



## Workshop Manual

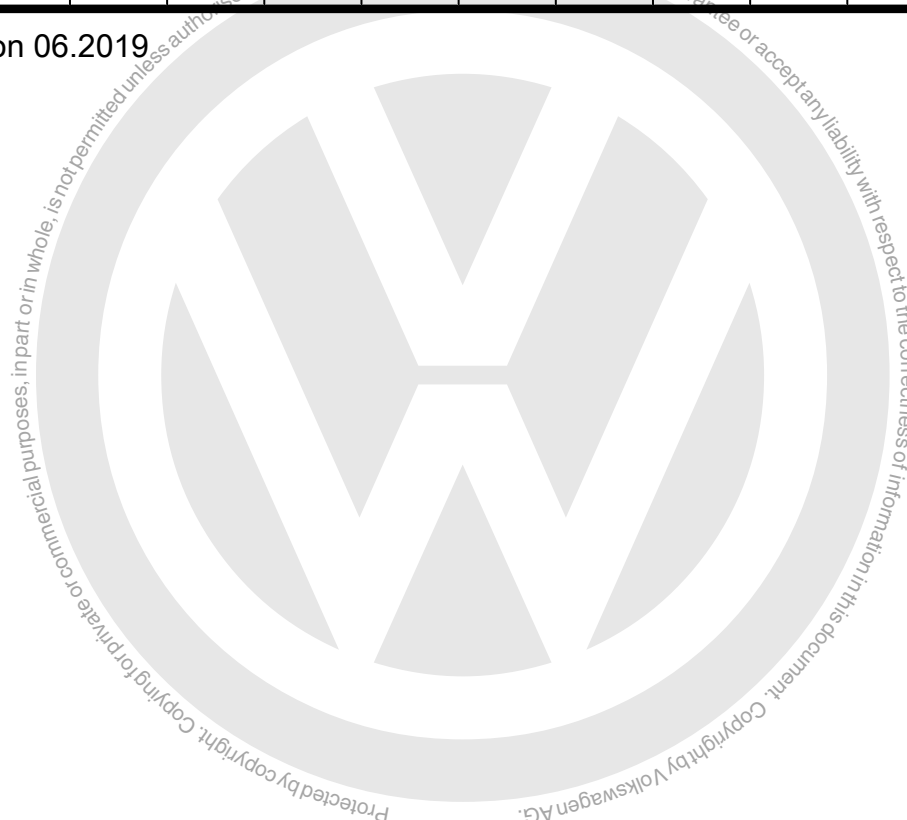
up! 2012 ➤

up! 2017 ➤

**3-cyl. injection engine (1.0 l, natural gas 4V, EA 211)**

Engine ID	CPG A							
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Edition 06.2019

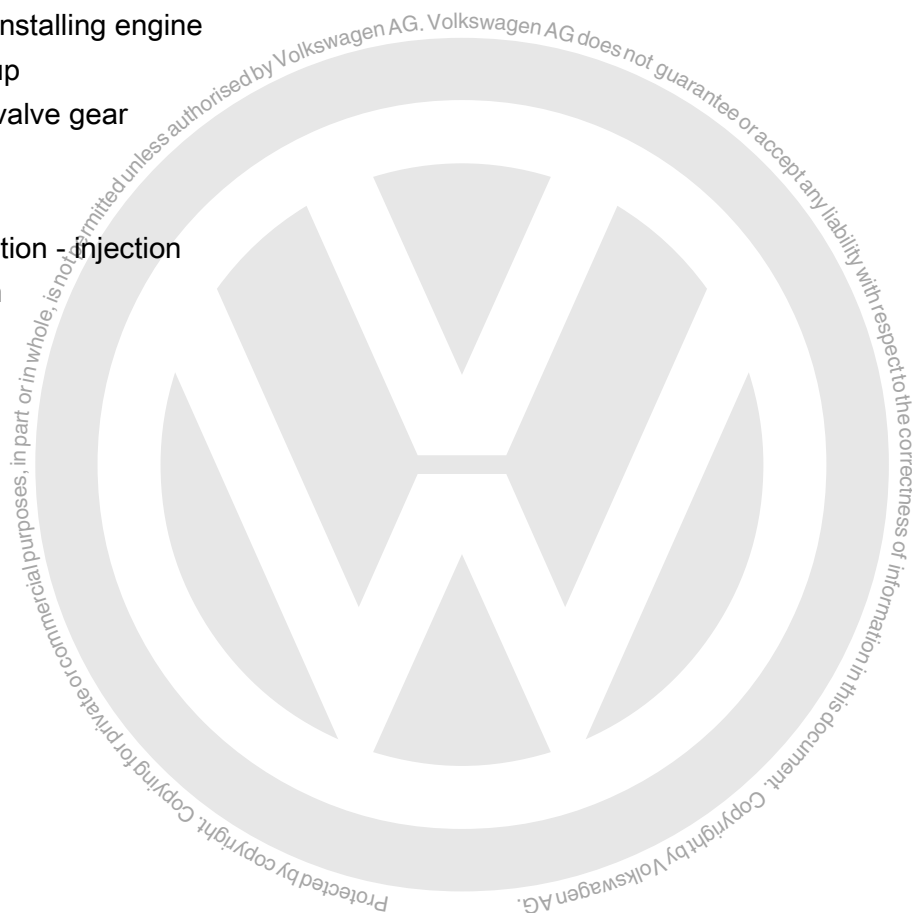




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Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions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



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## 00 – Technical data

### 1 Safety information

(VRL013107; Edition 06.2019)

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

⇒ [“1.2 Safety precautions when working on natural gas system”, page 1](#)

⇒ [“1.3 Safety measures when working on vehicles with a start/stop system”, page 4](#)

⇒ [“1.4 Safety precautions when using testers and measuring instruments during a road test”, page 4](#)

⇒ [“1.5 Safety precautions when working on the cooling system”, page 4](#)

⇒ [“1.6 Safety precautions when working on ignition system”, page 4](#)

#### 1.1 Safety measures when 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 protective goggles.
- Wear protective gloves.
- To release pressure, wrap a clean cloth around the connection and carefully loosen the connection.

**Danger of fire caused by 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 when working on natural gas system

- Before renewing tank shut-off valve or natural gas tank:
- Instruct the customer to leave as little natural gas in the tank as possible.
- This is to avoid unnecessary costs for the customer as well as the pollution of the environment.

**Risk of explosion from incorrect handling of natural gas system.**

Work on the natural gas system may only be performed by personnel specially trained for this purpose.



### **Risk of injury from natural gas under high pressure.**

- Release pressure in the system before working on the natural gas system.
- If releasing pressure from the natural gas tanks is not possible, close the tank shut-off valves again.
- Do not perform any further repair work.



#### **Note**

*Contact your importer for details on how to proceed regarding the return of natural gas tanks that are still filled with fuel.*

- Connect ⇒ Vehicle diagnostic tester, and perform Guided Function "Release pressure in natural gas high-pressure line".
- A leakage test of the natural gas supply system must always be performed after components have been removed  
⇒ ["3 Checking natural gas supply system for leaks", page 212](#).
- Depending on the respective section of the natural gas supply system, different procedures are described in this chapter.  
Note allocation  
⇒ ["3.1 Distinguishing between pressure sections of natural gas supply system", page 212](#).

### **Risk of natural gas explosion from electrostatic discharge.**

An electrostatic charge can be given off from the vehicle, the removed natural gas tanks and the fitter.

Before performing any work on the natural gas system, ensure that this static is safely discharged.

To avoid electrostatic discharge from the fitter, it is absolutely essential to wear suitable clothing.

- Protective gloves containing cotton must be worn to prevent a static charge from building up.
- Volkswagen safety shoes must be worn to avoid static charging.
- Volkswagen workwear (of cotton blend fabric) must be worn, because this workwear contains a residual moisture which also prevents static charging.

### **There is a risk of the natural gas exploding from static discharge while it is being evacuated.**

Do not evacuate natural gas fuel tanks in confined spaces.

Before evacuation, cordon off an area measuring 10m x 10m.

Releasing pressure from the natural gas tanks is only permissible with gas extractor - VAS 523 001- .





The safety zone must be permanently supervised during the evacuation.

There must be no open flame or source of ignition in the safety zone.

### **Risk of injury from extreme cold while pressure is being released from natural gas tanks**

Do not touch tank shut-off valves while pressure is being released as there is a risk of injury from extreme cold.

- Protective gloves containing cotton must be worn to prevent injury.

### **Risk of severe or fatal injuries caused by highly pressurised components of the natural gas system.**

If the pressure in the natural gas system is not reduced to ambient pressure, severe injuries caused by abruptly ejected components may result.

- Always reduce the pressure before performing any repair work on the natural gas system.



#### **Note**

*Observe the country-specific regulations as well as specifications provided by the importer regarding the safety measures described in this manual.*



#### **Note**

- ◆ *Route high-pressure lines in their original positions.*
- ◆ *Ensure lines have sufficient clearance to moving or hot components.*
- ◆ *Never attempt to reshape high-pressure lines of natural gas system.*
- ◆ *On no account may the union nuts be tightened further than specified. Otherwise, the special connection will be damaged and the pressure line must be renewed.*
- ◆ Disconnect battery earth strap before carrying out work on natural gas system.
- ◆ Only components of the same type and with the same type approval may be exchanged on the high-pressure system.



### 1.3 Safety measures when working on vehicles with a 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.

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

#### Risk of injury caused by unsecured testing and measuring instruments

When the front passenger airbag is triggered in an accident, insufficiently secured testing and measuring instruments become dangerous projectiles.

- Secure testing and measuring instruments on the rear seat.

OR

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

### 1.5 Safety precautions when working on the cooling system

#### Danger of scalding by 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 cloths and opening it carefully.

### 1.6 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.

#### Risk of damage to components

Connecting or disconnecting electric cables or washing the engine while it is running may damage components.

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



- Switch off the ignition before washing the engine.





## 2 Identification

⇒ **"2.1 Engine number/engine data", page 6**

### 2.1 Engine number/engine data

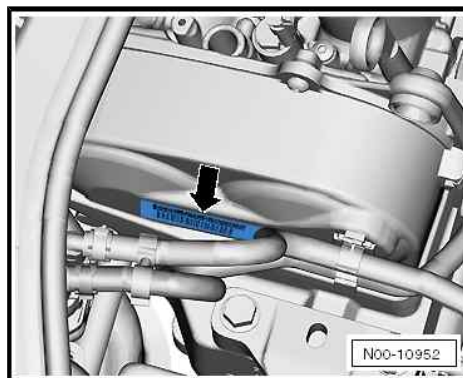
The engine code and the engine number can be found on the sticker -arrow- on the upper toothed belt guard.

The engine code is also on the vehicle data sticker and on the crankcase above the gearbox.

The engine number consists of up to 9 characters (alphanumeric). The first part (maximum 3 characters) makes up the "engine code", and the second part (6 characters), the "serial number". If more than 999,999 engines were produced with the same code letters, the first of the six digits is replaced by a letter.

#### Vehicles with four digit engine codes

Four-place engine codes are being introduced, starting with letter "C". The first 3 places show the mechanical design of engine and are stamped on the engine as previously. The fourth digit indicates the output and the torque of the engine. It depends on the engine control unit - J623- . The four-digit engine code can be found on the identification plate, the vehicle data sticker and on the engine control unit.



#### Note

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

Engine code		CPGA
Manufactured		11.12 ➤
Exhaust emission standard		EU5 plus/EU6
Displacement	cm <sup>3</sup>	999
Power	kW at rpm	50/6200 <sup>1)</sup>
Torque	Nm at rpm	90/3000 <sup>1)</sup>
Bore	Diameter, mm	74.5
Stroke	mm	76.4
Compression ratio		11.5
Valves per cylinder		4
RON	Petrol	95 unleaded
	Natural gas	Up to 140 <sup>1)</sup>
Injection, ignition system		Motronic ME 17
Firing order		1-2-3

- <sup>1)</sup> In gas mode, the engine output and the torque depend on the quality of the natural gas used. The methane content for L gas (low calorific gas: methane content 79.8 - 87.0% vol.) and H gas (high calorific gas: methane content 87.1 - 98.0% vol.) may vary in different regions.



## 3 Repair notes

⇒ [“3.1 Rules for cleanliness”, page 7](#)

⇒ [“3.2 Foreign objects in engine”, page 7](#)

⇒ [“3.3 Contact corrosion”, page 7](#)

⇒ [“3.4 Routing and attachment of lines”, page 7](#)

⇒ [“3.5 Fitting radiator and condensers”, page 8](#)

### 3.1 Rules for cleanliness

When working on fuel supply/injection system and natural gas system, pay careful attention to the following rules for cleanliness:

- ◆ Thoroughly clean all connections and adjacent areas before disconnecting.
- ◆ Place removed parts on a clean surface and cover them over. Use lint-free cloths only.
- ◆ Carefully cover opened components or seal them if repairs cannot be carried out immediately.
- ◆ Install only clean parts; do not remove new parts from packaging until immediately before installing. Do not use parts that have been kept unpackaged (for example in toolboxes).
- ◆ If system is open, do not work with compressed air. Do not move the vehicle.

### 3.2 Foreign objects in engine

To prevent the ingress of foreign bodies during work on the engine, seal open channels of the intake and exhaust sections with suitable plugs, for example from the engine bung set - VAS 6122-.

### 3.3 Contact corrosion

Contact corrosion can occur if non-approved fasteners are used on the vehicle (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

- ◆ In order to ensure that lines are all installed in their original position, the lines for the fuel, hydraulic and vacuum systems and for the activated charcoal filter system as well as electrical wires must be marked appropriately before they are removed. Where necessary, make sketches or take photographs.
- ◆ Because of the lack of space in the engine compartment, make sure that there is sufficient clearance between lines and all moving or hot components. This is to avoid damage to lines.
- ◆ Any clips, cable ties or other fastening devices that have been cut through or damaged when loosening must be renewed.
- ◆ Insulation mats and other insulating devices must always be re-fitted in their original positions.



### 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.





## 10 – Removing and installing engine

### 1 Removing and installing engine

⇒ [“1.1 Removing engine”, page 9](#)

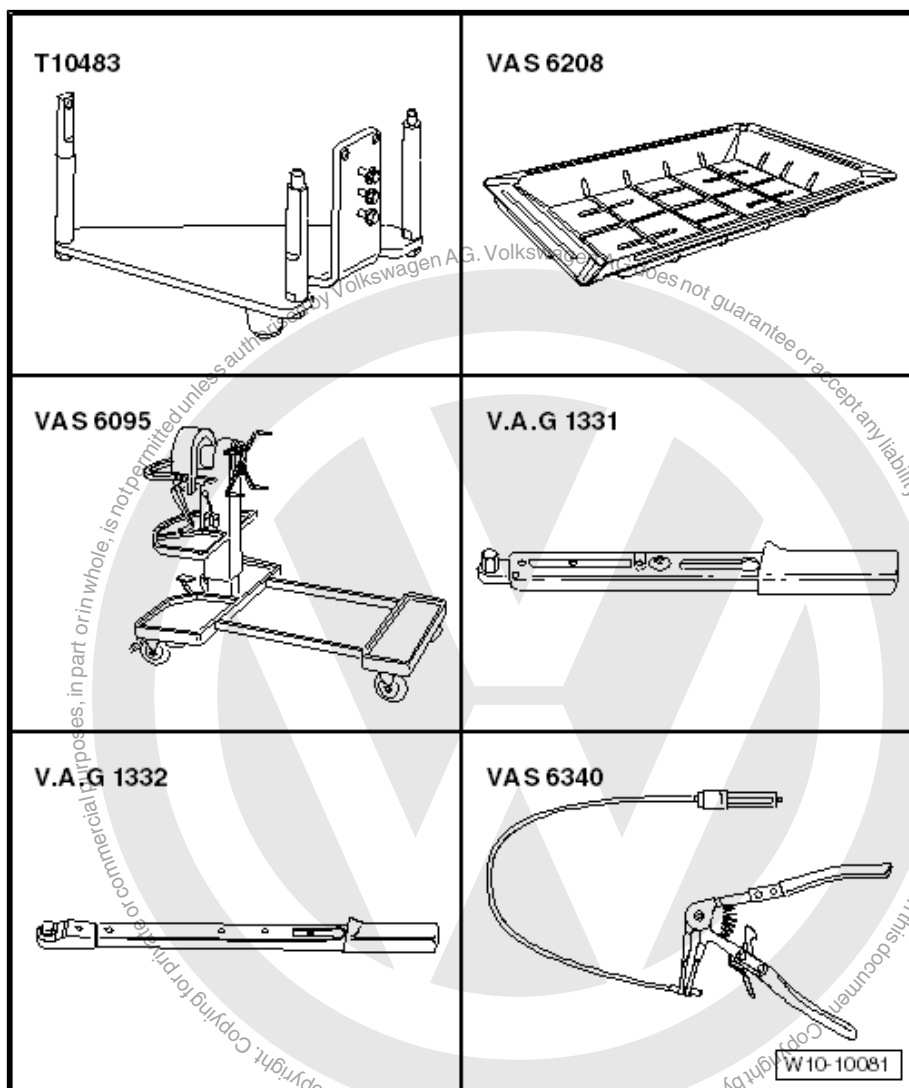
⇒ [“1.2 Separating engine and gearbox”, page 17](#)

⇒ [“1.3 Securing engine on engine and gearbox support”, page 18](#)

⇒ [“1.4 Installing engine”, page 20](#)

#### 1.1 Removing engine

Special tools and workshop equipment required



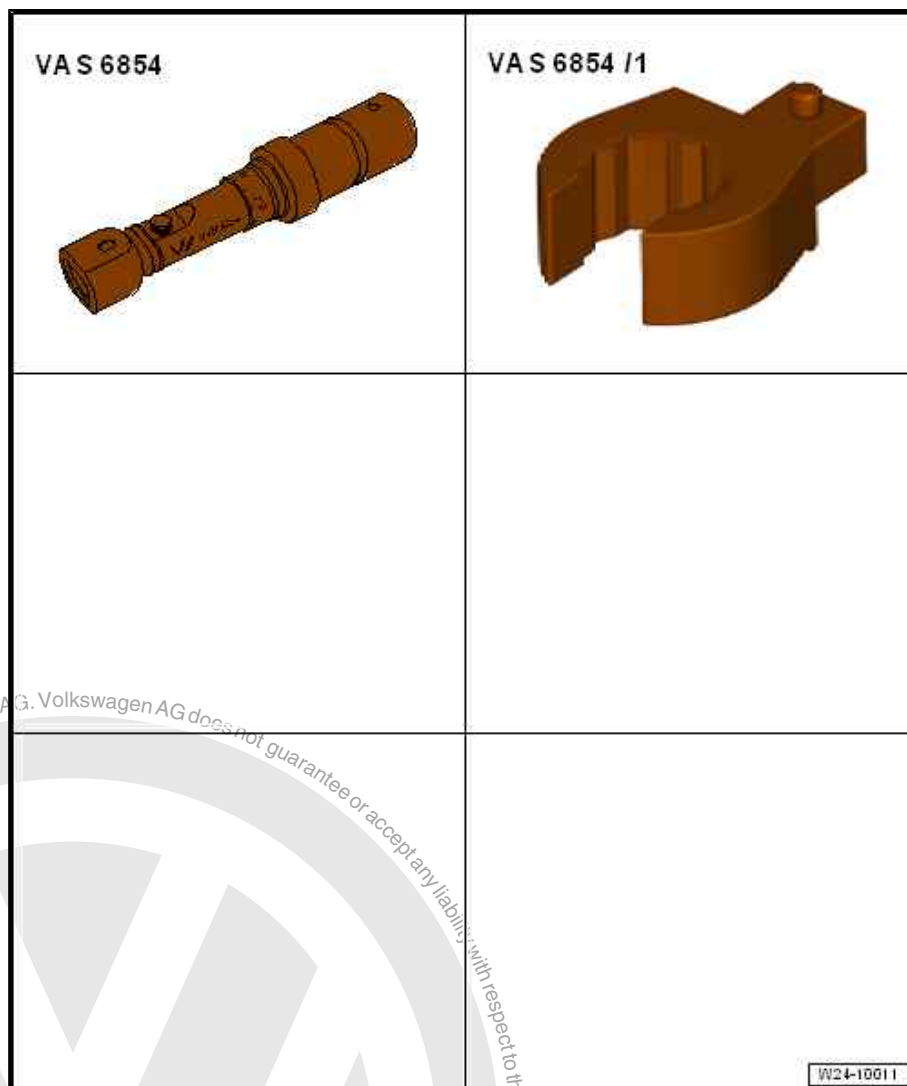
- ◆ Engine support - T10483-
- ◆ Drip tray for workshop hoist - VAS 6208-
- ◆ Engine and gearbox support - VAS 6095-
- ◆ Torque wrench - V.A.G 1331-
- ◆ Torque wrench - V.A.G 1332-
- ◆ Hose clamp pliers - VAS 6340-



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- ◆ Commercially available stepladder (not illustrated)
- ◆ Adapter - T10480- (not illustrated)



- ◆ Torque wrench - VAS 6854-
- ◆ Tool insert (AF 16) - VAS 6854/1-



#### Note

*The engine is removed downwards with gearbox.*



#### DANGER

**Risk of explosion and danger to life due to escaping natural gas.**  
If the manual tank shut-off valve is defective, natural gas may escape in an uncontrolled way. In addition, third parties may be able to activate the natural gas system unintentionally. Risk of explosion leading to serious injuries or death.

- Lock natural gas fuel tank electrically and manually.





- Before working on the natural gas system, always observe  
⇒ ["1.2 Safety precautions when working on natural gas system", page 1](#) !
- Empty gas system ⇒ Rep. gr. 20 ; Fuel tank; Releasing pressure in high-pressure line .
- Disconnect battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .
- Remove battery and battery tray ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery
- Detach or cut open cable tie.
- Remove air filter housing  
⇒ ["5.2 Removing and installing air filter housing", page 231](#) .
- Remove engine control unit  
⇒ ["8.2 Removing and installing engine \(motor\) control unit J623", page 243](#) .
- Unclip the wiring harness from the fastening points and attach it to the engine.

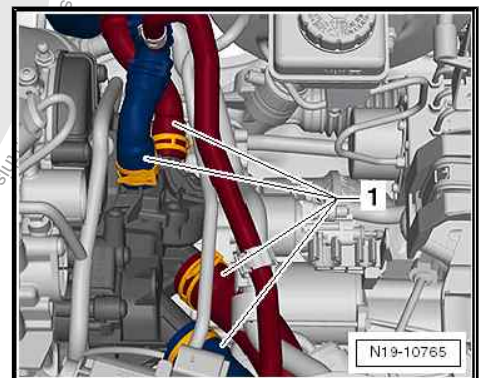
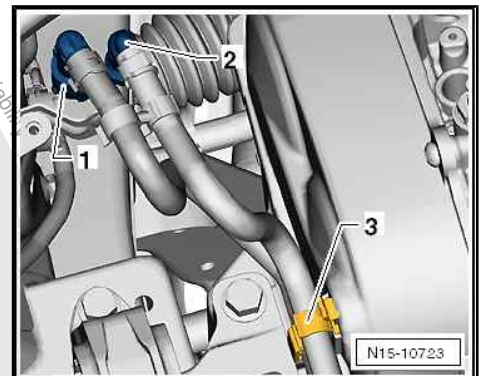
### ⚠ CAUTION

On a warm engine, the cooling system is under high pressure. 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 cloths and opening it carefully.

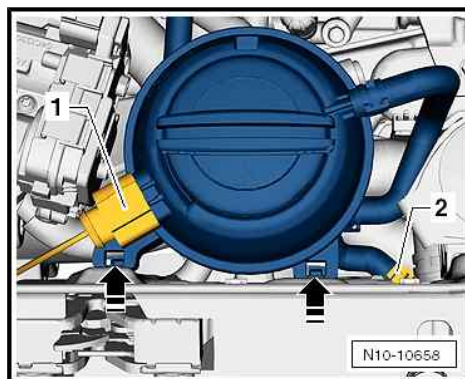
- Open and close coolant expansion tank cap to release pressure in cooling system.
  - Release and pull off fuel supply line -1- and breather line -2- ⇒ Rep. gr. 20 ; Plug-in connectors; Disconnecting plug-in connectors .
  - Open line guide -3- and remove hoses.
  - Seal lines so that fuel system is not contaminated by dirt.
- Drain coolant  
⇒ ["1.3 Draining and adding coolant", page 159](#) .

Disconnect all coolant hoses -1- from coolant pump.  
Pull off connector -1- from expansion tank.

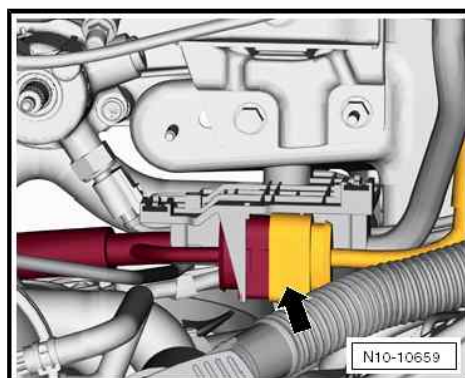




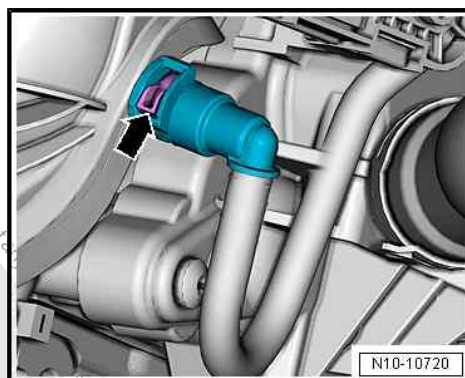
- While pushing locking tabs in -direction of arrow- pull expansion tank upwards.
- Pull off coolant hose -2-.



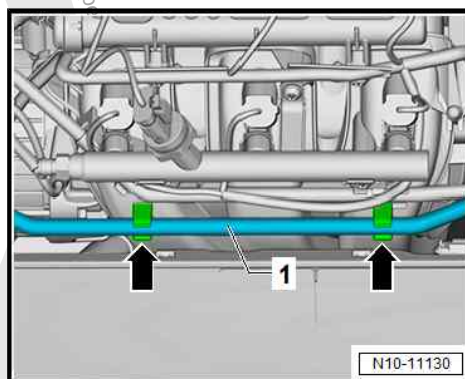
- Disconnect connector -arrow- and unclip line guide.



- Open vacuum line fastener -arrow- at intake manifold and pull off vacuum line.

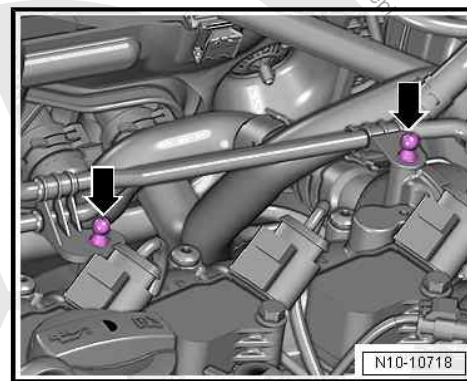


- If present, detach vacuum line -1- from retaining clips arrows-.

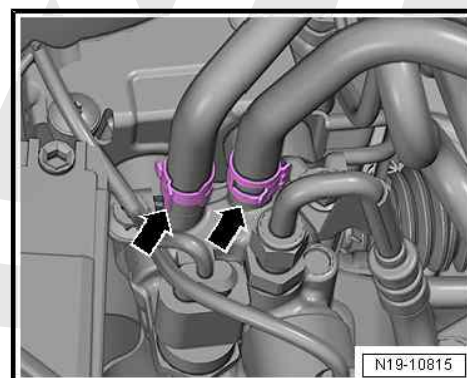




- Unscrew ball-head bolts -arrows-.



- Open clamps -arrows- on tank pressure sensor - G400- using hose clip pliers - VAS 6340- .
- Pull off coolant hoses.





- Loosen union nut -1- at low-pressure line and unscrew union nut. To do this, counterhold gas rail -2- with a spanner.
- Allow residual gas to escape.



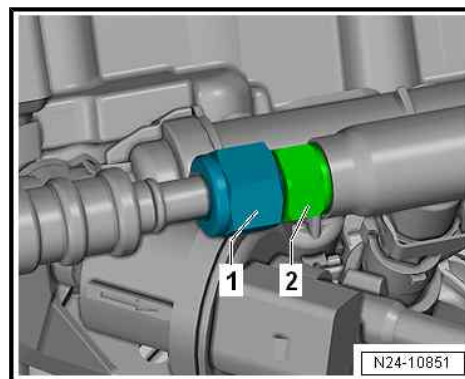
#### Note

*Ensure that the low-pressure line is not kinked.*

- Remove selector mechanism from gearbox: ⇒ Rep. gr. 34 ; Selector mechanism; Overview - selector mechanism

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

- Remove clutch slave cylinder: ⇒ Rep. gr. 30 ; Clutch slave cylinder; Removing and installing clutch slave cylinder



#### Vehicles with air conditioning system



#### Note

- ♦ *The air conditioning system lines must not be opened.*
- ♦ *Prevent damage to condenser and refrigerant lines and hoses.*
- ♦ *Do NOT stretch, kink or bend lines and hoses.*
- Remove poly V-belt  
⇒ ["1.3 Removing and installing poly-V belt", page 38](#) .
- Bring lock carrier into service position ⇒ General body repairs, exterior; Rep. gr. 50 ; Lock carrier .
- Remove air conditioner compressor: ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Removing and installing air conditioner compressor .
- Secure air conditioner compressor to lock carrier.

Make sure lines are not kinked.

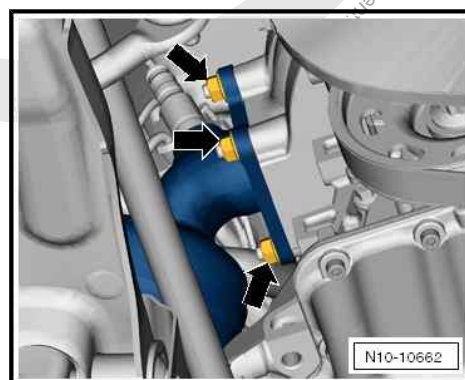
#### Continued for all vehicles

- Remove securing nuts -arrows- and pull catalytic converter off stud bolts.
- Secure catalytic converter to body.



#### Note

*Bolt -1- must not be loosened.*

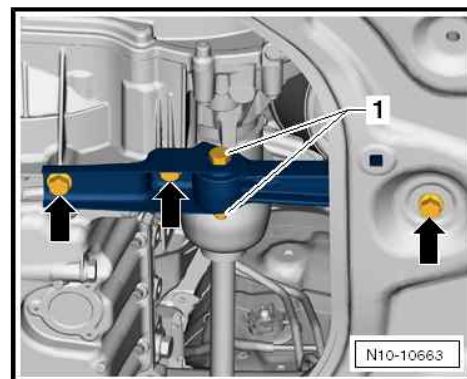






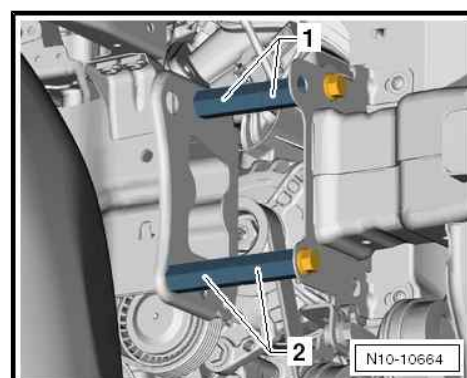
- Remove securing bolts -arrows- of pendulum support.
- Remove right and left drive shaft ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .

On right in direction of travel

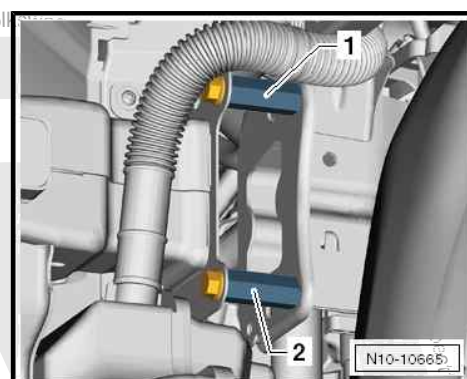


- Connect and install 2 adapters - T10480- -1- and -2- at each of the two positions.

On left in direction of travel

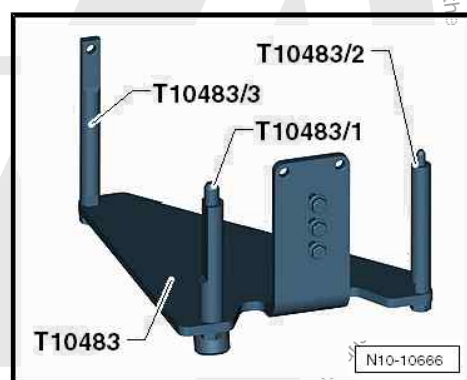


- Install 2 adapters - T10480- -1- and -2- in each position.



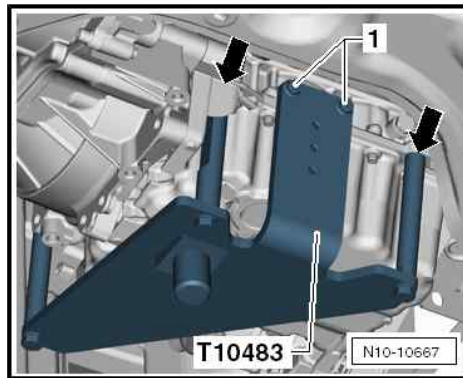
Engine support - T10483- with adapters -/1-, -/2- and -/3- is required to lower engine and gearbox.

- Push engine support - T10483- into crankcase holes -arrows- to stop.

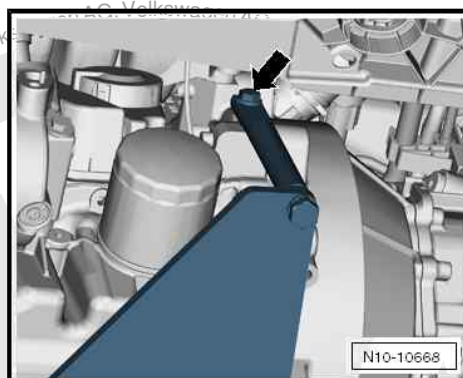




- Tighten bolts -1- by hand first.



- At first, tighten bolt -arrow- hand-tight.
- Tighten bolts -arrows- to 20 Nm.
- Also tighten all remaining bolts to 20 Nm.

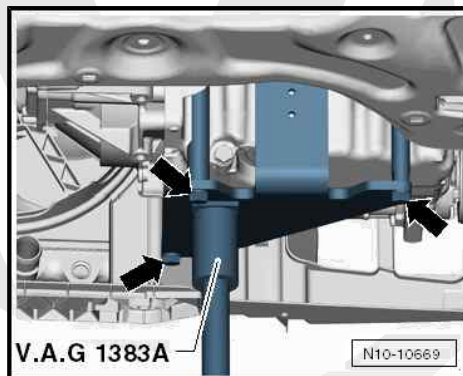


- Position engine and gearbox jack - V.A.G 1383 A- on engine support - T10416- .
- Lift engine and gearbox slightly using engine and gearbox jack - V.A.G 1383 A- .

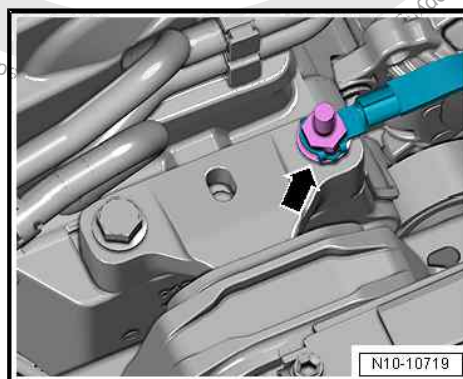


#### Note

*Use a commercially available stepladder to remove securing bolts.*

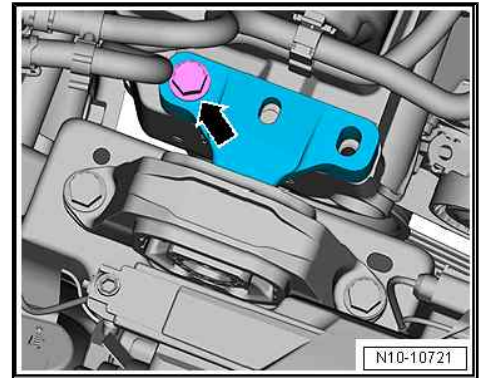


- Unscrew nut for earth strap -arrow- from assembly mounting.
- Place earth strap to one side and unscrew pin located underneath.





Unscrew securing bolt -arrow- and remove assembly mounting on engine side.



- Unscrew assembly mounting on gearbox side -arrows-.

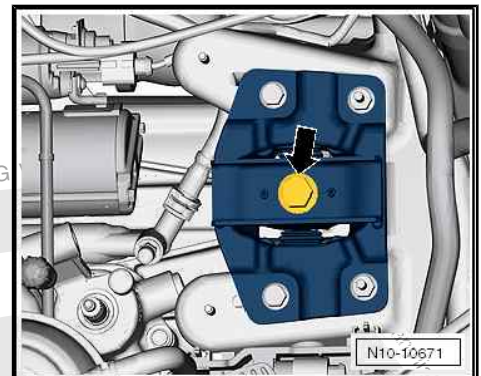


#### Note

*When removing, guide the assembly very carefully to prevent damage to body and trim.*

- Carefully lower engine and gearbox.

Secure engine to engine and gearbox support -VAS 6095- to carry out repairs.



## 1.2 Separating engine and gearbox

### Special tools and workshop equipment required

- ◆ Shackle - 10-222A/12-



- ◆ Workshop hoist - VAS 6100-



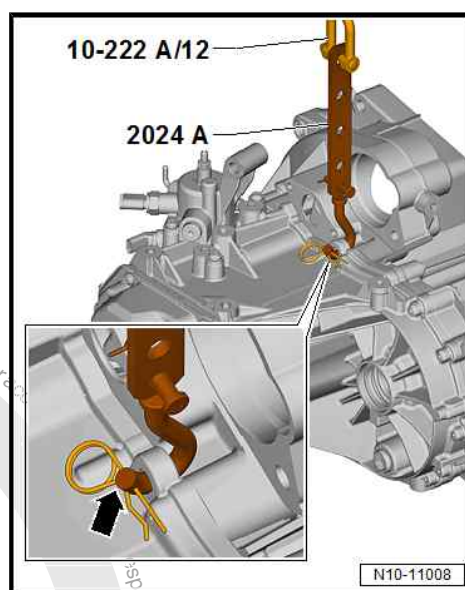


◆ Lifting tackle - 2024A-



**Procedure**

- Engine/gearbox assembly removed and attached to engine bracket - T10483- .
- Detach one hook from lifting tackle - 2024A- .
- Fit hook of lifting tackle - 2024A- to gearbox as shown in illustration, and secure connection with a split pin -arrow-.
- Fit shackle - 10-222A/12- to hook.
- Attach workshop hoist - VAS 6100- to shackle - 10-222A/12- .
- Raise gearbox slightly with workshop hoist - VAS 6100- .



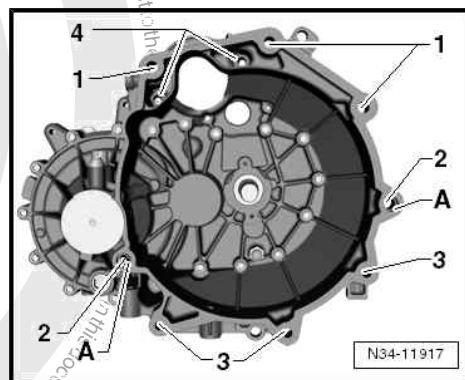
- Unscrew bolts -1, 2, 3-.



**Note**

Disregards items -4- and -A-.

- Pull gearbox off engine.



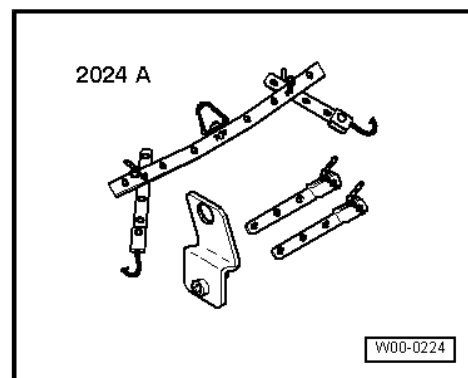
### 1.3 Securing engine on engine and gearbox support

Special tools and workshop equipment required

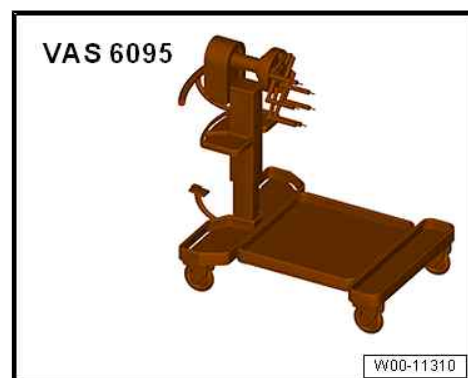




◆ Lifting tackle - 2024 A-



◆ Engine and gearbox support - VAS 6095-



◆ Workshop hoist - VAS 6100-



**Procedure**

- Engine removed ⇒ [“1.1 Removing engine”, page 9](#)
- Gearbox detached from engine  
⇒ [“1.2 Separating engine and gearbox”, page 17](#) .



**Note**

Disregard -item 2-.

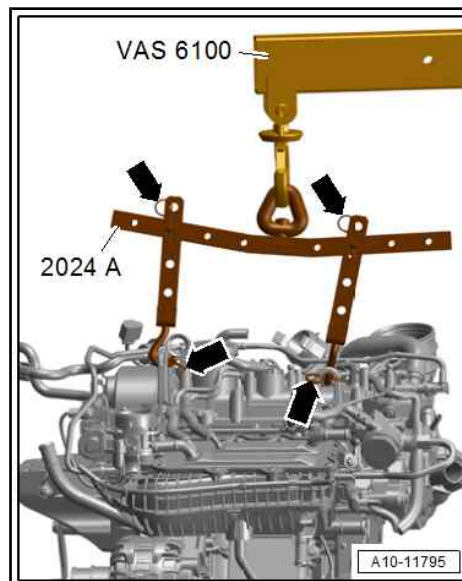


- Secure lifting tackle - 2024 A- on engine, and attach it to workshop hoist - VAS 6100- as shown in illustration.

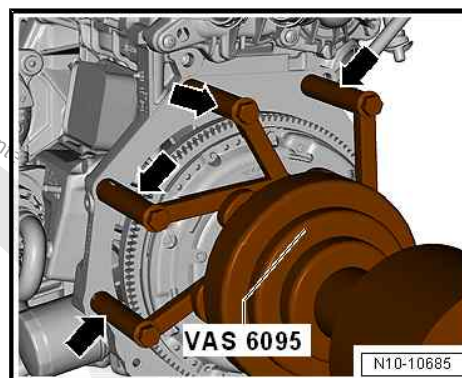


#### Note

- ◆ *In order to match the lifting tackle to the centre of gravity of the engine, the holes in the hook rail must be allocated as shown in the illustration.*
- ◆ *The support hooks and retaining pins on the lifting tackle must be secured with locking pins -arrows-.*
- Using workshop hoist - VAS 6100- , lift engine off engine bracket - T10483- .



- Secure engine on engine and gearbox support - VAS 6095- as shown in illustration.



## 1.4 Installing engine

Installation is carried out in reverse order of removal. When installing, note the following:

- Check clutch release bearing for wear and renew if necessary.
- Lightly grease clutch release bearing, release bearing guide sleeve and splines on input shaft with G 000 100.
- Check whether dowel sleeves for centring engine/gearbox have been fitted in cylinder block, insert if necessary.

Specified torques for gearbox: ⇒ Rep. gr. 34 ; Removing and installing gearbox: Specified torques for gearbox

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

- Rock engine to align engine mountings stress-free.

#### Vehicles with air conditioning system

- Install air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Removing and installing air conditioner compressor .
- Install poly V-belt  
⇒ ["1.3 Removing and installing poly-V belt", page 38](#) .

#### Continued for all vehicles

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



- Install selector mechanism to gearbox ⇒ Rep. gr. 34 ; Selector mechanism; Overview - selector mechanism .
- Add coolant ⇒ [“1.3 Draining and adding coolant”, page 159](#) .
- Install air filter housing  
⇒ [“5.2 Removing and installing air filter housing”, page 231](#) .

**Note**

- ◆ *The natural gas system may not be put into operation until it has been tested.*
- ◆ *The necessary scope of the leakage test depends on the pressure section which has been worked on.*
- ◆ *Observe the following allocation!*

**Allocation:**

⇒ [“3.1 Distinguishing between pressure sections of natural gas supply system”, page 212](#)

**DANGER**

Risk of explosion and danger to life due to escaping natural gas. Leaks in natural gas system may lead to uncontrolled escape of natural gas. Risk of explosion leading to serious injuries or death.

- Check natural gas system for leaks.

- Open fuel tank shut-off valves -N361/N362- using hand wheel - T50026- .

**DANGER**

Risk of explosion and danger to life due to escaping natural gas. A hissing noise is a sign that there are leaks in the natural gas system. Leaks in natural gas system may lead to uncontrolled escape of natural gas.

Risk of explosion leading to serious injuries or death.

- Do not perform any kind of work on the natural gas system if leaking gas can be heard.
- If a gas leak can be heard, do not drive the vehicle into the workshop.
- Park the vehicle outside and cordon off the area around it.

- Check the gas system  
⇒ [“3.5 Checking gas system for leaks”, page 217](#) .
- Connect ⇒ Vehicle diagnostic tester.
- Delete programmed values and adapt engine control unit - J623- to throttle valve control module.
- Switch on ignition, and select and carry out following menu options on ⇒ Vehicle diagnostic tester:
  - ◆ 0001 - Clear learnt values
  - ◆ 0001 - Adaption of throttle valve module - J338
- Perform vehicle system test ⇒ Vehicle diagnostic tester.
- Finish the vehicle system test so that any event entries stored during assembly can be cleared automatically.
- Carry out road test.



- Then carry out vehicle system test again and rectify any faults which may have occurred.

#### Specified torques

- ◆ Ball-head bolts  
⇒ [“1.1 Assembly overview - cylinder head”, page 61](#)
- ◆ Assembly mountings ⇒ [“2 Assembly mountings”, page 23](#)
- ◆ Supply line for gas rail  
⇒ [“4.1 Assembly overview - gas rail”, page 222](#)





## 2 Assembly mountings

⇒ [“2.1 Assembly overview - assembly mountings”, page 23](#)

⇒ [“2.2 Removing and installing engine mounting”, page 24](#)

⇒ [“2.3 Removing and installing gearbox mounting”, page 25](#)

⇒ [“2.4 Removing and installing pendulum support”, page 26](#)

⇒ [“2.5 Supporting engine in installation position”, page 26](#)

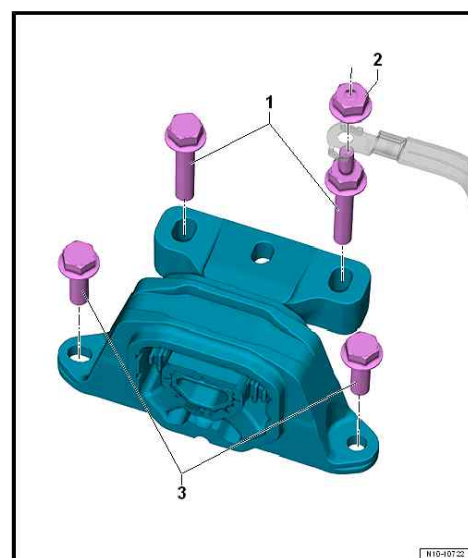
⇒ [“2.6 Adjusting assembly mountings”, page 34](#)

⇒ [“2.7 Checking adjustment of assembly mountings \(engine and gearbox mountings\)”, page 35](#)

### 2.1 Assembly overview - assembly mountings

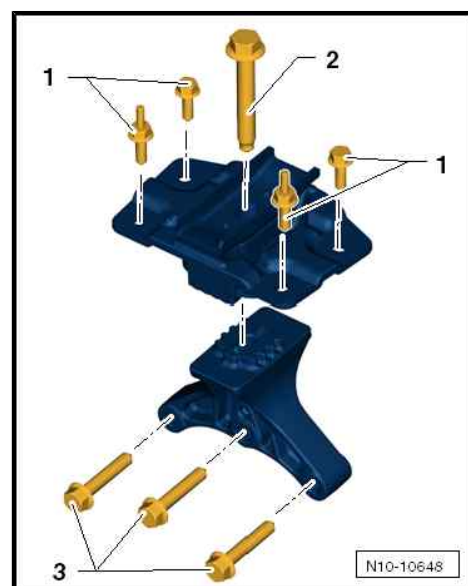
#### Engine mounting

Component	Specified torque	Condition
Item -1-: bolt	40 Nm +90° further	Renew bolts after removing
Item -2-: nut	20 Nm	
Item -3-: bolt	40 Nm +90° further	Renew bolts after removing



#### Gearbox mounting

Component	Specified torque	Condition
Item -1-: bolt	20 Nm +90° further	Renew bolts after removing
Item -2-: bolt	60 Nm +180° further	Renew bolts after removing
Item -3-: bolt	40 Nm +90° further	Renew bolts after removing





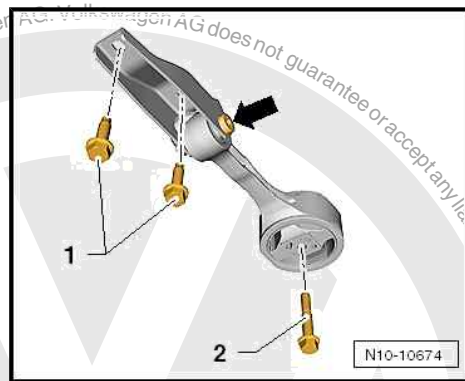
## Pendulum support



### Note

*Bolt -arrow- must not be loosened.*

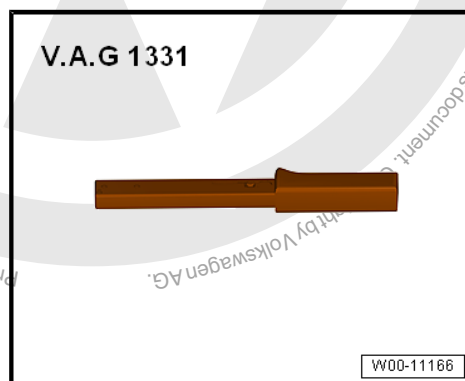
Component	Specified torque	Condition
Item -1-: bolt	40 Nm +90° further	Renew bolts after removing
Item -2-: bolt	40 Nm +90° further	Renew bolts after removing



## 2.2 Removing and installing engine mounting

### Special tools and workshop equipment required

- ◆ Torque wrench - V.A.G 1331-



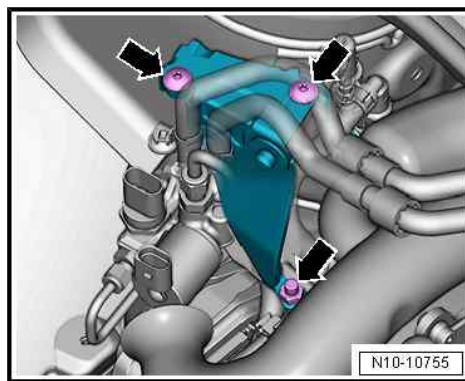
- Support engine in its installation position  
⇒ "2.5.1 Supporting engine in installation position, on camshaft housing (right-side)", page 26 .
- Unscrew securing bolts and securing nut -arrows- of gas pressure regulator.



### Note

*Take care not to bend the pipes.*

- Carefully push gas pressure regulator aside until the engine bracket bolts are accessible.
- Unscrew earth wire -1-.







Unscrew securing bolts -arrows- and remove assembly mounting on engine side.

Further assembly is basically a reverse of the dismantling sequence.



#### Note

- ◆ *The engine mounting must be free of tension when pre-tightening bolts.*
- ◆ *The final specified torque must not be applied until the vehicle has been lowered completely.*

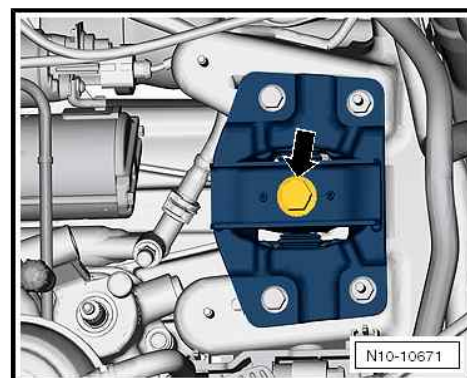
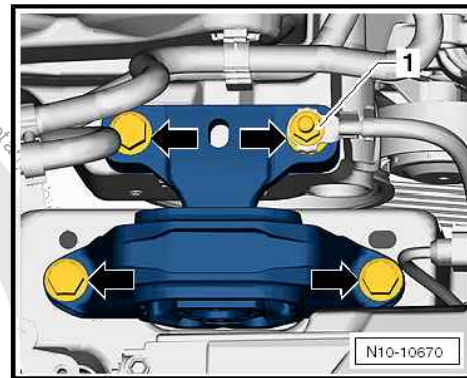
#### Specified torques

- ◆ → ["2.1 Assembly overview - assembly mountings", page 23](#)
- ◆ → ["10.1 Assembly overview - gas pressure regulator", page 255](#)

## 2.3 Removing and installing gearbox mounting

### Removing

- Remove battery tray ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery tray .
- Support engine in its installation position  
⇒ ["2.5.2 Supporting engine in installation position; on crank-case", page 28](#) .
- Unscrew bolt -arrow- from gearbox mounting.





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

### Installing

Install in reverse order, noting the following:

Risk of damaging thread in gearbox support if bolts are started at an angle.

- Gearbox support and support arm of gearbox mounting must be perfectly parallel to each other before screwing in bolts. If necessary, lift gearbox at rear using trolley jack.
- Tighten gearbox mounting on longitudinal member.



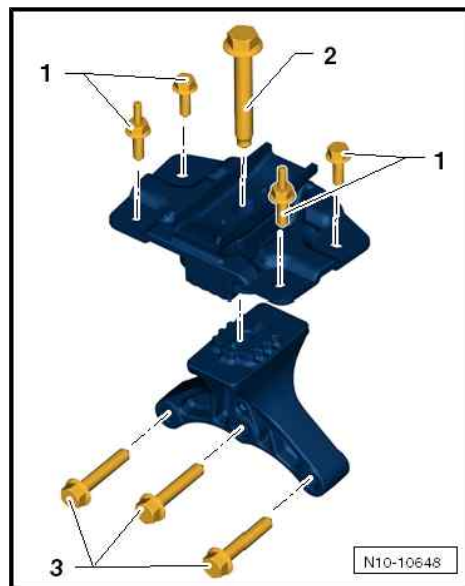
### Note

*Renew bolts that are tightened with specified further tightening angle.*

- Lift gearbox with spindle of support bracket until gearbox support makes contact with support arm of gearbox mounting.
- Check adjustment of assembly mountings.
- Remove support bracket - 10 - 222 A- from engine.

### Specified torques

- ♦ ⇒ [“2.1 Assembly overview - assembly mountings”, page 23](#)
- ♦ ⇒ Electrical system; Rep. gr. 27 ; Battery; Assembly overview - battery



## 2.4 Removing and installing pendulum support

- Remove securing bolts -arrows- of pendulum support.



### Note

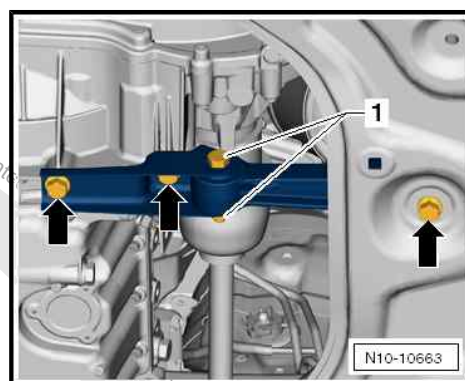
*Bolt -1- must not be loosened.*

### Installing

Install in reverse order, noting the following:

### Specified torques

- ♦ ⇒ [“2.1 Assembly overview - assembly mountings”, page 23](#)



## 2.5 Supporting engine in installation position

⇒ [“2.5.1 Supporting engine in installation position, on camshaft housing \(right-side\)”, page 26](#)

⇒ [“2.5.2 Supporting engine in installation position, on crankcase”, page 28](#)

⇒ [“2.5.3 Supporting engine in installation position, on left of camshaft housing”, page 31](#)

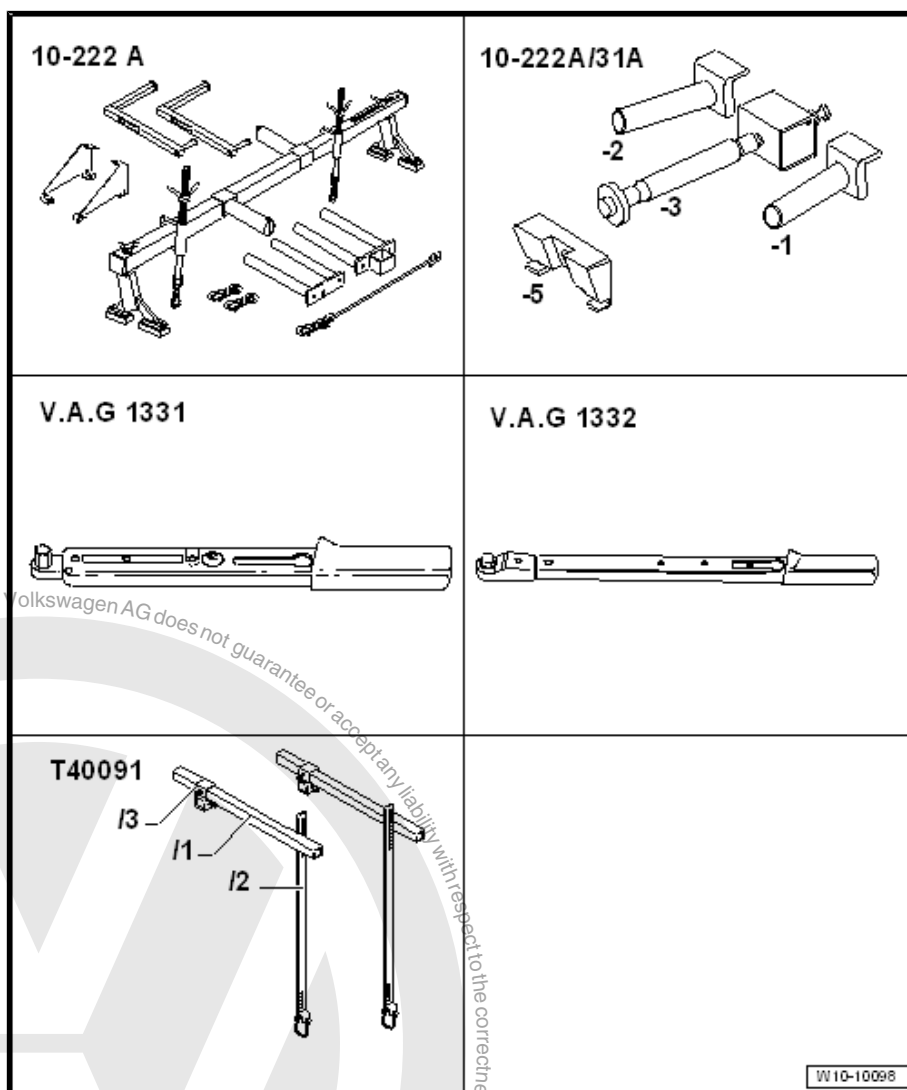
### 2.5.1 Supporting engine in installation position, on camshaft housing (right-side)

- Depending on which parts need to be removed, the engine must be supported at 2 different points.





- For removal of the following components, adopt the procedure as follows:
- Engine mounting
- Engine mounting bracket
- Toothed belt or components of belt drive to production date WEEK 22.2012
- A modified toothed belt tensioning roller is installed on vehicles manufactured as of week 22 of 2012.
- Due to the modified tensioning roller, the engine no longer needs to be supported by means of the support bracket when removing the cylinder head and camshaft housing.



#### Special tools and workshop equipment required

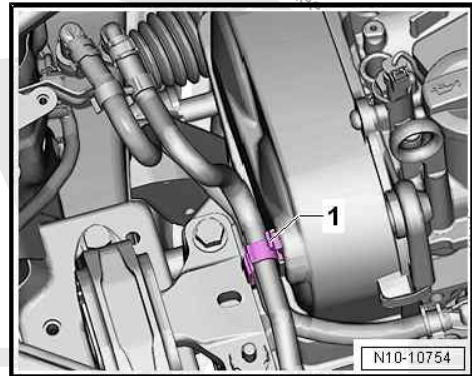
- ◆ Support - 10-222 A-
- ◆ Adapter - 10 - 222 A /3-
- ◆ Adapter - 10 - 222 A /31-1-
- ◆ Adapter - 10 - 222 A /31-2-
- ◆ Joints - T40091/3-



- ◆ Square tube - T40091/1-
- ◆ Support - 10 - 222 A /31-3-
- ◆ Adapter - 10 - 222 A /31-5-
- ◆ Torque wrench - V.A.G 1331-
- ◆ Torque wrench - V.A.G 1332-

#### Procedure

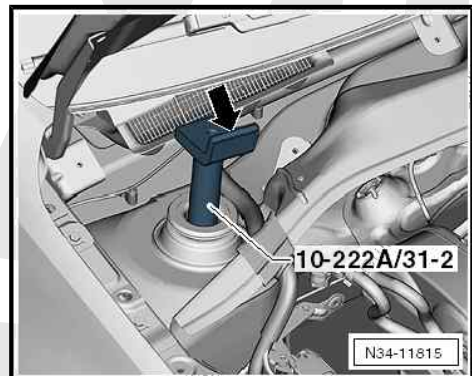
- Unclip coolant hoses from toothed belt guard.
- Remove air filter housing  
⇒ ["5.2 Removing and installing air filter housing", page 231](#) .
- Wiper arms ⇒ Electrical system; Rep. gr. 92 ; Windscreen wiper system; Removing and installing wiper arms .
- Plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover



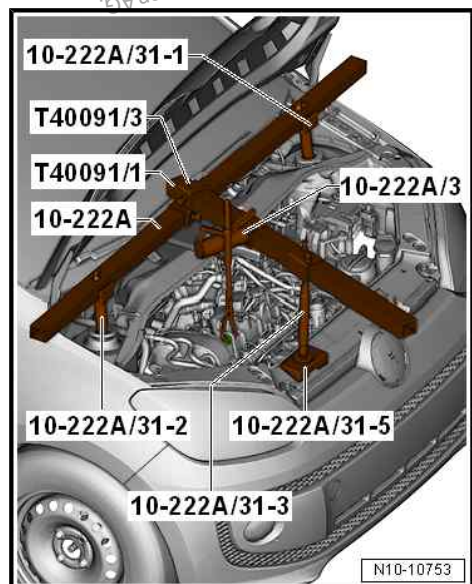
- Fit adapter - 10 - 222 A /31-1- and adapter - 10 - 222 A /31-2- onto suspension strut supports.

Angled pieces of adapters -arrow- point towards engine compartment.

- If fitted, pull bonnet seal off lock carrier.
- Fit support bracket - 10 - 222 A /31-5- near right headlight onto lock carrier.



- Slide connecting piece - T40091/3- onto support bracket - 10-222 A- .
- Bolt support bracket - 10-222 A- to adapter - 10 - 222 A /31-1- and to adapter - 10 - 222 A /31-2- .
- Connect square section tube - T40091/1- to support bracket - 10-222 A- .
- Fit square section tube over support - 10 - 222 A /31-3- onto adapter - 10 - 222 A /31-5- .
- Bolt spindle to adapter - 10 - 222 A /3- .
- Attach spindle to right lifting eye on engine.
- Take up weight of engine/gearbox assembly on spindle .



### 2.5.2 Supporting engine in installation position, on crankcase

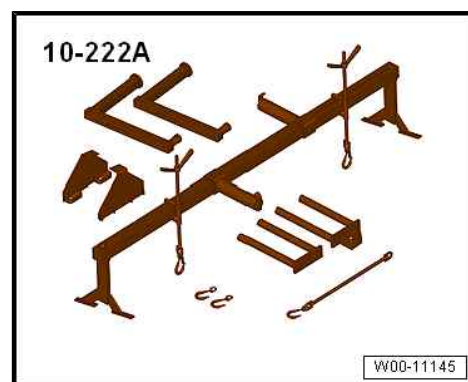
- Depending on which parts need to be removed, the engine must be supported at 2 different points.



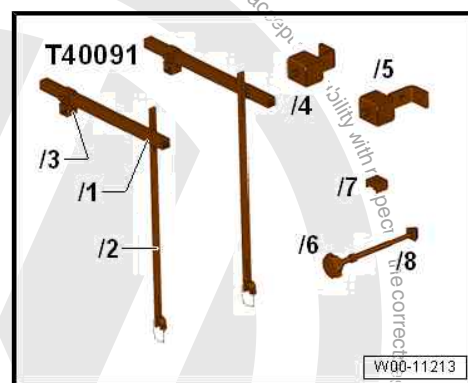
- For removal of the following component, adopt the procedure as follows:
- Gearbox mounting

#### Special tools and workshop equipment required

- ◆ Support - 10 - 222 A-



- ◆ Adapter - 10-222 A/31-2- (not illustrated)
- ◆ Support - 10-222 A/31-3- (not illustrated)
- ◆ Adapter - 10-222 A/31-5- (not illustrated)
- ◆ Shackle - 10-222 A/12- (not illustrated)
- ◆ Engine support basic set - T40091



- ◆ Square tube - T40091/1- (not illustrated)
- ◆ Connector - T40091/3- (not illustrated)
- ◆ Torque wrench - V.A.G 1332





◆ Bracket - T10358-

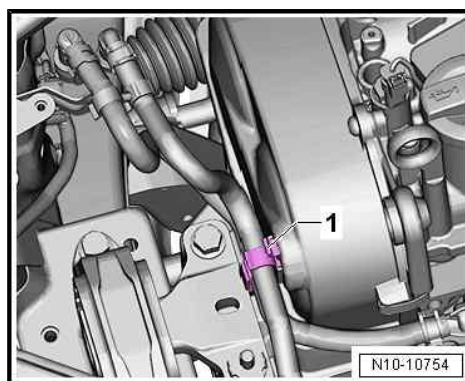


- Unclip coolant hoses from toothed belt guard.
- Remove air filter housing  
⇒ [“5.2 Removing and installing air filter housing”, page 231](#) .
- Drain coolant  
⇒ [“1.3 Draining and adding coolant”, page 159](#) .
- Remove coolant pump  
⇒ [“2.3 Removing and installing coolant pump”, page 169](#) .



**Note**

*The coolant pump toothed belt pulley is not being removed from the camshaft.*



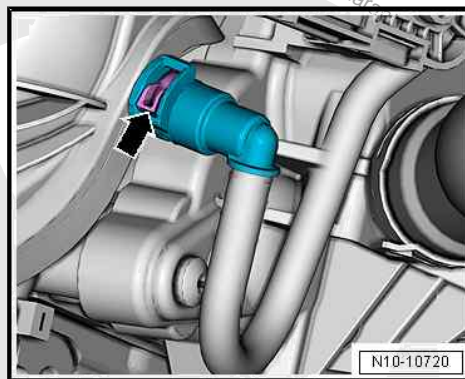
- Remove throttle valve module - GX3-  
⇒ [“6.3 Removing and installing throttle valve module GX3”, page 238](#) .
- Open vacuum line fastener -arrow- at intake manifold and pull off vacuum line.



**Note**

*A modified toothed belt tensioning roller is installed on vehicles as of week 22 of 2012. The removal and installation of the assembly mountings, the engine mounting bracket and the lower toothed belt guard are eliminated.*

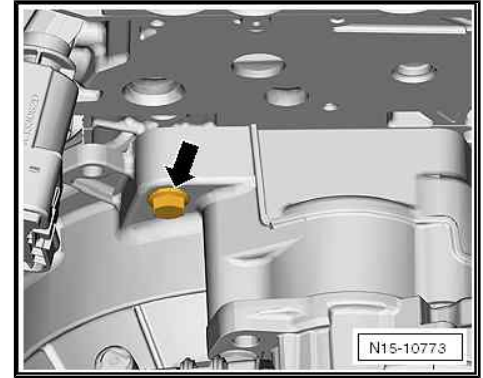
- Remove windscreen wiper arms: ⇒ Electrical system; Rep. gr. 92 ; Windscreen wiper system; Removing and installing windscreen wiper arms .
- Remove plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Plenum chamber bulkhead; Removing and installing plenum chamber cover .



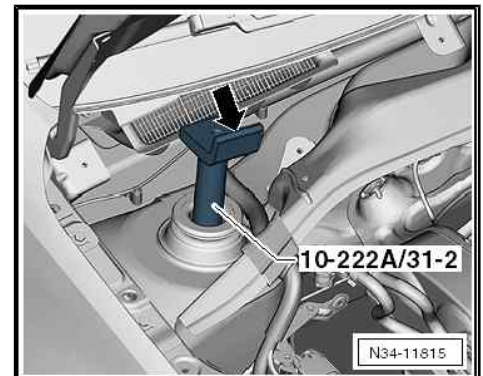




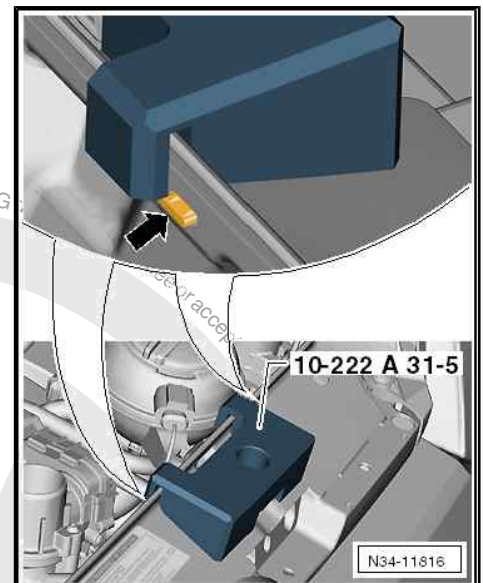
- Remove securing bolt -arrow- for gearbox.
- Connect bracket - T10358- to gearbox using securing bolt.



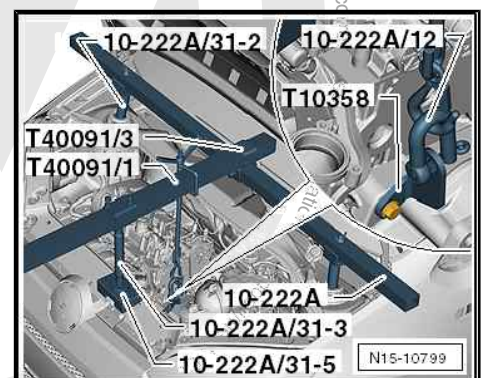
- Fit adapter - 10-222A/31-2- onto suspension struts.
- Angle pieces of adapter -arrow- point towards engine compartment.



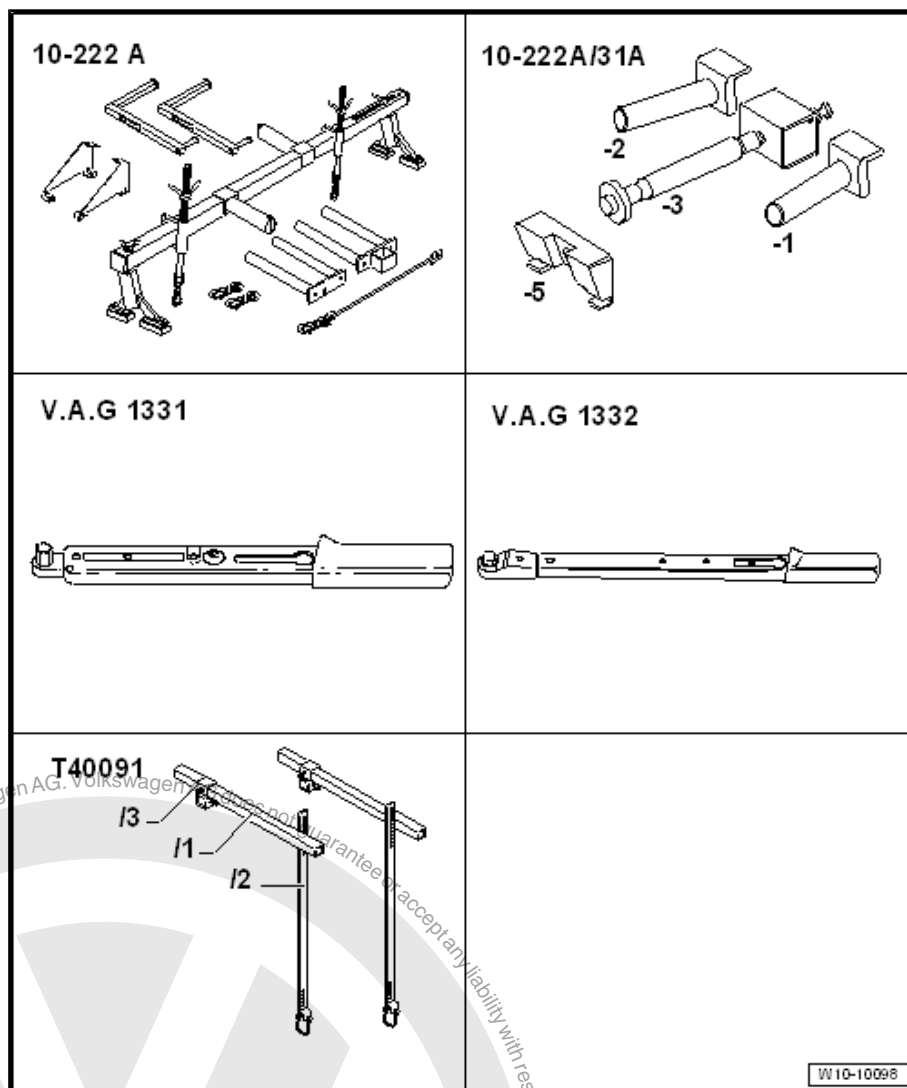
- Position support - 10-222A/31-5- above bonnet catch.
- Correct position is between 2 lugs -arrow-.
- Fit support bracket - 10 - 222 A- and engine support basic set - T40091- with adapters as shown.



- Bolt shackle - 10-222 A/12- to bracket - T10358- .
- Attach hook with spindle to shackle and slightly release load from assembly mounting by turning spindle.



### 2.5.3 Supporting engine in installation position, on left of camshaft housing



### Special tools and workshop equipment required

- ◆ Support - 10-222 A-
- ◆ Adapter - 10 - 222 A /3-
- ◆ Adapter - 10 - 222 A /31-1-
- ◆ Adapter - 10 - 222 A /31-2-
- ◆ Joints - T40091/3-
- ◆ Square tube - T40091/1-
- ◆ Support - 10 - 222 A /31-3-
- ◆ Adapter - 10 - 222 A /31-5-
- ◆ Shackle - 10 - 222 A /12-
- ◆ Torque wrench - V.A.G 1331-
- ◆ Torque wrench - V.A.G 1332-



### Check tools, and prepare them as necessary:

- If engine support bracket - 10 - 222 A- does not yet have hole (marked with -arrow-), the hole must now be drilled into engine support bracket.
- Dimension -a- = 225 mm
- Hole  $\varnothing$  = 12.5 mm.

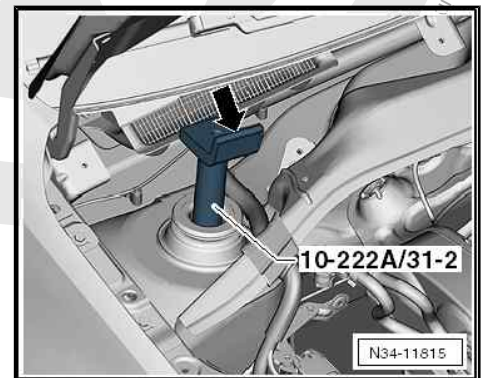
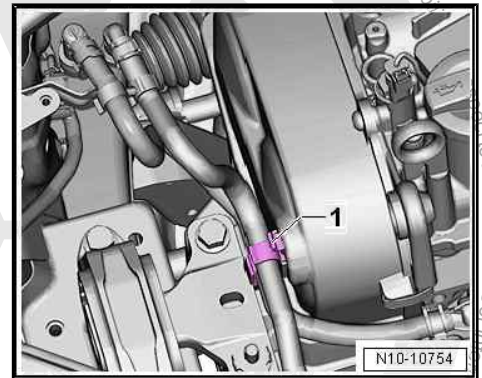
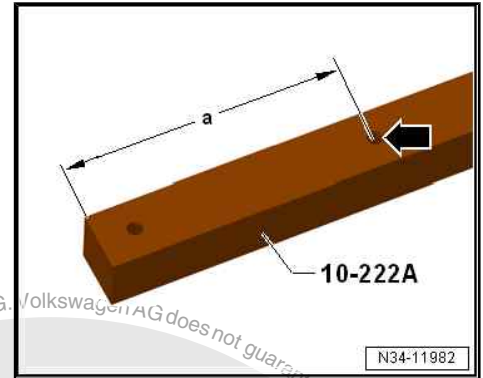
### Procedure



#### Note

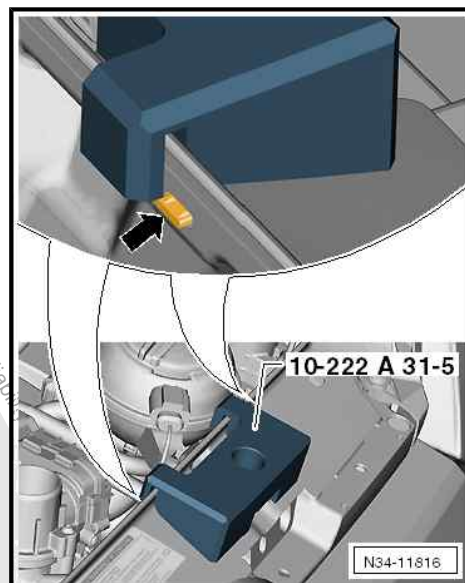
*The securing bolts for the assembly mountings must be removed only if the engine is supported in installation position using the support bracket - 10-222 A- !*

- Unclip coolant hoses from toothed belt guard.
- Remove air filter housing  
⇒ ["5.2 Removing and installing air filter housing", page 231](#) .
- Wiper arms ⇒ Electrical system; Rep. gr. 92 ; Windscreen wiper system; Removing and installing wiper arms .
- Plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber cover
- Remove caps from shock absorbers ⇒ Running gear, axles, steering; Rep. gr. 40 ; Suspension strut, upper suspension link; Assembly overview - suspension strut, upper suspension link .
- Fit adapter - 10 - 222 A /31-1- and adapter - 10 - 222 A /31-2- onto suspension strut supports.
- Angled pieces of adapters -arrow- point towards engine compartment.
- Pull bonnet seal off lock carrier.





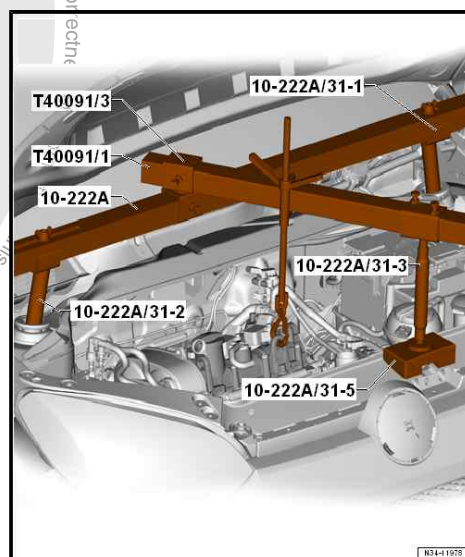
- Position support bracket - 10-222A/31-5- on lock carrier as shown in illustration.
- Observe angled pieces -arrow- on lock carrier.
- Attach support bracket - 10-222A/31-5- at rear to lock carrier as shown in illustration.



Fit support bracket, and attach it to left lifting eye as shown in illustration.

Slide connecting piece - T40091/3- onto support bracket - 10-222 A- .

- Bolt support bracket - 10-222 A- to adapter - 10 - 222 A /31-1- and to adapter - 10 - 222 A /31-2- .
- Push square tube - T40091/1- into mounting of support - 10 - 222 A /31-3- .
- Push adapter - 10 - 222 A /3- onto square tube - T40091/1- .
- Insert support - 10 - 222 A /31-3- into mounting - 10-222A/31-5- as shown in illustration.
- Screw shackle - 10 - 222 A /12- into support eye on left side.
- Attach spindle - 10-222A- to adapter - 10 - 222 A /3- .
- Attach spindle - 10-222A- to shackle - 10 - 222 A /12- on left side.
- Align support bracket; support bracket - 10-222A/31-5- can be moved on lock carrier during alignment.
- Tighten all threaded connections of support bracket.
- Take up weight of engine/gearbox assembly on spindle .



## 2.6 Adjusting assembly mountings

### Procedure

- Support engine in its installation position  
⇒ ["2.5.1 Supporting engine in installation position, on cam-shaft housing \(right-side\)", page 26](#) .
- Renew assembly mounting bolts one after the other (if not already carried out), and tighten them by hand.



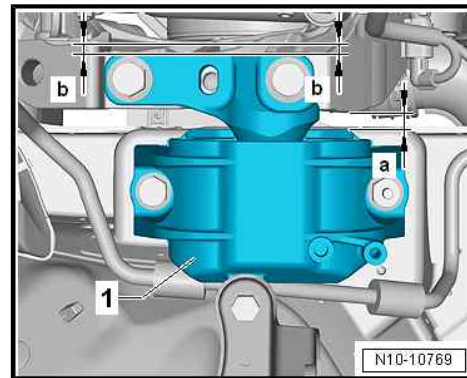


- The dimension -a- between engine support and right longitudinal member must be even at front and rear.
- Tighten bolts for assembly mounting.

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

#### Specified torques

- ◆ ⇒ [“2.7 Checking adjustment of assembly mountings \(engine and gearbox mountings\)”, page 35](#)



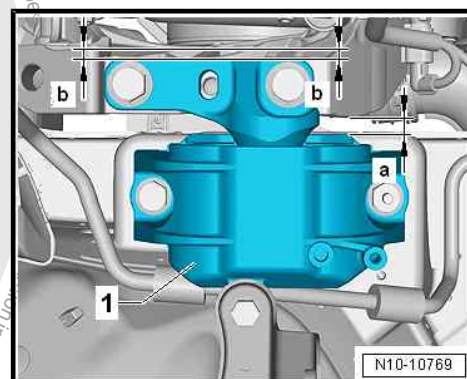
## 2.7 Checking adjustment of assembly mountings (engine and gearbox mountings)

### Procedure

- The dimension -a- between engine support and right longitudinal member must be even at front and rear.

**If there is a noise problem (engine or gearbox contacts longitudinal member when travelling around bends)**

- Adjusting assembly mountings  
⇒ [“2.6 Adjusting assembly mountings”, page 34](#) .



## 13 – Crankshaft group

### 1 Cylinder block (pulley end)

⇒ [“1.1 Assembly overview - poly V-belt drive”, page 36](#)

⇒ [“1.2 Assembly overview - cylinder block \(pulley end\)”, page 37](#)

⇒ [“1.3 Removing and installing poly-V belt”, page 38](#)

⇒ [“1.4 Renewing crankshaft oil seal - belt pulley end”, page 40](#)

#### 1.1 Assembly overview - poly V-belt drive

##### 1 - Bolt

- ☐ Renew after removal
- ☐ 150 Nm +180°

##### 2 - Vibration damper

- ☐ For crankshaft
- ☐ Do not cant when installing
- ☐ To remove and install, use counterhold tool - T10475-

##### 3 - Bolt

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

##### 4 - Cap

##### 5 - Bolt

- ☐ 30 Nm

##### 6 - Tensioning element

##### 7 - Bolt

- ☐ 23 Nm

##### 8 - Alternator

##### 9 - Guide bush

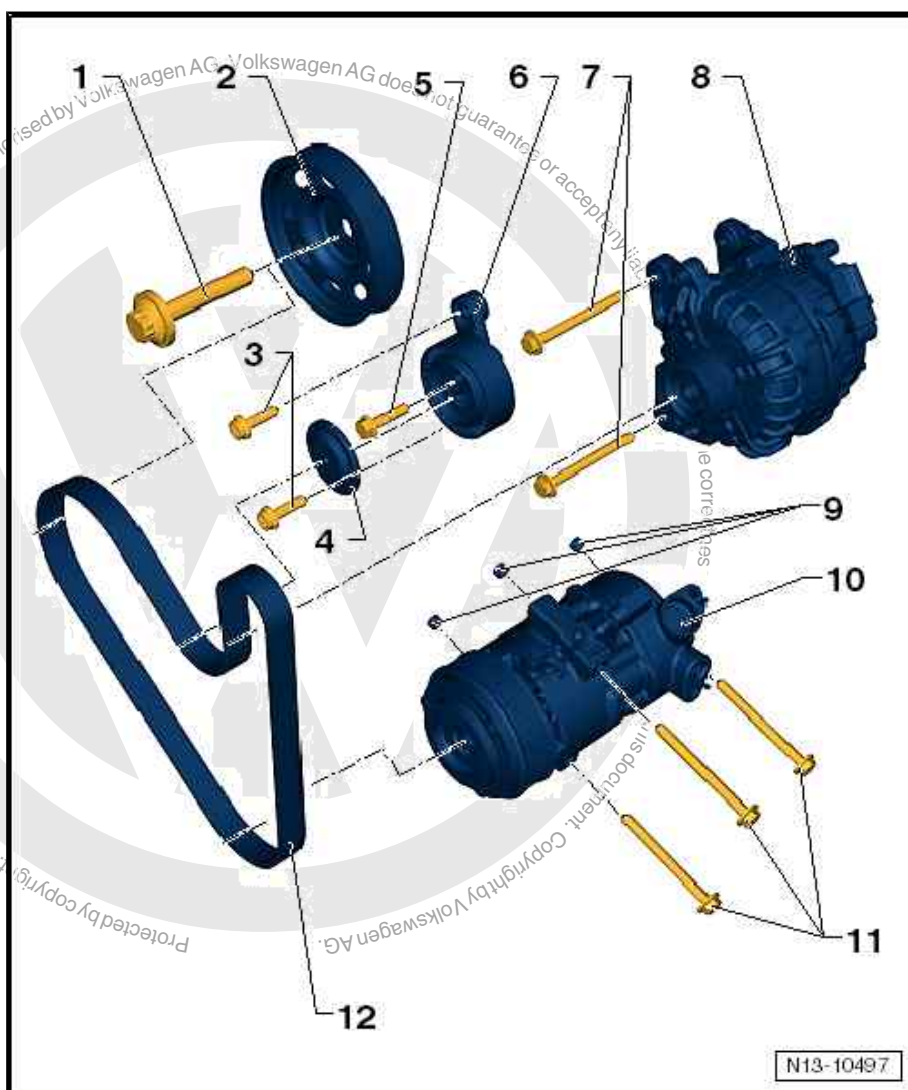
##### 10 - Air conditioner compressor

##### 11 - Bolt

- ☐ 23 Nm

##### 12 - Poly V-belt

- ☐ Mark direction of rotation before removing
- ☐ Removing and installing  
⇒ [“1.3 Removing and installing poly-V belt”, page 38](#)





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

### 1 - Bolt

- ☐ 8 Nm

### 2 - Toothed belt guard

### 3 - Bolt

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

### 4 - Crankshaft

- ☐ For exhaust camshaft
- ☐ Removing and installing  
⇒ [“3.4 Removing and installing toothed belt pulley”, page 118](#)

### 5 - Seal

- ☐ Removing and installing  
⇒ [“3.5 Removing and installing camshaft oil seal”, page 121](#)

### 6 - Toothed belt

- ☐ Removing and installing  
⇒ [“2.3 Removing and installing toothed belt”, page 81](#)

### 7 - Plug

- ☐ 20 Nm

### 8 - Seal

- ☐ Renew if damaged

### 9 - Bolt

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

### 10 - Camshaft adjuster

- ☐ For inlet camshaft
- ☐ Removing and installing ⇒ [“3.3 Removing and installing camshaft adjuster”, page 114](#)

### 11 - Guide bush

### 12 - Seal

- ☐ Removing and installing ⇒ [“3.5 Removing and installing camshaft oil seal”, page 121](#)

### 13 - Bolt

- ☐ 25 Nm

### 14 - Tensioning pulley

### 15 - Idler roller

### 16 - Spacer sleeve

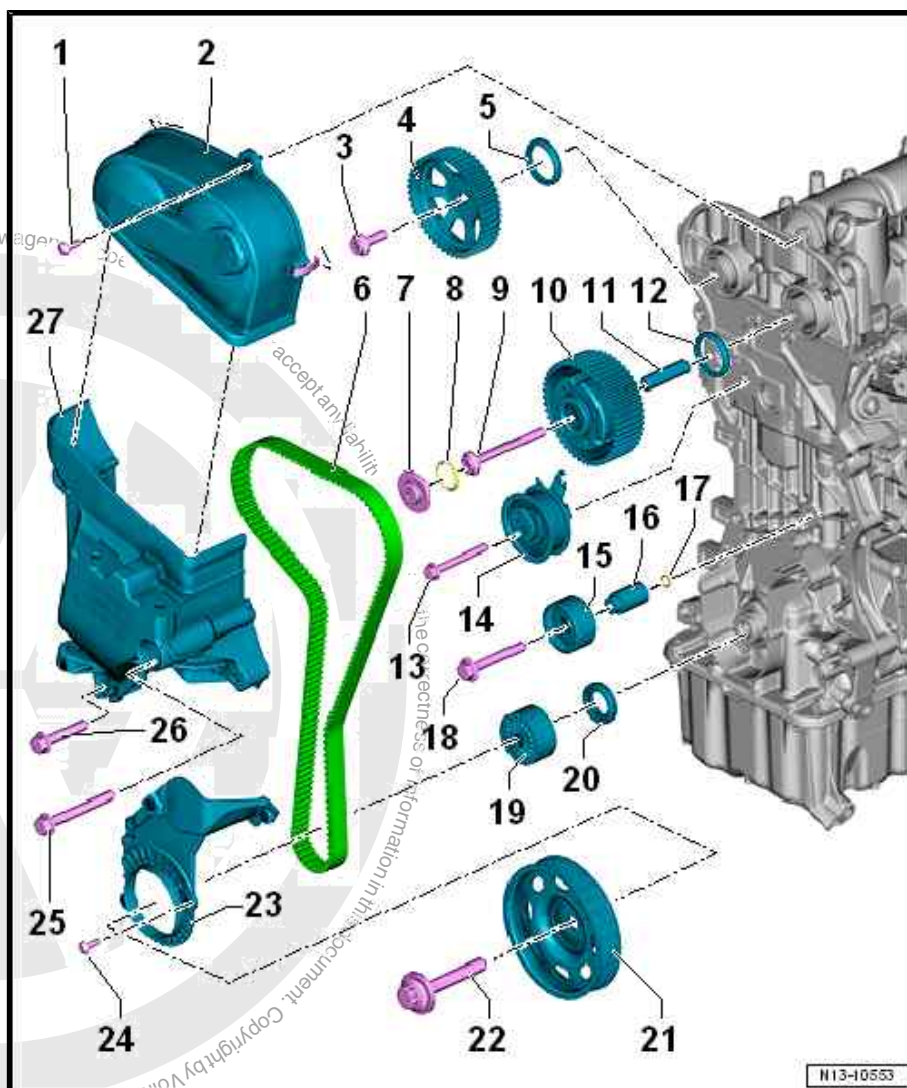
- ☐ In event of damage, only available in connection with idler roller »item 15«

### 17 - Seal

- ☐ In event of damage, only available in connection with idler roller »item 15«

### 18 - Bolt

- ☐ 25 Nm
- ☐ When removing and installing tensioning roller, keep from falling down



N13-10553



## 19 - Crankshaft

## 20 - Seal

- ☐ Removing and installing ⇒ ["1.4 Renewing crankshaft oil seal - belt pulley end", page 40](#)

## 21 - Vibration damper

- ☐ For crankshaft
- ☐ Do not cant when installing
- ☐ To remove and install, use counterhold tool - T10475- .

## 22 - Bolt

- ☐ Renew after removal
- ☐ 150 Nm +180°

## 23 - Toothed belt guard

## 24 - Bolt

- ☐ 8 Nm

## 25 - Bolt

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

## 26 - Bolt

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

## 27 - Engine mounting bracket

- ☐ Before removal, support using support bracket - 10 - 222 A-

## 1.3 Removing and installing poly-V belt

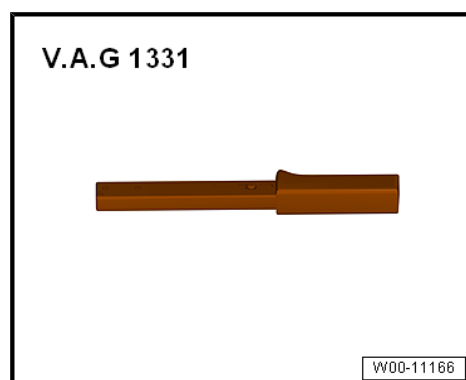
⇒ ["1.3.1 Removing and installing poly V-belt, vehicles with air conditioner compressor", page 38](#)

⇒ ["1.3.2 Removing and installing poly V-belt, vehicles without air conditioner compressor", page 39](#)

### 1.3.1 Removing and installing poly V-belt, vehicles with air conditioner compressor

#### Special tools and workshop equipment required

- ◆ Torque wrench - V.A.G 1331-



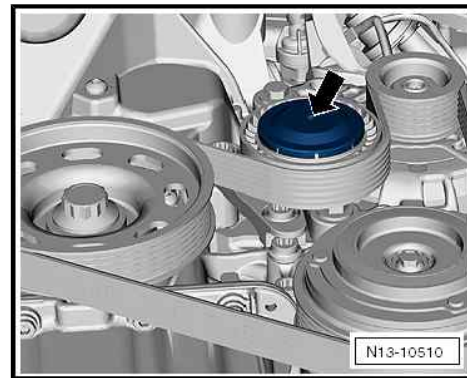
#### Removing

- If fitted, remove front noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
- Mark the direction of rotation of the poly V-belt with a marker.





- Lever off belt tensioner cap -arrow- using a screwdriver.
- Loosen securing bolt -1-.



- Turn belt tensioner -2- in -direction of arrow- past TDC using a socket.
- Remove poly V-belt.

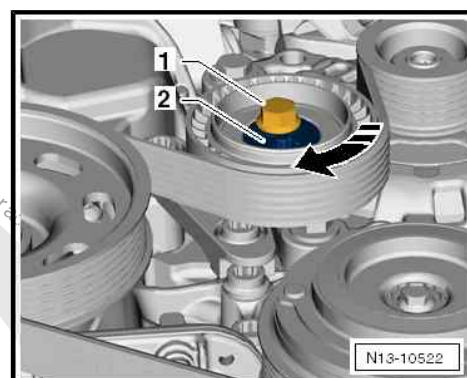
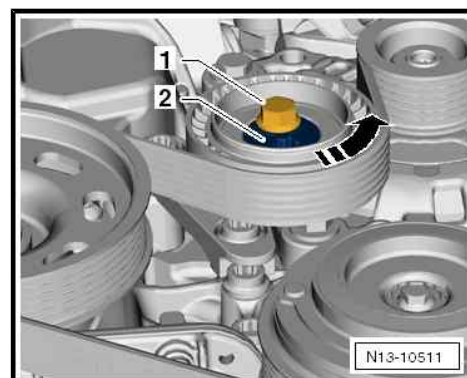
### Installing



#### Note

*When installing the poly V-belt, ensure that the belt is properly seated in the vibration damper and the belt pulleys.*

- Fit poly V-belt over vibration damper pulley and pulleys of alternator and air conditioner compressor.
- Push belt onto belt tensioner.
- Turn belt tensioner -2- in -direction of arrow- past TDC using a socket.
- Tighten securing bolt -1- to specified torque.

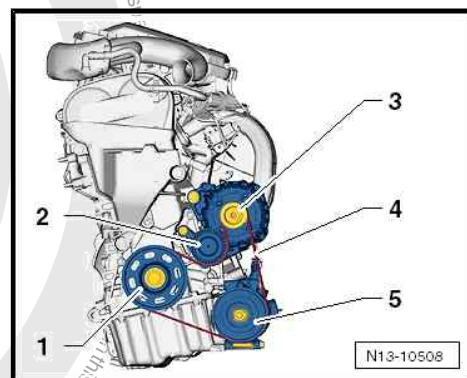


### Poly V-belt routing

- 1 - Vibration damper/crankshaft
- 2 - Tensioning pulley
- 3 - Alternator pulley
- 4 - Poly V-belt
- 5 - Air conditioner compressor pulley

### Specified torques

⇒ ["1.1 Assembly overview - poly V-belt drive", page 36](#)



## 1.3.2 Removing and installing poly V-belt, vehicles without air conditioner compressor

### Special tools and workshop equipment required



up! 2012 ➤ , up! 2017 ➤

3-cyl. injection engine (1.0 l, natural gas 4V, EA 211) - Edition 06.2019

- ♦ Poly V-belt repair kit with assembly tools ⇒ Electronic Parts Catalogue (ETKA)

#### Procedure



#### Note

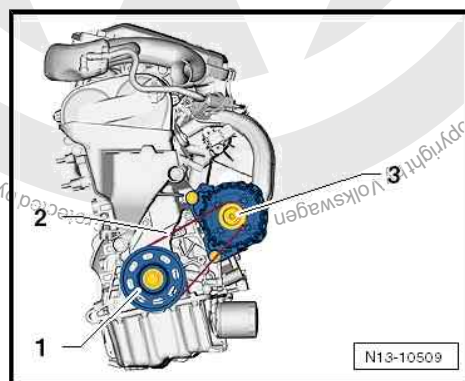
*The poly V-belt repair kit with assembly tool contains the assembly tool -T10367/2- and instructions.*

- If fitted, remove front noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
- Cut through poly V-belt.

Proceed as described in the instructions provided with the repair kit.

#### Poly V-belt routing

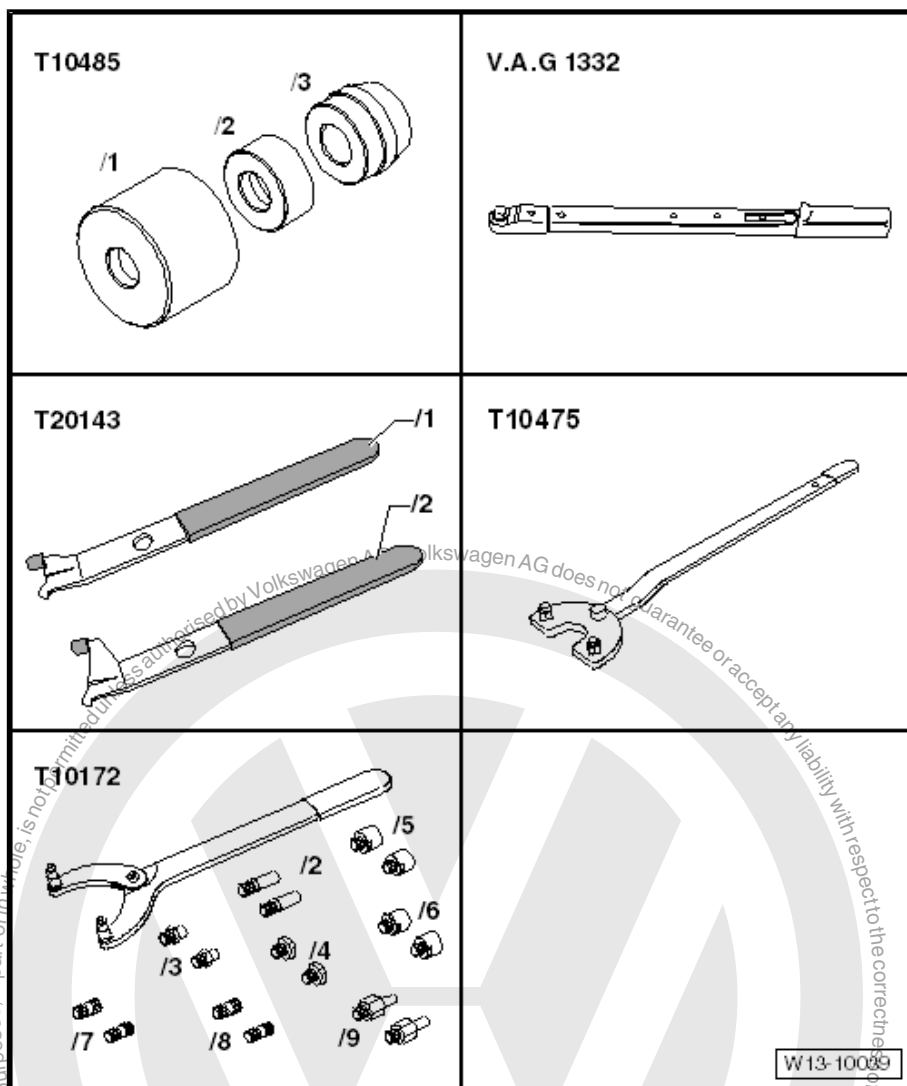
- 1 - Vibration damper/crankshaft
- 2 - Poly V-belt
- 3 - Alternator pulley



## 1.4 Renewing crankshaft oil seal - belt pulley end



# Special tools and workshop equipment required



- ◆ Assembly tool - T10485-
- ◆ Torque wrench - V.A.G 1332-
- ◆ Extractor hook - T20143-
- ◆ Counter-hold tool - T10475-
- ◆ Counter-hold tool - T10172-

## **NOTICE**

**Risk of damage to bearing pedestals when the crankshaft is removed.**

If the bolts of the crankshaft bearing cap are loosened, the bearing pedestals of the cylinder block will be deformed, and damage to the bearings will result.

- Never remove the crankshaft.



## **Note**

*Measuring the main bearing clearance is not possible with normal workshop equipment.*

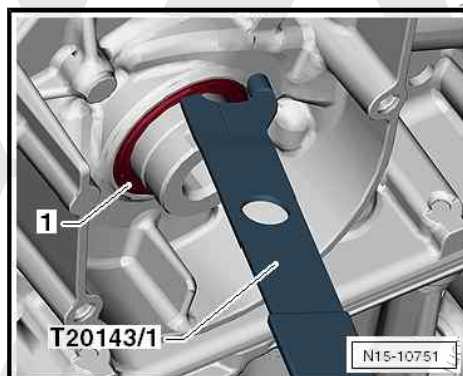


## Removing

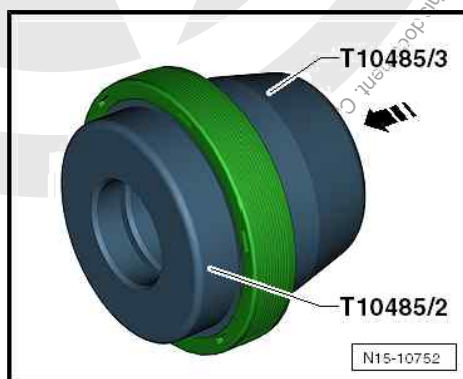
- Remove toothed belt  
⇒ [“2.3 Removing and installing toothed belt”, page 81](#) .
- Remove seal -1- using extractor hook - T20143/1- .

## Installing

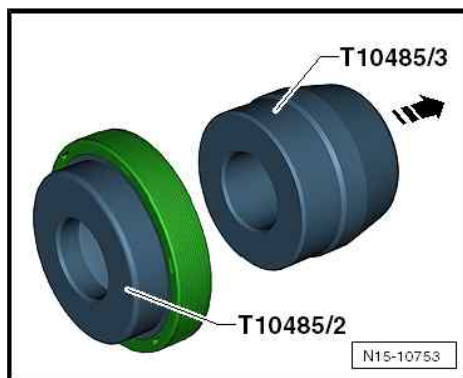
- Put together assembly sleeves - T10485/2- and -T10485/3- in -direction of arrow-.



- Fit new seal in -direction of arrow- onto assembly sleeve - T10485/2- .



- Pull off assembly sleeve - T10485/3- in -direction of arrow-.
- Fit assembly sleeve - T10485/2- with seal -1- onto crankshaft stub.







- Draw in thrust piece - T10485/1 - to stop with securing bolt of vibration damper -2-.
- Install toothed belt  
⇒ ["2.3 Removing and installing toothed belt", page 81](#).

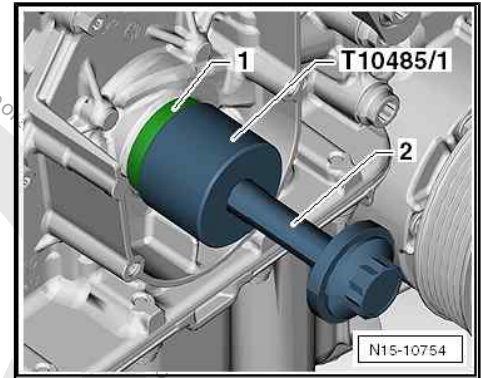
**Note**

*After completing work, it is essential to ensure that the locking pin - T10340- and the camshaft clamp - T10477- have been removed.*

Further assembly is basically a reverse of the dismantling sequence.

**Specified torques**

Component	Specified torque
Crankcase plug	30 Nm





## 2 Cylinder block, gearbox end

⇒ [“2.1 Assembly overview - cylinder block, gearbox end”, page 44](#)

⇒ [“2.2 Removing and installing flywheel”, page 45](#)

⇒ [“2.3 Removing and installing sealing flange on gearbox side”, page 46](#)

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

#### 1 - Engine speed sender - G28-

- ☐ Removing and installing  
⇒ [“1.5 Removing and installing engine speed sender G28”, page 281](#)

☐ 5 Nm

#### 2 - Connector

#### 3 - Sealing flange with sender wheel and oil seal

- ☐ Renew sealing flange complete with oil seal and sender wheel only.
- ☐ Removing and installing  
⇒ [“2.3 Removing and installing sealing flange on gearbox side”, page 46](#)

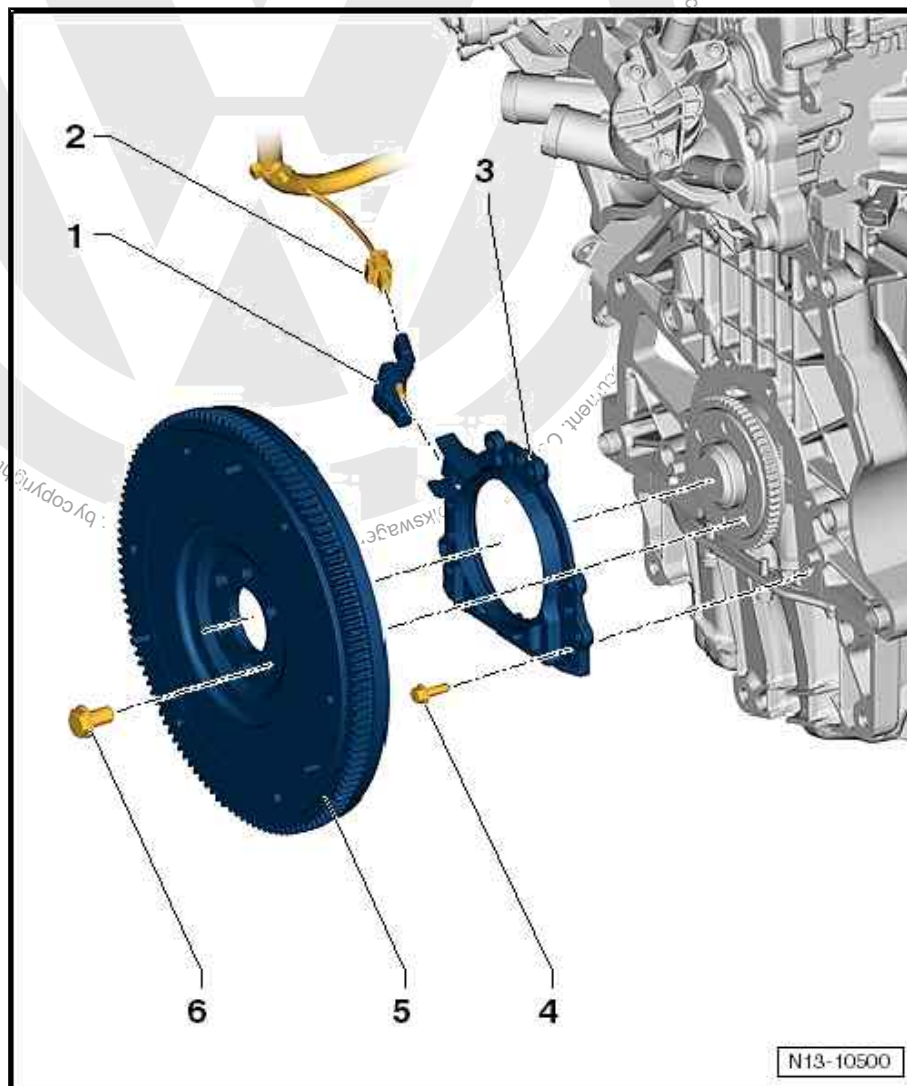
#### 4 - Bolt

☐ 8 Nm

#### 5 - Flywheel

#### 6 - Bolt

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

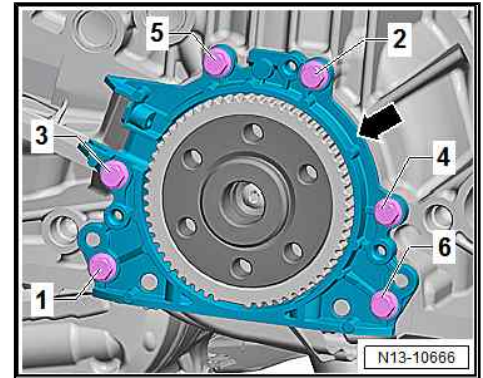




### Sealing flange on gearbox side - specified torque and tightening sequence

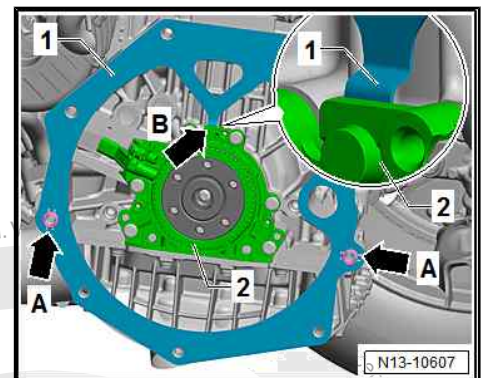
- Tighten bolts -1- to -6- in stages as follows:

Stage	Bolts	Specified torque
1)	-1 ... 6-	Screw in by hand as far as stop
2)	-1 ... 6-	In diagonal sequence and in stages; final torque 10 Nm



### Installing intermediate plate

- Attach intermediate plate -1- to sealing flange -2- -arrow B-.
- Slide intermediate plate onto dowel sleeves -arrows A-.



## 2.2 Removing and installing flywheel

### Special tools and workshop equipment required

- ◆ Counter-hold tool - 3067-



### Removing

- Gearbox removed



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

### Installing

Install in reverse order, noting the following:

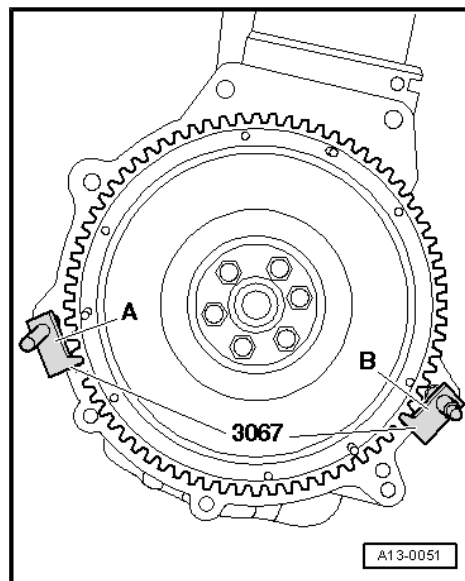


#### Note

- ◆ *Renew bolts that are tightened with turning further angle.*
- ◆ *Flywheel with sender wheel can only be fitted in one position.*
- Insert counterhold - 3067- in hole in cylinder block -item A-.

### Specified torques

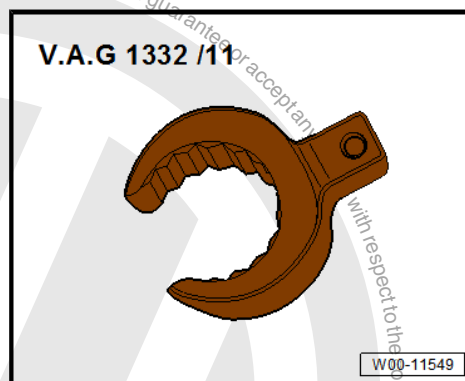
- ◆ ⇒ [“2.1 Assembly overview - cylinder block, gearbox end”, page 44](#)



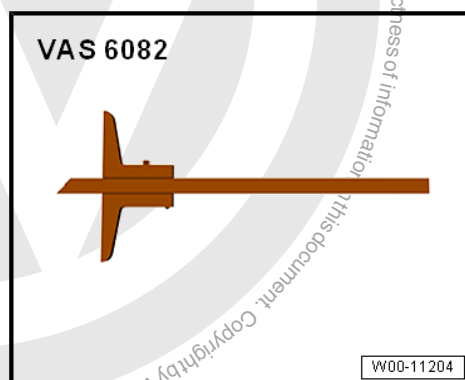
## 2.3 Removing and installing sealing flange on gearbox side

### Special tools and workshop equipment required

- ◆ Flared ring spanner tool insert AF 24 - V.A.G 1332/11-

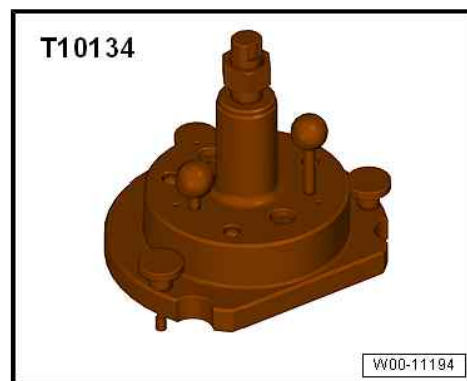


- ◆ Depth gauge - VAS 6082-

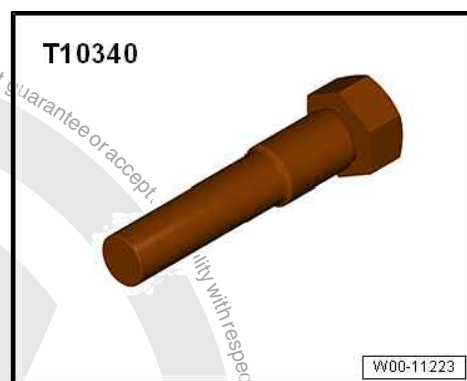




- ◆ Assembly tool - T10134-



- ◆ Locating bolt - T10340-



- ◆ Bolt M6×35 (qty. 3)
- ◆ Spark plug socket, e.g. -3122 B-
- ◆ Screwdriver with a shaft length of at least 250 mm
- ◆ Hexagon key

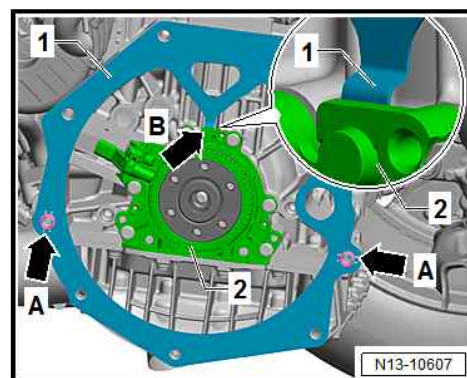
#### Procedure



#### Note

*For reasons of clarity, the illustration shows the work procedures with engine removed.*

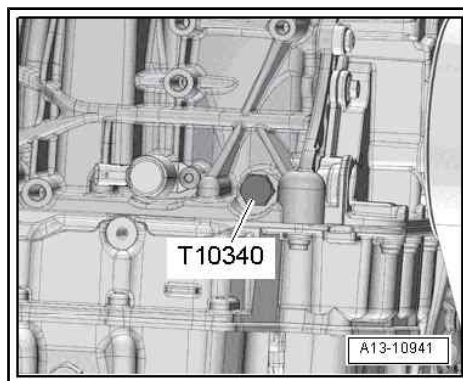
- Removing gearbox ⇒ Rep. gr. 34 ; Removing and installing gearbox .
- Remove clutch ⇒ Rep. gr. 30 ; Removing and installing clutch .
- Remove flywheel  
⇒ ["2.2 Removing and installing flywheel", page 45](#) .
- Remove intermediate plate -1- from dowel sleeves -arrows A-.
- Guide intermediate plate -1- upwards.
- While doing so, pull retaining lug -arrow B- of intermediate plate -1- out of recess behind sealing flange.







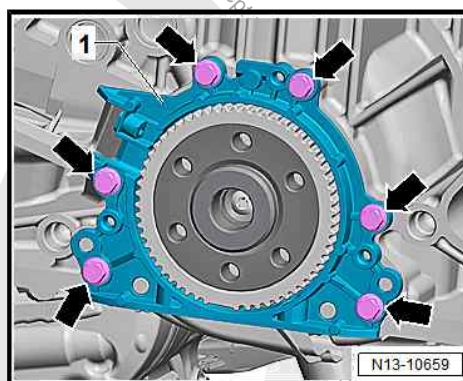
- Unscrew plug for "TDC" hole in cylinder block.
- Lower lifting platform completely.
- Locking pin is screwed in from above via engine compartment.
- To do this, guide locking pin under drive shaft.
- Screw locking pin - T10340- into cylinder block as far as stop and tighten to 30 Nm.
- Rotate crankshaft in normal direction of rotation as far as stop.
- The locking pin now rests against the crank web.



#### Note

*Locking pin - T10340- locks crankshaft in direction of engine rotation only.*

- Remove sump  
⇒ ["1.3 Removing and installing sump", page 141](#)
- Remove engine speed sender - G28- -arrow-  
⇒ ["1.5 Removing and installing engine speed sender G28", page 281](#) .
- Unscrew bolts -arrows- for sealing flange -1-.



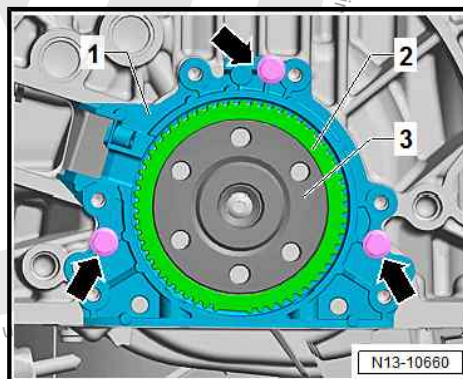
- To press off, screw 3 bolts M6 x 35 into sealing flange -1- -arrows-.



#### Note

*The sealing flange -1- is pressed off crankshaft -3- together with the sender wheel -2-.*

- Screw bolts alternately into sealing flange not more than 1/2 turn at a time.
- Remove sealing flange -1- together with sender wheel -2-.

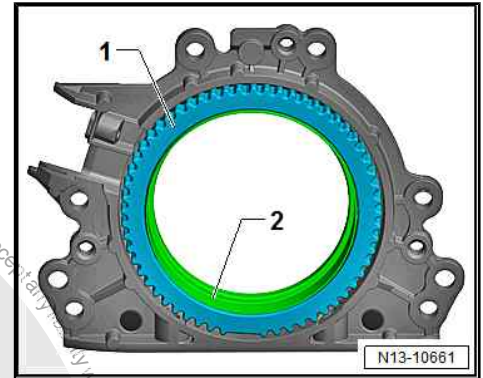


**Pressing in sealing flange with sender wheel**



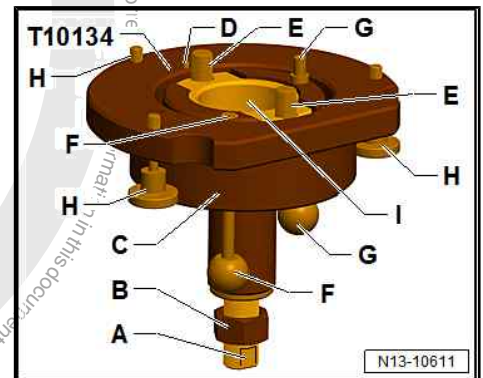
## Note

- ◆ The sealing flange with a PTFE seal is equipped with a sealing lip support ring -2-. This support ring serves as a fitting sleeve and must not be removed prior to installation.
- ◆ Sealing flange and sender wheel -1- must not be separated after removal from packaging.
- ◆ The sender wheel is held in its installation position on the locating pin of assembly tool - T10134- ⇒ [page 49](#).
- ◆ Sealing flange and oil seal form one unit and must only be renewed together with the sender wheel.
- ◆ The assembly tool - T10134- is held in its position relative to the crankshaft by a guide pin inserted into a hole in the crankshaft ⇒ [page 49](#).



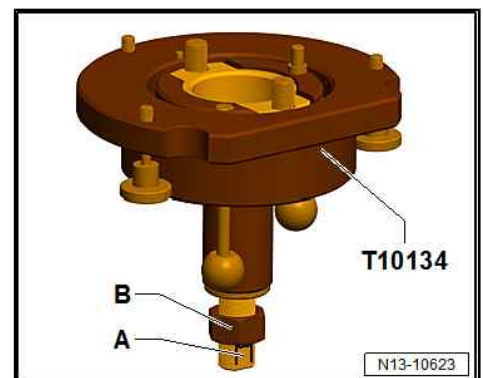
## Set-up of assembly tool - T10134- :

- A - Clamping surface
- B - Nut
- C - Assembly housing
- D - Locating pin
- E - Hexagon socket head bolt (qty. 2)
- F - Guide pin for petrol engines (red knob)
- G - Guide pin for diesel engines (black knob)
- H - Knurled screws (qty. 3)
- I - Inner part

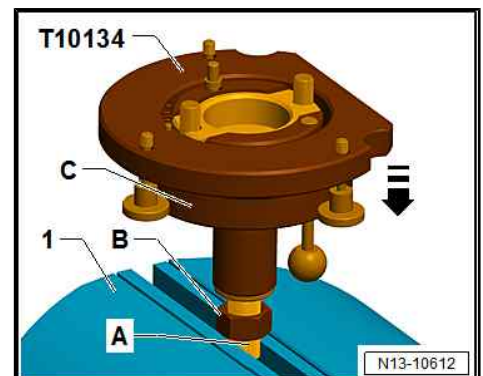


## Fitting sealing flange with sender wheel on assembly tool - T10134- :

- Screw on nut -B- until just before it touches the clamping surface -A- of the threaded spindle.



- Clamp assembly device - T10134- at clamping surface -A- of threaded spindle in a vice -1-.
- Push assembly housing -C- downwards until it rests against nut -B-.
- Inner part of assembly tool and assembly housing must be at same height.







- If fitted, remove securing clip -arrow- from new sealing flange.



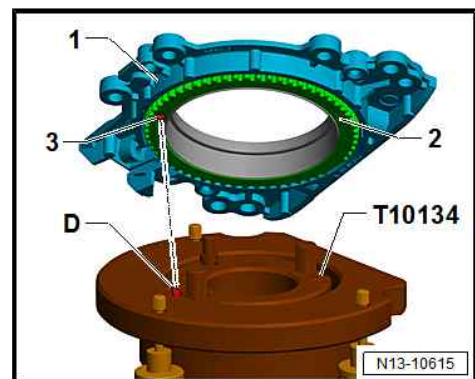
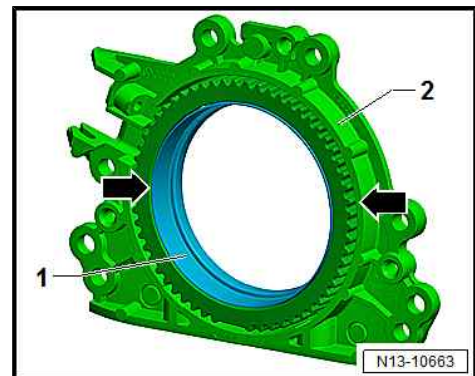
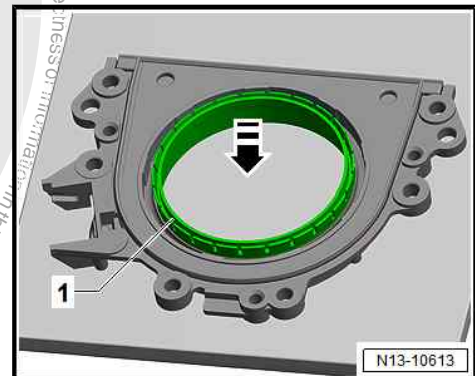
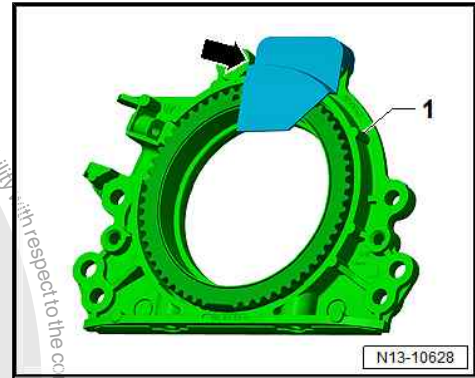
#### Note

*Do not take the sender wheel out of the sealing flange.*

- Place sealing flange -1- with front side facing downwards on a clean level surface.
- Push sealing lip support ring -1- downwards in -direction of arrow- until it rests against flat surface.

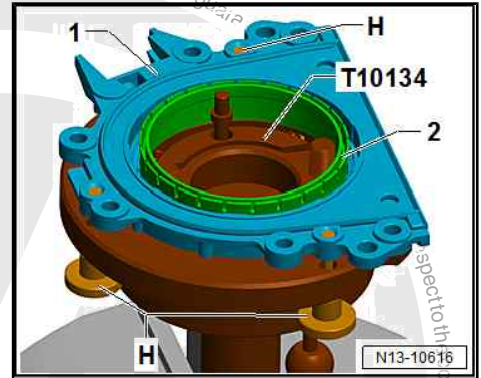
- Upper edge of sealing lip support ring -1- and front edge of sealing flange -2- must align -arrows-.

- Place sealing flange -1- with front side facing downwards onto assembly tool - T10134- so that locating pin -D- is seated in hole -3- in sender wheel hole -2-.
- The sealing flange must rest flat against the assembly tool.



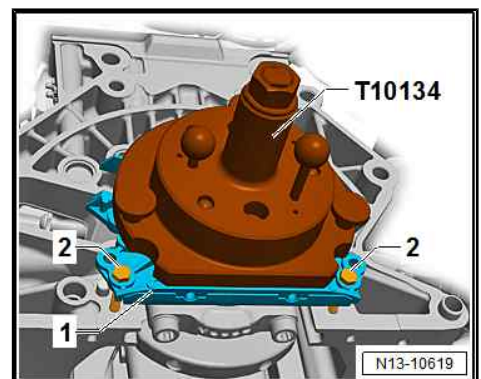
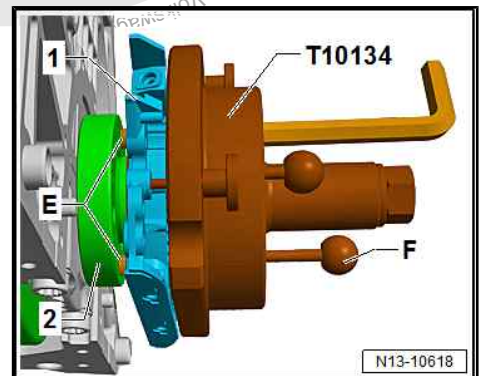
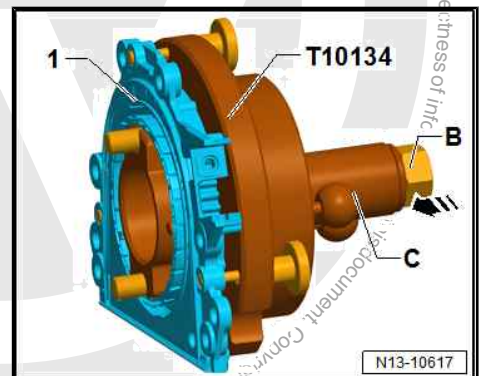


- Screw knurled screws -H- into sealing flange -1-.
- Press sealing flange -1- and sealing lip support ring -2- against surface of assembly tool - T10134- whilst tightening knurled screws.
- This prevents the locating pin from slipping out of the sender wheel hole.
- When installing sealing flange, ensure that sender wheel remains fixed in assembly tool.



#### Mounting assembly tool - T10134- with sealing flange -1- on crankshaft flange:

- The crankshaft flange must be free of grease and oil.
- Engine is at "TDC" position.
- Screw on nut -B- until it reaches end of threaded spindle.
- Press threaded spindle of assembly tool - T10134- in -direction of arrow-, until nut -B- rests against assembly housing -C-.
- Align flat side of assembly housing to sealing surface of cylinder block on sump side.
- Attach assembly tool - T10134- together with sealing flange -1- to crankshaft flange -2-.
- To do this, screw hexagon socket head bolts -E- into crankshaft flange (approx. 5 full turns) using a hexagon key.
- Push guide pin for petrol engines (red knob) -F- into crankshaft flange.
- To guide sealing flange -1-, screw two M6×35 mm bolts -2- into cylinder block.





### Bolting assembly tool - T10134- onto crankshaft flange:

- Push assembly housing -C- by hand in -direction of arrow- until sealing lip support ring -1- rests against crankshaft flange -2-.
- Make sure that guide pin for petrol engines (red knob) -F- is properly seated in hole in crankshaft. This ensures that the sender wheel reaches its final installation position.



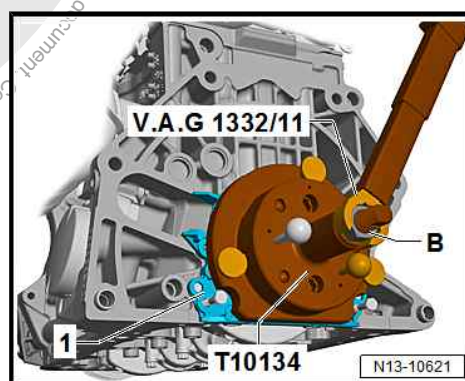
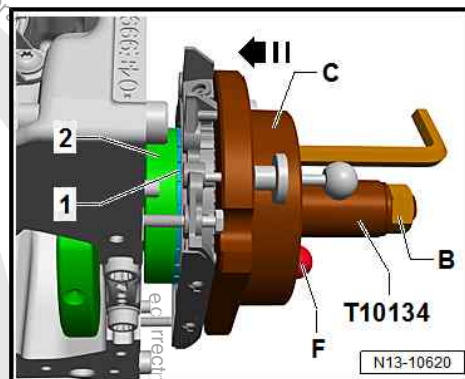
#### Note

*The guide pin for diesel engines (black knob) must not be inserted in threaded hole of crankshaft.*

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

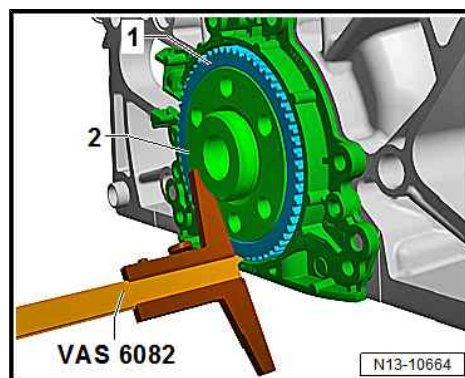
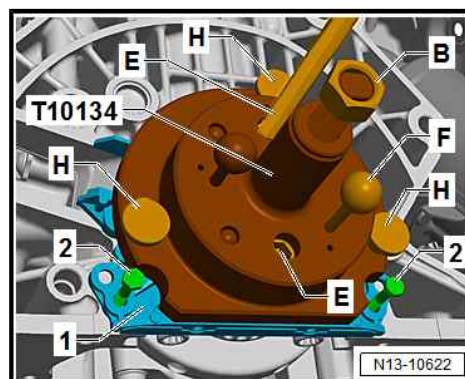
### Pressing sender wheel onto crankshaft flange using assembly tool - T10134- :

- Tighten nut -B- of assembly tool - T10134- to 35 Nm.
- After the nut has been tightened to 35 Nm, a small air gap must still be present between cylinder block and sealing flange -1-.



### Checking sender wheel installation position on crankshaft:

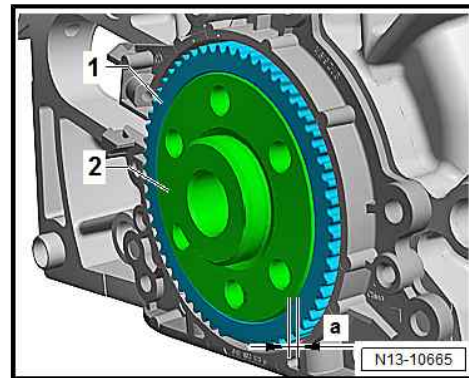
- Screw on nut -B- until it reaches end of threaded spindle.
- Unscrew the two bolts -2- from cylinder block.
- Pull guide pin for petrol engines (red knob) -F- out of crankshaft flange.
- Unscrew knurled screws -H- from sealing flange -1-.
- Unbolt assembly tool - T10134- from crankshaft flange, unscrewing hexagon socket head bolts -E- from crankshaft flange.
- Remove sealing lip support ring.
- Position depth gauge - VAS 6082- on crankshaft flange -2-.
- Measure distance between crankshaft flange -2- and sender wheel -1-.





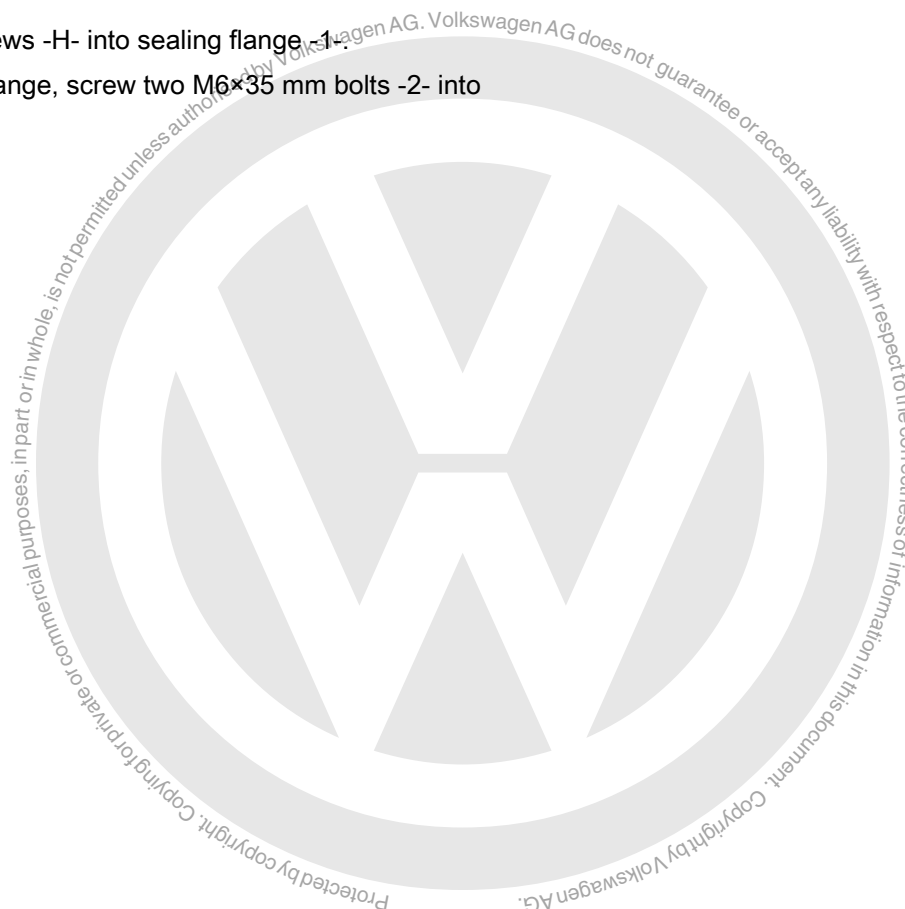
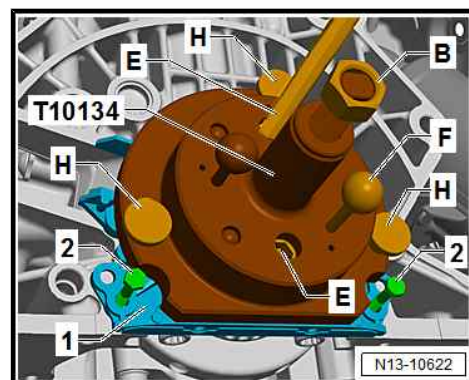


- Measure distance -a- between crankshaft flange -2- and sender wheel -1-.
- Specification: dimension -a- = 0.5 mm
- If specification is not achieved, press sender wheel further in ➔ [page 53](#) .
- If specification is achieved, proceed with subsequent work steps ➔ [page 54](#) .



#### Re-pressing sender wheel:

- Secure assembly tool - T10134- on crankshaft flange -2-.
- Make sure that locating pin of assembly tool - T10134- is properly seated in sender wheel hole.
- Tighten hexagon socket head bolts -E- by hand.
- Push assembly tool - T10134- by hand against sealing flange -1-.
- Screw nut -B- by hand onto threaded spindle until it rests against assembly tool - T10134- .
- Push guide pin for petrol engines (red knob) -F- into crankshaft flange.
- Screw knurled screws -H- into sealing flange -1-.
- To guide sealing flange, screw two M6×35 mm bolts -2- into cylinder block.





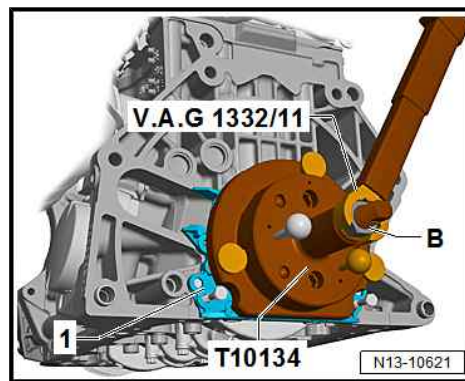
- Tighten nut -B- of assembly tool - T10134- to 40 Nm.
- Check sender wheel installation position on the crankshaft again ⇒ [page 52](#) .
- If the specification is not achieved, tighten nut of assembly tool - T10134- to 45 Nm.
- Check sender wheel installation position on the crankshaft again ⇒ [page 52](#) .

#### Installing

- Tighten bolts for sealing flange (vehicles with manual gearbox) ⇒ [page 45](#) .
- Install sump ⇒ ["1.3 Removing and installing sump", page 141](#) .
- Install intermediate plate (vehicles with manual gearbox) ⇒ [page 45](#) .
- Install flywheel (vehicles with manual gearbox) ⇒ ["2.2 Removing and installing flywheel", page 45](#) .

#### Specified torques

- ♦ ⇒ [Fig. ""Sealing flange on gearbox side - specified torque and tightening sequence"" , page 45](#)
- ♦ ⇒ ["2.1 Assembly overview - cylinder block, gearbox end", page 44](#)
- ♦ ⇒ ["1.1 Assembly overview - ignition system", page 275](#)
- ♦ ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation
- ♦ ⇒ Rep. gr. 34 ; Removing and installing gearbox; Specified torques for gearbox





## 3 Crankshaft

⇒ **"3.1 Crankshaft dimensions", page 55**

### 3.1 Crankshaft dimensions

#### NOTICE

**Risk of damage to bearing pedestals when the crankshaft is removed.**

**If the bolts of the crankshaft bearing cap are loosened, the bearing pedestals of the cylinder block will be deformed, and damage to the bearings will result.**

- Never remove the crankshaft.



#### Note

- ◆ *If the bearing cap bolts are loosened, the cylinder block must be renewed complete with the crankshaft.*
- ◆ *Measuring the main bearing clearance is not possible with normal workshop equipment.*

Honing dimension in mm	Crankshaft main journal Ø	Conrod journal Ø
Basic dimension	---	-0.022 42.00 -0.037

## 4 Pistons and conrods

⇒ [“4.1 Assembly overview - pistons and conrods”, page 56](#)

⇒ [“4.2 Checking pistons and cylinder bores”, page 57](#)

⇒ [“4.3 Separating new conrod”, page 58](#)

⇒ [“4.4 Setting piston to TDC position”, page 59](#)

### 4.1 Assembly overview - pistons and conrods

#### 1 - Retaining ring

#### 2 - Piston pin

- ☐ If difficult to remove, heat piston to 60°C.
- ☐ Remove and install using drift - 10 - 14- .

#### 3 - Piston

- ☐ Checking  
⇒ [“4.2 Checking pistons and cylinder bores”, page 57](#)
- ☐ Mark installation position and cylinder number.
- ☐ Arrow on piston crown points to belt pulley end.
- ☐ Install using piston ring clamp.

#### 4 - Compression rings

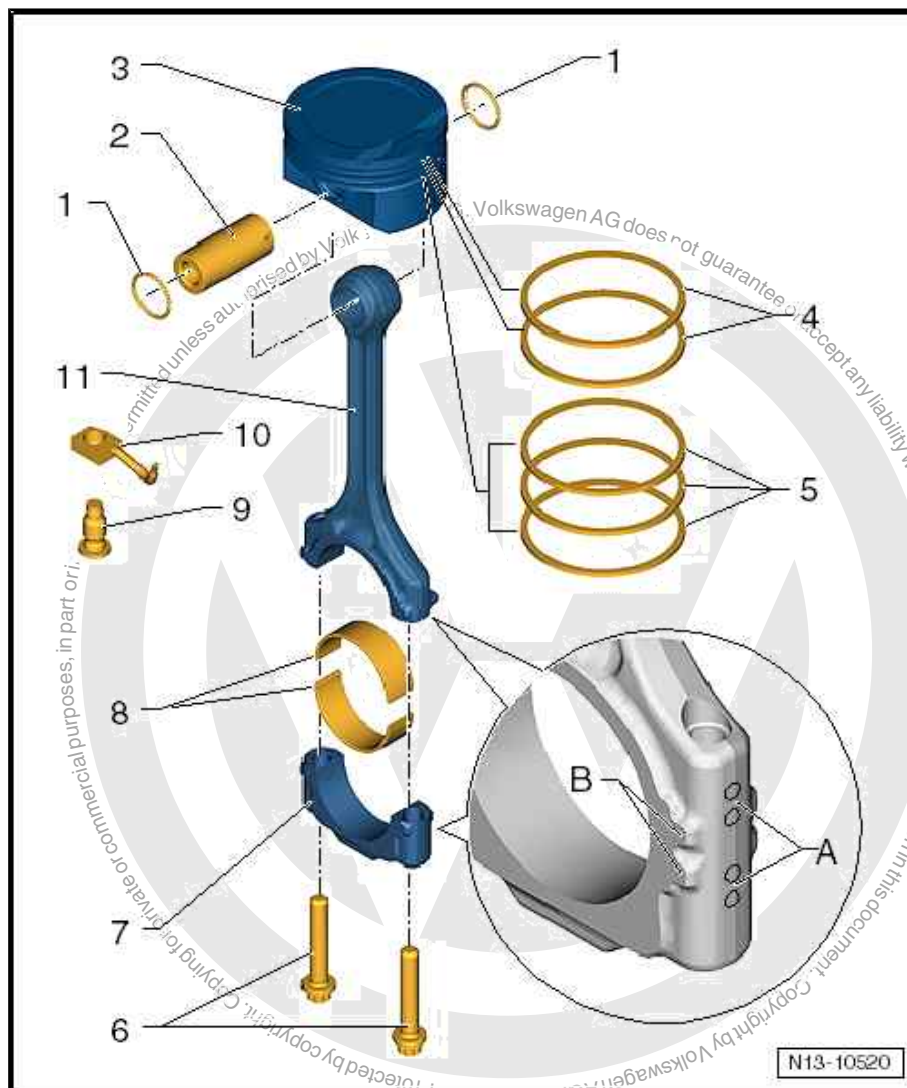
- ☐ Offset gaps by 120°
- ☐ Remove and install compression rings with piston ring pliers.
- ☐ “TOP” faces towards piston crown.
- ☐ Checking ring gap  
⇒ [“4.2 Checking pistons and cylinder bores”, page 57](#) .
- ☐ Checking ring-to-groove clearance  
⇒ [“4.2 Checking pistons and cylinder bores”, page 57](#) .

#### 5 - Oil scraper rings

- ☐ Carefully remove and install 3-part oil scraper rings by hand.
- ☐ Checking ring gap ⇒ [“4.2 Checking pistons and cylinder bores”, page 57](#) .
- ☐ Ring-to-groove clearance not measurable.

#### 6 - Conrod bolt

- ☐ Renew after removal
- ☐ Oil threads and contact surface
- ☐ To measure radial clearance, tighten to corresponding specified torque but not further.
- ☐ M8×1
- ☐ 30 Nm +90°







## 7 - Conrod bearing cap

- ☐ The caps only fit in one position and only on the appropriate conrod due to the breaking procedure (cracking) separating the cap from the conrod.
- ☐ Mark with cylinder number prior to removal -A-.
- ☐ Installation position: Mark -B- points to belt pulley end (if mark is missing, mark before removing).

## 8 - Bearing shell

- ☐ Do not interchange used bearing shells.
- ☐ Insert bearing shells centrally.

Checking radial clearance with Plastigage:

- ☐ New: 0.020 ... 0.060 mm
- ☐ Wear limit: 0.070 mm
- ☐ Do not rotate crankshaft when checking radial clearance.

## 9 - Pressure relief valve

- ☐ Opening pressure of pressure relief valve: 1.8 ... 2.2 bar
- ☐ 27 Nm

## 10 - Oil spray jet

- ☐ For piston cooling.

## 11 - Connecting rod

- ☐ Renew as set only.
- ☐ Mark with cylinder number -A-.
- ☐ Installation position: Mark -B- points to belt pulley end (if mark is missing, mark before removing).
- ☐ Guided axially by piston.

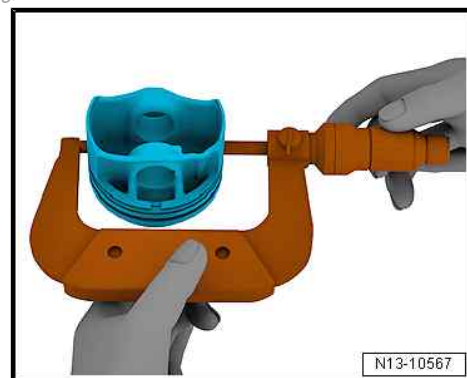
# 4.2 Checking pistons and cylinder bores

## Checking piston

### Special tools and workshop equipment required

- ◆ External micrometer 50-75 mm - VAS 6070-
- Using an external micrometre, measure approx. 10 mm from lower edge, offset 90° from piston pin axis.
- Maximum deviation from nominal dimension: -0.04 mm.

Piston diameter, mm	
Specification	74.454 ... 74.482 mm



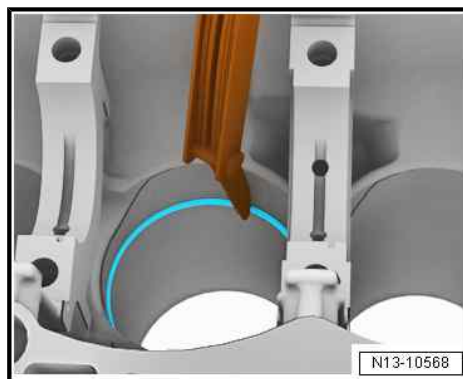


### Checking piston ring gap

- Push ring squarely from above down into cylinder bore to approx. 15 mm from bottom end of cylinder.

Piston ring dimensions in mm	New	Wear limit
1st compression ring	0.20 ... 0.35	1.0
2nd compression ring	0.40 ... 0.60	1.0
Oil scraper ring	0.20 ... 0.90	--- <sup>1)</sup>

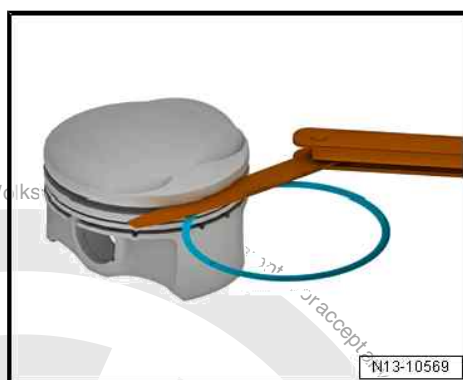
1) No wear limit details available



### Checking ring-to-groove clearance

Clean annular groove before check.

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

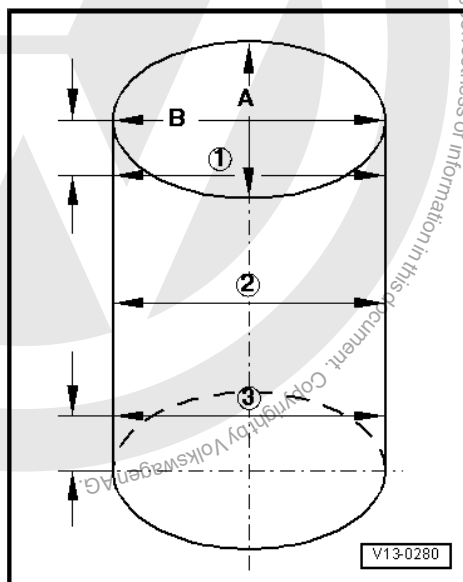


### Measuring cylinder bore

#### Special tools and workshop equipment required

- ◆ Cylinder gauge - VAS 6078-
- Do not measure cylinder bores when cylinder block is mounted on engine and gearbox support - VAS 6095- , as measurements may be incorrect.
- Using cylinder gauge - VAS 6078- take measurements at 3 positions diagonally in lateral direction -A- and longitudinal direction -B-.
- Maximum deviation from nominal dimension: 0.08 mm.

Cylinder bore diameter, mm		
Specification	mm	74.505 ... 74.515 mm
Permissible deviation		-15 ... +30 µm



## 4.3 Separating new conrod

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

- Mark the cylinder to which the conrod belongs  
⇒ [Item 11 \(page 57\)](#) .

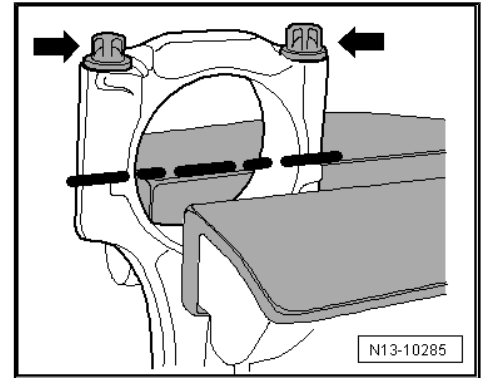


- Lightly clamp the conrod in a vice using aluminium vice clamps, as shown in the illustration.



#### Note

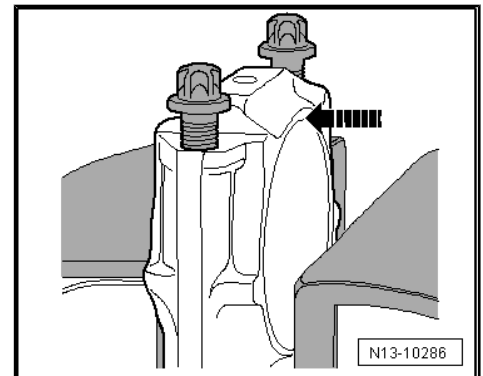
- ◆ Only clamp the conrod lightly in order to avoid damaging it.
- ◆ Conrod is clamped below the dashed line.
- Unscrew both bolts -arrows- about 5 turns.



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

#### Specified torque

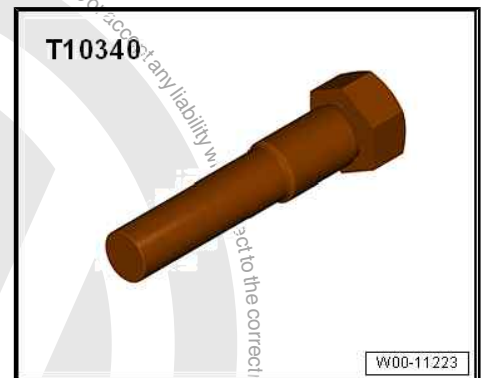
- ◆ Securing bolts for conrod bearing cap  
⇒ ["4.1 Assembly overview - pistons and conrods", page 56](#)



## 4.4 Setting piston to TDC position

### Special tools and workshop equipment required

- ◆ Locating bolt - T10340



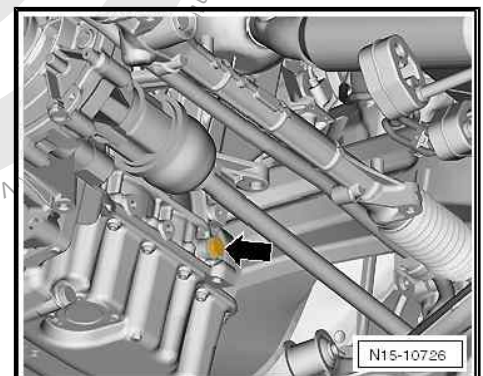
### Procedure

- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
- Unscrew plug -arrow- from crankcase.
- Lower lifting platform completely.



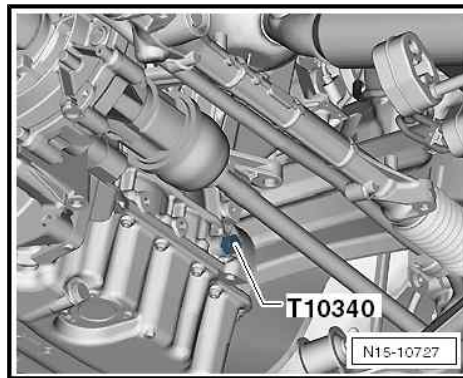
#### Note

- ◆ The lifting platform must be lowered completely so that the locking pin - T10340- can be screwed into the crankcase.
- ◆ When the vehicle is raised, the hole is hidden behind the drive shaft.





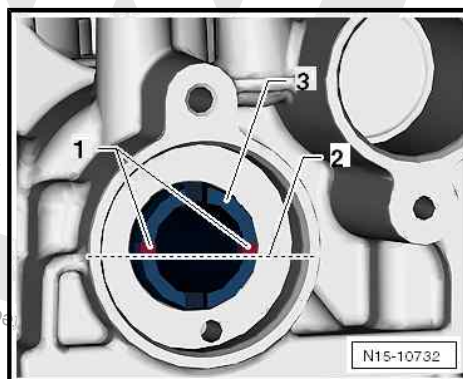
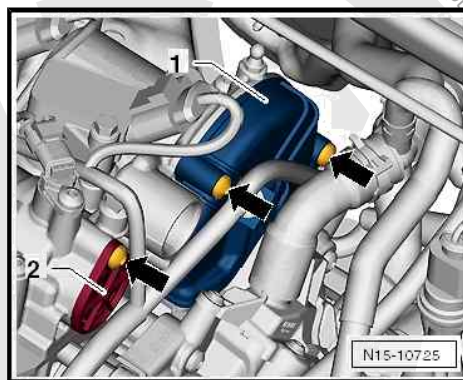
- Screw locking pin - T10340- into crankcase from above as far as it will go.
- The bolt head of locking pin - T10340- must contact cylinder block when doing this.
- If locking pin - T10340- cannot be screwed in as far as stop, this indicates that crankshaft is not in the correct position!
- Unscrew locking pin - T10340- .
- Turn crankshaft 90° in direction of rotation of engine.
- Screw locking pin - T10340- into cylinder block as far as stop and tighten to 30 Nm.
- Rotate crankshaft in normal direction of rotation as far as stop. The locking pin - T10340- now rests against the crank web.



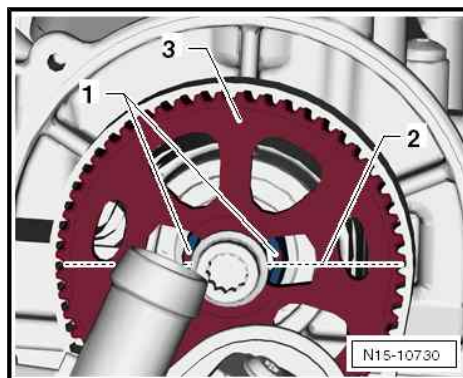
#### Note

*Locking pin - T10340- locks crankshaft in direction of engine rotation only.*

- Unclip line guide from cover.
- Remove cover -1- and cover -2-.



- Grooves -1- of inlet camshaft -3- are positioned above the horizontal camshaft centre line -2-.
- Grooves -1- of exhaust camshaft are positioned above horizontal camshaft centre line -2-.
- The centre-line of the holes close to hub of the gear -3- is slightly above the grooves.
- If the grooves of the camshafts are not in the specified position, turn the crankshaft 360° further in the direction of engine rotation and check the positions again.



#### Specified torque:

- ♦ ➔ ["1.1 Assembly overview - cylinder head", page 61](#)





## 15 – Cylinder head, valve gear

### 1 Cylinder head

⇒ [“1.1 Assembly overview - cylinder head”, page 61](#)

⇒ [“1.2 Removing and installing cylinder head”, page 63](#)

⇒ [“1.3 Removing and installing camshaft housing”, page 71](#)

⇒ [“1.4 Checking compression”, page 75](#)

#### 1.1 Assembly overview - cylinder head

##### 1 - Bolt

- ☐ Renew after removal
- ☐ Observe tightening sequence  
⇒ [“1.3 Removing and installing camshaft housing”, page 71](#)
- ☐ 10 Nm +180°

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

- ☐ Check O-ring for damage.
- ☐ If it is damaged, renew it together with camshaft control valve 1 - N205-.
- ☐ The O-ring cannot be renewed individually.

##### 3 - Bolt

- ☐ 8 Nm

##### 4 - Bolt

- ☐ Renew after removal
- ☐ Observe tightening sequence  
⇒ [“1.3 Removing and installing camshaft housing”, page 71](#)
- ☐ 10 Nm +180°

##### 5 - Hall sender - G40-

##### 6 - Bolt

- ☐ 8 Nm

##### 7 - Ball stud

- ☐ 2.5 Nm

##### 8 - Seal

- ☐ Removing and installing  
⇒ [“3.5.3 Removing and installing camshaft oil seal, exhaust camshaft, gearbox end”, page 126](#)

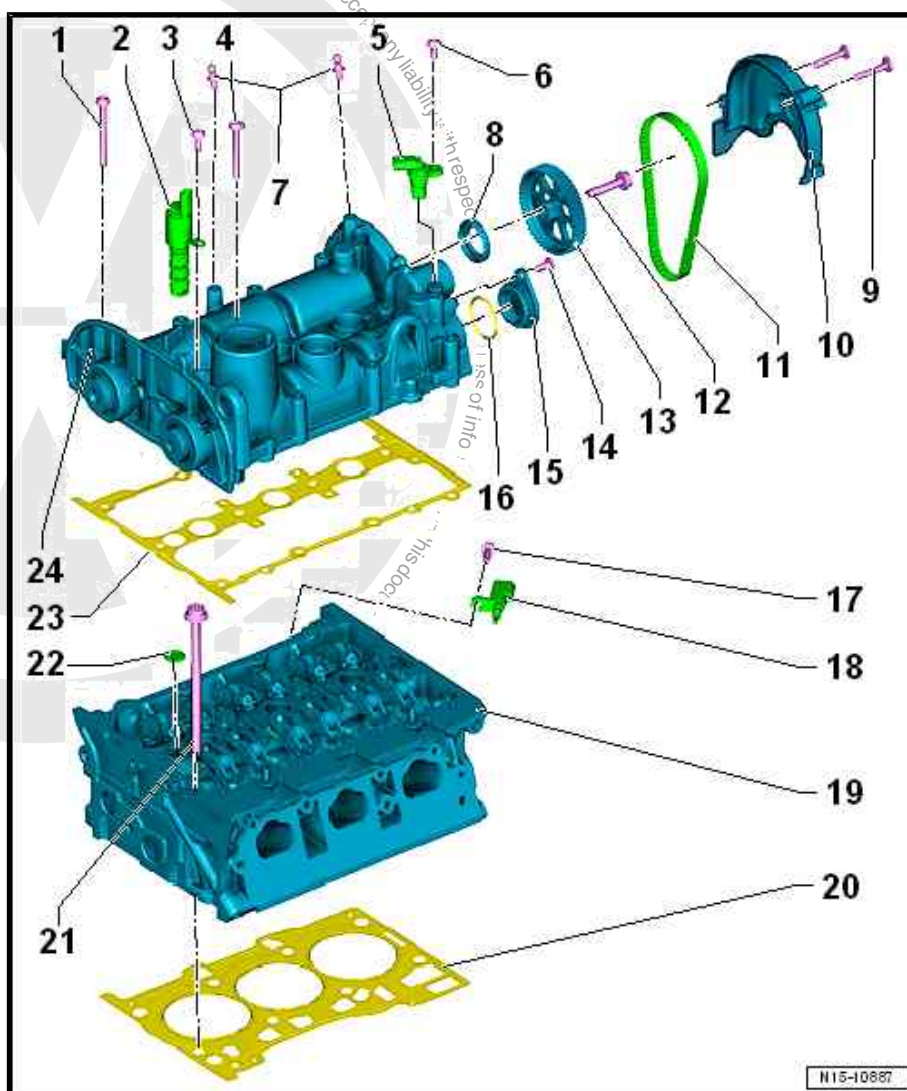
##### 9 - Bolt

- ☐ 8 Nm

##### 10 - Toothed belt guard

##### 11 - Poly V-belt

- ☐ For coolant pump





- ☐ Renew

## 12 - Bolt

- ☐ 20 Nm +90°
- ☐ Renew

## 13 - Crankshaft

- ☐ For coolant pump drive

## 14 - Bolt

- ☐ 8 Nm

## 15 - Cap

## 16 - O-ring

- ☐ Renew if damaged

## 17 - Bolt

- ☐ 8 Nm

## 18 - Radiator outlet coolant - G62-

## 19 - Cylinder head

- ☐ Removing and installing ⇒ [“1.2 Removing and installing cylinder head”, page 63](#)
- ☐ Reworking the valve seat is not permitted.
- ☐ Machining the cylinder head sealing surface on the cylinder block  
⇒ [“3.2 Measuring axial play of camshaft”, page 113](#)

## 20 - Seal

- ☐ Renew after removal

## 21 - Cylinder head bolt

- ☐ Renew after removal
- ☐ Follow installation instructions and sequence when loosening and tightening  
⇒ [“1.2 Removing and installing cylinder head”, page 63](#) .

## 22 - Oil strainer

- ☐ Renew after removal
- ☐ Inserted into cylinder head



### Note

- ◆ *Versions with or without oil strainers are used depending on production date.*
- ◆ *If no strainer was installed at the factory, a strainer is instead integrated in camshaft control valve 1 - N205- .*
- ◆ *Damage may result if the strainer is installed in both locations!*

## 23 - Seal

- ☐ Renew after removal

## 24 - Camshaft case

- ☐ Removing and installing ⇒ [“1.3 Removing and installing camshaft housing”, page 71](#)



### Note

- ◆ *The camshafts cannot be removed.*



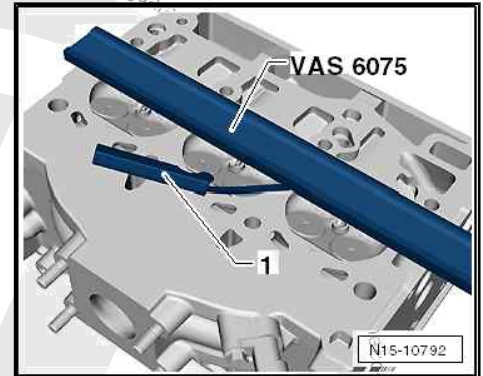


- ◆ *If repair is required, the camshaft housing and the camshafts need to be renewed as a complete unit.*

### Checking cylinder head for distortion

Check with 500 mm straight edge - VAS 6075- and feeler gauge -1-.

Max. permissible distortion: 0.05 mm



## 1.2 Removing and installing cylinder head

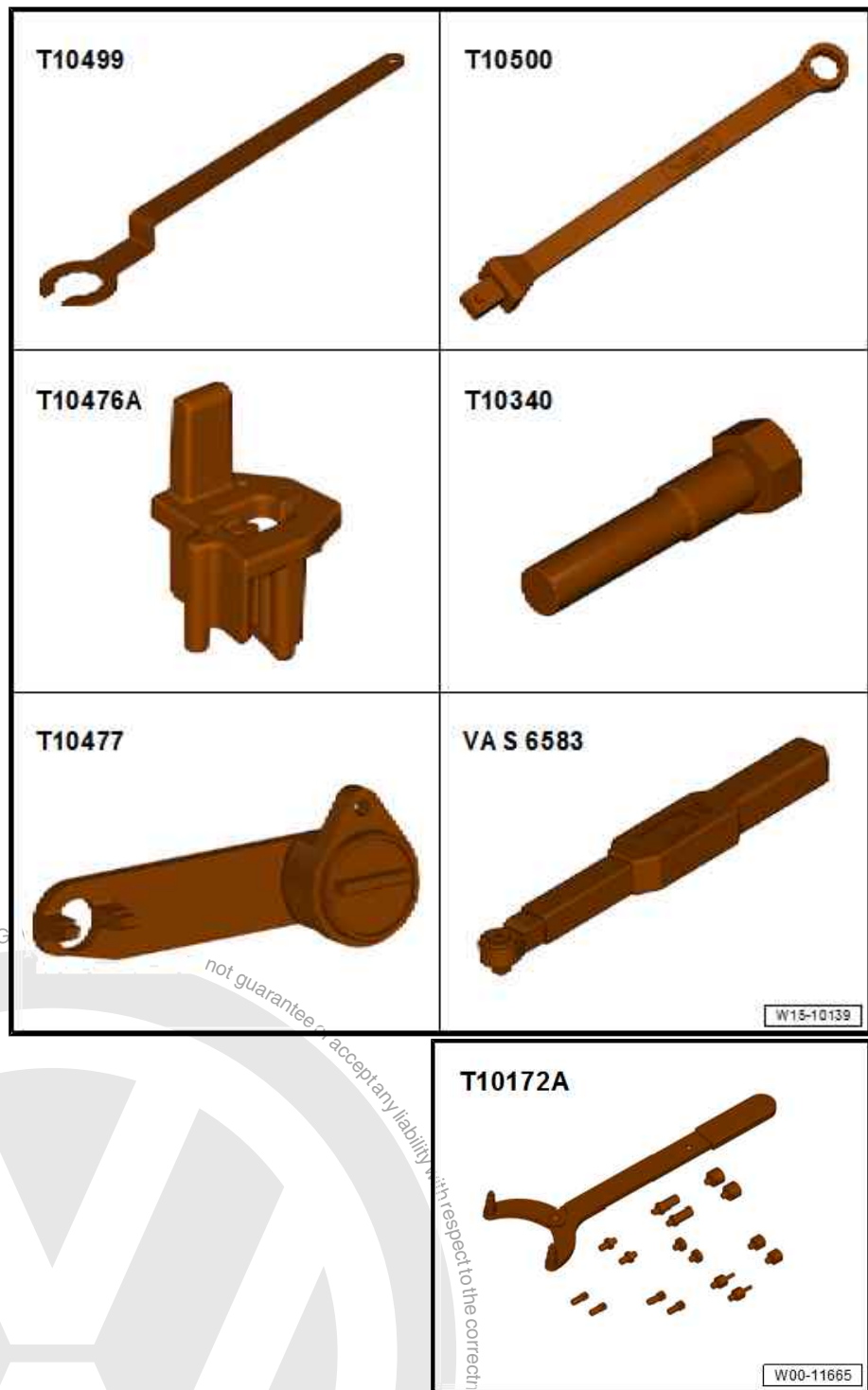


### Note

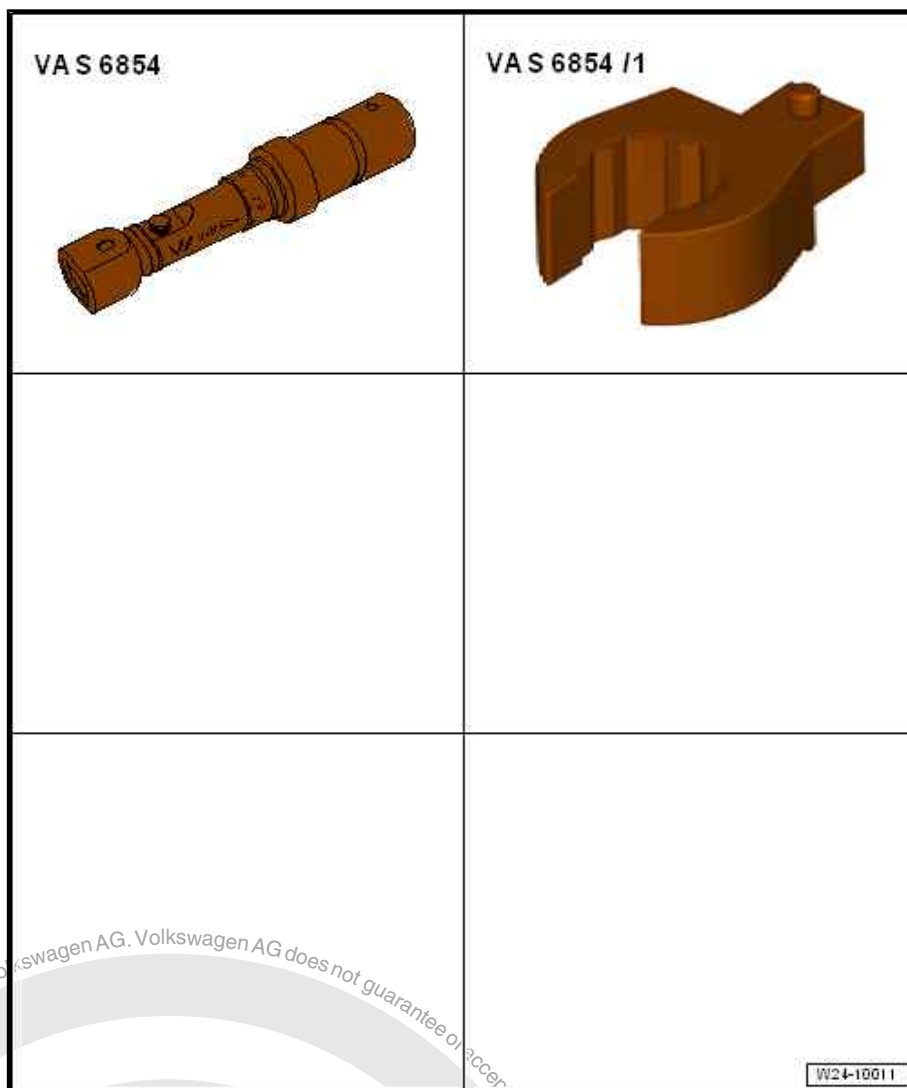
- ◆ *If an exchange cylinder head is installed, all the contact surfaces between the supporting elements, roller rocker fingers and the running surfaces of the camshaft must be oiled before the cylinder head cover is installed.*
- ◆ *The plastic protectors fitted to protect the open valves must only be removed immediately before fitting the cylinder head.*
- ◆ *If the cylinder head is renewed, the coolant and the engine oil must be renewed.*
- ◆ *Cylinder head is being removed together with intake manifold.*



**Special tools and workshop equipment required**



- ◆ Special wrench - T10499-
- ◆ Insert tool - T10500-
- ◆ Assembly tool - T10476A-
- ◆ Locating bolt - T10340-
- ◆ Camshaft clamp - T10477-
- ◆ Torque wrench - VAS 6583-
- ◆ Counter-hold tool - T10172A-



- ◆ Torque wrench - VAS 6854-
- ◆ Tool insert (AF 16) - VAS 6854/1-

#### Conditions

- The engine must be no more than warm to touch.

#### Removing

#### DANGER

Risk of explosion and danger to life due to escaping natural gas. If the manual tank shut-off valve is defective, natural gas may escape in an uncontrolled way. In addition, third parties may be able to activate the natural gas system unintentionally. Risk of explosion leading to serious injuries or death.

- Lock natural gas fuel tank electrically and manually.
- Before working on the natural gas system, always observe  
⇒ "1.2 Safety precautions when working on natural gas system", page 1 !
- Empty gas system ⇒ Rep. gr. 20 ; Fuel tank; Releasing pressure in high-pressure line .



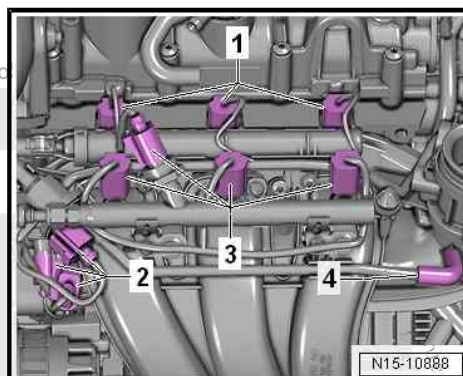
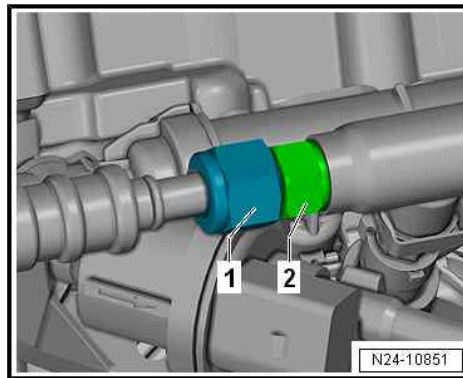
- Loosen union nut -1- at low-pressure line and unscrew union nut. To do this, counterhold gas rail -2- with a spanner.
- Allow residual gas to escape.



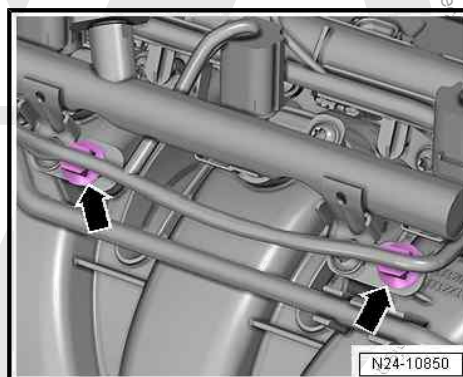
#### Note

- ◆ The connectors of fuel/gas injectors should be marked.
- ◆ This is necessary to prevent these compatible injectors from being accidentally interchanged!

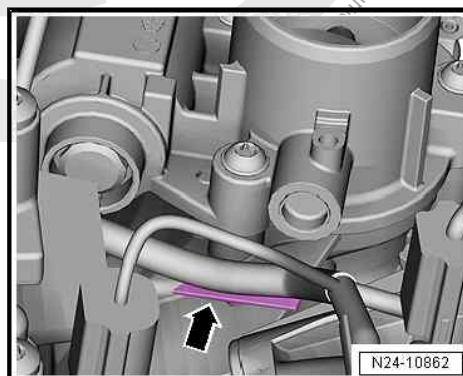
- Disconnect connectors -1- from injectors.
- Pull connectors -2- off activated charcoal filter solenoid valve 1 - N80- , oil pressure switch and intake manifold.
- Pull off connectors -3- of gas injectors -N366- , -N367- -N368- and gas rail sensor - G401- .
- Pull hose -4- off intake manifold.
- Unclip line with activated charcoal filter solenoid valve 1 - N80- .



- Unclip line at securing points -arrows-.
- Remove camshaft housing  
⇒ ["1.3 Removing and installing camshaft housing", page 71](#) .

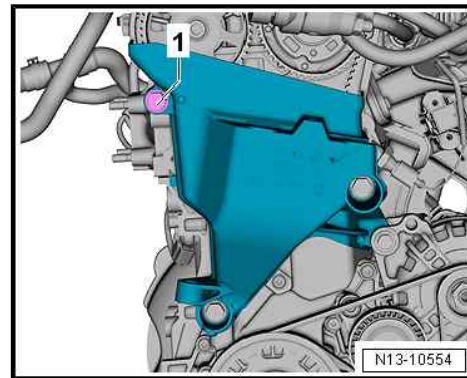


- Unclip wiring harness -arrow- from intake manifold.

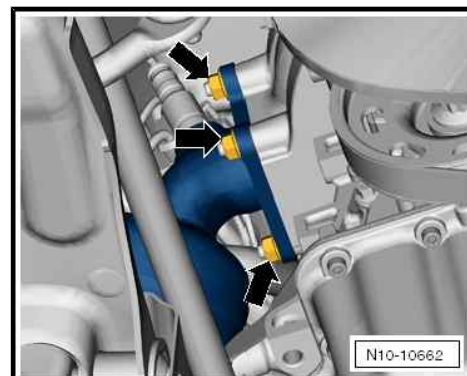




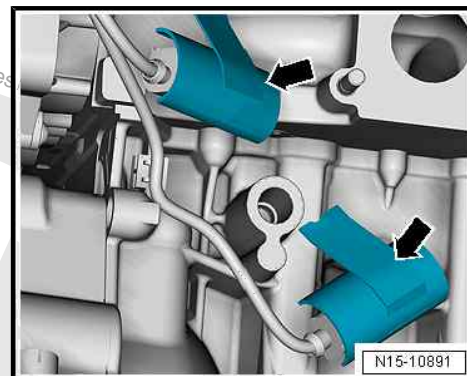
- Unscrew bolt -1- from console for engine mounting.



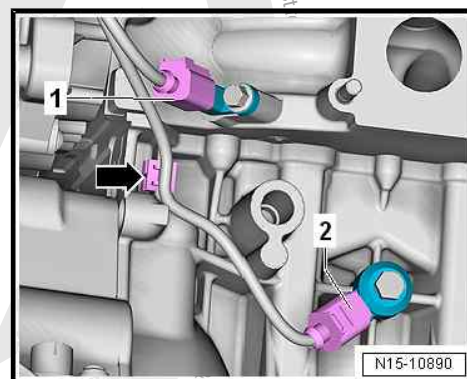
- Remove securing nuts -arrows- and pull catalytic converter off stud bolts.
- Secure catalytic converter to body.



- Open protective covers for senders -arrows-.



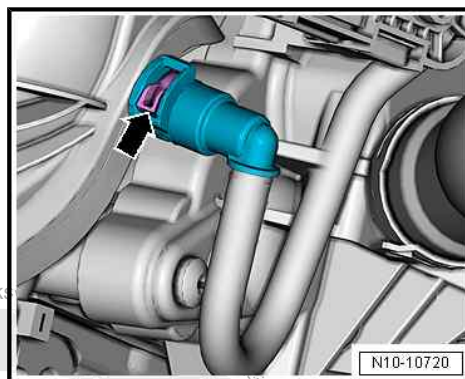
- Pull off connectors for coolant temperature sender - G62- -1- and knock sensor 1 - G61- -2-.
- Release fastener for wiring harness -arrows-.



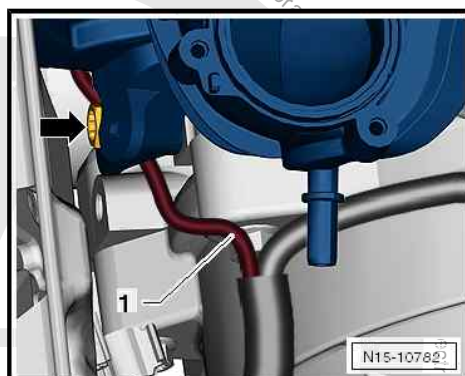




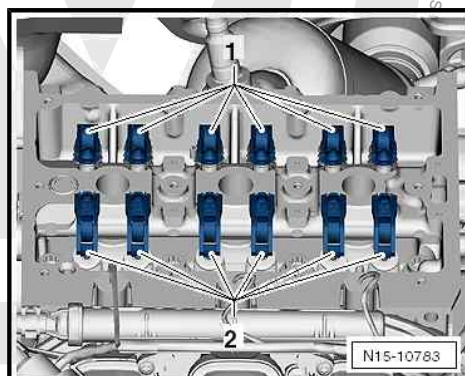
- Open vacuum line fastener -arrow- at intake manifold and pull off vacuum line.
- Unclip wiring harness -1- under intake manifold.



- Unscrew intake manifold support securing bolt -arrow-.
- Only disconnect roller rocker finger if cylinder head needs to be renewed:



- Remove rocker fingers -1- and -2- and place them on a clean surface.





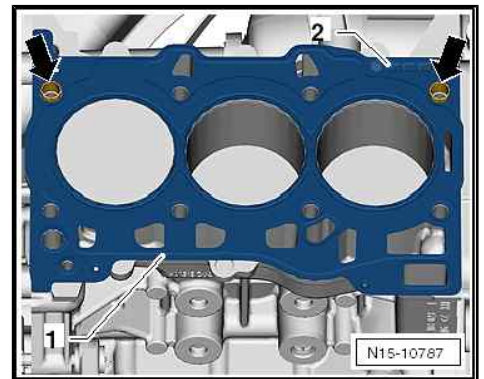
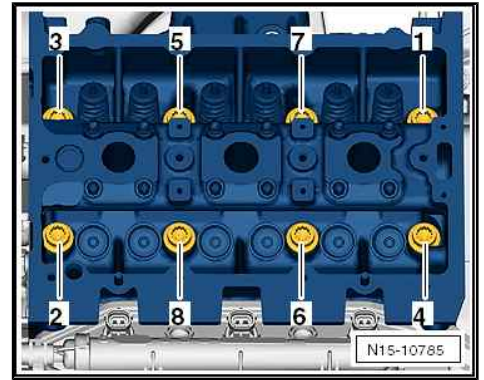
- Loosen cylinder head bolts -1- through -8- in sequence given and then remove completely.
- Remove cylinder head together with intake manifold.
- Remove cylinder head gasket.

### Installing



#### Note

- ◆ *Do not remove new cylinder head gasket from packaging until it is ready to be fitted.*
- ◆ *Handle new gasket very carefully. Damage will cause leakage.*
- Place clean cloths in cylinders so that no dirt or emery cloth particles can get in between cylinder wall and piston.
- Also prevent dirt and emery cloth particles from getting into coolant.
- Carefully clean sealing surfaces and bores of/in cylinder head and cylinder block. Ensure that surfaces are not scored or scratched (if abrasive paper is used, grade must not be less than 100).
- Carefully remove metal particles, emery residue and cloths.
- Set no. 1 cylinder piston to top dead centre and then turn crankshaft back slightly.
- Place new cylinder head gasket -1- onto centring bushes -arrows-. Inscription (Part No.) -2- must be readable.
- Fit cylinder head, install 8 new cylinder head bolts and tighten by hand.





- Tighten cylinder head bolts in sequence shown in illustration (-1- through -8-) to specified torque ⇒ [page 71](#) .



#### Note

When the camshaft is turned, the crankshaft must not be at "TDC" position. Avoid damage to valves and piston crowns.

#### Installing

- Adjust valve timing ⇒ ["2.6 Adjusting valve timing", page 98](#) .
- Install coolant pump  
⇒ ["2.3 Removing and installing coolant pump", page 169](#) .
- Add coolant ⇒ ["1.3 Draining and adding coolant", page 159](#) .
- Install catalytic converter  
⇒ ["2.2 Removing and installing catalytic converter", page 271](#) .

Further assembly is basically a reverse of the dismantling sequence.

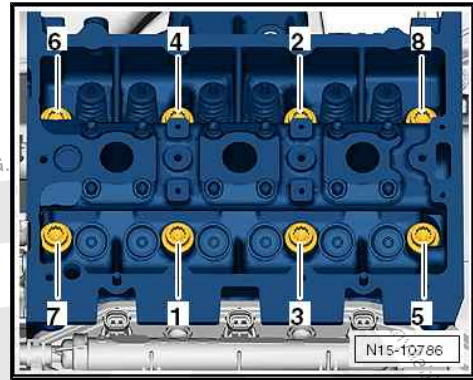


#### Note

- ♦ On no account must the union nut be tightened further than specified, since otherwise the special threaded connection will be damaged and the pressure line must be renewed.
- ♦ The natural gas system may not be put into operation until it has been tested.
- ♦ The necessary scope of the leakage test depends on the pressure section which has been worked on.
- ♦ Observe the following allocation!

#### Allocation:

⇒ ["3.1 Distinguishing between pressure sections of natural gas supply system", page 212](#)



#### DANGER

Risk of explosion and danger to life due to escaping natural gas. Leaks in natural gas system may lead to uncontrolled escape of natural gas. Risk of explosion leading to serious injuries or death.

- Check natural gas system for leaks.

- Open fuel tank shut-off valves -N361/N362- using hand wheel -T50026- .

#### DANGER

Risk of explosion and danger to life due to escaping natural gas. A hissing noise is a sign that there are leaks in the natural gas system. Leaks in natural gas system may lead to uncontrolled escape of natural gas.

Risk of explosion leading to serious injuries or death.

- Do not perform any kind of work on the natural gas system if leaking gas can be heard.
- If a gas leak can be heard, do not drive the vehicle into the workshop.
- Park the vehicle outside and cordon off the area around it.



- Check the gas system  
⇒ ["3.5 Checking gas system for leaks", page 217](#) .
- Connect ⇒ Vehicle diagnostic tester.
- Perform vehicle system test ⇒ Vehicle diagnostic tester.
- Finish the vehicle system test so that any event entries stored during assembly can be cleared automatically.
- Carry out road test.
- Then carry out vehicle system test again and rectify any faults which may have occurred.

#### Specified torques

Tightening sequence	Specified torque	Note
Stage 1	40 Nm	Renew bolts
Stage 2	Turn 90° further	With rigid spanner
Stage 3	Turn 90° further	With rigid spanner
Stage 4	Turn 90° further	With rigid spanner

- ◆ Bolt for intake manifold  
⇒ ["6.1 Assembly overview - intake manifold", page 232](#)
- ◆ Bolts for console for engine mounting  
⇒ ["1.2 Assembly overview - cylinder block \(pulley end\)", page 37](#)
- ◆ Install camshaft housing  
⇒ ["1.3 Removing and installing camshaft housing", page 71](#) .
- ◆ Flexible line to gas rail  
⇒ ["4.1 Assembly overview - gas rail", page 222](#)

### 1.3 Removing and installing camshaft housing



#### Note

- ◆ *The camshafts cannot be removed.*
- ◆ *If repair is required, the camshaft housing and the camshafts need to be renewed as a complete unit.*



up! 2012 ➤ , up! 2017 ➤

3-cyl. injection engine (1.0 l, natural gas 4V, EA 211) - Edition 06.2019

### Special tools and workshop equipment required



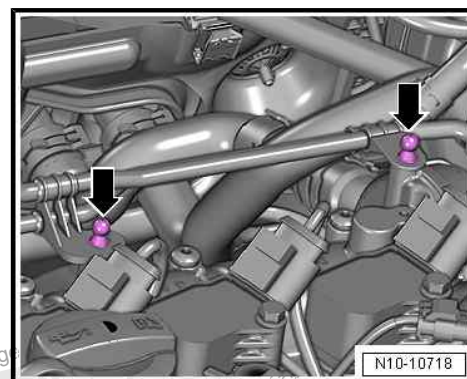
- ◆ Special wrench - T10499-
- ◆ Insert tool - T10500-
- ◆ Assembly tool - T10476A-
- ◆ Locating bolt - T10340-
- ◆ Camshaft clamp - T10477-
- ◆ Torque wrench - VAS 6583-
- ◆ Counter-hold tool - T10172A-



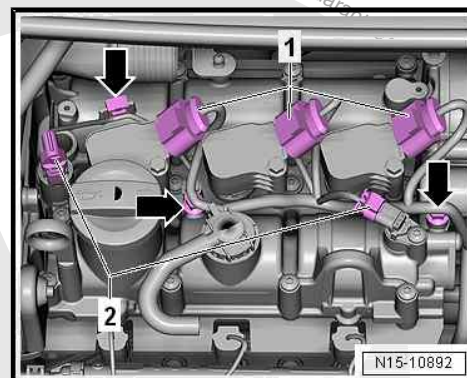


## Removing

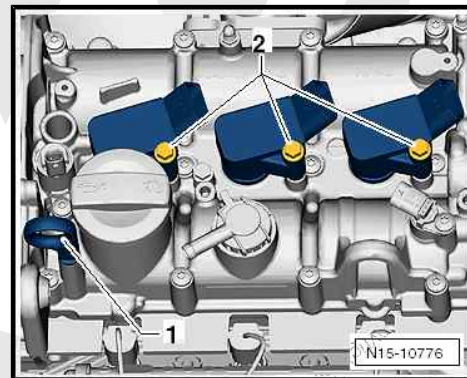
- First, check whether a coded radio is fitted. If so, obtain anti-theft coding.
- Disconnect battery earth strap with ignition switched off.
- Detach toothed belt from camshafts.  
⇒ [“2.6 Adjusting valve timing”, page 98](#)
- Unscrew ball-head bolts -arrows-.



- Pull off connectors of ignition coils -1- and senders -2-.
- Unclip line guide from camshaft housing -arrows- and lay wiring harness to one side.



- Pull out oil dipstick -1- and unscrew securing bolts -2- of ignition coils with output stages .
- Pull off ignition coils with output stages from spark plugs.





- Loosen securing bolts -1- through -12- of camshaft housing in sequence given and then remove completely.
- Lift off camshaft housing vertically from cylinder head.
- Remove gasket.
- Clean sealing surfaces. They must be free of oil and grease.

### Installing

#### Condition

- The pistons cannot be positioned at TDC.



#### Note

*If a piston is at top dead centre, the valves could strike the pistons when the camshafts turn.*

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



#### Note

- ◆ Versions with or without oil strainers are used depending on production date.
- ◆ If no strainer was installed at the factory, a strainer is instead integrated in camshaft control valve 1 - N205-.
- ◆ Damage may result if the strainer is installed in both locations!

- Renew seal and oil strainer -3-.

- Fit new gasket -1- onto dowel pins -2-.

Part number -3- of gasket must be readable from above.

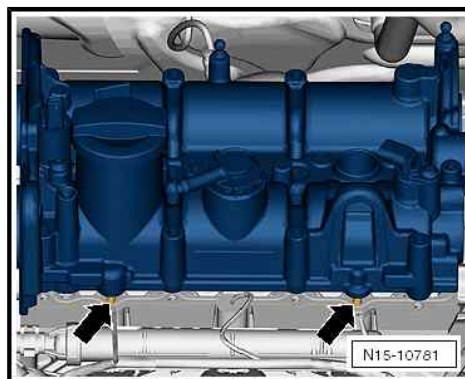
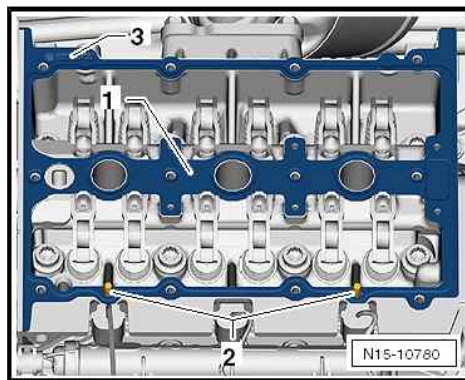
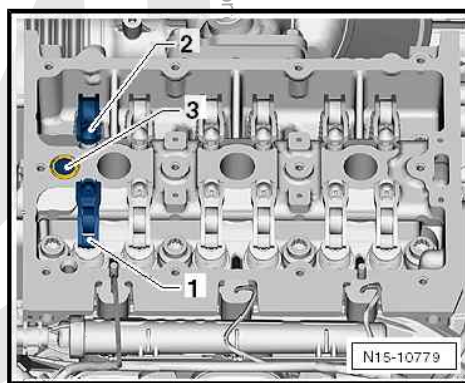
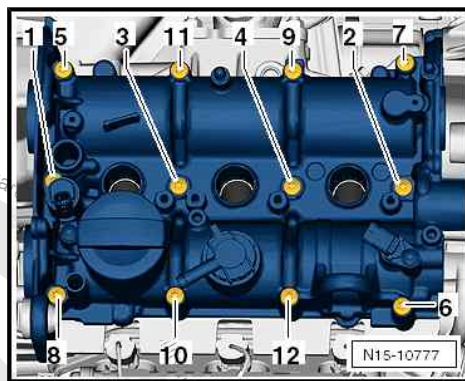


#### Note

- ◆ Risk of roller rocker fingers slipping off valve stem ends and compensation elements.
- ◆ Slowly fit camshaft housing vertically from above onto cylinder head.

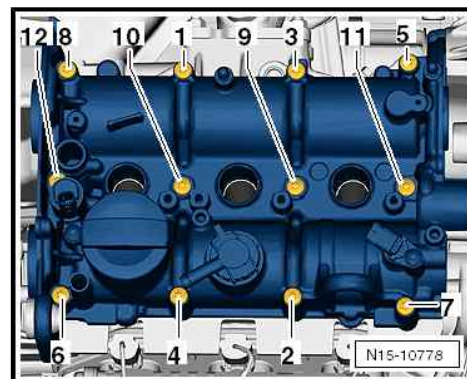
- Carefully fit camshaft housing vertically from above onto dowel pins -arrows-.

Note different bolt lengths.





- Tighten new securing bolts of camshaft housing in specified sequence -1- through -12-.



- Tighten securing bolt -arrow- of earth strap.

Bolt	Specified torques
-Arrow-	8 Nm

- Adjust valve timing ⇒ ["2.6 Adjusting valve timing", page 98](#) .

Install coolant pump

⇒ ["2.3 Removing and installing coolant pump", page 169](#) .

- Install throttle valve module - GX3-  
⇒ ["6.3 Removing and installing throttle valve module GX3", page 238](#) .

- Add coolant ⇒ ["1.3 Draining and adding coolant", page 159](#) .

Further assembly is basically a reverse of the dismantling sequence.

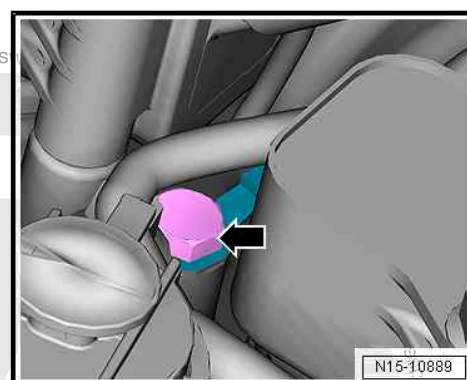
#### Specified torques

- ◆ ⇒ ["2.1 Assembly overview assembly mountings", page 23](#)
- ◆ ⇒ ["1.1 Assembly overview - ignition system", page 275](#)
- ◆ ⇒ ["1.1 Assembly overview - cylinder head", page 61](#)

## 1.4 Checking compression

### Special tools and workshop equipment required

- ◆ Spark plug socket - 3122 B-





◆ Compression tester - V.A.G 1763-



◆ Adapter - V.A.G 1763 /12- (not illustrated)

**Prerequisites for check**

- The engine oil temperature must be at least 30 °C.

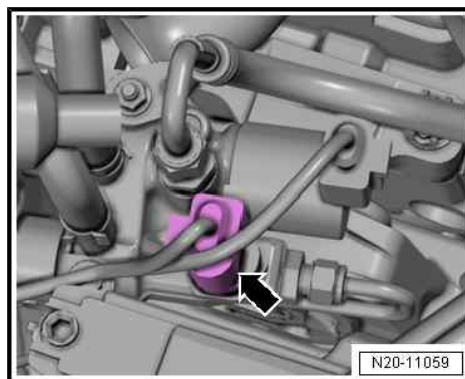
**Test sequence**

**! DANGER**

Risk of explosion and danger to life due to escaping natural gas. A hissing noise is a sign that there are leaks in the natural gas system. Leaks in natural gas system may lead to uncontrolled escape of natural gas.

Risk of explosion leading to serious injuries or death.

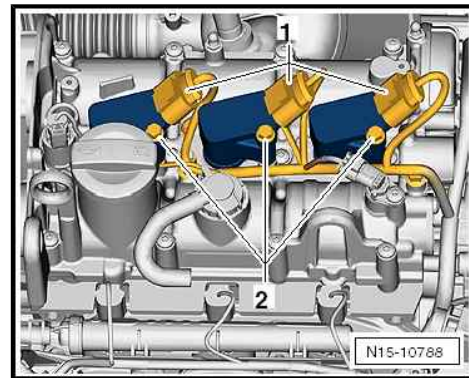
- Do not perform any kind of work on the natural gas system if leaking gas can be heard.
  - If a gas leak can be heard, do not drive the vehicle into the workshop.
  - Park the vehicle outside and cordon off the area around it.
- 
- Before working on the natural gas system, always observe ⇒ ["1.2 Safety precautions when working on natural gas system", page 1](#) !
  - Empty gas system ⇒ Rep. gr. 20 ; Fuel tank; Releasing pressure in high-pressure line .
  - Pull off connector -arrow- on tank pressure sensor - G400- .
  - Remove air filter housing ⇒ ["5.2 Removing and installing air filter housing", page 231](#) .



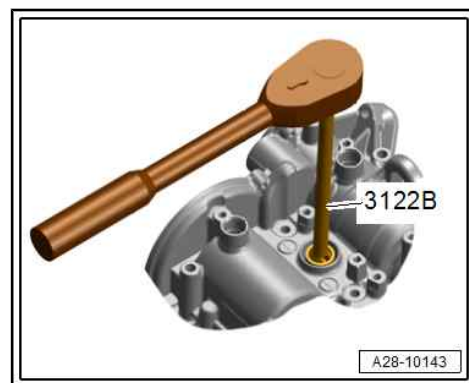




- Disconnect connectors -1- from ignition coils.
- Unscrew securing bolts -2- and pull off ignition coils from spark plugs.



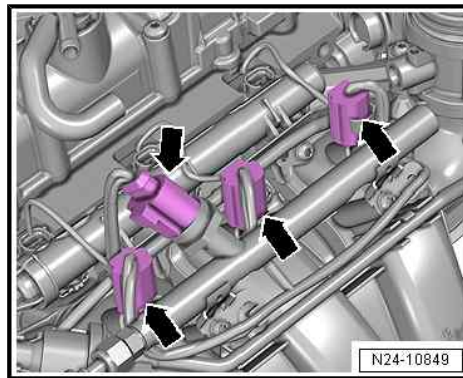
- Unscrew spark plugs using spark plug socket and extension - 3122 B- .







- Pull off connectors of gas injectors and gas rail sensor -arrows-.
- Remove fuse for injectors. Fuse assignment ⇒ Current flow diagrams, Electrical fault finding and Fitting locations
- Screw adapter - V.A.G 1763 /12- into spark plug thread, and tighten it slightly.
- Bolt compression tester - V.A.G 1763- to adapter - V.A.G 1763 /12- .
- Check compression using compression tester - V.A.G 1763- .



#### Note

*How to use the test unit is described in the respective operating instructions.*

- Operate starter until tester shows no further pressure increase.

#### Compression pressures

Compression pressures	Pressure
New	10 ... 15 bar
Wear limit	7 bar
Permissible deviation between cylinders	3 bar

- Screw in and tighten spark plugs using spark plug socket - 3122 B- .
- Fit connectors of gas injectors and gas rail sensor.
- Open fuel tank shut-off valves 1 and 2 - N361/N362- using hand wheel - T50026- .



#### Note

*It is not necessary to activate the gas mode via Guided Functions. The gas mode is activated automatically.*

#### Specified torques

Assembly is carried out in reverse sequence; note the following:

- Install spark plugs ⇒ Maintenance ; Booklet 819 .
- Install ignition coils  
⇒ ["1.2 Removing and installing ignition coils with output stage", page 277](#) .
- Clear any entries in event memory which may have been stored when checking ⇒ Vehicle diagnostic tester, Read event memory, then Generate readiness code.



## 2 Toothed belt drive

⇒ [“2.1 Assembly overview - toothed belt cover”, page 79](#)

⇒ [“2.2 Assembly overview - toothed belt”, page 80](#)

⇒ [“2.3 Removing and installing toothed belt”, page 81](#)

⇒ [“2.4 Preassembling and installing valve timing tool”, page 88](#)

⇒ [“2.5 Checking valve timing”, page 95](#)

⇒ [“2.6 Adjusting valve timing”, page 98](#)

⇒ [“2.7 Removing toothed belt from camshaft”, page 107](#)

### 2.1 Assembly overview - toothed belt cover

1 - Lower toothed belt guard

2 - Bolt

□ 8 Nm

3 - Engine support

□ Specified torque and tightening sequence

⇒ [“1.2 Assembly overview - cylinder block \(pulley end\)”, page 37](#)

4 - Bolt

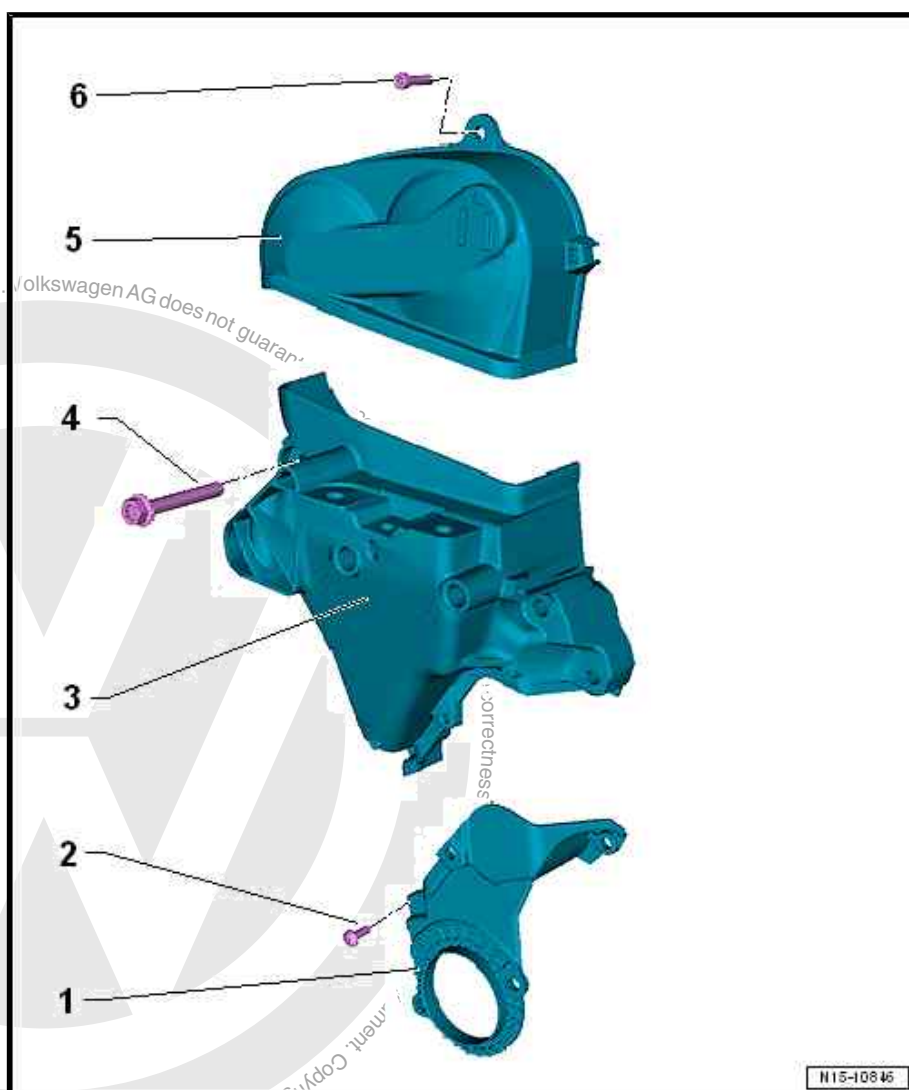
□ Specified torque and tightening sequence

⇒ [“1.2 Assembly overview - cylinder block \(pulley end\)”, page 37](#)

5 - Upper toothed belt guard

6 - Bolt

□ 8 Nm



## 2.2 Assembly overview - toothed belt

### 1 - Toothed belt

- ☐ Before removing, mark direction of rotation with chalk or felt-tipped marker pen.
- ☐ Check for wear ⇒ Maintenance ; Booklet 3.1
- ☐ Removing and installing ⇒ ["2.3 Removing and installing toothed belt", page 81](#)
- ☐ Adjusting valve timing ⇒ ["2.6 Adjusting valve timing", page 98](#)

### 2 - Bolt

- ☐ 25 Nm

### 3 - Tensioning pulley

- ☐ Removal and installation involve removing engine support ⇒ [Item 27 \(page 38\)](#).

### 4 - Bolt

- ☐ Renew
- ☐ 50 Nm +90°

### 5 - Exhaust camshaft toothed belt pulley

- ☐ Removing and installing ⇒ ["3.4 Removing and installing toothed belt pulley", page 118](#)

### 6 - Inlet camshaft toothed belt pulley

- ☐ With camshaft adjuster
- ☐ Removing and installing camshaft adjuster ⇒ ["3.3 Removing and installing camshaft adjuster", page 114](#)

### 7 - Guide bush

### 8 - Bolt

- ☐ Renew
- ☐ 50 Nm +135°

### 9 - O-ring

- ☐ Renew

### 10 - Plug

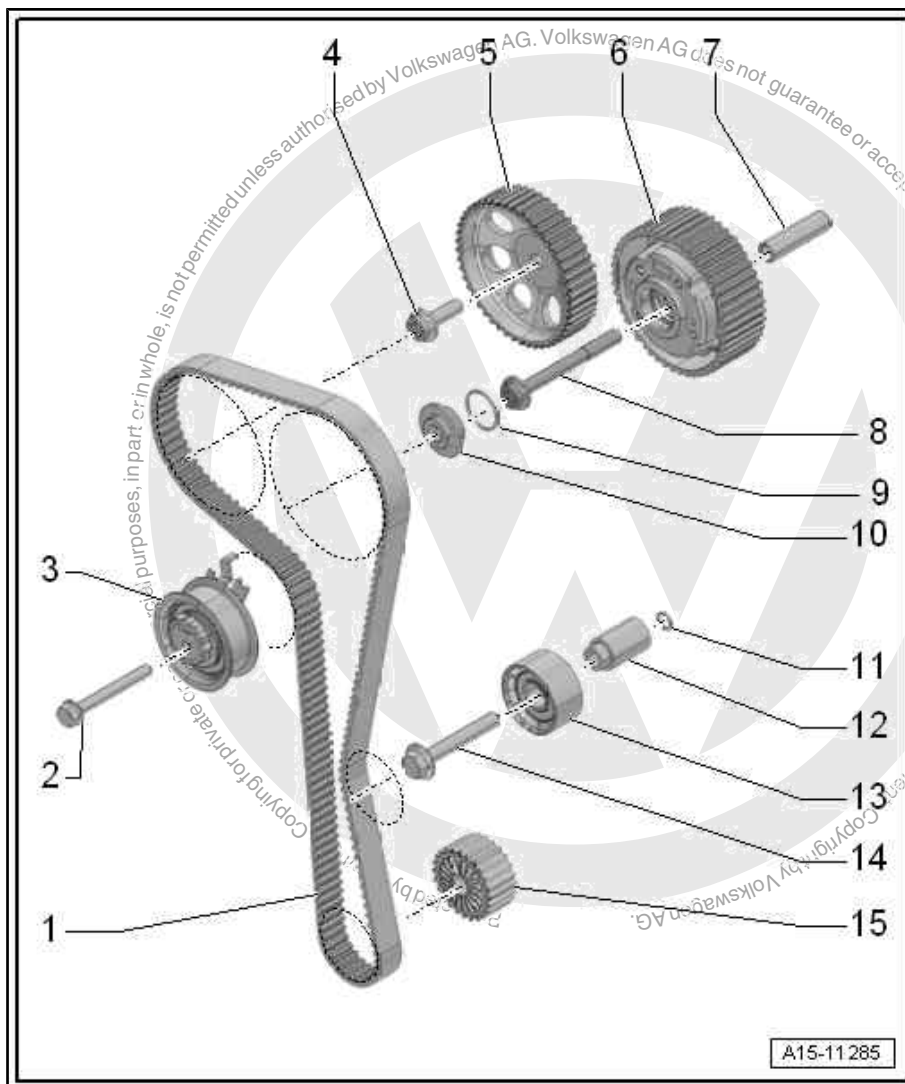
- ☐ 20 Nm
- ☐ Renew

### 11 - O-ring

- ☐ Captive, supplied with "item 13".
- ☐ Renew

### 12 - Spacer sleeve

- ☐ Supplied with item "13".
- ☐ Renew





### 13 - Idler roller

### 14 - Bolt

- ☐ 40 Nm

### 15 - Crankshaft pulley

- ☐ Contact surface between toothed belt pulley and crankshaft must be free from oil
- ☐ Can only be fitted in one position

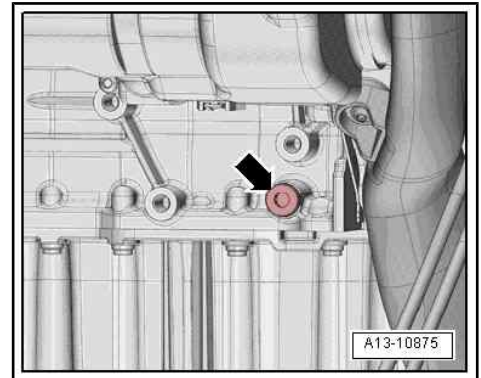
### Plug for "TDC" drilling in cylinder block - specified torque



#### Note

*Renew O-ring if damaged.*

- Tighten bolt -arrow- to 30 Nm.



## 2.3 Removing and installing toothed belt

### Special tools and workshop





## equipment required

- ◆ Torque wrench - VAS 6583-
- ◆ Counterhold - T10172- with adapter -T10172/1- and -T10172/2-
- ◆ Locating bolt - T10340-
- ◆ Counter-hold tool - T10475-
- ◆ Special wrench, 30 mm - T10499A-
- ◆ Insert tool - T10500-
- ◆ Assembly tool - T10487-

## Removing

- Set piston of cylinder no. 1 to "TDC" position.  
⇒ ["2.5 Checking valve timing", page 95](#)
- Mark direction of rotation of toothed belt with marker.
- Remove poly V-belt  
⇒ ["1.3 Removing and installing poly-V belt", page 38](#) .
- Unscrew securing bolt -1- and swivel alternator in direction of arrow-.



### NOTICE

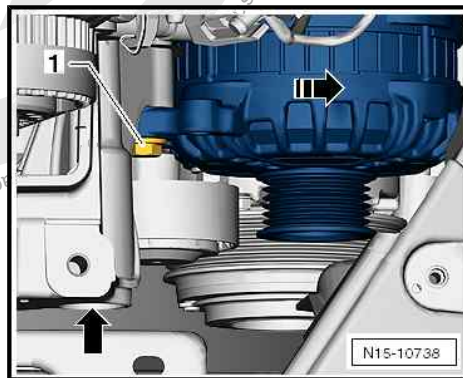
**Risk of damage to camshaft caused by improper handling.**

- **Never use the camshaft clamp for counter holding.**
- Mark direction of rotation of toothed belt with marker.



### Note

- ◆ *A small amount of oil can leak out while loosening the plug.*
- ◆ *To prevent the toothed belt from coming into contact with engine oil, place a cloth underneath the plug when loosening it.*
- Loosen plug of securing bolt for camshaft adjuster and unscrew  
⇒ ["3.3 Removing and installing camshaft adjuster", page 114](#) .



### Note

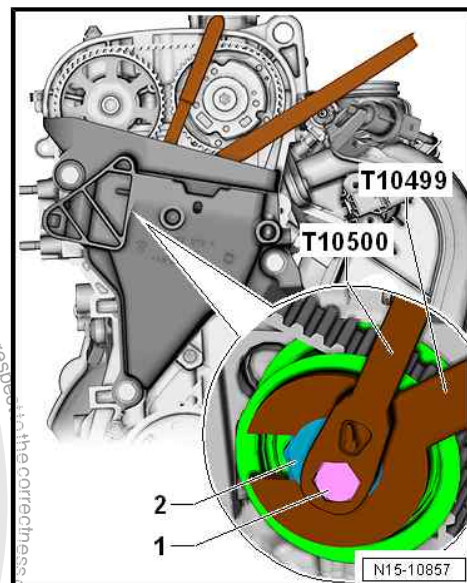
*When adjusting the valve timing, both camshaft pulleys must be loose.*

- Loosen securing bolt of camshaft adjuster  
⇒ ["3.3 Removing and installing camshaft adjuster", page 114](#) .
- Loosen securing bolt of toothed belt pulley  
⇒ ["3.4 Removing and installing toothed belt pulley", page 118](#) .





- Loosen bolt -1- with tool insert - T10500- .
- Relieve tension on tensioning roller at eccentric -2- using wrench - T10499- or wrench - T10499A- .

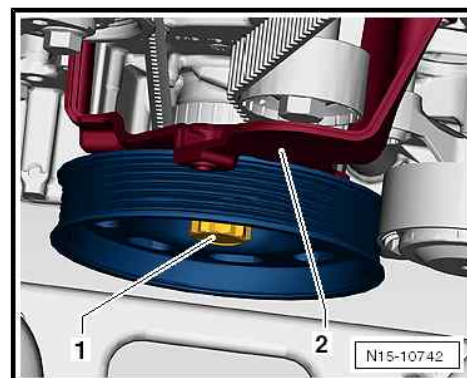
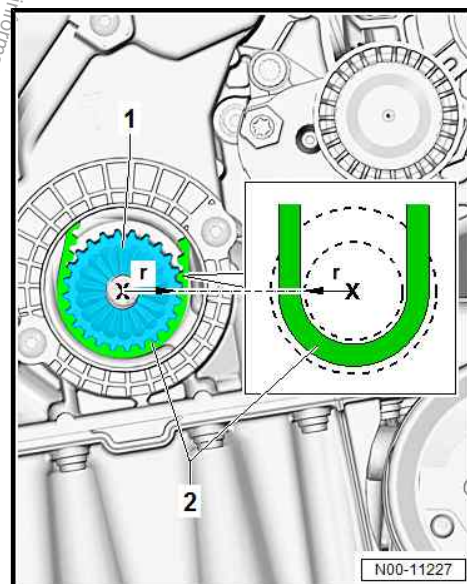


### Bend radius of toothed belt

#### ! NOTICE

**Risk of damage to toothed belt by bending it excessively. The toothed belt is made of glass fibre fabric which will be damaged if it is bent excessively.**

- **Never bend toothed belt to a radius less than  $r = 25$  mm.**
- Never kink any toothed belts, regardless of whether they are used or new.
- The bend radius -r- on the toothed belt -2- should therefore never be below 25 mm (approx. half diameter of gear -1- on crankshaft) ⇒ [page 83](#) .
- Push toothed belt from camshaft pulleys.
- Hold vibration damper using counter-hold tool - T10475- .
- Unscrew bolts -1- and remove vibration damper.

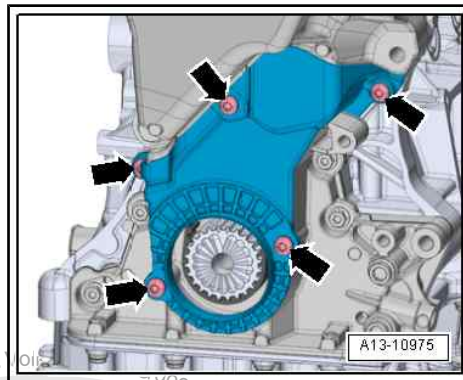




up! 2012 ➤ , up! 2017 ➤

3-cyl. injection engine (1.0 l, natural gas 4V, EA 211) - Edition 06.2019

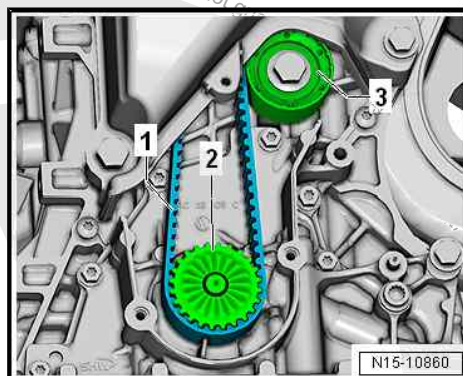
- Unscrew bolts -arrows-, remove lower toothed belt guard -2-.



- Remove toothed belt -1- together with crankshaft sprocket -2- from crankshaft stub.

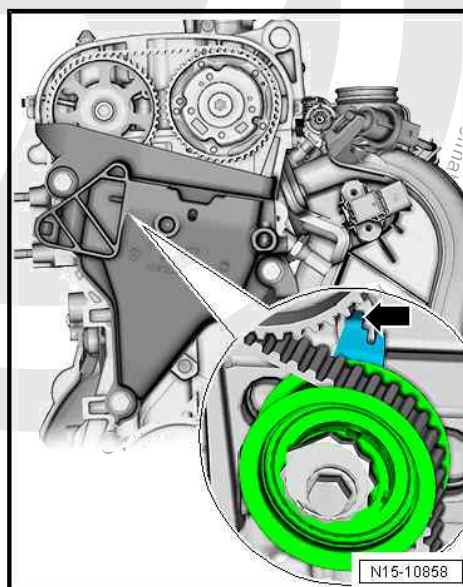
Disregard item -3-.

### Installing



The sheet-metal tab -arrow- of the tensioning roller must engage in the cast notch in the cylinder head.

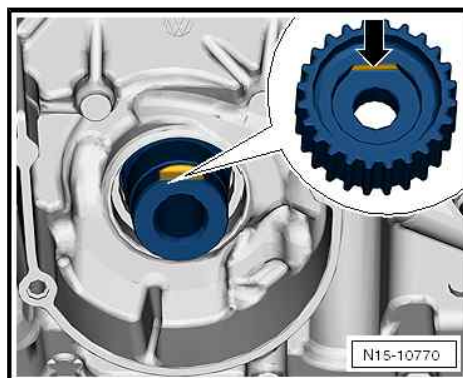
- Push crankshaft sprocket onto crankshaft stub to stop.



Milled surface of crankshaft sprocket -arrow- must be positioned on milled surface of crankshaft stub.

- Fit toothed belt -1- onto toothed belt pulley -2-.

**When existing toothed belt is reused:**

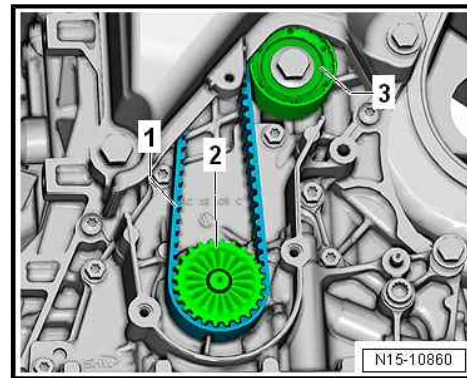




Note arrow for direction of rotation.

- Guide toothed belt to camshaft pulleys through console for engine mounting bracket.

Specified torque for idler pulley -3-: 45 Nm

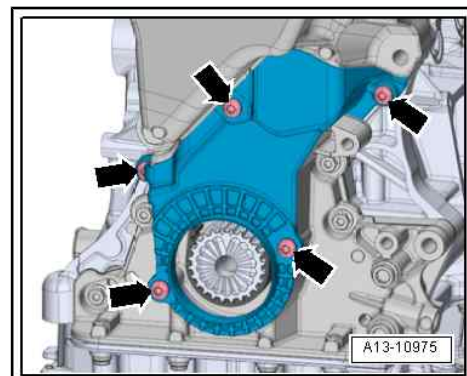


- Fit toothed belt guard, and tighten securing bolts -arrows- to 8 Nm.
- Install vibration damper.

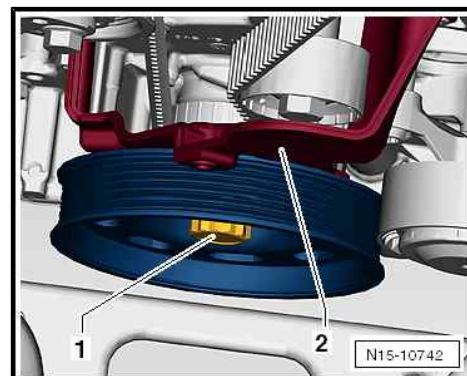
#### NOTICE

**Risk of damage to camshaft caused by improper handling.**

- Never use the camshaft clamp for counter holding.



- Tighten securing bolt -1- of crankshaft vibration damper.

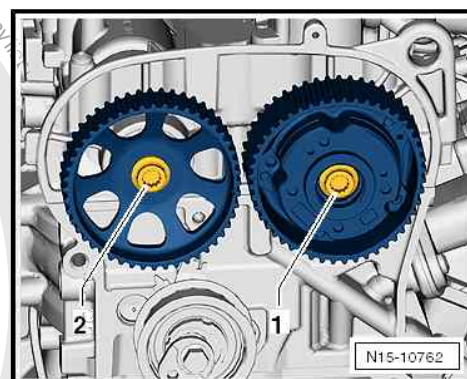


- Loosen securing bolts of camshaft pulleys -1- and -2- until pulleys can be rotated easily by hand.



#### Note

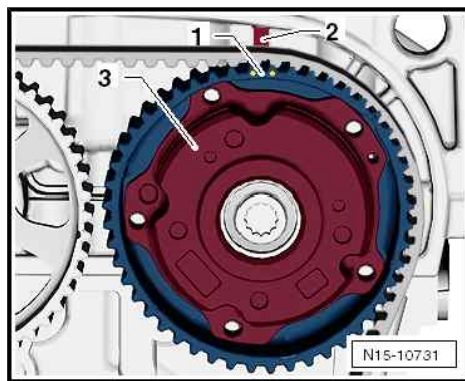
- ◆ The camshaft pulleys are not circular.
- ◆ If one or both camshaft pulleys have been loosened, they must be properly aligned with each other.
- ◆ It should just be possible to turn camshaft pulleys on camshafts but no rocking is permissible.
- ◆ The toothed belt has not yet been fitted.



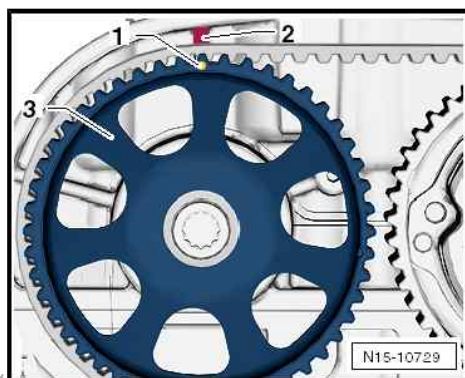




Align marked gap -1- in teeth of camshaft adjuster -3- with lug -2- of camshaft housing.



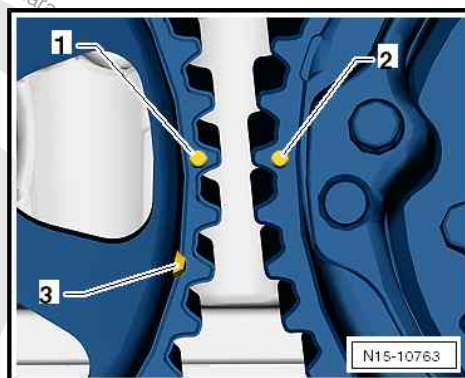
Align marked tooth -1- of exhaust camshaft pulley -3- with lug -2- of camshaft housing.



- Markings -1- and -2- on camshaft pulleys are aligned as shown.

Groove -3- for assembly tool - T10476A- is located on exhaust camshaft pulley.

- Insert assembly tool - T10476A- between camshaft pulleys.

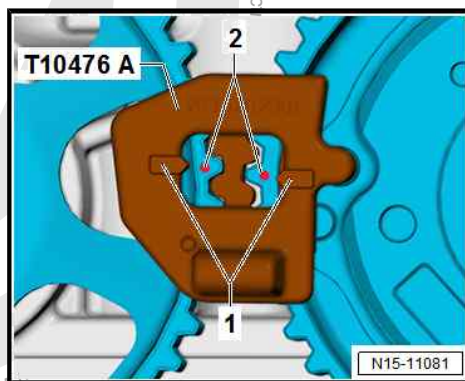


- Arrows -1- on assembly tool are aligned with marks -2- on camshaft pulleys.



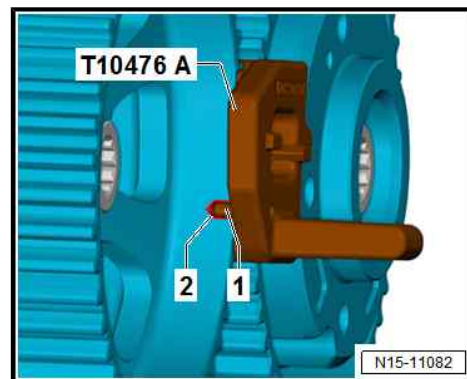
#### Note

*When the assembly tool - T10476A- is inserted, the marks -2- on the camshaft pulleys are slightly offset.*





- Dowel pin -1- of assembly tool - T10476A- must engage in groove -2- of exhaust camshaft pulley.
- Hand-tighten belt tensioner on cylinder head.



The sheet-metal tab -arrow- of the tensioning roller must engage in the cast notch in the cylinder head.



#### Note

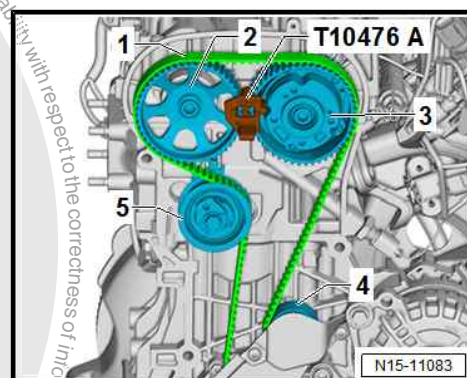
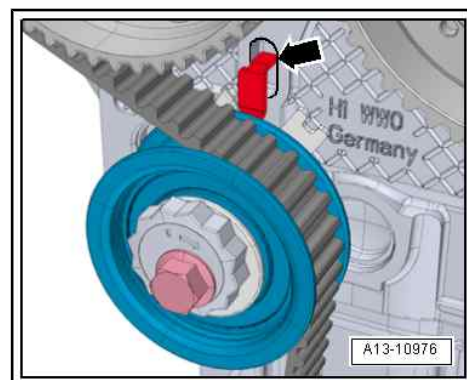
*When installing the toothed belt, ensure that the assembly tool - T10476A- is correctly positioned between the camshaft pulleys.*

- Toothed belt must make full contact with crankshaft pulley.
- Check that crankshaft is set to TDC for No. 1 cylinder.

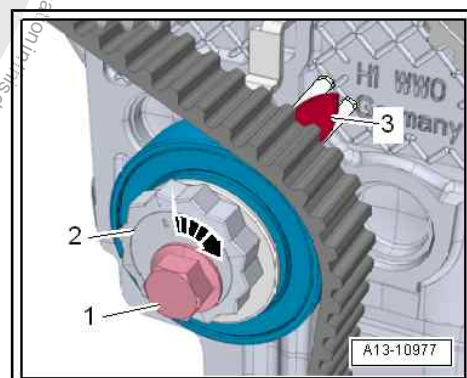
The crankshaft must make contact with the locking pin - T10340- in direction of engine rotation.

- Fit toothed belt -1- onto belt tensioner -5- and camshaft pulley -2-.
- Then fit toothed belt on camshaft adjuster -3- and on idler pulley -4-.

Remove assembly tool - T10476A- from camshaft pulleys.



- Rotate eccentric -2- of belt tensioner using tensioning spanner - T10499- in -direction of arrow- until adjustment pointer -3- is located approx. 10 mm to the right from adjustment window.
- Then rotate eccentric of belt tensioner back on 12-point surface -2- until adjustment pointer -3- is exactly centred in adjustment window.
- Hold eccentric on 12-point surface -2- in this position.



#### Note

- ◆ Risk of damage to engine due to incorrect tightening torque.
- ◆ Torque wrench - VAS 6583- must be used for tightening.
- ◆ When setting the specified torque on the torque wrench - VAS 6583- , the length indicated on the insert tool - T10500- must be entered in the torque wrench.



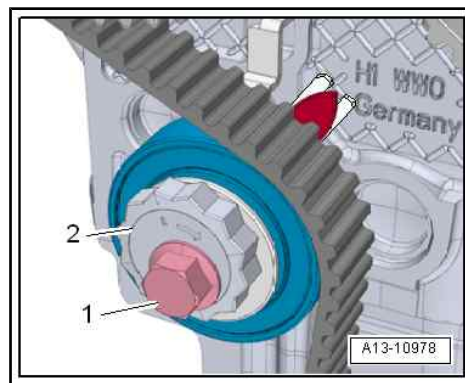


- Tighten securing bolt -1- to 25 Nm.



#### Note

- ◆ *When the engine has been rotated by hand or by engine operation, the position of the adjustment pointer -2- might be slightly offset from the adjustment window -3-.*
  - ◆ *However, this has no relevant influence on the valve timing. The toothed belt does not need to be retensioned.*
- Adjusting valve timing  
⇒ [“2.6 Adjusting valve timing”, page 98](#)



Further assembly is basically a reverse of the dismantling sequence.



#### DANGER

Risk of explosion and danger to life due to escaping natural gas. Leaks in natural gas system may lead to uncontrolled escape of natural gas. Risk of explosion leading to serious injuries or death.

- Check natural gas system for leaks.



#### DANGER

Risk of explosion and danger to life due to escaping natural gas. A hissing noise is a sign that there are leaks in the natural gas system. Leaks in natural gas system may lead to uncontrolled escape of natural gas.

Risk of explosion leading to serious injuries or death.

- Do not perform any kind of work on the natural gas system if leaking gas can be heard.
- If a gas leak can be heard, do not drive the vehicle into the workshop.
- Park the vehicle outside and cordon off the area around it.

#### Specified torques

Assembly overview - cylinder block (pulley end)

⇒ [“1.2 Assembly overview - cylinder block \(pulley end\)”, page 37](#).

## 2.4 Preassembling and installing valve timing tool

⇒ [“2.4.1 Preassembling valve timing tool”, page 88](#)

⇒ [“2.4.2 Installing test tool VAS 611 007”, page 91](#)

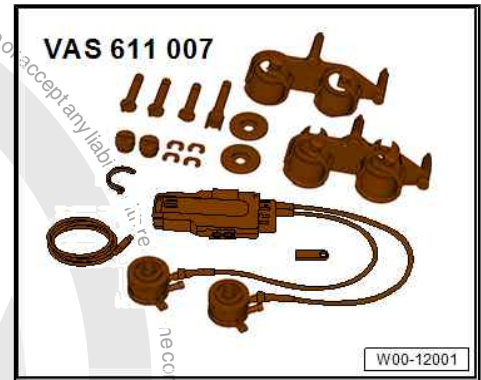
⇒ [“2.4.3 Teaching in test tool VAS 611 007 electronically and performing basic setting”, page 93](#)

### 2.4.1 Preassembling valve timing tool

Special tools and workshop equipment required



- ◆ Tester for checking elongation of chain links - VAS 611 007-



- ◆ Supplement set for MPI engines testing tool - VAS 611 007/18-

Test tool - VAS 611 007- :

A - Angle sensor - VAS 611 007/1-

B - Lock ring - VAS 611 007/2-

C - Clamping ring - VAS 611 007/3-

D - Adapter for camshaft housing - VAS 611 007/11- for 1.0 l engine MPI

E - Adapter for angle sensor - VAS 611 007/12- and adapter for angle sensor - VAS 611 007/13-

- ☐ Adapter for angle sensor - VAS 611 007/12- blue, for inlet camshaft
- ☐ Adapter for angle sensor - VAS 611 007/13- red, for exhaust camshaft





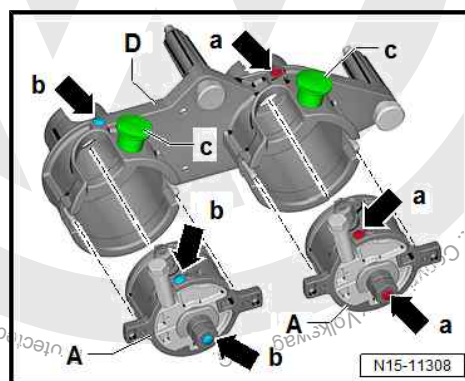
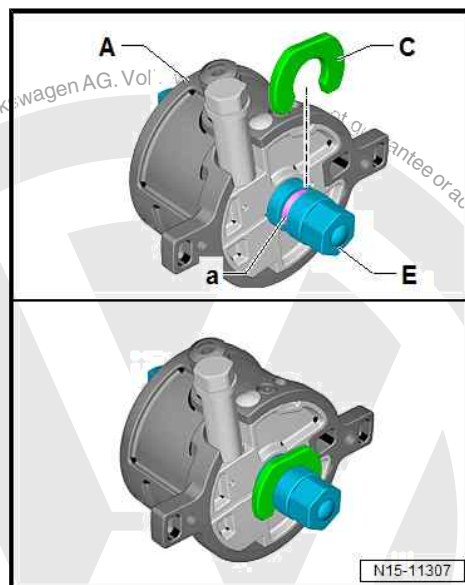
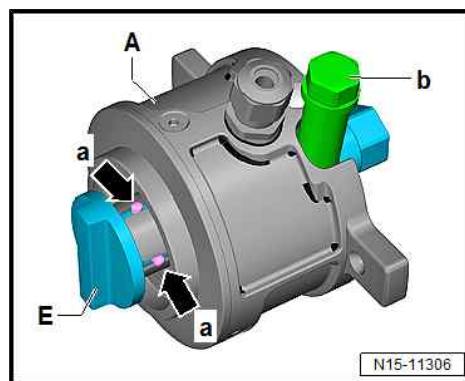
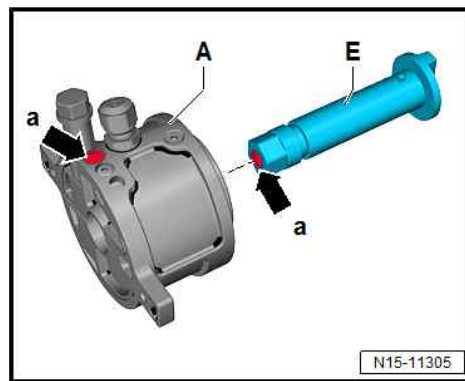
## Preassembling test tool - VAS 611 007- :



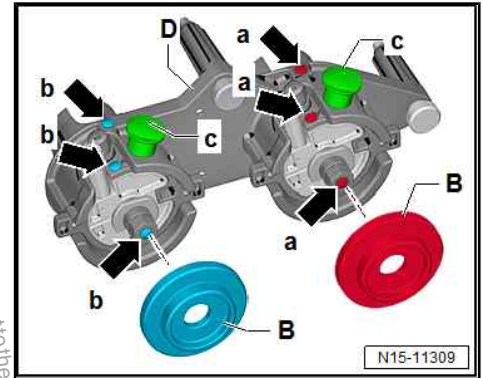
### Note

*The shape of the adapter for angle sensor -E- may differ depending on the engine.*

- Before inserting adapter for angle sensor - VAS 611 007/12- and adapter for angle sensor - VAS 611 007/13- -E- in angle sensors - VAS 611 007/1- -A-, verify correct allocation in accordance with colour coding -a-.
- Insert adapter for angle sensor - VAS 611 007/912- and adapter for angle sensor - VAS 611 007/13- -E- in angle sensors - VAS 611 007/1- -A-.
- Note position of dowel pins -a- when installing.
- The adapters for angle sensor - VAS 611 007/12- and -VAS 611 007/13- -E- can only be fitted in one position.
- Make sure that brake -b- is released. Do not apply force.
- Insert adapters for angle sensor - VAS 611 007/12- and -VAS 611 007/13- -E- to stop into angle sensor - VAS 611 007/1- -A-.
- Fit clamping ring - VAS 611 007/3- -C- in groove -a- of adapter for angle sensor - VAS 611 007/12- and -VAS 611 007/13- -E-, and clip it in until it can be heard to engage.
- Insert angle sensor - VAS 611 007/1- -A- with the red colour coding on the side marked in red -arrows a- of adapter for camshaft housing - VAS 611 007/11- -D-.
- To do this, release locking pins -c- by pulling them upwards.
- Insert angle sensor - VAS 611 007/1- -A-, and push it in until locking pin can be heard to engage.
- Repeat the procedure with the angle sensor - VAS 611 007/1- -A- with blue colour coding -arrows b-.



- Screw in securing rings - VAS 611 007/2- -B- approx. 2 turns.
- Note colour coding -arrows a- and -arrows b- when doing this.
- Make sure that the shafts are free to move. It must be possible to turn adapter for angle sensor - VAS 611 007/12- and -VAS 611 007/13- -E-.



## 2.4.2 Installing test tool - VAS 611 007-

### Special tools and workshop equipment required

- ◆ Tester for checking elongation of chain links - VAS 611 007-



- ◆ Supplement set for MPI engines testing tool - VAS 611 007/18-

### Procedure

- Preassemble test tool - VAS 611 007- ⇒ [page 90](#) .
- Teach in test tool - VAS 611 007- electronically, and perform basic setting ⇒ [page 93](#) .
- Turn the two adapter for angle sensor - VAS 611 007/12- and -VAS 611 007/13- in such a way that the display shows approx. »0°«.
- Perform the preliminary work for checking the valve timing ⇒ ["2.5 Checking valve timing", page 95](#) .
- Make sure that the piston in cylinder no. 1 is at "TDC" position for repair work on toothed belt drive ⇒ ["4.4 Setting piston to TDC position", page 59](#) .

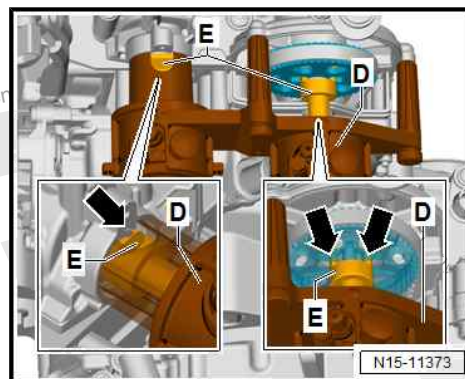


### Note

*Before positioning the test tool - VAS 611 007- against the camshaft housing, the grooves of the camshafts must be checked for damage.*



- Align adapter for angle sensor -E- by hand with grooves of camshafts -arrows-.
- Check proper alignment through recess, and adapt position by turning.

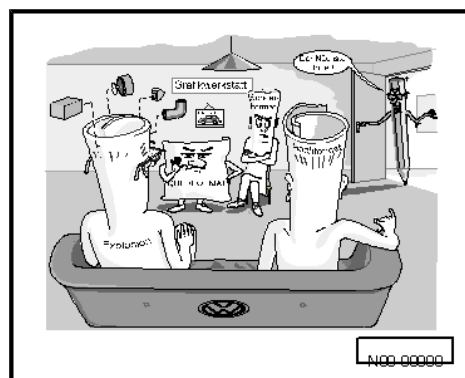
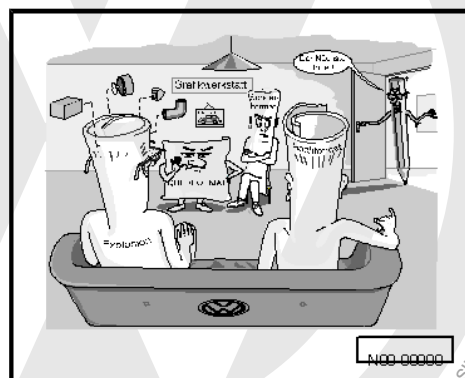


- Fit adapter for camshaft housing - VAS 611 007/11- -D- to camshaft housing, and slide it on.
- Tighten knurled screws -arrows a- alternately by hand.
- Make sure that adapter for camshaft housing - VAS 611 007/11- -D- is properly seated.



#### Note

- ♦ If camshaft housing adapter - VAS 611 007/11- -D- touches the housing of the coolant pump, the basic setting of the coolant pump is incorrect.
- ♦ In this case, correct adjustment or testing of the valve timing is not possible.
- ♦ The coolant pump must be removed and readjusted  
⇒ ["2.3 Removing and installing coolant pump", page 169](#).
- Test tool - VAS 611 007- must rest flush against camshaft housing.
- Make sure that brakes on angle sensor - VAS 611 007/1- are released on both sides ⇒ [page 90](#).
- Tighten locking ring - VAS 611 007/2- -B- on both sides evenly by hand. When doing this, ensure that camshaft housing adapter - VAS 611 007/11- -D- always lies flat against camshaft housing -1-.







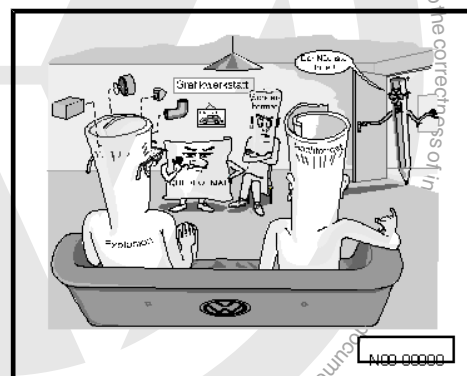
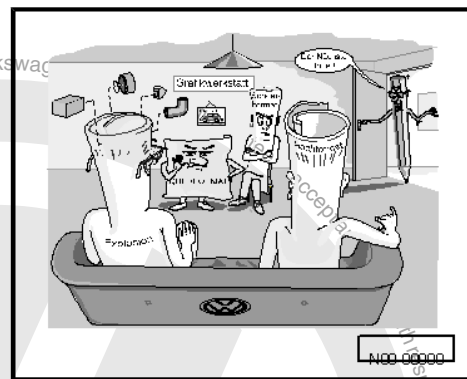
- Camshaft housing adapter - VAS 611 007/11- -D- should not lift off of camshaft housing -1-.



#### Note

- ◆ The correct preload is achieved when the camshaft housing adapter - VAS 611 007/11- lies flat against the camshaft housing.
- ◆ If the locking ring - VAS 611 007/12- is tightened too much, the camshaft housing adapter - VAS 611 007/11- will lift off of the camshaft housing. This will falsify the result of the measurement.

- Make sure that brakes -a- are released on both sides.



### 2.4.3 Teaching in test tool - VAS 611 007- electronically and performing basic setting

#### Special tools and workshop equipment required

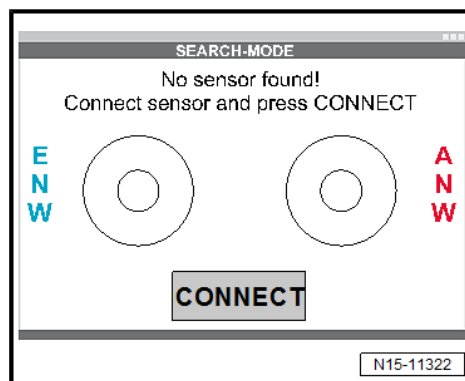
- ◆ Tester for checking elongation of chain links - VAS 611 007-



- ◆ Supplement set for MPI engines testing tool - VAS 611 007/18-
- Connect electronic measuring equipment of test tool - VAS 611 007- ⇒ Operating manual .
- Perform software installation of test tool - VAS 611 007- ⇒ Operating manual .
- Start test program ⇒ Operating manual .



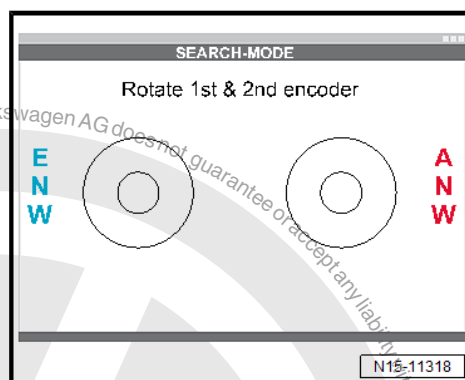
- If the angle sensors are not connected, the message shown in the illustration is displayed.
- Connect test tool - VAS 611 007- , and press **CONNECT**.



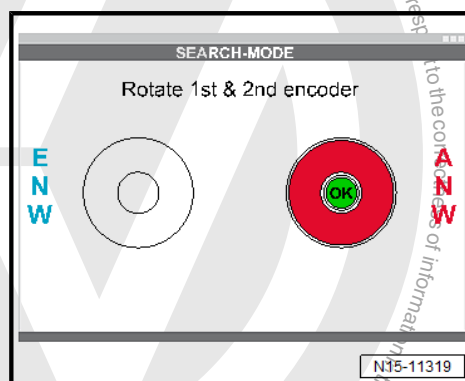
- If the test tool - VAS 611 007- is connected, the display is as shown in the illustration.

ANW - Exhaust camshaft, red

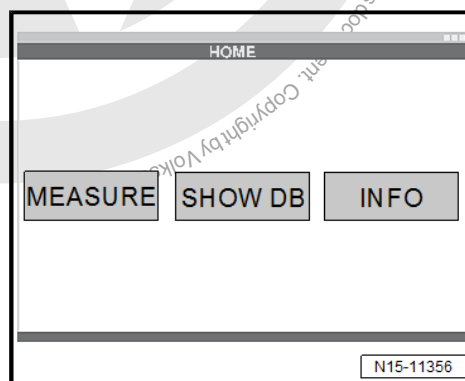
ENW - Inlet camshaft, blue



- Turn adapter for angle sensor - VAS 611 007/13- -E- of exhaust camshaft.
- If »OK« is displayed, the exhaust camshaft has been taught-in.
- Turn adapter for angle sensor - VAS 611 007/12- -E- of inlet camshaft.



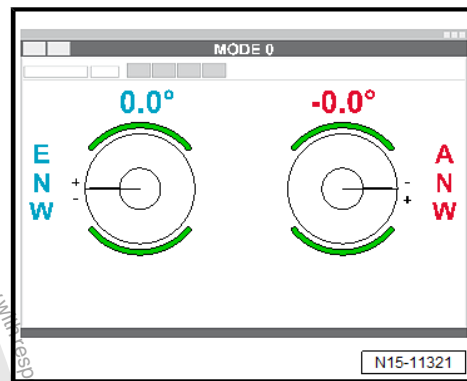
- If the display is as shown in the illustration, the exhaust camshaft has been taught-in.
- Select function **MEASURE**.



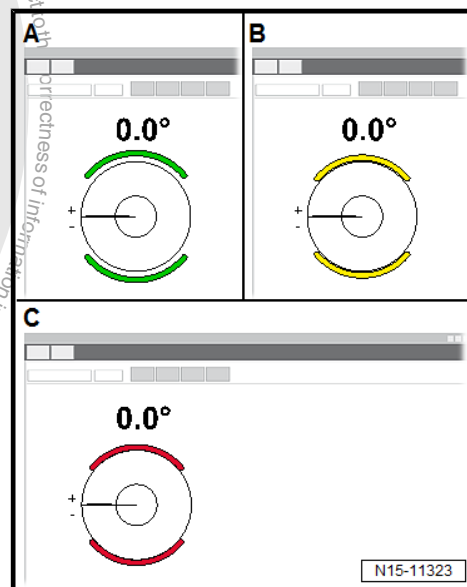


- When the angle display appears, the valve timing can be checked or adjusted

⇒ "2.5 Checking valve timing", page 95.



- Make sure that the brake indicator on the display is »green«.
- Display must not be »yellow« or »red«.
- A - »Green«, brake is released
- B - »Yellow«, brake is applied
- C - »Red«, brake has been tightened to final torque



## 2.5 Checking valve timing

### Special tools and workshop equipment required

- ◆ Tester for checking elongation of chain links - VAS 611 007-



- ◆ Supplement set for MPI engines testing tool - VAS 611 007/18-



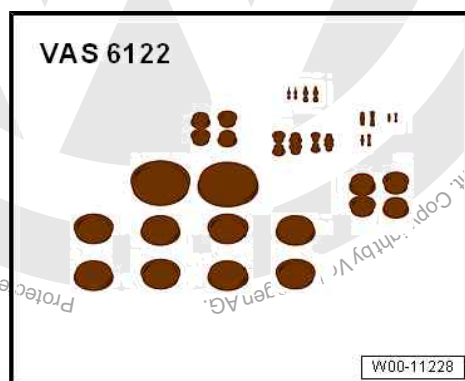
up! 2012 ➤ , up! 2017 ➤

3-cyl. injection engine (1.0 l, natural gas 4V, EA 211) - Edition 06.2019

◆ Locating bolt - T10340-

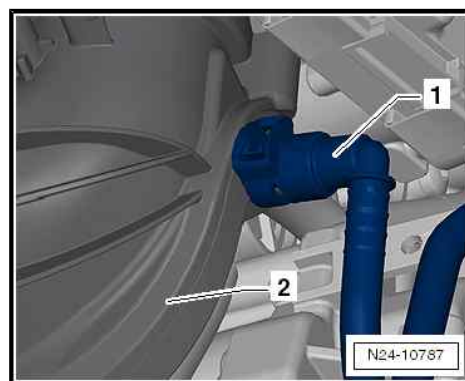


◆ Engine bung set - VAS 6122-

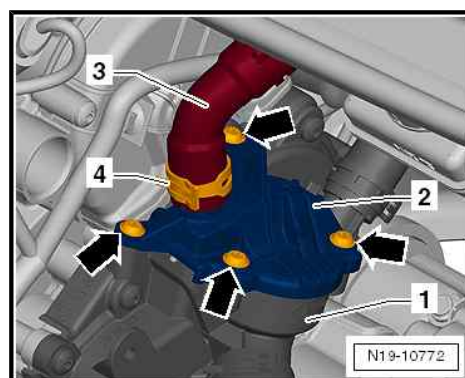


**Preliminary work for the procedure:**

- Remove air filter housing  
⇒ ["5.2 Removing and installing air filter housing", page 231](#) .
- Remove upper part of toothed belt guard  
⇒ ["1.2 Assembly overview - cylinder block \(pulley end\)", page 37](#) .
- Remove vacuum line -1- from intake manifold -2-.
- Lay vacuum line to one side.



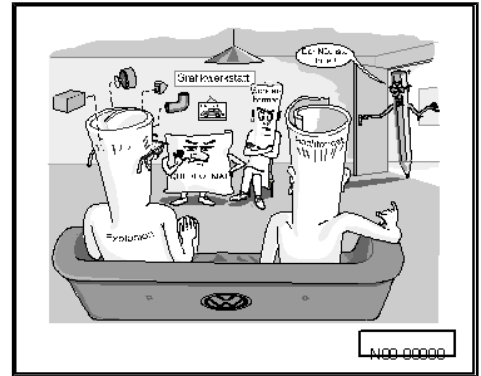
- Loosen clamp -4- and disconnect hose -3-.
- Unscrew bolts -arrows-.
- Remove cover -2-.
- Set piston in cylinder no. 1 to "TDC" position for repair work on toothed belt drive  
⇒ ["4.4 Setting piston to TDC position", page 59](#) .
- Preassemble test tool - VAS 611 007-  
⇒ ["2.4.1 Preassembling valve timing tool", page 88](#) .
- Install test tool - VAS 611 007-  
⇒ ["2.4.2 Installing test tool VAS 611 007 ", page 91](#) .



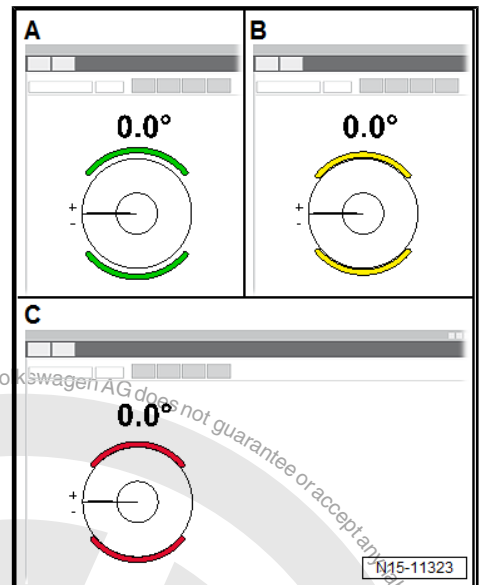


### Checking valve timing:

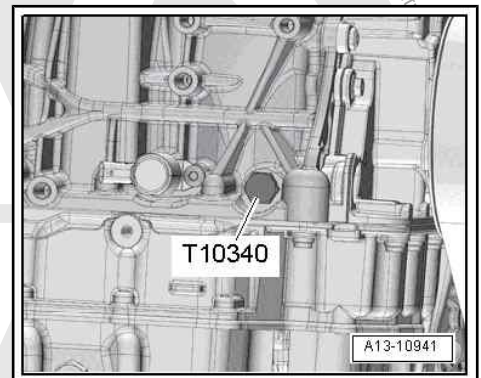
- Make sure that brakes -a- on test tool - VAS 611 007- are released on both sides.



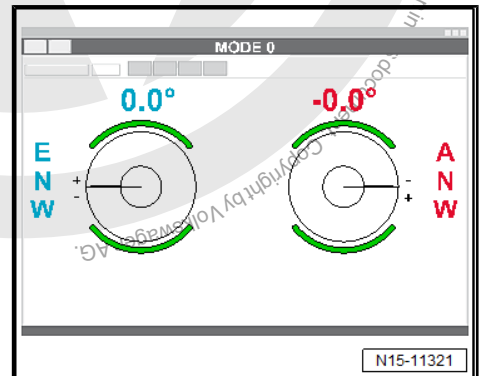
- Make sure that the brake indicator on the display is »green« -A-.
- Display must not be »yellow« or »red«.



- Unscrew locking pin - T10340- .
- Turn crankshaft 2 turns in direction of rotation of engine.
- Screw in locking pin - T10340- .
- Set piston in cylinder no. 1 to »TDC« position  
⇒ ["4.4 Setting piston to TDC position", page 59](#) .



- Read valve timing angles on display, and compare values with specifications.







Specified angle in °	Inlet camshaft	Exhaust camshaft
	0.0°±1.5°	-0.5°±1.5°

#### NOTICE

Adjust valve timing as precisely as possible. The settings must be as close to the specifications as possible.

The valve timing must not be outside the tolerance limits.

- If the valve timing is not OK, adjust valve timing  
⇒ [“2.6 Adjusting valve timing”, page 98](#) .

Assemble in reverse order of dismantling. The following should be observed:

- Add coolant ⇒ [“1.3 Draining and adding coolant”, page 159](#) .
- Install upper toothed belt guard  
⇒ [“1.2 Assembly overview - cylinder block \(pulley end\)”, page 37](#) .
- Install air filter housing  
⇒ [“5.2 Removing and installing air filter housing”, page 231](#) .



#### Note

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

- Renew O-rings, seals and gaskets after each removal.

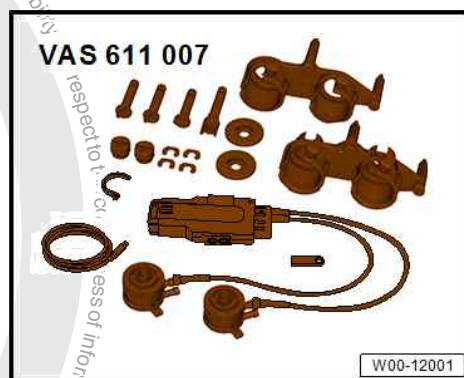
#### Specified torques

- ♦ ⇒ [“2.2 Assembly overview - toothed belt”, page 80](#)
- ♦ ⇒ [Fig. “Plug for TDC drilling in cylinder block - specified torque”, page 81](#)
- ♦ ⇒ [“1.1 Assembly overview - cylinder head”, page 61](#)
- ♦ ⇒ [“2.2 Assembly overview - thermostat”, page 168](#)

## 2.6 Adjusting valve timing

#### Special tools and workshop equipment required

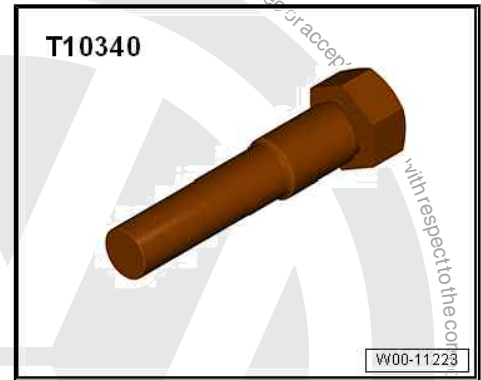
- ♦ Tester for checking elongation of chain links - VAS 611 007-



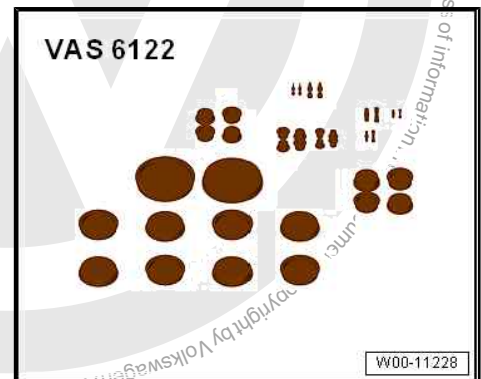
- ♦ Supplement set for MPI engines testing tool - VAS 611 007/18-



◆ Locating bolt - T10340-



◆ Engine bung set - VAS 6122-



## Procedure

- Toothed belt installed  
⇒ [“2.3 Removing and installing toothed belt”, page 81](#) .
- Check valve timing ⇒ [“2.5 Checking valve timing”, page 95](#) .
- Do not relieve tension from toothed belt, and do not remove toothed belt from camshafts when adjusting valve timing. Only loosen camshaft adjuster.
- Loosen camshaft adjuster on inlet side  
⇒ [“3.3 Removing and installing camshaft adjuster”, page 114](#) .
- Loosen toothed belt sprocket on exhaust side  
⇒ [“3.4 Removing and installing toothed belt pulley”, page 118](#) .

### NOTICE

Risk of damage to engine caused by incorrect valve timing.

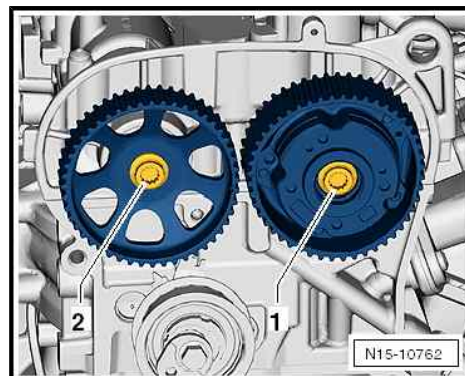
- Do not turn crankshaft out of TDC position.

### Note

- ◆ Place a cloth under the camshaft adjusters and over tensioning roller to catch the engine oil which runs out.
- ◆ The contact points between the toothed belt and components - such as camshaft pulleys, tensioning roller and idler pulley - must be kept free of oil.
- ◆ Catch any engine oil which runs out immediately, and remove it.
- ◆ Remove any engine oil which ran out from camshaft adjusters after the engine has been cranked.

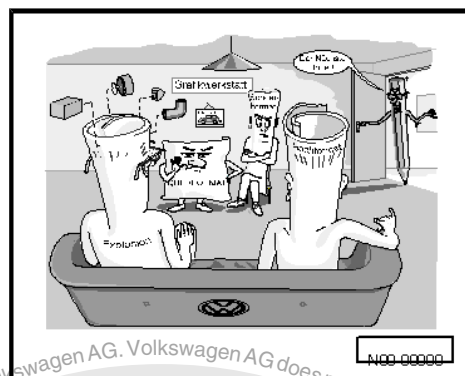


- Place a cloth under the camshaft adjusters and over tensioning roller to catch the engine oil which runs out.
- Make sure that the piston in cylinder no. 1 is at “TDC” position for repair work on toothed belt drive  
⇒ [“4.4 Setting piston to TDC position”, page 59](#) .
- Renew bolts -1- and -2- and screw in loosely  
⇒ [“3.3 Removing and installing camshaft adjuster”, page 114](#) .
- It should still be possible to turn the camshaft adjuster and toothed belt sprocket on the camshafts.

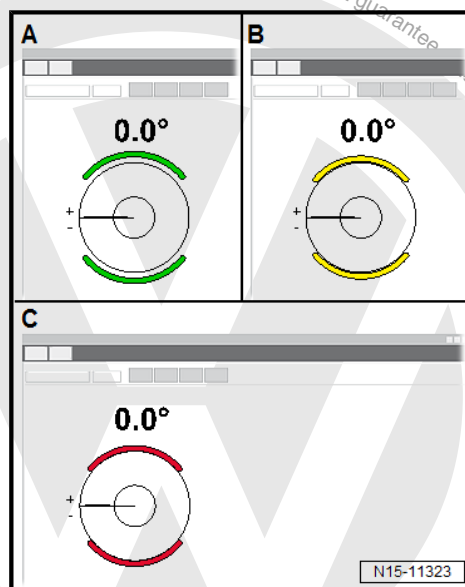


#### Setting camshafts to »0°«:

- Make sure that bolts -a- for brakes on test tool - VAS 611 007- are released on both sides.

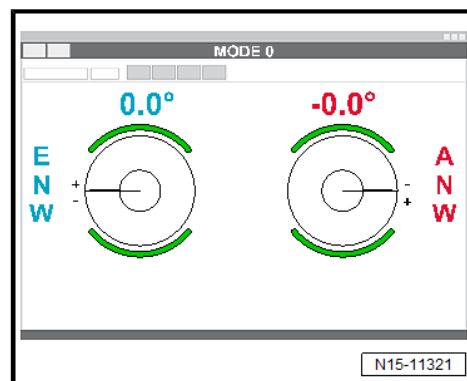


- Make sure that the brake indicator on the display is »green«  
-A-.
- Display must not be »yellow« or »red«.





- Set both camshafts to »0.0°«.

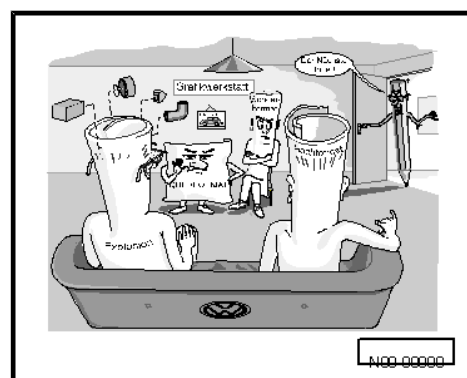


- To do this, turn camshafts with adapter for angle sensor - VAS 611 007/12- and -VAS 611 007/13- -E-.
- Hold camshafts in »0.0°« position using adapters for angle sensor - VAS 611 007/12- and -VAS 611 007/13- -E- and a hexagon key.

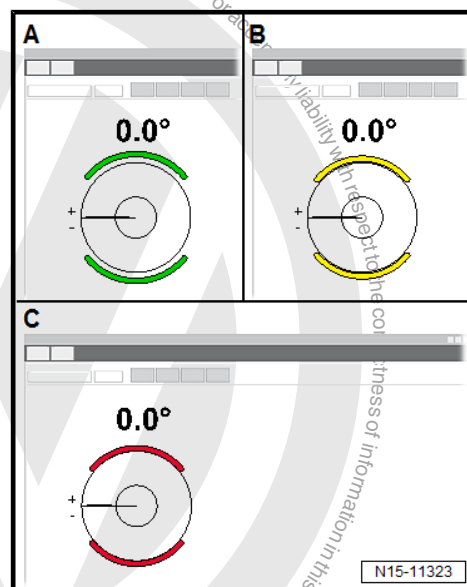


#### Note

- ◆ The camshafts tend to turn.
- ◆ Use a hexagon key to hold the camshafts in »0.0°« position.
- ◆ Always remove the hexagon key after the camshafts have been tightened.



- Tighten brakes after adjustment has been completed.
- Tighten bolts -a- for brakes on test tool - VAS 611 007- to 11 Nm on both sides.
- Make sure that the brake indicator on the display is »red« -C-.
- Display must not be »yellow« or »green«.

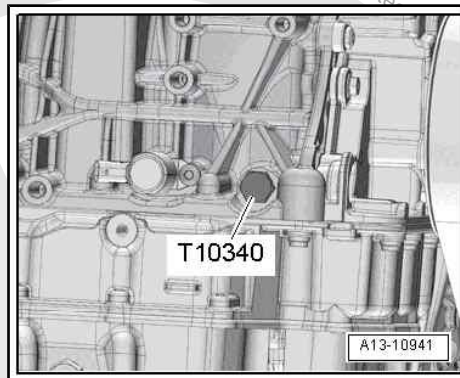




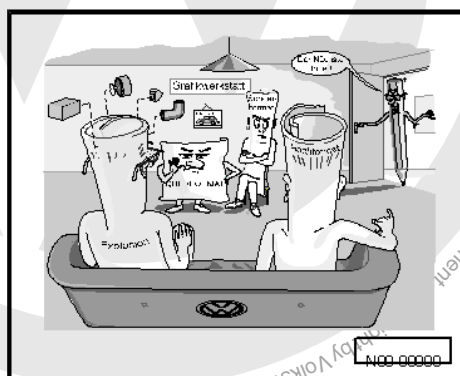
up! 2012 ➤ , up! 2017 ➤

3-cyl. injection engine (1.0 l, natural gas 4V, EA 211) - Edition 06.2019

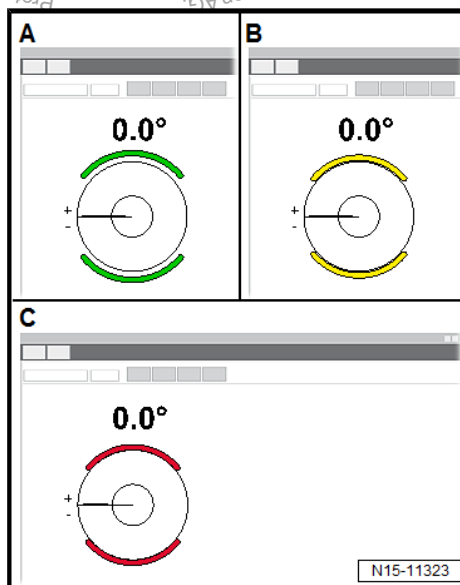
- Unscrew locking pin - T10340- .
- Tighten camshaft adjuster on inlet camshaft to specified initial torque ➔ [page 116](#) .
- Tighten toothed belt sprocket of exhaust camshaft to specified initial torque ➔ [page 116](#) .



- Make sure that brakes -a- on test tool -VAS 611 007- are released on both sides.



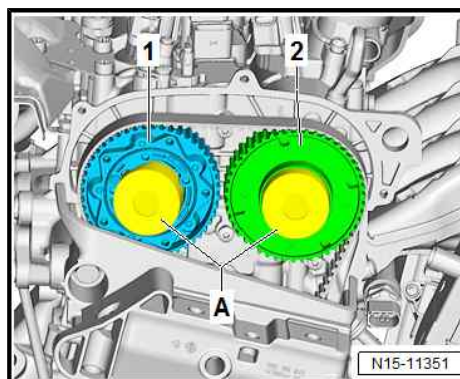
- Make sure that the brake indicator on the display is »green« -A-.
- Display must not be »yellow« or »red«.



- Seal camshaft adjusters -2-, as shown, using suitable plugs -A- from engine bung set -VAS 6122- .
- Fit a piece of paper into plugs to catch the engine oil.
- Insert plugs into camshaft adjusters with the open side facing towards front, as shown in illustration.
- Turn crankshaft 2 turns in direction of rotation of engine.

#### Determining correction angle:

- Screw in locking pin - T10340- .
- Set piston in cylinder no. 1 to »TDC« position ➔ ["4.4 Setting piston to TDC position", page 59](#) .





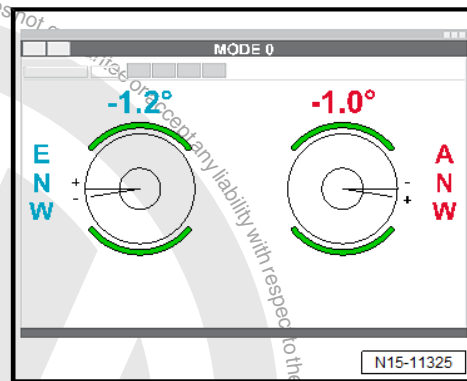


- Read valve timing on display and write down values. The illustration shows values as an example.



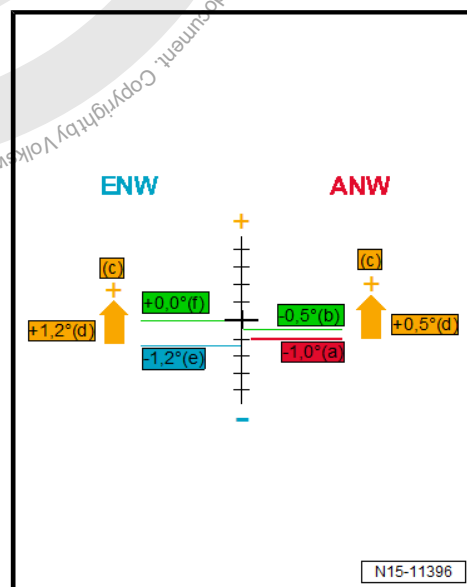
#### Note

- ◆ The correction angle is determined for each individual vehicle.
- ◆ The value read after the engine has been cranked is used for determining the correction angle.
- ◆ Note the algebraic signs of the values.
- ◆ The correction angle results from the difference between the specification and the value which has been read after the crankshaft has been cranked twice.
- ◆ The correction angle is used to adjust the valve timing.
- ◆ The difference between the actual value (read after 2 full revolutions of the engine) and the specification (see table) is calculated.
- ◆ The result is the correction angle to be set, with the corresponding algebraic sign/direction of rotation.



Example:

Index	Explanation
e	Inlet camshaft - actual value (after 2 full revolutions of the engine)
f	Inlet camshaft - specification (+/- tolerance)
c	Direction of correction (+/-)
d	Correction value - correction angle
a	Exhaust camshaft - actual value (after 2 full revolutions of the engine)
b	Exhaust camshaft - specification (+/- tolerance)



Angle in °	Inlet camshaft	Exhaust camshaft
Specified value	0.0° ± 1.5°	-0.5° ± 1.5°

- Set determined correction angle for camshafts.

#### Setting valve timing with correction angle:

- Place a cloth underneath camshaft adjuster to catch any engine oil which runs out.
- Remove plugs taken from engine bung set - VAS 6122- from camshaft adjuster.
- Remove paper from plugs and camshaft adjusters.
- Clean camshaft adjusters with a cleaning cloth, and remove as much engine oil as possible.

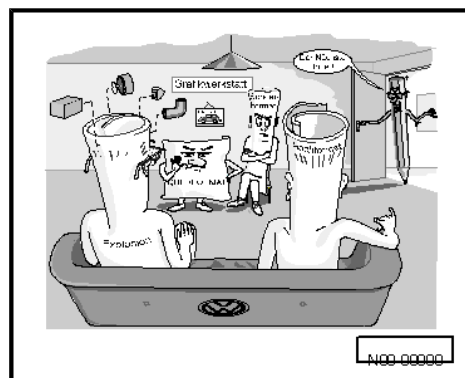


- Loosen camshaft adjuster on inlet side  
⇒ ["3.3 Removing and installing camshaft adjuster", page 114](#) .
- Loosen toothed belt sprocket on exhaust side  
⇒ ["3.4 Removing and installing toothed belt pulley", page 118](#) .

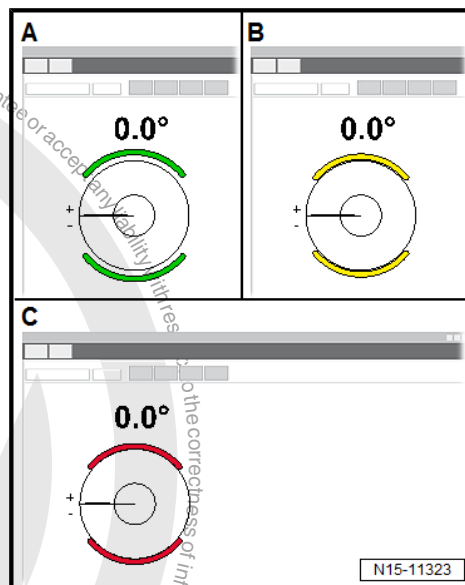
# NOTICE

**Risk of damage to engine caused by incorrect valve timing.**

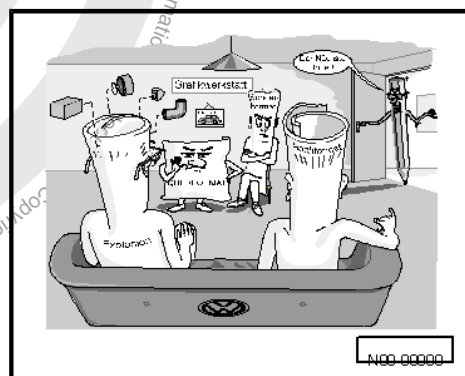
- Do not turn crankshaft out of TDC position.
- Make sure that the piston in cylinder no. 1 is at "TDC" position for repair work on toothed belt drive  
⇒ ["4.4 Setting piston to TDC position", page 59](#) .
- Make sure that bolts -a- for brakes on test tool - VAS 611 007- are released on both sides.



- Make sure that the brake indicator on the display is »green« -A-.
- Display must not be »yellow« or »red«.
- Set the two camshafts to the determined correction angle  
⇒ [page 102](#) .

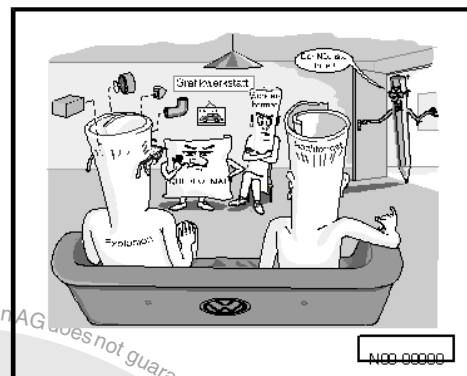


- To do this, turn camshafts with adapter for angle sensor - VAS 611 007/12- and -VAS 611 007/13- -E-.

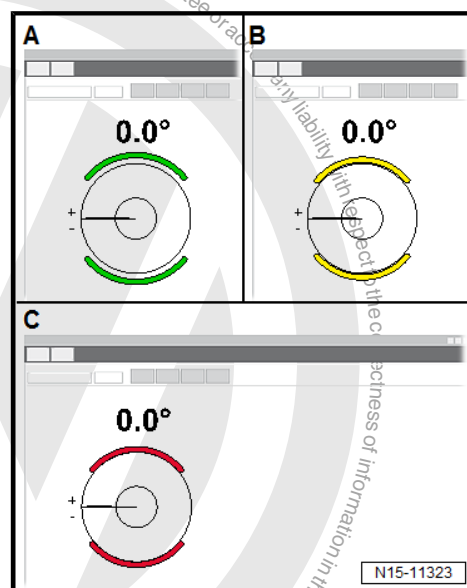


**If the valve timing has been set:**

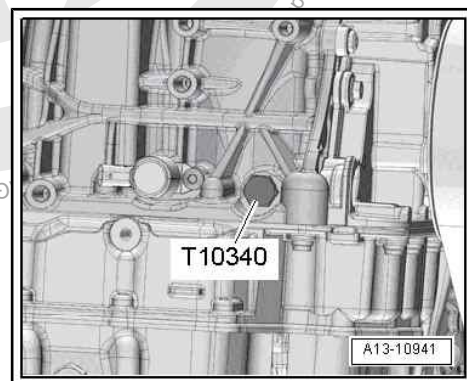
- Tighten bolts -a- for brakes on test tool - VAS 611 007- to 11 Nm on both sides.



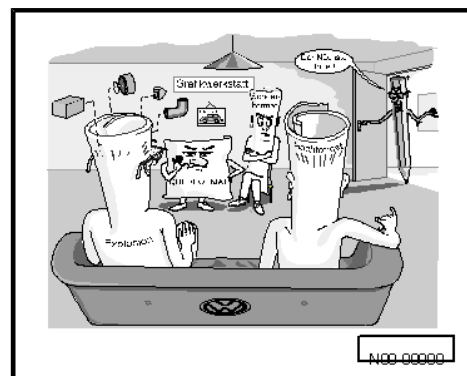
- Make sure that the brake indicator on the display is »red« -C-.
- Display must not be »yellow« or »green«.



- Unscrew locking pin - T10340-
- Tighten camshaft adjuster on inlet camshaft to specified initial torque [⇒ page 116](#).
- Tighten toothed belt sprocket of exhaust camshaft to specified initial torque [⇒ page 116](#).

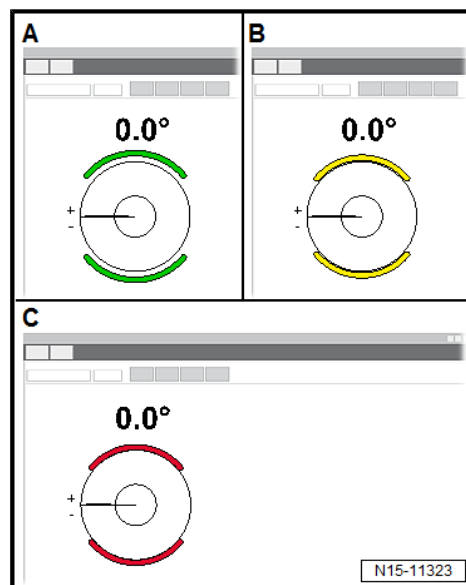


- Release brakes -a- on test tool - VAS 611 007- on both sides.





- Make sure that the brake indicator on the display is »green« -A-.
- Display must not be »yellow« or »red«.



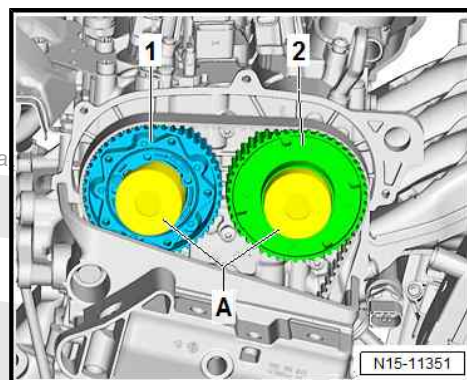
- Seal camshaft adjusters -2- again, as shown, using suitable plugs -A- from engine bung set - VAS 6122- .
- Fit a new piece of paper into plugs -A- to catch the engine oil.
- Turn crankshaft 2 turns in direction of rotation of engine.
- Screw in locking pin - T10340- .
- Set piston in cylinder no. 1 to »TDC« position  
⇒ ["4.4 Setting piston to TDC position", page 59](#) .
- Check valve timing ⇒ ["2.5 Checking valve timing", page 95](#) .

#### ! NOTICE

Adjust valve timing as precisely as possible. The settings must be as close to the specifications as possible.

The valve timing must not be outside the tolerance limits.

- Read valve timing, and compare it with specifications.



Specified angle in °	Inlet camshaft	Exhaust camshaft
	$0.0^\circ \pm 1.5^\circ$	$-0.5^\circ \pm 1.5^\circ$

- If the valve timing is not OK, adjust valve timing again  
⇒ ["2.6 Adjusting valve timing", page 98](#) .

Assembly is carried out in reverse sequence; note the following:

- Unscrew locking pin - T10340- .
- Make sure that brakes on test tool - VAS 611 007- are released on both sides.
- Tighten camshaft adjuster on inlet camshaft to specified final torque ⇒ [page 117](#) .
- Tighten toothed belt sprocket of exhaust camshaft to specified final torque ⇒ [page 117](#) .

#### Specified torques

- ◆ ⇒ ["2.2 Assembly overview - toothed belt", page 80](#)



- ◆ ⇒ Fig. ““Plug for TDC drilling in cylinder block - specified torque””, page 81
- ◆ ⇒ “1.1 Assembly overview - cylinder head”, page 61
- ◆ ⇒ “2.1 Assembly overview - crankcase breather system”, page 148
- ◆ ⇒ “2.2 Assembly overview - thermostat”, page 168

## 2.7 Removing toothed belt from camshaft

Special tools and workshop equipment required



- ◆ Torque wrench - VAS 6583-
- ◆ Counterhold - T10172- with adapter -T10172/1- and - T10172/2-
- ◆ Locating bolt - T10340-
- ◆ Counter-hold tool - T10475-
- ◆ Special wrench, 30 mm - T10499A-
- ◆ Insert tool - T10500-
- ◆ Assembly tool - T10487-





## Procedure

- Set piston in cylinder no. 1 to TDC position  
⇒ [“4.4 Setting piston to TDC position”, page 59](#) .
- Remove upper part of toothed belt guard  
⇒ [“1.2 Assembly overview - cylinder block \(pulley end\)”, page 37](#) .
- Loosen securing bolt for camshaft adjuster on inlet side  
⇒ [“3.3 Removing and installing camshaft adjuster”, page 114](#) .
- Loosen securing bolt of toothed belt pulley on exhaust side  
⇒ [“3.4 Removing and installing toothed belt pulley”, page 118](#) .
- Loosen bolt -1- with tool insert - T10500- .
- Release tension on tensioning roller at eccentric -2- using wrench - T10499- .
- Remove toothed belt from camshaft pulleys.

## Installing

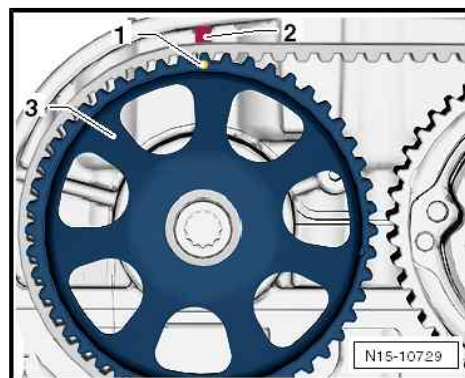
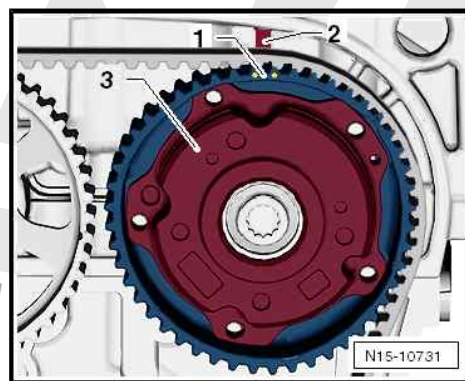
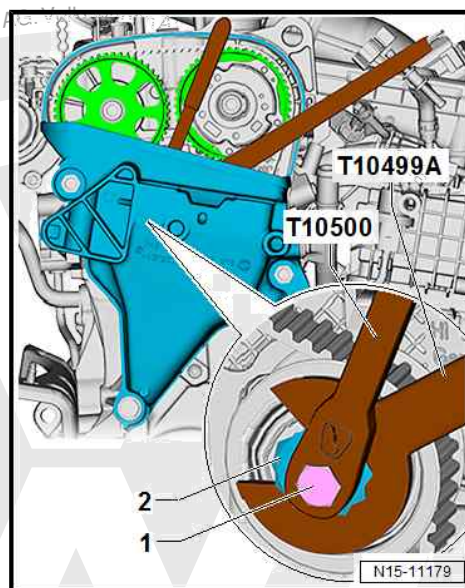


### Note

- ♦ *The camshaft pulleys are not circular.*
- ♦ *If one or both camshaft pulleys have been loosened, they must be properly aligned with each other.*
- ♦ *It should just be possible to turn camshaft pulleys on camshafts but no rocking is permissible.*
- ♦ *The toothed belt has not yet been fitted.*

Align marked gap -1- in teeth of camshaft adjuster -3- with lug -2- of camshaft housing.

Align marked tooth -1- of exhaust camshaft pulley -3- with lug -2- of camshaft housing.





- Markings -1- and -2- on camshaft pulleys are aligned as shown.

Groove -3- for assembly tool - T10476A- is located on exhaust camshaft pulley.

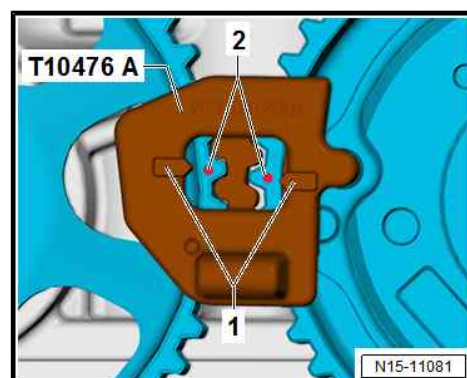
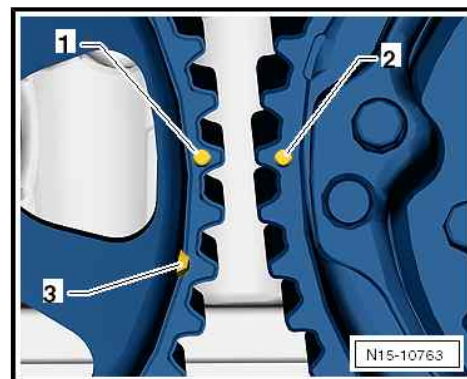
- Insert assembly tool - T10476A- between camshaft pulleys.

- Arrows -1- on assembly tool are aligned with marks -2- on camshaft pulleys.

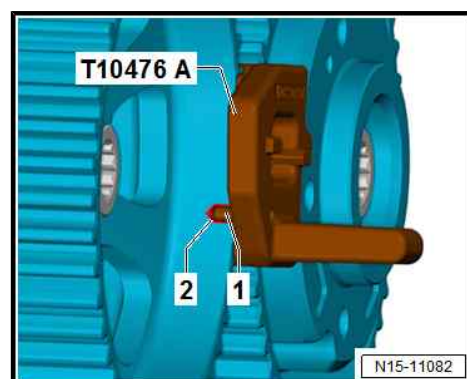


#### Note

*When the assembly tool - T10476A- is inserted, the marks -2- on the camshaft pulleys are slightly offset.*



- Dowel pin -1- of assembly tool - T10476A- must engage in groove -2- of exhaust camshaft pulley.
- Hand-tighten belt tensioner on cylinder head.



The sheet-metal tab -arrow- of the tensioning roller must engage in the cast notch in the cylinder head.

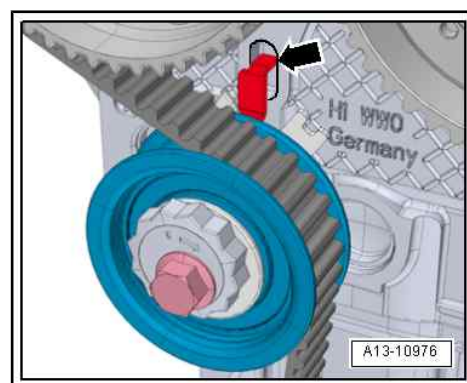


#### Note

*When installing the toothed belt, ensure that the assembly tool - T10476A- is correctly positioned between the camshaft pulleys.*

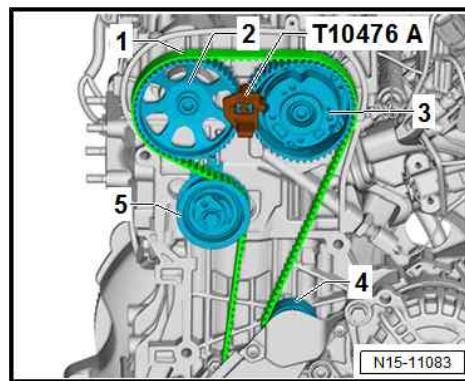
- Toothed belt must make full contact with crankshaft pulley.
- Check that crankshaft is set to TDC for No. 1 cylinder.

The crankshaft must make contact with the locking pin - T10340- in direction of engine rotation.

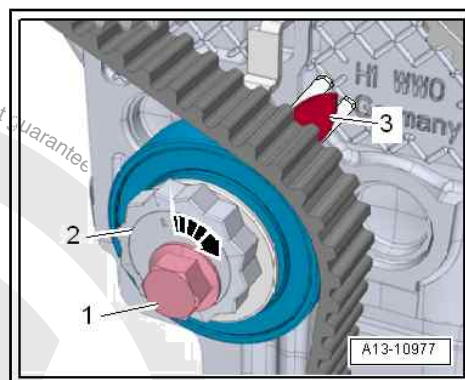




- Fit toothed belt -1- onto belt tensioner -5- and camshaft pulley -2-.
- Fit toothed belt on camshaft adjuster -3-, then push onto idler or guide pulley -4-.
- Remove assembly tool - T10476A- from camshaft pulleys.



- Rotate eccentric -2- of belt tensioner using tensioning spanner -T10499A- in -direction of arrow- until adjustment pointer -3- is located approx. 10 mm to the right from adjustment window.
- Then rotate eccentric of belt tensioner back on 12-point surface -2- until adjustment pointer -3- is exactly centred in adjustment window.
- Hold eccentric on 12-point surface -2- in this position.



#### Note

When setting the specified torque on the torque wrench - VAS 6583- , the length indicated on insert tool, 13 mm - T10500- must be entered in the torque wrench.



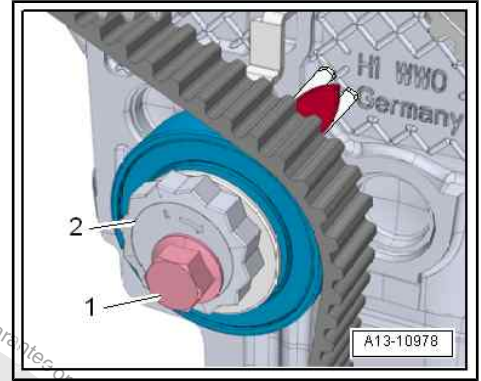
- Tighten securing bolt -1- to 25 Nm.



#### Note

- ◆ *When the engine has been rotated by hand or by engine operation, the position of the adjustment pointer might be slightly offset from the adjustment window.*
- ◆ *However, this has no relevant influence on the valve timing. The toothed belt does not need to be retensioned.*

- Adjust valve timing ⇒ [“2.6 Adjusting valve timing”, page 98](#) .



#### Note

*After completing work, make sure that the locking pin - T10340- has been removed.*

Continue installation in reverse order of removal.

#### Specified torques

- ◆ ⇒ [“1.2 Assembly overview - cylinder block \(pulley end\)”, page 37](#)
- ◆ ⇒ [“2.2 Assembly overview - toothed belt”, page 80](#)
- ◆ ⇒ [Fig. ““Plug for TDC drilling in cylinder block - specified torque””, page 81](#)
- ◆ ⇒ [“2.2 Assembly overview - thermostat”, page 168](#)
- ◆ ⇒ [“1.1 Assembly overview - poly V-belt drive”, page 36](#)
- ◆ ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation



### 3 Valve gear

⇒ [“3.1 Assembly overview - valve gear”, page 112](#)

⇒ [“3.2 Measuring axial play of camshaft”, page 113](#)

⇒ [“3.3 Removing and installing camshaft adjuster”, page 114](#)

⇒ [“3.4 Removing and installing toothed belt pulley”, page 118](#)

⇒ [“3.5 Removing and installing camshaft oil seal”, page 121](#)

⇒ [“3.6 Removing and installing valve stem seals”, page 129](#)

#### 3.1 Assembly overview - valve gear

##### 1 - Cylinder head

- ☐ Removing and installing  
⇒ [“1.2 Removing and installing cylinder head”, page 63](#)
- ☐ Machining the cylinder head sealing surface on the cylinder block  
⇒ [“3.2 Measuring axial play of camshaft”, page 113](#)

##### 2 - Roller rocker fingers

- ☐ Check roller bearing for ease of movement.
- ☐ Before assembly, lightly oil contact surfaces to valves and rollers.
- ☐ When installing, secure to supporting element using securing clip.

##### 3 - Support element

- ☐ Do not interchange
- ☐ With hydraulic valve clearance compensation.
- ☐ Oil contact surface

##### 4 - Valve spring plate

##### 5 - Valve springs

- ☐ Removing and installing  
⇒ [“3.6 Removing and installing valve stem seals”, page 129](#)

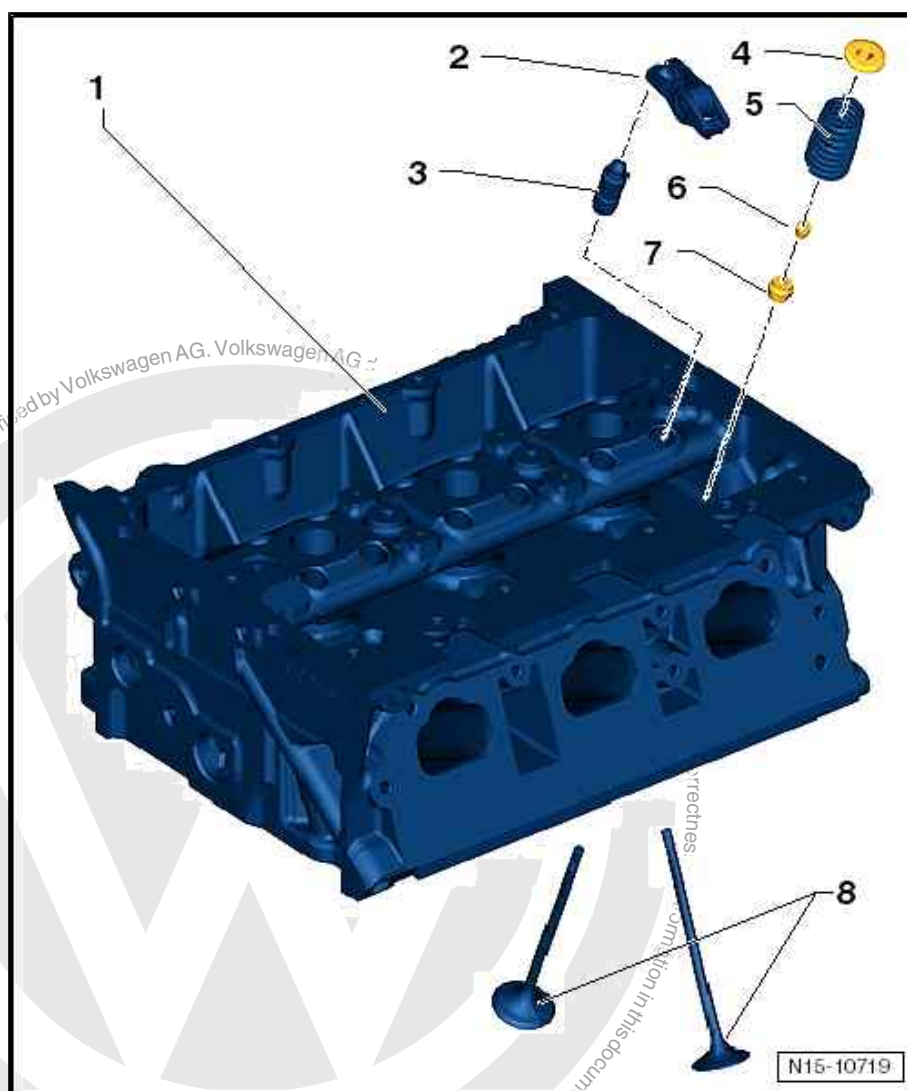
##### 6 - Cotters

##### 7 - Valve stem seal

- ☐ Renew after removal ⇒ [“3.6 Removing and installing valve stem seals”, page 129](#)

##### 8 - Valves

- ☐ Do not rework
- ☐ Lapping in valve seats is permitted
- ☐ Before assembly, lightly oil valve stems and ends of valves



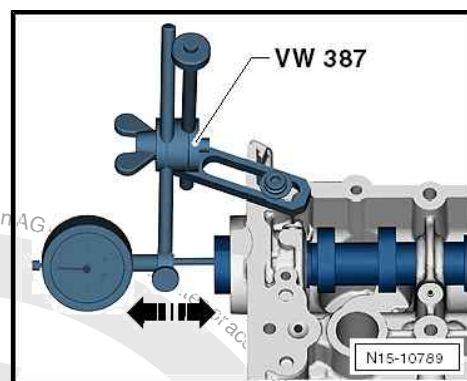
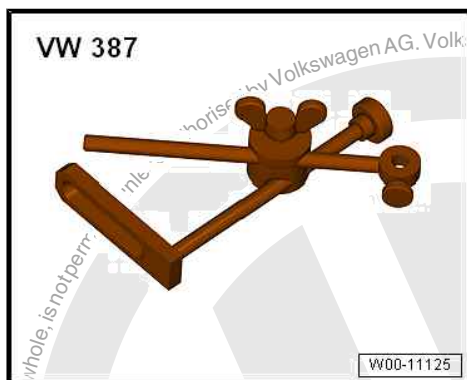




## 3.2 Measuring axial play of camshaft

**Special tools and workshop equipment required**

- ◆ Universal dial gauge holder - VW 387-
- ◆ Dial gauge



### Checking camshaft axial clearance

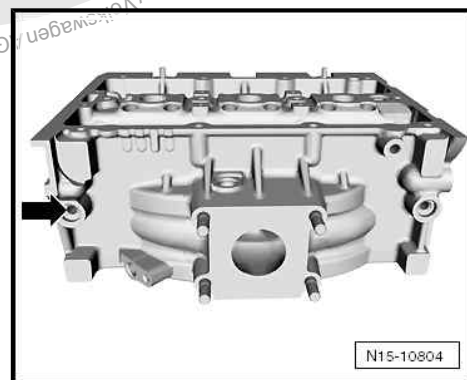
Take measurements with camshaft housing removed.

- Apply thumb pressure to one of the middle cams of the camshaft and move camshaft back and forth to check axial play.

Wear limit: max.  
0.25 mm

### Machining cylinder head sealing surface on cylinder block

- The dimension reference point is the centre of hole 14H7 -arrow-





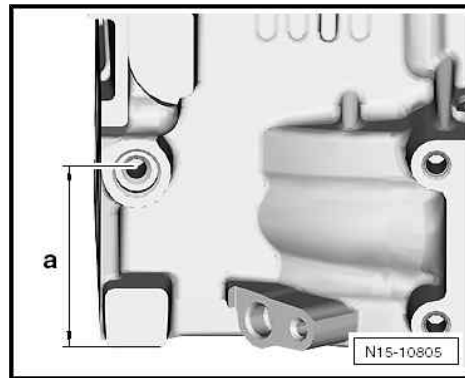
## Measure

Reworking dimension of cylinder head: a (centre of hole 14H7 to combustion chamber surface of cylinder head) = 58 mm ± 0.1 mm.



### Note

*If the dimension is less than -a-, machining the cylinder head is not permitted!*



## 3.3 Removing and installing camshaft adjuster

Camshaft adjuster for inlet camshaft

Special tools and workshop equipment required

- ◆ Torque wrench - VAS 6583-



- ◆ Counter-hold tool - T10554/1-



- ◆ Knurled screws - T10554/2- (not illustrated)
- ◆ Counter-hold tool - T10172A-





## Preparing tools

- Bolt on counter-hold tool - T10172- and counter-hold tool - T10554/1- using knurled screws - T10554/2- -arrows-.

## Removing



### Note

- ◆ Place a cloth under the camshaft adjuster and tensioning roller to catch the engine oil which runs out.
- ◆ The contact points between the toothed belt and components - such as camshaft pulleys, tensioning roller and idler pulley - must be kept free of oil.

- Set piston of cylinder no. 1 to TDC position  
⇒ [“2.5 Checking valve timing”, page 95](#)

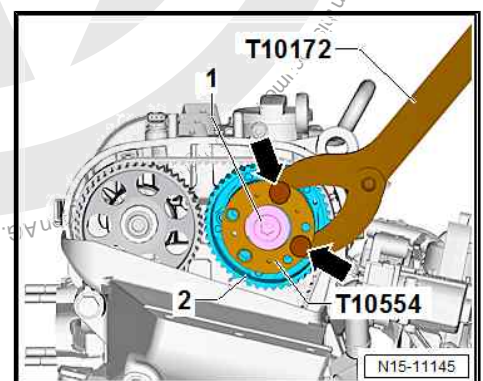
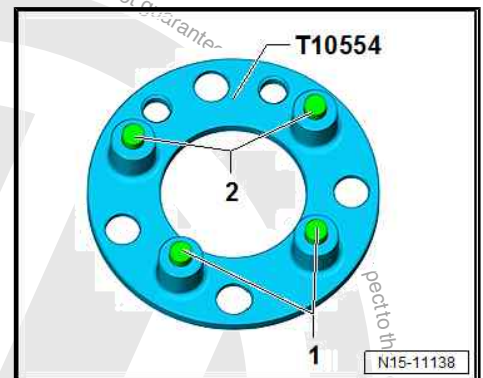
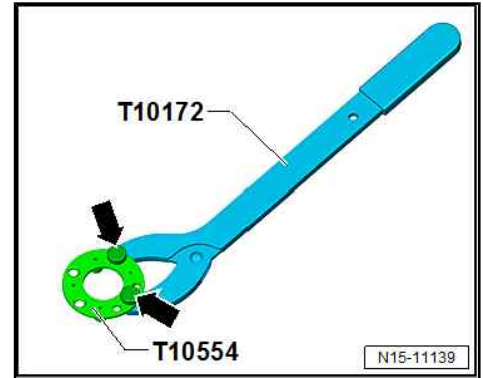
## Fitting counter-hold tool - T10554-

- The contours of pins -1- and -2- of counter-hold tool - T10554/1- are not distributed evenly on the bolt circle.
- They correspond to the contour of the bolt circle in the camshaft adjuster.



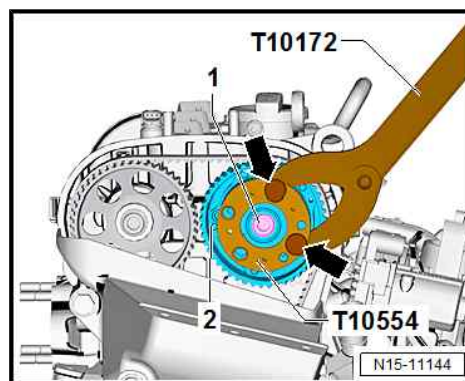
### Note

- ◆ When opening the plug on the inlet camshaft, a small amount of oil may escape.
- ◆ The contact points between the toothed belt and components - such as camshaft pulleys, tensioning roller and idler pulley - must be kept free of oil.
- ◆ Therefore, cover the area around the plug with a cloth.
- Hold camshaft in position using counterhold tool - T10554/1- and counterhold tool - T10172- .
- Loosen plug -1-, and unscrew it.





- Fit counter-hold tool - T10554/1- with counter-hold tool - T10172- again, to loosen securing bolt -1- of camshaft adjuster.
- Loosen bolt -1- of camshaft adjuster -2-.
- Loosen securing bolt of toothed belt pulley on exhaust side.  
⇒ ["3.4 Removing and installing toothed belt pulley", page 118](#)
- Detach toothed belt from camshafts.  
⇒ ["2.6 Adjusting valve timing", page 98](#)
- Unscrew securing bolt for camshaft adjuster and remove camshaft adjuster.



### Installing

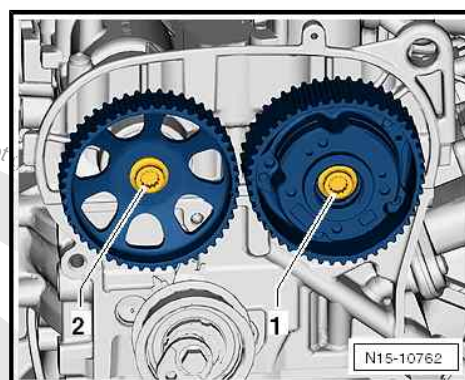
- Camshafts are located in "TDC" position.
- The camshaft pulleys are properly aligned with each other.
- Crankshaft is in "TDC position".



### Note

- ◆ *Renew bolts that are tightened with turning further angle.*
- ◆ *Renew O-ring of plug if damaged.*
- ◆ *Make sure to reinstall the guide sleeve ⇒ [Item 7 \(page 80\)](#).*

- Renew bolt -1- for camshaft adjuster on inlet side, and screw it in to stop by hand.
- Renew bolt -2- for toothed belt pulley on exhaust side, and screw it in to stop by hand.
- It should just be possible to turn camshaft pulleys on camshafts but no rocking is permissible.
- Fit toothed belt onto camshafts  
⇒ ["2.6 Adjusting valve timing", page 98](#).



### Pre-tightening



### Note

- ◆ *If the camshafts are turned when pre-tightening with the crankshaft fixed in place using the locking pin - T10340- , the valve timing will be changed.*
- ◆ *If the crankshaft is not locked in place, the deviations that occur when counter holding will be transferred to the crankshaft via the toothed belt.*
- ◆ *The valve timing will not be affected in this case.*
- Before pre-tightening, unscrew locking pin - T10340- .
- Hold inlet camshaft in position using counter-hold tool - T10554- and counter-hold tool - T10172- .

### Pre-tightening torque, inlet camshaft adjuster





- Pre-tighten bolt -1- to specified pre-tightening torque in two stages.

Stage	Securing bolt for camshaft adjuster	Specified torque
1)	-1-	18 Nm
2)	-1-	50 Nm

- Hold inlet camshaft in position using counter-hold tool - T10172- and adapter - T10172/1- .

#### Pre-tightening torque, toothed belt pulley on exhaust side

- Pre-tighten bolt -1- to specified pre-tightening torque in two stages.

Stage	Securing bolt for toothed belt pulley	Specified torque
1)	-1-	18 Nm
2)	-1-	50 Nm

#### Specified final torque, inlet camshaft adjuster

- Screw locking pin - T10340- back in.

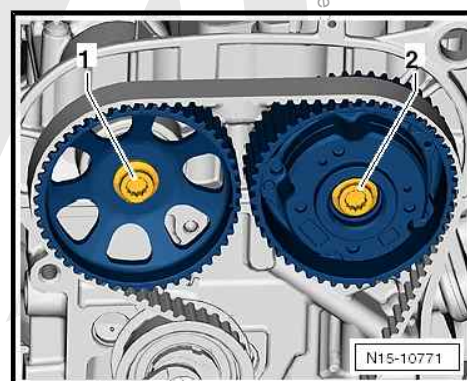
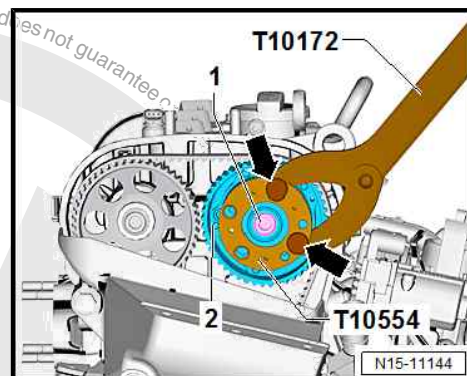
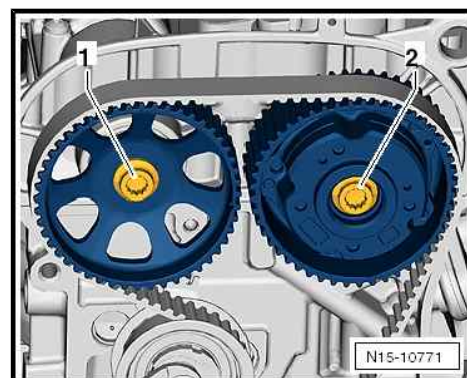
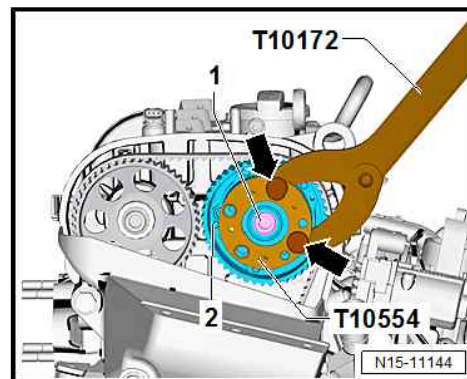
- Tighten bolt -1- for camshaft adjuster to final specified torque.

Stage	Securing bolt for camshaft adjuster	Angle to turn bolts
1)	-1-	135°

#### Specified final torque, toothed belt pulley on exhaust side

- Tighten securing bolt for toothed belt pulley on exhaust side to final specified torque.

Stage	Securing bolt for toothed belt pulley	Angle to turn bolts
1)	-1-	90°







up! 2012 ➤ , up! 2017 ➤

3-cyl. injection engine (1.0 l, natural gas 4V, EA 211) - Edition 06.2019

- Screw in plug -1-, and tighten it to specified torque.
- Hold inlet camshaft in position using counter-hold tool - T10172A- and counter-hold tool - T10554- .

Stage	Plug for camshaft adjuster	Specified torque
1)	-1-	20 Nm

Further assembly is performed in the reverse order of removal.

#### Specified torques

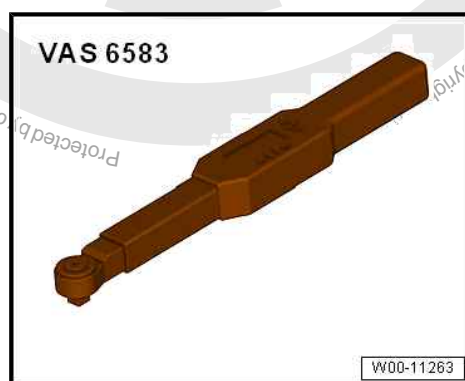
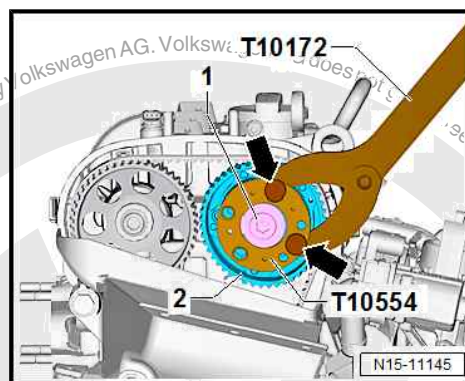
- ◆ ⇒ [“1.2 Assembly overview - cylinder block \(pulley end\)”, page 37](#)
- ◆ ⇒ [“1.1 Assembly overview - poly V-belt drive”, page 36](#)
- ◆ ⇒ [“2.1 Assembly overview - assembly mountings”, page 23](#)
- ◆ ⇒ [“1.1 Assembly overview - cylinder head”, page 61](#)
- ◆ ⇒ [“2.2 Assembly overview - thermostat”, page 168](#)

### 3.4 Removing and installing toothed belt pulley

Toothed belt pulley for exhaust camshaft

Special tools and workshop equipment required

- ◆ Torque wrench - VAS 6583-



- ◆ Counter-hold tool - T10554/1-



- ◆ Knurled screws - T10554/2- (not illustrated)

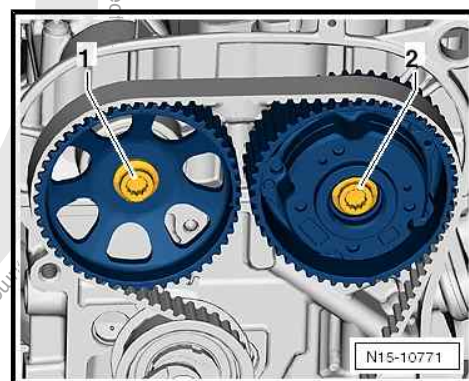


- ◆ Counter-hold tool - T10172A-



### Removing

- Crankshaft and camshafts remain locked in place until work is complete.
- Set piston in cylinder no. 1 to TDC position.  
⇒ [“2.5 Checking valve timing”, page 95](#)
- Loosen securing bolt -2- for camshaft adjuster on inlet side  
⇒ [“3.3 Removing and installing camshaft adjuster”, page 114](#).
- Unscrew bolt -1- about one turn.
- Use counterhold - T10172- with adapter -T10172/2- and -T10172/1- to do this.
- Detach toothed belt from camshafts.  
⇒ [“2.6 Adjusting valve timing”, page 98](#)
- Unscrew bolt for toothed belt pulley on exhaust side, and remove toothed belt pulley.



### Installing

Risk of damage to crankshaft group.

- Camshafts are located in “TDC” position.
- The camshaft pulleys are properly aligned with each other.
- Crankshaft is in “TDC position”.

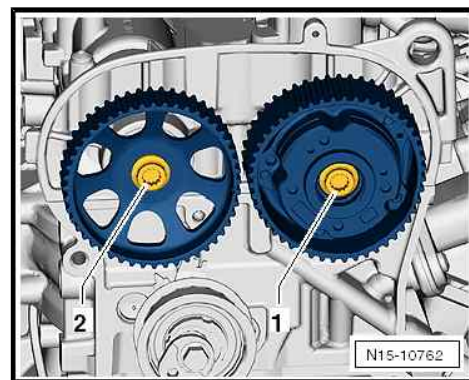


### Note

- ◆ *Renew bolts that are tightened with turning further angle.*
- ◆ *Renew O-ring of plug if damaged.*
- Renew bolt -1- for camshaft adjuster on inlet side, and screw it in to stop by hand.
- Renew bolt -2- for toothed belt pulley on exhaust side, and screw it in to stop by hand.
- It should just be possible to turn camshaft pulleys on camshafts but no rocking is permissible.
- Fit toothed belt onto camshafts.  
⇒ [“2.6 Adjusting valve timing”, page 98](#)

### Pre-tightening

- Hold inlet camshaft in position using counter-hold tool - T10554- and counter-hold tool - T10172- .

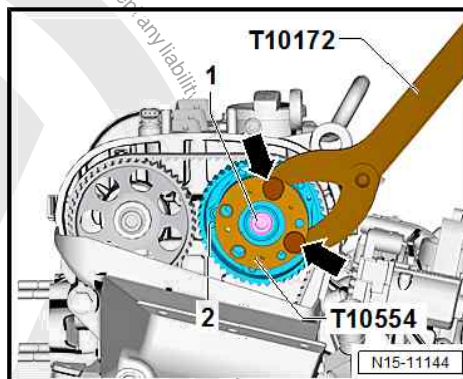




- Pre-tighten bolt -1- to specified pre-tightening torque in two stages.

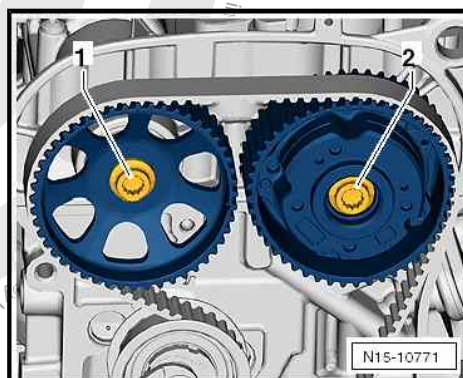
Stage	Securing bolt for camshaft adjuster	Specified torque
1)	-1-	18 Nm
2)	-1-	50 Nm

- Hold inlet camshaft in position using counter-hold tool - T10172- and adapter - T10554/1- .



- Pre-tighten bolt -1- to specified pre-tightening torque in two stages.

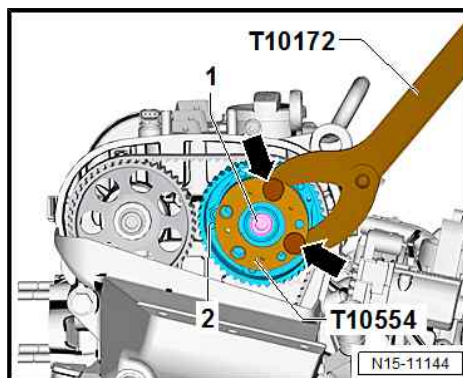
Stage	Securing bolt for toothed belt pulley	Specified torque
1)	-1-	18 Nm
2)	-1-	50 Nm



#### Tightening to final specified torque

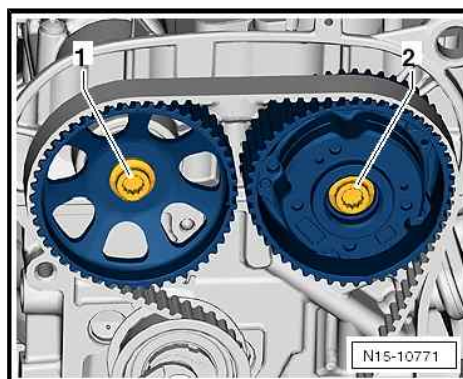
- Tighten bolt -1- for camshaft adjuster to final specified torque.

Stage	Securing bolt for camshaft adjuster	Angle to turn bolts
1)	-1-	135°



- Tighten securing bolt for toothed belt pulley on exhaust side to final specified torque.

Stage	Securing bolt for toothed belt pulley	Angle to turn bolts
1)	-1-	90°





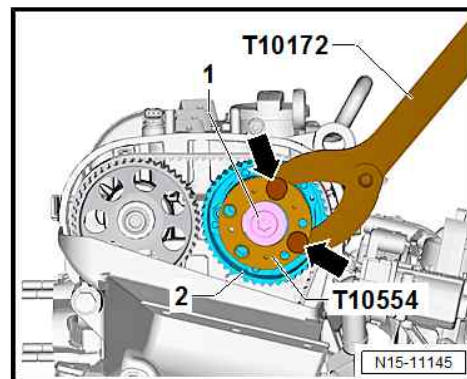
- Screw in plug -1-, and tighten it to specified torque.
- Hold inlet camshaft in position using counter-hold tool - T10172A- and counter-hold tool - T10554- .

Stage	Plug for camshaft adjuster	Specified torque
1)	-1-	20 Nm

Further assembly is performed in the reverse order of removal.

#### Specified torques:

- ⇒ [“1.2 Assembly overview - cylinder block \(pulley end\)”, page 37](#)
- ⇒ [“1.1 Assembly overview - poly V-belt drive”, page 36](#)
- ⇒ [“2.1 Assembly overview - assembly mountings”, page 23](#)
- ⇒ [“1.1 Assembly overview - cylinder head”, page 61](#)
- ⇒ [“2.2 Assembly overview - thermostat”, page 168](#)



### 3.5 Removing and installing camshaft oil seal

⇒ [“3.5.1 Removing and installing camshaft oil seal, inlet camshaft, pulley end”, page 121](#)

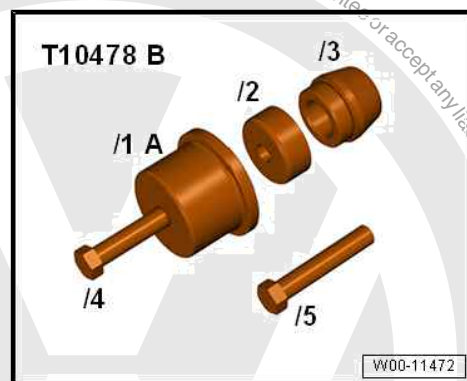
⇒ [“3.5.2 Removing and installing camshaft oil seal, exhaust camshaft, pulley end”, page 123](#)

⇒ [“3.5.3 Removing and installing camshaft oil seal, exhaust camshaft, gearbox end”, page 126](#)

#### 3.5.1 Removing and installing camshaft oil seal, inlet camshaft, pulley end

##### Special tools and workshop equipment required

- ◆ Assembly tool - T10478 B-



- ◆ Extractor hook - T20143-







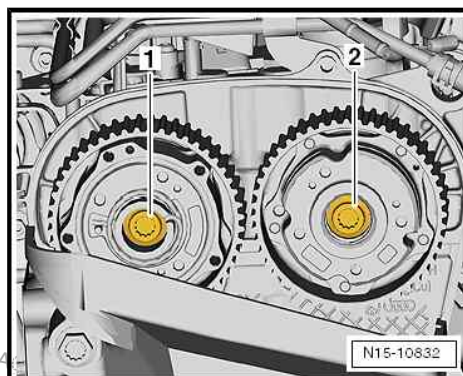
## Removing

- Removing camshaft adjuster  
⇒ [“3.3 Removing and installing camshaft adjuster”, page 114](#).
- Unscrew bolt -2-, and remove camshaft adjuster.

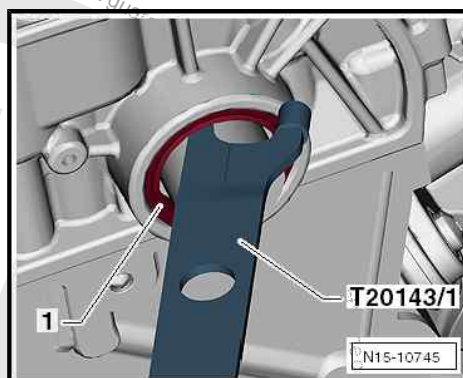


### Note

Disregard -item 1-.



- Pull out oil seal -1- using extractor tool -T20143/1-.



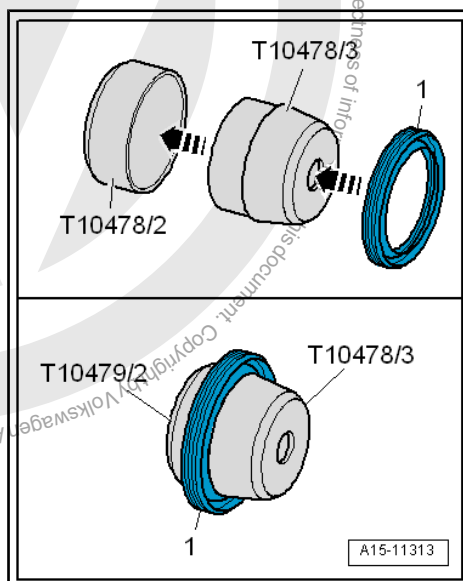
## Installing



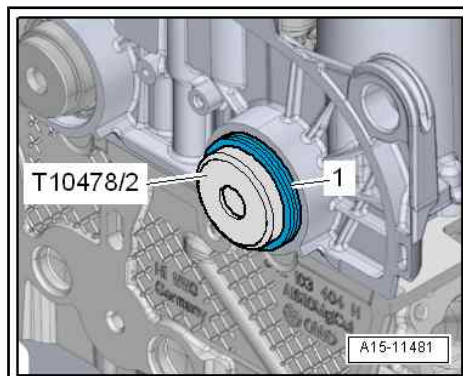
### Note

Do not lubricate new oil seal.

- Slide oil seal -1- over fitting sleeve -T10478/3- onto guide sleeve -T10478/2-.
- Fitting position: closed side of oil seal faces guide sleeve.
- Separate fitting sleeve and guide sleeve.



- Fit guide sleeve -T10478/2- with oil seal -1- onto camshaft.







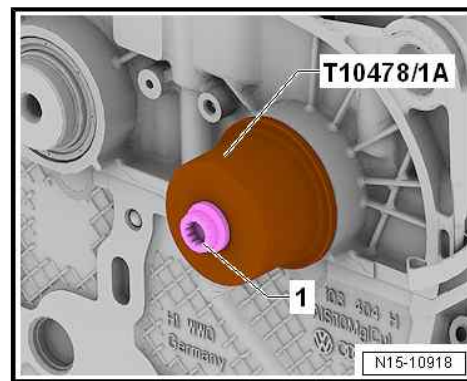
- Draw in seal to stop using thrust piece -T10478/1A- and old securing bolt -1- for camshaft adjuster.
- Install camshaft adjuster  
⇒ [“3.3 Removing and installing camshaft adjuster”, page 114](#).

Further assembly is basically a reverse of the dismantling sequence.

#### Specified torques

- ◆ Cover for coolant pump toothed belt  
⇒ [“1.1 Assembly overview - cylinder head”, page 61](#)
- ◆ Securing bolts for camshaft pulleys and tensioning roller  
⇒ [“1.2 Assembly overview - cylinder block \(pulley end\)”, page 37](#)

Component	Specified torque
Crankcase plug	30 Nm



### 3.5.2 Removing and installing camshaft oil seal, exhaust camshaft, pulley end

#### Special tools and workshop equipment required

- ◆ Assembly tool - T10476A-

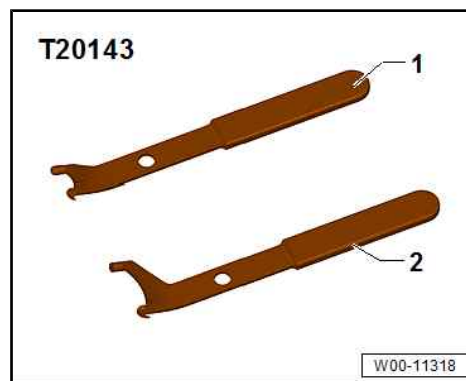


- ◆ Camshaft clamp - T10477-

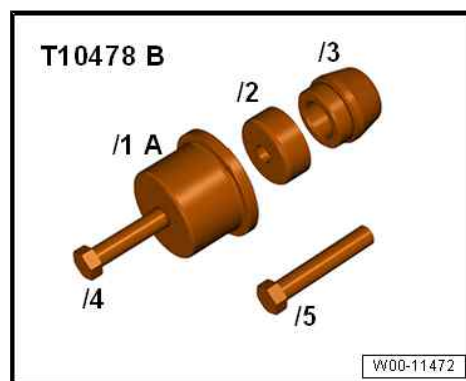




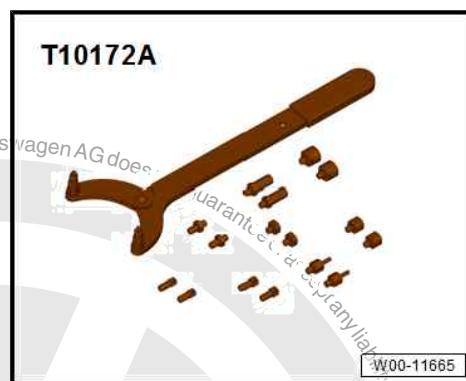
◆ Extractor hook - T20143/1-



◆ Assembly tool - T10478B-



◆ Counter-hold tool - T10172A-



**Removing**

- Remove toothed belt pulley for exhaust camshaft  
⇒ [“3.4 Removing and installing toothed belt pulley”, page 118](#).
- Remove seal -1- using extractor hook - T20143/1-.

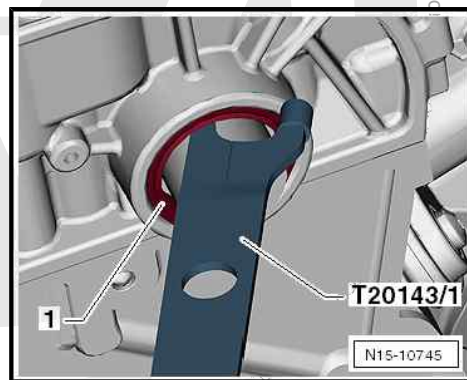
**Installing**



**Note**

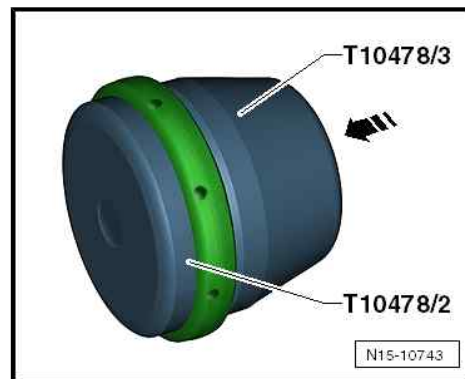
*Do not lubricate new seal.*

- Put together assembly sleeves - T10478/2- and -T10478/3- in -direction of arrow-.

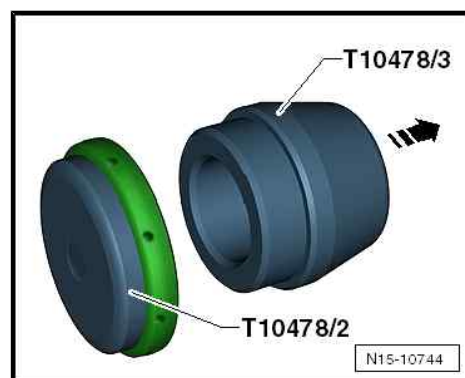




- Fit new seal in -direction of arrow- onto assembly sleeve - T10478/2- .



- Pull off assembly sleeve - T10478/3- in -direction of arrow-.
- Fit assembly sleeve - T10478/2- with seal -1- on camshaft.



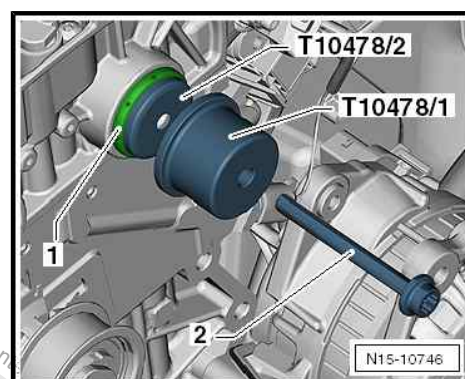
- Draw in thrust piece - T10478/1- to stop with securing bolt of camshaft adjuster -2-.



#### Note

When installing the seal of the exhaust camshaft, bolt - T10478/4- is used for this purpose.

- Install toothed belt pulley for exhaust camshaft  
⇒ ["3.4 Removing and installing toothed belt pulley", page 118](#) .



#### Note

- ◆ Risk of engine damage.
- ◆ After completing work, it is essential to ensure that the locking pin - T10340- and the camshaft clamp - T10477- have been removed.

Further assembly is basically a reverse of the dismantling sequence.

#### Specified torques

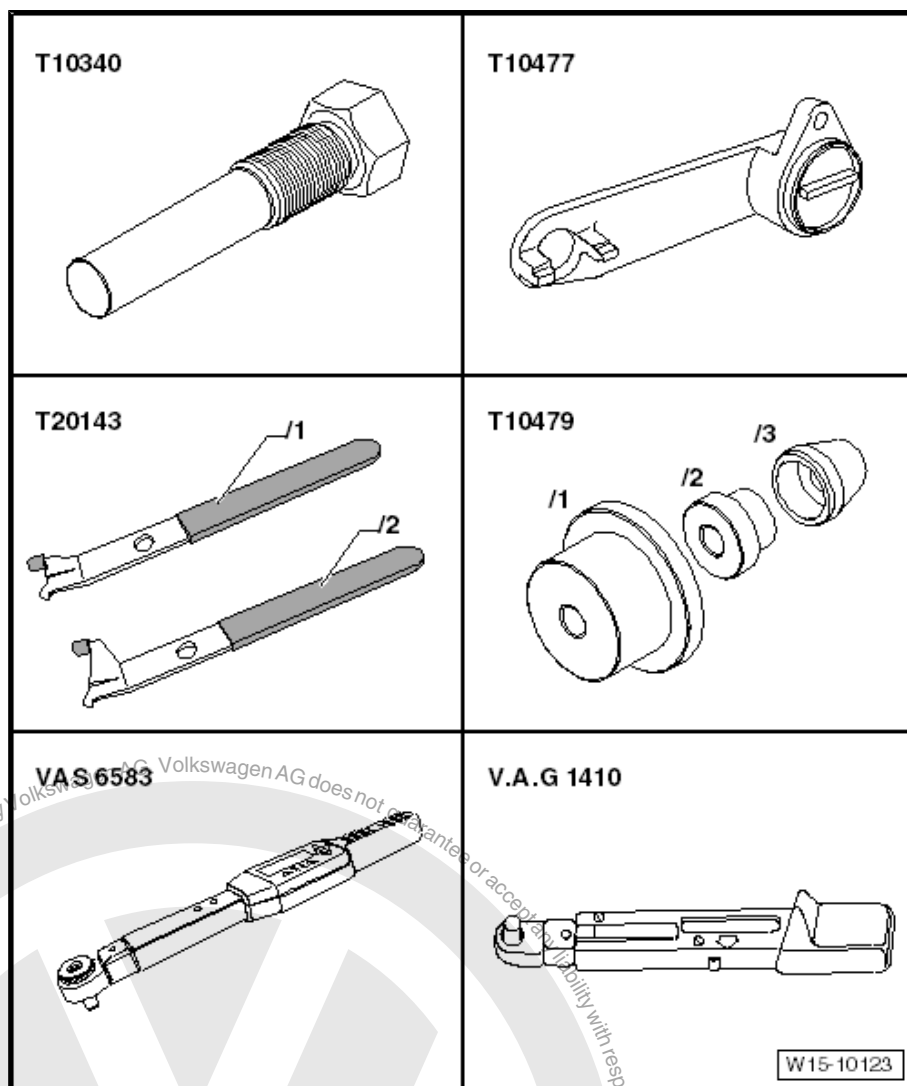
- ◆ Cover for coolant pump toothed belt  
⇒ ["1.1 Assembly overview - cylinder head", page 61](#)
- ◆ Securing bolts for camshaft pulleys and tensioning roller  
⇒ ["1.2 Assembly overview - cylinder block \(pulley end\)", page 37](#)

Component	Specified torque
Crankcase plug	30 Nm



### 3.5.3 Removing and installing camshaft oil seal, exhaust camshaft, gearbox end

Special tools and workshop equipment required

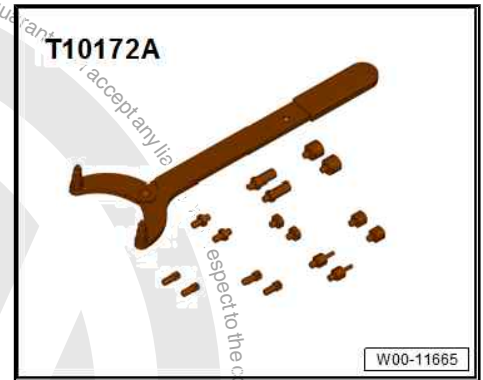


- ◆ Locating bolt - T10340-
- ◆ Camshaft clamp - T10477-
- ◆ Extractor hook - T20143/1-
- ◆ Assembly tool - T10479-
- ◆ Torque wrench - VAS 6583-
- ◆ Torque wrench - V.A.G 1410-

Special tools and workshop equipment required



# ◆ Counter-hold tool - T10172A



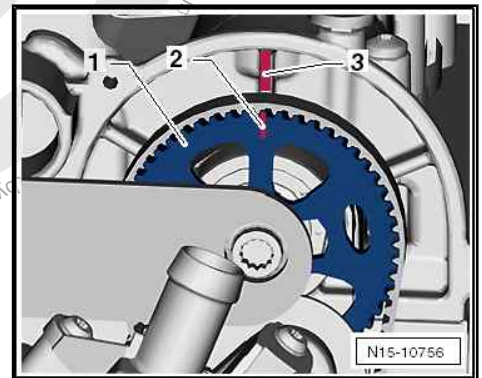
## Removing

- Remove coolant pump  
⇒ ["2.3 Removing and installing coolant pump", page 169](#).
- Set piston in cylinder no. 1 to TDC position.  
⇒ ["2.5 Checking valve timing", page 95](#)
- Mark position of coolant pump gear -1- with a marker -2- at lug -3-.



### Note

- The marking will be used for installing the gear at the correct position at a later point.
- Otherwise the camshaft clamp - T10477- cannot be inserted.

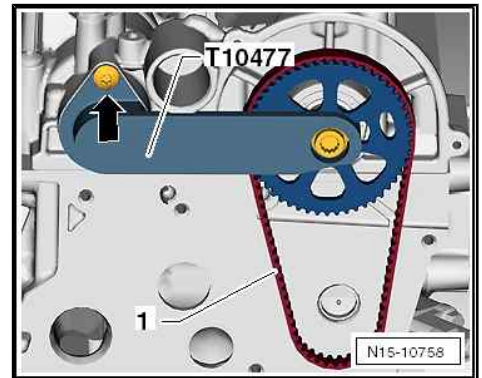


- Unscrew bolt -arrow- and remove camshaft clamp - T10477- from camshafts.
- Remove toothed belt -1- from coolant pump toothed belt pulley.

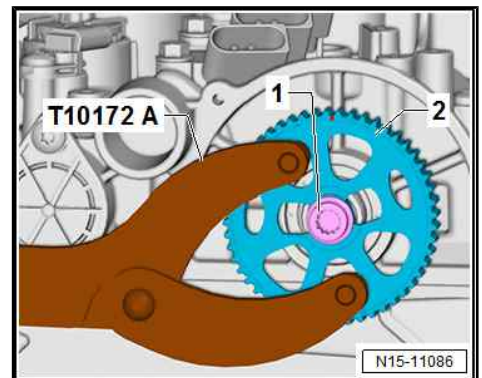


### Note

- Risk of noise complaints.
- The coolant pump toothed belt must be renewed after each removal!



- Secure toothed belt pulley -2- with counterhold tool - T10172A- and unscrew securing bolt -1-.
- Remove toothed belt pulley.







- Carefully fit extractor hook - T20143/1- between camshaft and seal -1-.
- Lever out seal -1-.

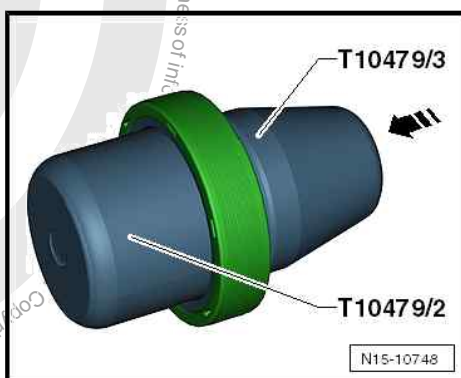
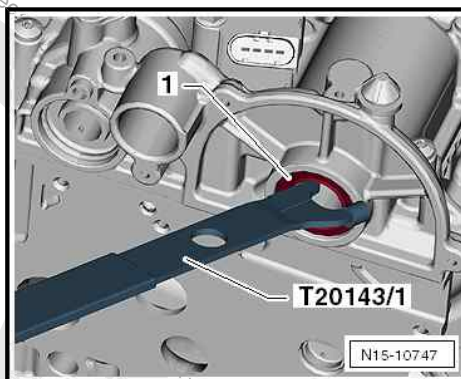
#### Installing



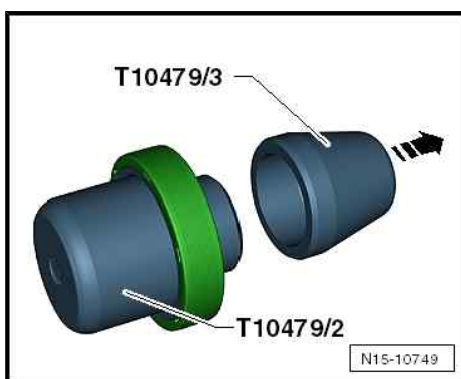
#### Note

*Do not lubricate new seal.*

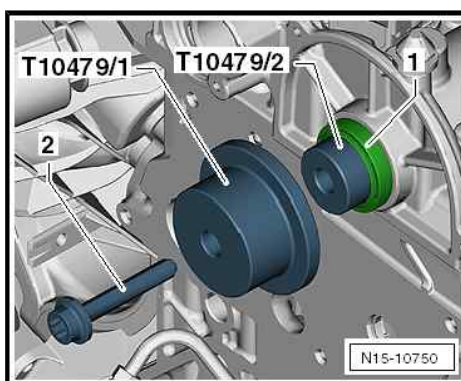
- Put together assembly sleeves - T10479/2- and -T10479/3- .
- Fit new seal in -direction of arrow- onto assembly sleeve - T10479/2- .



- Disconnect assembly sleeves - T10479/2- and -T10479/3- in -direction of arrow-.



- Fit assembly sleeve - T10479/2- with seal -1- on camshaft.
- Fit thrust piece - T10479/1- up to seal and press in onto stop using old securing bolt -2-.
- Mount toothed belt pulley -2- on camshaft with new securing bolt -1-.





Marking on toothed belt pulley must be aligned with lug.

- Secure toothed belt pulley -2- with counterhold tool - T10172A- .
- Tighten securing bolt -1- to 20 Nm.
- Moisten coolant pump seal with coolant.
- Fit toothed belt centrally onto camshaft pulley and coolant pump toothed belt pulley.
- Install coolant pump  
⇒ [“2.3 Removing and installing coolant pump”, page 169](#) .

Risk of engine damage:

After completing work, it is essential to ensure that the locking pin - T10340- and the camshaft clamp - T10477- have been removed.

Further assembly is basically a reverse of the dismantling sequence.

- Install selector mechanism to gearbox: ⇒ Rep. gr. 34 ; Selector mechanism; Overview - selector mechanism .
- Add coolant ⇒ [“1.3 Draining and adding coolant”, page 159](#) .
- Install air filter housing  
⇒ [“5.2 Removing and installing air filter housing”, page 231](#) .

#### Specified torques

- ◆ Cover for coolant pump toothed belt  
⇒ [“1.1 Assembly overview - cylinder head”, page 61](#)
- ◆ Securing bolts for camshaft pulleys and tensioning roller  
⇒ [“1.2 Assembly overview - cylinder block \(pulley end\)”, page 37](#)

Component	Specified torque
Crankcase plug	30 Nm

### 3.6 Removing and installing valve stem seals

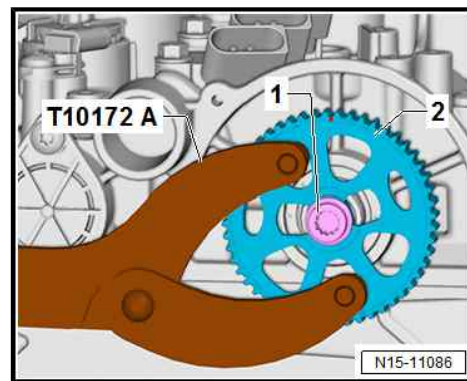
⇒ [“3.6.1 Removing and installing valve stem seals \(cylinder head installed\)”, page 129](#)

⇒ [“3.6.2 Removing and installing valve stem seals \(cylinder head removed\)”, page 133](#)

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

Special tools and workshop equipment required

- ◆ Spark plug socket - 3122 B-





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3-cyl. injection engine (1.0 l, natural gas 4V, EA 211) Edition 06.2019

- ◆ Removal and installation device for valve cotters - VAS 5161A- with guide plate - VAS 5161A/32-32- .

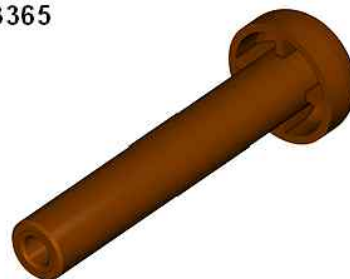
**VAS 5161 A**



W00-11584

- ◆ Compressed air adapter - VAS 5161 A/35- (not illustrated)
- ◆ Valve stem seal fitting tool - 3365-

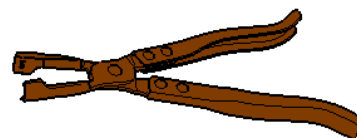
**3365**



W00-11141

- ◆ Valve stem pliers - VAS 6770-

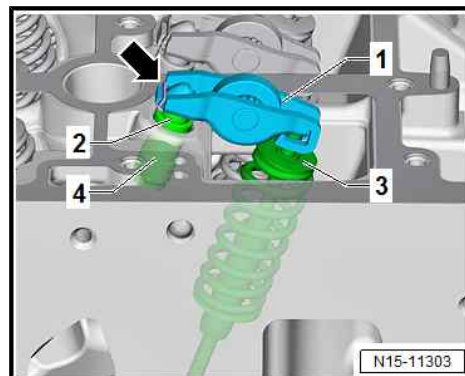
**VAS 6770**



W00-11550

## Procedure

- Remove camshaft housing  
⇒ ["1.3 Removing and installing camshaft housing", page 71](#) .
- Mark allocation of roller rocker fingers -1-, hydraulic compensation element -4- and valves -3- for reinstallation.
- Remove roller rocker fingers together with compensation elements and place them on a clean surface.
- Unscrew spark plugs with spark plug socket - 3122 B- .



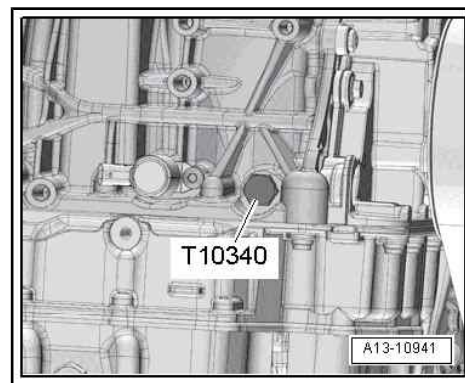


- Unscrew locking pin - T10340- .
- Set piston of respective cylinder to "bottom dead centre".



#### Note

- ◆ *The pistons of cylinders no. 1 and no. 4 are at »TDC« position after the camshaft housing has been removed.*
- ◆ *The pistons of cylinders no. 2 and no. 3 are at »bottom dead centre« position after the camshaft housing has been removed.*
- ◆ *Crank engine via crankshaft half a turn in direction of engine rotation. The pistons for cylinders no. 1 and no. 4 are at »bottom dead centre« position.*
- ◆ *When cranking the engine, hold and guide the toothed belt by hand to prevent it from being damaged.*

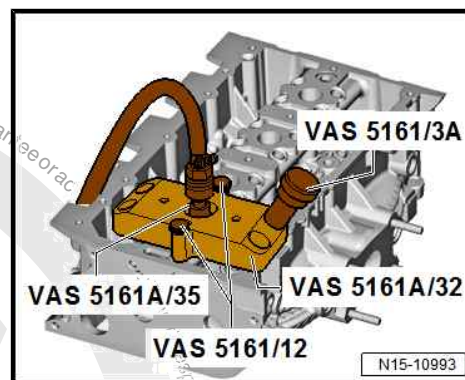


- Fit guide plate -VAS 5161A/32-1- onto cylinder head and secure with knurled screws -VAS 5161/12-.
- Screw compressed air adapter -VAS 5161 A/35- into the respective park plug thread hand-tight.

- Connect adapter to compressed air supply using a commercially available union and apply pressure continuously.

- Minimum pressure: 6 bar.

- Insert punch -VAS 5161/3A- into guide plate. Use a plastic hammer to knock loose the firmly seated valve cotters.



- Screw toothed piece -VAS 5161/6- with hooking fork -VAS 5161/5- into guide plate.

- Slide sleeve -VAS 5161A/32-2- onto assembly cartridge and insert cartridge into guide plate -VAS 5161A/32-3- .

- Attach pressure fork -VAS 5161/2- to toothed piece at a suitable angle and press assembly cartridge down.

- At the same time, turn knurled screw of assembly cartridge clockwise until tips engage in valve cotters.

- Move knurled screw back and forth to press apart valve cotters and capture them in assembly cartridge.

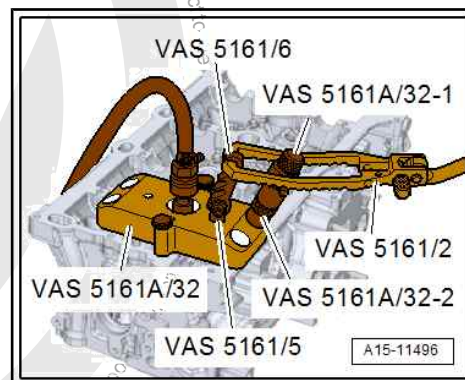
- Release pressure fork.

- Remove installation cartridge.

- Unbolt guide plate and move to side.

- The compressed air hose remains connected.

- Remove valve spring and valve spring plate.







- Pull off valve stem seal using valve stem pliers - VAS 6770- .

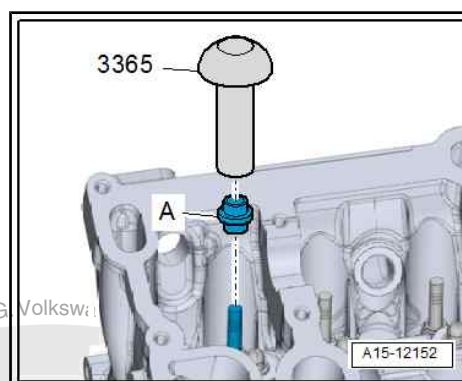


#### Note

*Risk of damage when installing valve stem seals.*

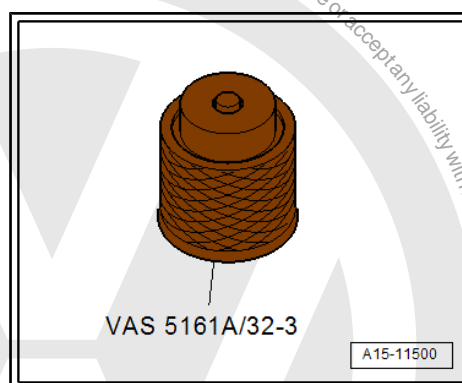


- Lightly oil sealing lip of valve stem seal -A-.
- Carefully press valve stem oil seal -A- onto valve guide using valve stem seal fitting tool - 3365- .



#### If valve cotters have been removed from assembly cartridge:

- First, insert valve cotters into insertion device - VAS 5161 A/ 32-3- .
- Press down spring washer until three grooves are visible.
- Fit valve cotters into grooves.
- Larger diameter of valve cotters faces upwards.
- Release the spring washer. The spring force pushes the washer back upwards and holds the valve cotters in place.
- Press assembly cartridge - VAS 5161A/32-1- onto insertion device from above and pick up valve cotters.
- To do this, move knurled screw back and forth to press apart valve cotters and capture them in assembly cartridge.







- Bolt guide plate -VAS 5161A/32-1- onto cylinder head again.
- Insert assembly cartridge -VAS 5161A/32-2- with sleeve -VAS 5161A/32-3- into guide plate.
- Press pressure fork downwards and pull knurled screw upwards, turning it clockwise and anticlockwise. This inserts the valve cotters.
- Reduce pressure on pressure fork whilst pulling on knurled screw.
- Repeat procedure on each valve.

### Installing

Assembly is carried out in reverse sequence; note the following:

- Install spark plugs ⇒ Maintenance ; Booklet .
- Install camshaft housing  
⇒ [“1.3 Removing and installing camshaft housing”, page 71](#) .

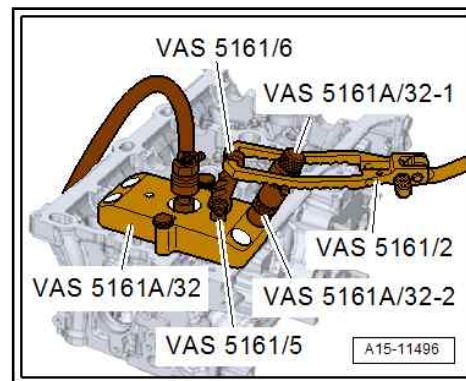
### Specified torques

- ◆ ⇒ [“1.1 Assembly overview - cylinder head”, page 61](#)

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

### Special tools and workshop equipment required

- ◆ Removal and installation device for valve cotters - VAS 5161A- with guide plate - VAS 5161A/32-32- .



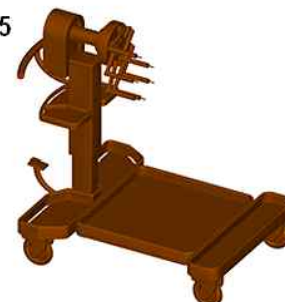
### VAS 5161 A



W00-11584

- ◆ Engine and gearbox support - VAS 6095-

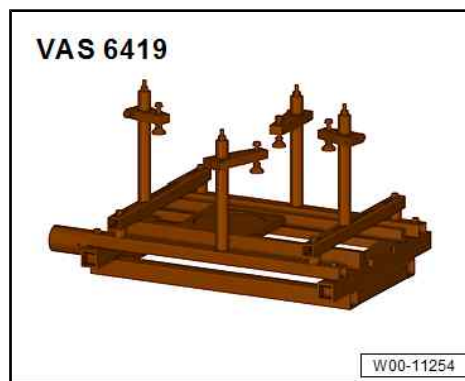
### VAS 6095



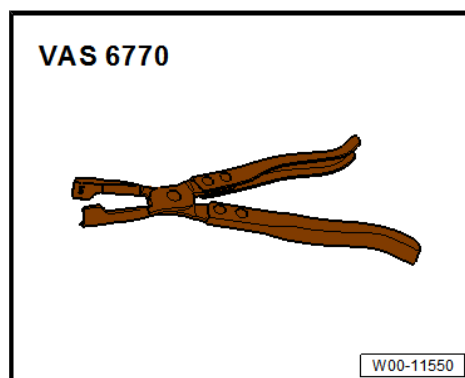
W00-11310



◆ Cylinder head tensioning device - VAS 6419-



◆ Valve stem pliers - VAS 6770-

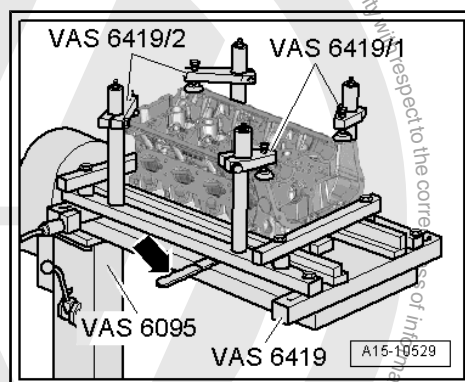


◆ Valve stem seal fitting tool - 3365-



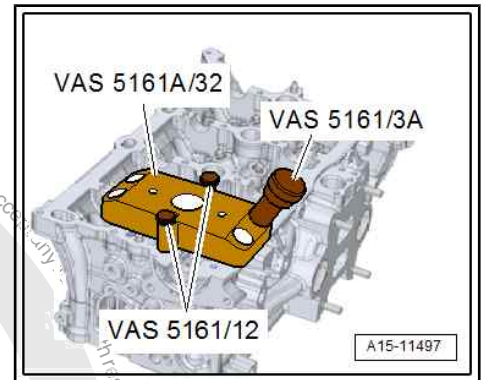
### Procedure

- Remove cylinder head  
⇒ ["1.2 Removing and installing cylinder head", page 63](#) .
- 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 combustion chamber from which valve stem seals are to be removed.
- Allow compressed air to flow into air cushion until it lies against valve disc.

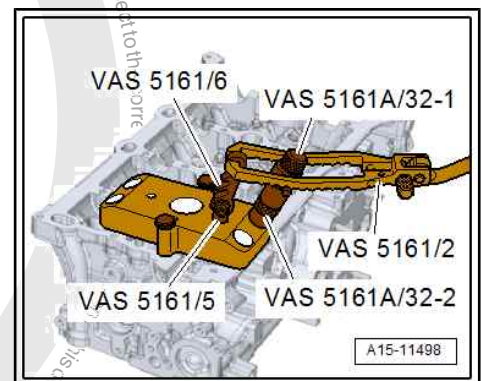




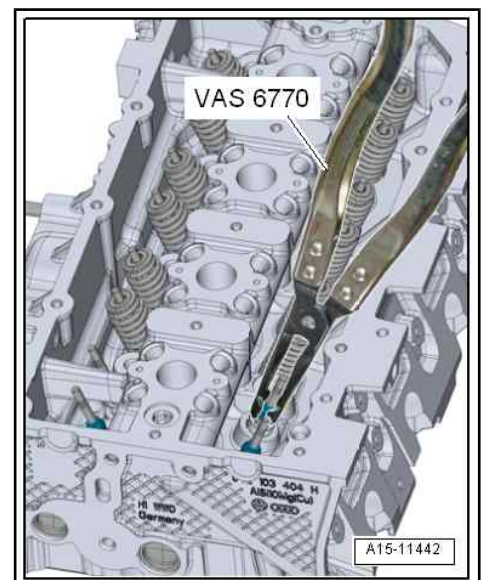
- Fit guide plate -VAS 5161A/32-1- onto cylinder head and secure with knurled screws -VAS 5161/12- .
- Insert punch -VAS 5161/3A- into guide plate. Use a plastic hammer to knock loose the firmly seated valve cotter.



- Screw toothed piece -VAS 5161/6- with hooking fork - VAS 5161/5- into guide plate.
- Slide sleeve -VAS 5161A/32-2- onto assembly cartridge and insert cartridge into guide plate -VAS 5161A/32-3- .
- Attach pressure fork -VAS 5161/2- to toothed piece and press assembly cartridge down.
- At the same time, turn knurled screw of assembly cartridge clockwise until tips engage in valve cotter.
- Move knurled screw back and forth to press apart valve cotter and capture them in assembly cartridge.
- Release pressure fork.
- Remove installation cartridge.
- Unbolt guide plate and move to side.
- Remove valve spring and valve spring plate.
- Pull off valve stem seal using valve stem pliers - VAS 6770- .

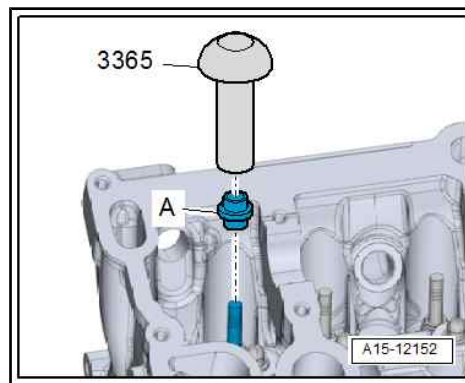
**Note**

*Risk of damage when installing valve stem seals.*





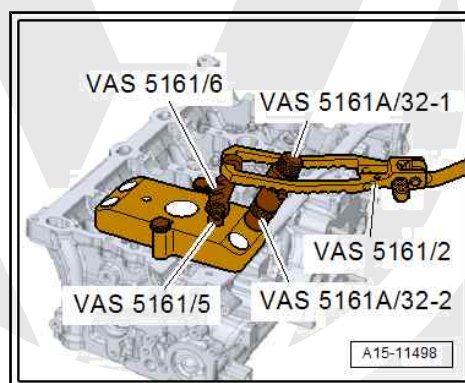
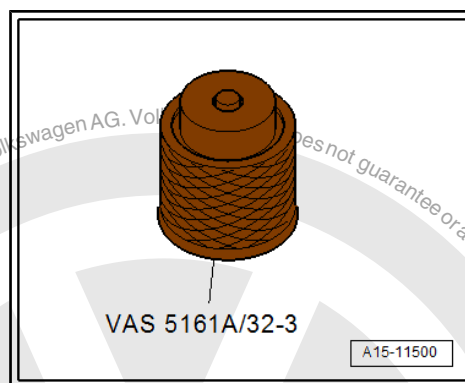
- Lightly oil sealing lip of valve stem seal -A-.
- Carefully press valve stem oil seal -A- onto valve guide using valve stem seal fitting tool - 3365- .



**If valve cotters have been removed from assembly cartridge:**

- First, insert valve cotters into insertion device - VAS 5161 A/ 32-3- .
- Press down spring washer until three grooves are visible.
- Fit valve cotters into grooves.
- Larger diameter of valve cotters faces upwards.
- Release the spring washer. The spring force pushes the washer back upwards and holds the valve cotters in place.
- Press assembly cartridge - VAS 5161A/32-1- onto insertion device from above, and pick up valve cotters.
- To do this, move knurled screw back and forth to press apart valve cotters and capture them in assembly cartridge.
- Bolt guide plate -VAS 5161A/32-1- onto cylinder head again.
- Insert assembly cartridge -VAS 5161A/32-2- with sleeve -VAS 5161A/32-3- into guide plate.
- Press pressure fork downwards and pull knurled screw upwards, turning it clockwise and anticlockwise. This inserts the valve cotters.
- Reduce pressure on pressure fork whilst pulling on knurled screw.
- Repeat procedure on each valve.
- Install cylinder head

⇒ "1.2 Removing and installing cylinder head", page 63 .





## 4 Inlet and exhaust valves

⇒ **"4.1 Checking valve guides", page 137**

### 4.1 Checking valve guides

**Special tools and workshop equipment required**

- ◆ Universal dial gauge holder - VW 387-
- ◆ Dial gauge



#### Test sequence

- Insert new valve in guide. The end of the valve stem must be flush with the guide. On account of differing stem diameters, only use inlet valve in inlet guide and exhaust valve in exhaust guide.
- Determine lateral play by moving valve in -direction of arrow-.

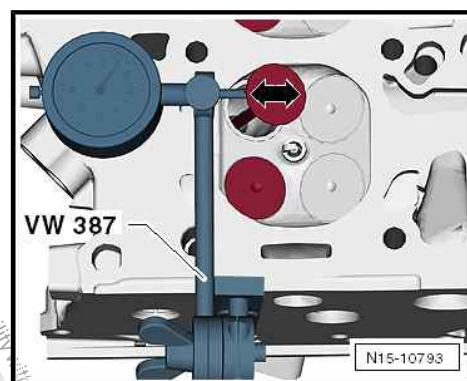
Wear limit: 0.5 mm

If wear limit is exceeded:

- Repeat measurement with a new valve.

If wear limit is exceeded again:

Renew cylinder head.





# 17 – Lubrication

## 1 Sump, oil pump

⇒ [“1.1 Assembly overview - sump/oil pump”, page 138](#)

⇒ [“1.2 Engine oil:”, page 141](#)

⇒ [“1.3 Removing and installing sump”, page 141](#)

⇒ [“1.4 Removing and installing oil pump”, page 145](#)

### 1.1 Assembly overview - sump/oil pump

#### 1 - Oil dipstick

- ☐ Oil capacities ⇒ Maintenance ; Booklet ; Engine oil: capacities and specifications
- ☐ Check engine oil level (min. and max. marks) ⇒ Maintenance ; Booklet ; Engine oil level: check .

#### 2 - Camshaft case

#### 3 - Cap

- ☐ Renew seal if damaged.

#### 4 - Non-return valve

#### 5 - Seal

- ☐ Renew if damaged

#### 6 - Oil separator

- ☐ To remove, intake manifold must be removed  
⇒ [“6.2 Removing and installing intake manifold”, page 233](#) .
- ☐ Install with sealant D 176 501 A1

#### 7 - Bolt

- ☐ 9 Nm

#### 8 - Oil pressure switch - F1-

- ☐ For pressure range of 0.3 ... 0.6 bar
- ☐ Checking oil pressure switch

⇒ [“3.2 Checking oil pressure and oil pressure switch”, page 152](#) .

- ☐ Removing and installing ⇒ [“3.1 Removing and installing oil pressure switch F1 ”, page 152](#)

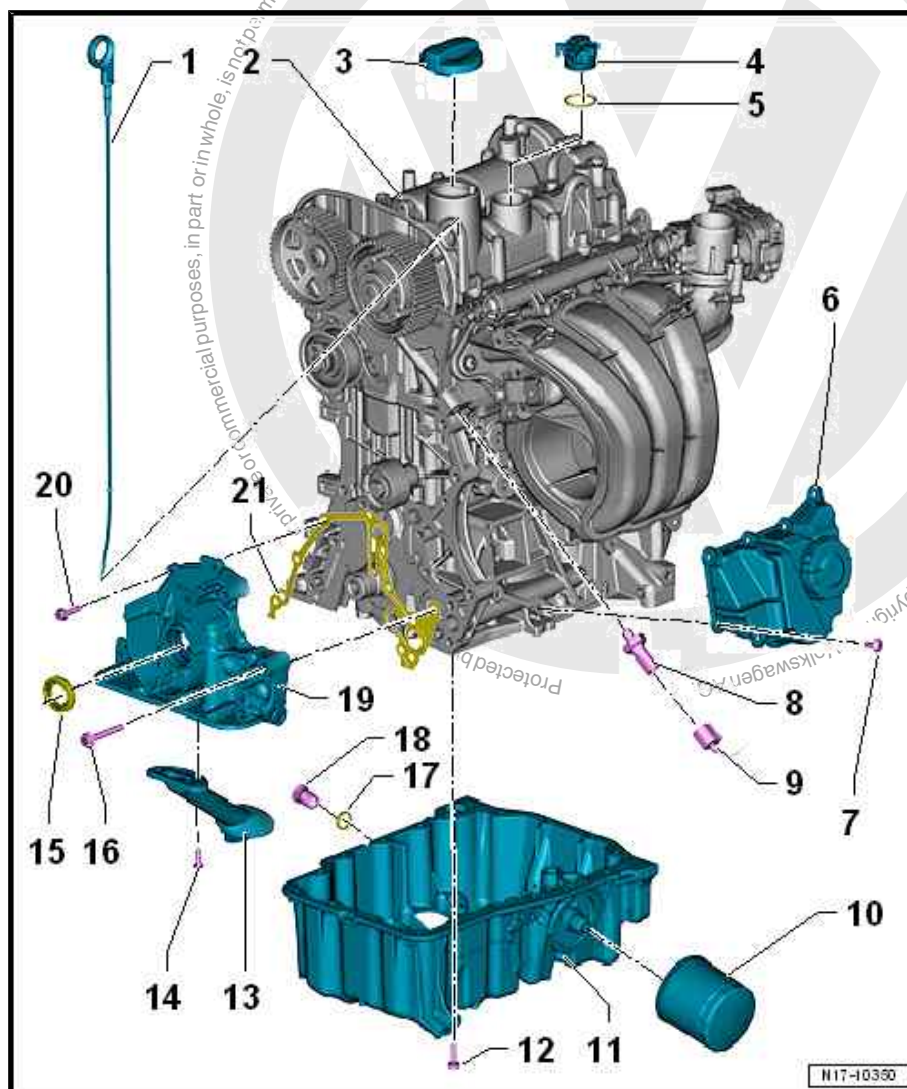
- ☐ 20 Nm

- ☐ Renew O-ring after each removal



#### Note

- ◆ *Factory-fitted oil pressure switch is equipped with a captive seal.*





- ◆ *The seal is not designed for repeated use.*
- ◆ *When reinstalling a used oil pressure switch, remove captive seal, and replace it with a new one.*

## 9 - Connector

## 10 - Oil filter

- ☐ Observe fitting instructions on oil filter
- ☐ Remove and install with oil filter tool - 3417- .
- ☐ If the connecting union for oil filter in sump became loose ⇒ [page 140](#)
- ☐ 20 Nm

## 11 - Sump

- ☐ Removing and installing ⇒ ["1.3 Removing and installing sump", page 141](#)
- ☐ Clean sealing surface before fitting.
- ☐ Tighten loosened connecting union for oil filter ⇒ [page 140](#)
- ☐ Apply silicone sealant when installing ⇒ ["1.3 Removing and installing sump", page 141](#)

## 12 - Bolt

- ☐ Renew after removal
- ☐ 8 Nm +90°

## 13 - Suction line

- ☐ With integrated seal

## 14 - Bolt

- ☐ 8 Nm

## 15 - Seal

- ☐ Renew if damaged
- ☐ Removing and installing ⇒ ["1.4 Renewing crankshaft oil seal - belt pulley end", page 40](#)

## 16 - Bolt

- ☐ 20 Nm

## 17 - Seal



### Note

*New procedure for all other service types ⇒ [page 140](#)*

## 18 - Oil drain plug



### Note

*Needs to be renewed only on 1st oil change after assembly in factory ⇒ [page 140](#).*

- ☐ 30 Nm

## 19 - Oil pump

- ☐ Renew only as complete unit
- ☐ Removing and installing ⇒ ["1.4 Removing and installing oil pump", page 145](#)

## 20 - Bolt

- ☐ Renew after removal
- ☐ 8 Nm +90°



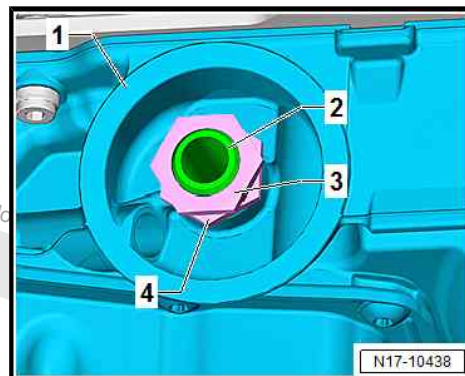
## 21 - Seal

### Tightening connecting union for oil filter

- If the connecting union -2- in the sump -1- became loose, re-tighten it as described below.

**Use only the two nuts -3 and 4- for this procedure.**

- Hexagon nut - 068 115 723- , qty. 2, ⇒ Electronic Parts Catalogue
- Screw nuts -3- and -4- onto connecting union -2-, and counterlock them.
- Tighten connecting union -2- using nut -3-.
- Loosen the two nuts and remove them, taking care not to loosen the connecting union.



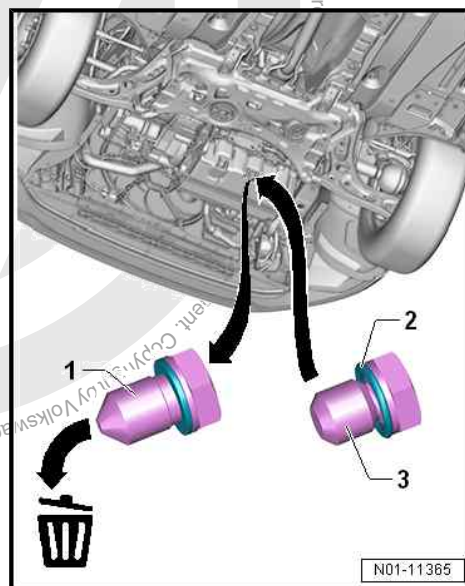
### Specified torques

Connecting union	Specified torque
-2-	50 Nm

### Oil drain plug with captive seal (factory-installed)

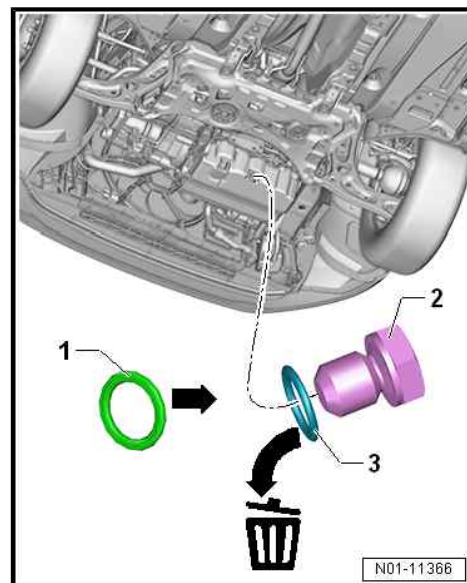
- On first oil change, oil drain plug with captive seal -1- is disposed of.
- Use a new oil drain plug -3- with renewable seal -2-.

### Oil drain plug with renewable seal (all future oil change services)





- Unscrew oil drain plug -2-, and dispose of old seal -3-.
- New oil seal -1- can be renewed individually when oil is changed in the future.



## 1.2 Engine oil:



### Note

- ♦ *Risk of damage to catalytic converter.*
- ♦ *Oil level must not be above "max." mark.*

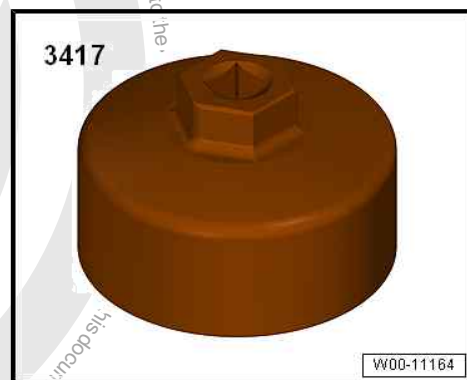
Capacities and specifications ⇒ Maintenance ; Booklet ; Engine oil: Capacities and specifications .

Check engine oil level ⇒ Maintenance ; Booklet ; Engine oil level: Checking .

## 1.3 Removing and installing sump

### Special tools and workshop equipment required

- ♦ Oil filter tool - 3417-





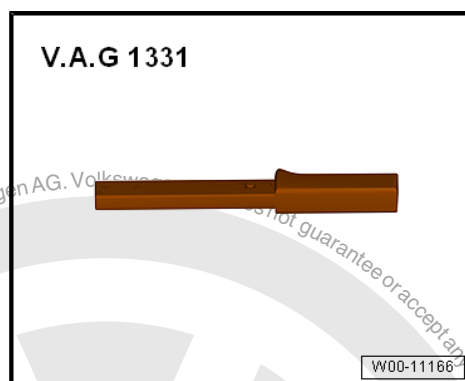
up! 2012 ➤ , up! 2017 ➤

3-cyl. injection engine (1.0 l, natural gas 4V, EA 211) - Edition 06.2019

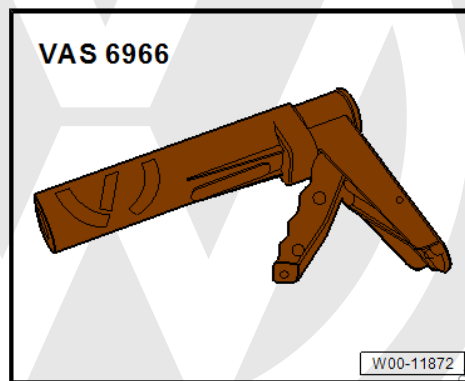
- ◆ Multi-point bit - T10058-



- ◆ Torque wrench - V.A.G 1331-



- ◆ Hand drill with plastic brush
- ◆ Scraper
- ◆ Applicator gun - VAS 6966-



- ◆ Silicone sealant D 176 501 A1

### Removing

- Drain engine oil.
- Remove oil filter with oil filter tool - 3417- .

### Only vehicles with air conditioner



### Note

- ◆ *The air conditioning system lines must not be opened.*
- ◆ *Prevent damage to condenser and refrigerant lines and hoses.*
- ◆ *Do NOT stretch, kink or bend lines and hoses.*

Remove poly V-belt

⇒ ["1.3 Removing and installing poly-V belt", page 38](#) .



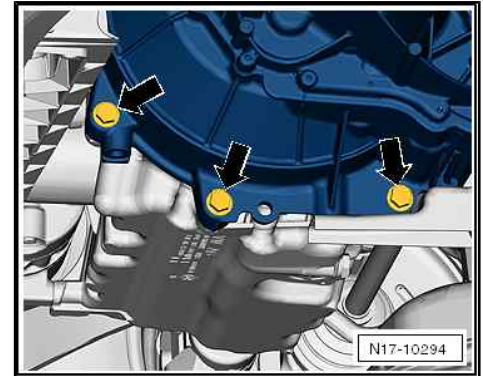


- Remove air conditioner compressor: ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Removing and installing air conditioner compressor .
- Secure air conditioner compressor to lock carrier.

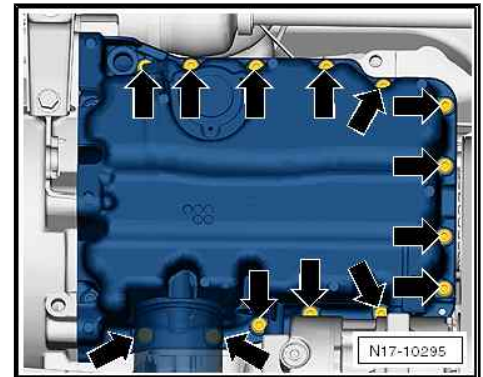
Make sure lines are not kinked.

#### Continued for all vehicles

- Remove securing bolts -arrows- for gearbox.



- Unscrew all sump securing bolts -arrows-.

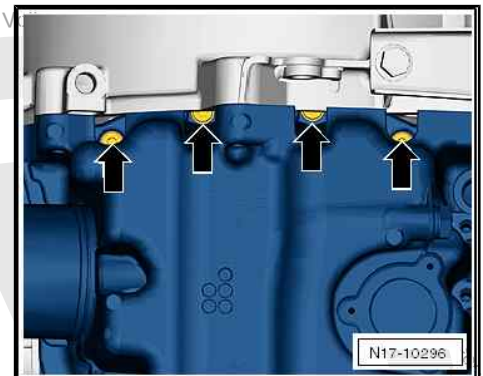


- Unscrew sump securing bolts on gearbox side -arrows- using Allen key, long reach 5 mm - T10058- .

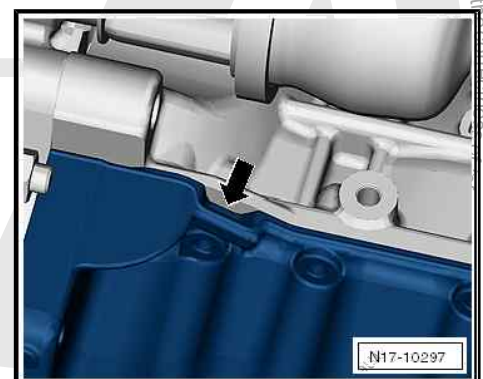


#### Note

- ◆ *The sump is sealed with liquid sealant.*
- ◆ *When hardened, the sealant has a high adhesive strength.*



- Carefully lever off sump from cylinder block at recess -arrow- using assembly lever.
- Remove sump. Loosen sump with light blows of a rubber headed hammer if necessary.
- Remove sealant residues from cylinder block with a flat scraper.





up! 2012 ➤ , up! 2017 ➤

3-cyl. injection engine (1.0 l, natural gas 4V, EA 211) - Edition 06.2019

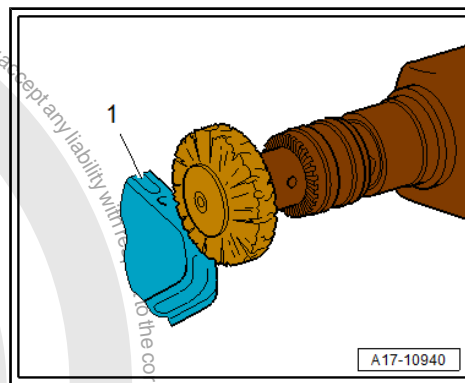
- Remove sealant residues on sump with a rotating brush, e.g. an electric drill with plastic brush attachment (wear eye protection).
- Clean sealing surfaces. They must be free of oil and grease.

### Installing



#### Note

- ◆ *Observe use-by-date of sealant.*
- ◆ *The sump must be installed within 5 minutes of applying silicone sealing compound.*
- ◆ *The sump can be positioned more easily and with greater security if M6 studs are inserted into the cylinder block flange at two positions as guides.*





- Cut off nozzle on tube at front marking ( $\varnothing$  of nozzle approx. 3 mm).
- Using applicator gun - VAS 6966- , apply silicone sealant to clean sealing surface of sump as shown in illustration.

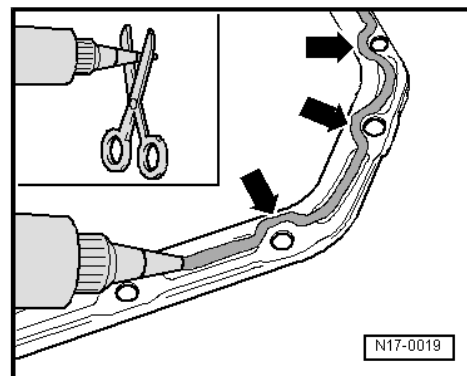
Sealant bead must be:

- ◆ 2 to 3 mm thick
- ◆ Run bead along inner side of bolt holes -arrows-.



#### Note

*The sealing compound bead cannot be thicker, or excessive sealing compound will enter the sump and may block the oil suction pipe strainer.*



- Fit sump immediately and lightly tighten all sump securing bolts.
- Tighten new sump bolts.
- Tighten securing bolts on gearbox.



#### Note

*Let sealing compound dry for approx. 30 minutes after installing oil sump. Only then fill with engine oil.*

- Fill oil filter with engine oil, and tighten it with oil filter tool - 3417- .
- Replenish engine oil.

Engine oil capacity ⇒ [“1.2 Engine oil.”, page 141](#) .

- Install air conditioner compressor: ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Removing and installing air conditioner compressor .

Install poly V-belt (only for vehicles with air conditioning system)  
⇒ [“1.3.1 Removing and installing poly V-belt, vehicles with air conditioner compressor”, page 38](#) .

Further assembly is basically a reverse of the dismantling sequence.

#### Specified torques

- ◆ Specified torques for gearbox bolts: ⇒ Rep. gr. 34 ; Removing and installing gearbox; Specified torques for gear box
- ◆ ⇒ [“1.1 Assembly overview - sump/oil pump”, page 138](#)

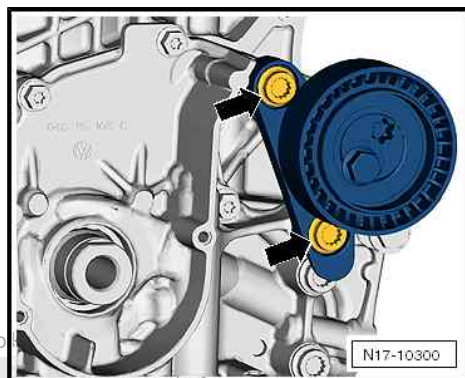
## 1.4 Removing and installing oil pump

### Removing

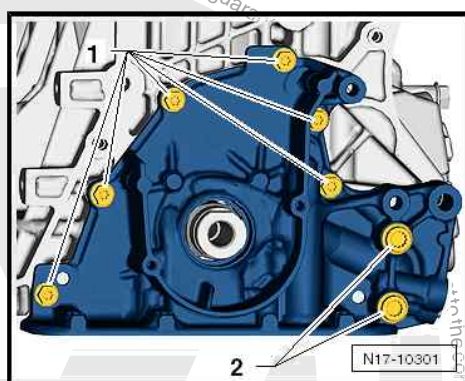
- Disconnect battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .
- Remove alternator ⇒ Electrical system; Rep. gr. 27 ; Alternator; Removing and installing alternator .
- Remove toothed belt  
⇒ [“2.3 Removing and installing toothed belt”, page 81](#) .
- Remove sump  
⇒ [“1.3 Removing and installing sump”, page 141](#) .



- Remove crankshaft oil seal on belt pulley end  
⇒ [“1.4 Renewing crankshaft oil seal - belt pulley end”, page 40](#) .
- Unscrew securing bolts -arrows- and remove tensioning element.



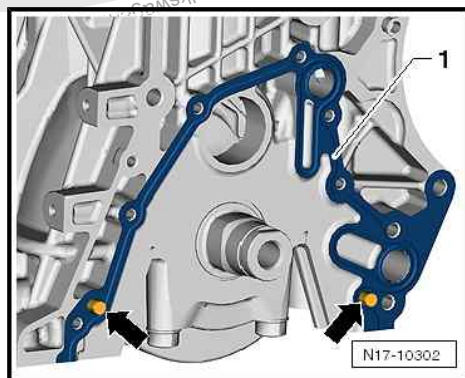
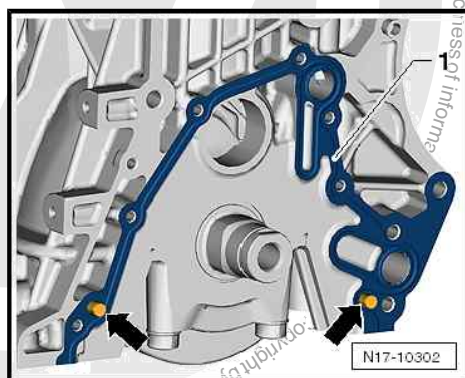
- Unscrew oil pump securing bolts -1- and -2-.
- Pull oil pump in a straight line off dowel pins on cylinder block.



- Remove gasket -1- from dowel pins -arrows-.

#### Installing

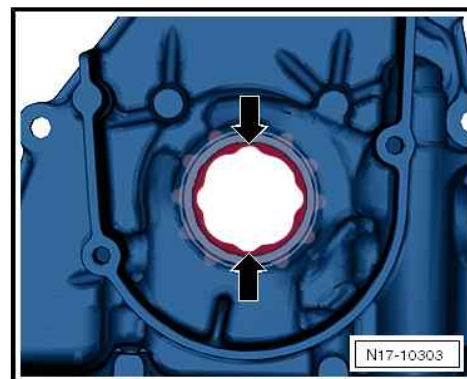
- Fit new gasket -1- onto dowel pins -arrows-.



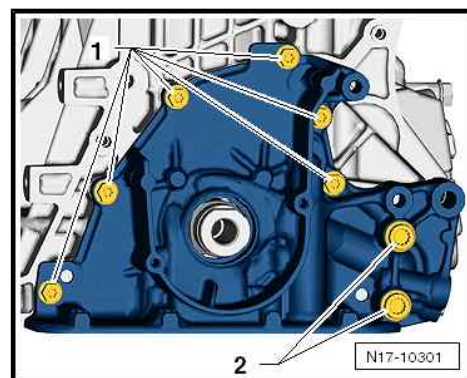




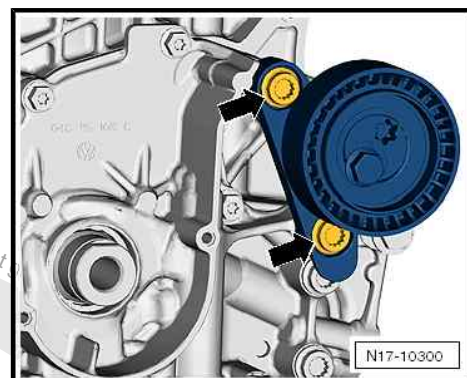
- Rotate oil pump gear to a position where 2 opposing notches -arrows- are aligned vertically.
- Fit oil pump onto dowel pins.
- Tighten new securing bolts -1- to specified torque  
⇒ [page 147](#) .



- Tighten securing bolts -2- to specified torque ⇒ [page 147](#) .
- Install new crankshaft oil seal on belt pulley end  
⇒ [“1.4 Renewing crankshaft oil seal - belt pulley end”](#),  
[page 40](#) .

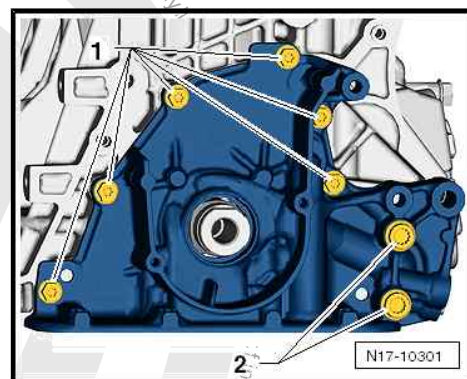


- Fit tensioning element with new securing bolts -arrows- and tighten securing bolts to specified torque ⇒ [page 147](#) .
- Install sump  
⇒ [“1.3 Removing and installing sump”](#), [page 141](#) .
- Install toothed belt  
⇒ [“2.3 Removing and installing toothed belt”](#), [page 81](#) .
- Install alternator ⇒ Electrical system; Rep. gr. 27 ; Alternator;  
Removing and installing alternator .



### Specified torques

Component	Specified torque	Note	Qty.
Securing bolts for oil pump -1-	8 Nm +90°	Renew	Qty. 6
Securing bolts for oil pump -2-	20 Nm		Qty. 2
Securing bolts for tensioning elements	20 Nm +90°	Renew	Qty. 2







## 2 Crankcase ventilation

⇒ ["2.1 Assembly overview - crankcase breather system", page 148](#)

⇒ ["2.2 Removing and installing oil separator", page 149](#)

### 2.1 Assembly overview - crankcase breather system

#### 1 - Oil separator

- ☐ Removing and installing  
⇒ ["2.2 Removing and installing oil separator", page 149](#)

- ☐ Renew if damaged

#### 2 - O-ring

- ☐ Renew after removal
- ☐ Moisten with oil before installing

#### 3 - Hose

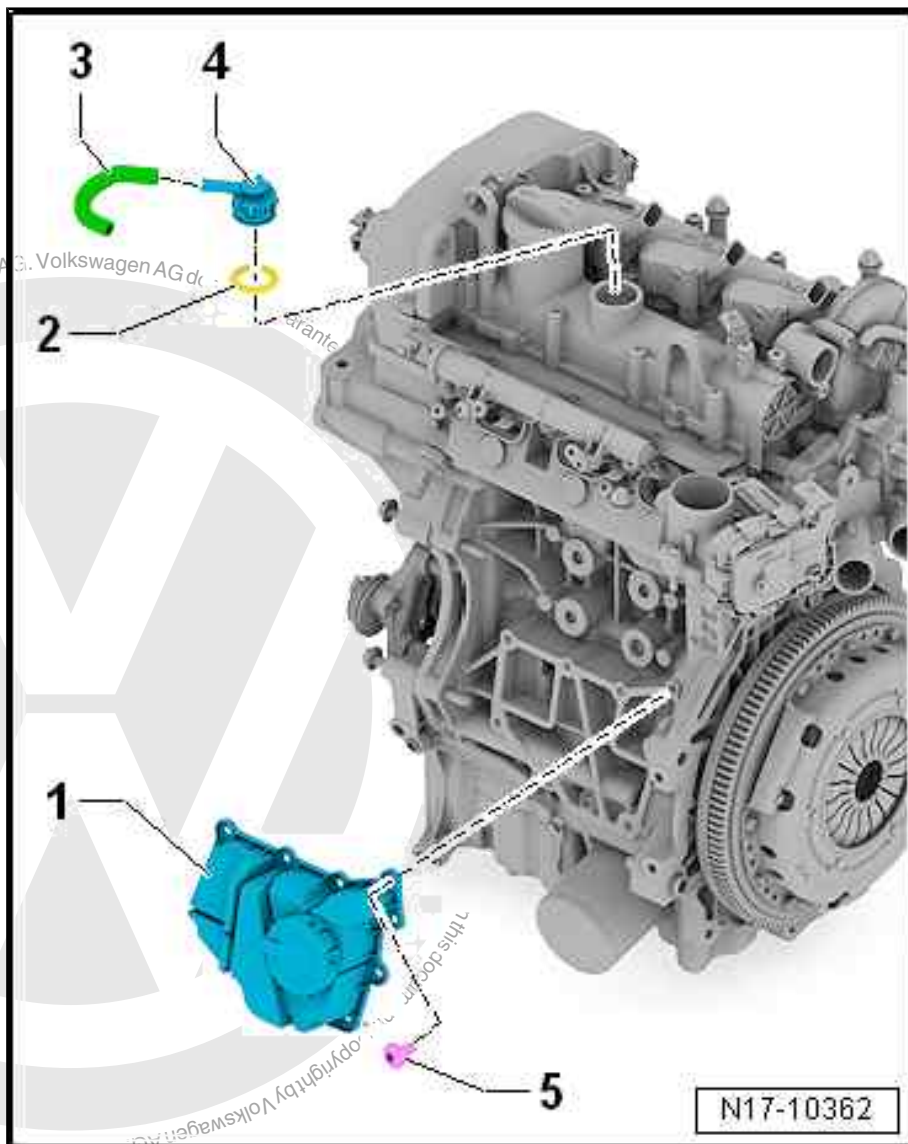
- ☐ For crankcase ventilation.

#### 4 - Union

- ☐ Check for correct positioning

#### 5 - Bolt

- ☐ Self-locking
- ☐ Renew after removal
- ☐ 9 Nm

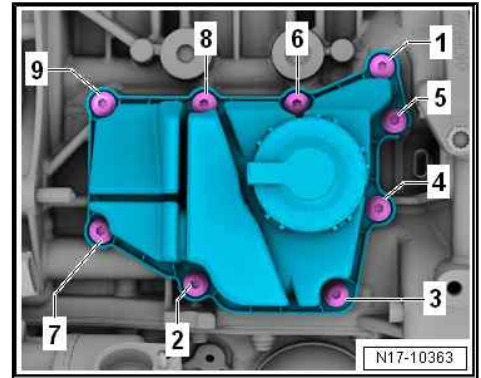




## Oil separator - tightening torque and sequence

- Tighten bolts in the sequence -1 ... 9-.

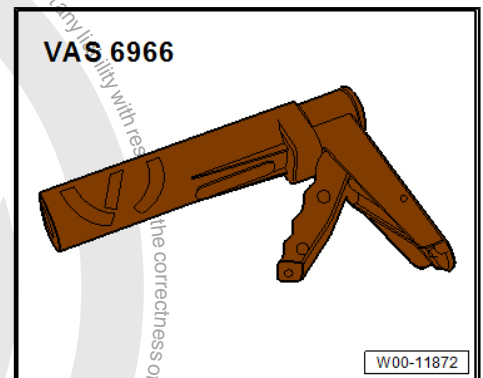
Bolt	Specified torque
-1 ... 9-	9 Nm



## 2.2 Removing and installing oil separator

### Special tools and workshop equipment required

- ◆ Commercially available sealant remover
- ◆ Applicator gun - VAS 6966-



- ◆ Sealant ⇒ Electronic Parts Catalogue

### Removing

#### DANGER

**Risk of explosion and danger to life due to escaping natural gas. A hissing noise is a sign that there are leaks in the natural gas system. Leaks in natural gas system may lead to uncontrolled escape of natural gas.**

**Risk of explosion leading to serious injuries or death.**

- Do not perform any kind of work on the natural gas system if leaking gas can be heard.
- If a gas leak can be heard, do not drive the vehicle into the workshop.
- Park the vehicle outside and cordon off the area around it.

- Empty gas system ⇒ Rep. gr. 20 ; Fuel tank; Releasing pressure in high-pressure line .
- Remove intake manifold  
⇒ [“6.2 Removing and installing intake manifold”, page 233](#) .



- Loosen and unscrew bolts in the sequence -9 to 1-.
- Carefully release oil separator from bonded joint.

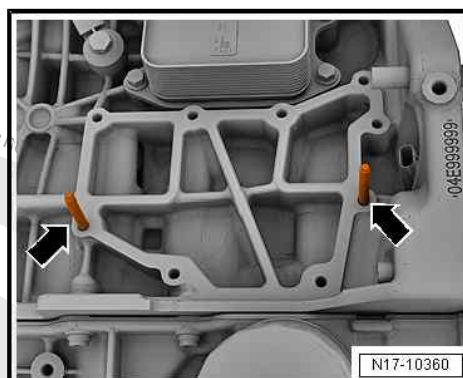
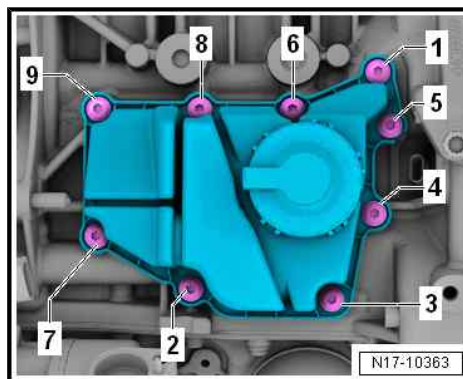
### Installing

Install in reverse order, noting the following:



#### Note

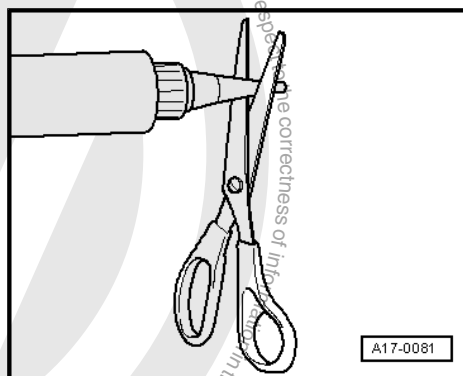
- ◆ *Risk of soiling the lubrication system.*
- ◆ *To prevent the sealing surfaces from being scratched, which could cause leaks, do not clean the sealing surfaces by mechanical means, e.g. using a flat scraper.*
- ◆ *Cover open parts of engine.*
- Thoroughly clean sealing surfaces on cylinder block and on oil separator using commercially available sealant remover.
- Remove any oil and grease from sealing surfaces.
- Screw 2 studs a few turns into holes -arrows-.



#### Note

*Observe use-by-date of sealant.*

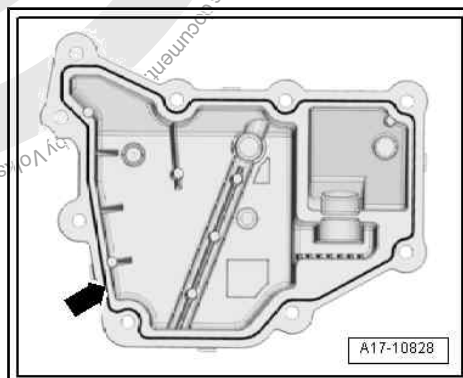
- Cut off nozzle on tube at front marking ( $\varnothing$  of nozzle approx. 1.5 mm).



#### Note

- ◆ *Risk of blocking lubrication system with excess sealant.*
- ◆ *Do not apply sealant bead thicker than specified.*
- Apply bead of sealant -arrow- onto clean sealing surface of oil separator using applicator gun - VAS 6966- as illustrated.
- Width of sealant bead: 2 mm.

The oil separator must be installed within 5 minutes of sealant being applied.





- Fit oil separator onto studs, and position it on crankcase.
- Unscrew studs.
- Tighten bolts to specified torque observing specified tightening sequence. ➔ [page 149](#)

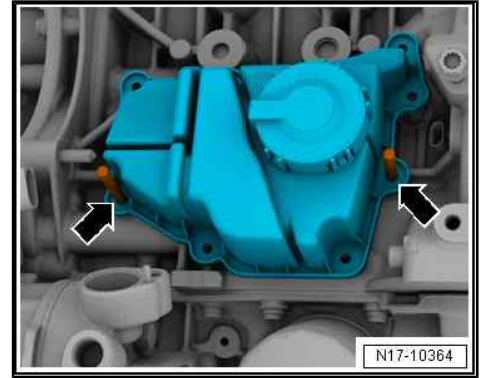
Further installation is carried out in reverse order of removal, observing the following:

- Install intake manifold  
➔ [“6.2 Removing and installing intake manifold”, page 233](#) .



#### Note

- ◆ *The natural gas system may not be put into operation until it has been tested.*
- ◆ *The necessary scope of the leakage test depends on the pressure section which has been worked on.*
- ◆ *Observe the following allocation!*



#### DANGER

Risk of explosion and danger to life due to escaping natural gas. Leaks in natural gas system may lead to uncontrolled escape of natural gas. Risk of explosion leading to serious injuries or death.

- Check natural gas system for leaks.

#### Allocation:

➔ [“3.1 Distinguishing between pressure sections of natural gas supply system”, page 212](#)

- Open fuel tank shut-off valves -N361/N362- using hand wheel  
- T50026- .



#### DANGER

Risk of explosion and danger to life due to escaping natural gas. A hissing noise is a sign that there are leaks in the natural gas system. Leaks in natural gas system may lead to uncontrolled escape of natural gas.

Risk of explosion leading to serious injuries or death.

- Do not perform any kind of work on the natural gas system if leaking gas can be heard.
- If a gas leak can be heard, do not drive the vehicle into the workshop.
- Park the vehicle outside and cordon off the area around it.

- Check the gas system  
➔ [“3.5 Checking gas system for leaks”, page 217](#) .

#### Specified torques

- ◆ Securing bolts for oil separator ➔ [page 149](#) .
- ◆ Specified torques for fuel rail  
➔ [“2.1 Assembly overview - fuel rail with injectors”, page 201](#)
- ◆ Specified torques for gas rail  
➔ [“4.1 Assembly overview - gas rail”, page 222](#)
- ◆ Securing bolts for intake manifold  
➔ [“6.2 Removing and installing intake manifold”, page 233](#)



### 3 Oil filter, oil pressure switch

⇒ "3.1 Removing and installing oil pressure switch F1",  
page 152

⇒ "3.2 Checking oil pressure and oil pressure switch",  
page 152

⇒ "3.3 Removing and installing oil filter housing", page 154

#### 3.1 Removing and installing oil pressure switch - F1-

Special tools and workshop equipment required

- ◆ Torque wrench - V.A.G 1331-

##### Removing

- Unplug connector -1-.



##### Note

- ◆ Risk of alternator damage from escaping engine oil.
- ◆ Cover alternator with a cloth.
- ◆ The oil pressure switch is fitted with a captive seal.
- ◆ The seal is not designed for repeated use.

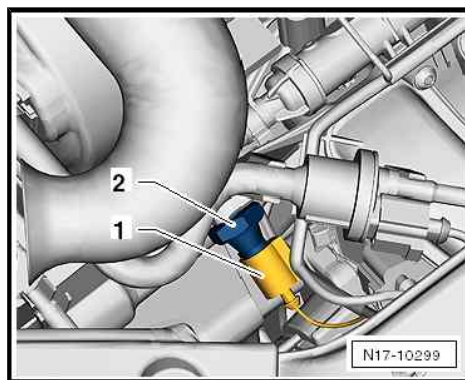
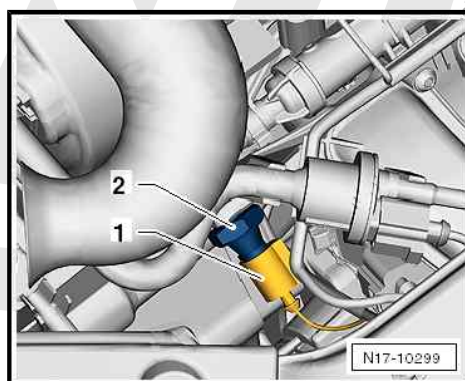
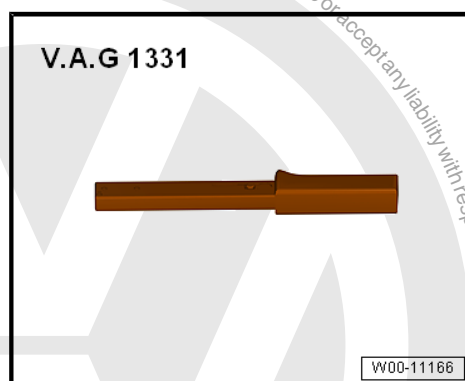
- Unscrew oil pressure switch -2- from cylinder head.

##### Installing

- Cut open the captive seal to renew it.
- Screw oil pressure switch -2- into cylinder head and tighten.
- Connect connector -1-.
- Remove cloth from alternator.

##### Specified torque for oil pressure switch

Component	Specified torque
Oil pressure switch	20 Nm

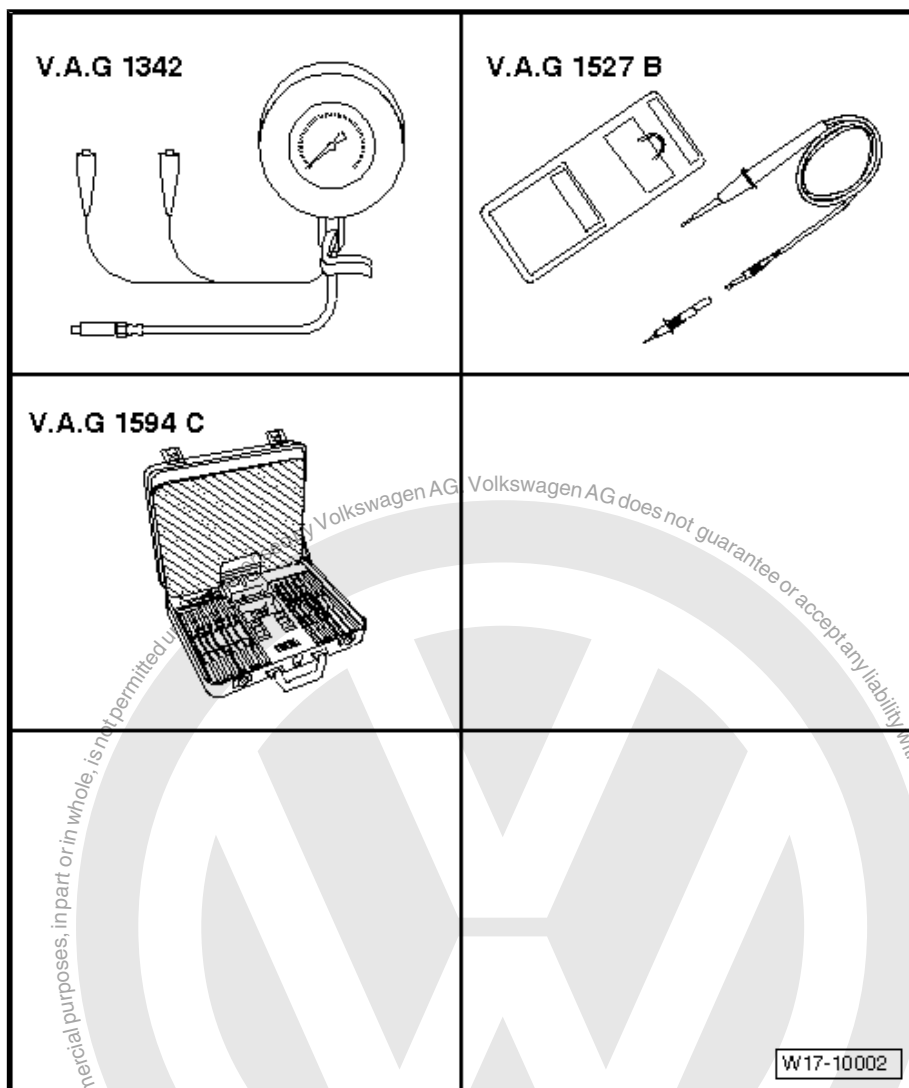


#### 3.2 Checking oil pressure and oil pressure switch





# Special tools and workshop equipment required



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



## Note

*Functional check and repair of the optical and acoustic oil pressure warning: ⇒ Current flow diagrams, Electrical fault finding and Fitting locations*

## Test sequence



## Note

- ◆ Risk of alternator damage from escaping engine oil.
- ◆ Cover alternator with a cloth.



- Unplug connector -1-.
- Unscrew oil pressure switch - F1- -2- from cylinder head ➔ [page 152](#) .



#### Note

- ◆ The oil pressure switch is fitted with a captive seal.
- ◆ The seal is not designed for repeated use.

- Screw oil pressure switch - F1- into tester.
- Screw tester into cylinder head in place of oil pressure switch.
- Connect brown wire of tester to earth (-).
- Connect voltage tester - V.A.G 1527B- to battery positive (+) and oil pressure switch using cables from auxiliary measuring set - V.A.G 1594C- .
- Start engine and increase revolutions slowly. At 0.3...0.6 bar, the LED must light up, otherwise the oil pressure switch must be renewed.
- Increase engine speed further. At 2,000 rpm and an oil temperature of 80°C; the oil pressure should be at least 2.0 bar.

At higher engine speeds, the oil pressure must not exceed 7.0 bar.

Install in reverse order.

- Cut open the captive seal to renew it.
- Install oil pressure switch - F1- ➔ [page 152](#) .

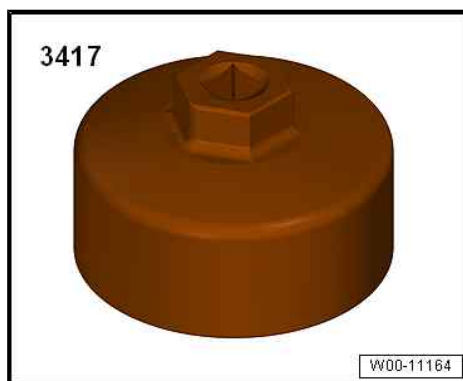
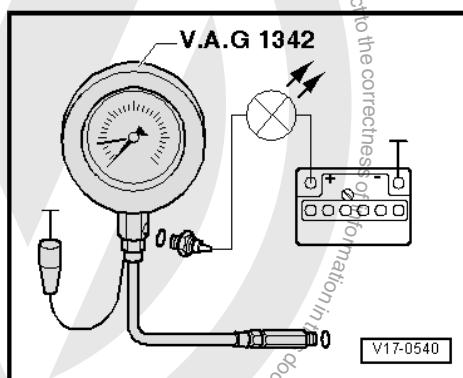
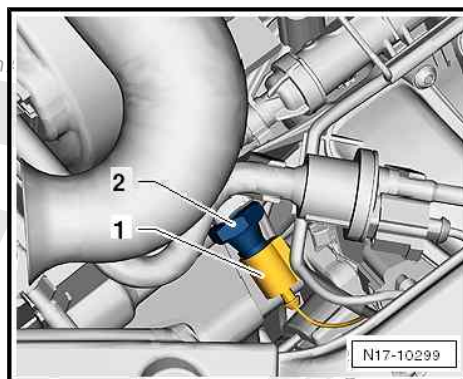
#### Specified torques

- ◆ Specified torque for oil pressure switch ➔ [page 152](#)

### 3.3 Removing and installing oil filter housing

#### Special tools and workshop equipment required

- ◆ Oil filter tool - 3417-



#### Removing



#### Note

Observe ➔ ["3.1 Rules for cleanliness", page 7](#) when working on the lubrication system!



- Drain engine oil.
- Remove oil filter -arrow- with oil filter tool - 3417- .

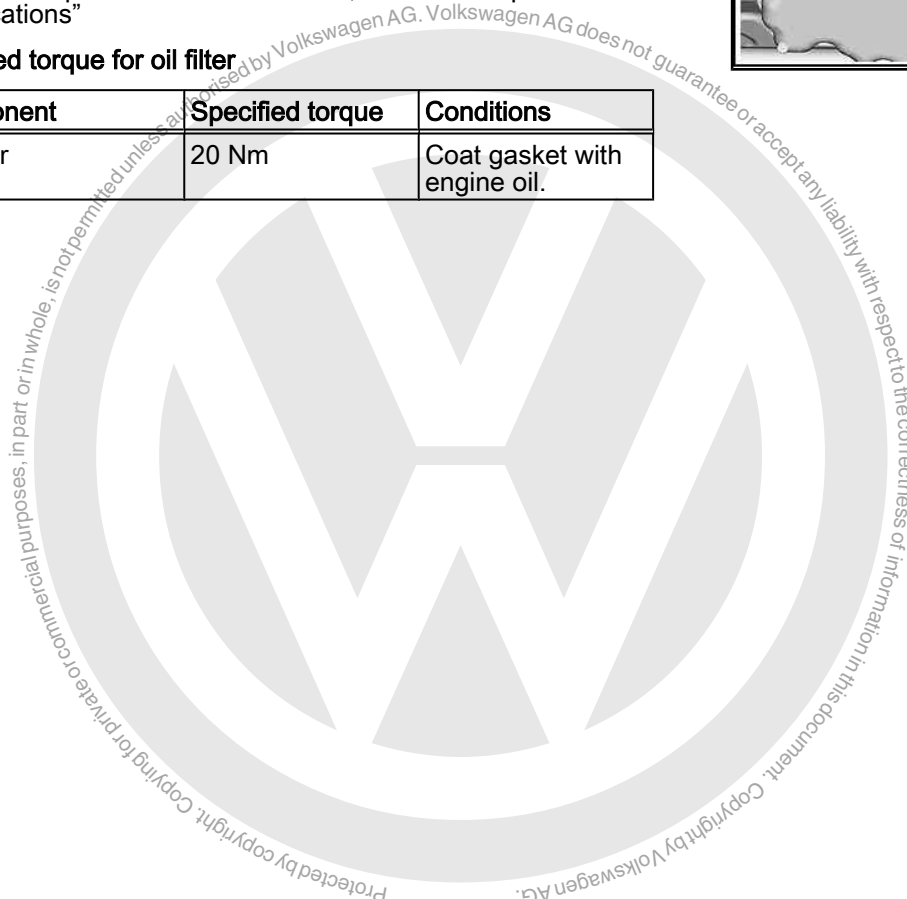
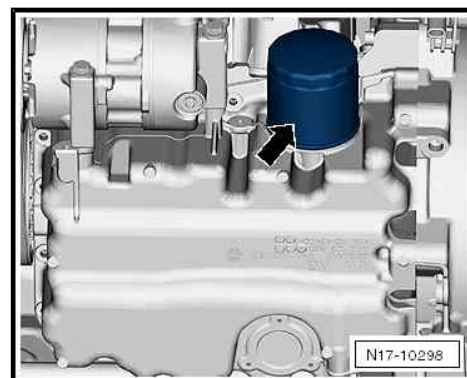
#### Installing

- Fill oil filter with engine oil and tighten it with oil filter tool - 3417- .
- If connecting union -2- in sump -1- became loose, retighten it as described below ⇒ [page 140](#) .
- Replenish engine oil.

Engine oil capacities ⇒ Maintenance ; Booklet "Capacities and specifications"

#### Specified torque for oil filter

Component	Specified torque	Conditions
Oil filter	20 Nm	Coat gasket with engine oil.





## 19 – Cooling

### 1 Cooling system/coolant

⇒ [“1.1 Connection diagram - coolant hoses”, page 156](#)

⇒ [“1.2 Checking cooling system for leaks”, page 156](#)

⇒ [“1.3 Draining and adding coolant”, page 159](#)

#### 1.1 Connection diagram - coolant hoses

1 - Heat exchanger for heater

2 - Expansion tank

- ❑ Check for leaks

⇒ [“1.2 Checking cooling system for leaks”, page 156](#)

3 - Radiator/cooler

- ❑ Removing and installing  
⇒ [“3.2 Removing and installing radiator”, page 187](#)

4 - Intake manifold

- ❑ Removing and installing  
⇒ [“6.2 Removing and installing intake manifold”, page 233](#)

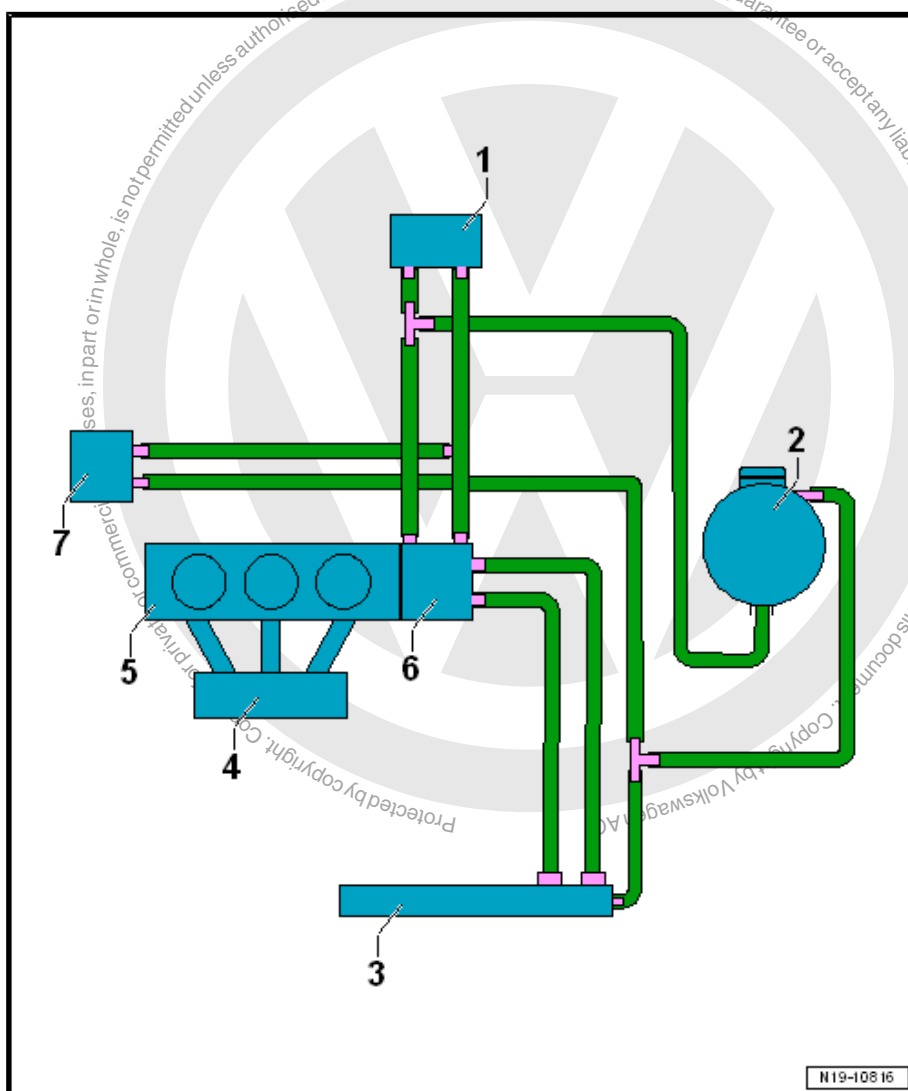
5 - Cylinder head and cylinder block

6 - Thermostat housing with coolant pump

- ❑ Removing and installing  
⇒ [“2.3 Removing and installing coolant pump”, page 169](#)

7 - Gas pressure regulator

- ❑ With tank pressure sensor - G400-
- ❑ Removing and installing  
⇒ [“10.2 Removing and installing gas pressure regulator”, page 256](#)

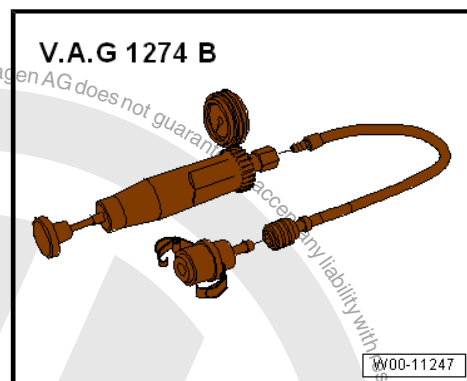


#### 1.2 Checking cooling system for leaks

Special tools and workshop equipment required



◆ Cooling system tester - V.A.G 1274 B-



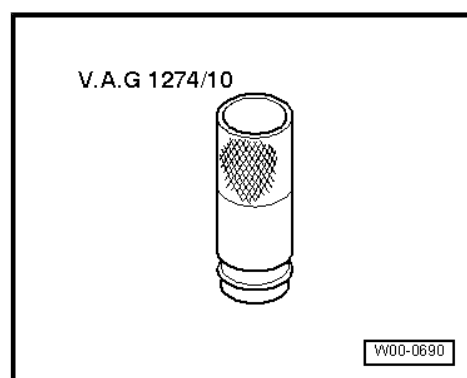
◆ Adapter for cooling system tester - V.A.G 1274/8-



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



◆ Adapter for cooling system tester - V.A.G 1274/10-



**Prerequisites for check**

- Engine at operating temperature.

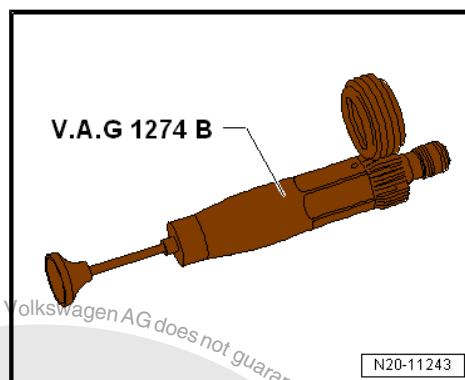




## Test sequence

### 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.

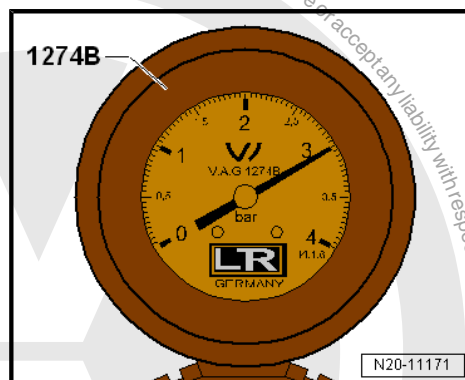
#### Checking cooling system for leaks

#### CAUTION

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

Skin and other parts of the body may be scalded.

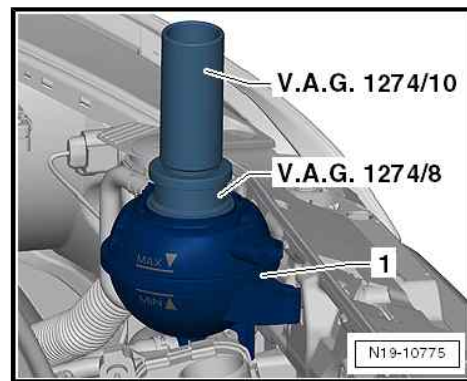
- Wear protective gloves.
- Wear protective goggles.
- Reduce excess pressure by covering cap of coolant expansion tank with cloths and opening it carefully.



- Open filler cap on coolant expansion tank.



- Screw adapter for cooling system tester - V.A.G 1274/8- into coolant expansion tank -1-.
- Screw adapter for cooling system tester - V.A.G 1274/10- into adapter for cooling system tester - V.A.G 1274/8- .
- Clamp connector - V.A.G 1274 B/1- into adapter for cooling system tester - V.A.G 1274/10- .
- Connect connector - V.A.G 1274 B/1- to cooling system tester - V.A.G 1274 B- using supplied hose.
- Using hand pump of tester, build up a pressure of approx. 1.5 bar.
- 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

- ◆ A pressure drop of 0.2 bar within 10 minutes is caused by the coolant cooling down.
- ◆ The colder the engine, the lower the pressure loss.
- ◆ If necessary, repeat the check while the engine is cold.



#### Note

- ◆ Before disconnecting cooling system tester - V.A.G 1274 B- from the connecting hose or connector - V.A.G 1274 B/1- , it is essential that the pressure is relieved.
- ◆ To do this, press pressure relief valve on cooling system tester - V.A.G 1274 B- until pressure gauge displays value of »0«.

#### Check pressure relief valve in cap.

- Screw cap -1- into adapter for cooling system tester - V.A.G 1274/9- -2-.
- Clamp connector - V.A.G 1274 B/1- into adapter for cooling system tester - V.A.G 1274/9- .
- Connect connector - V.A.G 1274 B/1- to cooling system tester - V.A.G 1274 B- using supplied hose.
- Using hand pump on cooling system tester, build up a pressure of max. 1.6 bar.

#### Blue cap

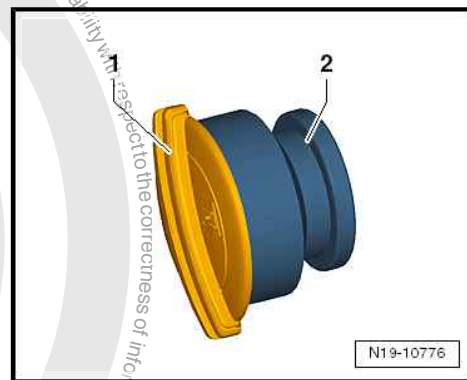
- ◆ The pressure relief valve must open at a pressure of 1.4 bar.

#### Black cap

- ◆ The pressure relief valve must open at a pressure of 1.6 to 1.8 bar.

If the pressure relief valve opens prematurely:

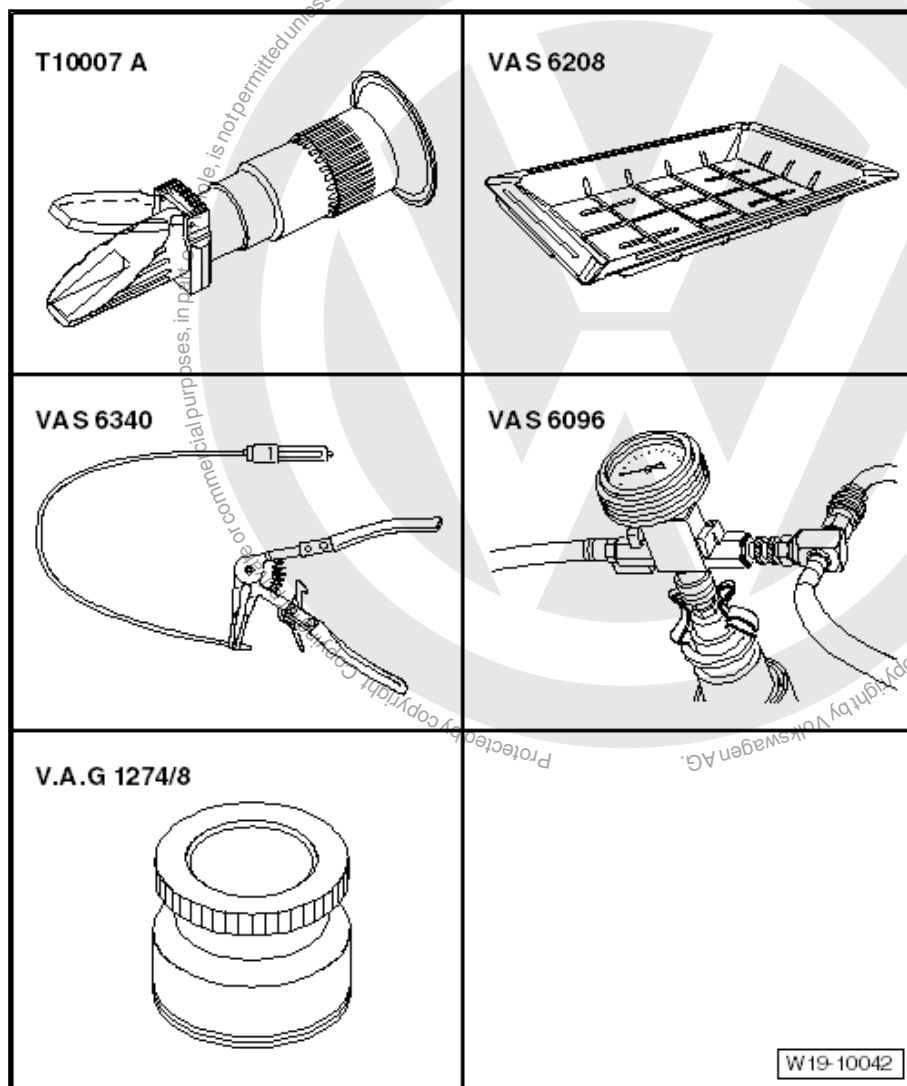
- Renew cap.



## 1.3 Draining and adding coolant



### Special tools and workshop equipment required



- ◆ Refractometer - T10007 A-
- ◆ Drip tray for workshop hoist - VAS 6208-
- ◆ Hose clamp pliers - VAS 6340-
- ◆ Coolant system charge unit - VAS 6096-
- ◆ Adapter for cooling system tester - V.A.G 1274/8-
- ◆ Safety glasses
- ◆ Safety gloves

### Draining coolant



#### CAUTION

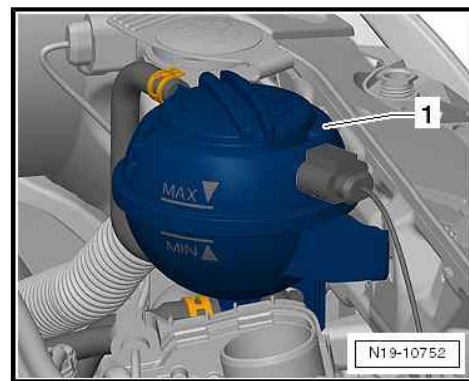
On a warm engine, the cooling system is under high pressure. Danger of scalding due to steam and hot coolant.

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 cloths and opening it carefully.



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

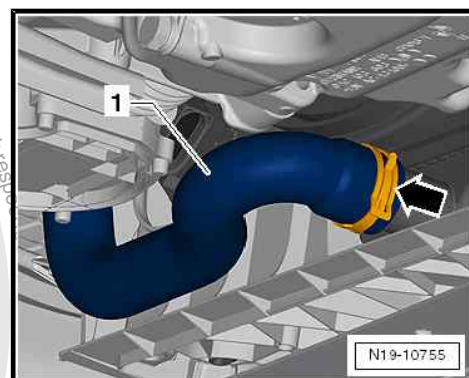


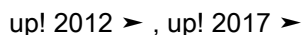
- Loosen hose clamp -arrow- and pull off coolant hose -1- from radiator  
⇒ ["1.1 Connection diagram - coolant hoses", page 156](#) .
- Drain coolant.



**Note**

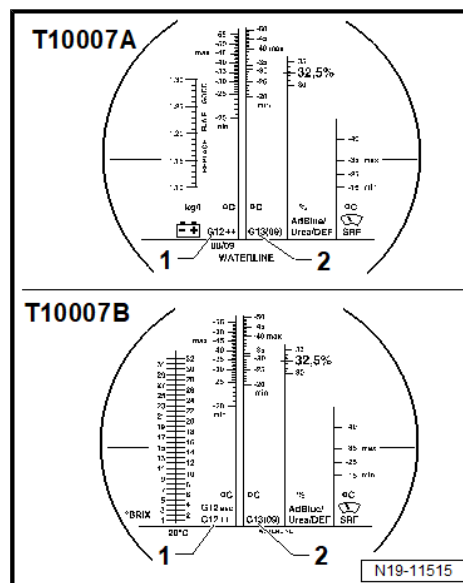
*Please observe disposal instructions!*





◆ *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, only ever use 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.
- ◆ The refractometer - T10007A- or refractometer - T10007B- must be used to determine the current anti-freeze value.
- ◆ The scale -1- of the refractometer is calibrated for the coolant additives G12++ and G12evo.
- ◆ The scale -2- of the refractometer is calibrated for the coolant additive G13.
- ◆ If it is not possible to ensure that the same type of coolant additive is filled: always determine anti-freeze protection using the scale for G13.
- ◆ Frost protection must be guaranteed down to  $-25^{\circ}\text{C}$  as a minimum and, in countries with arctic conditions, down to approx.  $-36^{\circ}\text{C}$ . Increasing the frost protection is permissible only if climatic conditions require stronger frost protection. It may, however, be increased only to a maximum of  $-48^{\circ}\text{C}$ . Otherwise, the cooling effect will be impaired.
- ◆ Do not reduce the coolant concentration by adding water even in warmer seasons and in warmer countries. Frost protection must be guaranteed down to at least  $-25^{\circ}\text{C}$ .
- ◆ The temperature reading on the refractometer corresponds to the »ice flocculation point«. Flakes of ice may start forming in the coolant below this temperature.
- ◆ Never reuse old coolant.
- ◆ Use only a water/coolant additive mixture as a slip agent for coolant hoses.



- ◆ *Use only distilled water for mixing coolant additives.*
- ◆ *The use of distilled water ensures optimum protection against corrosion.*



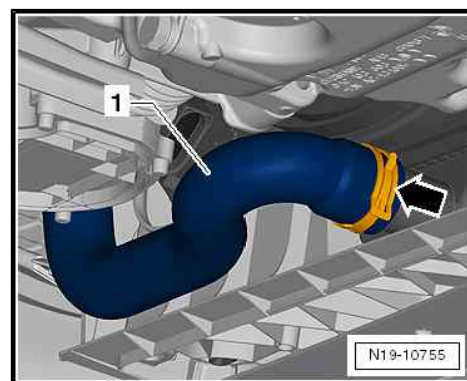


**Recommended mixing ratios (use only distilled water for mixing):**

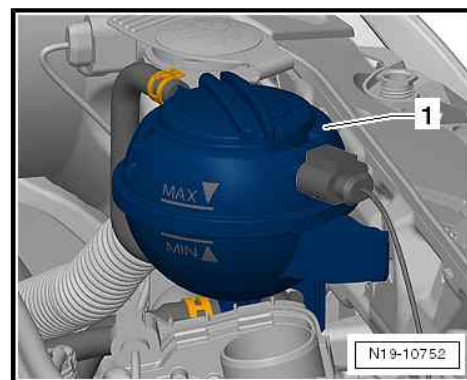
Frost protection to	Coolant additive
-25°C	40%
-36°C	50%

1) The quantity of coolant can vary depending on the vehicle equipment.

- Connect coolant hose -1- and secure with hose clamp -arrow-.
- Screw adapter for cooling system tester - V.A.G 1274/8- onto expansion tank.
- Fill coolant circuit using cooling system charge unit - VAS 6096- ➔ Operating instructions for cooling system charge unit VAS 6096 .

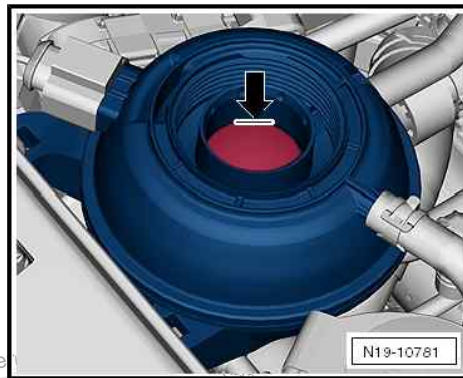


- Fill with coolant up to max. mark on expansion tank.
- Fit cooling system tester - V.A.G 1274 B- onto expansion tank and apply pressure of 1.5 bar to cooling system  
➔ ["1.2 Checking cooling system for leaks", page 156](#) .





- Fill with coolant up to edge -arrow- on expansion tank.
- Fit expansion tank cap.
- If fitted, switch off air conditioning system.
- Switch off heater controls.
- Start engine and let it warm up.
- Run engine at approx. 3,800 rpm until radiator fan cuts in.
- Once fan cuts in, run engine for a further 5 minutes at approx. 3,800 rpm.
- Switch off the engine.



**⚠ CAUTION**

**On a warm engine, the cooling system is under high pressure.  
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 cloths and opening it carefully.

- Check coolant level and top up as needed.
- When the engine is at operating temperature, it is permissible that the coolant level is at the "max. mark" or above.
- Coolant level must be between "min mark" and "max. mark" when engine is cold.

## 2 Coolant pump, regulation of cooling system

⇒ [“2.1 Assembly overview - coolant pump”, page 165](#)

⇒ [“2.2 Assembly overview - thermostat”, page 168](#)

⇒ [“2.3 Removing and installing coolant pump”, page 169](#)

⇒ [“2.4 Removing and installing thermostat”, page 173](#)

⇒ [“2.5 Removing and installing toothed belt for coolant pump”, page 178](#)

⇒ [“2.6 Removing and installing coolant temperature sender G62”, page 180](#)

⇒ [“2.7 Removing and installing radiator fan thermal switch F18”, page 182](#)

### 2.1 Assembly overview - coolant pump

#### 1 - Thermostat housing

- ☐ Removing and installing  
⇒ [“2.4.1 Removing and installing thermostat for cylinder block coolant circuit”, page 173](#)
- ☐ Observe tightening sequence when tightening to coolant pump  
⇒ [Fig. “Tightening sequence for tightening thermostat housing to coolant pump”](#), page 167 .

#### 2 - Thermostat

- ☐ For cylinder block coolant circuit
- ☐ Opening begins at approx. 97 °C
- ☐ Removing and installing  
⇒ [“2.4.2 Removing and installing thermostat for main coolant circuit \(radiator\)”, page 176](#)
- ☐ Note installation position  
⇒ [Fig. “Installation position of thermostat”](#), page 169

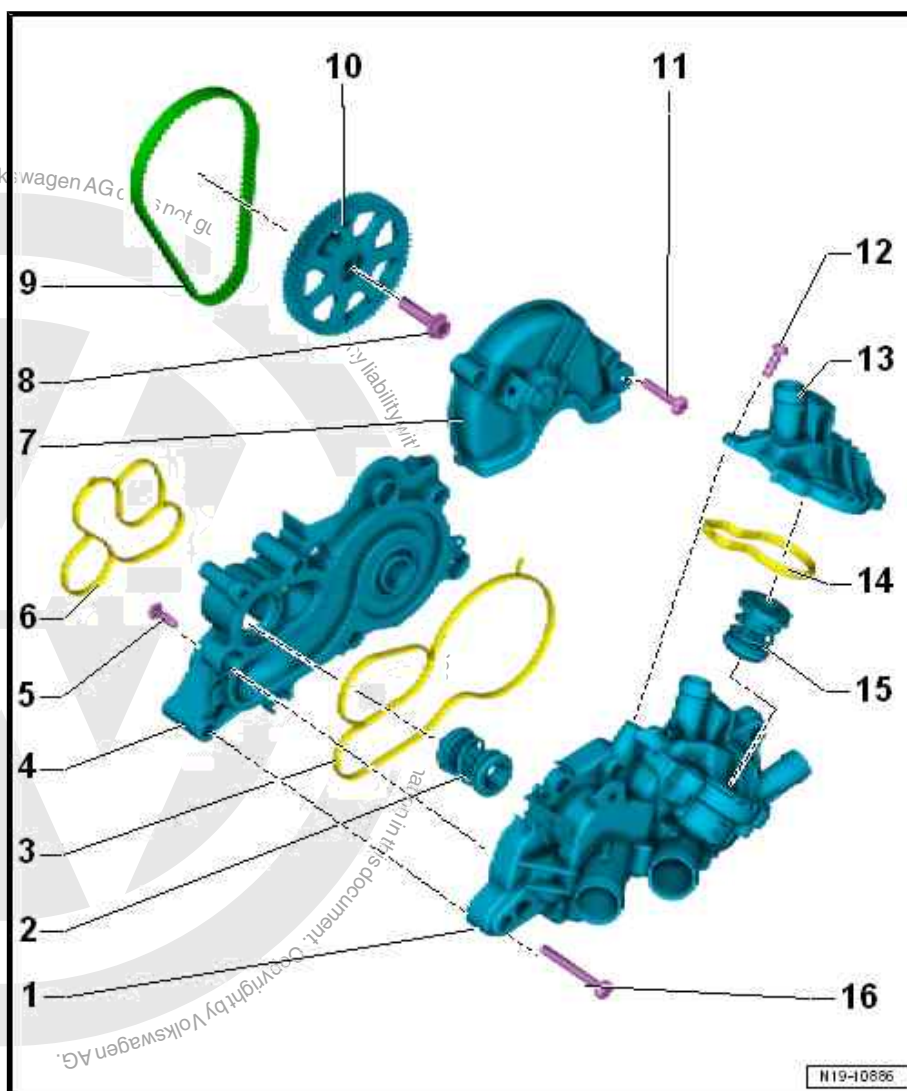
#### 3 - Seal

- ☐ Renew after removal
- ☐ Observe proper seating of gasket  
⇒ [Fig. “Installation position of gaskets”](#), page 167 .

- ☐ Lightly coat with coolant before installing.

#### 4 - Coolant pump

- ☐ Removing and installing ⇒ [“2.3 Removing and installing coolant pump”, page 169](#)





## 5 - Bolt

- ☐ Thread-cutting
- ☐ 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  
⇒ [Fig. "Tightening sequence for tightening thermostat housing to coolant pump"](#) , page 167

## 6 - Seal

- ☐ Renew after removal
- ☐ Observe proper seating of gasket ⇒ [Fig. "Installation position of gaskets"](#) , page 167 .
- ☐ Lightly coat with coolant before installing.

## 7 - Toothed belt guard

- ☐ For toothed belt for coolant pump

## 8 - Bolt

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

## 9 - Toothed belt

- ☐ Renew after removal ⇒ ["2.5 Removing and installing toothed belt for coolant pump"](#) , page 178
- ☐ For coolant pump drive
- ☐ Removing and installing ⇒ ["2.5 Removing and installing toothed belt for coolant pump"](#) , page 178

## 10 - Camshaft sprocket

- ☐ For coolant pump drive



### Note

- ◆ Before removing, set No. 1 cylinder to TDC.
- ◆ Mark position of camshaft pulley relative to camshaft housing before removing  
⇒ ["3.5.3 Removing and installing camshaft oil seal, exhaust camshaft, gearbox end"](#) , page 126 .

## 11 - Bolt

- ☐ 8 Nm

## 12 - Bolt

- ☐ Thread-cutting
- ☐ Fit and screw in bolt by hand so that it screws into old thread Then tighten bolt to torque.
- ☐ Specified torque and tightening sequence  
⇒ [Fig. "Tightening sequence for tightening thermostat cover to thermostat housing"](#) , page 169

## 13 - Cover

- ☐ For thermostat

## 14 - Seal

- ☐ Renew after removal

## 15 - Thermostat

- ☐ For main coolant circuit (radiator)
- ☐ Different versions. Refer to ⇒ Electronic parts catalogue
- ☐ Starts to open at approx. 87 °C
- ☐ Removing and installing  
⇒ ["2.4.2 Removing and installing thermostat for main coolant circuit \(radiator\)"](#) , page 176
- ☐ Fitting position ⇒ [Fig. "Installation position of thermostat"](#) , page 169

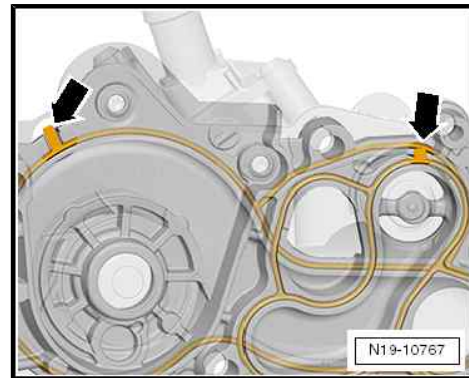


## 16 - Bolts

- ☐ Observe tightening sequence ➔ [“2.3 Removing and installing coolant pump”, page 169](#)
- ☐ 12 Nm

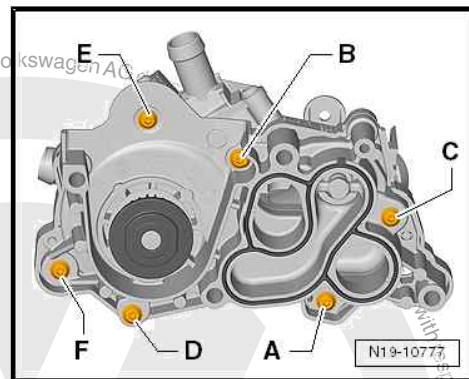
### Installation position of gaskets

- Ensure proper seating -arrows-.



### Tightening sequence for tightening thermostat housing to coolant pump

- Tighten securing bolts -A- through -F- in sequence given.





## 2.2 Assembly overview - thermostat

### 1 - Bolt

- ☐ Observe tightening sequence ⇒ [page 169](#)
- ☐ 7 Nm

### 2 - Thermostat cover

### 3 - Seal

- ☐ Renew after removal
- ☐ Ensure proper seating

### 4 - Thermostat

- ☐ For main coolant circuit (radiator)
- ☐ Starts to open at approx. 87 °C
- ☐ Removing and installing ⇒ [“2.4.2 Removing and installing thermostat for main coolant circuit \(radiator\)”, page 176](#)
- ☐ Note installation position ⇒ [Fig. “Installation position of thermostat”](#), [page 169](#)

### 5 - Bolt

- ☐ Observe tightening sequence ⇒ [Fig. “Tightening sequence for tightening thermostat housing to coolant pump”](#), [page 169](#)
- ☐ For installing thermostat housing to coolant pump
- ☐ 8 Nm

### 6 - Thermostat

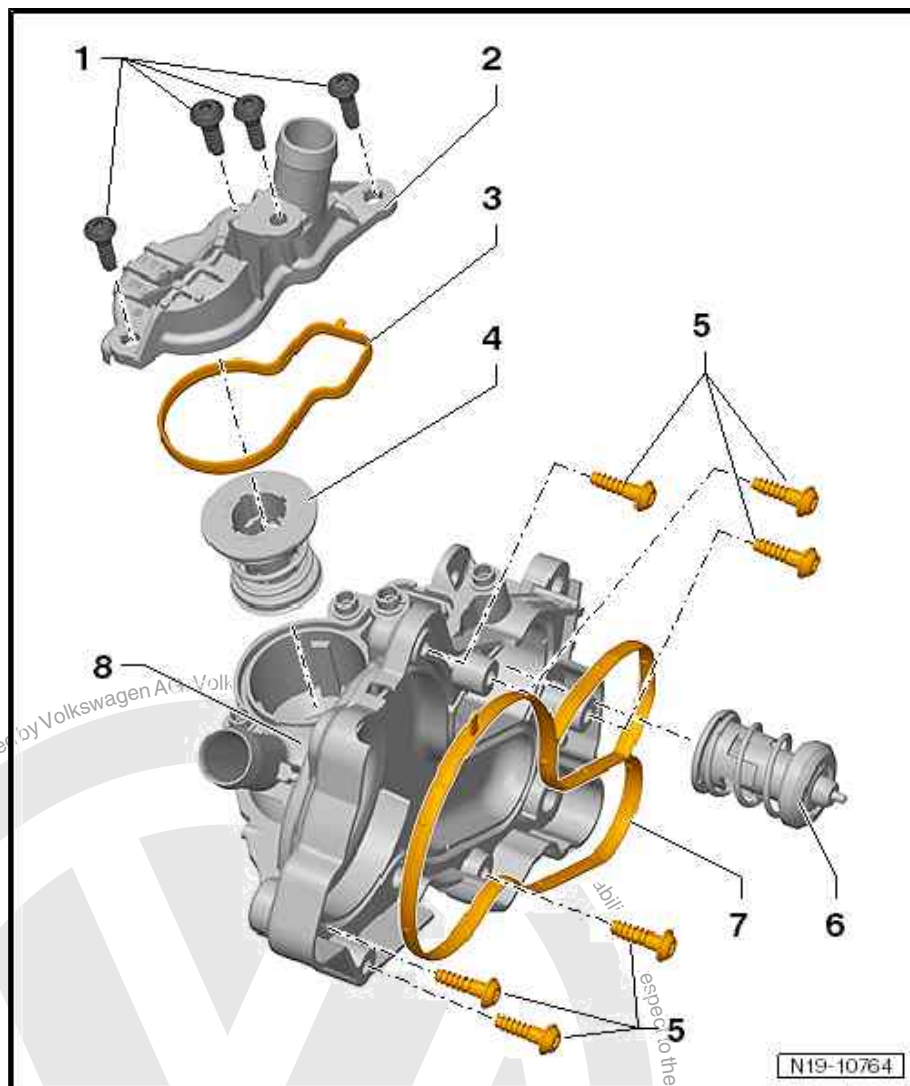
- ☐ For cylinder block coolant circuit
- ☐ Opening begins at approx. 97 °C
- ☐ Removing and installing ⇒ [“2.4.1 Removing and installing thermostat for cylinder block coolant circuit”, page 173](#)
- ☐ Note installation position ⇒ [Fig. “Installation position of thermostat”](#), [page 169](#)

### 7 - Seal

- ☐ Renew after removal
- ☐ Clean sealing surfaces.
- ☐ Check for proper seating ⇒ [Fig. “Installation position of gaskets”](#), [page 169](#)

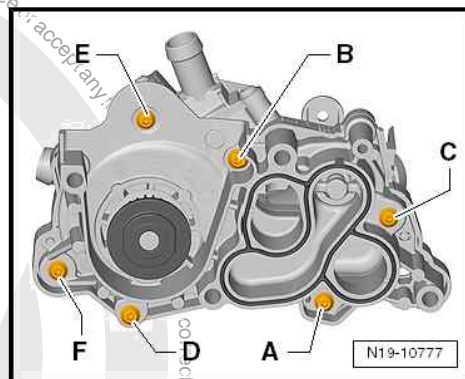
### 8 - Thermostat housing

- ☐ Removing and installing ⇒ [“2.4.1 Removing and installing thermostat for cylinder block coolant circuit”, page 173](#)



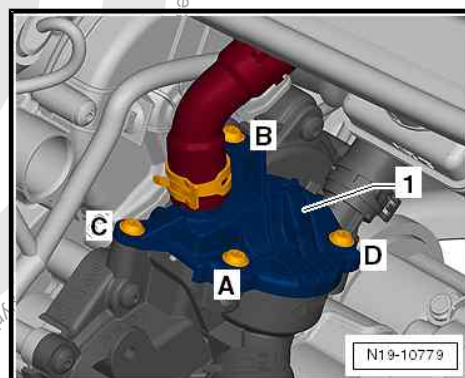
### Tightening sequence for tightening thermostat housing to coolant pump

- Tighten securing bolts -A- through -F- in sequence given.



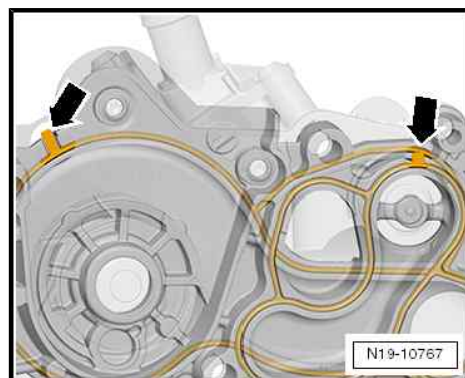
### Tightening sequence for tightening thermostat cover to thermostat housing

- Tighten securing bolts -A- through -D- in sequence given.



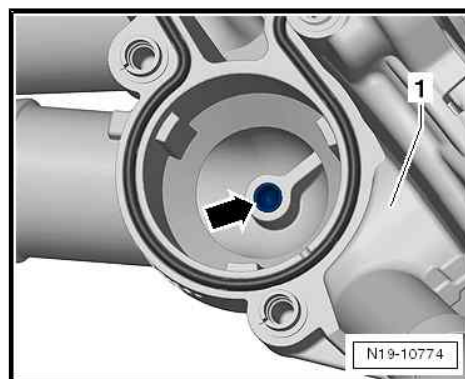
### Installation position of gaskets

- Ensure proper seating -arrows-.



### Installation position of thermostat

- Centring pin of thermostat must be fitted into guide -arrow-.

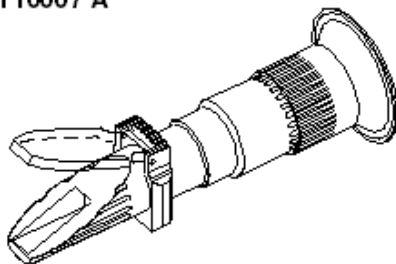


## 2.3 Removing and installing coolant pump

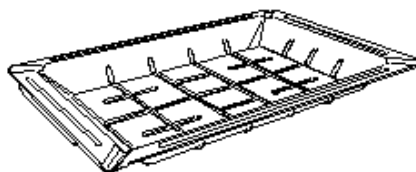


**Special tools and workshop equipment required**

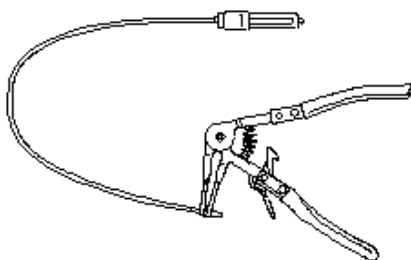
**T10007 A**



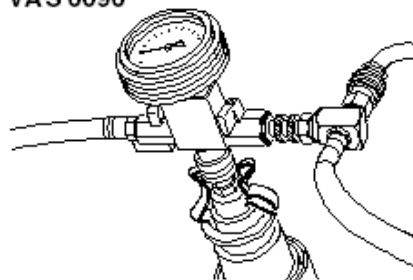
**VAS 6208**



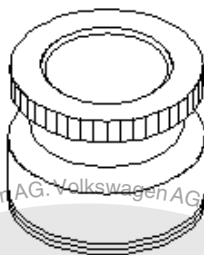
**VAS 6340**



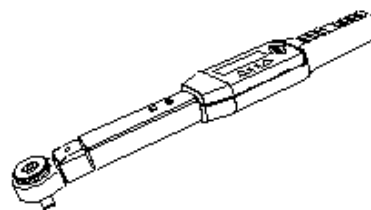
**VAS 6096**



**V.A.G 1274/8**



**VAS 6583**



W19-10047

- ◆ Refractometer - T10007 A-
- ◆ Drip tray for workshop hoist - VAS 6208-
- ◆ Hose clamp pliers - VAS 6340-
- ◆ Coolant system charge unit - VAS 6096-
- ◆ Adapter for cooling system tester - V.A.G 1274/8-
- ◆ Torque wrench - VAS 6583-
- ◆ Torque wrench - V.A.G 1410-

**V.A.G 1410**



W00-11174



## Removing

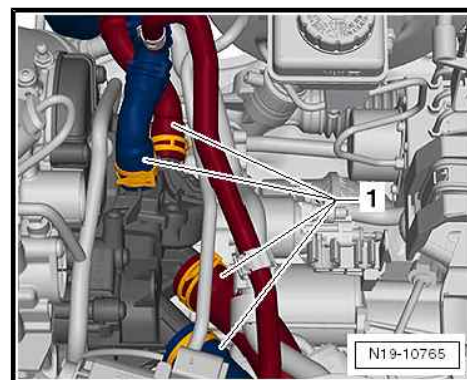
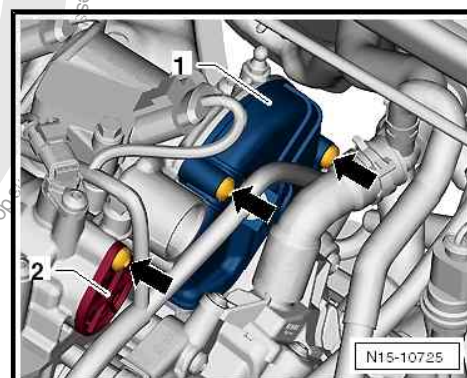
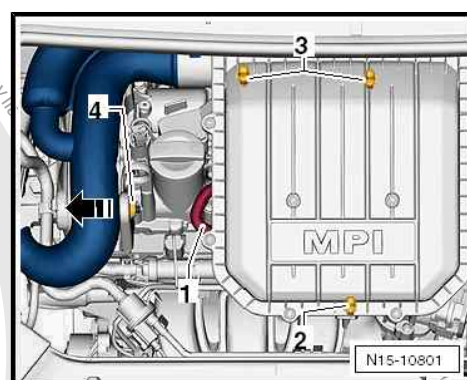
### **CAUTION**

On a warm engine, the cooling system is under high pressure.  
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 cloths and opening it carefully.

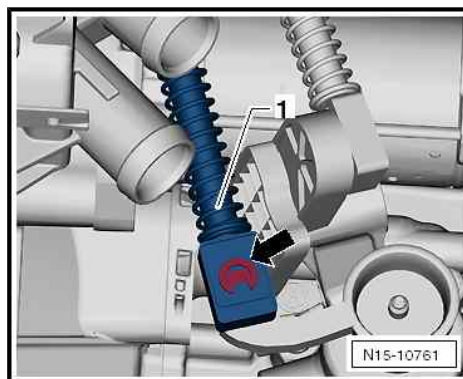
- Drain coolant  
⇒ "1.3 Draining and adding coolant", page 159
- Pull hose -1- off air filter housing.
- Pull air filter housing upwards off studs at positions -2- and -3-.
- Push air filter housing and intake connecting pipe in direction of arrow - out of mounting -4-.
- Remove air filter housing from engine compartment.
- Unscrew securing bolts -arrows- of cover -1-.
- Unclip line guide from cover.
- Take off cover -1-.
- Disconnect all coolant hoses -1- from coolant pump.







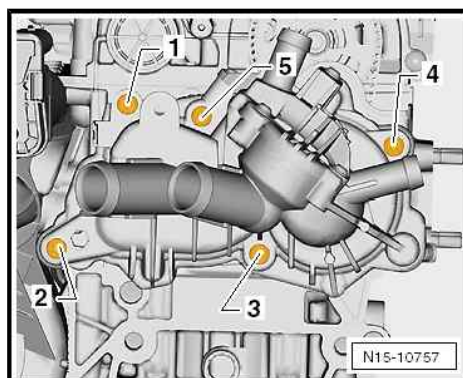
- Remove retaining ring -arrow- of gear selector cable.
- Remove gear selector cable -1- from selector lever and lay to side.



- Unscrew securing bolts -1- through -5- of coolant pump in sequence given.
- Remove coolant pump and thermostat housing.

**If the coolant pump is to be renewed:**

- Remove thermostat housing  
⇒ [“2.4.1 Removing and installing thermostat for cylinder block coolant circuit”, page 173](#) .



**Installing**

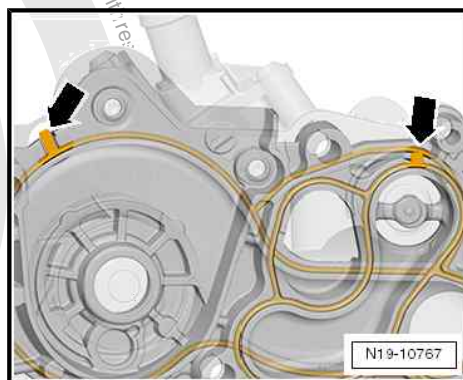
Install in reverse order. During this procedure, observe the following:

- The housing gasket -arrow- must always be renewed.
- If coolant pump has been renewed, install thermostat housing  
⇒ [“2.4.1 Removing and installing thermostat for cylinder block coolant circuit”, page 173](#) .
- Ensure proper seating of gaskets -arrows-.
- Moisten gasket with coolant.



**Note**

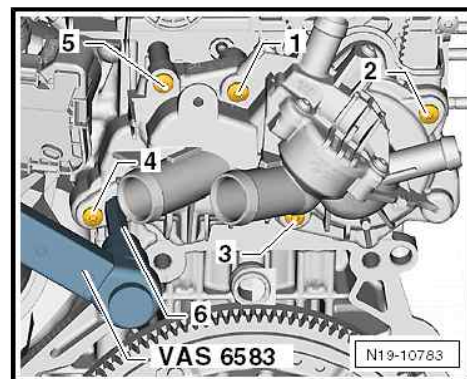
- ♦ *Always adhere to the sequence of work steps given below when installing the coolant pump.*
- ♦ *This ensures that the toothed belt is correctly tensioned.*
- ♦ *The following work steps must be carried out with the aid of a 2nd mechanic.*
- Always renew the toothed belts in conjunction with the fitting of a new coolant pump.
- Set cylinder no. 1 to “TDC” position  
⇒ [“2.5 Checking valve timing”, page 95](#) .
- Fit toothed belt centrally onto camshaft pulley and coolant pump toothed belt pulley.
- Mount coolant pump on cylinder head with securing bolts.
- First tighten securing bolts in sequence -1- to -5- to 10 Nm.



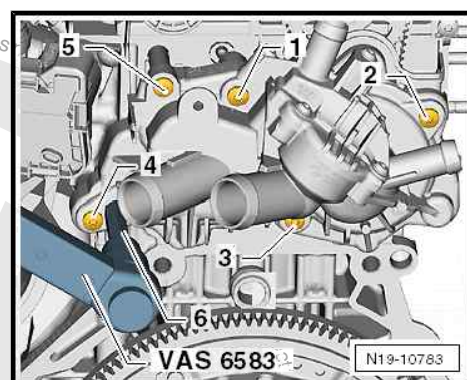




- Then, loosen all bolts by 360°.
- Using hexagon on coolant pump, preload coolant pump in clockwise direction to 30 Nm using 10 mm hexagon socket, item -6-, extension and torque wrench - VAS 6583- .



- For ease of use, fit torque wrench - VAS 6583- on vertically.
- Constantly keep torque wrench - VAS 6583- pushed to that torque. The torque wrench may not be supported by the other hand when doing this.
- To ensure the V-belt is not over tensioned, do not “over tension” the torque wrench - VAS 6583- .
- Have a second mechanic tighten securing bolts -2-, -1- and -5- to specified torque, while holding the torque wrench - VAS 6583- to the specified torque.
- Tighten securing bolts -2-, -1- and -5- to 10 Nm
- By tightening securing bolts -2-, -1- and -5- to specified torque, the desired belt tension is reached.
- After securing bolts have been tightened initially, torque wrench - VAS 6583- can be removed.
- Tighten securing bolts, in sequence, -3-, -4-, -5-, -1- and -2- to 12 Nm.
- Install gearbox selector mechanism ⇒ Rep. gr. 34 ; Selector mechanism .
- Add coolant ⇒ [“1.3 Draining and adding coolant”, page 159](#) .
- Install air filter housing ⇒ [“5.2 Removing and installing air filter housing”, page 231](#) .



### Specified torques

Component	Specified torque
Thermostat housing to coolant pump	8 Nm
Coolant pump	12 Nm
Toothed belt guard	8 Nm

## 2.4 Removing and installing thermostat

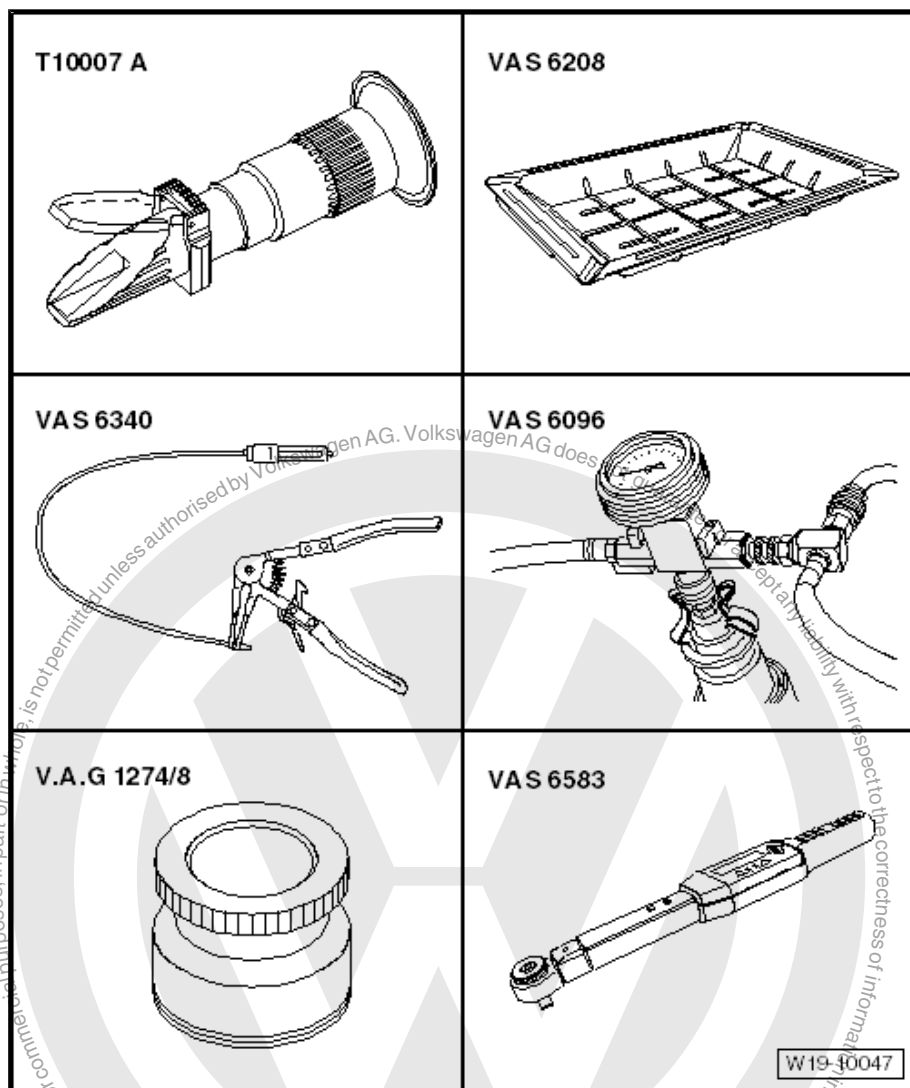
⇒ [“2.4.1 Removing and installing thermostat for cylinder block coolant circuit”, page 173](#)

⇒ [“2.4.2 Removing and installing thermostat for main coolant circuit \(radiator\)”, page 176](#)

### 2.4.1 Removing and installing thermostat for cylinder block coolant circuit



**Special tools and workshop equipment required**



- ◆ Refractometer - T10007 A-
- ◆ Drip tray for workshop hoist - VAS 6208-
- ◆ Hose clamp pliers - VAS 6340-
- ◆ Coolant system charge unit - VAS 6096-
- ◆ Adapter for cooling system tester - V.A.G 1274/8-
- ◆ Torque wrench - VAS 6583-
- ◆ Torque wrench - V.A.G 1410-





## Removing

- Drain coolant  
⇒ [“1.3 Draining and adding coolant”, page 159](#) .
- Remove coolant pump -1-  
⇒ [“2.3 Removing and installing coolant pump”, page 169](#) .
- Unscrew bolts -arrows-.
- Remove coolant pump -1- from thermostat housing -2-.
- Remove thermostat -3-.

## Installing

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

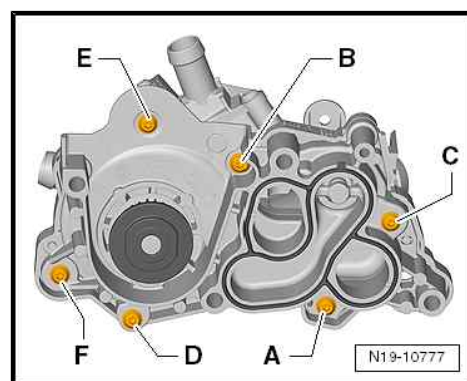
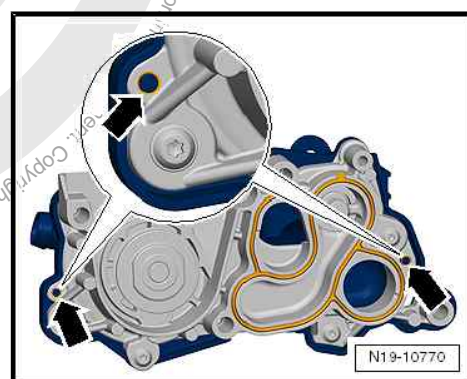
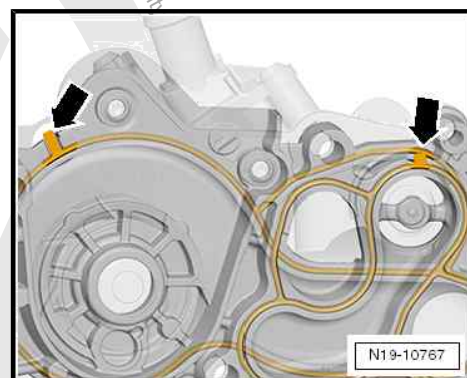
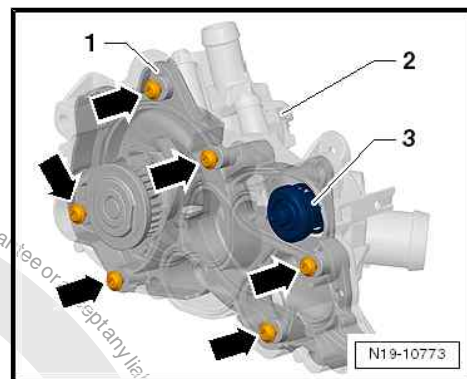
- Fit thermostat to coolant pump.
- Centring pin of thermostat must be fitted into guide on coolant pump.
- Ensure proper seating of gaskets -arrows-.
- Moisten gasket with coolant.
- Fit thermostat housing to coolant pump.
- Ensure proper seating of thermostat studs in guides -arrows- of coolant pump.



### Note

*If the guide pins have broken off, it is necessary to renew the coolant pump.*

- Thread and tighten securing bolts -A- through -F- in sequence given.
- Install coolant pump -1-  
⇒ [“2.3 Removing and installing coolant pump”, page 169](#) .
- Install selector mechanism to gearbox: ⇒ Rep. gr. 34 ; Selector mechanism; Overview - selector mechanism .
- Add coolant ⇒ [“1.3 Draining and adding coolant”, page 159](#) .
- Install air filter housing  
⇒ [“5.2 Removing and installing air filter housing”, page 231](#) .



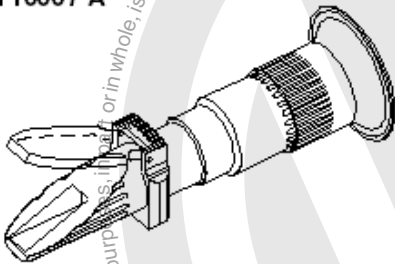
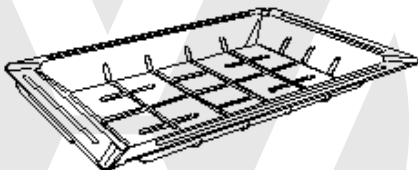
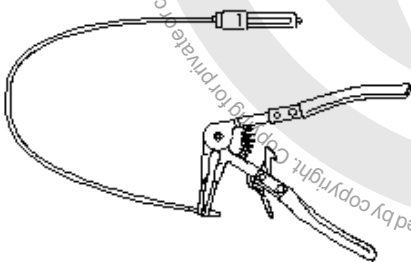
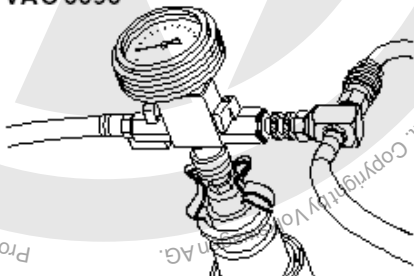
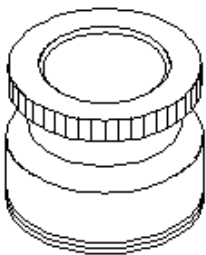




### Specified torques

Component	Specified torque
Thermostat housing to coolant pump	8 Nm
Coolant pump	12 Nm, observing tightening sequence ⇒ <a href="#">"2.3 Removing and installing coolant pump", page 169</a>

## 2.4.2 Removing and installing thermostat for main coolant circuit (radiator)

### Special tools and workshop equipment required

<b>T10007 A</b> 	<b>VAS 6208</b> 
<b>VAS 6340</b> 	<b>VAS 6096</b> 
<b>V.A.G 1274/8</b> 	
	<b>T10508</b> 

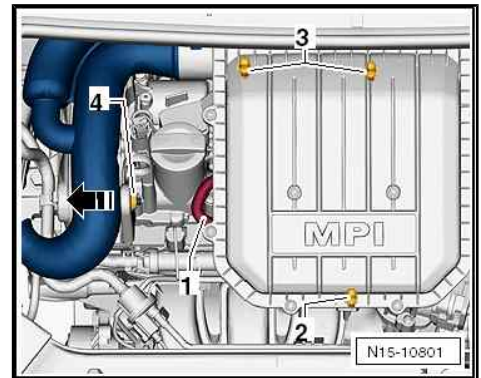




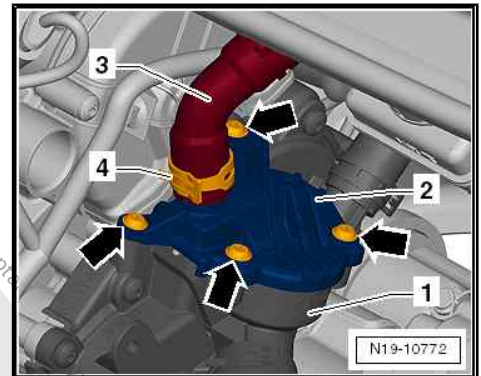
- ◆ Refractometer - T10007 A-
- ◆ Drip tray for workshop hoist - VAS 6208-
- ◆ Hose clamp pliers - VAS 6340-
- ◆ Coolant system charge unit - VAS 6096-
- ◆ Adapter for cooling system tester - V.A.G 1274/8-
- ◆ Special wrench - T10508-

### Removing

- Drain coolant  
⇒ ["1.3 Draining and adding coolant", page 159](#) .
- Pull hose -1- off air filter housing.
- Pull air filter housing upwards off studs at positions -2- and -3-.
- Push air filter housing and intake connecting pipe in -direction of arrow- out of mounting -4-.
- Remove air filter housing from engine compartment.



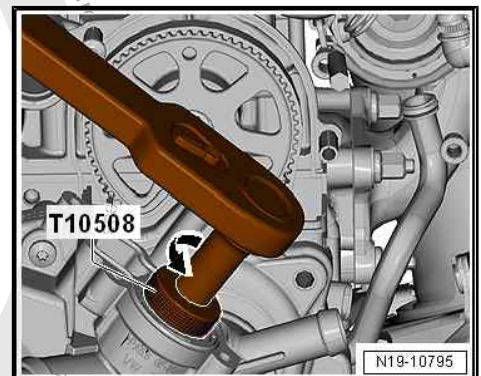
- Loosen clamp -4- and disconnect hose -3-.
- Unscrew bolts -arrows-.
- Remove cover -2-.



- Remove thermostat using special wrench - T10508- .
- Slightly push down special wrench - T10508- and turn it in direction of arrow- while doing so.

### Installing

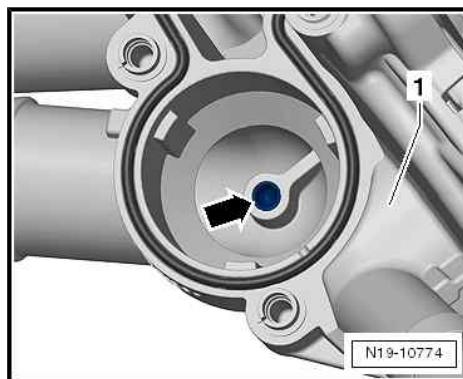
Install in the reverse order of removal, observing the following:



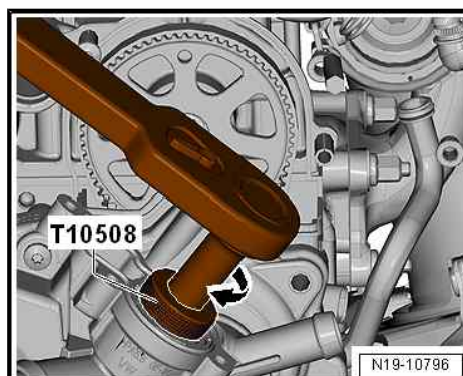




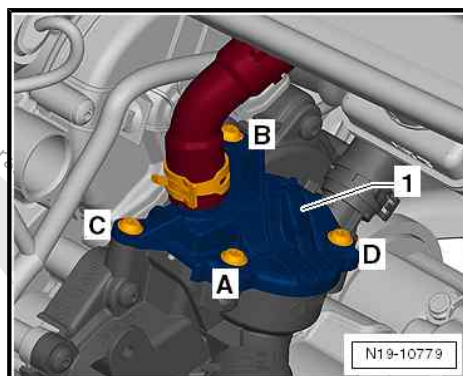
- Centring pin of thermostat must accurately be fitted into guide -arrow- on thermostat housing -1-.



- Install thermostat using special wrench - T10508- .
- Slightly push down special wrench - T10508- and turn it to stop in -direction of arrow- while doing so.
- Ensure proper seating of gasket.
- Moisten gasket with coolant.



- Fit cover -1- on thermostat housing.
- Thread and tighten securing bolts -A- through -D- in sequence given.
- Add coolant ⇒ [“1.3 Draining and adding coolant”, page 159](#) .
- Install air filter housing  
⇒ [“5.2 Removing and installing air filter housing”, page 231](#) .



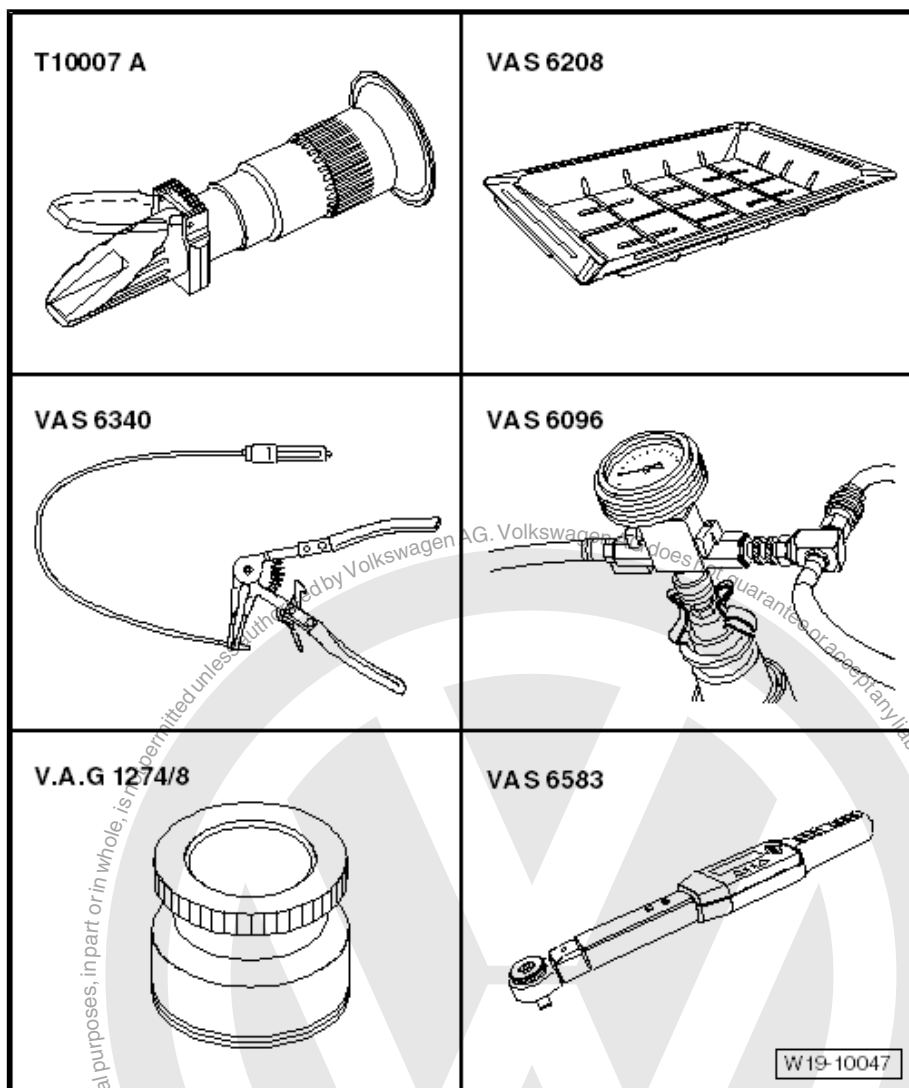
#### Specified torques

Component	Specified torque
Cover on thermostat housing	7 Nm

## 2.5 Removing and installing toothed belt for coolant pump



**Special tools and workshop equipment required**



- ◆ Refractometer - T10007 A-
- ◆ Drip tray for workshop hoist - VAS 6208-
- ◆ Hose clamp pliers - VAS 6340-
- ◆ Coolant system charge unit - VAS 6096-
- ◆ Adapter for cooling system tester - V.A.G 1274/8-
- ◆ Torque wrench - VAS 6583-
- ◆ Torque wrench - V.A.G 1410-



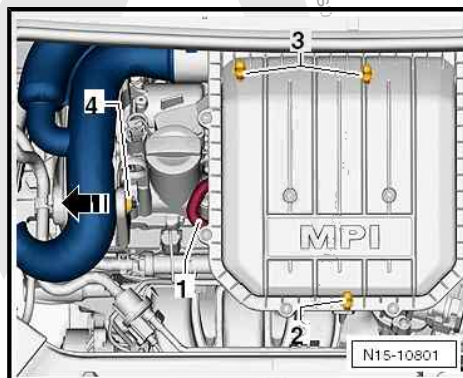


## Note

*The toothed belt must be renewed if it has been removed.*

## Removing

- Drain coolant  
⇒ [“1.3 Draining and adding coolant”, page 159](#) .
- Pull hose -1- off air filter housing.
- Pull air filter housing upwards off studs at positions -2- and -3-.
- Push air filter housing and intake connecting pipe in -direction of arrow- out of mounting -4-.
- Remove air filter housing from engine compartment.

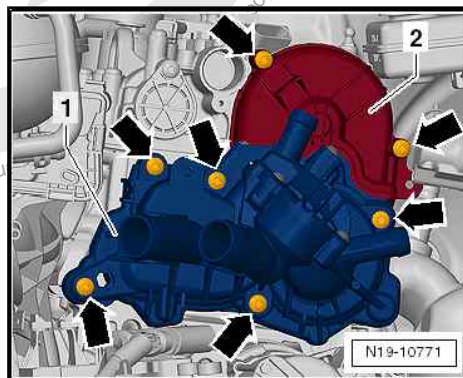


- Remove coolant pump -1- and toothed belt guard -2-  
⇒ [“2.3 Removing and installing coolant pump”, page 169](#) .
- Remove toothed belt -1- from coolant pump toothed belt pulley.

## Installing

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

- Fit toothed belt centrally onto camshaft pulley and coolant pump toothed belt pulley.
- Install coolant pump -1-  
⇒ [“2.3 Removing and installing coolant pump”, page 169](#) .
- Add coolant ⇒ [“1.3 Draining and adding coolant”, page 159](#) .
- Install air filter housing  
⇒ [“5.2 Removing and installing air filter housing”, page 231](#) .



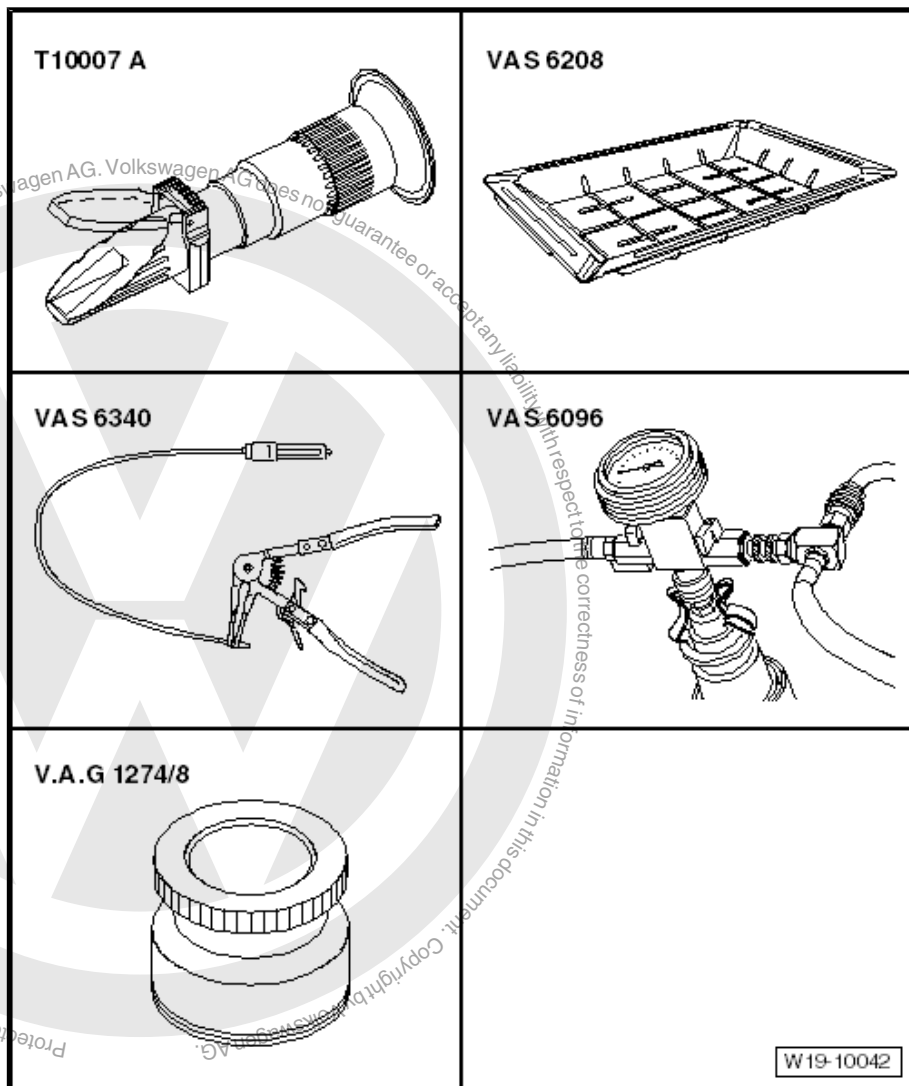
## Specified torques

Component	Specified torque
Coolant pump	12 Nm
Toothed belt guard	8 Nm

## 2.6 Removing and installing coolant temperature sender - G62-



## Special tools and workshop equipment required



- ◆ Refractometer - T10007 A-
- ◆ Drip tray for workshop hoist - VAS 6208-
- ◆ Hose clamp pliers - VAS 6340-
- ◆ Coolant system charge unit - VAS 6096-
- ◆ Adapter for cooling system tester - V.A.G 1274/8-

## Removing



### Note

*Always observe*

*⇒ "1.5 Safety precautions when working on the cooling system",  
page 4 .*

Fitting location: ⇒ [Item 18 \(page 62\)](#)

- Engine cold.



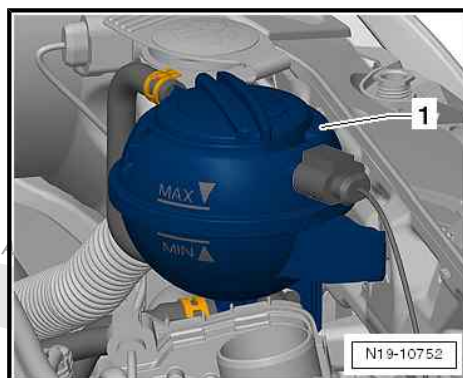
### ⚠ CAUTION

On a warm engine, the cooling system is under high pressure.  
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 cloths and opening it carefully.

- Briefly open filler cap -1- of coolant expansion tank in order to relieve remaining pressure from cooling system.



- Unlock and disconnect connector -2- from coolant temperature sender - G62- -1-.
- Place a cloth under connecting piece to absorb escaping coolant.
- Unscrew bolt -arrow-.

### Installing

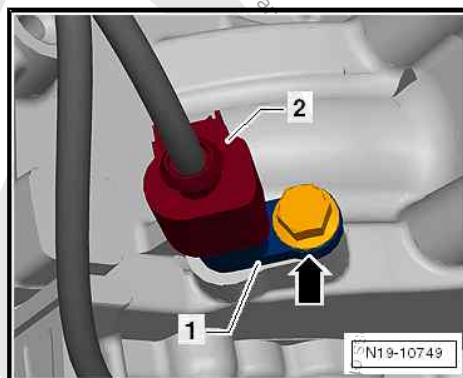
Install in reverse order. During this procedure, observe the following:



### Note

*Insert new coolant temperature sender - G62- immediately into cylinder head in order to avoid loss of coolant.*

- Check coolant level  
⇒ [“1.3 Draining and adding coolant”, page 159](#).



### Specified torques

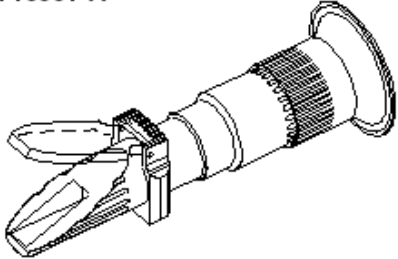
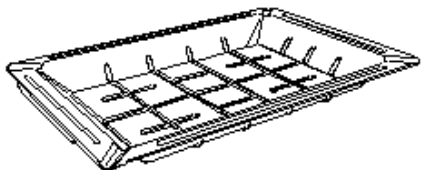
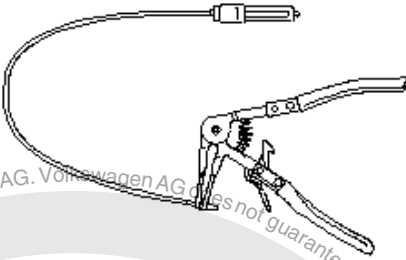
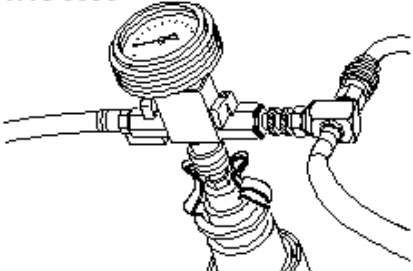
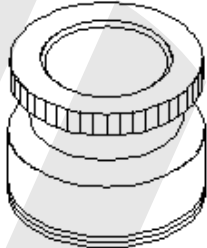
Component	Specified torque
Coolant temperature sender - G62-	8 Nm

## 2.7 Removing and installing radiator fan thermal switch - F18-





## Special tools and workshop equipment required

<p><b>T10007 A</b></p> 	<p><b>VAS 6208</b></p> 
<p><b>VAS 6340</b></p> 	<p><b>VAS 6096</b></p> 
<p><b>V.A.G 1274/8</b></p> 	<p>W19-10042</p>

- ◆ Refractometer - T10007 A-
- ◆ Drip tray for workshop hoist - VAS 6208-
- ◆ Hose clamp pliers - VAS 6340-
- ◆ Coolant system charge unit - VAS 6096-
- ◆ Adapter for cooling system tester - V.A.G 1274/8-

## Removing

Fitting location: ➔ [Item 12 \(page 186\)](#)



### CAUTION

On a warm engine, the cooling system is under high pressure. 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 cloths and opening it carefully.

- Drain coolant  
➔ ["1.3 Draining and adding coolant", page 159](#) .



up! 2012 ➤ , up! 2017 ➤

3-cyl. injection engine (1.0 l, natural gas 4V, EA 211) - Edition 06.2019

- Release and pull off connector -1- on radiator fan thermal switch - F18- -2-.
- Unscrew radiator fan thermal switch - F18- -2-.

### Installing

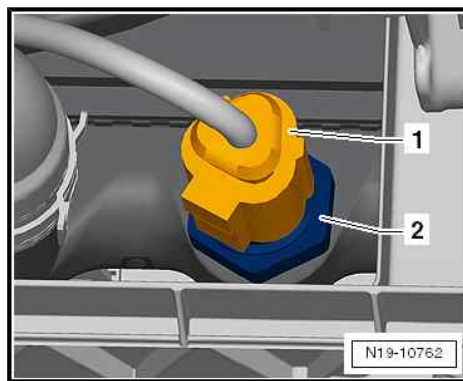
Install in reverse order. During this procedure, observe the following:



### Note

*Fit gasket.*

- Add coolant ➔ [“1.3 Draining and adding coolant”, page 159](#) .



### Specified torque:

Component	Specified torque
Thermal switch to radiator	50 Nm



### 3 Radiator, radiator fan

⇒ [“3.1 Assembly overview - radiator, radiator fan”, page 185](#)

⇒ [“3.2 Removing and installing radiator”, page 187](#)

⇒ [“3.3 Removing and installing radiator cowl with radiator fan”, page 190](#)

⇒ [“3.4 Removing and installing radiator fan V7”, page 192](#)

#### 3.1 Assembly overview - radiator, radiator fan

##### 1 - Radiator/cooler

- ☐ Removing and installing  
⇒ [“3.2 Removing and installing radiator”, page 187](#)
- ☐ Connection diagram for coolant hoses  
⇒ [“1.1 Connection diagram - coolant hoses”, page 156](#)
- ☐ After renewing, renew entire coolant  
⇒ [“1.3 Draining and adding coolant”, page 159](#)

##### 2 - Cap

- ☐ Checking  
⇒ [“1.2 Checking cooling system for leaks”, page 156](#)
- ☐ Check using cooling system tester - V.A.G 1274 B- and adapter for cooling system tester - V.A.G 1274/9-
- ☐ Test pressure: 1.4 to 1.6 bar

##### 3 - Expansion tank

- ☐ Check for leaks  
⇒ [“1.2 Checking cooling system for leaks”, page 156](#)
- ☐ Check cooling system for leaks using cooling system tester - V.A.G 1274 B- and adapter for cooling system tester - V.A.G 1274/8-

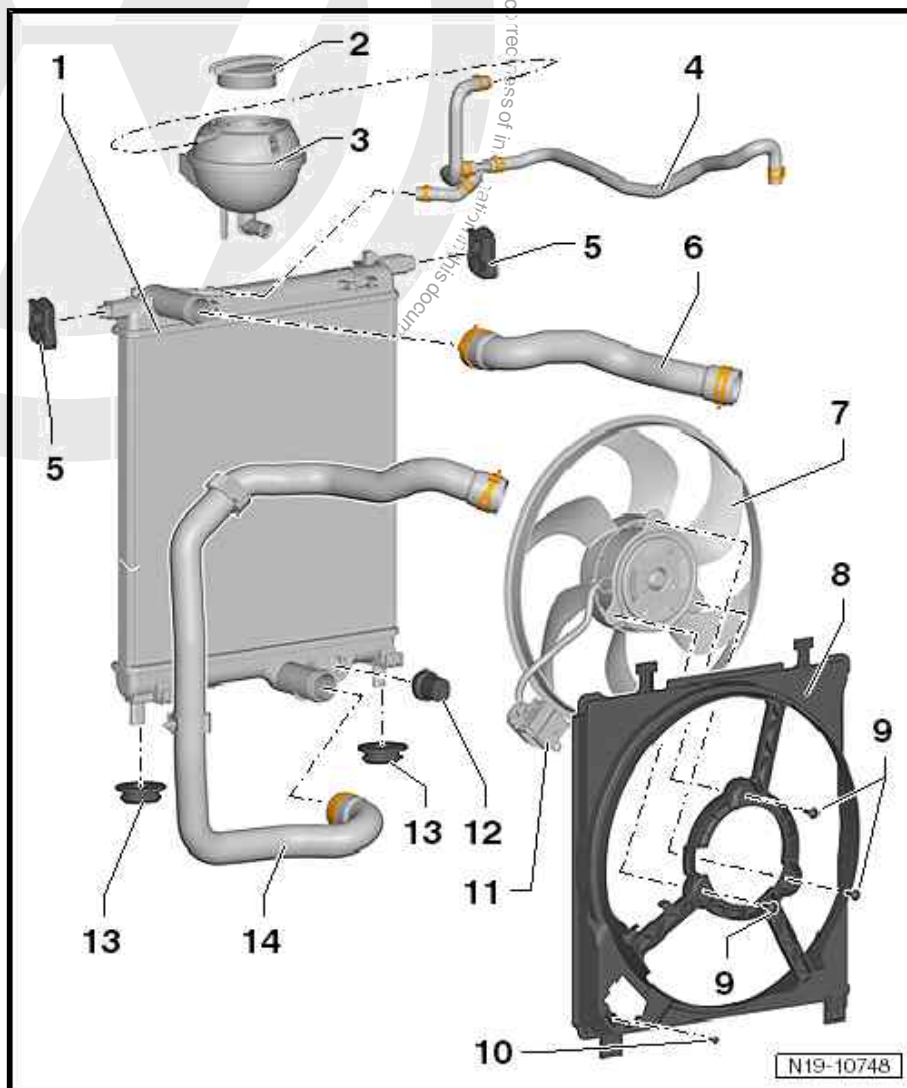
- ☐ Connection diagram for coolant hoses ⇒ [“1.1 Connection diagram - coolant hoses”, page 156](#)

##### 4 - Coolant hose

- ☐ Connection diagram for coolant hoses ⇒ [“1.1 Connection diagram - coolant hoses”, page 156](#)
- ☐ Check for firm seating

##### 5 - Radiator mounting

- ☐ For radiator
- ☐ Observe installation position
- ☐ Note locking mechanism ⇒ [Fig. ““Locking mechanism of radiator mounting””, page 186](#) .





## 6 - Upper coolant hose

- ☐ Connection diagram for coolant hoses ⇒ [“1.1 Connection diagram - coolant hoses”, page 156](#)
- ☐ Check for firm seating

## 7 - Radiator fan

- ☐ Removing and installing ⇒ [“3.4 Removing and installing radiator fan V7”, page 192](#)

## 8 - Cowling

- ☐ Removing and installing ⇒ [“3.3 Removing and installing radiator cowl with radiator fan”, page 190](#)

## 9 - Bolt

- ☐ Installation radiator fan on cowling
- ☐ 10 Nm

## 10 - Bolt

- ☐ Coupling point connector
- ☐ 3 Nm

## 11 - Connector

## 12 - Radiator fan thermal switch - F18-

- ☐ Removing and installing ⇒ [“2.7 Removing and installing radiator fan thermal switch F18”, page 182](#)
- ☐ For radiator fan
- ☐ Only vehicles with no air conditioning system

## Switching temperatures

- ☐ Stage 1 on: 92 ... 97°C; off: 84 ... 91°C
- ☐ Stage 2 on: 99 ... 105 °C; off: 91 ... 98 °C
- ☐ 50 Nm

## 13 - Radiator mounting

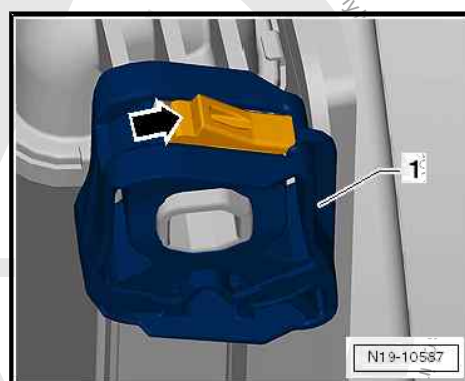
- ☐ Ensure proper seating

## 14 - Lower coolant hose

- ☐ Connection diagram for coolant hoses ⇒ [“1.1 Connection diagram - coolant hoses”, page 156](#)
- ☐ Check for firm seating

## Locking mechanism of radiator mounting

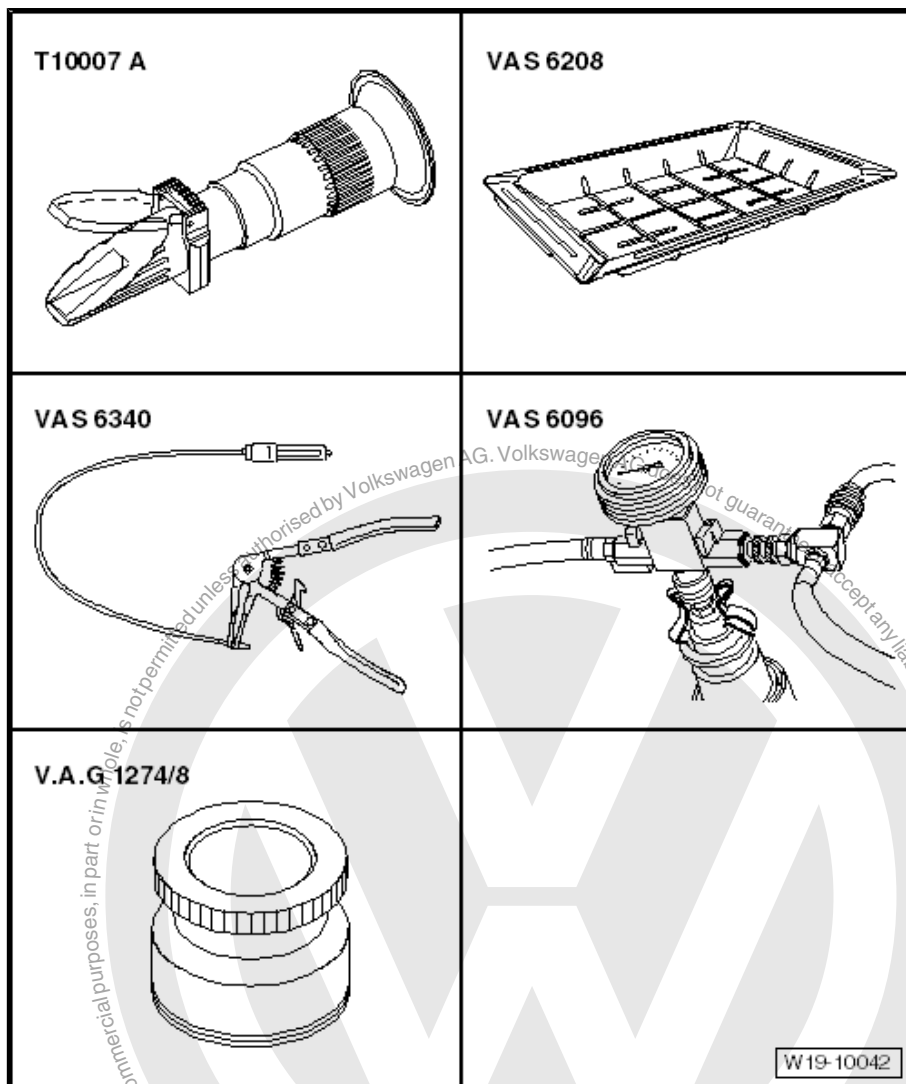
- Release locking lug -arrow- in order to loosen radiator mounting -1- from lock carrier.





## 3.2 Removing and installing radiator

Special tools and workshop equipment required



- ◆ Refractometer - T10007 A-
- ◆ Drip tray for workshop hoist - VAS 6208-
- ◆ Hose clamp pliers - VAS 6340-
- ◆ Coolant system charge unit - VAS 6096-
- ◆ Adapter for cooling system tester - V.A.G 1274/8-

### Removing

- Install front bumper ⇒ General body repairs, exterior; Rep. gr. 63 ; Front bumper .





### ⚠ CAUTION

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

Skin and other parts of the body may be scalded.

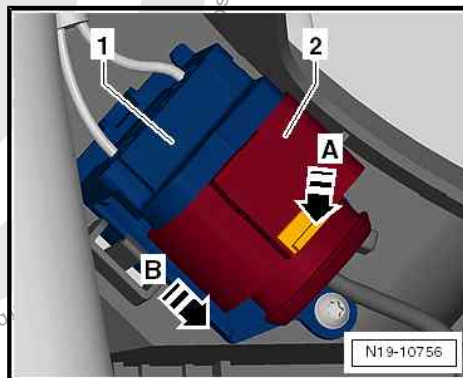
- Wear protective gloves.
- Wear protective goggles.
- Reduce excess pressure by covering cap of coolant expansion tank with cloths and opening it carefully.

- Drain coolant  
⇒ ["1.3 Draining and adding coolant", page 159](#).

### ⚠ CAUTION

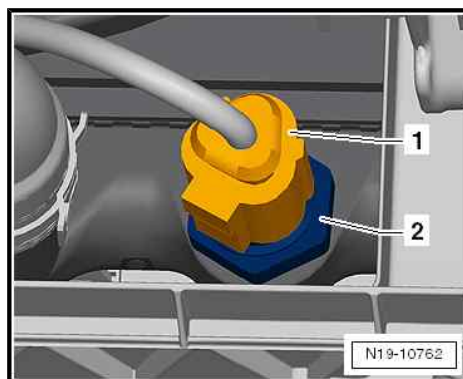
Danger of injury; the radiator fans can run at any time.

- Separate electrical connectors.
- Disconnect connector -2- from wiring harness -1- of radiator fan -2-.
- To do this, unlock locking tab -arrow A-.
- Disconnect connector -2- in -direction of arrow B-.



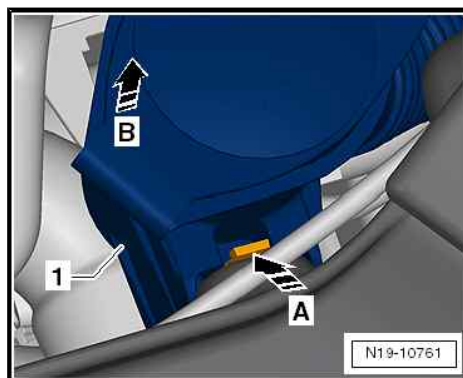
#### Vehicles with radiator fan thermal switch - F18-

- Unlock and disconnect connector -1- from radiator fan thermal switch - F18-.



#### Continued for all vehicles

- Unlock locking tab -1- on filler neck of washer fluid reservoir in -direction of arrow A-.
- Pull filler neck -1- of washer fluid reservoir off in -direction of arrow B-.





- Loosen clamps -arrows- and disconnect coolant hoses -1- at top of radiator.
- Pull connectors off thermal switch and radiator fan.
- Remove front left headlights ⇒ Electrical system; Rep. gr. 94 ; Headlights; Removing and installing headlights

#### Vehicles with air conditioning system



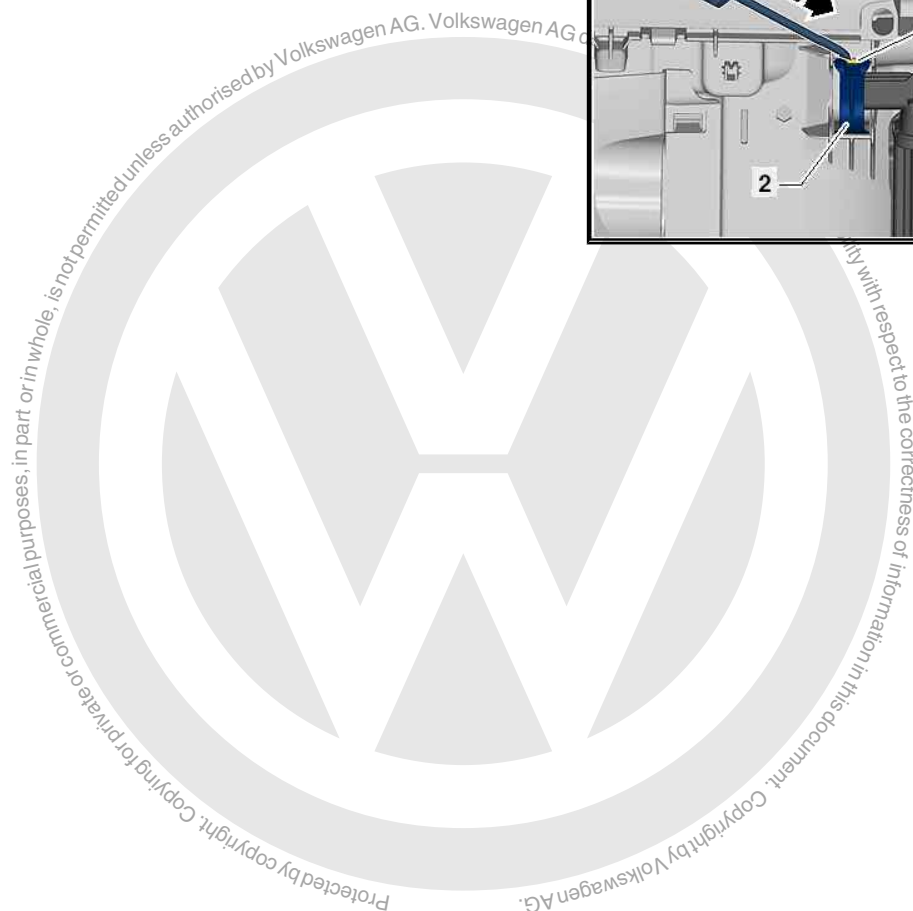
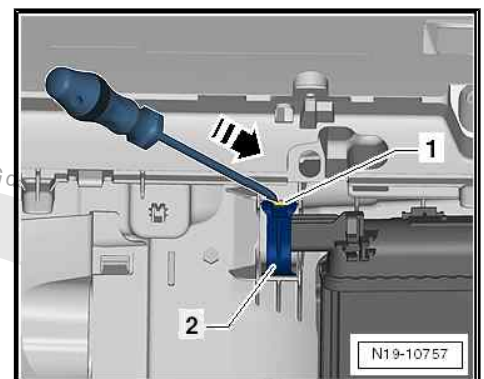
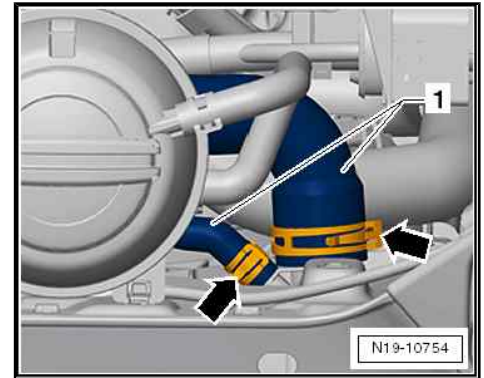
#### Note

*To prevent damage to condenser or to refrigerant lines and hoses, ensure that lines and hoses are not stretched, kinked or bent.*

- Remove condenser ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit; Removing and installing condenser .

#### Continued for all vehicles

- Unlock retainers -2- on left and right side by pushing locking tab -1- in -direction of arrow- using a screwdriver.





- Tilt radiator -1- in -direction of arrow A-.
- Pull right side of radiator -1- upwards in -direction of arrow B-.
- Tilt radiator -1- further forwards in -direction of arrow A- to release it from lock carrier.
- Pull radiator -1- out of bottom mountings in -direction of arrow C-.

**If the radiator is to be renewed:**

- Remove radiator cowl with radiator fan  
⇒ [“3.3 Removing and installing radiator cowl with radiator fan”](#),  
[page 190](#) .
- Remove radiator fan thermal switch - F18- .

**Installing**

Install in reverse order. During this procedure, observe the following:

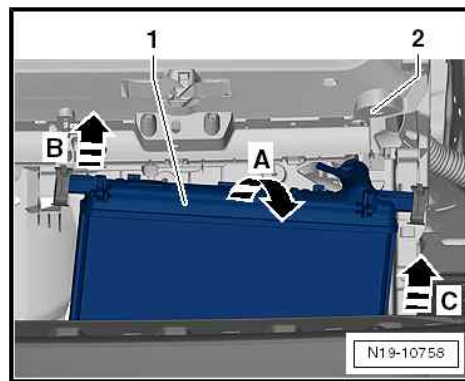
**Vehicles with air conditioning system**



**Note**

*To prevent damage to condenser or to refrigerant lines and hoses, ensure that lines and hoses are not stretched, kinked or bent.*

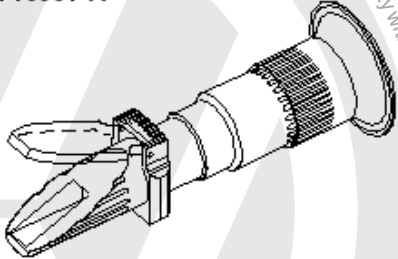
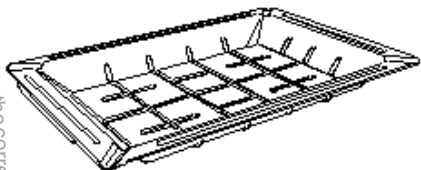
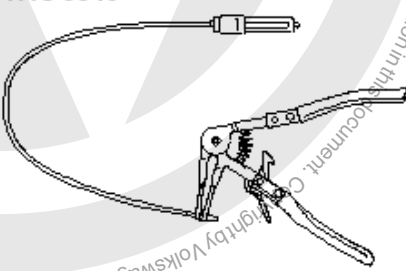
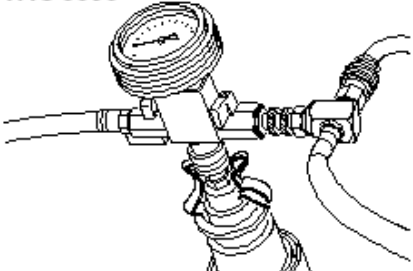
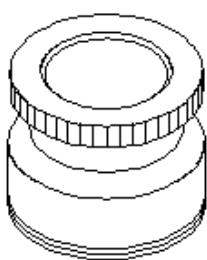
- Install condenser ⇒ Heating, air conditioning; Rep. gr. 87 ;  
Refrigerant circuit; Removing and installing condenser.
- Add coolant ⇒ [“1.3 Draining and adding coolant”](#), [page 159](#).
- Observe electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- Install front bumper ⇒ General body repairs, exterior; Rep. gr. 63 ; Front bumper .



### 3.3 Removing and installing radiator cowl with radiator fan



# Special tools and workshop equipment required

<p><b>T10007 A</b></p> 	<p><b>VAS 6208</b></p> 
<p><b>VAS 6340</b></p> 	<p><b>VAS 6096</b></p> 
<p><b>V.A.G 1274/8</b></p> 	<p>W19-10042</p>

- ◆ Refractometer - T10007 A-
- ◆ Drip tray for workshop hoist - VAS 6208-
- ◆ Hose clamp pliers - VAS 6340-
- ◆ Coolant system charge unit - VAS 6096-
- ◆ Adapter for cooling system tester - V.A.G 1274/8-

## **CAUTION**

**Danger of injury; the radiator fans can run at any time.**  
– Separate electrical connectors.



## Removing

### ⚠ CAUTION

On a warm engine, the cooling system is under high pressure. 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 cloths and opening it carefully.

- Drain coolant  
⇒ [“1.3 Draining and adding coolant”, page 159](#) .
- Install front bumper ⇒ General body repairs, exterior; Rep. gr. 63 ; Front bumper .
- Removing radiator  
⇒ [“3.2 Removing and installing radiator”, page 187](#) .
- Push locking tab in -direction of arrow A- in order to unlock radiator cowl -1-.
- Pull radiator cowl -1- in -direction of arrow B- out of retainer -2- on radiator.
- Tilt radiator cowl -1- in -direction of arrow C- and pull it out of bottom mountings.
- Remove radiator cowl -1-.

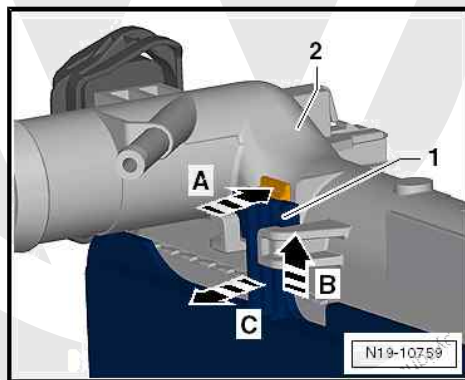
If the radiator cowl is to be renewed:

- Removing radiator fan  
⇒ [“3.3 Removing and installing radiator cowl with radiator fan”, page 190](#) .

## Installing

Install in reverse order. During this procedure, observe the following:

- Add coolant ⇒ [“1.3 Draining and adding coolant”, page 159](#) .
- Observe electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- Install front bumper ⇒ General body repairs, exterior; Rep. gr. 63 ; Front bumper .

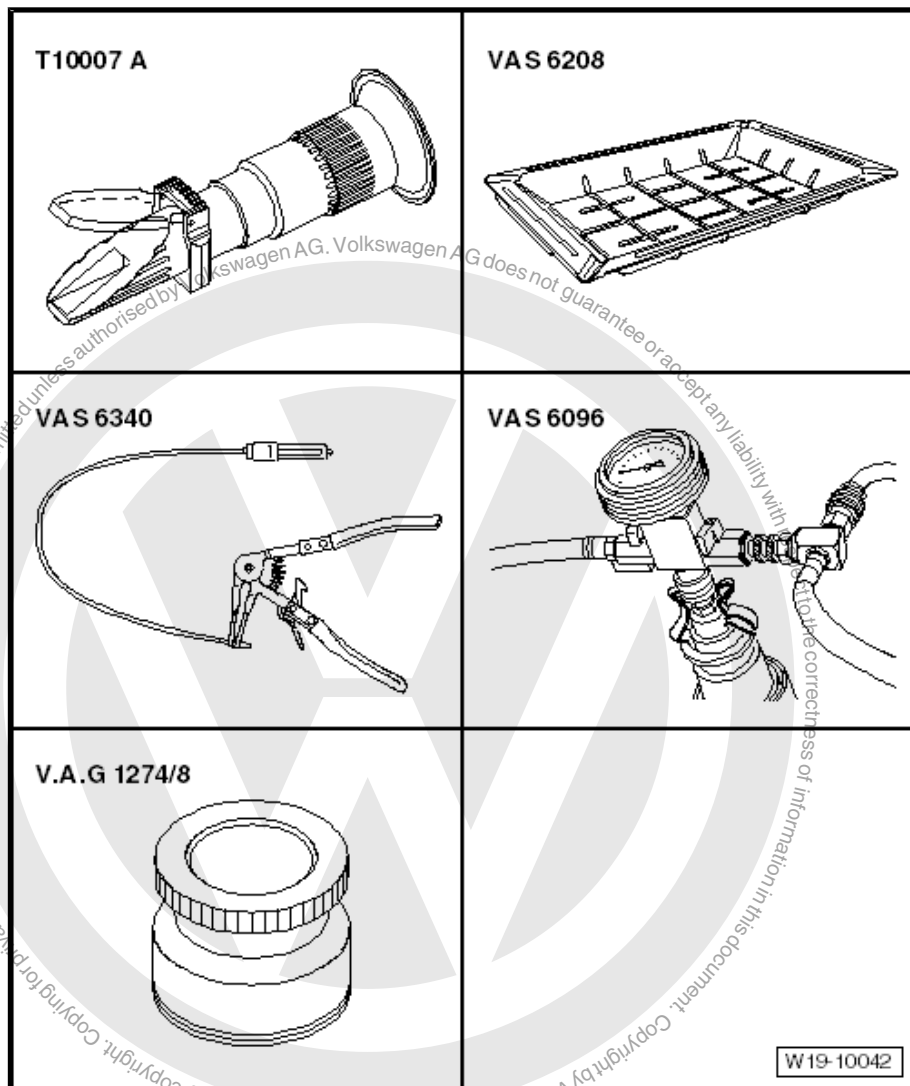


## 3.4 Removing and installing radiator fan - V7-





# Special tools and workshop equipment required



- ◆ Refractometer - T10007 A-
- ◆ Drip tray for workshop hoist - VAS 6208-
- ◆ Hose clamp pliers - VAS 6340-
- ◆ Coolant system charge unit - VAS 6096-
- ◆ Adapter for cooling system tester - V.A.G 1274/8-

## **CAUTION**

**Danger of injury; the radiator fans can run at any time.**  
– Separate electrical connectors.



## Removing

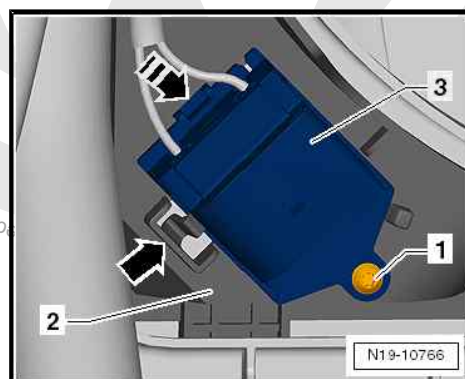
### CAUTION

On a warm engine, the cooling system is under high pressure. 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 cloths and opening it carefully.

- Drain coolant  
⇒ [“1.3 Draining and adding coolant”, page 159](#) .
- Install front bumper ⇒ General body repairs, exterior; Rep. gr. 63 ; Front bumper .
- Removing radiator  
⇒ [“3.2 Removing and installing radiator”, page 187](#) .
- Remove radiator cowl with radiator fan  
⇒ [“3.3 Removing and installing radiator cowl with radiator fan”, page 190](#) .
- Unscrew bolt -1- from radiator cowl -2-.
- Press locking tab in -direction of arrow- to unlock wiring harness -3-.
- Push wiring harness -3- in -direction of arrow- and remove.

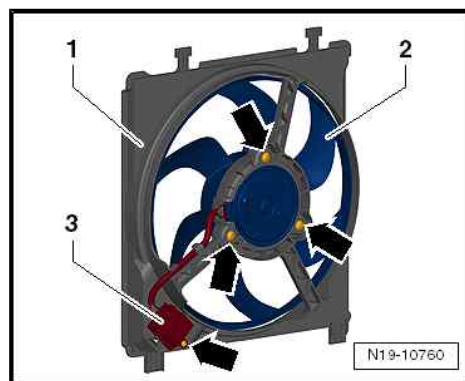


- Unscrew bolts -arrows-.
- Remove wiring harness -3- from wiring guides of radiator cowl -2-.
- Remove radiator fan -2-.

## Installing

Install in reverse order. During this procedure, observe the following:

- Add coolant ⇒ [“1.3 Draining and adding coolant”, page 159](#) .
- Observe electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- Install front bumper ⇒ General body repairs, exterior; Rep. gr. 63 ; Front bumper .



## Specified torques

- ♦ ⇒ [“3.1 Assembly overview - radiator, radiator fan”, page 185](#)
- ♦ ⇒ General body repairs, exterior; Rep. gr. 63 ; Front bumper .

## 24 – Mixture preparation - injection

### 1 Injection system

⇒ [“1.1 Overview of fitting locations - injection system”, page 195](#)

⇒ [“1.2 Assembly overview - fuel system”, page 199](#)

#### 1.1 Overview of fitting locations - injection system

Overview of fitting locations - engine compartment

1 - Inlet camshaft control valve  
1 - N205-

2 - Ignition coils with output stages

- ◆ Ignition coil 1 with output stage - N70-
- ◆ Ignition coil 2 with output stage - N127-
- ◆ Ignition coil 3 with output stage - N291-
- ❑ Removing and installing  
⇒ [“1.2 Removing and installing ignition coils with output stage”, page 277](#)

3 - Lambda probe 1 before catalytic converter - GX10-

- ❑ Consisting of  
Lambda probe before catalytic converter - G39-  
Lambda probe heater - Z19-
- ❑ Removing and installing  
⇒ [“9.2.1 Removing and installing Lambda probe 1 before catalytic converter GX10”, page 251](#)

4 - Lambda probe 1 after catalytic converter - GX7-

- ❑ Consisting of:  
Lambda probe after catalytic converter - G130-  
Lambda probe 1 heater after catalytic converter - Z29-

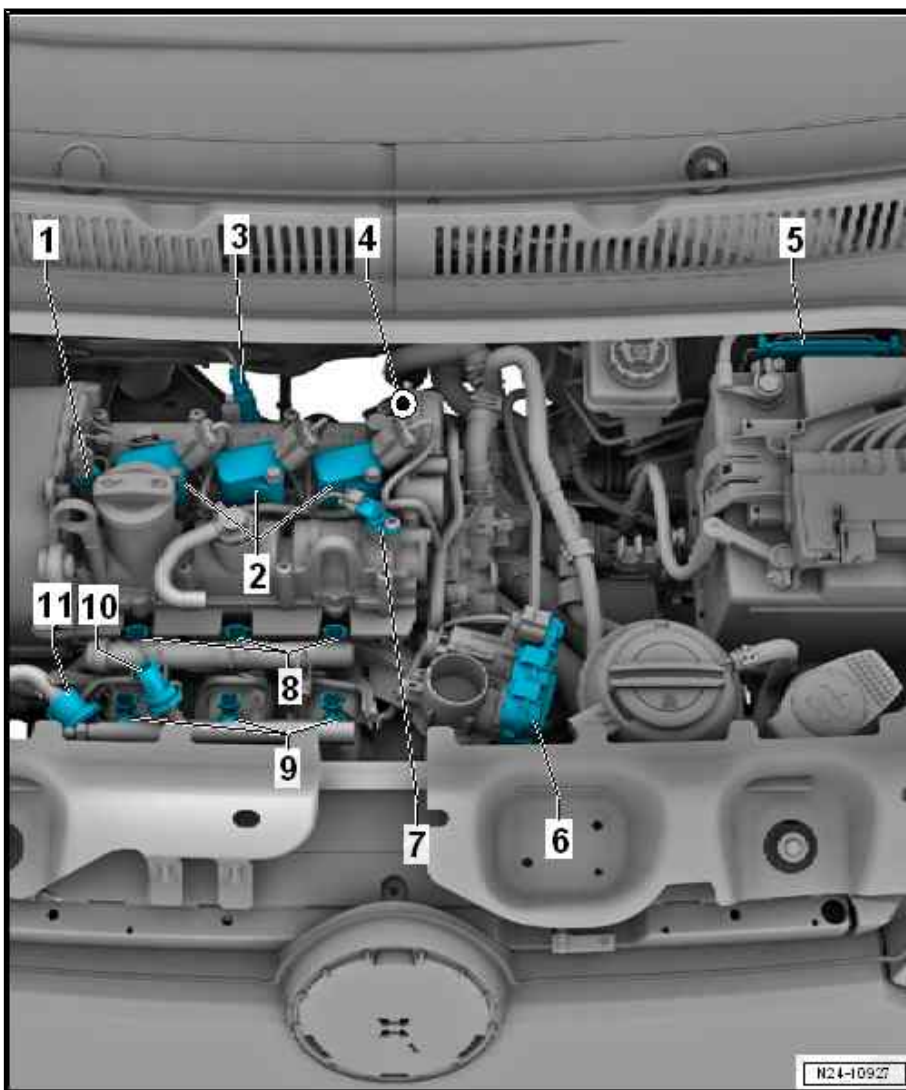
- ❑ Removing and installing  
⇒ [“9.2.2 Removing and installing Lambda probe 1 after catalytic converter GX7”, page 252](#)

5 - Engine control unit - J623-

- ❑ Removing and installing ⇒ [“8.2 Removing and installing engine \(motor\) control unit J623”, page 243](#)

6 - Throttle valve module - GX3-

- ❑ Consisting of:





Throttle valve module - J338-

Throttle valve drive for electronic power control - G186-

Throttle valve drive angle sender 1 for electronic power control - G187-

Throttle valve drive angle sender 2 for electronic power control - G188-

- ☐ Removing and installing ⇒ [“6.3 Removing and installing throttle valve module GX3 ”, page 238](#)
- ☐ Cleaning ⇒ [“6.4 Cleaning throttle valve module GX3 ”, page 239](#)

## 7 - Hall sender - G40-

- ☐ Removing and installing ⇒ [“1.4 Removing and installing Hall sender”, page 280](#)

## 8 - Injectors

◆ Injector, cylinder 1 - N30-

◆ Injector, cylinder 2 - N31-

◆ Injector, cylinder 3 - N32-

- ☐ Removing and installing ⇒ [“2.2 Removing and installing injectors”, page 201](#)
- ☐ Checking ⇒ [“2.3 Checking injectors”, page 205](#)

## 9 - Gas injectors

◆ Gas injection valve 1 - N366-

◆ Gas injection valve 2 - N367-

◆ Gas injection valve 3 - N368-

- ☐ Removing and installing ⇒ [“4.2 Removing and installing gas rail with gas injector N366 / N367 / N368”, page 223](#)

## 10 - Gas rail sensor - G401-

- ☐ Removing and installing ⇒ [“4.3 Removing and installing gas rail sensor G401”, page 227](#)

## 11 - Activated charcoal filter solenoid valve 1 - N80-

Installation location overview, intake side



### 1 - Oil pressure switch - F1-

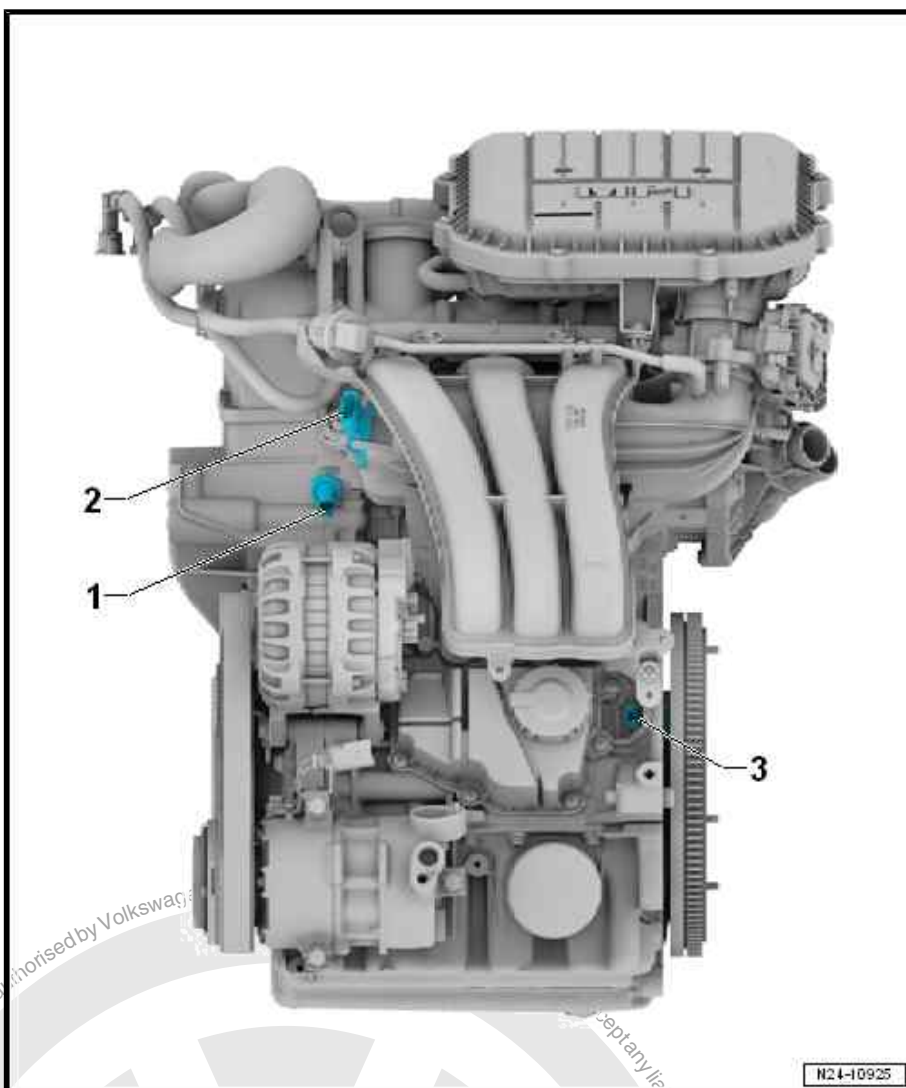
- ❑ Removing and installing  
⇒ ["3.1 Removing and installing oil pressure switch F1"](#), page 152
- ❑ Checking oil pressure and oil pressure switch  
⇒ ["3.2 Checking oil pressure and oil pressure switch"](#), page 152

### 2 - Intake manifold sender - GX9-

- ❑ Consisting of  
Intake air temperature sender 2 - G299-  
Intake manifold pressure sender - G71-
- ❑ Removing and installing  
⇒ ["7.1 Removing and installing intake manifold sender GX9"](#), page 241

### 3 - Engine speed sender - G28-

- ❑ Removing and installing  
⇒ ["1.5 Removing and installing engine speed sender G28"](#), page 281



Installation location overview, exhaust side



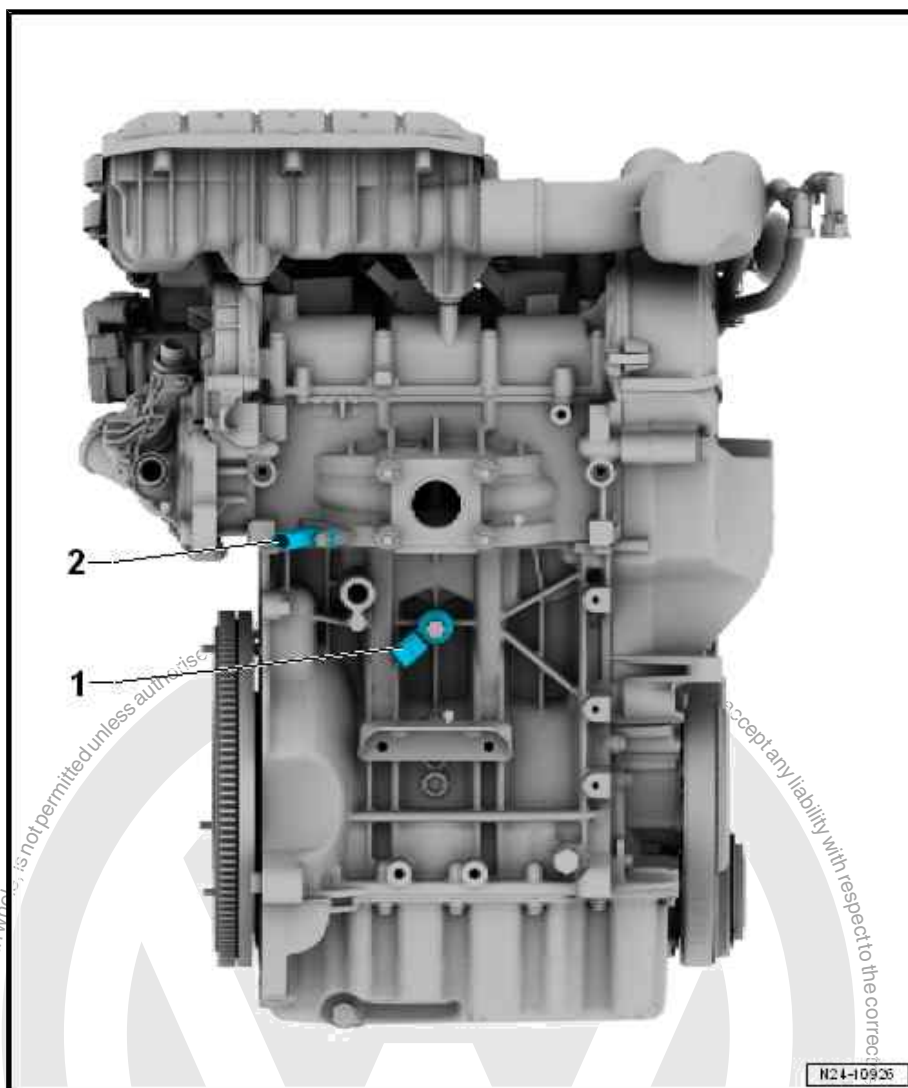


### 1 - Knock sensor 1 - G61-

- Removing and installing  
⇒ ["1.3 Removing and installing knock sensor 1 G61", page 280](#)

### 2 - Radiator outlet coolant - G62-

- Removing and installing  
⇒ ["2.6 Removing and installing coolant temperature sender G62", page 180](#)



## 1.2 Assembly overview - fuel system

### 1 - Air filter

- ☐ Removing and installing  
⇒ [“5.2 Removing and installing air filter housing”, page 231](#)

### 2 - Lambda probe 1 before catalytic converter - GX10-

- ☐ Consisting of  
Lambda probe before catalytic converter - G39-  
Lambda probe heater - Z19-

- ☐ Grease only the threads with “G 052 112 A3”; “G 052 112 A3” cannot get into the slots on the probe body

- ☐ Removing and installing  
⇒ [“9.2.1 Removing and installing Lambda probe 1 before catalytic converter GX10”, page 251](#)

- ☐ 50 Nm

### 3 - Engine control unit - J623-

- ☐ Removing and installing  
⇒ [“8.2 Removing and installing engine \(motor\) control unit J623”, page 243](#)

If the engine control unit - J623- needs to be renewed, connect ⇒ Vehicle diagnostic tester and perform “Guided functions, Renewing engine control unit”.

- ☐ If renewed, adapt engine control unit - J623- to electronic immobiliser ⇒ Vehicle diagnostic tester “Guided functions”.

### 4 - Bolt

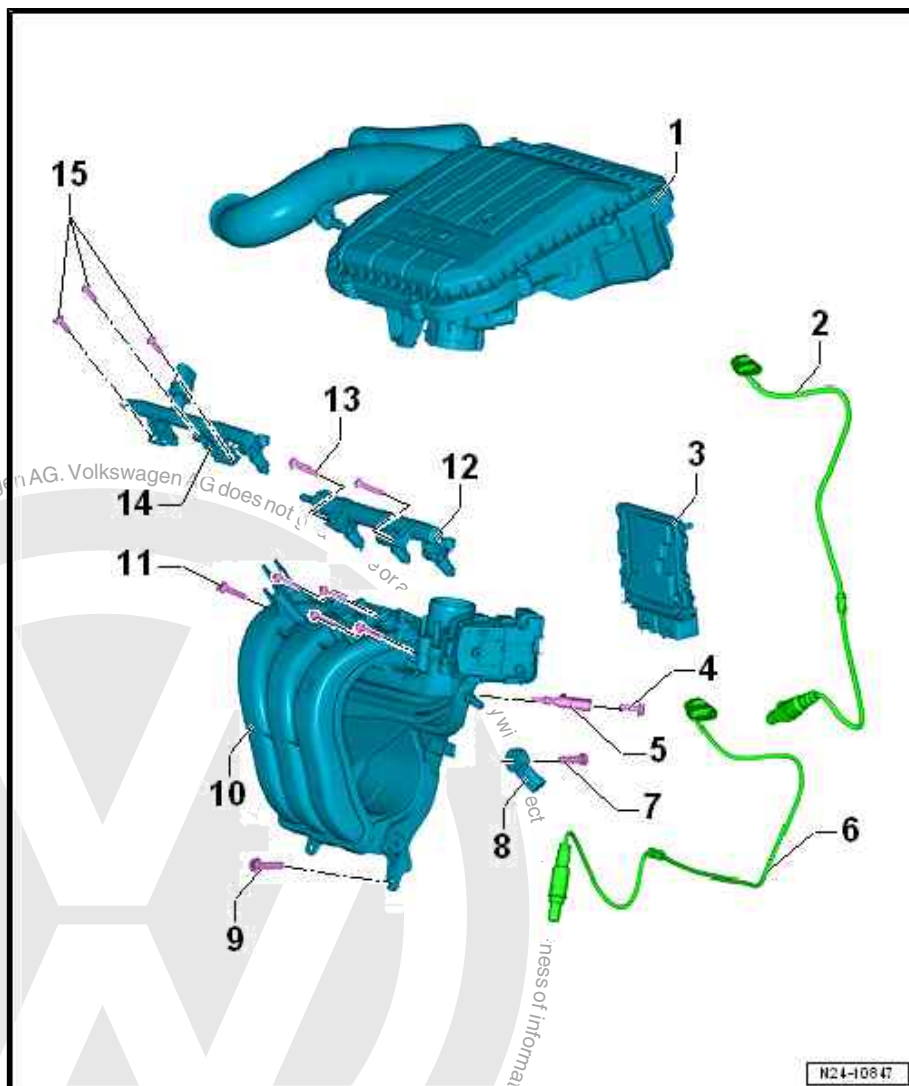
- ☐ For engine speed sender - G28- .
- ☐ 8 Nm

### 5 - Radiator outlet coolant - G62-

- ☐ Removing and installing ⇒ [“2.6 Removing and installing coolant temperature sender G62”, page 180](#)
- ☐ Before removing, release pressure in cooling system if necessary.

### 6 - Lambda probe 1 after catalytic converter - GX7-

- ☐ Consisting of:  
Lambda probe after catalytic converter - G130-  
Lambda probe 1 heater after catalytic converter - Z29-
- ☐ Grease only the threads with “G 052 112 A3”; “G 052 112 A3” cannot get into the slots on the probe body.
- ☐ Remove and install with  
⇒ [“9.2.2 Removing and installing Lambda probe 1 after catalytic converter GX7”, page 252](#) .





- ☐ 50 Nm

#### 7 - Bolt

- ☐ For knock sensor
- ☐ 20 Nm

#### 8 - Knock sensor 1 - G61-

- ☐ Removing and installing ⇒ ["1.3 Removing and installing knock sensor 1 G61", page 280](#)

#### 9 - Bolt

- ☐ 20 Nm

#### 10 - Intake manifold

- ☐ Removing and installing ⇒ ["6.2 Removing and installing intake manifold", page 233](#)

#### 11 - Bolt

- ☐ Qty. 5
- ☐ 8 Nm

#### 12 - Fuel rail with injectors

- ☐ Injector, cylinder 1 - N30-
- ☐ Injector, cylinder 2 - N31-
- ☐ Injector, cylinder 3 - N32-
- ☐ Removing and installing ⇒ ["2.1 Assembly overview - fuel rail with injectors", page 201](#)

#### 13 - Bolt

- ☐ Qty. 2
- ☐ 7 Nm

#### 14 - Gas rail with gas injectors

- ☐ Gas injection valve 1 - N366-
- ☐ Gas injection valve 2 - N367-
- ☐ Gas injection valve 3 - N368-
- ☐ Removing and installing  
⇒ ["4.2 Removing and installing gas rail with gas injector N366 / N367 / N368", page 223](#)

#### 15 - Bolt

- ☐ Qty. 3
- ☐ 7 Nm



## 2 Injectors

⇒ [“2.1 Assembly overview - fuel rail with injectors”, page 201](#)

⇒ [“2.2 Removing and installing injectors”, page 201](#)

⇒ [“2.3 Checking injectors”, page 205](#)

⇒ [“2.4 Cleaning injectors”, page 209](#)

### 2.1 Assembly overview - fuel rail with injectors

#### 1 - Supply line

- ☐ Black with white marks.
- ☐ Secure with spring-type clips
- ☐ Ensure firm seating
- ☐ From fuel filter.

#### 2 - Bolt

- ☐ Qty. 2
- ☐ 7 Nm

#### 3 - O-ring

- ☐ Renew after removal
- ☐ Before installing, moisten lightly with clean engine oil.

#### 4 - Injection valve

- ☐ Injector, cylinder 1 - N30-
- ☐ Injector, cylinder 2 - N31-
- ☐ Injector, cylinder 3 - N32-
- ☐ Removing and installing  
⇒ [“2.2 Removing and installing injectors”, page 201](#)
- ☐ Checking injectors for leaks and quantity injected  
⇒ [“2.3 Checking injectors”, page 205](#)

#### 5 - Retaining clip

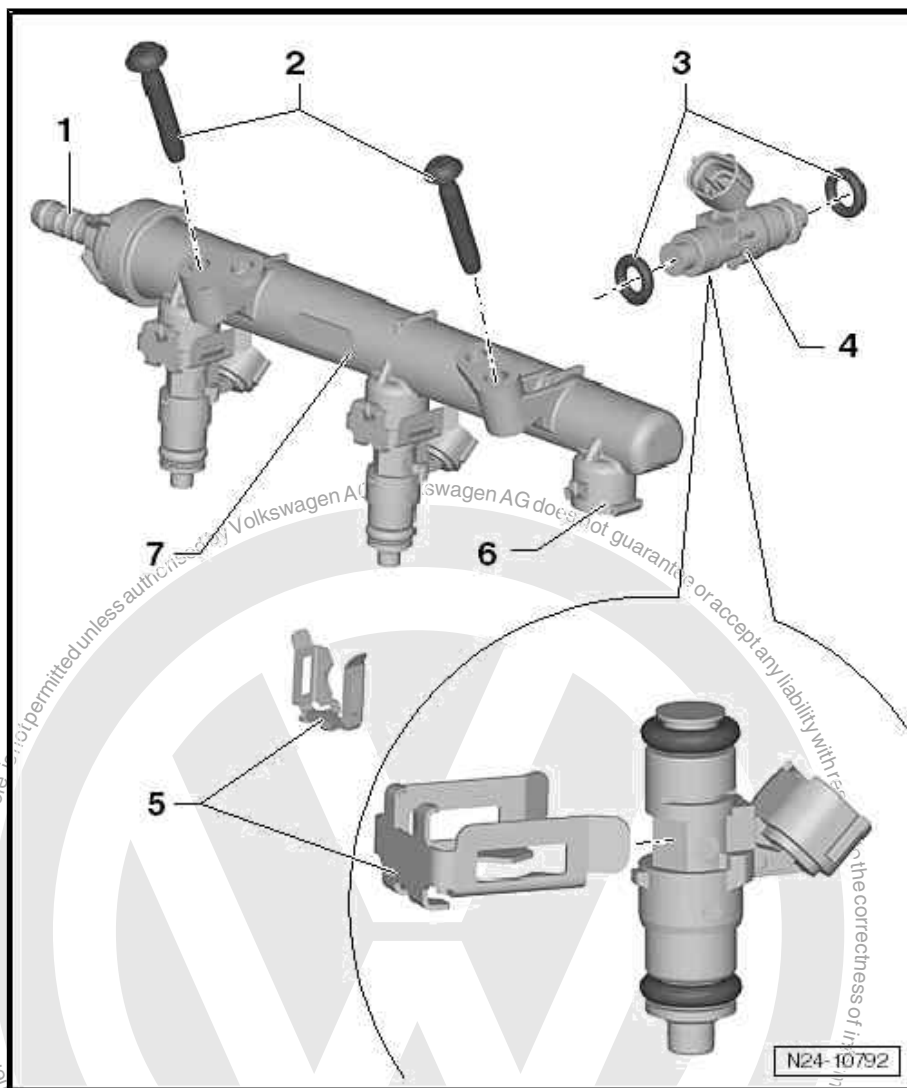
- ☐ Ensure correct seating on injector and fuel rail

#### 6 - Injector seat

- ☐ Ensure proper seating of retaining clip on fuel rail.

#### 7 - Fuel rail with injectors

- ☐ Checking injectors for leaks and quantity injected ⇒ [“2.3 Checking injectors”, page 205](#)

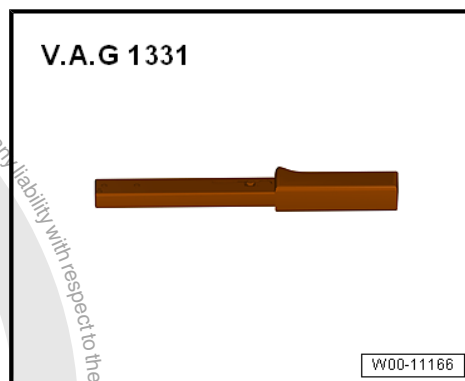


### 2.2 Removing and installing injectors

Special tools and workshop equipment required



◆ Torque wrench - V.A.G 1331-



Removing

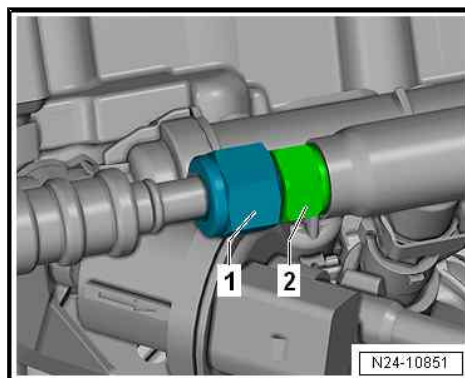
**! DANGER**

**Risk of explosion and danger to life due to escaping natural gas. A hissing noise is a sign that there are leaks in the natural gas system. Leaks in natural gas system may lead to uncontrolled escape of natural gas.**

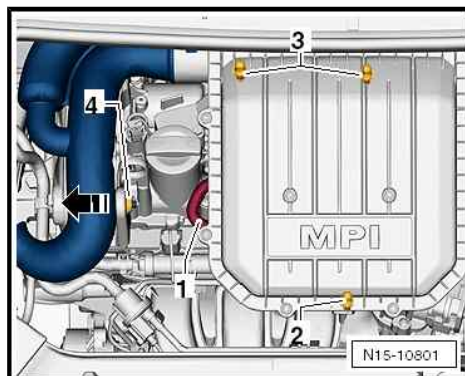
**Risk of explosion leading to serious injuries or death.**

- Do not perform any kind of work on the natural gas system if leaking gas can be heard.
- If a gas leak can be heard, do not drive the vehicle into the workshop.
- Park the vehicle outside and cordon off the area around it.

- Empty gas system ⇒ Rep. gr. 20 ; Fuel tank; Releasing pressure in high-pressure line .
- Loosen union nut at threaded connection of low-pressure line -1-, while at the same time counterholding at gas rail -2- with a spanner.
- Pull hose -1- off air filter housing.



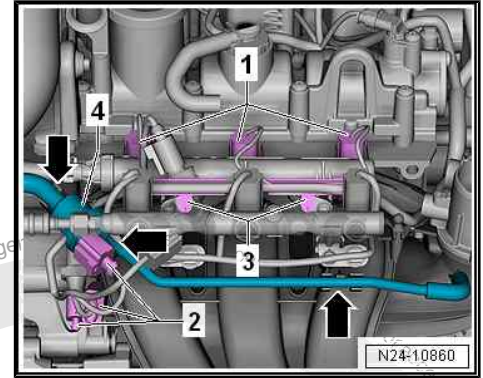
- Pull air filter housing upwards off studs at positions -2- and -3-.
- Push air filter housing and intake connecting pipe in -direction of arrow- out of mounting -4-.
- Remove air filter housing from engine compartment.



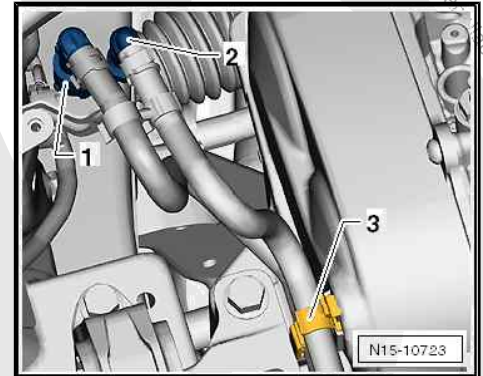




- Release and pull off connectors -1- and -2-.
- Unclip retaining clips -3- for wiring harness from fuel rail.
- Release activated charcoal filter solenoid valve 1 - N80- -4- and vacuum line -arrows- from retainers and lay to one side.
- Remove gas rail and gas injectors  
 ⇒ ["4.2 Removing and installing gas rail with gas injector N366 / N367 / N368", page 223](#) .



- Release and pull off fuel supply line -1- ⇒ Rep. gr. 20 ; Plug-in connectors; Disconnecting plug-in connectors .
- Open line guide -3- and remove hoses.
- Seal line so that fuel system is not contaminated by dirt.





- Unscrew bolts -2- from intake manifold.
- Pull fuel rail -7- with injectors -4- out of the intake manifold.
- Carefully remove retaining clip -5- of injector to be removed.
- Pull off injector from fuel rail.

### Installing

Install in reverse order. During this procedure, observe the following:

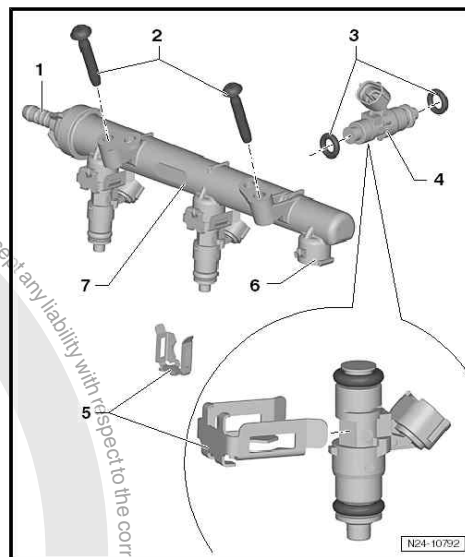
- Renew seals.
- Before installing, lightly coat seals with clean engine oil.
- Ensure proper seating of seals.
- Observe installation position of retaining clips.
- Ensure proper seating of injectors -4- on injector seat -6-.
- Install gas rail with gas injectors

⇒ [“4.2 Removing and installing gas rail with gas injector N366 / N367 / N368”, page 223](#).



### Note

- ♦ *On no account must the union nut be tightened further than specified, since otherwise the special threaded connection will be damaged and the pressure line must be renewed.*
- ♦ *The natural gas system may not be put into operation until it has been tested.*
- ♦ *The necessary scope of the leakage test depends on the pressure section which has been worked on.*
- ♦ *Observe the following allocation!*



### DANGER

Risk of explosion and danger to life due to escaping natural gas. Leaks in natural gas system may lead to uncontrolled escape of natural gas. Risk of explosion leading to serious injuries or death.

- Check natural gas system for leaks.

### Allocation:

⇒ [“3.1 Distinguishing between pressure sections of natural gas supply system”, page 212](#)

- Open fuel tank shut-off valves -N361/N362/N363/N429- using hand wheel - T50026- .



### DANGER

Risk of explosion and danger to life due to escaping natural gas. A hissing noise is a sign that there are leaks in the natural gas system. Leaks in natural gas system may lead to uncontrolled escape of natural gas.

Risk of explosion leading to serious injuries or death.

- Do not perform any kind of work on the natural gas system if leaking gas can be heard.
- If a gas leak can be heard, do not drive the vehicle into the workshop.
- Park the vehicle outside and cordon off the area around it.



- Check the gas system  
⇒ [“3.5 Checking gas system for leaks”, page 217](#) .

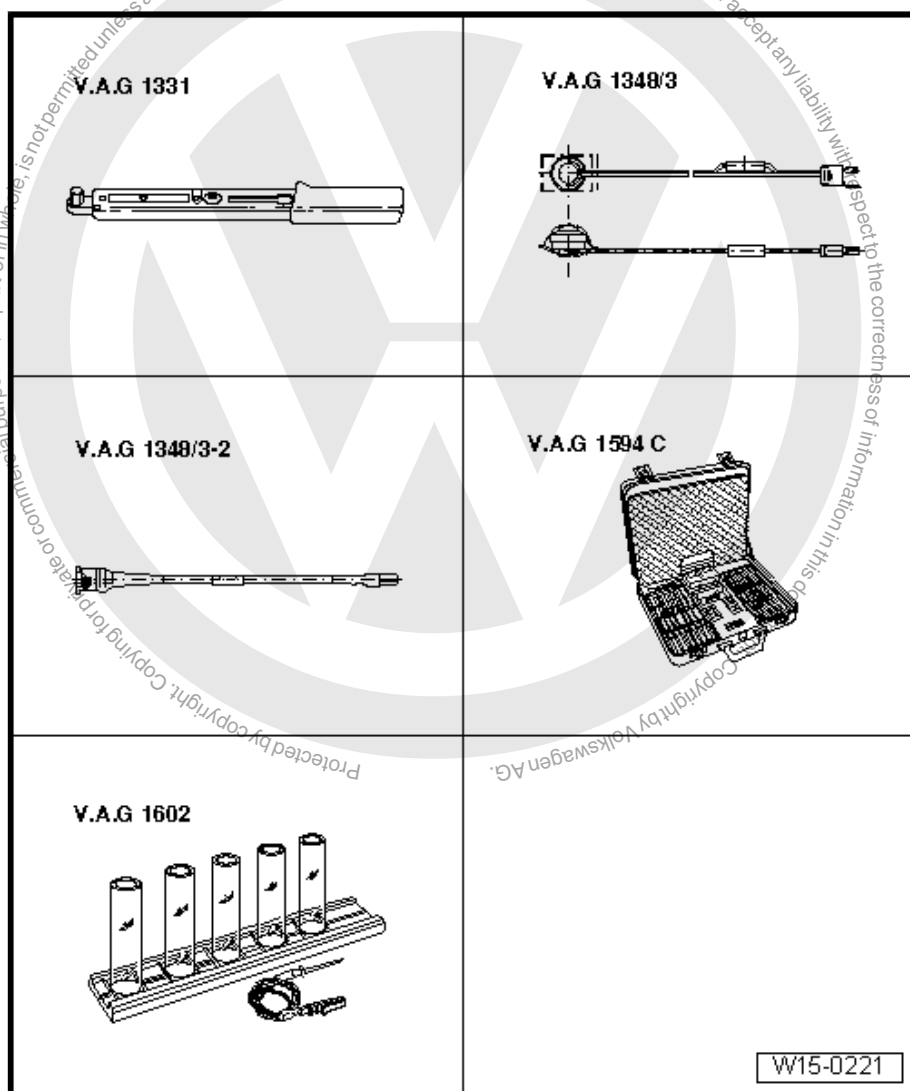
### Specified torques

- ◆ Specified torques for gas rail  
⇒ [“4.1 Assembly overview - gas rail”, page 222](#)

Component	Specified torque
Fuel rail to intake manifold	7 Nm

## 2.3 Checking injectors

### Special tools and workshop equipment required



- ◆ Torque wrench - V.A.G 1331-
- ◆ Remote control for V.A.G 1348 - V.A.G 1348/3A-
- ◆ Adapter line - V.A.G 1348/3-2-
- ◆ Adapter set - V.A.G 1594 C-
- ◆ Injection rate tester - V.A.G 1602-



## Checking injection rate of injectors

### Prerequisites for check

- Fuel pressure OK ⇒ Rep. gr. 20 ; Fuel pump; Checking fuel system pressurisation pump - G6- .
- Engine and fuel temperature: approx. 20°C.

### Test sequence

- Pull hose -1- off air filter housing.
- Pull air filter housing upwards off studs at positions -2- and -3-.
- Push air filter housing and intake connecting pipe in -direction of arrow- out of mounting -4-.
- Remove air filter housing from engine compartment.
- Remove fuel rail together with injectors  
⇒ [“2.2 Removing and installing injectors”, page 201](#) .



### Note

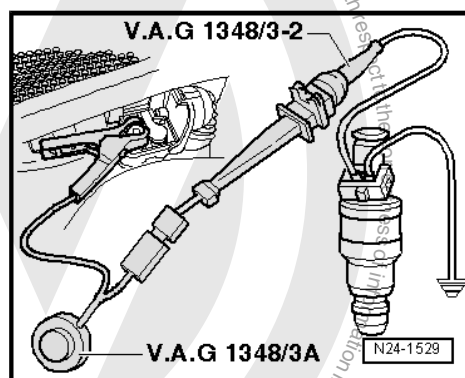
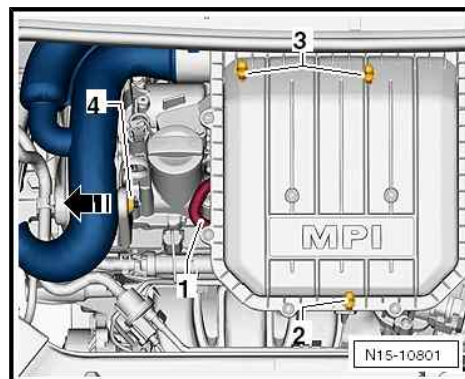
*Insert fuel rail loosely in intake manifold to prevent any dirt from entering when the test equipment is being connected.*

Do not disconnect fuel hoses.

Injectors are not removed from fuel rail.

All connectors for the injectors must be disconnected.

- Connect one contact of injector to be checked to remote control - V.A.G 1348/3-2- using test lead ( adapter cable - V.A.G 1348/3A- ).
- Connect other contact of injector to be checked to engine earth using auxiliary measuring set - V.A.G 1594C- .
- Connect earth wire to measuring cables - V.A.G 1594/2- , measuring cables - V.A.G 1594/19- and pick-up clamp - V.A.G 1594/14- .
- Connect crocodile clip to positive battery pole in engine compartment.
- For injection rate measurement, take three measuring glasses from injection rate tester - V.A.G 1602- .
- Use one measuring glass for each injector to be tested.

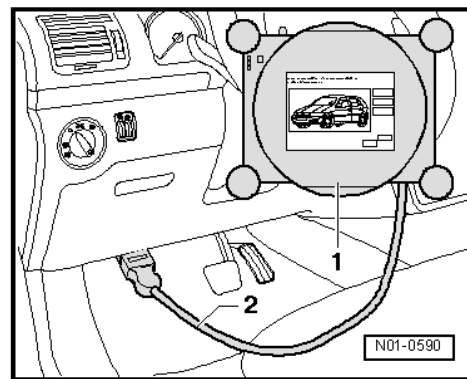




- Connect ⇒ Vehicle diagnostic tester as follows:
- Connect diagnosis cable connector -2- to diagnostic connection in driver footwell.

**Note**

- ◆ *During final control diagnosis, the relay for electronic fuel pump will only be activated for 30 seconds.*
- ◆ *The remote control of V.A.G 1348 - V.A.G 1348/3A- must be operated at the same moment as the final control diagnosis begins.*
- ◆ *The remote control of V.A.G 1348 - V.A.G 1348/3A- must be operated until no more fuel escapes from the injector.*



- Switch on ignition.
- Switch on ignition, and select following menu options on⇒ Vehicle diagnostic tester:

- ◆ Vehicle self-diagnosis
- ◆ 01 - Engine electronics
- ◆ 005 - Final control diagnosis
- ◆ Fuel pump relay
- ◆ Start

**Note**

- ◆ *After the check of one of the injectors has been completed, switch the ignition off, on and off again, before beginning the check of another injector.*
- ◆ *If the ignition is not switched off, on and off again in the intervals between the checks, it might not be possible to perform the final control diagnosis more than once.*
- Repeat check on other injectors.
- After all injectors have been activated, place measuring beakers on a level surface and compare the quantity injected.

**Note**

- ◆ *At the end of the final control diagnosis, there is still a small volume of fuel in the system which needs to be taken into account.*
- ◆ *This quantity of approx. 6 ml of fuel needs to be subtracted from the total quantity during calculation.*
- ◆ *A sample calculation is provided in the table below.*





Total quantity in measuring glass after check is completed	Remaining quantity in system after check is completed (constant value)	Actual value
e.g.: 87 ml	- 6 ml	= 81 ml

Specification: 76...82 ml per injector

If the measured value is above or below the prescribed specifications:

- Renew defective injector  
⇒ ["2.2 Removing and installing injectors", page 201](#) .

#### Check for leaks

##### Prerequisites for check

- Fuel pressure OK.
- Engine and fuel temperature: approx. 20°C.
- Fuel rail is removed.
- Connectors of all injectors are disconnected.
- As a precaution, place a measuring glass - V.A.G 1602/1- under each injector.



#### Note

- ◆ *During the leakage test, pressure will build up in the fuel system.*
- ◆ *Injectors will not be actuated. If fuel escapes from a valve, the valve is defective.*



- Connect ⇒ Vehicle diagnostic tester as follows:
- Connect diagnosis cable connector -2- to diagnostic connection in driver footwell.
- Switch on ignition, and select following menu options on⇒ Vehicle diagnostic tester:

- ◆ Vehicle self-diagnosis
- ◆ 01 - Engine electronics
- ◆ 005 - Final control diagnosis
- ◆ Fuel pump relay
- ◆ Start

- Switch off ignition.

Specification: No more than 2 drops must escape during final control diagnosis.

**If the fuel loss is greater:**

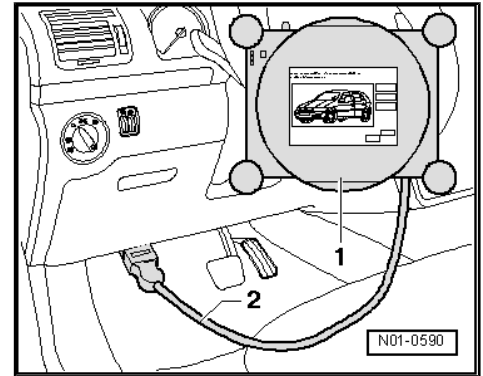
- Renew defective injector  
⇒ ["2.2 Removing and installing injectors", page 201](#) .

**Install injectors in the reverse order of removal, observing the following:**

- Renew O-rings on all injectors and lightly moisten with clean engine oil.

**Specified torques:**

- ◆ Fit fuel rail with secured injectors onto intake manifold and tighten evenly  
⇒ ["2.1 Assembly overview - fuel rail with injectors", page 201](#) .



## 2.4 Cleaning injectors

**Special tools and workshop equipment required**

- ◆ Ultrasonic cleaning device - VAS 6418-
- ◆ Mounting plate - VAS 6418/1-
- ◆ Cleaning fluid Cleaning fluid - VAS 6418/2- ⇒ Electronic parts catalogue
- ◆ Distilled water



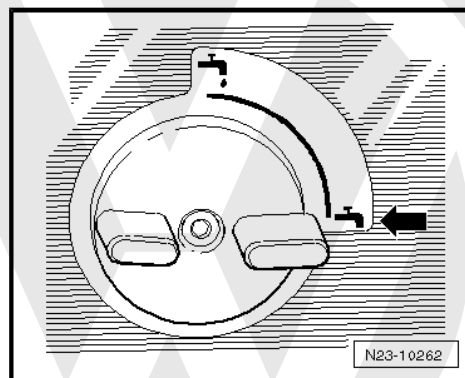
### Preparing ultrasonic cleaning unit - VAS 6418-

- Close drain tap -arrow- of ultrasonic cleaning unit - VAS 6418- at right-hand side of housing.
- Fill ultrasonic cleaning unit with 2120 ml of distilled water and 20 ml of cleaning fluid - VAS 6418/2- .



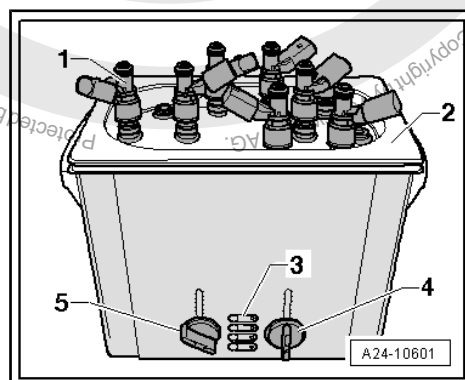
#### Note

- ♦ *The ultrasonic unit must be filled with cleaning agent to upper edge of holes (see detail).*
- ♦ *Observe safety instructions and operating instructions for the ultrasonic unit.*



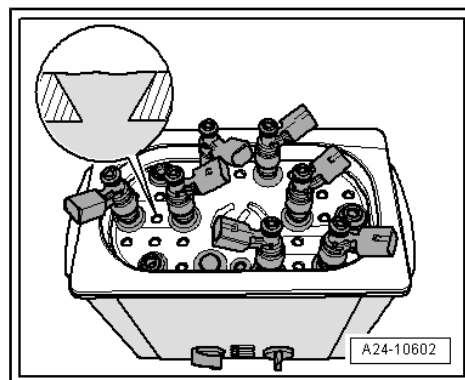
### Cleaning

- Remove injectors  
⇒ [“2.2 Removing and installing injectors”, page 201](#) .
- Insert injectors -1- all the way into mounting plate - VAS 6418/1- -item 2-.
- Immerse injectors with mounting plate - VAS 6418/1- into ultrasonic cleaning unit - VAS 6418- .



#### 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 fluid is approx. 1 to 4 mm above the base of the mounting plate -magnified area-. The ultrasonic cleaner - VAS 6418- could become damaged if the fluid level is too low.*
- ♦ *The electrical contacts must be protected against splash water by suitable means.*





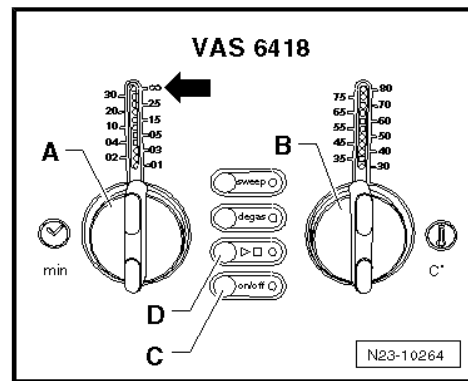
- Switch on cleaning unit by pressing **on/off** button -C-.
- Use rotary knob -A- to set cleaning time to 30 minutes.
- Set rotary knob -B- to a temperature of 50°C.
- Press button **▶** -D- to start the cleaning process.



#### 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.*

- Immediately after cleaning, remove water residues from the injectors.
- After cleaning, renew all seals on every injector.
- Installing injectors  
⇒ ["2.2 Removing and installing injectors", page 201](#)





### 3 Checking natural gas supply system for leaks

⇒ [“3.1 Distinguishing between pressure sections of natural gas supply system”, page 212](#)

⇒ [“3.2 Determining pressure in gas system”, page 215](#)

⇒ [“3.3 Determining operating mode of natural gas vehicles”, page 215](#)

⇒ [“3.4 Activating and deactivating natural gas mode”, page 215](#)

⇒ [“3.5 Checking gas system for leaks”, page 217](#)

#### DANGER

Risk of explosion and danger to life due to escaping natural gas. A hissing noise is a sign that there are leaks in the natural gas system. Leaks in natural gas system may lead to uncontrolled escape of natural gas.

Risk of explosion leading to serious injuries or death.

- Do not perform any kind of work on the natural gas system if leaking gas can be heard.
- If a gas leak can be heard, do not drive the vehicle into the workshop.
- Park the vehicle outside and cordon off the area around it.

#### DANGER

Risk of explosion and danger to life due to escaping natural gas.

Risk of explosion leading to serious injuries or loss of life.

- Leaks may occur after repair work has been carried out on the natural gas system. Natural gas may escape in an uncontrolled way.
- After any repair work on the natural gas system, a leakage test must always be performed.

Depending on the respective section of the natural gas supply system, different procedures are described in this chapter.

- These depend on the pressure section  
⇒ [“3.1 Distinguishing between pressure sections of natural gas supply system”, page 212](#) that has been worked on, as well as on the actual pressure of the natural gas system  
⇒ [“3.2 Determining pressure in gas system”, page 215](#).
- After working on high-pressure section, perform leakage test according to manufacturer specifications ⇒ Maintenance ; Booklet 35.1 ; Description of work; Performing visual inspection of natural gas tanks for corrosion and leakage test .
- After working on low pressure section, perform leakage test.  
⇒ [“3.5 Checking gas system for leaks”, page 217](#)

### 3.1 Distinguishing between pressure sections of natural gas supply system

⇒ [“3.1.1 High-pressure section”, page 213](#)

⇒ [“3.1.2 Low-pressure section”, page 214](#)

- The pressure sections are defined by the components of the natural gas system.



- The pressure system comprises the high-pressure section and the low-pressure section.
- The scope of the necessary leakage test  
⇒ ["3.5 Checking gas system for leaks", page 217](#) upon completion of repair work will be different depending on the pressure section that has been worked on.
- The allocation does not depend on the actual pressure in the respective section.
- Example: if the actual pressure in the high-pressure section is below 5 bar, proceed according to instructions for the  
⇒ ["3.1.1 High-pressure section", page 213](#).

### 3.1.1 High-pressure section

The high-pressure section comprises the following:

- ◆ All gas-conducting components from filler neck to (and including) pressure regulator.
- ◆ Components -1- through -10- belong to high-pressure section.

#### 1 - Natural gas fuel tank

- ❑ Made of steel or fibre composite material, depending on type and version

#### 2 - Tank shut-off valve with solenoid valve

- ❑ Number depends on type and vehicle model

#### 3 - High-pressure line

#### 4 - Natural gas fuel tank

- ❑ Made of steel or fibre composite material, depending on type and version

#### 5 - Tank shut-off valve with solenoid valve

- ❑ Number depends on type and vehicle model

#### 6 - High-pressure line

#### 7 - Manifold



#### Note

*Different designs possible depending on vehicle type*

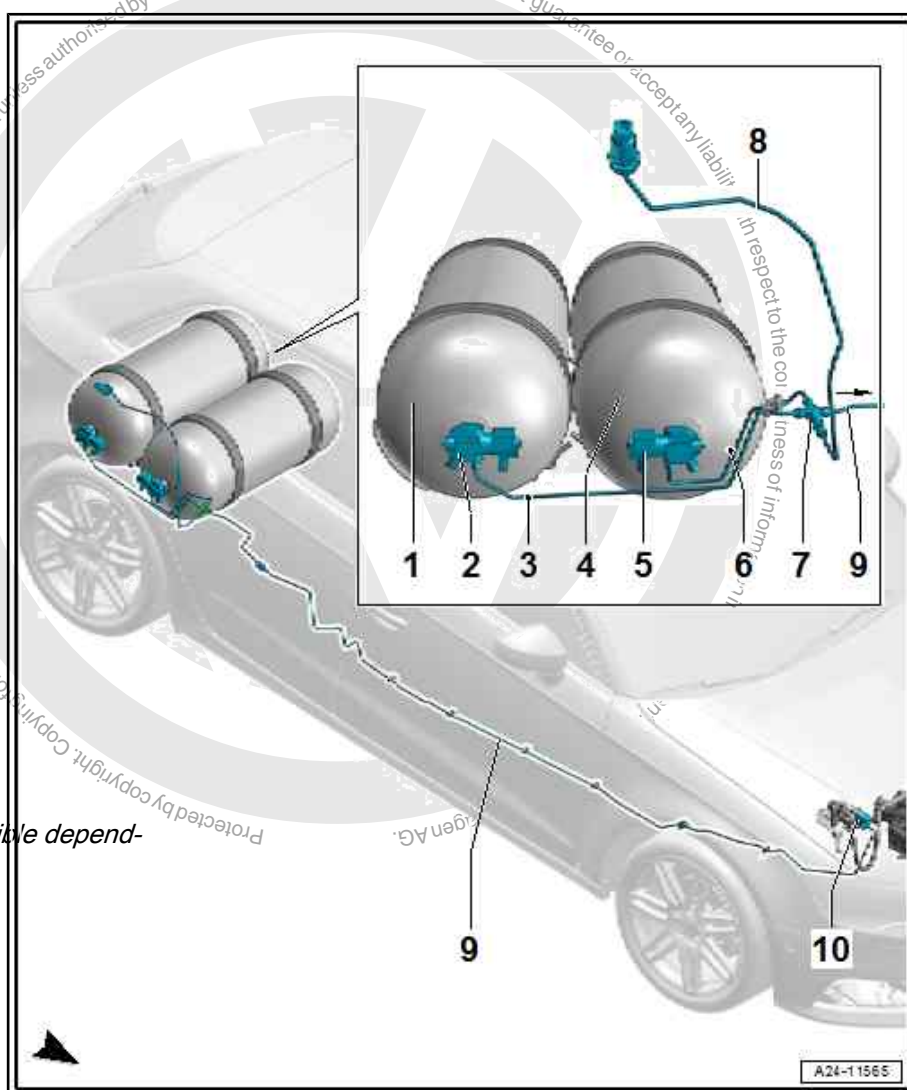
- ❑ Connecting piece with 2 connections
- ❑ T-piece design
- ❑ Cross-piece design

#### 8 - Filling connection with filler line

#### 9 - High-pressure line

#### 10 - Pressure regulator

- ❑ Pressure regulator serves as transition between





- ◆ High-pressure section and
- ◆ Low-pressure section

### Leakage test to be performed

- After working on high-pressure section, perform leakage test according to manufacturer specifications ⇒ Maintenance ; Booklet 35.1 ; Description of work; Performing visual inspection of natural gas tanks for corrosion and leakage test .

## 3.1.2 Low-pressure section

The low-pressure section comprises all gas-conducting components from the pressure regulator and up to the gas injection valves »green«

### 9 - High-pressure line

- After working on high-pressure section, perform leakage test according to manufacturer specifications ⇒ Maintenance ; Booklet 35.1 ; Description of work; Performing visual inspection of natural gas tanks for corrosion and leakage test .

- ☐ (High-pressure section)

### 10 - Pressure regulator

- After working on high-pressure section, perform leakage test according to manufacturer specifications ⇒ Maintenance ; Booklet 35.1 ; Description of work; Performing visual inspection of natural gas tanks for corrosion and leakage test .

- ☐ Pressure regulator serves as transition between

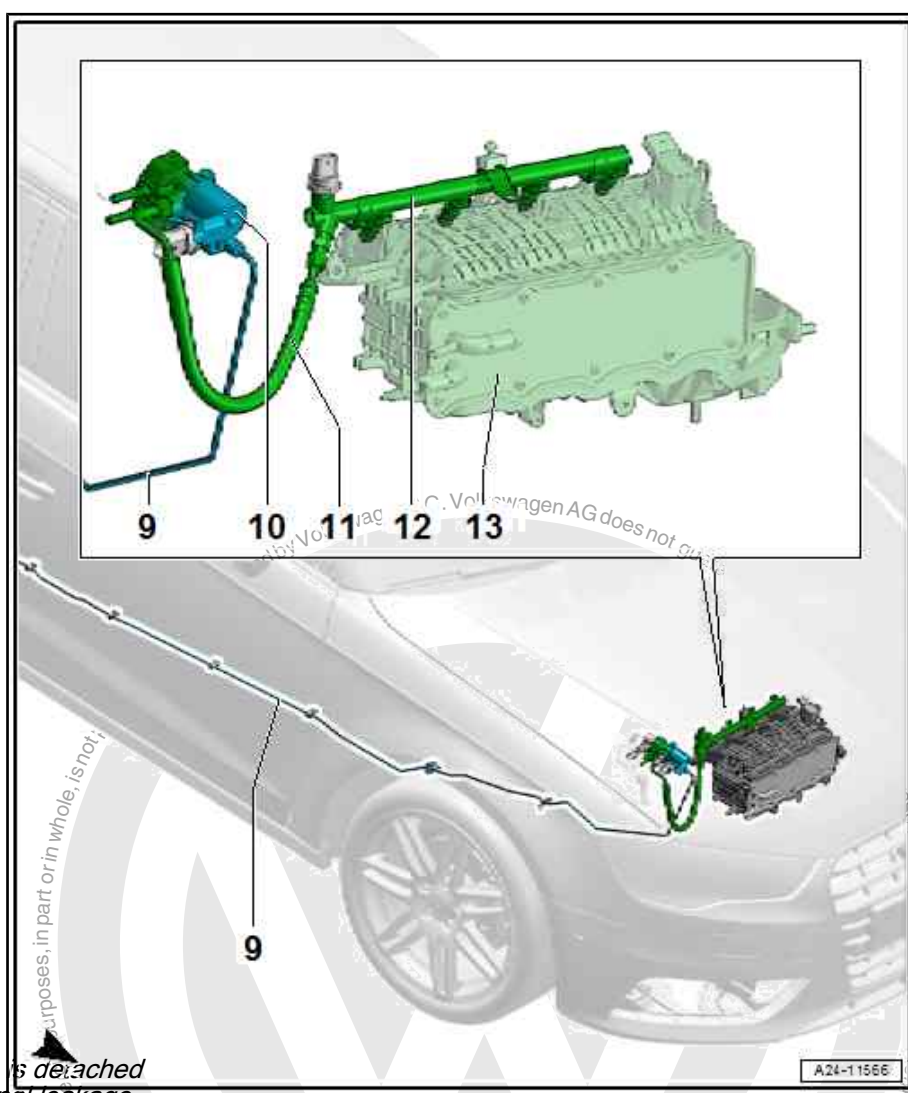
- ◆ High-pressure section and
- ◆ Low-pressure section

### 11 - Low-pressure line



#### Note

*If the low-pressure line is detached or renewed, an additional leakage test will be necessary at the union nut of the high-pressure line -9- on the pressure regulator -10-.*



### 12 - Gas rail with gas injection valves and pressure and temperature sender

### 13 - Intake manifold



### Leakage test to be performed

- After working on low pressure section, perform leakage test.  
⇒ [“3.5.2 Checking gas system for leaks after working on the low-pressure section”, page 219](#)

## 3.2 Determining pressure in gas system

### Special tools and workshop equipment required

- ◆ Diagnosis system VCI, Win7 - VAS 6150C-

### Read system pressure using respective function

- Switch on ignition.
- Connect ⇒ Vehicle diagnostic tester and start self-diagnosis.
- ◆ **Measured values**
- ◆ **Tank pressure sensor/actual value**
- Further procedure depends on the determined system pressure; allocation  
⇒ [“3.5 Checking gas system for leaks”, page 217](#)

## 3.3 Determining operating mode of natural gas vehicles

### Natural gas operating mode indicator in dash panel insert



#### Note

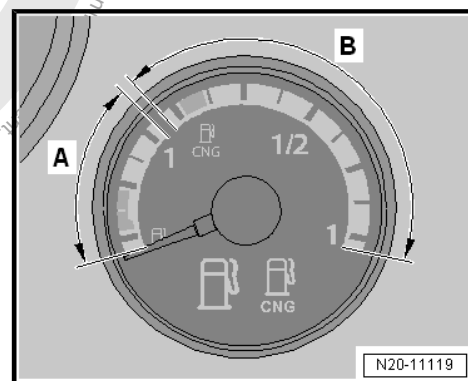
*The type of indicator may vary depending on the model year.*

- Start vehicle, and ensure that natural gas mode is indicated in dash panel insert.



#### Note

- ◆ *In area -A- of the gauge, the fill level and the operating condition of the petrol system are displayed.*
- ◆ *In area -B- of the gauge, the fill level and the operating condition of the gas system are displayed.*
- ◆ *If the needle is in area -B- of the gauge, the vehicle is in natural gas mode.*
- Start vehicle, and check via fuel gauge -section B- in dash panel if vehicle is in natural gas mode.

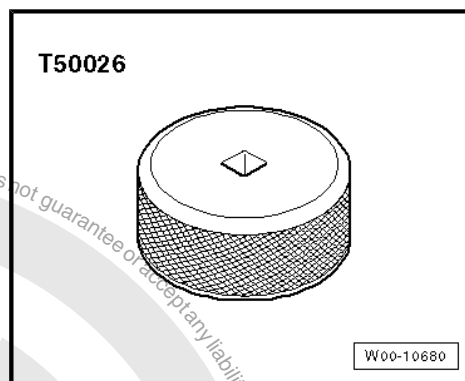


## 3.4 Activating and deactivating natural gas mode

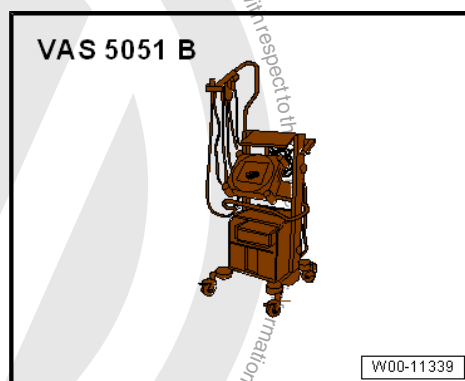
### Special tools and workshop equipment required



◆ Handwheel - T50026-



◆ Vehicle diagnosis, testing and information system - VAS 5051B-



- The fuel tank must be run empty, provided that the vehicle is fully functional and fit for the road.

### Deactivating natural gas mode



#### Note

When the gauge for natural gas shows "Tank empty"  
⇒ [page 215](#) and the engine control unit has switched to petrol mode, there may still be a pressure of about 12 bar in the high-pressure section of the natural gas system.

- Activate »Petrol mode« using function Release pressure in natural gas high-pressure line ⇒ Vehicle diagnostic tester.
- Close fuel tank shut-off valves -N361- and -N362- using handwheel - T50026- .
- Pull relay for gas shut-off valves - J908- out of relay carrier.

### Activating natural gas mode

- Insert relay for gas shut-off valves - J908- into relay carrier.
- Open fuel tank shut-off valves -N361- and -N362- using handwheel - T50026- .
- Resume function Release pressure in natural gas high-pressure line ⇒ Vehicle diagnostic tester to activate natural gas system.



**! DANGER**

Risk of explosion and danger to life due to escaping natural gas. Leaks in natural gas system may lead to uncontrolled escape of natural gas. Risk of explosion leading to serious injuries or death.

- Check natural gas system for leaks.

- Scope of the leakage test depends on the pressure section  
⇒ [“3.1 Distinguishing between pressure sections of natural gas supply system”, page 212](#) which has been worked on.

**! DANGER**

Risk of explosion and danger to life due to escaping natural gas. A hissing noise is a sign that there are leaks in the natural gas system. Leaks in natural gas system may lead to uncontrolled escape of natural gas.

Risk of explosion leading to serious injuries or death.

- Do not perform any kind of work on the natural gas system if leaking gas can be heard.
- If a gas leak can be heard, do not drive the vehicle into the workshop.
- Park the vehicle outside and cordon off the area around it.

### 3.5 Checking gas system for leaks

- Determine pressure in natural gas system.  
⇒ [“3.2 Determining pressure in gas system”, page 215](#)

#### Test conditions

- If the actual pressure is less than the required minimum pressure of approx. 5 bar, refuel the vehicle.
- The natural gas tanks must be filled up to maximum pressure.
- However, the minimum fill level is  $\geq 160$  bar (80%).
- In order to avoid uncontrolled escape of natural gas after refuelling and before leakage test, pull relay for gas shut-off valves - J908- out of relay carrier.



#### Note

- ◆ *The gas shut-off valves are closed electrically upon pulling out the relay for gas shut-off valves - J908- . The gas system can still be filled.*
- ◆ *This will deactivate the gas system and it prevents the leakage of larger amounts of gas through any possible leaks after the gas system has been filled.*

- Drive to the petrol station in petrol mode.

#### After refuelling

- Drive back to the workshop in petrol mode.
- Before driving the vehicle into the workshop, reactivate natural gas mode by inserting the relay for gas shut-off valves - J908- into the relay carrier.





#### Note

- ◆ *The fuel tank shut-off valves will be activated for only two seconds after the ignition has been switched on.*
- ◆ *During the activation, a mechanical »clicking« noise can be heard.*
- ◆ *During actuation of the fuel tank shut-off valves, listen carefully for the sound of leaking gas in the section which was repaired.*
- ◆ *If the injectors are not activated, perform an adaption drive to activate the gas system.*
- ◆ *To ensure successful results from the adaption drive, the engine must repeatedly be operated with partial load during the drive.*
- ◆ *To check whether the natural gas system has been activated successfully, consult the fuel gauge of the natural gas system  
⇒ [page 215](#)*
- Before driving the vehicle into the workshop, listen carefully for the sound of leaking gas.

If noise can be heard:



#### DANGER

Risk of explosion and danger to life due to escaping natural gas. A hissing noise is a sign that there are leaks in the natural gas system. Leaks in natural gas system may lead to uncontrolled escape of natural gas.

Risk of explosion leading to serious injuries or death.

- Do not perform any kind of work on the natural gas system if leaking gas can be heard.
- If a gas leak can be heard, do not drive the vehicle into the workshop.
- Park the vehicle outside and cordon off the area around it.

- Activate petrol mode using function Release pressure in natural gas high-pressure line ⇒ Vehicle diagnostic tester.
- Wait until no sound of escaping gas can be heard.

When escaping gas can no longer be heard:

- Drive vehicle into workshop.
- Loosen all threaded connections loosened during repair work and tighten according to specifications.
- Drive vehicle out of workshop.
- Deactivate petrol mode using function Release pressure in natural gas high-pressure line ⇒ Vehicle diagnostic tester.
- Check if the sound of escaping gas can be heard.

If no noise can be heard:

- Drive vehicle into workshop.
- Perform required leakage test after working on the high-pressure section  
⇒ ["3.5.1 Checking gas system for leaks after working on the high-pressure section", page 219](#), or the required leakage



test after working on the low-pressure section

⇒ "3.5.2 Checking gas system for leaks after working on the low-pressure section", page 219 .

### 3.5.1 Checking gas system for leaks after working on the high-pressure section

Test pressure: 160 to 200 bar

#### DANGER

Risk of explosion and danger to life due to escaping natural gas. A hissing noise is a sign that there are leaks in the natural gas system. Leaks in natural gas system may lead to uncontrolled escape of natural gas.

Risk of explosion leading to serious injuries or death.

- Do not perform any kind of work on the natural gas system if leaking gas can be heard.
- If a gas leak can be heard, do not drive the vehicle into the workshop.
- Park the vehicle outside and cordon off the area around it.

- A leakage test according to manufacturer specifications  
⇒ Maintenance ; Booklet 35.1 ; Description of work; Performing visual inspection of gas tanks for corrosion and leakage test must be performed at max. system pressure of 200 bar.
- Not all filling systems are capable of pressurising the gas system up to the maximum pressure.
- Minimum pressure is 160 bar.

#### DANGER

Risk of explosion and danger to life due to escaping natural gas. Leaks in natural gas system may lead to uncontrolled escape of natural gas. Risk of explosion leading to serious injuries or death.

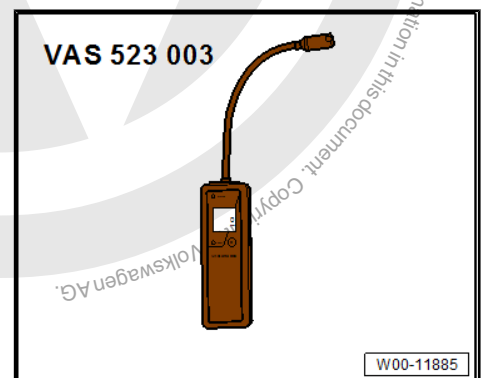
- Check natural gas system for leaks.

The vehicle must not be handed over to the customer without a leakage test having been performed successfully.

### 3.5.2 Checking gas system for leaks after working on the low-pressure section

Special tools and workshop equipment required

- ◆ Leak detector - VAS 523 003



- ◆ Leak detector spray (commercially available)



## Note

- ♦ *The test »Checking gas system for leaks after working on the low-pressure section« is not a substitute for the »Leakage test according to manufacturer's specifications« which must be performed according to the maintenance schedule.*
- ♦ *Any work, including leakage tests, on the natural gas system must be performed only by specially trained personnel.*
- ♦ *Check the gas system for leaks if gas-conducting components in the low-pressure section have been loosened or renewed  
⇒ ["3.1.2 Low-pressure section", page 214](#) .*

## Test prerequisites:

- Test pressure: approx. 5 bar in low-pressure section, 160 to 200 bar at transition between low-pressure section and high-pressure section ⇒ ["3.1.2 Low-pressure section", page 214](#) .
- When the system activates, it can be assumed that the required minimum pressure of 5 bar is attained.
- If the system is not activated, it is impossible to perform a reliable test. Fill natural gas system.
- All screwed connections tightened to specifications.

If shut-off valves have been closed electrically or mechanically beforehand:

- Reinsert relay for gas shut-off valves - J908- .
- Open shut-off valves -N361- and -N362- .
- Reactivate natural gas system  
⇒ ["3.4 Activating and deactivating natural gas mode", page 215](#) .



## DANGER

**Risk of explosion and danger to life due to escaping natural gas.**  
A hissing noise is a sign that there are leaks in the natural gas system. Leaks in natural gas system may lead to uncontrolled escape of natural gas.

**Risk of explosion leading to serious injuries or death.**

- Do not perform any kind of work on the natural gas system if leaking gas can be heard.
- If a gas leak can be heard, do not drive the vehicle into the workshop.
- Park the vehicle outside and cordon off the area around it.



## Note

- ♦ *The gas leak detector can only be used to find out whether there is any gas in the surrounding air.*
- ♦ *Any other result than a green LED for »OK« is not permitted on the gas leak detector. If a yellow or red LED lights up, a leak detection spray must be used to verify whether gas is really escaping from the vehicle's natural gas system or not. When leak detection spray is being used, it must be ensured that no bubbles come out of the sprayed area within a testing time of 3 minutes. Any leaks that occur must be repaired, and the test must then be repeated.*



## Procedure

- ➔ **“3.2 Determining pressure in gas system”, page 215** , use function `0001 - Read measured values` to interrogate value of tank pressure sensor ➔ Vehicle diagnostic tester.
- All connections and components which have been opened or exchanged, must be checked with leak detector - VAS 523 003- and leak detector spray.

### DANGER

**Risk of explosion and danger to life due to escaping natural gas. Leaks in natural gas system may lead to uncontrolled escape of natural gas. Risk of explosion leading to serious injuries or death.**

- Check natural gas system for leaks.

- Guide the gas leak tester around the point to be tested (»repair area«), and take measurements every 90° for at least 5 seconds.

### **If leaks were detected using the leak detector - VAS 523 003- :**

- Spray the respective connection or component with leak detection spray and observe approx. 3 minutes. Ensure that there are no bubbles.
- If the leakage test does not detect a concentration of natural gas and consequently no gas leak, the vehicle can be taken into operation.
- If the leakage test detects a gas leak, the cause of fault must be determined and eliminated. The leakage test must then be carried out again.
- The vehicle must not be handed over to the customer without a leakage test having been performed successfully.





## 4 Gas injectors

⇒ [“4.1 Assembly overview - gas rail”, page 222](#)

⇒ [“4.2 Removing and installing gas rail with gas injector N366 / N367 / N368”, page 223](#)

⇒ [“4.3 Removing and installing gas rail sensor G401”, page 227](#)

### 4.1 Assembly overview - gas rail

#### 1 - Bolt

- 7 Nm

#### 2 - Gas rail sensor - G401-

- Removing and installing  
⇒ [“4.3 Removing and installing gas rail sensor G401”, page 227](#)

- Coat sealing taper and thread with silicone-free engine oil.

- Counterhold with wrench when fastening to the fuel rail

- A leakage test of the system must always be performed after components have been removed ⇒ Maintenance ; Booklet 35.1 ; Description of work; Performing visual inspection of gas tanks for corrosion and leakage test .

- 22 Nm

#### 3 - Supply line

- Screw on union nut by hand as far as stop.
- 5 Nm +70° (turning further to torque angle can be performed in 2 stages)

#### 4 - Gas injector

- Gas injection valve 1 - N366-
- Gas injection valve 2 - N367-
- Gas injection valve 3 - N368-

- Removing and installing ⇒ [“2.2 Removing and installing injectors”, page 201](#)

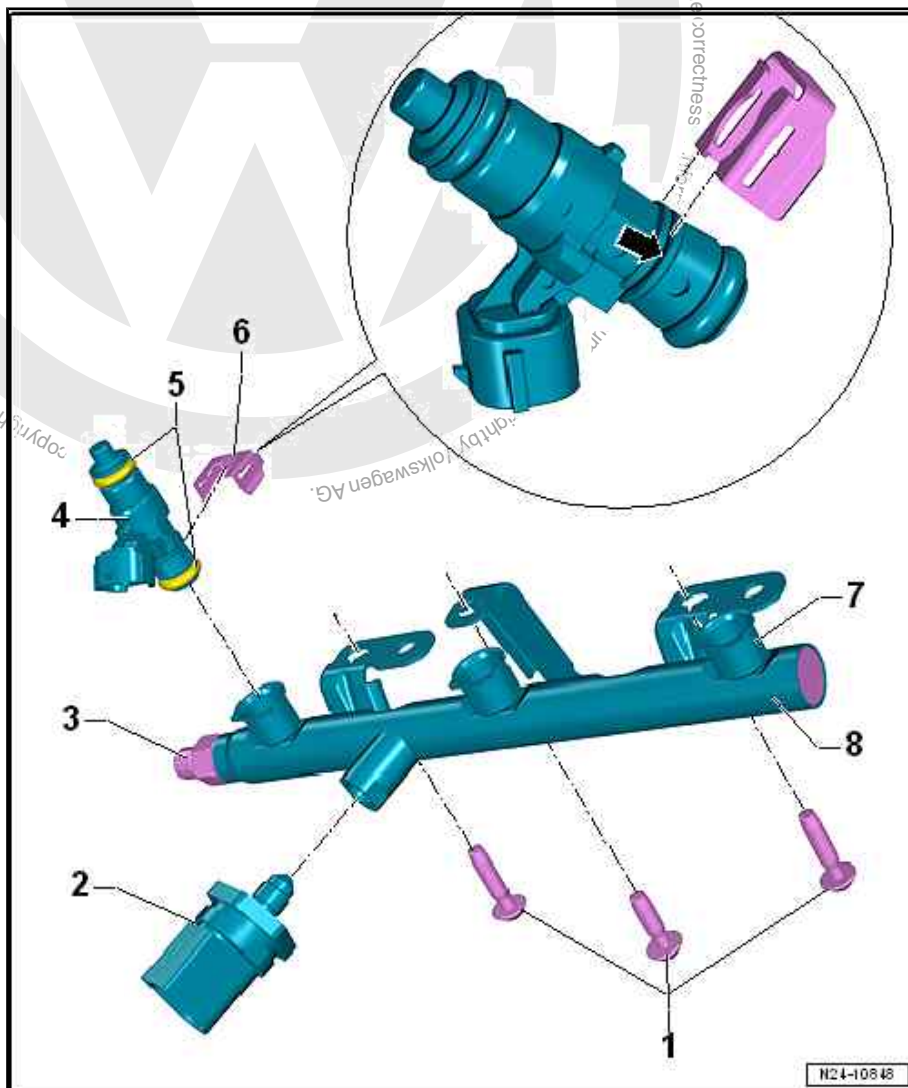
- A leakage test of the system must always be performed after components have been removed ⇒ Maintenance ; Booklet 35.1 ; Description of work; Performing visual inspection of gas tanks for corrosion and leakage test .

#### 5 - O-ring

- Insert dry
- Renew after removal

#### 6 - Retaining clip

- Ensure correct seating on injector and fuel rail







- ☐ Renew after removal

#### 7 - Gas injector seat

- ☐ Ensure proper seating of retaining clip on fuel rail.
- ☐ Proper sealing effect is reached only if there are no residues.

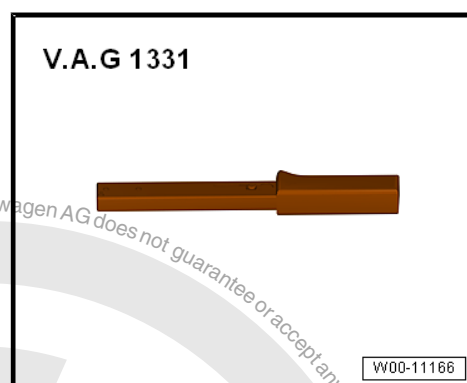
#### 8 - Fuel rail with injectors

- ☐ A leakage test of the system must always be performed after components have been removed ⇒ Maintenance ; Booklet 35.1 ; Description of work; Performing visual inspection of gas tanks for corrosion and leakage test .

## 4.2 Removing and installing gas rail with gas injector -N366- / -N367- / -N368-

### Special tools and workshop equipment required

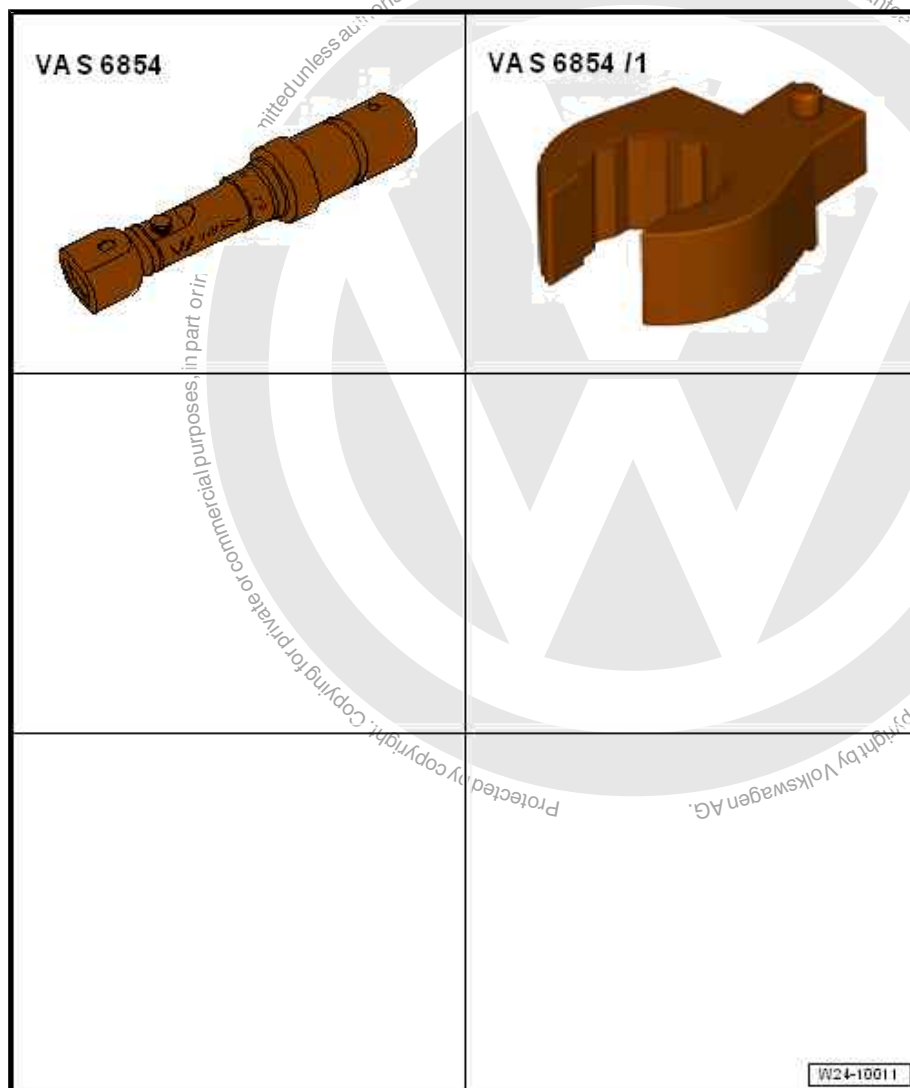
- ◆ Torque wrench - V.A.G 1331-





up! 2012 ➤ , up! 2017 ➤

3-cyl. injection engine (1.0 l, natural gas 4V, EA 211) - Edition 06.2019



- ◆ Torque wrench - VAS 6854-
- ◆ Tool insert (AF 16) - VAS 6854/1-

### Removing

- Pull hose -1- off air filter housing.



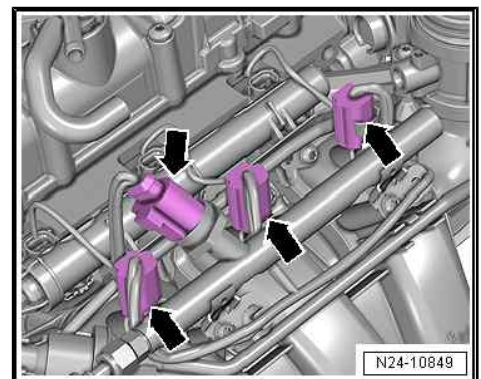
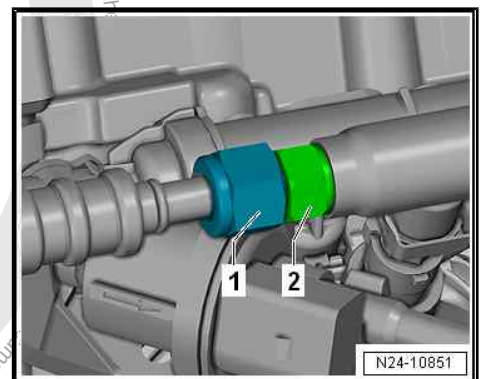
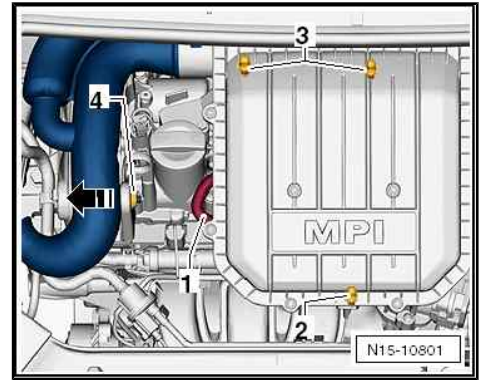
- Pull air filter housing upwards off studs at positions -2- and -3-.
- Push air filter housing and intake connecting pipe in -direction of arrow- out of mounting -4-.
- Remove air filter housing from engine compartment.

### **! DANGER**

**Risk of explosion and danger to life due to escaping natural gas. A hissing noise is a sign that there are leaks in the natural gas system. Leaks in natural gas system may lead to uncontrolled escape of natural gas.**

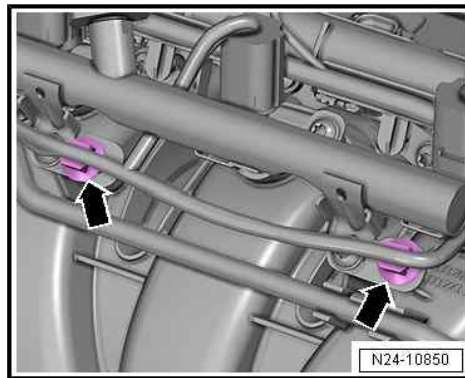
**Risk of explosion leading to serious injuries or death.**

- Do not perform any kind of work on the natural gas system if leaking gas can be heard.
- If a gas leak can be heard, do not drive the vehicle into the workshop.
- Park the vehicle outside and cordon off the area around it.
- Empty gas system ⇒ Rep. gr. 20 ; Fuel tank; Releasing pressure in high-pressure line .
- Loosen union nut at threaded connection of low-pressure line -1-, while at the same time counterholding at gas rail -2- with a spanner.
- Pull connectors -arrows- off gas injectors "-N366-, -N367-, -N368-" and gas rail sensor - G401- .





- Release retaining clips for wiring harness -arrows-.



- Unscrew bolts -1- from intake manifold.
- Pull gas rail -8- with gas injectors -4- out of the intake manifold.

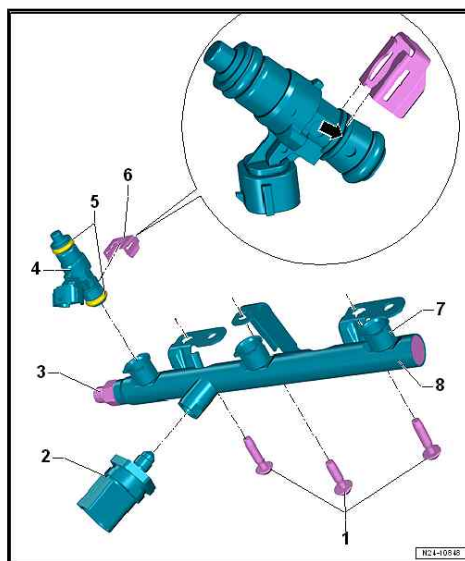
**If gas injectors or gas injector gaskets need to be renewed:**

- Carefully pull off retaining clip -6- of gas injector to be removed.
- Pull gas injector out of gas rail.

### Installing

Install in reverse order. During this procedure, observe the following:

- Renew seals -5-.
- Ensure proper seating of seals.





- Observe installation position of retaining clips -6- relative to gas injector -4-.
- Ensure proper seating of injectors -4- on injector seat -7-.

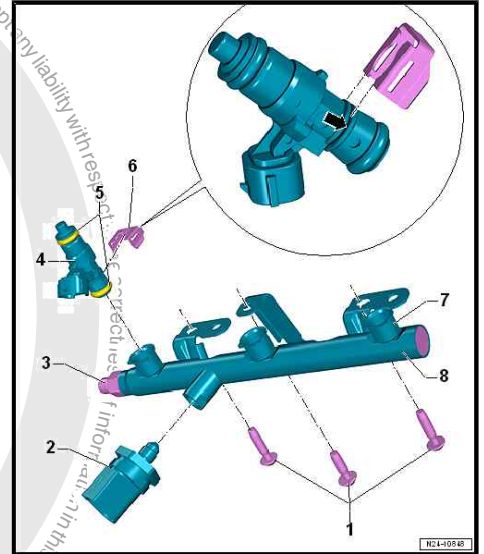
#### Note

- ◆ *The natural gas system may not be put into operation until it has been tested.*
- ◆ *The necessary scope of the leakage test depends on the pressure section which has been worked on.*
- ◆ *Observe the following allocation!*

#### DANGER

Risk of explosion and danger to life due to escaping natural gas. Leaks in natural gas system may lead to uncontrolled escape of natural gas. Risk of explosion leading to serious injuries or death.

- Check natural gas system for leaks.



#### Allocation:

⇒ **“3.1 Distinguishing between pressure sections of natural gas supply system”, page 212**

- Open fuel tank shut-off valves -N361/N362- using hand wheel - T50026- .

#### DANGER

Risk of explosion and danger to life due to escaping natural gas. A hissing noise is a sign that there are leaks in the natural gas system. Leaks in natural gas system may lead to uncontrolled escape of natural gas.

Risk of explosion leading to serious injuries or death.

- Do not perform any kind of work on the natural gas system if leaking gas can be heard.
- If a gas leak can be heard, do not drive the vehicle into the workshop.
- Park the vehicle outside and cordon off the area around it.

- Check the gas system  
⇒ **“3.5 Checking gas system for leaks”, page 217** .

#### Specified torques

- ◆ Union nut to gas rail  
⇒ **“4.1 Assembly overview - gas rail”, page 222**

Component	Specified torque
Bolts for securing fuel rail to intake manifold	7 Nm

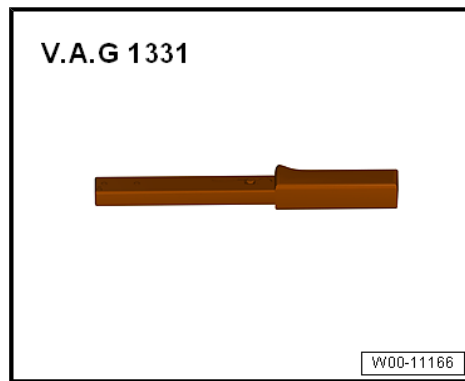
## 4.3 Removing and installing gas rail sensor - G401-

Special tools and workshop equipment required





- ◆ Torque wrench - V.A.G 1331-



#### Prerequisites for removal

##### **DANGER**

**Risk of explosion and danger to life due to escaping natural gas.**  
A hissing noise is a sign that there are leaks in the natural gas system. Leaks in natural gas system may lead to uncontrolled escape of natural gas.

**Risk of explosion leading to serious injuries or death.**

- Do not perform any kind of work on the natural gas system if leaking gas can be heard.
  - If a gas leak can be heard, do not drive the vehicle into the workshop.
  - Park the vehicle outside and cordon off the area around it.
- 
- Empty gas system ⇒ Rep. gr. 20 ; Fuel tank; Releasing pressure in high-pressure line .



- Pull off connector -1- and unscrew gas rail sensor - G401-2-.

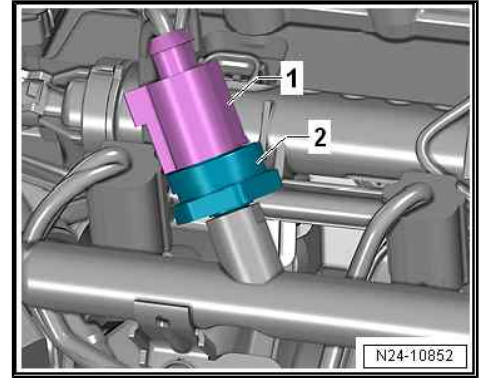
### Installing

Install in reverse order.



#### Note

- ◆ The natural gas system may not be put into operation until it has been tested.
- ◆ The necessary scope of the leakage test depends on the pressure section which has been worked on.
- ◆ Observe the following allocation!



### **! DANGER**

Risk of explosion and danger to life due to escaping natural gas. Leaks in natural gas system may lead to uncontrolled escape of natural gas. Risk of explosion leading to serious injuries or death.

- Check natural gas system for leaks.

#### Allocation:

⇒ **"3.1 Distinguishing between pressure sections of natural gas supply system", page 212**

- Open fuel tank shut-off valves -N361/N362- using hand wheel - T50026- .

### **! DANGER**

Risk of explosion and danger to life due to escaping natural gas. A hissing noise is a sign that there are leaks in the natural gas system. Leaks in natural gas system may lead to uncontrolled escape of natural gas.

Risk of explosion leading to serious injuries or death.

- Do not perform any kind of work on the natural gas system if leaking gas can be heard.
- If a gas leak can be heard, do not drive the vehicle into the workshop.
- Park the vehicle outside and cordon off the area around it.

- Check the gas system  
⇒ **"3.5 Checking gas system for leaks", page 217** .

### Specified torques

- ◆ Tightening gas rail sensor  
⇒ **"4.1 Assembly overview - gas rail", page 222**



## 5 Air filter

⇒ ["5.1 Assembly overview - air filter housing", page 230](#)

⇒ ["5.2 Removing and installing air filter housing", page 231](#)

### 5.1 Assembly overview - air filter housing

1 - Intake hose

2 - Bolt

□ Qty. 11

□ 1.6 Nm

3 - Air filter upper part

4 - Air filter element

□ ⇒ Maintenance ; Book-  
let 808

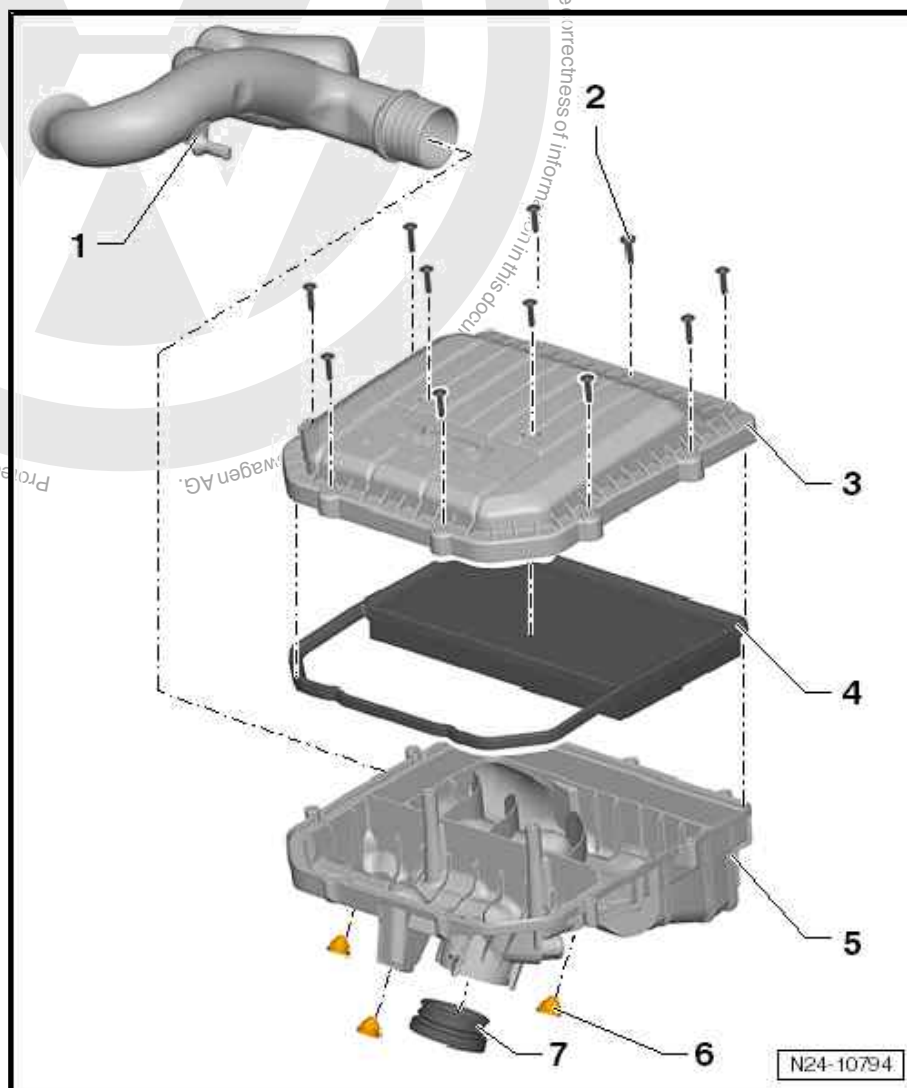
5 - Air filter lower part

6 - Rubber mounting

□ Ensure it is properly  
seated

7 - Seal

□ Ensure it is properly  
seated





## 5.2 Removing and installing air filter housing



### Note

- ◆ *Self-tapping bolts are used in production to fasten the upper part of the air filter to the lower part of the air filter. When these screws are loosened or tightened using a power tool, the threads in the intake manifold or the lower part of air filter may be damaged.*
- ◆ *Therefore, the use of a power tool is only permitted if the tool speed is max. 200 rpm.*
- ◆ *The tightening torque must not exceed 1.6 Nm.*

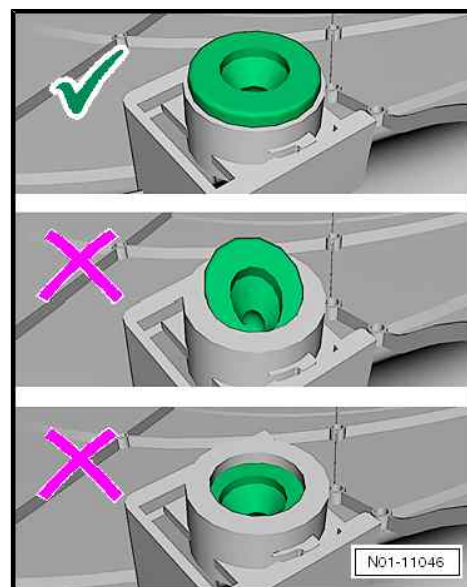
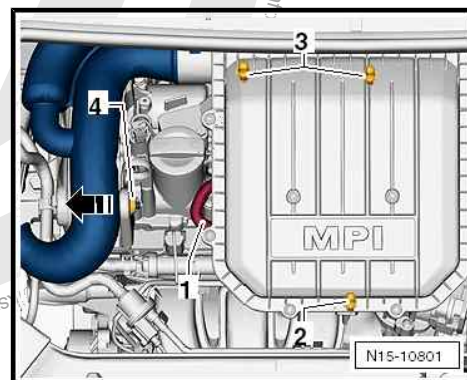
### Removing

- Pull hose -1- off air filter housing.
- Pull air filter housing upwards off studs at positions -2- and -3-.
- Push air filter housing and intake connecting pipe in -direction of arrow- out of mounting -4-.
- Remove air filter housing from engine compartment.
- Unscrew bolts ➔ [Item 2 \(page 230\)](#) for dismantling.

### Installing

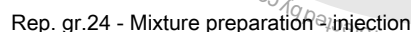
Install in reverse order. During this procedure, observe the following:

- Ensure proper seating of gasket.
- When installing engine cover panel, make sure that rubber buffers are correctly inserted into mountings.
- Ensure proper seating of air filter.



⇒ “6.4 Cleaning throttle valve module GX3”, page 239

- ☐ For fuel rail
- ☐ 7 Nm







## 6 - Intake manifold sender - GX9-

- ☐ Consisting of

Intake air temperature sender 2 - G299-

Intake manifold pressure sender - G71-

- ☐ Removing and installing ⇒ [“7.1 Removing and installing intake manifold sender GX9”, page 241](#)
- ☐ Repairing solution for missing locking tab  
⇒ [“7.1 Removing and installing intake manifold sender GX9”, page 241](#)
- ☐ 4-pin connector
- ☐ Gold-plated contacts
- ☐ When bolted 3 Nm

## 7 - O-ring

- ☐ Renew if damaged

## 8 - Intake manifold

- ☐ Removing and installing ⇒ [“6.2 Removing and installing intake manifold”, page 233](#)

## 9 - Bolt

- ☐ 20 Nm

## 10 - Seal

- ☐ Renew if damaged

## 11 - Seal

- ☐ Renew if damaged

## 6.2 Removing and installing intake manifold

### Special tools and workshop equipment required

- ◆ Torque wrench - V.A.G 1331-

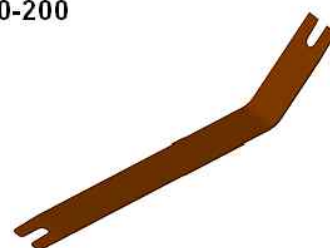
V.A.G 1331



W00-11166

- ◆ Release lever - 80 - 200-

80-200



W00-11156



## Removing

### DANGER

Risk of explosion and danger to life due to escaping natural gas. A hissing noise is a sign that there are leaks in the natural gas system. Leaks in natural gas system may lead to uncontrolled escape of natural gas.

Risk of explosion leading to serious injuries or death.

- Do not perform any kind of work on the natural gas system if leaking gas can be heard.
- If a gas leak can be heard, do not drive the vehicle into the workshop.
- Park the vehicle outside and cordon off the area around it.

- Empty gas system ⇒ Rep. gr. 20 ; Fuel tank; Releasing pressure in high-pressure line .
- Pull hose -1- off air filter housing.
- Pull air filter housing upwards off studs at positions -2- and -3-.
- Push air filter housing and intake connecting pipe in -direction of arrow- out of mounting -4-.
- Remove air filter housing from engine compartment.
- Bring lock carrier into service position ⇒ General body repairs, exterior; Rep. gr. 50 ; Lock carrier .



### Note

Place a cloth underneath to catch escaping fuel.

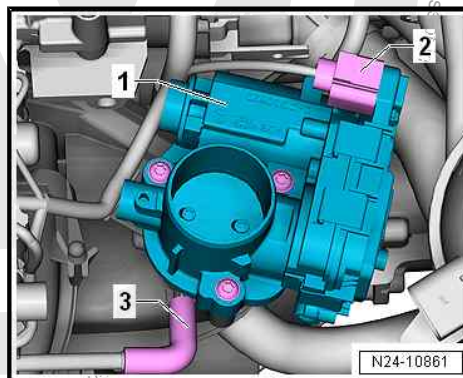
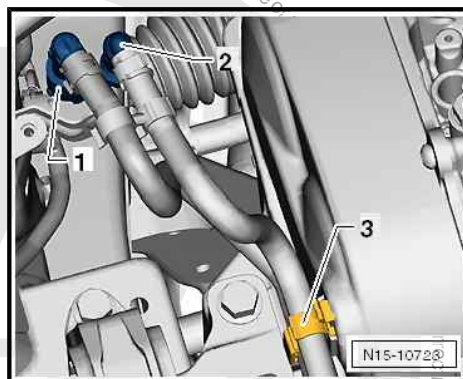
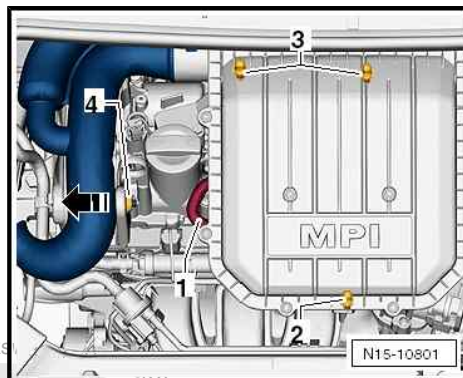
- Release and pull off fuel supply line -1- and breather line -2- ⇒ Rep. gr. 20 ; Plug-in connectors, Disconnecting plug-in connectors .
- Open line guide -3- and remove hoses.
- Seal lines so that fuel system is not contaminated by dirt.

- Release connector -2- and pull it off throttle valve module - GX3- -1-.
- Disconnect hose -3- from throttle valve module - GX3- .



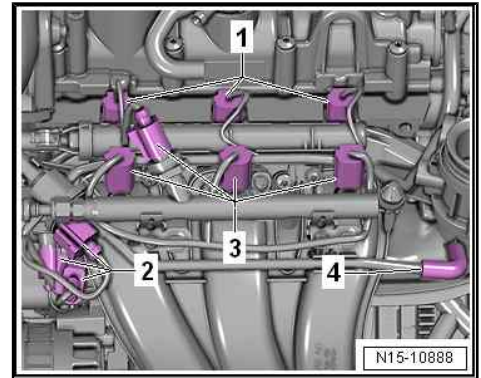
### Note

The connectors of fuel/gas injectors should be marked. This is necessary to prevent these compatible injectors from being accidentally interchanged!

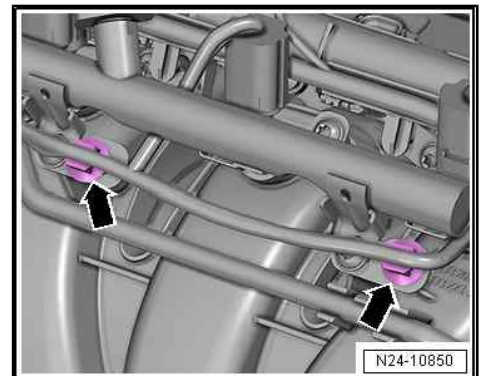




- Release and pull off connectors -1-, -2- and -3-.
- Remove line -4- together with activated charcoal filter system solenoid valve 1 - N80- and lay to side.

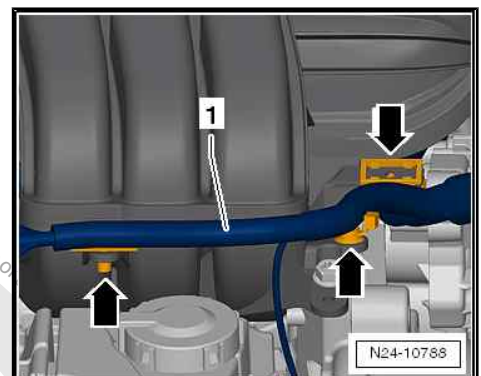


- Unclip wiring harness from retainers -arrows- on gas rail and lay to one side.
- Remove gas rail with gas injectors  
⇒ ["4.2 Removing and installing gas rail with gas injector N366 / N367 / N368", page 223](#) .
- Remove fuel rail together with injectors and lay to side  
⇒ ["2.2 Removing and installing injectors", page 201](#) .

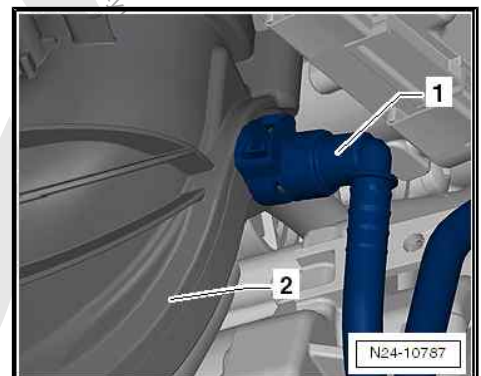


### Note

- ◆ *The fuel line does not need to be disconnected.*
- ◆ *Do not remove injectors from fuel rail.*
- Remove wiring harness -1- from retainers -arrows- on intake manifold.



- Remove vacuum line -1- from intake manifold -2-.

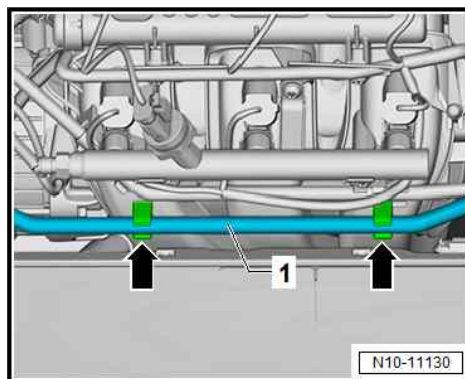




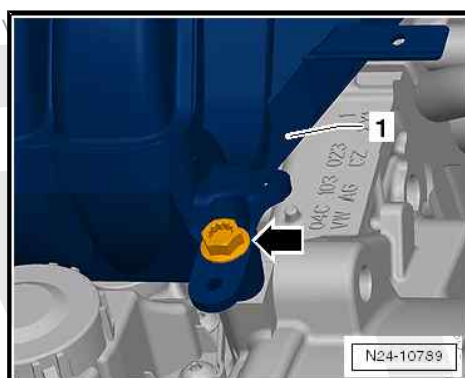
up! 2012 ➤ , up! 2017 ➤

3-cyl. injection engine (1.0 l, natural gas 4V, EA 211) - Edition 06.2019

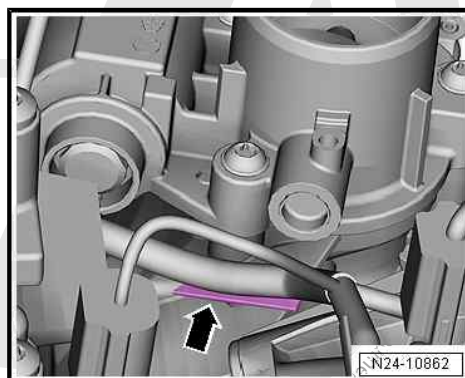
- If present, detach vacuum line -1- from retaining clips -arrows-.



- Unscrew lower bolt -arrow- from intake manifold -1-.



- Unclip wiring harness -arrow- from intake manifold.



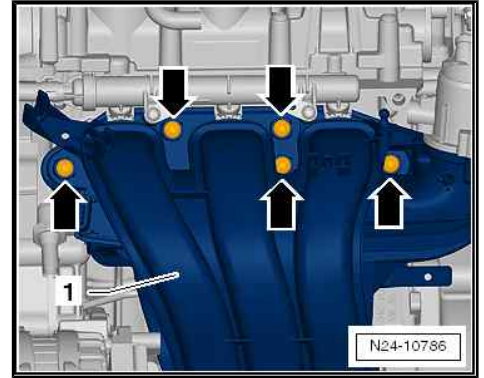


- Unscrew bolts -arrows-.
- Remove intake manifold -1-.
- If intake manifold is to be renewed, remove throttle valve module - GX3-  
⇒ [“6.3 Removing and installing throttle valve module GX3”](#),  
[page 238](#) .

### Installing

Install in reverse order. During this procedure, observe the following:

- Ensure proper seating of gaskets.
- Installing fuel rail  
⇒ [“2.2 Removing and installing injectors”](#), [page 201](#) .
- Install gas rail  
⇒ [“4.2 Removing and installing gas rail with gas injector N366 / N367 / N368”](#), [page 223](#) .



### Note

- ◆ *The natural gas system may not be put into operation until it has been tested.*
- ◆ *The necessary scope of the leakage test depends on the pressure section which has been worked on.*
- ◆ *Observe the following allocation!*



### DANGER

Risk of explosion and danger to life due to escaping natural gas. Leaks in natural gas system may lead to uncontrolled escape of natural gas. Risk of explosion leading to serious injuries or death.

- Check natural gas system for leaks.

### Allocation:

⇒ [“3.1 Distinguishing between pressure sections of natural gas supply system”](#), [page 212](#)

- Open fuel tank shut-off valves -N361/N362- using hand wheel - T50026- .



### DANGER

Risk of explosion and danger to life due to escaping natural gas. A hissing noise is a sign that there are leaks in the natural gas system. Leaks in natural gas system may lead to uncontrolled escape of natural gas.

Risk of explosion leading to serious injuries or death.

- Do not perform any kind of work on the natural gas system if leaking gas can be heard.
- If a gas leak can be heard, do not drive the vehicle into the workshop.
- Park the vehicle outside and cordon off the area around it.

- Check the gas system  
⇒ [“3.5 Checking gas system for leaks”](#), [page 217](#) .

### Specified torques

- ◆ Specified torques for fuel rail  
⇒ [“2.1 Assembly overview - fuel rail with injectors”](#), [page 201](#)





- ◆ Specified torques for gas rail  
⇒ [“4.1 Assembly overview - gas rail”, page 222](#)
- ◆ ⇒ [“6.1 Assembly overview - intake manifold”, page 232](#)

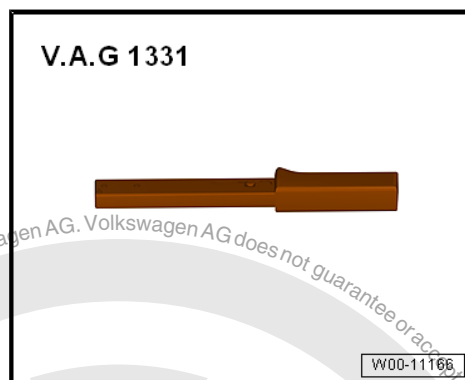
## 6.3 Removing and installing throttle valve module - GX3-

Throttle valve module - GX3- consists of

- ◆ Throttle valve module - J338-
- ◆ Throttle valve drive for electronic power control - G186-
- ◆ Throttle valve drive angle sender 1 for electronic power control - G187-
- ◆ Throttle valve drive angle sender 2 for electronic power control - G188-

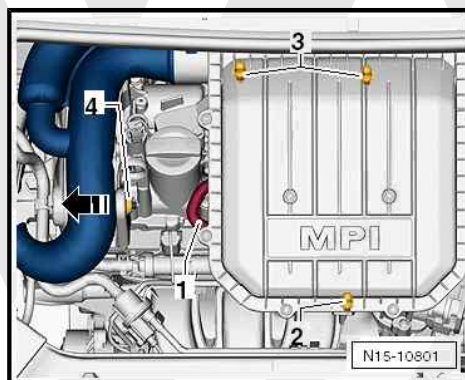
### Special tools and workshop equipment required

- ◆ Torque wrench - V.A.G 1331-

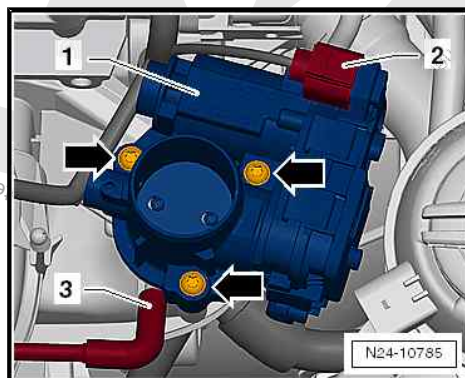


### Removing

- Pull hose -1- off air filter housing.
- Pull air filter housing upwards off studs at positions -2- and -3-.
- Push air filter housing and intake connecting pipe in -direction of arrow- out of mounting -4-.
- Remove air filter housing from engine compartment.



- Unlock and disconnect connector -2- from throttle valve module - GX3- -1-.
- Pull off hose -3-.
- Remove bolts -arrows- and detach throttle valve module - GX3- .



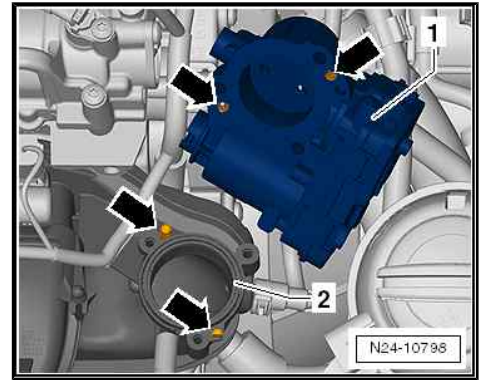
### Installing

Install in reverse order. During this procedure, observe the following:

- Check throttle valve module - GX3- for cleanliness.
- Ensure proper seating of gasket.



- Ensure proper seating of guides -arrows-.
- Throttle valve module - GX3- -1- must accurately be fitted onto intake manifold -2-.
- After throttle valve control module - GX3- has been replaced, it must be re-adapted to engine control unit - J623- .
- Connect a ➔ Vehicle diagnostic tester.
- Switch on ignition, and select and carry out following menu options on➔ Vehicle diagnostic tester:
  - ◆ `0001 - Clear learnt values`
  - ◆ `0001 - Adaption of throttle valve module - J338`



#### Specified torques

- ◆ ➔ ["6.1 Assembly overview - intake manifold", page 232](#)

## 6.4 Cleaning throttle valve module - GX3-



#### Note

- ◆ *If a new engine control unit - J623- is installed, the throttle valve module must be adjusted. Adaptation is only allowed to be made with a new or cleaned throttle valve module.*
- ◆ *Contamination and coking in throttle valve end stop can result in incorrect adaptation values.*
- ◆ *When cleaning the throttle valve housing, take care not to scratch it.*
- Remove throttle valve module  
➔ ["6.3 Removing and installing throttle valve module GX3 ", page 238](#) .
- Open throttle valve by hand, and use a suitable object to lock it in open position (e.g. wood or plastic wedge) -arrow-.



#### CAUTION

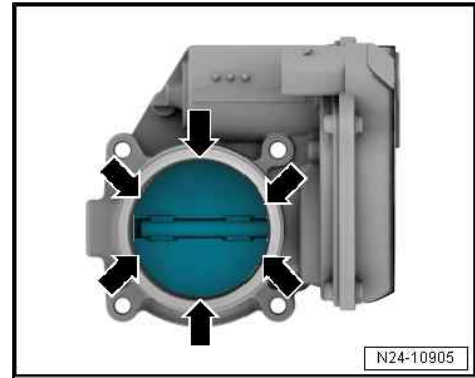
**Risk of injury caused by acetone. Acetone is highly flammable and may cause eye and skin irritation.**

- Wear protective goggles.
- Wear protective gloves.





- Thoroughly clean throttle valve connection, especially around closed throttle valve -arrows- using commercially available acetone to DIN 53247 and a brush.
- Wipe the inside of the throttle valve housing with a lint-free cloth.
- Allow acetone to vent completely and reinstall cleaned throttle valve module  
⇒ ["6.3 Removing and installing throttle valve module GX3 ", page 238](#) .
- After throttle valve control module - GX3- has been replaced, it must be re-adapted to engine control unit - J623- .
- Connect a ⇒ Vehicle diagnostic tester.
- Switch on ignition, and select and carry out following menu options on⇒ Vehicle diagnostic tester:
  - ◆ 0001 - Clear learnt values
  - ◆ 0001 - Adaption of throttle valve module - J338





## 7 Senders and sensors

⇒ **"7.1 Removing and installing intake manifold sender GX9", page 241**

### 7.1 Removing and installing intake manifold sender - GX9-

Intake manifold sender - GX9- consists of:

- ◆ Intake air temperature sender 2 - G299-
- ◆ Intake manifold pressure sender - G71-

**Special tools and workshop equipment required**

- ◆ Torque wrench - V.A.G 1783-



#### Removing

- Release and disconnect connector from intake manifold sender - GX9-
- Remove intake manifold sender - GX9- -2-. To do this, carefully release retaining tab -arrow-.



#### Note

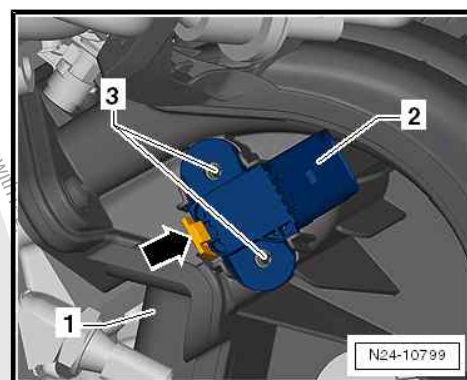
*The intake manifold sender - GX9- could also be bolted to the intake manifold -2-. In this case unscrew the bolts from holes -3-.*

#### Installing

Install in reverse order. During this procedure, observe the following:

- Check seal for damage and renew if necessary.

Ensure that intake manifold sender - GX9- is properly seated and securely engaged in intake manifold.



#### Note

- ◆ *The intake manifold sender - GX9- may also be bolted to intake manifold -2-.*
- ◆ *Observe allocation of bolts ⇒ Electronic Parts Catalogue (ET-KA).*



up! 2012 ➤ , up! 2017 ➤

3-cyl. injection engine (1.0 l, natural gas 4V, EA 211) - Edition 06.2019

### Specified torques

Component	Specified torque
Intake manifold sender - GX9- to intake manifold	3 Nm



## 8 Engine control unit

⇒ ["8.1 Assembly overview - engine control unit", page 243](#)

⇒ ["8.2 Removing and installing engine \(motor\) control unit J623", page 243](#)

⇒ ["8.3 Removing and installing engine \(motor\) control unit J623 with protective housing", page 245](#)

### 8.1 Assembly overview - engine control unit

#### 1 - Bracket

- ☐ Bracket secured to battery tray

#### 2 - Bolt without theft protection

- ☐ For vehicle without theft protection
- ☐ Installed on left and right
- ☐ Allocation ⇒ Electronic parts catalogue (ETKA)
- ☐ 9 Nm

#### 3 - Engine control unit - J623-

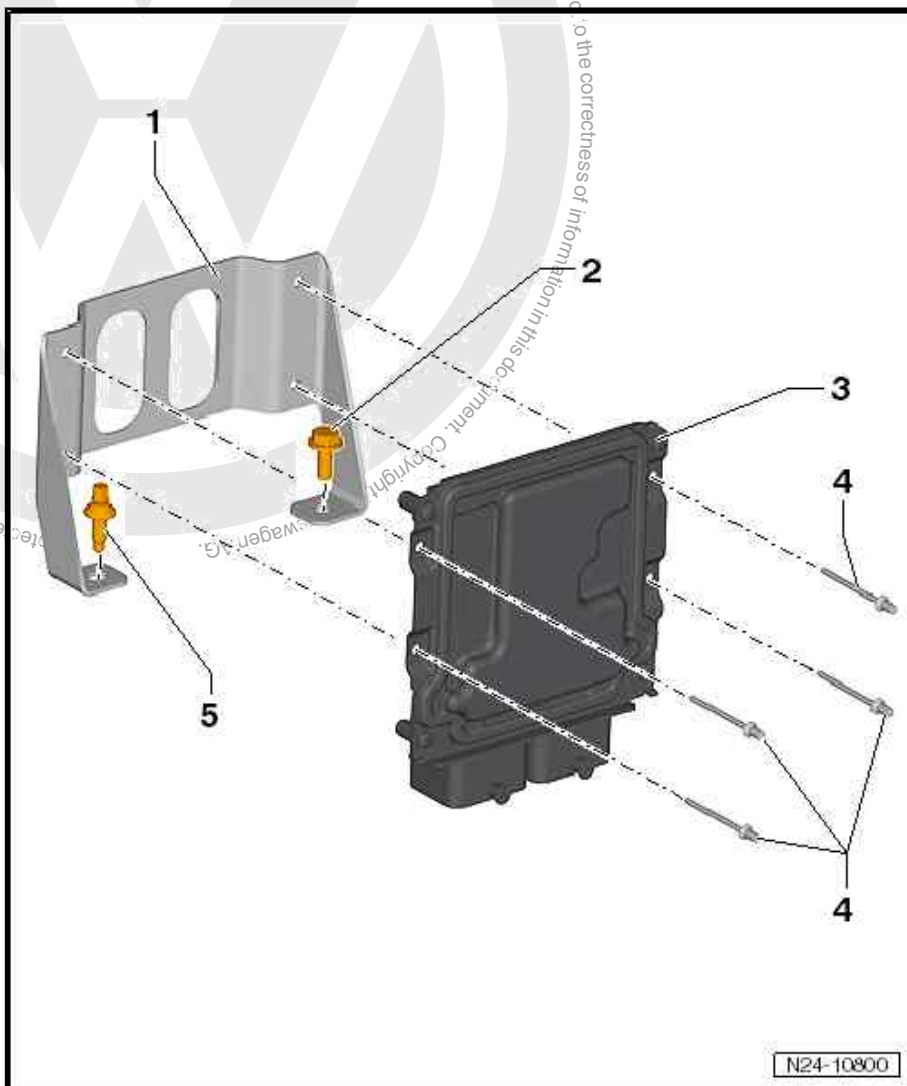
- ☐ Removing and installing without theft protection  
⇒ ["8.2 Removing and installing engine \(motor\) control unit J623", page 243](#)
- ☐ Removing and installing with theft protection  
⇒ ["8.3 Removing and installing engine \(motor\) control unit J623 with protective housing", page 245](#)

#### 4 - Rivets

- ☐ For securing bracket to engine control unit
- ☐ Allocation ⇒ Electronic parts catalogue (ETKA)

#### 5 - Bolt with theft protection

- ☐ For vehicles with theft protection
- ☐ Installed on left and right
- ☐ Tighten shear-head screws evenly until head shears off.
- ☐ Allocation ⇒ Electronic parts catalogue (ETKA)

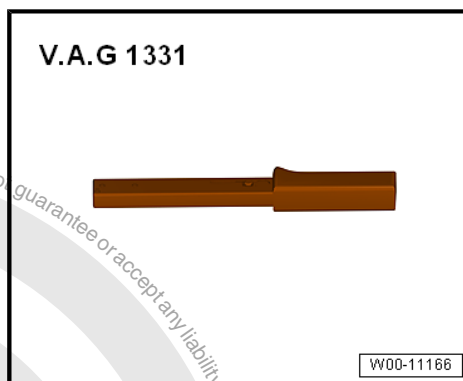


### 8.2 Removing and installing engine (motor) control unit - J623-

Special tools and workshop equipment required

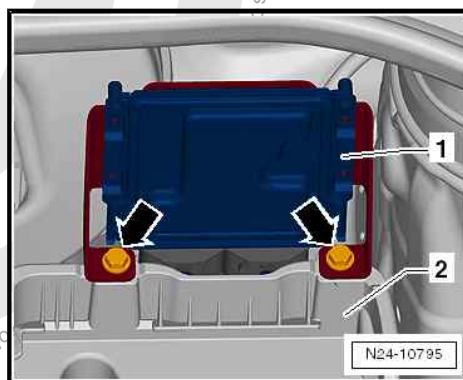


- ◆ Torque wrench - V.A.G 1331-

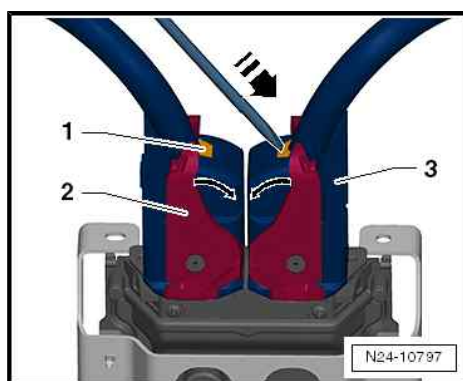


### Removing

- If engine control unit is renewed, select 0001 - Renew engine control unit in ⇒ Vehicle diagnostic tester.
- Switch off ignition.
- Remove battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery .
- Unscrew bolts -arrows- from battery tray -2-.
- Tilt engine control unit -1- forwards together with bracket.



- Push locking mechanism -1- with a screwdriver in -direction of arrow- and keep pushed.
- Unlock connector -3- from engine control unit using locking bar -2-.
- To do this, push locking bar -2- in -direction of arrow-.
- Remove engine control unit together with bracket.



### Installing

Install in reverse order. During this procedure, observe the following:

**After installing a new engine control unit, the following operations must be performed:**

- Connect ⇒ Vehicle diagnostic tester.
- Switch on ignition, and select following menu options on⇒ Vehicle diagnostic tester:
  - ◆ 0001 - Renew engine control unit
  - ◆ 0001 - Adapt new engine control unit to immobiliser



## Specified torques

Component	Specified torque
Engine control unit to battery tray	9 Nm

- ◆ Install battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery .

## 8.3 Removing and installing engine (motor) control unit - J623- with protective housing

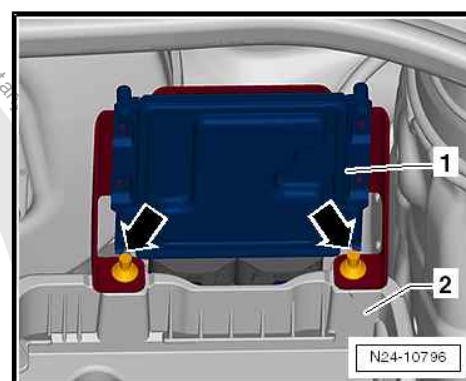
### Special tools and workshop equipment required

- ◆ Torque wrench - V.A.G 1331-



### Removing

- If engine control unit is renewed, select 0001 - Renew engine control unit in ⇒ Vehicle diagnostic tester.
- Switch off ignition.
- Remove battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery .
- Remove shear-head bolts -arrows- with suitable workshop equipment.
- Unscrew bolts -arrows- from battery tray -2-.
- Tilt engine control unit -1- forwards together with bracket.





- Push locking mechanism -1- with a screwdriver in -direction of arrow- and keep pushed.
- Unlock connector -3- from engine control unit using locking bar -2-.
- To do this, push locking bar -2- in -direction of arrow-.
- Remove engine control unit together with bracket.

#### Installing

Install in reverse order. During this procedure, observe the following:

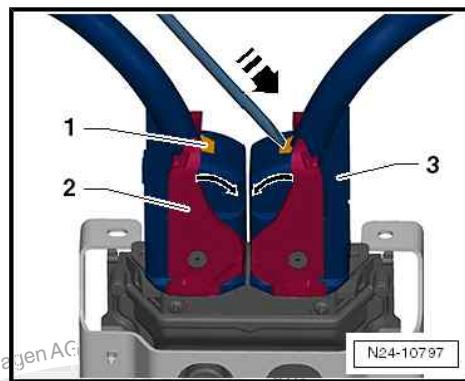
- Tighten shear-head screws evenly until head shears off.

**After installing a new engine control unit, the following operations must be performed:**

- Connect ⇒ Vehicle diagnostic tester.
- Switch on ignition, and select following menu options on⇒ Vehicle diagnostic tester:

◆ 0001 - Renew engine control unit

◆ 0001 - Adapt new engine control unit to immobiliser



#### Specified torques

Component	Specified torque
Engine control unit to battery tray	9 Nm
Battery	⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery .

## 9 Lambda probe

⇒ [“9.1 Assembly overview - Lambda probe”, page 247](#)

⇒ [“9.2 Removing and installing Lambda probe”, page 251](#)

### 9.1 Assembly overview - Lambda probe

⇒ [“9.1.1 Assembly overview - lambda probe, vehicles with close-coupled emission control”, page 247](#)

⇒ [“9.1.2 Assembly overview - lambda probe, vehicles with emission control on underbody”, page 249](#)

⇒ [“9.1.3 Assembly overview - lambda probe, vehicles with two catalytic converters”, page 250](#)

#### 9.1.1 Assembly overview - lambda probe, vehicles with close-coupled emission control

##### 1 - Engine

##### 2 - Seal

- ☐ Renew after removal

##### 3 - Lambda probe 1 before catalytic converter - GX10-

Consisting of:

Lambda probe - G39-

Lambda probe heater - Z19-

- ☐ Grease only the threads with “G 052 112 A3”; “G 052 112 A3” cannot get into the slots on the probe body.
- ☐ Removing and installing  
⇒ [“9.2.1 Removing and installing Lambda probe 1 before catalytic converter GX10”, page 251](#)
- ☐ If seal is leaking, nip open and renew.
- ☐ 50 Nm

##### 4 - Nut

- ☐ Observe assembling procedure ⇒ [page 268](#)
- ☐ 23 Nm

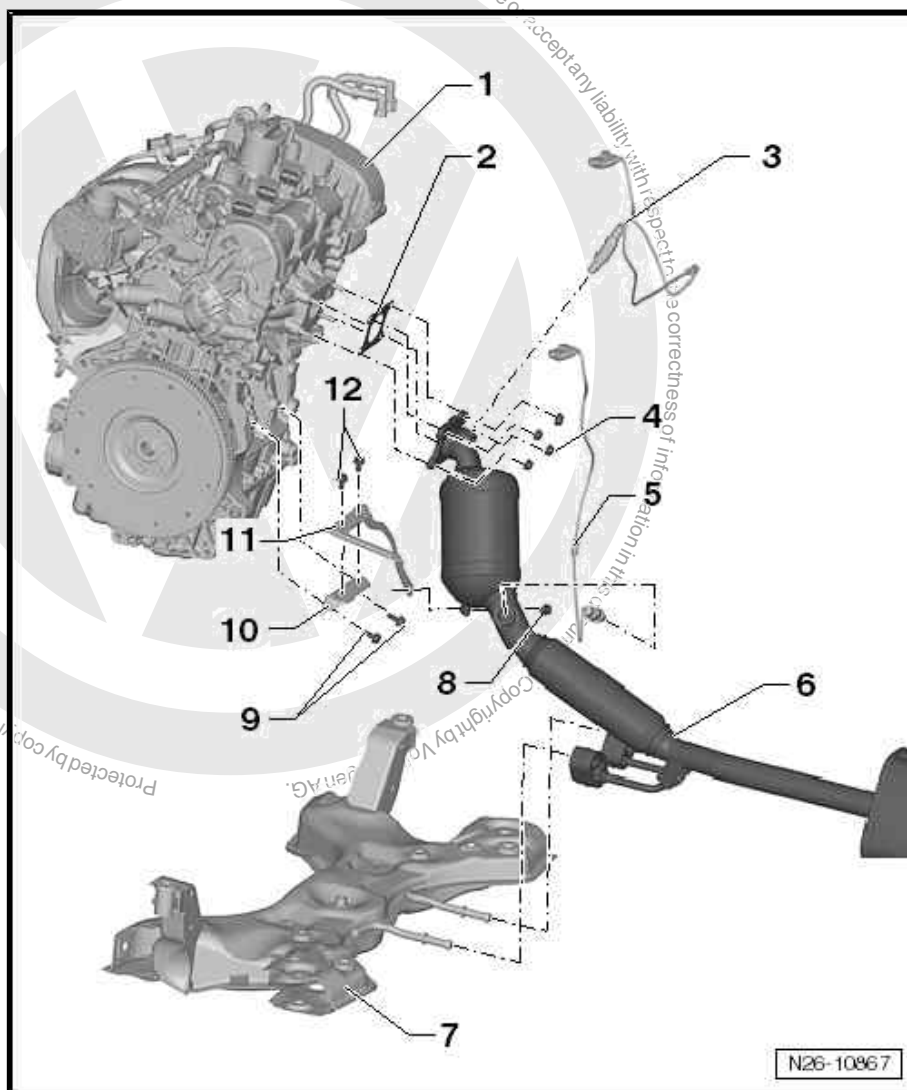
##### 5 - Lambda probe 1 after catalytic converter - GX7-

Consisting of:

Lambda probe after catalytic converter - G130-

Lambda probe 1 heater after catalytic converter - Z29-

- ☐ Grease only the threads with “G 052 112 A3”; “G 052 112 A3” cannot get into the slots on the probe body.
- ☐ Removing and installing  
⇒ [“9.2.2 Removing and installing Lambda probe 1 after catalytic converter GX7”, page 252](#)



N26-10867





- ☐ If seal is leaking, nip open and renew.
- ☐ 50 Nm

#### 6 - Front exhaust pipe

- ☐ Removing and installing ⇒ ["2.2 Removing and installing catalytic converter", page 271](#)

#### 7 - Subframe with bracket

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

#### 8 - Bolt

- ☐ Catalytic converter to bracket
- ☐ 23 Nm

#### 9 - Bolt

- ☐ Bracket to cylinder block
- ☐ 23 Nm

#### 10 - Bracket

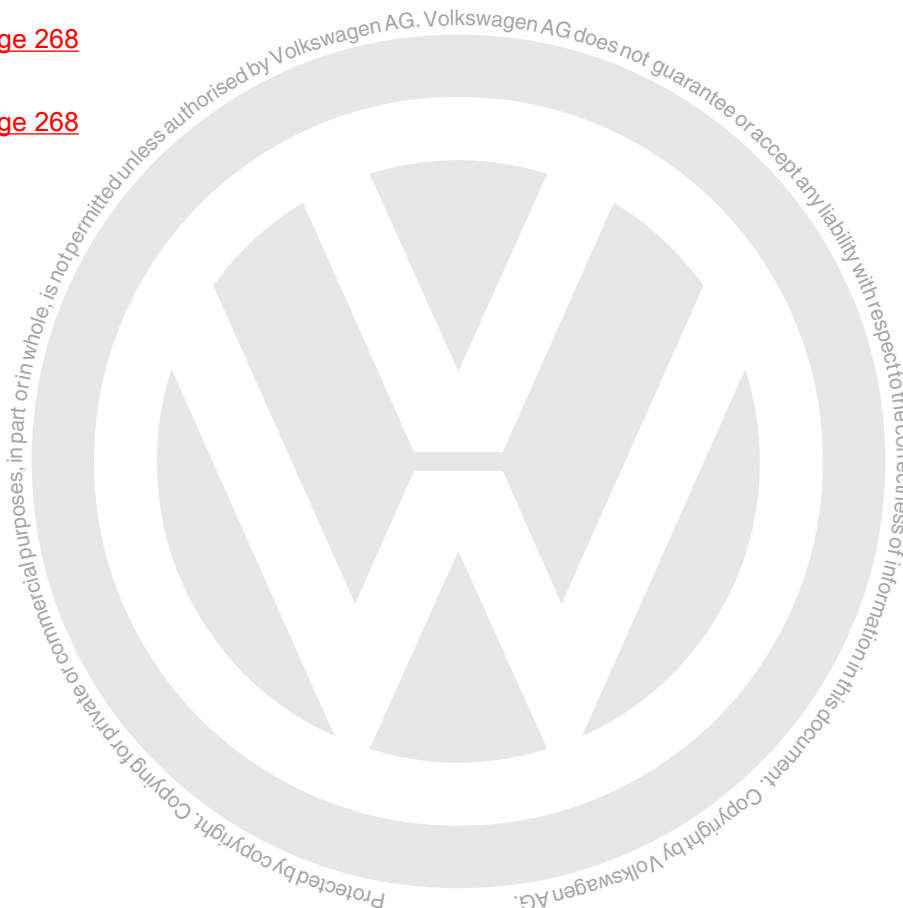
- ☐ to cylinder block
- ☐ Observe assembling procedure ⇒ [page 268](#)

#### 11 - Bracket

- ☐ Observe assembling procedure ⇒ [page 268](#)

#### 12 - Bolt

- ☐ 23 Nm





## 9.1.2 Assembly overview - lambda probe, vehicles with emission control on underbody

### 1 - Engine

### 2 - Seal

- ☐ Renew after removal

### 3 - Lambda probe 1 after catalytic converter - GX7-

Consisting of:

Lambda probe after catalytic converter - G130-

Lambda probe 1 heater after catalytic converter - Z29-

- ☐ Grease only the threads with "G 052 112 A3"; "G 052 112 A3" cannot get into the slots on the probe body.
- ☐ Removing and installing
- ☐ If seal is leaking, nip open and renew.
- ☐ 50 Nm

### 4 - Nut

- ☐ 23 Nm

### 5 - Front exhaust pipe

- ☐ Removing and installing  
⇒ ["2.2 Removing and installing catalytic converter", page 271](#)

### 6 - Mounting

- ☐ Renew if damaged

### 7 - Subframe with bracket

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

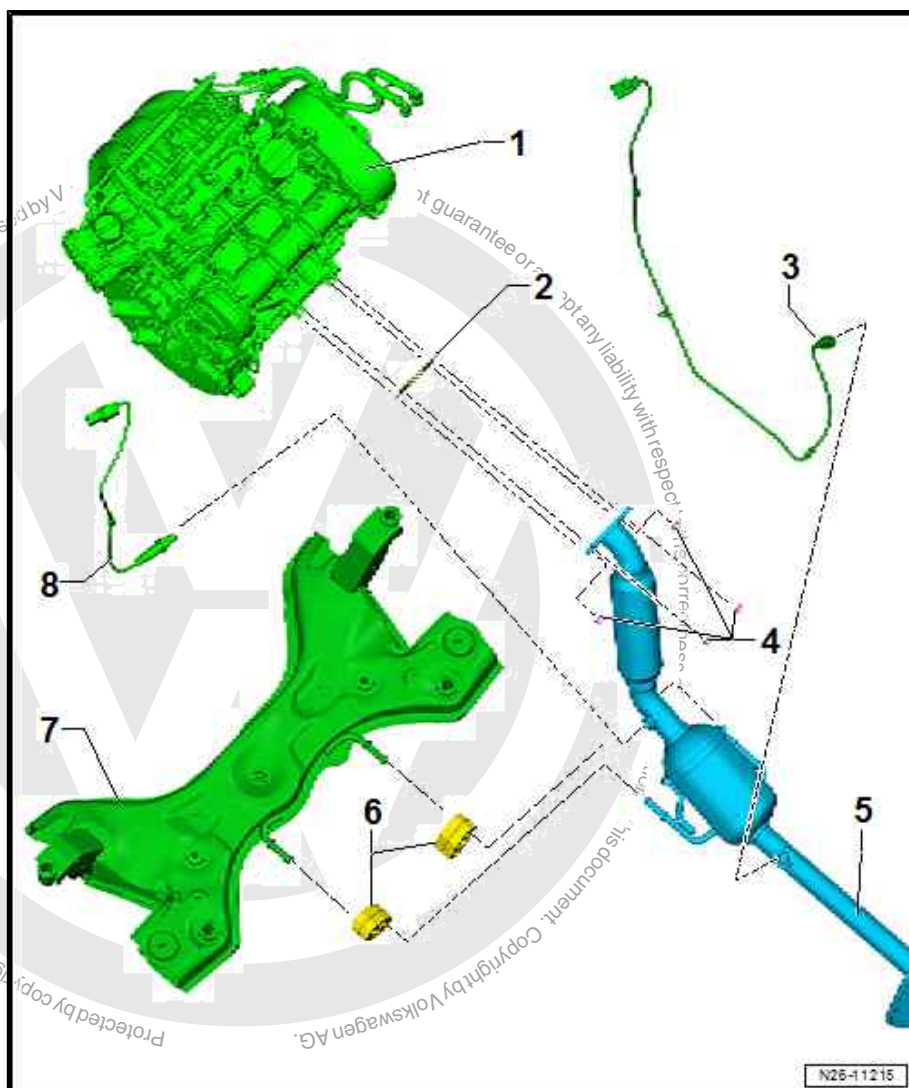
### 8 - Lambda probe 1 before catalytic converter - GX10-

Consisting of:

Lambda probe - G39-

Lambda probe heater - Z19-

- ☐ Grease only the threads with "G 052 112 A3"; "G 052 112 A3" cannot get into the slots on the probe body.
- ☐ Removing and installing
- ☐ If seal is leaking, nip open and renew.
- ☐ 50 Nm



### 9.1.3 Assembly overview - lambda probe, vehicles with two catalytic converters

#### 1 - Engine

#### 2 - Seal

- ☐ Renew after removal

#### 3 - Lambda probe 1 ahead of catalytic converter - GX10-

- ☐ Grease only the threads with "G 052 112 A3"; "G 052 112 A3" cannot get into the slots on the probe body.
- ☐ Removing and installing ⇒ ["9.2.1 Removing and installing Lambda probe 1 before catalytic converter GX10"](#), page 251
- ☐ If seal is leaking, nip open and renew.
- ☐ 50 Nm

#### 4 - Nut

- ☐ Observe assembling procedure ⇒ [page 271](#)
- ☐ 23 Nm

#### 5 - Lambda probe 1 after catalytic converter - GX7-

- ☐ Grease only the threads with "G 052 112 A3"; "G 052 112 A3" cannot get into the slots on the probe body.
- ☐ Removing and installing ⇒ ["9.2.2 Removing and installing Lambda probe 1 after catalytic converter GX7"](#), page 252
- ☐ If seal is leaking, nip open and renew.
- ☐ 50 Nm

#### 6 - Front exhaust pipe

- ☐ Removing and installing ⇒ ["2.2 Removing and installing catalytic converter"](#), page 271

#### 7 - Subframe with bracket

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

#### 8 - Bolt

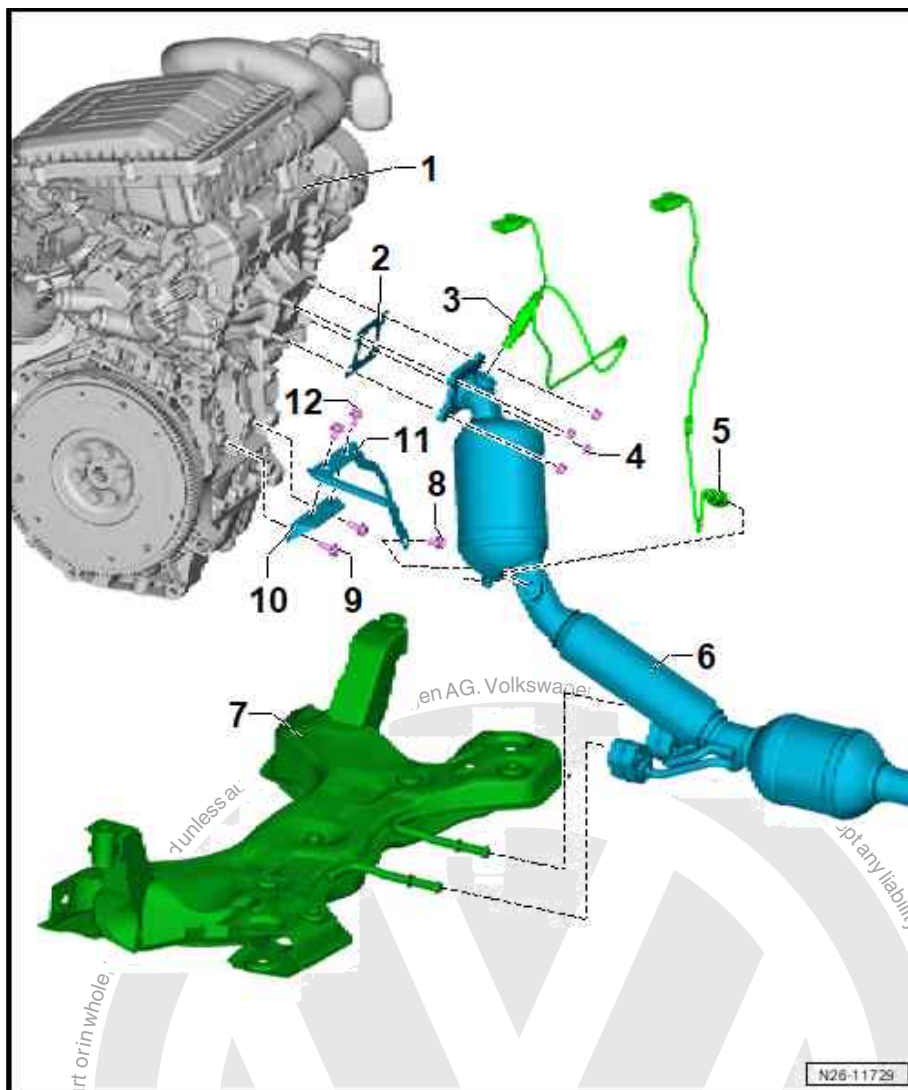
- ☐ Catalytic converter to bracket
- ☐ 23 Nm

#### 9 - Bolt

- ☐ Bracket to cylinder block
- ☐ 23 Nm

#### 10 - Bracket

- ☐ to cylinder block
- ☐ Observe assembling procedure ⇒ [page 271](#)





## 11 - Bracket

- ☐ Observe assembling procedure ➔ [page 271](#)

## 12 - Bolt

- ☐ 23 Nm

## 9.2 Removing and installing Lambda probe

➔ ["9.2.1 Removing and installing Lambda probe 1 before catalytic converter GX10", page 251](#)

➔ ["9.2.2 Removing and installing Lambda probe 1 after catalytic converter GX7", page 252](#)

➔ ["9.2.3 Removing and installing lambda probe, vehicles with emission control on underbody", page 253](#)

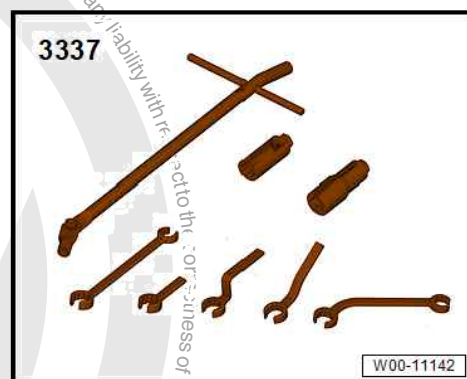
### 9.2.1 Removing and installing Lambda probe 1 before catalytic converter - GX10-

Lambda probe 1 before catalytic converter - GX10- consists of

- ◆ Lambda probe - G39-
- ◆ Lambda probe heater - Z19-

**Special tools and workshop equipment required**

- ◆ Lambda probe open ring spanner set - 3337-



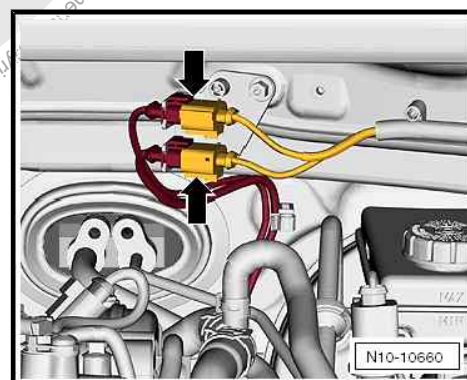
### Removing

- Pull hose 1- off air filter housing.
- Remove air filter housing  
➔ ["5.2 Removing and installing air filter housing", page 231](#) .
- Release and pull off lower connectors of lambda probe 1 before catalytic converter - GX10- -arrow-.

Steckerfarbe braun - Lambda probe 1 before catalytic converter - GX10-

Steckerfarbe schwarz - Lambda probe 1 after catalytic converter - GX7-

- Remove wiring harness from guides.





- Unscrew lambda probe 1 before catalytic converter - GX10-  
-1- from catalytic converter -2-.

### Installing

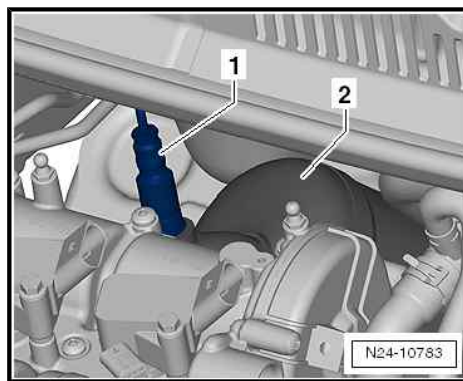
Install in reverse order. During this procedure, observe the following:

Grease only the threads with "G 052 112 A3"; "G 052 112 A3" must not get into the slots on the probe body.

If seal is leaking, nip open and renew.

### Specified torques

- ♦ ⇒ ["9.1 Assembly overview - Lambda probe", page 247](#)



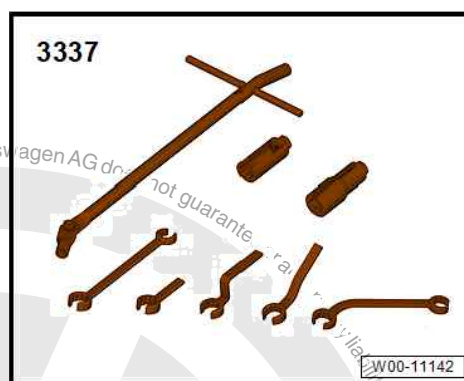
## 9.2.2 Removing and installing Lambda probe 1 after catalytic converter - GX7-

Lambda probe 1 after catalytic converter - GX7- consists 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-



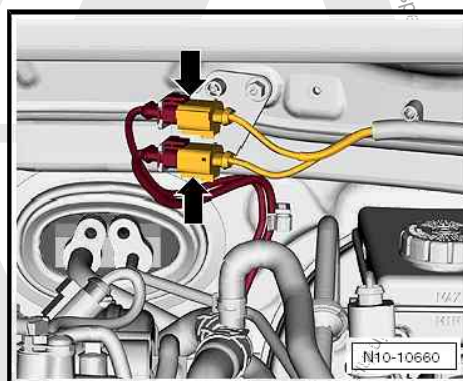
### Removing

- Release and pull off upper connectors of lambda probe 1 after catalytic converter - GX7- -arrow-.

Steckerfarbe braun - Lambda probe 1 before catalytic converter - GX10-

Steckerfarbe schwarz - Lambda probe 1 after catalytic converter - GX7-

- Remove wiring harness from guides.







- Unscrew lambda probe 1 after catalytic converter - GX7- -1- from catalytic converter -2- from below.

### Installing

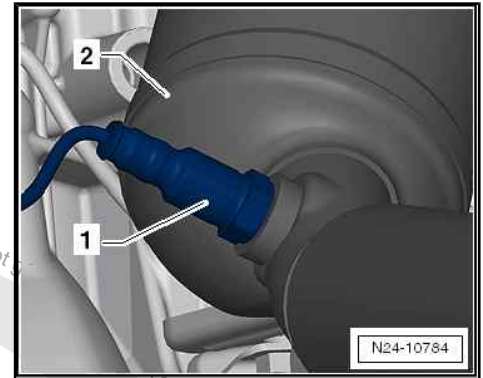
Install in reverse order. During this procedure, observe the following:

Grease only the threads with "G 052 112 A3"; "G 052 112 A3" must not get into the slots on the probe body.

If seal is leaking, nip open and renew.

### Specified torques

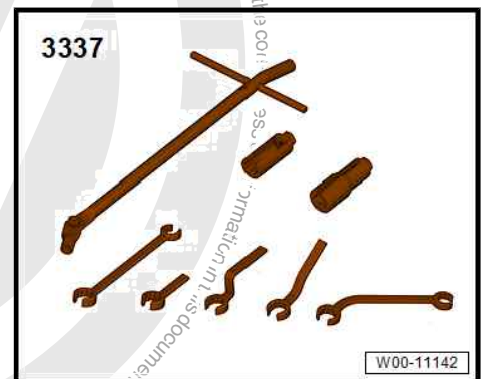
- ◆ ⇒ ["9.1 Assembly overview - Lambda probe", page 247](#)



## 9.2.3 Removing and installing lambda probe, vehicles with emission control on underbody

### Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set - 3337-



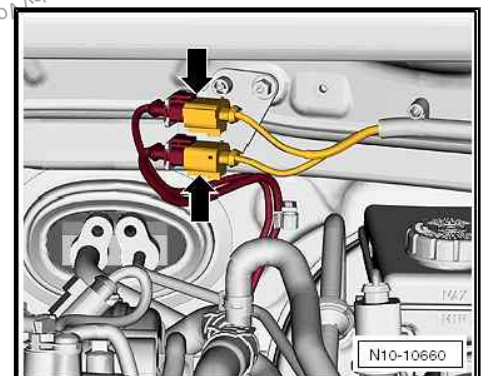
### Removing

- Release and pull off relevant connectors -arrow-.

Steckerfarbe braun - Lambda probe 1 before catalytic converter - GX10-

Steckerfarbe schwarz - Lambda probe 1 after catalytic converter - GX7-

- Unclip connector from relevant bracket.
- Remove wiring harness from guides.





up! 2012 ➤ , up! 2017 ➤

3-cyl. injection engine (1.0 l, natural gas 4V, EA 211) - Edition 06.2019

- Unscrew respective lambda probe from catalytic converter -1-.

2 - Lambda probe 1 before catalytic converter - GX10-

3 - Lambda probe 1 after catalytic converter - GX7-

### Installing

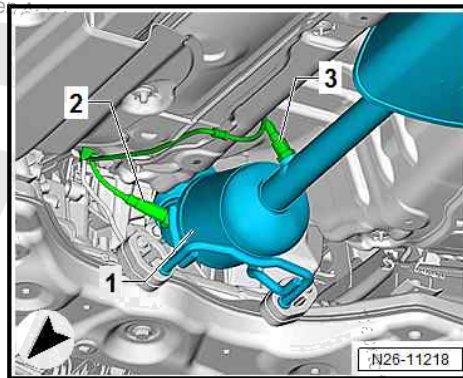
Install in reverse order. During this procedure, observe the following:

Grease only the threads with "G 052 112 A3"; "G 052 112 A3" must not get into the slots on the probe body.

If seal is leaking, nip open and renew.

### Specified torques

- ◆ ⇒ ["9.1 Assembly overview - Lambda probe", page 247](#)



## 10 Gas pressure regulator

⇒ ["10.1 Assembly overview - gas pressure regulator", page 255](#)

⇒ ["10.2 Removing and installing gas pressure regulator", page 256](#)

⇒ ["10.3 Removing and installing tank pressure sensor G400", page 259](#)

### 10.1 Assembly overview - gas pressure regulator

#### 1 - Connector

- ☐ Tank pressure sensor - G400-

#### 2 - Connector

- ☐ High-pressure valve for gas mode - N372-

#### 3 - Coolant hoses

- ☐ Remove and install spring-type clips with hose clip pliers - VAS 6340- .

#### 4 - Bolts

- ☐ Qty. 2
- ☐ 8 Nm

#### 5 - Bolts

- ☐ Qty. 2
- ☐ 8 Nm

#### 6 - Bracket

#### 7 - Nut

- ☐ 8 Nm

#### 8 - Bonded rubber bush

- ☐ Screw in hand-tight

#### 9 - Bracket

#### 10 - Nut

- ☐ 8 Nm

#### 11 - Low-pressure line

- ☐ 5 Nm +135°

#### 12 - Pipe connection

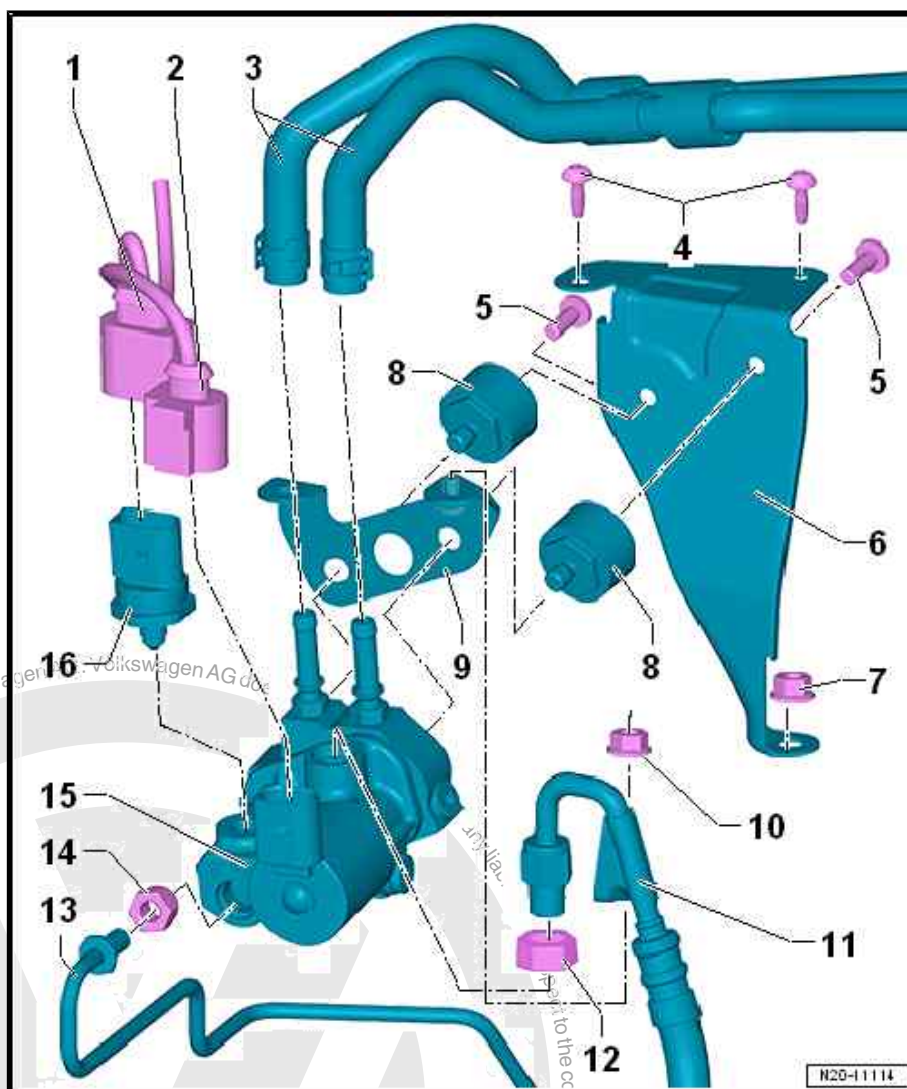
- ☐ Counterhold on pipe connection when loosening fuel line.
- ☐ 18 Nm + 2 Nm

#### 13 - High-pressure line

- ☐ Counterhold on pipe connection when loosening fuel line.
- ☐ Screw on union nut by hand as far as stop.
- ☐ 17 Nm

#### 14 - Pipe connection

- ☐ Counterhold on pipe connection when loosening fuel line.
- ☐ 18 Nm + 2 Nm





## 15 - Gas pressure regulator

- ☐ To high-pressure valve for gas mode - N372-
- ☐ Removing and installing ⇒ ["10.2 Removing and installing gas pressure regulator", page 256](#)

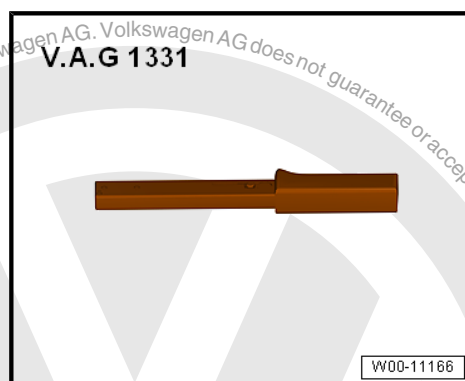
## 16 - Tank pressure sensor - G400-

- ☐ Removing and installing ⇒ ["10.3 Removing and installing tank pressure sensor G400 ", page 259](#)
- ☐ 20 Nm

## 10.2 Removing and installing gas pressure regulator

### Special tools and workshop equipment required

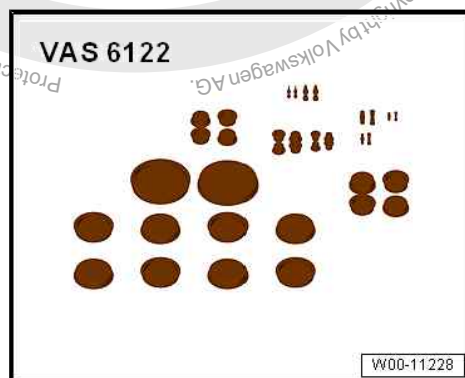
- ◆ Torque wrench - V.A.G 1331-



- ◆ Hose clamps to 25 mm - 3094-

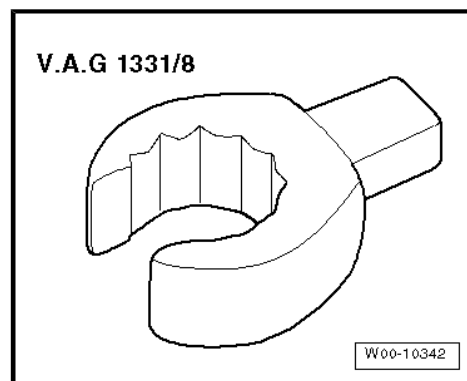


- ◆ Engine bung set - VAS 6122-

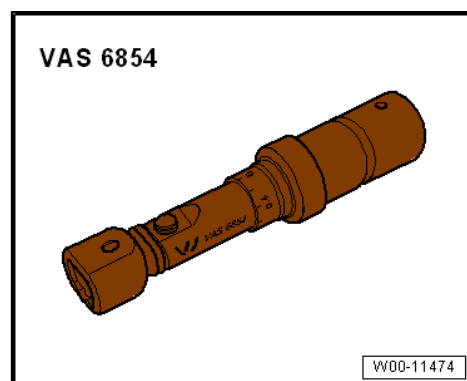




- ◆ Flared ring tool insert AF 14 - V.A.G 1331/8-



- ◆ Torque wrench - VAS 6854-



- ◆ 16 mm open-ring tool insert - VAS 6854/1-

#### Removing

#### DANGER

Risk of explosion and danger to life due to escaping natural gas. A hissing noise is a sign that there are leaks in the natural gas system. Leaks in natural gas system may lead to uncontrolled escape of natural gas.

Risk of explosion leading to serious injuries or death.

- Do not perform any kind of work on the natural gas system if leaking gas can be heard.
  - If a gas leak can be heard, do not drive the vehicle into the workshop.
  - Park the vehicle outside and cordon off the area around it.
- 
- Release pressure in high-pressure line  
⇒ "3.4 Activating and deactivating natural gas mode", page 215.
  - Disconnect battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .





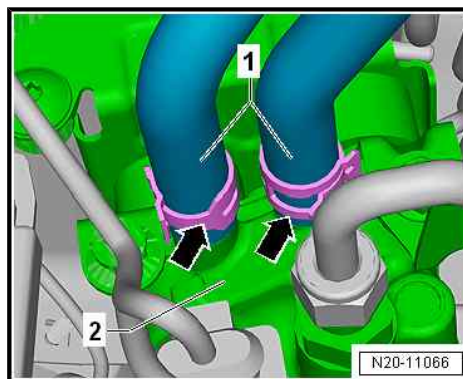
- Clamp off coolant hoses -1- using hose clamps, up to 25 mm - 3094- .

### ⚠ CAUTION

On a warm engine, the cooling system is under high pressure. 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 cloths and opening it carefully.

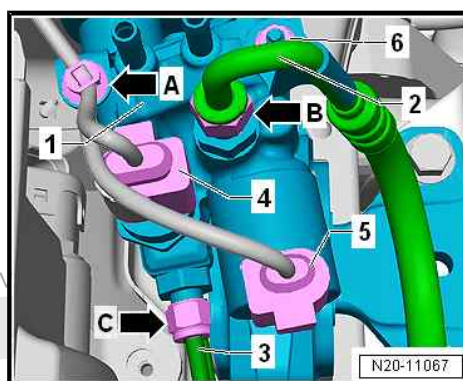


- Open clips -arrows-.
- Pull coolant hose -1- off gas pressure regulator -2-.
- Release and pull off connectors -4- and -5-.
- Unclip wiring harness on gas pressure regulator -1- -arrow A-.
- Unbolt high-pressure line -3- from gas pressure regulator -1-.
- To do this, unscrew union nut -arrow C-.
- Counterhold using a suitable tool while doing so.



### Note

*A small amount of gas may still escape!*



- Unscrew nut -6-.
- Unbolt low-pressure line -2- from gas pressure regulator -1-.
- To do this, unscrew union nut -arrow B-.
- Counterhold using a suitable tool while doing so.
- Immediately seal open connections using suitable plugs from engine bung set - VAS 6122- .



- Unscrew bolts -arrows B- on gas pressure regulator -1-.
- Unscrew nut -arrow A-.

### Installing

Install in reverse order. During this procedure, observe the following:

- Check coolant level  
⇒ [“1.3 Draining and adding coolant”, page 159](#) .



### Note

- ◆ *The natural gas system may not be put into operation until it has been tested.*
- ◆ *The necessary scope of the leakage test depends on the pressure section which has been worked on.*
- ◆ *Observe the following allocation!*



### DANGER

Risk of explosion and danger to life due to escaping natural gas. Leaks in natural gas system may lead to uncontrolled escape of natural gas. Risk of explosion leading to serious injuries or death.

- Check natural gas system for leaks.

### Allocation:

⇒ [“3.1 Distinguishing between pressure sections of natural gas supply system”, page 212](#)

- Open fuel tank shut-off valve -N361/N362- again ⇒ Fuel supply system – natural gas engines; Rep. gr. 20 ; Fuel tanks; Closing fuel tank shut-off valve by mechanical means .

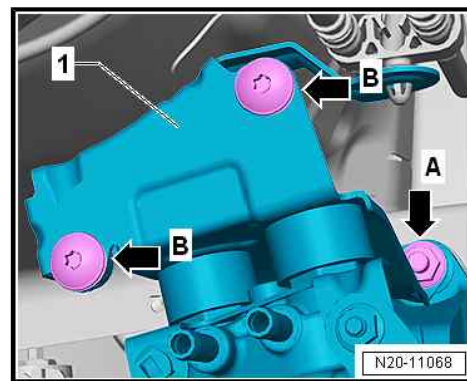


### DANGER

Risk of explosion and danger to life due to escaping natural gas. A hissing noise is a sign that there are leaks in the natural gas system. Leaks in natural gas system may lead to uncontrolled escape of natural gas.

Risk of explosion leading to serious injuries or death.

- Do not perform any kind of work on the natural gas system if leaking gas can be heard.
- If a gas leak can be heard, do not drive the vehicle into the workshop.
- Park the vehicle outside and cordon off the area around it.



### Specified torques

- ◆ ⇒ [“10.1 Assembly overview - gas pressure regulator”, page 255](#)
- ◆ ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody cladding

## 10.3 Removing and installing tank pressure sensor - G400-

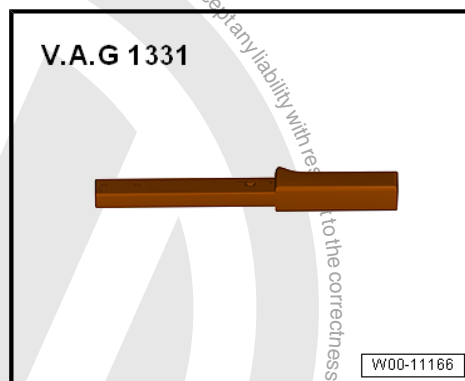
Special tools and workshop equipment required



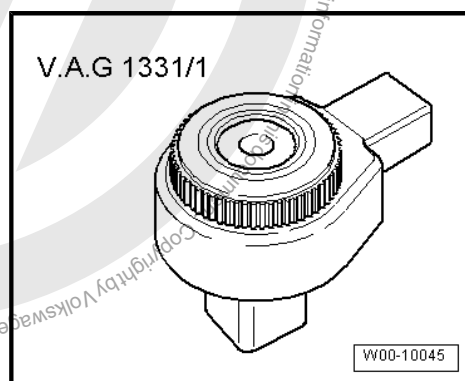
up! 2012 ➤ , up! 2017 ➤

3-cyl. injection engine (1.0 l, natural gas 4V, EA 211) - Edition 06.2019

◆ Torque wrench - V.A.G 1331-



◆ Ratchet wrench - V.A.G 1331/1-



◆ Socket, 27 mm - T40218-



## Removing

### DANGER

Risk of explosion and danger to life due to escaping natural gas. A hissing noise is a sign that there are leaks in the natural gas system. Leaks in natural gas system may lead to uncontrolled escape of natural gas.

Risk of explosion leading to serious injuries or death.

- Do not perform any kind of work on the natural gas system if leaking gas can be heard.
  - If a gas leak can be heard, do not drive the vehicle into the workshop.
  - Park the vehicle outside and cordon off the area around it.
- 
- Release pressure in high-pressure line  
⇒ ["3.4 Activating and deactivating natural gas mode", page 215](#).
  - Disconnect battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .



- Release connector -1- and pull off.
- Unscrew tank pressure sensor - G400- -3- from gas pressure regulator -2-.

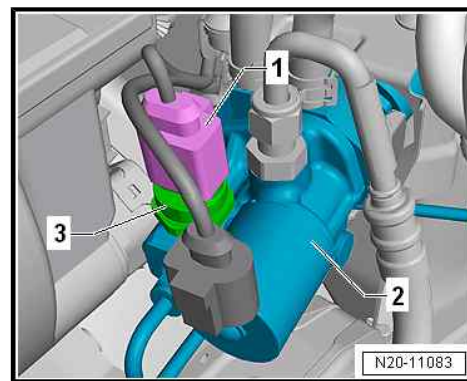
### Installing

Install in reverse order. During this procedure, observe the following:



#### Note

- ◆ *The natural gas system may not be put into operation until it has been tested.*
- ◆ *The necessary scope of the leakage test depends on the pressure section which has been worked on.*
- ◆ *Observe the following allocation!*



### **! DANGER**

Risk of explosion and danger to life due to escaping natural gas. Leaks in natural gas system may lead to uncontrolled escape of natural gas. Risk of explosion leading to serious injuries or death.

- Check natural gas system for leaks.

#### Allocation:

⇒ **“3.1 Distinguishing between pressure sections of natural gas supply system”, page 212**

- Open fuel tank shut-off valve -N361/N362- again ⇒ Fuel supply system – natural gas engines; Rep. gr. 20 ; Fuel tanks; Closing fuel tank shut-off valve by mechanical means .

### **! DANGER**

Risk of explosion and danger to life due to escaping natural gas. A hissing noise is a sign that there are leaks in the natural gas system. Leaks in natural gas system may lead to uncontrolled escape of natural gas.

Risk of explosion leading to serious injuries or death.

Do not perform any kind of work on the natural gas system if leaking gas can be heard.

- If a gas leak can be heard, do not drive the vehicle into the workshop.
- Park the vehicle outside and cordon off the area around it.

- Check the gas system  
⇒ **“3.5 Checking gas system for leaks”, page 217** .

### Specified torques

⇒ **“10.1 Assembly overview - gas pressure regulator”, page 255**



## 26 – Exhaust system

### 1 Exhaust pipes and silencers

⇒ [“1.1 Assembly overview - silencers”, page 262](#)

⇒ [“1.2 Separating exhaust pipes from silencers”, page 263](#)

⇒ [“1.3 Removing and installing silencer”, page 264](#)

⇒ [“1.4 Checking exhaust system for leaks”, page 265](#)

⇒ [“1.5 Installation position of clamp”, page 266](#)

#### 1.1 Assembly overview - silencers

##### 1 - Tunnel cross-piece

- ☐ Note installation position (mark before removal, if necessary).
- ☐ Remove tunnel cross-piece ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody cladding

##### 2 - Nut

- ☐ 20 Nm

##### 3 - Silencer

- ☐ Removing and installing  
⇒ [“1.3 Removing and installing silencer”, page 264](#)

##### 4 - Clip

- ☐ Part of tailpipe

##### 5 - Threaded union

- ☐ 30 Nm
- ☐ The nut may be loosened and retightened once.
- ☐ If the nut has to be loosened a second time, the component must be renewed.

##### 6 - Tailpipe

- ☐ Fitting position  
⇒ [page 265](#)

##### 7 - Rear mounting

- ☐ Renew if damaged

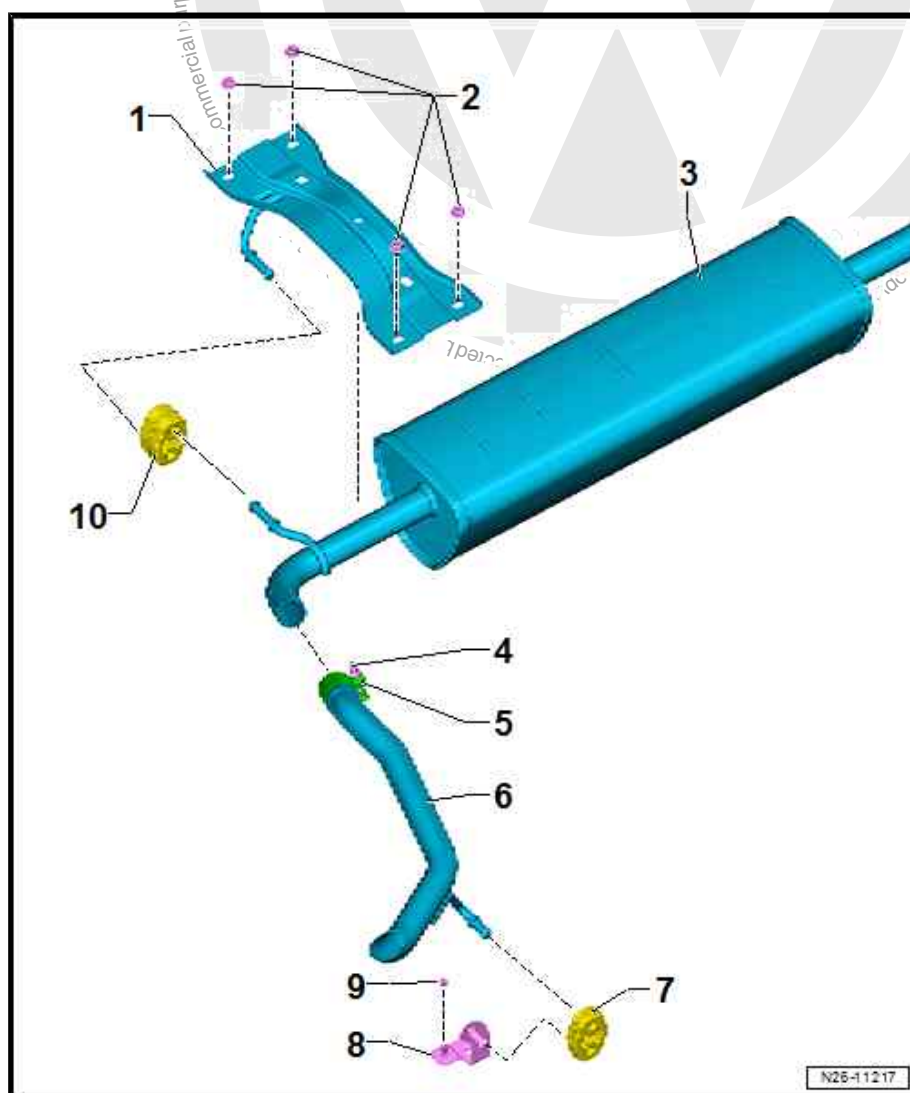
##### 8 - Bracket

##### 9 - Bolt

- ☐ 23 Nm

##### 10 - Front mounting

- ☐ Renew if damaged



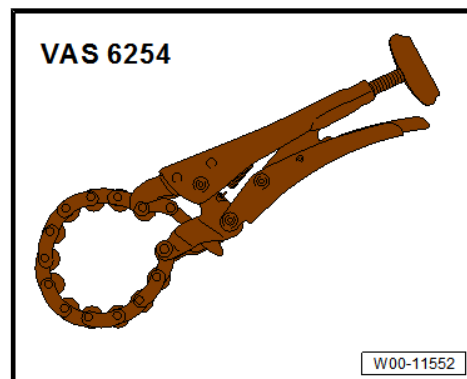




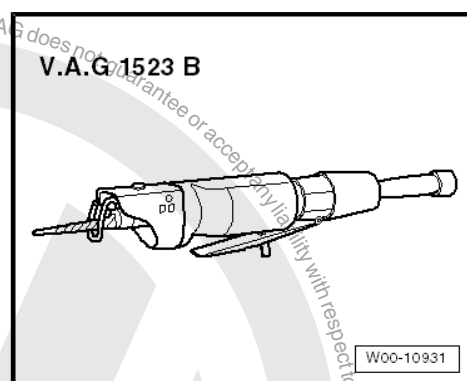
## 1.2 Separating exhaust pipes from silencers

### Special tools and workshop equipment required

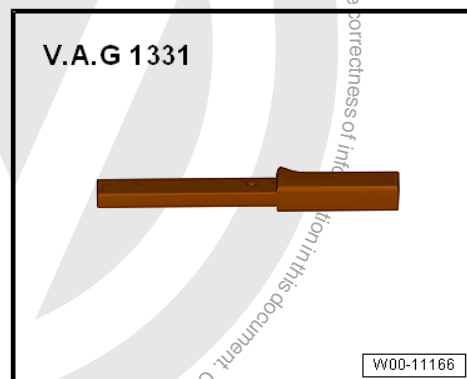
- ◆ Chain-type pipe cutter - VAS 6254-



- ◆ Pneumatic sabre saw - V.A.G 1523A-



- ◆ Torque wrench - V.A.G 1331-



- ◆ The connecting pipe can be cut through at the point marked in order to remove parts of the exhaust system separately.
- ◆ The separating point is marked around the exhaust pipe.

### CAUTION

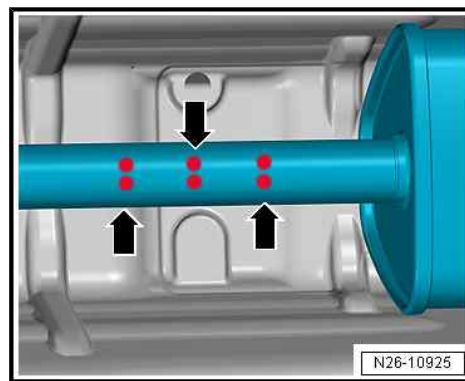
Risk of injury from swarf being flung into air.  
Irritation and injury to skin and eyes possible.

- Wear protective goggles.
- Wear protective gloves.



### Separating point on exhaust pipe

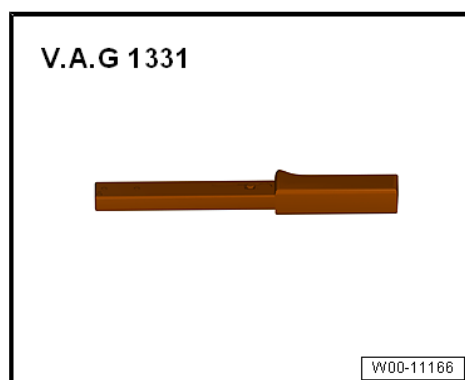
- Cut through exhaust pipe at centre separating point -arrow- at right angles e.g. with pneumatic sabre saw - V.A.G 1523A- or chain pipe cutter - VAS 6254- .
- Position repair double clamp centrally between outer markings.
- Take installation position of clamp into account  
⇒ [“1.5 Installation position of clamp”, page 266](#) .



## 1.3 Removing and installing silencer

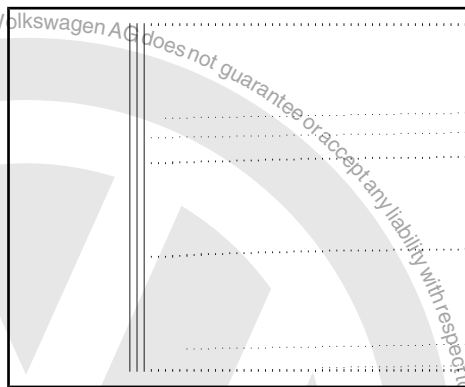
### Special tools and workshop equipment required

- ♦ Torque wrench - V.A.G 1331-

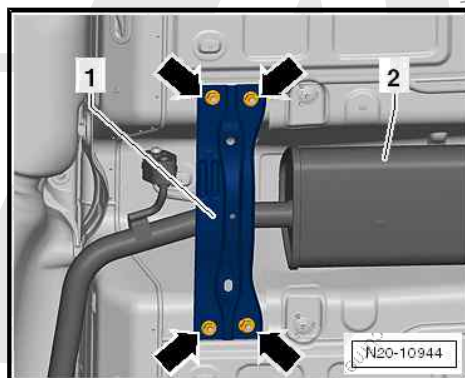


### Removing

- If necessary, disconnect exhaust system  
⇒ [“1.2 Separating exhaust pipes from silencers”, page 263](#) .
- If fitted, loosen clamp -arrows-.



- Remove cross strut -1- from underbody -2-.
- Remove nuts -arrows-





- Remove rear bracket -1- for exhaust system -2-.
- Unscrew bolt -arrow-.

### ⚠ CAUTION

Risk of accident caused by high weight of silencers.

- Seek help from a second a mechanic for the following work.

- Remove silencer.
- Disconnect exhaust pipe from silencer.

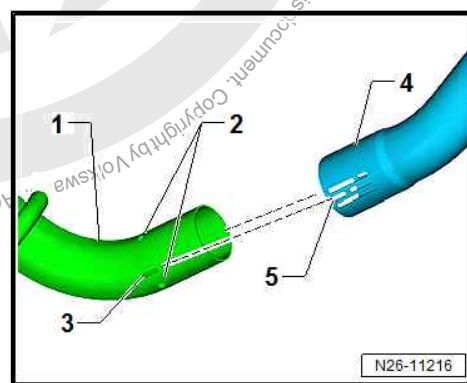
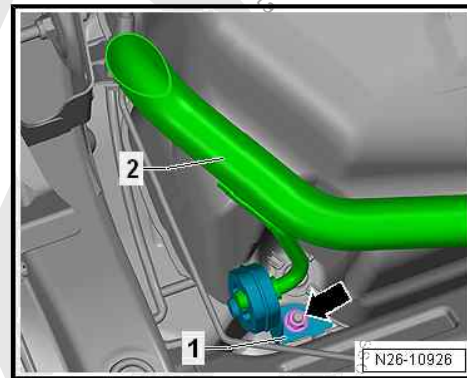
### Installing

Install in reverse order. The following should be observed:

Note installation position of clamp

⇒ [“1.5 Installation position of clamp”, page 266](#) .

- Slide tailpipe -4- onto silencer -1-.
- Slide on tailpipe -4- until it rests against stops -2-.
- Align tailpipe in such a way that the marks -3- and -5- are properly aligned.
- After working on the exhaust system, ensure that the system is not under tension
- and that there is sufficient clearance to the bodywork.
- Renew self-locking nuts.
- Before installing securing nuts, apply high-temperature paste to studs in accordance with TL 521 12 ⇒ Electronic parts catalogue “ETKA” .
- Note installation position of clamp  
⇒ [“1.5 Installation position of clamp”, page 266](#) .



### Specified torques

- ◆ ⇒ [“2.1 Assembly overview - emission control”, page 267](#)
- ◆ ⇒ [“1.1 Assembly overview - silencers”, page 262](#)
- ◆ ⇒ [“1.5 Installation position of clamp”, page 266](#)

## 1.4 Checking exhaust system for leaks

### Procedure

- Start engine and run it at idling speed.
- Seal end 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.



## 1.5 Installation position of clamp



### Note

*Note introduction of clamps with continuous clip.*

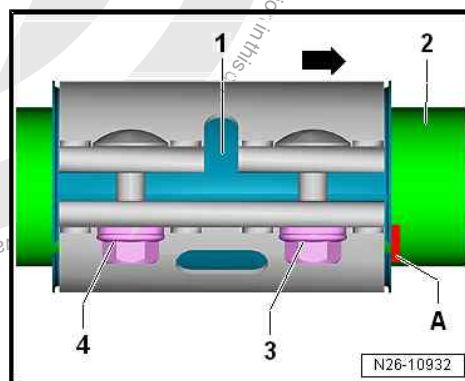
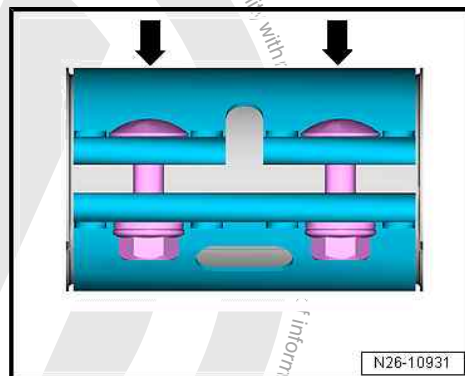
### Specified torque and mounting dimensions of clamping sleeve.

Specified torque ➔ [page 266](#)

Installation dimension at marking -A- (only for front clamp)

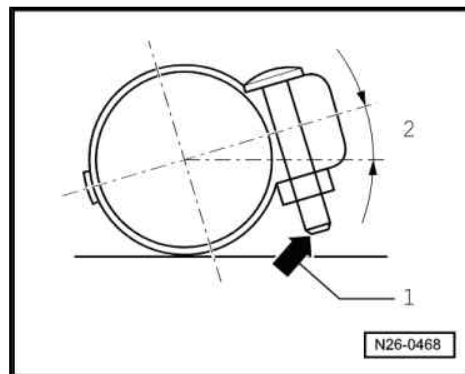
Installation dimension for vehicles with marking -A- on front exhaust pipe

- 1 - Clamping sleeve
- 2 - Front exhaust pipe
- 3 - Securing nut
- 4 - Securing nut
- A - Marking



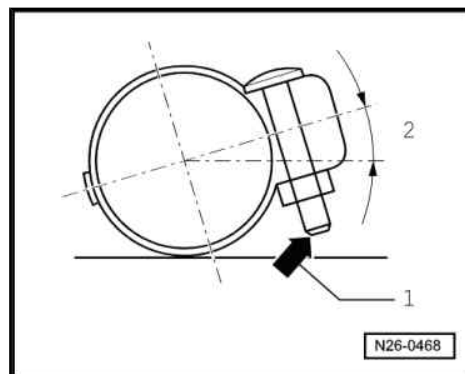
### Installation position of front clamp

- Install clamp so that end of bolt -arrow- does not extend beyond lower edge of clamp.
- Threaded connection faces right



### Installation position of rear clamp

- Install clamp so that end of bolt -arrow- does not extend beyond lower edge of clamp.
- Threaded connection faces to rear.



### Specified torques

Component	Specified torque
Clamping sleeve	30 Nm

## 2 Emission control

⇒ [“2.1 Assembly overview - emission control”, page 267](#)

⇒ [“2.2 Removing and installing catalytic converter”, page 271](#)

### 2.1 Assembly overview - emission control

⇒ [“2.1.1 Assembly overview - emission control, vehicles with close-coupled emission control”, page 267](#)

⇒ [“2.1.2 Assembly overview - emission control, vehicles with emission control on underbody”, page 269](#)

⇒ [“2.1.3 Assembly overview - emission control, vehicles with two catalytic converters”, page 270](#)

#### 2.1.1 Assembly overview - emission control, vehicles with close-coupled emission control

##### 1 - Engine

##### 2 - Seal

- ☐ Renew after removal

##### 3 - Lambda probe 1 ahead of catalytic converter - GX10-

- ☐ Grease only the threads with “G 052 112 A3”; “G 052 112 A3” cannot get into the slots on the probe body.
- ☐ Removing and installing  
⇒ [“9.2.1 Removing and installing Lambda probe 1 before catalytic converter GX10”, page 251](#)
- ☐ If seal is leaking, nip open and renew.
- ☐ 50 Nm

##### 4 - Nut

- ☐ Observe assembling procedure ⇒ [page 268](#)
- ☐ 23 Nm

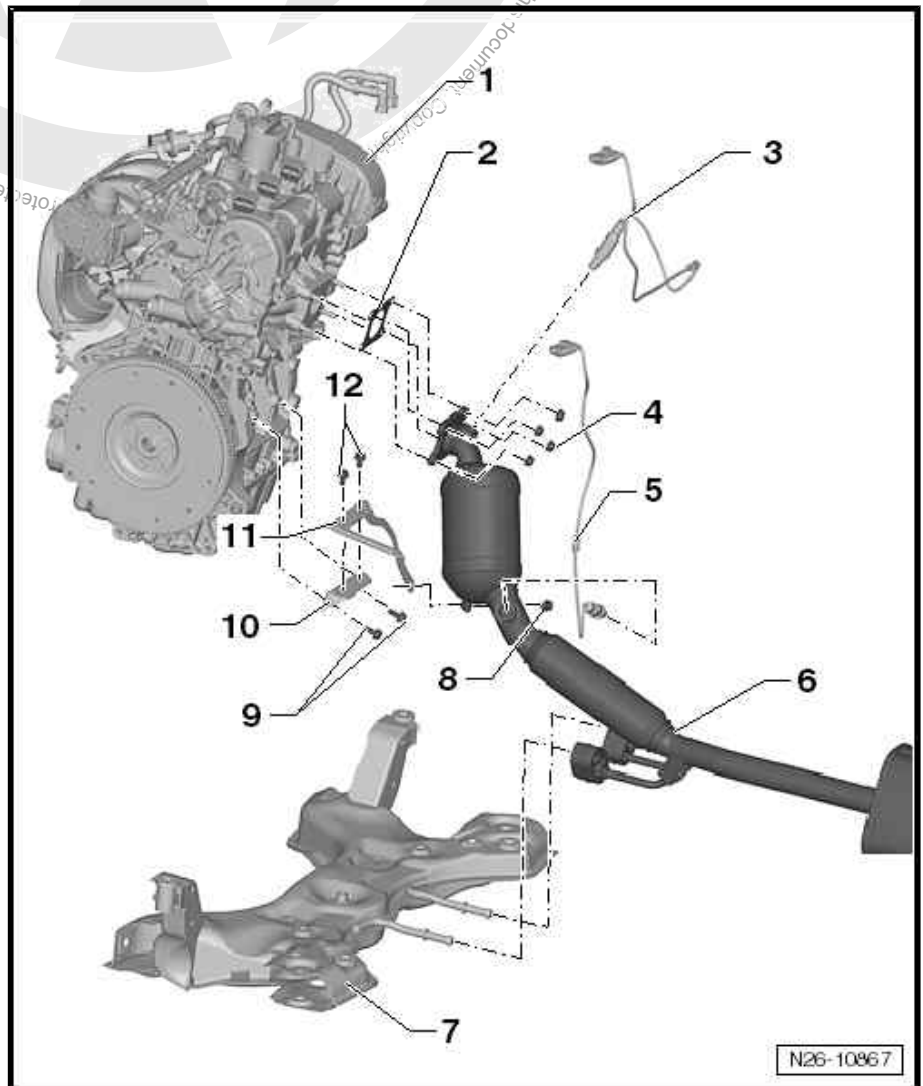
##### 5 - Lambda probe 1 after catalytic converter - GX7-

- ☐ Grease only the threads with “G 052 112 A3”; “G 052 112 A3” cannot get into the slots on the probe body.
- ☐ Removing and installing  
⇒ [“9.2.2 Removing and installing Lambda probe 1 after catalytic converter GX7”, page 252](#)

- ☐ If seal is leaking, nip open and renew.
- ☐ 50 Nm

##### 6 - Front exhaust pipe

- ☐ Removing and installing ⇒ [“2.2 Removing and installing catalytic converter”, page 271](#)







up! 2012 ➤ , up! 2017 ➤

3-cyl. injection engine (1.0 l, natural gas 4V, EA 211) - Edition 06.2019

## 7 - Subframe with bracket

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

## 8 - Bolt

- ❑ Catalytic converter to bracket
- ❑ 23 Nm

## 9 - Bolt

- ❑ Bracket to cylinder block
- ❑ 23 Nm

## 10 - Bracket

- ❑ to cylinder block
- ❑ Observe assembling procedure ⇒ [page 268](#)

## 11 - Bracket

- ❑ Observe assembling procedure ⇒ [page 268](#)

## 12 - Bolt

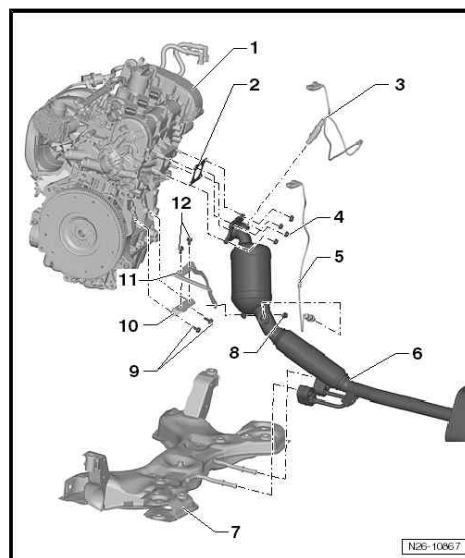
- ❑ 23 Nm



### Note

Before installing, coat threads of lock nuts and stud bolts with high-temperature paste - N 052.112.00- according to TL 521 12.

### Assembly sequence for mounting catalytic converter to cylinder head



### Tightening sequence

Step (sequence)	Component	Specified torque
1)	Secure bracket -10- to cylinder head.	23 Nm
2)	Loosely bolt bracket -11- to bracket -10-	
3)	Guide gasket -2- onto stud	
4)	Screw on nuts -4- by 2 to 3 full turns	
5)	Tighten the three nuts -4-	23 Nm
6)	Screw bolt -8- onto bracket -11- through hole in catalytic converter	
7)	Tighten bolt -8-	23 Nm



Step (sequence)	Component	Specified torque
8)	Secure brackets -10- and -11- with bolts -12-	23 Nm
9)	Tighten 4th nut -4-	23 Nm

## 2.1.2 Assembly overview - emission control, vehicles with emission control on underbody

### 1 - Engine

### 2 - Seal

- ☐ Renew after removal

### 3 - Lambda probe 1 after catalytic converter - GX7-

- ☐ Grease only the threads with "G 052 112 A3"; "G 052 112 A3" cannot get into the slots on the probe body.
- ☐ Removing and installing
- ☐ If seal is leaking, nip open and renew.
- ☐ 50 Nm

### 4 - Nut

- ☐ 23 Nm

### 5 - Front exhaust pipe

- ☐ Removing and installing  
⇒ ["2.2 Removing and installing catalytic converter", page 271](#)

### 6 - Mounting

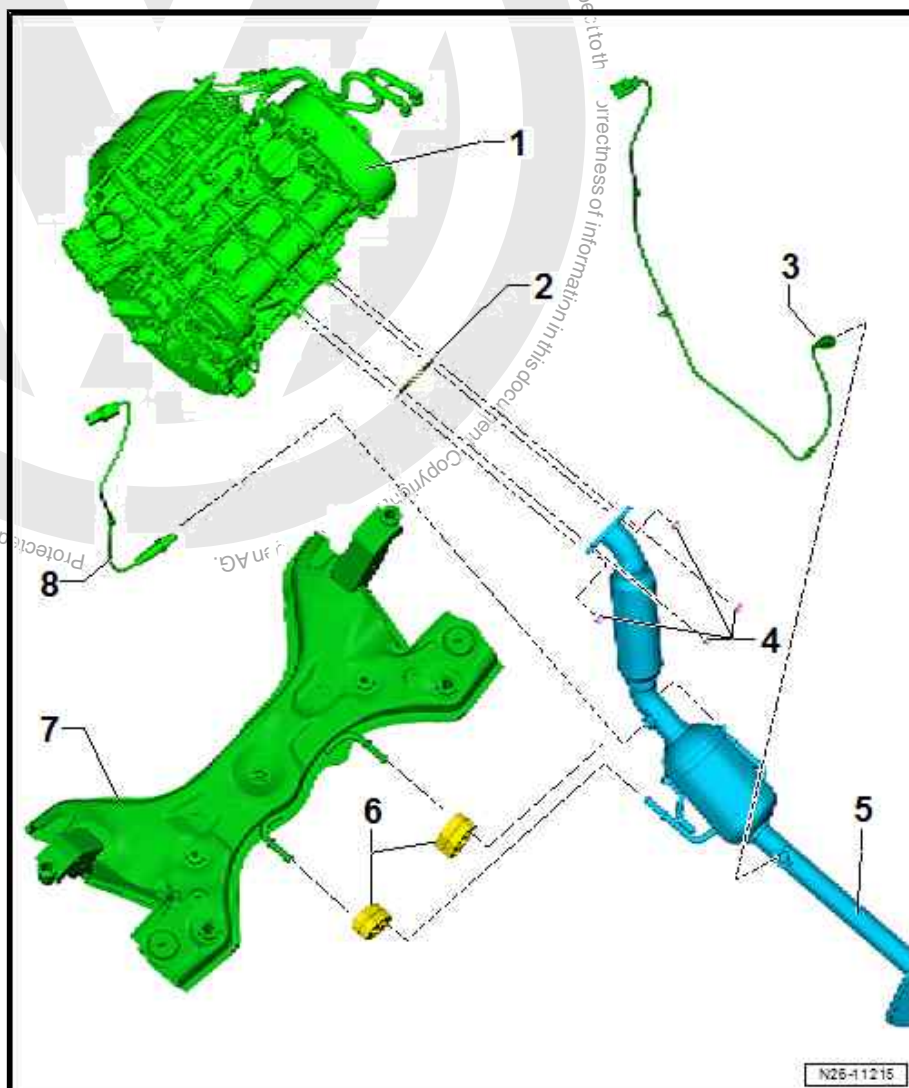
- ☐ Renew if damaged

### 7 - Subframe with bracket

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

### 8 - Lambda probe 1 before catalytic converter - GX10-

- ☐ Grease only the threads with "G 052 112 A3"; "G 052 112 A3" cannot get into the slots on the probe body.
- ☐ Removing and installing
- ☐ If seal is leaking, nip open and renew.
- ☐ 50 Nm





## 2.1.3 Assembly overview - emission control, vehicles with two catalytic converters

### 1 - Engine

### 2 - Seal

- ☐ Renew after removal

### 3 - Lambda probe 1 ahead of catalytic converter - GX10-

- ☐ Grease only the threads with "G 052 112 A3"; "G 052 112 A3" cannot get into the slots on the probe body.
- ☐ Removing and installing ⇒ ["9.2.1 Removing and installing Lambda probe 1 before catalytic converter GX10"](#), page 251
- ☐ If seal is leaking, nip open and renew.
- ☐ 50 Nm

### 4 - Nut

- ☐ Observe assembling procedure ⇒ [page 271](#)
- ☐ 23 Nm

### 5 - Lambda probe 1 after catalytic converter - GX7-

- ☐ Grease only the threads with "G 052 112 A3"; "G 052 112 A3" cannot get into the slots on the probe body.
- ☐ Removing and installing ⇒ ["9.2.2 Removing and installing Lambda probe 1 after catalytic converter GX7"](#), page 252
- ☐ If seal is leaking, nip open and renew.
- ☐ 50 Nm

### 6 - Front exhaust pipe

- ☐ Removing and installing ⇒ ["2.2 Removing and installing catalytic converter"](#), page 271

### 7 - Subframe with bracket

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

### 8 - Bolt

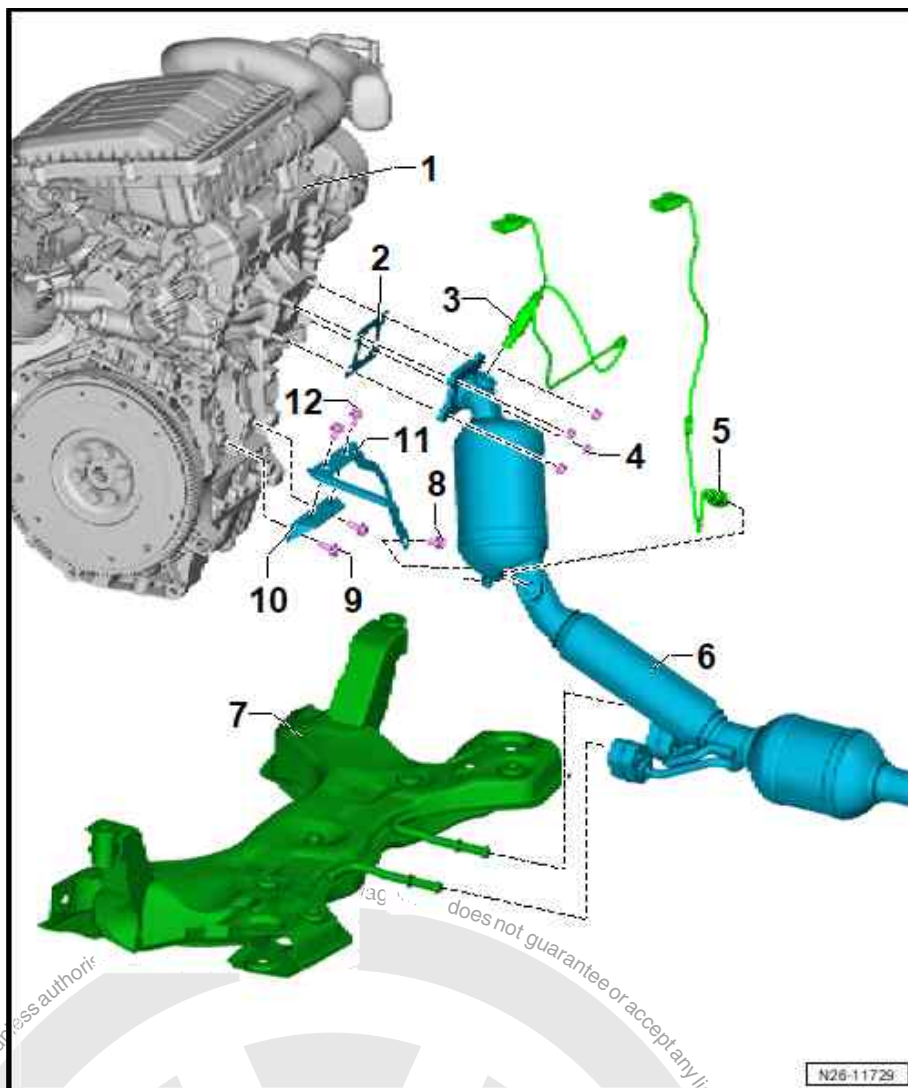
- ☐ Catalytic converter to bracket
- ☐ 23 Nm

### 9 - Bolt

- ☐ Bracket to cylinder block
- ☐ 23 Nm

### 10 - Bracket

- ☐ to cylinder block
- ☐ Observe assembling procedure ⇒ [page 271](#)





## 11 - Bracket

- ❑ Observe assembling procedure ➔ [page 271](#)

## 12 - Bolt

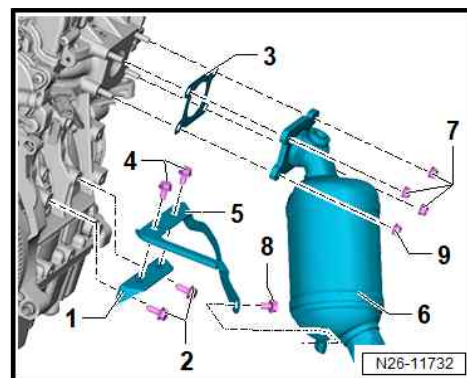
- ❑ 23 Nm



### Note

*Before installing, coat threads of lock nuts and stud bolts with high-temperature paste - N 052.112.00- according to TL 521 12.*

**Assembly sequence for mounting catalytic converter to cylinder head**



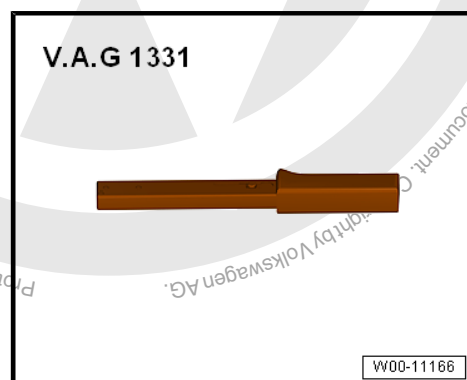
### Tightening sequence

Step (sequence)	Component	Specified torque
1)	Secure bracket -1- to cylinder head with bolts -2-.	➔ <a href="#">Item 9 (page 270)</a>
2)	Guide gasket -3- onto stud	
3)	Loosely bolt bracket -5- to bracket -4- with bolts -4-	
4)	Screw on nuts -7- and -9- by 2 to 3 full turns	
5)	Tighten nuts -7-	➔ <a href="#">Item 4 (page 270)</a>
6)	Tighten bolt -8- on bracket -5- through hole in catalytic converter	➔ <a href="#">Item 8 (page 270)</a>
7)	Tighten bolts -4-	➔ <a href="#">Item 12 (page 271)</a>
9)	Tighten nut -9-	➔ <a href="#">Item 4 (page 270)</a>

## 2.2 Removing and installing catalytic converter

### Special tools and workshop equipment required

- ◆ Torque wrench - V.A.G 1331-







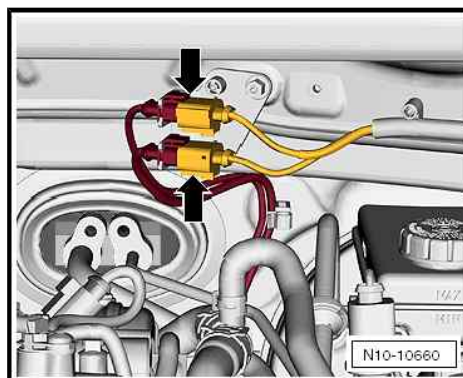
## Removing

- Release and pull off connectors of lambda probes -arrows-.

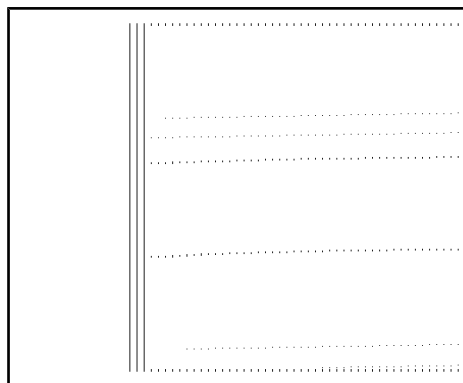
Steckerfarbe braun - Lambda probe 1 before catalytic converter  
- GX10-

Steckerfarbe schwarz - Lambda probe 1 after catalytic converter  
- GX7-

- Unclip connector from relevant bracket.
- Remove wiring harness from guides.
- If necessary, disconnect exhaust system  
⇒ ["1.2 Separating exhaust pipes from silencers", page 263](#) .



- If fitted, loosen clamp -arrows-.

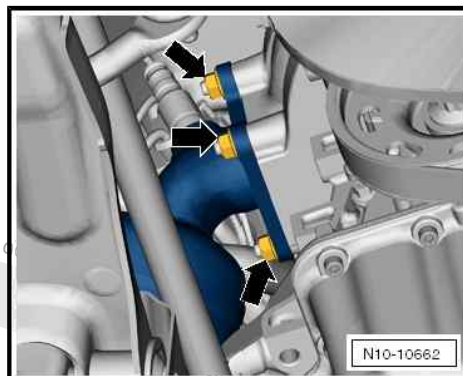


- Remove securing nuts -arrows- and pull catalytic converter off stud bolts.



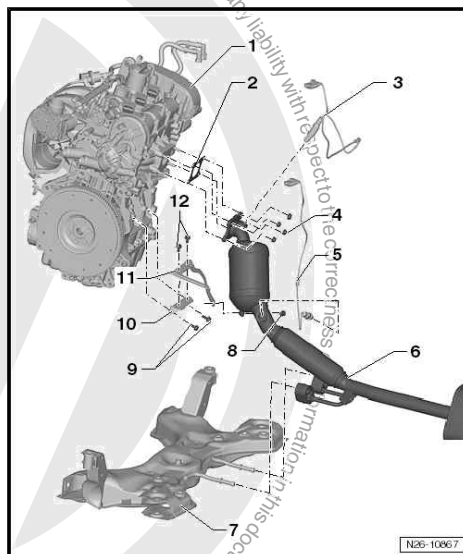
## Note

Qty. 4 ⇒ [Item 4 \(page 267\)](#) .



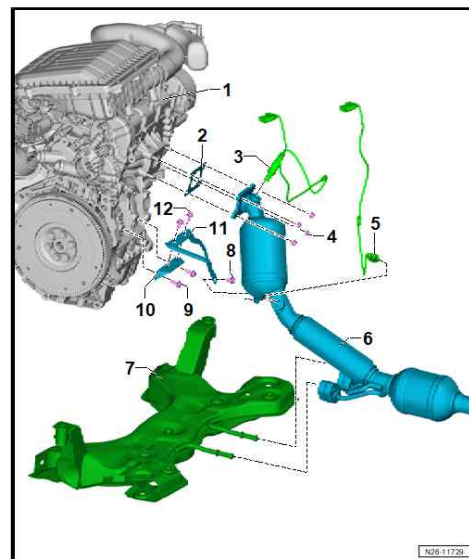
## Vehicles with close-coupled emission control:

- Unscrew bolt -8-.

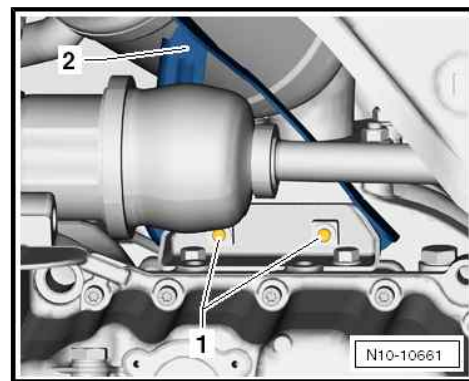




- Unscrew bolt -8-.



- Remove bolts -1-.
- Remove retainer -2-.





- Pull retaining rings -1- for exhaust pipe off subframe -2-.

### Installing

Install in reverse order. During this procedure, observe the following:

**Vehicles with close-coupled emission control:**

Adhere to assembling sequence ⇒ [page 268](#) .

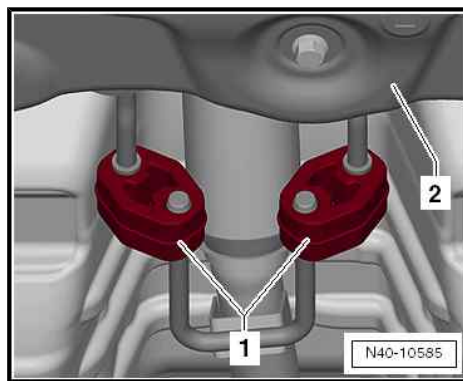
**Vehicles with two catalytic converters:**

Adhere to assembling sequence ⇒ [page 271](#) .

**Continued for all vehicles:**

Note installation position of clamp

⇒ ["1.5 Installation position of clamp", page 266](#) .



### Note

- ◆ *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 double clamp and align silencer and exhaust pipe so that sufficient clearance is maintained to the bodywork and the support rings are evenly loaded.*
- ◆ *Renew self-locking nuts.*
- ◆ *Before installing, coat threads of lock nuts and stud bolts with high-temperature paste - N 052.112.00- according to TL 521 12.*

### Specified torque:

Component	Specified torque
Catalytic converter	⇒ <a href="#">"2.1 Assembly overview - emission control", page 267</a>
Clamping sleeve	⇒ <a href="#">"1.5 Installation position of clamp", page 266</a>

## 28 – Ignition system

### 1 Ignition system

⇒ [“1.1 Assembly overview - ignition system”, page 275](#)

⇒ [“1.2 Removing and installing ignition coils with output stage”, page 277](#)

⇒ [“1.3 Removing and installing knock sensor 1 G61 ”, page 280](#)

⇒ [“1.4 Removing and installing Hall sender”, page 280](#)

⇒ [“1.5 Removing and installing engine speed sender G28 ”, page 281](#)

#### 1.1 Assembly overview - ignition system

##### 1 - Cylinder head cover

##### 2 - Spark plug

- ☐ Remove and install with spark plug socket and extension - 3122 B- ⇒ Maintenance ; Booklet 819
- ☐ Allocation ⇒ Electronic parts catalogue (ETKA)
- ☐ 22 Nm
- ☐ Change interval ⇒ Maintenance tables

##### 3 - Ignition coil 1 with output stage - N70-

- ☐ Ignition coil 2 with output stage - N127-
- ☐ Ignition coil 3 with output stage - N291-
- ☐ Removing and installing ⇒ [“1.2 Removing and installing ignition coils with output stage”, page 277](#)

##### 4 - Bolt

- ☐ 8 Nm

##### 5 - Connector

- ☐ black
- ☐ 4-pin

##### 6 - Bolt

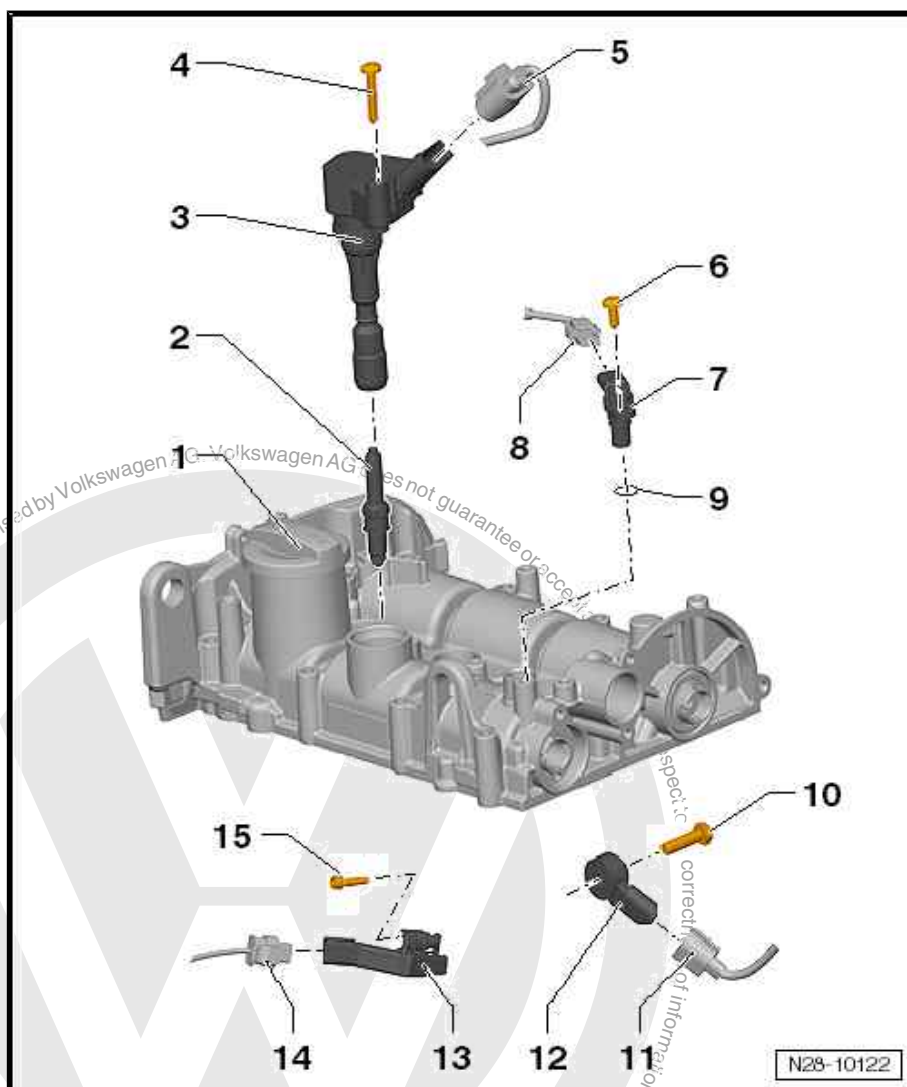
- ☐ for Hall sender - G40-
- ☐ 10 Nm

##### 7 - Hall sender - G40-

- ☐ Removing and installing ⇒ [“1.4 Removing and installing Hall sender”, page 280](#)

##### 8 - Connector

- ☐ Black, 3-pin.
- ☐ for Hall sender - G40-





#### 9 - Seal

- ☐ Renew if damaged

#### 10 - Bolt

- ☐ The specified torque influences the function of the knock sensor.
- ☐ 20 Nm

#### 11 - Connector

- ☐ black
- ☐ 2-pin
- ☐ For knock sensor 1 - G61- .
- ☐ Connector contacts are gold-plated.

#### 12 - Knock sensor 1 - G61-

- ☐ Removing and installing ⇒ ["1.3 Removing and installing knock sensor 1 G61 ", page 280](#)
- ☐ Connector contacts are gold-plated.

#### 13 - Engine speed sender - G28-

- ☐ Removing and installing ⇒ ["1.5 Removing and installing engine speed sender G28 ", page 281](#)

#### 14 - Connector

- ☐ black
- ☐ 3-pin
- ☐ For engine speed sender - G28-

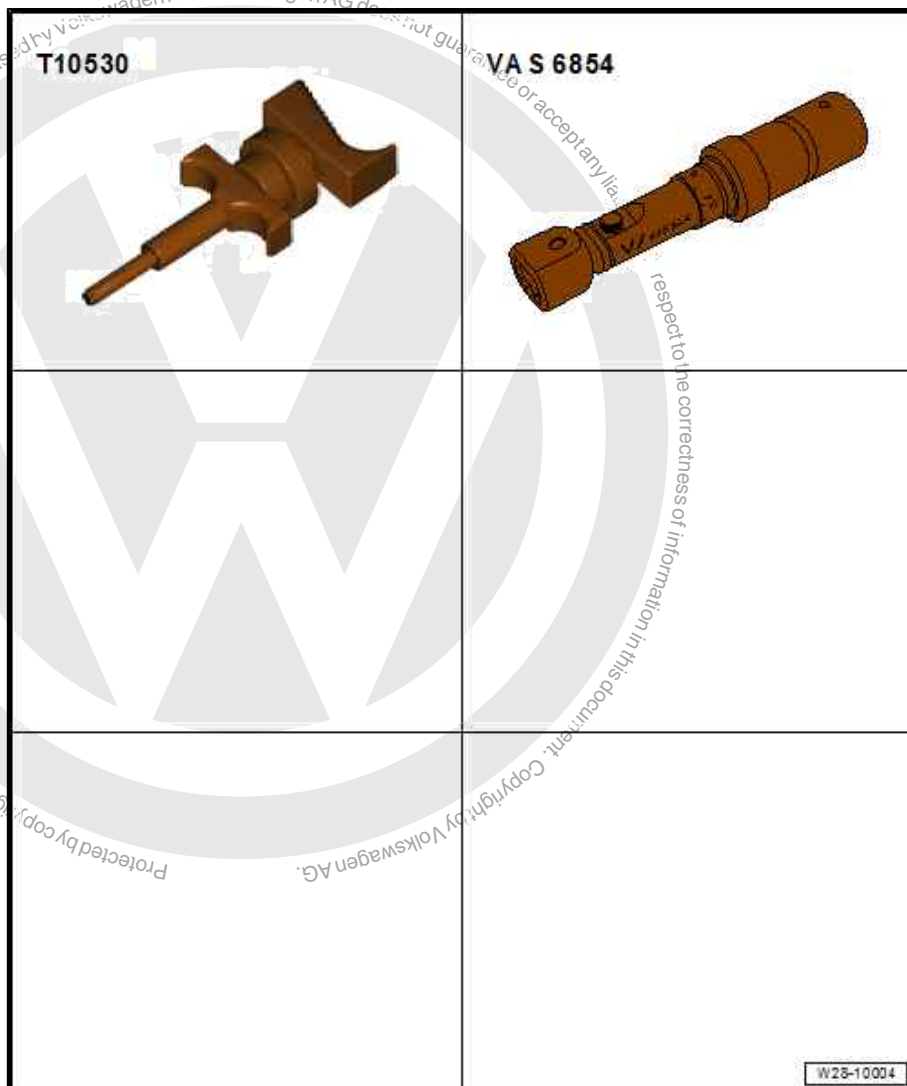
#### 15 - Bolt

- ☐ For engine speed sender - G28-
- ☐ 8 Nm



## 1.2 Removing and installing ignition coils with output stage

### Special tools and workshop equipment required



- ◆ Torque wrench -VAS 6854-
- ◆ Puller -T10530-



### Note

- ◆ *The ignition coils are easier to remove when the engine is warm.*
- ◆ *The grease used during the first installation of the ignition coils makes it easier to remove the spark plug connectors when the engine is warm.*
- ◆ *When installing used ignition coils with output stage, the ignition coils must be lubricated with silicone paste ⇒ Electronic parts catalogue (ETKA) .*
- ◆ *Ignition coils with output stage and spark plug connectors are available individually for repairs ⇒ Electronic parts catalogue (ETKA)*





## Removing

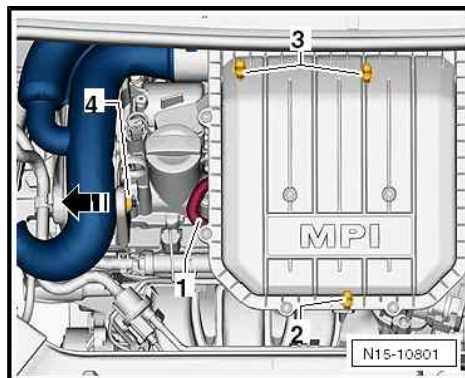
- Pull hose -1- off air filter housing.
- Pull air filter housing upwards off studs at positions -2- and -3-.
- Push air filter housing and intake connecting pipe in -direction of arrow- out of mounting -4-.
- Remove air filter housing from engine compartment.



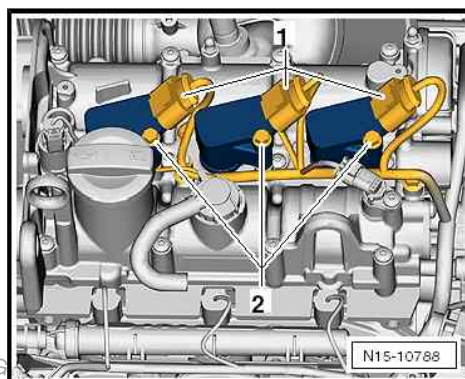
### Note

*It is essential to always observe*

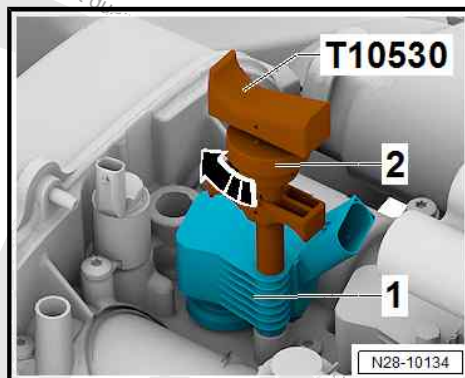
*⇒ "1.6 Safety precautions when working on ignition system", page 4!*



- Release connector -1- and pull off.
- Unscrew bolts -2-.



- Push puller - T10530- as far as stop into hole in ignition coil -1-.
- Tighten knurled nut -2- in -direction of arrow-.

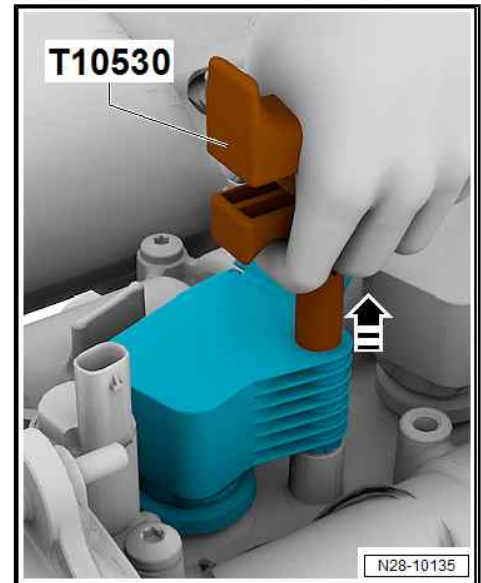




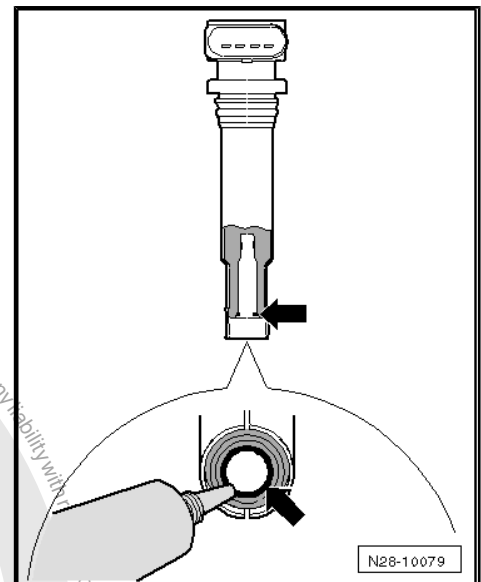
- Pull ignition coil on puller - T10530- in direction of -arrow- out of cylinder head cover.

### Installing

Install in reverse order. During this procedure, observe the following:

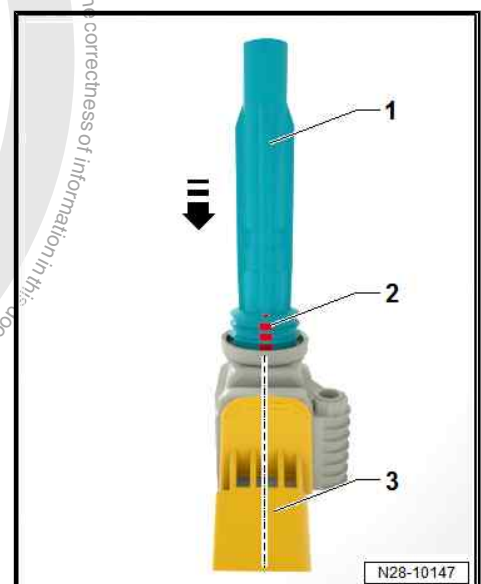


- Apply a thin bead of silicone paste around sealing hose of ignition coil.



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.
- Insert all ignition coils loosely into spark plug hole.
- Align ignition coils with connectors and simultaneously push all connectors onto ignition coils.
- Press ignition coils evenly onto spark plugs by hand (do not use tools).
- Tighten securing bolt with the torque wrench - VAS 6854- and the specified torque ➔ [page 280](#) .





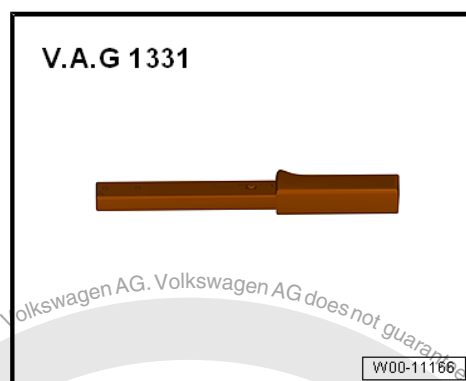
### Specified torques

Component	Specified torque
Securing bolts for ignition coil with output stage	8 Nm

## 1.3 Removing and installing knock sensor 1 - G61-

### Special tools and workshop equipment required

- ◆ Torque wrench - V.A.G 1331-



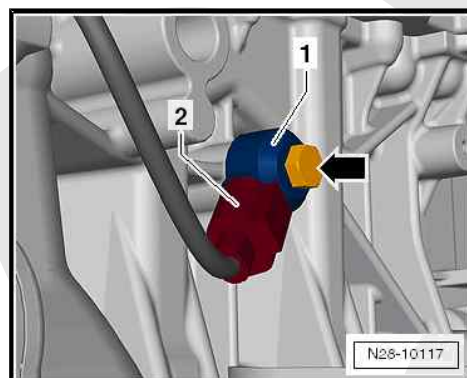
### Removing

- Release connector -2- and pull off.
- Unscrew bolt -arrow- and remove knock sensor 1 - G61- -1- from engine.

### Installing

Install in reverse order. During this procedure, observe the following:

The torque specification influences the function of knock sensor 1 - G61- .



### Specified torques

Component	Specified torque
Securing bolt for knock sensor 1 - G61-	20 Nm

## 1.4 Removing and installing Hall sender

### Special tools and workshop equipment required



◆ Torque wrench - V.A.G 1331-

V.A.G 1331

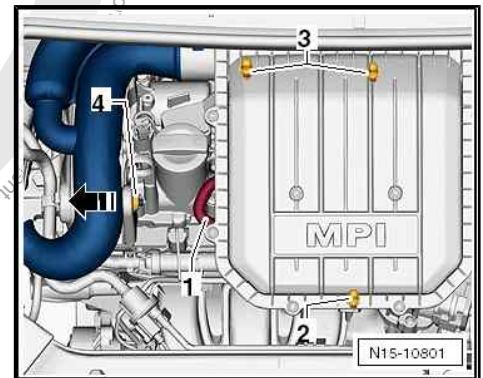


W00-11166

### Removing

Fitting location ⇒ [Item 5 \(page 61\)](#) .

- Pull hose -1- off air filter housing.
- Pull air filter housing upwards off studs at positions -2- and -3-.
- Push air filter housing and intake connecting pipe in -direction of arrow- out of mounting -4-.
- Remove air filter housing from engine compartment.

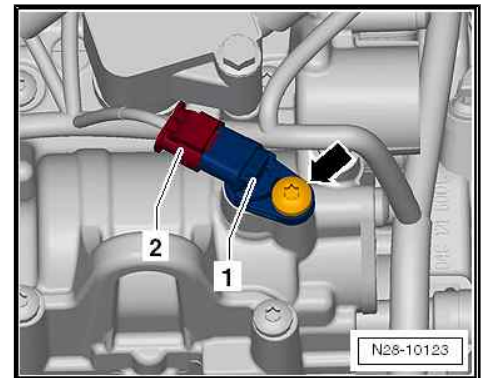


- Release connector -2- and pull off.
- Unscrew bolt -arrow-.
- Remove Hall sender - G40- -1-.

### Installing

Install in reverse order. During this procedure, observe the following:

Renew seal ⇒ [Item 9 \(page 276\)](#) if damaged.



### Specified torques

Component	Specified torque
Securing bolt for Hall sender - G40-	10 Nm
Air filter	⇒ <a href="#">"5 Air filter", page 230</a>

## 1.5 Removing and installing engine speed sender - G28-

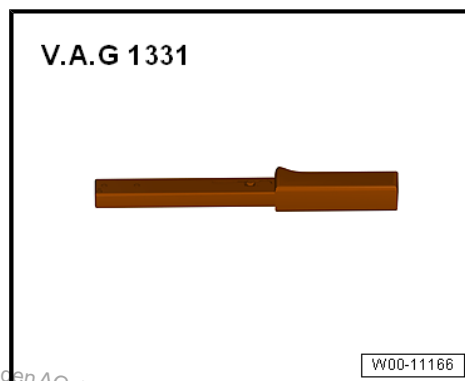
Special tools and workshop equipment required



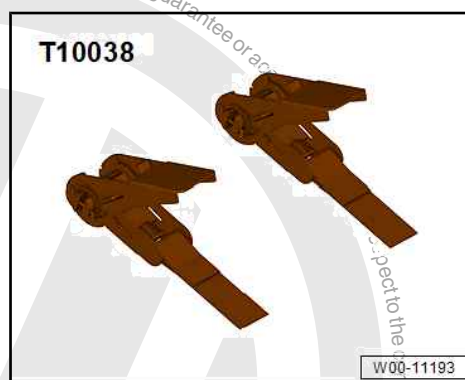
up! 2012 ➤ , up! 2017 ➤

3-cyl. injection engine (1.0 l, natural gas 4V, EA 211) - Edition 06.2019

- ◆ Torque wrench - V.A.G 1331-



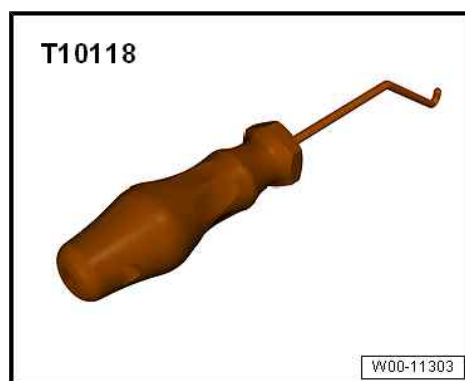
- ◆ Tensioning strap - T10038-



- ◆ Socket, 4 mm - T10370



- ◆ Assembly tool - T10118-



## Removing

Fitting location ➔ [Item 1 \(page 44\)](#) .



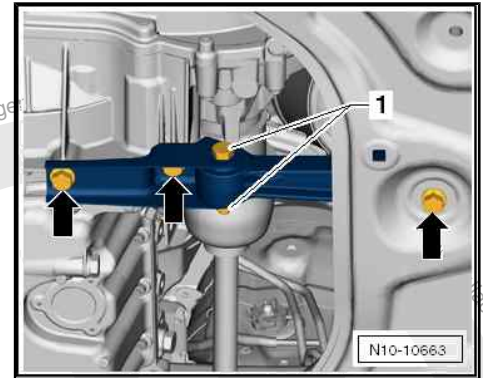


- Remove securing bolts -arrows- of pendulum support.



**Note**

*Bolt -1- must not be loosened.*

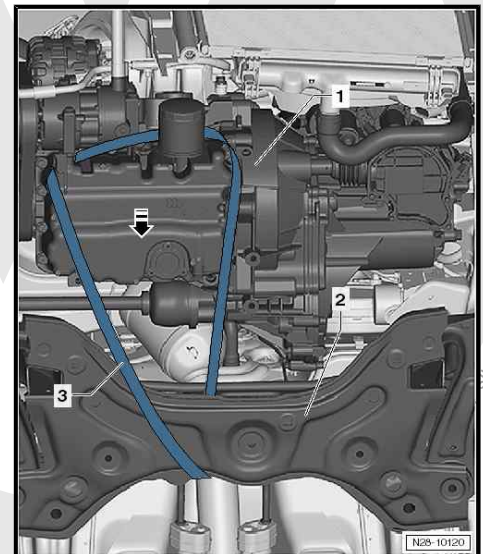


- Fit tensioning strap - T10038- -3- to engine -1- and subframe -2- as shown.
- Pull engine -1- in -direction of arrow- using tensioning strap - T10038- .

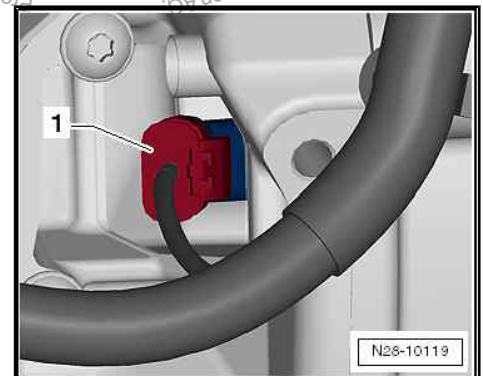


**Note**

*Ensure that there is sufficient clearance to the bodywork.*



- Release connector -1- and pull off.

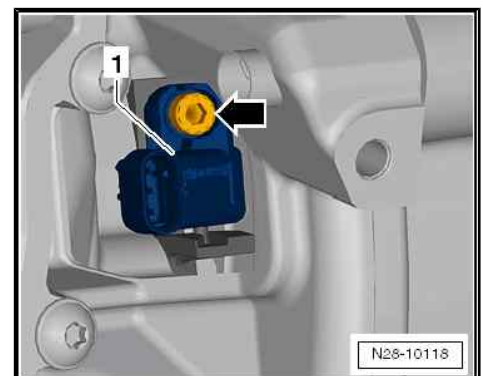


- Unscrew bolt -arrow- using 4 mm socket insert - T10370- .
- Remove engine speed sender - G28- -1-.

**Installing**

Install in reverse order. During this procedure, observe the following:

Secure bolt -arrows- against falling.





up! 2012 ➤ , up! 2017 ➤

3-cyl. injection engine (1.0 l, natural gas 4V, EA 211) - Edition 06.2019

### Specified torques

Component	Specified torque
Securing bolt for engine speed sender - G28-	8 Nm
Pendulum support	⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Assembly overview - subframe

