

Workshop Manual Audi Q3 2012 ➤

5-cylinder direct injection engine (2.5 ltr. 4-valve TFSI)

Engine ID	CTS A	CZG A	CZG B					
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Edition 02.2017

Audi

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List of Workshop Manual Repair Groups

Repair Group

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- 24 - Mixture preparation - injection
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- 28 - Ignition system



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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

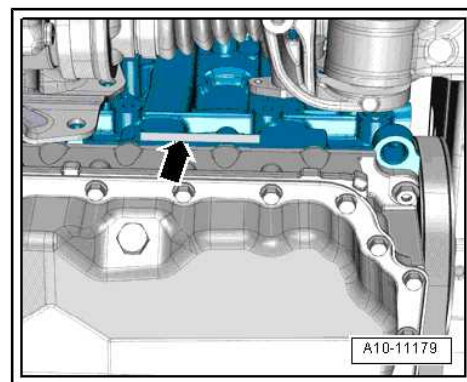
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⇒ [“1.1 Engine identification number/engine data”, page 1](#)

1.1 Engine identification number/engine data

Engine number

- ◆ The engine number (“engine code letters” and “serial number”) is located at the rear of the joint between cylinder block and sump (top section) -arrow-.
- ◆ There is also a sticker on the timing chain cover (top) showing the “engine code” and “serial number”.
- ◆ Engine codes starting with the letter “C” have four letters (previously three letters).
- ◆ The first 3 characters of the engine code stand for the engine capacity and the mechanical construction and design. They are stamped 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 .*

Engine data

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



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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

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

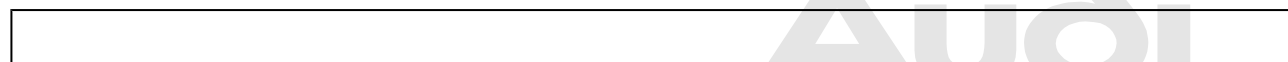
Before opening the fuel system:

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

Risk of fire due to escaping fuel

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

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



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

Risk of injury - engine may start unexpectedly

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

- Deactivate start/stop system by switching off ignition.

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2.3 Safety precautions when 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

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.
- Cover filler cap on expansion tank with a cloth and open carefully to release pressure.



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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](#)

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 204](#)

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

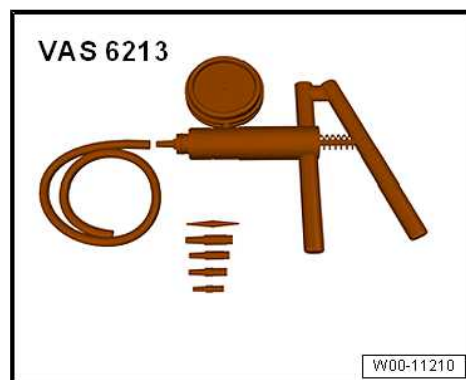
3.5 Installing radiators and condensers

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

3.6 Checking vacuum system

Special tools and workshop equipment required

- ◆ Hand vacuum pump - VAS 6213-



Procedure

- Check all vacuum lines in the complete vacuum system for:
 - ◆ Cracks
 - ◆ Traces of animal bites
 - ◆ Kinked or crushed lines
 - ◆ Porous or leaking lines
- Check vacuum line to solenoid valve and from solenoid valve to corresponding component.
- If a fault is stored in the event memory, check all vacuum lines leading to the corresponding component, and also check the remaining vacuum lines leading to other components.

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



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10 – Removing and installing engine

1 Removing and installing engine

⇒ "1.1 Removing engine", page 8

⇒ "1.2 Separating engine and gearbox", page 20

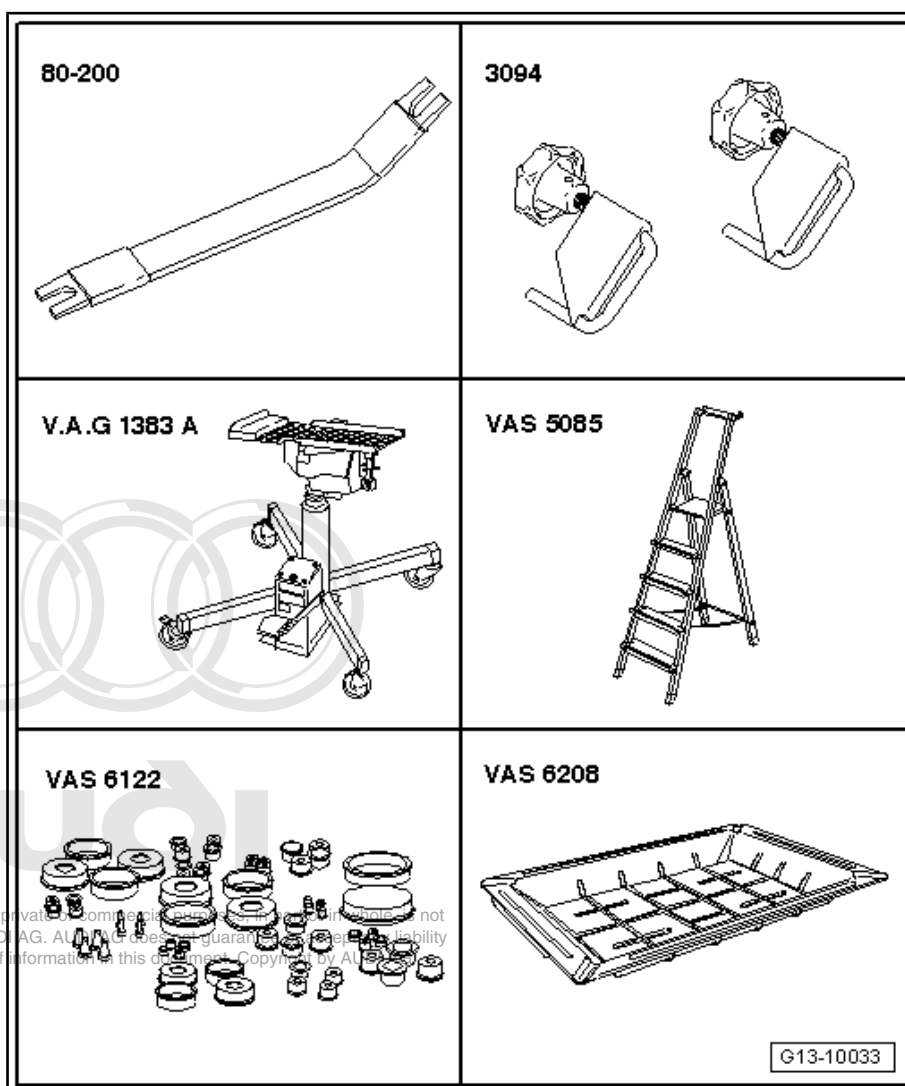
⇒ "1.3 Securing engine to engine and gearbox support", page 23

⇒ "1.4 Installing engine", page 25

1.1 Removing engine

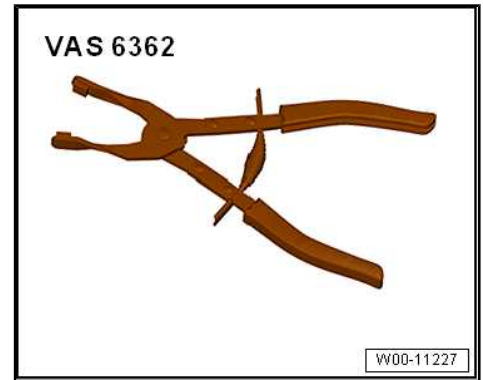
Special tools and workshop equipment required

- ◆ Removal lever - 80-200-
- ◆ Hose clamps, up to 25 mm - 3094-
- ◆ Engine and gearbox jack - V.A.G 1383 A-
- ◆ Stepladder (commercially available) or -VAS 5085-
- ◆ Engine bung set - VAS 6122-
- ◆ Coolant collecting system - VAS 5014- or drip tray for workshop hoist - VAS 6208-

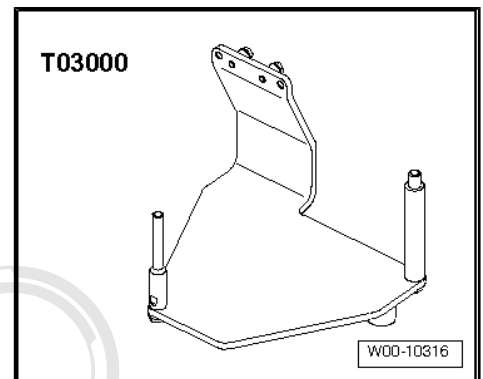


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- ◆ Hose clip pliers - VAS 6362-



- ◆ Engine bracket -T03000-



Procedure



Note

- ◆ The engine is removed from underneath together with the gearbox.
- ◆ Fit cable ties in the original positions when installing.
- ◆ Routing and attachment of pipes, hoses and wiring in engine compartment → [page 6](#)



Caution

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

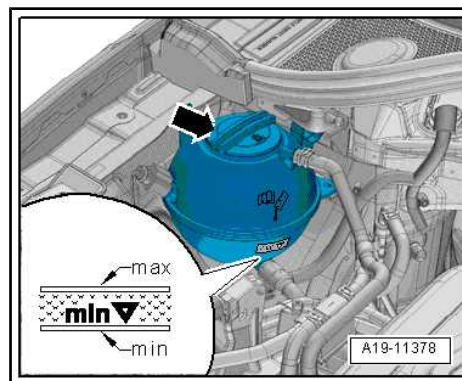
- ◆ Observe notes on procedure for disconnecting the battery.

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

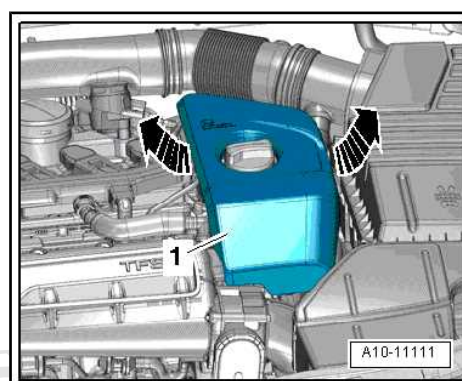

WARNING

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

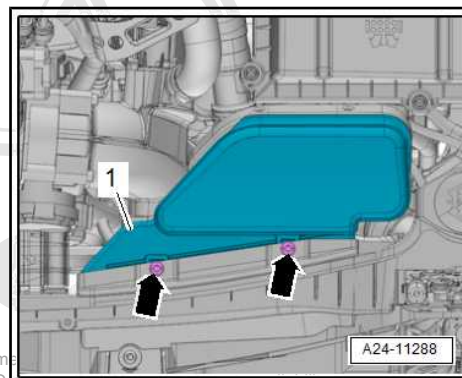
- ◆ *The cooling system is under pressure when the engine is hot.*
- ◆ *Cover filler cap on coolant expansion tank with a cloth and open carefully to dissipate pressure.*



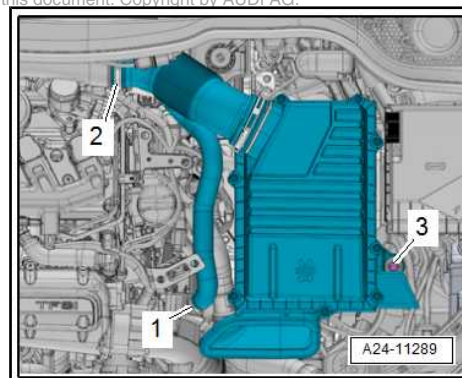
- Open filler cap -arrow- on coolant expansion tank.
- Remove subframe without steering rack ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Removing and installing subframe without steering rack .
- Pull engine cover panel -1- off upwards -arrows-.



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

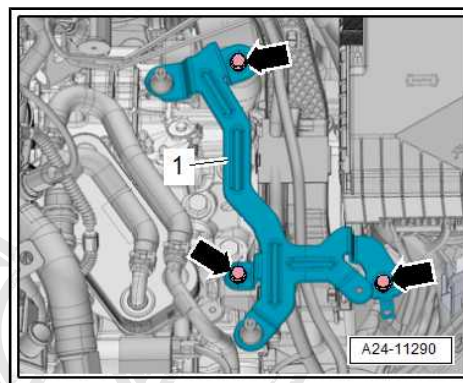


- Release hose clips -1, 2- and detach air hoses.
- Remove bolt -3- and detach air cleaner housing from retaining pegs.



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- Remove bolts -arrows- and detach bracket -1- for air cleaner housing.



Intake connecting pipe (version 1):

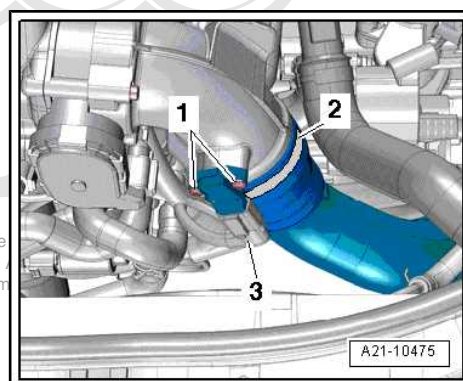
- Release hose clip -2-.



Note

Disregard items -1 and 3-.

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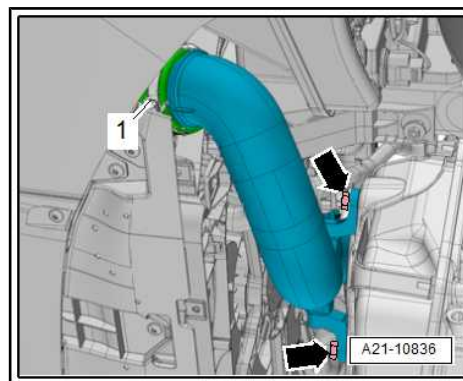
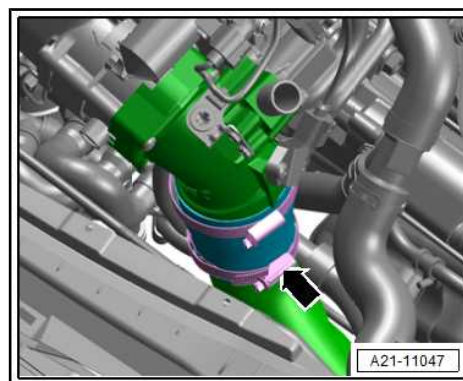


Intake connecting pipe (version 2):

- Release hose clip -arrow-.

All engine versions (continued):

- 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 (front left and front right) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Removing and installing wheel housing liner (front) .
- Remove wheel housing liners (front left and front right) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Removing and installing wheel housing liner (front) .
- Remove nuts -arrows-.
- Release hose clip -1- and detach air pipe.



- Place collector tank from coolant collecting system -VAS 5014- or drip tray for workshop hoist - VAS 6208- underneath.
- Remove bolt -2-.
- Release hose clip -3-, disconnect coolant pipe and drain off coolant.

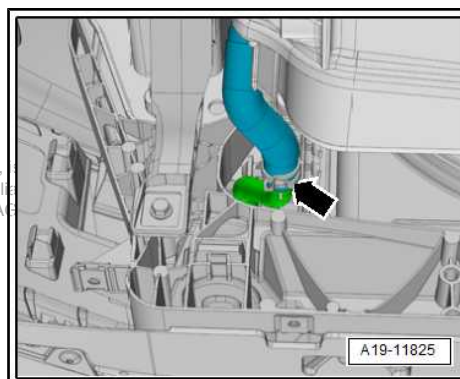
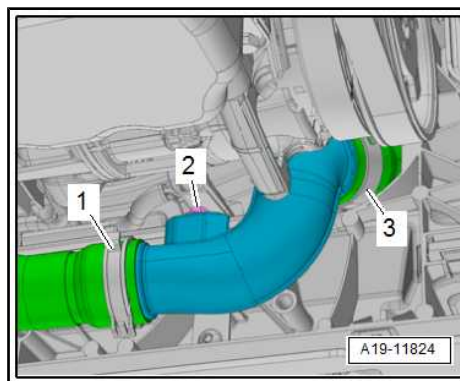


Note

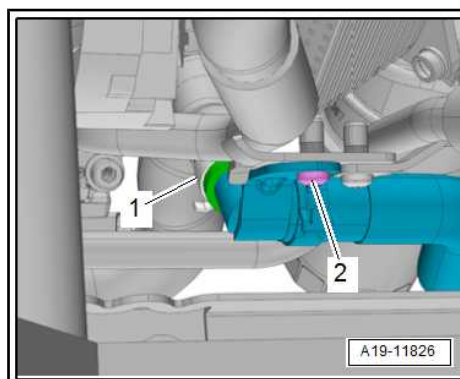
Disregard -item 1-.

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

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- Remove bolt -2- at connection on coolant pipes.
- Release hose clip -1- and detach coolant hose.

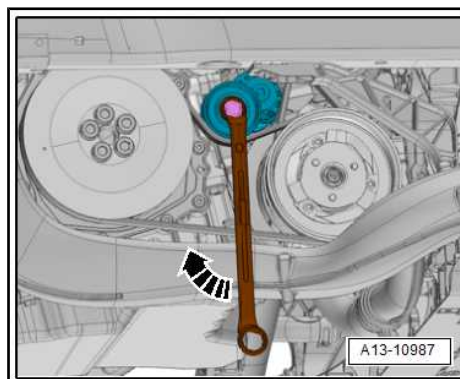


Caution

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

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

- To slacken poly V-belt, turn tensioner in clockwise direction -arrow-.
- Detach poly V-belt for air conditioner compressor and release tensioner.

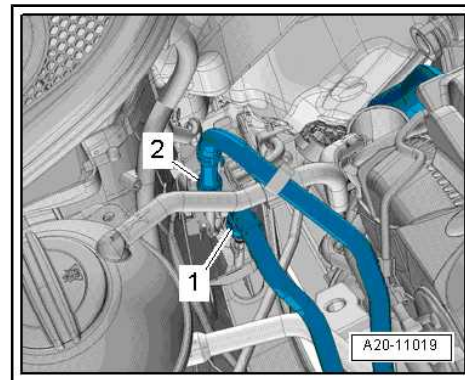




Caution

Risk of damage caused by particles of dirt.

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



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 a clean cloth around connection and open connection carefully).

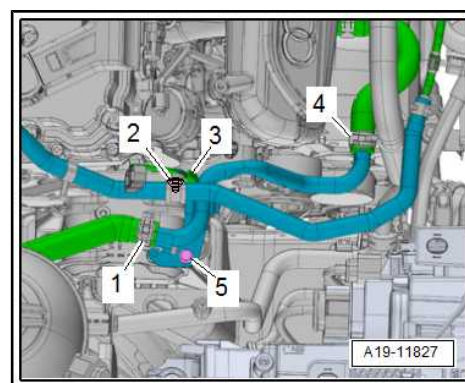
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- Disconnect fuel supply line -2- (pull release ring) and move fuel hose clear.
- Seal off open lines and connections with clean plugs from engine bung set - VAS 6122- .
- Disconnect hose -1- at activated charcoal filter (press release tab) and move hose clear.
- Release hose clip -4- and detach coolant hose.
- Remove bolt -5- and move coolant pipe (right-side) to the side.



Note

Disregard -items 1, 2, 3-.

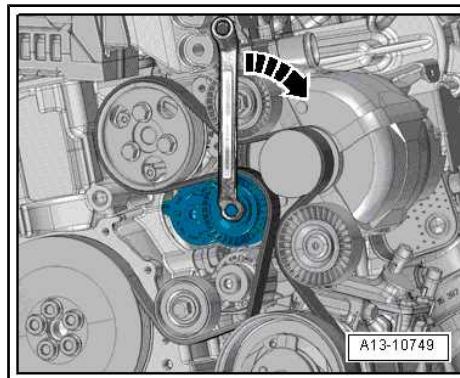




Caution

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

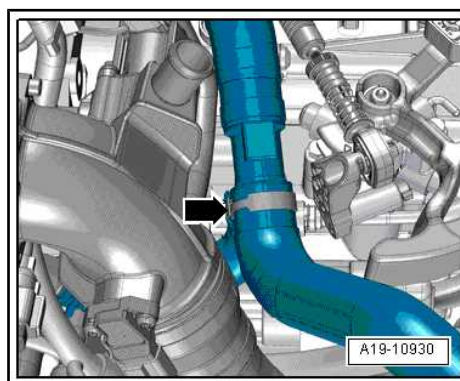
- ◆ **Before removing, mark direction of rotation of poly V-belt for alternator and coolant pump with chalk or felt-tip pen for re-installation.**



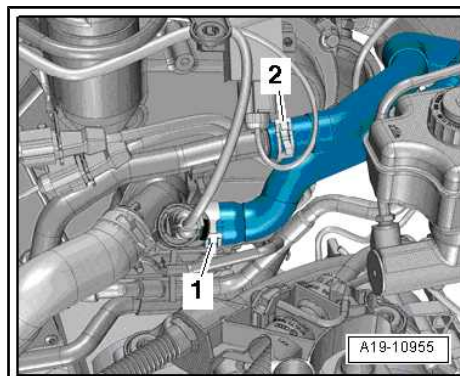
- To slacken poly V-belt, turn tensioner in clockwise direction -arrow-.

- Detach poly V-belt for alternator and coolant pump and release tensioner.

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



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



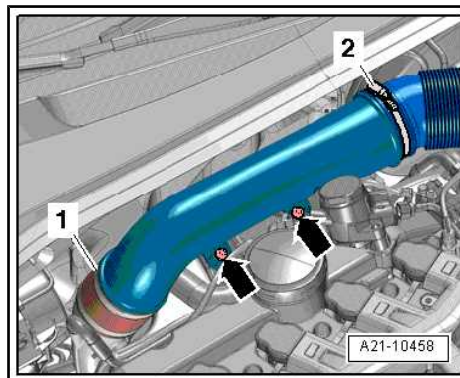
- Remove bolts -arrows-.

- Release hose clip -1- and detach air pipe.

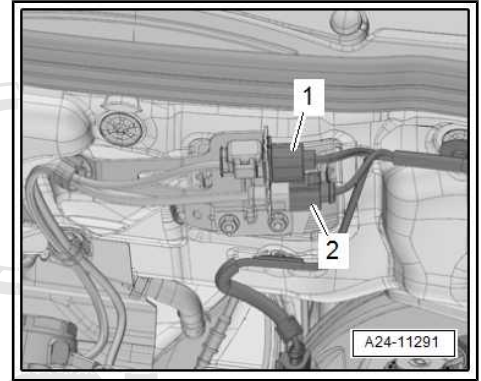


Note

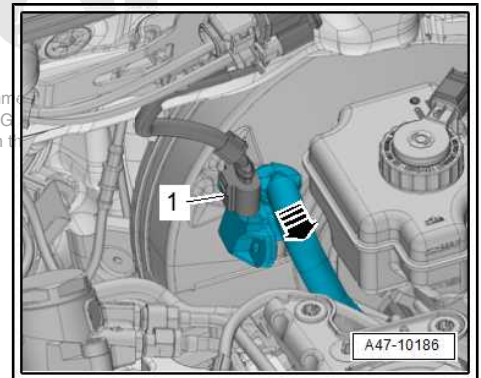
Disregard -item 2-.



- Detach electrical connectors from bracket and unplug.
- 1 - For Lambda probe - G39-
- 2 - For Lambda probe after catalytic converter - G130-
- Move clear electrical wire leading to Lambda probes.

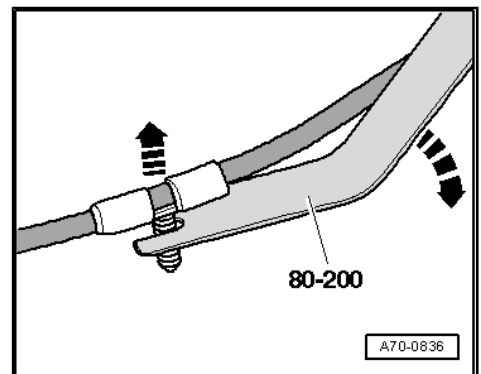


- Unplug electrical connector -1-.
- Detach vacuum line from brake servo -arrow-.
- Remove engine control unit ⇒ [page 262](#).

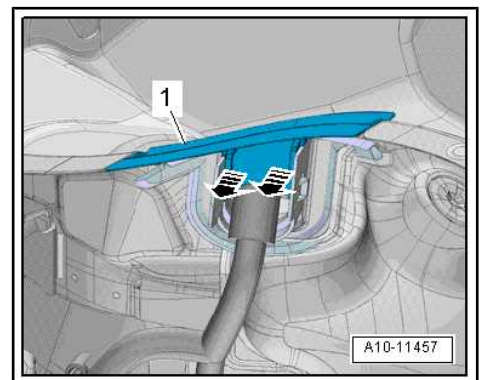


Note

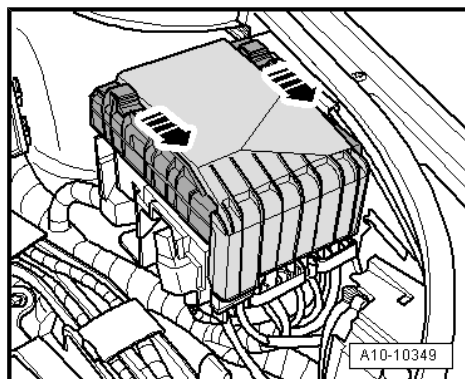
Use removal lever - 80-200- to lever out the wiring clips when performing the next work steps.



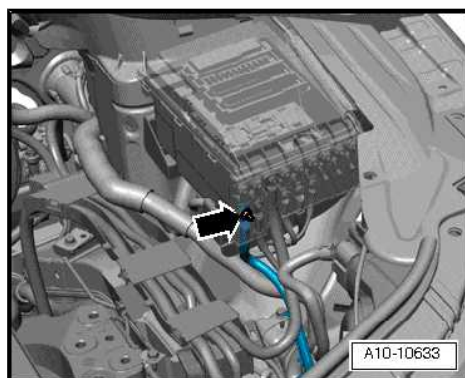
- Release wiring protector -1- for engine wiring harness -arrows- and lift off.



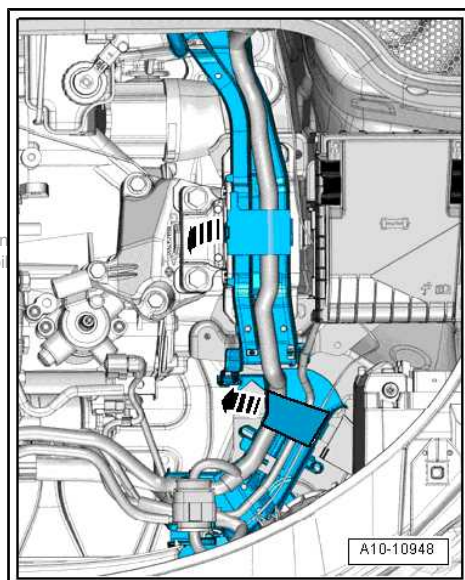
- Slide the two clips in the direction of the -arrows- and remove cover from electronics box in engine compartment.



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



- Open wiring duct brackets -arrows-.



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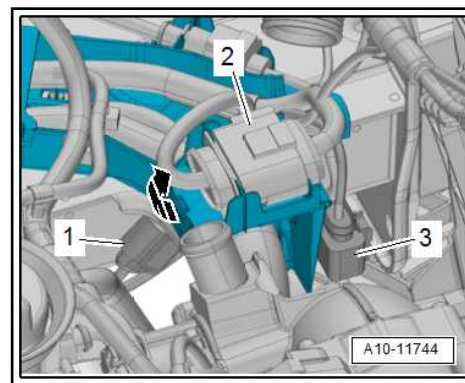
- Unplug electrical connector -1- at longitudinal member (bottom left).



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.**



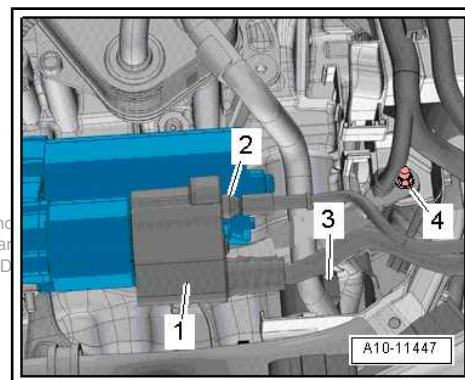
- Touch vehicle earth with bare hands to eliminate any static charge.
- Remove electrical connector -3- for gearbox from bracket and unplug connector (depending on version).
- Unclip electrical connector -2- from bracket and unplug.
- Open wiring duct bracket located underneath -arrow-.
- Unclip wiring harness for engine control unit from wiring duct.
- Place engine wiring harness on top of engine.
- Secure engine control unit to prevent it falling.
- Unplug electrical connector -2- at starter.
- Push back protective cover -1- and unscrew B+ cable at starter solenoid switch.
- Remove bolt -4- for earth connection.



Note

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Disregard -item 3-.

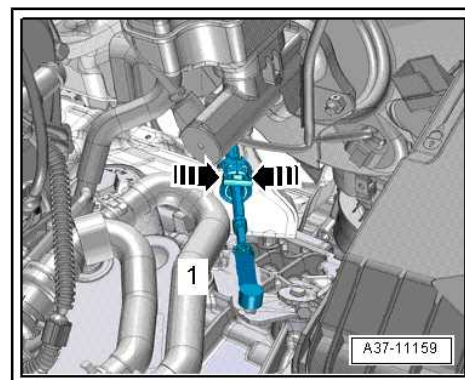


- Pry ball socket of selector lever cable off gearbox selector lever using removal lever - 80-200- .
- Release fasteners -arrows- and move selector lever cable clear.

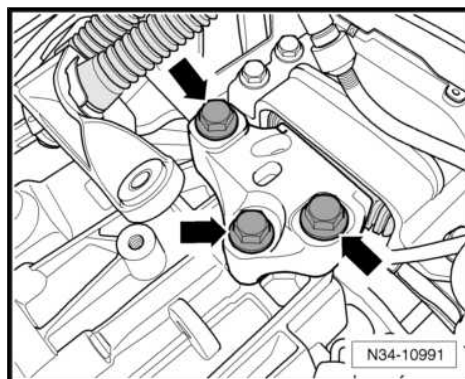


Note

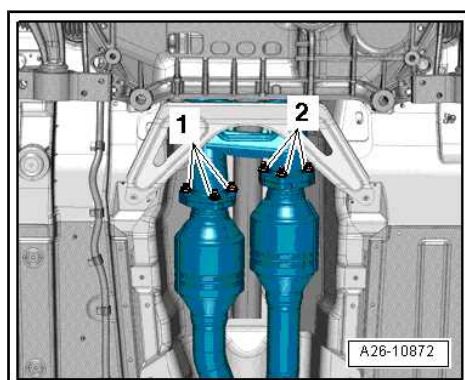
Take care not to bend or kink selector lever cable.



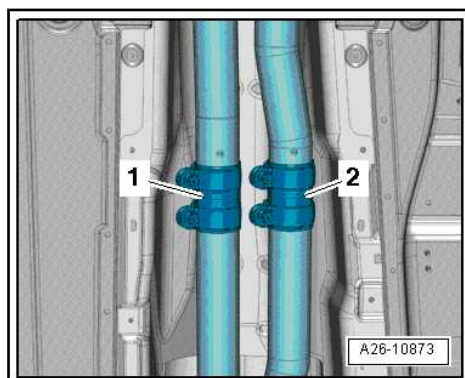
- Loosen bolts -arrows- for gearbox mounting approx. 2 turns.



- Remove nuts -1- and -2-.



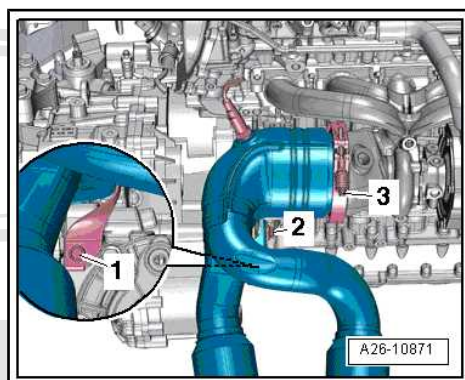
- Detach clamps -1, 2- and detach catalytic converters with clamps.



- Loosen bolt -3- and push clamp onto starter catalytic converter.
- Remove bolt -2-, tie up starter catalytic converter to rear.

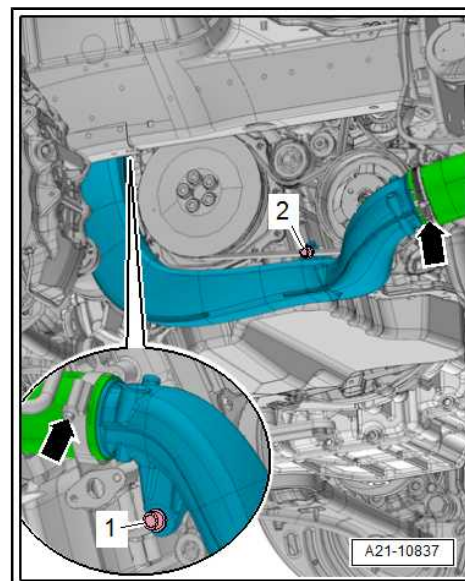

Note

Disregard -item 1-.



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- Remove bolts -1- and -2-.
- Loosen hose clips -arrows- and detach air pipe.



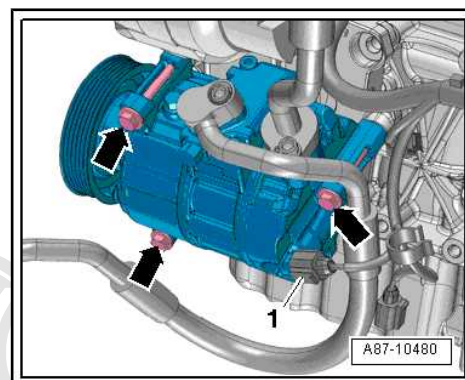
- Unplug electrical connector -1- on air conditioner compressor regulating valve - N280- .



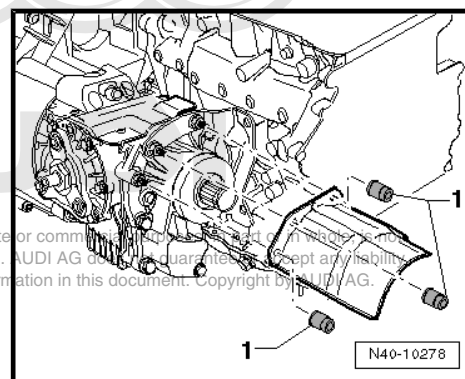
Caution

Danger of damage to refrigerant lines and hoses.

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

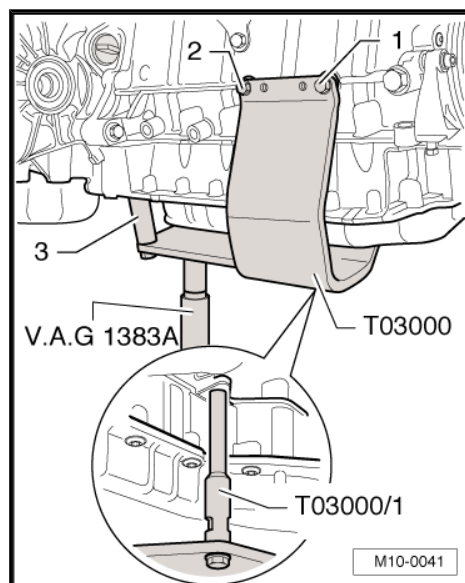


- Remove bolts -arrows-.
- Detach air conditioner compressor from bracket for ancillaries and tie up to the right side.
- Remove nuts -1- and detach heat shield for drive shaft (right-side).
- Detach drive shaft (left and right) from gearbox and tie up to rear ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .
- Detach propshaft from bevel box ⇒ Rear final drive; Rep. gr. 39 ; Propshaft; Removing and installing propshaft .



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- Unscrew pin -T03000/1- from engine bracket -T03000- .
- Fit engine bracket -T03000- with remaining pin -3- to cylinder block, screw in bolts -1- and -2- by hand until they make contact.
- Fit pin -T03000/1- to cylinder block and tighten to 20 Nm.
- Tighten bolts -1- and -2- to 25 Nm.
- Insert engine and gearbox jack - V.A.G 1383 A- in engine bracket -T03000- and raise engine/gearbox assembly slightly.

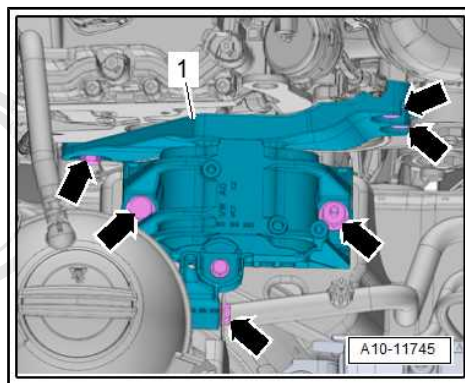

Note

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

- Remove bolts for engine mounting -arrows-.


Note

The bolt at the rear of the cylinder block can be accessed from the wheel housing side.

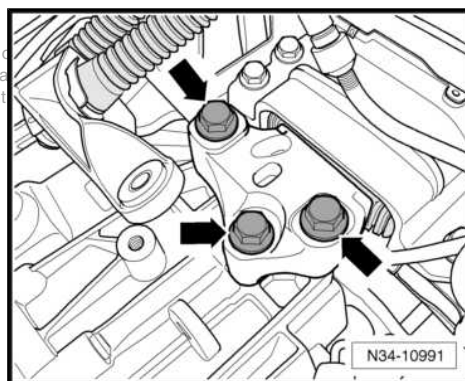


- Remove bolts -arrows- securing gearbox mounting.


Caution

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

- ◆ Check that all hoses and wiring connections between engine, gearbox, subframe and body have been detached.
- ◆ Carefully guide engine/gearbox assembly out of engine compartment when lowering.
- ◆ Make sure there is sufficient clearance from air conditioner compressor.
- ◆ Take care not to damage heat shield for tunnel (centre).

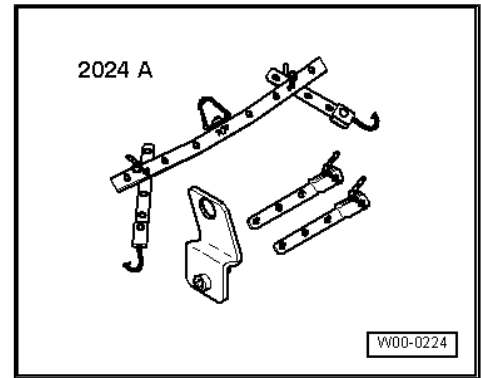


- Swing gearbox section of engine/gearbox assembly to front and only then lower further.

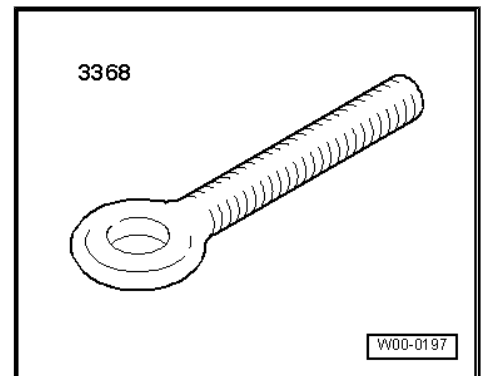
1.2 Separating engine and gearbox

Special tools and workshop equipment required

◆ Lifting tackle - 2024 A-



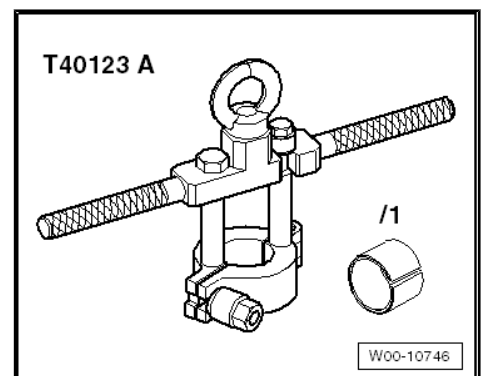
◆ Eye-head bolt - 3368-



◆ Workshop hoist - VAS 6100-



◆ Puller for ATF-supply - T40123 A-



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Procedure

- Engine/gearbox assembly removed and attached to engine support -T03000- .
- Remove bevel box ⇒ Rep. gr. 34 ; Bevel box; Removing bevel box .

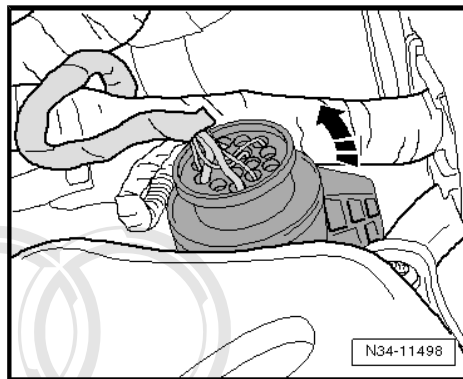
- Remove starter ⇒ Electrical system; Rep. gr. 27 ; Starter; Removing and installing starter .



Caution

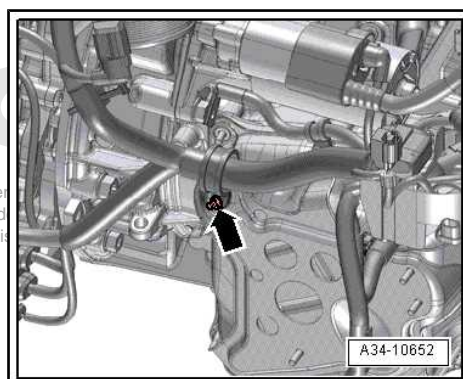
Risk of irreparable damage to control unit (mechatronic unit) because of electrostatic discharge.

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

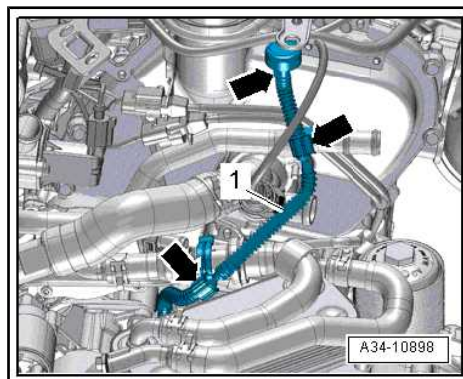


- Touch vehicle earth with bare hands to eliminate any static charge.
- Turn retainer catch anti-clockwise -arrow- and unplug electrical connector (depending on version).
- Remove nut -arrow- and move electrical wiring harness clear.

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- Move breather hose -1- clear -arrows-.



- Release hose clip -arrow- and disconnect coolant hose from ATF cooler.
- Remove gear oil filter ⇒ Rep. gr. 34 ; Gear oil circuit; Removing and installing gear oil filter .



- 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

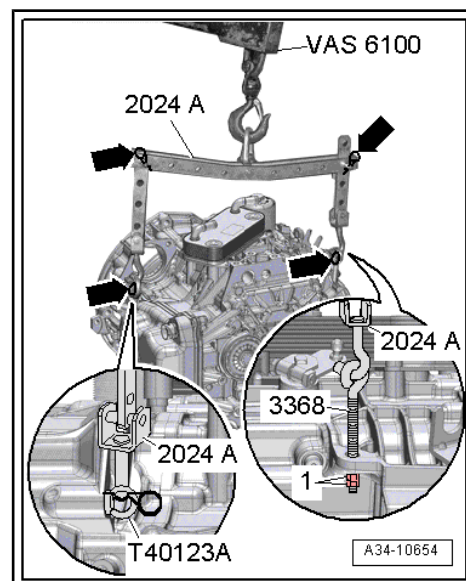
To adjust to the centre of gravity of the gearbox, the perforated rails of the support hooks must be positioned as shown.



WARNING

Accident risk from loose components of lifting tackle.

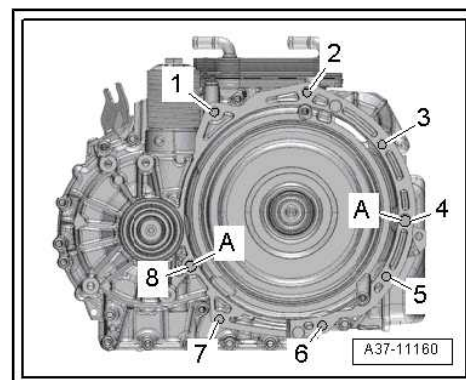
- ◆ **The support hooks and retaining pins on the lifting tackle must be secured with locking pins -arrows-.**



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

 Note

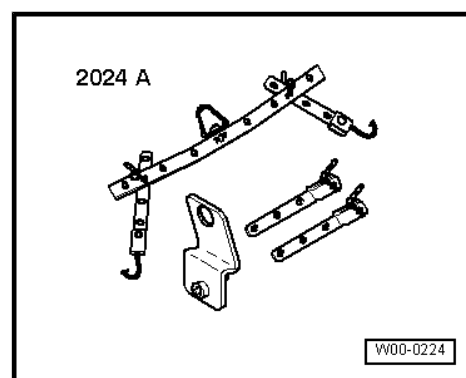
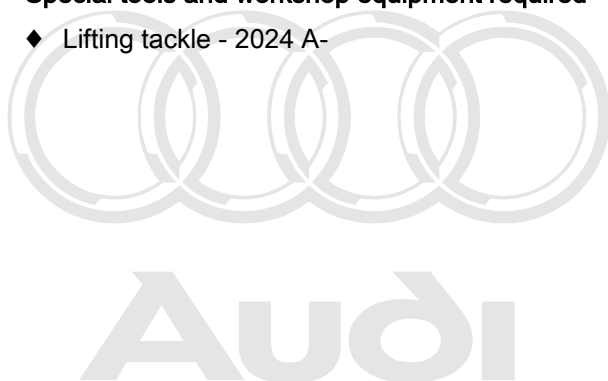
Disregard -item A-.



1.3 Securing engine to engine and gearbox support

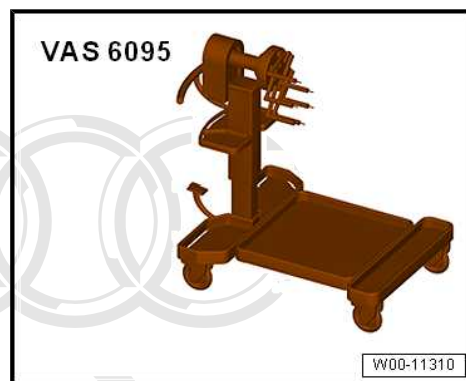
Special tools and workshop equipment required

- ◆ Lifting tackle - 2024 A-



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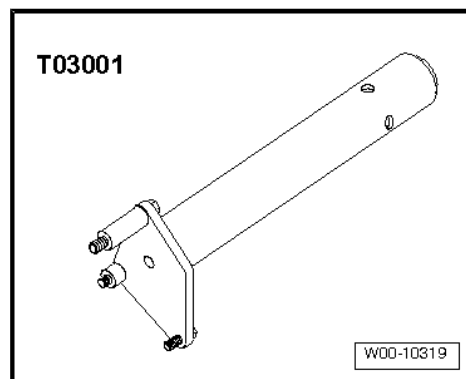
◆ Engine and gearbox support - VAS 6095-



◆ Workshop hoist - VAS 6100-

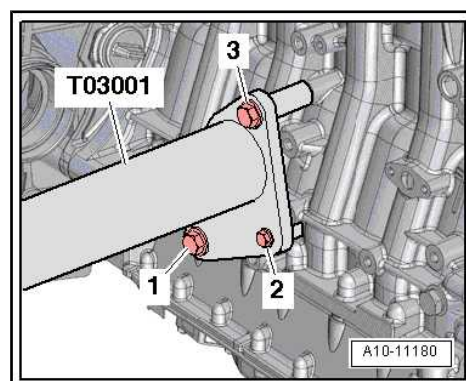


◆ Engine bracket - T03001-



Procedure

- Gearbox detached from engine.
- Secure engine bracket - T03001- to cylinder block:
 - 1 - 40 Nm
 - 2 - 25 Nm
 - 3 - 40 Nm



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

 Note

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

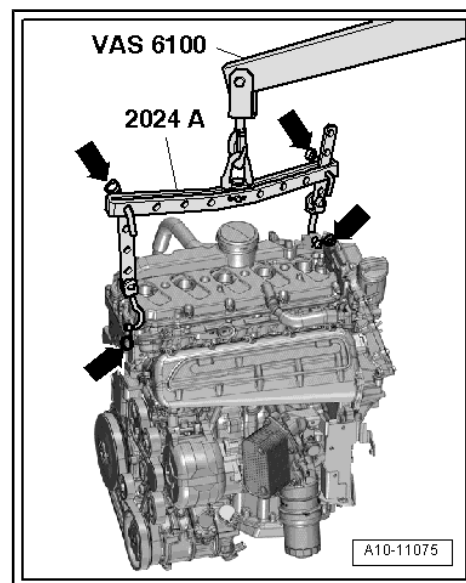


WARNING

Accident risk from loose components of lifting tackle.

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

- Lift engine off engine bracket -T03000- using workshop hoist - VAS 6100- .
- Secure engine to engine and gearbox support - VAS 6095- using engine bracket - T03001- .



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 gearbox oil may be used, but do not use lubricants containing graphite.*
- ◆ *Do not use degreased parts.*
- ◆ *Tolerance for tightening torques: $\pm 15\%$.*

Component		Nm
Bolts/nuts	M6	10
	M7	15
	M8	22
	M10	40
	M12	65

- ◆ **Assembly mountings**
⇒ **"2.1 Exploded view - assembly mountings", page 29**
- ◆ **Securing dual clutch gearbox to engine** ⇒ Rep. gr. 34 ; Removing and installing gearbox; Tightening torques for gearbox

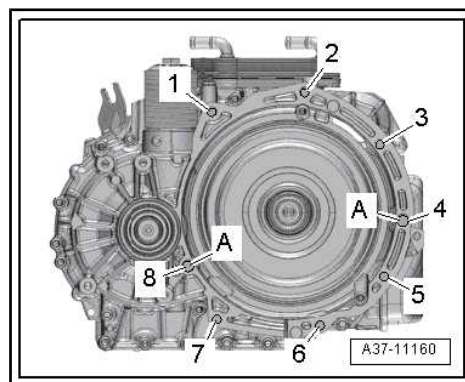
Procedure

- Engine/gearbox assembly attached to engine bracket - T03001- .

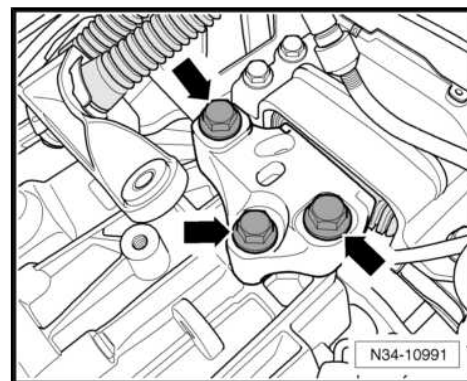


Note

- ◆ *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.*
- ◆ *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.*
- ◆ *Routing and attachment of pipes, hoses and wiring in engine compartment ⇒ [page 6](#) .*
- ◆ *Fit all cable ties in the original positions when installing.*
- 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 62](#) .
- Secure gearbox to engine.
- Secure bracket for bevel box ⇒ Rep. gr. 34 ; Bevel box; Installing bevel box .
- Install gear oil filter ⇒ Rep. gr. 34 ; Gear oil circuit; Removing and installing gear oil filter .
- Guide engine/gearbox assembly into body.
- Install engine mountings ⇒ [page 29](#) .



- Initially screw in bolts -arrows- for gearbox mounting by hand until they make contact.
- Detach engine support -T03000- from engine.
- Secure propshaft to bevel box ⇒ Rear final drive; Rep. gr. 39 ; Propshaft; Removing and installing propshaft .
- Push engine/gearbox assembly towards plenum chamber partition panel, guiding pin on bevel box flange carefully into propshaft flange.
- Secure propshaft ⇒ Rep. gr. 39 ; Propshaft; Removing and installing propshaft .



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

- Install starter catalytic converter ⇒ [page 271](#) .
- Install drive shafts ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .
- Install heat shield for drive shaft ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Exploded view - drive shaft .
- Install and adjust selector lever cable ⇒ Rep. gr. 34 ; Selector mechanism; Checking and adjusting selector lever cable .
- Install starter ⇒ Electrical system; Rep. gr. 27 ; Starter; Removing and installing starter .
- Install coolant pipe (right-side) ⇒ [page 177](#) .
- Install subframe ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Removing and installing subframe without steering rack .
- Install coolant pipe at lock carrier ⇒ [page 187](#) .
- Install air pipes ⇒ [page 210](#) and [page 200](#) .
- 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 for alternator and coolant pump ⇒ [page 46](#) .
- Install poly V-belt for air conditioner compressor ⇒ [page 45](#) .
- Install wheel housing liner and wheel spoiler ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front) .
- Fit front wheels ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres .
- Adjust assembly mountings ⇒ [page 39](#) .
- Install engine control unit ⇒ [page 262](#) .
- Install air cleaner housing ⇒ [page 225](#) .
- Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- Observe steps required after re-connecting battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .
- Check oil level ⇒ Maintenance ; Booklet 820 .

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Caution

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

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

- Connect coolant hoses with plug-in connector ⇒ [page 188](#) .



Note

Do not reuse coolant.

- Fill up with coolant ⇒ [page 161](#) .



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2 Assembly mountings

⇒ [“2.1 Exploded view - assembly mountings”, page 29](#)

⇒ [“2.2 Supporting engine in installation position”, page 30](#)

⇒ [“2.3 Removing and installing engine mountings”, page 33](#)

⇒ [“2.4 Removing and installing gearbox mounting”, page 36](#)

⇒ [“2.5 Removing and installing pendulum support”, page 38](#)

⇒ [“2.6 Checking adjustment of assembly mountings \(engine/gearbox mountings\)”, page 39](#)

⇒ [“2.7 Adjusting assembly mountings”, page 39](#)

2.1 Exploded view - assembly mountings

1 - Bolt

- ☐ Renew after removing
- ☐ 40 Nm +90°

2 - Bolt

- ☐ Renew after removing
- ☐ 40 Nm +90°

3 - Bolt

- ☐ Renew after removing
- ☐ 40 Nm +90°

4 - Engine mounting

- ☐ Checking adjustment
⇒ [page 39](#)
- ☐ Adjusting ⇒ [page 39](#)
- ☐ Removing and installing
⇒ [page 33](#)

5 - Bolt

- ☐ Renew after removing
- ☐ 20 Nm +90°

6 - Support

7 - Bolt

- ☐ Renew after removing
- ☐ 20 Nm +90°

8 - Bolt

- ☐ Renew after removing
- ☐ 40 Nm +90°

9 - Bolt

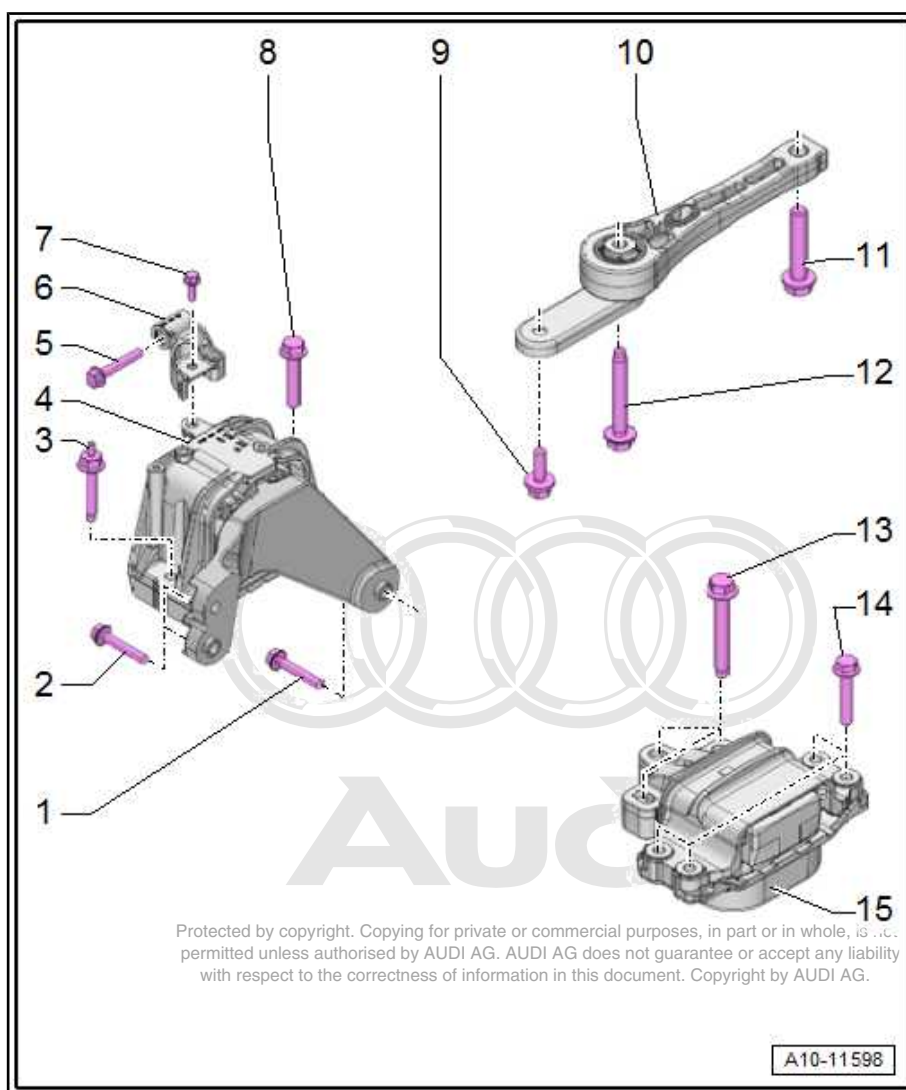
- ☐ Renew after removing
- ☐ Tightening torque and sequence ⇒ [page 30](#)

10 - Pendulum support

- ☐ Removing and installing ⇒ [page 38](#)

11 - Bolt

- ☐ Renew after removing
- ☐ Tightening torque and sequence ⇒ [page 30](#)



12 - Bolt

- ☐ Renew after removing
- ☐ Tightening torque and sequence ⇒ [page 30](#)

13 - Bolt

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

14 - Bolt

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

15 - Gearbox mounting

- ☐ Checking adjustment ⇒ [page 39](#)
- ☐ Adjusting ⇒ [page 39](#)
- ☐ Removing and installing ⇒ [page 36](#)

Installing pendulum support

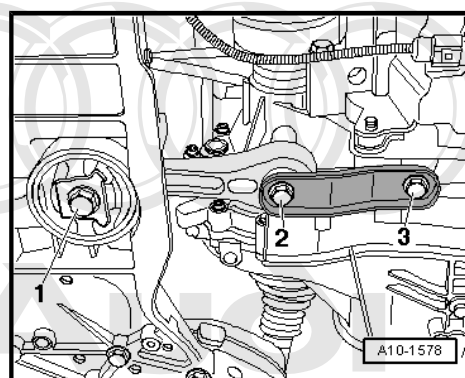


Note

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

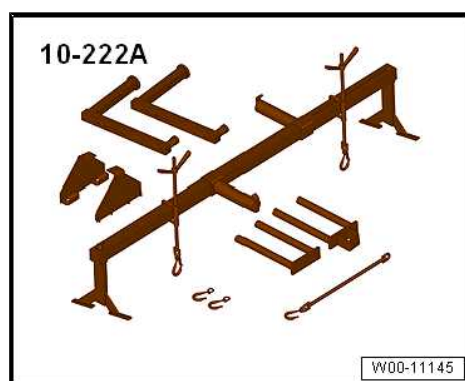


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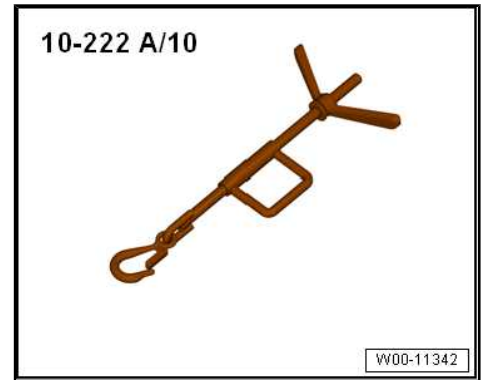
2.2 Supporting engine in installation position

Special tools and workshop equipment required

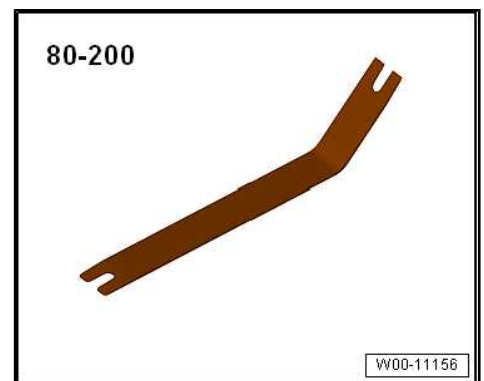
- ◆ Support bracket - 10-222A-



◆ Hook - 10-222A/10-

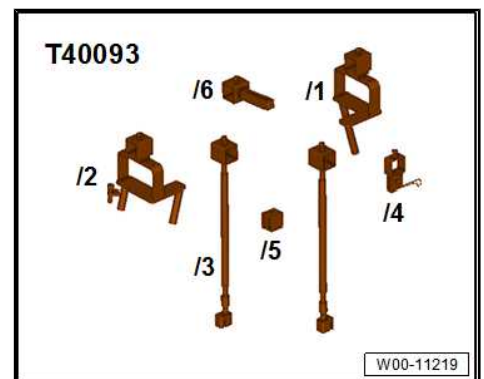


◆ Removal lever - 80-200-



◆ -T40093/6- from engine support supplementary set - T40093-

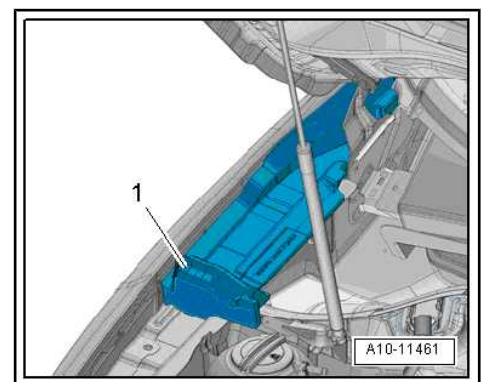
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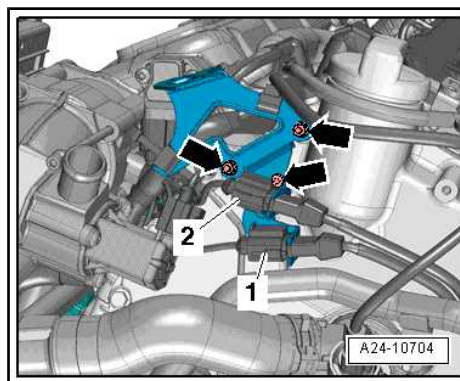
◆ Bracket -T40299-

Procedure

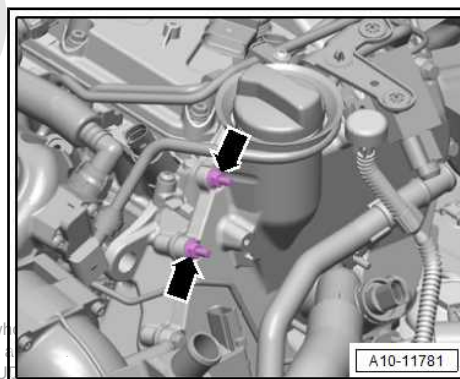
- Remove air cleaner housing ⇒ [page 225](#) .
- Unclip sealing element -1- (left and right) using removal lever - 80-200- .



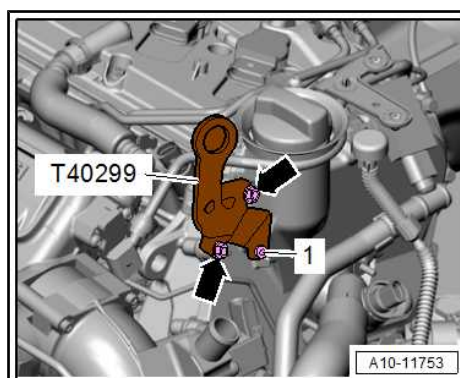
- Detach electrical connectors -1, 2- from bracket.
- Remove nuts and bolt -arrows- and detach bracket.



- Remove centre hex studs -arrows-.



- Secure bracket -T40299- with M6x25 bolts -arrows- and M6x20 bolt -1-, as shown in illustration.

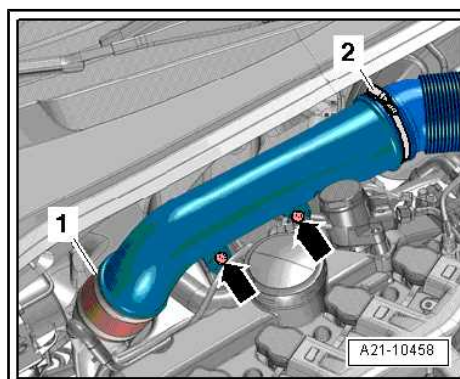


- Remove bolts -arrows-.



Note

Disregard items -1 and 2-.



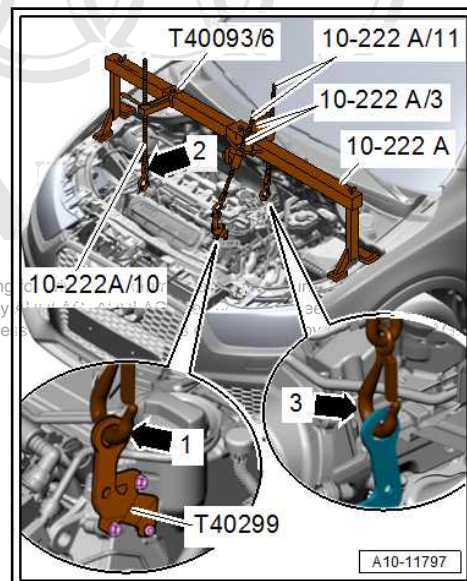
- Position support bracket - 10-222A- on bolted flanges of wing panels as shown in illustration.
- Attach snap element of hook -10-222A/10- to engine lifting eye (front right) -arrow 2-.
- Attach hook of spindle - 10-222A/11- to engine lifting eye (rear left) -arrow 3-.
- Engage hook of spindle - 10-222A/11- to bracket -T40299- (front left) -arrow 1-.
- Take up weight of engine/gearbox assembly **evenly with all** spindles (do not raise assembly).

Assembling

Assemble in reverse order.

Tightening torques

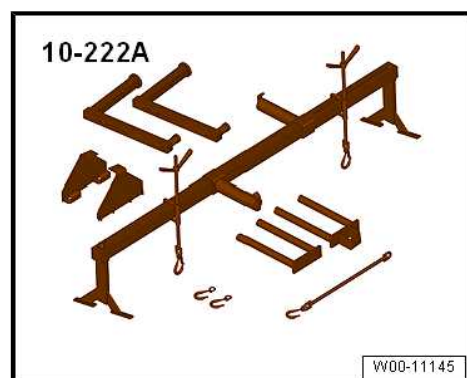
- ◆ ⇒ [“1.1 Exploded view - timing chain cover”, page 72](#)
- ◆ ⇒ [“1.1 Exploded view - turbocharger”, page 200](#)
- ◆ ⇒ [“2.1 Exploded view - air cleaner housing”, page 224](#)



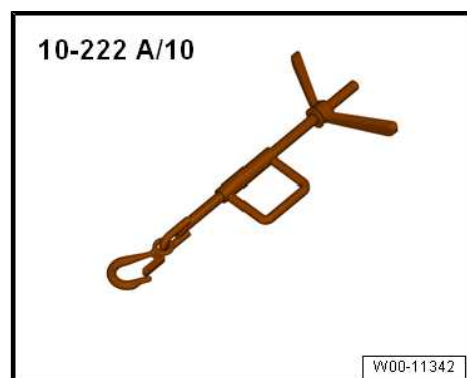
2.3 Removing and installing engine mountings

Special tools and workshop equipment required

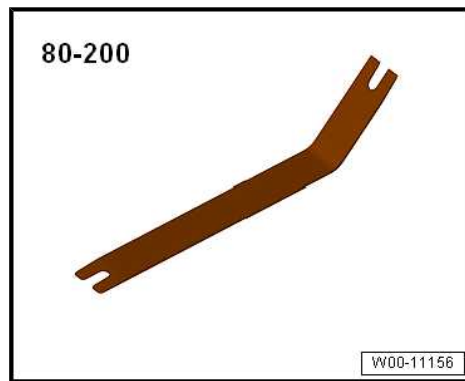
- ◆ Support bracket - 10-222A-



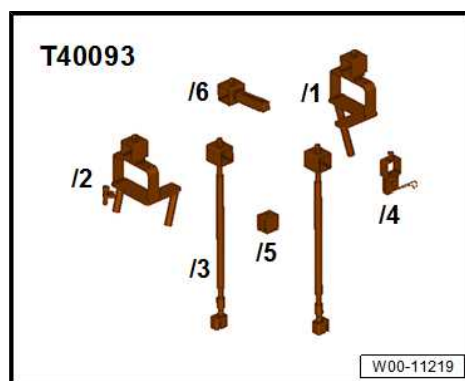
- ◆ Hook - 10-222A/10-



- ◆ Removal lever - 80-200-



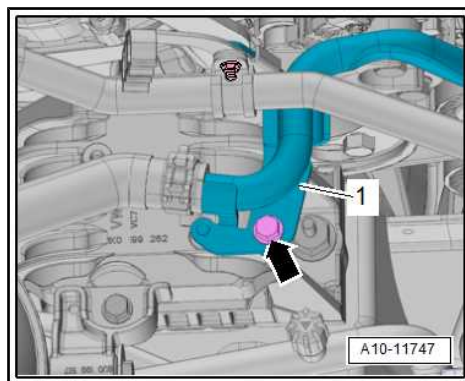
- ◆ -T40093/6- from engine support supplementary set - T40093-



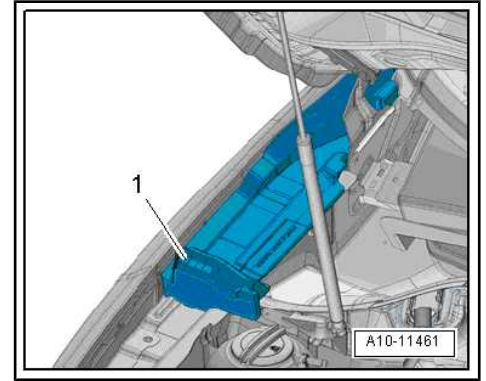
- ◆ Flange nut M10 or nut with washer

Removing

- Remove front wheel (right-side) ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres .
- Remove front wheel housing liner (right-side) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Removing and installing wheel housing liner (front).
- Remove bolt -arrow- and move coolant pipe (right-side) to one side.



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

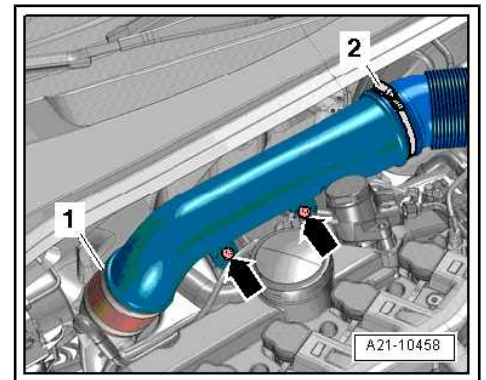


- Release hose clip -2- and detach air pipe.
- Remove bolts -arrows-.

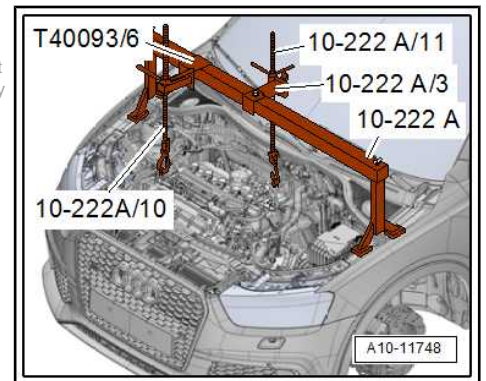


Note

Disregard -item 1-.



- Position support bracket - 10-222A- on bolted flanges of wing panels as shown in illustration.
- Attach hooks of spindles to engine lifting eyes.
- Take up weight of engine/gearbox assembly evenly with both spindles; do not lift.





Note

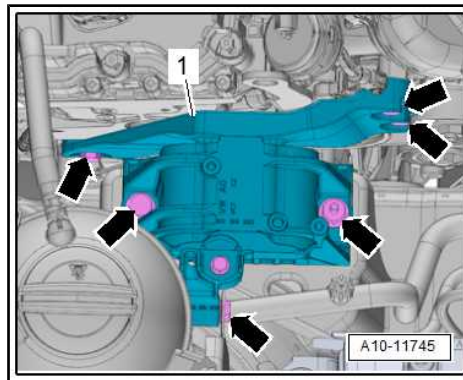
Mark installation position of engine mounting if it is going to be reinstalled.

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



Note

The bolt at the rear of the cylinder block can be accessed from the wheel housing side.



Installing

- When reinstalling engine mounting, position it according to marking made previously and secure.

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

- Install front wheel housing liner (right-side) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Removing and installing front wheel housing liner .
- Fit front wheel (right-side) ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres .

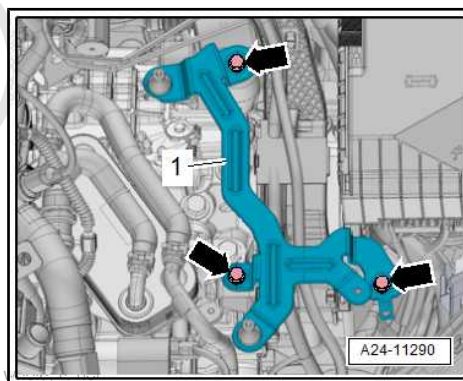
Tightening torques

- ♦ ⇒ [“2.1 Exploded view - assembly mountings”, page 29](#)
- ♦ ⇒ [“3.1 Exploded view - coolant pipes”, page 177](#)
- ♦ ⇒ [“1.1 Exploded view - turbocharger”, page 200](#)

2.4 Removing and installing gearbox mounting

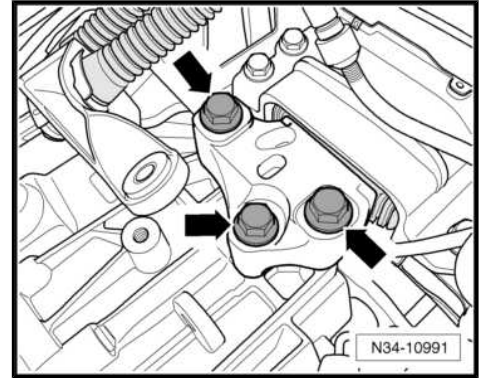
Removing

- Support engine in installation position ⇒ [page 30](#) .
- Move electrical wiring harness clear at bracket for air cleaner housing.
- Remove bolts -arrows- and detach bracket -1- for air cleaner housing.

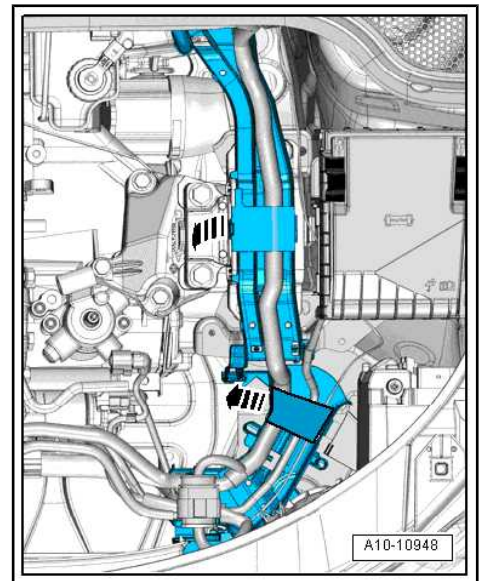


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- Remove bolts -arrows- securing gearbox mounting.



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



 Note

Mark installation position of gearbox mounting if it is going to be reinstalled.

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

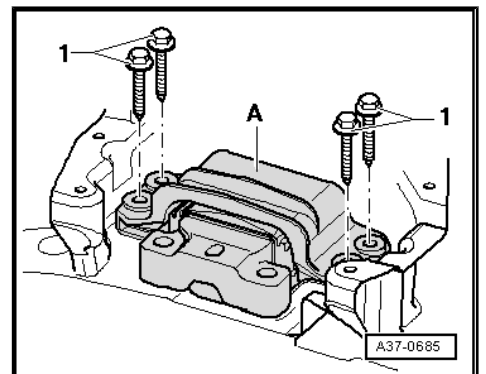
Installing

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.



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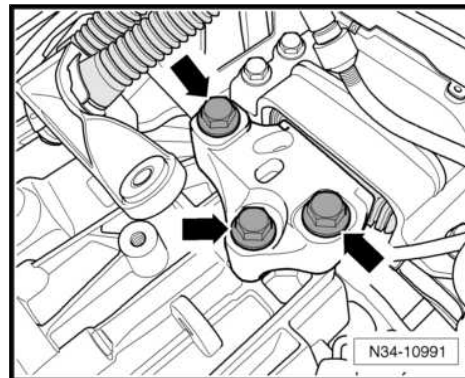
- When reinstalling gearbox mounting, position it according to marking made previously and secure.



Caution

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

- ◆ **Gearbox bracket 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.**



- Lift gearbox with spindle of support bracket until gearbox bracket makes contact with support arm of gearbox mounting.
- Detach support bracket - 10-222A- from engine.

Tightening torques

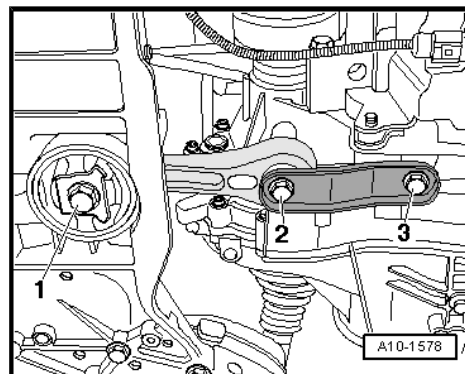
- ◆ ⇒ [“2.1 Exploded view - air cleaner housing”, page 224](#)
- ◆ ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

2.5 Removing and installing pendulum support

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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:

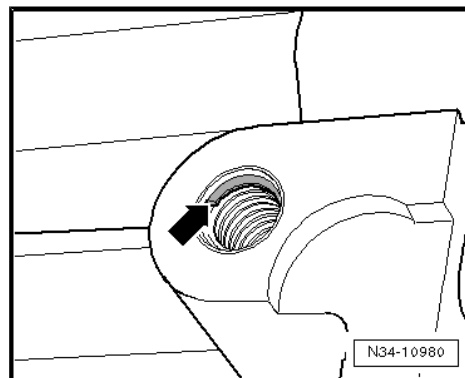


Note

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

Tightening torques

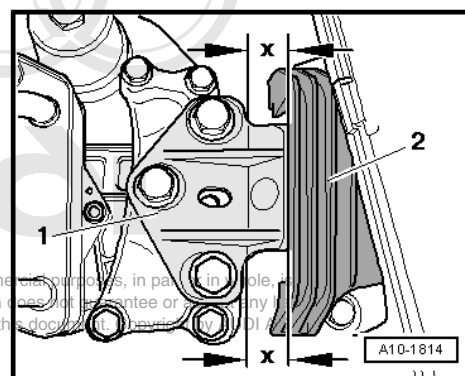
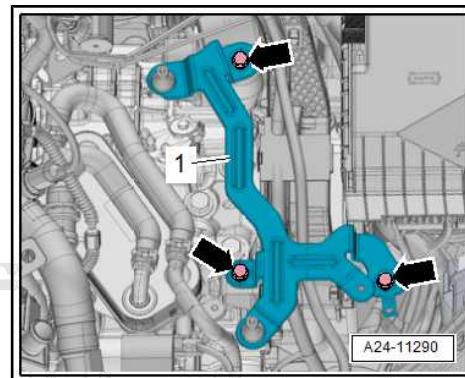
- ◆ ⇒ [Fig. “Installing pendulum support”, page 30](#)
- ◆ ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation



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

Procedure

- Remove air cleaner housing ⇒ [page 225](#) .
 - Move electrical wiring harness clear at bracket for air cleaner housing.
 - Remove bolts -arrows- and detach bracket for air cleaner housing.
-
- Ensure that edges of support arm (on gearbox side) -1- and gearbox mounting -2- are parallel.
 - Dimension -x- = dimension -x-.



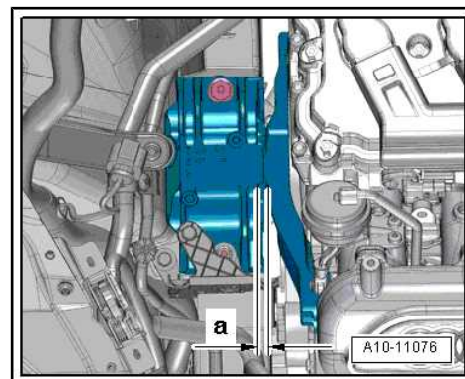
- Check installation position at engine mounting:
- The distance -a- between support arm and engine mounting must be at least 9 mm.



Note

Distance -a- can be checked using a $\varnothing 9$ mm drill bit or similar.

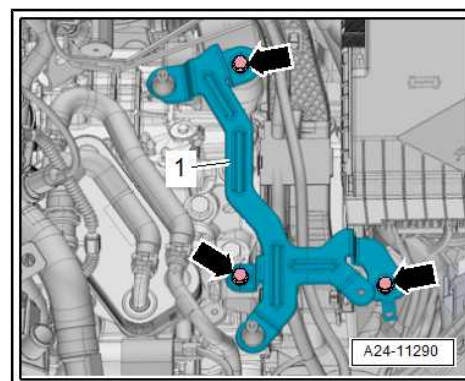
- If the distance measured is too small, the assembly mounting must be adjusted ⇒ [page 39](#) .



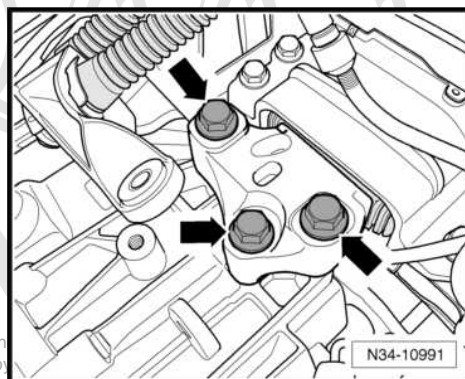
2.7 Adjusting assembly mountings

Procedure

- Support engine in installation position ⇒ [page 30](#) .
- Move electrical wiring harness clear at bracket for air cleaner housing.
- Remove bolts -arrows- and detach bracket for air cleaner housing.

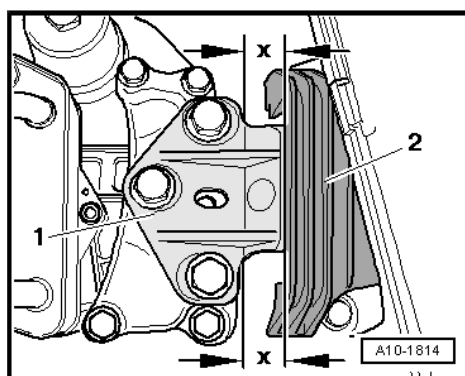


- Remove bolts -arrows- securing gearbox mounting.
- Renew all three bolts one by one and screw in by hand until they make contact.



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- 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.



- Check installation position at engine mounting:
- The distance -a- between support arm and engine mounting must be at least 9 mm.

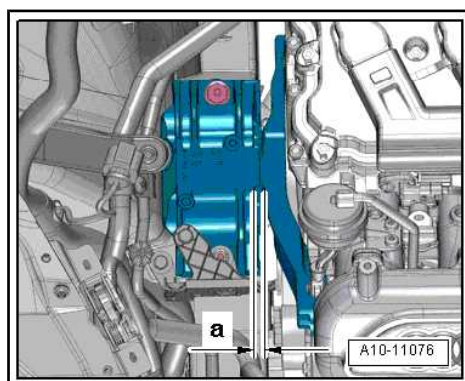


Note

Distance -a- can be checked using a $\varnothing$ 9 mm drill bit or similar.

- Move engine/gearbox assembly sideways if necessary.

The remaining installation steps are carried out in the reverse sequence.



Tightening torques

- ◆ ⇒ [“2.1 Exploded view - assembly mountings”, page 29](#)
- ◆ ⇒ [“2.1 Exploded view - air cleaner housing”, page 224](#)
- ◆ ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

3 Engine cover panel

⇒ ["3.1 Removing and installing engine cover panel", page 41](#)

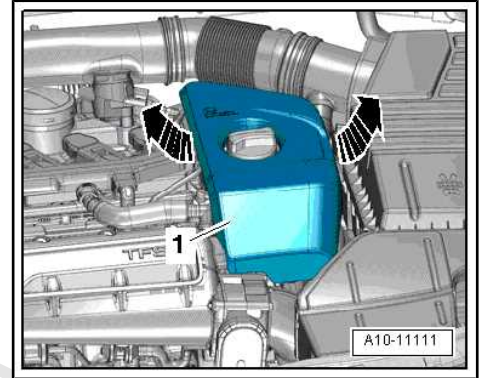
3.1 Removing and installing engine cover panel

Removing

- Pull engine cover panel -1- off upwards -arrows-.

Installing

- To avoid damage, do not strike the engine cover panel with your fist or with any kind of tool.
- Press engine cover panel onto ball studs.



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13 – Crankshaft group

1 Cylinder block (pulley end)

⇒ [“1.1 Exploded view - cylinder block \(pulley end\)”, page 42](#)

⇒ [“1.2 Exploded view - sealing flange \(pulley end\)”, page 44](#)

⇒ [“1.3 Removing and installing poly V-belts”, page 45](#)

⇒ [“1.4 Removing and installing tensioner for poly V-belt”, page 47](#)

⇒ [“1.5 Removing and installing vibration damper”, page 48](#)

⇒ [“1.6 Removing and installing bracket for ancillaries”, page 50](#)

⇒ [“1.7 Removing and installing sealing flange \(pulley end\)”, page 50](#)

1.1 Exploded view - cylinder block (pulley end)

1 - Bolt

- ☐ 35 Nm

2 - Bolt

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

3 - Vibration damper

- ☐ Removing and installing ⇒ [page 48](#)
- ☐ Can only be installed in one position

4 - Poly V-belt for air conditioner compressor

- ☐ Check for wear
- ☐ Before removing, mark direction of rotation with chalk or felt-tip pen
- ☐ Removing and installing ⇒ [page 45](#)
- ☐ Do not kink
- ☐ When installing, make sure it is properly seated on pulleys

5 - Tensioner

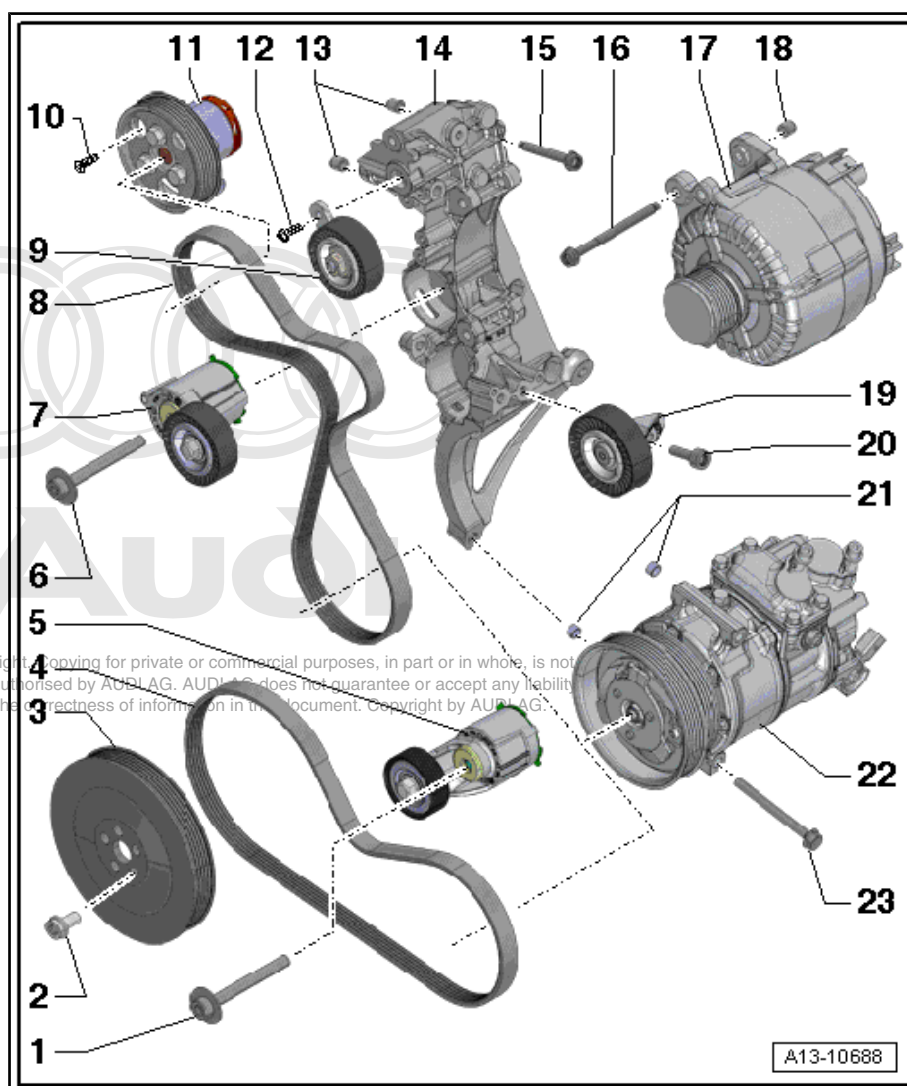
- ☐ For poly V-belt for air conditioner compressor
- ☐ Removing and installing ⇒ [page 47](#)

6 - Bolt

- ☐ 35 Nm

7 - Tensioner

- ☐ For poly V-belt for alternator and coolant pump
- ☐ Removing and installing ⇒ [page 47](#)



8 - Poly V-belt for alternator and coolant pump

- ☐ Check for wear
- ☐ Before removing, mark direction of rotation with chalk or felt-tip pen
- ☐ Removing and installing ⇒ [page 46](#)
- ☐ Do not kink
- ☐ When installing, make sure it is properly seated on pulleys

9 - Idler roller

10 - Bolt

- ☐ Tightening torque ⇒ [Item 2 \(page 166\)](#)

11 - Coolant pump

- ☐ Removing and installing ⇒ [page 168](#)

12 - Bolt

- ☐ 8 Nm

13 - Dowel sleeves

- ☐ For bracket for ancillaries

14 - Bracket for ancillaries

- ☐ Removing and installing ⇒ [page 50](#)

15 - Bolt

- ☐ Different lengths
- ☐ Tightening torque and sequence ⇒ [page 44](#)

16 - Bolt

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

17 - Alternator

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

18 - Sliding bush

19 - Idler roller

20 - Bolt

- ☐ 23 Nm

21 - Dowel sleeves

- ☐ For air conditioner compressor

22 - Air conditioner compressor

- ☐ With double-sided poly V-belt pulley
- ☐ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Detaching and attaching air conditioner compressor at bracket

23 - Bolt

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

Bracket for ancillaries - tightening torque and tightening sequence

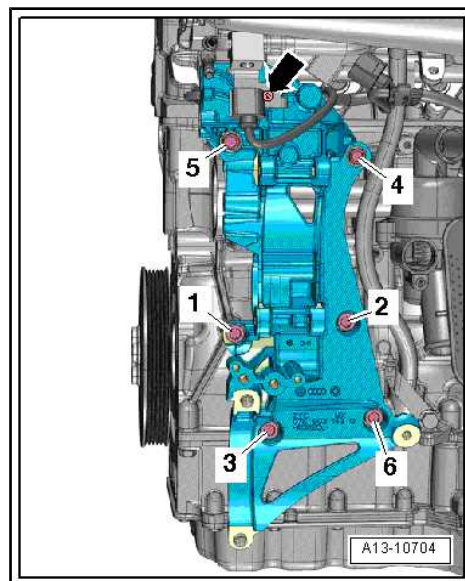
– Renew bolts for bracket for ancillaries and fit as follows:

- ◆ Bolts -1, 2, 3, 6- M8x30
- ◆ Bolt -4- M8x60
- ◆ Bolt -5- M8x110

– Tighten bolts in 2 stages in the sequence shown:

Stage	Bolts	Tightening torque
1.	-1 ... 6-	Screw in by hand until contact is made
2.	-1 ... 6-	23 Nm

– Tighten bolts -arrow- to 9 Nm.



1.2 Exploded view - sealing flange (pulley end)

1 - Bolt

- ❑ Tightening torque
⇒ [Item 2 \(page 42\)](#)

2 - Vibration damper

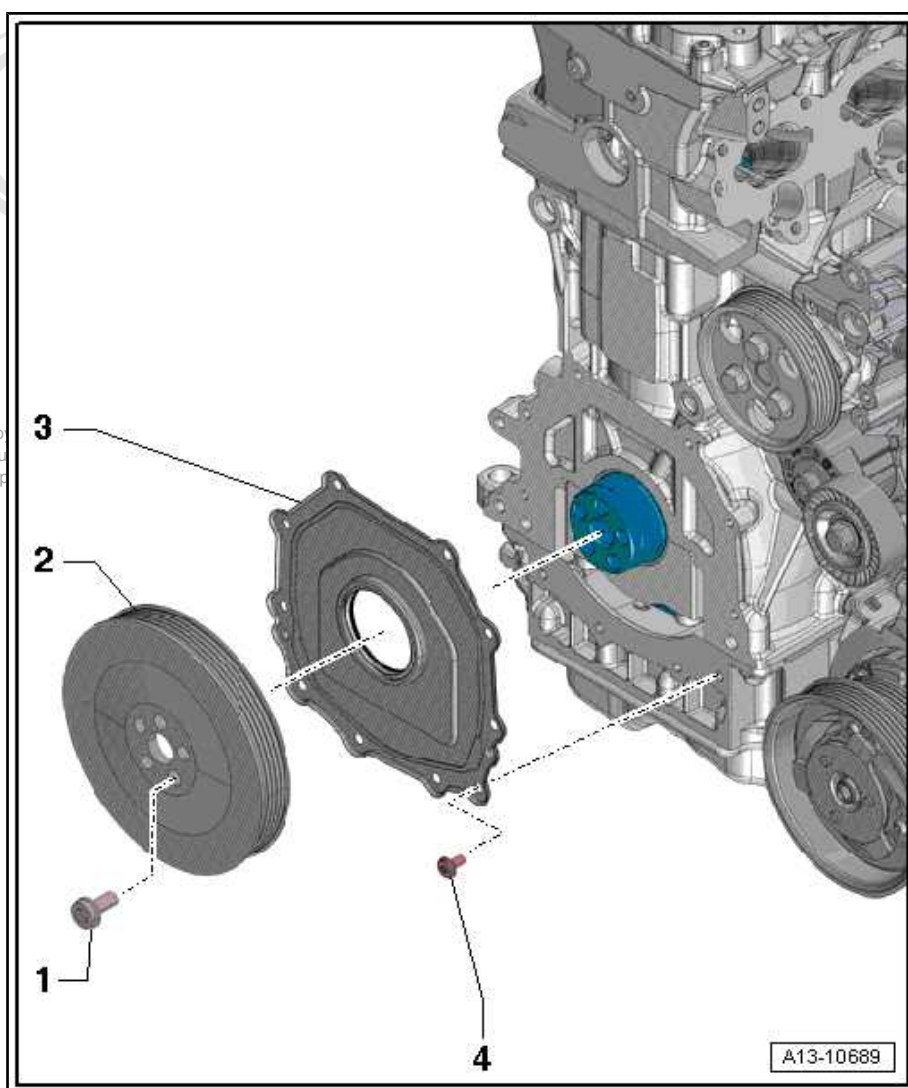
- ❑ Removing and installing
⇒ [page 48](#)
- ❑ Can only be installed in one position

3 - Sealing flange (pulley end)

- ❑ With centring collar
- ❑ Renewing ⇒ [page 50](#)
- ❑ Apply sealant when installing; refer to ⇒ [Elec](#) tronic parts catalogue

4 - Bolt

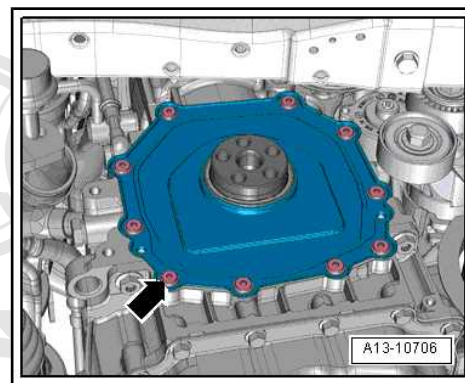
- ❑ Tightening torque and sequence ⇒ [page 45](#)



Sealing flange (pulley end) - tightening torque and sequence

- Tighten bolts in 2 stages:

Stage	Bolts	Tightening torque
1.	-arrow-	Screw in by hand until contact is made
2.	-arrow-	Tighten in stages and in diagonal sequence; final torque 9 Nm



1.3 Removing and installing poly V-belts

⇒ "1.3.1 Removing and installing poly V-belt for air conditioner compressor", page 45

⇒ "1.3.2 Removing and installing poly V-belt for alternator and coolant pump", page 46

1.3.1 Removing and installing poly V-belt for air conditioner compressor

Removing

- Remove front wheel (right-side) ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres .
- Remove wheel spoiler (front right) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Removing and installing wheel housing liner (front) .



Caution

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

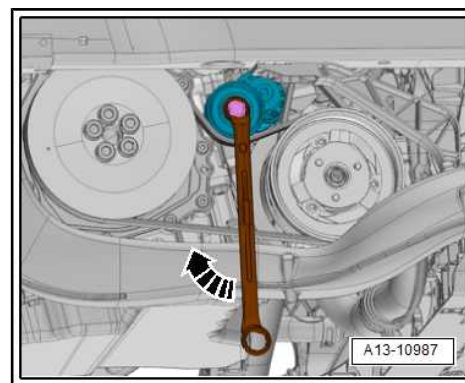
- ◆ *Before removing, mark direction of rotation of poly V-belt for air conditioner compressor with chalk or felt-tip pen for re-installation.*

- To slacken poly V-belt, turn tensioner in clockwise direction -arrow-.
- Detach poly V-belt for air conditioner compressor and release tensioner.

Installing

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

- Swivel tensioner in clockwise direction -arrow-.



- Fit poly V-belt on poly V-belt pulleys (on air conditioner pulley last).
- 1 - Vibration damper
- 2 - Tensioner
- 3 - Air conditioner compressor
- Release tensioner.
- Check that poly V-belt is in correct position.
- Start engine and check that poly V-belt(s) run properly.

Tightening torques

- ◆ Wheel spoiler (front right) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front)
- ◆ ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres

1.3.2 Removing and installing poly V-belt for alternator and coolant pump

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- Remove poly V-belt for air conditioner compressor
⇒ [page 45](#).



Caution

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

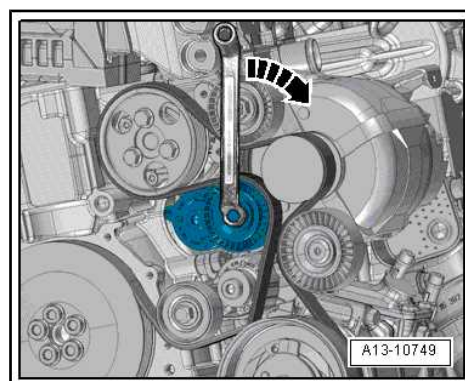
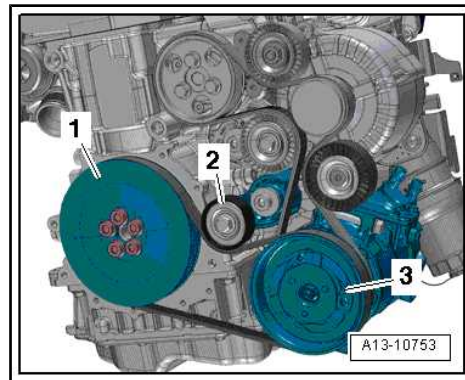
- ◆ *Before removing, mark direction of rotation of poly V-belt for alternator and coolant pump with chalk or felt-tip pen for re-installation.*

- To slacken poly V-belt, turn tensioner in clockwise direction -arrow-.
- Detach poly V-belt for alternator and coolant pump and release tensioner.

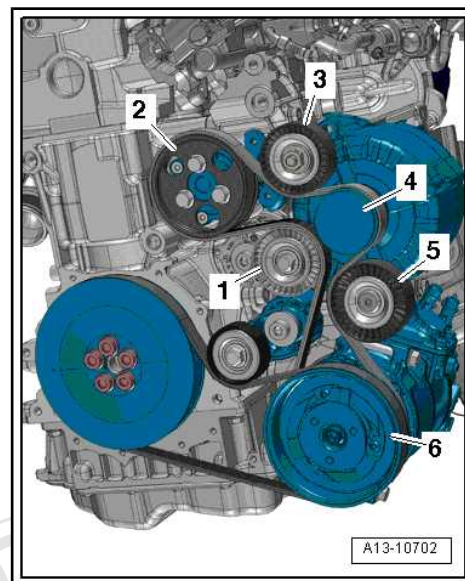
Installing

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

- Swivel tensioner in clockwise direction -arrow-.



- Fit poly V-belt on poly V-belt pulleys (on alternator pulley last).
- 1 - Tensioner
- 2 - Coolant pump
- 3 - Idler roller
- 4 - Alternator
- 5 - Idler roller
- 6 - Air conditioner compressor
- Release tensioner.
- Check that poly V-belt is in correct position.
- Install poly V-belt for air conditioner compressor [⇒ page 45](#).



1.4 Removing and installing tensioner for poly V-belt

[⇒ "1.4.1 Removing and installing poly V-belt tensioner for air conditioner compressor", page 47](#)

[⇒ "1.4.2 Removing and installing poly V-belt tensioner for alternator and coolant pump", page 47](#)

1.4.1 Removing and installing poly V-belt tensioner for air conditioner compressor

Removing

- Remove poly V-belt for air conditioner compressor [⇒ page 45](#).
- Remove bolt -arrow- and detach tensioner -1-.

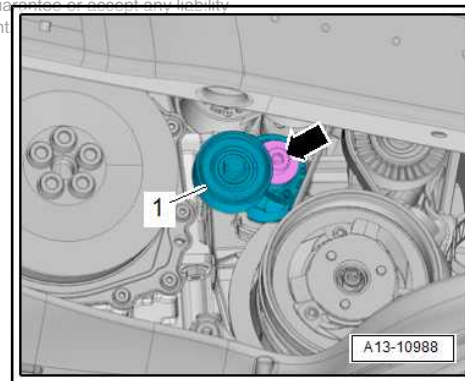
Installing

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

- Install poly V-belt for air conditioner compressor [⇒ page 45](#).

Tightening torques

- ◆ [⇒ "1.1 Exploded view - cylinder block \(pulley end\)", page 42](#)

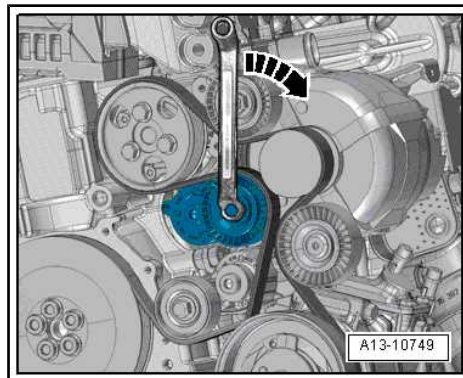


1.4.2 Removing and installing poly V-belt tensioner for alternator and coolant pump

Removing

- Remove poly V-belt tensioner for air conditioner compressor [⇒ page 47](#).

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



- Remove bolt -arrow- and detach tensioner.

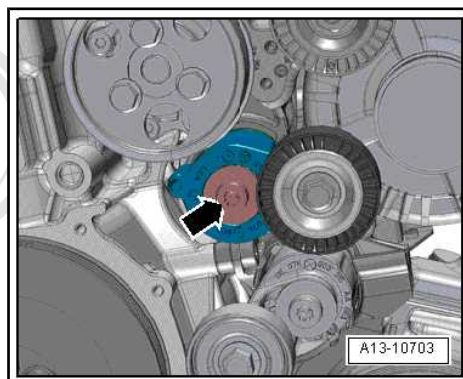
Installing

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

- Install poly V-belt for alternator and coolant pump
⇒ [page 46](#) .

Tightening torques

- ♦ ⇒ "1.1 Exploded view - cylinder block (pulley end)", [page 42](#)

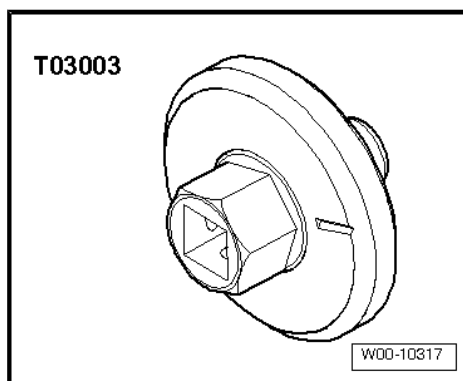


1.5 Removing and installing vibration damp-er

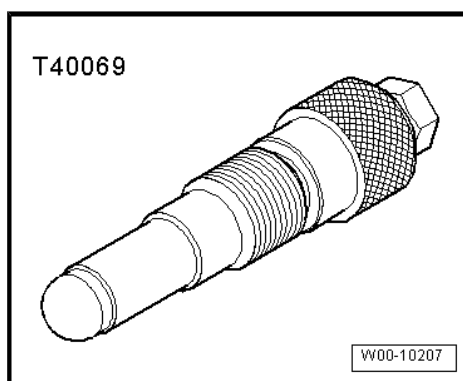
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Special tools and workshop equipment required

- ♦ Key - T03003-



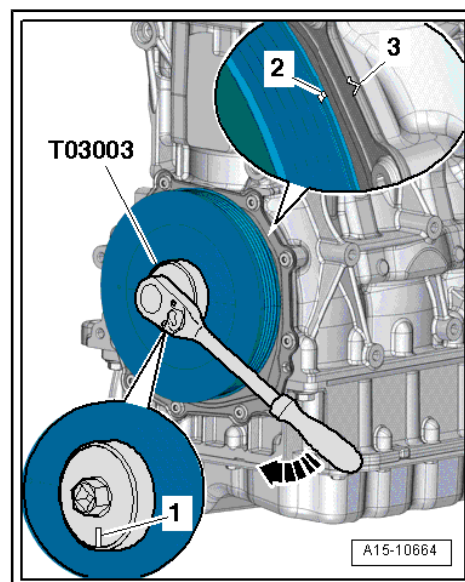
- ♦ Locking pin - T40069-



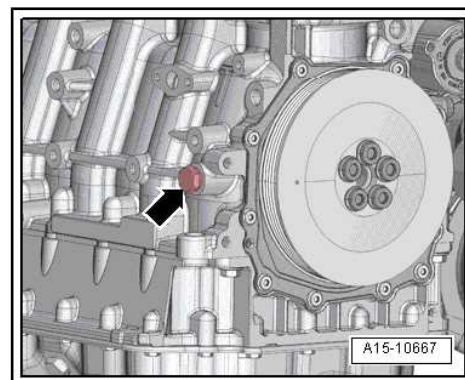
Removing

- Remove poly V-belt for air conditioner compressor
⇒ [page 45](#).
- Remove noise insulation ⇒ General body repairs, exterior;
Rep. gr. 66 ; Noise insulation; Removing and installing noise
insulation.
- Turn crankshaft with wrench - T03003- in normal direction of
rotation -arrow- to "TDC" position.
• **Notch 1 in wrench T03003 must be perpendicular to seal-**
ing surface of sump.
- Marking -2- on vibration damper must be opposite marking
-3- on sealing flange.

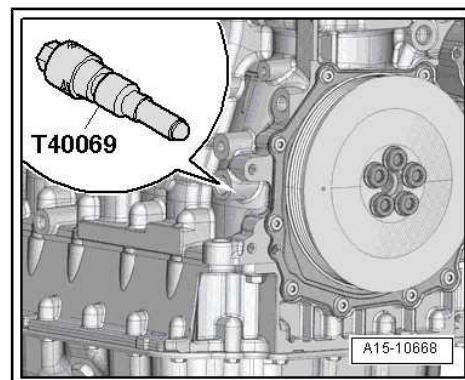
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- Unscrew plug -arrow- for "TDC" marking from cylinder block.



- Screw locking pin - T40069- into locating groove and tighten
to 15 Nm. If necessary, turn crankshaft backwards and for-
wards slightly to fully centralise locking pin.



- Unscrew bolts -arrow- and remove vibration damper.

Installing

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

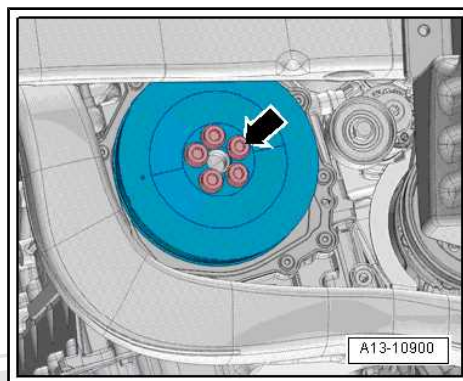


Note

- ◆ *Renew the bolts tightened with specified tightening angle.*
- ◆ *The vibration damper can only be fitted in one position.*
- Remove locking pin - T40069- .
- Install poly V-belt for air conditioner compressor ⇒ [page 45](#) .

Tightening torques

- ◆ ⇒ [“1.1 Exploded view - cylinder block \(pulley end\)”](#), [page 42](#)
- ◆ ⇒ [Fig. “Plug for TDC marking - tightening torque”](#), [page 62](#)
- ◆ ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation



1.6 Removing and installing bracket for ancillaries

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Removing

- Remove poly V-belt tensioner for air conditioner compressor ⇒ [page 47](#) .
- Remove engine mounting ⇒ [page 33](#) .
- Remove alternator ⇒ Electrical system; Rep. gr. 27 ; Alternator; Removing and installing alternator .
- Remove bolt -arrow-.
- Remove bolts -1 ... 6- and detach bracket for ancillaries.

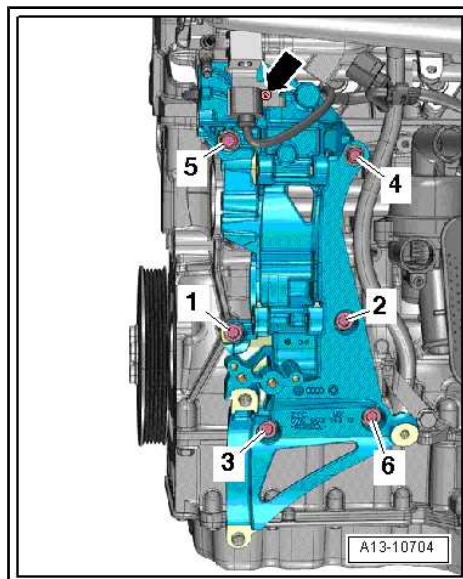
Installing

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

- Install engine mountings ⇒ [page 33](#) .
- Install alternator ⇒ Electrical system; Rep. gr. 27 ; Alternator; Removing and installing alternator .
- Install poly V-belt tensioner for air conditioner compressor ⇒ [page 47](#) .

Tightening torques

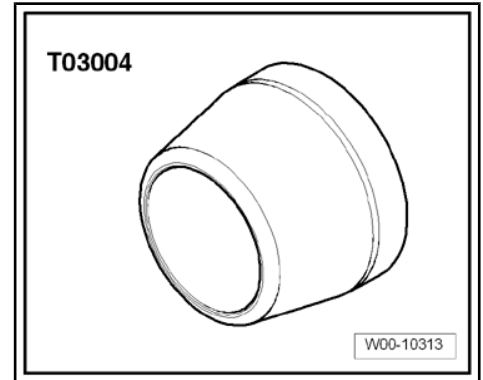
- ◆ ⇒ [Fig. “Bracket for ancillaries - tightening torque and tightening sequence”](#), [page 44](#)



1.7 Removing and installing sealing flange (pulley end)

Special tools and workshop equipment required

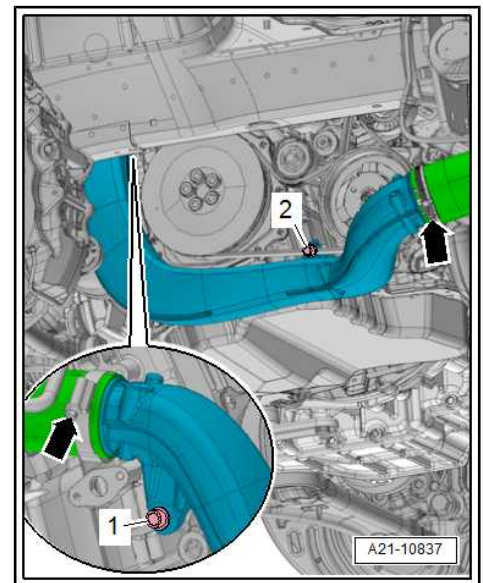
◆ Assembly sleeve -T03004-



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

Procedure

- Remove vibration damper ⇒ [page 48](#).
- Remove bolts -1- and -2-.
- Loosen hose clips -arrows- and detach air pipe.



- Remove bolts -arrows-.
- Carefully release sealing flange from bonded joint.



Note

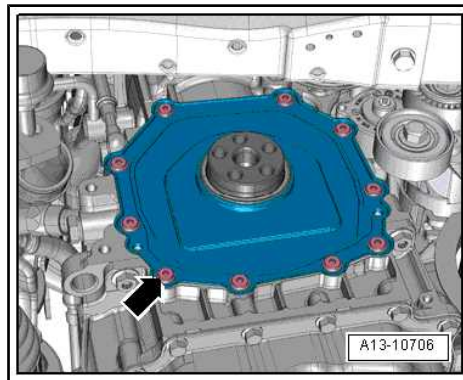
Renew sealing flange.



Caution

Make sure sealant residue does not enter lubrication system.

- ◆ Cover open area of cylinder block with a cloth.



WARNING

Risk of eye injury.

- ◆ Put on safety goggles.

- Use e.g. rotating plastic brush to remove sealant residue on cylinder block.
- Clean sealing surfaces and crankshaft journal; they must be free of oil and grease.



Note

Do not additionally oil or grease sealing lip of oil seal in sealing flange.

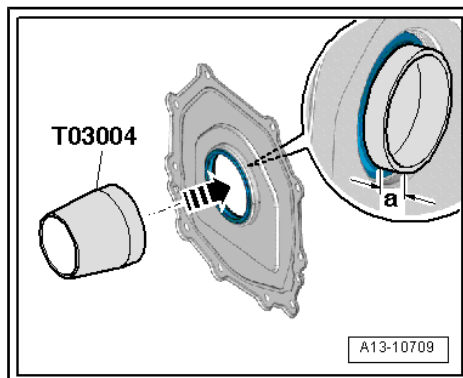
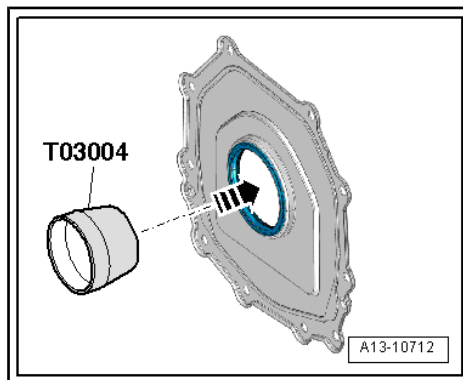


Caution

Risk of damage to oil seal in sealing flange

- ◆ To make sure sealing lip of oil seal is folded over when installing, the following procedures must be performed.

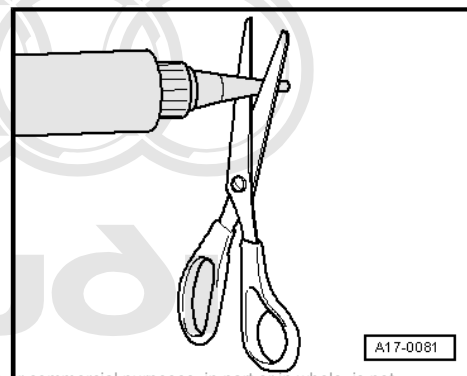
- Open out sealing lip of oil seal in sealing flange using assembly sleeve -T03004- as shown in illustration.
- Small diameter faces oil seal.
- Detach assembly sleeve -T03004- after a short while, turn over and insert in oil seal again.
- Large diameter faces oil seal.
- Assembly sleeve -T03004- must protrude by distance -a- at inside of flange
- Distance -a- = approx. 3 mm.



 Note

Note the use-by date of the sealant.

- Cut off nozzle of tube at front marking (nozzle $\varnothing$ approx. 2 mm).

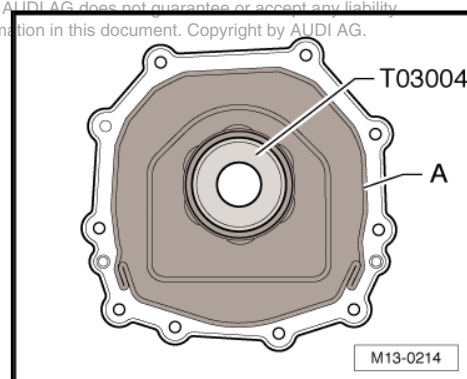


Caution

Make sure lubrication system is not clogged by excess sealant.

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

- Apply bead of sealant -A- onto clean sealing surface of sealing flange as shown in illustration.
- Width of sealant bead: 2.5 ... 3 mm
- The bead of sealant must project approx. 1.0 mm above the sealing surface.



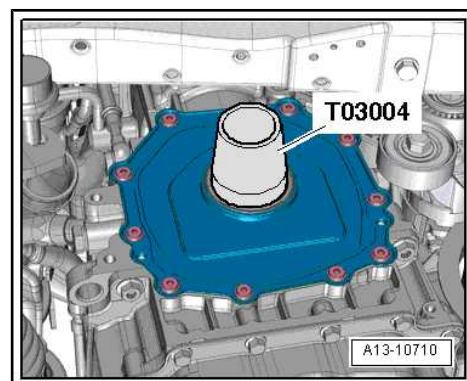
 Note

The sealing flange must be installed within 5 minutes after applying the sealant.

- Use assembly sleeve -T03004- to carefully fit sealing flange onto crankshaft journal and press onto cylinder block evenly (note centring collar on left and right).
- Tighten sealing flange [⇒ page 45](#).
- Install vibration damper [⇒ page 48](#).

Tightening torques

- ◆ [⇒ Fig. “Sealing flange \(pulley end\) - tightening torque and sequence”, page 45](#)
- ◆ Air pipe
[⇒ “2.1 Exploded view - charge air system”, page 210](#)



2 Cylinder block (gearbox end)

⇒ "2.1 Exploded view - flywheel", page 54

⇒ "2.2 Removing and installing flywheel", page 55

⇒ "2.3 Checking sender wheel", page 56

⇒ "2.4 Renewing crankshaft oil seal (gearbox end)", page 57

2.1 Exploded view - flywheel



Note

When performing assembly work, secure engine to engine and gearbox support ⇒ [page 23](#).

1 - Bolt

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

2 - Flywheel

- ☐ Removing and installing
⇒ [page 55](#)
- ☐ Can only be installed in one position

3 - Diamond-coated washer

- ☐ Must always be renewed if bolts for fly-wheel are loosened
- ☐ Can only be installed in one position

4 - Sender wheel

- ☐ For engine speed sender - G28-
- ☐ Can only be installed in one position



Caution

Risk of magnetic fields causing irreparable damage to sender wheel.

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

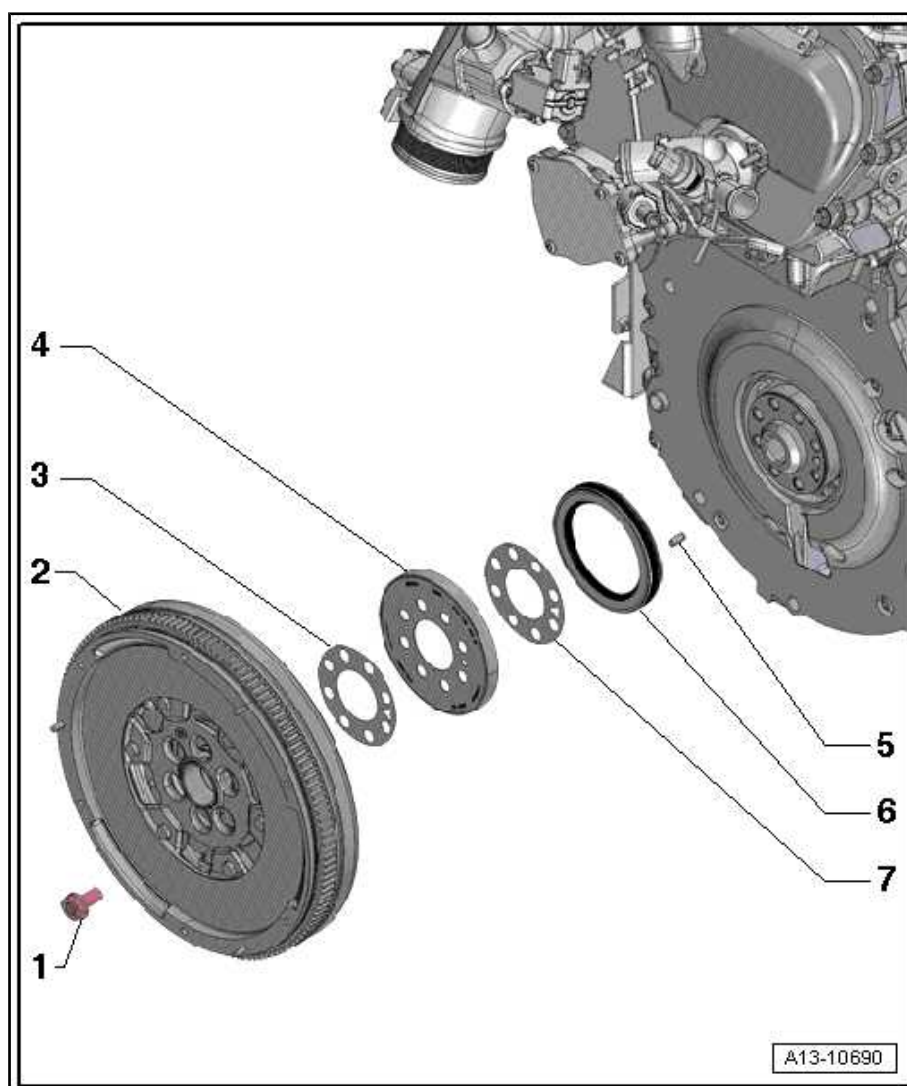
! If the drive plate/flywheel or the sender wheel itself has been removed or renewed, check that the sender wheel is operating correctly before installation ⇒ [page 56](#).

- ☐ Checking ⇒ [page 56](#)

5 - Dowel pin

6 - Crankshaft oil seal (gearbox end)

- ☐ Renewing ⇒ [page 57](#)



7 - Diamond-coated washer

- ☐ Must always be renewed if bolts for flywheel are loosened
- ☐ Can only be installed in one position

2.2 Removing and installing flywheel

Special tools and workshop equipment required

- ◆ Counterhold tool - 3067-

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Removing

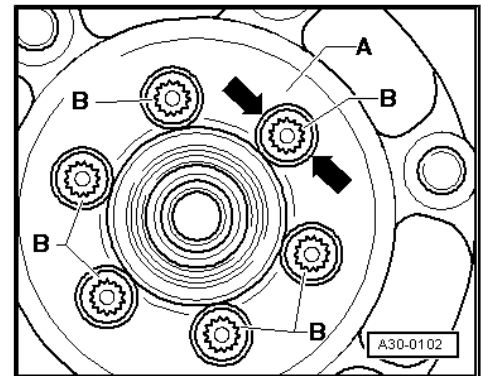
- Gearbox removed ⇒ Rep. gr. 34 ; Removing and installing gearbox; Removing gearbox



Caution

Risk of serious damage to flywheel.

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



- Insert counterhold tool - 3067- in hole on cylinder block -item B-, slacken and remove bolts for flywheel.

Installing

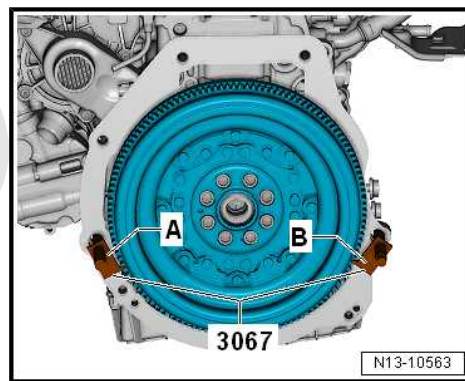
Installation is carried out in the reverse order; note the following:



Caution

Make sure friction is sufficient.

- ◆ **Always renew diamond-coated washers**
⇒ **Item 3 (page 54)** and ⇒ **Item 7 (page 55)** after loosening bolts for flywheel.



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Risk of magnetic fields causing irreparable damage to sender wheel.

- ◆ **The sender wheel must be kept away from magnets (e.g. base of torch, loudspeaker).**
- ◆ **If the drive plate/flywheel or the sender wheel itself has been removed or renewed, check that the sender wheel is operating correctly before installation** ⇒ **page 56**.



Note

- ◆ **Renew the bolts tightened with specified tightening angle.**
 - ◆ **Flywheel with sender wheel and diamond-coated washers can only be fitted in one position.**
- Insert counterhold - 3067- in hole on cylinder block -item A-.

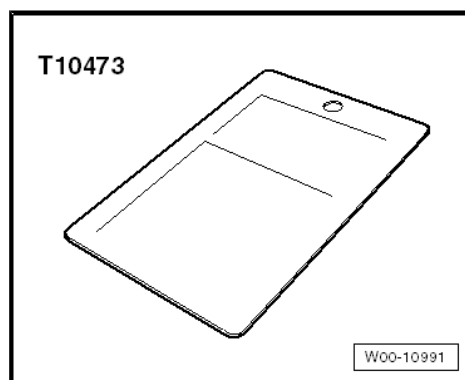
Tightening torques

- ◆ ⇒ **“2.1 Exploded view - flywheel”, page 54**

2.3 Checking sender wheel

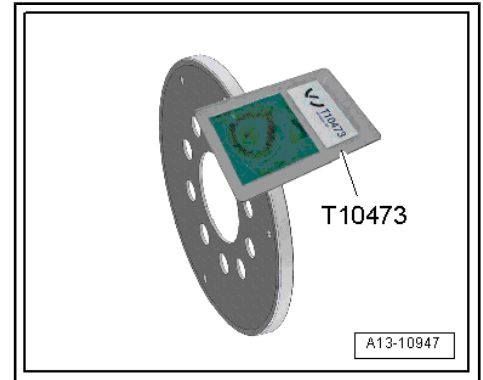
Special tools and workshop equipment required

- ◆ Sensor gauge - T10473-



Procedure

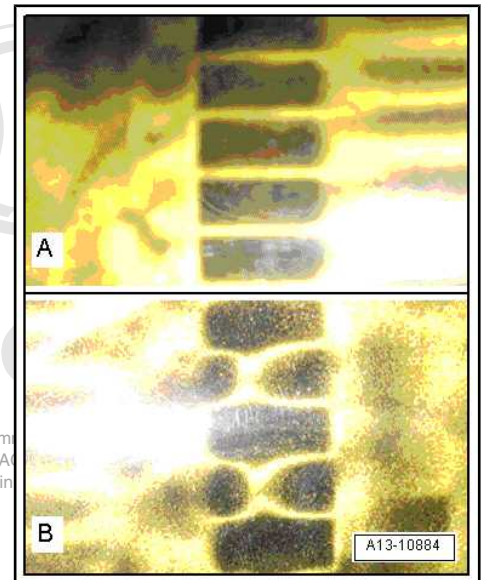
- Sender wheel removed
- Check entire circumference of sender wheel using sensor gauge - T10473- , as shown in illustration.



Inspection image of sender wheel

A - Sender wheel OK

B - Sender wheel defective

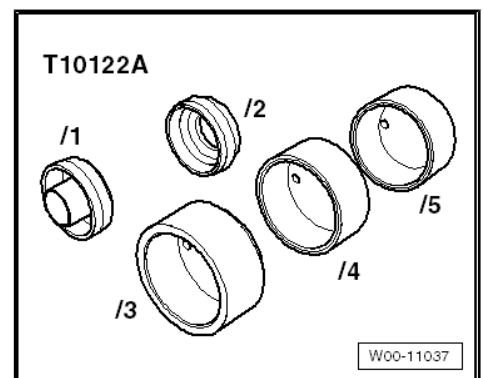


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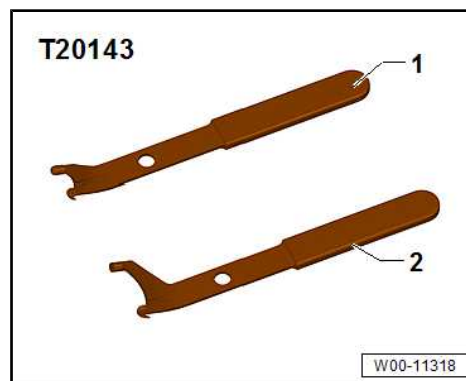
2.4 Renewing crankshaft oil seal (gearbox end)

Special tools and workshop equipment required

- ◆ Fitting tool - T10122 A- with adapter -T10122/6-



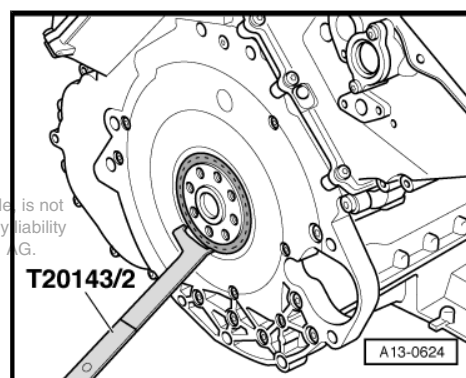
◆ Extractor hook - T20143/2-



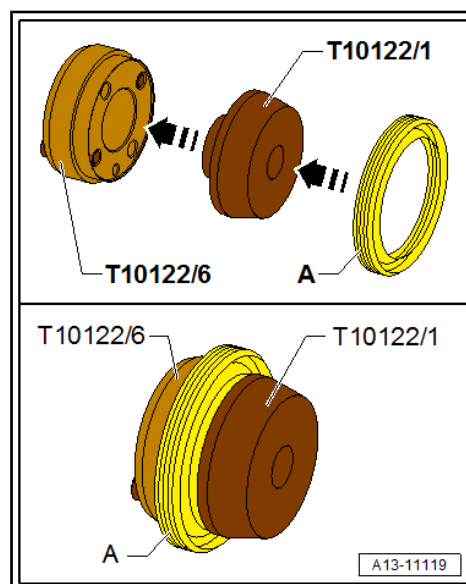
Procedure

- Gearbox removed ⇒ Rep. gr. 34 ; Removing and installing gearbox; Removing gearbox
- Pry out oil seal using extractor tool -T20143/2- .
- Clean contact surface and sealing surface.

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



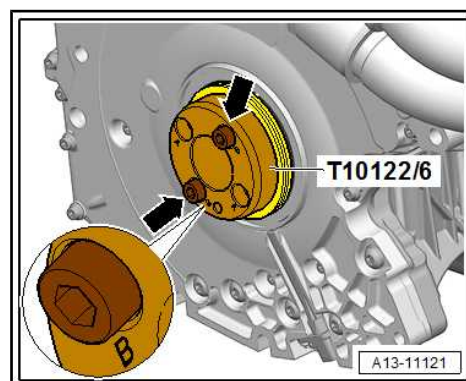
- Fit guide piece - T10122/6- onto crankshaft.
- Bolt guide piece to crankshaft through securing points -B- using bolts -arrows-.



Caution

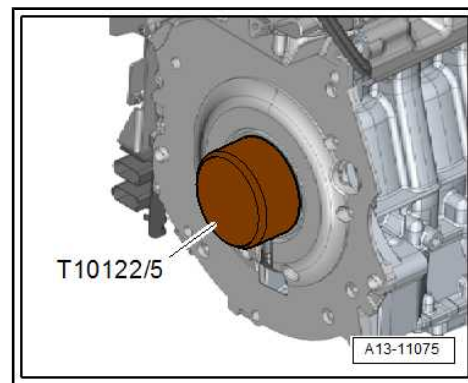
Risk of leaks if installed incorrectly.

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



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

- Press in oil seal uniformly until flush all round using thrust piece -T10122/5- .
- Remove guide piece - T10122/6- .
- Check that oil seal and its sealing lip are correctly seated. If sealing lip is partially folded over, repeat procedure with a new oil seal.



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3 Crankshaft

⇒ "3.1 Exploded view - crankshaft", page 60

⇒ "3.2 Crankshaft dimensions", page 62

⇒ "3.3 Renewing needle bearing in crankshaft", page 62

⇒ "3.4 Measuring axial clearance of crankshaft", page 64

⇒ "3.5 Measuring radial clearance of crankshaft", page 65

3.1 Exploded view - crankshaft



Note

- ◆ When performing assembly work, secure engine to engine and gearbox support ⇒ [page 23](#).
- ◆ If large quantities of metal shavings or abrasion are found when performing engine repairs, this may be an indication of damage to the crankshaft or conrod bearings. To prevent further damage, the following steps are required after completion of repair work: clean the oil passages carefully and renew the oil spray jets, engine oil cooler and oil filter.

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1 - Bolt

- ☐ Renew after removing
- ☐ Use old bolts when measuring radial clearance
- ☐ 40 Nm +90°

2 - Bearing caps

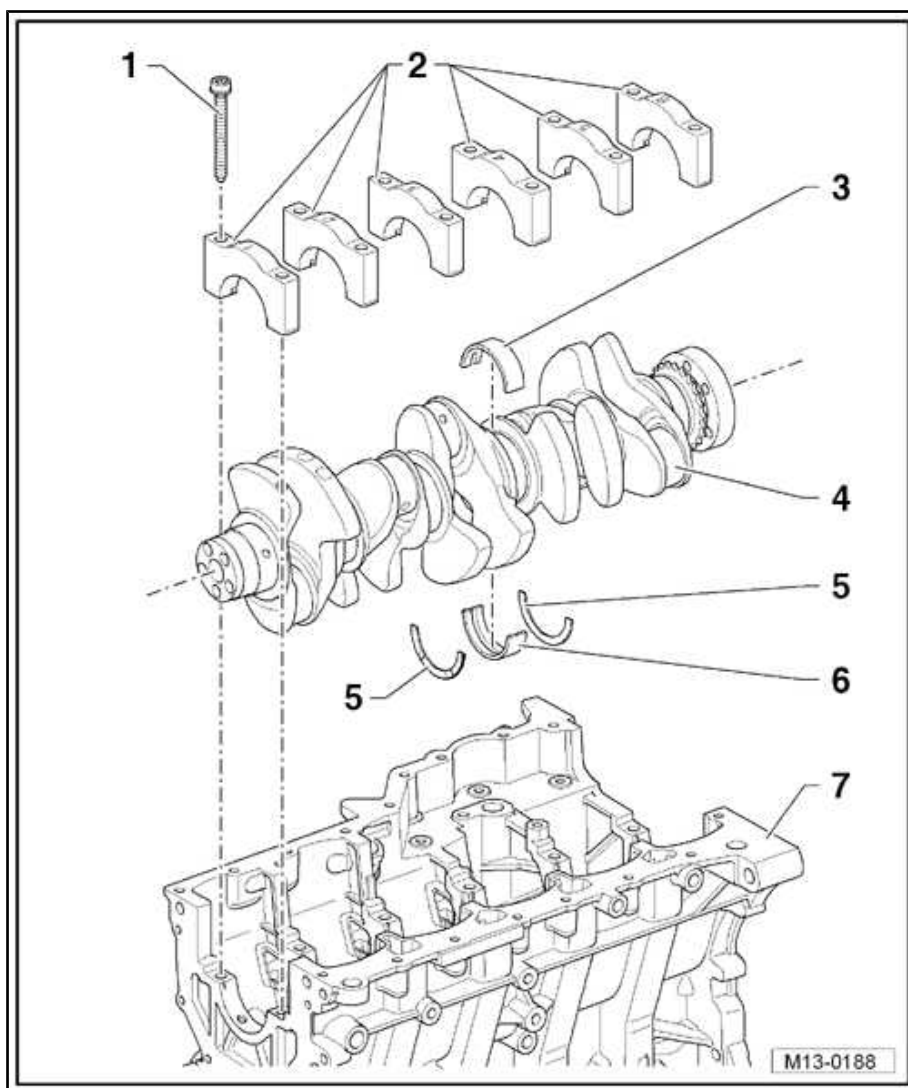
- ☐ Bearing cap 1: Pulley end
- ☐ Installation position: retaining lugs on bearing shells in cylinder block and bearing caps must be on the same side

3 - Bearing shell

- ☐ For bearing cap (without oil groove)
- ☐ Renew used bearing shells
- ☐ Insert new bearing shells with correct colour-coding ⇒ [page 61](#)

4 - Crankshaft

- ☐ For vehicles with dual clutch gearbox and needle bearing
- ☐ Renew needle bearing ⇒ [page 62](#)
- ☐ Measuring axial clearance ⇒ [page 64](#)
- ☐ Measuring radial clearance ⇒ [page 65](#)
- ☐ Use old bolts when measuring radial clearance
- ☐ Crankshaft dimensions ⇒ [page 62](#)



5 - Thrust washers

- ☐ For bearing No. 3

6 - Bearing shell

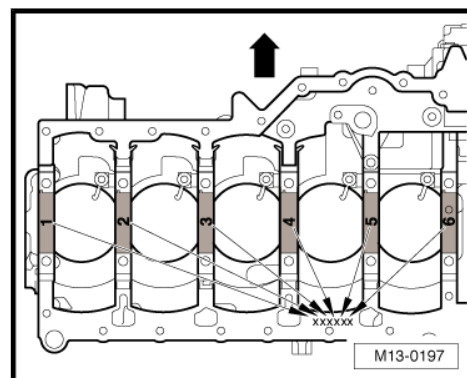
- ☐ For cylinder block (with oil groove)
- ☐ Renew used bearing shells
- ☐ Install new bearing shells for the cylinder block with the correct coloured markings ⇒ [page 61](#)

7 - Cylinder block

Allocation of crankshaft bearing shells for cylinder block

- ◆ Bearing shells of the correct thickness are matched to the bearings in the cylinder block at the factory. Coloured dots on the side of the bearing shells are used to identify the bearing shell thickness.
- ◆ Letter codes on the lower sealing surface of the cylinder block indicate the thickness of the bearing shell to be fitted at each location.

Letter on cylinder block	Colour coding of bearing
G =	Yellow
B =	Blue
W =	White



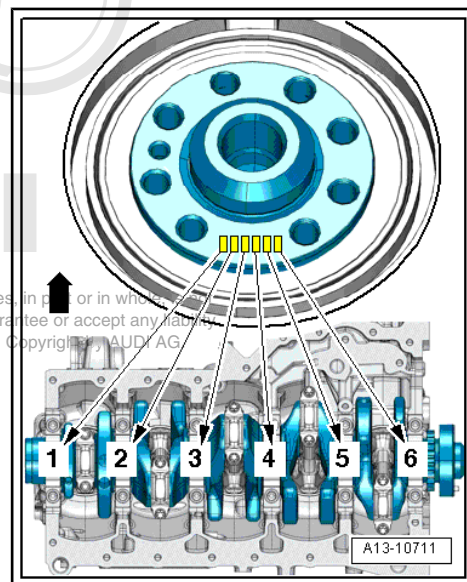
Note

-Arrow- points in direction of travel.

Allocation of crankshaft bearing shells for bearing caps

- ◆ Bearing shells of the correct thickness are assigned to the bearing caps at the factory. Coloured dots on the side of the bearing shells are used to identify the bearing shell thickness.
- ◆ The correct allocation of bearing shells to bearing cap is indicated by a sequence of letters on the pulley flange of the crankshaft. The first letter in the sequence stands for bearing "1", the second letter for bearing "2", etc.

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



Note

-Arrow- points in direction of travel.

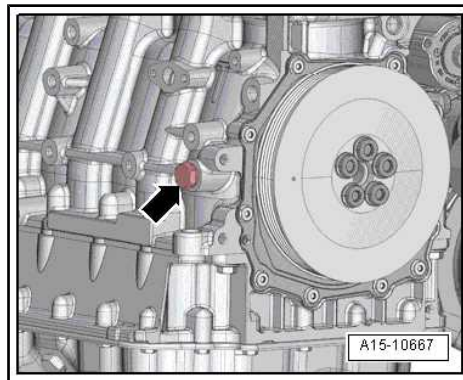
Plug for "TDC" marking - tightening torque



Note

Renew seal.

- Tighten plug -arrow- for "TDC" marking to 45 Nm.



3.2 Crankshaft dimensions

Honing dimension	Main bearing journal Ø mm	Conrod journal Ø mm
Basic dimension	58.000 – 0.022 – 0.042	47.800 – 0.022 – 0.042

3.3 Renewing needle bearing in crankshaft

Only fitted on vehicles with dual clutch gearbox



Note

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

Special tools and workshop equipment required

- ◆ Drift - VW 207 C-



- ◆ Internal puller Kukko 21/2



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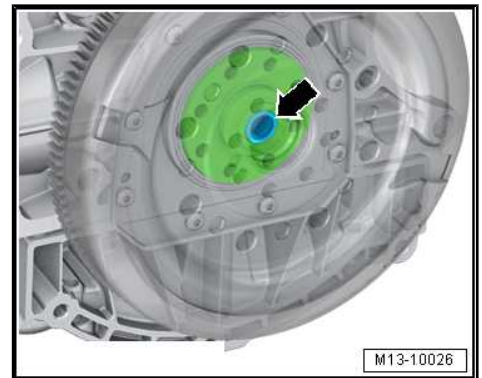
◆ Counter-support Kukko 22/1



Procedure

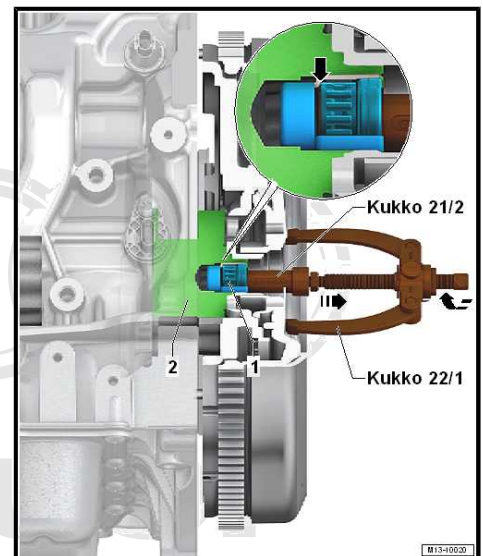
Conditions

- Gearbox removed ⇒ Rep. gr. 34 ; Removing and installing gearbox; Removing gearbox
- The front edges of the internal puller must not be chipped.



Removing

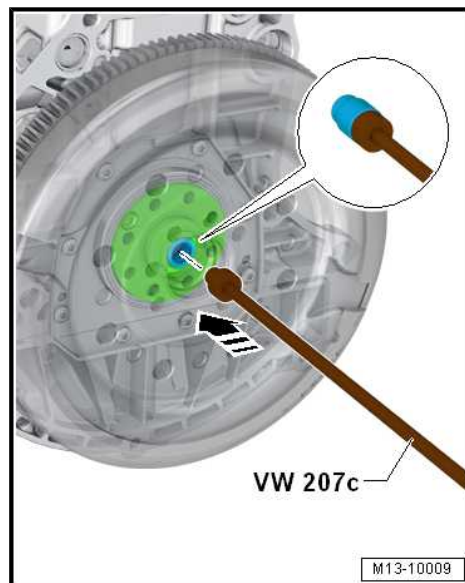
- Pull needle bearing -1- out of crankshaft -2- using commercially available internal puller (e.g. Kukko - 21/2-) and counter-support (e.g. Kukko - 22/1-).
- Internal puller must be positioned behind needle roller -arrow-.



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Installing

- Clean bearing seat in crankshaft and grease lightly.
- Drive needle bearing into crankshaft with drift - VW 207 C- until it reaches installation depth.

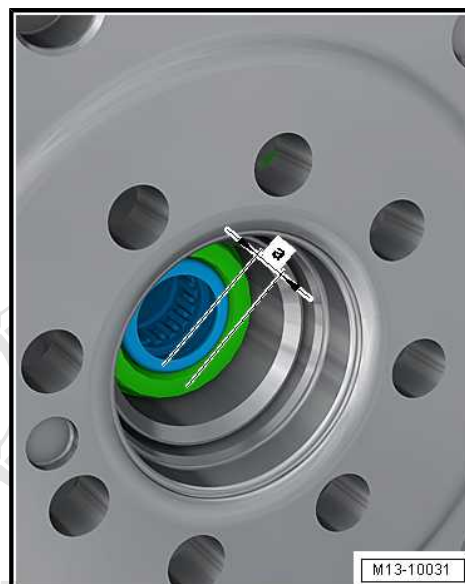


- Installation depth: dimension -a- = 1.5 mm



Note

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



3.4 Measuring axial clearance of crankshaft

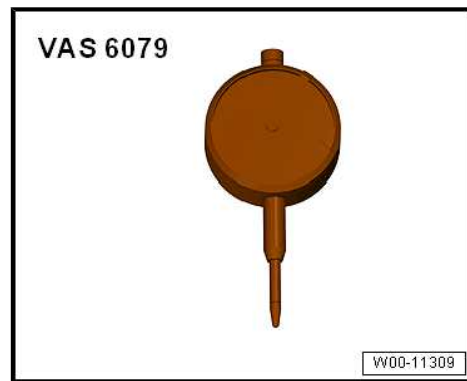
Special tools and workshop equipment required

- ◆ Universal dial gauge bracket - VW 387

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◆ Dial gauge - VAS 6079-

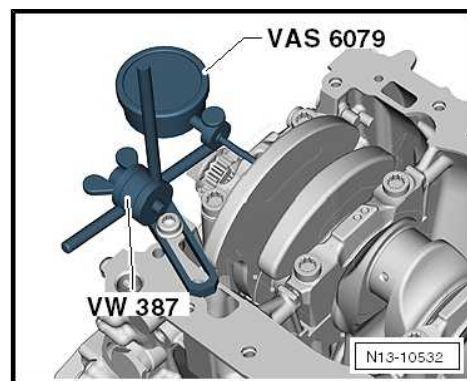


Procedure

- Secure dial gauge - VAS 6079- with universal dial gauge bracket - VW 387- to cylinder block as shown in illustration.
- Apply dial gauge to crank web.
- Press crankshaft against dial gauge by hand and set gauge to "0".
- Push crankshaft away from dial gauge and read off value.

Axial clearance:

- New: 0.07 ... 0.21 mm.
- Wear limit: 0.30 mm.



3.5 Measuring radial clearance of crankshaft

Special tools and workshop equipment required

- ◆ Plastigauge

Procedure



Note

Use old bolts when measuring radial clearance.

- Remove bearing cap.
- Clean bearing cap and bearing journal.
- Place a length of Plastigauge corresponding to the width of the bearing on the bearing journal or in the bearing shell.
- The Plastigauge must be positioned in the centre of the bearing shell.
- Fit bearing cap and secure with old bolts (tighten to 40 Nm + 90° further) without rotating crankshaft.
- Remove bearing cap again.
- Compare width of Plastigauge with measurement scale.

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Radial clearance:

- New: 0.023 ... 0.043 mm.
- Wear limit: 0.07 mm.
- When carrying out final assembly, renew bolts.

4 Pistons and conrods

⇒ "4.1 Exploded view - pistons and conrods", page 66

⇒ "4.2 Removing and installing pistons", page 67

⇒ "4.3 Checking pistons and cylinder bores", page 69

⇒ "4.4 Separating parts of new conrod", page 70

⇒ "4.5 Checking radial clearance of conrod bearings", page 71

4.1 Exploded view - pistons and conrods

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Note

- ◆ All bearing and running surfaces must be oiled before assembling.
- ◆ Oil spray jet and pressure relief valve ⇒ [page 67](#)

1 - Bolts

- ☐ Renew after removing
- ☐ Use old bolts when measuring radial clearance
- ☐ Lubricate threads and contact surface
- ☐ 45 Nm +90°

2 - Conrod bearing cap

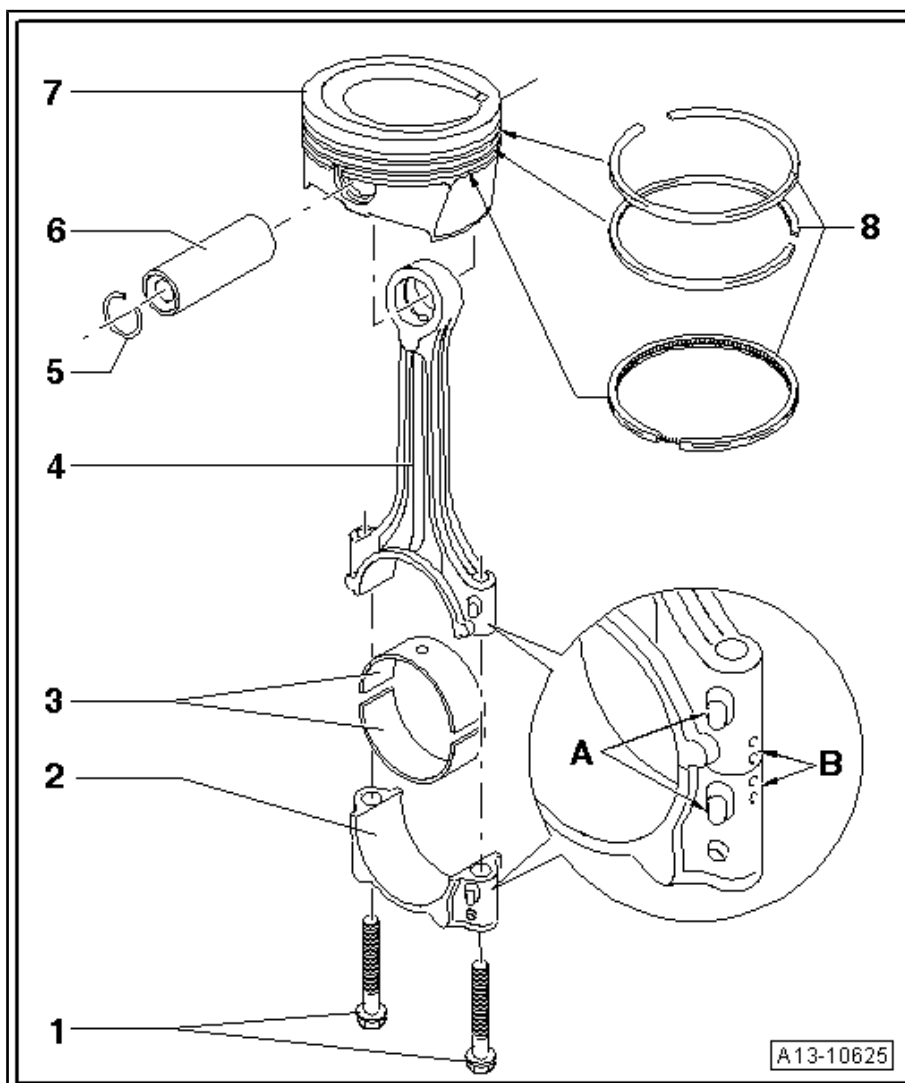
- ☐ Note installation position
- ☐ Due to the cracking method used to separate the bearing cap from the conrod in manufacture, the caps only fit in one position and only on the appropriate conrod
- ☐ Mark cylinder and conrod allocation in colour -B-
- ☐ Installation position: Markings -A- face towards pulley end
- ☐ Separating parts of new conrod ⇒ [page 70](#)

3 - Bearing shells

- ☐ Without oil drilling
- ☐ Installation position ⇒ [page 67](#)
- ☐ Renew used bearing shells

4 - Conrod

- ☐ Only renew as a complete set
- ☐ Mark cylinder and conrod bearing cap allocation in colour -B-
- ☐ Installation position: Markings -A- face towards pulley end



- ☐ Measuring radial clearance ⇒ [page 71](#)
- ☐ Use old bolts when measuring radial clearance
- ☐ Separating parts of new conrod ⇒ [page 70](#)

5 - Retaining ring

- ☐ Renew

6 - Piston pin

- ☐ Removing and installing ⇒ [“4.2 Removing and installing pistons”, page 67](#)

7 - Piston

- ☐ Mark installation position to conrod and cylinder allocation
- ☐ Installation position: arrow on piston crown points to pulley end
- ☐ Removing and installing ⇒ [page 67](#)
- ☐ Checking pistons and cylinder bores ⇒ [page 69](#)

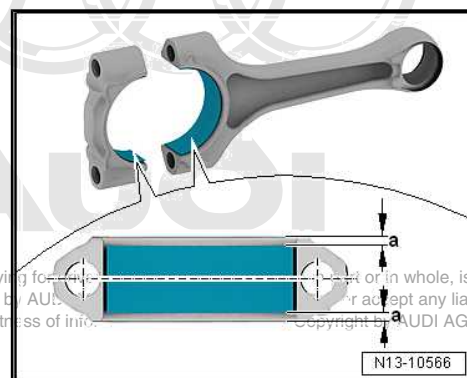
8 - Piston rings

- ☐ Offset gaps by 120°
- ☐ Use piston ring pliers to remove and install
- ☐ Inscription “TOP” faces towards piston crown
- ☐ Measuring ring gap ⇒ [page 69](#)
- ☐ Measuring ring-to-groove clearance ⇒ [page 69](#)

Installation position of bearing shells in conrods

- Insert bearing shells centrally in conrod/conrod bearing cap.
- Distance -a- = approx. 1.5 mm.

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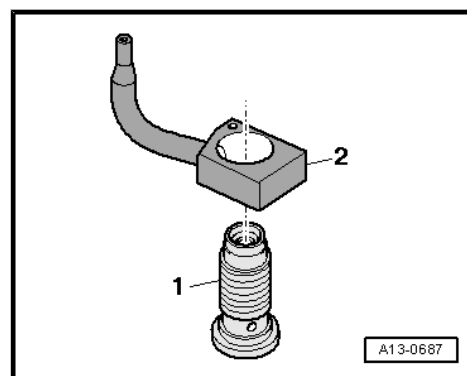
Oil spray jet and pressure relief valve

- 1 - Bolt with pressure relief valve, 27 Nm
 - 2 - Oil spray jet (for cooling of pistons)
- Installation position: align locating edge of oil spray jet with machined surface of cylinder block.



Note

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



4.2 Removing and installing pistons

Special tools and workshop equipment required

◆ Drift - VW 222A-



◆ Piston ring clamp, commercially available

Removing

- Secure engine to engine and gearbox support - VAS 6095-
⇒ [page 23](#) .
- Remove cylinder head ⇒ [page 95](#) .
- Remove sump (top section) ⇒ [page 134](#) .
- Mark installation position and cylinder number of piston.
- Mark installation position and cylinder number of conrod
⇒ [Item 4 \(page 66\)](#) .
- 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 222A- to drive out piston pin.

Installing

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



Note

- ◆ *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 7 \(page 67\)](#) .
- Install conrod bearing cap; note installation position
⇒ [Item 2 \(page 66\)](#) .
- Install cylinder head ⇒ [page 95](#) .
- Install sump (upper section) ⇒ [page 134](#) .

Tightening torques

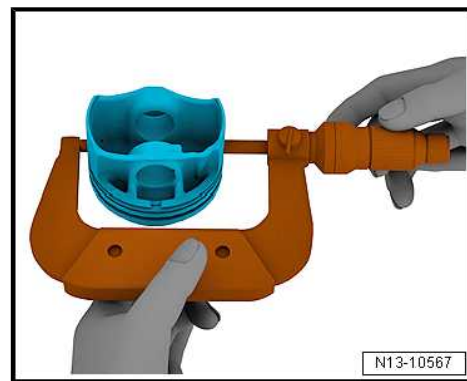
- ◆ ⇒ [“4.1 Exploded view - pistons and conrods”, page 66](#)

4.3 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.

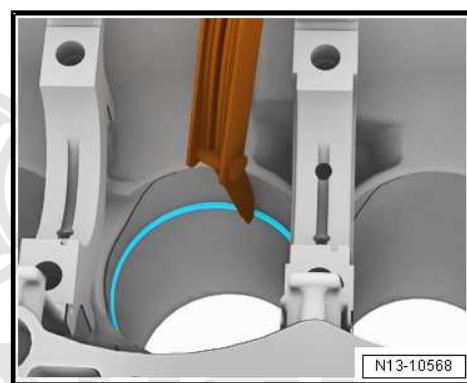
		Piston Ø
Nominal dimension	mm	82.451 ¹⁾
• ¹⁾ Dimensions not including coating (thickness 0.02 mm). The coating will wear down in service.		



Measuring piston ring gap

- Insert ring at right angle to cylinder wall from above and push down into lower cylinder opening approx. 15 mm from bottom of cylinder.
- To do so, use a piston without rings.
- Check gap using feeler gauge.

Piston ring	new mm	Wear limit mm
Compression rings	0.20 ... 0.40	0.8
Oil scraper ring	0.25 ... 0.50	0.8



Measuring ring-to-groove clearance

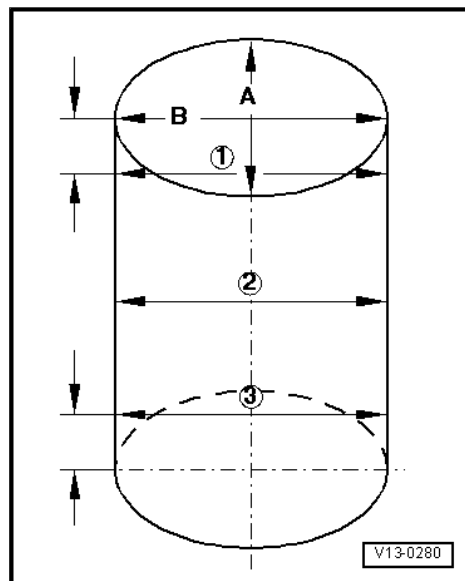
- Clean annular groove of piston.
- Check gap using feeler gauge.

Piston ring	new mm	Wear limit mm
Compression rings	0.06 ... 0.09	0.20
Oil scraper ring	0.03 ... 0.06	0.15



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Checking cylinder bore



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 Ø
Nominal dimension	mm	82.51



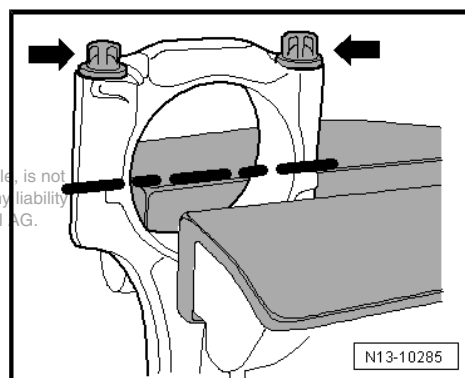
Note

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

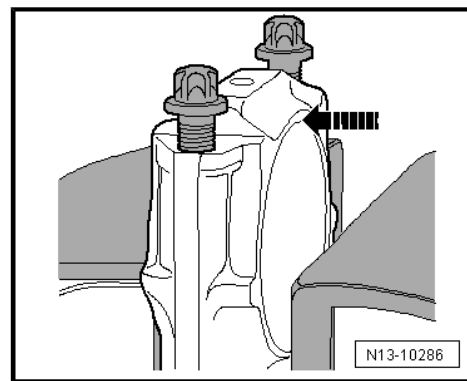
4.4 Separating parts of new conrod

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:

- To avoid any risk of damage, the conrod should only be clamped lightly in a vice using jaw covers as shown in illustration.
- The conrod is clamped in position below the dotted line.
- Unscrew bolts -arrows- approx. 5 turns.



- Using a plastic hammer, carefully knock conrod bearing cap loose -arrow-.



4.5 Checking radial clearance of conrod bearings

Special tools and workshop equipment required

- ◆ Plastigauge

Procedure



Note

Use old bolts when measuring radial clearance.

- ~~Remove conrod bearing cap. Clean bearing cap and bearing journal.~~

- Place a length of Plastigauge corresponding to the width of the bearing on the bearing journal or in the bearing shell.
- The Plastigauge must be positioned in the centre of the bearing shell.
- Fit conrod bearing cap and secure with old bolts (tighten to 45 Nm + 90° further) without rotating crankshaft.
- Remove conrod bearing cap again.
- Compare width of Plastigauge 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 72](#)

⇒ [“1.2 Removing and installing timing chain cover”, page 74](#)

1.1 Exploded view - timing chain cover

1 - Engine speed sender - G28-

- ☐ Removing and installing
⇒ [page 278](#)

2 - Crankshaft oil seal (gearbox end)

- ☐ Renewing ⇒ [page 57](#)

3 - Dowel sleeve

4 - Bolt

- ☐ Tightening torque and sequence ⇒ [page 73](#)

5 - O-ring

- ☐ Renew after removing

6 - Cylinder head gasket

7 - Centre hex stud

- ☐ Tightening torque and sequence ⇒ [page 73](#)

8 - Nut

- ☐ 8 Nm

9 - Bracket

- ☐ For engine cover panel and high-pressure pipe

10 - Bolt

- ☐ 8 Nm

11 - Nut

- ☐ 8 Nm

12 - Bracket

- ☐ For engine cover panel and electrical connectors

13 - Centre hex stud

- ☐ Tightening torque and sequence ⇒ [page 73](#)

14 - Filler cap for oil filler neck

15 - Grommet

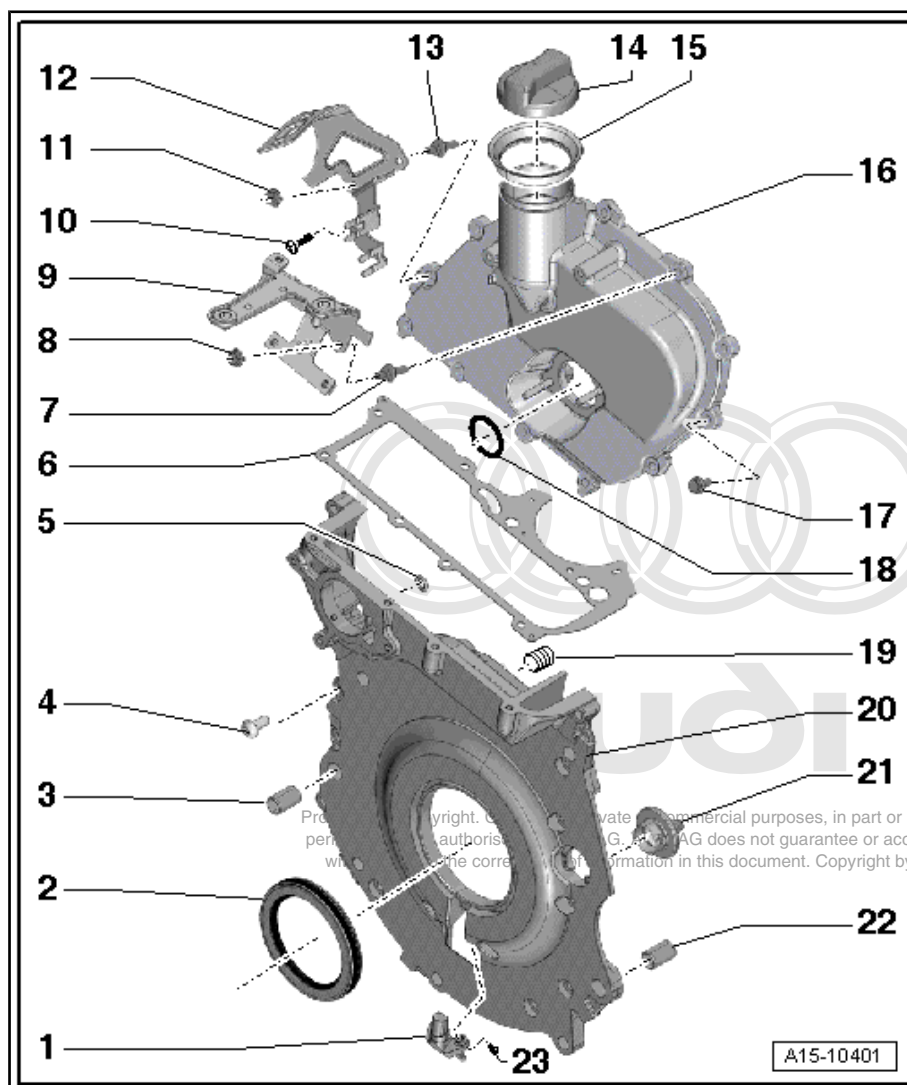
16 - Upper cover for timing chains

- ☐ Removing and installing ⇒ [page 74](#)

- ☐ Apply sealant when installing; refer to ⇒ Electronic parts catalogue

17 - Bolt

- ☐ Tightening torque and sequence ⇒ [page 73](#)



18 - Oil seal

- ☐ Renewing ⇒ [page 76](#)

19 - Sealing sleeve

- ☐ Renew after removing

20 - Timing chain cover (bottom)

- ☐ Removing and installing ⇒ [page 78](#)
- ☐ Apply sealant when installing; refer to ⇒ Electronic parts catalogue

21 - Plug

22 - Dowel sleeve

23 - Bolt

- ☐ Tightening torque ⇒ [Item 16 \(page 275\)](#)

Timing chain cover (top) - tightening torque and tightening sequence

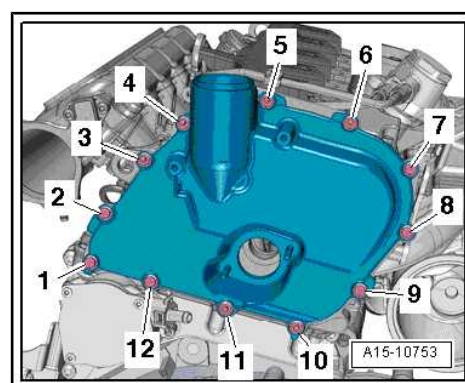


Note

Bolts -3, 4, 5, 6, 10, 11- are supplied as centre hex studs.

- Tighten bolts in 2 stages in the sequence shown:

Stage	Bolts	Tightening torque
1.	-1 ... 12-	Screw in by hand until contact is made
2.	-1 ... 12-	9 Nm



Timing chain cover (bottom) - tightening torque and sequence

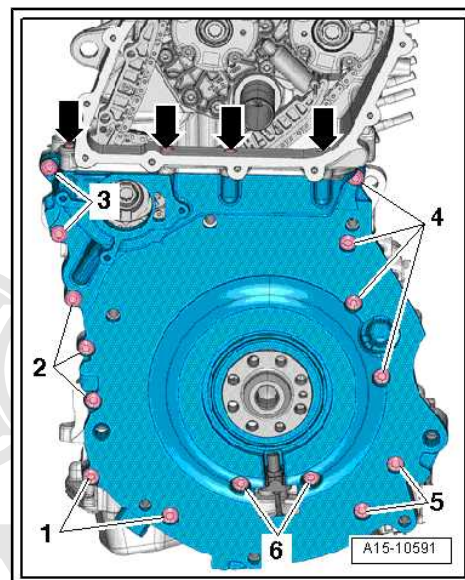


Note

Renew the bolts tightened with specified tightening angle.

- Tighten bolts in 6 stages:

Stage	Bolts	Tightening torque
1.	-1 ... 6- and -arrows-	Screw in by hand until contact is made
2.	-arrows-	5 Nm
3.	-1 ... 6-	8 Nm in diagonal sequence
4.	-arrows-	8 Nm
5.	-1 ... 6-	20 Nm in diagonal sequence
6.	-arrows-	Turn 90° further



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1.2 Removing and installing timing chain cover

⇒ ["1.2.1 Removing and installing timing chain cover \(top\)"](#),
page 74

⇒ ["1.2.2 Renewing oil seal in timing chain cover \(top\)"](#),
page 76

⇒ ["1.2.3 Removing and installing timing chain cover \(bottom\)"](#),
page 78

1.2.1 Removing and installing timing chain cover (top)

Special tools and workshop equipment required

- ◆ Hose clip pliers - VAS 6362-



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

Removing

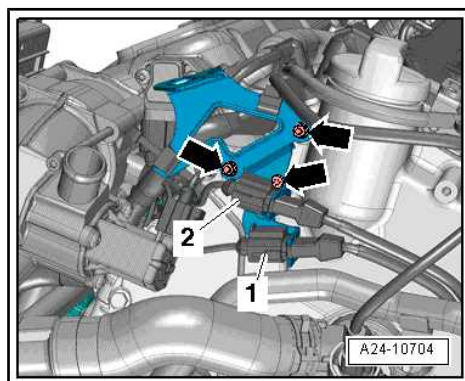


Note

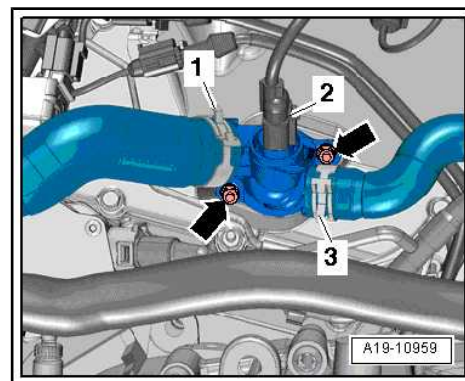
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Routing and attachment of pipes, hoses and wiring in engine compartment ⇒ [page 6](#).

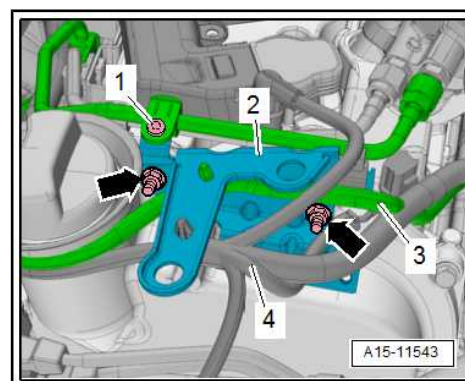
- Unplug electrical connectors -1- and -2-.
- Unscrew nuts and bolt -arrows- and move bracket for connectors to one side.
- Remove front coolant pipes ⇒ [page 183](#).
- Remove coolant pipe (left-side) ⇒ [page 178](#).



- Unplug electrical connector -2- at coolant temperature sender - G62- .
- Release hose clip -3- and detach coolant hose.
- Unscrew nut and centre hex stud -arrows- and move coolant connection to side with coolant hose -1- connected.



- Move clear electrical wiring harness -4- and line -3- from activated charcoal filter.
- Remove bolt -1- from retaining clip for fuel line.
- Remove nuts -arrows- and detach bracket -2-.



- Remove bolts in the sequence -12 ... 1- and carefully release timing chain cover (top) from bonded joint.
- Drive out oil seal in timing chain cover (top) ⇒ [page 76](#) .

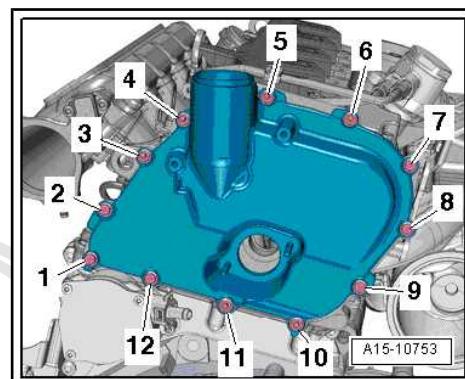
Installing



Caution

Protect lubrication system against contamination.

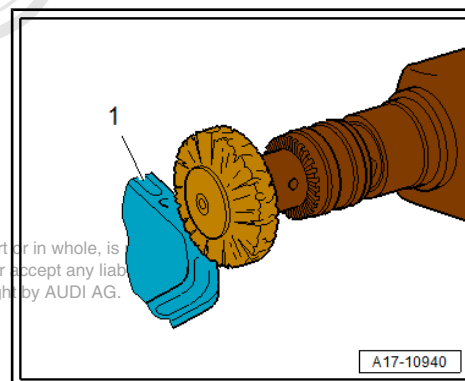
- ◆ *Cover exposed parts of the engine.*



WARNING

Risk of eye injury.

- ◆ *Put on safety goggles.*



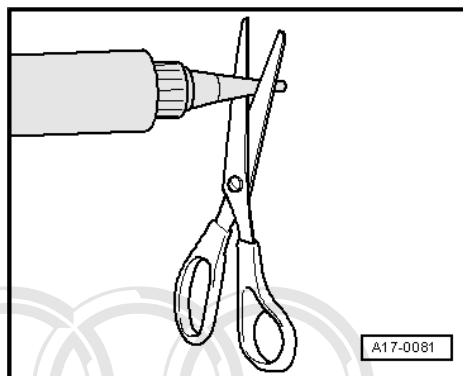
- Remove remaining sealant on timing chain cover -1- cylinder block and cylinder head using rotating plastic brush or similar.
- Press in new oil seal in timing chain cover (top) ⇒ [page 76](#) .
- Clean sealing surfaces; they must be free of oil and grease.



Note

Note the use-by date of the sealant.

- Cut off nozzle of tube at front marking (nozzle Ø approx. 1.5 mm).

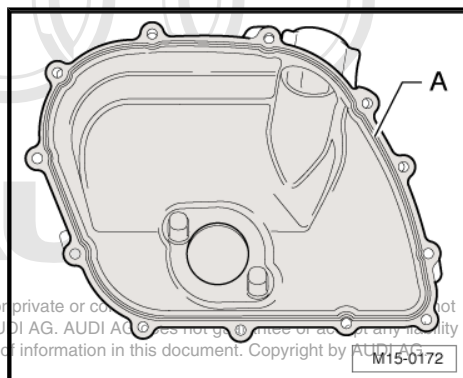


Caution

Make sure lubrication system is not clogged by excess sealant.

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

- Apply sealant bead -A- onto the clean sealing surface of the timing chain cover (top) as illustrated.
- Thickness of sealant bead: 1.5 ... 2.0 mm.



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Note

The timing chain cover (top) must be installed within 5 minutes after applying the sealant.

- Install timing chain cover (top) and tighten bolts ⇒ [page 73](#) .

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

- Install coolant pipe (left-side) ⇒ [page 178](#) .
- Install coolant pipes (front) ⇒ [page 183](#) .

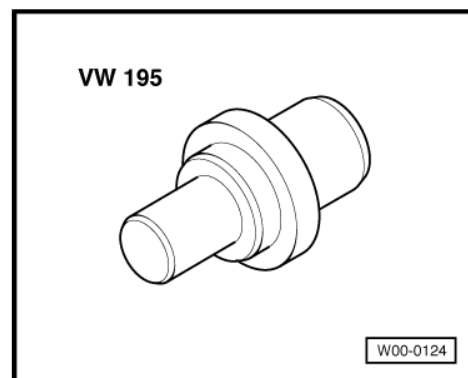
Tightening torques

- ◆ ⇒ [Fig. “Timing chain cover \(top\) - tightening torque and tightening sequence”](#), [page 73](#)
- ◆ Coolant hose/pipe connection
⇒ [“3.1 Exploded view - coolant pipes”](#), [page 177](#)
- ◆ Fuel line
⇒ [“6.1 Exploded view - high-pressure pump”](#), [page 249](#)

1.2.2 Renewing oil seal in timing chain cover (top)

Special tools and workshop equipment required

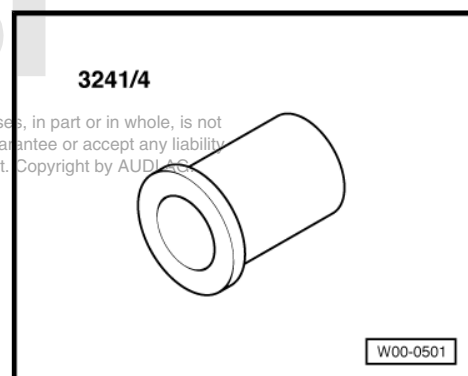
◆ Punch - VW 195-



◆ Tube - VW 415 A-



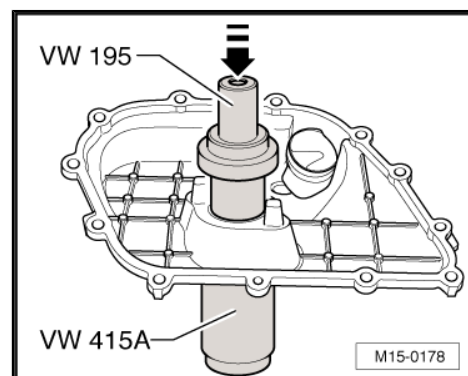
◆ Fitting sleeve -3241/4-



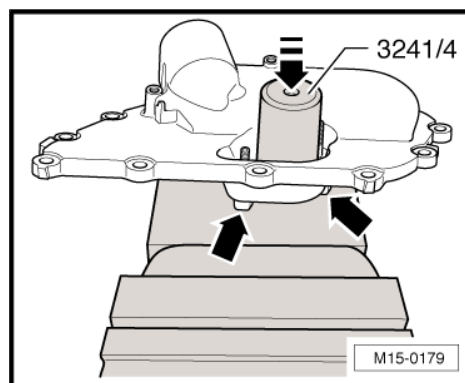
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Procedure

- Remove timing chain cover (top) ⇒ [page 74](#) .
- Use punch - VW 195- to drive out oil seal -arrow-.



- Remove any sealant residue from timing chain cover (top), place cover on a fixed surface with lugs on casting -arrows- facing downwards and press in new seal until it makes contact using fitting sleeve -3241/4- .
- Install timing chain cover (top) ⇒ [page 74](#) .



1.2.3 Removing and installing timing chain cover (bottom)

Special tools and workshop equipment required

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

Removing

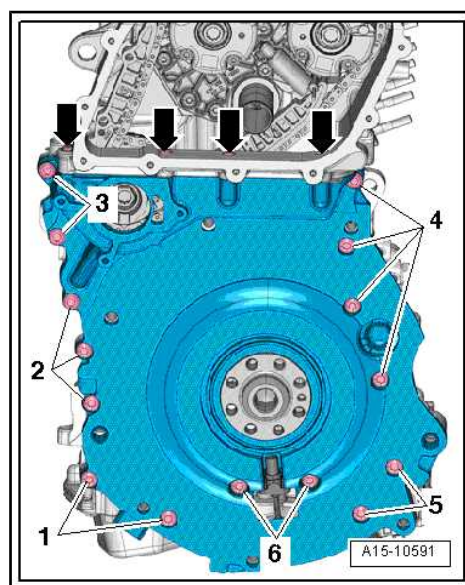
- Gearbox removed ⇒ Rep. gr. 34 ; Removing and installing gearbox; Removing gearbox



Note

Fit all cable ties in the original positions when installing.

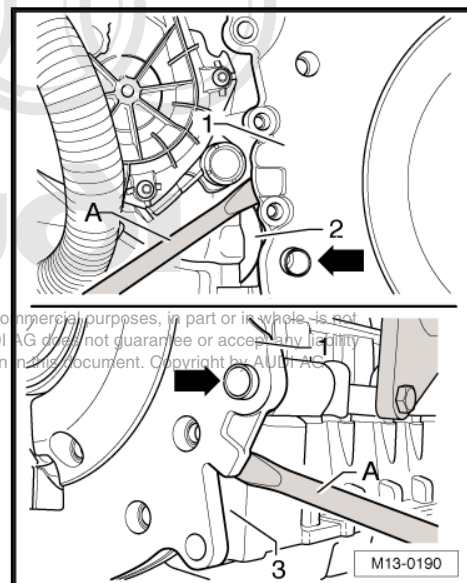
- Remove flywheel ⇒ [page 55](#) .
- Remove timing chain cover (top) ⇒ [page 74](#) .
- Remove vacuum pump ⇒ Brake system; Rep. gr. 47 ; Vacuum system; Removing and installing vacuum pump .
- Remove engine speed sender - G28- ⇒ [page 278](#) .
- First remove bolts -arrows-, then -1 ... 6-.



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- Carefully release timing chain cover (bottom) -1- from bonded joint; to do so, apply screwdriver -A- at the correct positions at top and bottom.
- 2 - Cylinder block
- 3 - Sump (top section)
- Always start to release cover in area of dowel sleeves -arrows-.
- Press crankshaft oil seal (gearbox end) out of timing chain cover (bottom).

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Installing

- Drive back dowel sleeves -arrows- in timing chain cover (bottom) that they do not protrude beyond sealing surface.



Note

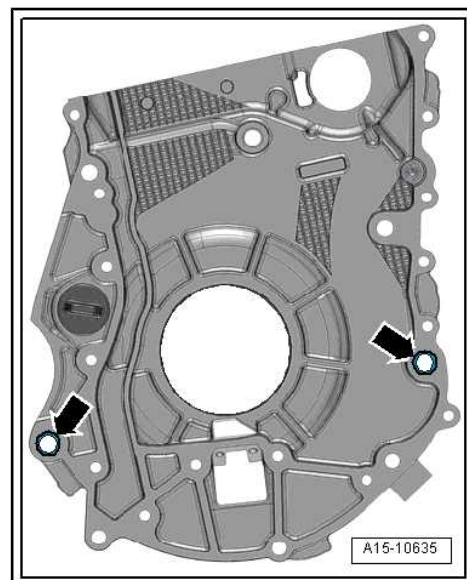
Renew gaskets, seals and O-rings.



Caution

Protect lubrication system against contamination.

- ◆ *Cover exposed parts of the engine.*

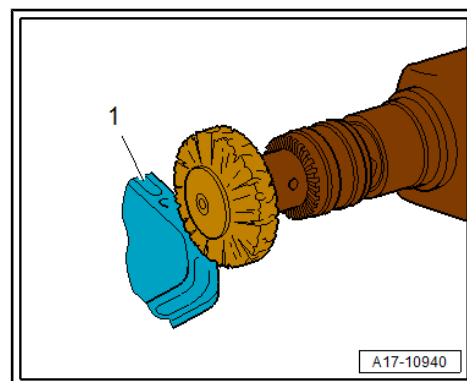


WARNING

Risk of eye injury.

- ◆ *Put on safety goggles.*

- Remove remaining sealant on timing chain cover (bottom) -1-, cylinder block and sump (top section) using rotating plastic brush or similar.
- Clean sealing surfaces; they must be free of oil and grease.

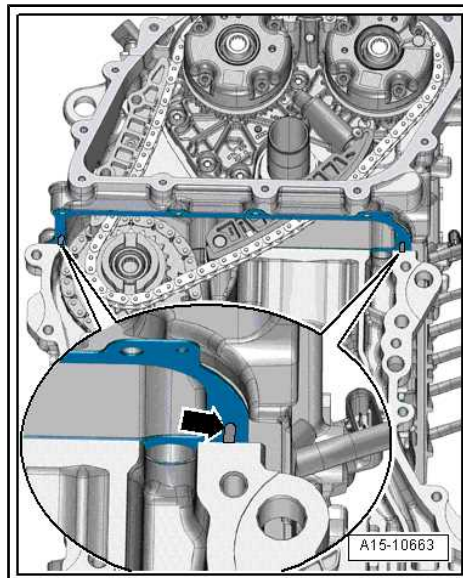


- Clean old sealant from holes -arrow- in cylinder head gasket.



Note

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



Caution

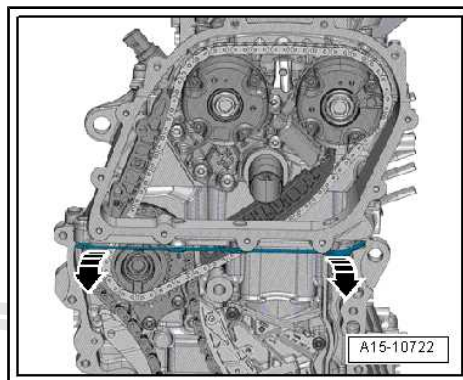
Avoid damage to cylinder head gasket.

- ◆ **Only bend the end of the cylinder head gasket slightly and do not kink.**



Note

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



- Carefully bend the end of the cylinder head gasket down very slightly -arrows-, just far enough to be able to clean the upper sealing surface on the cylinder head gasket and cylinder head.
- Clean cylinder head gasket (top and bottom); it must be free of oil and grease.

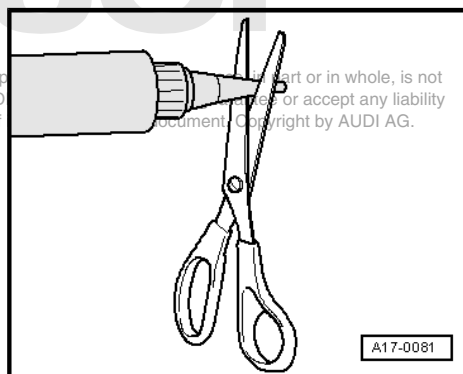


Note

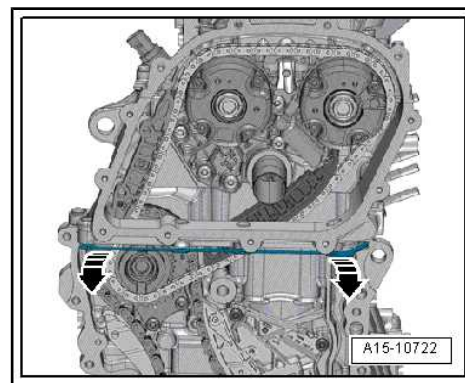
Note the use-by date of the sealant.

- Cut off nozzle of tube at front marking (nozzle Ø approx. 2 mm).

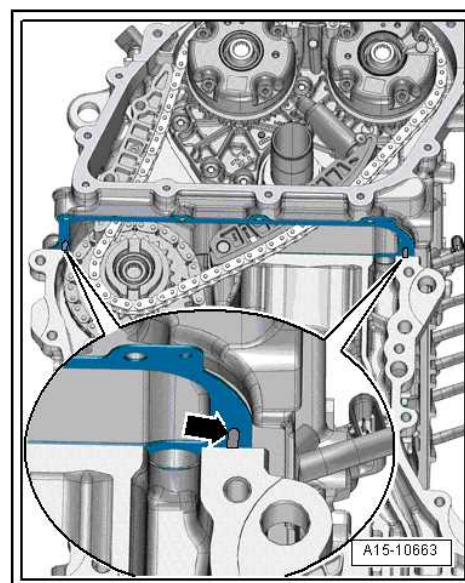
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- Apply a small amount of sealant to sealing surface of cylinder head gasket (top and bottom). To do so, you again have to bend cylinder head gasket down very slightly -arrows-.
- Use a flat object (e.g. a feeler gauge) to apply sealant to the area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



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

**Caution**

Make sure lubrication system is not clogged by excess sealant.

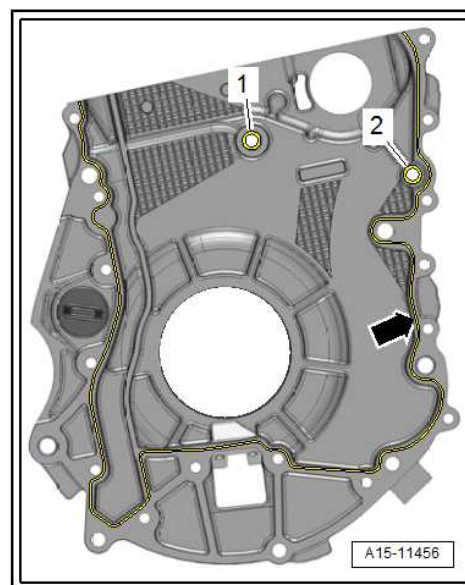
- ◆ *The sealant bead must not be thicker than specified.*

- Apply sealant bead -arrow- onto the clean sealing surface of the timing chain cover (bottom) as illustrated.
- Thickness of sealant bead: 1.5 ... 2.0 mm.

**Note**

The timing chain cover (bottom) must be installed within 5 minutes after applying the sealant.

- Fit dowel sleeve -1- and O-ring -2-.
- Fit timing chain cover (bottom), guiding it towards the sealing surface on cylinder block and cylinder head at an angle and from below.
- Take care not to damage the cylinder head gasket when fitting the cover.



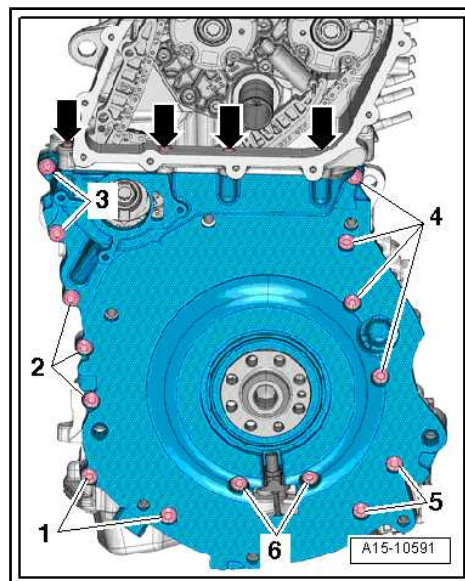
- Initially screw in bolts for timing chain cover (bottom) by hand until they make contact.
- Drive in dowel sleeves from timing chain cover (bottom) into cylinder block in each case until they make contact.
- Tighten bolts for timing chain cover (bottom) ⇒ [page 73](#) .

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

- Install engine speed sender - G28- ⇒ [page 278](#) .
- Install vacuum pump ⇒ Brake system; Rep. gr. 47 ; Vacuum system; Removing and installing vacuum pump .
- Install timing chain cover (top) ⇒ [page 74](#) .
- Install crankshaft oil seal (gearbox end) ⇒ [page 57](#) .
- Install flywheel ⇒ [page 55](#) .

Tightening torques

- ⇒ [Fig. “Timing chain cover \(bottom\) - tightening torque and sequence”](#) , [page 73](#)



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2 Chain drive

⇒ [“2.1 Exploded view - camshaft timing chains”, page 83](#)

⇒ [“2.2 Exploded view - drive chain for valve gear”, page 84](#)

⇒ [“2.3 Removing and installing camshaft timing chain”, page 85](#)

⇒ [“2.4 Removing and installing drive chain for valve gear”, page 91](#)

2.1 Exploded view - camshaft timing chains

1 - Chain sprocket for camshaft timing chain

2 - Guide rail

3 - Bolt

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

4 - Camshaft adjuster for inlet camshaft

- ☐ Identification: “IN”
- ☐ Removing and installing
⇒ [“2.3 Removing and installing camshaft timing chain”, page 85](#)

5 - Bolt

- ☐ 9 Nm

6 - Chain tensioner for camshaft timing chain

7 - Oil strainer

- ☐ Inserted into cylinder head

8 - Gasket

- ☐ Renew after removing

9 - Camshaft adjuster for exhaust camshaft

- ☐ Identification: “EX”
- ☐ Removing and installing
⇒ [“2.3 Removing and installing camshaft timing chain”, page 85](#)

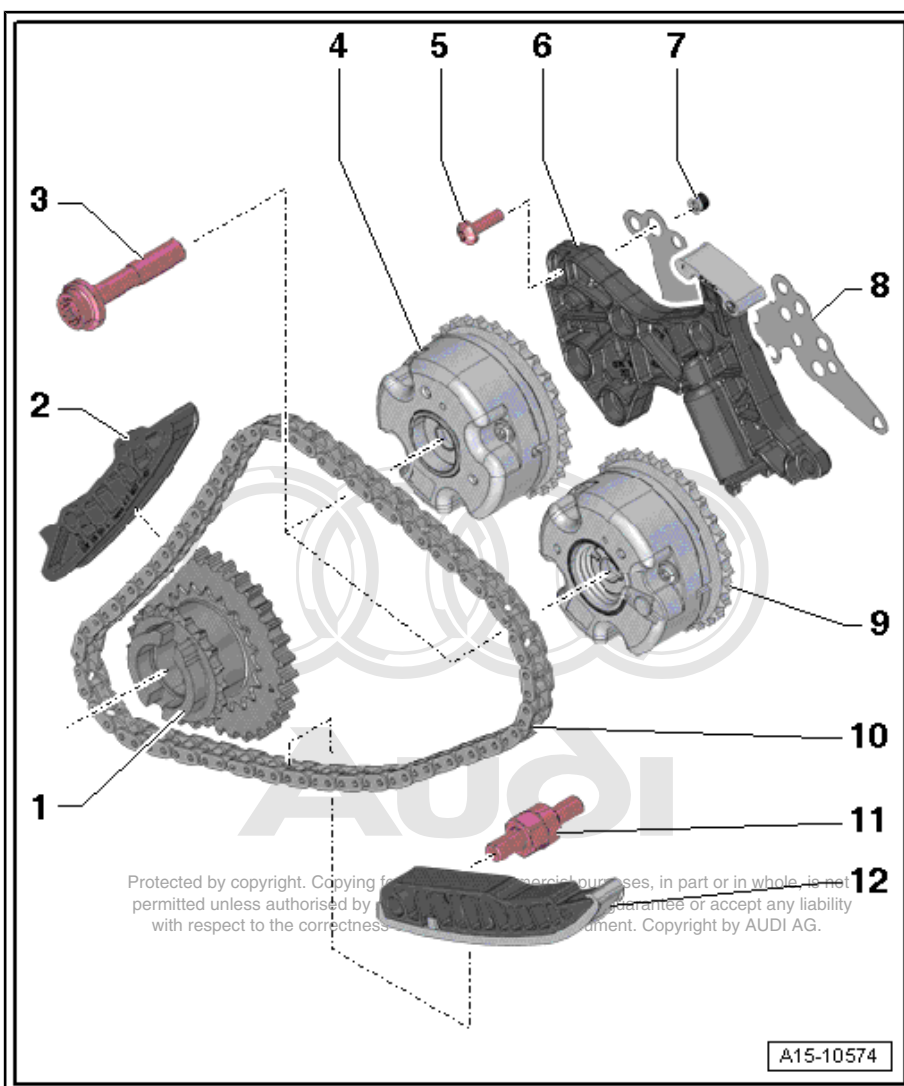
10 - Camshaft timing chain

- ☐ Before removing, mark running direction with paint
- ☐ Removing and installing ⇒ [page 85](#)

11 - Bearing mounting

- ☐ 40 Nm

12 - Tensioning rail



2.2 Exploded view - drive chain for valve gear

1 - Bolt

- ☐ Renew after removing
- ☐ 20 Nm +90°

2 - Drive chain sprocket for oil pump

3 - Guide rail

4 - Bolt

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

5 - Drive chain for valve gear

- ☐ Before removing, mark running direction with paint
- ☐ Removing and installing
⇒ [page 91](#)

6 - Chain sprocket for camshaft timing chain

- ☐ To remove, unscrew bolts -item 4- and -item 9- and detach chain sprocket together with bearing journal -item 7-

7 - Bearing journal for chain sprocket

8 - Thrust washer

9 - Bolt

- ☐ 9 Nm

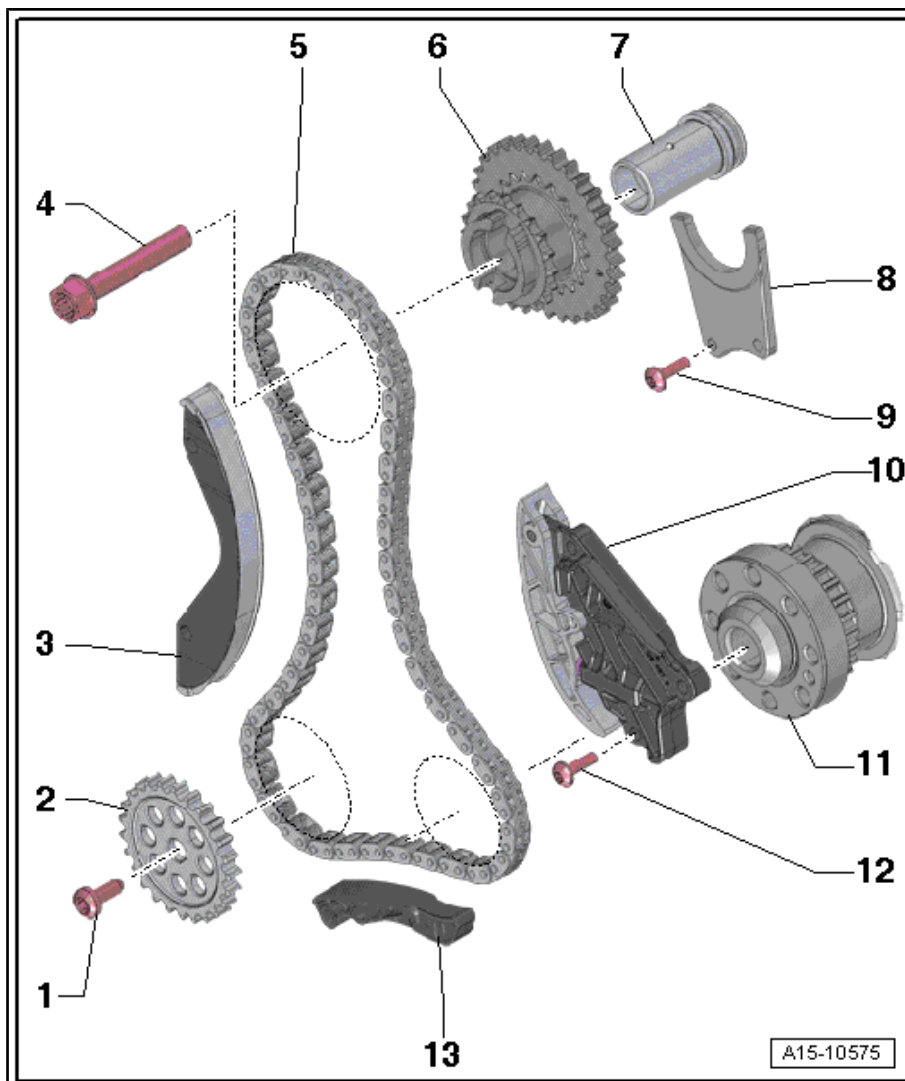
10 - Chain tensioner

11 - Crankshaft

12 - Bolt

- ☐ 9 Nm

13 - Guide rail

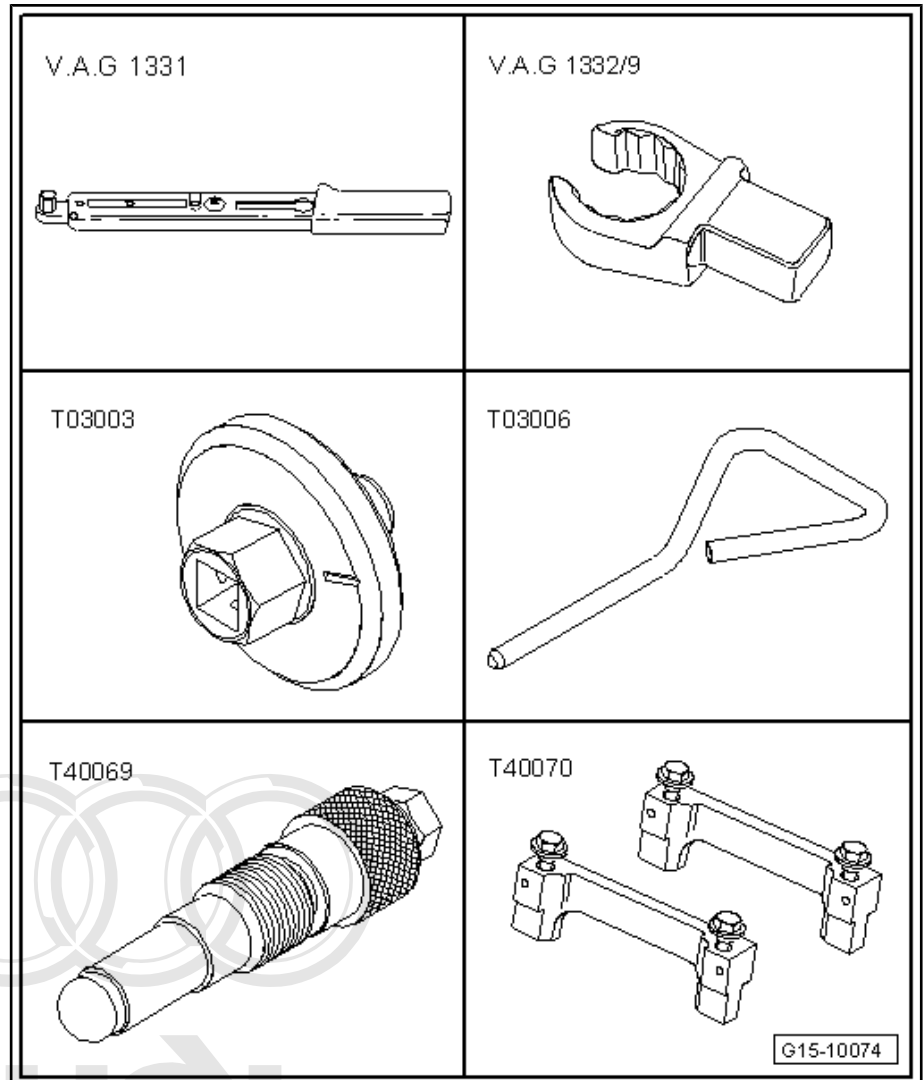


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2.3 Removing and installing camshaft timing chain

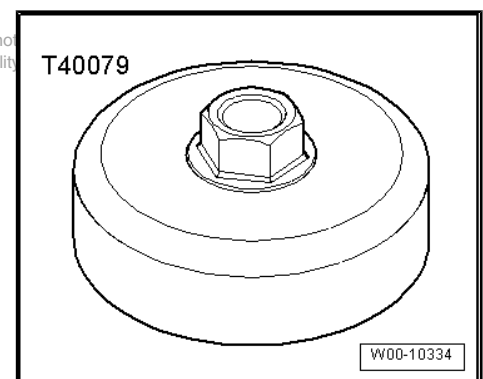
Special tools and workshop equipment required

- ◆ Torque wrench - V.A.G 1331-
- ◆ Tool insert - V.A.G 1332/9-
- ◆ Key - T03003-
- ◆ Locking pin - T03006-
- ◆ Locking pin - T40069-
- ◆ Camshaft clamp - T40070-



- ◆ Key - T40079-

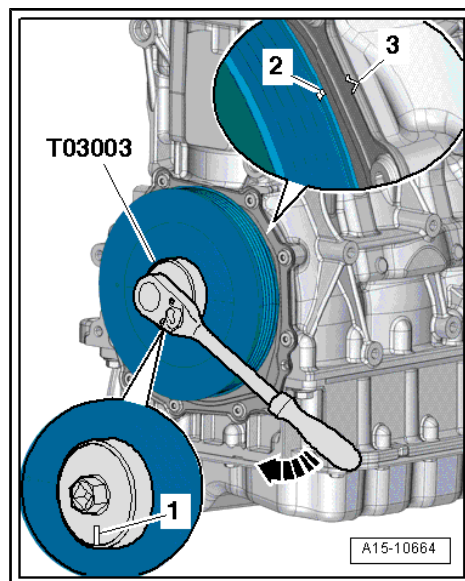
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Removing

- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .
- Remove vacuum pump ⇒ Brake system; Rep. gr. 47 ; Vacuum system; Removing and installing vacuum pump .

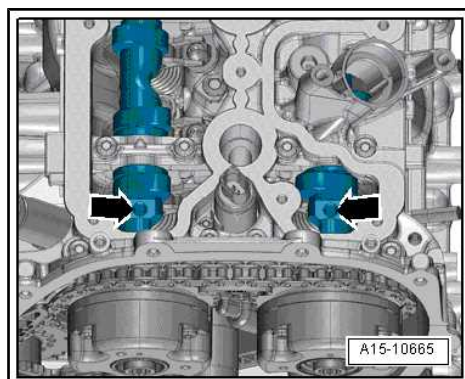
- Remove cylinder head cover ⇒ [page 104](#) .
- Remove timing chain cover (top) ⇒ [page 74](#) .
- Turn crankshaft with wrench - T03003- in normal direction of rotation -arrow- to "TDC" position.
- Notch -1- in wrench - T03003- must be perpendicular to sealing surface of sump.
- Marking -2- on vibration damper must be opposite marking -3- on sealing flange.



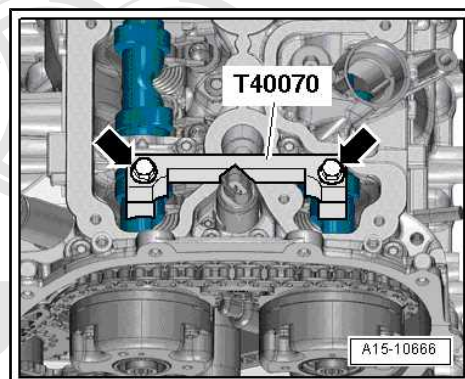
- The threaded holes -arrows- in the camshafts must face upwards.


Note

Turn crankshaft by 360° if the threaded holes do not point upwards.

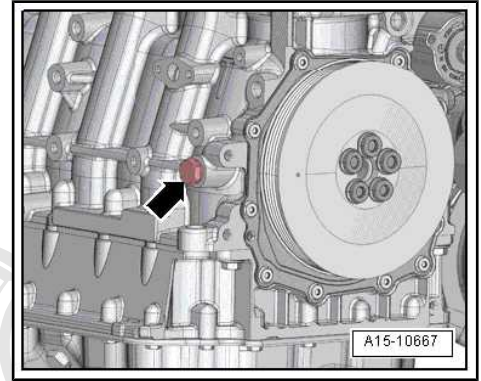


- Fit camshaft clamp - T40070- onto cylinder head and tighten bolts -arrows- to 25 Nm.
- The camshaft clamp - T40070- is positioned correctly if the holes for the cylinder head bolts remain free.

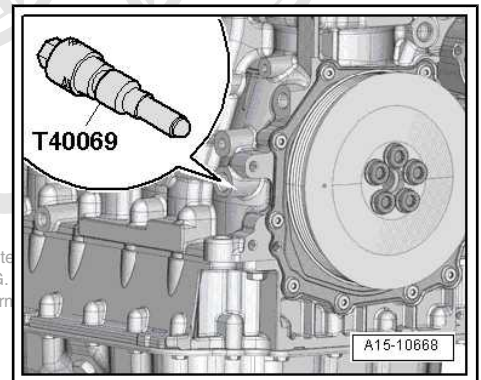


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- Unscrew plug -arrow- for “TDC” marking from cylinder block.



- Screw locking pin - T40069- into locating groove and tighten to 15 Nm. If necessary, turn crankshaft backwards and forwards slightly to fully centralise locking pin.



- Press guide rail of chain tensioner for camshaft timing chain inwards as far as the stop using a screwdriver. Then lock chain tensioner by inserting locking pin - T03006- .



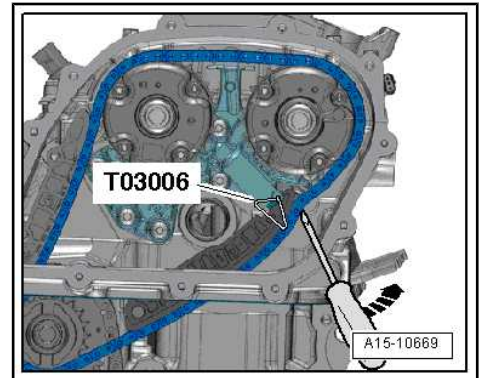
Caution

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

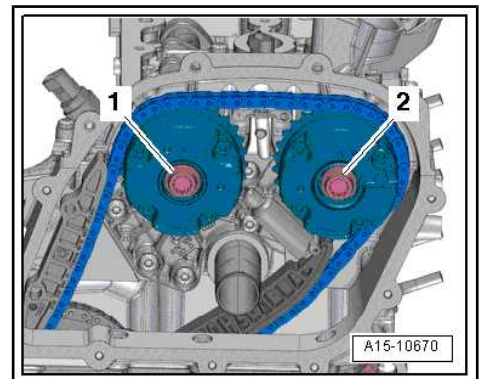
- ◆ *Mark running direction of timing chain with coloured arrows for re-installation. Do not mark timing chain by means of centre punch, notch or the like.*

Risk of irreparable damage to engine.

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



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



- Detach camshaft timing chain from drive chain sprocket -arrow- for camshaft timing chain.

Installing



Note

Renew the bolts tightened with specified tightening angle.

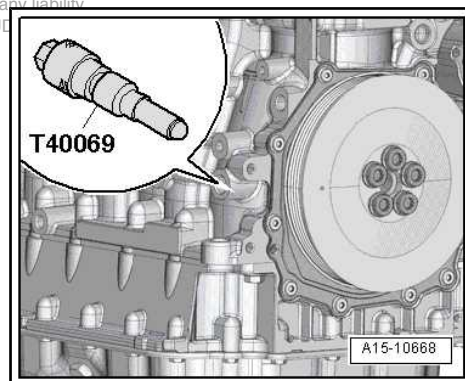
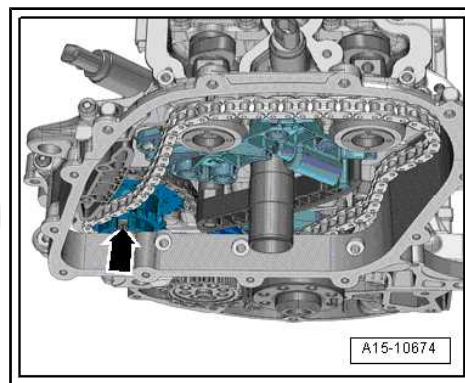


Caution

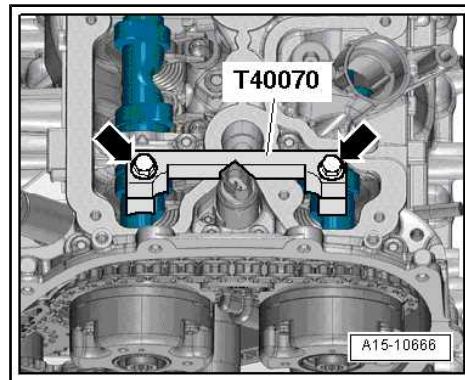
Risk of damage to valves and piston crowns.

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

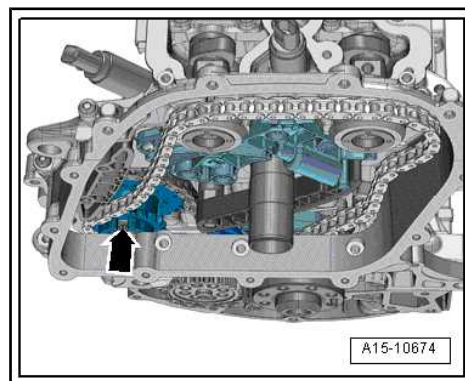
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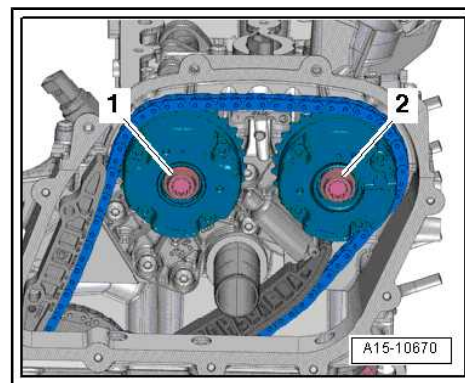
- Drive chain for valve gear installed ⇒ [page 91](#)
- Crankshaft locked in position with locking pin - T40069- .
- Camshaft clamp - T40070- installed and tightened to 25 Nm -arrows-.



- Fit camshaft timing chain onto drive chain sprocket -arrow- for camshaft timing chain.



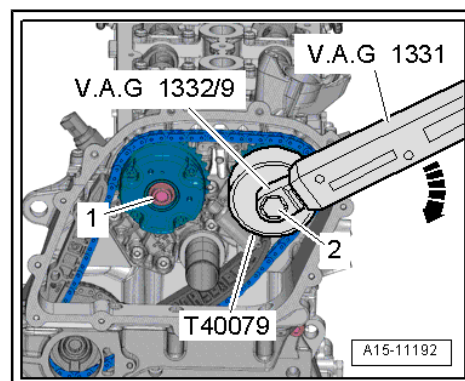
- Install camshaft adjusters according to marks applied when removing ⇒ [Item 4 \(page 83\)](#) and ⇒ [Item 9 \(page 83\)](#) .
- Attach camshaft adjusters with camshaft timing chain fitted, fit bolts -1- and -2- without tightening.
- It should just be possible to turn both camshaft adjusters on the camshaft without axial movement.
- Remove locking pin - T03006- .



Note

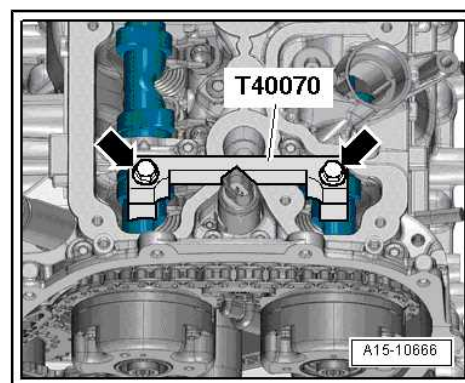
A second mechanic is required for the following work steps.

- Fit key - T40079- onto camshaft adjuster of exhaust camshaft.
- Apply torque wrench - V.A.G 1331- with open ring spanner insert - V.A.G 1332/9- to key - T40079- .
- Have a 2nd mechanic apply a torque of 25 Nm to camshaft adjuster in clockwise direction -arrow-.
- Tighten bolts as follows while keeping camshaft adjuster under tension:



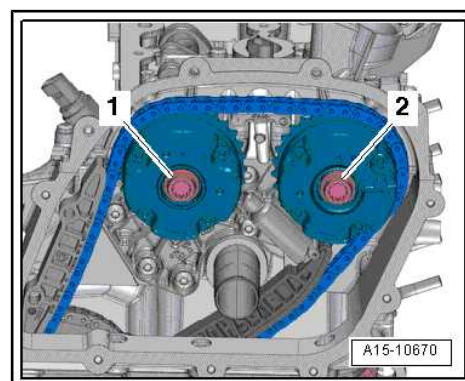
Stage	Bolt	Tightening torque
1.	-1-	On inlet camshaft: 60 Nm
1.	-2-	On exhaust camshaft: 60 Nm

- Remove key - T40079- .
- Remove camshaft clamp - T40070- -arrows-.

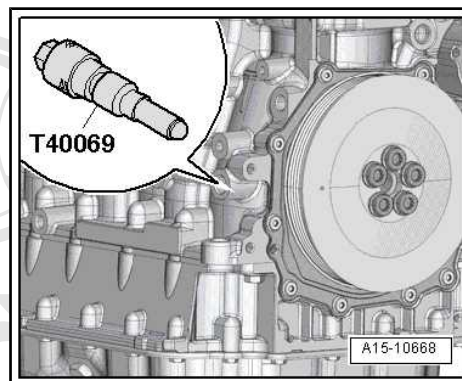


- Tighten bolts for camshaft adjusters in the following sequence:

Stage	Bolt	Angle to turn bolts
2.	-1-	90°
2.	-2-	90°



- Remove locking pin - T40069- .

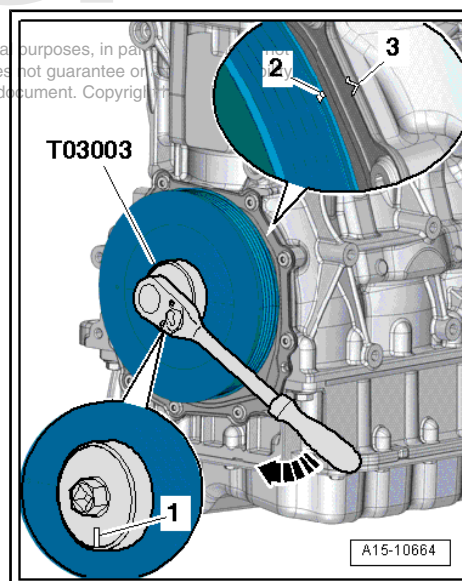


- Using wrench - T03003- , turn crankshaft 2 revolutions in normal direction of rotation -arrow- until crankshaft is at "TDC" again.
- Notch -1- in wrench - T03003- must be perpendicular to sealing surface of sump.
- Marking -2- on vibration damper must be opposite marking -3- on sealing flange.



Note

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

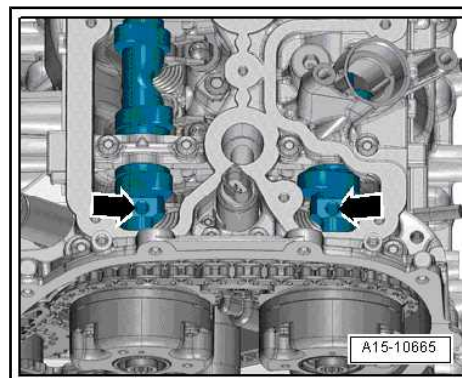


- The threaded holes -arrows- in the camshafts must face upwards.

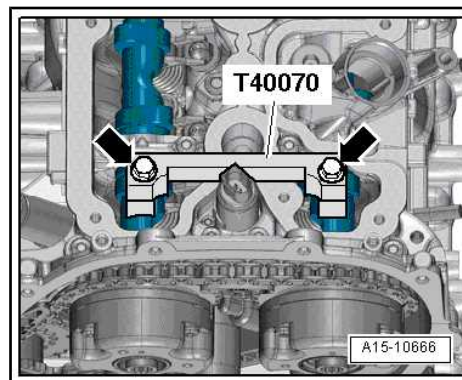


Note

Turn crankshaft by 360° if the threaded holes do not point upwards.



- Fit camshaft clamp - T40070- and tighten bolts -arrows- to 25 Nm.
- The camshaft clamp - T40070- is positioned correctly if the holes for the cylinder head bolts remain free.



- Screw locking pin - T40069- into locating groove and tighten to 15 Nm.
- The locking pin - T40069- must engage in the groove in the crankshaft. If it does not, reset valve timing.
- Remove camshaft clamp.
- Remove locking pin.

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

- Install timing chain cover (top) ⇒ [page 74](#) .
- Install cylinder head cover ⇒ [page 104](#) .
- Install vacuum pump ⇒ Brake system; Rep. gr. 47 ; Vacuum system; Removing and installing vacuum pump .

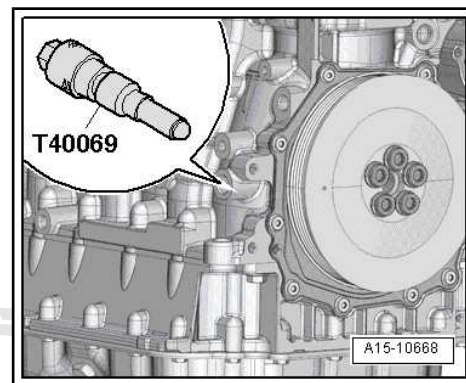
Tightening torques

- ◆ ⇒ Fig. ““Plug for TDC marking - tightening torque””, page 62
- ◆ ⇒ “2.1 Exploded view - camshaft timing chains”, page 83
- ◆ ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

2.4 Removing and installing drive chain for valve gear

Special tools and workshop equipment required

- ◆ Locking pin - T03006-



Removing

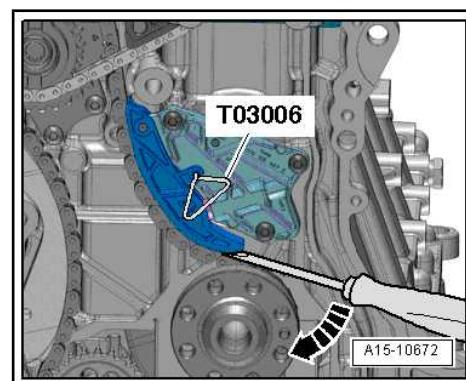
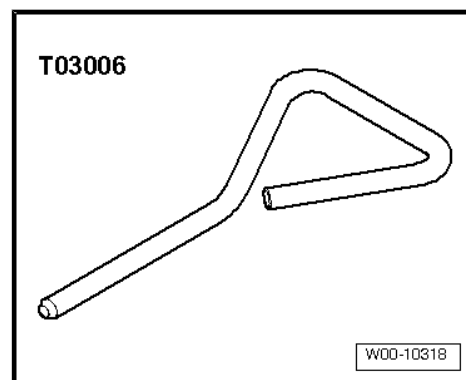
- Gearbox removed ⇒ Rep. gr. 34 ; Removing and installing gearbox; Removing gearbox
- Remove camshaft timing chain ⇒ [page 85](#) .
- Remove timing chain cover (bottom) ⇒ [page 78](#) .
- Press guide rail of chain tensioner for drive chain in direction of -arrow- and lock chain tensioner by inserting locking pin - T03006- .



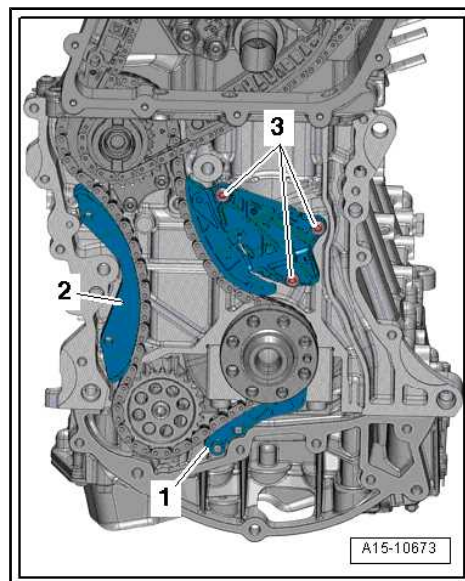
Caution

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

- ◆ *Mark running direction of drive chain with paint for re-installation. Do not mark drive chain by means of centre punch, notch or the like.*



- Remove bolts -3- and take off chain tensioner.
- Detach guide rails -1- and -2-.



- Remove bolts -3-.
- Detach thrust washer -1-.
- Pull drive sprocket -2- for camshaft timing chain slightly off engine.
- Detach drive chain for valve gear.

Installing

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



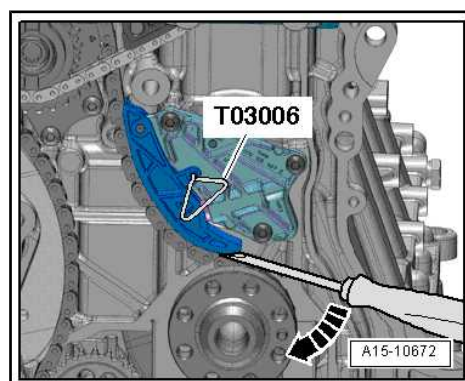
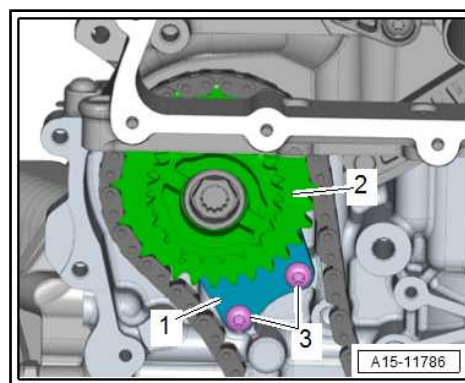
Note

Renew the bolts tightened with specified tightening angle.

- Position drive chain for valve gear onto drive chain sprockets (according to marks applied during removal).
- Install guide rails -1- and -2-.
- Install chain tensioner and tighten bolts -3-.
- Press guide rail of chain tensioner for drive chain in direction of -arrow- and remove locking pin - T03006- .
- Install timing chain cover (bottom) ⇒ [page 78](#) .
- Install camshaft timing chain ⇒ [page 85](#) .

Tightening torques

- ◆ ⇒ [“2.2 Exploded view - drive chain for valve gear”, page 84](#)



3 Cylinder head

⇒ [“3.1 Exploded view - cylinder head”, page 93](#)

⇒ [“3.2 Removing and installing cylinder head”, page 95](#)

⇒ [“3.3 Removing and installing cylinder head cover”, page 104](#)

⇒ [“3.4 Checking compression”, page 106](#)

3.1 Exploded view - cylinder head

1 - Cylinder head gasket

- ☐ Renewing
⇒ [“3.2 Removing and installing cylinder head”, page 95](#)
- ☐ Note installation position: part number must face cylinder head
- ☐ Apply sealant when installing; refer to ⇒ Electronic parts catalogue

2 - Plug

- ☐ Renew after removing
- ☐ 15 Nm

3 - Cylinder head

- ☐ Removing and installing
⇒ [page 95](#)
- ☐ Should be positioned on dowel pins
- ☐ Checking for distortion
⇒ [page 95](#)
- ☐ Cylinder head machining limit ⇒ [page 95](#)
- ☐ If renewed, change coolant and engine oil

4 - Engine lifting eye

5 - Bolt

- ☐ 22 Nm

6 - Gasket

- ☐ For cylinder head cover
- ☐ Renew if damaged or leaking

7 - Cylinder head cover

- ☐ Removing and installing ⇒ [page 104](#)

8 - Bolt

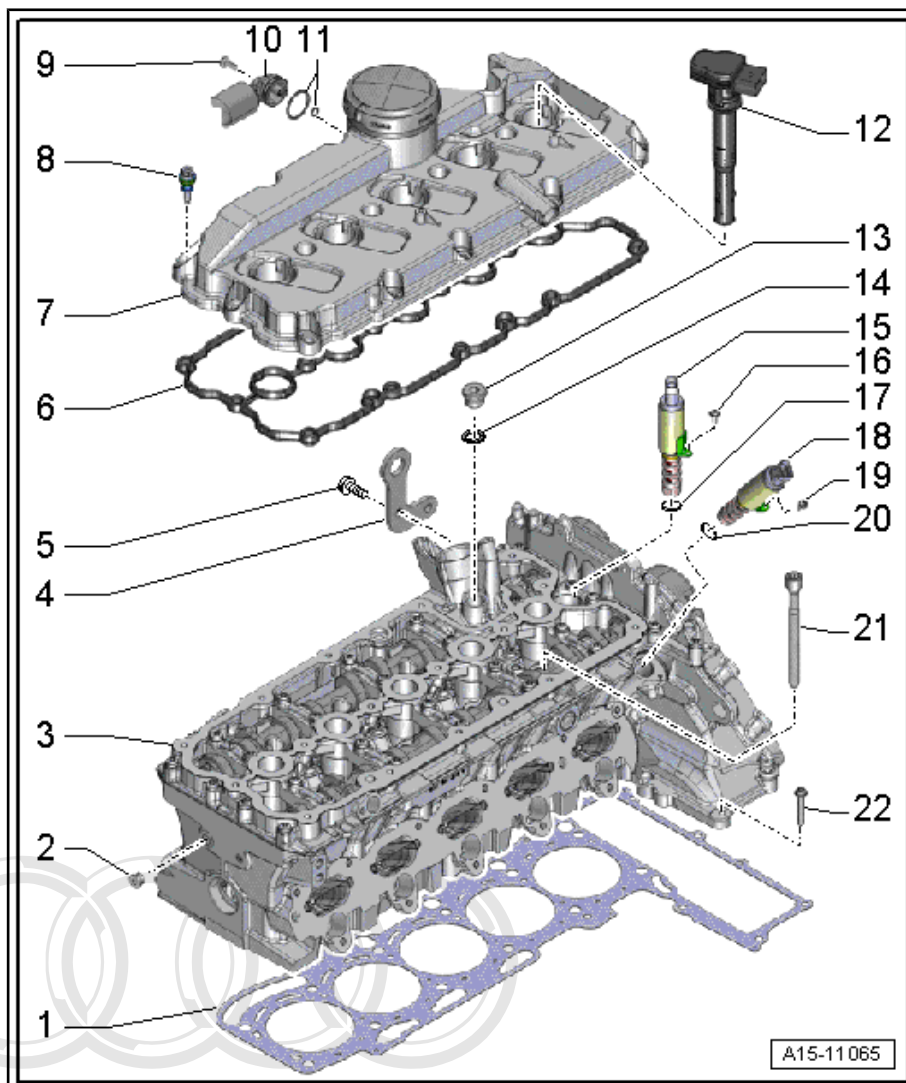
- ☐ Renew if gasket is damaged
- ☐ Tightening sequence ⇒ [page 94](#)

9 - Bolt

- ☐ 3.2 Nm

10 - Housing

- ☐ For crankcase breather



11 - Seals

- ☐ Renew after removing

12 - Ignition coil

- ☐ Removing and installing ⇒ [page 275](#)

13 - Plug

- ☐ 35 Nm

14 - Seal

- ☐ Renew after removing

15 - Camshaft control valve 1 - N205-

- ☐ Removing and installing ⇒ [page 116](#)

16 - Bolt

- ☐ 2.4 Nm

17 - O-ring

- ☐ Renew after removing

18 - Exhaust camshaft control valve 1 - N318-

- ☐ Removing and installing ⇒ [page 117](#)

19 - Bolt

- ☐ 2.4 Nm

20 - O-ring

- ☐ Renew after removing

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21 - Bolt

- ☐ Renew after removing
- ☐ Note correct sequence when loosening ⇒ [page 101](#)
- ☐ Tightening torque and sequence ⇒ [page 95](#)

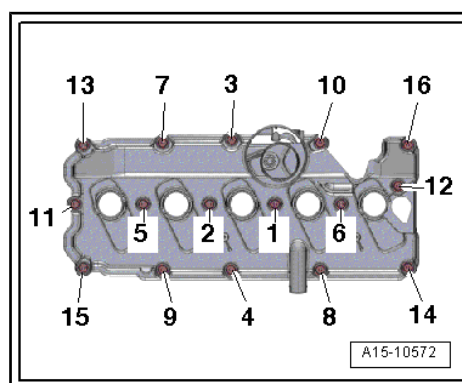
22 - Bolt

- ☐ Renew after removing
- ☐ Note correct sequence when loosening ⇒ [page 101](#)
- ☐ Tightening torque and sequence ⇒ [page 95](#)

Cylinder head cover - tightening torque and sequence

– Tighten bolts in 2 stages in the sequence shown:

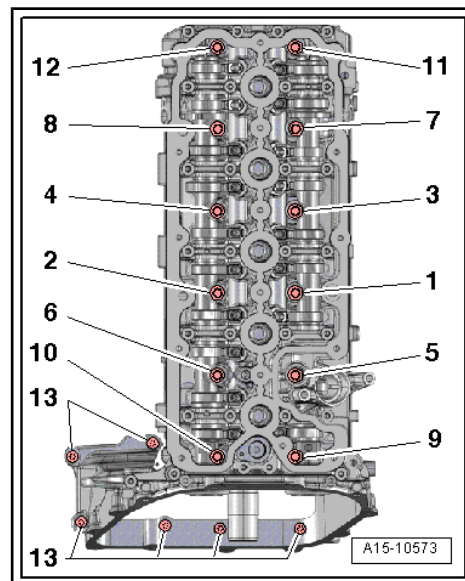
Stage	Bolt	Tightening torque
1.	-1 ... 16-	Screw in by hand until contact is made
2.	-1 ... 16-	10 Nm



Cylinder head - tightening torque and sequence

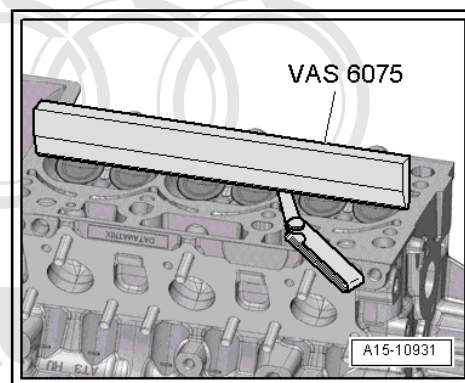
– Tighten bolts in 6 stages in the sequence shown:

Stage	Bolts	Tightening torque/tightening angle
1.	-1 ... 12-	10 Nm
2.	-1 ... 12-	40 Nm
3.	-1 ... 12-	Turn 90° further
4.	-1 ... 12-	Turn 90° further
5.	-13-	8 Nm
6.	-13-	Turn 90° further



Checking cylinder head for distortion

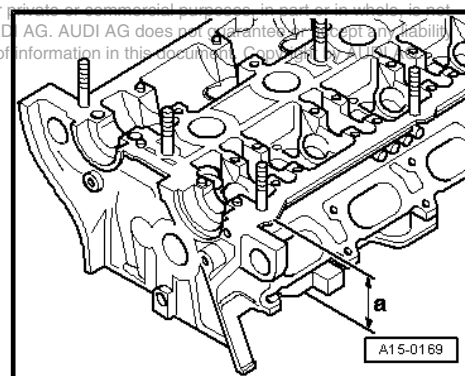
- Use straight edge 500 mm - VAS 6075- and feeler gauge to measure cylinder head for distortion at several points.
- Max. permissible distortion: 0.05 mm.



Cylinder head machining limit

Machining of the cylinder head (surface grinding) is only permissible down to the minimum dimension -a-.

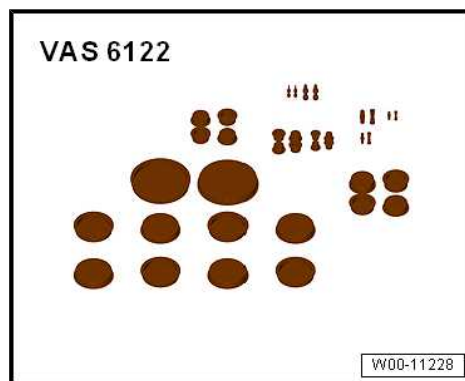
- Minimum dimension: -a- = 139.20 mm



3.2 Removing and installing cylinder head

Special tools and workshop equipment required

◆ Engine bung set - VAS 6122-



◆ Hose clip pliers - VAS 6362-



◆ Special wrench - T10070- or commercially available socket XZN M12 (at least 140 mm)



Removing



Note

Fit all cable ties in the original positions when installing.



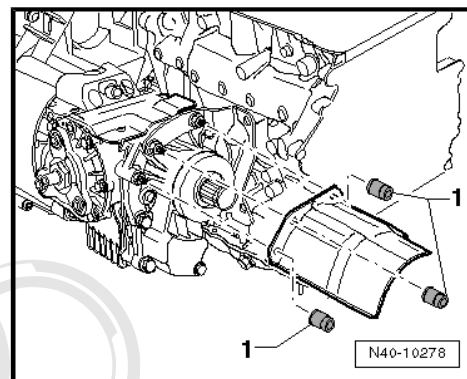
Caution

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

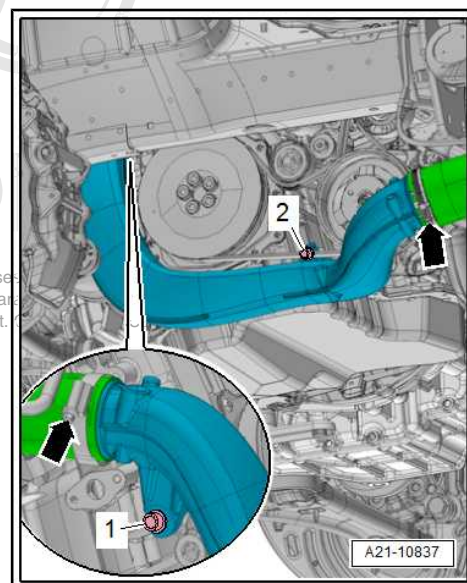
- ◆ **Observe notes on procedure for disconnecting the battery.**

- Disconnect battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .
- Drain coolant ⇒ [page 159](#) .
- Remove catalytic converters ⇒ [page 270](#) .

- Remove nuts -1- and detach heat shield for drive shaft (right-side).



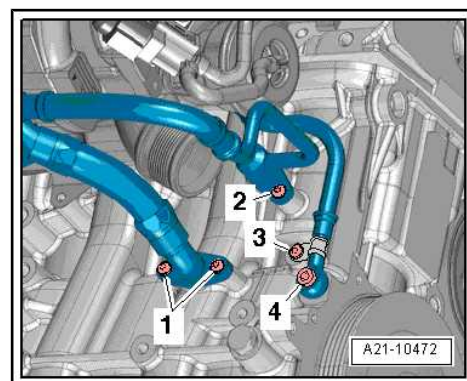
- Remove bolts -1, 2-.
- Loosen hose clips -arrows- and detach air pipe.



 Note

Place a cloth underneath to catch escaping coolant and engine oil.

- Unscrew bolts -1, 2, 3- and banjo bolt -4- and detach pipes from cylinder block.
- Seal off open lines and connections with clean plugs from engine bung set - VAS 6122- .
- Remove intake manifold (top section) ⇒ [page 230](#) .



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

Risk of damage caused by particles of dirt.

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

- Disconnect fuel supply line -2- (pull release ring) and move clear.
- Disconnect hose -1- at activated charcoal filter (press release tab) and move hose clear.
- Seal off open lines and connections with clean plugs from engine bung set - VAS 6122- .

- Remove nut -4- and move earth wire clear.

- Unplug electrical connectors:

1 - Charge pressure control solenoid valve - N75-

2 - Hall sender 3 - G300-

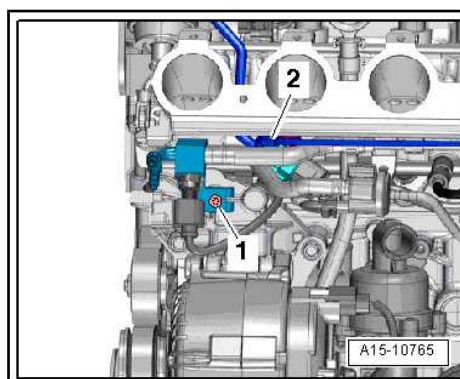
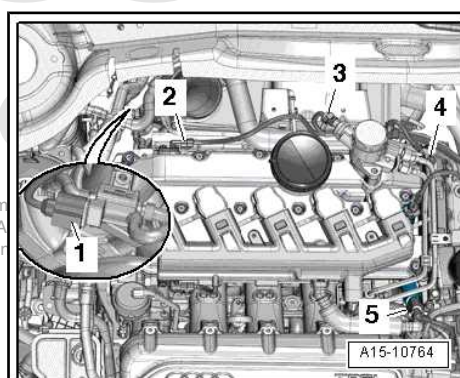
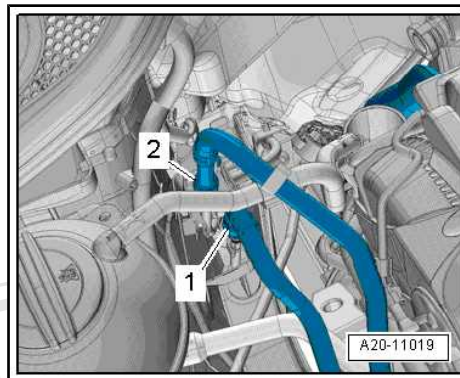
3 - Fuel metering valve - N290-

5 - Camshaft control valve 1 - N205-

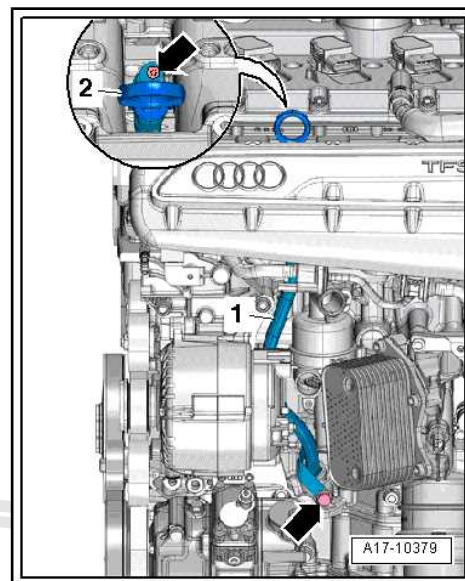
- Move electrical wiring harness clear.

- Remove bolt -1-.

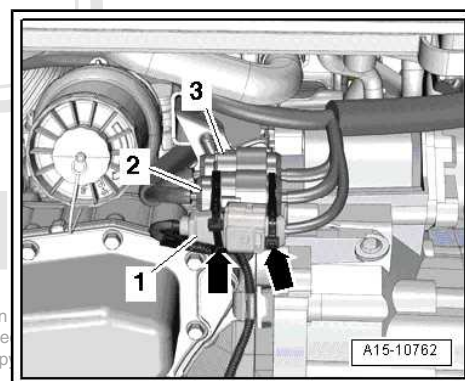
- Detach vacuum hose -2- and move clear.



- Pull out oil dipstick -2-.
- Remove bolts -arrows- and pull guide tube -1- for oil dipstick out of cylinder block (leave in installation position).
- Remove camshaft timing chain [⇒ page 85](#).

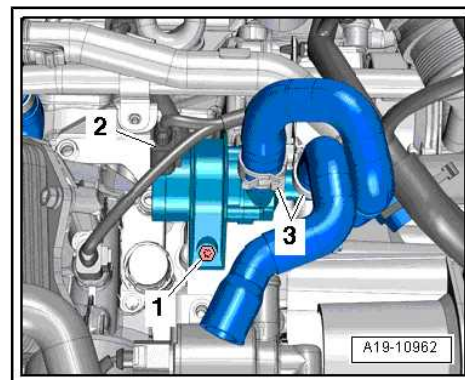


- Take electrical connector -1- out of bracket and move it clear; to do so, cut open cable ties (if fitted) -arrows-.
- Take electrical connectors -2- and -3- out of bracket.
- Move electrical wiring harness clear.

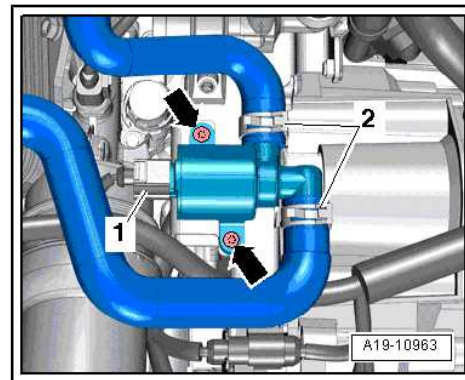


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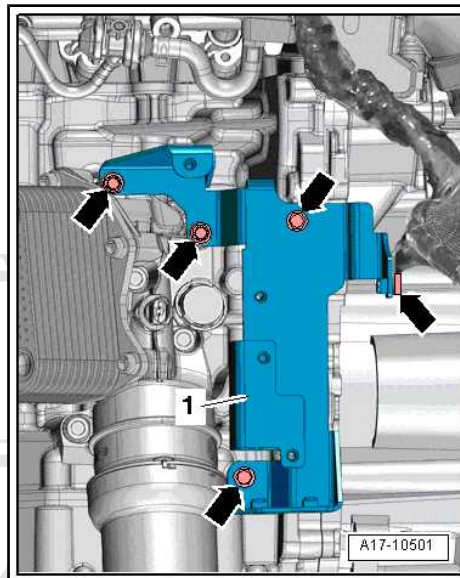
- Unplug electrical connector -2-.
- Unscrew bolt -1- and move continued coolant circulation pump - V51- to one side (coolant hoses -3- remain connected).



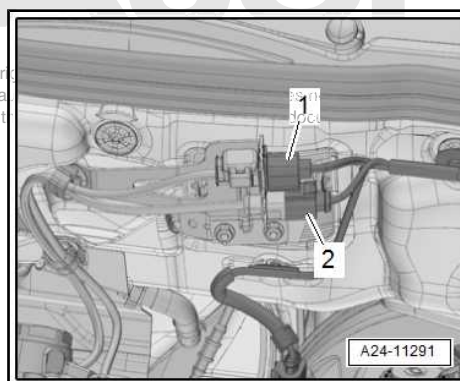
- Unplug electrical connector -1-.
- Unscrew bolts -arrows- and move solenoid valve for coolant circuit - N492- to one side (coolant hoses -2- remain connected).



- Unscrew bolts -arrows- and detach bracket -1-.
- Move electrical wiring clear.



- Detach electrical connectors from bracket and unplug.
- 1 - For Lambda probe - G39-
- 2 - For Lambda probe after catalytic converter - G130-
- Move clear electrical wire leading to Lambda probes.

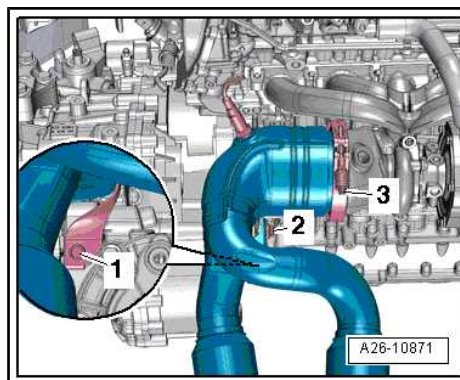


- Loosen bolt -3- and push clamp onto starter catalytic converter.
- Remove bolt -2-, tie up starter catalytic converter to rear.



Note

Disregard -item 1-.

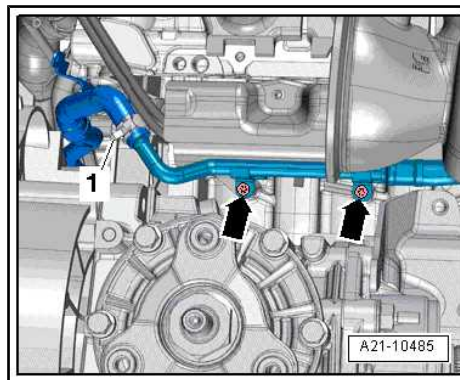


- Remove bolts -arrows-.



Note

Disregard -item 1-.



- Loosen and remove cylinder head bolts in sequence -13 ... 1-.

**Note**

- ◆ *If bolt -10- cannot be removed with a magnet, loosen bolts of camshaft clamp - T40070- one turn, push -T40070- to front right and tighten bolts again.*
- ◆ *Two mechanics are needed to remove the cylinder head.*
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- Detach cylinder head; pay attention to guide tube for oil dipstick when doing so.

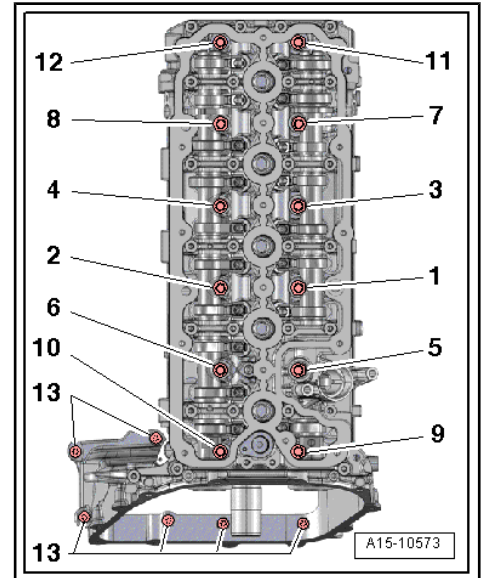
**Caution**

Risk of irreparable damage to engine.

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

Avoid damage to cylinder walls.

- ◆ *Cover cylinders with clean cloths to prevent metal particles and emery remains from entering the space between cylinder wall and piston.*



Installing

- Camshafts locked in position with camshaft clamp - T40070 -



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.

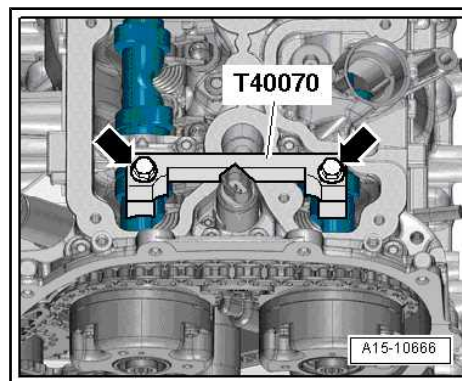
- ◆ *No oil or coolant must be allowed to remain in the blind holes for the cylinder head bolts in the cylinder block.*

Risk of leaks at cylinder head gasket.

- ◆ *Carefully remove any sealant residue from the cylinder head and cylinder block. Ensure that no long scores or scratches are made on the surfaces.*
- ◆ *Carefully remove any remaining emery and abrasive material.*
- ◆ *Do not remove new cylinder head gasket from packaging until it is ready to be fitted.*
- ◆ *Handle the cylinder head gasket very carefully to prevent damage to the silicone coating or the indented area of the gasket.*

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.*



Note

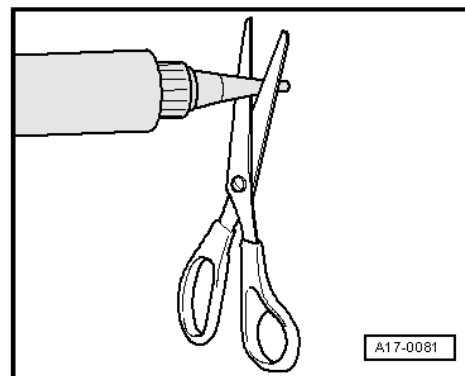
- ◆ *Renew the bolts tightened with specified tightening angle.*
 - ◆ *Renew self-locking nuts as well as seals, gaskets and O-rings.*
 - ◆ *When installing an exchange cylinder head, the contact surfaces between the hydraulic compensation elements, roller rocker fingers and cams must be oiled before installing the cylinder head.*
 - ◆ *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 .*
 - ◆ *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 coolant.*
- Clean sealing surfaces; they must be free of oil and grease.

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 Note

Note the use-by date of the sealant.

- Cut off nozzle of tube at front marking (nozzle $\varnothing$ approx. 2.0 mm).

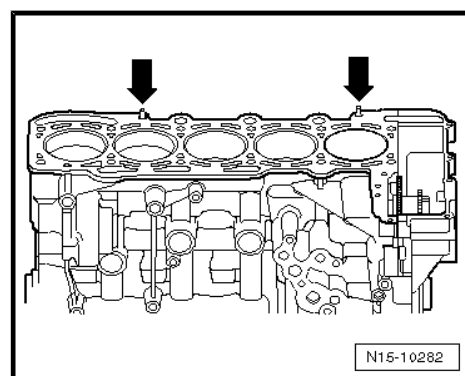
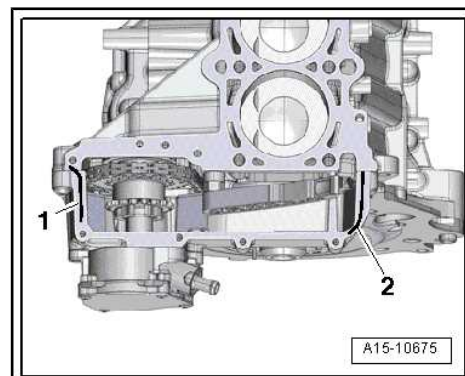


Caution

Make sure lubrication system is not clogged by excess sealant.

◆ The sealant beads must not be thicker than specified.

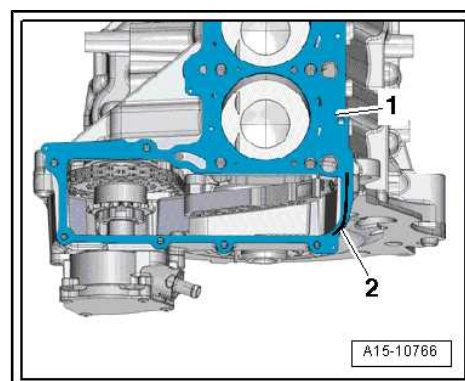
- Apply beads of sealant -1- and -2- onto clean sealing surfaces of cylinder block as shown in illustration.
- Thickness of sealant bead: 2.0 ... 2.5 mm.
- Place cylinder head gasket in position.
- Installation position: Part No. must be visible.
- Pay attention to dowel sleeves -arrows- in cylinder block.



- Apply bead of sealant -2- onto cylinder head gasket -1- as shown in illustration.

 Note

The cylinder head must be installed within 5 minutes after applying the sealant.



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- Fit cylinder head.
- Tighten cylinder head bolts ⇒ [page 95](#) .



Note

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

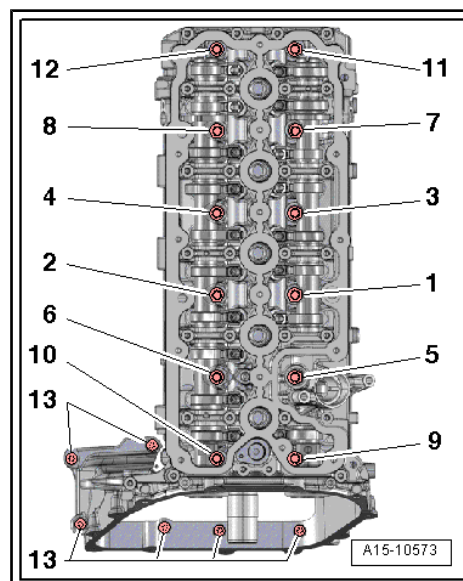
- Wipe off surplus sealant.

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

- Install camshaft timing chain ⇒ [page 85](#) .
- Install intake manifold (top section) ⇒ [page 230](#) .
- Install turbocharger ⇒ [page 200](#) .
- Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- Observe steps required after re-connecting battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .
- Change engine oil ⇒ Maintenance ; Booklet 820 .
- Fill cooling system with fresh coolant ⇒ [page 159](#) .

Tightening torques

- ◆ ⇒ [Fig. “Cylinder head - tightening torque and sequence”](#), [page 95](#)
- ◆ ⇒ [“3.1 Exploded view - cylinder head”](#), [page 93](#)
- ◆ ⇒ [Fig. “Guide tube for oil dipstick - tightening torque”](#), [page 132](#)
- ◆ ⇒ [“3.1 Exploded view - oil filter housing/oil pressure switches”](#), [page 148](#)
- ◆ Continued coolant circuit pump - V51- , solenoid valve for coolant circuit - N492-
⇒ [“2.1 Exploded view - coolant pump/thermostat”](#), [page 166](#)
- ◆ Coolant return hose/pipe
⇒ [“1.1 Exploded view - turbocharger”](#), [page 200](#)
- ◆ Air pipe
⇒ [“2.1 Exploded view - charge air system”](#), [page 210](#)
- ◆ Starter catalytic converter
⇒ [“2.1 Exploded view - emission control system”](#), [page 269](#)
- ◆ Heat shield for drive shaft ⇒ Running gear, axles, steering;
Rep. gr. 40 ; Drive shaft; Exploded view - drive shaft

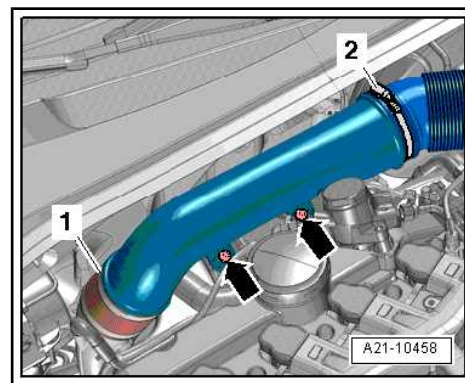


3.3 Removing and installing cylinder head cover

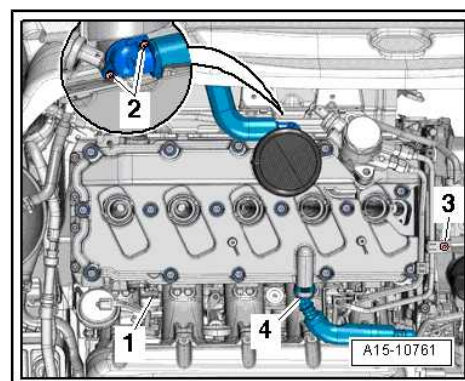
Removing

- Remove exhaust camshaft control valve 1 - N318-
⇒ [page 117](#) .
- Remove ignition coils ⇒ [page 275](#) .

- Remove bolts -arrows-.
- Release hose clips -1- and -2- and remove air pipe.



- Unplug electrical connector -1- and move electrical wiring harness clear.
- Remove bolts -2- and detach crankcase breather hose.
- Detach crankshaft breather hose -4- on opposite side (press release tabs on both sides).
- Remove bolt -3-, detach retaining clip for fuel line.



- Slacken cylinder head cover bolts in the sequence -16 ... 1-.
- Remove bolts and take off cylinder head cover.

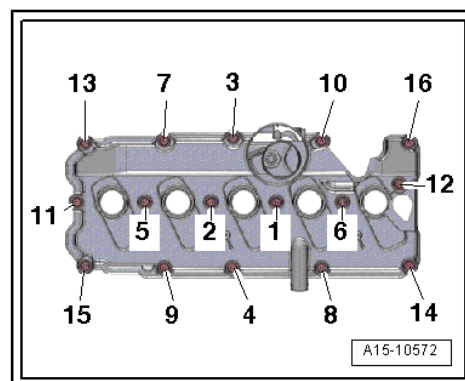
Installing

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



Note

- ◆ *Renew gasket for cylinder head cover if damaged.*
- ◆ *Renew bolts for cylinder head cover if seals on bolts are damaged.*
- ◆ *Fit new O-rings.*
- ◆ *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- ◆ *The screw sections of used screw-type clips must be sprayed with rust remover prior to fitting so that the air hoses can be attached securely to the hose connections.*



- Install ignition coils ⇒ [page 275](#) .
- Install exhaust camshaft control valve 1 - N318-
⇒ [page 117](#) .

Tightening torques

- ◆ ⇒ [Fig. "Cylinder head cover - tightening torque and sequence"](#) , [page 94](#)
- ◆ Air pipe ⇒ ["1.1 Exploded view - turbocharger"](#) , [page 200](#)

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3.4 Checking compression

Special tools and workshop equipment required

- ◆ Spark plug spanner - 3122 B-

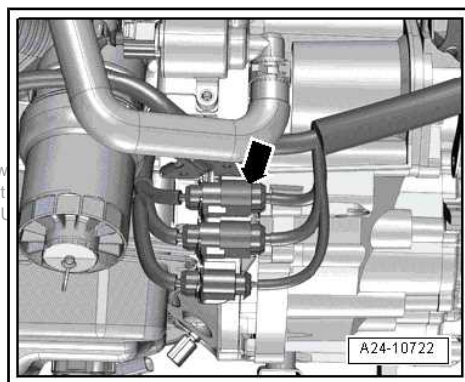


- ◆ Compression tester - V.A.G 1763-



Procedure

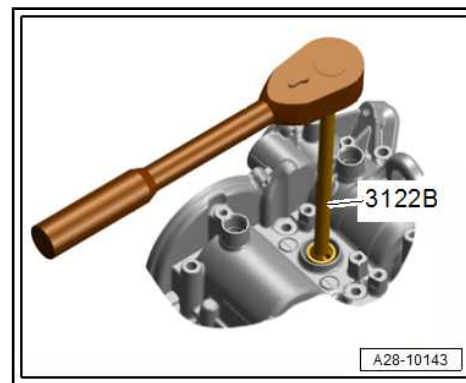
- Engine oil temperature at least 30 °C
- Battery voltage at least 12.5 V
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .
- Unplug electrical connector -arrow- for injectors.
- Remove ignition coils ⇒ [page 275](#) .



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- Unscrew spark plugs using spark plug socket - 3122 B- .
- Check compression pressure with compression tester - V.A.G 1763- (see ⇒ operating instructions for details of how to use tester).
- Have a 2nd mechanic press down the accelerator pedal completely and at the same time operate the starter until the pressure on the tester display no longer increases.
- Repeat procedure on each cylinder.

Compression pressure	bar
When new	10.0 ... 14.0
Wear limit	7.0
Maximum difference between cylinders	3.0



Assembling

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

- Install spark plugs ⇒ Maintenance ; Booklet 820 .
- Install ignition coils ⇒ [page 275](#) .
- Erase any entries in event memory resulting from testing ⇒ Vehicle diagnostic tester, Guided Functions, Interrogate event memory, then Generate readiness code.

Tightening torques

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

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4 Valve gear

⇒ [“4.1 Exploded view - valve gear”, page 108](#)

⇒ [“4.2 Measuring axial clearance of camshaft”, page 111](#)

⇒ [“4.3 Measuring radial clearance of camshaft”, page 112](#)

⇒ [“4.4 Removing and installing camshaft”, page 112](#)

⇒ [“4.5 Removing and installing camshaft control valve 1 N205 ”, page 116](#)

⇒ [“4.6 Removing and installing exhaust camshaft control valve 1 N318 ”, page 117](#)

⇒ [“4.7 Checking hydraulic compensation elements”, page 117](#)

⇒ [“4.8 Removing and installing valve stem oil seals”, page 119](#)

4.1 Exploded view - valve gear



Note

Cylinder heads which have cracks between the valve seats or between a valve seat insert and the spark plug thread can be re-installed without reducing service life, provided the cracks are only slight and do not exceed a maximum of 0.3 mm in width, and no more than the first 4 turns of the spark plug threads are cracked.



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1 - Cylinder head

- ☐ Checking valve guides
⇒ [page 126](#)

2 - Dowel pins

3 - Bolt

- ☐ Tightening torque
⇒ [page 274](#)

4 - Hall sender 3 - G300-

- ☐ Exhaust side
- ☐ Removing and installing
⇒ [page 278](#)

5 - O-ring

- ☐ Renew after removing

6 - Inlet camshaft

- ☐ Removing and installing
⇒ [page 112](#)
- ☐ Measuring axial clearance ⇒ [page 111](#)
- ☐ Measuring radial clearance ⇒ [page 112](#)
- ☐ Use old bolts when measuring radial clearance
- ☐ Runout: max. 0.04 mm

7 - Exhaust camshaft

- ☐ With additional cam for high-pressure pump
- ☐ Removing and installing
⇒ [page 112](#)
- ☐ Measuring axial clearance ⇒ [page 111](#)
- ☐ Measuring radial clearance ⇒ [page 112](#)
- ☐ Use old bolts when measuring radial clearance
- ☐ Runout: max. 0.04 mm

8 - Retaining frame

- ☐ With integrated camshaft bearings

9 - Bolt

- ☐ To avoid damage to retaining frame for camshafts, refer to tightening torque and sequence
⇒ [page 111](#)

10 - O-ring

- ☐ Renew after removing

11 - Hall sender - G40-

- ☐ Inlet side
- ☐ Removing and installing ⇒ [page 278](#)

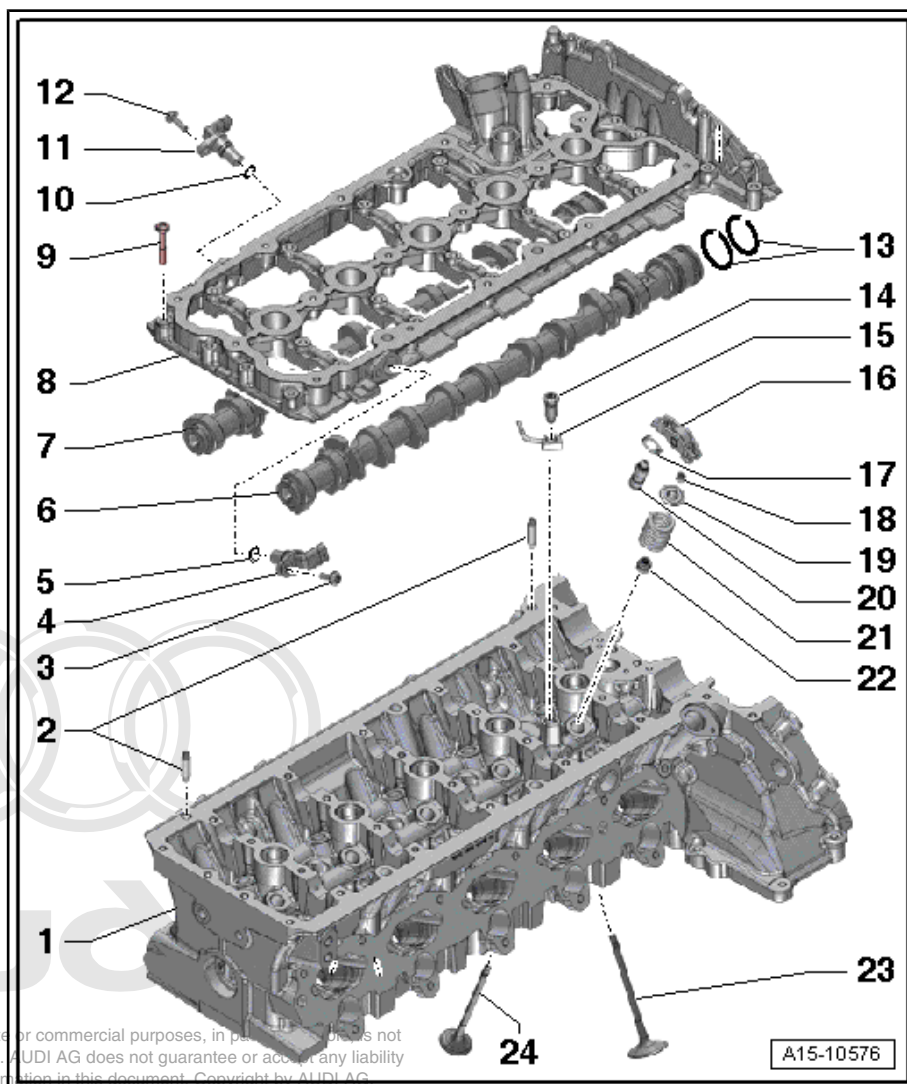
12 - Bolt

- ☐ Tightening torque ⇒ [page 274](#)

13 - Rectangular section seals

14 - Bolt

- ☐ With pressure relief valve
- ☐ 27 Nm



15 - Oil spray jet**16 - Roller rocker finger**

- ☐ Mark installation position for re-installation
- ☐ Check roller bearings for ease of movement
- ☐ Lubricate contact surface before installing
- ☐ Assembly: attach to hydraulic compensation element -item 20- using securing clip -item 17-

17 - Securing clip

- ☐ Not supplied separately
- ☐ Check for firm attachment

18 - Valve cotters**19 - Valve spring plate****20 - Hydraulic compensation element**

- ☐ Clipped into roller rocker finger -item 16-
- ☐ Checking ⇒ [page 117](#)
- ☐ Mark installation position for re-installation
- ☐ Lubricate contact surface before installing

21 - Valve spring

- ☐ Installation position ⇒ [page 110](#)

22 - Valve stem oil seal

- ☐ Renewing ⇒ [page 119](#)

23 - Inlet valve

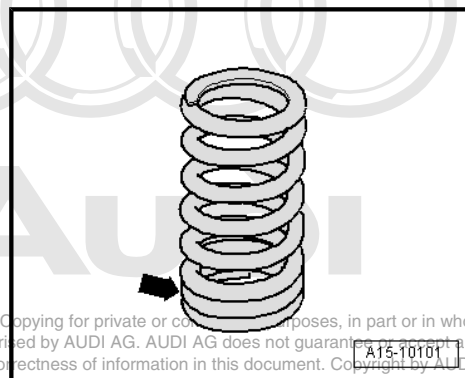
- ☐ Must not be machined; only grinding-in is permissible
- ☐ Mark installation position for re-installation
- ☐ Checking ⇒ [page 127](#)
- ☐ Valve dimensions ⇒ [page 128](#)
- ☐ Checking valve guides ⇒ [page 126](#)

24 - Exhaust valve

- ☐ Must not be machined; only grinding-in is permissible
- ☐ Mark installation position for re-installation
- ☐ Checking ⇒ [page 127](#)
- ☐ Valve dimensions ⇒ [page 128](#)
- ☐ Checking valve guides ⇒ [page 126](#)

Position of valve spring

- The closely spaced spring coils -arrow- face the cylinder head.



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A15-10101

Retaining frame for camshafts - tightening torque and sequence



Note

Renew the bolts tightened with specified tightening angle.



Caution

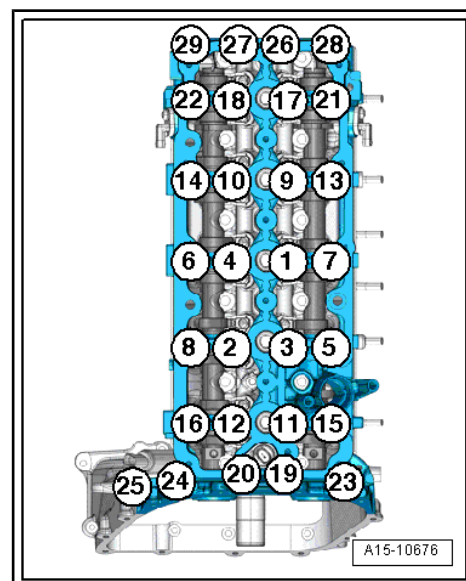
Risk of damage to retaining frame for camshafts.

- ◆ It is important to tighten the bolts securing the retaining frame as described below.

– Tighten bolts in 4 stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1.	-1 ... 29-	Screw in by hand until bolt heads make contact with retaining frame
2.	-1 ... 29-	Continue tightening 1 turn at a time in several stages until retaining frame makes full contact with cylinder head and a torque of 8 Nm is reached
3.	-1 ... 29-	8 Nm ¹⁾
4.	-1 ... 29-	Turn 90° further

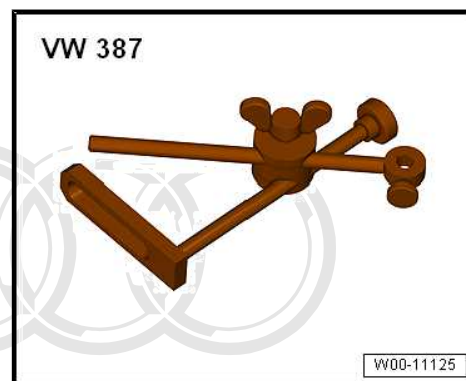
• ¹⁾ This procedure guarantees that all bolts are tightened to 8 Nm after retaining frame has settled.



4.2 Measuring axial clearance of camshaft

Special tools and workshop equipment required

- ◆ Universal dial gauge bracket - VW 387-



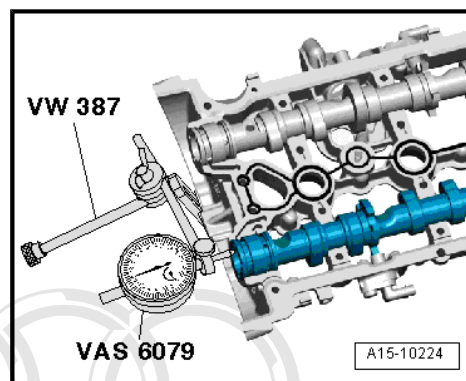
- ◆ Dial gauge - VAS 6079-



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Procedure

- Remove retaining frame
⇒ [“4.4 Removing and installing camshaft”, page 112](#).
- Fit camshaft to be tested in retaining frame.
- Attach dial gauge - VAS 6079- with universal dial gauge bracket - VW 387- to retaining frame.
- Press camshaft against dial gauge by hand.
- Set dial gauge to “0”.
- Press camshaft away from dial gauge and read off value:
- Axial clearance: 0.100 ... 0.191 mm



4.3 Measuring radial clearance of camshaft

Special tools and workshop equipment required

- ◆ Plastigauge

Procedure



Note

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Use old bolts when measuring radial clearance.

- Remove roller rocker fingers
⇒ [“4.4 Removing and installing camshaft”, page 112](#).
- Clean bearings and bearing journals.
- Place a length of Plastigauge corresponding to the width of the bearing on the bearing journal or bearing shell to be measured.
- The Plastigauge must be positioned in the centre of the bearing.
- Fit retaining frame and secure with old bolts (tighten further to appropriate torque) ⇒ [page 111](#) without rotating camshafts.
- Remove retaining frame again.
- Compare width of Plastigauge with measurement scale.

Radial clearance:

- 24 mm bearing diameter: 0.024 ... 0.066 mm.
- 36 mm bearing diameter: 0.050 ... 0.100 mm.
- When carrying out final assembly, renew bolts.

4.4 Removing and installing camshaft

Special tools and workshop equipment required

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

Removing

- Remove camshaft timing chain ⇒ [page 85](#) .
- Remove nut -4- and move earth wire clear.
- Unplug electrical connectors:
2 - Hall sender 3 - G300-
3 - Fuel metering valve - N290-

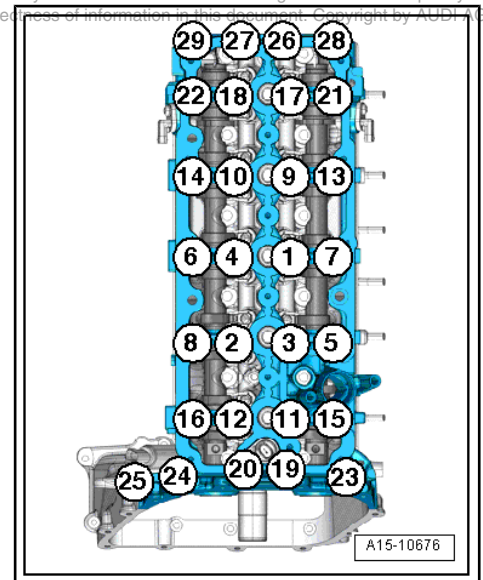
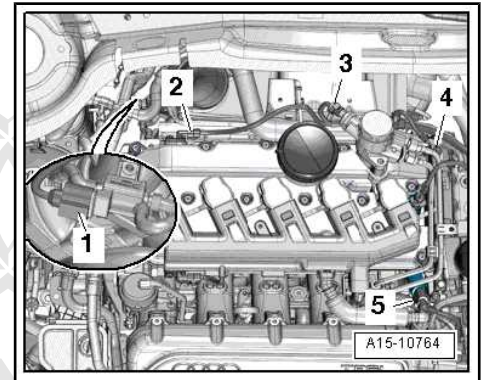


Note

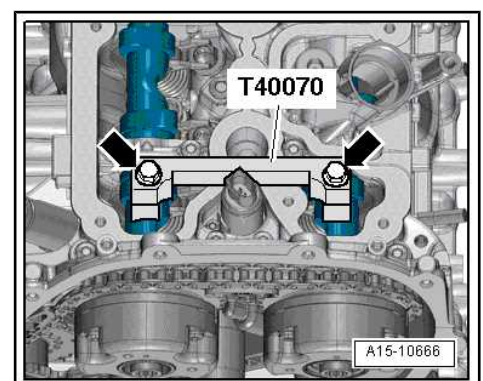
Disregard items -1 and 5-.

- Remove high-pressure pipe ⇒ [page 251](#) .
- Remove high-pressure pump ⇒ [page 250](#) .
- Slacken retaining frame bolts in the sequence -29 ... 1-.
- Remove bolts, carefully release retaining frame from bonded joint and set it down on a soft surface on workbench.

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- Remove camshaft clamp - T40070- .
- Mark and remove camshafts.



Installing

- Crankshaft locked in position with locking pin - T40069- .
- Hydraulic compensation elements and roller rocker fingers installed.



Note

- ◆ *Renew the bolts tightened with specified tightening angle.*
- ◆ *Renew seals/gaskets and sealing plugs.*



Caution

Protect lubrication system and bearings against contamination.

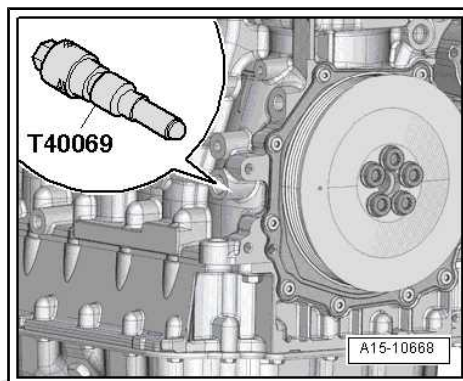
- ◆ *Cover exposed parts of the engine.*



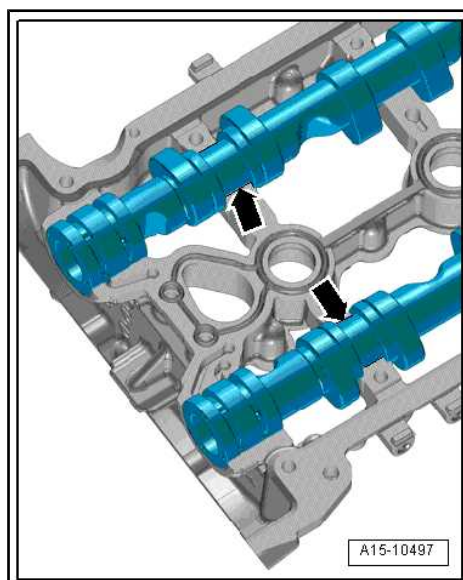
WARNING

Risk of eye injury.

- ◆ *Put on safety goggles.*

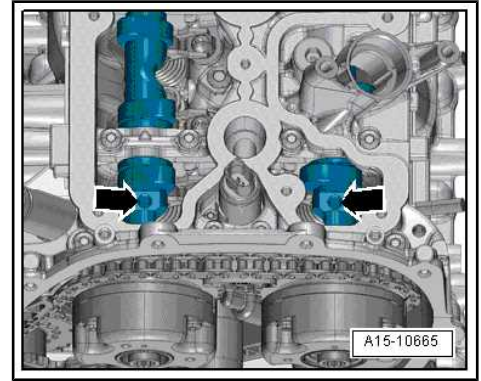


- Remove remaining sealant from cylinder head and retaining frame using rotating plastic brush or similar.
- Clean sealing surfaces and grooves in sealing surfaces; they must be free of oil and grease.
- Oil running surfaces of both camshafts.
- Fit camshafts in retaining frame.
- The exhaust camshaft has an additional cam for high-pressure pump.
- Camshafts must be in correct position in axial bearings -arrows- in retaining frame.
- Turn retaining frame over with camshafts fitted, holding camshafts firmly in position.

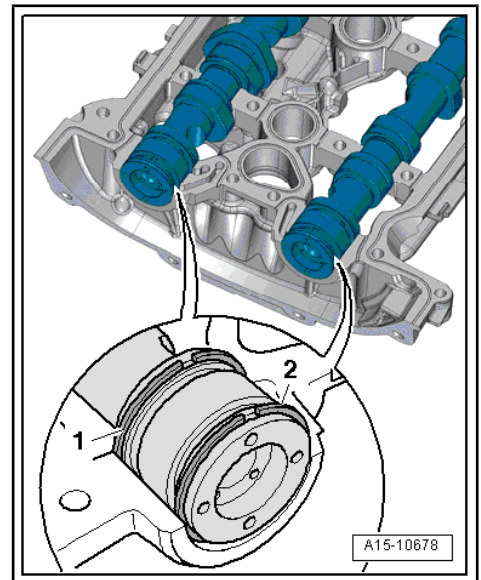


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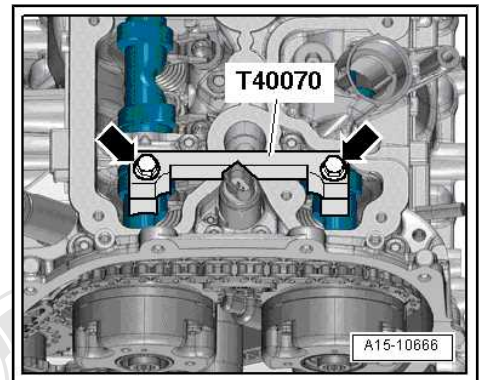
- Turn camshafts until threaded holes -arrows- point upwards.
- Check that camshafts are still in correct position in axial bearings in retaining frame.



- Check position of ends of rectangular section seals.
- The ends of the rectangular section seals -1- and -2- must point up or down, never to the side.



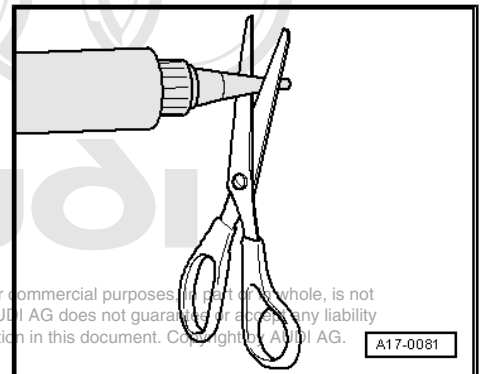
- Fit camshaft clamp - T40070- and tighten bolts -arrows- to 25 Nm.



Note

Note the use-by date of the sealant.

- Cut off nozzle of tube at front marking (nozzle Ø approx. 2 mm).



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- Turn retaining frame upside down again.



Caution

Make sure lubrication system is not clogged by excess sealant.

- ◆ **The sealant beads must not be thicker than specified.**

- Apply even, slightly protruding sealant beads into clean grooves of retaining frame as shown in illustration.
- Width of sealant bead -1-: 4.0 mm.
- Width of sealant beads -2, 3-: 3.0 mm.



Note

The retaining frame must be installed within 5 minutes after applying the sealant.

- Fit retaining frame with camshafts onto cylinder head.
- Fit bolts securing retaining frame for camshafts and tighten [⇒ page 111](#).

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Note

After installing the retaining frame, wait about 30 minutes for the sealant to dry.

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

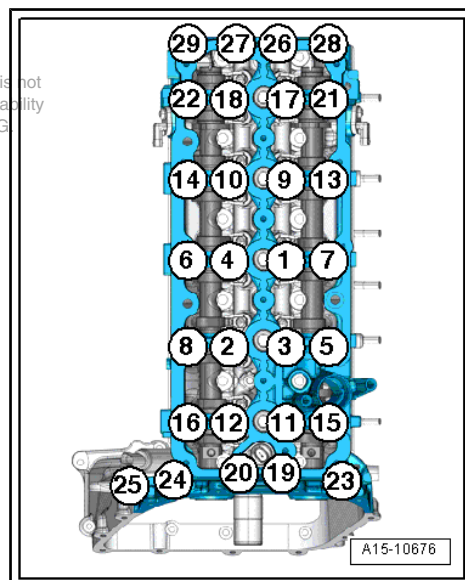
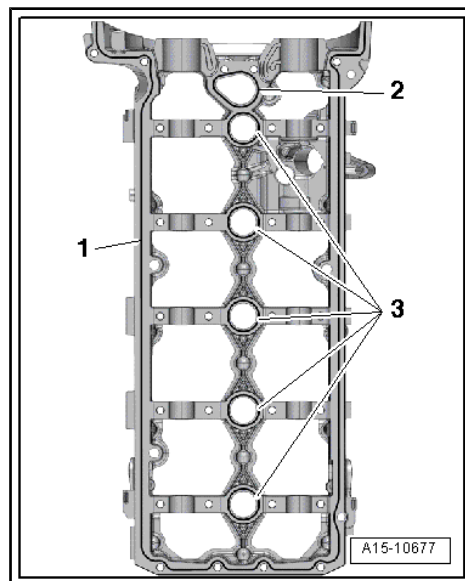
- Install high-pressure pump and high-pressure pipe [⇒ page 250](#).
- Install camshaft timing chain [⇒ page 85](#).



Caution

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.**



Tightening torques

- ◆ [⇒ Fig. “Retaining frame for camshafts - tightening torque and sequence”, page 111](#)

4.5 Removing and installing camshaft control valve 1 - N205-

Removing

- Remove engine cover panel [⇒ page 41](#).
- Unplug electrical connector -1-.

- Unscrew bolt -arrow- and remove camshaft control valve 1 - N205- .

Installing

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



Note

- ◆ *Fit new O-ring.*
- ◆ *Clean camshaft control valve and mounting in cylinder head from any kind of dirt.*

- Lubricate O-ring with engine oil.
- Install engine cover panel ⇒ [page 41](#) .

Tightening torques

- ◆ ⇒ [“3.1 Exploded view - cylinder head”, page 93](#)

4.6 Removing and installing exhaust camshaft control valve 1 - N318-

Removing

- Remove engine cover panel ⇒ [page 41](#) .
- Unplug electrical connector -1-.
- Remove bolt -arrow- and remove exhaust camshaft control valve 1 - N318- .

Installing

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



Note

- ◆ *Fit new O-ring.*
- ◆ *Clean camshaft control valve and mounting in cylinder head from any kind of dirt.*

- Lubricate O-ring with engine oil.
- Install engine cover panel ⇒ [page 41](#) .

Tightening torques

- ◆ ⇒ [“3.1 Exploded view - cylinder head”, page 93](#)

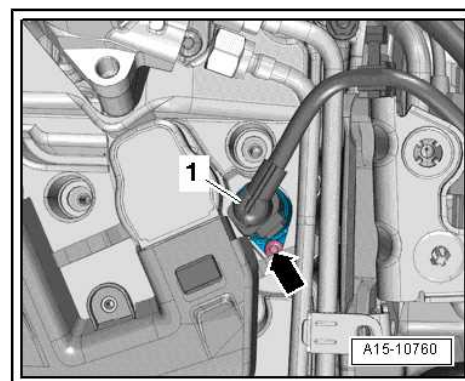
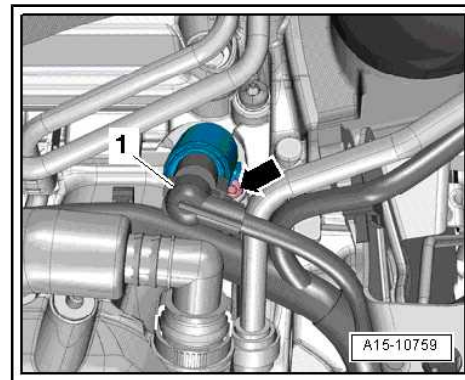
4.7 Checking hydraulic compensation elements



Note

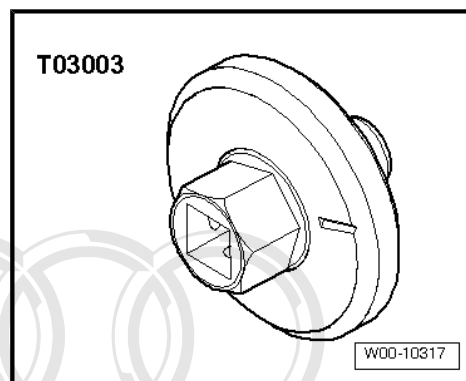
- ◆ *The hydraulic compensation elements cannot be serviced.*
- ◆ *Irregular valve noises when starting engine are normal.*

Special tools and workshop equipment required



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◆ Wrench -T03003-



◆ Feeler gauge

Procedure

- Start engine and run until radiator fan has started up once.
- Increase engine speed to approx. 2500 rpm for 2 minutes (perform road test if necessary).



Note

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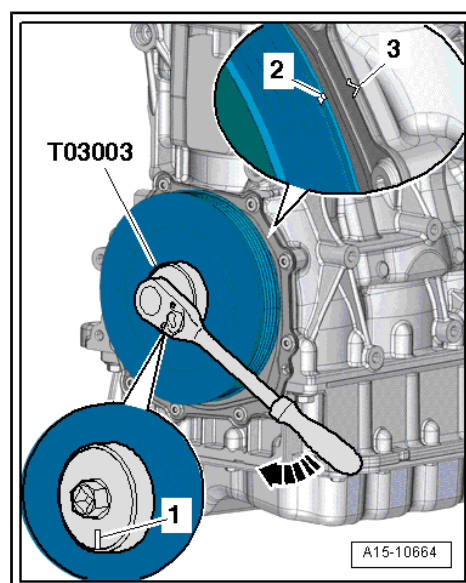
If irregular valve noise disappears but repeatedly re-occurs when travelling short distances, renew oil filter bracket with integrated oil retention valve.

- If the compensation elements are still noisy, locate the defective compensation element as follows:
- Remove cylinder head cover ⇒ [page 104](#) .
- Remove front wheel (right-side) ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres .
- Remove wheel spoiler (front right) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Removing and installing wheel housing liner (front) .
- Turn crankshaft with socket -T03003- in direction of engine rotation -arrow- until cam of hydraulic compensation element to be tested faces upwards.



Note

Disregard items -1 and 2-.



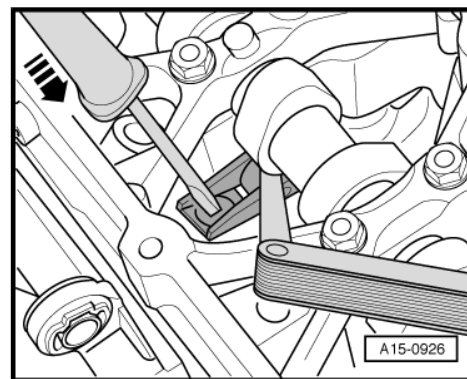
- Press roller rocker finger down -arrow- to determine clearance between cam and roller rocker finger.
- If it is possible to insert a feeler gauge of 0.20 mm between cam and roller rocker finger, renew hydraulic compensation element
⇒ [“4.4 Removing and installing camshaft”, page 112](#) .

Final steps

- Fit front wheel (right-side) ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres .
- Install cylinder head cover ⇒ [page 104](#) .

Tightening torques

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



4.8 Removing and installing valve stem oil seals

⇒ [“4.8.1 Removing and installing valve stem oil seals \(cylinder head installed\)”, page 119](#)

⇒ [“4.8.2 Removing and installing valve stem oil seals \(cylinder head removed\)”, page 122](#)

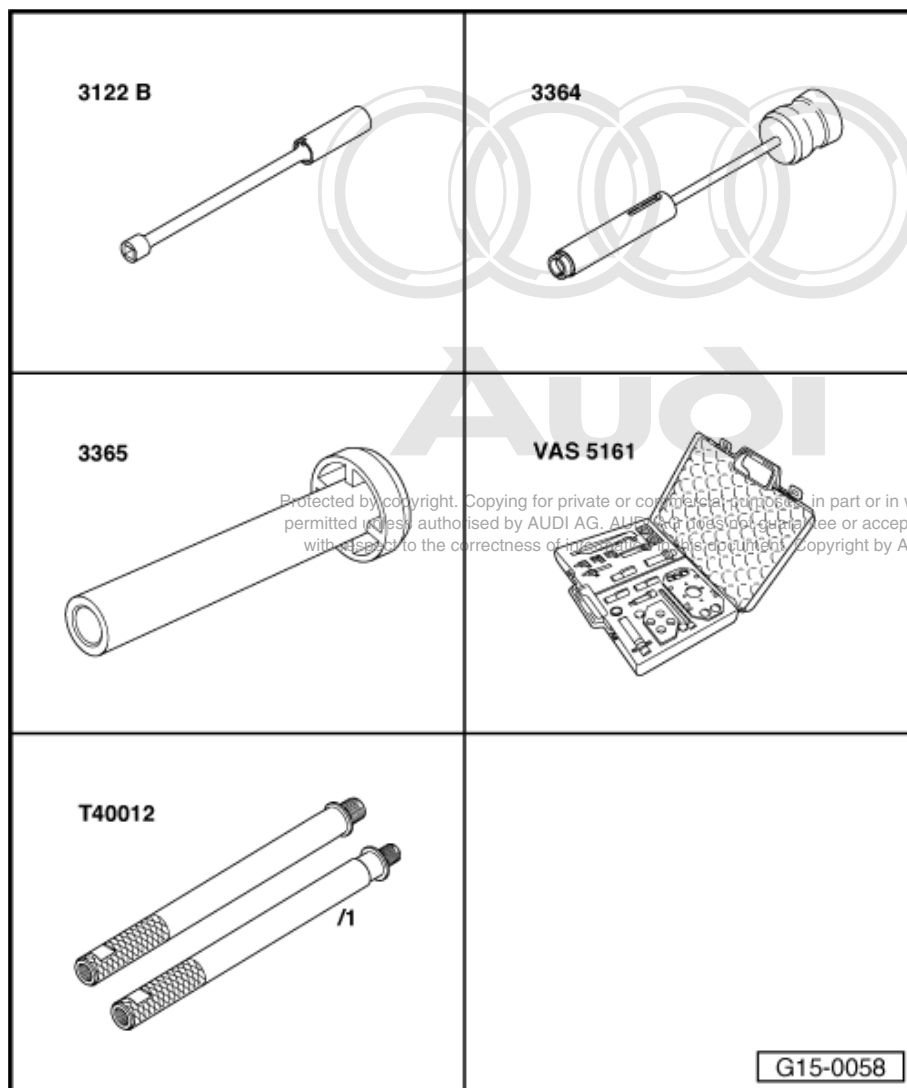
4.8.1 Removing and installing valve stem oil seals (cylinder head installed)



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Special tools and workshop equipment required

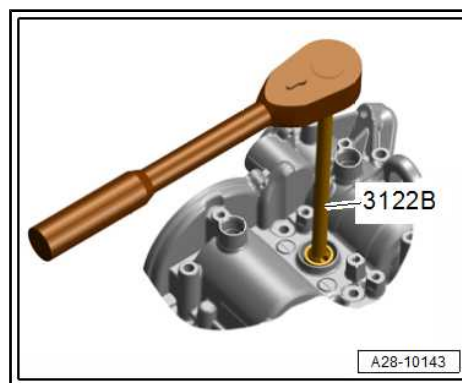
- ◆ Spark plug spanner - 3122 B-
- ◆ Valve stem seal puller - 3364-
- ◆ Valve stem seal fitting tool - 3365-
- ◆ Removal and installation device for valve cotters - VAS 5161 A- with guide plate for 2.0 ltr. and 3.0 ltr. FSI engine - VAS 5161/19C-
- ◆ Adapters - T40012-



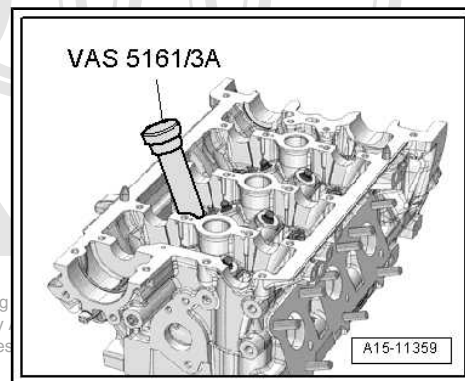
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Removing

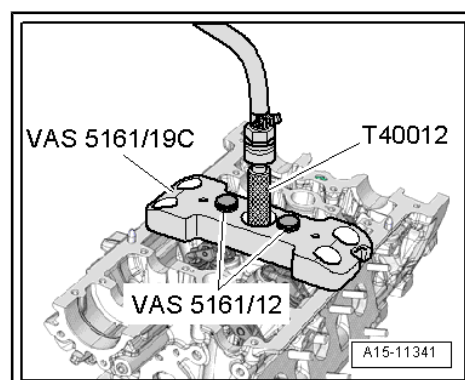
- Remove camshafts ⇒ [page 112](#) .
- Mark original positions of roller rocker fingers and hydraulic compensation elements for re-installation.
- Remove roller rocker fingers together with hydraulic compensation elements and put down on a clean surface.
- Unscrew spark plugs using spark plug socket - 3122 B- .
- Set piston of appropriate cylinder to “bottom dead centre”.



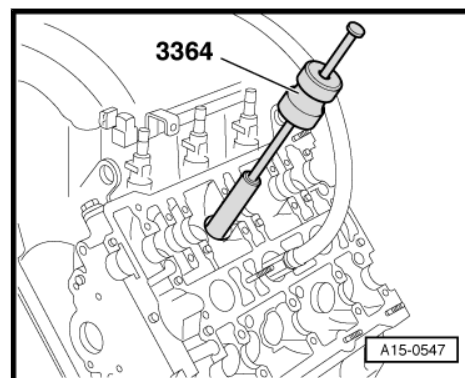
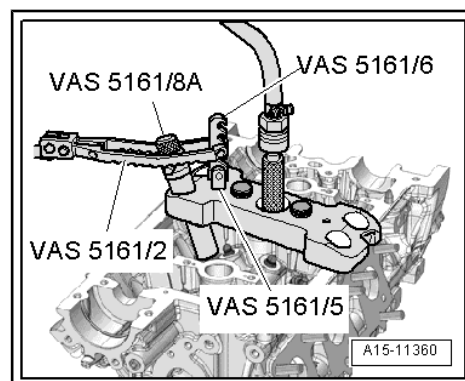
- Apply drift -VAS 5161/3A- to valve spring plate and use plastic-headed hammer to release sticking valve cotteners.



- Fit guide plate for 2.0 ltr. and 3.0 ltr. FSI engine - VAS 5161/19C- onto cylinder head.
- Secure guide plate with knurled screws -VAS 5161/12- .
- Screw adapter - T40012- with seal hand-tight into the corresponding spark plug thread.
- Connect adapter to compressed air line using a commercially available connection piece, and apply constant air pressure.
- Minimum pressure: 6 bar



- Screw snap-in device -VAS 5161/6- with engaging fork - VAS 5161/5- into guide plate.
- Insert assembly cartridge -VAS 5161/8A- in guide plate.
- Attach pressure fork -VAS 5161/2- to snap-in device and push assembly cartridge down.
- At the same time, turn knurled screw of assembly cartridge clockwise until tips engage in valve cotteners.
- Move knurled screw back and forth slightly; the valve cotteners are thus forced apart and taken up by the assembly cartridge.
- Release pressure fork.
- Take out assembly cartridge.
- Detach guide plate and turn to one side.
- The compressed air hose remains connected.
- Detach valve spring with valve spring plate.
- Pull off valve stem oil seal with valve stem seal puller - 3364- .





Caution

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

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

- Lightly oil sealing lip of valve stem oil seal.
- Slide valve stem oil seal onto plastic sleeve.
- Carefully press valve stem oil seal onto valve guide using valve stem seal fitting tool - 3365- .
- Take off plastic sleeve.

If valve cotters have been removed from assembly cartridge, they must first be inserted in insertion device -VAS 5161/18- .

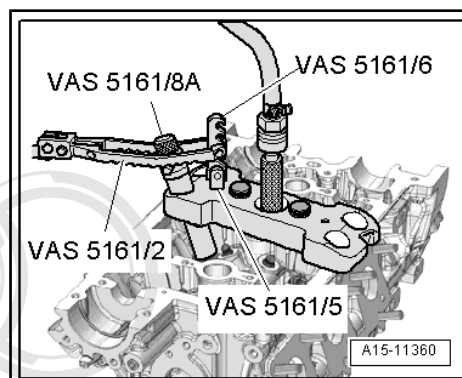
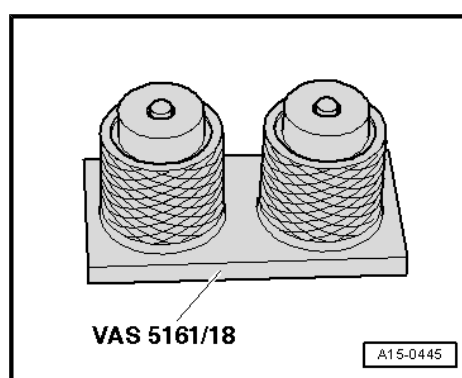
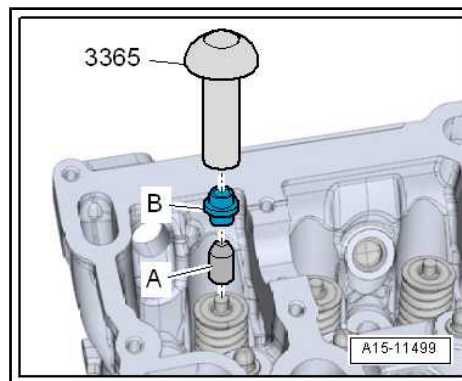
- Larger diameter of valve cotters faces upwards.
- Press assembly cartridge onto insertion device from above and pick up valve cotters.
- Insert valve spring and valve spring plate ➔ [page 110](#) .

- Bolt guide plate for 2.0 ltr. and 3.0 ltr. FSI engine - VAS 5161/19C- onto cylinder head once again.
- Insert assembly cartridge in guide plate.
- Press down pressure fork and pull knurled screw upwards while turning screw in both directions - this will insert the valve cotters.
- Release pressure fork with knurled screw still in pulled position.
- Repeat procedure for each valve.

Assembling

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

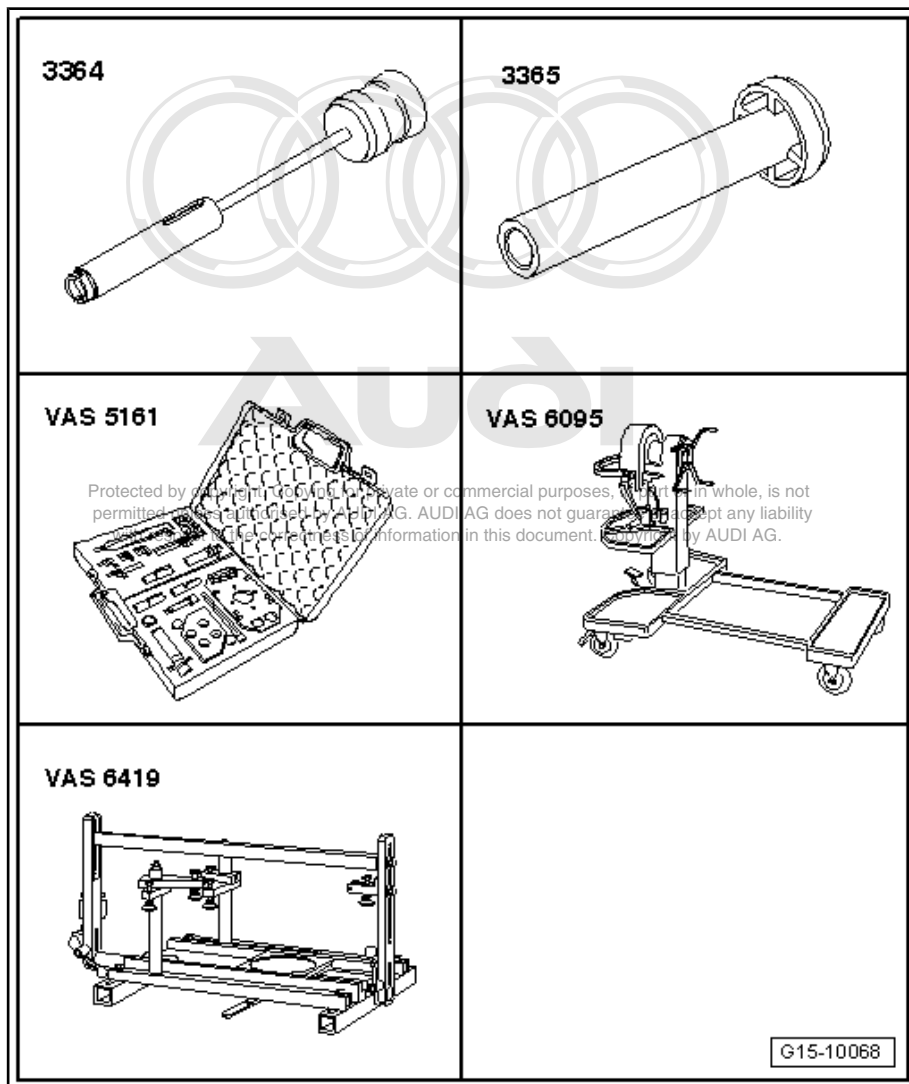
- Ensure that all roller rocker fingers make contact with the ends of the valve stems correctly and are clipped onto their respective hydraulic compensation elements.
- Install camshafts ➔ [page 112](#) .
- Install spark plugs ➔ [Maintenance ; Booklet 820](#) .



4.8.2 Removing and installing valve stem oil seals (cylinder head removed)

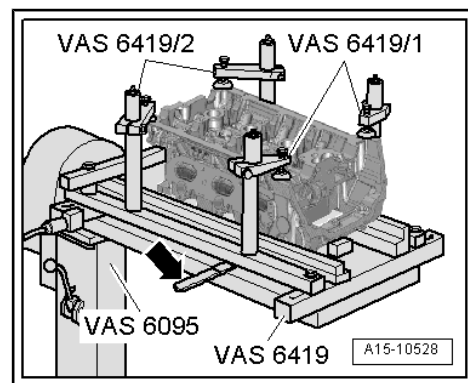
Special tools and workshop equipment required

- ◆ Valve stem seal puller - 3364-
- ◆ Valve stem seal fitting tool - 3365-
- ◆ Removal and installation device for valve cotters - VAS 5161 A- with guide plate for 2.0 ltr. and 3.0 ltr. FSI engine - VAS 5161/19C-
- ◆ Engine and gearbox support - VAS 6095-
- ◆ Cylinder head tensoning device - VAS 6419-

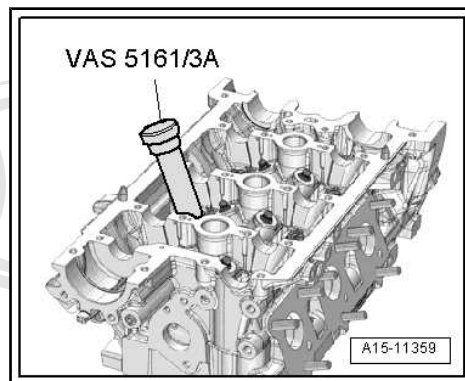


Procedure

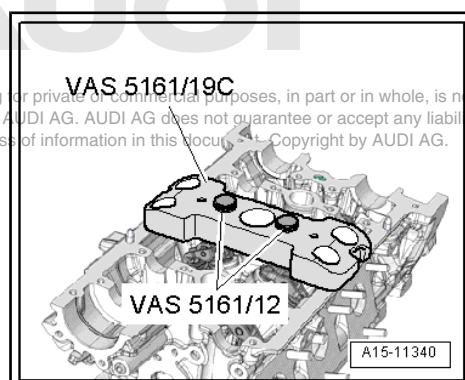
- Remove camshafts ⇒ [page 112](#) .
- Mark original positions of roller rocker fingers and hydraulic compensation elements for re-installation.
- Remove roller rocker fingers together with hydraulic compensation elements and put down on a clean surface.
- Insert cylinder head tensoning device - VAS 6419- into engine and engine and gearbox support - VAS 6095- .
- Secure cylinder head in cylinder head tensoning device, as shown in illustration.
- Connect cylinder head tensoning device to compressed air supply.
- Using lever -arrow-, slide air pad under combustion chamber where valve stem oil seal is to be removed.
- Apply just enough compressed air to bring air pad into contact with valve heads.



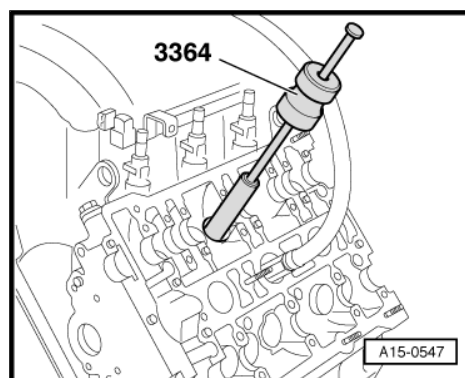
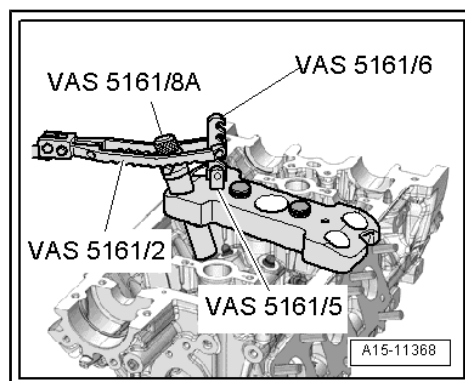
- Apply drift -VAS 5161/3A- to valve spring plate and use plastic-headed hammer to release sticking valve cotters.



- Fit guide plate for 2.0 ltr. and 3.0 ltr. FSI engine - VAS 5161/19C- onto cylinder head.
- Secure guide plate with knurled screws -VAS 5161/12-



- Screw snap-in device -VAS 5161/6- with engaging fork -VAS 5161/5- into guide plate.
- Insert assembly cartridge -VAS 5161/8A- in guide plate.
- Attach pressure fork -VAS 5161/2- to snap-in device and push assembly cartridge down.
- At the same time, turn knurled screw of assembly cartridge clockwise until tips engage in valve cotters.
- Move knurled screw back and forth slightly; the valve cotters are thus forced apart and taken up by the assembly cartridge.
- Release pressure fork.
- Take out assembly cartridge.
- Detach guide plate and turn to one side.
- Detach valve spring with valve spring plate.
- Pull off valve stem oil seal with valve stem seal puller - 3364- .



**Caution**

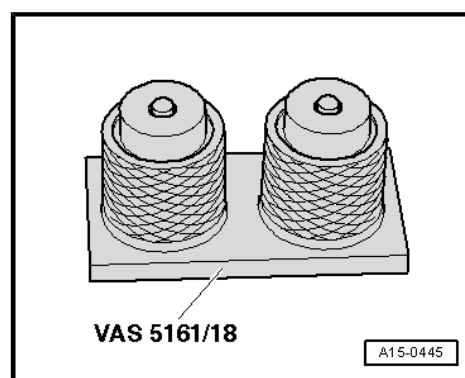
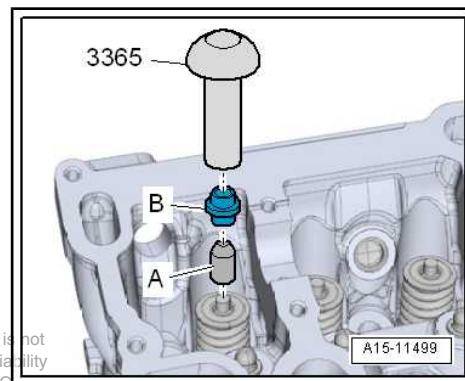
Make sure valve stem oil seals are not damaged when installing.

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

- Lightly oil sealing lip of valve stem oil seal.
- Slide valve stem oil seal onto plastic sleeve.
- Carefully press valve stem oil seal onto valve guide using valve stem seal fitting tool - 3365- .
- Take off plastic sleeve.

If valve cotter pins have been removed from assembly cartridge, they must first be inserted in insertion device -VAS 5161/18- .

- Larger diameter of valve cotter pins faces upwards.
- Press assembly cartridge onto insertion device from above and pick up valve cotter pins.
- Insert valve spring and valve spring plate ⇒ [page 110](#) .

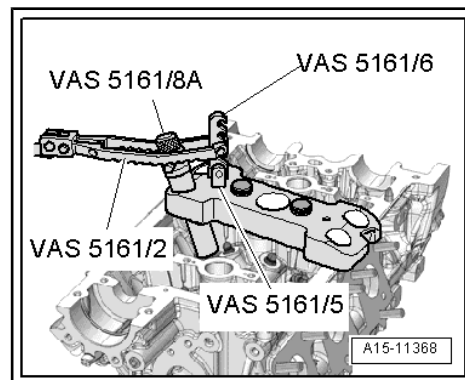


- Bolt guide plate for 2.0 ltr. and 3.0 ltr. FSI engine - VAS 5161/19C- onto cylinder head once again.
- Insert assembly cartridge in guide plate.
- Press down pressure fork and pull knurled screw upwards while turning screw in both directions - this will insert the valve cotter pins.
- Release pressure fork with knurled screw still in pulled position.
- Repeat procedure for each valve.

Assembling

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

- Ensure that all roller rocker fingers make contact with the ends of the valve stems correctly and are clipped onto their respective hydraulic compensation elements.
- Install camshafts ⇒ [page 112](#) .



5 Inlet and exhaust valves

⇒ ["5.1 Checking valve guides", page 126](#)

⇒ ["5.2 Checking valves", page 127](#)

⇒ ["5.3 Valve dimensions", page 128](#)

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-



Procedure



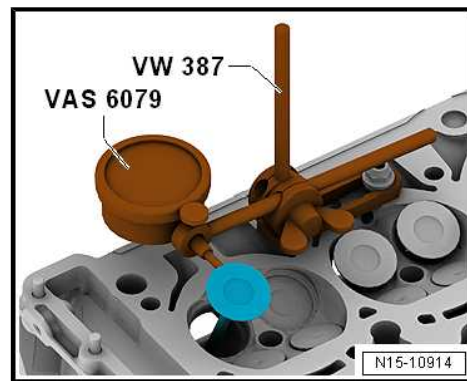
Note

- ◆ *If the valve has to be renewed as part of a repair, use a new valve for the measurement.*
- ◆ *Only insert inlet valve into inlet valve guide and exhaust valve into exhaust valve guide, as the stem diameters are different.*
- Insert valve into guide.
- End of valve stem must be flush with valve guide.
- Measure the amount of sideways play.
- Wear limit: 0.8 mm.
- If the wear limit is exceeded, repeat the measurement with new valves.
- Renew cylinder head if wear limit is still exceeded.



Note

Valve guides cannot be renewed.



5.2 Checking valves

- Visually inspect for scoring on valve stems and valve seat surfaces.
- Renew valve if scoring is clearly visible.

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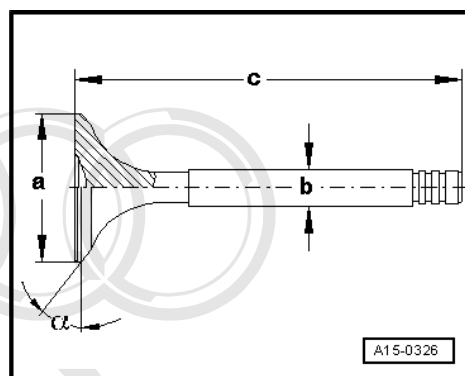
5.3 Valve dimensions



Note

Inlet and exhaust valves must not be machined. Only grinding-in is permitted.

Dimension		Inlet valve	Exhaust valve
Ø a	mm	33.85 + 0.10	28.0 + 0.1
Ø b	mm	5.965 + 0.005	5.955 + 0.007
c	mm	103.97 + 0.20	101.87 + 0.20
α	°	45	45



WARNING

Care must be taken when disposing of old sodium-cooled exhaust valves - risk of injury.

- ◆ *The valves must be sawn in two with a metal saw between the centre of the stem and valve head. When doing so, the valves must not come into contact with water.*
- ◆ *Then throw a maximum of ten valves into a bucket of water and step away immediately.*
- ◆ *A sudden chemical reaction will occur upon contact with water in which the sodium filling burns.*
- ◆ *After performing these steps the valves can be disposed of in the normal way.*

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17 – Lubrication

1 Sump/oil pump

⇒ [“1.1 Exploded view - sump/oil pump”, page 129](#)

⇒ [“1.2 Engine oil”, page 132](#)

⇒ [“1.3 Removing and installing sump \(bottom section\)”, page 132](#)

⇒ [“1.4 Removing and installing sump \(top section\)”, page 134](#)

⇒ [“1.5 Removing and installing oil pump”, page 140](#)

⇒ [“1.6 Removing and installing oil level and oil temperature sender G266”, page 146](#)

1.1 Exploded view - sump/oil pump



Note

- ◆ *If large quantities of metal shavings or abrasion are found when performing engine repairs, this is an indication of damage to the crankshaft or conrod bearings. To prevent further damage, the following steps are required after completion of repair work: clean the oil passages carefully and renew the oil spray jets, engine oil cooler and oil filter.*
- ◆ *Oil spray jet and pressure relief valve ⇒ [page 67](#)*

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1 - Sump (bottom section)

- ☐ Removing and installing
⇒ [page 132](#)
- ☐ Apply sealant when installing; refer to ⇒ Electronic parts catalogue

2 - Bolt

- ☐ With bush and rubber ring
- ☐ 9 Nm

3 - Bolt

- ☐ 9 Nm

4 - Bracket

- ☐ For oil intake pipe

5 - Seal

- ☐ Renew after removing

6 - Bolt

- ☐ Renew after removing
- ☐ Tightening torque and sequence ⇒ [page 131](#)

7 - Sump (top section)

- ☐ Removing and installing
⇒ [page 134](#)
- ☐ Apply sealant when installing; refer to ⇒ Electronic parts catalogue

8 - Bolt

- ☐ 20 Nm

9 - Oil pump

- ☐ Do not dismantle
- ☐ Removing and installing ⇒ [page 140](#)

10 - Drive chain sprocket

- ☐ For oil pump
- ☐ Installation position: lettering must be legible from outside

11 - Bolt

- ☐ Renew after removing
- ☐ 20 Nm +90°

12 - Cylinder block

13 - O-ring

- ☐ Renew after removing

14 - O-ring

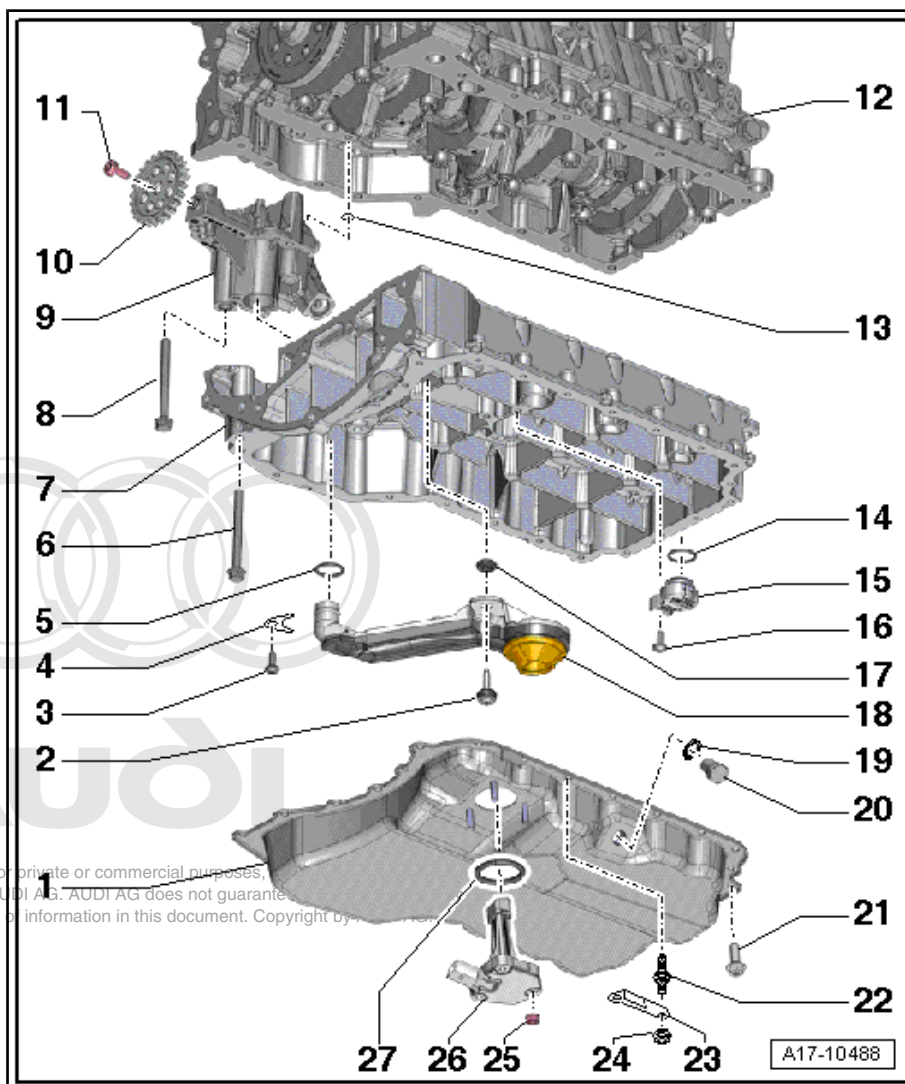
- ☐ Renew after removing

15 - Connection

- ☐ For oil return

16 - Bolt

- ☐ 9 Nm



17 - Rubber ring

18 - Oil intake pipe

19 - Seal

- ☐ Renew after removing

20 - Oil drain plug

- ☐ 25 Nm

21 - Bolt

- ☐ Renew after removing
- ☐ Tightening torque and sequence ⇒ [page 131](#)

22 - Not fitted

23 - Not fitted

24 - Not fitted

25 - Nut

- ☐ 9 Nm

26 - Oil level and oil temperature sender - G266-

- ☐ Removing and installing ⇒ [page 146](#)

27 - Seal

- ☐ Renew after removing

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Sump (bottom section) - tightening torque and sequence

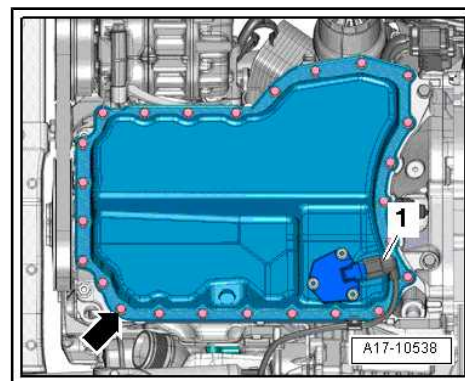


Note

Renew the bolts tightened with specified tightening angle.

- Tighten bolts in 3 stages:

Stage	Bolts	Tightening torque/angle specification
1.	-arrow-	Screw in by hand until contact is made
2.	-arrow-	8 Nm in diagonal sequence
3.	-arrow-	Turn 45° further in diagonal sequence



Sump (top section) - tightening torque and sequence

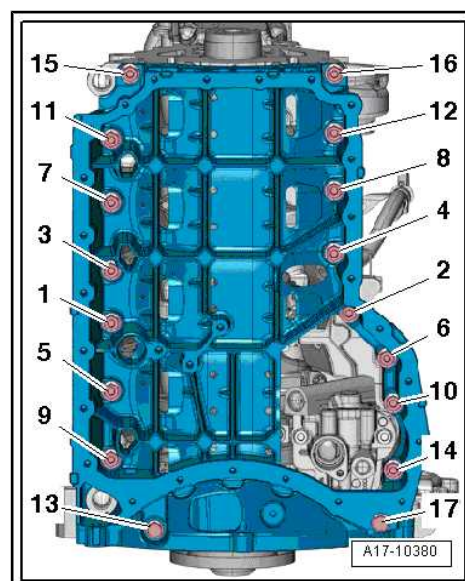


Note

Renew the bolts tightened with specified tightening angle.

- Tighten bolts in 3 stages in the sequence shown:

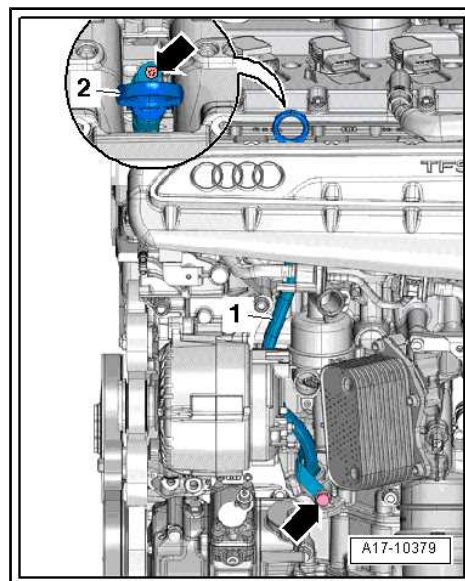
Stage	Bolts	Tightening torque/angle specification
1.	-1 ... 17-	Screw in by hand until contact is made
2.	-1 ... 17-	20 Nm
3.	-1 ... 17-	Turn 90° further



Guide tube for oil dipstick - tightening torque

– Tighten bolts -arrows- as follows:

- ◆ M6: 9 Nm
- ◆ M8: 23 Nm



1.2 Engine oil

Refer to ⇒ Maintenance tables for engine oil capacity, oil specifications and viscosity grades.

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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

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

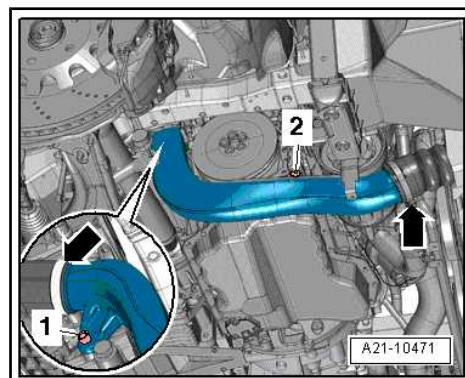
Removing

- Engine oil drained ⇒ Maintenance ; Booklet 820
- Remove wheel spoiler (front right) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Removing and installing wheel housing liner (front) .
- Remove bolts -1, 2- and press air pipe to left side.

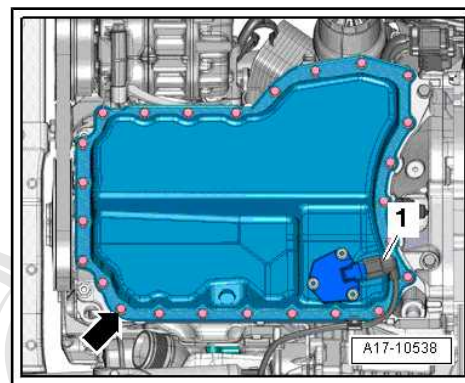


Note

Disregard -arrows-.



- Unplug electrical connector -1- at oil level and oil temperature sender - G266- .
- Remove bolts -arrow- for sump (bottom section) in diagonal sequence.



- Carefully release sump (bottom section) from bonded joint; to do so, apply screwdriver at the slots -arrows- all round the sump.

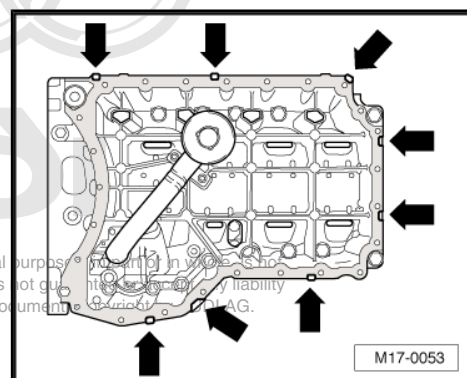
Installing



Caution

Protect lubrication system against contamination.

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

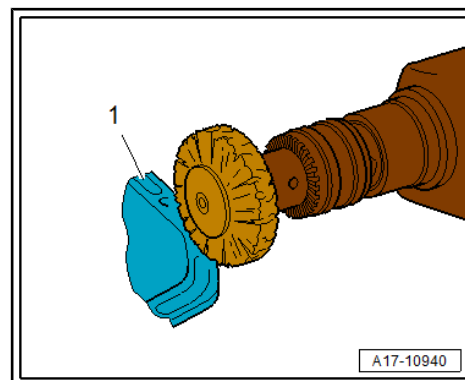


WARNING

Risk of eye injury.

- ◆ **Put on safety goggles.**

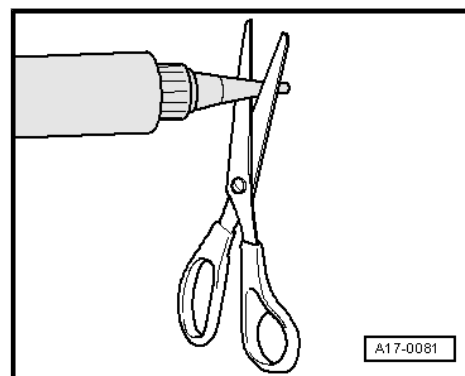
- Remove remaining sealant on bottom section -1- and top section of sump with a rotating plastic brush or similar.
- Clean sealing surfaces; they must be free of oil and grease.



Note

Note the use-by date of the sealant.

- Cut off nozzle of tube at front marking (nozzle Ø approx. 2.0 mm).





Caution

Make sure lubrication system is not clogged by excess sealant.

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

- Apply bead of sealant -arrow- onto clean sealing surface of sump (bottom section) as shown in illustration.
- Thickness of sealant bead: 1.5 ... 2.0 mm.



Note

The sump (bottom section) must be installed within 5 minutes after applying the sealant.

- Fit sump (bottom section) and tighten bolts ⇒ [page 131](#) .



Note

- ◆ *After installing the sump (bottom section), wait about 30 minutes for the sealant to dry. Then (and only then) fill the engine with engine oil.*
- ◆ *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.*

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

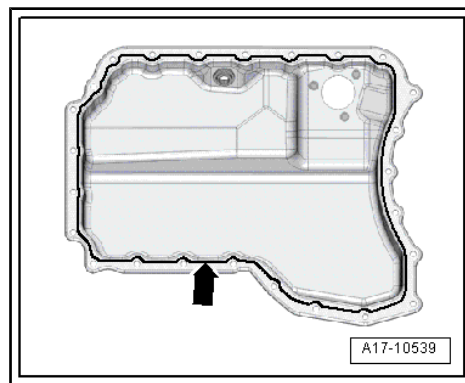
- Fill with engine oil and check oil level ⇒ Maintenance ; Booklet 820 .

Tightening torques

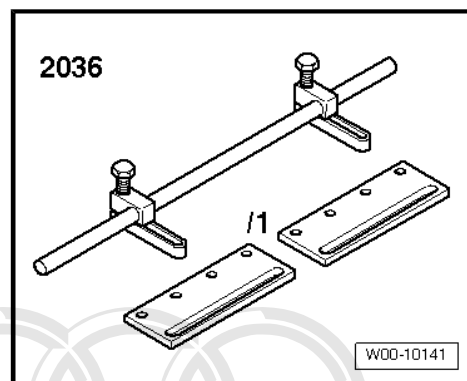
- ◆ ⇒ [Fig. “Sump \(bottom section\) - tightening torque and sequence”](#) , [page 131](#)
- ◆ Air pipe
⇒ [“2.1 Exploded view - charge air system”](#) , [page 210](#)
- ◆ Wheel spoiler (front right) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front)

1.4 Removing and installing sump (top section)

Special tools and workshop equipment required



- ◆ Plates -2036/1- from valve assembly device - 2036-

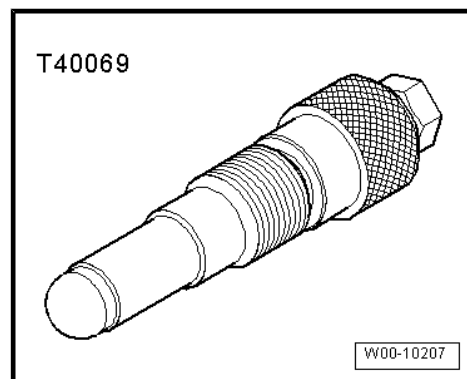


- ◆ Counterhold tool - T10172A-



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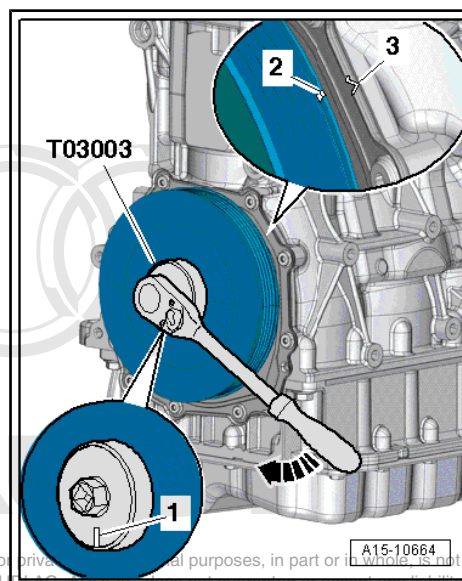
- ◆ Locking pin - T40069-



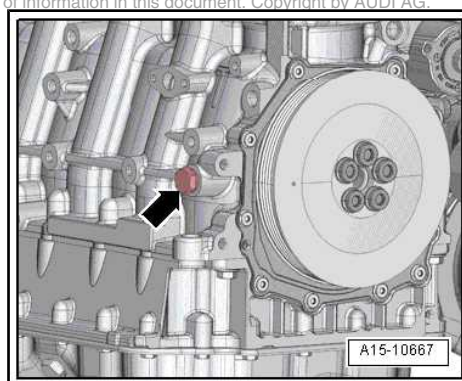
- ◆ Safety goggles
- ◆ Electric drill with plastic brush attachment
- ◆ Sealant ⇒ Electronic parts catalogue

Removing

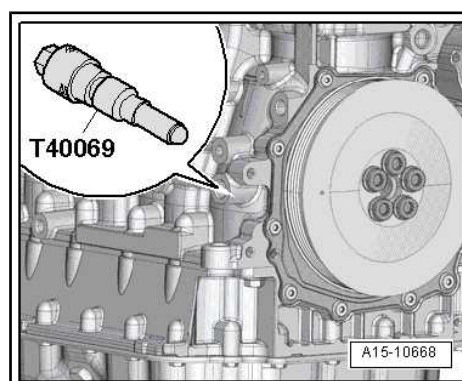
- Gearbox removed ⇒ Rep. gr. 34 ; Removing and installing gearbox; Removing gearbox
- Turn crankshaft with socket -T03003- in normal direction of rotation -arrow- to "TDC position".
- Notch -1- in socket -T03003- must be perpendicular to sealing surface of sump.
- Marking -2- on vibration damper must be opposite marking -3- on sealing flange.



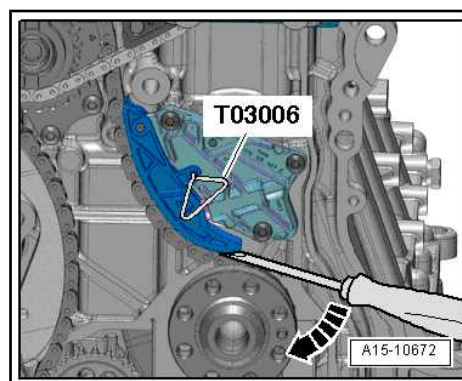
- Unscrew plug -arrow- for "TDC" marking from cylinder block.



- Screw locking pin - T40069- into locating groove and tighten to 15 Nm. If necessary, turn crankshaft backwards and forwards slightly to fully centralise locking pin.
- Remove sealing flange (pulley end) ⇒ [page 50](#) .
- Remove timing chain cover (bottom) ⇒ [page 78](#) .



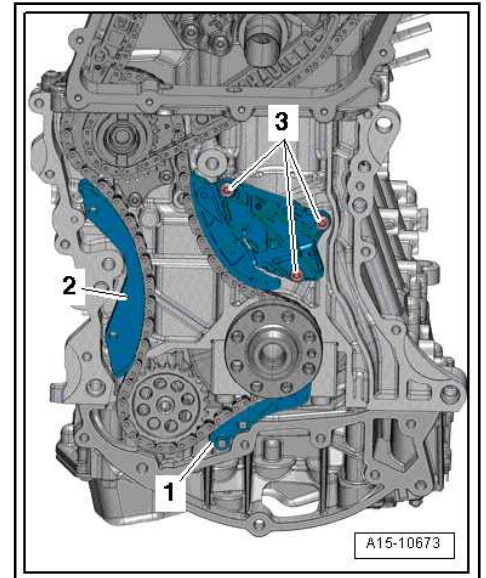
- Press guide rail of chain tensioner for drive chain in direction of -arrow- and lock chain tensioner by inserting locking pin - T03006- .



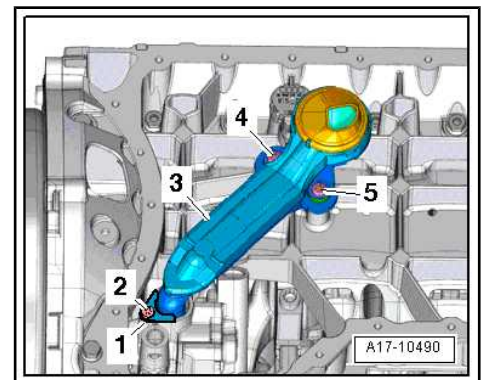
- Detach guide rail (bottom) -1-.



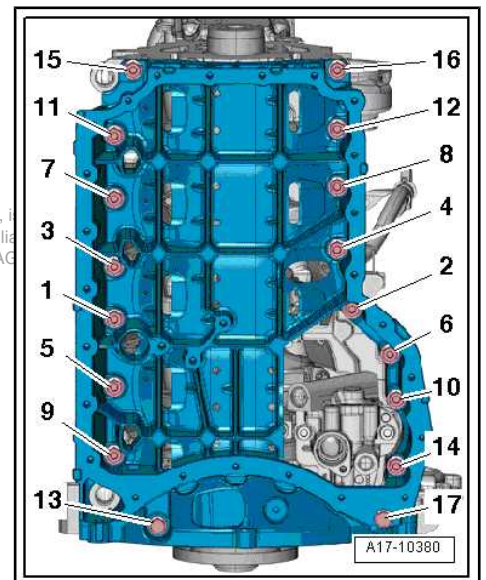
Disregard items -2 and 3-.



- Remove sump (bottom section) ⇒ [page 132](#) .
- Unscrew bolts -2, 4, 5- and remove bracket -1-.
- Detach oil intake pipe -3-.



- Slacken and remove bolts in the sequence: -17 ... 1-.



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- Carefully release sump (top section) from bonded joint; apply screwdriver -A- at positions shown in illustration.

B - Bearing cap 6 for crankshaft

C - Bearing cap 1 for crankshaft

Installing



Note

Renew seals and O-rings.



Caution

Protect lubrication system against contamination.

- ◆ *Cover exposed parts of the engine.*

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WARNING

Risk of eye injury.

- ◆ *Put on safety goggles.*

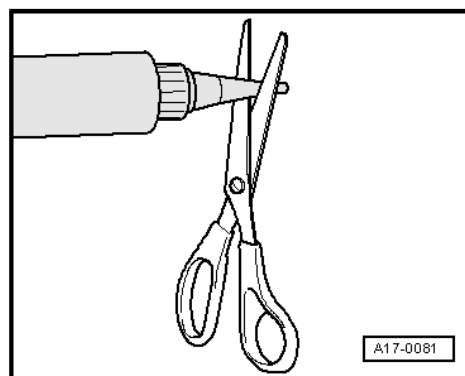
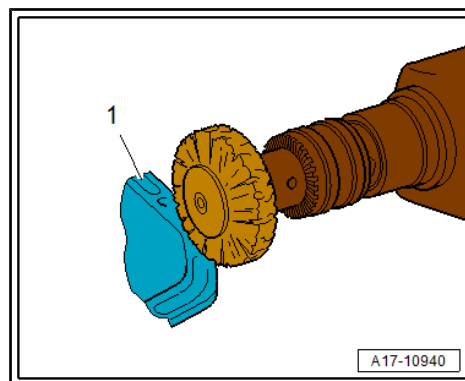
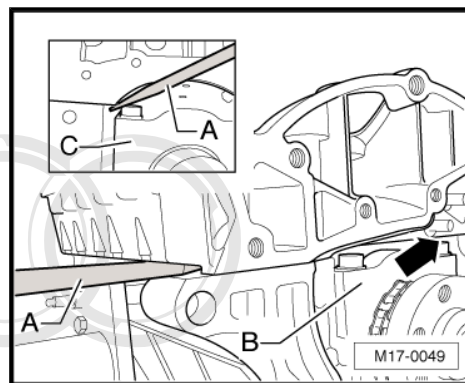
- Remove sealant residue from sump (top section) -1- and cylinder block using rotating plastic brush or similar.
- Clean sealing surfaces; they must be free of oil and grease.



Note

Note the use-by date of the sealant.

- Cut off nozzle of tube at front marking (nozzle Ø approx. 1.5 mm).





Caution

Make sure lubrication system is not clogged by excess sealant.

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

- Apply beads of sealant -1, 2, 3- onto clean sealing surface of sump (top section) as shown in illustration.
- Thickness of sealant bead: 1.5 ... 2.0 mm.

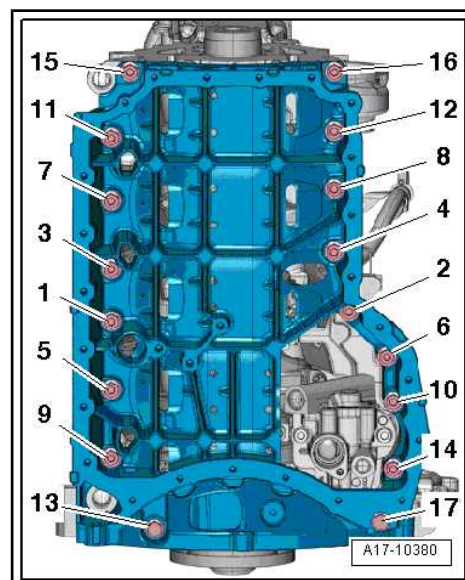
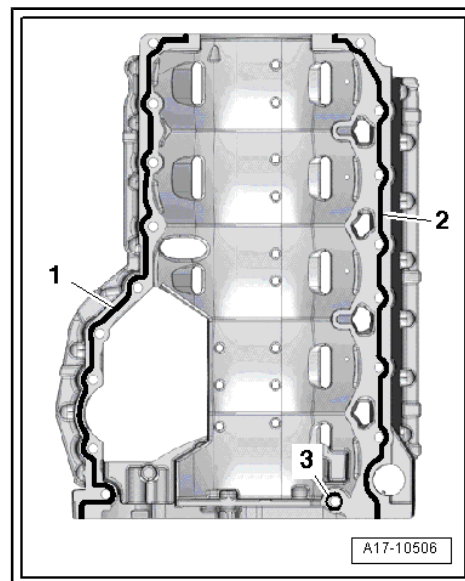


Note

The sump (top section) must be installed within 5 minutes after applying the sealant.

- Fit sump (top section) and screw in bolts -13, 15, 16, 17- by hand until they make contact.

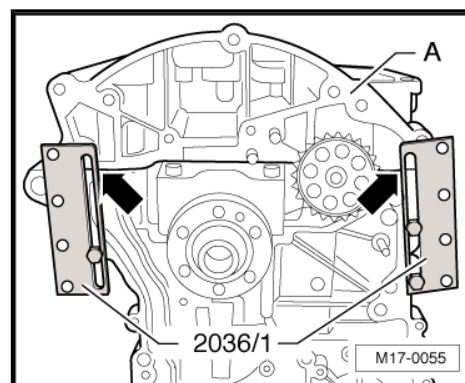
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- Wipe off surplus sealant -arrows-.
- Loosen bolts slightly.
- Secure plates -2036/1- to 20 Nm at cylinder block as shown in illustration.
- Press sump (top section) -A- firmly onto plates.
- Tighten bolts for sump (top section) ⇒ [page 131](#) .
- The sump (top section) must remain in contact with plates.

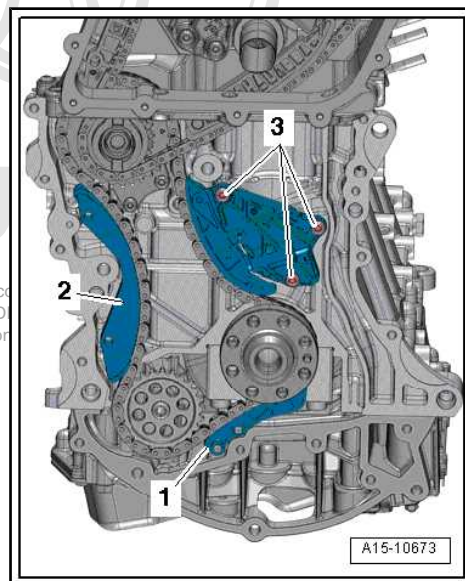
Remaining installation steps are carried out in reverse sequence; note the following:

- Install sump (bottom section) ⇒ [page 132](#) .



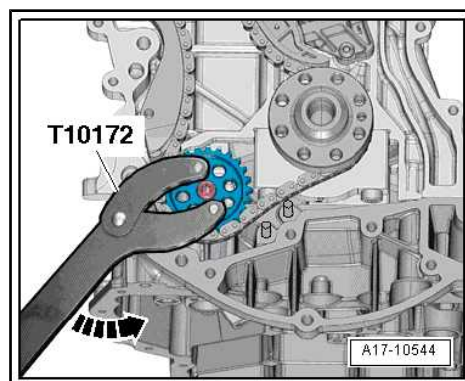
- Insert guide rail (bottom) -1-.

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Note

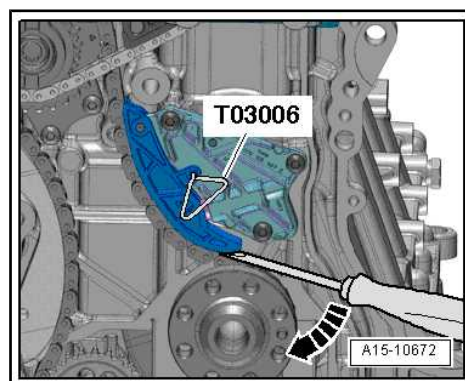
If necessary for insertion of guide rail, pre-tension drive chain for valve gear via oil pump drive chain sprocket using counterhold tool - T10172A- .



- Press guide rail of chain tensioner for drive chain in direction of -arrow- and remove locking pin -T03006- .
- Install timing chain cover (bottom) ⇒ [page 78](#) .
- Install sealing flange (pulley end) ⇒ [page 50](#) .
- Remove locking pin - T40069- .

Tightening torques

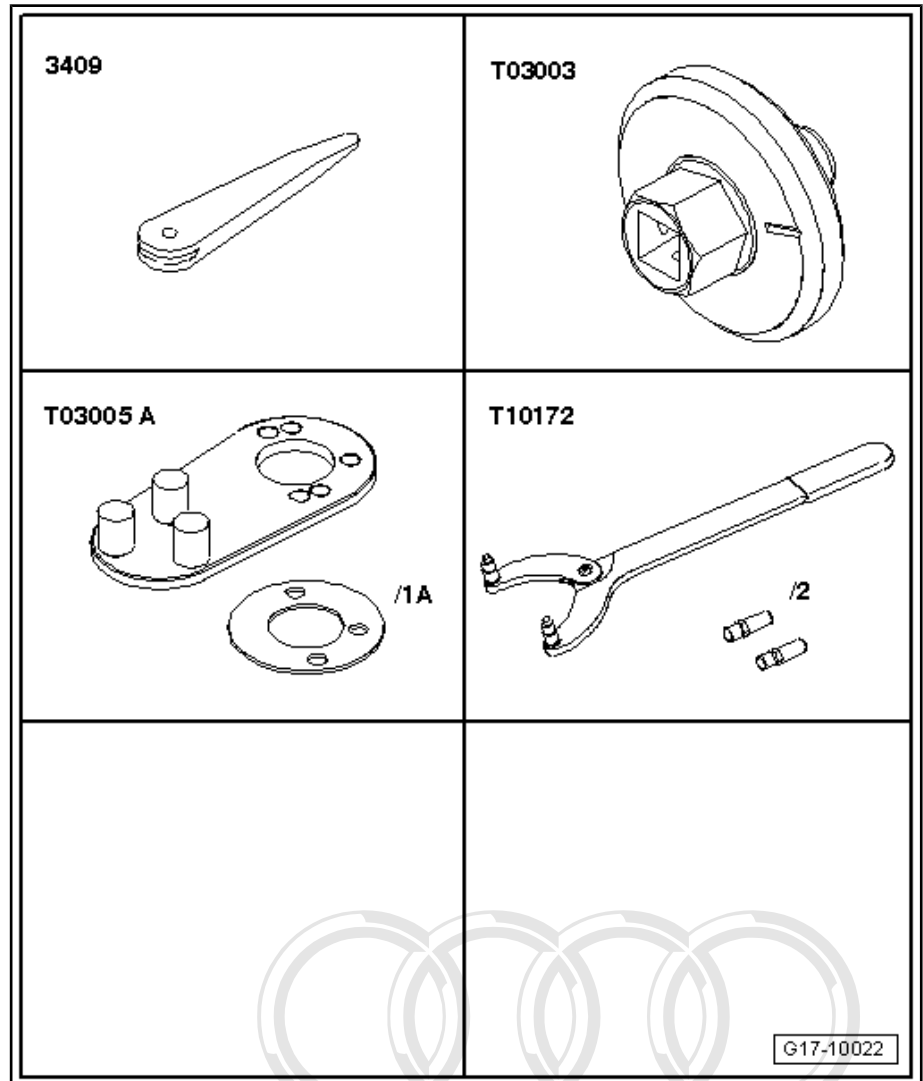
- ◆ ⇒ [Fig. "Plug for TDC marking - tightening torque" , page 62](#)
- ◆ ⇒ [Fig. "Sump \(top section\) - tightening torque and sequence" , page 131](#)



1.5 Removing and installing oil pump

Special tools and workshop equipment required

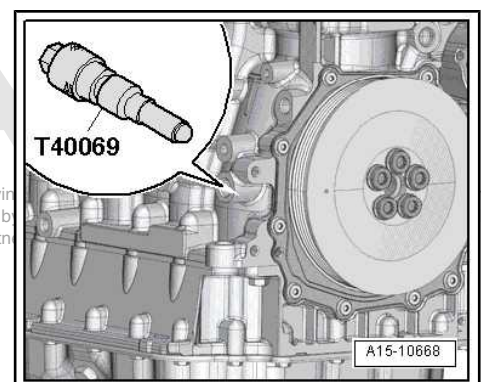
- ◆ Removal wedge - 3409-
- ◆ Wrench -T03003-
- ◆ Oil pump lock -T03005 A-
- ◆ Counterhold tool - T10172A-



Removing

- Remove sump (top section) ⇒ [page 134](#) .
- Crankshaft locked in position with locking pin - T40069- .

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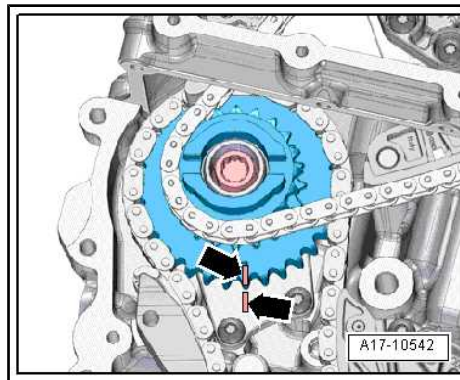
- Mark position of drive chain sprocket for camshaft timing chain and thrust washer with paint -arrows-.



Caution

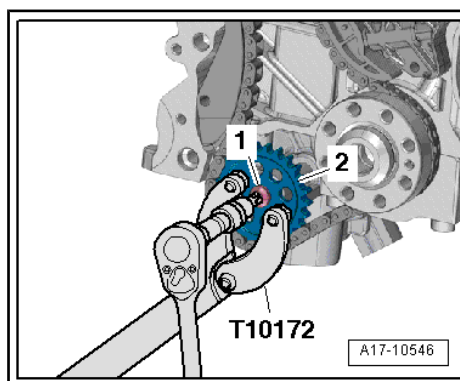
Risk of damage to engine.

- ◆ *The markings serve to check whether the position of the drive chain sprocket for camshaft (and, as a result, the position of the camshafts) has been changed during the following work steps.*
- ◆ *If the position was changed, the valve timing must be adjusted after completing work
⇒ "2.3 Removing and installing camshaft timing chain",
page 85.*

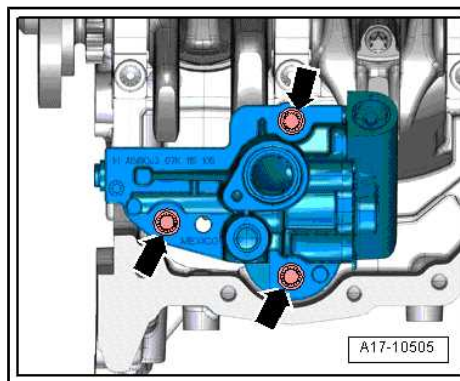


- Counterhold using counterhold tool - T10172A- , remove bolt -1- and detach drive chain sprocket -2-.

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- Remove bolts -arrows- and detach oil pump.



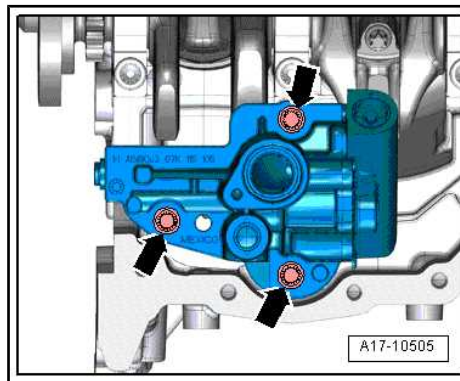
Installing



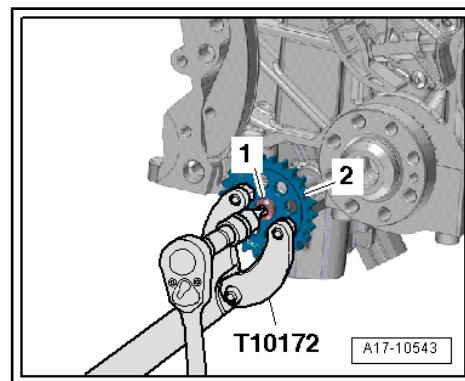
Note

Fit new O-ring.

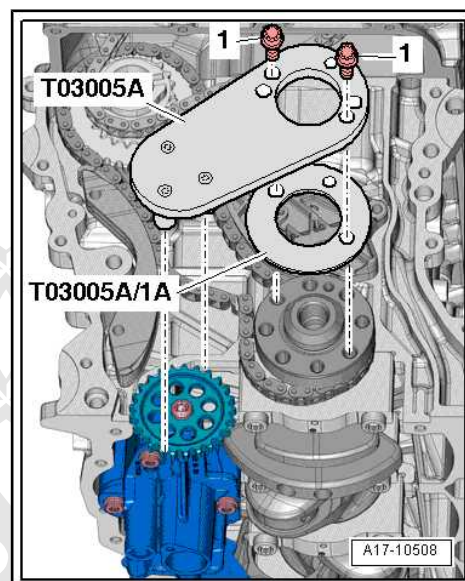
- Initially screw in bolts -arrows- for oil pump by hand until they make contact.
- It must still be possible to move oil pump by hand.



- Drive chain for valve gear must not be fitted.
- Fit drive chain sprocket -2- onto oil pump.
- Lettering on drive chain sprocket must be legible.
- Tighten bolt -1- to 20 Nm (counterhold using counterhold tool - T10172A-).

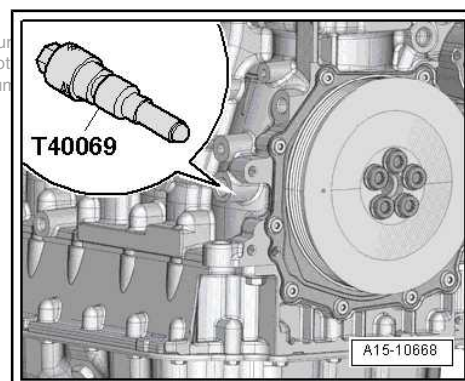


- Remove protective plates on magnets of oil pump lock - T03005 A- if fitted.
- Check if there are metal shavings on the magnets of oil pump lock.
- The contact surfaces on crankshaft, tools and drive chain sprocket must be clean.
- Fit plate -T03005 /1A- and oil pump lock -T03005 A- at crankshaft journal and tighten to 30 Nm with two bolts -1- for flywheel.
- The oil pump is drawn nearer by the magnets.

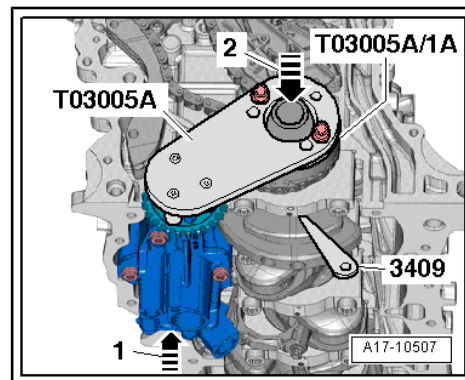


- Remove locking pin - T40069- .

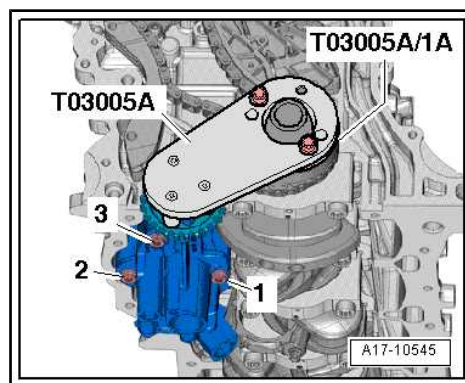
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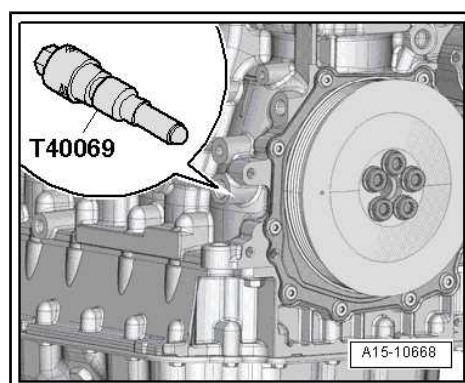
- Press crankshaft via axial bearing clearance towards pulley end -arrow 2- and secure in this position using removal wedge - 3409- .
- Press oil pump via axial bearing clearance slightly towards gearbox end -arrow 1- and hold in position.



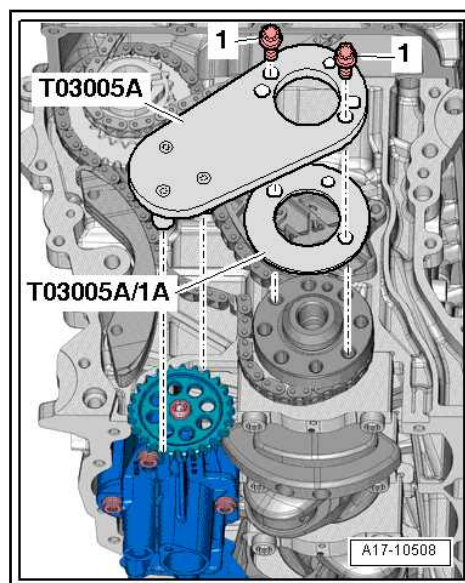
- Tighten bolts in the sequence -1, 2, 3-.



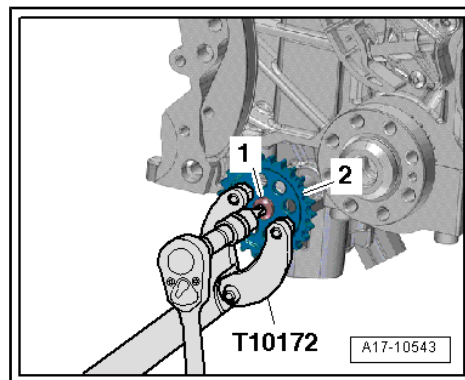
- Screw locking pin - T40069 - into locating groove and tighten to 15 Nm.



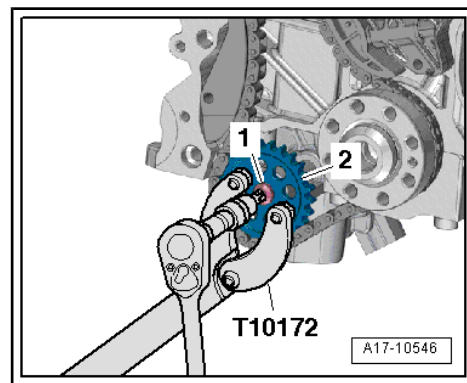
- Remove bolts -1- and detach oil pump lock -T03005 A- and plate -T03005 /1A- .
- If a new oil pump is fitted, fill in clean engine oil via intake port and turn oil pump several turns.



- Counterhold using counterhold tool - T10172A- , remove bolt -1- and detach drive chain sprocket -2- again.



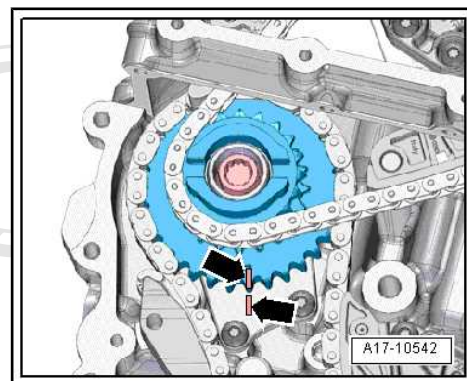
- Insert drive chain sprocket in drive chain, tighten bolt -1- (counterhold using counterhold tool - T10172A-).
- Install sump (upper section) ⇒ [page 134](#) .



- Check that colour codings -arrows- marking position between drive chain sprocket for camshaft timing chain and thrust washer still align.
- Continue installation if the markings align.
- Adjust valve timing if the markings do not align
⇒ [“2.3 Removing and installing camshaft timing chain”, page 85](#) .

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

- Remove locking pin - T40069- .



Note

Clean removal wedge - 3409- thoroughly as wedge is normally used for interior body repairs.

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Tightening torques

- ◆ ⇒ [“1.1 Exploded view - sump/oil pump”, page 129](#)
- ◆ ⇒ [Fig. ““Plug for TDC marking - tightening torque””, page 62](#)

1.6 Removing and installing oil level and oil temperature sender - G266-

Removing

- Drain off engine oil ⇒ Maintenance ; Booklet 820 .
- Unplug electrical connector -2-.
- Remove nuts -1-.
- Pull oil level and oil temperature sender - G266- -item 3- off sump (bottom section) and remove together with seal -4-.

Installing

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



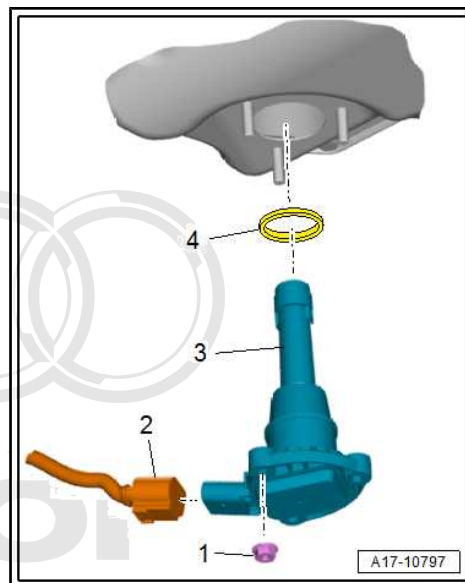
Note

Renew seal.

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

Tightening torques

- ◆ ⇒ ["1.1 Exploded view - sump/oil pump" page 129](#)



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2 Engine oil cooler

⇒ [“2.1 Removing and installing engine oil cooler”, page 147](#)

2.1 Removing and installing engine oil cooler

Removing

- Remove thermostat with housing ⇒ [page 171](#) .



Place a cloth beneath the oil filter housing to catch escaping oil.

- Remove bolts -arrows-.
- Detach engine oil cooler -1- and detach coolant hose (release hose clip -2-).

Installing

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

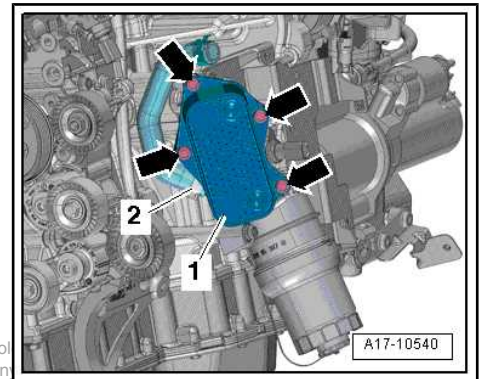


Renew all seals and gaskets.

- Install thermostat with housing ⇒ [page 171](#) .
- Check oil level ⇒ Maintenance ; Booklet 820 .

Tightening torques

- ◆ ⇒ [“3.1 Exploded view - oil filter housing/oil pressure switches”, page 148](#)



3 Oil filter/oil pressure switches

⇒ ["3.1 Exploded view - oil filter housing/oil pressure switches", page 148](#)

⇒ ["3.2 Removing and installing oil pressure switch F22", page 150](#)

⇒ ["3.3 Removing and installing oil pressure switch for reduced oil pressure F378", page 152](#)

⇒ ["3.4 Checking oil pressure", page 152](#)

⇒ ["3.5 Removing and installing oil filter housing", page 153](#)

⇒ ["3.6 Removing and installing valve for oil pressure control N428", page 155](#)

3.1 Exploded view - oil filter housing/oil pressure switches

1 - Seal

- ☐ Renew after removing
- ☐ Lubricate lightly with oil
- ☐ Installation position: service lug faces upwards

2 - Oil filter element

- ☐ Removing and installing
⇒ Maintenance ; Booklet 820

3 - Bolt

- ☐ 20 Nm

4 - Engine oil cooler

- ☐ See note ⇒ [page 129](#)
- ☐ Ensure clearance from surrounding components
- ☐ Connection diagram - coolant hoses
⇒ [page 157](#)
- ☐ Removing and installing
⇒ [page 147](#)

5 - Seal

- ☐ Renew after removing
- ☐ Insert positioning lug in groove on oil filter bracket

6 - Gasket

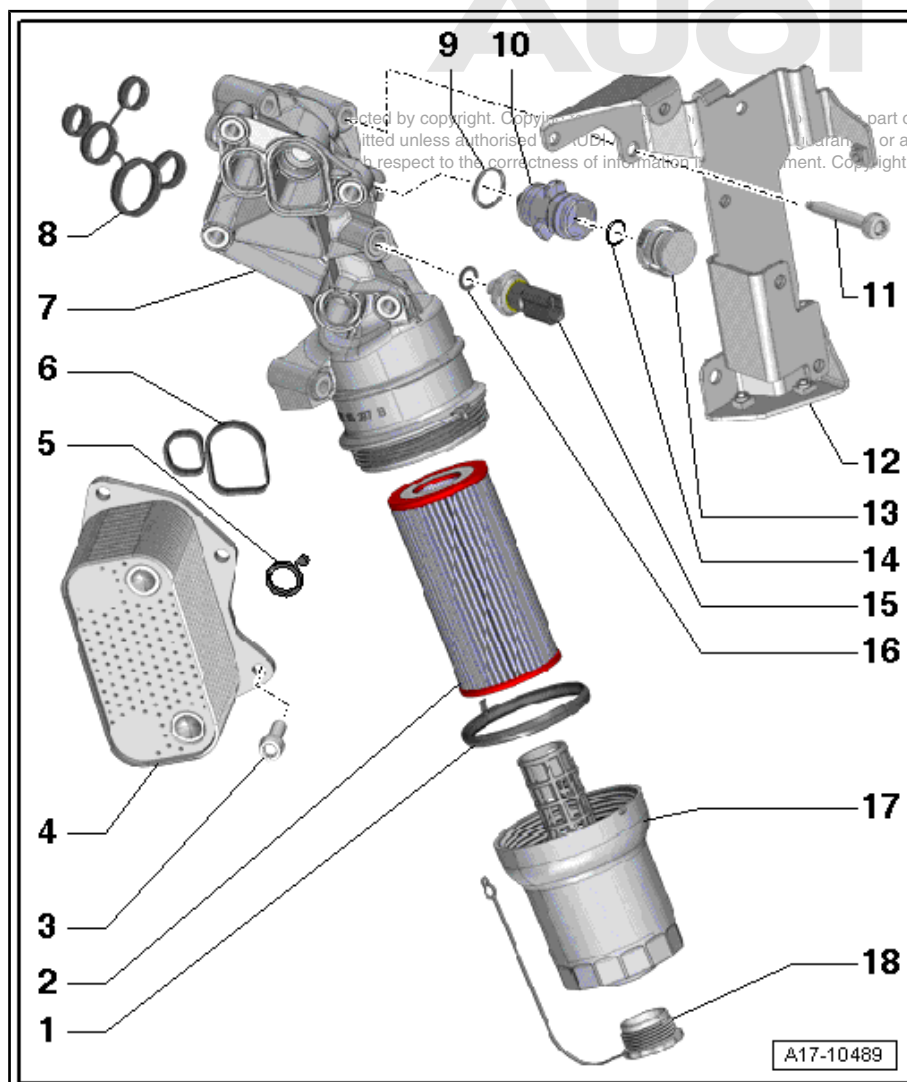
- ☐ Renew after removing

7 - Oil filter housing

- ☐ With bypass valve for engine oil cooler and oil retention valve
- ☐ Removing and installing ⇒ [page 153](#)

8 - Gasket

- ☐ Renew after removing



9 - O-ring

- ☐ Renew after removing

10 - Connecting piece

11 - Bolt

- ☐ 20 Nm

12 - Bracket

13 - Cap

14 - O-ring

- ☐ Renew after removing

15 - Oil pressure switch for reduced oil pressure - F378-

- ☐ Brown insulation
- ☐ Opening/closing pressure 0.55 ... 0.85 bar
- ☐ Check in Guided Functions ⇒ Vehicle diagnostic tester.
- ☐ Removing and installing ⇒ [page 152](#)
- ☐ 20 Nm

16 - Seal

- ☐ Renew after removing

17 - Cover for oil filter housing

- ☐ Draining, removing and installing ⇒ [Maintenance ; Booklet 820](#)

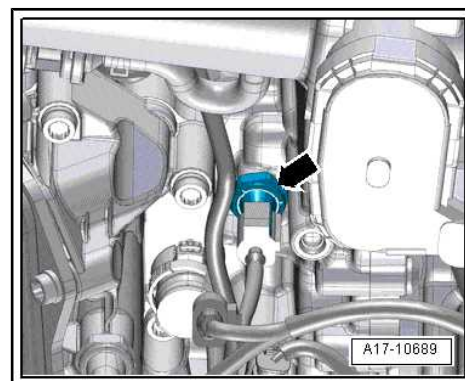
18 - Dust cap

Oil pressure switch - F22-

- ◆ Blue insulation
- ◆ Opening/closing pressure 2.15 ... 2.95 bar
- ◆ 20 Nm
- ◆ Renew seal.

Checking in Guided Functions ⇒ Vehicle diagnostic tester

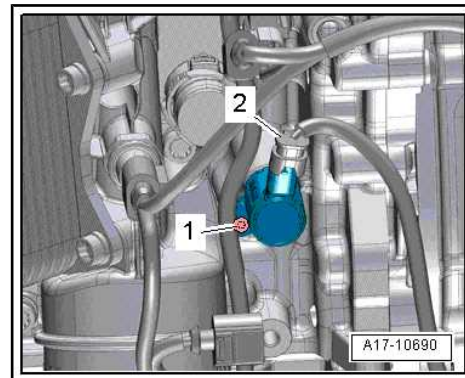
Removing and installing ⇒ [page 150](#)



Valve for oil pressure control - N428-

- 1 - Bolt
- ◆ 9 Nm
- ◆ Renew O-ring
- 2 - Electrical connector

Removing and installing ⇒ [page 150](#)



3.2 Removing and installing oil pressure switch - F22-

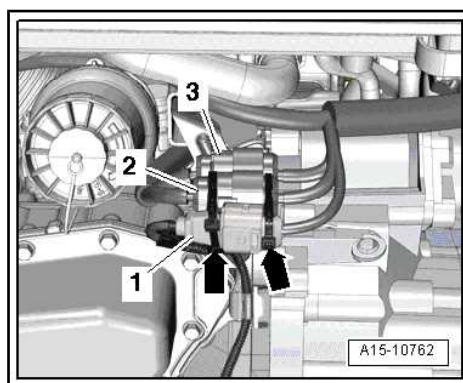
Removing



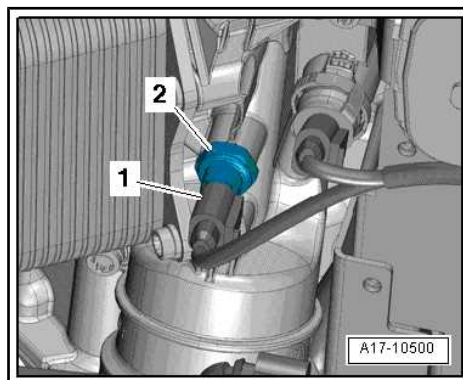
Note

Fit all cable ties in the original positions when installing.

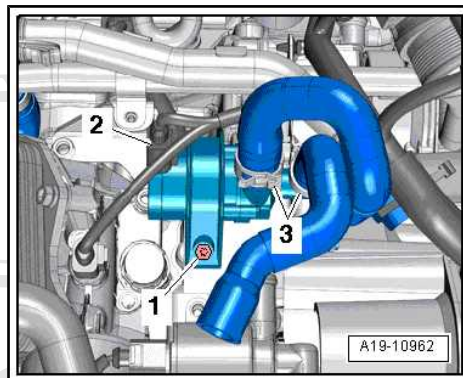
- Empty cover for oil filter housing ⇒ Maintenance ; Booklet 820 .
- Remove front coolant pipes ⇒ [page 183](#) .
- Take electrical connector -1- out of bracket and move it clear; to do so, cut open cable ties (if fitted) -arrows-.
- Take electrical connectors -2- and -3- out of bracket.



- Unplug electrical connector -1- on oil pressure switch -2-.

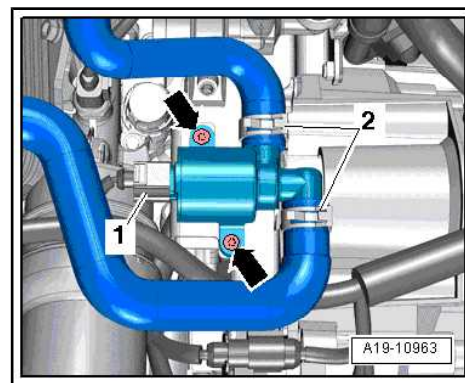


- Unplug electrical connector -2-.
- Unscrew bolt -1- and move continued coolant circulation pump - V51- to one side (coolant hoses -3- remain connected).

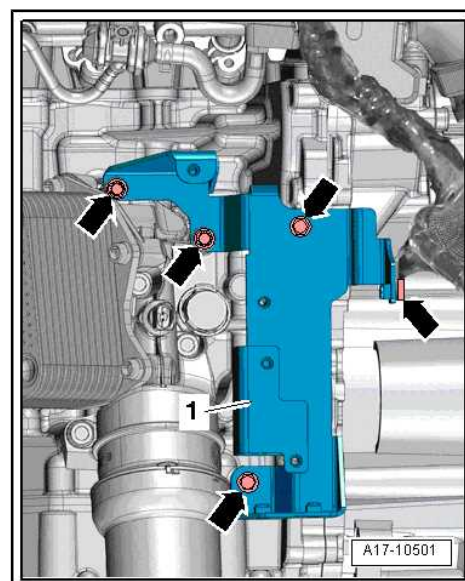


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- Unplug electrical connector -1-.
- Unscrew bolts -arrows- and move solenoid valve for coolant circuit - N492- to one side (coolant hoses -2- remain connected).



- Remove bolts -arrows-, detach bracket -1- and move electrical wiring clear.



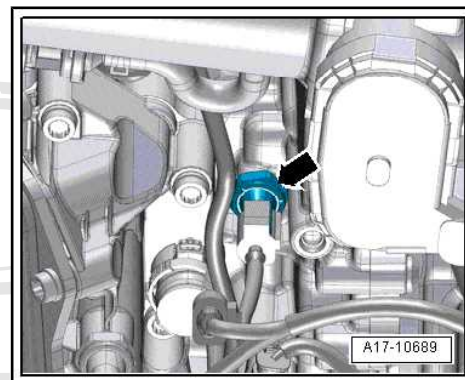
Note

Place a cloth underneath to catch escaping engine oil.

- Unplug electrical connector -arrow-.
- Unscrew oil pressure switch - F22- .

Installing

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



Note

Renew seal/O-ring.

- Install coolant pipe (left-side) ⇒ [page 178](#).
- Install coolant pipes (front) ⇒ [page 183](#) .
- Check oil level ⇒ Maintenance ; Booklet 820 .

Tightening torques

- ♦ ⇒ Fig. ““ Oil pressure switch -F22- ””, page 149
- ♦ Continued coolant circulation pump - V51- and solenoid valve for coolant circuit - N492-
⇒ [“2.1 Exploded view - coolant pump/thermostat”, page 166](#)

3.3 Removing and installing oil pressure switch for reduced oil pressure - F378-

Removing

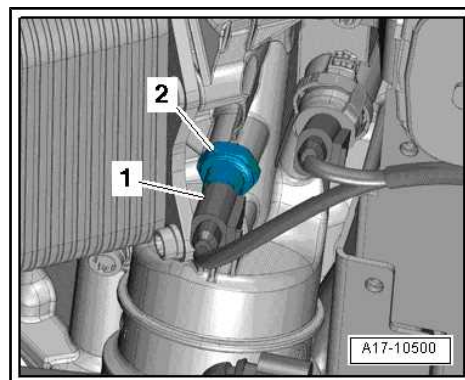
- Unplug electrical connector -1-.
- Unscrew oil pressure switch for reduced oil pressure - F378-item 2-.

Installing

Installation is carried out in reverse sequence.

Tightening torques

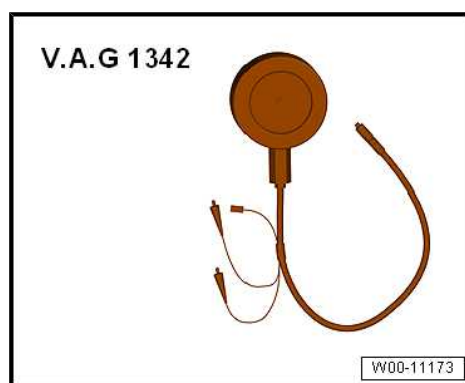
- ♦ ⇒ [“3.1 Exploded view - oil filter housing/oil pressure switches”, page 148](#)



3.4 Checking oil pressure

Special tools and workshop equipment required

- ♦ Oil pressure tester - V.A.G 1342-



Procedure

- Oil level OK
- Engine oil temperature approx. 80 °C
- Remove oil pressure switch for reduced oil pressure - F378-
⇒ [page 152](#) .
- Screw oil pressure switch into oil pressure tester - V.A.G 1342- .
- Screw oil pressure tester - V.A.G 1342- into bore for oil pressure switch in oil filter bracket.
- Start engine.
- Oil pressure at idling speed: at least 1.0 bar.
- Oil pressure at 3800 rpm: at least 3.0 bar.
- Install oil pressure switch for reduced oil pressure - F378-
⇒ [page 152](#) .

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3.5 Removing and installing oil filter housing

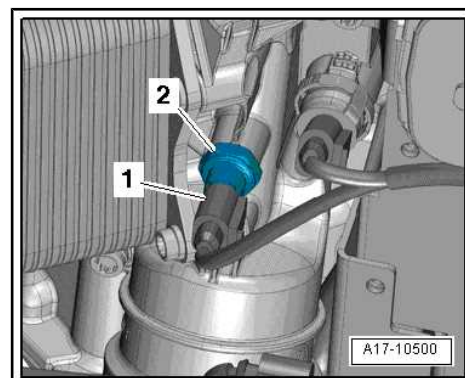
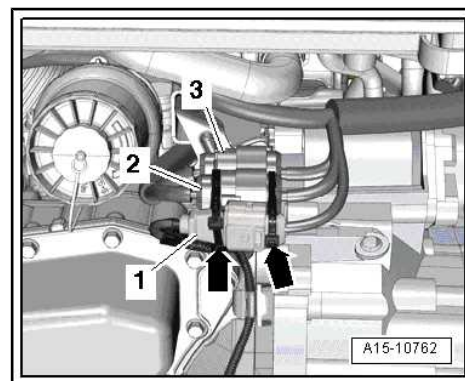
Removing



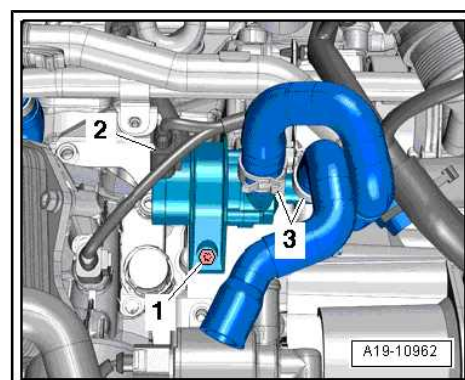
Note

- ◆ *The oil filter housing is removed and installed together with the engine oil cooler.*
- ◆ *Fit all cable ties in the original positions when installing.*
- Empty cover for oil filter housing ⇒ Maintenance ; Booklet 820 .
- Remove front coolant pipes ⇒ [page 183](#) .
- Take electrical connector -1- out of bracket and move it clear; to do so, cut open cable ties (if fitted) -arrows-.
- Take electrical connectors -2- and -3- out of bracket.

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

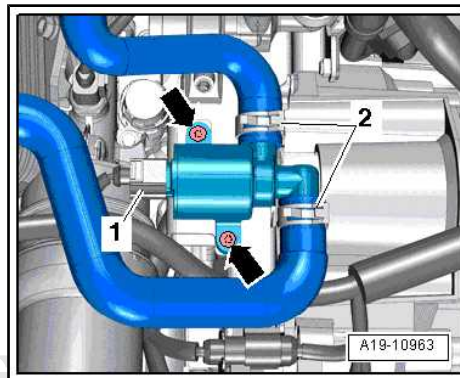


- Unplug electrical connector -2-.
- Unscrew bolt -1- and move continued coolant circulation pump - V51- to one side (coolant hoses -3- remain connected).

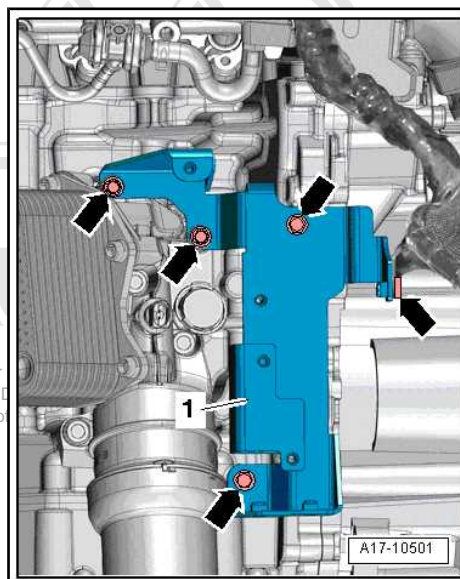


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- Unplug electrical connector -1-.
- Unscrew bolts -arrows- and move solenoid valve for coolant circuit - N492- to one side (coolant hoses -2- remain connected).



- Remove bolts -arrows-, detach bracket -1- and move electrical wiring clear.



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Note

Place a cloth beneath the oil filter housing to catch escaping oil.

- Unscrew bolts -arrows- and remove oil filter bracket with engine oil cooler.

Installing

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



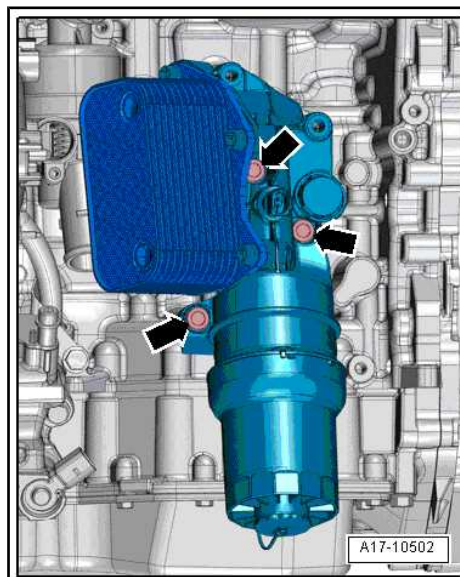
Note

Renew seals and/or gaskets.

- Install coolant pipe (left-side) ⇒ [page 178](#) .
- Install coolant pipes (front) ⇒ [page 183](#) .
- Check oil level ⇒ Maintenance ; Booklet 820 .

Tightening torques

- ♦ ⇒ [“3.1 Exploded view - oil filter housing/oil pressure switches”, page 148](#)
- ♦ Continued coolant circuit pump - V51- , solenoid valve for coolant circuit - N492-
⇒ [“2.1 Exploded view - coolant pump/thermostat”, page 166](#)



3.6 Removing and installing valve for oil pressure control - N428-

Removing

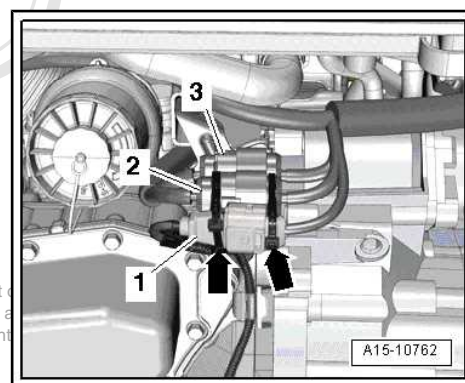


Note

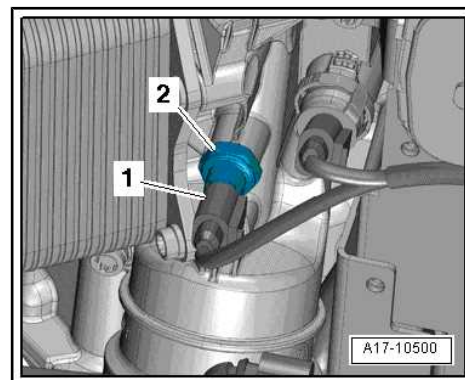
Fit all cable ties in the original positions when installing.

- Empty cover for oil filter housing ⇒ Maintenance ; Booklet 820 .
- Remove front coolant pipes ⇒ [page 183](#) .
- Move electrical connector -1- clear and cut open cable ties (if fitted) -arrows-.
- Take electrical connectors -2- and -3- out of bracket.

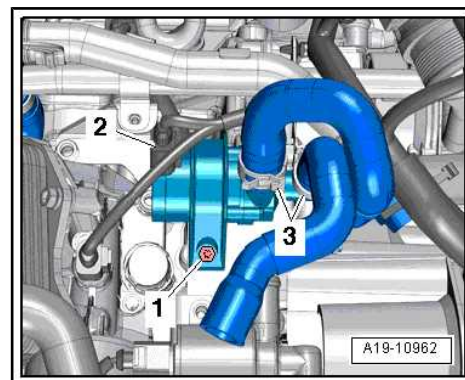
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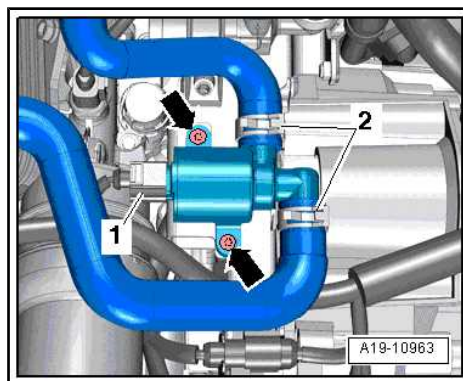
- Unplug electrical connector -1- on oil pressure switch -2-.



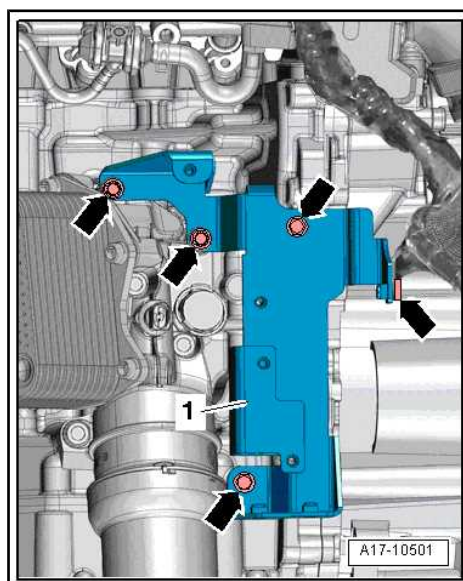
- Unplug electrical connector -2-.
- Unscrew bolt -1- and move continued coolant circulation pump - V51- to one side (coolant hoses -3- remain connected).



- Unplug electrical connector -1-.
- Unscrew bolts -arrows- and move solenoid valve for coolant circuit - N492- to one side (coolant hoses -2- remain connected).



- Unscrew bolts -arrows- and detach bracket -1-.
- Move electrical wiring clear.



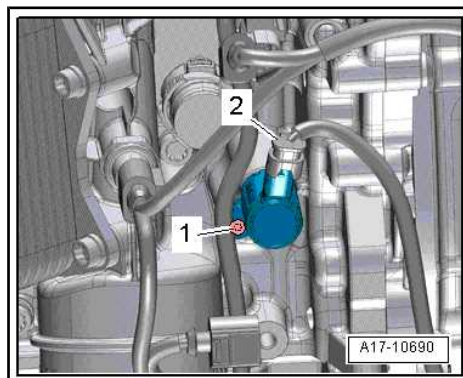
Note

Place a cloth underneath to catch escaping engine oil.

- Unplug electrical connector -2-.
- Remove bolt -1- and detach valve for oil pressure control - N428-.

Installing

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



Note

Renew seal/O-ring.

- Install coolant pipe (left-side) ⇒ [page 178](#) .
- Install coolant pipes (front) ⇒ [page 183](#) .
- Check oil level ⇒ Maintenance ; Booklet 820 .

Tightening torques

- ♦ ⇒ [Fig. “Valve for oil pressure control -N428-”](#), [page 149](#)
- ♦ Continued coolant circulation pump - V51- and solenoid valve for coolant circuit - N492- ⇒ [page 166](#)

19 – Cooling

1 Cooling system/coolant

⇒ “1.1 Connection diagram - coolant hoses”, page 157

⇒ “1.2 Checking cooling system for leaks”, page 158

⇒ “1.3 Draining and filling cooling system”, page 159

1.1 Connection diagram - coolant hoses



Note

- ◆ Blue = Large coolant circuit.
- ◆ Red = Small coolant circuit with heating circuit.
- ◆ Purple = Coolant circuit for turbocharger.
- ◆ Arrows show direction of coolant flow.

1 - Auxiliary radiator

- ☐ For coolant circuit for gearbox

2 - Radiator

3 - Non-return valve

- ☐ Arrow indicates direction of flow

4 - Thermostat with housing

5 - Coolant pump

6 - Cylinder head and cylinder block

7 - Coolant expansion tank

- ☐ With filler cap and pressure relief valve
- ☐ Checking pressure relief valve ⇒ [page 159](#)

8 - Heat exchanger for heater

9 - Restrictor

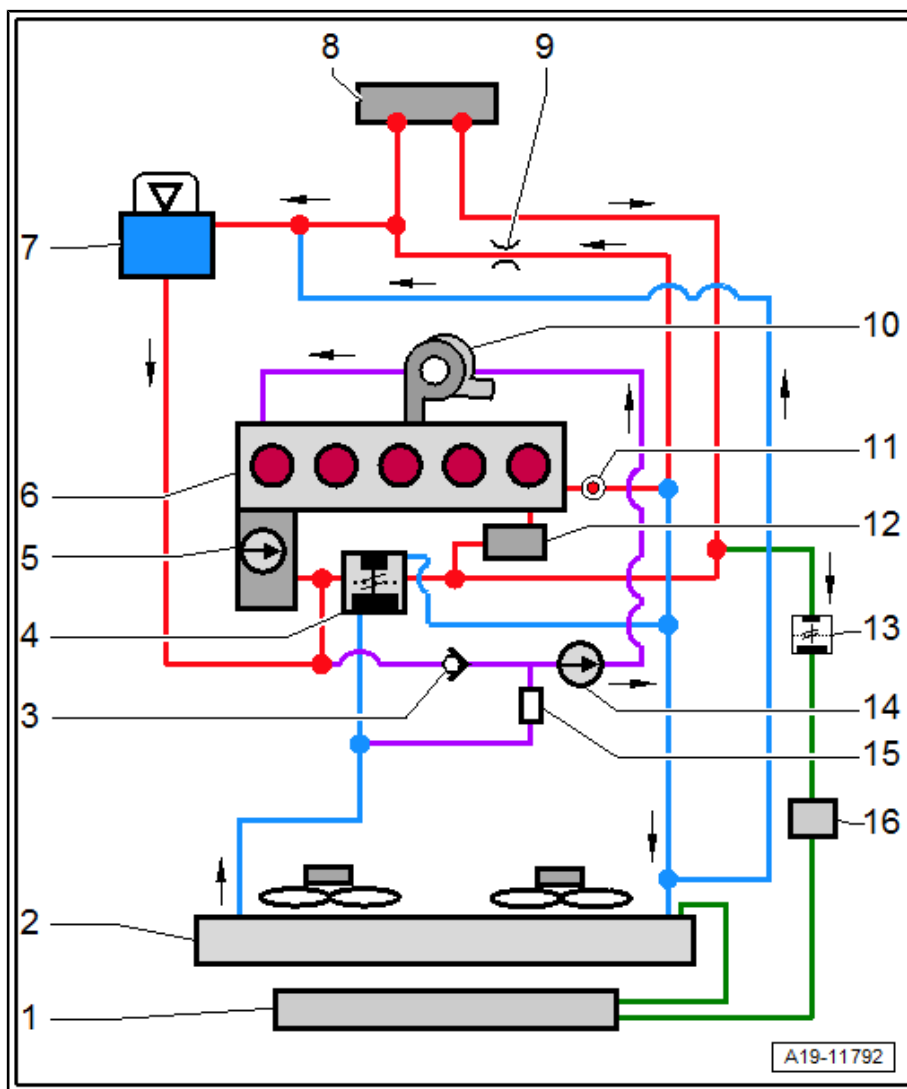
10 - Turbocharger

11 - Coolant temperature sender - G62-

12 - Engine oil cooler

13 - Thermostat

- ☐ For coolant circuit for gearbox



14 - Continued coolant circulation pump - V51-

15 - Solenoid for coolant circuit - N492-

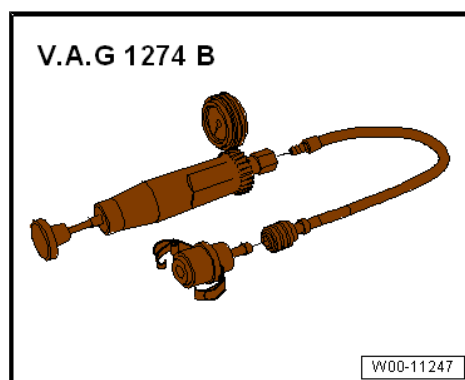
16 - Heat exchanger

☐ For gear oil

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

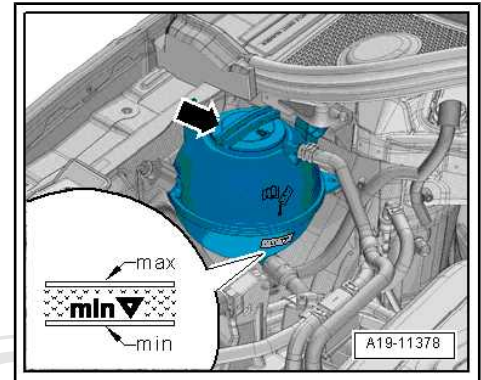
- Engine must be warm.



WARNING

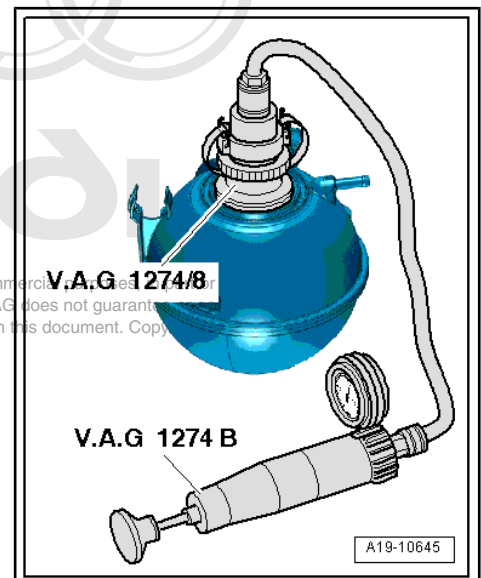
Hot steam/hot coolant can escape - risk of scalding.

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



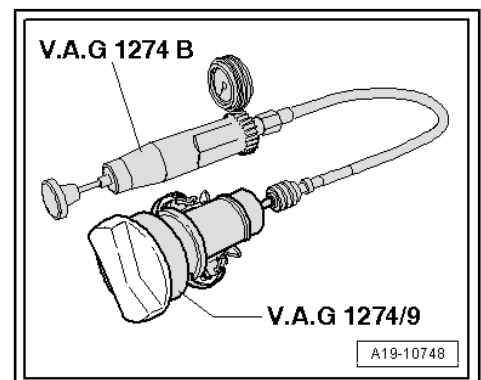
- Open filler cap -arrow- on coolant expansion tank.
- Fit cooling system tester - V.A.G 1274 B- with adapter - V.A.G 1274/8- onto coolant expansion tank.
- Using hand pump on cooling system tester, build up a pressure of approx. 1.0 bar.
- If this pressure is not maintained, locate and rectify leaks.

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Checking pressure relief valve in filler cap

- Fit cooling system tester - V.A.G 1274 B- with adapter - V.A.G 1274/9- onto filler cap.
- Build up pressure with hand pump on cooling system tester.
- The pressure relief valve should open at a pressure of 1.4 ... 1.6 bar.
- Renew filler cap if pressure relief valve does not open as described.

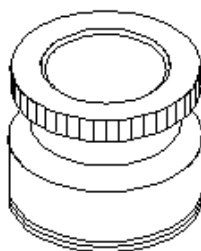


1.3 Draining and filling cooling system

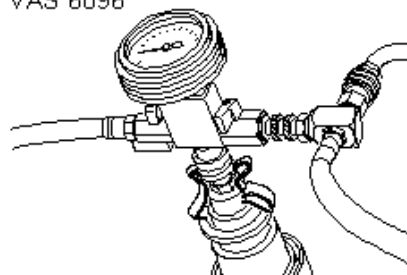
Special tools and workshop equipment required

- ◆ Adapter for cooling system tester - V.A.G 1274/8-
- ◆ Cooling system charge unit - VAS 6096- with - VAS 6096/1-
- ◆ Coolant collecting system - VAS 5014- or drip tray for workshop hoist - VAS 6208-
- ◆ Hose clip pliers - VAS 6362-
- ◆ Refractometer - T10007 A-

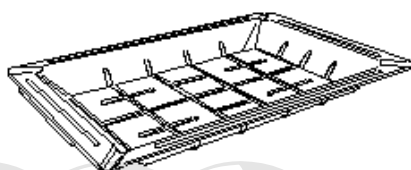
V.A.G 1274/8



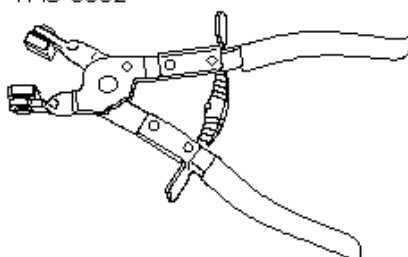
VAS 6096



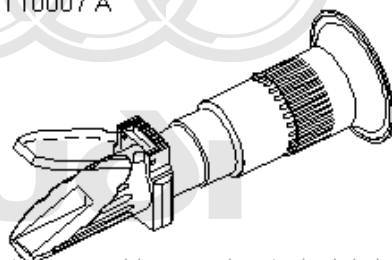
VAS 6208



VAS 6362



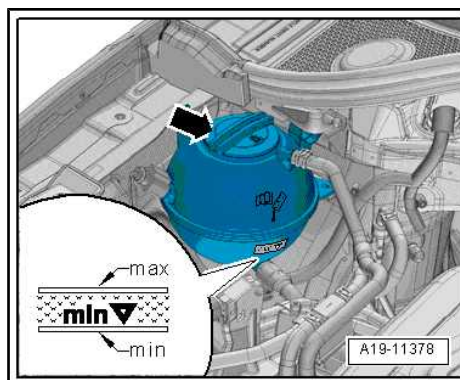
T10007 A



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G19-10030

Draining



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.

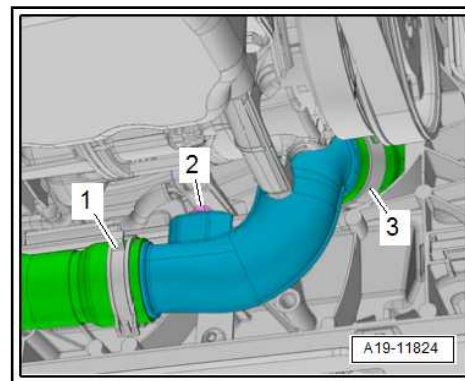
- Put on protective gloves.
- Put on safety goggles.
- Cover filler cap on expansion tank with a cloth and open carefully to release pressure.

- 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 collector tank from coolant collecting system -VAS
5014- or drip tray for workshop hoist - VAS 6208- underneath.
- Release hose clip -1-, disconnect coolant hose and drain off
coolant.

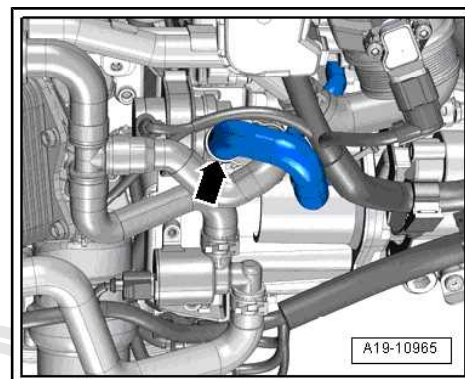


Note

Disregard items -2 and 3-.



- Release hose clip -arrow-, disconnect coolant hose from con-
tinued coolant circulation pump - V51- and drain off coolant.



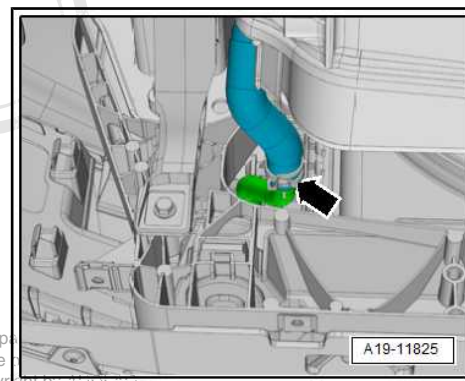
- Release hose clip -arrow-, disconnect coolant hose (left-side)
and drain off coolant.

Filling



Caution

***To ensure optimal corrosion protection, only distilled water
may be mixed with coolant additives.***



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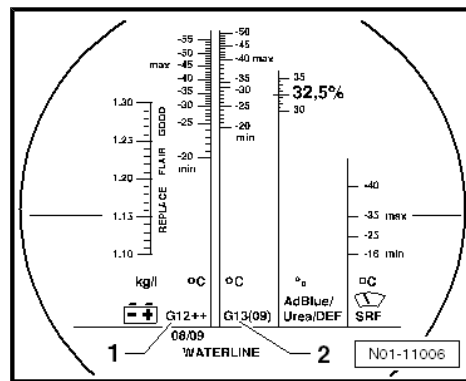


Note

- ◆ *The effectiveness of the coolant is greatly influenced by the quality of the water with which it is mixed. Because water may contain different substances depending on the country or even the region, the water quality to be used for cooling systems has been specified. Distilled water meets all the requirements and is therefore recommended for use when topping up or filling up with coolant.*
- ◆ *Use only coolant additives listed in the ⇒ Electronic parts catalogue (ETKA) . If you use other coolant additives, this can significantly impair in particular the corrosion protection effect. The resulting damage could lead to loss of coolant and consequently to serious engine damage.*
- ◆ *Coolant with the recommended mixture ratio prevents frost and corrosion damage and stops scaling. At the same time it raises the boiling point of the fluid in the system. For this reason the cooling system must be filled all year round with the correct coolant additive.*
- ◆ *Because of its high boiling point, the coolant improves engine reliability under heavy loads, particularly in countries with tropical climates.*
- ◆ *The refractometer - T10007A- MUST be used to determine the current level of frost protection.*
- ◆ *The mixture must guarantee frost protection down to at least -25 °C (in countries with arctic climate: down to -36 °C). The amount of antifreeze should only be increased if greater frost protection is required in very cold climates. This must only be down to -48 °C, however, as otherwise the cooling efficiency of the coolant is impaired.*
- ◆ *The coolant concentration must not be reduced by adding water even in warmer seasons and in warmer countries. Frost protection must be provided to at least -25 °C.*
- ◆ *Read off the level of frost protection on the scale for the relevant coolant additive.*
- ◆ *The temperature indicated on the refractometer - T10007A- corresponds to the temperature at which the first ice crystals can form in the coolant.*
- ◆ *Do not reuse coolant.*
- ◆ *Only use water/coolant additive as a lubricant for coolant hoses.*

Recommended mixture ratio for coolant

- Coolant (40 %) and distilled water (60 %) for frost protection to -25 °C
- Coolant (50 %) and distilled water (50 %) for frost protection to -36 °C
- Coolant ⇒ Electronic parts catalogue (ETKA)



Procedure

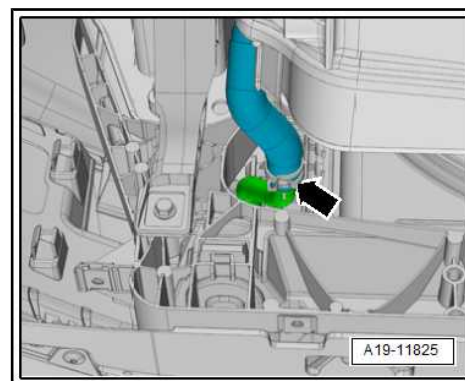
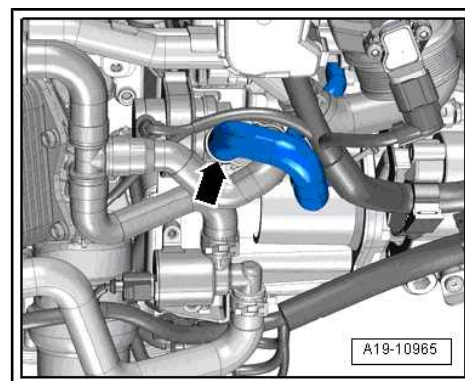
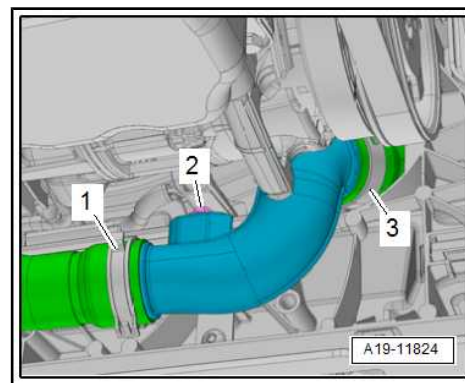
- Connect coolant hose using hose clip -1-.



- Connect coolant hose using hose clip -arrow-.

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- Connect coolant hose using hose clip -arrow-.



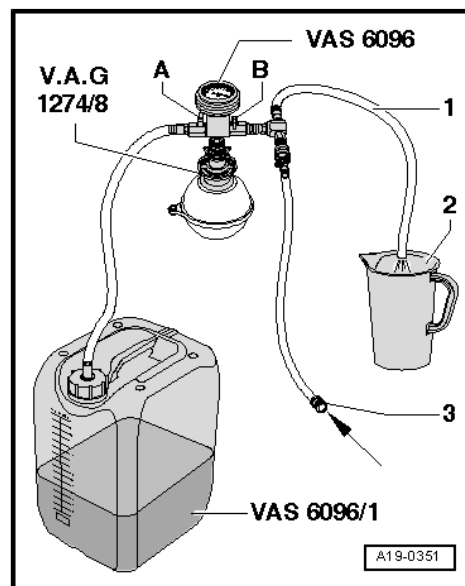
- Fill reservoir of cooling system charge unit - VAS 6096- with 10 litres of premixed coolant (according to recommended ratio [⇒ page 162](#)).
- Fit adapter for cooling system tester - V.A.G 1274/8- onto coolant expansion tank.
- Fit cooling system charge unit - VAS 6096- onto adapter for cooling system tester - V.A.G 1274/8- .
- Run vent hose -1- into a small container -2-.



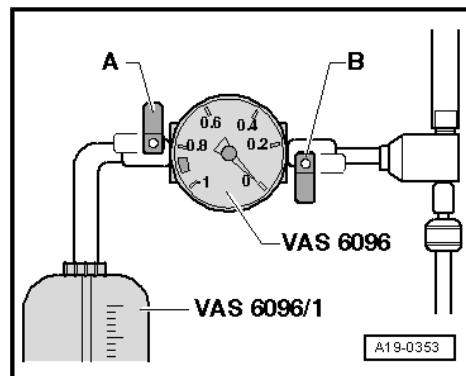
Note

The vented air draws along a small amount of coolant, which should be collected.

- Close both valves -A- and -B- (turn lever at right angles to direction of flow).
- Connect hose -3- to compressed air supply.
- Pressure: 6 ... 10 bar.

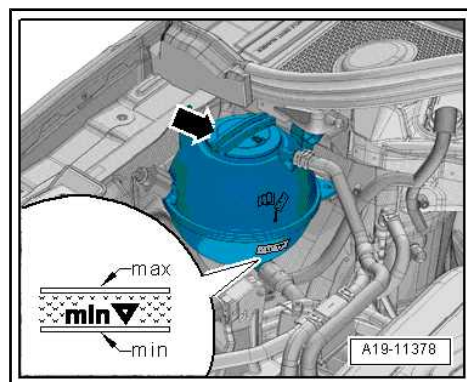


- Open valve -B- by setting lever in direction of flow.
- The suction jet pump generates a partial vacuum in the cooling system; the needle on the gauge should move into the green zone.
- Also briefly open valve -A- (turn lever in direction of flow) so that hose on reservoir of cooling system charge 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.

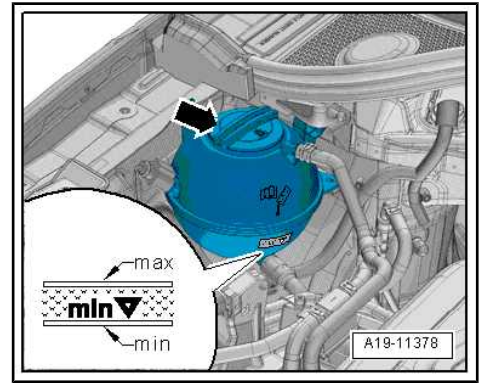


Note

- ◆ *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.
- Top up coolant to “max” mark.
- 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.
- Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .
- Check coolant level.



- The coolant level must be between the “min” and “max” markings when the engine is cold.
- The coolant level can be at the “max” marking when the engine is warm.
- Top up with coolant again if necessary.



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2 Coolant pump/thermostat assembly

⇒ ["2.1 Exploded view - coolant pump/thermostat", page 166](#)

⇒ ["2.2 Removing and installing electric coolant pump", page 167](#)

⇒ ["2.3 Removing and installing coolant pump", page 168](#)

⇒ ["2.4 Removing and installing thermostat", page 171](#)

⇒ ["2.5 Removing and installing coolant distributor housing", page 174](#)

⇒ ["2.6 Removing and installing coolant temperature sender G62", page 175](#)

⇒ ["2.7 Removing and installing coolant valves", page 175](#)

2.1 Exploded view - coolant pump/thermostat

1 - Seal

- ☐ Renew after removing

2 - Bolt

- ☐ 9 Nm

3 - Coolant pump

- ☐ Removing and installing
⇒ [page 168](#)

4 - Continued coolant circulation pump - V51-

- ☐ Removing and installing
⇒ [page 167](#)

5 - Bolt

- ☐ 9 Nm

6 - Solenoid for coolant circuit - N492-

- ☐ Removing and installing
⇒ [page 175](#)

7 - Bolt

- ☐ 9 Nm

8 - Coolant distributor housing

- ☐ Removing and installing
⇒ [page 174](#)

9 - O-ring

- ☐ Renew after removing

10 - Bolt

- ☐ 6 Nm

11 - Coolant pipes (front)

12 - Bolt

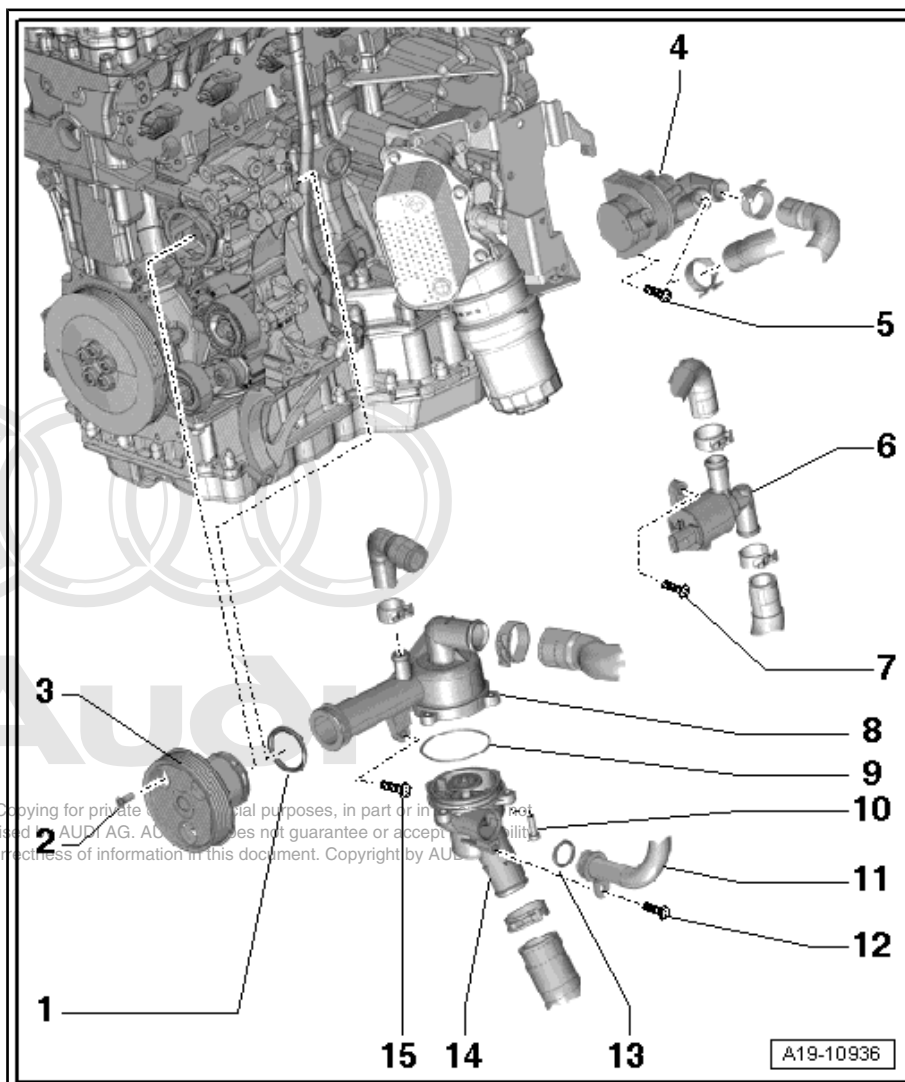
- ☐ 9 Nm

13 - O-ring

- ☐ Renew after removing

14 - Thermostat with housing

- ☐ Removing and installing ⇒ [page 171](#)



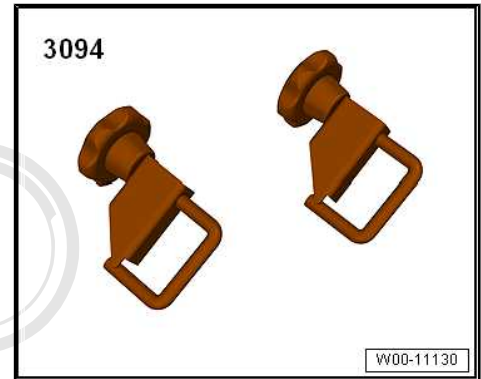
15 - Bolt

- 9 Nm

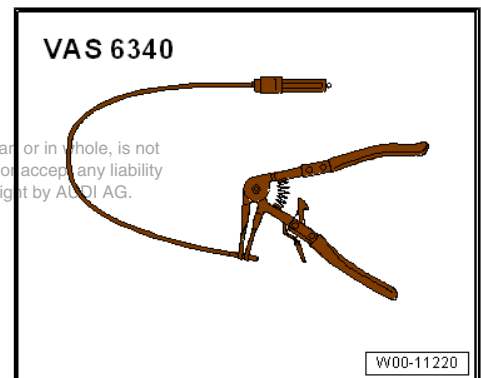
2.2 Removing and installing electric coolant pump

Special tools and workshop equipment required

- ◆ Hose clamps, up to 25 mm - 3094-



- ◆ Hose clip pliers - VAS 6340-



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Removing

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



Note

Place a cloth underneath to catch escaping coolant.

- Unplug electrical connector -2-.
- Remove bolt -1- and detach continued coolant circulation pump - V51- .
- Clamp off coolant hoses -3- with hose clamps up to 25 mm - 3094- and detach.

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 164](#) .

Tightening torques

- ◆ ⇒ [“2.1 Exploded view - coolant pump/thermostat”, page 166](#)
- ◆ ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

2.3 Removing and installing coolant pump

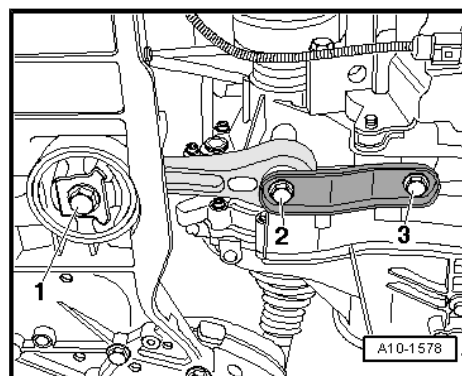
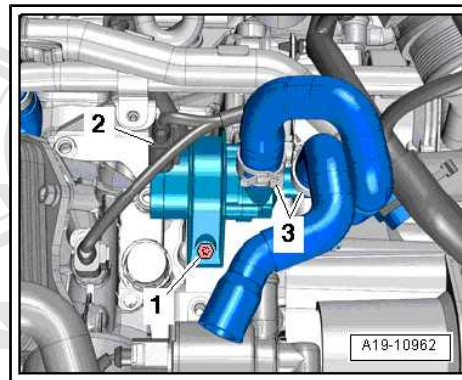
Removing

- Remove wheel spoiler (front right) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Removing and installing wheel housing liner (front) .
- Drain coolant ⇒ [page 159](#) .
- Support engine in installation position ⇒ [page 30](#) .
- Remove engine mounting ⇒ [page 33](#) .
- Remove bolts -2- and -3-.



Note

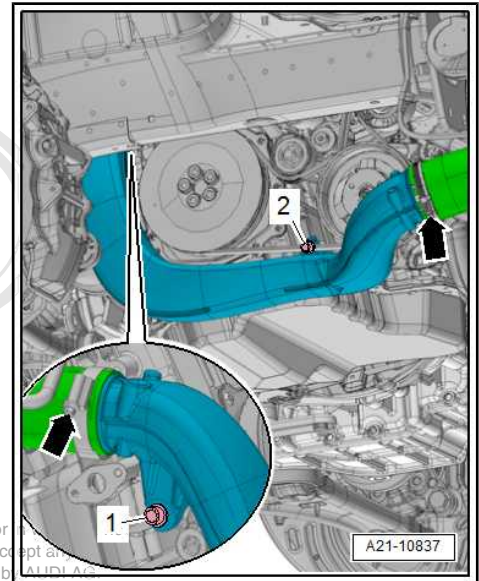
Disregard -item 1-.



- Remove bolts -1- and -2-.
- Loosen hose clips -arrows- and detach air pipe.



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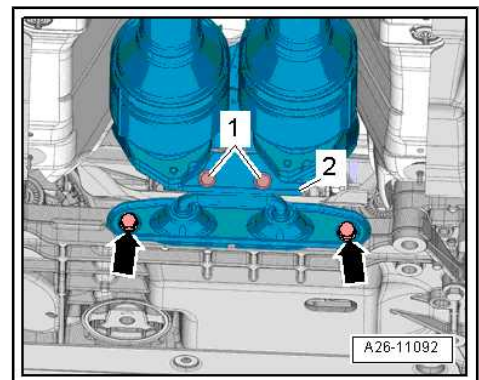


- Remove bolts -arrows-.

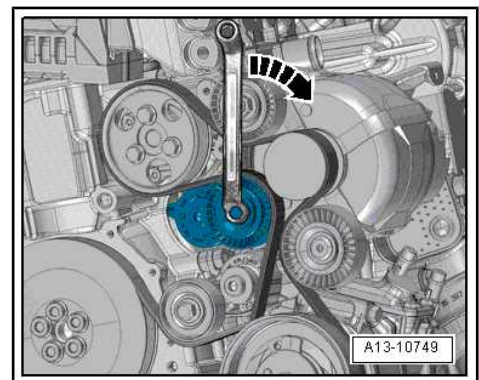


Note

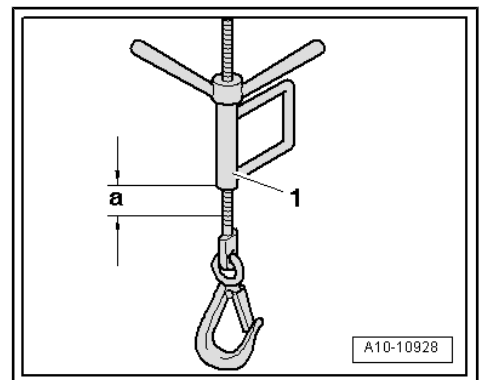
Disregard items -1 and 2-.



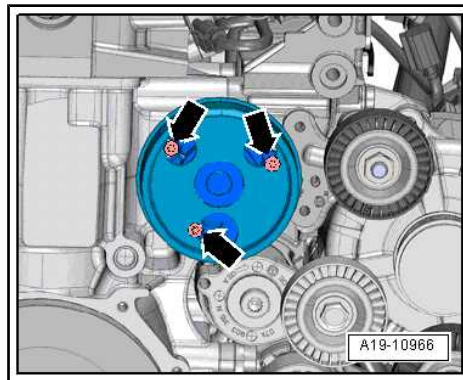
- Move tensioner in clockwise direction -arrow- to slacken poly V-belt.
- Remove poly V-belt from alternator and release tensioner.



- Using spindle (right-side) -1-, raise engine through distance -a-:
- Dimension -a- = 55 mm



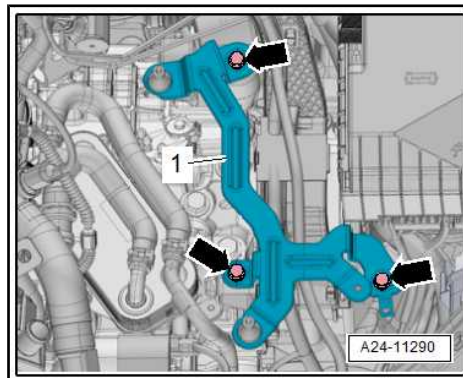
- Remove bolts -arrows- (access via holes in poly V-belt pulley) and detach coolant pump.



Note

Depending on the tolerance position of the assembly mountings, it might be necessary to also loosen the bolts for the gearbox mounting before the coolant pump can be detached. To do so, proceed as follows:

- Remove bolts -arrows- and detach bracket for air cleaner housing.

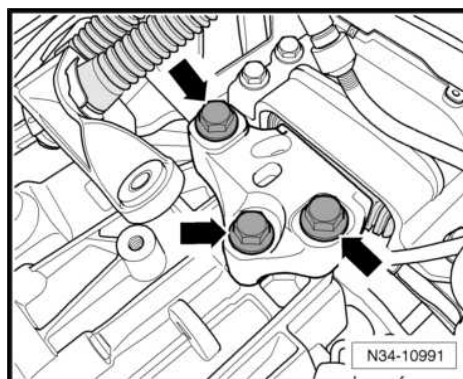


- Remove bolts -arrows- securing gearbox mounting.
- Push engine/gearbox assembly slightly towards left and detach coolant pump.

Installing

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

- Clean and smoothen sealing surface for integrated silicone seal on coolant pump.
- Install engine mountings ⇒ [page 33](#) .
- Install gearbox mounting ⇒ [page 36](#) .
- Install poly V-belt for alternator and coolant pump ⇒ [page 46](#) .



Note

Do not reuse coolant.

- Fill up with coolant ⇒ [page 161](#) .

Tightening torques

- ♦ ⇒ [“2.1 Exploded view - coolant pump/thermostat”, page 166](#)
- ♦ ⇒ [Fig. “Installing pendulum support”, page 30](#)
- ♦ Air pipe
⇒ [“2.1 Exploded view - charge air system”, page 210](#)
- ♦ ⇒ [“2.1 Exploded view - air cleaner housing”, page 224](#)
- ♦ ⇒ [“2.1 Exploded view - emission control system”, page 269](#)
- ♦ Wheel spoiler (front right) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front)

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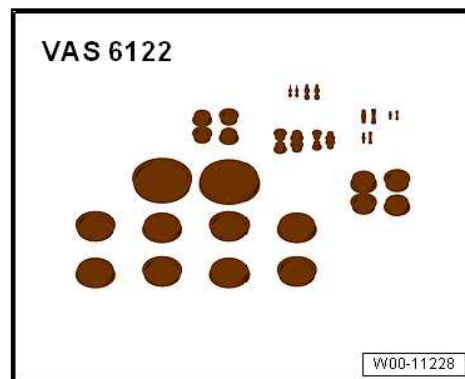
2.4 Removing and installing thermostat

Special tools and workshop equipment required

- ◆ Engine bung set - VAS 6122-

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- ◆ Drip tray for workshop hoist - VAS 6208-



- ◆ Hose clip pliers - VAS 6362-



Removing

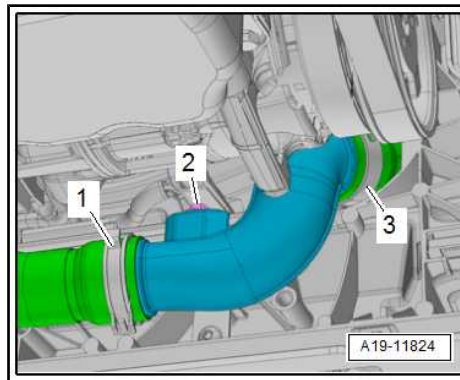
- Remove poly V-belt for alternator and coolant pump
⇒ [page 46](#) .
- Remove noise insulation ⇒ General body repairs, exterior;
Rep. gr. 66 ; Noise insulation; Removing and installing noise
insulation .

- Place collector tank from coolant collecting system -VAS 5014- or drip tray for workshop hoist - VAS 6208- underneath.
- Remove bolt -2-.
- Release hose clip -3-, disconnect coolant hose and drain off coolant.



Note

Disregard -item 1-.



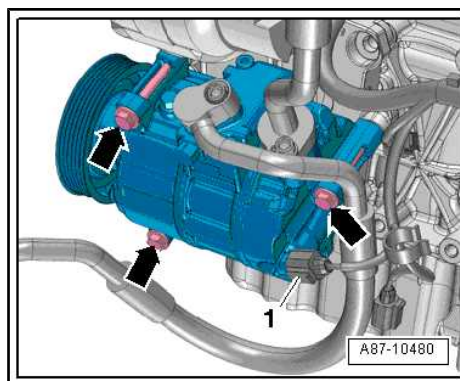
- Unplug electrical connector -1- on air conditioner compressor regulating valve - N280- .



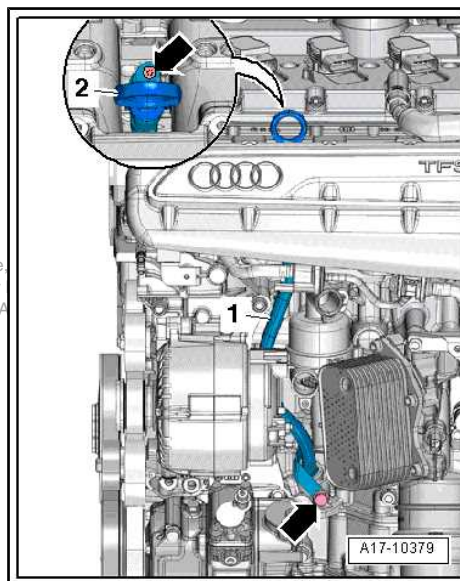
Caution

Danger of damage to refrigerant lines and hoses.

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

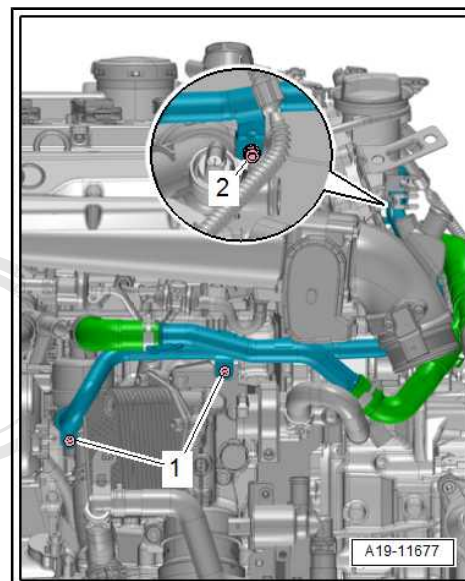


- Remove bolts -arrows-.
- Detach air conditioner compressor from bracket for ancillaries and tie up to the right side.
- Pull out oil dipstick -2-.
- Remove bolts -arrows-, pull out guide tube -1- for oil dipstick upwards and move it to one side.
- Seal off open lines and connections with clean plugs from engine bung set - VAS 6122- .
- Remove air cleaner housing ⇒ [page 225](#) .



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- Remove bolts -1- and nut -2- and detach front coolant pipes from thermostat housing.



- Remove bolts -arrows- and detach thermostat housing.

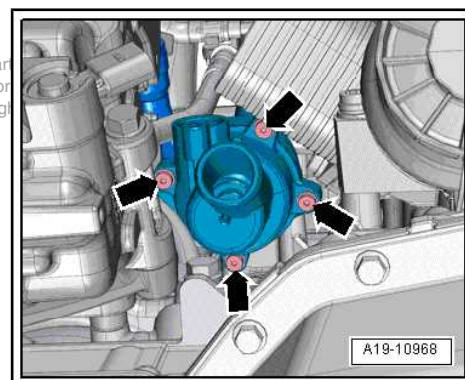
Installing

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



Note

- ◆ Fit new O-ring.
- ◆ Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ *Electronic parts catalogue*.
- Clean and smoothen sealing surface for O-ring.
- Lubricate O-ring with coolant.
- Install coolant pipes (front) ⇒ [page 183](#).
- 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 for alternator and coolant pump ⇒ [page 46](#).



Note

Do not reuse coolant.

- Fill up with coolant ⇒ [page 161](#).

Tightening torques

- ◆ ⇒ [“2.1 Exploded view - coolant pump/thermostat”, page 166](#)
- ◆ ⇒ [Fig. ““Guide tube for oil dipstick - tightening torque””, page 132](#)
- ◆ Coolant pipe at lock carrier
⇒ [“4.1 Exploded view - radiator/radiator fans”, page 187](#)
- ◆ ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

2.5 Removing and installing coolant distributor housing

Special tools and workshop equipment required

- ◆ Hose clip pliers - VAS 6362-



Removing

- Remove intake manifold (top section) ⇒ [page 230](#) .
- Remove thermostat with housing ⇒ [page 171](#) .
- Detach guide tube for oil dipstick.
- Release hose clips -1, 2- and disconnect coolant hoses.
- Remove bolts -arrows- and detach coolant distributor housing -3- to the left from cylinder block.

Installing

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



Note

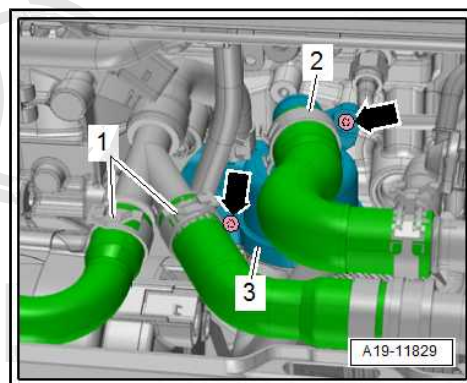
- ◆ *Fit new O-rings.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ [Electronic parts catalogue](#).*

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- Clean and smoothen sealing surface for O-ring.
- Lubricate O-ring with coolant and slide onto coolant distributor housing.
- Slide coolant distributor housing into bore in cylinder block.
- Install thermostat with housing ⇒ [page 171](#) .
- Install intake manifold (top section) ⇒ [page 230](#) .

Tightening torques

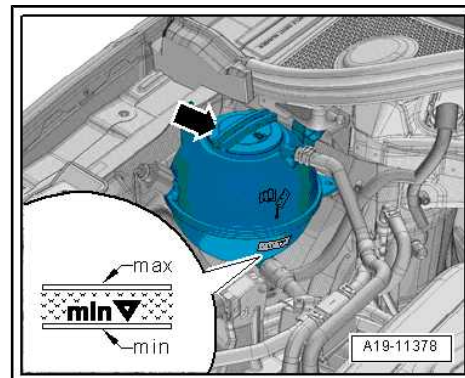
- ◆ ⇒ [“2.1 Exploded view - coolant pump/thermostat”, page 166](#)



2.6 Removing and installing coolant temperature sender - G62-

Removing

- Engine cold.
- Open filler cap -arrow- on coolant expansion tank briefly to relieve residual pressure in cooling system.
- Remove air cleaner housing ⇒ [page 225](#) .



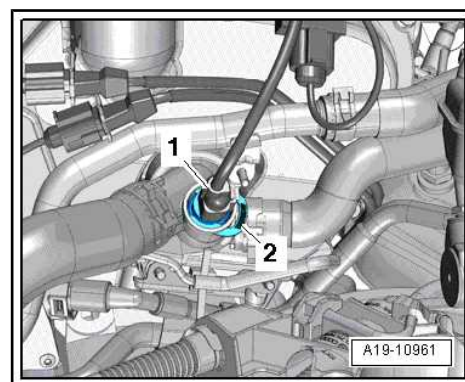
- Unplug electrical connector -1-.



Note

Place a cloth underneath to catch escaping coolant.

- Pull out retaining clip -2- and detach coolant temperature sender - G62- .



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.*

- Check coolant level ⇒ [page 164](#)

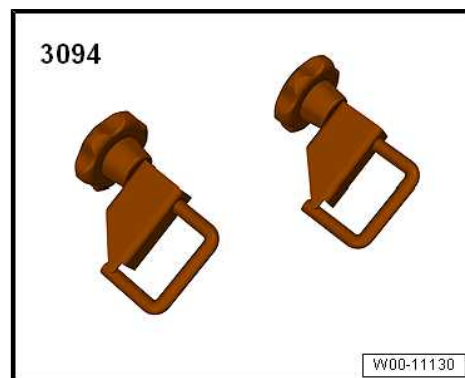
Tightening torques

- ◆ ⇒ [“2.1 Exploded view - air cleaner housing”, page 224](#)

2.7 Removing and installing coolant valves

Special tools and workshop equipment required

- ◆ Hose clamps, up to 25 mm - 3094-



- ◆ Hose clip pliers - VAS 6362-



Removing

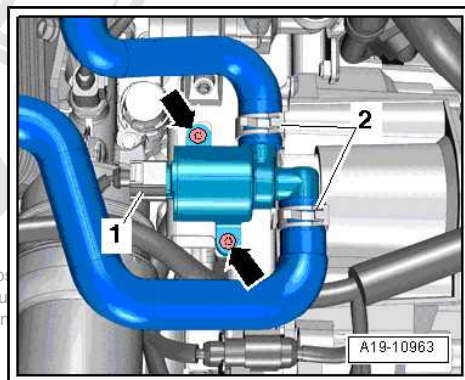
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .



Note

Place a cloth underneath to catch escaping coolant.

- Unplug electrical connector -1-.
- Remove bolts -arrows- and detach solenoid valve for coolant circuit - N492- .
- Clamp off coolant hoses -2- with hose clamps up to 25 mm 3094- and detach.



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 164](#) .

Tightening torques

- ◆ ⇒ [“2.1 Exploded view - coolant pump/thermostat”, page 166](#)
- ◆ ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

3 Coolant pipes

⇒ [“3.1 Exploded view - coolant pipes”, page 177](#)

⇒ [“3.2 Removing and installing coolant pipes”, page 178](#)

3.1 Exploded view - coolant pipes



Note

The arrow markings on coolant pipes and on ends of hoses must align when installing.

1 - Coolant pipe (right-side)

- ☐ Removing and installing
⇒ [page 182](#)

2 - Support ring

3 - Bolt

- ☐ 9 Nm

4 - Nut

- ☐ 5 Nm

5 - Bracket

- ☐ For fuel hoses

6 - Support ring

7 - Seal

- ☐ Renew after removing

8 - Bolt

- ☐ 9 Nm

9 - Retaining clip

10 - Coolant temperature sender - G62-

- ☐ Removing and installing
⇒ [page 175](#)

11 - O-ring

- ☐ Renew after removing

12 - Coolant connection

13 - Nut

- ☐ 9 Nm

14 - Nut

- ☐ 9 Nm

15 - Coolant pipe (left-side)

- ☐ Removing and installing ⇒ [page 178](#)

16 - Bolt

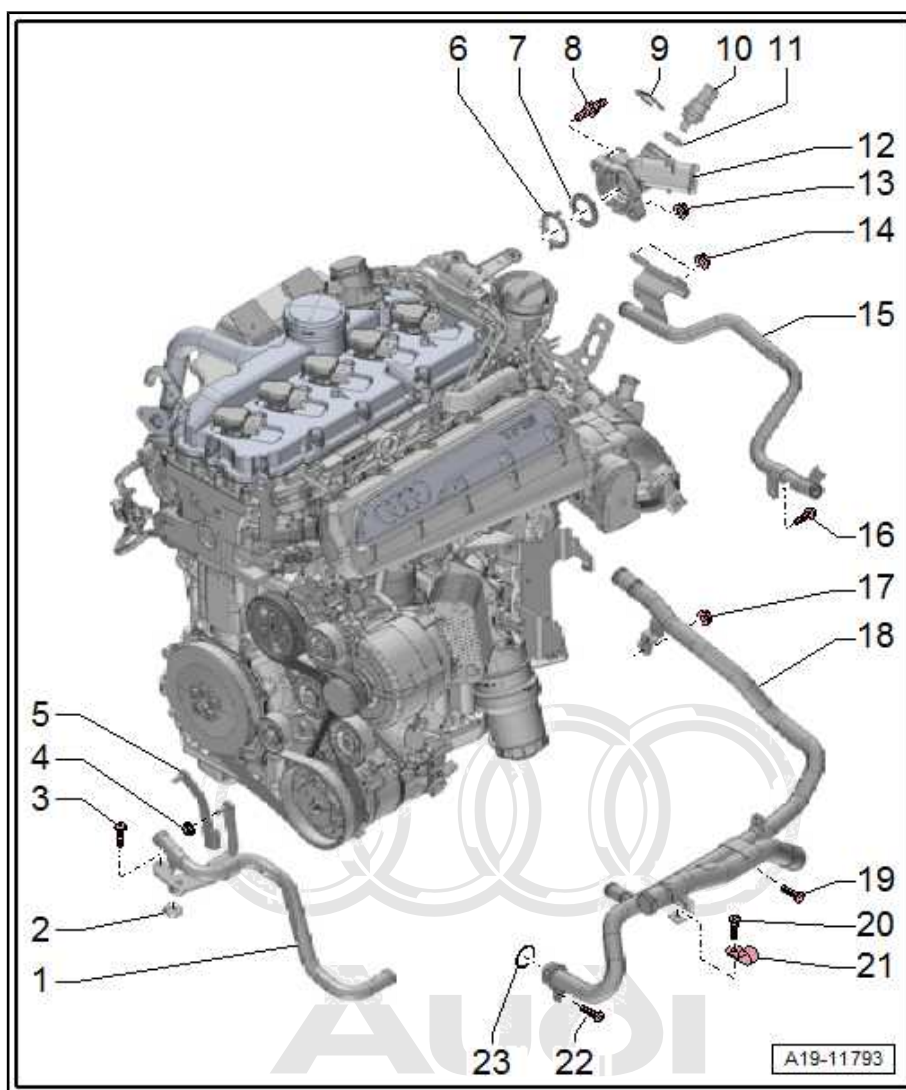
- ☐ 9 Nm

17 - Nut

- ☐ 9 Nm

18 - Coolant pipes (front)

- ☐ Removing and installing ⇒ [page 183](#)



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19 - Bolt

- ☐ 9 Nm

20 - Bolt

- ☐ 9 Nm

21 - Retaining clamp**22 - Bolt**

- ☐ 9 Nm

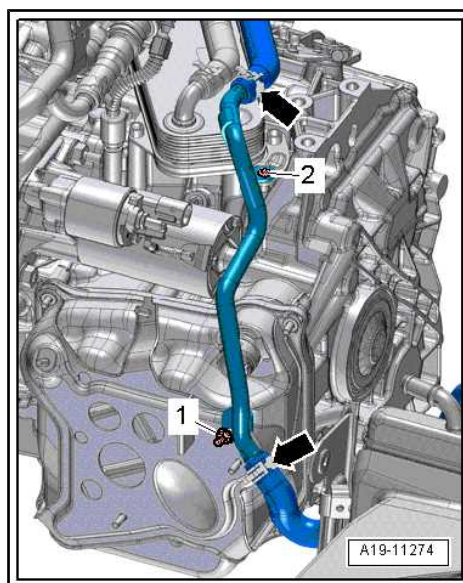
23 - O-ring

- ☐ Renew after removing

Coolant pipe on gearbox - tightening torques

- 1 - Nut, 9 Nm

- 2 - Bolt, 9 Nm

**3.2 Removing and installing coolant pipes**

⇒ [“3.2.1 Removing and installing coolant pipe \(left-side\)”, page 178](#)

⇒ [“3.2.2 Removing and installing coolant pipe \(right-side\)”, page 182](#)

⇒ [“3.2.3 Removing and installing coolant pipes \(front\)”, page 183](#)

⇒ [“3.2.4 Removing and installing coolant pipe on gearbox”, page 185](#)

3.2.1 Removing and installing coolant pipe (left-side)

Special tools and workshop equipment required

- ◆ Hose clip pliers - VAS 6362-



Removing

- Drain coolant ⇒ [page 159](#) .
- Remove starter ⇒ Electrical system; Rep. gr. 27 ; Starter; Removing and installing starter .
- Remove wheel spoiler (front left) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Removing and installing wheel housing liner (front) .

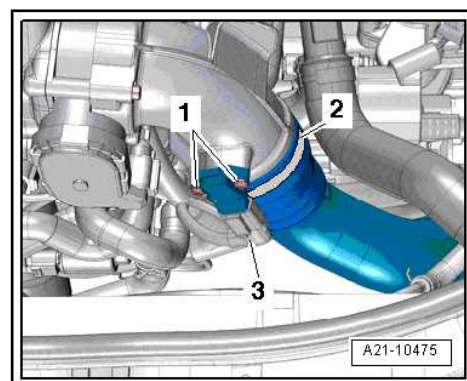
Intake connecting pipe (version 1):

- Release hose clip -2-.



Note

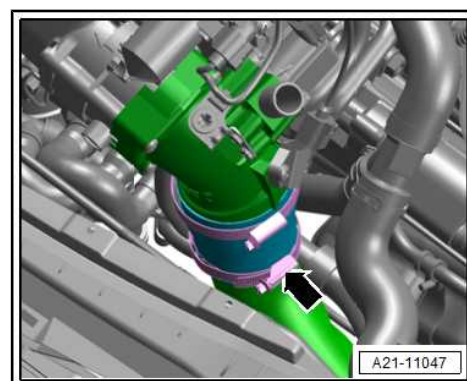
Disregard items -1 and 3-.



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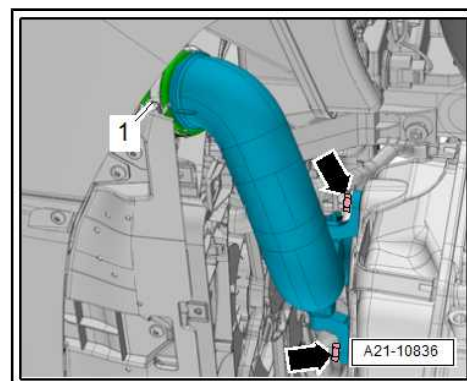
Intake connecting pipe (version 2):

- Release hose clip -arrow-.

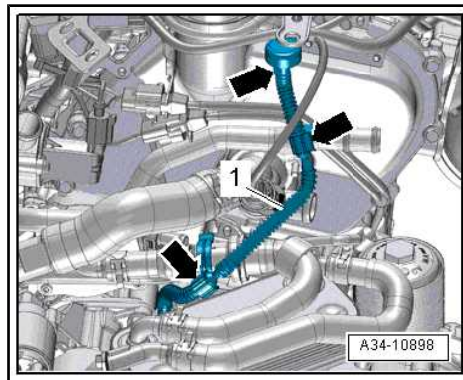


All engine versions (continued):

- Remove nuts -arrows-.
- Release hose clip -1- and detach air pipe.

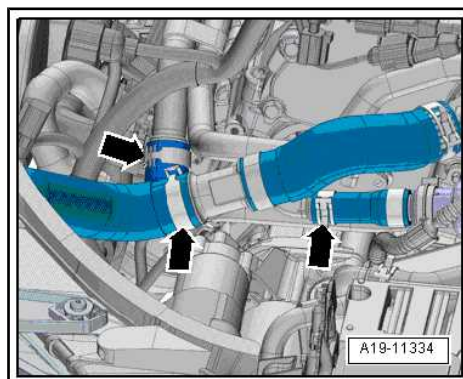


- Move breather hose -1- clear -arrows-.



Hose connection (version 1):

- Release hose clips -arrows- and detach coolant hoses.

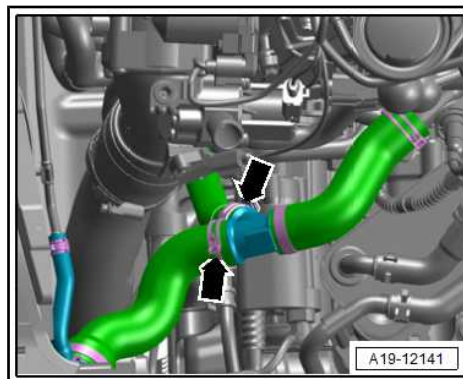


Hose connection (version 2):

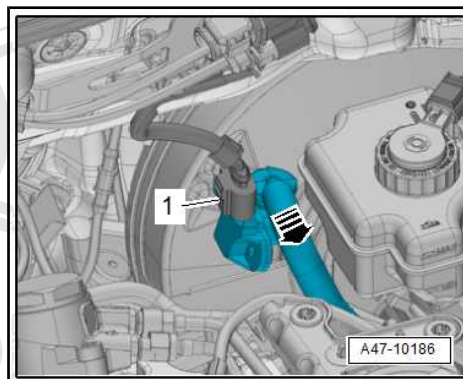
- Release hose clips -arrows- and detach coolant hoses.

All engine versions (continued):

- Remove gear oil filter ⇒ Rep. gr. 34 ; Gear oil circuit; Removing and installing gear oil filter .

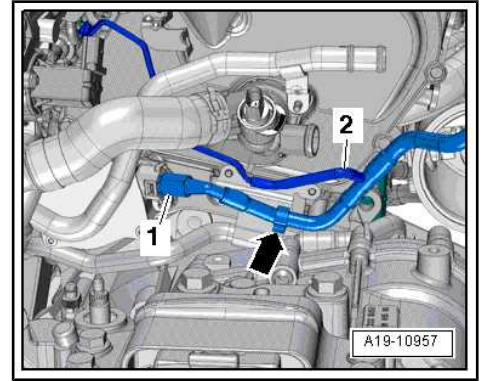


- Unplug electrical connector -1-.
- Detach vacuum line from brake servo -arrow-.

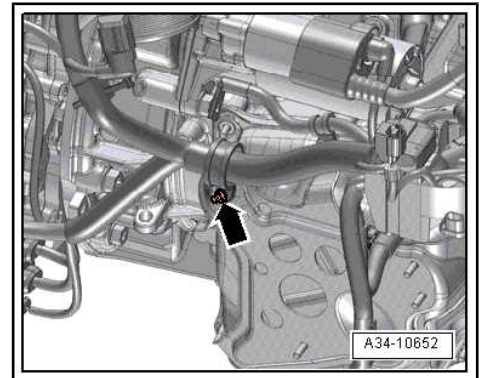


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- Disconnect vacuum hose -2- and move hose clear at bracket.
- Move clear vacuum hose -1- -arrow-, disconnect from vacuum pump for brake servo and remove.



- Remove nut -arrow- and move electrical wiring harness clear.



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- Move electrical wiring harness clear.
- Remove nuts and bolts -arrows-.
- Release hose clip -2- and detach coolant pipe (left-side).



Note

Disregard -item 1-.

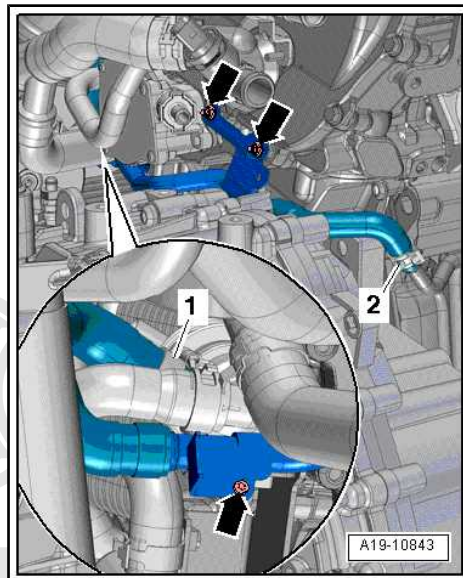
Installing

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



Note

- ◆ *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
 - ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
 - ◆ *The screw sections of used screw-type clips must be sprayed with rust remover prior to fitting so that the air hoses can be attached securely to the hose connections.*
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- Install gear oil filter ⇒ Rep. gr. 34 ; Gear oil circuit; Removing and installing gear oil filter .
 - Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.



Note

Do not reuse coolant.

- Fill up with coolant ⇒ [page 161](#) .

Tightening torques

- ◆ ⇒ [“3.1 Exploded view - coolant pipes”, page 177](#)
- ◆ Air pipe
⇒ [“2.1 Exploded view - charge air system”, page 210](#)
- ◆ ⇒ Electrical system; Rep. gr. 27 ; Starter; Exploded view - starter
- ◆ Wheel spoiler (front left) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front)

3.2.2 Removing and installing coolant pipe (right-side)

Special tools and workshop equipment required

- ◆ Hose clamps, up to 25 mm - 3094-



- ◆ Hose clip pliers - VAS 6362-



Removing

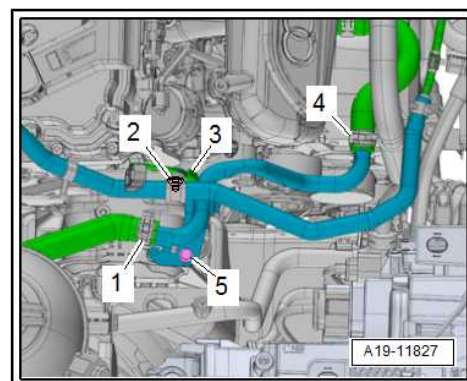
- Remove nut -arrow- and move bracket -3- to one side.



Note

Place a cloth underneath to catch escaping coolant.

- Clamp off coolant hoses using hose clamps, up to 25 mm - 3094- , release hose clips -1 and 4- and disconnect hoses.
- Unscrew bolt -5- and remove coolant pipe (right-side).



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 164](#) .

Tightening torques

- ◆ ⇒ [“3.1 Exploded view - coolant pipes”, page 177](#)

3.2.3 Removing and installing coolant pipes (front)

Special tools and workshop equipment required

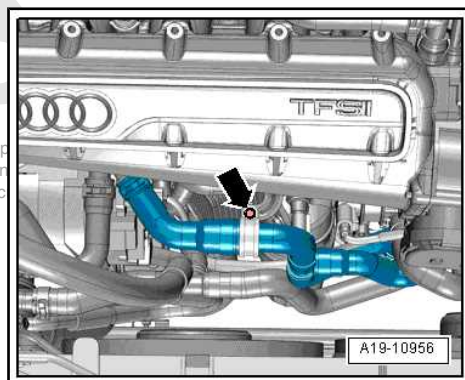
- ◆ Hose clip pliers - VAS 6362-



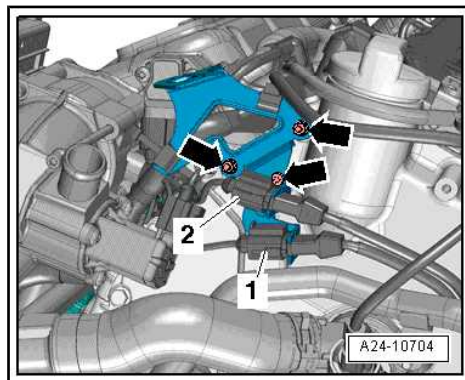
Removing

- Remove air cleaner housing ➔ [page 225](#) .
- Remove intake manifold (top section) ➔ [page 230](#) .
- Drain coolant ➔ [page 159](#) .
- Remove bolt -arrow- from retaining clamp.

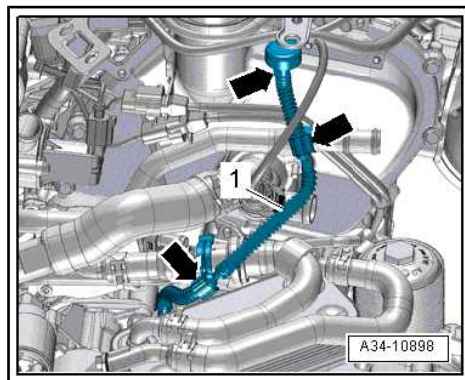
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- Take electrical connectors -1- and -2- out of bracket and move wiring harness clear.
- Remove nuts and bolt -arrows- and detach bracket.

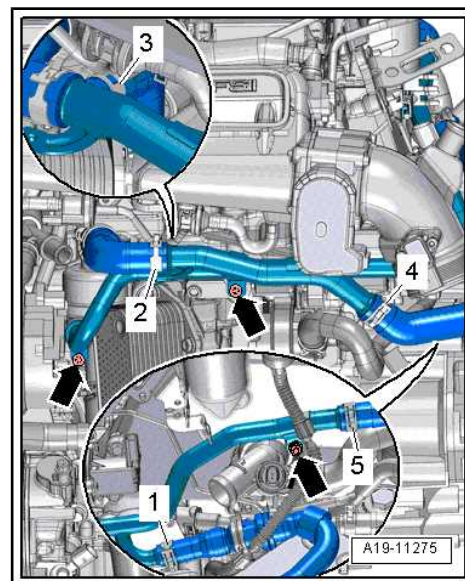


- Move breather hose -1- clear -arrows-.



Coolant pipes (front; version 1):

- Move electrical wiring harness clear.
- Release hose clips -1 ... 5- and detach coolant hoses.
- Remove bolts and nut -arrows- and detach front coolant pipes from thermostat housing.



Coolant pipes (front; version 2):

- Move electrical wiring harness clear.
- Release hose clips -1 ... 4- and detach coolant hoses.
- Remove bolts and nut -arrows- and detach front coolant pipes from thermostat housing.

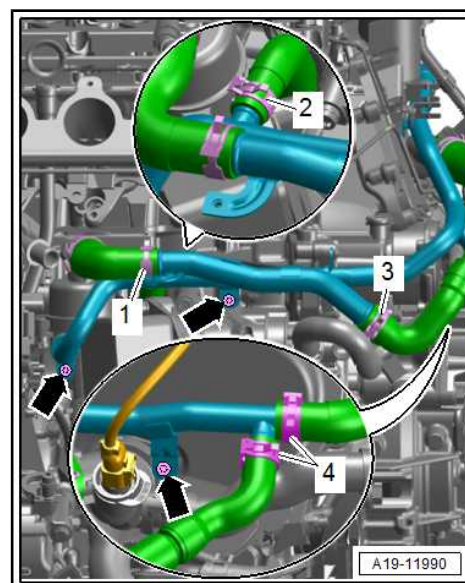
Installing

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



Note

- ◆ Fit new O-ring.
- ◆ Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ *Electronic parts catalogue*.
- Install intake manifold (top section) ⇒ [page 230](#).



Note

Do not reuse coolant.

- Fill up with coolant ⇒ [page 161](#).

Tightening torques

- ◆ Bracket for electrical connectors
⇒ ["1.1 Exploded view - timing chain cover", page 72](#)
- ◆ ⇒ ["3.1 Exploded view - coolant pipes", page 177](#)
- ◆ ⇒ ["2.1 Exploded view - air cleaner housing", page 224](#)

3.2.4 Removing and installing coolant pipe on gearbox

Special tools and workshop equipment required

- ◆ Hose clamps, up to 25 mm - 3094-



- ◆ Hose clip pliers - VAS 6362-



Removing

- Remove air cleaner housing ⇒ [page 225](#) .
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .
- Remove wheel spoiler (front left) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Removing and installing wheel housing liner (front) .
- Remove nut -1- and bolt -2- .

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Note

Place a cloth underneath to catch escaping coolant.

- Clamp off coolant hoses -arrows- with hose clamps up to 25 mm - 3094- and detach from coolant pipe.

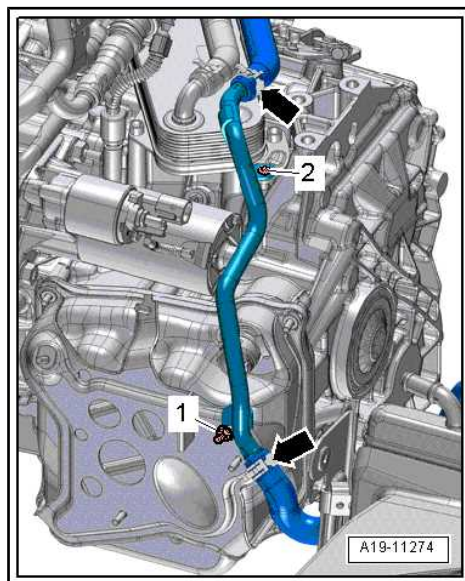
Installing

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

- Check coolant level ⇒ [page 164](#) .

Tightening torques

- ◆ ⇒ [“3.1 Exploded view - coolant pipes”, page 177](#)
- ◆ ⇒ [“2.1 Exploded view - air cleaner housing”, page 224](#)
- ◆ ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation
- ◆ Wheel spoiler (front left) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front)



4 Radiator/radiator fans

⇒ [“4.1 Exploded view - radiator/radiator fans”, page 187](#)

⇒ [“4.2 Removing and installing radiator”, page 189](#)

⇒ [“4.3 Removing and installing radiator cowl”, page 193](#)

⇒ [“4.4 Removing and installing radiator fans”, page 196](#)

⇒ [“4.5 Removing and installing auxiliary radiator”, page 197](#)

4.1 Exploded view - radiator/radiator fans

Radiator

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1 - Coolant pipe

2 - Bolt

- ☐ 5 Nm

3 - Bracket

4 - Bolt

- ☐ 8 Nm

5 - Radiator

- ☐ Removing and installing
⇒ [page 189](#)
- ☐ If renewed, refill system
with fresh coolant

6 - Coolant hose (top)

- ☐ Connecting to radiator
⇒ [page 188](#)

7 - O-ring

- ☐ Renew after removing

8 - Rubber bush

- ☐ For radiator

9 - Bolt

- ☐ 5 Nm

10 - Bolt

- ☐ 5 Nm

11 - Coolant pipes

12 - Retaining pin

- ☐ Use screwdriver to re-
lease and pull off

13 - Condenser

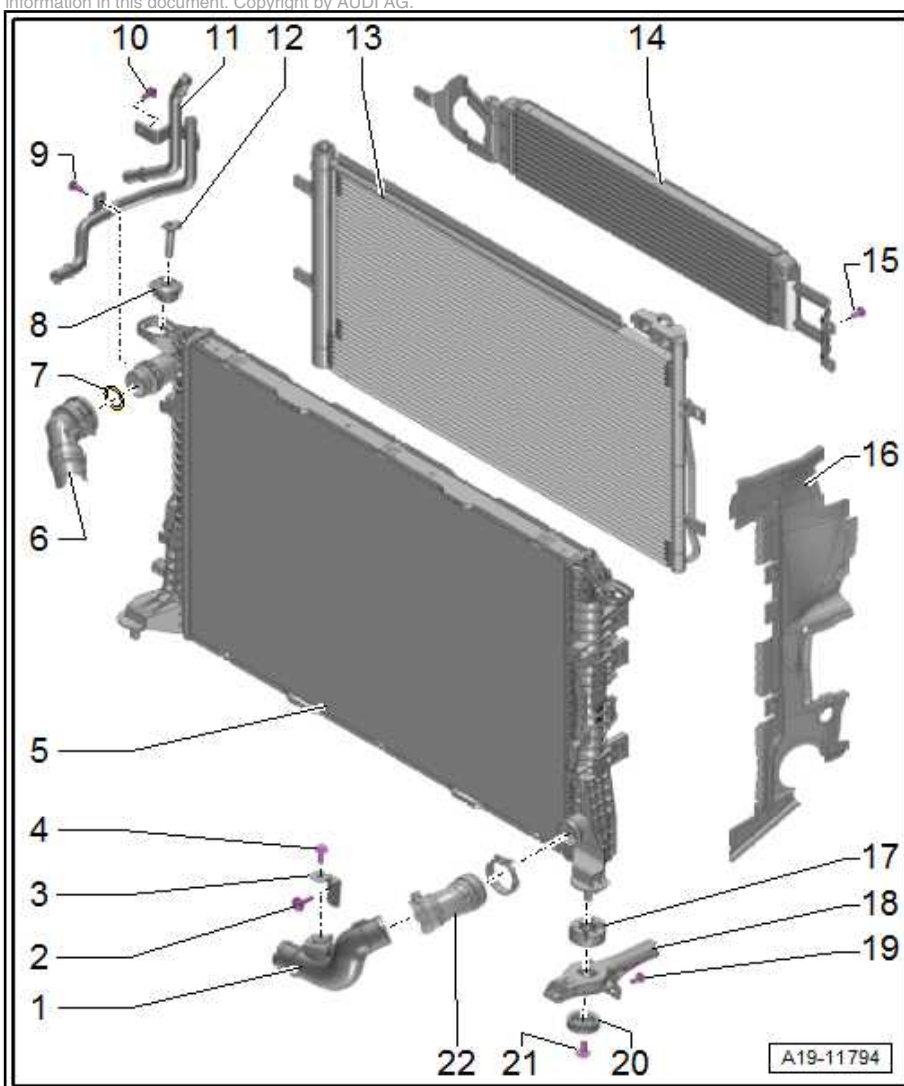
- ☐ Removing and installing
⇒ Heating, air condi-
tioning; Rep. gr. 87 ; Refrigerant circuit; Removing and installing condenser

14 - Auxiliary radiator

- ☐ Removing and installing ⇒ [page 197](#)

15 - Bolt

- ☐ 5 Nm



16 - Air duct**17 - Rubber bush**

- For radiator

18 - Radiator bracket**19 - Bolt**

- 5 Nm

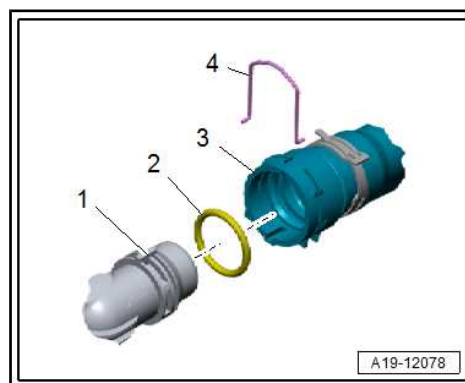
20 - Washer**21 - Bolt**

- 8 Nm

22 - Coolant hose**Connecting coolant hose with plug-in connector to radiator****Note**

If damaged, renew retaining clip -4-.

- 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 radiator -1- until it engages with a click.
- Press coolant hose in again and then pull to check that plug-in connector is correctly engaged.

**Radiator cowl and radiator fans**

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1 - Radiator fan control unit

- ☐ Radiator fan control unit - J293- with radiator fan control unit 2 - J671-
- ☐ Removing and installing ⇒ [page 197](#)

2 - Bolt

- ☐ 3.5 Nm

3 - Bolt

- ☐ 5 Nm

4 - Radiator cowl

- ☐ Removing and installing ⇒ [page 193](#)

5 - Radiator fan - V7-

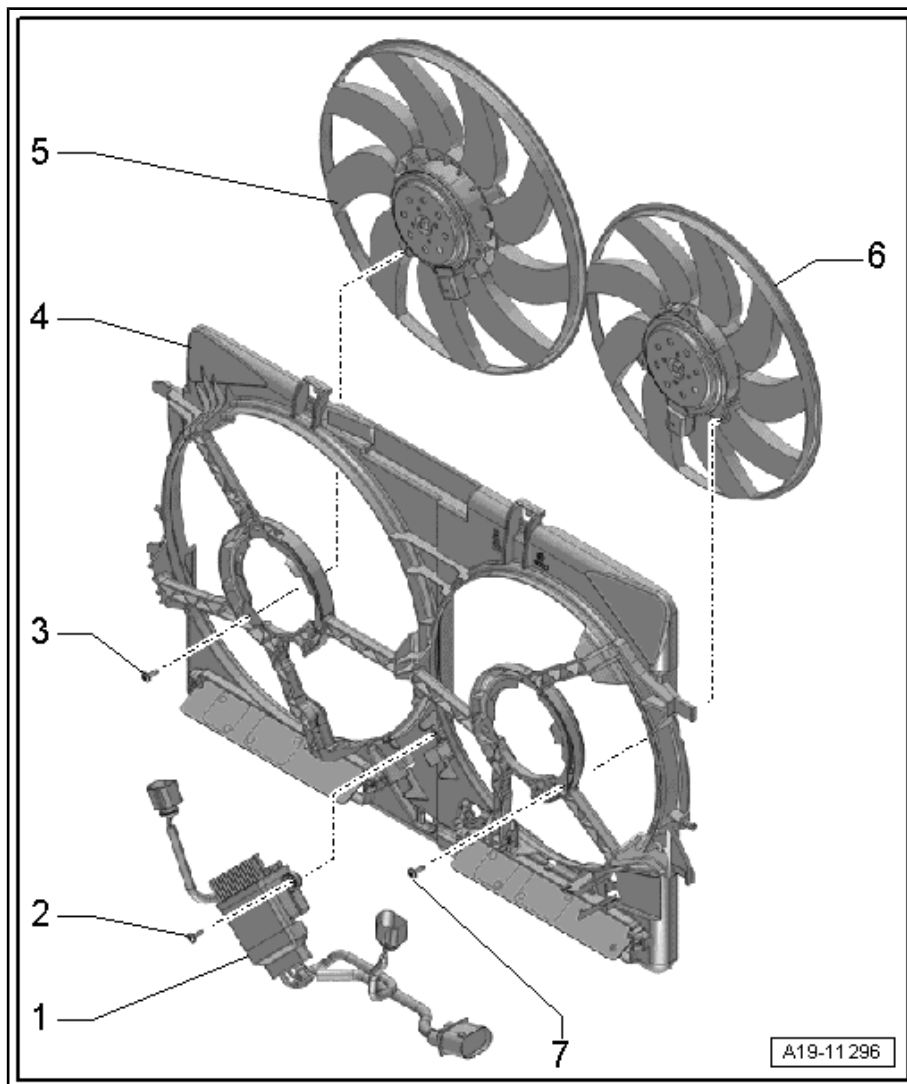
- ☐ Removing and installing ⇒ [page 196](#)

6 - Radiator fan 2 - V177-

- ☐ Removing and installing ⇒ [page 196](#)

7 - Bolt

- ☐ 5 Nm



4.2 Removing and installing radiator



Note

The radiator is removed together with the radiator cowl.

Special tools and workshop equipment required

- ◆ Coolant collecting system - VAS 5014- or drip tray for workshop hoist - VAS 6208-

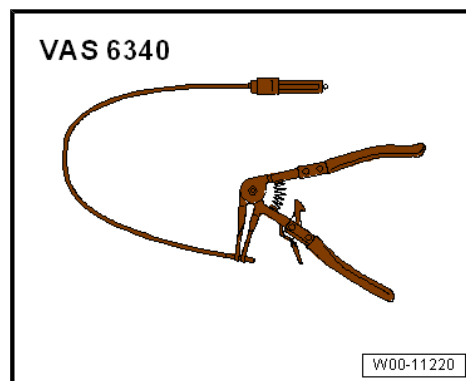
VAS 6208



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W00-11209

- ◆ Hose clip pliers - VAS 6340-



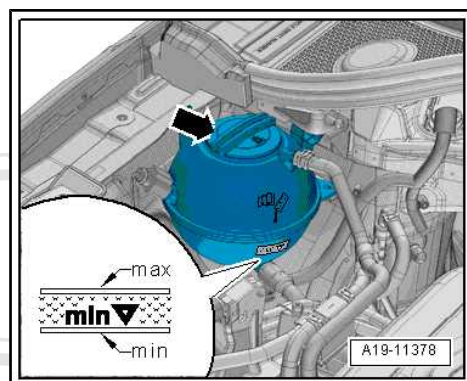
Removing



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.*

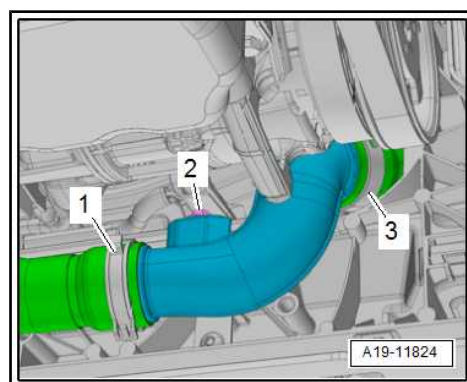


- Open filler cap -arrow- on coolant expansion tank.
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .
- Remove charge air cooler ⇒ [page 211](#) .
- Remove impact bar ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing impact bar .
- Place collector tank from coolant collecting system -VAS 5014- or drip tray for workshop hoist - VAS 6208- underneath.
- Remove bolt -2-.
- Release hose clip -3-, disconnect coolant hose and drain off coolant.



Note

Disregard -item 1-.



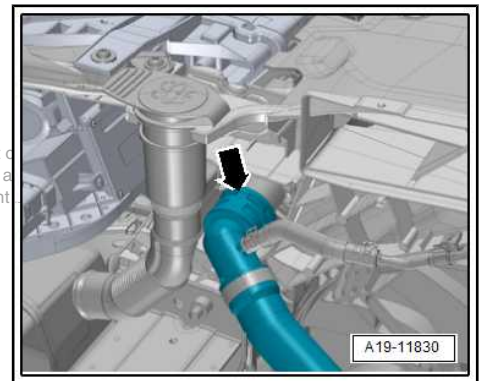
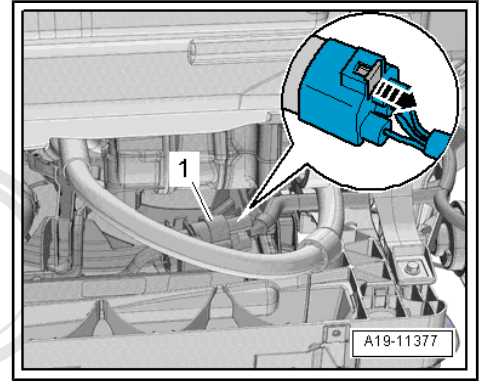


WARNING

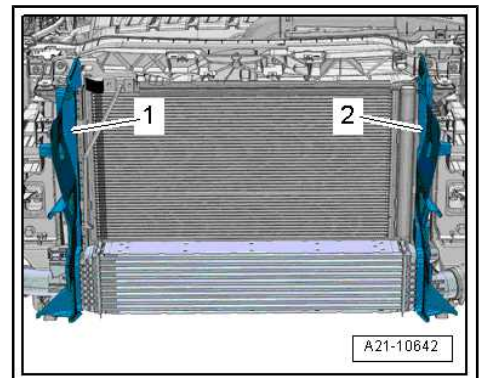
Risk of injury as the radiator fans may start up automatically.

- ◆ *Unplug electrical connectors before starting to work in the area of radiator cowl.*

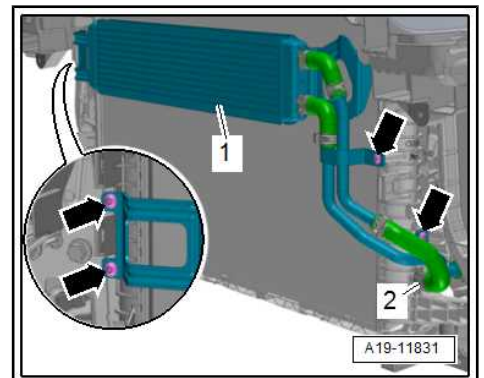
- Unplug electrical connector -1- for radiator fan (push retainer to the rear -arrow- and press down release catch).
- Lift retaining clip -arrow-, disconnect coolant hose (bottom) from radiator and drain off coolant.
- Detach connection from radiator (lift retaining clip -arrow-).



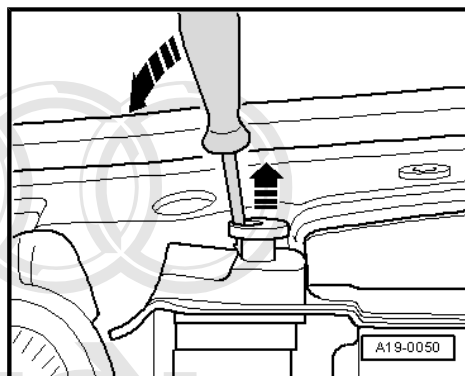
- Unclip air ducts -1 and 2-.



- Release hose clip -2- and detach coolant hose.
- Remove bolts -arrows-, detach auxiliary radiator (front) -1- from radiator and tie up to left side.



- 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-.



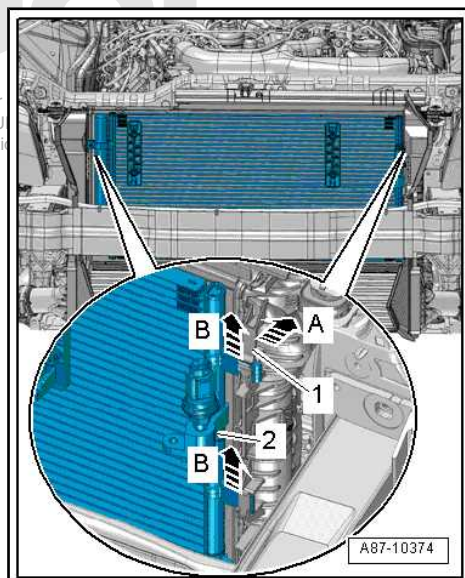
Caution

Risk of damage to condenser, refrigerant lines and refrigerant hoses.

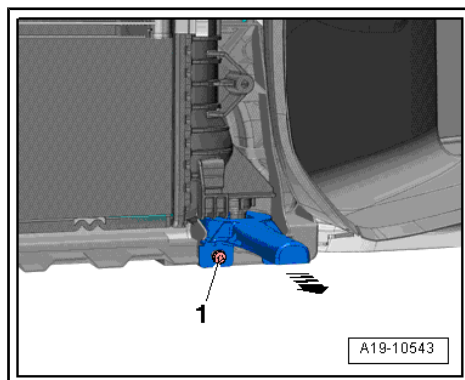
- ◆ **Do NOT stretch, kink or bend refrigerant lines and hoses.**

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- 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](#).

- Install impact bar [⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper \(front\); Removing and installing impact bar](#).
- Connect coolant hose with plug-in connector to radiator [⇒ page 188](#).
- Install charge air cooler [⇒ page 211](#).



Note

Do not reuse coolant.

- Fill up with coolant [⇒ page 161](#).

Tightening torques

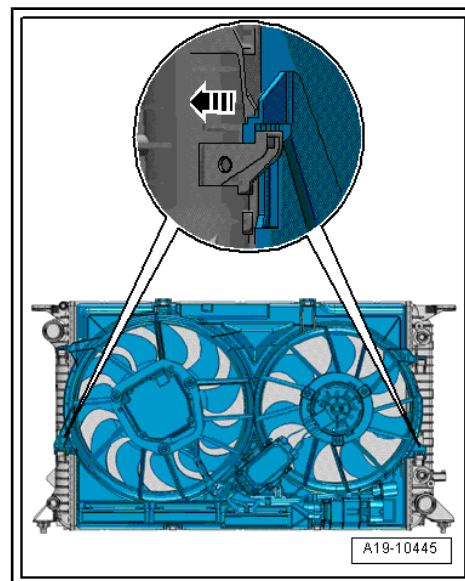
- ◆ [⇒ “4.1 Exploded view - radiator/radiator fans”, page 187](#)
- ◆ [⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation](#)

4.3 Removing and installing radiator cowl

Special tools and workshop equipment required

- ◆ Coolant collecting system - VAS 5014- or drip tray for workshop hoist - VAS 6208-

- ◆ Hose clip pliers - VAS 6362-

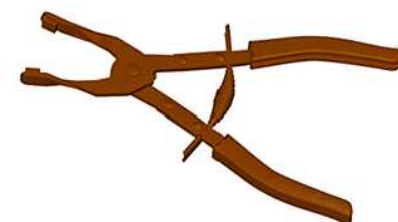


VAS 6208



W00-11209

VAS 6362



W00-11227

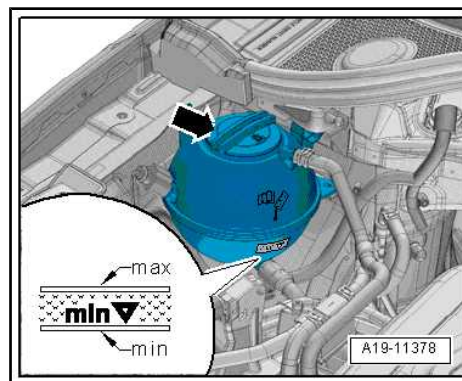
Removing



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.*



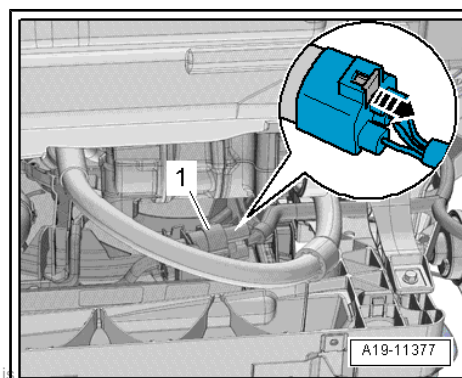
- Open filler cap -arrow- on coolant expansion tank.
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .
- Remove charge air cooler ⇒ [page 211](#) .
- Remove impact bar ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing impact bar .
- Unclip air duct -2-.



WARNING

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

- ◆ *Unplug electrical connectors before starting to work in the area of radiator cowl.*



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

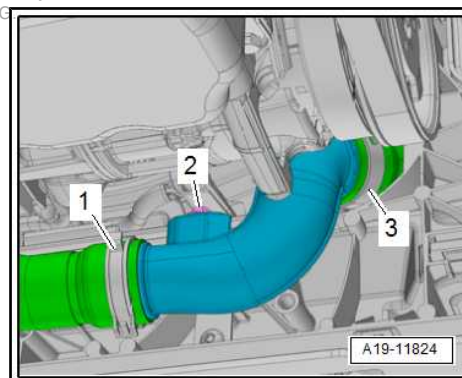
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- Place collector tank from coolant collecting system -VAS 5014- or drip tray for workshop hoist - VAS 6208- underneath.
- Remove bolt -2-.
- Release hose clip -3-, disconnect coolant hose and drain off coolant.



Note

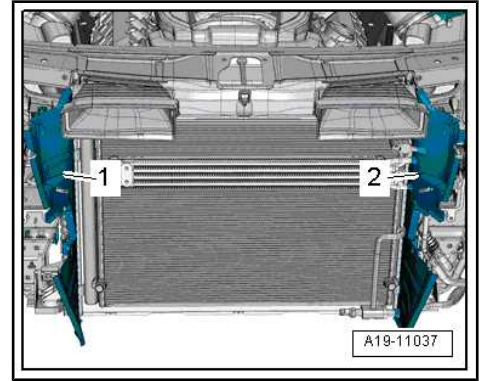
Disregard -item 1-.



- Unclip air duct -2-.



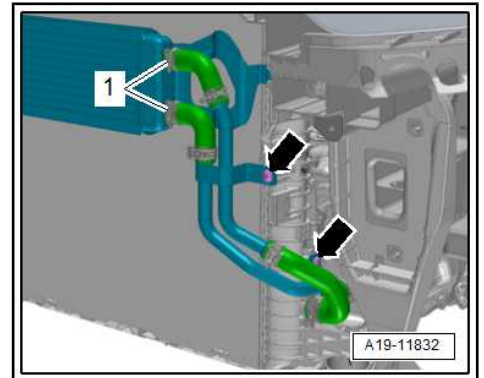
Disregard -item 1-.



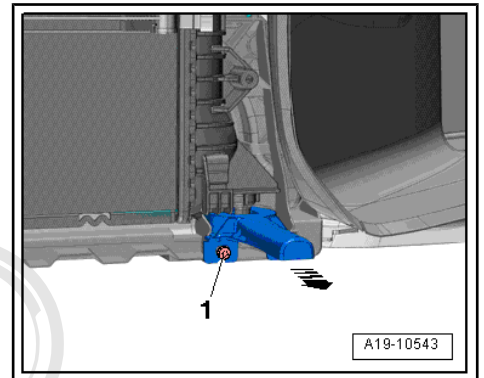
- Remove bolts -arrows-.



Disregard -item 1-.



- 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-, lift radiator cowl off radiator and then remove from below.

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 impact bar ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing impact bar .



Note

Do not reuse coolant.

- Fill up with coolant ⇒ [page 161](#) .

Tightening torques

- ♦ ⇒ [“4.1 Exploded view - radiator/radiator fans”, page 187](#)
- ♦ Charge air coolers
⇒ [“2.1 Exploded view - charge air system”, page 210](#)
- ♦ ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

4.4 Removing and installing radiator fans

⇒ [“4.4.1 Removing and installing radiator fans V7 / V177”, page 196](#)

⇒ [“4.4.2 Removing and installing radiator fan control unit J293”, page 197](#)

4.4.1 Removing and installing radiator fans - V7- / -V177-

Removing

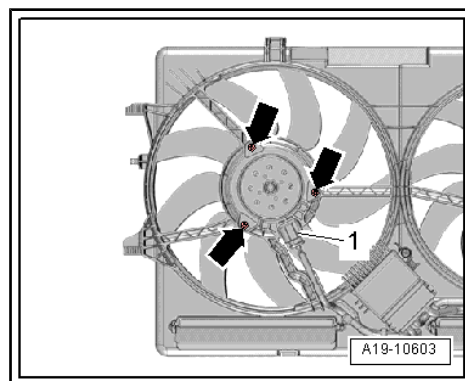
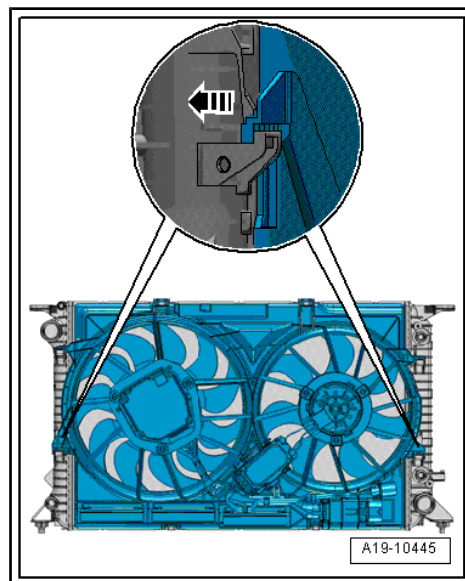


Note

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Fit all cable ties in the original positions when installing.

- Remove radiator cowl ⇒ [page 193](#) .
- Unplug electrical connector -1-.
- Unscrew bolts -arrows- and remove radiator fan - V7- .



- Unplug electrical connector -1-.
- Unscrew bolts -arrows- and remove radiator fan 2 - V177- .

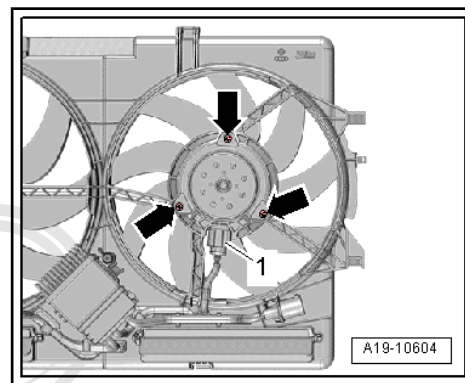
Installing

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

- Install radiator cowl ⇒ [page 193](#) .

Tightening torques

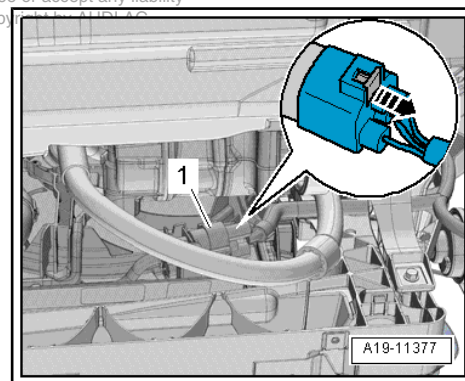
- ♦ ⇒ [“4.1 Exploded view - radiator/radiator fans”, page 187](#)



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.



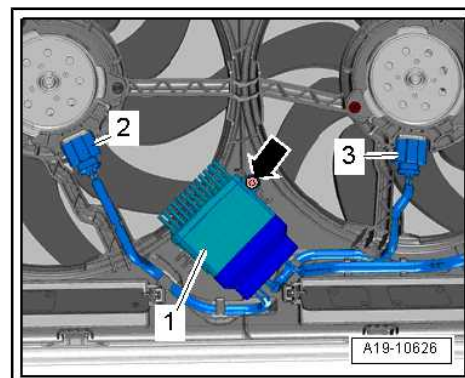
- Unplug electrical connectors -2, 3-.
- Unscrew bolt -arrow- and remove radiator fan control unit -1-.

Installing

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

Tightening torques

- ♦ ⇒ [“4.1 Exploded view - radiator/radiator fans”, page 187](#)
- ♦ ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation



4.5 Removing and installing auxiliary radiator

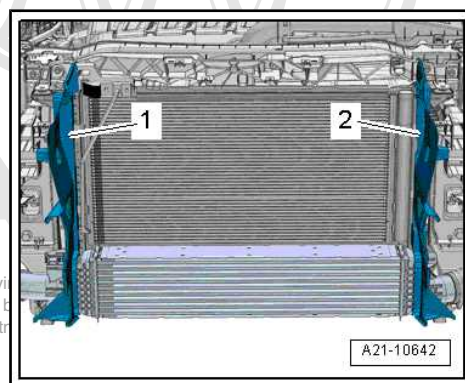
Special tools and workshop equipment required

- ◆ Hose clip pliers - VAS 6362-

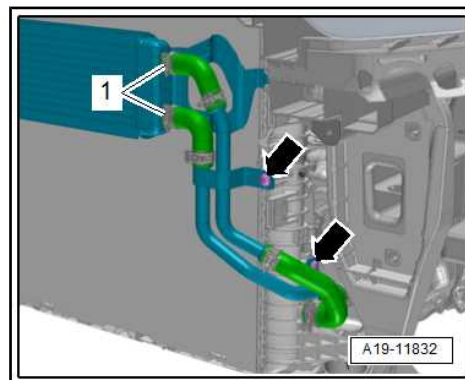


Removing

- Remove impact bar ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing impact bar .
- Unclip air ducts -1 and 2-.



- Remove bolts -arrows-.
- Clamp off coolant hoses using hose clamps -3094- , release hose clips -1- and disconnect coolant hoses.



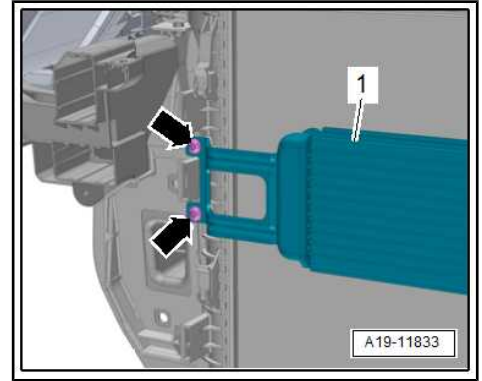
- Remove bolts -arrows- and detach auxiliary radiator.



Caution

Take care to keep components clean.

◆ *There will still be some coolant in the auxiliary cooler.*



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 impact bar ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing impact bar .



Note

Do not reuse coolant.

- Fill up with coolant ⇒ [page 161](#) .

Tightening torques

- ◆ ⇒ [“4.1 Exploded view - radiator/radiator fans”, page 187](#)

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21 – Turbocharging/supercharging

1 Turbocharger

⇒ [“1.1 Exploded view - turbocharger”, page 200](#)

⇒ [“1.2 Removing and installing turbocharger”, page 204](#)

1.1 Exploded view - turbocharger

Part 1

1 - Coolant supply line

2 - Banjo bolt

□ 37.5 Nm

3 - Seals

□ Renew after removing

4 - Not fitted

5 - Turbocharger

□ Combined with exhaust manifold

□ Removing and installing
⇒ [page 204](#)

6 - Lambda probe - G39- with
Lambda probe heater - Z19-

□ Removing and installing
⇒ [page 256](#)

7 - Nut

□ Tightening torque and
sequence ⇒ [page 201](#)

8 - Bolt

□ 9 Nm

9 - Coolant return line

10 - Seals

□ Renew after removing

11 - Banjo bolt

□ 37.5 Nm

12 - Oil supply line

13 - Bolt

□ 9 Nm

14 - Seals

□ Renew after removing

15 - Banjo bolt

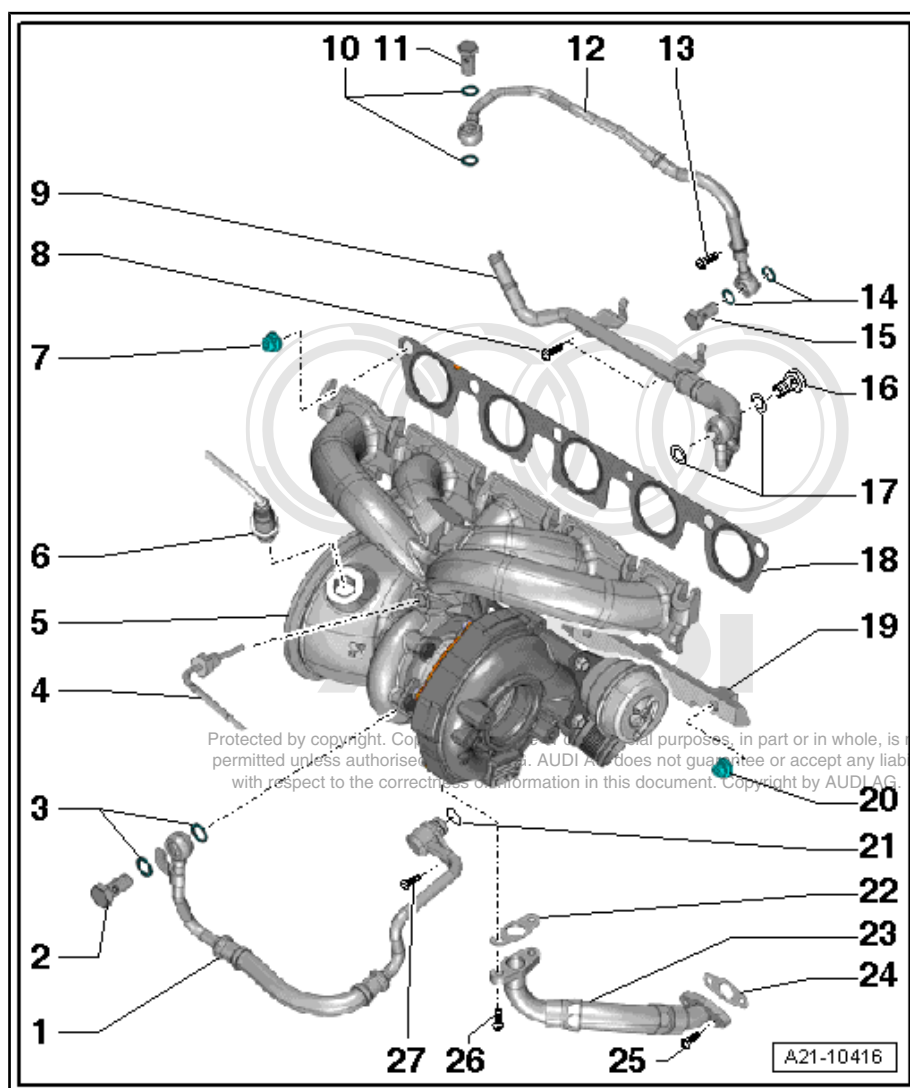
□ 37.5 Nm

16 - Banjo bolt

□ 37.5 Nm

17 - Seals

□ Renew after removing



18 - Gasket

- ☐ Renew after removing

19 - Mounting strip

- ☐ Remains installed when turbocharger is removed

20 - Nut

- ☐ Renew after removing
- ☐ First tighten centre nut on mounting strip
- ☐ 30 Nm

21 - O-ring

- ☐ Renew after removing

22 - Gasket

- ☐ Renew after removing

23 - Oil return line

24 - Gasket

- ☐ Renew after removing

25 - Bolt

- ☐ 9 Nm

26 - Bolt

- ☐ 9 Nm

27 - Bolt

- ☐ 9 Nm

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Turbocharger - tightening torque and sequence

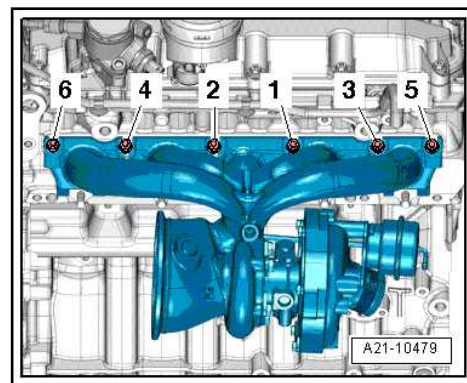


Note

Renew nuts for turbocharger.

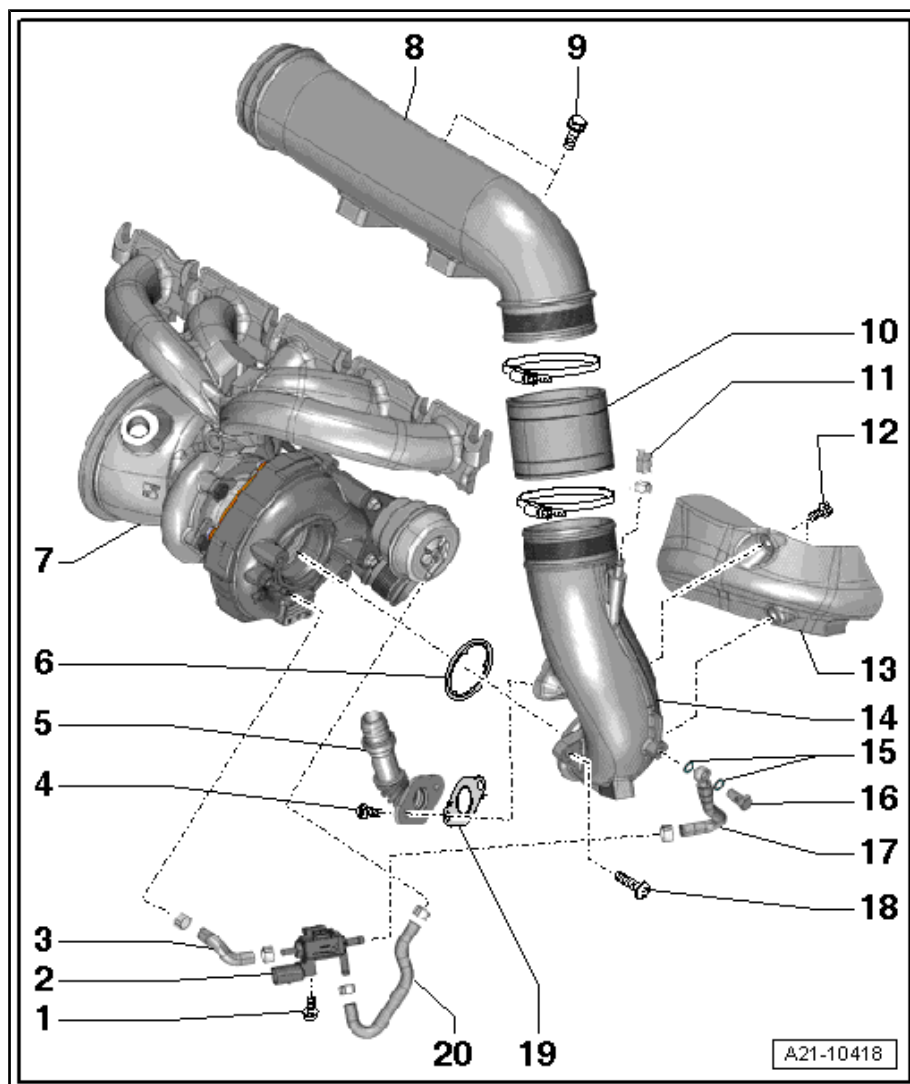
– Tighten bolts in 4 stages in the sequence shown:

Stage	Bolts	Tightening torque
1.	-1 ... 6-	15 Nm
2.	-1 ... 6-	33 Nm
3.	-1 ... 6-	33 Nm ¹⁾
4.	-1 ... 6-	33 Nm ¹⁾
¹⁾ Performing this procedure guarantees all bolts remain tightened to 33 Nm after turbocharger gasket has settled.		



Part 2

- 1 - Bolt
 - ☐ 4 Nm
- 2 - Charge pressure control solenoid valve - N75-
- 3 - Hose
- 4 - Bolt
 - ☐ 9 Nm
- 5 - Connection
 - ☐ For crankcase breather
- 6 - Seal
 - ☐ Renew after removing
 - ☐ Clip onto air pipe
- 7 - Turbocharger
 - ☐ Combined with exhaust manifold
 - ☐ Removing and installing
⇒ [page 204](#)
- 8 - Air pipe
- 9 - Bolt
 - ☐ 9 Nm
- 10 - Air hose
- 11 - Hose
- 12 - Bolt
 - ☐ 9 Nm
- 13 - Heat shield
- 14 - Air pipe
- 15 - Seals
 - ☐ Renew after removing
- 16 - Banjo bolt
 - ☐ 15.5 Nm
- 17 - Hose
- 18 - Bolt
 - ☐ 9 Nm
- 19 - Gasket
 - ☐ Renew after removing
 - ☐ Clip onto connection
- 20 - Hose



1 - O-ring

- ☐ Renew after removing

2 - Throttle valve module - J338-

- ☐ Removing and installing
⇒ [page 235](#)

3 - Intake connecting pipe

4 - Bolt

- ☐ 9 Nm

5 - Turbocharger air recirculation valve - N249-

- ☐ Removing and installing
⇒ [page 213](#)

6 - Bolt

- ☐ 9 Nm

7 - O-ring

- ☐ Renew after removing

8 - O-ring

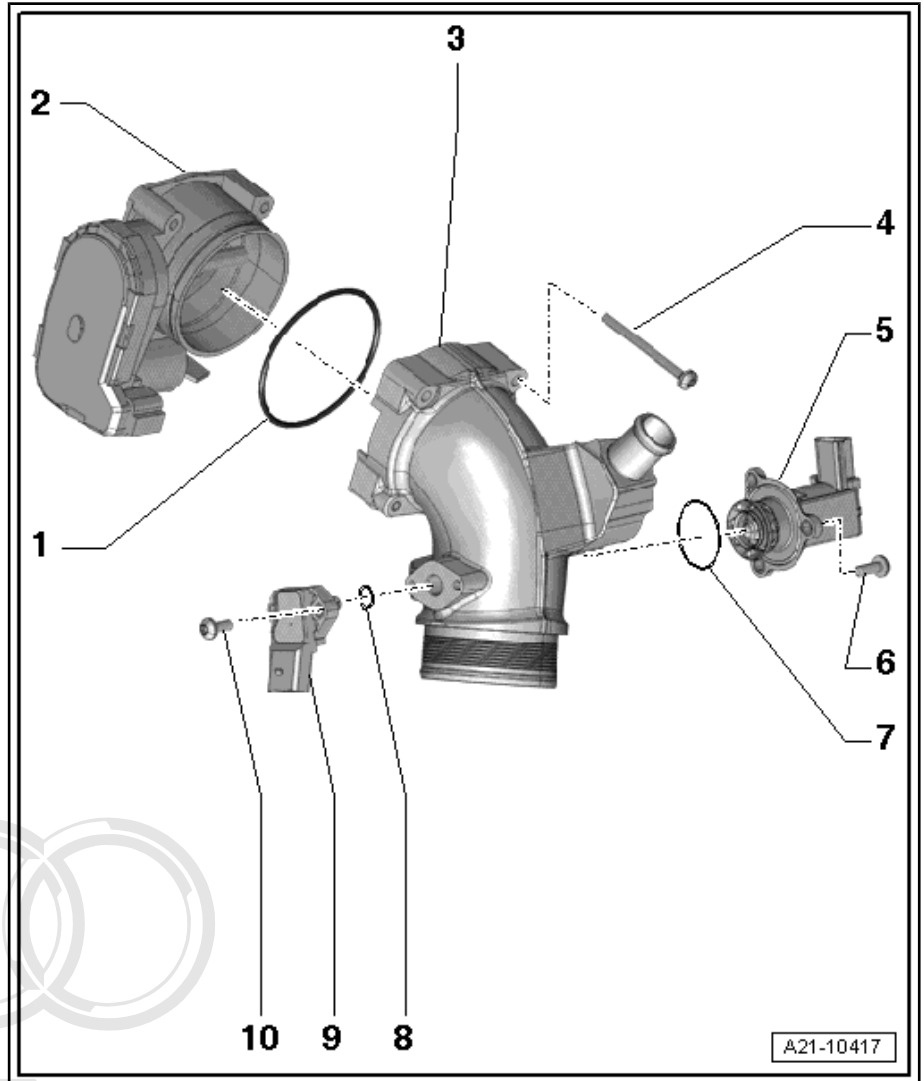
- ☐ Renew after removing

9 - Charge pressure sender - G31- / intake air temperature sender 2 - G299-

- ☐ Removing and installing
⇒ [page 213](#)

10 - Bolt

- ☐ 9 Nm



Part 3 (version 2)

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1 - Bolt

- ☐ 9 Nm

2 - Intake connecting pipe
3 - O-ring

- ☐ Renew after removing

4 - Throttle valve module - J338-

- ☐ Removing and installing
⇒ [page 235](#)

5 - Bolt

- ☐ 9 Nm

6 - Bracket

- ☐ For engine cover panel

7 - Grommet
8 - O-ring

- ☐ Renew after removing

9 - Bolt

- ☐ 9 Nm

10 - Turbocharger air recirculation valve - N249-

- ☐ Removing and installing
⇒ [page 213](#)

11 - Charge pressure sender - G31- / intake air temperature sender 2 - G299-

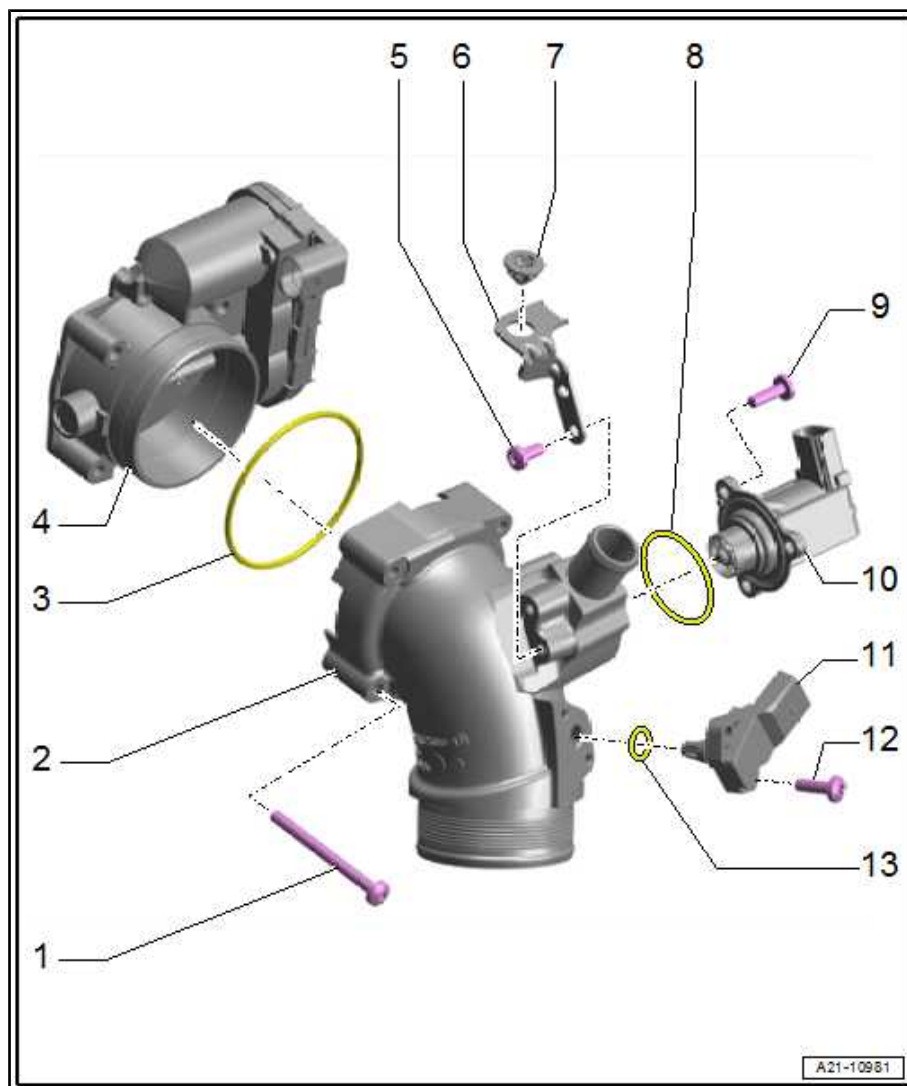
- ☐ Removing and installing
⇒ [page 213](#)

12 - Bolt

- ☐ 9 Nm

13 - O-ring

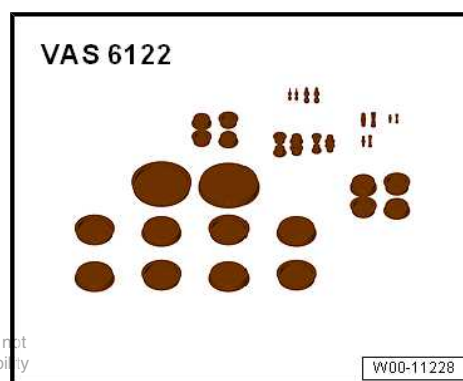
- ☐ Renew after removing



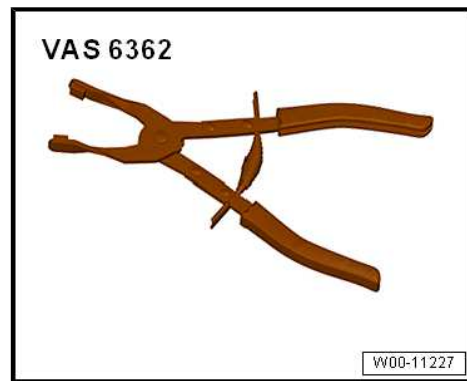
1.2 Removing and installing turbocharger

Special tools and workshop equipment required

- ◆ Engine bung set - VAS 6122-



- ◆ Hose clip pliers - VAS 6362-



Removing



Note

- ◆ *Observe rules for cleanliness ⇒ [page 5](#) .*
- ◆ *Check that all air pipes and hoses and vacuum lines are correctly fitted and that there are no leaks before carrying out tests or repairs.*



Caution

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:

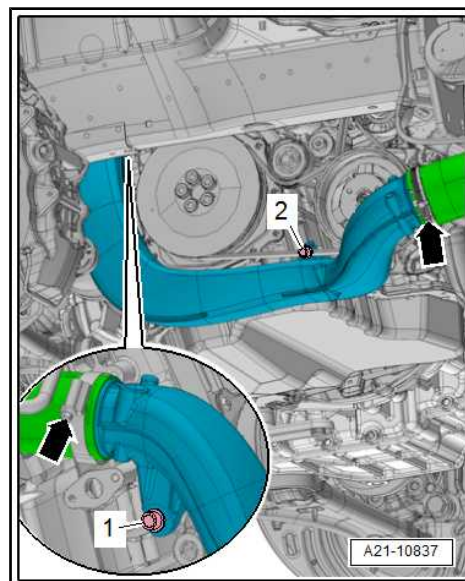
- ◆ ***Check air cleaner housing, air filter element and air hoses for dirt and foreign particles.***
- ◆ ***Check the entire charge air system (including the charge air cooler) for foreign matter.***
- ◆ ***If foreign matter is found in the charge air system, clean all relevant ducts and hoses and renew charge air cooler if necessary.***

- Drain coolant ⇒ [page 159](#) .
- Remove Lambda probe - G39- ⇒ [page 256](#) .
- Remove high-pressure pump ⇒ [page 250](#) .
- Remove catalytic converters ⇒ [page 270](#) .

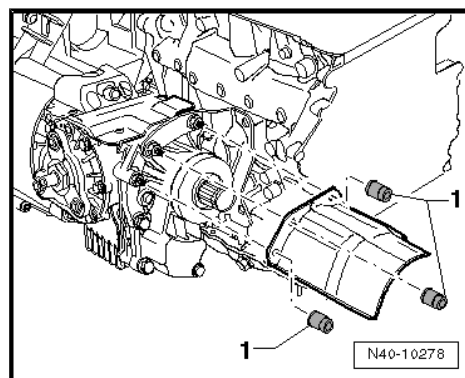


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- Remove bolts -1- and -2-.
- Loosen hose clips -arrows- and detach air pipe.



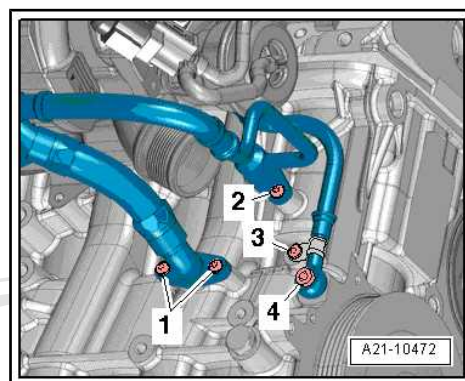
- Remove nuts -1- and detach heat shield for drive shaft (right-side).



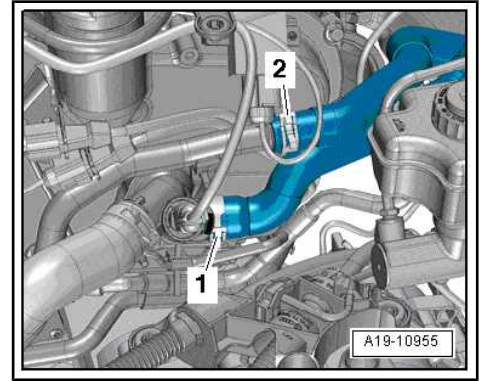
Note

Place a cloth underneath to catch escaping coolant and engine oil.

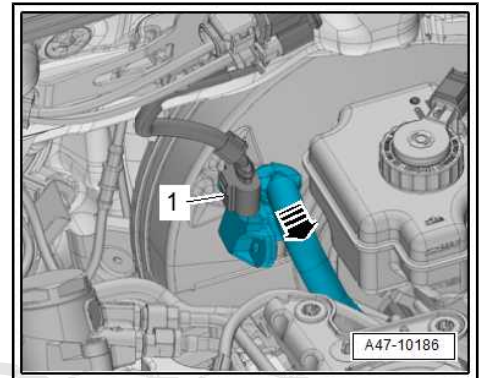
- Unscrew bolts -1, 2, 3- and banjo bolt -4- and detach pipes from cylinder block.
- Seal openings on turbocharger and all relevant ducts and hoses of the charge air system with plugs from engine bung set - VAS 6122- .
- Remove air cleaner housing ⇒ [page 225](#) .
- Remove gear oil filter ⇒ Rep. gr. 34 ; Gear oil circuit; Removing and installing gear oil filter .



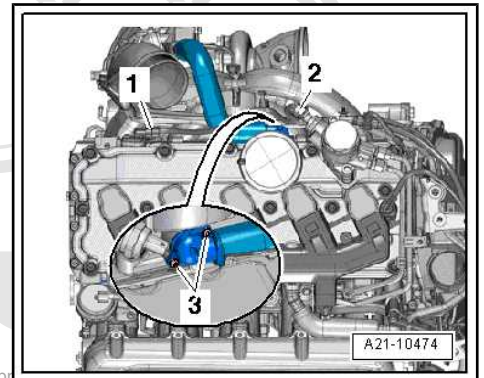
- Release hose clips -1, 2- and disconnect coolant hoses.



- Unplug electrical connector -1-.
- Detach vacuum line from brake servo -arrow-.

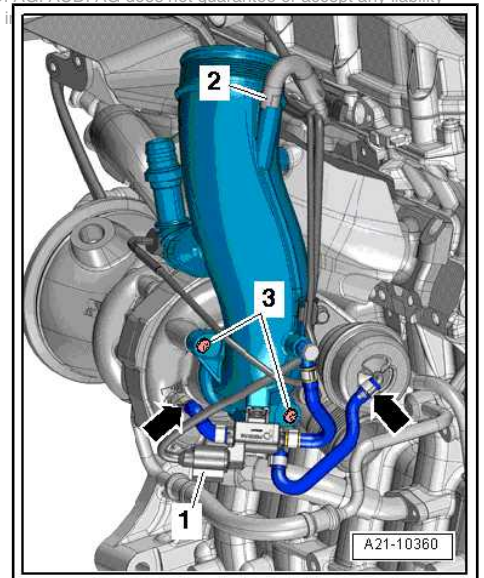


- Unplug electrical connectors -1- and -2-.
- Remove bolts -3- and detach crankcase breather housing from cylinder head cover.

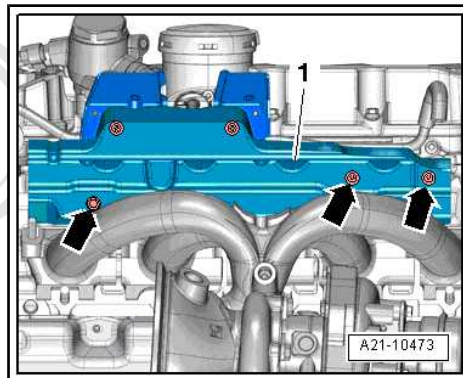


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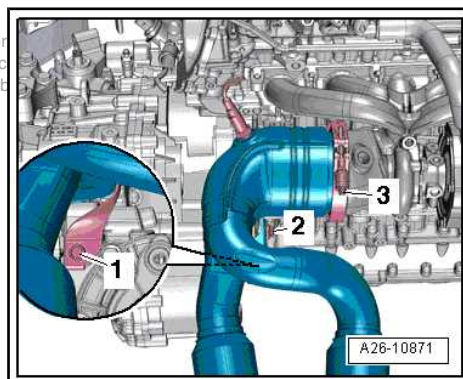
- Unplug electrical connector -1- at charge pressure control solenoid valve - N75- and move electrical wiring clear.
- Release hose clips -arrows- and -2- and detach hoses.
- Remove bolts -3- and move intake connecting pipe to rear.



- Move clear electrical wiring harness at heat shield -1-.
- Remove bolts -arrows- and detach heat shield.
- Detach intake connecting pipe.



- Loosen bolt -3- and push clamp onto starter catalytic converter.
- Remove bolt -2-, tie up starter catalytic converter to rear.



Note

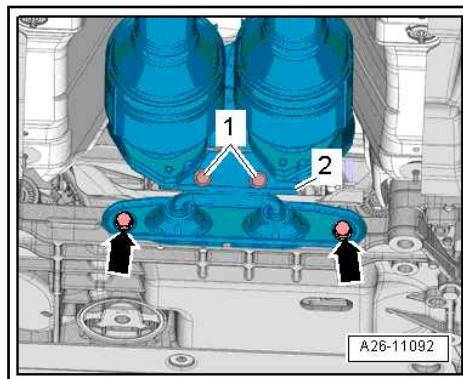
Disregard -item 1-.

- Remove bolts -arrows-.

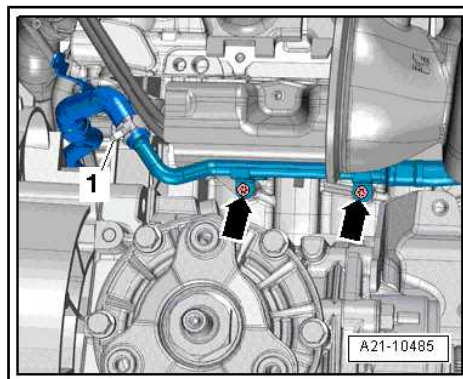


Note

Disregard items -1 and 2-.



- Remove bolts -arrows-.
- Release hose clip -1- and detach coolant hose.
- Remove cylinder head cover ⇒ [page 104](#) .



- Remove nuts in the sequence: -6 ... 1- and detach turbocharger.
- Seal off open lines and connections with clean plugs from engine bung set - VAS 6122- .

Installing

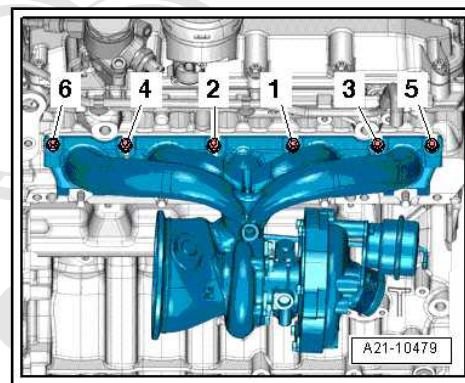
Installation is carried out in the reverse order; note the following:



Note

- ◆ *Renew seals and O-rings.*
- ◆ *Fill turbocharger with engine oil **at connection for oil supply line.***
- ◆ *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ [Electronic parts catalogue](#) .*
- ◆ *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 installing the turbocharger, allow the engine to idle for approx. 1 minute without pressing the accelerator to ensure that the turbocharger is supplied with oil.*

- Install gear oil filter ⇒ Rep. gr. 34 ; Gear oil circuit; Removing and installing gear oil filter .
- Install cylinder head cover ⇒ [page 104](#) .
- Install high-pressure pump ⇒ [page 250](#) .
- Install Lambda probe - G39- ⇒ [page 256](#) .
- Check oil level ⇒ Maintenance ; Booklet 820 .



Note

Do not reuse coolant.

- Fill up with coolant ⇒ [page 161](#) .

Tightening torques

- ◆ Crankcase breather housing
⇒ [“3.1 Exploded view - cylinder head”, page 93](#)
- ◆ ⇒ [“1.1 Exploded view - turbocharger”, page 200](#)
- ◆ Air pipe
⇒ [“2.1 Exploded view - charge air system”, page 210](#)
- ◆ ⇒ [“2.1 Exploded view - air cleaner housing”, page 224](#)
- ◆ Catalytic converters
⇒ [“2.1 Exploded view - emission control system”, page 269](#)
- ◆ Heat shield for drive shaft ⇒ Running gear, axles, steering;
Rep. gr. 40 ; Drive shaft; Exploded view - drive shaft

2 Charge air system

⇒ [“2.1 Exploded view - charge air system”, page 210](#)

⇒ [“2.2 Removing and installing charge air cooler”, page 211](#)

⇒ [“2.3 Removing and installing charge pressure sender G31 / intake air temperature sender 2 G299”, page 213](#)

⇒ [“2.4 Removing and installing turbocharger air recirculation valve N249”, page 213](#)

⇒ [“2.5 Checking charge air system for leaks”, page 214](#)

2.1 Exploded view - charge air system

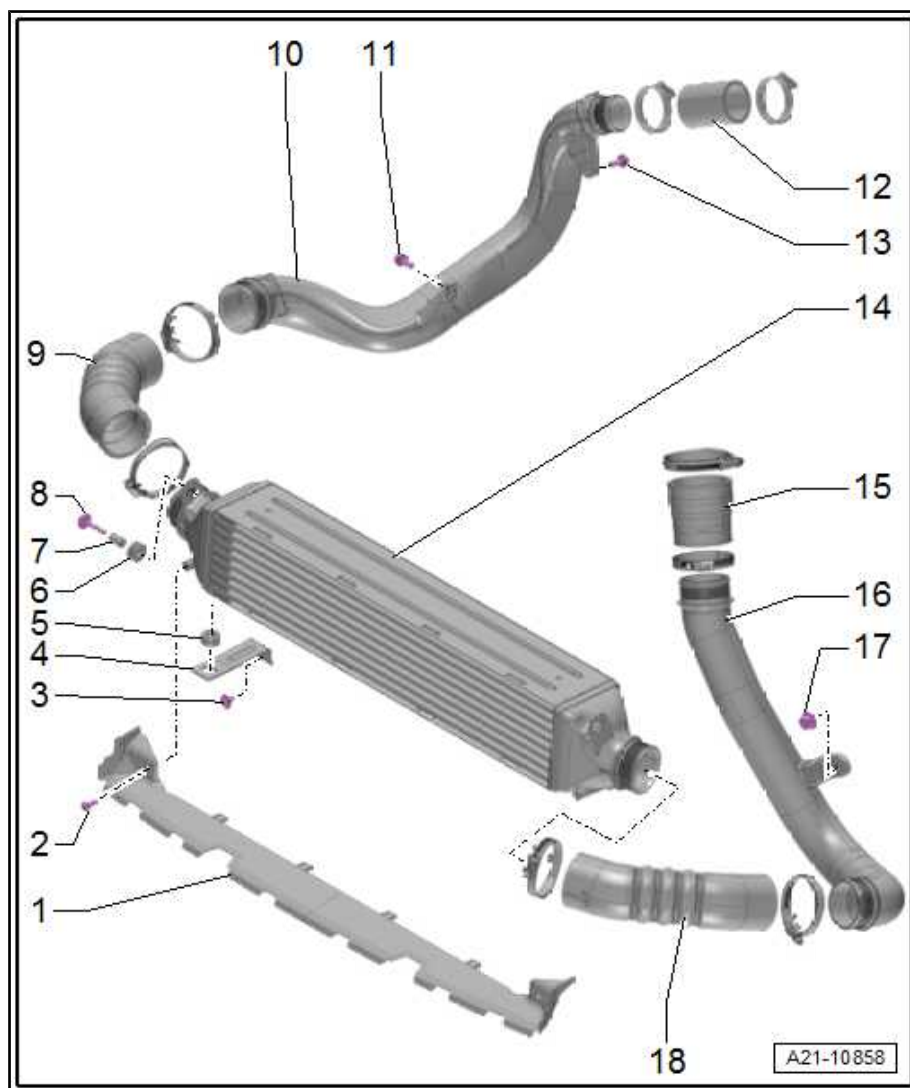


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- ◆ *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ [Electronic parts catalogue](#) .*
- ◆ *To ensure that the charge air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.*

- 1 - Air duct
- 2 - Bolt
 - ☐ 9 Nm
- 3 - Bolt
 - ☐ 5 Nm
- 4 - Bracket
- 5 - Grommet
- 6 - Grommet
- 7 - Bush
- 8 - Bolt
 - ☐ 5 Nm
- 9 - Air hose
 - ☐ Installation position
⇒ [page 211](#)
- 10 - Air pipe (right-side)
- 11 - Bolt
 - ☐ 9 Nm
- 12 - Air hose
 - ☐ Installation position
⇒ [page 211](#)
- 13 - Bolt
 - ☐ 20 Nm
- 14 - Charge air cooler
 - ☐ Removing and installing
⇒ [page 211](#)
- 15 - Air hose
 - ☐ Installation position
⇒ [page 211](#)



16 - Air pipe (left-side)

17 - Bolt

- 9 Nm

18 - Air hose

- Installation position ⇒ [page 211](#)

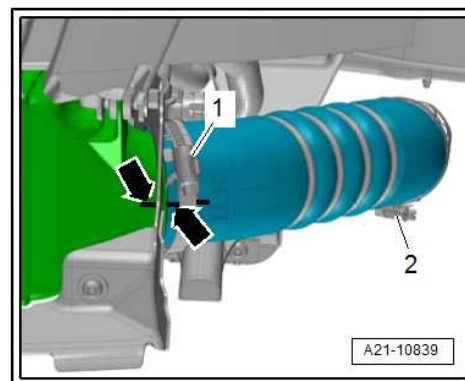
Air hoses to charge air cooler - installation position and tightening torque

- The marks -arrows- must align.

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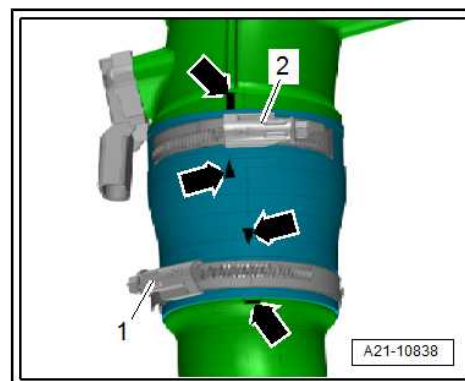
- The fastening screws of hose clips -1- and -2- fitted must be positioned as shown.

- Tighten hose clips to 5.5 Nm



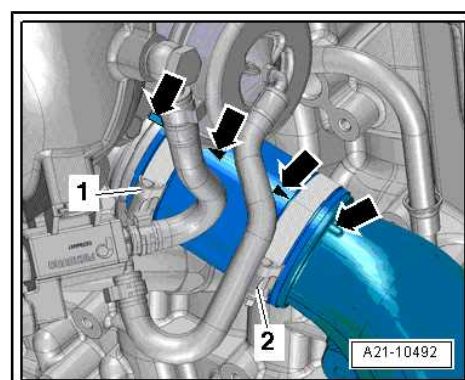
Air duct (left-side) to intake connecting pipe - installation position and tightening torque

- The marks -arrows- must align.
- The fastening screws of hose clips -1- and -2- fitted must be positioned as shown.
- Tighten hose clips to 5.5 Nm



Air duct (right-side) to turbocharger - installation position and tightening torque

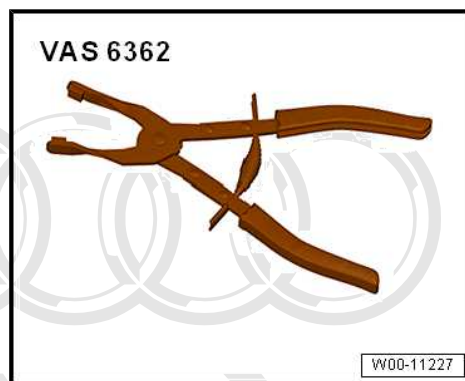
- The marks -arrows- must align.
- The fastening screws of hose clips -1- and -2- fitted must be positioned as shown.
- Tighten hose clips to 5.5 Nm



2.2 Removing and installing charge air cooler

Special tools and workshop equipment required

- ◆ Hose clip pliers - VAS 6362-



Removing

- Remove bumper cover (front) ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing bumper cover .
- Release hose clips -4- (left and right) and remove air hoses.
- Unscrew bolt -1- (left and right) and remove bracket -2-.
- Unscrew bolt -3- (left and right) and remove charge air cooler.

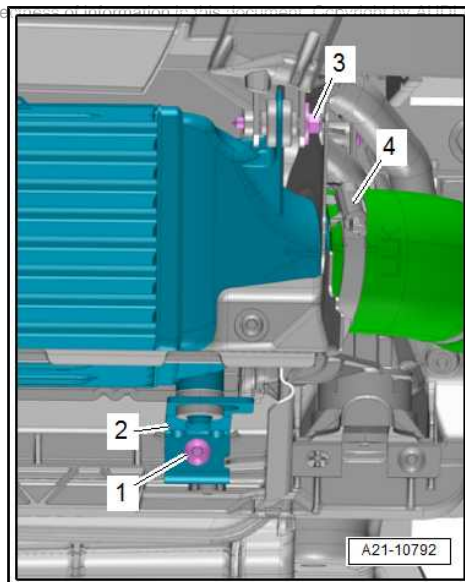
Installing

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



Note

- ◆ If there are slight impressions on the fins, refer to ⇒ [page 6](#) .
 - ◆ Hose connections and charge air system hoses must be free of oil and grease prior to fitting.
 - ◆ Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ *Electronic parts catalogue* .
 - ◆ 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.
- Install bumper cover (front) ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing bumper cover .



Tightening torques

- ◆ ⇒ [“2.1 Exploded view - charge air system”, page 210](#)

2.3 Removing and installing charge pressure sender - G31- / intake air temperature sender 2 - G299-

Removing

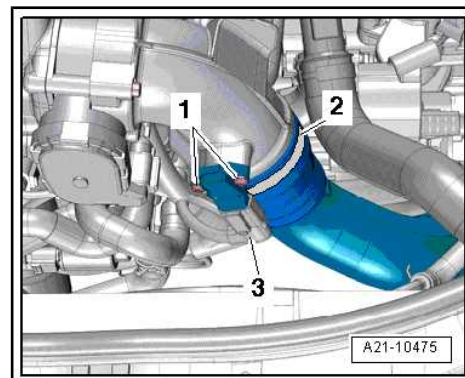
Charge pressure sender - G31- / intake air temperature sender 2 - G299- (version 1):

- Unplug electrical connector -3-.
- Unscrew bolts -1- and remove charge pressure sender - G31- / intake air temperature sender 2 - G299- .



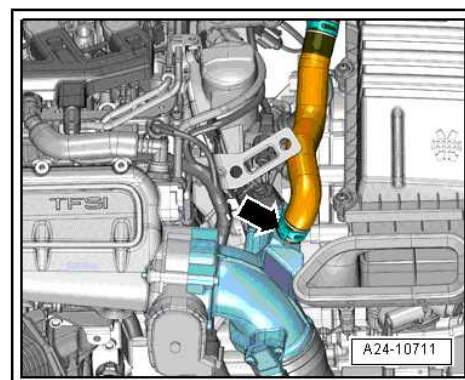
Note

Disregard -item 2-.



Charge pressure sender - G31- / intake air temperature sender 2 - G299- (version 2):

- Remove engine cover panel [⇒ page 41](#) .
- Release hose clip -arrow- and detach air hose.



- Unplug electrical connector -2-.
- Unscrew bolts -1- and remove charge pressure sender - G31- / intake air temperature sender 2 - G299- .

Installing

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



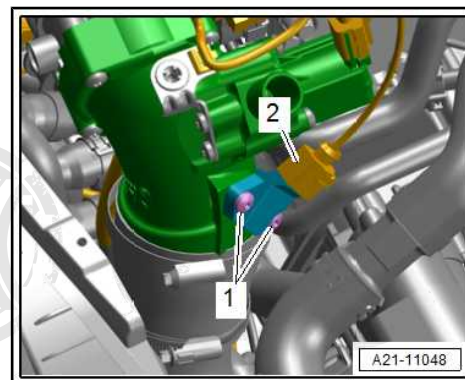
Note

Fit new O-ring.

- Install engine cover panel [⇒ page 41](#) .

Tightening torques

- ♦ [⇒ "1.1 Exploded view - turbocharger", page 200](#)



2.4 Removing and installing turbocharger air recirculation valve - N249-

Removing

- Remove air cleaner housing [⇒ page 225](#) .

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- Unplug electrical connector -2-.
- Unscrew bolts -1- and remove turbocharger air recirculation valve - N249- .



Note

Different installation position depending on version.

Installing

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



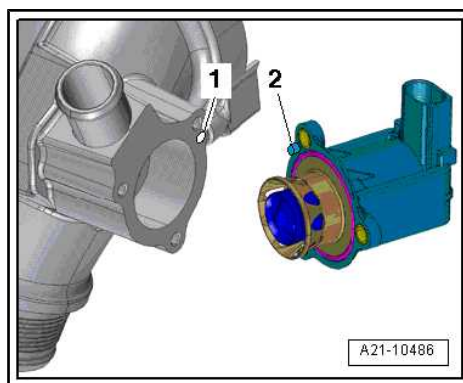
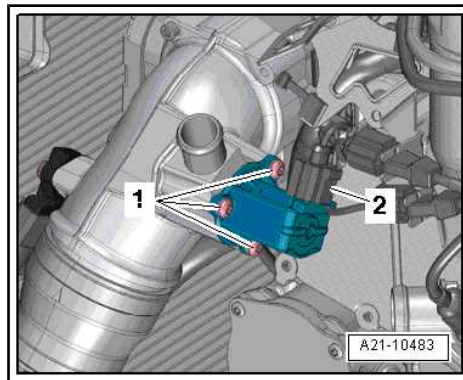
Note

Fit new O-ring.

- Installation position: Lug -2- on turbocharger air recirculation valve - N249- must be inserted in hole -1- on intake connection.

Tightening torques

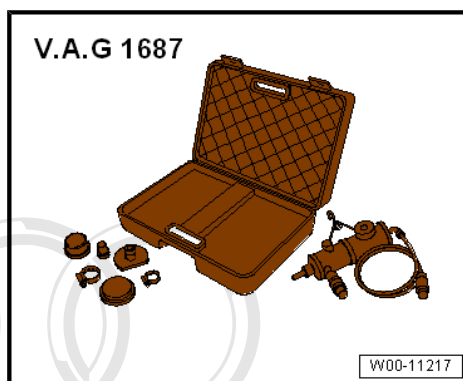
- ◆ ⇒ [“1.1 Exploded view - turbocharger”, page 200](#)
- ◆ ⇒ [“2.1 Exploded view - air cleaner housing”, page 224](#)



2.5 Checking charge air system for leaks

Special tools and workshop equipment required

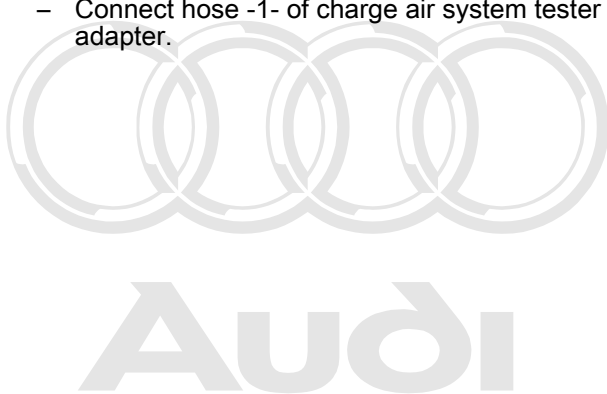
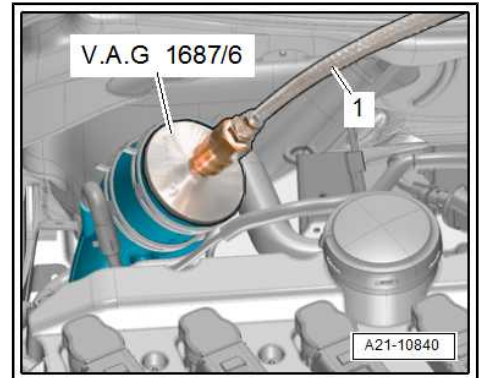
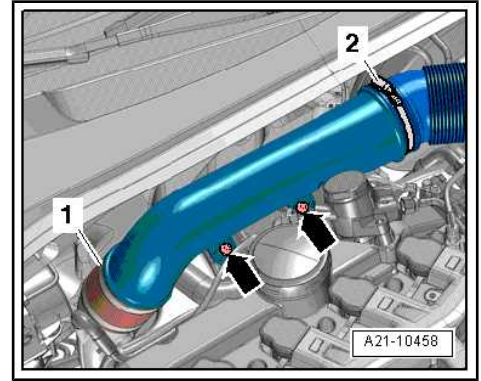
- ◆ Charge air system tester - V.A.G 1687-



- ◆ Adapter - V.A.G 1687/6-

Procedure

- Remove engine cover panel ⇒ [page 41](#) .
 - Remove bolts -arrows-.
 - Release hose clips -1- and -2- and remove air pipe.
-
- Connect adapter - V.A.G 1687/6- to turbocharger, as shown in illustration.
 - Connect hose -1- of charge air system tester -V.A.G 1687- to adapter.



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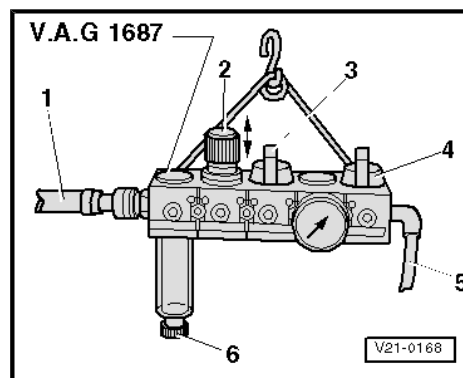
Prepare charge air system tester - V.A.G 1687- as follows:

- 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 0.2 bar.***

- Adjust pressure to 0.2 bar via pressure control valve -2-.
- Open valve -4- and wait until test system is pressurised. If necessary, adjust pressure to 0.2 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.*

Assembling

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



Note

- ◆ ***Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.***
- ◆ ***Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .***
- ◆ ***The screw sections of used screw-type clips must be sprayed with rust remover prior to fitting so that the air hoses can be attached securely to the hose connections.***
- Install engine cover panel ⇒ [page 41](#) .

Tightening torques

- ♦ Air pipe ⇒ ["1.1 Exploded view - turbocharger", page 200](#)



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24 – Mixture preparation - injection

1 Injection system

⇒ [“1.1 Overview of fitting locations - injection system”, page 218](#)

1.1 Overview of fitting locations - injection system

Engine (intake side)

1 - Intake manifold flap valve - N316-

2 - Fuel pressure sender for low pressure - G410-

3 - Injector, cylinder 2 - N31-

- ❑ Exploded view
⇒ [page 239](#)

4 - Injector, cylinder 1 - N30-

- ❑ Exploded view
⇒ [page 239](#)

5 - Hall sender - G40-

- ❑ Inlet side
- ❑ Exploded view
⇒ [page 278](#)

6 - Ignition coil 1 with output stage - N70-

- ❑ Exploded view
⇒ [page 274](#)

7 - Ignition coil 2 with output stage - N127-

- ❑ Exploded view
⇒ [page 274](#)

8 - Ignition coil 3 with output stage - N291-

- ❑ Exploded view
⇒ [page 274](#)

9 - Ignition coil 4 with output stage - N292-

- ❑ Exploded view
⇒ [page 274](#)

10 - Ignition coil 5 with output stage - N323-

- ❑ Exploded view ⇒ [page 274](#)

11 - Camshaft control valve 1 - N205-

- ❑ Exploded view ⇒ [page 93](#)

12 - Intake air temperature sender - G42- / intake manifold pressure sender - G71-

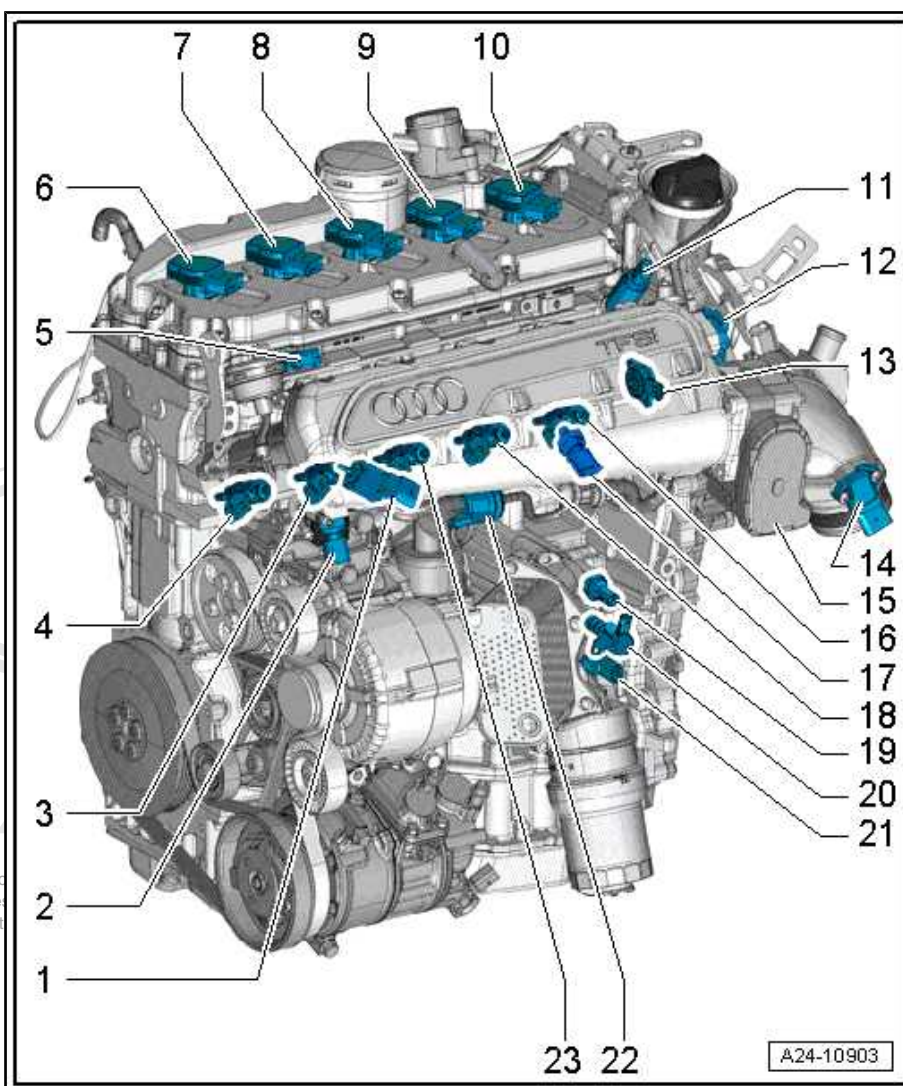
- ❑ Exploded view ⇒ [page 226](#)

13 - Intake manifold flap potentiometer - G336-

- ❑ Exploded view ⇒ [page 226](#)

14 - Charge pressure sender - G31- / intake air temperature sender 2 - G299-

- ❑ Different installation position depending on version



- ❑ Exploded view ➔ [page 200](#)

15 - 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 226](#)

16 - Injector, cylinder 5 - N83-

- ❑ Exploded view ➔ [page 239](#)

17 - Fuel pressure sender - G247-

- ❑ Exploded view ➔ [page 239](#)

18 - Injector, cylinder 4 - N33-

- ❑ Exploded view ➔ [page 239](#)

19 - Oil pressure switch - F22-

- ❑ Removing and installing ➔ [page 150](#)

20 - Valve for oil pressure control - N428-

- ❑ Removing and installing ➔ [page 155](#)

21 - Oil pressure switch for reduced oil pressure - F378-

- ❑ Exploded view ➔ [page 148](#)

22 - Activated charcoal filter solenoid valve 1 - N80-

23 - Injector, cylinder 3 - N32-

- ❑ Exploded view ➔ [page 239](#)

Engine (exhaust side)



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1 - Engine speed sender - G28-

- ☐ Exploded view
⇒ [page 274](#)

2 - Lambda probe after catalytic converter - G130- with Lambda probe 1 heater after catalytic converter - Z29-

- ☐ Fitting location of connector ⇒ [page 221](#)
- ☐ Exploded view
⇒ [page 255](#)

3 - Coolant temperature sender - G62-

- ☐ Exploded view
⇒ [page 177](#)

4 - Turbocharger air recirculation valve - N249-

- ☐ Exploded view
⇒ [page 200](#)

5 - Exhaust camshaft control valve 1 - N318-

- ☐ Exploded view
⇒ [page 93](#)

6 - Fuel metering valve - N290-

- ☐ Combined with high-pressure pump
- ☐ Cannot be renewed separately

7 - Hall sender 3 - G300-

- ☐ Exhaust side
- ☐ Exploded view
⇒ [page 274](#)

8 - Charge pressure control solenoid valve - N75-
9 - Lambda probe - G39- (before catalytic converter) with Lambda probe heater - Z19-

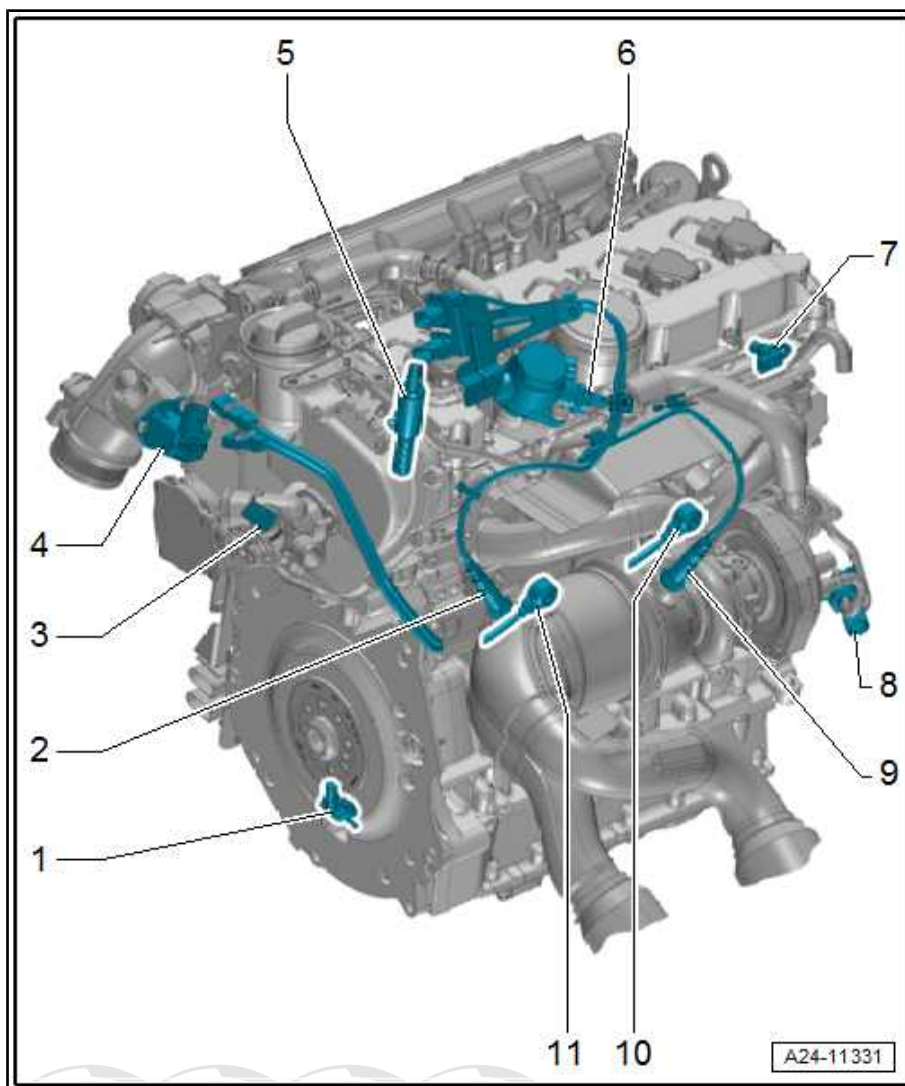
- ☐ Fitting location of connector ⇒ [page 221](#)
- ☐ Exploded view ⇒ [page 255](#)

10 - Knock sensor 1 - G61-

- ☐ Fitting location of connector ⇒ [page 222](#)
- ☐ Exploded view ⇒ [page 274](#)

11 - Knock sensor 2 - G66-

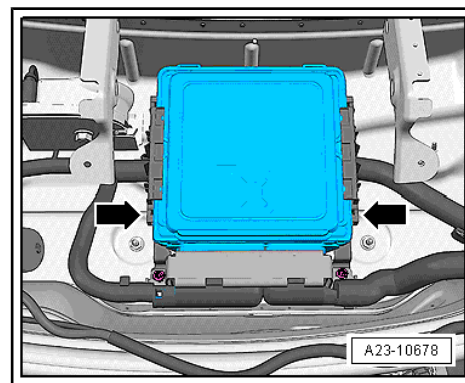
- ☐ Fitting location of connector ⇒ [page 222](#)
- ☐ Exploded view ⇒ [page 274](#)



Fitting location of engine control unit - J623-

- ◆ In electronics box (plenum chamber)

Removing and installing ⇒ [page 262](#)



Fitting location of accelerator position sender - G79- with accelerator position sender 2 - G185-

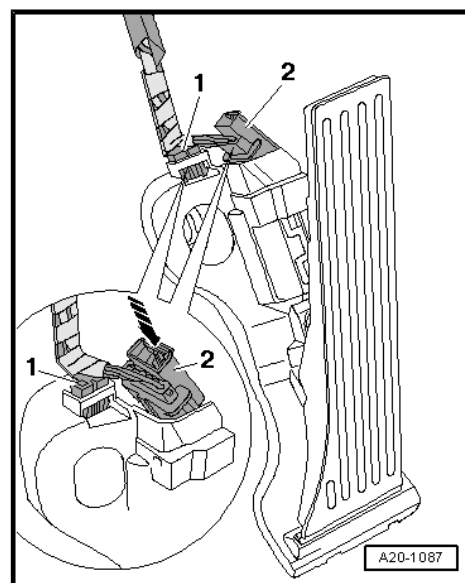
- ◆ Combined with accelerator pedal module



Note

The illustration shows the set-up for left-hand drive vehicles.

Removing and installing accelerator pedal module ⇒ Fuel supply system; Rep. gr. 20 ; Accelerator mechanism; Removing and installing accelerator pedal module with accelerator position sender -G79- / -G185- .

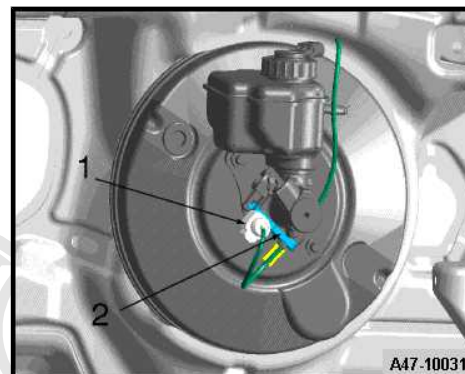


Fitting location of brake light switch - F- with brake pedal switch - F63-

- ◆ On brake master cylinder

1 - Brake light switch - F- with brake pedal switch - F63-

Removing and installing ⇒ Brake system; Rep. gr. 47 ; Brake servo/brake master cylinder; Removing and installing brake light switch

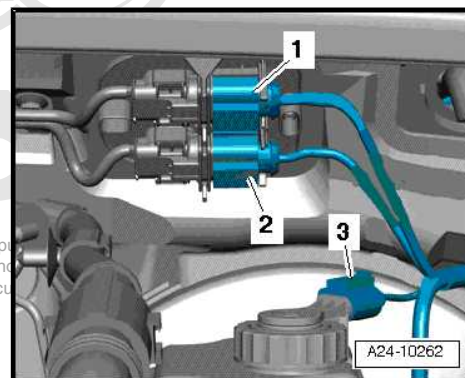


Fitting location of electrical connectors for Lambda probes

- ◆ At plenum chamber partition panel

- 1 - For Lambda probe, before catalytic converter - G39- with Lambda probe heater - Z19-
- 2 - For Lambda probe after catalytic converter - G130- with Lambda probe 1 heater after catalytic converter - Z29-

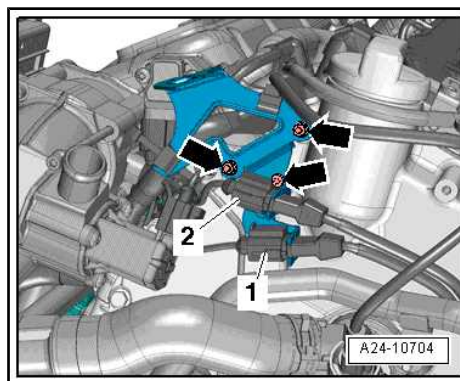
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Fitting location of electrical connectors for knock sensors

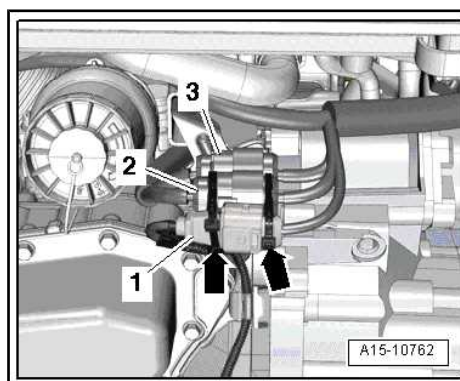
◆ On cylinder head cover

- 1 - For knock sensor 2 - G66-
- 2 - For knock sensor 1 - G61-



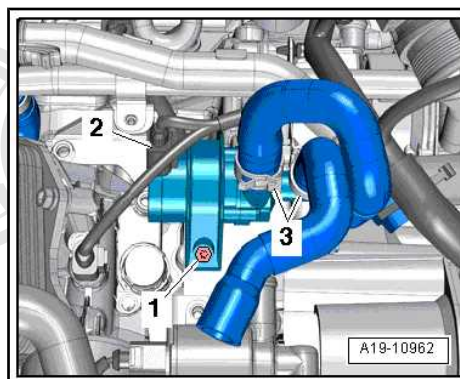
Fitting location of electrical connectors on cylinder head

- 1 - For engine speed sender - G28-
- 3 - For injectors



Fitting location of continued coolant circulation pump - V51-

- ◆ On cylinder block (inlet side)
- 2 - Continued coolant circulation pump - V51-

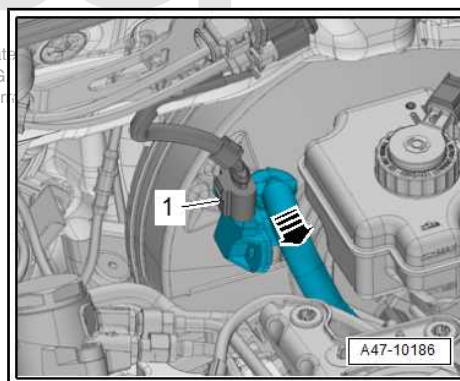


Fitting location of brake servo pressure sensor - G294-

◆ On brake servo

- 1 - Electrical connector for brake servo pressure sensor - G294-

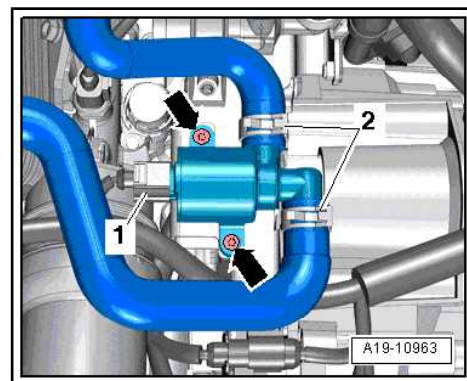
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Fitting location of solenoid for coolant circuit - N492-

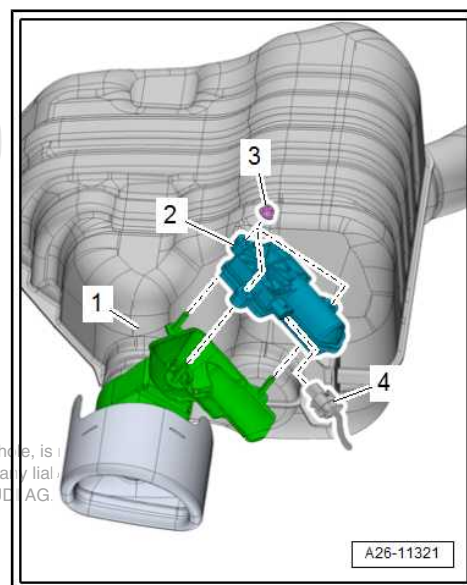
- ◆ On cylinder block (inlet side)

1 - Solenoid for coolant circuit - N492-



Fitting location of exhaust flap control unit - J883-

- ◆ -Item 2- on rear silencer



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2 Air cleaner

⇒ "2.1 Exploded view - air cleaner housing", page 224

⇒ "2.2 Removing and installing air cleaner housing", page 225

2.1 Exploded view - air cleaner housing

1 - Retaining peg

- ☐ 10 Nm

2 - Rubber grommet

3 - Water drain

- ☐ Clean

4 - Air cleaner housing

- ☐ Clean out salt deposits, dirt and leaves, etc.
- ☐ Removing and installing
⇒ page 225

5 - Gasket

- ☐ Clipped into air cleaner (bottom section)

6 - Front air duct

- ☐ Remove any salt residue, dirt and leaves

7 - Bolt

- ☐ 2 Nm

8 - Air duct cover

9 - Bolt

- ☐ 5 Nm

10 - Hose

- ☐ For crankcase breather

11 - Air hose

12 - Bolt

- ☐ 3 Nm

13 - Air pipe

14 - Seal

- ☐ Renew if damaged

15 - Air cleaner (top section)

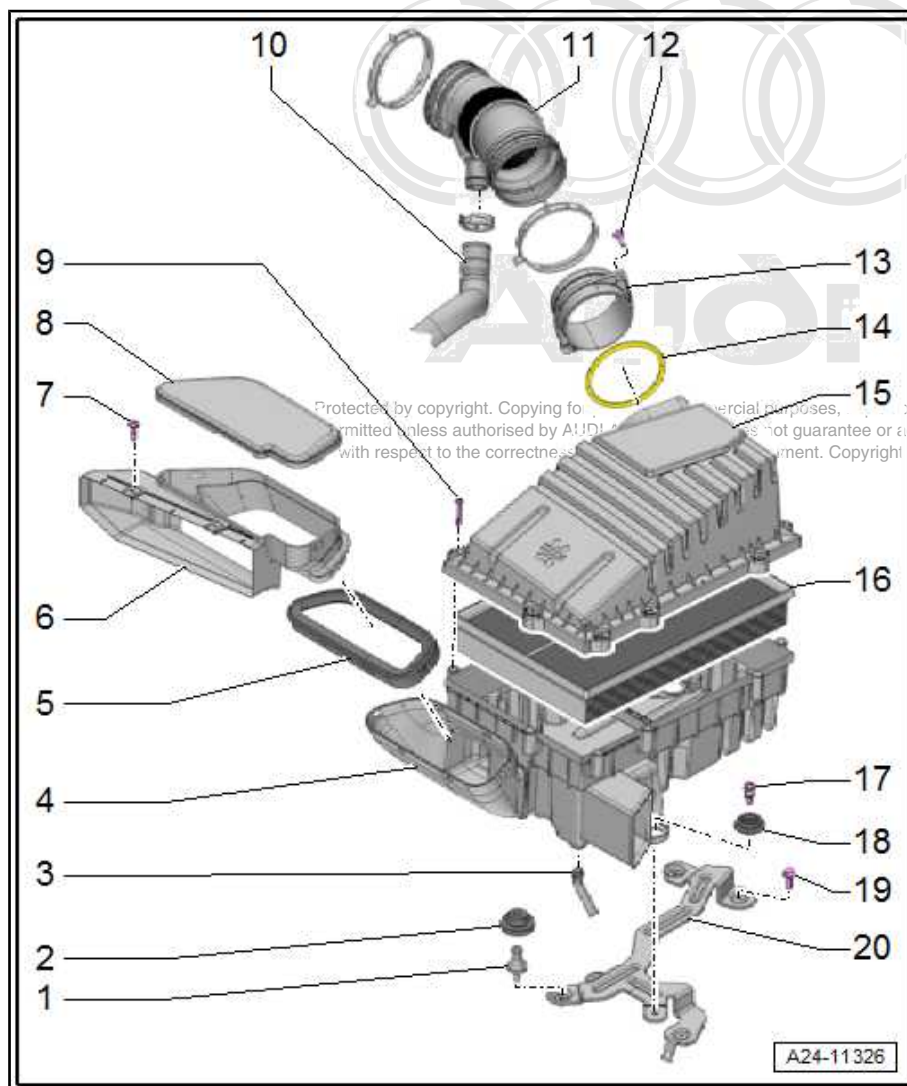
- ☐ Clean out salt deposits, dirt and leaves, etc.

16 - Air filter element

- ☐ Change intervals ⇒ Maintenance tables
- ☐ Removing and installing ⇒ Maintenance ; Booklet 820
- ☐ Always use genuine part for air filter element

17 - Bolt

- ☐ With attached bush
- ☐ 10 Nm



18 - Rubber grommet

19 - Bolt

□ 10 Nm

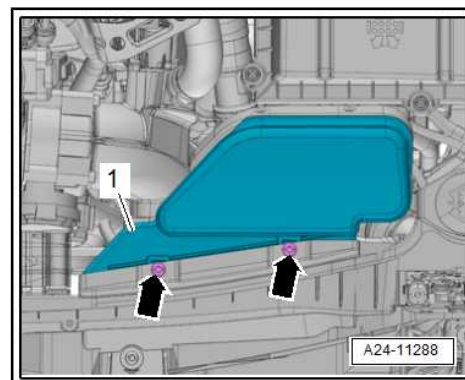
20 - Bracket

□ For air cleaner housing

2.2 Removing and installing air cleaner housing

Removing

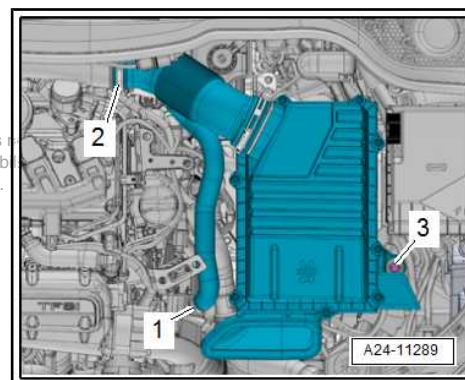
- Remove engine cover panel ⇒ [page 41](#) .
- Remove bolts -arrows- and detach air duct -1-.



- Release hose clips -1- and -2- and disconnect air hoses.
- Remove bolt -3- and detach air cleaner housing from retaining pegs.

Installing Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability for errors or omissions in the text or illustrations. The text and illustrations are the property of AUDI AG.

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



Note

- ◆ *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- ◆ *Do not use any lubricants containing silicone when assembling.*
- ◆ *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.*
- Check air duct leading from lock carrier to air cleaner housing for dirt and leaves.
- Install engine cover panel ⇒ [page 41](#) .

Tightening torques

- ◆ ⇒ [“2.1 Exploded view - air cleaner housing”, page 224](#)

3 Intake manifold

⇒ ["3.1 Exploded view - intake manifold", page 226](#)

⇒ ["3.2 Removing and installing intake manifold \(top section\)", page 230](#)

⇒ ["3.3 Removing and installing intake manifold \(bottom section\) with fuel rail", page 233](#)

⇒ ["3.4 Removing and installing throttle valve module J338", page 235](#)

3.1 Exploded view - intake manifold

Intake manifold (top section; version 1)

1 - Seal

- ☐ Renew after removing

2 - Throttle valve module J338

- ☐ Removing and installing ⇒ [page 235](#)
- ☐ After renewing, perform "Adaption" for engine control unit - J623- / throttle valve module - J338- in ⇒ Vehicle diagnostic tester, [Guided Functions](#)

3 - Non-return valve

4 - Bolt

- ☐ 9 Nm

5 - Activated charcoal filter solenoid valve 1 - N80-

6 - Bolt

- ☐ 9 Nm

7 - Bracket

8 - Intake manifold (top section)

- ☐ Removing and installing ⇒ [page 230](#)

9 - Trim

10 - Emblem

11 - Gasket

- ☐ Renew after removing

12 - Hose

- ☐ For crankcase breather

13 - O-ring

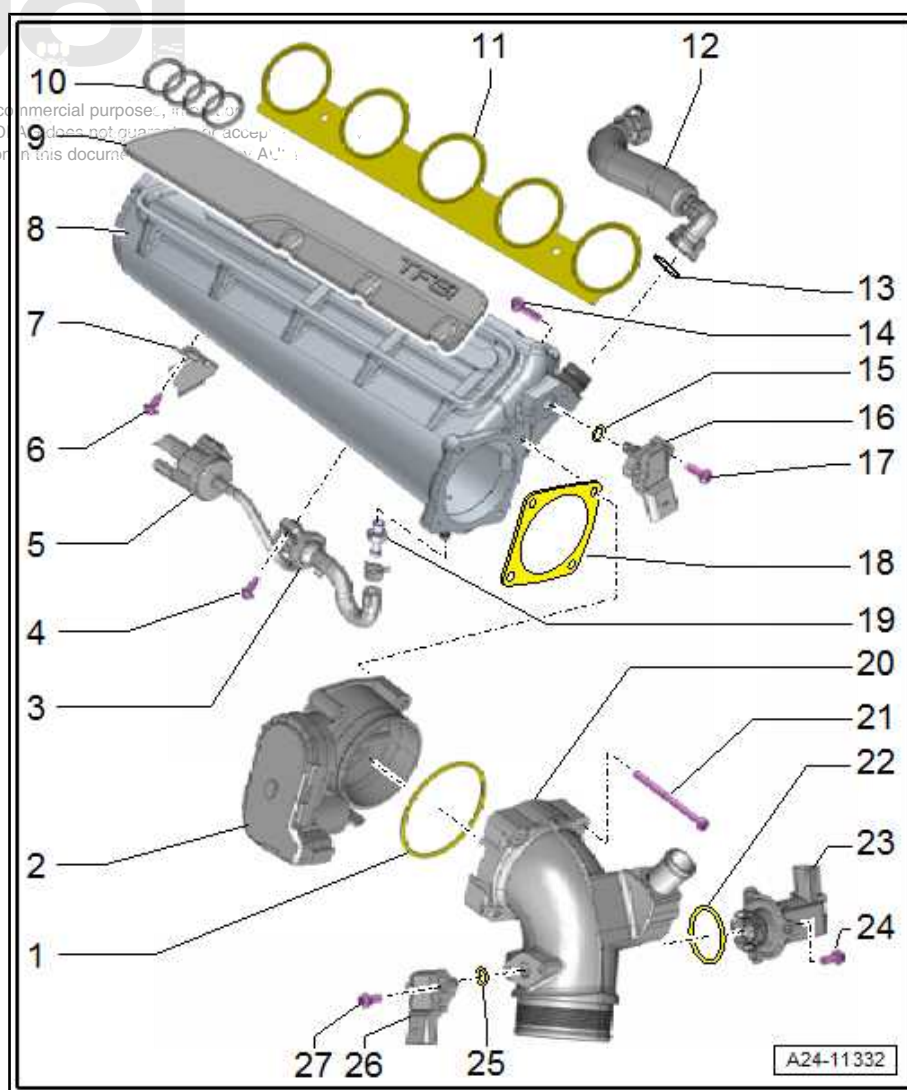
- ☐ Renew after removing

14 - Bolt/nut

- ☐ Tightening torque and sequence ⇒ [page 227](#)

15 - O-ring

- ☐ Renew after removing



16 - Intake air temperature sender - G42- / intake manifold pressure sender - G71-

- ☐ Removing and installing ⇒ [page 248](#)

17 - Bolt

- ☐ 9 Nm

18 - Gasket

- ☐ Renew after removing

19 - Union

- ☐ Apply locking fluid when installing; refer to ⇒ Electronic parts catalogue
- ☐ 20 Nm

20 - Intake connecting pipe

21 - Bolt

- ☐ 9 Nm

22 - O-ring

- ☐ Renew after removing

23 - Turbocharger air recirculation valve - N249-

- ☐ Removing and installing ⇒ [page 213](#)

24 - Bolt

- ☐ 9 Nm

25 - O-ring

- ☐ Renew after removing

26 - Charge pressure sender - G31- / intake air temperature sender 2 - G299-

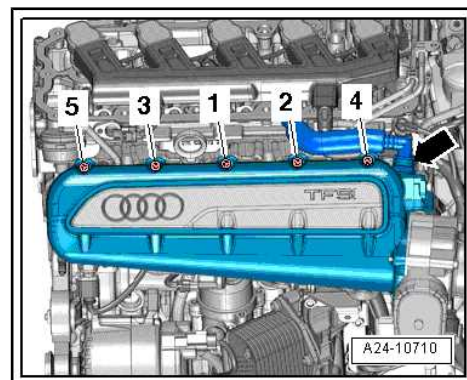
- ☐ Removing and installing ⇒ [page 213](#)

27 - Bolt

- ☐ 9 Nm

Intake manifold (top section) - tightening torque and sequence

- Tighten bolts/nuts in the sequence -1 ... 5-
- ◆ Initially screw in by hand until contact is made.
- ◆ Subsequently tighten to 9 Nm



Intake manifold (top section; version 2)

1 - O-ring

- ☐ Renew after removing

2 - Throttle valve module - J338-

- ☐ Removing and installing ⇒ [page 235](#)
- ☐ After renewing, perform "Adaption" for engine control unit - J623- / throttle valve module - J338- in ⇒ Vehicle diagnostic tester, [Guided Functions](#)

3 - Gaskets

- ☐ Renew after removing

4 - Flange
5 - Non-return valve
6 - Bolt

- ☐ 9 Nm

7 - Activated charcoal filter solenoid valve 1 - N80-
8 - Union

- ☐ Apply locking fluid when installing; refer to ⇒ Electronic parts catalogue
- ☐ 20 Nm

9 - Bolt

- ☐ 9 Nm

10 - Bolt

- ☐ 9 Nm

11 - Bracket
12 - Emblem
13 - Trim
14 - Intake manifold (top section)

- ☐ Removing and installing ⇒ [page 230](#)

15 - Bolt/nut

- ☐ Tightening torque and sequence ⇒ [page 227](#)

16 - Hose

- ☐ For crankcase breather

17 - O-rings

- ☐ Renew after removing

18 - Intake air temperature sender - G42- / intake manifold pressure sender - G71-

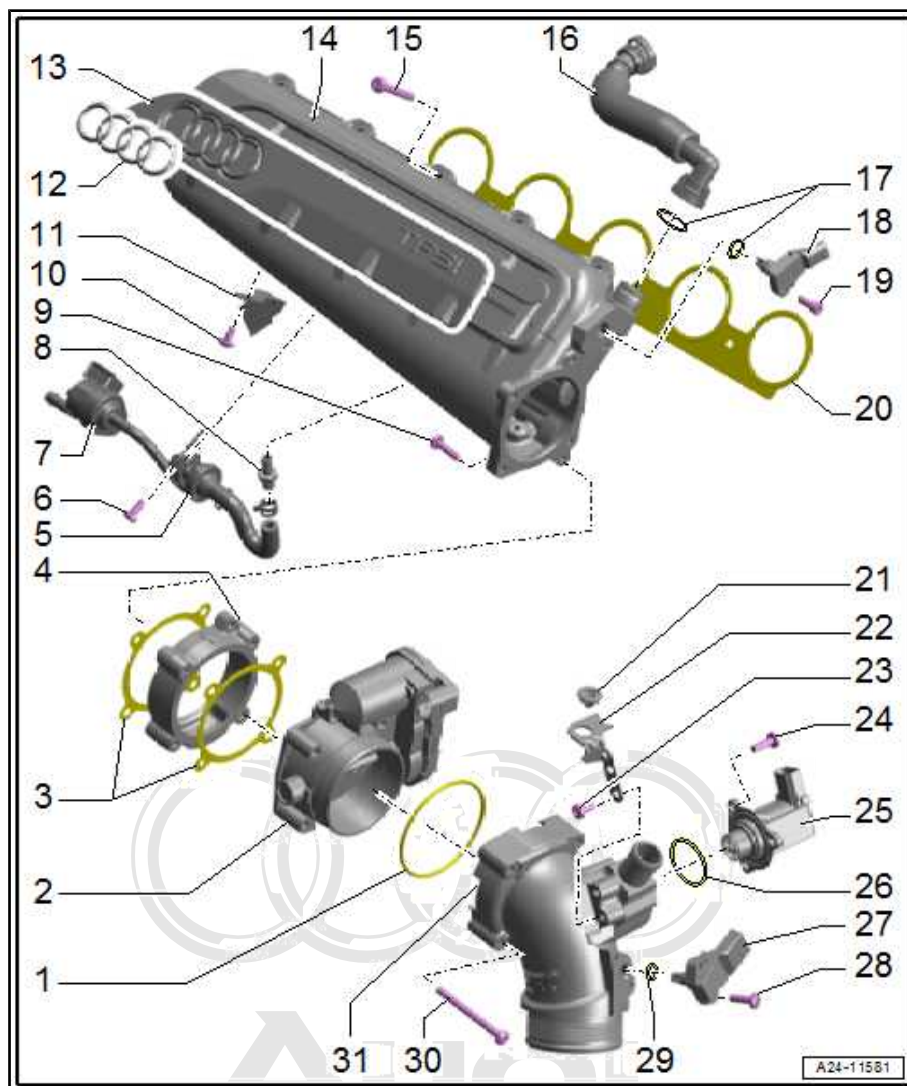
- ☐ Removing and installing ⇒ [page 248](#)

19 - Bolt

- ☐ 9 Nm

20 - Gasket

- ☐ Renew after removing



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21 - Grommet

22 - Bracket

- ☐ For engine cover panel

23 - Bolt

- ☐ 9 Nm

24 - Bolt

- ☐ 9 Nm

25 - Turbocharger air recirculation valve - N249-

- ☐ Removing and installing ⇒ [page 213](#)

26 - O-ring

- ☐ Renew after removing

27 - Charge pressure sender - G31- / intake air temperature sender 2 - G299-

- ☐ Removing and installing ⇒ [page 213](#)

28 - Bolt

- ☐ 9 Nm

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29 - O-ring

- ☐ Renew after removing

30 - Bolt

- ☐ 9 Nm

31 - Intake connecting pipe

Intake manifold (bottom section)

1 - Intake manifold (bottom section)

- ☐ With vacuum unit for intake manifold flaps
- ☐ Removing and installing
⇒ [page 233](#)

2 - Bolt

- ☐ 9 Nm

3 - Fuel line (low-pressure)

4 - Bracket

5 - Bolt

- ☐ 9 Nm

6 - Dowel pin

- ☐ 2x

7 - Gasket

- ☐ Renew after removing

8 - Dowel pin

- ☐ 2x

9 - Intake manifold flap potentiometer - G336-

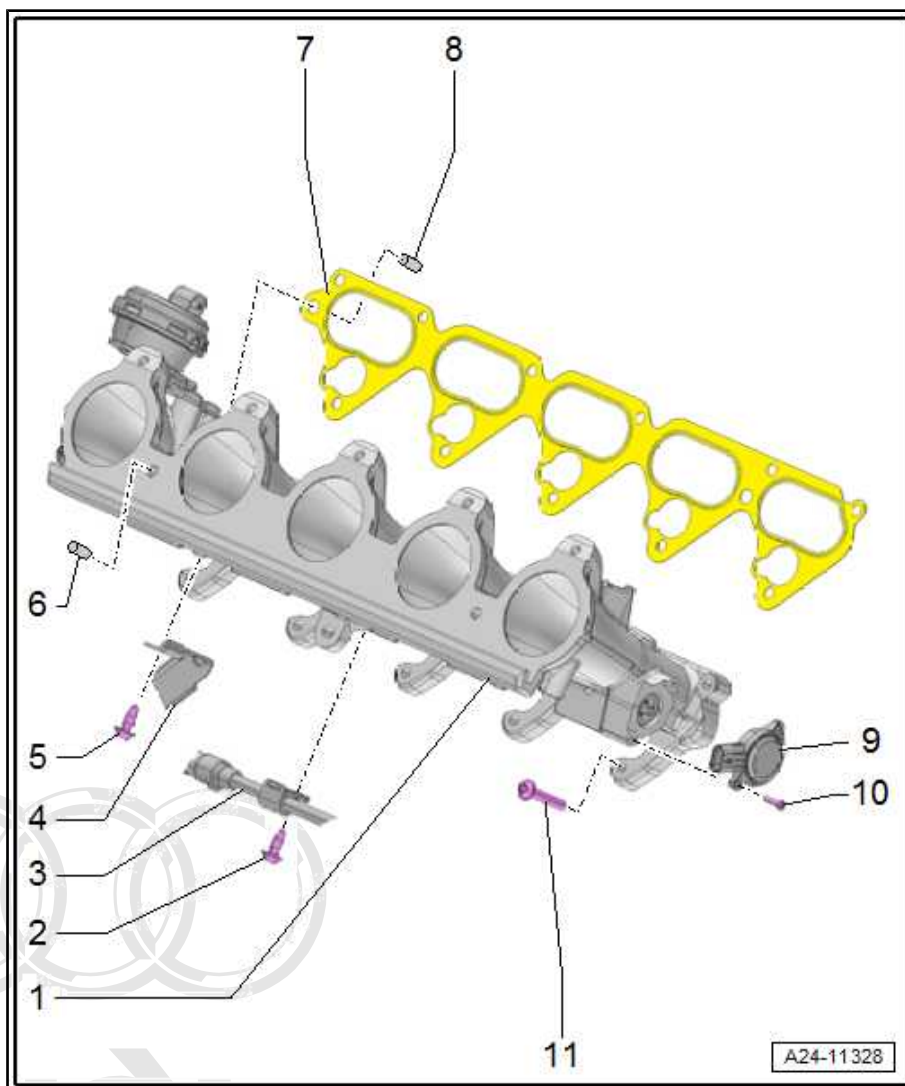
- ☐ After renewing, perform "Adaption" for engine control unit - J623- / intake manifold flap potentiometer - G336- using ⇒ [Vehicle diagnostic tester, Guided Functions](#)

10 - Bolt

- ☐ 2.5 Nm

11 - Bolt

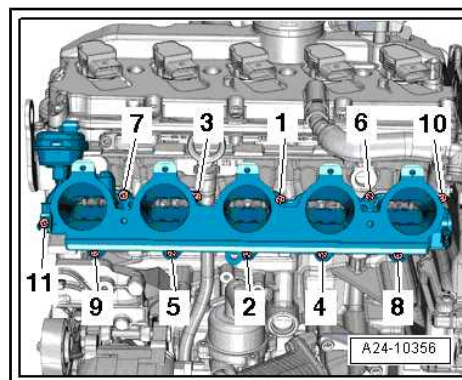
- ☐ Tightening torque and tightening sequence ⇒ [page 230](#)



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Intake manifold (bottom section) - tightening torque and tightening sequence

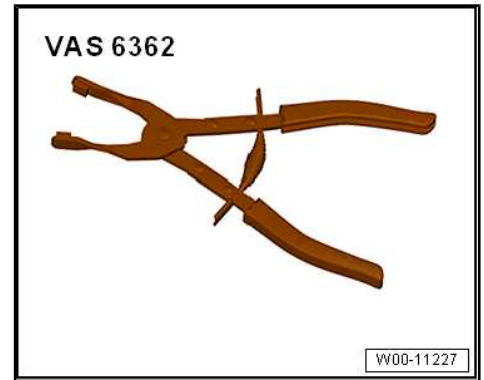
- Tighten bolts and nuts for intake manifold (bottom section) in the sequence -1 to 11- in 2 stages.
- ◆ Tighten initially to 7 Nm
- ◆ Subsequently tighten to 9 Nm



3.2 Removing and installing intake manifold (top section)

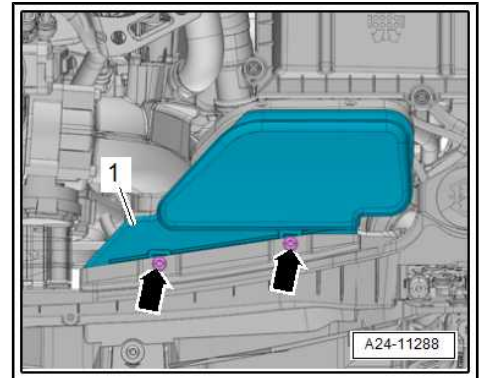
Special tools and workshop equipment required

- ◆ Hose clip pliers - VAS 6362-

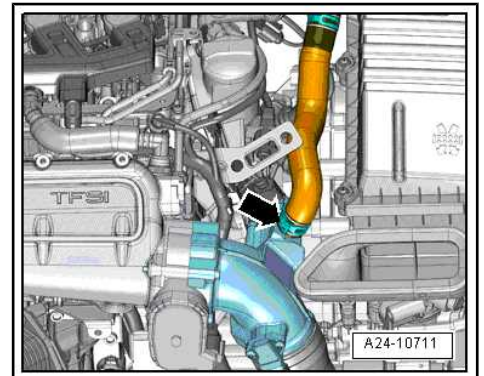


Removing

- Remove engine cover panel ⇒ [page 41](#) .
- Remove bolts -arrows- and detach air duct -1-.



- Release hose clip -arrow- and detach air hose.

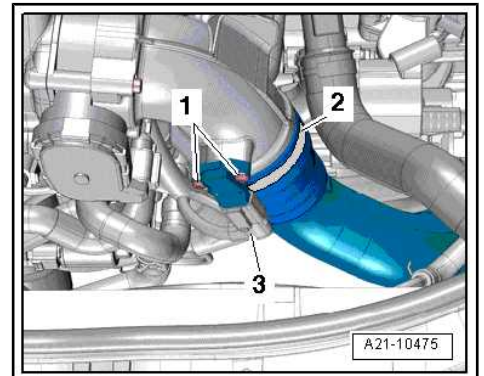


Intake manifold (top section; version 1):

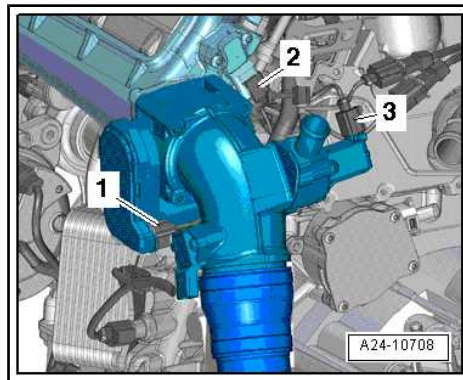
- Release hose clip -2-.
- Unplug electrical connector -3- at charge pressure sender - G31- / intake air temperature sender 2 - G299- .



Disregard -item 1-.

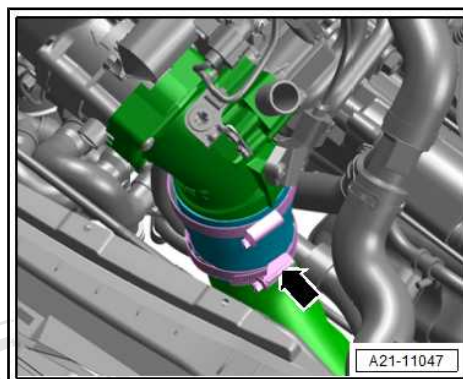


- Unplug electrical connectors:
- 1 - Throttle valve module - J338-
- 2 - Intake air temperature sender - G42- / intake manifold pressure sender - G71-
- 3 - Turbocharger air recirculation valve - N249-
- If intake manifold is secured with nuts: Remove throttle valve module - J338- ⇒ [page 235](#) .

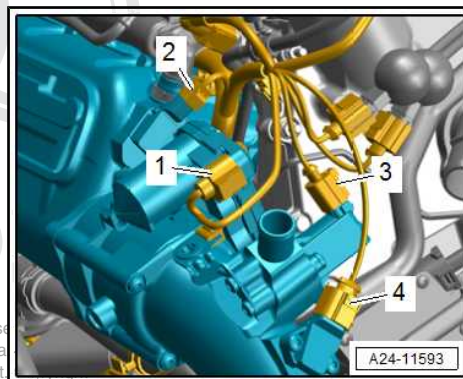


Intake manifold (top section; version 2):

- Release hose clip -arrow-.



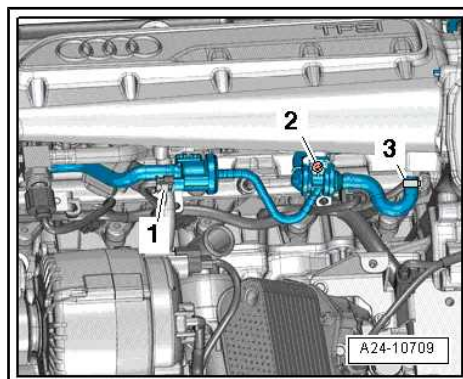
- Unplug electrical connectors:
- 1 - For throttle valve module - J338-
- 2 - For intake air temperature sender - G42- / intake manifold pressure sender - G71-
- 3 - For turbocharger air recirculation valve - N249-
- 4 - For charge pressure sender - G31- / intake air temperature sender 2 - G299-



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All engine versions (continued):

- Disengage activated charcoal filter solenoid valve 1 - N80- -item 1-.
- Remove bolt -2-.
- Release hose clip -3- and detach hose.



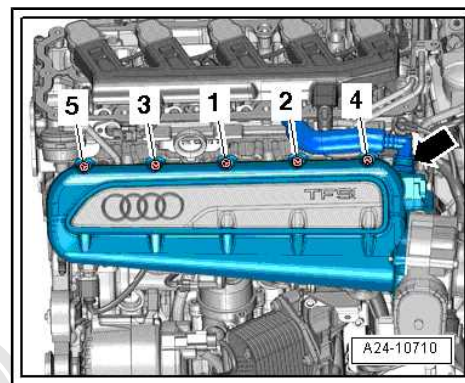
- Press release tabs and disconnect crankcase breather hose -arrow-.
- Unscrew bolts/nuts -1 ... 5- and detach intake manifold (top section).



Caution

Risk of irreparable damage to engine.

- ◆ *Should any aluminium chips drop into the intake ports when the top section of the intake manifold is lifted off, they must be extracted with a vacuum cleaner.*
- ◆ *Block off the openings of the intake ports in the cylinder head with a clean cloth to prevent small items from dropping into the engine.*



Installing

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



Note

- ◆ *Renew gasket and O-ring.*
- ◆ *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- ◆ *Do not use any lubricants containing silicone when assembling.*
- ◆ *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.*
- Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- If intake manifold is secured with nuts: Install throttle valve module - J338- ⇒ [page 235](#) .
- Install engine cover panel ⇒ [page 41](#) .

Tightening torques

- ◆ ⇒ [“3.1 Exploded view - intake manifold”, page 226](#)
- ◆ ⇒ [Fig. “Intake manifold \(top section\) - tightening torque and sequence”, page 227](#)
- ◆ ⇒ [“2.1 Exploded view - air cleaner housing”, page 224](#)

3.3 Removing and installing intake manifold (bottom section) with fuel rail

Removing

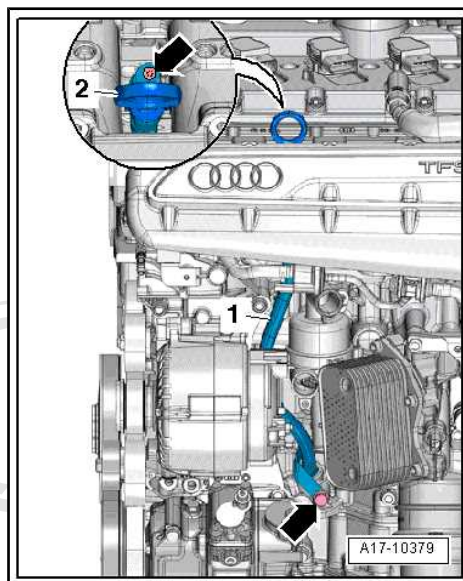


Note

Fit all cable ties in the original positions when installing.

- Remove intake manifold (top section) ⇒ [page 230](#) .

- Remove high-pressure pipe ⇒ [page 251](#) .
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .
- Pull out oil dipstick -2-.
- Remove bolts -arrows- and pull guide tube -1- for oil dipstick out of cylinder block (leave in installation position).



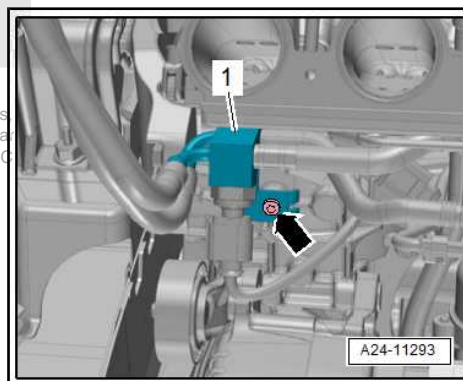
- Remove bolt -arrow- and place connection -1- to one side.



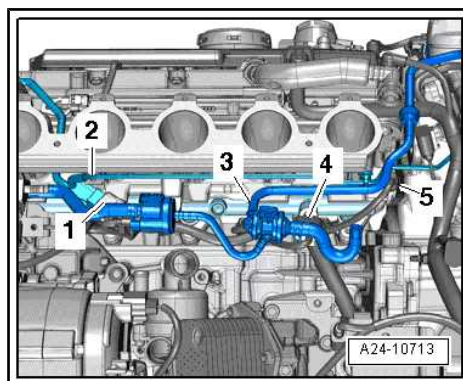
Note

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Different types depending on vehicle version.



- Unplug electrical connectors:
- 1 - Intake manifold flap valve - N316-
- 4 - Fuel pressure sender - G247-
- 5 - Intake manifold flap potentiometer - G336-
- Disconnect vacuum hose -2- and hose -3- from activated charcoal filter and move clear.
- Move electrical wiring harness clear at fuel rail and intake manifold (bottom section).



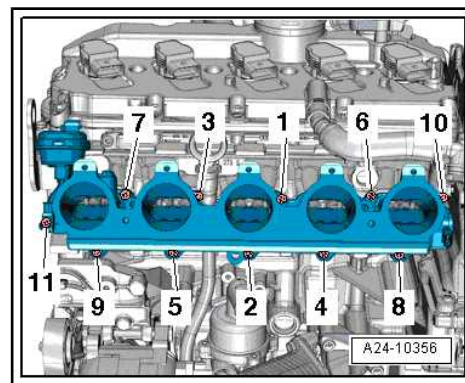
- Loosen bolts in the sequence -11 ... 1-.
- Remove bolts and detach intake manifold (bottom section); pay attention to guide tube for oil dipstick when doing so.



Caution

Risk of irreparable damage to engine.

- ◆ *Block off the openings of the intake ports in the cylinder head with a clean cloth to prevent small items from dropping into the engine.*



Note

Injectors must be removed before gasket for intake manifold (bottom section) can be detached.

- Remove injectors ⇒ [page 240](#) .

Installing

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



Note

- ◆ *Renew seals and O-rings.*
- ◆ *Injectors must be installed after gasket for intake manifold (bottom section) has been attached.*
- Install injectors ⇒ [page 240](#) .
- Install high-pressure pipe ⇒ [page 251](#) .
- Install intake manifold (top section) ⇒ [page 230](#) .
- Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.

Tightening torques

- ◆ ⇒ [Fig. “Intake manifold \(bottom section\) - tightening torque and tightening sequence”](#), [page 230](#)
- ◆ ⇒ [Fig. “Guide tube for oil dipstick - tightening torque”](#), [page 132](#)
- ◆ ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

3.4 Removing and installing throttle valve module - J338-

⇒ [“3.4.1 Removing and installing throttle valve module J338 , version 1”](#), [page 235](#)

⇒ [“3.4.2 Removing and installing throttle valve module J338 , version 2”](#), [page 238](#)

3.4.1 Removing and installing throttle valve module - J338- , version 1

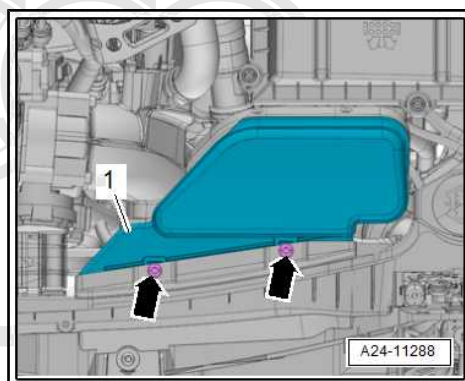
Special tools and workshop equipment required

- ◆ Hose clip pliers - VAS 6362-

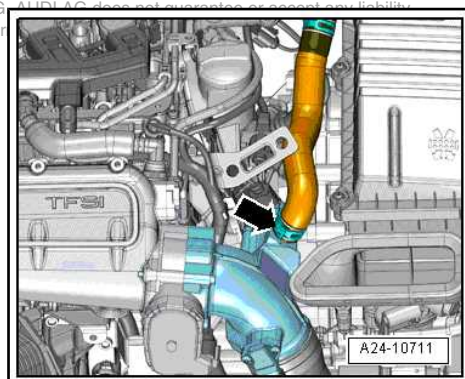


Removing

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



- Release hose clip -arrow- and detach air hose.

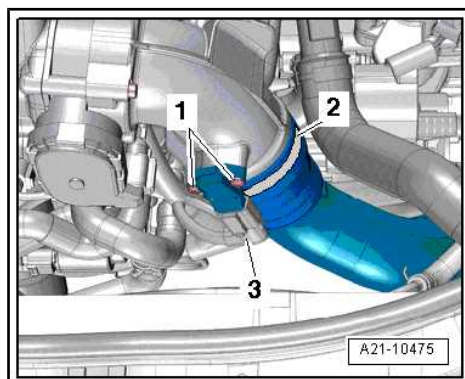


- Release hose clip -2-.
- Unplug electrical connector -3- at charge pressure sender - G31- / intake air temperature sender 2 - G299- .



Note

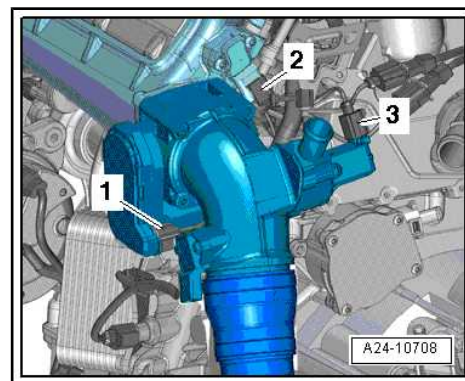
Disregard -item 1-.



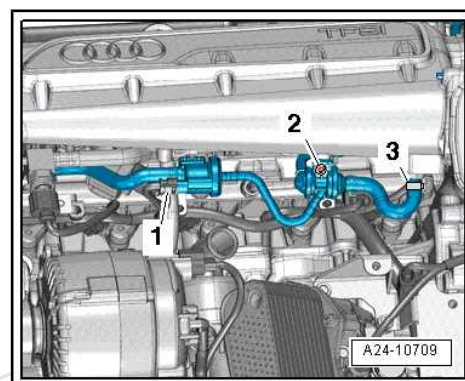
- Unplug electrical connectors:
- 1 - For throttle valve module - J338-
- 3 - For turbocharger air recirculation valve - N249-

 Note

Disregard -item 2-.



- Disengage activated charcoal filter solenoid valve 1 - N80-item 1-.
- Remove bolt -2-.
- Release hose clip -3- and detach hose.



- Remove bolts -arrows- and detach throttle valve module - J338- -item 1- with connection from air hose -2-.

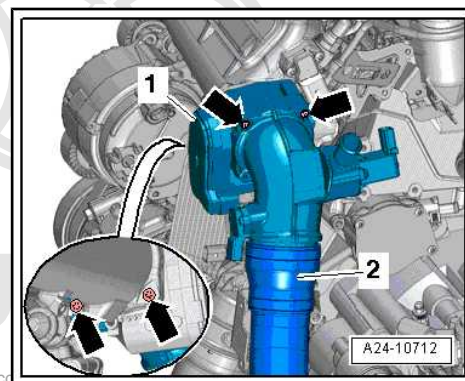
Installing

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

 Note

Renew gasket and O-ring.

- Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations
- After renewing, perform "Adaption" for engine control unit J623- / throttle valve module - J338- using ⇒ Vehicle diagnostic tester, Guided Functions.



Tightening torques

- ◆ Air duct
⇒ ["2.1 Exploded view - air cleaner housing", page 224](#)
- ◆ ⇒ ["3.1 Exploded view - intake manifold", page 226](#)

3.4.2 Removing and installing throttle valve module - J338- , version 2

Removing

- Remove intake manifold (top section) ⇒ [page 230](#) .
- Remove bolts -arrows- and detach throttle valve module - J338- -1-.

Installing

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



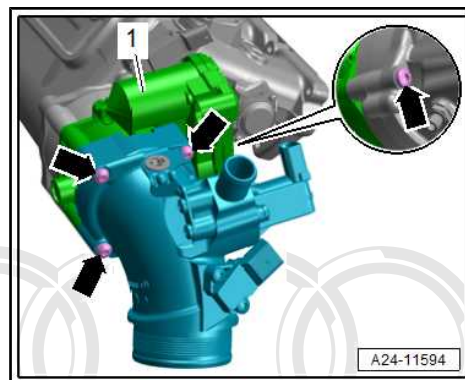
Note

Renew gasket and O-rings.

- Install intake manifold (top section) ⇒ [page 230](#) .
- After renewing, perform “Adaption” for engine control unit - J623- / throttle valve module - J338- using ⇒ Vehicle diagnostic tester, Guided Functions.

Tightening torques

- ◆ ⇒ [“3.1 Exploded view - intake manifold”, page 226](#)



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4 Injectors

⇒ ["4.1 Exploded view - fuel rail with injectors", page 239](#)

⇒ ["4.2 Removing and installing injectors", page 240](#)

⇒ ["4.3 Cleaning injectors", page 244](#)

4.1 Exploded view - fuel rail with injectors

1 - Fuel pressure sender - G247-

- ☐ Removing and installing
⇒ [page 246](#)
- ☐ 25 Nm

2 - Bolt

- ☐ 9 Nm

3 - High-pressure pipe

- ☐ Connections must not be damaged
- ☐ Do not alter shape
- ☐ Removing and installing
⇒ [page 251](#)
- ☐ 27 Nm

4 - Connecting piece

- ☐ Renew
- ☐ 40 Nm

5 - Fuel rail

- ☐ Removing and installing
⇒ [page 233](#)

6 - Bolt

- ☐ 9 Nm

7 - Sealing element

- ☐ Combined as a unit with -item 8-
- ☐ Renew after removing

8 - Mounting

- ☐ Combined as a unit with -item 7-
- ☐ Renew after removing

9 - Combustion chamber ring seal

- ☐ Do not apply grease to ring seal or use any other lubricants
- ☐ Renewing ⇒ ["4.2 Removing and installing injectors", page 240](#)

10 - Injector

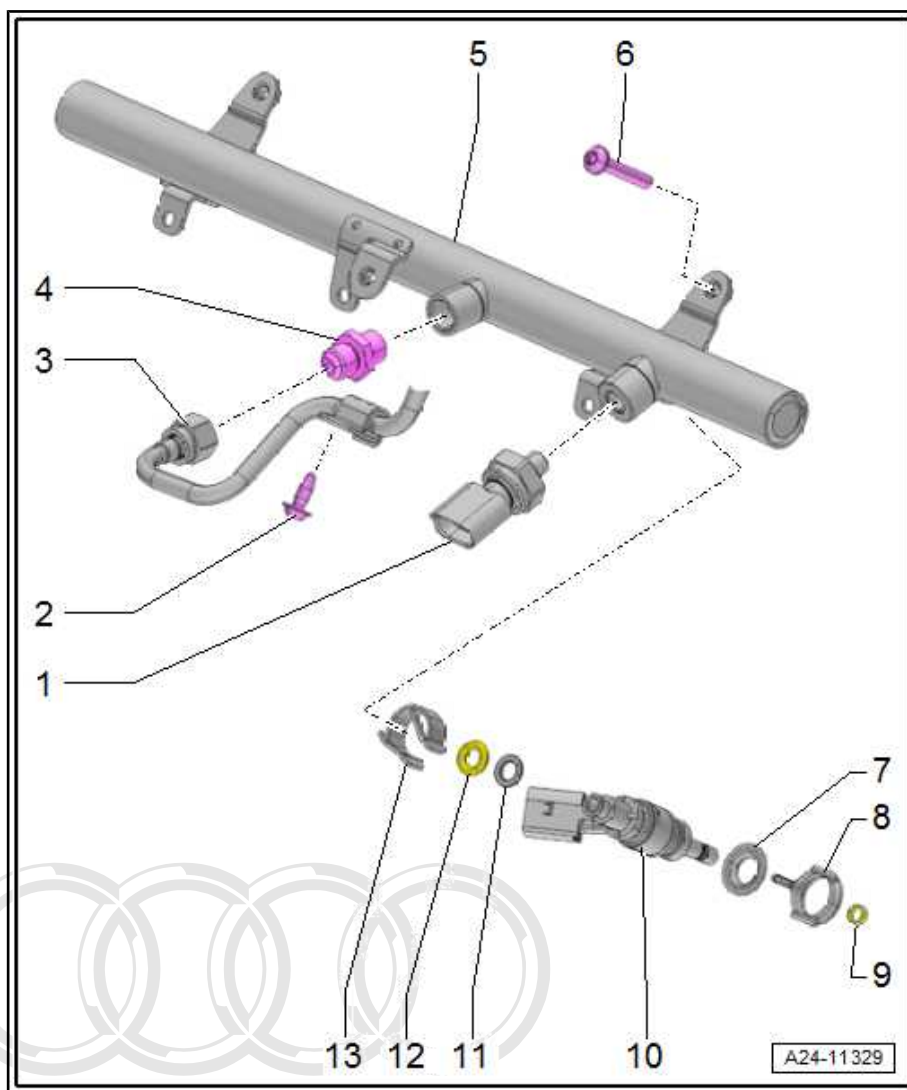
- ☐ Removing and installing ⇒ [page 240](#)

11 - Spacer ring

- ☐ Renew after removing

12 - O-ring

- ☐ Renew after removing
- ☐ Lubricate lightly with clean engine oil



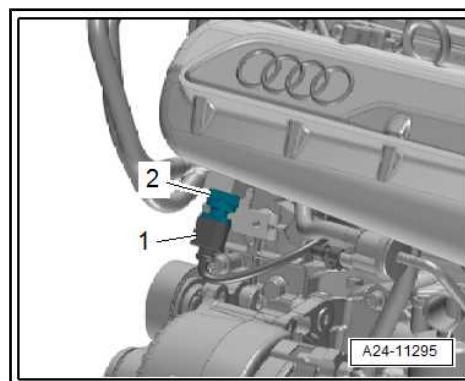
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13 - Support ring

- ☐ Renew after removing
- ☐ Via this support ring, the fuel rail exerts the clamping force that holds the injector in the cylinder head
- ☐ Clipped to -item 10-

Fuel pressure sender for low pressure - G410-

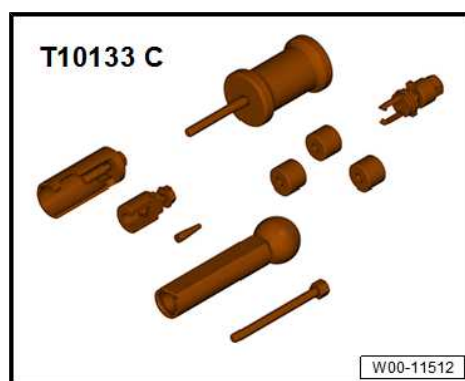
- 1 - Electrical connector
- 2 - Fuel pressure sender for low pressure - G410-
- ◆ 15 Nm
- ◆ Renew O-ring
- ◆ Removing and installing ⇒ [page 247](#)



4.2 Removing and installing injectors

Special tools and workshop equipment required

- ◆ Tool set for FSI engines - T10133C-



Removing

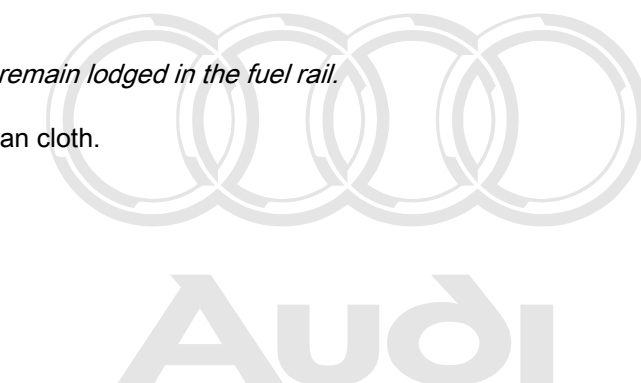
- Remove intake manifold (bottom section) with fuel rail
⇒ [page 233](#) .



Note

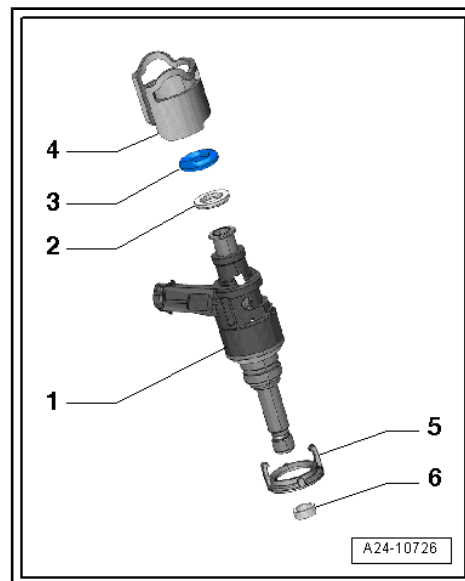
Carefully pull out any injectors that remain lodged in the fuel rail.

- Cover open inlet ports with a clean cloth.

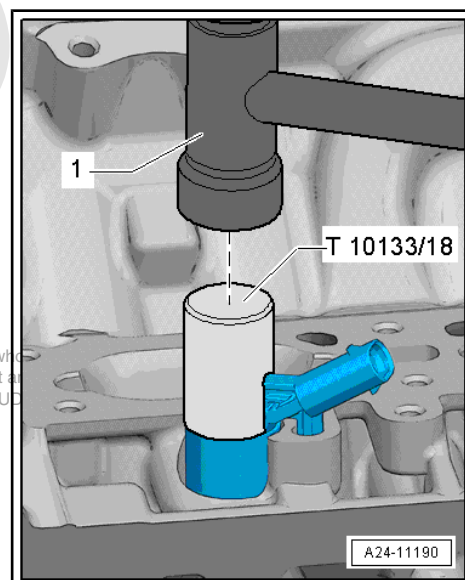


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- Unplug electrical connector on injector -1- that is to be removed and pull off support ring -4-.

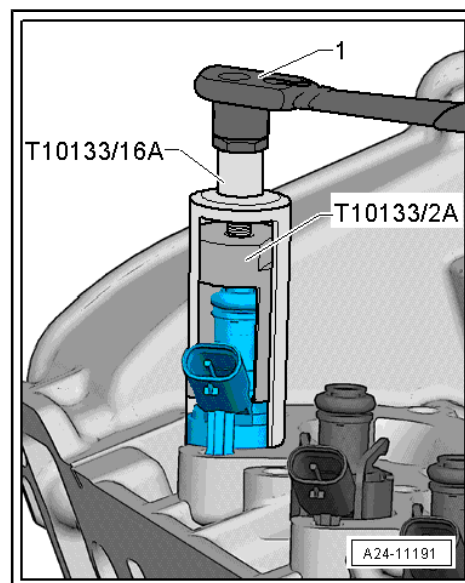


- Slide stop sleeve -T10133/18- over injector.
- Carefully knock against stop sleeve several times with a plastic hammer -1- to loosen injector.



Note

- ◆ Use a torque wrench to pull out injector.
- ◆ Set torque wrench to 5 Nm.
- ◆ Observe correct torque to avoid irreparable damage to injector.
- Guide puller -T10133/2A- into groove on injector.
- Then apply puller T10133/16A .
- Pull out injector by turning bolt with torque wrench -1-.
- If injector does not come loose after torque limit of 5 Nm is reached, remove puller again.
- Repeat procedure using stop sleeve to loosen injector.
- Repeat procedure for each injector.
- Detach gasket for intake manifold (bottom section).



Dismantling injector

- Pull O-ring -3- and spacer ring -2- off injector -1-.
- Unclip sealing element -5-.
- Carefully remove old combustion chamber ring seal -6-. 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.

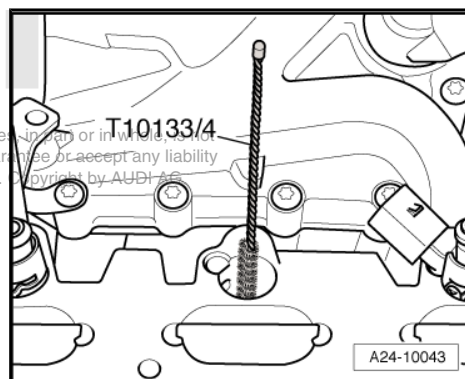
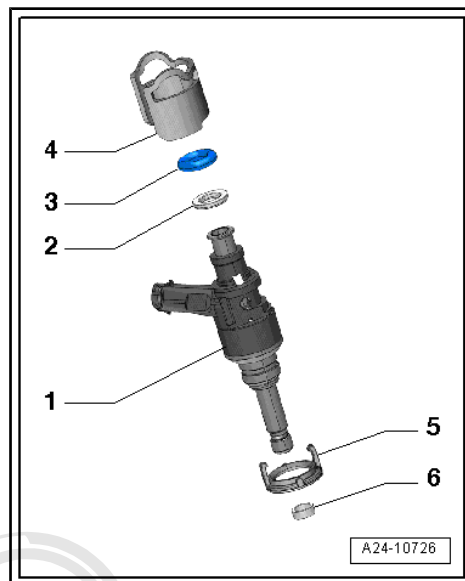
Installing



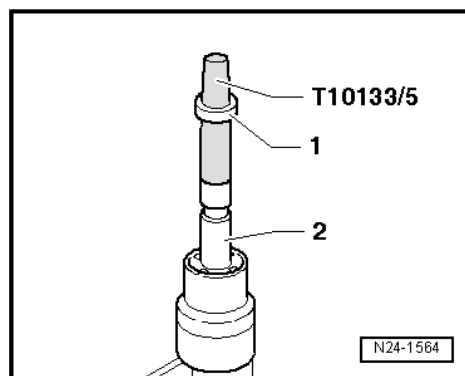
Note

- ◆ Use complete repair set when installing.
- ◆ Renew support ring.
- ◆ Renew combustion chamber ring seal before re-installing injector.
- ◆ Lubricate O-rings of injectors lightly with clean engine oil.

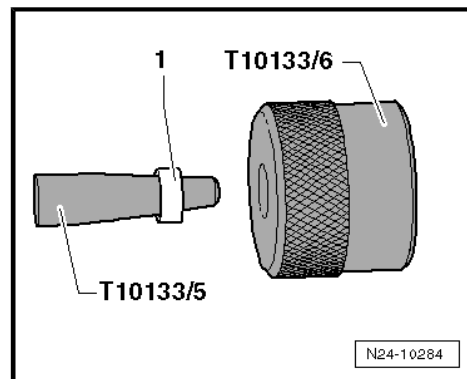
- Clean bore in cylinder head with nylon cylinder brush - T10133/4- .
- Before new combustion chamber ring seal is fitted, any combustion residue must be removed from ring groove and injector stem using a clean cloth.



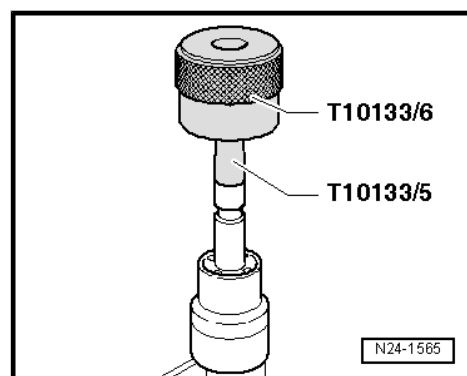
- Fit assembly cone -T10133/5- with new combustion chamber ring seal -1- onto injector -2-.



- Using assembly sleeve -T10133/6- , push combustion chamber ring seal -1- onto assembly cone -T10133/5- as far as it will go.



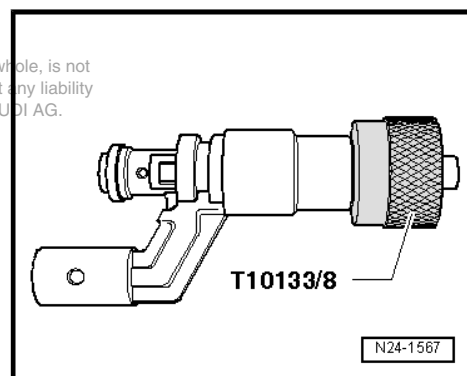
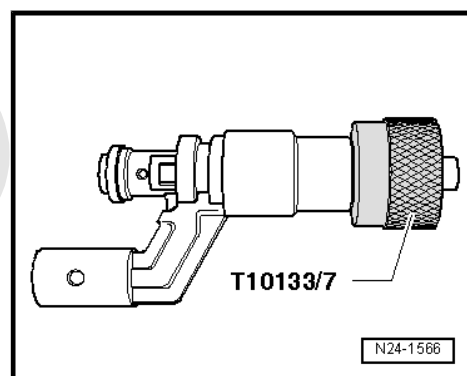
- Turn round assembly sleeve -T10133/6- and slide combustion chamber ring seal into groove.



Note

The combustion chamber ring seal is widened when it is pushed onto the injector. After pushing it on, it therefore has to be compressed again. This is done in two stages, as described below.

- Push calibration sleeve -T10133/7- onto injector as far as it will go and simultaneously turn it slightly (approx. 180°).
- Pull calibration sleeve -T10133/7- off again by turning it in the opposite direction.
- Push calibration sleeve -T10133/8- onto injector as far as it will go and simultaneously turn it slightly (approx. 180°).
- Pull calibration sleeve -T10133/8- off again by turning it in the opposite direction.



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- Before installing new injector -1-, lubricate new O-ring -3- lightly with clean engine oil.


Note

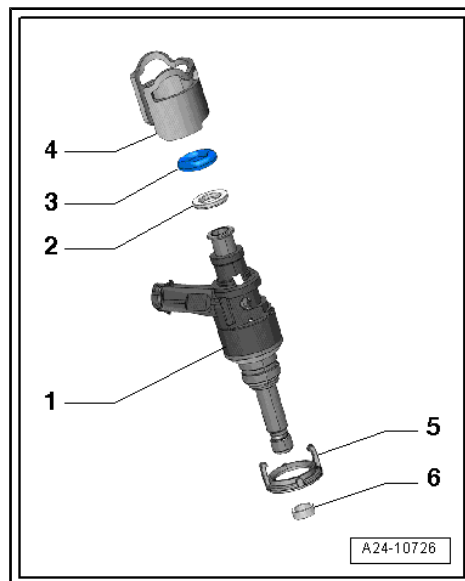
The combustion chamber ring seal -6- must not be lubricated.

- Fit new gasket for intake manifold (bottom section).
- Position fuel rail on injectors and press into place evenly.
- Push injector by hand as far as it will go into aperture in cylinder head (do not use oil or grease). Ensure that the injector is properly seated in the cylinder head.
- Electrical connector of injector must engage in recess in cylinder head.


Note

It should be possible to insert injector easily. If necessary wait until the combustion chamber ring seal has contracted sufficiently.

- Fit support ring onto injector.
- Install intake manifold (bottom section) with fuel rail
⇒ [page 233](#).



4.3 Cleaning injectors

Special tools and workshop equipment required

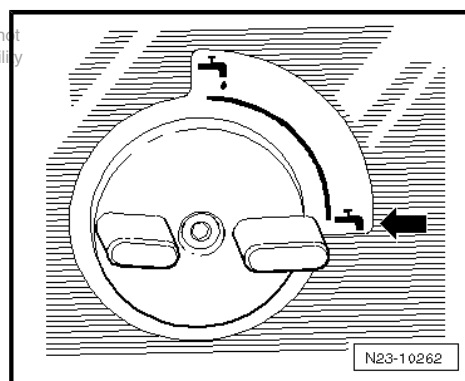
- ◆ Ultrasonic cleaning unit - VAS 6418-
- ◆ Mounting plate for injection modules - VAS 6418/1-
- ◆ Cleaning fluid ⇒ Electronic parts catalogue

Cleaning

- Remove injectors ⇒ [page 240](#).
- Close drain tap -arrow- on ultrasonic cleaning unit - VAS 6418- (located on right side of housing).
- Fill ultrasonic unit with 2,120 ml of water which has been allowed to settle for a few minutes and cleaning fluid - VAS 6418/2-.

Mixture ratio for cleaning fluid

- 2,100 ml of tap water which has been allowed to settle for a few minutes and 20 ml of cleaning fluid - VAS 6418/2-



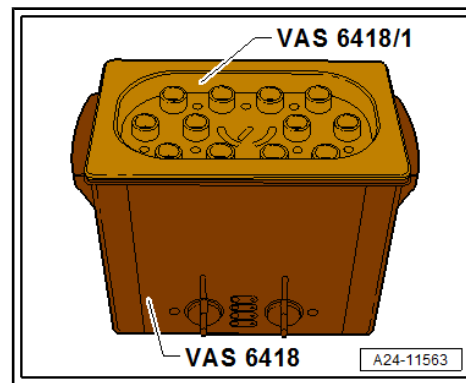
- Place mounting plate for injection modules - VAS 6418/1- on top of cleaning unit.



WARNING

It is important to read the safety notes in the operating instructions before switching on the ultrasonic cleaning unit - VAS 6418-.

The ideal fluid level is approx. 1-4 mm above the base of the mounting plate. The ultrasonic cleaning unit - VAS 6418- can be damaged if the fluid level is too low.

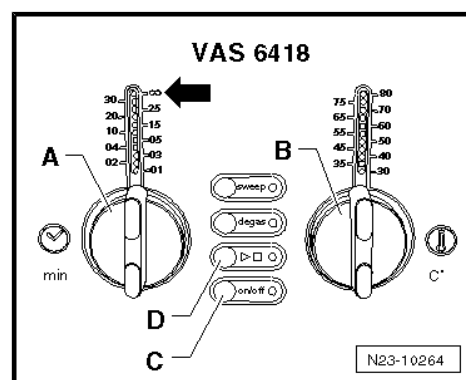


- Insert injectors all the way into guides of mounting plate for injection modules - VAS 6418/1- .
- Switch on cleaning unit by pressing **[on/off]** button -C-.
- Select a cleaning time of 30 minutes with rotary control -A-.
- Set rotary control -B- to a temperature of 50°C.
- Press **[▶]** button -D- to start cleaning procedure.



Note

- ◆ *The temperature-controlled cleaning process is now started. While the fluid is being heated, the ultrasound is activated at intervals in order to circulate the cleaning solution. The ultrasound is activated continuously when the preselected temperature is reached.*
 - ◆ *The actual cleaning process commences when the temperature reaches at least 50 °C and must last for at least 30 minutes.*
- Install injectors with new combustion chamber seal
⇒ [page 240](#) .



5 Senders and sensors

⇒ ["5.1 Removing and installing fuel pressure sender G247", page 246](#)

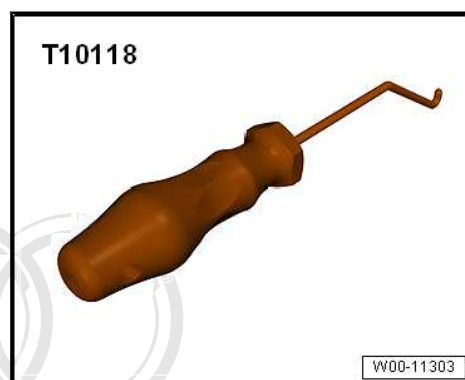
⇒ ["5.2 Removing and installing fuel pressure sender for low pressure G410", page 247](#)

⇒ ["5.3 Removing and installing intake air temperature sender G42 / intake manifold pressure sender G71", page 248](#)

5.1 Removing and installing fuel pressure sender - G247-

Special tools and workshop equipment required

◆ Assembly tool - T10118-



◆ Socket - T40218-



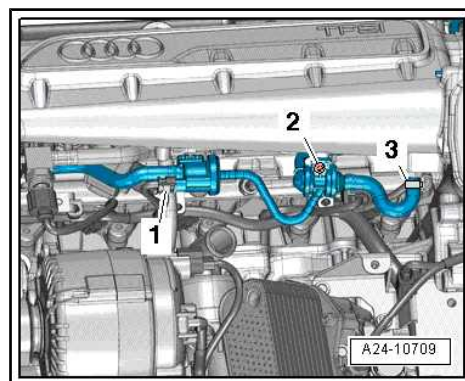
Removing

- Disengage activated charcoal filter solenoid valve 1 - N80-item 1-.
- Remove bolt -2- for non-return valve.
- Release hose clip -3- and detach hose.

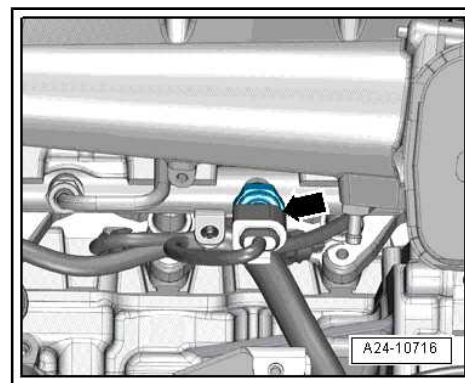


Note

Place a cloth underneath to catch escaping fuel.



- Unplug electrical connector -arrow-.



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 a clean cloth around connection and open connection carefully).

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- Unscrew fuel pressure sender - G247- using socket, 27 mm - T40218- .

Installing

Installation is carried out in reverse sequence.

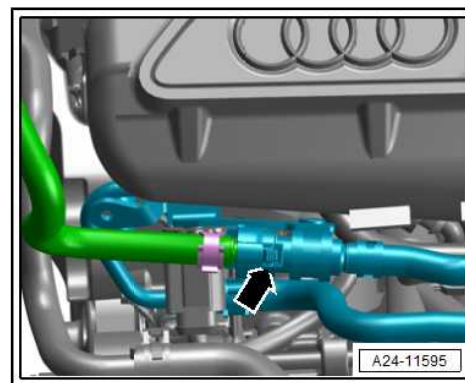
Tightening torques

- ◆ ⇒ [“2.1 Exploded view - air cleaner housing”, page 224](#)
- ◆ Non-return valve
⇒ [“3.1 Exploded view - intake manifold”, page 226](#)
- ◆ ⇒ [“4.1 Exploded view - fuel rail with injectors”, page 239](#)

5.2 Removing and installing fuel pressure sender for low pressure - G410-

Removing

- Remove intake manifold (top section) ⇒ [page 230](#) .
- If fitted, disconnect fuel hose -arrow-, move it clear and press to one side ⇒ Fuel supply system; Rep. gr. 20 ; Plug-in connectors; Disconnecting plug-in connectors .
- Move fuel hose clear and press to one side.



- Unplug electrical connector -1-.
- Unscrew fuel pressure sender for low pressure - G410- -item 2- (counterhold at bracket if necessary).

Installing

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



Note

- ◆ *Fit new O-ring.*
- ◆ *Lubricate the O-ring with clean engine oil.*
- Install intake manifold (top section) ⇒ [page 230](#) .

Tightening torques

- ◆ ⇒ [Fig. ““ Fuel pressure sender for low pressure -G410- ””, page 240](#)

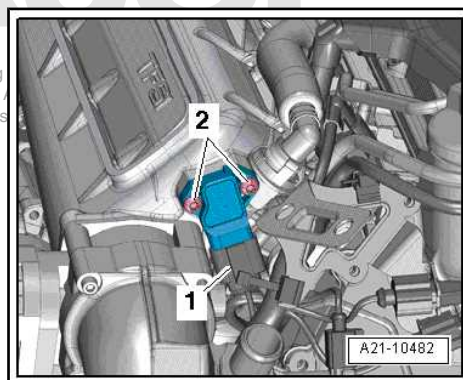
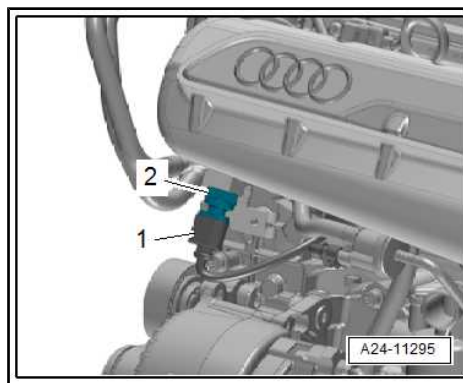
5.3 Removing and installing intake air temperature sender - G42- / intake manifold pressure sender - G71-

Removing

- Remove engine cover panel ⇒ [page 41](#) .

Version 1:

- Unplug electrical connector -1-.
- Unscrew bolts -2- and detach intake air temperature sender - G42- / intake manifold pressure sender - G71- .



Version 2:

- Remove throttle valve module - J338- ⇒ [page 238](#) .
- Unscrew bolt -1- and detach intake air temperature sender - G42- / intake manifold pressure sender - G71- -item 2-.

Installing

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



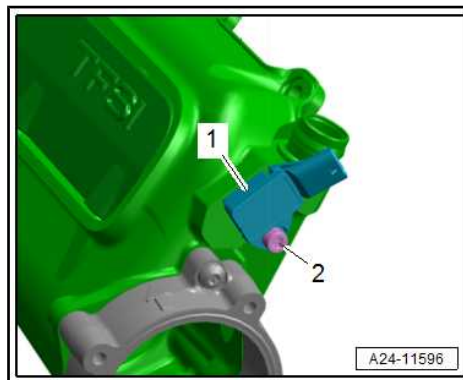
Note

Fit new O-ring.

- Install engine cover panel ⇒ [page 41](#) .

Tightening torques

- ◆ ⇒ [“3.1 Exploded view - intake manifold”, page 226](#)



6 High-pressure pump

⇒ "6.1 Exploded view - high-pressure pump", page 249

⇒ "6.2 Removing and installing high-pressure pump", page 250

⇒ "6.3 Removing and installing high-pressure pipe", page 251

6.1 Exploded view - high-pressure pump

1 - High-pressure pipe

- ☐ Different versions available; for correct version refer to ⇒ Electronic parts catalogue
- ☐ Connections must not be damaged
- ☐ Do not alter shape
- ☐ Lubricate thread lightly with oil
- ☐ Removing and installing
⇒ [page 251](#)

2 - Bolt

- ☐ 9 Nm

3 - Union nut

- ☐ Connections must not be damaged
- ☐ 27 Nm

4 - Roller tappet

5 - O-ring

- ☐ Renew after removing

6 - High-pressure pump

- ☐ Removing and installing
⇒ [page 250](#)

7 - Bolt

- ☐ Tighten in stages
⇒ [page 251](#)
- ☐ Final tightening torque:
20 Nm

8 - Connecting piece

- ☐ 35 Nm
- ☐ Renew

9 - Connection

- ☐ 35 Nm
- ☐ Renew

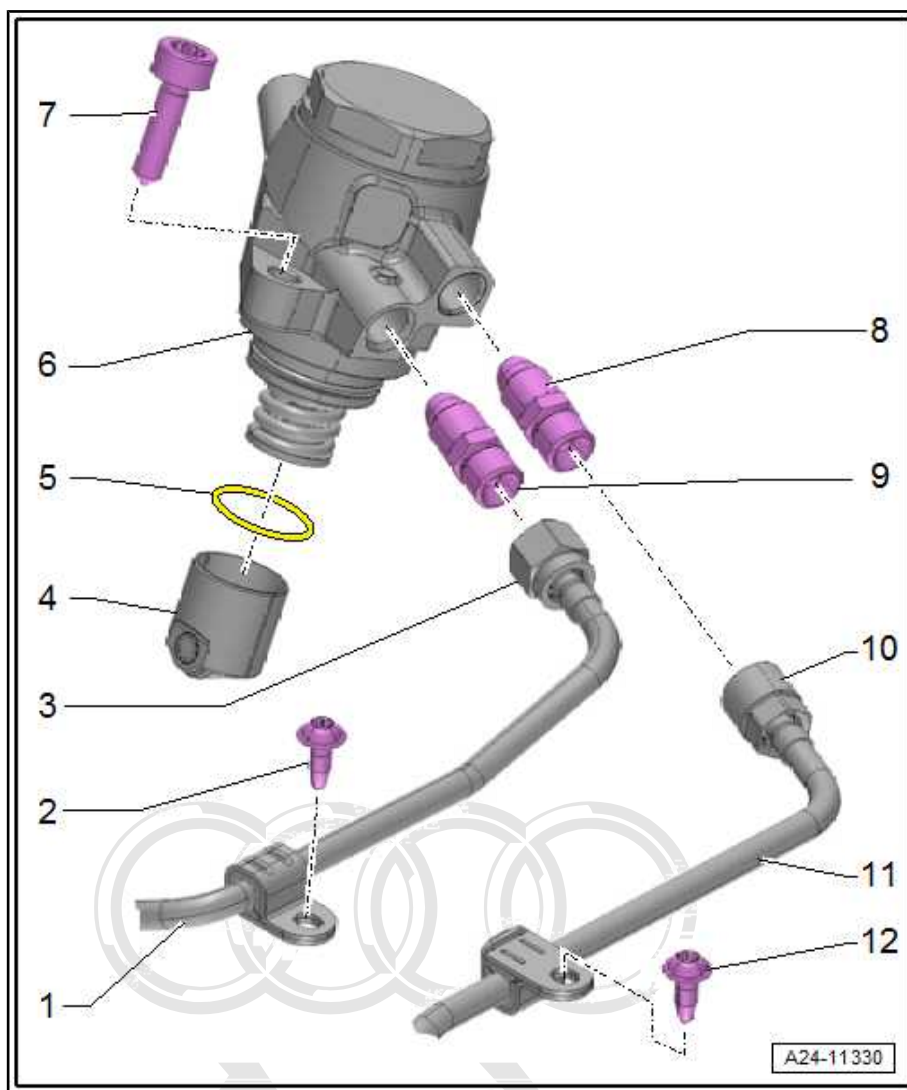
10 - Union nut

- ☐ Connections must not be damaged
- ☐ 27 Nm

11 - Fuel supply line

12 - Bolt

- ☐ 9 Nm



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6.2 Removing and installing high-pressure pump

Special tools and workshop equipment required

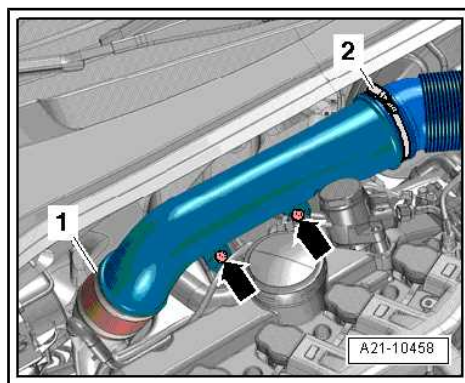
- ◆ Hose clip pliers - VAS 6362-



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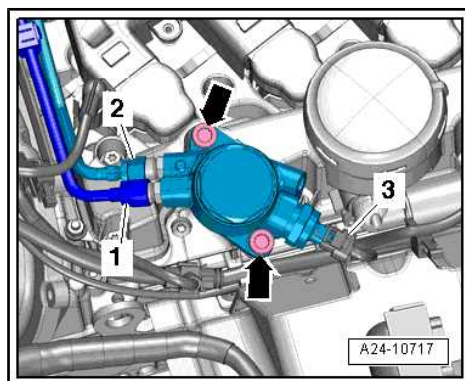
Removing

- Remove engine cover panel ⇒ [page 41](#) .
- Remove bolts -arrows-.
- Release hose clips -1- and -2- and remove air pipe.



Note

Place a cloth underneath to catch escaping fuel.



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 a clean cloth around connection and open connection carefully).

- Unscrew union nuts -1- and -2-.
- Unplug electrical connector -3- for fuel metering valve - N290- .
- Remove bolts -arrows-.
- Carefully press fuel lines to the side and detach high-pressure fuel pump.

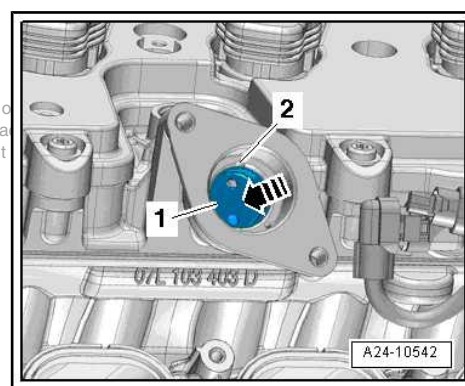
Installing

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



Note

- ◆ *Renew O-ring for high-pressure pump.*
- ◆ *The connections of the high-pressure pipes must not be damaged.*
- Check roller tappet -1- for damage and renew if necessary.
- Lightly lubricate roller tappet with oil and fit in cylinder head so that guide -2- is in correct position -arrow-.
- Fit high-pressure pump and press downwards in guide as far as stop.
- Tighten bolts hand tight in small steps.
- Then initially tighten bolts alternately to 5 Nm (do not tilt high-pressure pump).



Note

- ◆ *The high-pressure pump can be damaged if it is tightened too much on one side (keep it straight).*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- Final tightening torque for bolts ⇒ [Item 7 \(page 249\)](#)
- Install engine cover panel ⇒ [page 41](#) .

Tightening torques

- ◆ ⇒ [“6.1 Exploded view - high-pressure pump”, page 249](#)
- ◆ Air pipe ⇒ [“1.1 Exploded view - turbocharger”, page 200](#)

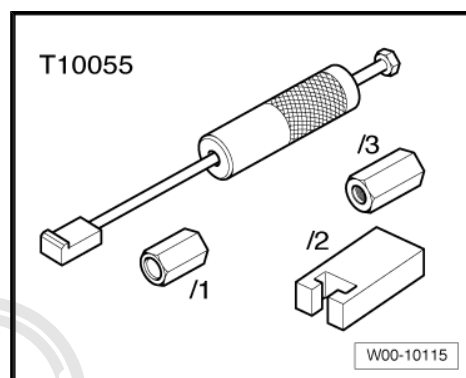
6.3 Removing and installing high-pressure pipe

Special tools and workshop equipment required

- ◆ Open end spanner insert, AF 17 - V.A.G 1331/6-



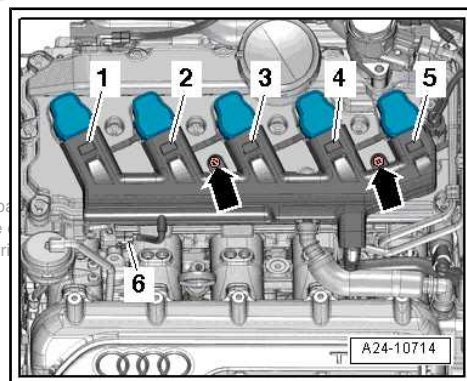
- ◆ Puller - T10055-



Removing

- Remove intake manifold (top section) ⇒ [page 230](#) .
- Remove bolts -arrows-.
- Unplug electrical connector -6- for Hall sender 3 - G300- .
- Release electrical connectors and at the same time unplug connectors for ignition coils -1 ... 5-.
- Disengage electrical wiring harness and move clear to left side.

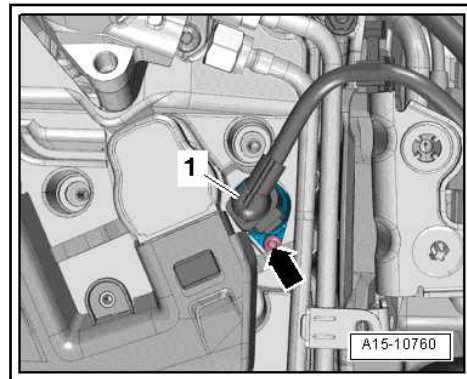
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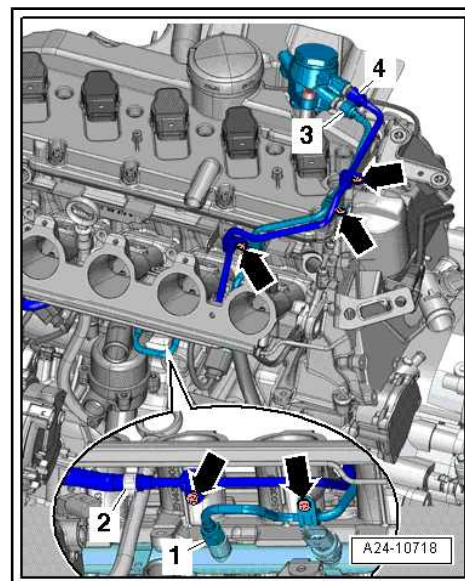


- Unplug electrical connector -1- at exhaust camshaft control valve 1 - N318- .



Disregard -arrow-.





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 a clean cloth around connection and open connection carefully).

- Release hose clip -2- and detach fuel hose.
- Remove bolts -arrows- and union nut -4-.
- Detach fuel supply line.
- Remove union nuts -1- and -3- and detach high-pressure pipe.



Note

Do not attempt to bend high-pressure pipe to a different shape.

Installing



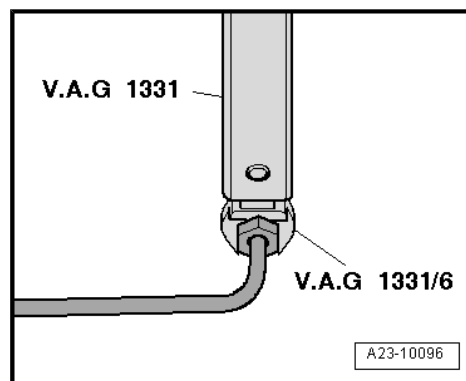
Note

- ◆ *The connections of the high-pressure pipe must not be damaged.*
- ◆ *Do not attempt to bend high-pressure pipe to a different shape.*

- First tighten union nut by hand until it makes contact, making sure that high-pressure pipe is not under tension.
- Tighten union nut with torque wrench - V.A.G 1331- and open end spanner insert (AF 17) - V.A.G 1331/6- ; to do so, counterhold at hexagon flats of threaded connection with an open end spanner.
- Do not tighten bolt for retainer until high-pressure pipe has been tightened.
- Install intake manifold (top section) ⇒ [page 230](#) .

Tightening torques

- ◆ ⇒ [“4.1 Exploded view - fuel rail with injectors”, page 239](#)
- ◆ ⇒ [“6.1 Exploded view - high-pressure pump”, page 249](#)
- ◆ Electrical connectors for ignition coils
⇒ [“1.1 Exploded view - ignition system”, page 274](#)



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7 Lambda probe

⇒ "7.1 Exploded view - Lambda probe", page 255

⇒ "7.2 Removing and installing Lambda probe", page 256

7.1 Exploded view - Lambda probe



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. For high-temperature paste refer to ⇒ Electronic parts catalogue
- ◆ When installing, it is important to re-attach the Lambda probe wiring at the same locations to prevent it from coming into contact with the exhaust pipe.

1 - Starter catalytic converter

2 - Lambda probe after catalytic converter - G130- with Lambda probe 1 heater after catalytic converter - Z29-

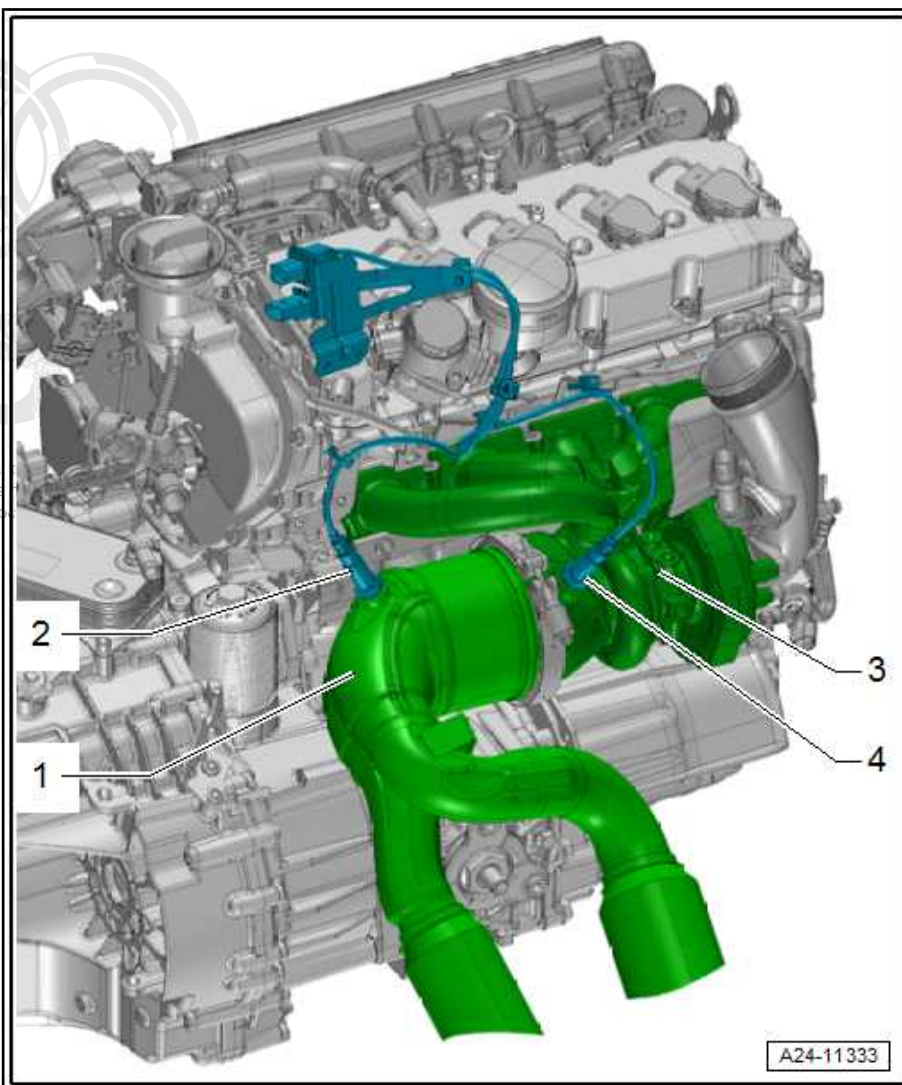
- ☐ Removing and installing
⇒ [page 258](#)
- ☐ 55 Nm

3 - Lambda probe - G39- with Lambda probe heater - Z19-

- ☐ Removing and installing
⇒ [page 256](#)
- ☐ 55 Nm

4 - Turbocharger

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7.2 Removing and installing Lambda probe

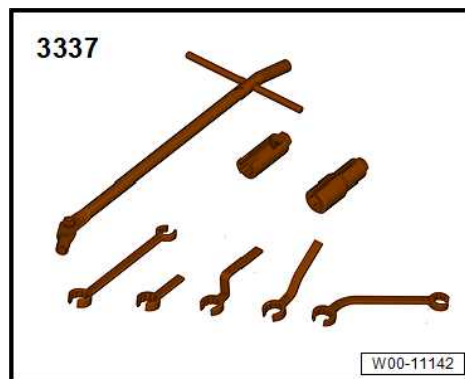
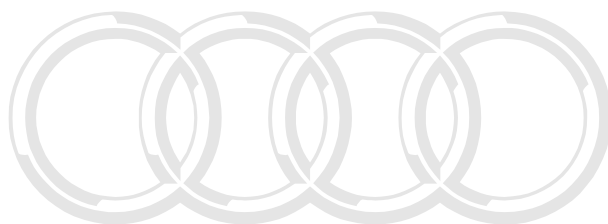
⇒ ["7.2.1 Removing and installing Lambda probe G39", page 256](#)

⇒ ["7.2.2 Removing and installing Lambda probe after catalytic converter G130", page 258](#)

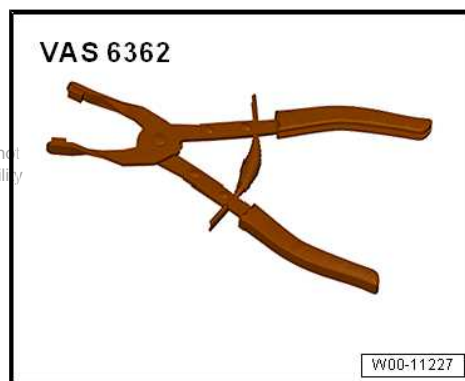
7.2.1 Removing and installing Lambda probe - G39-

Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set - 3337-



- ◆ Hose clip pliers - VAS 6362-



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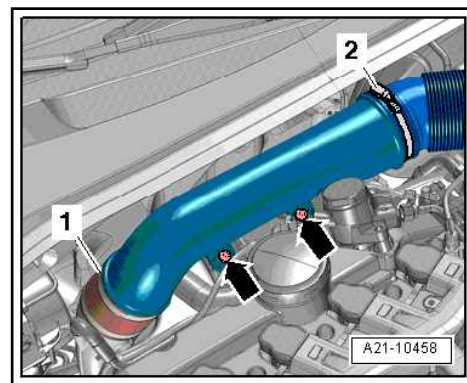
Removing



Note

- ◆ *Fit cable ties in the original positions when installing.*
- ◆ *Fit heat insulation sleeves in the original positions when installing.*
- Remove engine cover panel ⇒ [page 41](#) .

- Remove bolts -arrows-.
- Release hose clips -1- and -2- and remove air pipe.

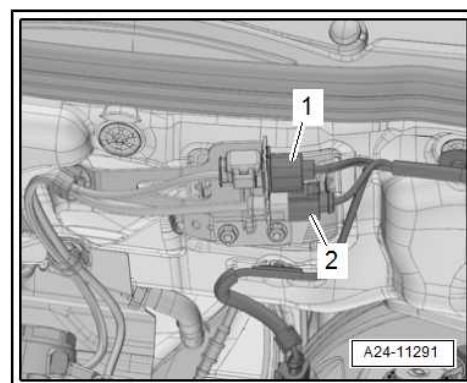


- Remove electrical connector -1- for Lambda probe - G39- from bracket and unplug connector.
- Move clear electrical wiring for Lambda probe.



Note

Disregard -item 2-.



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- Detach heat shield sleeve.
- Unscrew Lambda probe - G39- -item 2- using a tool from Lambda probe open ring spanner set - 3337- .


Note

Disregard -item 1-.

Installing

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


Note

- ◆ *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- ◆ *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the Lambda probe body. For high-temperature paste refer to ⇒ Electronic parts catalogue*
- ◆ *When installing, it is important to re-attach the Lambda probe wiring at the same locations to prevent it from coming into contact with the exhaust pipe.*
- ◆ *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- ◆ *Do not use any lubricants containing silicone when assembling.*
- ◆ *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.*

- Install engine cover panel ⇒ [page 41](#) .

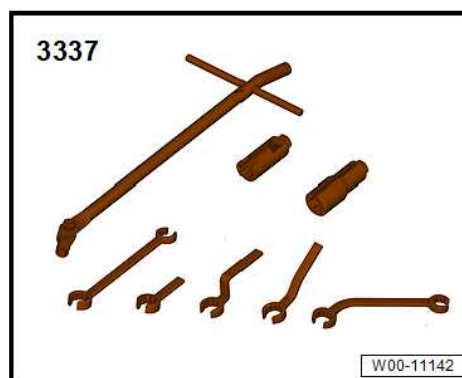
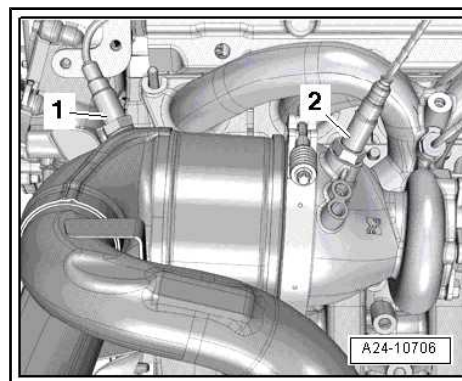
Tightening torques

- ◆ ⇒ [“7.1 Exploded view - Lambda probe”, page 255](#)
- ◆ Air pipe ⇒ [“1.1 Exploded view - turbocharger”, page 200](#)

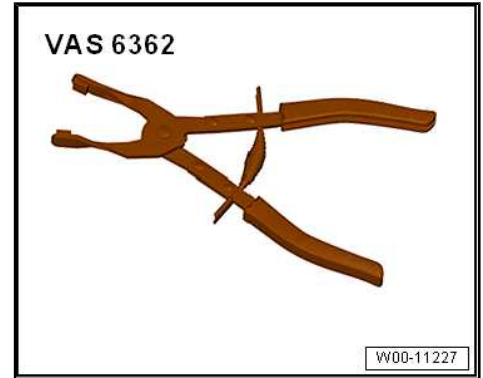
7.2.2 Removing and installing Lambda probe after catalytic converter - G130-

Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set - 3337-



- ◆ Hose clip pliers - VAS 6362-

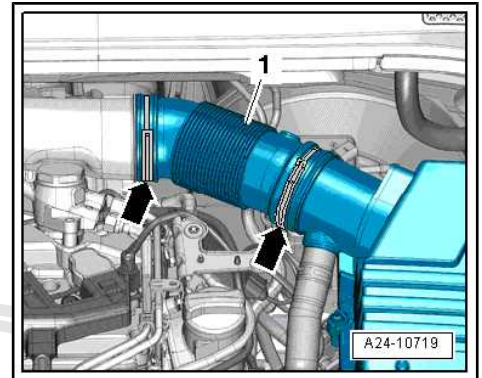


Removing

Note

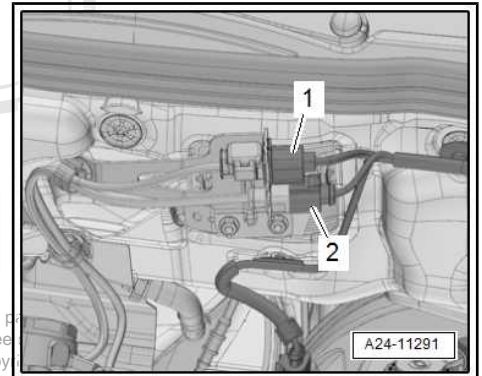
Fit cable ties in the original positions when installing.

- Remove engine cover panel ⇒ [page 41](#) .
- Release hose clips -arrows- and detach air pipe -1-.
- Remove electrical connector -2- for Lambda probe after catalytic converter - G130- from bracket and unplug connector.
- Move clear electrical wiring for Lambda probe.



Note

Disregard -item 1-.



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- Unscrew Lambda probe after catalytic converter - G130-
-item 1- using a tool from Lambda probe open ring spanner
set - 3337- .



Note

Disregard -item 2-.

Installing

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



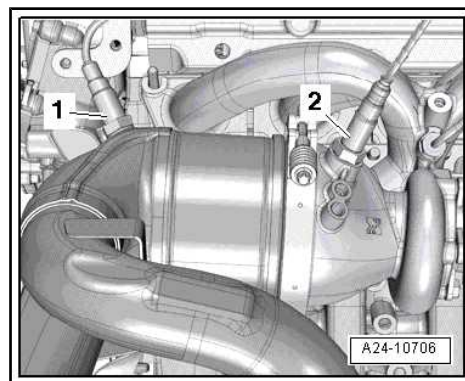
Note

- ◆ *Threads of new Lambda probes are already coated with as-
sembly 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. For high-temperature paste
refer to ⇒ *Electronic parts catalogue**
- ◆ *When installing, it is important to re-attach the Lambda probe
wiring at the same locations to prevent it from coming into
contact with the exhaust pipe.*
- ◆ *Hose connections and air pipes/hoses must be free of oil and
grease prior to fitting.*
- ◆ *Do not use any lubricants containing silicone when assem-
bling.*
- ◆ *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.*

- Install engine cover panel ⇒ [page 41](#) .

Tightening torques

- ◆ ⇒ [“7.1 Exploded view - Lambda probe”, page 255](#)



8 Engine control unit

⇒ "8.1 Exploded view - engine control unit", page 261

⇒ "8.2 Removing and installing engine control unit J623 ",
page 262

8.1 Exploded view - engine control unit

1 - Nuts

- 9 Nm

2 - Bracket

- For engine control unit - J623-

3 - Mounting

4 - Retaining bracket

5 - Shear bolt

- Renew after removing

6 - Engine control unit - J623-

- Removing and installing
⇒ page 262

7 - Boot

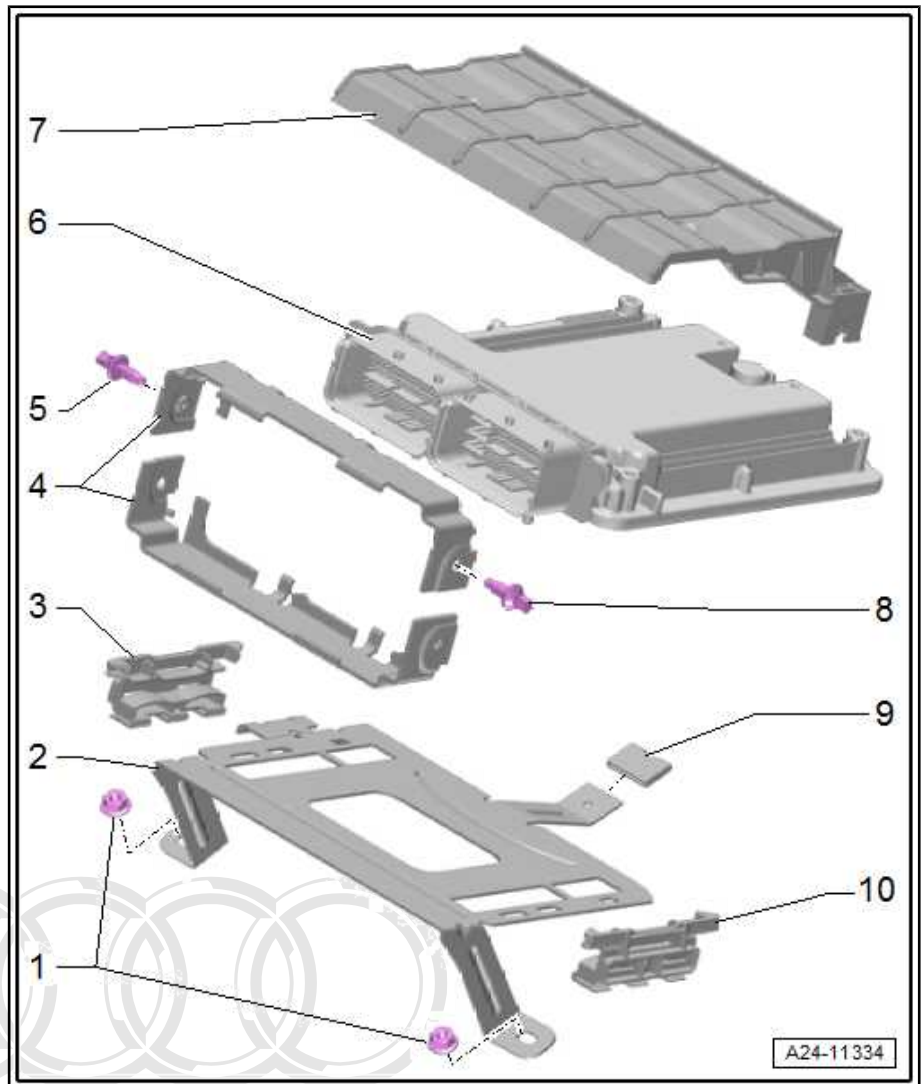
- Depending on version

8 - Shear bolt

- Renew after removing

9 - Clip

10 - Mounting



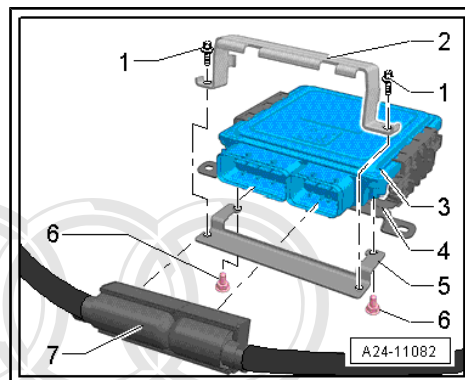
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8.2 Removing and installing engine control unit - J623-



Note

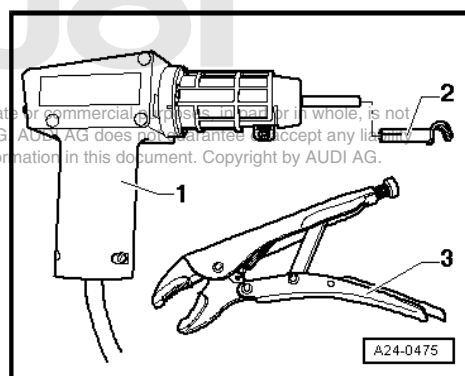
- ◆ Not every engine control unit is bolted to a protective housing. Whether a protective housing is fitted depends on the engine/gearbox combination.
- ◆ The engine control unit -3- is bolted to the retaining bracket -2 and 5-. To make it more difficult to unscrew the shear bolts -1- for locking plate -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).



Special tools and workshop equipment required

- ◆ Hot air blower - VAS 1978/14A- -item 1- with nozzle attachment -2- from wiring harness repair set - VAS 1978 B-

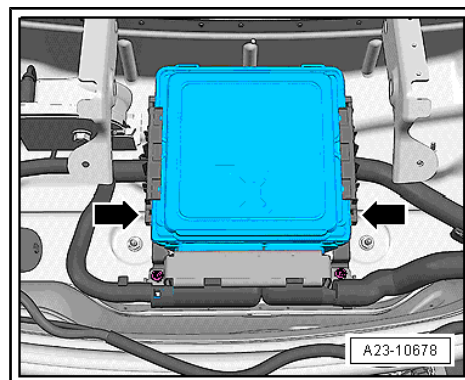
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- ◆ Small vice-grip pliers (commercially available)

Removing

- If engine control unit is to be renewed, select test sequence/function "Replace engine control unit" using ⇒ Vehicle diagnostic tester, Guided Functions.
- Remove plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .
- Release clips -arrows- and pull out engine control unit - J623- towards front.

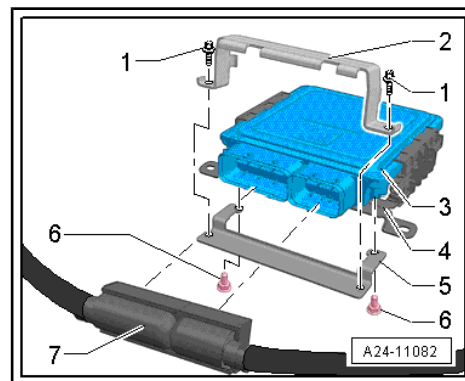


Engine control unit with retaining bracket:



Note

The threads of the two shear bolts -1- which are not screwed into the engine control unit are secured with locking fluid. To unscrew these bolts, the threads must therefore be heated with the hot air blower.



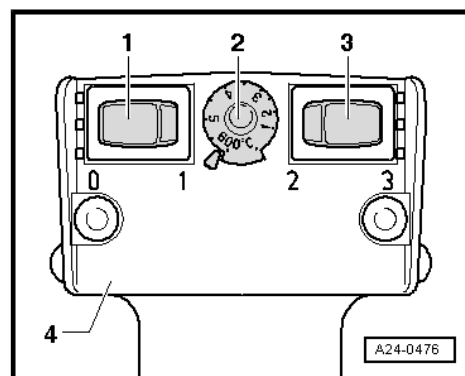
- Select settings on hot air blower as shown in illustration, i.e. set temperature potentiometer -2- to maximum heat output and two-stage air flow switch -3- to position 3.



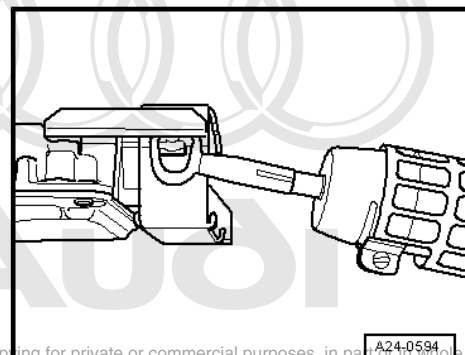
WARNING

Risk of burns from hot air blower.

- ◆ *Parts of the protective housing will become very hot as a result of heating the threads. It is also important to ensure that only the thread is heated and none of the surrounding components if at all possible. These should be covered if necessary.*

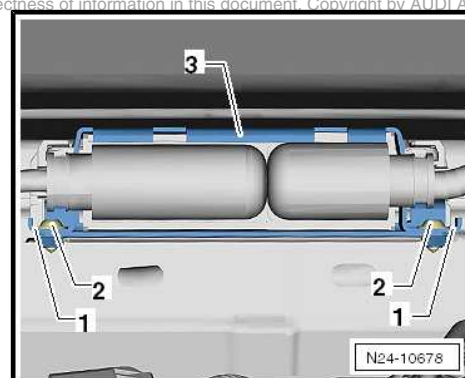


- Switch on hot air blower and heat bolt for 20 to 30 seconds.



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- If necessary, 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

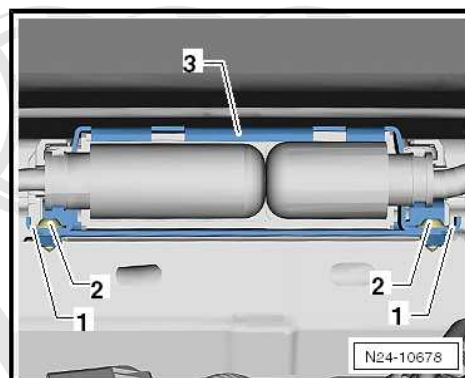
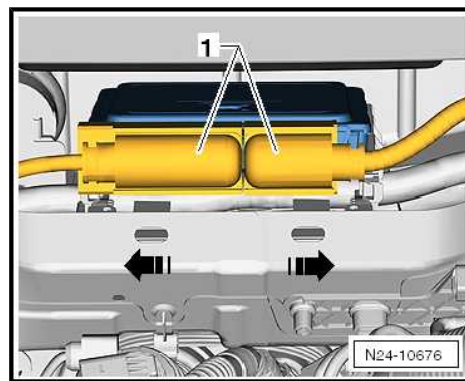
Installation is carried out in the reverse order; note the following:

- Clean threaded holes for shear bolts to remove any residue from locking fluid. This can be done using a thread tap.
- Always use new shear bolts.
- Retaining bracket must be renewed if it has been bent outwards.
- Tighten retaining bracket -3- with new shear bolts -2- evenly until heads of bolts shear off.



Note

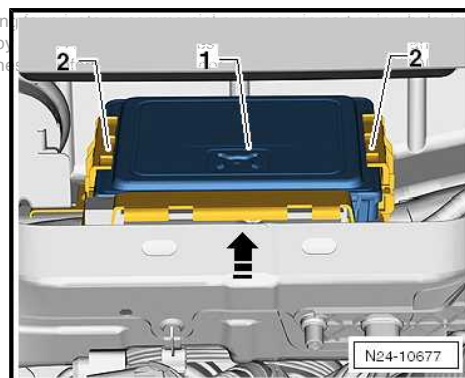
Disregard -item 1-.



- Slide engine control unit -1- in direction of -arrow- into side guides -2-.
- Install plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .

After installing a new engine control unit, the following operation must be performed:

- Activate engine control unit in test sequence/function "Replace engine control unit" using ⇒ Vehicle diagnostic tester, Guided Functions.



26 – Exhaust system

1 Exhaust pipes/silencers

⇒ [“1.1 Exploded view - silencers”, page 265](#)

⇒ [“1.2 Removing and installing silencers”, page 265](#)

⇒ [“1.3 Stress-free alignment of exhaust system”, page 266](#)

⇒ [“1.4 Checking exhaust system for leaks”, page 268](#)

1.1 Exploded view - silencers

1 - Centre silencer/rear silencer

- ☐ Align exhaust system so it is free of stress
⇒ [page 266](#)

2 - Bracket for exhaust system

3 - Bolt

- ☐ 23 Nm

4 - Bolt

- ☐ 23 Nm

5 - Bracket for exhaust system

6 - Rubber mounting

- ☐ Renew if damaged

7 - Bolt

- ☐ 3 Nm

8 - Exhaust flap control unit - J883-

- ☐ Removing and installing
⇒ [page 272](#)

9 - Nut

- ☐ 20 Nm

10 - Bracket for exhaust system

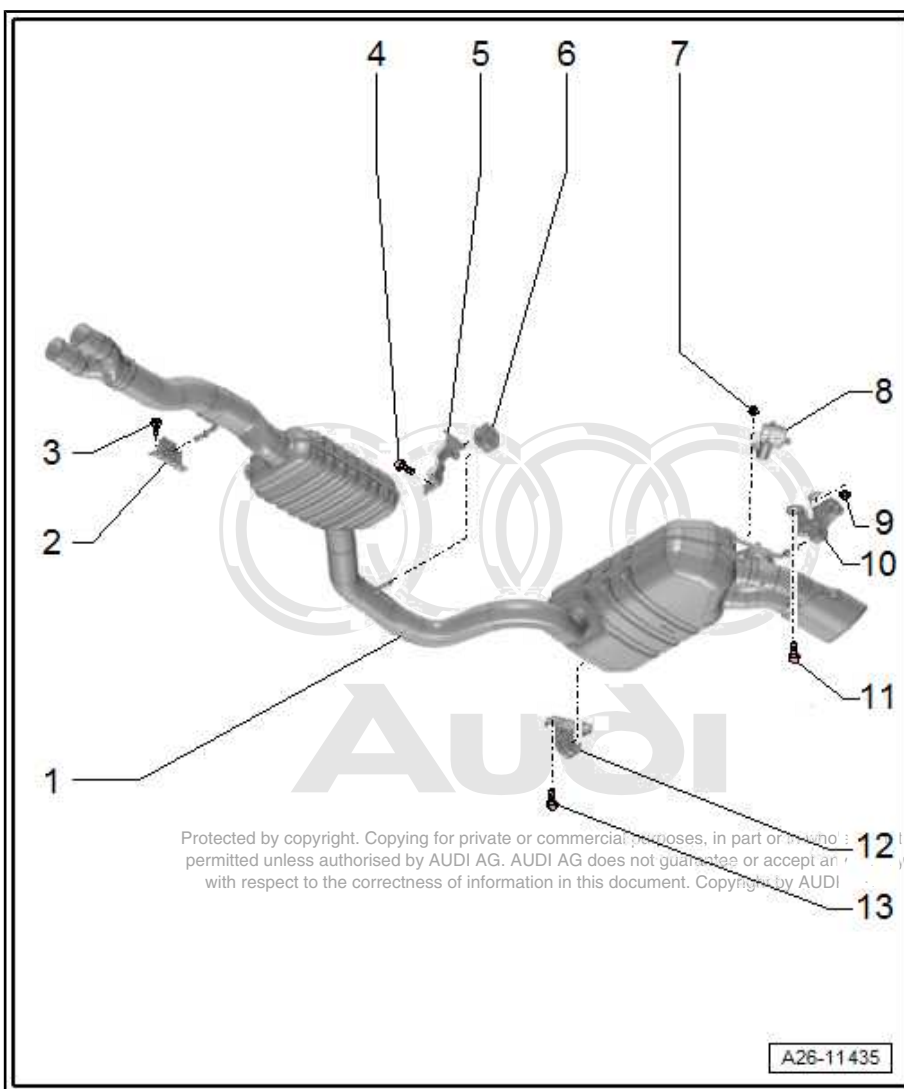
11 - Bolt

- ☐ 23 Nm

12 - Bracket for exhaust system

13 - Bolt

- ☐ 23 Nm

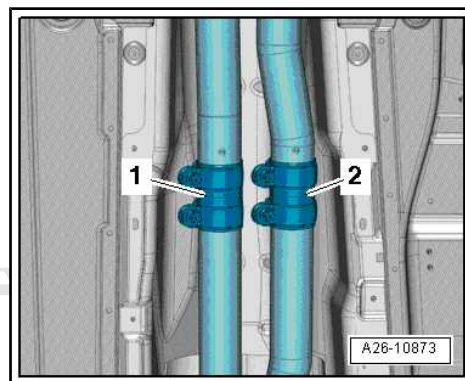


1.2 Removing and installing silencers

Removing

- Remove tunnel cross-piece ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim; Exploded view - underbody trim .

- Loosen bolts of clamps -1, 2-.



- Unplug electrical connector -5- from exhaust flap control unit - J883- .



WARNING

Risk of accident caused by weight of silencers.

- ◆ *A second mechanic is required for removal of the rear silencer.*

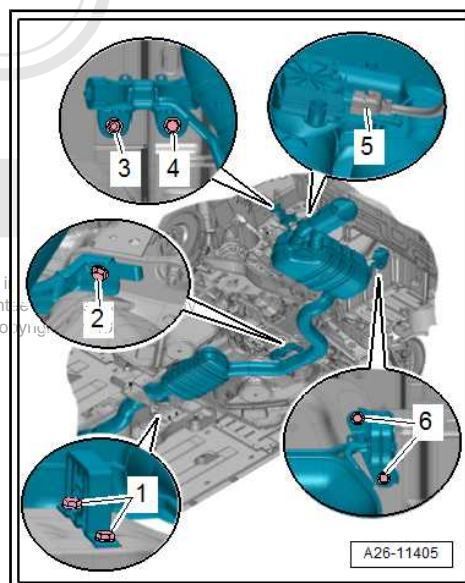
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- Unscrew bolts -2, 3, 4, 6- and remove silencers.



Note

Disregard -item 1-.



Installing

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

- Align the exhaust system so it is free of stress ⇒ [page 266](#) .

Tightening torques

- ◆ ⇒ [“1.1 Exploded view - silencers”, page 265](#)
- ◆ ⇒ [“2.1 Exploded view - emission control system”, page 269](#)
- ◆ Tunnel cross-piece ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody trim; Exploded view - underbody trim

1.3 Stress-free alignment of exhaust system

⇒ [“1.3.1 Stress-free alignment of exhaust system”, page 266](#)

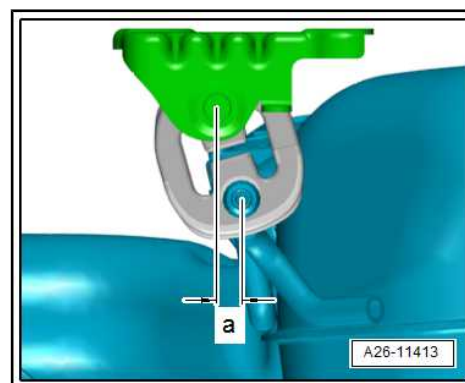
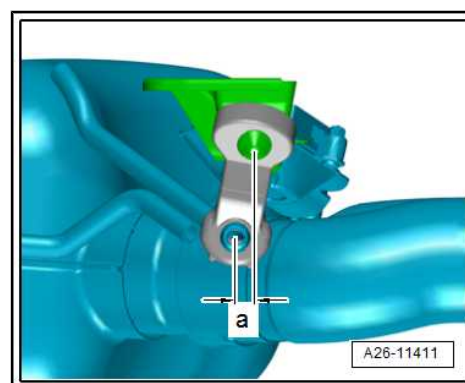
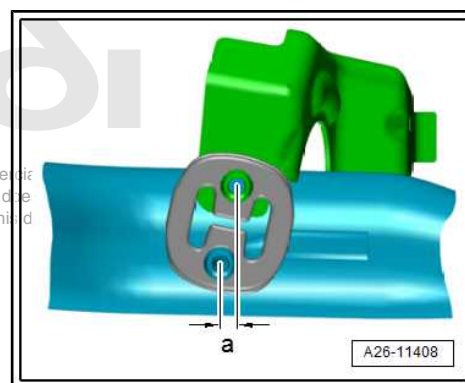
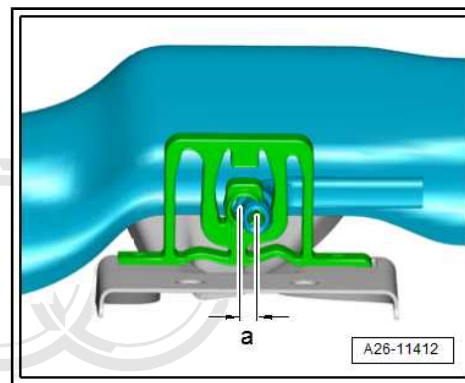
⇒ [“1.3.2 Aligning tailpipes”, page 268](#)

1.3.1 Stress-free alignment of exhaust system

Procedure

- The exhaust system must be aligned when it is cool.
- Loosen bolt connections for clamps.
- Push front exhaust system far enough towards front of vehicle so that rubber mountings are pre-loaded as follows:

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- ◆ Rubber mounting (front): dimension -a- = 4.7 mm
- ◆ Rubber mounting (centre): dimension -a- = 8 mm
- ◆ Rubber mounting (rear left): dimension -a- = 11 mm
- ◆ Rubber mounting (rear right): dimension -a- = 10.3 mm
- Installation position of clamps ⇒ [page 270](#) and ⇒ [page 270](#)

Tightening torques

- ◆ ⇒ ["2.1 Exploded view - emission control system"](#), page 269

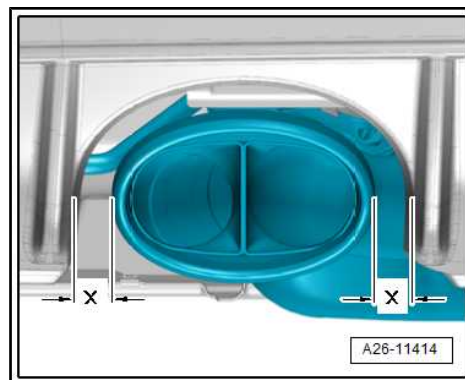
1.3.2 Aligning tailpipes

Procedure

- Adjust rear silencer so that there is an even distance between bumper cut-out and tailpipes.
- -X- = -X-.
- Unfasten rear silencer mounting to align tailpipes.

Tightening torques

- ◆ ⇒ [“1.1 Exploded view - silencers”, page 265](#)



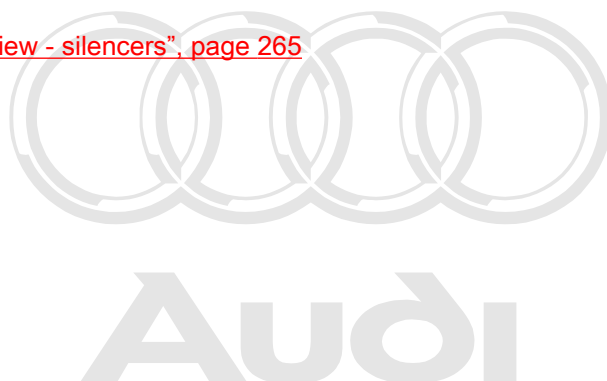
1.4 Checking exhaust system for leaks

Procedure

- Start engine and run at idling speed.
- Plug tailpipes during leak test (e.g. with cloth or plugs).
- Listen for noise at connections between cylinder head/exhaust manifold with turbocharger, exhaust manifold with turbocharger/starter catalytic converter etc. to locate any leaks.
- Rectify any leaks that are found.

Tightening torques

- ◆ ⇒ [“1.1 Exploded view - silencers”, page 265](#)



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2 Emission control system

⇒ ["2.1 Exploded view - emission control system", page 269](#)

⇒ ["2.2 Removing and installing catalytic converter", page 270](#)

⇒ ["2.3 Removing and installing starter catalytic converter", page 271](#)

⇒ ["2.4 Removing and installing exhaust flap control unit J883 ", page 272](#)

2.1 Exploded view - emission control system

1 - Bolt

- ☐ 20 Nm

2 - Bracket

3 - Bolt

- ☐ 20 Nm

4 - Bracket

- ☐ Renew if damaged

5 - Bolt

- ☐ 20 Nm

6 - Bracket

7 - Bolt

- ☐ 20 Nm

8 - Clip

- ☐ 7 Nm

9 - Starter catalytic converter

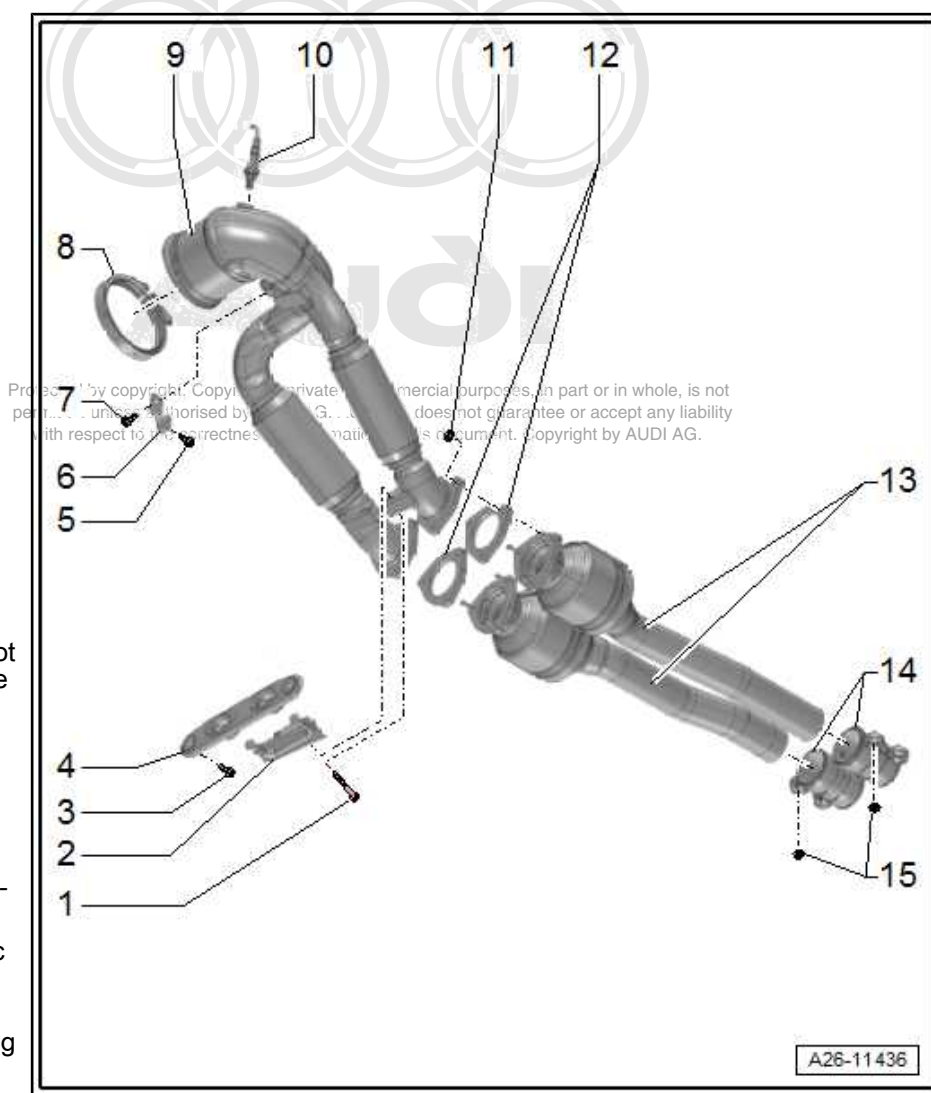
- ☐ With flexible joint; do not bend flexible joint more than 10° – otherwise it can be damaged
- ☐ Install flexible joint so that it is not under tension.
- ☐ Take care not to damage wire mesh on flexible joint
- ☐ Protect starter catalytic converter against knocks and impact
- ☐ Removing and installing
⇒ [page 271](#)
- ☐ 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 266](#)

10 - Lambda probe after catalytic converter - G130- with Lambda probe 1 heater after catalytic converter - Z29-

- ☐ Removing and installing ⇒ [page 258](#)

11 - Nut

- ☐ Renew after removing
- ☐ Coat threaded pins with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ☐ 23 Nm



12 - Gaskets

- ☐ Renew after removing

13 - Catalytic converters

- ☐ Protect catalytic converter from damage by knocks and impact
- ☐ Removing and installing ⇒ [page 270](#)
- ☐ Align exhaust system so it is free of stress ⇒ [page 266](#)

14 - Clamps

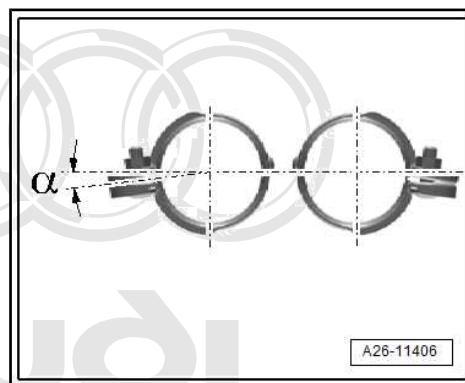
- ☐ Before tightening, align exhaust system so it is free of stress ⇒ [page 266](#)
- ☐ Installation position ⇒ [page 270](#) , ⇒ [page 270](#)
- ☐ Tighten bolted connections evenly

15 - Nuts

- ☐ Tighten bolted connections evenly
- ☐ 23 Nm

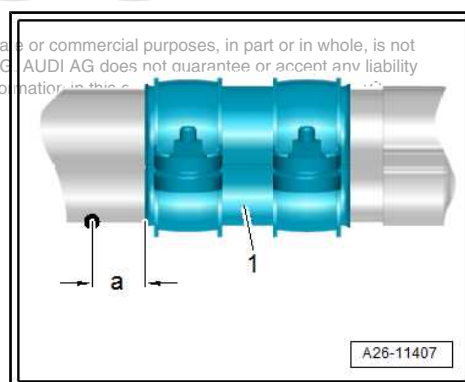
Installation position of clamps

- Fit clamps as illustrated.
- Angle α = 5°



Installation position of clamps

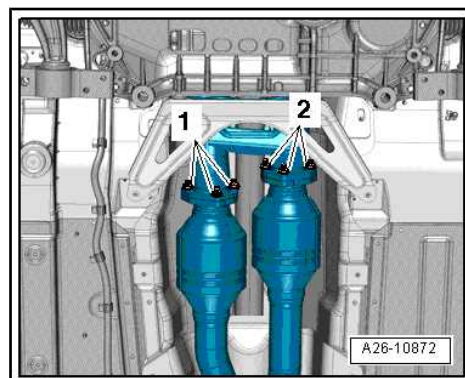
- Align clamp -1- at marking -arrow- on catalytic converter.
- Dimension -a- = 5 mm



2.2 Removing and installing catalytic converter

Removing

- Remove nuts -1- or -2-.



- Detach clamp -1- or -2- and detach catalytic converter with clamp.

Installing

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



Note

Renew gasket and self-locking nuts.

Tightening torques

- ◆ ⇒ [“2.1 Exploded view - emission control system”, page 269](#)

2.3 Removing and installing starter catalytic converter

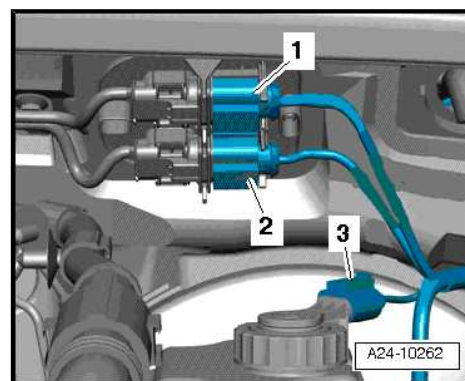
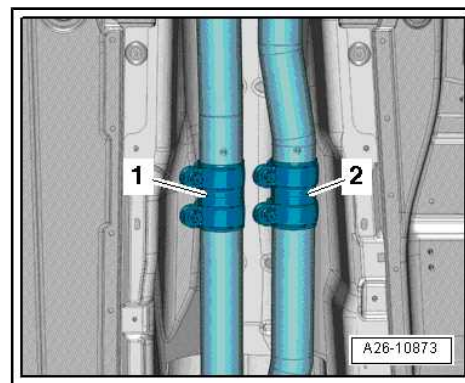
Removing

- Install heat shield for tunnel (centre) ⇒ General body repairs, exterior; Rep. gr. 66 ; Strips / trim panels / extensions; Removing and installing heat shield for floor .
- Remove propshaft ⇒ Rep. gr. 39 ; Propshaft; Removing and installing propshaft .
- Remove electrical connector -1- for Lambda probe - G39- from bracket and unplug connector.
- Move clear electrical wiring to Lambda probe.



Note

Disregard items -2 and 3-.



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- Unscrew bolts -1- and -2- and remove bracket for starter catalytic converter.
- Slacken bolt -3- and remove clamp from flange
- Remove starter catalytic converter.

Installing

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



Note

Renew gasket and self-locking nuts.

- Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- Install propshaft ⇒ Rep. gr. 39 ; Propshaft; Removing and installing propshaft .
- Align the exhaust system so it is free of stress ⇒ [page 266](#) .

Tightening torques

- ♦ ⇒ [“2.1 Exploded view - emission control system”, page 269](#)
- ♦ Heat shield ⇒ General body repairs, exterior; Rep. gr. 66 ; Strips / trim panels / extensions; Exploded view - heat shield

2.4 Removing and installing exhaust flap control unit - J883-

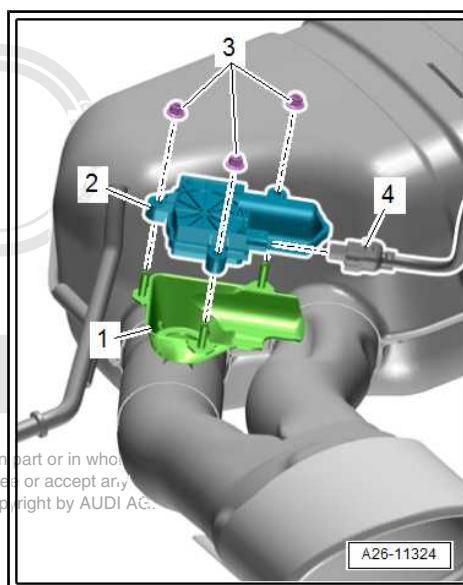
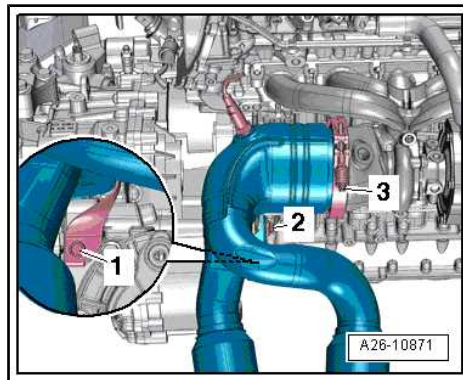
Removing

- Remove silencer ⇒ [page 265](#) .
- Remove nuts -3- and detach exhaust flap control unit -2-.



Note

Disregard items -1 and 4-.



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Installing

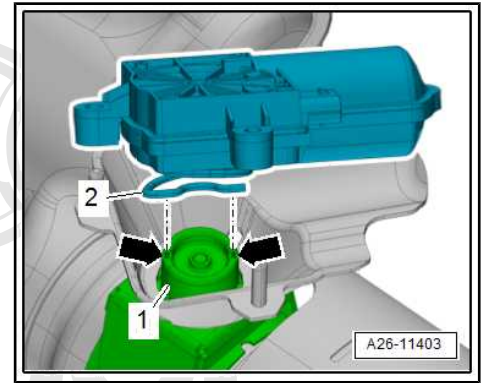
Installation is carried out in the reverse order; note the following:



Note

Renew nuts.

- Move exhaust flap control unit - J883- into installation position.
- Spring -2- must engage in grooves -arrows- on exhaust flap -1-.
- Install silencer ⇒ [page 265](#) .



Tightening torques

- ◆ ⇒ ["1.1 Exploded view - silencers", page 265](#)

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28 – Ignition system

1 Ignition system

⇒ "1.1 Exploded view - ignition system", page 274

⇒ "1.2 Test data, spark plugs", page 275

⇒ "1.3 Removing and installing ignition coils with output stages", page 275

⇒ "1.4 Removing and installing knock sensor", page 277

⇒ "1.5 Removing and installing Hall senders", page 278

⇒ "1.6 Removing and installing engine speed sender G28 ", page 278

1.1 Exploded view - ignition system

1 - Bolt

- 9 Nm

2 - Hall sender - G40-

- Removing and installing
⇒ page 278

3 - O-ring

- Renew if damaged
- Lubricate lightly with clean engine oil

4 - O-ring

- Renew if damaged
- Lubricate lightly with clean engine oil

5 - Hall sender 3 - G300-

- Removing and installing
⇒ page 278

6 - Bolt

- 9 Nm

7 - Electrical connector

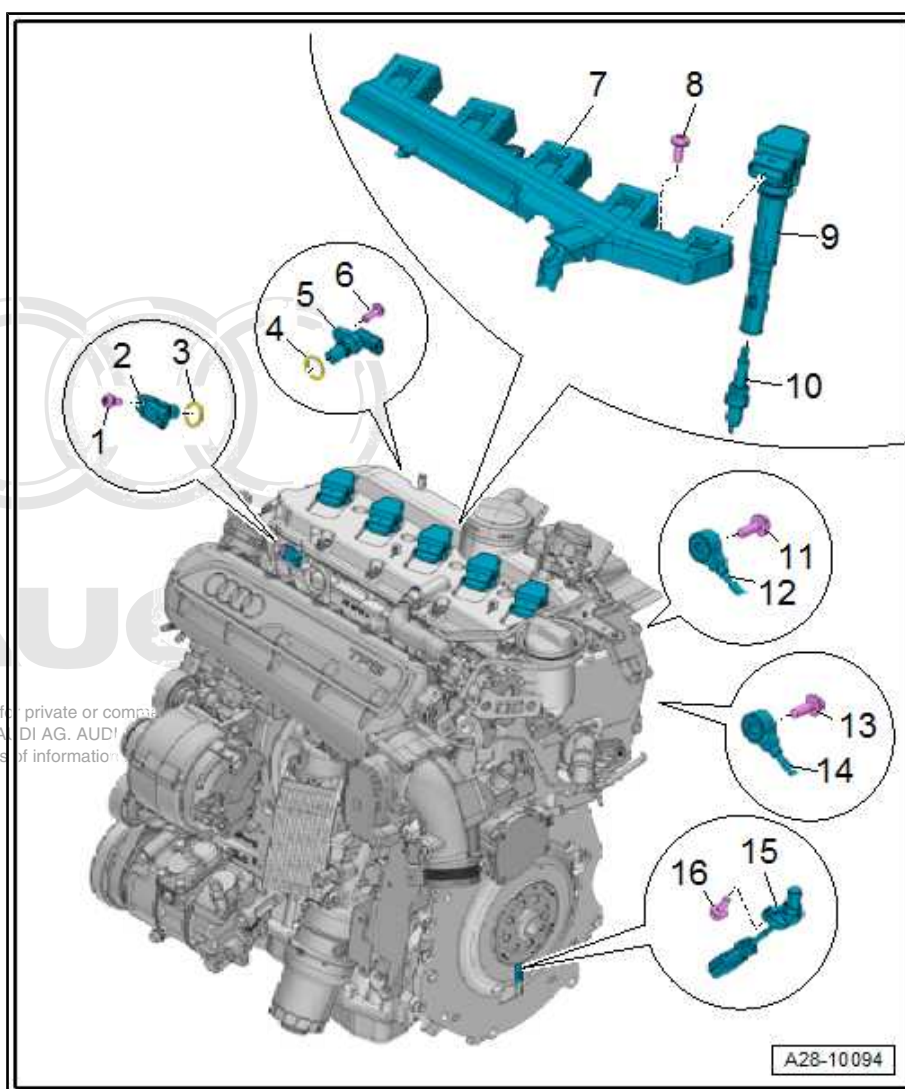
- For ignition coils

8 - Bolt

- 5 Nm

9 - Ignition coil

- Ignition coil 1 with output stage - N70-
- Ignition coil 2 with output stage - N127-
- Ignition coil 3 with output stage - N291-
- Ignition coil 4 with output stage - N292-
- Ignition coil 5 with output stage - N323-
- Removing and installing ⇒ page 275



10 - Spark plug

- ☐ Remove and install with spark plug socket and extension - 3122 B- ⇒ Maintenance ; Booklet 820

11 - Bolt

- ☐ The tightening torque influences the function of the knock sensor
- ☐ 20 Nm

12 - Knock sensor 1 - G61-

- ☐ Contact surfaces between knock sensor and cylinder block must be free of corrosion, oil and grease
- ☐ Removing and installing ⇒ [page 277](#)

13 - Bolt

- ☐ The tightening torque influences the function of the knock sensor
- ☐ 20 Nm

14 - Knock sensor 2 - G66-

- ☐ Contact surfaces between knock sensor and cylinder block must be free of corrosion, oil and grease
- ☐ Removing and installing ⇒ [page 277](#)

15 - Engine speed sender - G28-

- ☐ Removing and installing ⇒ [page 278](#)

16 - Bolt

- ☐ Not available separately; supplied with -item 15-
- ☐ 5 Nm

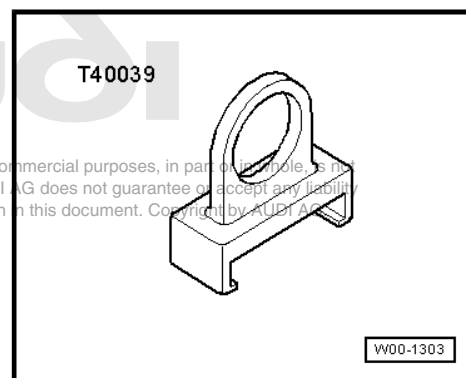
1.2 Test data, spark plugs

Engine data	2.5 ltr. TFSI engine
Idling speed (not adjustable)	
Ignition timing	Not adjustable (determined by control unit)
Ignition system	Multi-coil system with 5 ignition coils (output stages integrated) connected directly to spark plugs via spark plug connectors
Spark plugs	⇒ Electronic parts catalogue
Firing order	1-2-4-5-3

1.3 Removing and installing ignition coils with output stages

Special tools and workshop equipment required

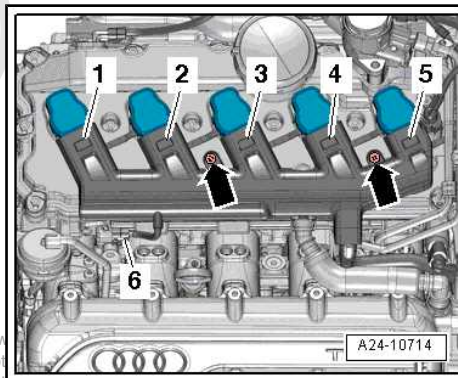
- ◆ Puller - T40039-



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Removing

- Unplug electrical connector -6- for Hall sender 3 - G300- .
- Remove bolts -arrows-.
- Release electrical connectors and pull connectors off ignition coils -1 ... 5- simultaneously.

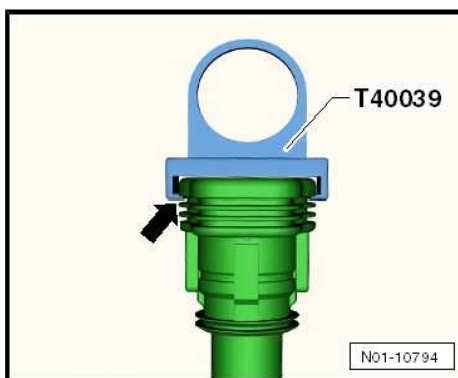


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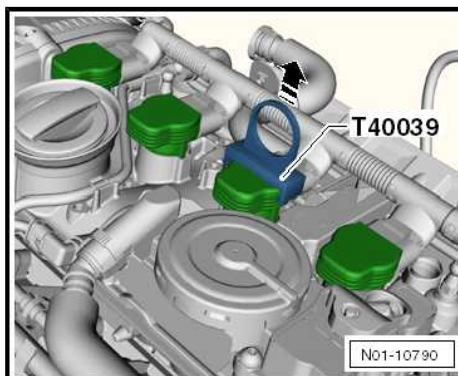


Note

- ◆ *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.*



- Pull out ignition coil -arrow-.



Installing

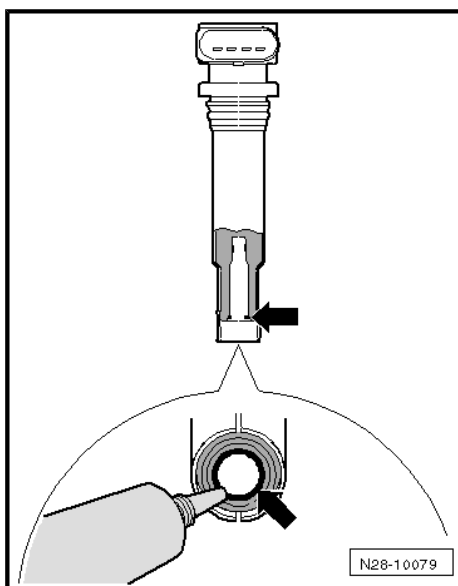
- Apply a thin bead of silicone paste all around end of sealing hose of ignition coil with output stage -arrow-.

Silicone paste ⇒ Electronic parts catalogue (ETKA) .

- Fit all ignition coils loosely into spark plug holes.
- Align ignition coils with connectors and attach all connectors onto ignition coils simultaneously.
- Press ignition coils onto spark plugs by hand evenly (do not knock in with tools).

Tightening torques

- ◆ ⇒ [“1.1 Exploded view - ignition system”, page 274](#)



1.4 Removing and installing knock sensor

Removing

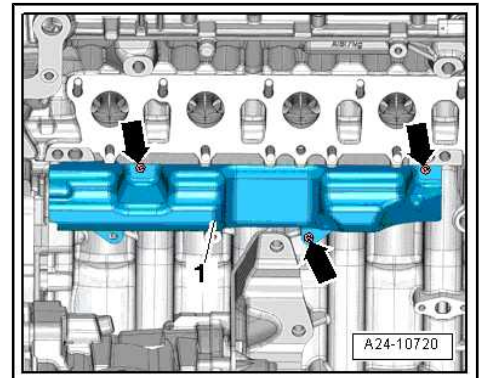
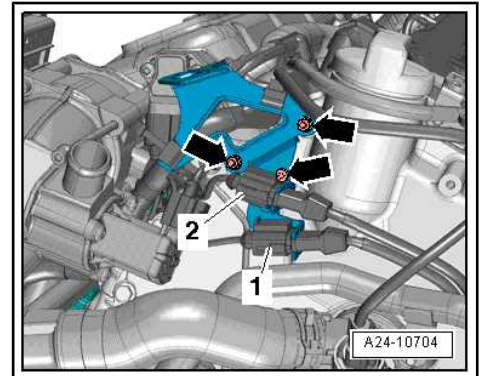
- Remove turbocharger ⇒ [page 204](#) .
- Detach appropriate electrical connector from bracket and unplug:
 - 1 - For knock sensor 2 - G66-
 - 2 - For knock sensor 1 - G61-



Note

Disregard -arrows-.

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



- Remove corresponding bolt and detach knock sensor:

- 1 - Knock sensor 2 - G66-
- 2 - Knock sensor 1 - G61-

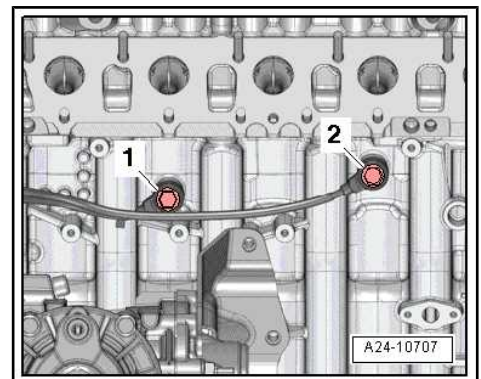
Installing

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

- Install turbocharger ⇒ [page 204](#) .

Tightening torques

- ◆ ⇒ [“1.1 Exploded view - ignition system”, page 274](#)



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1.5 Removing and installing Hall senders

⇒ [“1.5.1 Removing and installing Hall sender G40”, page 278](#)

⇒ [“1.5.2 Removing and installing Hall sender 3 G300”, page 278](#)

1.5.1 Removing and installing Hall sender - G40-

Removing

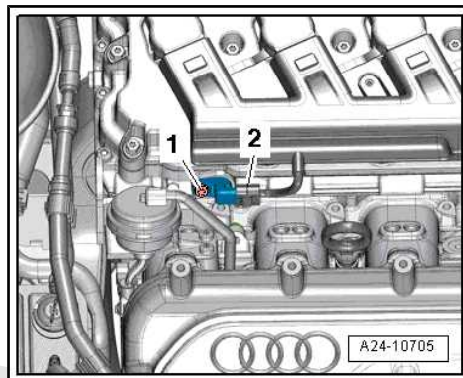
- Unplug electrical connector -2-.
- Unscrew bolt -1- and remove Hall sender - G40- .

Installing

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



Fit new O-rings.



Tightening torques

♦ ⇒ [“1.1 Exploded view - ignition system”, page 274](#)

1.5.2 Removing and installing Hall sender 3 - G300-

Removing

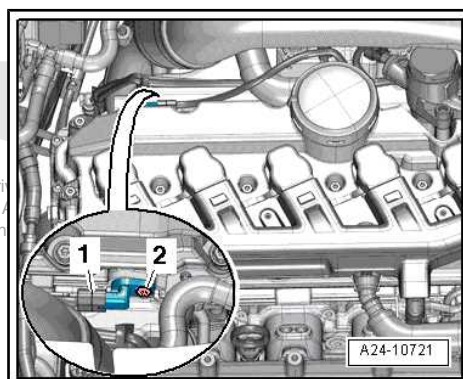
- Unplug electrical connector -1-.
- Unscrew bolt -2- and remove Hall sender 3 - G300- .

Installing

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



Fit new O-rings.



Tightening torques

♦ ⇒ [“1.1 Exploded view - ignition system”, page 274](#)

1.6 Removing and installing engine speed sender - G28-

Removing



Fit all cable ties in the original positions when installing.

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

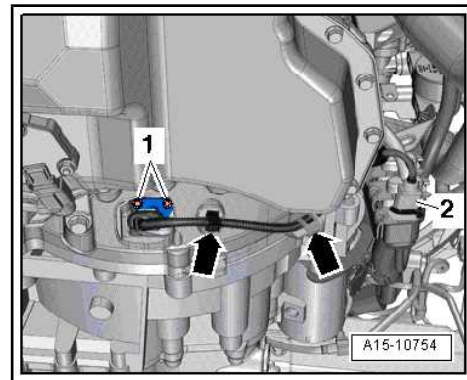
- Move electrical connector -2- clear and disconnect.
- Move electrical wiring harness clear -arrows-.
- Unscrew bolts -1- and detach engine speed sender - G28- .

Installing

Installation is carried out in reverse sequence.

Tightening torques

- ◆ ⇒ [“1.1 Exploded view - ignition system”, page 274](#)
- ◆ ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation



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