

## Workshop Manual

Ateca 2017 ➤

León 2013 ➤

León ST 2013 ➤

4-cylinder petrol engine (2.0 l with direct injection, 4 V, turbocharger, timing chain, EA 888 III Generation BZ)

Engine ID	CZP B	DKZ A							
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Edition 07.2018

## List of Workshop Manual Repair Groups

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

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4-cylinder petrol engine (2.0 l with direct injection, 4 V, turbocharger, timing chain, EA 888 III  
Generation BZ) - Edition 07.2018

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## 00 – Technical data

### 1 Safety information

(ERL003729; Edition 07.2018)

⇒ [“1.1 Safety regulations for working on fuel supply”, page 1](#)

⇒ [“1.2 Safety precautions for working on vehicles with start-stop system.”, page 1](#)

⇒ [“1.3 Safety precautions when using testers and measuring instruments during a road test”, page 2](#)

⇒ [“1.4 Safety precautions when working on ignition system”, page 2](#)

⇒ [“1.5 Safety precautions when working on the cooling system”, page 2](#)

⇒ [“1.6 Safety precautions when working on exhaust system”, page 2](#)

#### 1.1 Safety regulations for working on fuel supply

**Risk of injury from highly-pressurised fuel.**

The fuel system is pressurised. Injury from fuel spray possible.

Before opening the fuel system:

- Wear safety goggles.
- Wear protective gloves.
- To release pressure, wrap a clean cloth around the connection and carefully loosen the connection.

#### **Danger of fire from escaping fuel**

When the battery is connected and the driver door opens, the door contact switch activates the fuel pump. Escaping fuel can ignite and cause a fire.

- Disconnect voltage supply to fuel pump before opening the fuel system.

#### 1.2 Safety precautions for working on vehicles with start-stop system.

**Risk of injury due to unexpected motor start**

If the vehicle's start/stop system is activated, the engine can start unexpectedly. A message in the dash panel insert indicates whether the Start/Stop system is activated.

- Deactivate Start/Stop system by switching off the ignition

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

### Risk of injury due to unsecured test and measuring equipment

If a front passenger airbag is triggered during an accident, unsecured test and measuring equipment can become dangerous projectiles.

- Secure test and measuring equipment with seat belts on the rear seat.

Or

- Have a second person operate test and measuring equipment on the rear seat.

## 1.4 Safety precautions when working on ignition system

### Risk of injury due to electric shock

The ignition system is under high voltage when the engine is running. Touching the ignition system may result in an electric shock.

- Do not touch or disconnect ignition cables when the engine is running or being turned at starter speed.



### WARNING

#### Risk of damage to components

If the engine is washed or if electric cables are connected or disconnected while the engine is running, components may be damaged.

- Switch off the ignition before connecting or disconnecting electric cables.
- Switch off the ignition before washing the engine.

## 1.5 Safety precautions when working on the cooling system

### Scalding through hot coolant

On a warm engine, the cooling system is under high pressure. Danger of scalding due to steam and hot coolant.

- Wear protective gloves.
- Wear protective goggles.
- Reduce excess pressure by covering cap of coolant expansion tank with a cloth and opening it carefully.

## 1.6 Safety precautions when working on exhaust system

### Risk of poisoning due to chemical substances

Exhaust gas temperature sensors may contain chemical substances. There is a risk of poisoning or injuries to respiratory system.

- Never open an exhaust gas temperature sender by cutting, sawing or any other means.

**Risk of injury due to hot condensate and particles in the exhaust system.**

The exhaust system could contain hot condensate and/or particles. There is a risk of injury to the eyes, skin and respiratory system, as well as poisoning.

- Always wear protective gloves and eye protection when cutting the exhaust system.
- When cutting, use an extraction system or otherwise ensure sufficient ventilation.

## 2 Identification

⇒ **“2.1 Engine identification number/engine data”, page 4**

### 2.1 Engine identification number/engine data

#### Engine number

The engine number (“code letters” and “serial number”) can be found at the joint between the engine and gearbox.

The engine code is also stamped on the cylinder block behind the oil filter.

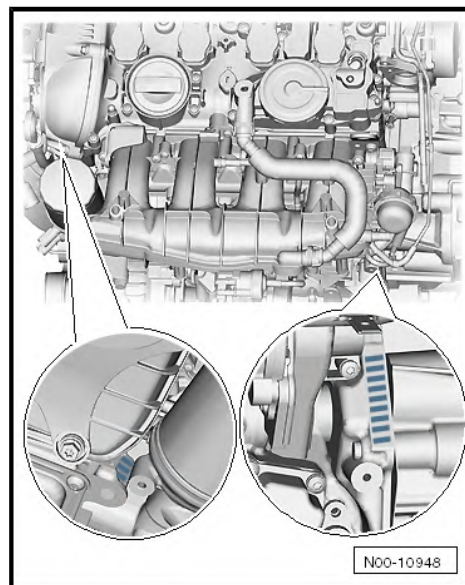
In addition, there is a sticker on the right of the timing chain cover with “engine code” and “serial number”.

The first 3 digits denote the mechanical design of the engine and are stamped on the engine. The fourth place shows the engine output and torque and varies according to engine control unit. The four-character engine code can be found on the identification plate as well as on the vehicle data sticker. It can also be read from the engine control unit.



#### Note

*Fitting locations of vehicle data sticker ⇒ Maintenance ; Booklet KH1 ; Vehicle data sticker .*



#### Engine data

Code	CZPB	DKZA
Exhaust emissions fulfil	EU6	EU6
Displacement l	2.0	2.0
Power kW at rpm	140 at 4200 to 6000	140 at 4200 to 6000
Rotation Nm at rpm	320 at 1450 to 4200	320 at 1500 to 4100
Cylinder bore Diameter, mm	82.5	82.5
Stroke mm	92.8	92.8
Compression ratio	11.65:1	11.65:1
RON	95	95
Injection system	Direct injection and intake manifold injection	Direct injection and intake manifold injection
Firing order	1-3-4-2	1-3-4-2
Charging	Turbocharged	Turbocharged
Camshaft timing adjustment	yes	yes
Variable valve timing	Inlet side	Inlet side
Secondary air injection	No	No
Valves per cylinder	4	4
Particulate filter	No	yes
Oil pressure control	yes	yes

Volkswagen Technical Site: <http://vwts.ru> <http://vwts.info>



## 3 Repair notes

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

⇒ [“3.2 Foreign objects in engine”, page 5](#)

⇒ [“3.3 Contact corrosion”, page 5](#)

⇒ [“3.4 Routing and attachment of lines”, page 5](#)

⇒ [“3.5 Fitting radiator and condensers”, page 6](#)

⇒ [“3.6 Checking vacuum system”, page 6](#)

### 3.1 Rules for cleanliness

Even slight soiling can cause faults. Following the following rules for cleanliness when working on the fuel supply system and injection system or on the turbocharger:

- ◆ Thoroughly clean connections and the surrounding areas with engine cleaner or brake cleaner, and dry the cleaned areas thoroughly.
- ◆ Seal off open pipes/lines and connections immediately with clean plugs, e.g. from engine sealing cap set - VAS 6122- .
- ◆ Place removed parts on a clean surface. Cover with lint-free cloths only.
- ◆ If repair work cannot be performed immediately, cover new parts which have been removed from their packing.
- ◆ Only install clean components: Only unpack replacement parts immediately prior to installation. Do not fit parts that have been stored unpackaged (e.g. in tool boxes etc.).
- ◆ When the system is open, do not work with compressed air or move the vehicle.
- ◆ Make sure that no fuel gets onto the fuel hoses. Should this occur, the fuel hoses must be cleaned immediately.
- ◆ Protect disconnected electrical connectors from dirt and water, and only reconnect them in dry condition.

### 3.2 Foreign objects in engine

- ◆ Before working on the engine, all open inlet and exhaust ports must be sealed with suitable plugs (from engine bung set - VAS 6122- ) to prevent foreign particles from entering the engine.

### 3.3 Contact corrosion

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

For this reason, only connecting elements with a special surface coating have been fitted.

In addition, rubber, plastic and adhesives are made of non-conductive materials.

If there is any doubt about the suitability of parts, a general rule is to use new parts ⇒ Electronic Parts Catalogue (ETKA) .

### 3.4 Routing and attachment of lines

- ◆ Mark fuel lines, vacuum lines, pipes/hoses for activated charcoal filter system and electrical wiring etc. before removal so they can be re-installed in the original positions and correctly connected. If necessary, take a photo or make a sketch.

- ◆ Because of the limited space in the engine compartment, ensure sufficient clearance to all moving or hot components to prevent damage to the lines.

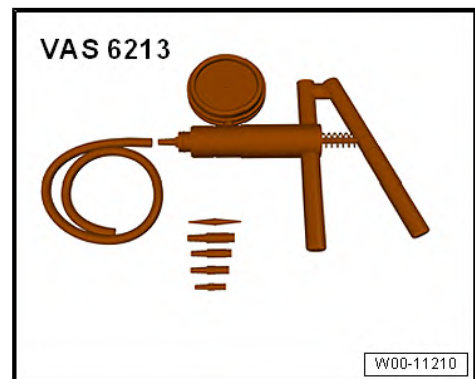
### 3.5 Fitting radiator and condensers

Even if installed correctly, the radiator, the condenser and the charge air cooler may have small dents in their fins. This does not mean that these components have been damaged. It is not permissible to renew radiators, condensers or charge air coolers only because of such minor dents.

### 3.6 Checking vacuum system

#### Special tools and workshop equipment required

- ◆ Hand operated vacuum pump - VAS 6213-



#### Procedure

- Check all vacuum lines throughout entire vacuum system for:
  - ◆ Cracks
  - ◆ Marten bites
  - ◆ Crushing
  - ◆ Porous areas and other leaks
- Check vacuum line to solenoid valve and from solenoid valve to relevant component.
- If a fault has been entered in the event memory, make sure to check not only all vacuum lines leading to the specified component, but also those leading to other components.
- If pressure cannot be built-up using hand vacuum pump - VAS 6213- or pressure immediately drops again, check hand vacuum pump and connecting hoses for leaks.

## 10 – Removing and installing engine

### 1 Removing and installing engine

⇒ [“1.1 Removing engine”, page 7](#)

⇒ [“1.2 Separating engine and gearbox”, page 24](#)

⇒ [“1.3 Securing engine on engine and gearbox support”,  
page 29](#)

⇒ [“1.4 Installing engine”, page 31](#)

#### 1.1 Removing engine

Special tools and workshop equipment required

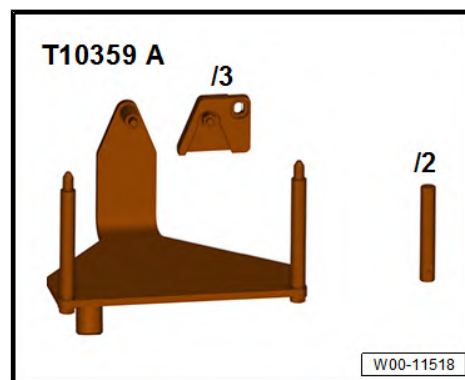
◆ Engine and gearbox jack - VAS 6931-



◆ Support bridge - T10323- for vehicles with all-wheel drive



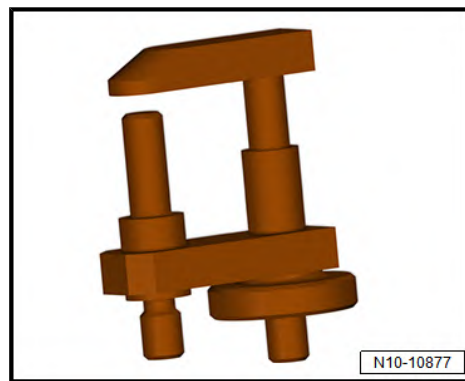
◆ Engine support - T10359 A-



◆ Pin - T10359/2-

◆ Adapter part - T10359/3-

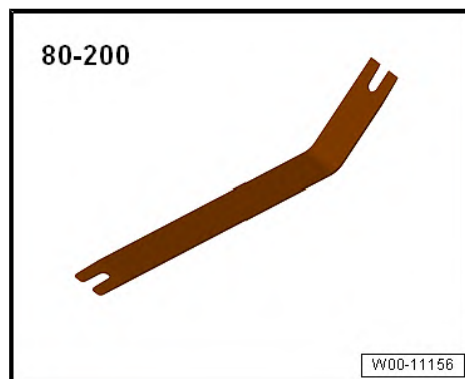
- ◆ Securing element from gearbox support - 3282-



- ◆ Spring-type clip pliers - VAS 6362-



- ◆ Release lever - 80 - 200-



- ◆ Safety glasses
- ◆ Cut-proof gloves
- ◆ Stepladder

#### Work sequence

#### Note

- ◆ *The engine is removed downwards with gearbox. To do this, the subframe needs to be removed.*
- ◆ *After removing coolant or fuel lines, these must be sealed using the engine sealing plug set - VAS 6122- to prevent dirt from entering or coolant or fuel from running out.*
- ◆ *The cable clamps must be installed in their same place again.*
- ◆ *All cable ties which were opened or cut when the engine was removed must be replaced with new cable ties in the same positions when engine is installed.*

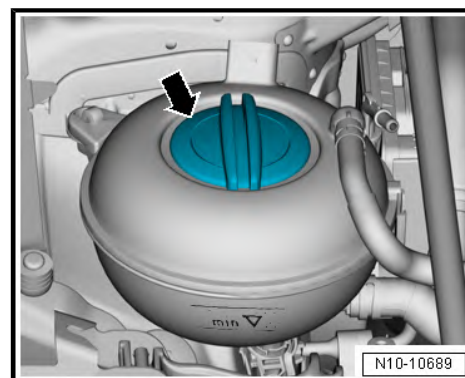
**⚠ CAUTION**

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

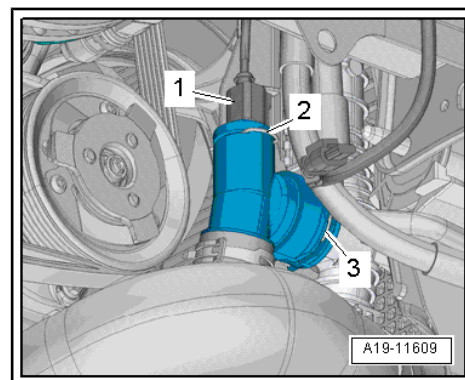
Skin and other parts of the body may be scalded.

- Wear protective gloves.
- Wear protective goggles.
- Reduce excess pressure by covering cap of coolant expansion tank with a cloth and opening it carefully.

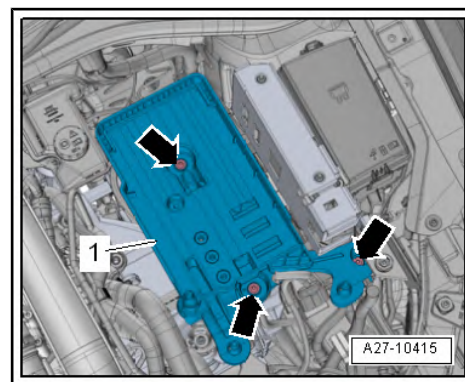
- Open filler cap -arrow- for coolant expansion tank.
- Remove engine cover panel ⇒ [page 50](#) .
- Remove left and right front wheel housing liner ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Assembly overview - front wheel housing liner .
- Remove subframe with steering rack ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Removing and installing subframe with steering rack .



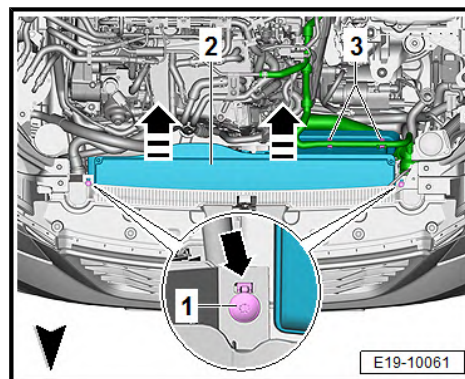
- Disconnect connector -1-.
- Place drip tray for workshop hoist - VAS 6208- underneath.
- Lift retaining clip -3-, disconnect coolant hose (bottom right) from radiator and drain off coolant.
- For reasons of space, remove the air filter housing together with the intake hose ⇒ [page 323](#) .
- Disconnect battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .



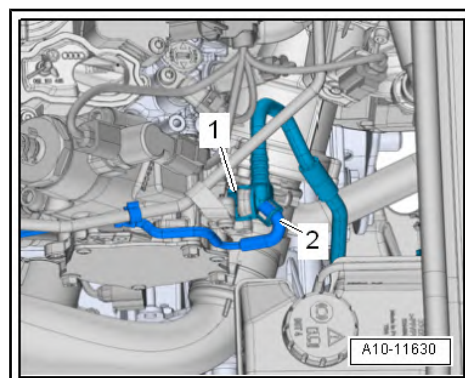
- Remove battery tray -1- ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery tray .



- Lay coolant hose -3- to one side.
- Unscrew bolts -1-.
- Release locking lugs-arrow-, unclip air hose -2- from the front end and remove in -direction of the arrow-.

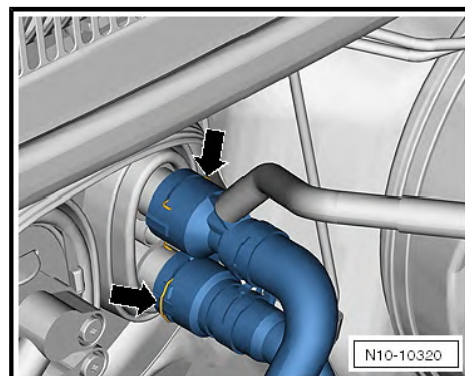


- Disconnect vacuum hose -2-.
- Press release tabs on vacuum hose -1-, and remove hose from vacuum pump.



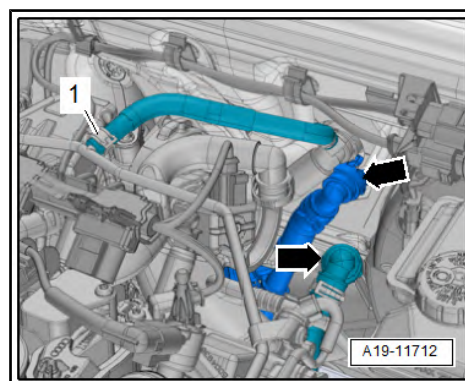
#### Vehicles with no auxiliary heater

- Lift the retaining clips -arrows- and detach the coolant hoses from the heat exchanger for heater.
- Hold coolant hoses downwards to allow coolant to drain.



#### Vehicles with auxiliary heater

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

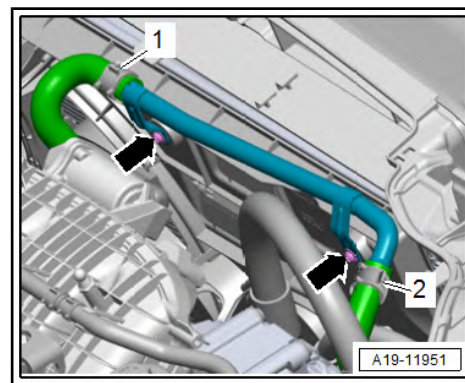




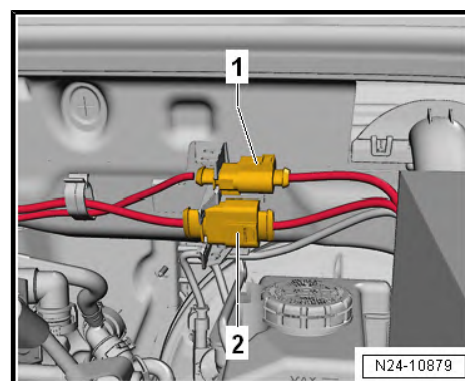
### Vehicles with auxiliary air cooler

- Release hose clips -1- and -2- and detach the coolant hoses.

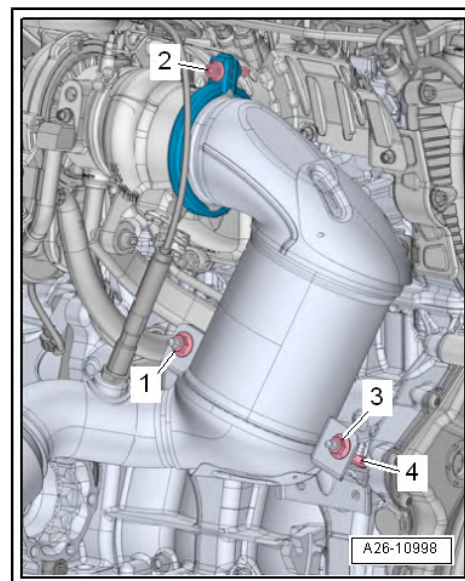
Continued for all vehicles



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

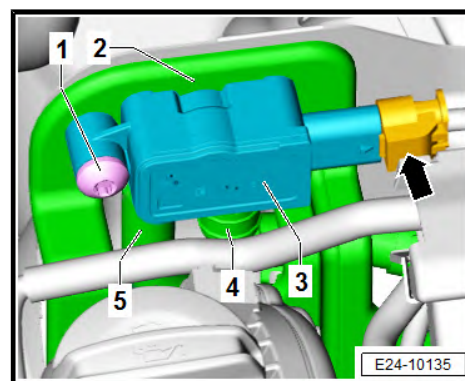


- Unscrew bolt -2-; remove screw-type clip.
- Unscrew nuts -1 and 3-. (Illustration shows engine removed.)

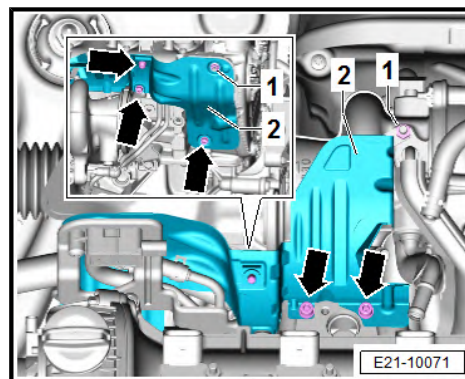


### For vehicles with particulate filter

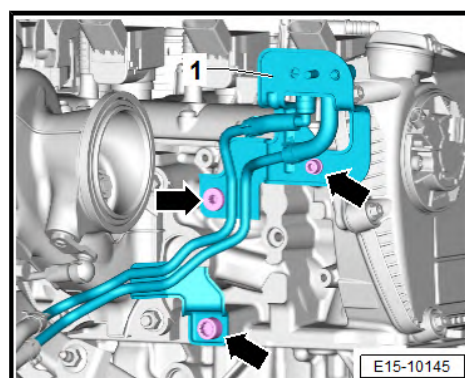
- Disconnect electrical connector -arrow-.



- Remove bolts -arrows- and nuts -1-.
- Remove heat shield -2-.



- Remove bolts -arrows- from the exhaust gas pressure sensor 1 - G450- -1- bracket.
- Push the exhaust gas pressure sensor 1 - G450- -1- bracket to the rear.



#### Continued for all vehicles

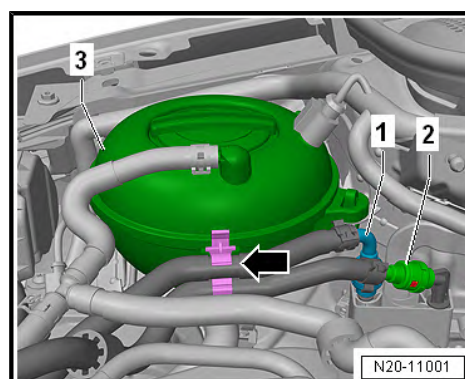
- Disconnect hose couplings -1- and -2- ➔ Rep. gr. 20 ; Plug-in connectors; Disconnecting plug-in connectors . Detach hoses from coolant expansion tank -3-.

#### CAUTION

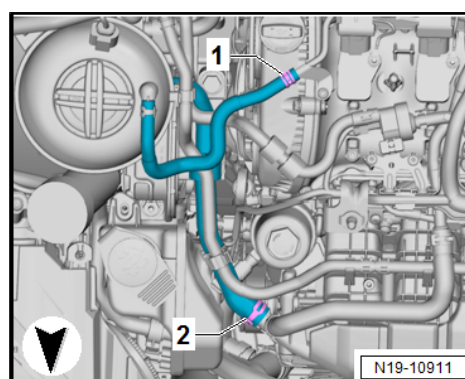
The fuel system is pressurised.

Danger of injury through fuel spray.

- Wear safety goggles.
- Wear protective gloves.
- To release pressure, wrap a clean cloth around the connection and carefully loosen the connection.

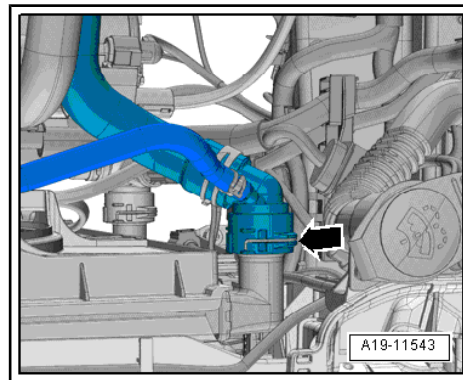


- Release hose clips -1, 2-, and remove coolant hoses.

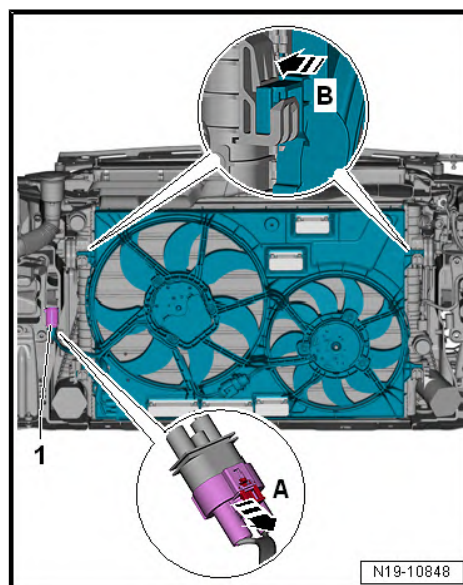




- Lift the retaining clip -arrow-, remove the coolant hose at the top left from the radiator.

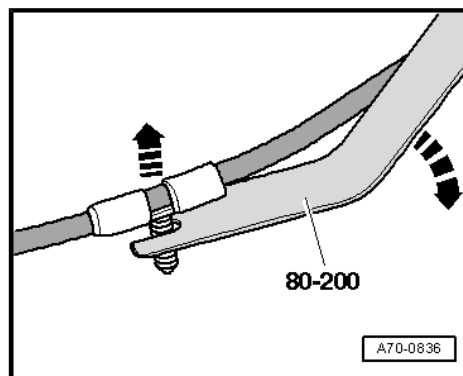


- Unplug electrical connector -1- for radiator fan (push retainer in direction of -arrow A- and press release catch down).
- Press locking tabs -B- on left and right sides of radiator cowl simultaneously. Unhook radiator cowl and remove upwards.

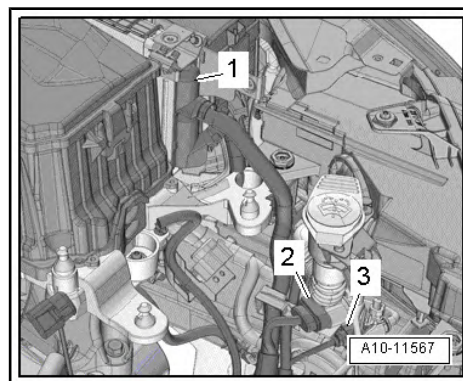


#### Note

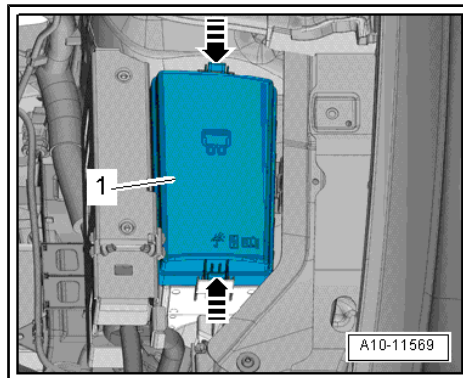
For the work steps below, use removal lever - 80 - 200- to unclip the binding clips.



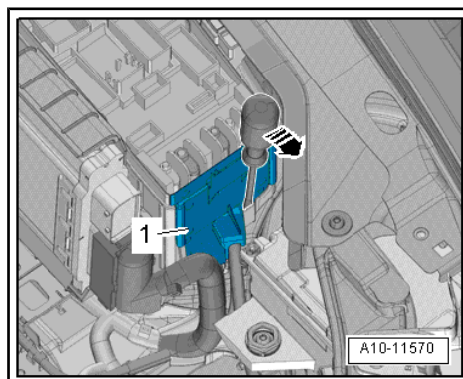
- Disconnect connector -1- on engine control unit - J623-  
 => [page 345](#) .
- Remove connectors -2 and 3- from retainer and disconnect them.
- Lay wires to one side.



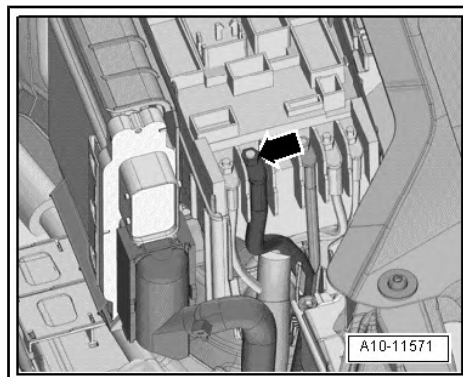
- Release catches -arrows- and detach cover -1- for electronics box in engine compartment.



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



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



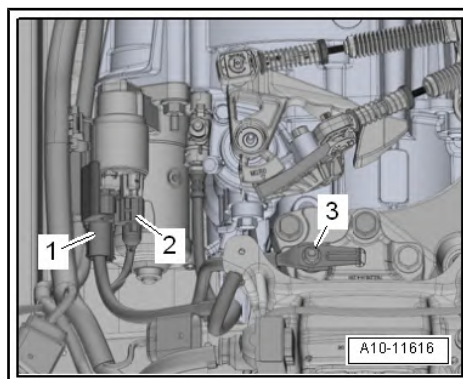
#### Vehicles with manual gearbox

- Disconnect connector -2-.
- Push back cover for battery positive terminal -1-, and unbolt battery positive cable from starter solenoid switch.
- Unscrew nut -3- and remove earth wire.

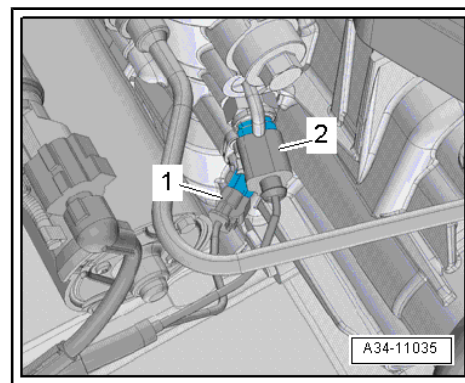


#### Note

Depending on vehicle version, the earth wire is secured to the starter bolt.



- Disconnect electrical connections at front left of gearbox.
- 1 - For gearbox neutral position sender - G701-
- 2 - For reversing light switch - F4-
- Disconnect gear selector cable and gate selector cable from gearbox. Then, unbolt cable support bracket, and lay it to one side together with cables ⇒ Rep. gr. 34 ; Selector mechanism; Removing and installing selector mechanism .
- Loosen line on clutch slave cylinder ⇒ Rep. gr. 30 ; Clutch mechanism; Remove and install clutch slave cylinder .



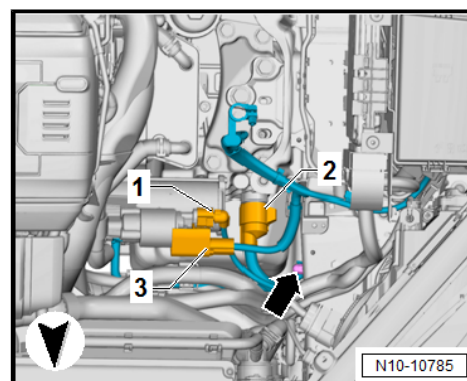
#### Vehicles with dual clutch gearbox:

- Disconnect connector -1-.
- Push back cover for battery positive terminal -3-, and unbolt battery positive cable from starter solenoid switch.
- Loosen nut -arrow-, and remove earth wire.



#### Note

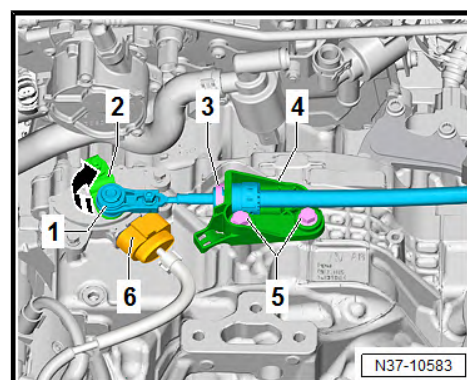
*Depending on vehicle version, the earth wire is secured to the starter bolt.*



- Touch earth connection (without gloves) in order to discharge yourself.
- Do NOT touch connector contacts in gearbox connector with your hands.
- Disconnect connector -2- for mechatronic unit for dual clutch gearbox - J743- . To do this, turn rotary fastener in anti-clockwise direction.
- Disconnect selector lever cable from gearbox, and pull it out of cable support bracket ⇒ Rep. gr. 34 ; Selector mechanism; Removing and installing selector mechanism .

#### Vehicles with an automatic gearbox

- Using an open-end spanner, for example, lever selector lever cable -1- off gearbox selector lever -2-.
- Pull connector -6- off multifunction switch - F125- and lay electrical wiring on bracket aside.
- Unscrew bolts -5- from cable support bracket -4-. Do not detach securing clip -3-.



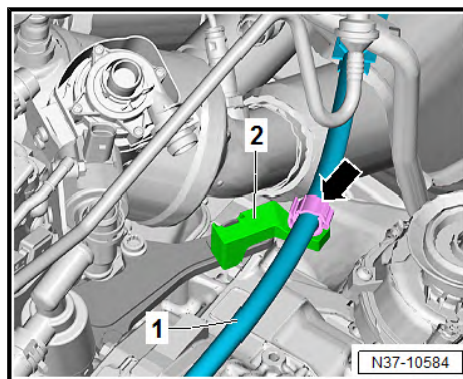


- Unhook selector lever cable -1- from securing clip -arrow-.

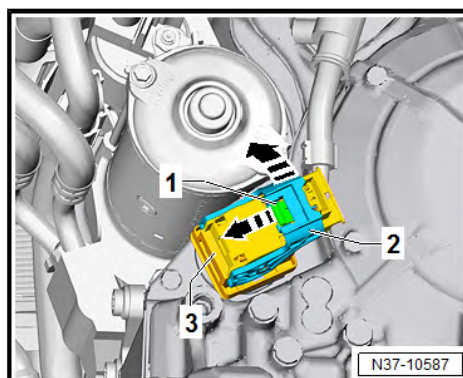


#### Note

- ♦ *Do not bend or twist the selector lever cable.*
- ♦ *To ensure that the cable is not a hindrance when removing and installing the gearbox, raise the cable to a suitable position on the body and tie using e.g. cable ties.*

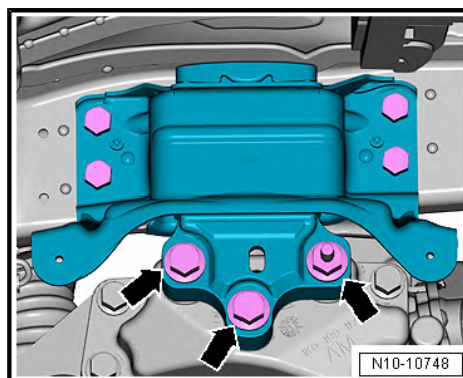


- Detach electrical connector from gearbox as follows. Push locking mechanism -1- in direction of arrow, fold out bar -2-, and pull connector -3- off gearbox.
- Separate electrical connectors from starter ➔ Electrical system; Rep. gr. 27 ; Starter; Removing and installing starter .

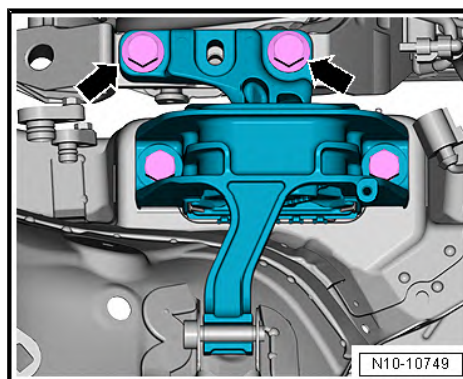


#### Continuation for all:

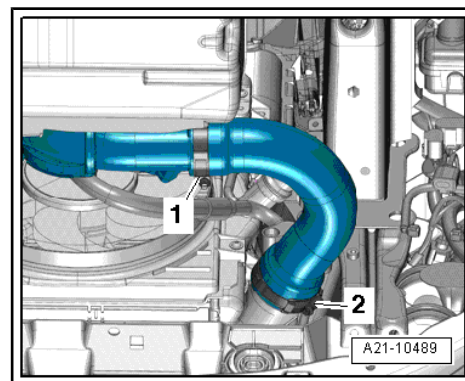
- Loosen bolts -arrows- for gearbox mounting approx. 2 turns.



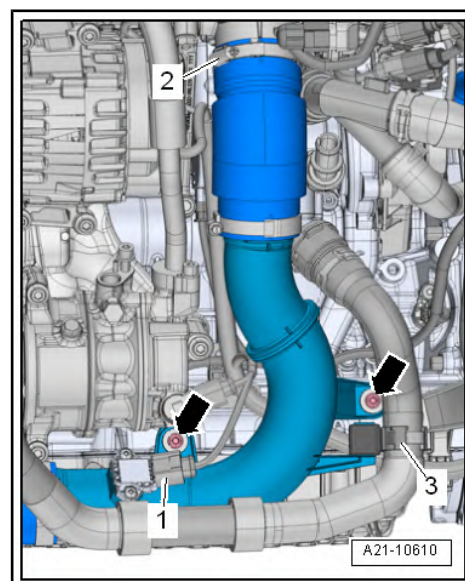
- Loosen bolts -arrows- for engine mounting approx. 2 turns.



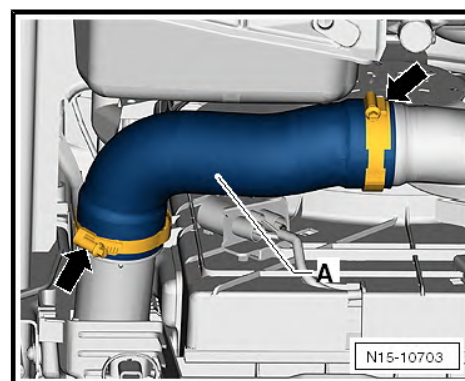
- Release hose clip -1- and -2-, and remove right charge air hose.
- Seal open lines and unions with clean plugs from engine sealing plug set - VAS 6122- .



- Move coolant hose on retainer -3- clear to one side.
- Unscrew bolts -arrows-.
- Loosen hose clip -2-.
- Disconnect electrical connector -1- from charge pressure sender - G31- .
- Remove air pipe.



- Open the hose clip on charge air cooler -arrows- and pull off the left charge air hose -A- from charge air cooler.



## Vehicles with all-wheel drive

- Unscrew screws -arrows- with the bit - 3247- and remove heat shield -1-.

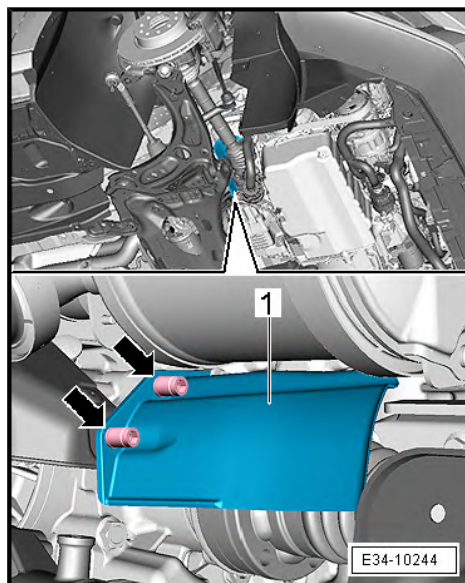
### Continued for all vehicles

- Remove left drive shaft from flange shaft ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .
- Remove right drive shaft ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .

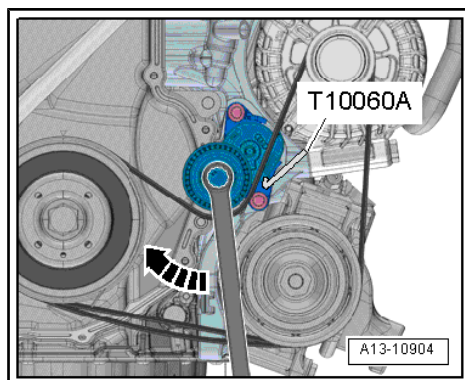


### Note

*Take care not to damage the surface protection of the drive shaft.*



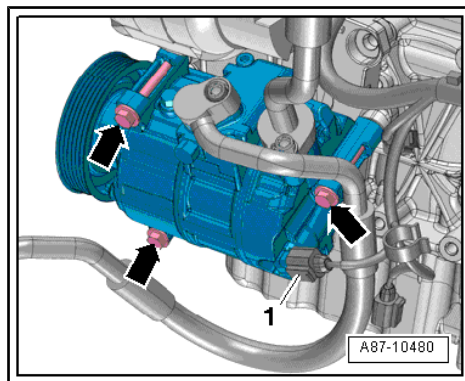
- Before removing, mark direction of rotation of poly V-belt with chalk or felt-tipped pen for re-installation.
- To relieve tension on poly V-belt, swivel tensioning device in clockwise direction -arrow-.
- Remove poly V-belt from poly V-belt pulley of air conditioner compressor and release tensioning device. If necessary remove pin - T10060 A- .



## CAUTION

**Risk of freezing injury caused by refrigerant.**

- Do not open refrigerant circuit of air conditioning system.
- Disconnect connector -1- on air conditioning compressor regulating valve - N280- .
- Unscrew bolts -arrows-.
- Detach air conditioner compressor with refrigerant hoses connected from bracket, and tie it up on the right side. Do NOT stretch, kink or bend refrigerant lines and hoses while doing so.



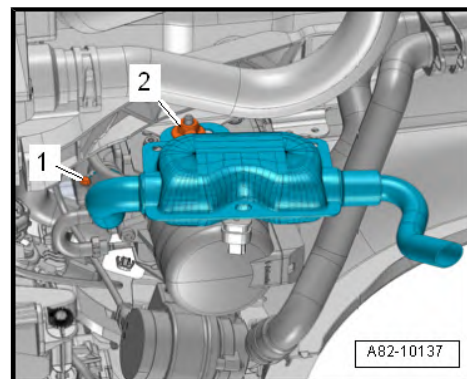
### Note

*Take care not to damage the surface protection of the drive shaft.*



### Vehicles with auxiliary heater

- Loosen clamp -1-, unscrew bolt -2-, and remove the silencer for auxiliary heater.



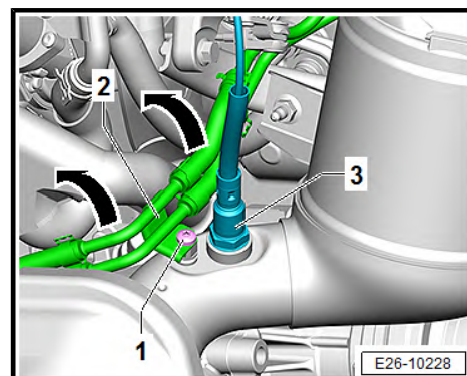
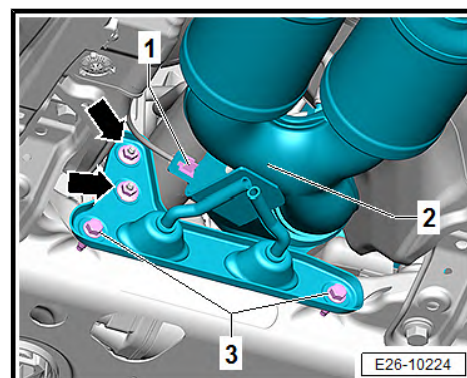
### For vehicles with particulate filter

- Unclip wiring -1- and remove nuts -arrows-.
- Remove bolt -1- and disconnect lines from exhaust gas pressure sensor 1 - G450- -2- in -direction of arrow-.

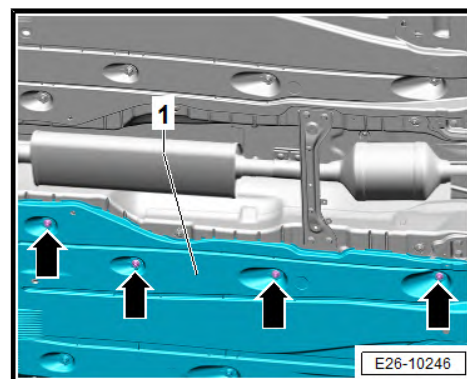


#### Note

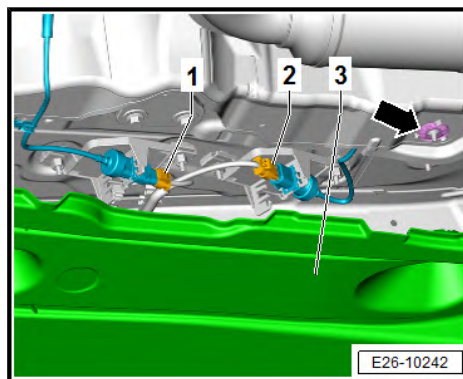
-Item 3- should be disregarded.



- Unscrew the four plastic nuts -arrows- from the left undercarriage panel -1- and move the panel slightly downward.



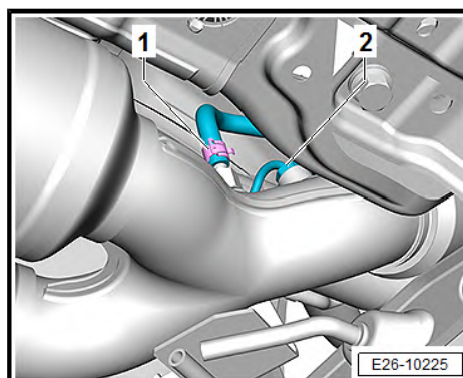
- Release and disconnect electrical connectors -1-, -2- of the temperature sender in front of -G506- and behind -G527- the particulate filter.
- Press out securing clip -1- which fixes the heat shield for the centre tunnel with the removal lever - 80 200- .
- Loosen the wiring of the senders -G506- and -G527- from their securing elements.



- Open spring-type clip -1- and remove the hose of the exhaust gas pressure sensor 1 - G450- .

**Note**

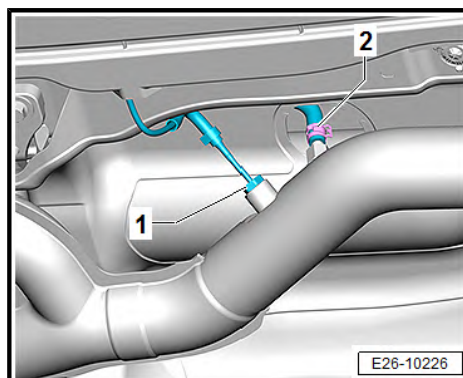
*-Item 2- should be disregarded.*



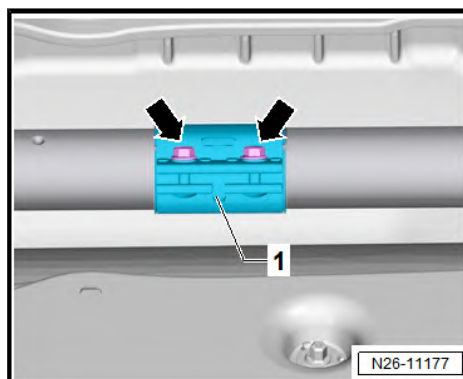
- Open spring-type clip -2- and remove the hose of the exhaust gas pressure sensor 1 - G450- .

**Note**

*-Item 1- should be disregarded.*

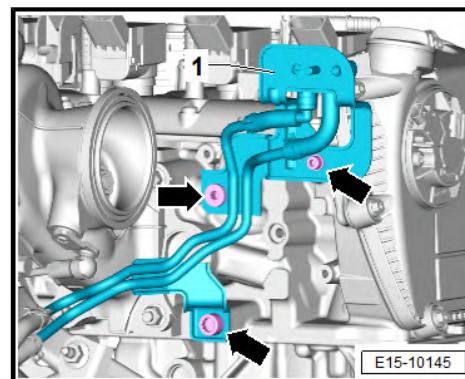


- Loosen clamp -arrow-, and push it to rear.
- Remove the particulate filter together with the sensors.



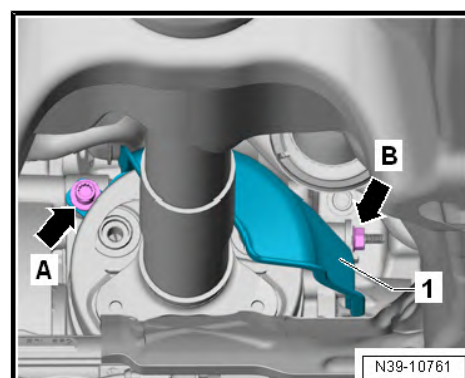


- Push the exhaust gas pressure sensor 1 - G450- -1- bracket to the rear and bind it into place.

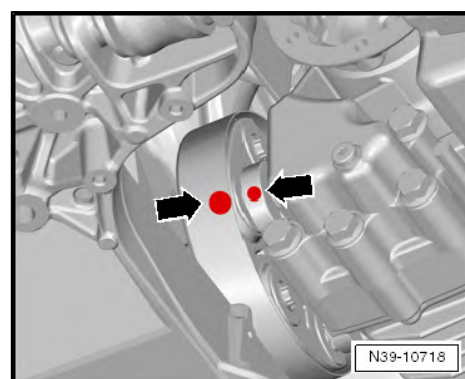


#### Further for models with all-wheel drive

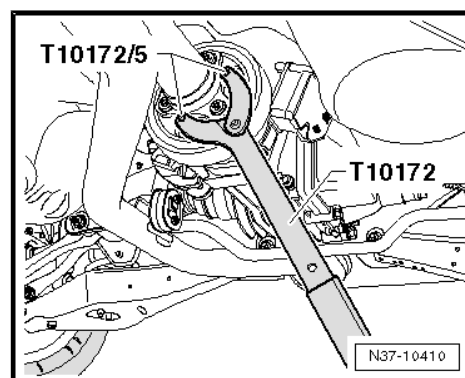
- Unscrew bolts -A- and -B- from bevel box and remove heat shield -1-.



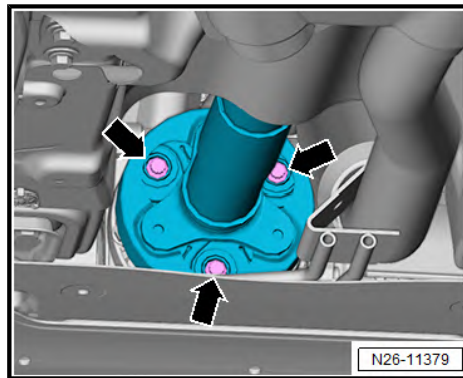
- Mark the position of the propshaft to the flange of the bevel box.



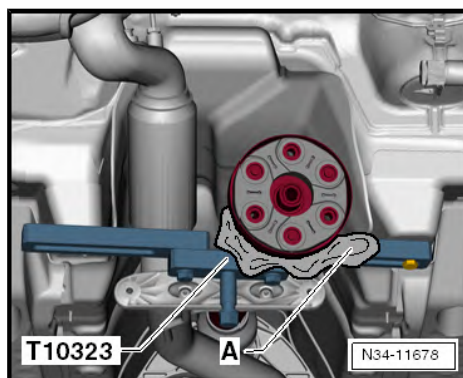
- To loosen and tighten propshaft, counterhold on rear final drive.



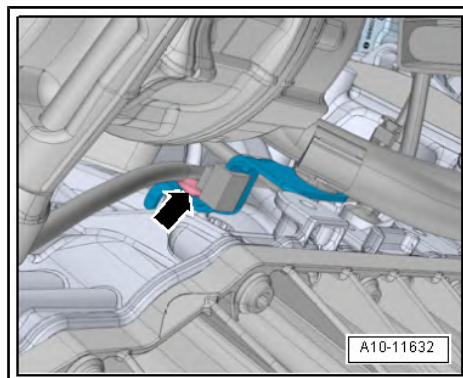
- Unbolt propshaft at front from bevel box -arrows-.
- Loosen clamp -1- between catalytic converter and front silencer, and push it in direction of travel -arrow-.



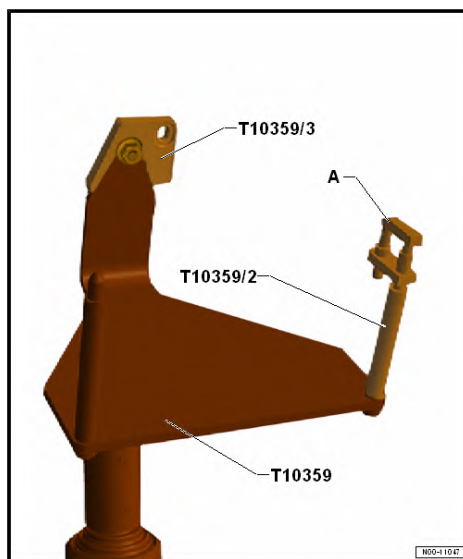
- Secure the support bridge - T10323- with a bolt on inside rear threaded hole for subframe.
- To do this, the securing bolt for subframe can be used.
- Place a cloth -A- onto support bridge .
- Dismantle propshaft off bevel box, and lay it to one side.



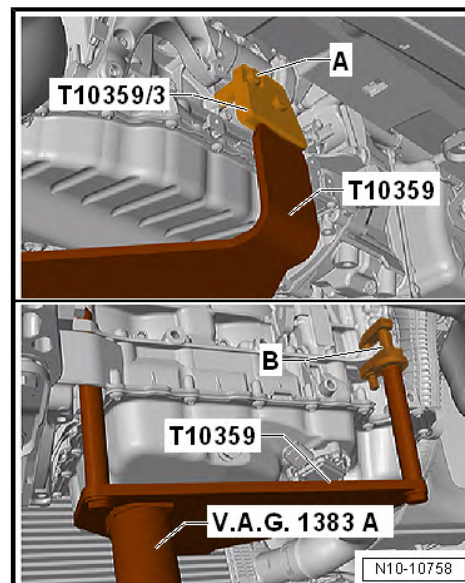
- Remove bolt -arrow- and push bracket for electrical wiring harness to one side.



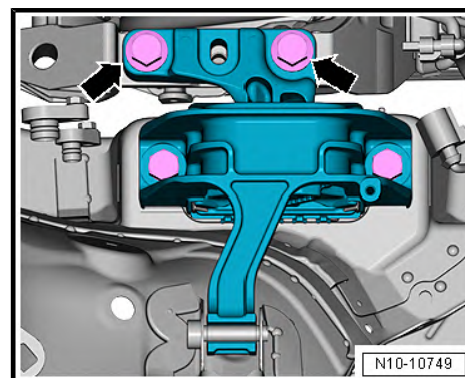
- Secure adapter -T10359/3- to engine support - T10359- , as shown in illustration.
- Use locking element -A- from gearbox support - 3282- to secure pin -T10359/2- to engine support.
- Insert engine support - T10359- in engine and gearbox jack - VAS 6931- .



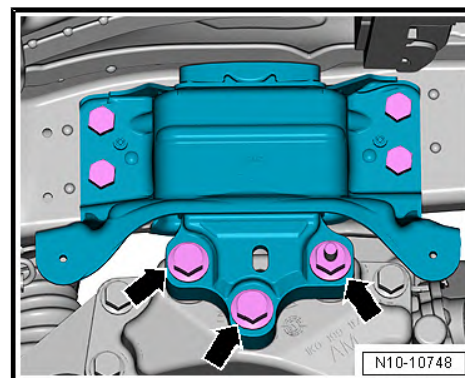
- Fit engine support - T10359- to cylinder block. Screw bolt -A- with spacer sleeve into cylinder block. Specified torque: 20 Nm
- Secure engine with locking element -B-, and slightly lift engine with gearbox.



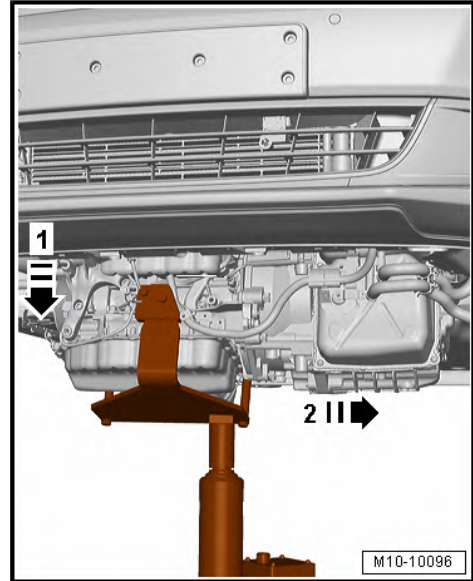
- Remove bolts -arrows- for engine mounting.



- Remove bolts -arrows- securing gearbox mounting.



- Carefully lower engine/gearbox assembly. Check that all vacuum lines and electrical wiring between engine, gearbox and body have been detached while doing so.



## 1.2 Separating engine and gearbox

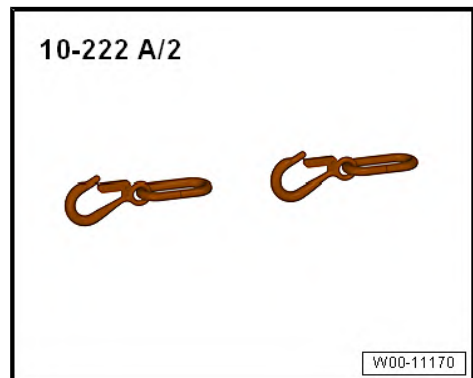
⇒ ["1.2.1 Separating engine and gearbox, vehicles with manual gearbox", page 24](#)

⇒ ["1.2.2 Separating engine and gearbox, vehicles with dual clutch gearbox", page 26](#)

### 1.2.1 Separating engine and gearbox, vehicles with manual gearbox

Special tools and workshop equipment required

- ◆ Hook - 10 - 222 A /2-

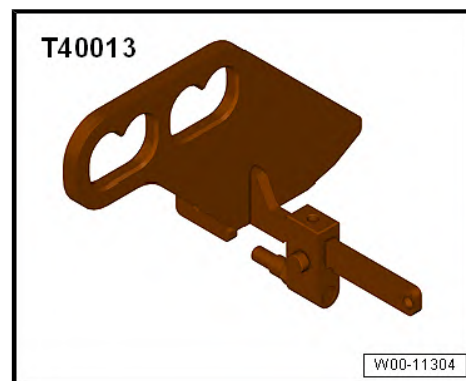


- ◆ Workshop hoist - VAS 6100-



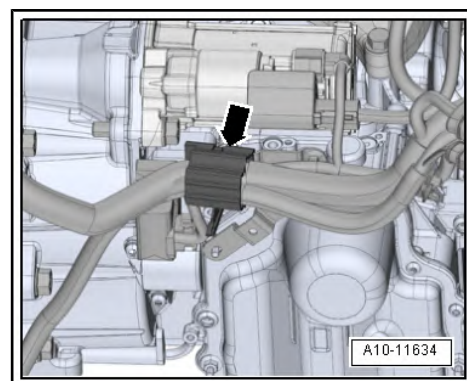


◆ Lifting tackle - T40013-

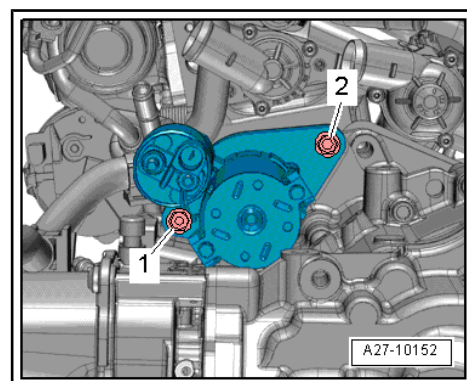


**Procedure**

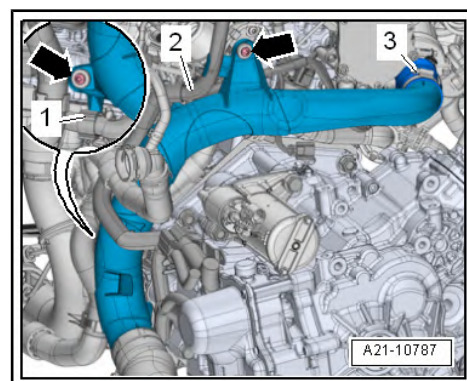
- Engine/gearbox assembly removed and attached to engine bracket - T10359- .
- Release electrical wires from retainer -arrow- and lay them to one side.



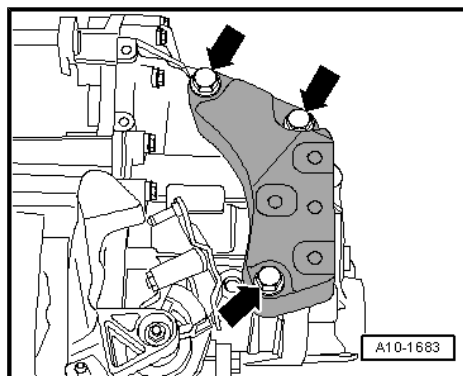
- Unscrew bolts -1 and 2-, and remove starter from gearbox.



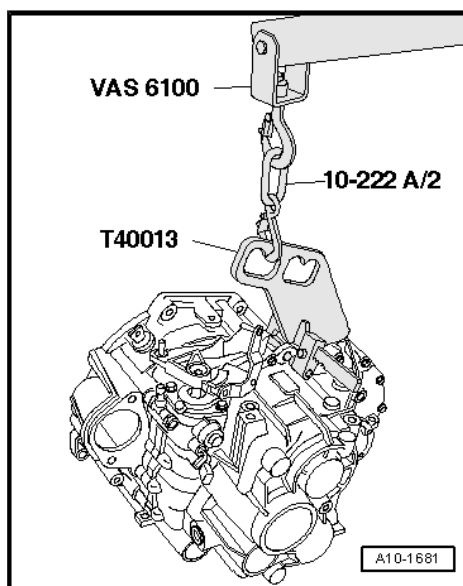
- Move electrical wiring harnesses -1, 2- clear at air pipe.
- Loosen screw-type clip -3-.
- Remove bolts -arrows- and detach air pipe.



Unscrew bolts -arrows- and detach gearbox support.



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



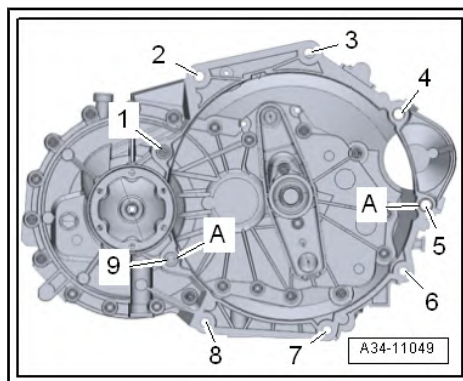
- Unscrew bolts -1, 2, 3, 6, 7, 8, 9- from gearbox to engine connection.



#### Note

Ignore -items 4, 5- and -A-.

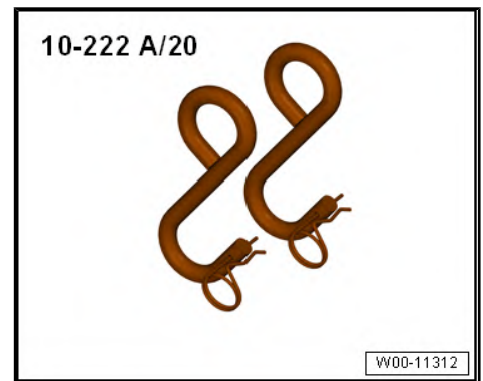
- Separate gearbox from engine.



## 1.2.2 Separating engine and gearbox, vehicles with dual clutch gearbox

Special tools and workshop equipment required

- ◆ Adapter part - 10 - 222 A /20-



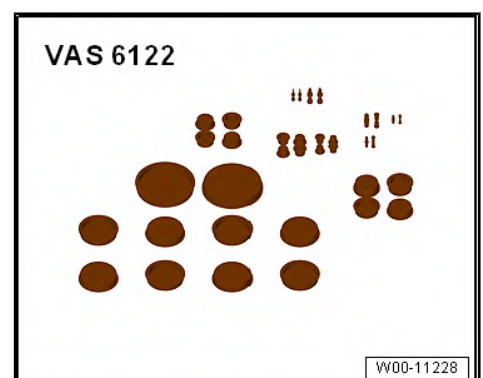
- ◆ Hook of -2024 A /1- lifting tackle - 2024 A-



- ◆ Workshop hoist - VAS 6100-



- ◆ Set of plugs for engine - VAS 6122-

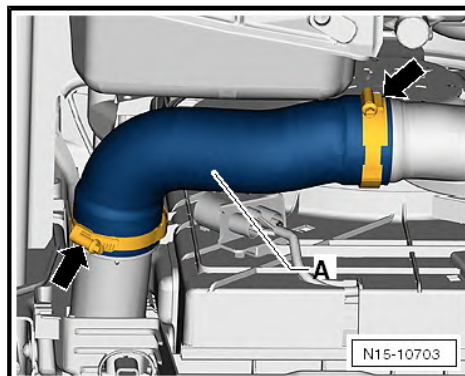


**! NOTICE**

If engine and gearbox are separated, needle bearing in crankshaft must be renewed ⇒ [page 76](#) .

## Procedure

- Engine/gearbox assembly removed and attached to engine bracket - T10497- .
- Open the hose clip on charge air cooler -arrows- and pull off the left charge air hose -A- from charge air cooler.

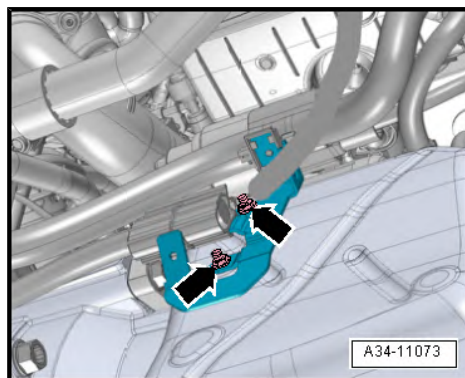


- Unscrew nuts -arrows-, and remove bracket at front of sump.

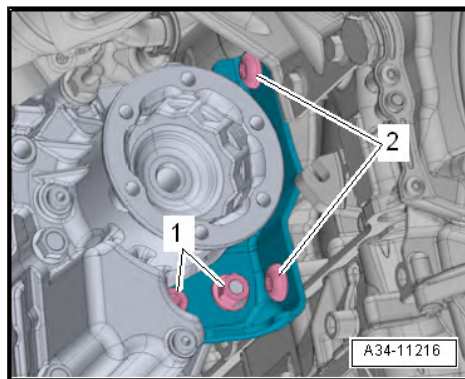


### Note

*The studs are welded to the front of the sump.*



- Unscrew bolts -1 and 2- and remove the bevel box carrier.



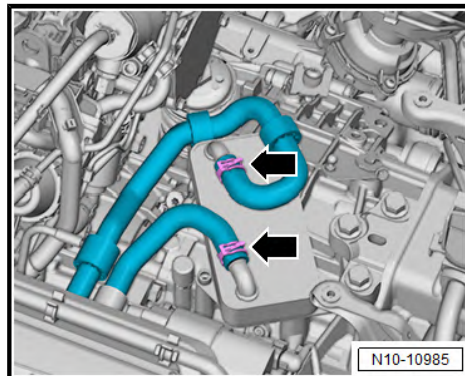
- Open hose clips -arrows- and disconnect the coolant hoses from gear oil cooler.



### Note

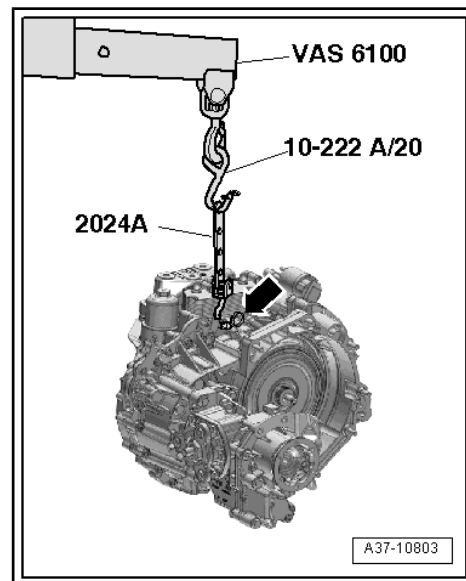
*Place a cloth underneath to catch escaping coolant.*

- Open lines and connections must be sealed with clean plugs from the Engine sealing plug set , for example -VAS 6122- .
- Remove starter ⇒ Vehicle electrics; Rep. gr. 27 ; Starter; Removing and installing starter .





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



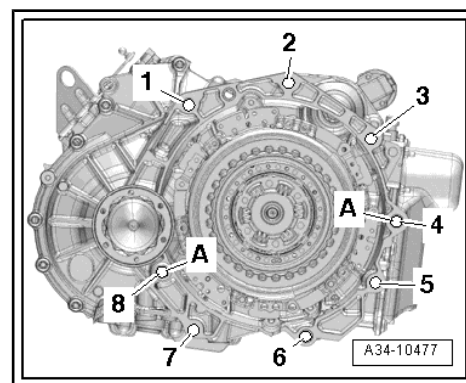
- Unscrew bolts -1 to 8- securing gearbox to engine.



#### Note

*Disregard -Item A-.*

- Separate gearbox from engine.



## 1.3 Securing engine on engine and gearbox support

Special tools and workshop equipment required

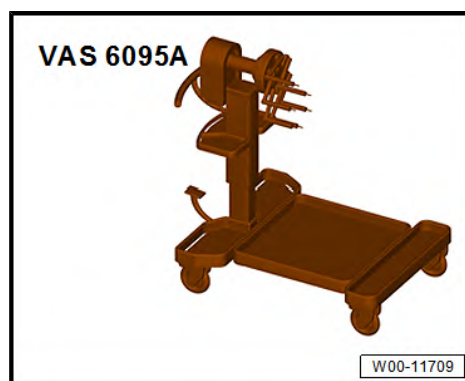
- ◆ Lifting tackle - 2024 A-



◆ Workshop hoist - VAS 6100-



◆ Engine and gearbox support - VAS 6095A-



**Procedure**

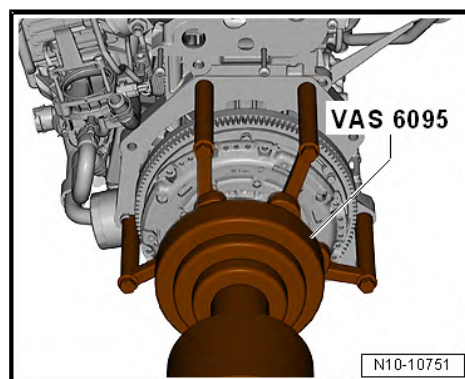
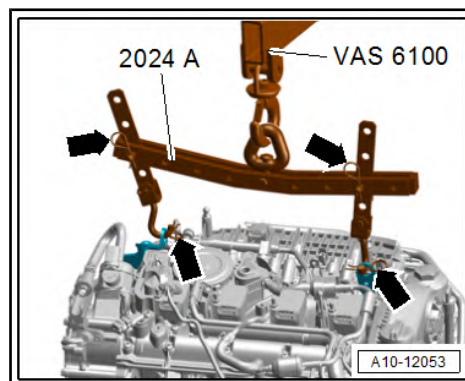
- Gearbox detached from engine ⇒ [page 24](#) .
- Attach lifting tackle - 2024 A- to engine on workshop hoist - VAS 6100- .
- In order to balance out the centre of gravity of the subframe, the perforated rails of the lifting tackle must be inserted as shown in the illustration.

**CAUTION**

Risk of injury caused by falling engine.

Body parts may become trapped.

- The hook attachments and the locking pins of the lifting tackle must be secured with a pin.
- The hook attachments and the locking pins must be secured with pins -arrows-.
- Using workshop hoist - VAS 6100- , lift engine off engine and gearbox jack - VAS 6931- .
- Remove dowel sleeves for gearbox, and, on gearbox side, bolt engine to engine and gearbox support - VAS 6095- .



## 1.4 Installing engine

### Procedure

- Check for damage to dowel sleeves in cylinder block for centring engine and gearbox and renew them as needed.
- Hook intermediate plate onto sealing flange and slide onto dowel sleeves -arrows-.

### Vehicles with manual gearbox

- If clutch release bearing is worn, renew it ⇒ Rep. gr. 30 ; Clutch mechanism; Repairing clutch release mechanism .
- Lightly grease input shaft splines using grease as per ⇒ Electronic parts catalogue (ETKA) .
- Check centring of clutch plate.
- Bolt gearbox to engine.

### Vehicles with dual clutch gearbox

- If engine and gearbox are separated, needle bearing in crankshaft must be renewed ⇒ [page 76](#) .

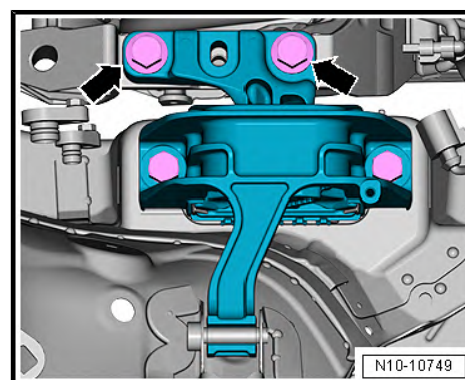
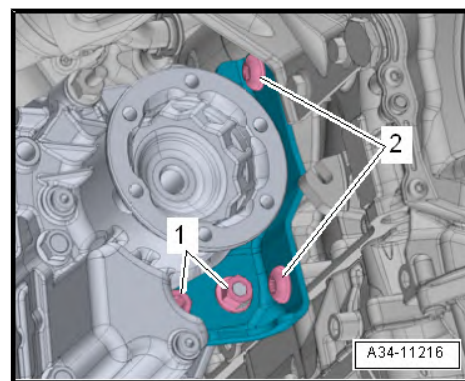
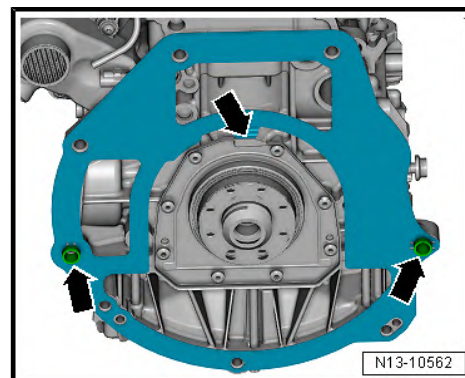
### Vehicles with all-wheel drive

- Bolt gearbox to engine.
- Install bracket for bevel box.

### Continued for all vehicles

- Install starter ⇒ Electrical system; Rep. gr. 27 ; Starter; Removing and installing starter .
- Guide engine/gearbox assembly into body.

- First screw bolts -arrows- for engine mountings into stop by hand.



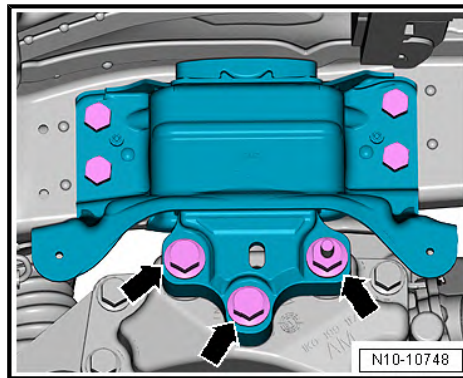
- Initially screw in bolts -arrows- for gearbox mounting by hand until they make contact.



#### Note

*The bolts are tightened to final torque only after adjusting the assembly mountings ⇒ [page 34](#) .*

- Remove engine bracket - T10359- from engine.
- Install drive shafts ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Assembly overview - drive shaft .



#### Vehicles with all-wheel drive

- Tighten propshaft on bevel box ⇒ rear final drive; Rep. gr. 39 ; Propshaft; Assembly overview - propshaft .

#### Vehicles with manual gearbox

- Install clutch slave cylinder ⇒ Rep. gr. 30 ; Clutch mechanism; Removing and installing clutch slave cylinder .
- Install cables with cable support bracket ⇒ Rep. gr. 34 ; Selector mechanism; Exploded view - selector cables .

#### Vehicles with dual clutch gearbox

- Install and adjust selector lever cable ⇒ Rep. gr. 34 ; Selector mechanism; Removing and installing selector lever cable .

#### Continuation for all vehicles

- Install air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Assembly overview - drive unit of air conditioner compressor .
- Fit poly V-belt ⇒ [page 53](#) .
- Adjust assembly mountings ⇒ [page 47](#) .
- Install battery tray ⇒ Electrical system; Rep. gr. 27 ; Battery; Exploded view - battery .
- Electrical connections and routing ⇒ Electrical system; Rep. gr. 97 ; Relay carriers, fuse carriers, electronics boxes; Overview of fitting locations - relay carriers, fuse carriers, electronics boxes and ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- Install air filter housing ⇒ [page 322](#) .
- Remove catalytic converter ⇒ [page 376](#) .
- Install subframe ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Removing and installing subframe without steering rack .
- Install front wheel housing liners ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liner; Removing and installing front wheel housing liner .
- Check oil level.
- Connect coolant hoses with plug-in connector ⇒ [page 259](#) .
- Fill up coolant ⇒ [page 208](#) .
- Fit engine cover panel ⇒ [page 50](#) .



## Note

*Never reuse old coolant.*

- ◆ Delete entries in the event memory , [Guided Functions](#),  
[Read event memory](#).

Also after replacing the engine:

- ◆ Set misfiring self-adaptation [Test plan](#) [001 - Engine electronics](#), [Retractor ring misfiring adjustments](#).
- ◆ Adjust chain length [Test plan](#) [001 - Engine electronics](#), [Adjustment diagnosis chain length](#).

## Specified torques



## Note

- ◆ *The specified torques are only valid for nuts and bolts which have been slightly greased, oiled, phosphate-treated or black-oxidized.*
- ◆ *Additional lubricant such as engine oil or gear oil may be used, but do not use lubricant containing graphite.*
- ◆ *Do not use degreased parts.*
- ◆ *Renew bolts that are tightened with turning further angle.*
- ◆ *Renew self-locking nuts and bolts, and seals, O-rings and gaskets.*
- ◆ *Hose unions and air intake pipes/hoses must be free of oil and grease when installing.*
- ◆ *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 position when installing.*
- ◆ *Tolerance for specified torques ± 15%.*

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

- ◆ ⇒ ["2.1 Assembly overview - emission control", page 369](#)
- ◆ ⇒ ["8.1 Assembly overview - Lambda probe", page 355](#)
- ◆ ⇒ ["2.1 Assembly overview - assembly mountings", page 34](#)
- ◆ ⇒ Rep. gr. 34 ; Removing and installing gearbox; Specified torques for gearbox .



## 2 Assembly mountings

⇒ [“2.1 Assembly overview - assembly mountings”, page 34](#)

⇒ [“2.2 Removing and installing motor mounting”, page 35](#)

⇒ [“2.3 Removing and installing gearbox mounting”, page 37](#)

⇒ [“2.4 Removing and installing pendulum support”, page 40](#)

⇒ [“2.5 Supporting engine in installation position”, page 41](#)

⇒ [“2.6 Adjusting assembly mountings”, page 47](#)

⇒ [“2.7 Checking adjustment of assembly mountings \(engine and gearbox mountings\)”, page 49](#)

### 2.1 Assembly overview - assembly mountings

#### 1 - Bolt

- ☐ Renewing:
- ☐ Specified torques and installation sequence  
⇒ [page 64](#) .

#### 2 - Engine support

- ☐ Removing and installing  
⇒ [page 62](#)

#### 3 - Engine mounting

- ☐ With support arm.
- ☐ Removing and installing  
⇒ [page 35](#)

#### 4 - Bolt

- ☐ Renewing:
- ☐ 40 Nm +90°

#### 5 - Bolt

- ☐ Renewing:
- ☐ 20 Nm +90°

#### 6 - Bolt

- ☐ Renewing:
- ☐ 40 Nm +90°

#### 7 - Bolt

- ☐ Renewing:
- ☐ 60 Nm +90°

#### 8 - Pendulum support

- ☐ Removing and installing  
⇒ [page 40](#)

#### 9 - Bolt

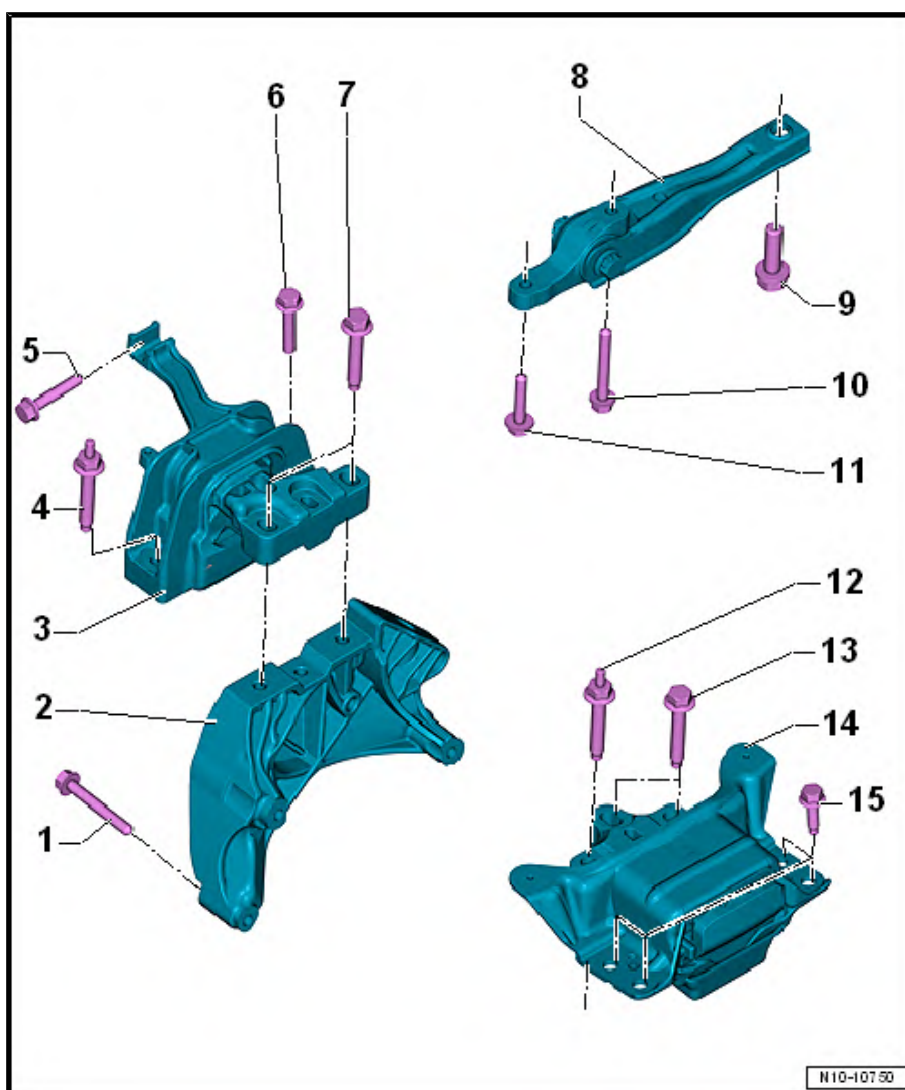
- ☐ Renewing:
- ☐ Specified torques and installation sequence ⇒ [page 40](#) .

#### 10 - Bolt

- ☐ Renewing:
- ☐ Specified torques and installation sequence ⇒ [page 40](#) .

#### 11 - Bolt

- ☐ Renewing:



- ☐ Specified torques and installation sequence ⇒ [page 40](#) .

#### 12 - Bolt

- ☐ Renewing:
- ☐ 60 Nm +90°

#### 13 - Bolt

- ☐ Renewing:
- ☐ 60 Nm +90°

#### 14 - Gearbox mounting

- ☐ With support arm.
- ☐ Removing and installing ⇒ [page 37](#)

#### 15 - Bolt

- ☐ Renewing:
- ☐ 50 Nm +90°

## 2.2 Removing and installing motor mounting

### Special tools and workshop equipment required

- ◆ Torque wrench - V.A.G 1331-



- ◆ Torque wrench - V.A.G 1332-



♦ Engine support - T50015A-



- ♦ Support plate of the positioner - T10533/2-
- ♦ Bolt M12 x 20 mm of the positioner - T10533/4-

### Removing

- Remove noise insulation ⇒ General body repairs, exterior;  
Rep. gr. 66 ; Noise insulation; Assembly overview - noise in-  
sulation .

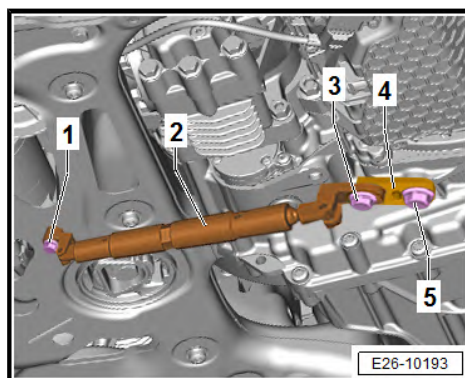
### Vehicles with all-wheel drive

- Remove pendulum support ⇒ [page 40](#) .



### Note

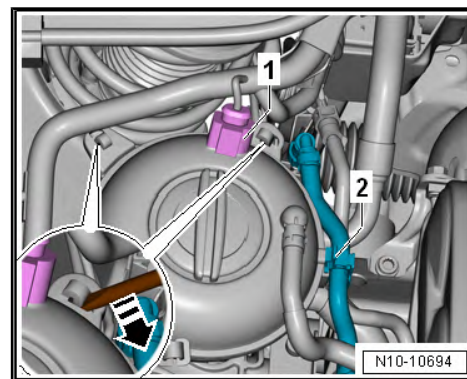
- ♦ *In order to prevent the backwards movement of the engine/ gearbox module when removing from one of the two support tools, the engine support - T50015A- must be used as described in the following. This way, the engine/gearbox module is partially held in its original position and the manual unscrewing of the screws of the support tools and the setting and the tightening are alleviated.*
- ♦ *Only attach with low tension, as otherwise there is a danger of damaging the propshaft.*
- ♦ *The engine and gearbox mounting must be set optimally in order to avoid vibrations.*
- Connect the engine support - T50015A- -2- as shown in the diagram.
- ♦ Screw a bolt M8 x 30 mm -1- with a washer into the threaded hole of the subframe.
- ♦ Fit the engine support - T50015A- -2- on the support plate of the positioner - T10533/2- -4-.
- ♦ Fasten the assembly kit engine support - T50015A- -2- and support plate of the positioner - T10533/2- -4- using the bolt M12 x 20 mm of the positioner - T10533/4- -5- o the threaded hole of the gearbox.
- By turning the spindle, the engine/gearbox unit is moved forwards until there is a small tension. Avoid collisions with other components.





### Continued for all vehicles

- Disconnect connector -1-.
- Free hoses -2- from fittings and lay them to one side.
- Using a screwdriver, release fasteners -arrow- and move coolant expansion tank to one side.
- Support engine in installation position ⇒ [page 41](#) .
- Tighten spindle slightly to take up weight of engine/gearbox assembly; do not lift.



- Unscrew bolts -arrows- and remove engine mounting -1-.

### Installing

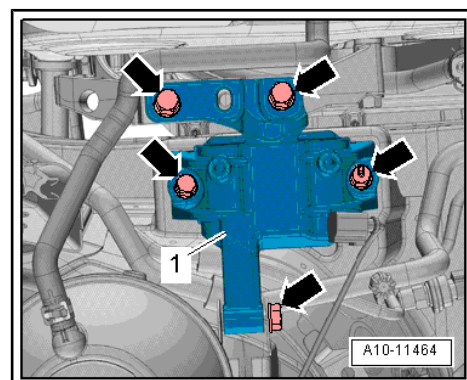
Remaining installation is carried out in the reverse order. When installing, note the following:



#### Note

- ◆ *Renew bolts that are tightened with turning further angle.*
- ◆ *The engine and gearbox mounting must be set optimally in order to avoid vibrations.*

- Checking adjustment of assembly mountings ⇒ [page 49](#) .



### Specified torques

- ◆ ⇒ [“2.1 Assembly overview - assembly mountings”, page 34](#)

## 2.3 Removing and installing gearbox mounting

### Special tools and workshop equipment required

- ◆ Torque wrench - V.A.G 1331-



- ◆ Torque wrench - V.A.G 1332-



- ◆ Engine support - T50015A-



- ◆ Support plate of the positioner - T10533/2-
- ◆ Bolt M12 x 20 mm of the positioner - T10533/4-

### Removing

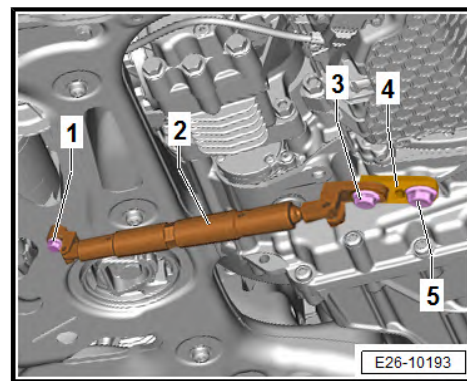
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
- Remove pendulum support ⇒ [page 40](#) .



### Note

- ◆ *In order to prevent the backwards movement of the engine/gearbox module when removing from one of the two support tools, the engine support - T50015A- must be used as described in the following. This way, the engine/gearbox module is partially held in its original position and the manual unscrewing of the screws of the support tools and the setting and the tightening are alleviated.*
- ◆ *Only attach with low tension, as otherwise there is a danger of damaging the propshaft.*
- ◆ *The engine and gearbox mounting must be set optimally in order to avoid vibrations.*

- Connect the engine support - T50015A- -2- as shown in the diagram.
- ◆ Screw a bolt M8 x 30 mm -1- with a washer into the threaded hole of the subframe.
- ◆ Fit the engine support - T50015A- -2- on the support plate of the positioner - T10533/2- -4-.
- ◆ Fasten the assembly kit engine support - T50015A- -2- and support plate of the positioner - T10533/2- -4- using the bolt M12 x 20 mm of the positioner - T10533/4- -5- o the threaded hole of the gearbox.
- By turning the spindle, the engine/gearbox module is moved forwards until there is a small tension. Avoid collisions of components.
- Remove battery tray -1- ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery tray .
- Remove engine control unit - J623- from bracket ⇒ [page 345](#) .

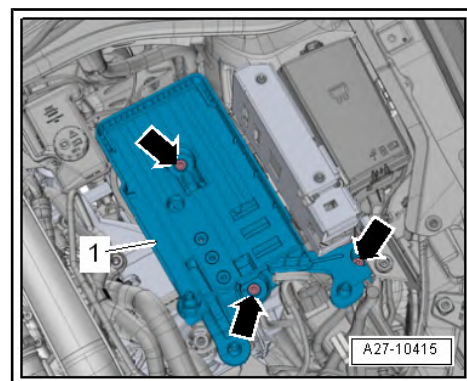


- Unscrew nuts -arrows- and remove bracket -1-.

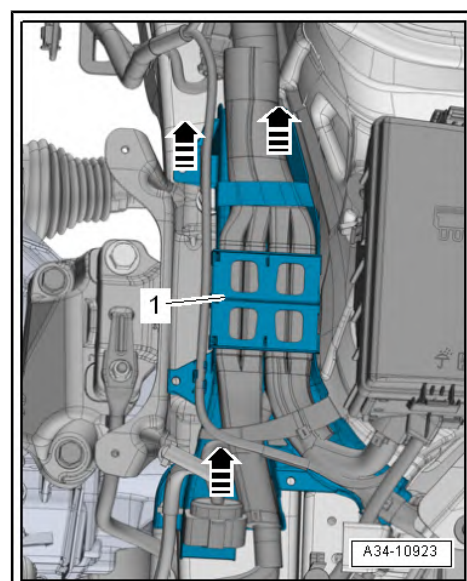


#### Note

*Different types of brackets are fitted depending on version.*



- Unclip wire guide -1- upwards -arrows-, and push it slightly to one side.
- Support engine in installation position ⇒ [page 41](#) .



- Unscrew bolts -2-. Then unscrew bolts -arrows-, and remove gearbox mounting -1-.

### Installing

Remaining installation is carried out in the reverse order. When installing, note the following:



### Note

- ◆ *Renew bolts that are tightened with turning further angle.*
- ◆ *The engine and gearbox mounting must be set optimally in order to avoid vibrations.*
- Tighten gearbox mounting on longitudinal member.
- Lift gearbox with spindle of support bracket until gearbox support makes contact with support arm of gearbox mounting.
- Start bolts by hand. Ensure to not screw in the bolts at an angle while doing so.
- Checking adjustment of assembly mountings ➔ [page 49](#) .
- When the bolts are tightened to specified torque, remove support bracket - 10 - 222 A- from engine.

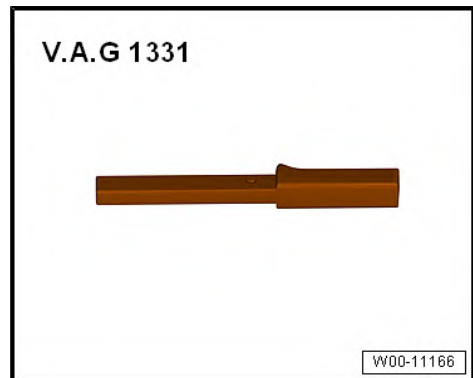
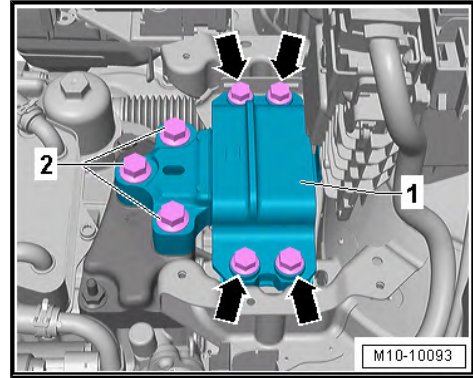
### Specified torques

- ◆ ➔ [“2.1 Assembly overview - assembly mountings”, page 34](#)
- ◆ Battery; Assembly overview - battery ➔ Electrical system; Rep. gr. 27 ; Battery; Assembly overview - battery .
- ◆ ➔ [“6.1 Removing and installing engine control unit J623 without protective housing”, page 345](#)

## 2.4 Removing and installing pendulum support

### Special tools and workshop equipment required

- ◆ Torque wrench - V.A.G 1331-



- ◆ Torque wrench - V.A.G 1332-



### Removing

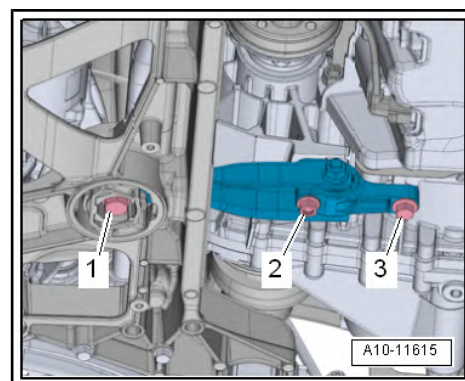
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
- Unscrew bolts -1, 2 and 3-, and remove pendulum support.

### Installing

Remaining installation is carried out in the reverse order. When installing, note the following:

### Specified torques

Stage	Bolts	Specified torque/turning further angle
1.	-2 and 3-	50 Nm
2.	-1-	130 Nm
3.	-1 ... 3-	Turn 90° further



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

## 2.5 Supporting engine in installation position

⇒ [“2.5.1 Supporting engine in installation position, Ateca”, page 41](#)

⇒ [“2.5.2 Supporting engine in installation position, León”, page 43](#)

### 2.5.1 Supporting engine in installation position, Ateca

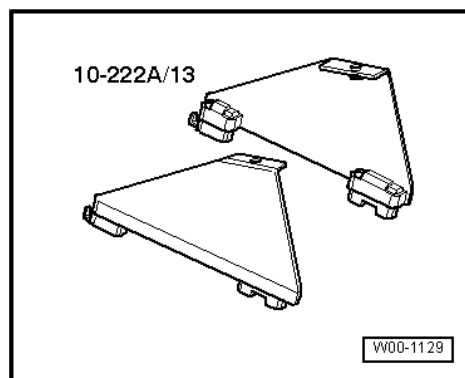
#### Special tools and workshop equipment required

- ◆ Support - 10 - 222 A-

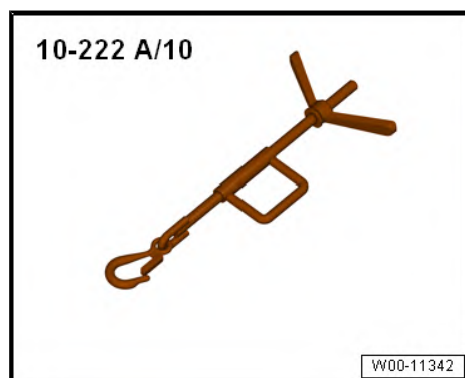




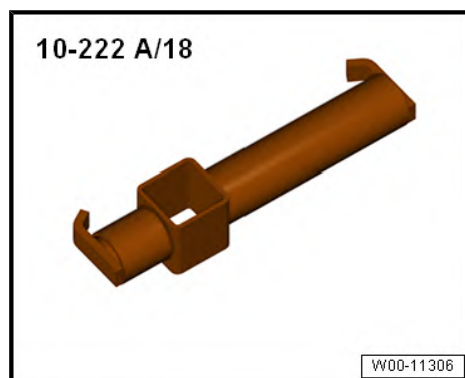
◆ Adapter part - 10-222A/13-



◆ Spindle - 10 - 222 A /10-



◆ Adapter part - 10 - 222 A /18-

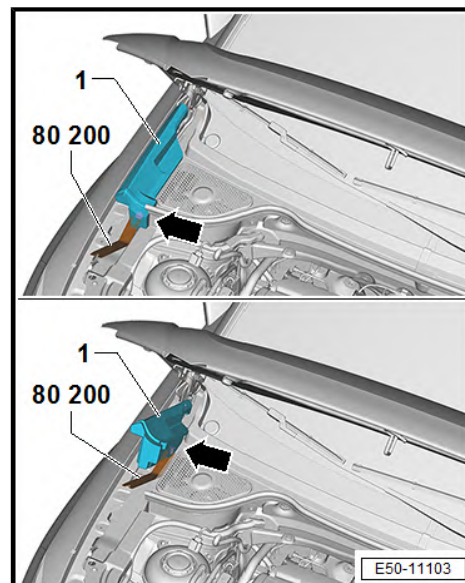


### Procedure

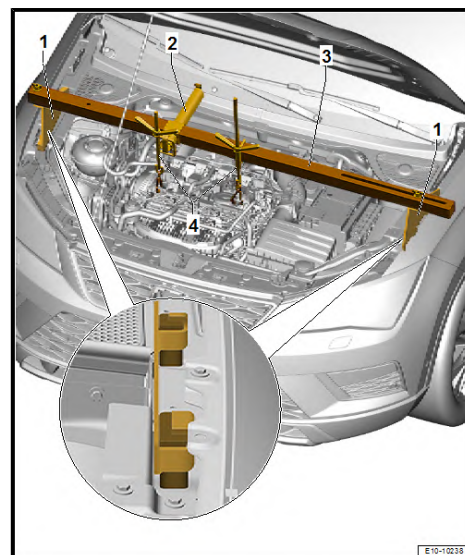
The securing bolts for the assembly mountings must be removed only if the engine is supported in installation position using the support bracket - 10-222 A- !

- Remove engine cover panel ➔ [page 50](#) .

- Clip out the filler part -1- using the lever - 80 200- on both sides.



- Slide the spindle - 10 - 222 A /10- -4- and adapter - 10 - 222 A /18- -2- onto the support bracket - 10 - 222 A- -3-.
- Screw in the adapter - 10 - 222 A /13- -1- into the engine interception device - 10-222 A- -3-.
- Attach spindles - 10 - 222 A /10- to engine lifting eyes.
- Tighten spindle to take up weight of engine/gearbox assembly; do not lift.



## 2.5.2 Supporting engine in installation position, Leon

Special tools and workshop equipment required

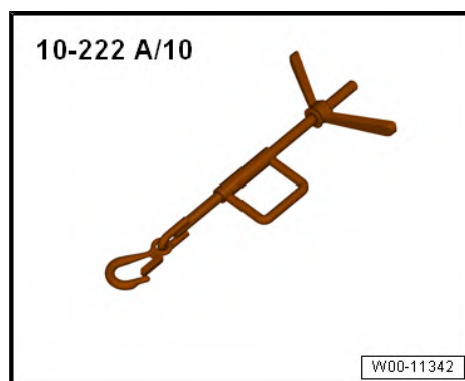
- ◆ Support tool - 10 - 222 A-



- ◆ Adapter part - 10 222A/29-



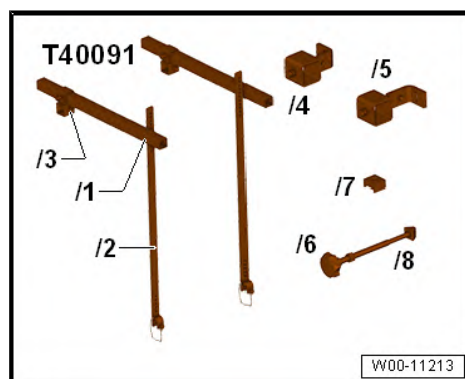
- ◆ Pull hook - 10 222A/10-



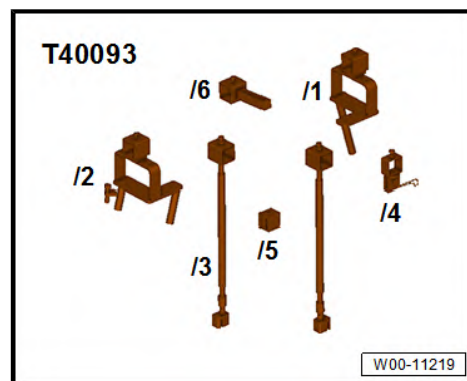
- ◆ Adapter - 10 - 222 A /18-



- ◆ Engine support basic set - T40091-

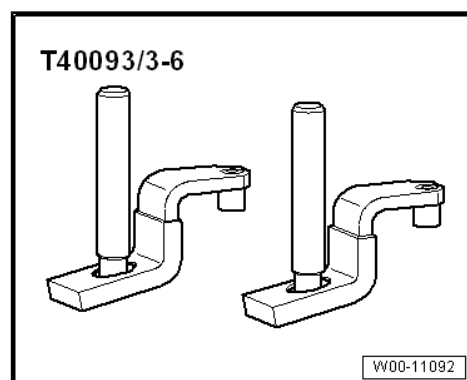


- ◆ -T40093/6- from engine support supplement set - T40093-



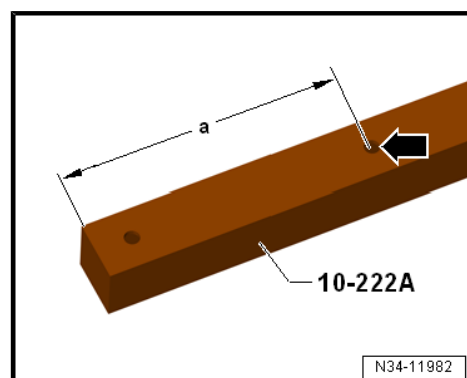
◆

- ◆ Adapter - T40093/3-6A-



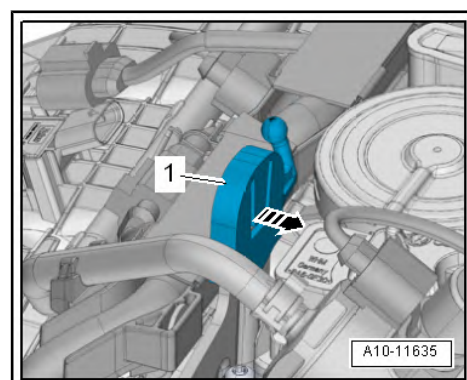
#### Check adapters - 10 - 222 A /4- and modify as necessary

- If adapter -10 - 222 A- does not yet have the hole -arrow-, it must now be drilled into it.
- Dimension -a- = 225 mm.
- Drill  $\varnothing$ : 12.5 mm.

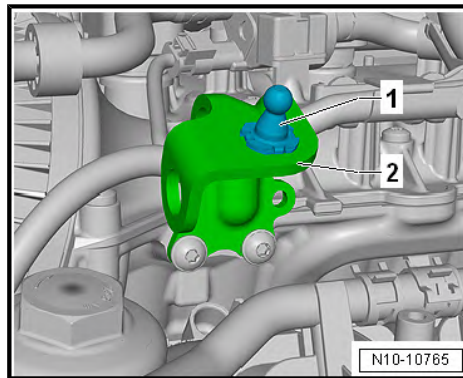


#### Work sequence

- Remove engine cover panel [⇒ page 50](#) .
- Release catch -arrow- and detach mounting -1- for engine cover panel.



- Unclip right mounting -1- for engine cover panel from retainer -2-.

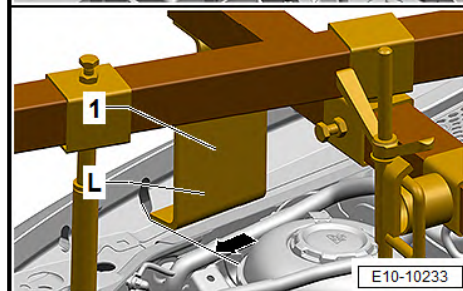
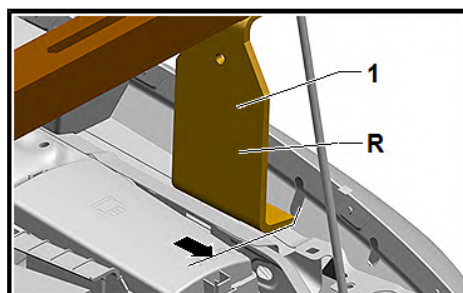


- On both sides of vehicle, insert adapters - 10 - 222 A /29- between upper wheel housing longitudinal member and mounting plate for wing located underneath.

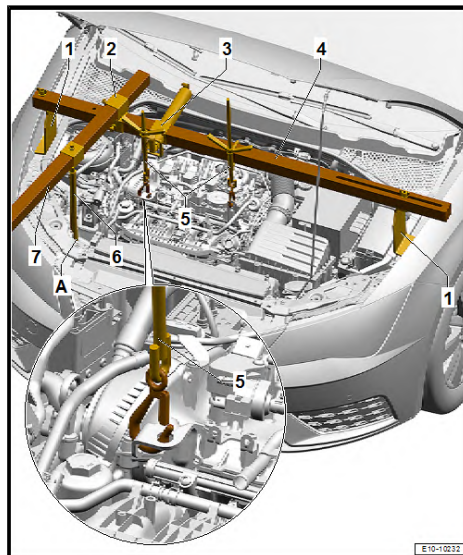
- Installation position:

Attach the "L" adapter to the "right" vehicle side ( adapter clicks into place in the wiring recess, observing the height -arrow-)

Attach the "R" adapter to the "left" vehicle side ( adapter -1- clicks into place in the wiring recess, observing the height -arrow-)

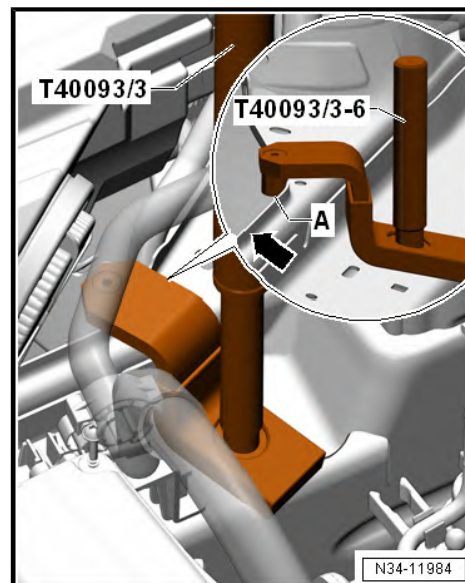


- Insert spindle - 10 - 222 A /10- -5-, adapter - 10 - 222 A /18- -3- and adapter - T40091/3- -2- into the support bracket - 10 - 222 A- -4-.
- Screw on support bracket - 10-222 A- -4- to adapters - 10 - 222 A /29- -1-.

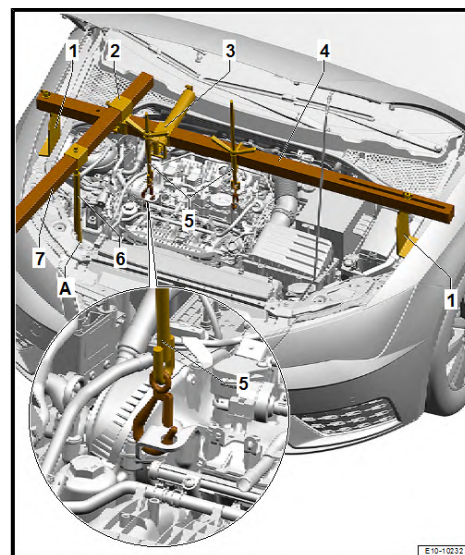




- If fitted, pull off electrical wiring in front area of web on both longitudinal members -arrow-. Do not disconnect pipe/hose system.
- Place the adapter - T40093/3-6- over the bottom right longitudinal member.
- Bolt -A- must remain behind the rim -arrow-.
- If necessary, carefully unclip any pipes for air conditioning system in front area. Do not disconnect pipe/hose system ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit; System overview - refrigerant circuit .



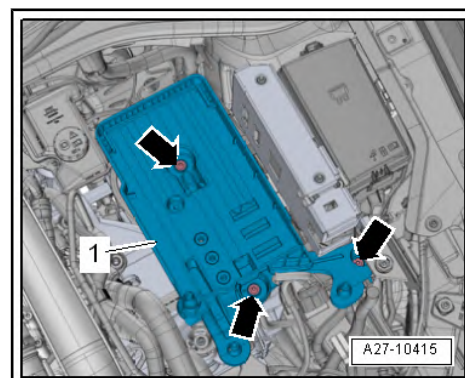
- Bolt the spindle of the engine support supplement set - T40093 /3- -6- to the adapter - T40093/3-6- -A-.
- Connect, fit and tighten the spindle engine support supplement set - T40093 /3- -6- to the adapter - T40091/3- -2- over the square section tube - T40091/1- -7-.
- Attach spindles - 10 - 222 A /10- -5- into the engine lifting eyes.
- Take up weight of engine/gearbox assembly with spindles, but without raising it.



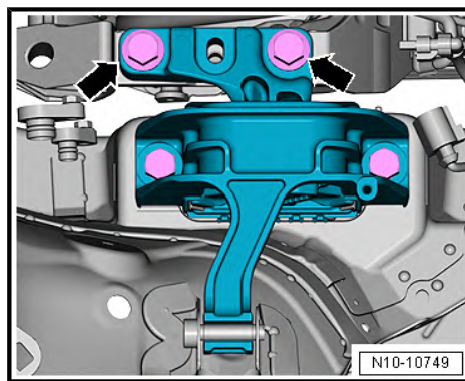
## 2.6 Adjusting assembly mountings

### Procedure

- Remove battery tray -1- ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery tray .
- Support engine in installation position ⇒ [page 41](#) .



- Unscrew engine mounting bolts -arrows- one after the other and renew them (if not already renewed when installing engine).
- First screw bolts in loosely.

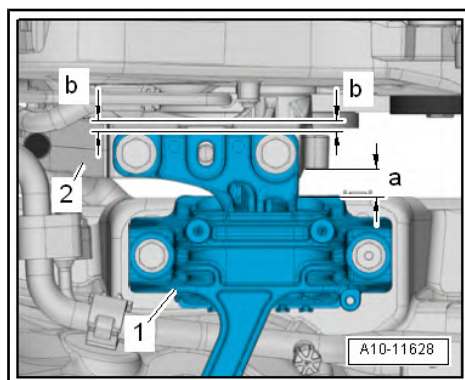


- Using assembly lever, adjust engine/gearbox assembly so that specifications listed below are attained:
  - There must be a distance of -a- = 10 mm between engine support -2- and engine mounting -1-.
  - Side surface of the engine support casting should be located parallel to support arm of engine mounting.
  - Distance -b- = distance -b-.

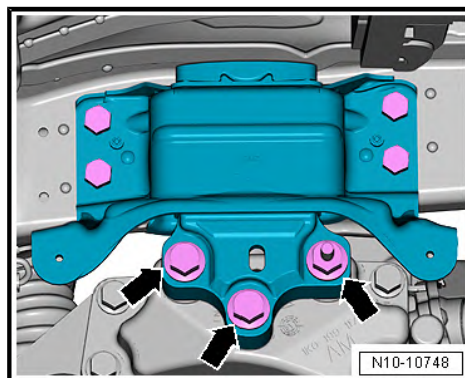


#### Note

Distance -a- = 10 mm can be checked with a metal rod of suitable size, or similar.



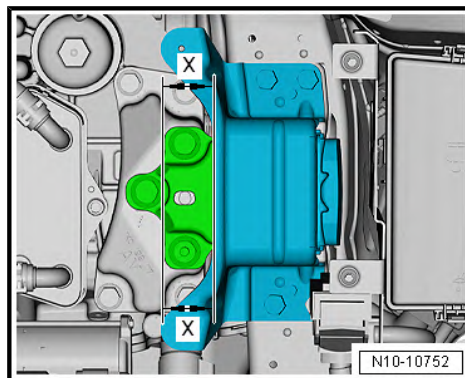
- Tighten bolts of engine mounting.
- Unscrew gearbox mounting bolts -arrows- one after the other and renew them (if not already renewed when installing engine).
- First screw bolts in loosely.



- On gearbox side, ensure that support arm and gearbox mounting are parallel.
  - Distance -x- = distance -x-.
- Tighten bolts for gearbox mounting.

#### Specified torques

- ♦ ⇒ [“2.1 Assembly overview - assembly mountings”, page 34](#)
- ♦ ⇒ Electrical system; Rep. gr. 27 ; Battery; Battery - Exploded view



## 2.7 Checking adjustment of assembly mountings (engine and gearbox mountings)

### Procedure

The following specifications must be obtained:

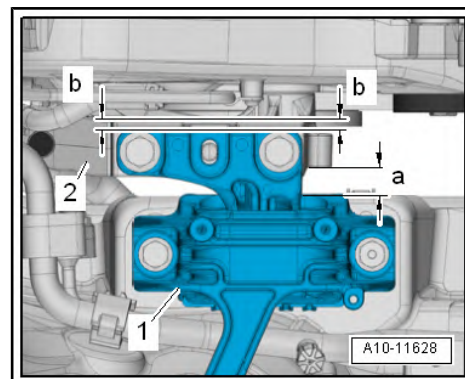
- There must be a distance of  $-a- = 10\text{ mm}$  between engine support -2- and engine mounting -1-.
- Side surface of engine support casting should be located parallel to support arm of engine mounting.
- Distance  $-b-$  = distance  $-b-$ .



### Note

*Distance  $-a-$  = 10 mm can be checked with a metal rod of suitable size, or similar.*

- If the dimension is too small or too high, adjust assembly mountings ⇒ [page 47](#) .



### 3 Motor cover

⇒ **“3.1 Engine cover: Removing and installing”, page 50**

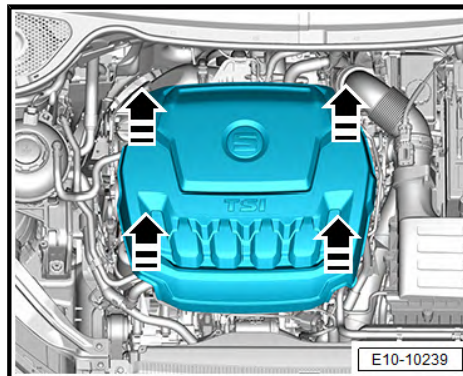
#### 3.1 Engine cover: Removing and installing

##### Removing

- Carefully pull engine cover panel off retaining pins, one after the other in the -direction of the arrow-. Do not pull off motor cover panel abruptly or only on one side.

##### Installing

- To avoid damage, do not strike the engine cover panel with your fist or with any kind of tool.
- Position engine cover panel, paying attention to oil filler neck and dipstick.
- Press engine cover panel into rubber grommets first on left side and then on right side.





## 13 – Crankshaft group

### 1 Cylinder block (pulley end)

⇒ [“1.1 Assembly overview - cylinder block \(pulley end\)”, page 51](#)

⇒ [“1.2 Removing and installing poly-V belt”, page 53](#)

⇒ [“1.3 Removing and installing tensioner for poly V-belt”, page 54](#)

⇒ [“1.4 Removing and installing vibration damper”, page 54](#)

⇒ [“1.5 Removing and installing bracket for ancillaries:”, page 60](#)

⇒ [“1.6 Removing and installing engine support”, page 62](#)

⇒ [“1.7 Renewing crankshaft oil seal - belt pulley end”, page 64](#)

#### 1.1 Assembly overview - cylinder block (pulley end)

##### 1 - Poly V-belt

- ☐ Check for wear
- ☐ Do not kink
- ☐ Poly V-belt routing  
⇒ [page 53](#)
- ☐ Removing and installing  
⇒ [page 53](#)
- ☐ When installing, make sure it is properly seated on pulleys.

##### 2 - Tensioning device for poly V-belt

- ☐ Swing with open-end spanner to slacken poly V-belt.
- ☐ Lock with locking pin - T10060 A- .
- ☐ Removing and installing  
⇒ [page 54](#)

##### 3 - Bolt

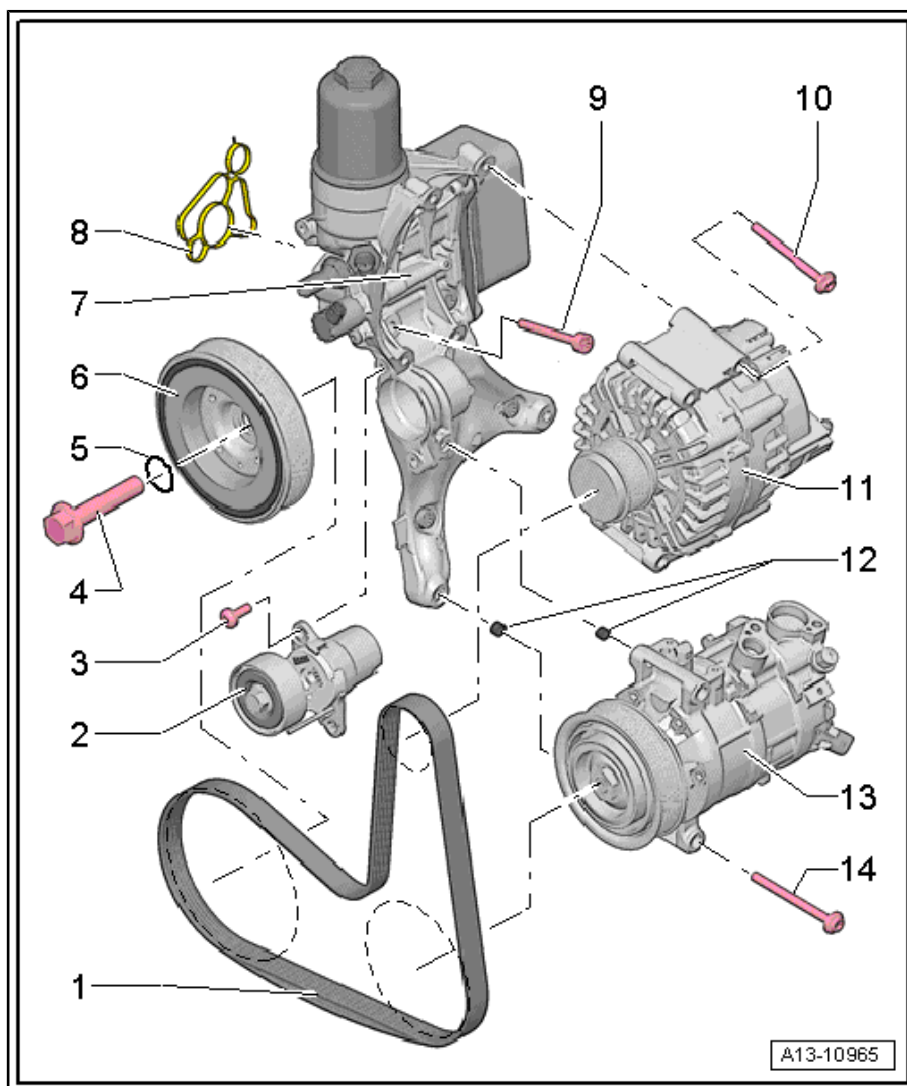
- ☐ Renewing:
- ☐ 8 Nm +45°

##### 4 - Bolt

- ☐ Renewing:
- ☐ Moisten O-ring with oil.
- ☐ 150 Nm +90°
- ☐ Use counterhold - T10355- to loosen and tighten.
- ☐ Removing and installing  
⇒ [page 54](#)

##### 5 - O-ring

- ☐ Not a replacement part. Included in items supplied with bolt.





## 6 - Vibration damper

- ☐ With poly V-belt pulley
- ☐ Removing and installing ⇒ [page 54](#)
- ☐ Renew seal for vibration damper ⇒ [page 64](#)

## 7 - Ancillary bracket

- ☐ With oil filter and engine oil cooler
- ☐ Removing and installing ancillary bracket ⇒ [page 60](#) .
- ☐ Removing and installing engine oil cooler ⇒ [page 184](#)

## 8 - Articulation

- ☐ Renewing:

## 9 - Bolt

- ☐ Renewing:
- ☐ Specified torques and installation sequence ⇒ [page 52](#) .

## 10 - Bolt

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

## 11 - Alternator

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

## 12 - Dowel sleeves

- ☐ For air conditioner compressor.

## 13 - Air conditioner compressor

- ☐ Do not unscrew or disconnect refrigerant lines
- ☐ Assembly overview ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Assembly overview - drive unit of air conditioner compressor .

## 14 - Bolt

- ☐ Specified torque ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Assembly overview - drive unit of air conditioner compressor .

## Ancillary bracket - specified torques and tightening sequence

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

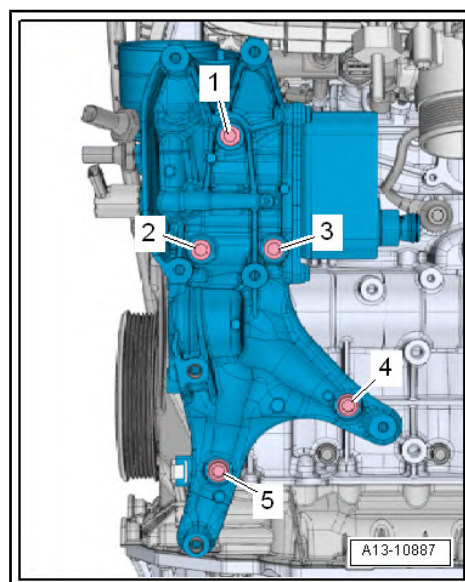


### Note

*Renew bolts that are tightened with turning further angle.*

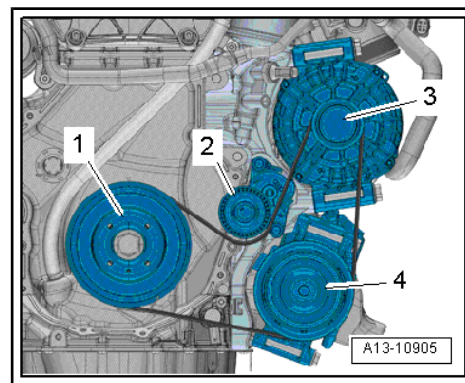
- Tighten bolts in sequence -1 ... 5- in 3 stages as follows:

Step	Bolts	Specified torques/angle specifications
1.	-1 ... 5-	Screw in by hand as far as stop
2.	-1 ... 5-	20 Nm
3.	-1 ... 5-	Turn 90° further



### Poly V-belt routing

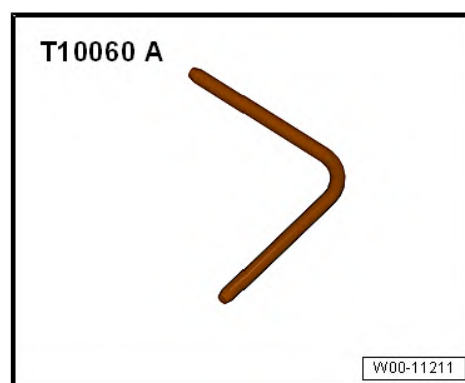
- 1 - Vibration damper
- 2 - Tensioning device for poly V-belt
- 3 - Alternator
- 4 - Air conditioner compressor



## 1.2 Removing and installing poly-V belt

### Special tools and workshop equipment required

- ◆ Locking pin - T10060 A-

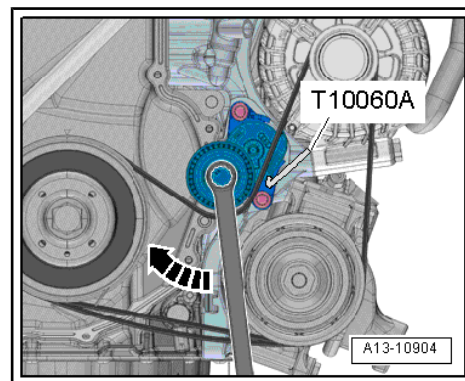


### Removing



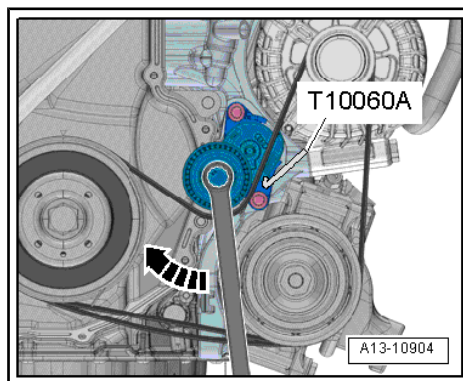
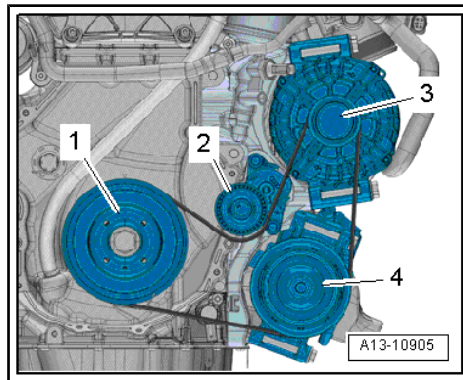
If a poly V-belt that has already been used is inserted in the reverse direction, it may become damaged.

- Make a marking for the direction of rotation with before removing.
- When installing again, ensure correct direction of running.
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
- If poly V-belt is to be reinstalled, mark direction of rotation on belt using chalk or felt tip pen before removing.
- To slacken poly V-belt turn tensioning device in direction of -arrow-. To do so, fit tool from "above".
- Lock tensioning device in place with locking pin - T10060 A- .
- Remove poly V-belt.



## Installing

- When installing used poly V-belts, observe the direction of rotation marked on removal.
  - Fit poly V-belt as shown in illustration.
- 1 - Vibration damper
  - 2 - Tensioning device for poly V-belt
  - 3 - Alternator
  - 4 - Air conditioner compressor
- Turn tensioning device in -direction of arrow-, and pull out locking pin - T10060 A- .
  - Release tensioner.
  - Check that poly V-belt is properly seated.
  - Start engine and check that poly V-belt runs properly.



## 1.3 Removing and installing tensioner for poly V-belt

### Removing

- Remove poly V-belt from tensioner  
⇒ [“1.2 Removing and installing poly-V belt”, page 53](#) .
- Unscrew bolts -arrows- and pull tensioning device -1- for poly V-belt off ancillary bracket.

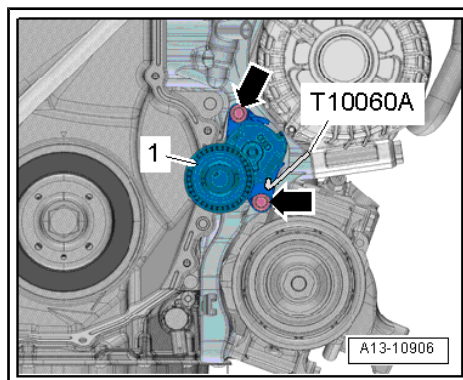
### Installing

Remaining installation is carried out in the reverse order. When installing, note the following:

- Fit poly V-belt ⇒ [page 53](#) .

### Specified torques

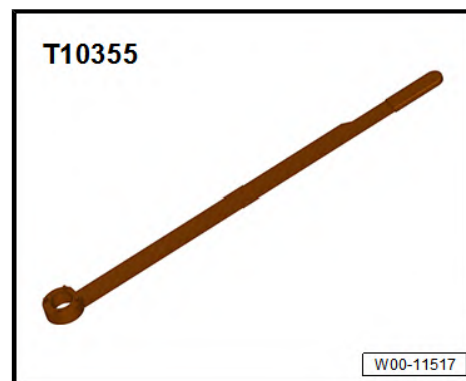
- ♦ ⇒ [“1.1 Assembly overview - cylinder block \(pulley end\)”, page 51](#)



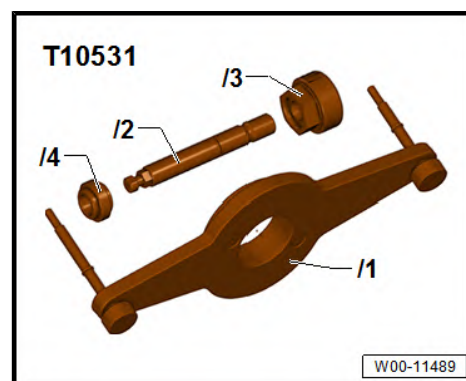
## 1.4 Removing and installing vibration damper

Special tools and workshop equipment required

◆ Counter-hold tool - T10355-

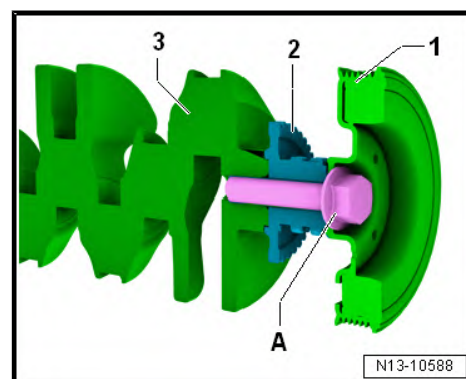


◆ Assembly tool - T10531-



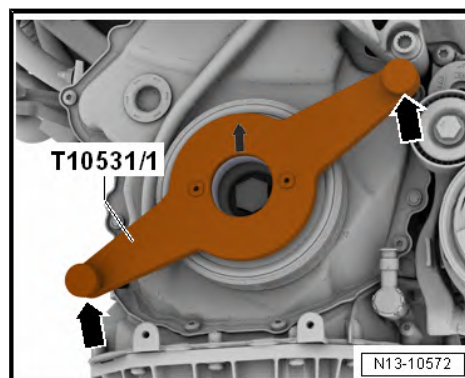
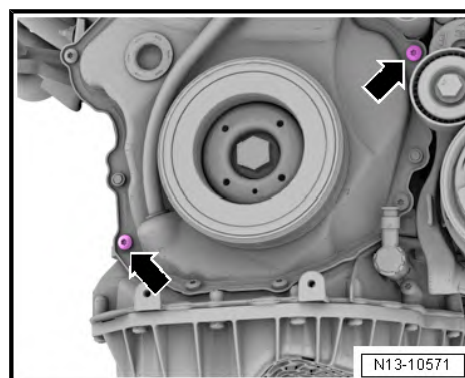
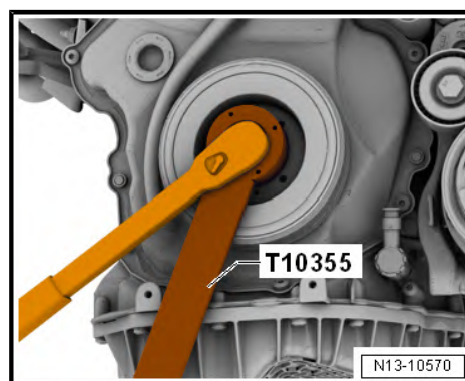
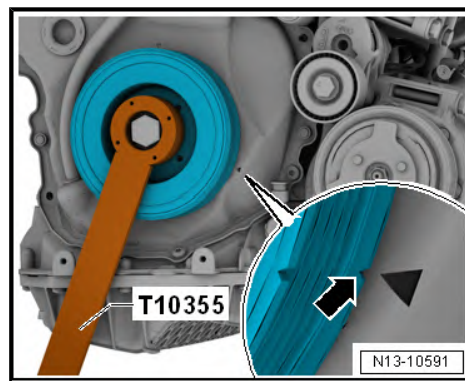
Components of assembly tool - T10531- :

- ◆ Support - T10531/1-
- ◆ Clamping pin - T10531/2-
- ◆ Turning over tool - T10531/3-
- ◆ Collar nut - T10531/4-
- The vibration damper bolt -A- is used to establish the connection between vibration damper -1-, timing chain sprocket -2- and crankshaft -3-. Before unscrewing the bolt, lock the timing sprocket in position relative to the crankshaft as described below.



## Removing

- Remove right wheel housing liner ➤ General body repairs, exterior; Rep. gr. 66 ; Removing and installing front wheel housing liner .
- Remove poly V-belt ➤ [page 53](#) .
- Pull locking pin - T10060 A- out of tensioning device for poly V-belt.
- Turn vibration damper to TDC position -arrow- using counterhold tool - T10355- .
  - Notch on vibration damper must align with arrow marking on bottom cover for timing chains.
  - The marking on the cover is located at »4 o'clock position«.
- Loosen vibration damper bolt by  $\frac{1}{2}$  turn. To do this, use counterhold tool - T10355- .
- If vibration damper was turned while loosening bolt, reset TDC position.
- Unscrew securing bolts -arrows- for timing chain cover. Bolts must be replaced.
- Fit support - T10531/1- to vibration damper, as shown in illustration, and tighten knurled screws -arrows- by hand.
- Unscrew vibration damper bolt completely.





- Check if turning over tool -A- slides easily over clamping pieces -B-. If required, turn tensioning bolt -arrow-.



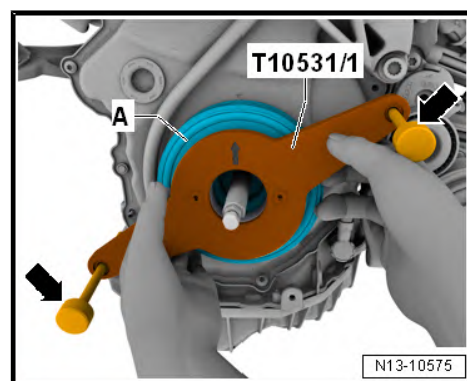
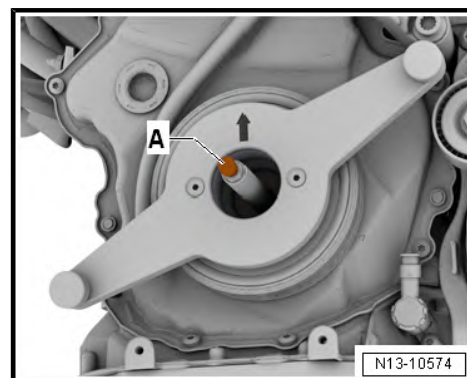
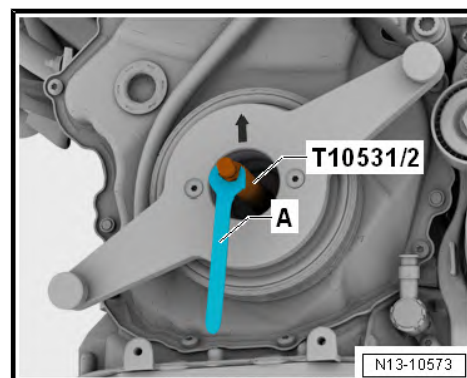
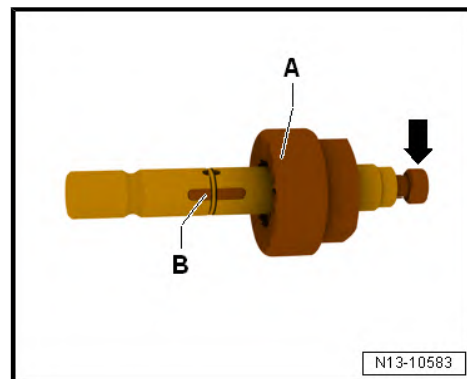
**Note**

*Do not turn the tensioning bolt anymore, otherwise the clamping pin - T10531/2- will be jammed when it is screwed into the crankshaft.*

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

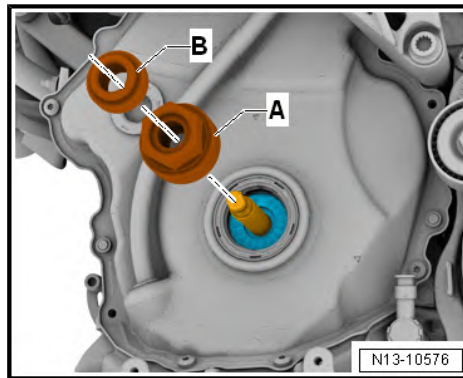
- Tighten tensioning bolt -A- by hand in order to lock the chain sprocket in position relative to crankshaft.

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

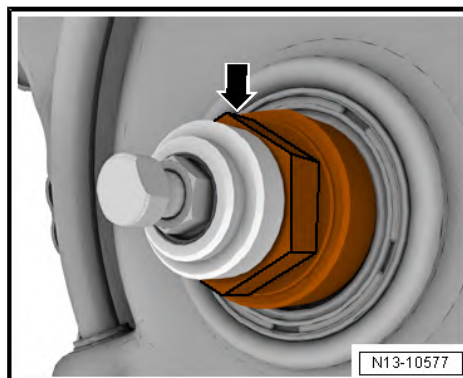


### Turning crankshaft without vibration damper:

- Fit turning over tool -A- on clamping pin. Pay attention to toothed contours of chain sprocket while doing so. In TDC position the flat section of the tool faces upwards.
- Tighten turning over tool with flange nut -B-.

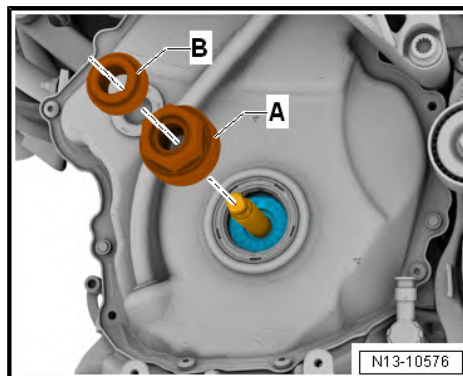


- Now, the crankshaft can be turned on hexagon -arrow-.

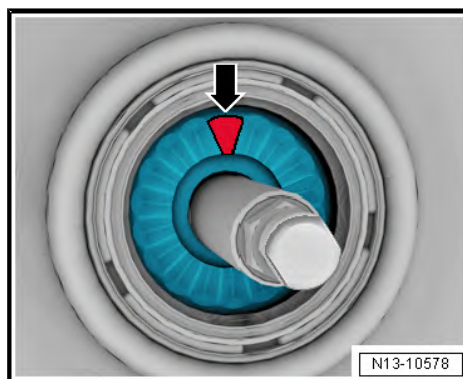


### Installing vibration damper

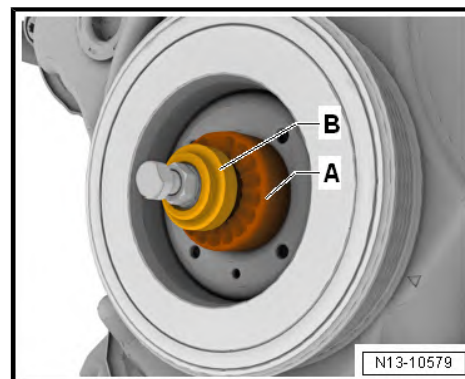
- If necessary, remove flange nut -B- and turning over tool -A- from clamping pin.



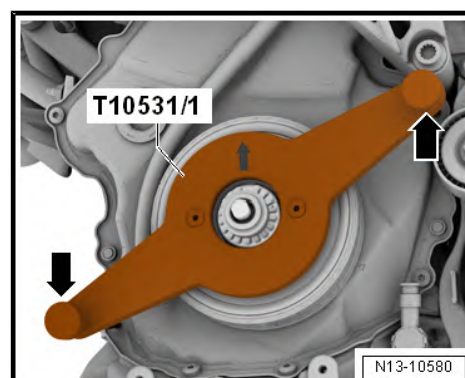
- Fit vibration damper in TDC position. Pay attention to teeth of chain sprocket -arrow- while doing so.



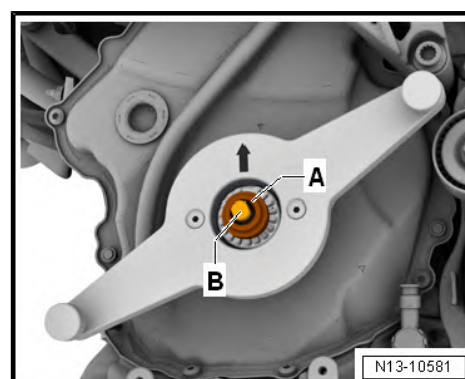
- Fit turning over tool -A- on clamping pin. The hexagon faces towards vibration damper while doing so.
- Screw on flange nut -B-. Move vibration damper back and forth slightly while doing so to ensure that vibration damper is properly seated on toothed contours. Tighten the flange nut until the vibration damper cannot be turned anymore.



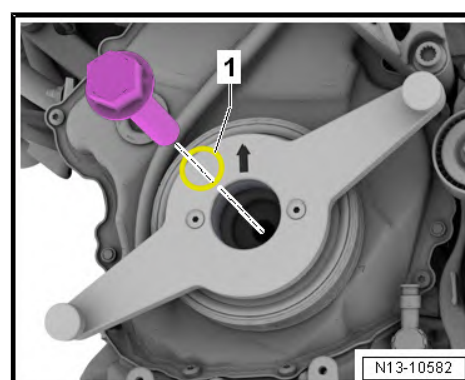
- Fit support - T10531/1- to vibration damper, as shown in illustration, and tighten knurled screws -arrows- by hand.



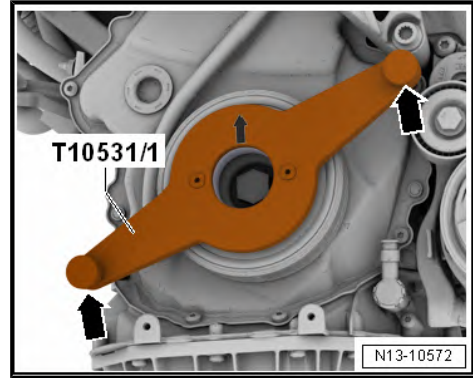
- Unscrew flange nut -A-, and loosen clamping pin -B-.
- Unscrew clamping pin , and remove it together with turning over tool .



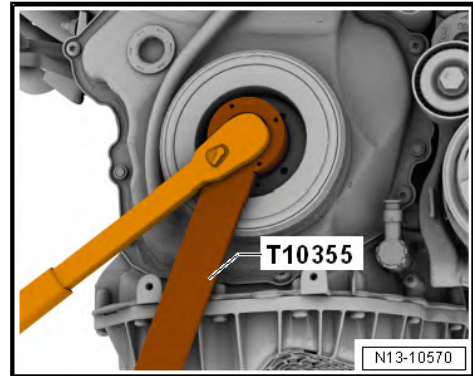
- Screw in new vibration damper bolt with lubricated O-ring -1- by hand.



- Unscrew knurled screws -arrows-, and remove support - T10531/1- .



- Tighten bolt for vibration damper using counter-hold tool - T10355- .

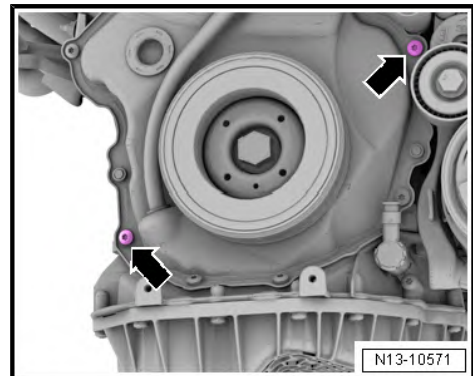


- Screw in new securing bolts -arrows-.

Further assembly is basically the reverse of the removal procedure.

#### Specified torques

- ◆ ⇒ [“1.1 Assembly overview - cylinder block \(pulley end\)”, page 51](#)
- ◆ ⇒ [“2.1 Assembly overview - cover for timing chain”, page 114](#)
- ◆ ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Assembly view - front wheel housing liner
- ◆ ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .



## 1.5 Removing and installing bracket for ancillaries:

#### Special tools and workshop equipment required

- ◆ Drip tray for workshop hoist - VAS 6208-





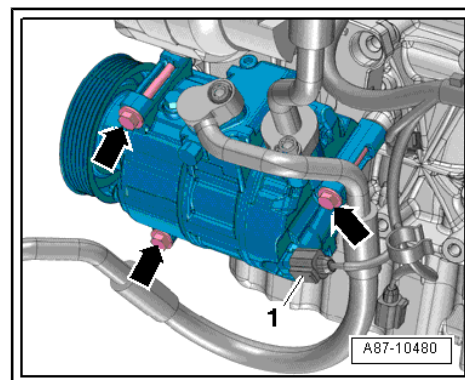
## Removing

- Drain coolant ⇒ [page 206](#) .
- Remove alternator ⇒ Electrical system; Rep. gr. 27 ; Alternator; Removing and installing alternator .

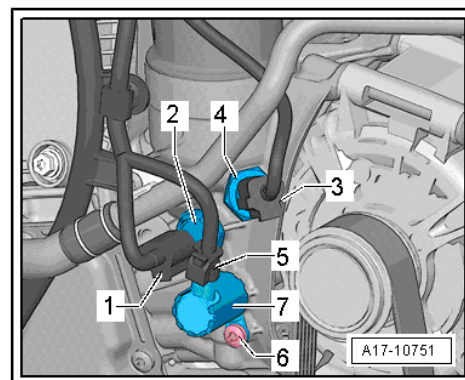
### **⚠ CAUTION**

**Risk of freezing injury caused by refrigerant.**

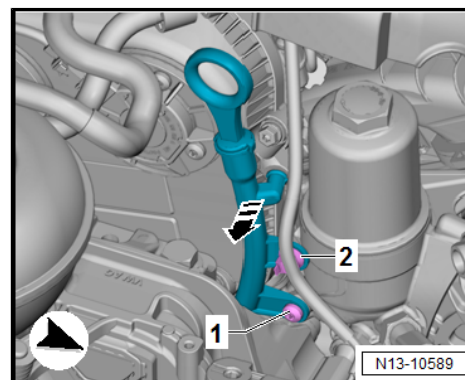
- Do not open refrigerant circuit of air conditioning system.
- Disconnect connector -1- on air conditioning compressor regulating valve - N280- .
- Unscrew bolts -arrows-.
- Detach air conditioner compressor with refrigerant hoses connected from bracket, and tie it up on the right side. Do NOT stretch, kink or bend refrigerant lines and hoses.



- Disconnect connectors:
- 1 - For oil pressure switch - F1- -item 2-.
- 3 - For oil pressure switch for reduced oil pressure - F378- -item 4-.
- 5 - For piston cooling jet control valve - N522- -item 7-
- Remove oil filter element ⇒ Maintenance ; Booklet KH1 ; Engine oil: Draining; Renewing oil filter and replenishing engine oil .



- Unclip pipe -2-.
- Remove bolt -1- for guide tube.
- Pull guide tube in -direction of arrow- off the cover.





- Move wiring harness clear.
- Place drip tray - VAS 6208- beneath engine.
- Unscrew bolts -1 to 5- and pull ancillary bracket with engine oil cooler off coolant pump housing.
- Remove ancillary bracket between intake manifold and engine support.

### Installing

Carry out installation in the reverse sequence, noting the following:



#### Note

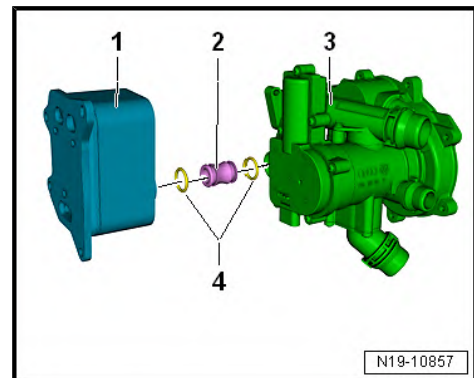
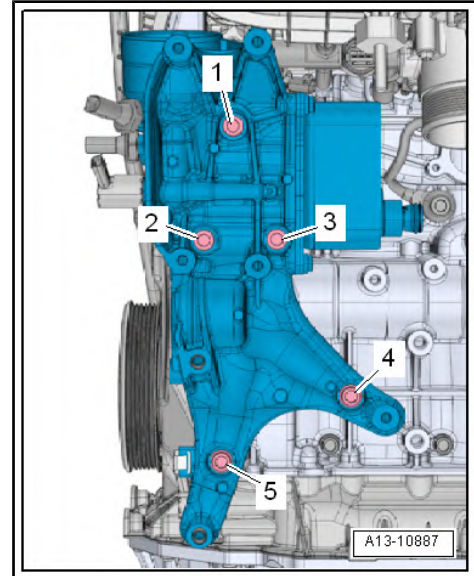
- ◆ *Replace bolts that are tightened with specified tightening angle.*
- ◆ *Renew seals and O-rings.*
- Moisten new O-rings -4- with coolant.
- Insert connecting piece -2- in engine oil cooler -1-.
- Push ancillary bracket with engine oil cooler -1- onto connecting piece, start bolts, and tighten them ➔ [page 52](#) .
- Install air conditioner compressor ➔ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Assembly overview - drive unit of air conditioner compressor .
- Install alternator ➔ Electrical system; Rep. gr. 27 ; Alternator; Removing and installing alternator .
- Fit poly V-belt ➔ [page 53](#) .
- Add coolant ➔ [page 208](#) .
- Install oil filter and check oil level ➔ Maintenance ; Booklet KH1 ; Engine oil: Draining; Renewing oil filter and replenishing engine oil .

### Specified torques

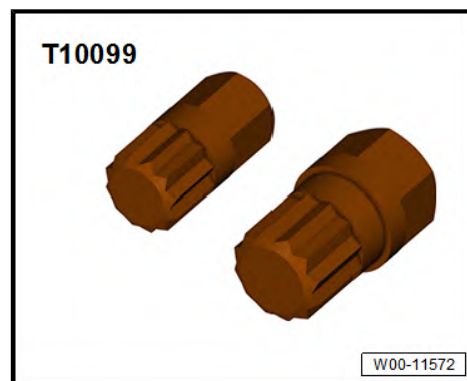
- ◆ ➔ [“1.1 Assembly overview - cylinder block \(pulley end\)”, page 51](#)
- ◆ ➔ [“2.1 Assembly overview - cover for timing chain”, page 114](#)
- ◆ Alternator; Assembly overview - alternator ➔ Electrical system; Rep. gr. 27 ; Alternator; Assembly overview - alternator .

## 1.6 Removing and installing engine support

Special tools and workshop equipment required



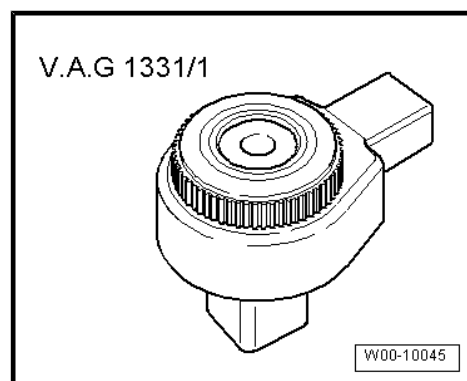
◆ Bits - T10099-



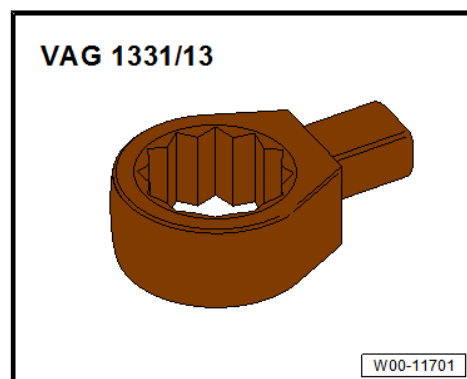
◆ Torque wrench 6-50 Nm - VAG 1331-



◆ Ratchet 1/2" x 9-12" Ref.(735/10) - VAG 1331/1-

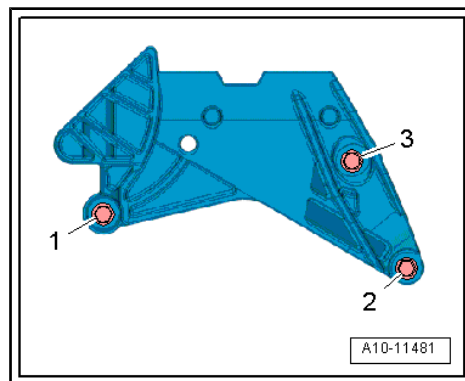


◆ Adapter part - VAG 1331/13-



## Removing

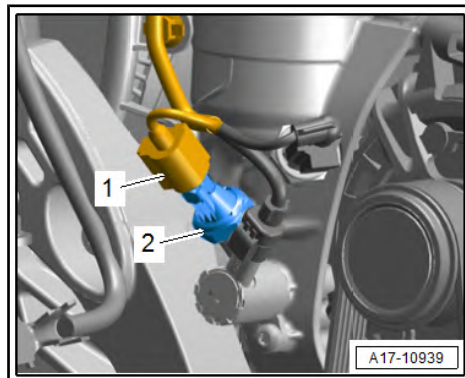
- Remove engine mounting ➤ [page 35](#) .
- Remove right wheel housing liner ➤ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liner; Removing and installing front wheel housing liner .
- Lower engine slightly. Use bit - T10099- to unscrew bolts -1- and -2- from below.
- Lift engine again, and unscrew bolt -3- from above.



- Separate electrical wiring -1- from oil pressure switch - F1- .
- Remove support leg upwards.

## Installing

Carry out installation in the reverse sequence, noting the following:



## Engine support - specified torque and tightening sequence



### Note

*Renew bolts.*

- Tighten bolts in stages in the sequence shown:

Stage	Bolts	Specified torque/turning further angle
1.	-1 ... 3-	7 Nm
2.	-1 ... 3-	40 Nm
3.	-1 ... 3-	Turn 90° further

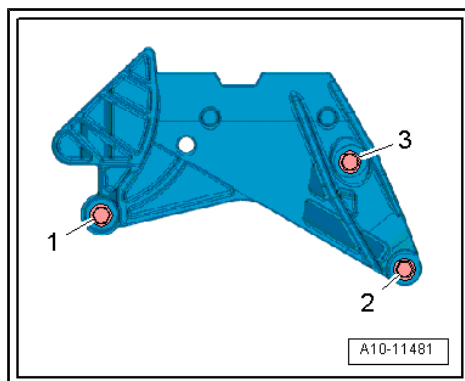
- Install engine mounting ➤ [page 35](#) .

## Specified torques

- ♦ ➤ ["2.1 Assembly overview - assembly mountings", page 34](#)
- ♦ ➤ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Assembly view - front wheel housing liner

## 1.7 Renewing crankshaft oil seal - belt pulley end

Special tools and workshop equipment required



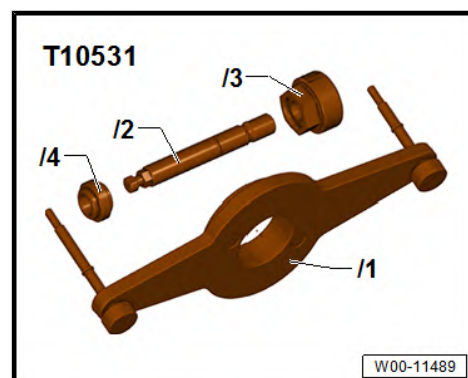
- ◆ Thrust piece - T10354-



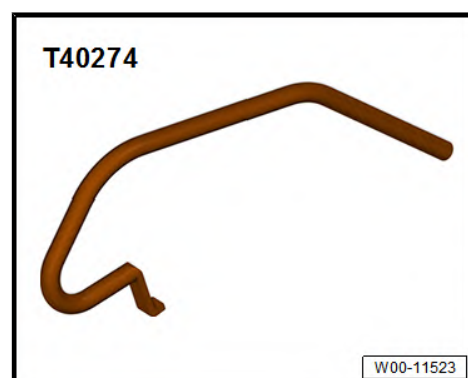
- ◆ Thrust washer - T10375-



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

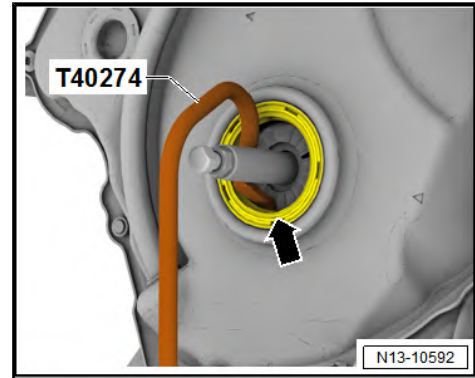


- ◆ Puller hooks - T40274-



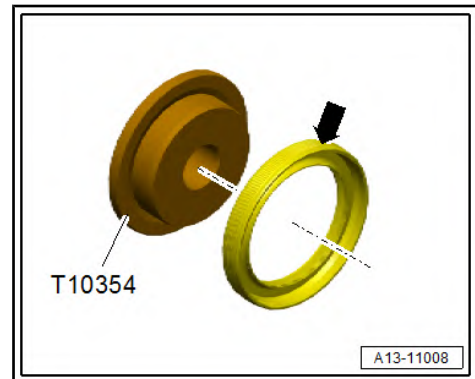
## Removing

- Remove vibration damper ➤ [page 54](#) .
- Clamping pin - T10531/2- is inserted.
- Using extractor hook - T40274- , pull out seal -arrow-.

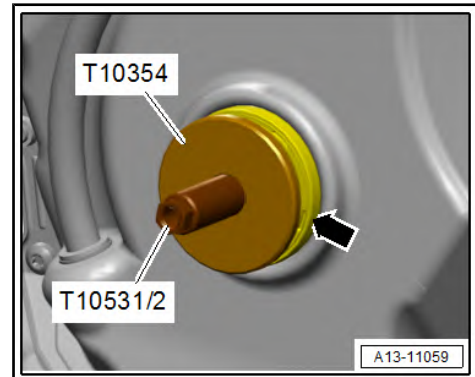


## Installing

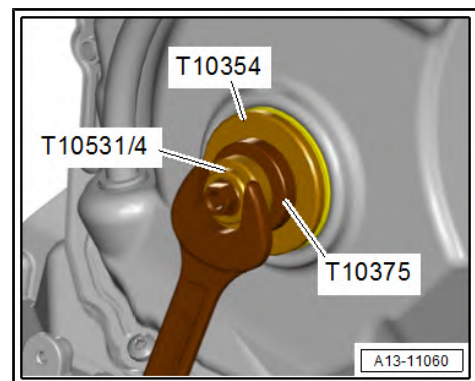
- Clean contact surface and sealing surface.
- Slide seal -arrow- onto thrust piece - T10354- .
- Closed side of oil seal faces towards thrust piece - T10354- .



- Slide seal -arrow- with thrust piece - T10354- onto clamping pin - T10531/2- , and fit it to lower timing chain cover.



- In addition, fit thrust pad - T10375- , and screw on flange nut - 10531/4- .
- Using a 21 mm open-end spanner, tighten flange nut until seal has been pressed in to stop.



### Note

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

Further assembly is basically the reverse of the removal procedure. Please observe the following:

- Install vibration damper ➤ [page 54](#) .

## Specified torques

- ◆ ➤ [“1.1 Assembly overview - cylinder block \(pulley end\)”, page 51](#)



## 2 Cylinder block, gearbox end

⇒ [“2.1 Assembly overview - cylinder block, gearbox end”, page 67](#)

⇒ [“2.2 Removing and installing flywheel”, page 68](#)

⇒ [“2.3 Removing and installing sealing flange on gearbox side”, page 69](#)

### 2.1 Assembly overview - cylinder block, gearbox end

#### 1 - Flywheel

- ☐ Removing and installing  
⇒ [page 68](#)
- ☐ Can only be installed in one position, holes are offset.

#### 2 - Dowel sleeve

#### 3 - Sealing flange, gearbox side

- ☐ With seal
- ☐ Renewing:
- ☐ Removing and installing  
⇒ [page 69](#)
- ☐ Before installing, remove oil residue from crankshaft journal using a clean cloth.
- ☐ Do not remove guide sleeve until sealing flange has been slid on to crankshaft journal.

#### 4 - Cylinder block

#### 5 - Bolt

- ☐ Specified torque and tightening sequence  
⇒ [page 68](#)

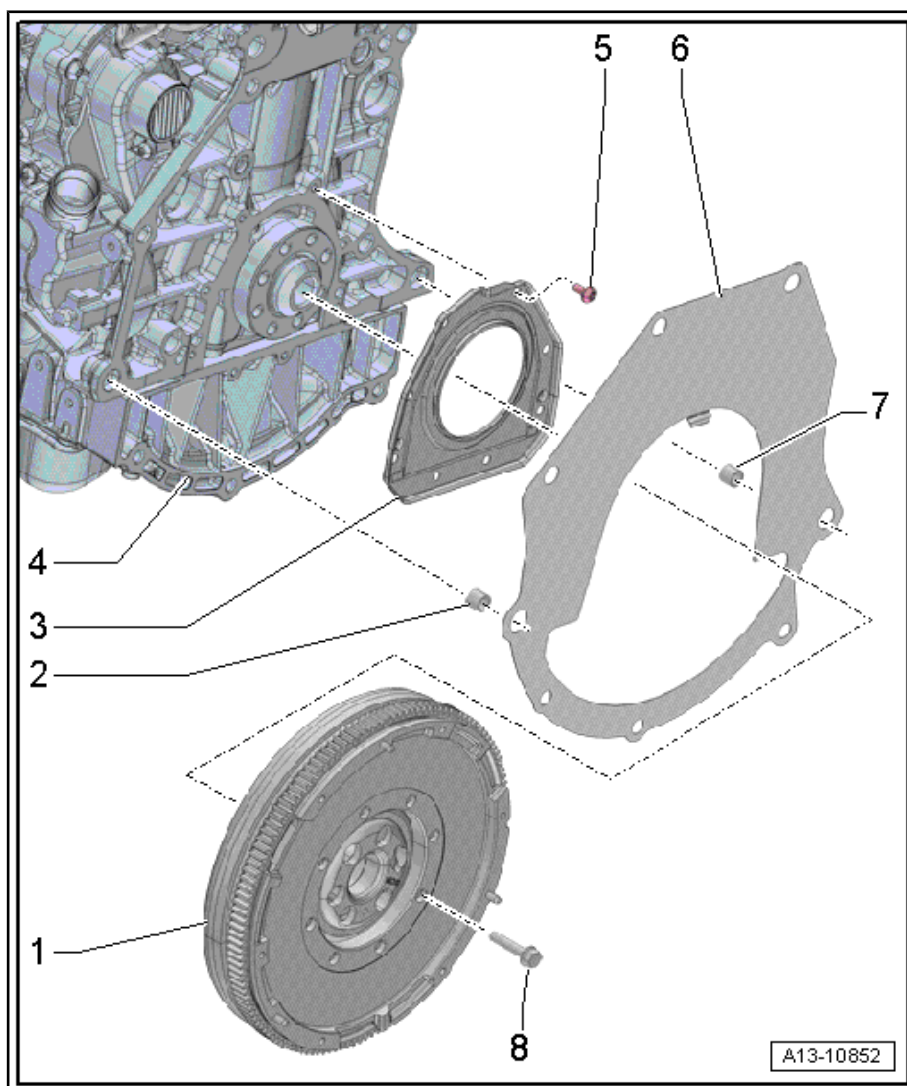
#### 6 - Backing plate

- ☐ Illustration does not show version installed in vehicle.
- ☐ Must sit on dowel sleeves
- ☐ Do not damage or bend when assembling.
- ☐ Is fitted onto sealing flange ⇒ [page 68](#)

#### 7 - Dowel sleeve

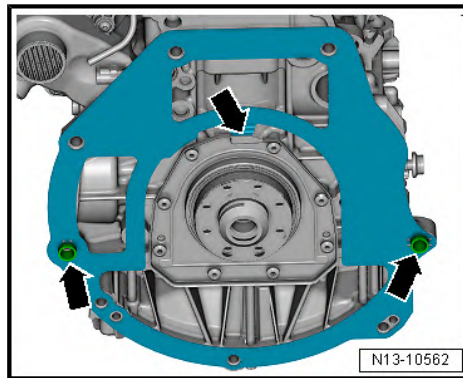
#### 8 - Bolt

- ☐ For dual-mass flywheel
- ☐ Renewing:
- ☐ 60 Nm +90°



## Installing intermediate plate

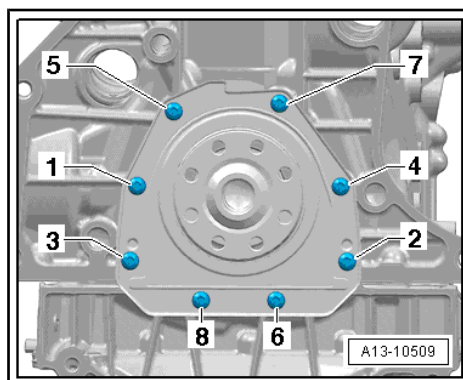
- Hook intermediate plate onto sealing flange and slide onto dowel sleeves -arrows-.



## Sealing flange at gearbox end - tightening sequence

- Tighten bolts -1 to 8- in the specified sequence.

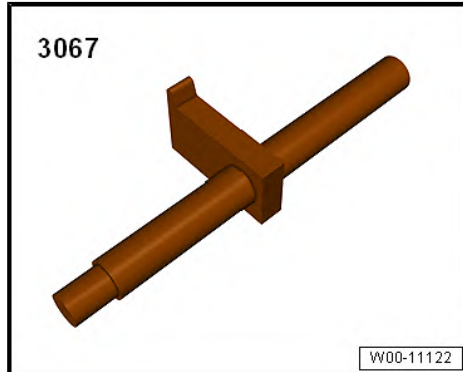
Stage	Bolts	Specified torque/turning further angle
1.	-1 ... 8-	Screw in by hand as far as stop
2.	-1 ... 8-	9 Nm



## 2.2 Removing and installing flywheel

### Special tools and workshop equipment required

- ♦ Counter-hold tool - 3067-



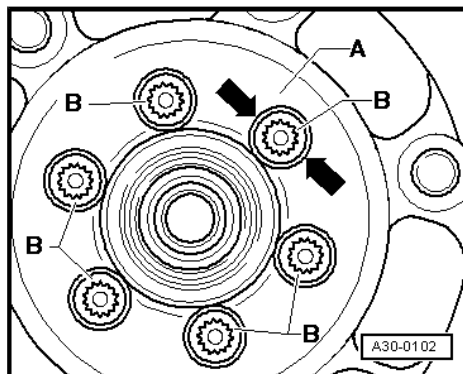
### Removing

- Gearbox has been removed.



#### Note

- ♦ *Screw out bolts -B- not with an air wrench or power impact wrench but by hand.*
- ♦ *When removing the bolts, make sure that the bolt heads do not come into contact with the flywheel.*
- ♦ *Rotate dual-mass flywheel -A- so that bolts -B- align centrally with the holes -arrows-.*



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

### Installing

Remaining installation is carried out in the reverse order. When installing, note the following:



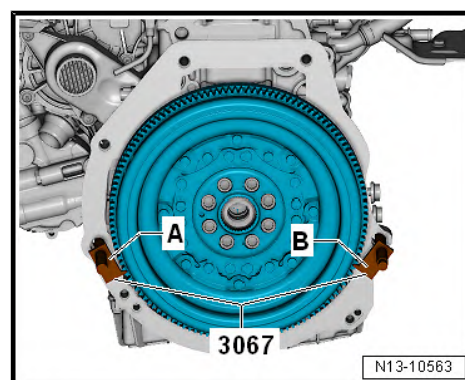
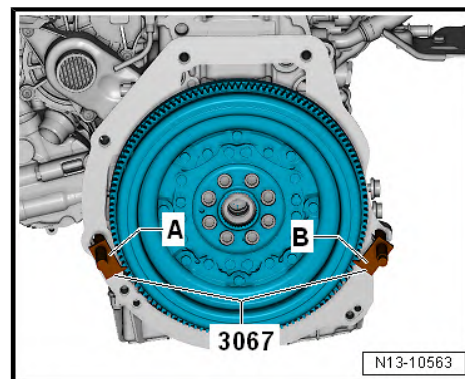
#### Note

*Renew bolts that are tightened with turning further angle.*

- Insert counterhold tool - 3067- in hole -A- of cylinder block.

### Specified torques

- ◆ ⇒ [“2.1 Assembly overview - cylinder block, gearbox end”, page 67](#)



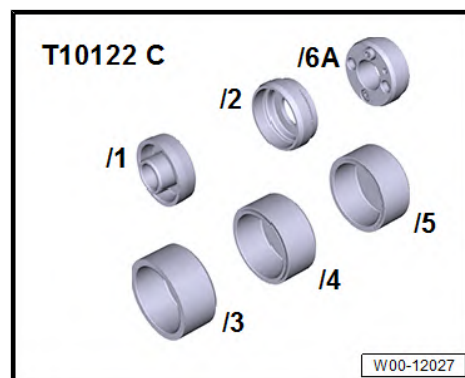
## 2.3 Removing and installing sealing flange on gearbox side

### Special tools and workshop equipment required

- ◆ Guide piece - T10122/6- or -T10122/6A- from fitting tools - T10122B- or -T10122C-



- ◆ Assembly aid - T10122/1- from fitting tools - T10122B- or -T10122C-

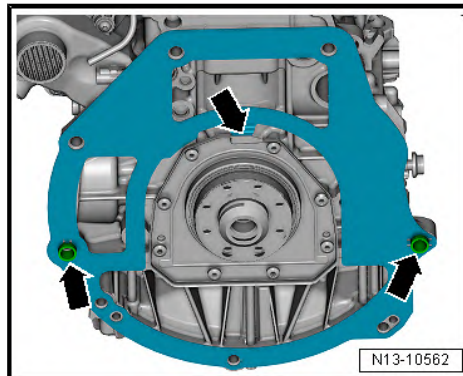


- ◆ Hand drill with plastic brush attachment
- ◆ Eye protection

- ◆ Sealant ⇒ Electronic parts catalogue (ETKA)

### Removing

- Gearbox has been removed.
- Remove flywheel ⇒ [page 68](#) .
- Detach intermediate plate at sealing flange and dowel sleeves -arrows-.



- Unscrew bolts -1 ... 8-.
- Remove sealing flange.

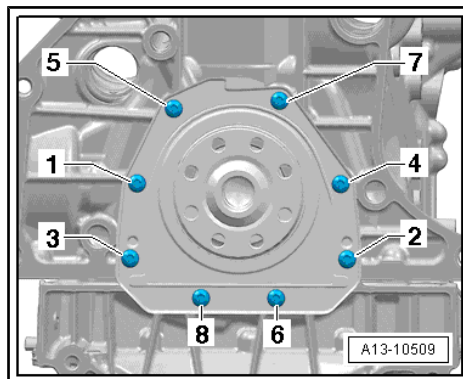
### Installing

Install in the reverse order of removal, observing the following.



#### Note

- ◆ *Observe use-by date of silicone sealant.*
- ◆ *The sealing flange must be installed within 5 minutes of applying the silicone sealant.*
- ◆ *In order to prevent the lubrication system from being soiled with sealant residue cover the open section of the sump with a clean cloth.*



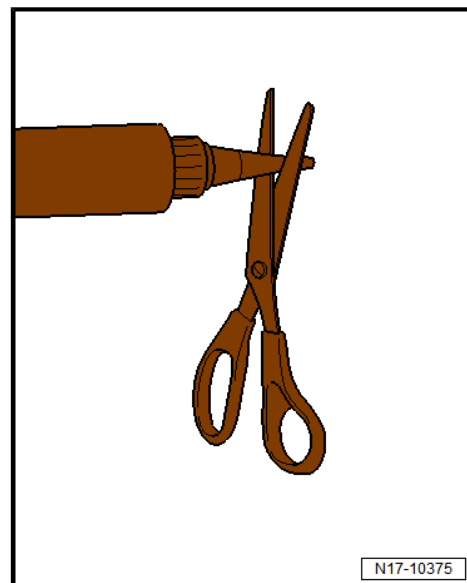
### CAUTION

Risk of eye injury caused by sealant residue.

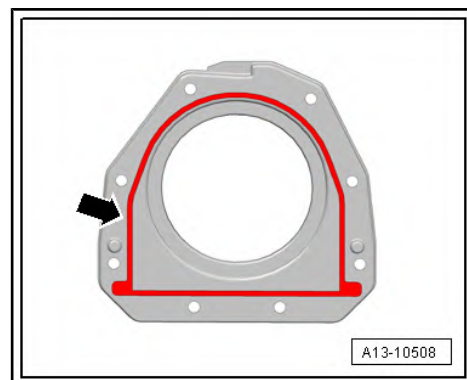
- Wear protective goggles.

- Remove sealant remaining on cylinder block with flat scraper or rotating plastic brush.
- Clean sealing surfaces. They must be oil and grease-free.
- Clean crankshaft journal. If there is any rust, lightly coat crankshaft journal with oil.

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

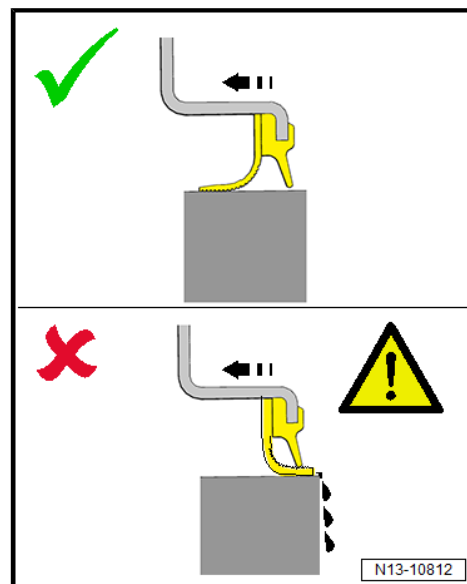


- Apply silicone sealant as shown to clean sealing surface of sealing flange.
- ◆ Thickness of sealant bead: 2 to 3 mm.



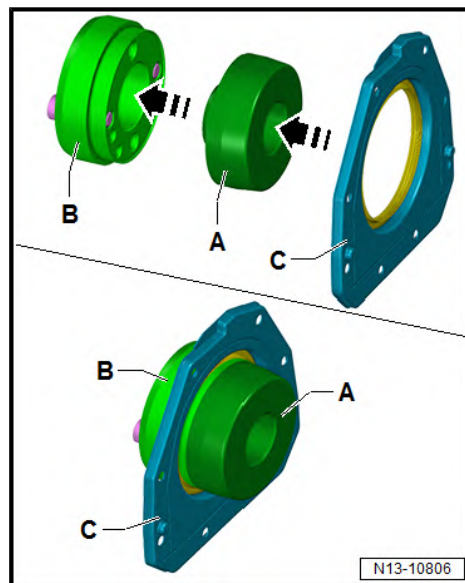
#### Note

- ◆ The sealing flange must be installed within 5 minutes after applying the silicone sealant.
- ◆ The bead of sealant must not be thicker than specified, otherwise excess sealant can enter the sump and obstruct the strainer in the oil intake pipe.
- ◆ Check sealing flange; it must be free of kinks and damage.
- ◆ The sealing lip must face engine following installation. If the sealing lip folds outwards during installation, this will lead to oil leaks.





- Check guide - T10122/6- -B-; it must be clean and free of sharp edges.
- Attach assembly aid - T10122/1- -A- to guide - T10122/6- -B-.
- Push sealing flange -C-, with outer side leading, onto guide piece - T10122/6- -B-.
- Remove assembly aid -A-.



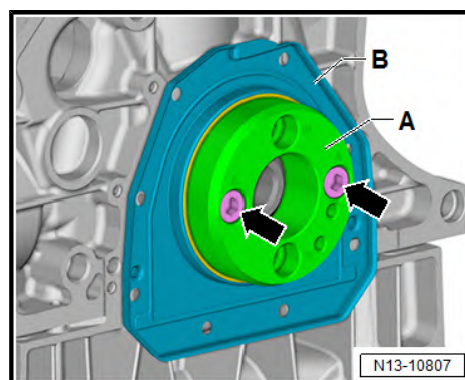
- Put guide -A- with sealing flange -B- onto crankshaft journal.



#### Note

*It is not necessary to tighten the bolts -arrows-.*

- Push sealing flange -B- over guide -A- onto crankshaft journal.
- Remove guide -A-.



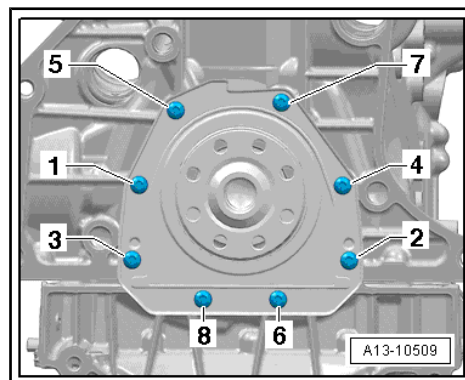
- Tighten new bolts evenly in the sequence shown.

Stage	Bolts	Specified torque/turning further angle
1.	-1 ... 8-	Screw in by hand as far as stop
2.	-1 ... 8-	9 Nm



#### Note

*After installing the sealing flange, wait about 30 minutes for the sealant to dry. Only then fill with engine oil.*



Further assembly is basically a reverse of the dismantling sequence.

#### Specified torques

- ♦ ➔ ["2.1 Assembly overview - cylinder block, gearbox end", page 67](#)

## 3 Crankshaft

⇒ [“3.1 Assembly overview - crankshaft”, page 73](#)

⇒ [“3.2 Crankshaft dimensions”, page 75](#)

⇒ [“3.3 Arrangement of the crankshaft bearing shells”, page 75](#)

⇒ [“3.4 Renewing needle bearing in crankshaft”, page 76](#)

⇒ [“3.5 Measuring axial clearance of crankshaft”, page 78](#)

⇒ [“3.6 Measuring radial clearance of crankshaft”, page 79](#)

⇒ [“3.7 Removing and installing sender wheel”, page 80](#)

### 3.1 Assembly overview - crankshaft



#### Note

Secure engine to assembly stand using engine and gearbox support - VAS 6095- to carry out repairs on engine ⇒ [page 29](#).

#### 1 - Cylinder block

#### 2 - Bearing shell for cylinder block

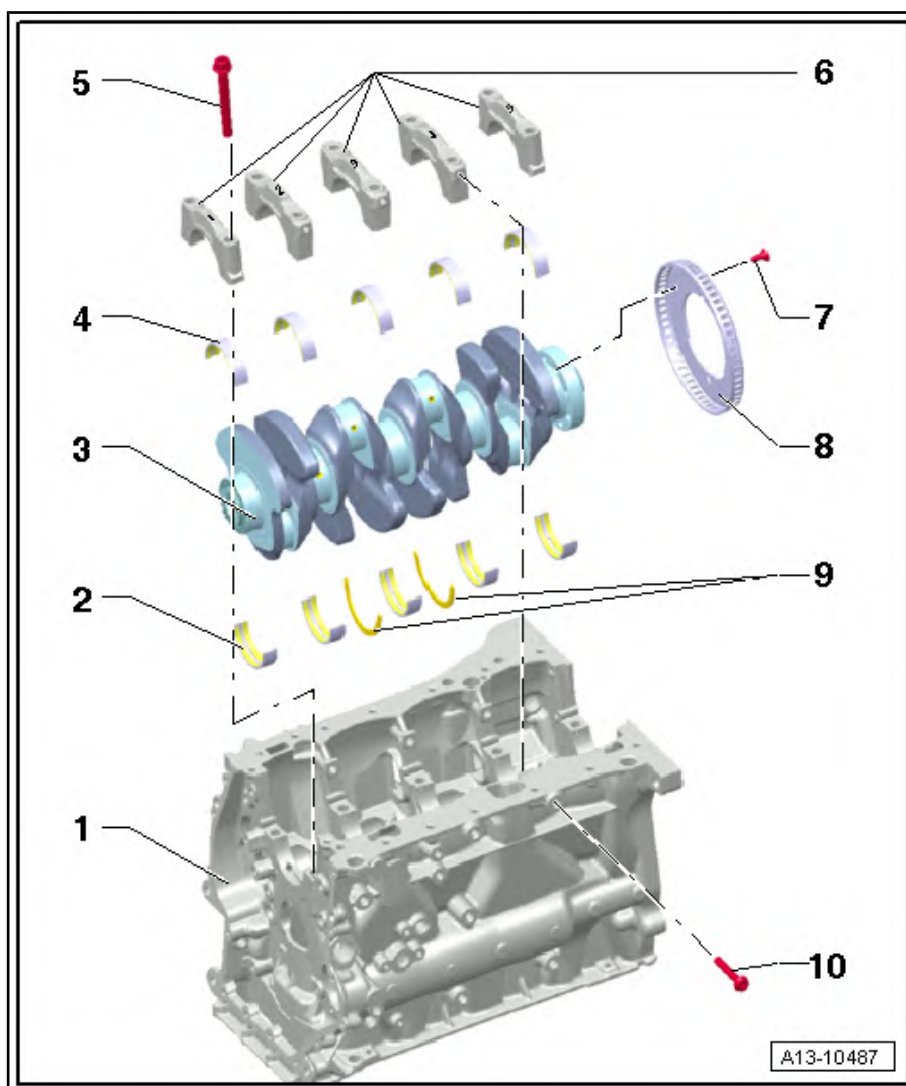
- ☐ With oil groove.
- ☐ Coat with oil.
- ☐ Do not interchange used bearing shells (mark).
- ☐ Marking of crankshaft bearing shells (classification) ⇒ [page 75](#)

#### 3 - Crankshaft

- ☐ After removing, place it down so that the sender wheel ⇒ [Item 8 \(page 74\)](#) is not damaged and the crankshaft does not rest on the sender wheel
- ☐ If crankshaft is renewed, bearing shells must be reassigned to bearing cap ⇒ [page 75](#)
- ☐ Axial clearance ⇒ [page 78](#)
- ☐ Radial clearance ⇒ [page 79](#)
- ☐ Do not rotate crankshaft when checking radial clearance
- ☐ Crankshaft dimensions ⇒ [page 75](#).

#### 4 - Bearing shell for bearing cap

- ☐ Without oil groove.
- ☐ Coat with oil.
- ☐ Do not interchange used bearing shells (mark).



- ☐ Marking of crankshaft bearing shells (classification) ➔ [page 75](#)

#### 5 - Bolt

- ☐ Renewing:
- ☐ Tightening sequence ➔ [page 74](#)

#### 6 - Bearing cap

- ☐ Bearing cap 1: belt pulley end.
- ☐ Bearing shell retaining lugs in cylinder block and bearing caps must align above one another.

#### 7 - Bolt

- ☐ 10 Nm +90°
- ☐ Renewing:
- ☐ Sender wheel must be renewed if bolts are loosened ➔ [page 80](#)

#### 8 - Sender wheel

- ☐ For engine speed sender - G28-
- ☐ Can only be installed in one position, holes are offset.
- ☐ Sender wheel must be renewed if bolts are loosened
- ☐ Removing and installing ➔ [page 80](#)

#### 9 - Thrust washers

- ☐ For bearing 3
- ☐ Coat with oil.

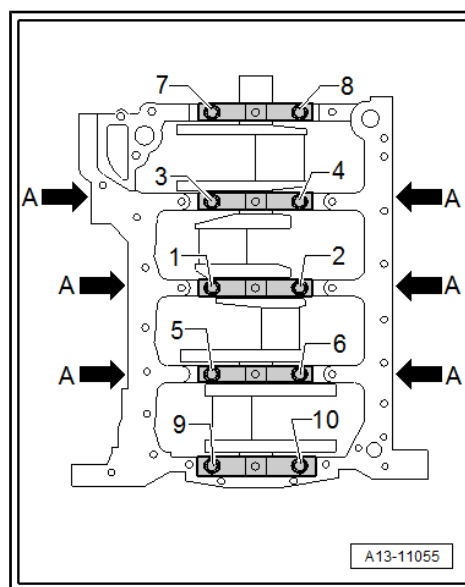
#### 10 - Bolt

- ☐ Renewing:
- ☐ Tightening sequence ➔ [page 74](#)

### Crankshaft - specified torques and tightening sequence

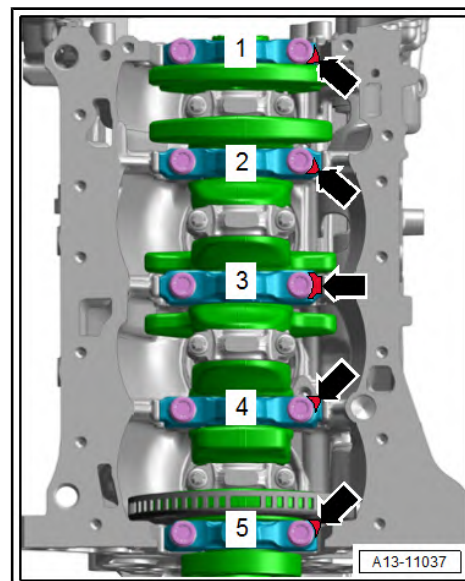
- Tighten bolts in stages in the sequence shown:

Stage	Bolts	Specified torques/angle specifications
1.	-1 ... 10- and -arrows A-	Screw in by hand as far as stop
2.	-1 ... 10-	65 Nm
3.	-1 ... 10-	Turn 90° further
4.	-Arrows A-	15 Nm
5th	-Arrows A-	Turn 90° further



### Crankshaft bearing caps identification

- Mark the installation position of the bearing cap -1- for refitting.
- Tabs -arrows- on bearing caps must face towards crankshaft bearing “3” on the intake side.



## 3.2 Crankshaft dimensions

(Dimensions in mm)

Honing dimension 1)	Ø Crankshaft main bearing journal	Conrod journal Ø
Basic dimension	48.00	47.80

1) No provision has yet been made to recondition worn crankshafts.

## 3.3 Arrangement of the crankshaft bearing shells

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

Which bearing shell is to be inserted at each place in the cylinder block (upper bearing shell) is marked by letters on the lower sealing surface or on the front side of cylinder block.

Which bearing shell is to be inserted at each place in bearing cap (lower bearing shell) is marked by letters on the crankshaft.

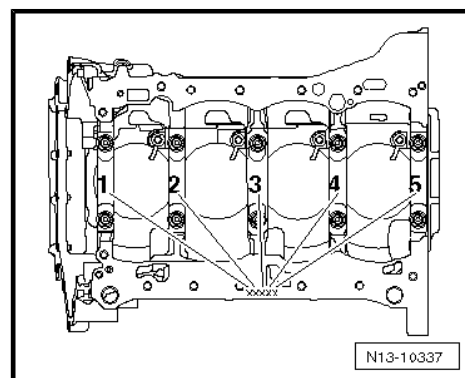
The first letter is allocated to bearing cap one, the second to bearing cap two, etc.

**Marking on bearing shell for cylinder block:**



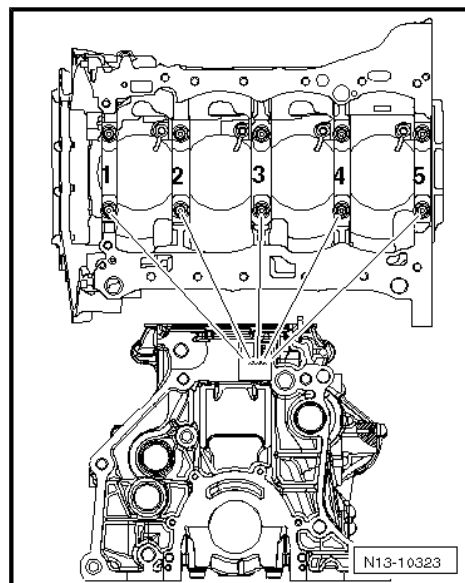
**Note**

*The marking on the cylinder block can be found engraved either in the sump sealing surface or in the front end (gearbox side) of the cylinder block.*



Identification on cylinder block is allocated to upper bearing shell (bearing shell for cylinder block).

- Make a note of the letters, and determine the colour code for installation with the aid of the table.

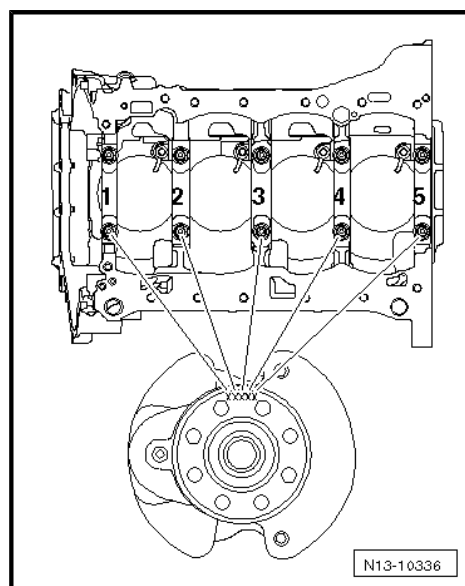


#### Marking on bearing shell for bearing cap:

Identification on crankshaft is allocated to lower bearing shell (bearing shell for bearing cap).

- Make a note of the letters, and determine the colour code for installation with the aid of the table.

S	=	Black
R	=	red
G	=	yellow
B	=	blue
W	=	white



### 3.4 Renewing needle bearing in crankshaft

Only vehicles with a dual clutch gearbox

Special tools and workshop equipment required

- ♦ Counter support e.g. KUKKO 22-1 - VAS 251 621-





◆ Internal puller - VAS 251 635-



◆ Drift - VW 207 C-

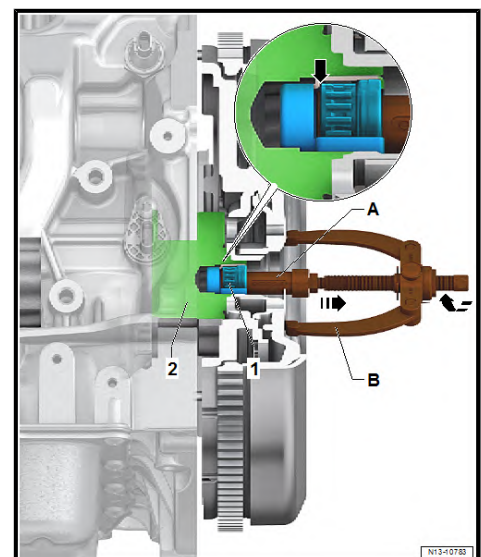


**Requirement:**

- The front edges of the inner puller must not be chipped.
- Gearbox has been removed.

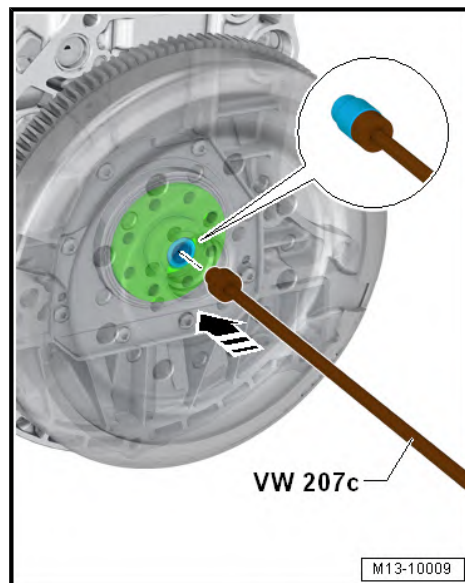
**Driving out needle bearing**

- Pull out needle bearing -1- with internal puller - VAS 251 635- -A- and counter support, e.g. KUKKO 22-1 - VAS 251 621- -B- from crankshaft -2-.
- The internal puller must be positioned behind the needle-and-cage assembly -arrow-.



### Installing

- Clean bearing seat in crankshaft and apply as thin coating of grease.
- Drive needle bearing into crankshaft to installation depth using drift - VW 207 C- .

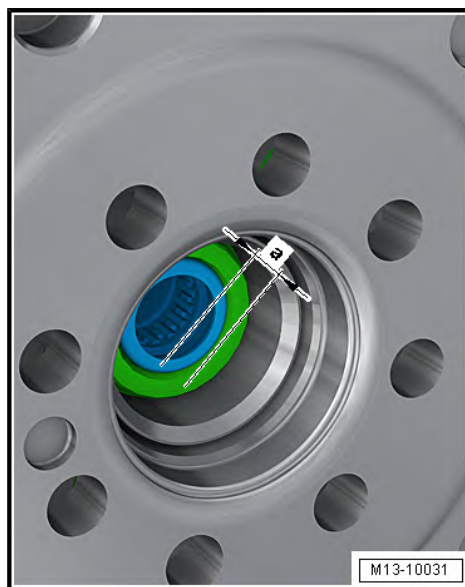


Installation depth: dimension -a- = 2.0 mm



#### Note

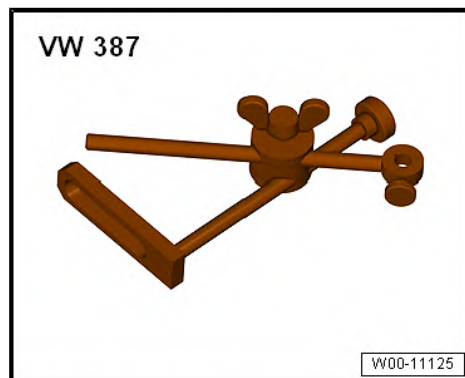
*If the needle bearing has been accidentally driven in too far, it must be renewed because it will be damaged when it is pulled out.*



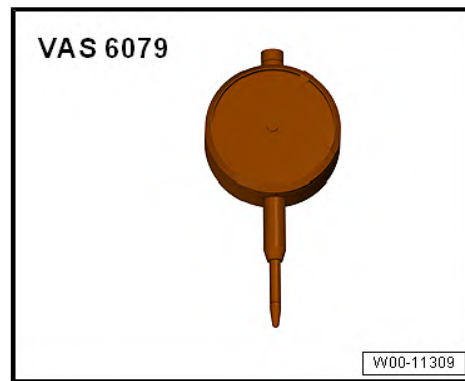
## 3.5 Measuring axial clearance of crankshaft

Special tools and workshop equipment required

- ♦ Universal dial gauge bracket - VW 387-



◆ Gauge - VAS 6079-

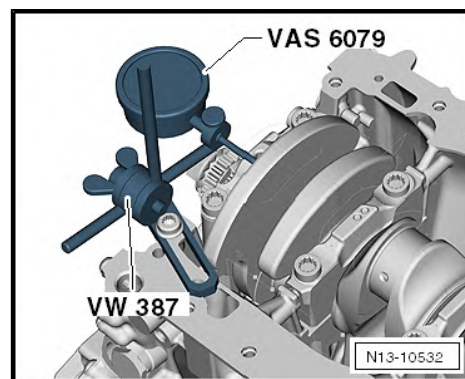


**Procedure**

- Screw dial gauge - VAS 6079- with universal dial gauge holder - VW 387- onto cylinder block and set against crank web with projection of approx. 2 mm.
- Press crankshaft against dial gauge by hand and set gauge to "0".
- Push crankshaft away from dial gauge and read off value.

Axial clearance:

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



### 3.6 Measuring radial clearance of crankshaft

**Special tools and workshop equipment required**

- ◆ Plastigage

**Procedure**



**Note**

- ◆ *Do not interchange used bearings.*
- ◆ *Renew bearing shells worn down to nickel layer.*
- Remove crankshaft bearing cap, and clean bearing cap and bearing journal.
- Place a length of Plastigage corresponding to the width of the bearing on the bearing journal or on the bearing shell.
- The Plastigage must rest in the middle of the bearing shell.

- Fit crankshaft bearing cap, and tighten it to 1 Nm using old bolts -1 ... 10- ➔ [page 74](#) . Make sure not to rotate crankshaft while tightening.



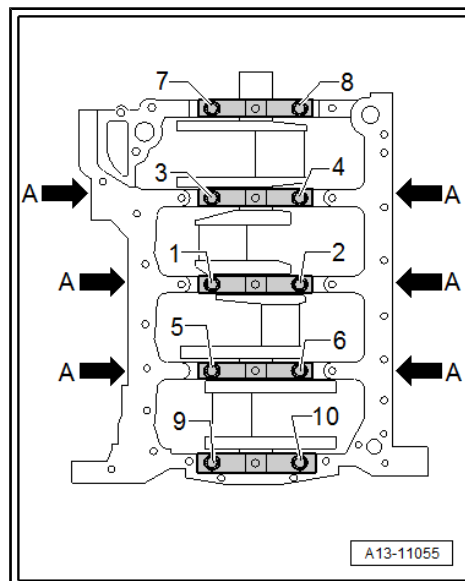
#### Note

Disregard bolts -arrows A-.

- Remove crankshaft bearing cap again.
- Compare width of Plastigage with the measurement scale.

Radial clearance:

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



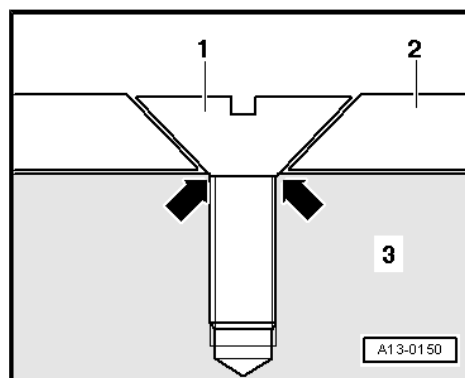
### 3.7 Removing and installing sender wheel

- Remove engine.
- Remove sealing flange on gearbox side ➔ [page 69](#) .
- Remove upper part of sump ➔ [page 177](#) .
- Remove balance shaft timing chain ➔ [page 136](#) .
- Unscrew conrod bearing cap.
- Remove crankshaft bearing cap.
- Remove crankshaft and unscrew sender wheel.
- Renew sender wheel -2- each time bolts -1- are loosened.



#### Note

- ◆ *The second time the bolts are tightened, the contact points in the sender wheel for the countersunk heads are deformed so much that the bolt heads seat on the crankshaft -3-, -arrows- and the sender wheel is loose under the bolts.*
- ◆ *The sender wheel can only be installed in one position; the holes are offset.*



#### Specified torques

- ◆ ➔ ["3.1 Assembly overview - crankshaft", page 73](#)

## 4 Balancer shaft

⇒ ["4.1 Assembly overview - balance shaft", page 81](#)

⇒ ["4.2 Removing and installing balance shaft", page 82](#)

⇒ ["4.3 Renewing oil seal for balance shaft \(inlet side\)", page 87](#)

### 4.1 Assembly overview - balance shaft

1 - Cylinder block

2 - Bolt

- ☐ 9 Nm

3 - Balance shaft intake side

- ☐ Lubricate bearing with engine oil
- ☐ Only replace in twos  
⇒ [page 82](#)

4 - Tube

- ☐ For balance shaft, ex-  
haust side
- ☐ Fitting position  
⇒ [page 82](#)

5 - Bolt

- ☐ 9 Nm

6 - Balance shaft, exhaust side

- ☐ Lubricate bearing with engine oil
- ☐ Only replace in twos  
⇒ [page 85](#)

7 - Needle bearing

- ☐ Renew after removing.
- ☐ The needle bearing rim is coloured. A needle bearing of the same colour must be fitted.
- ☐ Lubricate bearing with engine oil

8 - Needle bearing

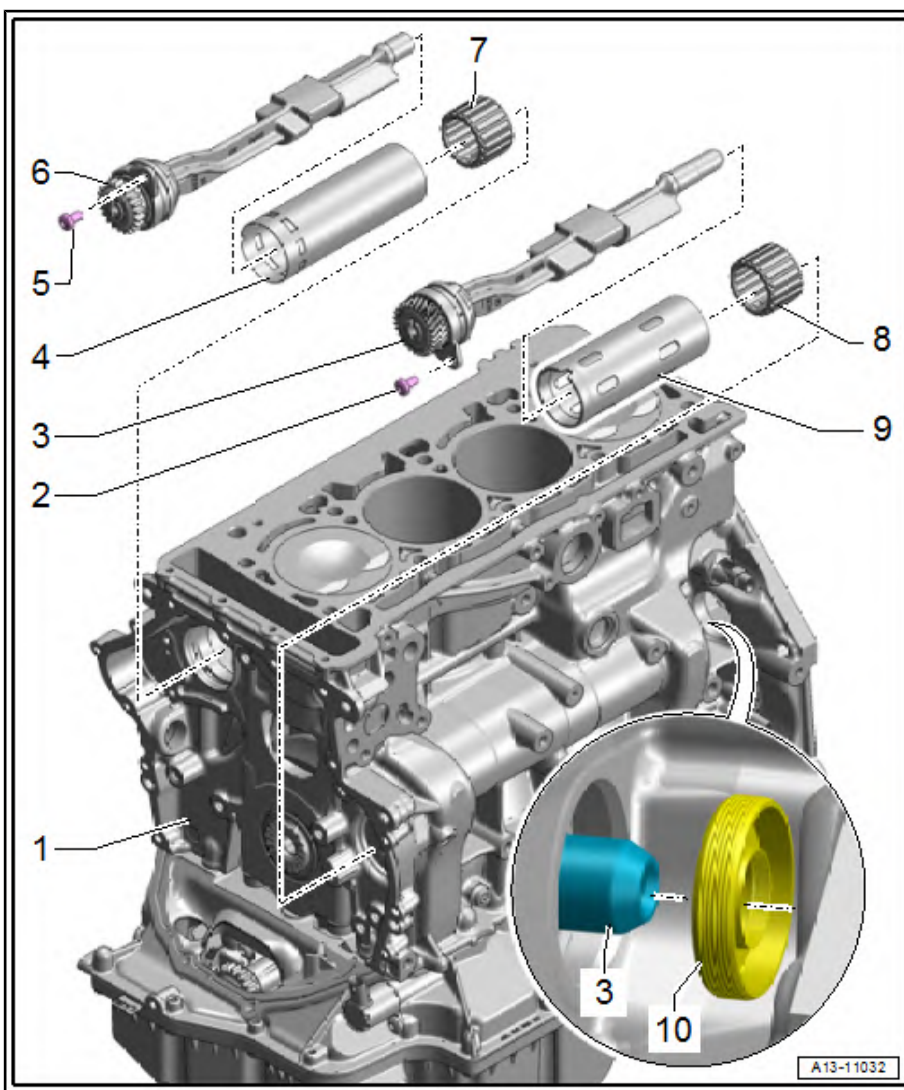
- ☐ Renew after removing.
- ☐ The needle bearing rim is coloured. A needle bearing of the same colour must be fitted.
- ☐ Lubricate bearing with engine oil

9 - Tube

- ☐ For balance shaft, intake side
- ☐ Fitting position ⇒ [page 82](#)

10 - Seal

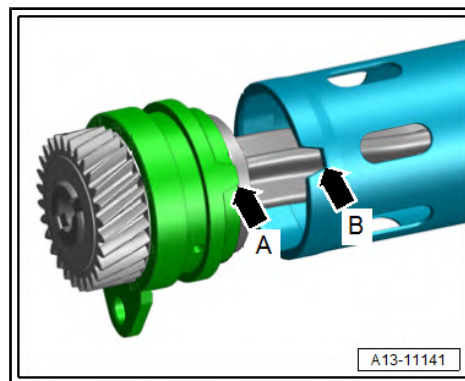
- ☐ For balance shaft, intake side
- ☐ Renew ⇒ [page 87](#)





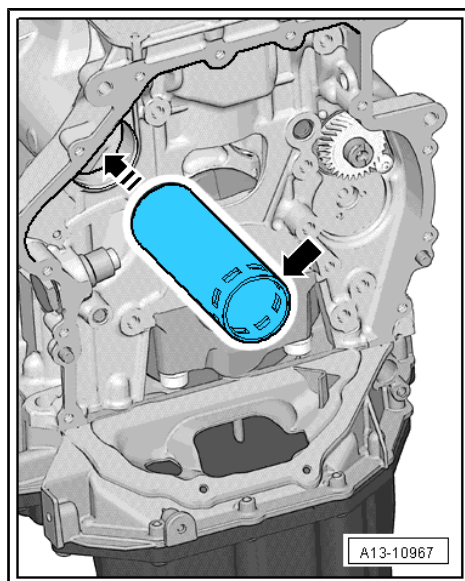
### Tube for balance shaft, intake side - installation position

- Tab -arrow A- on balance shaft must engage in recess -arrow B- on tube.

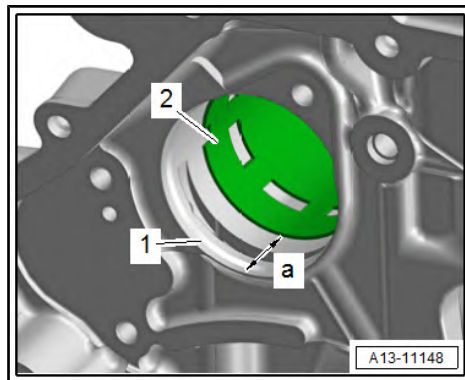


### Tube for balance shaft, exhaust side - installation position

- The apertures -right arrow- must face towards chain side.



- Insert the tube -2- for the balancer shaft to the engine block -1-.
- In the right installation position, dimension -a- = 21 mm.



## 4.2 Removing and installing balance shaft

⇒ ["4.2.1 Removing and installing inlet side balance shaft", page 82](#)

⇒ ["4.2.2 Removing and installing exhaust side balance shaft", page 85](#)

### 4.2.1 Removing and installing inlet side balance shaft

Needle bearing for balance shaft must be renewed each time it is removed. Install new needle bearing with same colour code.

## Removing

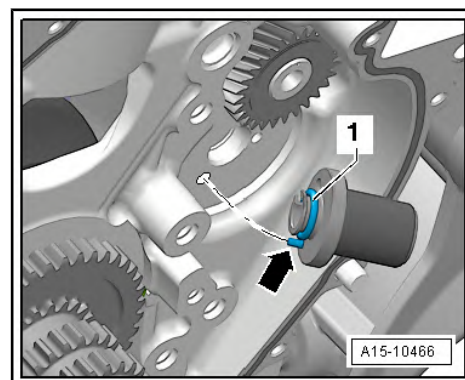
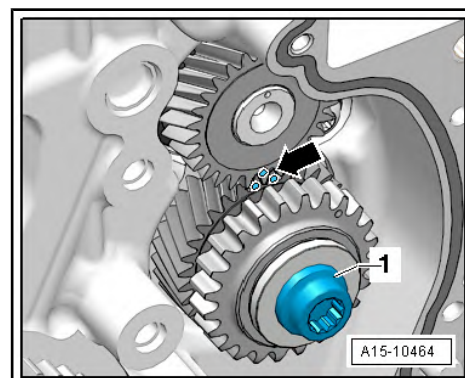
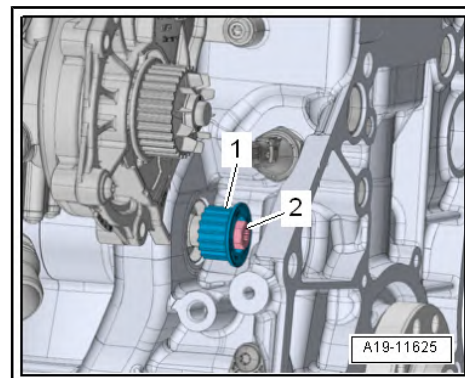
- Engine removed and secured to engine and gearbox support  
⇒ [page 29](#) .
- Remove toothed belt for coolant pump ⇒ [page 244](#) .
- Remove the upper cover of the distribution chain  
⇒ [page 115](#) .
- Remove the lower cover of the distribution chain  
⇒ [page 117](#) .
- Remove camshaft timing chain and drive chain for balance  
shafts ⇒ [page 125](#) .
- Loosen bolt -2-.



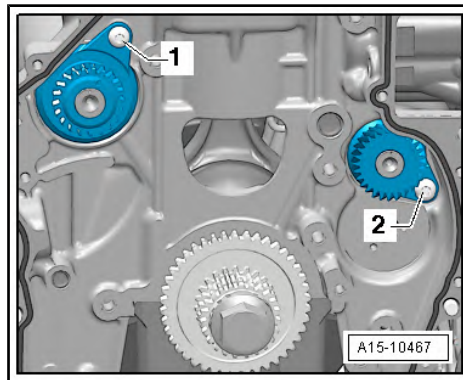
### Note

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

- Detach drive sprocket -1- for toothed belt for coolant pump.
- Remove intermediate shaft sprocket -1-.
- Remove bearing mounting -1-.

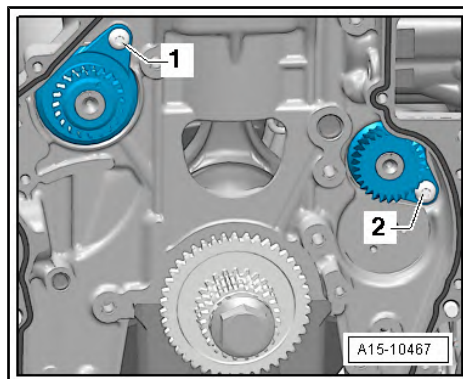
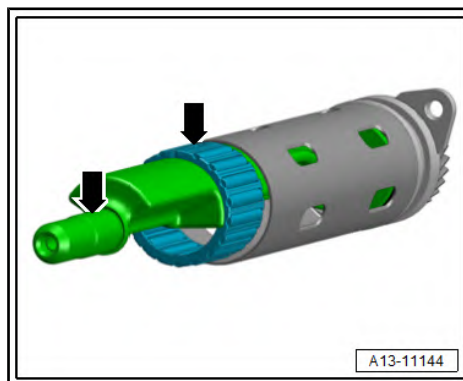


- Unscrew bolt -2- for balance shaft on inlet side, and pull out balance shaft.



### Installing

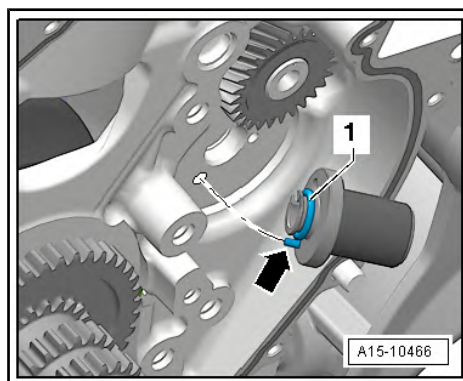
- Insert tube, making sure the installation position is correct ➔ [page 82](#) .
- Clip in new needle bearing.
- Lubricate bearing and contact surface of the bearing -arrows- of the balance shaft intake side with engine oil.
- Turn balance shaft to installation position.
- The half-round contact surface of the bearing must point upwards for installation.
- Install balance shaft for inlet side and tighten bolt -2-.



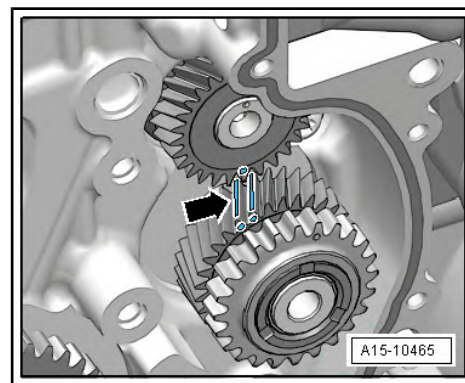
- Renew O-ring -1- and lubricate with engine oil.
- Lubricate bearing mounting with engine oil and install; dowel pin -arrow- for bearing mounting must engage in bore in cylinder block.

### Note

- ♦ *The idler gear must always be renewed. Otherwise no tooth backlash is set, engine damage.*
- ♦ *The new idler gear is coated with a solid film lubricant that wears off after a short period and thus automatically sets the tooth backlash.*



- Mark faces of gear teeth of idler gear with paint -arrow-.
- Insert idler gear; marking on balance shaft must be positioned between markings on faces of gear teeth.



- Fit a new bolt -1- for the intermediate shaft sprocket and tighten as follows:

1. Initially tighten to 10 Nm.
2. Turn idler gear.

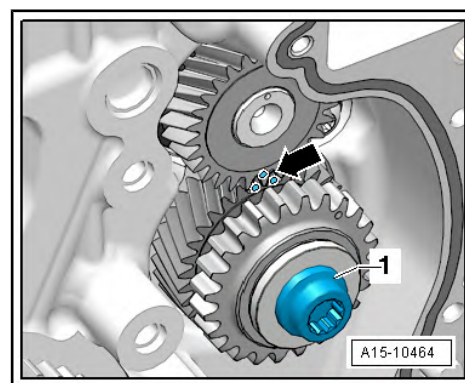
There must be no play in idler gear. Otherwise loosen and tighten again.

3. Tighten to 25 Nm.
4. Use fixed wrench to turn 90° further.

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

Further assembly is basically the reverse of the removal procedure. Please observe the following:

- Install drive chain for balance shafts and camshaft timing chain ⇒ [page 125](#) .
- Install timing chain cover (bottom) ⇒ [page 117](#) .
- Install timing chain cover (top) ⇒ [page 115](#) .
- Renew oil seal for balance shaft on inlet side ⇒ [page 87](#) .
- Fit toothed belt for coolant pump ⇒ [page 244](#) .



#### Specified torques

- ◆ ⇒ [“4.1 Assembly overview - balance shaft”, page 81](#)

### 4.2.2 Removing and installing exhaust side balance shaft

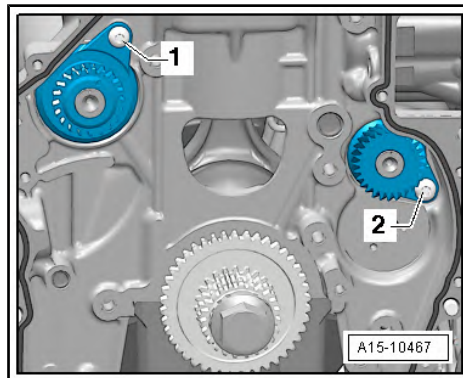
Needle bearing for balance shaft must be renewed each time it is removed. Install new needle bearing with same colour code.

#### Removing

- Remove the upper cover of the distribution chain ⇒ [page 115](#) .
- Remove the lower cover of the distribution chain ⇒ [page 117](#) .
- Remove camshaft timing chain and drive chain for balance shafts ⇒ [page 125](#) .

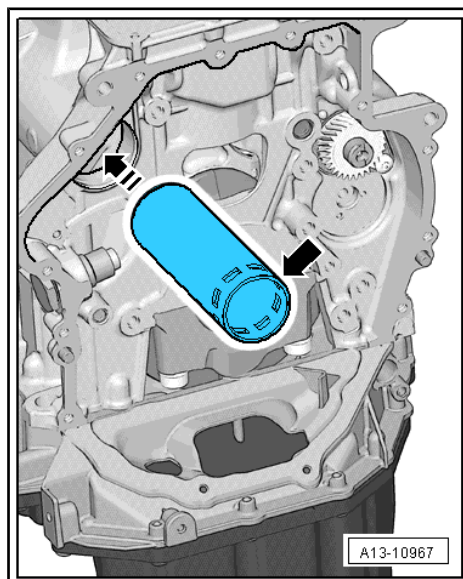


- Unscrew bolt -1- for balance shaft on exhaust side, and pull out balance shaft.

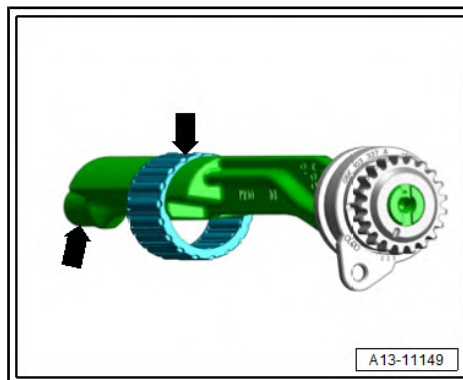


### Installing

- Check installation position of tube for balance shaft. The apertures -arrow- must face towards chain side.



- Lubricate bearing and contact surface of the bearing -arrows- of the balance shaft outlet side with engine oil.
- Turn balance shaft to installation position.
- The half-round contact surface of the bearing must point upwards for installation.





- Install balance shaft for exhaust side.
- Before tightening bolt -1-, check if balance shaft rests flat against crankcase.



#### Note

*If the balance shaft does not rest flat, the pipe for balance shaft must be inserted again.*

Further assembly is basically the reverse of the removal procedure. Please observe the following:

- Install drive chain for balance shafts and camshaft timing chain ⇒ [page 125](#) .
- Install timing chain cover (bottom) ⇒ [page 117](#) .
- Install timing chain cover (top) ⇒ [page 115](#) .

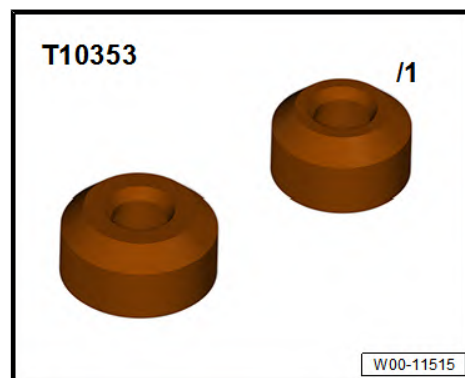
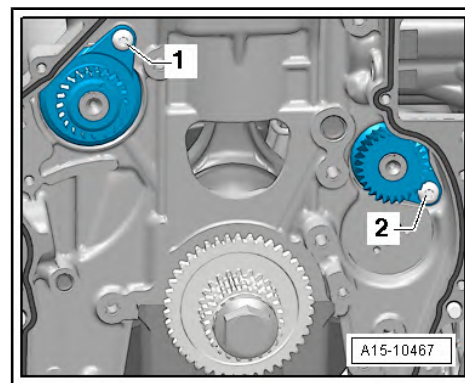
#### Specified torques

- ♦ ⇒ [“4.1 Assembly overview - balance shaft”, page 81](#)

### 4.3 Renewing oil seal for balance shaft (inlet side)

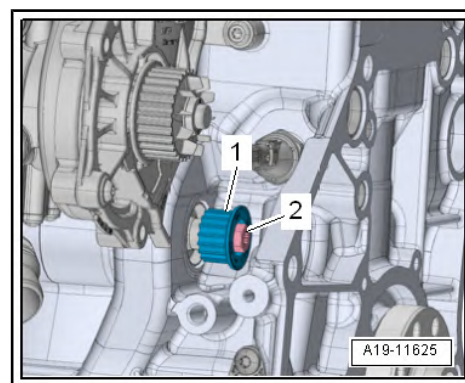
#### Special tools and workshop equipment required

- ♦ Thrust piece - T10353/1-

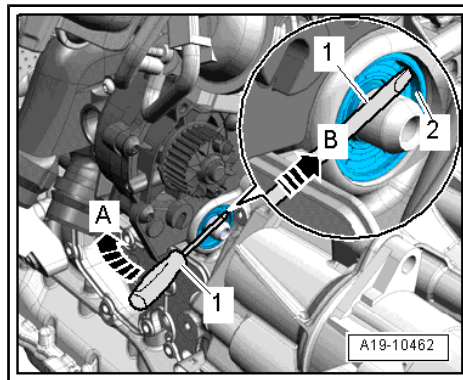


#### Procedure

- Remove toothed belt for coolant pump ⇒ [page 244](#) .
- Unscrew screw -2-.
- Detach drive sprocket -1- for toothed belt for coolant pump.



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

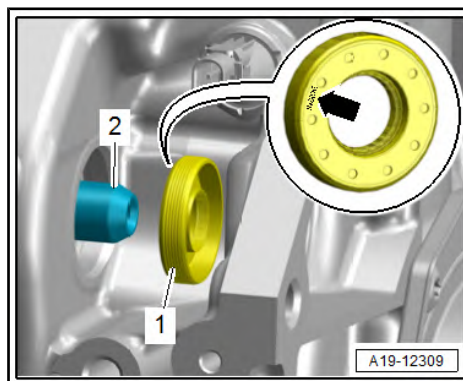


- Lubricate sealing surface of balance shaft -2- with engine oil.
- Fit seal -1- onto balance shaft.
- The inscription "Inside" -arrow- must point towards engine.

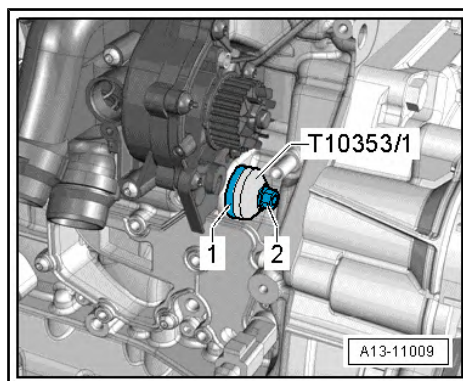


#### Note

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



- Apply thrust piece - T10353/1- to oil seal -1- and press into cylinder block as far as stop using bolt -2- (take care not to tilt oil seal).
- Fit toothed belt for coolant pump ➤ [page 244](#) .
- Add coolant ➤ [page 208](#) .



## 5 Pistons and conrods

⇒ ["5.1 Pistons with conrods - general over view of components", page 89](#)

⇒ ["5.2 Removing and installing pistons", page 92](#)

⇒ ["5.3 Checking pistons and cylinder bores", page 93](#)

⇒ ["5.4 Separating new conrod", page 95](#)

⇒ ["5.5 Checking radial clearance of conrods", page 96](#)

⇒ ["5.6 Removing and installing oil spray jets", page 96](#)

### 5.1 Pistons with conrods - general over view of components

#### 1 - Bolts

- ☐ Renew after removing.
- ☐ Grease thread and contact surface with engine oil
- ☐ Use old bolts to measure radial clearance.
- ☐ 45 Nm +90°

#### 2 - Conrod bearing cap

- ☐ Observe installation position.
- ☐ The conrod bearing cap only fits in one position and only on the appropriate conrod due to the breaking procedure (cracking) separating the cap from the conrod.
- ☐ Mark allocation to cylinder and conrod in colour -A-
- ☐ Installation position: Marking -B- faces towards pulley end.
- ☐ Separating new conrod ⇒ [page 95](#).

#### 3 - Bearing bushes

- ☐ Fitting position ⇒ [page 90](#)
- ☐ Renew worn bearing shells
- ☐ Coat with engine oil before installing.
- ☐ Axial clearance

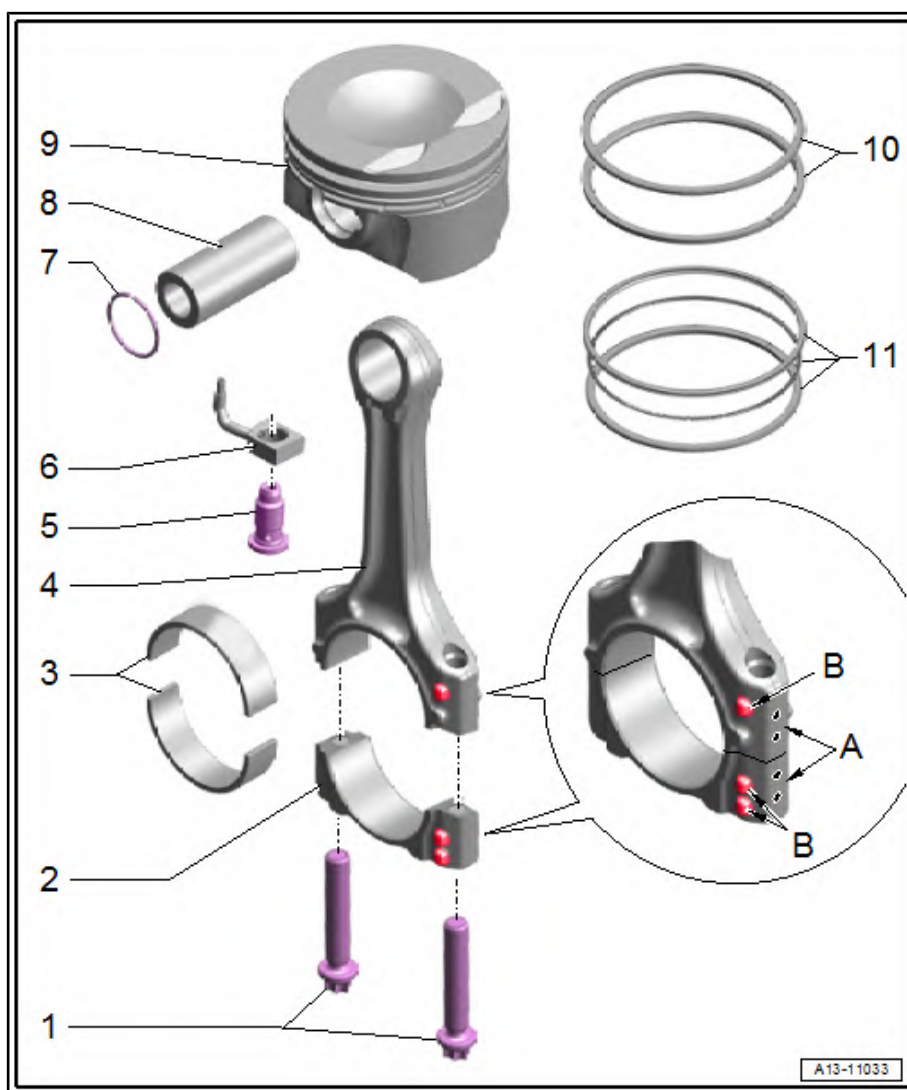
◆ New: 0.10 ... 0.35 mm

◆ Wear limit: 0.40 mm

- ☐ Measuring radial clearance ⇒ [page 96](#)

#### 4 - Connecting rod

- ☐ Renew as set only.
- ☐ Mark allocation to cylinder and to bearing cap
- ☐ Installation position: Marking -B- faces towards pulley end.



- ☐ Separating new conrod ➔ [page 95](#) .
- ☐ Measuring radial clearance ➔ [page 96](#)

#### 5 - High-pressure safety valve

- ☐ 27 Nm

#### 6 - Oil spray jet

- ☐ For piston cooling
- ☐ Fitting position ➔ [page 92](#)
- ☐ Removing and installing ➔ [page 96](#)

#### 7 - Circlip

- ☐ Renew after removing.

#### 8 - Piston pin

- ☐ Coat with engine oil before installing.

#### 9 - Piston

- ☐ Mark allocation to cylinder
- ☐ Mount with sleeve for piston assembly -T40347-
- ☐ Removing and installing ➔ [page 92](#)
- ☐ Installation position: arrow on piston crown faces towards pulley end
- ☐ Mark allocation to cylinder
- ☐ Checking piston and cylinder bore ➔ [page 93](#)

#### 10 - Compression rings

- ☐ Install with piston ring pliers -VAS 211 003- ➔ [page 91](#)
- ☐ Allocation and installation position ➔ [page 91](#)
- ☐ Offset gaps by 120°
- ☐ Installation position: "TOP" or "R" marking must face upwards towards piston crown.
- ☐ Checking ring-to-groove clearance ➔ [page 94](#) .
- ☐ Checking ring gap ➔ [page 94](#) .
- ☐ Ring-to-groove clearance cannot be checked.

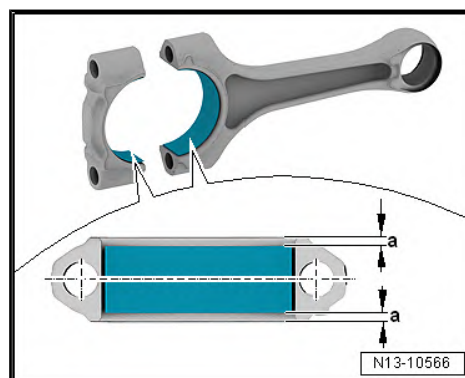
#### 11 - Oil scraper ring

- ☐ Three-piece design
- ☐ Remove and install by hand
- ☐ Install such that upper gap of oil scraper ring is offset by 120° relative to adjacent compression ring
- ☐ Contact float not measurable.
- ☐ Ring-to-groove clearance cannot be checked.

#### Bearing shells - installation position

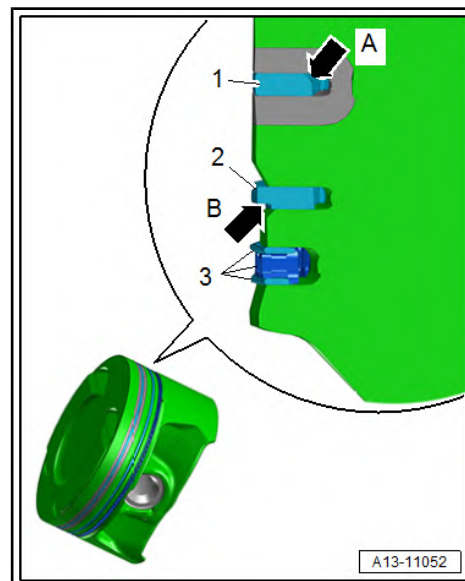
- Position bearing shells in centre of conrod and conrod bearing cap when fitting.

Dimension -a- must be identical on both sides.



### Allocation of piston rings in connection with three-part oil scraper ring

- 1 - Compression ring with chamfer -arrow A- within the upper part. The marking »TOP« or the lettering points upwards
- 2 - Compression ring, shoulder -arrow B- on the outside of the lower part. The marking »TOP« or the lettering points upwards
- 3 - Three-part oil scraper ring



### Installing compression rings

- The marking »TOP« or the lettering points upwards.
- Use piston ring pliers -VAS 211 003- and only open compression ring -2- until it can be placed on the piston -1-.

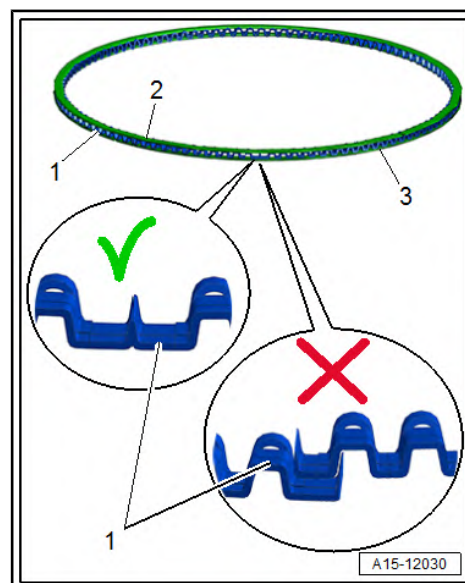


### Installing oil scraper ring, three-part

- Note installation position of spring:
- The cuts of the plates -2, 3- and the spring -1- must be displaced by a minimum of 90° to one another.
- Install by hand.

#### Assembly sequence:

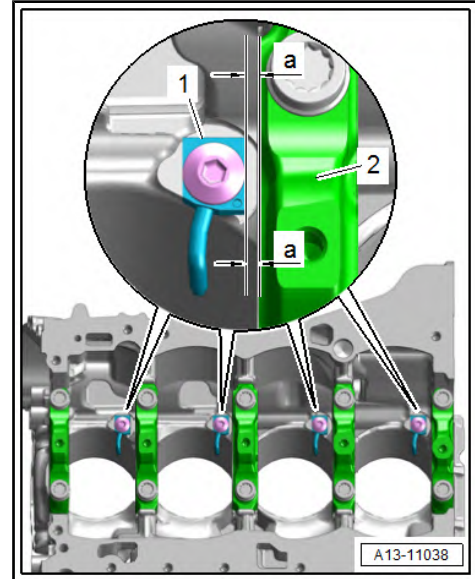
- 1. Insert spring -1- into groove.
- 2. Insert lower plate -3- into groove.
- 3. Insert upper plate -2- into groove.





### Oil spray jets - installation position

- The side wall of the oil spray jet -1- must be parallel to the crankshaft bearing -2-.
- Distance -a- = distance -a-.



## 5.2 Removing and installing pistons

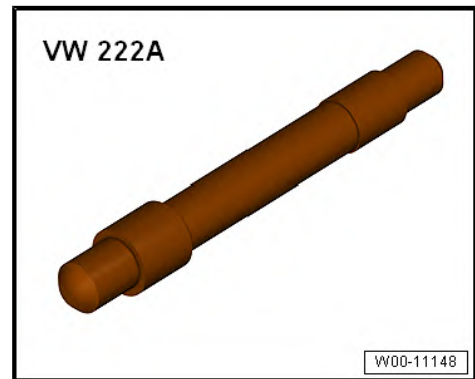


### Note

*If pistons with 3-part oil scraper ring are installed without the piston installation sleeve being used - T40347- , the oil scraper ring will be damaged.*

### Special tools and workshop equipment required

- ◆ Scriber - VW 222 A-



- ◆ Sleeve for installing the piston -T40347- , without illustration

### Removing

- Engine removed and secured to engine and gearbox support  
⇒ [page 29](#) .
- Remove cylinder head ⇒ [page 101](#) .
- Remove upper part of sump ⇒ [page 177](#) .
- Mark installation position and allocation:
- Mark piston installation position and corresponding cylinder number.
- Mark conrod installation position and corresponding cylinder number ⇒ [Item 4 \(page 89\)](#) .
- Remove conrod bearing cap and withdraw piston and conrod upwards.

**Note**

*If the piston pin is difficult to move, heat the piston to approx. 60 °C.*

- Remove retaining ring -2- from piston pin eye.
- Drive out piston pin -3- using drift - VW 222A- .
- Remove piston -1- from conrod -4-.

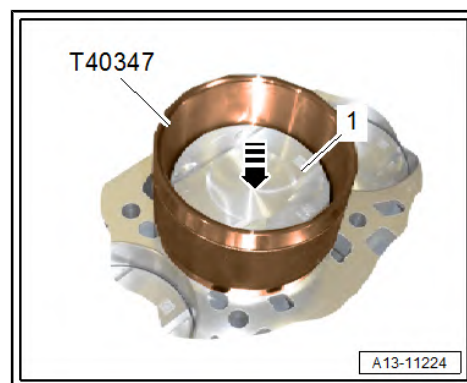
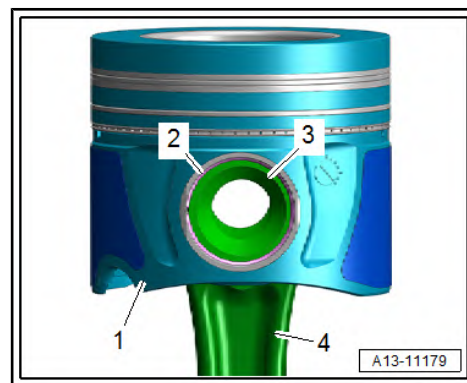
**Installing**

Remaining installation is carried out in the reverse order. When installing, note the following:

- After removal, renew the bolts that are tightened with turning further angle.
- Arrow on piston crown points to belt pulley end.
- Install in such a way that upper gap of three-part oil scraper ring is offset by 120° relative to adjacent compression ring
- Fit the oil scraper ring, procedure for three-part oil scraper ring ⇒ [page 91](#) .
- Install compression rings ⇒ [page 91](#)
- Oil contact surfaces of bearing shells and cylinder wall with engine oil.
- Carefully slide in piston -1- with sleeve for piston assembly - T40347- by hand into the cylinder -arrow-.
- Install conrod bearing cap, noting installation position ⇒ [Item 2 \(page 89\)](#) .
- Install cylinder head ⇒ [page 101](#) .
- Install sump (top section) ⇒ [page 177](#) .

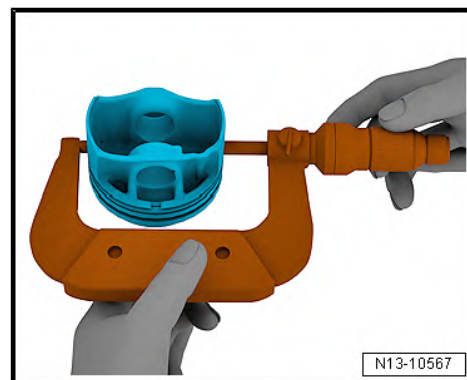
**Specified torques**

- ◆ ⇒ [“5.1 Pistons with conrods - general over view of components”, page 89](#)



## 5.3 Checking pistons and cylinder bores

### Checking piston



**Special tools and workshop equipment required**

- ◆ Micrometer caliper 75 - 100 mm - VAS 6071-
- Using a micrometer, measure approx. 10 mm from the lower edge, perpendicular to the piston pin axis.
- ◆ Deviation from nominal dimension max. 0.06 mm.

- Using a micrometer (75 ... 100 mm), measure approx. 15 mm from the lower edge, perpendicular to the piston pin axis.
- ♦ Maximum deviation from nominal dimension: 0.04 mm.

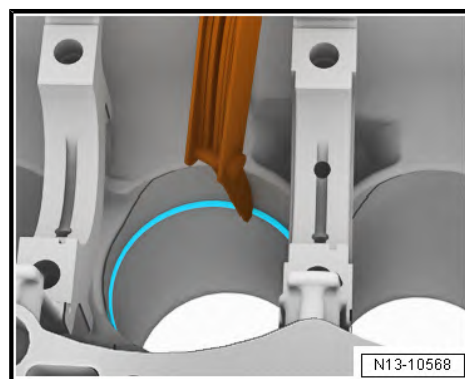
Piston Ø in mm	
Specification	82.420 <sup>1)</sup>
<ul style="list-style-type: none"> <li>• <sup>1)</sup> Dimensions without coating (thickness 0.02 mm) The coating will wear down.</li> </ul>	

#### Checking piston ring gap

- Push ring at right angles to cylinder wall from above down to approx. 15 mm from bottom end of cylinder. Push in using a piston without rings.

Piston ring gap in connection with two-part oil scraper ring	New	Wear limit
1st compression ring	0.30 ... 0.40	0.80
2nd compression ring	0.40 ... 0.50	0.80
Oil scraper ring	0.20 ... 0.40	0.80

Piston ring gap in connection with three-part oil scraper ring	New	Wear limit
1st compression ring	0.30... 0.40 mm	0.60 mm
2nd compression ring	0.40... 0.50 mm	0.70 mm
Oil scraper ring	Cannot be measured	Cannot be measured

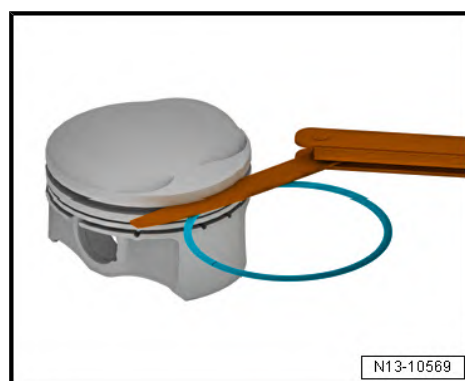


#### Checking ring-to-groove clearance

- Clean annular groove of piston before check.

Ring-to-groove clearance in connection with two-part oil scraper ring	New	Wear limit
1st compression ring	0.06... 0.09 mm	0.20 mm
2nd compression ring	0.03... 0.06 mm	0.15 mm
Oil scraper rings	Cannot be measured	

Ring-to-groove clearance in connection with three-part oil scraper ring	New	Wear limit
1st compression ring	Cannot be measured	
2nd compression ring	Cannot be measured	
Oil scraper rings	Cannot be measured	

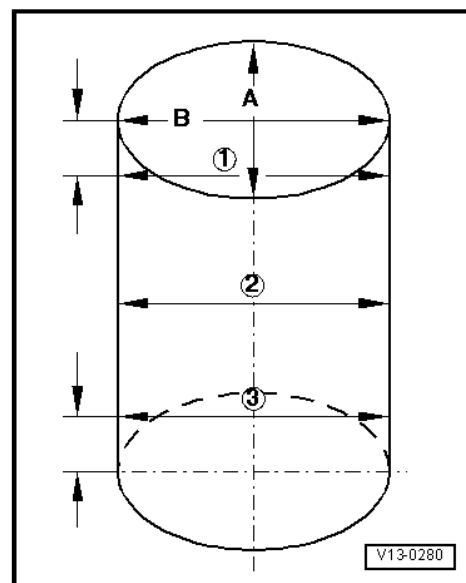


## Checking cylinder bores



### Note

*Cylinder bores must not be measured when cylinder block is mounted in engine and gearbox support - VAS 6095- , as measurements may be incorrect.*



## Special tools and workshop equipment required

- ◆ Cylinder gauge - VAS 6078-



### NOTICE

**Risk of damage to the surface of the cylinder bore caused by incorrect machining.**

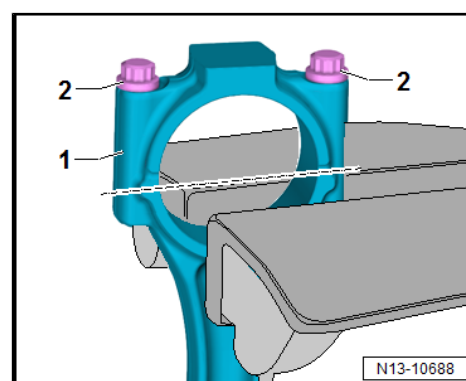
- Do not machine cylinder bore (reboring, honing, grinding) with workshop equipment.
- Take measurements at 3 positions in both lateral direction -A- and longitudinal direction -B-.
- ◆ Deviation from nominal dimension: max. 0.08 mm

	Piston Ø	Cylinder bore Ø
Basic dimension mm	82.42 <sup>1</sup>	82.51
<ul style="list-style-type: none"> <li>• <sup>1</sup>) Dimensions without graphite coating (thickness 0.02 mm). The graphite coating wears away.</li> </ul>		

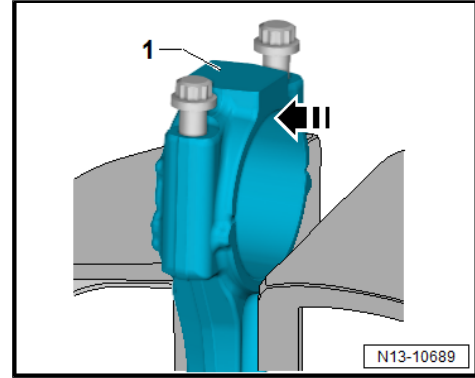
## 5.4 Separating new conrod

On new conrods it is possible that the breaking point is not fully separated. If the conrod bearing cap cannot be removed by hand, proceed as follows:

- Mark cylinder allocation of conrod ⇒ [Item 4 \(page 89\)](#) .
- Clamp conrod -1- in a vice below the dashed line using aluminium vice clamps.
- Unscrew both bolts -2- about 5 turns.



- Using a plastic hammer, carefully knock against conrod bearing cap in -direction of arrow- until it is loose.



## 5.5 Checking radial clearance of conrods

### Special tools and workshop equipment required

- ◆ Plastigage

#### Procedure

- Remove conrod bearing cap.
- Clean bearing cap and bearing journal.
- Place a length of Plastigage corresponding to the width of the bearing on the bearing journal or on the bearing shell.
- Fit conrod bearing cap and tighten it using old bolts  
⇒ [Item 1 \(page 89\)](#) . When tightening, make sure not to rotate crankshaft.
- Remove conrod bearing cap again.
- Compare width of Plastigage with the measurement scale.

Radial clearance:

- New: 0.02 ... 0.06 mm.
- Wear limit: 0.09 mm.
- Renew conrod bolts.

## 5.6 Removing and installing oil spray jets

### Special tools and workshop equipment required

- ◆ Bit - T10545-

#### Removing

- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
- Remove upper part of sump ⇒ [page 177](#) .

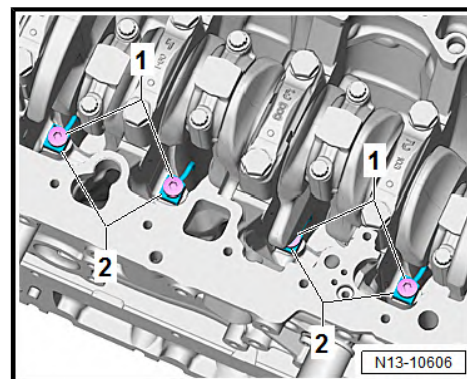


**Irreparable engine damage can be caused if the distribution chain breaks open.**

- Only turn the engine in the direction of rotation of the engine.
- Turn crankshaft via vibration damper securing bolt in direction of engine rotation until the respective bolt is accessible.



- Unscrew pressure relief valve -1- using Torx bit T40 - T10545- .



- Unscrew the outlet valves -1- of the oil spray jets -2- with the socket - T10545- .
- Remove oil spray jet -2-.

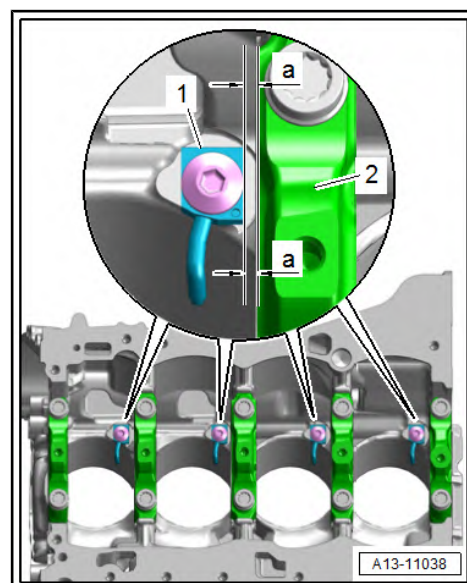
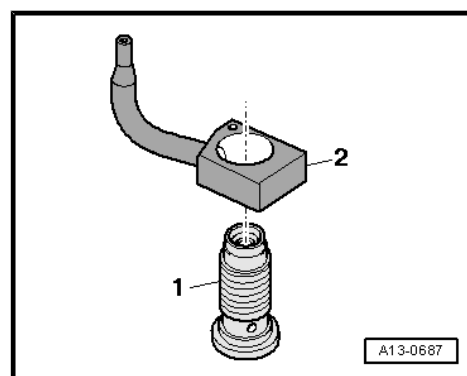
#### Installing



#### NOTICE

Risk of damage to oil spray jets caused by deformation.

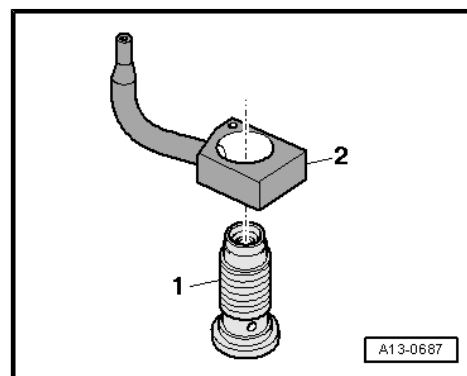
- Do not bend oil spray jets.
- The side wall of the oil spray jet -1- must be parallel to the crankshaft bearing -2-.
- Distance -a- = distance -a-.



- 1 - Pressure relief valve - specified torque ⇒ [Item 5 \(page 90\)](#)
- 2 - Oil spray jet
- Installation position: align leading edge of oil spray jet arrow with machined surface of cylinder block.
- Install sump (top section) ⇒ [page 177](#) .
- Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview – noise insulation .

#### Specified torques

- ◆ ⇒ ["5.1 Pistons with conrods - general over view of components", page 89](#)



## 15 – Cylinder head, valve gear

### 1 Cylinder head

⇒ [“1.1 Assembly overview - cylinder head”, page 98](#)

⇒ [“1.2 Removing and installing cylinder head”, page 101](#)

⇒ [“1.3 Assembly overview - vacuum pump”, page 109](#)

⇒ [“1.4 Removing and installing vacuum pump”, page 110](#)

⇒ [“1.5 Checking compression”, page 111](#)

#### 1.1 Assembly overview - cylinder head



##### Note

- ◆ *Renew cylinder head bolts.*
- ◆ *Always renew self-locking nuts, bolts which have been tightened with turning further angle, as well as oil seals and gaskets.*
- ◆ *The plastic protectors fitted to protect the open valves must not be removed until just before the cylinder head is fitted.*
- ◆ *After fitting a new cylinder head or cylinder head gasket, the engine oil and coolant must be changed.*

**1 - Heat shield**

**2 - Bolt**

- ☐ 9 Nm

**3 - Studs**

- ☐ For turbocharger
- ☐ Coat with high-temperature paste.
- ☐ 15 Nm

**4 - Bolt**

- ☐ 9 Nm

**5 - Union**

- ☐ For coolant hose

**6 - O-ring**

- ☐ Renew after removing.
- ☐ Moisten with coolant

**7 - Bolt**

- ☐ Renew after removal
- ☐ Note procedure when loosening ⇒ [page 100](#).
- ☐ Tightening torques and sequence ⇒ [page 100](#)

**8 - Cylinder head**

- ☐ Removing and installing ⇒ [page 101](#)
- ☐ Check for distortion ⇒ [page 101](#).

**9 - O-ring**

- ☐ Renew after removing.
- ☐ Moisten with coolant

**10 - Union**

- ☐ For coolant hose

**11 - Bolt**

- ☐ 9 Nm

**12 - Engine lifting eye**

**13 - Bolts**

- ☐ 10 Nm +90°

**14 - Hall sender - G40-**

- ☐ Removing and installing ⇒ [page 409](#)

**15 - Bolt**

- ☐ 9 Nm

**16 - Partition**

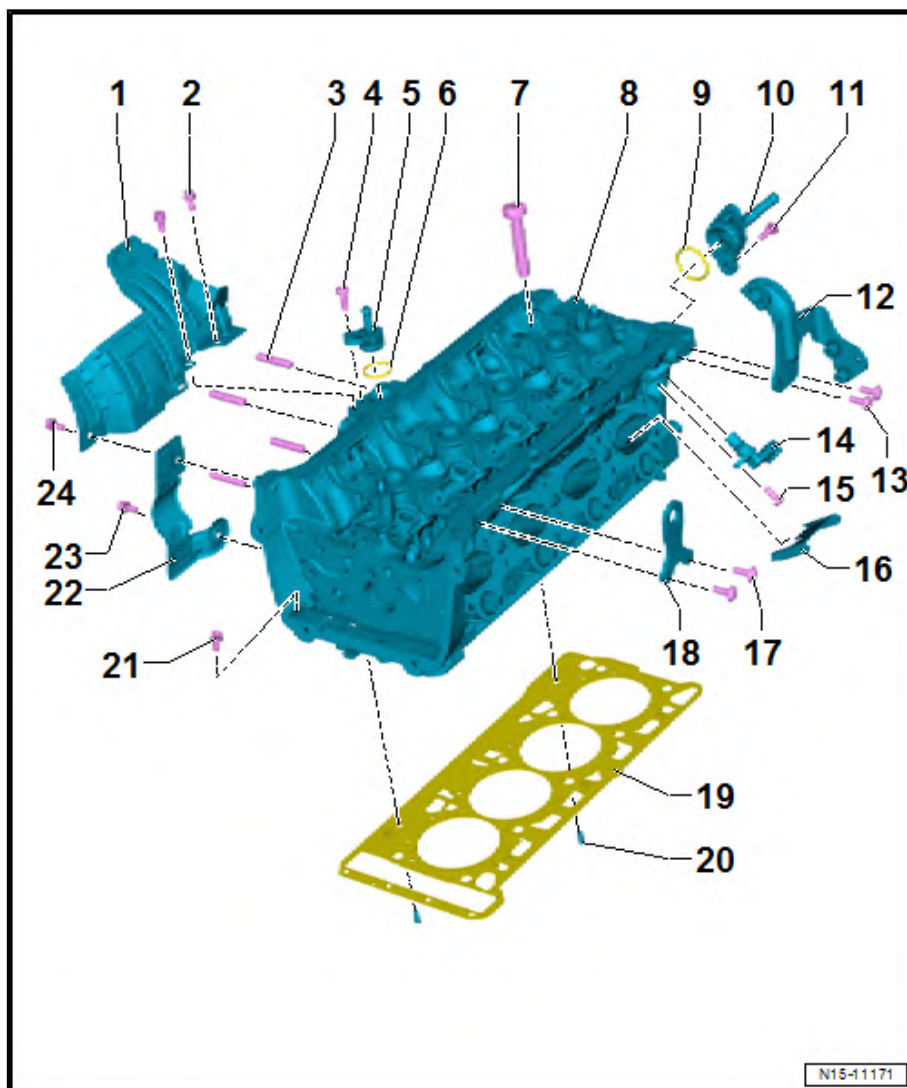
**17 - Bolts**

- ☐ 10 Nm +90°

**18 - Engine lifting eye**

**19 - Cylinder head gasket**

- ☐ Renewing:
- ☐ Observe installation position: reference number of the cylinder head



## 20 - Pin

## 21 - Bolt

- ☐ Renewing:
- ☐ Note procedure when loosening ➤ [page 100](#) .
- ☐ Note procedure when tightening ➤ [page 100](#) .
- ☐ 8 Nm +90°

## 22 - Heat shield

## 23 - Bolt

- ☐ 9 Nm

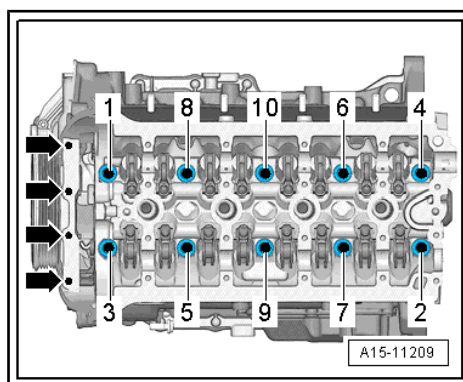
## 24 - Bolt

- ☐ 9 Nm

### Loosening cylinder head bolts

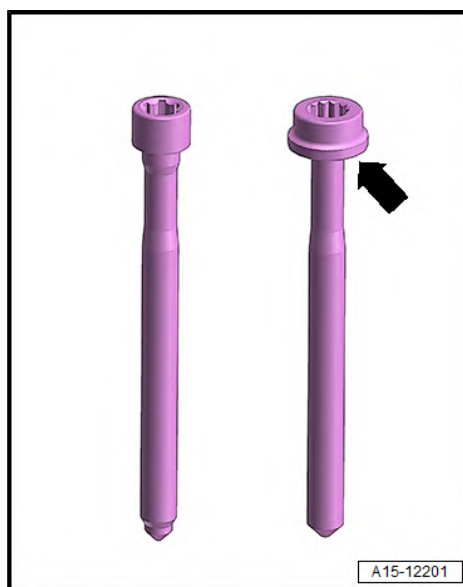
- Unscrew bolts -arrows-.
- Slacken cylinder head bolts in the sequence -1 ... 10-.

Renew after removal



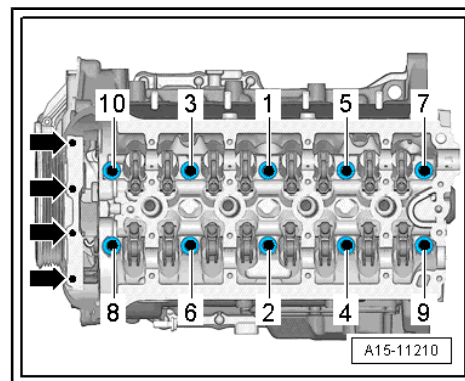
### Cylinder head - specified torques and tightening sequence

- After removal, renew the bolts that are tightened with turning further angle.
- Bolts - difference:
- Bolt without collar
- Bolt with collar -arrow-



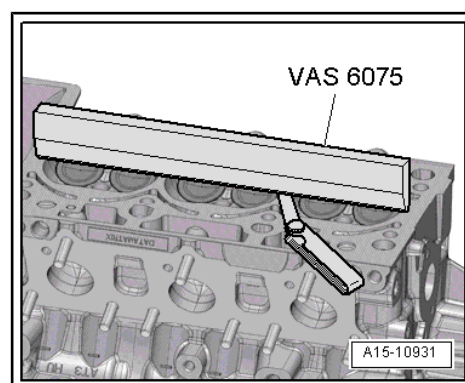
- Tighten bolts in stages in the sequence shown:

Stage	Bolts	Specified torques/angle specifications
1.	-1 ... 10-	Screw in by hand as far as stop
2.	-1 ... 10-	"Without collar": 40 Nm; "with collar": 50 Nm (difference ⇒ <a href="#">page 100</a> )
3.	-1 ... 10-	Turn 90° further
4.	-1 ... 10-	Turn 90° further
5th	-Arrows-	8 Nm
6th	-Arrows-	Turn 90° further



### Checking cylinder head for distortion

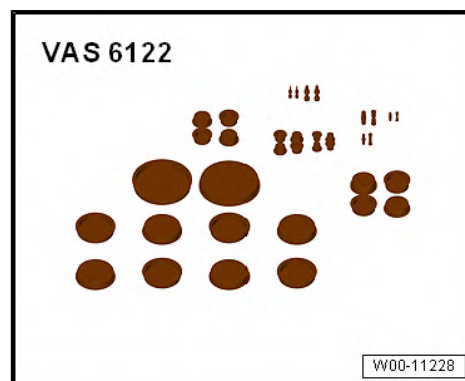
- Use straight edge 500 mm - VAS 6075- and feeler gauge to measure cylinder head for distortion at several points.
- ♦ Max. permissible distortion: 0.05 mm



## 1.2 Removing and installing cylinder head

### Special tools and workshop equipment required

- ♦ Set of plugs for engine - VAS 6122-



- ♦ Spring-type clip pliers - VAS 6362-





- ◆ Special wrench, long reach - T10070-



- ◆ Bit XZN 12 - T40270-



## Removing



### Note

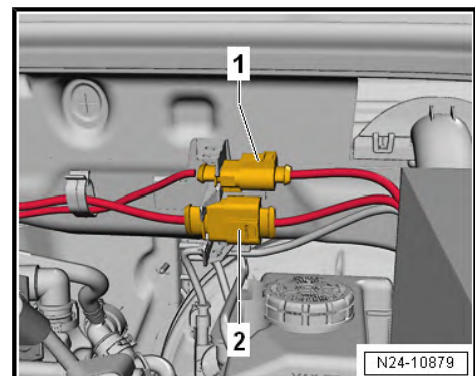
- ◆ *Before the cylinder head is removed, the engine support and engine mounting must be reinstalled temporarily, because the eyes of the support bracket are secured to the cylinder head.*
- ◆ *The cable ties must be installed in their same place again.*
- ◆ *Seal open channels of intake and exhaust system with suitable plugs from engine bung set - VAS 6122- .*
- ◆ *Cover the openings in the gearbox with a cloth to avoid letting coolant in the clutch housing.*
- Drain coolant ➔ [page 206](#) .
- Remove camshafts ➔ [page 147](#) .

### Vehicles without particulate filter

- Remove catalytic converter ➔ [page 376](#) .

### Vehicles with particulate filter and all-wheel drive

- Disconnect connector -1- for Lambda probe 1 after catalytic converter - GX7- .



- Lay wires on plenum chamber bulkhead to one side.
- Disconnect the catalytic converter of the turbocharger and slide to one side ⇒ [page 383](#) .
- Remove bolt -1- and disconnect lines from exhaust gas pressure sensor 1 - G450- -2- in -direction of arrow-.



**Note**

*-Item 3- should be disregarded.*

**Vehicles with particulate filter, all-wheel drive**

- Remove particulate filter ⇒ [page 389](#) .

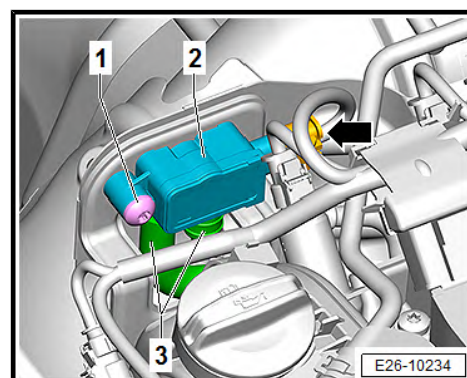
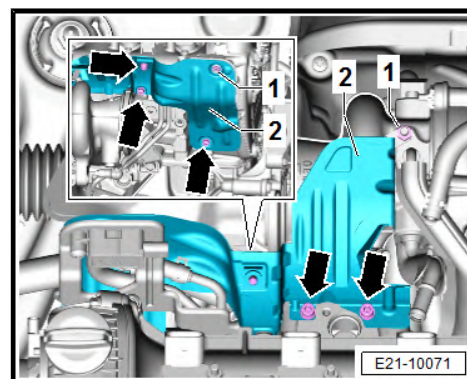
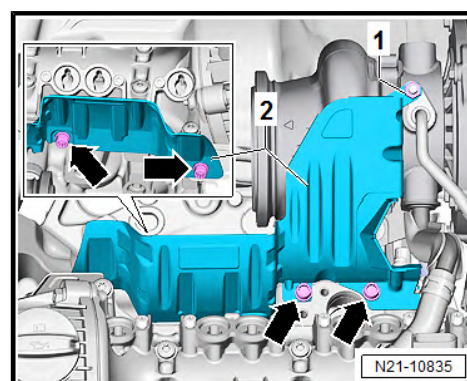
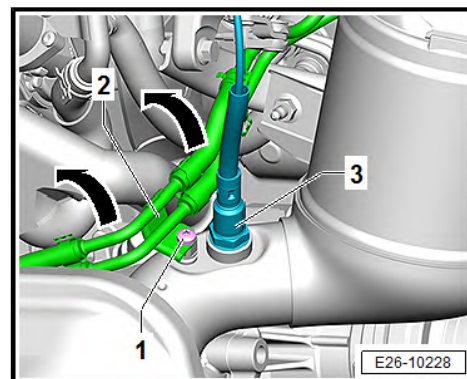
**Continued for all vehicles**

- Unscrew bolts -arrows- and nut -1-.
- Remove heat shield -2-.

**For vehicles with particulate filter**

- Remove bolts -arrows- and nuts -1-.
- Remove heat shield -2-.

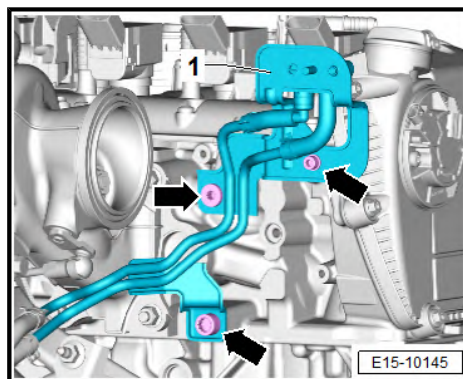
- Remove the electrical connector -arrow- from the exhaust gas pressure sensor 1 - G450- .



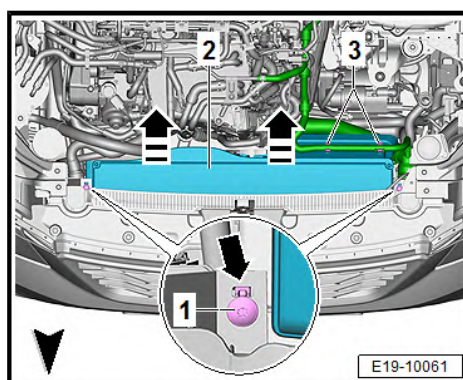
- Remove bolts -arrows- from the exhaust gas pressure sensor 1 - G450- -1- bracket.
- Push the exhaust gas pressure sensor 1 - G450- -1- bracket to the rear and bind it into place.

#### Continued for all vehicles

- Remove Lambda probe 1 before catalytic converter - GX10- ➔ [page 358](#) .
- Remove air filter housing ➔ [page 322](#) .



- Lay coolant hose -3- to one side.
- Unscrew bolts -1-.
- Release locking lugs-arrow-, unclip air hose -2- from the front end and remove in -direction of the arrow-.



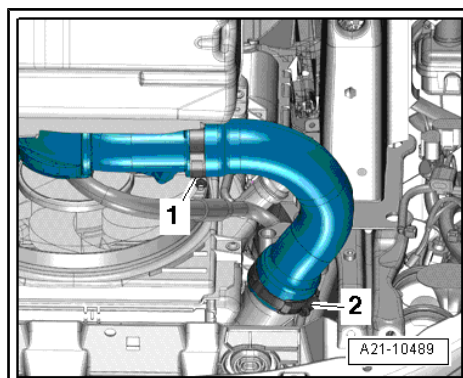
- Release hose clip -2-, and detach charge air hose from charge air cooler.



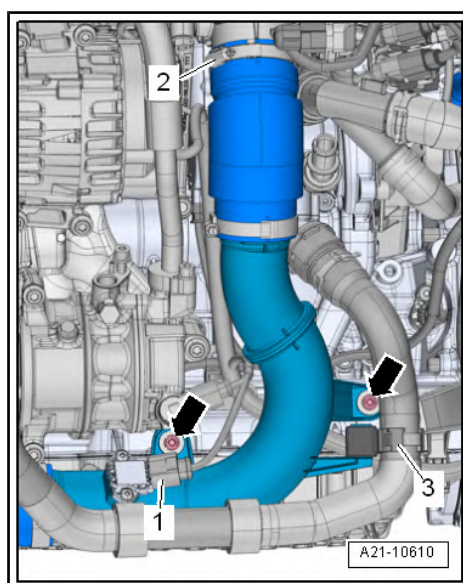
#### Note

*-Item 1- should be disregarded.*

- Seal open lines and connections using clean plugs from engine bung set - VAS 6122- .

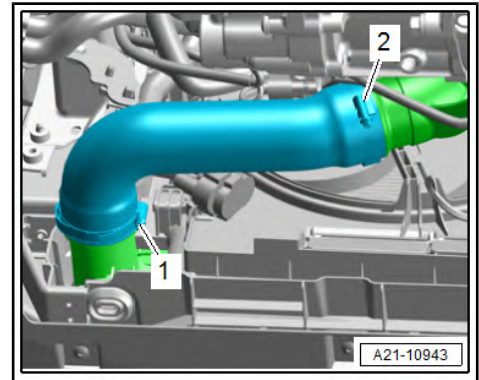


- Release hose clip -2-.
- Move coolant hose on retainer -3- clear to one side.
- Unscrew bolts -arrows-.
- Unplug electrical connector -1- at charge pressure sender - G31- and detach air pipe (right-side).

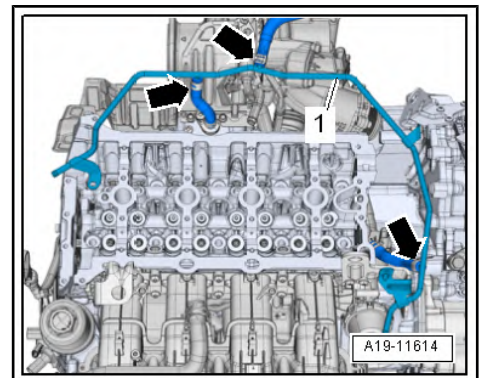




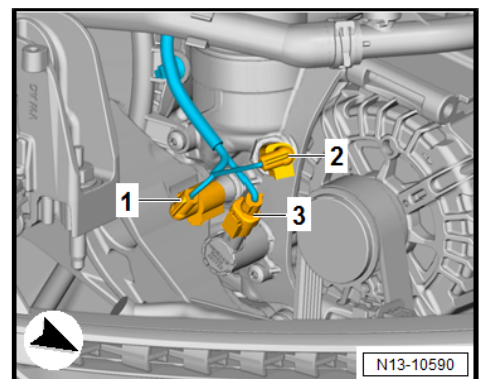
- Release hose clip -1- and detach air hose from charge air cooler.



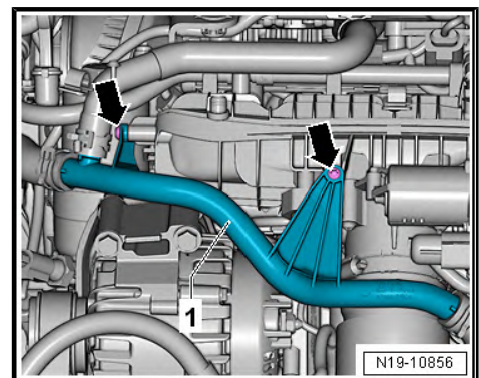
- Release hose clips -arrows-, and remove coolant hoses.
- Swivel coolant line -1- to side.



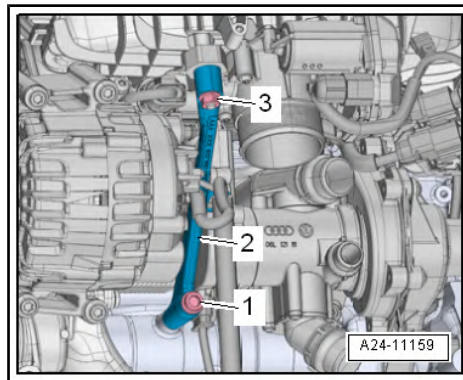
- Disconnect connectors -1, 2 and 3-.



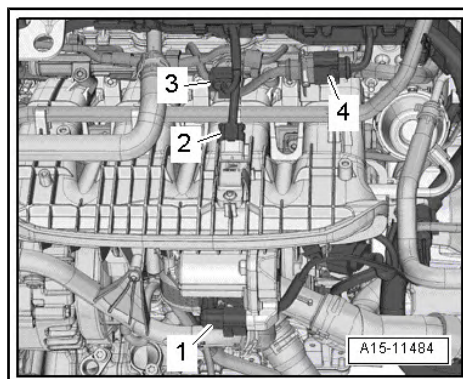
- Unscrew bolts -arrows-.



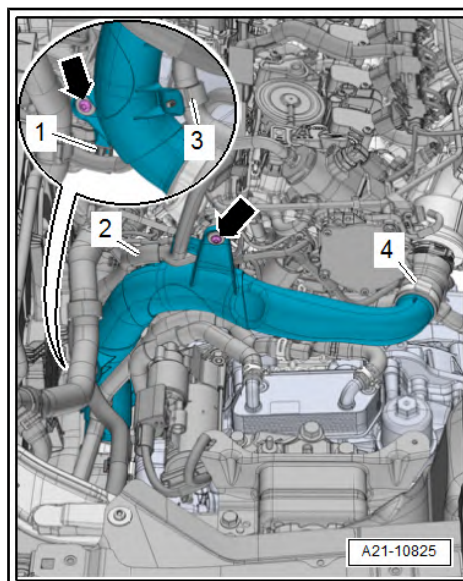
- Unscrew bolt -1- and nut -3- and remove bracket -2- for intake manifold.



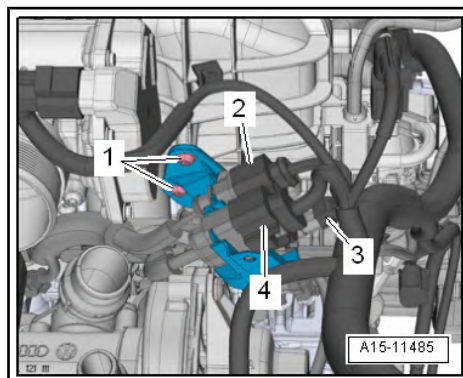
- Disconnect connectors:
  - 1 - For throttle valve module - GX3-
  - 2 - For intake manifold sender - GX9- .
  - 3 - For fuel pressure sender - G247- .
- Unclip connector -4- from retainer.
- Move electrical wiring harness clear and press to one side.



- Free electrical wiring harnesses -1 and 2- from fittings and lay them to one side.
- Loosen screw-type clip -4-.
- Unscrew bolts -arrows- and remove air pipe.



- Remove connector -3- for knock sensor 1 - G61- from retainer and disconnect it.
- Disconnect connectors -2 and 4-.

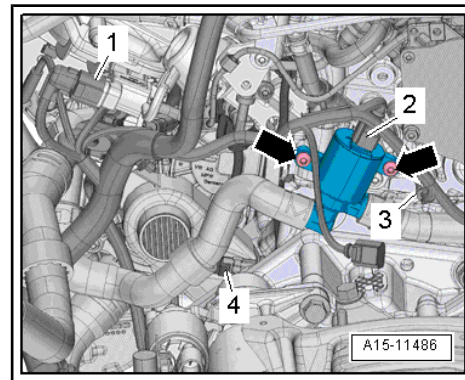




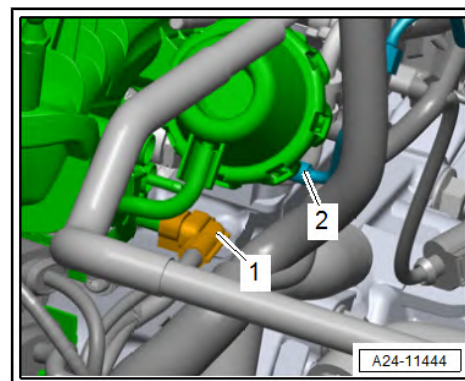
- Disconnect connectors and lay wiring harnesses to one side:

- 2 - For coolant shut-off valve - N82- .
- 3 - For coolant temperature sender - G62-
- 4 - For stage 3 oil pressure switch - F447-

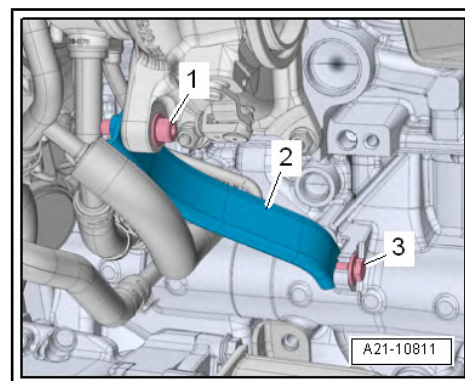
- Unscrew bolts -arrows-.



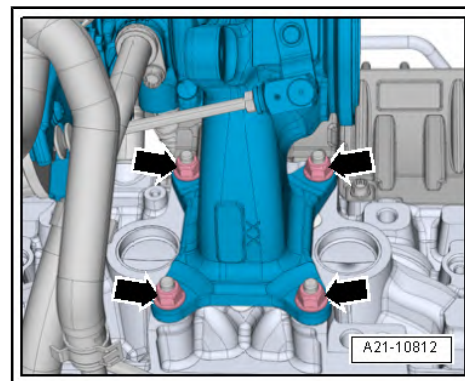
- Disconnect connector -1- for the intake manifold flap valve - N316- .
- Disconnect vacuum hose -2-.



- Unscrew bolt -1-.
- Remove bracket -2- for turbocharger.



- Unscrew nuts -arrows-.
- Detach turbocharger from cylinder head and tie up to rear.



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



#### Note

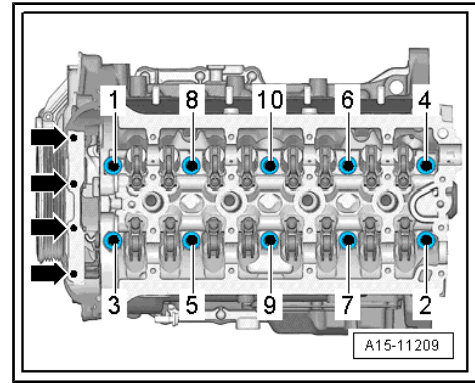
- ◆ *Make sure all hoses/pipes and wiring are removed.*
- ◆ *Ensure tensioning rail and guide rail are not damaged when lifting off cylinder head.*
- Remove cylinder head.
- Place cylinder head onto soft surface (foam plastic).
- Seal open channels of intake and exhaust system with a clean cloth or thoroughly cleaned plugs from engine bung set - VAS 6122- .

#### Installing



#### Note

- ◆ *Replace bolts that are tightened with specified tightening angle.*
- ◆ *Gaskets, oil seals and self-locking nuts must be renewed*
- ◆ *Hose connections and air duct pipes must be free of oil and grease before assembly.*
- ◆ *Secure all hose connections with hose clips corresponding to the series equipment ⇒ Electronic parts catalogue .*
- ◆ *Spray the worm screws of the used hose clips with penetrating spray before installing.*
- Do not remove the new cylinder head gasket from its packaging until just before installation. The silicon coating and the ribbed area of the cylinder head gasket must not be damaged.
- Carefully remove sealant residue from cylinder head and cylinder block. Ensure that no long scores or scratches are made on the surfaces. Carefully remove emery and abrasive remains.
- Clean blind holes for cylinder head bolts. Blow out with compressed air if necessary.



- Position cylinder head gasket.
- ◆ Pay attention to centring pins in cylinder block -arrows-.
- ◆ Note installation position of cylinder head gasket. Part No. should be legible from inlet side.
- If crankshaft has been rotated: set No. 1 cylinder piston to top dead centre and then turn crankshaft back again from the "PRS" 90° in an anticlockwise direction.
- Insert cylinder head bolts, and tighten them by hand.
- Fit cylinder head.



#### Note

*After repair work it is not necessary to retighten the cylinder head bolts.*

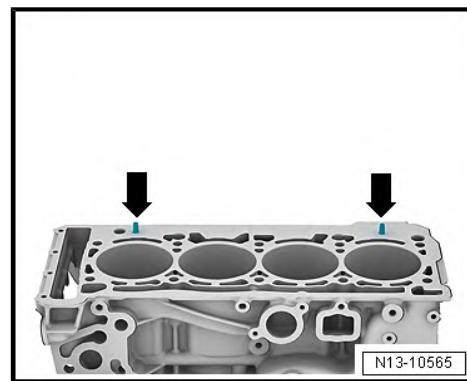
- Insert and tighten cylinder head bolts. Tightening sequence  
⇒ [Fig. "Cylinder head - specified torques and tightening sequence", page 100](#)  
⇒ [Fig. "Cylinder head - specified torques and tightening sequence", page 100](#).
- Install camshafts, but do not fit camshaft timing chain yet  
⇒ [page 152](#).
- Removing engine mounting and engine support.
- Now, install camshaft timing chain ⇒ [page 131](#).
- Install Lambda probe 1 before catalytic converter - GX10-  
⇒ [page 358](#).

Installation is carried out in reverse order of removal. The following should be observed:

- Change engine oil ⇒ Maintenance ; Booklet KH1 ; Engine oil: draining; Renewing oil filter and replenishing engine oil .
- Fill cooling system with fresh coolant ⇒ [page 206](#) .

#### Tightening torques

- ◆ ⇒ ["1.1 Assembly overview - cylinder head", page 98](#)
- ◆ ⇒ ["2.1 Assembly overview - emission control", page 369](#)
- ◆ ⇒ ["8.1 Assembly overview - Lambda probe", page 355](#)
- ◆ ⇒ ["4.1 Assembly overview - intake manifold", page 325](#)
- ◆ ⇒ ["3.1 Assembly overview - coolant pipes", page 254](#)
- ◆ ⇒ ["1.1 Assembly overview - turbocharger", page 272](#)
- ◆ ⇒ ["3.1 Assembly overview - air filter housing", page 321](#)



## 1.3 Assembly overview - vacuum pump

**1 - Articulation**

- ☐ Renew after removing.

**2 - Vacuum pump**

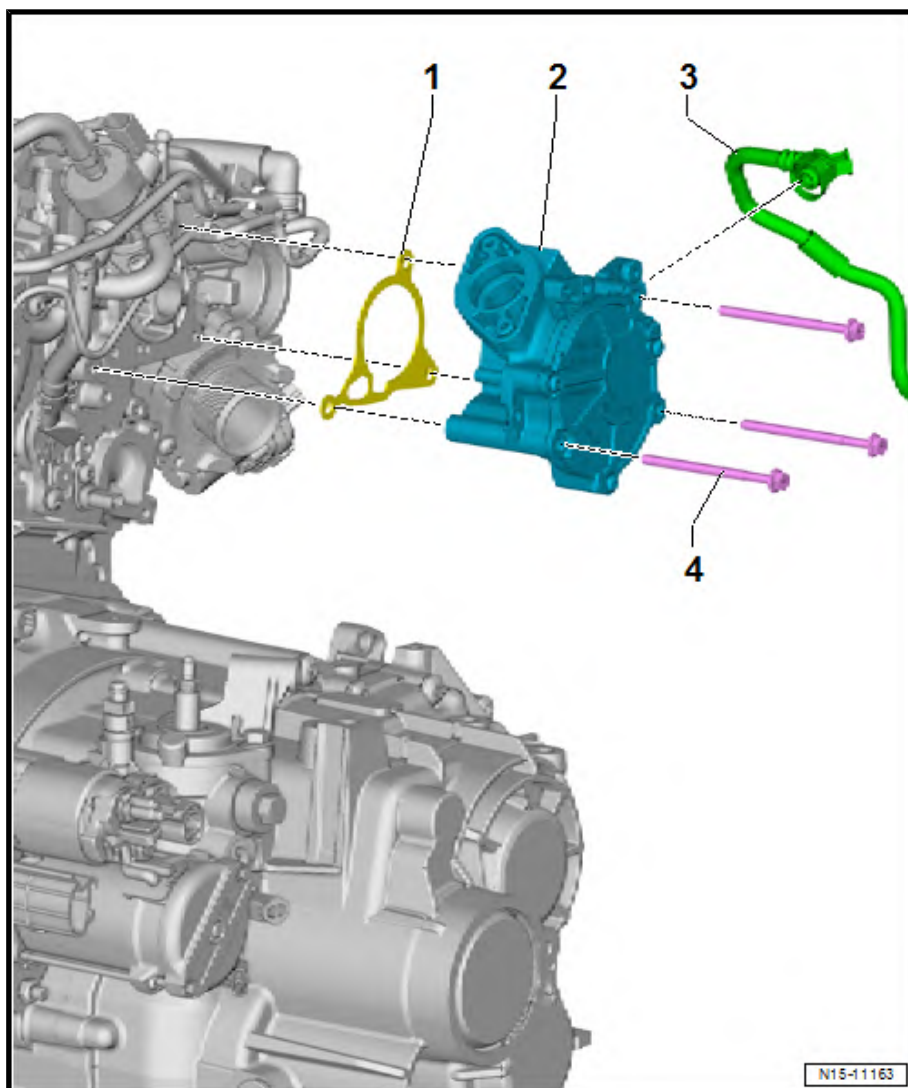
- ☐ No provision is made for the vacuum pump to be dismantled.

**3 - Vacuum hose**

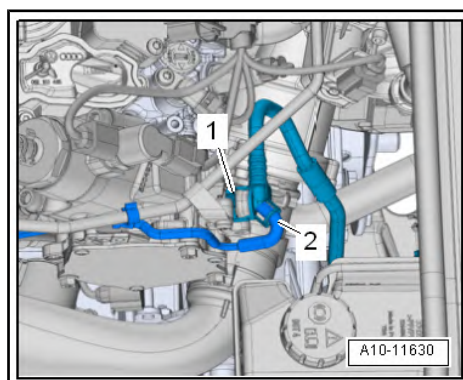
- ☐ To brake servo

**4 - Bolts**

- ☐ 8 Nm +180°

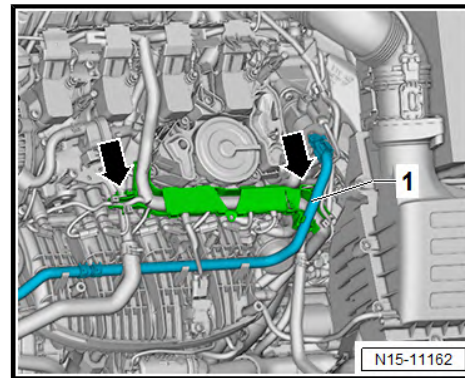
**1.4 Removing and installing vacuum pump****Removing**

- Remove engine cover panel ➔ [page 50](#) .
- Remove air filter housing ➔ [page 322](#) .
- Detach vacuum hose -2-.
- Press release tabs on vacuum hose -1-, and remove hose from vacuum pump.





- Unclip fuel hose -1-, release wiring duct -arrows-, and pull it upwards out of the bracket.

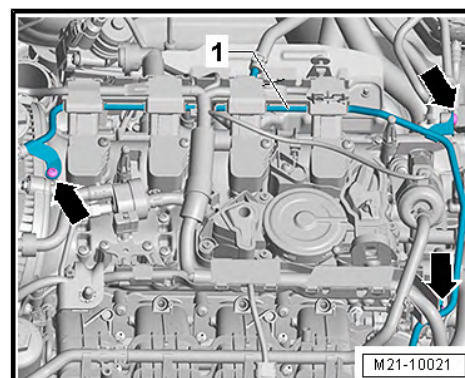


- Unscrew bolts -arrows- for coolant pipe -1-.

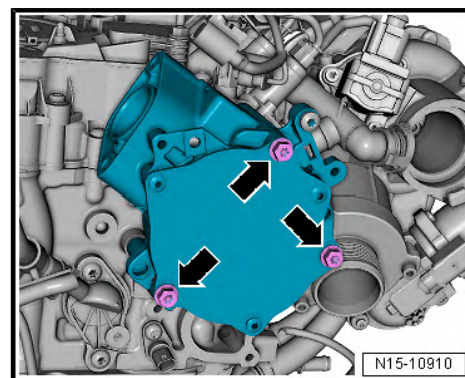
**NOTICE**

**Risk of damage to coolant pipes caused by deformation.**

- **Never attempt to reshape the coolant pipe.**
- Remove high-pressure pump with »roller tappet«  
 ⇒ [page 350](#) .



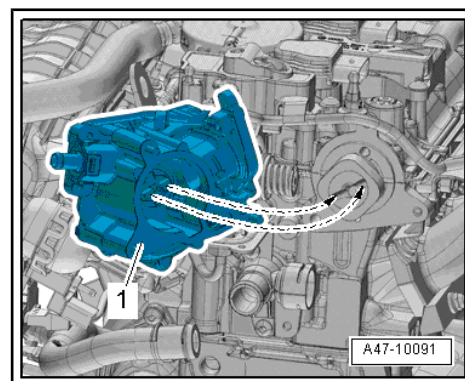
- Unscrew bolts -arrows-, and remove vacuum pump.



### Installing

- Specified torques ⇒ [page 109](#)
- Clean sealing surfaces.
- Position drive lug of vacuum pump carrier -1- so that it engages in slot of camshaft when vacuum pump is fitted.
- Position new gasket on vacuum pump, insert 2 bolts, and fit vacuum pump with gasket on cylinder head.
- When doing so, ensure that vacuum pump is flush with flange.




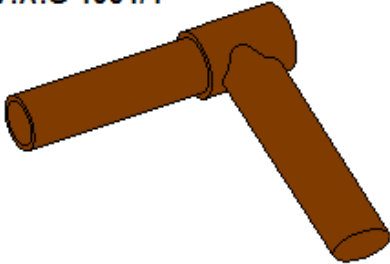


Further assembly is basically the reverse of the removal procedure.



## 1.5 Checking compression



### Special tools and workshop equipment required

<p><b>3122 B</b></p> 	<p><b>V.A.G 1763</b></p> 
<p><b>V.A.G 1381/5 A</b></p> 	<p><b>V.A.G 1381/1</b></p> 
<p><b>V.A.G 1763</b></p> 	

W15-10134

- ◆ Spark plug socket - 3122 B-
- ◆ Compression tester - V.A.G 1763-
- ◆ Adapter part - V.A.G 1381/1-
- ◆ Adapter part - V.A.G 1381/5A-

### Test procedure

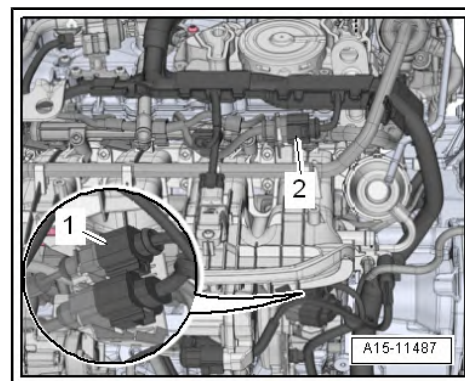


#### Note

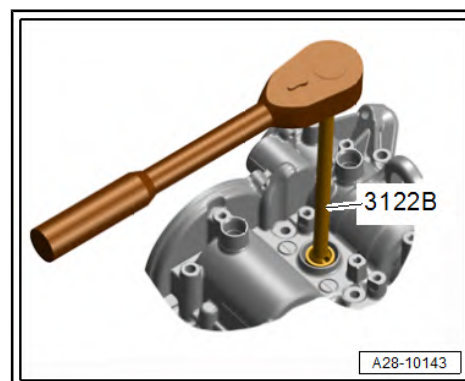
- ◆ *Engine oil temperature min. 30 °C*
- ◆ *Battery voltage: at least 12.7 V*
- Removing ignition coils with output stages ⇒ [page 407](#) .

– Disconnect connectors:

- 1 - For injectors -N30- to -N33-
- 2 - For injectors 2 -N532- ... -N535-



– Unscrew spark plugs using spark plug socket and extension - 3122 B- .



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

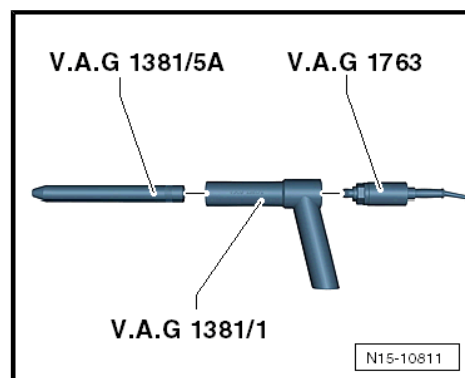


#### Note

*Using compression tester: ⇒ Operating instructions .*

– Start engine until tester shows no further pressure increase.

Compression pressures	bar
New	16.0 ... 19.0
Wear limits	12.0
Maximum difference between cylinders	3.0



– Install spark plugs ⇒ Maintenance ; Booklet KH1 ; Spark plugs: Renewing .

– Install ignition coils ⇒ [page 407](#) .



#### Note

*Faults will have been stored in the memory because connectors have been disconnected. Read and clear the event memory after the measurement.*

– Switch on ignition, and select following menu option on vehicle diagnostic tester :

- ◆ 0001 - Generate readiness code

## 2 Timing chain cover

⇒ ["2.1 Assembly overview - cover for timing chain", page 114](#)

⇒ ["2.2 Removing and installing timing chain cover", page 115](#)

### 2.1 Assembly overview - cover for timing chain

#### 1 - Bolt

- ☐ 9 Nm

#### 2 - Exhaust camshaft control valve 1 - N318-

#### 3 - Oil seals

- ☐ To remove, cover must be removed.

#### 4 - Upper cover for timing chain

- ☐ Removing and installing  
⇒ [page 115](#)

#### 5 - Articulation

- ☐ Renew if damaged

#### 6 - Sealing cover

- ☐ Extension may be fitted between end cap and cover

#### 7 - Bolt

- ☐ Tightening sequence  
⇒ [page 117](#)
- ☐ 9 Nm

#### 8 - Articulation

- ☐ Renew if damaged

#### 9 - O-ring

- ☐ Renewing:
- ☐ Moisten with engine oil.

#### 10 - Not installed

#### 11 - Engine

#### 12 - Pins

- ☐ For centring cover

#### 13 - Lower cover for timing chain

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

#### 14 - Seal

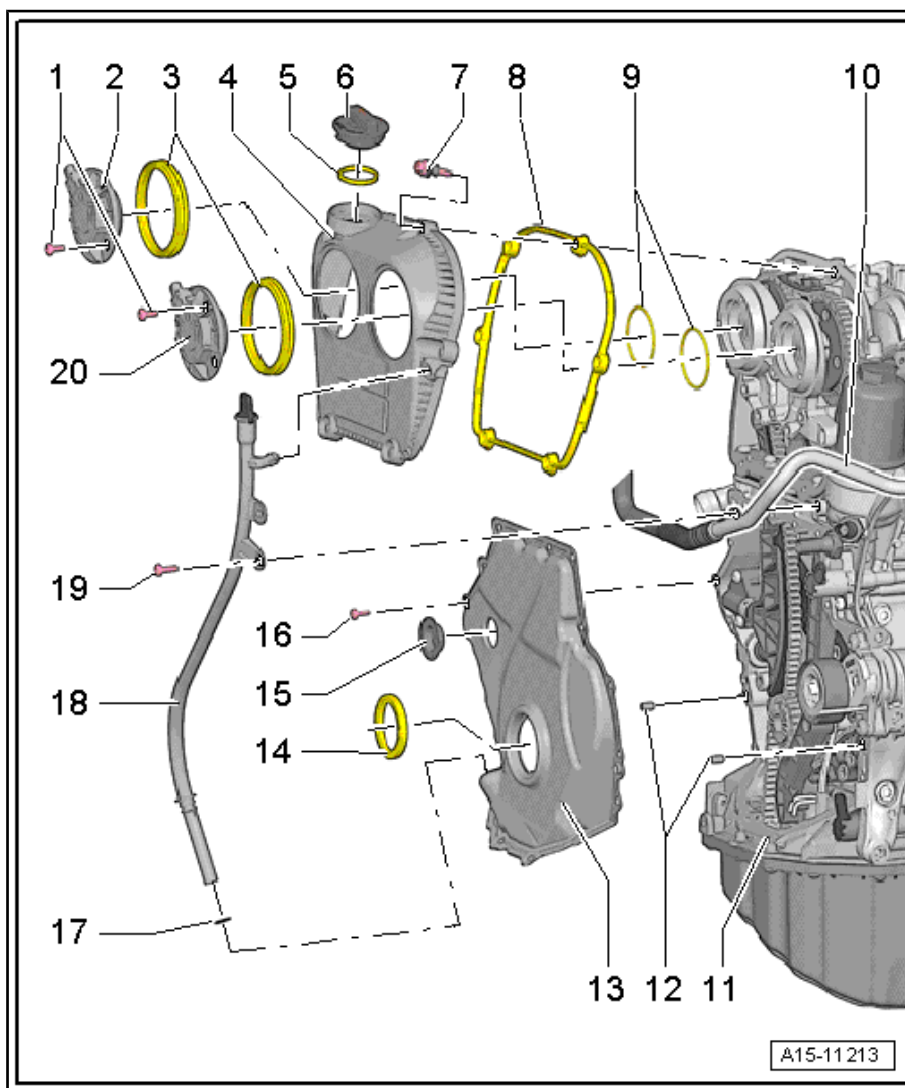
- ☐ For vibration damper.
- ☐ Renew ⇒ [page 64](#)

#### 15 - Sealing cover

- ☐ Renewing:

#### 16 - Bolt

- ☐ Renewing:
- ☐ Tightening sequence ⇒ [page 120](#)



### 17 - O-ring

- ☐ Renewing:
- ☐ Moisten with oil before installing.

### 18 - Dipstick guide tube

### 19 - Bolt

- ☐ 9 Nm

### 20 - Inlet camshaft control valve 1 - N205-

- ☐ Removing and installing ⇒ [page 155](#)

## 2.2 Removing and installing timing chain cover

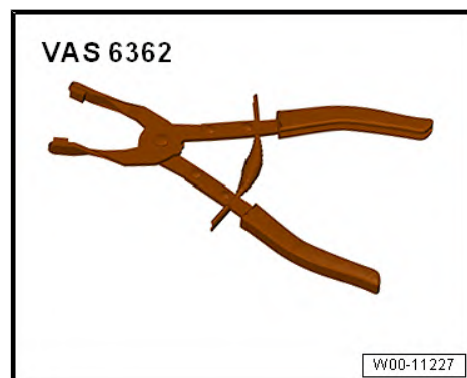
⇒ [“2.2.1 Removing and installing upper timing chain cover”, page 115](#)

⇒ [“2.2.2 Removing and installing lower timing chain cover”, page 117](#)

### 2.2.1 Removing and installing upper timing chain cover

Special tools and workshop equipment required

- ◆ Spring-type clip pliers - VAS 6362-



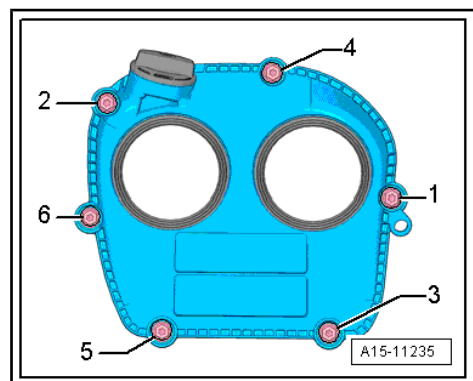
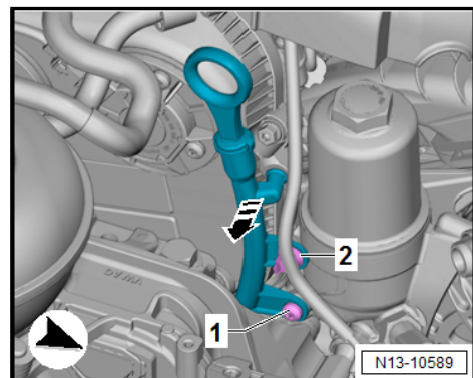
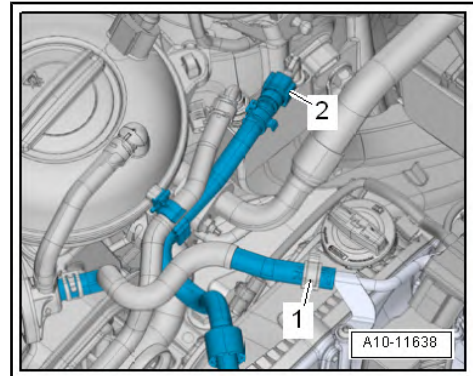
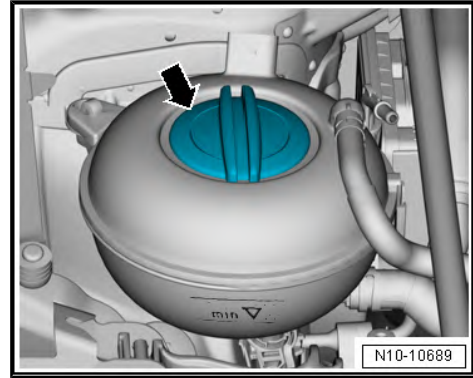
- ◆ Torque wrench - V.A.G 1783-



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

## Removing

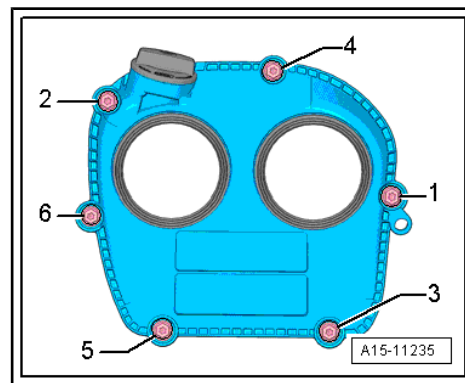
- Engine cold.
- Briefly open filler cap -arrow- for coolant expansion tank in order to reduce residual pressure in cooling system.
- Remove engine cover panel ➔ [page 50](#) .
- Release hose clip -1-, disconnect coolant hose and push towards right.
- Disconnect hose -2- for activated charcoal filter (press release tab on hose) and move hose clear.
- Remove inlet camshaft control valve 1 - N205- / exhaust camshaft control valve 1 - N318- ➔ [page 155](#) .
- Unscrew bolt -1-, and unclip wiring harness -2-.
- Pull guide tube for oil dipstick off upper timing chain cover -arrow-.
- Pull guide tube for oil dipstick down slightly out of its bearing in the cover.
- Unclip wiring harness for camshaft control valves, and lay it to one side.
- Unscrew bolts -1 to 6- and detach top cover for timing chain.
- Remove bolts -3, 5- if necessary.





## Installing

- Renew seals, and apply engine oil to new ones.
- Fit cover on cylinder head, and screw in bolts by hand. When doing so, ensure that cylinder head gasket is seated properly on cylinder head.
- Tighten bolts -1 to 6- by hand in the sequence shown. Use torque wrench - V.A.G 1783- and open-end spanner insert AF 10 - V.A.G 1783/1- for bolts -3- and -5-.
- Install camshaft control valve 1 - N205- and exhaust camshaft control valve 1 - N318- [⇒ page 155](#) .
- Check if dipstick guide tube is properly inserted into lower cover.
- Fit engine cover panel [⇒ page 50](#) .



## Specified torques

- ♦ [⇒ "2.1 Assembly overview - cover for timing chain", page 114](#)

## 2.2.2 Removing and installing lower timing chain cover

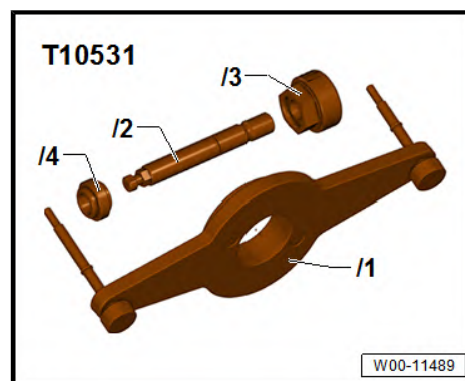


### Note

*Due to the adhesive strength of the sealant, the cover is bent when being removed. For this reason, the cover always needs be renewed.*

## Special tools and workshop equipment required

- ♦ Assembly tool - T10531-

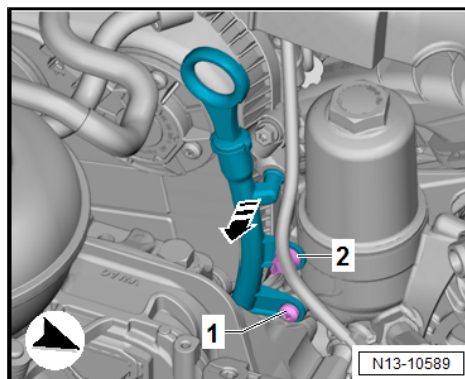


- ♦ Silicone sealant [⇒ Electronic parts catalogue \(ETKA\)](#)
- ♦ Applicator gun - VAS 6966-

## Removing

- Remove front right wheel housing liner [⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liner; Removing and installing front wheel housing liner](#) .
- Remove engine support [⇒ page 62](#) .
- Remove vibration damper [⇒ page 54](#) .
- Drain engine oil [⇒ Maintenance ; Booklet KH1 ; Engine oil: Draining; Renewing oil filter and replenishing engine oil](#) .
- Remove valve for oil pressure control - N428- [⇒ page 199](#) .
- Remove tensioner for poly V-belt [⇒ page 54](#) .

- Move retaining clip -2- for electrical wiring harness clear.
- Unscrew screw -1-.
- Take dipstick guide tube out of the cover -arrow-.
- Pull dipstick guide tube out of the timing chain cover.



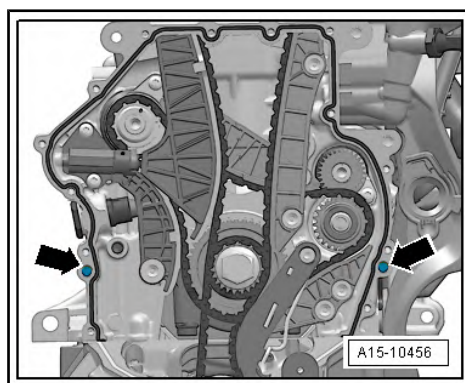
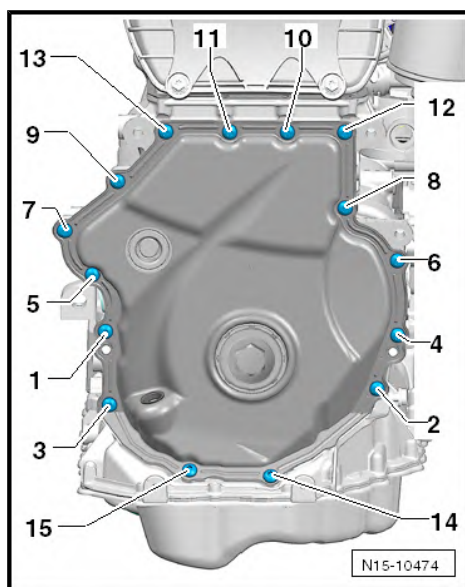
- Unscrew bolts -1 ... 15-.
- Lever lower timing chain cover off.

### Installing

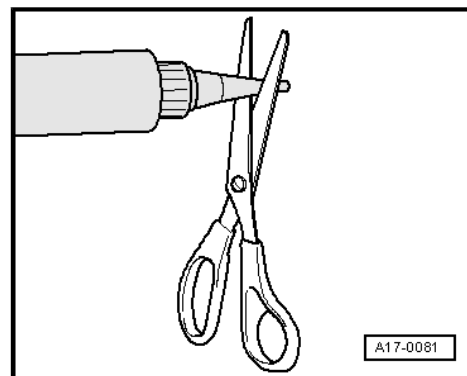


#### Note

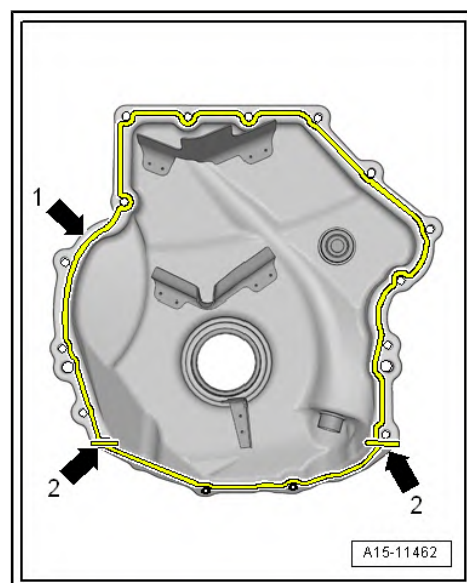
- ◆ *Note expiry date of silicone sealant.*
- ◆ *Engine oil: capacities and specifications*
- ◆ *The cover must be installed within 5 minutes after applying the silicone sealant.*
- ◆ *Renew bolts that are tightened with turning further angle.*
- ◆ *Renew seal and O-ring.*
- ◆ *Danger of contaminating lubrication system! Cover open parts of engine.*
- Remove sealant residues from cylinder block with a flat scraper.
- Remove any oil and grease from sealing surfaces.
- Check that both dowel pins for centring the cover -arrows- are fitted.



- Cut off nozzle on tube at front marking ( $\varnothing$  of nozzle approx. 3 mm).



- Apply silicone sealant onto clean sealing surface -arrow 1- and edges -arrows 2- of new cover, as shown in illustration.
- ◆ Thickness of sealant bead: 2 to 3 mm.



- Connect the cover immediately and tighten bolts in the indicated sequence.



#### Note

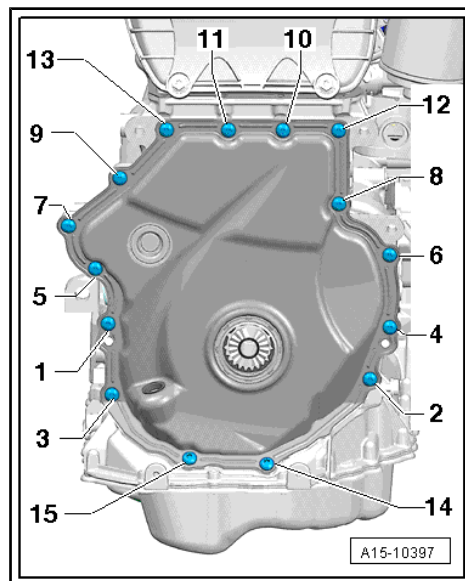
*Do not tighten bolts -3- and -6- with turning further angle until after the vibration damper has been installed. The bolts must be unscrewed again for installing the vibration damper.*

Stage	Bolts	Specified torque/turning further angle
1.	-1 ... 15-	Screw in by hand as far as stop
2.	-1 ... 15-	8 Nm
3.	-1 ... 15-	45° (turn the bolts 3 and 6 45° further after vibration damper has been installed)

- Install vibration damper ➔ [page 54](#) .
- Install valve for oil pressure control - N428- ➔ [page 199](#) .
- Install tensioner for poly V-belt ➔ [page 60](#) .
- Fit poly V-belt ➔ [page 53](#) .
- Install front right wheel housing liner ➔ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liner; Removing and installing front wheel housing liner .
- Replenish engine oil, and check oil level ➔ Maintenance ; Booklet KH1 ; Engine oil: Draining; Renewing oil filter and replenishing engine oil .

#### Specified torques

- ♦ ➔ [“2.1 Assembly overview - cover for timing chain”, page 114](#)
- ♦ ➔ [“2.1 Assembly overview - assembly mountings”, page 34](#)



## 3 Chain drive

⇒ [“3.1 Assembly overview - camshaft timing chains”, page 121](#)

⇒ [“3.2 Assembly overview - drive chain for balance shaft”, page 123](#)

⇒ [“3.3 Removing and installing camshaft timing chain”, page 125](#)

⇒ [“3.4 Removing and installing drive chain for balance shaft”, page 136](#)

⇒ [“3.5 Checking valve timing”, page 139](#)

⇒ [“3.6 Checking timing chain”, page 141](#)

### 3.1 Assembly overview - camshaft timing chains



#### Note

- ◆ *After working on the chain drive, adapt learnt values in engine control unit. To do this, switch on ignition, and select the following menu options on vehicle diagnostic tester :*
- ◆ Test plan 001 - Engine electronics, Adjustment diagnosis chain length



# 1 - Chain tensioner

- ☐ Is spring-loaded
- ☐ Secure with locking tool - T40267- before removing.

# 2 - Bolt

- ☐ Renew after removing.
- ☐ 4 Nm +90°

# 3 - Guide pin

- ☐ 20 Nm

# 4 - Bolt

- ☐ Renew after removing.
- ☐ Specified torques and installation sequence ➔ [page 123](#) .

# 5 - Clamping sleeve

- ☐ Is pulled into cylinder head together with securing bolt

# 6 - Timing valves

- ☐ Left-hand thread
- ☐ 35 Nm
- ☐ Checking ➔ [page 123](#)
- ☐ Depending on version, remove using removal tool - T10352/2- or - T10352/4- .

# 7 - Timing valves

- ☐ Left-hand thread
- ☐ 35 Nm
- ☐ Checking ➔ [page 123](#)
- ☐ Depending on version, remove using removal tool - T10352/2- or -T10352/4- .

# 8 - Bearing frame

- ☐ Specified torques and installation sequence ➔ [page 123](#) .

# 9 - Cylinder head cover

# 10 - Bolt

- ☐ 9 Nm

# 11 - Slide rail

- ☐ For camshaft timing chain

# 12 - Camshaft timing chain

- ☐ Removing and installing ➔ [page 125](#)

# 13 - Guide rail for camshaft timing chain

# 14 - Guide pin

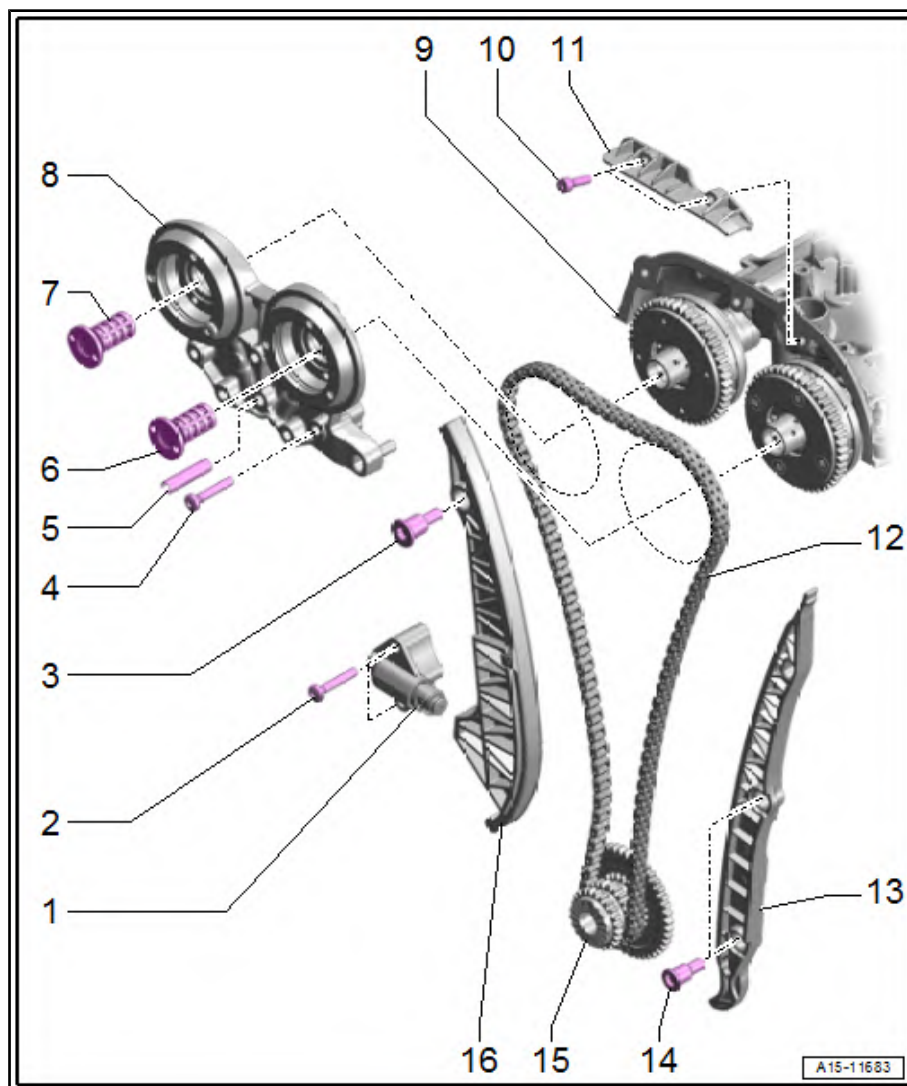
- ☐ 20 Nm

# 15 - Crankshaft gear

- ☐ Fitting position ➔ [page 123](#)

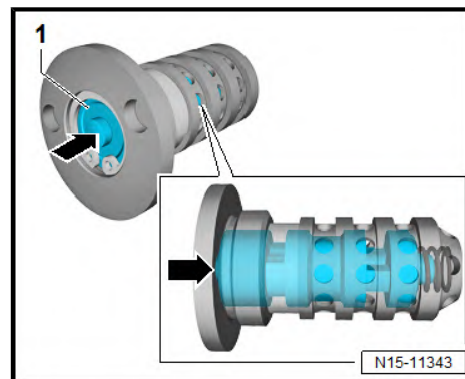
# 16 - Tensioning rail

- ☐ For camshaft timing chain



### Checking control valve

- It must be possible to press in piston -1- approx. 3 mm against spring force. It must move freely, without sticking.

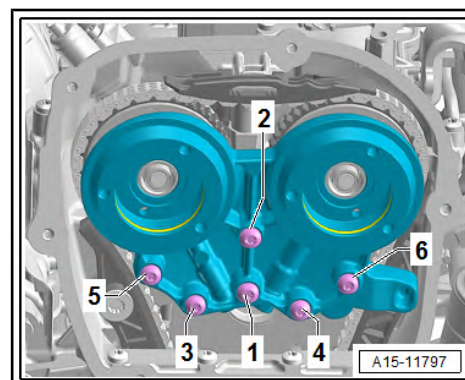


### Bearing saddle - specified torque and tightening sequence

If a clamping sleeve is installed, it is pulled into the cylinder head together with bolt -1-.

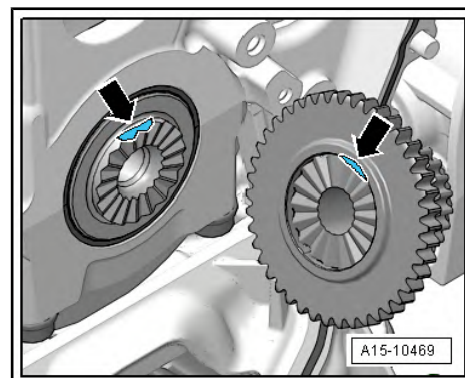
- Tighten bolts in stages in the sequence shown:

Stage	Bolt	Specified torque/turning further angle
1.	-1-	3 Nm (press in clamping sleeve)
2.	-1 ... 6-	9 Nm



### Triple chain sprocket - installation position

- The two sections -arrows- must be aligned.



## 3.2 Assembly overview - drive chain for balance shaft



### Note

- ◆ After working on the chain drive, adapt learnt values in engine control unit. To do this, switch on ignition, and select the following menu options on vehicle diagnostic tester :  
Test plan 001 - Engine electronics, Adjustment diagnosis chain length

# 1 - Crankshaft gear

- ☐ Fitting position  
⇒ [page 123](#)

# 2 - Guide pin

- ☐ 20 Nm

# 3 - Tensioning rail

- ☐ For drive chain for balance shaft

# 4 - Drive chain for balance shafts

- ☐ Removing and installing  
⇒ [page 136](#)

# 5 - Guide pin

- ☐ 20 Nm

# 6 - Balance shaft, exhaust side

- ☐ Assembly overview  
⇒ [page 81](#)

# 7 - Chain tensioner

- ☐ 85 Nm

# 8 - Seal

- ☐ Renew after removing.
- ☐ Moisten with sealant - D 154 103 A1-

# 9 - Cylinder block

# 10 - Balance shaft intake side

- ☐ Assembly overview  
⇒ [page 81](#)

# 11 - O-ring

- ☐ Lubricate with engine oil

# 12 - Stud

- ☐ Lubricate with engine oil
- ☐ Fitting position ⇒ [page 125](#)

# 13 - Intermediate gear

- ☐ If bolt ⇒ [Item 15 \(page 124\)](#) has been loosened, idler gear will need to be renewed.

# 14 - Thrust washer

# 15 - Bolt

- ☐ Renew after removing.
- ☐ If bolt has been loosened, idler gear will need to be renewed ⇒ [Item 13 \(page 124\)](#)
- ☐ Specified torque and tightening sequence ⇒ [page 125](#)

# 16 - Slide rail

- ☐ For drive chain for balance shaft

# 17 - Guide pin

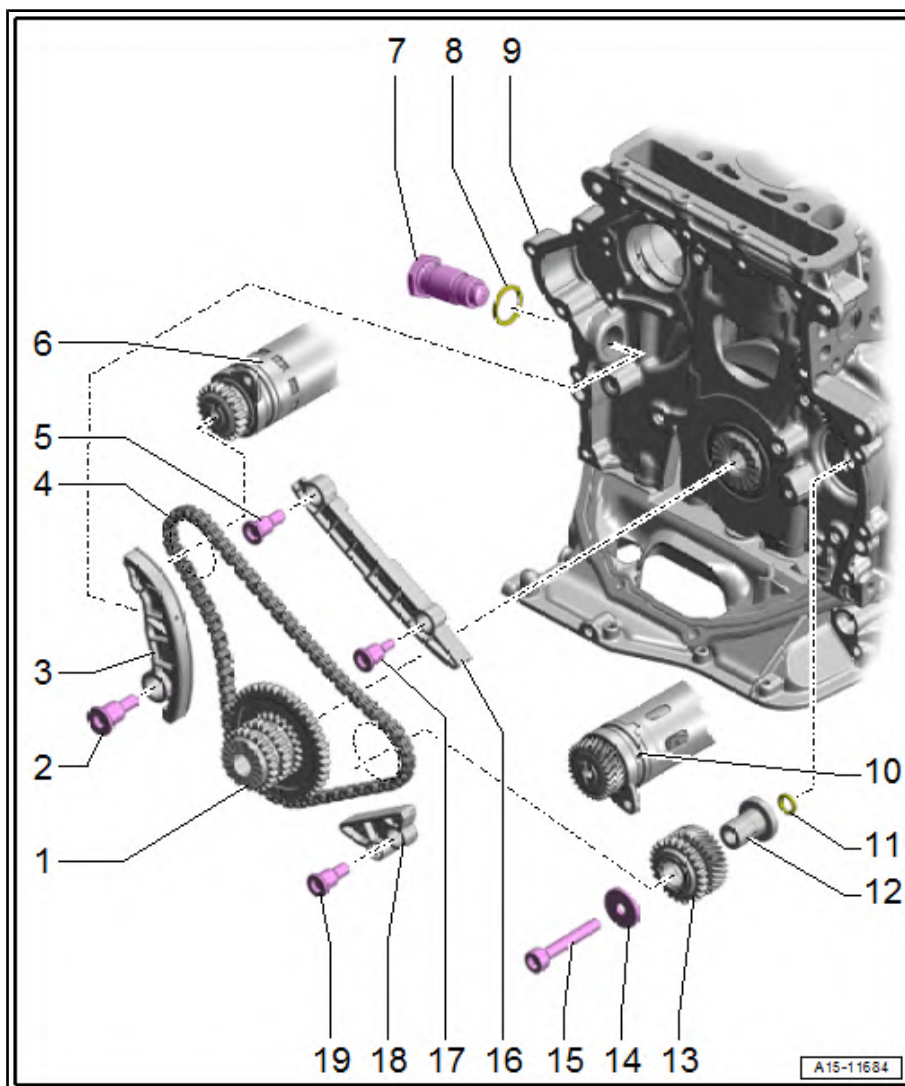
- ☐ 20 Nm

# 18 - Slide rail

- ☐ For balance shaft timing chain

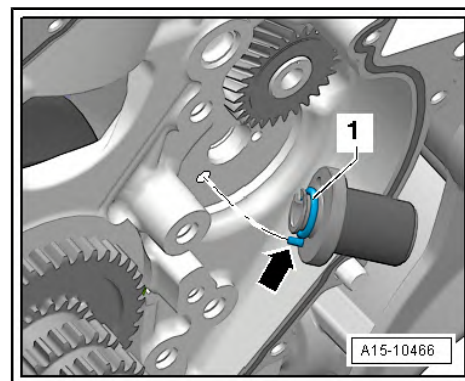
# 19 - Guide pin

- ☐ 12 Nm



### Bearing mounting - installation position

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



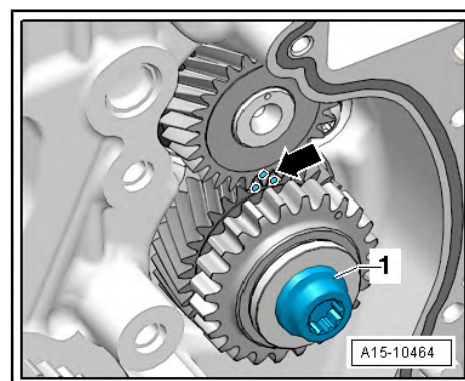
### Tightening sequence - idler gear



#### Note

- ◆ *The idler gear must always be renewed. Otherwise no tooth backlash is set, which may result in damage to the engine.*
- ◆ *The new idler gear is coated with a solid film lubricant that wears off after a short period as a result of which the tooth backlash is automatically set.*

– Tighten as follows using new bolt:

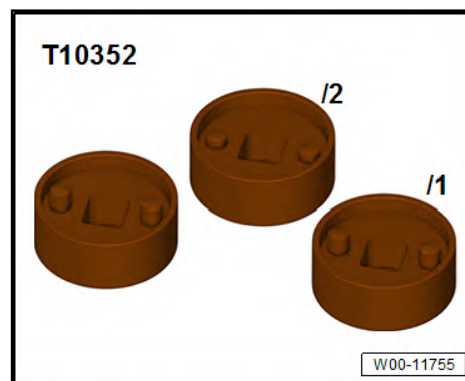


Stage	Specified torques/angle specifications
1.	10 Nm
2.	– Turn intermediate gear <ul style="list-style-type: none"> <li>• There must be no play in intermediate gear; otherwise loosen bolt and tighten again</li> </ul>
3.	25 Nm
4.	Turn 90° further

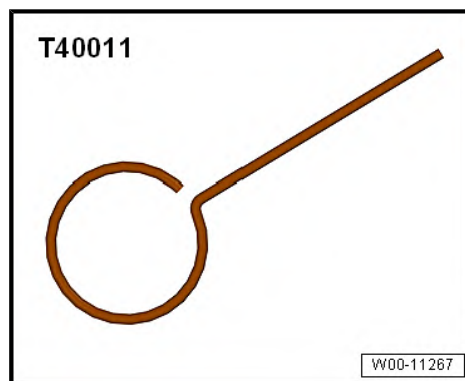
## 3.3 Removing and installing camshaft timing chain

### Special tools and workshop equipment required

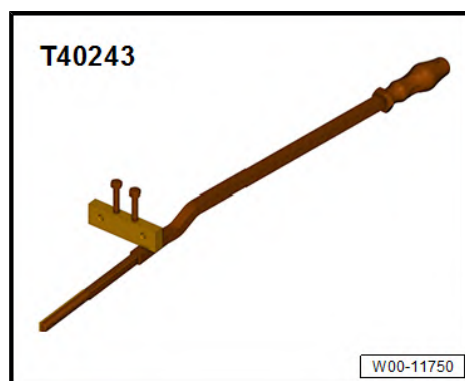
- ◆ Depending on version assembly tool - T10352/2- or - T10352/4-



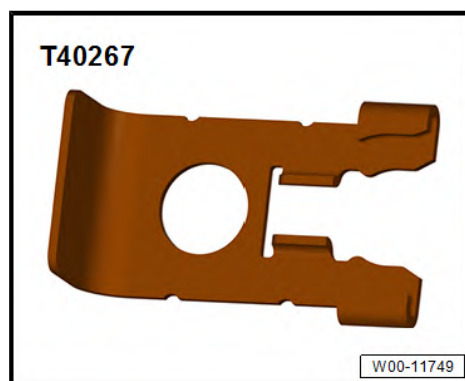
◆ Pin - T40011-



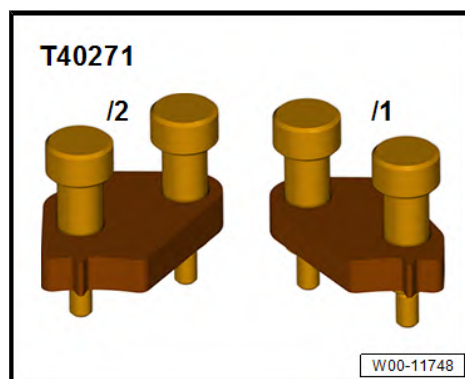
◆ Assembly lever - T40243-



◆ Release lever - T40267-

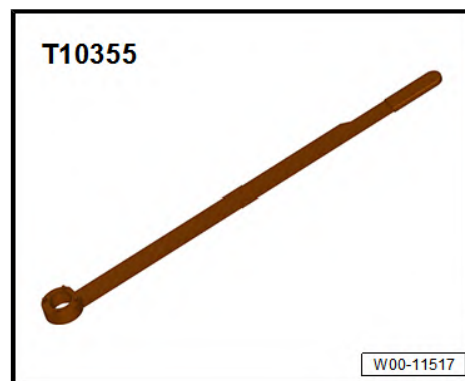


◆ Camshaft clamp - T40271-

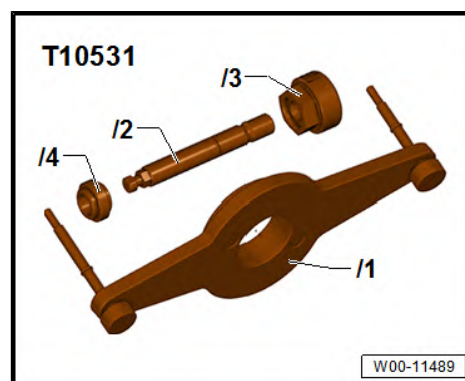




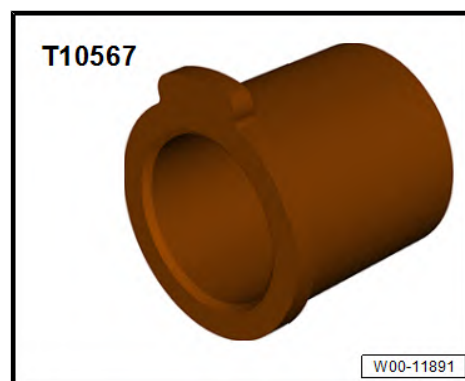
- ◆ Counter-hold tool - T10355-



- ◆ Assembly tool - T10531-



- ◆ Assembly tool - T10567-



## Removing

- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
- Remove right wheel housing liner ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liner; Removing and installing front wheel housing liner .
- Support engine in installation position ⇒ [page 41](#) .
- Removing engine mounting ⇒ [page 35](#) .
- Remove engine support ⇒ [page 62](#) .
- Remove timing chain cover (top) ⇒ [page 115](#) .

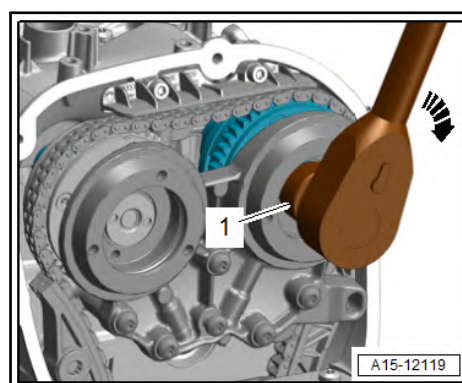
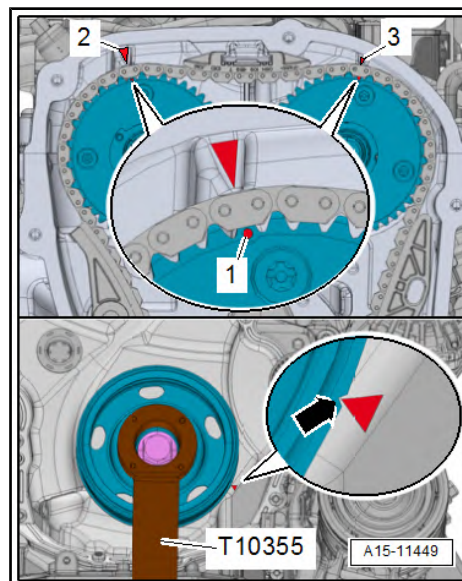
- Turn vibration damper to “TDC” position using counter-hold tool - T10355- .
- The markings -1- on the camshaft sprockets must align with markings -2- and -3-.
- The notch on the vibration damper must align with the marking on the lower timing chain cover -arrow-.
- Remove lower timing chain cover ➔ [page 117](#) .



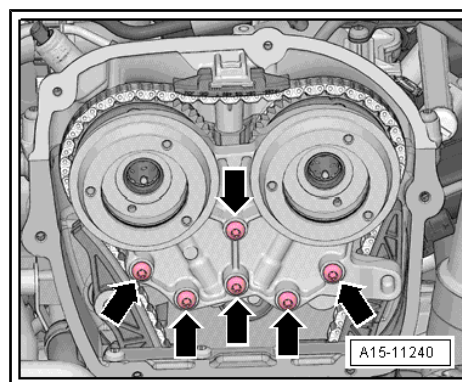
#### Note

- ♦ *The timing valves have left-hand threads.*
- ♦ *Depending on the version, different timing valves may be installed. Use the appropriate assembly tool -1-.*

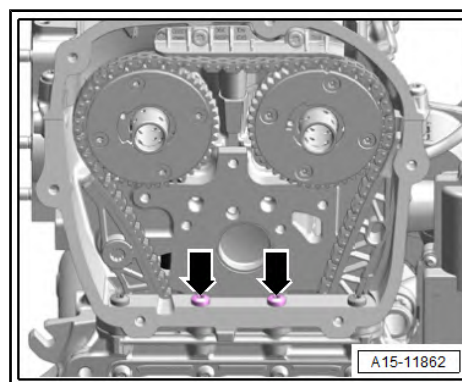
- Turn assembly tool - T10352/2- or -T10352/4- in -direction of arrow- to remove left and right timing valves.



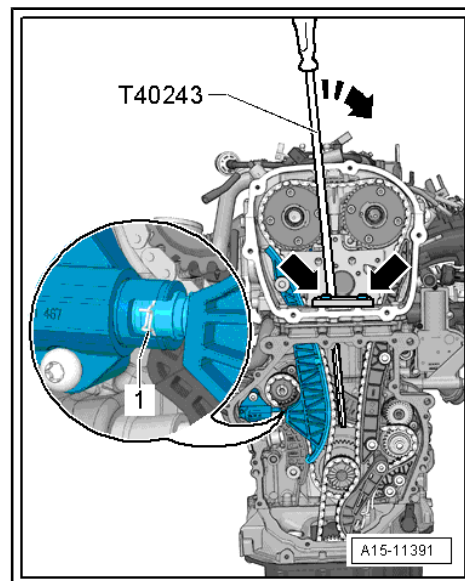
- Unscrew bolts -arrows-, and remove bearing saddle.



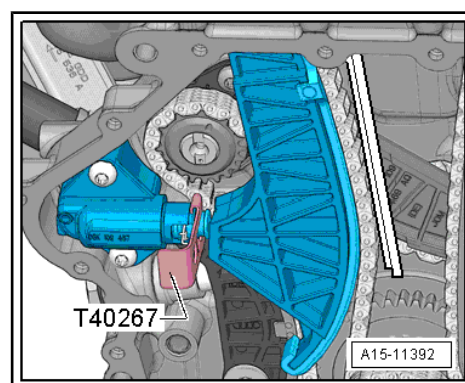
- Unscrew bolts -arrows-.



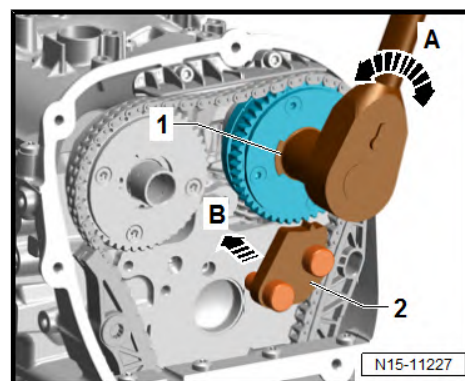
- Screw in lever - T40243- -arrows-.
- Press together retaining ring -1- of chain tensioner and hold it in that position.
- Slowly push lever - T40243- in -direction of arrow-, and hold it in that position.



- Secure chain tensioner with locking pin - T40267- .
- Remove lever - T40243- .

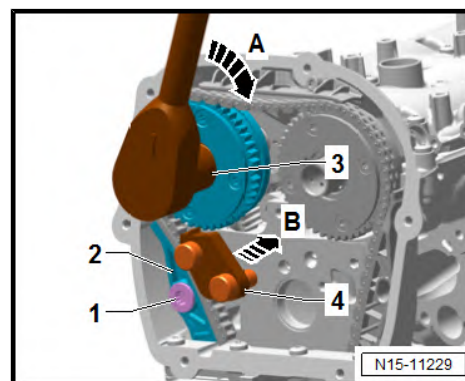


- Bolt camshaft clamp - T40271/2- -2- to cylinder head.
- Insert camshaft clamp between teeth of chain sprocket -arrow B-.
- If necessary, use adapter - T10567- -1- to slightly turn inlet camshaft back and forth -arrows A-.

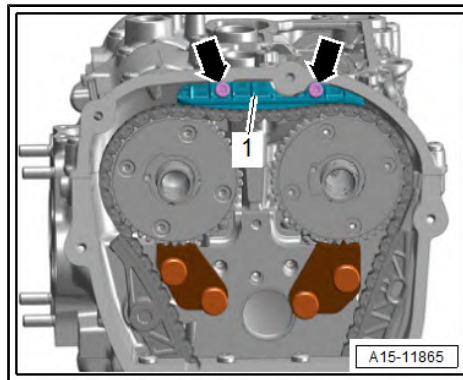


- Bolt camshaft clamp - T40271/1- to cylinder head.
- A second mechanic is required for the following work step.

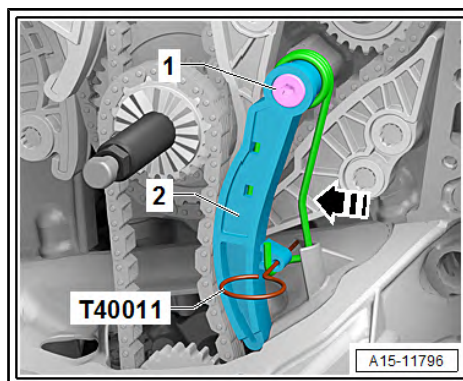
- Turn exhaust camshaft with assembly tool - T10567- -3- in direction of arrow -A-. Unscrew bolt -1-, and guide tensioning rail -2- downwards.
- Turn camshaft clockwise -A- until camshaft clamp - T40271/1- -4- can be inserted in teeth of chain sprocket -B-.



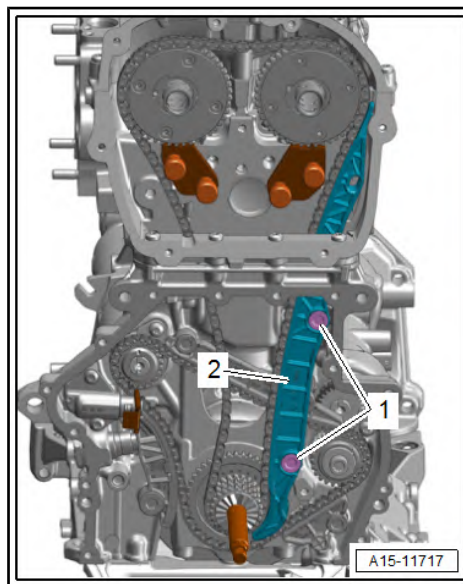
- Unscrew bolts -arrows-, and remove guide rail -1-.



- Press tensioning bar of oil pump chain tensioner in direction of -arrow- and lock it with locking pin - T40011- .
- Unscrew bolt -1-, and remove chain tensioner -2-.
- Remove chain for oil pump towards front from crankshaft wheel, pull it off and lay it down on oil pump chain sprocket.



- Unscrew guide pins -1-, and remove guide rail -2-.
- Remove camshaft timing chain from camshaft sprockets, and remove it downwards.

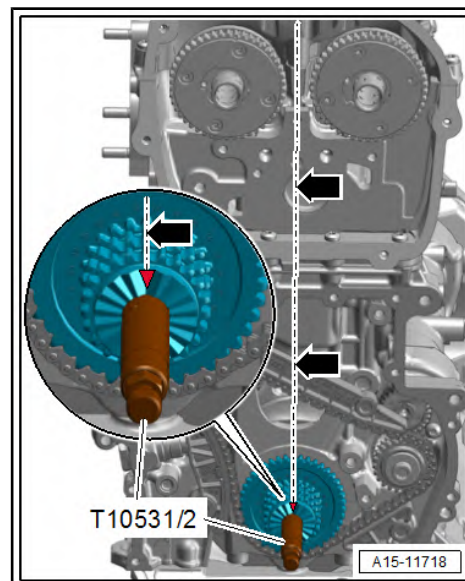




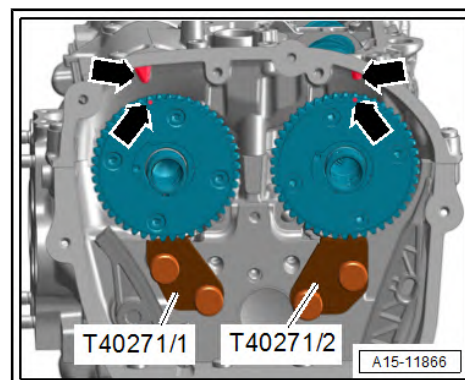
## Installing camshaft timing chain

This is achieved when:

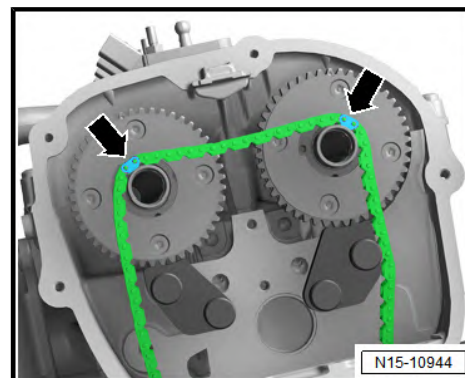
- The crank shaft is in "TDC" and the V-shaped recess on the crankshaft wheel shows a centred imaginary horizontal line between the camshaft at -arrows-.
- Crankshaft wheel is locked in position with clamping pin - T10531/2- .



- Crankshaft wheels are locked in position at "TDC" with camshaft clamps - T40271/1- and -T40271/2- .
- The marks must coincide -arrows-.
- Marking on exhaust camshaft is slightly offset towards right.
- Use a waterproof pen for additional identification of markings (notches with a dot behind). The points on the notches are partly covered by the chain.

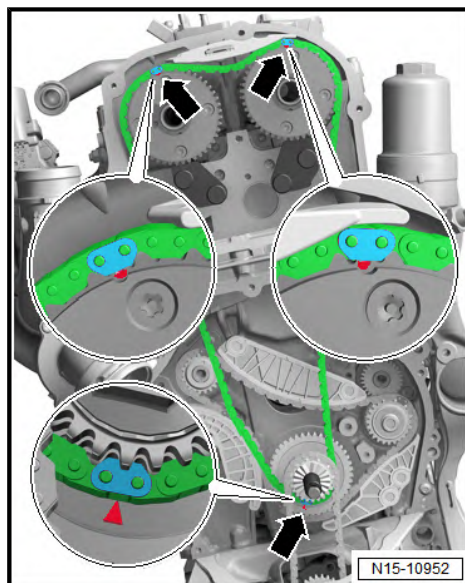


- Fit camshaft timing chain onto camshaft journals with coloured markings -arrows- properly aligned.

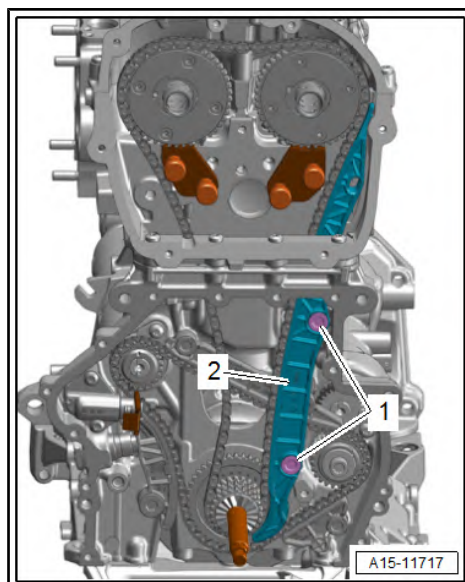




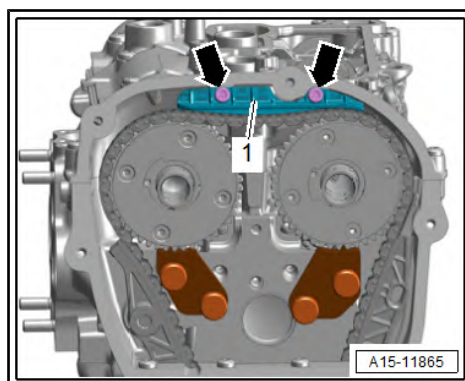
- Fit camshaft timing chain on inlet camshaft, exhaust camshaft and crankshaft wheel.
- The chain links with coloured markings must be positioned opposite the markings on the sprockets -arrows-.



- Connect guide rail -2- and tighten guide pins -1-.



- Connect guide rail -1-, and tighten bolts -arrows-.



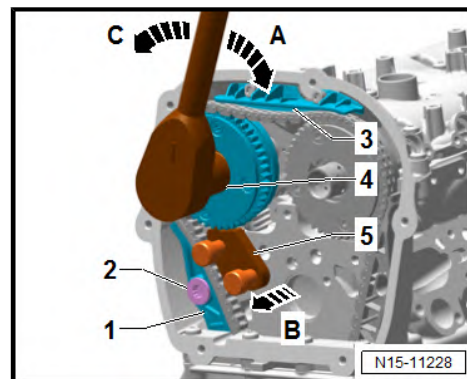
A second mechanic is required for the following work step.

- Reduce preload of exhaust camshaft in direction of -arrow A- using assembly tool - T10567- -4- and pull camshaft clamp - T40271/1- -5- out of teeth of chain sprocket -arrow B-.
- Have exhaust camshaft turned in direction of arrow -C- until timing chain is in contact with guide rail -3-.
- Hold camshaft in this position, install tensioning rail -1- and tighten guide pin -2-.



#### Note

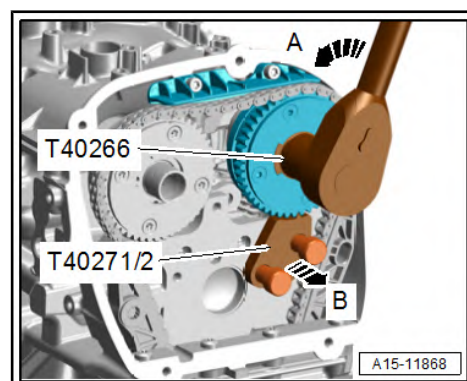
*If the camshaft is not counterheld until the tensioning rail has been installed, the timing chain may break open.*



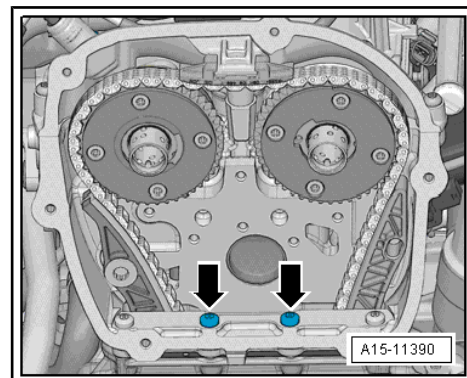
#### Note

*Failure to counterhold the camshaft while the tensioning rail is being installed may cause the timing chain to jump!*

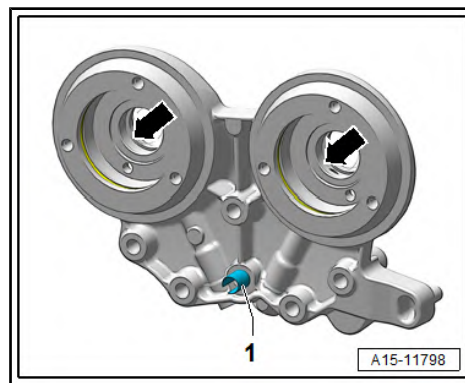
- Reduce preload of inlet camshaft with assembly tool - T10567- in -direction of arrow A- and take camshaft clamp - T40271/2- in -direction of arrow B- out of the teeth of the chain sprocket and bring camshaft into rest position.
- Remove camshaft clamp - T40271/1- and -T40271/2- .



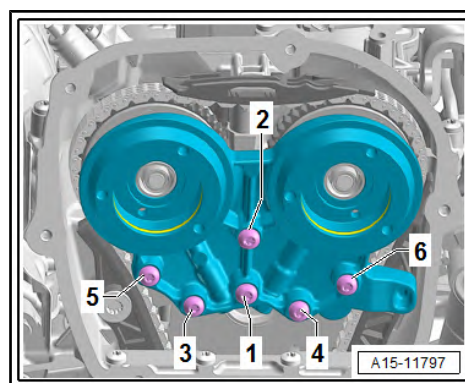
- Screw in bolts -arrows- and tighten them. Specified torque  
 ⇒ [Item 21 \(page 100\)](#) .



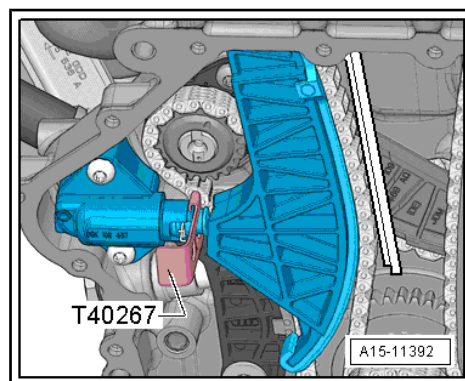
- Make sure the clamping sleeve -1- is pressed backwards before reusing the bearing saddle. The clamping sleeve must be flush with the cylinder head side of the bearing saddle.
- Moisten holes -arrows- with engine oil.



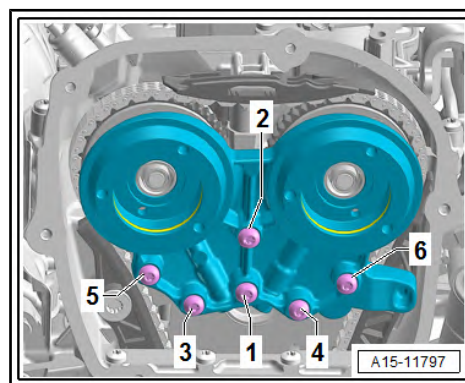
- Fit bearing saddle. Do not cant bearing saddle, while doing so. Screw in bolts -1...6- by hand.
- The clamping sleeve is pulled into the cylinder head by the bolt -1-.



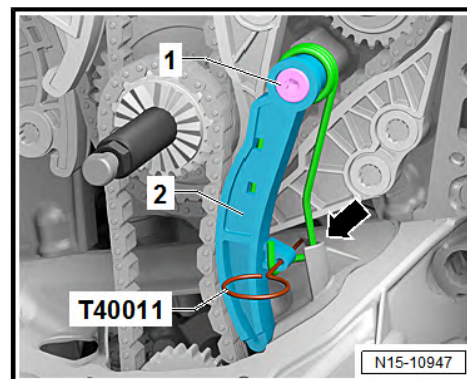
- Remove locking tool - T40267- .



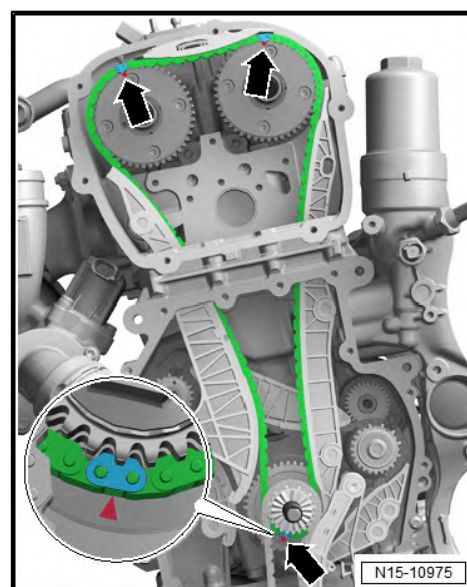
- Tighten bolts for bearing saddle. Specified torque and tightening sequence ➔ [page 123](#) .



- Lay chain on the oil pump.
- Connect chain tensioner -2- and tighten guide pins -1-.
- Remove locking pin - T40011- making sure that retaining clip is seated in recess in top section of sump -arrow-.



- Check the adjustment:
  - The chain links with coloured markings must be positioned opposite the markings on the sprockets -arrows-.
- Install timing valves => [Item 6 \(page 122\)](#) .





- Fit turning over tool - T10531/3- and flange nut - T10531/4- .
- Turn engine two revolutions in direction of engine rotation.



#### Note

*Due to the gear ratio, the coloured chain links do not align with the markings anymore after the engine has been turned.*

- Remove turning over tool, and install lower timing chain cover ➔ [page 118](#) .
- Install vibration damper ➔ [page 54](#) .
- Install timing chain cover (top) ➔ [page 115](#) .
- Install tensioner for poly V-belt ➔ [page 54](#) .
- Fit poly V-belt ➔ [page 53](#) .

Carry out the remaining installation in reverse sequence, noting the following:

- After working on the chain drive, adapt learnt values in engine control unit. To do this, switch on ignition, and select the following menu options on vehicle diagnostic tester :

◆ Test plan 001 - Engine electronics, Adjustment diagnosis chain length

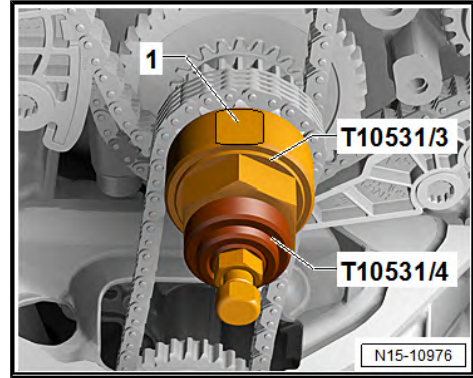
#### Specified torques

- ◆ ➔ ["3.1 Assembly overview - camshaft timing chains", page 121](#)
- ◆ ➔ ["3.2 Assembly overview - drive chain for balance shaft", page 123](#)
- ◆ Noise insulation; Assembly overview - noise insulation ➔ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .

## 3.4 Removing and installing drive chain for balance shaft

### Removing

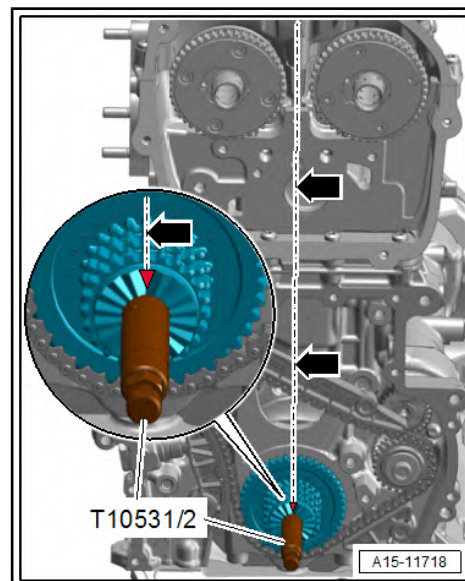
- Remove camshaft timing chain ➔ [page 125](#) .
- Remove right drive shaft ➔ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .



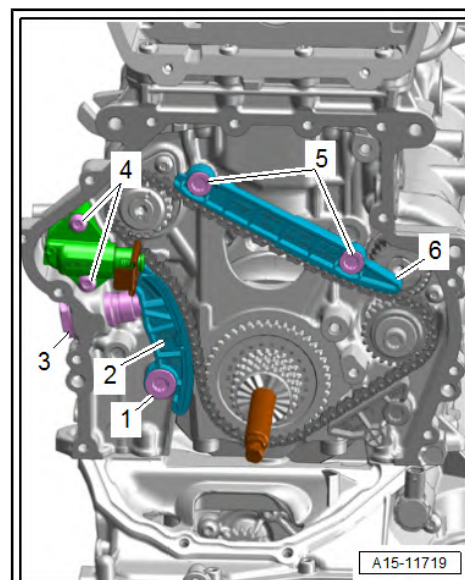


This is achieved when:

- The crank shaft is in "TDC" and the V-shaped recess on the crankshaft wheel shows a centred imaginary horizontal line between the camshaft at -arrows-.
- Crankshaft wheel is locked in position with clamping pin - T10531/2- .



- Unscrew bolts -4- and remove chain tensioner from the camshafts.
- Remove chain tensioner -3- for drive chain of balance shafts.
- Unscrew guide pins -1 and 5- and remove tensioning rail -2- and guide rail -6-.
- Remove drive chain from balance shaft.

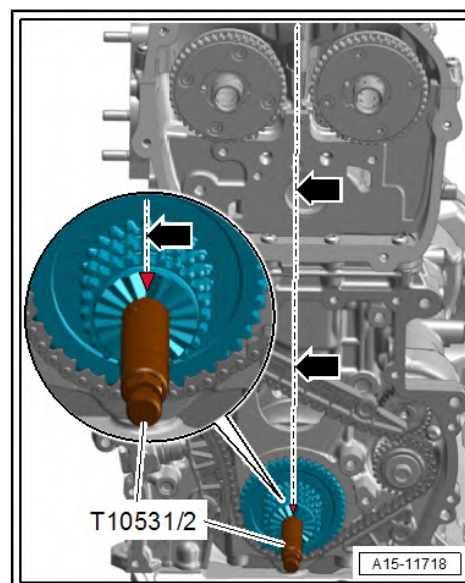


## Installing

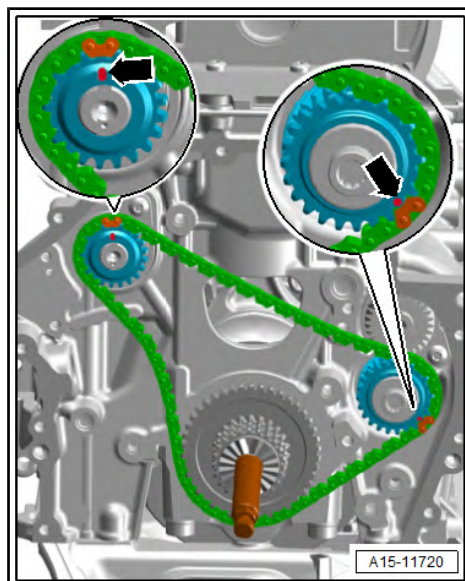
Carry out installation in the reverse sequence, noting the following:

This is achieved when:

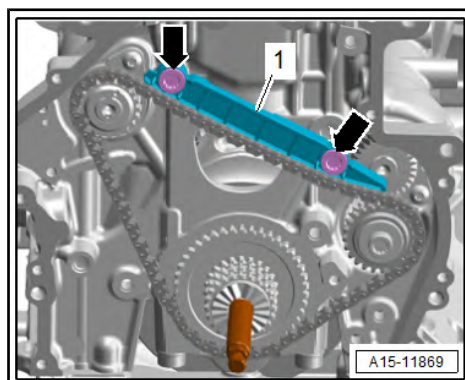
- The crank shaft is in "TDC" and the V-shaped recess on the crankshaft wheel shows a centred imaginary horizontal line between the camshaft at -arrows-.
- Crankshaft wheel is locked in position with clamping pin - T10531/2- .



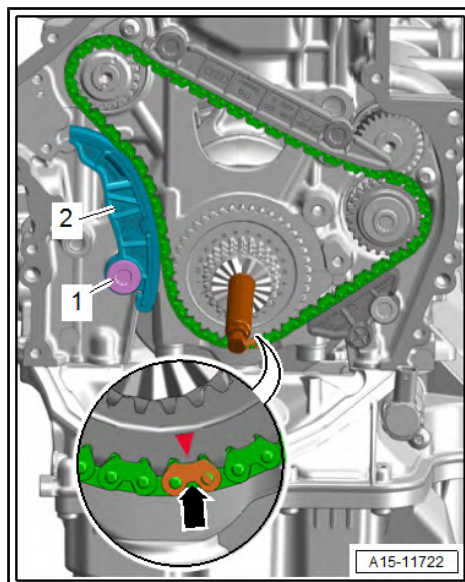
- First lay the drive chain fro balance shafts on the balance shafts as shown in the illustration.
- The chain links with coloured markings must be positioned opposite the markings -arrows- on the sprockets.



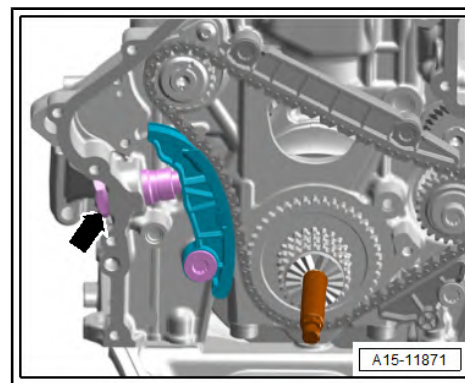
- Connect guide rail -1- and tighten guide pins -arrows-.



- Align coloured chain link -arrow- of drive chain for balance shafts with marking on the camshaft wheel as shown in illustration.
- Connect tensioning tail -2- and tighten guide pins -1-.



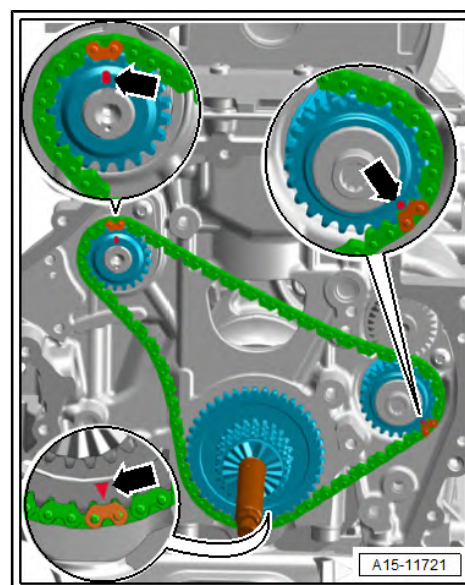
- Bolt on chain tensioner -arrow-.



- Check adjustment again:
  - The chain links with coloured markings must be positioned opposite the markings -arrows- on the sprockets.
- Install camshaft timing chain => [page 125](#).

#### Specified torques

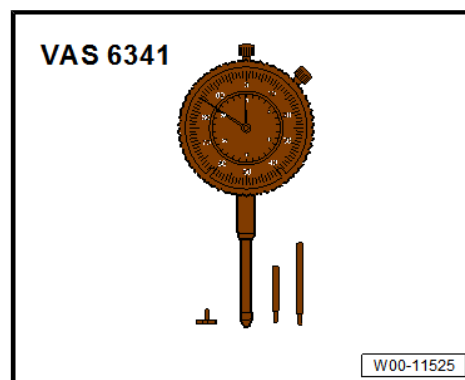
- ◆ => [“3.2 Assembly overview - drive chain for balance shaft”, page 123](#)



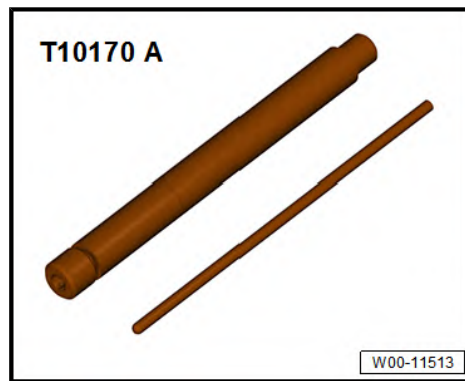
### 3.5 Checking valve timing

#### Special tools and workshop equipment required

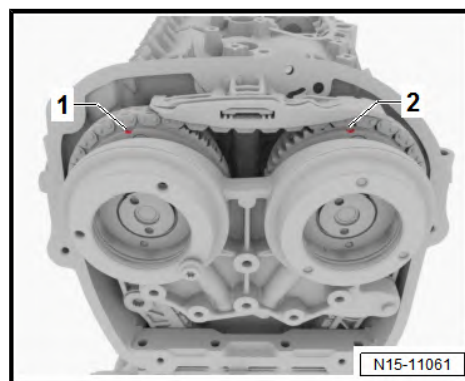
- ◆ Dial gauge set, 4-part - VAS 6341-



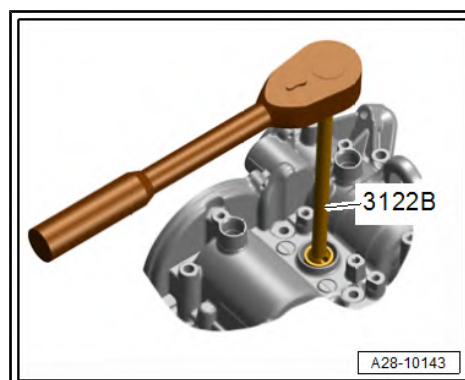
◆ Dial gauge adapter - T10170 A-



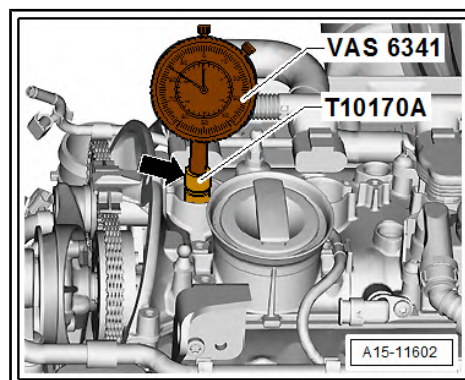
- Remove timing chain cover (top) ⇒ [page 115](#) .
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
- Remove right wheel and right wheel housing liner ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Removing and installing front wheel housing liner .
- Using 24 mm socket, turn crankshaft via vibration damper in direction of engine rotation until markings -1- and -2- are almost at top.
- Remove ignition coil with output stage for cylinder 1 ⇒ [page 407](#) .



- Remove spark plug for cylinder 1 using spark plug socket and extension - 3122 B- .



- Screw dial gauge adapter - T10170/A- into spark plug thread to stop.
- Insert dial gauge - VAS 6341- with extension - T10170A/1- as far as it will go and secure in place with self-locking nut -arrow-.
- Slowly turn crankshaft in engine DOR to maximum needle deflection. Once maximum needle deflection is reached (reverse point of needle), piston is at »TDC«.

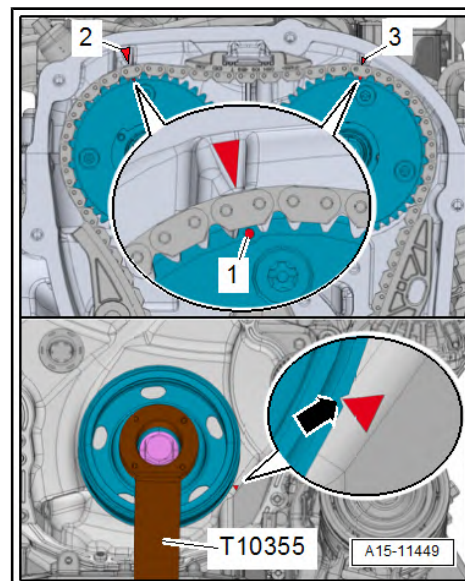






#### Note

- ◆ Use a ratchet spanner with a 24 mm socket to turn the vibration damper.
- ◆ If the crankshaft has been turned beyond "TDC" turn engine another two revolutions in direction of engine rotation. Do not turn engine in opposite direction to normal rotation.
- ◆ Marking -1- on exhaust camshaft is slightly offset towards right.
- Notch on vibration damper must align with arrow marking on timing chain cover (bottom) -arrow-.
- The wheel marks -1- of the camshafts (notches with a dot behind) must align with markings -2- and -3- on cylinder head.



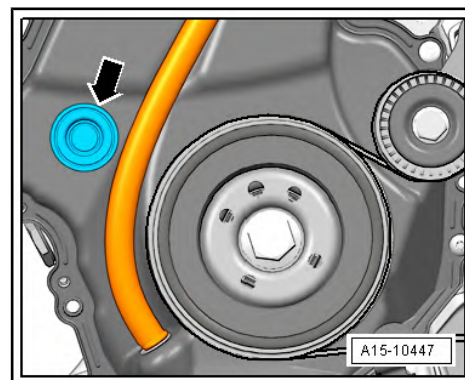
### 3.6 Checking timing chain



#### Note

If complaints (e.g. noise) indicate a stretched camshaft timing chain, check timing chain as described below.

- Remove front right wheel housing liner ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liner; Removing and installing front wheel housing liner .
- Remove sealing plug -arrow-. The sealing cap must be renewed.



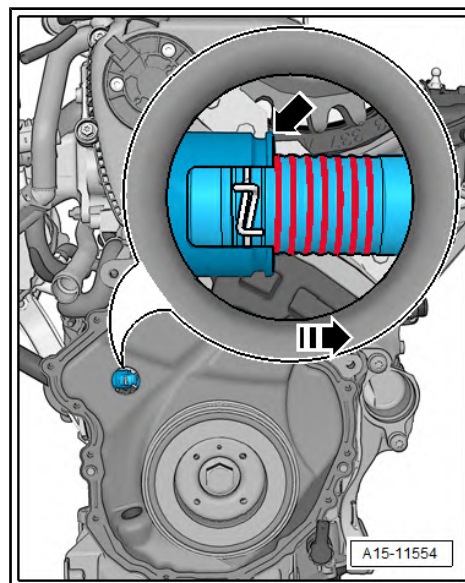


- Turn vibration damper in direction of engine rotation until piston of chain tensioner is fully extended in -direction of arrow-.
- Count piston notches that are visible.

**Note**

*Visible notches are those located to the right from the chain tensioner housing -arrow-.*

- ◆ If 6 or less notches are visible, the camshaft timing chain must not be renewed.
- ◆ If 7 or more teeth are visible: camshaft timing chain must be replaced ➔ [page 125](#) .



## 4 Valve gear

⇒ [“4.1 Valve gear - Components overview”, page 143](#)

⇒ [“4.2 Removing and installing camshaft”, page 147](#)

⇒ [“4.3 Removing and installing camshaft control valve 1 N205 and exhaust camshaft control valve 1 N318”, page 155](#)

⇒ [“4.4 Installing ball for sliding piece”, page 155](#)

⇒ [“4.5 Removing and installing actuator for camshaft adjuster”, page 156](#)

⇒ [“4.6 Removing and installing valve stem seals”, page 157](#)

### 4.1 Valve gear - Components overview



#### Note

- ◆ *Cylinder head and cylinder head cover must be renewed together.*
- ◆ *After installing camshafts wait for approx. 30 minutes before starting engine. The hydraulic compensation elements must settle (otherwise valves will strike pistons).*
- ◆ *After working on the valve gear, turn the engine carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.*
- ◆ *Renew gaskets and seals.*
- ◆ *After working on the chain drive, adapt learnt values in engine control unit. To do this, switch on ignition, and select the following menu options on vehicle diagnostic tester :*
- ◆ *Test plan* `001 - Engine electronics`, `Adjustment diagnosis chain length`

### 1 - Outlet valve

- ☐ Do not rework. Only lap-ping in is permitted.
- ☐ Valve dimensions  
⇒ [page 168](#)
- ☐ Valve guides: check  
⇒ [page 167](#)

### 2 - Cylinder head

- ☐ Do not machine sealing surface (top)
- ☐ Cylinder head and cylinder head cover should always be renewed together

### 3 - Valve stem seal

- ☐ Renew ⇒ [page 157](#)
- ☐ Differing valve stem oil seals ⇒ [page 147](#)

### 4 - Valve springs

- ☐ Installation position of the valve springs  
⇒ [page 147](#)

### 5 - Hydraulic compensation element

- ☐ Do not interchange
- ☐ Lubricate contact surface with engine oil

### 6 - Valve spring plate

### 7 - Valve cotters

### 8 - Retaining clip

- ☐ For hydraulic compensation element

### 9 - Roller rocker fingers

- ☐ Removing and installing ⇒ ["4.2 Removing and installing camshaft", page 147](#)
- ☐ Mark installation position for re-installation.
- ☐ Check roller bearing for ease of movement.
- ☐ Lubricate contact surfaces with engine oil

### 10 - Exhaust camshaft

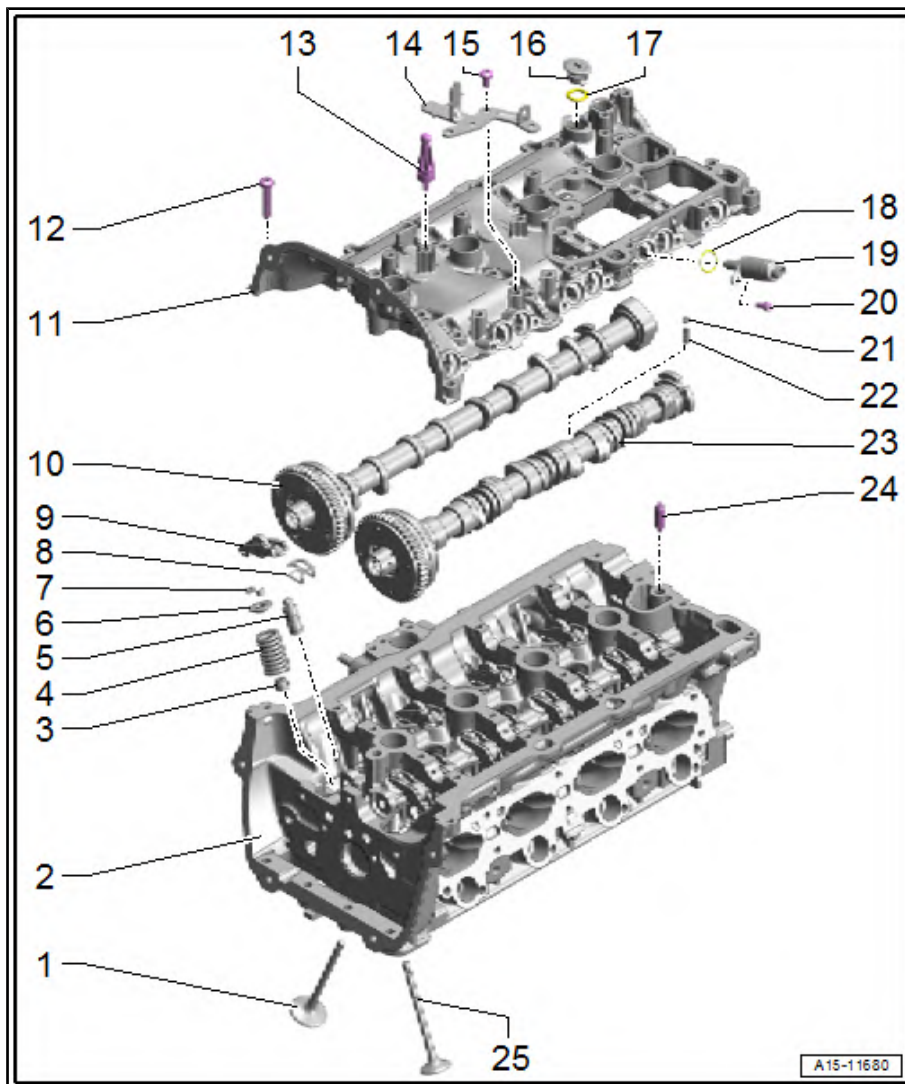
- ☐ Removing and installing ⇒ [page 147](#)
- ☐ Check radial clearance with Plastigage (roller rocker fingers removed)
- ☐ Axial clearance: 0.095 ... 0.202 mm
- ☐ Radial clearance: 0.024 ... 0.066 mm
- ☐ Maximum run-out: 0.04 mm

### 11 - Cylinder head cover

- ☐ With integrated camshaft bearings.
- ☐ Removing and installing ⇒ ["4.2 Removing and installing camshaft", page 147](#)
- ☐ Clean sealing surface. Do not rework
- ☐ Completely remove sealant residue
- ☐ Cylinder head and cylinder head cover should always be renewed together

### 12 - Bolt

- ☐ Renew after removing.



- ☐ Unclip ⇒ [page 146](#)
- ☐ Specified torque and tightening sequence ⇒ [page 146](#)

### 13 - Ball-head pin

- ☐ For engine cover panel
- ☐ 9 Nm

### 14 - Carrier

- ☐ For wiring harness

### 15 - Bolt

- ☐ 9 Nm

### 16 - Sealing cover

### 17 - O-ring

- ☐ Renew after removing.

### 18 - O-ring

- ☐ Not a replacement part, provided together with actuator for camshaft adjustment

### 19 - Actuator for camshaft adjustment

- ☐ assignment ⇒ [page 145](#)
- ☐ Removing and installing ⇒ [page 156](#)

### 20 - Bolt

- ☐ 4.5 Nm

### 21 - Spring

- ☐ No replacement part

### 22 - Ball

- ☐ For sliding piece
- ☐ Installing ⇒ [page 155](#)

### 23 - Inlet camshaft

- ☐ Removing and installing ⇒ [page 147](#)
- ☐ Check radial clearance with Plastigage (roller rocker fingers removed)
- ☐ Axial clearance: 0.095 ... 0.202 mm
- ☐ Radial clearance: 0.024 ... 0.066 mm
- ☐ Runout: max. 0.04 mm

### 24 - Pin

- ☐ 2x.

### 25 - Inlet valve

- ☐ Do not rework. Only lapping in is permitted.
- ☐ Valve dimensions ⇒ [page 168](#)
- ☐ Valve guides: check ⇒ [page 167](#)

## Actuators for camshaft adjustment

1 - Inlet cam actuator A for cylinder 1 - N576-

2 - Inlet cam actuator B for cylinder 1 - N577-

3 - Inlet cam actuator B for cylinder 2 - N585-

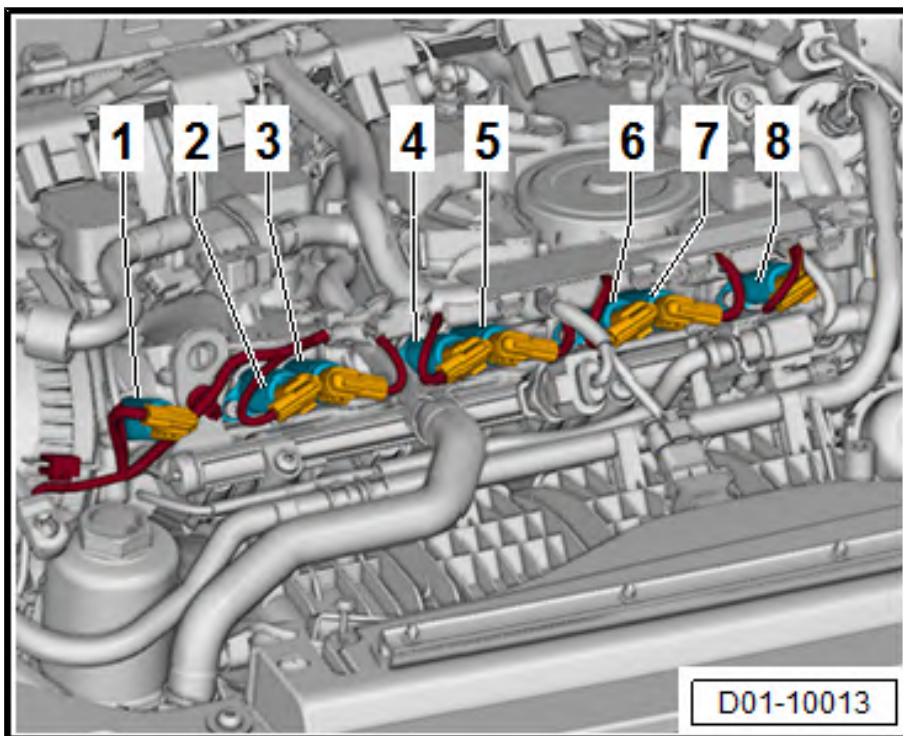
4 - Inlet cam actuator A for cylinder 2 - N584-

5 - Inlet cam actuator A for cylinder 3 - N592-

6 - Inlet cam actuator B for cylinder 3 - N593-

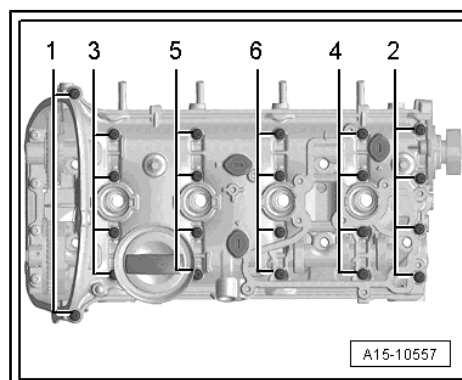
7 - Inlet cam actuator B for cylinder 4 - N601-

8 - Inlet cam actuator A for cylinder 4 - N600-



#### Cylinder head cover - release

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



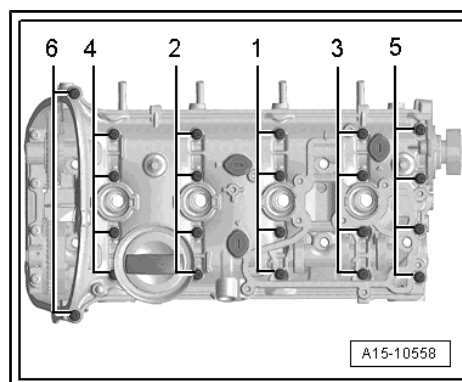
#### Tightening sequence for cylinder head cover

##### Note

- Renew bolts that are tightened with turning further angle.
- Take care to keep cylinder head cover level.

- Tighten bolts in stages in the sequence shown:

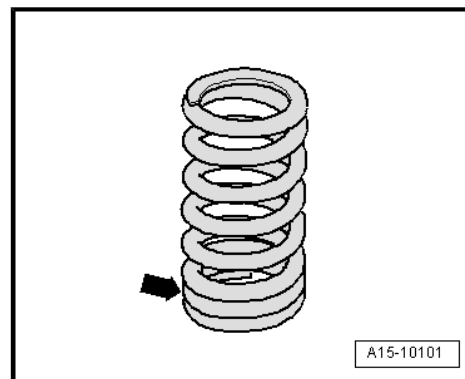
Stage	Bolts	Specified torques/angle specifications
1.	-1 ... 6-	Screw in by hand in several stages as far as stop
2.	-1 ... 6-	8 Nm
3.	-1 ... 6-	Turn 90° further





### Installation position of valve spring

- The area in which the spring coil rest on each other -arrow- must point towards the cylinder head.



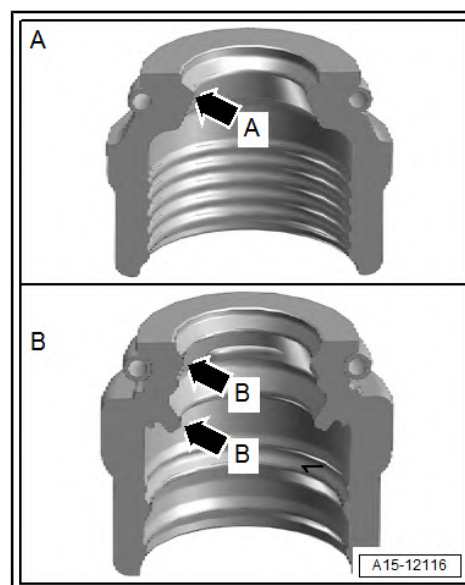
### Differing valve stem oil seals

A - Valve stem oil seal with a sealing lip -A-

- ◆ for inlet and outlet side

B - Valve stem oil seal with two sealing lips -B-

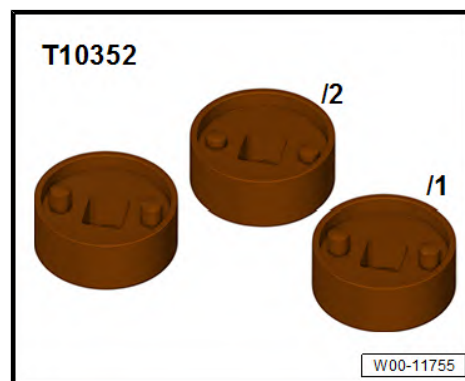
- ◆ only for outlet side for certain engines, allocation to ⇒ Electronic parts catalogue



## 4.2 Removing and installing camshaft

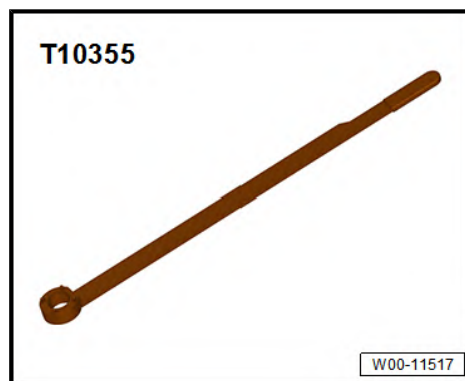
### Special tools and workshop equipment required

- ◆ Dependent on construction standard, assembly tool - T10352A-

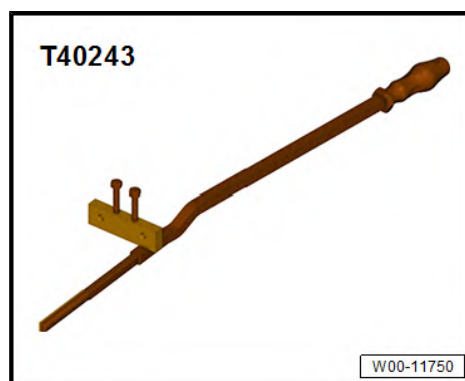


- ◆ Assembly tool - T10352/1-
- ◆ Assembly tool - T10352/2-
- ◆ Assembly tool - T10352/3-
- ◆ Assembly tool - T10352/4-

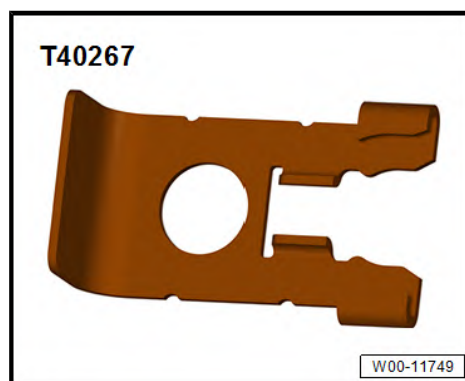
◆ Counter-hold tool - T10355-



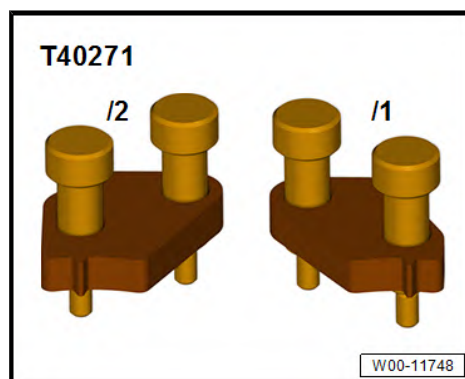
◆ Assembly lever - T40243-



◆ Locking tool - T40267-



◆ Camshaft clamp - T40271-



- ◆ Assembly tool - T10567-



- ◆ Hose clamps, up to Ø 25 mm - 3094-



- ◆ Sealant - D 154 103 A1-

#### Removing



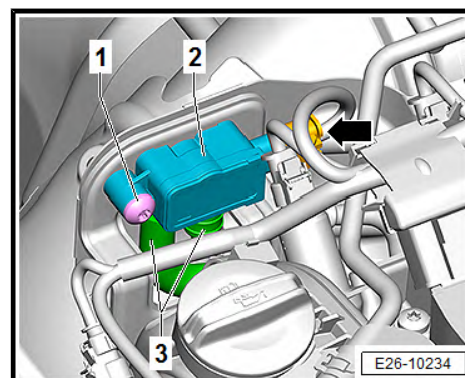
#### Note

- ◆ *Before the cylinder head is removed, the engine support and engine mounting must be reinstalled temporarily, because the eyes of the support bracket are secured to the cylinder head.*
- ◆ *Sealing surfaces at bottom of cylinder head cover and top of cylinder head must not be machined.*
- ◆ *Camshaft bearings are integrated into cylinder head and cylinder head cover. Camshaft timing chain must be relieved of tension before you detach cylinder head cover.*
- ◆ *The cable ties must be installed in their same place again.*

- Remove air filter housing ⇒ [page 322](#) .
- Remove timing chain cover (top) ⇒ [page 115](#) .

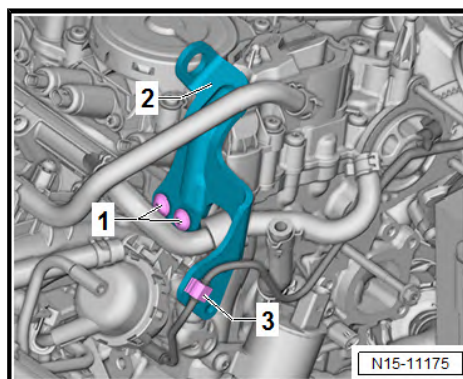
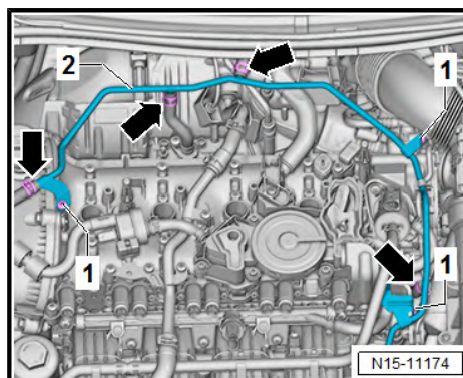
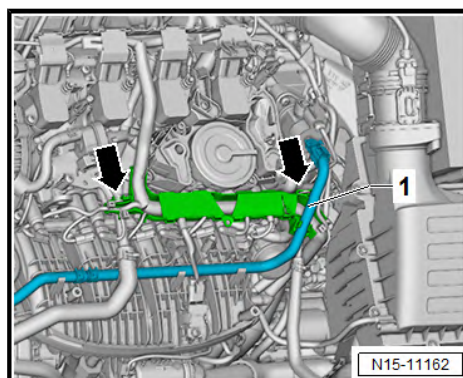
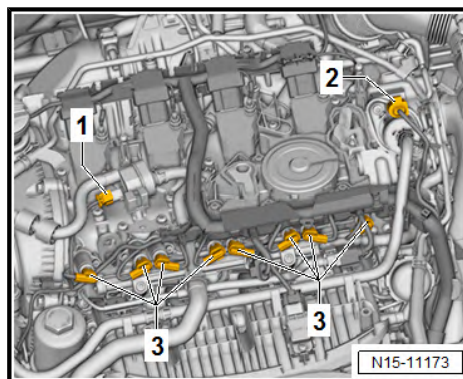
#### For vehicles with particulate filter

- Remove the electrical connector -arrow- from the exhaust gas pressure sensor 1 - G450- .



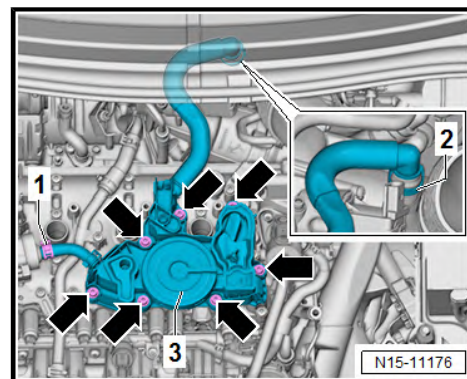
### Continued for all vehicles

- Disconnect connectors -1-, -2- and -3-.
  - Move wiring harness towards the front.
  - Remove ignition coils with output stage ⇒ [page 407](#) .
- 
- Unclip fuel hose -1-, release wiring duct -arrows-, and pull it upwards off bracket.
  - Unclip wiring harness, and lay it to one side.
- 
- Unscrew bolts -1-.
  - Remove coolant hoses -arrows-, and swing coolant pipe -2- to one side.
- 
- Unclip hose -3-.
  - Unscrew bolts -1-, and remove engine lifting eye -2-.

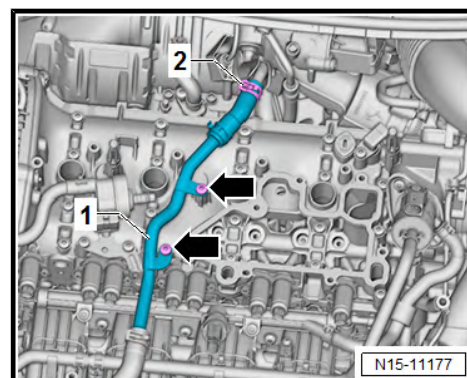




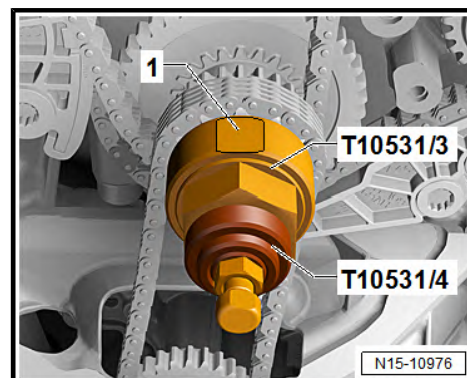
- Open hose clip -1-, and detach hose from activated charcoal filter solenoid valve 1 - N80- .
- Release and disconnect crankcase breather line -2-.
- Unscrew bolts -arrows-, and remove oil separator -3-.
- Pull activated charcoal filter solenoid valve 1 - N80- off retain-  
er.



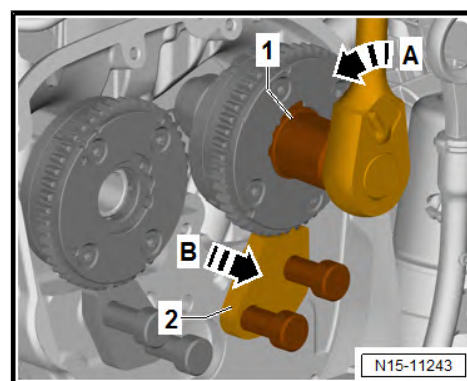
- Unscrew bolts -arrows-.
- Open clamp -2- and pull coolant hose.
- Push coolant pipe -1- to one side.
- Remove high-pressure pump ⇒ [page 350](#) .
- Remove vacuum pump ⇒ [page 110](#) .
- Remove camshaft timing chain ⇒ [page 125](#) .



- Fit turning over tool - T10531/3- . At “TDC position” the flat section -1- faces upwards. Screw on flange nut - T10531/4- . Turn crankshaft with a 32 mm open-end spanner anti-clock-  
wise to move it out of “TDC position”.

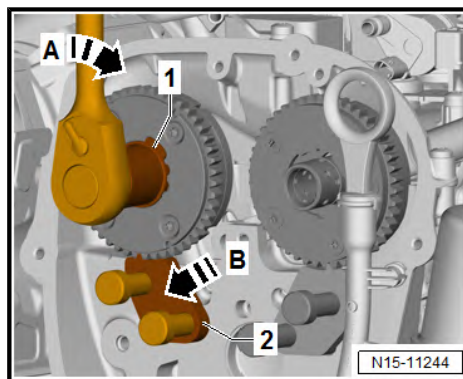


- Turn inlet camshaft in direction of arrow -A- using assembly  
tool - T10567- -1-, take camshaft clamp - T40271/2- -2- out of  
teeth of chain sprocket -B- and bring camshaft into rest posi-  
tion.





- Turn inlet camshaft in direction of arrow -A- using assembly tool - T10567- -1-, push camshaft clamp - T40271/1- -2- out of teeth of chain sprocket -B- and bring camshaft into rest position.



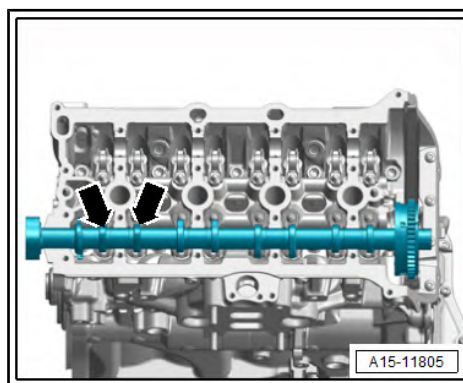
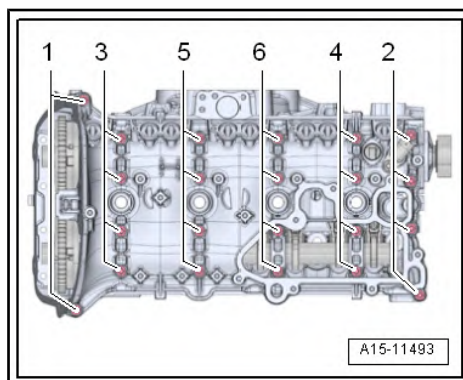
- Undo and remove cylinder head cover bolts in the sequence -1 ... 6-.
- Remove cylinder head cover.
- Remove camshafts, and cover open parts of engine.

### Installing camshafts

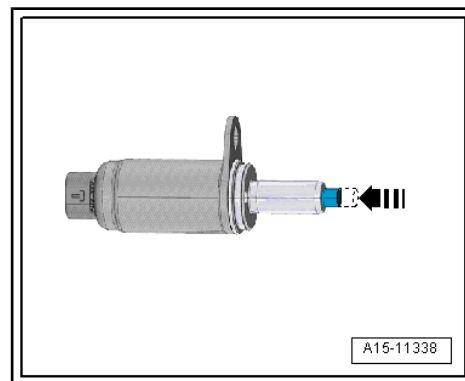


#### Note

- ◆ *Sealing surfaces must be free of oil and grease.*
- ◆ *Ensure that all roller rocker fingers are properly seated on valve stem ends. Correspondence ➔ [Item 9 \(page 144\)](#) .*
- If crankshaft has been turned in the meantime, position cylinder number 1 piston to TDC and then turn crankshaft back slightly.
- Remove sealant residue from groove in cylinder head cover and from sealing surfaces.
- Clean sealing surfaces. They must be oil and grease-free.
- Oil running surfaces of camshafts.
- Insert exhaust camshaft into cylinder head. Turn cams for cylinder 4 -arrows- upwards.



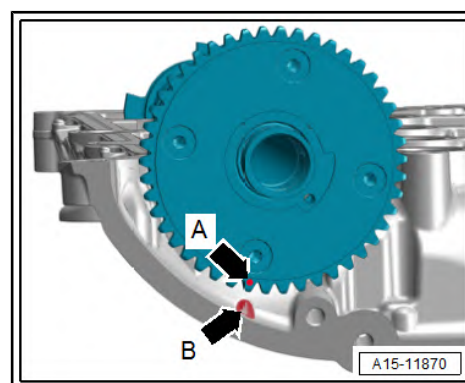
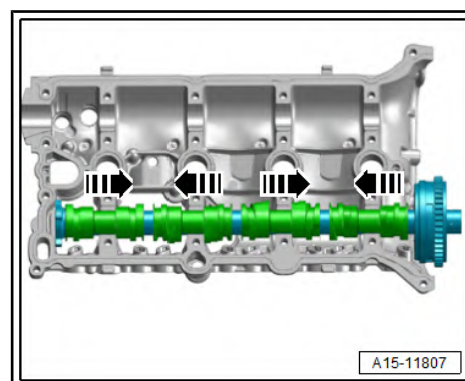
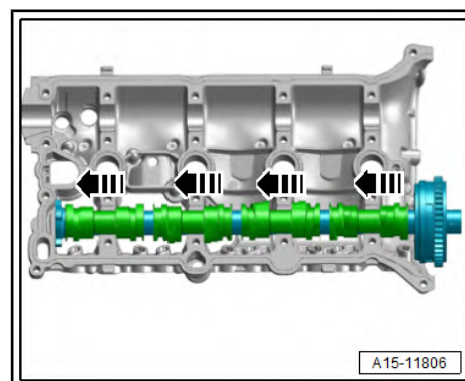
- Make sure that plungers of the actuators for camshaft adjustment are retracted.



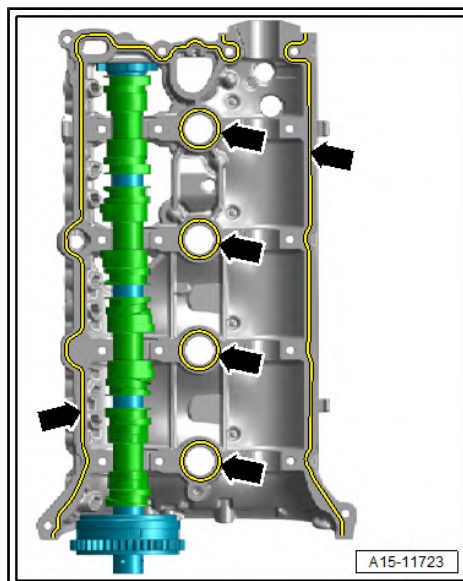
**⚠ CAUTION**

The ball for the sliding piece may pop out! Risk of eye injury!

- Wear protective goggles.
- Only slide the sliding pieces of the inlet camshaft within the normal sliding range to one side and the other.
- Insert the inlet camshaft into cylinder head cover.
- Make sure that sliding pieces have been pushed away from chain sprocket -arrows- and removed.
- Push together the front and rear sliding pieces with the inlet camshaft inserted -arrows-.
- Bring the inlet camshaft into the “TDC” position.
- Marking -arrow A- must align with the tab -arrow B- on cylinder head cover.



- Apply sealant to clean sealing surface of cylinder head cover as shown in illustration -arrows-.
- ♦ Thickness of sealant bead: 2 to 3 mm.
- Hold camshaft in place, and fit cylinder head cover with camshaft fitted on cylinder head.

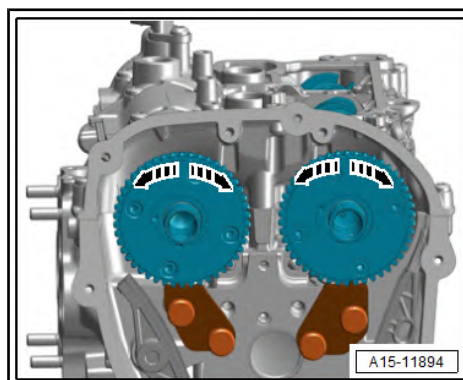


- Slightly press on cylinder head cover with one hand, and turn camshafts slightly while doing so, until cylinder head cover is properly seated on cylinder head and is »free of stress«.
- Renew bolts for cylinder head cover.
- Tighten bolts in several stages, tightening sequence ➔ [page 146](#).

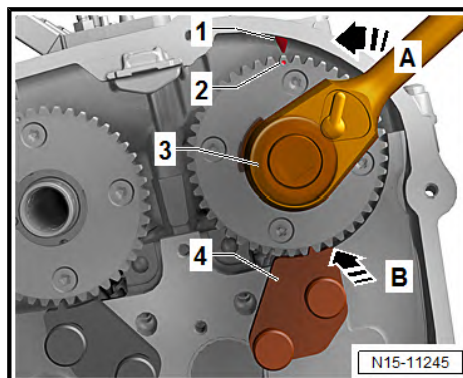


#### Note

Take care to keep cylinder head cover level.



- Turn inlet camshaft using assembly tool - T10567- -3- in direction of arrow -A-, until the markings -1- and -2- align.
- Insert camshaft clamp - T40271/2- -4- between teeth of chain sprocket -B-.

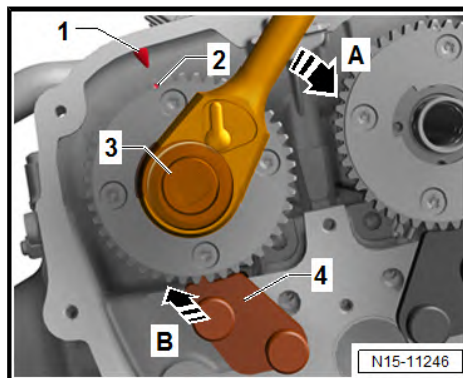


- Turn exhaust camshaft using assembly tool - T10567- -3- in direction of arrow -A- until the markings -1- and -2- align.
- Insert camshaft clamp - T40271/1- -4- between teeth of chain sprocket -B-.



#### Note

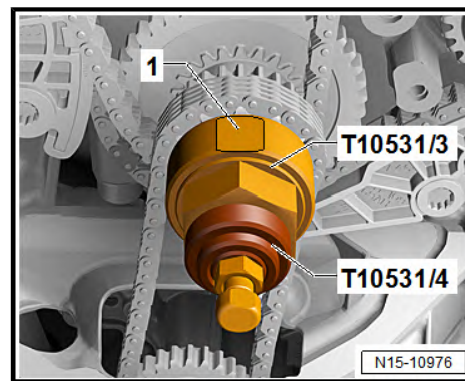
Marking -2- is slightly offset towards right.



- Turn crankshaft on hexagon to “TDC position”. At “TDC position” the flat section -1- faces upwards.
- Assemble cylinder head in reverse order.
- Reattach support bracket.
- Removing engine mounting and engine support.
- Install camshaft timing chain ⇒ [page 125](#) .

#### Specified torques

- ◆ ⇒ [“4.1 Valve gear - Components overview”, page 143](#)
- ◆ ⇒ [“3.1 Assembly overview - crankcase breather system”, page 187](#)



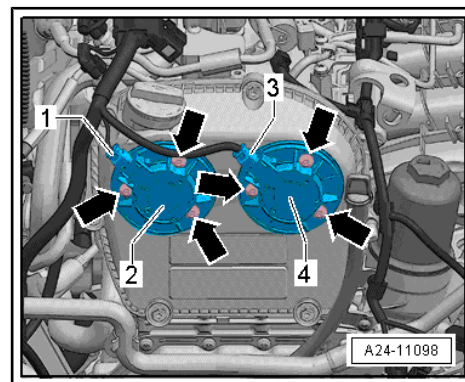
### 4.3 Removing and installing camshaft control valve 1 - N205- and exhaust camshaft control valve 1 - N318-

#### Removing

- Pull connector -1- off exhaust camshaft control valve 1 - N318- , and pull connector -3- off camshaft control valve 1 - N205- .
- Place a clean cloth under camshaft control valves.
- Unscrew bolts -arrows-, and remove camshaft control valve 1 - N205- -item 4- and exhaust camshaft control valve 1 - N318- -item 2-.

#### Installing

Remaining installation is carried out in the reverse order. When installing, note the following:



#### Note

*Renew seals and O-ring.*

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

#### Specified torques

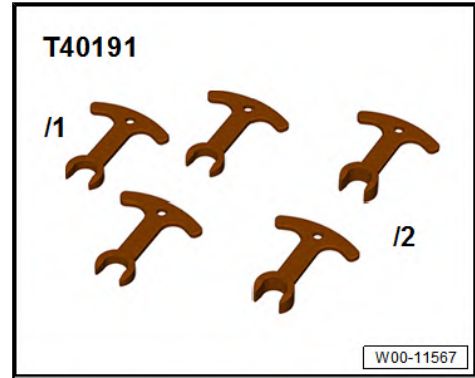
- ◆ ⇒ [“2.1 Assembly overview - cover for timing chain”, page 114](#)

### 4.4 Installing ball for sliding piece

Special tools and workshop equipment required



◆ Spacers - T40191-



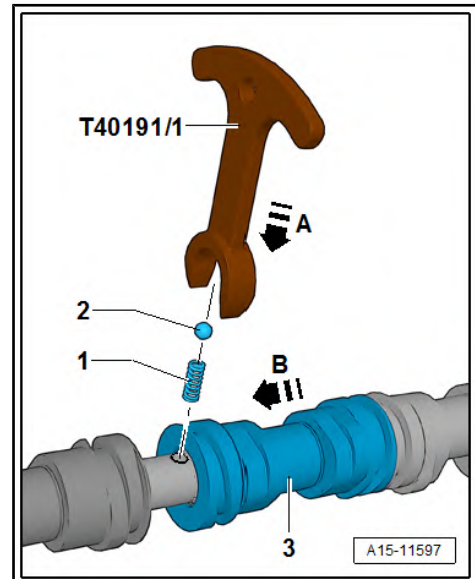
Installing

**CAUTION**

The ball for the sliding piece may pop out! Risk of eye injury!

- Wear protective goggles.

- Insert spring -1- into camshaft.
- Place ball -2- onto spring in camshaft.
- Using spacer - T40191/1-, press ball and spring downwards in -direction of arrow A-, and hold them in this position.
- Slide sliding piece -3- in -direction of arrow B-.



## 4.5 Removing and installing actuator for camshaft adjuster

Allocation ➤ [page 145](#) .

Removing

- Remove engine cover panel ➤ [page 50](#) .
- Disconnect relevant electrical connector -2-.
- Unscrew bolt -1-, and take off actuator for camshaft adjustment.

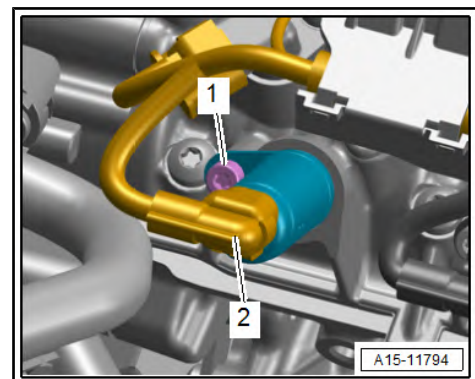
Installing

Carry out installation in the reverse sequence, noting the following:



**Note**

Check O-rings for damage.



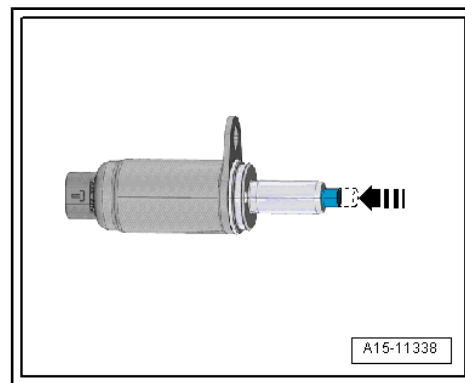


Installation position of the actuators for camshaft adjuster.

- Press in the pin of actuator for camshaft adjustment -arrow- by hand.
- The dowel pin of the actuator may not be in the outer position.
- Fit engine cover panel ⇒ [page 50](#) .

#### Specified torques

- ◆ ⇒ [“4.1 Valve gear - Components overview”, page 143](#)



## 4.6 Removing and installing valve stem seals

⇒ [“4.6.1 Removing and installing valve stem seals \(cylinder head installed\)”, page 157](#)

⇒ [“4.6.2 Removing and installing valve stem seals \(cylinder head removed\)”, page 162](#)

### 4.6.1 Removing and installing valve stem seals (cylinder head installed)

Special tools and workshop equipment required

- ◆ Spark plug socket - 3122B-



- ◆ Valve stem seal puller - 3364-



- ◆ Valve stem seal fitting tool - 3365-



- ◆ Assembly and removal device for valve cotters - VAS 5161 A-  
with guide plate -VAS 5161/19C-



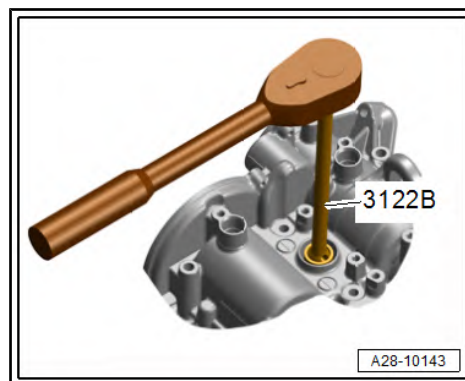
- ◆ Adapter part - T40012-



- ◆ Assembly sleeve ⇒ Electronic parts catalogue
- ◆ Torque wrench - V.A.G 1331-

#### Removing valve stem oil seals:

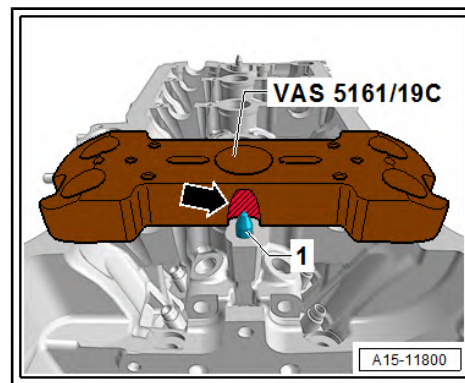
- Remove camshafts ⇒ [page 147](#) .
- Mark allocation of roller rocker fingers and hydraulic compensation elements for reinstallation.
- Remove roller rocker fingers together with hydraulic compensation elements and place down on a clean surface.
- Unscrew spark plugs using spark plug socket and extension - 3122 B- .



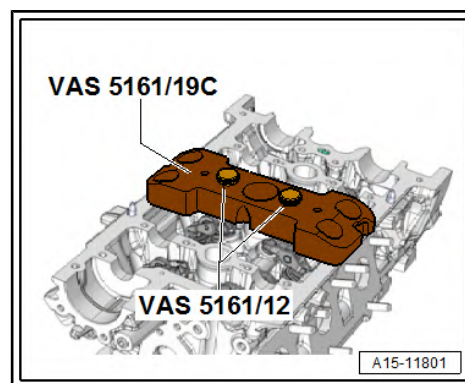
## Reworking guide plate

Check if recess -arrow- is present.

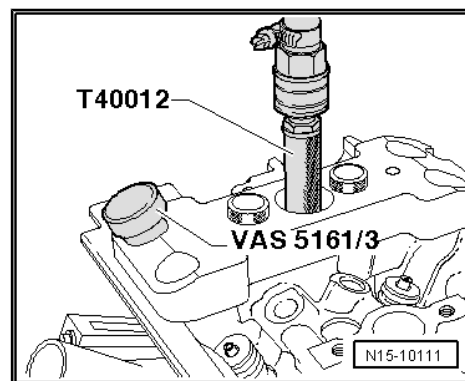
- If necessary, rework guide plate - VAS 5161/19C- -arrow-, until it rests against cylinder head and guide plate -1- is free.



- Screw guide plate - VAS 5161/19C- to cylinder head, as shown in illustration, using knurled screws - VAS 5161/12- .
- Set piston of respective cylinder to “bottom dead centre”.

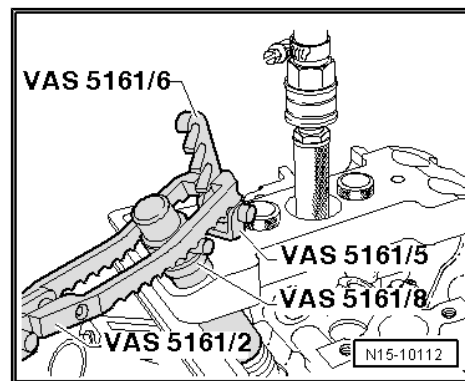


- Screw adapter - T40012- into spark plug thread.
- Connect compressed air with pressure rating of at least 6 bar.
- Strike tight valve cotters with drift - VAS 5161/3- and a plastic hammer.



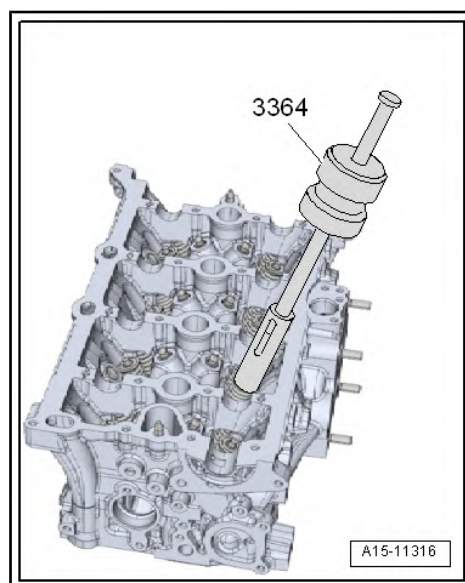
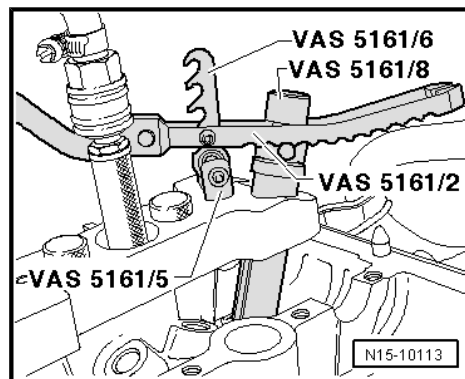
## For inlet side

- Screw retainer - VAS 5161/6- with guide fork - VAS 5161/5- into centre thread of guide plate - VAS 5161/19C- .
- Insert assembly cartridge - VAS 5161/8- into guide plate - VAS 5161/19C- .
- Attach pressure fork - VAS 5161/2- to ratchet piece - VAS 5161/6- .

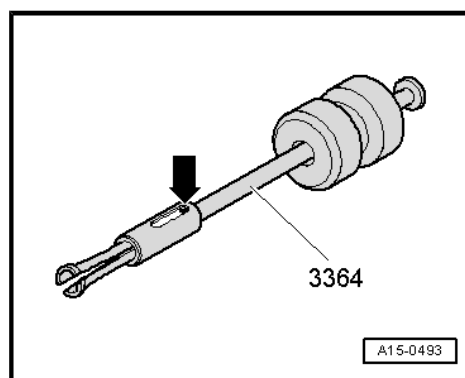


### For exhaust side

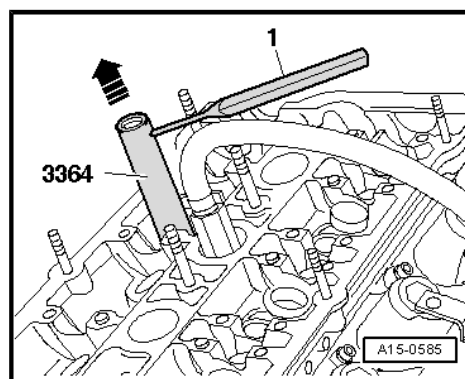
- Screw ratchet piece - VAS 5161/6- with attachment fork - VAS 5161/5- into outer thread of guide plate - VAS 5161/19C- .
- Press installation cartridge - VAS 5161/8- down and turn knurled screw of installation cartridge - VAS 5161/8- to right until tips engage in valve cotters.
- Move knurled screw back and forth slightly to press apart valve cotters, and capture them in the assembly cartridge.
- Release pressure fork - VAS 5161/2- .
- Remove assembly cartridge - VAS 5161/8- .
- Pull off valve stem seals using valve stem seal puller - 3364- .



- If valve stem seal puller - 3364- cannot be used on account of restricted space, knock out pin -arrow- with a punch, and remove the impact extractor attachment.

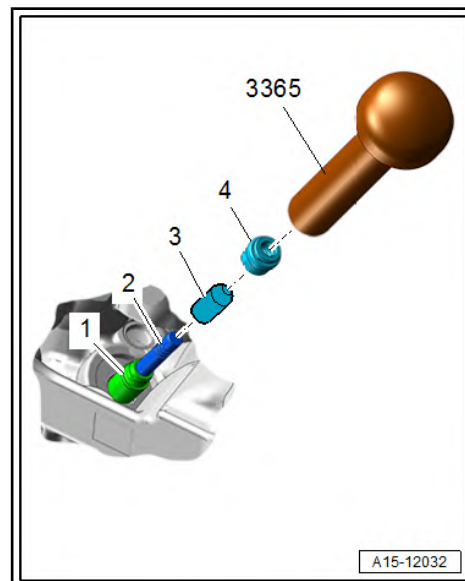


- Place lower part of valve stem seal puller - 3364- onto valve stem seal.
- Insert punch -1- into bore in lower part of puller.
- Place installation lever on puller and pull out valve stem seal -arrow-.

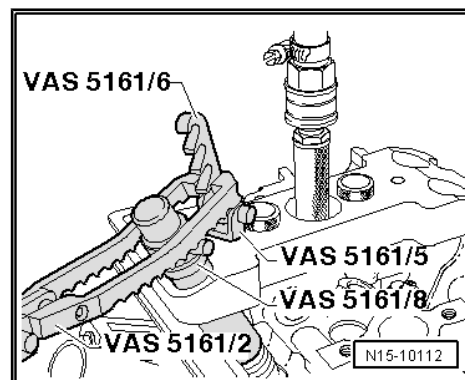


### Installing valve stem seals:

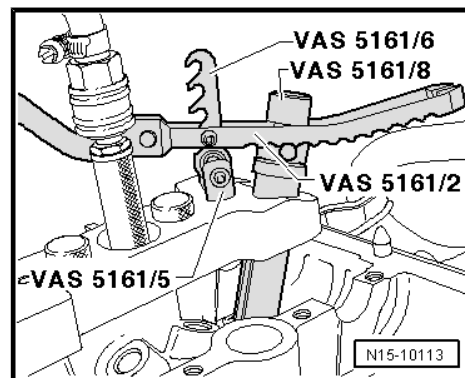
- So that the new valve stem seal -4- is not damaged during installation, the plastic sleeve -3- must be affixed to the valve shaft -2-.
- Lightly oil sealing lip of valve stem seal.
- Push valve stem oil seal onto plastic sleeve.
- Carefully press valve stem seal onto valve guide using valve stem seal fitting tool - 3365- .
- Take out plastic sleeve.
- Insert valve spring and valve spring plate ⇒ [page 147](#) .
- Install removal and installation device for valve cotters - VAS 5161- as shown.



### Inlet side



### Exhaust side







## Note

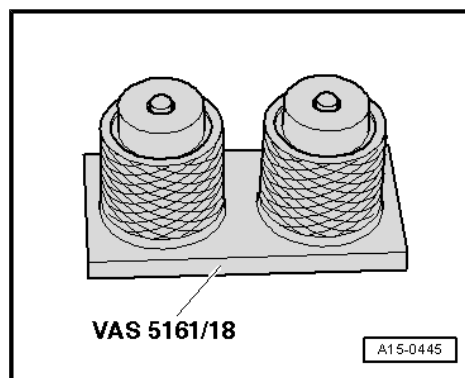
- ◆ *If the valve cotters have been removed from the installation cartridge, they must first be inserted into the insertion device - VAS 5161/18- .*
- ◆ *Press assembly cartridge -VAS 5161/8- onto insertion device from above and pick up valve cotters.*
- Press installation cartridge - VAS 5161/8- down with pressure fork - VAS 5161/2- , and turn installation cartridge knurled screw back and forth whilst pulling upwards.
- Relieve pressure fork - VAS 5161/2- whilst pulling on knurled screw.
- Remove removal and installation device - VAS 5161- .

Installation is carried out in reverse order of removal. The following should be observed:

- Install camshafts ➔ [page 147](#) .

## 4.6.2 Removing and installing valve stem seals (cylinder head removed)

Valve stem seal puller - 3364-



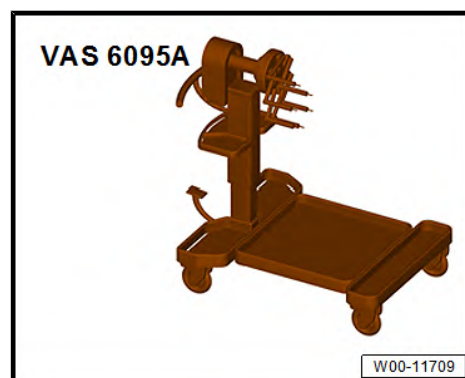
Valve stem seal fitting tool - 3365-



Assembly and removal device for valve cotters - VAS 5161 A- with  
 guide plate -VAS 5161/19C-



Engine and gearbox support - VAS 6095A-

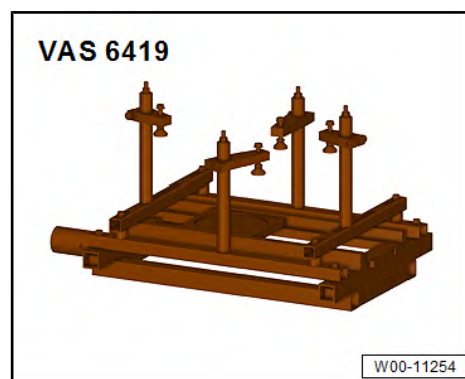


Cylinder head tensioning device - VAS 6419-

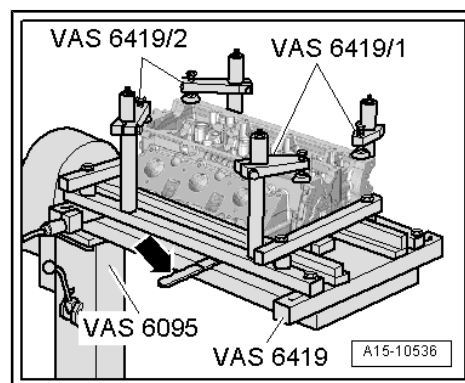
Assembly sleeve ⇒ Electronic parts catalogue

**Removing valve stem oil seals:**

- Remove camshafts ⇒ [page 147](#) .
- Mark allocation of roller rocker fingers and hydraulic compensation elements for reinstallation.
- Remove roller rocker fingers together with hydraulic compensation elements and place down on a clean surface.



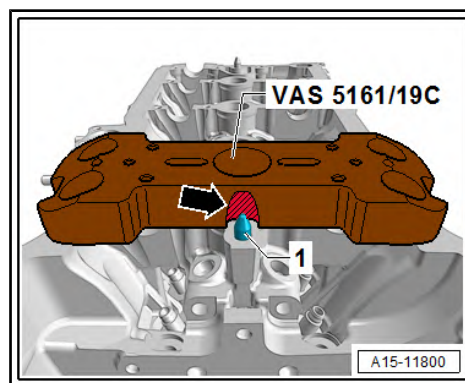
- Insert cylinder head tensioning device - VAS 6419- into engine and gearbox support - VAS 6095- .
- Tension cylinder head on cylinder head tensioning device as shown in illustration.
- Connect cylinder head tensioning device to compressed air.
- Use lever -arrow- to slide air cushion under the combustion chamber from which valve stem seal is to be removed.
- Allow compressed air to flow into air cushion until it lies against valve disc.



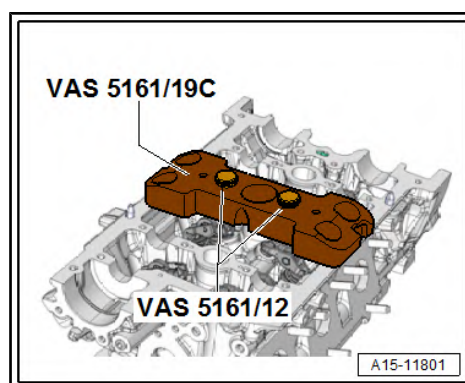
## Reworking guide plate

Check if recess -arrow- is present.

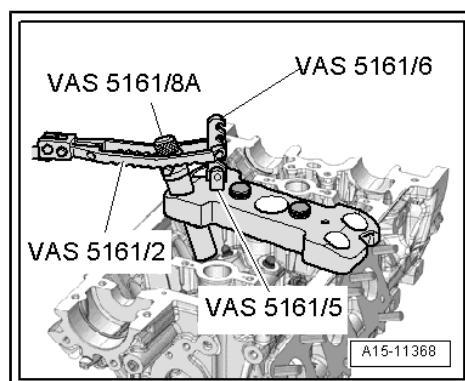
- If necessary, rework guide plate - VAS 5161/19C- -arrow-, until it rests against cylinder head and guide plate -1- is free.



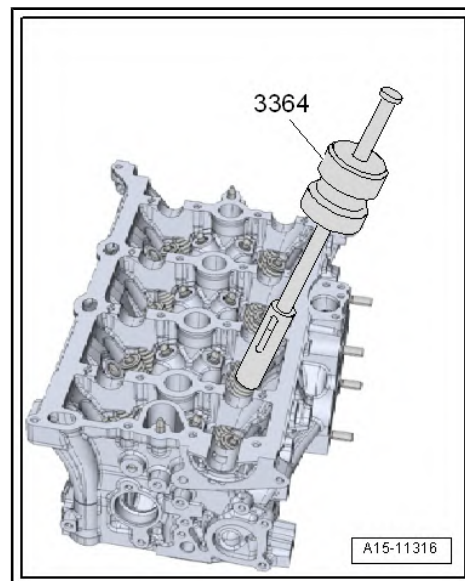
- Screw guide plate - VAS 5161/19C- to cylinder head, as shown in illustration, using knurled screws - VAS 5161/12- .
- Insert drift -VAS 5161/3- into guide plate and use a plastic hammer to knock loose the firmly seated valve cotters.



- Screw retainer - VAS 5161/6- with guide fork - VAS 5161/5- into thread of guide plate - VAS 5161/19C- .
- Insert assembly cartridge - VAS 5161/8A- into guide plate - VAS 5161/19C- .
- Attach pressure fork - VAS 5161/2- to ratchet piece - VAS 5161/6- .
- Press installation cartridge - VAS 5161/8- down and turn knurled screw of installation cartridge - VAS 5161/8- to right until tips engage in valve cotters.
- Move knurled screw back and forth slightly to press apart valve cotters, and capture them in the assembly cartridge.
- Release pressure fork - VAS 5161/2- .
- Remove assembly cartridge - VAS 5161/8- .

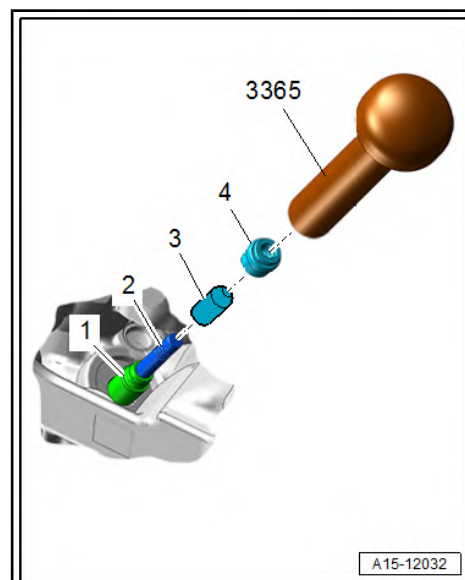


- Pull off valve stem seals using valve stem seal puller - 3364- .

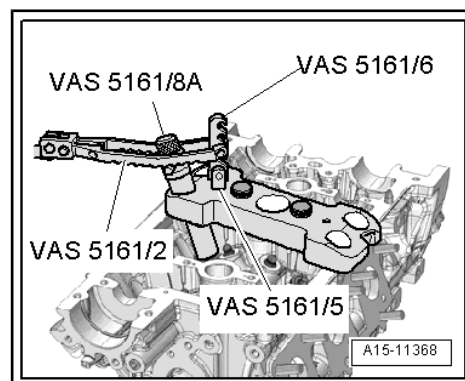


#### Installing valve stem seals:

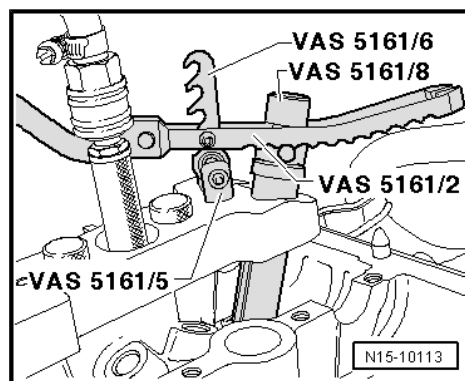
- So that the new valve stem seal -4- is not damaged during installation, the plastic sleeve -3- must be affixed to the valve shaft -2-.
- Lightly oil sealing lip of valve stem seal.
- Push valve stem oil seal onto plastic sleeve.
- Carefully press valve stem seal onto valve guide using valve stem seal fitting tool - 3365- .
- Remove plastic sleeve.
- Insert valve springs and valve spring plate ⇒ [page 147](#)
- Remove removal and installation device for valve cotters - VAS 5161- as shown.



#### Inlet side



## Exhaust side

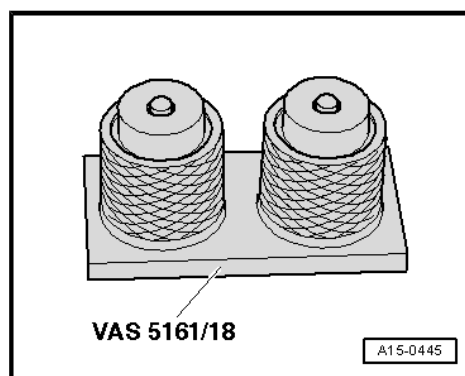


## Note

- ◆ *If the valve cotters have been removed from the installation cartridge, they must first be inserted into the insertion device - VAS 5161/18- .*
- ◆ *Press assembly cartridge -VAS 5161/8- onto insertion device from above and pick up valve cotters.*
- Press installation cartridge - VAS 5161/8- down with pressure fork - VAS 5161/2- , and turn installation cartridge knurled screw back and forth whilst pulling upwards.
- Relieve pressure fork - VAS 5161/2- whilst pulling on knurled screw.
- Remove removal and installation device for valve cotters - VAS 5161- .

Further assembly is basically the reverse of the removal procedure. Please observe the following:

- Install camshafts ➔ [page 147](#) .





## 5 Inlet and exhaust valves

⇒ ["5.1 Checking valve guides", page 167](#)

⇒ ["5.2 Checking valves", page 168](#)

⇒ ["5.3 Valve dimensions", page 168](#)

### 5.1 Checking valve guides

Special tools and workshop equipment required

◆ Universal dial gauge bracket - VW 387-



◆ Gauge - VAS 6079-

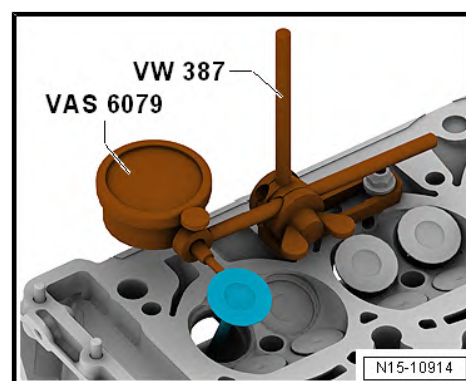


#### Test procedure

- Insert a new valve in the guide. End of valve stem must be at same height as guide. On account of differing stem diameters, only use inlet valve in inlet valve guide and exhaust valve in exhaust valve guide.
- Determine rock.

#### Wear limits

Inlet valve guide	Exhaust valve guide
0.80 mm	0.80 mm



#### Note

- ◆ If the wear limit is exceeded, repeat the measurement with new valves. Renew cylinder head if the wear limit is still exceeded.
- ◆ If the valve is to be renewed as part of a repair, use a new valve for the measurement.

## 5.2 Checking valves

- Check for scoring on valve stems and valve seat surfaces.
- Exchange valve if significant scoring can be seen.

## 5.3 Valve dimensions

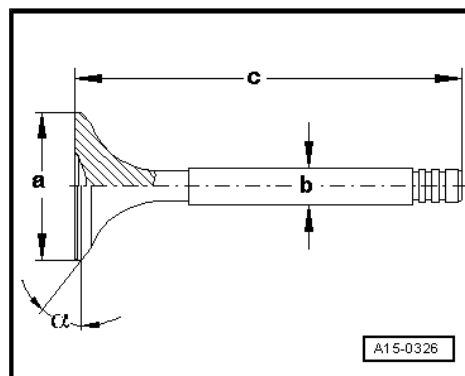
Valve dimensions



### Note

*Inlet and exhaust valves must not be reworked. Only lapping-in is permitted.*

Dimension		Inlet valve	Outlet valve
Ø a	mm	$33.85 \pm 0.10$	$28.0 \pm 0.1$
Ø b	mm	$5.98 \pm 0.01$	$5.96 \pm 0.01$
c	mm	$104.0 \pm 0.2$	$101.9 \pm 0.2$
α	°	45	45



## 17 – Lubrication

### 1 Sump, oil pump

⇒ [“1.1 Assembly overview - sump, oil pump”, page 169](#)

⇒ [“1.2 Engine oil:”, page 171](#)

⇒ [“1.3 Removing and installing lower part of sump”, page 172](#)

⇒ [“1.4 Removing and installing upper part of sump”, page 177](#)

⇒ [“1.5 Removing and installing oil pump”, page 180](#)

⇒ [“1.6 Removing and installing oil level and oil temperature sender G266”, page 182](#)

#### 1.1 Assembly overview - sump, oil pump



##### Note

*If large quantities of swarf or metal particles (caused, for example, by partial seizure of the crankshaft or conrod bearings) are found in the engine oil when performing repairs, clean the oil passages thoroughly and renew the engine oil cooler to prevent subsequent damage.*

# 1 - Nut

- ☐ 9 Nm

# 2 - Oil level and oil temperature sender - G266-

- ☐ Removing and installing  
⇒ [page 182](#)

# 3 - O-ring

- ☐ Moisten with engine oil.
- ☐ Renew after removing.

# 4 - Oil drain plug/sealing plug

- ☐ Sheet-metal sump:  
30 Nm
- ☐ Turn the plastic sump  
using the assembly tool  
- T10549- until the end

# 5 - Seal / O-ring

- ☐ Renew seal after each  
removal
- ☐ Renew O-ring in case of  
leaks.

# 6 - Gasket/sealant

- ☐ ⇒ Electronic Parts  
Catalogue (ETKA)

# 7 - Bolt

- ☐ For baffle plate and oil  
suction pipe
- ☐ Renew after removing.
- ☐ 4 Nm +45°

# 8 - Baffle plate

- ☐ If the top section of  
sump is renewed, the  
baffle plate must be renewed as well.

# 9 - O-ring

- ☐ Moisten with engine oil.
- ☐ Renew after removing.

# 10 - Oil intake tube

- ☐ Clean strainer if soiled

# 11 - Centring sleeve

# 12 - Bolt

- ☐ Renew after removing.
- ☐ Tightening sequence ⇒ [page 171](#)

# 13 - Upper part of sump

- ☐ Removing and installing ⇒ [page 177](#)
- ☐ Tightening sequence ⇒ [page 171](#)
- ☐ If the top section of sump is renewed, the baffle plate must be renewed as well.

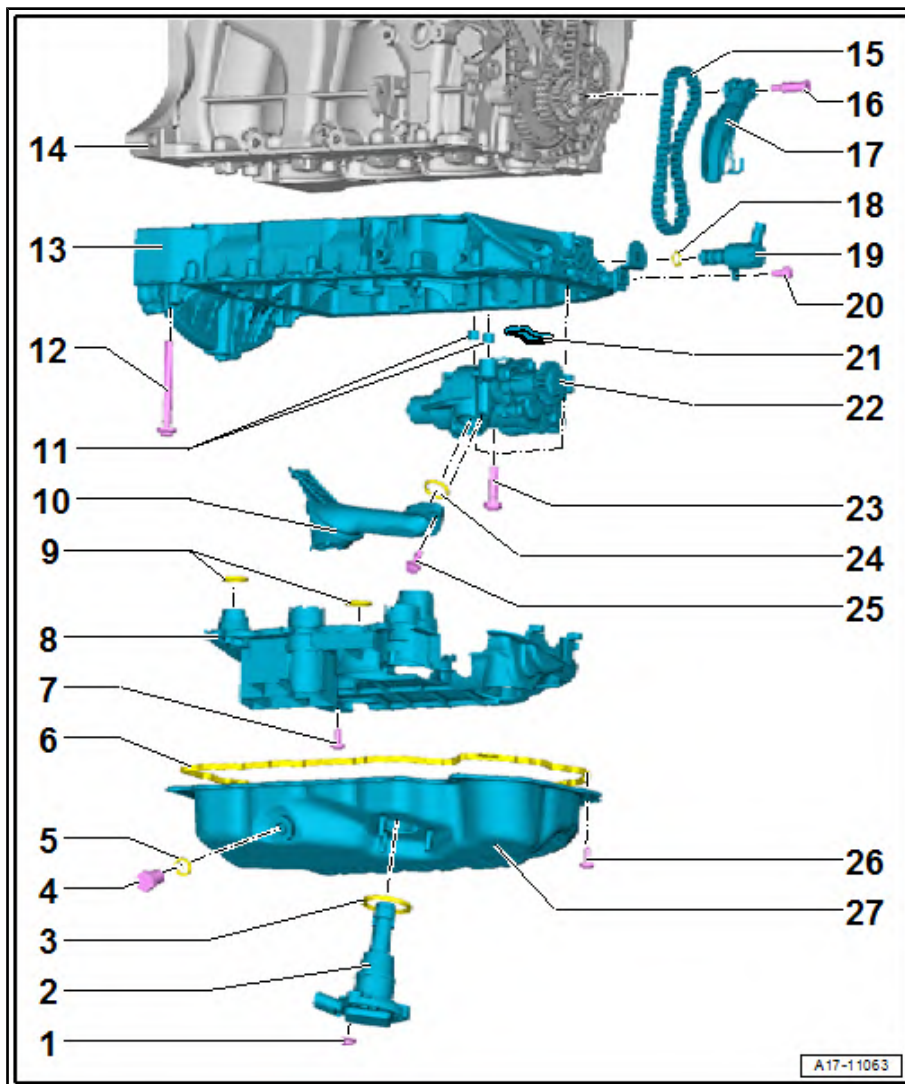
# 14 - Cylinder block

# 15 - Drive chain for oil pump

- ☐ Mark direction of rotation before removing.

# 16 - Bolt

- ☐ 9 Nm



## 17 - Chain tensioner

## 18 - O-ring

- ☐ Moisten with engine oil.
- ☐ Renew after removing.

## 19 - Valve for oil pressure control - N428-

- ☐ Removing and installing ⇒ [page 199](#)

## 20 - Bolt

- ☐ Torque setting ⇒ [Item 1 \(page 191\)](#)

## 21 - Oil strainer

## 22 - Oil pump

- ☐ Removing and installing ⇒ [page 180](#)

## 23 - Bolt for oil pump

- ☐ Renew after removing.
- ☐ 8 Nm +90°

## 24 - O-ring

- ☐ Moisten with engine oil.
- ☐ Renew after removing.

## 25 - Bolt for oil suction pipe

- ☐ Renew after removing.
- ☐ 4 Nm +45°

## 26 - Bolt for sump

- ☐ Renew after removing.
- ☐ Tightening sequence ⇒ [page 172](#)

## 27 - Oil pan lower section

- ☐ Sheet-metal or plastic
- ☐ Removing and installing ⇒ [page 172](#)

### Tightening sequence for sump (top section)

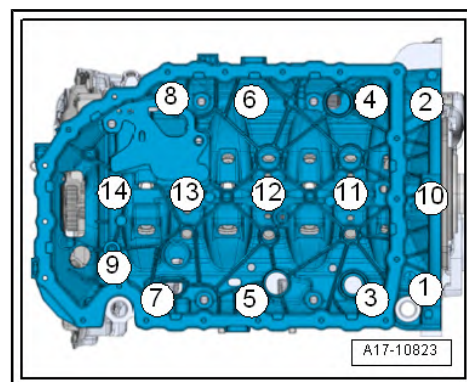


#### Note

*Renew bolts that are tightened with turning further angle.*

- Tighten bolts -1 to 14- by hand in the sequence shown.

Stage	Tightening sequence/specified torque
1. Bolts -1- to -14-	Tighten to 8 Nm
2. Bolts -1- and -2-	Turn 180° further
3. Bolts -3- to -9-	Turn 45° further
4. Bolt -10-	Turn 180° further
5th Bolts -11- to -14-	Turn 90° further



## 1.2 Engine oil:

Capacities and specifications ⇒ Maintenance ; Booklet KH1 ;  
 Engine oil: capacities and specifications .

Change engine oil ⇒ Maintenance ; Booklet KH1 ; Engine oil:  
 draining; Renewing oil filter and replenishing engine oil .



Check engine oil level ⇒ Maintenance ; Booklet KH1 ; Engine oil level: check

## 1.3 Removing and installing lower part of sump

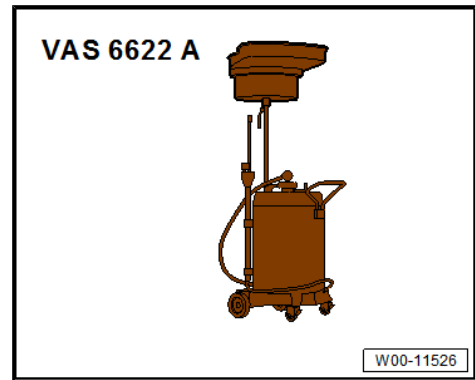
⇒ ["1.3.1 Removing and installing bottom section of sump, plastic sump", page 172](#)

⇒ ["1.3.2 Removing and installing bottom section of sump, sheet-metal sump", page 174](#)

### 1.3.1 Removing and installing bottom section of sump, plastic sump

Special tools and workshop equipment required

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



- ◆ Assembly tool - T10549-

#### Removing

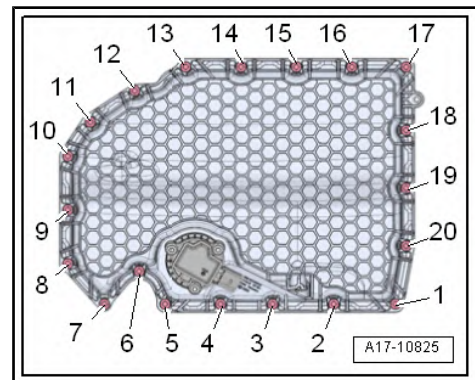
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
- Place used oil collection and extraction unit - VAS 6622A- under engine, and drain engine oil.



#### Note

*Please observe disposal instructions!*

- Unscrew bolts -1 ... 20-, and remove sump.

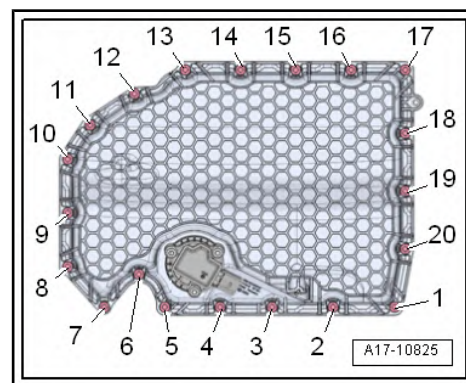


## Installing

- Install baffle plate, specified torque ⇒ [Item 7 \(page 170\)](#) .
- Tighten new bolts -1- to -20- in two stages in the sequence shown:

Stage	Tightening sequence/specified torque
1. Bolts -1- to -20-	Tighten to 8 Nm
2. Bolts -1- to -20-	Turn 90° further

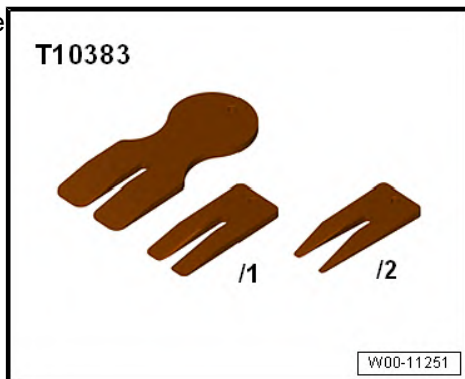
- Replenish engine oil, and check oil level ⇒ Maintenance ; Booklet KH1 ; Engine oil: Draining; Renewing oil filter and replenishing engine oil .



## 1.3.2 Removing and installing bottom section of sump, sheet-metal sump

### Special tools and work-shop equipment required

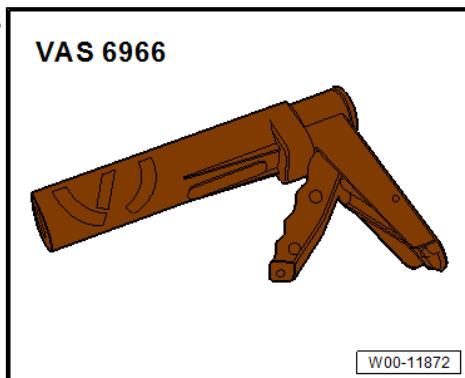
- ◆ Wedge shaped piece - T10383/2-



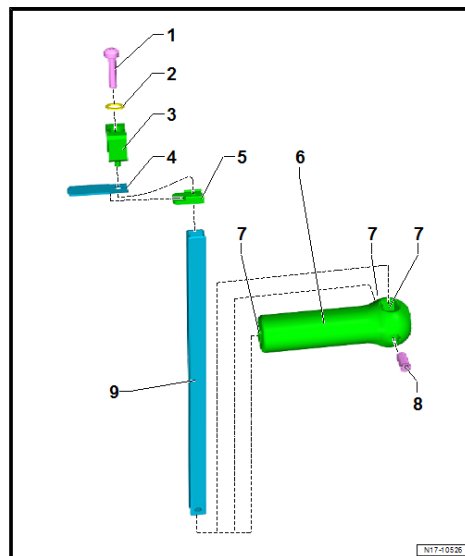
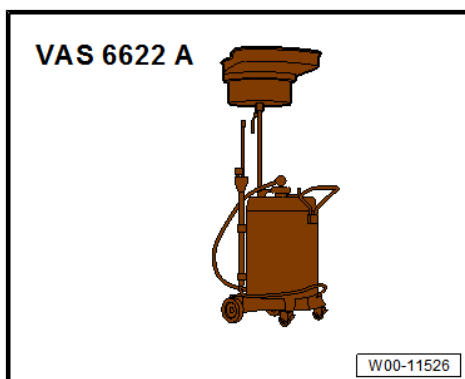
- ◆ Cutting tool - T10561-



- ◆ Applicator gun - VAS 6966-



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



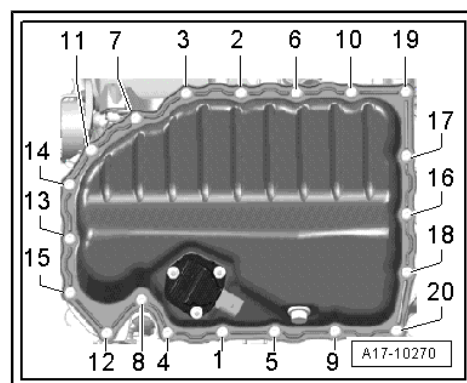
- ◆ Commercially available scraper
- ◆ Hand drill with plastic brush attachment
- ◆ Eye protection
- ◆ Silicone sealant ⇒  
Electronic parts catalogue (ETKA)

#### Components of the separating tool - T10561-

- 1 - Bolt
- 2 - Washer
- 3 - Carrier
- 4 - Knife
- 5 - Wedge guide
- 6 - Handle
- 7 - Inserts for support (rod) for conversion of handle
- 8 - Bolt
- 9 - Support bearing

#### Removing

- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
- Place used oil collection and extraction unit - VAS 6622A- under engine, and drain engine oil.
- Unscrew all but 2 fixing screws of the oil sump.
- Loosen 2 bolts on oil sump, but do not unscrew completely.

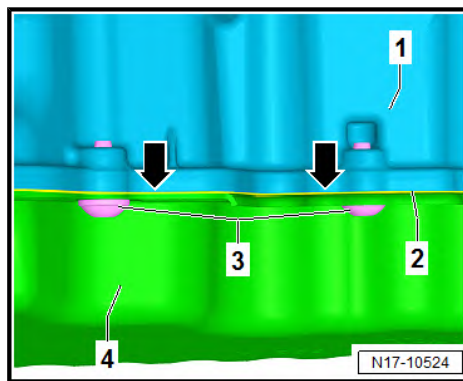


- Cut through seal between oil sump -4- and engine -1-.
- Use cutting tool - T10561- to do this.



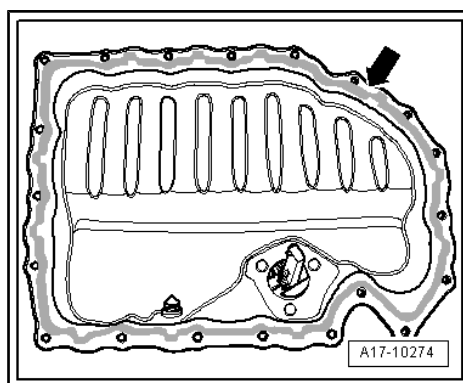
#### Note

- ♦ *The sump is sealed with liquid sealant -2- ⇒ Electronic Parts Catalogue .*
- ♦ *When hardened, the sealant has a high adhesive strength.*
- Separation is made centrally between bolts -3-.
- Position cutting tool - T10561- on seal -arrows- without it canting.
- Drive in cutting tool - T10561- -3- using a hammer as far as it will go -arrow-.
- Do not cant cutting tool - T10561- when doing this.
- Do not cut tool - T10561- sideways.
- Do not lever with cutting tool - T10561- .
- Carry out the procedure at various points, until the oil sump has been loosened.
- Use wedge - T10383/2- to further loosen detached positions.
- Using a plastic hammer carefully drive in wedge.
- Drive in wedge - T10383/2- only to same depth as sealing surface.
- Carefully detach bottom section of sump from bonded joint.
- Fit wedge - T10383/2- at another position and detach the bonded joint in the same way.
- Carefully detach lower part of sump from adhesive bond using a commercially available scraper.



#### Installing

- Install baffle plate, specified torque ⇒ [Item 7 \(page 170\)](#) .
- Remove any sealant residue, and clean contact surfaces.
- Apply the bead of silicone sealant onto the sealing surface of the bottom section of sump, as shown in illustration.

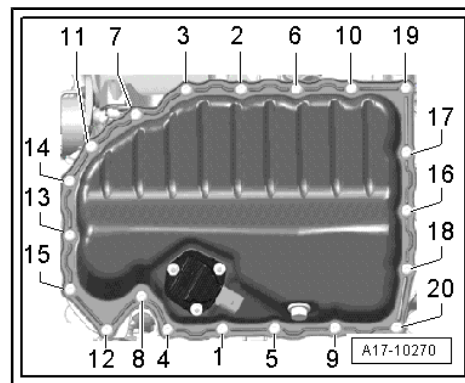




- Tighten new bolts -1- to -20- in two stages in the sequence shown:

Stage	Tightening sequence/specified torque
1. Bolts -1- to -20-	Tighten to 8 Nm
2. Bolts -1- to -20-	Turn 45° further

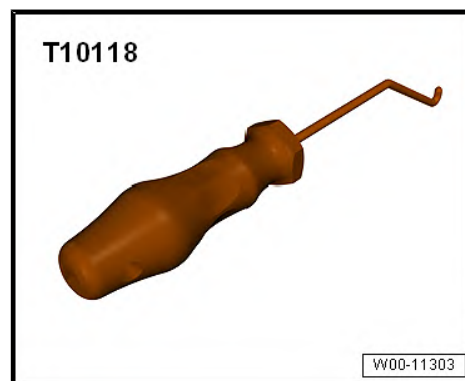
- Replenish engine oil, and check oil level ⇒ Maintenance ; Booklet KH1 ; Engine oil: Draining; Renewing oil filter and replenishing engine oil .



## 1.4 Removing and installing upper part of sump

### Special tools and workshop equipment required

- ◆ Assembly tool - T10118-



- ◆ Pin - T40265-



- ◆ Hand drill with plastic brush attachment
- ◆ Safety glasses
- ◆ Silicone sealant ⇒ Electronic parts catalogue (ETKA)
- ◆ Applicator gun - VAS 6966-



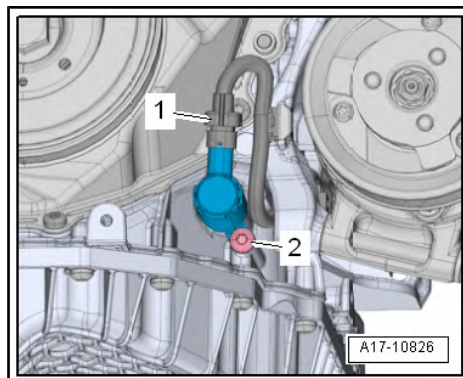
### Note

*If the top section of sump is renewed, the baffle plate must be renewed as well.*

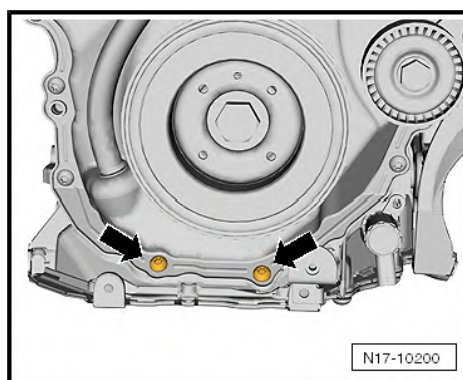
### Removing

- Gearbox has been removed.
- Unbolt lower part of sump ⇒ [page 172](#) .

- Remove rear sealing flange ➔ [page 69](#) .
- Remove oil pump ➔ [page 180](#) .
- Disconnect connector -1-.



- Unscrew bolts -arrows-.



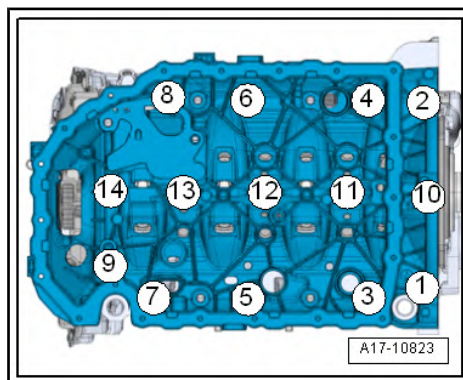
- Unscrew bolts -1 through 14-.
- Lever off upper part of sump on gearbox side first. When levering off, exercise caution to ensure the timing chain cover is not bent in the process.

#### Installing



#### Note

- ◆ *Observe use-by date of silicone sealant.*
- ◆ *The upper part of sump must be installed within 5 minutes of applying silicone sealing compound.*
- ◆ *Replace bolts that are tightened with specified tightening angle.*
- ◆ *Gaskets, oil seals and self-locking nuts must be renewed*
- Remove sealant residues from cylinder block with a flat scraper.



#### CAUTION

Risk of eye injury caused by sealant residue.

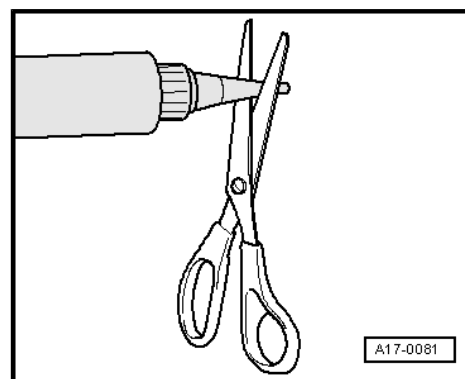
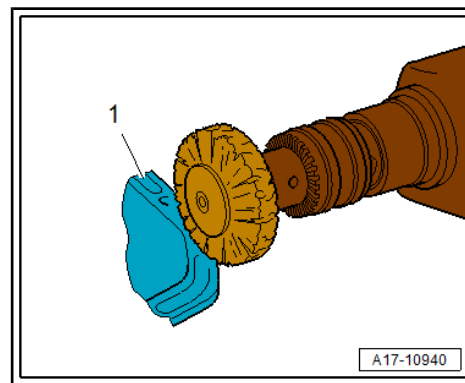
- Wear protective goggles.

- Remove sealant residue from sump (top section) using a rotating plastic brush, for example.

**i Note**

*Check timing chain cover for deformation. To do this, fit sump upper part first without sealant and check gap between cover and sump upper part. If deformation is evident and cover cannot be repaired, renew cover after top section of sump has been installed.*

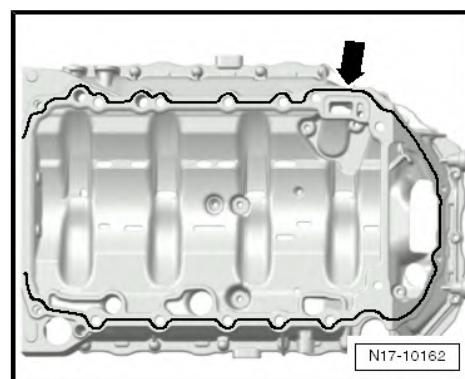
- Clean sealing surfaces. They must be oil and grease-free.
- Check oil passages in top section of sump and in crankcase for soiling.
- Cut off nozzle on tube at front marking (Ø of nozzle approx. 2 mm).



**i Note**

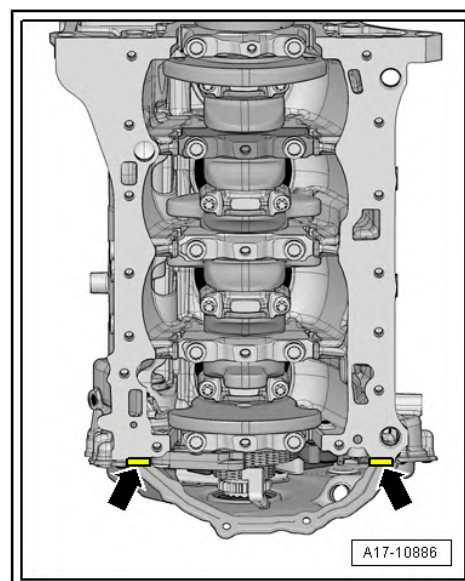
*Risk of blocking lubrication system with excess sealant. Do not apply sealant bead thicker than specified.*

- Apply silicone sealant onto clean sealing surface of top section of sump as illustrated -arrow-.
- Thickness of sealant bead: 2 to 3 mm.
- Apply silicone sealant between cylinder block and lower timing chain cover, as shown in illustration -arrows-.



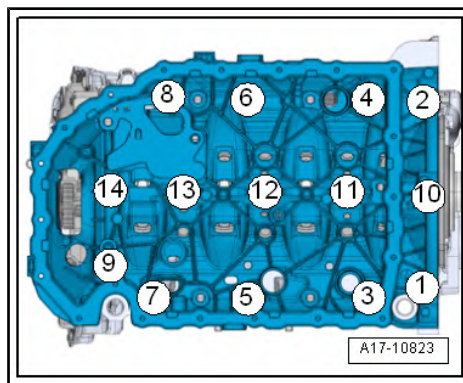
**i Note**

- ◆ *The upper part of sump must be installed within 5 minutes of applying silicone sealing compound.*
- ◆ *The bead of sealant must not be thicker than specified, otherwise excess sealant can enter the sump and obstruct the strainer in the oil intake pipe.*
- Sump upper part and crankcase must be flush on gearbox side.



- Fit upper part of sump immediately, and tighten bolts -1 to 14- in the sequence shown.

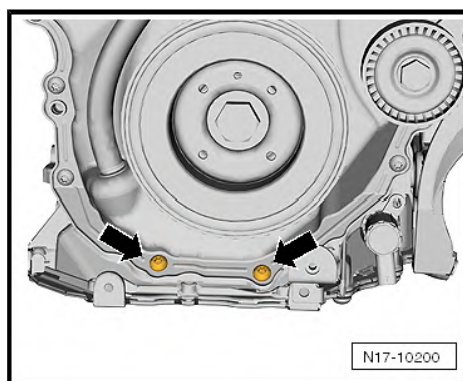
1. Tighten bolts -1 to 14- to 8 Nm.
2. Turn bolts -1 and 2- 180° further.
3. Turn bolts -3 to 9- 45° further.
4. Turn bolt -10- 180° further.
5. Turn bolts -11 to 14- 90° further.



- Screw in new bolts -arrows-. Tightening torque 8 Nm +45°.
- Install rear sealing flange ➔ [page 69](#) .
- Install oil pump ➔ [page 180](#) .
- Insert new baffle plate, and bolt it on.
- Install bottom section of sump ➔ [page 172](#) .

Further assembly is basically the reverse of the removal procedure.

- Replenish engine oil, and check oil level ➔ Maintenance ; Booklet KH1 ; Engine oil: Draining; Renewing oil filter and replenishing engine oil .



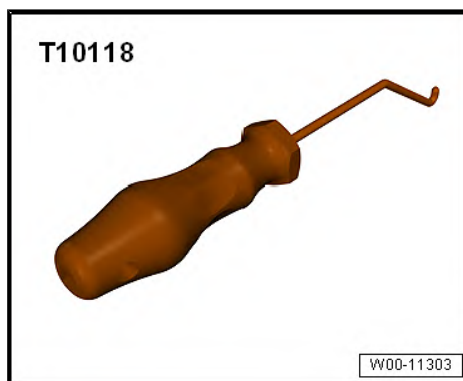
#### Specified torques

- ♦ ➔ ["1.1 Assembly overview - sump, oil pump", page 169](#)

## 1.5 Removing and installing oil pump

### Special tools and workshop equipment required

- ♦ Assembly tool - T10118-

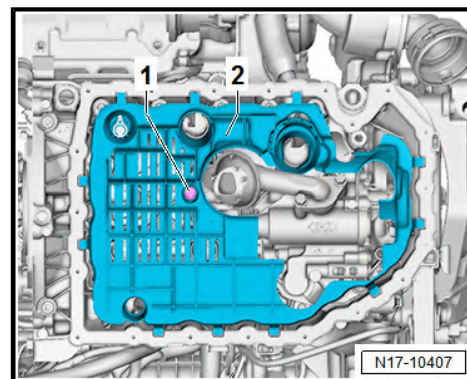


- ♦ Pin - T40265-

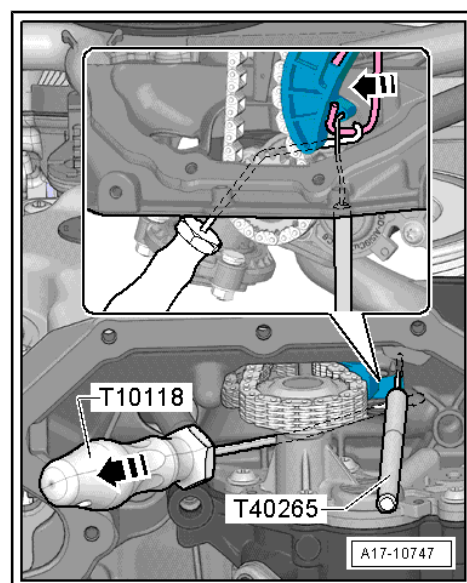


## Removing

- Unbolt lower part of sump ⇒ [page 172](#) .
- Unscrew bolt -1- and pull off baffle plate -2-.



- Pull spring of chain tensioner in -direction of arrow- using assembly tool - T10118- and secure it with locking pin - T40265- .

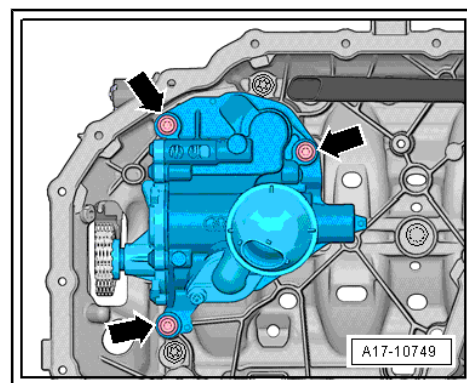


- Unscrew bolts -arrows-, and remove oil pump.

## Installing

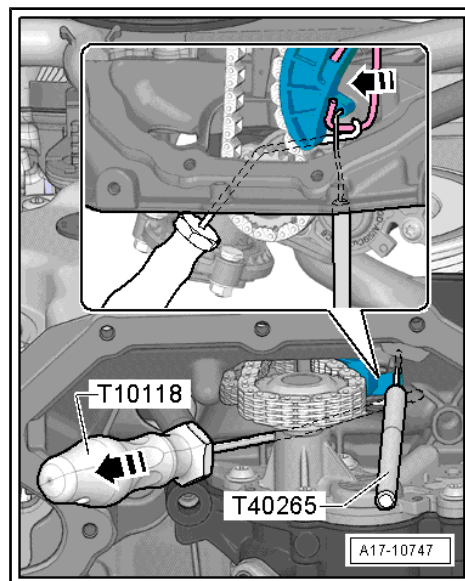
Remaining installation is carried out in the reverse order. When installing, note the following:

- Check that both centring sleeves for centring oil pump are present.
- Before installing oil pump, check strainer in oil suction pipe and oil galleries in upper part of sump for soiling.
- Guide oil pump chain sprocket into drive chain and install oil pump.





- Pull spring of chain tensioner in -direction of arrow- using assembly tool - T10118- and remove locking pin - T40265- .
- Slowly relieve tension from assembly tool - T10118- .

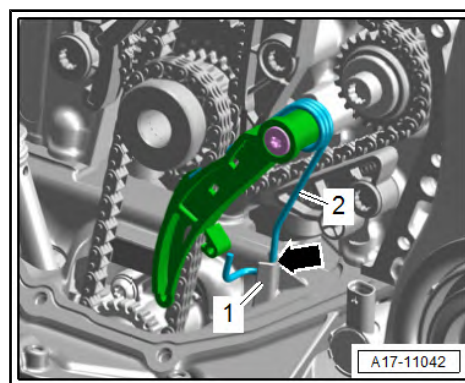


- Inspect lay-on position of the retaining clip of the chain tensioner.
- The retaining clip -2- must, as shown in the illustration, rest on the tab -1- of the upper part of the sump -arrow-.



#### Note

For improved illustration, the figure is shown with the lower chain cover removed.



- Fit O-rings ⇒ [Item 9 \(page 170\)](#) onto baffle plate, and moisten them with engine oil.
- Insert new baffle plate, and bolt it on.
- Install bottom section of sump ⇒ [page 172](#) .
- Replenish engine oil, and check oil level ⇒ Maintenance ; Booklet KH1 ; Engine oil: Draining; Renewing oil filter and replenishing engine oil .

#### Specified torques

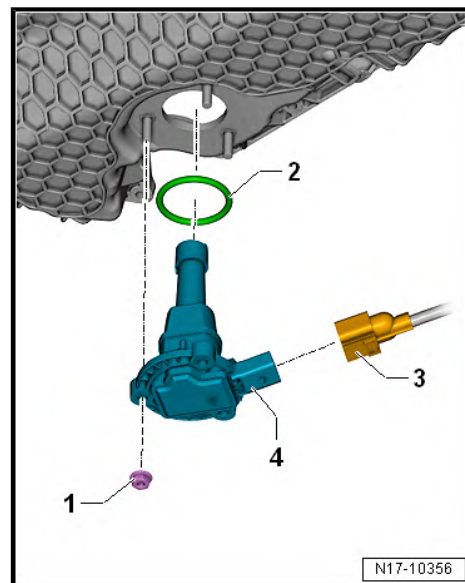
- ♦ ⇒ [“1.1 Assembly overview - sump, oil pump”, page 169](#)

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

### Removing

- Drain engine oil ⇒ Maintenance ; Booklet KH1 ; Engine oil: Draining; Renewing oil filter and replenishing engine oil .
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .

- Disconnect connector -3-.
- Undo nuts -1- and remove oil level and oil temperature sender - G266- -item 4-.



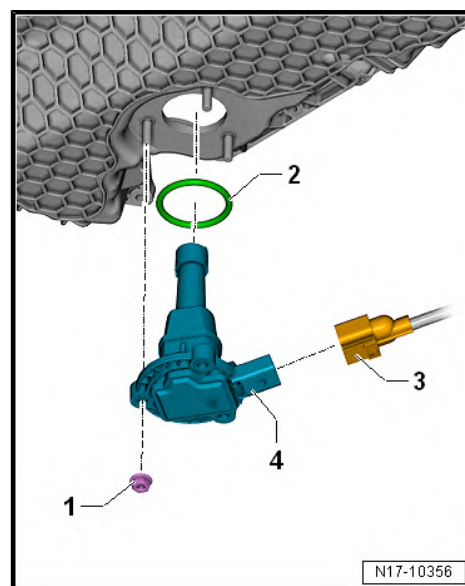
### Installing

Installation is carried out in reverse order of removal. When installing, note the following:

- Renew oil seal -2-.
- Replenish engine oil, and check oil level ⇒ Maintenance ; Booklet KH1 ; Engine oil: Draining; Renewing oil filter and replenishing engine oil .

### Specified torques

- ◆ ⇒ [“1.1 Assembly overview - sump, oil pump”, page 169](#)



## 2 Engine oil cooler

⇒ [“2.1 Assembly overview - engine oil cooler”, page 184](#)

⇒ [“2.2 Removing and installing engine oil cooler”, page 184](#)

⇒ [“2.3 Removing and installing mechanical switching valve”, page 186](#)

### 2.1 Assembly overview - engine oil cooler

#### 1 - Ancillary bracket

- ☐ Removing and installing  
 ⇒ [page 60](#)

#### 2 - Articulation

- ☐ Renewing:

#### 3 - O-rings

- ☐ Renewing:
- ☐ Moisten with engine oil.

#### 4 - Mechanical switching valve

- ☐ Renew ⇒ [page 186](#)

#### 5 - Engine oil cooler

- ☐ See note ⇒ [page 169](#) .
- ☐ Removing and installing  
 ⇒ [page 184](#)

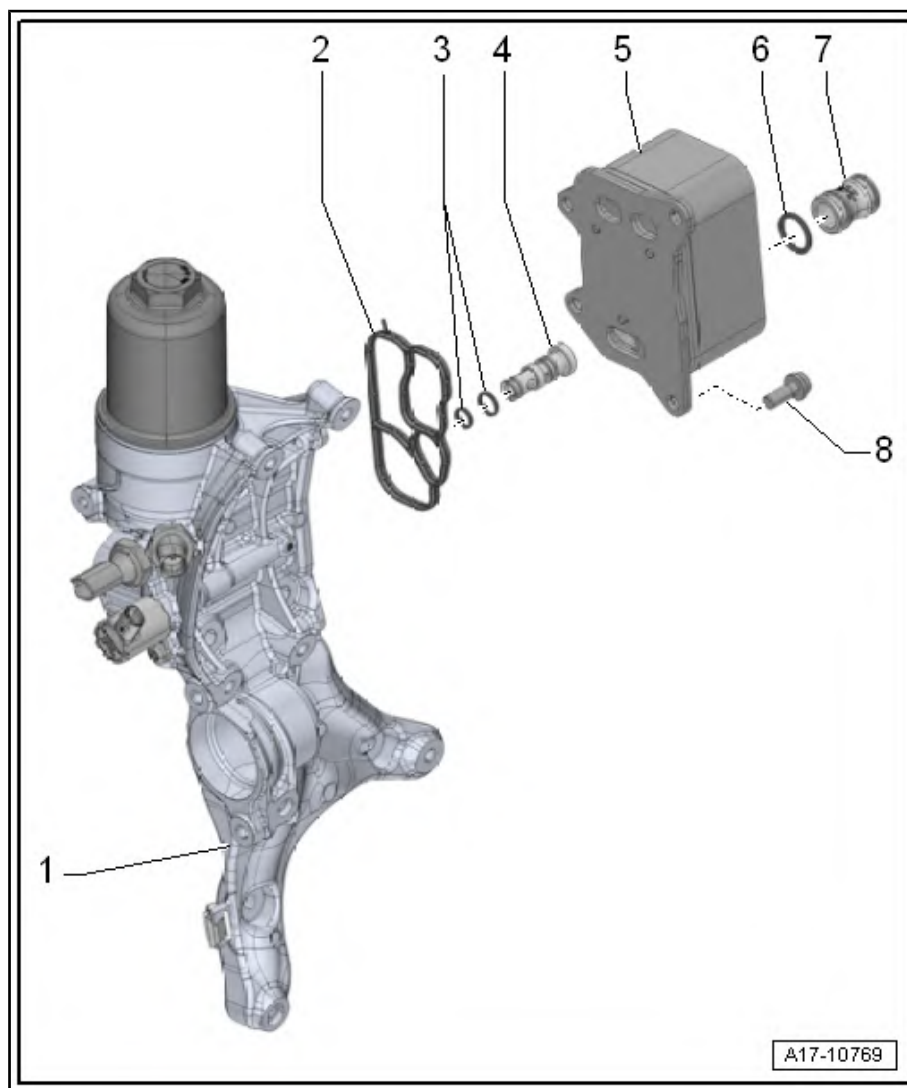
#### 6 - Seal

- ☐ Renewing:
- ☐ Moisten with coolant

#### 7 - Connecting collar

#### 8 - Bolt

- ☐ Renewing:
- ☐ 8 Nm +45°



### 2.2 Removing and installing engine oil cooler

Special tools and workshop equipment required

- ◆ Drip tray for workshop hoist - VAS 6208-



## Removing

### ⚠ CAUTION

On a warm engine, the cooling system is under high pressure. Hot steam/hot coolant can escape - risk of scalding.

Skin and other parts of the body may be scalded.

- Wear protective gloves.
- Wear protective goggles.
- Reduce pressure by covering the cap of the coolant expansion tank with cloths and opening it carefully.
- Drain coolant ➔ [page 206](#) .
- Remove bracket for ancillaries ➔ [page 60](#) .
- Unscrew bolts -4 and 5-, and remove engine oil cooler -3- together with gasket -2-.

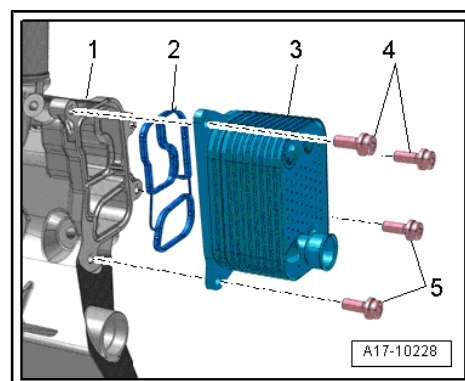
## Installing

Remaining installation is carried out in the reverse order. When installing, note the following:



### Note

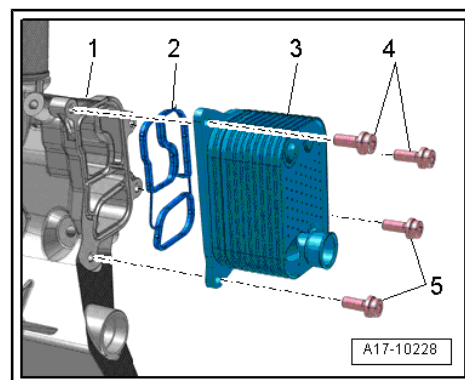
- ◆ *Renew gaskets and seals.*
- ◆ *Secure all hose connections with hose clips corresponding to the series production status ➔ Electronic Parts Catalogue (ETKA) .*



- Install engine oil cooler -3- with new seal -2-.
- Install bracket for ancillaries ➔ [page 60](#) .
- Add coolant ➔ [page 208](#) .
- Replenish engine oil, and check oil level ➔ Maintenance ; Booklet KH1 ; Engine oil: Draining; Renewing oil filter and replenishing engine oil .

## Specified torques

- ◆ ➔ ["2.1 Assembly overview - engine oil cooler", page 184](#)



## 2.3 Removing and installing mechanical switching valve

### Removing

- Remove engine oil cooler ➤ [page 184](#) .
- Remove mechanical switching valve -1- from ancillary bracket -arrow-.

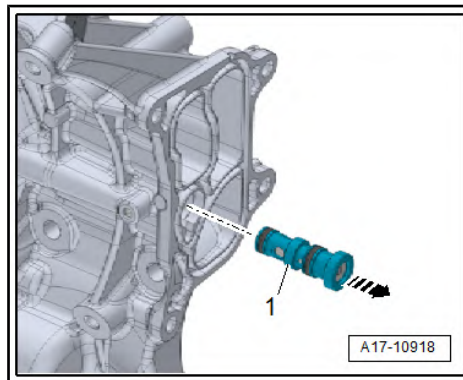
### Installing

Remaining installation is carried out in the reverse order. When installing, note the following:



#### Note

- ◆ *Renew gaskets and seals.*
- ◆ *Secure all hose connections with hose clips corresponding to the series production status ➤ Electronic Parts Catalogue (ETKA) .*
- Moisten O-rings of mechanical switching valve with engine oil, and install switching valve.
- Install engine oil cooler ➤ [page 184](#) .





### 3 Crankcase ventilation

⇒ [“3.1 Assembly overview - crankcase breather system”, page 187](#)

⇒ [“3.2 Removing and installing oil separator”, page 188](#)

#### 3.1 Assembly overview - crankcase breather system

##### 1 - Cylinder head cover

##### 2 - Articulation

- ☐ Renew after removing.

##### 3 - Flexible pipe

- ☐ To activated charcoal filter solenoid valve 1 - N80-

##### 4 - Oil separator

- ☐ Removing and installing  
 ⇒ [page 188](#)

##### 5 - Seal

- ☐ Renew after removing.

##### 6 - Flexible pipe

- ☐ For crankcase ventilation.
- ☐ To turbocharger

##### 7 - Bolt

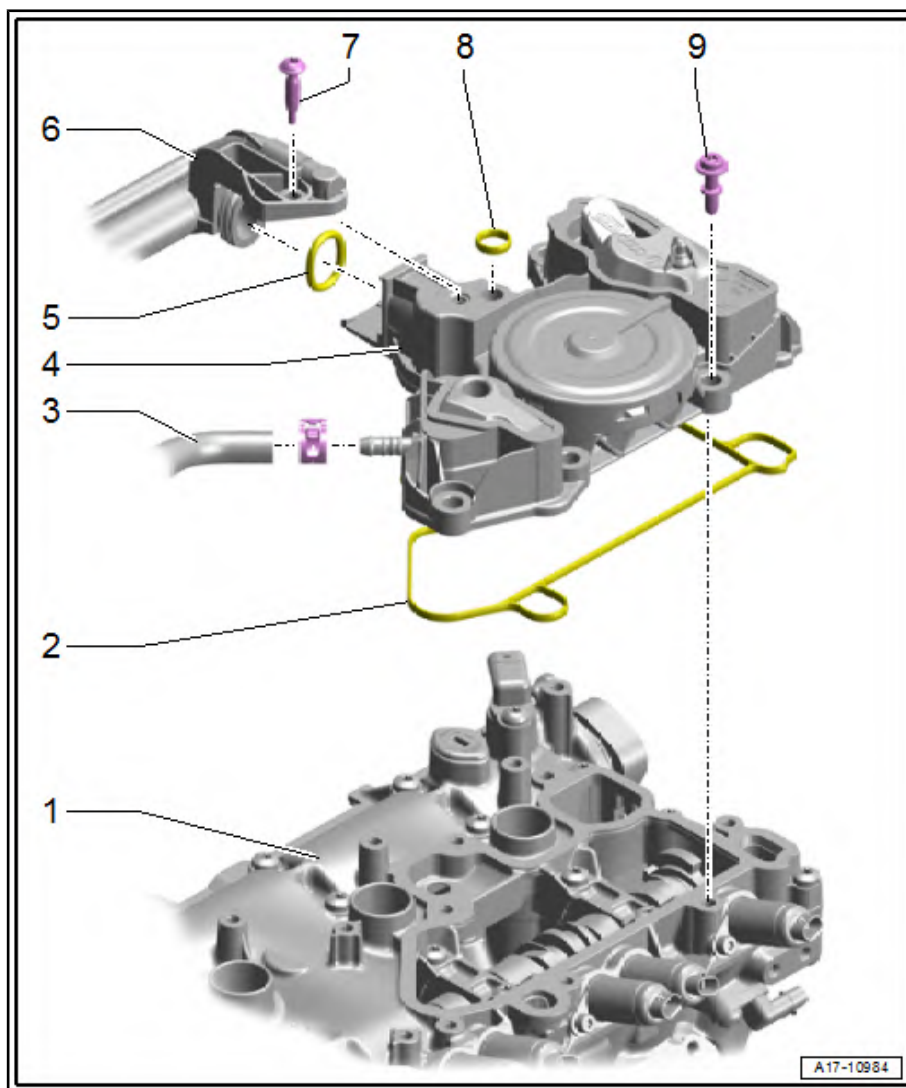
- ☐ Self-tapping
- ☐ Fit and screw in bolt by hand so that it screws into old thread Then tighten bolt to specified torque
- ☐ 4 Nm

##### 8 - Seal

- ☐ Renew after removing.

##### 9 - Bolt

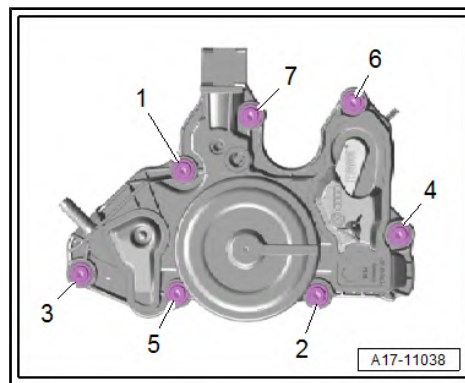
- ☐ Self-tapping
- ☐ Fit and screw in bolt by hand so that it screws into old thread Then tighten bolt to specified torque
- ☐ Specified torque and tightening sequence ⇒ [page 188](#)



A17-10964

### Tightening sequence - oil separator

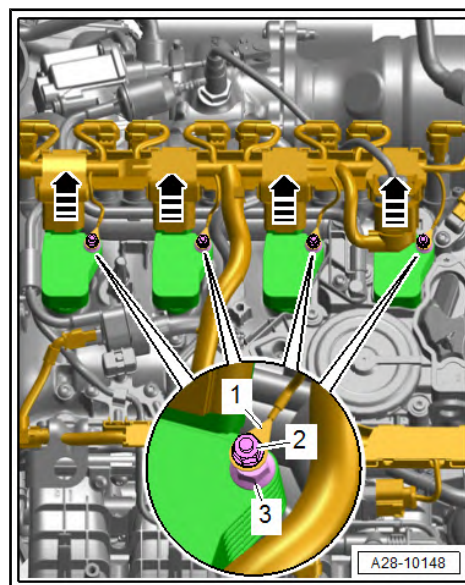
- Tighten bolts in the order -1 ... 7- to 9 Nm.



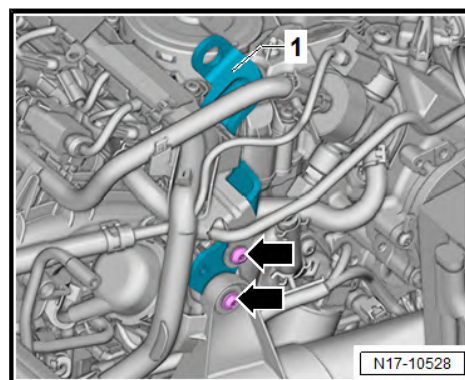
## 3.2 Removing and installing oil separator

### Removing

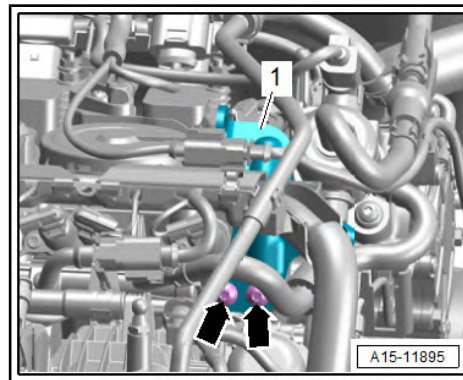
- Remove engine cover panel ➤ [page 50](#) .
- Unscrew nuts -2-, and lay earth wire -1- to one side.
- Release ignition coil connectors and, at the same time, pull connectors off ignition coils.
- Unscrew ignition coil bolts "3 and 4", and pull out ignition coils.
- Remove air filter housing ➤ [page 322](#) .



- Unscrew bolts -arrows- of engine lifting eye -1-.



- Unscrew bolts -arrows- and push engine lifting eye -1- to the side.



- Open hose clip -1-, and detach hose from activated charcoal filter solenoid valve 1 - N80- .
- Release and disconnect crankcase breather line -2-.
- Unscrew bolts -arrows-, and remove oil separator -3-.

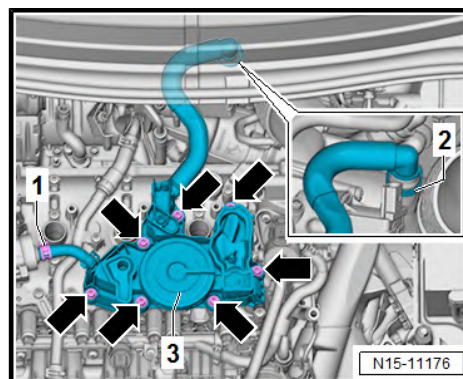
### Installing

Remaining installation is carried out in the reverse order. When installing, note the following:



#### Note

- ◆ *Renew gasket and seals.*
- ◆ *Secure all hose connections with hose clips corresponding to the series production status ⇒ Electronic Parts Catalogue (ETKA) .*



### Specified torques

- ◆ ⇒ [“3.1 Assembly overview - crankcase breather system”, page 187](#)

## 4 Oil filter, oil pressure switch

⇒ [“4.1 Assembly overview - oil filter”, page 190](#)

⇒ [“4.2 Exploded view - oil pressure switches/oil pressure control”, page 191](#)

⇒ [“4.3 Removing and installing piston cooling jet control valve N522”, page 192](#)

⇒ [“4.4 Removing and installing oil pressure switch F1”, page 192](#)

⇒ [“4.5 Removing and installing oil pressure switch for reduced oil pressure F378”, page 193](#)

⇒ [“4.6 Removing and installing stage 3 oil pressure switch F447”, page 194](#)

⇒ [“4.7 Checking oil pressure”, page 196](#)

⇒ [“4.8 Removing and installing oil pressure regulating valve N428”, page 199](#)

### 4.1 Assembly overview - oil filter

#### 1 - Ancillary bracket

- ☐ Removing and installing  
⇒ [page 60](#)

#### 2 - Articulation

- ☐ Renewing:

#### 3 - Oil filter element

- ☐ Removing and installing  
⇒ Maintenance ; Booklet KH1 ; Engine oil: Draining; Renewing oil filter and replenishing engine oil

#### 4 - O-ring

- ☐ Renewing:
- ☐ Moisten with engine oil.

#### 5 - Oil filter housing

- ☐ 25 Nm

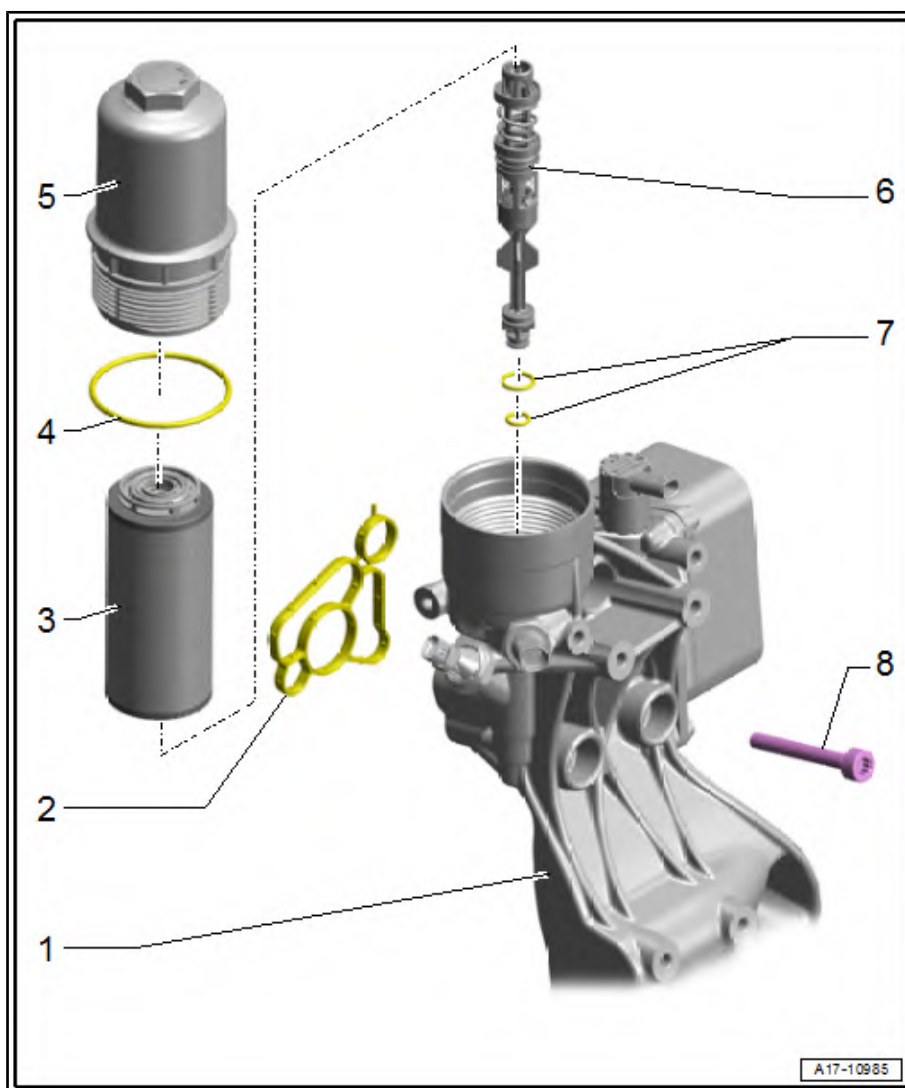
#### 6 - Oil drain connection

#### 7 - O-rings

- ☐ Not available as replacement part, supplied together with  
⇒ [Item 6 \(page 190\)](#)

#### 8 - Bolt

- ☐ Specified torques and installation sequence  
⇒ [page 52](#) .





## 4.2 Exploded view - oil pressure switches/oil pressure control

### 1 - Bolt

- ☐ Renewing:
- ☐ 4 Nm +90°

### 2 - Valve for oil pressure control - N428-

- ☐ Checking ⇒ Vehicle diagnostic tester
- ☐ Removing and installing ⇒ [page 199](#)

### 3 - O-ring

- ☐ Renewing:
- ☐ Moisten with engine oil.

### 4 - O-rings

- ☐ Renewing:
- ☐ Moisten with engine oil.

### 5 - Bolt

- ☐ Renewing:
- ☐ 4 Nm +45°

### 6 - Piston cooling jet control valve - N522-

- ☐ Checking ⇒ Vehicle diagnostic tester
- ☐ Removing and installing ⇒ [page 192](#)

### 7 - Seal

- ☐ Renew oil pressure switch each time it has been loosened.

### 8 - Oil pressure switch - F1-

- ☐ Blue or grey insulation
- ☐ Checking ⇒ Vehicle diagnostic tester
- ☐ Removing and installing ⇒ [page 192](#)
- ☐ 20 Nm

### 9 - Oil pressure switch for reduced oil pressure - F378-

- ☐ Brown insulation
- ☐ Checking ⇒ Vehicle diagnostic tester
- ☐ Removing and installing ⇒ [page 193](#)
- ☐ 20 Nm

### 10 - Seal

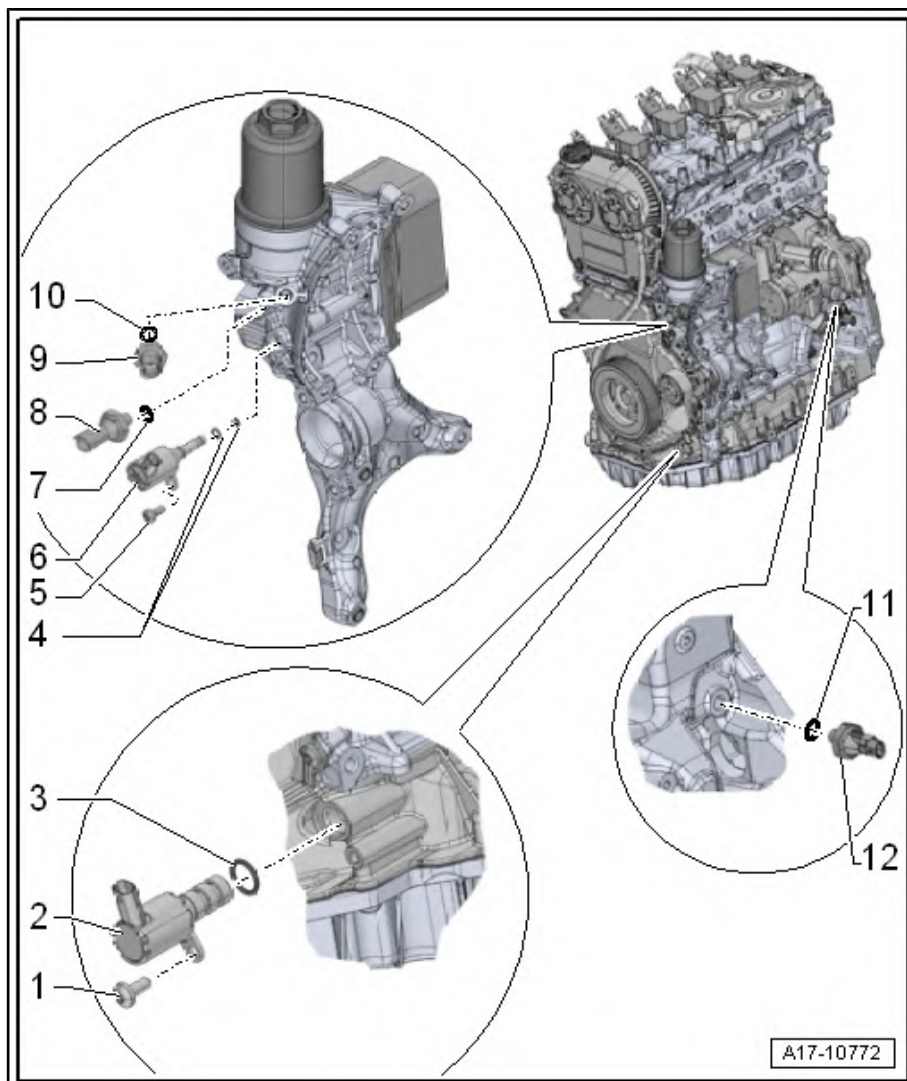
- ☐ Renew oil pressure switch each time it has been loosened.

### 11 - Seal

- ☐ Renew oil pressure switch each time it has been loosened.

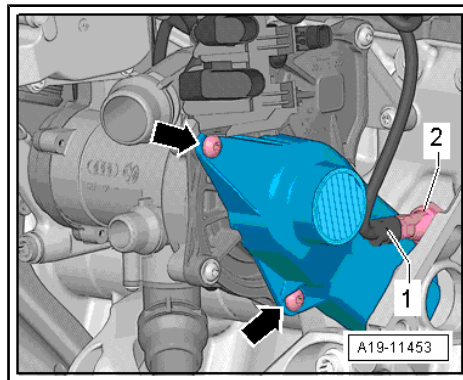
### 12 - Stage 3 oil pressure switch - F447-

- ☐ Checking ⇒ Vehicle diagnostic tester
- ☐ Removing and installing ⇒ [page 194](#)
- ☐ Fitting position ⇒ [page 192](#)
- ☐ 20 Nm





installation position of stage 3 oil pressure switch - F447-



### 4.3 Removing and installing piston cooling jet control valve - N522-

Removing



Note

*Place a cloth underneath ancillary bracket to catch any escaping engine oil.*

- Disconnect connector -2- on piston cooling jet control valve - N522- .
- Unscrew bolt -3-, and remove piston cooling jet control valve - N522- -1-.

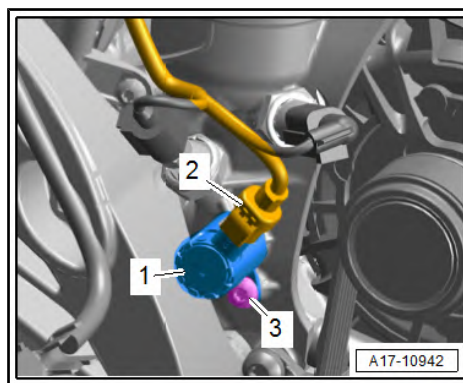
Installing

Remaining installation is carried out in the reverse order. When installing, note the following:



Note

- ♦ *Renew O-rings.*
- ♦ *Insert piston cooling jet control valves - N522- immediately in hole to avoid loss of oil.*
- Check oil level ⇒ Maintenance ; Booklet KH1 ; Draining engine oil; Renewing oil filter and replenishing engine oil .



Specified torques

- ♦ ⇒ ["4.2 Exploded view - oil pressure switches/oil pressure control", page 191](#)

### 4.4 Removing and installing oil pressure switch - F1-

Special tools and workshop equipment required

- ◆ 10 mm jointed spanner - T40175-

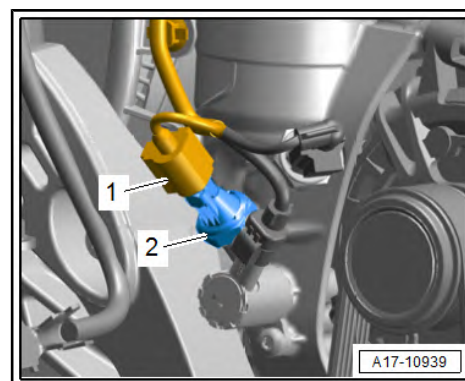


## Removing



### Note

- ◆ Place a cloth underneath ancillary bracket to catch any escaping engine oil.
- ◆ Renew the seal each time the oil pressure switch has been loosened.
- Separate electrical connector -1- on oil pressure switch - F1- .
- Remove oil pressure switch -2-.



## Installing

Remaining installation is carried out in the reverse order. When installing, note the following:



### Note

*Screw oil pressure switch - F1- immediately into bore to avoid loss of oil.*

- Check oil level ⇒ Maintenance ; Booklet KH1 ; Draining engine oil; Renewing oil filter and replenishing engine oil .

## Specified torques

- ◆ ⇒ ["4.2 Exploded view - oil pressure switches/oil pressure control", page 191](#)

## 4.5 Removing and installing oil pressure switch for reduced oil pressure - F378-

### Special tools and workshop equipment required

- ◆ 10 mm jointed spanner - T40175-

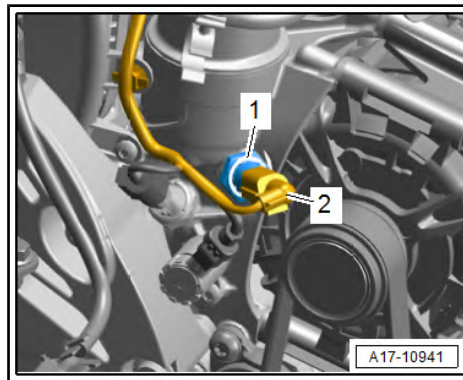


## Removing



### Note

- ◆ *Place a cloth underneath ancillary bracket to catch any escaping engine oil.*
- ◆ *Renew the seal each time the oil pressure switch has been loosened.*
- ◆ *Screw oil pressure switch for reduced oil pressure - F378- immediately into bore to avoid loss of oil.*
- Separate electrical connector -2- on oil pressure switch for reduced oil pressure - F378- .
- Unscrew oil pressure switch for reduced oil pressure -1-.



## Installing

Remaining installation is carried out in the reverse order. When installing, note the following:

- Check oil level ⇒ Maintenance ; Booklet KH1 ; Draining engine oil; Renewing oil filter and replenishing engine oil .

## Specified torques

- ◆ ⇒ [“4.2 Exploded view - oil pressure switches/oil pressure control”, page 191](#)

## 4.6 Removing and installing stage 3 oil pressure switch - F447-

### Special tools and workshop equipment required

- ◆ 10 mm jointed spanner - T40175-

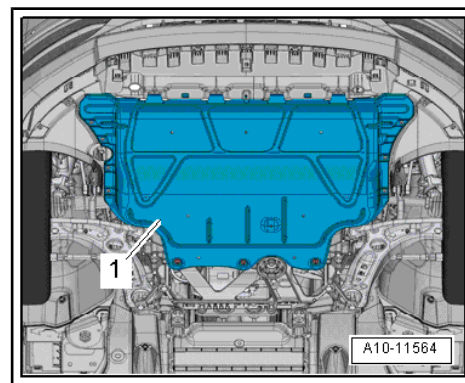


### Note

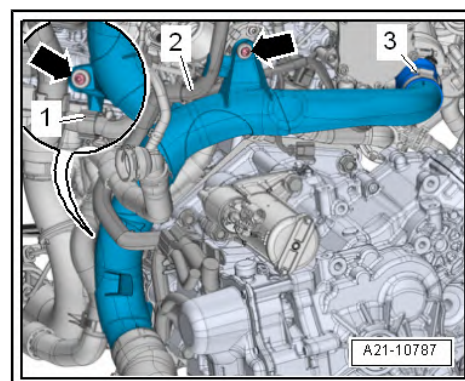
*Renew the seal each time the oil pressure switch has been loosened.*

## Removing

- Remove noise insulation-1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
- Remove air filter housing ⇒ [page 322](#) .



- Free electrical wiring harnesses -1- and -2- from fittings and lay them to one side.
- Loosen screw-type clip -3-.
- Unscrew bolts -arrows-, loosen screw-type clip at bottom, and remove air pipe.



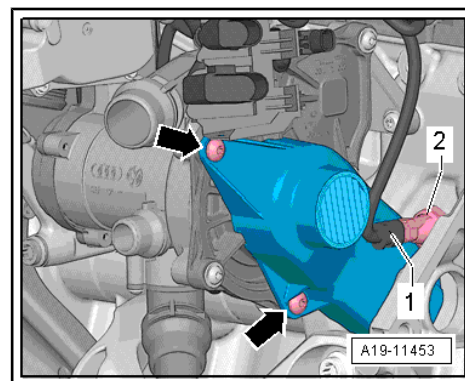
- Disconnect connector -1- from stage 3 oil pressure switch - F447- .
- Unscrew bolts -arrows- and remove toothed belt guard.



### Note

*Use cloth to catch escaping engine oil.*

- Use articulated wrench, 24 mm - F447- to unscrew stage 3 oil pressure switch - T40175- -item 2-.



## Installing

Remaining installation is carried out in the reverse order. When installing, note the following:



### Note

*Screw stage 3 oil pressure switch - F447- immediately into bore to avoid loss of oil.*

- Check oil level ⇒ Maintenance ; Booklet KH1 ; Draining engine oil; Renewing oil filter and replenishing engine oil .

## Specified torques

- ◆ ⇒ [“4.2 Exploded view - oil pressure switches/oil pressure control”, page 191](#)
- ◆ ⇒ [“3.1 Assembly overview - air filter housing”, page 321](#)
- ◆ Noise insulation; Assembly overview - noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .

## 4.7 Checking oil pressure

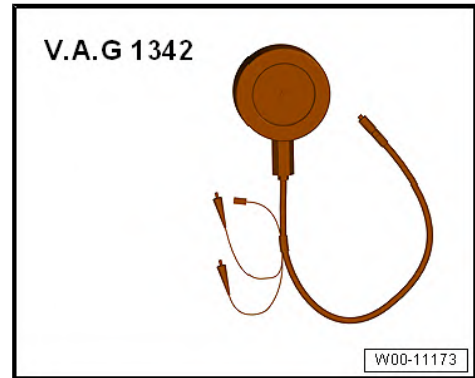
⇒ [“4.7.1 Checking engine oil pressure”, page 196](#)

⇒ [“4.7.2 Checking oil pressure and oil spray jets”, page 197](#)

### 4.7.1 Checking engine oil pressure

Special tools and workshop equipment required

- ◆ Oil pressure tester - V.A.G 1342-



- ◆ 10 mm jointed spanner - T40175-



Test conditions:

- Oil level OK.
- Minimum temperature of engine oil 80 °C (the radiator fan must have started once).



#### Note

- ◆ *The oil pump is regulated and has 2 pressure levels. The pressure levels are checked subsequently.*
- ◆ *During the run-in period (approx. 1000 km) or emergency running mode of the engine, the oil pump operates only at high pressure level.*
- ◆ *The oil pressure depends on the engine oil temperature. At an engine oil temperature of 80°C the mean value must be attained approximately.*



### Test procedure

- Separate electrical connector -2- on oil pressure switch for reduced oil pressure - F378- .
- Place a cloth underneath ancillary bracket to catch any escaping engine oil.
- Unscrew oil pressure switch for reduced oil pressure -1-.
- Screw oil pressure tester - V.A.G 1342- into oil filter bracket in place of the oil pressure switch.
- Screw oil pressure switch for reduced oil pressure - F378- into oil pressure tester , and connect connector.
- Connect oil pressure tester to earth.
- Start engine, and check oil pressure at the specified engine speed levels (low pressure level).
  - Oil pressure at idling speed: 0.85...1.6 bar
  - Oil pressure at 2000 rpm: 1.2 ... 1.6 bar
  - Oil pressure at 3000 rpm: 1.2 ... 1.6 bar
- Switch off the engine.
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
- Pull connector -1- off valve for oil pressure control - N428- . Unclip cable and route it towards bottom to prevent it from being trapped in the belt drive. With disconnected connector the oil pump operates at high pressure level.
- Start engine, and check oil pressure at the specified engine speed levels (high pressure level).
  - Oil pressure at idling speed: 0.85...4.0 bar
  - Oil pressure at 2000 rpm: 2.0 ... 4.0 bar
  - Oil pressure at 3000 rpm: 3.0 ... 4.0 bar

### Assembly

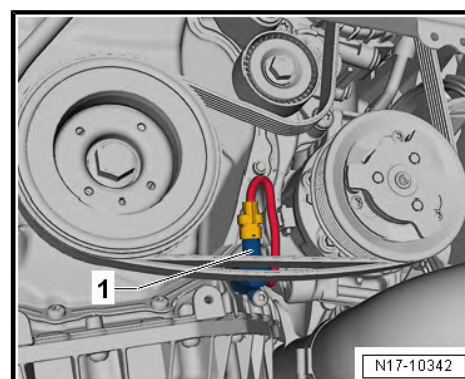
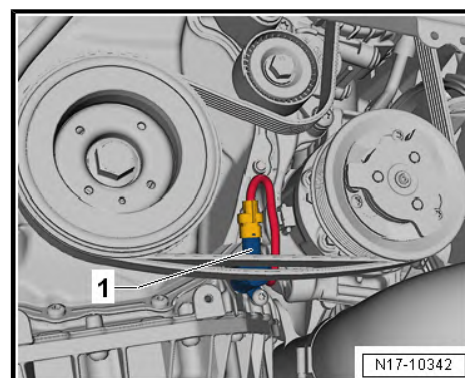
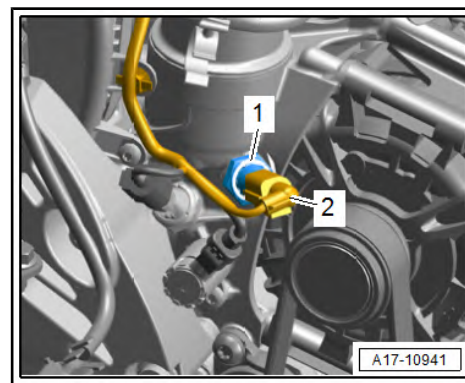
- Install oil pressure switch.
- Connect connector -1- to valve for oil pressure control - N428- . Route cable carefully.
- Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview – noise insulation .
- Read engine control unit event memory, and clear all entries.

### Specified torques

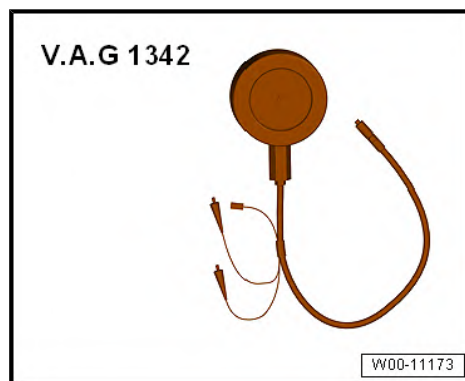
- ◆ ⇒ [“4.2 Exploded view - oil pressure switches/oil pressure control”, page 191](#)

## 4.7.2 Checking oil pressure and oil spray jets

### Special tools and workshop equipment required



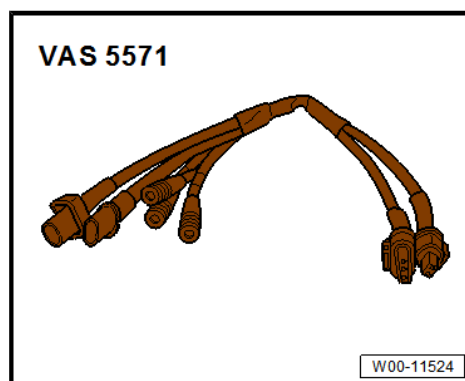
◆ Oil pressure tester - V.A.G 1342-



◆ 10 mm jointed spanner - T40175-



◆ Test instrument/DSO adapter - VAS 5571-



**Note**

*During this check procedure, the piston cooling jet control valve - N522- and the oil passage to the oil spray jets for cooling the pistons are checked.*

**Test conditions:**

- Oil level OK.
- Engine oil pressure OK.
- Oil pressure tester - V.A.G 1342- is connected as described in section ➔ ["4.7.1 Checking engine oil pressure", page 196](#) .

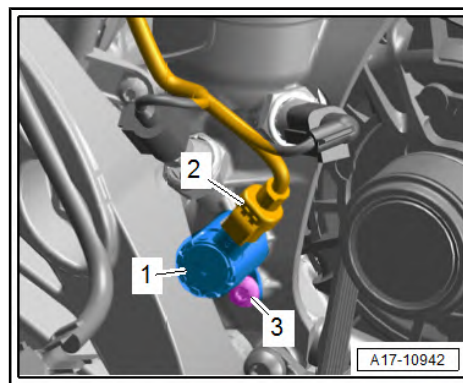
### Test procedure

- Pull connector -2- off piston cooling jet control valve - N522- . Connect connector and control valve to test instrument/DSO adapter - VAS 5571- .
- Start engine and run at idling speed.
- Observe oil pressure tester , disconnect connector for control valve, and connect it again. A pressure variation must be indicated on the oil pressure tester .



### Note

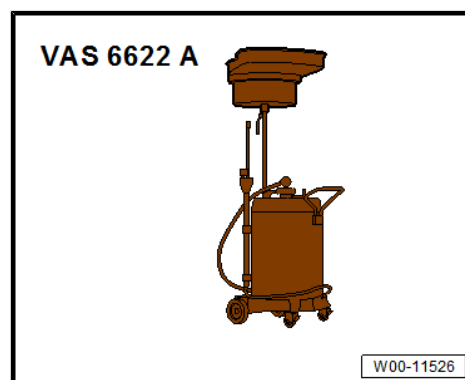
*If the engine runs at idling speed, the oil passage to the oil spray jets is closed. When the connector is pulled off, the oil passage to the oil spray jets is opened. If no pressure variation is indicated, the piston cooling jet control valve - N522- is defective, or the oil passage to the oil spray jets is blocked.*



## 4.8 Removing and installing oil pressure regulating valve - N428-

### Special tools and workshop equipment required

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



### Removing

- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
- Remove poly V-belt ⇒ [page 53](#) .

- Position used oil collection and extraction unit - VAS 6622- below engine.
- Disconnect connector -1-.
- Unscrew bolt -2-, and pull off valve for oil pressure control - N428- -3-.

### Installing

Remaining installation is carried out in the reverse order. When installing, note the following:

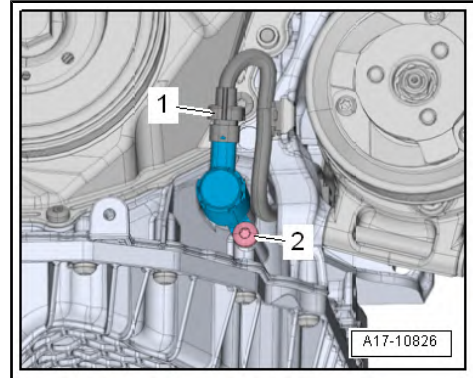


#### Note

*Renew O-ring.*

### Specified torques

- ◆ ⇒ [“4.2 Exploded view - oil pressure switches/oil pressure control”, page 191](#)
- ◆ Noise insulation; Assembly overview - noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .



## 19 – Cooling

### 1 Cooling system/coolant

⇒ [“1.1 Connection diagram - coolant hoses”, page 201](#)

⇒ [“1.2 Checking cooling system for leaks”, page 204](#)

⇒ [“1.3 Draining and adding coolant”, page 206](#)

⇒ [“1.4 Flushing cooling system”, page 212](#)

⇒ [“1.5 Flushing cooling system, quick reference guide”,  
page 231](#)

#### 1.1 Connection diagram - coolant hoses

⇒ [“1.1.1 Vehicles with manual gearbox”, page 201](#)

⇒ [“1.1.2 Vehicles with dual clutch gearbox”, page 202](#)

##### 1.1.1 Vehicles with manual gearbox



#### Note

- ◆ *Blue = large coolant circuit.*
- ◆ *Red = small coolant circuit.*
- ◆ *Brown = heater circuit.*
- ◆ *Yellow = gearbox oil cooling circuit.*
- ◆ *The arrows point in the direction of coolant flow.*



1 - Radiator for engine coolant

2 - Radiator outlet coolant temperature sender - G83-

3 - Actuator for engine temperature regulation - N493-

4 - Cylinder head and crank-case

5 - Throttle

6 - Auxiliary heater

☐ Equipment version

7 - Coolant expansion tank

8 - Cap for coolant expansion tank

☐ Check pressure relief valve ➔ [page 206](#)

9 - Back-pressure valve

10 - Exhaust manifold

☐ Integrated in cylinder head

11 - Exhaust turbocharger

12 - Heat exchanger for heater

13 - Throttle

14 - Back-pressure valve

15 - Auxiliary pump for heating - V488-

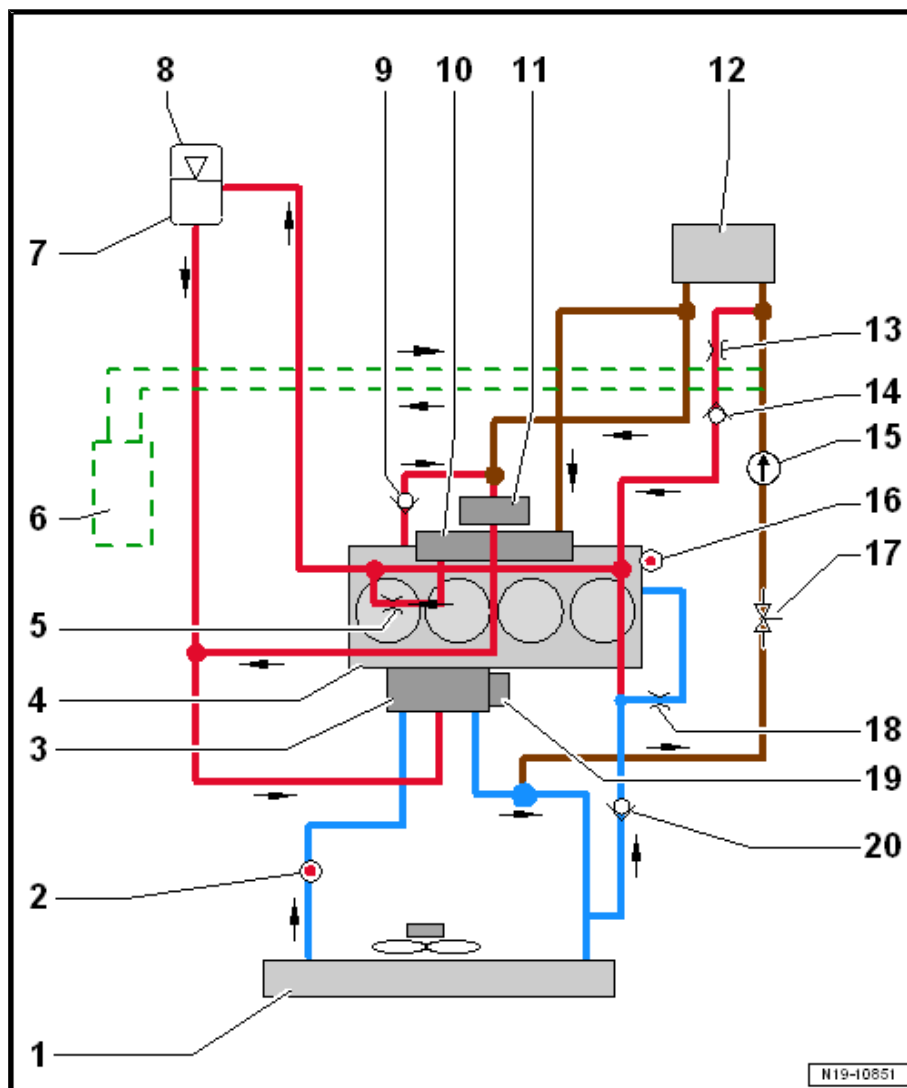
16 - Coolant temperature sender - G62-

17 - Coolant shut-off valve - N82-

18 - Throttle

19 - Coolant pump

20 - Back-pressure valve



## 1.1.2 Vehicles with dual clutch gearbox



### Note

- ◆ Blue = large coolant circuit.
- ◆ Red = small coolant circuit.
- ◆ Brown = heater circuit.
- ◆ Yellow = gearbox oil cooling circuit.
- ◆ The arrows point in the direction of coolant flow.

1 - Radiator for engine coolant

2 - Radiator outlet coolant temperature sender - G83-

3 - Actuator for engine temperature regulation - N493-

4 - Cylinder head and crank-case

5 - Throttle

6 - Auxiliary heater

☐ Equipment version

7 - Coolant expansion tank

8 - Cap for coolant expansion tank

☐ Check pressure relief valve ⇒ [page 206](#)

9 - Back-pressure valve

10 - Exhaust manifold

☐ Integrated in cylinder head

11 - Exhaust turbocharger

12 - Heat exchanger for heater

13 - Throttle

14 - Back-pressure valve

15 - Continued coolant circulation pump - V51-

☐ for vehicles with double clutch gearbox

16 - Coolant temperature sender - G62-

17 - Coolant shut-off valve - N82-

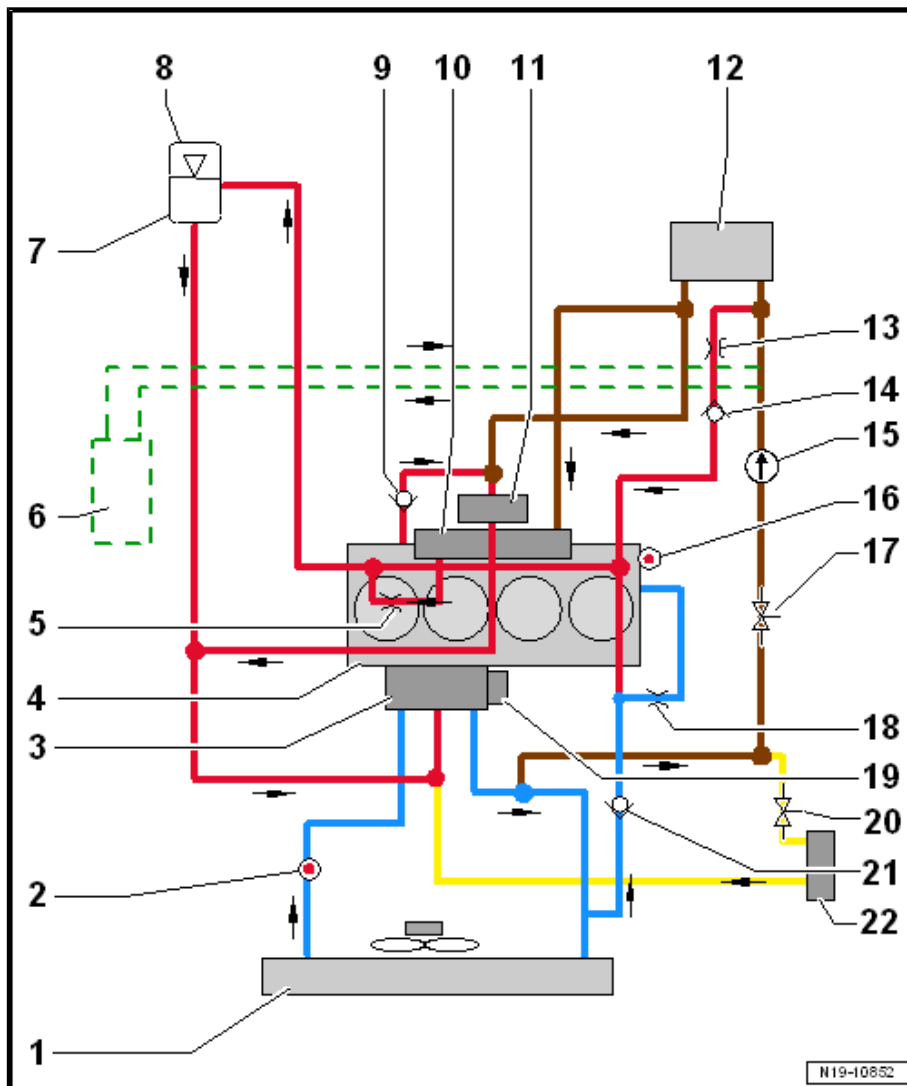
18 - Throttle

19 - Coolant pump

20 - Coolant valve for gearbox - N488-

21 - Back-pressure valve


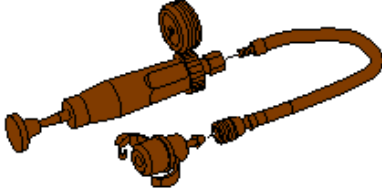
22 - Gear oil cooler



Volkswagen Technical Site: <http://vwts.ru> <http://vwts.info>

## 1.2 Checking cooling system for leaks

Special tools and workshop  
equipment required

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

- ◆ 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-

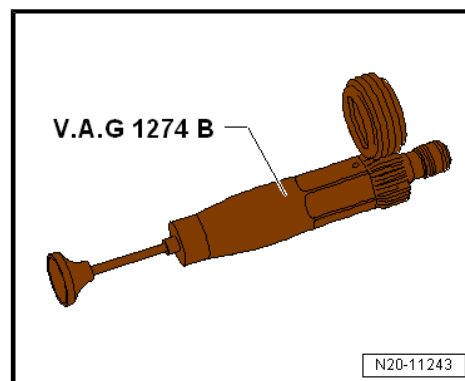


**Note**

*To perform the leakage test correctly, first run a self-test on the cooling system tester - V.A.G 1274 B- .*

### Self-test of cooling system tester - V.A.G 1274 B-

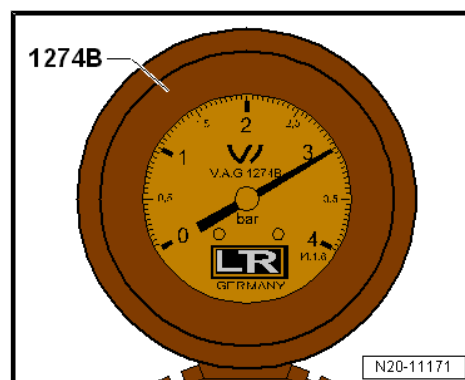
- Operate cooling system tester - V.A.G 1274 B- several times.



- Build up a pressure of 3.0 bar on cooling system tester .
- Observe pressure on pressure gauge of cooling system tester for 30 seconds.

**If no pressure builds up or if the pressure drops again:**

The cooling system tester - V.A.G 1274 B- is leaking and should not be used.



### Procedure

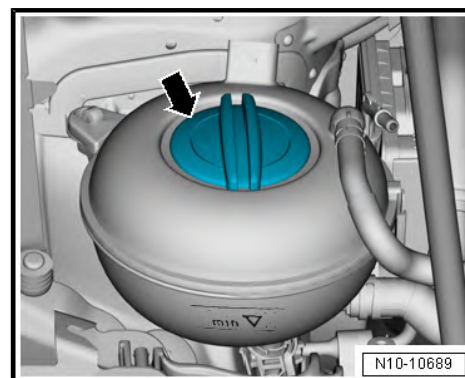
- Engine at operating temperature.

#### CAUTION

On a warm engine, the cooling system is under high pressure. Hot steam/hot coolant can escape - risk of scalding.

Skin and other parts of the body may be scalded.

- Wear protective gloves.
- Wear protective goggles.
- Reduce pressure by covering the cap of the coolant expansion tank with cloths and opening it carefully.

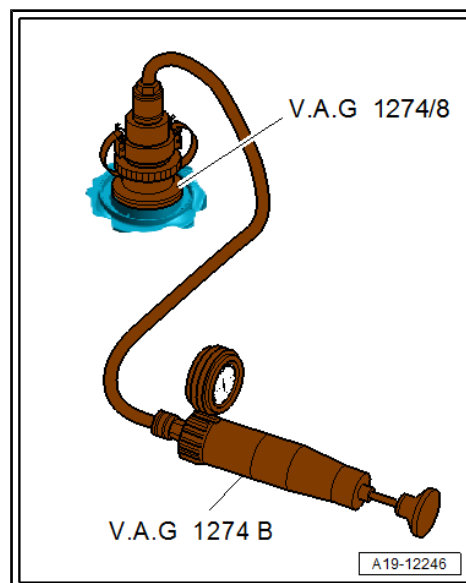


- Open filler cap -arrow- for coolant expansion tank.

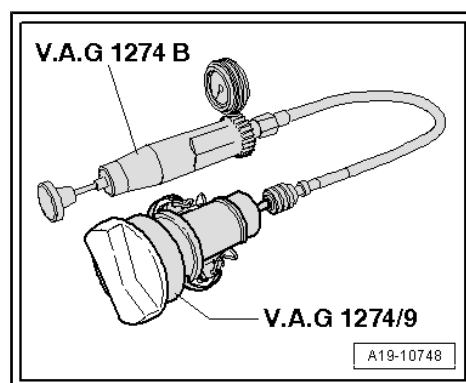
- Fit cooling system tester - V.A.G 1274 B- with adapter - V.A.G 1274/8- to coolant expansion tank.
- Build up pressure of approx. 1.5 bar using hand pump of cooling system tester.
- The pressure must not drop by more than 0.2 bar within 10 minutes.
- If pressure drops by more than 0.2 bar, locate leaks and rectify faults.

**Note**

*The pressure drop of 0.2 bar within 10 minutes depends on the how far the coolant can cool down. The colder the engine the lower the pressure drop. If necessary, repeat the check while the engine is cold.*

**Check pressure relief valve in cap.**

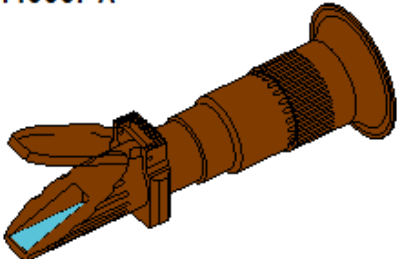
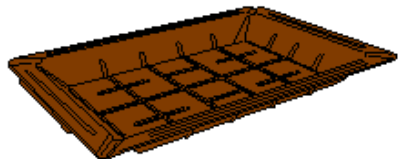
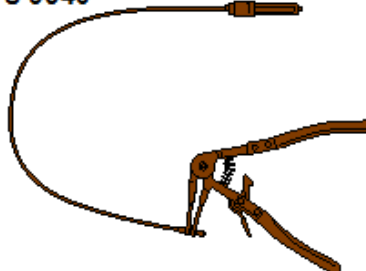
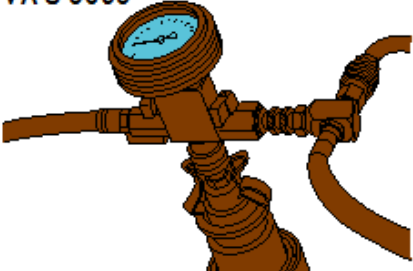


- Fit cooling system tester - V.A.G 1274 B- with adapter - V.A.G 1274/9- onto coolant filler cap.
- Build up pressure using hand pump of cooling system tester.
- The pressure relief valve must open at a pressure of 1.6 to 1.8 bar.
- Renew filler cap, if pressure relief valve does not open as described.



## 1.3 Draining and adding coolant



**Special tools and workshop  
 equipment required**

<p><b>T10007 A</b></p> 	<p><b>VA S 6208</b></p> 
<p><b>VA S 6340</b></p> 	<p><b>VA S 6096</b></p> 
<p><b>V.A.G. 1274/8</b></p> 	

W19-10053

- ◆ Adapter for cooling system tester - V.A.G 1274/8-
- ◆ Hose clamp pliers - VAS 6340-
- ◆ Coolant system charge unit - VAS 6096-
- ◆ Drip tray for workshop hoist - VAS 6208-
- ◆ Refractometer - T10007 A-
- ◆ Vehicle diagnostic tester

## Draining

### ⚠ CAUTION

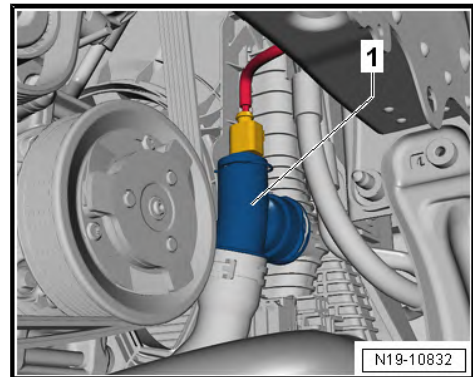
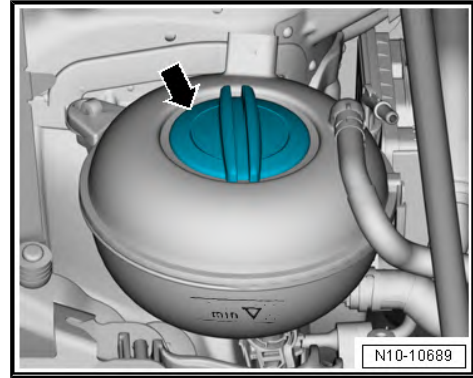
On a warm engine, the cooling system is under high pressure. Hot steam/hot coolant can escape - risk of scalding.

Skin and other parts of the body may be scalded.

- Wear protective gloves.
- Wear protective goggles.
- Reduce pressure by covering the cap of the coolant expansion tank with cloths and opening it carefully.

- Open filler cap -arrow- for coolant expansion tank.
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
- Place drip tray for workshop hoist - VAS 6208- underneath.
- Disconnect coolant hose -1- from lower right of radiator, and drain coolant.

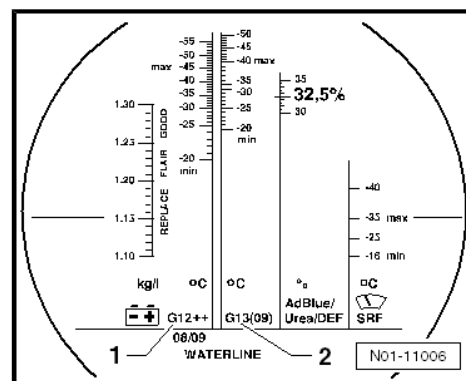
Preparing cooling system for filling:





## Note

- ◆ *The water used for mixing has a major influence on the effectiveness of the coolant. Because the water quality differs from country to country and even from region to region, the quality of the water to be used in the cooling system has been specified by Volkswagen. Distilled water fulfils all requirements. Therefore, always use only distilled water when mixing coolant for topping up or renewing coolant.*
- ◆ *Use only coolant additives which conform with the ⇒ Electronic parts catalogue (ETKA) . Other coolant additives may reduce corrosion protection substantially. The resulting damage could lead to loss of coolant and subsequent severe damage to the engine.*
- ◆ *Mixed in the proper proportions, coolant inhibits frost and corrosion damage as well as scaling. Such additives also raise the boiling point of the coolant. For this reason, the cooling system must be filled all-year-round with coolant additives.*
- ◆ *Because of its high boiling point, the coolant improves engine reliability under heavy loads, particularly in countries with tropical climates.*
- ◆ *Use ONLY refractometer - T10007A- for determining current anti-freeze value.*
- ◆ *The frost protection must be effective down to at least -25 °C, and approx. -36 °C in cold countries. The effectiveness of the frost protection may only be increased if a higher level of frost protection is required due to the climate. It may, however, be increased only to a maximum of -48°C. Otherwise, the cooling effect will be impaired.*
- ◆ *The coolant concentration must not be reduced by adding water even in warmer seasons and in warmer countries. Frost protection must be guaranteed down to at least -25 °C.*
- ◆ *Read off the level of frost protection on the scale for the relevant coolant additive.*
- ◆ *The temperature read off the refractometer - T10007A- corresponds the »ice flocculation point«. Flakes of ice may start forming in the coolant at this temperature.*
- ◆ *Never reuse old coolant.*
- ◆ *Use only a water/coolant additive mixture as a slip agent for coolant hoses.*

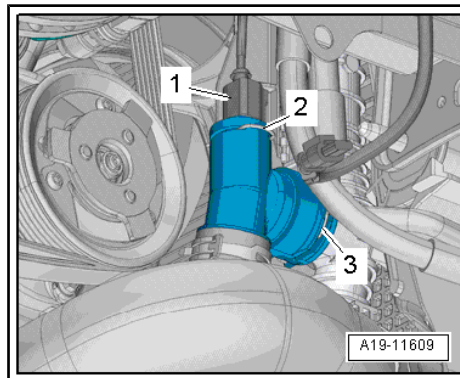


## Coolant mixture ratio

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

## Procedure

- Connect coolant hose with plug-in connector -1- to radiator at bottom right ➔ [page 259](#) .
- Connect connector -1- of radiator outlet coolant temperature sender .



- Fill coolant expansion tank of -VAS 6096- with 10 litres of pre-mixed coolant in correct mixture ratio; mixture ratio ➔ [page 209](#) .
- Screw adapter for cooling system tester - V.A.G 1274/8- into coolant expansion tank.
- Place cooling system charge unit - VAS 6096- on adapter - V.A.G 1274/8- .
- Feed vent hose -2- into a small container -3-.



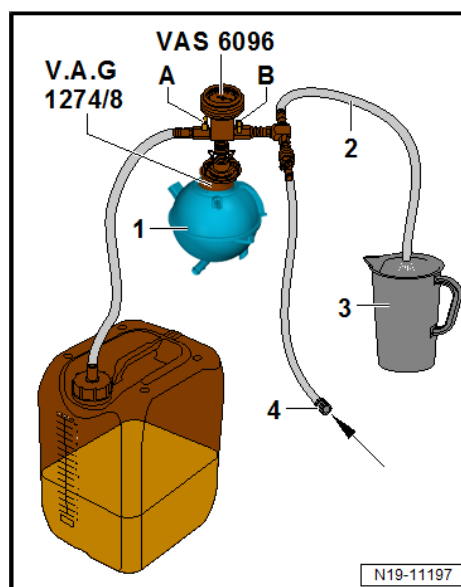
## Note

*Exhaust air takes a slight quantity of coolant along with it; this should be collected.*

- Close both valves -A- and -B- and turn the lever at right angles to direction of flow.
- Fit hose -3- to compressed air supply with a pressure of 6 ... 10 bar.
- Connect ➔ Vehicle diagnostic tester, and select following functions.

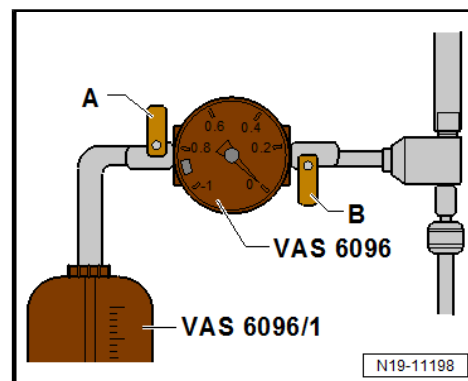
◆ Engine control unit functions

◆ 0001 - Fill/bleed cooling system




### Filling with coolant:

- Open valve -B- by setting lever in direction of flow.
- The suction-jet pump reduces pressure in the cooling system to below atmospheric pressure. The display instrument needle must move to the green area.
- Also briefly open valve -A- (turn lever in direction of flow to do this) so that hose on -VAS 6096- coolant reservoir fills with coolant.
- Close valve -A- again.
- Leave valve -B- open for a further 2 minutes.
- The suction-jet pump will continue generating a vacuum in the cooling system. The pointer of the indicator must remain in the green zone.
- Close valve -B-.
- The needle on the gauge must stay in the green zone. The low pressure in the cooling system is then sufficient for subsequent filling.

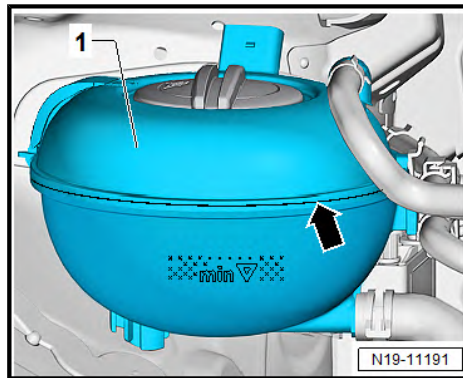


### Note

- ◆ *If the needle does not reach the green zone, repeat the process.*
- ◆ *If vacuum drops, cooling system must be checked for leaks.*
- ◆ *The subsequent filling must be performed »slowly«.*
- Detach the compressed air hose.
- Open valve -A- slowly.
- Vacuum in cooling system causes coolant to be extracted from -VAS 6096- coolant reservoir and coolant system to be filled.
- The coolant level must be above the max. marking after filling.
- Remove cooling system charge unit - VAS 6096- from coolant expansion tank.
- Fill coolant up to max. mark.
- Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
- On vehicles with auxiliary heater, switch on auxiliary heater for about 30 seconds.
- Set temperature regulator to “HI”.
- Switch off air conditioner compressor. To do this, press  button.
- LED in button should not light up.
- Start engine and run it for max. 2 min. at a speed of approx. 1500 rpm.
- Fill coolant up to the overflow hole of the coolant expansion tank while the engine is running.
- Tighten cap of coolant expansion tank until it engages.
- Then run engine at idling speed until radiator fan cuts in.



- Check coolant level.

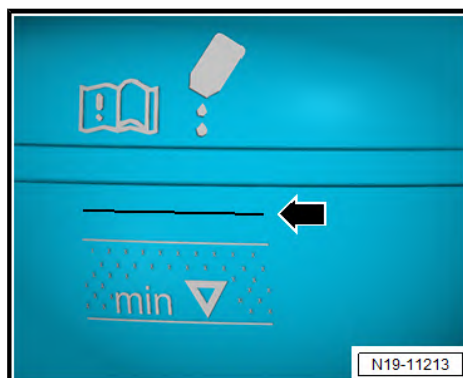


- When the engine is at operating temperature, the coolant level must be at the »weld seam« -arrow-.
- When the engine is cold, the coolant level must be approx. 5 mm above the max. mark -arrow-.



#### Note

*This excessive amount of coolant level is necessary since the coolant level may decrease automatically due to bleeding process.*



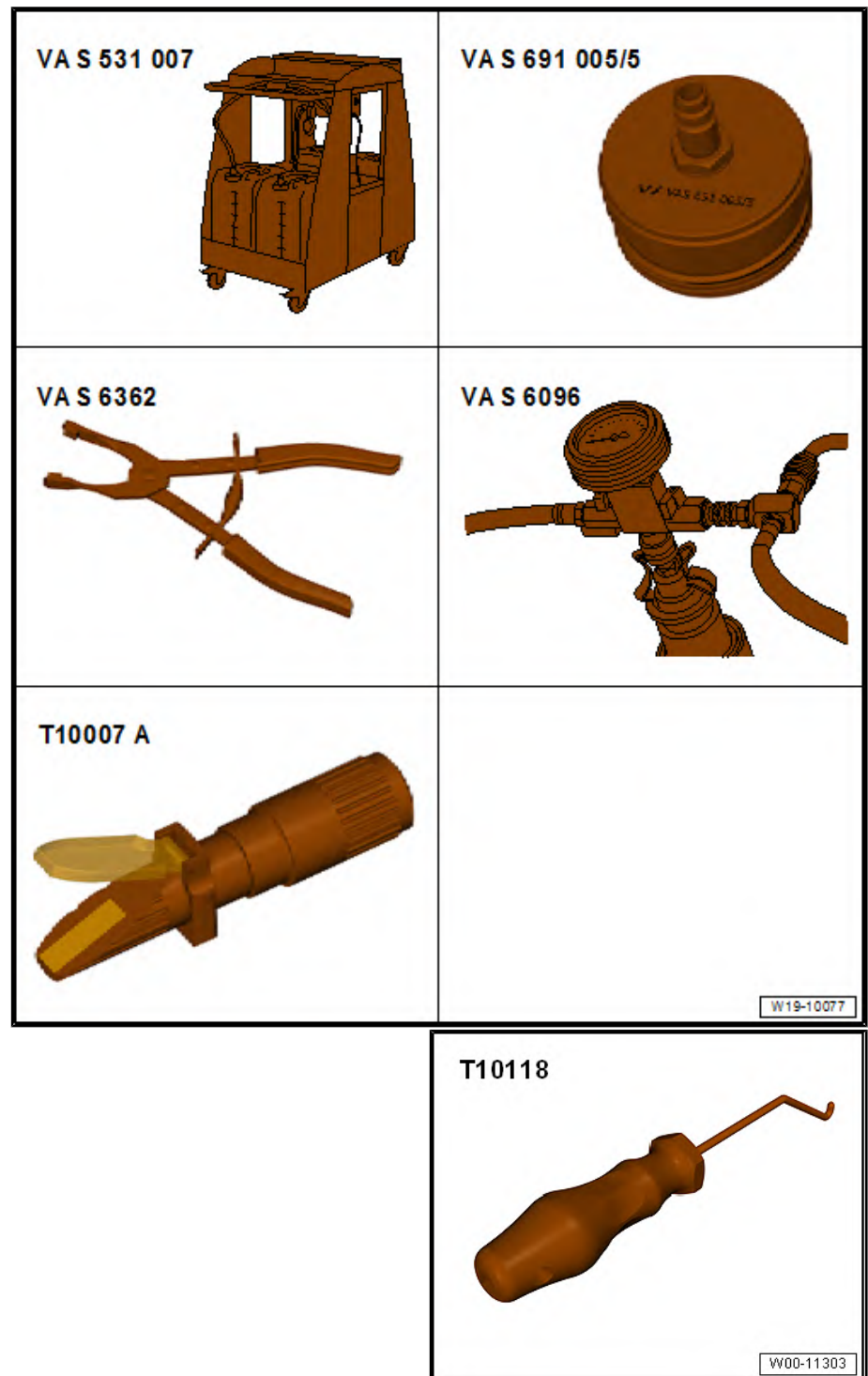
## 1.4 Flushing cooling system



#### Note

- ◆ *The coolant must be drained before the system is flushed. Then the cooling system must be filled with distilled water.*
- ◆ *The cooling system is flushed with 20 l of distilled water. Then, the distilled water is replaced by coolant (mixture ratio 50:50).*
- ◆ *Never reuse old coolant.*
- ◆ *For a quick reference guide, refer to ⇒ ["1.5 Flushing cooling system, quick reference guide"](#), page 231 . The quick reference guide contains the basic steps of the workflow. It might be helpful to print out the guide and tick off the corresponding work steps after having performed them.*

**Special tools and workshop  
 equipment required**



- ◆ Coolant flushing and filling device - VAS 531 007-
- ◆ Test adapter - VAS 691 005/5-
- ◆ Hose clip pliers - VAS 6362-
- ◆ Drip tray for workshop hoist - VAS 6208-
- ◆ Suction-jet pump from cooling system charge unit - VAS 6096-
- ◆ Refractometer - T10007 A-
- ◆ Compressed air connection with 6 ... 10 bar(g)

◆ Assembly aid - T10118-

**Schematic overview of coolant flushing and filling device - VAS 531 007- :**

**1 - Container with distilled water**

- ☐ Fill with 30 l of distilled water

**2 - Container with coolant**

- ☐ Fill with 30 l of coolant
- ☐ Frost protection down to approx. -36 °C

**3 - Empty container**

- ☐ For used coolant

**4 - Empty container**

- ☐ For used coolant

**5 - Suction hose**

- ☐ Comes from connection 2 on sight glass

**6 - Inspection hole**

- ☐ When opaque, clean sight glass with a nylon brush

**7 - Pump**

- ☐ Cut-out pressure approx. 1.5 bar

**8 - Valve block**

- ☐ With pressure gauge and shut-off taps

**9 - Drain hose**

- ☐ Connected to valve block for releasing pressure

**10 - Flushing hose**

- ☐ Connected to breather hose of coolant expansion tank for flushing
- ☐ Comes from connection 1 on sight glass
- ☐ Seal with plugs when not in use

**11 - Sealing cap**

**12 - Hose clamps**

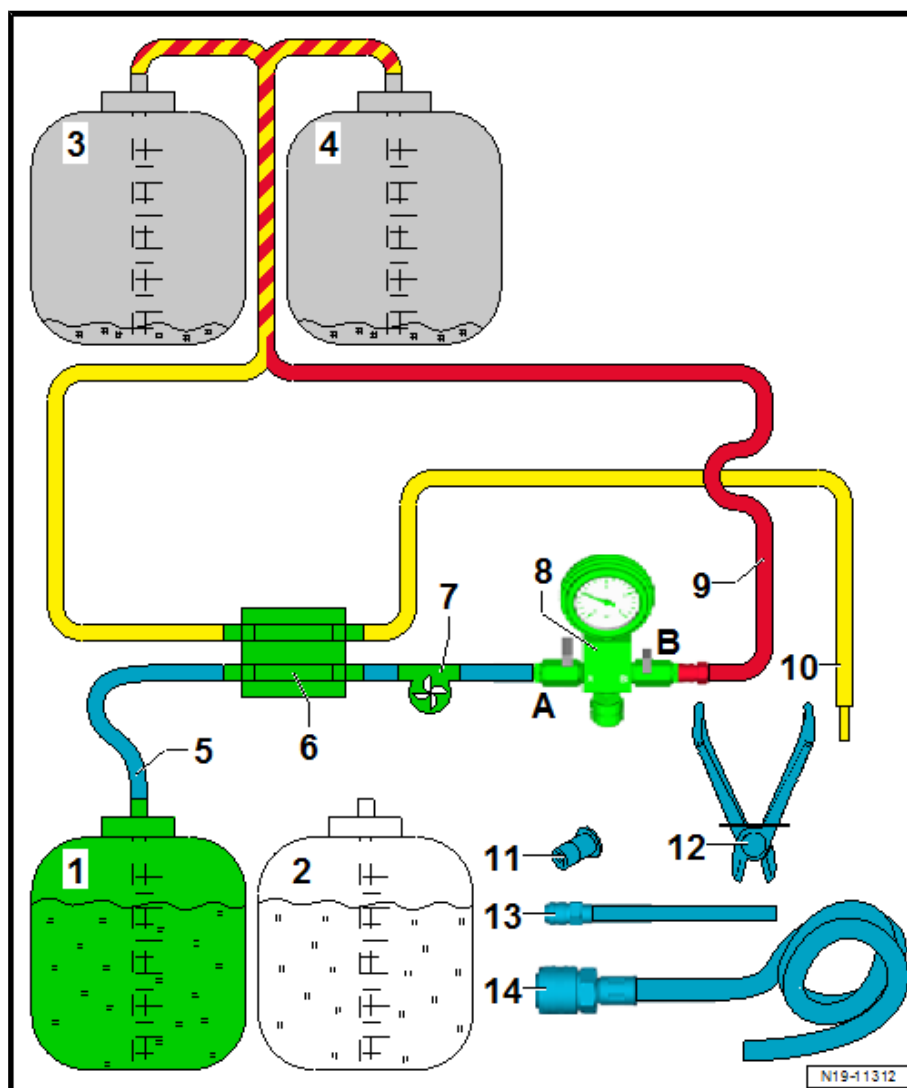
- ☐ 4 pieces

**13 - Cleaning adapter**

- ☐ Approx. 15 cm in length
- ☐ For cleaning coolant flushing and filling device after flushing
- ☐ Connected between valve block and flushing hose ➔ [Item 10 \(page 214\)](#) (10)

**14 - Extraction adapter**

- ☐ Approx. 100 cm in length
- ☐ Connected to suction hose ➔ [Item 5 \(page 214\)](#) (5) for extracting coolant



**Procedure:**

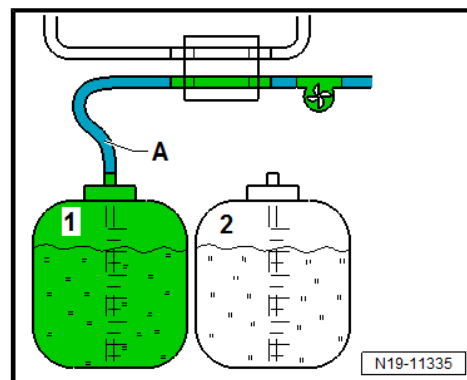
- Remove engine cover panel ⇒ [page 50](#) .
- Drain coolant ⇒ [page 206](#) .
- With coolant hose pulled off, pour approximately 1 litre of distilled water into the coolant expansion tank.
- Drain coolant into drip tray .
- Re-connect detached coolant hoses.

**Preparing coolant flushing and filling device - VAS 531 007- :**

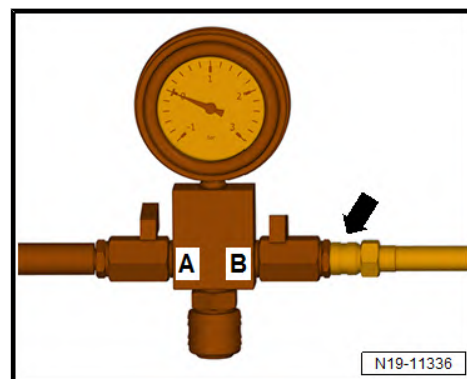
- Fill container »1« with 30 l of distilled water.
- Fill container »2« with 30 l of coolant. Mixture ratio is 50:50 for frost protection down to approx. -36°C.
- Empty containers »3« and »4«.
- Remove valve block from plug-in connector on equipment trolley.
- Connect coolant flushing and filling device - VAS 531 007- to battery.

**Bleeding coolant flushing and filling device - VAS 531 007- :**

- Connect suction hose -A- to container »1« with distilled water.



- Connect drain hose -arrow- to plug-in connector -B- on valve block.



- Close shut-off taps -A- and -B-.



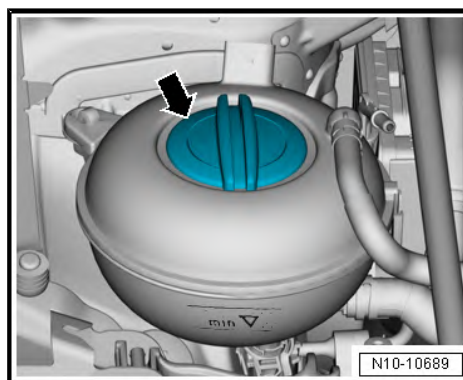
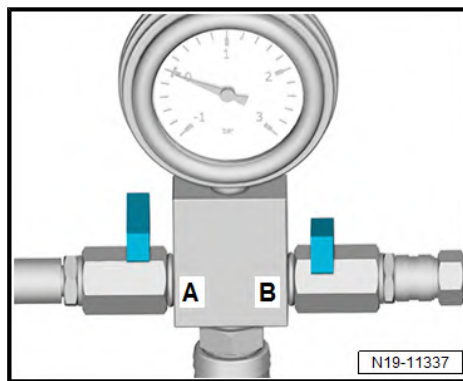
### Note

*Do not fit the valve block onto the test adapter - VAS 691 005/5- yet. The filler hose must be bled first.*

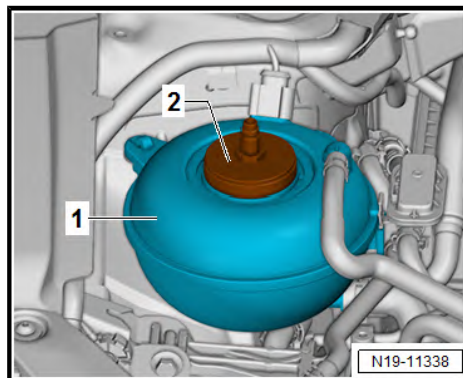
- Switch on pump for -VAS 531 007- .
- Open cut-off tap -A-.
- Open shut-off tap -B- briefly to bleed filler hose.
- Close shut-off taps -A- and -B-.

### Connecting coolant flushing and filling device - VAS 531 007- :

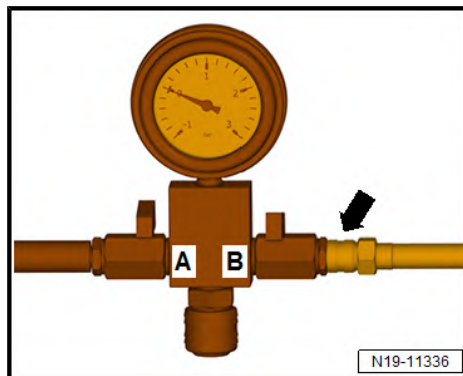
- Open filler cap -arrow- of coolant expansion tank.



- Screw test adapter -2- ( -VAS 691 005/5- ) onto coolant expansion tank -1-.

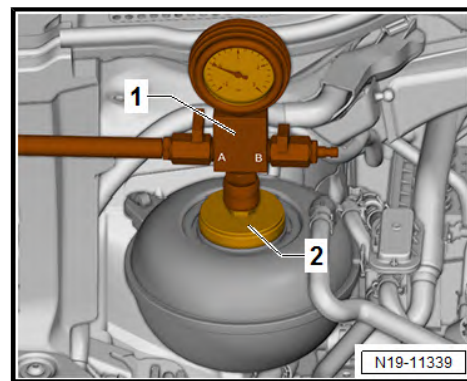


- Pull drain hose -arrow- off plug-in connector -B- on valve block.

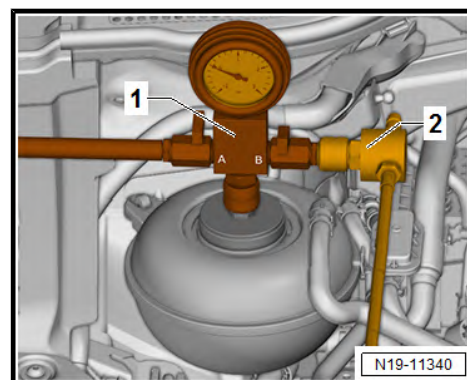




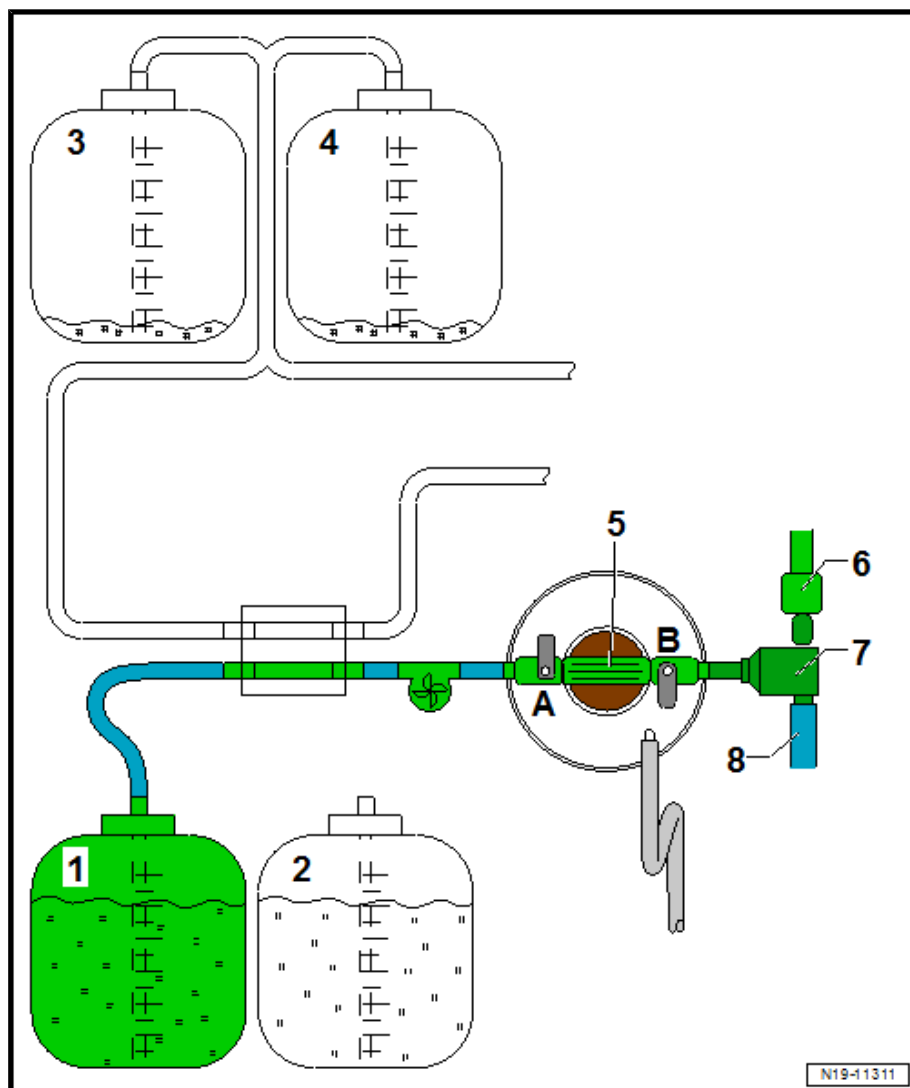
- Fit valve block -1- onto test adapter -2-.



- Connect suction-jet pump -2- from -VAS 6096- to plug-in connector -B- on valve block -1-.



Filling cooling system with distilled water:



- Place end of vent hose -8- of suction-jet pump into a container.
- Connect compressed air hose -6- to suction-jet pump -7-.
- Open shut-off tap -B- on valve block -5-.
- The suction-jet pump reduces pressure in the cooling system to below atmospheric pressure. The pointer of the pressure gauge must fall to at least - 0.85 bar.
- Close shut-off tap -B-.
- Pull off compressed air hose -6-.
- Observe pressure gauge. The pointer of the pressure gauge must remain stationary at - 0.85 bar at least. The low pressure in the cooling system is then sufficient for subsequent filling.



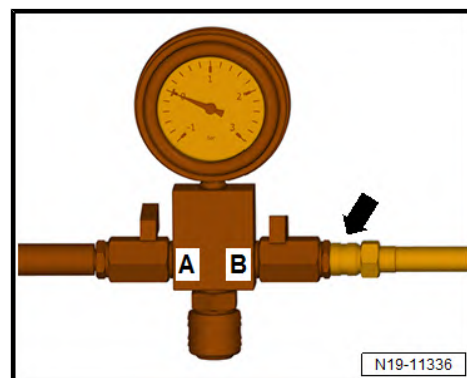
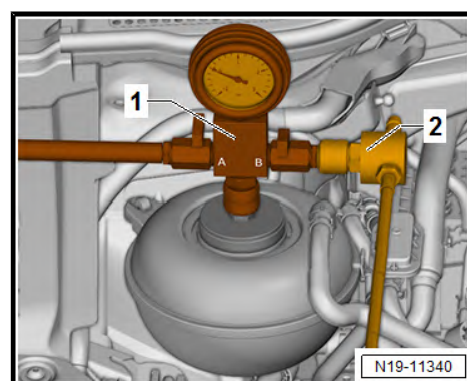
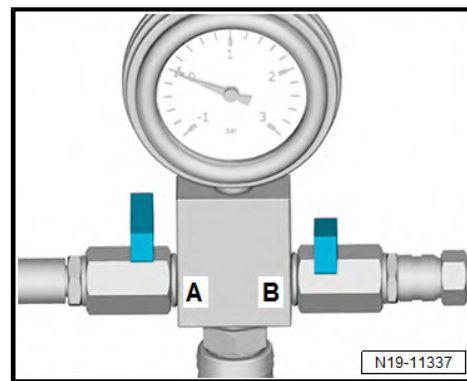
#### Note

- ◆ If the vacuum drops, the cooling system must be checked for leaks.
- ◆ The vacuum that builds up depends on the pressure in the compressed air system.

- The pump of the -VAS 531 007- must be switched on.
- Slowly open shut-off tap -A-.
- The vacuum in the cooling system causes the distilled water to be drawn into the cooling system, and thus causes the cooling system to be filled. In addition, the pump of the -VAS 531 007- feeds distilled water into the coolant expansion tank.
- Fill cooling system until pressure of approx. 1 bar can be read off gauge.

After filling, the pressure in the coolant expansion tank must be released. Proceed as follows to do this:

- Close shut-off tap -A- after filling.
- Remove suction-jet pump -2- from valve block -1- .
- Connect drain hose -arrow- to plug-in connector. Open shut-off tap -B-, and leave it open so that the pressure in the cooling system releases.



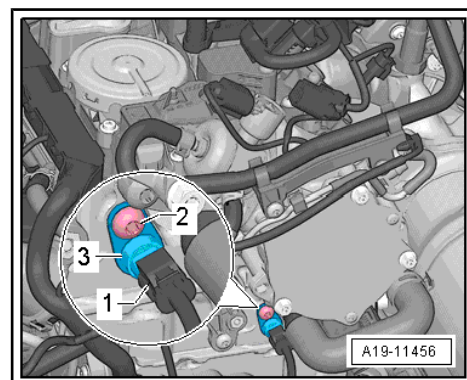
- Remove air filter housing ⇒ [page 322](#) .
- With ignition switched off, release and pull off electrical connector -1- on engine temperature sender - G62- -3-.



#### Note

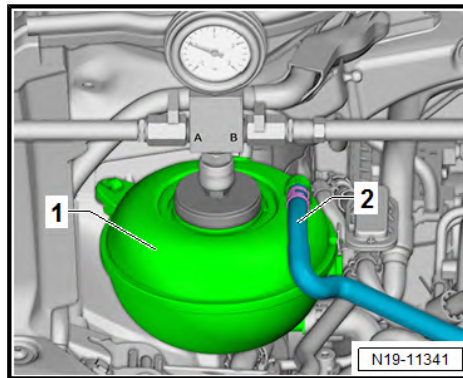
*If the connector of the coolant temperature sender - G62- is pulled off, the actuator for engine temperature regulation - N493- will open and the radiator fan will start to operate as soon as the engine is started.*

- Temporarily, install air filter housing so that corresponding location on cylinder head remains free. Air filter housing can be placed on battery, for example.
- Start engine and increase speed for approximately 1 minute. Then, switch the engine off again.



### Flushing cooling system with distilled water:

- Shut-off tap -A- is closed; shut-off tap -B- is open.
- Remove breather hose -2- from coolant expansion tank -1-.

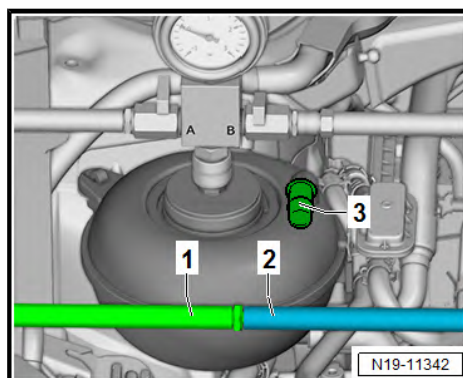


- Connect breather hose -2- from coolant expansion tank to flushing hose -1-.
- Seal connection on coolant expansion tank using plug -3-. Secure plug with a hose clip.
- Close shut-off tap -B-.

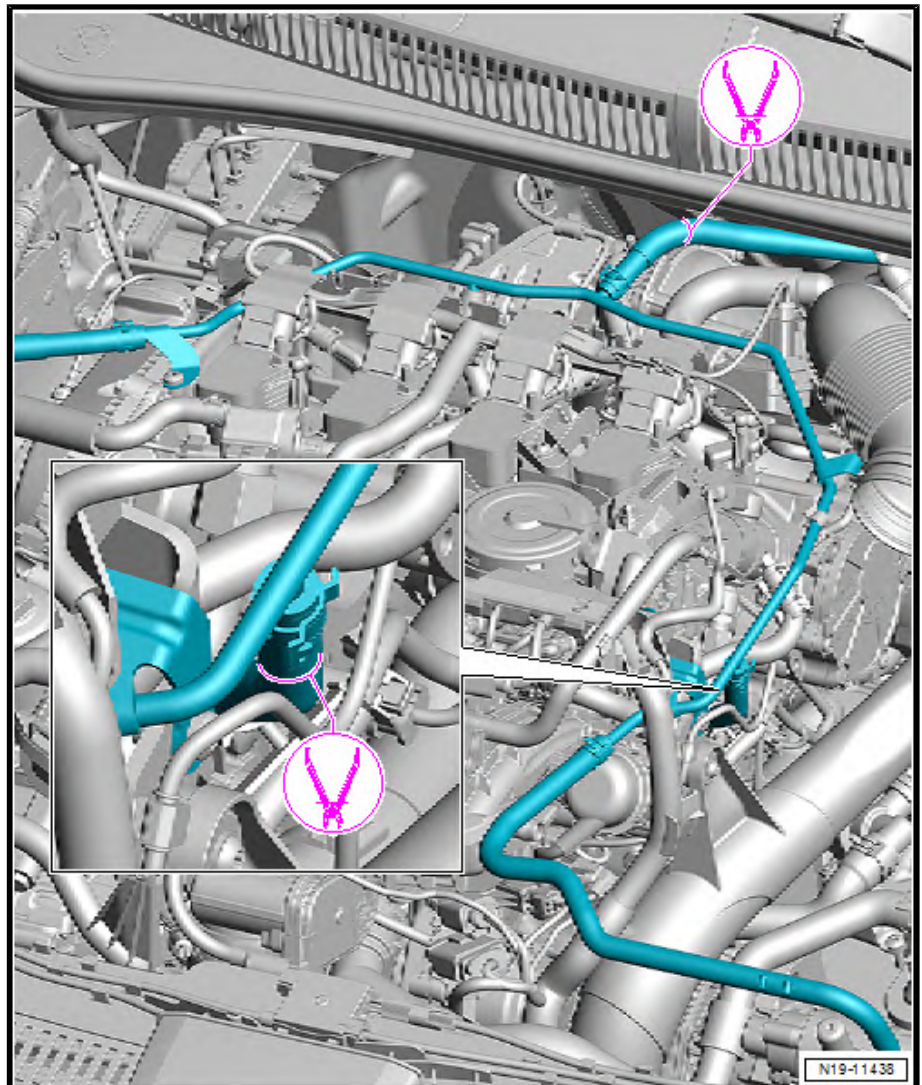


#### Note

- ◆ *Flushing of the cooling system will now begin. Please note the fill level of the tanks in order to assure correct flushing capacities.*
- ◆ *The engine is running at idling speed during the entire flushing process.*
- Start engine and run it at idling speed.
- Set heater temperature to “HI”.
- Switch off air conditioner compressor. To do this, press **AC** button.



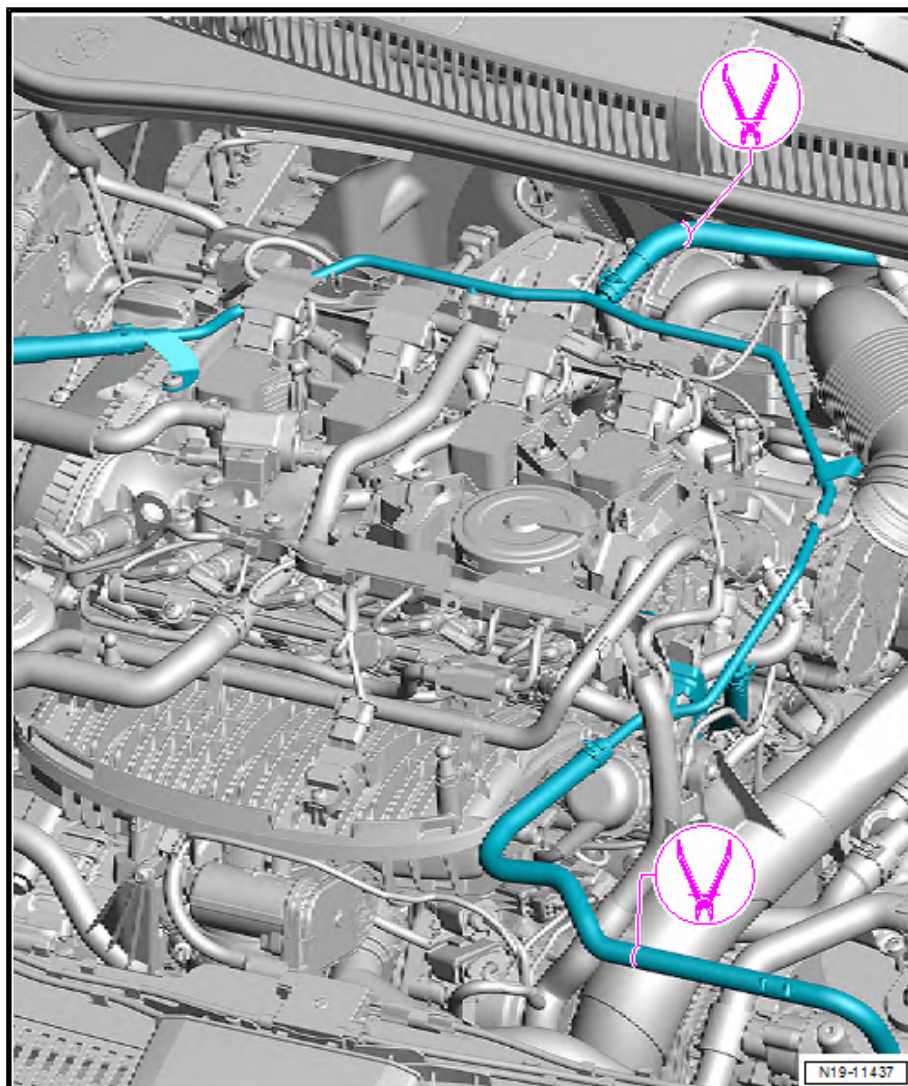
### 1. Flush cylinder block with distilled water:



- Clamp off breather hoses for heat exchanger and cylinder head with hose clamps.
- Open shut-off tap -A- on valve block.
- Pump approx. 9 litres of distilled water through engine.
- Close shut-off tap -A-.

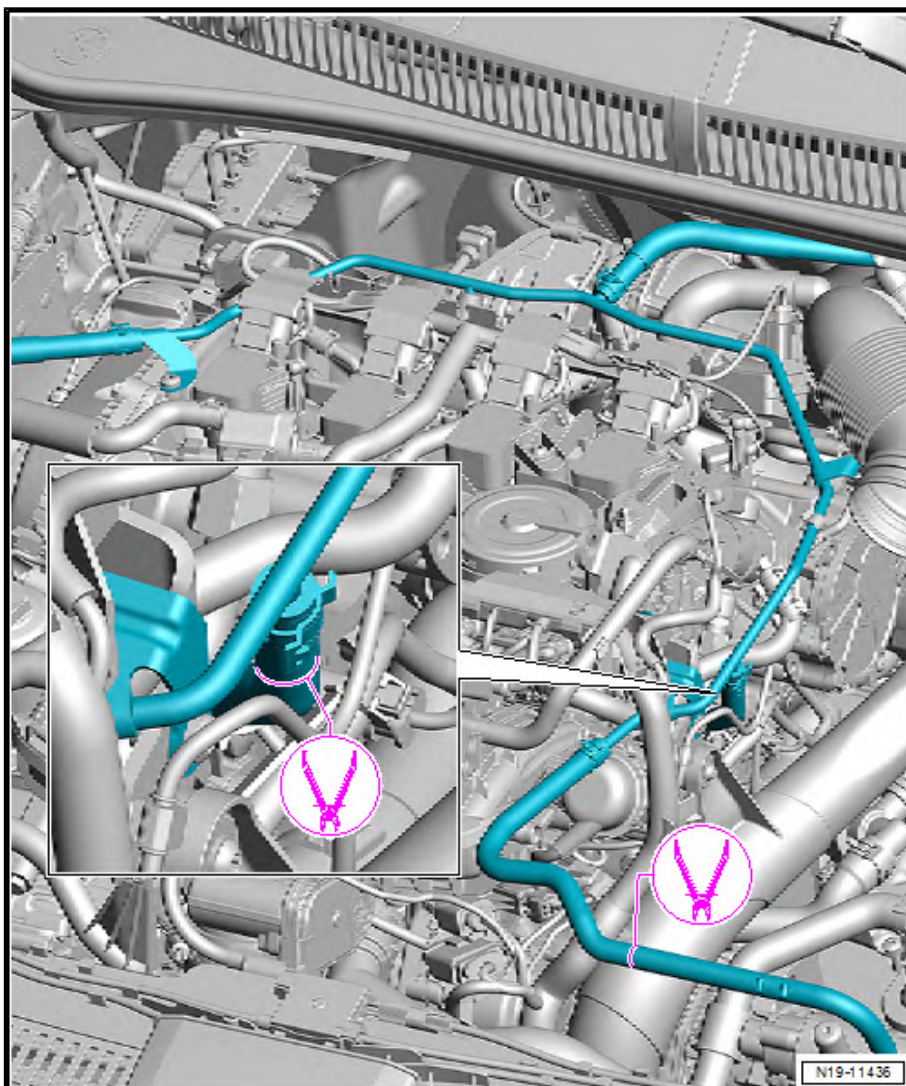
**2. Flush cylinder head with distilled water:**





- Clamp off breather hoses for heat exchanger and radiator with hose clamps.
- Open shut-off tap -A- on valve block.
- Pump approx. 2 litres of distilled water through engine.
- Close shut-off tap -A-.

**3. Flushing heat exchanger for heater with distilled water:**



- Clamp off breather hoses for radiator and cylinder head with hose clamps.
- Open shut-off tap -A- on valve block.
- Pump approx. 2 litres of distilled water through engine.
- Close shut-off tap -A-.

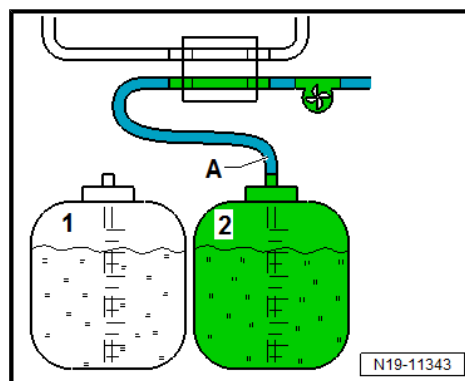
#### 4th Flushing entire cooling system

- Remove any hose clamps.
- Open shut-off tap -A- on valve block.
- Pump approx. 6 litres of distilled water through engine.
- Close shut-off tap -A-.

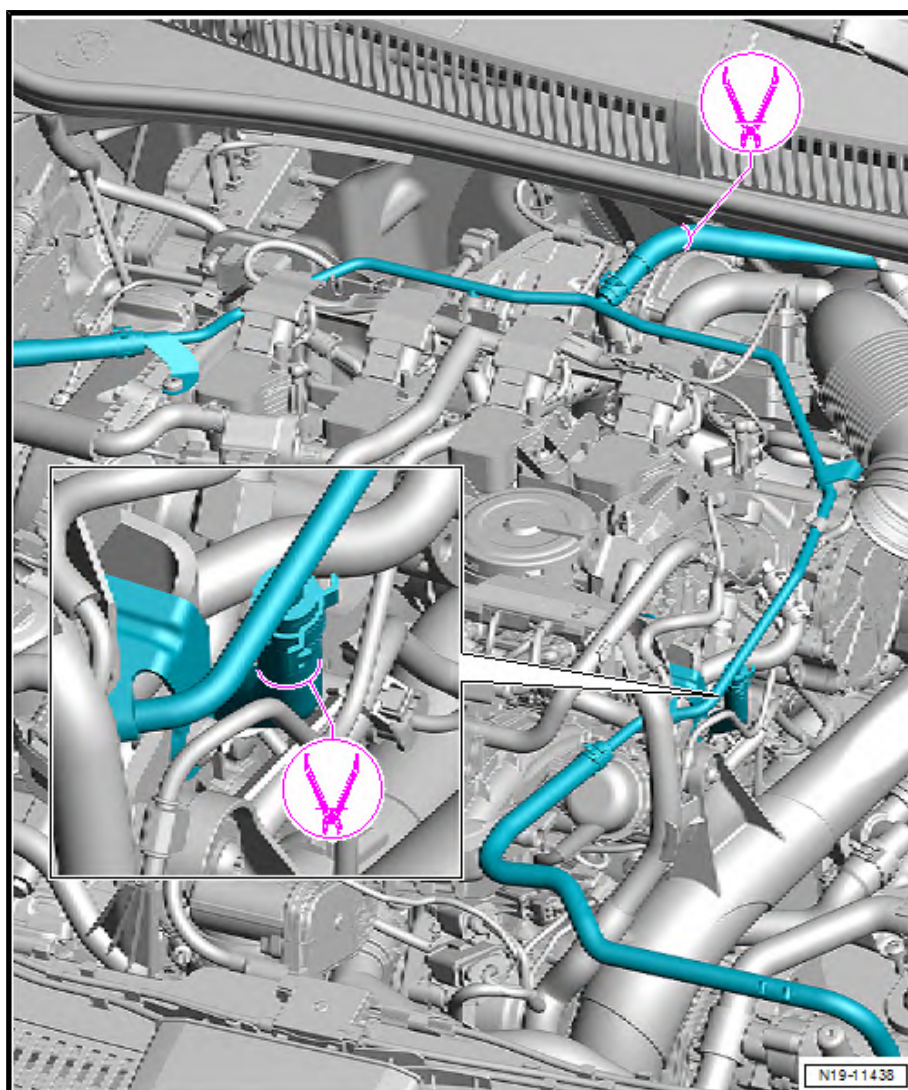


### Flushing cooling system with coolant

- Connect suction hose -A- to container -2- for coolant.

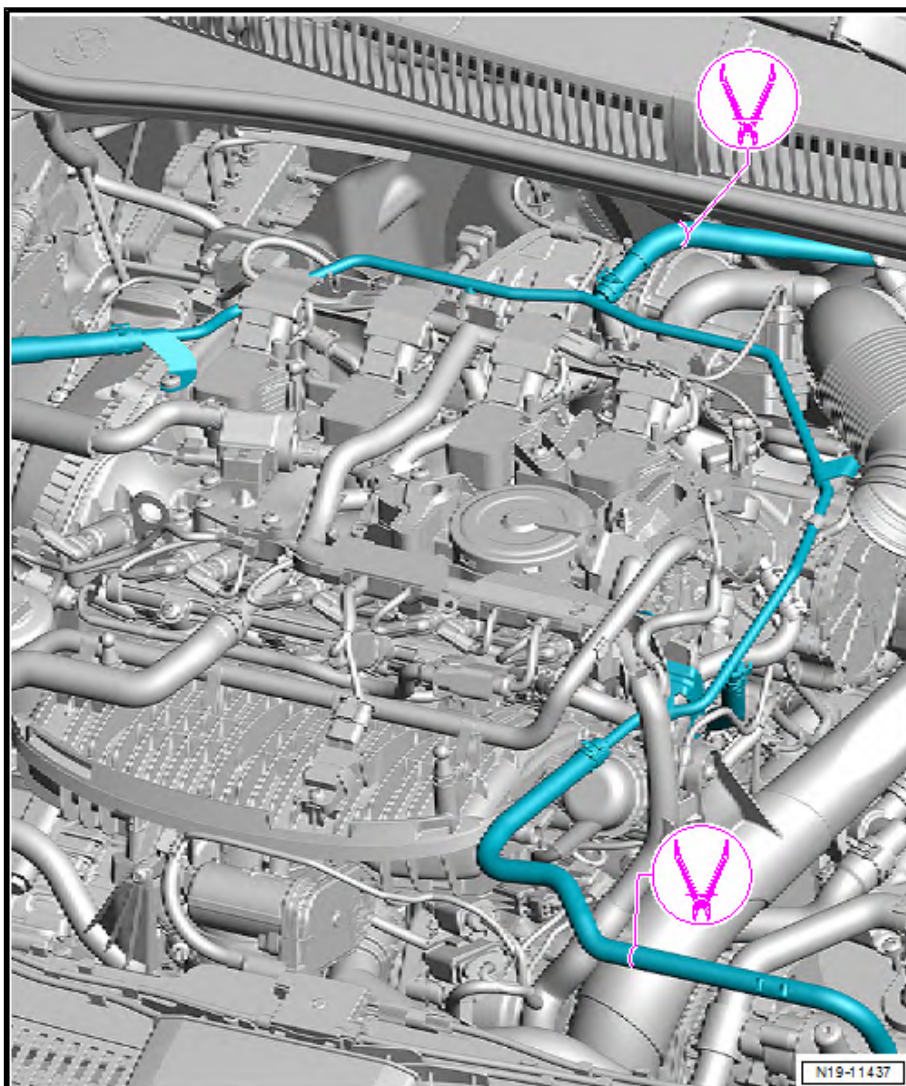


#### 1. Flush cylinder block with coolant:



- Clamp off breather hoses for heat exchanger and cylinder head with hose clamps.
- Open shut-off tap -A- on valve block.
- Pump approx. 5 litres of coolant through engine.
- Close shut-off tap -A-.

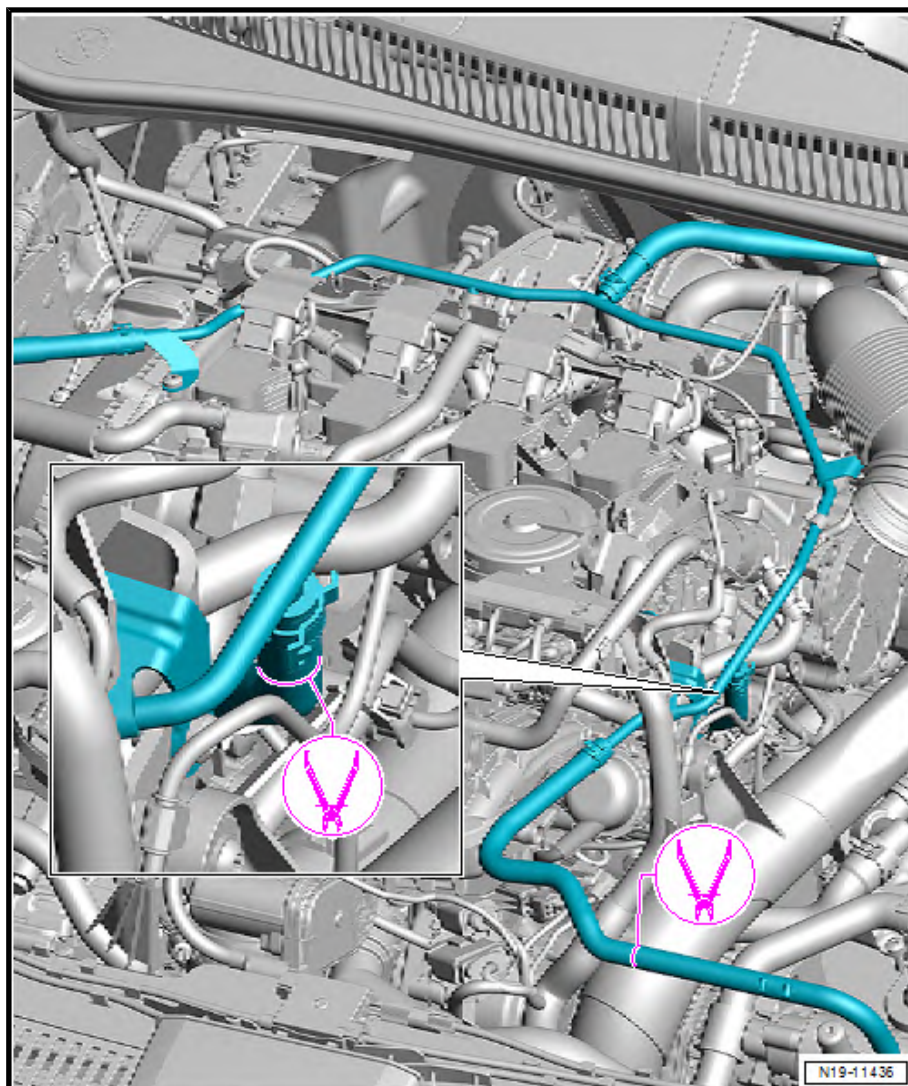
#### 2. Flush cylinder head with coolant:



- Clamp off breather hoses for heat exchanger and radiator with hose clamps.
- Open shut-off tap -A- on valve block.
- Pump approx. 5 litres of coolant through engine.
- Close shut-off tap -A-.

**3. Flushing heat exchanger for heater with coolant:**





- Clamp off breather hoses for radiator and cylinder head with hose clamps.
- Open shut-off tap -A- on valve block.
- Pump approx. 2 litres of coolant through engine.
- Close shut-off tap -A-.

#### 4th Flushing entire cooling system

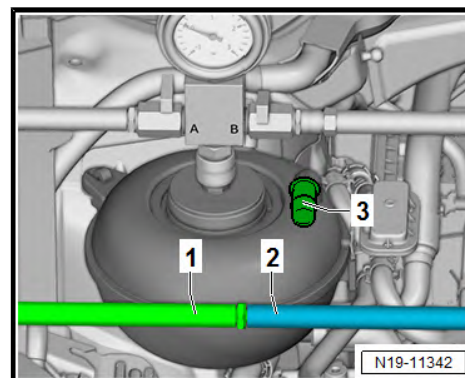
- Remove any hose clamps.
- Open shut-off tap -A- on valve block.
- Pump approx. 6 litres of coolant through engine.
- Close shut-off tap -A-.



The flushing process is now completed. Switch off the pump, and switch off the engine.

#### Removing coolant flushing and filling device - VAS 531 007- :

- Open shut-off tap -B-, and leave it open so that the pressure in the cooling system releases.
- Pull plug -3- off coolant expansion tank, and reconnect breather hose -2-.
- Use plug to seal flushing hose -1-.

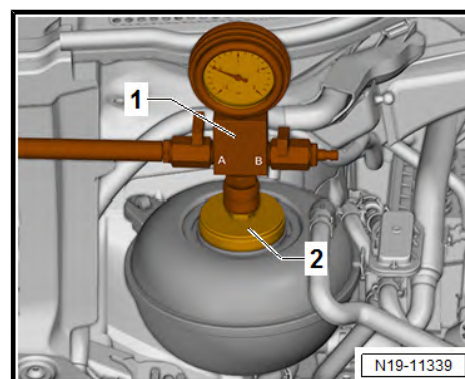


- Remove valve block -1- and test adapter -2-.
- If anti-freeze protection down to approx. -36°C is required, drain coolant expansion tank empty, and fill it with coolant concentrate.

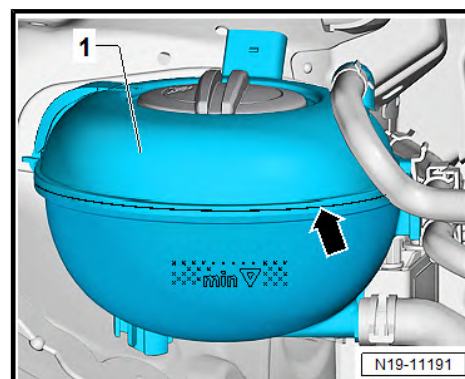


#### Note

The coolant flushing and filling device - VAS 531 007- can be used for extracting coolant ⇒ [page 228](#).



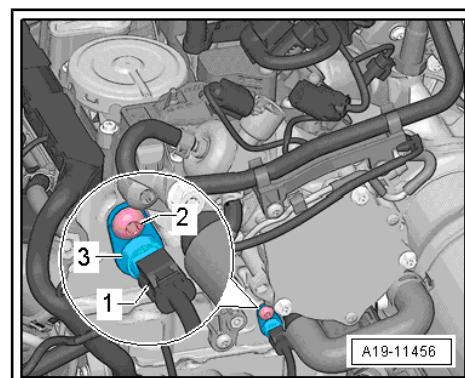
- The coolant level must be at the »weld seam« -arrow-.

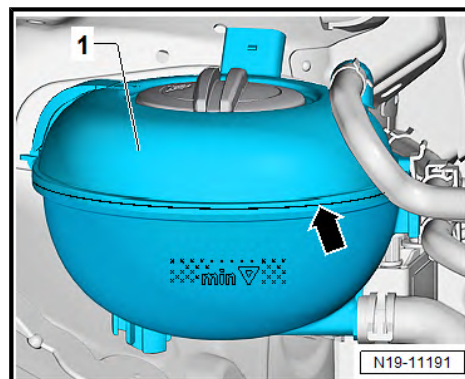


- Reattach electrical connector -1- on coolant temperature sender - G62- -3-.
- Install air filter housing at its final installation position.
- Separating the connectors caused entries to be stored in the event memory of the engine control unit. Erase event memory ⇒ Vehicle diagnostic tester.
- Close filler cap on coolant expansion tank (make sure it engages).
- Then run engine at idling speed until radiator fan cuts in.

#### Check coolant level and frost protection

- If the frost protection is not sufficient, extract coolant from coolant expansion tank. Set correct frost protection by filling more coolant concentrate.
- After each time coolant concentrate has been filled, run engine at increased engine speed for about 2 minutes, and check frost protection again.

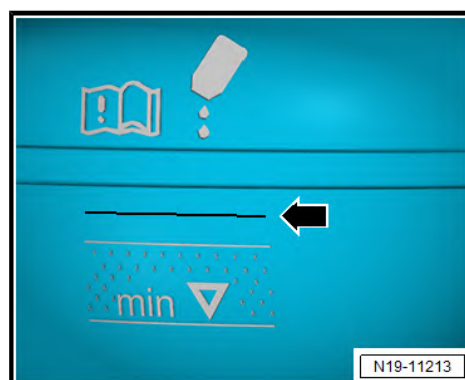


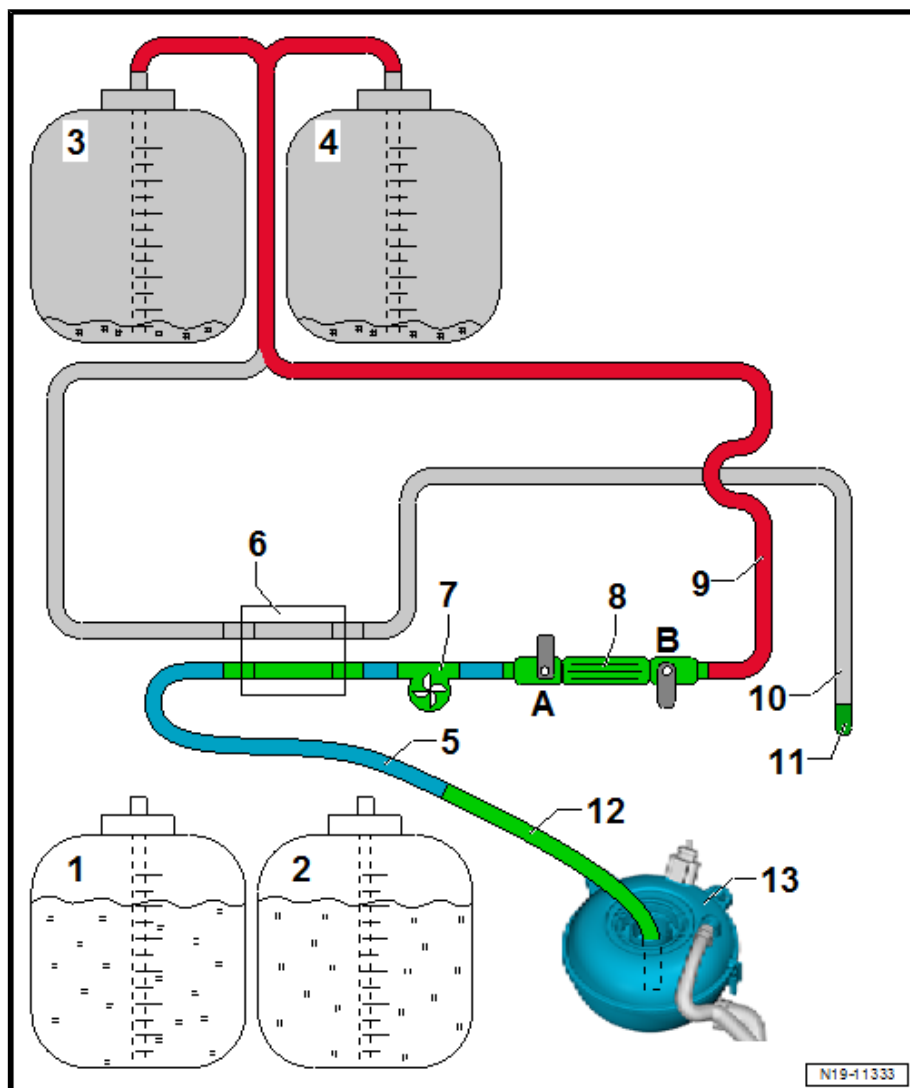


- The frost protection must be effective down to at least -25 °C, and approx. -36 °C in cold countries. The effectiveness of the frost protection may only be increased if a higher level of frost protection is required due to the climate. But only down to -48 °C, otherwise the cooling effect of the coolant gets worse.
- When the engine is at operating temperature, the coolant level must be at the »weld seam« -arrow-.
- When the engine is cold, the coolant level must be approx. 5 mm above the max. mark -arrow-.

**Note**

*This excessive amount of coolant level is necessary since the coolant level may decrease automatically due to bleeding process.*

**Extracting coolant:**

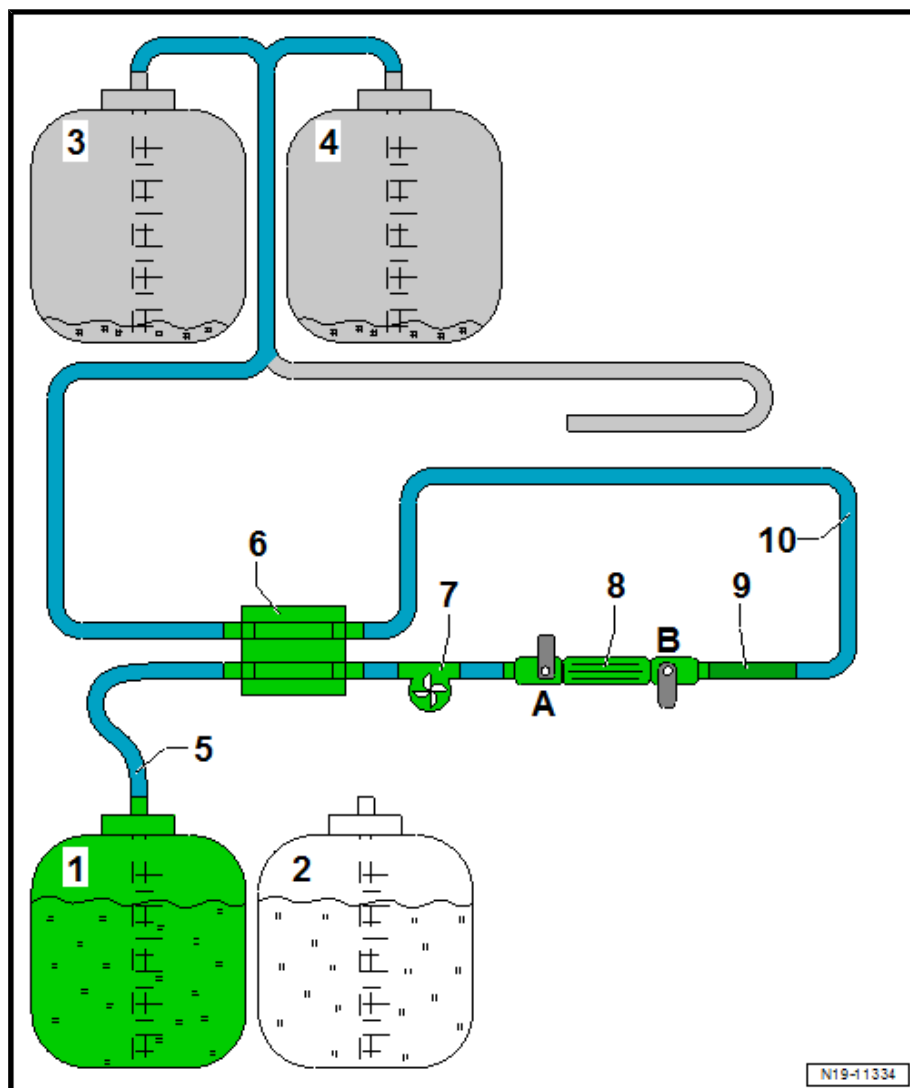


#### Note

Use the extraction adapter ⇒ [Item 14 \(page 214\)](#) (14) for extracting the coolant.

- Detach suction hose -5- from container -2-.
- Fit extraction adapter -12- onto plug-in connector of suction hose -5-.
- Switch on pump -7-, and open shut-off taps -A- and -B- on valve block -8-.
- Use extraction adapter -12- to extract any excess coolant.
- Close shut-off taps on valve block, and switch off pump.

**Cleaning coolant flushing and filling device - VAS 531 007- :**



### Note

- ◆ If coolant remains in the sight glass for longer periods of time, the sight glass may become opaque. Therefore, the sight glass must be flushed with distilled water after the flushing procedure has been completed.
- ◆ If the sight glass is opaque, it must be cleaned with a nylon brush.
- ◆ Use cleaning adapter ⇒ [Item 13 \(page 214\)](#) (13) for flushing.
- Connect suction hose -5- to container -1- for distilled water.
- Fit flushing hose -10- onto cleaning adapter -9-. Fit cleaning adapter -9- to plug-in connector -B- on valve block -8-.
- Open shut-off valves -A- and -B- on valve block -8-.
- Switch on pump -7-, and pump distilled water through hoses until coolant has been flushed out of sight glass -6-.
- Switch off pump, and close shut-off taps.
- Remove cleaning adapter, and seal flushing hose with plug.

## 1.5 Flushing cooling system, quick reference guide



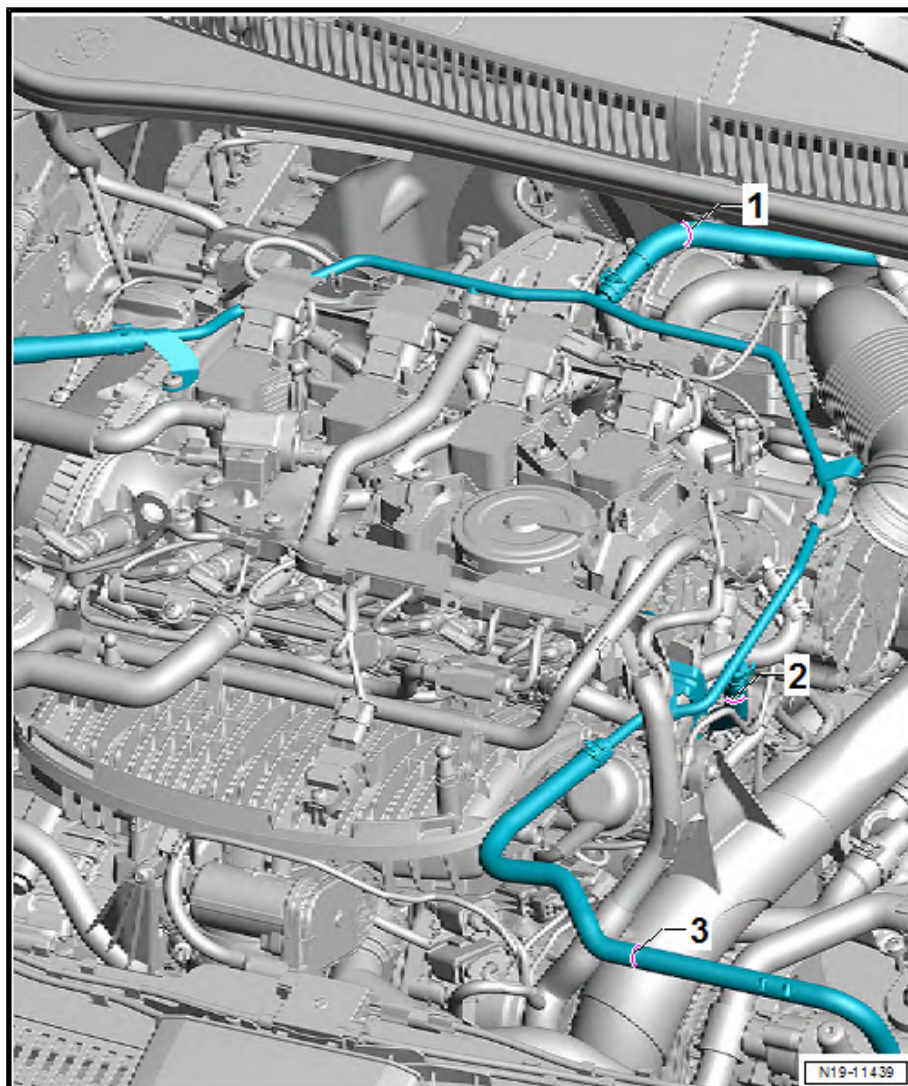
### Note

*The quick reference guide contains the basic steps of the workflow. It might be helpful to print out the guide and tick off the corresponding work steps after having performed them. For a detailed description of the necessary work steps, refer to ⇒ "1.4 Flushing cooling system", page 212.*

phase	Measure	Volume of flushing medium
1	Coolant: draining	---
2	Fill cooling system with distilled water	---
3	Pull connector off coolant temperature sender - G62-	---
4	Run engine at idling speed	---
5	Clamp off breather hose for heat exchanger -1- and cylinder head -2-; flush cooling system	9 l of distilled water
6	Clamp off breather hose for heat exchanger -1- and radiator -3-; flush cooling system	2 l of distilled water
7	Clamp off breather hose for cylinder head -2- and radiator -3-; flush cooling system	2 l of distilled water
8	Remove all clamps; flush cooling system	6 l of distilled water
9	Clamp off breather hose for heat exchanger -1- and cylinder head -2-; flush cooling system	5 l of coolant
10	Clamp off breather hose for heat exchanger -1- and radiator -3-; flush cooling system	5 l of coolant
11	Clamp off breather hose for cylinder head -2- and radiator -3-; flush cooling system	2 l of coolant
12	Remove all clamps; flush cooling system	6 l of coolant
13	Switch off engine	---
14	Drain coolant expansion tank empty, and fill with coolant concentrate	---
15	Fit connector of coolant temperature sender - G62-	---
16	Run engine until radiator fan starts to operate.	---
17	Checking frost protection	---



- 1 - Breather hose of heat exchanger for heater unit
- 2 - Breather hose for cylinder head
- 3 - Breather hose of radiator for engine coolant



## 2 Coolant pump/thermostat assembly

⇒ ["2.1 Assembly overview - coolant pump, thermostat", page 233](#)

⇒ ["2.2 Assembly overview - electric coolant pump", page 235](#)

⇒ ["2.3 Assembly overview - coolant temperature sender", page 238](#)

⇒ ["2.4 Coolant trailing pump V51 : removing and installing", page 238](#)

⇒ ["2.5 Removing and installing coolant pump", page 241](#)

⇒ ["2.6 Removing and installing toothed belt for coolant pump", page 244](#)

⇒ ["2.7 Removing and installing coolant shut-off valve N82 ", page 246](#)

⇒ ["2.8 Removing and installing coolant valve for gearbox N488 , vehicles with dual clutch gearbox", page 248](#)

⇒ ["2.9 Removing and installing actuator for engine temperature regulation N493 ", page 250](#)

⇒ ["2.10 Removing and installing coolant temperature sender G62 .", page 251](#)

⇒ ["2.11 Removing and installing radiator outlet coolant temperature sender G83 ", page 252](#)

### 2.1 Assembly overview - coolant pump, thermostat

# 1 - Connecting collar

## 2 - O-ring

- ☐ Renewing:
- ☐ Moisten with coolant

## 3 - Centring pin

## 4 - Bolt

- ☐ Specified torques and installation sequence  
⇒ [page 235](#).

## 5 - Articulation

- ☐ Renewing:

## 6 - Coolant pump

- ☐ Removing and installing  
⇒ [page 241](#)
- ☐ New coolant pump: remove protective cap

## 7 - Bolt

- ☐ Tightening sequence  
⇒ [page 235](#)

## 8 - Toothed belt

- ☐ For coolant pump
- ☐ Removing and installing  
⇒ [page 244](#)

## 9 - Bolt

- ☐ 9 Nm

## 10 - Toothed belt guard

## 11 - Bolt

- ☐ Left-hand thread
- ☐ Renewing:
- ☐ 10 Nm +90°

## 12 - Toothed belt drive sprocket

- ☐ Observe installation position.

## 13 - Oil seal for balance shaft, inlet side

- ☐ Renew ⇒ [page 87](#)

## 14 - Balancer shaft

## 15 - Articulation

- ☐ Renewing:

## 16 - Bolt

- ☐ 9 Nm

## 17 - Union

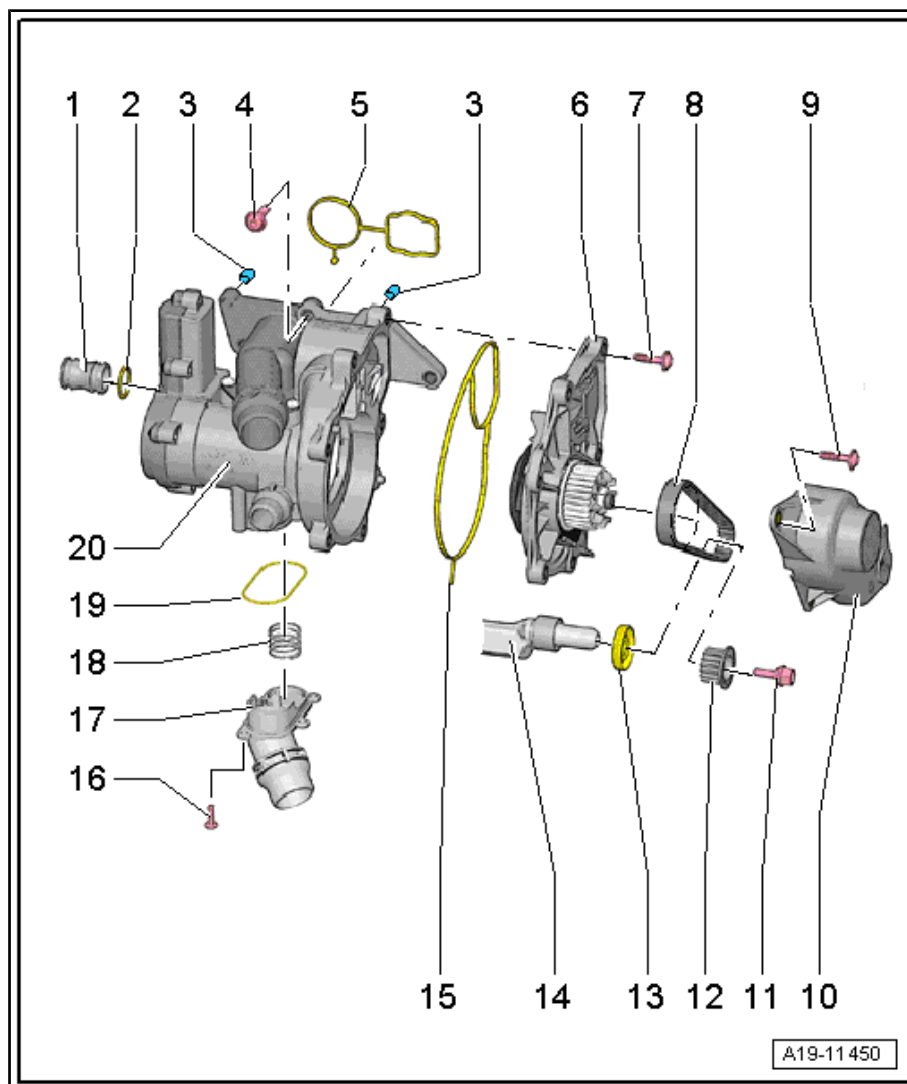
## 18 - Spring

## 19 - Articulation

- ☐ Renewing:

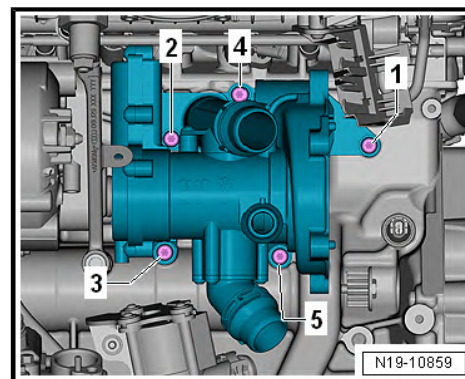
## 20 - Actuator for engine temperature regulation - N493-

- ☐ Removing and installing ⇒ [page 250](#)



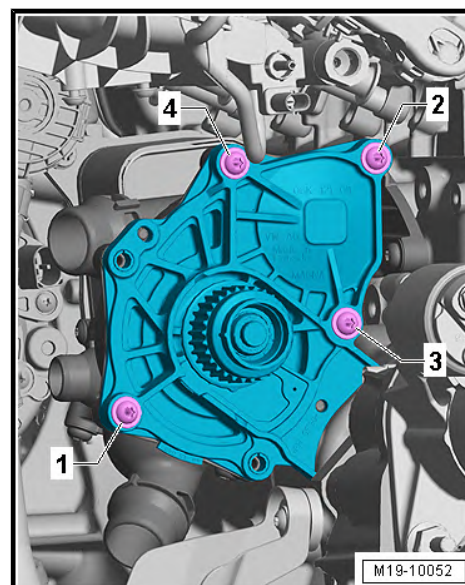
### Actuator for engine temperature regulation - N493- - tightening torque and sequence

- Tighten bolts in the order -1 ... 5- to 9 Nm.



### Coolant pump - specified torque and tightening sequence

- Tighten bolts for coolant pump in the sequence -1 ... 4- to 9 Nm.



## 2.2 Assembly overview - electric coolant pump

⇒ [“2.2.1 Continued coolant circulation pump V51 , coolant shut-off valve N82 ”, page 235](#)

⇒ [“2.2.2 Coolant valve for gearbox N488 , vehicles with dual clutch gearbox”, page 237](#)

### 2.2.1 Continued coolant circulation pump - V51- , coolant shut-off valve - N82-

Continued coolant circulation pump - V51- , coolant shut-off valve - N82-

**1 - Coolant hose****2 - Coolant shut-off valve - N82-**

- ☐ Removing and installing  
⇒ [page 246](#)

**3 - Coolant hose****4 - Continued coolant circulation pump - V51-**

- ☐ Removing and installing  
⇒ [page 238](#)

**5 - Carrier**

- ☐ For continued coolant circulation pump - V51-

**6 - Bolt**

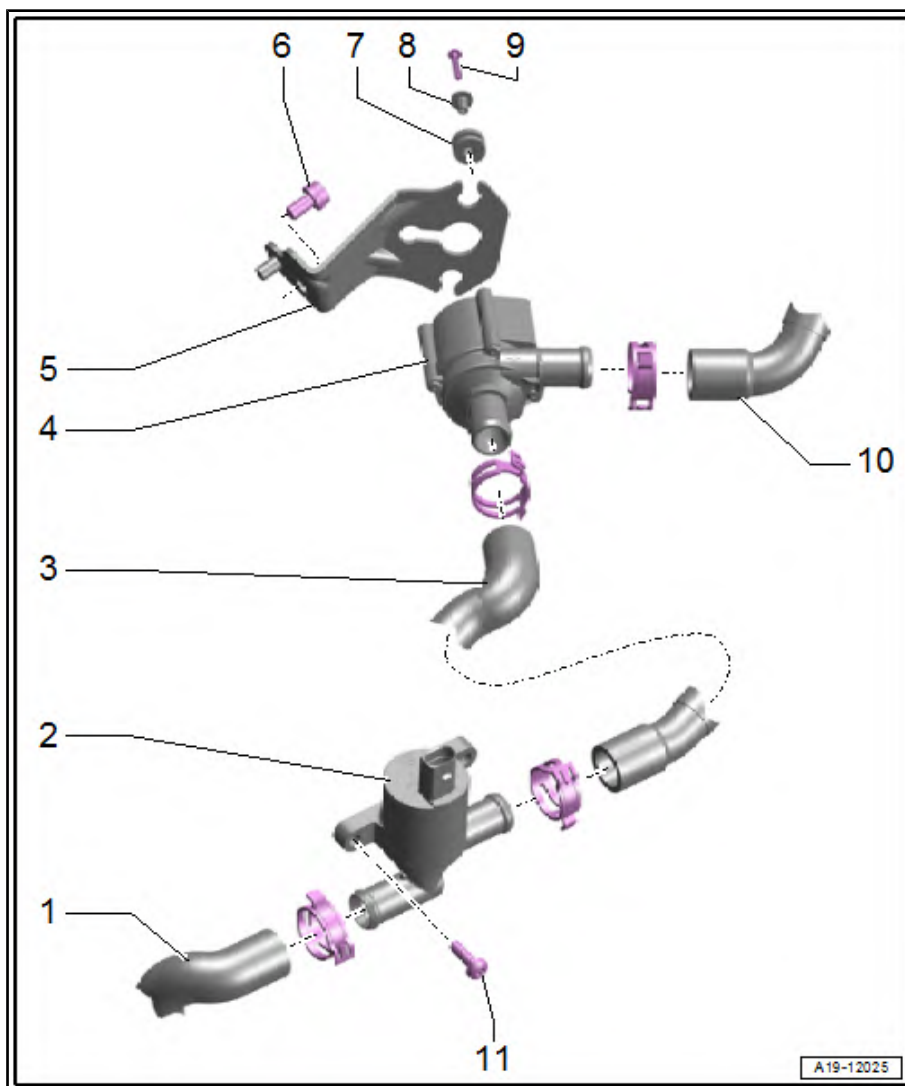
- ☐ 40 Nm

**7 - Nozzle/spout****8 - Spacer sleeve****9 - Bolt**

- ☐ 1.5 Nm

**10 - Coolant hose****11 - Bolt**

- ☐ 9 Nm



A19-12025



## 2.2.2 Coolant valve for gearbox - N488- , vehicles with dual clutch gearbox

1 - Coolant hose

2 - Hose clamp

3 - Bolts

□ 25 Nm

4 - Carrier

□ For coolant valve for  
gearbox - N488-

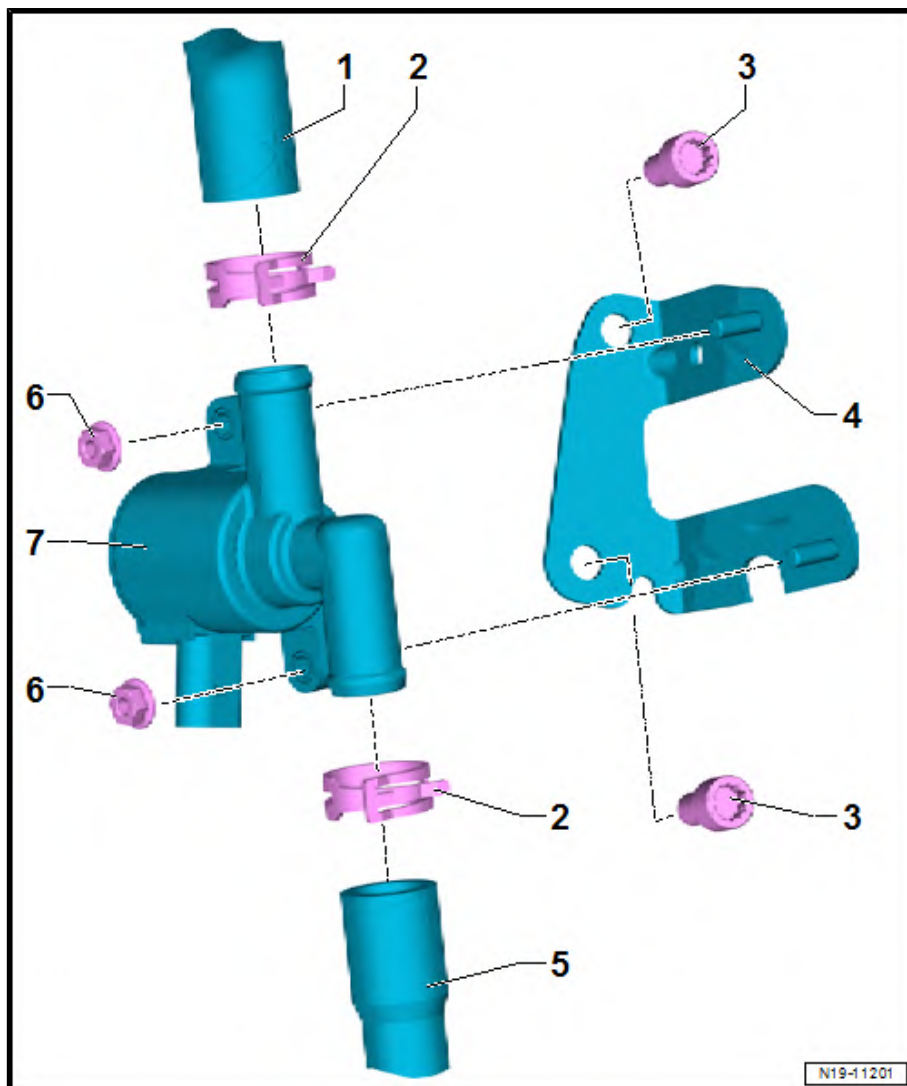
5 - Coolant hose

6 - Nuts

□ 9 Nm

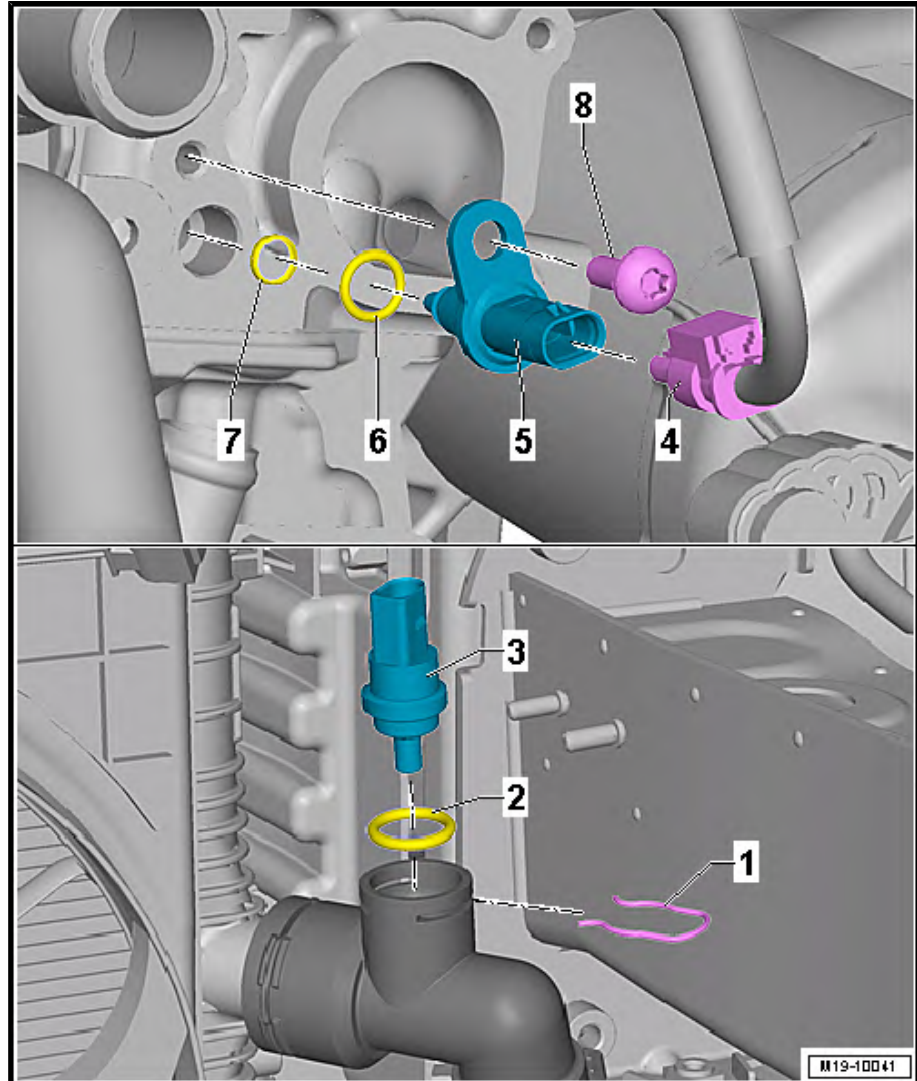
7 - Coolant valve for gearbox -  
N488-

□ Removing and installing  
⇒ [page 248](#)



## 2.3 Assembly overview - coolant temperature sender

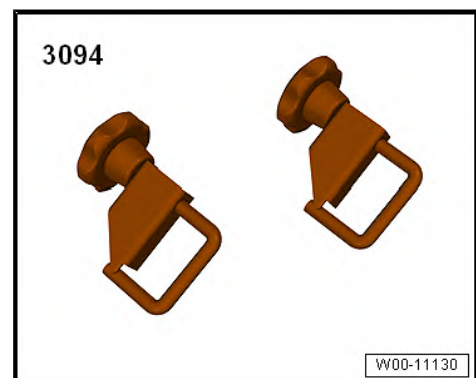
- 1 - Retaining clip**
  - ☐ Ensure correct seating
- 2 - O-ring**
  - ☐ Renewing:
- 3 - Radiator outlet coolant temperature sender - G83-**
  - ☐ Removing and installing  
⇒ [page 252](#)
- 4 - Electrical connector**
- 5 - Coolant temperature sender - G62-**
  - ☐ On cylinder head (gear-box end).
  - ☐ Removing and installing  
⇒ [page 251](#)
- 6 - O-ring**
  - ☐ Renewing:
  - ☐ Moisten with coolant
- 7 - O-ring**
  - ☐ Renewing:
  - ☐ Moisten with coolant
- 8 - Bolt**
  - ☐ Renewing:
  - ☐ 4 Nm +45°



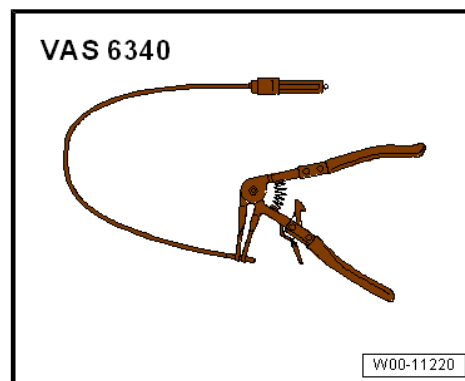
## 2.4 Coolant trailing pump - V51- : removing and installing

Special tools and workshop equipment required

- ◆ Hose clamps to 25 mm - 3094-



- ◆ Hose clamp pliers - VAS 6340-



- ◆ Spring-type clip pliers - VAS 6362-



## Removing



### Note

*Fit heat shield sleeves in the same place when installing.*

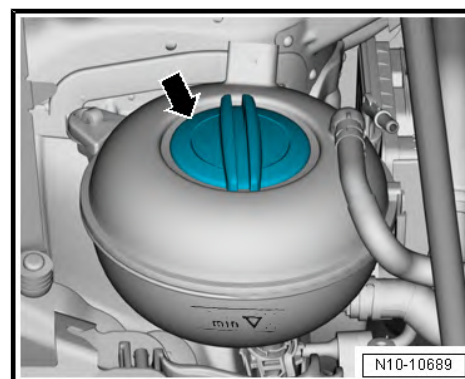


### CAUTION

On a warm engine, the cooling system is under high pressure. Hot steam/hot coolant can escape - risk of scalding.

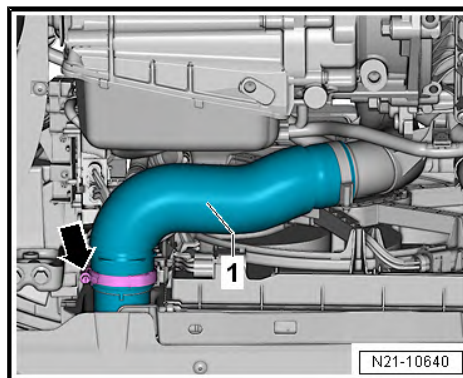
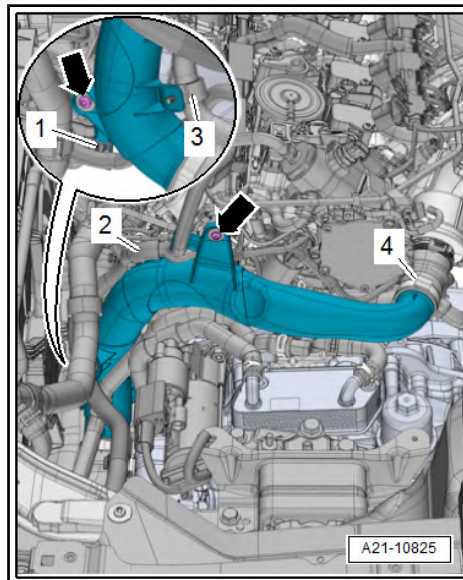
Skin and other parts of the body may be scalded.

- Wear protective gloves.
- Wear protective goggles.
- Reduce pressure by covering the cap of the coolant expansion tank with cloths and opening it carefully.



- Open filler cap -arrow- for coolant expansion tank.
- Remove air filter housing together with air intake hose  
⇒ [page 323](#) .

- If fitted, lay coolant hose -3- to one side.
- Free electrical wiring harnesses -1 and 2- from fittings and lay them to one side.
- Loosen screw-type clip -4-.
- Unscrew bolts -arrows-.
- Remove noise insulation ⇒ General body repairs, exterior;  
 Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
- Loosen hose clip -arrow-, and remove charge air hose -1- to the side, together with air pipe.



- Open heat insulation sleeve -3-.
- Release and pull off electrical connector -1-.
- Clamp off the coolant hoses on continued coolant circulation pump - V51- using hose clamps up to 25 mm in diameter -3094- .



#### Note

*Place a cloth underneath to catch escaping coolant.*

- Release hose clips -arrows-, and remove coolant hoses.
- Unscrew the fastening bolt -2- and remove the coolant trailing pump - V51- .

#### Installing

Remaining installation is carried out in the reverse order. When installing, note the following:



#### Note

*Secure all hose connections with hose clips corresponding to the series production status ⇒ Electronic Parts Catalogue (ETKA) .*

- Check coolant level ⇒ [page 212](#) .

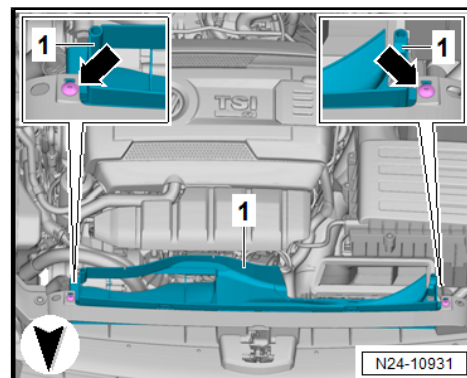
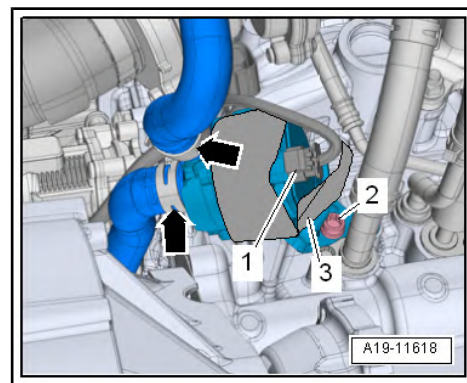
#### Specified torques

- ♦ ⇒ [“2.2 Assembly overview - electric coolant pump”, page 235](#)
- ♦ ⇒ [“3.1 Assembly overview - air filter housing”, page 321](#)
- ♦ Noise insulation; Assembly overview - noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .

## 2.5 Removing and installing coolant pump

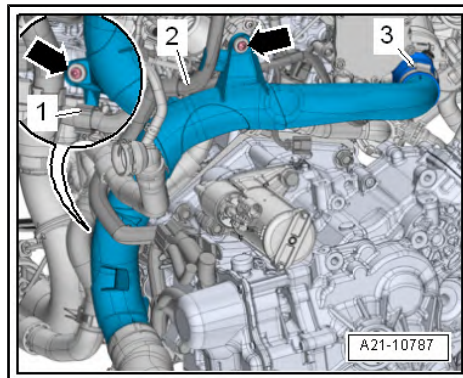
### Removing

- Drain coolant ⇒ [page 206](#) .
- Remove air filter housing ⇒ [page 322](#) .
- Unscrew bolt -arrow- on left and right.
- Unclip lower part of air duct -1- and remove it.

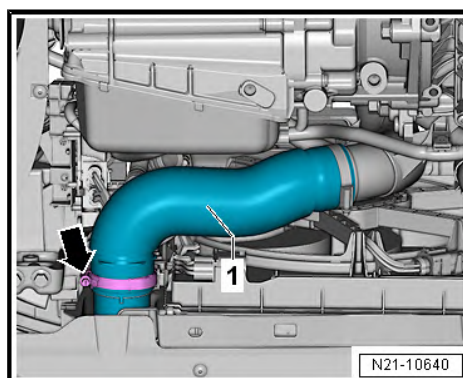




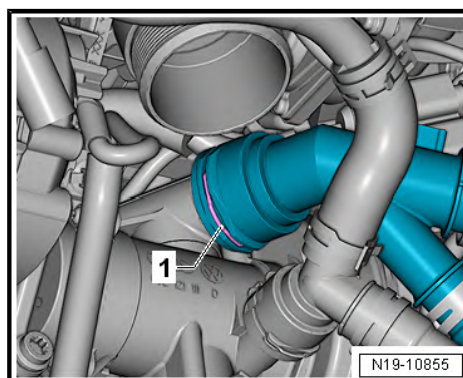
- Free electrical wiring harnesses -1- and -2- from fittings and lay them to one side.
- Loosen screw-type clip -3-.
- Unscrew bolts -arrows-.



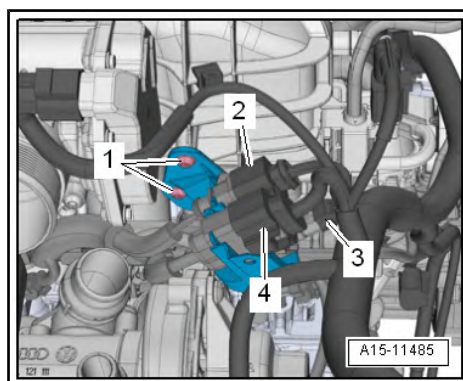
- Loosen hose clip -arrow-, and remove charge air hose -1- downwards, together with air pipe.
- Remove throttle valve module ➔ [page 331](#) .



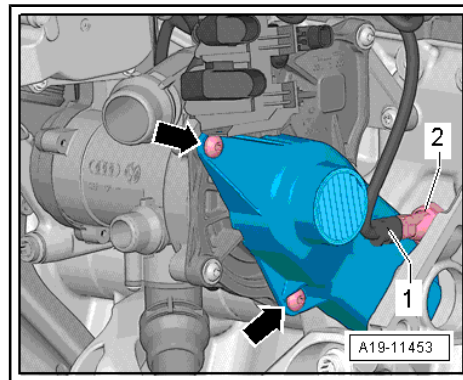
- Lift retaining clip -1-, detach upper coolant connection and push it to one side.



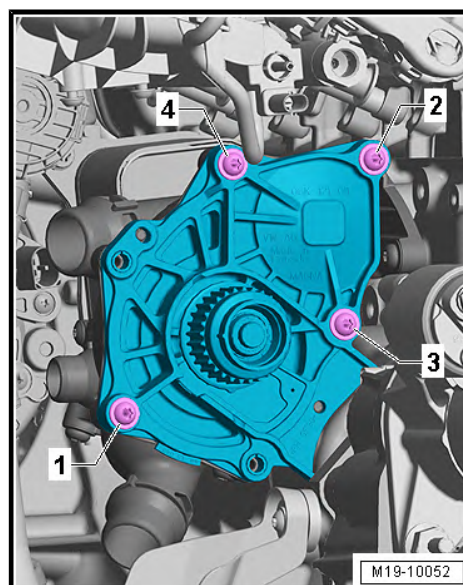
- Disconnect connectors -2, 3 and 4-. Unscrew securing bolts -1-, and lay bracket to one side.



- Separate electrical connector -1- on oil pressure switch -2-.
- Unscrew bolts -arrows- and remove toothed belt guard.



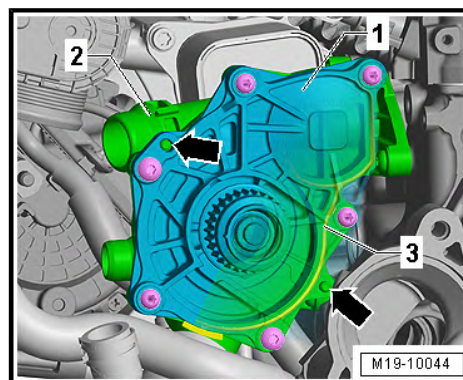
- Unscrew bolts -1 ... 4-, and remove toothed belt from coolant pump.
- Unscrew bolts -1 ... 4- completely, and detach coolant pump from actuator for engine temperature regulation - N493- .



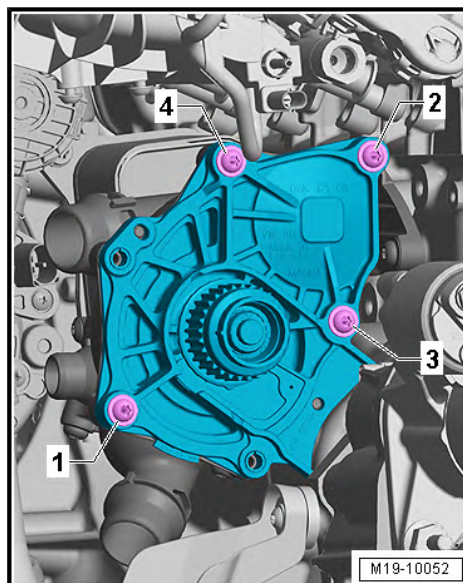
### Installing

Remaining installation is carried out in the reverse order. When installing, note the following:

- Fit coolant pump, and install toothed belt.
- Ensure correct seating of centring rings -arrows- and seal -3-.



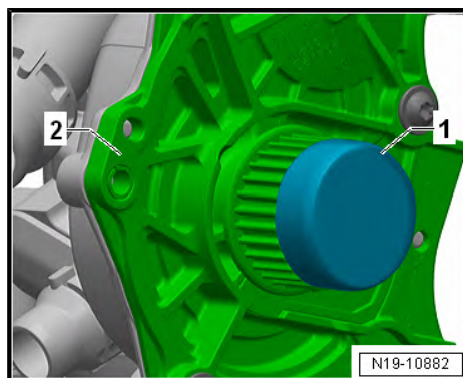
- Tighten bolts -1 ... 4- when the toothed belt is fitted. Specified torque and tightening sequence ⇒ [page 235](#) .



- If a new coolant pump has been installed, pull off protective cap -1-.
- Add coolant ⇒ [page 208](#) .

#### Specified torques

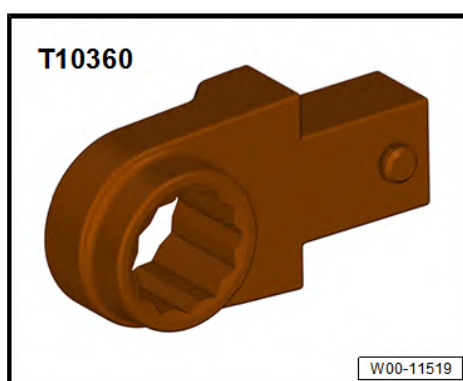
- ♦ ⇒ [“2.1 Assembly overview - coolant pump, thermostat”, page 233](#)
- ♦ ⇒ [“3.1 Assembly overview - air filter housing”, page 321](#)



## 2.6 Removing and installing toothed belt for coolant pump

#### Special tools and workshop equipment required

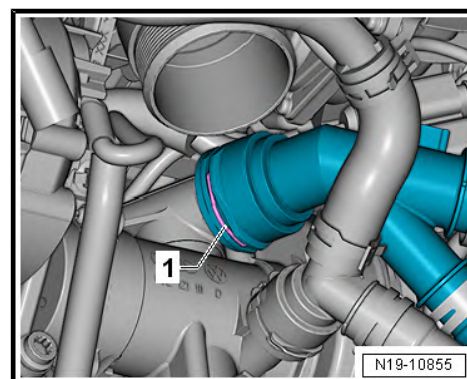
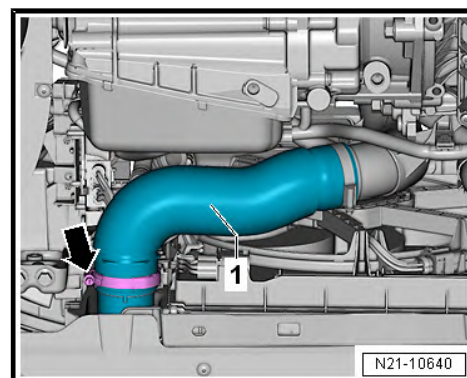
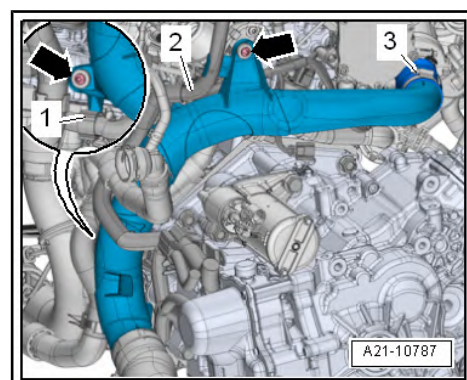
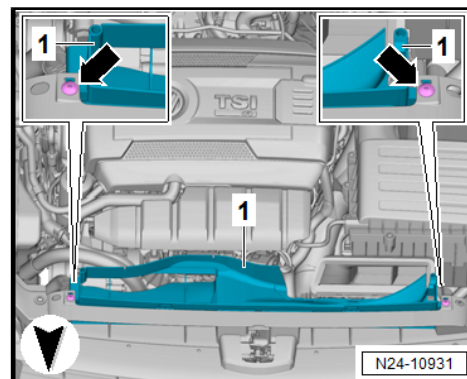
- ♦ Insert tool - T10360-



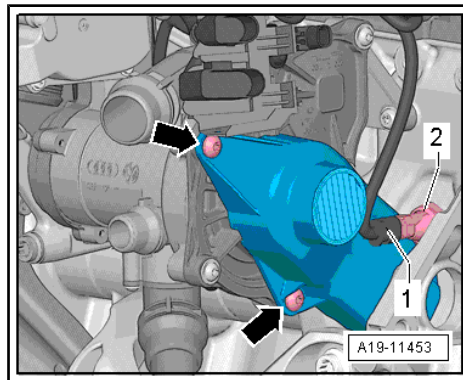


## Removing

- Drain coolant ⇒ [page 206](#) .
- Remove air filter housing ⇒ [page 322](#) .
- Unscrew bolt -arrow- on left and right.
- Unclip lower part of air duct -1- and remove it.
- Free electrical wiring harnesses -1- and -2- from fittings and lay them to one side.
- Loosen screw-type clip -3-.
- Unscrew bolts -arrows-.
- Loosen hose clip -arrow-, and remove charge air hose -1- downwards, together with air pipe.
- Lift retaining clip -1-, detach upper coolant connection and push it to one side.



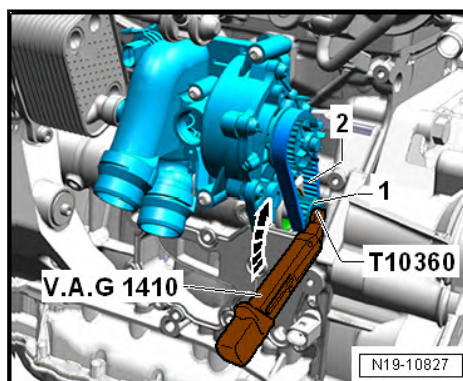
- Separate electrical connector -1- on oil pressure switch -2-.
- Unscrew bolts -arrows- and remove toothed belt guard.



#### Note

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

- Loosen bolt on drive sprocket -1- for coolant pump using torque wrench - V.A.G 1410- and insert tool - T10360- , and unscrew it by 3 turns. To do this, counterhold at vibration damper.



#### Note

*If tool cannot be used on account of starter securing bolt (on vehicles with manual gearbox), unscrew respective securing bolt by approx. 15 mm.*

- Remove toothed belt -2-.

#### Installing

Remaining installation is carried out in the reverse order. When installing, note the following:

- Renew bolt for drive sprocket.
- Installation position of the drive gear: Collar on drive gear faces gearbox.
- Fit toothed belt and tighten securing bolt.
- Add coolant ⇒ [page 208](#) .

#### Specified torques

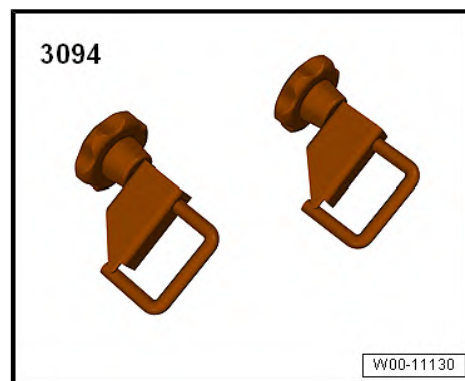
- ◆ ⇒ [“2.1 Assembly overview - coolant pump, thermostat”, page 233](#)
- ◆ ⇒ [“3.1 Assembly overview - air filter housing”, page 321](#)

## 2.7 Removing and installing coolant shut-off valve - N82-

Special tools and workshop equipment required



- ◆ Hose clamps to 25 mm - 3094-

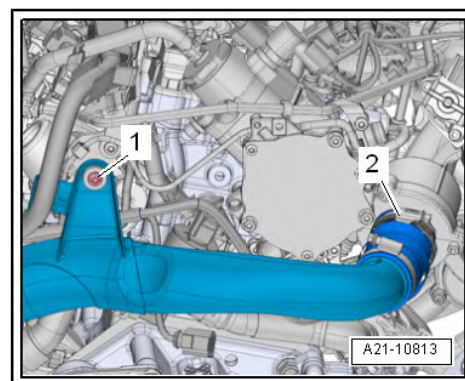


- ◆ Spring-type clip pliers - VAS 6362-



### Removing

- Remove air filter housing together with air intake hose  
⇒ [page 323](#) .
- Loosen hose clip -2-.
- Remove bolt -1- and press air pipe (left-side) towards left slightly.



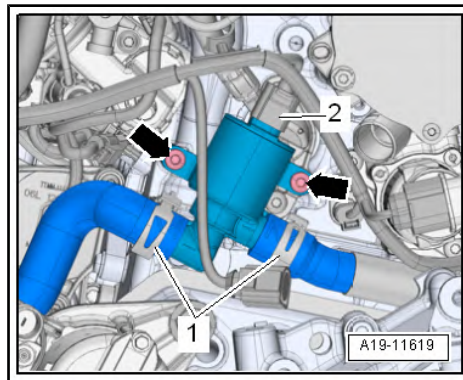
- Disconnect connector -2-.
- Use hose clamps -N82- to clamp off coolant hoses on coolant shut-off valve - 3094- .



#### Note

*Cover the openings in the gearbox with a cloth to prevent any coolant from getting into the clutch housing.*

- Loosen the hose clips -1-, remove the coolant hoses.
- Unscrew bolt -arrows- and detach coolant shut-off valve - N82- .



#### Installing

Remaining installation is carried out in the reverse order. When installing, note the following:



#### Note

*Secure all hose connections with hose clips corresponding to the series production status ⇒ Electronic Parts Catalogue (ETKA) .*

- Check coolant level ⇒ [page 212](#) .

#### Specified torques

- ♦ ⇒ [“2.2 Assembly overview - electric coolant pump”, page 235](#)
- ♦ ⇒ [“3.1 Assembly overview - air filter housing”, page 321](#)

## 2.8 Removing and installing coolant valve for gearbox - N488- , vehicles with dual clutch gearbox

#### Special tools and workshop equipment required

- ♦ Hose clamps to 25 mm - 3094-

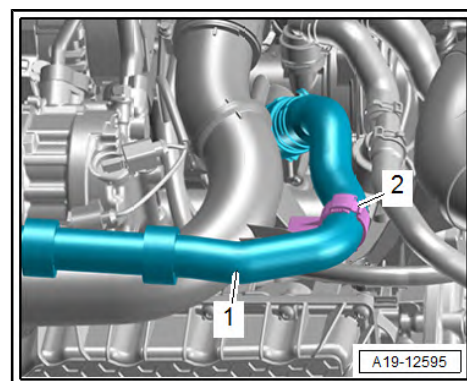


- ◆ Spring-type clip pliers - VAS 6362-



### Removing

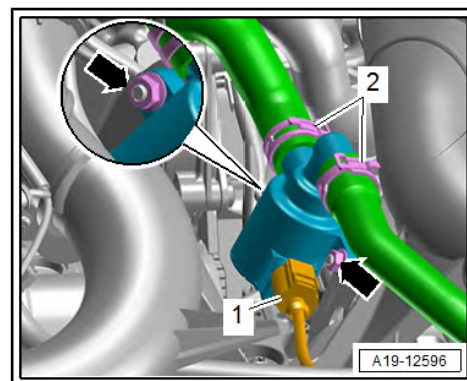
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
- Open retaining clips -2-, move clear coolant hose -1-, and push them aside.
- Remove retaining clip upwards from the air pipe.



- Disconnect electrical connector -1-.
- Unscrew nuts -arrows-.
- Place a cloth underneath to catch any escaping coolant.
- Clamp off and remove the coolant hoses on the coolant valve for gearbox - N488- with the hose clamps -3094- , to do so loosen the clamps -2-.
- Remove coolant valve for gearbox - N488- .

### Installing

Remaining installation is carried out in the reverse order. When installing, note the following:



### Note

Secure all hose connections with hose clips corresponding to the series production status ⇒ *Electronic Parts Catalogue (ETKA)* .

- Check coolant level ⇒ [page 212](#) .

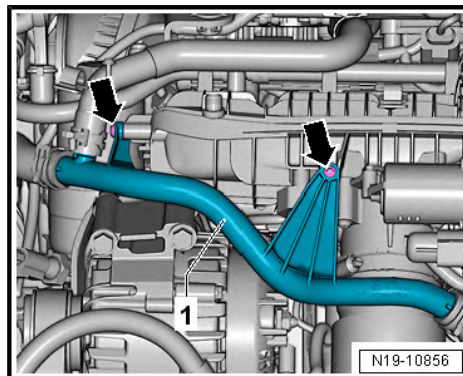
### Specified torques

- ◆ ⇒ ["2.2 Assembly overview - electric coolant pump", page 235](#)
- ◆ ⇒ ["3.1 Assembly overview - air filter housing", page 321](#)
- ◆ Noise insulation; Assembly overview - noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .

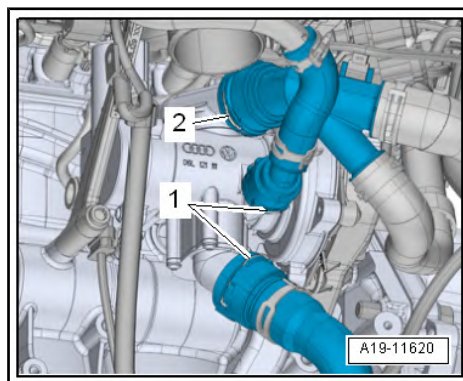
## 2.9 Removing and installing actuator for engine temperature regulation - N493-

### Removing

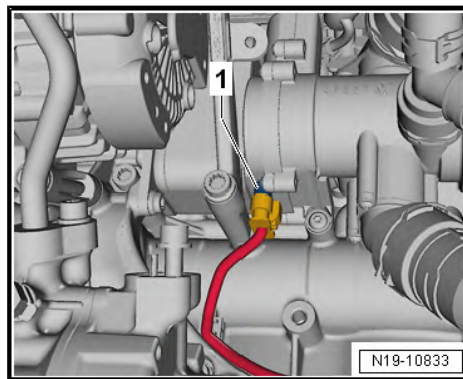
- Remove coolant pump ➔ [page 241](#) .
- Remove throttle valve module - GX3- ➔ [page 331](#) .
- Unscrew coolant pipe from intake manifold -arrows-.



- Lift retaining clips -1- and disconnect coolant hoses.



- Pull connector -1- off actuator for engine temperature regulation - N493- .



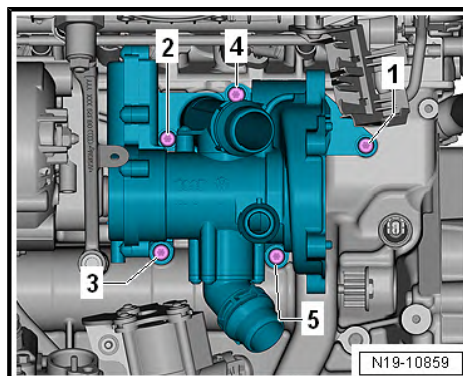
- Unscrew bolts -1 ... 5-
- Detach actuator for engine temperature regulation - N493- from centring pins, and pull it off engine oil cooler.

### Installing



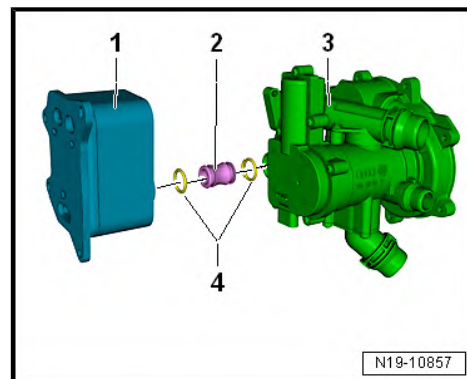
#### Note

*Renew gaskets, seals and O-rings.*





- Moisten new O-rings -4- and gasket of actuator with coolant.
- Check whether the two centring pins are fitted in the cylinder block; install if necessary.
- Fit connecting piece -2- into engine oil cooler -1-.
- Push actuator for engine temperature regulation - N493- -3- onto connecting piece and centring pins in cylinder block.



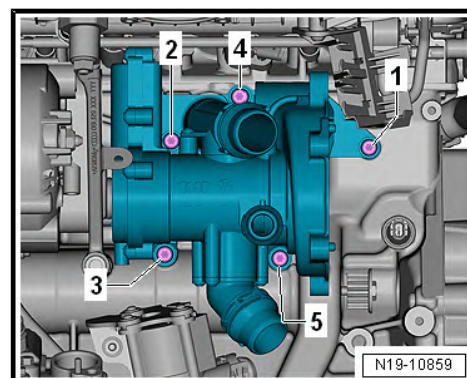
- Tighten bolts for actuator for engine temperature regulation - N493- ➔ [page 235](#) .
- Install coolant pump ➔ [page 241](#) .

Further installation is carried out in the reverse order of removal; note the following:

- Check cooling system for leaks after all coolant hoses have been connected ➔ [page 204](#) .
- Add coolant ➔ [page 208](#) .

#### Specified torques

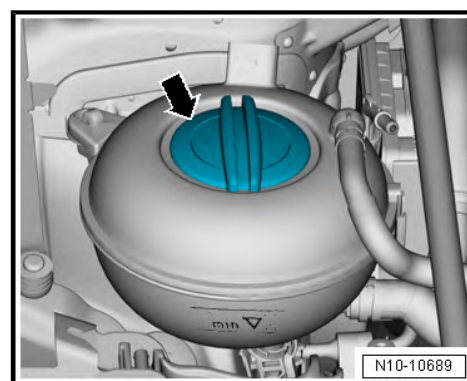
- ◆ ➔ [“2.1 Assembly overview - coolant pump, thermostat”, page 233](#)
- ◆ ➔ [“4.1 Assembly overview - intake manifold”, page 325](#)



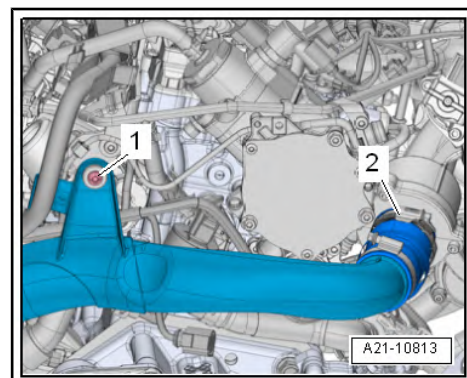
## 2.10 Removing and installing coolant temperature sender - G62- .

### Removing

- Engine cold.
- Briefly open cap of coolant expansion tank -arrow- in order to eliminate residual pressure in the cooling system, then tighten the cap again until it engages.
- Remove air filter housing ➔ [page 322](#) .



- Loosen hose clip -2-.
- Remove bolt -1- and press air pipe (left-side) towards left slightly.



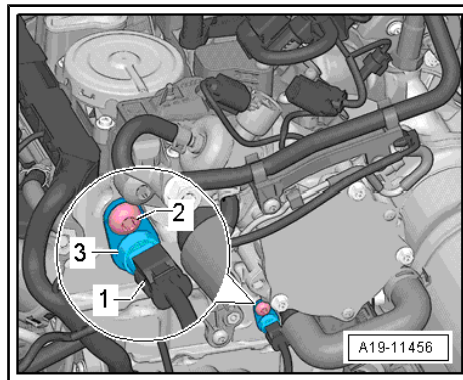


- Disconnect connector -1-.



#### Note

- ♦ *Cover the openings in the gearbox with a cloth to prevent any coolant from getting into the clutch housing.*
- ♦ *Insert new coolant temperature sender - G62- immediately into connection to avoid loss of coolant.*
- Remove bolt -2- and detach coolant temperature sender - G62- -item 3-.



#### Installing

Remaining installation is carried out in the reverse order. When installing, note the following:



#### Note

*Renew O-rings.*

- Check coolant level ➔ [page 208](#) .

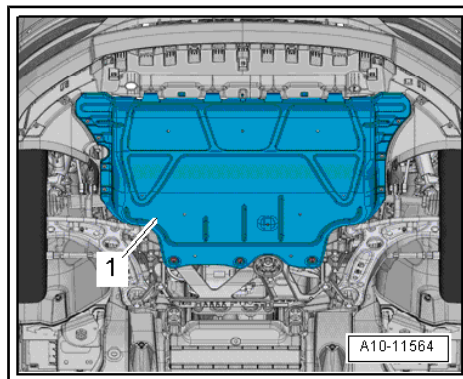
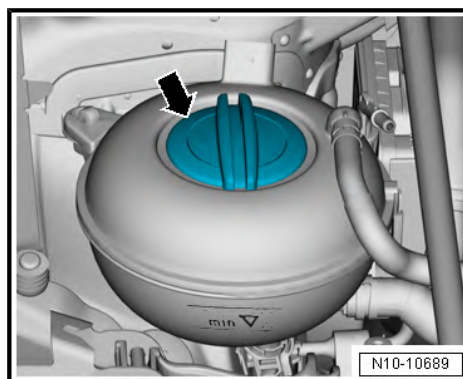
#### Specified torques

- ♦ ➔ [“2.3 Assembly overview - coolant temperature sender”, page 238](#)
- ♦ ➔ [“3.1 Assembly overview - air filter housing”, page 321](#)

## 2.11 Removing and installing radiator outlet coolant temperature sender - G83-

#### Removing

- Engine cold.
- Briefly open cap of coolant expansion tank -arrow- in order to eliminate residual pressure in the cooling system, then tighten the cap again until it engages.
- Remove noise insulation-1- ➔ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .



- Disconnect connector -1-.
- Pull out retaining clip -2-, and pull off radiator outlet coolant temperature sender - G83- .



#### Note

- ◆ Place a cloth underneath to catch escaping coolant.
- ◆ Insert new coolant temperature sender at radiator outlet - G83- into connection immediately to avoid loss of coolant.

#### Installing

Remaining installation is carried out in the reverse order. When installing, note the following:



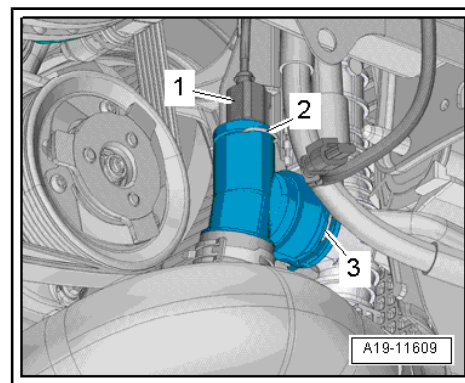
#### Note

Renew O-ring.

- Check coolant level ⇒ [page 208](#) .

#### Specified torques

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



### 3 Coolant pipes

⇒ ["3.1 Assembly overview - coolant pipes", page 254](#)

⇒ ["3.2 Removing and installing front coolant pipe.", page 254](#)

⇒ ["3.3 Removing and installing upper coolant pipes", page 256](#)

#### 3.1 Assembly overview - coolant pipes

##### 1 - Coolant pipe

- ☐ On top of engine
- ☐ Removing and installing  
⇒ [page 256](#)

##### 2 - Bolts

- ☐ 9 Nm

##### 3 - Bolts

- ☐ 9 Nm

##### 4 - Coolant line

##### 5 - Bolts

- ☐ 9 Nm

##### 6 - Coolant pipe

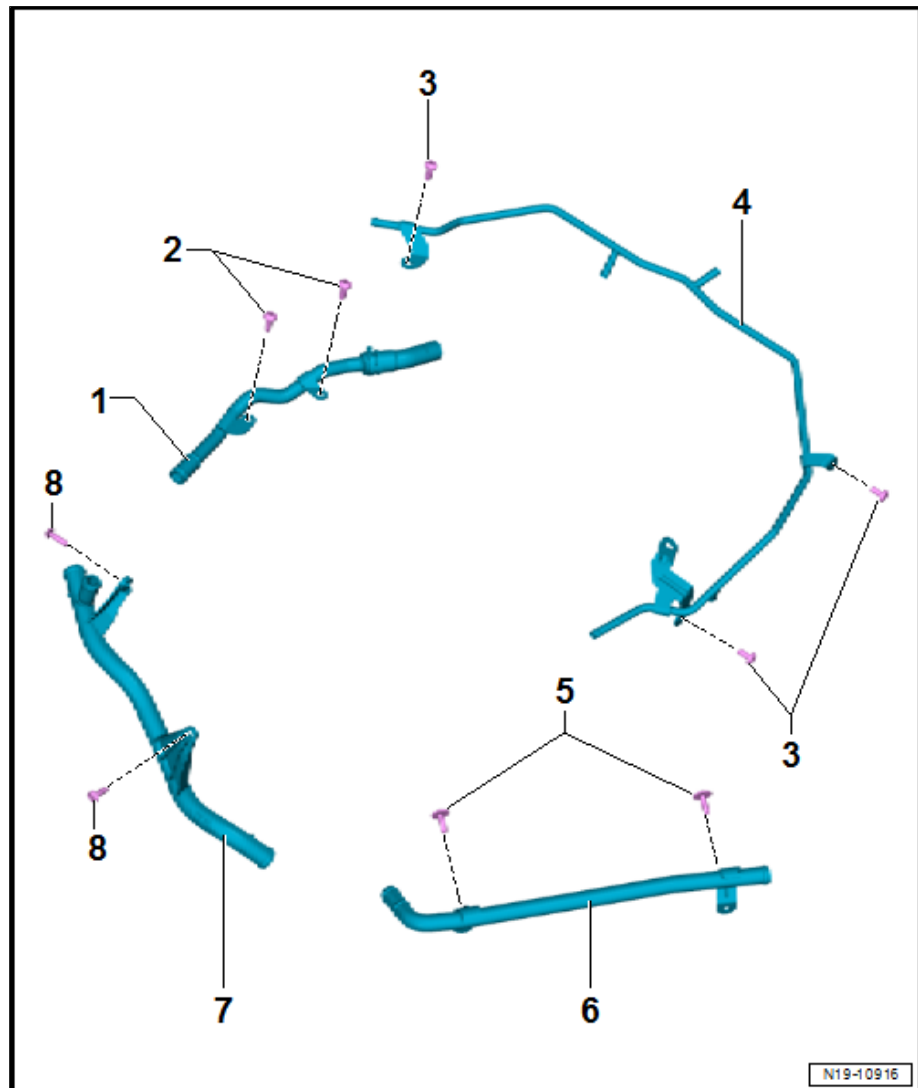
- ☐ to radiator cowl
- ☐ Only for vehicles with  
auxiliary radiator

##### 7 - Coolant pipe

- ☐ On front of engine
- ☐ Removing and installing  
⇒ [page 254](#)

##### 8 - Bolts

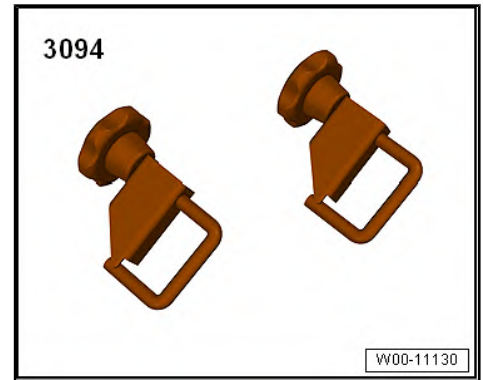
- ☐ 6 Nm



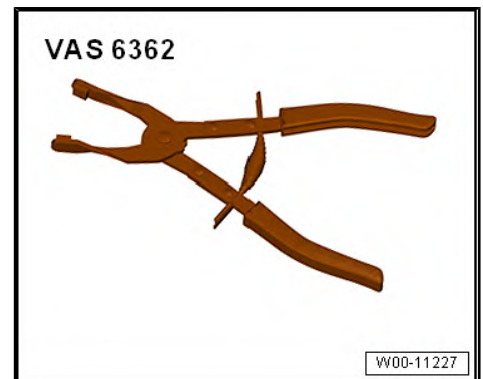
#### 3.2 Removing and installing front coolant pipe.

Special tools and workshop equipment required

- ◆ Hose clamps to 25 mm - 3094-

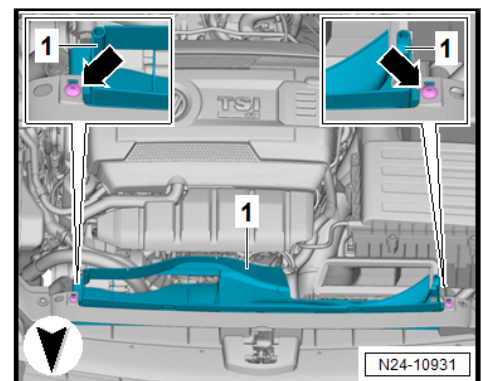


- ◆ Spring-type clip pliers - VAS 6362-



### Removing

- Remove air filter housing => [page 322](#) .
- Unscrew bolt -arrow- on left and right.
- Unclip lower part of air duct -1- and remove it.





### Note

Place a cloth underneath to catch escaping coolant.

- Clamp off coolant hoses -1 and 2- with hose clamps, up to 25 mm in diameter - 3094- .
- Release hose clips and detach coolant hoses.
- Unscrew bolts -arrows- and remove front coolant pipe.

### Installing

Remaining installation is carried out in the reverse order. When installing, note the following:



### Note

Secure all hose connections with hose clips corresponding to the series production status ⇒ *Electronic Parts Catalogue (ETKA)* .

- Check coolant level ⇒ [page 212](#) .

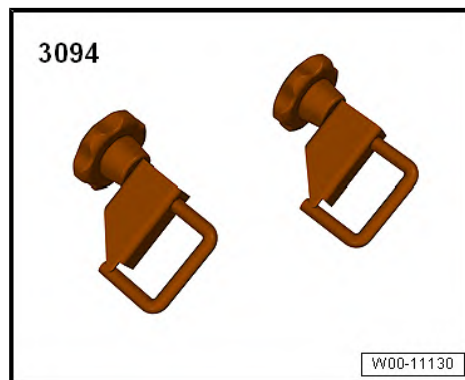
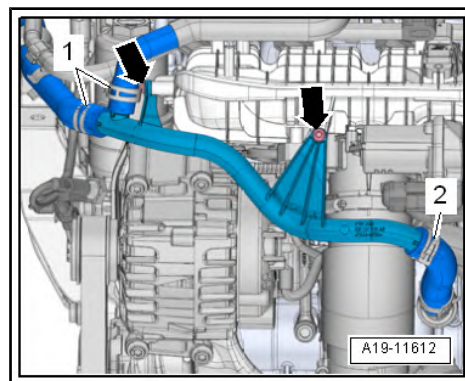
### Specified torques

- ♦ ⇒ [“3.1 Assembly overview - coolant pipes”, page 254](#)

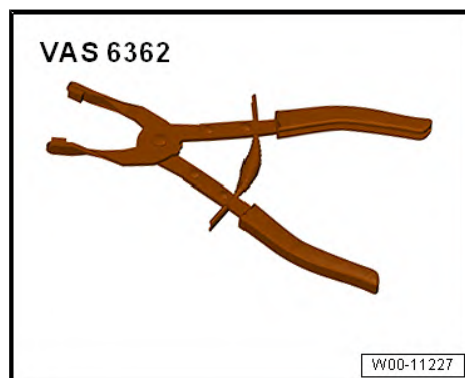
## 3.3 Removing and installing upper coolant pipes

### Special tools and workshop equipment required

- ♦ Hose clamps to 25 mm - 3094-



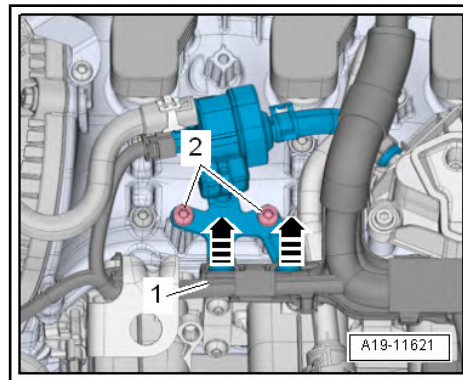
- ♦ Spring-type clip pliers - VAS 6362-





## Removing

- Remove Ignition coil with output stage for cylinder “3”  
⇒ [page 407](#) .
- Release fasteners -arrows- and detach wiring duct -1- from bracket.



- Clamp off coolant hoses before and after coolant pipe using hose clamps up to 25 mm - 3094- .
- Release hose clips -arrows-, and remove coolant hoses.
- Unscrew bolt -1- and remove coolant pipe (top).

## Installing

Remaining installation is carried out in the reverse order. When installing, note the following:



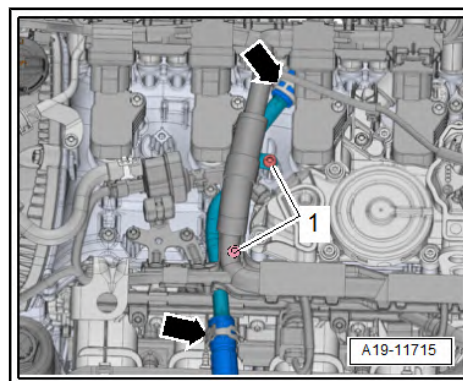
### Note

*Secure all hose connections with hose clips corresponding to the series production status ⇒ Electronic Parts Catalogue (ETKA) .*

- Check coolant level ⇒ [page 212](#) .

## Specified torques

- ◆ ⇒ [“3.1 Assembly overview - coolant pipes”, page 254](#)



## 4 Radiator, radiator fan

⇒ [“4.1 Assembly overview - radiator/radiator fan”, page 258](#)

⇒ [“4.2 Assembly overview - auxiliary radiator”, page 259](#)

⇒ [“4.3 Assembly overview - radiator cowl and radiator fan”, page 262](#)

⇒ [“4.4 Removing and installing radiator”, page 262](#)

⇒ [“4.5 Removing and installing radiator cowl”, page 265](#)

⇒ [“4.6 Removing and installing radiator fan”, page 267](#)

⇒ [“4.7 Removing and installing auxiliary radiator”, page 267](#)

### 4.1 Assembly overview - radiator/radiator fan

#### 1 - Coolant hose

- ☐ Pull out retaining clip to remove
- ☐ Joining ⇒ [page 259](#)

#### 2 - O-ring

- ☐ Renewing:
- ☐ Moisten with coolant

#### 3 - Radiator outlet coolant temperature sender - G83-

- ☐ Removing and installing  
⇒ [page 252](#)

#### 4 - Radiator for engine coolant

- ☐ Removing and installing  
⇒ [page 262](#)

#### 5 - Coolant hose

- ☐ Pull out retaining clip to remove
- ☐ Joining ⇒ [page 259](#)

#### 6 - O-ring

- ☐ Renewing:
- ☐ Moisten with coolant

#### 7 - Intercooler

- ☐ Removing and installing  
⇒ [page 291](#)

#### 8 - Cowling

#### 9 - Cowling

#### 10 - Radiator mounting

#### 11 - Condenser

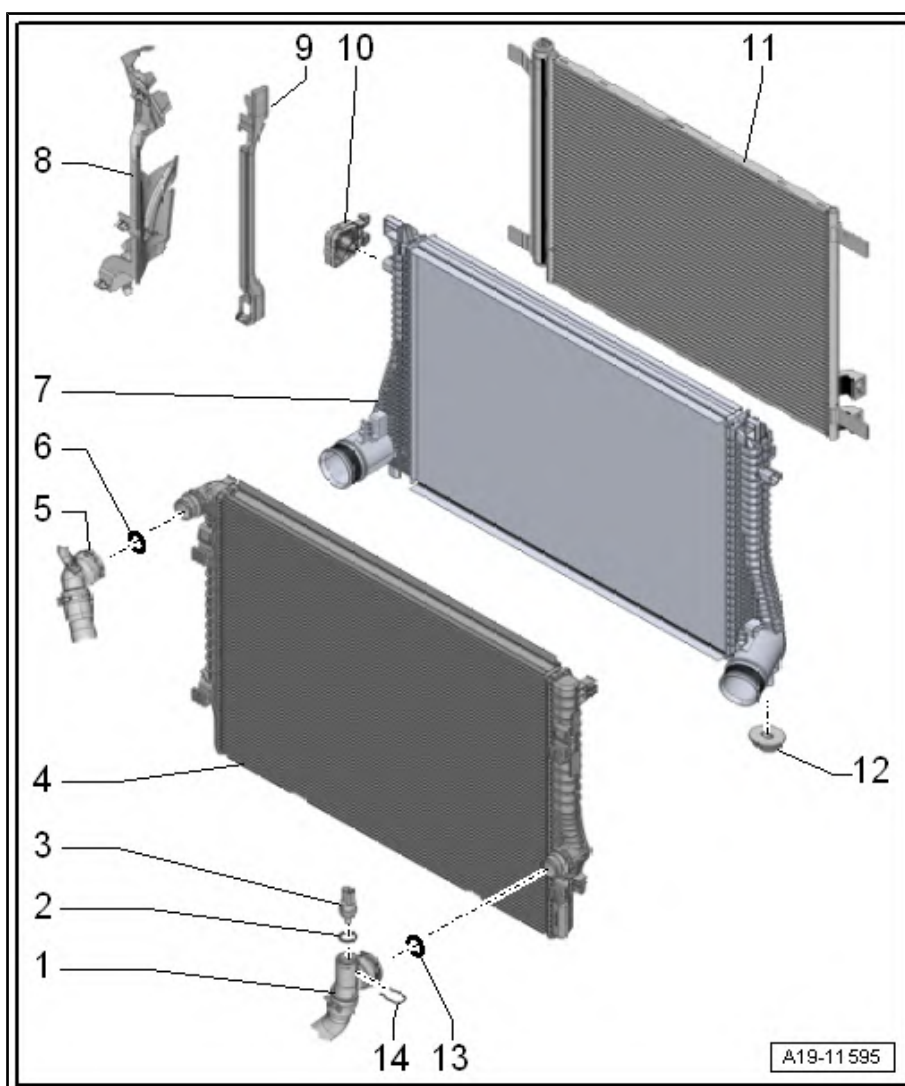
- ☐ Removing and installing  
⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit; Removing and installing condenser .

#### 12 - Bonded rubber bush

- ☐ For charge air cooler.

#### 13 - O-ring

- ☐ Renewing:
- ☐ Moisten with coolant

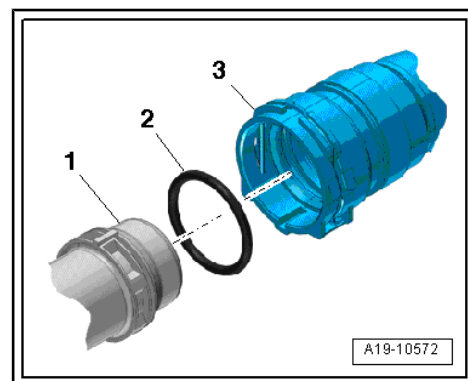


## 14 - Retaining clip

- ❑ For radiator outlet coolant temperature sender - G83- .

### Connecting coolant hose with plug-in connector:

- Remove old O-ring -2- in coolant hose -3-.
- Moisten new O-ring with coolant and insert it into coolant hose.
- Push coolant hose onto coolant pipe -1- until it audibly engages.
- Press again on coolant hose and check plug-in connector is engaged correctly by pulling hose back.



## 4.2 Assembly overview - auxiliary radiator

⇒ [“4.2.1 Assembly overview - right auxiliary radiator”, page 259](#)

⇒ [“4.2.2 Assembly overview - left auxiliary radiator”, page 260](#)

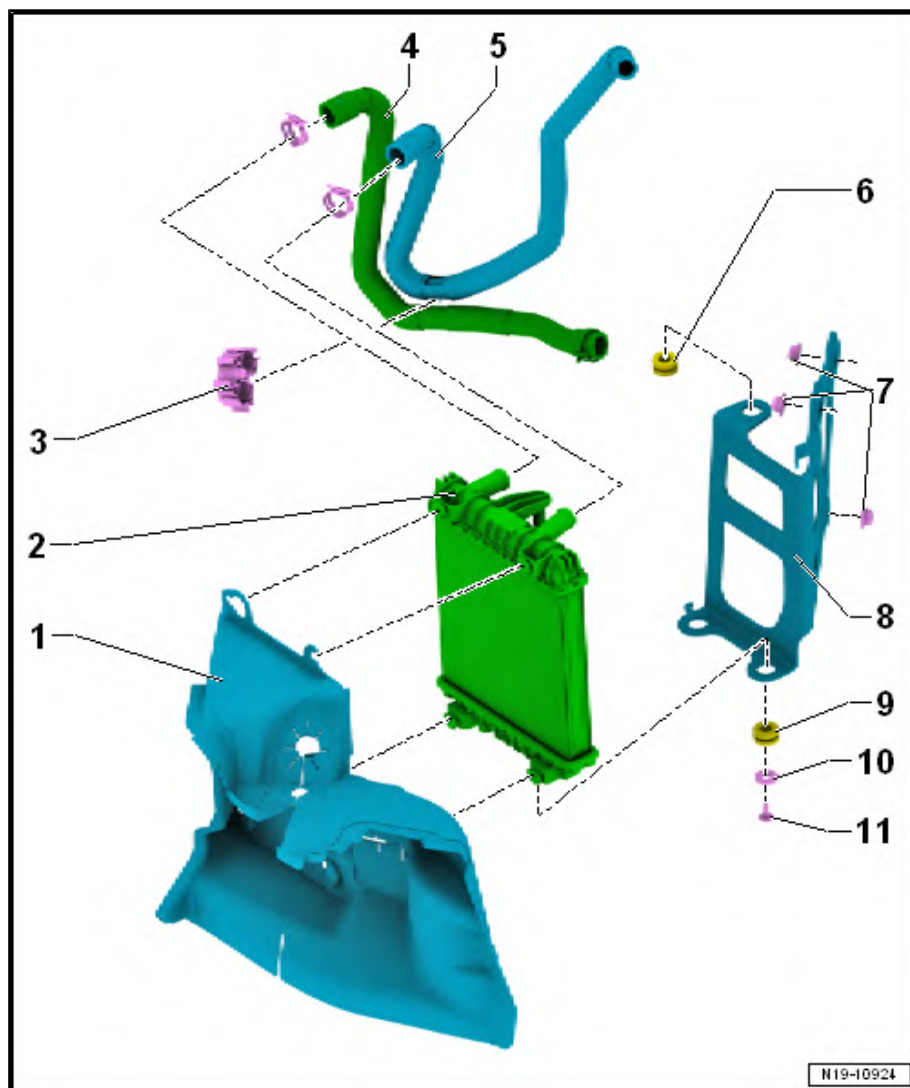
### 4.2.1 Assembly overview - right auxiliary radiator



#### Note

*On vehicles with dual clutch gearbox, an auxiliary radiator may be installed at front right (depending on version).*

- 1 - Cowling
- 2 - Auxiliary radiator
  - ☐ Removing and installing  
⇒ [page 267](#)
- 3 - Hose retainer
- 4 - Coolant hose
  - ☐ Return
- 5 - Coolant hose
  - ☐ Supply
- 6 - Radiator mounting
  - ☐ top:
- 7 - Nuts
  - ☐ 9 Nm
- 8 - Bracket
  - ☐ For additional cooler
- 9 - Radiator mounting
  - ☐ Bottom
- 10 - Base plate
- 11 - Bolt
  - ☐ 3.5 Nm



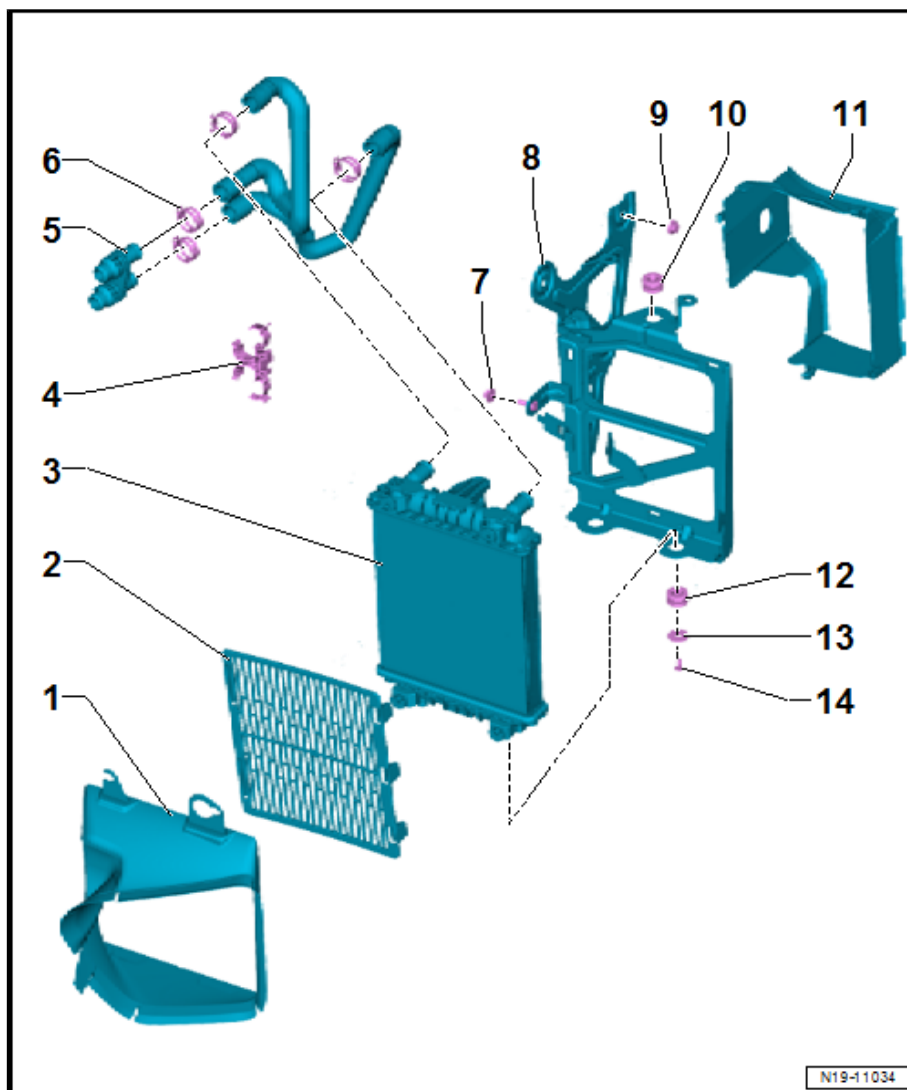
#### 4.2.2 Assembly overview - left auxiliary radiator



##### Note

*On vehicles with dual clutch gearbox, an auxiliary radiator may be installed at front left (depending on version).*

- 1 - Air duct
- 2 - Protective grid
- 3 - Auxiliary radiator
  - ❑ Removing and installing  
 ⇒ [page 267](#)
- 4 - Hose retainer
- 5 - Connecting piece
- 6 - Hose clamps
- 7 - Nut
  - ❑ 9 Nm
- 8 - Carrier
  - ❑ For additional cooler
- 9 - Nut
  - ❑ 9 Nm
- 10 - Rubber grommet
  - ❑ For additional cooler
- 11 - Air duct
- 12 - Rubber grommet
  - ❑ For additional cooler
- 13 - Base plate
- 14 - Bolt
  - ❑ 3.5 Nm



N19-11034



### 4.3 Assembly overview - radiator cowl and radiator fan

#### 1 - Bolt

- 5 Nm

#### 2 - Fan ring

- Removing and installing  
⇒ [page 265](#)

#### 3 - Bolt

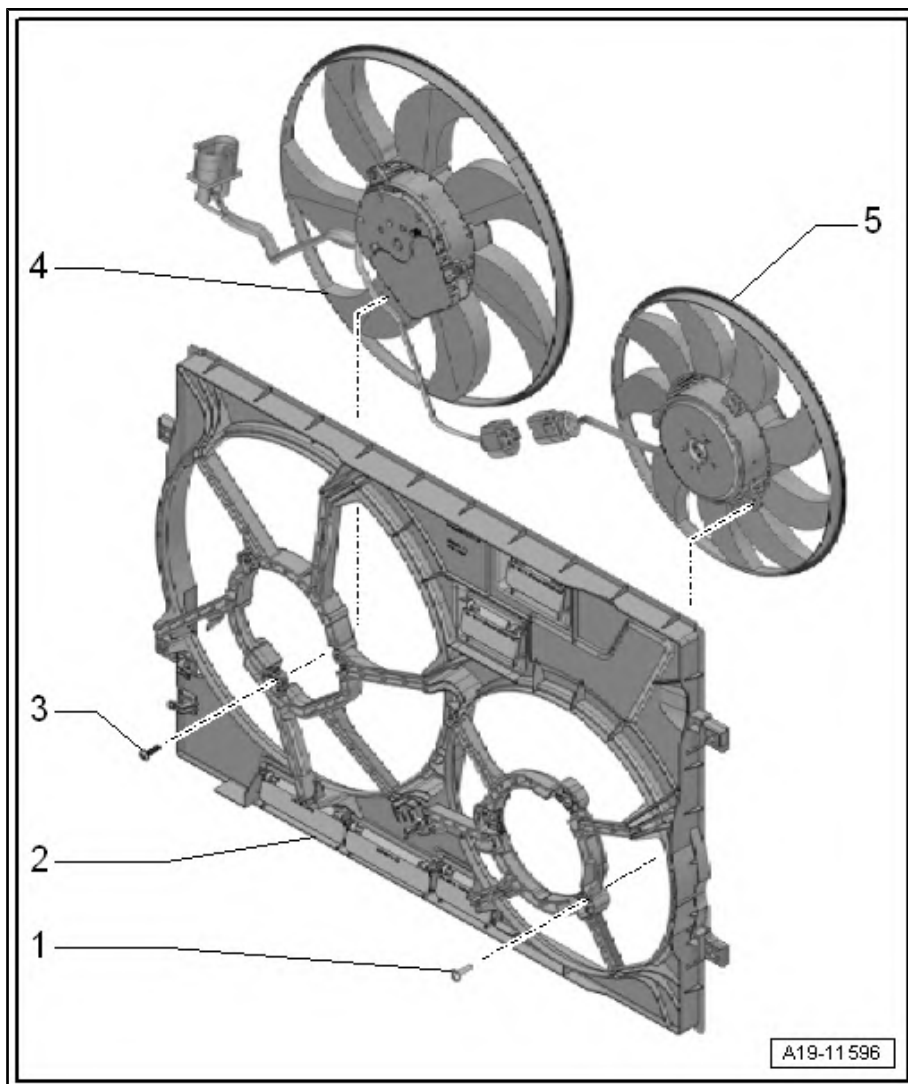
- 5 Nm

#### 4 - Radiator fan - V7-

- Removing and installing  
⇒ [page 267](#)

#### 5 - Radiator fan 2 - V177-

- Removing and installing  
⇒ [page 267](#)



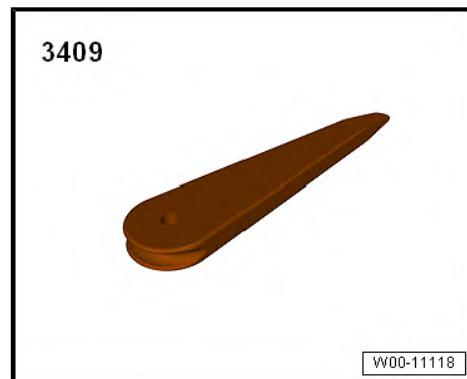
### 4.4 Removing and installing radiator

#### Special tools and workshop equipment required

- ◆ Drip tray for workshop hoist - VAS 6208-

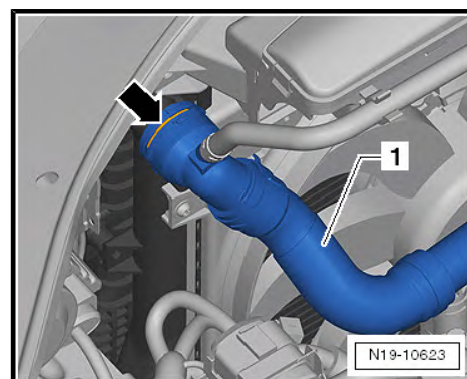


◆ Removal wedge - 3409-



**Removing**

- Drain coolant ⇒ [page 206](#) .
- Remove coolant hose at top left from radiator -arrow-.
- Remove radiator cowl ⇒ [page 265](#) .
- Seal open lines and unions with clean plugs from engine sealing plug set - VAS 6122- .
- Remove front bumper ⇒ General body repairs, exterior; Rep. gr. 63 ; Front bumper; Removing and installing bumper cover .



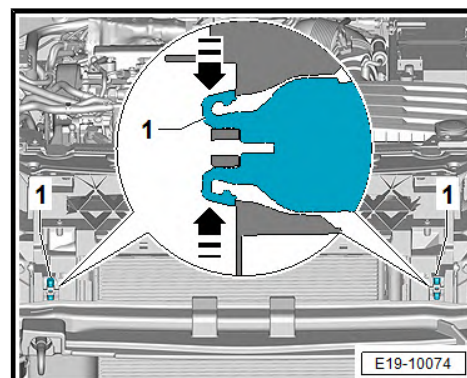
**Vehicles with coolant bearing support, clipped in.**

- Release catches -arrows- of radiator mounting -1- on left and right, or pinch them off using side cutters.



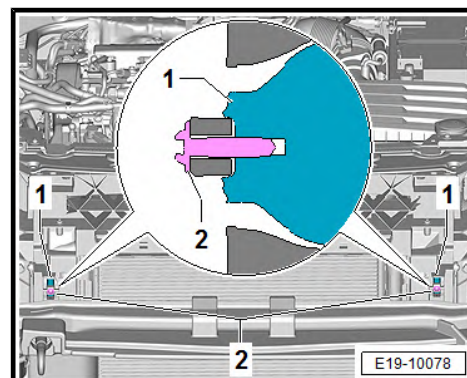
**Note**

*The radiator mounting will be reused when reinstalling the radiator. It will then be bolted to lock carrier. For bolts, refer to ⇒ Electronic Parts Catalogue (ETKA) .*



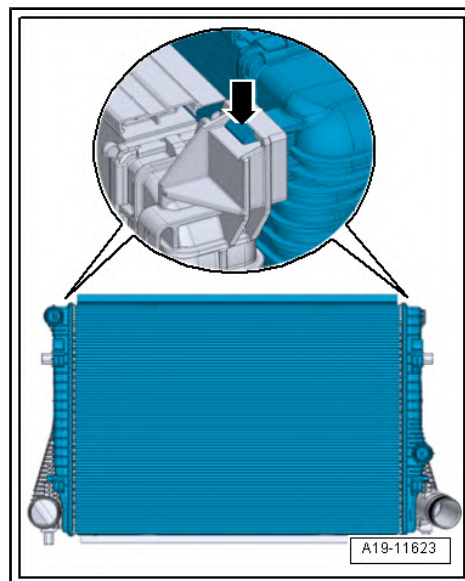
**Vehicles with coolant bearing support, screwed**

- Unscrew the screws -2- of the radiator mounting bracket -1- right and left.



### Continuation for all vehicles

- Turn radiator component with top edge towards the engine.
- Press down left and right locking pins -arrow- of the radiator. Press radiator off charge air cooler.
- Remove radiator upwards.

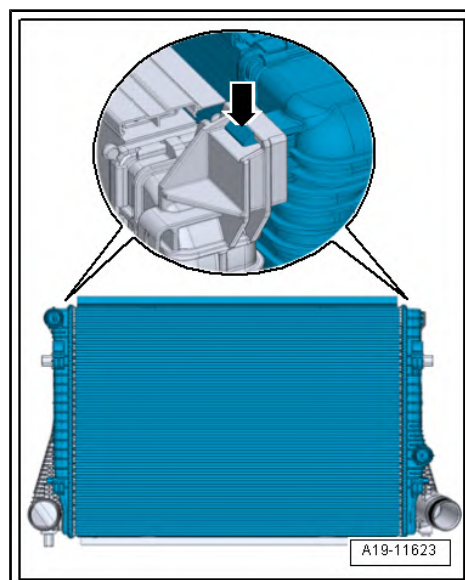


### Installing



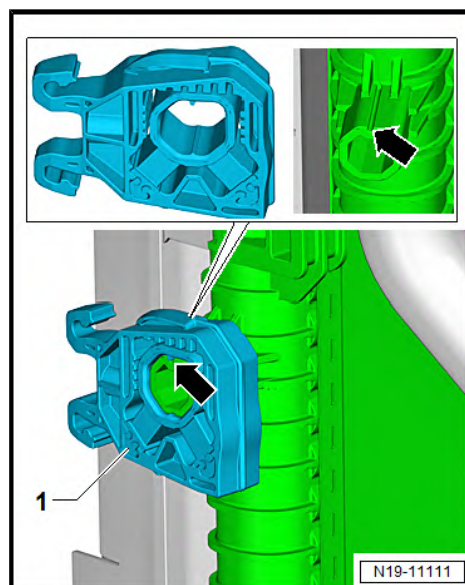
#### Note

- ♦ *Observe the instructions if there are minor dents in the fins  
 ⇒ [page 6](#).*
- ♦ *Renew O-rings after removal.*
- Insert radiator at an angle into lower charge air cooler mounting, and engage radiator in charge air cooler -arrow-. Ensure proper engagement by pulling.

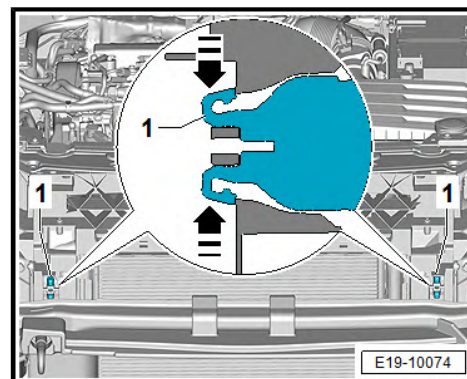


### Installation position of the bearing support for the charge-air cooler

- Position right and left bearing support for the charge-air cooler -1- on the cooler. When doing so, note the installation position -arrow-.



- Swing water radiator for charge air cooling circuit into lock carrier. Ensure proper seating of radiator mountings -1- in lock carrier.

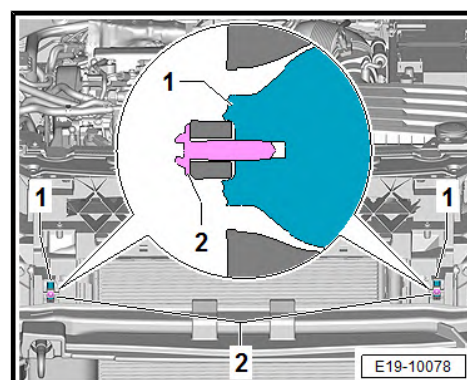


#### Vehicles with bearing support for charge-air cooler, bolted.

- Use bolts to secure radiator mountings, whose fasteners have been pinched off, to lock carrier. Screws -2- ➔ ETKA (electronic spare parts catalogue) .
- Specified torque: 5 Nm

#### Continuation for all vehicles

- Install radiator cowl ➔ [page 265](#) .
- Connect coolant hose with plug-in connector ➔ [page 259](#) .
- Install front bumper ➔ General body repairs, exterior; Rep. gr. 63 ; Front bumper; Removing and installing front bumper cover .
- Fill with new coolant ➔ [page 212](#) .



#### Specified torques

- ◆ ➔ [“4.1 Assembly overview - radiator/radiator fan”, page 258](#)

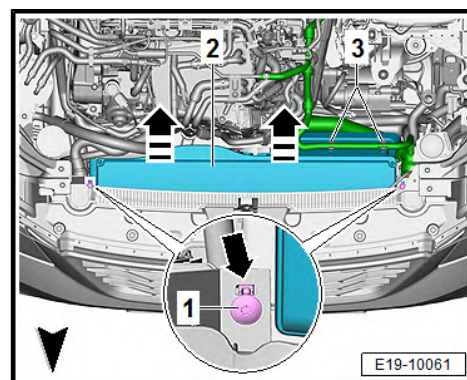
## 4.5 Removing and installing radiator cowl

#### Special tools and workshop equipment required

- ◆ Protective mat - VAS 531 003-

#### Removing

- Remove air filter housing ➔ [page 322](#) .
- Lay coolant hose -3- to one side.
- Unscrew bolts -1-.
- Release locking lugs-arrow-, unclip air hose -2- from the front end and remove in -direction of the arrow-.



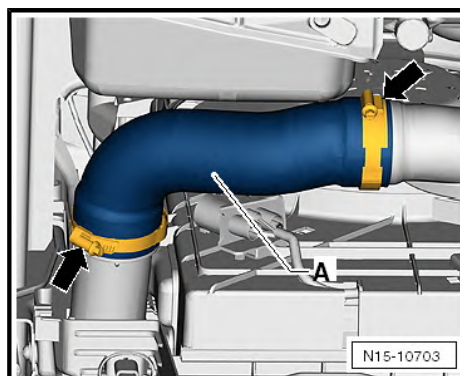
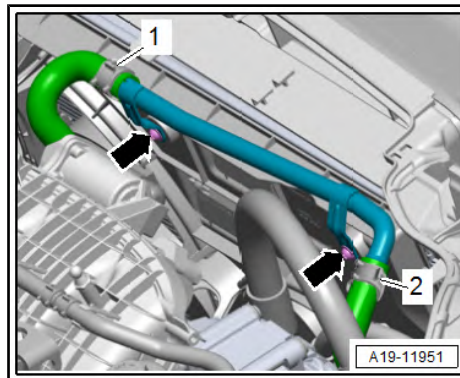


- Vehicles with additional cooler Unscrew bolts -arrows- and remove the engine hose.

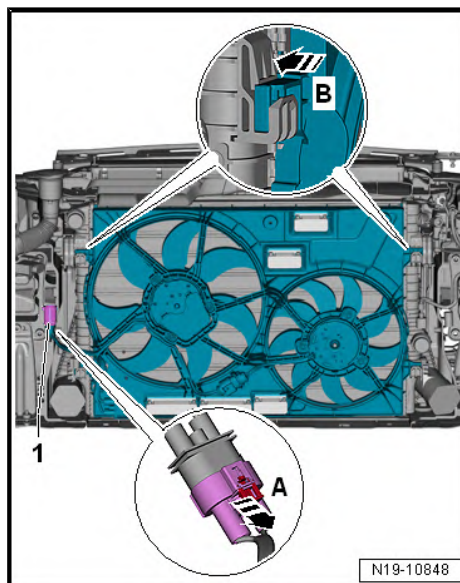
### ⚠ CAUTION

Risk of injury; the radiator fans can run at any time.

- Disconnect electrical connectors.
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
- Loosen hose clips -arrows-, and remove charge air hose -A-.



- Unplug electrical connector -1- for radiator fan (push retainer in direction of -arrow A- and press release catch down).
- Press locking tabs -B- on left and right sides of radiator cowl simultaneously. Unhook radiator cowl and remove downwards from radiator.



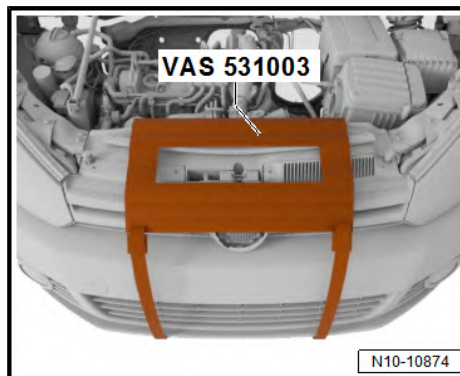
- Cover radiator using protective mat - VAS 531 003- .

### Installing

Install in reverse order of removal.

### Specified torques

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





## 4.6 Removing and installing radiator fan

### Removing



#### Note

*Fit all cable ties in the original position when installing.*

- Remove radiator cowl with fans ⇒ [page 265](#) .
- Disconnect electrical connector.
- Move wiring harness clear.
- Unscrew bolts -arrows- and remove radiator fan.

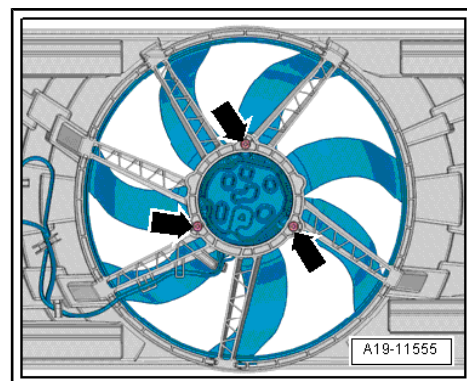
### Installing

Carry out installation in the reverse sequence, noting the following:

- Install radiator cowl ⇒ [page 265](#) .

### Specified torques

- ◆ ⇒ [“4.3 Assembly overview - radiator cowl and radiator fan”, page 262](#)



## 4.7 Removing and installing auxiliary radiator

⇒ [“4.7.1 Removing and installing right auxiliary radiator”, page 267](#)

⇒ [“4.7.2 Removing and installing left auxiliary radiator”, page 269](#)

### 4.7.1 Removing and installing right auxiliary radiator

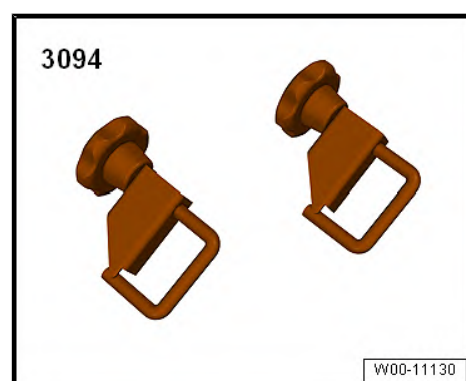


#### Note

*On vehicles with dual clutch gearbox, an auxiliary radiator may be installed at front right (depending on version).*

### Special tools and workshop equipment required

- ◆ Hose clamps to Ø 25 mm - 3094-

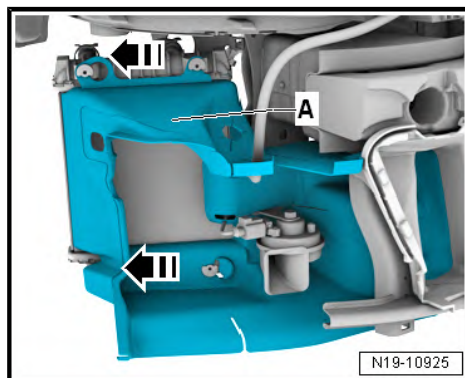


◆ Drip tray for workshop hoist - VAS 6208-

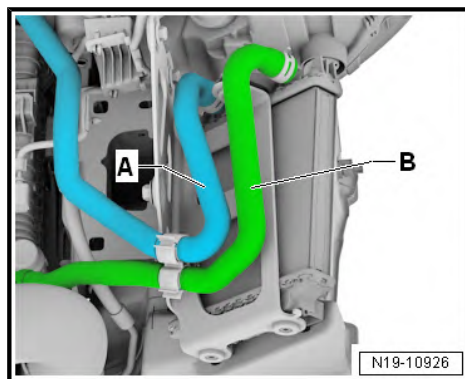


### Removing

- Remove front right wheel ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres and alignment .
- Remove nose insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
- Remove front part of front right wheel housing liner ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liner; Removing and installing front wheel housing liner .
- Remove front bumper ⇒ General body repairs, exterior; Rep. gr. 63 ; Front bumper; Removing and installing bumper .
- Pull air duct -A- in direction of arrow off auxiliary radiator.
- Place drip tray for workshop hoist - VAS 6208- underneath.



- Clamp off coolant hoses -A- and -B- with hose clamps - 3094- . Open spring-type clips, and remove hoses from auxiliary radiator.



- Unscrew bolts -arrows-. Remove auxiliary radiator -A- upwards from bracket.

### Installing

Install in reverse order of removal, observing the following:

- Install the front bumper ⇒ General body repairs, exterior; Rep. gr. 63 ; Front bumper; Remove and install front bumper cover .
- Install wheel housing liner ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liner; Removing and installing front wheel housing liner .
- Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview – noise insulation .
- Install wheel ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres; Changing wheel .
- Check coolant level and top up as needed ⇒ [page 212](#) .

### Specified torques

- ◆ ⇒ ["4.2.1 Assembly overview - right auxiliary radiator", page 259](#)

## 4.7.2 Removing and installing left auxiliary radiator

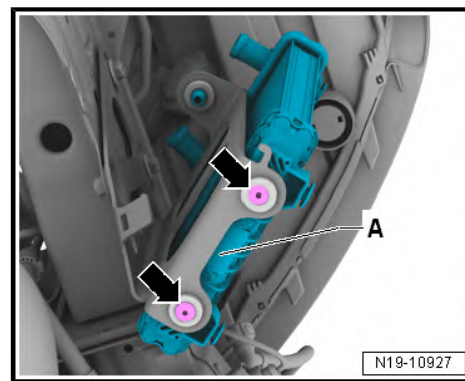


### Note

*On vehicles with dual clutch gearbox, an auxiliary radiator may be installed at front left (depending on version).*

### Special tools and workshop equipment required

- ◆ Hose clamps to Ø 25 mm - 3094-



- ◆ Drip tray for workshop hoist - VAS 6208-

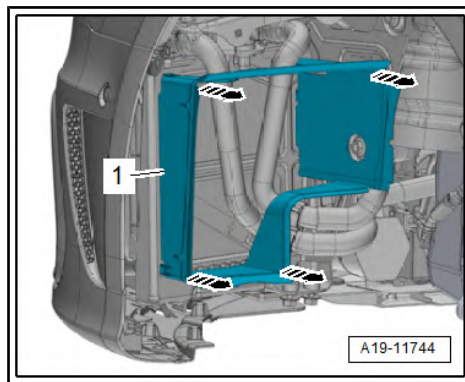


- ◆ Hose clip pliers - VAS 6362-

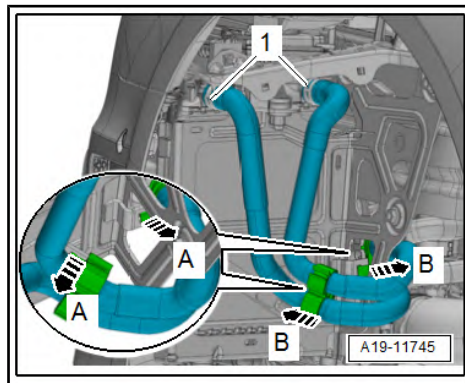


## Removing

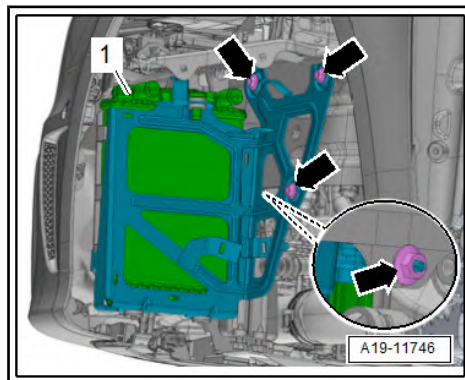
- Remove front left wheel ➔ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres; Removing tyres
- Remove front left wheel housing liner ➔ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liner; Assembly overview - front wheel housing liner .
- If fitted, unclip air duct -1- -arrows-.



- Move coolant hose on retainer to one side. To do so, release fasteners -arrows A-, and pull off -arrows B-.
- Place drip tray for workshop hoist - VAS 6208- underneath.
- Clamp off coolant hoses using the hose clamps - 3094- . Open spring-type clips -1-, and remove hoses from auxiliary radiator.



- Unscrew nuts -arrows-, and remove auxiliary radiator -1- together with bracket. If fitted, lay aside wiring harness.



- Pull off air duct -1- -arrow-.
- Unscrew bolts -4-, and remove auxiliary radiator -2- upwards from bracket -3-.

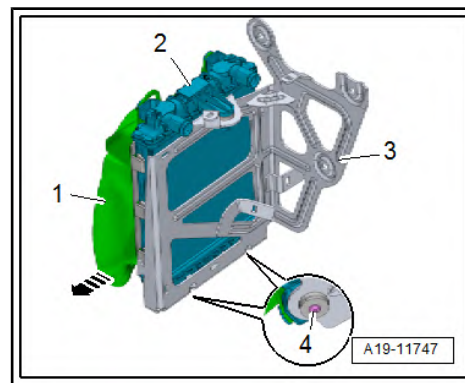
### Installing

Remaining installation is carried out in the reverse order. When installing, note the following:

- Install radiator together with air duct.
- Install wheel housing liner ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liner; Removing and installing front wheel housing liner .
- Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview – noise insulation .
- Install wheel ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres; Installing tyres .
- Check coolant level and top up as needed ⇒ [page 212](#) .

### Specified torques

- ◆ ⇒ [“4.2.2 Assembly overview - left auxiliary radiator”, page 260](#)





## 21 – Turbocharging/supercharging

### 1 Exhaust turbocharger

⇒ [“1.1 Assembly overview - turbocharger”, page 272](#)

⇒ [“1.2 Removing and installing turbocharger”, page 276](#)

⇒ [“1.3 Removing and installing turbocharger air recirculation valve N249”, page 288](#)

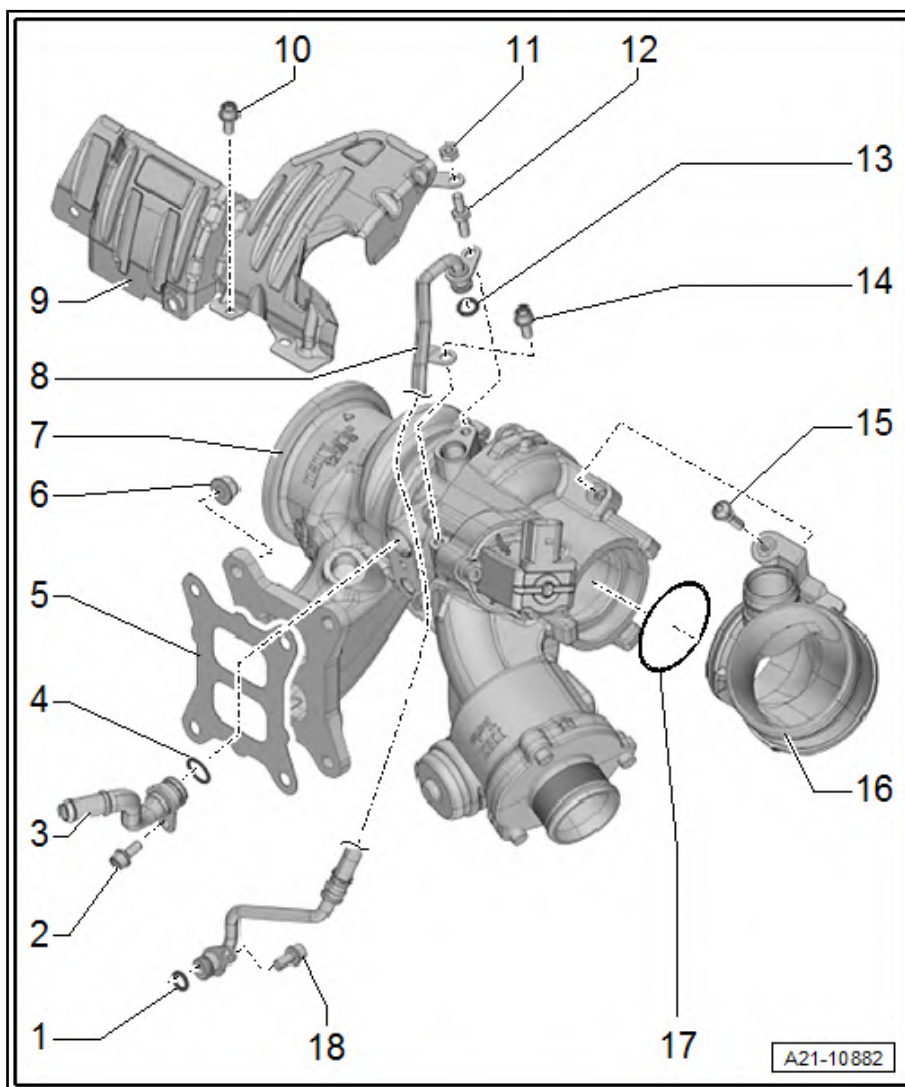
#### 1.1 Assembly overview - turbocharger

⇒ [“1.1.1 Assembly overview - turbocharger, part I”, page 272](#)

⇒ [“1.1.2 Assembly overview - turbocharger, part II”, page 274](#)

##### 1.1.1 Assembly overview - turbocharger, part I

- 1 - O-ring
  - ☐ Renewing:
  - ☐ Moisten with engine oil.
- 2 - Bolt
  - ☐ 9 Nm
- 3 - Coolant supply line
- 4 - O-ring
  - ☐ Renewing:
  - ☐ Moisten with coolant
- 5 - Articulation
  - ☐ Renew after removal
- 6 - Nut
  - ☐ Renew after removal
  - ☐ Coat stud with high-temperature paste; high-temperature paste ⇒ Electronic parts catalogue
  - ☐ Specified torque and tightening sequence  
⇒ [page 273](#).
- 7 - Turbocharged
  - ☐ Removing and installing  
⇒ [page 276](#)
- 8 - Oil supply line
- 9 - Heat shield
- 10 - Bolt
  - ☐ 9 Nm
- 11 - Nut
  - ☐ 9 Nm
- 12 - Bolt
  - ☐ 9 Nm
- 13 - O-ring
  - ☐ Renew after removal



Volkswagen Technical Site: <http://vwts.ru> <http://vwts.info>

- ☐ Moisten with engine oil.

**14 - Bolt**

- ☐ 9 Nm

**15 - Bolt**

- ☐ 9 Nm

**16 - Shift collar**

**17 - O-ring**

- ☐ Renew after removal

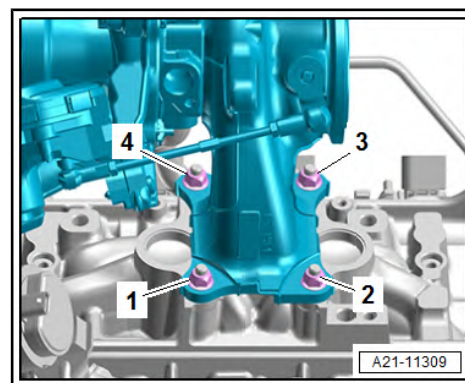
**18 - Bolt**

- ☐ 9 Nm

**Turbocharger - specified torques and tightening sequence**

- Renew nuts after removal.
- Tighten nuts in stages in the sequence shown:

Stage	Nuts	Tightening torques
1	-1, 2-	10 Nm
2	-3, 4-	25 Nm
3	-1, 2-	25 Nm



## 1.1.2 Assembly overview - turbocharger, part II

### 1 - Bolt

- ☐ 9 Nm

### 2 - Turbocharger air recirculation valve - N249-

- ☐ Removing and installing  
⇒ [page 288](#)
- ☐ Note installation position ⇒ [page 275](#)

### 3 - O-ring

- ☐ Renewing:

### 4 - Turbocharged

- ☐ Removing and installing  
⇒ [page 276](#)

### 5 - O-ring

- ☐ Renewing:
- ☐ Moisten with coolant

### 6 - Bolt

- ☐ 9 Nm

### 7 - Coolant return line

### 8 - Bolt

- ☐ 9 Nm

### 9 - O-ring

- ☐ Renewing:
- ☐ Moisten with coolant

### 10 - Bolt

- ☐ Coat with high-temperature paste ⇒ Electronic parts catalogue (ETKA)
- ☐ 30 Nm

### 11 - Bolt

- ☐ 30 Nm

### 12 - Carrier

- ☐ For turbocharger

### 13 - Oil return line

### 14 - Bolt

- ☐ 9 Nm

### 15 - O-ring

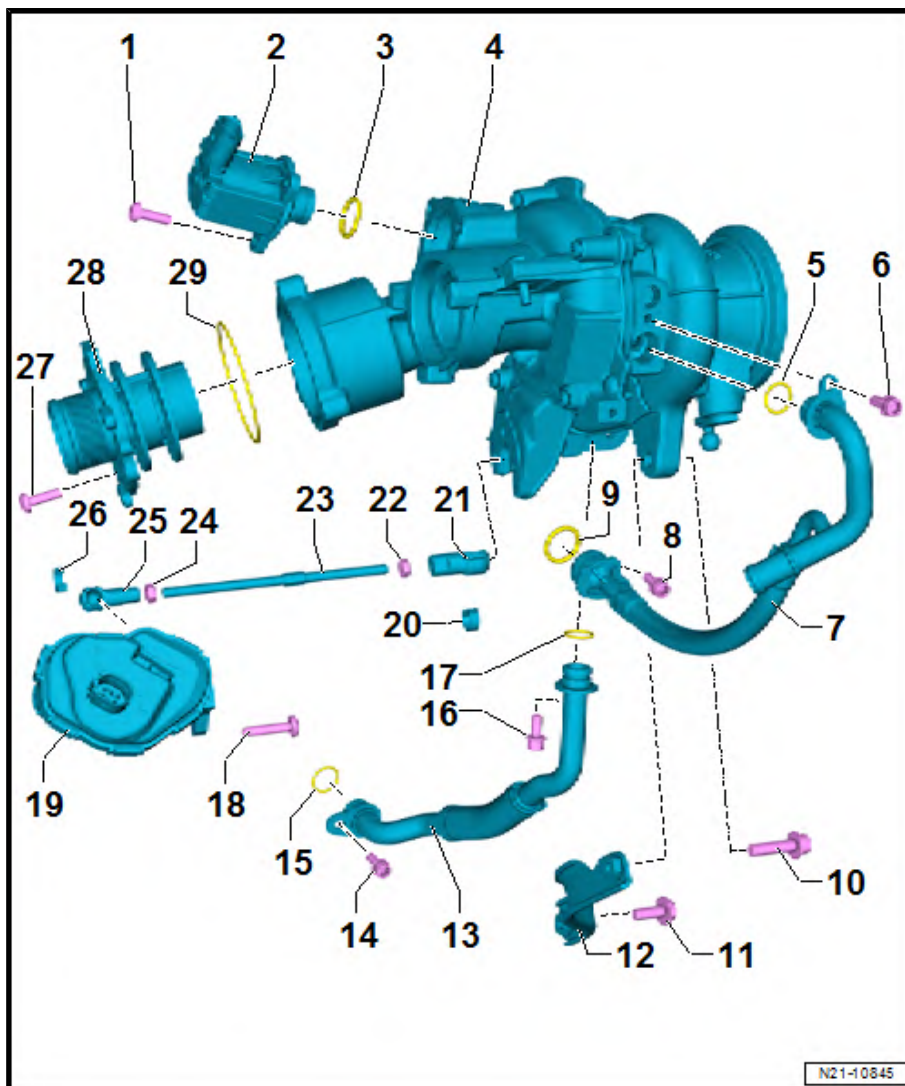
- ☐ Renewing:
- ☐ Moisten with engine oil.

### 16 - Bolt

- ☐ 9 Nm

### 17 - O-ring

- ☐ Renewing:
- ☐ Moisten with engine oil.



**18 - Bolt**

- ☐ 10 Nm

**19 - Charge air pressure controller - V465-**

- ☐ Not available individually; it is contained in the items supplied with the turbocharger

**20 - Clip**

**21 - Cup**

**22 - Nut**

- ☐ 10 Nm

**23 - Threaded rod**

**24 - Nut**

- ☐ 10 Nm

**25 - Cup**

**26 - Clip**

**27 - Bolt**

- ☐ 9 Nm

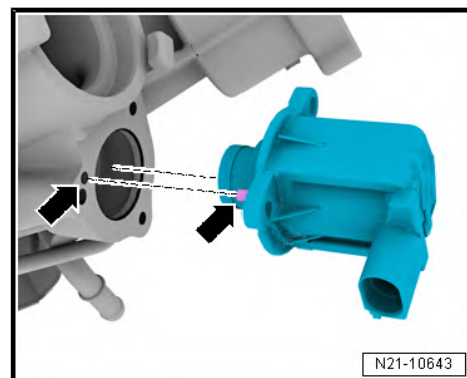
**28 - Shift collar**

**29 - O-ring**

- ☐ Renewing:
- ☐ Moisten with coolant

**Installation location of turbocharger air recirculation valve - N249-**

- Note installation position -arrows-.



## 1.2 Removing and installing turbocharger

⇒ ["1.2.1 Removing and installing turbocharger, vehicles without particulate filter", page 276](#)

⇒ ["1.2.2 Removing and installing turbocharger, vehicles with particulate filter", page 282](#)

### 1.2.1 Removing and installing turbocharger, vehicles without particulate filter

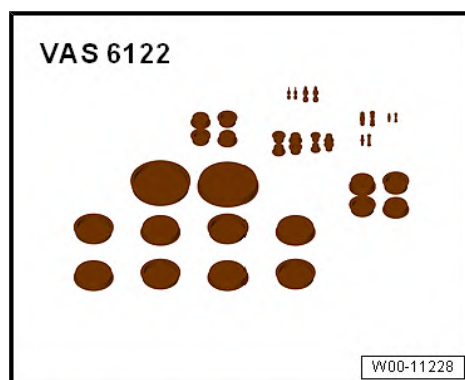


#### Note

- ◆ *The turbocharger is removed from above.*
- ◆ *If a mechanical fault is discovered on the turbocharger (e.g. a destroyed compressor impeller), it is not sufficient to just renew the turbocharger. To avoid subsequent damage, the following work must be carried out:*
- ◆ *Check air filter housing, air filter element and air inlet hoses for contamination.*
- ◆ *Check the whole charge air path and charge air cooler for foreign objects.*
- ◆ *If foreign objects are discovered in the charge air system, clean the charge air path and, if necessary, renew the charge air cooler.*

#### Special tools and workshop equipment required

- ◆ Set of plugs for engine - VAS 6122-

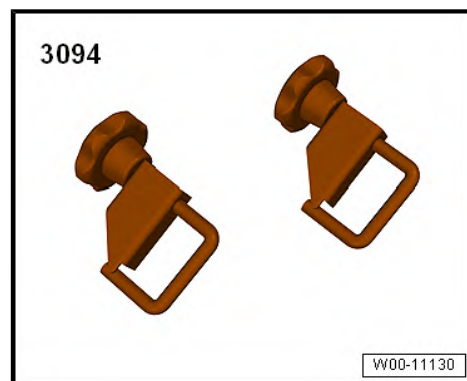


- ◆ Spring-type clip pliers - VAS 6362-



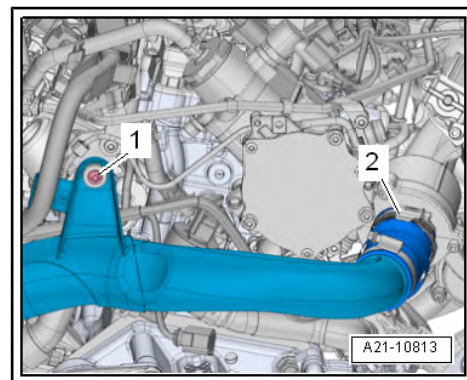


- ◆ Hose clamps, up to Ø 25 mm - 3094-

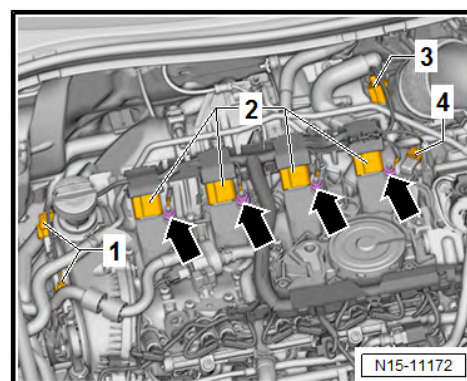


### Removing

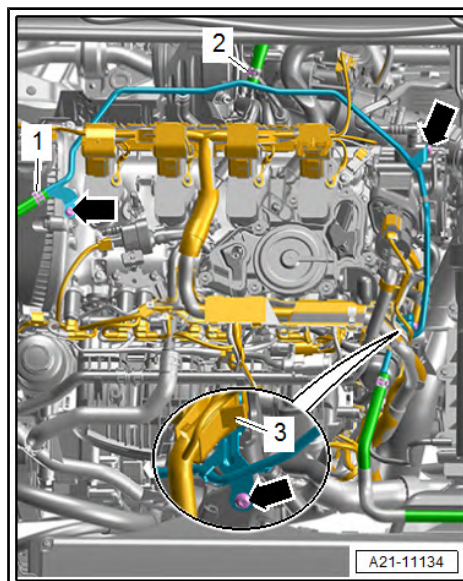
- Remove catalytic converter ⇒ [page 376](#) .
- Remove air filter housing together with air intake hose ⇒ [page 323](#) .
- Unscrew bolt -1-, and open hose clip -2-.
- Pull charge air pipe off turbocharger.



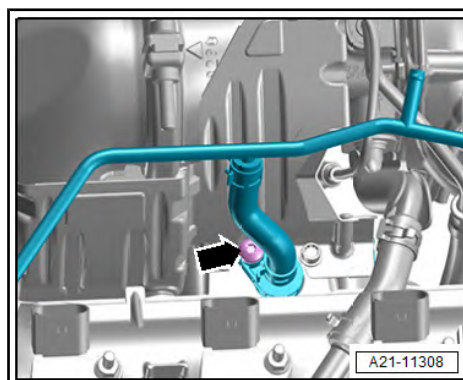
- Unscrew nuts -arrows- and move earth wires clear.
- Detach the electrical connectors -1-, -3- and -4-.
- Release the connectors -2- and disconnect all the connectors of the ignition coils at the same time.



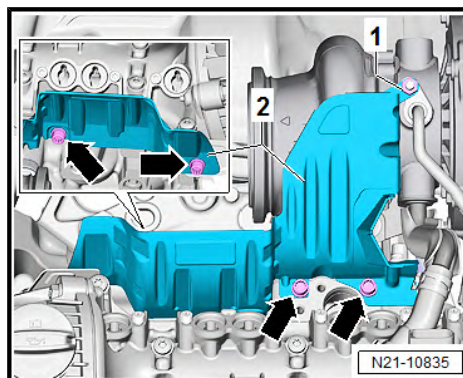
- Loosen the hose clips -1, 2- and remove the coolant hoses.
- Remove wiring duct -3- upwards from the bracket; also release the fastener.
- Unclip wiring harness, and lay it to one side.
- Remove bolts -arrows-.



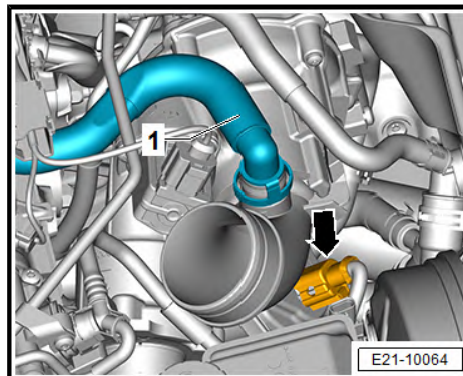
- Unscrew bolts -arrow-, and remove cylinder head connection. Swivel coolant pipe to the side.



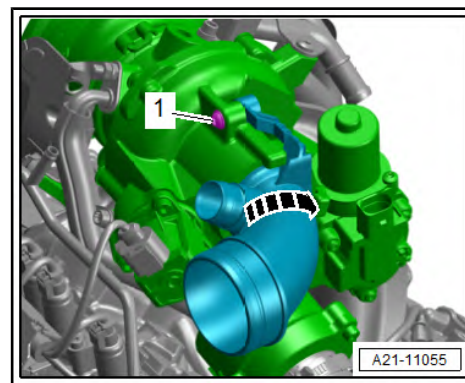
- Unscrew bolts -arrows- and nut -1-.
- Remove heat shield -2-.
- Remove Lambda probe 1 before catalytic converter - GX10- ➔ [page 358](#) .



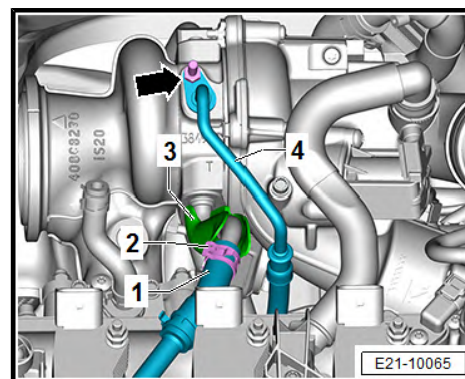
- Press release tabs on crankcase breather hose -1- and detach hose.
- Separate electrical connector -arrow-.



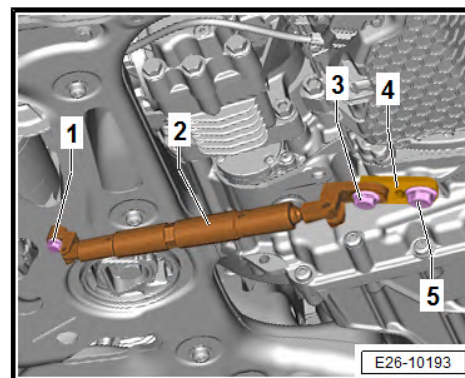
- Unscrew the bolt -1-, turn the rubber sleeve in the -direction of the arrow-, remove and place to one side.



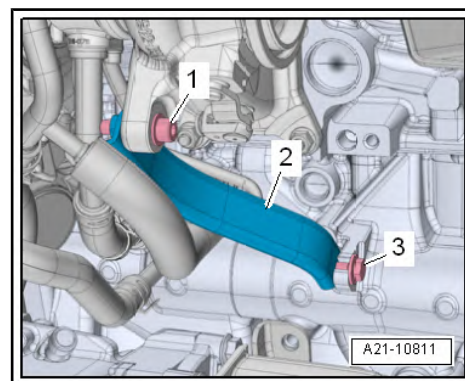
- Unscrew bolts -arrow-, and pull oil supply line -4- off turbocharger.
- Open the heat insulation of the oil supply line -3-.
- Open hose clip -2-, and pull hose -1- off turbocharger.
- Remove pendulum support ⇒ [page 40](#) .



- Assemble engine support - T50015A- as shown in the diagram.
- ◆ Screw a bolt M8 x 30 mm -1- with a washer into the threaded hole of the subframe.
- ◆ Fit the engine support - T50015A- -2- on the support plate of the positioner - T10533/2- -4-.
- ◆ Fasten the assembly kit engine support - T50015A- -2- and support plate of the positioner - T10533/2- -4- using the bolt M12 x 20 mm of the positioner - T10533/4- -5- on the threaded hole of the gearbox.
- By turning the spindle, the engine/gearbox unit is moved forwards until there is a small tension. Avoid collisions with other components.

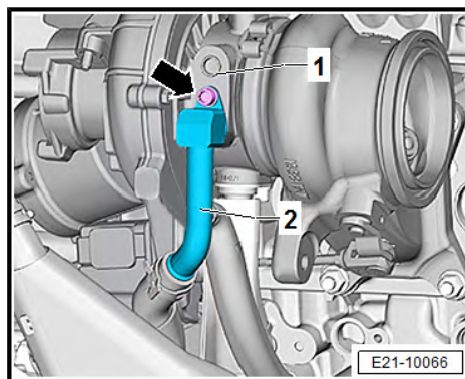


- Unscrew the bolt -1- from below out of the bracket -2- for the turbocharger.

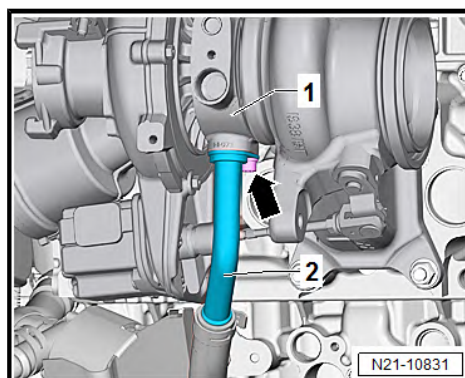




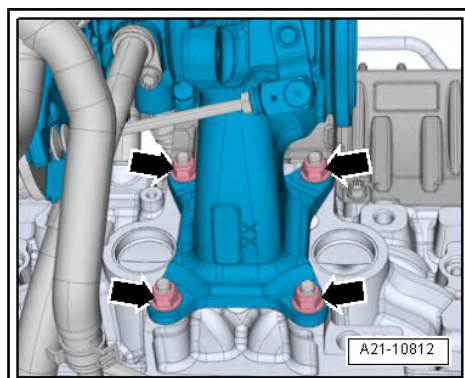
- Unscrew bolt -arrow-, and pull coolant pipe -2- off turbocharger -1-.



- Open the heat insulation of the oil supply line -2-.
- Unscrew bolts -arrow-, and pull oil supply line -2- off turbocharger -1-.



- Unscrew nuts -arrows-.



- Remove turbocharger from cylinder head, and remove it upwards.

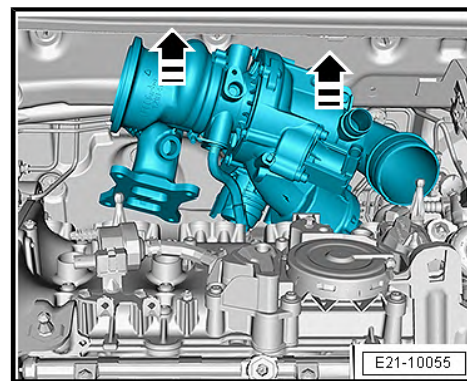
### Installing

Remaining installation is carried out in the reverse order. When installing, note the following:



#### Note

- ◆ *Renew seals, gaskets, O-rings and self-locking nuts.*
  - ◆ *Lubricate turbocharger studs with high-temperature paste. For high-temperature, paste refer to ⇒ [Electronic parts catalogue \(ETKA\)](#).*
  - ◆ *Fill turbocharger with engine oil at connection for oil supply line.*
  - ◆ *Hose connections and hoses for charge air system must be free of oil and grease before assembly.*
  - ◆ *Secure all hose connections with hose clips corresponding to the series production status ⇒ [Electronic Parts Catalogue \(ETKA\)](#).*
- Install front exhaust pipe with catalytic converter  
⇒ [page 376](#).
  - Align exhaust system free of stress ⇒ [page 368](#).
  - Add coolant ⇒ [page 208](#).
  - Check oil level.



#### Note

*After installing turbocharger, run engine for about 1 minute at idling speed and do not rev up immediately. This ensures that the turbocharger is fully primed with oil.*

### Specified torques

- ◆ ⇒ [“2.1 Assembly overview - assembly mountings”, page 34](#)
- ◆ ⇒ [“2.1 Assembly overview - emission control”, page 369](#)
- ◆ ⇒ [“1.1 Assembly overview - turbocharger”, page 272](#)
- ◆ ⇒ [“3.1 Assembly overview - air filter housing”, page 321](#)
- ◆ ⇒ [“8.1 Assembly overview - Lambda probe”, page 355](#)



## 1.2.2 Removing and installing turbocharger, vehicles with particulate filter

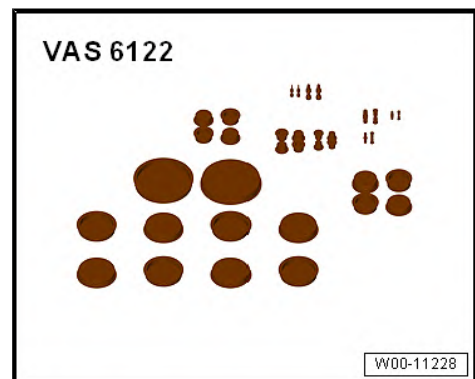


### Note

- ◆ *The turbocharger is removed from above.*
- ◆ *If a mechanical fault is discovered on the turbocharger (e.g. a destroyed compressor impeller), it is not sufficient to just renew the turbocharger. To avoid subsequent damage, the following work must be carried out:*
  - ◆ *Check air filter housing, air filter element and air inlet hoses for contamination.*
  - ◆ *Check the whole charge air path and charge air cooler for foreign objects.*
  - ◆ *If foreign objects are discovered in the charge air system, clean the charge air path and, if necessary, renew the charge air cooler.*

### Special tools and workshop equipment required

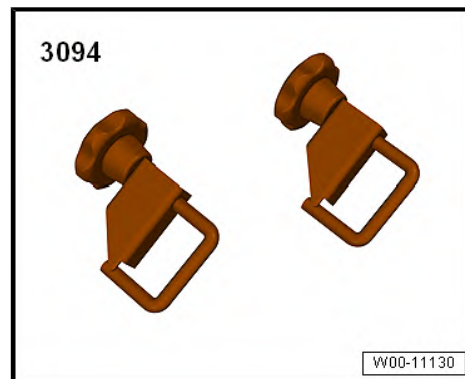
- ◆ Set of plugs for engine - VAS 6122-



- ◆ Spring-type clip pliers - VAS 6362-



- ◆ Hose clamps, up to Ø 25 mm - 3094-



## Removing

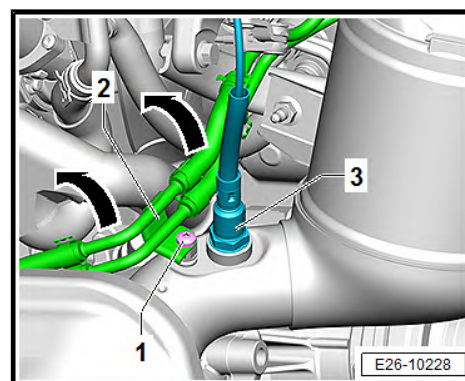
### Front-wheel drive vehicles:

- Disconnect the catalytic converter of the turbocharger and slide to one side ⇒ [page 376](#) .
- Remove bolt -1- and disconnect lines from exhaust gas pressure sensor 1 - G450- -2- in -direction of arrow-.



### Note

-Item 3- should be disregarded.

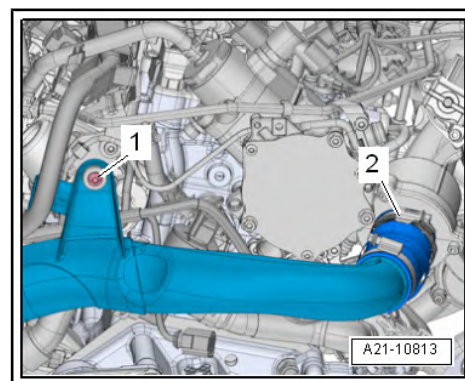


### Vehicles with all-wheel drive

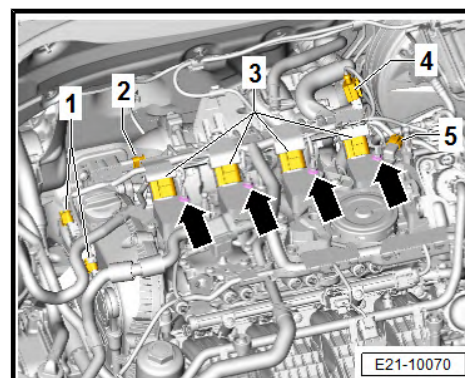
- Remove catalytic converter ⇒ [page 376](#) .

### Continued for all vehicles

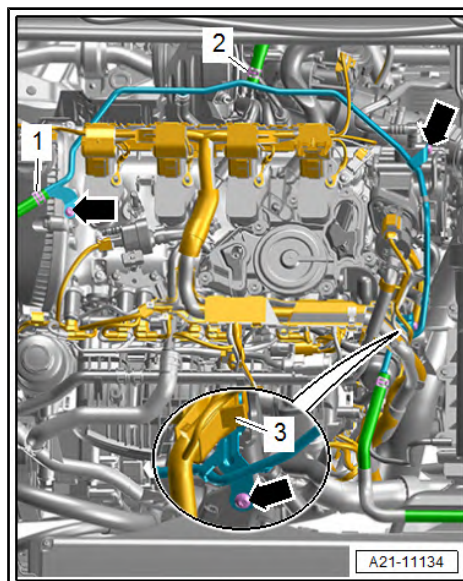
- Remove air filter housing together with air intake hose ⇒ [page 323](#) .
- Unscrew bolt -1-, and open hose clip -2-.
- Pull charge air pipe off turbocharger.



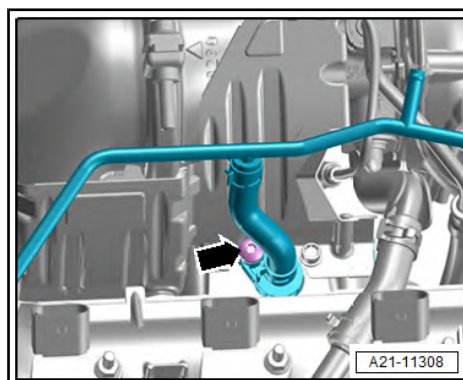
- Unscrew nuts -arrows- and move earth wires clear.
- Disconnect the connectors -1-, -2-, -4- and -5-.
- Release the connectors -3- and disconnect all the connectors of the ignition coils at the same time.



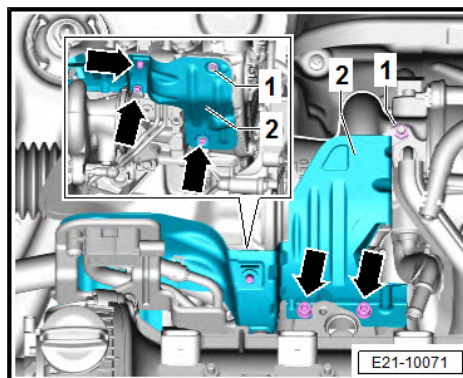
- Loosen the hose clips -1, 2- and remove the coolant hoses.
- Remove wiring duct -3- upwards from the bracket; also release the fastener.
- Unclip wiring harness, and lay it to one side.
- Remove bolts -arrows-.



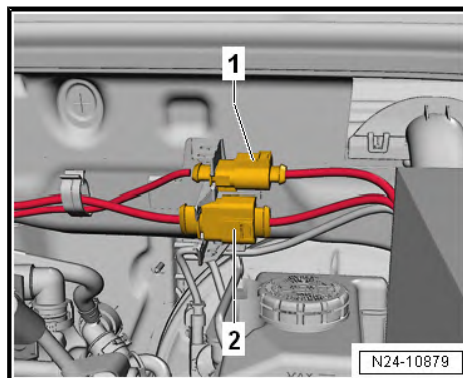
- Unscrew bolts -arrow-, and remove cylinder head connection. Swivel coolant pipe to the side.



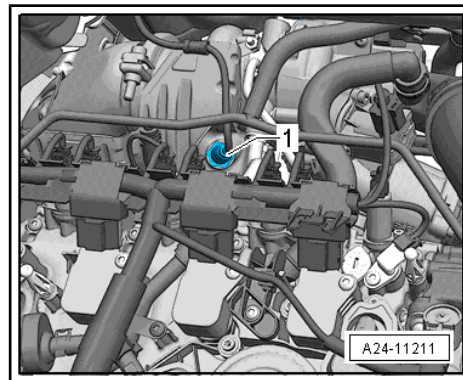
- Remove bolts -arrows- and nuts -1-.
- Remove heat shield -2-.



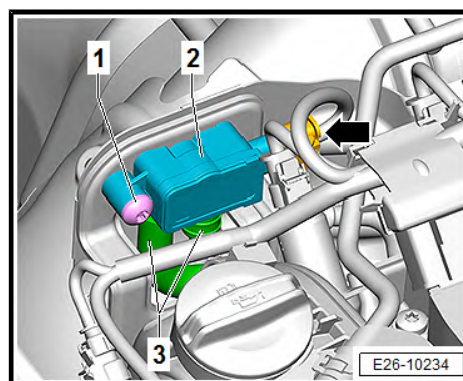
- Disconnect connector -2- for Lambda probe 1 before catalytic converter - GX10- .



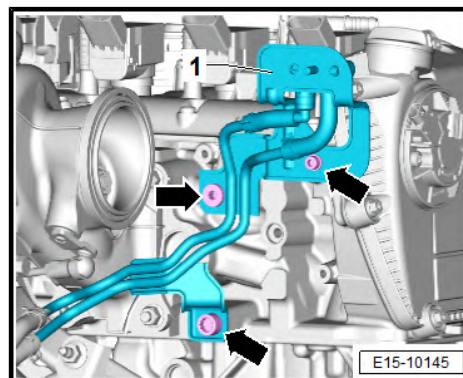
- Unscrew Lambda probe 1 before catalytic converter - GX10-1- using tool from Lambda probe open ring spanner set - 3337/7- .



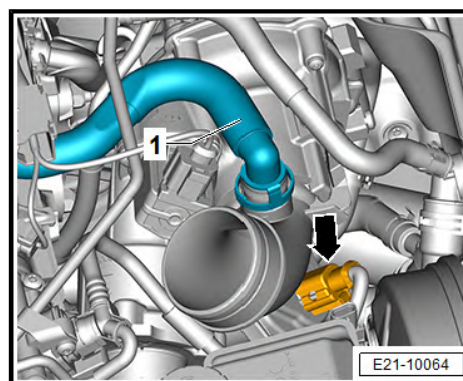
- Remove the electrical connector -arrow- from the exhaust gas pressure sensor 1 - G450- .



- Unscrew the bolts -arrows- and place the pressure lines together with the exhaust gas pressure sensor 1 - G450- to the rear.

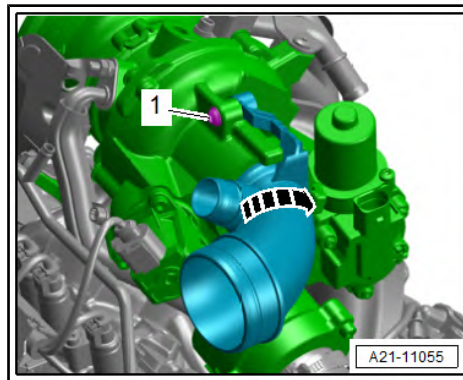


- Press release tabs on crankcase breather hose -1- and detach hose.
- Separate electrical connector -arrow-.

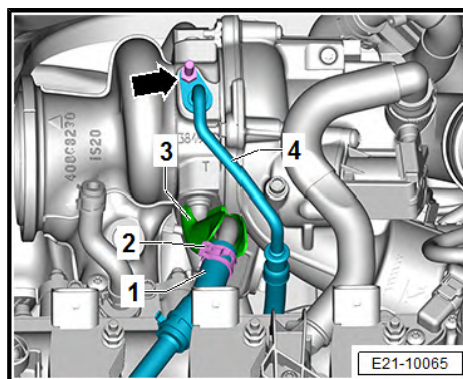




- Unscrew the bolt -1-, turn the rubber sleeve in the -direction of the arrow-, remove and place to one side.

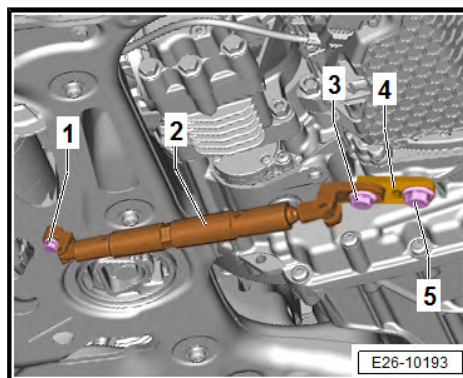


- Unscrew bolts -arrow-, and pull oil supply line -4- off turbocharger.
- Open the heat insulation of the oil supply line -3-.
- Seal open lines and connections using clean plugs from engine bung set - VAS 6122- .
- Open hose clip -2-, and pull hose -1- off turbocharger.



#### Front-wheel drive vehicles:

- Remove pendulum support ➔ [page 40](#) .
- Assemble engine support - T50015A- as shown in the diagram.
- ◆ Screw a bolt M8 x 30 mm -1- with a washer into the threaded hole of the subframe.
- ◆ Fit the engine support - T50015A- -2- on the support plate of the positioner - T10533/2- -4-.
- ◆ Fasten the assembly kit engine support - T50015A- -2- and support plate of the positioner - T10533/2- -4- using the bolt M12 x 20 mm of the positioner - T10533/4- -5- o the threaded hole of the gearbox.
- By turning the spindle, the engine/gearbox unit is moved forwards until there is a small tension. Avoid collisions with other components.



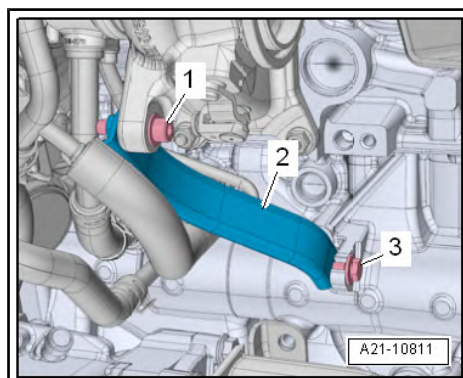
#### Continued for all vehicles

- Remove bolts -1- at top.



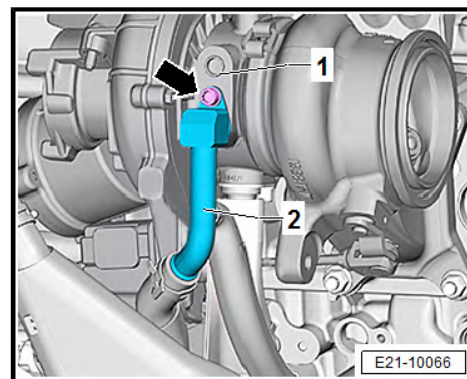
#### Note

-Item 3- should be disregarded.

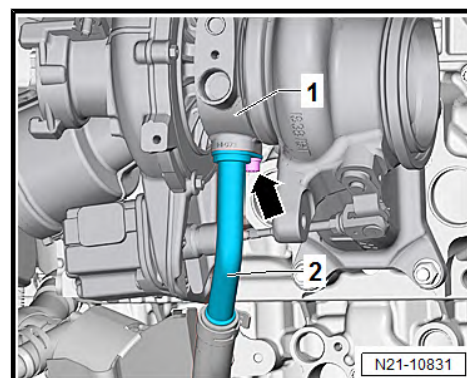




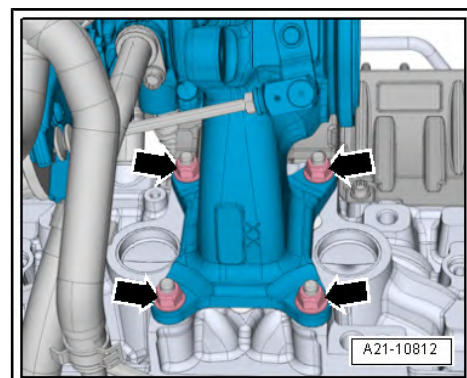
- Unscrew bolt -arrow-, and pull coolant pipe -2- off turbocharger -1-.



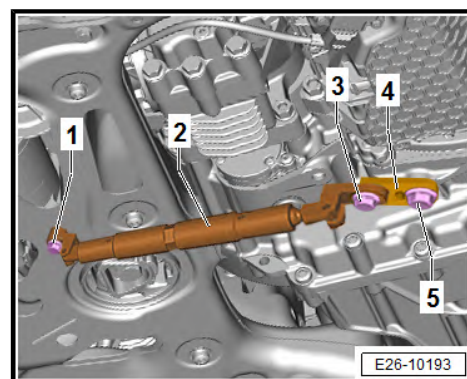
- Open the heat insulation of the oil supply line -2-.
- Unscrew bolts -arrow-, and pull oil supply line -2- off turbocharger -1-.



- Unscrew nuts -arrows-.



- By turning the spindle, move the engine/gearbox assembly to the rear until there is a small tension. Avoid collisions with other components.



- Remove turbocharger from cylinder head, and remove it upwards.

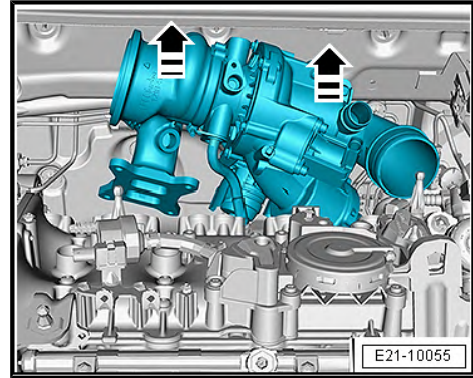
### Installing

Remaining installation is carried out in the reverse order. When installing, note the following:



#### Note

- ◆ *Renew seals, gaskets, O-rings and self-locking nuts.*
- ◆ *Lubricate turbocharger studs with high-temperature paste. For high-temperature, paste refer to ⇒ [Electronic parts catalogue \(ETKA\)](#).*
- ◆ *Fill turbocharger with engine oil at connection for oil supply line.*
- ◆ *Hose connections and hoses for charge air system must be free of oil and grease before assembly.*
- ◆ *Secure all hose connections with hose clips corresponding to the series production status ⇒ [Electronic Parts Catalogue \(ETKA\)](#).*
- Install front exhaust pipe with catalytic converter ⇒ [page 376](#).
- Align exhaust system free of stress ⇒ [page 368](#).
- Add coolant ⇒ [page 208](#).
- Check oil level.



#### Note

*After installing turbocharger, run engine for about 1 minute at idling speed and do not rev up immediately. This ensures that the turbocharger is fully primed with oil.*

### Specified torques

- ◆ ⇒ [“2.1 Assembly overview - assembly mountings”, page 34](#)
- ◆ ⇒ [“1.1 Assembly overview - turbocharger”, page 272](#)
- ◆ ⇒ [“3.1 Assembly overview - air filter housing”, page 321](#)
- ◆ ⇒ [“8.1 Assembly overview - Lambda probe”, page 355](#)
- ◆ ⇒ [“2.1 Assembly overview - emission control”, page 369](#)

## 1.3 Removing and installing turbocharger air recirculation valve - N249-

### Removing

- Remove engine cover panel ⇒ [page 50](#).

- Disconnect electrical connector -2-.
- Loosen the bolts -arrows- and remove the turbocharger air recirculation valve - N249- .

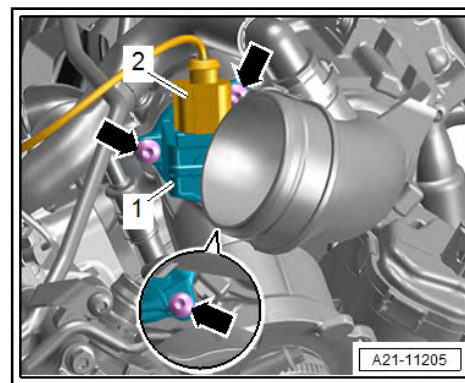
### Installing

Install in the reverse order of removal, observing the following.

- Installation position ⇒ [page 275](#) .
- Fit engine cover panel ⇒ [page 50](#) .

### Specified torques

- ◆ ⇒ [“1.1 Assembly overview - turbocharger”, page 272](#)



## 2 Charge air system

⇒ "2.1 Assembly overview - charge air system", page 290

⇒ "2.2 Assembly overview - charge-air hose connections", page 291

⇒ "2.3 Removing and installing charge air cooler", page 291

⇒ "2.4 Removing and installing charge air pressure sender G31", page 295

⇒ "2.5 Checking charge air system for leaks", page 296

### 2.1 Assembly overview - charge air system



#### Note

- ♦ Installing screw-type clips for charge air hose connections ⇒ [page 291](#).
- ♦ Check all air hoses and pipes for firm seating and leaks before carrying out tests or repairs.

1 - Air intake pipe

2 - Nozzle/spout

3 - Spacer sleeve

4 - Bolt

□ 7 Nm

5 - Charge air hose

□ Installing ⇒ [page 291](#)

6 - Cowling

7 - Intercooler

□ Removing and installing  
⇒ [page 291](#)



#### Note

If there are minor dents  
refer to ⇒ [page 6](#).

8 - Cowling

9 - Bonded rubber bush

□ For charge air cooler.

10 - Bonded rubber bush

□ For charge air cooler.

11 - Bolt

□ 7 Nm

12 - Spacer sleeve

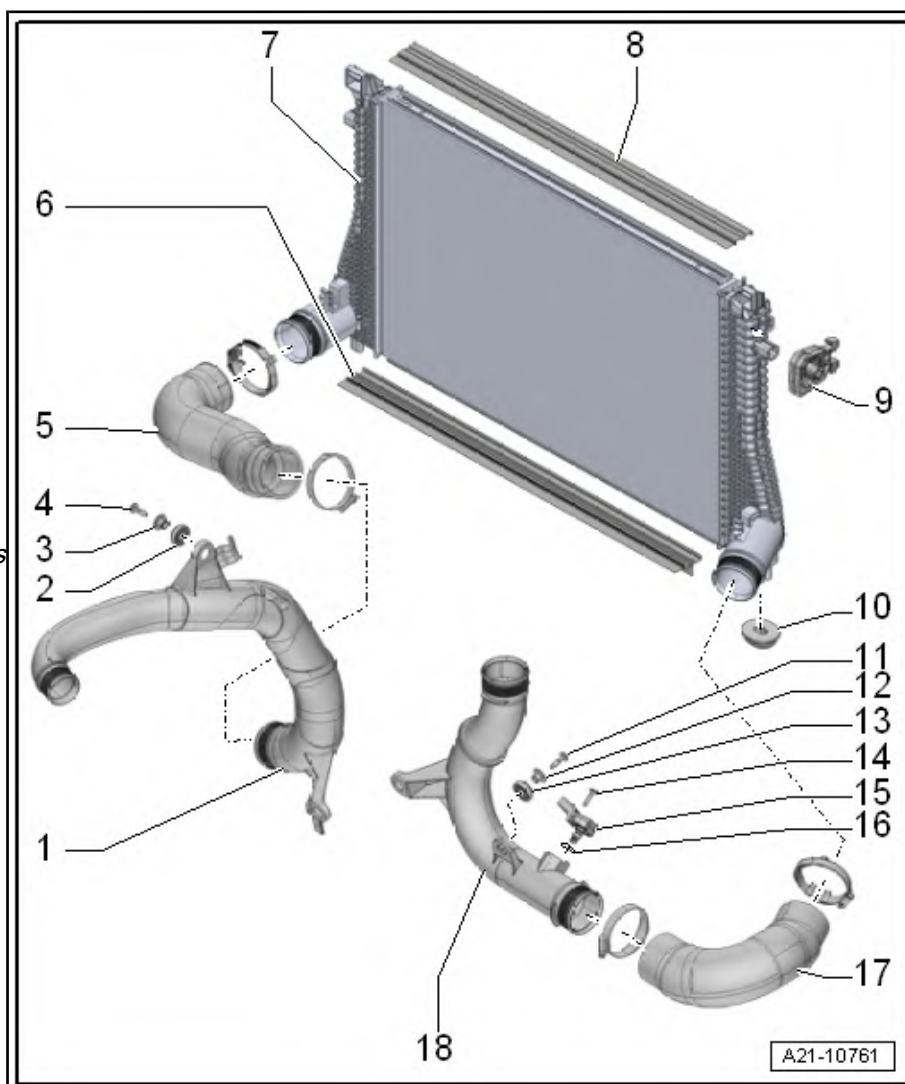
13 - Nozzle/spout

14 - Bolt

□ 5 Nm

15 - Charge air pressure sender - G31-

□ Removing and installing ⇒ [page 295](#)



## 16 - O-ring

- ☐ Renewing:

## 17 - Charge air hose

- ☐ Installing ⇒ [page 291](#)

## 18 - Air intake pipe

## 2.2 Assembly overview - charge-air hose connections

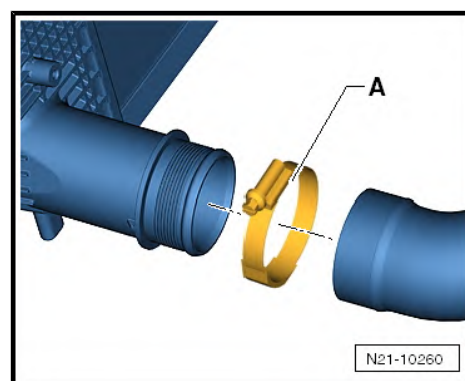
### Fitting hose connections with fluted union



#### Note

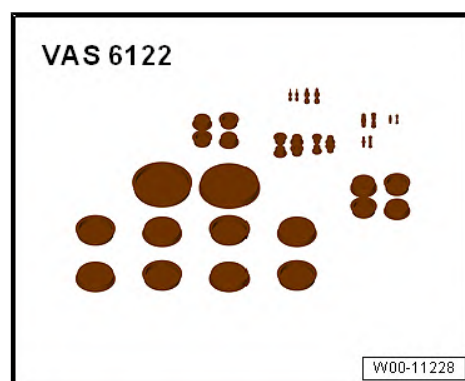
*The screw-type clips -A- on the charge air pipes must be tightened to 5.5 Nm. If the torque is too low or too high, the charge air hose may slip off the charge air pipe during vehicle operation.*

- Check all air hoses and pipes for firm seating and leaks before carrying out tests or repairs.
- Clean connection couplings, pipe lines and air intake hoses before installation. They must be free of oil and grease.
- Secure all hose connections with hose clips corresponding to the series production status ⇒ Electronic Parts Catalogue (ETKA) .
- Spray the worm screws of the used hose clips with penetrating spray before installing.



## 2.3 Removing and installing charge air cooler

Engine bung set - VAS 6122-



Drip tray for workshop hoist - VAS 6208-

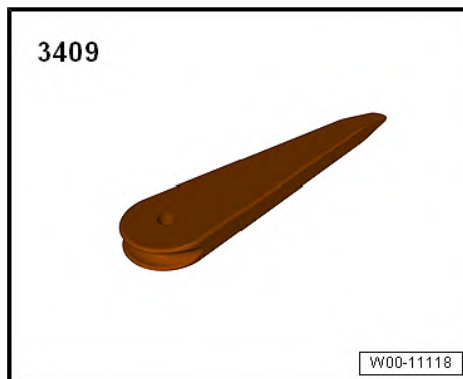




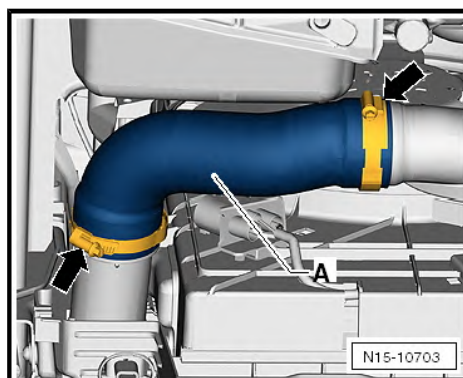
Removal wedge - 3409-

### Removing

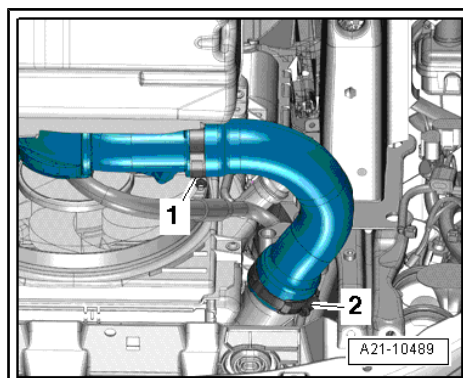
- Remove radiator cowl ➤ [page 265](#) .
- Remove radiator ➤ [page 262](#) .



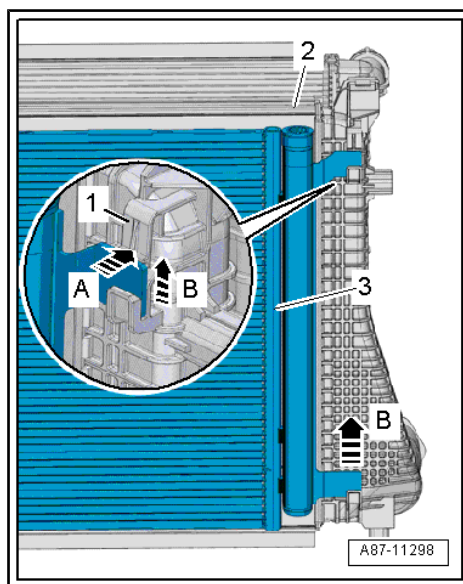
- Loosen hose clips -arrows-, and remove charge air hose -A-.



- Release hose clip -1- and -2-, and remove right charge air hose.
- Seal open lines and unions with clean plugs from engine sealing plug set - VAS 6122- .
- Unclip lower air ducts on both sides from lock carrier.



- Swivel the charge air cooler on the top edge in the direction of the engine.
- Lift charge-air cooler out of the lower supports and press backwards.
- Press catches -1- on both sides in -direction of arrow A- to release them.
- Pull the condenser -3- upwards in -direction of arrow B-, and detach it from charge-air cooler -2-.
- Secure condenser to lock carrier.
- Take out charge air cooler from underneath.



## Installing

Remaining installation is carried out in the reverse order. When installing, note the following:

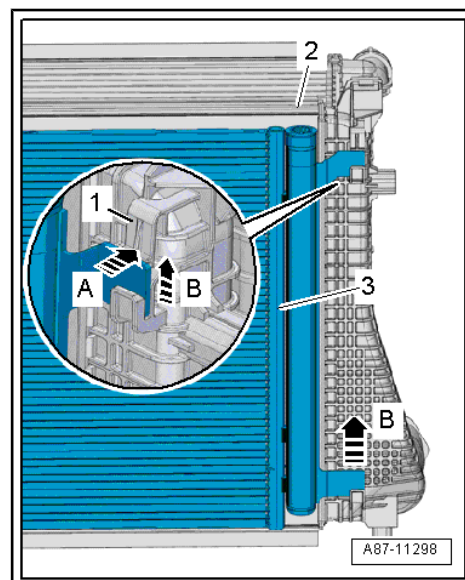
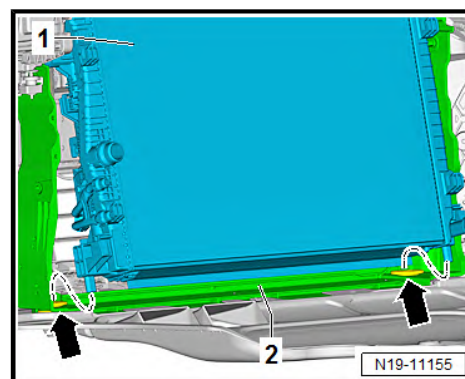
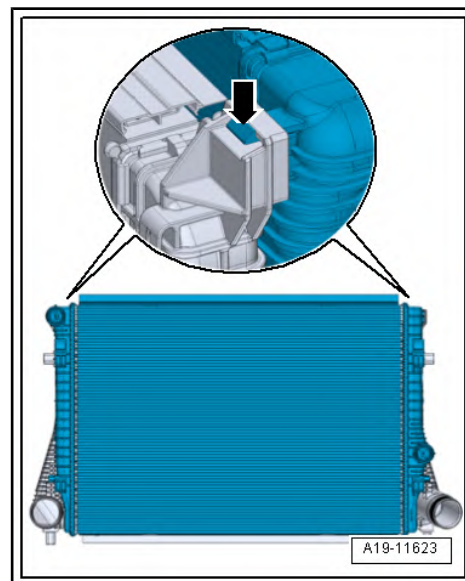


### Note

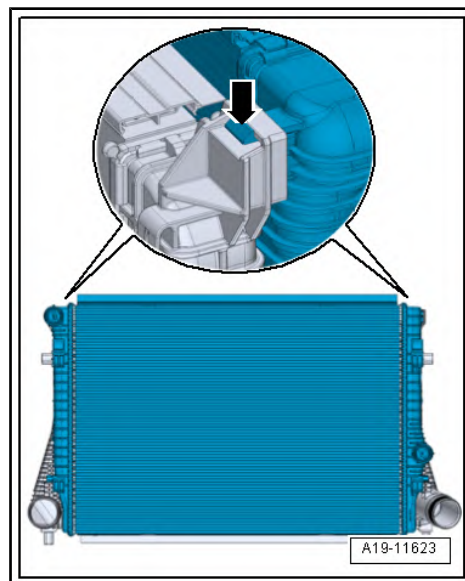
- ◆ *Observe the instructions if there are minor dents in the fins  
 ⇒ [page 6](#).*
- ◆ *Renew O-rings after removal.*

- Insert the charge-in cooler -1- below in the bearing support of the charge-air cooler -arrows-.

- Place the condenser -3- in the installation position.

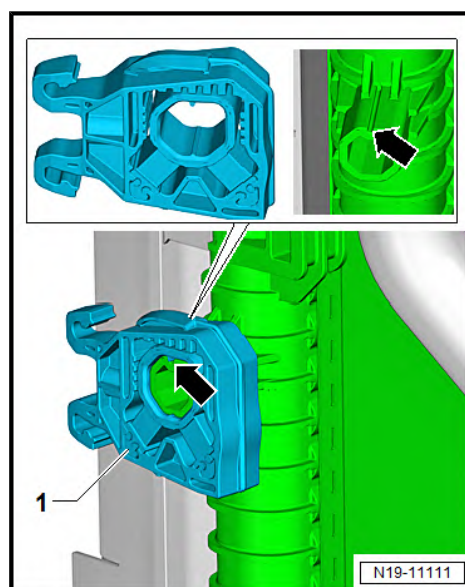


- Insert radiator at an angle into lower charge air cooler mounting, and engage radiator in charge air cooler -arrow-. Ensure proper engagement by pulling.

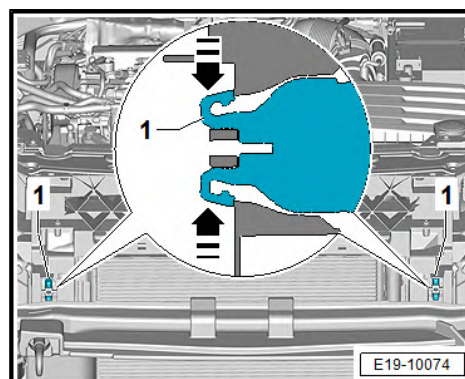


#### Installation position of the bearing support for the charge-air cooler

- Mount the charge-air cooler bearing support -1- right and left on the charge-air cooler. When doing so, note the installation position -arrow-.



- Attach charge air cooler to lock carrier. Ensure proper seating of radiator mountings -1- in lock carrier.



### Vehicles with bearing support for charge-air cooler, bolted.

- Use bolts to secure radiator mountings, whose fasteners have been pinched off, to lock carrier. Screws -2- ⇒ ETKA (electronic spare parts catalogue) .
- Specified torque: 5 Nm

### Continuation for all vehicles

- Install lower air ducts on both sides from lock carrier.



### Note

- ◆ *Hose connections as well as hoses for charge air system must be free of oil and grease when installing.*
- ◆ *Secure all hose connections with hose clips corresponding to the series production status ⇒ Electronic Parts Catalogue (ETKA) .*
- ◆ *In order to be in a position to securely attach the charge air hoses on their connections, the worm screws of the used hose clips have to be sprayed with penetrating spray before installing.*
- Install radiator cowl ⇒ [page 265](#) .
- Fit charge air hose connections ⇒ [page 291](#)
- Connect coolant hose with plug-in connector ⇒ [page 259](#) .
- Install the front bumper ⇒ General body repairs, exterior; Rep. gr. 63 ; Front bumper; Remove and install front bumper cover .
- Add coolant ⇒ [page 212](#) .

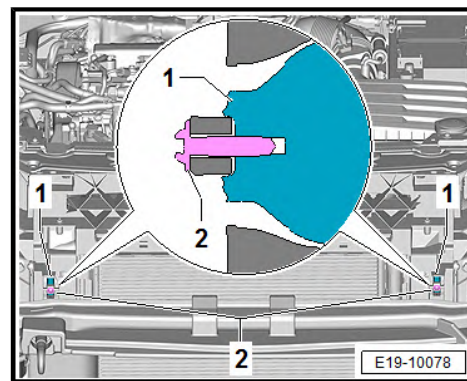
### Specified torques

- ◆ ⇒ [“4.1 Assembly overview - radiator/radiator fan”, page 258](#)
- ◆ ⇒ [“2.1 Assembly overview - charge air system”, page 290](#)

## 2.4 Removing and installing charge air pressure sender - G31-

### Removing

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



- Disconnect connector -2-.
- Unscrew bolts -1-, and pull charge pressure sender - G31- out of air pipe.

### Installing

Remaining installation is carried out in the reverse order. When installing, note the following:



### Note

*Renew O-ring.*

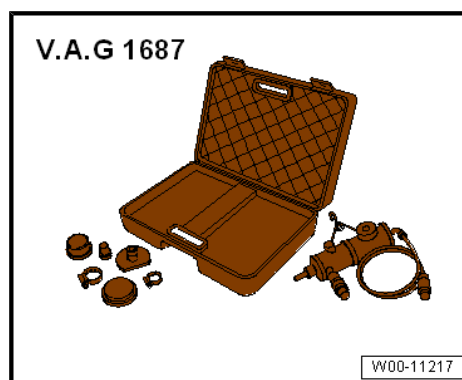
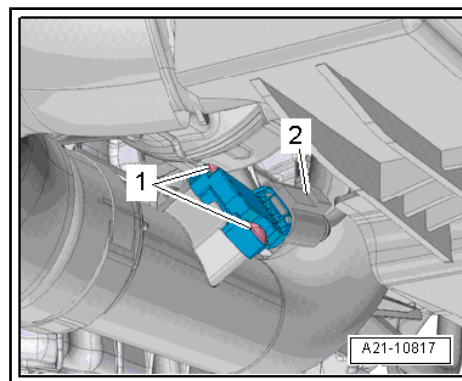
### Specified torques

- ◆ ⇒ [“2.1 Assembly overview - charge air system”, page 290](#)
- ◆ Assembly overview - noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .

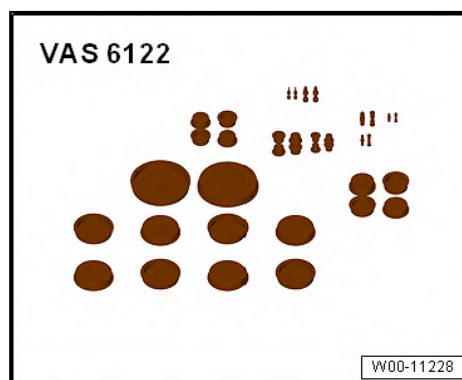
## 2.5 Checking charge air system for leaks

### Special tools and workshop equipment required

- ◆ Charge air system tester - V.A.G 1687-



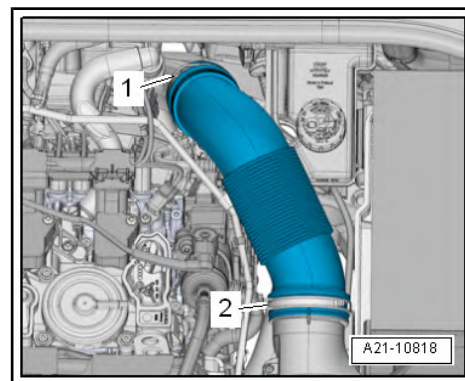
- ◆ Set of plugs for engine - VAS 6122-



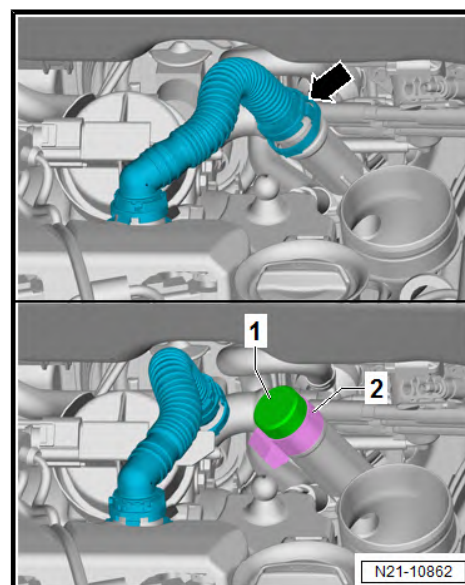


## Procedure

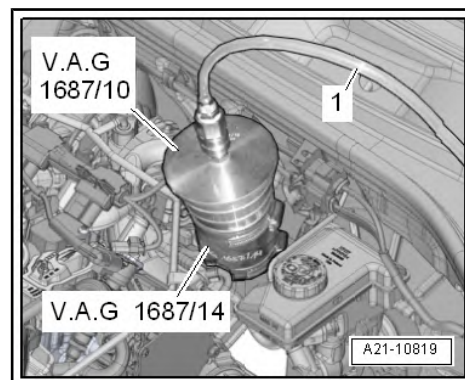
- Release hose clamps -1, 2- and remove air pipe.



- Pull off breather pipe for crankcase breather -arrow-.
- Seal connection using a sealing plug -1- from the engine bung set and secure it using a hose clip -2-.



- Connect adapter - V.A.G 1687/10- with adapter -V.A.G 1687/14- to turbocharger.
- Connect charge air system tester - V.A.G 1687- to adapter.

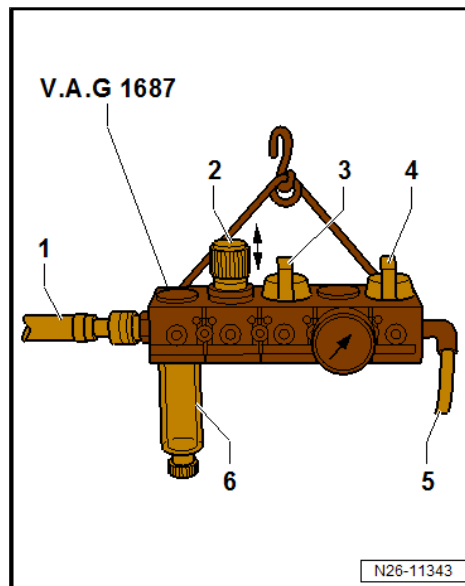


**Prepare charge air system tester - V.A.G 1687- as follows:**

- Pull pressure control valve -2- upwards, unscrew it completely, and close valves -3- and -4-.
- Connect charge air system tester - V.A.G 1687- to compressed air -1- via commercial adapter.

**Note**

- ◆ *If there is water in the sight glass, drain at water drain screw -6-.*
- ◆ *The set pressure must not exceed 0.5 bar!*
- Open valve -3-.
- Adjust pressure to 0.5 bar with pressure control valve -2-.
- Open valve -4- and wait until test circuit is full. If necessary, adjust pressure to 0.5 bar again.
- Check charge air system for leaks by listening, touching, with commercially available leak detector spray or using ultrasonic tester - V.A.G 1842- .

**Note**

- ◆ *A small amount of air escapes through the valves and enters the engine. Therefore a holding pressure test is not possible.*
- ◆ *For information on how to use the ultrasonic tester - V.A.G 1842- refer to the ⇒ operating instructions .*
- ◆ *Before removing the adapters, depressurise the test circuit by detaching the hose coupling.*

**Assembly**

Install in reverse order of removal.

## 24 – Mixture preparation - injection

### 1 Injection system

⇒ [“1.1 Overview of fitting locations - injection system”, page 299](#)

#### 1.1 Overview of fitting locations - injection system

⇒ [“1.1.1 Overview of fitting locations - engine top side”, page 299](#)

⇒ [“1.1.2 Overview of fitting locations - engine, inlet side”, page 301](#)

⇒ [“1.1.3 Overview of fitting locations - engine right side”, page 303](#)

⇒ [“1.1.4 Overview of fitting locations - engine, exhaust side”, page 304](#)

⇒ [“1.1.5 Location of components”, page 304](#)

##### 1.1.1 Overview of fitting locations - engine top side

###### 1 - Ignition coil 1 with output stage - N70-

- ☐ Assembly overview  
⇒ [page 406](#)
- ☐ Fitting location  
⇒ [page 305](#)

###### 2 - Ignition coil 2 with output stage - N127-

- ☐ Assembly overview  
⇒ [page 406](#)
- ☐ Fitting location  
⇒ [page 305](#)

###### 3 - Ignition coil 3 with output stage - N291-

- ☐ Assembly overview  
⇒ [page 406](#)
- ☐ Fitting location  
⇒ [page 305](#)

###### 4 - Ignition coil 4 with output stage - N292-

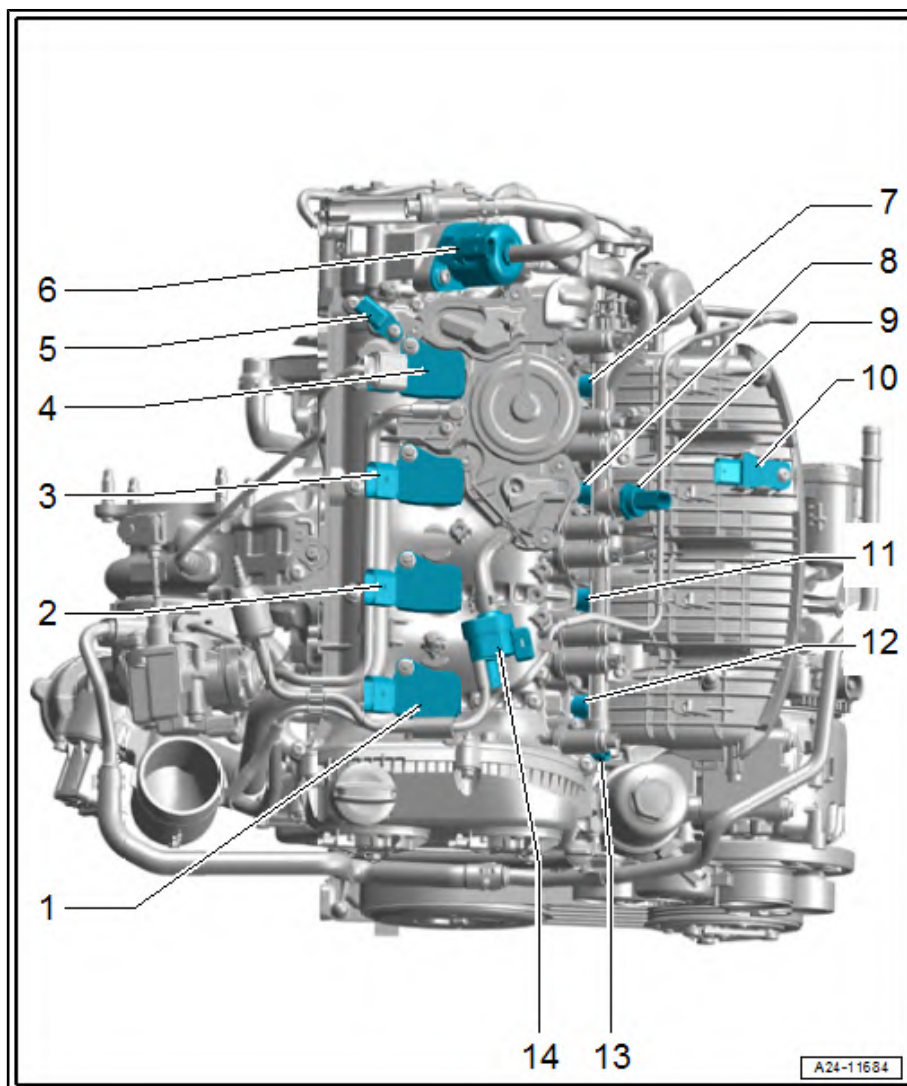
- ☐ Assembly overview  
⇒ [page 406](#)
- ☐ Fitting location  
⇒ [page 305](#)

###### 5 - Hall sender 3 - G300-

- ☐ Assembly overview  
⇒ [page 406](#)
- ☐ Fitting location  
⇒ [page 307](#)

###### 6 - Fuel metering valve - N290-

- ☐ Assembly overview  
⇒ [page 349](#)



**7 - Injector 2 for cylinder 4 - N535-**

- ☐ Assembly overview ➔ [page 311](#)
- ☐ Fitting location ➔ [page 306](#)

**8 - Injector 2 for cylinder 3 - N534-**

- ☐ Assembly overview ➔ [page 311](#)
- ☐ Fitting location ➔ [page 306](#)

**9 - Fuel pressure sender for low-pressure - G410-**

- ☐ Fitting location ➔ [page 306](#)

**10 - Intake air temperature sender - G42- / intake manifold pressure sender - G71- .**

- ☐ Removing and installing ➔ [page 341](#)

**11 - Injector 2 for cylinder 2 - N533-**

- ☐ Assembly overview ➔ [page 311](#)
- ☐ Fitting location ➔ [page 306](#)

**12 - Injector 2 for cylinder 1 - N532-**

- ☐ Assembly overview ➔ [page 311](#)
- ☐ Fitting location ➔ [page 306](#)

**13 - Intake manifold flap potentiometer - G336-**

- ☐ Bend aside retaining tabs to allow for pulling potentiometer out of intake manifold
- ☐ Fitting location ➔ [page 307](#)

**14 - Activated charcoal filter solenoid valve 1 - N80-**

- ☐ Fitting location ➔ [page 305](#)

## 1.1.2 Overview of fitting locations - engine, inlet side

### 1 - Oil level and oil temperature sender - G266-

- ☐ Assembly overview  
[⇒ page 169](#)

### 2 - Actuator for engine temperature regulation - N493-

- ☐ Assembly overview  
[⇒ page 233](#)

### 3 - No. 2 cyl. injector - N31-

- ☐ Assembly overview  
[⇒ page 310](#)
- ☐ Fitting location  
[⇒ page 306](#)

### 4 - No. 1 cyl. injector - N30-

- ☐ Assembly overview  
[⇒ page 310](#)
- ☐ Fitting location  
[⇒ page 306](#)

### 5 - Fuel pressure sender - G247-

- ☐ Fitting location  
[⇒ page 306](#)

### 6 - Throttle valve module - J338-

- ☐ and
- ◆ Throttle valve drive for electronic power control - G186-
- ◆ Angle sender 1 for throttle valve drive - G187-
- ◆ Angle sender 2 for throttle valve drive - G188-

- ☐ Assembly overview [⇒ page 325](#)

### 7 - Inlet cam actuator B for cylinder 1 - N577-

- ☐ Assembly overview [⇒ page 143](#)

### 8 - Inlet cam actuator A for cylinder 1 - N576-

- ☐ Assembly overview [⇒ page 143](#)

### 9 - Inlet cam actuator A for cylinder 2 - N584-

- ☐ Assembly overview [⇒ page 143](#)

### 10 - Inlet cam actuator B for cylinder 2 - N585-

- ☐ Assembly overview [⇒ page 143](#)

### 11 - Inlet cam actuator B for cylinder 3 - N593-

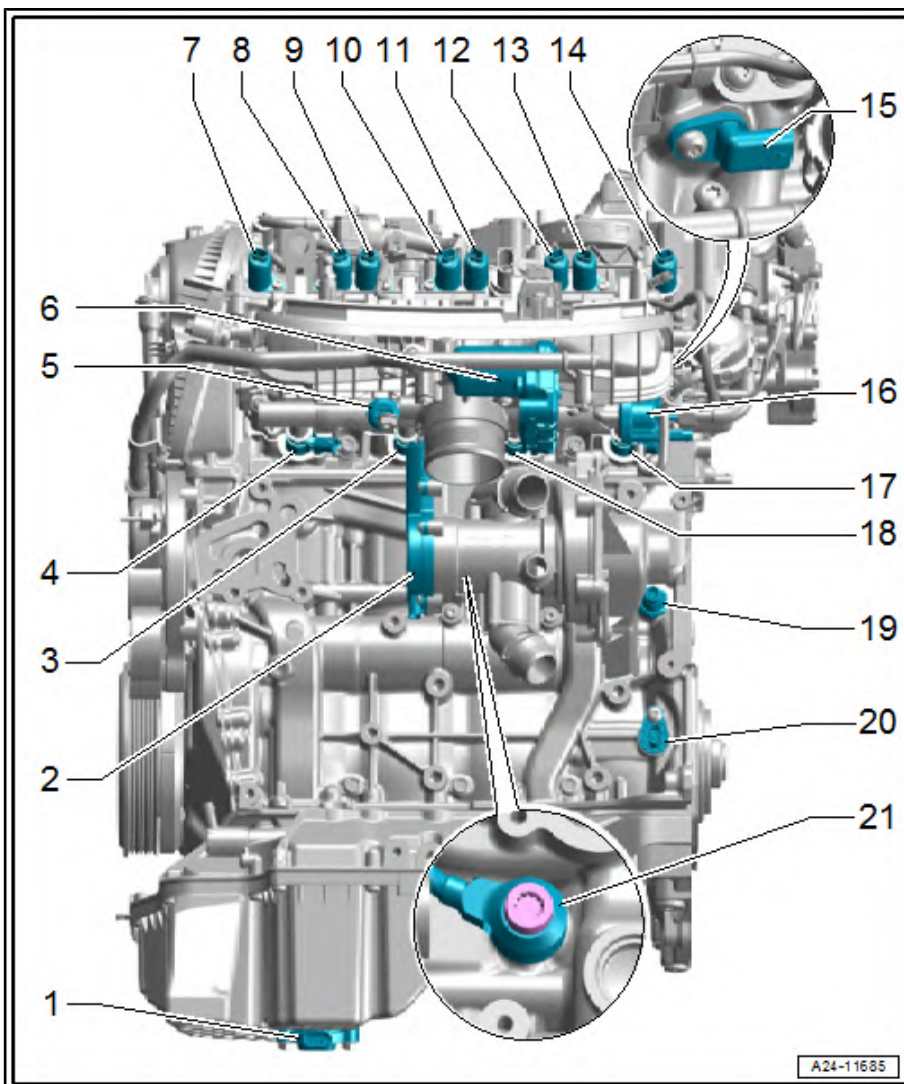
- ☐ Assembly overview [⇒ page 143](#)

### 12 - Inlet cam actuator A for cylinder 3 - N592-

- ☐ Assembly overview [⇒ page 143](#)

### 13 - Inlet cam actuator A for cylinder 4 - N600-

- ☐ Assembly overview [⇒ page 143](#)





**14 - Inlet cam actuator B for cylinder 4 - N601-**

- ☐ Assembly overview ➤ [page 143](#)

**15 - Hall sender - G40-**

- ☐ Assembly overview ➤ [page 406](#)
- ☐ Fitting location electrical connectors ➤ [page 307](#)

**16 - Intake manifold flap air flow control valve - N316-**

- ☐ Assembly overview ➤ [page 325](#)
- ☐ Fitting location ➤ [page 306](#)

**17 - No. 4 cyl. injector - N33-**

- ☐ Assembly overview ➤ [page 310](#)
- ☐ Fitting location ➤ [page 306](#)

**18 - No. 3 cyl. injector - N32-**

- ☐ Assembly overview ➤ [page 310](#)
- ☐ Fitting location ➤ [page 306](#)

**19 - Stage 3 oil pressure switch - F447-**

- ☐ Assembly overview ➤ [page 191](#)
- ☐ Fitting location electrical connectors ➤ [page 307](#)

**20 - Engine speed sender - G28-**

- ☐ Assembly overview ➤ [page 406](#)
- ☐ Fitting location ➤ [page 307](#)

**21 - Knock sensor 1 - G61-**

- ☐ Assembly overview ➤ [page 406](#)
- ☐ Fitting location ➤ [page 306](#)

### 1.1.3 Overview of fitting locations - engine right side

**1 - Exhaust camshaft control valve 1 - N318-**

- ☐ Assembly overview  
⇒ [page 114](#)

**2 - Inlet camshaft control valve 1 - N205-**

- ☐ Assembly overview  
⇒ [page 114](#)

**3 - Oil pressure switch - F22-**

- ☐ Assembly overview  
⇒ [page 191](#)

**4 - Oil pressure switch for reduced oil pressure - F378-**

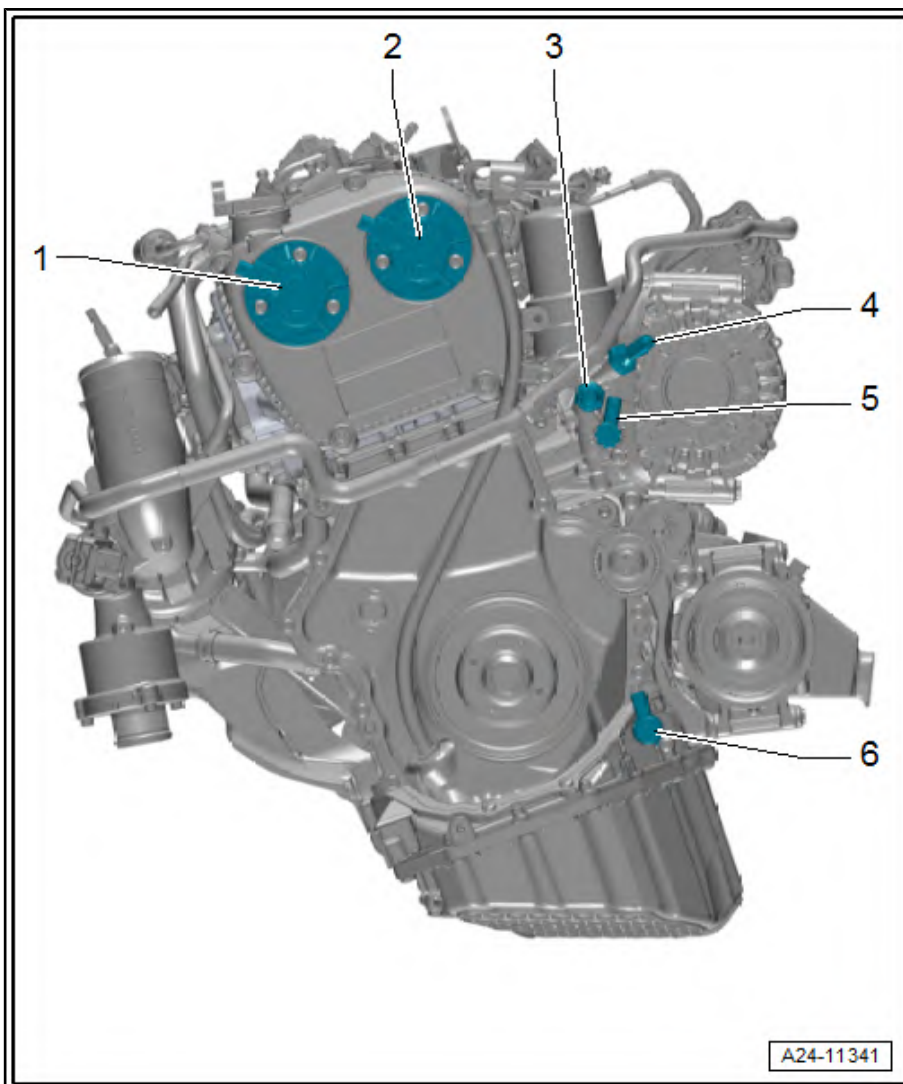
- ☐ Assembly overview  
⇒ [page 191](#)

**5 - Piston cooling jet control valve - N522-**

- ☐ Assembly overview  
⇒ [page 191](#)

**6 - Valve for oil pressure control - N428-**

- ☐ Assembly overview  
⇒ [page 191](#)



## 1.1.4 Overview of fitting locations - engine, exhaust side

### 1 - Turbocharger air recirculation valve - N249-

- ❑ Assembly overview  
 ➤ [page 272](#)

### 2 - Continued coolant circulation pump - V51-

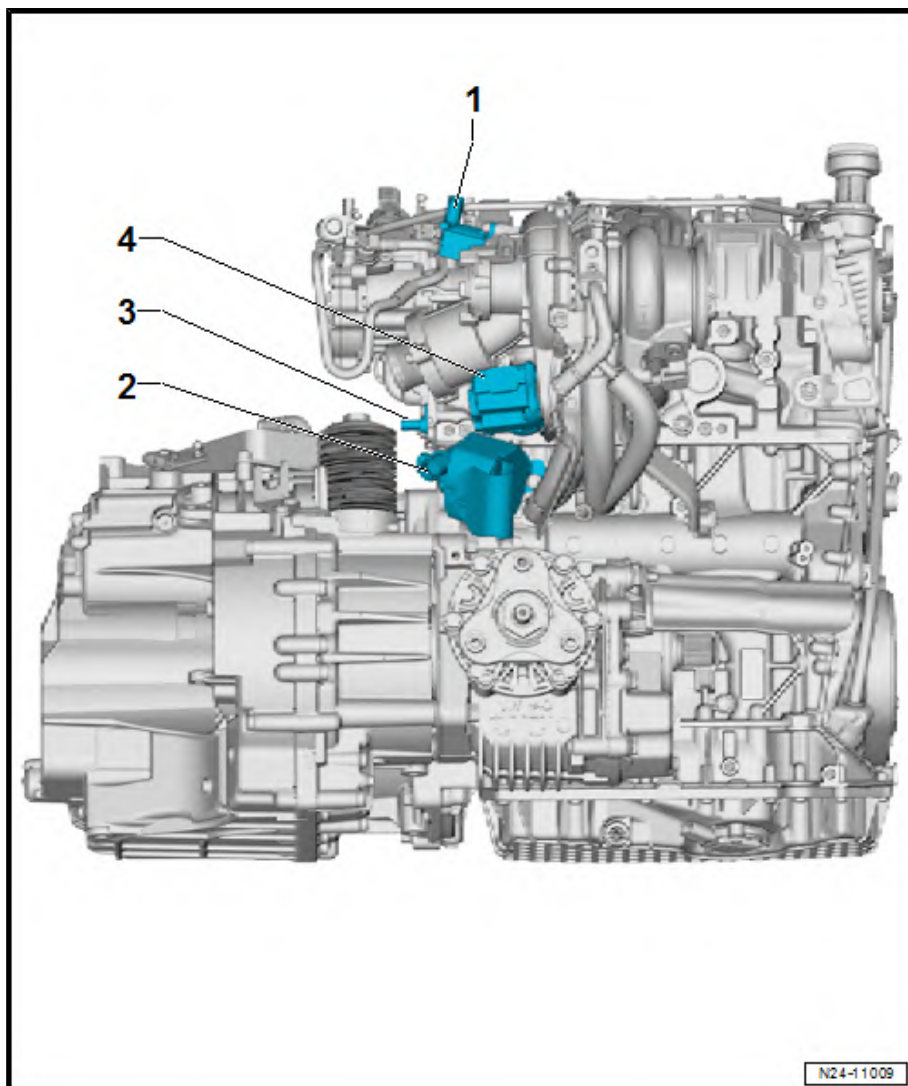
- ❑ Assembly overview  
 ➤ [page 235](#)

### 3 - Coolant temperature sender - G62-

- ❑ Assembly overview  
 ➤ [page 233](#)
- ❑ Fitting location electrical connectors  
 ➤ [page 307](#)

### 4 - Charge pressure positioner - V465- with position sender for charge pressure positioner - G581-

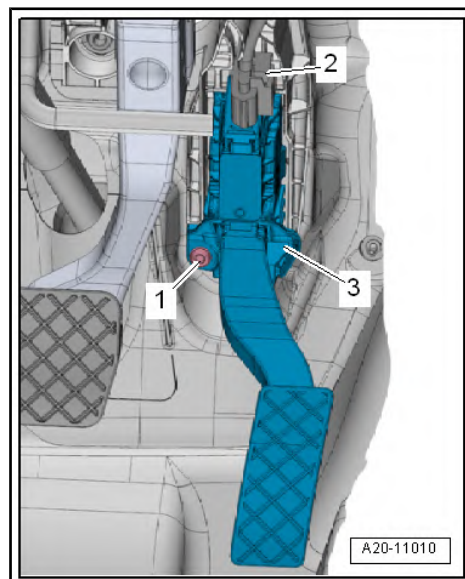
- ❑ Assembly overview  
 ➤ [page 272](#)



## 1.1.5 Location of components

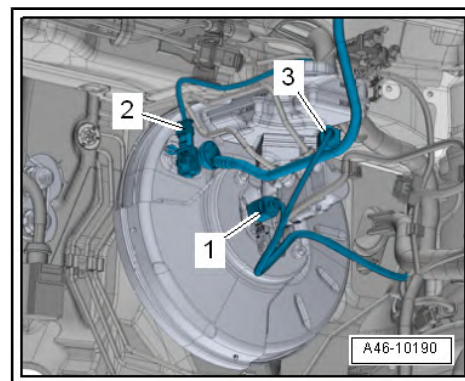
### Accelerator pedal module - GX2-

#### 2 - Connector for accelerator pedal module



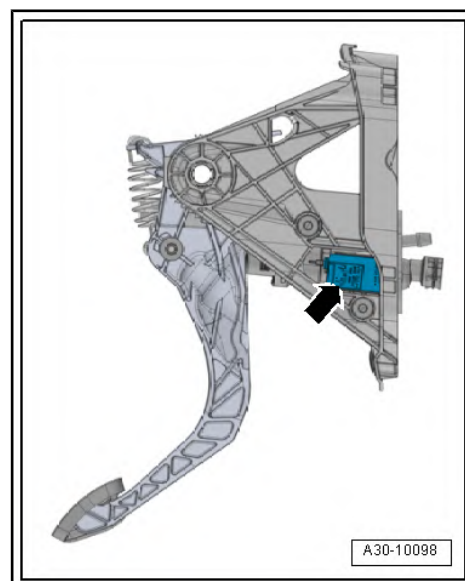
### Fitting location of brake light switch - F- , brake pedal switch - F63- and vacuum sender - G608-

- 1 - Brake light switch - F- / Brake pedal switch - F63-
- 2 - Vacuum sender - G608-
- ◆ On brake servo in engine compartment

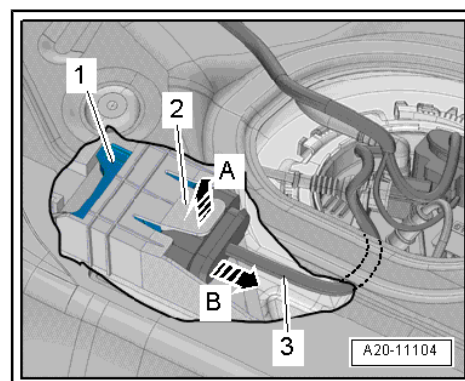


### Clutch position sender - G476- -2-

- On mounting bracket for clutch pedal -arrow-
- Removing and installing ⇒ Rep. gr. 30 ; Clutch mechanism

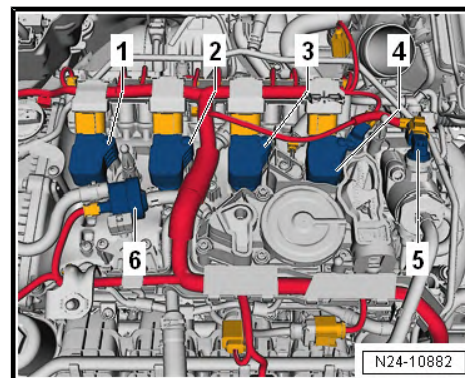


### Fuel pump control unit - J538- -1-



### Ignition coils with output stages

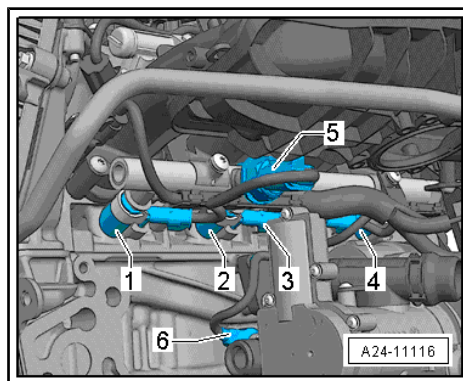
- 1 - Ignition coil 1 with output stage - N70-
- 2 - Ignition coil 2 with output stage - N127-
- 3 - Ignition coil 3 with output stage - N291-
- 4 - Ignition coil 4 with output stage - N292-
- 5 - Fuel pressure regulating valve - N276-
- 6 - Activated charcoal filter solenoid valve 1 - N80-





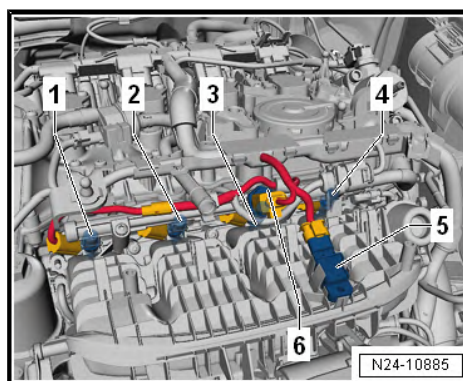
### Injectors (combustion chamber)

- 1 - No. 1 cyl. injector - N30-
- 2 - No. 2 cyl. injector - N31-
- 3 - No. 3 cyl. injector - N32-
- 4 - No. 4 cyl. injector - N33-
- 5 - Fuel pressure sender - G247-
- 6 - Knock sensor 1 - G61-



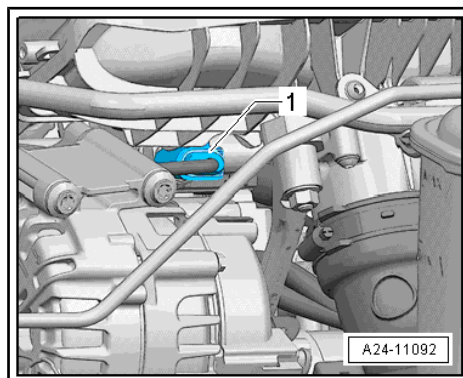
### Intake manifold injectors

- 1 - Injector 2 for cylinder 1 - N532-
- 2 - Injector 2 for cylinder 2 - N533-
- 3 - Injector 2 for cylinder 3 - N534-
- 4 - Injector 2 for cylinder 4 - N535-
- 5 - Intake manifold sender - GX9-
- 6 - Fuel pressure sender for low-pressure - G410-



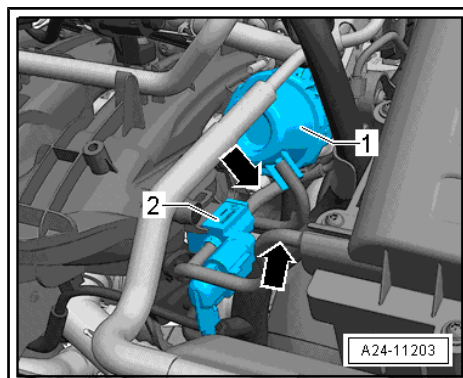
### Fuel pressure sender in high-pressure system

- 1 - Fuel pressure sender - G247-



### Variable intake manifold

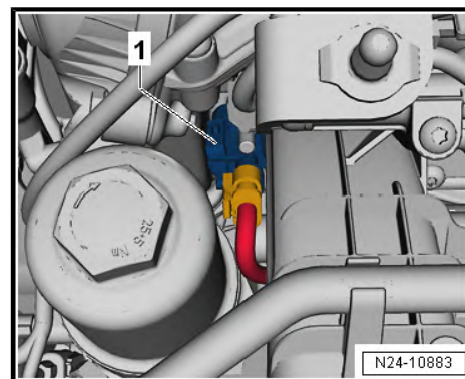
- 1 - Vacuum unit for intake manifold flaps
- 2 - Intake manifold flap air flow control valve - N316-





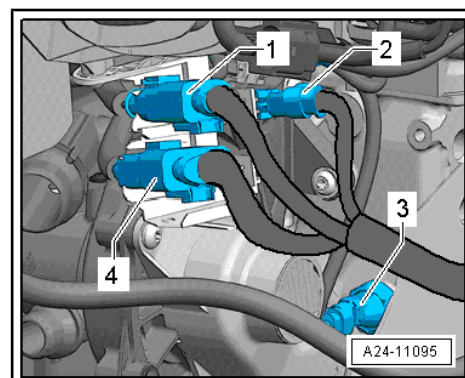
### Intake manifold flap potentiometer - G336-

Bend aside retaining tabs to allow for pulling potentiometer out of intake manifold.



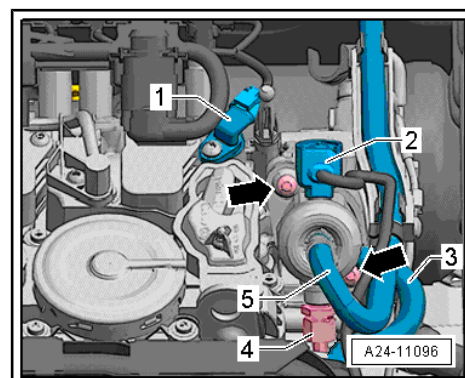
### Electrical connectors

- 1 - For injectors (combustion chamber).
- 2 - For knock sensor 1 - G61- .
- 3 - Stage 3 oil pressure switch - F447-
- 4 - For intake manifold flap valve - N316- , fuel pressure sender - G247- , intake manifold flap potentiometer - G336- , coolant temperature sender - G62- and Hall sender - G40- .

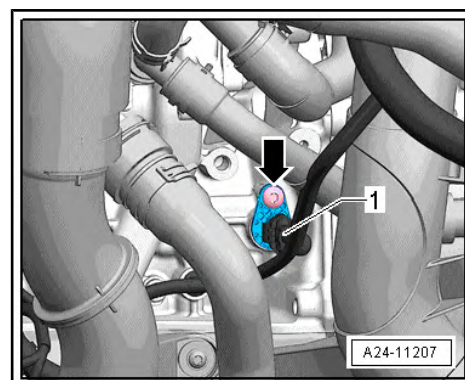


### High-pressure pump and Hall sender

- 1 - Hall sender 3 - G300-
- 2 - Fuel pressure regulating valve - N276-
- 3 - Fuel line leading to fuel rail for injectors (intake manifold)
- 4 - High-pressure line leading to fuel rail for injectors (combustion chamber)
- 5 - Fuel pressurisation line from fuel tank
- Pfeile - Securing bolts

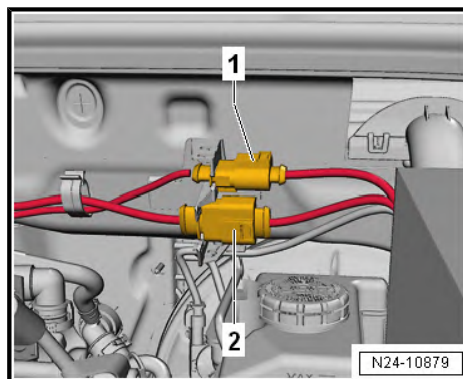


### Engine speed sender - G28- -1-

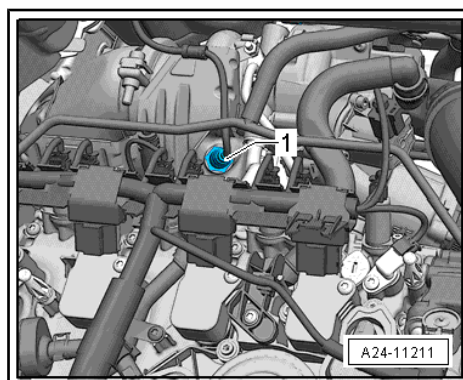


## Lambda probes

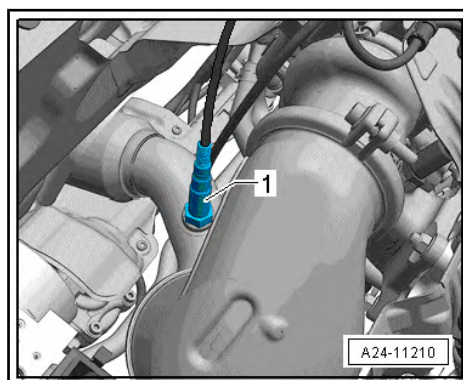
- 1 - Connector for Lambda probe 1 after catalytic converter - GX7-
- 2 - Connector for Lambda probe 1 before catalytic converter - GX10-



## Lambda probe 1 before catalytic converter - GX10- -1-



## Lambda probe 1 after catalytic converter - GX7- -1-

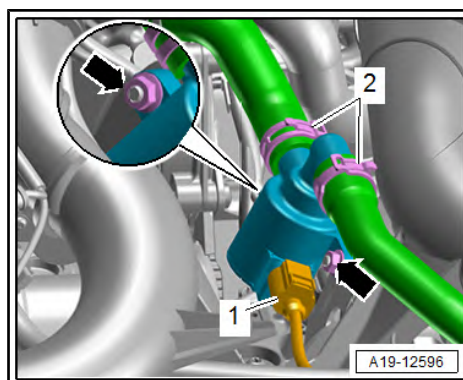


## Fitting location coolant valve for gearbox - N488-

- ◆ On front of engine

- 1 - Plug for coolant valve for gearbox - N488-

Assembly overview ⇒ [page 237](#) .

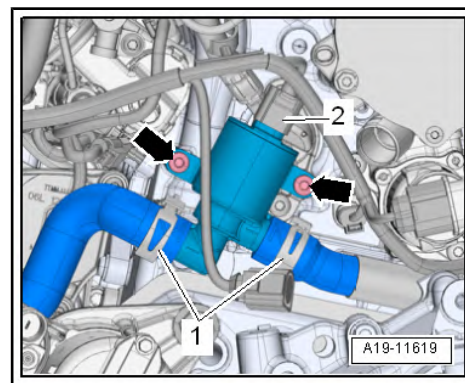


### Fitting location of coolant shut-off valve - N82-

◆ Left side, on the cylinder head.

2 - Plug for coolant shut-off valve - N82-

Assembly overview ⇒ [page 235](#) .



## 2 Injectors

⇒ ["2.1 Assembly overview - fuel rail with injectors", page 310](#)

⇒ ["2.2 Removing and installing fuel rail", page 312](#)

⇒ ["2.3 Removing and installing injectors", page 312](#)

⇒ ["2.4 Renewing seals on injectors", page 318](#)

⇒ ["2.5 Cleaning injectors", page 319](#)

### 2.1 Assembly overview - fuel rail with injectors

⇒ ["2.1.1 Assembly overview - fuel rail with injectors, direct injection", page 310](#)

⇒ ["2.1.2 Assembly overview - fuel rail with injectors, indirect injection", page 311](#)

#### 2.1.1 Assembly overview - fuel rail with injectors, direct injection

##### 1 - Bolt

- ☐ M6: 9 Nm
- ☐ Renew M8 bolt after removal
- ☐ M8: 20 Nm + 90°

##### 2 - Fuel rail for FSI injectors

- ☐ Removing and installing  
⇒ [page 312](#)

##### 3 - Fuel pressure sender - G247-

- ☐ Lubricate taper lightly with clean engine oil; do not lubricate thread
- ☐ Removing and installing  
⇒ [page 336](#)
- ☐ 27 Nm

##### 4 - Support ring

- ☐ Renew after removing.

##### 5 - O-ring

- ☐ Renew after removing.

##### 6 - Spacer ring

- ☐ Renew after removing.

##### 7 - Injector

- ☐ Ensure correct installation position
- ☐ Removing and installing  
⇒ [page 312](#)
- ☐ Cleaning ⇒ [page 319](#)

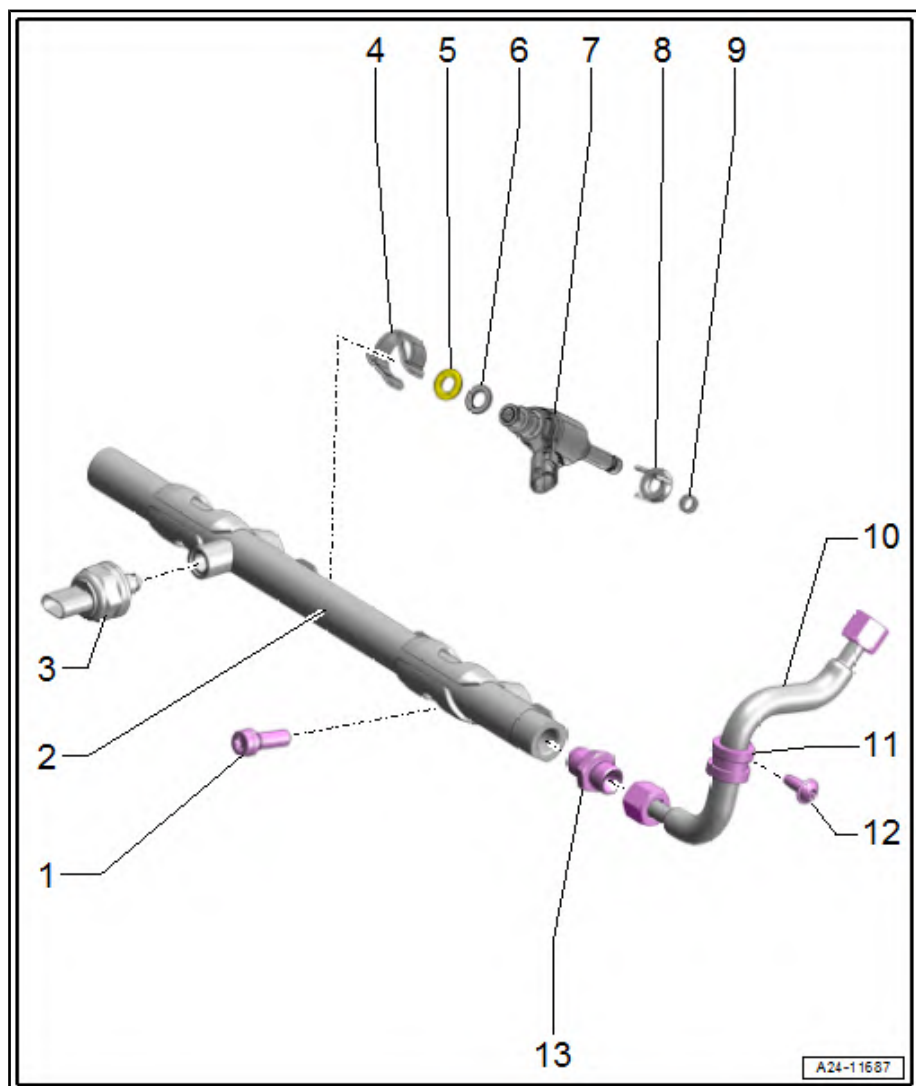
##### 8 - Sealing disc

##### 9 - Combustion chamber seal

- ☐ Renew after removing injector ⇒ [page 312](#)

##### 10 - High-pressure pipe

- ☐ From high-pressure pump



- ☐ Moisten ball of fuel supply line with engine oil.
- ☐ Do not fit nut under tension
- ☐ Union nut, 27 Nm

#### 11 - Clamp

#### 12 - Bolt

- ☐ 9 Nm

#### 13 - Union

- ☐ Renew after removing.
- ☐ Lubricate thread with clean engine oil
- ☐ 40 Nm

## 2.1.2 Assembly overview - fuel rail with injectors, indirect injection

#### 1 - Retaining clip

- ☐ For fuel pressure sender for low pressure - G410-

#### 2 - O-ring

- ☐ Renew after removing.

#### 3 - Adapter part

- ☐ Must be screwed onto fuel pressure sender for low pressure - G410- -item 4-
- ☐ 15 Nm

#### 4 - Fuel pressure sender for low-pressure - G410-

- ☐ Must be screwed onto adapter -item 3-
- ☐ Removing and installing ⇒ [page 341](#)
- ☐ 15 Nm

#### 5 - Fuel rail for injectors (intake manifold)

#### 6 - Bolt

- ☐ 9 Nm

#### 7 - Fuel supply line

- ☐ To fuel rail for injectors (intake manifold)
- ☐ Do not fit nut under tension

#### 8 - Retaining clip

#### 9 - O-ring

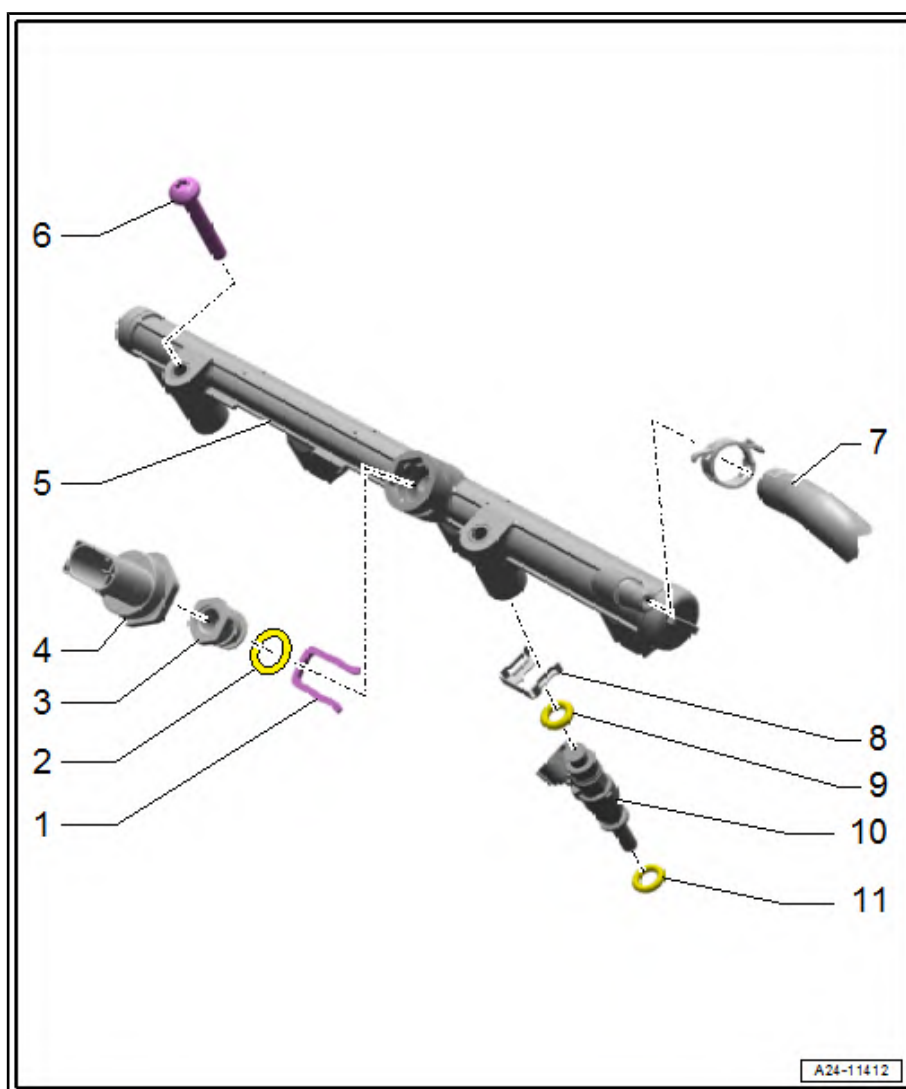
- ☐ Renew after removing.

#### 10 - Injector

- ☐ Ensure correct installation position
- ☐ Removing and installing ⇒ [page 316](#)

#### 11 - O-ring

- ☐ Renew after removing.





## 2.2 Removing and installing fuel rail



### Note

*In this section, the work procedure for direct injection engines is described.*

### Removing



### Note

*When fitting, attach all cable ties back to the same location.*

- Remove air intake pipe ⇒ [page 326](#) .
- Remove all connectors from injectors.
- Unscrew bolts -arrows-.
- Dismount fuel rail -1- together with wiring duct -2- from the injectors.
- Lay wiring duct to one side.

### Installing

Carry out installation in the reverse sequence, noting the following:

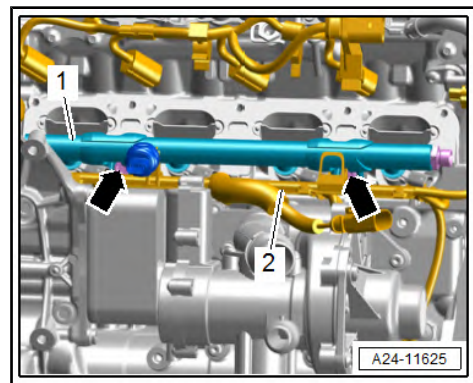


### Note

- ♦ *Replace support washer of the injectors after removal.*
- ♦ *If the injectors remain in the cylinder head when the fuel rail is pulled off, install only the O-rings and spacer rings from the repair kit.*
- ♦ *If the injectors are removed together with the fuel rail, the entire repair kit needs to be installed together with the combustion chamber ring seal ⇒ [page 312](#) .*
- Install intake manifold ⇒ [page 326](#) .

### Specified torques

- ♦ ⇒ [“2.1.1 Assembly overview - fuel rail with injectors, direct injection”, page 310](#)



## 2.3 Removing and installing injectors

⇒ [“2.3.1 Removing and installing injectors, direct injection”, page 312](#)

⇒ [“2.3.2 Removing and installing injectors, indirect injection”, page 316](#)

### 2.3.1 Removing and installing injectors, direct injection

Special tools and workshop equipment required

◆ Tool set for FSI engines - T10133 C-



Removing



Note

*Injectors must only be removed when the engine is cold.*

- Remove fuel rail ⇒ [page 312](#) .

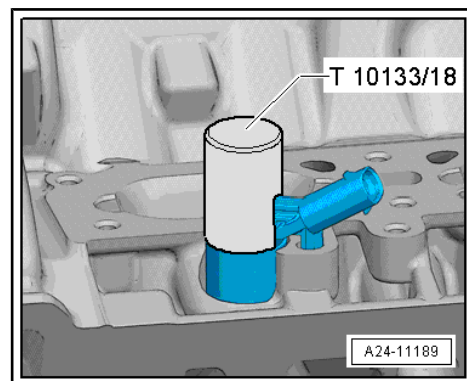


Note

*If the injectors remain in the fuel rail, carefully pull the injectors out of the fuel rail.*

**Remove injectors if they remain in cylinder head.**

- Cover open intake channels with a clean cloth.
- Disconnect connector from injector that is to be removed, and pull off support ring.
- Fit impact sleeve -T10133/18- over injector.

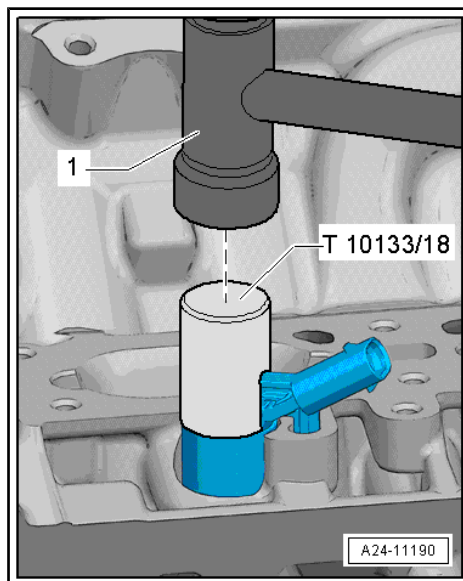


- Carefully release injector with light blows onto impact sleeve.



#### Note

- ♦ Use a torque wrench to pull out the injector.
- ♦ Set the torque wrench to 5 Nm.

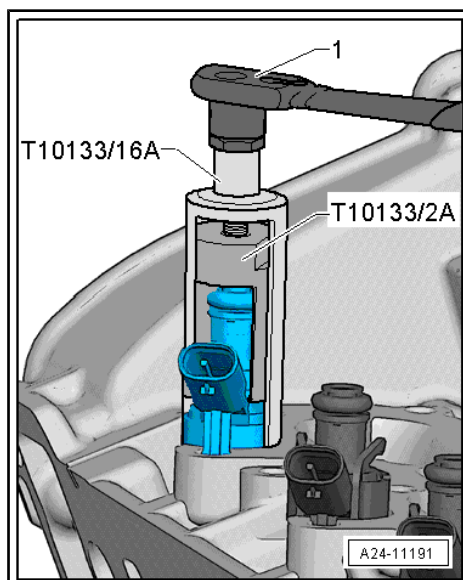


- Insert puller -T10133/2A- into groove in injector.
- Fit puller T10133/16A .
- Pull out injector by turning bolt with torque wrench -1-.
- If torque limit of »5 Nm« has been reached and the injector still cannot be pulled out, remove puller and use impact sleeve again to release injector.



#### Note

- ♦ If the torque limit is exceeded, the injector may become damaged.
- ♦ Always renew the combustion chamber seal before reinstalling the injector ➔ [page 315](#) .



## Dismantling injector

- Pull O-ring -3- and spacer ring -2- off injector -1-.
- Unclip sealing washer -5-.
- Carefully remove old combustion chamber ring seal -6-. To do so, cut open combustion chamber ring using knife or prise open ring with small screwdriver and then pull off forwards.
- 4 - Renew each time the support washer is removed.



### Note

*Take care not to damage the groove of injector. The injector must be renewed if the groove is damaged.*

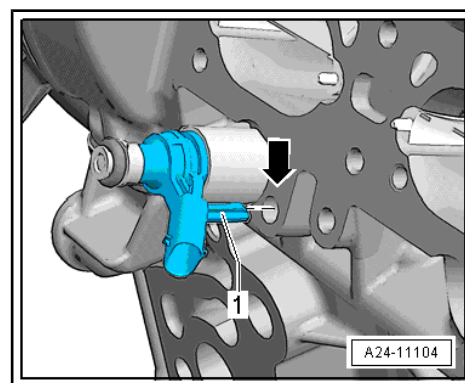
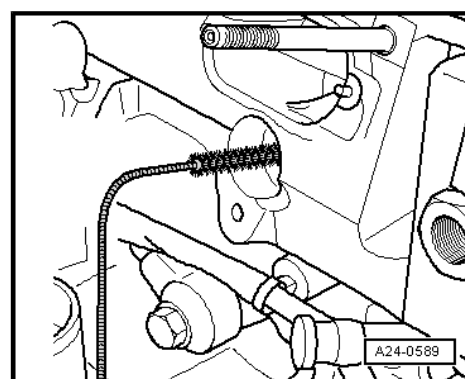
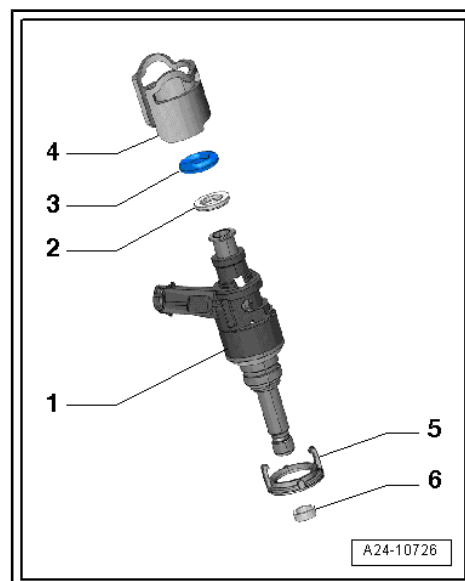
## Installing



### Note

- ◆ *Renew spacer ring if damaged.*
- ◆ *Lightly lubricate O-rings for injectors with clean engine oil.*
- ◆ *The combustion chamber seal on the injector must not be oiled or greased.*
- ◆ *There must be no cleaning fluid or oil in the bores in the cylinder head when installing the injector.*
- ◆ *Clean used injectors as necessary ⇒ [page 319](#).*
- Renewing seals on injector ⇒ [page 318](#).
- Before installing injectors, thoroughly clean injector bores in cylinder head with nylon brush - T10133/4-.
- Push injector by hand as far as it will go into the hole of the cylinder head (which must be free of oil and grease). Ensure injectors are positioned correctly in cylinder head.

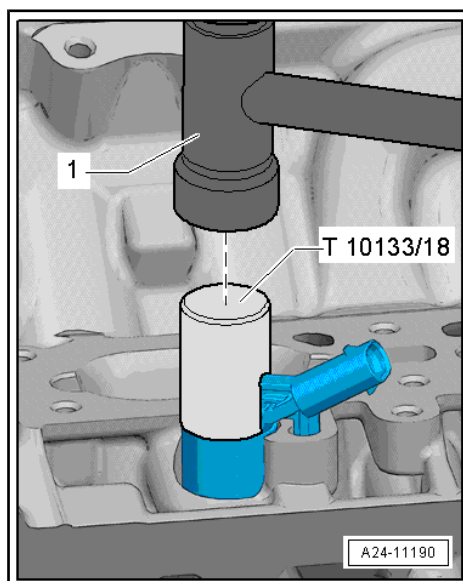
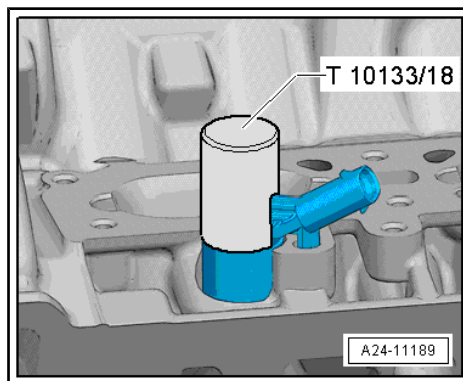
- Lug -1- and hole -arrow- in cylinder head must face each other.





#### Note

- ◆ *The injector should enter smoothly. Where necessary, wait until the combustion chamber seal has contracted sufficiently.*
- ◆ *Ensure correct installation position of injectors in cylinder head.*
- ◆ *Proceed as follows if the injector cannot be inserted by hand:*
- ◆ *Fit impact sleeve -T10133/18- over injector.*
- ◆ *Carefully drive in injector with light blows onto impact sleeve.*
- Fit support ring onto injector.
- Lightly lubricate O-rings for injectors with clean engine oil.
- Fit fuel rail to injectors, and press it in evenly.
- Installing fuel rail ➔ [page 312](#) .
- Install intake manifold ➔ [page 326](#) .



## 2.3.2 Removing and installing injectors, indirect injection

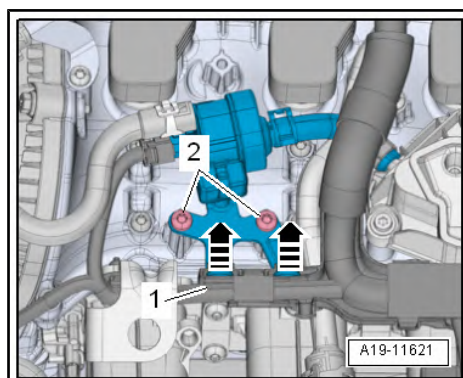
### Removing

- Remove engine cover panel ➔ [page 50](#) .
- Release fasteners -arrows- and detach wiring duct -1- from bracket.



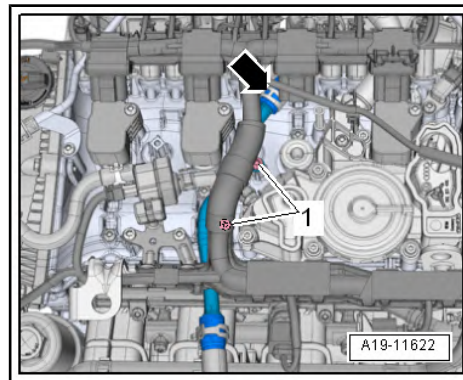
#### Note

*Disregard -item 2-.*

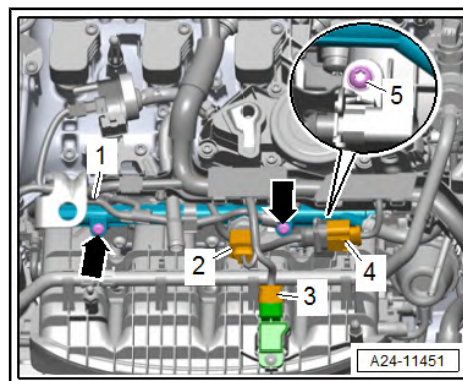




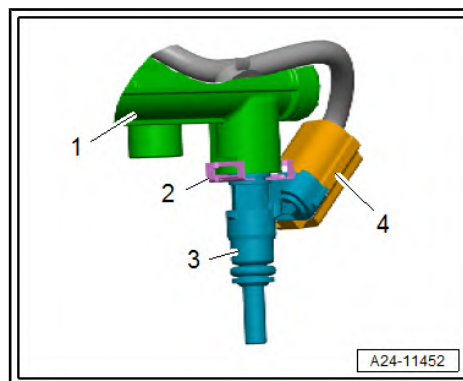
- Unscrew bolt -1- for upper coolant pipe -arrow-.



- Disconnect connectors:
- 2 - For fuel pressure sender for low pressure - G410-
- 3 - For intake manifold sender - GX9- .
- 4 - For intake manifold injectors
- Move clear wiring harness -1- at engine lifting eye.
- Unscrew bolts -arrows- at fuel rail.
- Unscrew bolt -5- for retainer of connector.
- Carefully pull out fuel rail with injectors upwards.



- Disconnect connector -4-.
- Pull off retaining clip -2-, and pull injector -3- off fuel rail -1-.



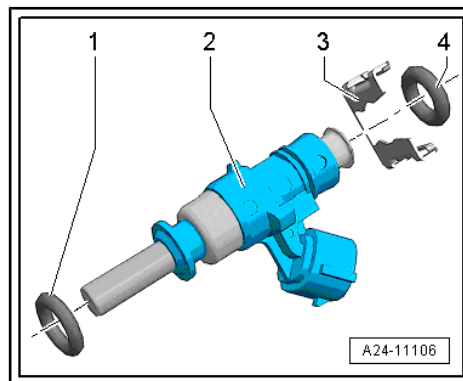
### Installing

- Renew O-rings -1, 4- for injector -2-.
- Before installing O-rings, lightly moisten them with clean engine oil.
- Secure injector in fuel rail using retaining clip -3-.
- Connect connectors.
- Push fuel rail with injectors by hand as far as stop into hole in intake manifold (which must be free of oil and grease).

Remainder of installation procedure is carried out in reverse order of removal.

### Specified torques

- ◆ ⇒ [“2.1.2 Assembly overview - fuel rail with injectors, indirect injection”, page 311](#)
- ◆ ⇒ [“3.1 Assembly overview - coolant pipes”, page 254](#)



## 2.4 Renewing seals on injectors



### Note

- ◆ In this section, the work procedure for the combustion chamber seals (Teflon ring seal) is described.
- ◆ The combustion chamber seal must always be renewed prior to reinstallation of the injector (combustion chamber).

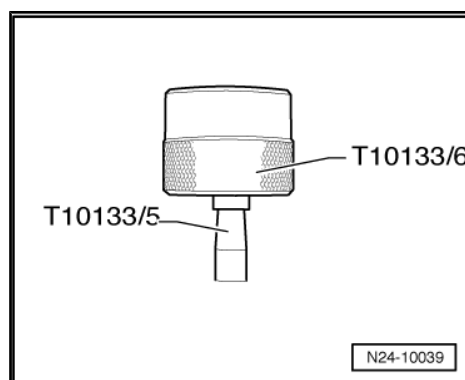
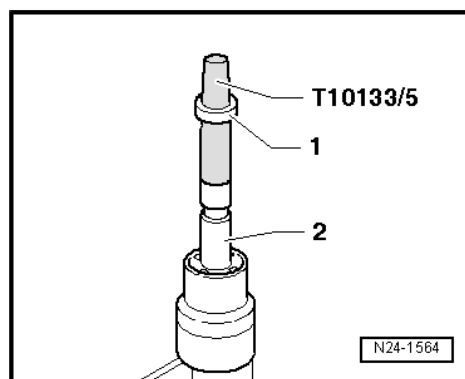
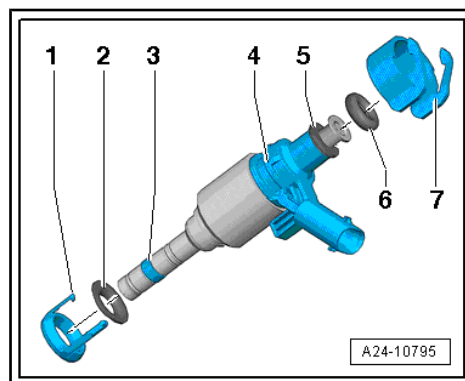
- Carefully remove combustion chamber ring seal -3- using a suitable tool (e.g. cut ring open using razor blade, or prise ring open with small screwdriver and then pull it off forwards). It is essential to ensure that the groove and continuous ridge in the groove surface are not damaged.



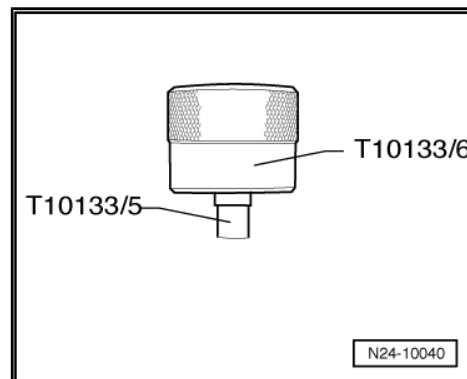
### Note

*Injector must be renewed if groove is damaged.*

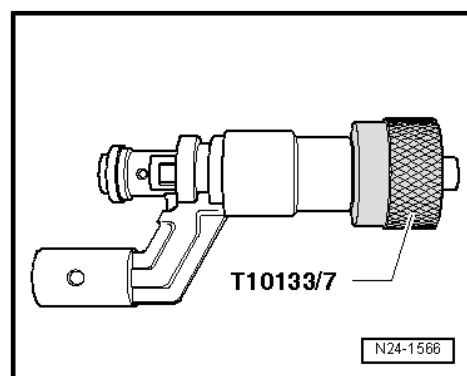
- Before new combustion chamber ring seal is fitted, remove any combustion residues from groove for combustion chamber ring seal and from injector shaft using a clean cloth.
- Fit assembly cone - T10133/5- with new combustion chamber ring seal -1- onto injector -2-.
- Slide combustion chamber ring seal with assembly sleeve - T10133/6- onto assembly cone -T10133/5- as far as it will go.



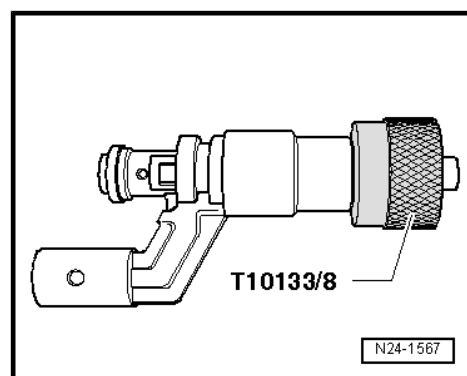
- Turn over assembly sleeve - T10133/6- , and push combustion chamber ring seal onto end of assembly cone - T10133/5- .
- Remove assembly cone - T10133/5- , and push combustion chamber ring seal into groove for combustion chamber ring seal using assembly sleeve - T10133/6- .



- Push calibration sleeve -T10133/7- onto injector to stop and simultaneously turn it slightly (approx. 180°).
- Twist calibration sleeve -T10133/7- in opposite direction and pull it off.



- Push calibration sleeve -T10133/8- onto injector to stop and simultaneously turn it slightly (approx. 180°).
- Twist calibration sleeve -T10133/8- in opposite direction and pull it off.
- Renew O-ring on injector. Before installing new O-ring, lightly moisten it with clean engine oil.



## 2.5 Cleaning injectors



### Note

*In this section, the work procedure for injectors (combustion chamber) is described.*

### Special tools and workshop equipment required

- ◆ Ultrasonic cleaning device - VAS 6418-
- ◆ Mounting plate for injection modules - VAS 6418/1-
- ◆ Cleaning fluid - VAS 6418/2-

## Cleaning

- Close drain tap -arrow- of ultrasonic cleaning unit - VAS 6418- at right-hand side of housing.
- Fill ultrasonic cleaning unit with 2120 ml of water which was allowed to stand for a while and with cleaning fluid - VAS 6418/2- .

### Mixing ratio for cleaning fluid

- 2100 ml of water which was allowed to stand for a while and 20 ml of cleaning fluid - VAS 6418/2- .
- Remove injectors ➔ [page 312](#) .

- Fit mounting plate for injection modules - VAS 6418/1- onto cleaning unit.

### Note

- ◆ *Before starting ultrasonic cleaning unit - VAS 6418- , it is essential that the safety information described in the operating manual is observed.*
- ◆ *The ideal fluid level is reached when the cleaning agent is approx. 1 to 4 mm above the base of the support plate. The ultrasonic cleaner - VAS 6418- could become damaged if the fluid level is too low.*

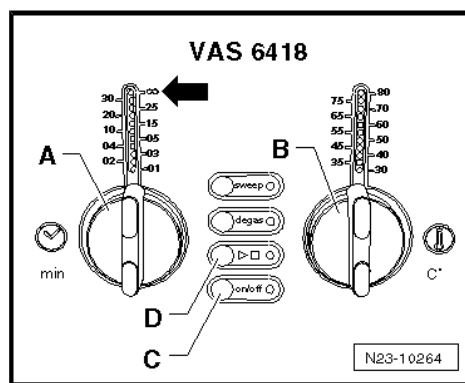
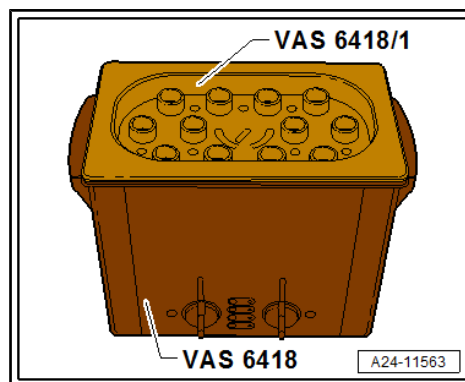
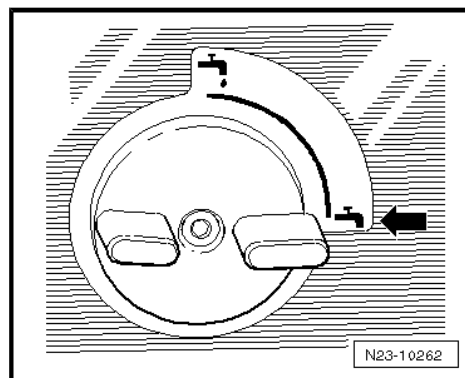
- Insert injectors into guides of mounting plate for injection modules - VAS 6418/1- as far as stop.
- Switch on cleaning unit by pressing ☐ on/off button -C-.  
☐ on/off button -C-.
- Use rotary knob -A- to set cleaning time to 30 minutes.
- Set rotary knob -B- to a temperature of 50°C.
- Press button ☐ -D- to start the cleaning process.

### Note

- ◆ *Temperature-controlled cleaning is now activated. During the warm-up period, ultrasonic waves are activated to mix the cleaning fluid. Once the preselected temperature is reached, the ultrasonic waves are switched to continuous operation.*
- ◆ *The cleaning time must be at least 30 minutes and cleaning only starts at a temperature of at least 50°C.*

- Each time after cleaning injectors (combustion chamber), renew combustion chamber seal (Teflon ring seal)  
➔ [page 318](#) .

- Install injectors (combustion chamber) ➔ [page 312](#) .



## 3 Air filter

⇒ [“3.1 Assembly overview - air filter housing”, page 321](#)

⇒ [“3.2 Removing and installing air filter housing”, page 322](#)

### 3.1 Assembly overview - air filter housing

#### 1 - Lower part of air duct

- ☐ On lock carrier

#### 2 - Bolt

- ☐ 2 Nm

#### 3 - Cover

- ☐ For air duct

#### 4 - Bolt

- ☐ 2 Nm

#### 5 - Vacuum hose

#### 6 - Air filter upper part

- ☐ Remove dirt, leaves and salt residues

#### 7 - Air mass meter - G70-

- ☐ Removing and installing  
⇒ [page 342](#)

#### 8 - Spring-type clip

#### 9 - Air intake hose

#### 10 - Bolt

- ☐ 1.5 Nm

#### 11 - O-ring

- ☐ Renew if damaged

#### 12 - Bolt

- ☐ 1.5 Nm

#### 13 - Air filter cartridge

- ☐ Use only genuine air filter elements ⇒ Electronic Parts Catalogue
- ☐ For change intervals refer to ⇒ Maintenance tables
- ☐ Removing and installing ⇒ Maintenance ; Booklet KH1

#### 14 - Battery cell

- ☐ For air filter lower part

#### 15 - For upper part of air duct

- ☐ On lock carrier

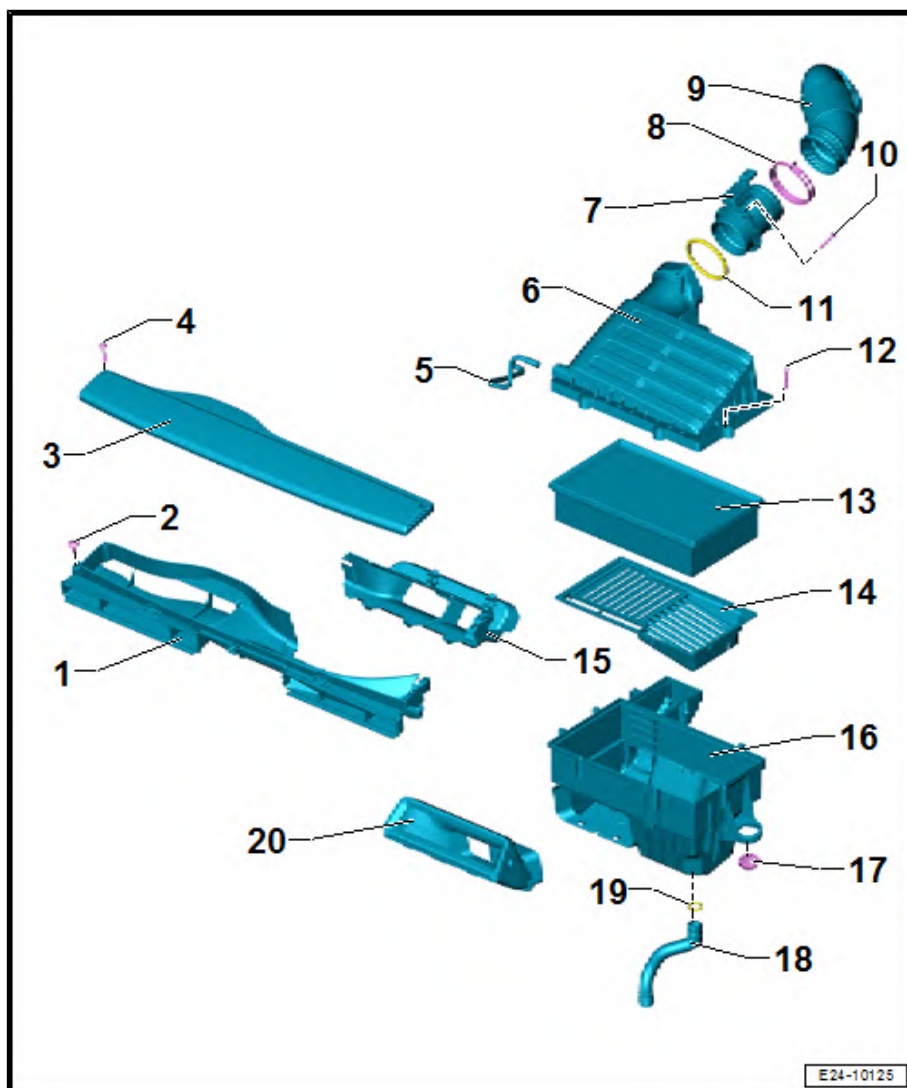
#### 16 - Air filter lower part

- ☐ Remove dirt, leaves and salt residues

#### 17 - Bump stop

#### 18 - Water drain hose

- ☐ Release by turning
- ☐ With valve



E24-10125



- ☐ Cleaning

### 19 - O-ring

- ☐ Renew if damaged

### 20 - Cowling

- ☐ On air cleaner (bottom section)

### Installing air ducts with screw-type clips

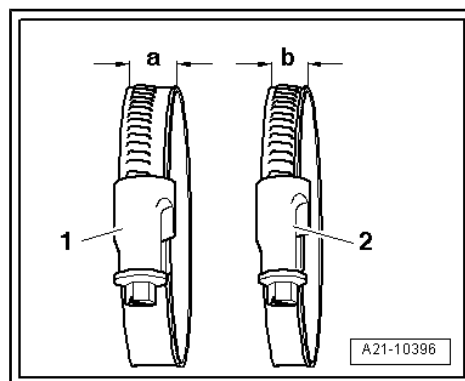


#### Note

- ◆ *Hose unions and air intake pipes/hoses must be free of oil and grease when installing.*
- ◆ *Secure all hose connections with hose clips corresponding to the series equipment ⇒ Electronic Parts Catalogue .*
- ◆ *Spray the worm screws of the used hose clips with penetrating spray before installing.*

#### Specified torque:

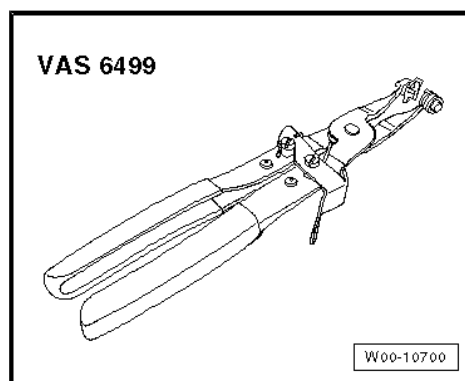
- 1 - Hose clip -a- = 13 mm wide: 5.5 Nm
- 2 - Hose clip -b- = 9 mm wide: 3 Nm



## 3.2 Removing and installing air filter housing

### Special tools and workshop equipment required

- ◆ Spring-type clip pliers - VAS 6499-



### Removing

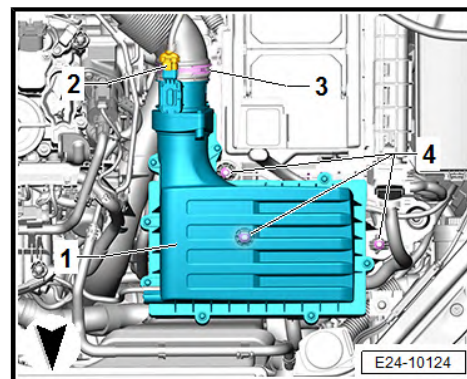
Depending on what is to be removed:

Remove air filter housing ⇒ [page 323](#) .

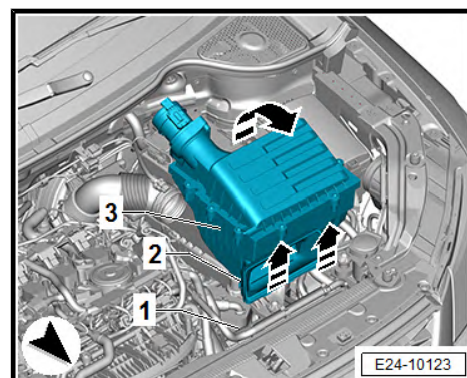
For reasons of space, remove the air filter housing together with the intake hose ⇒ [page 323](#) .

### Remove air filter housing.

- Disconnect connector -2- for air mass meter - G70- .
- Loosen hose clip -3- and detach air intake hose from connection.
- Pull off vacuum hose.
- Pull up the air filter cleaning -1- and remove from both of the retaining pins -4- of the battery tray.

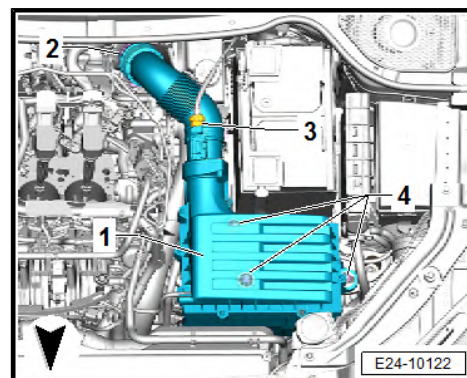


- Remove air filter housing -3- in -direction of arrow-. To do this, separate air pipe -2- from upper part of the air duct -1-.



### For reasons of space, remove air filter housing together with air intake hose.

- Disconnect connector -3- for air mass meter - G70- .
- Release hose clip -2- and detach air intake hose.
- Pull off vacuum hose.
- Pull up the air filter cleaning -1- and remove from both of the retaining pins -4- of the battery tray.



- Remove air filter housing -3- in -direction of arrow-. To do this, separate air pipe -2- from upper part of the air duct -1-.

### Installing



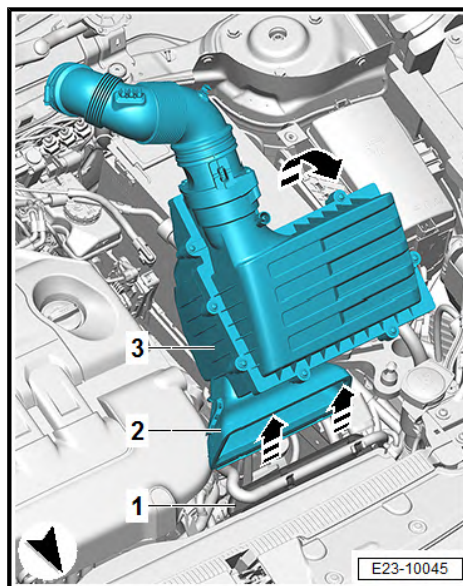
#### Note

- ◆ *Use a silicone-free lubricant when installing the air hose.*
- ◆ *Secure all hose connections with hose clips corresponding to the series production status ⇒ Electronic Parts Catalogue (ETKA) .*
- Check air intake hose for salt residue, dirt and leaves (clean air side).
- Check intake duct for contamination up to air filter element.
- Install air filter housing. Note water drain hose while doing this.



#### Note

*Make sure to route the water drain hose downwards without kinks.*



## 4 Intake manifold

⇒ [“4.1 Assembly overview - intake manifold”, page 325](#)

⇒ [“4.2 Removing and installing intake manifold”, page 326](#)

⇒ [“4.3 Removing and installing throttle valve module GX3”, page 331](#)

⇒ [“4.4 Cleaning throttle valve module”, page 333](#)

⇒ [“4.5 Checking intake manifold change-over”, page 334](#)

### 4.1 Assembly overview - intake manifold

#### 1 - Bolt

- 20 Nm

#### 2 - Support for intake manifold

#### 3 - Nut

- 10 Nm

#### 4 - Bonded rubber bushing

- 5 Nm

#### 5 - Bolt

- 7 Nm

#### 6 - Throttle valve module - GX3-

- Including throttle valve drive (electric throttle operation) - G186- , angle sender 1 for throttle valve drive (electric throttle operation) - G187- and angle sender 2 for throttle valve drive (electric throttle operation) - G188- .
- Throttle valve module - GX3- must be re-adapted to engine control unit - J623- after it has been removed, installed or renewed; see “Guided Functions”; use a ⇒ Vehicle diagnostic tester for this

#### 7 - Seal

- Renew after removing.

#### 8 - Intake manifold

- Removing and installing ⇒ [page 326](#)

#### 9 - Intake manifold flap potentiometer - G336-

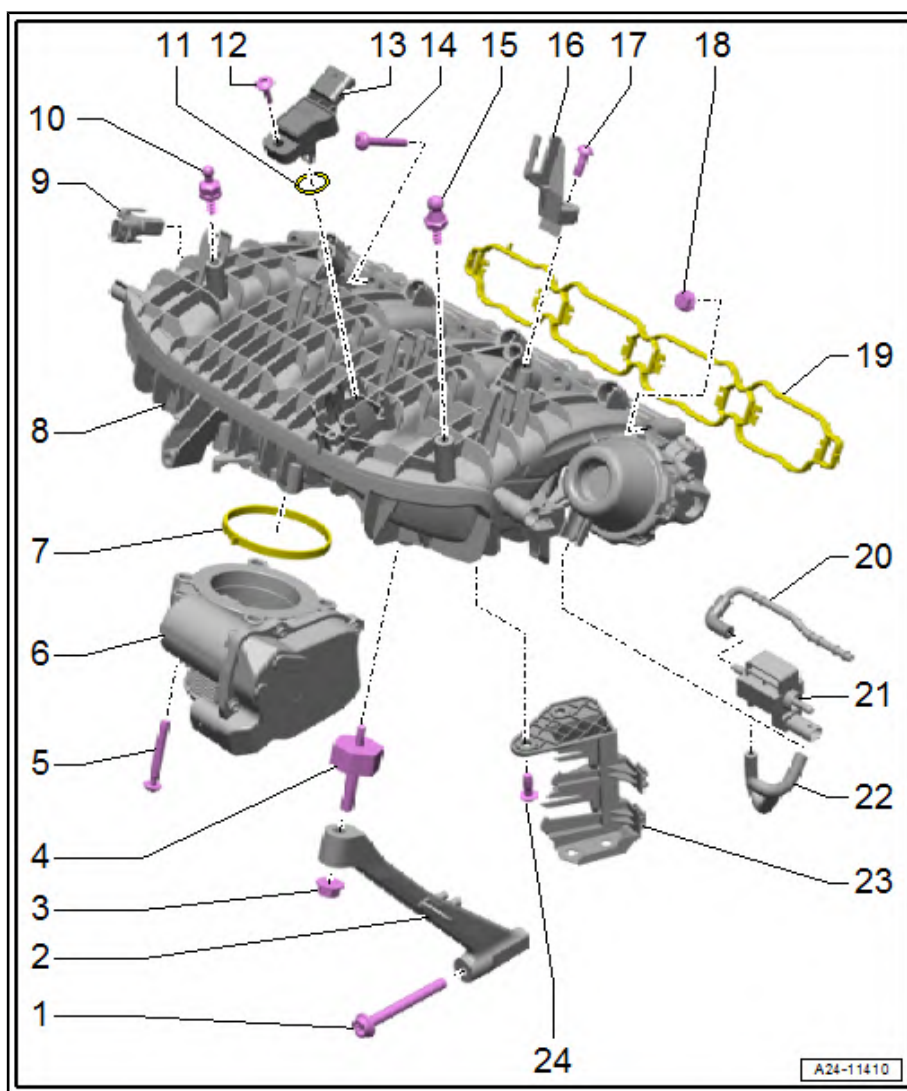
- Bend aside retaining tabs to allow for pulling potentiometer out of intake manifold.

#### 10 - Ball-head pin

- For engine cover panel
- 5 Nm

#### 11 - O-ring

- Renew after removing.



**12 - Bolt**

- ☐ 2.5 Nm

**13 - Intake manifold sender - GX9-**

Consisting of:

- ◆ Intake air temperature sender - G42-
- ◆ Intake manifold pressure sender - G71-
  - ☐ Removing and installing ⇒ [page 341](#)

**14 - Bolt**

- ☐ Tighten in several stages and in diagonal sequence
- ☐ 9 Nm

**15 - Ball-head pin**

- ☐ For engine cover panel
- ☐ 5 Nm

**16 - Carrier**

- ☐ For electrical connector.

**17 - Bolt**

- ☐ 5 Nm

**18 - Nut**

- ☐ 9 Nm
- ☐ Tighten in several stages and in diagonal sequence

**19 - Articulation**

- ☐ Renew after removing.

**20 - Vacuum hose****21 - Intake manifold flap air flow control valve - N316-****22 - Vacuum hose****23 - Carrier**

- ☐ For electrical connectors.

**24 - Bolt**

- ☐ 5 Nm

## 4.2 Removing and installing intake manifold

Special tools and workshop equipment required

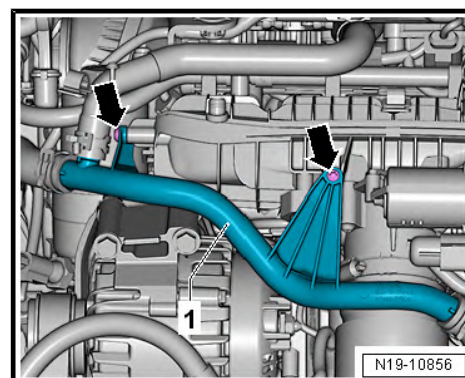
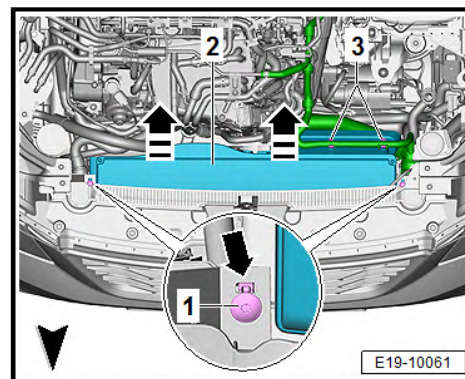
- ◆ Bit - T10347-



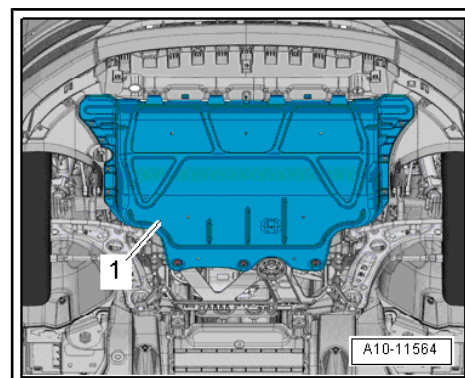


## Removing

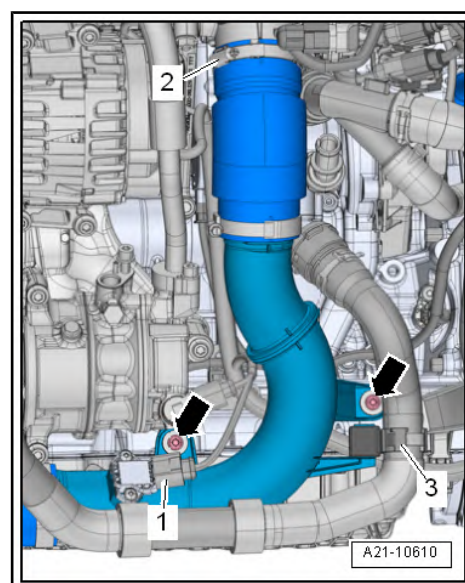
- Remove engine cover panel ➔ [page 50](#) .
- Remove air filter housing ➔ [page 322](#) .
- Disconnect battery ➔ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .
- Lay coolant hose -3- to one side.
- Unscrew bolts -1-.
- Release locking lugs-arrow-, unclip air hose -2- from the front end and remove in -direction of the arrow-.
- Unscrew bolts -arrows- for coolant pipe.



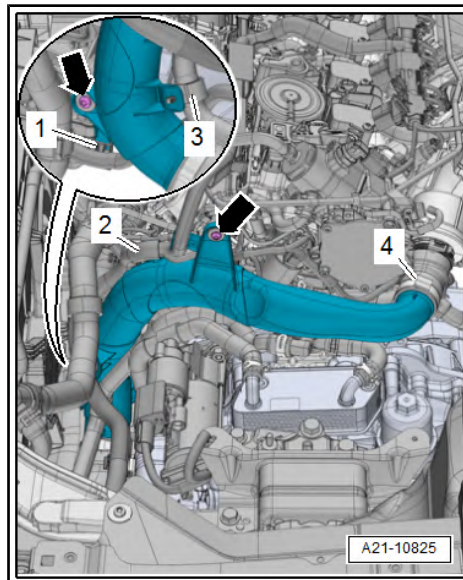
- Remove noise insulation-1- ➔ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .



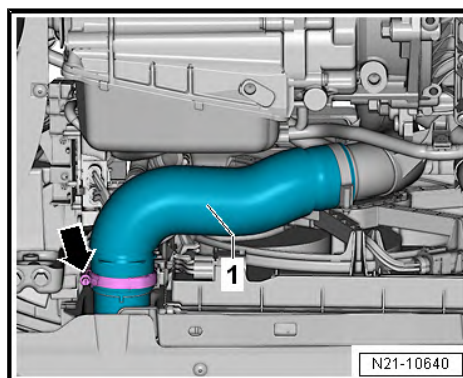
- Move coolant hose on retainer -3- clear to one side.
- Separate electrical connector -1- from charge pressure sender - G31- .
- Unscrew bolts -arrows-.
- Loosen hose clip -2- of charge air hose, and pull charge air hose downwards off throttle valve module - GX3- .



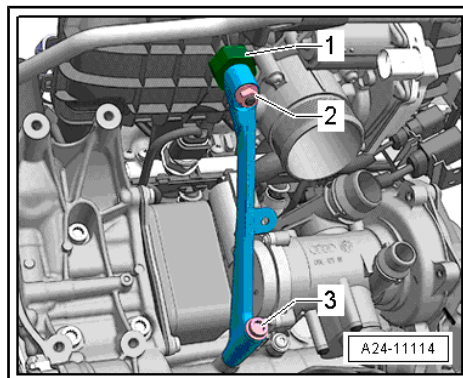
- Move coolant hose on retainer -3- clear to one side.
- Free electrical wiring harnesses -1- and -2- from fittings and lay them to one side.
- Loosen screw-type clip -4-.
- Unscrew bolts -arrows-.



- Loosen hose clip -arrow-, and remove left charge air hose -1- downwards, together with air pipe.

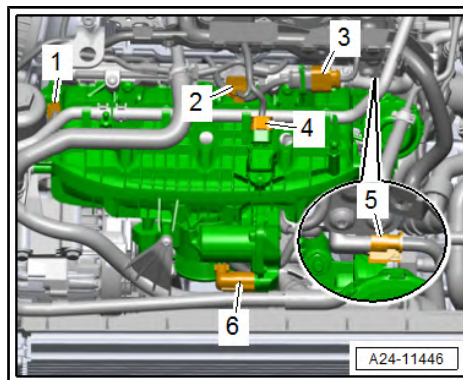


- Remove intake manifold support. To do this, unscrew nut -2- and bolt -3-.
- Remove rubber bush -1- for intake manifold support.

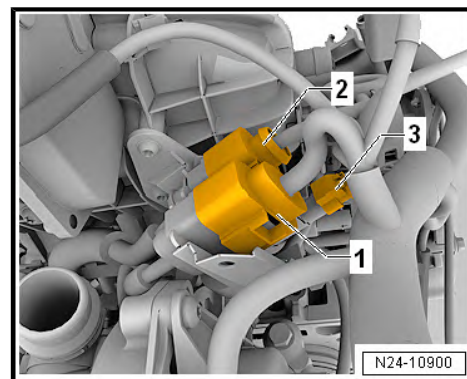


- Disconnect connectors and lay wiring harnesses to one side:

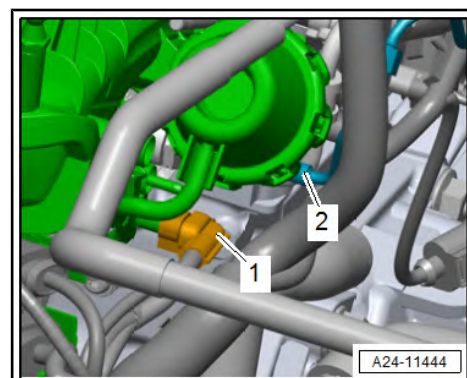
- 1 - For intake manifold flap potentiometer - G336- .
- 2 - For fuel pressure sender for low pressure - G410-
- 3 - Central connector for injectors (intake manifold)
- 4 - For intake manifold sender - GX9- .
- 5 - For Hall sender - G40- .
- 6 - For throttle valve module - J338-



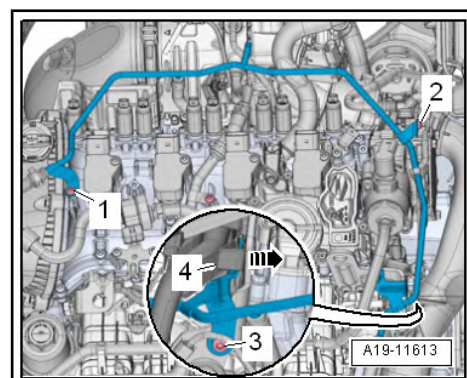
- Disconnect electrical connectors -1, 2, and 3- underneath intake manifold.



- Disconnect connector -1- at intake manifold flap valve - N316- .
- Detach vacuum hose -2-.



- Release fasteners -arrow-, and pull wiring duct slightly upwards.
- Unscrew bolts -2- and -3-, and carefully pull coolant line slightly upwards.

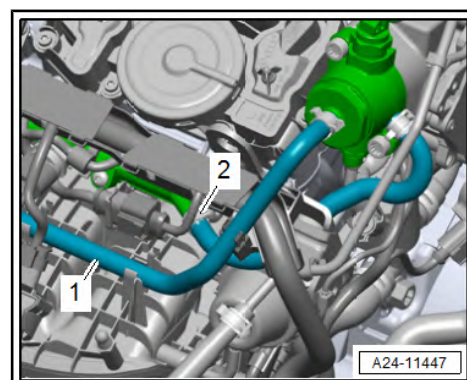


- Lay fuel hose -1- at intake manifold to one side.

**CAUTION**

The fuel system is pressurised.  
 Danger of injury through fuel spray.

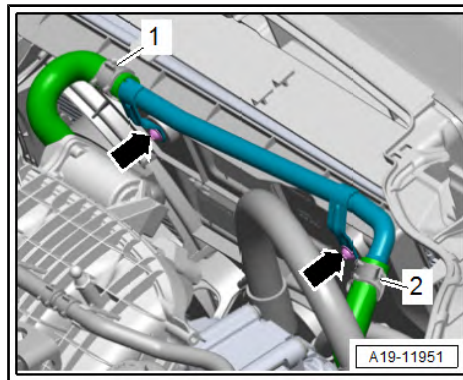
- Wear protective goggles.
- Wear protective gloves.
- To release pressure, wrap a clean cloth around the connection and carefully loosen the connection.



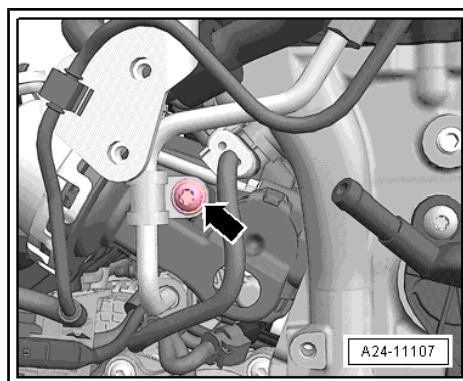
- Release hose clip -2-, and remove coolant hose.



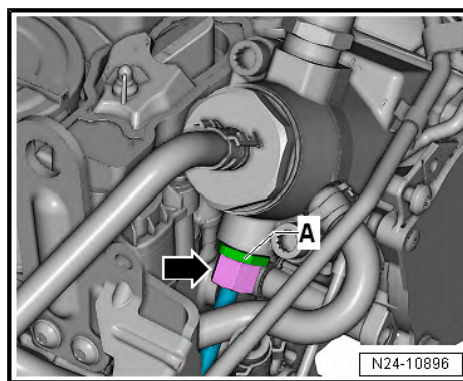
- Vehicles with auxiliary radiator: unscrew bolts -arrows-, and push coolant pipe slightly downwards.



- Unbolt retaining clip -arrow- for high-pressure line.



- Counter hold union -A- and unscrew union nut -arrow-.

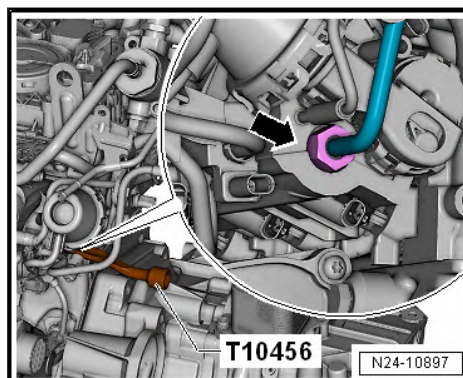


- Unscrew union nut on fuel rail using bit SW 17 - T10456- and remove high-pressure line.

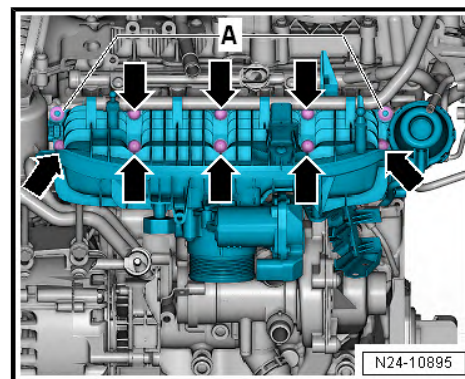


#### Note

- ◆ Collect escaping fuel with a clean cloth.
- ◆ Seal open connections with clean caps. Make sure no dirt gets into the fuel system.



- Unscrew nuts -A- from intake manifold, and unscrew bolts -arrows- using socket Torx T30 - T10347- .

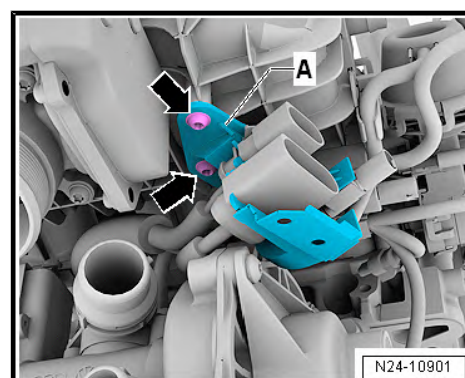


- Slightly pull off intake manifold from cylinder head and unscrew bolts -arrows-for bracket -A-.
- Take intake manifold off cylinder head.



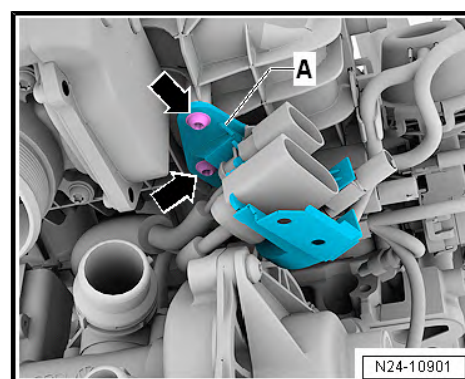
#### Note

*Seal intake ports with a clean cloth.*

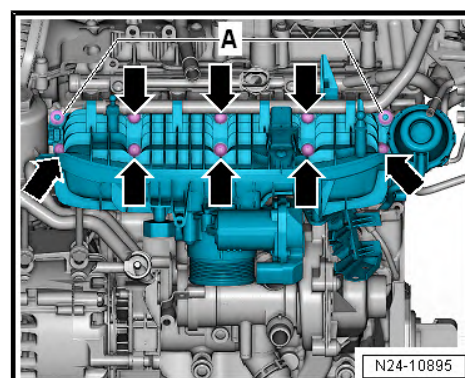


#### Installing

- If the connecting pieces on the high-pressure pump have been loosened, renew connecting pieces.
- Fit intake manifold on cylinder head and tighten bracket -A- for electrical connectors.



- Screw on nuts -A- hand-tight.
- Tighten bolts -arrows- diagonally and in several stages using socket Torx T30 - T10347- .
- Remainder of installation procedure is carried out in reverse order of removal.



#### Specified torques

- ♦ ➔ [“4.1 Assembly overview - intake manifold”, page 325](#)

### 4.3 Removing and installing throttle valve module - GX3-

Throttle valve module - GX3- consists of

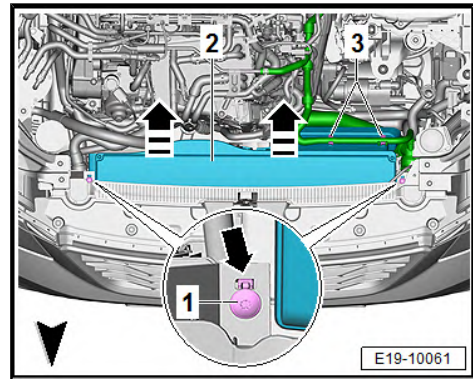
- ♦ Throttle valve drive for electronic power control - G186-
- ♦ Angle sender for throttle valve drive - G187-



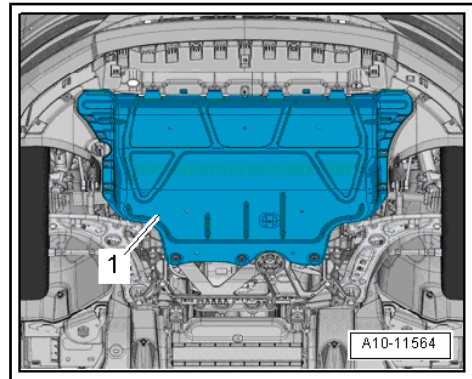
- ◆ Throttle valve drive angle sender 2 for electronic power control - G188-

## Removing

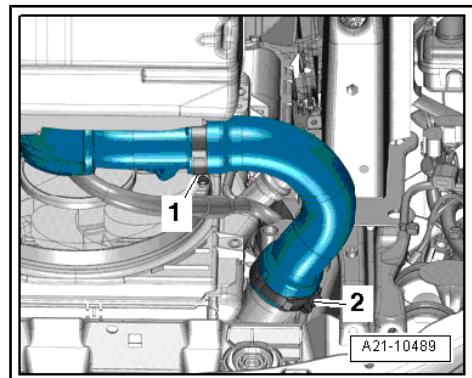
- Remove engine cover panel ⇒ [page 50](#) .
- Remove air filter housing ⇒ [page 322](#) .
- Lay coolant hose -3- to one side.
- Unscrew bolts -1-.
- Release locking lugs-arrow-, unclip air hose -2- from the front end and remove in -direction of the arrow-.



- Remove noise insulation-1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .



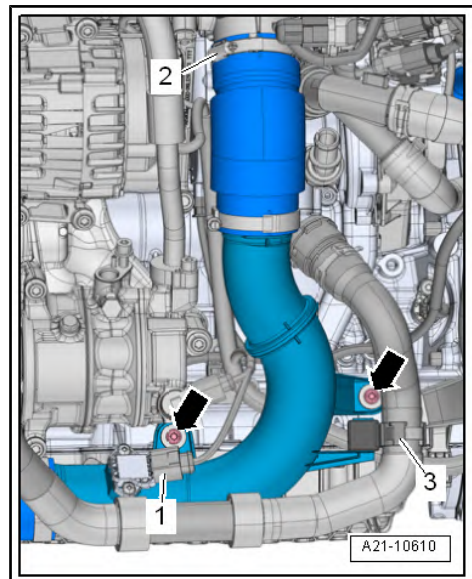
- Release hose clip -2-, and pull charge air hose off charge air cooler.



### Note

*Disregard -item 1-.*

- Move coolant hose on retainer -3- clear to one side.
- Separate electrical connector -1- from charge pressure sender - G31- .
- Unscrew bolts -arrows-.
- Release hose clip -2- on charge air hose, and pull charge air hose off throttle valve module - GX3- .
- Remove air intake hose downwards.



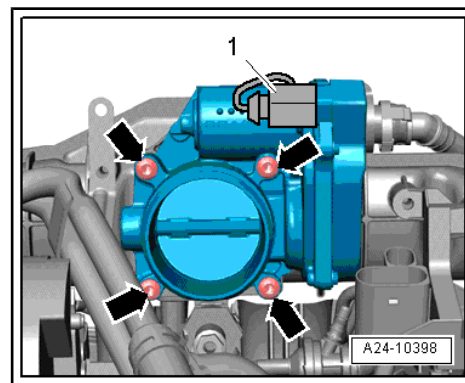
- Detach electrical connector -1- from throttle valve module .
- Unscrew bolts -arrows- on throttle valve module from underneath and detach throttle valve module .

#### Installing

- Install in reverse order of removal.
- Clean sealing surface for O-ring.
- Renew seal.

#### Specified torques

- ◆ ⇒ [“4.1 Assembly overview - intake manifold”, page 325](#)
- After throttle valve control module has been replaced, it must be re-adapted to engine control unit - J623- . Use ⇒ Vehicle diagnostic tester for this.



## 4.4 Cleaning throttle valve module



#### Note

- ◆ *If a new engine control unit - J623- is installed, the throttle valve module must be adapted.*
- ◆ *Contamination and coking in end stop can result in incorrect adaptation values.*
- ◆ *When cleaning the throttle valve nozzle it must not be scratched.*

#### Special tools and workshop equipment required

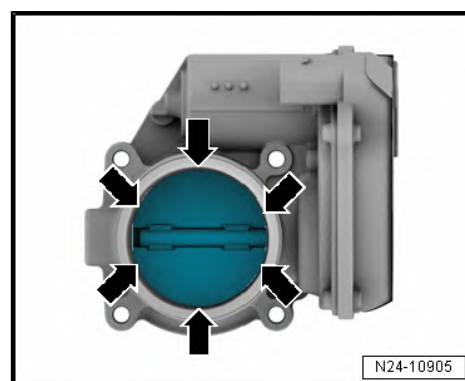
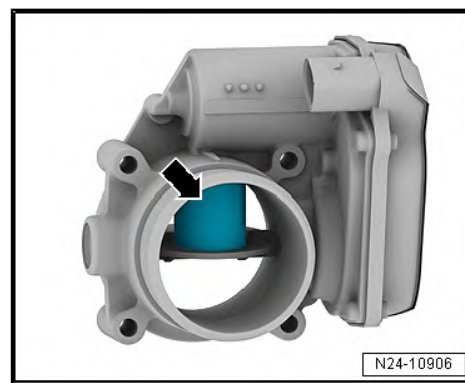
- ◆ Acetone (commercially available)
- ◆ Brush
- Remove throttle valve module ⇒ [page 331](#) .
- Open throttle valve by hand and lock it in open position with a wedge (plastic or wood) -arrow-.



#### CAUTION

Risk of injury caused by acetone. Acetone is highly flammable and may cause eye and skin irritation.

- Wear protective goggles.
- Wear protective gloves.



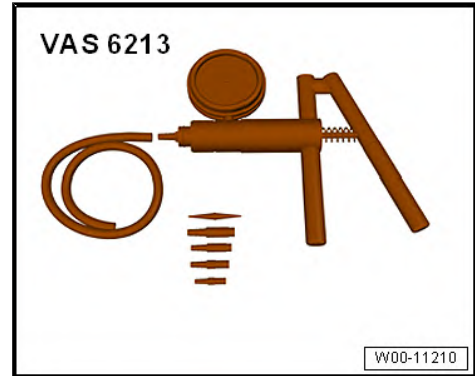
- Clean throttle valve housing thoroughly, especially around the points -arrows- where the throttle valve closes, using commercially available acetone and a small brush.
- Wipe out throttle valve housing with a lint-free cloth.
- Allow acetone to dry off completely.
- Install throttle valve module ⇒ [page 331](#) .
- Delete programmed values and adapt engine control unit - J623- to throttle valve module . Use ⇒ Vehicle diagnostic tester for this.

## 4.5 Checking intake manifold change-over

This check must only be carried out with insufficient torque. This means when recovery or traction are insufficient.

### Special tools and workshop equipment required

- ♦ Hand operated vacuum pump - VAS 6213-



### Prerequisites for check

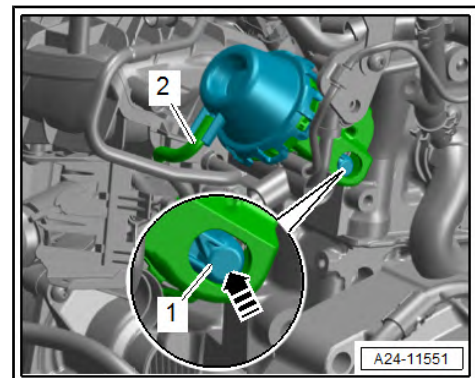
- ♦ The intake manifold flap valve - N316- was checked with a vehicle diagnostic tester.

Perform the following steps if the intake manifold flap valve - N316- is in good condition:

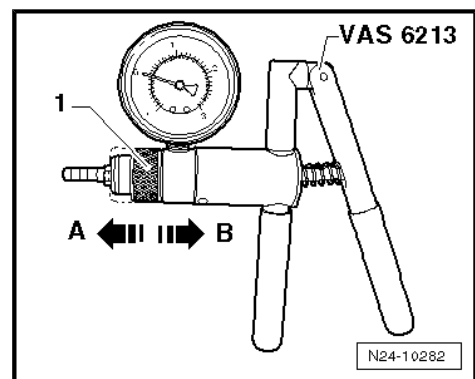
- Remove engine cover panel ➔ [page 50](#) .
- Start engine and run at idling speed.
- Have a second mechanic suddenly increase the engine speed (high revs of the engine). During the procedure, the vacuum unit for variable intake manifold change-over function must be monitored.
- The linkage -1- of the actuator for the intake manifold flap must be tightened -arrow-.

If changeover does not operate as indicated:

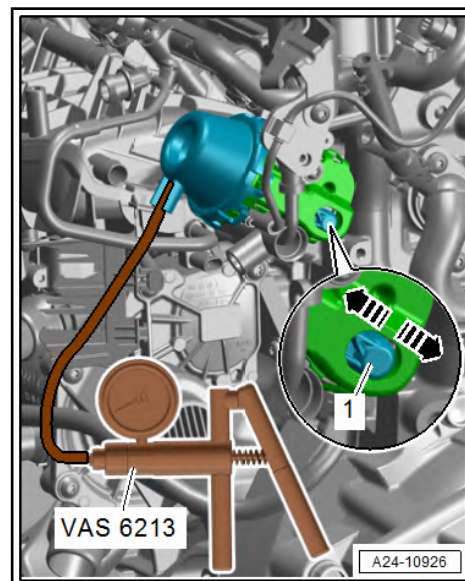
- Check vacuum system for leaks.
- Check that vacuum lines are connected correctly.
- Check vacuum hoses for porosity.



- Bring slide ring -1- on hand vacuum pump - VAS 6213- to position -A- for "vacuum".



- Connect the hand vacuum pump - VAS 6213- to the actuator for the intake manifold flap valve - N316- .
- Operate hand vacuum pump - VAS 6213- several times.
- The linkage -1- of the actuator for the intake manifold flap must be tightened.
- Discharge vacuum.
- The linkage returns to original position.
- The linkage must move in both directions -arrows-.
- If the linkage does not move, replace intake manifold.



## 5 Senders and sensors

⇒ ["5.1 Removing and installing fuel pressure sender G247", page 336](#)

⇒ ["5.2 Checking fuel pressure sender G247", page 338](#)

⇒ ["5.3 Removing and installing fuel pressure sender for low-pressure G410", page 341](#)

⇒ ["5.4 Removing and installing intake manifold sender GX9", page 341](#)

⇒ ["5.5 Removing and installing air mass meter G70 / intake air temperature sender G42", page 342](#)

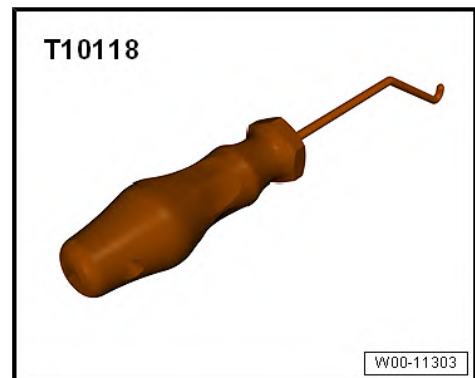
⇒ ["5.6 Removing and installing exhaust gas pressure sensor 1 G450", page 343](#)

### 5.1 Removing and installing fuel pressure sender - G247-

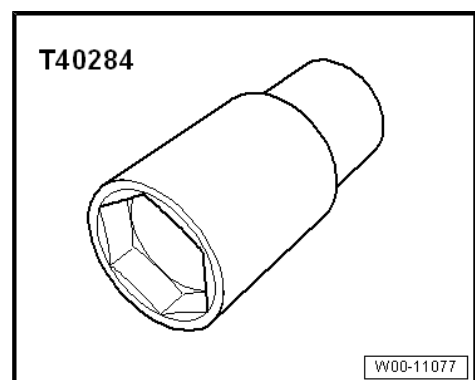
If fuel pressure sender - G247- fails, fuel pressure regulating valve - N276- is switched off, electric fuel pump is fully actuated, and engine is operated with available fuel pressure. This reduces the engine torque drastically.

#### Special tools and workshop equipment required

- ◆ Assembly tool - T10118-



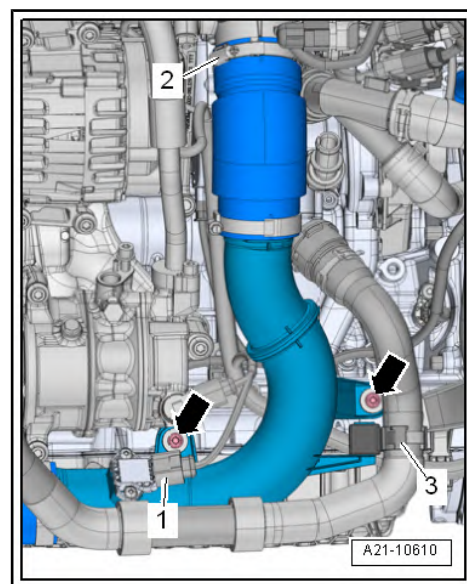
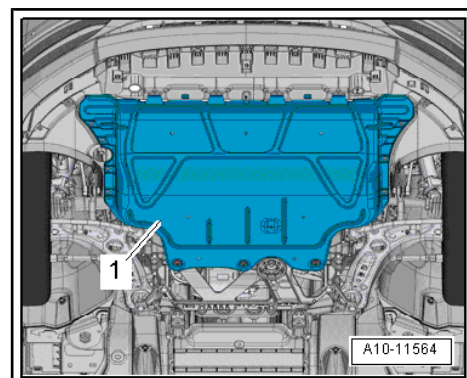
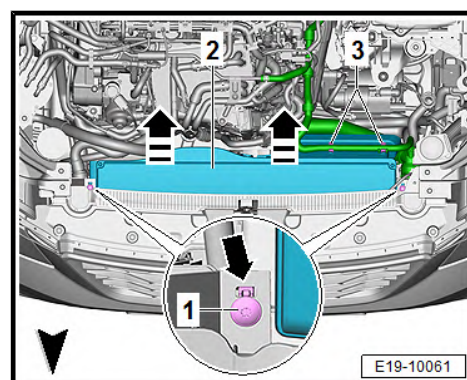
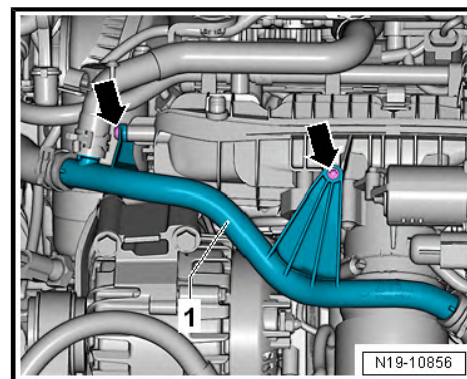
- ◆ Socket e/c 24 - T40284-



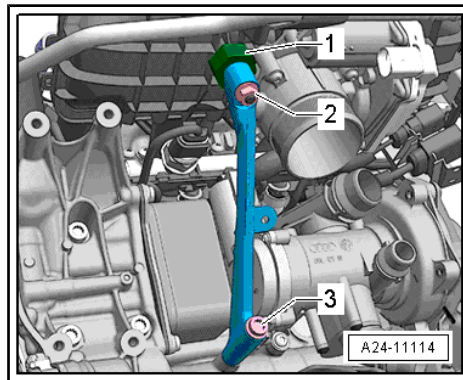


## Removing

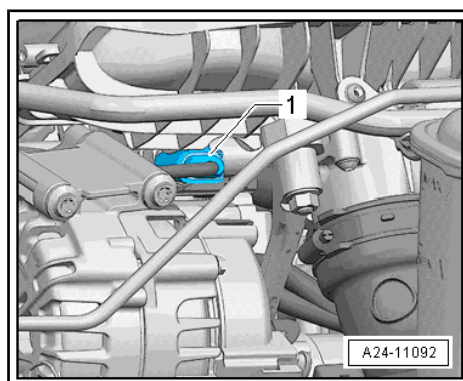
- Remove engine cover panel ⇒ [page 50](#) .
- Unscrew bolts -arrows-.
- Remove air filter housing ⇒ [page 322](#) .
- Lay coolant hose -3- to one side.
- Unscrew bolts -1-.
- Release locking lugs-arrow-, unclip air hose -2- from the front end and remove in -direction of the arrow-.
- Remove noise insulation-1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
- Move coolant hose on retainer -3- clear to one side.
- Separate electrical connector -1- from charge pressure sender - G31- .
- Unscrew bolts -arrows-.
- Loosen hose clip -2- of charge air hose, and pull charge air hose downwards off throttle valve module - GX3- .



- Remove intake manifold support. To do this, unscrew securing nut -2- and bolt -3-.
- Remove rubber bush -1- for intake manifold support.



- Release connector for fuel pressure sender - G247- -1- using assembly tool - T10118- .



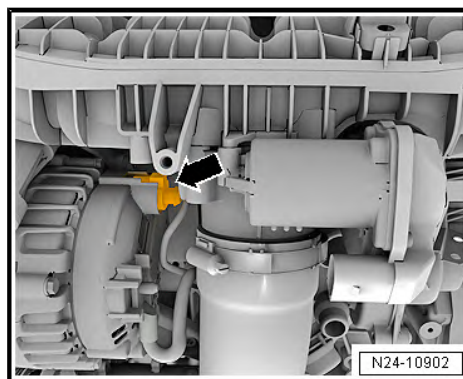
- Pull off connector -arrow- from alternator, otherwise the bit can be caught on the connector!
- Loosen fuel pressure sender - G247- -1- using socket AF 24 - T40284- and unscrew.

#### Installing

- Lubricate sealing cone and thread of fuel pressure sender - G247- with clean engine oil.
- Remainder of installation procedure is carried out in reverse order of removal.

#### Specified torques

- ♦ ⇒ [“2.1.1 Assembly overview - fuel rail with injectors, direct injection”, page 310](#)



## 5.2 Checking fuel pressure sender - G247-

#### Special tools and workshop equipment required

- ♦ Pressure sensor tester - VAS 6394-
- ♦ Adapter part - VAS 6394/2-
- ♦ Test adapter - VAS 5570-
- ♦ Torque wrench - V.A.G 1331-
- ♦ Vehicle diagnostic tester

#### Procedure:

- Remove engine cover panel ⇒ [page 50](#) .

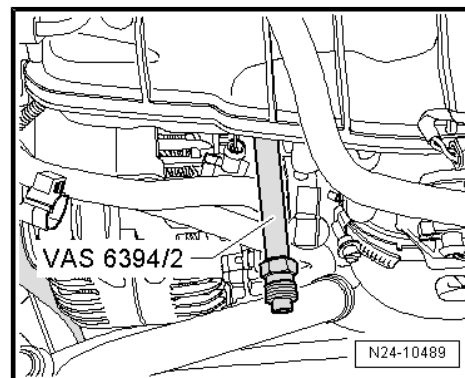
**CAUTION**

The fuel system is pressurised.

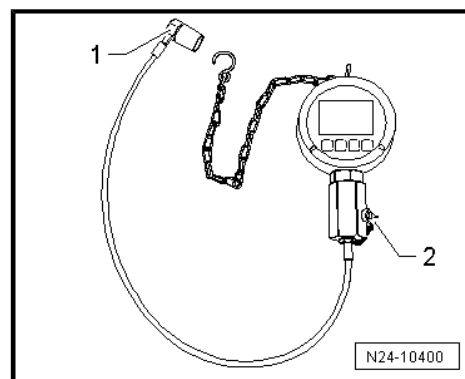
Danger of injury through fuel spray.

- Wear protective goggles.
- Wear protective gloves.
- To release pressure, wrap a clean cloth around the connection and carefully loosen the connection.

- Remove fuel pressure sender - G247- ⇒ [page 336](#) .
- Instead of fuel pressure sender - G247- , screw in adapter - VAS 6394/2- and tighten it to torque specified for fuel pressure sender - G247- .



- Open plug -2- of digital pressure gauge - VAS 6394/1- , screw previously removed fuel pressure sender - G247- into opening, and tighten it to specified torque.



- Use test adapter - VAS 5570- to establish electrical connection between vehicle and fuel pressure sender - G247- .

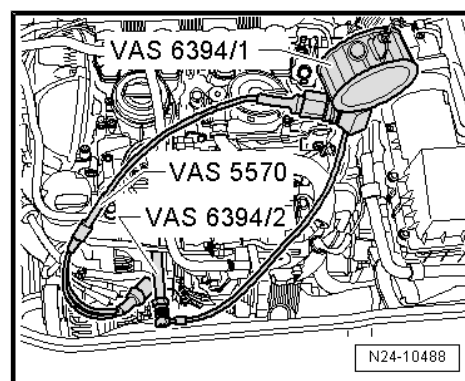


**Note**

*For the steps below, the engine must be started. Therefore, install the intake hose and the air filter housing.*

- Connect the vehicle diagnosis and service information system.
- Switch ignition on.
- Select “Engine electronics” in the self-diagnosis program.
- Select “Measured values”.
- Select “Fuel pressure” from the list.

Display field shows the actual value reported to the engine control unit by the fuel pressure sender - G247- .



- Switch on digital pressure gauge - VAS 6394/1- by briefly pressing -A- button once.



#### Note

*When button -A- is pressed for 2 seconds, the illumination is switched on for 20 seconds.*

Digital pressure gauge - VAS 6394/1- must display 0 bar; if this is not the case, briefly press button -C- to zero the device.

- Connect digital pressure gauge - VAS 6394/1- to adapter - VAS 6394/2- .
- Start engine.
- Compare pressure displayed on digital pressure gauge - VAS 6394/1- with actual value displayed on vehicle diagnostic tester.
- A maximum pressure deviation of 5 bar is permissible
- If the deviation is greater than 5 bar, test a new fuel pressure sender - G247- .



#### CAUTION

**The fuel system is pressurised.**

**Danger of injury through fuel spray.**

- Wear protective goggles.
- Wear protective gloves.
- To release pressure, wrap a clean cloth around the connection and carefully loosen the connection.

- Screw new fuel pressure sender - G247- into digital pressure gauge - VAS 6394/1- .
- Repeat test with new fuel pressure sender - G247- and compare both measured values.

**If measured values again fail to correspond:**

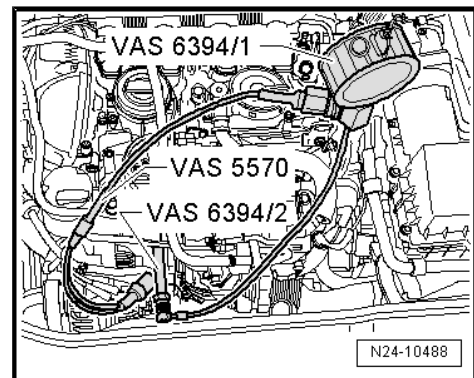
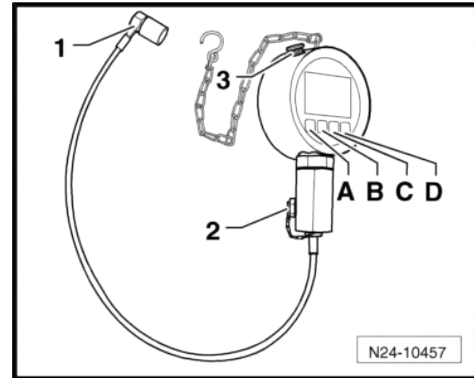
- Check electrical wiring between fuel pressure sender - G247- and engine control unit ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.

**If measured values correspond this time:**

- Install new fuel pressure sender - G247- ⇒ [page 336](#) .

#### Specified torques

- ♦ ⇒ [“2.1.1 Assembly overview - fuel rail with injectors, direct injection”, page 310](#)

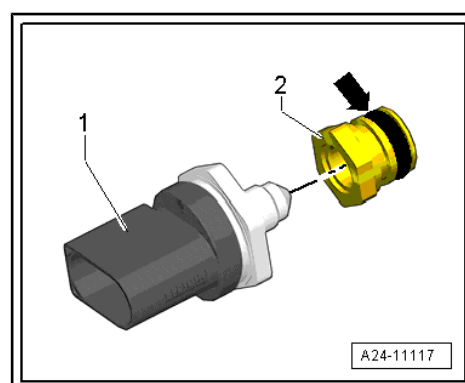
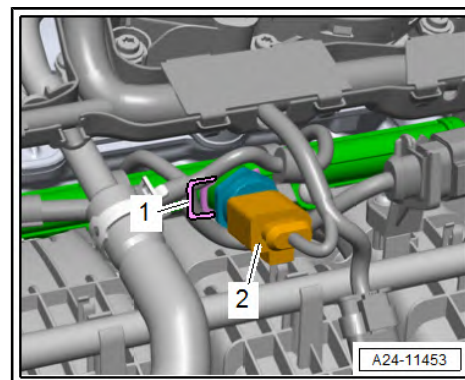




## 5.3 Removing and installing fuel pressure sender for low-pressure - G410-

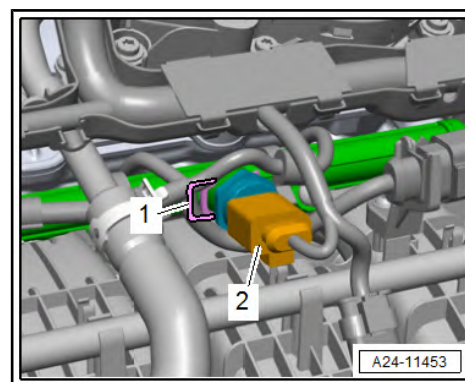
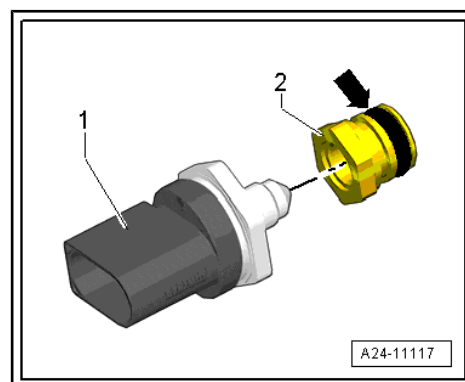
### Removing

- Remove engine cover panel ➔ [page 50](#) .
- Disconnect connector -2-.
- Pull out securing clip -1-.
- Pull fuel pressure sender for low pressure - G410- out of fuel rail.
- Unscrew fuel pressure sender for low-pressure - G410- -1- from adapter -2-.



### Installing

- Renew O-ring -arrow-.
- Screw fuel pressure sender for low-pressure - G410- -1- into adapter -2-.
- Carefully push fuel pressure sender for low pressure - G410- into fuel rail as far as stop.
- Insert securing clip -1- into groove.
- Reconnect electrical connector -2-.



### Specified torques

- ◆ ➔ ["2.1.2 Assembly overview - fuel rail with injectors, indirect injection", page 311](#)

## 5.4 Removing and installing intake manifold sender - GX9-

The intake manifold sender - GX9- consists of intake air temperature sender - G42- and intake manifold pressure sender - G71- .



### Removing

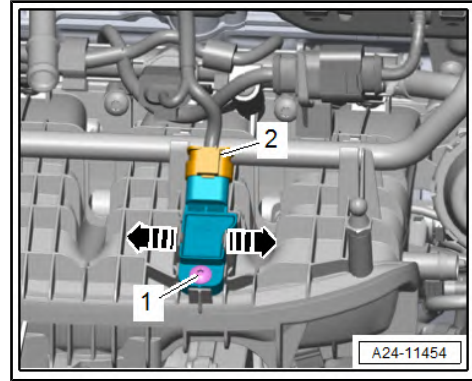
- Remove engine cover panel ➤ [page 50](#) .
- Disconnect connector -2-.
- Unscrew screw -1-.
- Release fasteners -arrows-, and pull intake manifold sender - GX9- off intake manifold.

### Installing

Install in reverse order of removal.

### Specified torques

- ♦ ➤ [“4.1 Assembly overview - intake manifold”, page 325](#)



## 5.5 Removing and installing air mass meter - G70- / intake air temperature sender - G42-

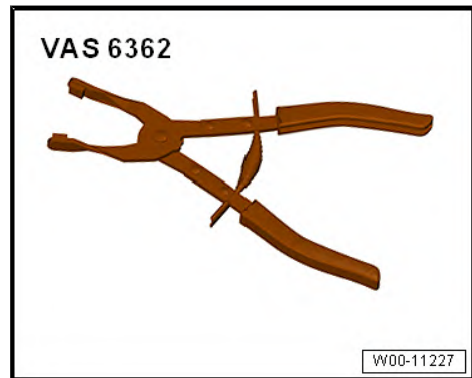


### Note

*The air mass meter - G70- and the intake air temperature sender - G42- are installed in a common housing.*

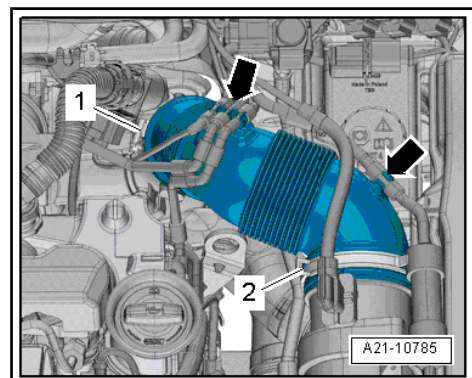
### Special tools and workshop equipment required

- ♦ Spring-type clip pliers - VAS 6362-



### Removing

- Remove engine cover panel ➤ [page 50](#) .
- Lay vacuum hoses -arrows- to side.
- Release and pull off connector.
- Release hose clamps -1, 2- and remove air pipe.



- Unscrew screw -1-.
- Turn air mass meter - G70- -item 2- in direction of -arrow B- and detach.

### Installing

To ensure the proper function of the air mass meter - G70- it is important to adhere to the following work sequences.

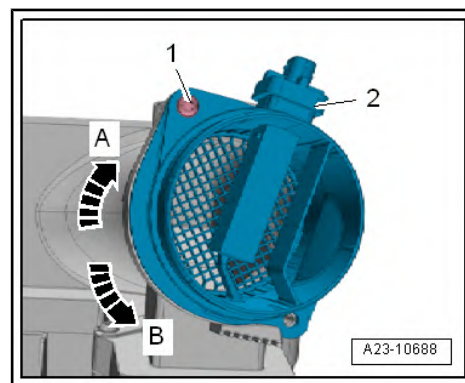
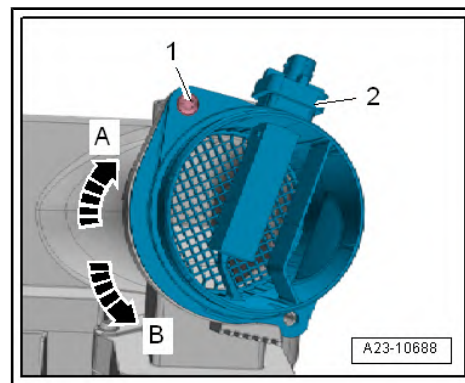


### Note

- ◆ *If the air filter element is very dirty or wet, particles of dirt or water may reach the air mass meter and falsify the measured air mass value. This would lead to loss of power, since a smaller injection quantity is calculated.*
- ◆ *Always use genuine part for air filter element*
- ◆ *Always renew seal if damaged (infiltrating air).*
- ◆ *Use a silicone-free lubricant to install the air hose and seal.*
- ◆ *Hose unions and air intake pipes/hoses must be free of oil and grease when installing.*
- ◆ *Secure all hose connections with hose clips corresponding to the series equipment ⇒ Electronic Parts Catalogue .*
- Check for salt residue, dirt and leaves in air mass meter and air hose (clean air side).
- Check intake duct for contamination up to air filter element. If contamination is found, remove salt residue, dirt or leaves from air filter housing.
- To install, insert air mass meter - G70- -item 2- and turn it in direction of -arrow A-.
- Fit engine cover panel ⇒ [page 50](#) .

### Specified torques

- ◆ ⇒ [page 321](#)



## 5.6 Removing and installing exhaust gas pressure sensor 1 - G450-

### Special tools and workshop equipment required

- ◆ Vehicle diagnostic tester
- ◆ Silicone-free lubricant

### Removing

- Remove engine cover panel ⇒ [page 50](#) .

- Disconnect electrical connector -arrow-.
- Unscrew bolt -1-.
- Press the exhaust gas pressure sensor 1 - G450- -2- a little to one side.
- Lightly lubricate the hoses -3- on the exhaust gas pressure sensor 1 - G450- with silicone-free lubricant.
- Remove lines carefully from the connections in order to avoid a breakage of the connections.

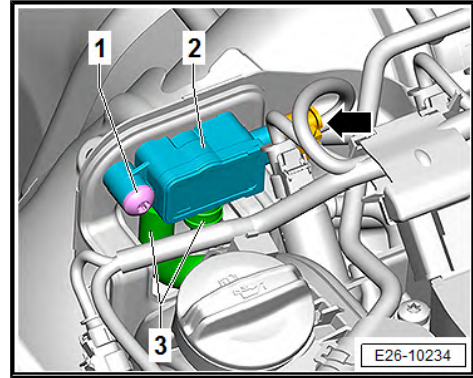
### Installing

Remaining installation is carried out in the reverse order. When installing, note the following:

- Before installing, blow out control lines from exhaust gas pressure sensor 1 - G450- (towards emission control module) with compressed air (pipes can become obstructed or may ice up due to condensation).
- Make sure that hose is securely fitted and that there are no leaks.
- Install engine cover panel ⇒ [page 50](#) .
- After renewal of the exhaust pressure sensor 1 -G450- , the learnt values must be reset to the starting condition ⇒ Vehicle diagnostic tester, Guided Functions, 01 - Reset learnt values.

### Tightening torques

- ◆ ⇒ [“8.1 Assembly overview - Lambda probe”, page 355](#)



## 6 Engine (motor) control unit

⇒ [“6.1 Removing and installing engine control unit J623 without protective housing”, page 345](#)

⇒ [“6.2 Removing and installing engine control unit J623 with protective housing”, page 346](#)

### 6.1 Removing and installing engine control unit - J623- without protective housing

Special tools and workshop equipment required

- ◆ Vehicle diagnosis and service information system

#### Removing

- If the engine control unit is to be renewed, switch on ignition, and select the following menu options on vehicle diagnostic tester :

◆ 0001 - Renew engine control unit

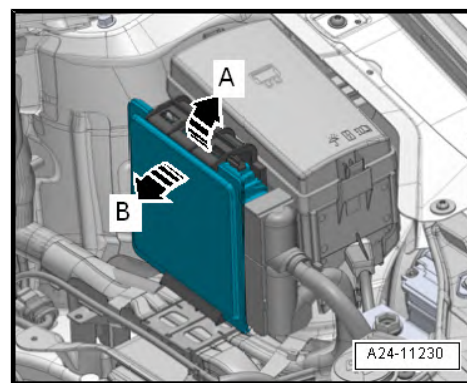
- Switch off ignition, and remove ignition key.



#### Note

*If the engine (motor) control unit comes into contact with the positive battery terminal, permanent damage to the engine (motor) control unit will be the consequence. For this reason, the battery always needs to be disconnected prior to removing the engine control unit from its bracket ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .*

- Release fastener -arrow A-, and remove engine control unit - J623- -arrow B-.
- Release and pull off connectors for engine (motor) control unit - J623- .



## Installing

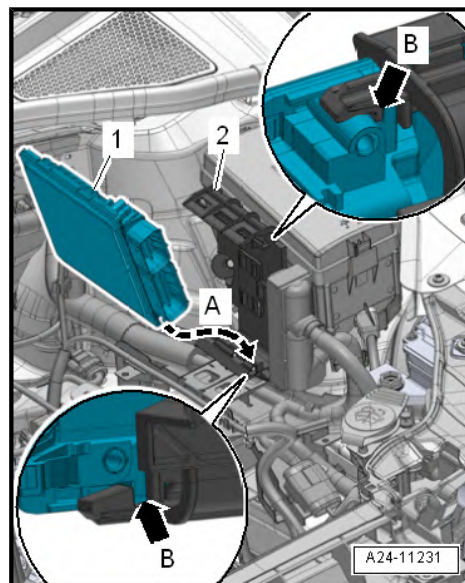
Installation is carried out in reverse order of removal. When installing, note the following:

- Insert lower edge of engine control unit - J623- into bracket -arrow A-, and engage engine control unit in bracket at upper edge.
- When doing this, ensure that lugs of engine control unit engage in notches at top and bottom of bracket -arrows B-.
- Connect battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .

**After having installed the new engine control unit, the following work must be carried out:**

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

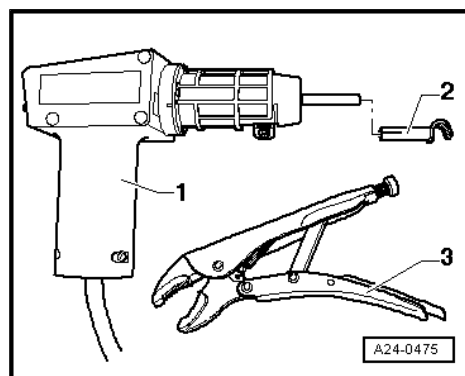
◆ 0001 - Renew engine control unit



## 6.2 Removing and installing engine control unit - J623- with protective housing

### Special tools and workshop equipment required

- ◆ Hot air blower - VAS 1978/14A- -item 1- with plug-in nozzle -2- from wiring harness repair set - VAS 1978 B-



- ◆ Small grinder with cutting disc, commercially available
- ◆ Vehicle diagnosis and service information system

### Removing

- If the engine control unit is to be renewed, switch on ignition, and select the following menu options on vehicle diagnostic tester :

◆ 0001 - Renew engine control unit

- Switch off ignition, and remove ignition key.



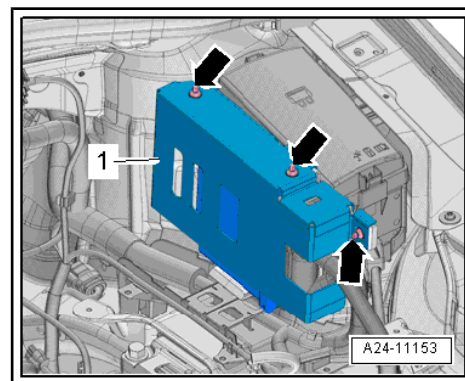
### Note

*If the engine (motor) control unit comes into contact with the positive battery terminal, permanent damage to the engine (motor) control unit will be the consequence. For this reason, the battery always needs to be disconnected prior to removing the engine control unit from its bracket ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .*

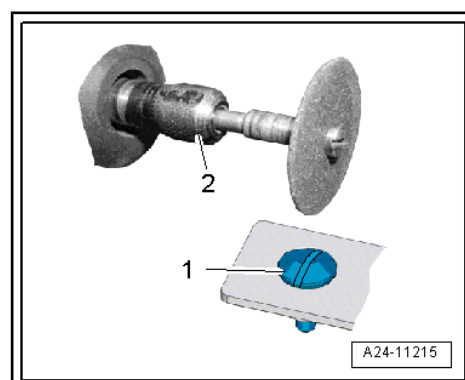
- Remove battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery .



To remove protective housing -1-, unscrew shear bolts -arrows- as follows:



- Make groove (for a screwdriver) in head of shear bolt -1- using a small grinder -2-.



#### Note

*The threads of the shear bolts are coated with locking compound. To unscrew these bolts, the threads must therefore be heated with the hot air blower.*

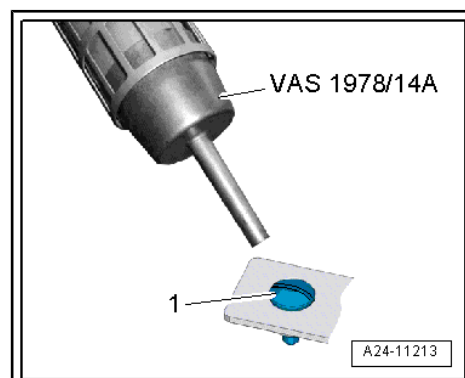
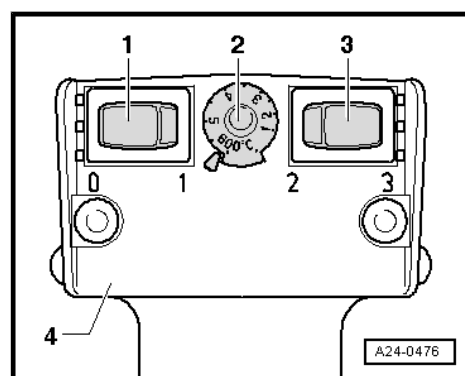
- Select settings on hot air blower as shown in illustration, i.e. set temperature potentiometer -2- to maximum heat output and two-stage air flow switch -3- to position 3.



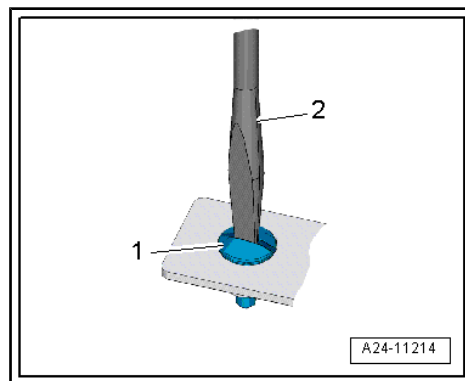
#### NOTICE

**Risk of damage to adjacent components caused by hot air blower. Risk of overheating.**

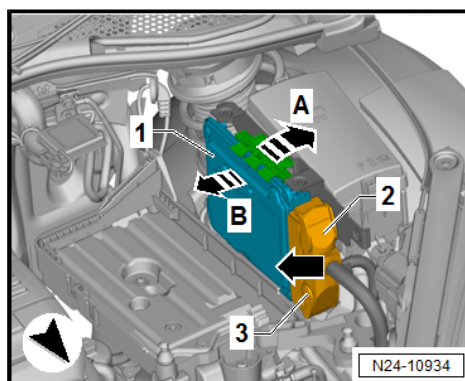
- If necessary, cover adjacent components.
- Heat head of shear bolt -1- for approx. 20 to 30 seconds.



- Unscrew shear bolt -1- with screwdriver -2-.
- Remove protective housing from engine (motor) control unit - J623- .



- Release and disconnect connectors -2 and 3- for engine control unit - J623- .
- Release fastener -arrow A-, and remove engine control unit - J623- -1- -arrow B-.



### Installing

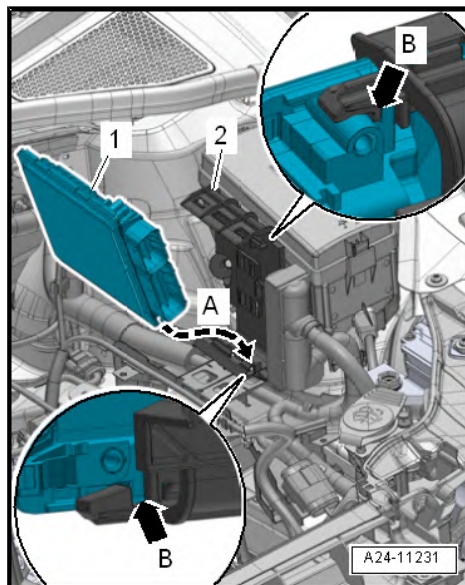
Installation is carried out in reverse order of removal. When installing, note the following:

- Insert lower edge of engine control unit - J623- into bracket -arrow A-, and engage engine control unit in bracket at upper edge.
- It is essential that the engine (motor) control unit - J623- be provided with the protective housing again.
- Clean threaded holes for shear-head bolts from locking compound residue. A thread chaser is suitable for cleaning.
- Always use new shear bolts.
- Install battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery .

**After having installed the new engine control unit, the following work must be carried out:**

- Switch on ignition, and select following menu option on vehicle diagnostic tester :

◆ 0001 - Renew engine control unit



## 7 High-pressure pump

⇒ [“7.1 Assembly overview - high-pressure pump”, page 349](#)

⇒ [“7.2 Removing and installing high-pressure pump”, page 350](#)

### 7.1 Assembly overview - high-pressure pump

#### ⚠ CAUTION

The fuel system is pressurised.

Danger of injury through fuel spray.

- Wear protective goggles.
- Wear protective gloves.
- To release pressure, wrap a clean cloth around the connection and carefully loosen the connection.

#### 1 - Quick-release coupling

- ☐ With shut-off valve
- ☐ Fitted depending on vehicle version

#### 2 - Electrical connector

#### 3 - Fuel metering valve - N290-

- ☐ Integrated in high-pressure pump, cannot be renewed individually

#### 4 - High-pressure pump

- ☐ Removing and installing  
⇒ [page 350](#)
- ☐ Do not cant when installing.

#### 5 - O-ring

- ☐ Renew if damaged

#### 6 - Roller tappet

- ☐ Can remain inserted in vacuum pump after removal of high-pressure pump

#### 7 - Vacuum pump

#### 8 - Union

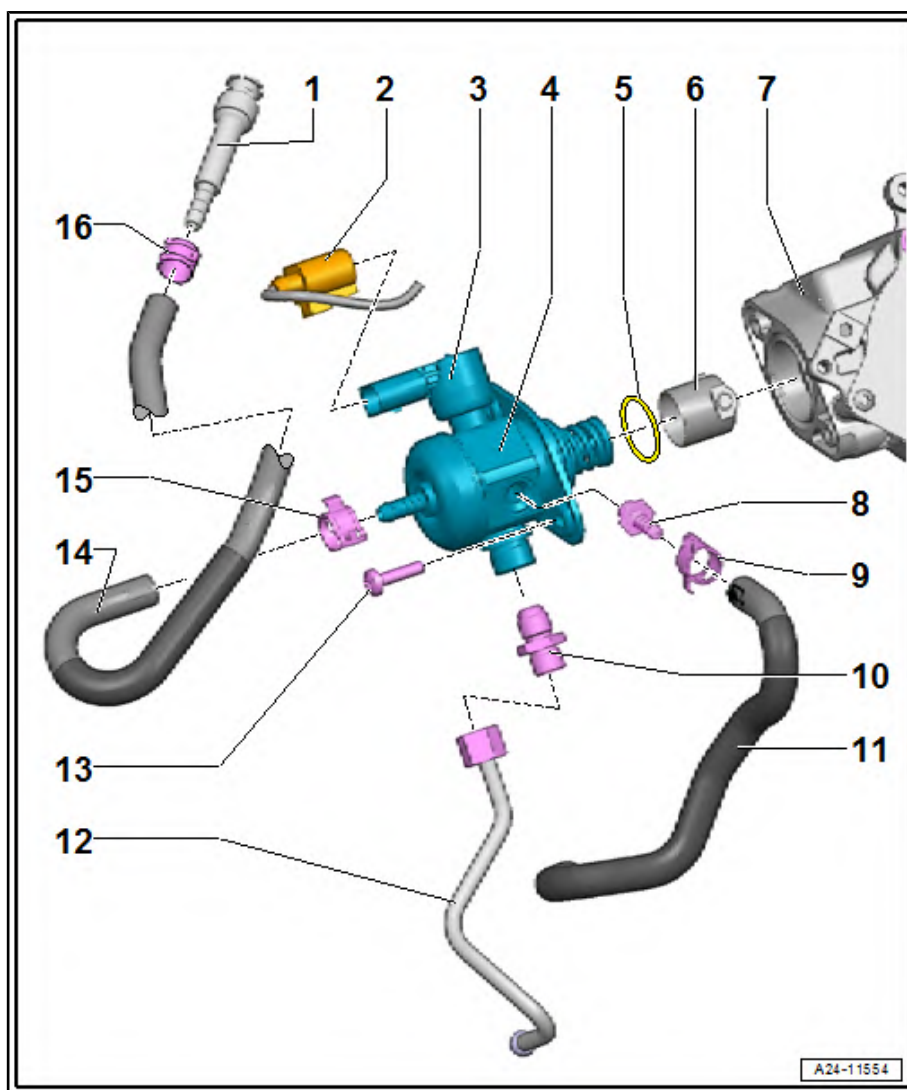
- ☐ Renew after removing.
- ☐ 15 Nm

#### 9 - Spring-type clip

- ☐ Renew after removing.

#### 10 - Union

- ☐ Counterhold connecting piece when loosening union nut
- ☐ Renew after removing.
- ☐ 40 Nm



### 11 - Fuel supply hose

- ☐ To fuel rail for MPI injectors

### 12 - High-pressure pipe

- ☐ To fuel rail for FSI injectors
- ☐ Moisten ball of fuel supply line with engine oil.
- ☐ Do not fit nut under tension
- ☐ Union nut, 27 Nm

### 13 - Bolt

- ☐ Renew after removing.
- ☐ Specified torques and tightening sequence ⇒ [page 350](#)

### 14 - Fuel supply hose

- ☐ From fuel tank

### 15 - Spring-type clip

- ☐ Renew after removing.

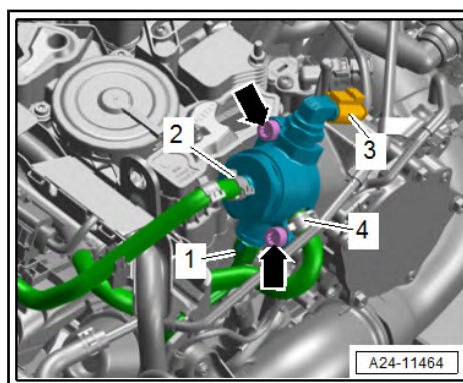
### 16 - Spring-type clip

- ☐ Renew after removing.

### High-pressure pump - specified torques and tightening sequence

- After removal, renew the bolts that are tightened with turning further angle.
- In order to prevent the flange of the high-pressure pump from becoming deformed during installation, tighten the bolts incrementally as follows:

Step	Bolts	Specified torque/turning further angle
1.	-Arrows-	Screw in by hand as far as stop
2.	-Arrows-	Tighten one turn alternately until flange of high-pressure pump makes contact with vacuum pump
3.	-Arrows-	8 Nm
4.	-Arrows-	Turn 90° further



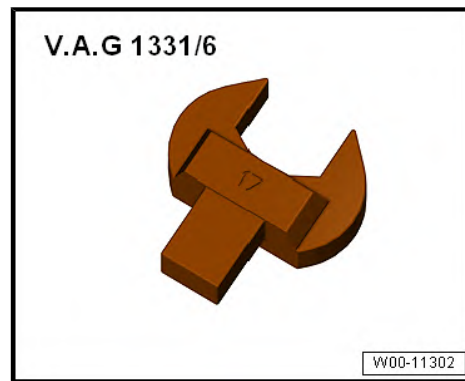
## 7.2 Removing and installing high-pressure pump

### Special tools and workshop equipment required

- ◆ Socket, 17 mm - T10456-



- ◆ Tool insert, 17 mm - V.A.G 1331/6-

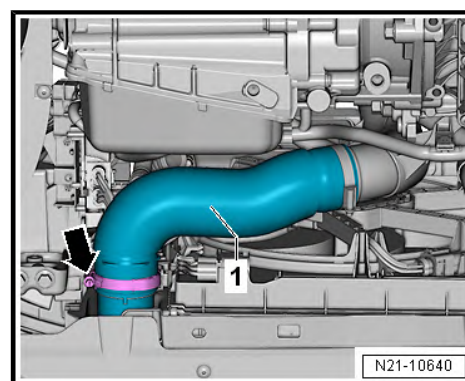


#### Note

- ◆ *high-pressure pump may only be removed when the engine is cold.*
- ◆ *When installing the high-pressure pump, it is essential to ensure that no dirt enters the fuel system.*
- ◆ *Collect escaping fuel with a cleaning cloth.*
- ◆ *Check O-ring of high-pressure pump and renew it if damaged.*
- ◆ *If the connecting piece for the high-pressure line  
⇒ [Item 10 \(page 349\)](#) has been loosened, it must be renewed.*
- ◆ *Moisten high-pressure line with engine oil, and always make sure it is free of tension when installed.*

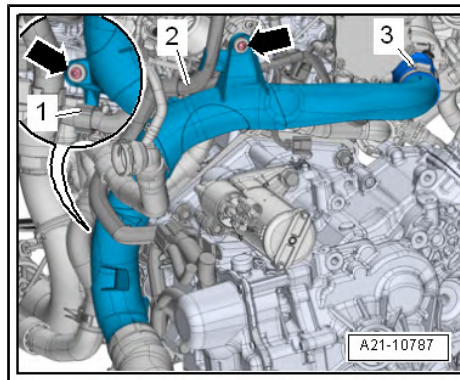
#### Removing

- Remove engine cover panel ⇒ [page 50](#) .
- Remove air filter housing ⇒ [page 323](#) .
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
- Loosen clamp -arrows- and disconnect the left charge air hose -1- from the charge air cooler.

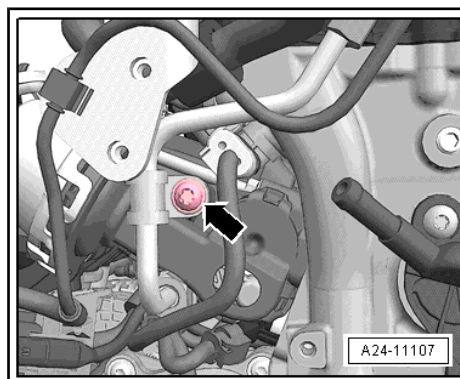




- Free electrical wiring harnesses -1- and -2- from fittings and lay them to one side.
- Loosen screw-type clip -3-.
- Unscrew bolts -arrows- and push air pipe clear to left side.



- Unbolt clamp -arrow-.

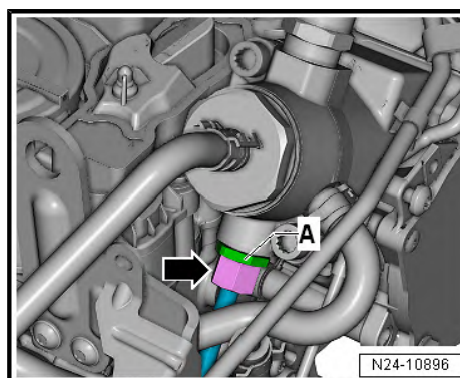
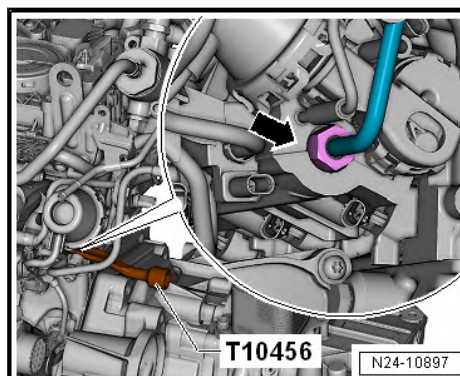


- Loosen union nut on fuel rail -arrow- using socket AF 17 mm - T10456- .

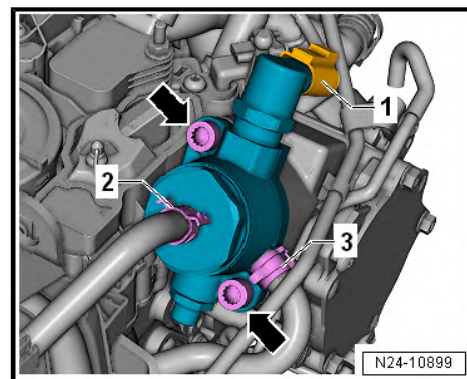
### ⚠ CAUTION

The fuel system is pressurised.  
 Danger of injury through fuel spray.

- Wear protective goggles.
  - Wear protective gloves.
  - To release pressure, wrap a clean cloth around the connection and carefully loosen the connection.
- Counterhold on hexagon -A-, and loosen union nut -arrow-. Remove high-pressure line.



- Pull off electrical connector -1- from fuel pressure regulating valve - N276- .
- Remove fuel hoses -2- and -3-.
- Unscrew bolts -arrows- alternately to make sure that high-pressure pump does not cant.
- Carefully pull out high-pressure pump. The roller plunger may possibly remain inserted in vacuum pump.



### Installing

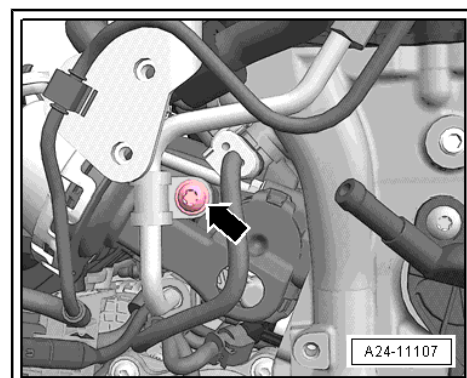
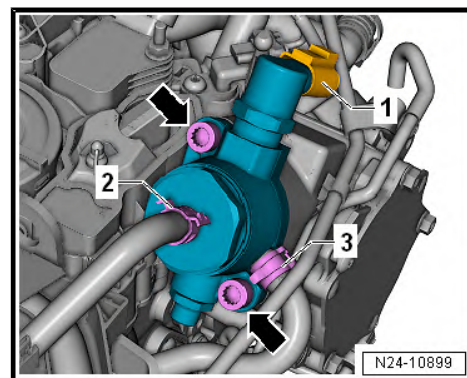
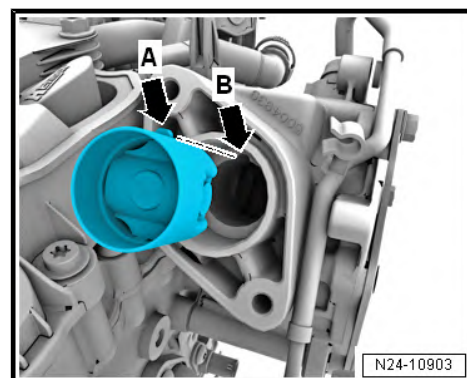
- Before inserting roller tappet, check it for damage, and renew it if necessary.
- Insert roller plunger into vacuum pump as shown.
- Check O-ring of high-pressure pump, and coat it slightly with clean engine oil.



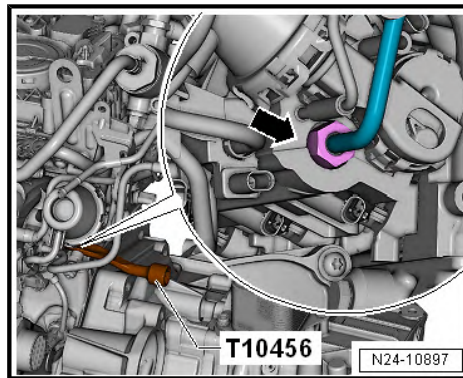
### Note

- ◆ *Roller tappet must be at bottom dead centre to enable high-pressure pump to be installed.*
- ◆ *If the connecting piece for the high-pressure line ⇒ [Item 10 \(page 349\)](#) has been loosened, it must be renewed.*

- Turn crankshaft until roller plunger is at bottom dead centre.
- Insert high-pressure pump into vacuum pump.
- Tighten bolts -arrows- alternately to make sure that high-pressure pump does not cant.
- Tighten bolts one turn alternately until flange of high-pressure pump makes contact with vacuum pump, tightening torque ⇒ [page 350](#) .
- Connect fuel hoses -2- and -3-, and secure them with spring-type clips.
- Connect connector -1- to fuel pressure regulating valve - N276- .
- Moisten balls of high-pressure line with engine oil, and install high-pressure line. Tighten union nuts by hand, and align high-pressure line free of stress.
- Install clamp -arrow-, and tighten it to 5 Nm.



- Tighten union nut on fuel rail -arrow- using socket AF 17 mm - T10456- .



- Counterhold on hexagon -A-, and tighten union nut -arrow- using open end spanner insert, AF 17 mm - V.A.G 1331/6- .

Further assembly is basically the reverse of the removal procedure.

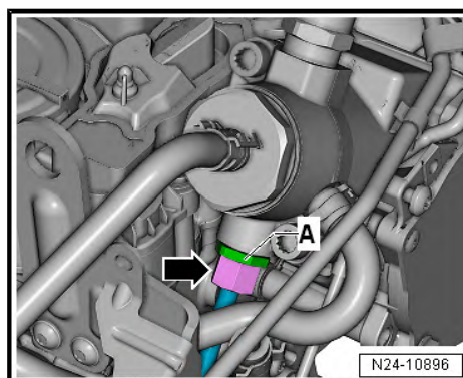


#### Note

*Upon completion of any repair work, check the fuel system for leaks.*

#### Specified torques

- ♦ ⇒ [“7.1 Assembly overview - high-pressure pump”, page 349](#)



## 8 Lambda probe

⇒ [“8.1 Assembly overview - Lambda probe”, page 355](#)

⇒ [“8.2 Removing and installing Lambda probe”, page 358](#)

### 8.1 Assembly overview - Lambda probe

⇒ [“8.1.1 Assembly overview - lambda probe, vehicles without particulate filter”, page 355](#)

⇒ [“8.1.2 Assembly overview - Lambda probe, vehicles with particulate filter, front-wheel drive”, page 356](#)

⇒ [“8.1.3 Assembly overview - Lambda probe, vehicles with particulate filter, all-wheel drive”, page 357](#)

#### 8.1.1 Assembly overview - lambda probe, vehicles without particulate filter

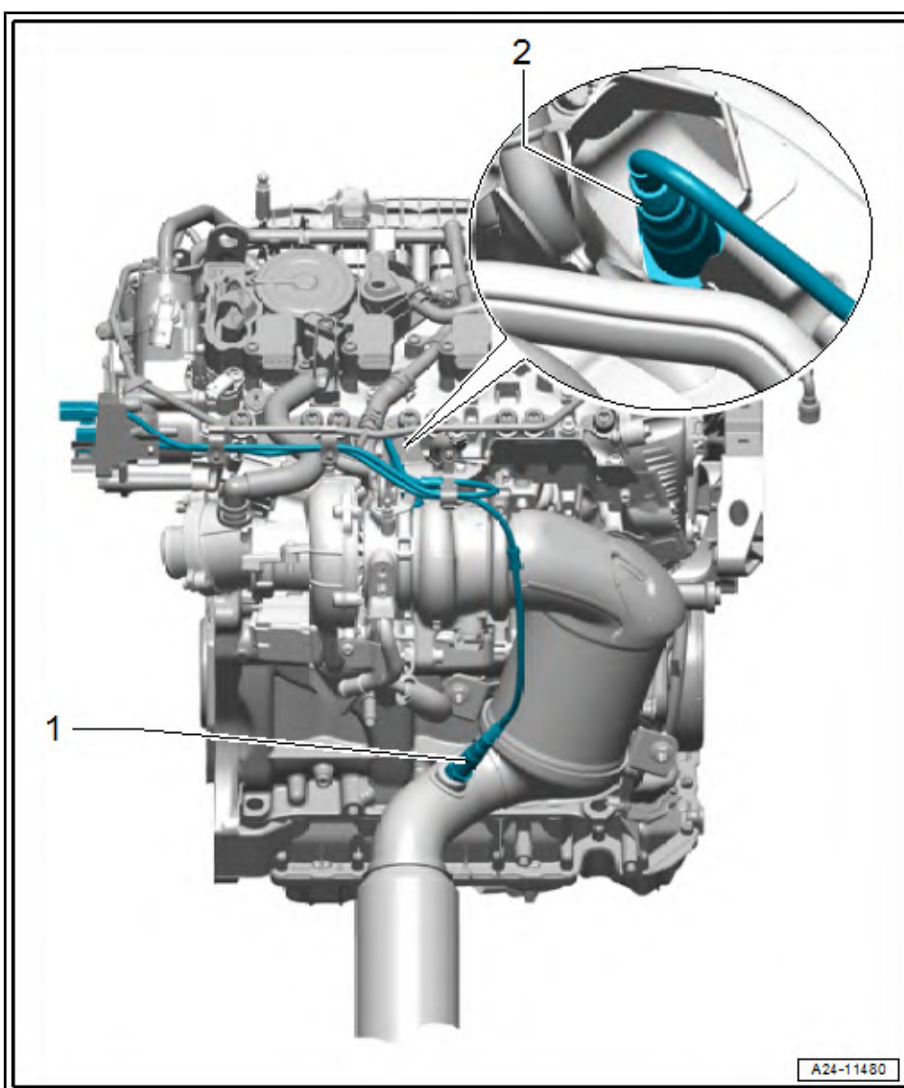
##### 1 - Lambda probe 1 after catalytic converter - GX7-

- ❑ Consisting of:
  - Lambda probe after catalytic converter - G130-
  - Lambda probe 1 heater after catalytic converter - Z29-

- ❑ Specified torque: 55 Nm
- ❑ Removing and installing  
⇒ [page 359](#)

##### 2 - Lambda probe 1 before catalytic converter - GX10-

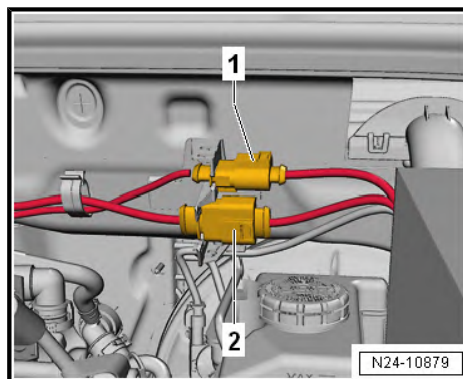
- ❑ Consisting of:
  - Lambda probe - G39-
  - Lambda probe heater - Z19-
- ❑ Specified torque: 55 Nm
- ❑ Removing and installing  
⇒ [page 358](#)





## Lambda probe connectors

- 1 - Connector for Lambda probe 1 after catalytic converter - GX7-
- 2 - Connector for Lambda probe 1 before catalytic converter - GX10-



## 8.1.2 Assembly overview - Lambda probe, vehicles with particulate filter, front-wheel drive

### 1 - Support bracket

- ☐ for pressure line

### 2 - Bolt

- ☐ Specified torque  
⇒ [Item 2 \(page 399\)](#)

### 3 - Exhaust gas pressure sensor 1 - G450-

- ☐ Removing and installing  
⇒ [page 343](#)

### 4 - Lambda sensor 1 before catalytic converter - GX10-

- ☐ Consisting of:  
Lambda probe - G39-  
Lambda probe heater - Z19-

- ☐ Specified torque: 55 Nm
- ☐ Removing and installing  
⇒ [page 358](#)

### 5 - Lambda probe 1 after catalytic converter - GX7-

- ☐ Consisting of:  
Lambda probe after catalytic converter - G130-  
Lambda probe 1 heater after catalytic converter - Z29-

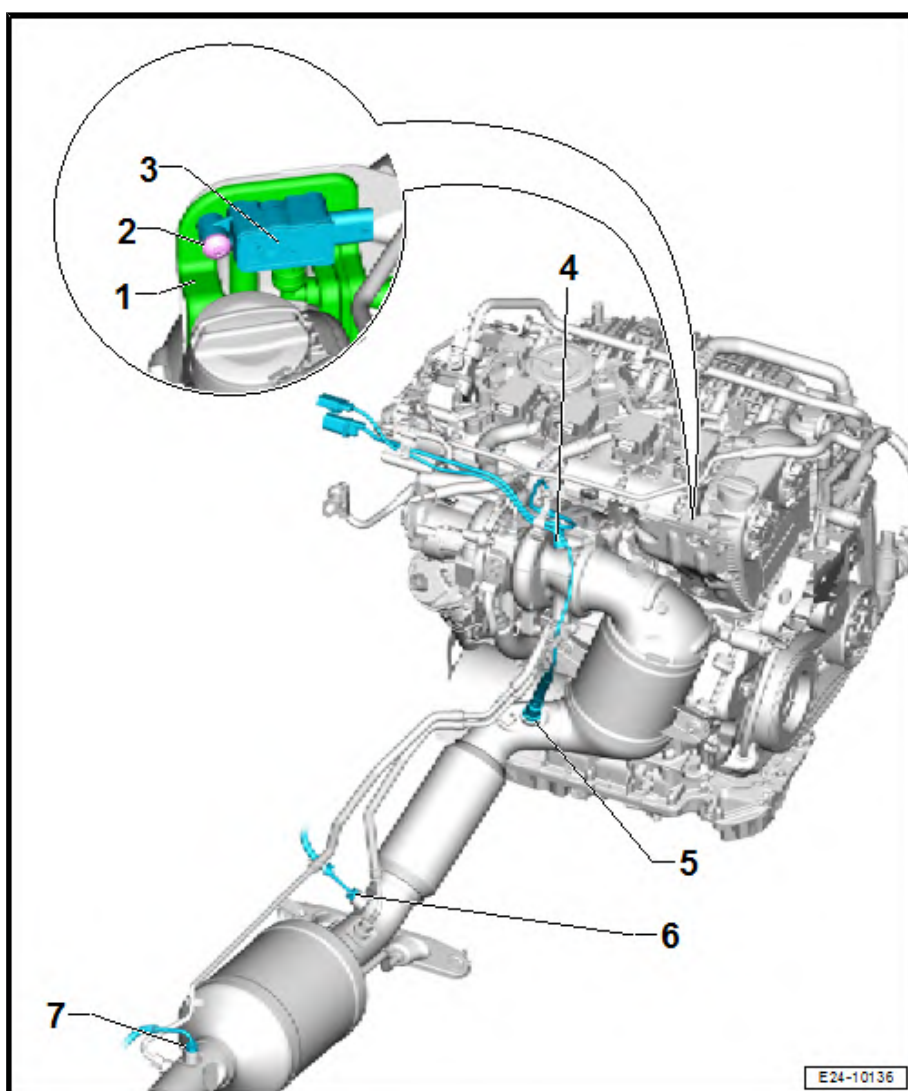
- ☐ Specified torque: 55 Nm
- ☐ Removing and installing  
⇒ [page 359](#)

### 6 - Temperature sender before particulate filter - G506-

- ☐ Specified torque ⇒ [Item 19 \(page 372\)](#)
- ☐ Removing and installing ⇒ [page 400](#)

### 7 - Temperature sender after particulate filter - G527-

- ☐ Specified torque ⇒ [Item 17 \(page 372\)](#)





- ❑ Removing and installing ⇒ [page 403](#)

### 8.1.3 Assembly overview - Lambda probe, vehicles with particulate filter, all-wheel drive

#### 1 - Support bracket

- ❑ for pressure line

#### 2 - Bolt

- ❑ Specified torque  
⇒ [Item 2 \(page 400\)](#)

#### 3 - Exhaust gas pressure sensor 1 - G450-

- Removing and installing  
⇒ [page 343](#)

#### 4 - Lambda sensor 1 before catalytic converter - GX10-

- ❑ Consisting of:  
Lambda probe - G39-  
Lambda probe heater - Z19-  
❑ Specified torque: 55 Nm  
❑ Removing and installing  
⇒ [page 358](#)

#### 5 - Lambda probe 1 after catalytic converter - GX7-

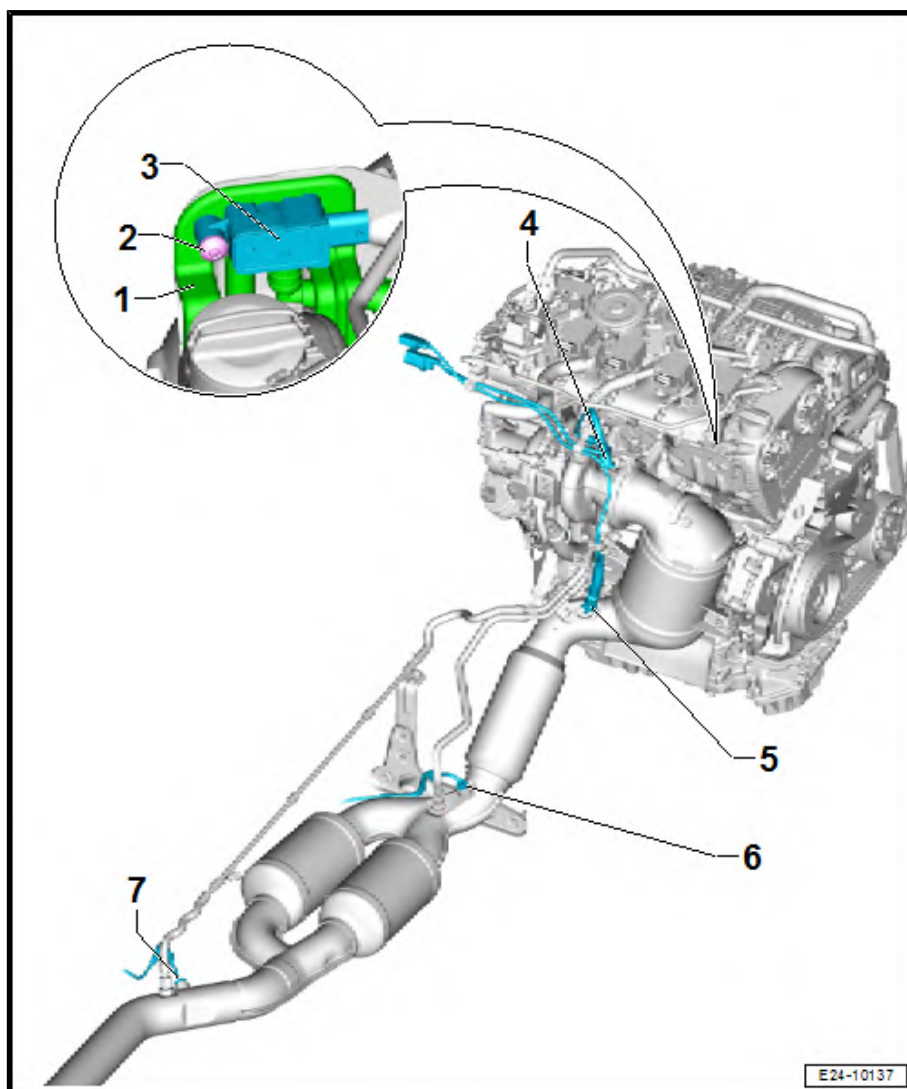
- ❑ Consisting of:  
Lambda probe after catalytic converter - G130-  
Lambda probe 1 heater after catalytic converter - Z29-  
❑ Specified torque: 55 Nm  
❑ Removing and installing  
⇒ [page 359](#)

#### 6 - Temperature sender before particulate filter - G506-

- ❑ Removing and installing ⇒ [page 400](#)

#### 7 - Temperature sender after particulate filter - G527-

- ❑ Removing and installing ⇒ [page 403](#)



## 8.2 Removing and installing Lambda probe

⇒ ["8.2.1 Removing and installing Lambda probe 1 before catalytic converter GX10", page 358](#)

⇒ ["8.2.2 Removing and installing Lambda probe 1 after catalytic converter GX7", page 359](#)

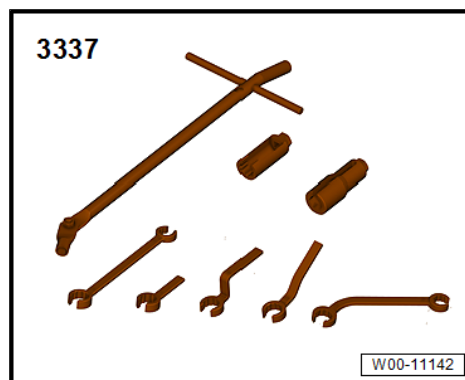
### 8.2.1 Removing and installing Lambda probe 1 before catalytic converter - GX10-

Lambda probe 1 before catalytic converter - GX10- consisting of:

- ◆ Lambda probe - G39-
- ◆ Lambda probe heater - Z19-

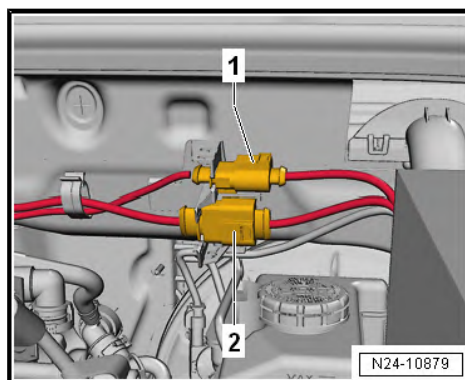
**Special tools and workshop equipment required**

- ◆ Lambda probe open ring spanner set - 3337-



#### Removing

- Disconnect connector -2- for Lambda probe 1 before catalytic converter - GX10- .



- Unscrew Lambda probe 1 before catalytic converter - GX10-1- using tool from Lambda probe open ring spanner set - 3337/7- .

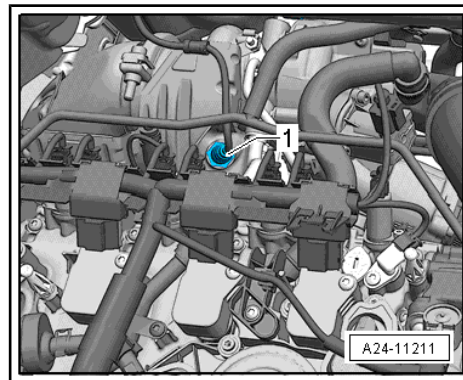
### Installing

When installing, note the following:



#### Note

- ◆ *New lambda probes are coated with an assembly paste. This paste must not get into the slots on the Lambda probe body.*
- ◆ *In the case of a used Lambda probe, grease only the thread with high-temperature paste. This paste must not get into the slots on the Lambda probe body. High-temperature paste ⇒ Electronic parts catalogue (ETKA) .*
- ◆ *During installation, the electrical connecting cable of the Lambda probe must be secured at the same points. The electrical wiring must be prevented from touching the exhaust pipe.*



### Specified torques

- ◆ ⇒ ["8.1 Assembly overview - Lambda probe", page 355](#)

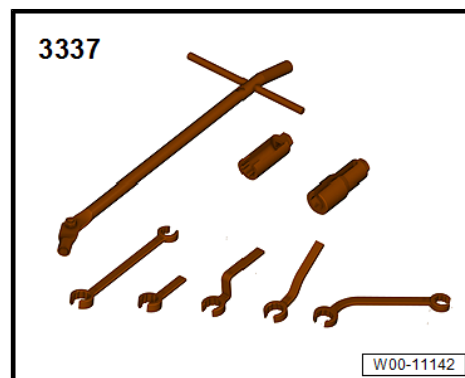
## 8.2.2 Removing and installing Lambda probe 1 after catalytic converter - GX7-

Lambda probe 1 after catalytic converter - GX7- consisting of:

- ◆ Lambda probe after catalytic converter - G130-
- ◆ Lambda probe 1 heater after catalytic converter - Z29-

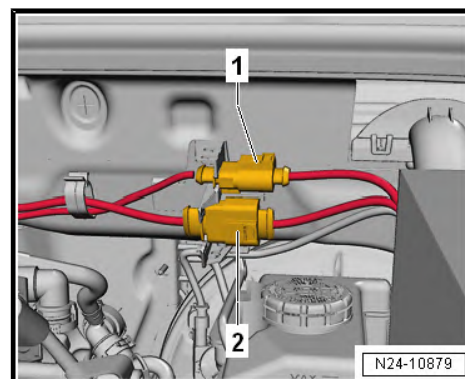
### Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set - 3337-



### Removing

- Disconnect connector -1- for Lambda probe 1 after catalytic converter - GX7- .



- Unscrew Lambda probe -1-, using tool from Lambda probe open ring spanner set - 3337- .

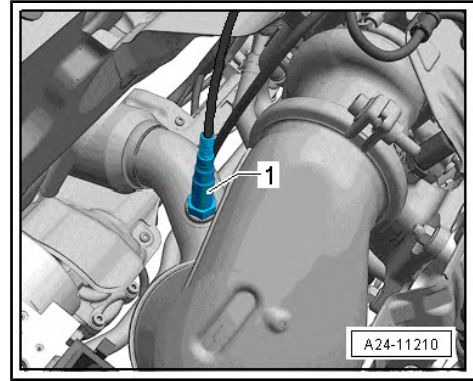
### Installing

When installing, note the following:



#### Note

- ◆ *New lambda probes are coated with an assembly paste. This paste must not get into the slots on the Lambda probe body.*
- ◆ *In the case of a used Lambda probe, grease only the thread with high-temperature paste. This paste must not get into the slots on the Lambda probe body. High-temperature paste ⇒ Electronic parts catalogue (ETKA) .*
- ◆ *During installation, the electrical connecting cable of the Lambda probe must be secured at the same points. The electrical wiring must be prevented from touching the exhaust pipe.*



### Specified torques

- ◆ ⇒ [“8.1 Assembly overview - Lambda probe”, page 355](#)

## 26 – Exhaust system

### 1 Exhaust pipes, silencers

⇒ [“1.1 Assembly overview - silencers”, page 361](#)

⇒ [“1.2 Separating exhaust pipes, silencers”, page 364](#)

⇒ [“1.3 Removing and installing silencer”, page 365](#)

⇒ [“1.4 Aligning exhaust system free of stress”, page 368](#)

⇒ [“1.5 Checking exhaust system for leaks.”, page 368](#)

⇒ [“1.6 Align end exhaust pipes”, page 368](#)

#### 1.1 Assembly overview - silencers

⇒ [page 361](#)

⇒ [page 363](#)

##### 1.1.1 Assembly overview - silencers, Ateca



#### Note

- ◆ *Renew seals and self-locking nuts after they have been removed.*
- ◆ *In the original factory equipment, this is a single piece with the centre silencer. Can be renewed individually for repair purposes.*
- ◆ *After working on the exhaust system, ensure that the system is not under stress and that there is sufficient clearance to the bodywork. If necessary, loosen clamp and align silencers and exhaust pipe so that sufficient clearance is maintained to the bodywork at all points and the mountings are evenly loaded.*



#### 1 - Bolt

- ☐ 20 Nm

#### 2 - Carrier

#### 3 - Mounting

- ☐ Renew if damaged

#### 4 - Clamping sleeve

- ☐ Tighten bolted connections evenly to 30 Nm
- ☐ Turn clamp in such a way that there is sufficient clearance to adjacent components
- ☐ Fitting position  
⇒ [page 362](#)
- ☐ Installation dimension for vehicles with marking on the exhaust pipe  
⇒ [page 363](#)

#### 5 - Front silencer

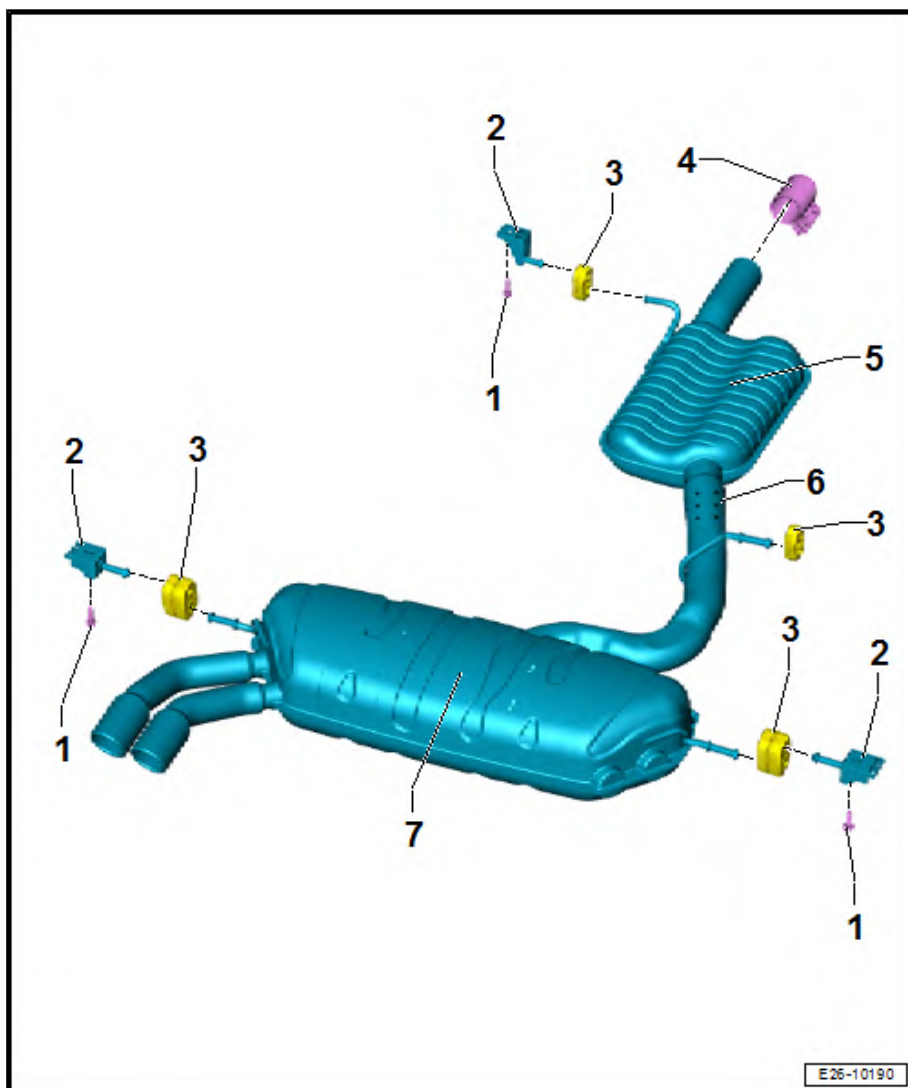
- ☐ Removing and installing  
⇒ [page 365](#)
- ☐ Separating exhaust pipes/silencers  
⇒ [page 364](#)
- ☐ Aligning exhaust system free of stress  
⇒ [page 368](#)

#### 6 - Separation point

- ☐ Separating exhaust pipes/silencers  
⇒ [page 364](#)

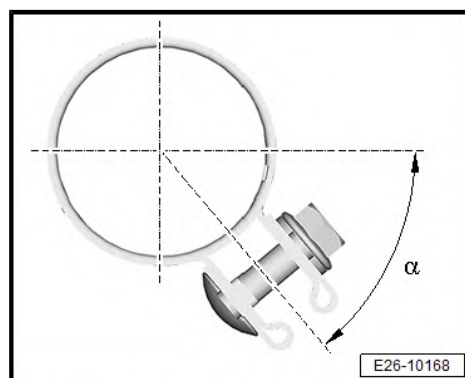
#### 7 - Rear silencer

- ☐ Removing and installing  
⇒ [page 366](#)
- ☐ Separating exhaust pipes/silencers ⇒ [page 364](#)
- ☐ Aligning exhaust system free of stress ⇒ [page 368](#)



#### Installation position of rear clamp

- Install clamp in illustrated angle position.
- Angle  $\alpha$  = about  $50^\circ + 20^\circ$ .
- Bolted connection facing towards right
- Nuts upwards.



## Installation dimension for vehicles with marking on exhaust pipe

1 - Clamping sleeve

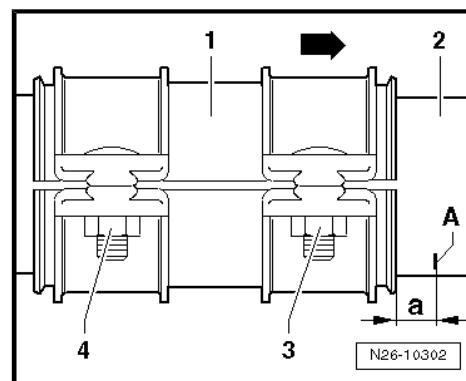
2 - Exhaust pipe

a - Installation dimension

A - Marking on exhaust system

Installation dimension -a- for clamp:

a - 8.5 mm



## 1.1.2 Assembly overview - silencer, León 2013

Original equipment as single assembly together with rear silencer; to be renewed individually in event of repair

### 1 - Front silencer

- ☐ Combined in one unit with rear silencer as original equipment. Can be renewed individually for repair purposes.
- ☐ Separating exhaust pipes, silencers  
⇒ [page 364](#)
- ☐ Aligning exhaust system free of stress  
⇒ [page 368](#)

### 2 - Bolt

- ☐ 20 Nm

### 3 - Support bracket

### 4 - Retaining rings

- ☐ Renew if damaged.

### 5 - Rear silencer

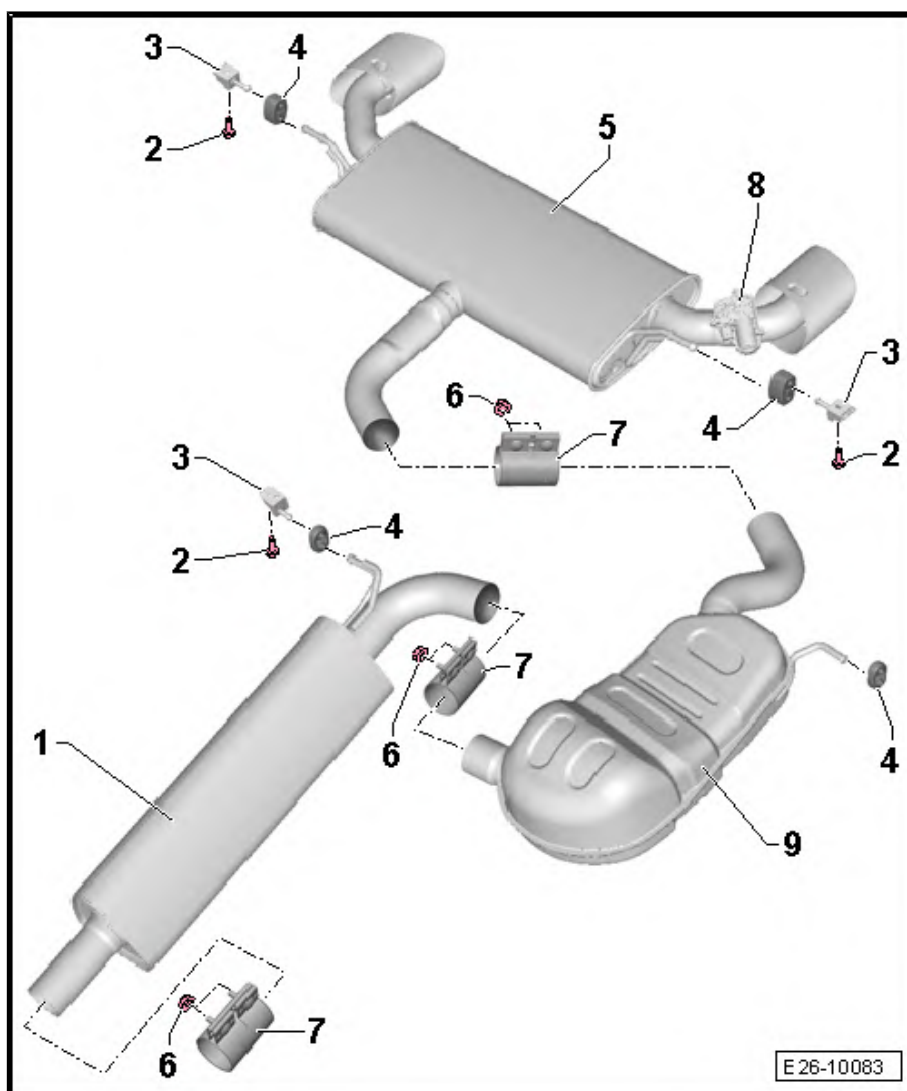
- ☐ In the original factory equipment, this is a single piece with the centre silencer. Can be renewed individually for repair purposes.
- ☐ Separating exhaust pipes, silencers  
⇒ [page 364](#)
- ☐ Aligning exhaust system free of stress  
⇒ [page 368](#)

### 6 - Nut

- ☐ 30 Nm

### 7 - Clamps (rear)

- ☐ Align exhaust system free of tension before tightening ⇒ [page 368](#).
- ☐ Installation position ⇒ [page 363](#).
- ☐ Tighten threaded connections evenly.



## 8 - Exhaust flap control unit - J883-

- ☐ Depending on version

## 9 - Middle silencer

- ☐ Combined in one unit with rear silencer as original equipment. Can be renewed individually for repair purposes.
- ☐ Separating exhaust pipes, silencers ➔ [page 364](#)
- ☐ Aligning exhaust system free of stress ➔ [page 368](#)

## 1.2 Separating exhaust pipes, silencers

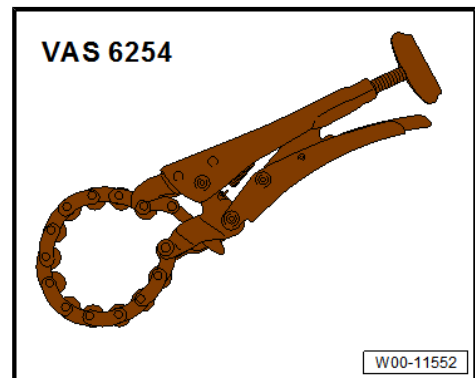


### Note

- ◆ *In the original factory equipment, this is a single piece with the centre silencer. Can be renewed individually for repair purposes.*
- ◆ *A separating point has been engineered in the connecting pipe should the centre silencer or rear silencer need to be replaced separately.*
- ◆ *Cutting location is marked by an indentation on the circumference of exhaust pipe.*

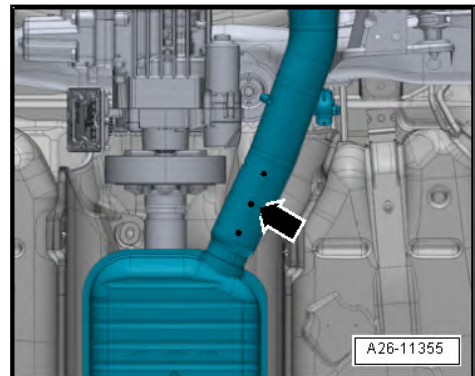
### Special tools and workshop equipment required

- ◆ Chain-type pipe cutter - VAS 6254-

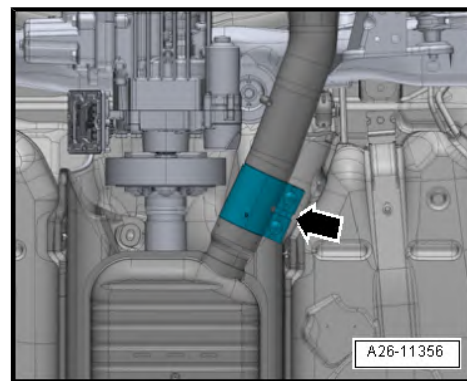


### Procedure

- Cut through exhaust pipe at right angles at separating point -arrow- using chain pipe cutter - VAS 6254- .



- When installing, position centre of clamp -arrow- over cutting location.
- Fit rear clamp ⇒ [page 363](#) .
- Align exhaust system free of stress ⇒ [page 368](#) .



## 1.3 Removing and installing silencer

⇒ [“1.3.1 Removing and installing front silencer”, page 365](#)

⇒ [“1.3.2 Removing and installing rear silencer”, page 366](#)

### 1.3.1 Removing and installing front silencer



#### Note

*In the original factory equipment, this is a single piece with the centre silencer. Can be renewed individually for repair purposes.*

#### Special tools and workshop equipment required

- ◆ Tensioning strap - T10038-



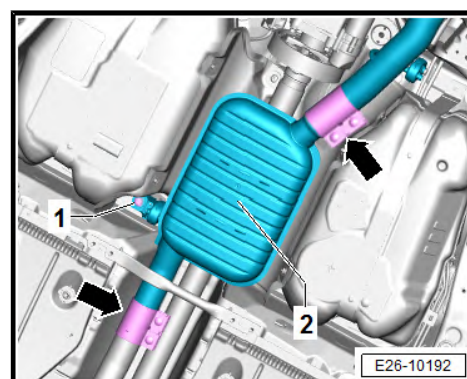
#### Removing

##### Vehicles without clamp on front silencer

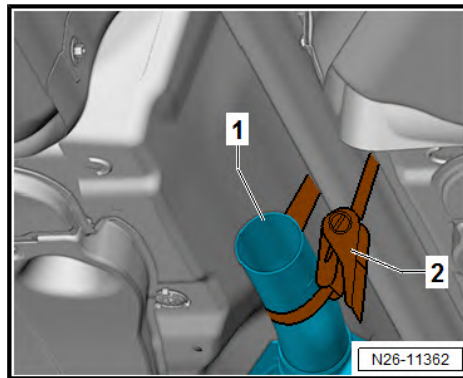
- Separate front silencer from the rear silencer ⇒ [page 364](#) .
- Observe cutting location -2-.

##### Continuation for all vehicles

- Loosen clamps -arrows- and push to rear.



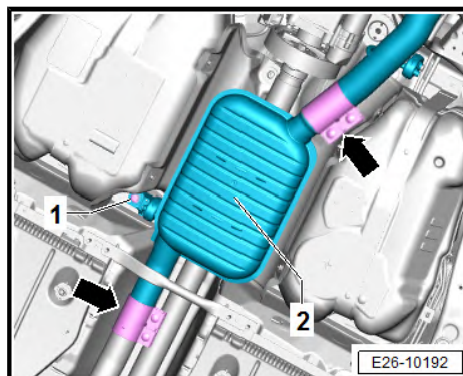
- Secure exhaust pipe -1- on propshaft with tensioning strap -2-.



- Unscrew bolt -1- from hanger.
- Remove front silencer -2-.

### Installing

Carry out installation in the reverse sequence, noting the following:

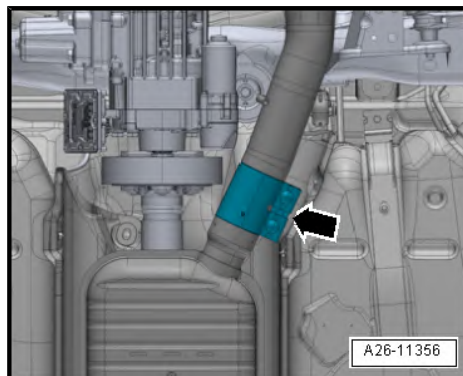


### Vehicles without clamp on rear silencer

- Fit clamp at rear -arrow-.
- When installing, position centre of clamp -arrow- over cutting location.
- Align exhaust system free of stress ⇒ [page 368](#) .

### Specified torques ⇒ [page 361](#)

- ♦ ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody cladding; Assembly overview – underbody cladding .



## 1.3.2 Removing and installing rear silencer



### Note

*In the original factory equipment, this is a single piece with the centre silencer. Can be renewed individually for repair purposes.*

**Special tools and workshop equipment required**



◆ Engine elevator - VAS 6931-



Removing

**CAUTION**

Risk of accident caused by high weight of silencers.

- Seek help from a second a mechanic for the following work.

**Vehicles without clamp on rear silencer**

- Observe cutting location -A-.
- Separate front silencer from the rear silencer ⇒ [page 364](#) .

**Vehicles with clamp on rear silencer**

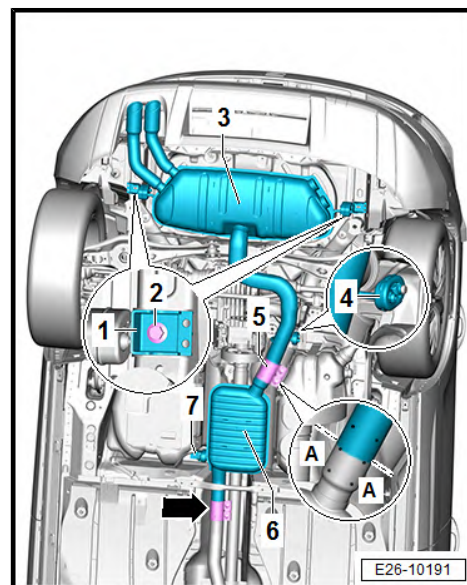
- Loosen clamp -5- between front silencer -6- and rear silencer -3- and push backwards.

**Continuation for all vehicles**

- Disengage rear silencer -3- from the hanger -4-.
- Unscrew bolts -2- from hanger -1-.
- Remove rear silencer -3-.

**Installing**

Carry out installation in the reverse sequence, noting the following:

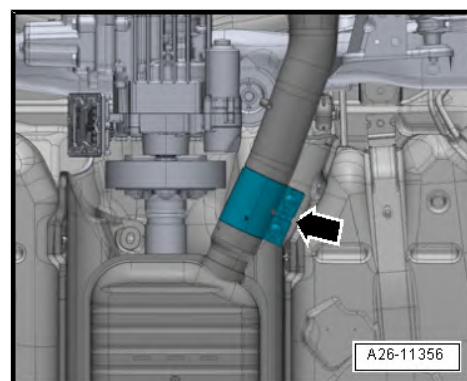


**Vehicles without clamp on rear silencer**

- Fit clamp at rear -arrow-.
- When installing, position centre of clamp -arrow- over cutting location.
- Align exhaust system free of stress ⇒ [page 368](#) .

**Specified torques ⇒ [page 361](#)**

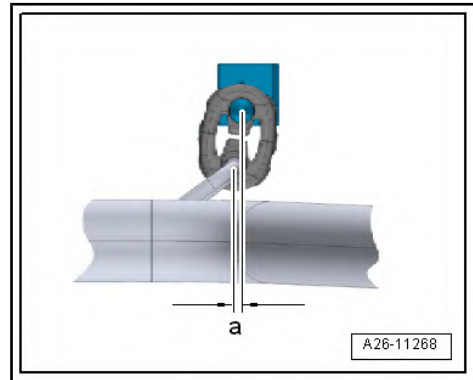
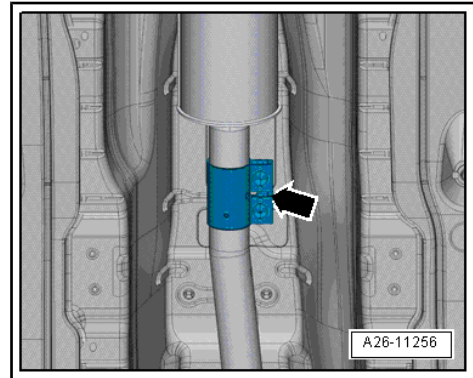
- ◆ ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody cladding; Assembly overview – underbody cladding .



## 1.4 Aligning exhaust system free of stress

### Procedure

- The exhaust system must be aligned when cold.
- Loosen bolt connections for front clamp -arrow-.
- Push exhaust system towards front until preloading at mounting for exhaust pipe -a- = 5 mm.

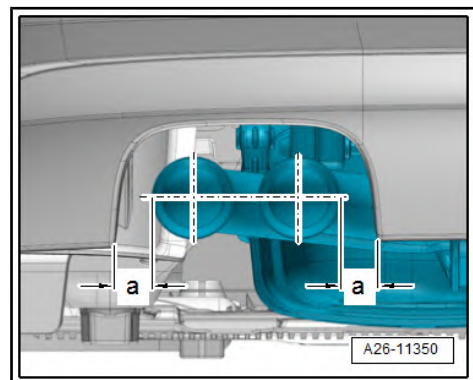


## 1.5 Checking exhaust system for leaks:

- Start engine and run at idling speed.
- Seal exhaust pipes with cloths or plugs, for example, for the duration of the leakage test.
- Check (by listening) points of connection between exhaust manifold and the cylinder head, between turbocharger and front exhaust pipe etc. to make sure there are no leaks.
- Repair any leaks found.

## 1.6 Align end exhaust pipes

- Adjust the rear silencer so that an even gap is formed between bumper cut-out and exhaust pipes.
- -a- = -a-
- Unfasten rear silencer mounting to align tailpipes.



## 2 Exhaust gas cleaning

⇒ [“2.1 Assembly overview - emission control”, page 369](#)

⇒ [“2.3 Removing and installing catalytic converter”, page 376](#)

### 2.1 Assembly overview - emission control

⇒ [“2.1.1 Assembly overview - emission control, vehicles without particulate filter”, page 369](#)

⇒ [“2.1.2 Assembly overview - Emission control, vehicles with particulate filter, front-wheel drive”, page 371](#)

⇒ [“2.1.3 Assembly overview - Emission control, vehicles with particulate filter, all-wheel drive”, page 373](#)

#### 2.1.1 Assembly overview - emission control, vehicles without particulate filter

##### 1 - Bolt

- ☐ 9 Nm

##### 2 - Carrier

- ☐ For catalytic converter

##### 3 - Three-way catalytic converter

The function of the 3-way catalytic converter is the cleaning of the following compounds:

- ◆ Nitrogen oxides (NOX)
- ◆ Carbon monoxide (CO)
- ◆ Hydrocarbons (HC)
  - ☐ With primary exhaust pipe
  - ☐ Protect catalytic converter from damage by knocks and impact
  - ☐ Removing and installing ⇒ [page 376](#)
  - ☐ Aligning exhaust system free of stress ⇒ [page 368](#)

##### 4 - Screw-type clamp

- ☐ Renew after removal
- ☐ Installation position ⇒ [page 370](#)
- ☐ Specified torques and installation sequence ⇒ [page 370](#)

##### 5 - Articulation

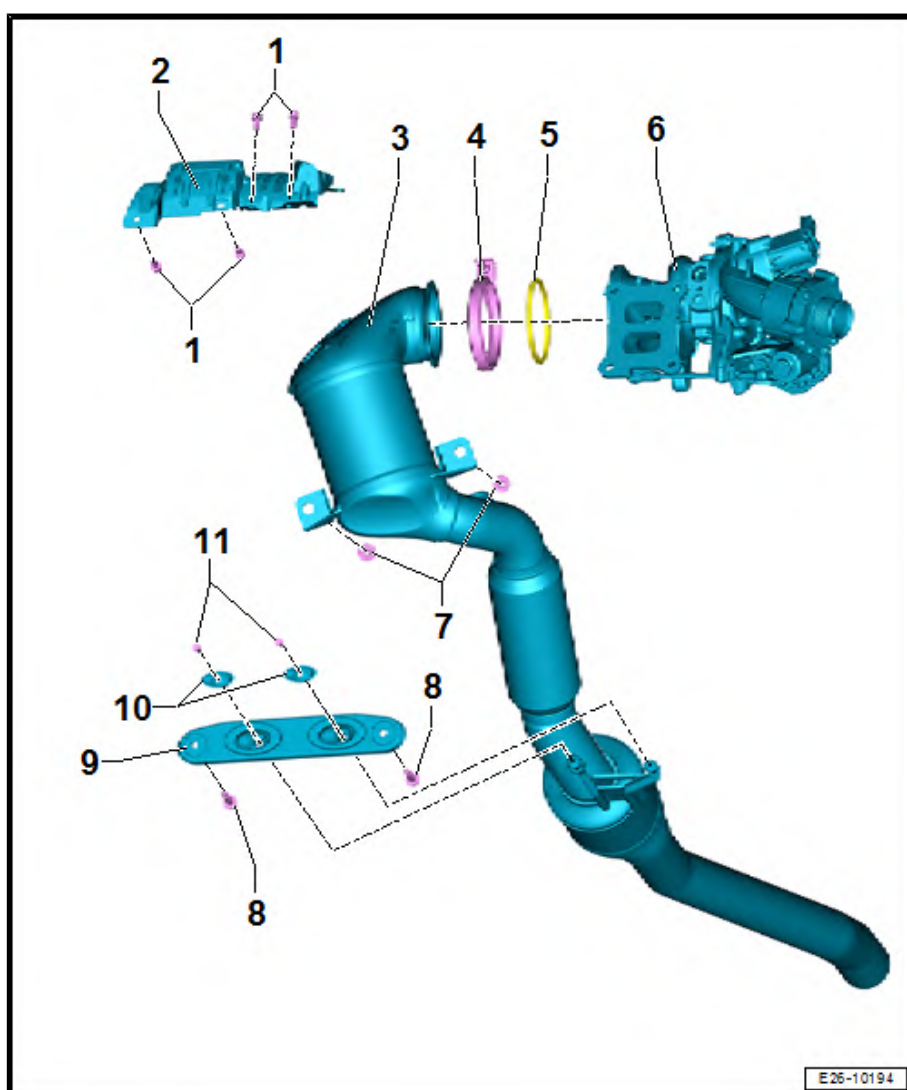
- ☐ Renew after removal

##### 6 - Turbocharged

- ☐ Removing and installing ⇒ [page 276](#)

##### 7 - Nut

Specified torques and installation sequence ⇒ [page 370](#)



E26-10194

## 8 - Bolt

- ☐ 20 Nm

## 9 - Carrier

- ☐ Renew if damaged

## 10 - Retaining ring

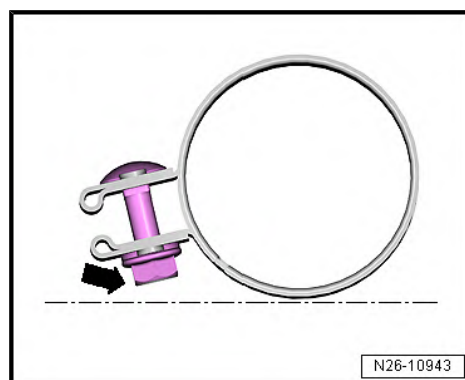
- ☐ Not fitted on all vehicles
- ☐ Removing and installing securing clip ⇒ [page 374](#)

## 11 - Pop rivets

- ☐ if a bracket is to be renewed, drill out pop rivet and remove lock washer ⇒ [page 374](#)

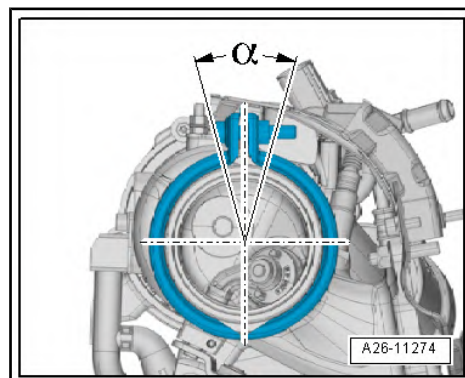
### Installation position of front clamp

- Fit clamp in position shown. Bolt -arrow- must not protrude beyond lower edge of clamp.



### Installation position of screw-type clip for catalytic converter

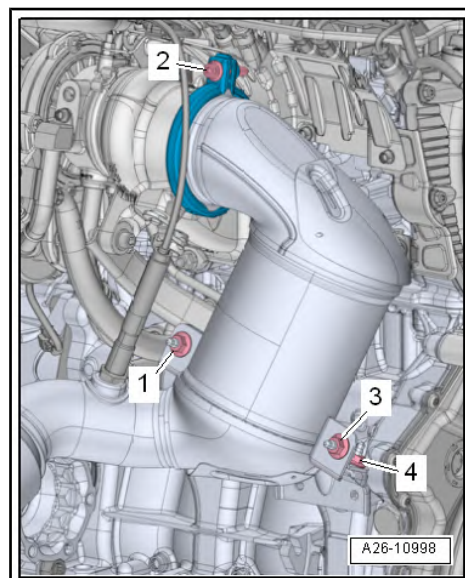
- Fit screw-type clip in position shown. Make sure there is sufficient clearance between bolted connection and other components.



### Catalytic converter - specified torque and tightening sequence

- Tighten bolted connections in stages in the sequence shown:

Stage	Screw-type clip/nuts	Specified torque
1.	-1, 3, 4-	Screw in by hand as far as stop • It should still be possible to move catalytic converter and bracket.
2.	-2-	Tighten screw-type clip to 15 Nm. Note installation position ⇒ <a href="#">page 370</a>
3.	-1, 3, 4-	Tighten to 20 Nm





## 2.1.2 Assembly overview - Emission control, vehicles with particulate filter, front-wheel drive

### 1 - Nut

- ☐ 9 Nm

### 2 - Bolt

- ☐ 9 Nm

### 3 - Nut

- ☐ 8 Nm

### 4 - Bolt

- ☐ 9 Nm

### 5 - Articulation

- ☐ Renew after removal

### 6 - Bolt

- ☐ 20 Nm

### 7 - Pressure pipes

- ☐ with exhaust gas pressure sensor 1 - G450-

### 8 - Bolt

- ☐ 9 Nm

### 9 - Three-way catalytic converter

- ☐ The function of the 3-way catalytic converter is the cleaning of the following compounds:

Nitrogen oxides (NOX)

Carbon monoxide (CO)

Hydrocarbons (HC)

- ☐ With primary exhaust pipe

- ☐ Protect catalytic converter from damage by knocks and impact

- ☐ Removing and installing ⇒ [page 383](#)

- ☐ Aligning exhaust system free of stress ⇒ [page 368](#)

### 10 - Bolt

- ☐ 20 Nm

### 11 - Support bracket

- ☐ for the catalytic converter

### 12 - Nut

Specified torques and installation sequence ⇒ [page 370](#) .

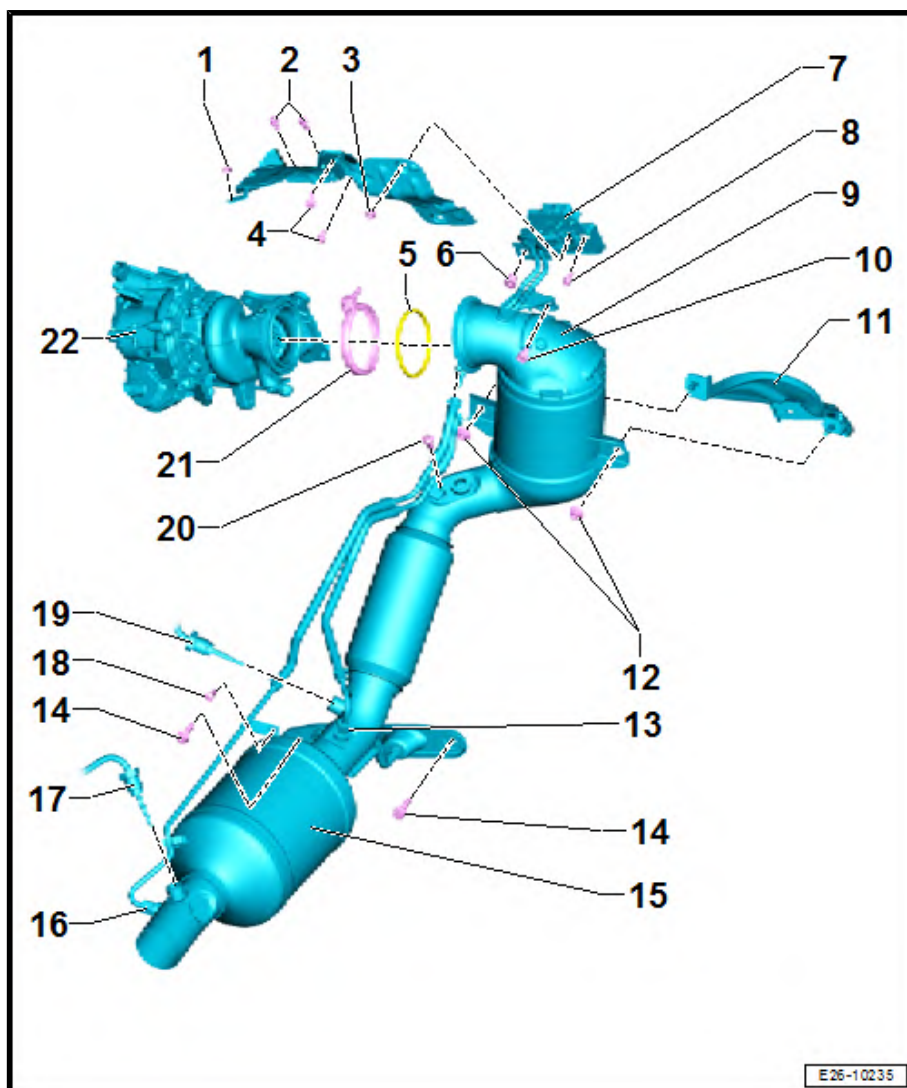
### 13 - Union nut

- ☐ for pressure line

- ☐ 45 Nm

### 14 - Bolt

- ☐ 20 Nm





### 15 - Particulate filter

- ☐ The function of the 4-way catalytic converter is the cleaning of the following compounds:

Nitrogen oxides (NOX)

Carbon monoxide (CO)

Hydrocarbons (HC)

Soot particles

- ☐ With primary exhaust pipe
- ☐ Protect catalytic converter from damage by knocks and impact
- ☐ Removing and installing ⇒ [page 383](#)
- ☐ Aligning exhaust system free of stress ⇒ [page 368](#)

### 16 - Union nut

- ☐ for pressure line
- ☐ 45 Nm

### 17 - Temperature sender before particulate filter - G527-

- ☐ Removing and installing ⇒ [page 403](#)
- ☐ 45 Nm

### 18 - Bolt

- ☐ 9 Nm

### 19 - Temperature sender after particulate filter - G506-

- ☐ Removing and installing ⇒ [page 400](#)
- ☐ 45 Nm

### 20 - Bolt

- ☐ 9 Nm

### 21 - Screw-type clamp

- ☐ Renew after removal
- ☐ Installation position ⇒ [page 370](#) .
- ☐ Specified torques and installation sequence ⇒ [page 370](#) .

### 22 - Turbocharged

- ☐ Removing and installing ⇒ [page 276](#)

## 2.1.3 Assembly overview - Emission control, vehicles with particulate filter, all-wheel drive

### 1 - Nut

- ☐ 9 Nm

### 2 - Bolt

- ☐ 9 Nm

### 3 - Nut

- ☐ 8 Nm

### 4 - Bolt

- ☐ 9 Nm

### 5 - Articulation

- ☐ Renew after removal

### 6 - Bolt

- ☐ 20 Nm

### 7 - Pressure pipes

- ☐ with exhaust gas pressure sensor 1 - G450-

### 8 - Bolt

- ☐ 9 Nm

### 9 - Three-way catalytic converter

The function of the 3-way catalytic converter is the cleaning of the following compounds:

- ◆ Nitrogen oxides (NOX)
- ◆ Carbon monoxide (CO)
- ◆ Hydrocarbons (HC)

- ☐ With primary exhaust pipe
- ☐ Protect catalytic converter from damage by knocks and impact

- ☐ Removing and installing ⇒ [page 376](#)

- ☐ Aligning exhaust system free of stress ⇒ [page 368](#) .

### 10 - Bolt

- ☐ 20 Nm

### 11 - Support bracket

- ☐ for the catalytic converter

### 12 - Nut

Specified torques and installation sequence ⇒ [page 370](#) .

### 13 - Union nut

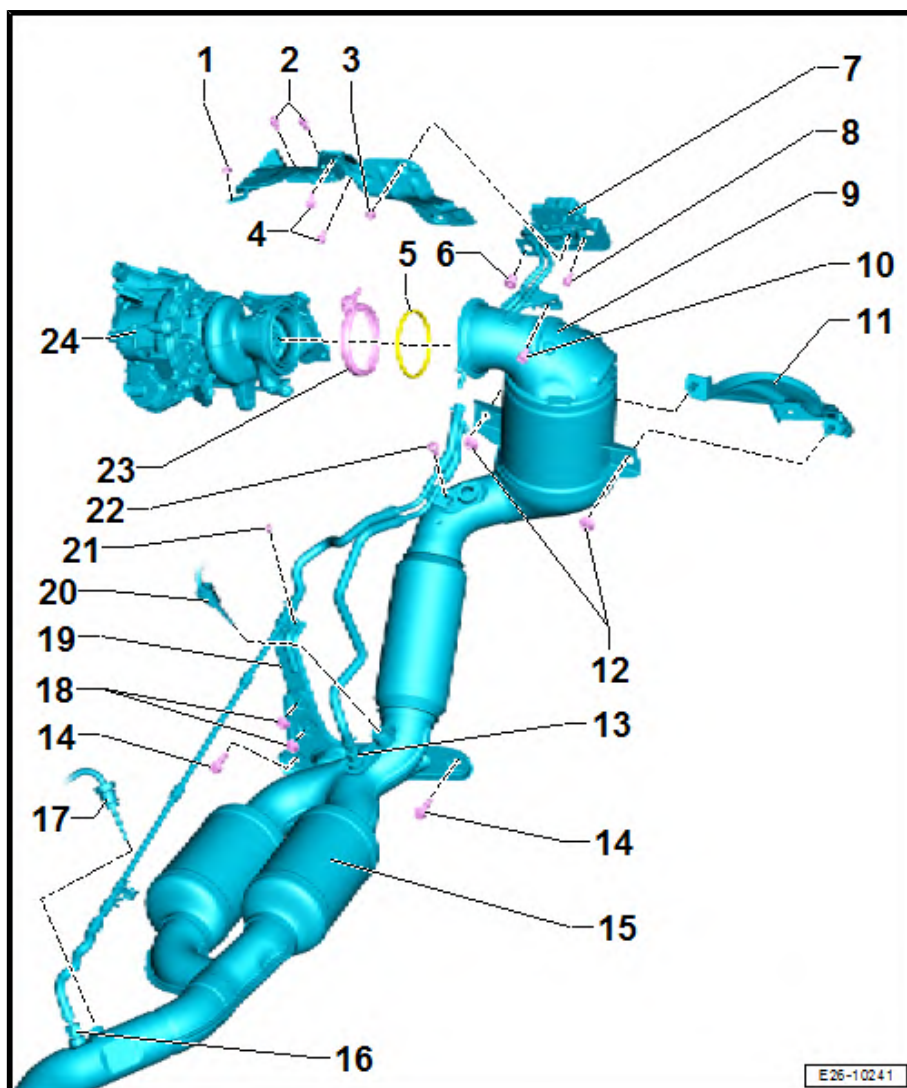
- ☐ for pressure line
- ☐ 45 Nm

### 14 - Bolt

- ☐ 20 Nm

### 15 - Particulate filter

The function of the 4-way catalytic converter is the cleaning of the following compounds:



- ◆ Nitrogen oxides (NOX)
- ◆ Carbon monoxide (CO)
- ◆ Hydrocarbons (HC)
- ◆ Soot particles
  - ☐ With primary exhaust pipe
  - ☐ Protect catalytic converter from damage by knocks and impact
  - ☐ Removing and installing ⇒ [page 376](#)
  - ☐ Aligning exhaust system free of stress ⇒ [page 368](#) .

#### 16 - Union nut

- ☐ for pressure line
- ☐ 45 Nm

#### 17 - Temperature sender before particulate filter - G527-

- ☐ Removing and installing ⇒ [page 403](#)
- ☐ 45 Nm

#### 18 - Nut

- ☐ 9 Nm

#### 19 - Bracket

- ☐ for pressure line

#### 20 - Temperature sender after particulate filter - G506-

- ☐ Removing and installing ⇒ [page 400](#)
- ☐ 45 Nm

#### 21 - Bolt

- ☐ 9 Nm

#### 22 - Bolt

- ☐ 9 Nm

#### 23 - Screw-type clamp

- ☐ Renew after removal
- ☐ Installation position ⇒ [page 370](#) .
- ☐ Specified torques and installation sequence ⇒ [page 370](#) .

#### 24 - Turbocharged

- ☐ Removing and installing ⇒ [page 276](#)

## 2.2 Removing and installing bracket for catalytic converter

### Special tools and workshop equipment required

- ◆ Rivet pliers, e.g. rivet pliers - VAS 6759-

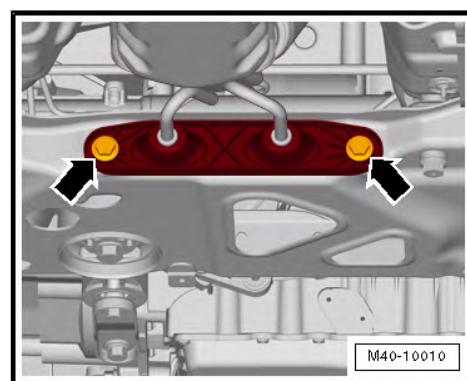
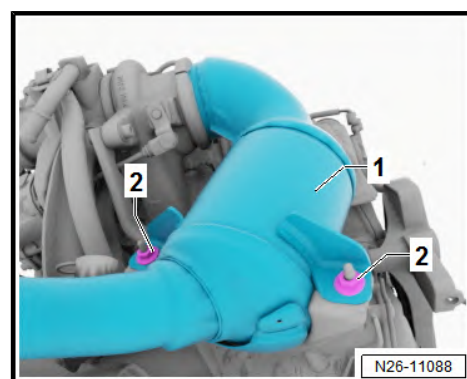
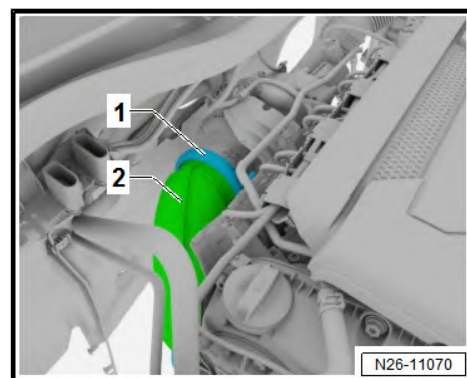
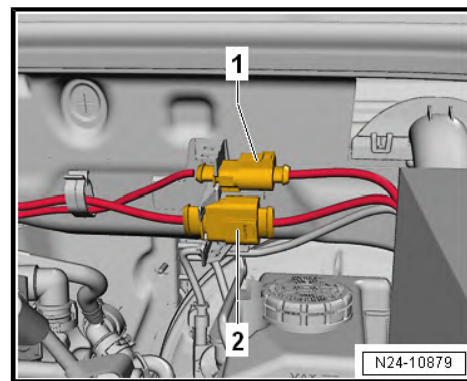


### Note

*Depending on the equipment level of the vehicle, a securing clip ⇒ [Item 10 \(page 370\)](#) for the bracket of the catalytic converter may be installed. When the vehicle »hits the ground«, the lock washer prevents the catalytic converter from slipping out of the bracket. The lock washer can also be retrofitted if necessary. For retrofit parts, refer to ⇒ [Electronic parts catalogue \(ETKA\)](#) .*

### To detach bracket from catalytic converter:

- Remove connector for Lambda probe 1 after catalytic converter - GX7- from retainer, disconnect it, and lay electrical wires to one side.
- Loosen clamp -1- for catalytic converter -2-, and push clamp onto turbocharger.
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
- If fitted, remove middle underbody cladding ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody cladding; Removing and installing underbody cladding .
- Remove nut -2-.
- Unscrew bolts -arrows- and lower the catalytic converter as far as possible.
- Drill out ⇒ [Item 11 \(page 370\)](#) pop rivets and detach lock washer.
- Remove holder for catalytic converter.



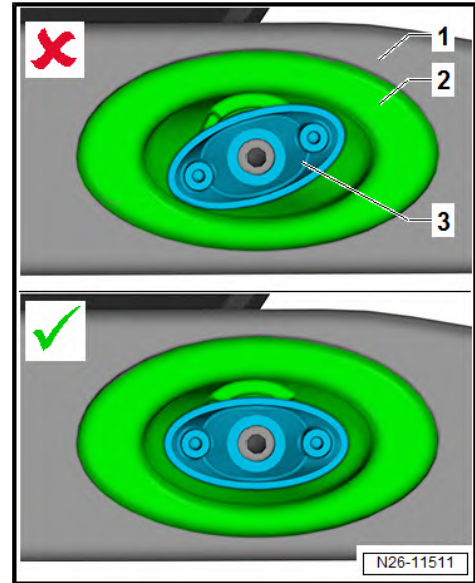
#### To fit bracket with lock washers:

- Check if pop rivets can be inserted into mounting on catalytic converter. If necessary, widen holes to 7 mm with a drill.
- Fit bracket -1- to mountings on catalytic converter.
- Secure lock washers -3- with rivets as shown in illustration, parallel to rubber part -2-.

Further assembly is basically a reverse of the dismantling sequence.

#### Specified torques

- ◆ ⇒ [“2.1.1 Assembly overview - emission control, vehicles without particulate filter”, page 369](#)



## 2.3 Removing and installing catalytic converter

⇒ [“2.3.1 Removing and installing catalytic converter, vehicles without particulate filter”, page 376](#)

⇒ [“2.3.2 Removing and installing catalytic converter, vehicles with particulate filter, front-wheel drive”, page 383](#)

⇒ [“2.3.3 Removing and installing catalytic converter, vehicles with particulate filter, all-wheel drive”, page 389](#)

### 2.3.1 Removing and installing catalytic converter, vehicles without particulate filter

#### Special tools and workshop equipment required

- ◆ Transport lock - T10404-





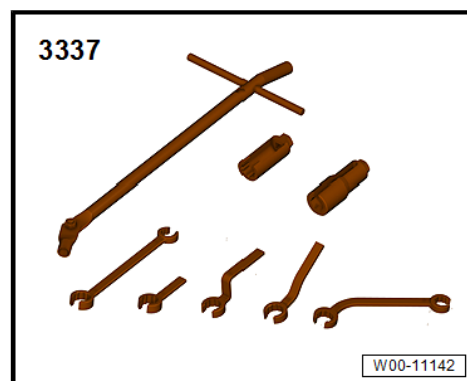
- ◆ Counter-hold tool - T10172-



- ◆ Tensioning strap - T10038-



- ◆ Lambda probe open ring spanner set - 3337-



- ◆ Grommet - 3247-



◆ Engine support - T50015A-



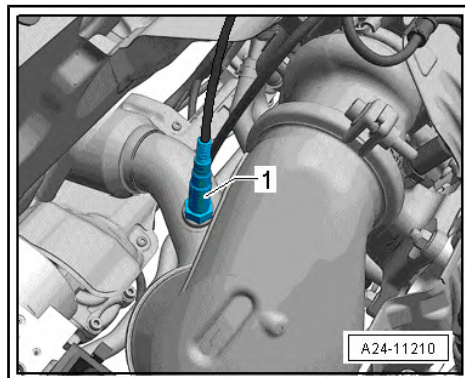
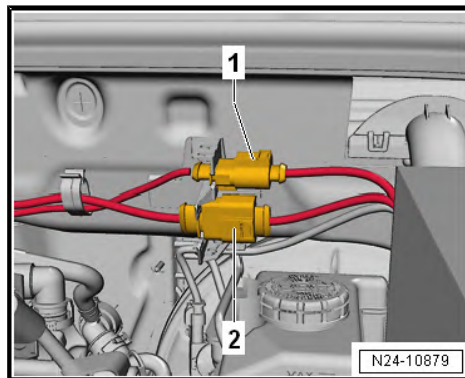
- ◆ Support plate of the positioner - T10533/2-
- ◆ Bolt M12 x 20 mm of the positioner - T10533/4-
- ◆ High-temperature paste ⇒ Electronic parts catalogue (ETKA) .

Removing



Note

- ◆ *The catalytic converter is removed together with the front exhaust pipe.*
- ◆ *Fit cable tie in same place when installing.*
- Disconnect connector -1- for Lambda probe 1 after catalytic converter - GX7- .
- Lay wires on plenum chamber bulkhead to one side.
- Unscrew Lambda probe -1-, using tool from Lambda probe open ring spanner set - 3337/7- .



- Unscrew bolt -2- and slide clamp onto the turbocharger.
- Unscrew nuts -1 and 3-.



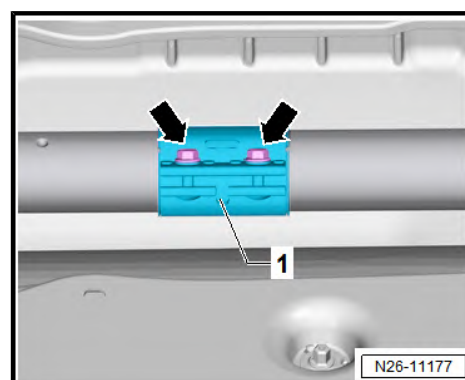
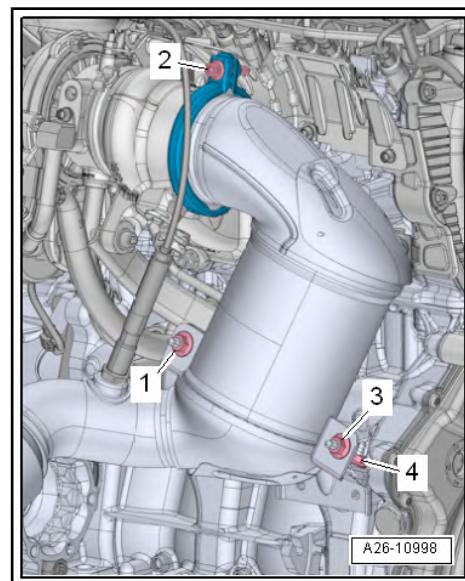
**Note**

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

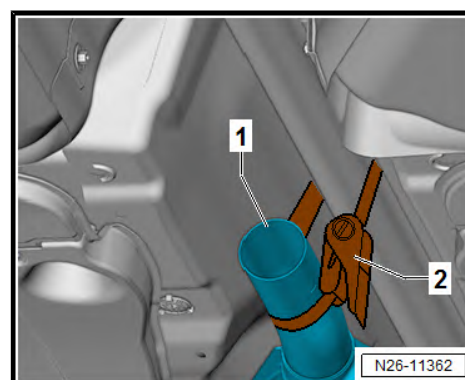


**Note**

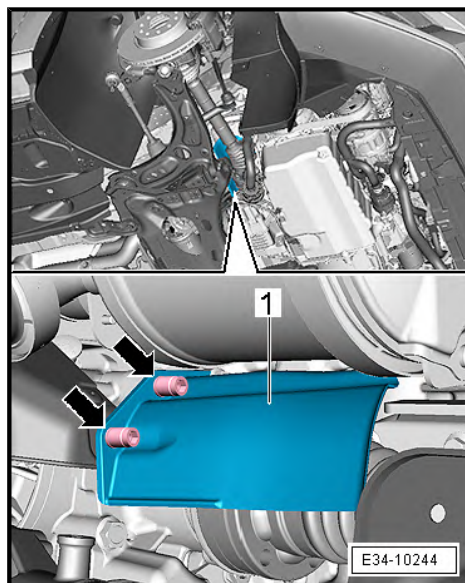
- ◆ *Risk of damage to flexible joint*
- ◆ *Do not allow the decoupling element to kink by more than 10°.*  
*Do not damage wire mesh on decoupling element.*
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
- Remove centre underbody cladding ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody cladding; Removing and installing underbody cladding .
- Loosen clamp -arrow-, and push it to rear.



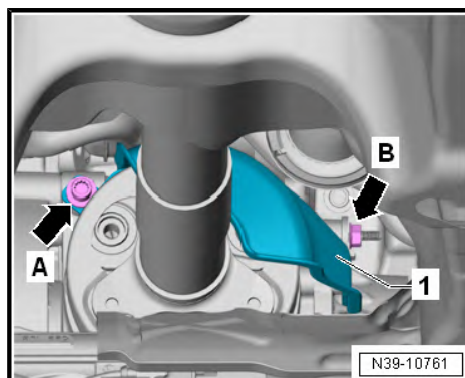
- Secure exhaust pipe -1- on propshaft with tensioning strap -2-.
- Remove right wheel.



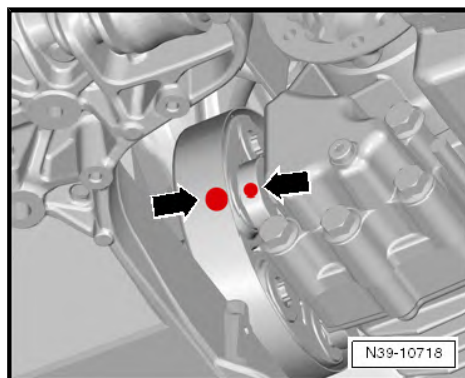
- Unscrew screws -arrows- with the bit - 3247- and remove heat shield -1-.



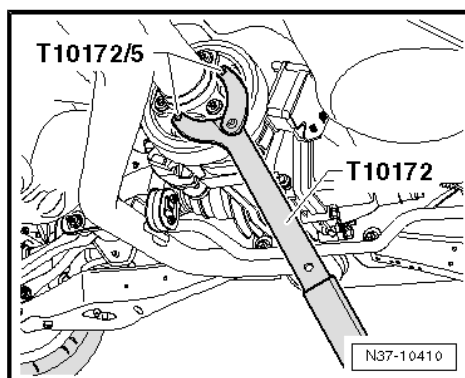
- Unscrew bolts -arrows- and remove heat shield -1-.



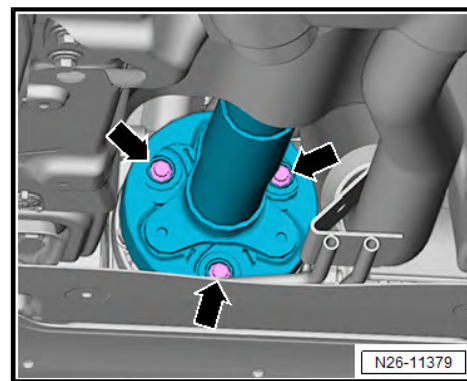
- Mark the position of the propshaft to the flange of the bevel box.



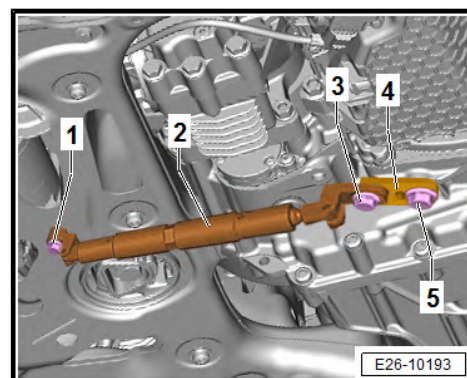
- To loosen and tighten propshaft, counterhold on rear final drive.



- Unbolt propshaft at front from bevel box -arrows-.
- Remove pendulum support ⇒ [page 40](#) .



- Connect the engine support - T50015A- -2- as shown in the diagram.
- ◆ Screw a bolt M8 x 30 mm -1- with a washer into the threaded hole of the subframe.
- ◆ Fit the engine support - T50015A- -2- on the support plate of the positioner - T10533/2- -4-.
- ◆ Fasten the assembly kit engine support - T50015A- -2- and support plate of the positioner - T10533/2- -4- using the bolt M12 x 20 mm of the positioner - T10533/4- -5- o the threaded hole of the gearbox.
- By turning the spindle, the engine/gearbox unit is moved forwards until there is a small tension. Avoid collisions of components.

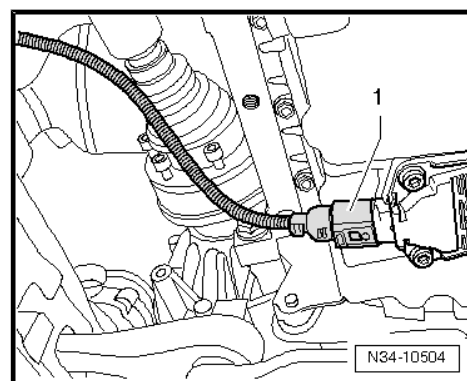
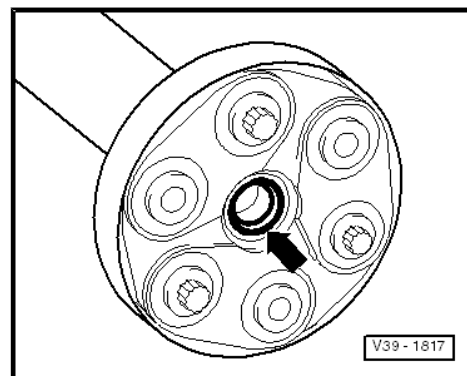


- When detaching and fixing the propshaft, it is always necessary to ensure that the socket -arrow- is not damaged.
- Pull propshaft off bevel box, and lay it to left side.
- Mask off propshaft in front area or cover it with a cloth to prevent any damage to surface protection.



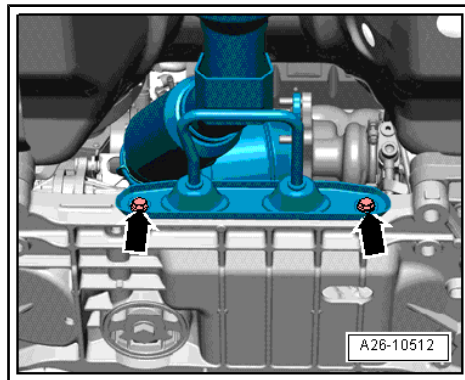
#### Note

- ◆ Risk of damage to flexible joint
- ◆ Do not allow the decoupling element to kink by more than 10°.
- ◆ Do not damage wire mesh on decoupling element.
- Disconnect the connector -1- of the oil level and temperature sender - G266- .

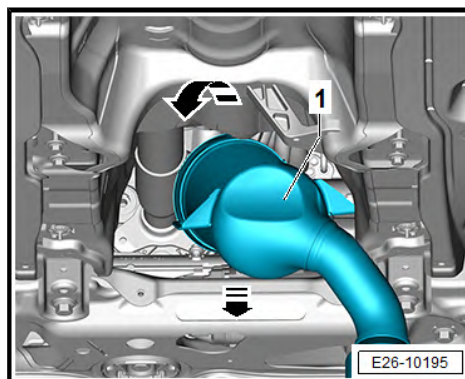




- Unscrew bolts -arrows-.

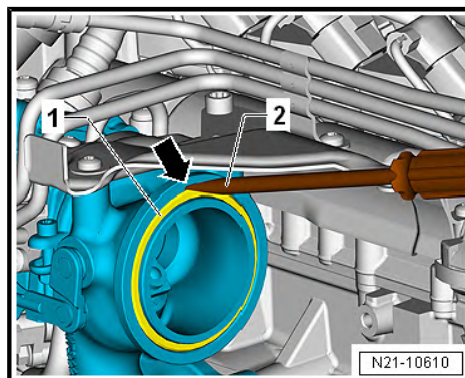


- Remove catalytic converter -1- through the tunnel opening by twisting 180° around its axis.



### Installing

- Insert screwdriver -2- into recess -arrow- on turbocharger, and lever out seal -1-.
- Insert new oil seal



- Fit screw-type clip on turbocharger.
- Fit catalytic converter on turbocharger. Attach screw-type clip of catalytic converter loosely without tightening it.
- Tighten nuts and screw-type clip ⇒ [page 370](#) . Note installation position of screw-type clip ⇒ [page 370](#) .
- Tighten propshaft ⇒ Rep. gr. 39 ; Propshaft; Removing and installing propshaft .
- Align exhaust system free of stress ⇒ [page 368](#) .

Further assembly is basically the reverse of the removal procedure.

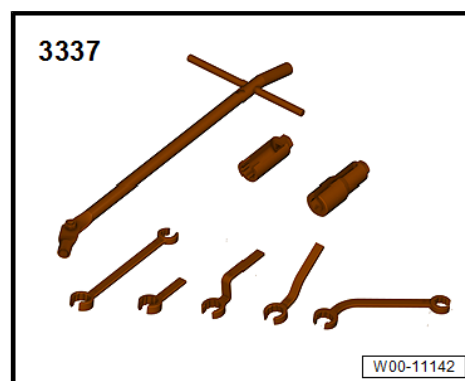
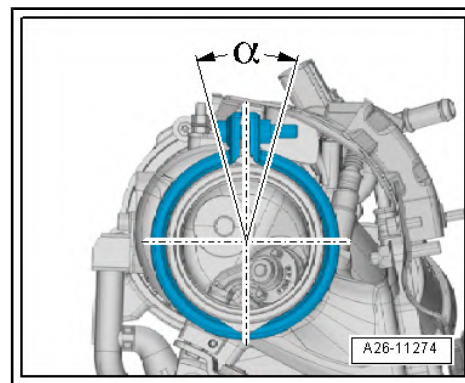
#### Specified torques

- ◆ ⇒ ["2.1 Assembly overview - assembly mountings", page 34](#)
- ◆ ⇒ ["8.1 Assembly overview - Lambda probe", page 355](#)
- ◆ ⇒ ["2.1 Assembly overview - emission control", page 369](#)
- ◆ Underbody cladding; Assembly overview - Underbody cladding ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody cladding; Assembly overview - Underbody cladding
- ◆ ⇒ Rep. gr. 39 ; Propshaft; Assembly overview - propshaft
- ◆ Noise insulation; Exploded view - noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation
- ◆ ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres; Wheel change .

### 2.3.2 Removing and installing catalytic converter, vehicles with particulate filter, front-wheel drive

#### Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set - 3337-



- ◆ Torque wrench - V.A.G 1331-



- ◆ Tool set - T10395 A-



- ◆ Engine support - T50015A-



- ◆ Support plate of the positioner - T10533/2-
- ◆ Bolt M12 x 20 mm of the positioner - T10533/4-
- ◆ High-temperature paste ⇒ Electronic parts catalogue (ETKA) .

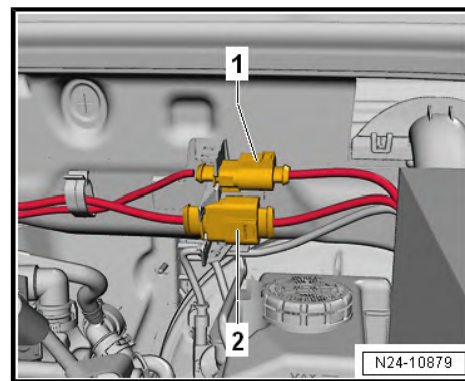
## Removing



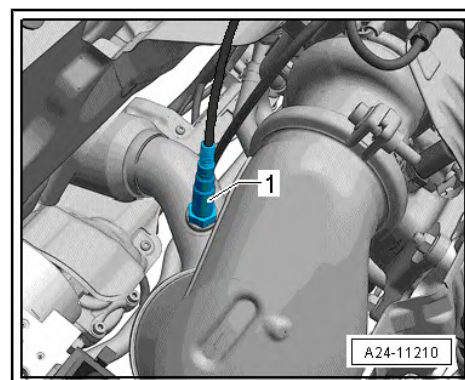
### Note

- ◆ *The catalytic converter is removed together with the front exhaust pipe.*
- ◆ *Fit cable tie in same place when installing.*
- Remove engine cover panel ⇒ [page 50](#) .

- Disconnect connector -1- for Lambda probe 1 after catalytic converter - GX7- .
- Lay wires on plenum chamber bulkhead to one side.



- Unscrew Lambda probe -1-, using tool from Lambda probe open ring spanner set - 3337/7- .



- Unscrew bolt -2- and slide clamp onto the turbocharger.
- Unscrew nuts -1 and 3-.



#### Note

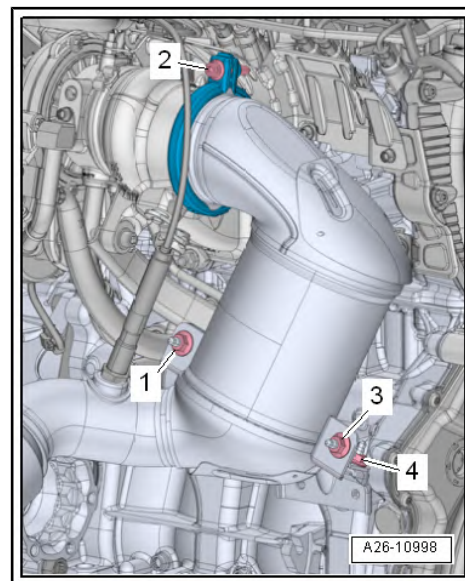
- ◆ *For illustration purposes, the installation position is shown with the engine removed.*
- ◆ *Disregard -item 4-.*



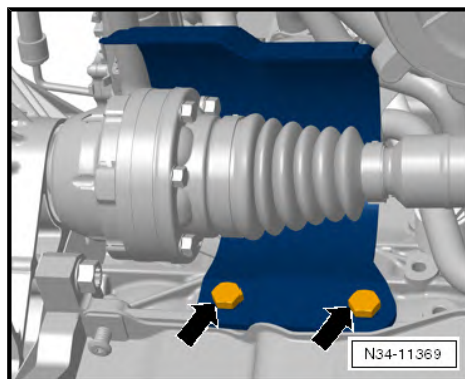
#### Note

- ◆ *Risk of damage to flexible joint*
- ◆ *Do not allow the decoupling element to kink by more than 10°. Do not damage wire mesh on decoupling element.*

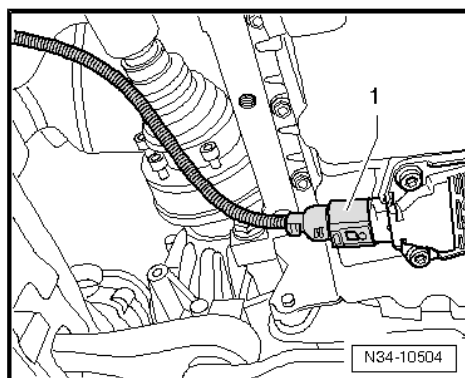
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
- Remove centre underbody cladding ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody cladding; Removing and installing underbody cladding .
- Remove pendulum support ⇒ [page 40](#) .



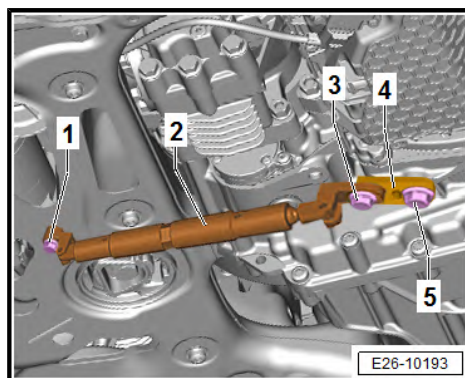
- Unscrew bolts -arrows- and remove heat shield for right drive shaft.



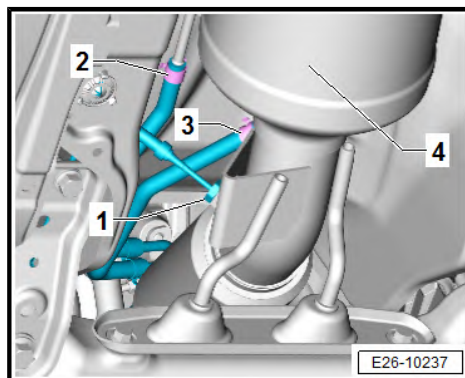
- Disconnect the connector -1- of the oil level and temperature sender - G266- .



- Assemble engine support - T50015A- as shown in the diagram.
- ◆ Screw a bolt M8 x 30 mm -1- with a washer into the threaded hole of the subframe.
- ◆ Fit the engine support - T50015A- -2- on the support plate of the positioner - T10533/2- -4-.
- ◆ Fasten the assembly kit engine support - T50015A- -2- and support plate of the positioner - T10533/2- -4- using the bolt M12 x 20 mm of the positioner - T10533/4- -5- o the threaded hole of the gearbox.
- By turning the spindle, the engine/gearbox unit is moved forwards until there is a small tension. Avoid collisions with other components.

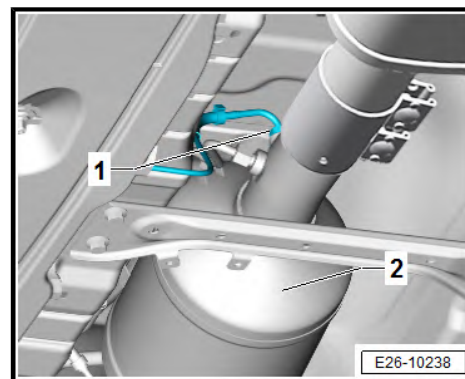


- Unscrew temperature sender before particulate filter - G506- -1- from the particulate filter.
- Open spring-type clips and detach the hoses -2- and -3- from exhaust gas pressure sensor 1 - G450-





- Unscrew temperature sender before particulate filter - G527-  
 -2- from the particulate filter.

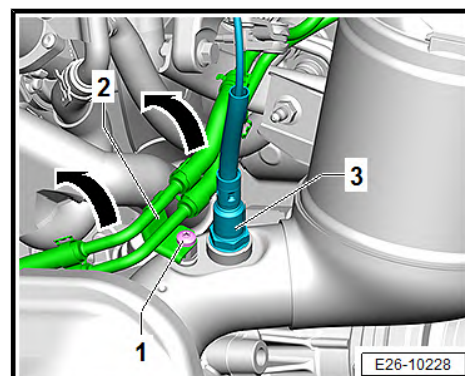


- Remove bolt -1- and disconnect lines from exhaust gas pressure sensor 1 - G450- -2- in -direction of arrow-.

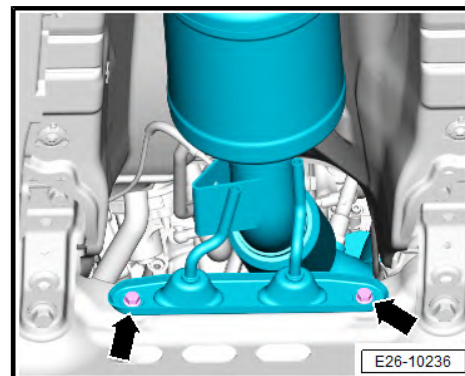


**Note**

*-Item 3- should be disregarded.*



- Remove bolts -arrows-.



- Loosen clamp -1- between catalytic converter and front silencer, and push it in direction of travel -arrow-.
- Unscrew the nuts at the rear of the tunnel bridge and remove the tunnel bridge ⇒ Body Repairs; Rep. gr. 66 ; Underbody panelling; remove and install the front tunnel bridge .

**Right-hand drive vehicle**

- Unscrew bolts and remove steering rack heat shield ⇒ running gear, axles, steering; Rep. gr. 48 ; steering rack, assembly overview - steering rack .

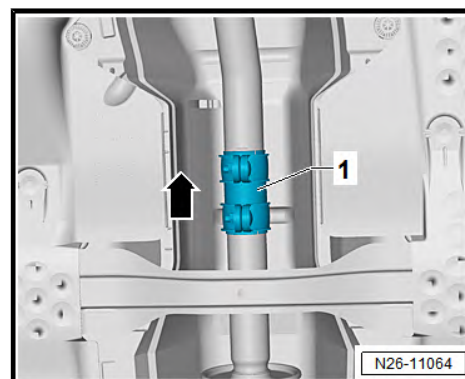
**Continued for all vehicles**



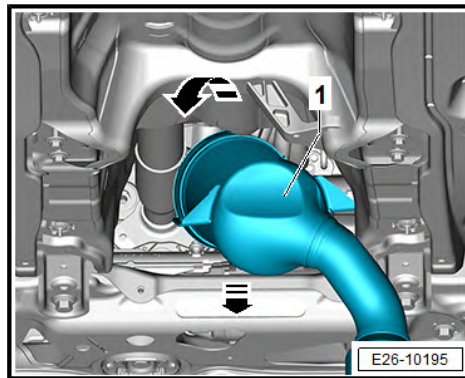
**CAUTION**

**Risk of accident caused by weight of catalytic converter**

- Seek help from a second a mechanic for the following work.

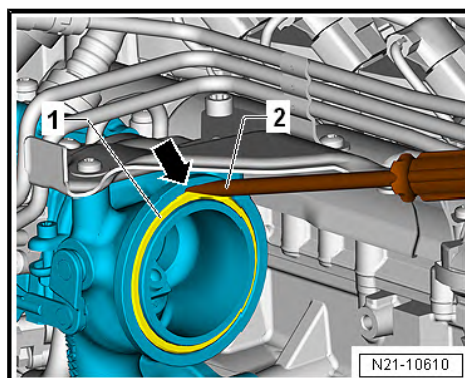


- Remove catalytic converter -1- through the tunnel opening by twisting 180° around its axis.



### Installing

- Insert screwdriver -2- into recess -arrow- on turbocharger, and lever out seal -1-.
- Insert new oil seal



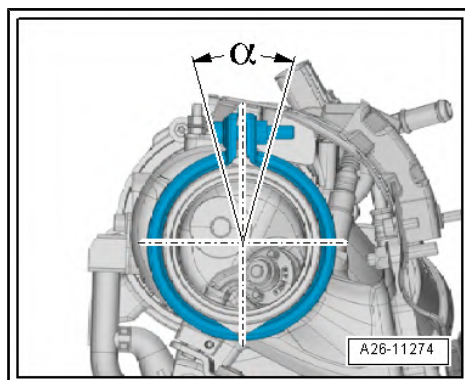
- Fit screw-type clip on turbocharger.

### CAUTION

**Risk of accident caused by weight of catalytic converter**

- Seek help from a second mechanic for the following work.

- Fit catalytic converter to turbocharger. Attach screw-type clip of catalytic converter loosely without tightening it.
- Tighten nuts and screw-type clip ⇒ [page 370](#) . Note installation position of screw-type clip ⇒ [page 370](#) .
- Install steering rack heat shield ⇒ running gear, axles, steering; Rep. gr. 48 ; steering rack, assembly overview - steering rack .

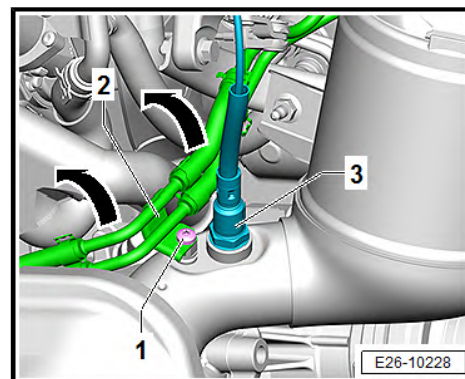


- Tighten bolt -1- of the piping of the exhaust gas pressure sensor 1 - G450- -2-.
- Install lambda probe 1 after catalytic converter - GX7- -3-.
- Install hoses of the exhaust gas pressure sensor 1 - G450- using the spring-type clips.
- Install temperature senders in front of and after the particulate filter -G506- and -G527- ➔ [page 399](#) .
- Align exhaust system free of stress ➔ [page 368](#) .

Further assembly is basically a reverse of the dismantling sequence.

#### Specified torques

- ◆ ➔ ["3.1 Assembly overview - exhaust gas temperature regulation", page 399](#)
- ◆ ➔ ["2.1 Assembly overview - assembly mountings", page 34](#)
- ◆ ➔ ["8.1 Assembly overview - Lambda probe", page 355](#)
- ◆ ➔ ["2.1 Assembly overview - emission control", page 369](#)
- ◆ ➔ Body Repairs; Rep. gr. 66 ; Underbody cladding; Remove and install tunnel bridge
- ◆ Underbody cladding; Assembly overview - Underbody cladding ➔ General body repairs, exterior; Rep. gr. 66 ; Underbody cladding; Assembly overview - Underbody cladding
- ◆ ➔ Running gear, axles, steering; Rep. gr. 48 ; steering rack, Assembly overview - steering rack
- ◆ Noise insulation; Exploded view - noise insulation ➔ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation



### 2.3.3 Removing and installing catalytic converter, vehicles with particulate filter, all-wheel drive

#### Special tools and workshop equipment required

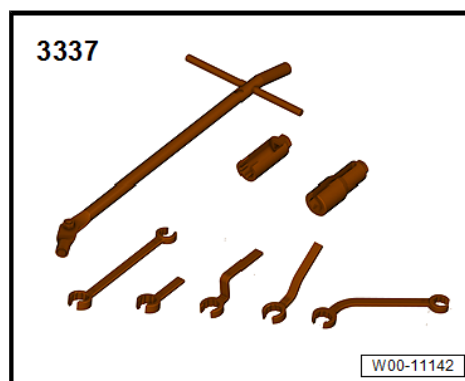
- ◆ Counterhold - T10172-



◆ Tensioning strap - T10038-



◆ Lambda probe open ring spanner set - 3337-



◆ Grommet - 3247-



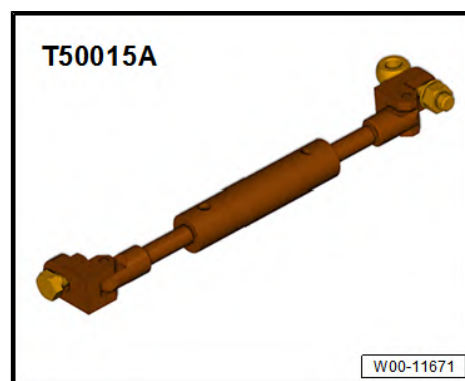
◆ Torque wrench - V.A.G 1331-



- ◆ Tool set - T10395 A-



- ◆ Engine support - T50015A-



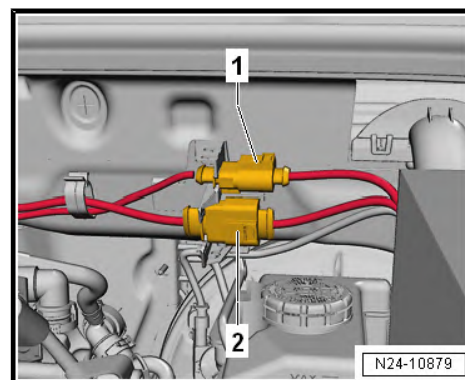
- ◆ Support plate of the positioner - T10533/2-
- ◆ Bolt M12 x 20 mm of the positioner - T10533/4-
- ◆ High-temperature paste ⇒ Electronic parts catalogue (ETKA) .

#### Removing



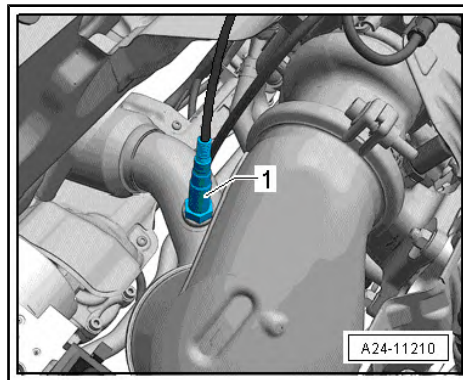
#### Note

- ◆ *The catalytic converter is removed together with the front exhaust pipe.*
- ◆ *Fit cable tie in same place when installing.*
- Remove engine cover panel ⇒ [page 50](#) .
- Disconnect connector -1- for Lambda probe 1 after catalytic converter - GX7- .
- Lay wires on plenum chamber bulkhead to one side.





- Unscrew Lambda probe -1-, using tool from Lambda probe open ring spanner set - 3337/7- .



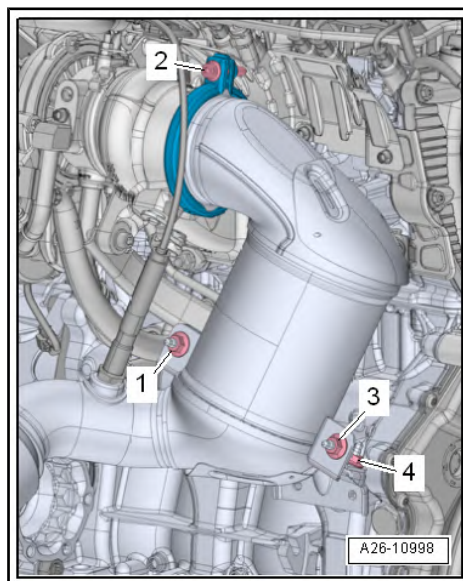
- Unscrew bolt -2- and slide clamp onto the turbocharger.
- Unscrew nuts -1 and 3-.

**i Note**

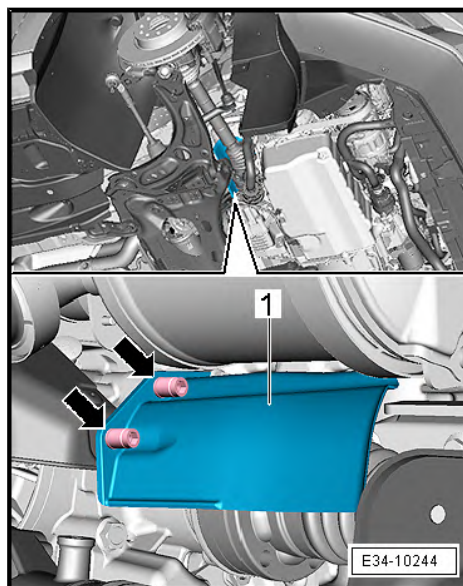
- ♦ *For illustration purposes, the installation position is shown with the engine removed.*
- ♦ *Disregard -item 4-.*

**i Note**

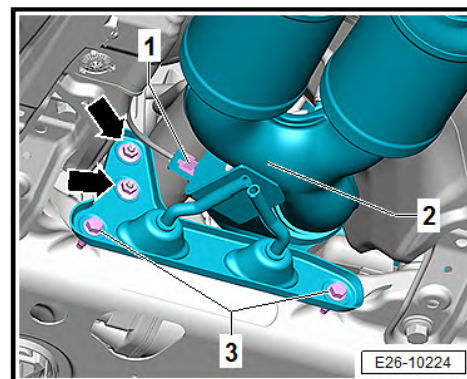
- ♦ *Risk of damage to flexible joint*
- ♦ *Do not allow the decoupling element to kink by more than 10°. Do not damage wire mesh on decoupling element.*



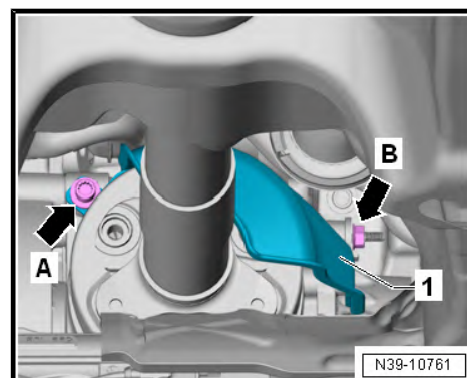
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
- Remove centre underbody cladding ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody cladding; Removing and installing underbody cladding .
- Remove right wheel.
- Unscrew screws -arrows- with the bit - 3247- and remove heat shield -1-.



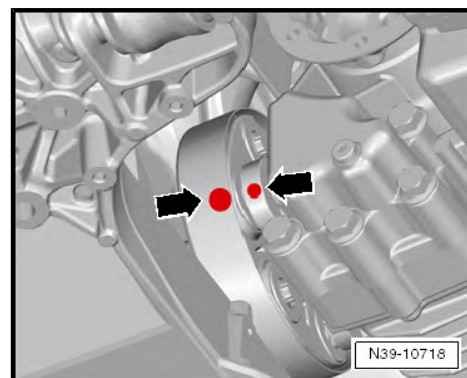
- Unclip wiring -1- and remove nuts -arrows-.
- Unscrew bolts -3-.



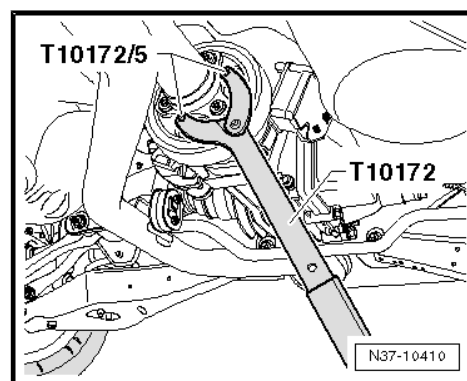
- Remove bolts -arrows- and detach heat shield -1-.



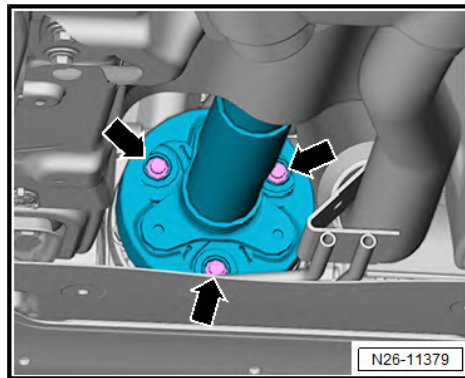
- Mark the position of the propshaft to the flange of the bevel box.



- To loosen and tighten propshaft, counterhold on rear final drive.



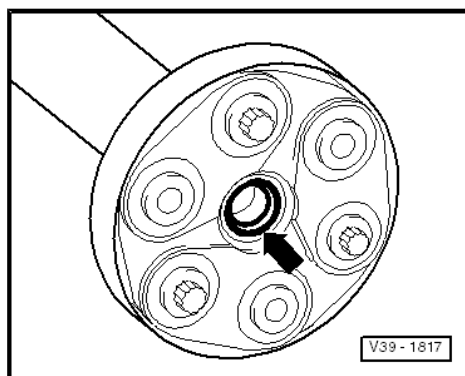
- Unbolt propshaft at front from bevel box -arrows-.
- By turning the spindle, the engine/gearbox unit is moved forwards until there is a small tension. Avoid collisions with other components.



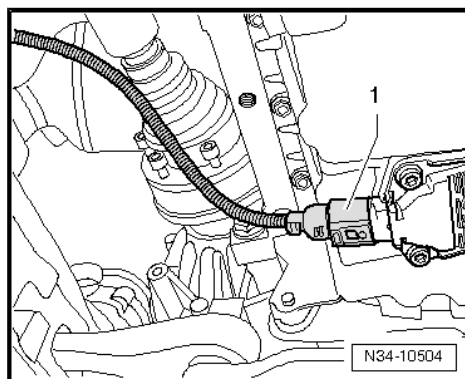
- When detaching and fixing the propshaft, it is always necessary to ensure that the socket -arrow- is not damaged.
- Pull propshaft off bevel box, and lay it to left side.
- Mask off propshaft in front area or cover it with a cloth to prevent any damage to surface protection.

**Note**

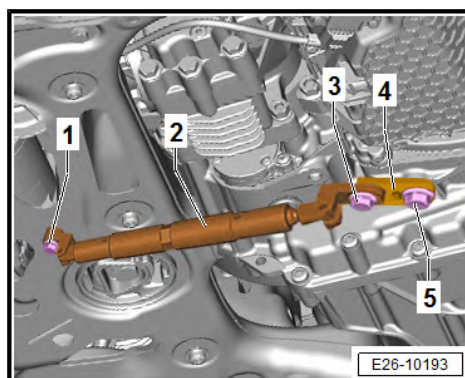
- ◆ Risk of damage to flexible joint
- ◆ Do not allow the decoupling element to kink by more than 10°. Do not damage wire mesh on decoupling element.



- Disconnect the connector -1- of the oil level and temperature sender - G266- .
- Remove pendulum support ➔ [page 40](#) .



- Connect the engine support - T50015A- -2- as shown in the diagram.
- ◆ Screw a bolt M8 x 30 mm -1- with a washer into the threaded hole of the subframe.
- ◆ Fit the engine support - T50015A- -2- on the support plate of the positioner - T10533/2- -4-.
- ◆ Fasten the assembly kit engine support - T50015A- -2- and support plate of the positioner - T10533/2- -4- using the bolt M12 x 20 mm of the positioner - T10533/4- -5- on the threaded hole of the gearbox.
- By turning the spindle, the engine/gearbox unit is moved forwards until there is a small tension. Avoid collisions with other components.

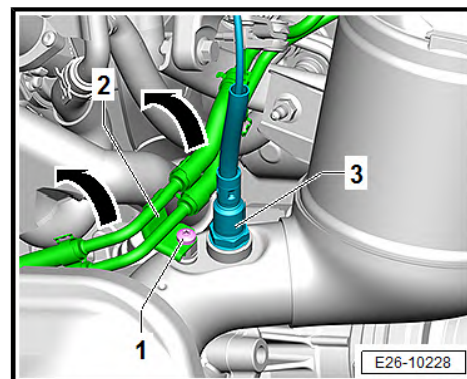


- Remove bolt -1- and disconnect lines from exhaust gas pressure sensor 1 - G450- -2- in -direction of arrow-.

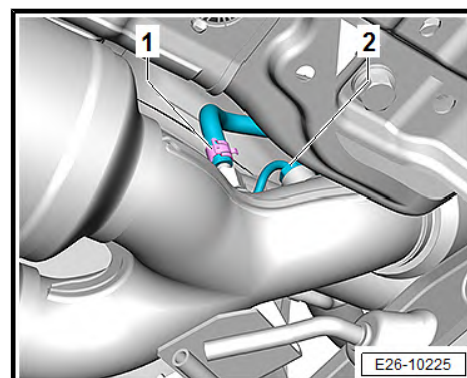


**Note**

*-Item 3- should be disregarded.*



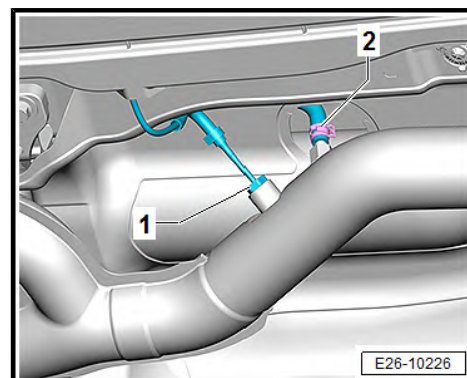
- Open spring-type clip -1- and remove the hose of the exhaust gas pressure sensor 1 - G450- .
- Unscrew temperature sender before particulate filter - G506- -2-.



- Open spring-type clip -2- and remove the hose of the exhaust gas pressure sensor 1 - G450- .
- Unscrew temperature sender after particulate filter - G527- -1-.

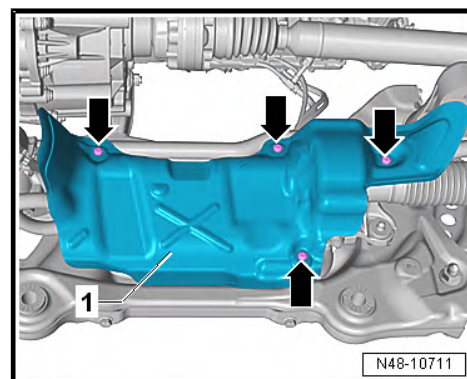
**Right-hand drive vehicle**

- Unscrew bolts and remove steering rack heat shield ⇒ running gear, axles, steering; Rep. gr. 48 ; steering rack, assembly overview - steering rack .



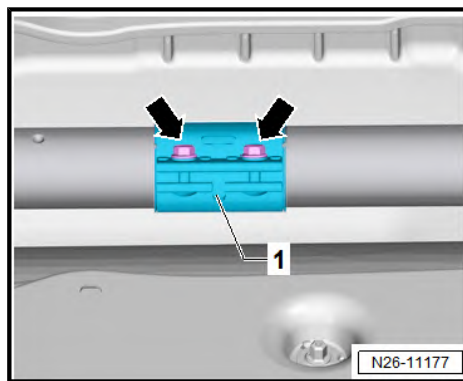
**Continued for all vehicles**

- Unscrew bolts -arrows- and remove heat shield -1- from steering box.





- Loosen clamp -arrow-, and push it to rear.

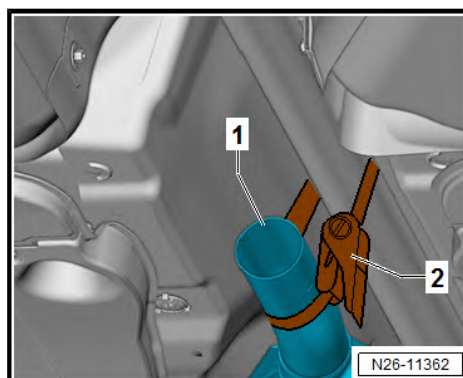


- Secure exhaust pipe -1- on propshaft with tensioning strap -2-.

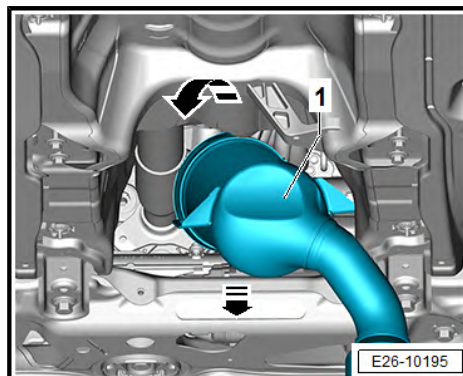
### ⚠ CAUTION

Risk of accident caused by weight of catalytic converter

- Seek help from a second a mechanic for the following work.

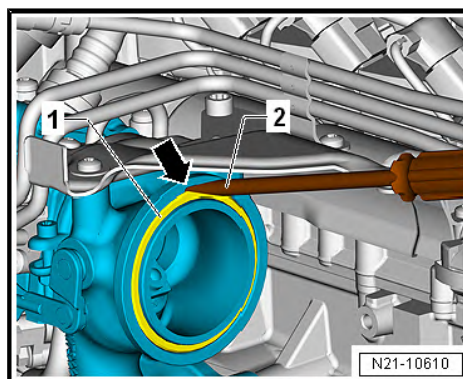


- Remove catalytic converter -1- through the tunnel opening by twisting 180° around its axis.



### Installing

- Insert screwdriver -2- into recess -arrow- on turbocharger, and lever out seal -1-.
- Insert new oil seal





- Fit screw-type clip on turbocharger.

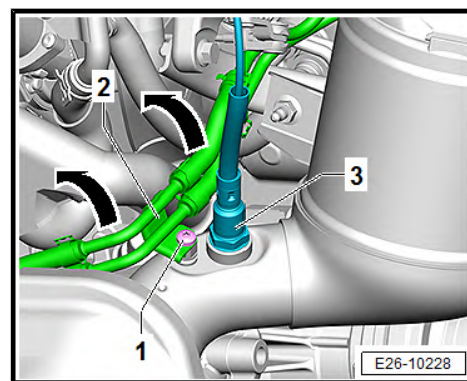
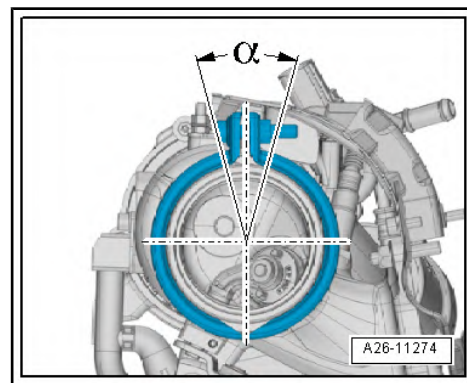


### CAUTION

**Risk of accident caused by weight of catalytic converter**

- Seek help from a second a mechanic for the following work.

- Fit catalytic converter to turbocharger. Attach screw-type clip of catalytic converter loosely without tightening it.
- Tighten nuts and screw-type clip ⇒ [page 370](#) . Note installation position of screw-type clip ⇒ [page 370](#) .
- Install steering rack heat shield ⇒ running gear, axles, steering; Rep. gr. 48 ; steering rack, assembly overview - steering rack .
- Tighten bolt -1- of the piping of the exhaust gas pressure sensor 1 - G450- -2-.
- Install lambda probe 1 after catalytic converter - GX7- -3-.
- Install propshaft ⇒ Rep. gr. 39 ; Propshaft; Removing and installing propshaft .

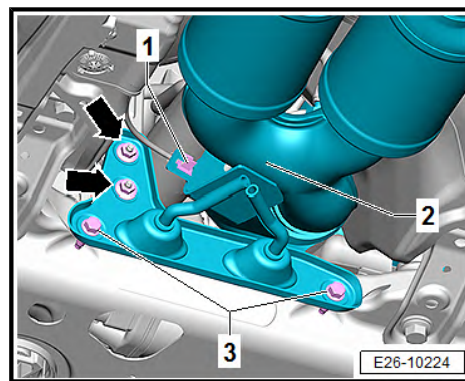


- Fix wiring -1- in position and tighten nuts -arrows-.
- Tighten bolts -3-.
- Install hoses of the exhaust gas pressure sensor 1 - G450- using the spring-type clips.
- Install temperature senders in front of and after the particulate filter -G506- and -G527- ➔ [page 399](#) .
- Align exhaust system free of stress ➔ [page 368](#) .

Further assembly is basically a reverse of the dismantling sequence.

### Specified torques

- ◆ ➔ ["3.1 Assembly overview - exhaust gas temperature regulation", page 399](#)
- ◆ ➔ ["2.1 Assembly overview - assembly mountings", page 34](#)
- ◆ ➔ ["8.1 Assembly overview - Lambda probe", page 355](#)
- ◆ ➔ ["2.1 Assembly overview - emission control", page 369](#)
- ◆ ➔ Running gear, axles, steering; Rep. gr. 48 ; steering rack, Assembly overview - steering rack
- ◆ ➔ Rep. gr. 39 ; Propshaft; Assembly overview - propshaft
- ◆ Noise insulation; Exploded view - noise insulation ➔ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation
- ◆ ➔ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres; Wheel change .
- ◆ ➔ Body Repairs; Rep. gr. 66 ; Underbody cladding; Remove and install tunnel bridge
- ◆ Underbody cladding; Assembly overview - Underbody cladding ➔ General body repairs, exterior; Rep. gr. 66 ; Underbody cladding; Assembly overview - Underbody cladding



### 3 Exhaust gas temperature regulation

⇒ [“3.1 Assembly overview - exhaust gas temperature regulation”, page 399](#)

⇒ [“3.2 Removing and installing temperature sender before particulate filter G506”, page 400](#)

⇒ [“3.3 Removing and installing temperature sender after particulate filter G527”, page 403](#)

#### 3.1 Assembly overview - exhaust gas temperature regulation

⇒ [“3.1.1 Assembly overview - exhaust gas temperature regulation, vehicles with front-wheel drive”, page 399](#)

⇒ [“3.1.2 Assembly overview - exhaust gas temperature regulation, vehicles with all-wheel drive”, page 400](#)

##### 3.1.1 Assembly overview - exhaust gas temperature regulation, vehicles with front-wheel drive

###### 1 - Support bracket

- for pressure line

###### 2 - Bolt

- 8 Nm

###### 3 - Exhaust gas pressure sensor 1 - G450-

- Removing and installing  
⇒ [page 343](#)

###### 4 - Lambda sensor 1 before catalytic converter - GX10-

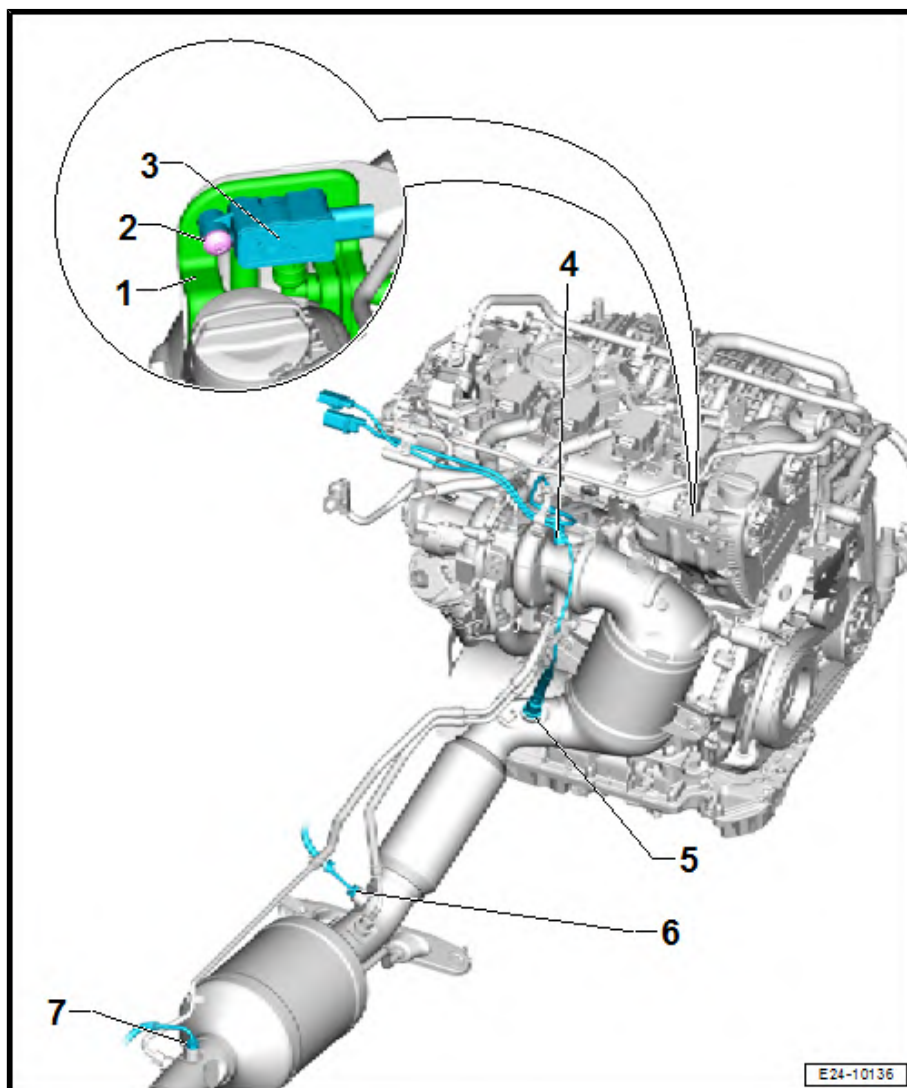
- Consisting of:  
Lambda probe - G39-  
Lambda probe heater - Z19-
- Specified torque: 55 Nm
- Removing and installing  
⇒ [page 358](#)

###### 5 - Lambda probe 1 after catalytic converter - GX7-

- Consisting of:  
Lambda probe after catalytic converter - G130-  
Lambda probe 1 heater after catalytic converter - Z29-
- Specified torque: 55 Nm
- Removing and installing  
⇒ [page 359](#)

###### 6 - Temperature sender before particulate filter - G506-

- Removing and installing ⇒ [page 400](#)



## 7 - Temperature sender after particulate filter - G527-

- ☐ Removing and installing ➤ [page 403](#)

## 3.1.2 Assembly overview - exhaust gas temperature regulation, vehicles with all-wheel drive

### 1 - Support bracket

- ☐ for pressure line

### 2 - Bolt

- ☐ 8 Nm

### 3 - Exhaust gas pressure sensor 1 - G450-

- ☐ Removing and installing ➤ [page 343](#)

### 4 - Lambda sensor 1 before catalytic converter - GX10-

- ☐ Consisting of:  
 Lambda probe - G39-  
 Lambda probe heater - Z19-

- ☐ Specified torque: 55 Nm

- ☐ Removing and installing ➤ [page 358](#)

### 5 - Lambda probe 1 after catalytic converter - GX7-

- ☐ Consisting of:  
 Lambda probe after catalytic converter - G130-  
 Lambda probe 1 heater after catalytic converter - Z29-

- ☐ Specified torque: 55 Nm

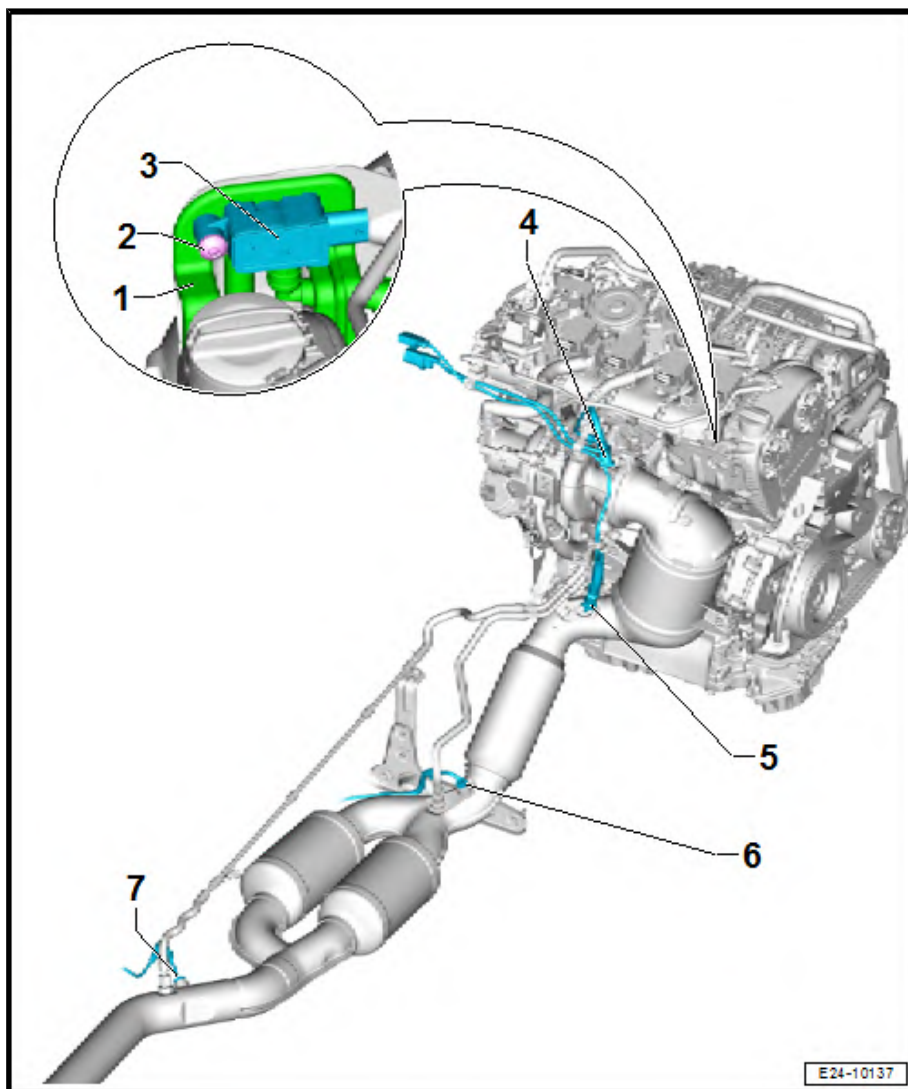
- ☐ Removing and installing ➤ [page 359](#)

### 6 - Temperature sender before particulate filter - G506-

- ☐ Removing and installing ➤ [page 400](#)

## 7 - Temperature sender after particulate filter - G527-

- ☐ Removing and installing ➤ [page 403](#)



## 3.2 Removing and installing temperature sender before particulate filter - G506-

Special tools and workshop equipment required

- ◆ Torque wrench - V.A.G 1331-

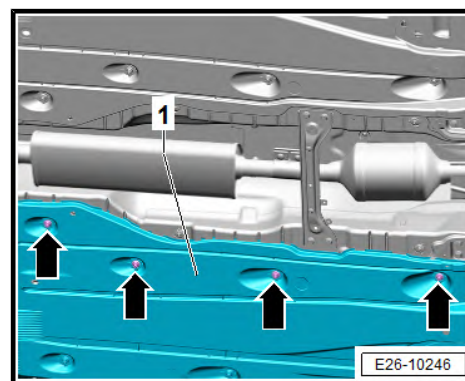


- ◆ Tool set - T10395 A-

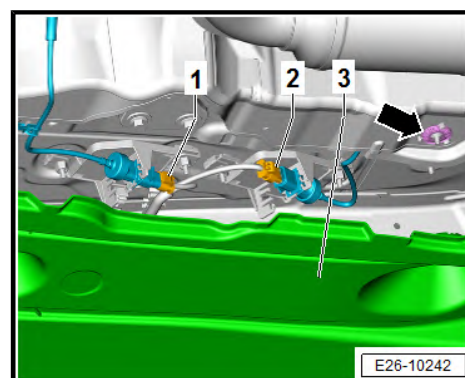


## Removing

- Observe safety precautions when working on the exhaust system ⇒ [page 2](#) .
- If installed, remove front centre underbody cover behind sub-frame ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody cover; Assembly overview - underbody covers .
- Unscrew the four plastic nuts -arrows- from the left undercarriage panel -1- and move the panel slightly downward.



- Release from bracket and detach electrical connector -2- of the temperature sender before particulate filter - G506- .
- Press out securing clip -1- which fixes the heat shield for the centre tunnel with the removal lever - 80 200- .
- Loosen wiring of the temperature sender before particulate filter - G506- from its fastenings.





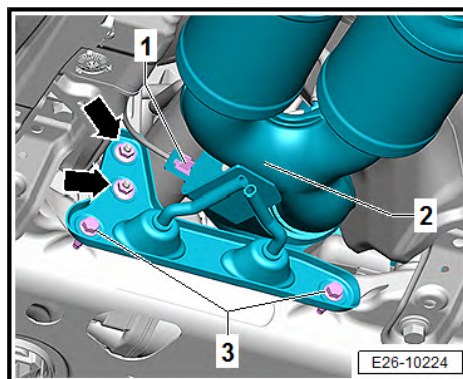
### Vehicles with all-wheel drive

- Unclip and detach wiring -1- from the particulate filter -2-.



#### Note

*Disregard -item 3- and -arrows-.*

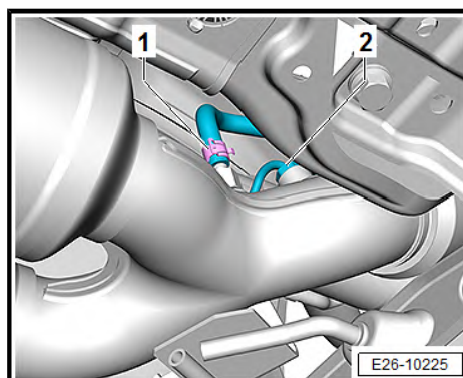


- Unscrew temperature sender before particulate filter - G506- -2-.



#### Note

*-Item 1- should be disregarded.*



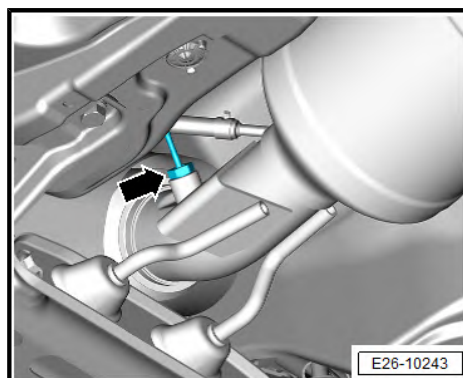
### Front-wheel drive vehicles:

- Unscrew temperature sender before particulate filter - G506- -Pfeil-.

### Installing

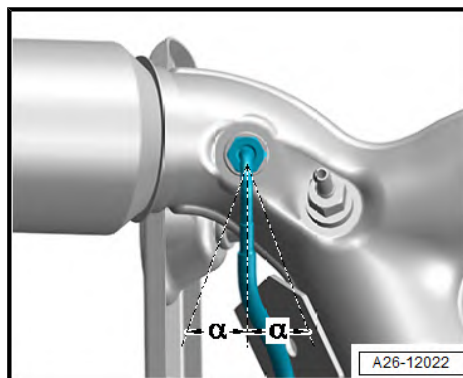
Remaining installation is carried out in the reverse order. When installing, note the following:

- Take care to protect exhaust gas temperature sender from knocks and impact: do not use exhaust gas temperature sensors which have fallen to the ground.
- For the application of tightening torque on the temperature sender before particulate filter - G506- , use an open-end spanner - T10395/6- .



### Vehicles with all-wheel drive

- Bring the temperature sender before particulate filter - G506- into installation position.
- Angle - $\alpha$ - = max. 15°.

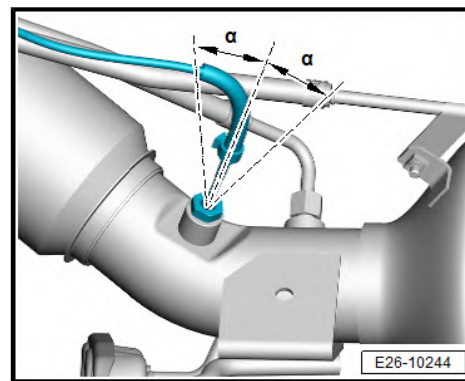


#### Front-wheel drive vehicles:

- Bring the temperature sender before particulate filter - G506- into installation position.
- Angle  $-\alpha-$  = max.  $15^\circ$ .

#### Tightening torques

- ◆ [⇒ "3.1 Assembly overview - exhaust gas temperature regulation", page 399](#)
- ◆ [⇒ General body repairs, exterior; Rep. gr. 66 ; Unterbody cladding; Assembly overview - underbody cladding](#)



### 3.3 Removing and installing temperature sender after particulate filter - G527-

#### Special tools and workshop equipment required

- ◆ Torque wrench - V.A.G 1331-



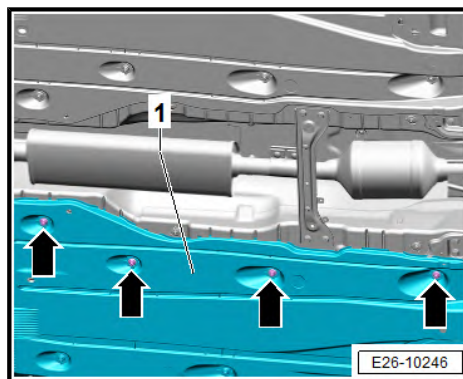
- ◆ Tool set - T10395 A-



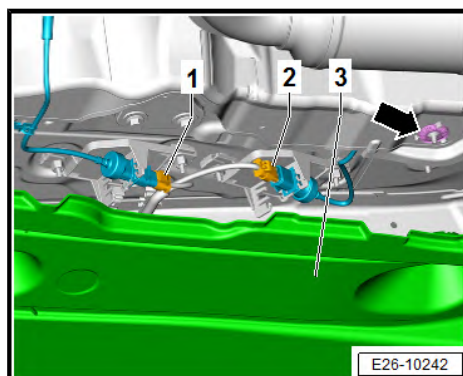
#### Removing

- Observe safety precautions when working on the exhaust system [⇒ page 2](#).

- Unscrew the four plastic nuts -arrows- from the left undercarriage panel -1- and move the panel slightly downward.



- Release from bracket and detach electrical connector -1- of the temperature sender after particulate filter - G527- .
- Loosen wiring of the temperature sender after particulate filter - G527- from its fastenings.



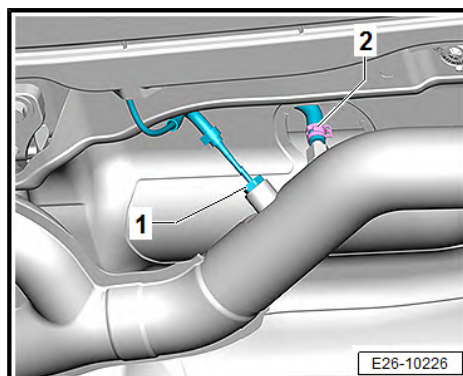
#### Vehicles with all-wheel drive

- Unscrew temperature sender after particulate filter - G527- -1-.



#### Note

-Item 2- should be disregarded.



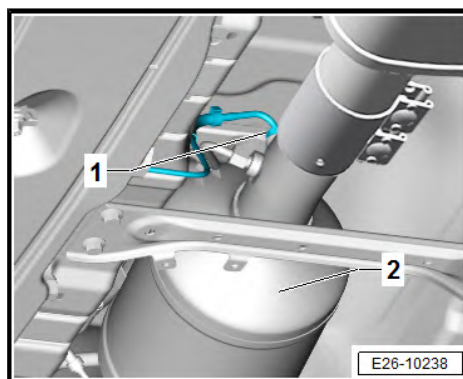
#### Front-wheel drive vehicles:

- Unscrew temperature sender after particulate filter - G527- -1-.

#### Installing

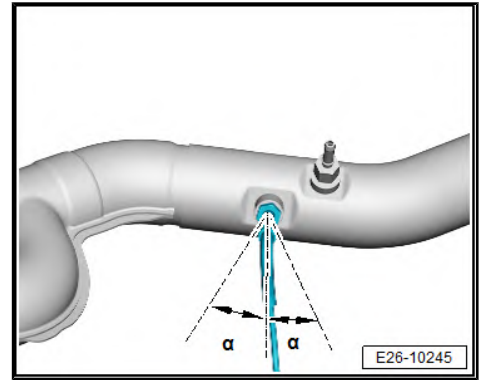
Remaining installation is carried out in the reverse order. When installing, note the following:

- Take care to protect exhaust gas temperature sender from knocks and impact: do not use exhaust gas temperature sensors which have fallen to the ground.



### Vehicles with all-wheel drive

- Bring the temperature sender after particulate filter - G527- into installation position.
- Angle  $-\alpha-$  = max.  $15^\circ$ .

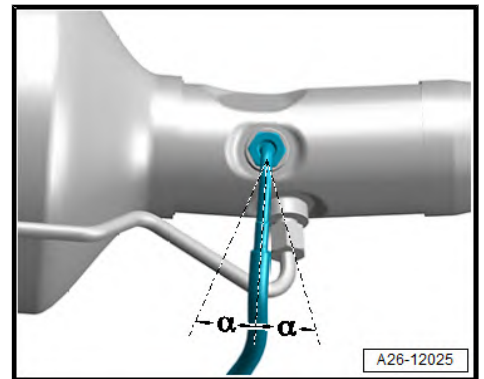


### Front-wheel drive vehicles:

- Bring the temperature sender after particulate filter - G527- into installation position.
- Angle  $-\alpha-$  = max.  $15^\circ$ .

### Tightening torques

- ◆ [⇒ "3.1 Assembly overview - exhaust gas temperature regulation", page 399](#)
- ◆ ⇒ General body repairs, exterior; Rep. gr. 66 ; Unterbody cladding; Assembly overview - underbody cladding



## 28 – Ignition system

### 1 Ignition system

⇒ "1.1 Assembly overview - ignition system", page 406

⇒ "1.2 Removing and installing ignition coils with output stage", page 407

⇒ "1.3 Removing and installing knock sensor I G61 ", page 409

⇒ "1.4 Removing and installing hall sender for exhaust camshaft", page 409

⇒ "1.5 Removing and installing engine speed sender G28 ", page 410

#### 1.1 Assembly overview - ignition system

##### 1 - Bolt

- ☐ Renewing:
- ☐ 8 Nm +90°
- ☐ The specified torque influences the function of the knock sensor.

##### 2 - Knock sensor 1 - G61-

- ☐ Removing and installing  
⇒ [page 409](#)

##### 3 - Spark plug

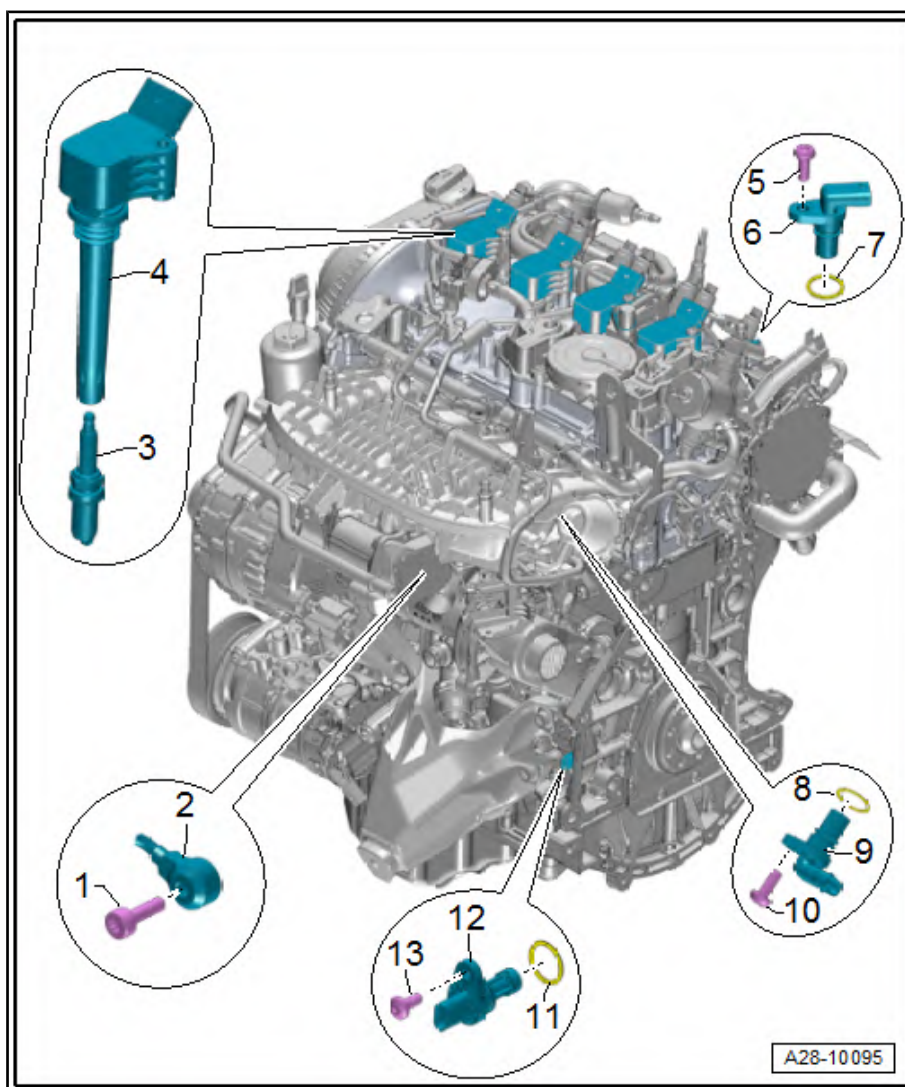
- ☐ 30 Nm
- ☐ Remove and install using spark plug socket and extension - 3122 B- .
- ☐ Renew spark plugs  
⇒ Maintenance ; Booklet KH1 ; Spark plugs: Renewing

##### 4 - 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-
- ☐ Individual ignition coils with output stage and spark plug connectors are available for repairs. Assemble ⇒ [page 408](#)
- ☐ Specified torque: 10 Nm
- ☐ Removing and installing ⇒ [page 407](#)

##### 5 - Bolt

- ☐ 9 Nm



Volkswagen Technical Site: <http://vwts.ru> <http://vwts.info>



#### 6 - Hall sender 3 - G300-

- ❑ Removing and installing ⇒ [page 410](#)

#### 7 - O-ring

- ❑ Renew if damaged

#### 8 - O-ring

- ❑ Renew if damaged

#### 9 - Hall sender - G40-

- ❑ Removing and installing ⇒ [page 409](#)

#### 10 - Bolt

- ❑ 9 Nm

#### 11 - O-ring

- ❑ Renew if damaged

#### 12 - Engine speed sender - G28-

- ❑ Check O-ring for damage.
- ❑ Removing and installing ⇒ [page 410](#)

#### 13 - Bolt

- ❑ 4 Nm +45°

## 1.2 Removing and installing ignition coils with output stage

### Special tools and workshop equipment required

- ◆ Puller - T10530-

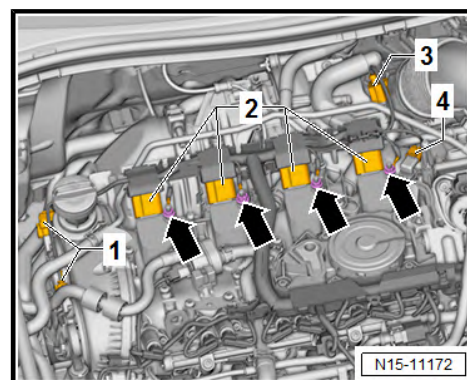


### Note

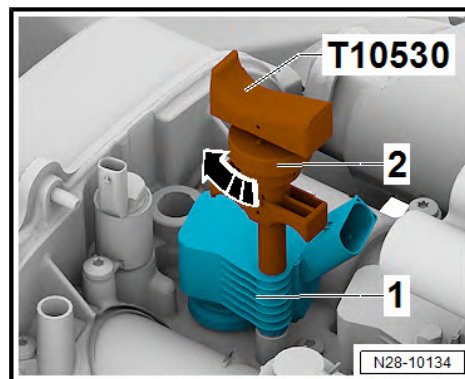
- ◆ *The ignition coils are easier to remove when the engine is warm. The grease added during installation of the ignition coils makes it easier to remove them and the ignition plug connectors when the engine is warm.*
- ◆ *Ignition coils with output stage and spark plug connectors are available individually for repairs ⇒ Electronic parts catalogue (ETKA)*
- ◆ *If the spark plugs are to be renewed, refer to ⇒ Maintenance ; Booklet KH1 ; Spark plugs: Renewing .*

### Removing:

- Remove engine cover panel ⇒ [page 50](#) .
- Unscrew nuts -arrows- and move earth wires clear.
- Release the connectors, and disconnect all the connectors of the ignition coils at the same time.
- Detach the electrical connectors -1-, -3- and -4-.
- Unclip wiring harness, and lay it to one side.
- Unscrew bolt of ignition coil which is to be removed.



- Insert puller - T10530- into hole -1- in ignition coil.
- Turn knurled nut -2- clockwise until puller is fixed in position.

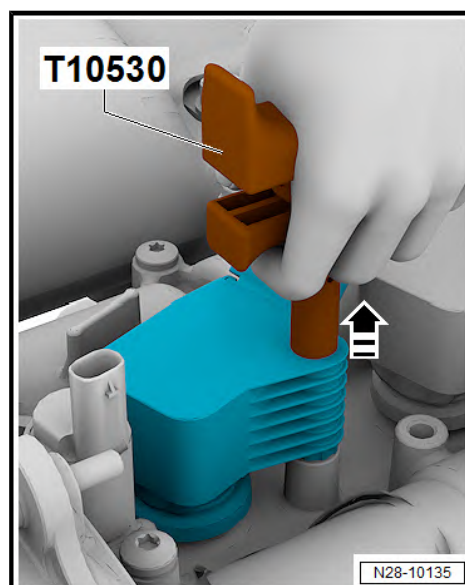


- Using puller - T10530- , carefully pull ignition coil vertically upwards to remove.



#### Note

- ♦ Ignition coils with output stage and spark plug connectors are available individually for repairs → Electronic parts catalogue (ETKA)
- ♦ The spark plug connectors are removed from the ignition coils by hand.



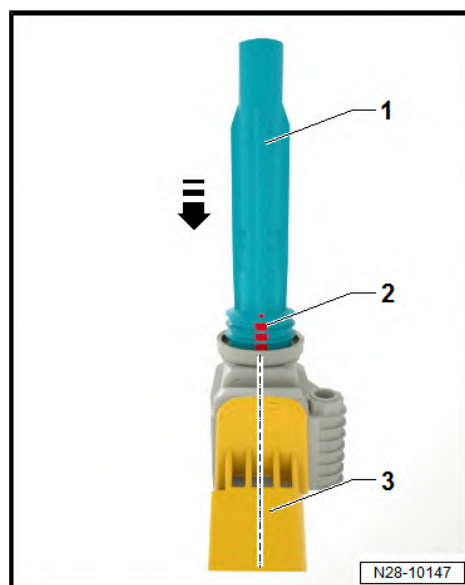
#### Assembling ignition coil with output stage and spark plug connector

- Slide spark plug connector -1- by hand onto ignition coil as far as stop.

The vent drilling -2- must be centred relative to connector housing -3- while doing so.

#### Installing ignition coil with output stage and spark plug connector

- Press ignition coils onto spark plugs by hand evenly (do not use tools).
- Tighten ignition coils to 10 Nm.



## 1.3 Removing and installing knock sensor I - G61-

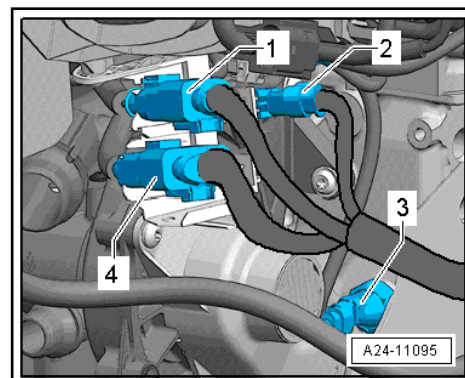
### Removing

- Disconnect connector -2- for knock sensor 1 - G61- .
- Remove actuator for engine temperature regulation - N493-  
⇒ [page 250](#) .

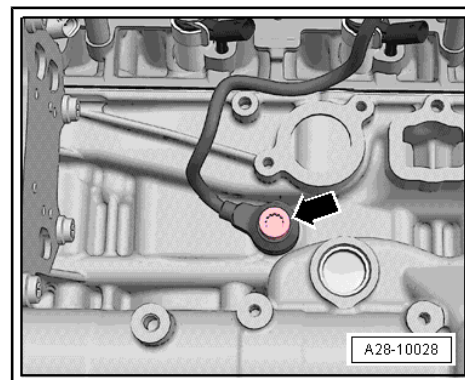


### Note

*The knock sensor I - G61- is located under the intake manifold behind the coolant pump.*



- Unscrew knock sensor 1 - G61- -arrow-.

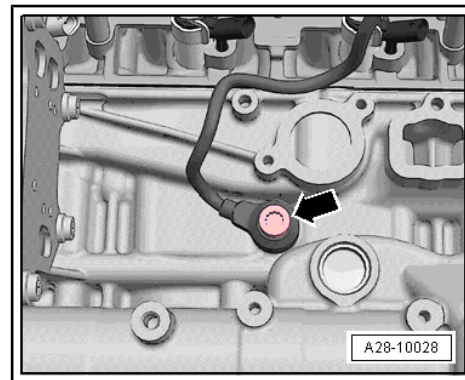


### Installing

- Install in reverse order of removal.
- Note installation position of knock sensor 1 - G61- .
- Install actuator for engine temperature regulation - N493-  
⇒ [page 250](#) .

### Specified torques

- ◆ ⇒ [“1.1 Assembly overview - ignition system”, page 406](#)



## 1.4 Removing and installing hall sender for exhaust camshaft

⇒ [“1.4.1 Removing and installing Hall sender G40”, page 409](#)

⇒ [“1.4.2 Removing and installing Hall sender 3 G300”, page 410](#)

### 1.4.1 Removing and installing Hall sender - G40-

#### Removing

- Remove engine cover panel ⇒ [page 50](#) .
- Remove air intake pipe ⇒ [page 326](#) .

- Disconnect connector -3-.
- Unscrew bolt -1-, and remove Hall sender -2-.

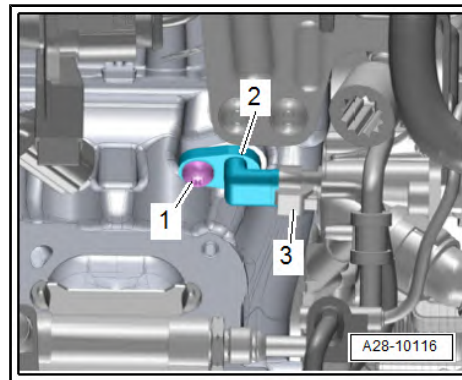
#### Installing

Remaining installation is carried out in the reverse order. When installing, note the following:

- Renew O-ring.

#### Specified torques

- ♦ ⇒ ["1.1 Assembly overview - ignition system", page 406](#)



### 1.4.2 Removing and installing Hall sender 3 - G300-

#### Removing

- Remove engine cover panel ⇒ [page 50](#) .
- Disconnect connector -3-.
- Unscrew bolt -1-, and remove Hall sender -2-.

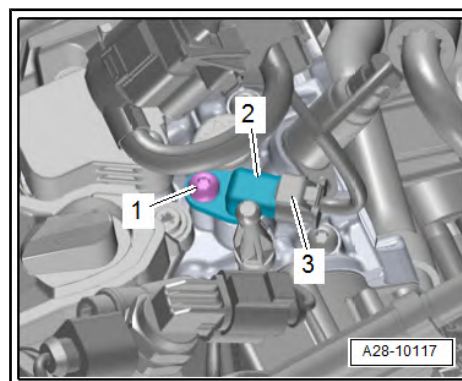
#### Installing

Remaining installation is carried out in the reverse order. When installing, note the following:

- Renew O-ring.

#### Specified torques

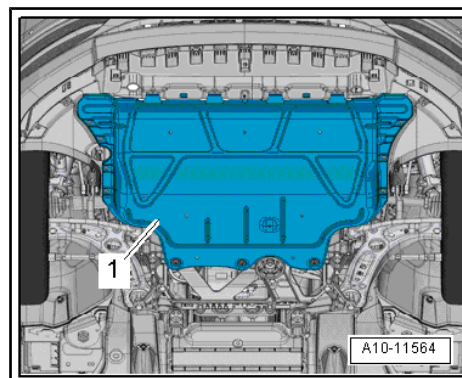
- ♦ ⇒ ["1.1 Assembly overview - ignition system", page 406](#)



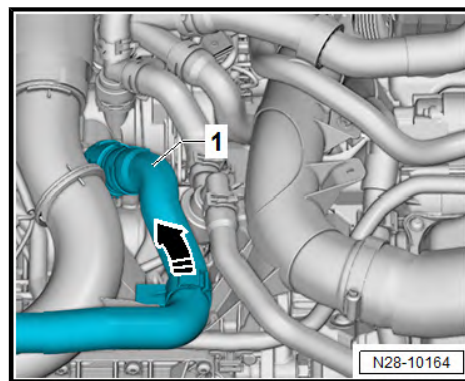
### 1.5 Removing and installing engine speed sender - G28-

#### Removing

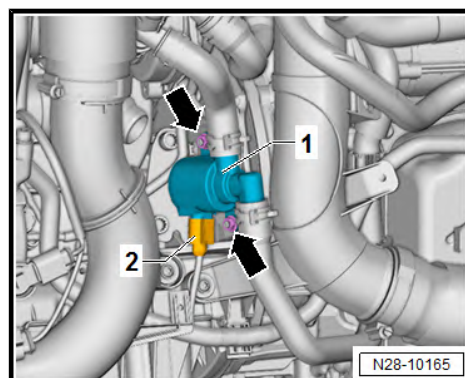
- Remove noise insulation-1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .



- Disconnect coolant hose -1- from charge air pipe, and push it upwards.



- Disconnect connector -2-.
- Unscrew nuts -arrows-, and push the coolant valve -1- to one side.



- Disconnect electrical connector -1- from engine speed sensor - G28- .
- Unscrew securing bolt -arrow-, and pull out engine speed sender - G28- .

### Installing

Install in reverse order of removal.

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

### Specified torques

- ◆ ⇒ [“1.1 Assembly overview - ignition system”, page 406](#)

