



Workshop Manual

Audi A1 2011 ➤

Audi A1 Sportback 2012 ➤

4-cylinder direct petrol injection engine (1.4 ltr. 4-valve turbo with supercharger EA111)

Engine ID	CAV G	CNU A	CTH G	CTJA					
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Edition 09.2019

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List of Workshop Manual Repair Groups

Repair Group

00 - Technical data

10 - Removing and installing engine

13 - Crankshaft group

15 - Cylinder head, valve gear

17 - Lubrication

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21 - Turbocharging/supercharging

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26 - Exhaust system

28 - Ignition system

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

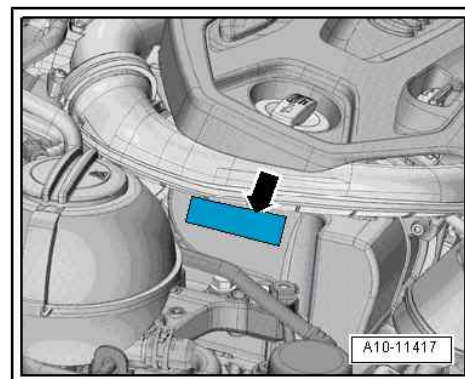
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⇒ ["1.1 Engine number/engine data", page 1](#)

1.1 Engine number/engine data

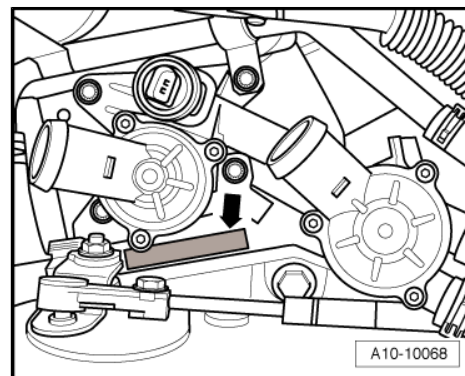
Engine number

- ◆ There is a sticker on the timing chain cover indicating the "Engine code" and "Serial number" -arrow-.
- ◆ Engine codes starting with the letter "C" have four letters (previously three letters).
- ◆ The first 3 characters of the engine code stand for the engine capacity and the mechanical construction and design. They are stamped onto the cylinder block together with the serial number.
- ◆ The 4th character indicates the power output and torque of the engine and is determined by the engine control unit.



Note

- ◆ *The four-letter engine code is found on the type plate (certain countries only), vehicle data sticker and engine control unit.*
- ◆ *Fitting locations of the type plate (certain countries only) and the vehicle data sticker ⇒ Maintenance ; Booklet 819*
- ◆ *If the sticker is missing, use a mirror and a torch to read off the "Engine code" and the "Serial number":*
- ◆ *Read off the engine code and serial number on the left-side of the cylinder block -arrow-.*



Engine data

- ◆ ⇒ Technical data for 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 using testers and measuring instruments during a road test”, page 3](#)

⇒ [“2.4 Safety precautions when working on the cooling system”, page 3](#)

⇒ [“2.5 Safety precautions when working on the ignition system”, page 3](#)

⇒ [“2.6 Safety precautions when working on the exhaust system”, page 3](#)

2.1 Safety precautions when working on the fuel supply system

Risk of injury - fuel system operates under high pressure

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

Before opening the fuel system:

- Put on safety goggles.
- Put on protective gloves.
- Release pressure (wrap 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

The engine can start unexpectedly if the vehicle's start/stop system is activated. A message in the instrument cluster indicates whether the start/stop system is activated.

- To deactivate the start/stop system, switch off the ignition.



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

Risk of injury if test equipment is not secured

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

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

Or:

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

2.4 Safety precautions when working on the cooling system

Risk of scalding as hot coolant can escape

The cooling system is under pressure when the engine is hot. Risk of scalding due to hot steam and hot coolant.

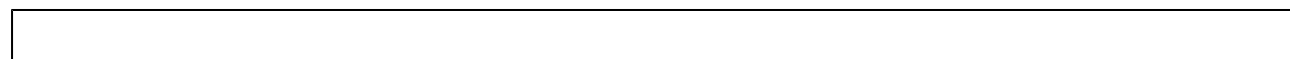
- Put on protective gloves.
- Put on safety goggles.
- Cover filler cap on expansion tank with a cloth and open carefully to release pressure.

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.
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2.6 Safety precautions when working on the exhaust system

Risk of damage to flexible joint

The flexible joint can be damaged or develop leaks if it is handled incorrectly.



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4-cylinder direct petrol injection engine (1.4 ltr. 4-valve turbo with supercharger EA111) - Edition 09.2019

- Do not bend flexible joint more than 10°.
- Install flexible joint so that it is not under tension.



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3 Repair instructions

⇒ [“3.1 Rules for cleanliness”, page 5](#)

⇒ [“3.2 General notes”, page 5](#)

⇒ [“3.3 General repair instructions”, page 6](#)

⇒ [“3.4 Foreign particles in engine”, page 6](#)

⇒ [“3.5 Contact corrosion”, page 6](#)

⇒ [“3.6 Routing and attachment of pipes, hoses and wiring”, page 7](#)

⇒ [“3.7 Installing radiators and condensers”, page 7](#)

⇒ [“3.8 Nuts, bolts”, page 7](#)

⇒ [“3.9 Identification plates”, page 7](#)

⇒ [“3.10 Use of impact wrenches”, page 8](#)

⇒ [“3.11 Checking vacuum system”, page 8](#)

3.1 Rules for cleanliness

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

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

3.2 General notes

- ◆ The engine control unit has a self-diagnosis capability. Before carrying out repairs and fault finding, the event memory must be interrogated. The vacuum hoses and connections must also be checked (unmetered air).
- ◆ Fuel hoses in engine compartment must only be secured with spring-type clips. O-type clips or screw-type clips must not be used.
- ◆ A voltage of at least 11.5 V is required for proper operation of the electrical components.
- ◆ Do not use sealants containing silicone. Particles of silicone drawn into the engine will not be burnt in the engine and will damage the Lambda probe.



- ◆ The vehicles are fitted with a crash fuel shut-off system. This system is designed to reduce the risk of a vehicle fire after a crash by deactivating the fuel pump via the fuel pump relay.
- ◆ At the same time, this system also improves the engine's starting performance. When the driver's door is opened, the fuel pump is activated for 2 seconds in order to build up pressure in the fuel system
⇒ ["2.1 Safety precautions when working on the fuel supply system", page 2](#) .

3.3 General repair instructions

- ◆ Clean tools and workbench etc. before working on the injection system.
- ◆ If the high-pressure fuel lines are to be re-used, you must mark them before removal. High-pressure pipes must always be re-installed on the same cylinder.
- ◆ Position high-pressure pipes so they are free of stress. Tighten all unions lightly to start with before tightening to final torque.
- ◆ Never attempt to bend high-pressure fuel lines to shape.
- ◆ When working on any parts of the high-pressure fuel system, tools may only be used for loosening and tightening pipe unions. All other components must always be removed and installed by hand without using tools or other equipment.
- ◆ All cable ties which are released or cut open when removing must be refitted in the same position when installing.
- ◆ Fuel hoses in engine compartment must only be secured with spring-type clips. O-type clips or screw-type clips must not be used.

3.4 Foreign particles in engine

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

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Note

If the turbocharger has suffered mechanical damage
⇒ ["1.2 Removing and installing turbocharger", page 206](#)

3.5 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 using Audi Genuine Accessories.
- ◆ Damage caused by contact corrosion is not covered by warranty.

3.6 Routing and attachment of pipes, hoses and wiring

- ◆ Mark fuel lines, hydraulic lines, vacuum lines, lines for activated charcoal filter and electrical wiring etc. before removal so they can be re-installed in the original positions and correctly connected. Make sketches or take photographs if necessary.
- ◆ Because of the limited space in the engine compartment, it is important to ensure that there is adequate clearance to any moving or hot components to avoid damage to lines and wiring.

3.7 Installing radiators and condensers

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

3.8 Nuts, bolts

- ◆ Loosen bolts in reverse sequence to specified tightening sequence.
- ◆ Bolts and nuts used to secure covers and housings must be tightened in steps according to the specified tightening sequence and method.
- ◆ Bolts and nuts which secure covers and housings should be loosened and tightened in diagonal sequence and in stages if no tightening sequence is specified.
- ◆ Always renew self-locking bolts and nuts.
- ◆ Unless otherwise specified, use a wire brush to clean the threads of bolts which are secured with locking fluid. Then install bolts with locking fluid; for locking fluid refer to ⇒ Electronic parts catalogue .
- ◆ Threaded holes which take self-locking bolts or bolts coated with locking fluid must be cleaned using a thread tap or similar. Otherwise there is a danger of the bolts shearing off the next time they are removed.
- ◆ The tightening torques stated apply to non-oiled nuts and bolts.

3.9 Identification plates

When renewing vehicle components, the identification plates on the old parts that have a replacement part number (see ⇒ Electronic parts catalogue) must be attached to the new parts due to approval regulations.



3.10 Use of impact wrenches

In general, it is permitted to use an impact wrench to unscrew bolts and nuts. An exception to this is when work is performed inside an open high-voltage battery. For this work, it is not permitted to use an impact wrench.

An impact wrench may be used to screw in bolts and nuts when performing repair work if the following requirements are observed. In general, electric and compressed-air impact wrenches should be used.

Requirements:

- Only screw in bolts with locking fluid or self-locking nuts at low speed.
- Use a suitable impact wrench with variable speed and adjustable torque range.
- Use suitable bits when working in the vicinity of sensitive surfaces, e.g. plastic-coated bits for aluminium rims.
- When working in the vicinity of natural gas systems, observe the information in the Workshop Manual "Natural gas engines - General information".

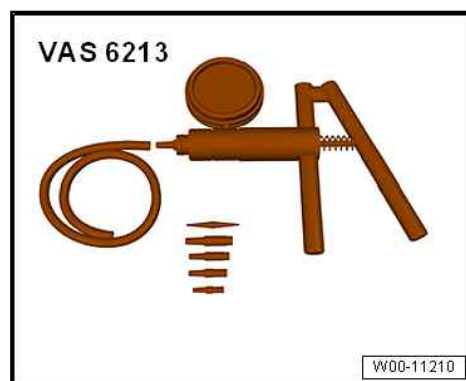
Use:

- Fit bolts/nuts by hand.
- Only use an impact wrench to screw in bolts/nuts until the head of the bolt/nut makes contact and then continue tightening with a torque wrench.
- Clean threaded pins before unscrewing the bolt/nut.

3.11 Checking vacuum system

Special tools and workshop equipment required

- ◆ Hand vacuum pump - VAS 6213-

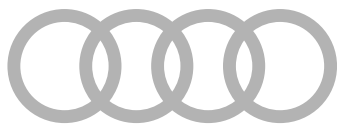


Procedure

- Check all vacuum lines in the complete vacuum system for:
 - ◆ Cracks
 - ◆ Traces of animal bites
 - ◆ Kinked or crushed lines
 - ◆ Porous or leaking lines



- Check vacuum line to solenoid valve and from solenoid valve to corresponding component.
- If an entry is stored in the event memory, check 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 10](#)

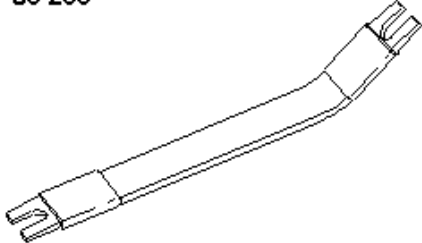
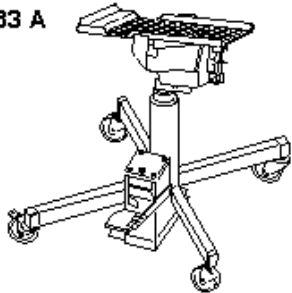
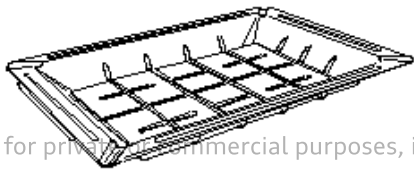
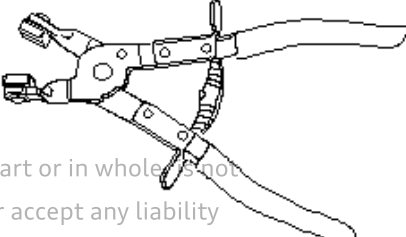
⇒ [“1.2 Separating engine and gearbox”, page 22](#)

⇒ [“1.3 Securing engine to engine and gearbox support”, page 24](#)

⇒ [“1.4 Installing engine”, page 25](#)

1.1 Removing engine

Special tools and workshop equipment required

80-200 	V.A.G 1383 A 
VAS 5085 	VAS 6122 
VAS 6208 	VAS 6362  G13-10035



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- ◆ Removal lever - 80 - 200-
- ◆ Engine and gearbox jack - V.A.G 1383 A-
- ◆ Stepladder - VAS 5085-
- ◆ Engine bung set - VAS 6122-
- ◆ Drip tray for workshop hoist - VAS 6208-
- ◆ Hose clip pliers - VAS 6362-



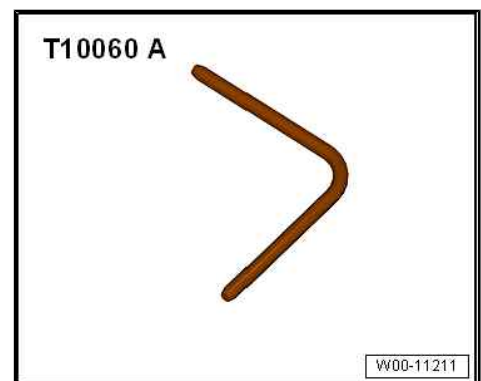
- ◆ Hook -2024 A /1- of lifting tackle - 2024 A-



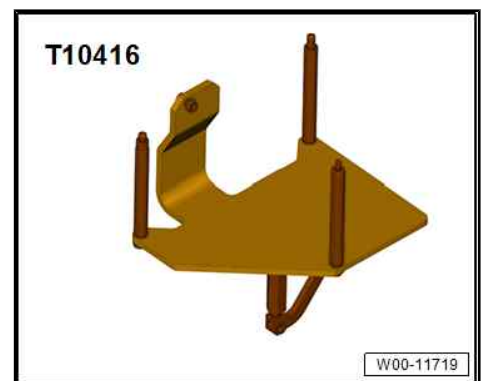
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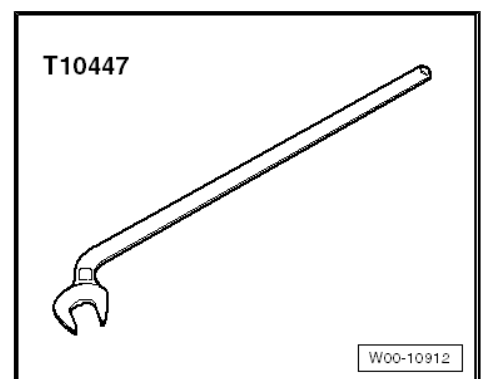
- ◆ Locking pin - T10060 A-



- ◆ Engine support - T10416- with adapters -T10416/1- , -
 T10416/2- , -T10416/3-



- ◆ Open-end spanner, 16 mm - T10447-



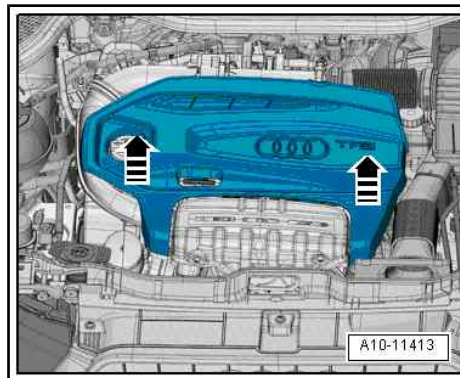


Procedure



Note

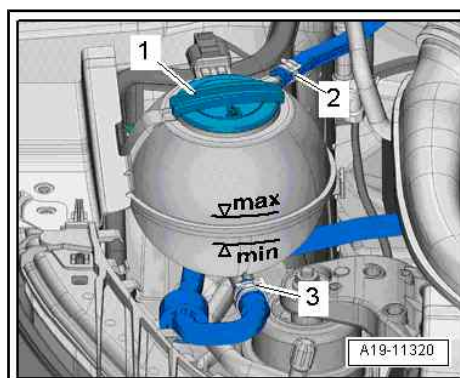
- ◆ *The engine is removed from underneath together with the gearbox.*
- ◆ *Fit all cable ties in the original positions when installing.*
- Detach engine cover panel (front) -arrows- and remove towards front.



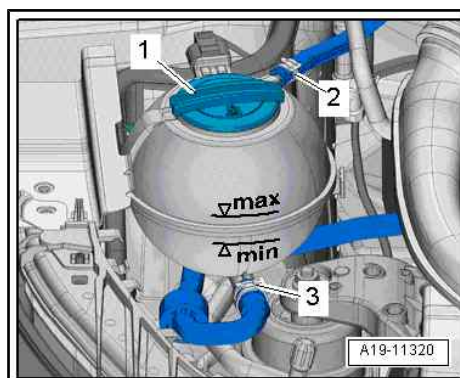
WARNING

Risk of scalding due to hot steam and hot coolant.

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



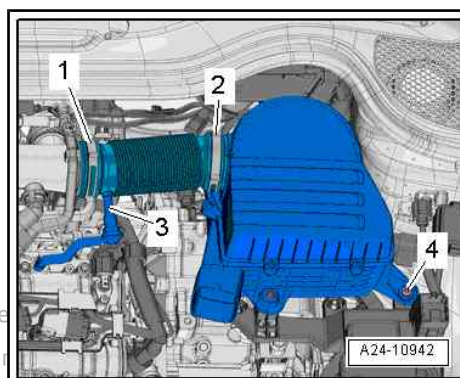
- Open filler cap -1- on coolant expansion tank.
- Remove radiator and charge air cooler
⇒ ["4.2 Removing and installing radiator", page 197](#) .
- Seal off open lines and connections with clean plugs from engine bung set - VAS 6122- .
- Release hose clips -2, 3- and disconnect coolant hoses.
- Remove 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) .
- Release hose clip -1- and detach air hose from intake manifold.
- Disconnect vacuum hose -3- from air hose.
- Unscrew bolt -4- and detach air cleaner housing.



Note

Disregard -item 2-.

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



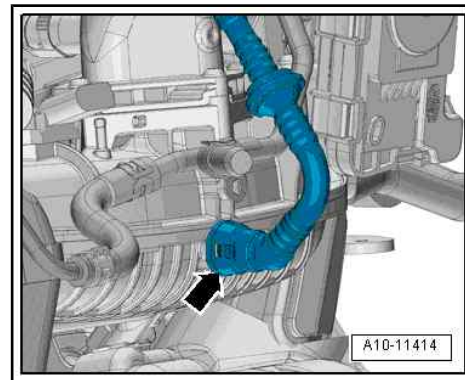


- Press release tabs and detach vacuum hose -arrow-.



Note

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



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

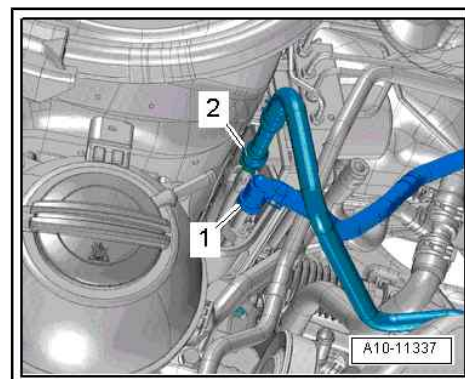


WARNING

The fuel system is pressurised.

Risk of injury as fuel may spray out.

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



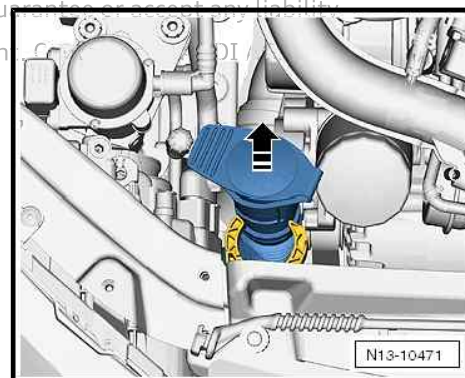
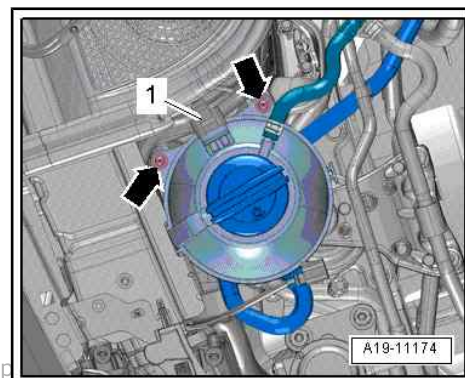
- Disconnect fuel supply line -2- (pull release ring).
- Seal off open lines and connections with clean plugs from engine bung set - VAS 6122- .
- Remove bolts -arrows-.
- Unplug electrical connector -1- for coolant shortage indicator switch - F66- and detach coolant expansion tank.



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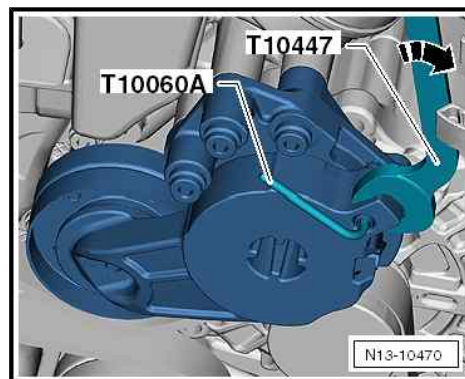
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- Press washer fluid filler neck out of bracket -arrow-.

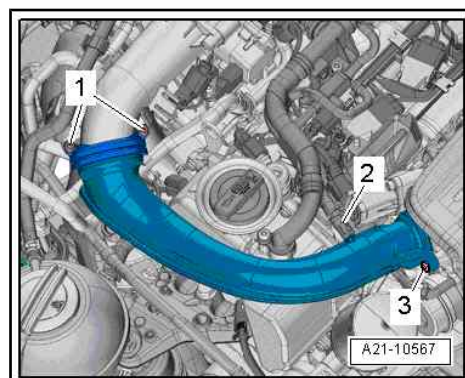




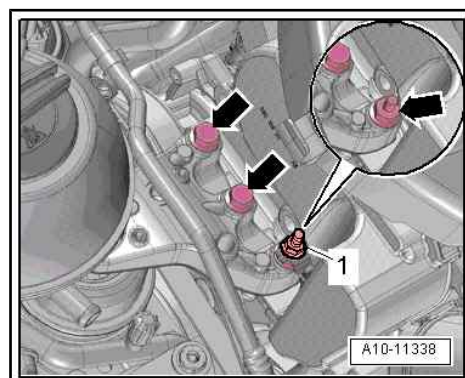
- Slacken poly V-belt by turning tensioner in clockwise direction -arrow- using open-end spanner, 16 mm - T10447- .
- Lock tensioner with locking pin - T10060 A- .



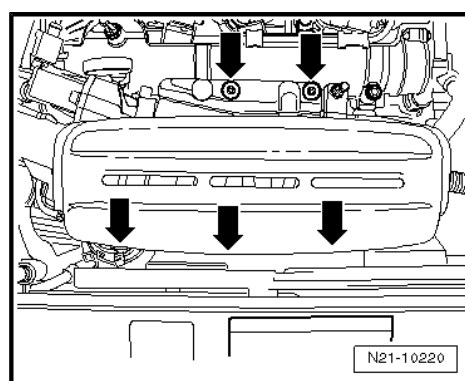
- Remove bolts -1, 3-.
- Release hose clip -2-, detach air pipe (top right) and remove air hose.



- Remove nut -1- and move earth wire clear.
- Loosen bolts -arrows- for support arm of engine mounting approx. 2 turns.



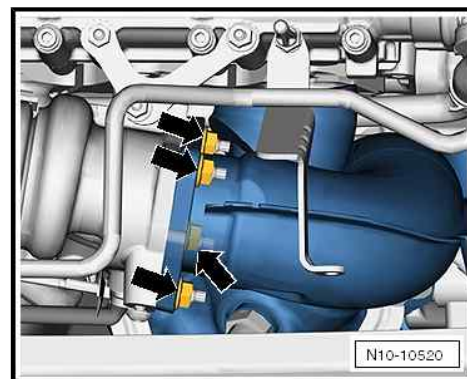
- Remove bolts -arrows- and detach heat shield for turbocharger.



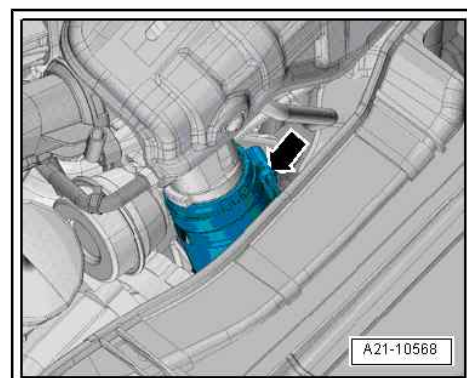
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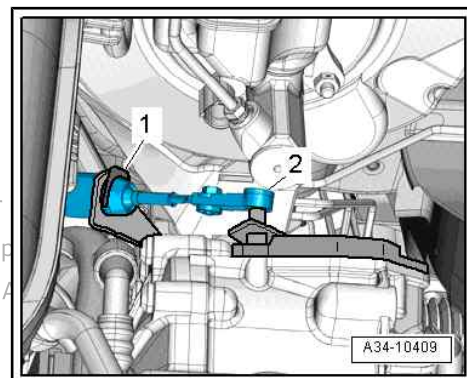
- Remove nuts -arrows- for catalytic converter.



- Release hose clip -arrow- on turbocharger.
- Press locking tabs (left and right) for radiator cowl -arrow- simultaneously.



- Use removal lever - 80 - 200- to prise selector lever cable -2- off gearbox selector lever.
- Pull off retaining clip -1-, detach selector lever cable and move clear to one side.

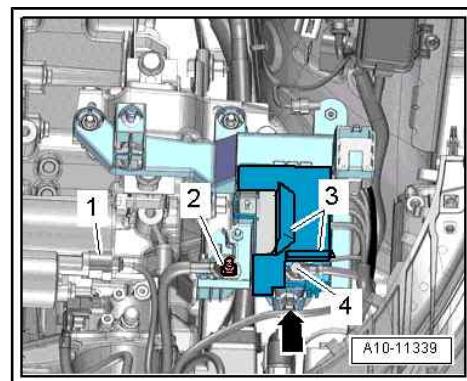


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Take care not to bend or kink selector lever cable.

- Unplug electrical connector -1- at starter.
- Open covers -3-.
- Unscrew nut -2- and move clear electrical wiring going to starter.
- Move clear electrical wiring -arrow-.



Note

Disregard -item 4-.

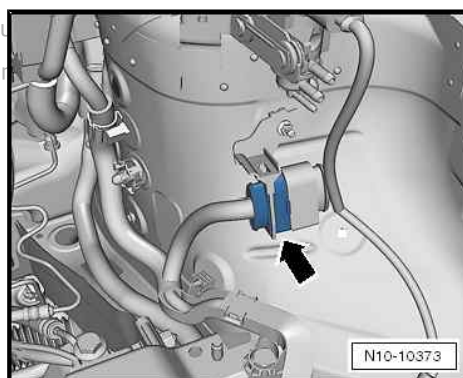
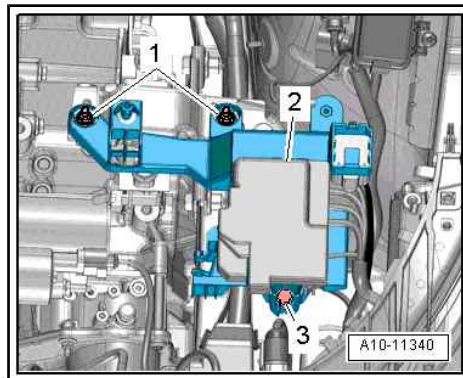


- Unscrew nuts -1- and bolt -3-, and push electronics box -2- to the side.
- Remove engine control unit
⇒ ["8.2 Removing and installing engine/motor control unit J623"](#), [page 275](#) .

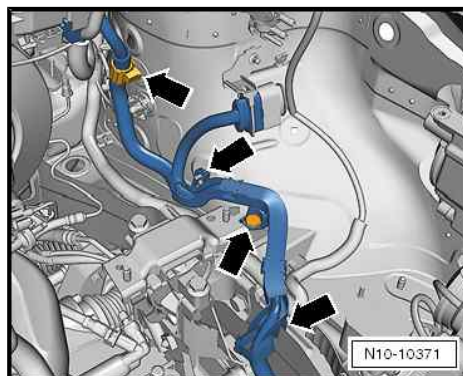


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- Detach electrical connector -arrow- from bracket and unplug



- Move engine wiring harness clear -arrows- and lay on top of engine.

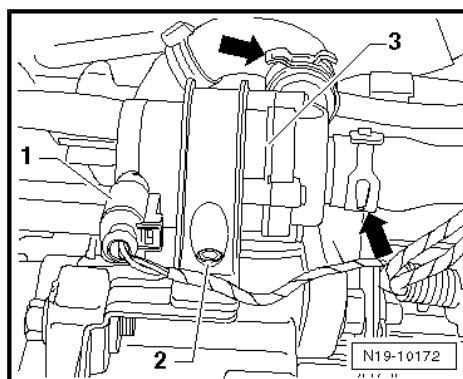


- Unplug electrical connector -1- at continued coolant circulation pump - V51- .



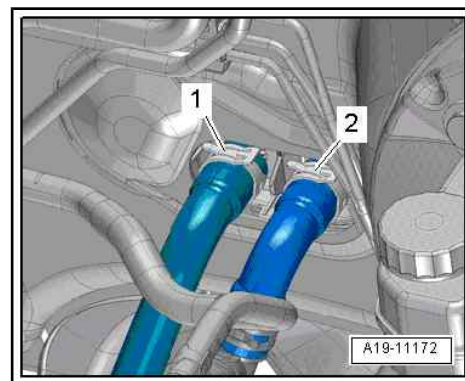
Note

Disregard items marked -2, 3- and -arrows-.

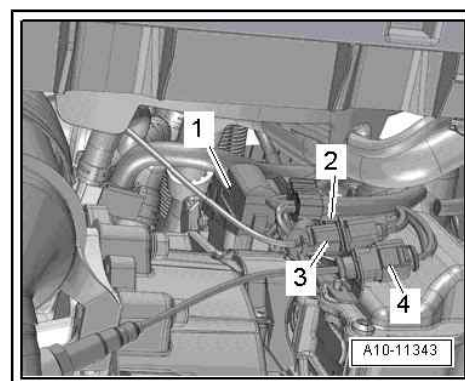




- Release hose clips -1 and 2- and disconnect coolant hoses from heat exchanger.



- Detach electrical connectors from bracket and unplug.
- 3 - For Lambda probe - G39-
- 4 - For Lambda probe after catalytic converter - G130-



Caution

Risk of serious damage to gearbox components.

- ◆ ***Do NOT touch connector contacts in gearbox connector with your hands. Static discharge could damage the control unit and the mechatronic unit irreparably.***

- Touch vehicle earth with bare hands to eliminate any static charge.
- Unplug electrical connector -1- for mechatronic unit for dual clutch gearbox - J743- .
- Detach electrical connector -2- from bracket.

Vehicles with air conditioner:

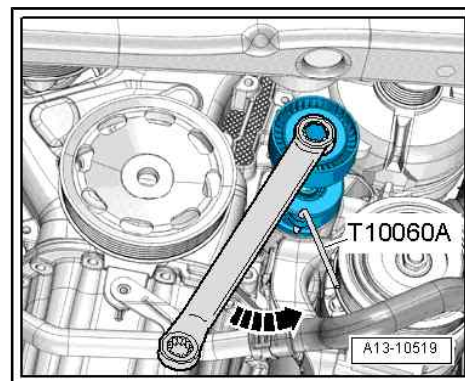


Caution

Running a used poly V-belt in the opposite direction could cause irreparable damage.

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

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



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



WARNING

Risk of injury caused by refrigerant.

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

- Remove bolts -arrows- for air conditioner compressor.

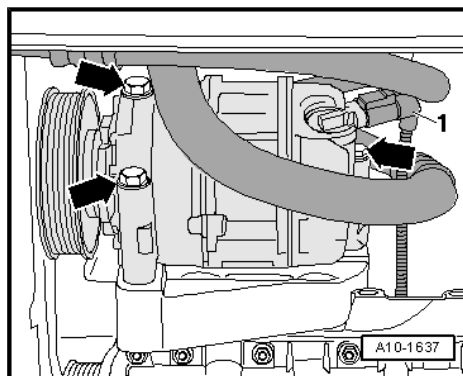


Caution

Risk of damage to refrigerant lines and hoses

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

- Tie up air conditioner compressor together with refrigerant hoses to longitudinal member (refrigerant hoses remain connected).

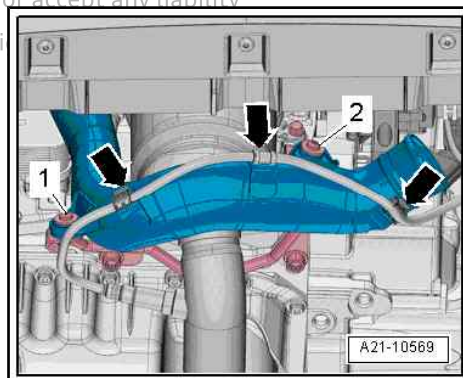


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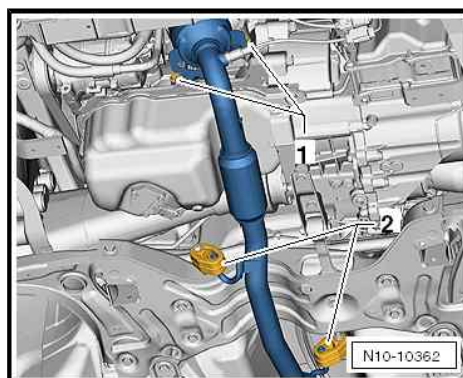
All vehicles (continued):

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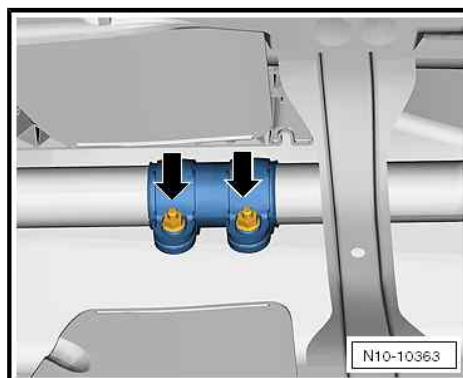
- Move electrical wiring harness clear -arrows-.
- Unscrew bolts -1 and 2- and detach air pipe (front).



- Move clear electrical wiring harness leading to alternator at catalytic converter.
- Unscrew bolts -1- and detach bracket for air pipe (front).
- Press mountings -2- for exhaust system off pins.

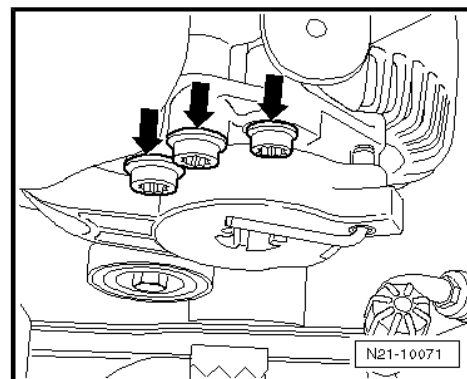


- Unscrew nuts -arrows- and push clamp towards rear.
- Detach catalytic converter and centre silencer from underneath.

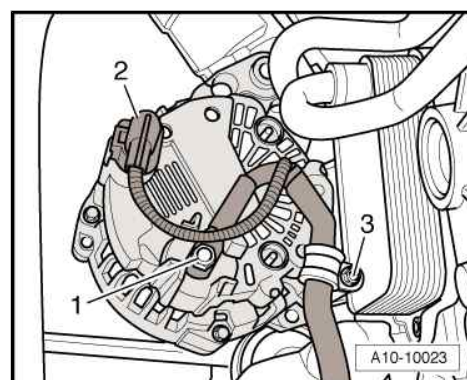




- Remove bolts -arrows- and take off poly V-belt tensioner.



- Unplug electrical connector -2-.
- Remove nut -1- and move electrical wiring clear.
- Unbolt retaining clamp -3- from alternator and move clear electrical wiring harness.



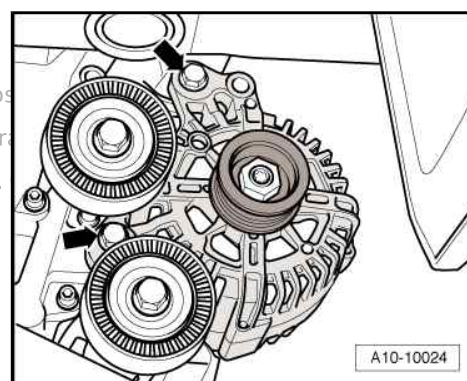
- Unscrew bolts -arrows- and remove alternator.



Note

- ♦ *If alternator sticks in its bracket, screw bolt back in again down to the last 2 turns.*
- ♦ *Tap carefully on bolt heads with flat side of hammer to release bushes of alternator mountings.*

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



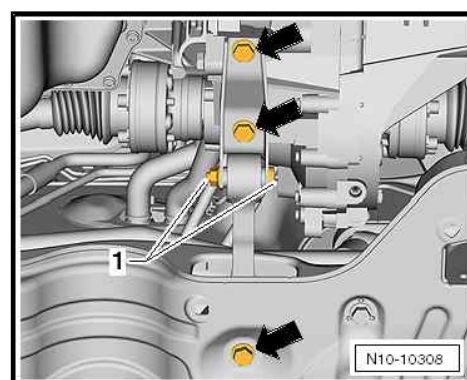
- Remove bolts -arrows- and detach pendulum support.



WARNING

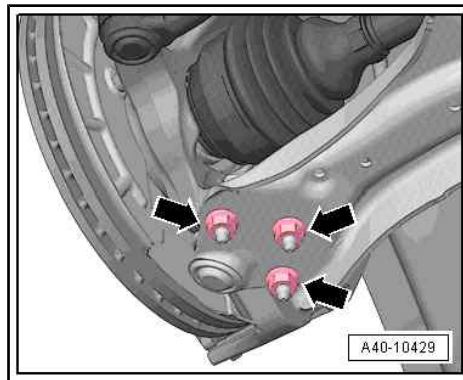
Risk of accident.

- ♦ *Do NOT loosen bolted connection -1-.*





- Remove nuts -arrows- for swivel joint on both sides.
- If fitted, loosen nut on bracket for front left vehicle level sender -G78- .
- Detach swivel joints from wishbones.

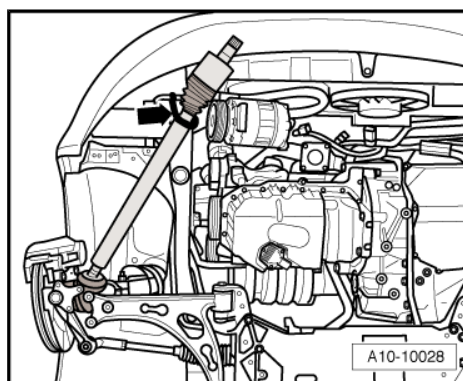


- Pivot drive shaft (right-side) forwards; to do so, push engine/ gearbox assembly slightly forwards.
- Tie up drive shaft to longitudinal member -arrow-.



Note

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



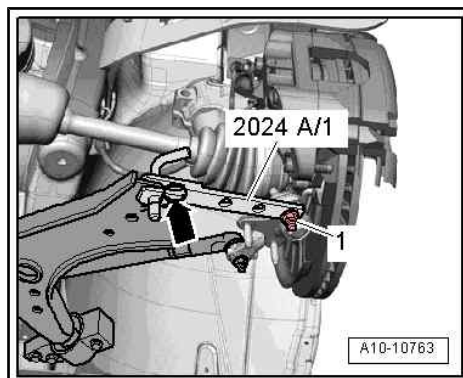
- Swivel suspension strut (left-side) outwards and support with support bracket -2024 A /1- , as shown in illustration.



WARNING

Accident risk from loose components of support bracket.

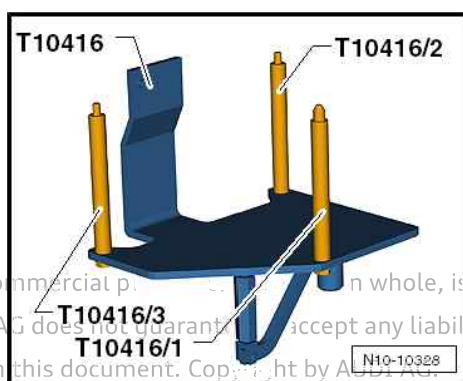
- ◆ **Secure retaining pin and swivel joint with locking pin -arrow- and nut -1-.**



Use engine support - T10416- with adapters -T10416/1- , - T10416/2- and -T10416/3- to lower engine/gearbox assembly.

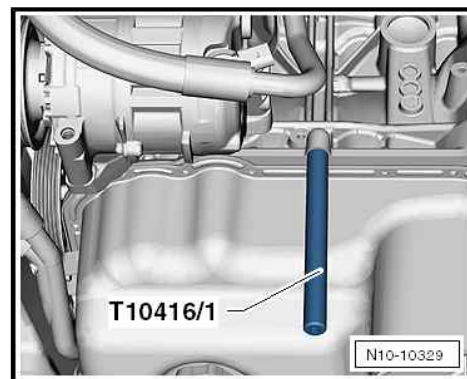


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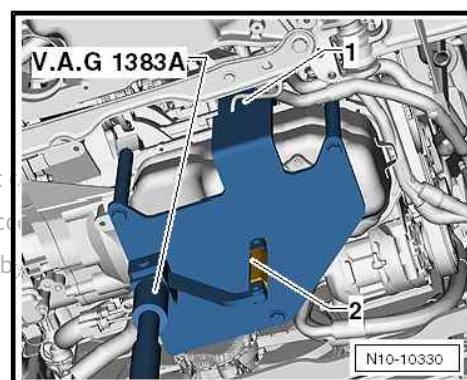




- Screw adapter -T10416/1- into hole on cylinder block as far as stop, as shown in illustration.
- Bring engine support - T10416- with adapters -T10416/2- and -T10416/3- into position on cylinder block.



- Screw in bolt -1- by hand until it makes contact.
- Tighten all bolts on engine support to 20 Nm.
- Attach engine and gearbox jack - V.A.G 1383 A- to engine support - T10416- .



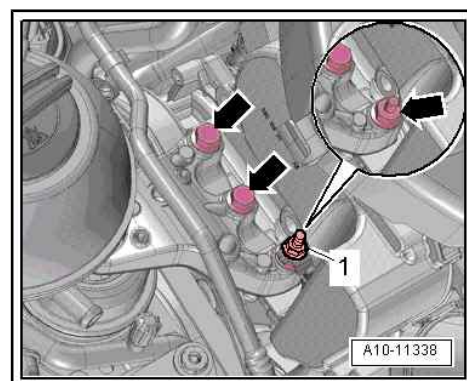
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Note

- ♦ *The adjuster nut -2- is used to set the correct angle between the pin on the engine support - T10416- and the engine and gearbox jack - V.A.G 1383 A- .*
- ♦ *To unscrew bolts for assembly mounting use stepladder - VAS 5085- .*

- Remove bolts -arrows- for support arm of engine mounting.

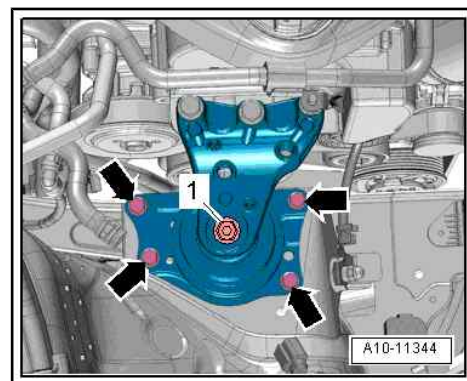


WARNING

Risk of accident.

- ♦ *Do not loosen nut -1- unless renewing engine mounting.*

- Remove bolts -arrows- and detach engine mounting.





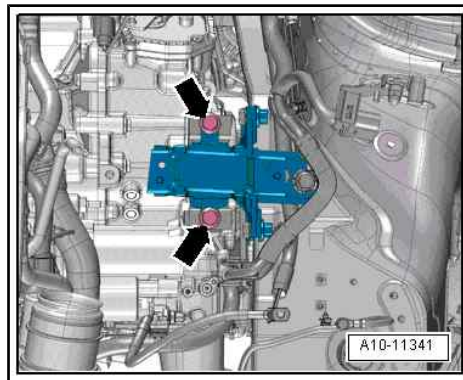
- Remove bolts -arrows- securing gearbox mounting.



Caution

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

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



- Pull engine/gearbox assembly as far forward as possible, and lower gradually.



Note

While lowering, alter the position of the engine/gearbox assembly as required by means of the adjuster nut of the engine support - T10416-.

1.2 Separating engine and gearbox

Special tools and workshop equipment required

- ◆ Shackle - 10 - 222 A /12-

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10-222 A/12



W00-11341

- ◆ Workshop hoist - VAS 6100-

VAS 6100



W00-11307



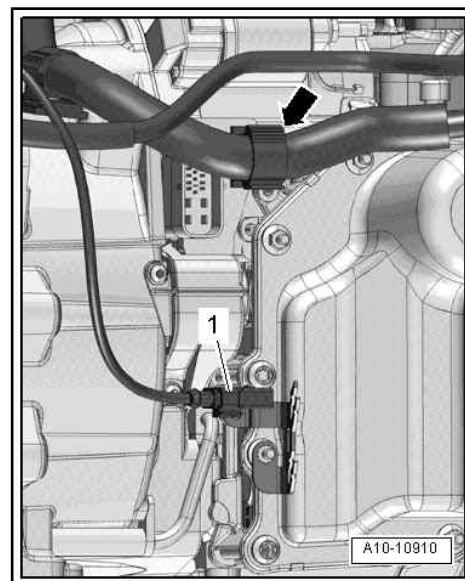
Procedure

- Engine/gearbox assembly removed and attached to engine support - T10416- .
- Move electrical wiring harness clear -arrow-.

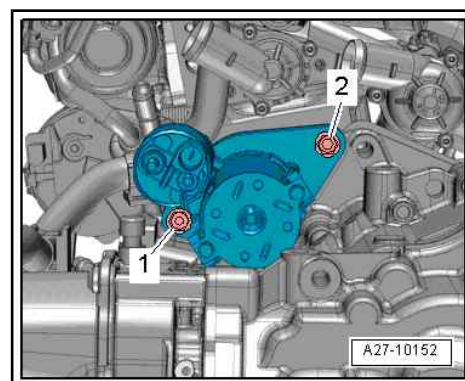


Note

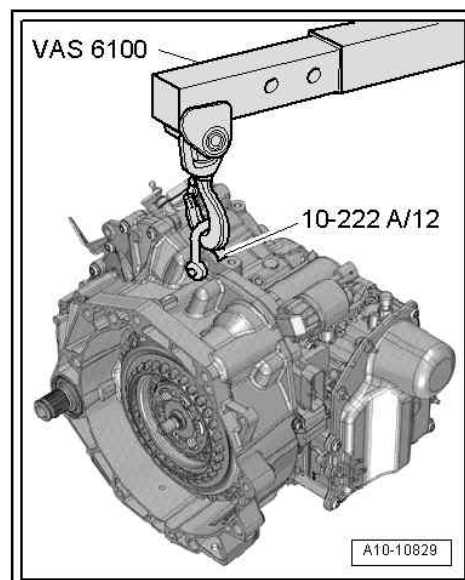
Disregard -item 1-.



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



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



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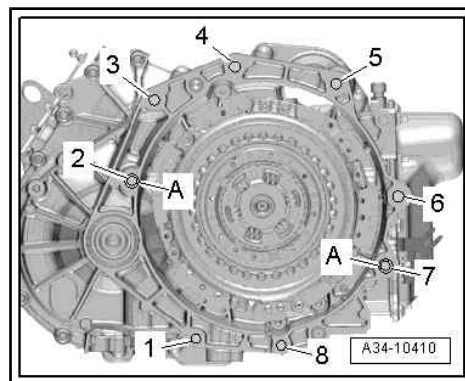
- Remove bolts -1 ... 8- securing gearbox to engine.



Note

Disregard -item A-.

- Detach gearbox from engine.



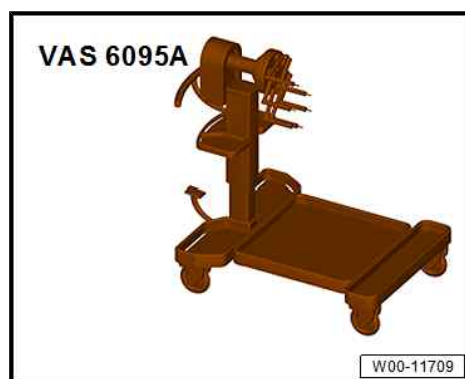
1.3 Securing engine to engine and gearbox support

Special tools and workshop equipment required

- ◆ Lifting tackle - 2024A-



- ◆ Engine and gearbox support - VAS 6095A-



- ◆ Workshop hoist - VAS 6100-



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Procedure

- Gearbox detached from engine
⇒ "1.2 Separating engine and gearbox", page 22 .
- Remove flywheel
⇒ "2.2 Removing and installing flywheel", page 60 .
- To transport engine, engage lifting tackle - 2024 A- on engine and workshop hoist - VAS 6100- .



Note

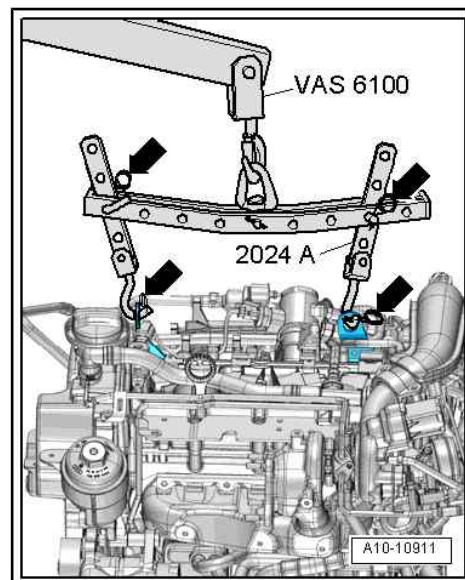
To adjust to the centre of gravity of the assembly, the perforated rails of the support hooks must be positioned as shown.



WARNING

Accident risk from loose components of support bracket.

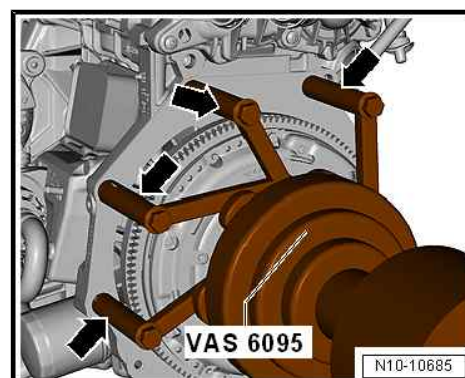
- ◆ The support hooks and retaining pins on the support bracket must be secured with locking pins -arrows-.



- Secure engine to engine and gearbox support - VAS 6095A- using pins -arrows-, as shown in illustration.

Tightening torque

Component		Nm
Bolts/nuts	M6	10
	M8	20
	M10	45
	M12	65



1.4 Installing engine

Tightening torques



Note

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◆ Tightening torques apply only to lightly greased, oiled, phosphated or black-finished nuts and bolts.

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- ◆ 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	9
	M7	15
	M8	22
	M10	40



Component	Nm
M12	65

- ◆ Assembly mountings
⇒ ["2.1 Exploded view - assembly mountings", page 29](#)
- ◆ Securing gearbox to engine ⇒ Rep. gr. 34 ; Removing and installing gearbox; Tightening torques for gearbox

Procedure

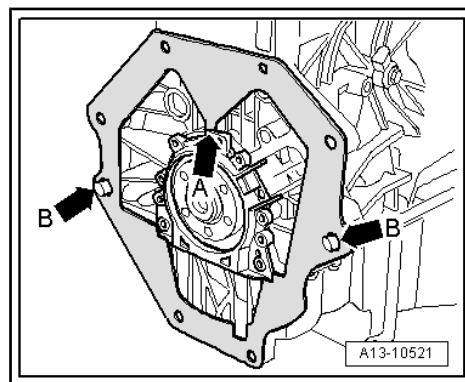
Installation is carried out in reverse order; note the following:

- Engine attached to engine support - T10416-



Note

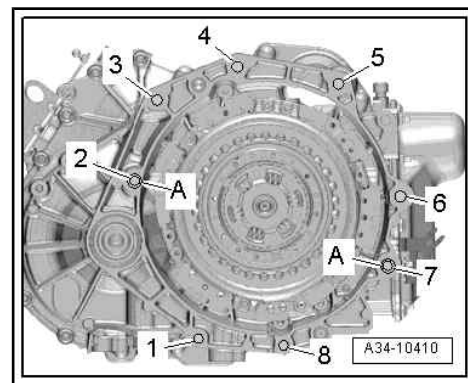
- ◆ *Renew bolts tightened with specified tightening angle.*
 - ◆ *Renew self-locking nuts and bolts as well as seals, gaskets and O-rings.*
 - ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
 - ◆ *Fit all cable ties in the original positions when installing.*
 - ◆ *Route lines of all types (e.g. vacuum lines, lines for fuel, hydraulic fluid, coolant, refrigerant and brake fluid, as well as for the activated charcoal filter system) and electrical wires in the same way as they were routed originally.*
 - ◆ *To prevent damage to lines and wiring, ensure sufficient clearance from all moving or hot components.*
- Ensure that intermediate plate is engaged on sealing flange -arrow A- and pushed onto dowel sleeves -arrows B-.



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- If not already fitted, install dowel sleeves -A- for centring engine and gearbox in cylinder block.
- Install needle bearing if not fitted in crankshaft
 ⇒ ["3.3 Renewing needle bearing in crankshaft", page 73](#) .
- Install flywheel
 ⇒ ["2.2 Removing and installing flywheel", page 60](#) .
- Secure gearbox to engine.
- Install starter ⇒ Electrical system; Rep. gr. 27 ; Starter; Exploded view - starter .
- Guide engine/gearbox assembly into body.



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- Remove engine bracket - T10416- from engine.
- Install drive shafts ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Exploded view - drive shaft.
- Install pendulum support
 ⇒ ["2.4 Removing and installing pendulum support", page 35](#) .
- Install wishbone and swivel joint ⇒ Running gear, axles, steering; Rep. gr. 40 ; Lower wishbone, swivel joint; Exploded view - lower wishbone, swivel joint .
- Install alternator ⇒ Electrical system; Rep. gr. 27 ; Alternator; Exploded view - alternator .
- Install air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Exploded view - air conditioner compressor drive unit .
- Install poly V-belt
 ⇒ ["1.2.1 Removing and installing poly V-belt for ancillaries", page 40](#) .
- Install engine control unit
 ⇒ ["8.2 Removing and installing engine/motor control unit J623", page 275](#) .
- Install electronics box ⇒ Electrical system; Rep. gr. 97 ; Relay carriers, fuse carriers, electronics boxes; Overview of fitting locations - relay carriers, fuse carriers, electronics boxes .
- Install selector lever cable ⇒ Rep. gr. 34 ; Selector mechanism; Exploded view - selector cables .
- Install radiator and charge air cooler
 ⇒ ["4.2 Removing and installing radiator", page 197](#) .
- Install radiator cowl
 ⇒ ["4.3 Removing and installing radiator cowl", page 201](#) .
- Install catalytic converter with centre silencer
 ⇒ ["2.1 Removing and installing catalytic converter", page 282](#) .
- Install engine mountings
 ⇒ ["2.1 Exploded view - assembly mountings", page 29](#) .
- 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 .
- Install air pipes
 ⇒ ["2.1 Exploded view - charge air system", page 220](#) .



- Install air cleaner housing
⇒ [“2.2 Removing and installing air cleaner housing”, page 239](#) .
- Install air hoses with screw-type clips
⇒ [“2.2 Exploded view - hose connections for charge air system”, page 221](#) .
- Install wheel housing liners ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front) .
- Check oil level ⇒ Maintenance ; Booklet 819 .



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
⇒ [Fig. “Connecting coolant hose with plug-in connector”](#), [page 197](#) .



Note

Do not reuse coolant.

- Fill up with coolant ⇒ [page 170](#) .
- After renewing engine, misfire adaption must be reset. To do so, select [\[01 - Reset adaptions misfires\]](#) in [\[Guided Functions\]](#) mode of ⇒ Vehicle diagnostic tester.

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2 Assembly mountings

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

⇒ [“2.2 Removing and installing engine mountings”, page 30](#)

⇒ [“2.3 Removing and installing gearbox mounting”, page 33](#)

⇒ [“2.4 Removing and installing pendulum support”, page 35](#)

2.1 Exploded view - assembly mountings

1 - Bolt

- ☐ Gearbox mounting to body
- ☐ Tightening torque ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

2 - Engine mounting

- ☐ Removing and installing ⇒ [“2.2 Removing and installing engine mountings”, page 30](#)

3 - Bolt

- ☐ Renew
- ☐ 20 Nm +90°

4 - Support arm

5 - Nut

- ☐ Do not loosen unless renewing engine mounting -item 2-
- ☐ Renew
- ☐ 40 Nm +90°

6 - Threaded pin

- ☐ Renew
- ☐ 30 Nm +90°

7 - Bolt

- ☐ Renew
- ☐ 30 Nm +90°

8 - Pendulum support

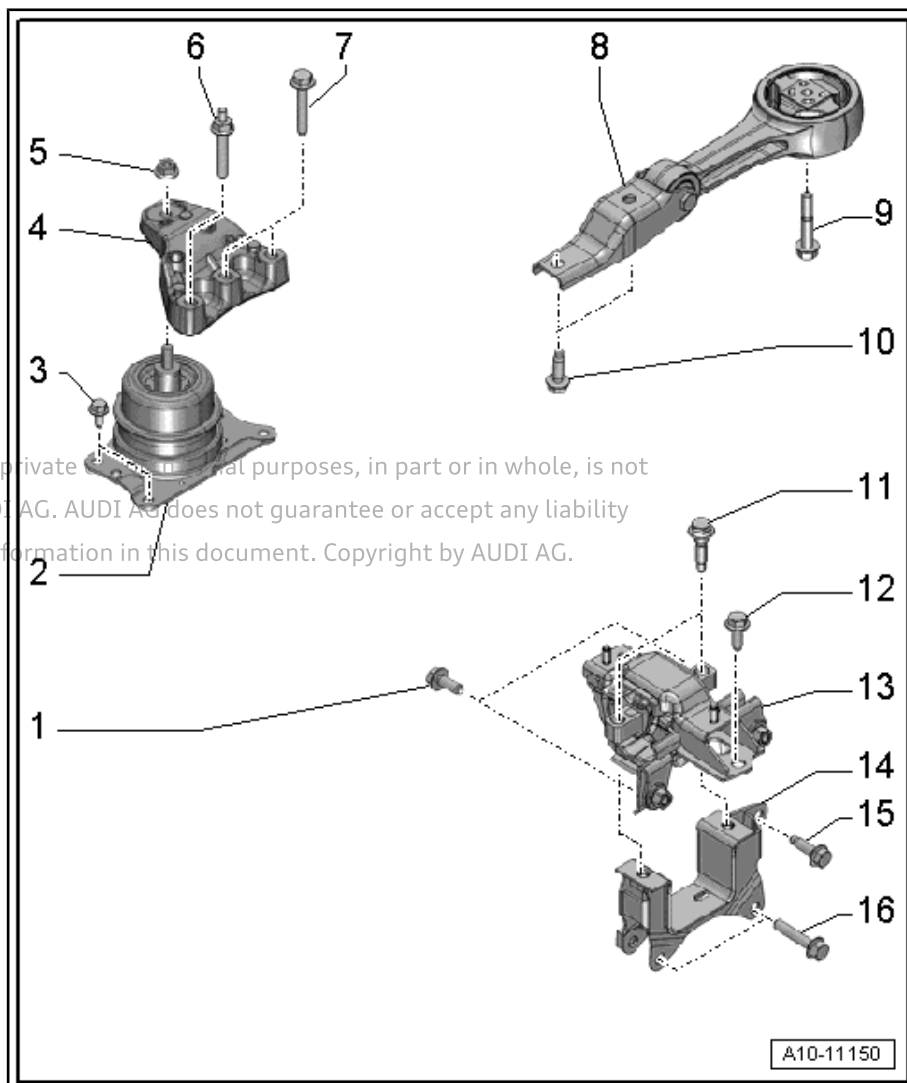
- ☐ Removing and installing ⇒ [“2.4 Removing and installing pendulum support”, page 35](#)

9 - Bolt

- ☐ Pendulum support to subframe
- ☐ Renew after removing
- ☐ 40 Nm +90°

10 - Bolt

- ☐ Pendulum support to gearbox
- ☐ Renew after removing
- ☐ 30 Nm +90°





11 - Bolt

- ☐ Gearbox mounting to gearbox support
- ☐ Tightening torque ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

12 - Bolt

- ☐ Gearbox mounting to body
- ☐ Tightening torque ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

13 - Gearbox mounting

- ☐ Removing and installing ⇒ [“2.3 Removing and installing gearbox mounting”, page 33](#)

14 - Gearbox support

- ☐ Removing and installing ⇒ [“2.3 Removing and installing gearbox mounting”, page 33](#)

15 - Bolt

- ☐ Gearbox support to gearbox
- ☐ Tightening torque ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

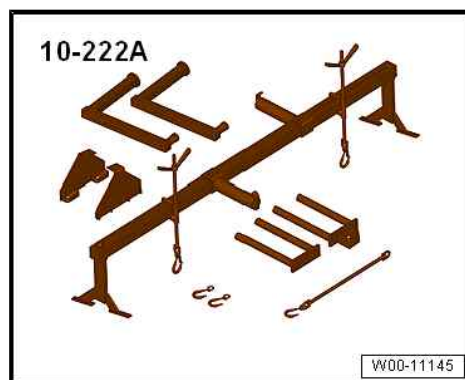
16 - Bolt

- ☐ Gearbox support to gearbox
- ☐ Tightening torque ⇒ Rep. gr. 34 ; Assembly mountings; Exploded view - assembly mountings

2.2 Removing and installing engine mountings

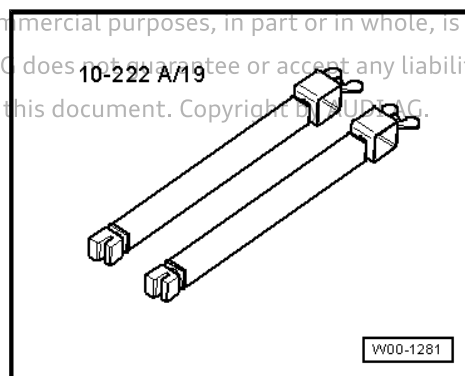
Special tools and workshop equipment required

- ◆ Support bracket - 10 - 222 A-



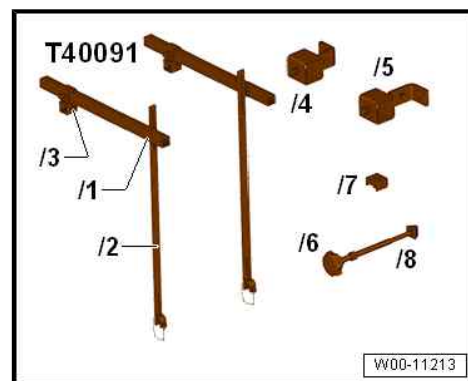
- ◆ Adapters - 10 - 222 A/19

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◆ Engine support basic set - T40091-



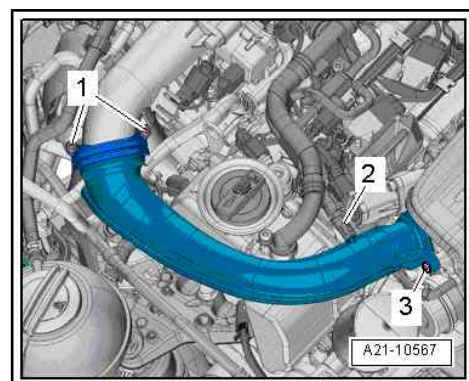
Removing

- Remove engine cover panel
 ⇒ [“3.1 Removing and installing engine cover panel”](#),
[page 36](#) .
- Remove bolts -1, 3-.
- Detach air pipe (top right) and push to side.

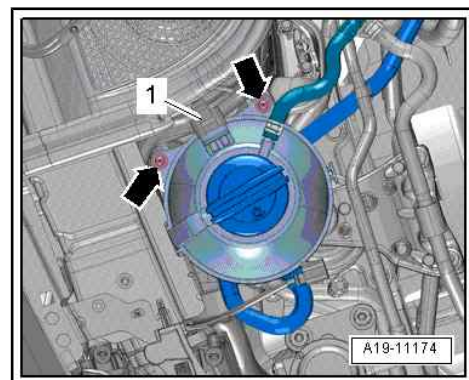


Note

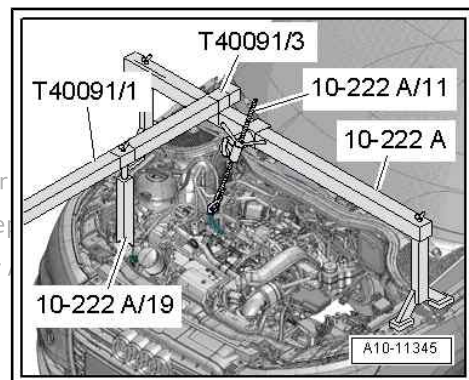
Disregard -item 2-.



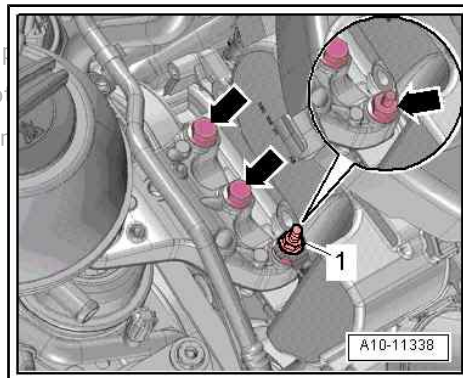
- Remove bolts -arrows-.
- Detach electrical connector -1- for coolant shortage indicator switch - F66- and move coolant expansion tank to side.



- Position support bracket - 10 - 222 A- on top edges of body flanges (left and right) and longitudinal member (right-side), as shown in illustration.
- Attach hook of spindle - 10 - 222 A /11- to engine lifting eye.
- Apply light tension to spindle.



- Remove nut -1- and move earth wire clear.
- Remove bolts -arrows- for support arm of engine mounting.



WARNING

Risk of accident.

- ◆ *Do not loosen nut -1- unless renewing engine mounting.*

- Remove bolts -arrows- and detach engine mounting.

Installing

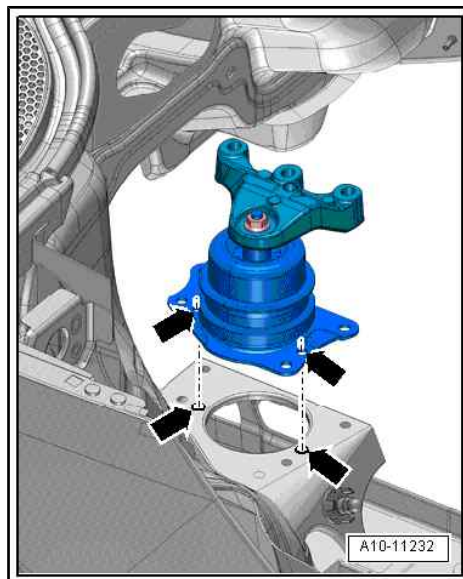
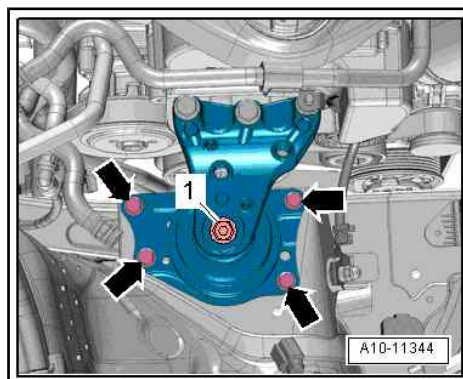
Installation is carried out in reverse order; note the following:



Note

Renew bolts tightened with specified tightening angle.

- Fit engine mounting on longitudinal member.
- The positioning holes -arrows- must align. If necessary, check with suitable drill bit.





- Initially screw in bolts -arrows- by hand until they make contact.
- Tighten bolts.



Note

Disregard -item 1-.

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- Initially hand-tighten bolts -arrows- for support arm of engine mounting until they make contact.
- The support arm must not turn when you tighten the bolts.
- Tighten bolts.



Note

Disregard -item 1-.

- Install air pipe (top right)
 ⇒ ["2.1 Exploded view - charge air system", page 220](#) .

Tightening torques

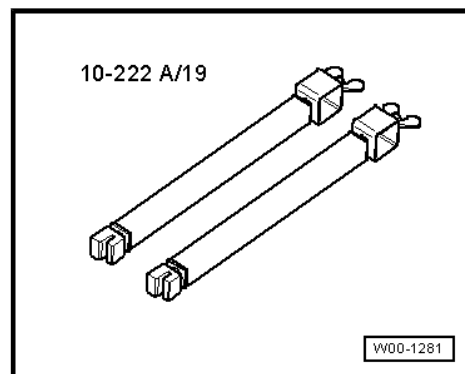
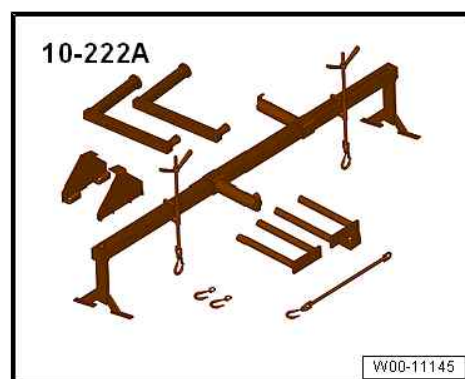
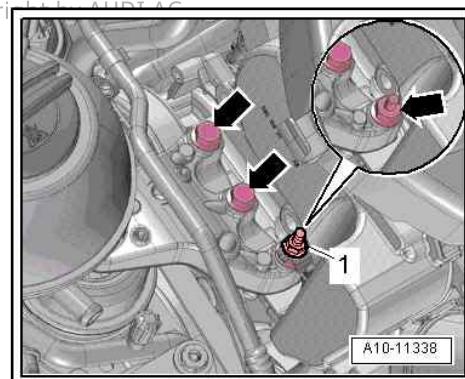
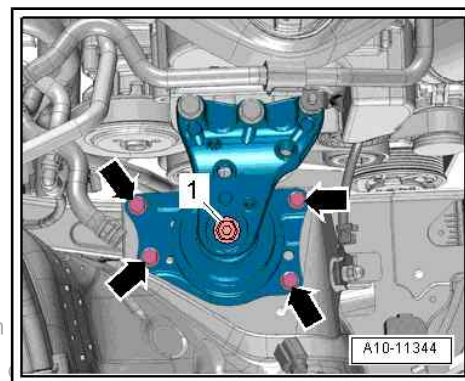
- ◆ ⇒ ["2.1 Exploded view - assembly mountings", page 29](#)

2.3 Removing and installing gearbox mounting

Special tools and workshop equipment required

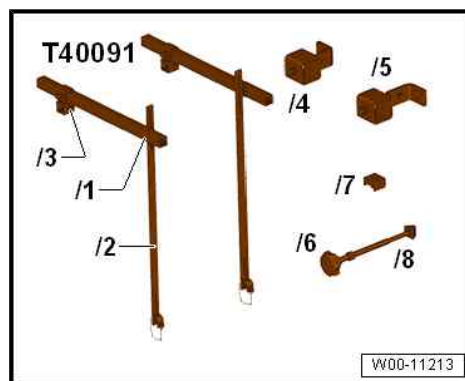
- ◆ Support bracket - 10 - 222 A-

- ◆ Adapters - 10 - 222 A /19-



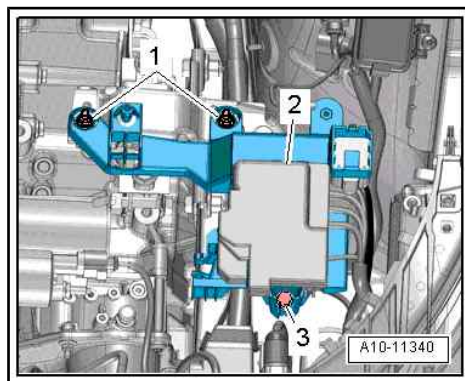


◆ Engine support basic set - T40091-



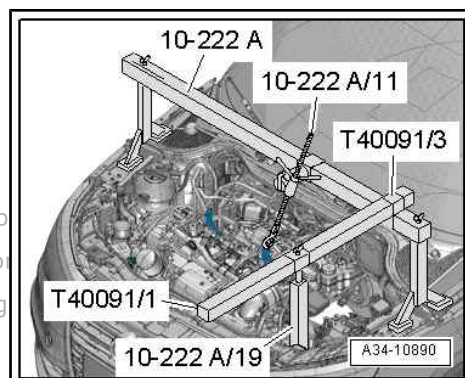
Removing

- Remove air cleaner housing
⇒ [“2.2 Removing and installing air cleaner housing”](#),
[page 239](#) .
- Remove engine cover panel
⇒ [“3.1 Removing and installing engine cover panel”](#),
[page 36](#) .
- Unscrew nut -1- and bolt -3-, and push electronics box -2- to the side.

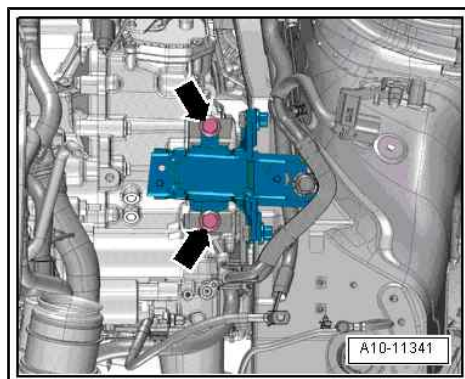


- Set up support bracket - 10 - 222 A- on top edges of body flanges (left and right) and longitudinal member (left-side), as shown in illustration.
- Attach hook of spindle - 10 - 222 A /11- to engine lifting eye (left-side).
- Take up weight of engine with the spindle, but do not lift.

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- Remove bolts -arrows- securing gearbox mounting.
- Lower engine/gearbox assembly slightly using spindle of support bracket - 10 - 222 A- .





- Remove bolts -arrows A, B, C- and detach gearbox mounting.

Installing

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



Note

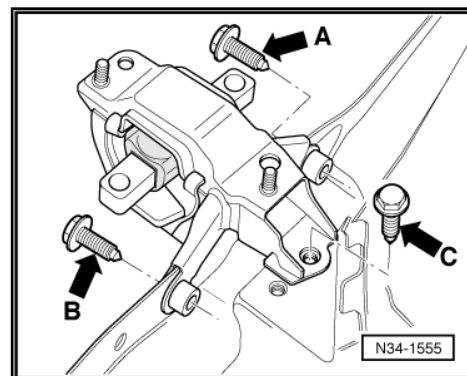
Renew bolts tightened with specified tightening angle.

- Bolt gearbox mounting to body; observe tightening torque and sequence.
- Lift gearbox with spindle of support bracket up to support arm of gearbox mounting.
- Install air cleaner housing
 ⇒ [“2.2 Removing and installing air cleaner housing”, page 239](#).
- Install engine cover panel
 ⇒ [“3.1 Removing and installing engine cover panel”, page 36](#).

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Tightening torques

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



2.4 Removing and installing pendulum support

Removing

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



WARNING

Risk of accident.

- ◆ **Do NOT loosen bolted connection -1-.**

- Remove bolts -arrows- and detach pendulum support.

Installing

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



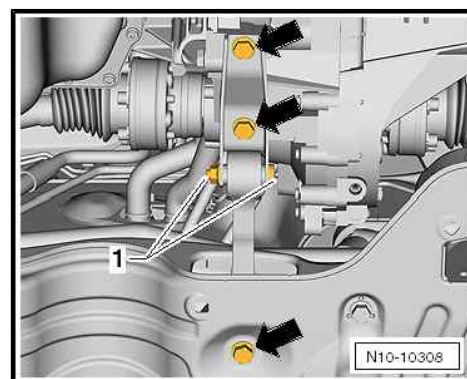
Note

Renew bolts tightened with specified tightening angle.

- Secure pendulum support first to gearbox and then to sub-frame.

Tightening torques

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





3 Engine cover panel

⇒ **"3.1 Removing and installing engine cover panel", page 36**

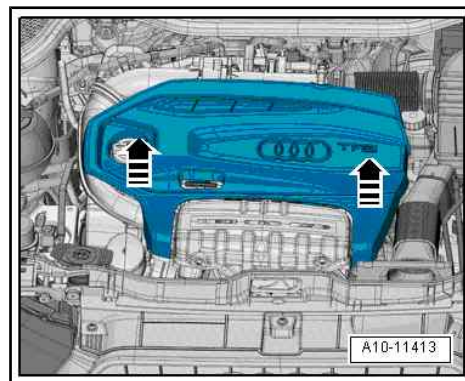
3.1 Removing and installing engine cover panel

Removing

- Detach engine cover panel (front) -arrows- and remove towards front.

Installing

- Carefully press engine cover panel back into groove and onto retaining pins.
- To avoid damage, do not strike the engine cover panel with your fist or with any kind of tool.



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13 – Crankshaft group

1 Cylinder block (pulley end)

⇒ [“1.1 Exploded view - poly V-belt drive”, page 37](#)

⇒ [“1.2 Removing and installing poly V-belts”, page 40](#)

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

⇒ [“1.4 Removing and installing bracket for ancillaries”, page 50](#)

⇒ [“1.5 Removing and installing pulley”, page 51](#)

⇒ [“1.6 Renewing crankshaft oil seal \(pulley end\)”, page 56](#)

1.1 Exploded view - poly V-belt drive

⇒ [“1.1.2 Exploded view - poly V-belt drive for supercharger”, page 39](#)

⇒ [“1.1.1 Exploded view - poly V-belt drive for ancillaries”, page 37](#)

1.1.1 Exploded view - poly V-belt drive for ancillaries

1 - Poly V-belt

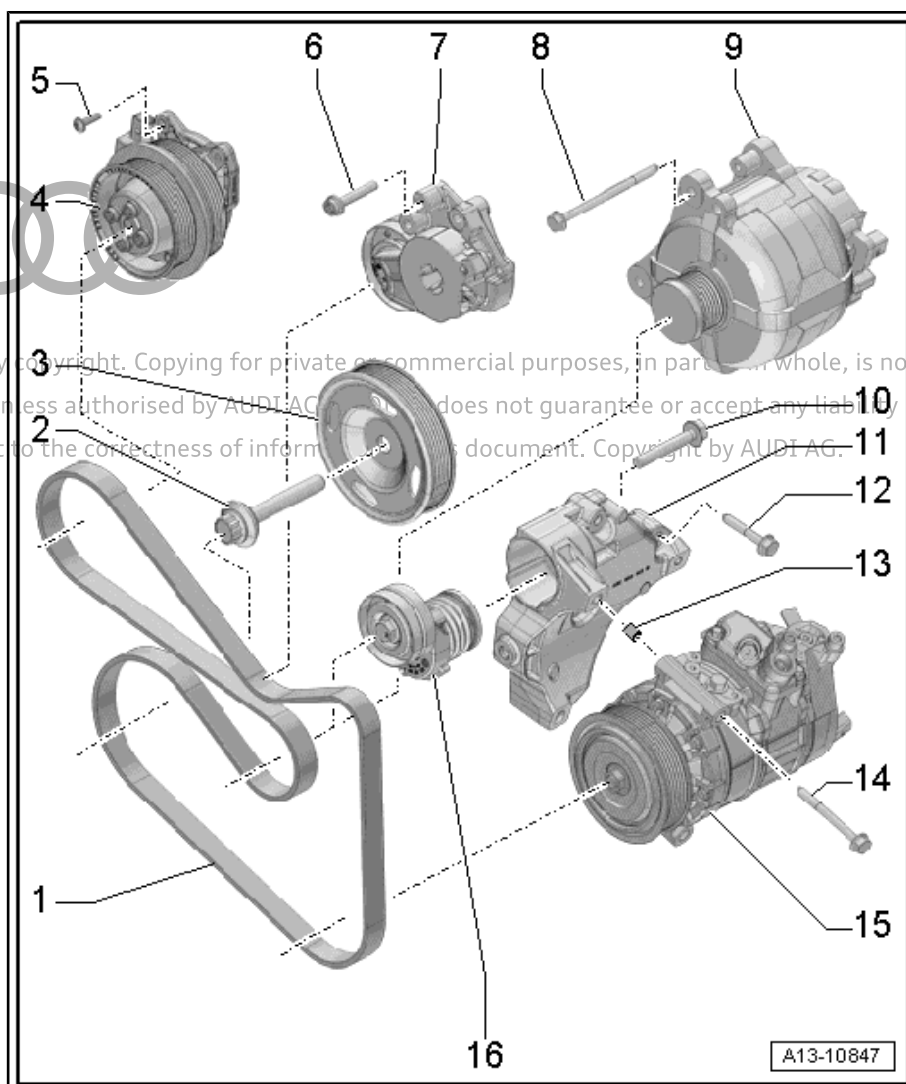
- ☐ Check for wear
- ☐ Mark direction of rotation with chalk or felt-tip pen for re-installation
- ☐ Removing and installing
⇒ [“1.2.1 Removing and installing poly V-belt for ancillaries”, page 40](#)
- ☐ Do not kink
- ☐ When installing, make sure it is properly seated on pulleys

2 - Bolt

- ☐ With washer
- ☐ Renew
- ☐ Lubricate thread with oil before fitting
- ☐ Contact surface must be free of oil and grease
- ☐ 150 Nm +180°

3 - Poly V-belt pulley

- ☐ For crankshaft
- ☐ With diamond-coated washer
⇒ [Fig. “Diamond-coated washers”, page 39](#)
- ☐ Removing and installing
⇒ [“1.5 Removing and installing pulley”, page 51](#)
- ☐ Contact surfaces must





be free of oil and grease



4 - Coolant pump

- ☐ With magnetic clutch for supercharger - N421-
- ☐ Removing and installing ⇒ [“2.4 Removing and installing coolant pump”, page 178](#)

5 - Bolt

- ☐ Tightening torque ⇒ [Item 2 \(page 175\)](#)

6 - Bolt

- ☐ 23 Nm

7 - Tensioner (top)

- ☐ For poly V-belt
- ☐ Removing and installing
⇒ [“1.3.1 Removing and installing tensioner for poly V-belt, tensioner \(top\) for ancillaries”, page 45](#)

8 - Bolt

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

9 - Alternator

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

10 - Bolt

- ☐ Renew
- ☐ 40 Nm +90°

11 - Bracket

- ☐ For air conditioner compressor
- ☐ Removing and installing ⇒ [“1.4 Removing and installing bracket for ancillaries”, page 50](#)

12 - Bolt

- ☐ 23 Nm

13 - Dowel sleeve

- ☐ 2x



14 - Bolt

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

15 - Air conditioner compressor

- ☐ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Exploded view - air conditioner compressor drive unit

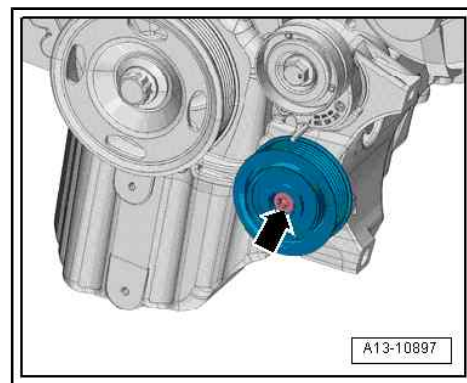
16 - Tensioner (bottom)

- ☐ For poly V-belt
- ☐ Removing and installing
⇒ [“1.3.2 Removing and installing poly V-belt tensioner \(bottom\), vehicles with air conditioning”, page 45](#)



Idler roller for vehicles without air conditioning

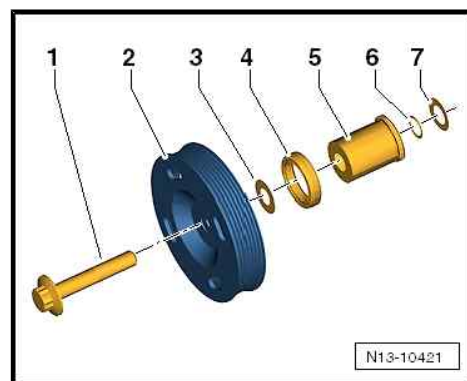
- Tighten bolt -arrow- to 55 Nm.



Diamond-coated washers

Two diamond-coated washers prevent the crankshaft from rotating when the bolt for the pulley is being tightened.

- 1 - Bolt
- 2 - Pulley
- 3 - Diamond-coated washer clipped into pulley - renew after removing
- 4 - Crankshaft oil seal
- 5 - Bearing bush
- 6 - O-ring
- 7 - Diamond-coated washer between bearing bush and crankshaft chain sprocket - renew after removing



1.1.2 Exploded view - poly V-belt drive for supercharger



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1 - Poly V-belt

- ☐ For supercharger
- ☐ Check for wear
- ☐ Mark direction of rotation with chalk or felt-tip pen for re-installation
- ☐ Removing and installing
⇒ [“1.2.2 Removing and installing poly V-belt for supercharger”, page 43](#)
- ☐ When installing, make sure it is properly seated on pulleys

2 - Tensioner

- ☐ For poly V-belt
- ☐ Removing and installing
⇒ [“1.3.3 Removing and installing tensioner for poly V-belt for supercharger”, page 46](#)

3 - Bolt

- ☐ 23 Nm

4 - Bolt

- ☐ Tightening torque
⇒ [Item 4 \(page 226\)](#)

5 - Poly V-belt pulley

6 - Compressor

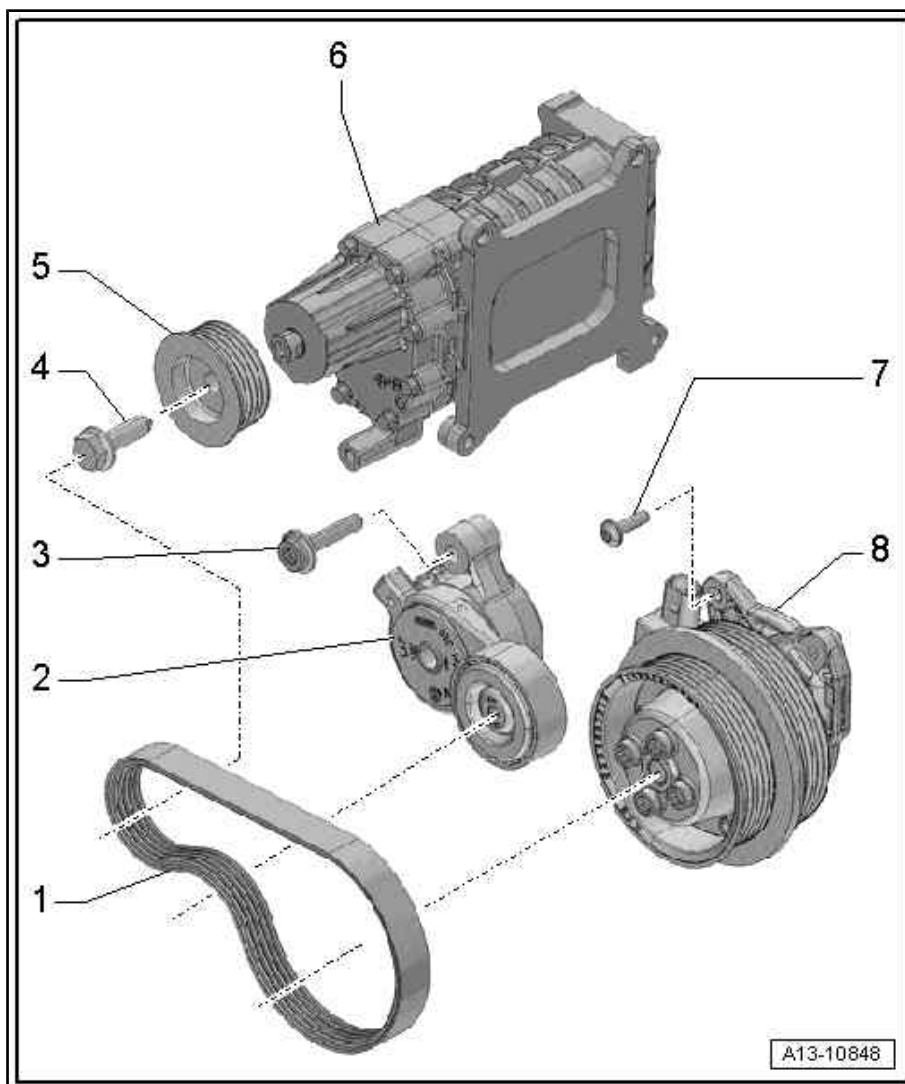
- ☐ Exploded view
⇒ [“3.1 Exploded view - compressor”, page 226](#)

7 - Bolt

- ☐ Tightening torque
⇒ [Item 2 \(page 175\)](#)

8 - Coolant pump

- ☐ With magnetic clutch for supercharger - N421-
- ☐ Removing and installing ⇒ [“2.4 Removing and installing coolant pump”, page 178](#)



1.2 Removing and installing poly V-belts

⇒ [“1.2.1 Removing and installing poly V-belt for ancillaries”, page 40](#)

⇒ [“1.2.2 Removing and installing poly V-belt for supercharger”, page 43](#)

1.2.1 Removing and installing poly V-belt for ancillaries

Special tools and workshop equipment required

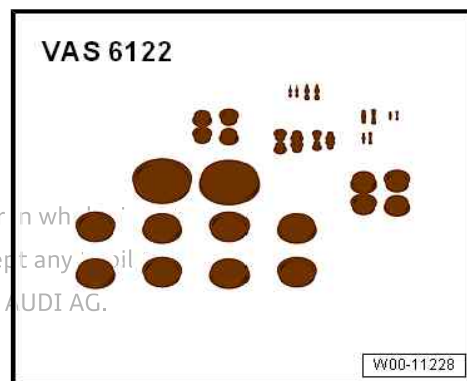
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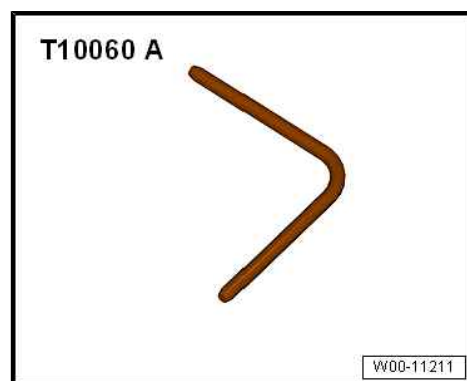
◆ Engine bung set - VAS 6122-



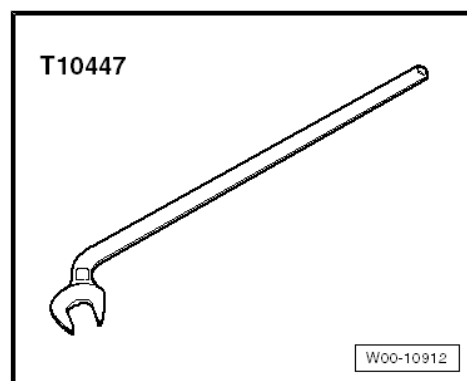
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◆ Locking pin - T10060 A-



◆ Open-end spanner, 16 mm - T10447-



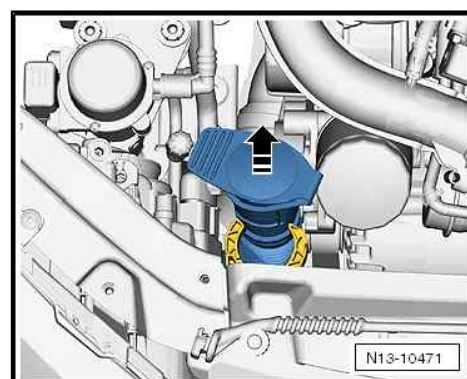
Removing



WARNING

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

- ◆ *Even when the ignition is switched off, the radiator fans can start up without warning due to accumulated heat in the engine compartment, etc.*
- ◆ *Unplug electrical connectors before working in vicinity of radiator cowl.*

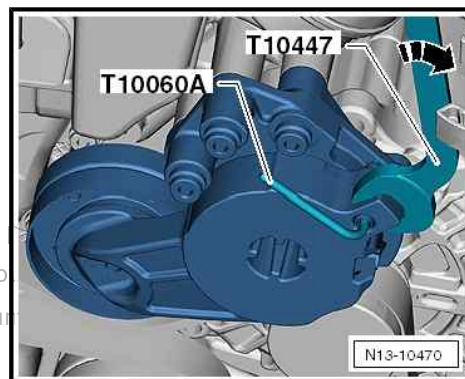


- Press washer fluid filler neck out of bracket -arrow-.

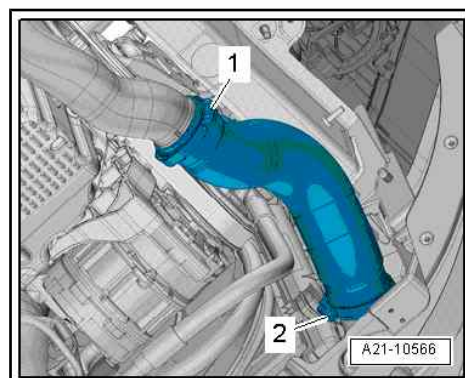


- Slacken poly V-belt by turning tensioner (top) in clockwise direction -arrow- using open-end spanner, 16 mm - T10447- .
- Lock tensioner with locking pin - T10060 A- .
- Remove noise insulation ➔ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

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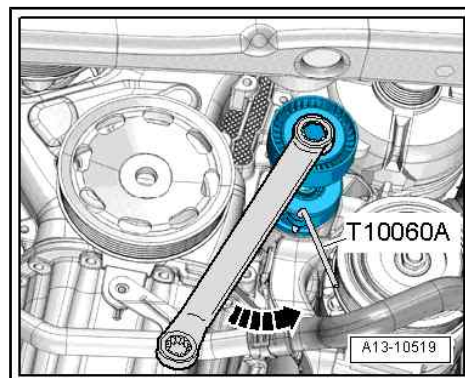
- Release hose clips -1 and 2- and remove air hose.
- Seal off open lines and connections with clean plugs from engine bung set - VAS 6122- .



Caution

Running a used poly V-belt in the opposite direction could cause irreparable damage.

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

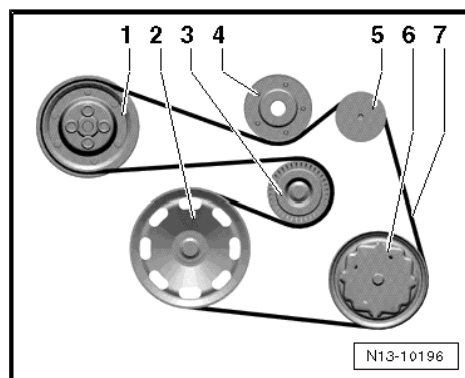


- Slacken poly V-belt by turning tensioner (bottom) in anti-clockwise direction -arrow-.
- Lock tensioner with locking pin - T10060 A- .
- Take off poly V-belt.

Installing

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

- Fit poly V-belt -7- onto pulleys as shown in illustration.
- 1 - Coolant pump
 - 2 - Crankshaft
 - 3 - Tensioner (bottom)
 - 4 - Tensioner (top)
 - 5 - Alternator
 - 6 - Vehicles not equipped with air conditioning: idler roller
 - 7 - Vehicles with air conditioning: A/C compressor





- Hold tensioner (bottom) with ring spanner and remove locking pin - T10060 A- .
- Release tensioner.



- Hold tensioner (top) with open-end spanner, 16 mm - T10447- and remove locking pin - T10060 A- .
- Release tensioner.

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Note

Make sure that the poly V-belt is properly seated on the pulleys.

- Install air hoses with screw-type clips
⇒ [“2.2 Exploded view - hose connections for charge air system”, page 221](#) .
- Start engine and check that poly V-belt runs properly.

Tightening torques

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

1.2.2 Removing and installing poly V-belt for supercharger

Removing

- Remove poly V-belt
⇒ [“1.2.1 Removing and installing poly V-belt for ancillaries”, page 40](#) .

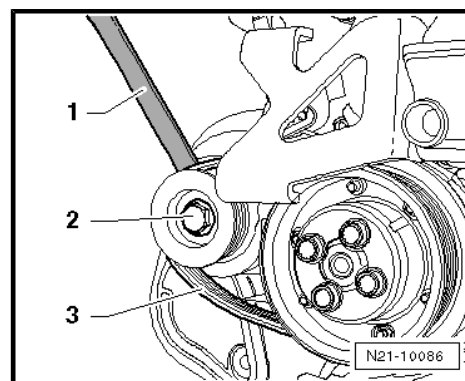
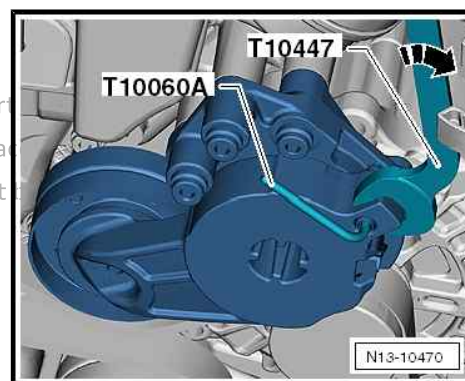
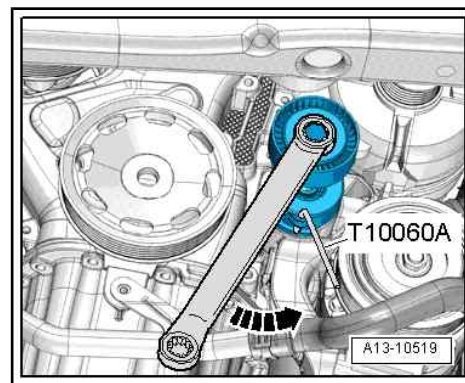


Caution

Running a used poly V-belt in the opposite direction could cause irreparable damage.

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

- Counterhold supercharger shaft using open-end spanner, 16 mm -item 1- and remove bolt -2-.
- Detach belt pulley and poly V-belt -3-.





Installing



Note

- ◆ *The pulley for the magnetic clutch for supercharger - N421- is located behind the coolant pump pulley.*
- ◆ *The poly V-belt -4- runs on the pulley for the magnetic clutch for supercharger - N421- .*

1 - Pulley for supercharger

2 - Tensioning roller

3 - Pulley for coolant pump with pulley for magnetic clutch for supercharger - N421-

4 - Poly V-belt

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



Note

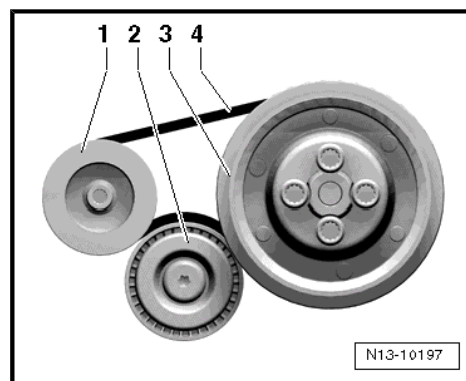
Make sure that the poly V-belt is properly seated on the pulleys.

- Install poly V-belt tensioner for supercharger
⇒ ["1.3.3 Removing and installing tensioner for poly V-belt for supercharger", page 46](#) .
- Start engine and check that poly V-belt(s) run properly.

Tightening torques

- ◆ ⇒ ["1.1.2 Exploded view - poly V-belt drive for supercharger", page 39](#)

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1.3 Removing and installing tensioner for poly V-belt

⇒ [“1.3.1 Removing and installing tensioner for poly V-belt, tensioner \(top\) for ancillaries”, page 45](#)

⇒ [“1.3.2 Removing and installing poly V-belt tensioner \(bottom\), vehicles with air conditioning”, page 45](#)

⇒ [“1.3.3 Removing and installing tensioner for poly V-belt for supercharger”, page 46](#)

⇒ [“1.3.4 Removing and installing idler roller, vehicles without air conditioning”, page 50](#)

1.3.1 Removing and installing tensioner for poly V-belt, tensioner (top) for ancillaries

Removing

- Remove poly V-belt
⇒ [“1.2.1 Removing and installing poly V-belt for ancillaries”, page 40](#) .
- Remove bolts -arrows- and take off poly V-belt tensioner (top).

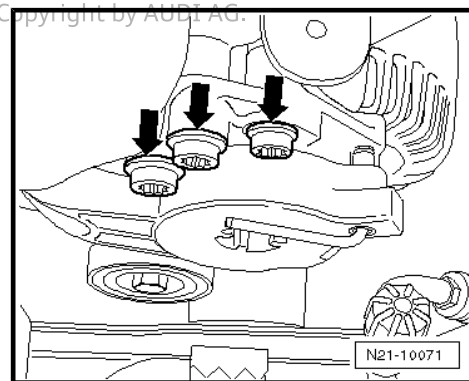
Installing

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

- Install poly V-belt
⇒ [“1.2.1 Removing and installing poly V-belt for ancillaries”, page 40](#) .

Tightening torques

- ◆ ⇒ [“1.1.1 Exploded view - poly V-belt drive for ancillaries”, page 37](#)



1.3.2 Removing and installing poly V-belt tensioner (bottom), vehicles with air conditioning

Removing

- Remove poly V-belt
⇒ [“1.2.1 Removing and installing poly V-belt for ancillaries”, page 40](#) .



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



WARNING

Risk of injury caused by refrigerant.

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

- Remove bolts -arrows- for air conditioner compressor.



Caution

Risk of damage to refrigerant lines and hoses

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

- Tie up air conditioner compressor together with refrigerant hoses to longitudinal member (refrigerant hoses remain connected).

- Remove bolt -arrow- and take off tensioner -1-.

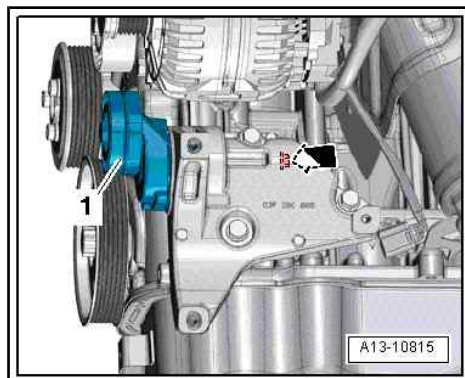
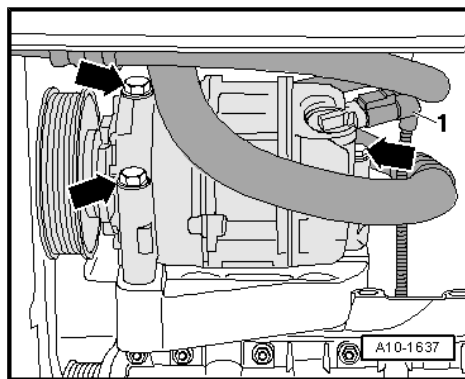
Installing

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

- Install poly V-belt
⇒ ["1.2.1 Removing and installing poly V-belt for ancillaries", page 40](#) .

Tightening torques

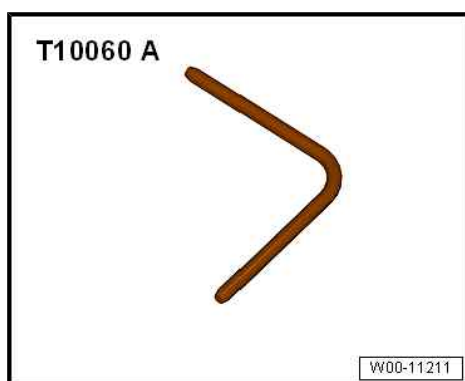
- ◆ ⇒ ["1.1.1 Exploded view - poly V-belt drive for ancillaries", page 37](#)
- ◆ ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Exploded view - air conditioner compressor drive unit



1.3.3 Removing and installing tensioner for poly V-belt for supercharger

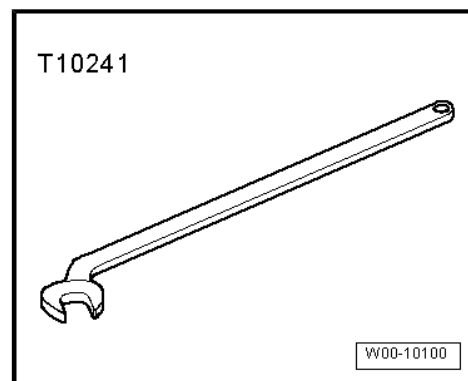
Special tools and workshop equipment required

- ◆ Locking pin - T10060 A-





- ◆ Open-end spanner, 16 mm - T10241-



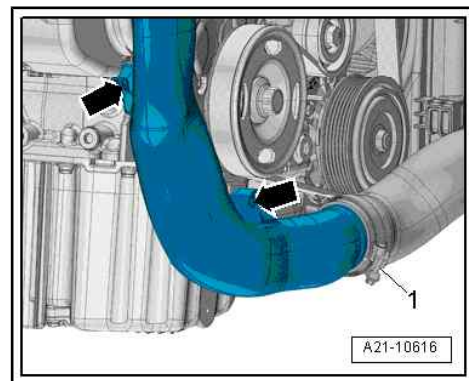
Removing

- Remove engine cover panel
⇒ ["3.1 Removing and installing engine cover panel"](#),
[page 36](#) .
- Remove wheel housing liner (front right) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Removing and installing wheel housing liner (front) .
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .
- Remove bolts -arrows-.



Note

Disregard -item 1-.

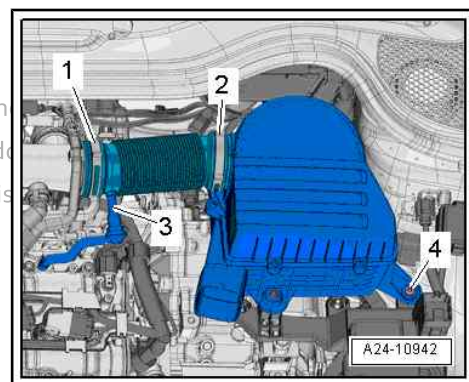


- Release hose clips -1 and 2- and remove air hose.
- Disconnect vacuum hose -3- from air hose.



Note

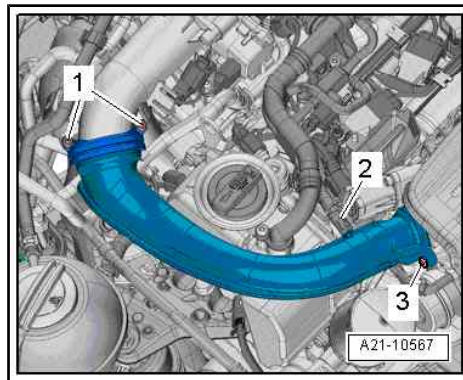
Disregard -item 4-.



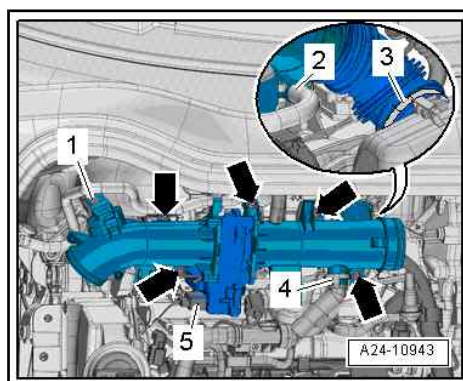
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- Remove bolts -1, 3-.
- Release hose clip -2-, detach air pipe (top right) and remove air hose.



- Unplug electrical connectors on:
 - 1 - Intake air temperature sender 3 - G520-
 - 5 - Regulating flap control unit - J808-
- Release hose clip -3- and move clear fuel hose -2-.
- Remove bolts -arrows-, detach intake connecting pipe and at the same time disconnect crankcase breather hose -4- (press release tabs).

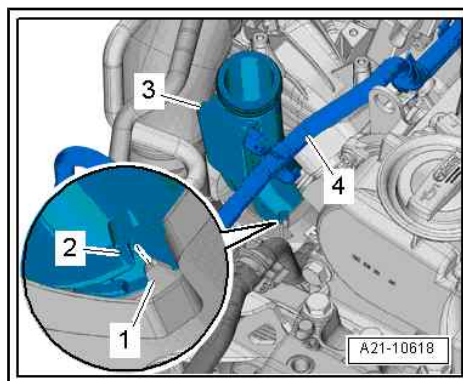


- Move clear fuel hose -4- and detach air pipe -3-.
- Seal off open connections to supercharger with clean cloths.

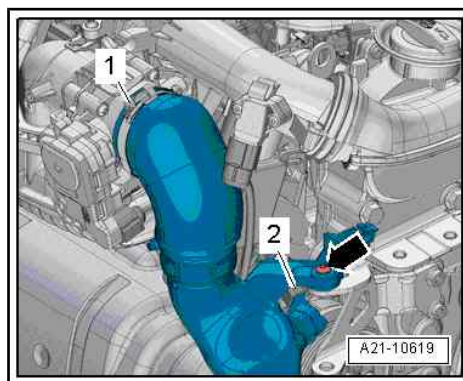


Note

Disregard items -1 and 2-.



- Unplug electrical connector -2- and release hose clip -1-.
- Remove bolt -arrow-.



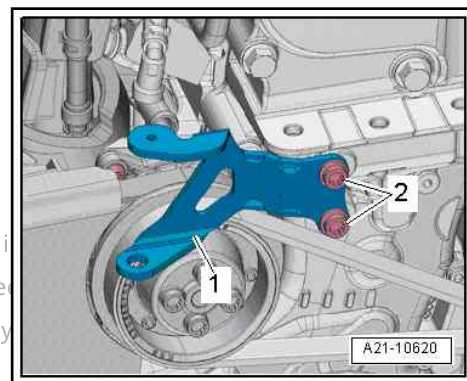
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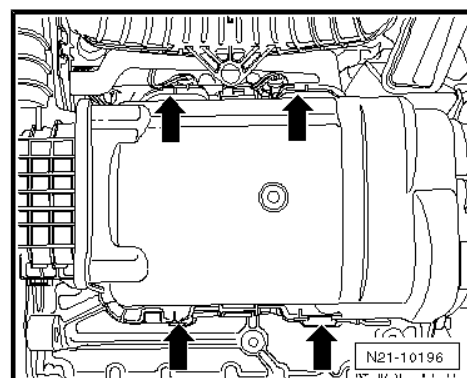
- Remove bolts -2- and detach bracket -1- and air pipe (right-side).



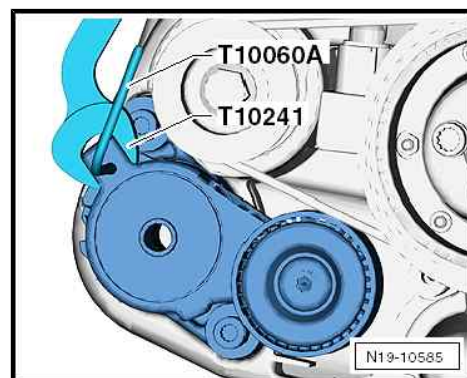
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- Carefully press retaining tabs on cover for noise insulation for supercharger outwards -arrows-.
- Detach cover (front) together with noise insulation.



- Slacken poly V-belt for supercharger by turning tensioner in clockwise direction using open-end spanner, 16 mm - T10241- .
- Lock tensioner with locking pin - T10060 A- .





- Remove bolts -arrows- and take off poly V-belt tensioner.

Installing

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



Note

Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ *Electronic parts catalogue* .

- Install air pipes
⇒ [“2.1 Exploded view - charge air system”, page 220](#) .
- Install air hoses with screw-type clips
⇒ [“2.2 Exploded view - hose connections for charge air system”, page 221](#) .

Tightening torques

- ♦ ⇒ [“1.1.2 Exploded view - poly V-belt drive for supercharger”, page 39](#)
- ♦ Intake connecting pipe
⇒ [“2.1 Exploded view - air cleaner housing”, page 238](#)
- ♦ ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front)
- ♦ ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

1.3.4 Removing and installing idler roller, vehicles without air conditioning

Removing

- Remove poly V-belt
⇒ [“1.2.1 Removing and installing poly V-belt for ancillaries”, page 40](#) .
- Unscrew bolt -arrow- and remove idler roller.

Installing

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

- Install poly V-belt
⇒ [“1.2.1 Removing and installing poly V-belt for ancillaries”, page 40](#) .

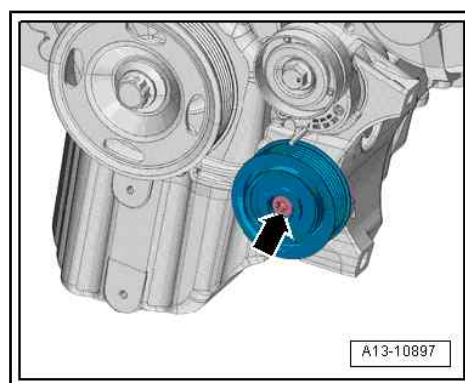
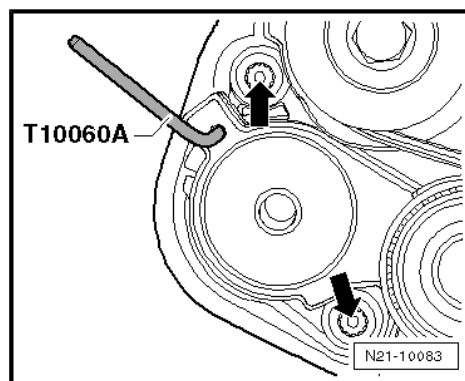
Tightening torques

- ♦ ⇒ [Fig. “Idler roller for vehicles without air conditioning”, page 39](#)

1.4 Removing and installing bracket for ancillaries

Removing

- Remove poly V-belt
⇒ [“1.2.1 Removing and installing poly V-belt for ancillaries”, page 40](#) .





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



WARNING

Risk of injury caused by refrigerant.

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

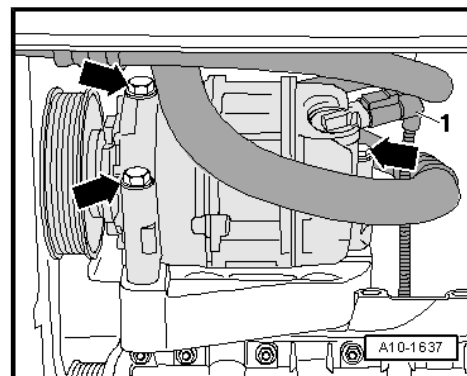
- Remove bolts -arrows- for air conditioner compressor.



Caution

Risk of damage to refrigerant lines and hoses

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



- Tie up air conditioner compressor together with refrigerant hoses to longitudinal member (refrigerant hoses remain connected).
- Unscrew bolts -1- and detach bracket for air conditioner compressor.

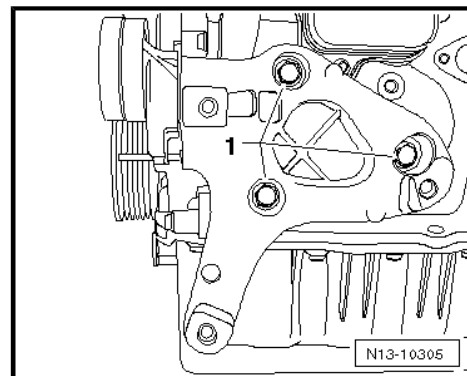
Installing

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

- Install poly V-belt
⇒ [“1.2.1 Removing and installing poly V-belt for ancillaries”, page 40](#) .

Tightening torques

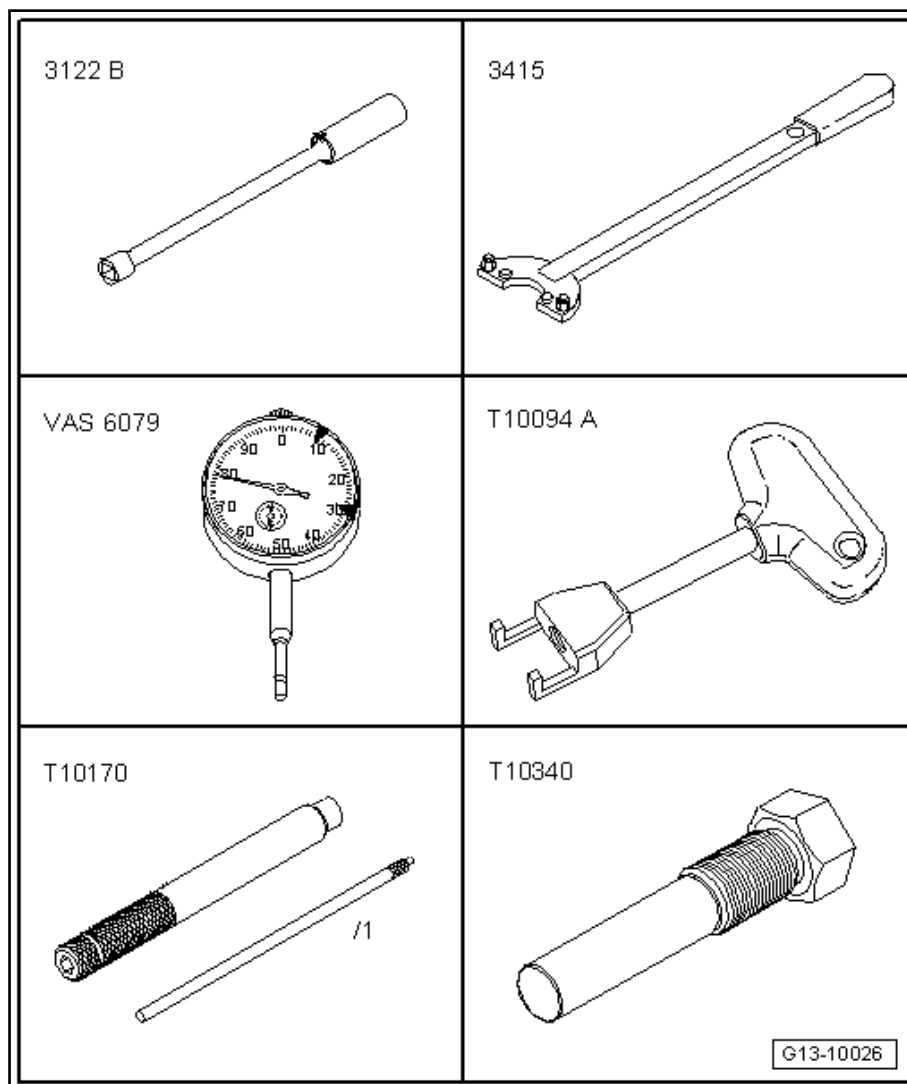
- ◆ ⇒ [“1.1.1 Exploded view - poly V-belt drive for ancillaries”, page 37](#)
- ◆ ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Exploded view - air conditioner compressor drive unit



1.5 Removing and installing pulley



Special tools and workshop equipment required



- ◆ Spark plug spanner - 3122 B-
- ◆ Counterhold tool - 3415- with pins -3415/1-
- ◆ Dial gauge - VAS 6079-
- ◆ Puller - T10094 A-
- ◆ Adapter for dial gauge - T10170-
- ◆ Locking pin - T10340-

Removing



Note

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- ◆ Use locking pin - 3415- in addition to counterhold tool - T10340- to prevent slipping and to make sure the tightening torque for the crankshaft pulley bolt is maintained.
- ◆ The locking pin - T10340- locks the crankshaft only in the direction of engine rotation.



Caution

Risk of damage to engine.

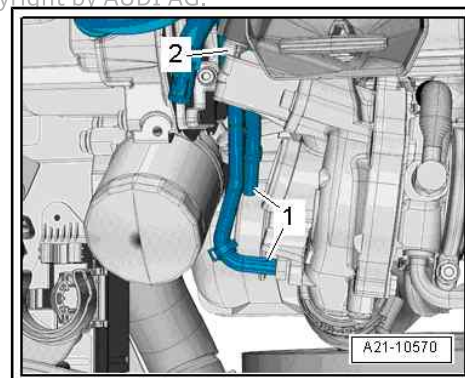
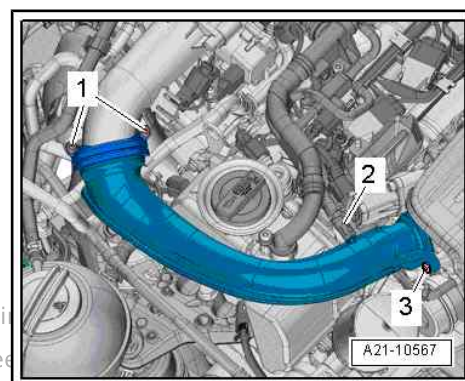
- ◆ **Locking pin - T10340- must be screwed in with crankshaft at "TDC" position.**

- Remove poly V-belt
 ⇒ ["1.2.1 Removing and installing poly V-belt for ancillaries", page 40](#) .
- Remove engine cover panel
 ⇒ ["3.1 Removing and installing engine cover panel", page 36](#) .
- Remove bolts -1, 3-.
- Release hose clip -2-, detach air pipe (top right) and remove air hose.

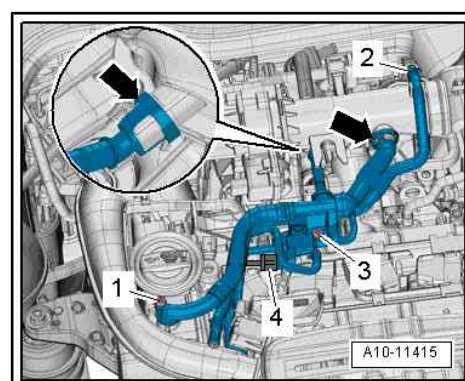


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- Unplug electrical connector -2-.
- Detach vacuum hoses -1-.

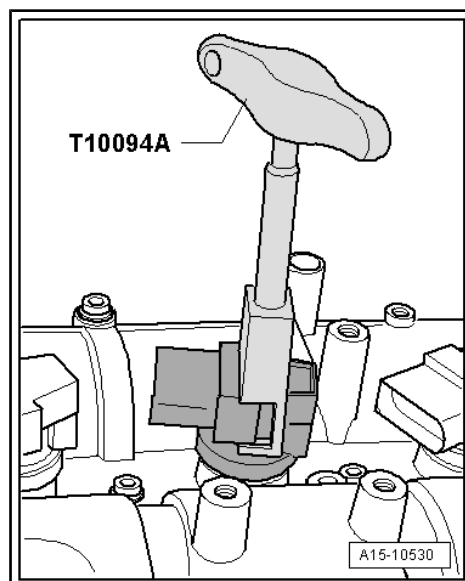


- Unplug electrical connector -4-.
- Remove bolts -1, 3-.
- Press release tabs and disconnect crankcase breather hoses -arrows-.
- Release hose clip -2- and disconnect hose at activated charcoal filter.
- Detach hoses.

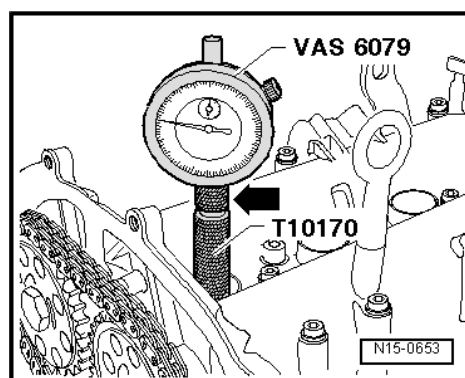




- Apply puller - T10094 A- to ignition coil for cylinder 1, pull out ignition coil and at the same time unplug electrical connector at ignition coil for cylinder 1.
- Remove spark plug for cylinder 1 with spark plug socket and extension - 3122 B- .



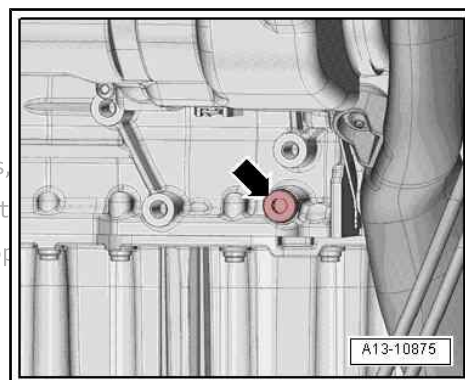
- Screw adapter for dial gauge - T10170- into spark plug hole as far as the stop.
- Insert dial gauge - VAS 6079- with extension -T10170/1- as far as the stop and secure using locking nut -arrow-.
- Rotate crankshaft in normal direction of rotation to “TDC”.
- “TDC” = maximum measured value on dial gauge.



- Unscrew plug -arrow- for “TDC” hole on cylinder block.



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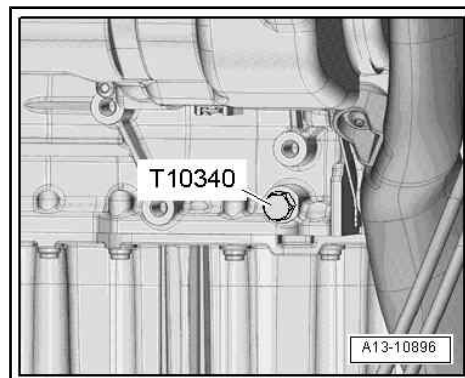
- Screw locking pin - T10340- into cylinder block as far as stop and tighten to 30 Nm.



Note

The locking pin - T10340- locks the crankshaft only in the direction of engine rotation.

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



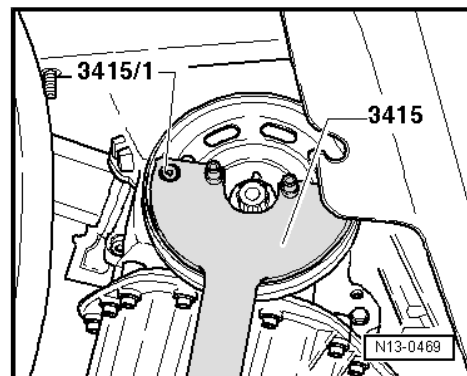


Caution

Risk of damage to engine.

- ◆ **To prevent the crankshaft chain sprocket from slipping off the drive lug, do not rotate the crankshaft after the poly V-belt pulley has been detached.**

- Loosen bolt for poly V-belt pulley using counterhold tool - 3415- with pin -3415/1- .
- Remove bolt and take off poly V-belt pulley.



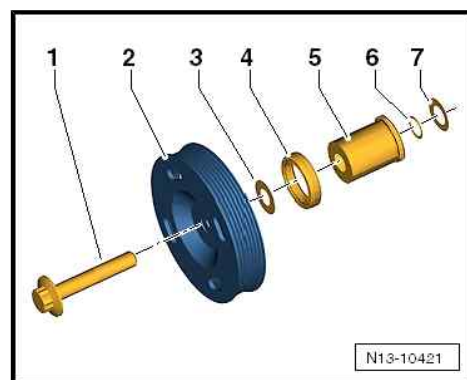
Installing

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Note

- ◆ **Renew bolts tightened with specified tightening angle.**
- ◆ **Renew diamond-coated washers.**
- All of the following contact surfaces including crankshaft chain sprocket must be free of oil and grease.
- 1 - Bolt
- 2 - Pulley
- 3 - Diamond-coated washer
- 5 - Bearing bush
- 7 - Diamond-coated washer
- Fit poly V-belt pulley, lubricate threads of bolt for poly V-belt pulley with oil and screw in by hand until bolt makes contact.

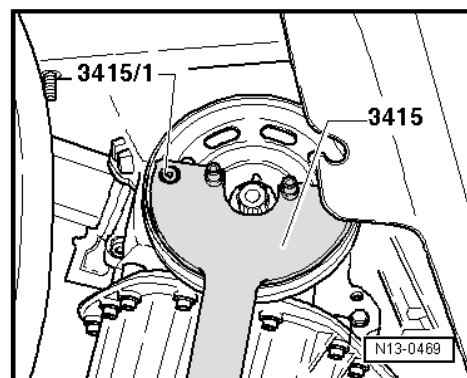


Caution

Risk of damage to engine.

- ◆ **Use dial gauge to check "TDC" position of crankshaft. Crankshaft must only be brought into contact with locking pin - T10340- from "TDC" position.**
- ◆ **Also use counterhold tool - 3415- and pin -3415/1- to counterhold poly V-belt pulley when tightening bolt.**

- Turn crankshaft in direction of engine rotation until it makes contact with locking pin - T10340- .
- Tighten bolt for poly V-belt pulley (counterhold with counterhold tool - 3415- and pin -3415/1-).





- Remove locking pin - T10340- .

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



Note

Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ *Electronic parts catalogue* .

- Install spark plug ⇒ Maintenance : Booklet 819
- Tighten plug for “TDC” drilling
⇒ [Fig. “Plug for TDC drilling - tightening torque”](#), [page 73](#) .
- Install air pipe (top right)
⇒ [“2.1 Exploded view - charge air system”, page 220](#) .
- Install air hoses with screw-type clips
⇒ [“2.2 Exploded view - hose connections for charge air system”, page 221](#) .
- Install poly V-belt
⇒ [“1.2.1 Removing and installing poly V-belt for ancillaries”, page 40](#) .

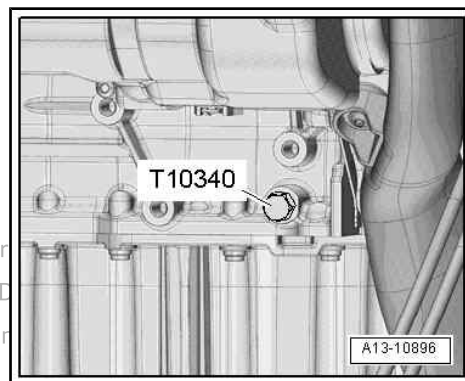
Tightening torques

- ♦ ⇒ [“1.1.1 Exploded view - poly V-belt drive for ancillaries”, page 37](#)
- ♦ ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front)

1.6 Renewing crankshaft oil seal (pulley end)

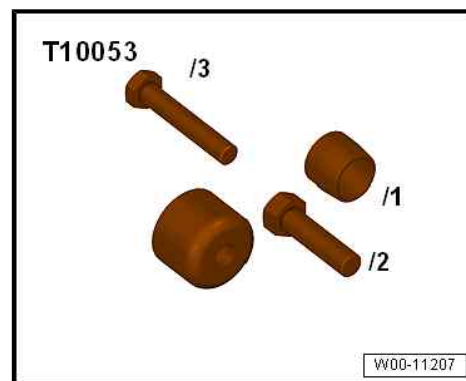
Special tools and workshop equipment required

- ♦ Oil seal extractor - 3203-

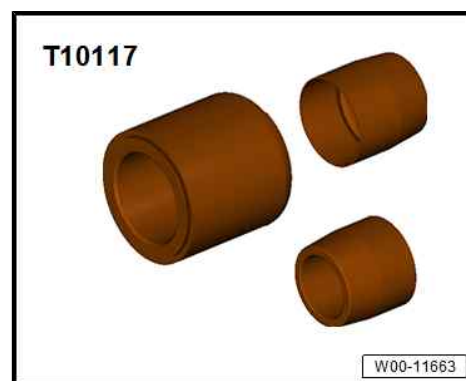




◆ Assembly tool - T10053-

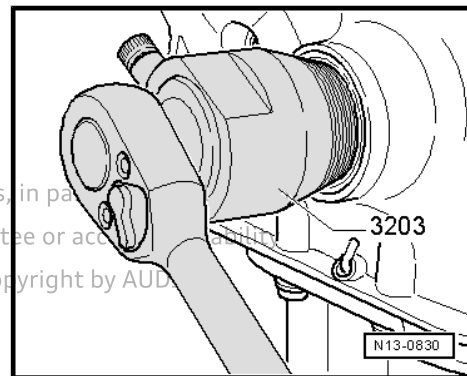


◆ Assembly tool - T10117-



Procedure

- Remove poly V-belt pulley for crankshaft
 ⇒ ["1.5 Removing and installing pulley", page 51](#) .
- Adjust inner part of oil seal extractor - 3203- so that it is level with the outer part and lock in position with knurled screw.
- Lubricate threaded head of oil seal extractor, place it in position and screw it into oil seal as far as possible (applying firm pressure).
- Loosen knurled screw and turn inner part against crankshaft until the oil seal is pulled out.
- Clamp flats of oil seal extractor in vice and use pliers to remove oil seal.
- Remove bearing bush and O-ring from crankshaft journal.
- Clean contact surfaces for crankshaft chain sprocket and bush.
- Clean contact surface and sealing surface for oil seal.



Note

Fit new O-ring.

- Push bush with O-ring onto crankshaft journal.

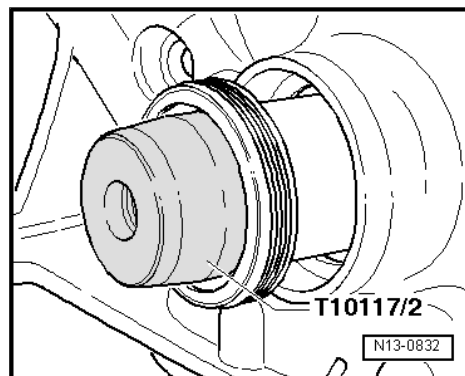


Note

Do not lubricate sealing lip and outer rim of oil seal before pressing in.



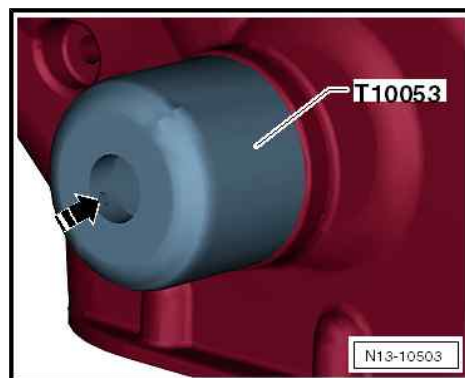
- Apply guide sleeve -T10117/2- to bearing bush and slide oil seal over guide sleeve.
- Take off guide sleeve.



- Drive in oil seal carefully as far as stop using assembly tool - T10053- and a hammer -arrow-.

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

- Install poly V-belt pulley for crankshaft
⇒ ["1.5 Removing and installing pulley", page 51](#) .



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2 Cylinder block (gearbox end)

⇒ [“2.1 Exploded view - cylinder block \(gearbox end\)”, page 59](#)

⇒ [“2.2 Removing and installing flywheel”, page 60](#)

⇒ [“2.3 Removing and installing sealing flange \(gearbox end\)”, page 61](#)

2.1 Exploded view - cylinder block (gearbox end)

1 - Bolt

- ☐ Renew
- ☐ 60 Nm +90°

2 - Flywheel

- ☐ Different versions available ⇒ Electronic parts catalogue
- ☐ Can only be installed in one position (holes are off-set)
- ☐ Removing and installing
⇒ [“2.2 Removing and installing flywheel”, page 60](#)

3 - Sender wheel

- ☐ For engine speed sender - G28
- ☐ Removing and installing
⇒ [“2.3 Removing and installing sealing flange \(gearbox end\)”, page 61](#)

4 - Bolt

- ☐ Renew
- ☐ 12 Nm

5 - Intermediate plate

- ☐ Must be positioned on dowel sleeves
- ☐ Do not damage or bend when assembling
- ☐ Installing
⇒ [Fig. “Installing intermediate plate””, page 60](#)

6 - Engine speed sender - G28-

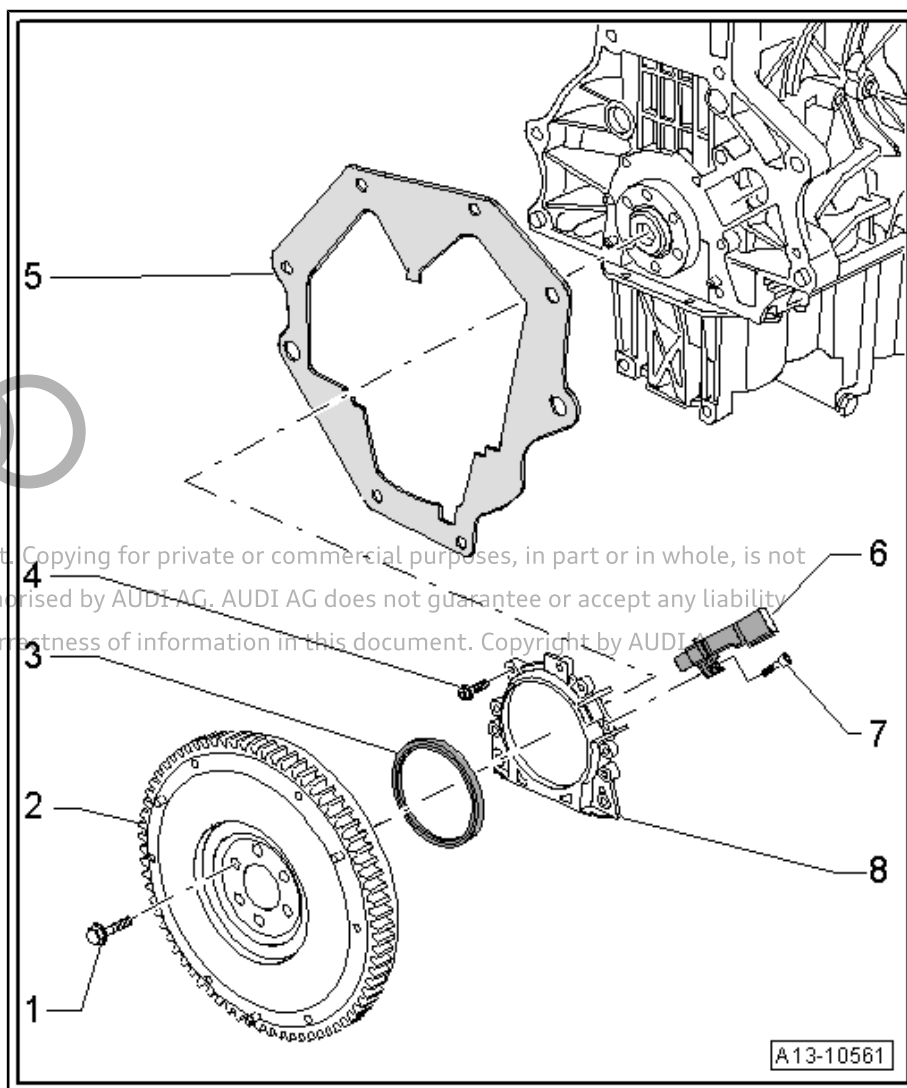
- ☐ Removing and installing ⇒ [“1.6 Removing and installing engine speed sender G28”, page 291](#)

7 - Bolt

- ☐ Tightening torque ⇒ [Item 10 \(page 288\)](#)

8 - Sealing flange

- ☐ With oil seal
- ☐ Renewing ⇒ [“2.3 Removing and installing sealing flange \(gearbox end\)”, page 61](#)

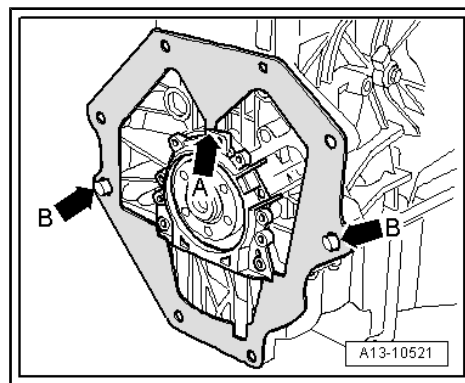


A13-10561



Installing intermediate plate

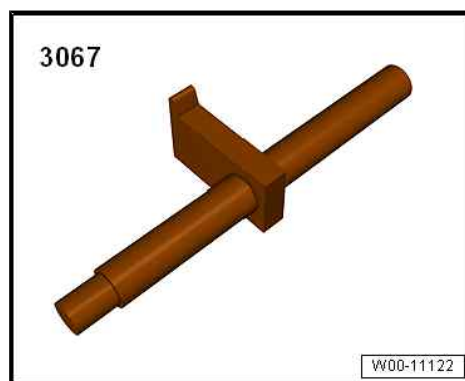
- Engage intermediate plate on sealing flange -arrow A- and push onto dowel sleeves -arrows B-.



2.2 Removing and installing flywheel

Special tools and workshop equipment required

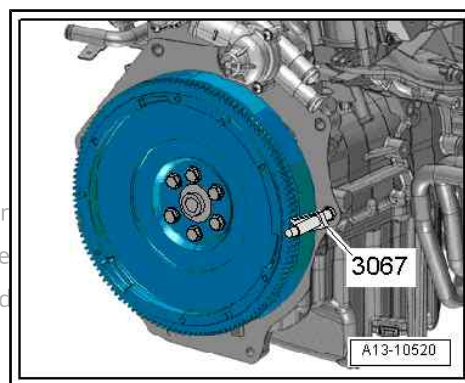
- ◆ Counterhold tool - 3067-



Removing

- Gearbox removed ⇒ Rep. gr. 34 ; Removing and installing gearbox; Removing gearbox
- Insert counterhold tool - 3067- to slacken bolts.

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Vehicles with dual-mass flywheel:

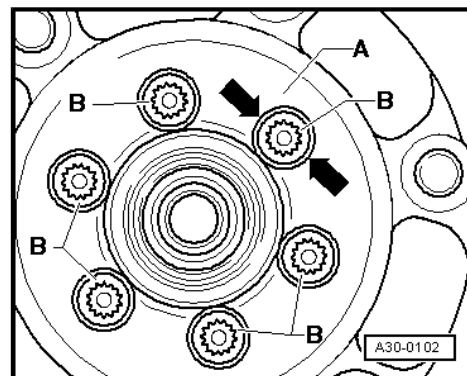


Caution

Make sure dual-mass flywheel is not damaged on removal.

- ◆ ***Remove bolts -B- using normal hand tools (do not use pneumatic wrench or impact driver, etc.). The bolts may only be removed by hand using conventional tools.***

- Rotate the dual-mass flywheel -A- so that the bolts align centrally with the holes -arrows-.
- When unscrewing the bolts, make sure that the bolt heads do not come into contact with the dual-mass flywheel; the flywheel will otherwise be damaged as the bolts are screwed out.



All vehicles (continued):

- Remove bolts and take off flywheel.

Installing

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



Note

- ◆ *Renew bolts tightened with specified tightening angle.*
- ◆ *Can only be installed in one position (holes are off-set)*
- Fit counterhold tool - 3067- the other way round to tighten bolts.

Tightening torques

- ◆ ⇒ "2.1 Exploded view - cylinder block (gearbox end)", page 59

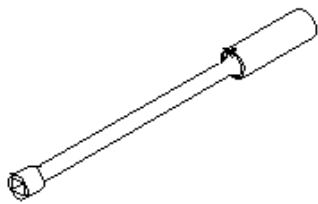
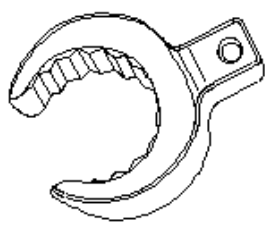
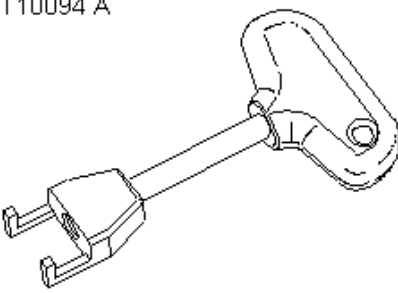
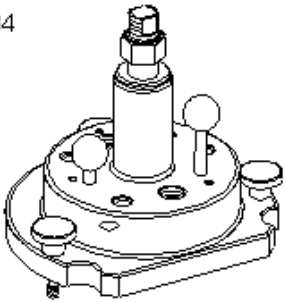
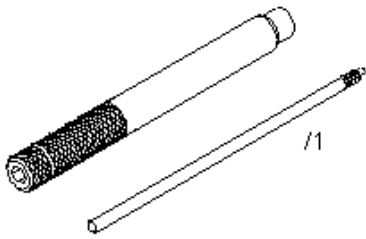
2.3 Removing and installing sealing flange (gearbox end)



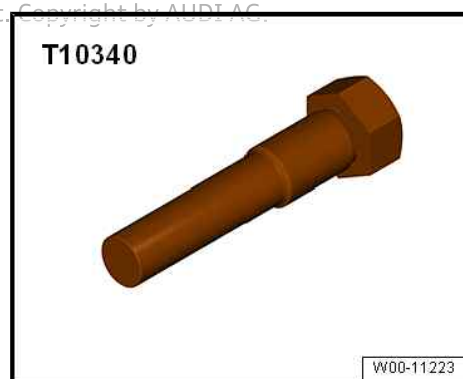
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Special tools and workshop equipment required

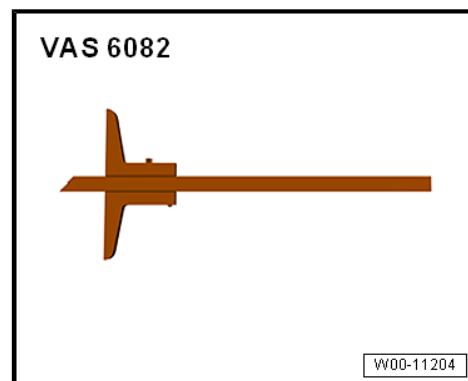
3122 B 	V.A.G 1332/11 
VAS 6079 	T10094 A 
T10134 	T10170  G13-10027

- ◆ Spark plug spanner - 3122 B-
- ◆ Open ring spanner - V.A.G 1332/11-
- ◆ Dial gauge - VAS 6079-
- ◆ Puller - T10094 A-
- ◆ Assembly tool - T10134-
- ◆ Adapter for dial gauge - T10170-
- ◆ Locking pin - T10340-





- ◆ Depth gauge - VAS 6082-



- ◆ Feeler gauge
- ◆ Bolt, M6x35 (3x)

Pressing sealing flange with sender wheel off crankshaft

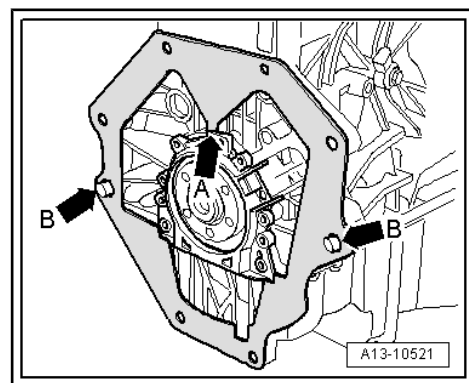
- Gearbox removed ⇒ Rep. gr. 34 ; Removing and installing gearbox; Removing gearbox



Note

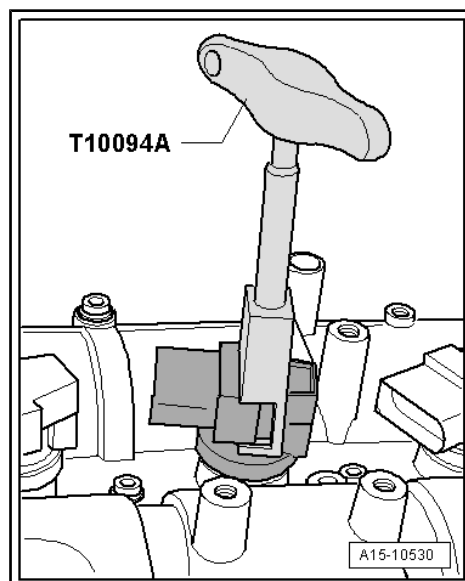
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- Remove flywheel
⇒ ["2.2 Removing and installing flywheel", page 60](#) .
- Remove engine speed sender - G28-
⇒ ["1.6 Removing and installing engine speed sender G28 ", page 291](#) .
- Press intermediate plate off dowel sleeves -arrows B- and detach from top of sealing flange -arrow A-

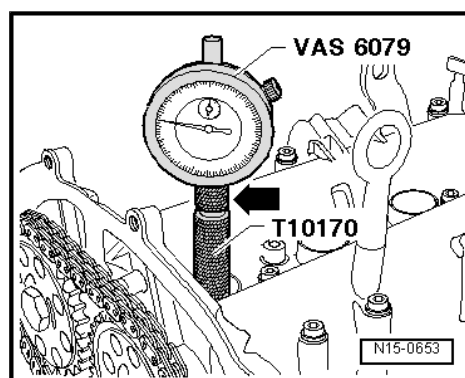




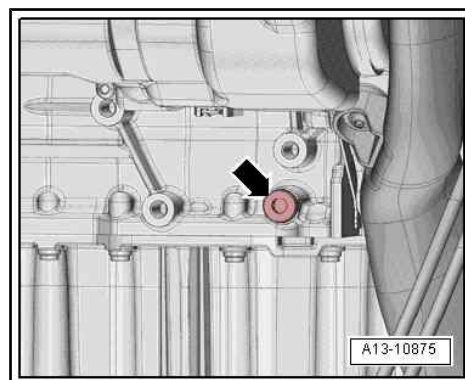
- Apply puller - T10094 A- to ignition coil for cylinder 1, pull out ignition coil and at the same time unplug electrical connector at ignition coil for cylinder 1.
- Remove spark plug for cylinder 1 with spark plug socket and extension - 3122 B- .



- Screw adapter for dial gauge - T10170- into spark plug hole as far as the stop.
- Insert dial gauge - VAS 6079- with extension -T10170/1- as far as the stop and secure using locking nut -arrow-.
- Rotate crankshaft in normal direction of rotation to "TDC".
- "TDC" = maximum measured value on dial gauge.



- Unscrew plug -arrow- for "TDC" hole on cylinder block.



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Caution

Risk of damage to engine.

- ◆ **Locking pin - T10340- must be screwed in with crankshaft at "TDC" position.**

- Screw locking pin - T10340- into cylinder block as far as stop and tighten to 30 Nm.



Note

The locking pin - T10340- locks the crankshaft only in the direction of engine rotation.

- Remove sump
⇒ ["1.3 Removing and installing sump", page 152](#) .
- Remove bolts for sealing flange.



Note

The sealing flange is pressed off the crankshaft together with the sender wheel.

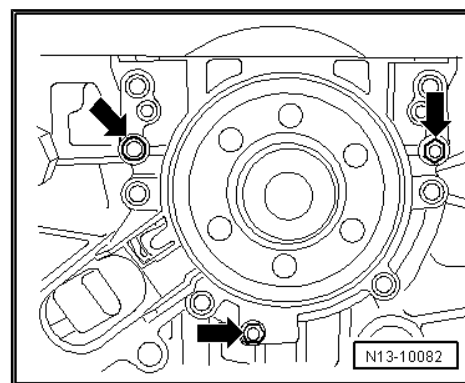
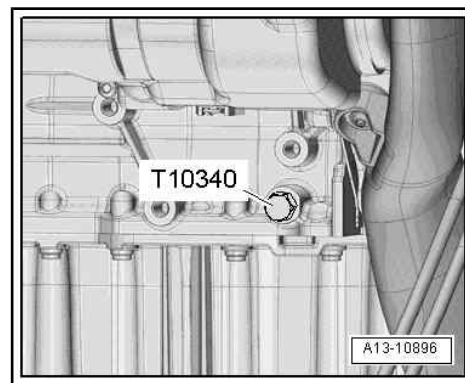
- To press off, screw 3 bolts M6x35 -arrows- alternately into sealing flange not more than 1/2 turn at a time.
- Take off sealing flange with sender wheel.

Pressing in sealing flange with sender wheel



Note

- ◆ *The sealing flange with PTFE oil seal is fitted with a sealing lip support ring. This support ring acts as an assembly sleeve and must not be removed before installation.*
- ◆ *Sealing flange and sender wheel must not be separated or rotated out of position after removal from packaging.*
- ◆ *The sender wheel is held in its installation position by a locating pin on the assembly tool - T10134- .*
- ◆ *The sealing flange and oil seal are one unit and can only be replaced together with the sender wheel.*
- ◆ *The assembly tool - T10134- is held in the correct position relative to the crankshaft by a guide pin which is inserted into a hole in the crankshaft.*





Construction of assembly tool - T10134- :

A - Tensioning flats

B - Nut

C - Assembly housing

D - Locating pin

E - Hexagon socket-head bolt

F - Guide pin for diesel engines (black handle)

G - Guide pin for petrol engines (red handle)

A - Fitting oil seal with sender wheel onto assembly tool - T10134- :

- Unscrew nut -B- until it is just in front of tightening flats -A- on threaded spindle.

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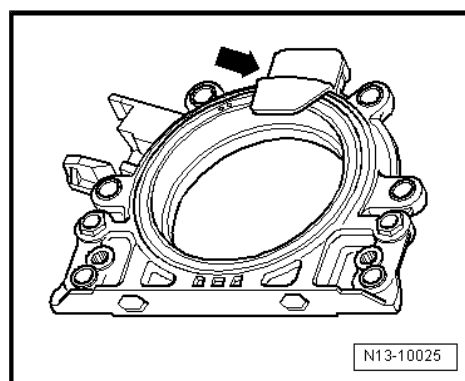
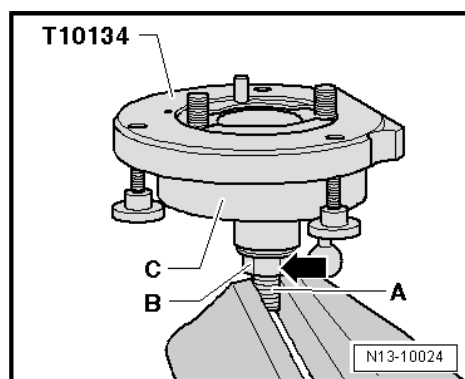
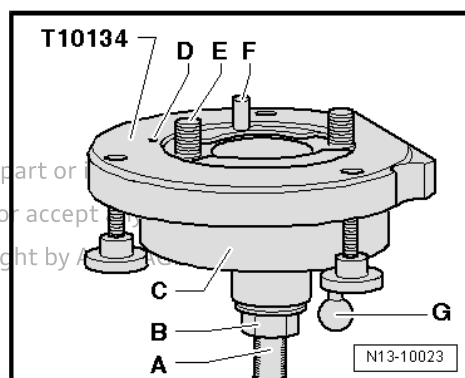
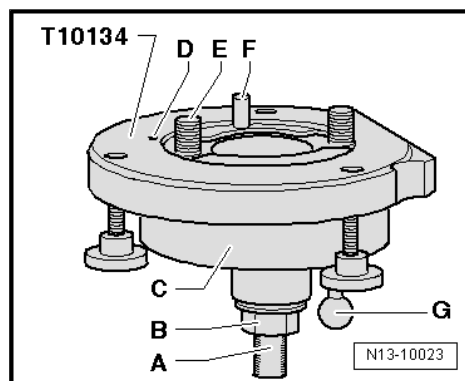
- Clamp assembly tool - T10134- in a vice on tightening flats -A- of threaded spindle.
- Press the assembly housing -C- downwards so that it lies on the nut -B- -arrow-.
- Inner part of assembly device and assembly housing must align (be level) with each other.

- Remove the securing clip -arrow- from new sealing flange.



Note

The sender wheel must not be taken out of the sealing flange or rotated out of position.



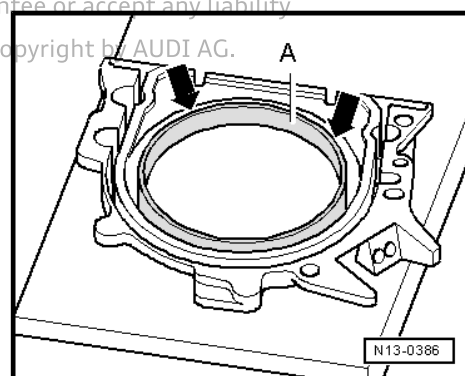
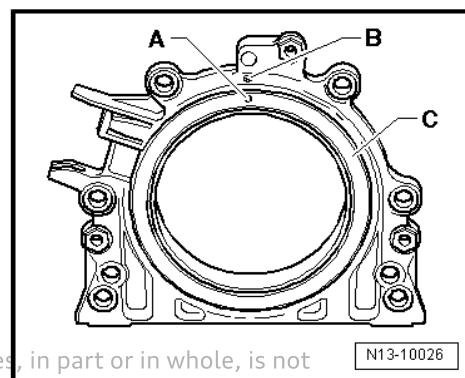


- The locating hole -A- on the sender wheel -C- must align with the marking -B- on the sealing flange.

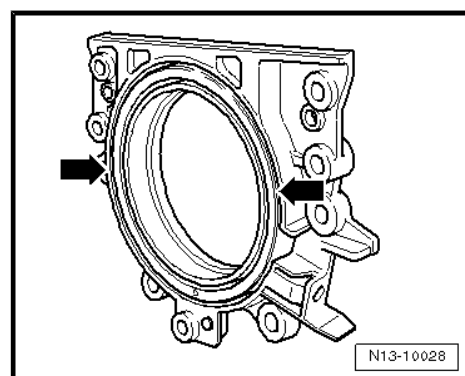


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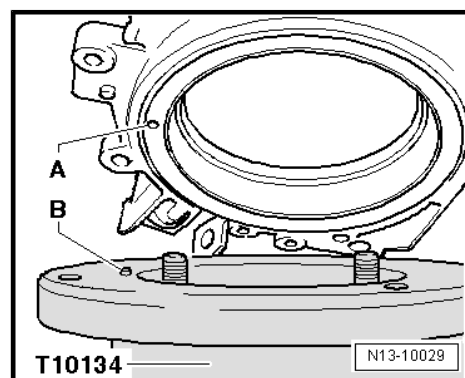
- Place sealing flange (with front side downwards) on a clean flat surface.
- Press the sealing lip support ring -A- downwards in direction of -arrows- until it lies against the flat surface.



- The upper edge of the sender wheel and the front edge of the sealing flange must align -arrows-.



- Place front side of sealing flange on assembly tool - T10134- , so that locating pin -B- can be inserted in hole -A- in sender wheel.
- Ensure the sealing flange lies flat on the assembly tool.





- Press the sealing flange and sealing lip support ring -B- onto the surface of the assembly tool - T10134- while tightening the 3 knurled screws -A- so that the locating pin will not slip out of the hole in the sender wheel.

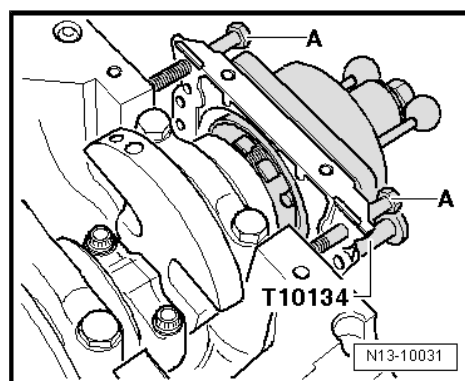
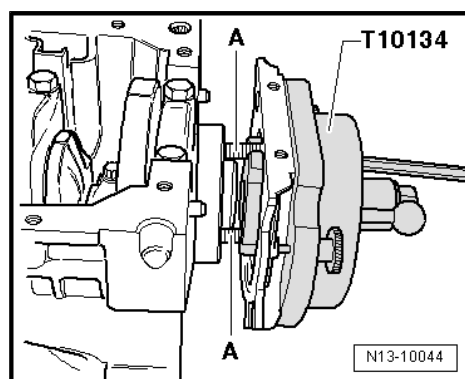
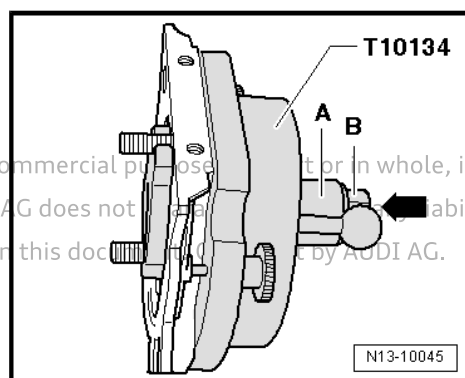
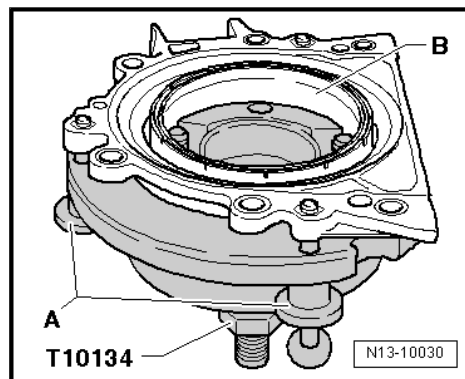


Note

Ensure that the sender wheel remains fixed on the assembly tool when installing the sealing flange.

B - Installing assembly tool - T10134- with sealing flange on crankshaft flange:

- Crankshaft flange must be free of oil and grease.
- Engine is at "TDC" position.
- Screw nut -B- to end of threaded spindle.
- Press threaded spindle of assembly tool - T10134- in direction of -arrow- until nut -B- makes contact with assembly housing -A-.
- Position flat edge of assembly housing towards sealing surface for sump on cylinder block.
- Secure assembly tool - T10134- to crankshaft flange by screwing hexagon socket head bolts -A- approx. 5 threads into crankshaft flange.
- Screw two bolts M6×35 mm -item A- into cylinder block to guide sealing flange.





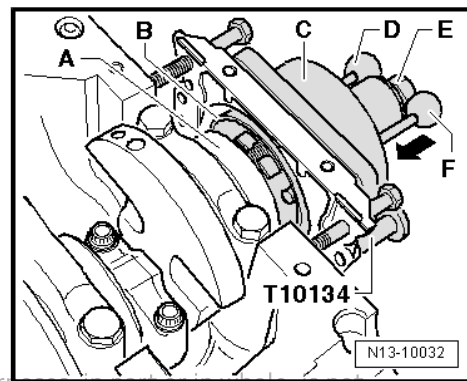
C - Securing assembly tool - T10134- onto crankshaft flange:

- Press the assembly housing -C- by hand in the direction of the -arrow- until the sealing lip support ring -B- lies on the surface of the crankshaft flange -A-.
- Press the guide pin for petrol engines (red handle) -F- into aperture in crankshaft. This ensures that sender wheel reaches its final installation position.



Note

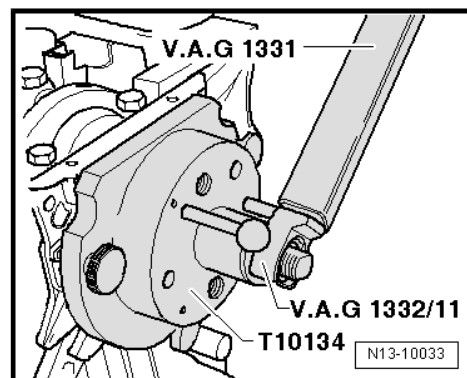
The guide pin for diesel engines (black handle) -D- must not be inserted into threaded hole in crankshaft.



- Tighten the two hexagon socket head bolts on assembly tool hand-tight.
- Screw nut -E- onto threaded spindle by hand until it lies against the assembly housing -C-.

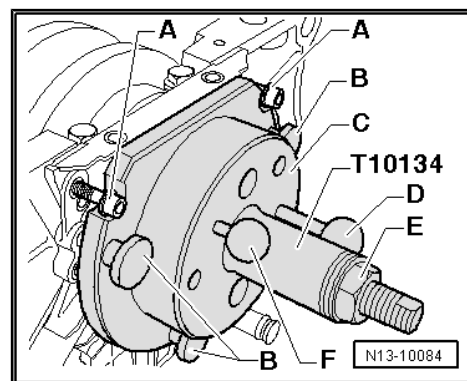
D - Pressing sender wheel onto crankshaft flange with assembly tool - T10134- :

- Tighten nut on assembly tool - T10134- to 35 Nm.
- A small air gap must be present between cylinder block and sealing flange after tightening nut to 35 Nm.

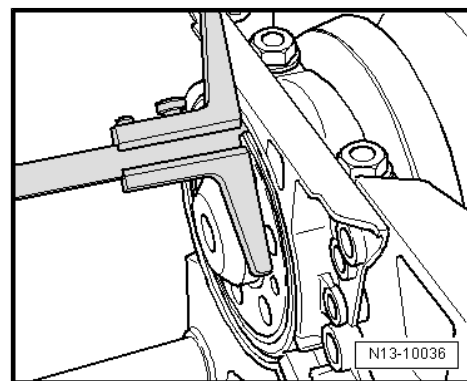


E - Checking installation position of sender wheel on crankshaft:

- Screw nut -E- to end of threaded spindle.
- Remove both bolts -A- from cylinder block.
- Unscrew the three knurled screws -B- from sealing flange.
- Remove hexagon socket head bolts and detach assembly tool - T10134- .
- Detach sealing lip support ring.

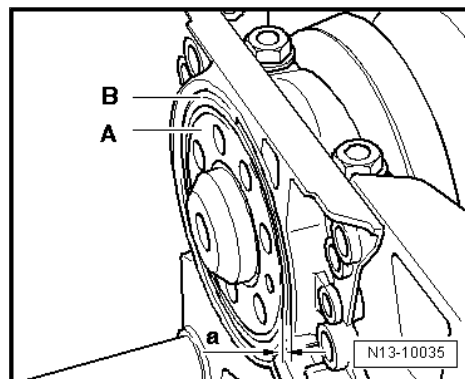


- Apply depth gauge - VAS 6082- to crankshaft flange.



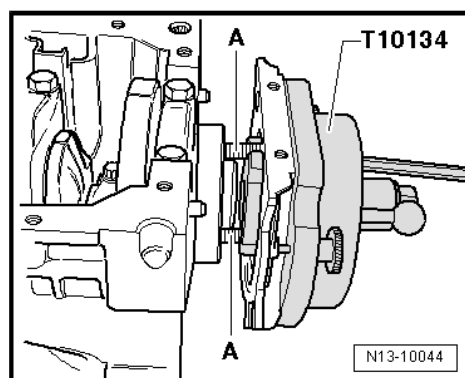


- Measure distance -a- between crankshaft flange -A- and sender wheel -B-.
- Specification: Distance -a- = 0.5 mm.
- Press sender wheel in further if distance is too small
⇒ [page 70](#) .
- If reading matches specification, continue with assembly
⇒ [page 71](#) .



F - Pressing sender wheel in further:

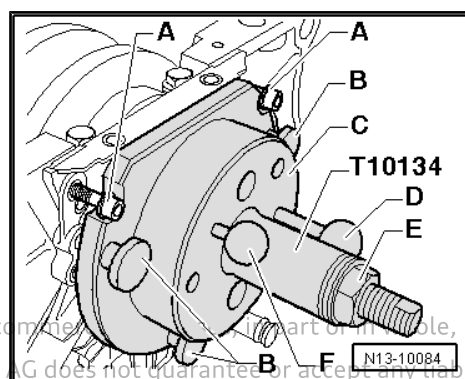
- Secure assembly tool - T10134- to crankshaft flange by tightening hexagon socket head bolts -A- hand-tight.
- Slide assembly tool - T10134- onto sealing flange by hand.



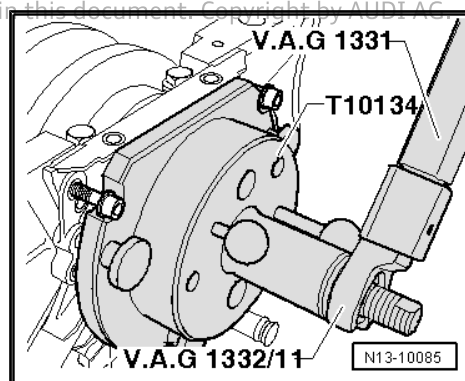
- Screw nut -E- onto threaded spindle by hand until it lies against the assembly housing -C-.



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- Tighten nut on assembly tool - T10134- to 40 Nm.
- Check installation position of sender wheel on crankshaft again ⇒ [page 69](#) .
- Tighten nut on assembly tool - T10134- to 45 Nm if distance is too small.
- Check installation position of sender wheel on crankshaft again ⇒ [page 69](#) .





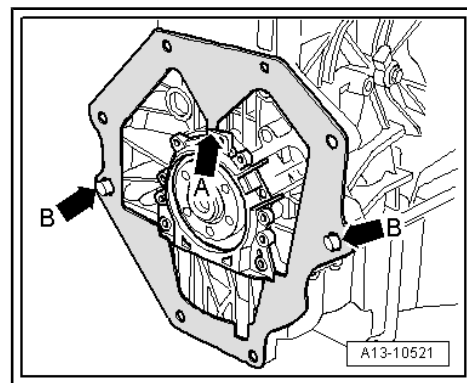
Assembling:



Note

Renew sealing flange bolts.

- Tighten bolts for sealing flange in diagonal sequence.
- Install engine speed sender - G28-
⇒ [“1.6 Removing and installing engine speed sender G28”](#),
[page 291](#) .
- Install sump
⇒ [“1.3 Removing and installing sump”](#), [page 152](#) .
- Engage intermediate plate at top of sealing flange -arrow A-
and push onto dowel sleeves -arrows B-.
- Tighten plug for “TDC” drilling
⇒ [Fig. ““Plug for TDC drilling - tightening torque””](#),
[page 73](#) .
- Install flywheel
⇒ [“2.2 Removing and installing flywheel”](#), [page 60](#) .
- After renewing sender wheel, misfire adaption must be reset.
To do so, select **01 - Reset adaption misfires** in **Guided Functions** mode of ⇒ Vehicle diagnostic tester.



Tightening torques

- ◆ ⇒ [“2.1 Exploded view - cylinder block \(gearbox end\)”](#),
[page 59](#)

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3 Crankshaft

⇒ [“3.1 Exploded view - crankshaft”, page 72](#)

⇒ [“3.2 Crankshaft dimensions”, page 73](#)

⇒ [“3.3 Renewing needle bearing in crankshaft”, page 73](#)

⇒ [“3.4 Measuring axial clearance of crankshaft”, page 75](#)

⇒ [“3.5 Measuring radial clearance of crankshaft”, page 76](#)

3.1 Exploded view - crankshaft

1 - Bearing shell

- ☐ For cylinder block (with oil groove)
- ☐ Renew used bearing shells
- ☐ Note location

2 - Chain sprocket

- ☐ For drive chain for oil pump and camshaft timing chain
- ☐ Push-fitted onto crankshaft
- ☐ To remove or install
⇒ [“2.2 Removing and installing camshaft timing chain”, page 88](#) and
⇒ [“1.4.2 Removing and installing oil pump”, page 156](#)
- ☐ Installation position
⇒ [Fig. “Installation position of chain sprocket”, page 73](#)
- ☐ Contact surfaces must be free of oil and grease

3 - Bearing shell

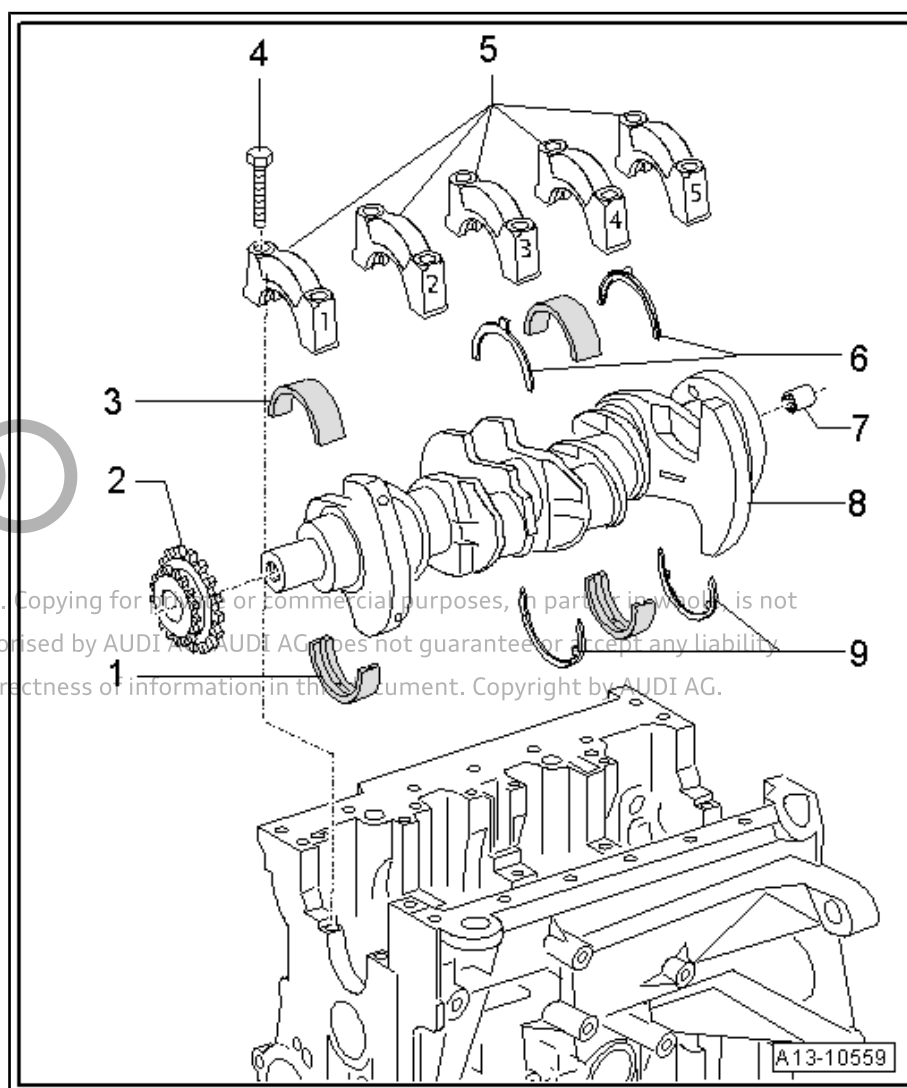
- ☐ For bearing cap (without oil groove)
- ☐ Renew used bearing shells
- ☐ Bearing shells in bearing caps are only supplied as spare parts with “yellow” colour-coding.
- ☐ Note location

4 - Bolt

- ☐ Renew
- ☐ Use old bolts when measuring radial clearance
- ☐ 50 Nm +90°

5 - Bearing caps

- ☐ Mark used bearing caps for re-installation
- ☐ Bearing cap 3 with recesses for thrust washers
- ☐ Installation position: retaining lugs on bearing shells in cylinder block and bearing caps must be on the same side





6 - Thrust washers

- ☐ For bearing cap 3
- ☐ Note location

7 - Needle bearing

- ☐ Only fitted on vehicles with dual clutch gearbox
- ☐ Extracting and driving in ⇒ [“3.3 Renewing needle bearing in crankshaft”, page 73](#)

8 - Crankshaft

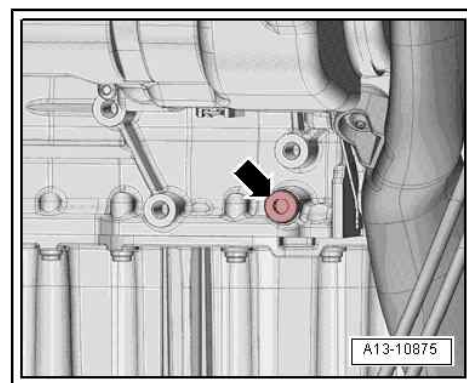
- ☐ Measuring axial clearance ⇒ [“3.4 Measuring axial clearance of crankshaft”, page 75](#)
- ☐ Measuring radial clearance ⇒ [“3.5 Measuring radial clearance of crankshaft”, page 76](#)
- ☐ Crankshaft dimensions ⇒ [“3.2 Crankshaft dimensions”, page 73](#)

9 - Thrust washers

- ☐ Only fitted on 3rd crankshaft bearing
- ☐ Installation position: oil grooves face toward crank webs

Plug for “TDC” drilling - tightening torque

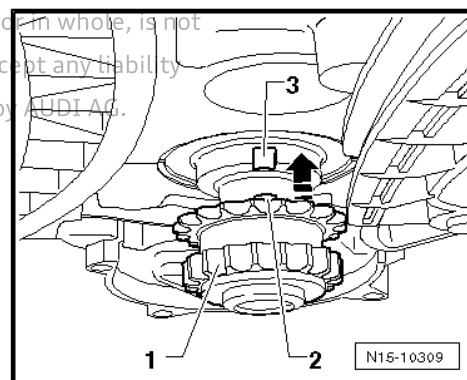
- Renew seal on plug for “TDC” drilling.
- Tighten plug -arrow- in cylinder block to 30 Nm.



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Installation position of chain sprocket

- Drive lug -2- on chain sprocket -1- must engage in groove -3- on crankshaft.



Note

Disregard -arrow-.

3.2 Crankshaft dimensions

Honing dimension	Main bearing journal Ø mm	Conrod journal Ø mm
Basic dimension	54.000 - 0.022 - 0.037	47.800 - 0.022 - 0.037
Repair undersize I	53.750 - 0.022 - 0.037	47.550 - 0.022 - 0.037
Repair undersize II	–	47.300 - 0.022 - 0.037

3.3 Renewing needle bearing in crankshaft

Special tools and workshop equipment required

◆ Counter-support - VAS 251 621-

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◆ Internal puller - VAS 251 635-



◆ Pin - VW 207 C-

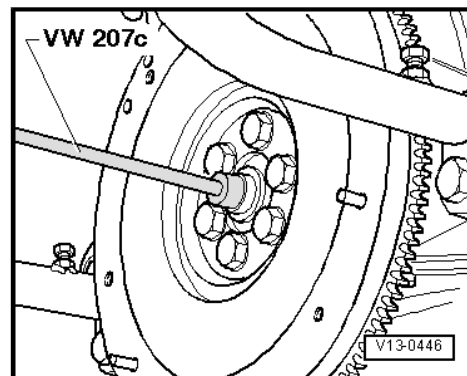


Procedure

- Gearbox removed
- Remove flywheel
⇒ ["2.2 Removing and installing flywheel", page 60](#) .
- Remove needle bearing from crankshaft using internal puller - VAS 251 635- and counter-support - VAS 251 621- .
- Internal puller must be positioned behind needle roller.



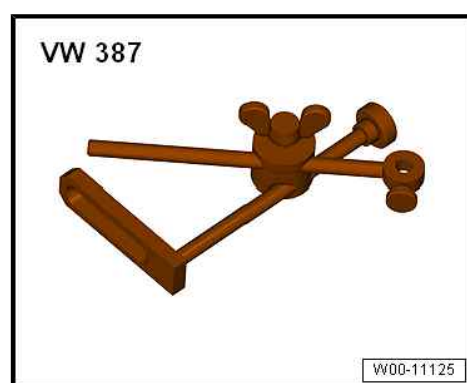
- Drive in flush with drift - VW 207 C- or centring mandrel - 3176- .
- Install flywheel
 ⇒ ["2.2 Removing and installing flywheel", page 60](#) .



3.4 Measuring axial clearance of crankshaft

Special tools and workshop equipment required

- ◆ Universal dial gauge bracket - VW 387-



- ◆ Dial gauge - VAS 6079-



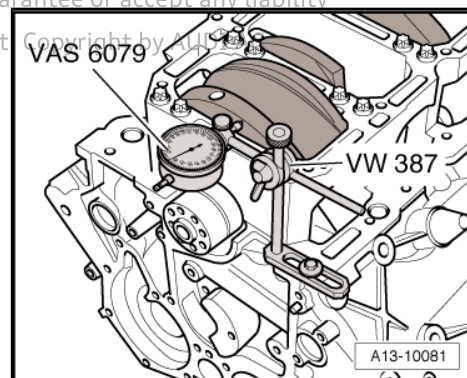
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Procedure

- 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 ... 0.24 mm.
- Wear limit: 0.26 mm.





3.5 Measuring radial clearance of crankshaft

Special tools and workshop equipment required

- ◆ Plastigauge

Procedure

- Remove bearing cap and clean 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 ⇒ [Item 4 \(page 72\)](#) without rotating crankshaft.
- Remove bearing cap again.
- Compare width of Plastigauge with measurement scale.

Radial clearance:

- New: 0.03 ... 0.05 mm.
- Wear limit: 0.13 mm.
- Renew bolts for bolted connection to crankshaft.



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4 Pistons and conrods

⇒ [“4.1 Exploded view - pistons and conrods”, page 77](#)

⇒ [“4.2 Removing and installing oil spray jets”, page 78](#)

⇒ [“4.3 Removing and installing pistons”, page 79](#)

⇒ [“4.4 Checking pistons and cylinder bores”, page 81](#)

⇒ [“4.5 Checking radial clearance of conrod bearings”, page 82](#)

4.1 Exploded view - pistons and conrods



Note

- ◆ All bearing and running surfaces must be oiled before assembling.
- ◆ Oil spray jet and pressure relief valve ⇒ [“4.2 Removing and installing oil spray jets”, page 78](#)

1 - Bolts

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

2 - Conrod bearing cap

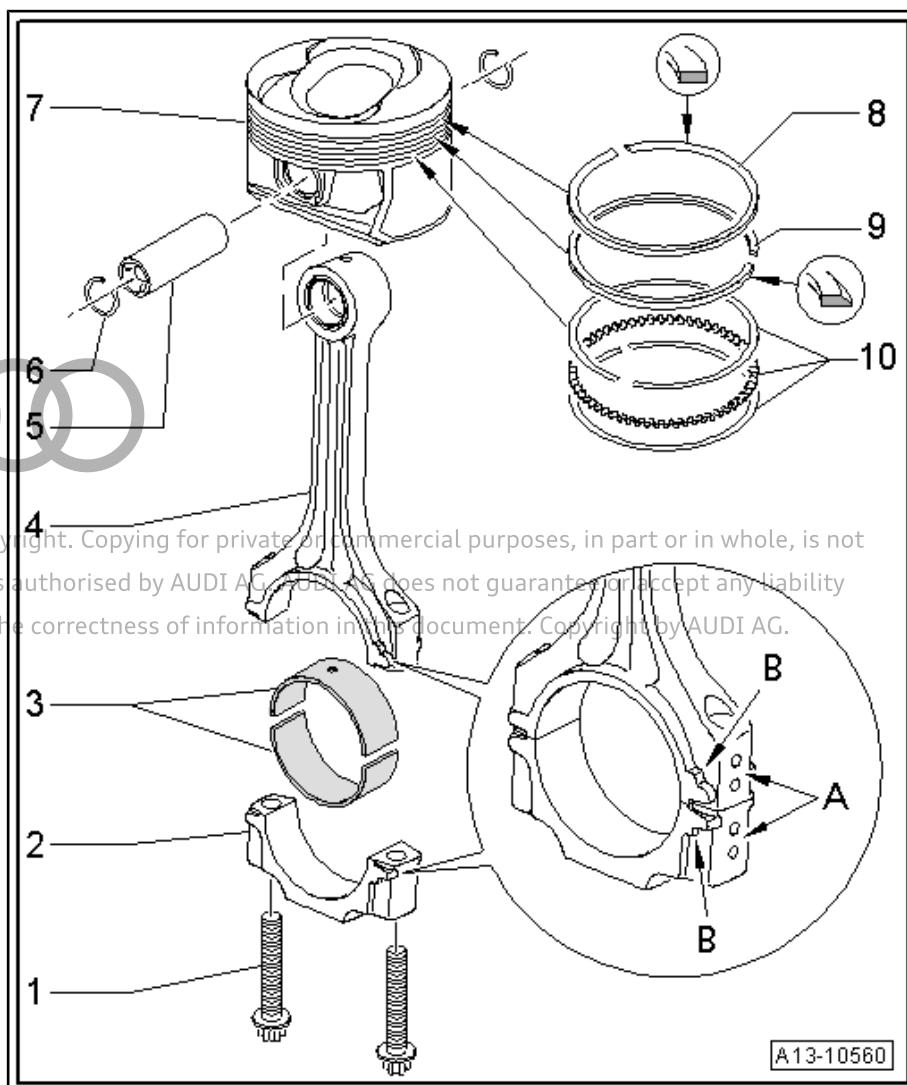
- ☐ Mark cylinder allocation before removing -A-
- ☐ Installation position: marking -B- faces towards pulley end (apply marking before removal if no marking is visible)

3 - Bearing shells

- ☐ Upper bearing shell with oil hole for piston pin lubrication
- ☐ Installation position ⇒ [Fig. “Installation position of bearing shells in conrods”, page 78](#)
- ☐ Renew used bearing shells

4 - Conrod

- ☐ Only renew as a complete set
- ☐ Mark cylinder and conrod bearing cap allocation before removing -A-
- ☐ Installation position: marking -B- faces towards pulley end (apply marking before removal if no marking is visible)
- ☐ Guided axially via piston
- ☐ Measuring radial clearance ⇒ [“4.5 Checking radial clearance of conrod bearings”, page 82](#)





5 - Piston pin

- ❑ Removing and installing ⇒ [“4.3 Removing and installing pistons”, page 79](#)

6 - Circlip

- ❑ Renew

7 - Piston

- ❑ Mark installation position and cylinder number
- ❑ Installation position: arrow on piston crown points to pulley end
- ❑ Removing and installing ⇒ [“4.3 Removing and installing pistons”, page 79](#)
- ❑ Checking pistons and cylinder bores ⇒ [“4.4 Checking pistons and cylinder bores”, page 81](#)

8 - Compression ring

- ❑ Pay attention to cross section
- ❑ Offset gap by 120° to next compression ring
- ❑ Use piston ring pliers to remove and install
- ❑ Inscription “TOP” faces towards piston crown
- ❑ Measuring ring gap ⇒ [Fig. ““Measuring piston ring gap””, page 81](#)
- ❑ Measuring ring-to-groove clearance ⇒ [Fig. ““Measuring ring-to-groove clearance””, page 81](#)

9 - Compression ring

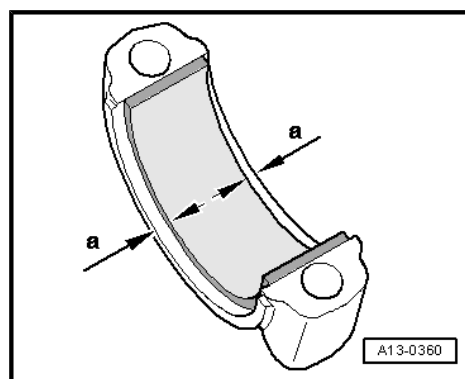
- ❑ Pay attention to cross section
- ❑ Offset gap 120° relative to adjacent oil scraper ring
- ❑ Use piston ring pliers to remove and install
- ❑ Inscription “TOP” faces towards piston crown
- ❑ Measuring ring gap ⇒ [Fig. ““Measuring piston ring gap””, page 81](#)
- ❑ Measuring ring-to-groove clearance ⇒ [Fig. ““Measuring ring-to-groove clearance””, page 81](#)

10 - Oil scraper ring

- ❑ 3 parts
- ❑ Offset gap of top steel element of piston ring by 120° to next compression ring
- ❑ Offset gaps of individual parts of oil scraper ring
- ❑ Measuring ring gap ⇒ [Fig. ““Measuring piston ring gap””, page 81](#)
- ❑ Ring-to-groove clearance cannot be checked

Installation position of bearing shells in conrods

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



4.2 Removing and installing oil spray jets

Special tools and workshop equipment required

- ◆ Socket - T10545-

Removing

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



- Remove wheel housing liner (front right) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Removing and installing wheel housing liner (front) .
- Remove sump
⇒ ["1.3 Removing and installing sump", page 152](#) .
- Remove oil pump
⇒ ["1.4.2 Removing and installing oil pump", page 156](#) .



Note

- ◆ *The crank web of the cylinder must be positioned so that socket - T10545- can be inserted as vertically as possible into the pressure relief valve.*
- ◆ *In addition, the teeth on the socket - T10545- and the pressure relief valve must mesh firmly.*
- Rotate crankshaft in direction of engine rotation by turning bolt for vibration damper until corresponding bolt is accessible.
- Unscrew pressure relief valve -1- using socket - T10545- .
- Remove oil spray jets -2-.

Installing



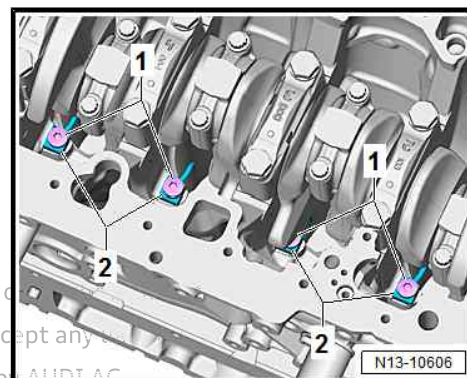
Caution

Risk of damage to oil spray jets.

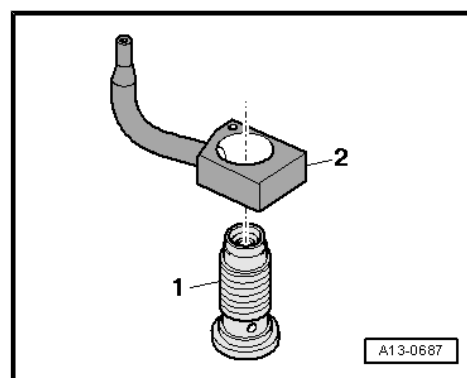
◆ **Do not bend oil spray jets.**

◆ **Check that oil spray jets have adequate clearance after re-installing pistons.**

◆ **Always renew bent oil spray jets.**



- 1 - Pressure relief valve - 27 Nm
- 2 - Oil spray jet
- Installation position: align locating edge of oil spray jet with machined surface of cylinder block.
- Install oil pump
⇒ ["1.4.2 Removing and installing oil pump", page 156](#) .
- Install sump
⇒ ["1.3 Removing and installing sump", page 152](#) .
- Install front wheel housing liner (right-side) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Removing and installing front wheel housing liner .
- Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .



4.3 Removing and installing pistons

Special tools and workshop equipment required



◆ Pin - VW 222 A-



◆ Piston ring clamp, commercially available

Removing

- Remove cylinder head
⇒ [“3.3 Removing and installing cylinder head”, page 111](#) .
- Remove oil pump
⇒ [“1.4.2 Removing and installing oil pump”, page 156](#) .
- Mark installation position and cylinder number of piston.
- Mark installation position and matching of cylinder and conrod bearing cap to conrod ⇒ [Item 4 \(page 77\)](#) .
- Remove conrod bearing cap and pull out piston and conrod upwards.



Note

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

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

Installing

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



Note

Renew bolts tightened with specified tightening angle.

- Oil running surfaces of bearing shells.
- Install piston using commercially available piston ring clamp; note installation position.
- Install conrod bearing cap; note installation position
⇒ [Fig. “Installation position of bearing shells in conrods” , page 78](#) .
- Install cylinder head
⇒ [“3.3 Removing and installing cylinder head” , page 111](#) .
- Install oil pump
⇒ [“1.4.2 Removing and installing oil pump”, page 156](#) .
- Install sump
⇒ [“1.3 Removing and installing sump”, page 152](#) .

Tightening torques

- ◆ ⇒ [“4.1 Exploded view - pistons and conrods”, page 77](#)



- ◆ ⇒ "1.1 Exploded view - sump/oil pump", page 149

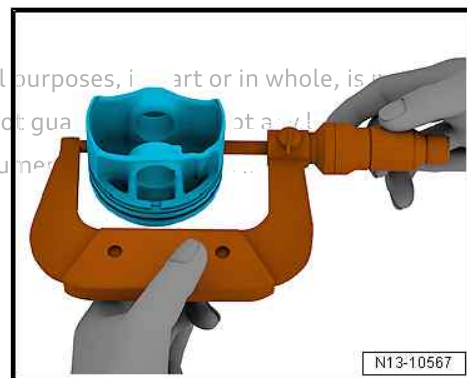
4.4 Checking pistons and cylinder bores

Checking piston

- Using a micrometer, measure approx. 12 mm from the lower edge, perpendicular to the piston pin axis.
- Maximum deviation from nominal dimension: 0.04 mm.

Honing dimension	Piston $\varnothing$ ¹⁾ mm
Basic dimension	76.46 ²⁾
Repair oversize I	76.71 ²⁾
Repair oversize II	76.96 ²⁾

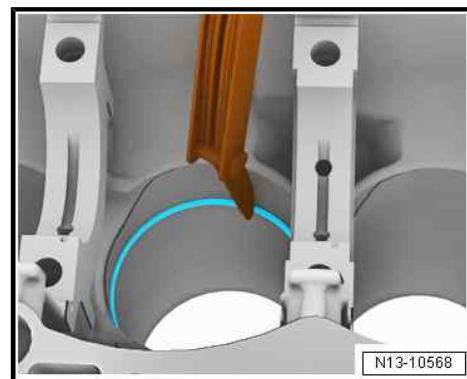
- ¹⁾ Measure approx. 12 mm from bottom edge of piston.
- ²⁾ Dimensions including coating (thickness 0.01 mm). The coating will wear down in service.



Measuring piston ring gap

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

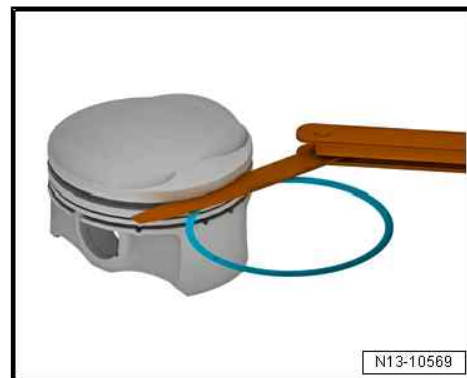
Piston ring	new mm	Wear limit mm
1st compression ring	0.20 ... 0.40	1.00
2nd compression ring	0.40 ... 0.60	1.00
Oil scraper ring	0.20 ... 0.80	No wear limit data available



Measuring ring-to-groove clearance

- Clean groove in piston before checking clearance.

Piston ring	new mm	Wear limit mm
1st compression ring	0.04 ... 0.08	0.15
2nd compression ring	0.02 ... 0.06	0.15
Oil scraper ring	Cannot be measured	





Measuring cylinder bore



Caution

Risk of damage to the surface of the cylinder bore.

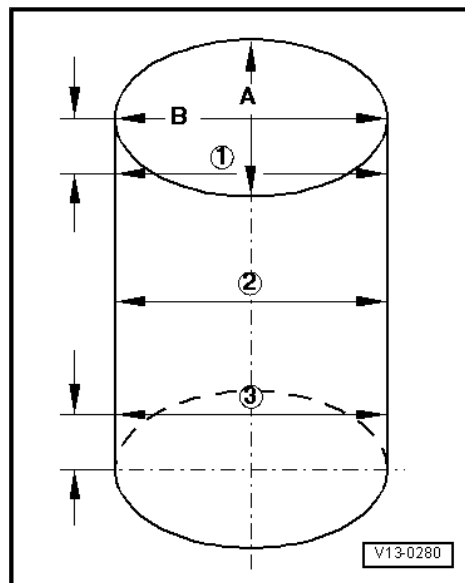
- ◆ **Do not machine cylinder bore (reboring, honing, grinding) with workshop equipment.**

- Use a cylinder gauge - VAS 6078- to take measurements at 3 points in transverse direction -A- and in longitudinal direction -B-.
- Maximum deviation from nominal dimension: 0.08 mm.



Note

Do not mount cylinder block on engine and gearbox support - VAS 6095- , as incorrect measurements may result.



Honing dimension	Cylinder bore Ø mm
Basic dimension	76.51
Repair oversize I	76.76
Repair oversize II	77.01



Note

4.5 Checking radial clearance of conrod bearings

Special tools and workshop equipment required

- ◆ Plastigauge

Procedure

- Remove conrod bearing cap.
- Clean bearing cap and bearing journal.
- Place a length of Plastigauge corresponding to the width of the bearing on the bearing journal or in the bearing shell.
- Fit conrod bearing cap and secure with old bolts
⇒ [Item 1 \(page 77\)](#) 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.**
 - **Renew conrod bolts.**
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15 – Cylinder head, valve gear

1 Timing chain cover

⇒ [“1.1 Exploded view - timing chain cover”, page 83](#)

⇒ [“1.2 Removing and installing timing chain cover”, page 84](#)

1.1 Exploded view - timing chain cover

1 - Bolt

- ☐ Renew
- ☐ Tightening torque
⇒ [Item 2 \(page 37\)](#)

2 - Poly V-belt pulley

- ☐ For crankshaft
- ☐ With diamond-coated washer
⇒ [Fig. “Diamond-coated washers”](#), page 39
- ☐ Removing and installing
⇒ [“1.5 Removing and installing pulley”, page 51](#)

Caution
Risk of damage to engine.
No prevent the crankshaft chain sprocket from slipping off the drive lug, do not rotate the crankshaft after the poly V-belt pulley has been detached.

3 - Bolt

- ☐ 9 Nm

4 - Bracket

- ☐ For air pipe (right-side)

5 - Bolt

- ☐ 20 Nm

6 - Bracket

- ☐ For air pipe (right-side)

7 - Bolt

- ☐ 50 Nm

8 - Timing chain cover

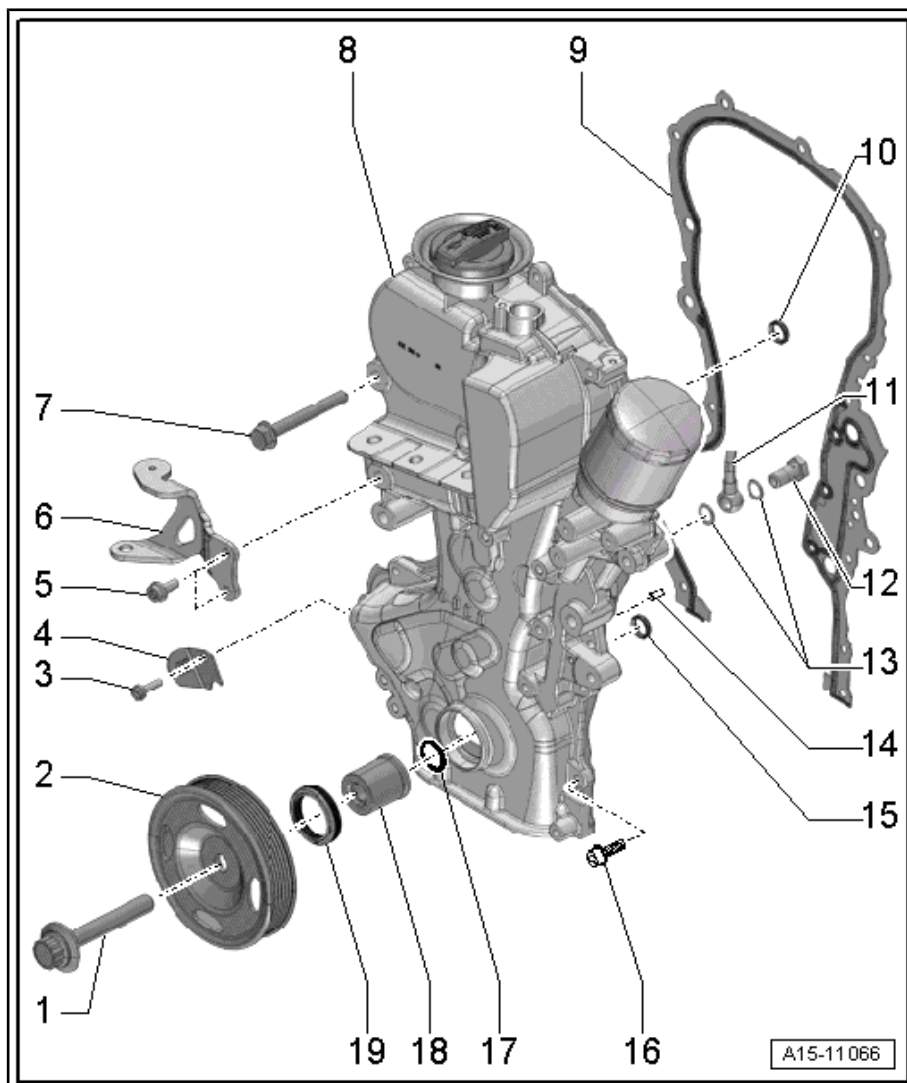
- ☐ Removing and installing ⇒ [“1.2 Removing and installing timing chain cover”, page 84](#)

9 - Gasket

- ☐ Renew
- ☐ Apply sealant when installing; refer to ⇒ [Electronic parts catalogue](#)

10 - Seal

- ☐ Inserted onto rear of timing chain cover
- ☐ Renew



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11 - Oil supply line

- ☐ To turbocharger

12 - Banjo bolt

- ☐ Tightening torque ➔ [Item 9 \(page 204\)](#)

13 - Seals

- ☐ Renew

14 - Dowel pin

15 - Seal

- ☐ Inserted onto rear of timing chain cover
- ☐ Renew

16 - Bolt

- ☐ Tighten in diagonal sequence
- ☐ 10 Nm

17 - O-ring

- ☐ Renew

18 - Bearing bush

- ☐ Installation position: collar faces crankshaft

19 - Oil seal

- ☐ For crankshaft
- ☐ Renewing ➔ ["1.6 Renewing crankshaft oil seal \(pulley end\)", page 56](#)

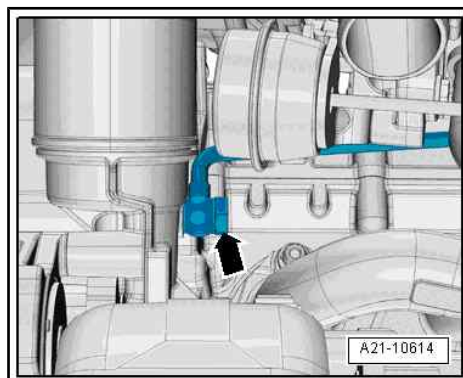
1.2 Removing and installing timing chain cover

Special tools and workshop equipment required

- ◆ Threaded pin M6x80 (2x)

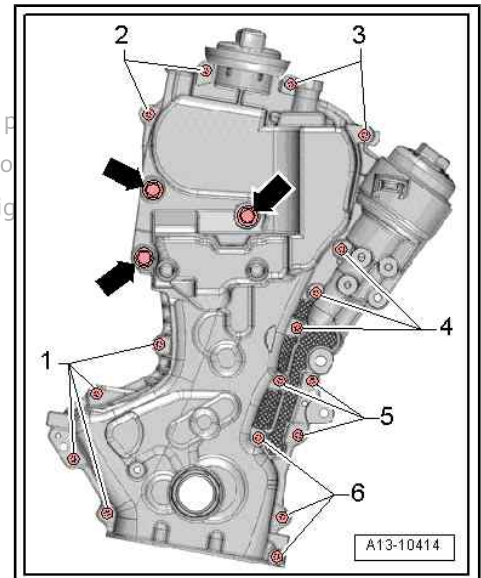
Removing

- Remove alternator ➔ Electrical system; Rep. gr. 27 ; Alternator; Removing and installing alternator .
- Remove poly V-belt pulley for crankshaft
➔ ["1.5 Removing and installing pulley", page 51](#) .
- Remove coolant pump
➔ ["2.4 Removing and installing coolant pump", page 178](#) .
- Remove sump
➔ ["1.3 Removing and installing sump", page 152](#) .
- Remove engine mounting
➔ ["2.2 Removing and installing engine mountings", page 30](#) .
- Remove banjo bolt -arrow- for oil supply line at timing chain cover.





- Remove bolts -1 ... 6- and -arrows- for timing chain cover.
- Raise engine slightly and remove timing chain cover.
- Use drift to drive out crankshaft oil seal.



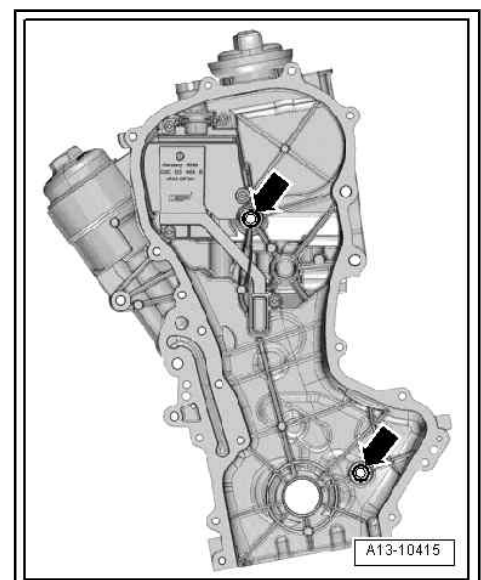
Installing



Note

Renew gasket and O-rings.

- Clean sealing surfaces; they must be free of oil and grease.
- Insert O-rings -arrows- on reverse side of timing chain cover.





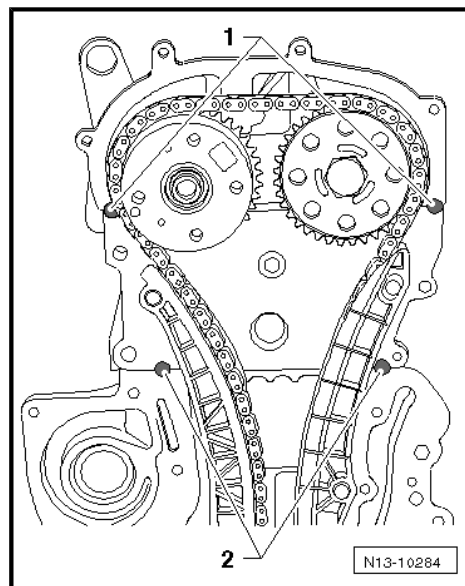
- Apply a bead of sealant to each joint, $\varnothing$ 10 mm, approx. 1 mm thick.
- 1 - Joint between camshaft housing and cylinder head
- 2 - Joint between cylinder head and cylinder block
- Fit gasket onto dowel pins in cylinder block.
- Screw 2 threaded pins M6x80 into cylinder head and cylinder block to help guide cover.
- Carefully fit timing chain cover onto threaded pins and dowel pins, then tighten bolts.

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

- Install engine mountings
⇒ ["2.2 Removing and installing engine mountings", page 30](#) .
- Renew crankshaft oil seal
⇒ ["1.6 Renewing crankshaft oil seal \(pulley end\)", page 56](#) .
- Install sump
⇒ ["1.3 Removing and installing sump", page 152](#) .
- Install coolant pump
⇒ ["2.4 Removing and installing coolant pump", page 178](#) .
- Install poly V-belt pulley for crankshaft
⇒ ["1.5 Removing and installing pulley", page 51](#) .
- Install poly V-belt
⇒ ["1.2.1 Removing and installing poly V-belt for ancillaries", page 40](#) .

Tightening torques

- ◆ ⇒ ["1.1 Exploded view - timing chain cover", page 83](#)
- ◆ ⇒ Electrical system; Rep. gr. 27 ; Alternator; Exploded view - alternator



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2 Chain drive

⇒ [“2.1 Exploded view - timing chain”, page 87](#)

⇒ [“2.2 Removing and installing camshaft timing chain”, page 88](#)

⇒ [“2.3 Checking timing chain”, page 98](#)

2.1 Exploded view - timing chain

1 - Bolt

- ☐ 9 Nm

2 - Chain tensioner

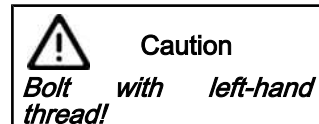
- ☐ Exerts spring pressure
- ☐ Before removing, lock in place using locking pin - T40011-

3 - Tensioning rail

4 - Guide pin

- ☐ 18 Nm

5 - Bolt



- ☐ Renew
- ☐ When loosening and tightening, lock camshaft chain sprocket using counterhold tool - T10172 A-
- ☐ 40 Nm +90°

6 - Camshaft adjuster

- ☐ For inlet camshaft
- ☐ Do not dismantle
- ☐ Removing and installing
⇒ [“2.2 Removing and installing camshaft timing chain”, page 88](#)

7 - Camshaft timing chain

- ☐ Before removing, mark running direction with paint
- ☐ Removing and installing ⇒ [“2.2 Removing and installing camshaft timing chain”, page 88](#)

8 - Bearing bush

- ☐ For camshaft adjuster

9 - Camshaft housing

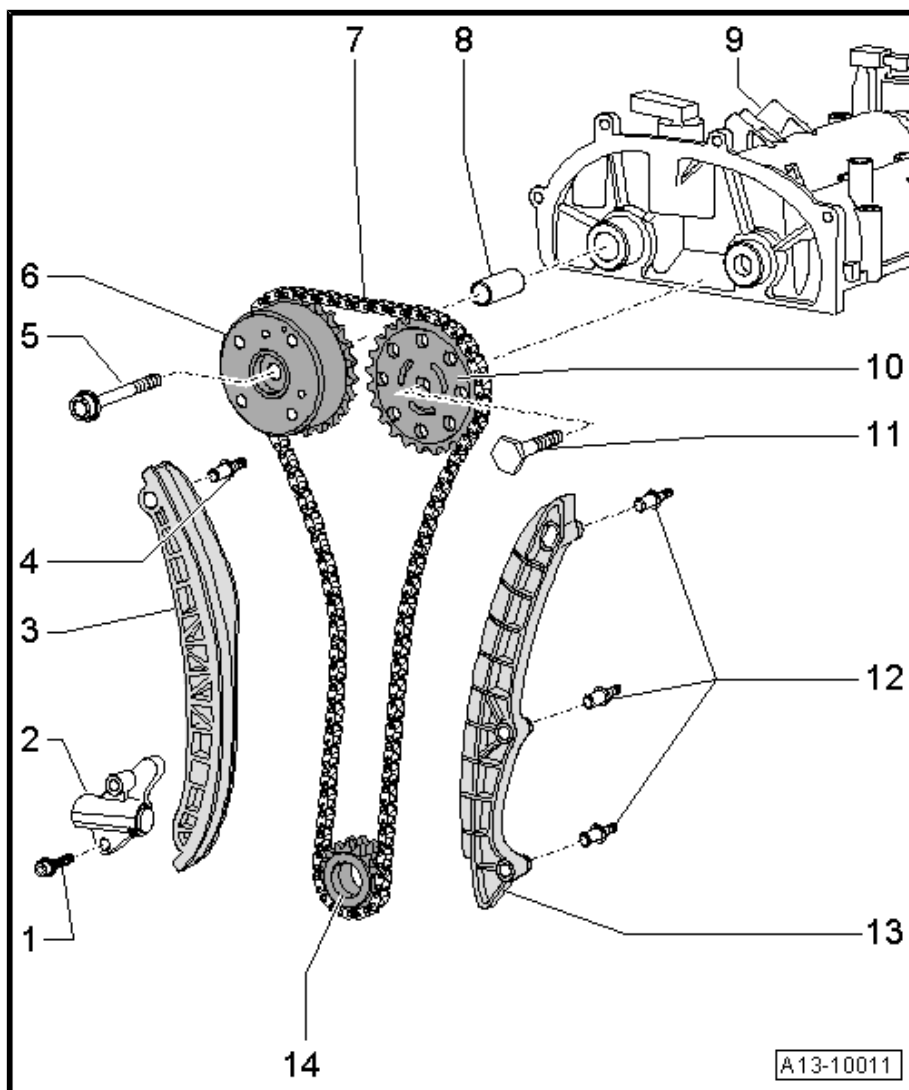
- ☐ Removing and installing ⇒ [“3.4 Removing and installing camshaft housing”, page 126](#)

10 - Camshaft chain sprocket

- ☐ For exhaust camshaft
- ☐ Removing and installing ⇒ [“2.2 Removing and installing camshaft timing chain”, page 88](#)

11 - Bolt

- ☐ Renew



❑ When loosening and tightening, lock camshaft chain sprocket using counterhold tool - T10172 A-

❑ 50 Nm +90° 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 with respect to the correctness of information in this document. Copyright by AUDI AG.

12 - Guide pin

❑ 18 Nm

13 - Guide rail

❑ Removing and installing ⇒ [“2.2 Removing and installing camshaft timing chain”, page 88](#)

14 - Chain sprocket

❑ For drive chain for oil pump and camshaft timing chain

❑ Push-fitted onto crankshaft

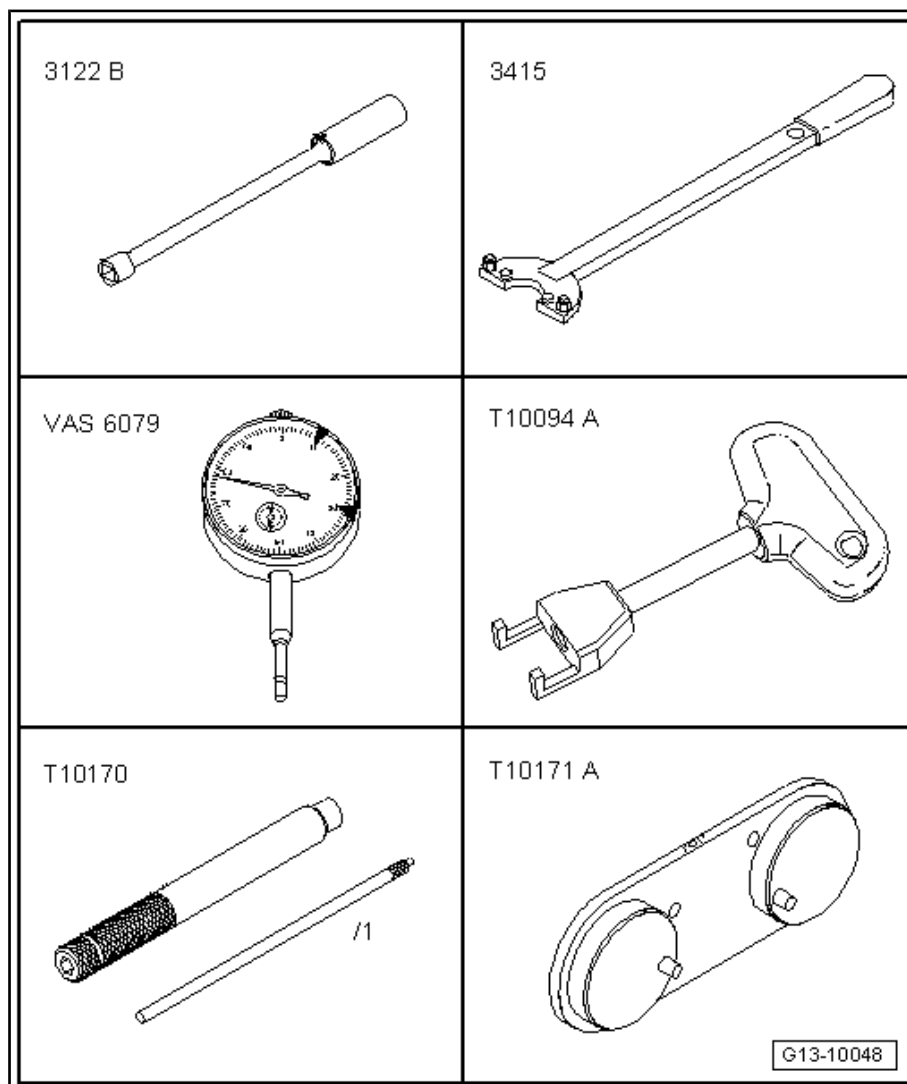
❑ To remove or install ⇒ [“2.2 Removing and installing camshaft timing chain”, page 88](#) and [“1.4.2 Removing and installing oil pump”, page 156](#)

❑ Installation position ⇒ [Fig. “Installation position of chain sprocket”](#), page 73

❑ Contact surfaces must be free of oil and grease

2.2 Removing and installing camshaft timing chain

Special tools and workshop equipment required



◆ Spark plug spanner - 3122 B-

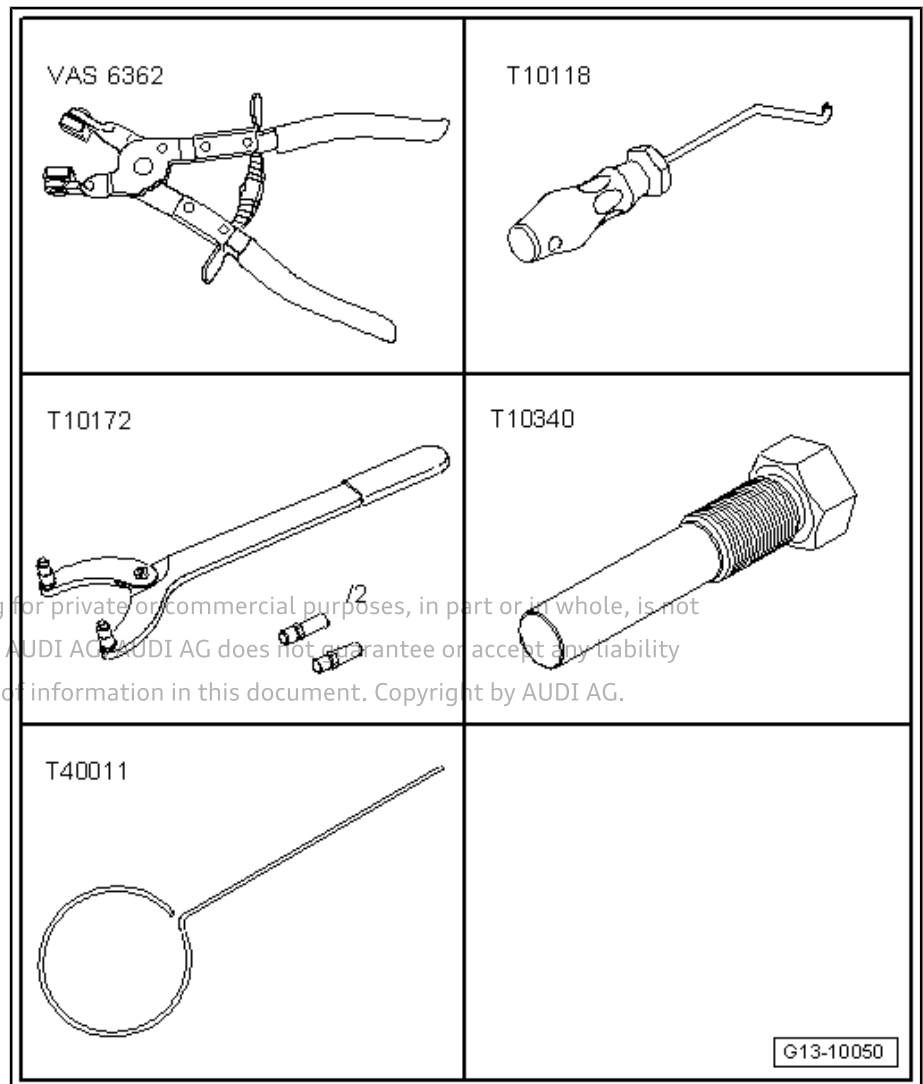
◆ Counterhold tool - 3415- with pins -3415/1-



- ◆ Dial gauge - VAS 6079-
- ◆ Puller - T10094 A-
- ◆ Adapter for dial gauge - T10170-
- ◆ Camshaft clamp - T10171 A-



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- ◆ Hose clip pliers - VAS 6362-
- ◆ Assembly tool - T10118-
- ◆ Counterhold tool - T10172 A-
- ◆ Locking pin - T10340-
- ◆ Locking pin - T40011-



Removing

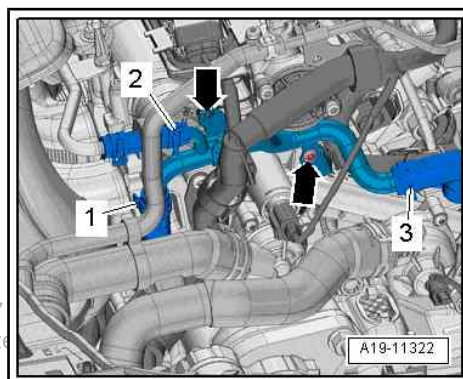
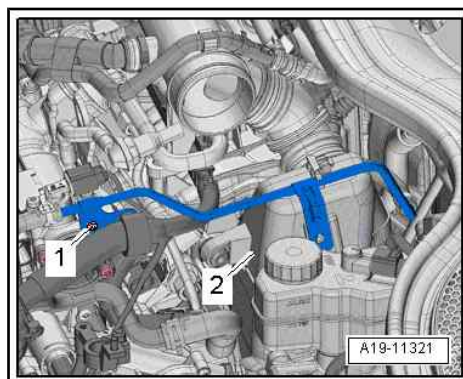
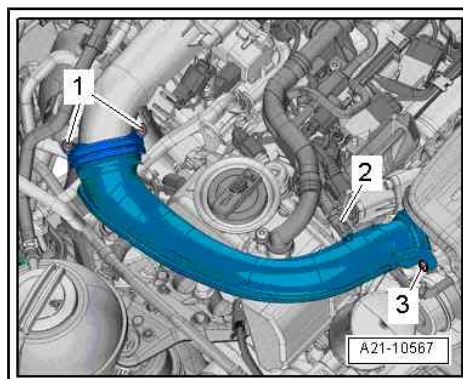
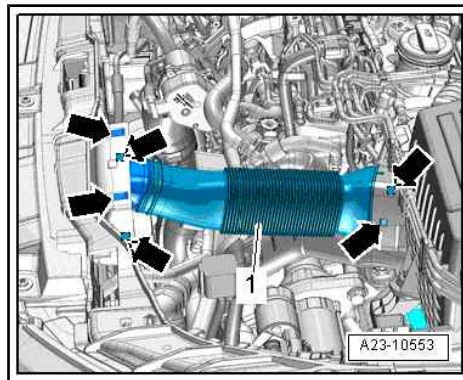
- Remove engine cover panel
⇒ [“3.1 Removing and installing engine cover panel”](#),
[page 36](#) .
- Release fasteners -arrows- and detach air pipe -1-.
- Remove bolts -1, 3-.
- Release hose clip -2-, detach air pipe (top right) and remove air hose.
- Remove bolt -1- and move coolant pipe clear at intake resonator -2-.
- Remove bolts -arrows-.
- Release hose clip -2- and push coolant pipe (left-side) slightly towards left.



Note

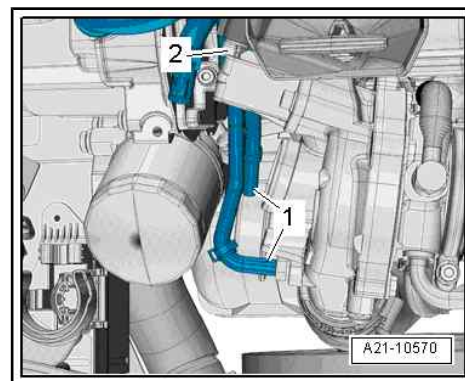
Disregard items -1 and 3-.

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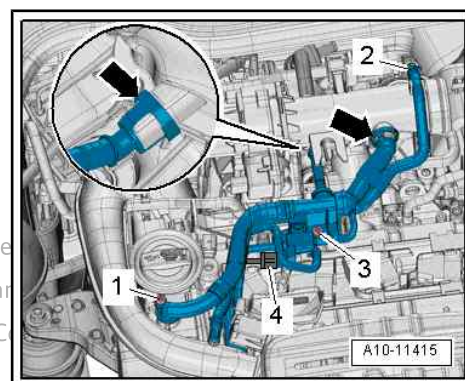


- Unplug electrical connector -2-.
- Detach vacuum hoses -1-.

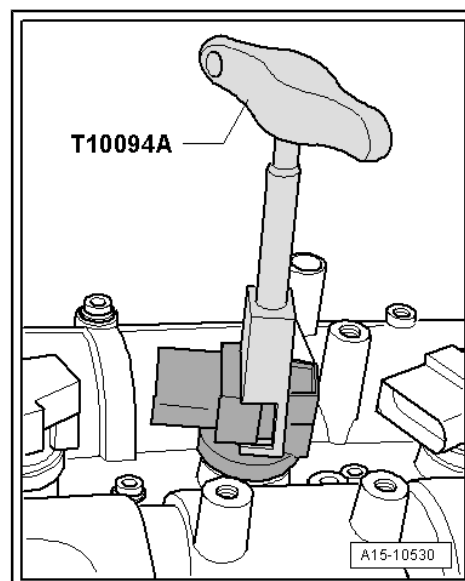


- Unplug electrical connector -4-.
- Remove bolts -1, 3-.
- Press release tabs and disconnect crankcase breather hoses -arrows-.
- Release hose clip -2- and disconnect hose at activated charcoal filter.
- Detach hoses.

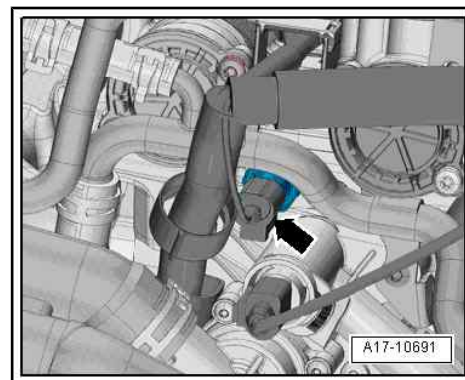
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- Apply puller - T10094 A- to ignition coil for cylinder 1, pull out ignition coil and at the same time unplug electrical connector at ignition coil for cylinder 1.
- Remove spark plug for cylinder 1 with spark plug socket and extension - 3122 B- .

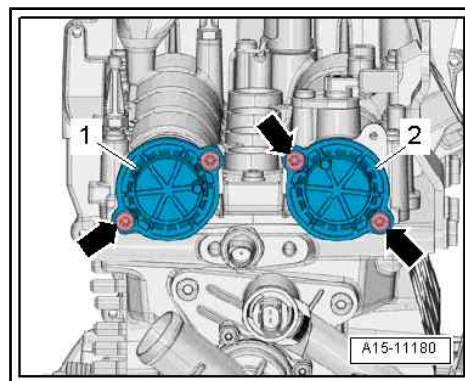


- Using assembly tool - T10118- , unplug electrical connector -arrow- at oil pressure switch - F1- .

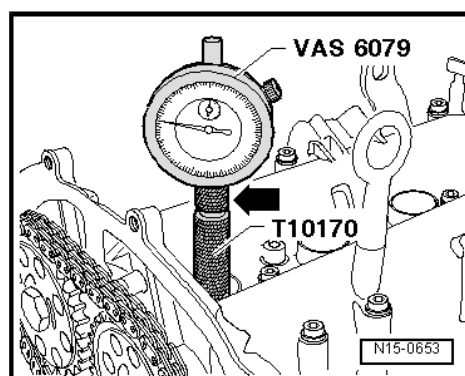




- Remove bolts -arrows- and detach sealing caps -1- and -2-.



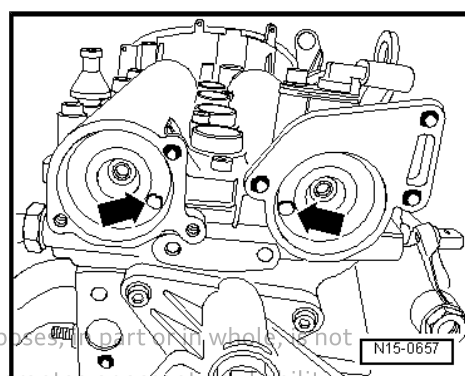
- Screw adapter for dial gauge - T10170- into spark plug hole as far as the stop.
- Insert dial gauge - VAS 6079- with extension -T10170/1- as far as the stop and secure using locking nut -arrow-.
- Rotate crankshaft in normal direction of rotation to “TDC”.
- “TDC” = maximum measured value on dial gauge.



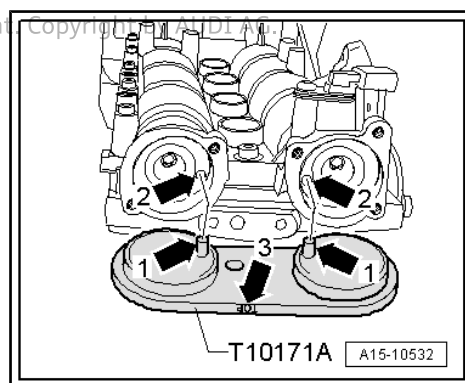
- The threaded holes -arrows- in the camshafts must be positioned as shown in illustration. Turn crankshaft one turn (360°) if necessary.



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- Insert camshaft clamp T10171A into holes in camshafts as far as stop.
- The locking pins -arrows 1- must engage in the holes -arrows 2-.
- The inscription “TOP” -arrow 3- should be legible from above.





- To secure the camshaft clamp - T10171 A- , screw in an M6 bolt -arrow- hand-tight, but do not tighten.

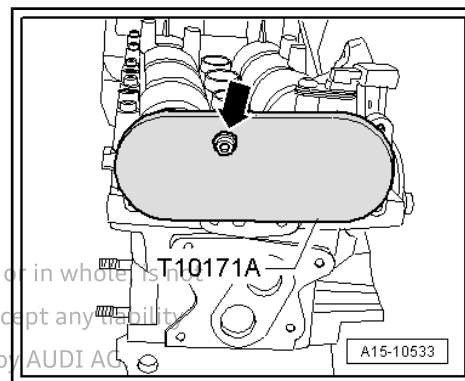


Caution

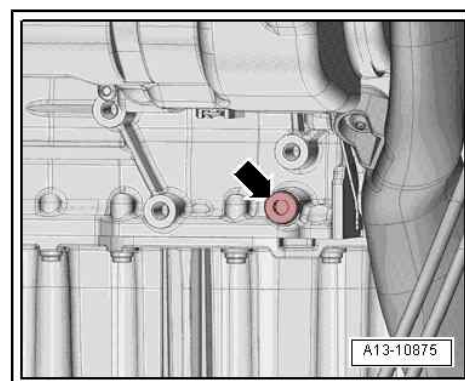
Risk of damage to camshafts.

- ◆ **The camshaft clamp - T10171 A- must not be used as a counterhold tool.**

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- Unscrew plug -arrow- for "TDC" hole on cylinder block.

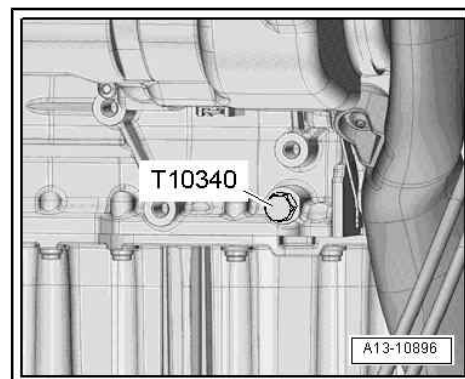


- Screw locking pin - T10340- into cylinder block as far as stop and tighten to 30 Nm.



Note

The locking pin - T10340- locks the crankshaft only in the direction of engine rotation.

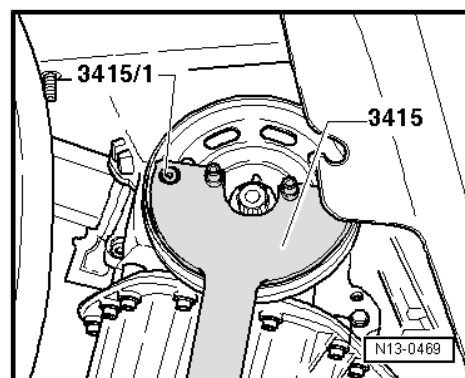


Caution

Risk of damage to engine.

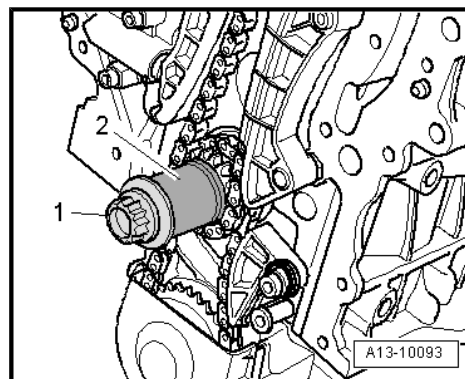
- ◆ **To prevent the crankshaft chain sprocket from slipping off the drive lug, do not rotate the crankshaft after the poly V-belt pulley has been detached.**

- Loosen bolt for poly V-belt pulley using counterhold tool - 3415- and pin -3415/1- .
- Remove bolt and take off poly V-belt pulley.
- Remove timing chain cover
 ⇒ ["1.2 Removing and installing timing chain cover", page 84](#) .

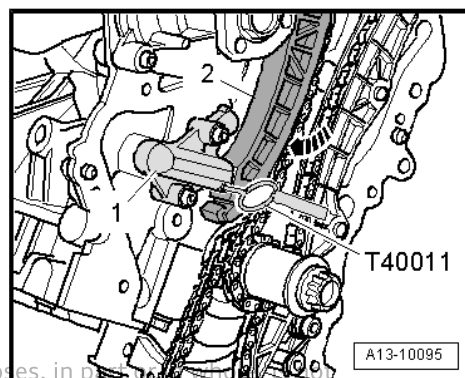




- Insert bearing bush -2- and screw in crankshaft pulley bolt -1- hand-tight to secure chain sprocket on crankshaft.



- Press tensioning rail -2- in direction of -arrow- and use locking pin - T40011- to lock piston for chain tensioner -1-.



Caution

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

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

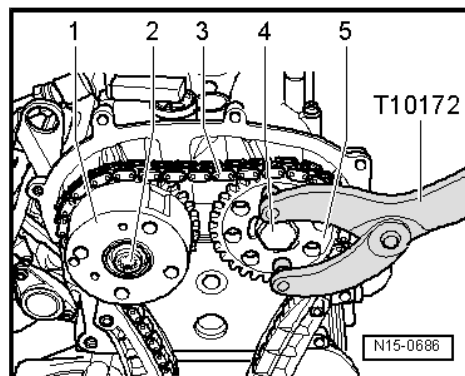
Risk of damage to camshafts.

- ◆ *The camshaft clamp - T10171 A- must not be used as a counterhold tool.*

Risk of damage to thread.

- ◆ *The camshaft adjuster central bolt has a left-hand thread.*

- Loosen bolt -2- for camshaft adjuster -1- and bolt -4- for camshaft chain sprocket -5-, using counterhold tool - T10172 A- to counterhold on camshaft chain sprocket.
- Detach camshaft chain sprocket together with camshaft timing chain -3-.



Note

Leave camshaft adjuster on camshaft.

Installing



Note

- ◆ *Renew bolts tightened with specified tightening angle.*
- ◆ *Renew gaskets and O-rings for camshaft sealing caps.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*



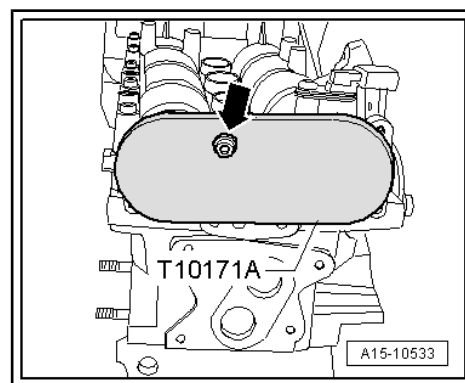
- Check “TDC” position of camshaft and crankshaft:
- The camshaft clamp - T10171 A- must be fitted to camshaft housing.



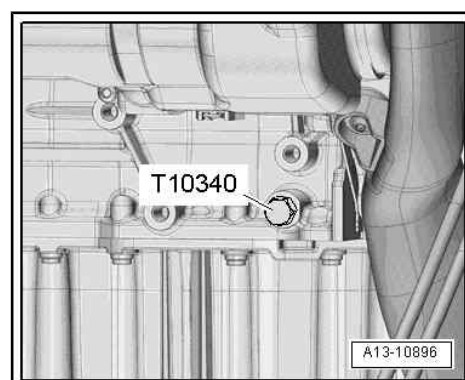
Caution

Risk of damage to valve gear.

- ◆ *The camshafts must not be moved axially when turning.*



- Locking pin - T10340- screwed into cylinder block as far as stop and tightened to 30 Nm.
- Turn crankshaft in direction of engine rotation until it makes contact with locking pin - T10340- .

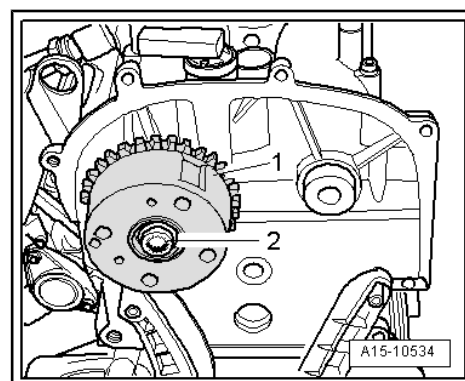


Caution

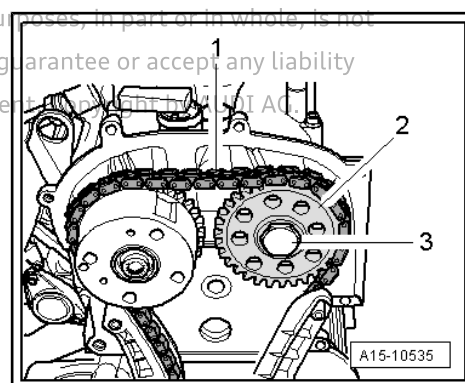
Risk of damage to thread.

- ◆ *The camshaft adjuster central bolt has a left-hand thread.*

- Fit bolt -2- for camshaft adjuster -1- without tightening.
- It should just be possible to turn the adjuster on the camshaft without axial movement.



- Fit camshaft timing chain according to marks applied when removing.
- Fit camshaft timing chain- 1- together with camshaft chain sprocket -2- for exhaust camshaft onto crankshaft sprocket and camshaft adjuster.
- Fit bolt -3- for camshaft chain sprocket without tightening.
- It should just be possible to turn the camshaft chain sprocket on the camshaft without axial movement.

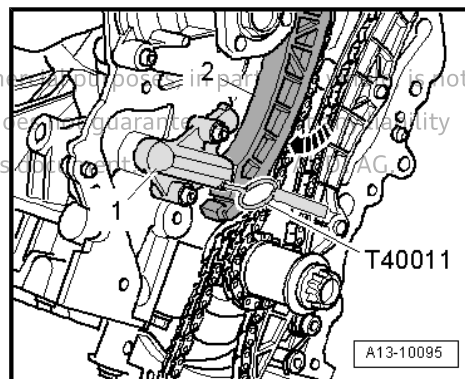


- Remove locking pin - T40011- from chain tensioner -1- and tension camshaft timing chain.
- Check "TDC" position of camshaft and crankshaft again
⇒ [page 95](#) .



Note

Disregard -arrow-.

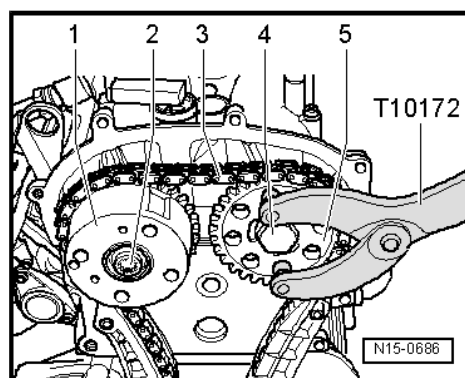


Caution

Risk of damage to thread.

- ◆ **The camshaft adjuster central bolt has a left-hand thread.**

- Tighten bolt -2- for camshaft adjuster -1- to 40 Nm and bolt -4- for camshaft chain sprocket -5- to 50 Nm, using counterhold tool - T10172 A- to counterhold on camshaft chain sprocket.



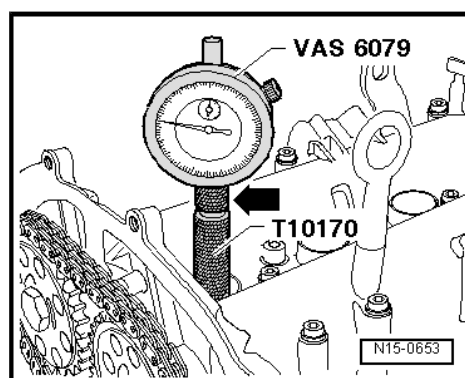
Note

- ◆ **Do not tighten bolts for camshaft adjuster and camshaft chain sprocket to final torque before checking timing again.**
- ◆ **When tightening the bolts, the crankshaft must not turn and the camshaft timing chain -3- must remain tensioned on both sides.**
- Detach camshaft clamp - T10171 A- .
- Remove locking pin - T10340- .
- Turn crankshaft 2 revolutions in direction of engine rotation and set to "TDC".
- "TDC" = maximum measured value on dial gauge.



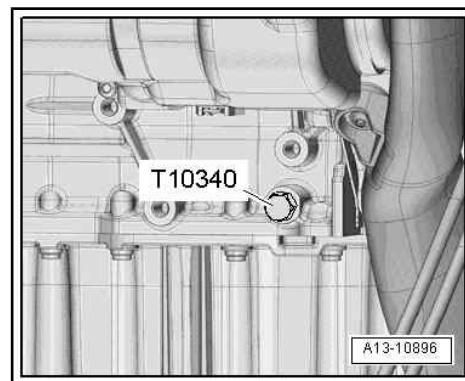
Note

- ◆ **If the crankshaft was turned more than 0.01 mm beyond "TDC", turn back the crankshaft approx. 45° in the opposite direction of normal rotation. Then turn crankshaft in normal direction of rotation to "TDC".**
- ◆ **Permissible deviation from TDC: ± 0.01 mm.**
- ◆ **Disregard -arrow-.**

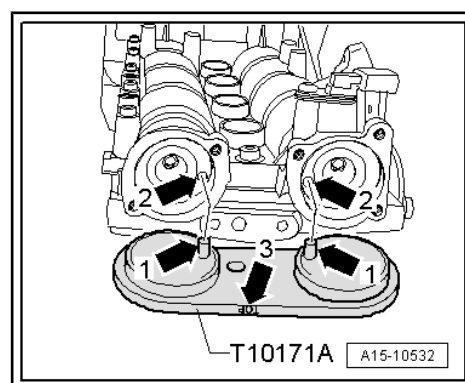




- Screw locking pin - T10340- into cylinder block as far as stop and tighten to 30 Nm.
- Turn crankshaft in direction of engine rotation until it makes contact with locking pin.



- Insert camshaft clamp - T10171 A- into holes in camshafts as far as stop.
- The locking pins -arrows 1- must engage in the holes -arrows 2-.
- The inscription “TOP” -arrow 3- should be legible from above.
- If camshaft clamp - T10171 A- cannot be fully inserted into holes in camshafts, repeat adjustment.
- If it is possible to insert camshaft clamp - T10171 A- completely, take off camshaft clamp again.
- Remove locking pin - T10340- .

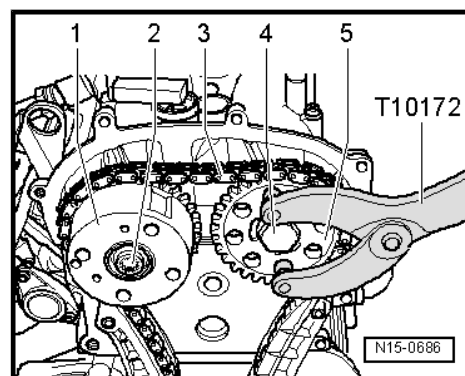


Caution

Risk of damage to thread.

◆ *The camshaft adjuster central bolt has a left-hand thread.*

- Tighten bolt -2- for camshaft adjuster -1- and bolt -4- for camshaft chain sprocket -5- and turn further through specified angle to final setting (counterhold at camshaft chain sprocket using counterhold tool - T10172 A-).



Note

Disregard -item 3-.

- Turn crankshaft 2 revolutions in direction of engine rotation and set to “TDC”.
- Check adjustment ➔ [page 96](#) ; repeat adjustment if necessary.



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Caution

Risk of damage to engine.

- ◆ **To prevent the crankshaft chain sprocket from slipping off the drive lug, do not rotate the crankshaft after the poly V-belt pulley has been detached.**

- Remove bolt for poly V-belt pulley -1-.



Note

Leave bearing bush -2- in position on crankshaft.

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

- Install timing chain cover
⇒ [“1.2 Removing and installing timing chain cover”, page 84](#) .
- Install sealing caps for camshafts
⇒ [“3.2 Exploded view - camshaft housing”, page 109](#) .
- Install poly V-belt pulley for crankshaft
⇒ [“1.5 Removing and installing pulley”, page 51](#) .
- Install coolant pipe (left-side)
⇒ [“3.2.2 Removing and installing coolant pipe \(left-side\)”, page 190](#) .
- Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- Install air pipe (top right)
⇒ [“1.1 Exploded view - turbocharger”, page 203](#) .
- Install air hoses with screw-type clips
⇒ [“2.2 Exploded view - hose connections for charge air system”, page 221](#) .

Tightening torques

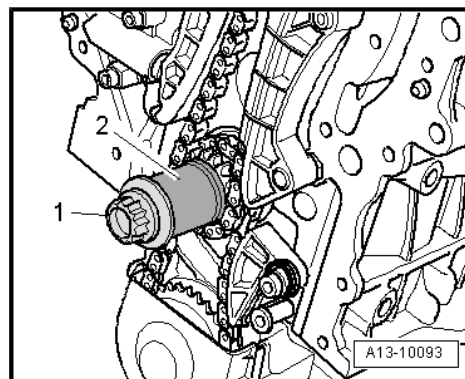
- ◆ ⇒ [“2.1 Exploded view - timing chain”, page 87](#)

2.3

Checking timing chain

Special tools and workshop equipment required

- ◆ Torque wrench - VAS 6583-





◆ Testing tools - T10550-



◆ Camshaft clamp - T10550/1-

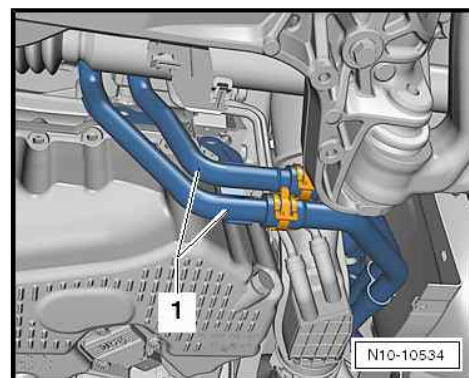
◆ Pointer - T10550/2-

◆ Scaling sleeve - T10550/3-

- Engine oil temperature must be at least 40 °C ⇒ Vehicle diagnostic tester.
- Engine must not be at »TDC« position.
- Remove front wheel (right-side) ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres .
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 50 ; Noise insulation; Exploded view - noise insulation .
- Remove front wheel housing liner (right-side) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Removing and installing wheel housing liner .
- Remove poly V-belt ⇒ [page 40](#) .

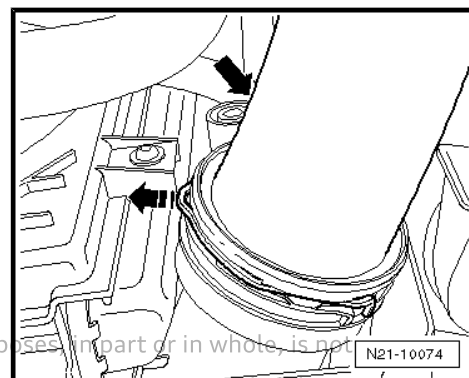
Vehicles with auxiliary/supplementary heater:

- Clamp off coolant hoses with hose clamps up to 25 mm - 3094- .
- Open clamps and disconnect coolant hoses from coolant pipes -1-.
- Remove auxiliary/supplementary heater with exhaust pipe and coolant hoses connected ⇒ Auxiliary/supplementary heater; Rep. gr. 82 ; Auxiliary/supplementary heater; Removing and installing auxiliary/supplementary heater .



All vehicles (continued):

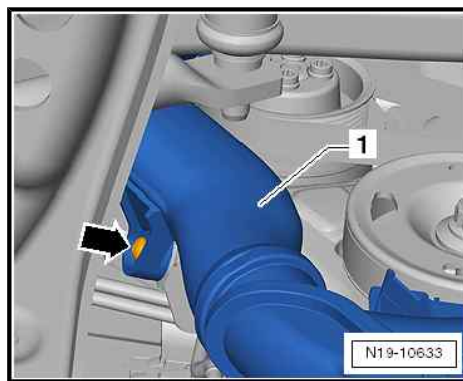
- Detach securing clip from charge air cooler in direction of -arrow-.
- Pull charge air hose -arrow- off charge air cooler.



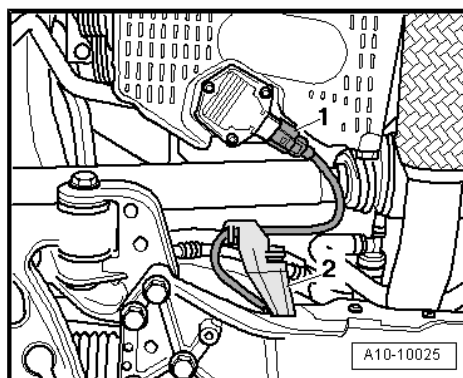
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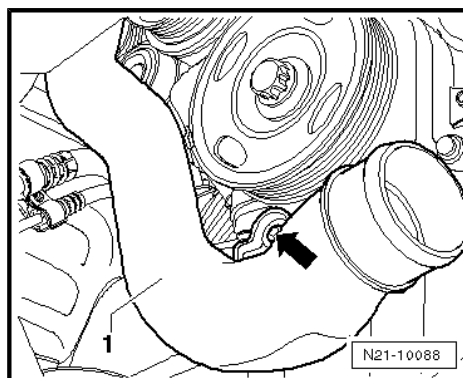
- Unscrew securing bolt -arrow- for charge air pipe -1-.



- Release and unplug connector -1- at oil level and oil temperature sender - G266- .
- Unclip bracket -2- for wire to oil level and oil temperature sender - G266- from subframe.



- Remove bolt -arrow- for charge air cooler -1-.
- Carefully press retaining tabs on housing for noise insulation for supercharger outwards -arrows-.

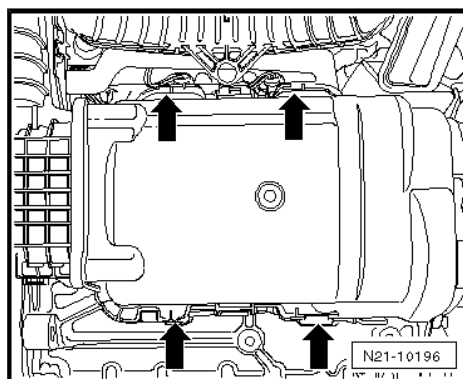


- Detach housing together with noise insulation and place down to one side.



Note

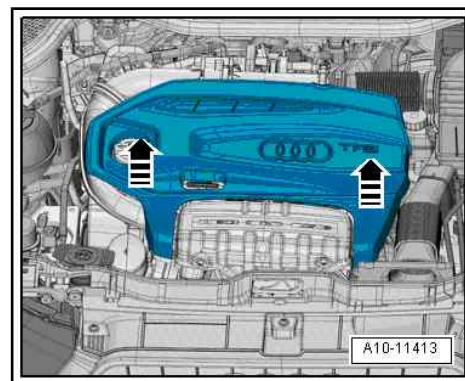
Housing with noise insulation remains in vehicle.



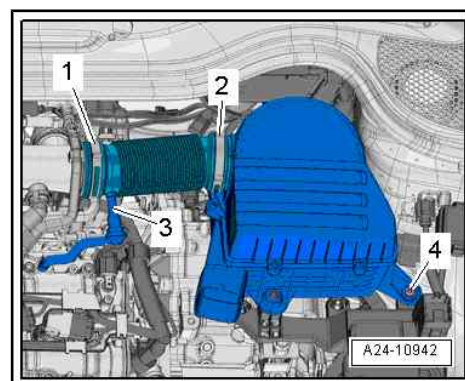
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- Detach engine cover panel (front) -arrows- and remove to-wards front.



- Release hose clip -1- and detach air hose from intake mani-fold.
- Disconnect vacuum hose -3- from air hose.
- Unscrew bolt -4- and detach air cleaner housing.



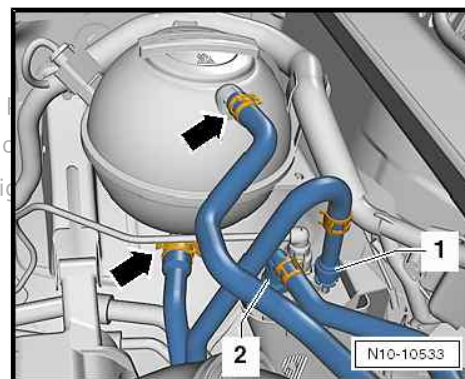
Note

Disregard -item 2-.

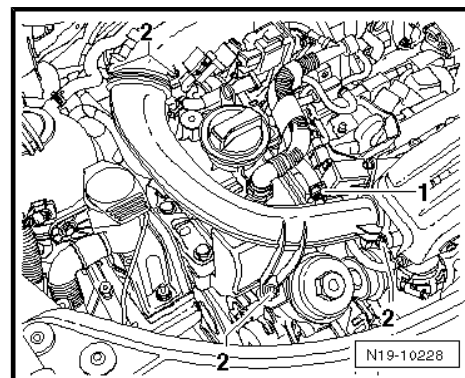


- Press release tabs and detach fuel supply line -1- and line to activated charcoal filter -2-.

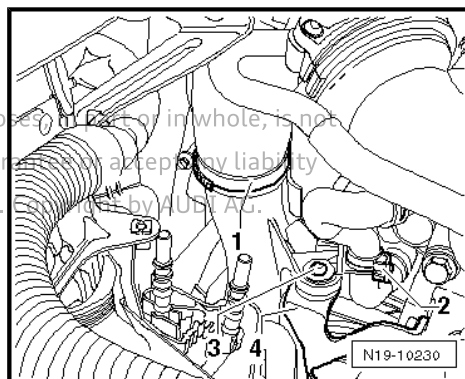
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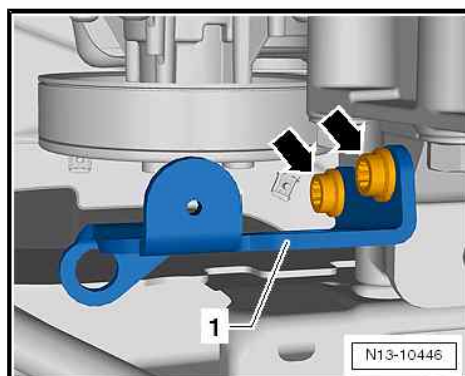
- Detach hose -1- from pressure pipe.
- Unscrew securing bolts -2- on pressure pipe and detach pres-sure pipe.



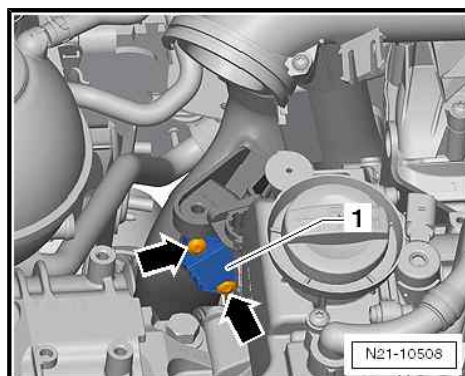
- Remove hose clip -1- from charge air pipe.
- Open retainer -2- and pull hose out.
- Unscrew securing bolt for charge air pipe -3- and unplug connector from charge pressure sender - G31- with intake air temperature sender 2 - G299-.
- Remove bracket -4-.



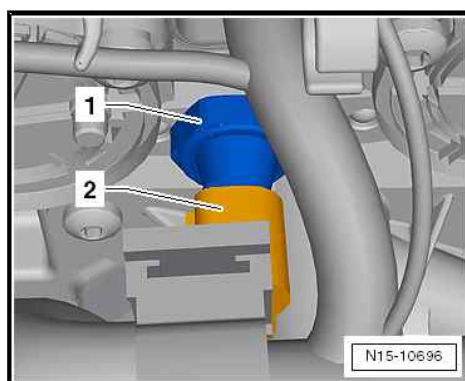
- To do so, unscrew bolts -arrows-.
- Detach bracket -1-.



- Unscrew bolts -arrows- and remove charge pressure sender - G31- .
- Remove charge air pipe downwards.

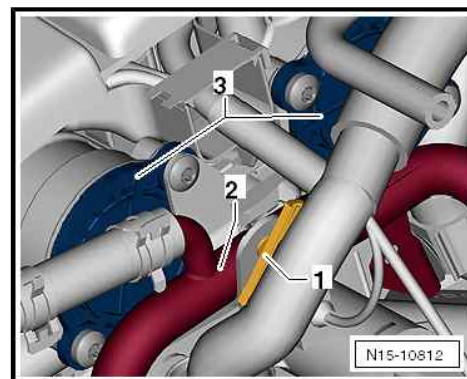


- Release connector -2- and unplug.

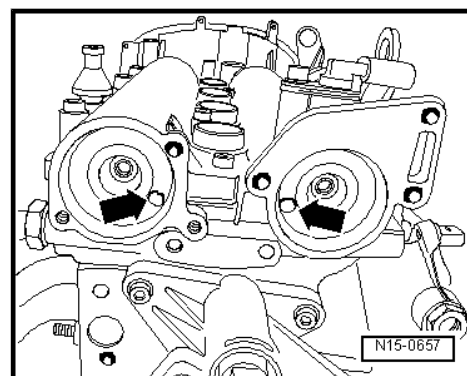




- Remove bolts from both camshaft covers -3-.
- Unclip electrical wiring harness -1-.
- Pull coolant pipe -2- and electrical wiring harness -1- away from cylinder head.
- Prise both camshaft covers -3- out of cylinder head.

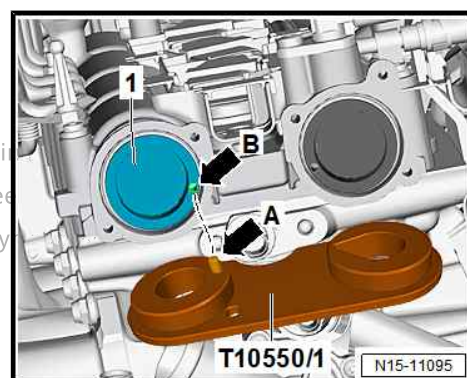


- Hole -left arrow- in exhaust camshaft (left-side) must be in position shown.
- If necessary, turn crankshaft in direction of engine rotation.

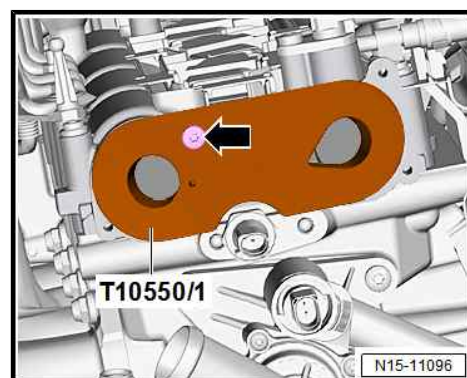


- Insert camshaft clamp - T10550/1- all the way into camshaft openings.
- Locking pin -arrow A- must engage in hole -arrow B- in exhaust camshaft.
- Marking "TOP" should be legible from above.

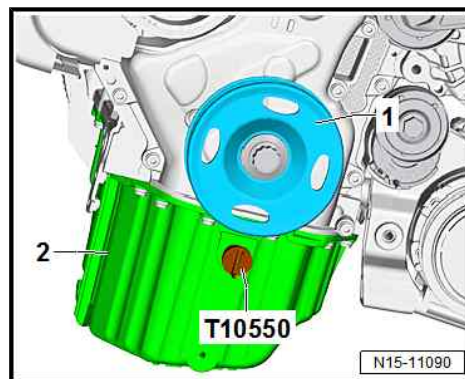
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- Secure camshaft clamp - T10550/1- with bolt so it is hand-tight.
- Use one of the camshaft cover bolts -arrow-.



- Screw pointer - T10550/2- into hole in sump.
- Align pointer vertically, ensuring that tip faces upwards.
- Tighten pointer with knurled nut.



- Position scaling sleeve - T10550/3- on pulley.



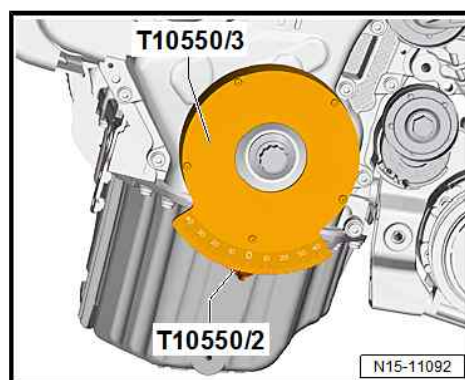
Caution

Risk of injury: fingers could become jammed between the parts.

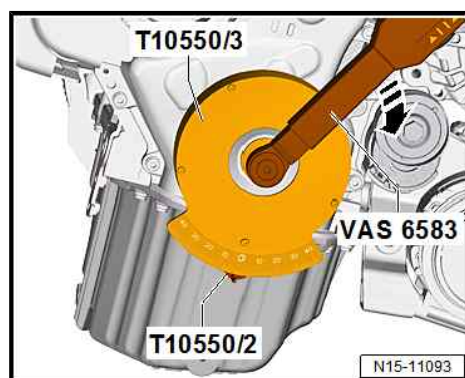
The scaling sleeve - T10550/3- is fitted with magnets.

Carefully bring the parts together.

When doing so, note that the parts pull towards each other very quickly.



- Align scaling sleeve - T10550/3- with pointer - T10550/2- as shown.
- Fit torque wrench - VAS 6583- onto crankshaft bolt using a suitable socket.
- Push torque wrench - VAS 6583- clockwise and hold at 40 Nm.
- Turn scaling sleeve - T10550/3- so that pointer - T10550/2- is at position »0«.



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- Switch torque wrench - VAS 6583- direction setting and slowly push it anti-clockwise.
- Hold torque wrench - VAS 6583- at 40 Nm.
- Read off value indicated on scaling sleeve.
- If timing chain skips during test, it must be renewed
⇒ [“2.2 Removing and installing camshaft timing chain”, page 88](#) .
- Timing chain skipping can be easily heard and felt.

Test evaluation

- If timing chain is elongated by up to 28°, it is OK.
- If timing chain is elongated by 29° or more, it is not OK and must be renewed
⇒ [“2.2 Removing and installing camshaft timing chain”, page 88](#) .

Assemble in reverse order. Note the following:

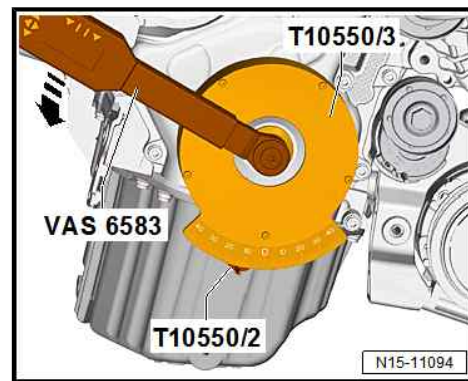


Note

- ◆ *The scaling sleeve - T10550/3- is fitted with magnets.*
- ◆ *Do not use any tools to prise the scaling sleeve - T10550/3- off the pulley.*
- Turn scaling sleeve - T10550/3- approx. 45° to the right so that the scaling area is no longer above the pointer - T10550/2- .
- Reach behind scaling sleeve - T10550/3- with both hands.
- Press against pulley bolt with your thumbs and pull off scaling sleeve - T10550/3- .
- Renew seals for camshaft sealing caps and lubricate with oil before installing.
- Fill up with coolant ⇒ [page 168](#) .

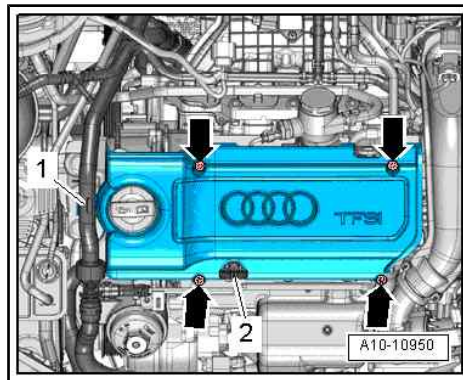
Tightening torques

- ◆ ⇒ [“2.1 Exploded view - timing chain”, page 87](#)
- ◆ ⇒ [“1.2.1 Removing and installing poly V-belt for ancillaries”, page 40](#)
- ◆ ⇒ General body repairs, exterior; Rep. gr. 50 ; Noise insulation; Exploded view - noise insulation
- ◆ ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Removing and installing wheel housing liner
- ◆ ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres





- Fit engine cover panel onto camshaft housing and engage coolant hose -1- in retainer.
- Tighten securing bolts -arrows- to 10 Nm.



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3 Cylinder head

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⇒ ["3.1 Exploded view - cylinder head", page 107](#)

⇒ ["3.2 Exploded view - camshaft housing", page 109](#)

⇒ ["3.3 Removing and installing cylinder head", page 111](#)

⇒ ["3.4 Removing and installing camshaft housing", page 126](#)

⇒ ["3.5 Checking compression", page 131](#)

3.1 Exploded view - cylinder head

1 - Cylinder head

- ☐ Removing and installing
⇒ ["3.3 Removing and installing cylinder head", page 111](#)
- ☐ Checking for distortion
⇒ Fig. ["Checking cylinder head for distortion", page 108](#)
- ☐ Sealing surface for camshaft housing must be free of oil and grease
- ☐ If renewed, change coolant and engine oil

2 - Guide pin

- ☐ Tightening torque
⇒ [Item 4 \(page 87\)](#)

3 - Bolt

- ☐ 20 Nm

4 - Engine lifting eye

5 - Hydraulic compensation element

- ☐ Do not interchange
- ☐ Lubricate running surfaces with oil

6 - Securing clip

- ☐ Check for firm attachment
- ☐ Not available as separate part

7 - Roller rocker finger

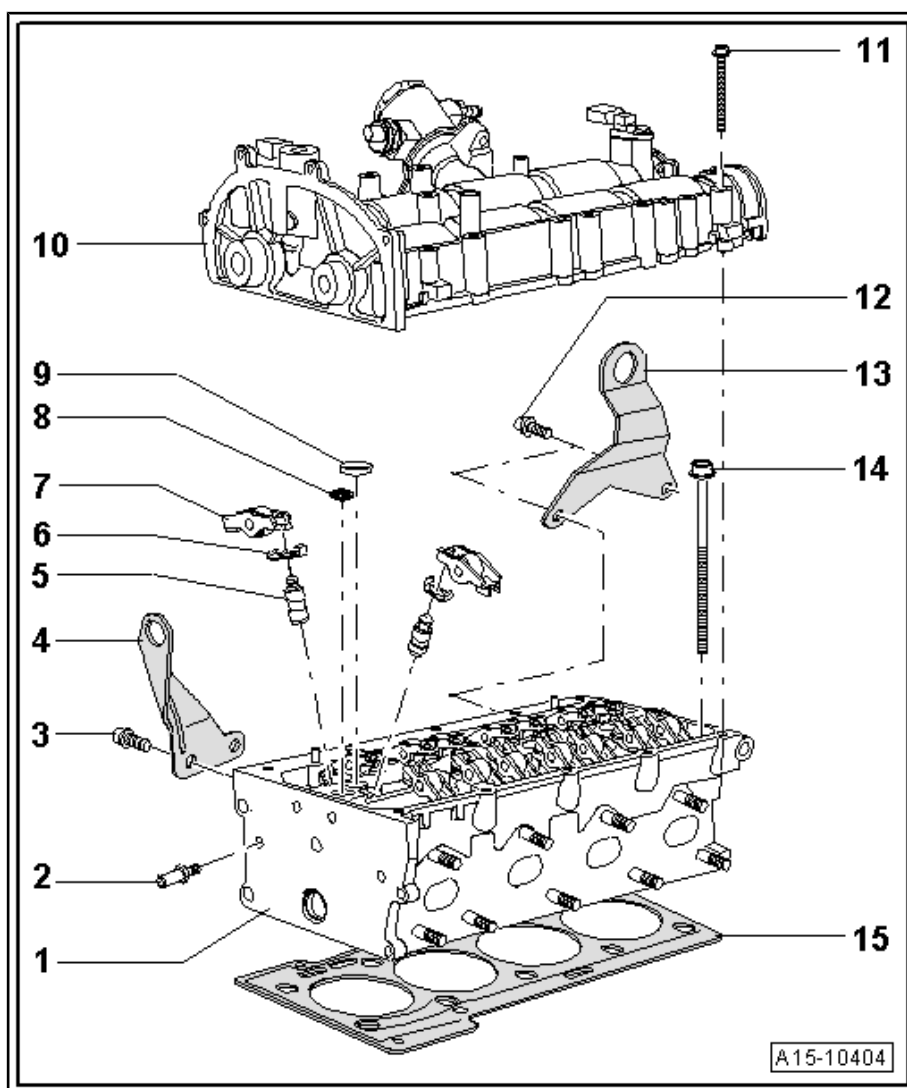
- ☐ Check roller bearings for ease of movement
- ☐ Lubricate contact surfaces before installing
- ☐ Attach to hydraulic compensation element -item 5- using securing clip -item 6-

8 - Oil strainer

- ☐ Inserted into cylinder head
- ☐ Renew

9 - Seal

- ☐ Inserted into cylinder head
- ☐ 4x
- ☐ Renew





10 - Camshaft housing

- ☐ Removing and installing ⇒ [“3.4 Removing and installing camshaft housing”, page 126](#)

11 - Bolt

- ☐ Renew
- ☐ Note correct sequence when loosening ⇒ [page 129](#)
- ☐ Tightening torque and sequence
⇒ [Fig. ““Camshaft housing - tightening torque and sequence””, page 110](#)

12 - Bolt

- ☐ 20 Nm

13 - Engine lifting eye

14 - Bolt

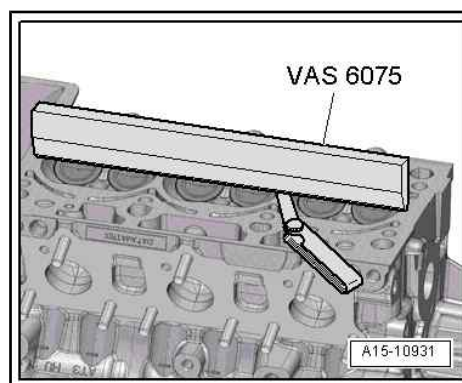
- ☐ Renew
- ☐ Note correct sequence when loosening ⇒ [page 122](#)
- ☐ Tightening torque and sequence ⇒ [Fig. ““Cylinder head - tightening torque and sequence””, page 109](#)

15 - Cylinder head gasket

- ☐ Renewing ⇒ [“3.3 Removing and installing cylinder head”, page 111](#)
- ☐ Installation position: Part number points towards cylinder head, and must be legible from exhaust side
- ☐ If renewed, change coolant and engine oil

Checking cylinder head for distortion

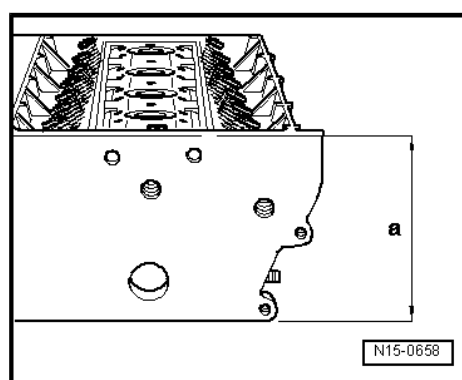
- Use straight edge 500 mm - VAS 6075- and feeler gauge to measure cylinder head for distortion at several points.
- Max. permissible distortion: 0.05 mm.



Reworking cylinder head sealing surface

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

- Minimum dimension: -a- = 108.25 mm





Cylinder head - tightening torque and sequence

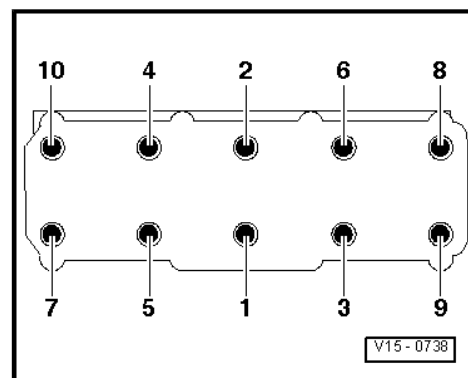


Note

Renew bolts tightened with specified tightening angle.

– Tighten bolts in stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1.	-1 ... 10-	Screw in by hand until contact is made
2.	-1 ... 10-	30 Nm
3.	-1 ... 10-	Turn 90° further
4.	-1 ... 10-	Turn 90° further
5.	-1 ... 10-	Turn 90° further



3.2 Exploded view - camshaft housing

1 - Guide sleeve

2 - Seal

- ☐ 4x
- ☐ Inserted into cylinder head
- ☐ Renew

3 - Oil strainer

- ☐ Inserted into cylinder head
- ☐ Renew

4 - Camshaft housing

- ☐ With integrated camshaft bearings
- ☐ Removing and installing
⇒ ["3.4 Removing and installing camshaft housing", page 126](#)

5 - O-ring

- ☐ Renew

6 - Camshaft control valve 1 - N205-

7 - Bolt

- ☐ 10 Nm

8 - High-pressure pump

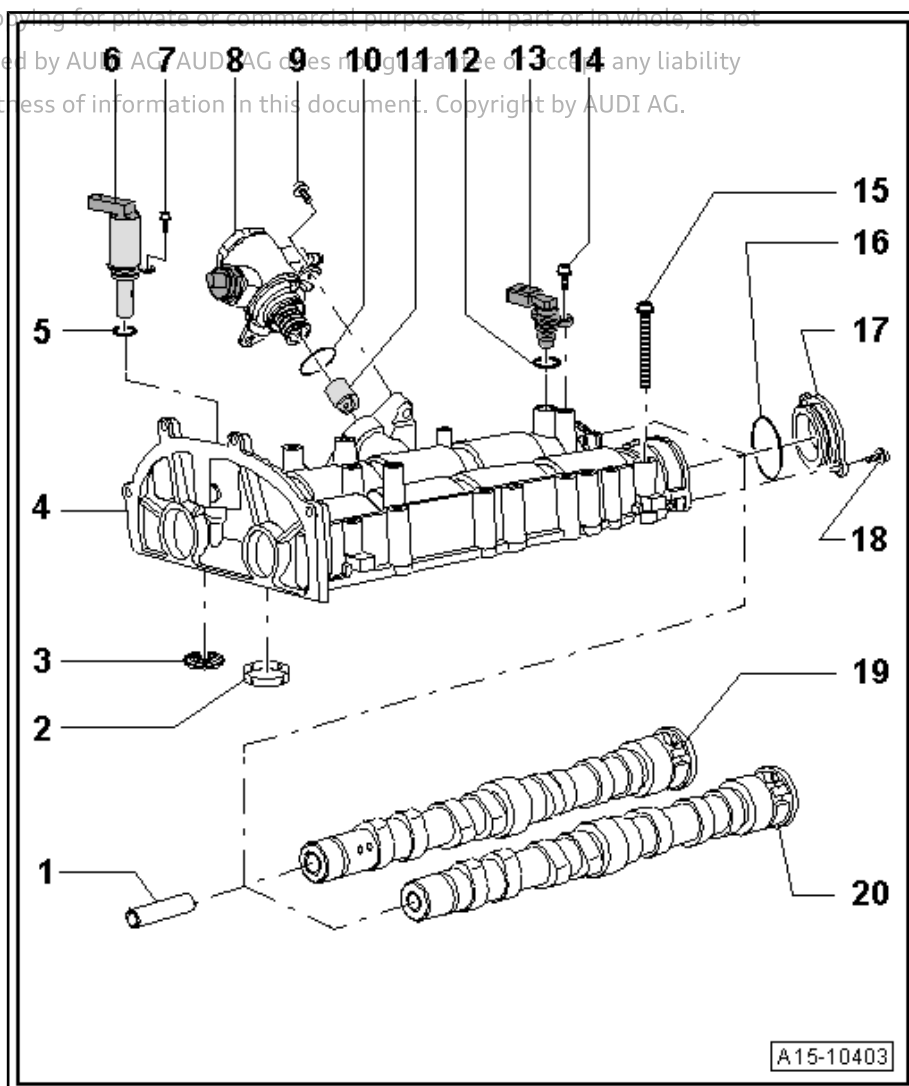
- ☐ With fuel pressure regulating valve - N276-
- ☐ Removing and installing
⇒ ["6.2 Removing and installing high-pressure pump", page 266](#)

9 - Bolt

- ☐ Tightening torque ⇒ [Item 4 \(page 266\)](#)

10 - O-ring

- ☐ Renew



**11 - Roller tappet**

- ☐ For high-pressure pump

12 - O-ring

- ☐ Renew

13 - Hall sender - G40-

- ☐ Removing and installing ⇒ [“1.5 Removing and installing Hall senders”, page 291](#)

14 - Bolt

- ☐ Tightening torque ⇒ [Item 4 \(page 287\)](#)

15 - Bolt

- ☐ Correct sequence when slackening ⇒ [page 129](#)
- ☐ Renew
- ☐ Tightening torque and sequence
⇒ [Fig. “Camshaft housing - tightening torque and sequence”, page 110](#)

16 - O-ring

- ☐ Renew
- ☐ Lubricate before fitting

17 - Sealing cap**18 - Bolt**

- ☐ 10 Nm

19 - Inlet camshaft

- ☐ With cam for high-pressure pump
- ☐ Before removing, detach roller tappet for high-pressure pump
- ☐ Measuring axial clearance ⇒ [“4.2 Measuring axial clearance of camshaft”, page 135](#)
- ☐ Removing and installing ⇒ [“4.3 Removing and installing camshaft”, page 136](#)
- ☐ Lubricate with oil before installing (also lubricate collar of axial bearing)

20 - Exhaust camshaft

- ☐ Measuring axial clearance ⇒ [“4.2 Measuring axial clearance of camshaft”, page 135](#)
- ☐ Removing and installing ⇒ [“4.3 Removing and installing camshaft”, page 136](#)
- ☐ Lubricate with oil before installing (also lubricate collar of axial bearing)

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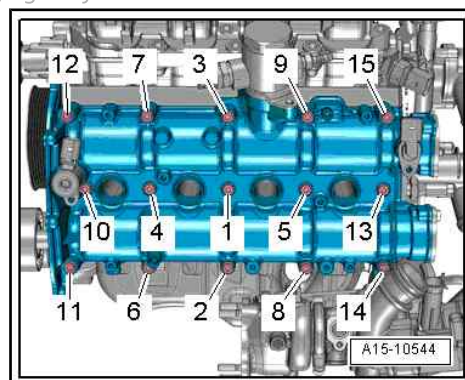
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Camshaft housing - tightening torque and sequence**Note**

Renew bolts tightened with specified tightening angle.

- Tighten bolts in 2 stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1.	-1 ... 15-	10 Nm
2.	-1 ... 15-	Turn 90° further



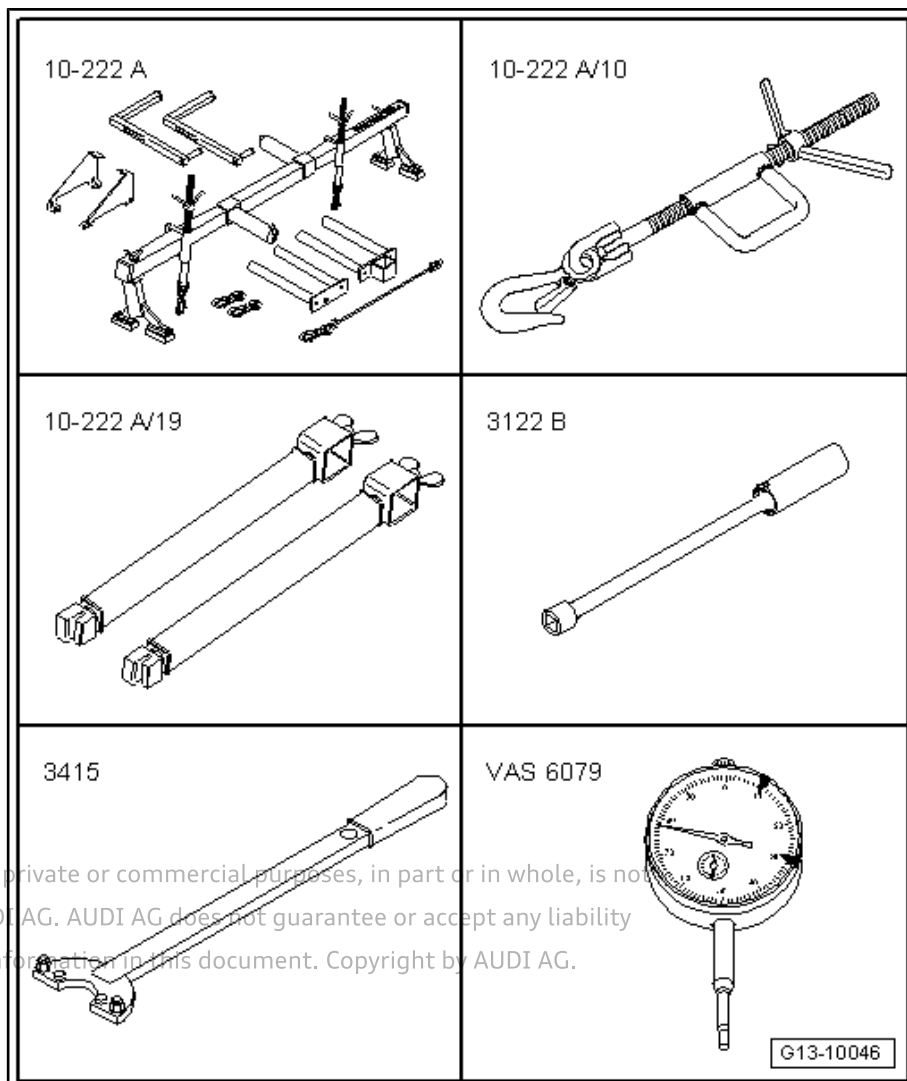


3.3 Removing and installing cylinder head

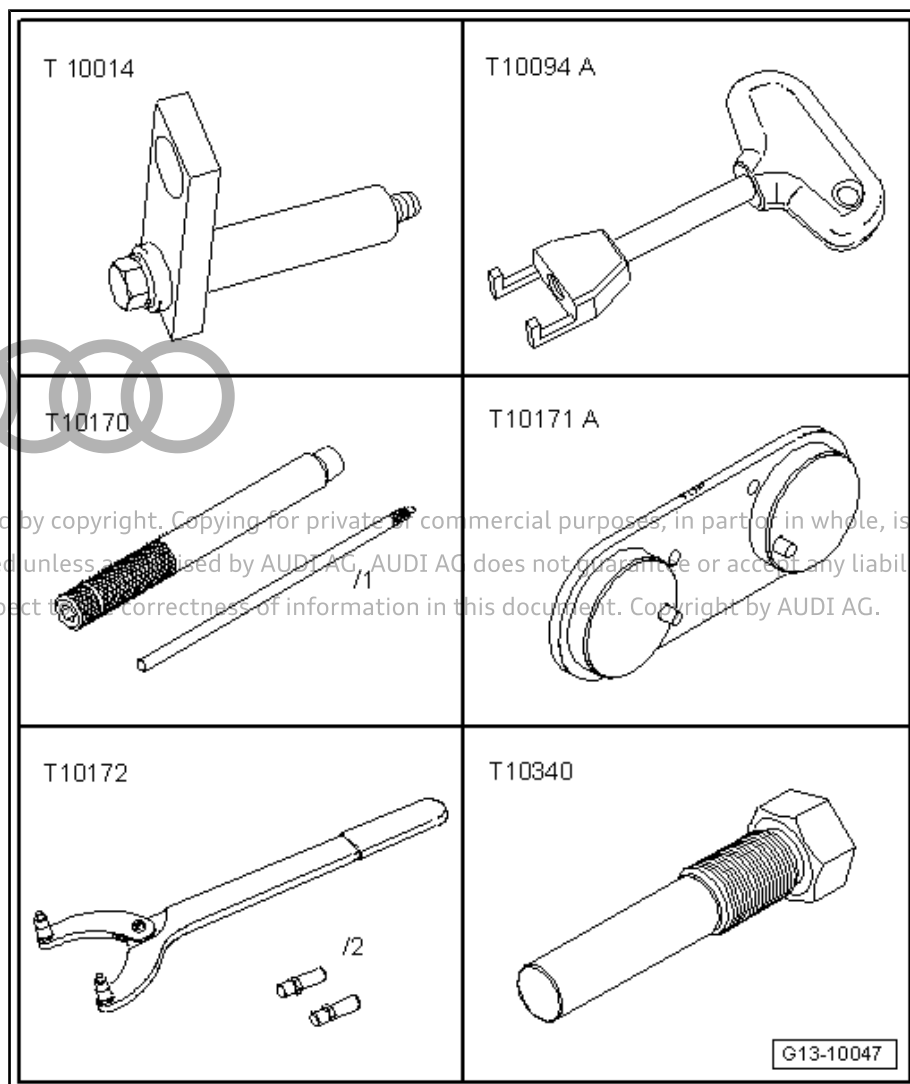
Special tools and workshop
 equipment required



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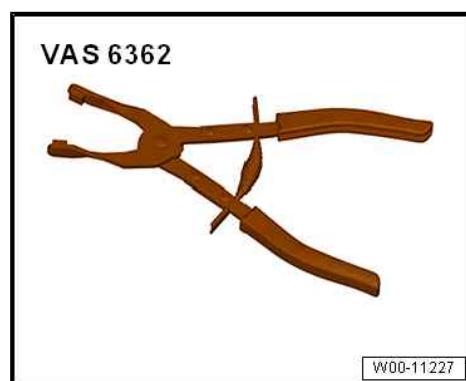


- ◆ Support bracket - 10 - 222 A-
- ◆ Hook - 10 - 222 A /10-
- ◆ Adapters - 10 - 222 A /19-
- ◆ Spark plug spanner - 3122 B-
- ◆ Counterhold tool - 3415-
- ◆ Dial gauge - VAS 6079-



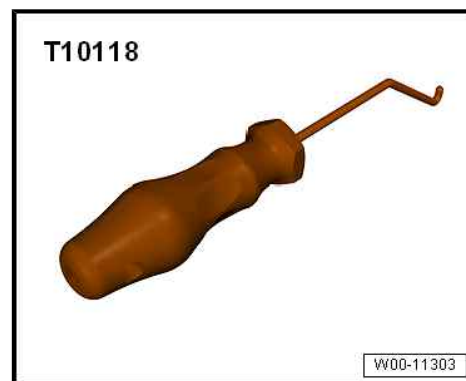
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- ◆ Bracket - T10014-
- ◆ Puller - T10094 A-
- ◆ Adapter for dial gauge - T10170-
- ◆ Camshaft clamp - T10171 A-
- ◆ Counterhold tool - T10172 A-
- ◆ Locking pin - T10340-
- ◆ Hose clip pliers - VAS 6362-

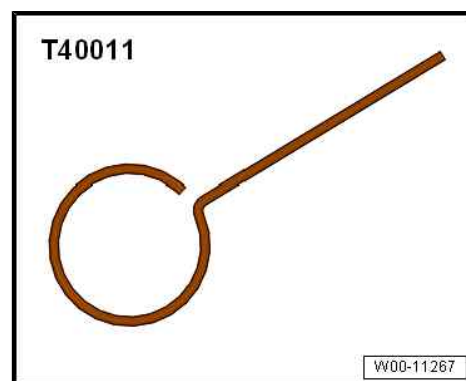




- ◆ Assembly tool - T10118-



- ◆ Locking pin - T40011-



Removing

- Remove catalytic converter with centre silencer
⇒ ["2.1 Removing and installing catalytic converter", page 282](#) .
- Remove thermostat housing with coolant pipe (rear)
⇒ ["3.2.3 Removing and installing coolant pipe \(rear\) with thermostat housing", page 191](#) .
- Remove bracket for ancillaries
⇒ ["1.4 Removing and installing bracket for ancillaries", page 50](#) .

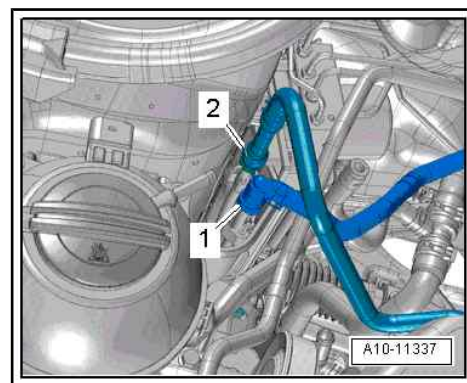


WARNING

The fuel system is pressurised.

Risk of injury as fuel may spray out.

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



- Disconnect fuel supply line -2- (pull release ring).



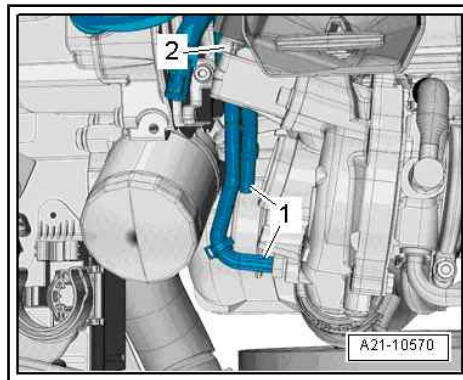
Note

Disregard -item 1-

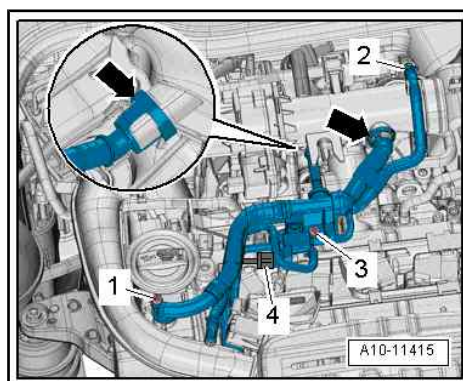
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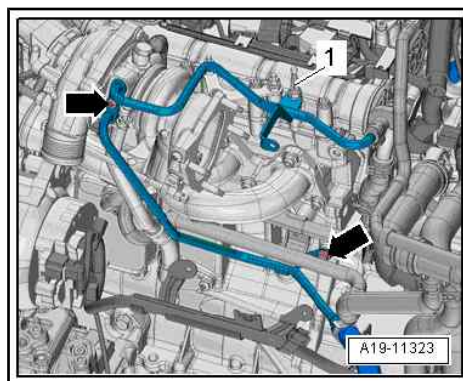
- Unplug electrical connector -2-.
- Detach vacuum hoses -1-.



- Unplug electrical connector -4-.
- Remove bolts -1, 3-.
- Press release tabs and disconnect crankcase breather hoses -arrows-.
- Release hose clip -2- and disconnect hose at activated charcoal filter.
- Detach hoses.



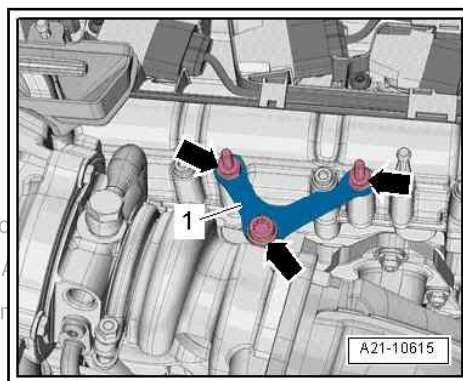
- Remove bolts -arrows- and ball stud -1-.



- Unscrew bolts -arrows- and detach bracket -1-.

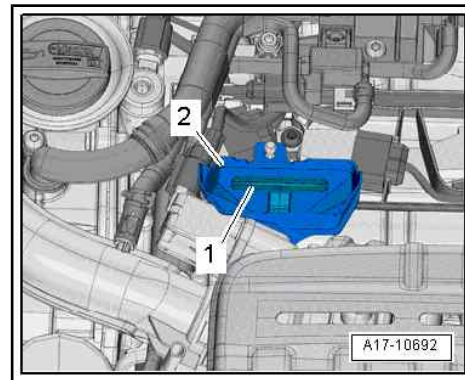


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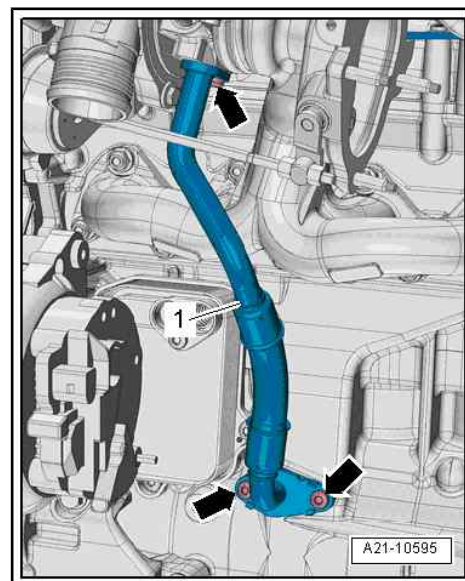




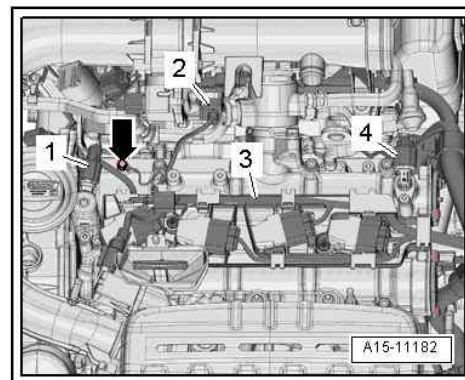
- Pull out oil dipstick -1- and sleeve -2-.



- Remove bolts -arrows- and detach oil return line -1- for turbo-charger.
- Remove ignition coils
 ⇒ [“1.3 Removing and installing ignition coils with output stages”, page 288](#) .
- Remove spark plug for cylinder 1 with spark plug socket and extension - 3122 B- .



- Unplug electrical connectors -1, 2, 4-, detach wiring duct -3- from camshaft housing and swivel to left side.
- Remove bolt -arrow- for earth wire.



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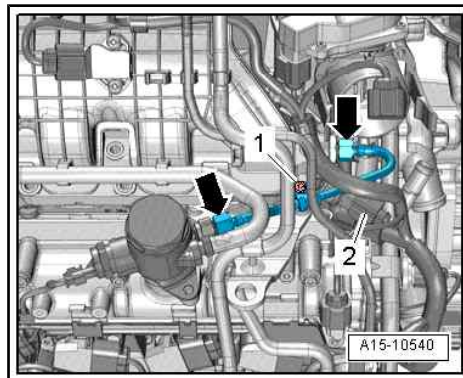


WARNING

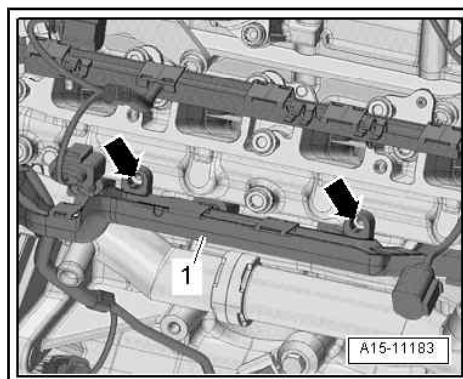
The fuel system is pressurised.

Risk of injury as fuel may spray out.

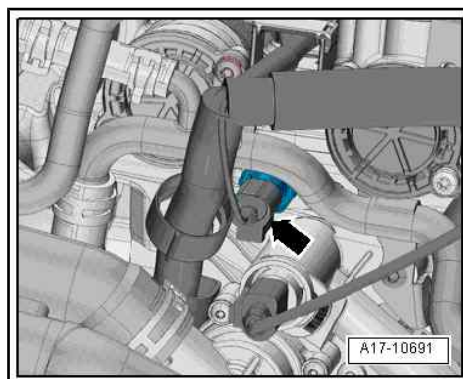
- *Put on safety goggles.*
- *Put on protective gloves.*
- *Release pressure (wrap a clean cloth around connection and open connection carefully).*



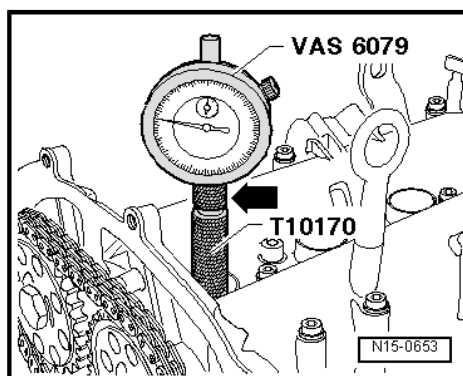
- Remove union nuts -arrows- and bolt -1- and detach high-pressure pipe.
- Unplug electrical connector -2- on fuel pressure regulating valve - N276-.
- Move wiring guide -1- clear -arrows-.
- Unplug electrical connectors at injectors and move clear.



- Using assembly tool - T10118- , unplug electrical connector -arrow- at oil pressure switch - F1- .

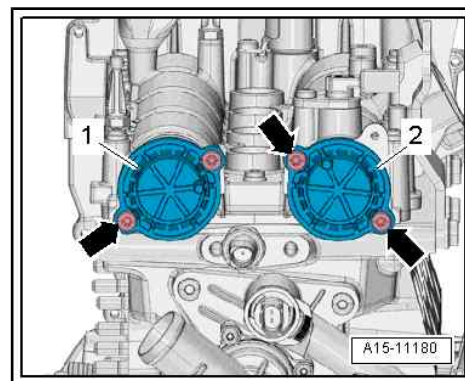


- Screw adapter for dial gauge - T10170- into spark plug hole as far as the stop.
- Insert dial gauge - VAS 6079- with extension -T10170/1- as far as the stop and secure using locking nut -arrow-.
- Rotate crankshaft in normal direction of rotation to “TDC”.
- “TDC” = maximum measured value on dial gauge.

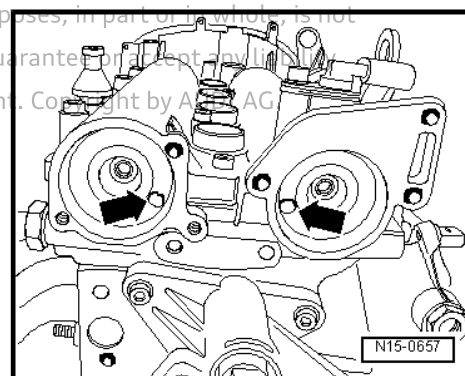




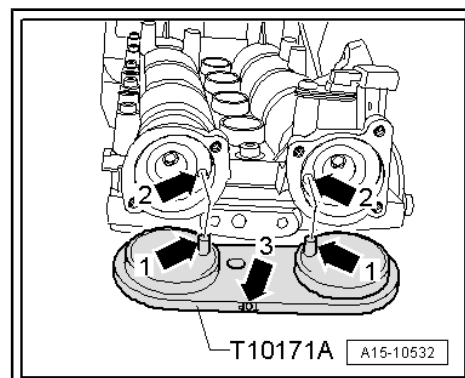
- Remove bolts -arrows- and detach sealing caps -1- and -2-.



- The threaded holes -arrows- in the camshafts must be positioned as shown in illustration. Turn crankshaft one turn (360°) if necessary.



- Insert camshaft clamp - T10171 A- into holes in camshafts as far as stop.
- The locking pins -arrows 1- must engage in the holes -arrows 2-.
- The inscription “TOP” -arrow 3- should be legible from above.



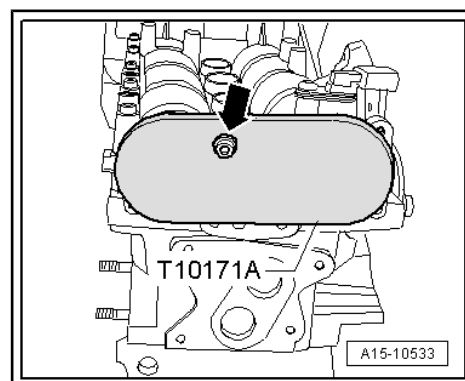
- To secure the camshaft clamp - T10171 A- , screw in an M6 bolt -arrow- hand-tight, but do not tighten.



Caution

Risk of damage to camshafts.

- ◆ **The camshaft clamp - T10171 A- must not be used as a counterhold tool.**





- Unscrew plug -arrow- for “TDC” hole on cylinder block.



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- Screw locking pin - T10340- into cylinder block as far as stop and tighten to 30 Nm.



Note

The locking pin - T10340- locks the crankshaft only in the direction of engine rotation.



Caution

Risk of damage to engine.

- ◆ *To prevent the crankshaft chain sprocket from slipping off the drive lug, do not rotate the crankshaft after the poly V-belt pulley has been detached.*

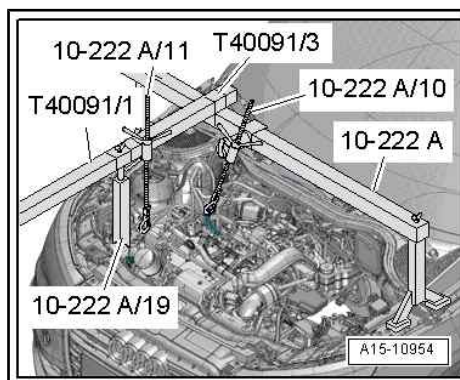
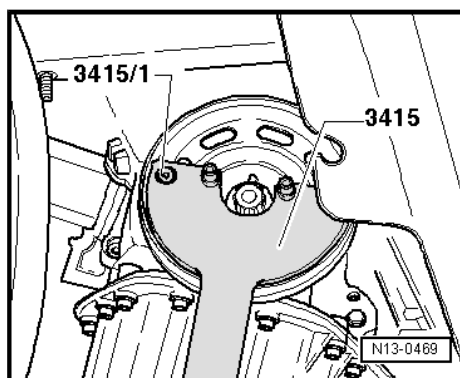
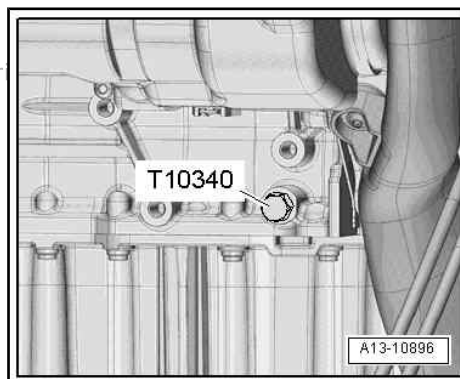
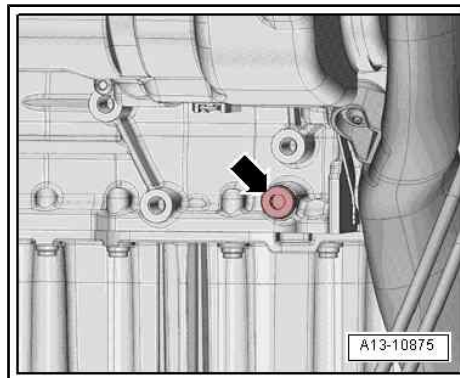
- Loosen bolt for poly V-belt pulley using counterhold tool - 3415- with pin -3415/1- .
- Remove bolt and take off poly V-belt pulley.
- Set up support bracket - 10 - 222 A- on top edges of body flanges (left and right) and longitudinal member (right-side), as shown in illustration.
- Attach hook - 10 - 222 A /10- in right engine lifting eye and tighten spindle slightly to take up weight of engine/gearbox assembly.



Note

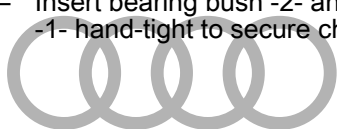
Spindle - 10 - 222 A /11- is not used at this stage.

- Remove timing chain cover
⇒ [“1.2 Removing and installing timing chain cover”, page 84](#) .

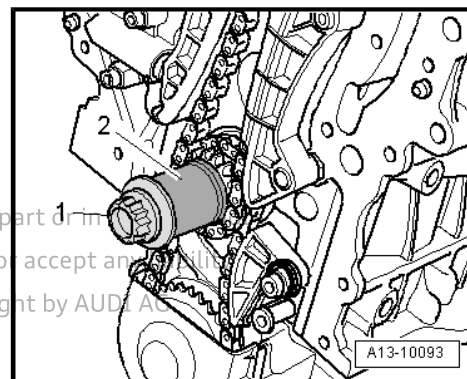




- Insert bearing bush -2- and screw in crankshaft pulley bolt -1- hand-tight to secure chain sprocket on crankshaft.



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- Press tensioning rail -2- in direction of -arrow- and use locking pin - T40011- to lock piston for chain tensioner -1-.



Caution

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

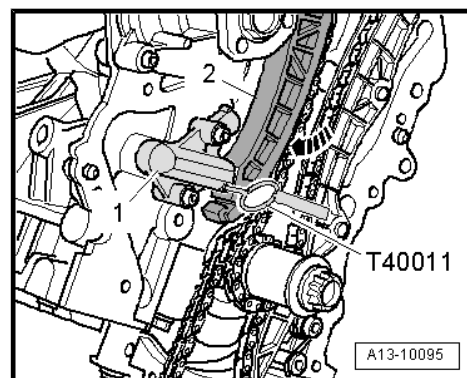
- ◆ *Mark running direction of timing chain with coloured arrows for re-installation. Do not mark timing chain by means of centre punch, notch or the like.*

Risk of damage to camshafts.

- ◆ *The camshaft clamp - T10171 A- must not be used as a counterhold tool.*

Risk of damage to thread.

- ◆ *The camshaft adjuster central bolt has a left-hand thread.*

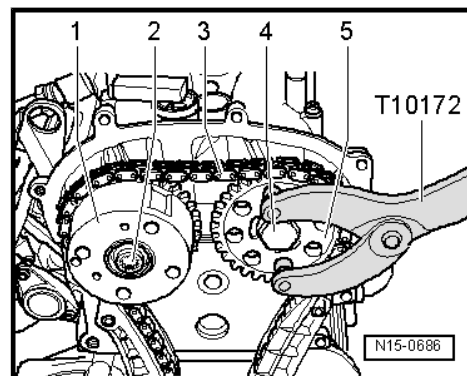


- Loosen bolt -2- for camshaft adjuster -1- and bolt -4- for camshaft chain sprocket -5-, using counterhold tool - T10172 A- to counterhold on camshaft chain sprocket.
- Detach camshaft chain sprocket together with camshaft timing chain -3-.

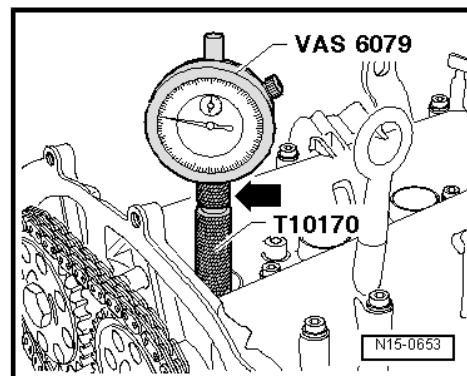


Note

Leave camshaft adjuster on camshaft.



- Loosen locking nut -arrow- and detach adapter for dial gauge - T10170- with dial gauge - VAS 6079- .

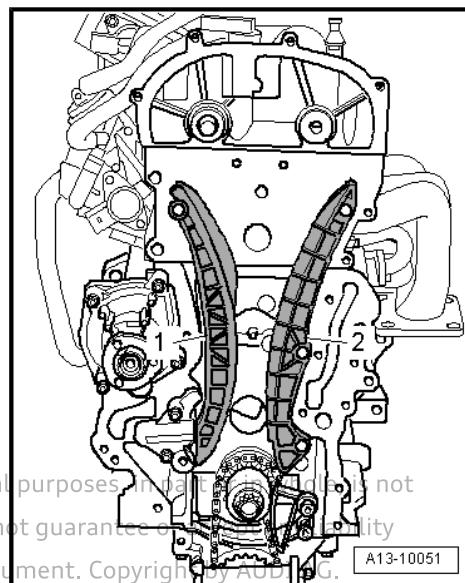




- Pull tensioning rail -1- and guide rail -2- off mounting pins.



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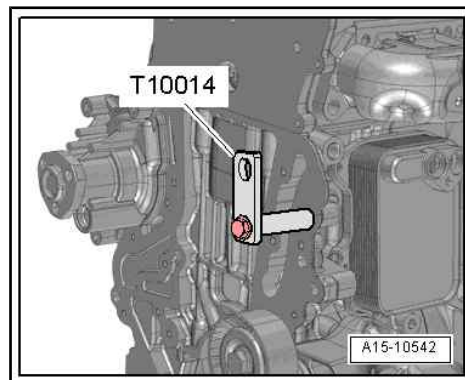
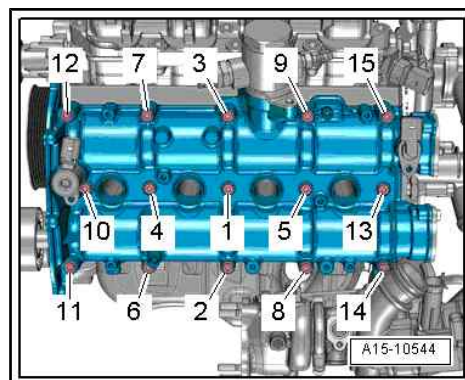
- Slacken camshaft housing bolts in the sequence -15 ... 1-.



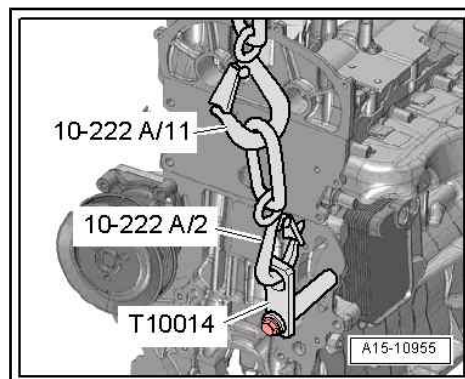
Note

Bolt -6- below turbocharger remains in camshaft housing.

- Carefully detach camshaft housing towards rear.
- Mark original positions of roller rocker fingers and compensation elements for re-installation.
- Remove roller rocker fingers together with compensation elements and put down on a clean surface.
- Secure retainer - T10014- in threaded hole in cylinder block as shown in illustration and tighten to 40 Nm.

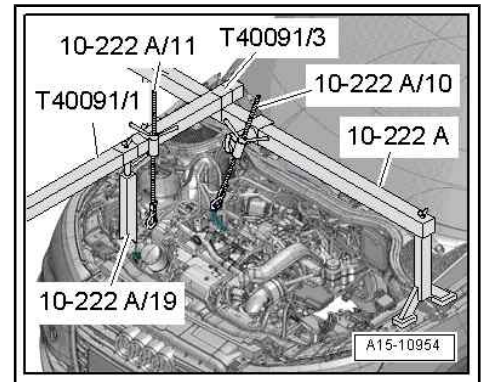


- Attach spindle - 10 - 222 A /11- of support bracket to retainer - 10 - 222 A /2- with hook - T10014- and partly take up weight with spindle.





- Detach hook - 10 - 222 A /10- and move clear to one side.



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- Slacken cylinder head bolts in the sequence -1 ... 10-.
- Remove bolts and carefully take off cylinder head.
- Place cylinder head onto soft surface (foam plastic).

Installing



Caution

Risk of damage to sealing surfaces.

- ◆ **Carefully remove sealant residue from cylinder head and cylinder block.**
- ◆ **Ensure that no long scores or scratches are made on the surfaces.**

Risk of damage to cylinder block.

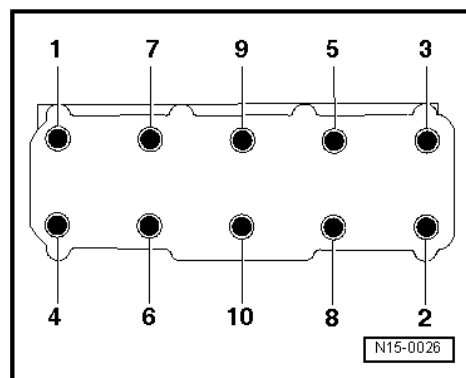
- ◆ **No oil or coolant must be allowed to remain in the blind holes for the cylinder head bolts in the cylinder block.**

Risk of leaks at cylinder head gasket.

- ◆ **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

- ◆ **Do NOT use abrasive materials (sandpaper, sanding discs, sanding pads, abrasive web, wire wool, etc.).**
- ◆ **When removing sealant residue, make sure none of the residue enters the open channels of the engine.**
- ◆ **Ensure that nearby workspaces are kept clean and that the abrasive materials listed above are not being used there.**
- ◆ **Use of non-approved abrasive materials can lead to subsequent damage to the turbocharger, conrod bearings, etc.**
- ◆ **Renew bolts tightened with specified tightening angle.**
- ◆ **Renew self-locking nuts as well as seals, gaskets and O-rings.**
- ◆ **Renew oil strainer in cylinder head.**
- ◆ **When installing an exchange cylinder head, the contact surfaces between the hydraulic compensation elements, roller rocker fingers and cams must be oiled before installing the cylinder head cover.**
- ◆ **Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .**
- ◆ **After fitting a new cylinder head or cylinder head gasket, change the engine oil and the coolant in the entire cooling system.**



Caution

Protect lubrication system and bearings against contamination.

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

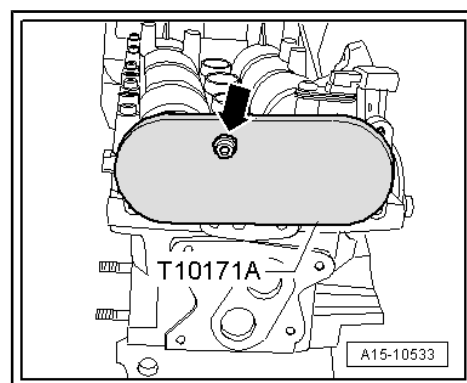
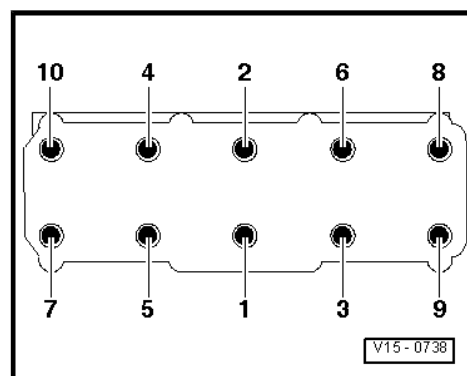
- Sealant residue may only be removed from cylinder head and cylinder block using a commercially available scraper (blade width at least 40 mm).
- Remove loose residue with a lint-free cloth.
- Remove sealant residue on cylinder head and camshaft housing.
- Clean sealing surfaces; they must be free of oil and grease.
- Check that crankshaft is still positioned at “TDC” and then turn back in the opposite direction of engine rotation by approx. 45°.
- Place cylinder head gasket in position.
- Installation position: Part No. must be visible.
- Note position of dowel sleeves in cylinder block.
- Fit cylinder head.
- Tighten cylinder head bolts
⇒ Fig. ““Cylinder head - tightening torque and sequence””, page 109 .



Note

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

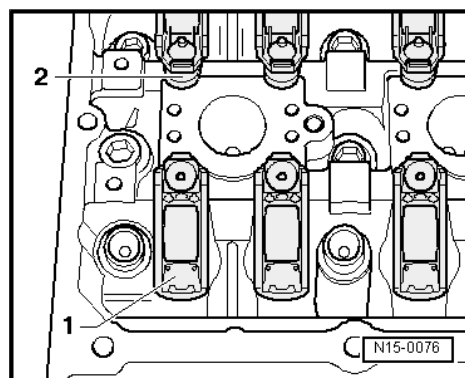
- Camshaft clamp - T10171 A- must be fitted and secured with a bolt -arrow- before installing camshaft housing.



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- Ensure all roller rocker fingers contact the valve ends -1- correctly and are clipped into their respective support elements -2-.

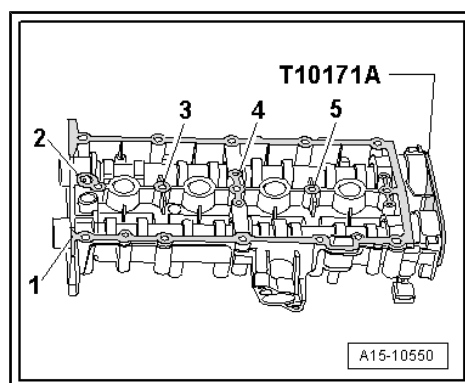


Caution

Make sure lubrication system is not clogged by excess sealant.

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

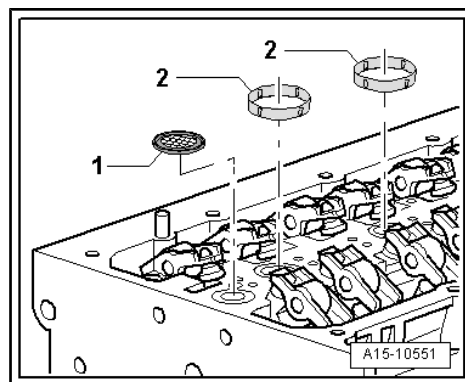
- Apply a thin and even layer of sealant to the clean sealing surface of the camshaft housing at grey-shaded areas -1 ... 5- shown in illustration.



Note

The camshaft housing must be installed within 5 minutes after applying the sealant.

- Fit new oil strainer -1- in cylinder head.
- Fit 4 seals -2- into cylinder head.



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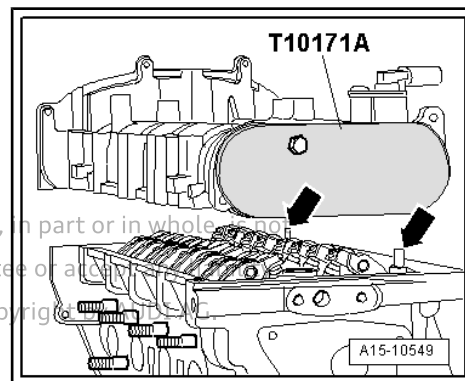


Caution

Make sure remnants of oil are removed before fitting, otherwise leakage can occur.

- ◆ **Make sure sealing surfaces are free of oil when fitting camshaft housing.**

- Carefully fit the camshaft housing vertically onto the dowel pins -arrows- on cylinder head from above.



Note

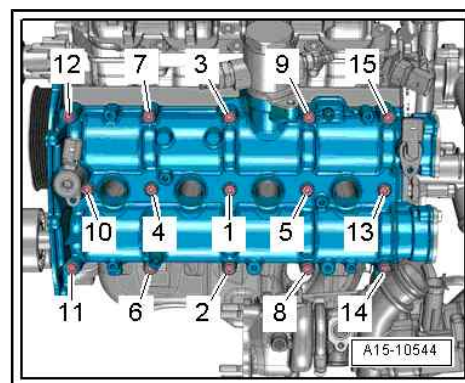
Make sure that camshaft housing is kept straight.

- Tighten camshaft housing bolts
 ⇒ Fig. [“Camshaft housing - tightening torque and sequence”](#),
[page 110](#) .



Note

After fitting camshaft housing, allow sealant to dry for approx. 30 minutes.

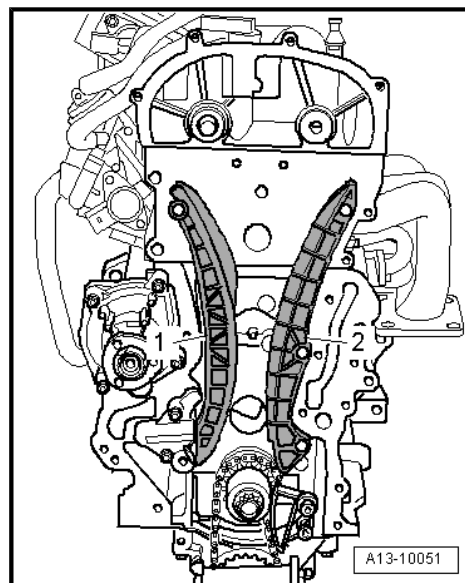




- Fit tensioning rail -1- and guide rail -2- onto mounting pins.
- Install camshaft timing chain ⇒ [page 94](#) .

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

- Install high-pressure pipe
⇒ [“6.3 Removing and installing high-pressure pipe”](#),
[page 269](#) .
- Electrical connections and routing ⇒ Current flow diagrams,
Electrical fault finding and Fitting locations.
- Install bracket for ancillaries
⇒ [“1.4 Removing and installing bracket for ancillaries”](#),
[page 50](#) .
- Install thermostat housing with coolant pipe (rear)
⇒ [“3.2.3 Removing and installing coolant pipe \(rear\) with thermostat housing”](#), [page 191](#) .
- Install catalytic converter with centre silencer
⇒ [“2.1 Removing and installing catalytic converter”](#),
[page 282](#) .



Caution

Risk of damage to valves and piston crowns after working on valve gear.

- ◆ **Turn the engine carefully at least 2 rotations by hand to ensure that none of the valves make contact when the starter is operated.**

Tightening torques

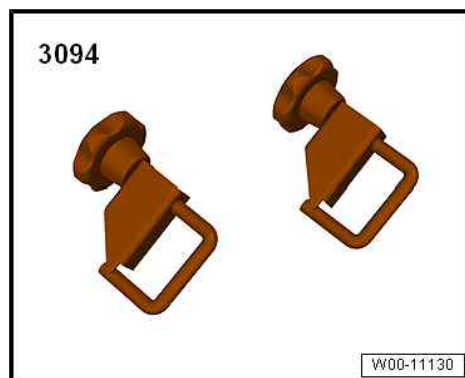
- ◆ ⇒ [“3.1 Exploded view - cylinder head”](#), [page 107](#)
- ◆ ⇒ [Fig. “Cylinder head - tightening torque and sequence”](#),
[page 109](#)
- ◆ ⇒ [Fig. “Camshaft housing - tightening torque and sequence”](#),
[page 110](#)
- ◆ ⇒ [“1.1 Exploded view - turbocharger”](#), [page 203](#)

3.4 Removing and installing camshaft housing

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- ◆ Hose clamps up to 25 mm - 3094-



- ◆ Sealant ⇒ Electronic parts catalogue



Removing

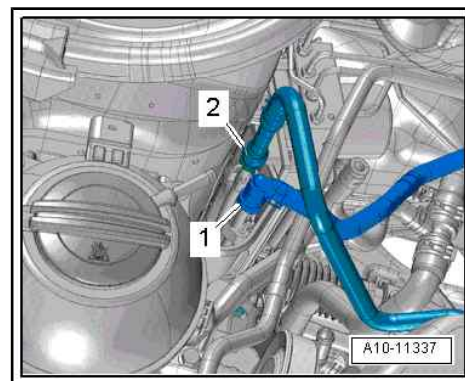


WARNING

The fuel system is pressurised.

Risk of injury as fuel may spray out.

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



- Disconnect fuel supply line -2- (pull release ring).



Note

Disregard -item 1-.

- Remove camshaft timing chain
⇒ ["2.2 Removing and installing camshaft timing chain", page 88](#).

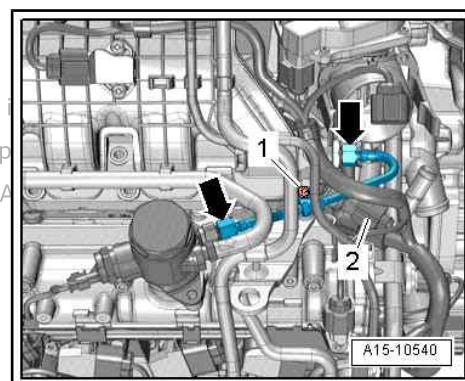


WARNING

The fuel system is pressurised.

Risk of injury as fuel may spray out.

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



- Remove union nuts -arrows- and bolt -1- and detach high-pressure pipe.

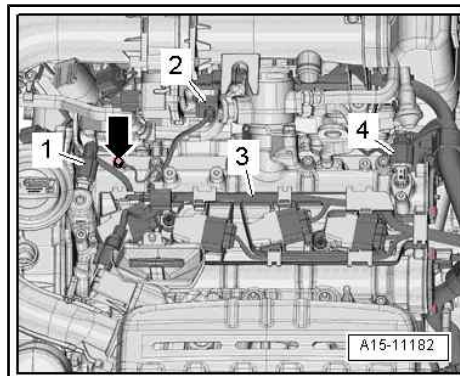


Note

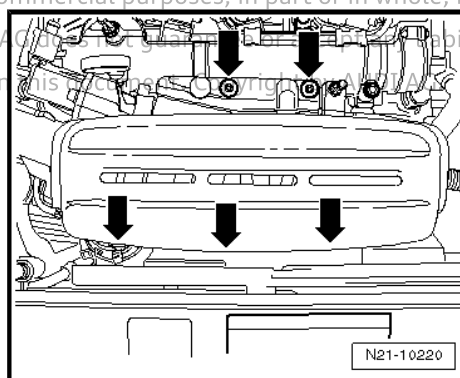
Disregard -item 2-.

- Remove ignition coils
⇒ ["1.3 Removing and installing ignition coils with output stages", page 288](#).

- Unplug electrical connectors -1, 2, 4-, detach wiring duct -3- from camshaft housing and swivel to left side.
- Remove bolt -arrow- for earth wire.



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



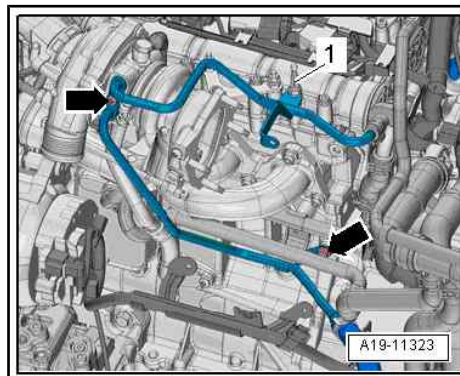
- Remove bolts -arrows- and ball stud -1-.



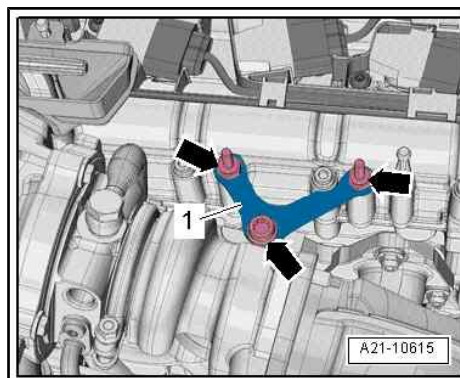
Note

Place a cloth underneath to catch escaping coolant.

- Disconnect coolant lines from turbocharger and move clear to one side.



- Unscrew bolts -arrows- and remove retaining plate -1-.





- Pull out oil dipstick -1- and sleeve -2-.
- Remove turbocharger air recirculation valve
⇒ [“1.6 Removing and installing turbocharger air recirculation valve N249”, page 218](#).



- Slacken camshaft housing bolts in the sequence -15 ... 1-.



Note

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Bolt -6- below turbocharger remains in camshaft housing.

- Carefully lift off camshaft housing.
- Mark original positions of roller rocker fingers and compensation elements for re-installation.
- Remove roller rocker fingers together with compensation elements and put down on a clean surface.

Installing

- No piston at “TDC”.



Note

Renew oil strainer, seals in cylinder head and O-rings.

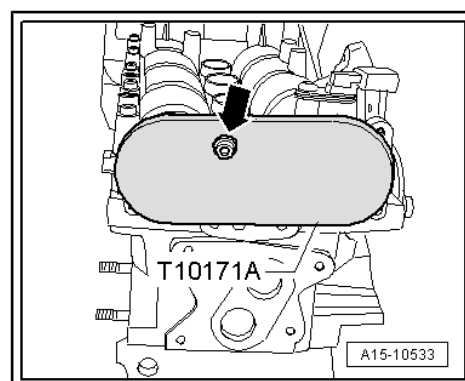
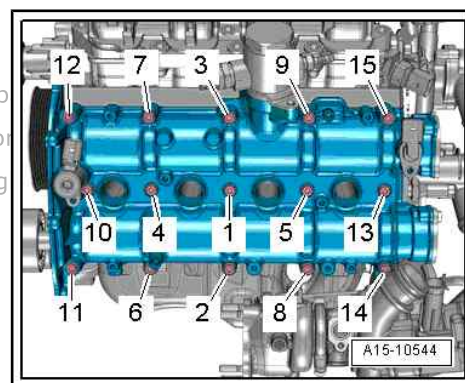
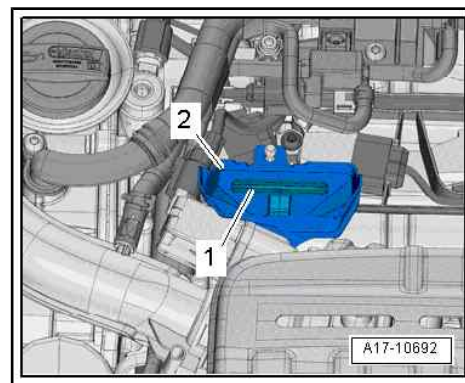


Caution

Protect lubrication system and bearings against contamination.

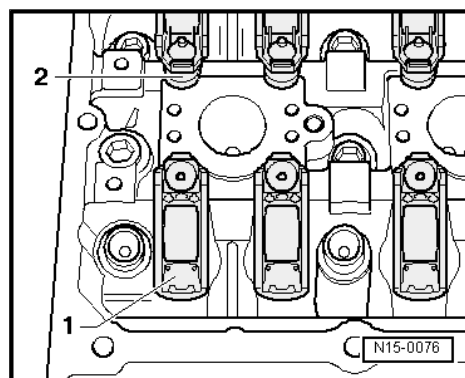
- ◆ **Cover exposed parts of the engine.**

- Carefully remove sealant residue on cylinder head and camshaft housing.
- Clean sealing surfaces; they must be free of oil and grease.
- Camshaft clamp - T10171 A- must be fitted and secured with a bolt -arrow- before installing camshaft housing.





- Ensure all roller rocker fingers contact the valve ends -1- correctly and are clipped into their respective support elements -2-.

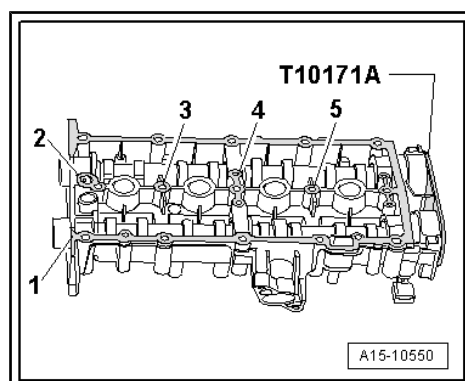


Caution

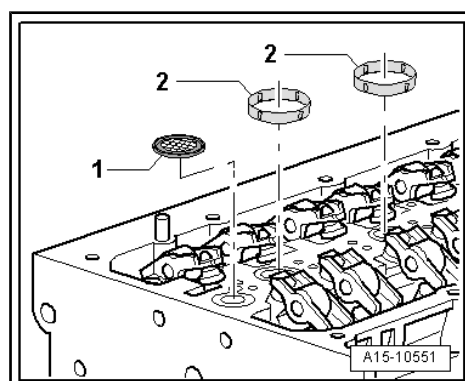
Make sure lubrication system is not clogged by excess sealant.

- ◆ ***Do not apply sealant too thick.***

- Apply a thin and even layer of sealant to the clean sealing surface of the camshaft housing at grey-shaded areas -1 ... 5- shown in illustration.



- Fit new oil strainer -1- in cylinder head.
- Fit 4 seals -2- into cylinder head.

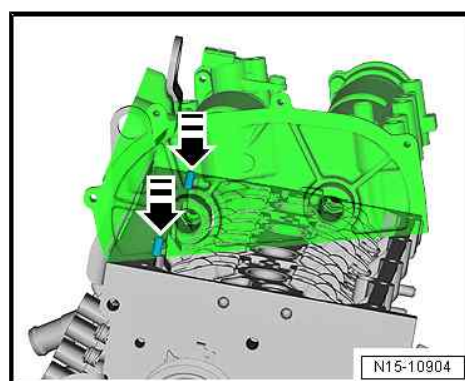


Caution

Make sure remnants of oil are removed before fitting, otherwise leakage can occur.

- ◆ ***Make sure sealing surfaces are free of oil when fitting camshaft housing.***

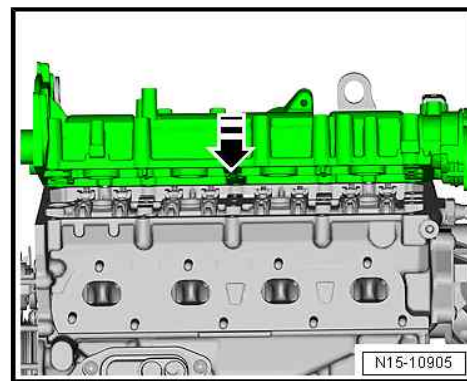
- First fit camshaft housing at an angle onto dowel pins -arrows- in cylinder head as shown.



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- Then carefully lower camshaft housing onto cylinder head in direction of -arrow-.



- Tighten camshaft housing bolts
 ⇒ [Fig. “Camshaft housing - tightening torque and sequence”](#),
[page 110](#) .

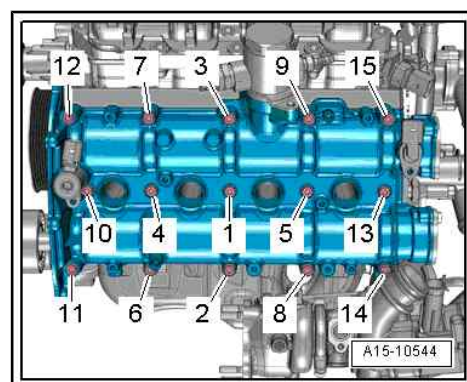


Note

After fitting camshaft housing, allow sealant to dry for approx. 30 minutes.

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

- Install high-pressure pipe
 ⇒ [“6.3 Removing and installing high-pressure pipe”](#),
[page 269](#) .
- Install camshaft timing chain ⇒ [page 94](#) .
- Install ignition coils
 ⇒ [“1.3 Removing and installing ignition coils with output stages”](#), [page 288](#) .
- Install turbocharger air recirculation valve
 ⇒ [“1.6 Removing and installing turbocharger air recirculation valve N249”](#), [page 218](#) .
- Check coolant level ⇒ [page 174](#) .



Tightening torques

- ◆ ⇒ [Fig. “Camshaft housing - tightening torque and sequence”](#),
[page 110](#)
- ◆ ⇒ [“1.1 Exploded view - turbocharger”](#), [page 203](#)

3.5 Checking compression

Special tools and workshop equipment required

- ◆ Spark plug spanner - 3122 B-





◆ Compression tester - V.A.G 1763-

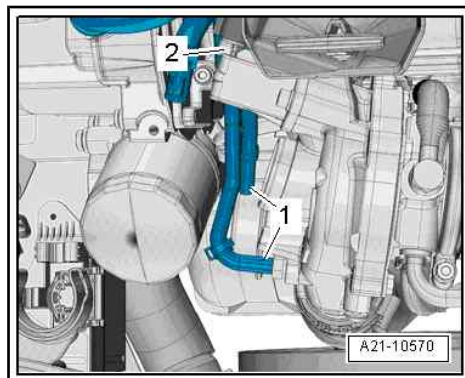
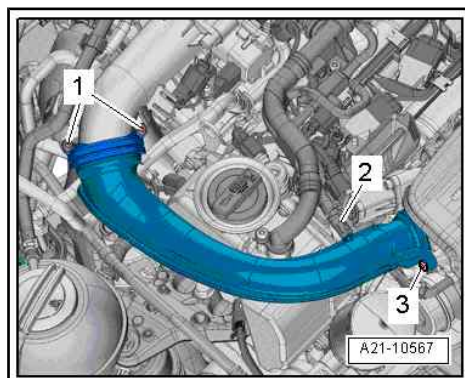


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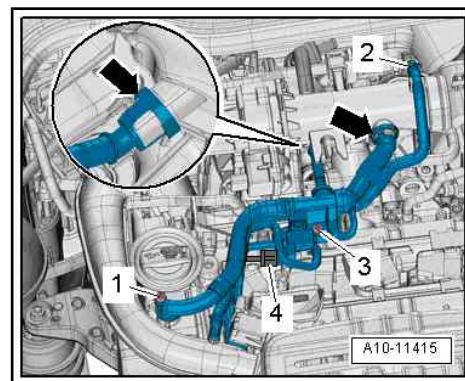
Procedure

- Engine oil temperature at least 30 °C
- Battery voltage at least 12.5 V
- Switch off ignition.
- Remove fuse for fuel pump control unit - J538- in fuse holder C - SC- under dash panel cover (driver's side); for identification of fuses refer to ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- Remove engine cover panel
⇒ ["3.1 Removing and installing engine cover panel", page 36](#) .
- Remove bolts -1, 3-.
- Release hose clip -2-, detach air pipe (top right) and remove air hose.
- Unplug electrical connector -2-.
- Detach vacuum hoses -1-.





- Unplug electrical connector -4-.
- Remove bolts -1, 3-.
- Press release tabs and disconnect crankcase breather hoses -arrows-.
- Release hose clip -2- and disconnect hose at activated charcoal filter.
- Detach hoses.
- Remove ignition coils
 ⇒ ["1.3 Removing and installing ignition coils with output stages", page 288](#) .
- 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 second 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 ... 15.0
Wear limit	9.0
Maximum difference between cylinders	3.0

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

- Install spark plugs ⇒ Maintenance ; Booklet 819 .
- Install ignition coils
 ⇒ ["1.3 Removing and installing ignition coils with output stages", page 288](#) .
- Install air pipe (top right)
 ⇒ ["2.1 Exploded view - charge air system", page 220](#) .
- Install air hoses with screw-type clips
 ⇒ ["2.2 Exploded view - hose connections for charge air system", page 221](#) .
- Erase any entries in event memory resulting from testing ⇒ Vehicle diagnostic tester, Guided Functions, then Interrogate event memory.



4 Valve gear

⇒ [“4.1 Exploded view - valve gear”, page 134](#)

⇒ [“4.2 Measuring axial clearance of camshaft”, page 135](#)

⇒ [“4.3 Removing and installing camshaft”, page 136](#)

⇒ [“4.4 Removing and installing valve stem oil seals”, page 136](#)

4.1 Exploded view - valve gear

1 - Inlet valve

- ☐ Must not be machined; only grinding-in is permissible
- ☐ Valve dimensions
⇒ [“5.4 Valve dimensions”, page 148](#)
- ☐ Checking valve guides
⇒ [“5.2 Checking valve guides”, page 146](#)
- ☐ Machining valve seats
⇒ [“5.1 Machining valve seats”, page 144](#)

2 - Exhaust valve

- ☐ Must not be machined; only grinding-in is permissible
- ☐ Valve dimensions
⇒ [“5.4 Valve dimensions”, page 148](#)
- ☐ Checking valve guides
⇒ [“5.2 Checking valve guides”, page 146](#)
- ☐ Machining valve seats
⇒ [“5.1 Machining valve seats”, page 144](#)

3 - Cylinder head

4 - Valve stem oil seal

- ☐ Renewing with cylinder head installed
⇒ [“4.4.1 Removing and installing valve stem oil seals \(cylinder head installed\)”, page 136](#)
- ☐ Renewing with cylinder head removed
⇒ [“4.4.2 Removing and installing valve stem oil seals \(cylinder head removed\)”, page 140](#)

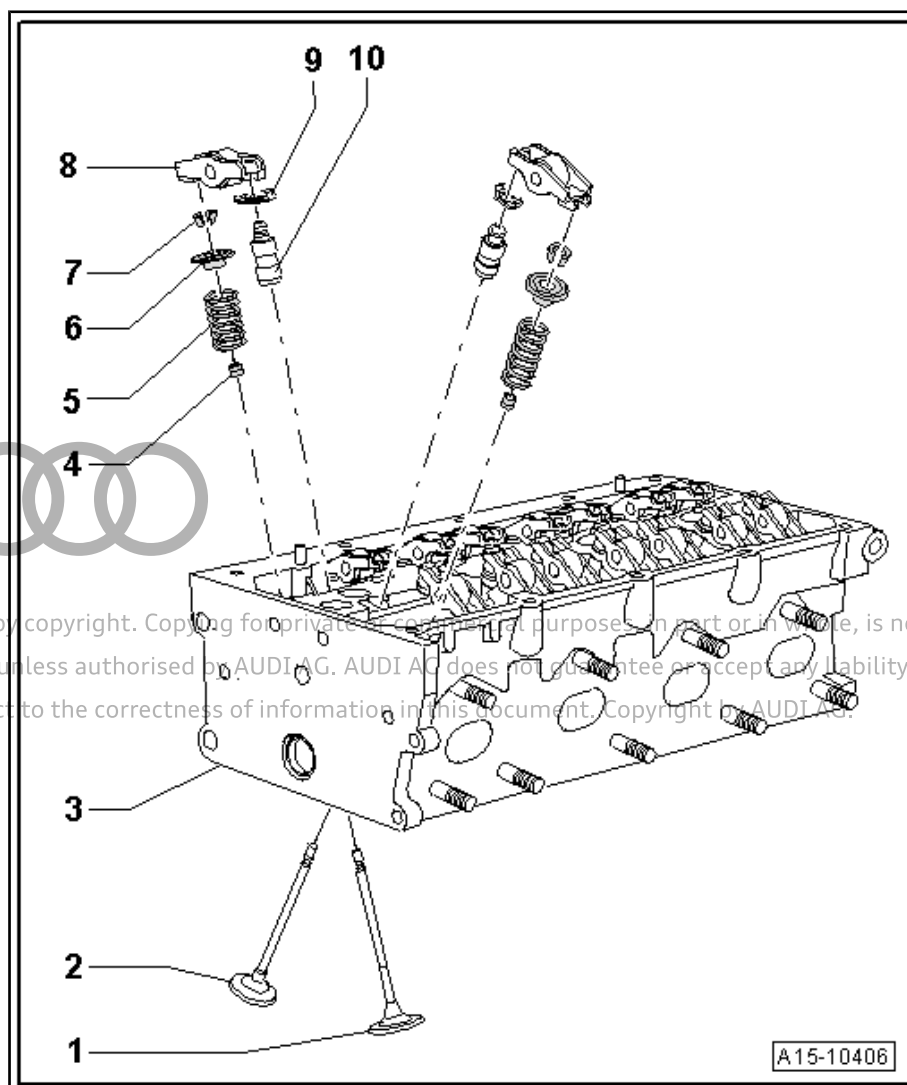
5 - Valve spring

6 - Valve spring plate

7 - Valve cotters

8 - Roller rocker finger

- ☐ Mark installation position for re-installation with a coloured pen
- ☐ Check roller bearings for ease of movement
- ☐ Lubricate contact surfaces before installing
- ☐ Attach to hydraulic compensation element -item 10- using securing clip -item 9-





9 - Securing clip

- ☐ Check for firm attachment
- ☐ Not available as separate part

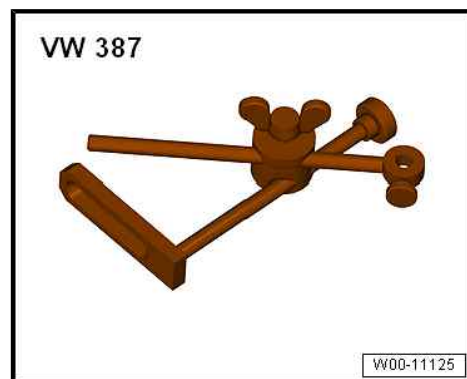
10 - Hydraulic compensation element

- ☐ Mark installation position for re-installation with a coloured pen
- ☐ Lubricate contact surfaces before installing

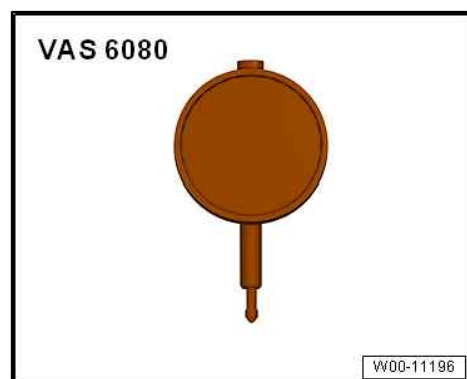
4.2 Measuring axial clearance of camshaft

Special tools and workshop equipment required

- ◆ Universal dial gauge bracket - VW 387-

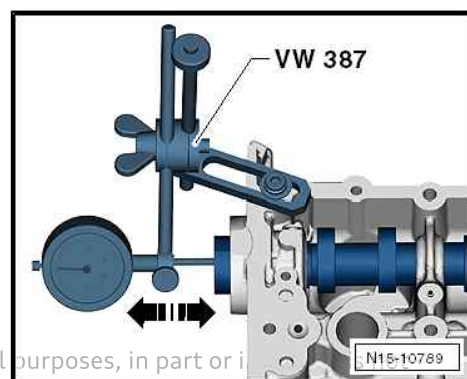


- ◆ Dial gauge - VAS 6080-



Procedure

- Perform measurements with camshaft housing removed and sealing caps fitted.
- Secure universal dial gauge bracket - VW 387- with dial gauge - VAS 6080- to camshaft housing, as shown in illustration.
- Measure axial clearance.
- Wear limit: 0.40 mm.



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4.3 Removing and installing camshaft

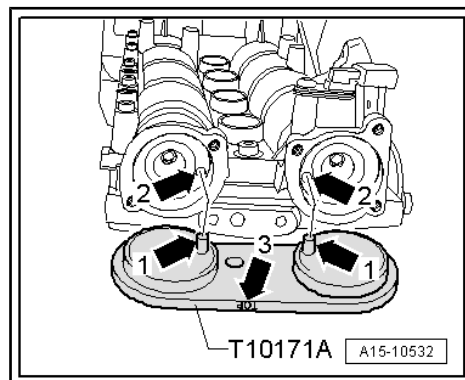
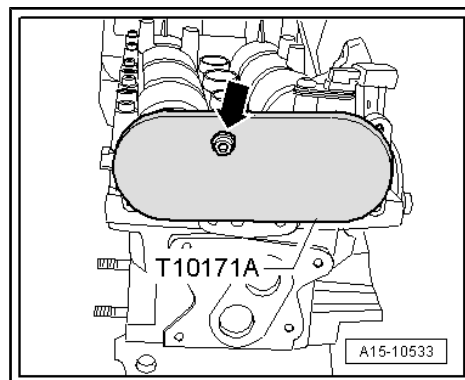
Removing

- Remove camshaft housing
⇒ [“3.4 Removing and installing camshaft housing”, page 126](#) .
- Remove high-pressure pump and roller tappet
⇒ [“6.2 Removing and installing high-pressure pump”, page 266](#) .
- Remove camshaft clamp - T10171 A- -arrow-.
- Pull camshafts out of camshaft housing.

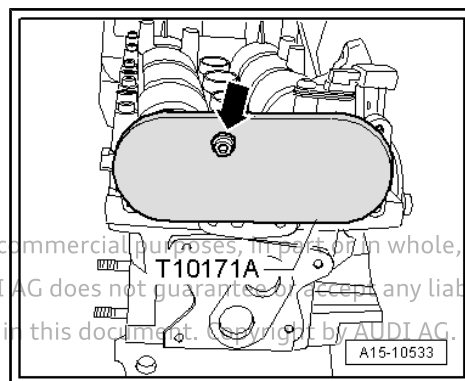
Installing

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

- Insert camshafts into camshaft housing (lubricate running surfaces including collar of axial bearing with oil before fitting).
- Turn the inlet and exhaust camshafts in the removed camshaft housing by hand until the camshaft clamp - T10171 A- can be inserted all the way into the holes in the camshafts.
- The locking pins -arrows 1- must engage in the holes -arrows 2-.
- The inscription “TOP” -arrow 3- should be legible from above.



- To secure the camshaft clamp - T10171 A- , screw in an M6 bolt -arrow- hand-tight, but do not tighten.
- Install high-pressure pump
⇒ [“6.2 Removing and installing high-pressure pump”, page 266](#) .
- Install camshaft housing
⇒ [“3.4 Removing and installing camshaft housing”, page 126](#) .



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4.4 Removing and installing valve stem oil seals

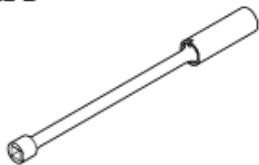
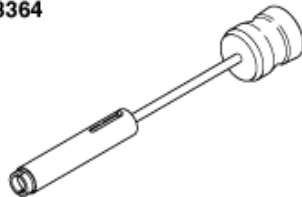
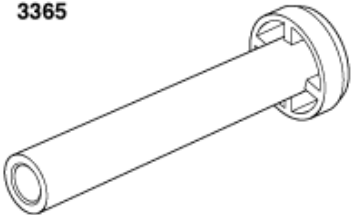
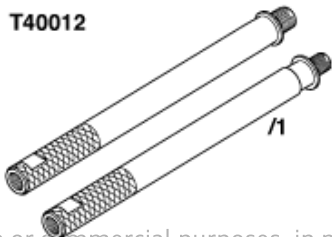
⇒ [“4.4.1 Removing and installing valve stem oil seals \(cylinder head installed\)”, page 136](#)

⇒ [“4.4.2 Removing and installing valve stem oil seals \(cylinder head removed\)”, page 140](#)

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



Special tools and workshop equipment required

3122 B 	3364 
3365 	VAS 5161 
T40012 	G15-0058



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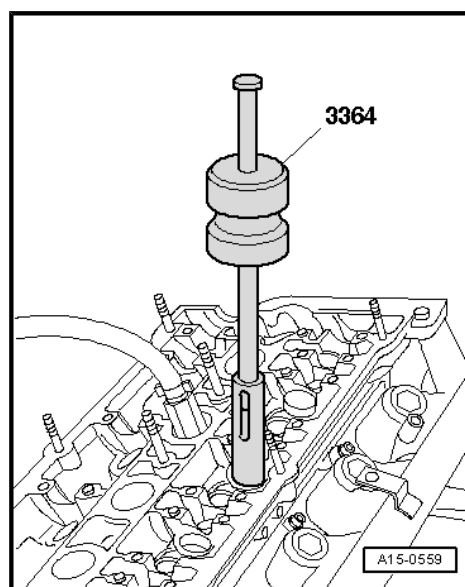
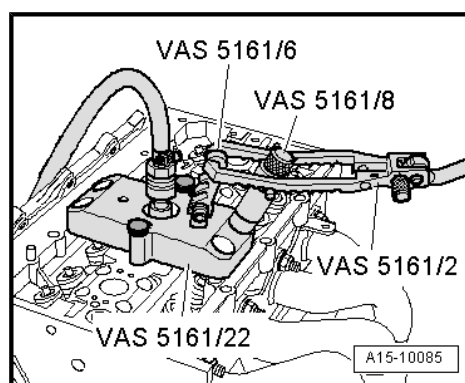
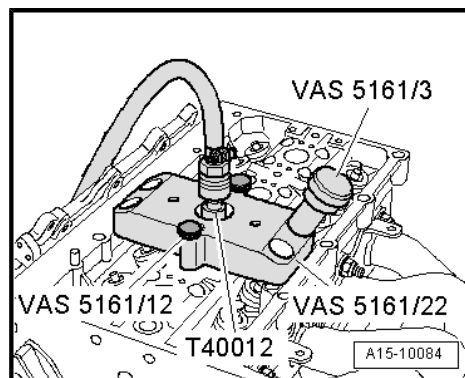
- ◆ Spark plug spanner - 3122 B-
- ◆ Valve stem seal puller - 3364-
- ◆ Valve stem oil seal fitting tool - 3365-
- ◆ Removal and installation device for valve cotters - VAS 5161
 A- with guide plate for 1.6 ltr. FSI engine - VAS 5161/22-
- ◆ Adapters - T40012-

Procedure

- Remove intake manifold (top section)
 ⇒ ["3.3 Removing and installing intake manifold \(top section\)", page 245](#) .
- Remove camshaft housing
 ⇒ ["3.4 Removing and installing camshaft housing", page 126](#) .
- Detach intake manifold (bottom section) with fuel rail from cylinder head
 ⇒ ["3.4 Removing and installing intake manifold \(bottom section\) with fuel rail", page 246](#) .
- Detach engine lifting eyes from cylinder head.
- Remove turbocharger
 ⇒ ["1.2 Removing and installing turbocharger", page 206](#) .



- Unscrew spark plugs using spark plug socket - 3122 B- .
- Set piston of appropriate cylinder to "bottom dead centre".
- 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
- Fit guide plate for 1.6 ltr. FSI engine - VAS 5161/22- onto cylinder head.
- Secure guide plate with knurled screws -VAS 5161/12- onto cylinder head.
- Apply drift -VAS 5161/3- to guide plate and use plastic-headed hammer to release sticking valve cotters.
- Screw snap-in device -VAS 5161/6- with engaging fork - VAS 5161/5- into guide plate.
- Insert assembly cartridge -VAS 5161/8- in guide plate.
- Attach pressure fork -VAS 5161/2- to snap-in device and push assembly cartridge down.
- At the same time, turn knurled screw of assembly cartridge clockwise until tips engage in valve cotters.
- Move knurled screw back and forth slightly; the valve cotters are thus forced apart and taken up by the assembly cartridge.
- Release pressure fork.
- Take out assembly cartridge.
- Detach guide plate and turn to one side.
- The compressed air hose remains connected.
- Detach valve spring with valve spring plate.
- Pull off valve stem oil seal with valve stem seal puller - 3364- .



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Caution

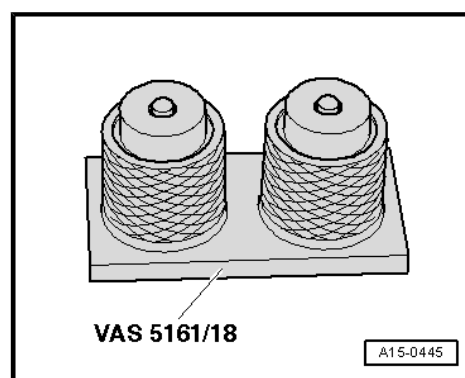
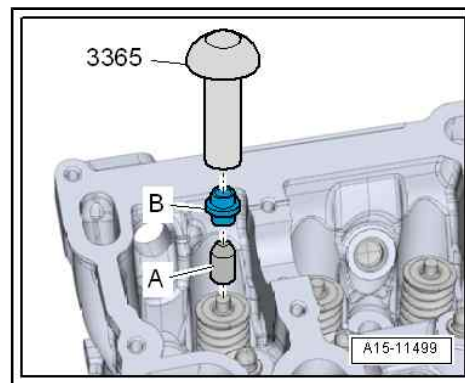
Make sure valve stem oil seals are not damaged when installing.

- ◆ ***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- .
- Remove plastic sleeve.

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

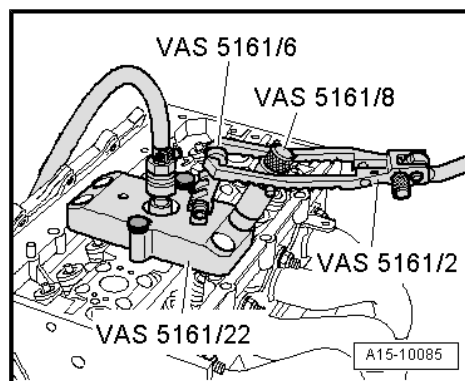
- Larger diameter of valve cotters faces upwards.
- Press assembly cartridge onto insertion device from above and pick up valve cotters.



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- Insert valve spring and valve spring plate.
- Bolt guide plate for 1.6 ltr. FSI engine - VAS 5161/22- onto cylinder head once again.
- Insert assembly cartridge -VAS 5161/8- in guide plate.
- Press down pressure fork and pull knurled screw upwards while turning screw in both directions - this will insert the valve cotteners.
- 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:

- Install spark plugs ⇒ Maintenance ; Booklet 819 .
- Install turbocharger
⇒ [“1.2 Removing and installing turbocharger”, page 206](#) .
- Install engine lifting eyes
⇒ [“3.1 Exploded view - cylinder head”, page 107](#) .
- Install intake manifold (bottom section) with fuel rail
⇒ [“3.4 Removing and installing intake manifold \(bottom section\) with fuel rail”, page 246](#) .
- Install camshaft housing
⇒ [“3.4 Removing and installing camshaft housing”, page 126](#) .
- Install intake manifold (top section)
⇒ [“3.3 Removing and installing intake manifold \(top section\)”, page 245](#) .

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



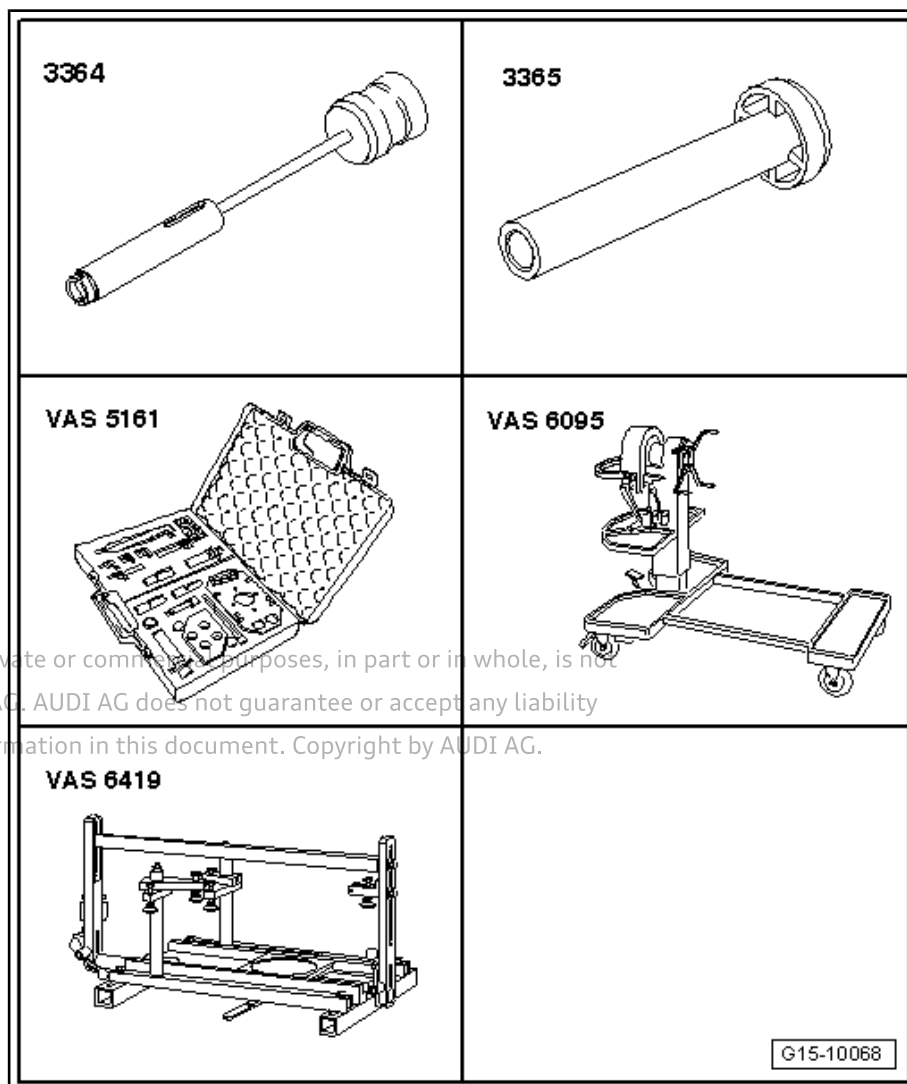
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Special tools and workshop equipment required



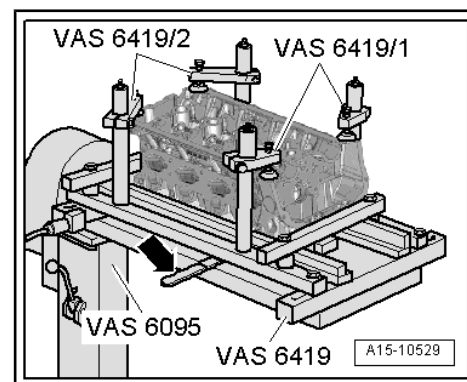
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- ◆ Valve stem seal puller - 3364-
- ◆ Valve stem oil seal fitting tool - 3365-
- ◆ Removal and installation device for valve cotters - VAS 5161
 A- with guide plate for 1.6 ltr. FSI engine - VAS 5161/22-
- ◆ Engine and gearbox support - VAS 6095-
- ◆ Cylinder head tensioning device - VAS 6419-

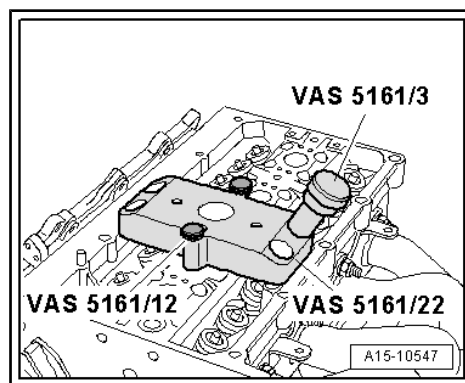
Procedure

- Insert cylinder head tensioning device - VAS 6419- into engine and gearbox support - VAS 6095- .
- Secure cylinder head in cylinder head tensioning device, as illustrated.
- Connect cylinder head tensioning device to compressed air supply.
- Using lever -arrow-, slide air pad under combustion chamber where valve stem oil seals are to be removed.
- Apply just enough compressed air to bring air pad into contact with valve heads.

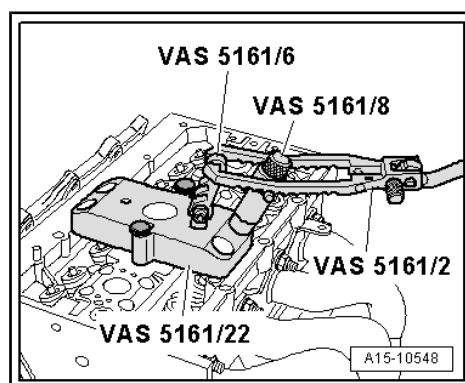




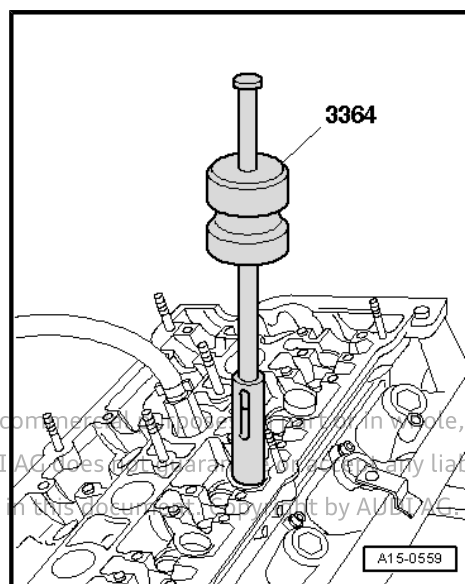
- Fit guide plate for 1.6 ltr. FSI engine - VAS 5161/22- onto cylinder head.
- Secure guide plate with knurled screws -VAS 5161/12- onto cylinder head.
- Apply drift -VAS 5161/3- to guide plate and use plastic-headed hammer to release sticking valve cotters.



- Screw snap-in device -VAS 5161/6- with engaging fork -VAS 5161/5- into guide plate.
- Insert assembly cartridge -VAS 5161/8- 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- .



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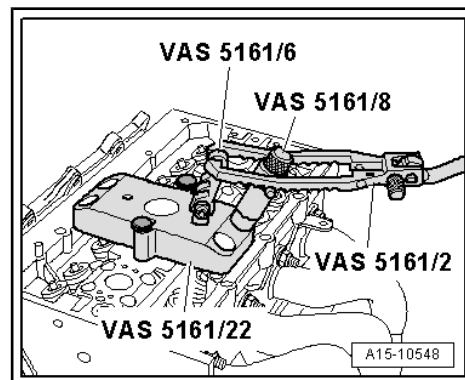
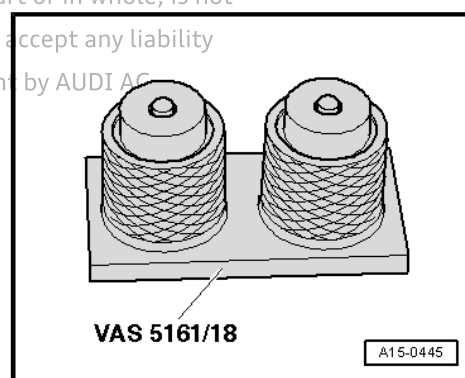
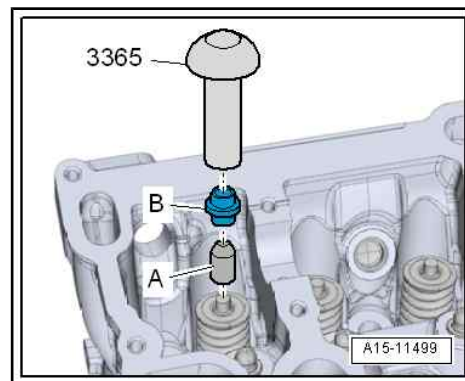
◆ **New valve stem oil seals -B- are supplied with plastic sleeve; fit plastic sleeve -A- onto valve stem.**

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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.
- Bolt guide plate for 1.6 ltr. FSI engine - VAS 5161/22- onto cylinder head once again.
- Insert assembly cartridge -VAS 5161/8- 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.





5 Inlet and exhaust valves

⇒ ["5.1 Machining valve seats", page 144](#)

⇒ ["5.2 Checking valve guides", page 146](#)

⇒ ["5.3 Checking valves", page 147](#)

⇒ ["5.4 Valve dimensions", page 148](#)

5.1 Machining valve seats

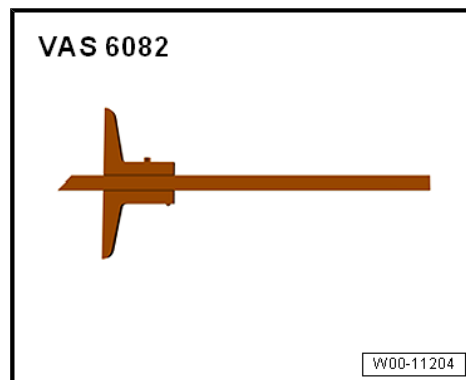


Note

- ◆ *If a good seating pattern cannot be obtained by grinding the valve seats (lapping), they must be refaced (machined).*
- ◆ *When servicing engines with leaking valves, it is not sufficient to machine (reface) the valve seats and renew the valves. The valve guides must also be checked for wear. This is particularly important on high-mileage engines
⇒ ["5.2 Checking valve guides", page 146](#).*
- ◆ *Valve seats should only be machined to the extent required to give a proper seating pattern.*
- ◆ *The maximum permissible machining dimension must be calculated before starting work.*
- ◆ *If the machining dimension is exceeded, the function of the hydraulic valve play compensation can no longer be guaranteed and the cylinder head must be renewed.*

Special tools and workshop equipment required

- ◆ Depth gauge - VAS 6082-



- ◆ Valve seat machining tool



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A - Calculating maximum permissible machining dimension

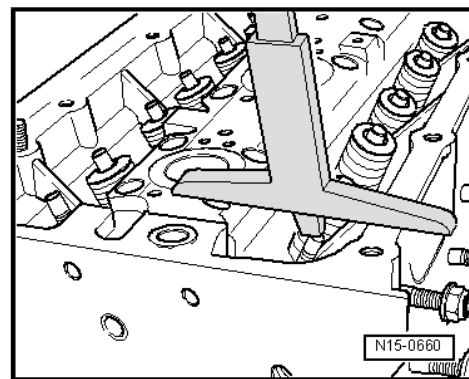
- Insert valve and press firmly against valve seat.



Note

If the valve has to be renewed as part of a repair, use a new valve for the measurement.

- Measure distance between end of valve stem (upper edge) and top surface of cylinder head.
- Calculate maximum permissible machining dimension from measured distance and minimum dimension.
- Minimum dimension for inlet valve and exhaust valve: 7.6 mm.
Measured distance minus minimum dimension = max. permissible machining dimension.



Example:

Measured distance	8.0 mm
Minimum dimension	– 7.6 mm
Maximum permissible machining dimension	= 0.4 mm



Note

- ◆ *If the calculated maximum permissible machining dimension is 0 mm or less than 0 mm, repeat the measurement with a new valve.*
- ◆ *If the result is again 0 mm or less than 0 mm, renew the cylinder head.*

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B - Machining valve seats

Inlet valve seat

a - $\varnothing$ 28.7 mm

b - Maximum permissible machining dimension

c - 1.5...1.8 mm

Z - Bottom surface of cylinder head

α - 45° valve seat angle

β - 30° upper correction angle

γ - 60° lower correction angle

Exhaust valve seat

a - $\varnothing$ 25.0 mm

b - Maximum permissible machining dimension

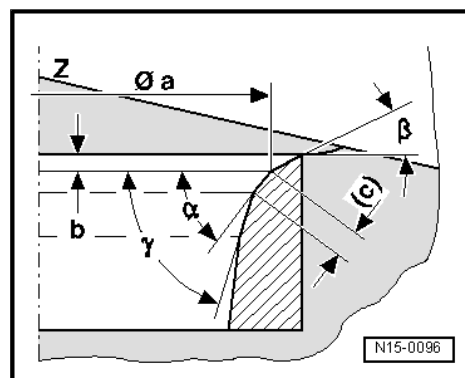
c - approx. 1.8 mm

Z - Lower edge of cylinder head

α - 45° valve seat angle

β - 30° upper correction angle

γ - 60° lower correction angle



Note

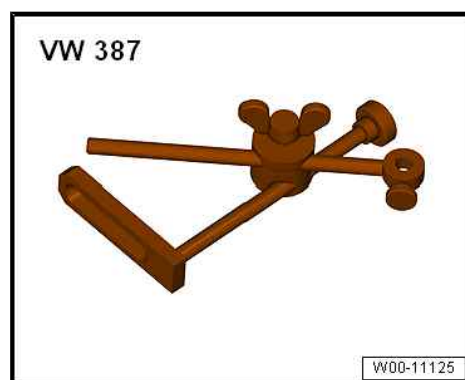
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Calculating maximum permissible machining dimension
⇒ [page 145](#).

5.2 Checking valve guides

Special tools and workshop equipment required

- ◆ Universal dial gauge bracket - VW 387-





◆ Dial gauge - VAS 6079-



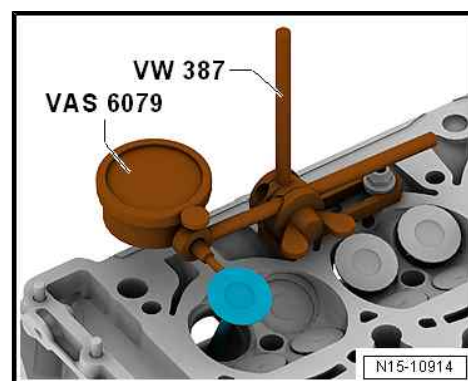
Procedure



Note

- ◆ *If the valve has to be renewed as part of a repair, use a new valve for the measurement.*
- ◆ *Only insert inlet valve into inlet 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.



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Valve guides cannot be renewed.

5.3 Checking valves

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



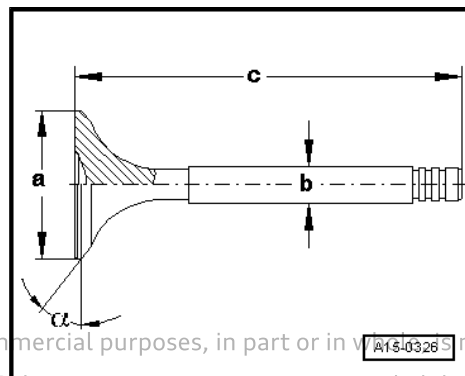
5.4 Valve dimensions



Note

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

Dimension		Inlet valve	Exhaust valve
Ø a	mm	29.5	26.0
Ø b	mm	5.973	5.953
c	mm	100.9	100.5
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.*



17 – Lubrication

1 Sump/oil pump

⇒ [“1.1 Exploded view - sump/oil pump”, page 149](#)

⇒ [“1.2 Engine oil”, page 151](#)

⇒ [“1.3 Removing and installing sump”, page 152](#)

⇒ [“1.4 Removing and installing oil pump”, page 155](#)

⇒ [“1.5 Removing and installing oil level and oil temperature sender G266”, page 159](#)

1.1 Exploded view - sump/oil pump



Note

- ◆ *If large quantities of metal shavings or abrasion are found when performing engine repairs, this may be an indication of damage to the crankshaft or conrod bearings. To prevent further damage, the following steps are required after completion of repair work: clean the oil passages carefully and renew the oil spray jets, engine oil cooler and oil filter.*
- ◆ *Oil spray jet and pressure relief valve ⇒ [“4.2 Removing and installing oil spray jets”, page 78](#)*



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1 - Oil level and oil temperature sender - G266-

- ☐ Removing and installing
⇒ ["1.5 Removing and installing oil level and oil temperature sender G266", page 159](#)

2 - Seal

- ☐ Renew

3 - Sump

- ☐ Removing and installing
⇒ ["1.3 Removing and installing sump", page 152](#)

4 - Bolt

- ☐ Renew
- ☐ Tightening torque and sequence
⇒ [Fig. "Sump - tightening torque and sequence", page 151](#)

5 - Bolt

- ☐ Renew
- ☐ 14 Nm +90°

6 - Chain sprocket

- ☐ For oil pump
- ☐ Sprocket can only be fitted on oil pump shaft in one position.

7 - Bolt

- ☐ Renew
- ☐ 20 Nm +90°

8 - Cover

- ☐ For chain sprocket
- ☐ Clipped onto oil pump

9 - Drive chain

- ☐ For oil pump
- ☐ Before removing, mark running direction with paint
- ☐ Check for wear
- ☐ Removing and installing ⇒ ["1.4.1 Removing and installing drive chain for oil pump", page 155](#)

10 - Stop bolt

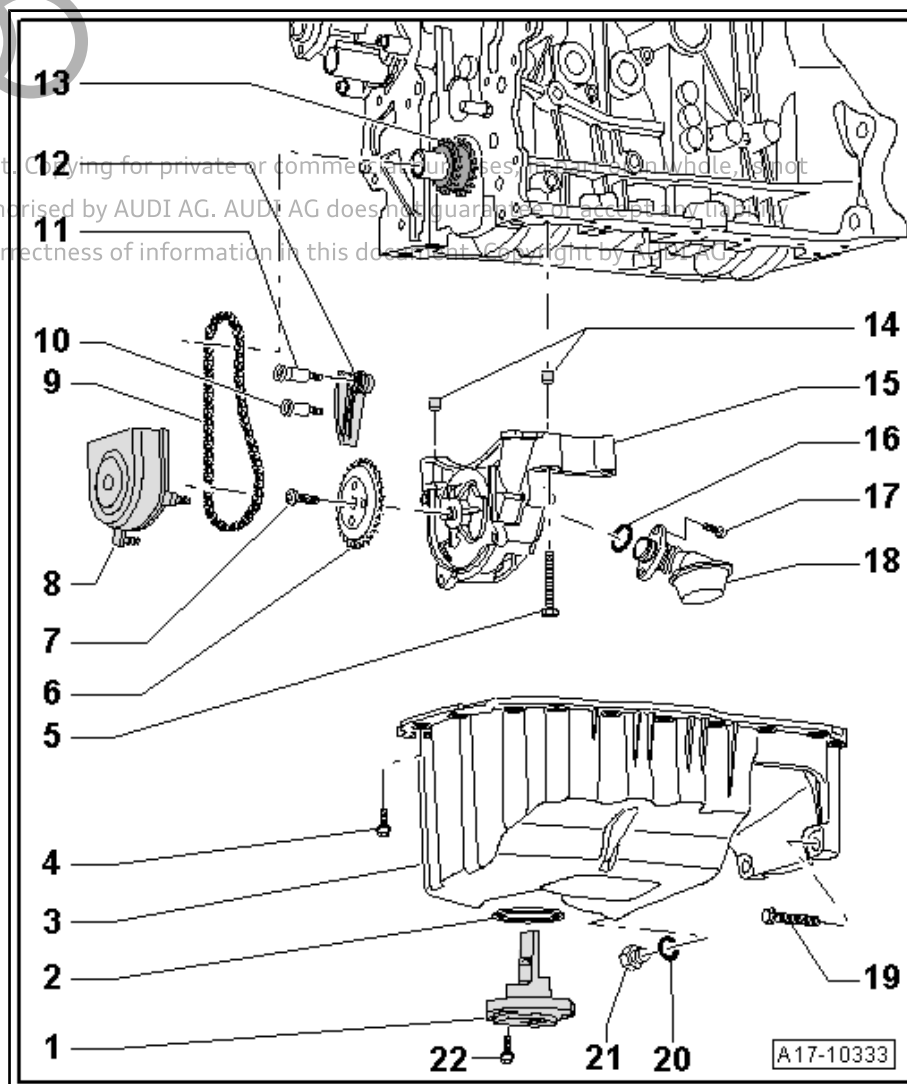
- ☐ For chain tensioner
- ☐ 8 Nm

11 - Bearing mounting

- ☐ For chain tensioner
- ☐ 8 Nm

12 - Chain tensioner

- ☐ For drive chain for oil pump
- ☐ With tensioning spring
- ☐ Do not dismantle
- ☐ When installing, pre-tension spring and engage





13 - Chain sprocket

- ☐ For drive chain for oil pump and camshaft timing chain
- ☐ Push-fitted onto crankshaft
- ☐ To remove or install ⇒ [“2.2 Removing and installing camshaft timing chain”, page 88](#) and
⇒ [“1.4.2 Removing and installing oil pump”, page 156](#)
- ☐ Installation position ⇒ [Fig. “Installation position of chain sprocket”](#), page 73
- ☐ Contact surfaces must be free of oil and grease

14 - Dowel sleeves

15 - Oil pump

- ☐ With pressure relief valve
- ☐ Removing and installing ⇒ [“1.4.2 Removing and installing oil pump”, page 156](#)
- ☐ Before installing, check that the two dowel sleeves for centring oil pump/cylinder block are fitted

16 - O-ring

- ☐ Renew

17 - Bolt

- ☐ 10 Nm

18 - Suction pipe

- ☐ Clean strainer if dirty

19 - Bolt

- ☐ Tightening torque and sequence ⇒ [Fig. “Sump - tightening torque and sequence”](#), page 151

20 - Seal

21 - Oil drain plug

- ☐ Renew
- ☐ 30 Nm

22 - Bolt

- ☐ 10 Nm

Sump - tightening torque and sequence

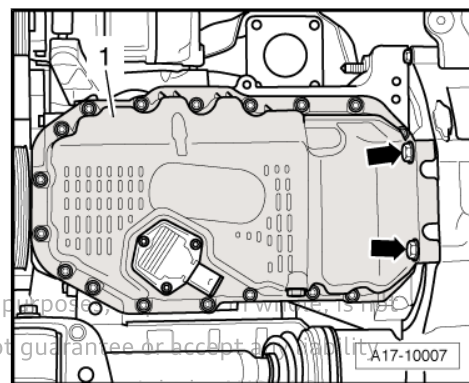


Note

Renew bolts.

– Tighten bolts in 3 stages as follows:

Stage	Bolts	Tightening torque
1.	Sump to cylinder block	5 Nm in diagonal sequence
2.	Arrows	40 Nm, using Allen key, long reach - T10058-
3.	Sump to cylinder block	13 Nm in diagonal sequence



1.2 Engine oil

For engine oil capacity, oil specifications and viscosity grades, refer to ⇒ Maintenance tables or ⇒ Technical data for engines; Rep. gr. 00 ; Overview of engines .



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

Special tools and workshop equipment required

- ◆ Socket - T10058-

T10058

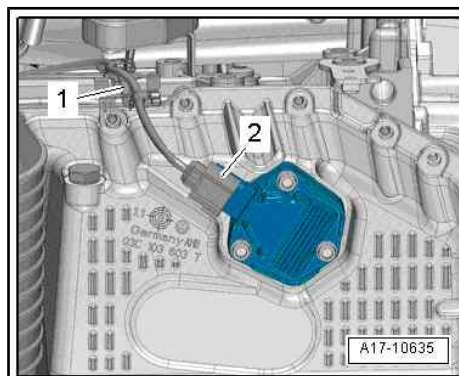


W00-11195

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

Removing

- Engine oil drained ➔ Maintenance ; Booklet 819
- Remove catalytic converter with centre silencer
➔ ["2.1 Removing and installing catalytic converter", page 282](#) .
- Unplug electrical connector -2- at oil level and oil temperature sender - G266- .
- Unclip retainer -1- for electrical wiring.

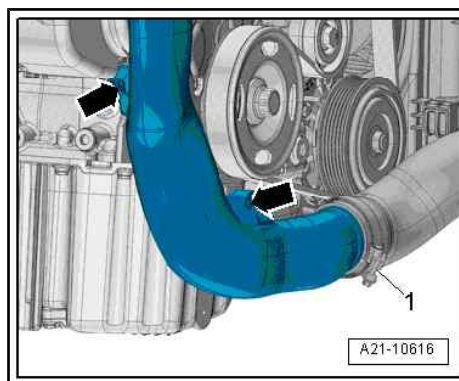


- Remove bolts -arrows- and move air pipe (right-side) to side.



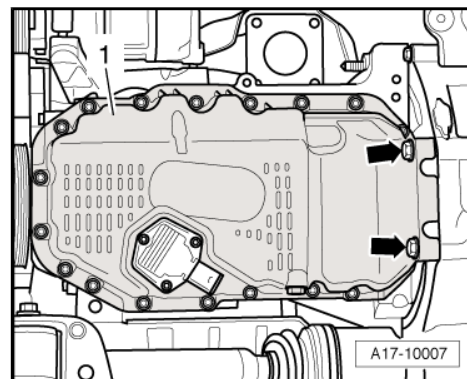
Note

Disregard -item 1-.





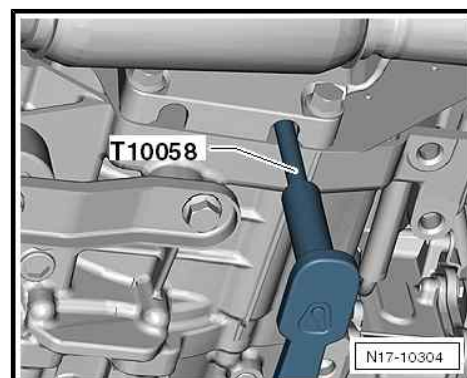
- Remove bolts -arrows- securing sump to gearbox using Allen key, long reach - T10058- .
- Unscrew bolts for sump -1- in diagonal sequence and remove.



Note

Depending on its position, the flywheel may cover the bolts securing the sump to the cylinder block on the gearbox end. If this is the case, turn the crankshaft in normal direction of engine rotation until the bolts are accessible through the openings in the flywheel.

- Carefully release sump from bonded joint.



Installing



Caution

Take care to keep cylinder block clean.

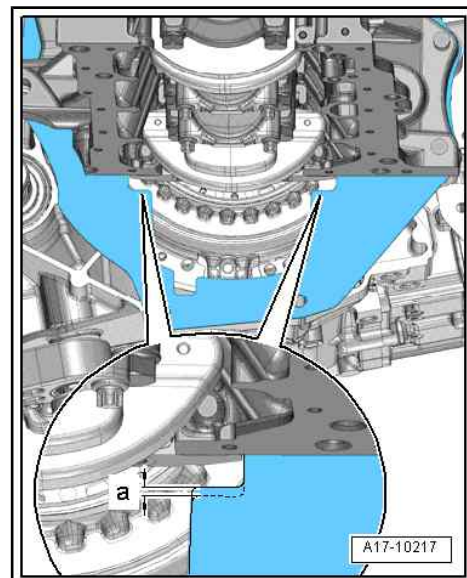
◆ *Cover exposed parts of the engine.*

- Machine intermediate plate between engine and gearbox to dimension -a- as shown in illustration.
- Dimension -a- = 5 mm



Note

It is not possible to fit sump with sealant bead onto cylinder block without machining the intermediate plate.



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Caution

Protect lubrication system against contamination.

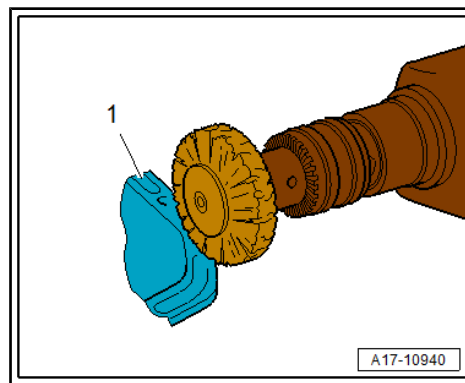
- ◆ **Cover exposed parts of the engine.**



WARNING

Risk of eye injury.

- ◆ **Put on safety goggles.**



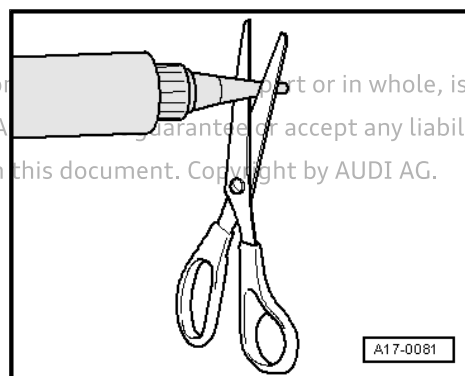
- Remove sealant residue from sump and cylinder block using rotating plastic brush or similar.
- Clean sealing surfaces; they must be free of oil and grease.



Note

Note the use-by date of the sealant.

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



Caution

Make sure lubrication system is not clogged by excess sealant.

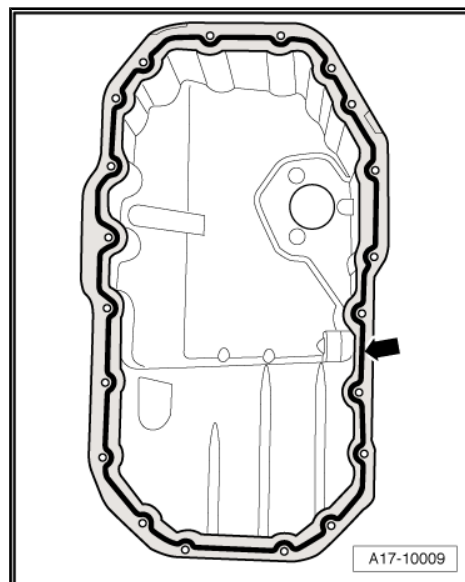
- ◆ **The sealant bead must not be thicker than specified.**

- Apply bead of sealant -arrow- onto clean sealing surface of sump as illustrated.
- Thickness of sealant bead: 2 ... 3 mm



Note

- ◆ **Take particular care when applying sealant bead in area of sealing flange.**
- ◆ **The sump must be installed within 5 minutes after applying the sealant.**





- Fit sump and tighten bolts
⇒ [Fig. “Sump - tightening torque and sequence”](#),
[page 151](#) .



Note

- ◆ If sump is fitted with engine removed, make sure sump is flush with cylinder block at gearbox end.
- ◆ After fitting sump, sealant must dry for approx. 30 minutes. Then (and only then) fill the engine with engine oil.

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

- Install air pipe (right-side)
⇒ [“2.1 Exploded view - charge air system”](#), [page 220](#) .
- Install catalytic converter with centre silencer
⇒ [“2.1 Removing and installing catalytic converter”](#),
[page 282](#) .
- Fill with engine oil and check oil level ⇒ Maintenance ; Booklet 819 .

Tightening torques

- ◆ ⇒ [Fig. “Sump - tightening torque and sequence”](#) , [page 151](#)

1.4 Removing and installing oil pump

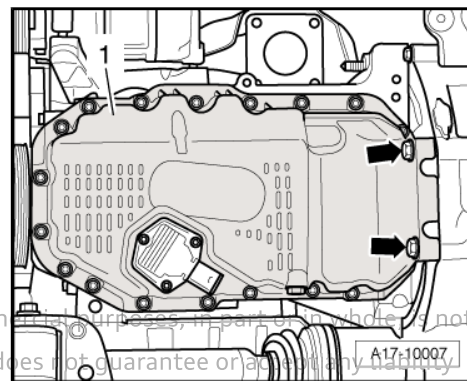
⇒ [“1.4.1 Removing and installing drive chain for oil pump”](#),
[page 155](#)

⇒ [“1.4.2 Removing and installing oil pump”](#), [page 156](#)

1.4.1 Removing and installing drive chain for oil pump

Special tools and workshop equipment required

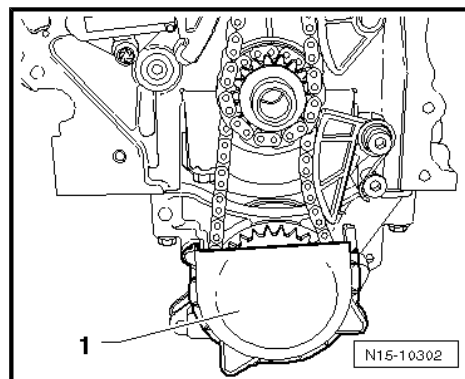
- ◆ Counterhold tool - T10172 A-





Removing

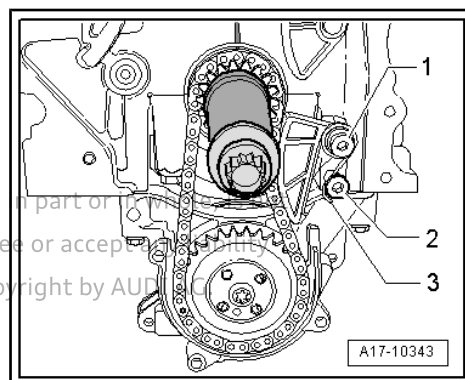
- Remove camshaft timing chain
⇒ ["2.2 Removing and installing camshaft timing chain", page 88](#).
- Unclip cover -1- for chain sprocket for oil pump



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.**



- Using a screwdriver, pry off tensioning spring -3- at bolt -2- and detach



Note

Disregard -item 1-.

- Loosen bolt -1- for chain sprocket for oil pump; use counterhold tool - T10172 A- to counterhold at chain sprocket.
- Remove bolt for chain sprocket for oil pump and detach chain sprocket for oil pump with drive chain.

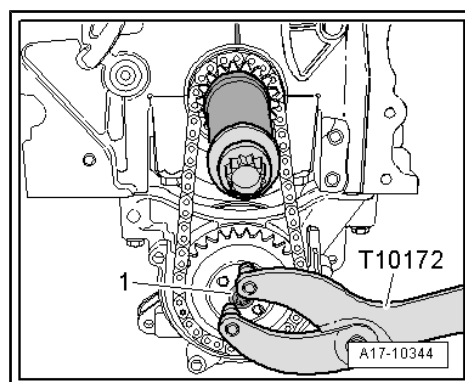
Installing

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



Note

Renew bolts tightened with specified tightening angle.



- Install drive chain for oil pump together with chain sprocket for oil pump according to marks applied when removing.
- The chain sprocket for oil pump can only be installed correctly in one position.
- Install camshaft timing chain
⇒ ["2.2 Removing and installing camshaft timing chain", page 88](#).

Tightening torques

- ◆ ⇒ ["1.1 Exploded view - sump/oil pump", page 149](#)

1.4.2 Removing and installing oil pump

Special tools and workshop equipment required



◆ Counterhold tool - T10172 A-

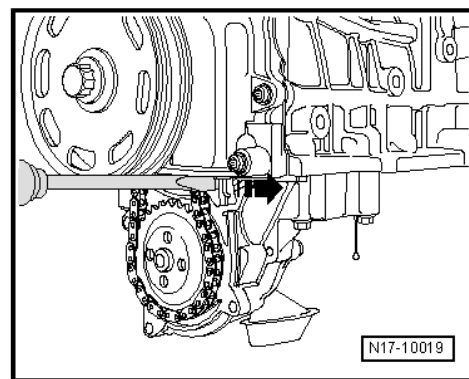
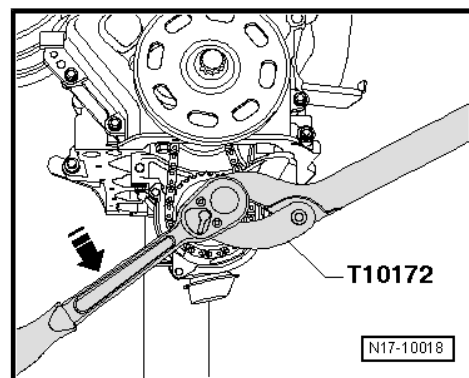
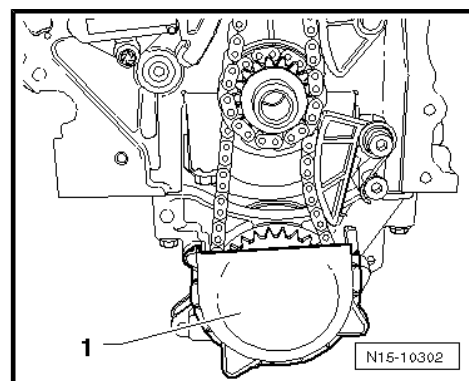


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Removing

- Remove sump
⇒ [“1.3 Removing and installing sump”, page 152](#) .
- Unclip cover -1- for chain sprocket for oil pump
- Slacken off bolt for chain sprocket for oil pump several turns -arrow-; use counterhold tool - T10172 A- to counterhold at chain sprocket.
- Use screwdriver to press chain tensioner in direction of -arrow-.
- Remove bolt for chain sprocket for oil pump.
- Detach chain sprocket from oil pump and take out of drive chain.





- Remove bolts -arrows- and remove oil pump.

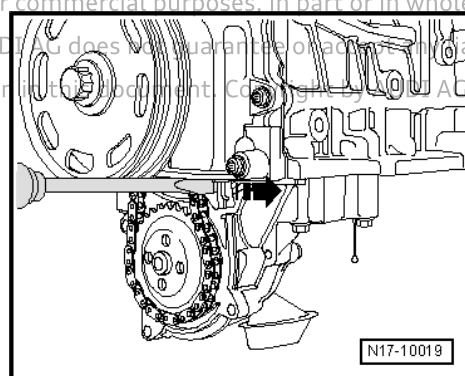
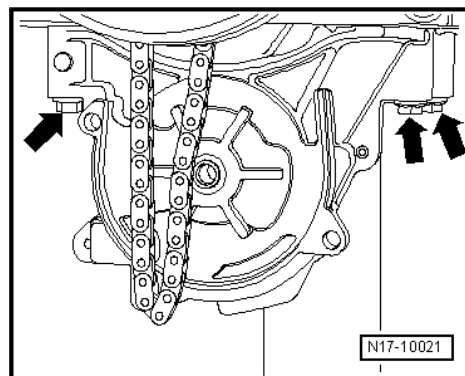
Installing



Note

Renew bolts tightened with specified tightening angle.

- Check whether dowel sleeves for centring oil pump and cylinder block are fitted; install missing dowel sleeves.
- Fit oil pump and tighten bolts.
- Use screwdriver to press chain tensioner in direction of -arrow-.



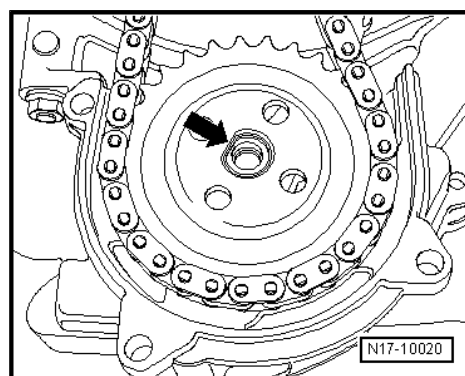
- Fit chain sprocket for oil pump
- Installation position: Sprocket can only be fitted on oil pump shaft in one position -arrow-.

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

- Install sump
⇒ [“1.3 Removing and installing sump”, page 152](#) .

Tightening torques

- ◆ ⇒ [“1.1 Exploded view - sump/oil pump”, page 149](#)





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

Removing

- Engine oil drained ⇒ Maintenance ; Booklet 819
- Unplug electrical connector -3-.
- Remove bolts -1- and detach oil level and oil temperature sender - G266- -item 4-.

Installing

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



Note

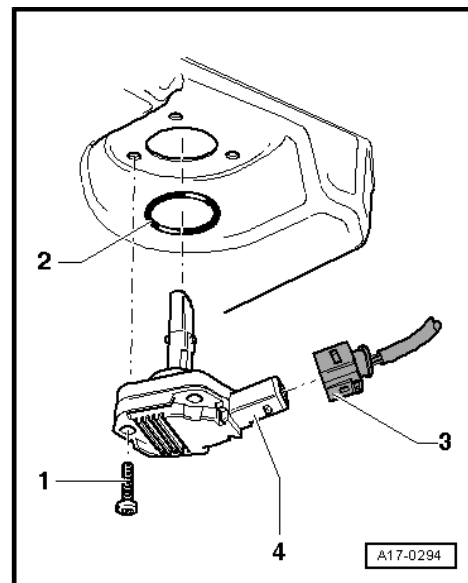
Renew seal -2-.

- Fill with engine oil and check oil level ⇒ Maintenance ; Booklet 819 .

Tightening torques

- ◆ ⇒ ["1.1 Exploded view - sump/oil pump", page 149](#)

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2 Engine oil cooler

⇒ ["2.1 Exploded view - engine oil cooler", page 160](#)

⇒ ["2.2 Removing and installing engine oil cooler", page 160](#)

2.1 Exploded view - engine oil cooler

1 - Engine oil cooler

- ☐ See note ⇒ , [page 149](#)
- ☐ Removing and installing
⇒ ["2.2 Removing and installing engine oil cooler", page 160](#)

2 - Gasket

- ☐ Renew

3 - O-rings

- ☐ Renew

4 - Coolant pipes (front)

- ☐ Version fitted in vehicle may differ from illustration

5 - Bolt

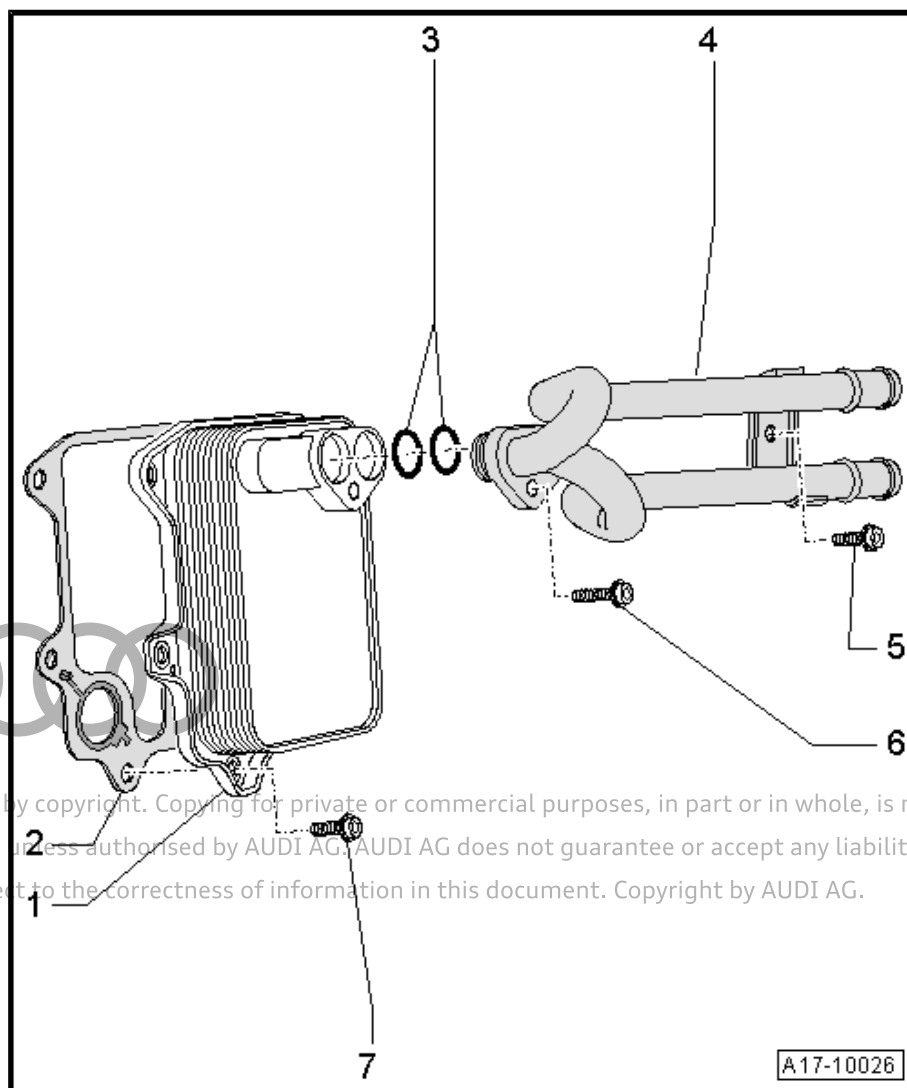
- ☐ Tightening torque
⇒ [Item 2 \(page 188\)](#)

6 - Bolt

- ☐ Tightening torque
⇒ [Item 3 \(page 188\)](#)

7 - Bolt

- ☐ 8 Nm

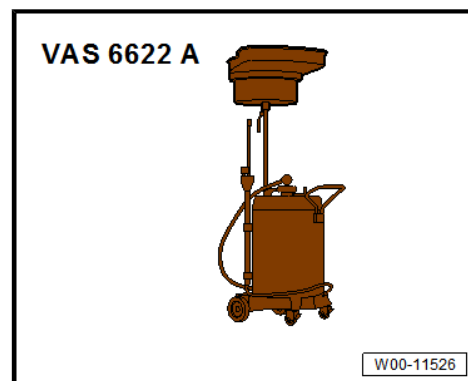


2.2 Removing and installing engine oil cooler

Special tools and workshop equipment required

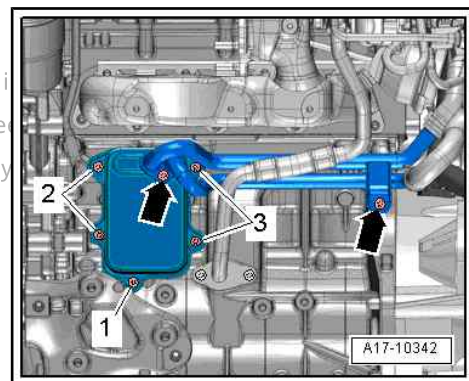


- ◆ Used oil collection and extraction unit - VAS 6622A-



Removing

- Drain coolant
 ⇒ ["1.3 Draining and filling cooling system", page 168](#) .
- Remove alternator ⇒ Electrical system; Rep. gr. 27 ; Alternator; Removing and installing alternator .
- Remove catalytic converter with centre silencer
 ⇒ ["2.1 Removing and installing catalytic converter", page 282](#) .
- Remove bolts -arrows- for coolant pipes at cylinder block and engine oil cooler.
- Position used oil collection and extraction unit - VAS 6622A- below engine.
- Pull coolant pipes forwards out of engine oil cooler.
- Unscrew bolts -1, 2, 3- and remove engine oil cooler from cylinder block.



Installing

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



Note

Fit new O-rings.

- Install catalytic converter with centre silencer
 ⇒ ["2.1 Removing and installing catalytic converter", page 282](#) .



Note

Do not reuse coolant.

- Fill up with coolant ⇒ [page 170](#) .

Tightening torques

- ◆ ⇒ ["2.1 Exploded view - engine oil cooler", page 160](#)
- ◆ ⇒ Electrical system; Rep. gr. 27 ; Alternator; Exploded view - alternator



3 Oil filter/oil pressure switches

⇒ ["3.1 Exploded view - oil filter", page 162](#)

⇒ ["3.2 Removing and installing oil pressure switch F1", page 163](#)

⇒ ["3.3 Checking oil pressure and oil pressure switch", page 164](#)

3.1 Exploded view - oil filter

1 - Timing chain cover with oil filter housing

2 - Cap

3 - Seal

☐ Renew if leaking

4 - Filler cap

5 - Bolt

☐ 9 Nm

6 - Hose

☐ For crankcase breather

☐ Press release tabs to detach

7 - O-ring

☐ Renew

8 - Seal

☐ Renew if leaking

9 - Bolt

☐ 5 Nm

10 - Oil separator

11 - Oil supply line

☐ To turbocharger

12 - Banjo bolt

☐ 20 Nm

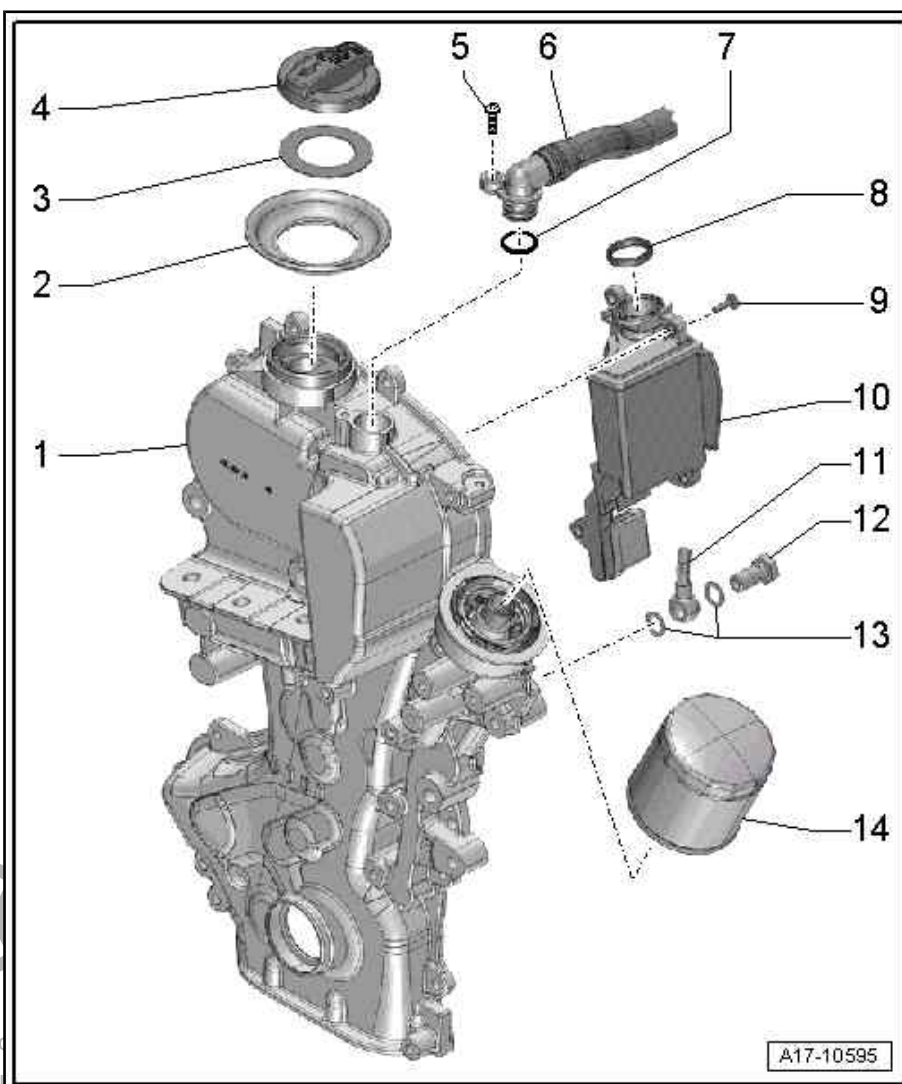
13 - Seals

☐ Renew

14 - Oil filter

☐ Removing and installing
⇒ Maintenance ; Book-
let 819

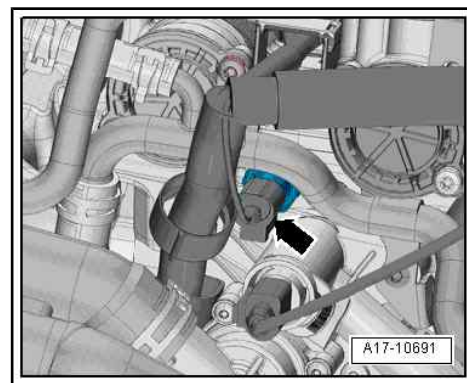
☐ 20 Nm





Oil pressure switch - F1- - tightening torque

- Tighten oil pressure switch - F1- -arrow- to 20 Nm.



3.2 Removing and installing oil pressure switch - F1-

Special tools and workshop equipment required

- ◆ Assembly tool - T10118-



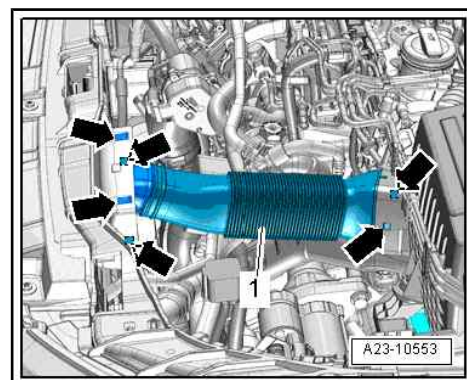
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T10118



Removing

- Release fasteners -arrows- and detach air duct -1-.



- Use assembly tool - T10118- to unplug electrical connector -arrow-.
- Unscrew oil pressure switch - F1- .

Installing

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



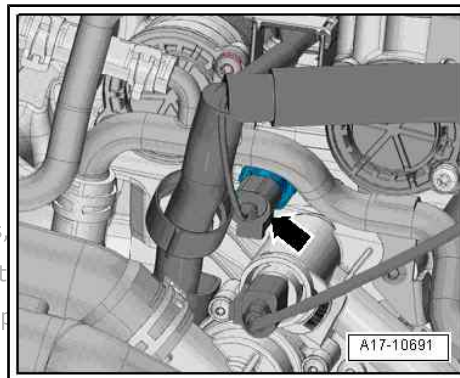
Note

- ♦ *Renew seal.*
- ♦ *Fit the new oil pressure switch - F1- into the connection immediately to avoid loss of oil.*

- Check oil level ⇒ Maintenance ; Booklet 819 .

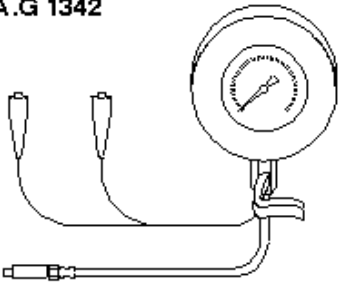
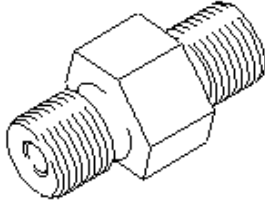
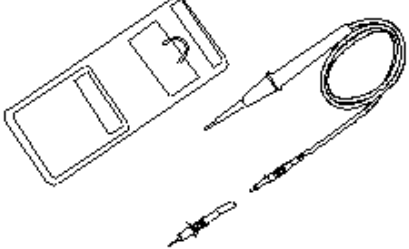
Tightening torques

- ♦ ⇒ [Fig. ““ Oil pressure switch -F1- - tightening torque”“](#), [page 163](#)



3.3 Checking oil pressure and oil pressure switch

Special tools and workshop equipment required

V.A.G 1342 	V.A.G 1342/14 
V.A.G 1527 B 	V.A.G 1594 C 
	G17-10005



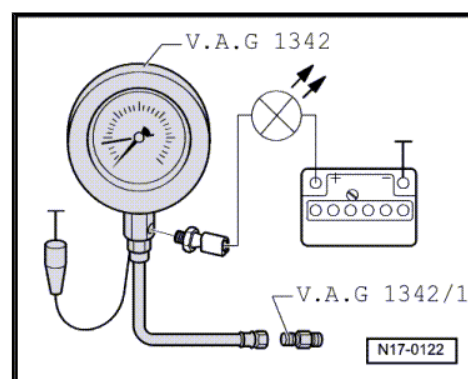
- ◆ Oil pressure tester - V.A.G 1342-
- ◆ Adapter - V.A.G 1342/14-
- ◆ Voltage tester - V.A.G 1527B-
- ◆ Auxiliary measuring set - V.A.G 1594C-

Procedure

- Oil level OK
- Engine oil temperature approx. 80 °C
- Remove oil pressure switch - F1-
⇒ [“3.2 Removing and installing oil pressure switch F1”, page 163](#).
- Connect oil pressure tester - V.A.G 1342- with adapter - V.A.G 1342/14- to bore for oil pressure switch.
- Screw oil pressure switch - F1- into oil pressure tester - V.A.G 1342-.
- Connect brown wire of oil pressure tester to earth “-”.

Checking oil pressure switch

- Connect voltage tester - V.A.G 1527B- with adapter leads from auxiliary measuring set - V.A.G 1594C- to oil pressure switch and battery positive (“+”).
- LED should not light up.



Note

Renew oil pressure switch if LED lights up at this stage.

- Start engine.



Note

Observe oil pressure tester and LED while starting engine, as switching point of oil pressure switch may already be exceeded when starting.

- LED should light up at 0.3 ... 0.6 bar.
- Renew oil pressure switch if LED does not light up.

Checking oil pressure

- Start engine.
- Oil pressure at 2000 rpm: at least 2.0 bar.

Assembling

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

- Install oil pressure switch - F1-
⇒ [“3.2 Removing and installing oil pressure switch F1”, page 163](#).





19 – Cooling

1 Cooling system/coolant

⇒ [“1.1 Connection diagram - coolant hoses”, page 166](#)

⇒ [“1.2 Checking cooling system for leaks”, page 167](#)

⇒ [“1.3 Draining and filling cooling system”, page 168](#)

1.1 Connection diagram - coolant hoses



Note

- ◆ Blue = Large coolant circuit
- ◆ Red = Small coolant circuit
- ◆ Brown = Heating circuit
- ◆ Arrows show direction of coolant flow.

1 - Radiator

2 - Continued coolant circulation pump - V51-

3 - Turbocharger

4 - Cylinder head and cylinder block

5 - Coolant pump

6 - Coolant expansion tank

7 - Filler cap

- ☐ For coolant expansion tank
- ☐ Checking pressure relief valve ⇒ [page 168](#)

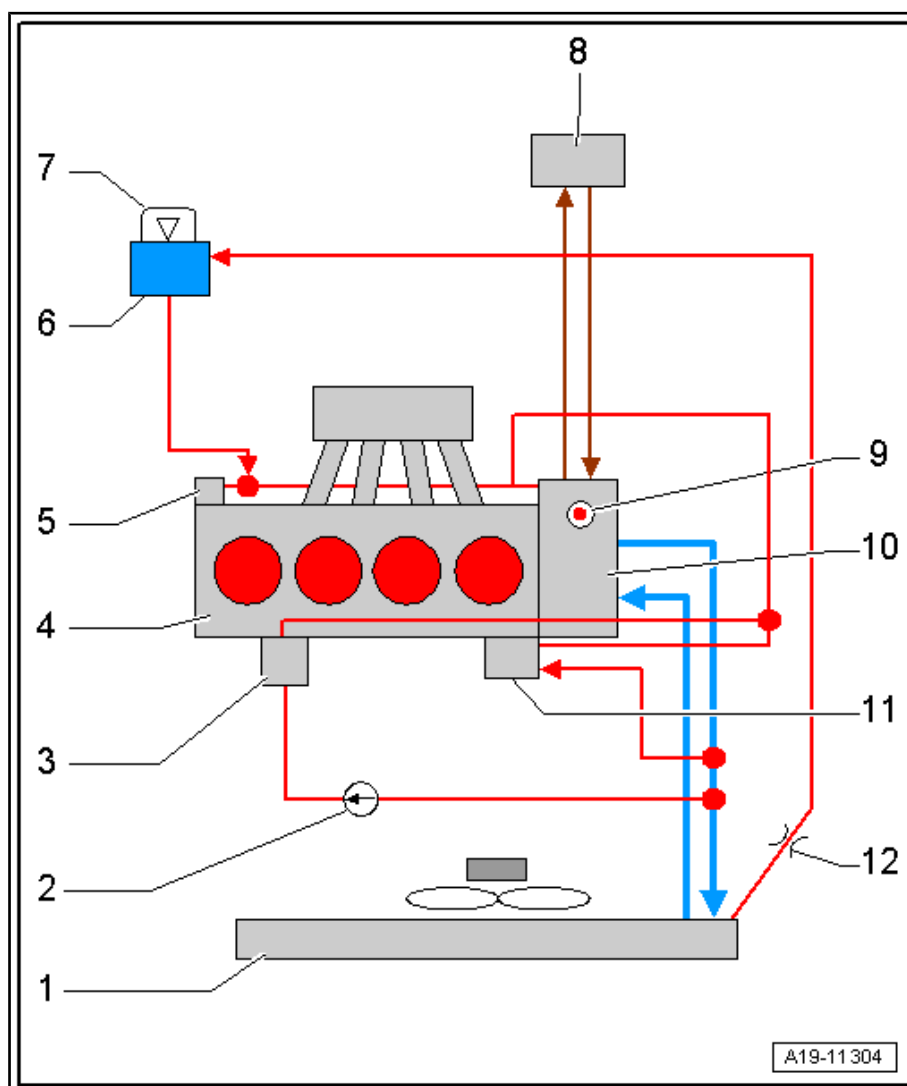
8 - Heat exchanger for heater

9 - Coolant temperature sender - G62-

10 - Thermostat housing

11 - Engine oil cooler

12 - Restrictor



A19-11 304



1.2 Checking cooling system for leaks

Special tools and workshop
 equipment required

V.A.G 1274/8 	V.A.G 1274/9 
V.A.G 1274 B 	
	W19-10069

- ◆ Adapter for cooling system tester - V.A.G 1274/8-
- ◆ Adapter for cooling system tester - V.A.G 1274/9-
- ◆ Cooling system tester - V.A.G 1274 B-

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Procedure

- Engine must be warm.

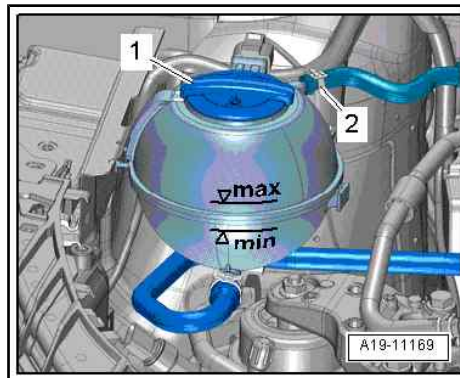


WARNING

The cooling system is under pressure when the engine is hot. Risk of scalding due to hot steam and hot coolant.

Danger of scalding skin and other parts of the body.

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



- Open filler cap -1- on coolant expansion tank.



Note

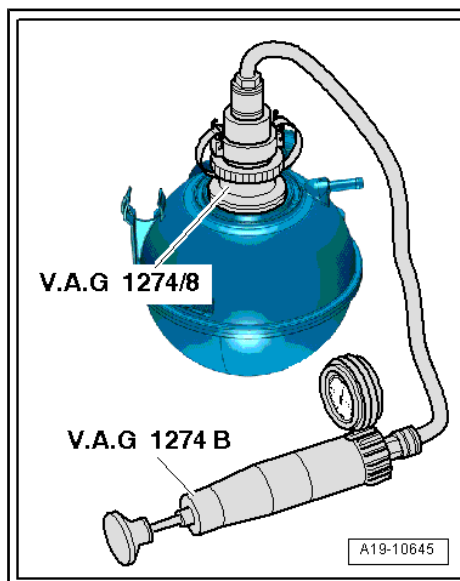
Disregard -item 2-.

- Fit cooling system tester - V.A.G 1274 B- with adapter - V.A.G 1274/8- onto coolant expansion tank.
- Using hand pump on cooling system tester, build up a pressure of approx. 1.5 bar.
- The pressure should not drop more than 0.2 bar within 10 minutes.
- If the pressure drops more than 0.2 bar, locate leak and eliminate fault.



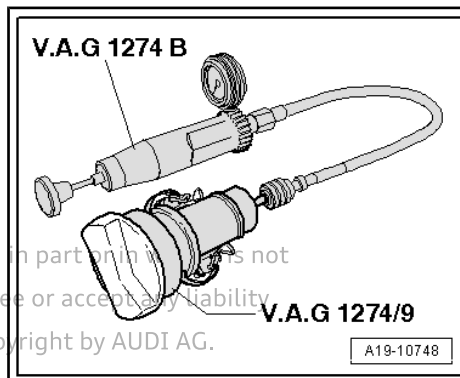
Note

The drop in pressure of 0.2 bar within 10 minutes is caused by the decrease in coolant temperature. The colder the engine is, the less the pressure will fall. If necessary, check again when the engine is cold.



Checking pressure relief valve in filler cap

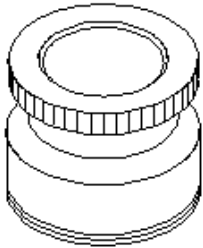
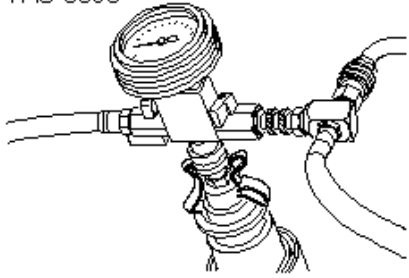
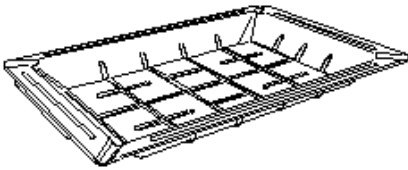
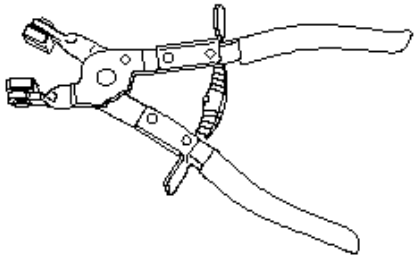
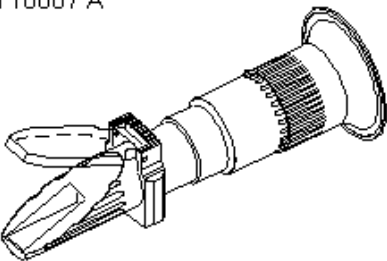
- Fit cooling system tester - V.A.G 1274 B- with adapter - V.A.G 1274/9- onto filler cap.
- Build up pressure with hand pump on cooling system tester.
- The pressure relief valve should open at a pressure of 1.4 ... 1.6 bar.
- Renew filler cap if pressure relief valve does not open as described.



1.3 Draining and filling cooling system



Special tools and workshop equipment required

V.A.G 1274/8 	VAS 6096 
VAS 6208 	VAS 6362 
T10007 A 	G19-10030

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

Draining



WARNING

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

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

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WARNING

Risk of scalding due to hot steam and hot coolant.

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

- Open filler cap -1- on coolant expansion tank.



Note

Disregard -item 2-.

- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .
- Place drip tray for workshop hoist - VAS 6208- beneath engine.
- Release hose clip -arrow- and detach coolant hose (bottom left) from radiator.



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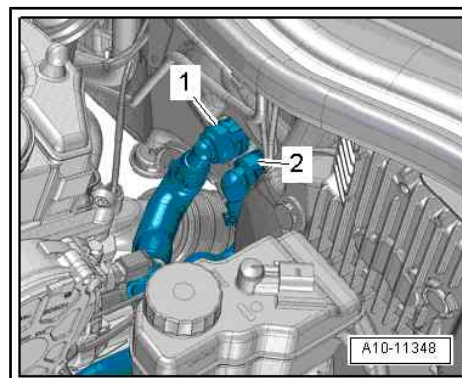
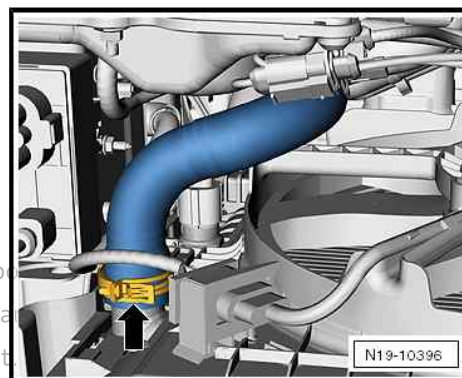
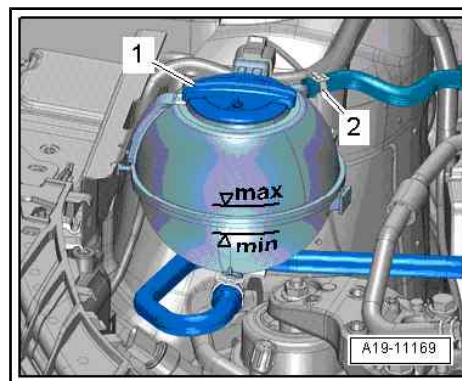
- Place drip tray for workshop hoist - VAS 6208- under connection.
- Lift retaining clips -1 and 2- and disconnect coolant hoses from heat exchanger for heater.
- Guide coolant hoses downwards and drain off coolant.

Filling



Caution

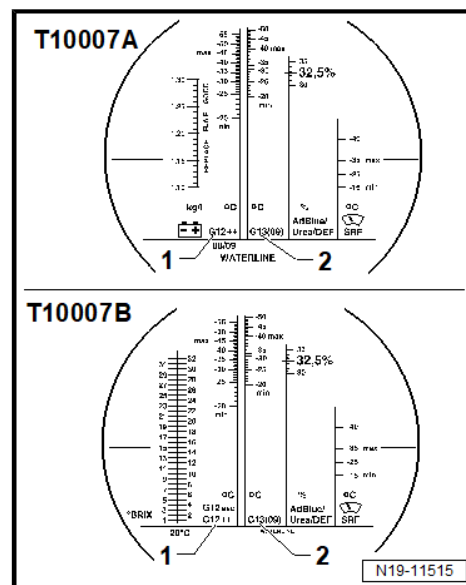
To ensure optimal corrosion protection, only distilled water may be mixed with coolant additives.





Note

- ◆ The effectiveness of the coolant is greatly influenced by the quality of the water with which it is mixed. Because water may contain different substances depending on the country or even the region, the water quality to be used for cooling systems has been specified. Distilled water meets all the requirements and is therefore recommended for use when topping up or filling up with coolant.
- ◆ Use only coolant additives listed in the ⇒ Electronic parts catalogue (ETKA) . If you use other coolant additives, this can significantly impair in particular the corrosion protection effect. The resulting damage could lead to loss of coolant and consequently to serious engine damage.
- ◆ Coolant with the recommended mixture ratio prevents frost and corrosion damage and stops scaling. At the same time it raises the boiling point of the fluid in the system. For this reason the cooling system must be filled all year round with the correct coolant additive.
- ◆ Because of its high boiling point, the coolant improves engine reliability under heavy loads, particularly in countries with tropical climates.
- ◆ Refractometer - T10007A- or refractometer - T10007B- MUST be used to determine the current level of frost protection.
- ◆ Scale -1- on the refractometer applies to coolant additives G12 ++ and G12evo.
- ◆ Scale -2- on the refractometer applies to coolant additive G13.
- ◆ If more than one type of coolant additive has been used: Always use the scale for G13 to determine the anti-freeze 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.
- ◆ The temperature indicated on the refractometer 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

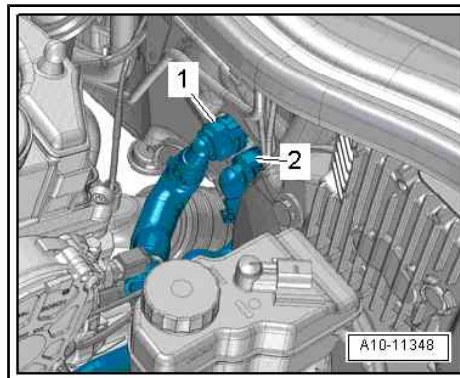
- Coolant (40 %) and distilled water (60 %) for frost protection to -25 °C
- Coolant (50 %) and distilled water (50 %) for frost protection to -36 °C
- Coolant ⇒ Electronic parts catalogue



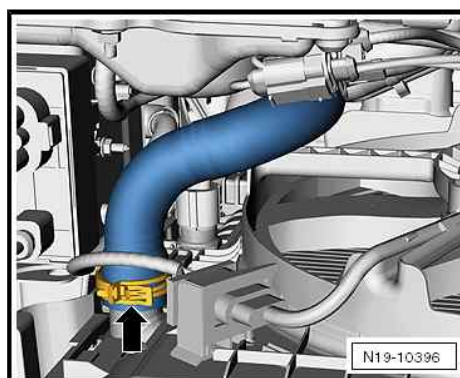
Procedure

- Connect coolant hoses -1 and 2- with plug-in connectors to heat exchanger for heater

⇒ Fig. [“Connecting coolant hose with plug-in connector”](#), page 197 .



- Connect coolant hose to radiator (bottom) with hose clip -arrow-.



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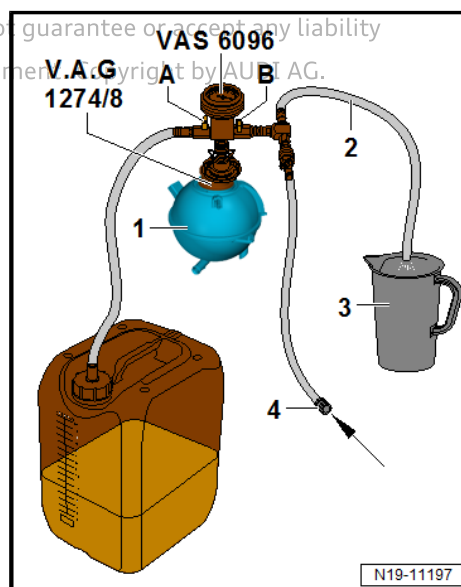
- Fill reservoir of VAS 6096- with at least 8 litres of premixed coolant (according to recommended ratio).
- Fit adapter for cooling system tester - V.A.G 1274/8- onto coolant expansion tank.
- Attach cooling system charge unit - VAS 6096- to adapter - V.A.G 1274/8- .
- Run vent hose -2- into a small container -3-.



Note

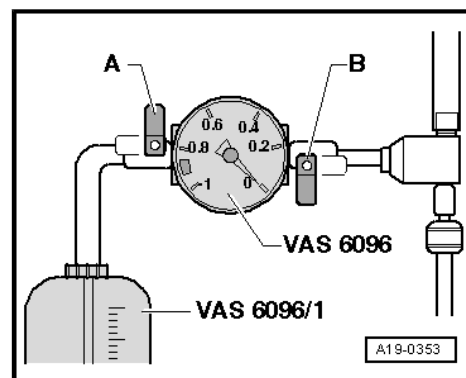
The vented air draws along a small amount of coolant, which should be collected.

- Close both valves -A- and -B- (turn lever at right angles to direction of flow).
- Connect hose -4- to compressed air supply.
- Pressure: 7 ... 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 -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.

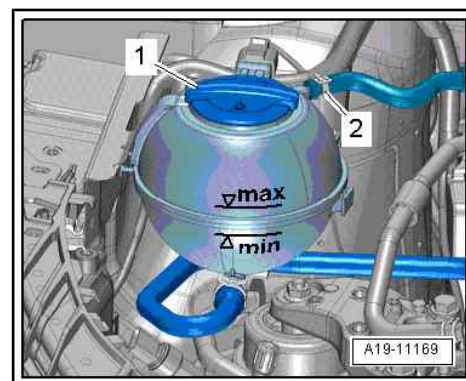


- ◆ *If the needle does not reach the green zone, repeat the process.*

- ◆ *Check cooling system for leaks if the vacuum is not maintained.*

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- Detach compressed air hose.
- Open valve -A-.
- The vacuum in the cooling system causes the coolant to be drawn out of the reservoir of -VAS 6096- ; the cooling system is then filled.
- Top up coolant to "max" mark.
- Set temperature to "HI".
- Set fresh air blower to lowest setting.
- Switch off air conditioner compressor (press **AC** button).
- Start engine and run for 2 minutes (maximum) at approx. 1500 rpm.
- Top up coolant to overflow hole on expansion tank with engine running.
- On vehicles with auxiliary heater, switch heater on (for about 30 seconds) and then off again.
- Close filler cap on coolant expansion tank (make sure it engages).
- 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 .



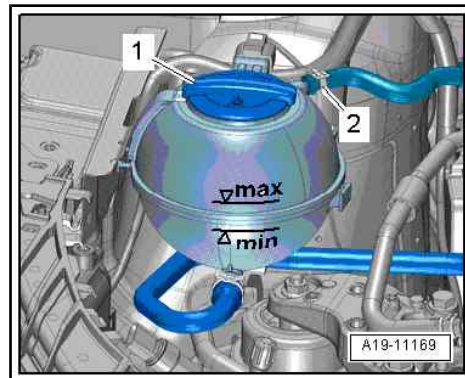


- Check coolant level.
- The coolant level must be between the “min” and “max” markings when the engine is cold.
- The coolant level can be at the “max” marking when the engine is warm.
- Top up with coolant again if necessary.



Note

Disregard items -1 and 2-



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2 Coolant pump/thermostat assembly

⇒ [“2.1 Exploded view - coolant pump”, page 175](#)

⇒ [“2.2 Exploded view - thermostat”, page 176](#)

⇒ [“2.3 Removing and installing electric coolant pump”, page 177](#)

⇒ [“2.4 Removing and installing coolant pump”, page 178](#)

⇒ [“2.5 Removing and installing thermostat”, page 183](#)

⇒ [“2.6 Removing and installing coolant temperature sender G62”, page 185](#)

⇒ [“2.7 Removing and installing radiator outlet coolant temperature sender G83”, page 186](#)

2.1 Exploded view - coolant pump

1 - Coolant pump

- ☐ With magnetic clutch for supercharger - N421-
- ☐ Removing and installing
⇒ [“2.4 Removing and installing coolant pump”, page 178](#)
- ☐ With integral seal

2 - Bolt

- ☐ 9 Nm

3 - Coolant hose

4 - Bolt

- ☐ Tightening torque ⇒
Rep. gr. 34 ; Removing and installing gearbox;
Tightening torques for gearbox

5 - Coolant hose

6 - Continued coolant circulation pump - V51-

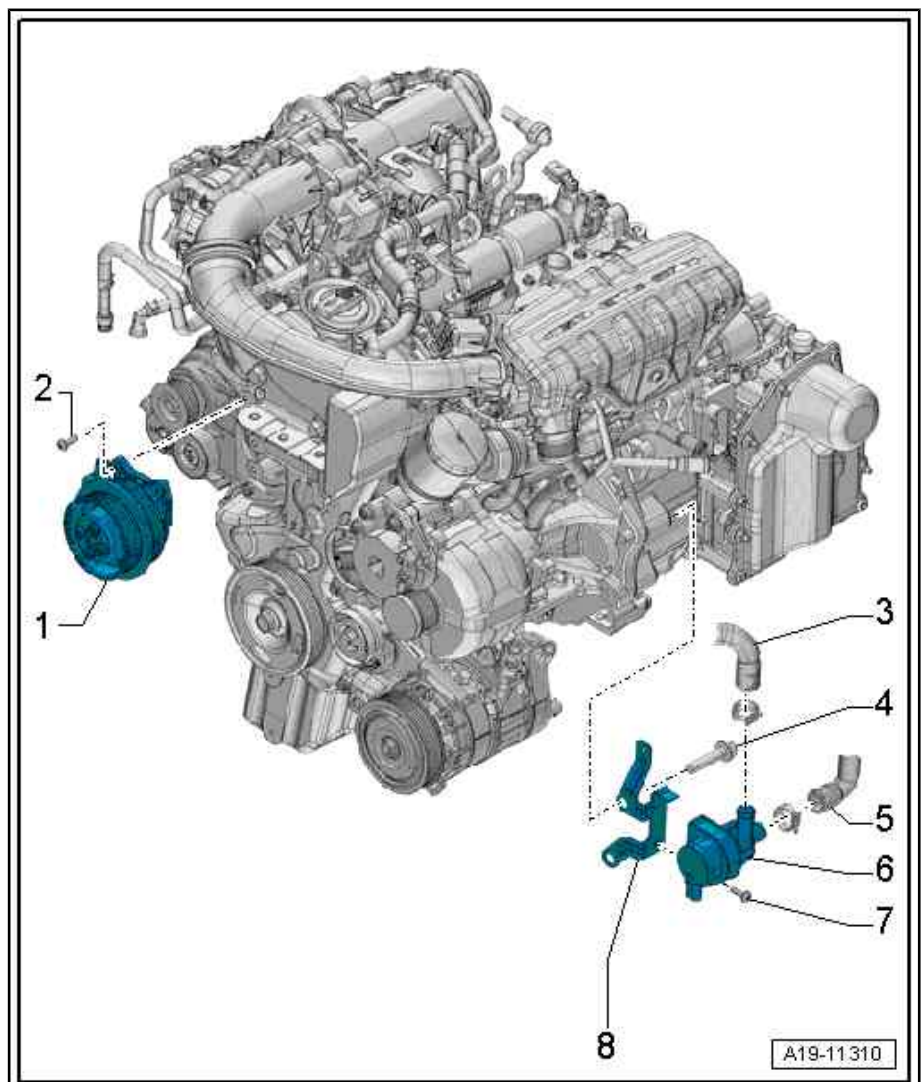
- ☐ Removing and installing
⇒ [“2.3 Removing and installing electric coolant pump”, page 177](#)

7 - Bolt

- ☐ 8 Nm

8 - Bracket

- ☐ For continued coolant circulation pump - V51-





2.2 Exploded view - thermostat

1 - Bolt

- 5 Nm

2 - Connection

3 - Bolt

- 5 Nm

4 - Connection

5 - O-ring

- Renew

6 - Compression spring

7 - Plunger

- For thermostat
- Removing and installing
⇒ ["3.2.3 Removing and installing coolant pipe \(rear\) with thermostat housing"](#), page 191

8 - Thermal element

- For 95 °C thermostat
- Removing and installing
⇒ ["3.2.3 Removing and installing coolant pipe \(rear\) with thermostat housing"](#), page 191

9 - Retaining clip

- Check for firm attachment

10 - Coolant temperature sender - G62-

- Removing and installing
⇒ ["2.6 Removing and installing coolant temperature sender G62"](#), page 185

11 - O-ring

- Renew

12 - Bolt

- 10 Nm

13 - Thermostat housing

- Removing and installing
⇒ ["3.2.3 Removing and installing coolant pipe \(rear\) with thermostat housing"](#), page 191

14 - Gasket

- Renew

15 - O-ring

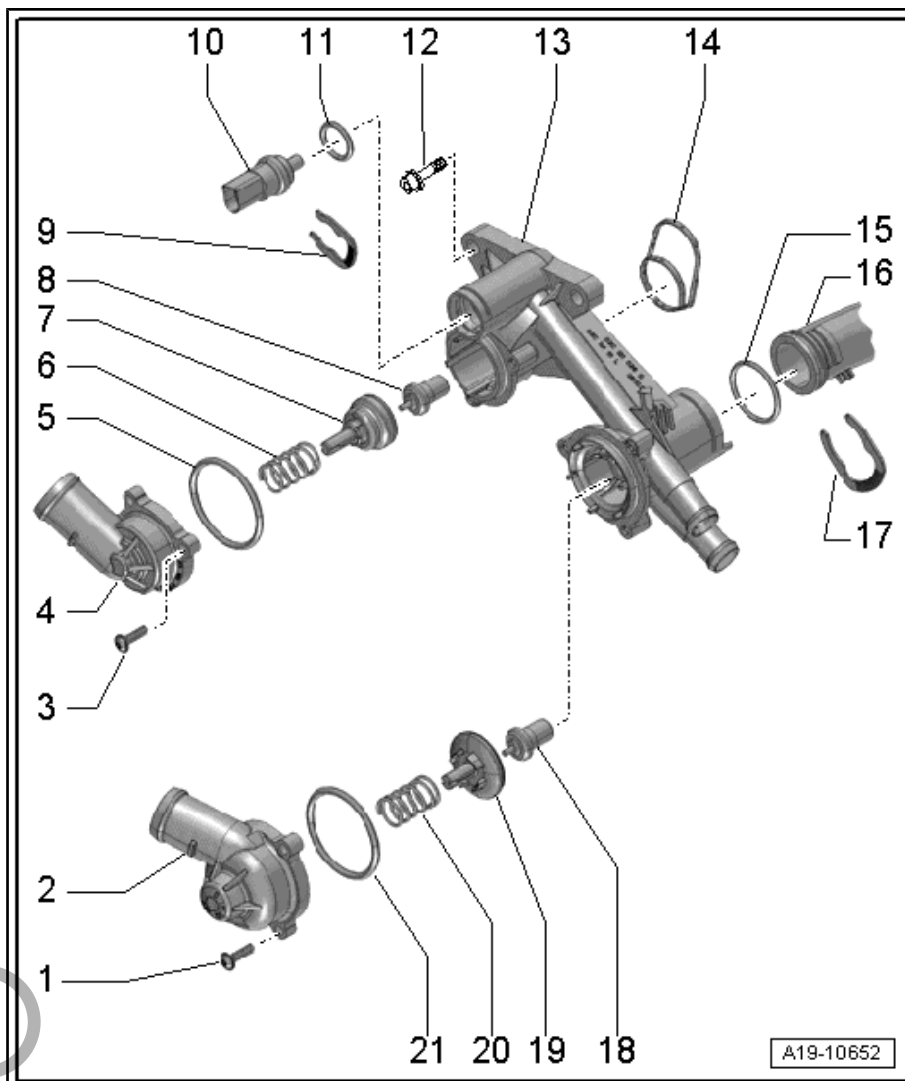
- Renew

16 - Coolant pipe

- Removing and installing ⇒ ["2.5 Removing and installing thermostat"](#), page 183

17 - Retaining clip

- For coolant pipe



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18 - Thermal element

- ☐ For 83 °C thermostat
- ☐ Removing and installing
⇒ [“3.2.3 Removing and installing coolant pipe \(rear\) with thermostat housing”, page 191](#)

19 - Plunger

- ☐ For thermostat
- ☐ Removing and installing
⇒ [“3.2.3 Removing and installing coolant pipe \(rear\) with thermostat housing”, page 191](#)

20 - Compression spring

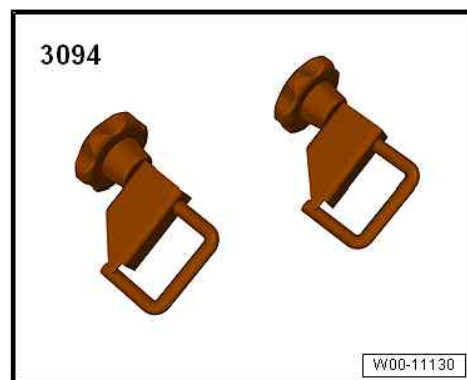
21 - O-ring

- ☐ Renew

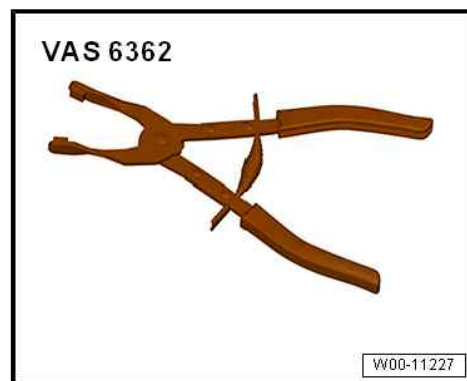
2.3 Removing and installing electric coolant pump

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 .
- Unplug electrical connector -1-.
- Remove bolt -2- and detach continued coolant circulation pump - V51- -item 3- from bracket.



Note

Place a cloth underneath to catch escaping coolant.

- Clamp off coolant hoses -arrows- with hose clamps, up to 25 mm - 3094- and disconnect hoses from continued coolant circulation pump - V51- .

Installing

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



Note

Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ *Electronic parts catalogue*

- Check coolant level ⇒ [page 174](#) .

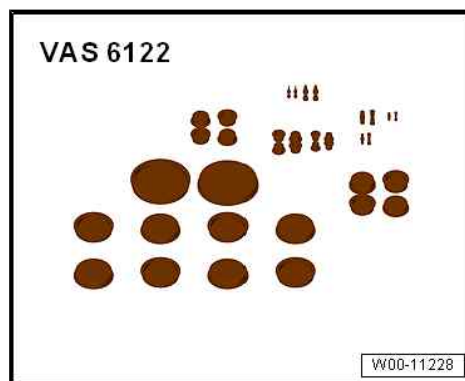
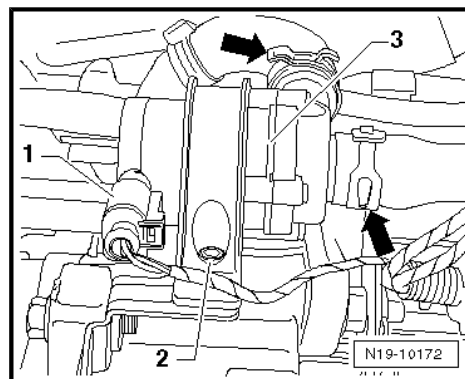
Tightening torques

- ♦ ⇒ [“2.1 Exploded view - coolant pump”, page 175](#)
- ♦ ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

2.4 Removing and installing coolant pump

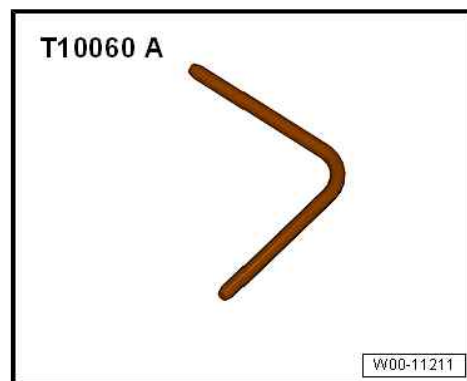
Special tools and workshop equipment required

- ♦ Engine bung set - VAS 6122-





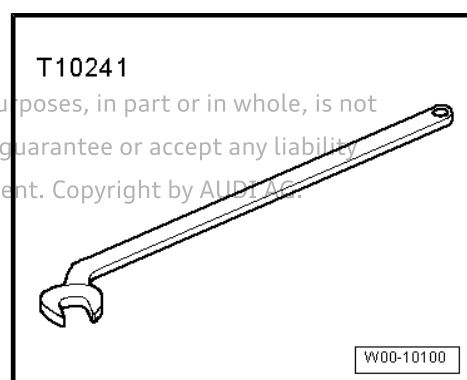
- ◆ Locking pin - T10060 A-



- ◆ Open-end spanner, 16 mm - T10241-

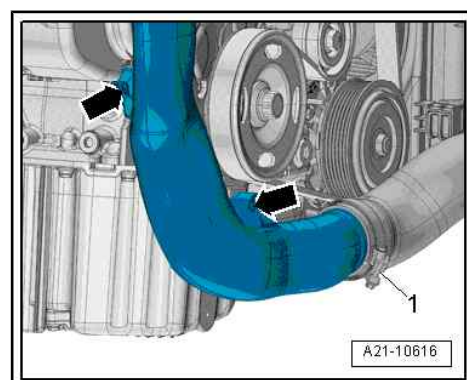


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Removing

- Drain coolant
 ⇒ ["1.3 Draining and filling cooling system", page 168](#) .
- Remove wheel housing liner (front right) ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Removing and installing wheel housing liner (front) .
- Remove poly V-belt
 ⇒ ["1.2.1 Removing and installing poly V-belt for ancillaries", page 40](#) .
- Release hose clip -1- and detach air hose.
- Remove bolts -arrows-.





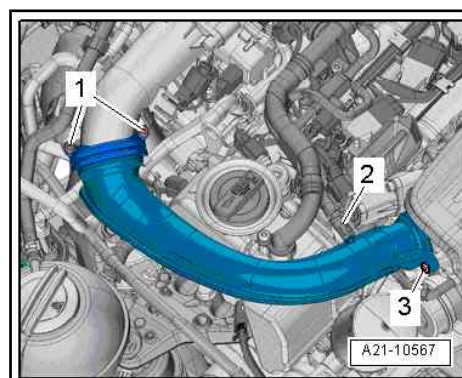
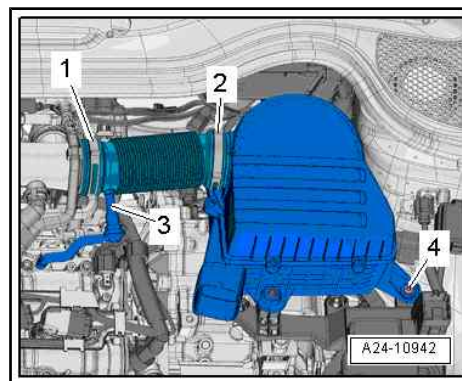
- Release hose clips -1 and 2- and remove air hose.
- Disconnect vacuum hose -3- from air hose.



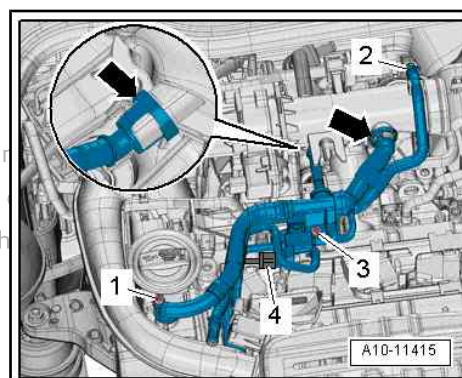
Note

Disregard -item 4-.

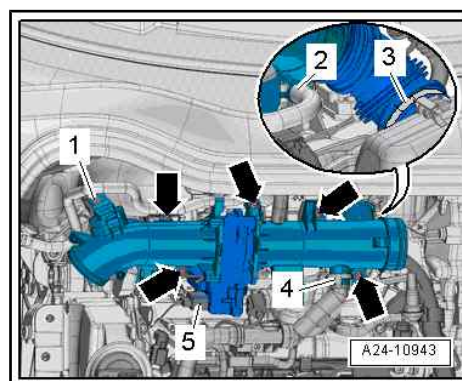
- Remove bolts -1, 3-.
- Release hose clip -2-, detach air pipe (top right) and remove air hose.



- Unplug electrical connector -4-.
- Remove bolts -1, 3-.
- Press release tabs and disconnect crankcase breather hoses -arrows-.
- Release hose clip -2- and disconnect hose at activated charcoal filter.
- Push hoses aside.



- Unplug electrical connectors on:
 - 1 - Intake air temperature sender 3 - G520-
 - 5 - Regulating flap control unit - J808-
- Release hose clip -3- and move clear fuel hose -2-.
- Remove bolts -arrows-, detach intake connecting pipe and at the same time disconnect crankcase breather hose -4- (press release tabs).
- Remove assembly mounting for engine
 ⇒ ["2.2 Removing and installing engine mountings", page 30](#) .



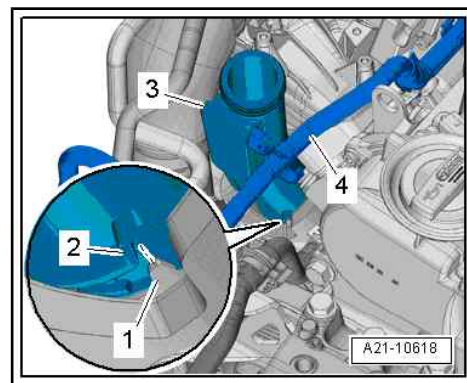


- Move clear fuel hose -4- and detach air pipe -3-.
- Seal off open connections to supercharger with clean cloths.

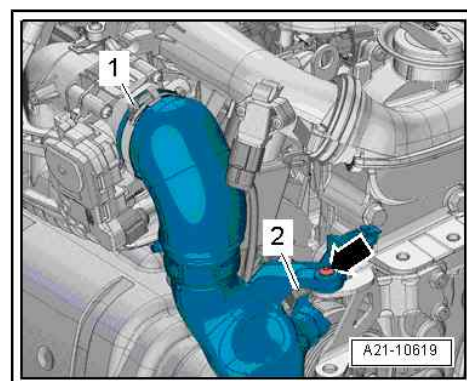


Note

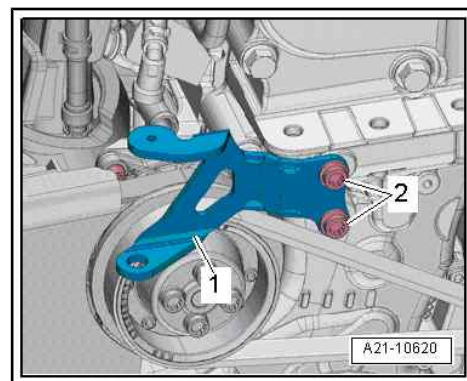
Disregard items -1 and 2-.



- Unplug electrical connector -2- and release hose clip -1-.
- Remove bolt -arrow-.

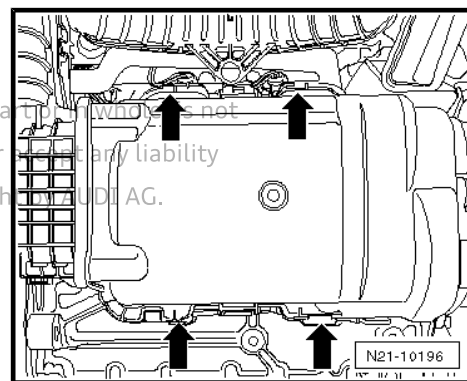


- Remove bolts -2- and detach bracket -1- and air pipe (right-side).



- Carefully press retaining tabs on cover for noise insulation for supercharger outwards -arrows-.

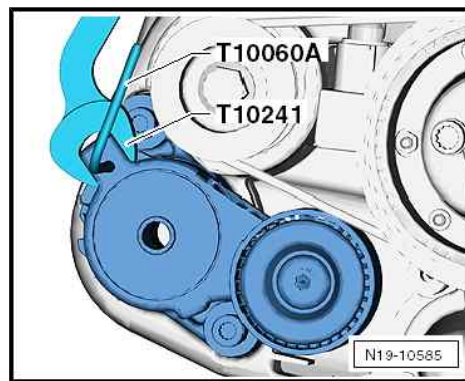
- Detach cover (front) together with noise insulation.



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- Slacken poly V-belt for supercharger by turning tensioner in clockwise direction using open-end spanner, 16 mm - T10241- .
- Lock tensioner with locking pin - T10060 A- .



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- Unplug electrical connector -1-.
- Remove bolts -arrows- and detach coolant pump with magnetic clutch for supercharger - N421- .

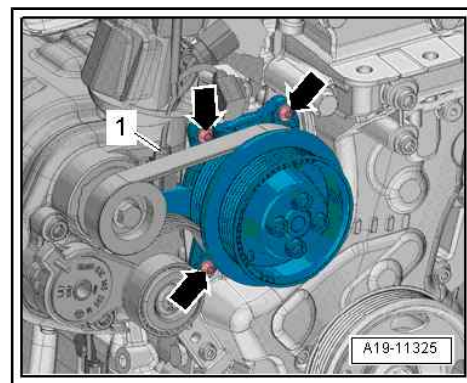
Installing

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



Note

- ◆ *The coolant pump seal is bonded in position. The coolant pump must be renewed if the seal is damaged.*
- ◆ *Fit new O-ring.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ [Electronic parts catalogue](#) .*
- Install crankcase breather hoses
 ⇒ [“3.1 Exploded view - oil filter”, page 162](#) .
- Install air pipes
 ⇒ [“2.1 Exploded view - charge air system”, page 220](#) .
- Install air hoses with screw-type clips
 ⇒ [“2.2 Exploded view - hose connections for charge air system”, page 221](#) .
- Install poly V-belt
 ⇒ [“1.2.1 Removing and installing poly V-belt for ancillaries”, page 40](#) .
- Install engine mountings
 ⇒ [“2.2 Removing and installing engine mountings”, page 30](#) .



Note

Do not reuse coolant.

- Fill up with coolant ⇒ [page 170](#) .
- Reset current adaption values of magnetic clutch for supercharger - N421- in “Guided Functions” using ⇒ Vehicle diagnostic tester.

Tightening torques

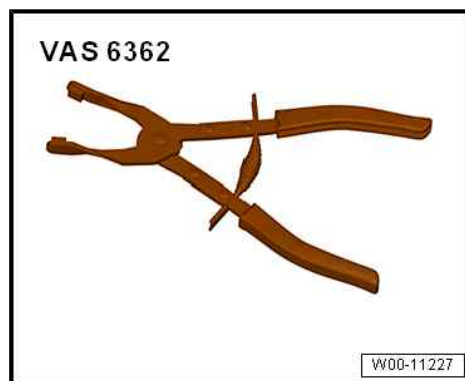
- ◆ ⇒ [“2.1 Exploded view - coolant pump”, page 175](#)
- ◆ Intake connecting pipe
 ⇒ [“2.1 Exploded view - air cleaner housing”, page 238](#)
- ◆ ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front)

2.5 Removing and installing thermostat

Special tools and workshop equipment required



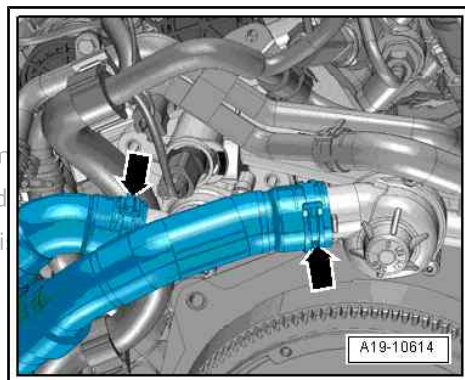
- ◆ Hose clip pliers - VAS 6362-



Removing

- Drain coolant
⇒ ["1.3 Draining and filling cooling system", page 168](#) .
- Remove air cleaner housing
⇒ ["2.2 Removing and installing air cleaner housing", page 239](#) .
- Release hose clips -arrows- and disconnect coolant hoses from thermostat housing.

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- Unscrew bolts -arrows- and remove corresponding connection.
- Detach spring, plunger and thermostat.

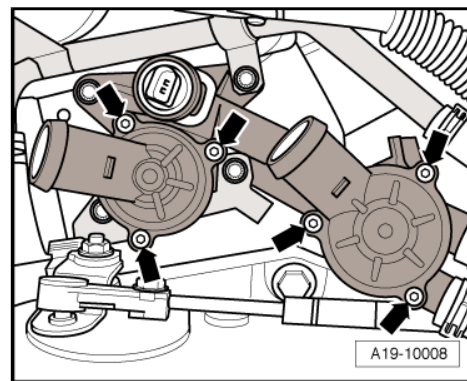
Installing

Installation is carried out in 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 .*
- Clean and smoothen sealing surfaces for O-rings.
- Lubricate O-rings with coolant.
- Insert thermostat.
- Installation position: the hole in the thermostat plunger must face upwards.
- Install air cleaner housing
 ⇒ [“2.2 Removing and installing air cleaner housing”, page 239](#) .



Note

Do not reuse coolant.

- Fill up with coolant ⇒ [page 170](#) .

Tightening torques

- ◆ ⇒ [“2.2 Exploded view - thermostat”, page 176](#)

2.6 Removing and installing coolant temperature sender - G62-

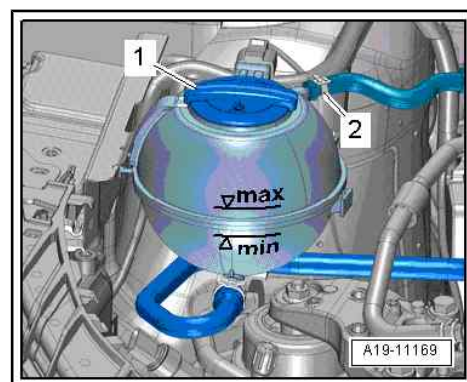
Removing

- Engine cold.
- To relieve residual pressure in cooling system, open filler cap -1- on coolant expansion tank briefly and then close cap again (it should click into place).



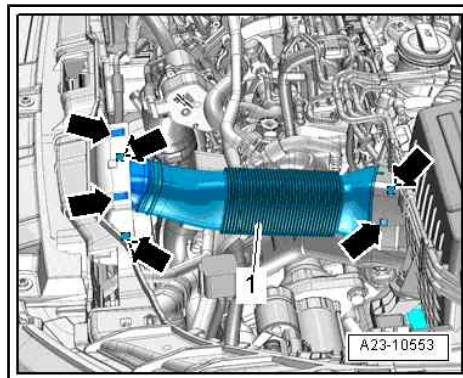
Note

Disregard -item 2-.





- Release fasteners -arrows- and detach air duct -1-.



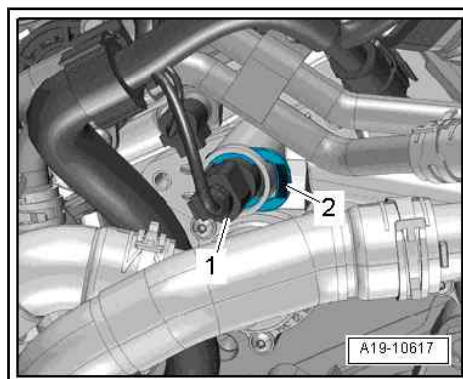
- Unplug electrical connector -1-.



Note

Place a cloth underneath to catch escaping coolant.

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



Installing

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



Note

- ♦ *Fit new O-ring.*
- ♦ *Insert new coolant temperature sender - G62- immediately into connection to avoid loss of coolant.*

- Check coolant level ⇒ [page 174](#) .

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2.7 Removing and installing radiator outlet coolant temperature sender - G83-

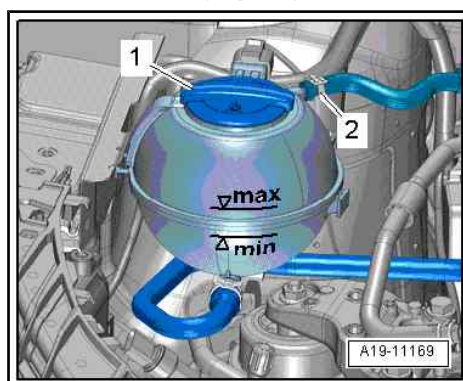
Removing

- Engine cold.
- To relieve residual pressure in cooling system, open filler cap -1- on coolant expansion tank briefly and then close cap again (it should click into place).



Note

Disregard -item 2-.





- Unplug electrical connector -arrow-.



Note

Place a cloth underneath to catch escaping coolant.

- Unscrew radiator outlet coolant temperature sender - G83- .

Installing

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

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Note

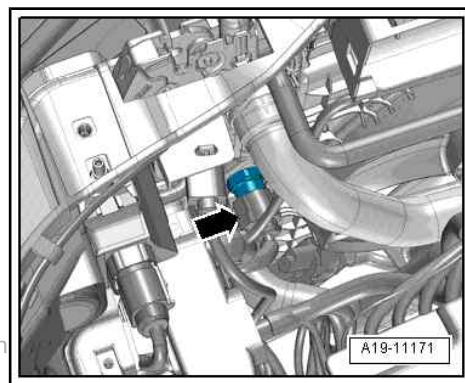
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To avoid loss of coolant, screw in new radiator outlet coolant temperature sender - G83- immediately.

- Check coolant level ⇒ [page 174](#) .

Tightening torques

- ◆ ⇒ [“4.1 Exploded view - radiator/radiator fans”, page 196](#)





3 Coolant pipes

⇒ [“3.1 Exploded view - coolant pipes”, page 188](#)

⇒ [“3.2 Removing and installing coolant pipes”, page 189](#)

3.1 Exploded view - coolant pipes



Note

The arrow markings on coolant pipes and on ends of hoses must align.

1 - Coolant pipes (front)

- ❑ Removing and installing
⇒ [“3.2.1 Removing and installing coolant pipes \(front\)”, page 189](#)

2 - Bolt

- ❑ 20 Nm

3 - Bolt

- ❑ 8 Nm

4 - O-rings

- ❑ Renew

5 - Coolant pipe

6 - Bolt

- ❑ 5 Nm

7 - Bolt

- ❑ 5 Nm

8 - Coolant pipe

9 - Bolt

- ❑ 5 Nm

10 - Coolant pipe (left-side)

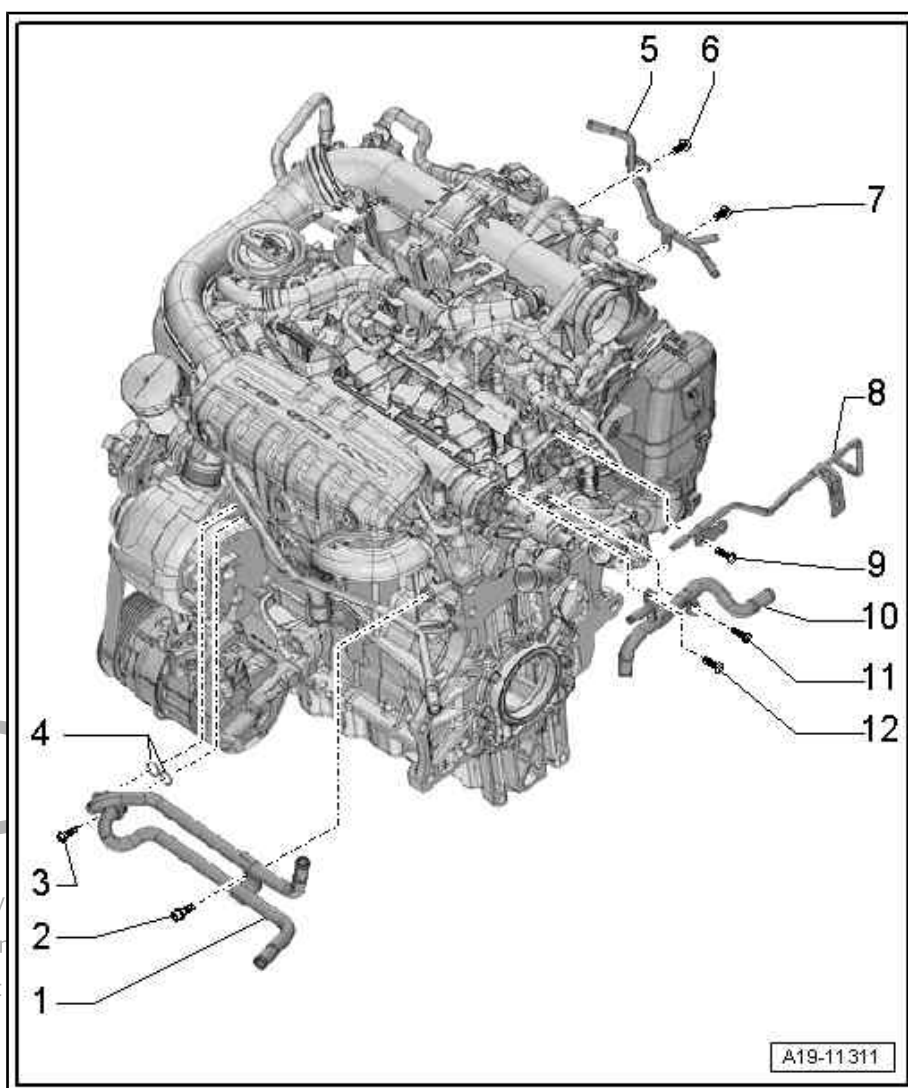
- ❑ Removing and installing
⇒ [“3.2.2 Removing and installing coolant pipe \(left-side\)”, page 190](#)

11 - Bolt

- ❑ 9 Nm

12 - Bolt

- ❑ 9 Nm





3.2 Removing and installing coolant pipes

⇒ [“3.2.1 Removing and installing coolant pipes \(front\)”, page 189](#)

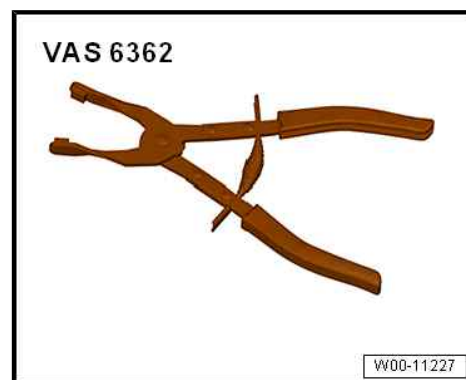
⇒ [“3.2.2 Removing and installing coolant pipe \(left-side\)”, page 190](#)

⇒ [“3.2.3 Removing and installing coolant pipe \(rear\) with thermostat housing”, page 191](#)

3.2.1 Removing and installing coolant pipes (front)

Special tools and workshop equipment required

- ◆ Hose clip pliers - VAS 6362-



Removing



Note

Fit all heat insulation sleeves in the original position when installing.

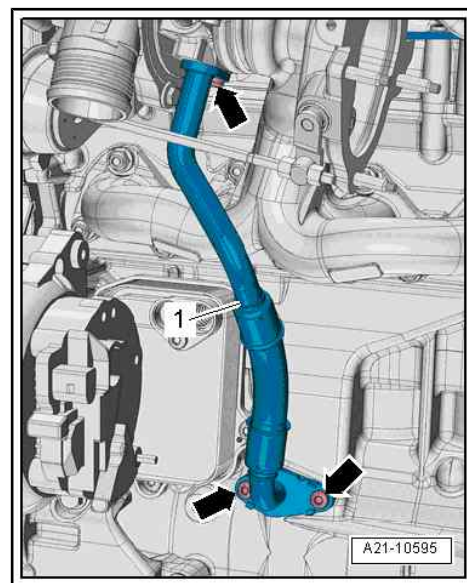
- Drain coolant
⇒ [“1.3 Draining and filling cooling system”, page 168](#) .
- Remove catalytic converter with centre silencer
⇒ [“2.1 Removing and installing catalytic converter”, page 282](#) .



Note

Place a cloth underneath to catch escaping engine oil.

- Remove bolts -arrows- and detach oil return line -1- for turbo-charger.



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- Detach heat insulation sleeve.
- Move electrical wiring harness clear.
- Remove bolts -1- and -2- and detach coolant pipes (front) from engine oil cooler.
- Detach coolant hoses -arrows-.

Installing

Installation is carried out in 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](#) .*
- Install oil return line for turbocharger
⇒ [“1.1 Exploded view - turbocharger”, page 203](#) .
- Install catalytic converter with centre silencer
⇒ [“2.1 Removing and installing catalytic converter”, page 282](#) .



Note

Do not reuse coolant.

- Fill up with coolant ⇒ [page 170](#) .

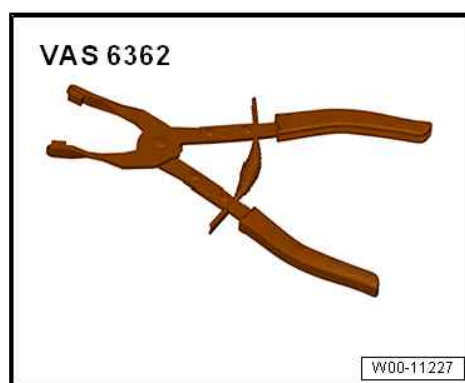
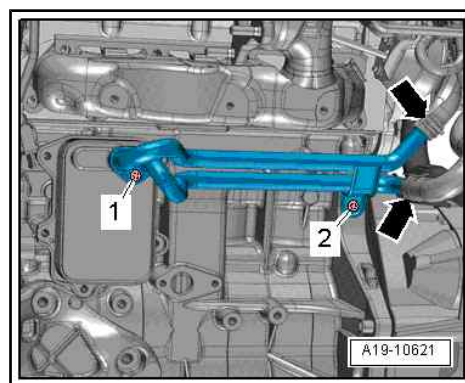
Tightening torques

- ◆ ⇒ [“3.1 Exploded view - coolant pipes”, page 188](#)

3.2.2 Removing and installing coolant pipe (left-side)

Special tools and workshop equipment required

- ◆ Hose clip pliers - VAS 6362-



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Note

Fit all heat insulation sleeves in the original position when installing.



- Drain coolant
⇒ ["1.3 Draining and filling cooling system", page 168](#) .
- Remove air cleaner housing
⇒ ["2.2 Removing and installing air cleaner housing", page 239](#) .
- Detach heat insulation sleeve.
- Remove bolts -arrows-.
- Release hose clips -1, 2 and 3- and detach coolant hoses and coolant pipe (left-side).

Installing

Installation is carried out in 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](#) .*
- Install air cleaner housing
⇒ ["2.2 Removing and installing air cleaner housing", page 239](#) .



Note

Do not reuse coolant.

- Fill up with coolant ⇒ [page 170](#) .

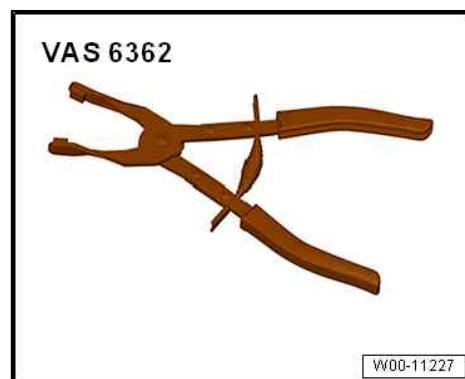
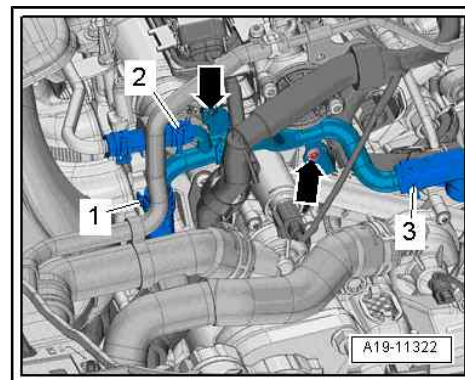
Tightening torques

- ◆ ⇒ ["3.1 Exploded view - coolant pipes", page 188](#)

3.2.3 Removing and installing coolant pipe (rear) with thermostat housing

Special tools and workshop equipment required

- ◆ Hose clip pliers - VAS 6362-



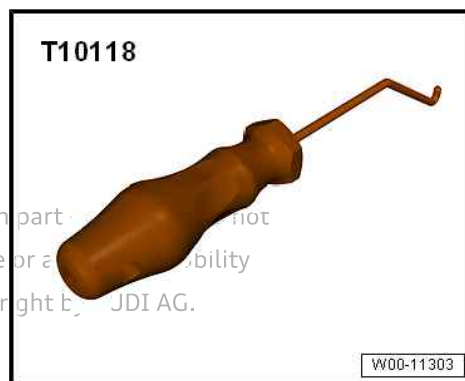
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◆ Assembly tool - T10118-

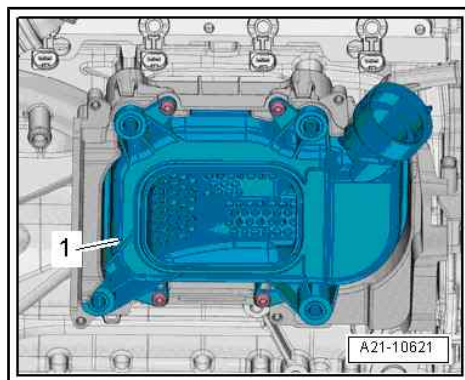


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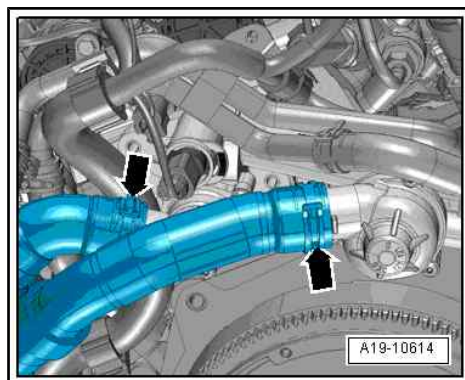


Removing

- Drain coolant
⇒ [“1.3 Draining and filling cooling system”, page 168](#) .
- Remove air cleaner housing
⇒ [“2.2 Removing and installing air cleaner housing”, page 239](#) .
- Remove supercharger
⇒ [“3.2 Removing and installing supercharger”, page 227](#) .
- Remove coolant pipe (left-side)
⇒ [“3.2.2 Removing and installing coolant pipe \(left-side\)”, page 190](#) .
- Detach noise insulation -1- for charge air system.

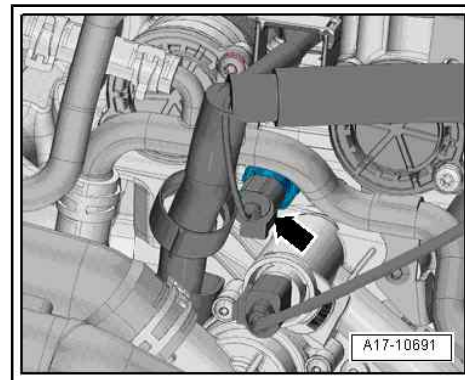


- Release hose clips -arrows- and disconnect coolant hoses from thermostat housing.





- Using assembly tool - T10118- , unplug electrical connector -arrow- at oil pressure switch - F1- .

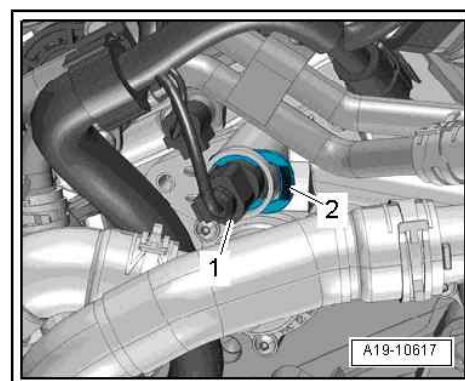


- Unplug electrical connector -1- at coolant temperature sender - G62- .

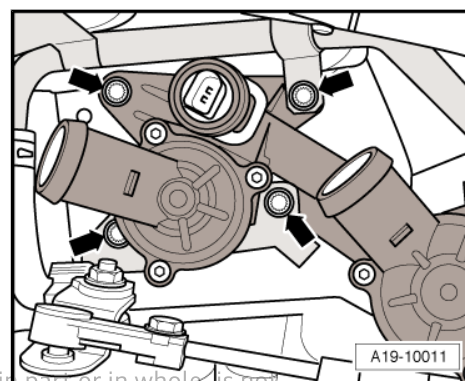


Note

Disregard -item 2-.



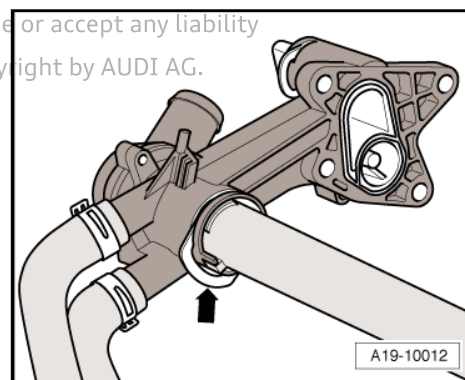
- Remove bolts -arrows- for thermostat housing.



Note

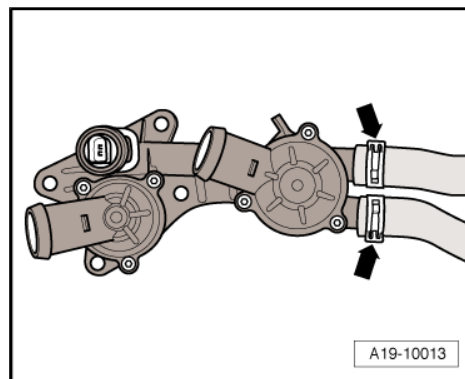
For illustration purposes, the installation position is shown with the thermostat housing removed.

- Pull out retaining clip -arrow- for coolant pipe.
- Detach thermostat housing from coolant pipe.

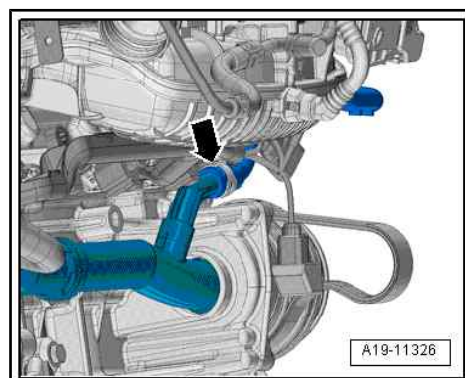




- Pull thermostat housing slightly towards front.
- Mark position of coolant hoses on thermostat housing for re-installation, release hose clips -arrows- and detach coolant hoses.



- Release hose clip -arrow- and disconnect coolant hose from rear coolant pipe.



- Detach coolant pipe -1- (rear) from cylinder block -3-.
- Detach O-ring -2-.

Installing

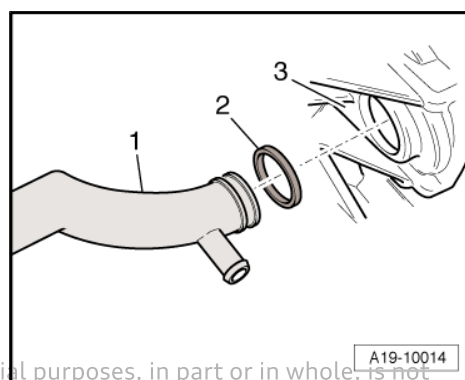
Installation is carried out in reverse order; note the following:



Note



- ◆ *Renew gaskets, seals and O-rings.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) → Electronic parts catalogue.*



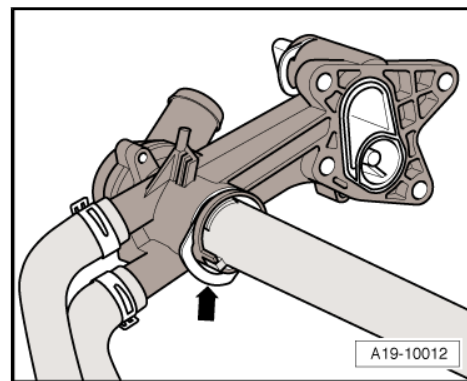
- Clean and smoothen sealing surface for O-ring.
- Lubricate O-ring with coolant.
- Attach coolant hoses to thermostat housing according to markings made during removal.



- After securing thermostat housing, move coolant pipe up against housing as far as stop and only then insert retaining clip -arrow-.
- Check that coolant pipe is firmly secured in thermostat housing.

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

- Install coolant pipe (left-side)
⇒ [“3.2.2 Removing and installing coolant pipe \(left-side\)”, page 190](#) .
- Install supercharger
⇒ [“3.2 Removing and installing supercharger”, page 227](#) .
- Install air cleaner housing
⇒ [“2.2 Removing and installing air cleaner housing”, page 239](#) .



Note

Do not reuse coolant.

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- Fill up with coolant ⇒ [page 170](#)

Tightening torques

- ◆ ⇒ [“2.2 Exploded view - thermostat”, page 176](#)



4 Radiator/radiator fans

⇒ ["4.1 Exploded view - radiator/radiator fans", page 196](#)

⇒ ["4.2 Removing and installing radiator", page 197](#)

⇒ ["4.3 Removing and installing radiator cowl", page 201](#)

⇒ ["4.4 Removing and installing radiator fans", page 202](#)

4.1 Exploded view - radiator/radiator fans

1 - Radiator fan 2 - V177-

- ☐ With radiator fan control unit 2 - J671-
- ☐ Removing and installing
⇒ ["4.4 Removing and installing radiator fans", page 202](#)

2 - Radiator fan - V7-

- ☐ With radiator fan control unit - J293-
- ☐ Removing and installing
⇒ ["4.4 Removing and installing radiator fans", page 202](#)

3 - Retainer

- ☐ For electrical connector

4 - Radiator cowl

- ☐ Removing and installing
⇒ ["4.3 Removing and installing radiator cowl", page 201](#)

5 - Nut

- ☐ 8 Nm

6 - Grommet

- ☐ For charge air cooler

7 - Coolant hose

8 - Radiator outlet coolant temperature sender - G83-

- ☐ Removing and installing
⇒ ["2.7 Removing and installing radiator outlet coolant temperature sender G83", page 186](#)

- ☐ 35 Nm

9 - O-ring

- ☐ Not fitted on this model

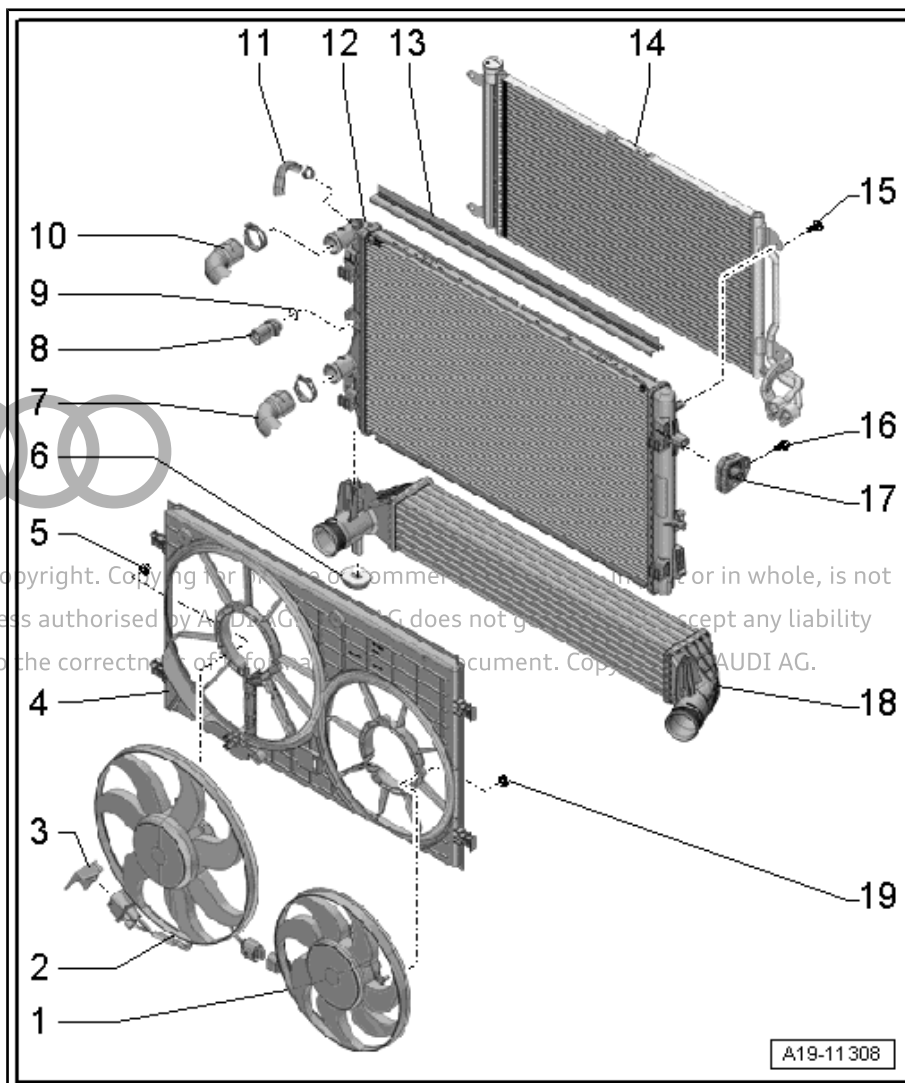
10 - Coolant hose

11 - Coolant hose

- ☐ To coolant expansion tank

12 - Radiator

- ☐ Removing and installing ⇒ ["4.2 Removing and installing radiator", page 197](#)
- ☐ If renewed, change coolant in entire system





13 - Air duct

14 - Condenser

- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit; Removing and installing condenser

15 - Bolt

- ❑ Tightening torque ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit; Exploded view - condenser

16 - Bolt

- ❑ 7 Nm

17 - Retainer

- ❑ Note installation position

18 - Charge air cooler

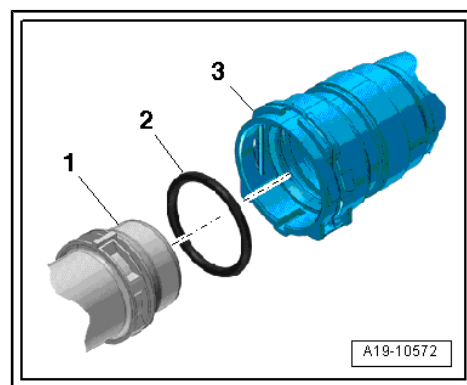
- ❑ Removing and installing ⇒ ["4.2 Removing and installing radiator", page 197](#)

19 - Nut

- ❑ 8 Nm

Connecting coolant hose with plug-in connector

- Remove old O-ring -2- from coolant hose -3-.
- Lightly lubricate new O-ring with coolant and fit O-ring in coolant hose.
- Press coolant hose onto connection -1- until it engages audibly.
- Press coolant hose in again and then pull to check that plug-in connector is correctly engaged.



4.2 Removing and installing radiator



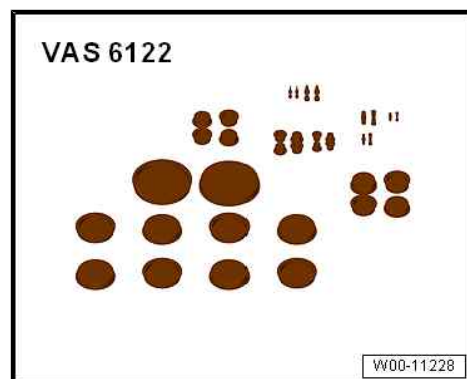
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The radiator and charge air cooler must be removed and installed together.

Special tools and workshop equipment required

- ◆ Engine bung set - VAS 6122-





- ◆ Drip tray for workshop hoist - VAS 6208-

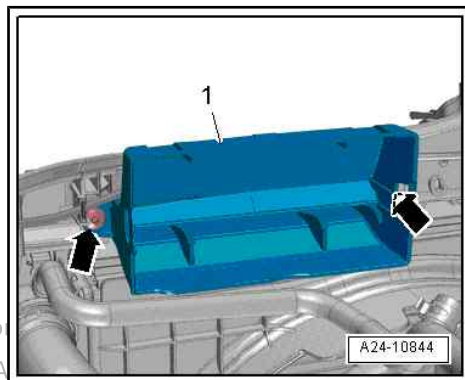
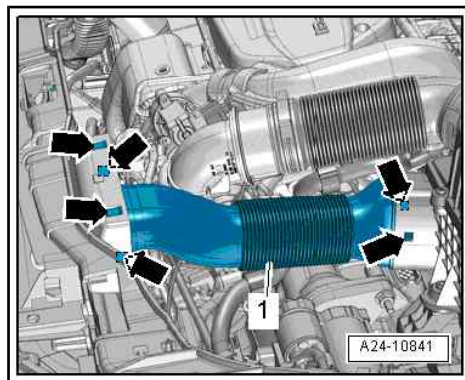


- ◆ Hose clip pliers - VAS 6362-



Removing

- Remove radiator cowl
⇒ ["4.3 Removing and installing radiator cowl", page 201](#) .
- Drain coolant
⇒ ["1.3 Draining and filling cooling system", page 168](#) .
- Remove bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Removing and installing bumper cover .
- Release fasteners -arrows- and detach air duct -1-.
- Remove bolts -arrows- and detach air duct -1- from lock carrier.



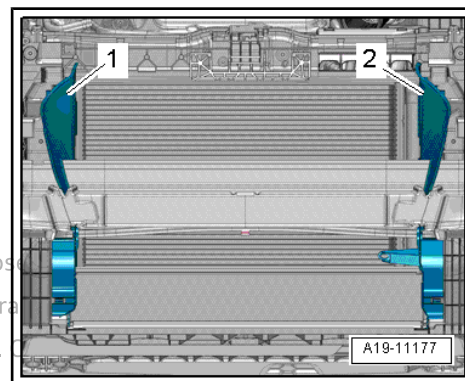
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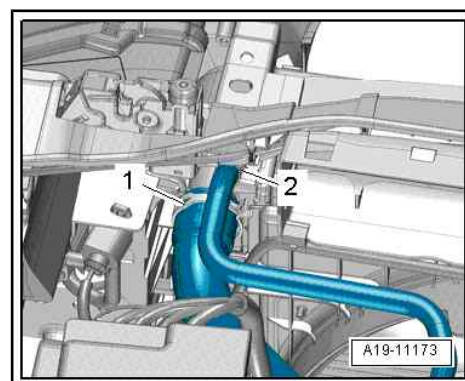
- Release fasteners and detach air ducts -1 and 2-.



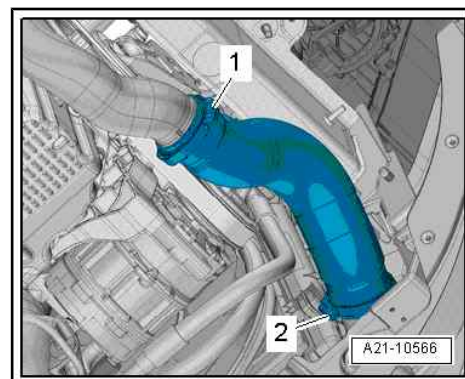
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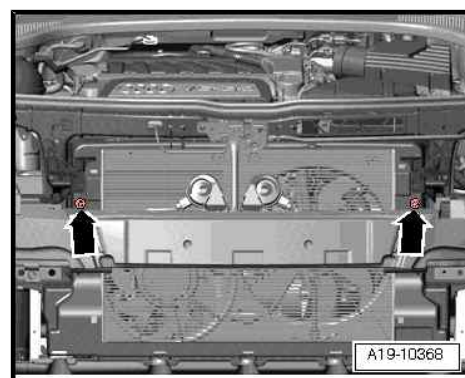
- Release hose clips -1 and 2- and detach coolant hoses (top left) from radiator.



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



- Remove bolts -arrows-.
- Swivel top edge of radiator slightly to rear.
- Lift radiator, disengage it from bottom mounting points and press it to the rear.





Vehicles with air conditioner:



WARNING

Risk of injury caused by refrigerant.

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

- Remove bolts -arrows-.

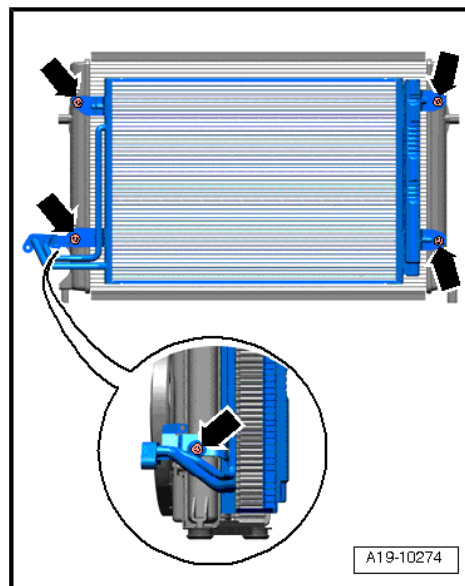


Caution

Risk of damage to refrigerant lines and hoses

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

- Move condenser to front and place in lock carrier, then secure with cable ties to prevent from dropping.



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All vehicles (continued):

- Release fasteners on charge air cooler -1- -arrows A-.
- Pull charge air cooler off radiator -2- -arrow B- and disengage -arrow C-.
- Take off radiator and charge air cooler.

Installing

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



Note

- ♦ *If there are slight impressions on the fins, refer to ➔ [“3.7 Installing radiators and condensers”, page 7](#) .*
- ♦ *Secure all hose connections with the correct type of hose clips (same as original equipment) ➔ [Electronic parts catalogue](#) .*
- Vehicles with air conditioning: Install condenser ➔ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit; Removing and installing condenser .
- Install air duct on lock carrier
 ➔ [“2.1 Exploded view - air cleaner housing”, page 238](#) .
- Install air hoses with screw-type clips
 ➔ [“2.2 Exploded view - hose connections for charge air system”, page 221](#) .
- Install bumper cover ➔ General body repairs, exterior; Rep. gr. 63 ; Bumper (front); Exploded view - bumper cover .

Install radiator cowl

➔ [“4.3 Removing and installing radiator cowl”, page 201](#) .



Note

Do not reuse coolant.

- Fill up with coolant ➔ [page 170](#) .

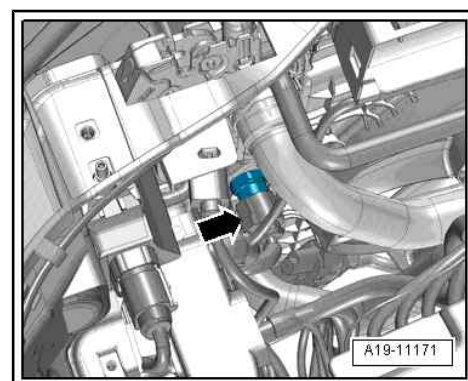
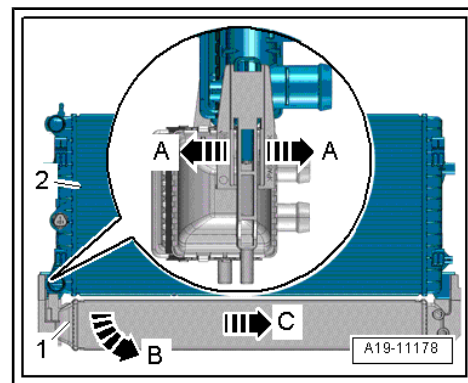
Tightening torques

- ♦ ➔ [“4.1 Exploded view - radiator/radiator fans”, page 196](#)

4.3 Removing and installing radiator cowl

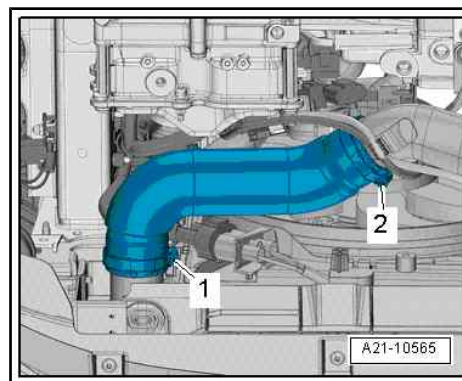
Removing

- Remove noise insulation ➔ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .
- Unplug electrical connector -arrow- at radiator outlet coolant temperature sender - G83- .





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



WARNING

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

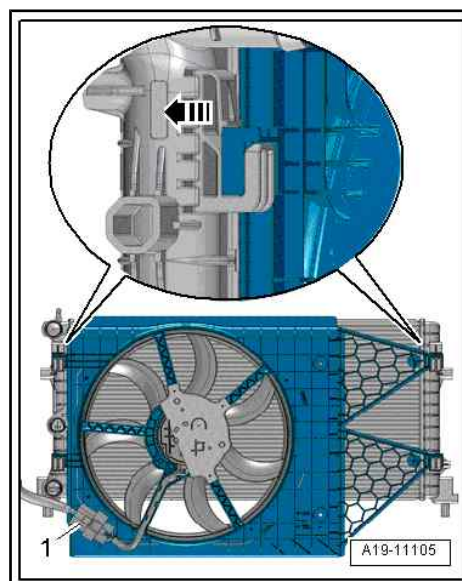
- ◆ *Unplug electrical connectors before performing work on radiator cowl.*

- Unplug electrical connector -1- for radiator fan at bottom of radiator cowl.
- Press locking tabs on left and right sides of radiator cowl simultaneously -arrow-, lift radiator cowl off radiator and remove from below.

Installing

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

- Install air hoses with screw-type clips
⇒ [“2.2 Exploded view - hose connections for charge air system”, page 221](#) .



Tightening torques

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

4.4 Removing and installing radiator fans

Removing

- Remove radiator cowl
⇒ [“4.3 Removing and installing radiator cowl”, page 201](#) .
- Unplug electrical connector -1- and move wiring clear.
- Unscrew nuts -arrows- and remove corresponding radiator fan.

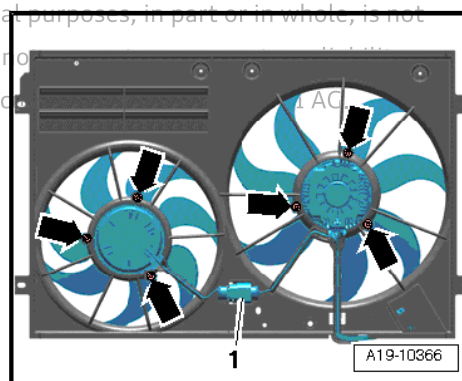
Installing

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

- Install radiator cowl
⇒ [“4.3 Removing and installing radiator cowl”, page 201](#) .

Tightening torques

- ◆ ⇒ [“4.1 Exploded view - radiator/radiator fans”, page 196](#)





21 – Turbocharging/supercharging

1 Turbocharger

⇒ [“1.1 Exploded view - turbocharger”, page 203](#)

⇒ [“1.2 Removing and installing turbocharger”, page 206](#)

⇒ [“1.3 Checking vacuum unit for turbocharger”, page 209](#)

⇒ [“1.4 Adjusting vacuum unit for turbocharger”, page 211](#)

⇒ [“1.5 Renewing vacuum unit for turbocharger”, page 216](#)

⇒ [“1.6 Removing and installing turbocharger air recirculation valve N249 ”, page 218](#)

1.1 Exploded view - turbocharger

Part 1

1 - Overrun cut-off valve - N65-

2 - Bolt

□ 10 Nm

3 - Bolts

□ 11 Nm

4 - Turbocharger air recirculation valve - N249-

□ Removing and installing
 ⇒ [“1.6 Removing and installing turbocharger air recirculation valve N249 ”, page 218](#)

5 - O-ring

□ Renew

6 - Turbocharger

□ Combined with exhaust manifold

□ Removing and installing
 ⇒ [“1.2 Removing and installing turbocharger”, page 206](#)

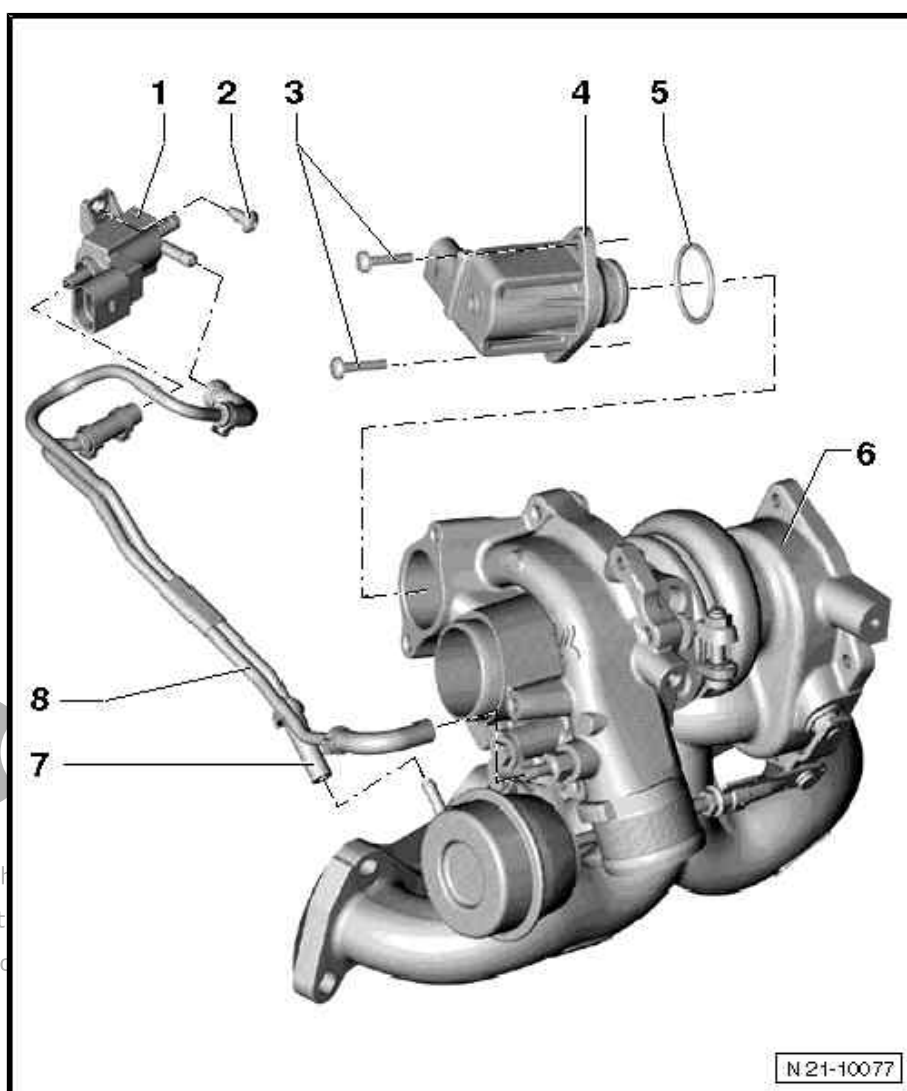
□ Checking vacuum unit for turbocharger
 ⇒ [“1.3 Checking vacuum unit for turbocharger”, page 209](#)

□ Removing and installing vacuum unit for turbocharger
 ⇒ [“1.5 Renewing vacuum unit for turbocharger”, page 216](#)

□ Adjusting vacuum unit for turbocharger
 ⇒ [“1.4 Adjusting vacuum unit for turbocharger”, page 211](#)

7 - Hose

8 - Hose





Part 2

1 - Bolt

- ☐ 9 Nm

2 - Oil return line

3 - O-ring

- ☐ Renew

4 - Bolt

- ☐ 9 Nm

5 - O-rings

- ☐ Renew

6 - Nut

- ☐ Secure with sealing paint after tightening
- ☐ 9 Nm

7 - Vacuum unit for turbocharger

- ☐ Checking
⇒ ["1.3 Checking vacuum unit for turbocharger", page 209](#)
- ☐ Removing and installing
⇒ ["1.5 Renewing vacuum unit for turbocharger", page 216](#)
- ☐ Adjusting
⇒ ["1.4 Adjusting vacuum unit for turbocharger", page 211](#)

8 - Bolt

- ☐ 9 Nm

9 - Banjo bolt

- ☐ Renew
- ☐ 30 Nm

10 - Seals

- ☐ Renew

11 - Oil supply line

12 - Seals

- ☐ Renew

13 - Banjo bolt

- ☐ Renew
- ☐ 30 Nm

14 - Bolt

- ☐ 9 Nm

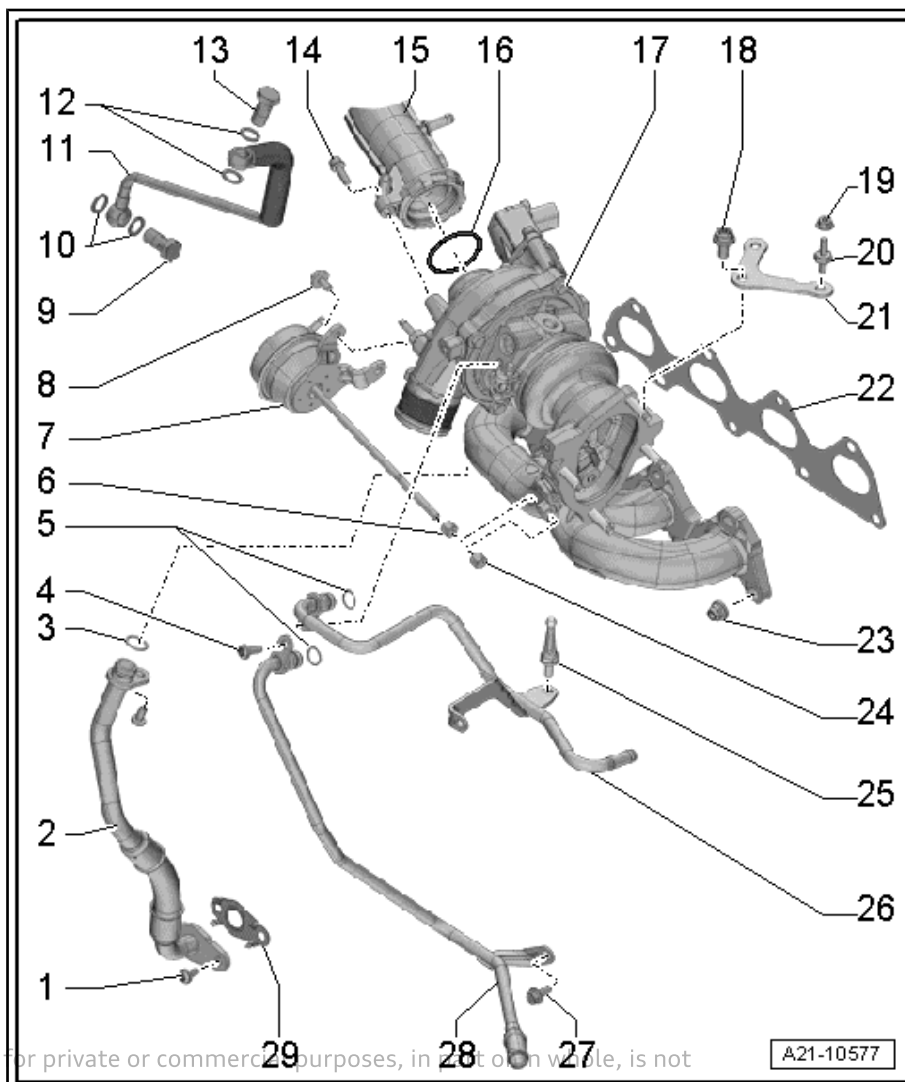
15 - Air pipe (top right)

16 - O-ring

- ☐ Renew

17 - Turbocharger

- ☐ Combined with exhaust manifold



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- ☐ Removing and installing ⇒ [“1.2 Removing and installing turbocharger”, page 206](#)

18 - Bolt

- ☐ 20 Nm

19 - Nut/bolt

- ☐ For heat shield
- ☐ 9 Nm

20 - Threaded pin

- ☐ 9 Nm

21 - Bracket

- ☐ For turbocharger

22 - Gasket

- ☐ Renew

23 - Nut

- ☐ Tightening torque and sequence ⇒ [Fig. ““Turbocharger - tightening torque and sequence”” , page 205](#)

24 - Nut

- ☐ Secure with sealing paint after tightening
- ☐ 9 Nm

25 - Ball stud

- ☐ For engine cover panel
- ☐ 9 Nm

26 - Coolant return line

27 - Bolt

- ☐ 23 Nm

28 - Coolant supply line

29 - Gasket

- ☐ Renew

Turbocharger - tightening torque and sequence

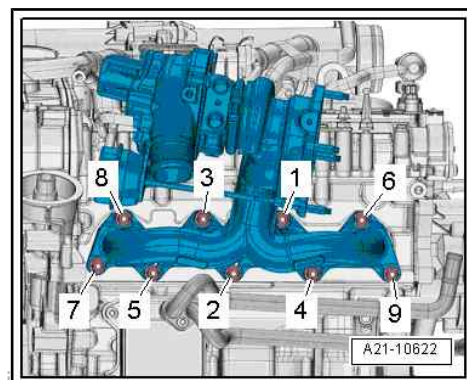


Note

Renew nuts.

- Tighten nuts in 2 stages in the sequence shown:

Stage	Nuts	Tightening torque
1.	-1 ... 9-	Screw in by hand until contact is made
2.	-1 ... 9-	25 Nm

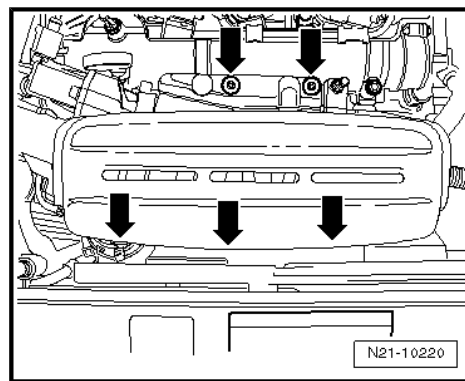


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Heat shield for turbocharger - tightening torque:

- Bolts -arrows-: 9 Nm.



1.2 Removing and installing turbocharger

Special tools and workshop equipment required

- ◆ Hose clamps up to 25 mm - 3094-



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- ◆ Hose clip pliers - VAS 6362-



Removing



Caution

If the turbocharger has suffered mechanical damage (e.g. damaged compressor wheel), it is not sufficient merely to fit a new turbocharger. The following work must be performed in order to avoid further damage:

- ◆ *Check air cleaner housing, air filter element and air hoses for dirt and foreign particles.*
- ◆ *Check the entire charge air system (including the charge air cooler) for foreign matter.*
- ◆ *If foreign matter is found in the charge air system, clean all relevant ducts and hoses and renew charge air cooler if necessary.*

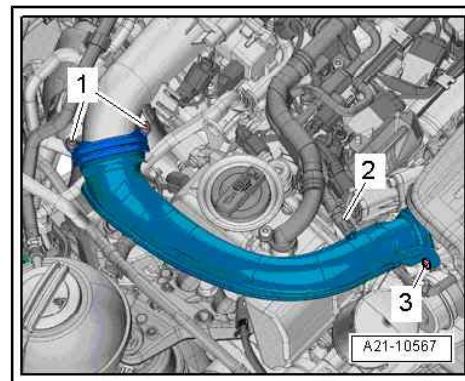


i Note

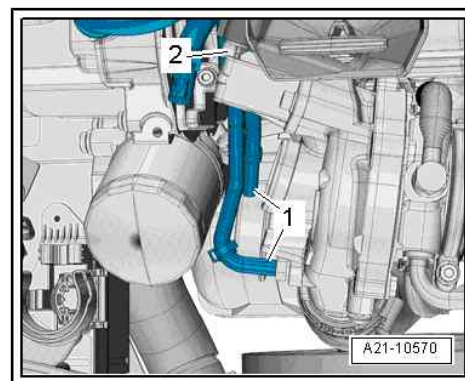
Observe rules for cleanliness

⇒ *"3.1 Rules for cleanliness", page 5*.

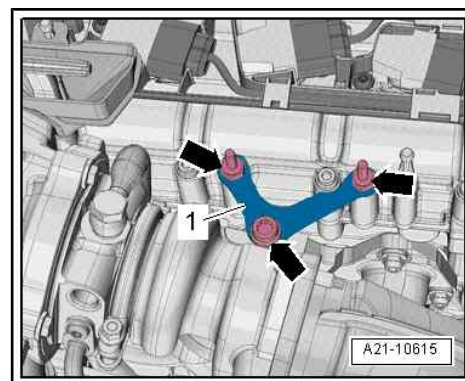
- Remove catalytic converter with centre silencer
⇒ *"2.1 Removing and installing catalytic converter",
page 282*.
- Remove bolts -1, 3-.
- Release hose clip -2-, detach air pipe (top right) and remove
air hose.



- Unplug electrical connector -2-.
- Detach vacuum hoses -1-.



- Unscrew bolts -arrows- and remove retaining plate -1-.



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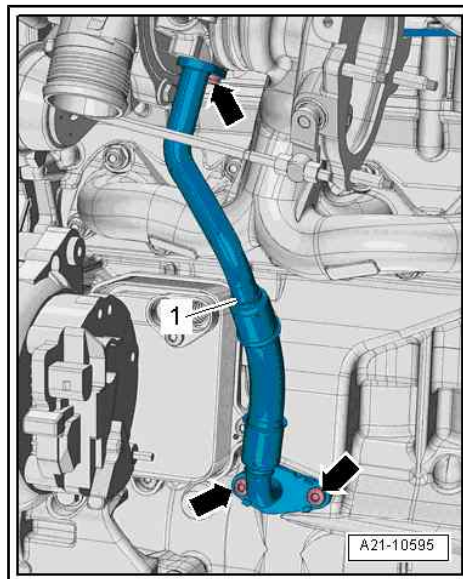
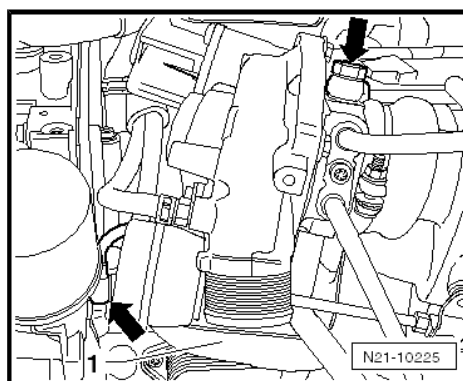
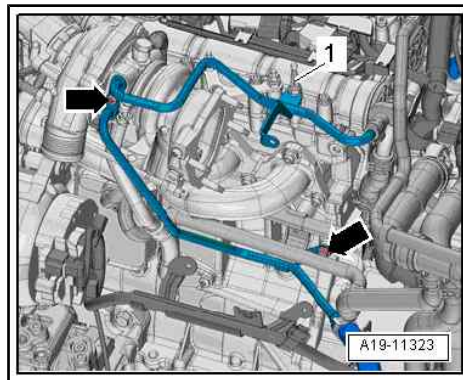
- Remove bolts -arrows- and ball stud -1-.



Note

Place a cloth underneath to catch escaping coolant.

- Disconnect coolant lines from turbocharger, lift clear and tie up.
- Remove banjo bolts -arrows- on valve timing housing and turbocharger and detach oil supply line.
- Remove bolts -arrows- and detach oil return line -1- for turbocharger.



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- Remove nuts in the sequence -9 ... 1- and detach turbocharger with exhaust manifold.

i Note

Seal off open pipes/lines and connections on turbocharger with clean plugs or protective caps to prevent dirt from entering.

Installing

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

i Note

- ◆ *Renew seals, gaskets, O-rings and self-locking nuts.*
- ◆ *Fill turbocharger with engine oil at connection for oil supply line.*
- ◆ *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 air pipe (top right)
 ⇒ [“2.1 Exploded view - charge air system”, page 220](#) .
- Install air hoses with screw-type clips
 ⇒ [“2.2 Exploded view - hose connections for charge air system”, page 221](#) .
- Install catalytic converter with centre silencer
 ⇒ [“2.1 Removing and installing catalytic converter”, page 282](#) .
- Check oil level ⇒ Maintenance ; Booklet 819 .
- Check coolant level ⇒ [page 174](#) .

Tightening torques

- ◆ ⇒ [“1.1 Exploded view - turbocharger”, page 203](#)
- ◆ ⇒ [“2.1 Exploded view - charge air system”, page 220](#)
- ◆ ⇒ [Fig. “Turbocharger - tightening torque and sequence”, page 205](#)

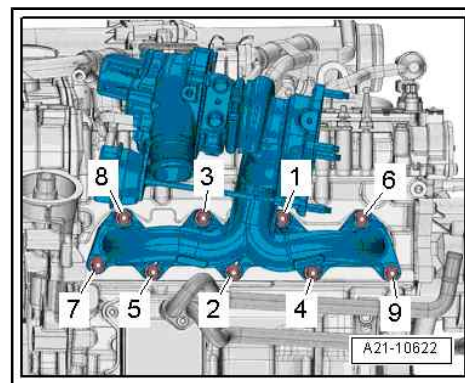
1.3 Checking vacuum unit for turbocharger

Special tools and workshop equipment required

- ◆ Hand vacuum pump - VAS 6213-



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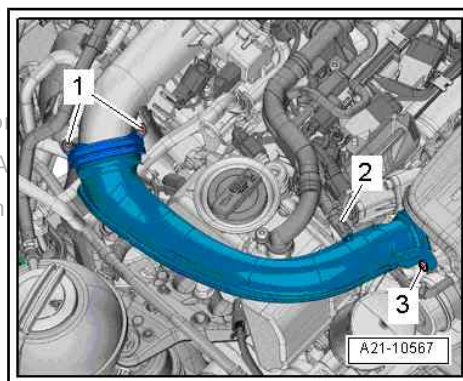




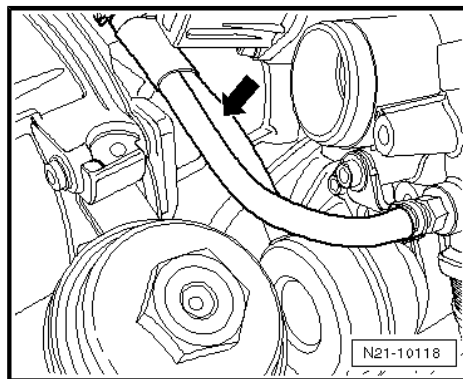
Procedure

- Hose from turbocharger to vacuum unit via overrun cut-off valve - N65- must be airtight and unobstructed.
- Overrun cut-off valve - N65- OK
- Remove engine cover panel
⇒ [“3.1 Removing and installing engine cover panel”](#),
[page 36](#) .
- Remove bolts -1, 3-.
- Release hose clip -2-, detach air pipe (top right) and remove air hose.

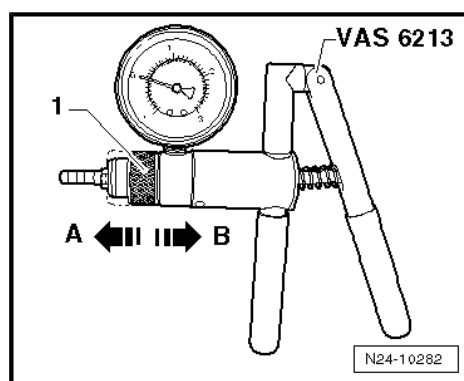
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- Disconnect hose -arrow- from vacuum unit.



- Connect hose from hand vacuum pump - VAS 6213- to vacuum unit.
- Move adjuster ring -1- on hand vacuum pump - VAS 6213- to position -B- to select “pressure”.





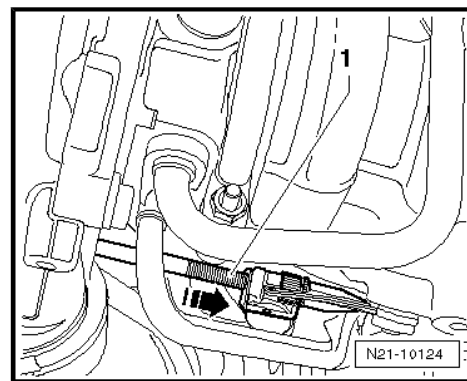
- Operate hand vacuum pump - VAS 6213- several times.



Caution

Risk of damage to vacuum unit on account of excessive pressure.

- ◆ **The pressure must not exceed 700 mbar.**



- Observe operating rod -1- of vacuum unit for turbocharger.
- The operating rod should move at a pressure of approx. 300 mbar and above.
- The operating rod should reach its end position -arrow- at a pressure of approx. 700 mbar.
- Vent hand vacuum pump - VAS 6213- -arrow A-.
- The operating rod should move in the opposite direction.



Note

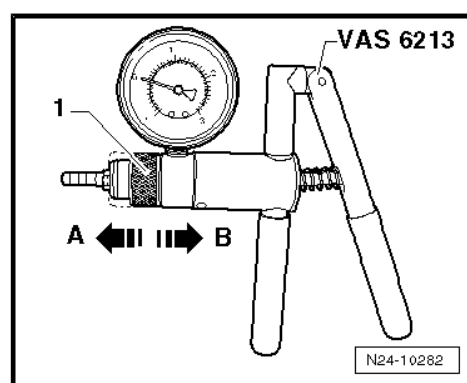
Observe the movement of the operating rod over the complete range of travel. It should move steadily and smoothly.

- If pressure drops abruptly, renew vacuum unit
 ⇒ [“1.5 Renewing vacuum unit for turbocharger”, page 216](#) .

Assembling

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

- Install air pipe (top right)
 ⇒ [“2.1 Exploded view - charge air system”, page 220](#) .
- Install air hoses with screw-type clips
 ⇒ [“2.2 Exploded view - hose connections for charge air system”, page 221](#) .



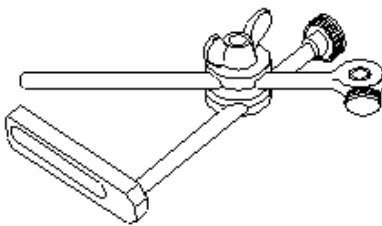
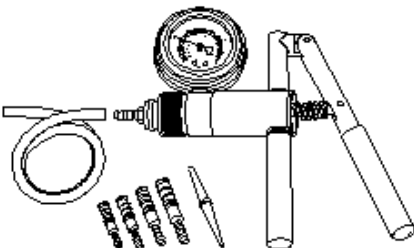
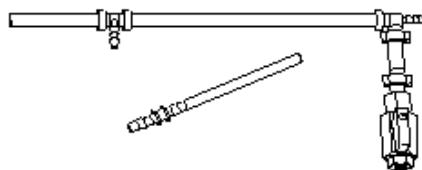
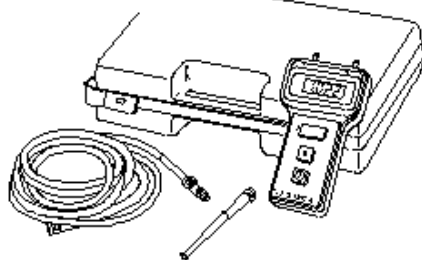
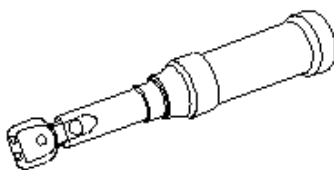
Tightening torques

- ◆ ⇒ [“1.1 Exploded view - turbocharger”, page 203](#)
- ◆ ⇒ [“2.1 Exploded view - charge air system”, page 220](#)

1.4 Adjusting vacuum unit for turbocharger



Special tools and workshop equipment required

VW 387 	VAS 6213 
VAS 6342 	V.A.G 1397 A 
VAS 6341 	V.A.G 1783  G21-10000

- ◆ Universal dial gauge bracket - VW 387-
- ◆ Hand vacuum pump - VAS 6213-
- ◆ Pressure control valve - VAS 6342-
- ◆ Turbocharger tester - V.A.G 1397A-
- ◆ Dial gauge set, 4-part - VAS 6341-
- ◆ Torque wrench - V.A.G 1783-
- ◆ Hose clip pliers - VAS 6362-

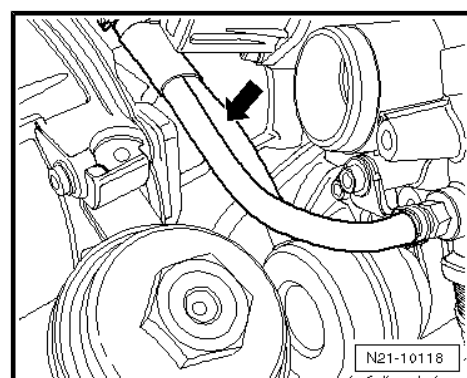
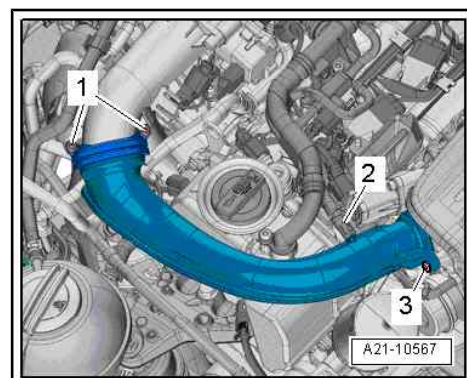
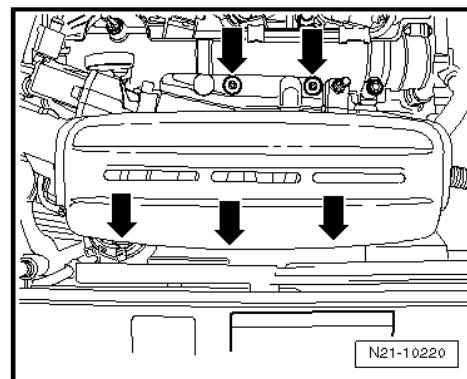
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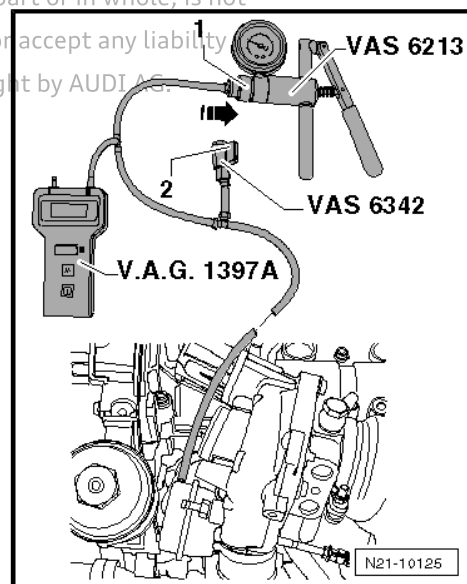
Procedure

- Remove engine cover panel
 ⇒ [“3.1 Removing and installing engine cover panel”](#),
[page 36](#) .
- Remove bolts -arrows- and detach heat shield for turbocharg-
 er.
- Remove bolts -1, 3-.
- Release hose clip -2-, detach air pipe (top right) and remove
 air hose.
- Disconnect hose -arrow- from vacuum unit.



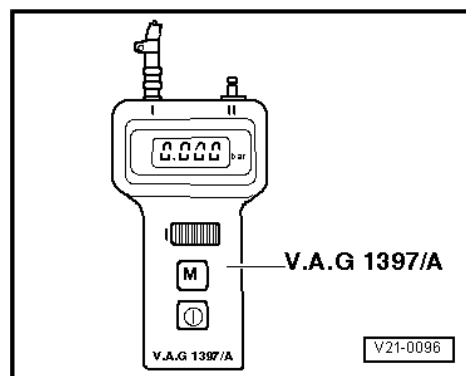
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- Close lever -2- on pressure control valve - VAS 6342- .
- Set up measuring equipment and testers as shown in illustration and connect to connection “II” of turbocharger tester -
 V.A.G 1397A- and to vacuum unit for turbocharger.
- Move adjuster ring -1- on hand vacuum pump - VAS 6213- to
 select “pressure” -arrow-.





- Switch on turbocharger tester - V.A.G 1397A- and set sliding switch to position "II".



- Operate hand vacuum pump - VAS 6213- several times until the pressure is approx. 800 mbar.

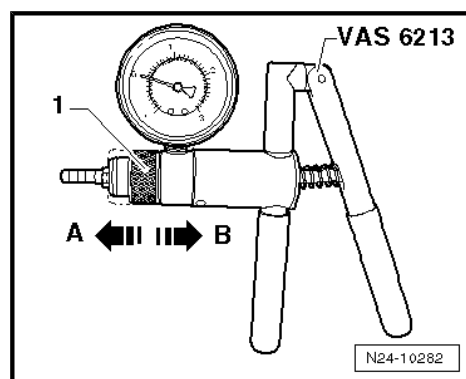


Caution

Risk of damage to vacuum unit on account of excessive pressure.

- ◆ **The pressure must not exceed 800 mbar.**

- Vent hand vacuum pump - VAS 6213- -arrow A- to make sure the linkage of the charge pressure control in the turbocharger is free to move.
- Repeat procedure 5 times.



Note

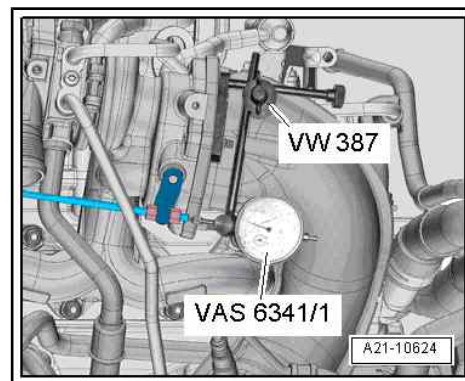
This procedure should prevent the bypass flap and the vacuum unit linkage from sticking.



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- Attach dial gauge -VAS 6341/1- to universal dial gauge bracket - VW 387- .
- Secure universal dial gauge bracket - VW 387- to turbocharger as shown in illustration.
- The dial gauge linkage must be in line with the linkage of the vacuum unit.
- With pressure at 0 bar, set dial gauge -VAS 6341/1- to 1 mm preload.
- Operate hand vacuum pump - VAS 6213- several times until the pressure displayed on turbocharger tester - V.A.G 1397A- is approx. 800 mbar.
- Specification on dial gauge -VAS 6341/1- : 1 mm travel
- Vent system via pressure control valve - VAS 6342- so that pressure reading drops to 0 mbar.



Checking adjustment of vacuum unit

- Set scale of dial gauge -VAS 6341/1- to "0".



Note

The following measurements must be performed in the specified sequence. Do not allow the pressure to drop to 0 between measurements.

- Operate hand vacuum pump - VAS 6213- several times until a pressure of 500 ± 5 mbar is displayed on turbocharger tester - V.A.G 1397A- .
- Read off and note travel indicated on dial gauge - VAS 6341/1- .
- Operate hand vacuum pump - VAS 6213- several times until a pressure of 800 ± 5 mbar is displayed on turbocharger tester - V.A.G 1397A- .
- Vent system via pressure control valve - VAS 6342- so that pressure reading drops to 500 ± 5 mbar.
- Read off and note travel indicated on dial gauge - VAS 6341/1- .
- Determine average value: add values "1" and "2" together and divide by 2.
- Specification: 5.50 ± 0.25 mm.



Note

- ◆ If reading does not match specification, loosen lock nut -1-.
- ◆ Turn nut -2- until specification is obtained.
- ◆ Tighten lock nut -1-.

- When adjustment is correct, tighten lock nut -1- and secure with sealing paint.

Assembling

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*.
- Install air pipe (top right)
⇒ [“2.1 Exploded view - charge air system”, page 220](#).
- Install air hoses with screw-type clips
⇒ [“2.2 Exploded view - hose connections for charge air system”, page 221](#).

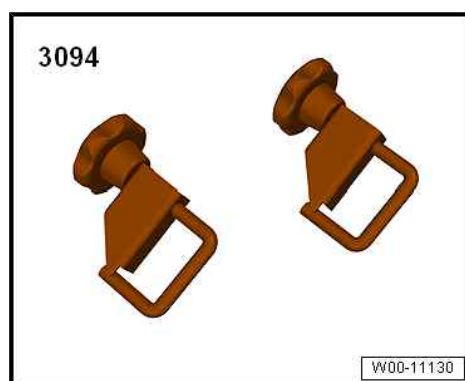
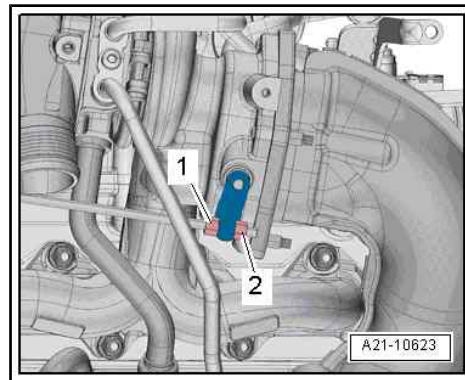
Tightening torques

- ◆ ⇒ [“1.1 Exploded view - turbocharger”, page 203](#)
- ◆ ⇒ [“2.1 Exploded view - charge air system”, page 220](#)

1.5 Renewing vacuum unit for turbocharger

Special tools and workshop equipment required

- ◆ Hose clamps up to 25 mm - 3094-





◆ Drip tray for workshop hoist - VAS 6208-



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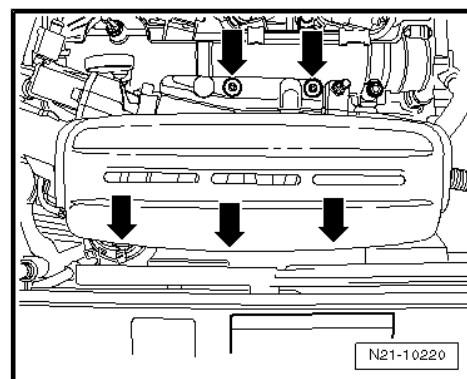


◆ Hose clip pliers - VAS 6362-

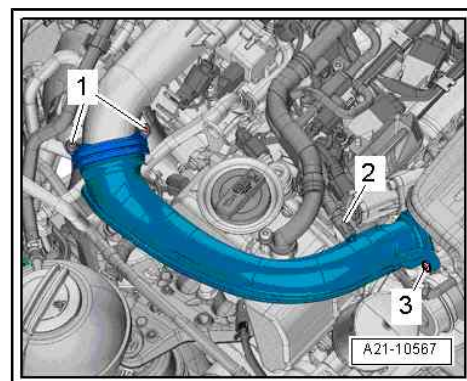


Removing

- Remove engine cover panel ➔ [page 36](#) .
- Remove bolts -arrows- and detach heat shield for turbocharger.



- Remove bolts -1, 3-.
- Release hose clip -2-, detach air pipe (top right) and remove air hose.

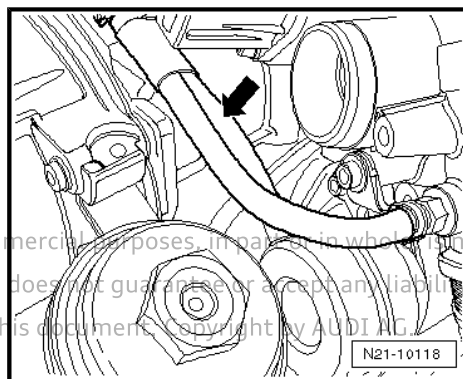




- Disconnect hose -arrow- from vacuum unit.



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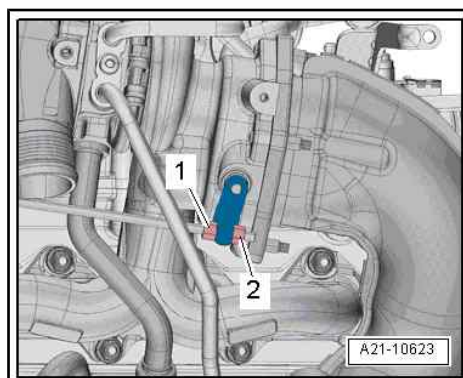


- Unscrew nut -2-.



Note

Disregard -item 1-.



- Remove bolts -arrows- and detach vacuum unit for turbo-charger.

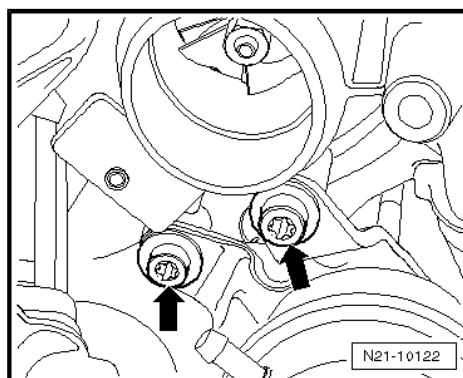
Installing

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



Note

- ♦ Renew retaining clip for operating rod.
 - ♦ Check correct installation of the vacuum unit and its operating rod.
- Adjust vacuum unit for turbocharger
⇒ [“1.4 Adjusting vacuum unit for turbocharger”, page 211](#) .



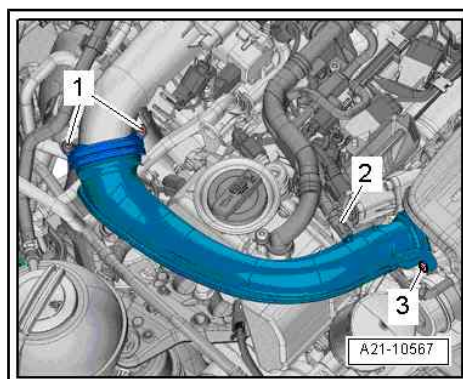
Tightening torques

- ♦ ⇒ [“1.1 Exploded view - turbocharger”, page 203](#)

1.6 Removing and installing turbocharger air recirculation valve - N249-

Removing

- Remove engine cover panel ⇒ [page 36](#) .
- Remove bolts -1, 3-.
- Release hose clip -2-, detach air pipe (top right) and remove air hose.





- Unplug electrical connector -1-.
- Unscrew bolts -arrows- and detach turbocharger air recirculation valve - N249- .

Installing

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



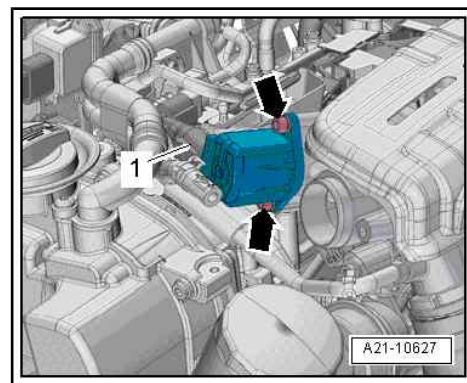
Note

Fit new O-ring.

- Install air pipe (top right)
⇒ [“2.1 Exploded view - charge air system”, page 220](#) .
- Install air hoses with screw-type clips
⇒ [“2.2 Exploded view - hose connections for charge air system”, page 221](#) .

Tightening torques

- ◆ ⇒ [“1.1 Exploded view - turbocharger”, page 203](#)



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2 Charge air system

⇒ ["2.1 Exploded view - charge air system", page 220](#)

⇒ ["2.3 Removing and installing charge pressure sender G31 / intake air temperature sender 2 G299", page 221](#)

⇒ ["2.4 Checking charge air system for leaks", page 222](#)

2.1 Exploded view - charge air system

1 - Air pipe (right-side)

2 - Air hose

3 - Grommet

4 - Bracket

□ For front air pipe

5 - Bolt

□ Tightening torque
⇒ [Item 5 \(page 279\)](#)

6 - Front air pipe

7 - Air hose

8 - Air hose

9 - Grommet

10 - Charge air cooler

□ Removing and installing
⇒ ["4.2 Removing and installing radiator", page 197](#)

11 - Bolt

□ 8 Nm

12 - Sleeve

13 - Charge pressure sender - G31- / intake air temperature sender 2 - G299-

□ Removing and installing
⇒ ["2.3 Removing and installing charge pressure sender G31 / intake air temperature sender 2 G299", page 221](#)

14 - Bolt

□ 3.5 Nm

15 - O-ring

□ Renew

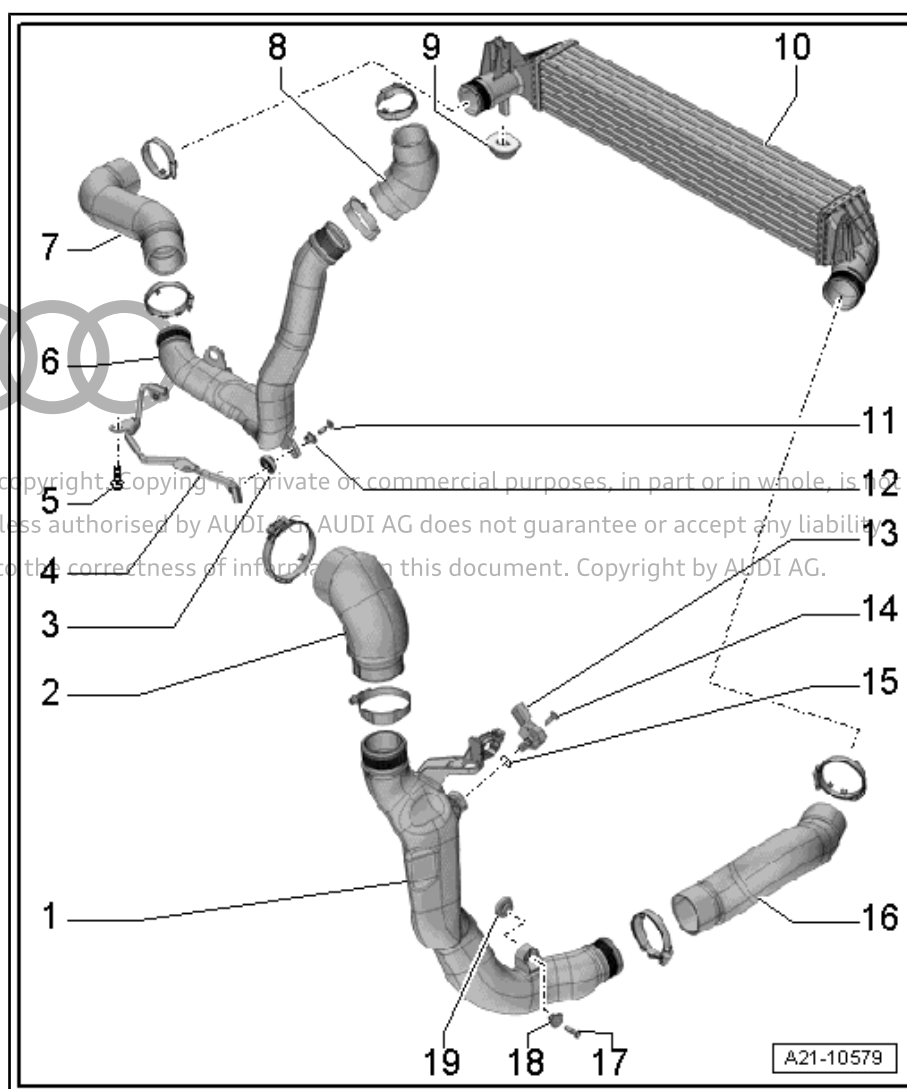
16 - Air hose

17 - Bolt

□ 8 Nm

18 - Sleeve

19 - Grommet





2.2 Exploded view - hose connections for charge air system

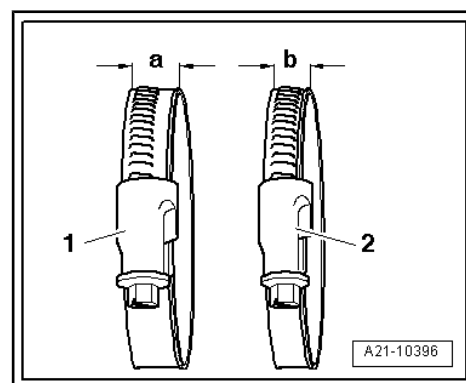


Note

- ◆ *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- ◆ *The screw sections of used screw-type clips must be sprayed with rust remover prior to fitting so that the air hoses can be attached securely to the hose connections.*

Tightening torque for

- 1 - Hose clip with width -a- = 13 mm: 5.5 Nm
- 2 - Hose clip with width -b- = 9 mm: 3 Nm



2.3 Removing and installing charge pressure sender - G31- / intake air temperature sender 2 - G299-

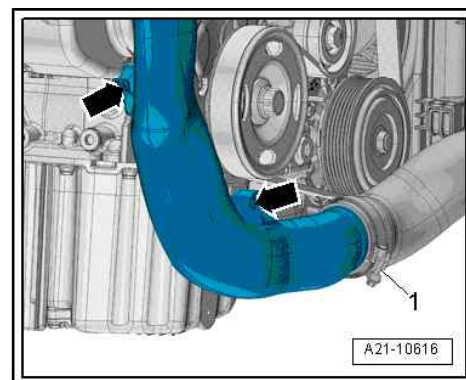
Removing



Note

*Observe rules for cleanliness
⇒ "3.1 Rules for cleanliness", page 5 .*

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

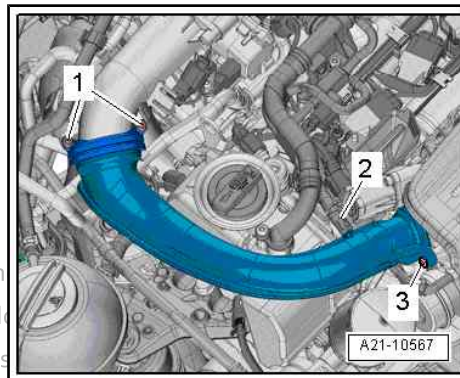




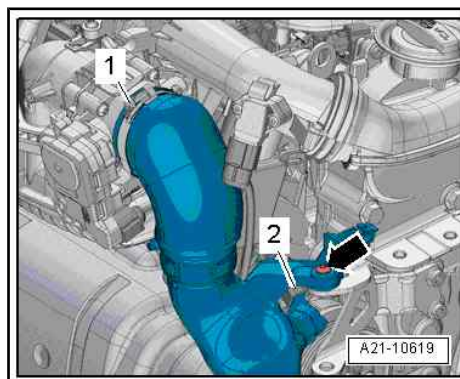
- Remove bolts -1, 3-.
- Release hose clip -2-, detach air pipe (top right) and remove air hose.



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- Unplug electrical connector -2-.
- Remove bolt -arrow- and move air hose slightly to rear.



- Unscrew bolts -arrows- and remove charge pressure sender - G31- / intake air temperature sender 2 - G299- -item 1-.

Installing

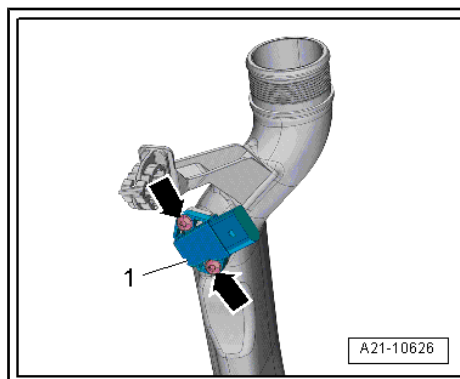
Installation is carried out in reverse sequence.



Note

Fit new O-ring.

- Install air pipe (top right)
⇒ [“2.1 Exploded view - charge air system”, page 220](#) .
- Install air hoses with screw-type clips
⇒ [“2.2 Exploded view - hose connections for charge air system”, page 221](#) .



Tightening torques

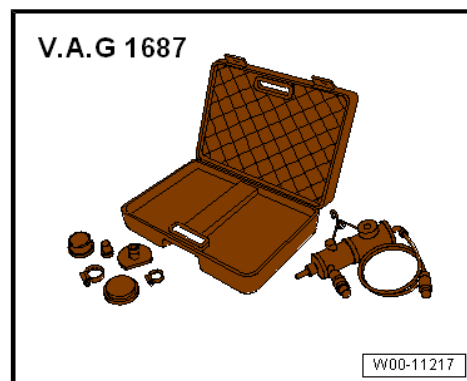
- ♦ ⇒ [“1.1 Exploded view - turbocharger”, page 203](#)
- ♦ ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front)

2.4 Checking charge air system for leaks

Special tools and workshop equipment required



- ◆ Charge air system tester - V.A.G 1687- with adapters -V.A.G 1687/10- and -V.A.G 1687/14-



- ◆ Hose clip pliers - VAS 6362-



Procedure

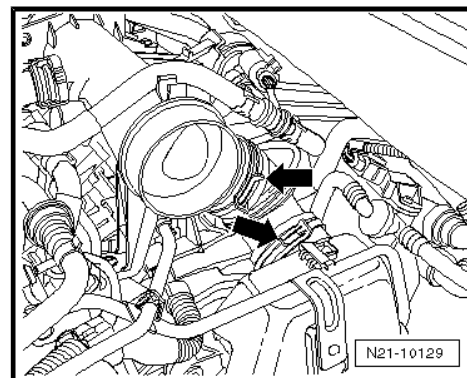


Note

Observe rules for cleanliness

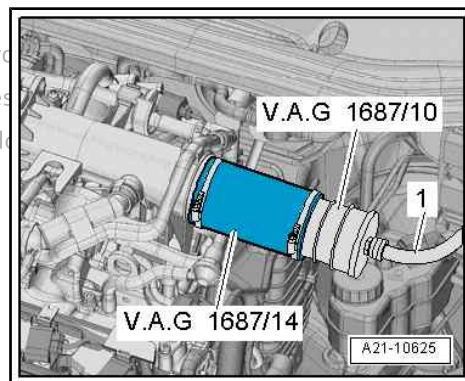
⇒ ["3.1 Rules for cleanliness", page 5](#) .

- Remove engine cover panel
 ⇒ ["3.1 Removing and installing engine cover panel", page 36](#) .
- Remove air cleaner housing
 ⇒ ["2.2 Removing and installing air cleaner housing", page 239](#) .
- Plug vacuum hose -3-.
- When performing test, fit screw-type hose clips from charge air system tester - V.A.G 1687- in place of spring-type clips -arrows-.





- Connect adapter - V.A.G 1687/10- with -V.A.G 1687/14- to turbocharger.
- Connect hose 1- of charge air system tester -V.A.G 1687- to adapter.





Prepare charge air system tester - V.A.G 1687- as follows:

- Unscrew pressure control valve -2- completely and close valves -3- and -4-.
- Make sure knob is pulled out before turning pressure control valve.
- 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 detection spray or use ultrasonic tester - V.A.G 1842- .

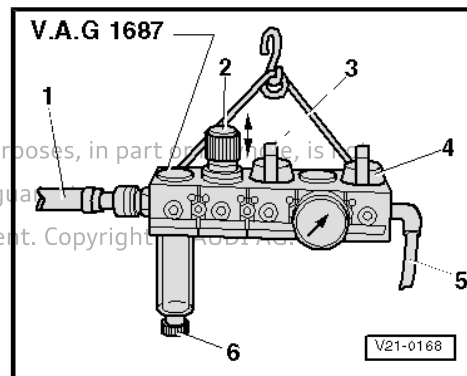


Note

- ♦ *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

- Install air hoses with screw-type clips
 ⇒ ["2.2 Exploded view - hose connections for charge air system", page 221](#) .
- Remove air cleaner housing
 ⇒ ["2.2 Removing and installing air cleaner housing", page 239](#) .





3 Compressor

⇒ [“3.1 Exploded view - compressor”, page 226](#)

⇒ [“3.2 Removing and installing supercharger”, page 227](#)

3.1 Exploded view - compressor

1 - Air pipe

- ☐ Installation position
⇒ [Fig. “Installation position of air pipe”](#), page 227

2 - Seals

- ☐ Renew
- ☐ Lubricate lightly with engine oil before fitting

3 - Noise insulation

4 - Bolt

- ☐ Renew
- ☐ 40 Nm +90°

5 - Poly V-belt pulley

6 - Compressor

- ☐ Removing and installing
⇒ [“3.2 Removing and installing supercharger”](#), page 227

7 - Bolt

- ☐ 25 Nm

8 - Noise insulation

9 - Cover

- ☐ For noise insulation

10 - Gasket

- ☐ Renew

11 - Dowel sleeve

- ☐ 2x

12 - Noise insulation (bottom rear)

13 - Noise insulation (top rear)

14 - Gasket

- ☐ Renew

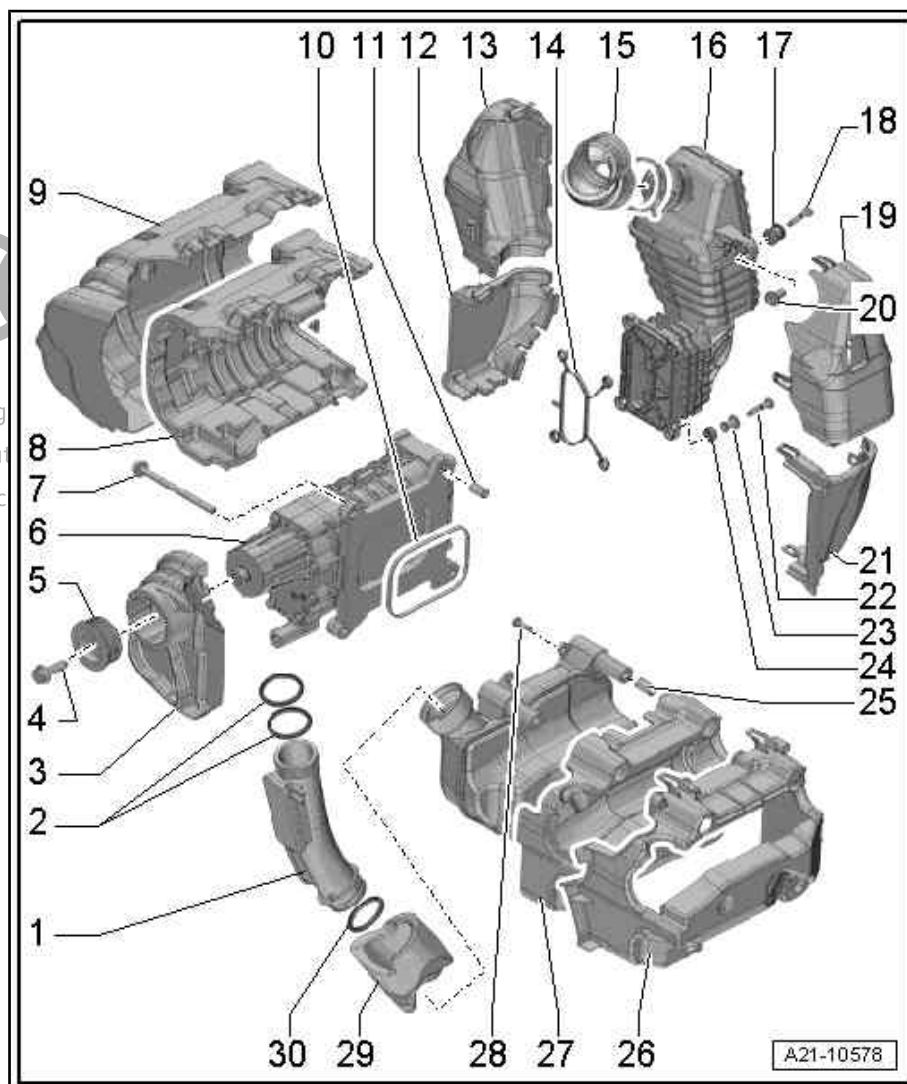
15 - Air pipe

16 - Intake resonator

17 - Grommet

18 - Bolt

- ☐ 7 Nm





19 - Noise insulation (top front)

20 - Sleeve

21 - Noise insulation (bottom front)

22 - Bolt

- ☐ 7 Nm

23 - Sleeve

24 - Grommet

25 - Dowel sleeve

- ☐ 2x

26 - Cover

- ☐ For noise insulation

27 - Noise insulation

28 - Bolt

- ☐ 7 Nm

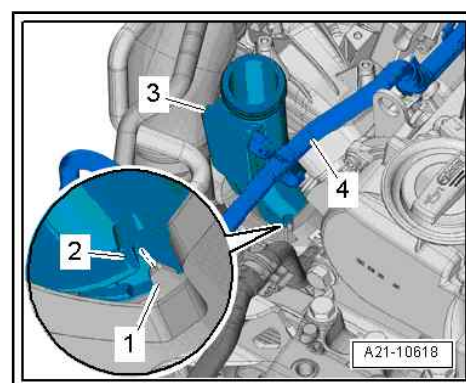
29 - Noise insulation

30 - Seal

- ☐ Renew
- ☐ Lubricate lightly with engine oil before fitting

Installation position of air pipe

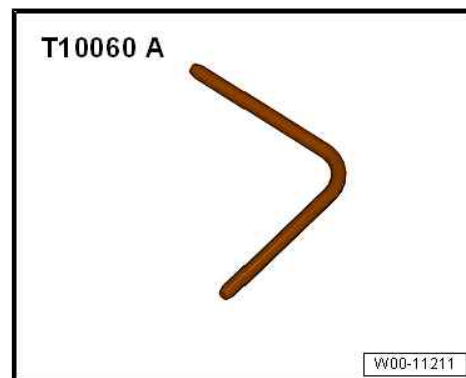
- Fit air pipe in noise insulation.
- Lug -1- must engage in recess -2-.



3.2 Removing and installing supercharger

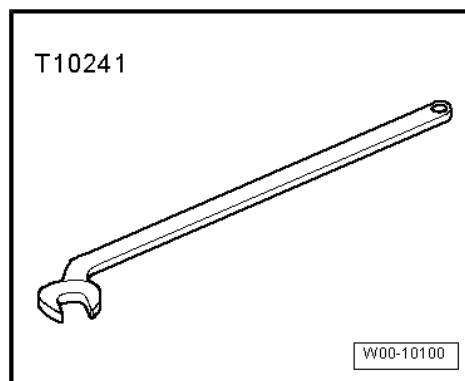
Special tools and workshop equipment required

- ◆ Locking pin - T10060 A-





- ◆ Open-end spanner, 16 mm - T10241-



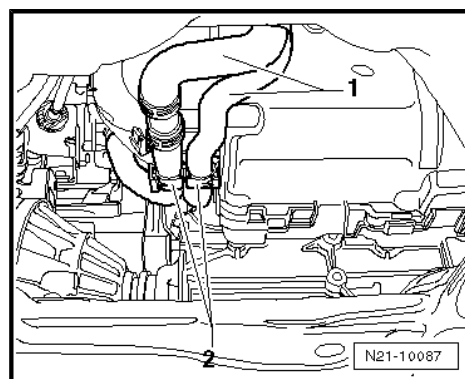
Removing

- Remove intake manifold (top section)
⇒ [“3.3 Removing and installing intake manifold \(top section\)”](#), [page 245](#) .
- Disengage coolant hoses at hose guides -2- and push to one side.

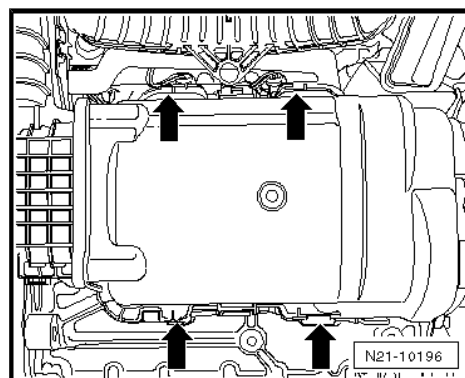


Note

Disregard -item 1-.



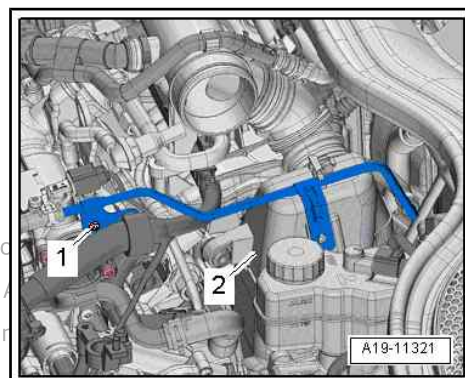
- Carefully press retaining tabs on housing for noise insulation for supercharger outwards -arrows-.
- Detach housing (front) together with noise insulation.



- Remove bolt -1- and move coolant pipe clear at intake resonator -2-.

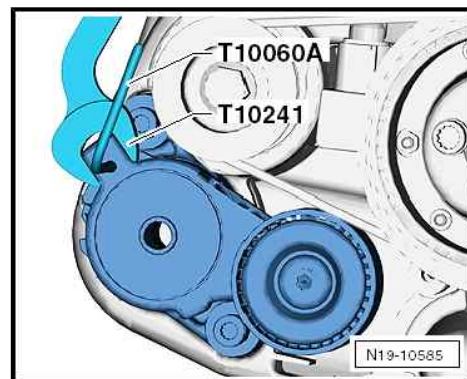


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- Slacken poly V-belt for supercharger by turning tensioner in clockwise direction using open-end spanner, 16 mm - T10241- .
- Lock tensioner with locking pin - T10060 A- .



- Remove bolts -1-, take out supercharger together with intake resonator and at the same time detach poly V-belt from supercharger pulley.

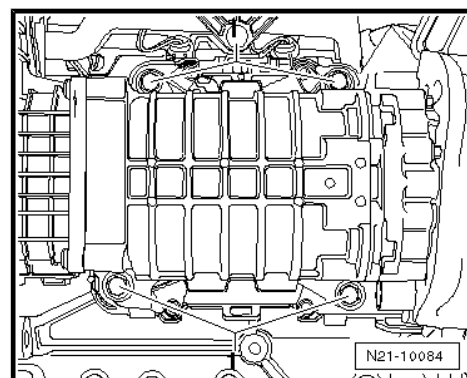
Installing

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



Note

- ◆ *Renew all seals and gaskets.*
- ◆ *Lubricate seals lightly with engine oil before fitting.*
- Locate supercharger with intake resonator on dowel sleeves and at the same time fit poly V-belt on supercharger pulley.
- Initially screw in bolts for supercharger by hand until they make contact, then tighten to final setting.
- Note installation position of air pipe
⇒ [Fig. “Installation position of air pipe”](#), page 227 .
- Install intake manifold (top section)
⇒ [“3.3 Removing and installing intake manifold \(top section\)”](#), page 245 .



Tightening torques

- ◆ ⇒ [“3.1 Exploded view - compressor”](#), page 226



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24 – Mixture preparation - injection

1 Injection system

⇒ [“1.1 Overview of fitting locations - injection system”, page 230](#)

1.1 Overview of fitting locations - injection system

Engine compartment

1 - Intake air temperature sender 3 - G520- with intake manifold pressure sender 3 - G583-

2 - Charge pressure sender - G31- / intake air temperature sender 2 - G299-

- ❑ Fitting location
⇒ [Fig. ““ Charge pressure sender -G31- / intake air temperature sender 2 -G299- ””, page 236](#)

- ❑ Removing and installing
⇒ [“2.3 Removing and installing charge pressure sender G31 / intake air temperature sender 2 G299”, page 221](#)

3 - Throttle valve module - J338-

- ❑ Including throttle valve drive for electric throttle - G186- , throttle valve drive angle sender 1 for electric throttle - G187- and throttle valve drive angle sender 2 for electric throttle - G188-

- ❑ Removing and installing
⇒ [“3.5 Removing and installing throttle valve module J338”, page 249](#)

4 - Regulating flap control unit - J808-

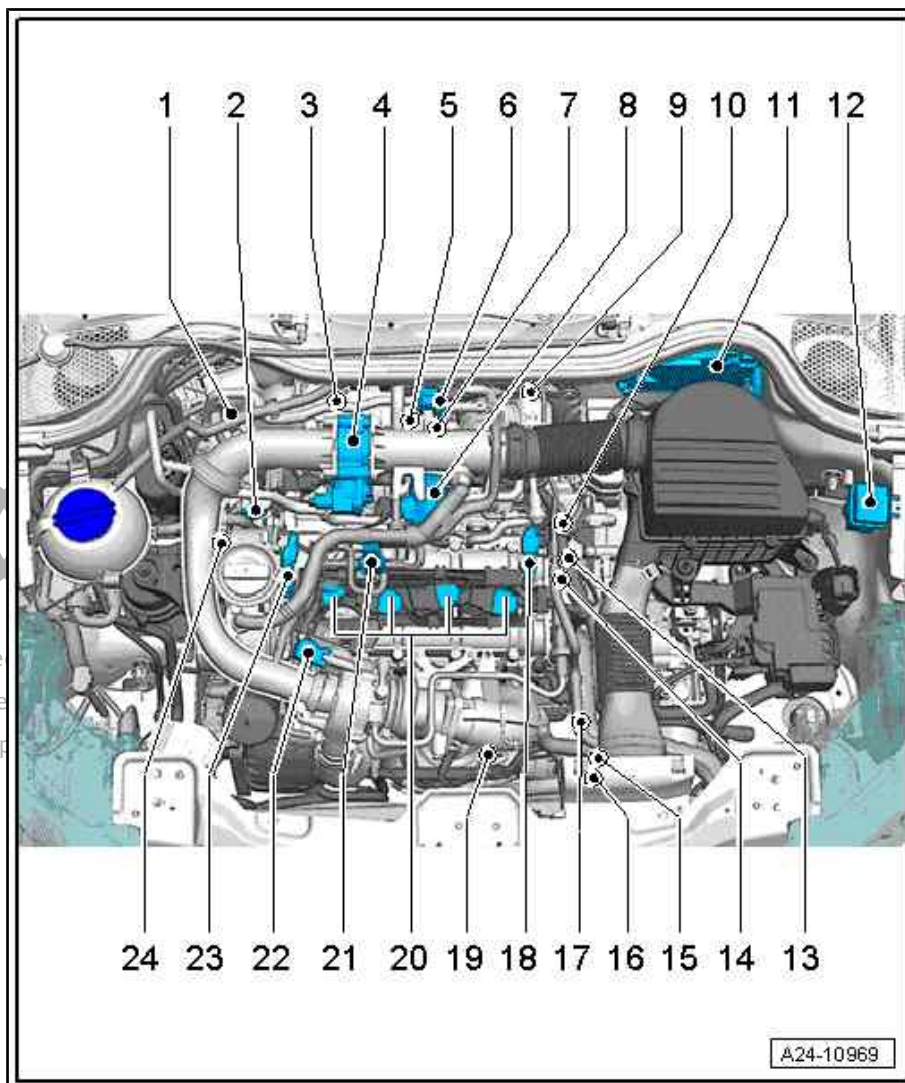
- ❑ With regulating flap potentiometer - G584-
- ❑ Removing and installing ⇒ [“3.7 Removing and installing regulating flap control unit J808”, page 251](#)

5 - Knock sensor 1 - G61-

- ❑ Exploded view ⇒ [“1.1 Exploded view - ignition system”, page 287](#)
- ❑ Removing and installing ⇒ [“1.4 Removing and installing knock sensor”, page 290](#)

6 - Activated charcoal filter solenoid valve 1 - N80-

- ❑ Fitting location ⇒ [Fig. ““Components””, page 235](#)





7 - Intake manifold pressure sender - G71- with intake air temperature sender - G42-

- ☐ Fitting location
⇒ [Fig. "Intake manifold pressure sender -G71- with intake air temperature sender -G42- ", page 234](#)

8 - High-pressure pump

- ☐ With fuel pressure regulating valve - N276-
- ☐ Removing and installing ⇒ ["6.2 Removing and installing high-pressure pump", page 266](#)

9 - Brake servo pressure sensor - G294-

- ☐ Fitting location ⇒ [Fig. "Components", page 235](#)

10 - Fuel pressure sender - G247-

- ☐ Exploded view ⇒ ["3.2 Exploded view - intake manifold \(bottom section\) with fuel rail", page 244](#)

11 - Engine control unit - J623-

- ☐ Fitting location ⇒ [Fig. "Fitting location of engine control unit -J623- ", page 234](#)

12 - Additional coolant pump relay - J496-

- ☐ Fitting location
⇒ [Fig. "Additional coolant pump relay -J496- for activation of continued coolant circulation pump -V51- ", page 235](#)

13 - Coolant temperature sender - G62-

- ☐ Fitting location ⇒ [Fig. "Coolant temperature sender -G62- ", page 235](#)
- ☐ Exploded view ⇒ ["2.2 Exploded view - thermostat", page 176](#)

14 - Oil pressure switch - F1-

- ☐ Fitting location ⇒ [Fig. "Oil pressure switch -F1- ", page 235](#)
- ☐ Removing and installing ⇒ ["3.2 Removing and installing oil pressure switch F1 ", page 163](#)

15 - Radiator fan control unit - J293-

16 - Radiator outlet coolant temperature sender - G83-

- ☐ Fitting location ⇒ [Fig. "Radiator outlet coolant temperature sender -G83- ", page 236](#)
- ☐ Removing and installing
⇒ ["2.7 Removing and installing radiator outlet coolant temperature sender G83 ", page 186](#)

17 - Continued coolant circulation pump - V51-

- ☐ Fitting location ⇒ [Fig. "Continued coolant circulation pump -V51- ", page 236](#)
- ☐ Removing and installing ⇒ ["2.3 Removing and installing electric coolant pump", page 177](#)

18 - Hall sender - G40-

- ☐ Exploded view ⇒ ["1.1 Exploded view - ignition system", page 287](#)
- ☐ Removing and installing ⇒ ["1.5 Removing and installing Hall senders", page 291](#)

19 - Lambda probes

- ☐ Removing and installing Lambda probe - G39- with Lambda probe heater - Z19-
⇒ ["7.2.1 Removing and installing Lambda probe G39 ", page 272](#)
- ☐ Removing and installing Lambda probe after catalytic converter - G130- with Lambda probe 1 heater after catalytic converter - Z29-
⇒ ["7.2.2 Removing and installing Lambda probe after catalytic converter G130 ", page 272](#)
- ☐ Fitting location ⇒ [Fig. "Lambda probes", page 236](#)
- ☐ Exploded view ⇒ ["7.1 Exploded view - Lambda probe", page 271](#)

20 - Ignition coils and injectors

- ☐ 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-
- ☐ Injector, cylinder 1 - N30-
- ☐ Injector, cylinder 2 - N31-



- ❑ Injector, cylinder 3 - N32-
- ❑ Injector, cylinder 4 - N33-
- ❑ Exploded view ⇒ ["1.1 Exploded view - ignition system", page 287](#) ,
⇒ ["3.2 Exploded view - intake manifold \(bottom section\) with fuel rail", page 244](#)

21 - Charge pressure control solenoid valve - N75-

22 - Turbocharger air recirculation valve - N249-

- ❑ Fitting location ⇒ [Fig. "Turbocharger air recirculation valve -N249- ", page 237](#)
- ❑ Removing and installing
⇒ ["1.6 Removing and installing turbocharger air recirculation valve N249 ", page 218](#)

23 - Camshaft control valve 1 - N205-

- ❑ Exploded view ⇒ ["3.2 Exploded view - camshaft housing", page 109](#)

24 - Magnetic clutch for supercharger - N421-

- ❑ Combined with coolant pump in one unit
- ❑ Fitting location ⇒ [Fig. "Magnetic clutch for supercharger -N421- ", page 237](#)
- ❑ Removing and installing ⇒ ["2.4 Removing and installing coolant pump", page 178](#)

Engine (intake side)

1 - High-pressure pump

- ❑ With fuel pressure regulating valve - N276-
- ❑ Removing and installing
⇒ ["6.2 Removing and installing high-pressure pump", page 266](#)

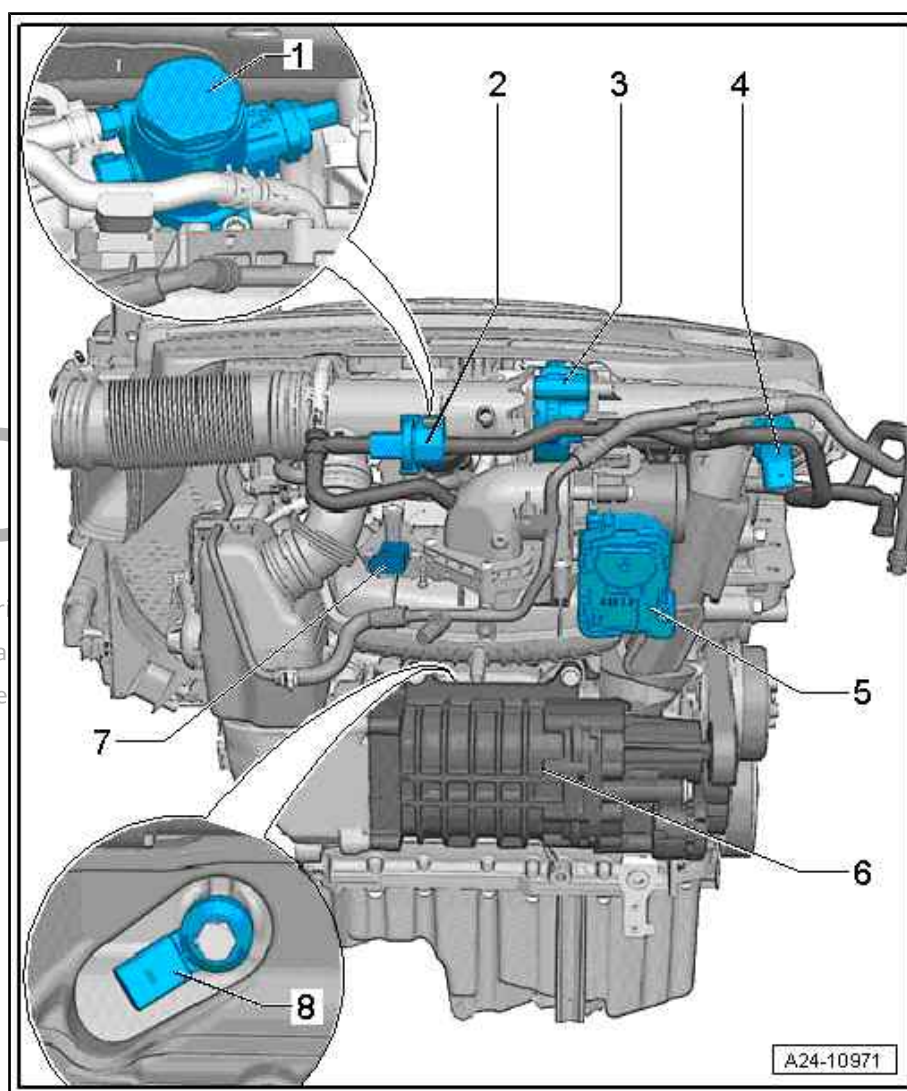
2 - Activated charcoal filter solenoid valve 1 - N80-

3 - Regulating flap control unit - J808-

- ❑ With regulating flap potentiometer - G584-
- ❑ Removing and installing
⇒ ["3.7 Removing and installing regulating flap control unit J808 ", page 251](#)

4 - Throttle valve module - J338-

- ❑ Including throttle valve drive for electric throttle - G186- , throttle valve drive angle sender 1 for electric throttle - G187- and throttle valve drive angle sender 2 for electric throttle - G188-
- ❑ Removing and installing
⇒ ["3.5 Removing and installing throttle valve module J338 ", page 249](#)



A24-10971



5 - Intake air temperature sender 3 - G520- with intake manifold pressure sender 3 - G583-

6 - Compressor

- ☐ Removing and installing ⇒ [“3.2 Removing and installing supercharger”, page 227](#)

7 - Intake manifold pressure sender - G71- with intake air temperature sender - G42-

- ☐ Fitting location
⇒ [Fig. “Intake manifold pressure sender -G71- with intake air temperature sender -G42- ”, page 234](#)

8 - Knock sensor 1 - G61-

- ☐ Exploded view ⇒ [“1.1 Exploded view - ignition system”, page 287](#)
- ☐ Removing and installing ⇒ [“1.4 Removing and installing knock sensor”, page 290](#)

Engine (gearbox end)

1 - Oil pressure switch - F1-

- ☐ Fitting location
⇒ [Fig. “Oil pressure switch -F1- ”, page 235](#)
- ☐ Removing and installing
⇒ [“3.2 Removing and installing oil pressure switch F1”, page 163](#)

2 - Coolant temperature sender - G62-

- ☐ Fitting location
⇒ [Fig. “Coolant temperature sender -G62- ”, page 235](#)
- ☐ Exploded view
⇒ [“2.2 Exploded view - thermostat”, page 176](#)

3 - Hall sender - G40-

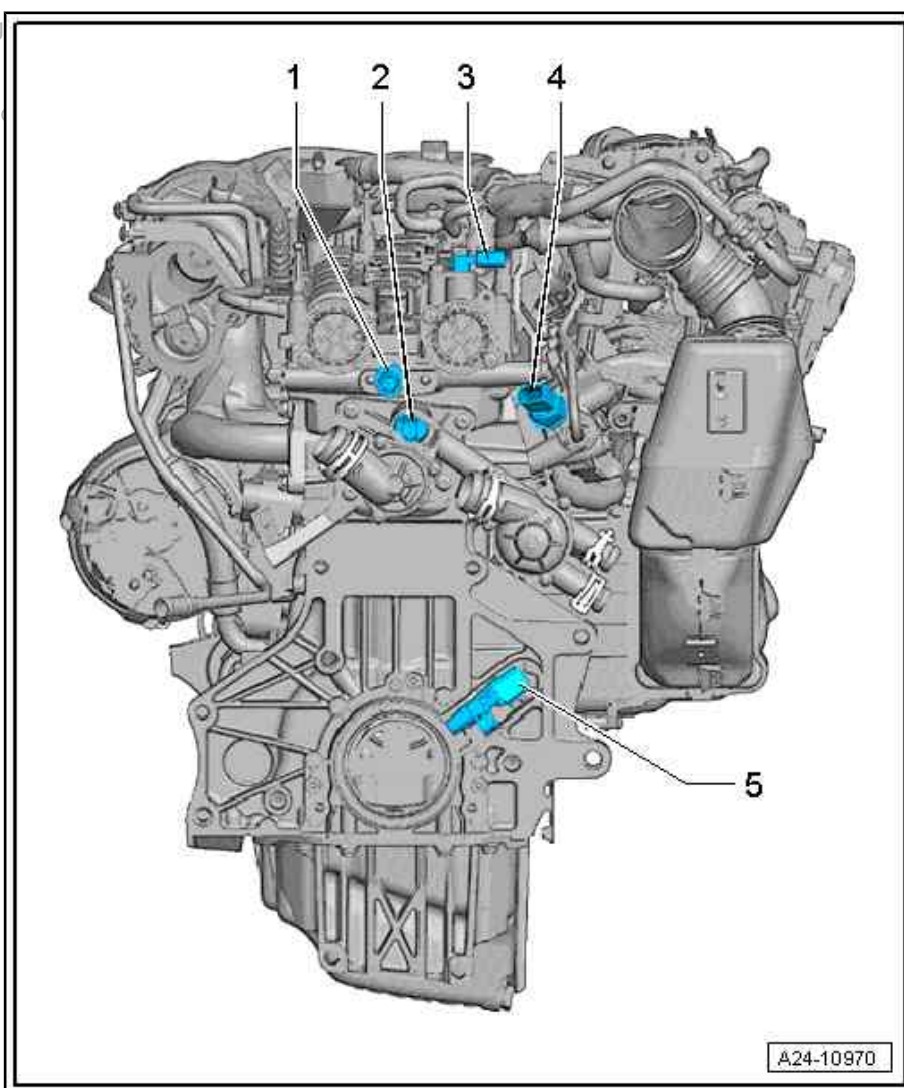
- ☐ Removing and installing
⇒ [“1.5 Removing and installing Hall senders”, page 291](#)

4 - Fuel pressure sender - G247-

- ☐ Exploded view
⇒ [“3.2 Exploded view - intake manifold \(bottom section\) with fuel rail”, page 244](#)

5 - Engine speed sender - G28-

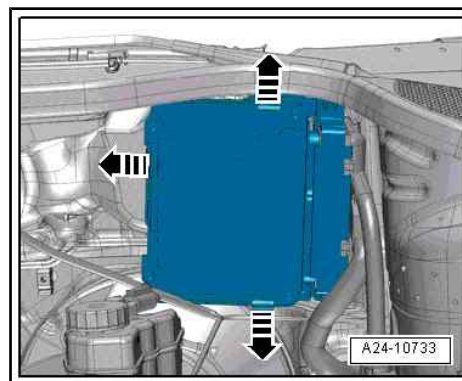
- ☐ Exploded view
⇒ [“1.1 Exploded view - ignition system”, page 287](#)





Fitting location of engine control unit - J623-

- ◆ At plenum chamber partition panel (left-side)



Fitting location of accelerator position sender - G79- / accelerator position sender 2 - G185-

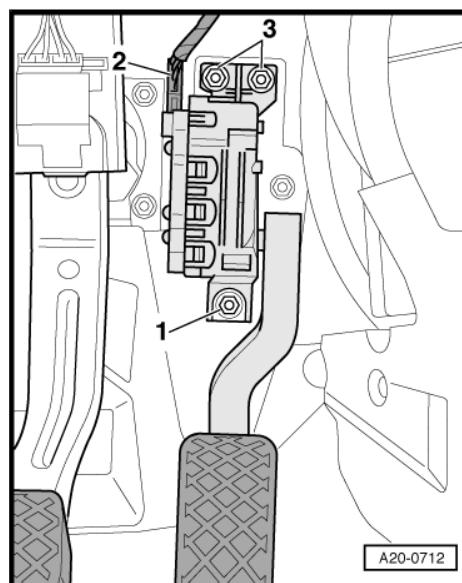
- 2 - Electrical connector for accelerator pedal module



Note

The accelerator position sender - G79- and accelerator position sender 2 - G185- are integrated in the accelerator pedal module and cannot be renewed individually.

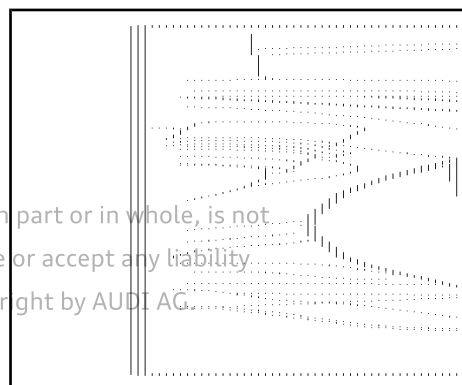
Removing and installing ⇒ Fuel supply system, petrol engines;
Rep. gr. 20 ; Accelerator mechanism; Removing and installing
accelerator pedal module with accelerator position sender -G79- /
-G185-



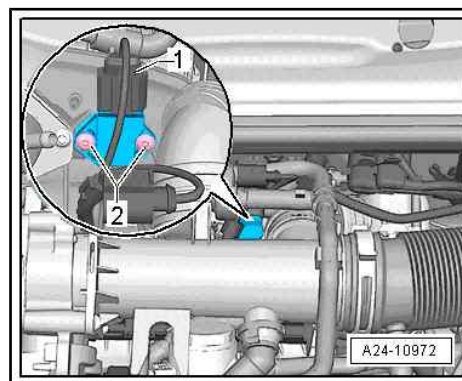
Fitting location of brake light switch - F-

- ◆ On brake master cylinder
- C - Brake light switch - F-

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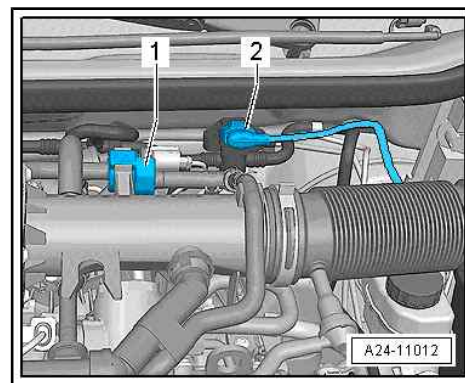
Intake manifold pressure sender - G71- with intake air temperature sender - G42-





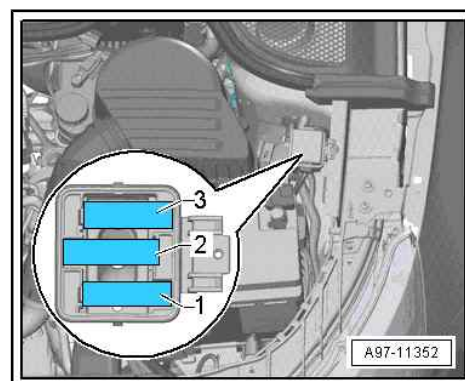
Components

- 1 - Activated charcoal filter solenoid valve 1 - N80-
- 2 - Brake servo pressure sensor - G294-

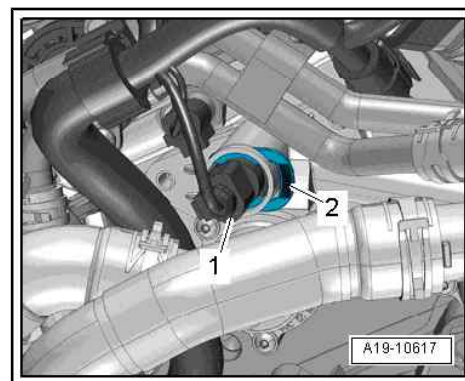


Additional coolant pump relay - J496- for activation of continued coolant circulation pump - V51-

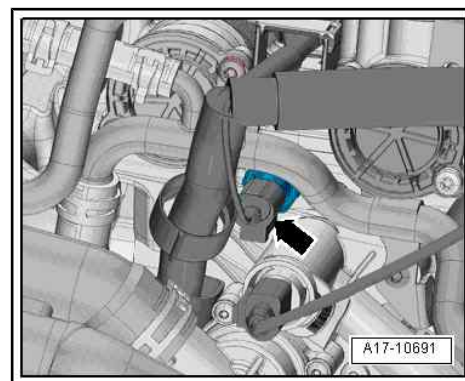
For current assignment refer to ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.



Coolant temperature sender - G62-



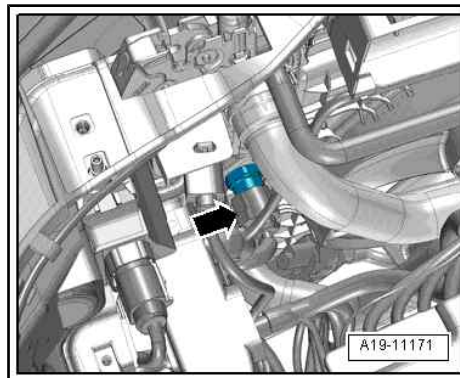
Oil pressure switch - F1-



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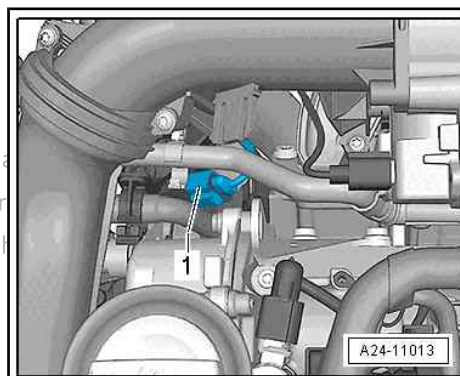


Radiator outlet coolant temperature sender - G83-

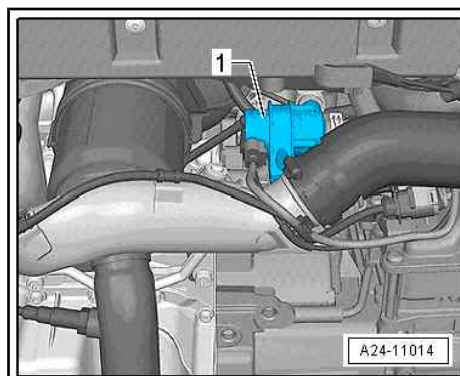


Charge pressure sender - G31- / intake air temperature sender 2 - G299-

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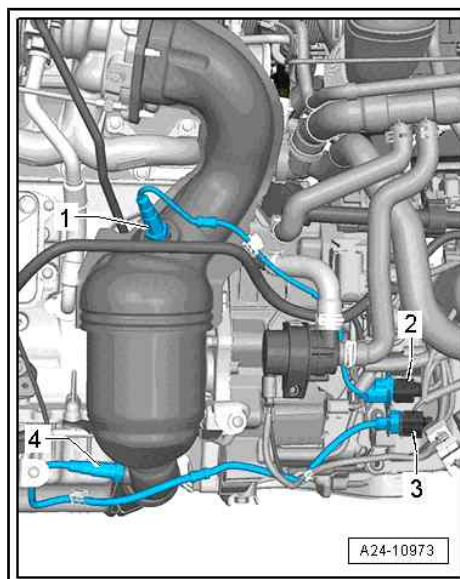


Continued coolant circulation pump - V51-



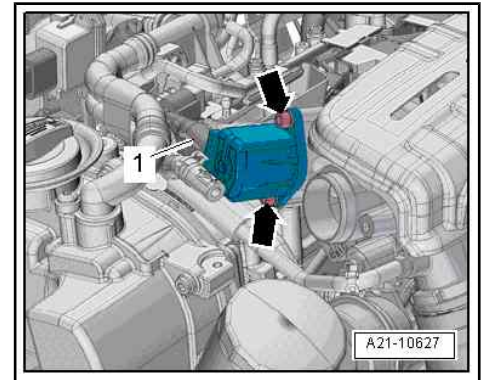
Lambda probes

- 1 - Lambda probe - G39-
- 2 - Electrical connector for Lambda probe - G39-
- 3 - Electrical connector for Lambda probe after catalytic converter - G130-
- 4 - Lambda probe after catalytic converter - G130-

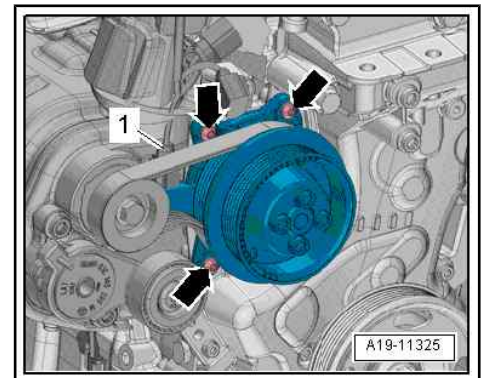




Turbocharger air recirculation valve - N249-



Magnetic clutch for supercharger - N421-



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2 Air cleaner

⇒ "2.1 Exploded view - air cleaner housing", page 238

⇒ "2.2 Removing and installing air cleaner housing", page 239

2.1 Exploded view - air cleaner housing

1 - Spring-type clip

- ☐ Remove and install using hose clip pliers - VAS 6340-

2 - Intake hose

3 - Air cleaner (top section)

- ☐ Clean out salt deposits, dirt and leaves, etc.

4 - Bolt

- ☐ 1.6 Nm

5 - Seal

- ☐ Renew if damaged

6 - Air filter element

- ☐ Use genuine air filter element ⇒ Electronic parts catalogue
- ☐ Change intervals ⇒ Maintenance tables
- ☐ Removing and installing ⇒ Maintenance ; Booklet 819

7 - O-ring

- ☐ Renew if damaged

8 - Air cleaner (bottom section)

- ☐ Clean out salt deposits, dirt and leaves, etc.
- ☐ Removing and installing ⇒ "2.2 Removing and installing air cleaner housing", page 239

9 - Bolt

- ☐ 9 Nm

10 - Bush

11 - Rubber mounting

12 - Rubber mounting

13 - Water drain hose

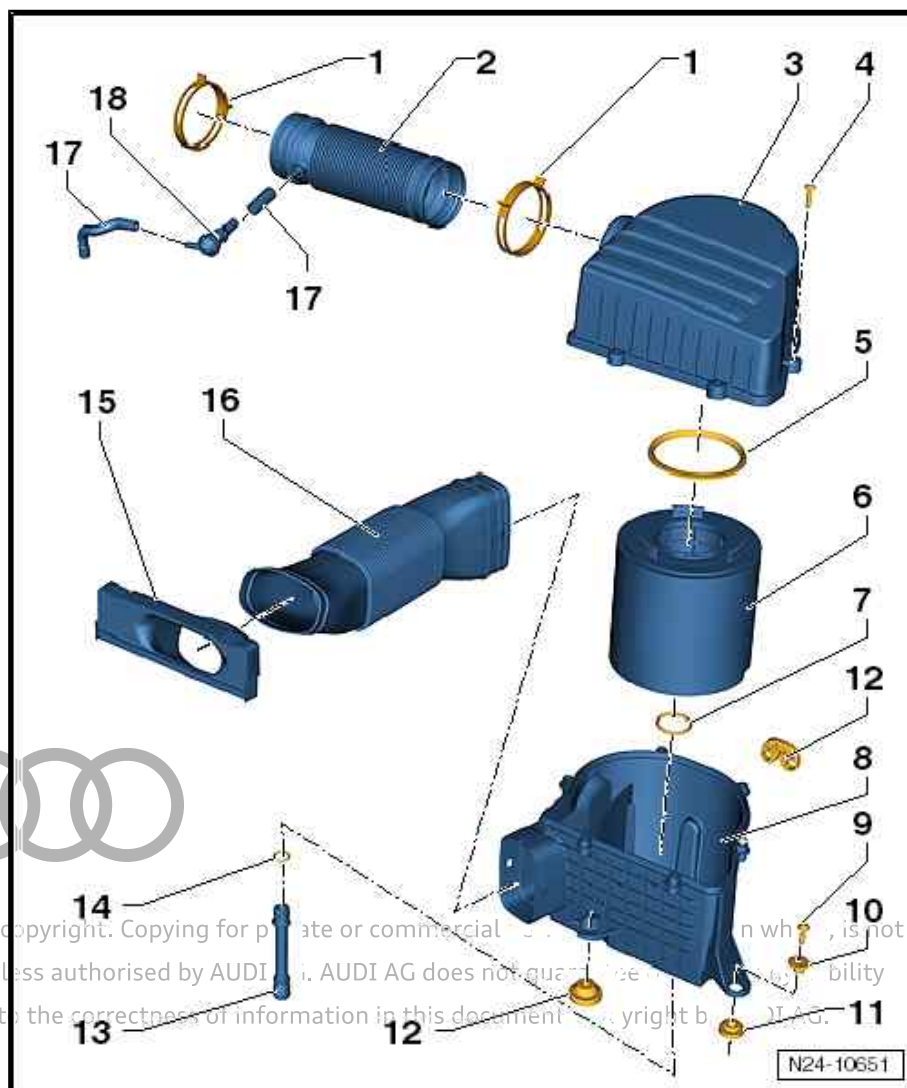
- ☐ Clean

14 - O-ring

- ☐ Renew if damaged
- ☐ Use lubricant when installing

15 - Air duct

- ☐ To lock carrier
- ☐ Clean out salt deposits, dirt and leaves, etc.





- ❑ 3 Nm

16 - Connection

17 - Vacuum hose

- ❑ Renew if damaged
- ❑ To cylinder head cover

18 - Non-return valve

2.2 Removing and installing air cleaner housing

Removing

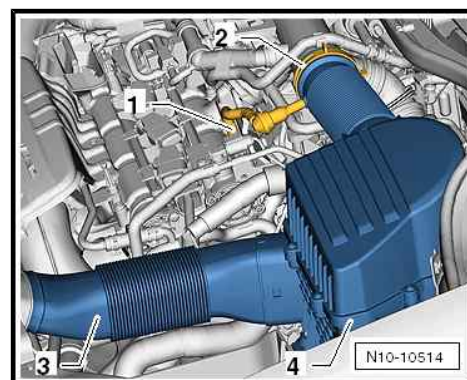
- Remove engine cover panel
⇒ [“3.1 Removing and installing engine cover panel”](#),
[page 36](#) .
- Release spring-type clip -2- and detach air intake hose.
- Pull air intake hose -3- out of intake connecting pipe.
- Unscrew bolt -4- and pull up air cleaner housing.

Installing



Note

- ◆ *Always use genuine air filter elements (same as original equipment).*
- ◆ *Hose connections and charge air system hoses must be free of oil and grease prior to fitting. Do not use any lubricants containing silicone when assembling.*
- ◆ *Both sections of the air cleaner housing must be clean.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ [Electronic parts catalogue](#) .*
- ◆ *To prevent malfunctions, cover all critical parts of the engine air intake tract with a clean cloth when blowing out the air cleaner housing with compressed air.*
- ◆ *Please observe requirements for disposal.*



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3 Intake manifold

⇒ ["3.1 Exploded view - intake manifold", page 240](#)

⇒ ["3.2 Exploded view - intake manifold \(bottom section\) with fuel rail", page 244](#)

⇒ ["3.3 Removing and installing intake manifold \(top section\)", page 245](#)

⇒ ["3.4 Removing and installing intake manifold \(bottom section\) with fuel rail", page 246](#)

⇒ ["3.5 Removing and installing throttle valve module J338 ", page 249](#)

⇒ ["3.6 Cleaning throttle valve module", page 250](#)

⇒ ["3.7 Removing and installing regulating flap control unit J808 ", page 251](#)

3.1 Exploded view - intake manifold



Note

- ◆ *If any hoses have been disconnected during the repair work, check that all hoses are securely seated after installation.*
- ◆ *Check that hoses with fasteners are engaged securely by pulling at them.*

Part 1



1 - Intake air temperature sender 3 - G520- with intake manifold pressure sender 3 - G583-

2 - Bolt

☐ 5 Nm

3 - Bolt

☐ Thread-cutting bolt

☐ 7 Nm

4 - Intake connecting pipe

5 - Seal

☐ Renew

6 - Regulating flap control unit - J808- with regulating flap potentiometer - G584-

☐ Removing and installing
 ⇒ ["3.7 Removing and installing regulating flap control unit J808", page 251](#)

7 - Bolt

☐ Thread-cutting bolt

☐ 7 Nm

8 - Intake connecting pipe

9 - Intake manifold connection

10 - Bolt

☐ Thread-cutting bolt

☐ 7 Nm

11 - Bolt

☐ 5 Nm

12 - Intake manifold pressure sender - G71-

13 - O-ring

☐ Renew

14 - Intake manifold (top section)

☐ Removing and installing ⇒ ["3.3 Removing and installing intake manifold \(top section\)", page 245](#)

15 - Bolt

☐ 20 Nm

16 - Fuel pressure sender - G247-

☐ 22 Nm

☐ Removing and installing ⇒ ["5.4 Removing and installing fuel pressure sender G247", page 262](#)

17 - Connection

☐ 80 Nm

18 - Intake manifold (bottom section)

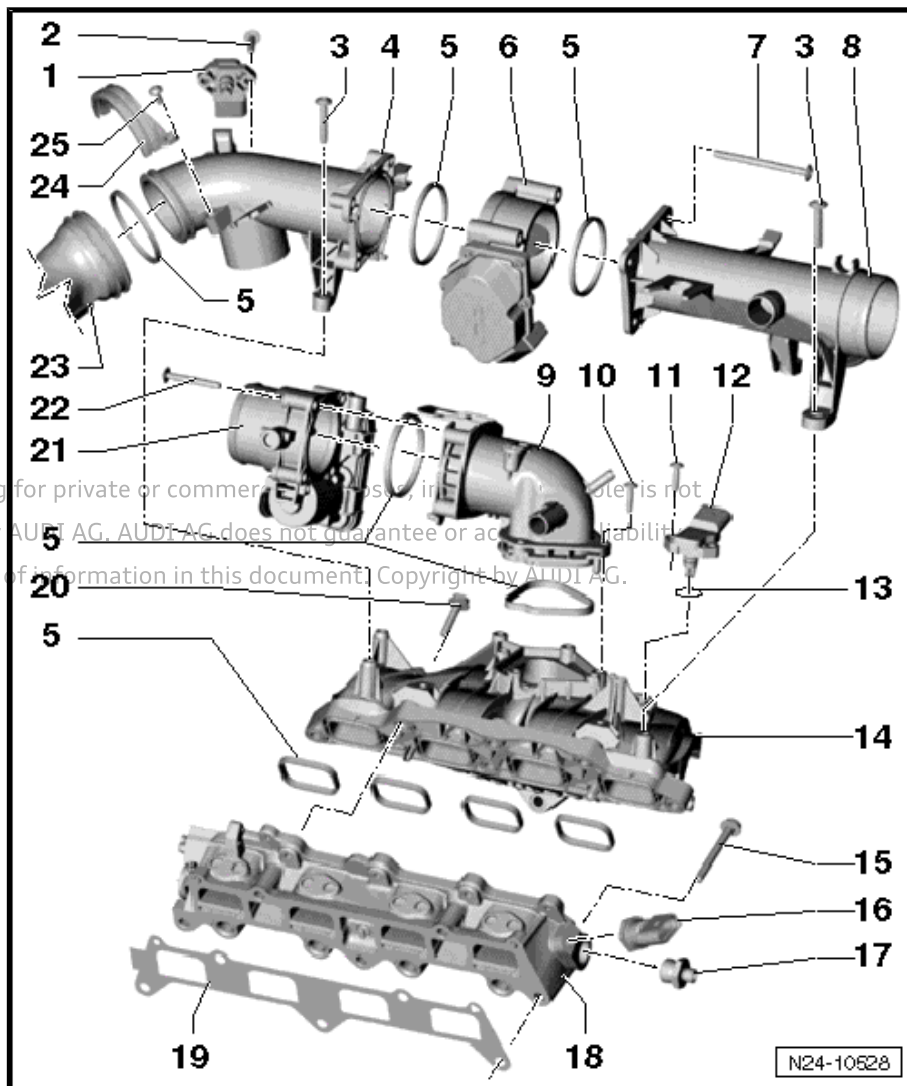
☐ Removing and installing

⇒ ["3.4 Removing and installing intake manifold \(bottom section\) with fuel rail", page 246](#)

19 - Gasket

☐ Renew

☐ Note installation position





20 - Bolt

- ☐ 20 Nm

21 - Throttle valve module - J338

- ☐ Removing and installing ⇒ ["3.5 Removing and installing throttle valve module J338", page 249](#)
- ☐ Cleaning ⇒ ["3.6 Cleaning throttle valve module", page 250](#)
- ☐ After this component has been renewed, learnt values must be erased and engine control unit - J623- must be adapted using ⇒ Vehicle diagnostic tester

22 - Bolt

- ☐ 7 Nm

23 - Pressure pipe

- ☐ From turbocharger

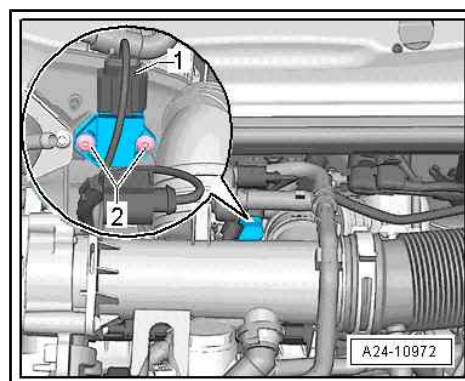
24 - Retaining clip

25 - Bolt

- ☐ 7 Nm

Intake air temperature sender - G42- / intake manifold pressure sender - G71- - tightening torque

- Tighten bolts -2- for intake air temperature sender - G42- / intake manifold pressure sender - G71- -item 1- to 5 Nm.



Part 2



1 - Connection

- ☐ For fuel supply

2 - Fuel hose

- ☐ For fuel supply
- ☐ To high-pressure pump

3 - Retaining clamp

4 - Connecting hose

- ☐ To activated charcoal filter solenoid valve 1 - N80-

5 - Activated charcoal filter solenoid valve 1 - N80-

6 - Connecting hose

7 - Connecting hose to pressure pipe

8 - Connecting pipe

9 - Connecting hose

- ☐ To intake manifold connection

10 - Bolt

- ☐ 8 Nm

11 - High-pressure pipe

- ☐ 25 Nm

12 - Connection

- ☐ To intake connecting pipe

13 - Connecting hose

14 - Non-return valve

- ☐ For crankcase breather
- ☐ 10 Nm

15 - Connecting hose

16 - Charge pressure control solenoid valve - N75-

17 - Connecting hose

18 - Connecting hose

- ☐ To turbocharger

19 - Connection

20 - Bolt

- ☐ 5 Nm

21 - Connecting hose

- ☐ To vacuum unit on turbocharger

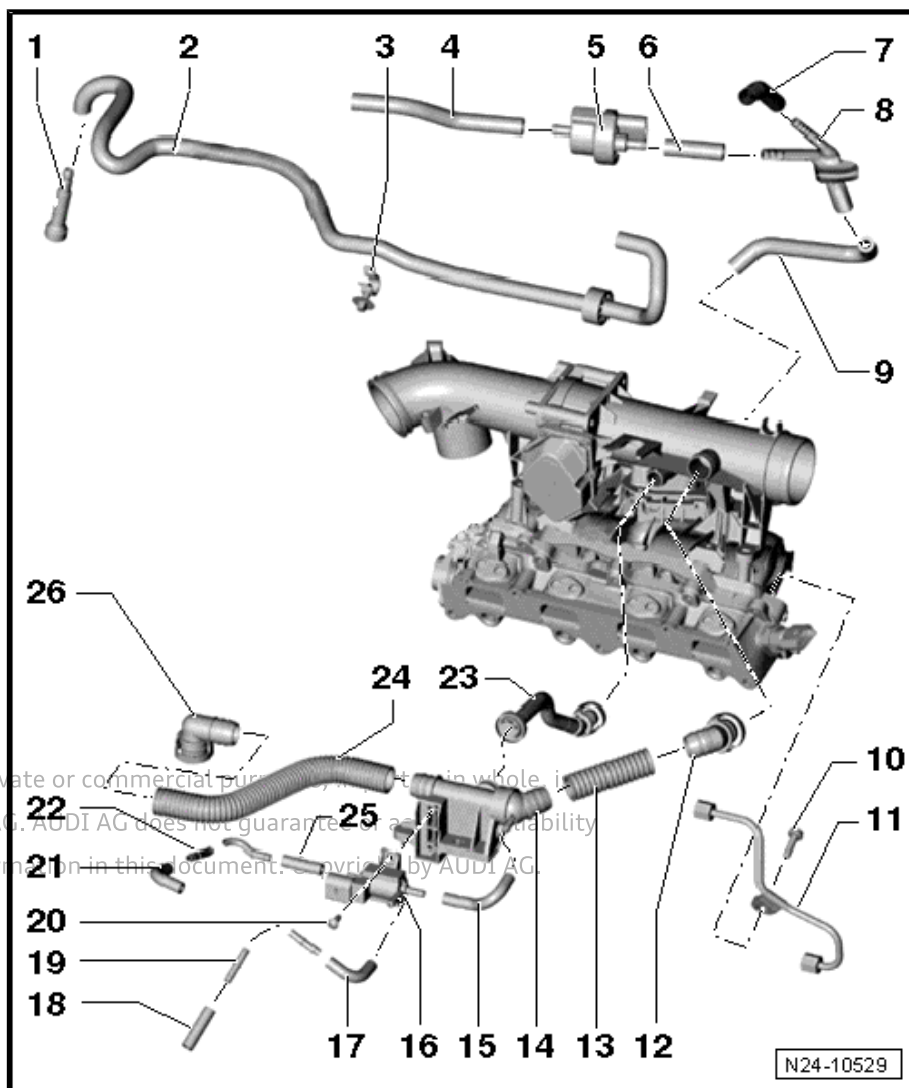
22 - Connection

23 - Connection

- ☐ For crankcase breather

24 - Connecting hose

- ☐ For crankcase breather





25 - Connecting hose

- ☐ To charge pressure control solenoid valve - N75-

26 - Connection

- ☐ For crankcase breather

3.2 Exploded view - intake manifold (bottom section) with fuel rail

1 - Intake manifold (bottom section)

- ☐ Removing and installing
⇒ ["3.4 Removing and installing intake manifold \(bottom section\) with fuel rail", page 246](#)

2 - Connection

- ☐ For high-pressure pipe
- ☐ 80 Nm

3 - Fuel pressure sender - G247-

- ☐ Removing and installing
⇒ ["5.4 Removing and installing fuel pressure sender G247", page 262](#)

- ☐ Lubricate threads
- ☐ 22 Nm

4 - Gasket

- ☐ Renew

5 - Bolt

- ☐ Starting from centre, tighten in stages
- ☐ 20 Nm

6 - O-ring

- ☐ Renew
- ☐ Before installing, lubricate lightly with clean engine oil

7 - Support ring

- ☐ Renew

8 - Spring element

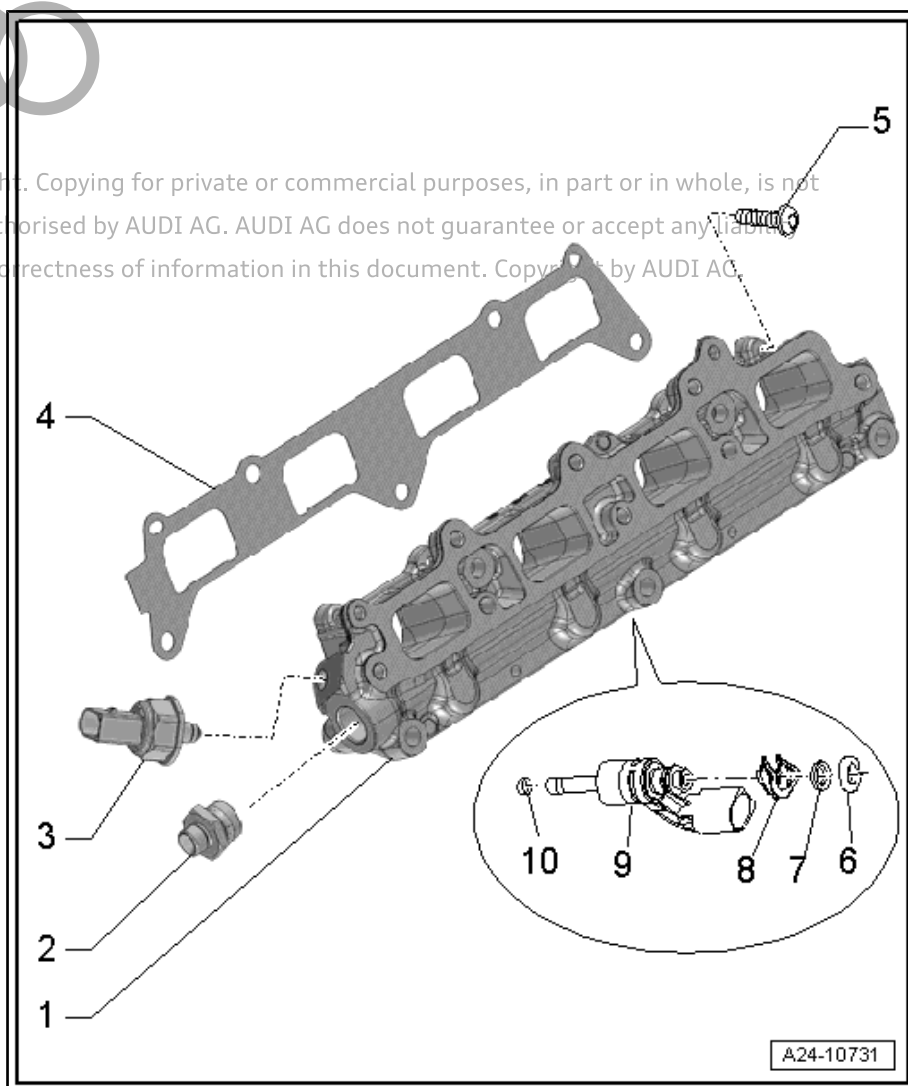
- ☐ Always renew if intake manifold (bottom section) is removed
- ☐ Check for correct fit on injector

9 - Injector

- ☐ Injector, cylinder 1 - N30-
- ☐ Injector, cylinder 2 - N31-
- ☐ Injector, cylinder 3 - N32-
- ☐ Injector, cylinder 4 - N33-
- ☐ Removing and installing ⇒ ["4.1 Removing and installing injectors", page 253](#)

10 - Combustion chamber ring seal

- ☐ Renewing ⇒ ["4.1 Removing and installing injectors", page 253](#)





3.3 Removing and installing intake manifold (top section)

Special tools and workshop equipment required

- ◆ Hose clip pliers - VAS 6362-

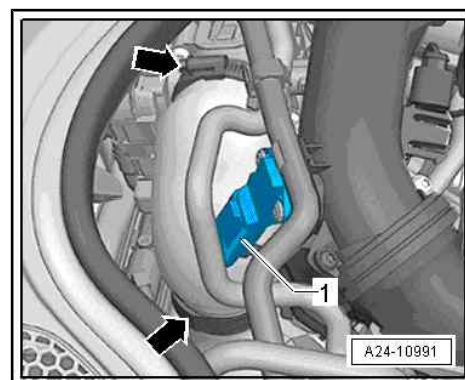


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Removing

- Remove intake connecting pipe together with regulating flap control unit - J808-
⇒ ["3.7 Removing and installing regulating flap control unit J808"](#), page 251 .
- Release upper spring-type clip -top arrow- and disconnect charge air hose from throttle valve module - J338- and air pipe.
- Detach cable duct from intake manifold.
- Unplug electrical connector at throttle valve module - J338- .

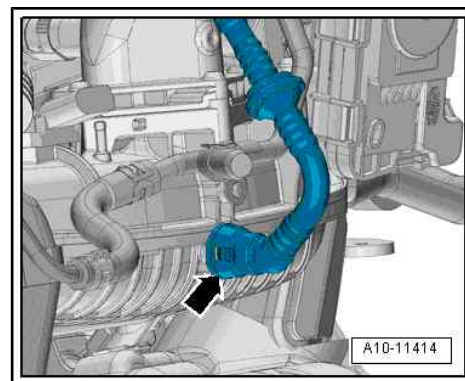


- Press release tabs and detach vacuum hose -arrow-.



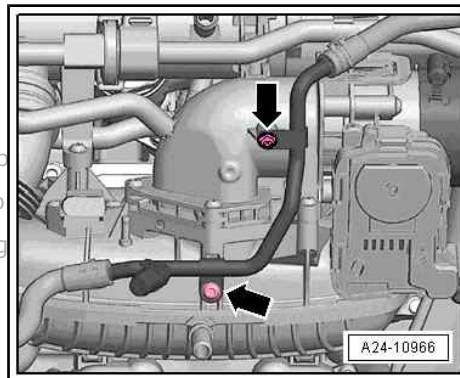
Note

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



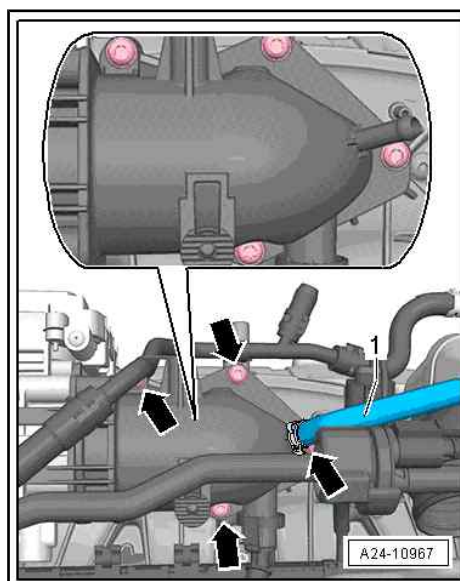


- Unbolt water pipe -arrows- from rear of intake manifold.



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- Disconnect vacuum pipe -1- from intake manifold connection.
- Unscrew bolts -arrows- from intake manifold connection.



- Remove bolt -arrow-.
- Unscrew bolts securing manifold.
- Carefully remove intake manifold upwards.

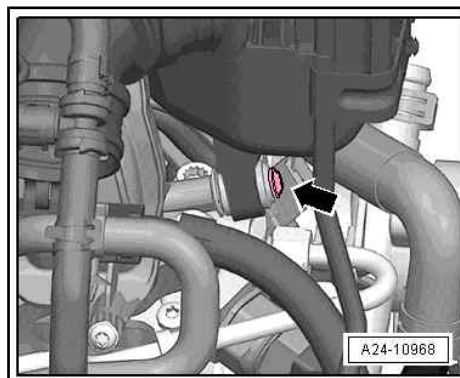
Installing

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



Note

- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- ◆ *If the intake manifold has been removed, check that all hoses are securely seated at the intake manifold after installation.*
- ◆ *Check that hoses with fasteners are engaged securely by pulling at them.*



Tightening torques

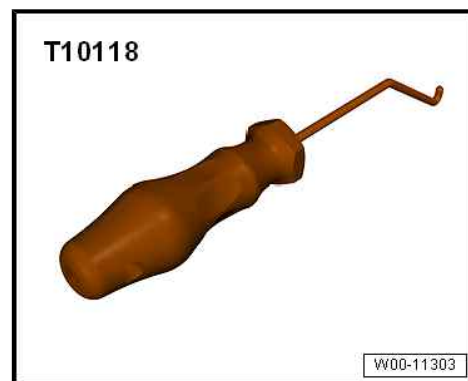
- ◆ ⇒ [“3.1 Exploded view - intake manifold”, page 240](#)

3.4 Removing and installing intake manifold (bottom section) with fuel rail

Special tools and workshop equipment required



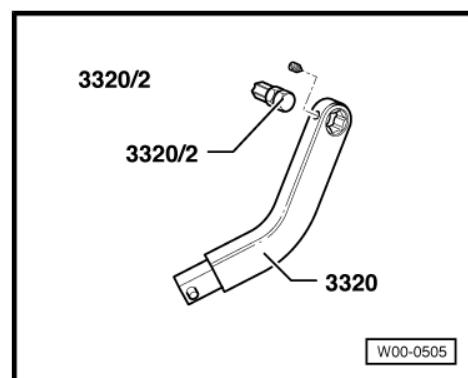
- ◆ Assembly tool - T10118-



- ◆ Holder for 5/16 inch bits - V.A.G 1766/2- from TORX bit set - V.A.G 1766-



- ◆ Special wrench, long reach - 3320/2- (included with door alignment tool - 3320-)



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- Remove regulating flap control unit J808-
⇒ ["3.7 Removing and installing regulating flap control unit J808"](#), [page 251](#) .
- Remove intake manifold
⇒ ["3.3 Removing and installing intake manifold \(top section\)"](#), [page 245](#) .

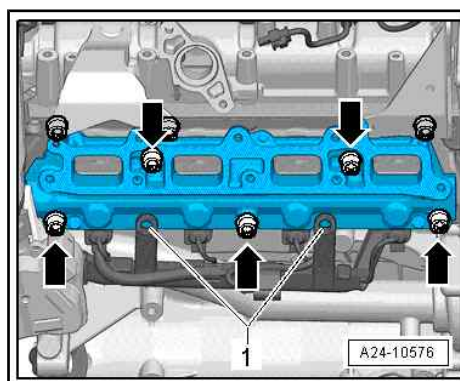
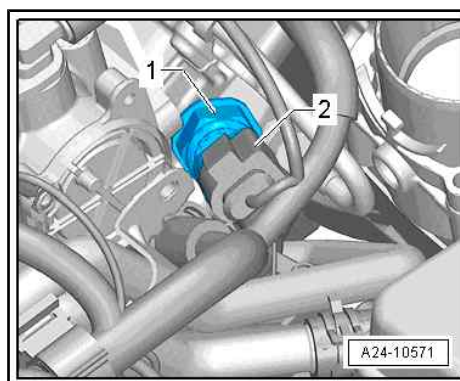
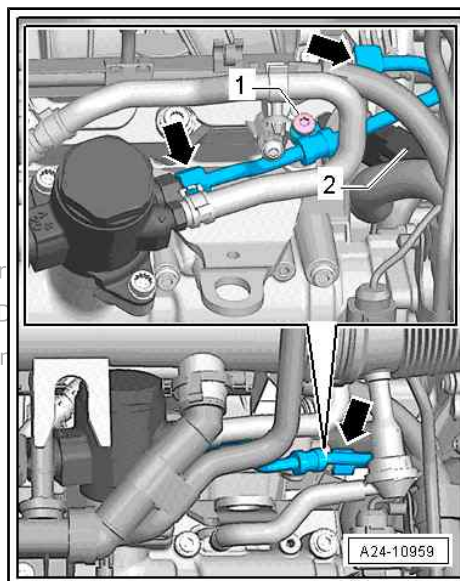


WARNING

*The fuel system is pressurised.
Risk of injury as fuel may spray out.*

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

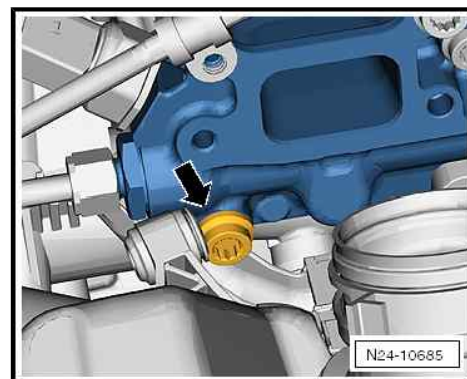
- Remove union nuts -arrows- and bolt -1- and detach high-pressure pipe.
- Unplug electrical connector -2- at fuel pressure sender - G247-1-.
- Pull wiring duct for injectors out of both clips -1-.
- Unscrew securing bolts -arrows- from intake manifold (bottom section).





Note

- ◆ Use holder for 5/16 inch bits - V.A.G 1766/2- and bit - 3320/2- to remove and install securing bolt -arrow-.
 - ◆ If you only want to remove the bottom section of the intake manifold, make sure the injectors remain in the cylinder head. If necessary, have a second mechanic hold the injectors in position.
 - ◆ Reason: If the injectors are removed, the combustion chamber ring seals and the support ring must be renewed.
- Carefully detach intake manifold (bottom section) from injectors.



Installing

- The remaining installation steps are carried out in the reverse sequence.
- Install intake manifold (top section)
⇒ ["3.3 Removing and installing intake manifold \(top section\)", page 245](#) .

Tightening torques

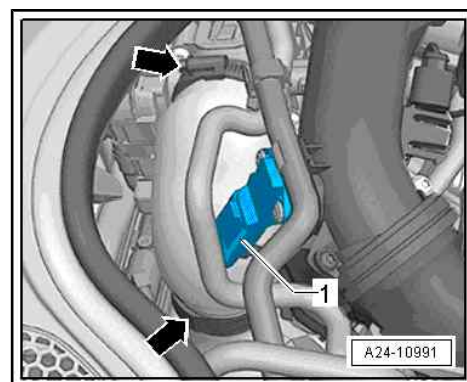
- ◆ ⇒ ["3.2 Exploded view - intake manifold \(bottom section\) with fuel rail", page 244](#)

3.5 Removing and installing throttle valve module - J338-

Removing

The regulating flap control unit - J338- must be removed before the throttle valve module - J808- can be removed
⇒ ["3.7 Removing and installing regulating flap control unit J808 ", page 251](#) .

- Unplug electrical connector -1- at intake air temperature sender 3 - G520- .
- Release spring-type clips -arrows- and remove charge air hose from throttle valve module - J338- and air pipe.



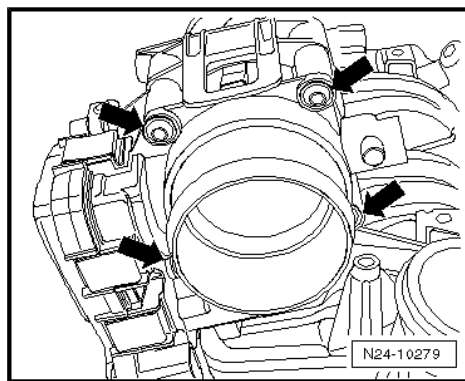


- Remove securing bolts -arrows- and pull throttle valve module - J338- off intake manifold connection.

Installing

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

- ◆ Renew seals.
- ◆ 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).
- Erase learnt values and adapt engine control unit - J623- to throttle valve module. Use ⇒ Vehicle diagnostic tester.



Tightening torques

- ◆ ⇒ [“3.1 Exploded view - intake manifold”, page 240](#)

3.6 Cleaning throttle valve module



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Special tools and workshop equipment required

- ◆ Acetone (commercially available)
- ◆ Brush

Procedure

- Remove throttle valve module - J338-
⇒ [“3.5 Removing and installing throttle valve module J338 ”, page 249](#) .
- Open throttle valve by hand and block it in the open position with a suitable object (e.g. plastic or wooden wedge) -arrow-.

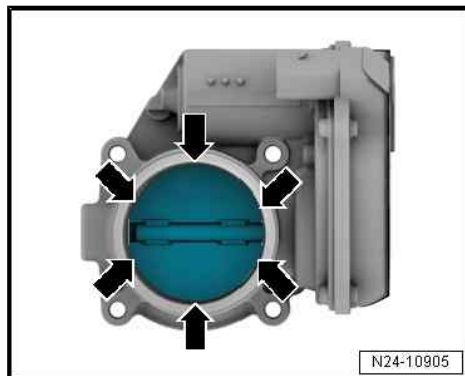


WARNING

Acetone is highly flammable. Please observe all accident prevention regulations and safety precautions when handling flammable liquids. Do not use compressed air when cleaning the throttle valve. Wear safety goggles and protective clothing to avoid possible injury and skin contact.



- Clean throttle valve housing thoroughly, especially around the points -arrows- where the throttle valve closes, using commercially available acetone and a small brush.
- Wipe out throttle valve housing with a lint-free cloth.
- Allow acetone to evaporate completely and re-install throttle valve module after cleaning.
- Install throttle valve module - J338-
⇒ [“3.5 Removing and installing throttle valve module J338 ”, page 249](#) .
- Erase learnt values and adapt engine control unit - J623- to throttle valve module. Use ⇒ Vehicle diagnostic tester.

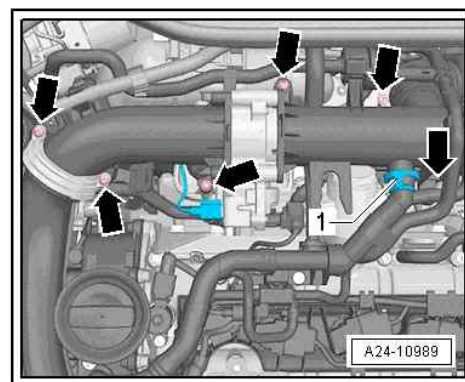
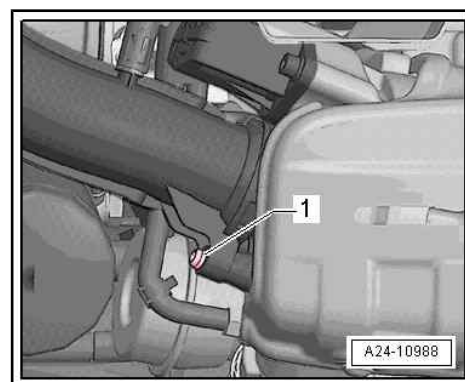
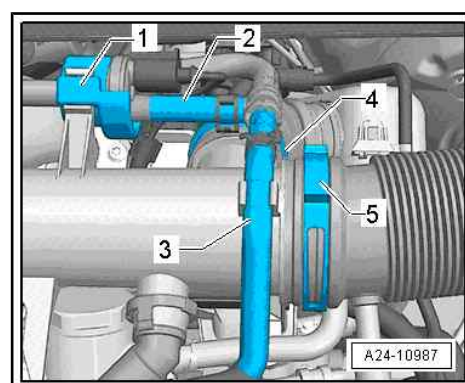
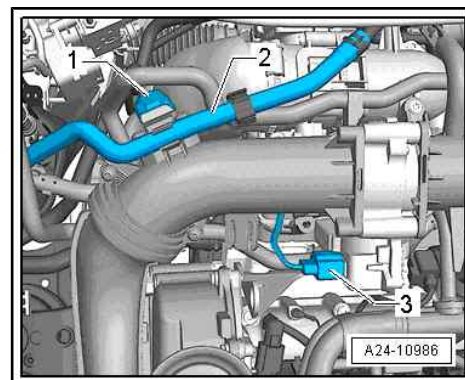




3.7 Removing and installing regulating flap control unit - J808-

Removing

- Remove engine cover panel
 ⇒ ["3.1 Removing and installing engine cover panel", page 36](#) .
- Unplug electrical connectors -1 and 3-.
- Unclip coolant hose -2- from intake connecting pipe.
- Detach hose -2- from activated charcoal filter solenoid valve 1 - N80- .
- Pull activated charcoal filter solenoid valve 1 - N80- -1- out of bracket.
- Unclip hose -3- from intake connecting pipe.
- Release spring-type clip -4- and slide it downwards.
- Release spring-type clip -5- and disconnect intake hose from intake connecting pipe.
- Unscrew bolt -1- from pressure pipe.
- Unscrew all bolts -arrows- from intake connecting pipe.
- Lift intake connecting pipe slightly and at the same time disconnect connection -1- and rear crankcase breather hose.
- Disconnect intake connecting pipe from pressure pipe and take out intake connecting pipe upwards together with regulating flap control unit - J808- .
- Disconnect intake connecting pipe to remove regulating flap control unit - J808- .





- To do so, loosen bolts -arrows- on regulating flap control unit - J808- .

Installing

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

- ◆ Renew seals and gaskets.
- ◆ 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).



Note

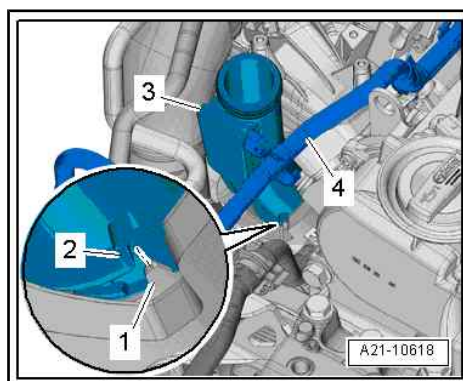
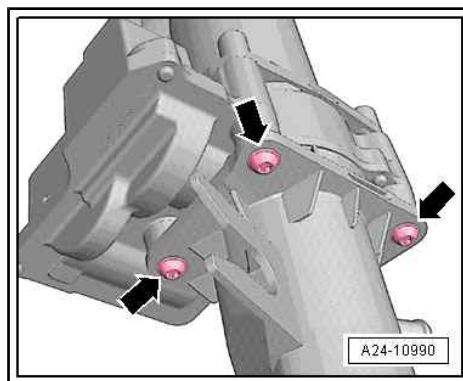
Lug -1- must engage in recess -2- of air pipe.

If a new regulating flap control unit - J808- has been installed:

- Erase learnt values and adapt engine control unit - J623- to regulating flap control unit - J808- using ⇒ Vehicle diagnostic tester.

Tightening torques

- ◆ ⇒ [“3.1 Exploded view - intake manifold”, page 240](#)



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4 Injectors

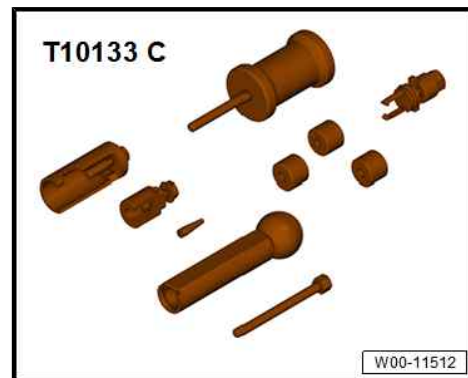
⇒ [“4.1 Removing and installing injectors”, page 253](#)

⇒ [“4.2 Cleaning injectors”, page 257](#)

4.1 Removing and installing injectors

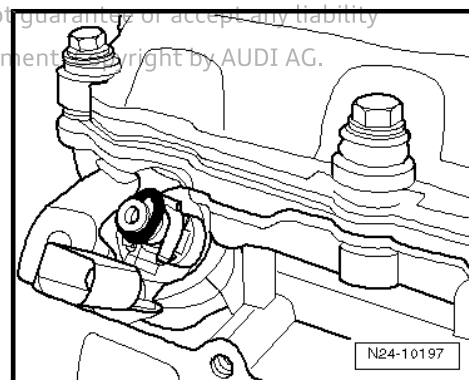
Special tools and workshop equipment required

- ◆ Tool set for FSI engines - T10133C-



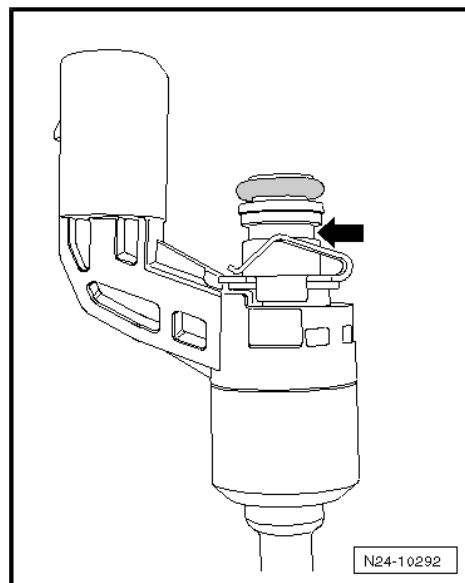
Removing

- Remove intake connecting pipe together with regulating flap control unit - J808-
⇒ [“3.7 Removing and installing regulating flap control unit J808”, page 251](#) .
- Remove intake manifold
⇒ [“3.3 Removing and installing intake manifold \(top section\)”, page 245](#) .
- Remove intake manifold (bottom section)
⇒ [“3.4 Removing and installing intake manifold \(bottom section\) with fuel rail”, page 246](#) .
- Press O-ring by hand upwards (as illustrated) and remove from injector.
- Screw striker - T10133/3- onto puller - T10133/15- .





- Then guide puller - T10133/15- into groove -arrow- on injector.



- Pull out injector by knocking carefully.

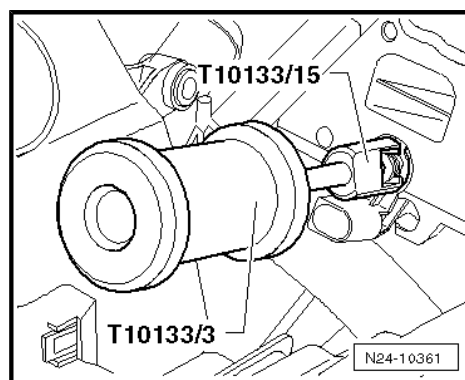


Note

The combustion chamber ring seal must always be renewed before the injector is re-installed.

Renewing combustion chamber ring seal

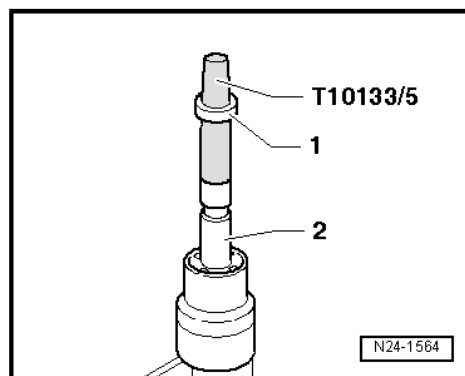
- Remove injector
⇒ ["4.1 Removing and installing injectors", page 253](#) .
- Carefully remove old combustion chamber ring seal using suitable tools (e.g. cut open ring using razor blade, or prise open ring with small screwdriver and then pull off forwards). It is important to ensure that the groove and the continuous ridge in the bottom of the groove are not damaged.



Note

The injector must be renewed if the groove is damaged.

- Before new combustion chamber ring seal is fitted, any combustion residue must be removed from ring groove and injector stem using a clean cloth.
- Fit assembly cone - T10133/5- with new combustion chamber ring seal -1- onto injector -2-.





- Use assembly sleeve - T10133/6- to press combustion chamber ring seal further onto assembly cone - T10133/5- until it seats in groove. Do not use any lubricants during this procedure.



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.

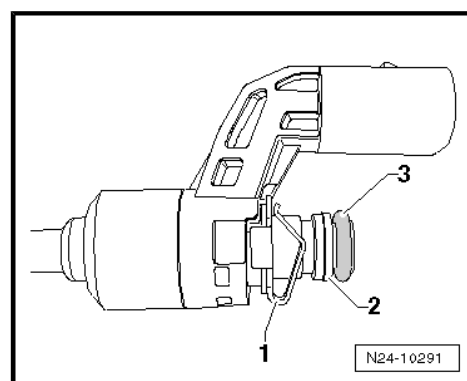
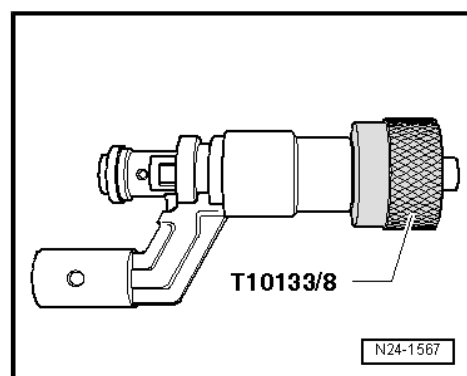
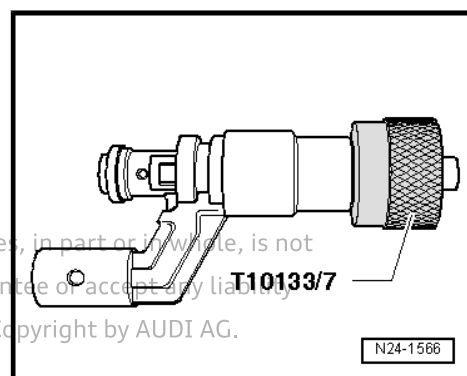
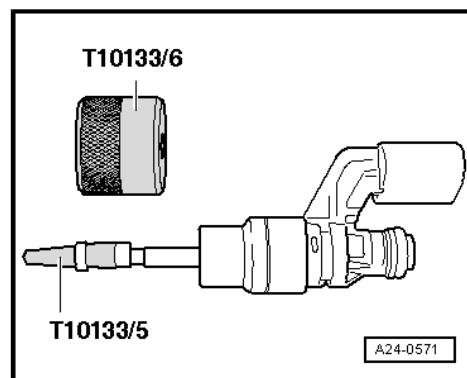
- Push calibration sleeve -T10133/7- onto injector as far as it will go and simultaneously turn it slightly (approx. 180°).
- Pull calibration sleeve -T10133/7- off again by turning it in the opposite direction.

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- 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.

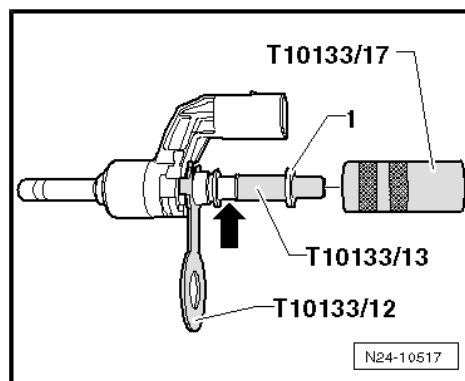
Renewing support ring and O-ring

- Remove O-ring -3-.
- Cut open support ring -2- with small side-cutting pliers and remove support ring.
- Detach spring element -1- from injector and fit locking plate - T10133/12- in place of spring element.
- Fit a new support ring -1- onto assembly cone - T10133/13- and fit onto injector (as illustrated).





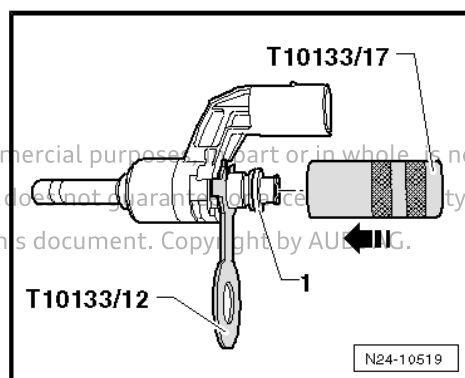
- Using calibration sleeve - T10133/17- (knurled side faces towards injector), push support ring -1- into first groove -arrow- on injector.
- Then turn round calibration sleeve - T10133/17- (knurled side now faces away from injector). Push calibration sleeve over support ring -1- in direction of -arrow- until it makes contact with locking plate - T10133/12- .



- Pull calibration sleeve - T10133/17- off again.
Support ring now has its correct installation depth.

- Now install a new spring element -1- in place of locking plate - T10133/12- .

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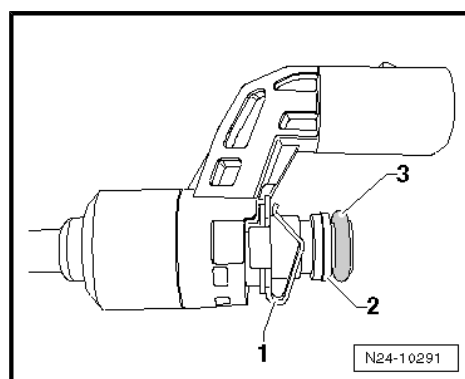


- Renew O-ring -3-.



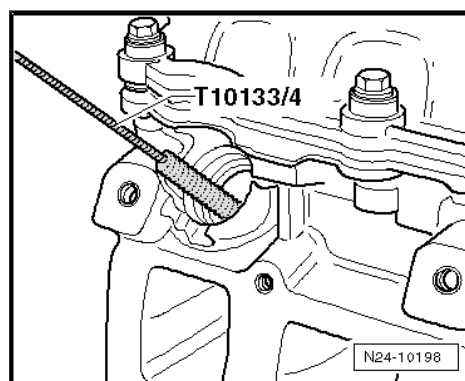
Note

Lubricate O-ring lightly with assembly oil or engine oil before installing.



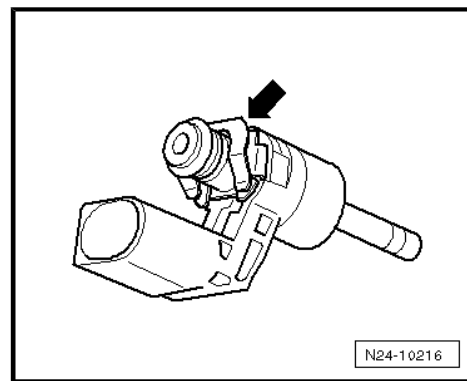
Installing

- Before installing injectors, thoroughly clean apertures for injectors in cylinder head using supplied nylon brush - T10133/4- .

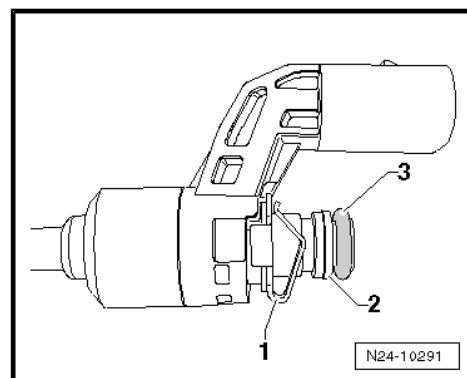




- Always renew spring element -arrow- if injectors have been removed.

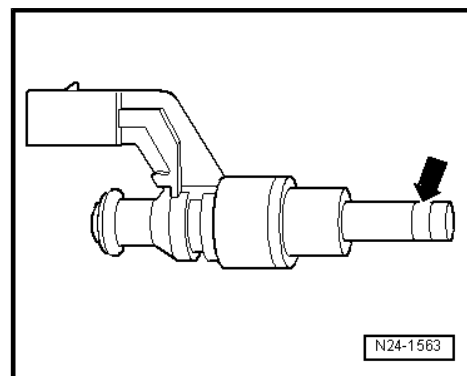


- Fit a new O-ring on each injector. Lubricate O-ring -3- lightly with clean engine oil before installing.
- Push injector by hand as far as it will go into aperture in cylinder head (do not use oil or grease). Ensure that the injector is properly seated in the cylinder head.



Note

- ◆ The teflon seal -arrow- must not be lubricated when fitting the injector.
- ◆ Make sure that there is no cleaning fluid or oil in the holes in the cylinder head when installing the injectors.
- ◆ It should be possible to insert the injector easily. If necessary, wait until the teflon seal has contracted sufficiently.
- ◆ Note correct installation position and ensure that injectors are properly seated in cylinder head.



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

- Install bottom section of intake manifold
⇒ [“3.4 Removing and installing intake manifold \(bottom section\) with fuel rail”, page 246](#) .
- Install intake manifold
⇒ [“3.3 Removing and installing intake manifold \(top section\)”, page 245](#) .
- Install intake connecting pipe together with regulating flap control unit - J808-
⇒ [“3.7 Removing and installing regulating flap control unit J808”, page 251](#) .

4.2 Cleaning injectors

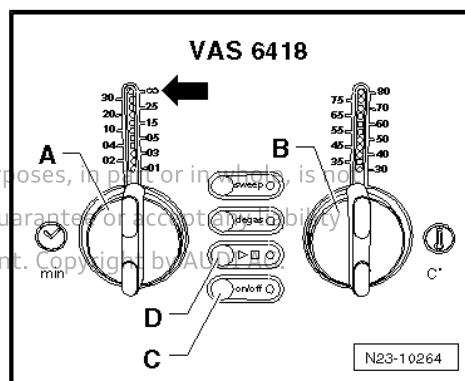
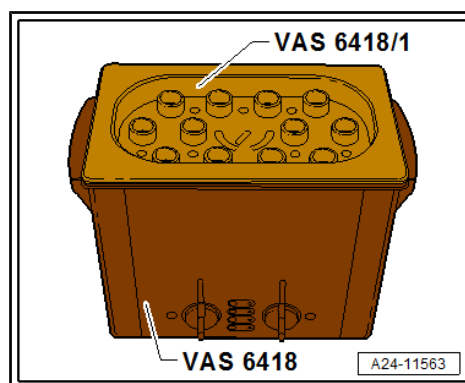
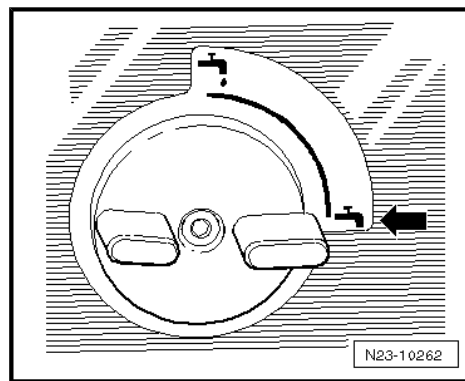
Special tools and workshop equipment required

- ◆ Ultrasonic cleaning unit - VAS 6418-
- ◆ Mounting plate for injectors - VAS 6418/1-
- ◆ Cleaning fluid - VAS 6418/2-



Procedure

- Close drain tap -arrow- on ultrasonic cleaning unit - VAS 6418- (located on right side of housing).
- Fill up ultrasonic cleaning unit - VAS 6418- .
- Ratio of 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-
- 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.
- Remove injectors
⇒ ["4.1 Removing and installing injectors", page 253](#) .
- Place mounting plate for injectors - VAS 6418/1- on top of cleaning unit.
- It is important to read the safety notes in the operating instructions before switching on the ultrasonic cleaning unit - VAS 6418- .
- Insert FSI injectors all the way into guides of mounting plate for injectors - 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.
- The actual cleaning process commences when the temperature reaches at least 50 °C and must last for at least 30 minutes.
- Install injectors
⇒ ["4.1 Removing and installing injectors", page 253](#) .





5 Senders and sensors

⇒ **"5.1 Exploded view - actuator for structure-borne sound and control unit for structure-borne sound", page 259**

⇒ **"5.2 Removing and installing control unit for structure-borne sound J869", page 260**

⇒ **"5.3 Removing and installing actuator for structure-borne sound R214", page 262**

⇒ **"5.4 Removing and installing fuel pressure sender G247", page 262**

⇒ **"5.5 Removing and installing intake air temperature sender G42 / intake manifold pressure sender G71", page 264**

5.1 Exploded view - actuator for structure-borne sound and control unit for structure-borne sound

1 - Electrical connector

2 - Actuator for structure-borne sound - R214-

- ☐ Removing and installing
⇒ **"5.3 Removing and installing actuator for structure-borne sound R214", page 262**

3 - Nut

- ☐ 5 Nm

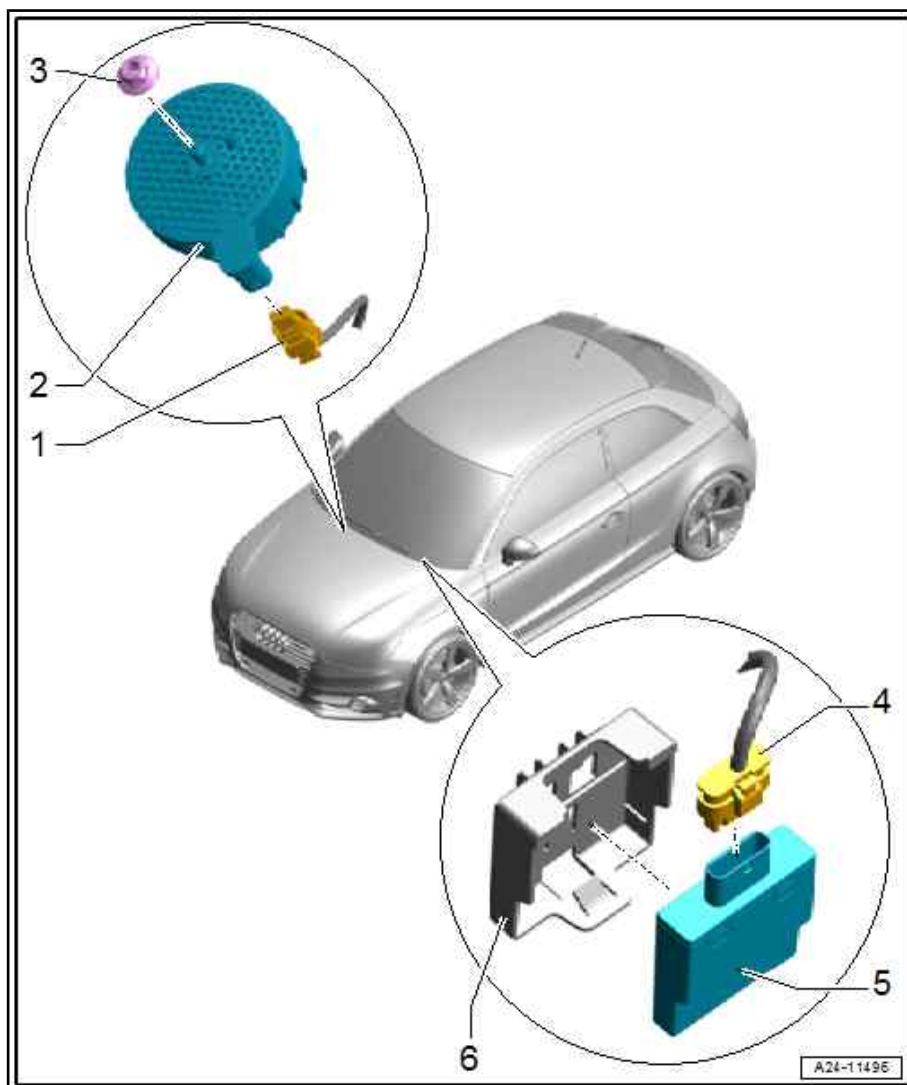
4 - Electrical connector

5 - Control unit for structure-borne sound - J869-

- ☐ Fitting location up to 04.11.2013: under front passenger's seat
- ☐ Fitting location from 04.11.2013 onwards: behind dash panel cover (driver's side) in centre console
- ☐ Removing and installing
⇒ **"5.2 Removing and installing control unit for structure-borne sound J869", page 260**

6 - Mounting

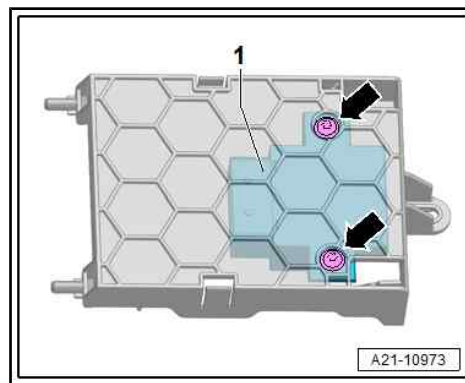
- ☐ For control unit for structure-borne sound - J869-





Control unit for structure-borne sound - J869- up to 4.11.2013 - tightening torque

- Tighten bolts -arrows- for control unit for structure-borne sound - J869- -item 1- to 3 Nm.



5.2 Removing and installing control unit for structure-borne sound - J869-

⇒ [“5.2.1 Removing and installing control unit for structure-borne sound J869 , up to 4.11.2013”, page 260](#)

⇒ [“5.2.2 Removing and installing control unit for structure-borne sound J869 , from 4.11.2013 onwards”, page 261](#)

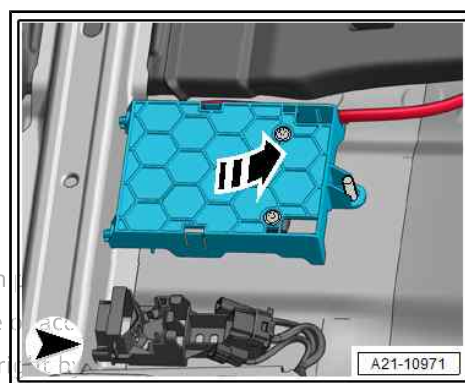
5.2.1 Removing and installing control unit for structure-borne sound - J869- , up to 4.11.2013

Removing

- Remove front passenger's seat ⇒ General body repairs, interior; Rep. gr. 72 ; Front seats; Removing and installing front seat .
- Remove A-pillar trim (bottom) ⇒ General body repairs, interior; Rep. gr. 70 ; Passenger compartment trim panels; Removing and installing A-pillar trim .
- Remove sill panel trim ⇒ General body repairs, interior; Rep. gr. 70 ; Passenger compartment trim panels; Removing and installing sill panel trim .
- Fold back floor covering slightly towards centre of vehicle.
- Detach retainer with control unit for structure-borne sound - J869- upwards from weld stud and from cross member for seat towards front.

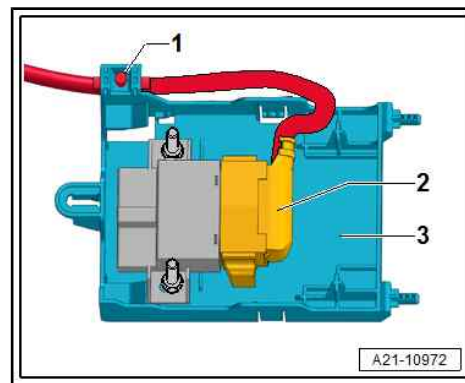


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- Detach cable retainer -1- downwards and unplug electrical connector -2-.
- Remove retainer -3- with control unit for structure-borne sound - J869- .

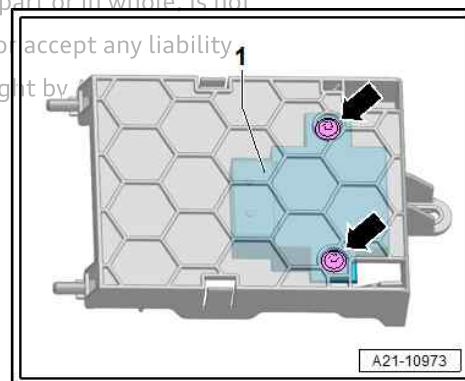


- Remove bolts -arrows- and detach control unit for structure-borne sound - J869- from retainer -1-.

Installing

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

- Unfold and align floor covering.
- Install sill panel trim ⇒ General body repairs, interior; Rep. gr. 70 ; Passenger compartment trim panels; Removing and installing sill panel trim .
- Install A-pillar trim (bottom) ⇒ General body repairs, interior; Rep. gr. 70 ; Passenger compartment trim panels; Removing and installing A-pillar trim .
- Install front passenger's seat ⇒ General body repairs, interior; Rep. gr. 72 ; Front seats; Removing and installing front seat .



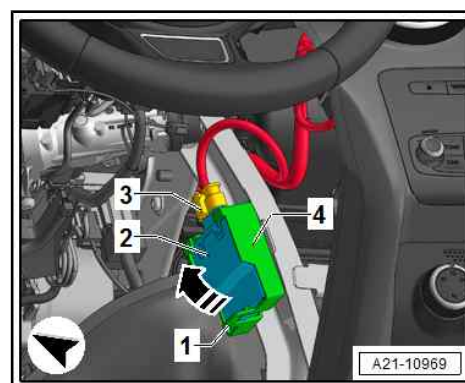
Tightening torques

- ◆ ⇒ Fig. "“ Control unit for structure-borne sound -J869- up to 4.11.2013 - tightening torque”“ , page 260

5.2.2 Removing and installing control unit for structure-borne sound - J869- , from 4.11.2013 onwards

Removing

- Remove dash panel cover (driver side) ⇒ General body repairs, interior; Rep. gr. 68 ; Storage compartments/covers/trim panels; Removing and installing dash panel cover (driver side) .
- Release retaining tab -1- downwards and detach control unit for structure-borne sound - J869- -2- from retainer -4- in direction of -arrow-.
- Release electrical connector -3- and detach from control unit for structure-borne sound - J869- .
- Detach control unit for structure-borne sound - J869- -2-.



Installing

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

- Install dash panel cover (driver side) ⇒ General body repairs, interior; Rep. gr. 68 ; Storage compartments/covers/trim panels; Removing and installing dash panel cover (driver side) .



5.3 Removing and installing actuator for structure-borne sound - R214-

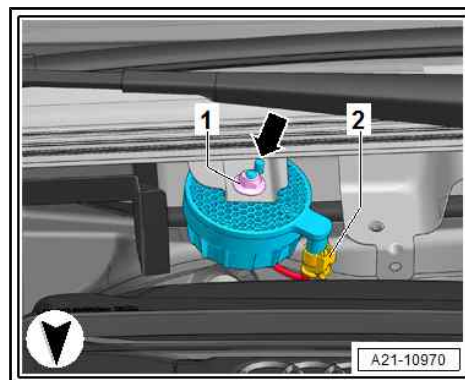
Removing

- Remove wiper arms ⇒ Electrical system; Rep. gr. 92 ; Wind-screen wiper system; Removing and installing wiper arms .
- Remove plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .
- Unscrew nut -1-.
- Detach actuator for structure-borne sound - R214- and disconnect electrical connector -2-.

Installing

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

- Install actuator for structure-borne sound - R214- , ensuring that retaining pin -arrow- fits into hole.
- Install plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover .
- Install wiper arms ⇒ Electrical system; Rep. gr. 92 ; Wind-screen wiper system; Removing and installing wiper arms .



Tightening torques

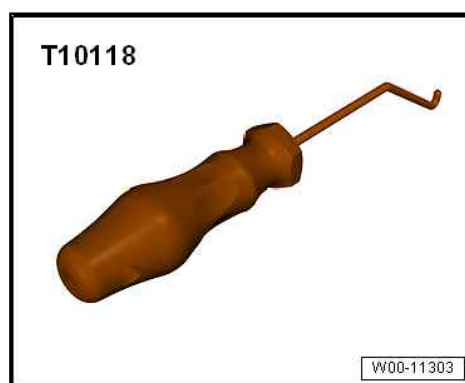
- ♦ ⇒ [“5.1 Exploded view - actuator for structure-borne sound and control unit for structure-borne sound”, page 259](#)

5.4 Removing and installing fuel pressure sender - G247-

If the fuel pressure sender - G247- fails, the fuel pressure regulating valve - N276- is switched off, the electric fuel pump is fully activated and the engine is operated with the fuel pressure which remains. This will reduce engine torque considerably.

Special tools and workshop equipment required

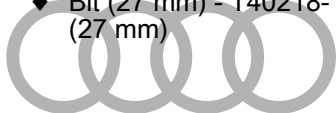
- ♦ Assembly tool - T10118-



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- ◆ Bit (27 mm) - T40218- or commercially available socket (27 mm)



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Removing

- Unplug electrical connector -2- at fuel pressure sender - G247- -1- using assembly tool - T10118- .

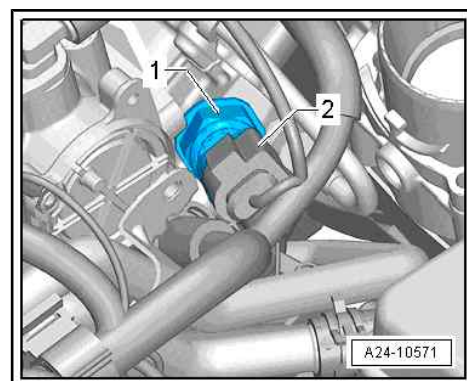


WARNING

The fuel system is pressurised.

Risk of injury as fuel may spray out.

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



- Unscrew fuel pressure sender - G247- -1- using bit, 27 mm - T40218- .

Installing

- Installation is carried out in reverse sequence.

Tightening torques

- ◆ ⇒ [“3.2 Exploded view - intake manifold \(bottom section\) with fuel rail”, page 244](#)



5.5 Removing and installing intake air temperature sender - G42- / intake manifold pressure sender - G71-

Removing

- Unplug electrical connector -1-.
- Unscrew bolts -2- and pull out intake manifold pressure sender - G71- / intake air temperature sender - G42- .

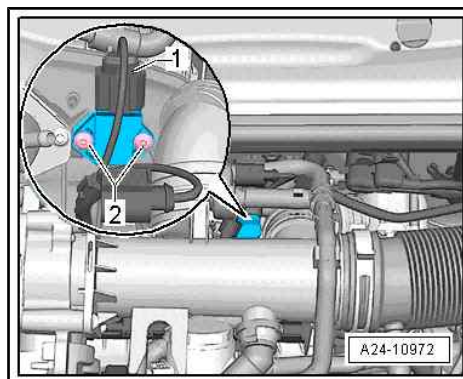
Installing

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



Note

Fit new O-ring.



Tightening torques

- ♦ ➔ [Fig. “Intake air temperature sender -G42- / intake manifold pressure sender -G71- - tightening torque”](#), page 242



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6 High-pressure pump

⇒ [“6.1 Exploded view - high-pressure pump”, page 265](#)

⇒ [“6.2 Removing and installing high-pressure pump”, page 266](#)

6.1 Exploded view - high-pressure pump



Note

Observe installation instructions for high-pressure pump.

1 - Roller tappet

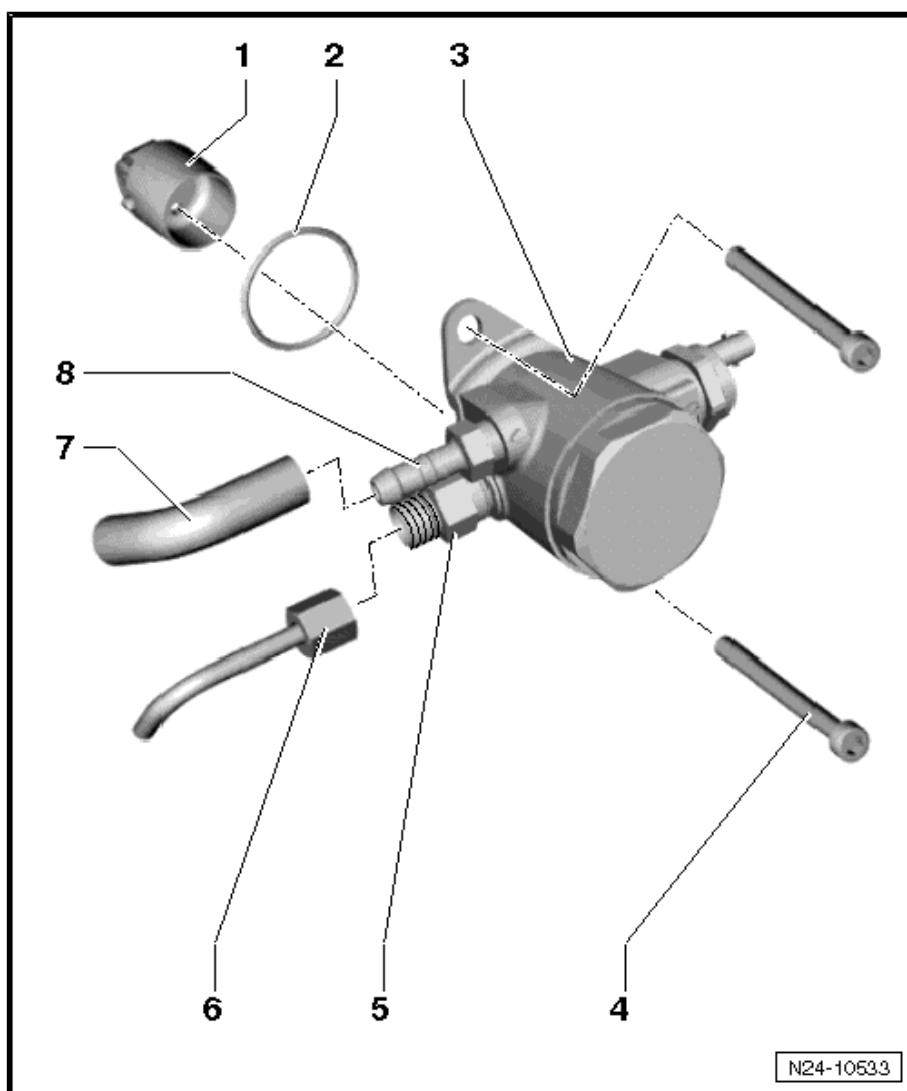
- ☐ May possibly remain lodged in camshaft housing when high-pressure pump is removed
- ☐ When installing lubricate lightly with engine oil

2 - O-ring

- ☐ Renew
- ☐ When installing lubricate lightly with engine oil

3 - High-pressure pump with fuel pressure regulating valve - N276-

- ☐ An electric fuel pump (fitted in fuel tank) supplies fuel to the mechanical high-pressure pump
- ☐ When installing the high-pressure fuel pump, it is essential to ensure that no dirt enters the fuel system.
- ☐ The fuel system must not be under pressure when installing the high-pressure pump.
- ☐ Fuel lines must be free of tension when installed.
- ☐ When connector is unplugged, high-pressure



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pump switches to full delivery (approx. 140 bar)



- ☐ Removing and installing ⇒ [“6.2 Removing and installing high-pressure pump”, page 266](#)

4 - Bolts for high-pressure pump

- ☐ Hand-tighten alternately, then tighten to 5 Nm and finally tighten to final torque
- ☐ Final torque: 20 Nm
- ☐ Do not tilt high-pressure pump

5 - Connection

- ☐ Check tightening torque: 30 Nm

6 - High-pressure pipe

- ☐ Do not alter shape
- ☐ Check for damage before re-installing
- ☐ Lubricate thread of union nut with fuel
- ☐ 15 Nm

7 - Fuel supply line

- ☐ From fuel tank

8 - Connecting piece for fuel supply line from fuel tank

6.2 Removing and installing high-pressure pump

Removing



Note

- ◆ *The high-pressure fuel pump should only be removed and installed when the engine is cold.*
- ◆ *When installing the high-pressure fuel pump, it is essential to ensure that no dirt enters the fuel system.*
- ◆ *Use a cloth to catch escaping fuel.*
- ◆ *The O-ring must always be renewed.*
- ◆ *Always ensure that the high-pressure fuel pipe is free of tension when tightening the connections.*
- Remove engine cover panel
⇒ [“3.1 Removing and installing engine cover panel”, page 36](#).
- Remove intake connecting pipe together with regulating flap control unit - J808-

⇒ "3.7 Removing and installing regulating flap control unit J808"
", page 251 .



WARNING

The fuel system is pressurised.

Risk of injury as fuel may spray out.

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

- Remove union nuts -arrows- at high-pressure pipe, remove bolt -1- from bracket and detach high-pressure pipe.



Note

- ◆ *Do NOT bend open bracket for fuel line.*
- ◆ *If bracket has been bent open or fuel line has to be renewed, bracket must also be renewed.*

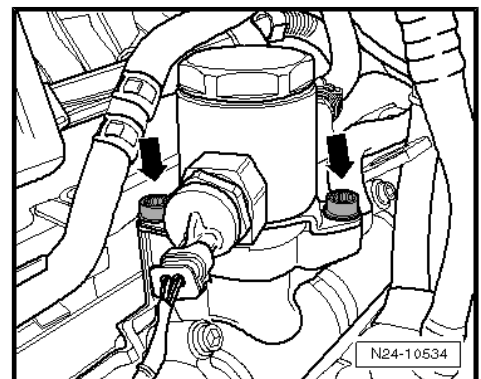
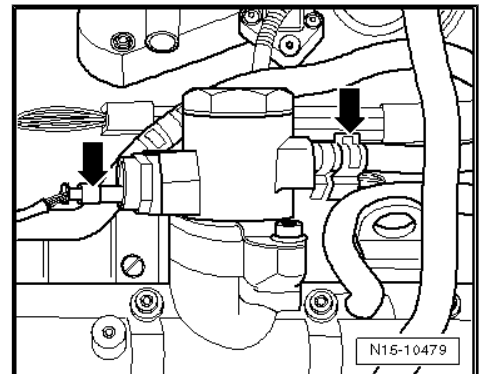
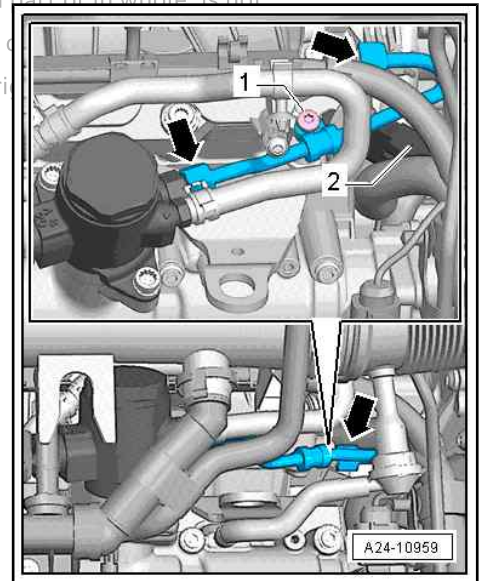
- Detach connector and fuel supply line -arrows- from high-pressure pump.



Note

Use a cloth to catch escaping fuel.

- Unscrew securing bolts -arrows- evenly.





- Pull high-pressure pump -3- and roller tappet -1- out of camshaft housing.



Caution

When removing or installing the high-pressure pump, take hold of it only by the housing.

If the piston spring assembly of the high-pressure pump comes loose, the high-pressure pump will leak and must be renewed.

Installing



Note

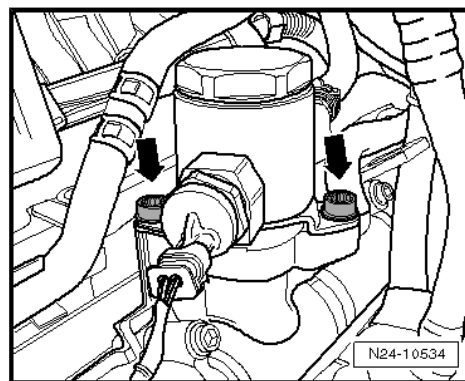
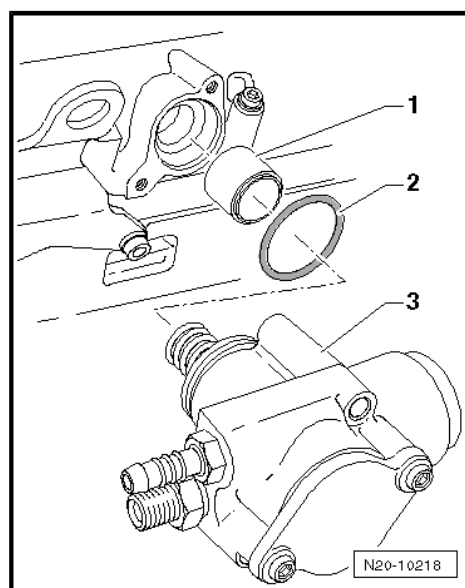
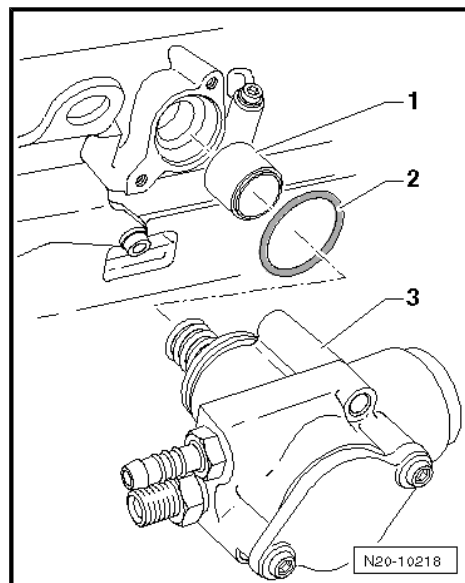
Renew O-ring for high-pressure pump.

- Check roller tappet for damage and renew if necessary.
- Lubricate roller tappet -1- with clean engine oil.
- Insert lubricated roller tappet -1- into camshaft housing.
- Turn crankshaft in direction of engine rotation until roller tappet is positioned at lowest point.
- Renew connecting piece for high-pressure pipe at high-pressure pump.
- Insert a new, oiled O-ring -2- into groove on high-pressure pump -3-.
- Carefully insert high-pressure pump -3-.
- Press high-pressure pump down by hand as far as possible onto stop.

- At the same time, tighten securing bolts -arrows- by hand.
- Then tighten securing bolts -arrows- alternately to 5 Nm (do not tilt high-pressure pump).
- Now tighten securing bolts -arrows- alternately to final torque.

Fitting instructions for high-pressure pipe: (install free of stress)

- Screw in union nuts on high-pressure pipe (two threads by hand).
- Tighten both union nuts on high-pressure pipe as far as stop.
- Tighten bolt for bracket to 8 Nm.
- Tighten both union nuts on high-pressure pipe to specified torque.



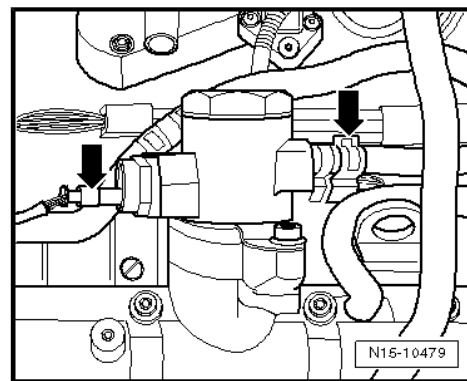


- Re-connect fuel supply line -right arrow- to high-pressure pump (make sure it is securely fitted).
- Plug electrical connector -left arrow- in again at fuel pressure regulating valve - N276- .
- Install intake connecting pipe together with regulating flap control unit - J808-
⇒ [“3.7 Removing and installing regulating flap control unit J808”](#), page 251 .



Note

Check fuel system for leaks.



Tightening torques

- ◆ ⇒ [“6.1 Exploded view - high-pressure pump”](#), page 265

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-

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Removing



WARNING

The fuel system is pressurised.
Risk of injury as fuel may spray out.

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

- Remove union nuts -arrows- at high-pressure pipe, remove bolt -1- from bracket and detach high-pressure pipe.

Installing

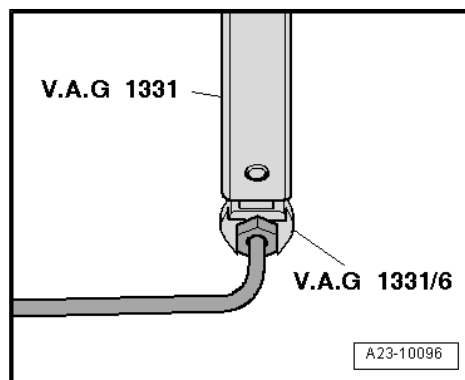
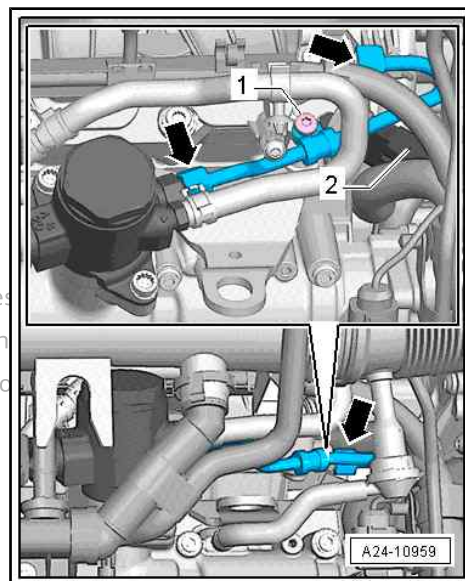


Note

- ◆ **Do NOT bend open bracket for fuel line.**
- ◆ **If bracket has been bent open or fuel line has to be renewed, bracket must also be renewed.**
- ◆ **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.

Tightening torques

- ◆ ⇒ [“6.1 Exploded view - high-pressure pump”, page 265](#)





7 Lambda probe

⇒ [“7.1 Exploded view - Lambda probe”, page 271](#)

⇒ [“7.2 Removing and installing Lambda probe”, page 272](#)

7.1 Exploded view - Lambda probe

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Note

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- ◆ *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- ◆ *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the Lambda probe body. High-temperature paste ⇒ [Parts catalogue](#)*
- ◆ *When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*

1 - Lambda probe after catalytic converter - G130-

- ☐ With Lambda probe 1 heater after catalytic converter - Z29-
- ☐ Removing and installing
⇒ [“7.2.1 Removing and installing Lambda probe G39”, page 272](#)
- ☐ 55 Nm

2 - Lambda probe - G39-

- ☐ With Lambda probe heater - Z19-
- ☐ Removing and installing
⇒ [“7.2.1 Removing and installing Lambda probe G39”, page 272](#)
- ☐ 55 Nm

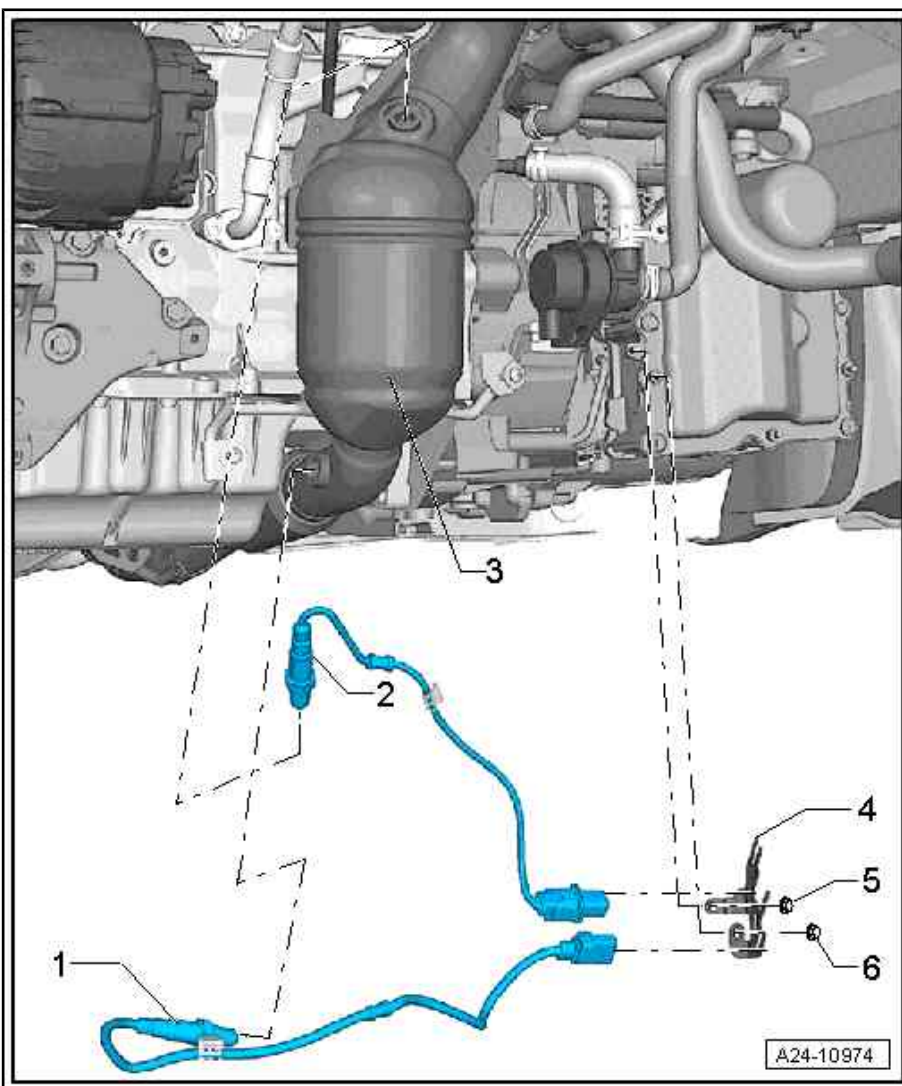
3 - Catalytic converter

4 - Bracket

- ☐ For electrical connectors

5 - Nut

6 - Nut





7.2 Removing and installing Lambda probe

⇒ [“7.2.1 Removing and installing Lambda probe G39”, page 272](#)

⇒ [“7.2.2 Removing and installing Lambda probe after catalytic converter G130”, page 272](#)

7.2.1 Removing and installing Lambda probe - G39-

Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set - 3337-

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Removing

- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .
- Unplug electrical connector -2- for Lambda probe - G39- .
- Unscrew Lambda probe - G39- -1- using tool from Lambda probe open ring spanner set - 3337- .

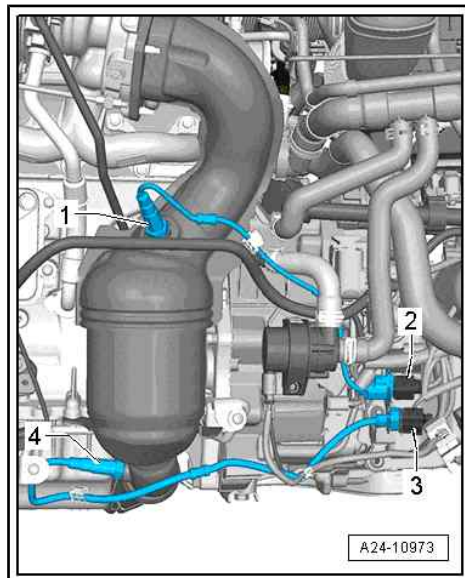
Installing

When installing, note the following:



Note

- ◆ *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- ◆ *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the Lambda probe body. High-temperature paste ⇒ Parts catalogue*
- ◆ *When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*



Tightening torques

- ◆ ⇒ [“7.1 Exploded view - Lambda probe”, page 271](#)
- ◆ ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

7.2.2 Removing and installing Lambda probe after catalytic converter - G130-

Special tools and workshop equipment required



- ◆ Lambda probe open ring spanner set - 3337-



Removing

- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation, Removing and installing noise insulation
- Unplug connector -3- for Lambda probe after catalytic converter - G130- .
- Unscrew Lambda probe after catalytic converter - G130- -4- using tool from Lambda probe open ring spanner set - 3337- .

Installing

When installing, note the following:

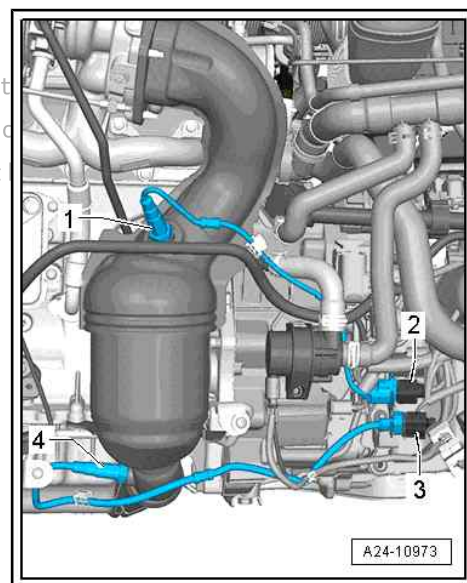
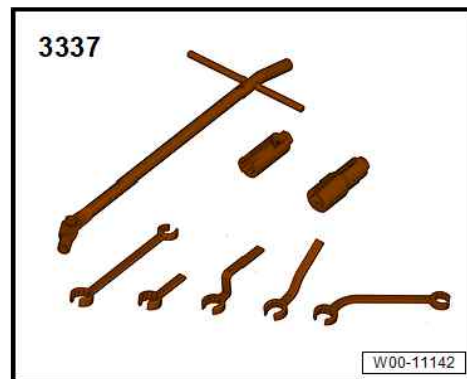


Note

- ◆ *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- ◆ *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the Lambda probe body. High-temperature paste ⇒ Parts catalogue*
- ◆ *When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*

Tightening torques

- ◆ ⇒ [“7.1 Exploded view - Lambda probe”, page 271](#)
- ◆ ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation





8 Engine control unit

⇒ ["8.1 Wiring and component check with test box", page 274](#)

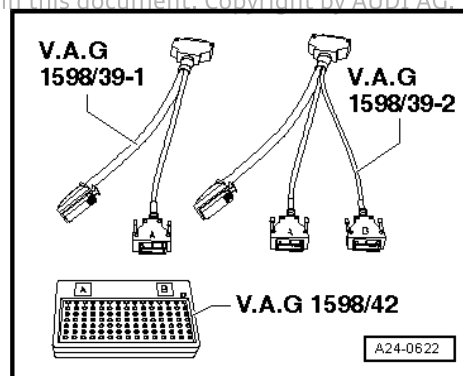
⇒ ["8.2 Removing and installing engine/motor control unit J623 ", page 275](#)

8.1 Wiring and component check with test box

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Special tools and workshop equipment required

- ◆ Adapter cable - V.A.G 1598/39-



- ◆ Test box - V.A.G 1598/42-
- ◆ Vehicle diagnostic tester



Note

- ◆ The test box - V.A.G 1598/42- has 105 sockets. It can be connected to the engine control unit via 2 different adapter cables.
- ◆ Each engine control unit is connected to the vehicle's wiring harness via two connectors, one of which has 60 pins, the other has 94 pins.
- ◆ To carry out tests on the 60-pin wiring harness connector, the adapter cable - V.A.G 1598/39-1- is connected to connector -A- on the test box. For components connected to 60-pin wiring harness connector ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- ◆ To carry out tests on the 94-pin wiring harness connector, the adapter cable - V.A.G 1598/39-2- must be connected to connectors -A- and -B- on the test box. For components connected to 94-pin wiring harness connector ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- ◆ The test box - V.A.G 1598/42- is designed so it can be connected both to the wiring harness for the engine control unit and to the engine control unit itself at the same time. The advantage of this is that the electronic engine control system remains fully functional when the test box is connected (for example, for measuring signals when the engine is running).
- ◆ Always use auxiliary measuring set - V.A.G 1527B- to connect test equipment (e.g. voltage tester - V.A.G 1526D- , hand-held multimeter - V.A.G 1594C- etc.).

The engine control unit has to be removed before connectors can be unplugged from engine control unit

⇒ ["8.2 Removing and installing engine/motor control unit J623 ", page 275](#) .



Caution

Risk of irreparable damage to electronic components.

- ◆ **Select the appropriate measuring range before connecting the test leads and observe test requirements.**

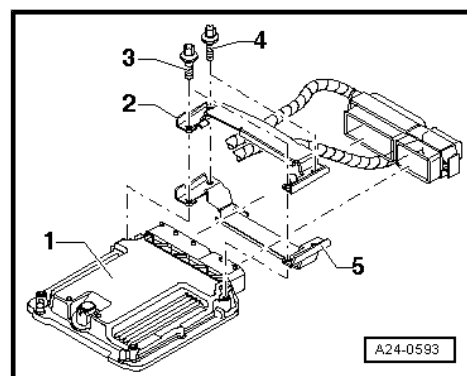
- Connect test box - V.A.G 1598/42- to wiring harness with adapter cable - V.A.G 1598/39-1- or adapter cable - V.A.G 1598/39-2- . Connect earth clip of test box to negative terminal of battery. The instructions for performing the individual tests indicate whether or not the engine control unit itself also needs to be connected to the test box.
- Carry out test as described in repair procedure.
- Make sure you fit protective housing back on engine control unit.
- 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.
- Interrogate event memory and erase if necessary.

8.2 Removing and installing engine/motor control unit - J623-



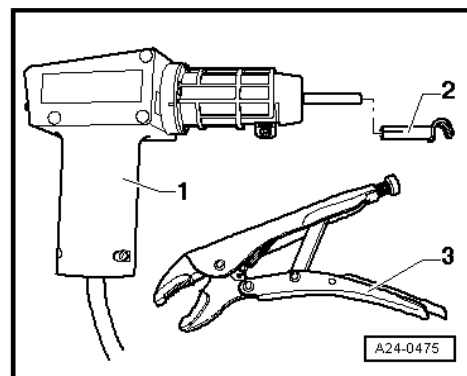
Note

- ◆ *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 -1- is bolted to the protective housing -5-. To make it more difficult to unscrew the shear bolts -4- for locking plate -2-, their threads have been coated with locking fluid.*
- ◆ *The 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-

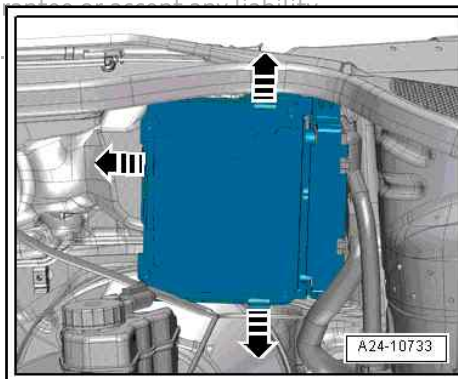


- ◆ Small mole grips -3- (commercially available)



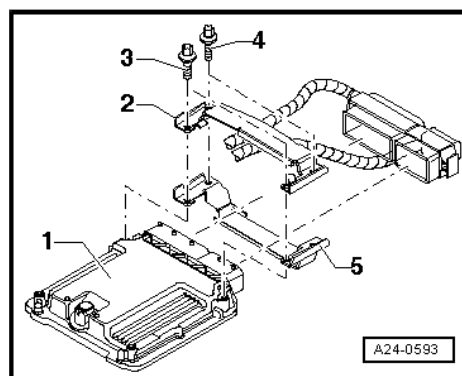
Removing

- When renewing engine control unit, select diagnosis object "Replace engine control unit" in "Guided Functions" mode of ⇒ Vehicle diagnostic tester.
- Switch off ignition and remove ignition key.
- Remove air cleaner housing
⇒ ["2.2 Removing and installing air cleaner housing"](#), page 239.
- Release fasteners -arrows- and detach engine control unit - J623- from bracket.



Note

- ◆ The threads of the two shear bolts -4- which are not screwed into the engine control unit -1- are secured with locking fluid. To unscrew these two bolts, the threads must therefore be heated with the hot air blower.
- ◆ The threads of the two shear bolts -3- which are screwed into the engine control unit are not secured with locking fluid. Do not apply heat to the threads in the control unit housing; this is not necessary and would cause overheating of the control unit.



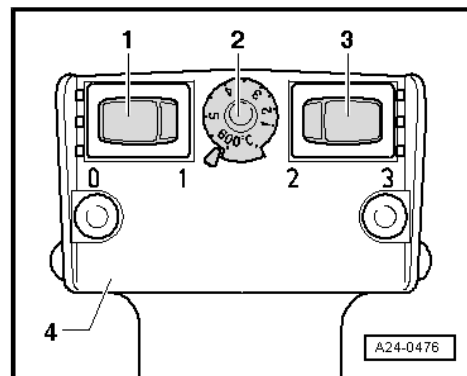


Caution

Wiring, connectors, insulation and control units can be burnt and damaged.

- ◆ *Keep exactly to the following procedure. Observe operating instructions for hot air blower.*

- Select settings on hot air blower -4- as shown in illustration:
- 2 - Temperature potentiometer to maximum heat output
- 3 - Two-stage air flow switch to position "3"



Note

- ◆ *Then use hot air blower to heat threaded holes in protective housing into which shear bolts have been screwed. This reduces the inhibiting action of the locking fluid on the shear bolt threads and makes it easier to unscrew these bolts.*
- ◆ *Cover up all painted parts to avoid any damage caused by hot air blower or vice-grip pliers.*



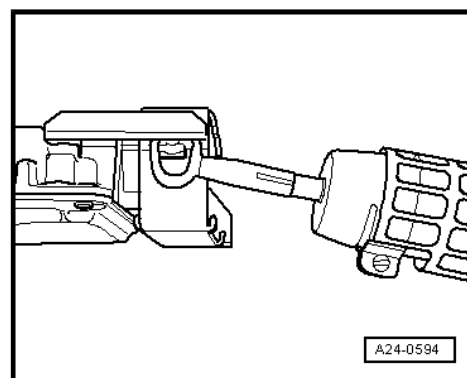
WARNING

Risk of burns.

- ◆ *Parts of the metal locking plate will become very hot as a result of heating the shear bolts. Try to ensure that only the thread is heated and none of the nearby components. These should be covered if necessary.*

Apply heat to the threads of the shear bolts on the connector side as shown in the illustration.

Switch on the hot air blower and heat the bolt for approximately 20 ... 30 seconds.



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- Then grasp bolt head with vice-grip pliers and unscrew shear bolt.
- Repeat procedure for second shear bolt.
- Detach protective housing from multi-pin connectors.
- Unscrew the two shear bolts screwed into the engine control unit (they do not need to be heated).

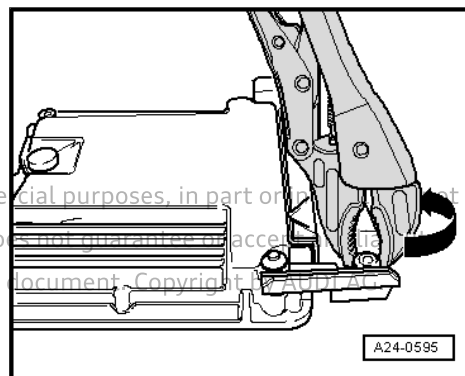
Installing

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

- After installation, the protective housing must be re-fitted on the engine control unit - J623- .
- Clean threaded holes for shear bolts to remove any residue from locking fluid. This can be done using a thread tap.
- Always use new shear bolts.

After installing a new engine control unit, the following operation must be performed:

- Activate engine control unit using ⇒ Vehicle diagnostic tester in “Guided Functions” mode, “Replace engine control unit”.





26 – Exhaust system

1 Exhaust pipes/silencers

⇒ ["1.1 Exploded view - silencers", page 279](#)

⇒ ["1.2 Stress-free alignment of exhaust system", page 280](#)

⇒ ["1.3 Checking exhaust system for leaks", page 281](#)

1.1 Exploded view - silencers



Note

The exhaust manifold and the turbocharger are combined as one unit; removing and installing

⇒ ["1.2 Removing and installing turbocharger", page 206](#).

1 - Bolt

- ☐ 23 Nm

2 - Rubber mounting

- ☐ Renew if damaged

3 - Rear silencer

- ☐ Align exhaust system so it is free of stress
⇒ ["1.2 Stress-free alignment of exhaust system", page 280](#)

4 - Rubber mounting

- ☐ Renew if damaged

5 - Bolt

- ☐ Tightening sequence
⇒ [page 285](#)
- ☐ 23 Nm

6 - Retainer

- ☐ For air pipe

7 - Turbocharger

8 - Gasket

- ☐ Renew

9 - Nut

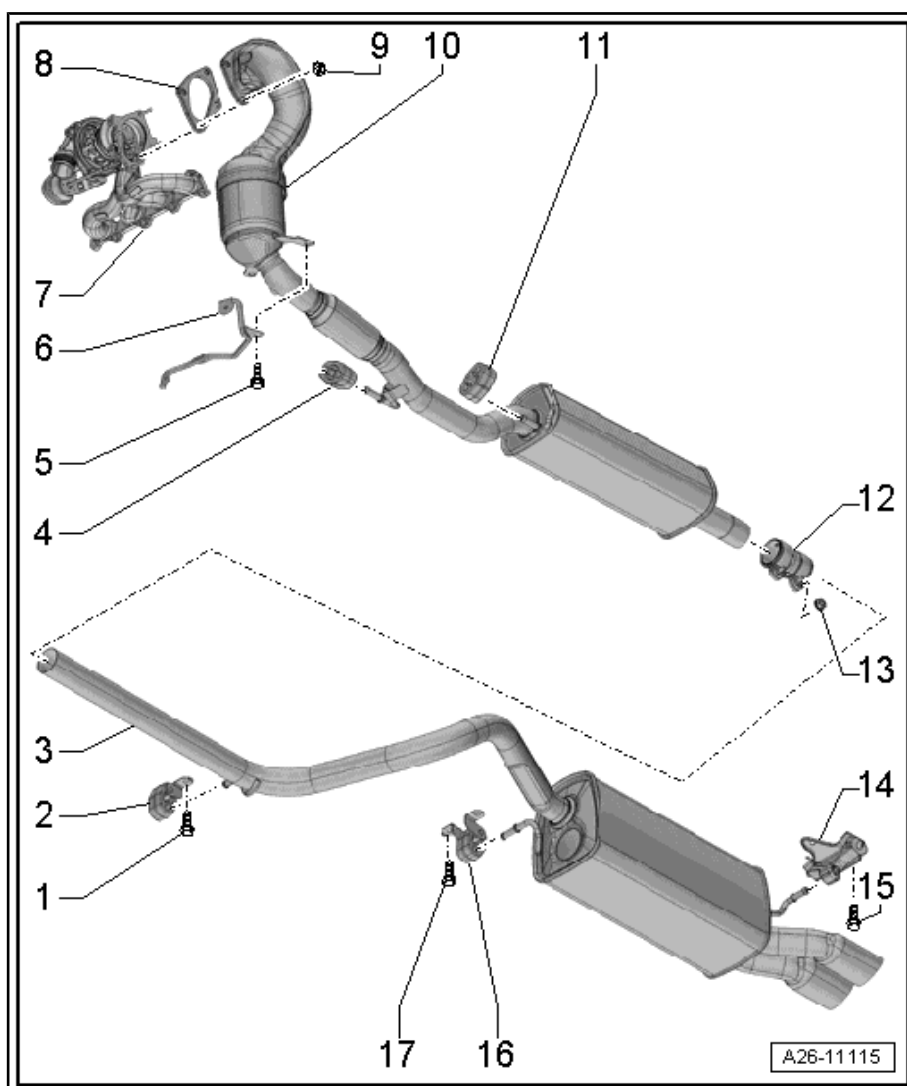
- ☐ Tightening sequence
⇒ [page 285](#)
- ☐ 23 Nm

10 - Catalytic converter with centre silencer

- ☐ Protect against knocks and impact
- ☐ Removing and installing
⇒ ["2.1 Removing and installing catalytic converter", page 282](#)

11 - Rubber mounting

- ☐ Renew if damaged





12 - Clamp

- ☐ Before tightening, align exhaust system so it is free of stress
⇒ [“1.2 Stress-free alignment of exhaust system”, page 280](#)
- ☐ Installation position ⇒ [Fig. “Installation position of clamp”](#), page 280
- ☐ Tighten bolted connections evenly

13 - Nut

- ☐ 23 Nm

14 - Rubber mounting

- ☐ Renew if damaged

15 - Bolt

- ☐ 23 Nm

16 - Rubber mounting

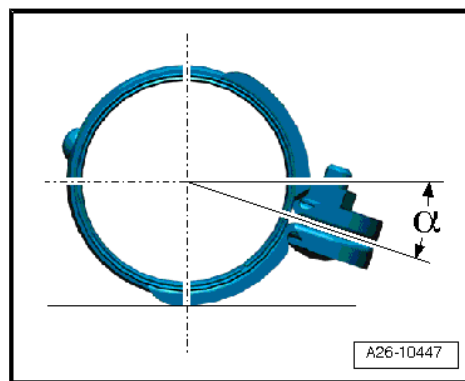
- ☐ Renew if damaged

17 - Bolt

- ☐ 23 Nm

Installation position of clamp

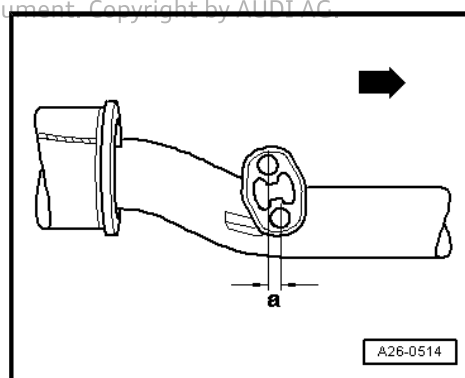
- Fit the clamp at the angle shown.
- Bolted connections face to right.
- Nuts face upwards.
- α = approx. 20°



1.2 Stress-free alignment of exhaust system

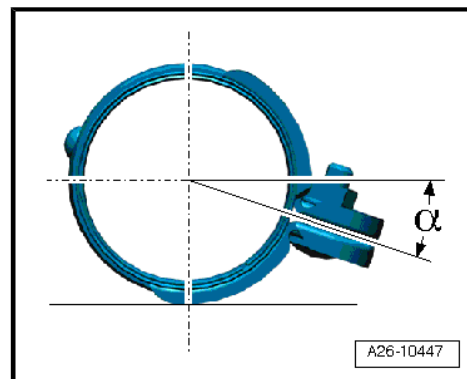
Procedure

- The exhaust system must be aligned when it is cool.
- Loosen bolted connections on front clamp.
- Push rear section of exhaust system towards front of vehicle -arrow-, so that rear mounting for centre silencer is preloaded by $-a = 13 \dots 17 \text{ mm}$.

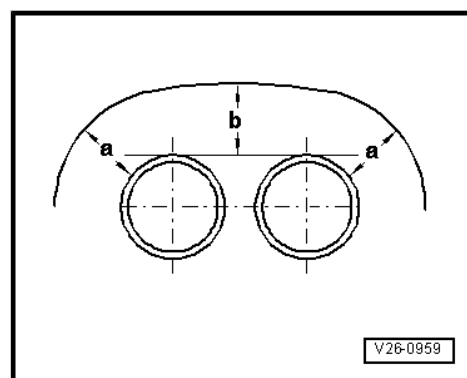




- Fit the clamp at the angle shown.
- Bolted connections face to right.
- Nuts face upwards.
- $\alpha = \text{approx. } 20^\circ$



- Position rear silencer to align tailpipes as follows:
- Distance between tailpipes and bumper cut-out must be equal on both sides.
- Distance -a- is the same on both sides.
- At the same time, specified clearance must be maintained between bumper cut-out and top of tailpipes.
- Distance -b- = 21 mm.
- If necessary, unfasten rear silencer mounting to align tailpipes.



Tightening torques

- ◆ ⇒ ["1.1 Exploded view - silencers", page 279](#)

1.3 Checking exhaust system for leaks

Procedure

- Start the engine and run at idling speed.
- Plug tailpipes during leak test (e.g. with cloth or plugs).
- Listen for leaks at joints between cylinder head and exhaust manifold with turbocharger, exhaust manifold/turbocharger and front exhaust pipe, etc.
- Rectify any leaks that are found.



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2 Emission control system

⇒ ["2.1 Removing and installing catalytic converter", page 282](#)

2.1 Removing and installing catalytic converter

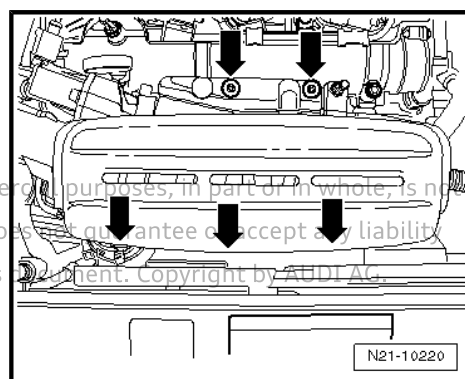


Note

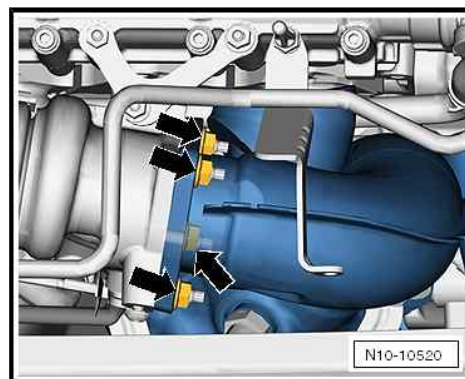
The catalytic converter and centre silencer must be removed together.

Removing

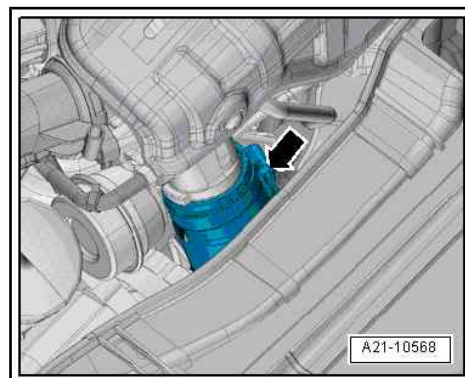
- Remove engine cover panel
⇒ ["3.1 Removing and installing engine cover panel", page 36](#).
- Remove bolts -arrows- and detach heat shield for turbocharger.



- Remove nuts -arrows- for catalytic converter.



- Release hose clip -arrow- on turbocharger.





- Detach electrical connectors from bracket and unplug.
- 3 - For Lambda probe after catalytic converter - G130-
- 4 - For Lambda probe - G39-



Note

Disregard items -1 and 2-.

Vehicles with air conditioner:

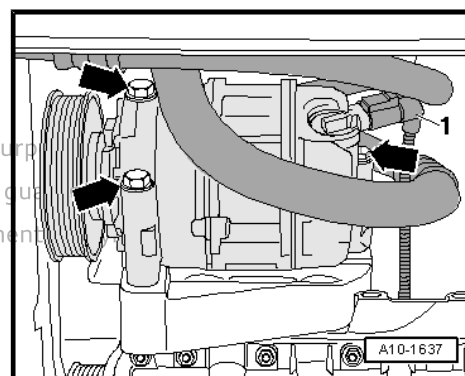
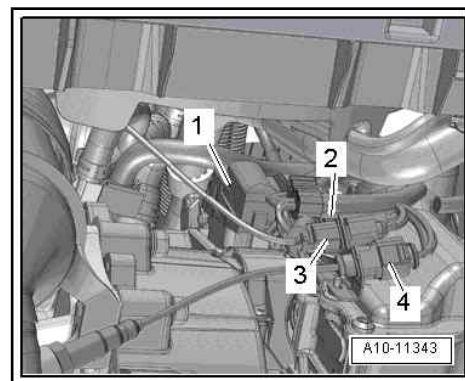
- Remove poly V-belt
⇒ ["1.2.1 Removing and installing poly V-belt for ancillaries", page 40](#).
- Unplug electrical connector -1- for air conditioner compressor regulating valve - N280- at air conditioner compressor.



WARNING

Risk of injury caused by refrigerant.

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



- Remove bolts -arrows- for air conditioner compressor.

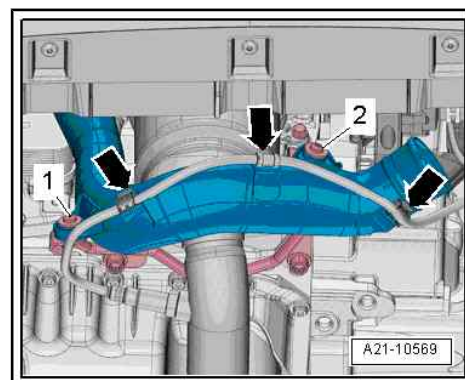


Caution

Risk of damage to refrigerant lines and hoses

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

- Tie up air conditioner compressor together with refrigerant hoses to longitudinal member (refrigerant hoses remain connected).
- Move clear electrical wiring harness leading to alternator at catalytic converter.
- Move electrical wiring harness clear -arrows-.
- Unscrew bolts -1 and 2- and detach air pipe (front).





- Move clear electrical wiring harness leading to alternator at catalytic converter.
- Unscrew bolts -1- and detach bracket for air pipe (front).
- Press mountings -2- for exhaust system off pins.



- Unscrew nuts -arrows- and push clamp towards rear.
- Detach catalytic converter and centre silencer from underneath.

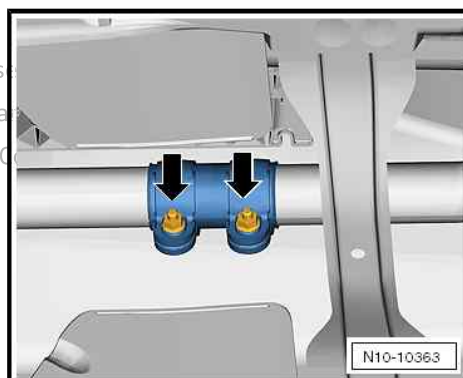
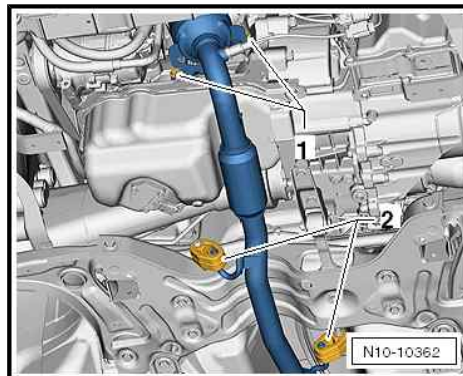
Installing

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



Note

Renew gasket and nuts.





- Note sequence for installing catalytic converter:



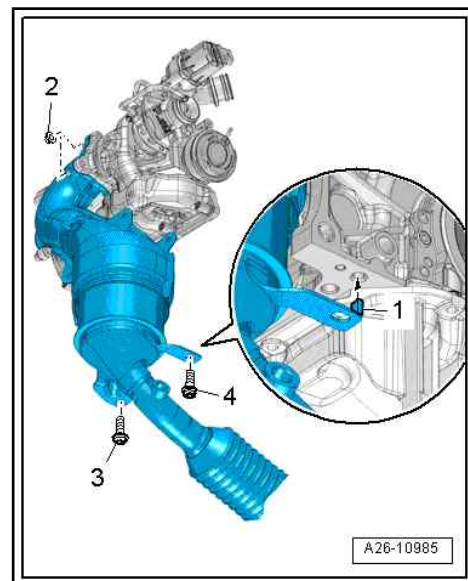
Caution

Risk of damage to flexible joint.

- ◆ **While the catalytic converter is being secured to the engine, a second mechanic must take hold of the centre silencer to take the load off the flexible joint.**

- Secure catalytic converter in 6 stages as follows:

Stage	Bolts/nuts	Tightening torque
1.		Insert centring lug -1- on catalytic converter in hole in cylinder block -arrow-.
2.		Fit catalytic converter onto studs of turbocharger.
3.	-2-	Screw in by hand until contact is made
4.	-3-	Tighten
5.	-4-	Tighten
6.	-2-	Tighten



- Install air pipe (front)
⇒ [“2.1 Exploded view - charge air system”, page 220](#) .
- Install poly V-belt
⇒ [“1.2.1 Removing and installing poly V-belt for ancillaries”, page 40](#) .
- Electrical connections and routing ⇒ [Current flow diagrams](#),
[Electrical fault finding and Fitting locations](#).
- Install heat shield for turbocharger
⇒ [“1.1 Exploded view - turbocharger”, page 203](#) .
- Install air hoses with screw-type clips
⇒ [“2.2 Exploded view - hose connections for charge air system”, page 221](#) .
- Align the exhaust system so it is free of stress
⇒ [“1.2 Stress-free alignment of exhaust system”, page 280](#) .

Tightening torques

- ◆ ⇒ [“1.1 Exploded view - silencers”, page 279](#)
- ◆ ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Exploded view - air conditioner compressor drive unit



3 Exhaust manifold

The exhaust manifold and the turbocharger are combined as one unit; removing and installing

⇒ ["1.2 Removing and installing turbocharger", page 206](#) .



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28 – Ignition system

1 Ignition system

⇒ [“1.1 Exploded view - ignition system”, page 287](#)

⇒ [“1.2 Test data - spark plugs”, page 288](#)

⇒ [“1.3 Removing and installing ignition coils with output stages”, page 288](#)

⇒ [“1.4 Removing and installing knock sensor”, page 290](#)

⇒ [“1.5 Removing and installing Hall senders”, page 291](#)

⇒ [“1.6 Removing and installing engine speed sender G28”, page 291](#)

1.1 Exploded view - ignition system

1 - Spark plug

- ☐ Remove and install with spark plug socket and extension - 3122 B-
⇒ Maintenance ; Book-let 819
- ☐ Change interval ⇒ Maintenance tables
- ☐ Tightening torque
⇒ Maintenance ; Book-let 819

2 - Cable guide

3 - Ignition coil with output stage

- ☐ Ignition coil 1 with output stage - N70-
- ☐ Ignition coil 2 with output stage - N127-
- ☐ Ignition coil 3 with output stage - N291-
- ☐ Ignition coil 4 with output stage - N292-
- ☐ Removing and installing
⇒ [“1.3 Removing and installing ignition coils with output stages”, page 288](#)

4 - Bolt

- ☐ 9 Nm

5 - Hall sender - G40-

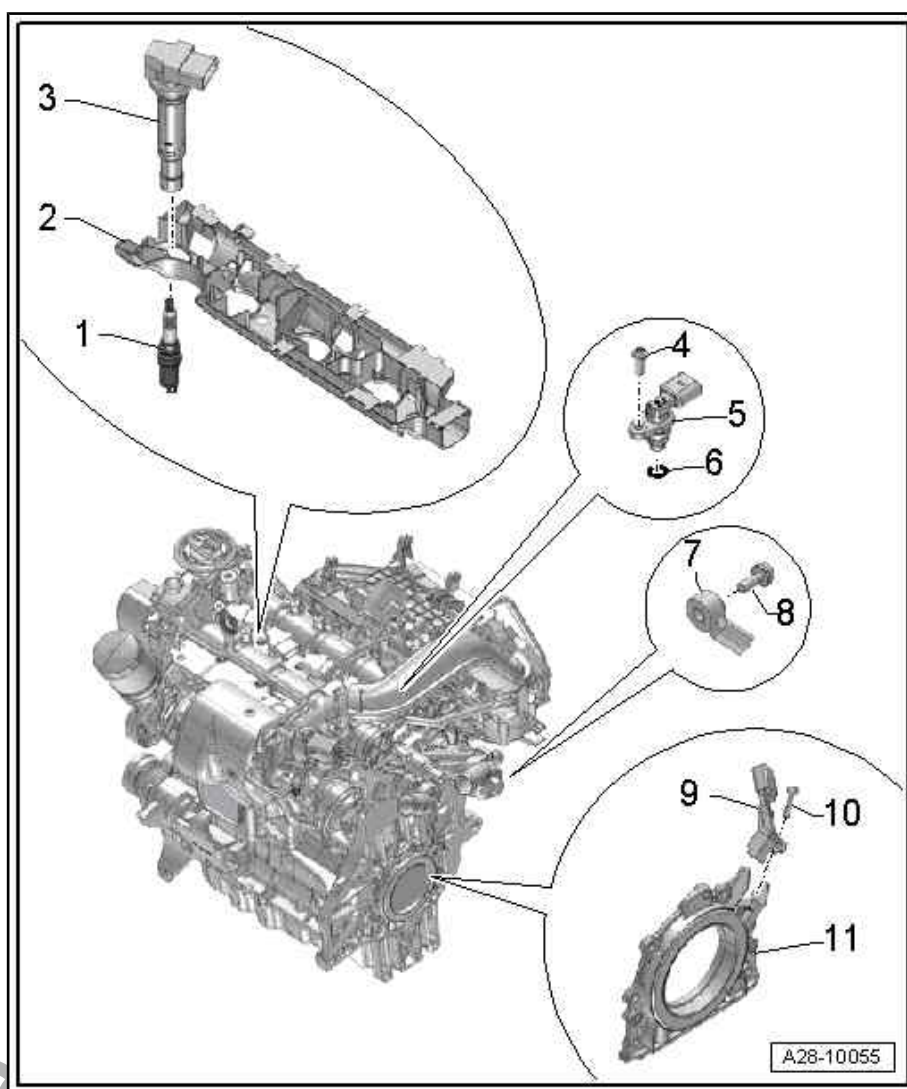
- ☐ Removing and installing
⇒ [“1.5 Removing and installing Hall senders”, page 291](#)

6 - O-ring

- ☐ Renew if damaged

7 - Knock sensor 1 - G61-

- ☐ Removing and installing ⇒ [“1.4 Removing and installing knock sensor”, page 290](#)



A28-10055



8 - Bolt

- ☐ 20 Nm
- ☐ Tightening torque influences the function of the knock sensor

9 - Engine speed sender - G28-

- ☐ Removing and installing ⇒ ["1.6 Removing and installing engine speed sender G28 ", page 291](#)

10 - Bolt

- ☐ 4.5 Nm

11 - Sender wheel

- ☐ For engine speed sender - G28-
- ☐ Removing and installing ⇒ ["2.3 Removing and installing sealing flange \(gearbox end\)", page 61](#)

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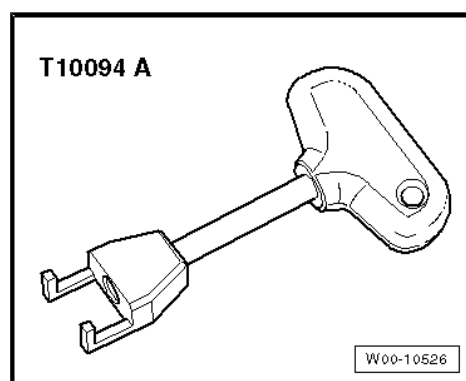
1.2 Test data - spark plugs

1.4 ltr. TFSI engine		
Idling speed		Cannot be adjusted; regulated by idling speed stabilisation
Ignition timing		Cannot be adjusted; determined by control unit
Ignition system		Multi-coil system with 4 ignition coils (output stages integrated) connected directly to spark plugs via spark plug connectors
Spark plugs	Designations	⇒ Electronic parts catalogue
	Tightening torque	⇒ Maintenance ; Booklet 819
Firing order		1-3-4-2

1.3 Removing and installing ignition coils with output stages

Special tools and workshop equipment required

- ◆ Puller - T10094 A-



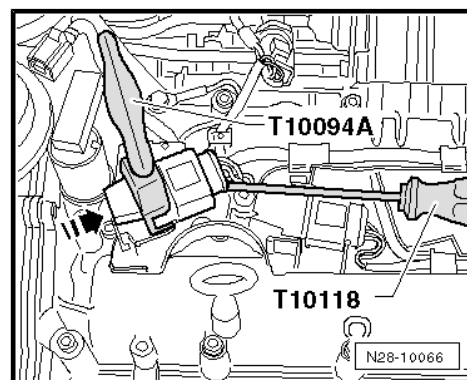
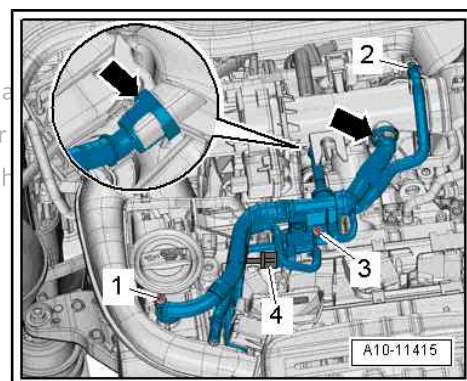
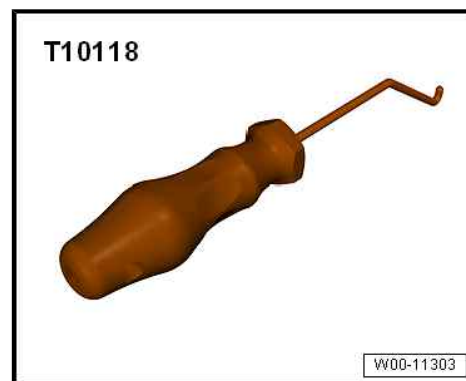


◆ Assembly tool - T10118-



Removing

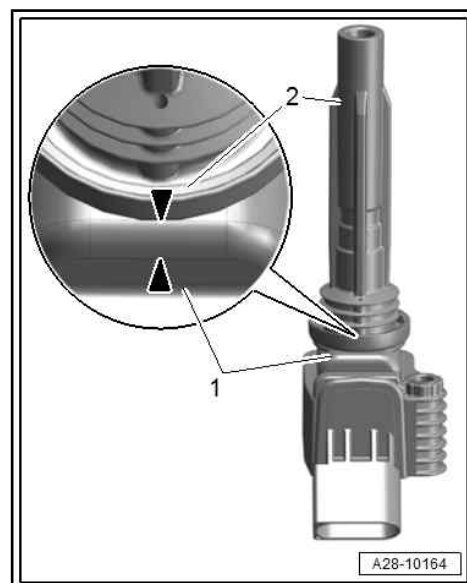
- Remove engine cover panel
 ➤ ["3.1 Removing and installing engine cover panel", page 36](#)
- Unplug electrical connector -4-
- Remove bolts -1, 3-.
- Press release tabs and disconnect crankcase breather hoses -arrows-.
- Release hose clip -2- and disconnect hose at activated charcoal filter.
- Detach hoses and push them to one side.
- Apply puller - T10094 A- to all ignition coils and pull out ignition coils.
- At the same time detach electrical connectors at all ignition coils; to do so apply assembly tool - T10118- as shown and release electrical connectors.



Installing

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

- Push spark plug connector -2- onto ignition coil -1- by hand as far as stop.
- The arrow markings on the spark plug connector and the ignition coil must be aligned, as shown.



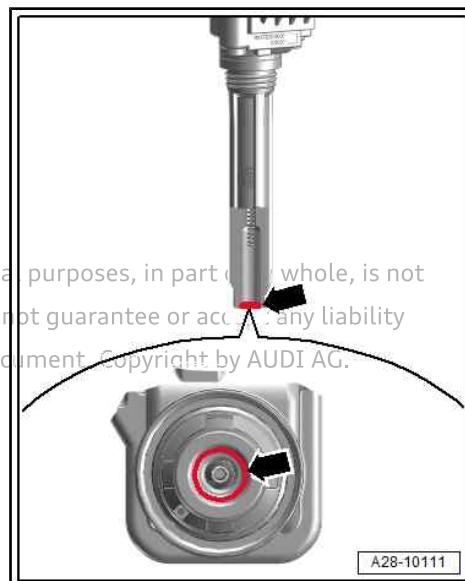


Caution

Ignition coils can be damaged irreparably if the wrong lubricant is used.

- ◆ *Use only the approved silicone paste ⇒ Electronic parts catalogue .*

- Apply a thin bead of silicone paste all around end of sealing hose of ignition coil with output stage -arrow-.
- Fit all ignition coils loosely into spark plug holes.
- Align ignition coils with connectors and attach all connectors onto ignition coils.
- Press ignition coils onto spark plugs by hand with uniform pressure (do not use tools).



1.4 Removing and installing knock sensor

Removing

- Remove intake manifold
⇒ ["3.3 Removing and installing intake manifold \(top section\)", page 245](#) .
- Remove supercharger
⇒ ["3.2 Removing and installing supercharger", page 227](#) .
- Unplug electrical connector -1- at knock sensor 1 - G61- .



Note

Knock sensor 1 - G61- is located below intake manifold and knock sensor 1 - G61- must therefore be removed from below.

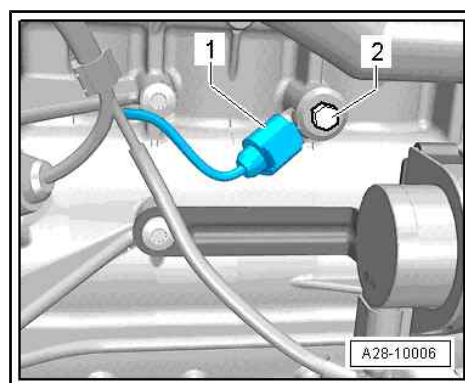
- Remove knock sensor 1 - G61- -2-.

Installing

- Installation is carried out in reverse sequence.
- Install supercharger
⇒ ["3.2 Removing and installing supercharger", page 227](#) .
- Install intake manifold
⇒ ["3.3 Removing and installing intake manifold \(top section\)", page 245](#) .

Tightening torques

- ◆ ⇒ ["1.1 Exploded view - ignition system", page 287](#)





1.5 Removing and installing Hall senders

Removing

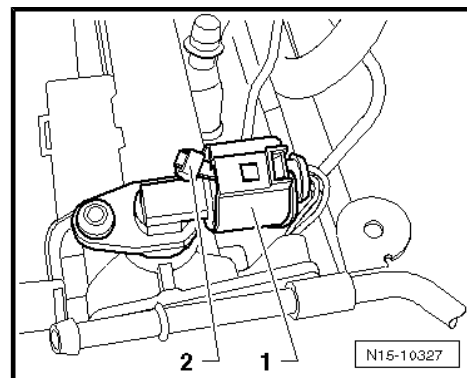
- Remove engine cover panel
⇒ [“3.1 Removing and installing engine cover panel”, page 36](#) .
- Unplug electrical connector -1-.
- Unscrew bolt and remove Hall sender - G40- .

Installing

- Installation is carried out in reverse sequence.

Tightening torques

- ◆ ⇒ [“1.1 Exploded view - ignition system”, page 287](#)



1.6 Removing and installing engine speed sender - G28-

Special tools and workshop equipment required

- ◆ Socket, 4 mm - T10370-

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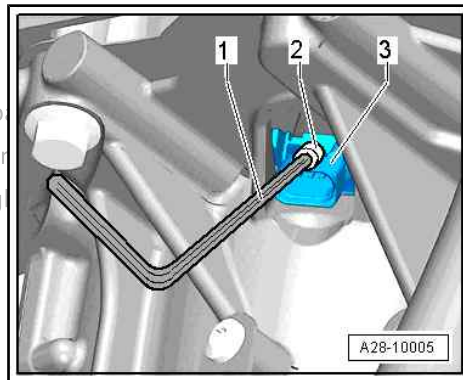
Removing

- Remove intake manifold
⇒ [“3.3 Removing and installing intake manifold \(top section\)”, page 245](#).
- Remove supercharger
⇒ [“3.2 Removing and installing supercharger”, page 227](#).
- Unplug electrical connector for engine speed sender - G28-
-item 3-.
- Unscrew bolt -2- and detach engine speed sender.



Note

If access is difficult, use socket (4 mm) - T10370- .



Installing

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

- Lubricate O-ring with clean engine oil.
- Carefully insert engine speed sender - G28- into guide (do not knock in).
- Install supercharger
⇒ [“3.2 Removing and installing supercharger”, page 227](#) .
- Install intake manifold
⇒ [“3.3 Removing and installing intake manifold \(top section\)”, page 245](#) .

Tightening torques

- ◆ ⇒ [“1.1 Exploded view - ignition system”, page 287](#)