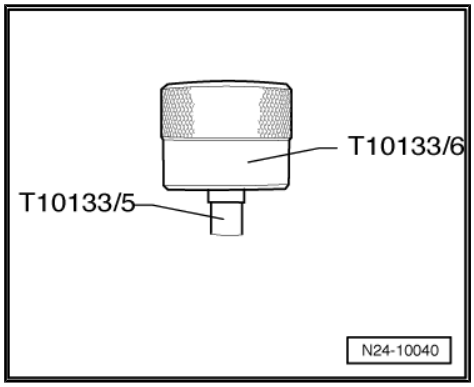
– Fit assembly cone -T10133/5- with new combustion chamber ring seal -1- onto injector -2-.



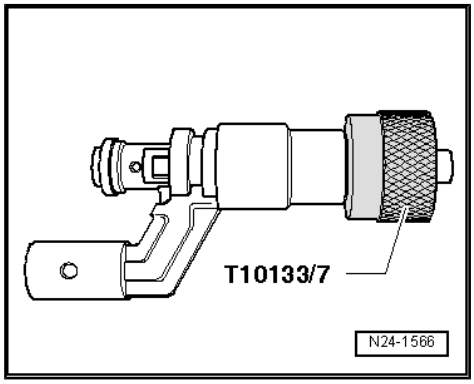
– Using assembly sleeve -T10133/6- , push combustion chamber ring seal onto assembly cone -T10133/5- as far as it will go.



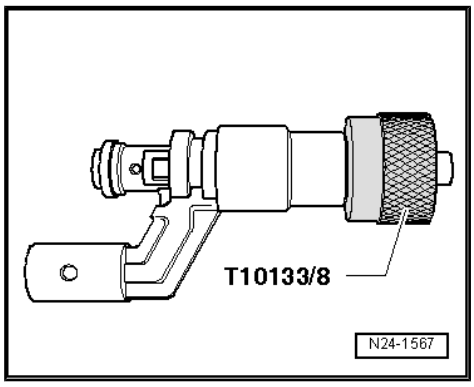
– Turn round assembly sleeve - T10133/6- and push combustion chamber ring seal up to end of assembly cone - T10133/5- .
– Remove assembly cone - T10133/5- and push combustion chamber ring seal into sealing ring groove using assembly sleeve - T10133/6- .



– 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.



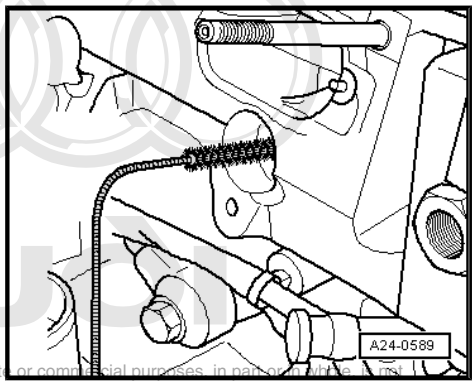
– Push calibration sleeve -T10133/8- onto injector as far as it will go and simultaneously turn it slightly (approx. 180°).
– Pull calibration sleeve -T10133/8- off again by turning it in the opposite direction.
– Fully assemble injector using parts from repair kit.



Note

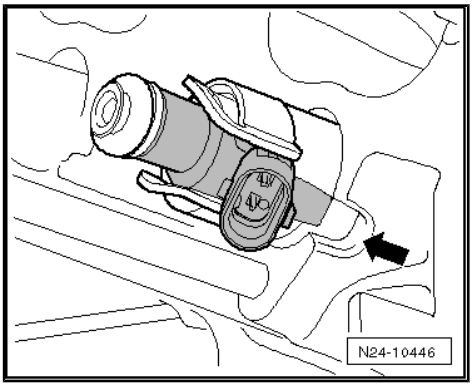
- *The combustion chamber ring seal on the injector must not be oiled or greased.*
- *Make sure that there is no cleaning fluid or oil in the holes in the cylinder head when installing the injectors.*

– Before installing injectors, thoroughly clean apertures for injectors in cylinder head using supplied nylon brush - T10133/4- .



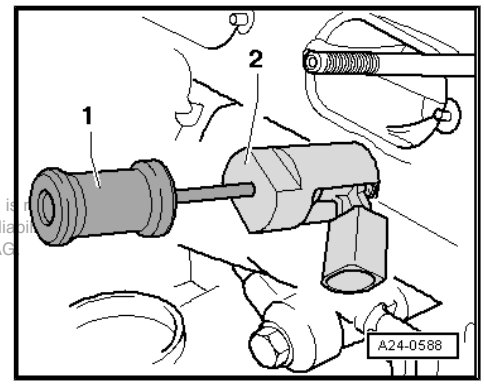
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– Press injector by hand as far as it will go into aperture in cylinder head (aperture must be free of oil and grease). Ensure that the injector is properly seated -arrow- in the cylinder head.



Note

If the injector cannot be pushed in by hand, use puller - T10133/2A- -2- with striker - T10133/3- to insert the injector.



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– Fit support ring onto injector.
– Lightly lubricate O-rings for injectors with clean engine oil.
– Position fuel rail on injectors and press into place evenly.
– Install intake manifold with fuel rail ⇒ page 262 .

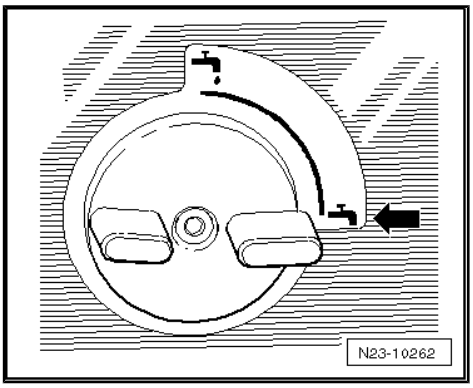
4.4 Cleaning injectors

Special tools and workshop equipment required

- Ultrasonic cleaning unit - VAS 6418-
- Mounting plate for injection modules - VAS 6418/1-
- Cleaning fluid - VAS 6418/2-

Cleaning

– 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- .

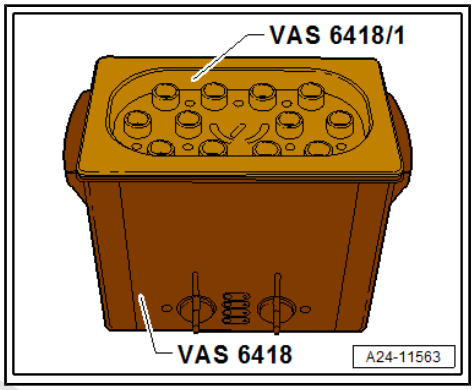


Mixture ratio for cleaning fluid

- 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 FSI injectors ⇒ page 272 .

– Place mounting plate for injection modules - VAS 6418/1- on top of cleaning unit.



WARNING

It is important to read the safety notes in the operating instructions before switching on the ultrasonic cleaning unit - VAS 6418- .

The ideal fluid level is approx. 1-4 mm above the base of the mounting plate. The ultrasonic cleaning unit - VAS 6418- can be damaged if the fluid level is too low.

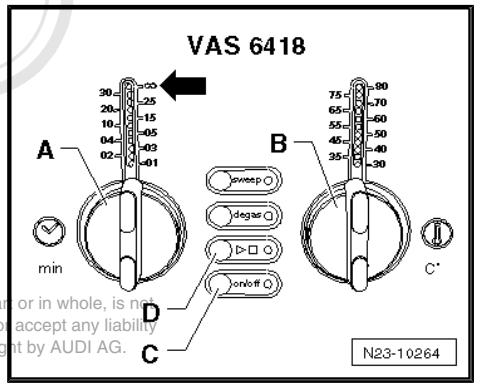
– Insert FSI injectors all the way into guides of mounting plate for injection modules - VAS 6418/1- .

– Switch on cleaning unit by pressing on/off button -C-.

– Select a cleaning time of 30 minutes with rotary knob -A-.

– Set rotary knob -B- to a temperature of 50°C.

– Press ▶ button -D- to start cleaning procedure.



Note

- *The temperature-controlled cleaning process is now started. While the fluid is being heated, the ultrasound is activated at intervals in order to circulate the cleaning solution. The ultrasound is activated continuously when the preselected temperature is reached.*
- *The actual cleaning process commences when the temperature reaches at least 50 °C and must last for at least 30 minutes.*

– Install FSI injectors with new combustion chamber seals ⇒ page 272 .

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5 Senders and sensors

⇒ “5.1 Removing and installing air mass meter”, page 279

⇒ “5.2 Removing and installing intake air temperature sender G42 ”, page 280

⇒ “5.3 Removing and installing fuel pressure sender G247 ”, page 280

⇒ “5.4 Checking fuel pressure sender G247 ”, page 281

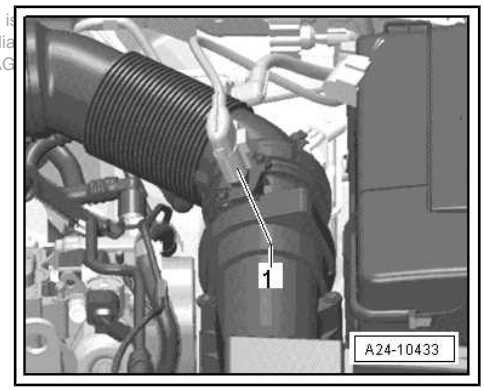
⇒ “5.5 Checking dual non-return valve”, page 284

5.1 Removing and installing air mass meter

Removing

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

– Unscrew bolts from air mass meter - G70- and carefully pull air mass meter - G70- out of guide in air cleaner housing.



Installing

To ensure the correct function of the air mass meter - G70- , it is important to observe the following notes and instructions.

Note

- *If the air filter element is very dirty or wet, dirt particles or water can reach the air mass meter - G70- and falsify the detected air mass values. This will cause a loss of power, as the calculated injection quantities will be too low.*
- *Always use genuine air filter elements (same as original equipment).*
- *Use a silicone-free lubricant when installing the intake hose.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

– Check air mass meter and intake hose (engine intake side) for salt residue, dirt and leaves.

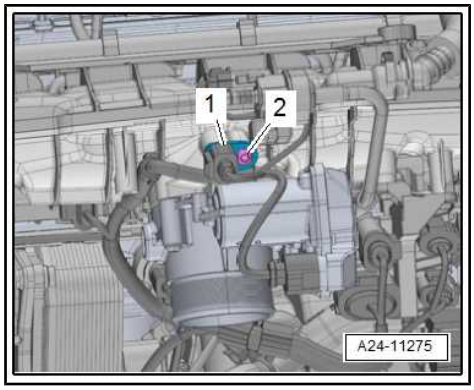
– Check for dirt in intake duct leading to air filter element. If necessary, clean salt residue, dirt and leaves out of air cleaner housing (top and bottom sections); wash out or use a vacuum cleaner as required. Removing and installing air cleaner ⇒ Maintenance ; Booklet 820 .

The remaining installation steps are carried out in the reverse sequence.

Tightening torques

- ⇒ “2.1 Exploded view - air cleaner housing”, page 258

5.2 Removing and installing intake air temperature sender - G42-



Removing

– Remove engine cover panel ⇒ page 46 .

– Unplug electrical connector -1-.

– Unscrew bolt -2- and detach intake air temperature sender - G42- .

Installing

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

– Install engine cover panel ⇒ page 46 .

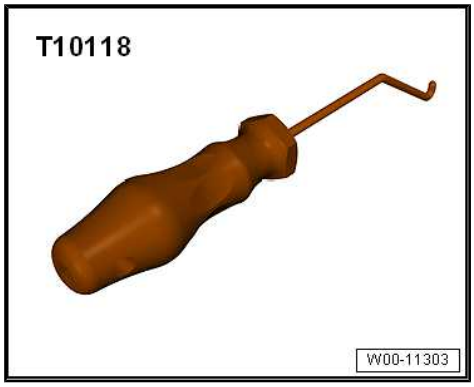
Tightening torques

♦ ⇒ “3.1 Exploded view - intake manifold”, page 261

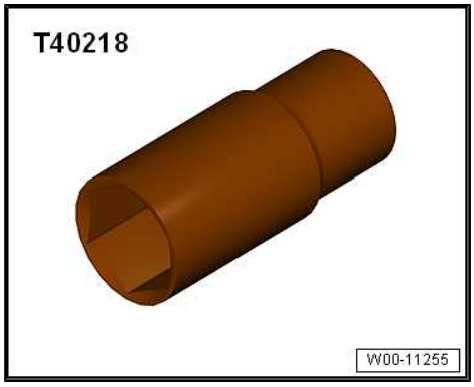
5.3 Removing and installing fuel pressure sender - G247-

Special tools and workshop equipment required

♦ Assembly tool - T10118-



♦ Socket (27 mm) - T40218- or commercially available socket (27 mm)

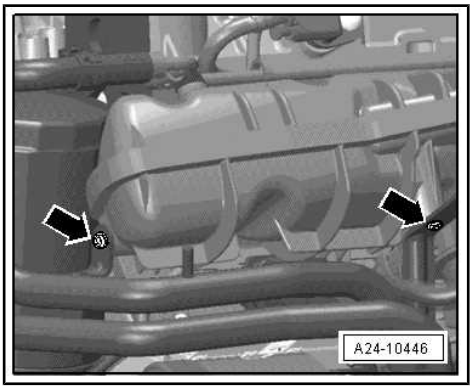


Removing

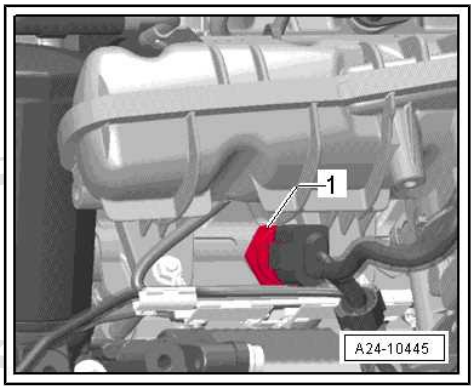
– Remove engine cover panel ⇒ page 46 .

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– Unscrew bolts -arrows- for coolant line from intake manifold.



– Release connector on fuel pressure sender - G247- using assembly tool - T10118- .



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).

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– Unscrew fuel pressure sender - G247- using socket, 27 mm - T40218- .

Installing

– Install in reverse sequence.

– Install engine cover panel ⇒ page 46 .

Tightening torques

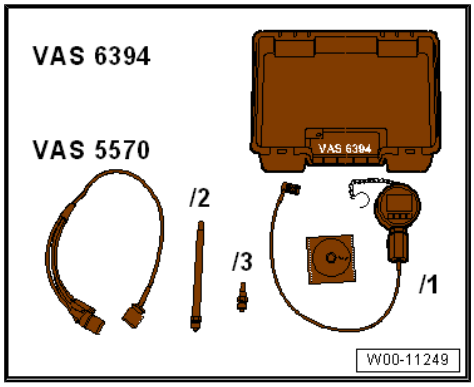
♦ ⇒ “4.1 Exploded view - fuel rail with injectors”, page 271

5.4 Checking fuel pressure sender - G247-

Special tools and workshop equipment required

♦ Vehicle diagnostic tester

- Pressure sensor tester - VAS 6394-



- Adapter - VAS 6394/2-
- Test adapter - VAS 5570-

Procedure:

– Remove engine cover panel ⇒ page 46 .

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:

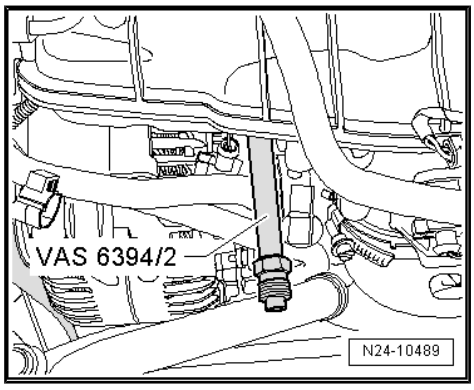
– Put on safety goggles.

– Put on protective gloves.

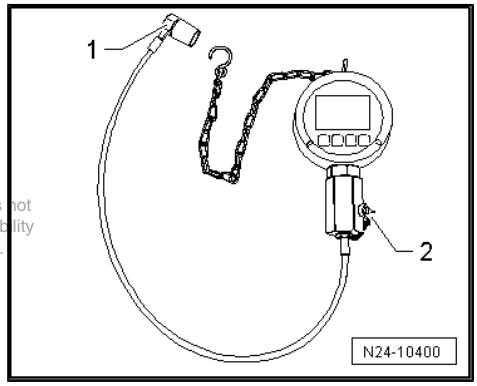
– Release pressure (wrap clean cloth around connection and open connection carefully).

– Remove fuel pressure sender - G247- ⇒ page 280 .

– Screw in adapter - G247- in place of fuel pressure sender - VAS 6294/2- and tighten adapter with the same torque as that specified for fuel pressure sender - G247- .



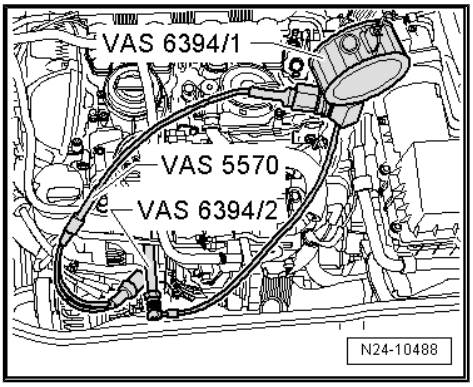
– Unscrew plug -2- on pressure sensor tester - VAS 6394/1- and screw in the removed fuel pressure sender - G247- . Tighten to torque normally specified for fuel pressure sender.



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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.
– Then select “Read measured values”.
– Select “Fuel pressure” from list.

The actual pressure value being transmitted to the engine control unit by the fuel pressure sender - G247- is displayed.

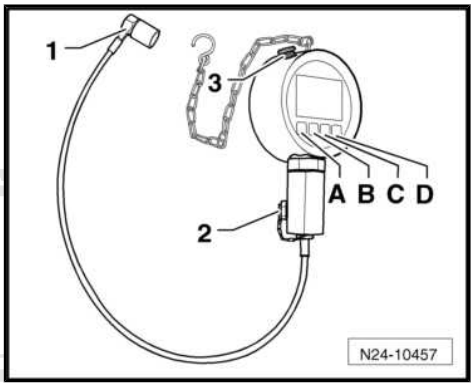


– Switch on pressure sensor tester - VAS 6394/1- by pressing button -A- once briefly.

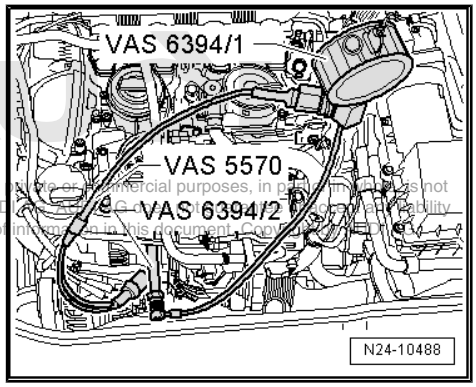
Note

You can press and hold button -A- for 2 seconds to switch on the illumination for 20 seconds.

Pressure sensor tester - VAS 6394/1- should indicate 0 bar. If this is not the case, press button -C- once briefly to zero the tester.



– Connect pressure line of pressure sensor tester - VAS 6394/1- to adapter - VAS 6394/2- .
– Start the engine.
– Compare the pressure indicated by pressure sensor tester - VAS 6394/1- with the actual pressure value on the ⇒ 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- .



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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).

– 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 280 .

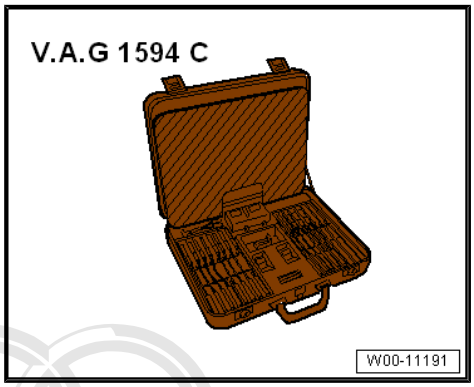
Tightening torques

♦ ⇒ “4.1 Exploded view - fuel rail with injectors”, page 271

5.5 Checking dual non-return valve

Special tools and workshop equipment required

♦ Auxiliary measuring set - V.A.G 1594C-



♦ Hand vacuum pump - VAS 6213-



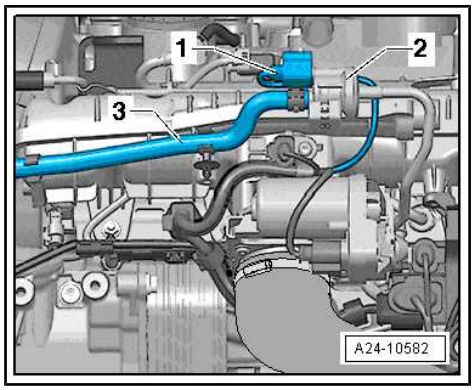
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Procedure

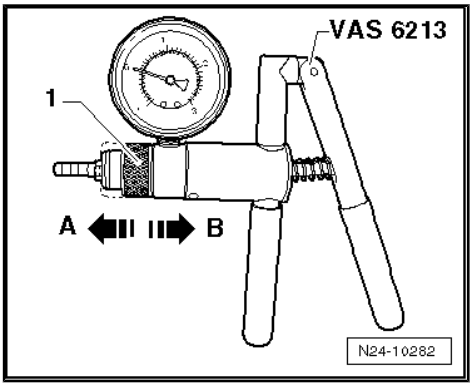
• Activated charcoal filter solenoid valve 1 - N80- has been checked with vehicle diagnostic tester and is OK.

– Remove engine cover panel ⇒ page 46 .

– Unplug connector -1- and detach breather hose -3- from activated charcoal filter solenoid valve 1 - N80- -2-.



– Move adjuster ring -1- on hand vacuum pump - VAS 6213- to position -A- to select "vacuum".



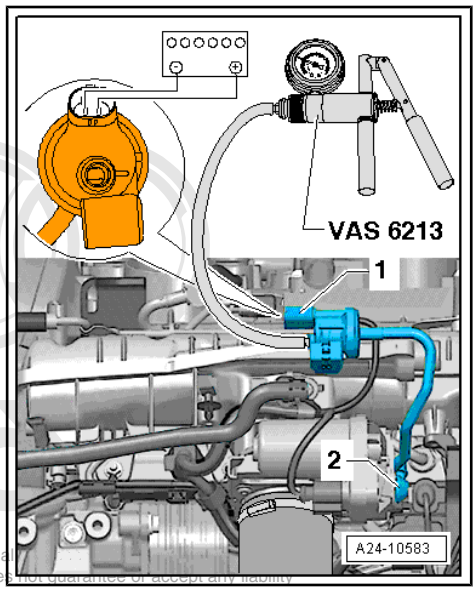
– Connect hand vacuum pump - VAS 6213- to activated charcoal filter solenoid valve 1 - N80- .

– Connect contacts of activated charcoal filter solenoid valve 1 - N80- -1- to battery using test leads. This will open activated charcoal filter solenoid valve 1 - N80- .

– Operate hand vacuum pump - VAS 6213- several times.

• Vacuum should build up.

– Again disconnect test leads from battery to cut off current supply.



If vacuum does not build up:

– Renew dual non-return valve.

Dual non-return valve, activated charcoal filter solenoid valve 1 - N80- and plastic hoses are combined as one unit and can only be renewed together.

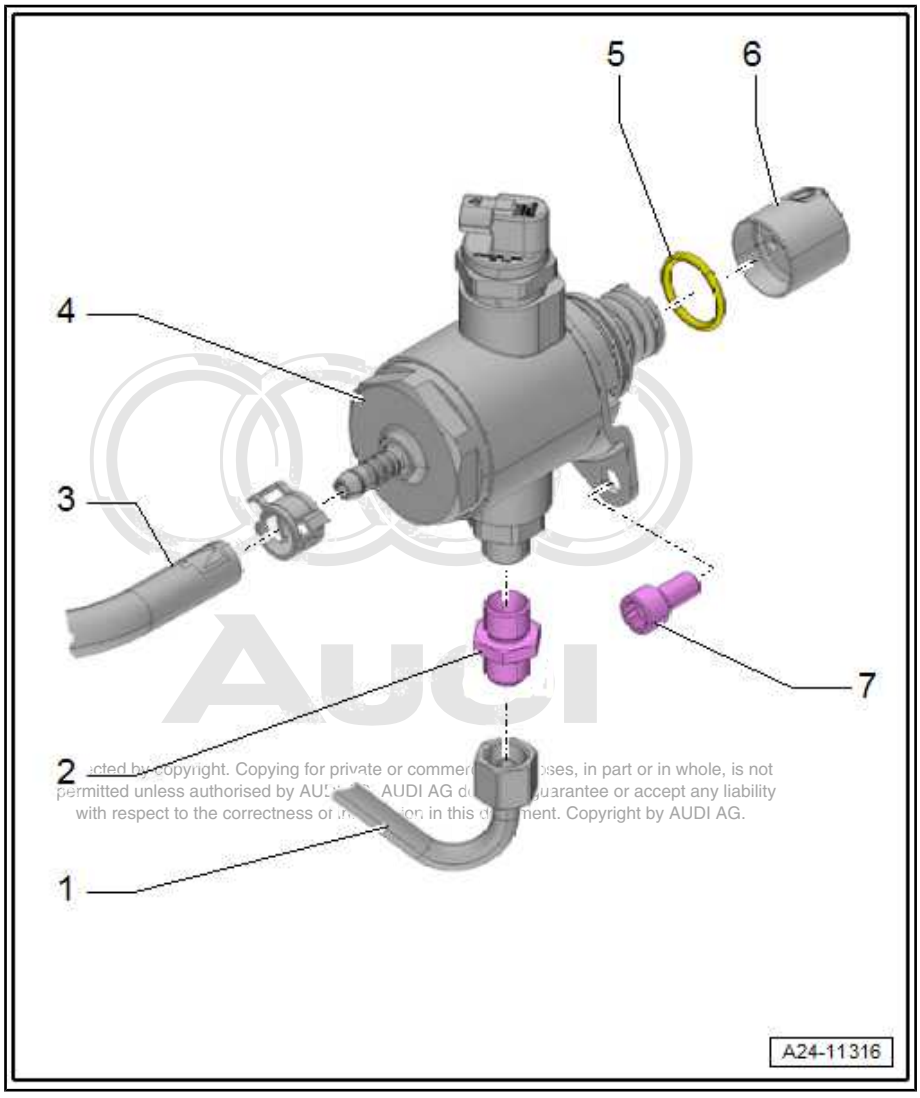
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6 High-pressure pump

⇒ “6.1 Exploded view - high-pressure pump”, page 286

⇒ “6.2 Removing and installing high-pressure pump”, page 287

6.1 Exploded view - high-pressure pump



1 - High-pressure pipe

- ❑ Do not alter shape
- ❑ Install so that parts are free of tension
- ❑ Lubricate thread of union nut with clean engine oil
- ❑ Tighten union nut to 18 Nm

2 - Connecting piece

- ❑ For high-pressure pipe
- ❑ Counterhold when loosening union nut
- ❑ Must always be renewed once loosened
- ❑ 40 Nm

3 - Fuel supply hose

- ❑ From fuel tank

4 - High-pressure pump

- ❑ Depending on version, with fuel metering valve - N290- or fuel pressure regulating valve - N276- (do not loosen)
- ❑ Observe rules for cleanliness when installing ⇒ page 5
- ❑ Removing and installing ⇒ page 287
- ❑ Take care not to tilt when installing

5 - O-ring

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

6 - Roller tappet

- ❑ May remain lodged in vacuum pump when high-pressure pump is removed

7 - Bolt

- ❑ M6; renew
- ❑ Tightening torque and sequence ⇒ page 287

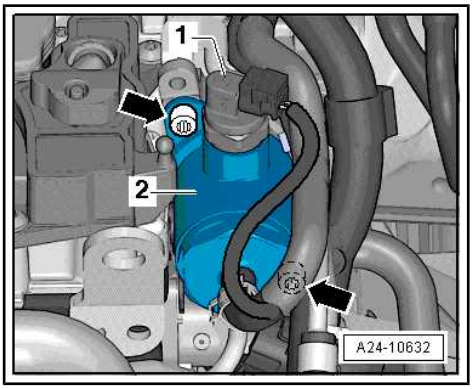
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High-pressure pump - tightening torque and sequence

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



6.2 Removing and installing high-pressure pump

Removing

Caution

Risk of damage caused by particles of dirt.

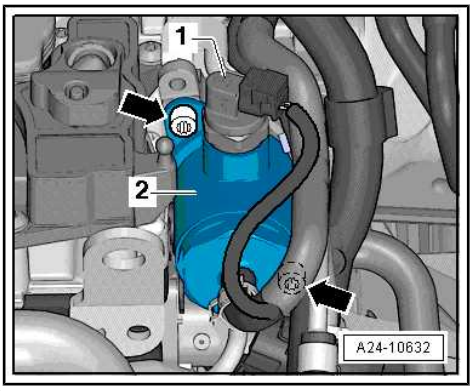
- *Observe ⇒ "3.1 Rules for cleanliness", page 5 .*

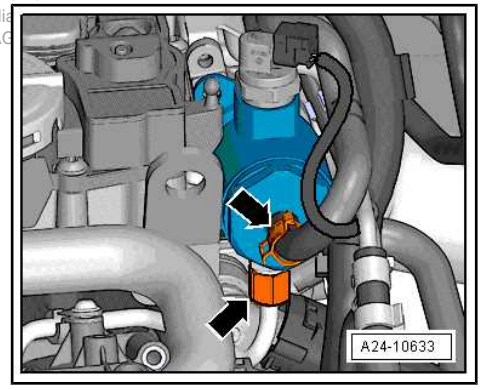
Note

The high-pressure fuel pump should only be removed and installed when the engine is cold.

– Remove engine cover panel ⇒ page 46 .

– Unplug electrical connector -1-.





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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.

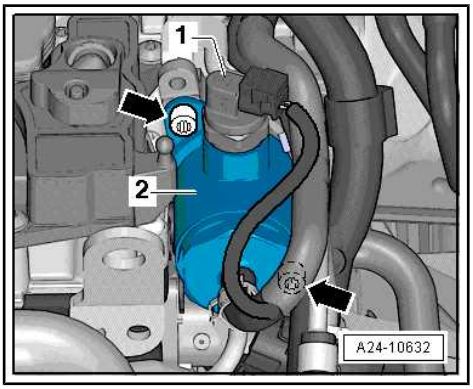
– Release pressure (wrap clean cloth around connection and open connection carefully).

– Disconnect fuel lines -arrows-.

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– Remove bolts -arrows-.

– Carefully pull out high-pressure pump. It is possible that the roller tappet may remain lodged in the vacuum pump.



Installing

– Fit roller tappet in vacuum pump (check roller tappet for damage first).

Note

- *Renew O-ring.*
- *Always ensure that the high-pressure fuel pipes are free of tension when tightening the connections.*
- *The roller tappet must be positioned at the lowest point when installing the high-pressure pump.*
- *When installing a used high-pressure pump, the connecting piece for the fuel supply line (high-pressure section of the system) must be renewed.*

– Turn crankshaft until roller tappet is positioned at lowest point.

– Fit high-pressure pump in vacuum pump.

– Tighten bolts in stages ⇒ page 287 .

Note

The high-pressure pump can be damaged if it is tightened too much on one side (keep it straight).

– Tighten union nut on fuel supply line hand-tight and align line so that it is free of stress.

Note

Check fuel system for leaks.

Tightening torques

- ⇒ “6.1 Exploded view - high-pressure pump”, page 286
- ⇒ Fig. ““High-pressure pump - tightening torque and sequence”“ , page 287
- ⇒ “3.1 Exploded view - intake manifold”, page 261

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7 Lambda probe

⇒ “7.1 Exploded view - Lambda probe”, page 290

⇒ “7.2 Removing and installing Lambda probe”, page 290

7.1 Exploded view - Lambda probe

1 - Lambda probe after catalytic converter - G130- and Lambda probe heater 1 after catalytic converter - Z29-

- ❑ Removing and installing ⇒ page 291
- ❑ Observe fitting instructions ⇒ page 293
- ❑ 55 Nm

2 - Lambda probe - G39- and Lambda probe heater - Z19-

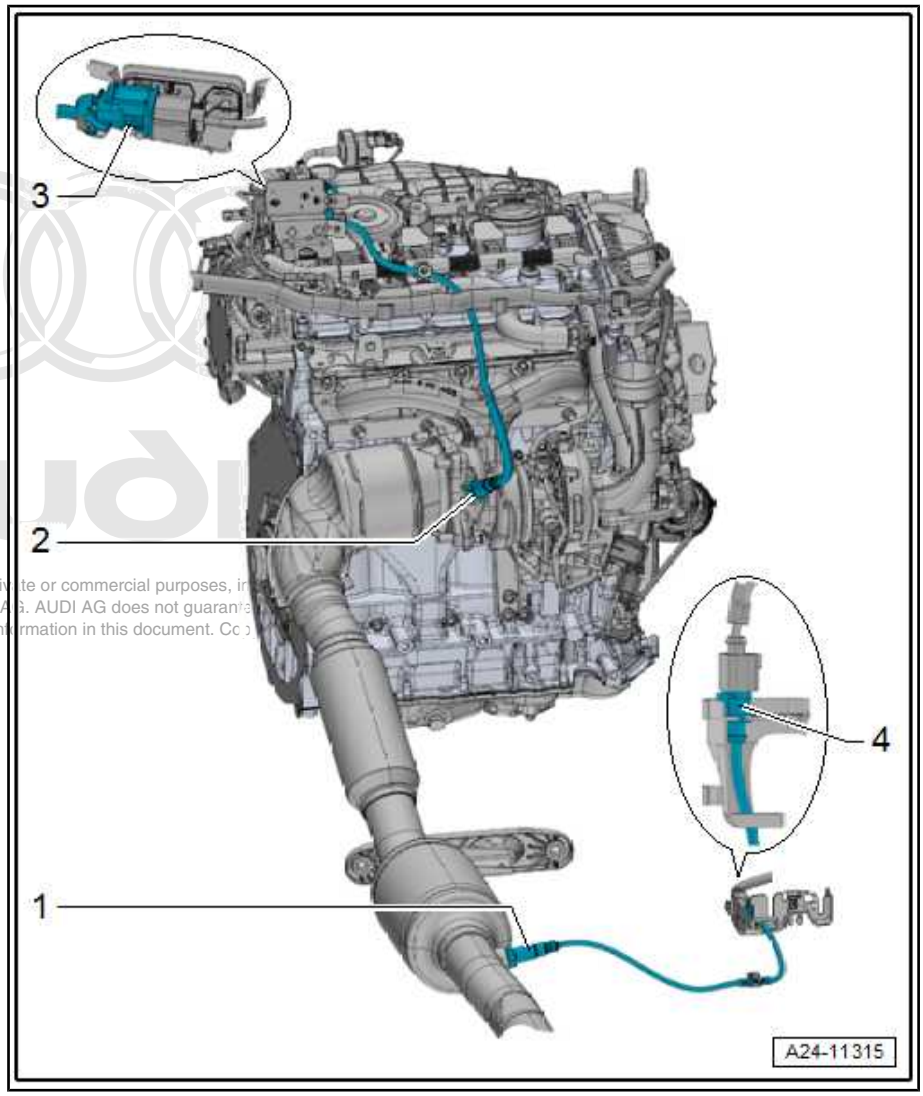
- ❑ Removing and installing ⇒ page 290
- ❑ Observe fitting instructions ⇒ page 291
- ❑ 55 Nm

3 - Electrical connector

- ❑ For Lambda probe - G39- and Lambda probe heater - Z19-

4 - Electrical connector

- ❑ For Lambda probe after catalytic converter - G130- and Lambda probe heater 1 after catalytic converter - Z29-



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7.2 Removing and installing Lambda probe

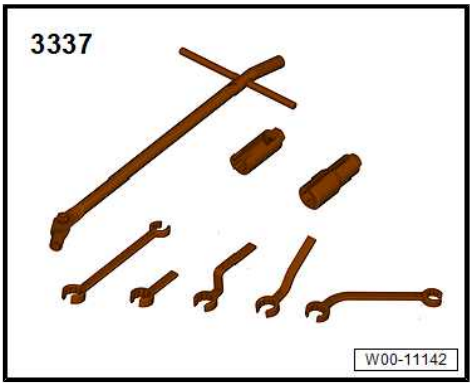
⇒ “7.2.1 Removing and installing Lambda probe G39 ”, page 290

⇒ “7.2.2 Removing and installing Lambda probe after catalytic converter G130 ”, page 291

7.2.1 Removing and installing Lambda probe - G39-

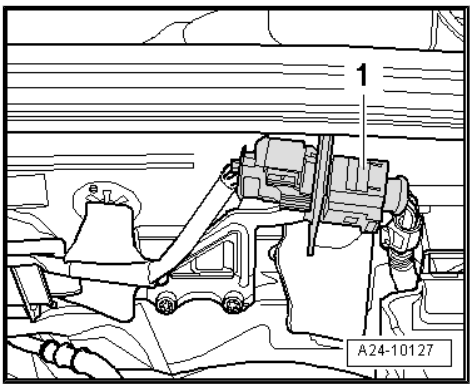
Special tools and workshop equipment required

♦ Lambda probe open ring spanner set - 3337-

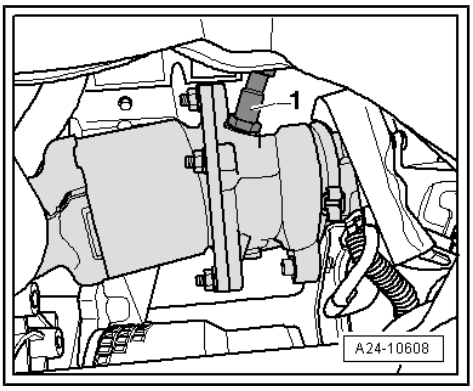


Removing

– Unplug electrical connector -1- for Lambda probe - G39- and Lambda probe heater - Z19- .



– Unscrew Lambda probe - G39- -1- using a tool from Lambda probe open ring spanner set - 3337- .



Installing

When installing, note the following:

Note

♦ *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*

♦ *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the Lambda probe body. High-temperature paste ⇒ Electronic parts catalogue*

♦ *When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*

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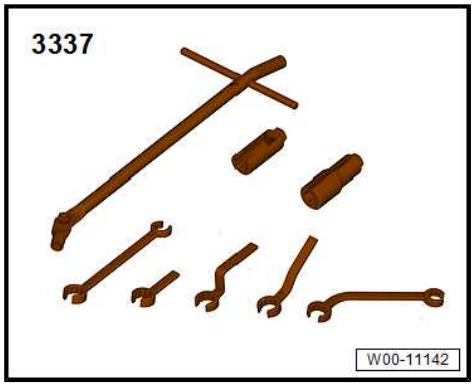
Tightening torques

♦ ⇒ “7.1 Exploded view - Lambda probe”, page 290

7.2.2 Removing and installing Lambda probe after catalytic converter - G130-

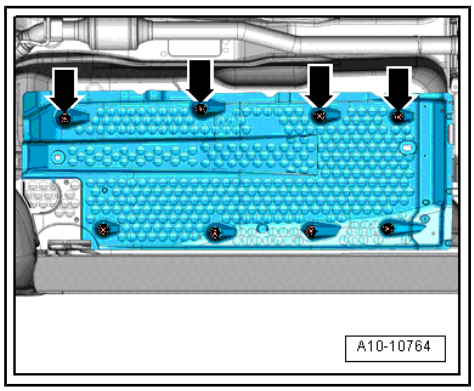
Special tools and workshop equipment required

♦ Lambda probe open ring spanner set - 3337-



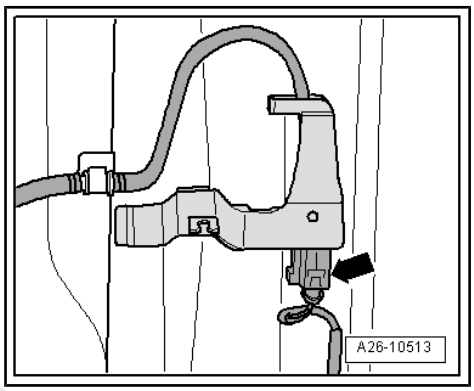
Removing

– Unscrew nuts -arrows- and pull underbody cover (right-side) down slightly.



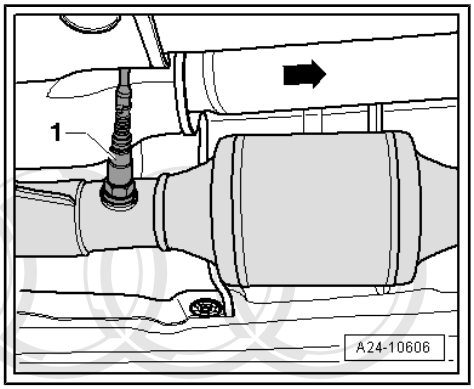
– Unplug electrical connector -arrow- for Lambda probe after catalytic converter - G130- and Lambda probe 1 heater after catalytic converter - Z29- .

– Detach electrical connector from bracket and move clear wiring to Lambda probe.



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– Unscrew Lambda probe after catalytic converter - G130- -1- using a tool from Lambda probe open ring spanner set - 3337- .



Installing

When installing, note the following:

Note

- *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the Lambda probe body. High-temperature paste ⇒ Electronic parts catalogue*
- *When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*

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Tightening torques

- ⇒ “7.1 Exploded view - Lambda probe”, page 290

8 Engine control unit

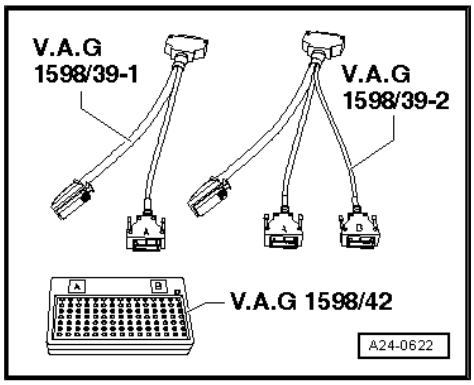
⇒ “8.1 Wiring and component check”, page 294

⇒ “8.2 Removing and installing engine control unit J623 ”, page 296

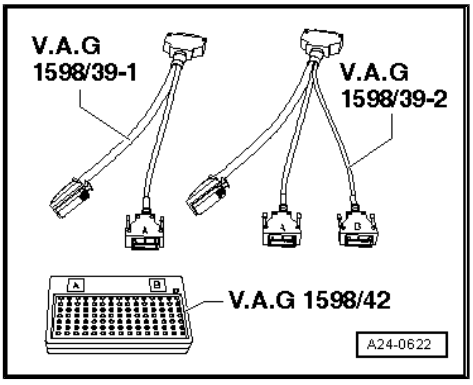
8.1 Wiring and component check

Special tools and workshop equipment required

- Adapter cable - V.A.G 1598/39-1-
- Adapter cable - V.A.G 1598/39-2-
- Test box - V.A.G 1598/42-



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Note

- *The test box has 105 sockets. The connecting cable can be disconnected from the test box. This means that only the cable (and not the test box) has to be purchased for future engine control units with different types of connectors.*
- *The smaller of the two connectors on the engine control unit has the contacts 1 to 60. The larger of the two connectors has the contacts 1 to 94.*
- *To carry out tests on the 60-pin wiring harness connector, the adapter cable - V.A.G 1598/39-1- is connected to connector -A- on the test box. For components connected to 60-pin wiring harness connector ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.*
- *To carry out tests on the 94-pin wiring harness connector, the adapter cable - V.A.G 1598/39-2- must be connected to connectors -A- and -B- on the test box. For components connected to 94-pin wiring harness connector ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.*
- *The test box - V.A.G 1598/42- is designed so it can be connected both to the wiring harness for the engine control unit and to the engine control unit itself at the same time.*
- *The advantage of this is that the electronic engine control system remains fully functional when the test box is connected (for example, for measuring signals when the engine is running).*
- *The relevant test procedure will state whether it is necessary to also connect the engine control unit to the test box.*
- *Always use auxiliary measuring set - V.A.G 1527 B- to connect test equipment (e.g. voltage tester - V.A.G 1526 C- , hand-held multimeter - V.A.G 1594 C- etc.).*

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WARNING

To prevent irreparable damage to the electronic components, select appropriate measuring range before connecting the measuring cables and observe the test requirements.

The engine control unit has to be removed before multi-pin connectors can be unplugged from engine control unit ⇒ page 296 .

– Connect test box - V.A.G 1598/42- to wiring harness connector. The earth clip on the test box must be connected to the negative battery terminal. The instructions for performing the individual tests indicate whether or not the engine control unit itself also needs to be connected to the test box.

– Carry out test as described in appropriate repair procedures.

Installing engine control unit

Installation is performed in the reverse sequence.

– After installation, the locking plate must be re-fitted on the control unit.

– Clean threaded holes for shear bolts to remove any residue from locking fluid. This can be done using a thread tap.

– Use new shear bolts.

– Interrogate event memory and erase if necessary. Use ⇒ Vehicle diagnostic tester.

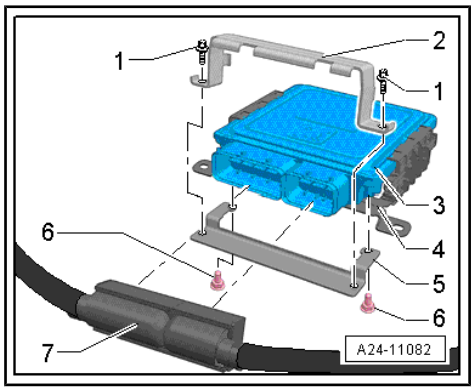
8.2 Removing and installing engine control unit - J623-

Special tools and workshop equipment required

- Mole grips (commercially available type)

Note

- *Not every engine control unit is bolted to a protective housing. Whether a protective housing is fitted depends on the engine/gearbox combination.*
- *The engine control unit -3- is bolted to the retaining bracket -2 and 5-. To make it more difficult to unscrew the shear bolts -1- for locking plate -2-, their threads have been coated with locking fluid.*
- *The protective housing has to be removed before the connectors can be unplugged from the engine control unit (e.g. to connect the test box or renew the engine control unit).*



Removing

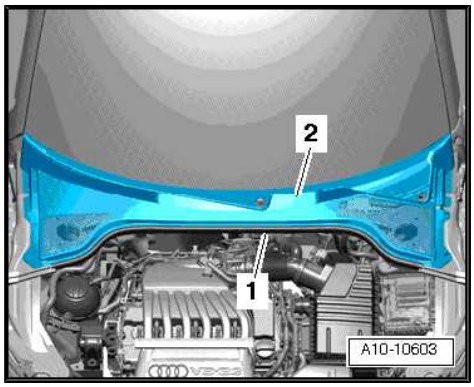
– When renewing engine control unit, select diagnosis object “Replace engine control unit” in “Guided Functions” mode of ⇒ Vehicle diagnostic tester.

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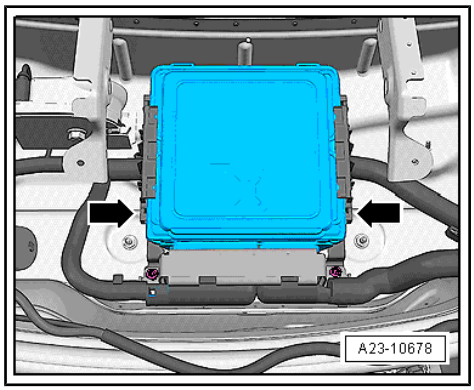
– Switch off ignition and remove ignition key.

– Remove wiper arms ⇒ Electrical system; Rep. gr. 92 ; Windscreen wiper system; Removing and installing wiper arms .

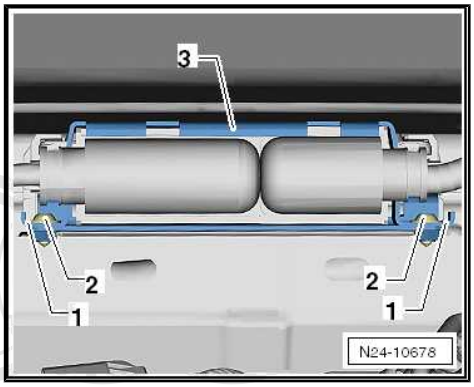
– Pull off rubber seal -1- and remove plenum chamber cover -2-.



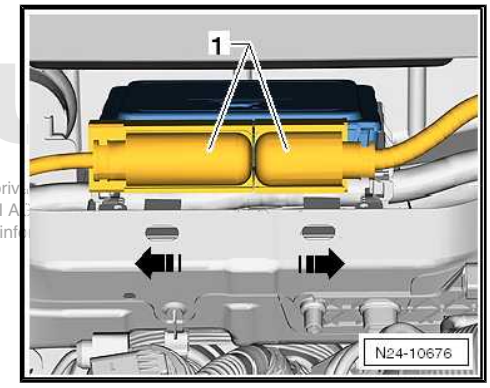
– Release clips -arrows- and pull out engine control unit - J623- towards front.



– Bend vertical edges -1- of retaining bracket outwards.
– Remove shear bolts -2- using mole grips and detach retaining bracket -3-.



– Slide catches -1- on engine control unit in direction of -arrow- and unplug both connectors.

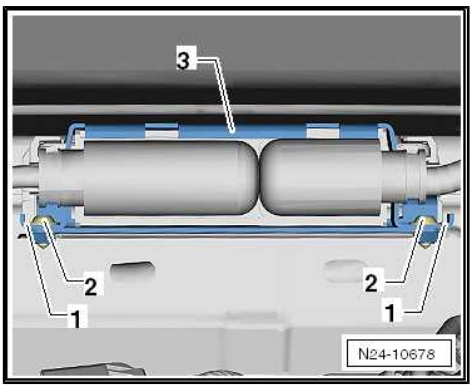


Installing

Installation is performed in the reverse sequence.

– Clean threaded holes for shear bolts to remove any residue from locking fluid. This can be done using a thread tap.
– Plug connectors into engine control unit and push catches inwards until they engage.
– Use new shear bolts and a new retaining bracket.

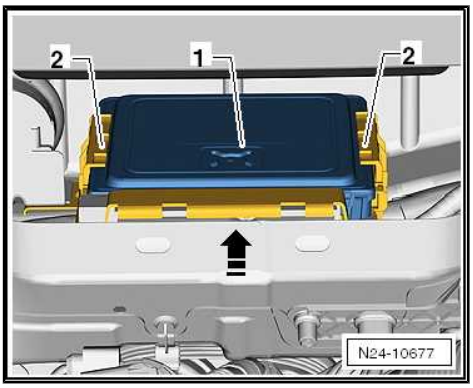
– Tighten new holding bracket -3- with new shear bolts -2- evenly until heads of bolts shear off.



Note

Item -1- can be disregarded.

– Slide engine control unit -1- in direction of -arrow- into side guides -2-.
– Install wiper arms ⇒ Electrical system; Rep. gr. 92 ; Windscreen wiper system; Removing and installing wiper arms .



After installing a new engine control unit, the following operation must be performed:

– Activate engine control unit in “Guided Functions” mode, “Replace engine control unit”; use ⇒ Vehicle diagnostic tester.

26 – Exhaust system

1 Exhaust pipes/silencers

⇒ "1.1 Exploded view - silencers", page 298

⇒ "1.2 Removing and installing front exhaust pipe", page 300

⇒ "1.3 Separating exhaust pipes/silencers", page 302

⇒ "1.4 Stress-free alignment of exhaust system", page 303

⇒ "1.5 Checking exhaust system for leaks", page 304

1.1 Exploded view - silencers

Note

- *After working on the exhaust system, ensure that the system is not under stress and that it has sufficient clearance from the body. If necessary, loosen clamp and align silencers and exhaust pipe so that sufficient clearance is maintained to the body at all points and the mountings are evenly loaded.*
- *The exhaust manifold and the turbocharger are combined as one unit; removing and installing ⇒ page 236 .*

1 - Bolts
- ❑ 25 Nm

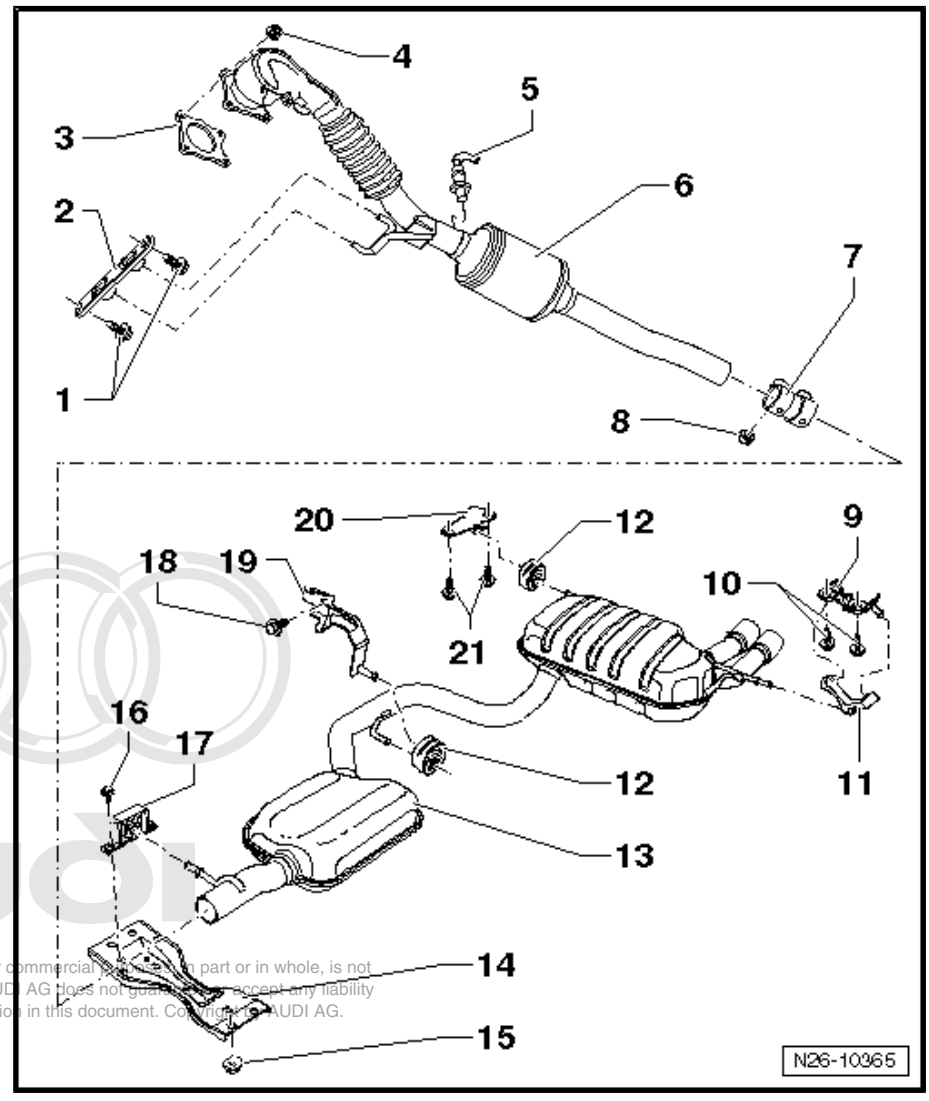
2 - Mounting
- ❑ Renew if damaged

3 - Gasket
- ❑ Renew

4 - Nut
- ❑ Renew
- ❑ Lubricate exhaust manifold studs with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 40 Nm

5 - Lambda probe
- ❑ Different fitting locations ⇒ page 290
- ❑ Removing and installing ⇒ page 290

6 - Front exhaust pipe with catalytic converter
- ❑ Do not bend flexible joint more than 10° - otherwise it can be damaged
- ❑ Install flexible joint so that it is not under tension.
- ❑ Take care not to damage wire mesh on flexible joint
- ❑ Protect catalytic con-



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verter from damage by knocks and impact

- ❑ Removing and installing ⇒ page 300
- ❑ Do not remove protective packaging from replacement part until you are ready to fit the flexible joint
- ❑ Align exhaust system so it is free of stress ⇒ page 303

7 - Clamp (front)

- ❑ Before tightening, align exhaust system so it is free of stress ⇒ page 303
- ❑ Installation position ⇒ page 300
- ❑ Tighten bolted connections evenly

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8 - Nut

- ❑ 25 Nm

9 - Bracket

10 - Bolts

- ❑ 25 Nm

11 - Mounting

12 - Rubber mounting

- ❑ Renew if damaged

13 - Centre and rear silencers

- ❑ Combined in one unit as original equipment. Can be renewed individually for repair purposes
- ❑ Separating centre and rear silencers ⇒ page 302
- ❑ Align exhaust system so it is free of stress ⇒ page 303

14 - Tunnel cross-piece

- ❑ Removing and installing ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim; Removing and installing tunnel cross-piece

15 - Nut

- ❑ Tightening torque ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim; Exploded view - underbody trim

16 - Bolt

- ❑ 25 Nm

17 - Mounting

- ❑ Renew if damaged

18 - Bolt

- ❑ 20 Nm

19 - Bracket

20 - Bracket

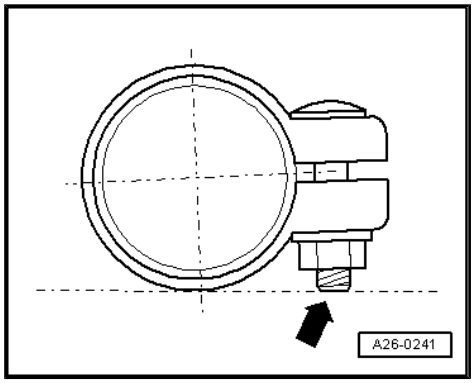
21 - Bolts

- ❑ 25 Nm

Installation position of front clamp

– Install clamp so that end of bolt -arrow- does not protrude below bottom of clamp.

• Bolt connection faces to right.



1.2 Removing and installing front exhaust pipe

Note

The front exhaust pipe is removed together with the catalytic converter.

Special tools and workshop equipment required

♦ High-temperature paste ⇒ Electronic parts catalogue

Removing

Note

Fit all cable ties in the original positions when installing.

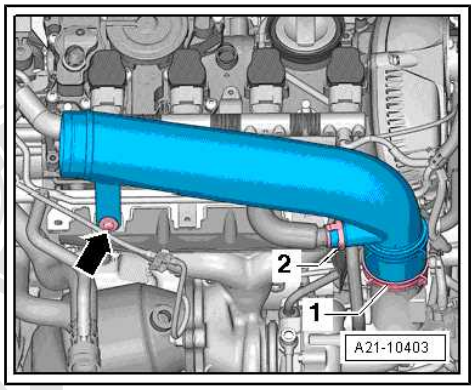
– Remove engine cover panel ⇒ page 46 .

– Remove air cleaner housing ⇒ page 259 .

– Remove bolt -arrow-.

– Loosen hose clip -1- and remove air hose.

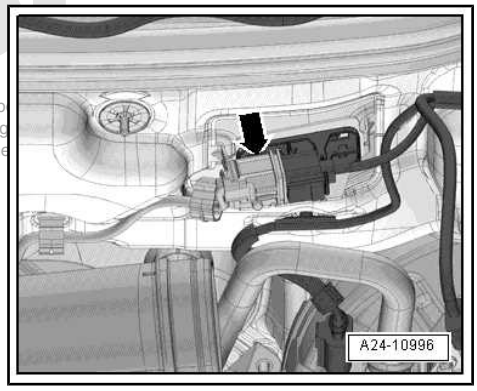
– Press release tabs and disconnect air hose -2-.



Vehicles with engine code CCZC:

– Unplug electrical connector -arrow- for Lambda probe - G39- and Lambda probe heater - Z19- and move wiring clear.

– Remove nuts (accessible from above) -arrows- securing front exhaust pipe to turbocharger.

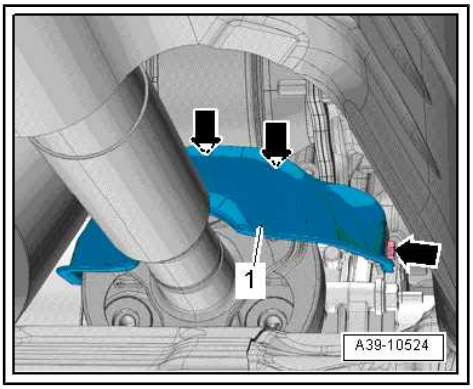


Continued for all vehicles:

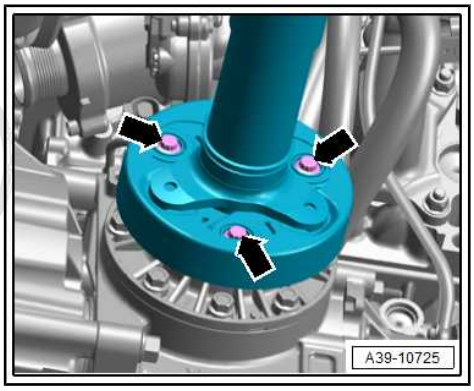
– Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

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– Remove bolts -arrows- and detach heat shield.



– Mark position of flexible coupling and flange for bevel box in relation to each other for re-installation.
– Remove bolts -arrows- securing flexible coupling for propshaft to bevel box (counterhold using a suitable lever at triangular flange).



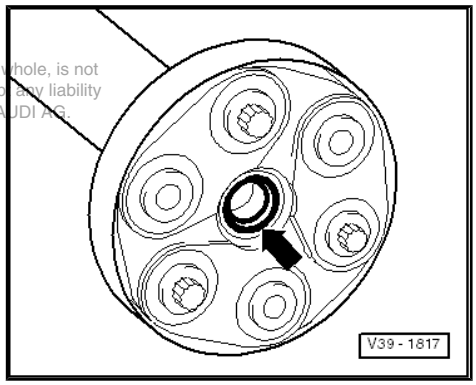
– Push engine/gearbox assembly forward slightly (towards front end) and pull propshaft off bevel box.

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Caution

Make sure not to damage the oil seal -arrow- in the propshaft flange.

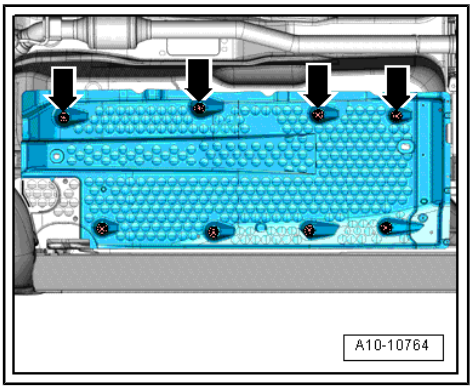
- ***Push the propshaft horizontally to the rear and towards the right side of vehicle as far as possible.***



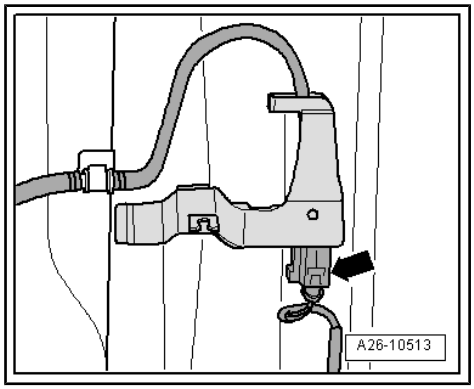
Note

The propshaft must be renewed if the oil seal is damaged.

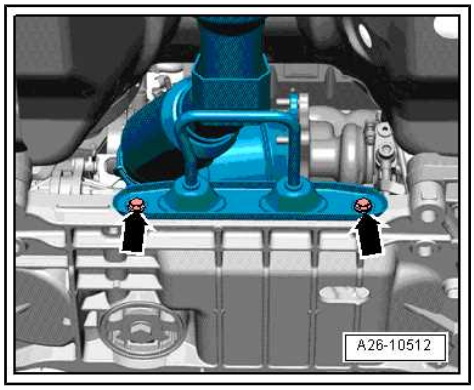
– Remove nuts -arrows- and pull underbody trim (right-side) down slightly.



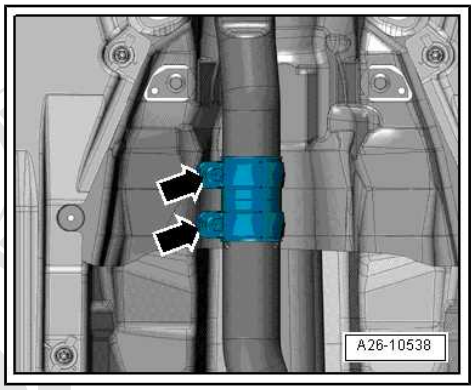
– Unplug electrical connector -arrow- for Lambda probe after catalytic converter - G130- and Lambda probe 1 heater after catalytic converter - Z29- on underbody (right-side).
– Detach electrical connector from bracket and move clear wiring to Lambda probe.



– Remove bolts -arrows- and detach bracket for exhaust system.



– Loosen nuts -1- and push clamp towards rear.
– Detach catalytic converter with front exhaust pipe.



Installing

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

Note

- *Renew seals, gaskets and self-locking nuts.*
- *Coat exhaust manifold studs with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .*

– Align the exhaust system so it is free of stress ⇒ page 303 .
– Install underbody trim (right-side) ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim; Exploded view - underbody trim .
– Secure propshaft ⇒ Rep. gr. 39 ; Propshaft; Removing and installing propshaft .
– Install air cleaner housing ⇒ page 259 .
– Install engine cover panel ⇒ page 46 .

Tightening torques

- ⇒ “1.1 Exploded view - silencers”, page 298 .
- ⇒ “2.2 Exploded view - hose connections for charge air system”, page 248

1.3 Separating exhaust pipes/silencers

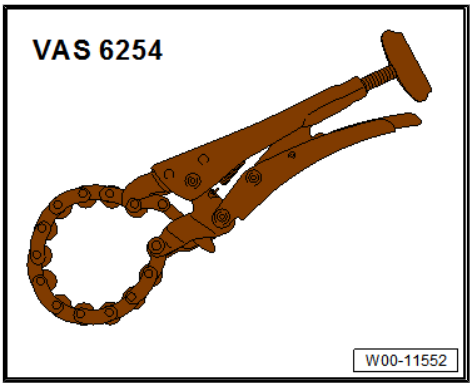
- The connecting pipe can be cut through at the cutting location in order to renew the centre and rear silencers separately.

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♦ The cutting point is marked by an indentation on the circumference of the exhaust pipe.

Special tools and workshop equipment required

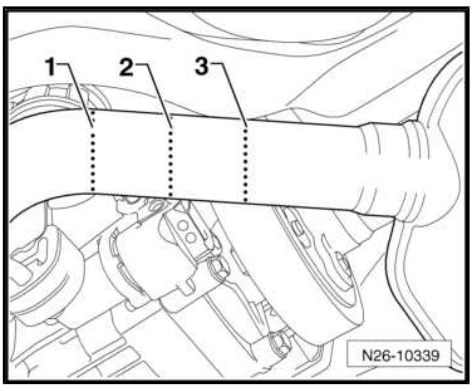
♦ Chain pipe cutter - VAS 6254-



Procedure

– Cut through exhaust pipe at right angle at position marked -2- using chain pipe cutter - VAS 6254- .

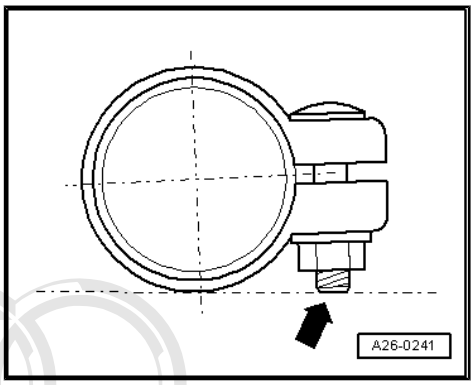
– Position clamp centrally at side marks -1- and -3- when installing.



– Install rear clamp so that end of bolt -arrow- does not protrude below bottom of clamp.

• Bolted connection faces to rear

– Align the exhaust system so it is free of stress ⇒ page 303 .



1.4 Stress-free alignment of exhaust system

⇒ “1.4.1 Stress-free alignment of exhaust system”, page 303

⇒ “1.4.2 Aligning tailpipes”, page 304

1.4.1 Stress-free alignment of exhaust system

Procedure

• The exhaust system must be aligned when it is cool.

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Note

-Arrow- points in direction of travel.

– Loosen bolt connections -3 and 4- on front clamp -1-.

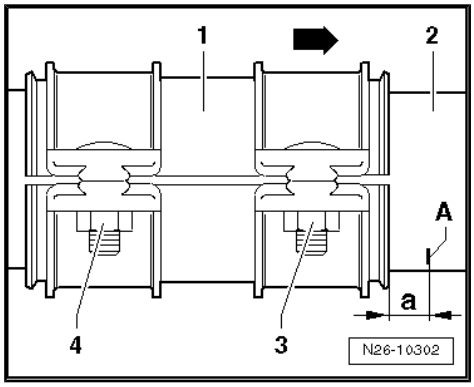
– Align front clamp according to mark -A- on front exhaust pipe.

• Dimension -a- = 5 mm

– Install clamp so that ends of bolts do not protrude beyond bottom of clamp.

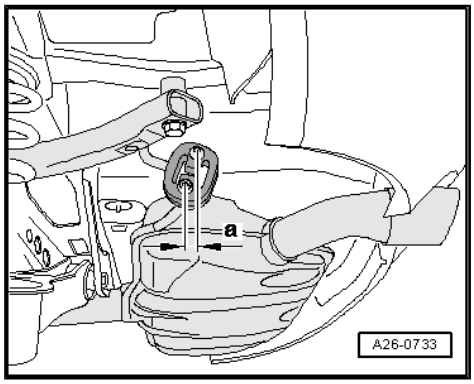
• Bolt connection faces to right.

– Tighten front bolt connection -3- on clamp hand-tight.



– Push exhaust system towards front of vehicle until preloading at mounting for rear silencer -a- = 15 ... 17 mm.

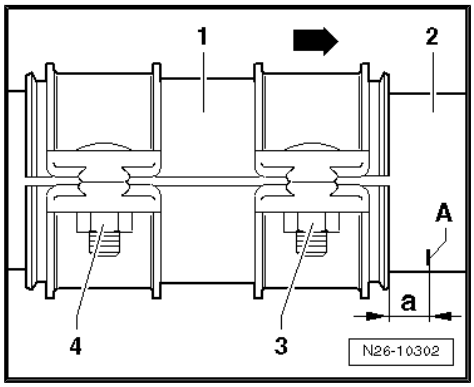
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– Tighten bolt connections -3 and 4- on clamp evenly.

Tightening torques

◆ ⇒ “1.1 Exploded view - silencers”, page 298 .



1.4.2 Aligning tailpipes

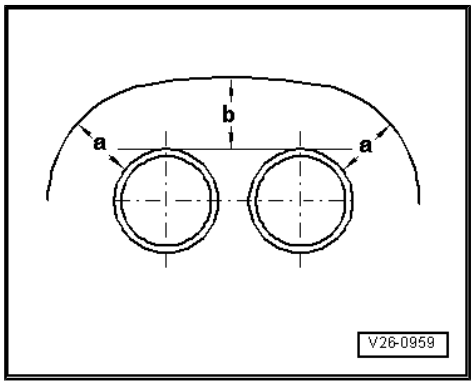
Procedure

– Align rear silencer so that there is an equal distance -a- and -b- between bumper cut-out and tailpipes.

– Unfasten rear silencer mounting to align tailpipes.

Tightening torques

◆ ⇒ “1.1 Exploded view - silencers”, page 298 .



1.5 Checking exhaust system for leaks

Procedure

– 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.

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28 – Ignition system

1 Ignition system

⇒ “1.1 Exploded view - ignition system”, page 306

⇒ “1.2 Test data, spark plugs”, page 307

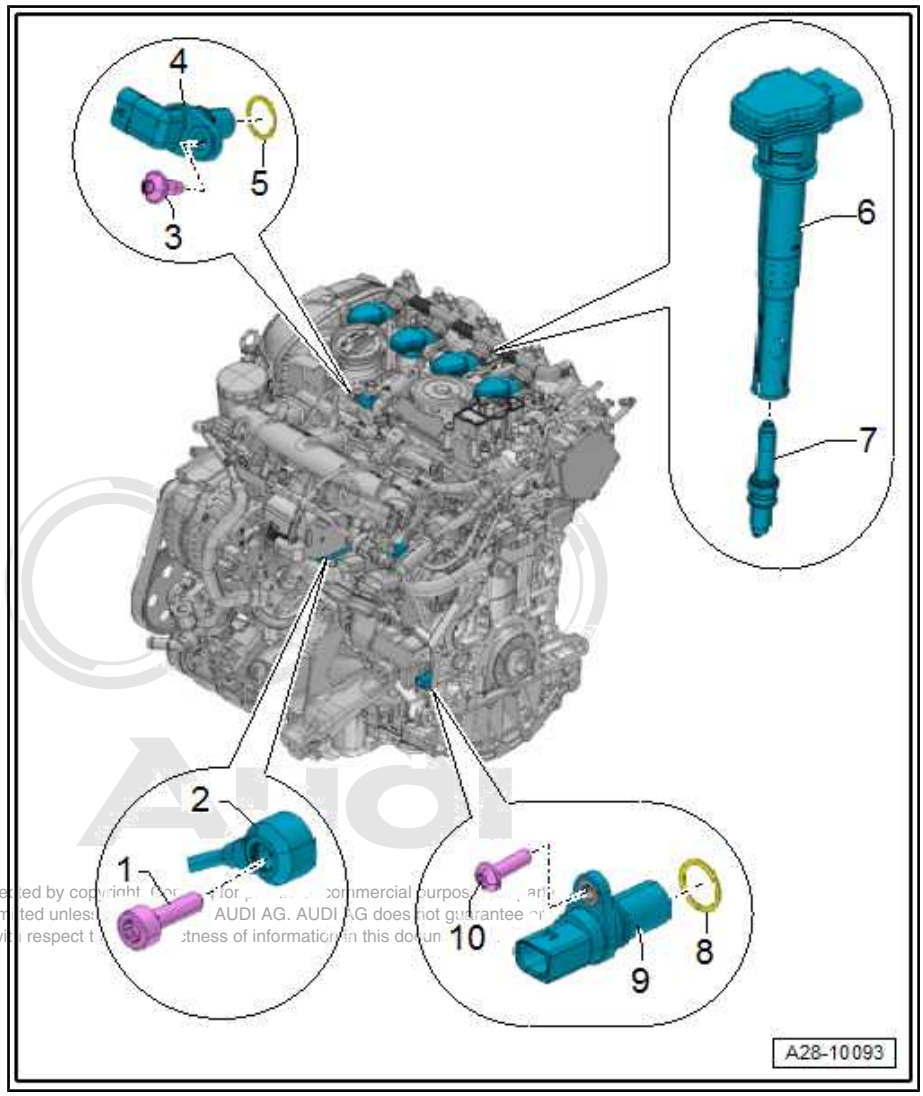
⇒ “1.3 Removing and installing ignition coils with output stages”, page 307

⇒ “1.4 Removing and installing knock sensor”, page 308

⇒ “1.5 Removing and installing engine speed sender G28 ”, page 309

⇒ “1.6 Removing and installing Hall sender”, page 311

1.1 Exploded view - ignition system



1 - Bolt

- ❑ The tightening torque influences the function of the knock sensor
- ❑ 20 Nm

2 - Knock sensor 1 - G61-

- ❑ Contacts gold-plated
- ❑ Removing and installing ⇒ page 308

3 - Bolt

- ❑ 9 Nm

4 - Hall sender - G40-

- ❑ Removing and installing ⇒ page 311

5 - O-ring

- ❑ Renew

6 - 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 307

7 - Spark plug

- ❑ Removing and installing, tightening torque ⇒ Maintenance ; Booklet 820

8 - O-ring

- ❑ Renew

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9 - Engine speed sender - G28-

- ❑ Removing and installing ⇒ page 309

10 - Bolt

- ❑ 4.5 Nm

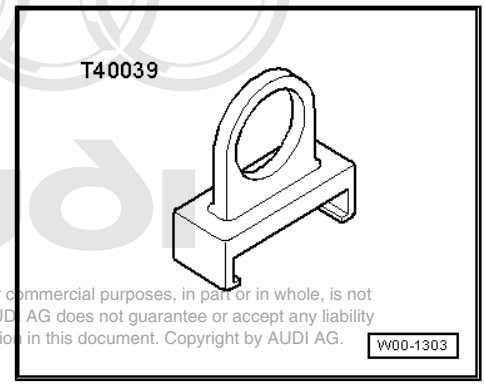
1.2 Test data, spark plugs

Engine data		2.0 ltr. turbo FSI engine
Idling speed is not adjustable; controlled by the idling speed stabilisation		640...800 rpm
Engine speed limiter (deactivates injectors/closes throttle valve)		approx. 6,500 rpm
Ignition timing is determined by the control unit. Ignition timing cannot be adjusted.		
Ignition system		Multi-coil system with 4 ignition coils (output stages integrated) connected directly to spark plugs via spark plug connectors
Spark plugs	Designations	⇒ Electronic parts catalogue
	Tightening torque	⇒ Maintenance ; Booklet 820
Firing order		1-3-4-2

1.3 Removing and installing ignition coils with output stages

Special tools and workshop equipment required

- ♦ Puller - T40039-

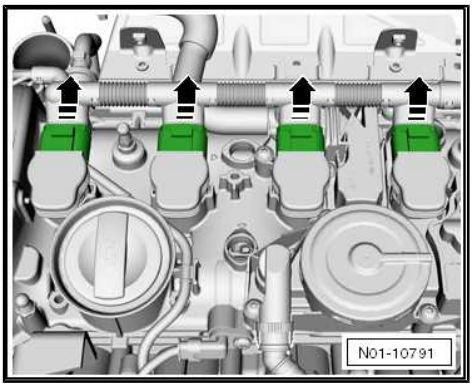


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Removing

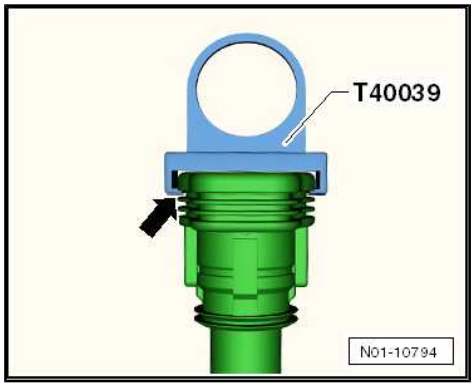
– Remove engine cover panel ⇒ page 46 .

– Release electrical connectors at all ignition coils and unplug all connectors from ignition coils simultaneously -arrows-.

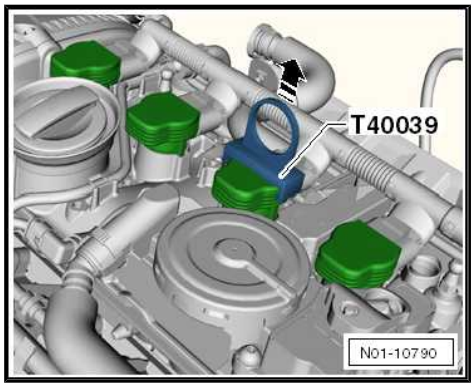


Note

- *To remove ignition coils, fit puller - T40039- onto upper (thick) rib -arrow- of ignition coil with output stage.*
- *The lower ribs can be damaged if they are used.*



– Using puller - T40039- , pull all ignition coils out of spark plug holes.

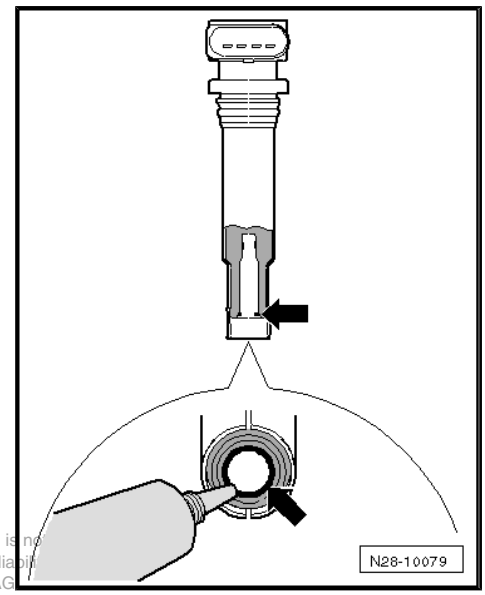


Installing

– Apply a thin bead of silicone paste all around end of sealing hose of ignition coil with output stage -arrow-.

Silicone paste ⇒ Electronic parts catalogue (ETKA) .

– Fit all ignition coils loosely into spark plug holes.
– Align ignition coils with electrical connectors and plug all connectors simultaneously onto coils.
– Press ignition coils onto spark plugs by hand with uniform pressure (do not use tool).



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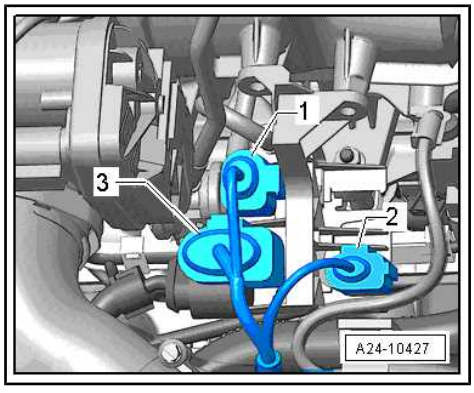
1.4 Removing and installing knock sensor

Removing

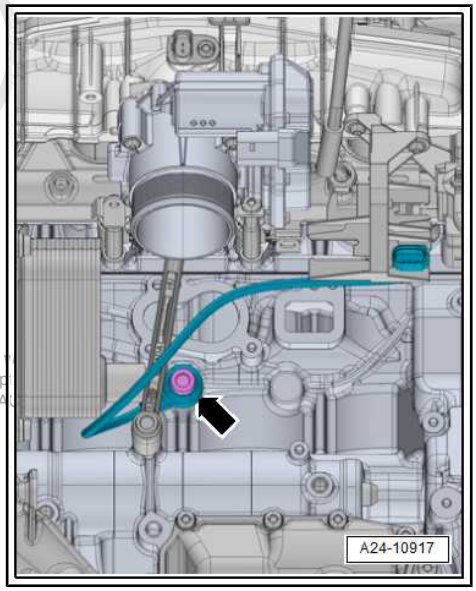
– Unplug electrical connector -2- for knock sensor 1 - G61- .
– Remove coolant pump ⇒ page 207 and thermostat ⇒ page 208 .

Note

Knock sensor 1 - G61- is located below the intake manifold and behind the coolant pump.



– Unscrew bolt -arrow- and remove knock sensor 1 - G61- .



Installing

– Install in reverse sequence.

Tightening torques

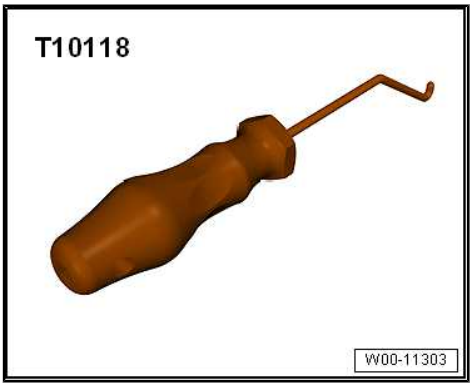
♦ ⇒ “1.1 Exploded view - ignition system”, page 306

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1.5 Removing and installing engine speed sender - G28-

Special tools and workshop equipment required

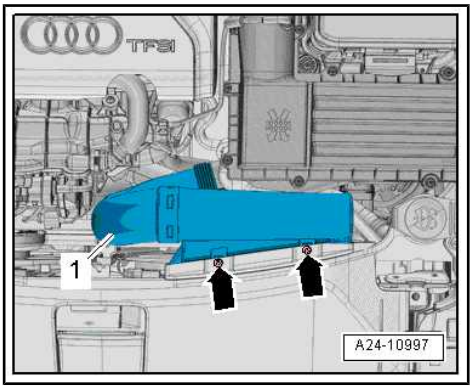
♦ Assembly tool - T10118-



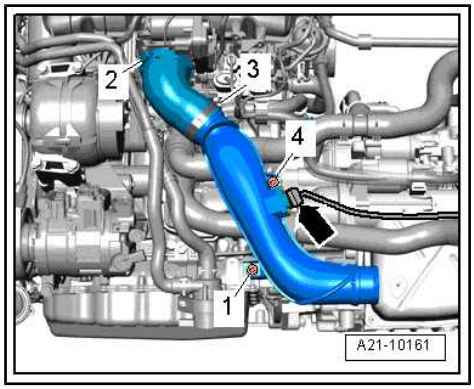
Removing

– Remove engine cover panel ⇒ page 46 .

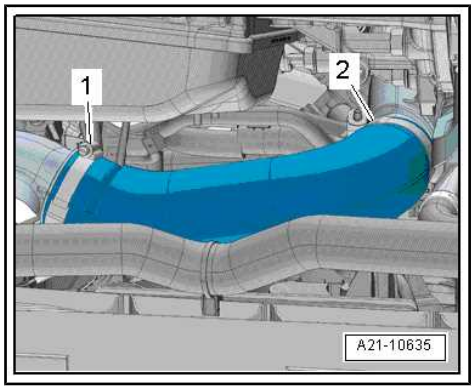
– Remove bolts -arrows- and detach air duct with air pipe -1-.



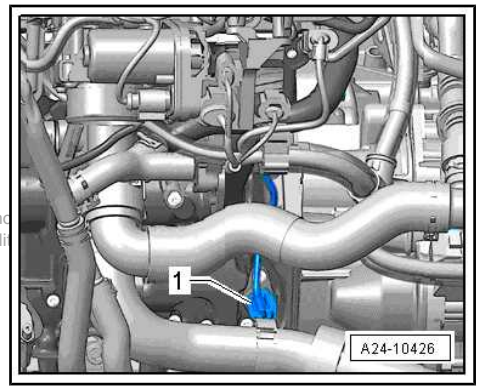
– Release hose clip -2- on air pipe.
– Remove bolt -4-.
– Unplug electrical connector -arrow-.
– Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .



– Release hose clips -1 and 2- and remove air hose.
– Unscrew bolt -1- and remove air hose from throttle valve module - J338- downwards.



– Unplug electrical connector -1- at engine speed sender - G28- .
– Unscrew securing bolt for engine speed sender - G28- .



Installing

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

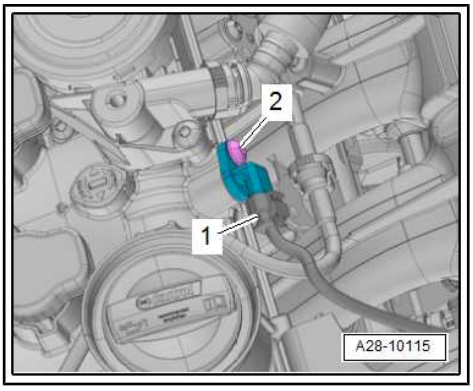
– Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .
– Install air duct ⇒ page 259 .
– Install engine cover panel ⇒ page 46 .

Tightening torques

♦ ⇒ “1.1 Exploded view - ignition system”, page 306

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1.6 Removing and installing Hall sender



Removing

– Remove engine cover panel ⇒ page 46 .
– Unplug electrical connector -1-.
– Unscrew bolt -2- and detach Hall sender - G40- .

Installing

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

Note

Renew O-ring.

Tightening torques

♦ ⇒ “1.1 Exploded view - ignition system”, page 306

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