



## Workshop Manual

Polo 2010 ➤

Polo 2014 ➤

Polo Lim RUS 2016 ➤

4-cyl. direct injection (1.4 l, 4V, EA 211, turbocharger)									
Engine ID	CPT A	CZC A	CZE A						

Edition 11.2018



## List of Workshop Manual Repair Groups

### Repair Group

- 00 - Technical data
- 10 - Removing and installing engine
- 13 - Crankshaft group
- 15 - Cylinder head, valve gear
- 17 - Lubrication
- 19 - Cooling
- 21 - Turbocharging/supercharging
- 24 - Mixture preparation - injection
- 26 - Exhaust system
- 28 - Ignition system

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

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## Contents

<b>00 - Technical data</b> .....	<b>1</b>
<b>1 Safety information</b> .....	<b>1</b>
1.1 Safety regulations for working on fuel supply .....	1
1.2 Safety measures when working on vehicles with a start/stop system .....	1
1.3 Safety precautions when using testers and measuring instruments during a road test .....	2
1.4 Safety precautions when working on the cooling system .....	2
1.5 Safety precautions when working on ignition system .....	2
<b>2 Identification</b> .....	<b>3</b>
2.1 Engine number/engine data .....	3
<b>3 Repair instructions</b> .....	<b>4</b>
3.1 Rules for cleanliness .....	4
3.2 Foreign objects in engine .....	4
3.3 Contact corrosion .....	4
3.4 Routing and attachment of lines .....	4
3.5 Fitting radiator and condensers .....	5
<b>10 - Removing and installing engine</b> .....	<b>6</b>
<b>1 Removing and installing engine</b> .....	<b>6</b>
1.1 Removing engine .....	6
1.2 Separating engine and gearbox .....	15
1.3 Securing engine on engine and gearbox support .....	16
1.4 Installing engine .....	17
<b>2 Assembly mountings</b> .....	<b>21</b>
2.1 Assembly overview - assembly mountings .....	21
2.2 Removing and installing engine mounting .....	26
2.3 Removing and installing gearbox mounting .....	27
2.4 Removing and installing pendulum support .....	28
2.5 Supporting engine in installation position .....	30
<b>13 - Crankshaft group</b> .....	<b>34</b>
<b>1 Cylinder block (pulley end)</b> .....	<b>34</b>
1.1 Assembly overview - poly V-belt drive .....	34
1.2 Assembly overview - sealing flange, belt pulley end .....	37
1.3 Removing and installing poly-V belt .....	38
1.4 Removing and installing tensioner for poly V-belt .....	40
1.5 Removing and installing vibration damper .....	41
1.6 Removing and installing engine support .....	43
1.7 Renewing crankshaft oil seal - belt pulley end .....	45
1.8 Removing and installing sealing flange on pulley end .....	47
<b>2 Cylinder block, gearbox end</b> .....	<b>51</b>
2.1 Assembly overview - cylinder block, gearbox end .....	51
2.2 Removing and installing flywheel .....	52
2.3 Removing and installing sealing flange on gearbox side .....	53
<b>3 Crankshaft</b> .....	<b>61</b>
3.1 Crankshaft dimensions .....	61
3.2 Renewing needle bearing in crankshaft .....	61
3.3 Measuring axial clearance of crankshaft .....	64
<b>4 Pistons and conrods</b> .....	<b>65</b>
4.1 Assembly overview - pistons and conrods .....	65
4.2 Separating new conrod .....	67
4.3 Removing and installing pistons .....	67
4.4 Removing and installing oil spray jets .....	68



4.5	Checking pistons and cylinder bores	70
4.6	Checking radial clearance of conrods	71
4.7	Setting piston to TDC position	71
<b>15</b>	<b>Cylinder head, valve gear</b>	<b>76</b>
<b>1</b>	<b>Cylinder head</b>	<b>76</b>
1.1	Assembly overview - cylinder head	76
1.2	Assembly overview - camshaft housing	78
1.3	Removing and installing cylinder head	81
1.4	Removing and installing camshaft housing	85
1.5	Checking compression	88
<b>2</b>	<b>Toothed belt drive</b>	<b>91</b>
2.1	Assembly overview - toothed belt cover	91
2.2	Assembly overview - toothed belt	92
2.3	Removing and installing toothed belt guard	95
2.4	Preassembling and installing valve timing tool	96
2.5	Checking valve timing	109
2.6	Adjusting valve timing	115
2.7	Removing toothed belt from camshaft	133
2.8	Removing and installing toothed belt	138
<b>3</b>	<b>Valve gear</b>	<b>144</b>
3.1	Assembly overview - valve gear	144
3.2	Removing and installing camshaft oil seal	145
3.3	Removing and installing camshaft adjuster	157
3.4	Removing and installing toothed belt pulley	173
3.5	Removing and installing camshaft control valve 1 N205	178
3.6	Removing and installing exhaust camshaft control valve 1 N318	179
3.7	Removing and installing valve stem seals	179
3.8	Removing and installing cam actuators	187
<b>4</b>	<b>Inlet and exhaust valves</b>	<b>191</b>
4.1	Checking valve guides	191
4.2	Checking valves	191
4.3	Valve dimensions	192
<b>17</b>	<b>Lubrication</b>	<b>193</b>
<b>1</b>	<b>Sump, oil pump</b>	<b>193</b>
1.1	Assembly overview - sump/oil pump	193
1.2	Engine oil:	196
1.3	Removing and installing lower part of sump	197
1.4	Removing and installing upper part of sump	201
1.5	Removing and installing oil pump	204
1.6	Removing and installing oil level and oil temperature sender G266	205
<b>2</b>	<b>Engine oil cooler</b>	<b>207</b>
2.1	Assembly overview - engine oil cooler	207
2.2	Removing and installing engine oil cooler	207
<b>3</b>	<b>Crankcase ventilation</b>	<b>209</b>
3.1	Assembly overview - crankcase breather system	209
3.2	Removing and installing oil separator	210
<b>4</b>	<b>Oil filter, oil pressure switch</b>	<b>213</b>
4.1	Assembly overview - oil filter/oil pressure switch	213
4.2	Removing and installing oil pressure switch F1	214
4.3	Removing and installing oil pressure switch for reduced oil pressure F378	215
4.4	Checking oil pressure	216
4.5	Removing and installing oil pressure regulating valve N428	218



<b>19 - Cooling</b>	<b>220</b>
<b>1 Cooling system/coolant</b>	<b>220</b>
1.1 Connection diagram - coolant hoses	220
1.2 Checking cooling system for leaks	223
1.3 Draining and adding coolant	225
<b>2 Coolant pump, regulation of cooling system</b>	<b>232</b>
2.1 Assembly overview - coolant pump, thermostat	232
2.2 Assembly overview - electric coolant pump	234
2.3 Assembly overview - coolant temperature sender	236
2.4 Removing and installing electric coolant pump	236
2.5 Removing and installing coolant pump	238
2.6 Removing and installing thermostat	242
2.7 Removing and installing toothed belt pulley for coolant pump	245
2.8 Removing and installing coolant temperature sender G62	248
2.9 Removing and installing radiator outlet coolant temperature sender G83	250
<b>3 Coolant pipes</b>	<b>253</b>
3.1 Assembly overview - coolant pipes	253
3.2 Removing and installing coolant pipes	253
<b>4 Radiator, radiator fan</b>	<b>257</b>
4.1 Assembly overview - radiator/radiator fan	257
4.2 Assembly overview - radiator cowl and radiator fan	259
4.3 Removing and installing radiator	260
4.4 Removing and installing water radiator for charge air cooling circuit	263
4.5 Removing and installing radiator cowl with radiator fan	267
4.6 Removing and installing radiator fan V7	268
<b>21 - Turbocharging/supercharging</b>	<b>270</b>
<b>1 Exhaust turbocharger</b>	<b>270</b>
1.1 Assembly overview - turbocharger	270
1.2 Removing and installing turbocharger	274
1.3 Removing and installing charge pressure positioner V465	277
1.4 Removing and installing connection for turbocharger	279
<b>2 Charge air system</b>	<b>283</b>
2.1 Assembly overview - charge air system	283
2.2 Removing and installing charge air cooler	285
2.3 Removing and installing charge pressure sender GX26	286
2.4 Checking charge air system for leaks	287
2.5 Removing and installing air intake pipe	289
<b>24 - Mixture preparation - injection</b>	<b>291</b>
<b>1 Injection system</b>	<b>291</b>
1.1 Overview of fitting locations - injection system	291
<b>2 Injectors</b>	<b>299</b>
2.1 Assembly overview - fuel rail with injectors	299
2.2 Removing and installing fuel rail	300
2.3 Removing and installing injectors	301
2.4 Cleaning injectors	306
<b>3 Air filter</b>	<b>307</b>
3.1 Assembly overview - air filter housing	307
3.2 Removing and installing air filter housing	308
3.3 Removing and installing resonator for intake air	309
<b>4 Intake manifold</b>	<b>310</b>
4.1 Assembly overview - intake manifold	310
4.2 Removing and installing intake manifold	312



4.3	Removing and installing throttle valve module GX3	314
4.4	Cleaning throttle valve module GX3	315
<b>5</b>	<b>Senders and sensors</b>	<b>317</b>
5.1	Removing and installing fuel pressure sender G247	317
5.2	Checking fuel pressure sender G247	318
5.3	Removing and installing intake manifold sender GX9	321
<b>6</b>	<b>Engine control unit</b>	<b>323</b>
6.1	Removing and installing engine (motor) control unit J623	323
6.2	Removing and installing engine (motor) control unit J623 with protective housing	324
<b>7</b>	<b>High-pressure pump</b>	<b>326</b>
7.1	Assembly overview - high-pressure pump	326
7.2	Removing and installing high-pressure pump	330
7.3	Removing and installing high-pressure pipe	331
<b>8</b>	<b>Lambda probe</b>	<b>333</b>
8.1	Assembly overview - Lambda probe	333
8.2	Removing and installing Lambda probe	334
<b>26</b>	<b>- Exhaust system</b>	<b>337</b>
<b>1</b>	<b>Exhaust pipes and silencers</b>	<b>337</b>
1.1	Assembly overview - silencers	337
1.2	Separating exhaust pipes from silencers	338
1.3	Removing and installing silencer	339
1.4	Aligning exhaust system free of stress	340
1.5	Check exhaust system for leaks	341
<b>2</b>	<b>Exhaust gas cleaning</b>	<b>342</b>
2.1	Assembly overview - emission control	342
2.2	Removing and installing catalytic converter	343
<b>28</b>	<b>- Ignition system</b>	<b>348</b>
<b>1</b>	<b>Ignition system</b>	<b>348</b>
1.1	Assembly overview - ignition system	348
1.2	Removing and installing ignition coils with output stage	349
1.3	Removing and installing knock sensor 1 G61	352
1.4	Removing and installing Hall sender	352
1.5	Removing and installing engine speed sender G28	353



## 00 – Technical data

### 1 Safety information

(VRL012422; Edition 11.2018)

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

⇒ [“1.2 Safety measures when working on vehicles with a start/stop system”, page 1](#)

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

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

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

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

##### Risk of injury from highly pressurised fuel.

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

Before opening the fuel system:

- Wear 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 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 could start unexpectedly. A message in the dash panel insert indicates whether the start/stop system is activated.

- Deactivate start/stop system by switching off the ignition.



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

#### Risk of injury 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.

### 1.4 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 by 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.

### 1.5 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 3**

### 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”. After 999,999 engines with the same code letters have been produced, the first of the six digits is replaced by a letter.

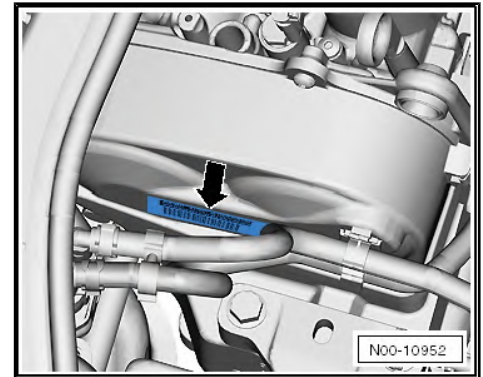
#### Vehicles with four digit engine codes

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 denotes the performance and torque rating of the engine, depending on the engine control unit - J623- .

The four-digit engine code can be found on the identification plate, the vehicle data sticker and the engine control unit.



#### Note

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

Engine code	CPTA	CZCA	CZEA
Manufactured	06.12 ►	05.16 ►	05.14 ►
Exhaust emission standard	EU5	EU6	EU6
Displacement cm <sup>3</sup>	1395	1395	1395
Power kW at rpm	103/4500-6000	92/5000-6000	110/5000-6000
Torque Nm at rpm	250/1500-3500	200/1400-4000	250/1500-3500
Bore Ø mm	74.5	74.5	74.5
Stroke mm	80.0	80.0	80.0
Compression ratio	10.5	10.0	10.0
Valves per cylinder	4	4	4
RON min.	95 unleaded <sup>1</sup>	95 unleaded <sup>1</sup>	95 unleaded <sup>1</sup>
Injection, ignition system	Motronic ME 17	Motronic ME 17	Motronic ME 17
Firing order	1-3-4-2	1-3-4-2	1-3-4-2

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

1) In exceptional circumstances min. 91 RON, however with reduced performance.



## 3 Repair instructions

⇒ [“3.1 Rules for cleanliness”, page 4](#)

⇒ [“3.2 Foreign objects in engine”, page 4](#)

⇒ [“3.3 Contact corrosion”, page 4](#)

⇒ [“3.4 Routing and attachment of lines”, page 4](#)

⇒ [“3.5 Fitting radiator and condensers”, page 5](#)

### 3.1 Rules for cleanliness

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

- ◆ Thoroughly clean all joints and surrounding areas before dismantling.
- ◆ 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 clean components only: do not remove replacement parts from packing 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.
- ◆ Make sure that no fuel gets onto the fuel hoses. Should this occur, the fuel hoses must be cleaned immediately.
- ◆ Protect disconnected electrical connectors from dirt and water, and reconnect them only when dry.

### 3.2 Foreign objects in engine

Prevent the ingress of foreign bodies. When carrying out installation work on the engine, open channels must be sealed with suitable plugs such as those 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 .

### 3.4 Routing and attachment of lines

- ◆ Avoid interchanging and ensure that the original installation position is restored. Mark the lines for the fuel, hydraulic and vacuum systems and for the activated charcoal filter system as well as electrical lines before they are removed. Where necessary, make sketches or take photographs.
- ◆ To avoid damaging pipes and wires, ensure adequate clearance from all moving or hot components in the engine compartment on account of the confined space.



### **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 6](#)

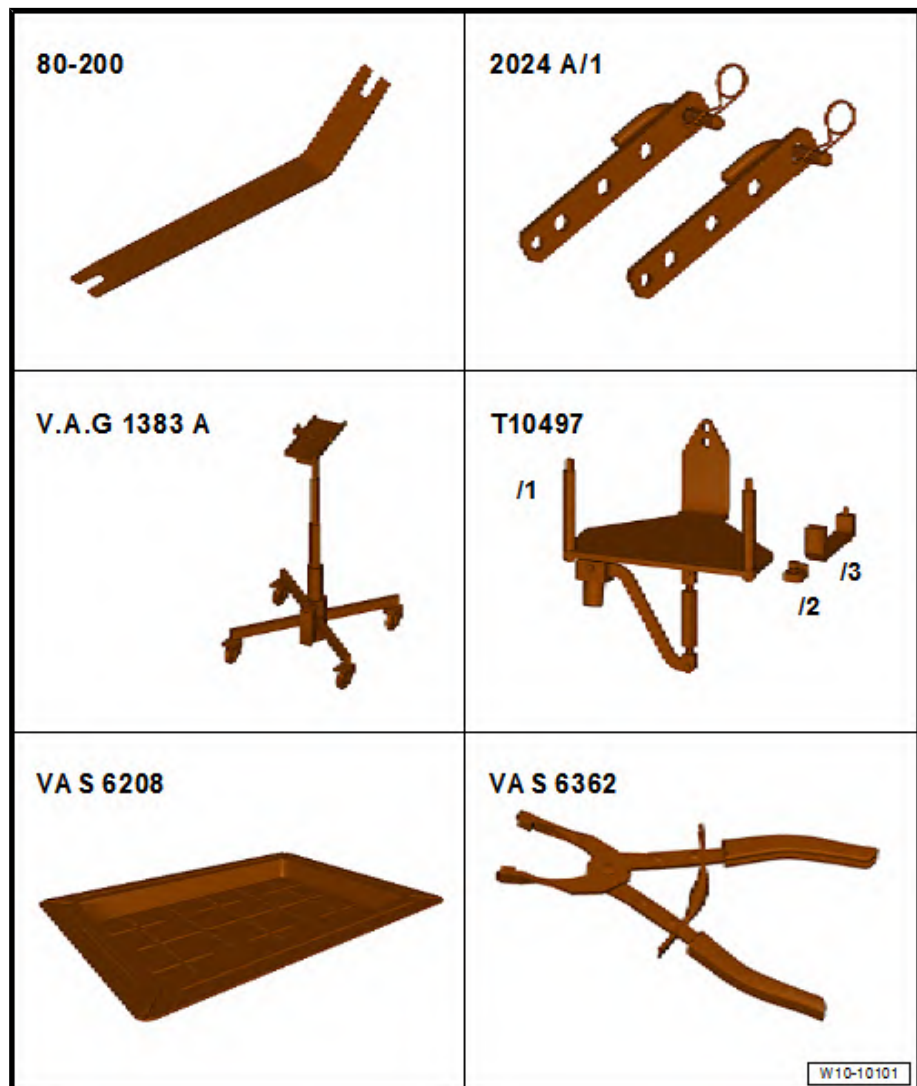
⇒ [“1.2 Separating engine and gearbox”, page 15](#)

⇒ [“1.3 Securing engine on engine and gearbox support”, page 16](#)

⇒ [“1.4 Installing engine”, page 17](#)

#### 1.1 Removing engine

Special tools and workshop equipment required



- ◆ Release lever - 80 - 200-
- ◆ Engine and gearbox jack - V.A.G 1383 A-
- ◆ Engine support - T10497-
- ◆ Drip tray for workshop hoist - VAS 6208-
- ◆ Spring-type clip pliers - VAS 6362-



- ◆ Commercially available stepladder
- ◆ Safety glasses
- ◆ Safety gloves

### Removing

#### Note

- ◆ The engine is removed downwards together with the gearbox.
  - ◆ Reinstall all cable ties in the same locations when installing.
- Carefully open filler cap -1- on coolant expansion tank -2- in -direction of arrow-.

#### CAUTION

On a warm engine, the cooling system is under high pressure. Danger of scalding by 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.

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

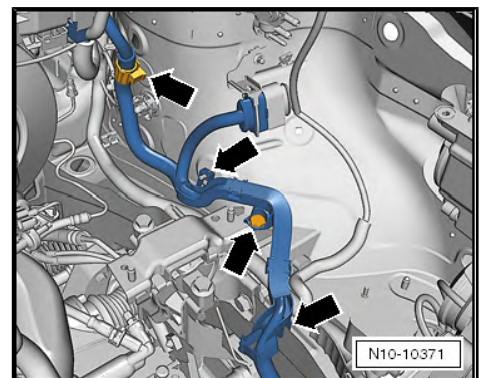
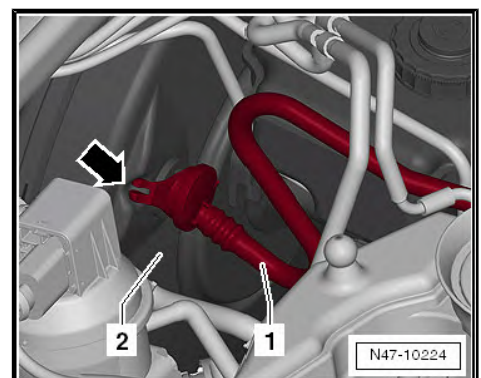
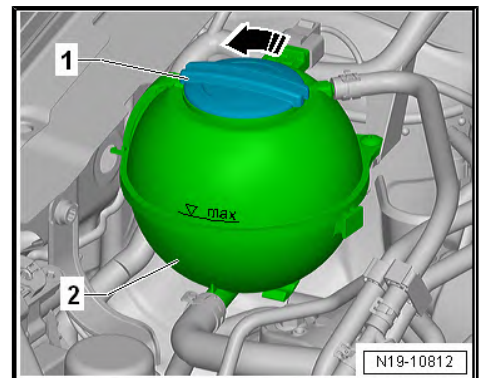
#### Vehicles with manual gearbox

- Pull vacuum line -1- off brake servo -2-.
- If fitted, release and disconnect connector on vacuum sender on vacuum line.

#### Continued for all vehicles

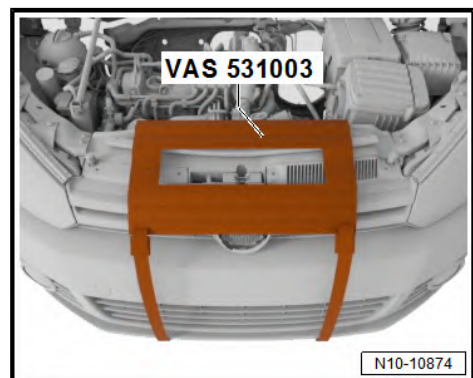
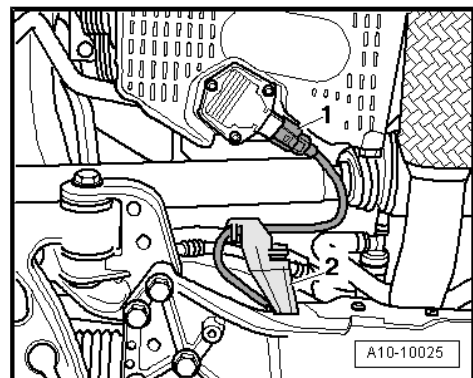
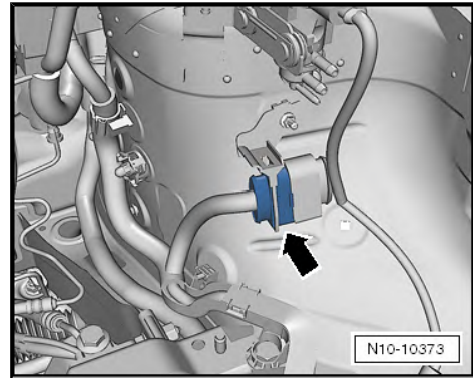
- Remove air filter housing  
⇒ ["3.2 Removing and installing air filter housing", page 308](#) .

- Carefully loosen wiring harness at its fastening points -arrows-.





- Release connector -arrow-, pull off and unclip from bracket.
- Release connector from engine control unit and pull off  
⇒ [“6 Engine control unit”, page 323](#) .
- Place wiring harness on engine.
- Remove front wheels ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres; Specified torque for wheel bolts .
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation .
- Remove front left and right wheel housing liners ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liner .
- If fitted, release and pull off connector -1- on oil level and oil temperature sender - G266- .
- Move clear electrical wiring harness, and lay it to one side.
- Remove heat shield for right drive shaft ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft heat shield .
- Remove left and right drive shafts ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .
- Remove radiator cowl  
⇒ [“4.5 Removing and installing radiator cowl with radiator fan”, page 267](#) .
- Attach protective mat - VAS 531003- to vehicle as shown in illustration.
- Drain coolant  
⇒ [“1.3 Draining and adding coolant”, page 225](#) .



**Vehicles with air conditioner compressor:**

**⚠ CAUTION**

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

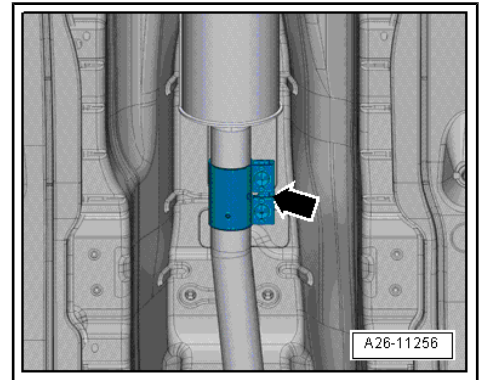
- **Do not open refrigerant circuit of air conditioning system.**

- Remove poly V-belt  
⇒ [“1.3 Removing and installing poly-V belt”, page 38](#) .
- Separate connector -1- on air conditioning compressor regulating valve - N280- .
- Remove air conditioner compressor with refrigerant lines connected from engine ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Removing air conditioner compressor from and installing to bracket .
- Detach air conditioner compressor from bracket (refrigerant hoses remain connected) and tie up to right side.
- Do NOT stretch, kink or bend refrigerant lines and hoses while doing so.

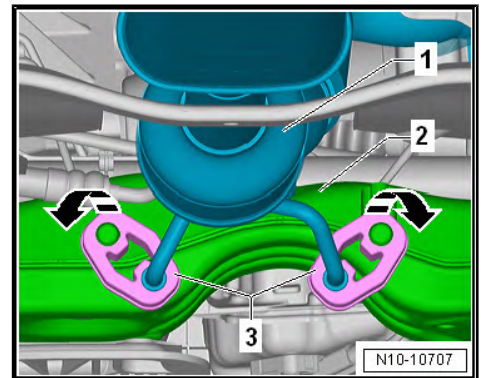


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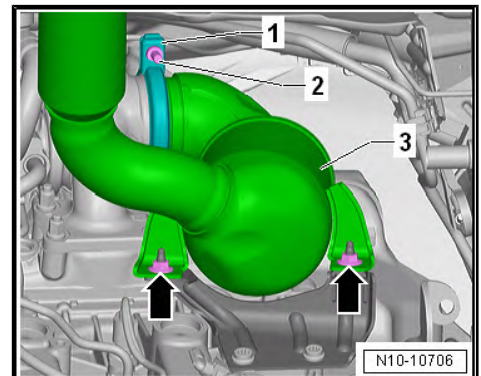
- Loosen clamp -arrow-, and push it to rear.



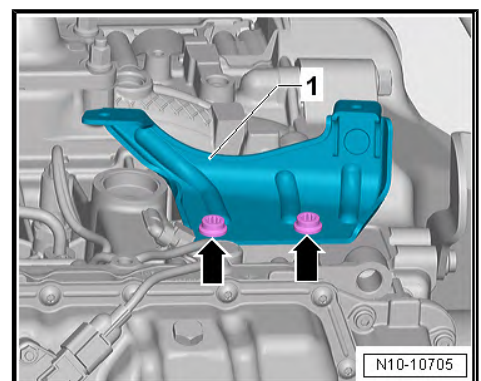
- Detach exhaust hangers -3- in -direction of arrow- from subframe -2-.
- Lower exhaust system -1- until it rests on subframe -2-.



- Unscrew bolt -2-.
- Remove screw-type clip -1-.
- Unscrew nuts -arrows- and tie up catalytic converter -3-.

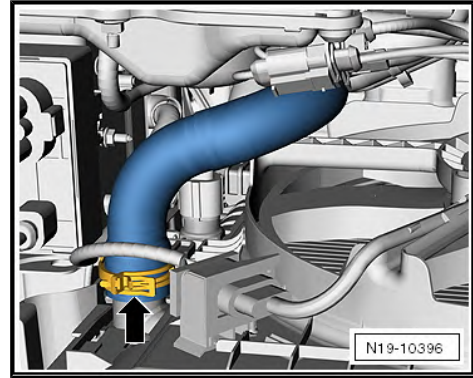


- Unscrew bolts -arrows- and remove bracket -1-.

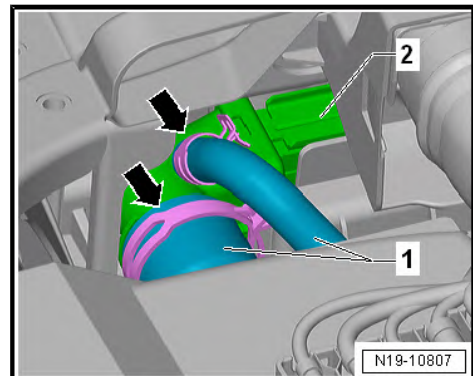




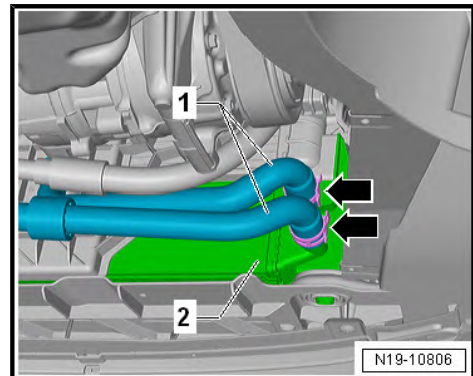
- Open spring-type clip -arrow- and pull off coolant hose downwards.



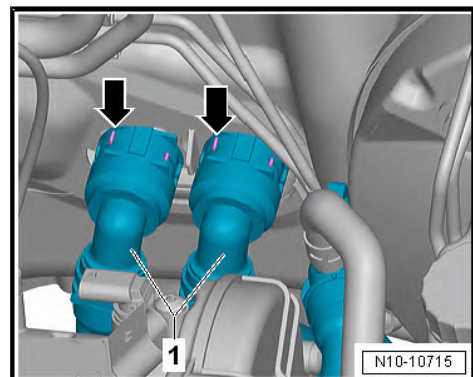
- Open spring-type clips -arrows-.
- Pull coolant hose -1- off radiator -2-.



- Open spring-type clips -arrows-.
- Pull coolant hoses -1- off water radiator for charge air cooling circuit -2-.



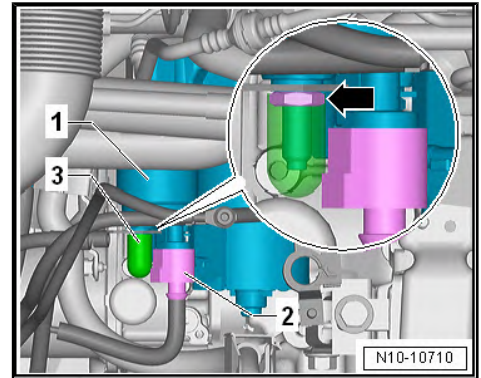
- Release retaining clips -arrows-.
- Pull coolant hoses -1- off heat exchanger for heater unit.



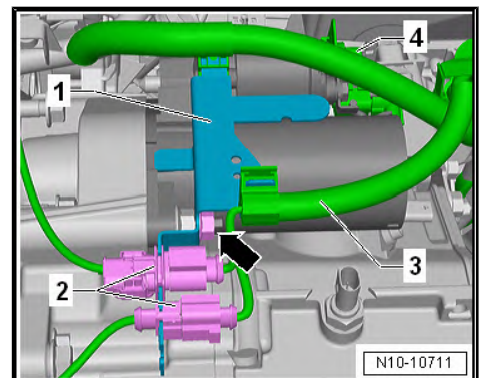




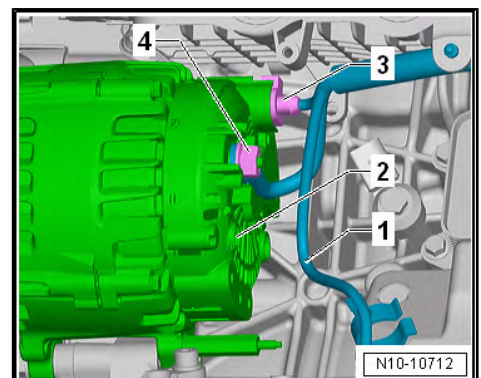
- Release and pull off connector -2- on starter -1-.
- Pull off protective cap -3-.
- Unscrew nut -arrow- and remove line from starter -1-.



- Release and pull off connectors -2-.
- Unclip connectors -2- from bracket -1-.
- Unclip wires -3- and -4- from bracket -1-.
- Unscrew nuts -arrow-.
- Remove bracket -1- from gearbox.



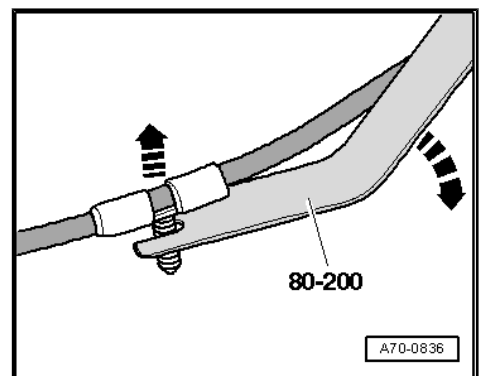
- Release and pull off connector -3- on alternator -2-.
- Unscrew nut -4-.
- Remove wire -1- from alternator -2-.
- Lay wiring harness -1- on coolant hose to one side.



- Lay lower wiring harness on intake manifold to one side.
- Use removal lever - 80 - 200- to do this.

#### Vehicles with manual gearbox

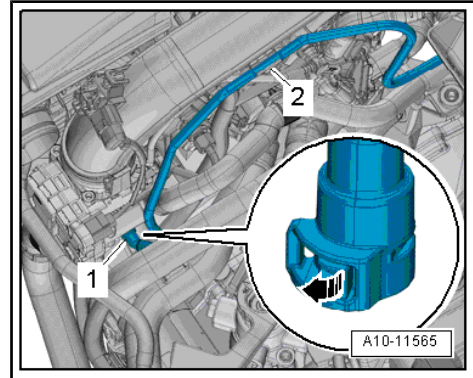
- Release and pull off connectors on gearbox.
- Remove selector mechanism from gearbox ⇒ Rep. gr. 34 ; Selector mechanism; Removing and installing selector mechanism .
- Remove clutch slave cylinder ⇒ Rep. gr. 30 ; Clutch mechanism; Removing and installing clutch slave cylinder .



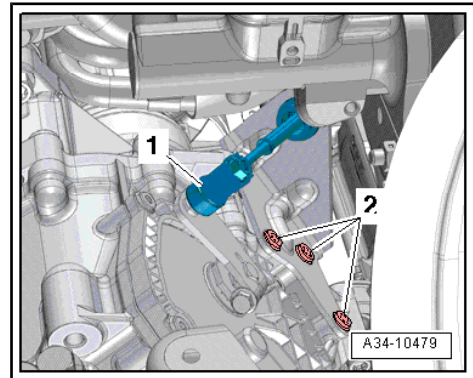


### Vehicles with dual clutch gearbox

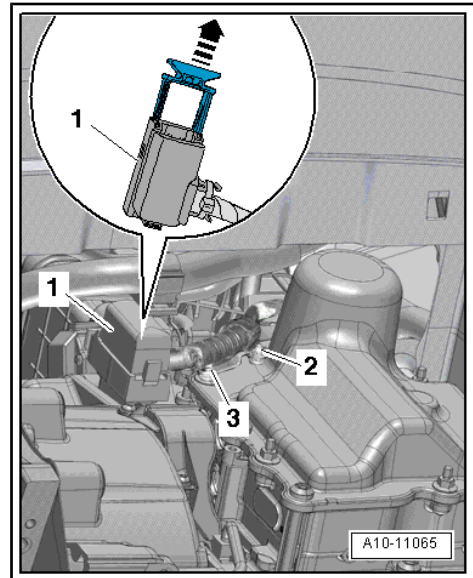
- Release catch -arrow- and disconnect vacuum hose -1-.
- Move clear vacuum hose at air intake pipe -2-.



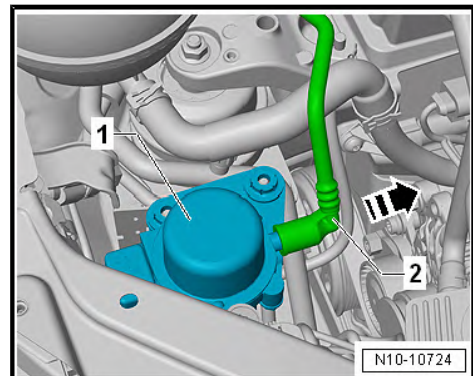
- Remove selector lever cable -1- ⇒ Rep. gr. 34 ; Removing and installing gearbox .
- Unscrew bolts -2- on gearbox.
- Lay selector lever cable with retainer to one side.



- Release and pull off connector -1- of mechatronic unit in -direction of arrow-.
- Unscrew bolts -2- and -3-.
- Remove retainer with wiring harness and lay them to one side.



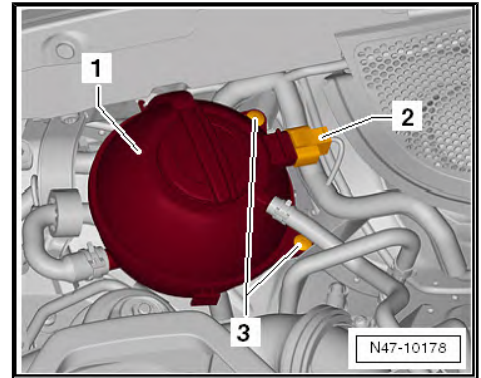
- Pull vacuum line -2- in direction of -arrow- off vacuum pump for brakes - V192- -1-.
- Lay vacuum line -1- to one side.



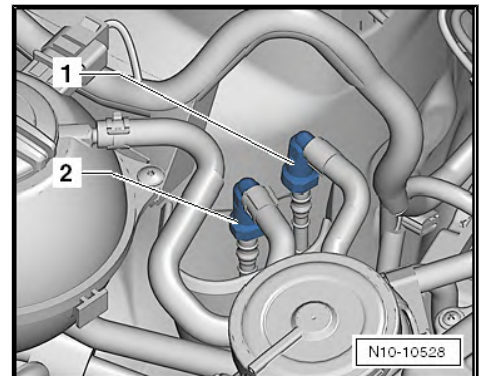


**Continued for all vehicles**

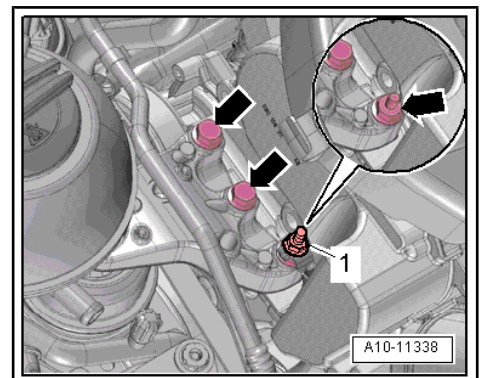
- Release connectors -2- and pull off.
- Unscrew securing bolts -3-.
- Place coolant expansion tank -1- on engine.



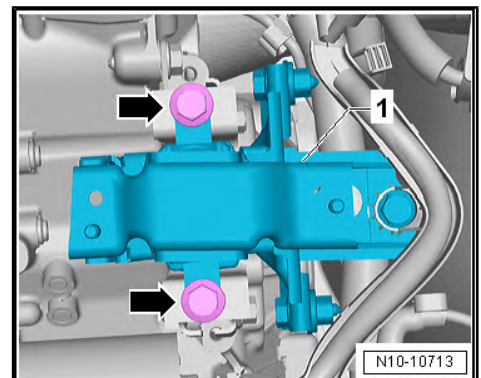
- Disconnect fuel supply line -1- and line to activated charcoal filter solenoid valve 1 - N80- -2-. Disconnect plug-in connectors => Rep. gr. 20 ; Plug-in connectors; Disconnecting plug-in connectors .



- Unscrew earth wire -1-.
- Unscrew bolts -arrows- on engine mounting approx. 2 turns.

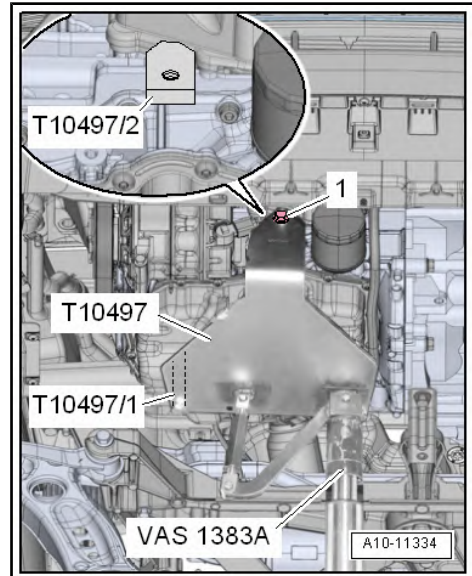


- Unscrew securing bolts -arrows- on gearbox mounting by approx. 2 turns.
- Remove pendulum support  
=> ["2.4 Removing and installing pendulum support", page 28](#) .
- Apply clamping piece T10497/2 at housing rib on cylinder block, as shown in illustration.





- Position engine support T10497 with pin T10497/1 on cylinder block.
- Screw in bolt -1- through hole "B" in engine support T10497 and tighten it to 20 Nm.

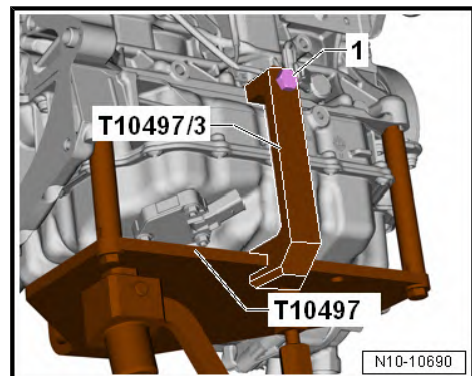


- Fit adapter - T10497/3- to engine support - T10497- and tighten bolt -1- to 20 Nm.
- Insert engine and gearbox jack - V.A.G 1383 A- in engine support T10497 , and raise engine/gearbox assembly slightly.

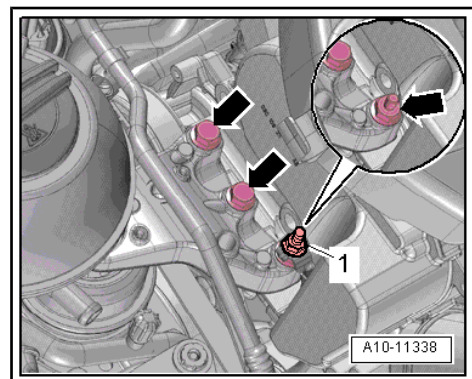


#### Note

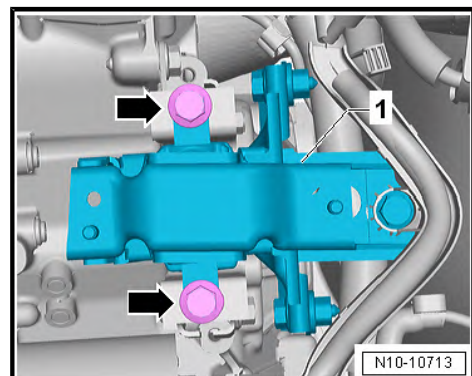
*To unscrew bolts for assembly mounting use commercially available stepladder.*



- Remove bolts -arrows- for engine mounting.



- Unscrew securing bolts -arrows- from gearbox mounting.
- Check that all vacuum lines and electrical wiring between engine, gearbox, subframe and body have been detached.
- When lowering, carefully guide engine/gearbox assembly with assembly carrier out of engine compartment.
- First lower engine/gearbox assembly slightly.
- Then push gearbox end of engine/gearbox assembly forwards and only then lower further.





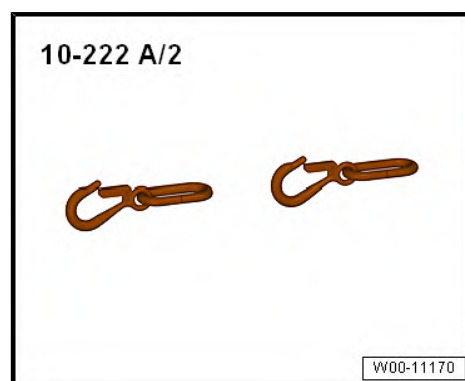
## 1.2 Separating engine and gearbox

### Special tools and workshop equipment required

- ◆ Shackle - 10 - 222 A /12-



- ◆ Hook - 10 - 222 A /2-



- ◆ Workshop hoist - VAS 6100-

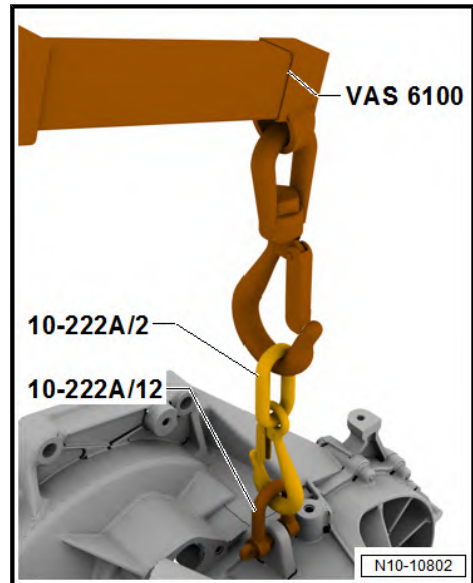


### Procedure

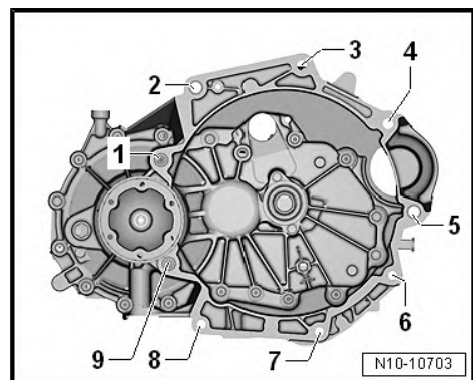
- Engine/gearbox assembly removed and attached to engine support T10497 .
- Remove starter ⇒ Electrical system; Rep. gr. 27 ; Starter; Removing and installing starter .



- Bolt shackle - 10 - 222 A /12- to gearbox.
- Attach workshop hoist - VAS 6100- with hook - 10 - 222 A /2- to shackle - 10 - 222 A /12- .



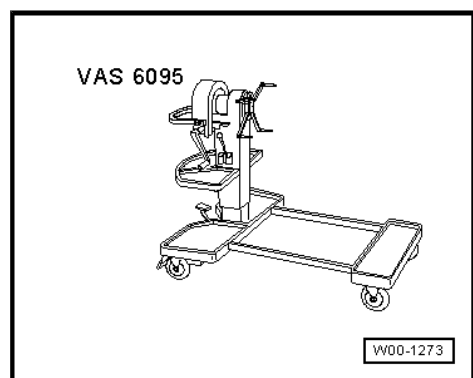
- Remove bolts -1, 2, 3, 6, 7, 8, 9- securing gearbox to engine.
- Pull gearbox off engine.



### 1.3 Securing engine on engine and gearbox support

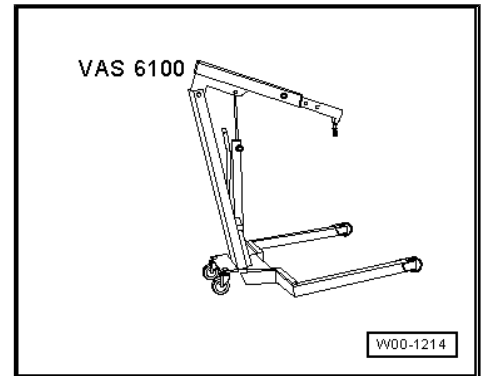
#### Special tools and workshop equipment required

- ◆ Engine and gearbox support - VAS 6095-





- ◆ Workshop hoist - VAS 6100-



### Procedure

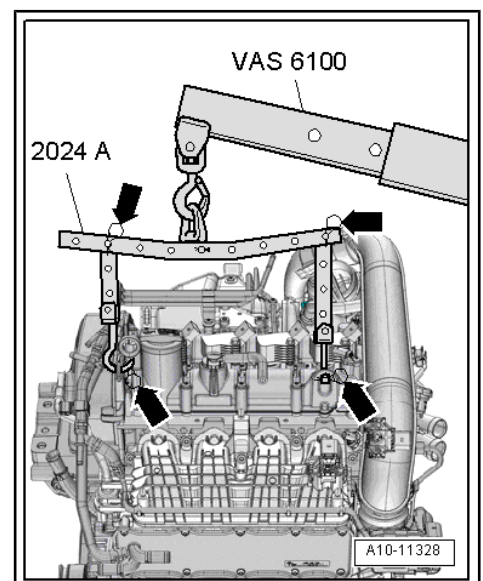
- Gearbox detached from engine  
⇒ "1.2 Separating engine and gearbox", page 15 .
- Secure lifting tackle - 2024 A- on engine, and attach it to workshop hoist - VAS 6100- as shown in illustration.



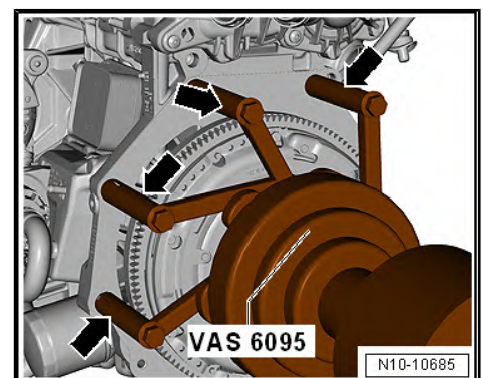
### Note

*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-.
- Lift engine off T10497 using workshop hoist - VAS 6100- .



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



## 1.4 Installing engine

Install in reverse order of removal. The following should be observed:

- Attach engine/gearbox assembly to engine support T10497 .



#### Note

- ◆ *Renew bolts that are tightened with turning further angle.*
- ◆ *Renew self-locking nuts and bolts, and seals, O-rings and gaskets.*
- ◆ *Secure all hose connections with hose clips corresponding to the series equipment ⇒ *Electronic Parts Catalogue* .*
- ◆ *Reinstall all cable ties in the same locations when installing.*

#### **When the gearbox has been separated from the engine:**

- Install intermediate plate ⇒ [page 52](#) .

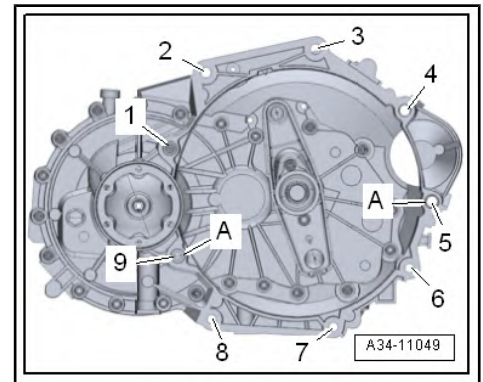




- If there are no dowel sleeves -A- in the cylinder block for centring the engine and gearbox, insert new dowel sleeves.
- Bolt gearbox to engine at positions -1, 2, 3, 6, 7, 8, 9-.
- Install starter ⇒ Electrical system; Rep. gr. 27 ; Starter; Removing and installing starter .

#### Installing engine/gearbox assembly in vehicle:

- Take up engine/gearbox assembly with engine support T10497 .
- Guide engine/gearbox assembly into body.
- Install engine mounting  
⇒ ["2.2 Removing and installing engine mounting", page 26](#) .
- Install gearbox mounting  
⇒ ["2.3 Removing and installing gearbox mounting", page 27](#) .
- Detach engine support T10497 from engine.
- Install pendulum support  
⇒ ["2.4 Removing and installing pendulum support", page 28](#) .



#### Vehicles with manual gearbox

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

#### Continued for all vehicles

- 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](#) .
- Connect wires to engine control unit - J623-  
⇒ ["6 Engine control unit", page 323](#) .
- Connect wires to alternator ⇒ Electrical system; Rep. gr. 27 ; Alternator; Assembly overview - alternator .
- Ensure proper electrical connections and routing ⇒ Electrical system; Rep. gr. 97 ; Relay carriers, fuse carriers, electronics boxes; Overview of fitting locations – relay carriers, fuse carriers, electronics boxes and ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- Install catalytic converter  
⇒ ["2.2 Removing and installing catalytic converter", page 343](#) .
- Install drive shafts ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .
- Install coolant expansion tank  
⇒ ["4 Radiator, radiator fan", page 257](#) .
- Install radiator cowl  
⇒ ["4.5 Removing and installing radiator cowl with radiator fan", page 267](#) .
- Install air filter housing  
⇒ ["3.2 Removing and installing air filter housing", page 308](#) .
- Install battery and battery tray ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery tray .



- Install wheel housing liners ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liner .
- Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation .
- Install front wheels ⇒ Running gear, axles, steering; Rep. gr. 44 ; Wheels, tyres; Specified torque for wheel bolts .
- Add coolant ⇒ [page 227](#) .

#### Torque settings



#### Note

- ◆ *The specified torques are only valid for nuts and bolts which have been slightly greased, oiled, phosphate-treated or black-oxidized.*
- ◆ *Additional lubricant such as engine oil or gear oil may be used, but do not use lubricant containing graphite.*
- ◆ *Do not use degreased parts.*
- ◆ ⇒ ["2.1 Assembly overview - assembly mountings", page 21](#)
- ◆ Securing gearbox on engine ⇒ Rep. gr. 34 ; Removing and installing gearbox; Specified torques for gearbox .

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



## 2 Assembly mountings

⇒ [“2.1 Assembly overview - assembly mountings”, page 21](#)

⇒ [“2.2 Removing and installing engine mounting”, page 26](#)

⇒ [“2.3 Removing and installing gearbox mounting”, page 27](#)

⇒ [“2.4 Removing and installing pendulum support”, page 28](#)

⇒ [“2.5 Supporting engine in installation position”, page 30](#)

### 2.1 Assembly overview - assembly mountings

⇒ [“2.1.1 Assembly overview - assembly mountings, manual gearbox”, page 21](#)

⇒ [“2.1.2 Assembly overview - assembly mountings, dual clutch gearbox”, page 23](#)

#### 2.1.1 Assembly overview - assembly mountings, manual gearbox

##### 1 - Engine support

- Removing and installing  
⇒ [“1.6 Removing and installing engine support”, page 43](#)
- Specified torque and tightening sequence  
⇒ [page 23](#)

##### 2 - Bolt

- Renew after removal
- Specified torque and tightening sequence  
⇒ [page 23](#)

##### 3 - Engine mounting

- Removing and installing  
⇒ [“2.2 Removing and installing engine mounting”, page 26](#)
- Aligning engine mounting ⇒ [page 22](#)

##### 4 - Bolt

- Renew after removal
- 20 Nm + 90°
- Qty. 4

##### 5 - Nut

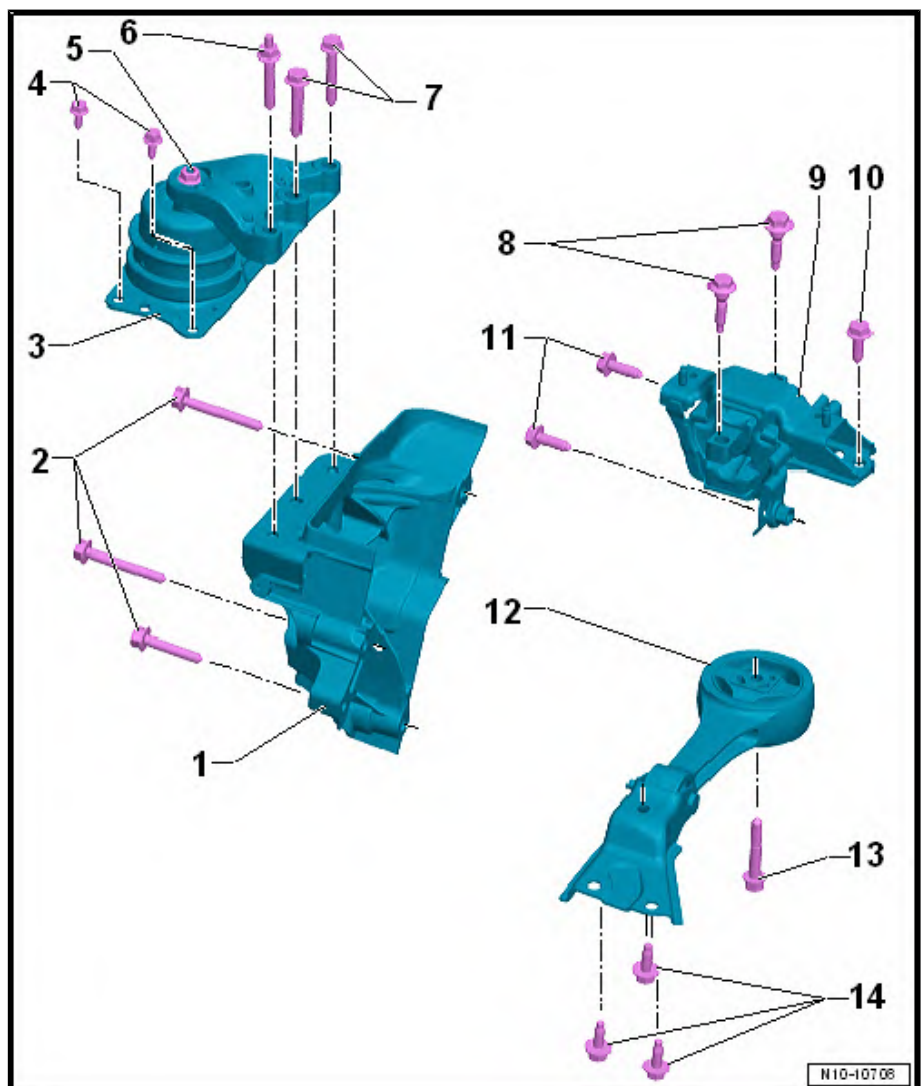
- The securing nut must not be loosened.

##### 6 - Centre hex stud

- With mounting for earth wire.
- Renew after removal
- 30 Nm + 90°

##### 7 - Bolt

- Qty. 2
- Renew after removal





- 30 Nm + 90°

#### 8 - Bolt

- Renew after removal
- 40 Nm + 90°
- Tightening sequence ⇒ [page 23](#)

#### 9 - Gearbox mounting

- Removing and installing ⇒ [“2.3 Removing and installing gearbox mounting”, page 27](#)
- Tightening sequence - gearbox mounting ⇒ [page 23](#) .

#### 10 - Bolt

- Renew after removal
- 50 Nm + 90°
- Tightening sequence - gearbox mounting ⇒ [page 23](#) .

#### 11 - Bolt

- Renew after removal
- 50 Nm + 90°
- Qty. 2
- Tightening sequence - gearbox mounting ⇒ [page 23](#) .

#### 12 - Pendulum support

- Removing and installing ⇒ [“2.4 Removing and installing pendulum support”, page 28](#)

#### 13 - Bolt

- Renew after removal
- 40 Nm + 90°

#### 14 - Bolt

- Renew after removal
- 30 Nm + 90°
- Qty. 3

#### 15 - Bolt

- Renew after removal
- 50 Nm + 90°

#### Aligning engine mountings:

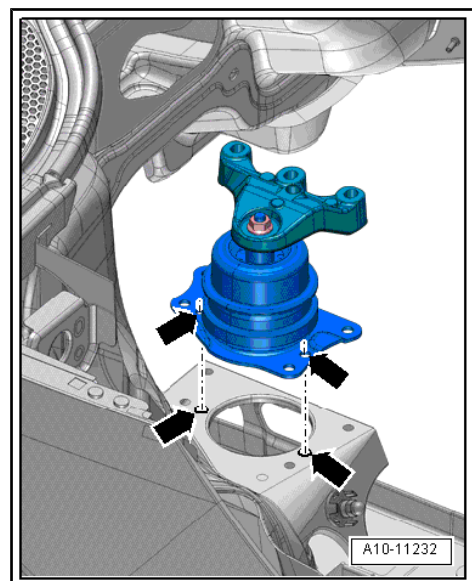
- Fit engine mounting on longitudinal member.



#### Note

*Risk of damage to threads by starting bolts at an angle.*

- The positioning holes -arrows- must be in line; check with appropriate drill if necessary.





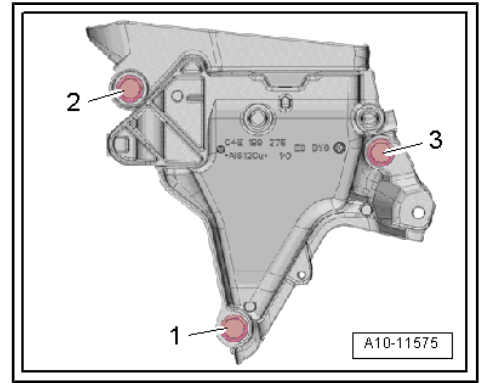
### Engine support - specified torque and tightening sequence

**i** Note

*Risk of damage to threads by starting bolts at an angle.*

– Tighten bolts in stages in the sequence shown.

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

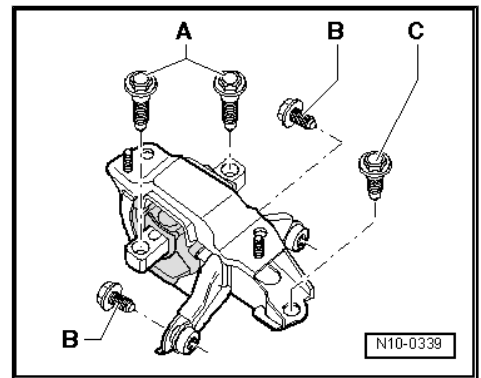


### Tightening sequence - gearbox mounting

**i** Note

*Risk of damage to threads by starting bolts at an angle.*

Item	Procedure	Torque setting
B and C	Start bolts before tightening them	hand-tight
B	Tighten bolts	50 Nm + 90°
C	Tighten bolt.	50 Nm + 90°
A	Start bolts before tightening them	hand-tight
A	Bolts	40 Nm + 90°



## 2.1.2 Assembly overview - assembly mountings, dual clutch gearbox



### 1 - Engine support

- Removing and installing ⇒ [“1.6 Removing and installing engine support”, page 43](#)
- Specified torque and tightening sequence ⇒ [page 25](#)

### 2 - Bolt

- Renew after removal
- Specified torque and tightening sequence ⇒ [page 25](#)

### 3 - Engine mounting

- Removing and installing ⇒ [“2.2 Removing and installing engine mounting”, page 26](#)
- Aligning engine mounting ⇒ [page 25](#)

### 4 - Bolt

- Renew after removal
- 20 Nm + 90°
- Qty. 4

### 5 - Nut

- The securing nut must not be loosened.

### 6 - Centre hex stud

- With mounting for earth wire.
- Renew after removal
- 30 Nm +90°

### 7 - Bolt

- Qty. 2
- Renew after removal
- 30 Nm + 90°

### 8 - Bolt

- Renew after removal
- 40 Nm + 90°
- Tightening sequence - gearbox mounting ⇒ [page 26](#) .

### 9 - Gearbox mounting

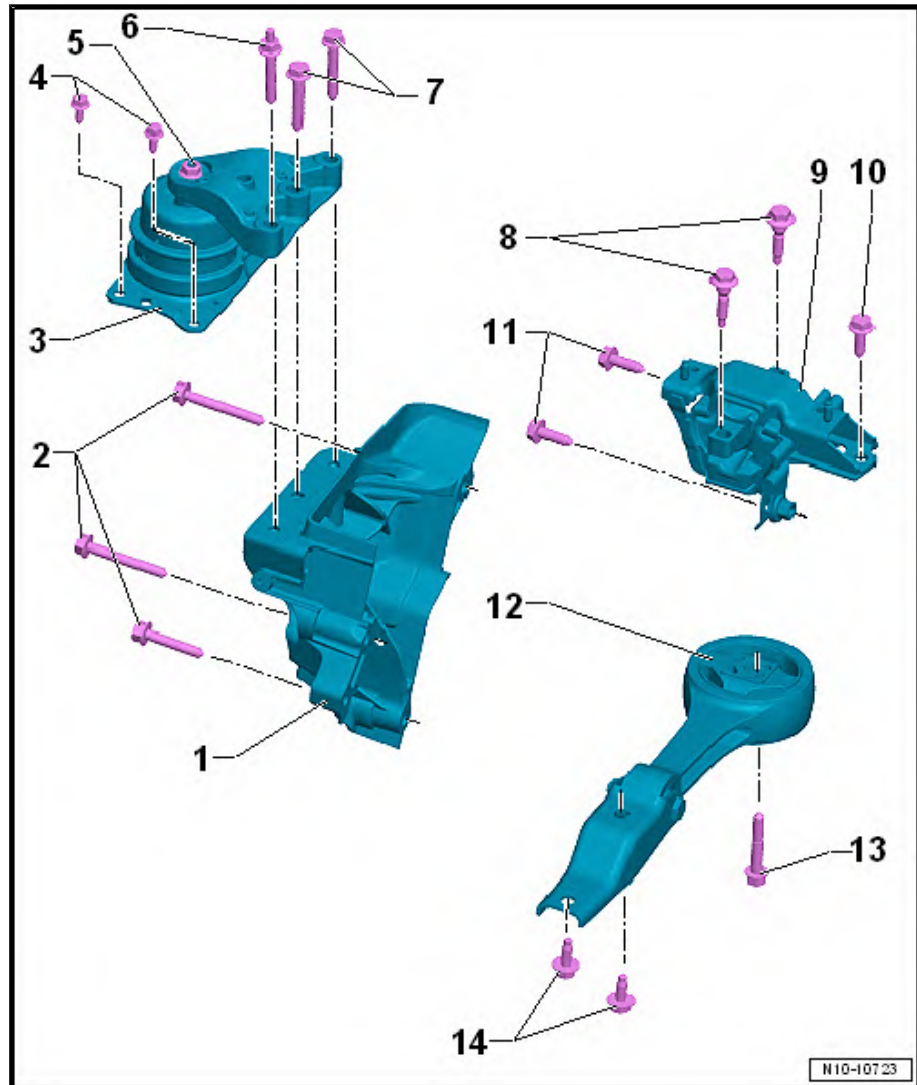
- Removing and installing ⇒ [“2.3 Removing and installing gearbox mounting”, page 27](#)
- Tightening sequence - gearbox mounting ⇒ [page 26](#) .

### 10 - Bolt

- Renew after removal
- 50 Nm + 90°
- Tightening sequence - gearbox mounting ⇒ [page 26](#) .

### 11 - Bolt

- Renew after removal
- 50 Nm + 90°
- Qty. 2



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



- Tightening sequence - gearbox mounting ⇒ [page 26](#) .

### 12 - Pendulum support

- Removing and installing ⇒ [“2.4 Removing and installing pendulum support”, page 28](#)

### 13 - Bolt

- Renew after removal
- 40 Nm + 90°

### 14 - Bolt

- Renew after removal
- 30 Nm + 90°
- Qty. 2

### 15 - Bolt

- Renew after removal
- 50 Nm + 90°

### Aligning engine mountings:

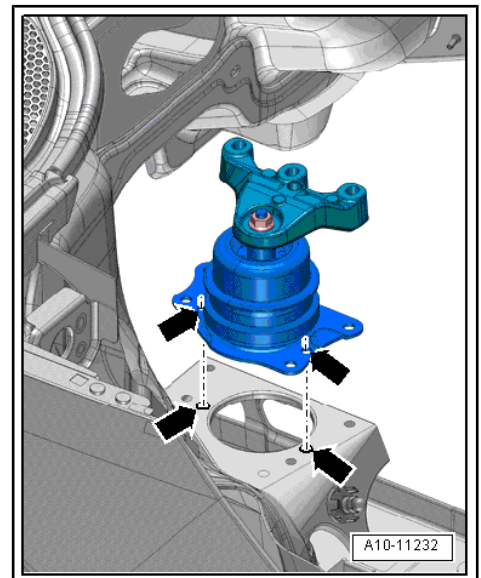
- Fit engine mounting on longitudinal member.



#### Note

*Risk of damage to threads by starting bolts at an angle.*

- The positioning holes -arrows- must be in line; check with appropriate drill if necessary.



### Engine support - specified torque and tightening sequence

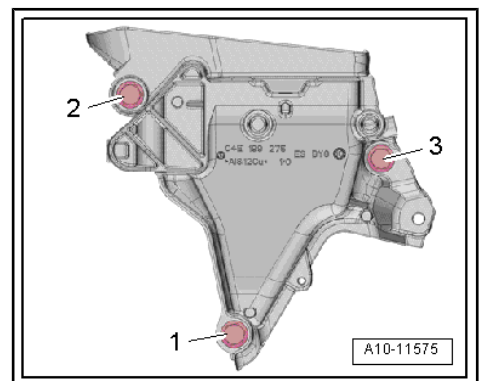


#### Note

*Risk of damage to threads by starting bolts at an angle:*

- Tighten bolts in stages in the sequence shown.

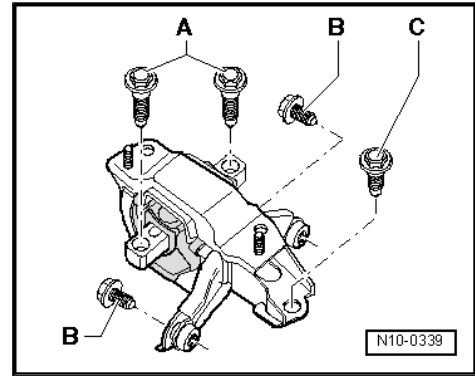
Stage	Bolts	Specified torque/turning further angle
1.	-1 ... 3-	7 Nm
2.	-1 ... 3-	40 Nm
3.	-1 ... 3-	Turn 90° further





### Tightening sequence - gearbox mounting

Item	Procedure	Torque setting
B and C	Start bolts before tightening them	hand-tight
B	Tighten bolts	50 Nm + 90°
C	Tighten bolt.	50 Nm + 90°
A	Start bolts before tightening them	hand-tight
A	Bolts	40 Nm + 90°



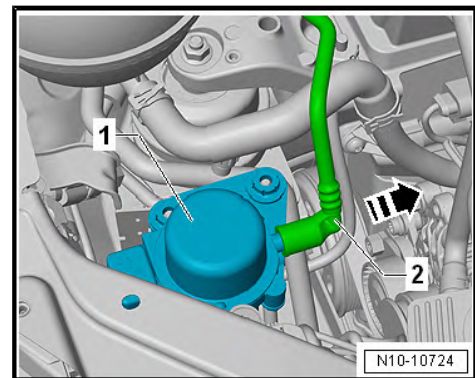
## 2.2 Removing and installing engine mounting

### Removing

- Remove resonator for intake air  
⇒ [“3.3 Removing and installing resonator for intake air”, page 309](#) .
- Remove air filter housing  
⇒ [“3.2 Removing and installing air filter housing”, page 308](#) .

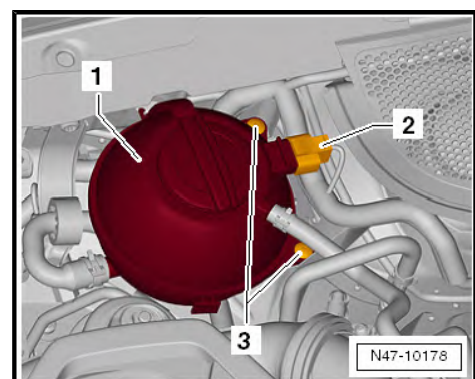
### Vehicles with dual clutch gearbox

- Pull vacuum line -2- in direction of -arrow- off vacuum pump for brakes - V192- -1-.
- Lay vacuum line -1- to one side.



### Continued for all vehicles

- Release connectors -2- and pull off.
- Unscrew securing bolts -3-.
- Place coolant expansion tank -1- on engine.
- Support engine in its installation position  
⇒ [“2.5 Supporting engine in installation position”, page 30](#) .
- Take up weight of engine/gearbox assembly slightly with spindle; do not lift.







- Unscrew nuts -3-.
- Remove earth wire.

**i** Note

*The securing nut -4- must not be loosened.*

- Unscrew bolts -2- between engine mounting and engine.
- Unscrew bolts -arrows- and remove engine mounting.

**Installing**

Install in reverse order of removal. The following should be observed:

- Place assembly mounting on longitudinal member.
- The positioning holes -arrows- must be in line; check with appropriate drill if necessary.

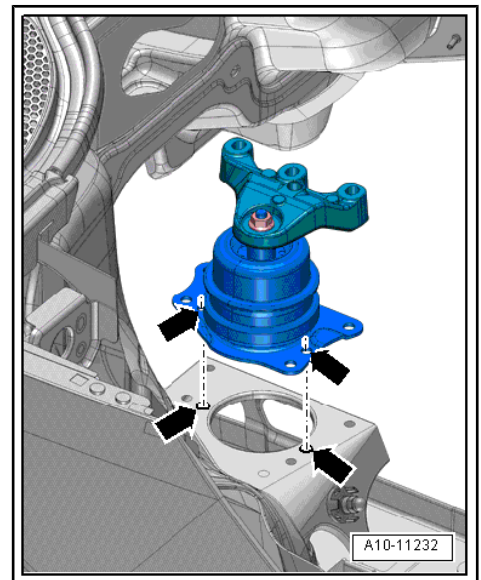
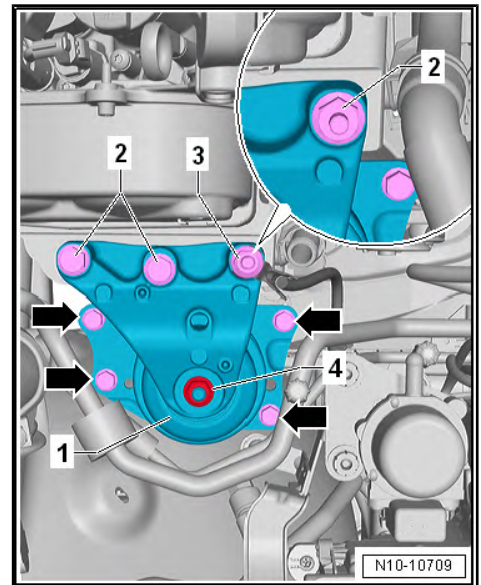
**i** Note

- ◆ Risk of damage to threads by starting bolts at an angle.
- ◆ Do not remove support bracket - 10 - 222 A- until the bolts securing the assembly mounting have been tightened to specified torque.

- Remove support bracket - 10 - 222 A- from engine.

**Torque settings**

- ◆ ⇒ ["2.1 Assembly overview - assembly mountings", page 21](#)
- ◆ ⇒ ["3.1 Assembly overview - air filter housing", page 307](#)



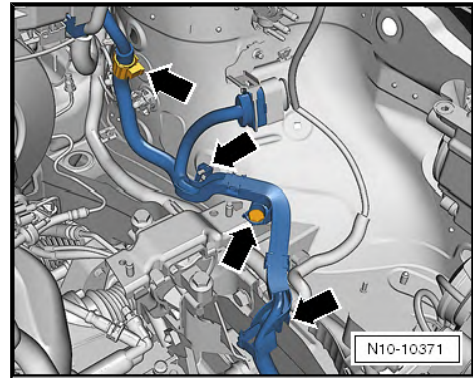
## 2.3 Removing and installing gearbox mounting

**Removing**

- Remove resonator for intake air  
 ⇒ ["3.3 Removing and installing resonator for intake air", page 309](#) .
- Remove air filter housing  
 ⇒ ["3.2 Removing and installing air filter housing", page 308](#) .
- Remove battery tray ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery tray .
- Support engine in its installation position  
 ⇒ ["2.5 Supporting engine in installation position", page 30](#) .
- Take up weight of engine/gearbox assembly slightly with spindle; do not lift.



- Carefully loosen wiring harness at its fastening points -arrows-.



- Unscrew securing bolts -arrows- from gearbox mounting.

### Installing

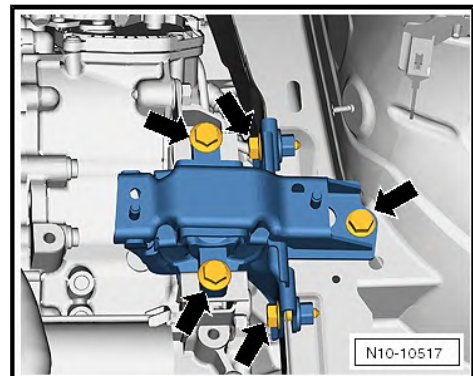
Install in reverse order of removal. The following should be observed:



#### Note

*Risk of damage to threads by starting bolts at an angle.*

- Remove support bracket - 10 - 222 A- from engine.



### Torque settings

- ◆ ⇒ [“2.1 Assembly overview - assembly mountings”, page 21](#)
- ◆ Tightening sequence for gearbox mounting ⇒ [page 23](#) .
- ◆ ⇒ [“3.1 Assembly overview - air filter housing”, page 307](#)
- ◆ ⇒ Electrical system; Rep. gr. 27 ; Battery; Assembly overview - battery

## 2.4 Removing and installing pendulum support

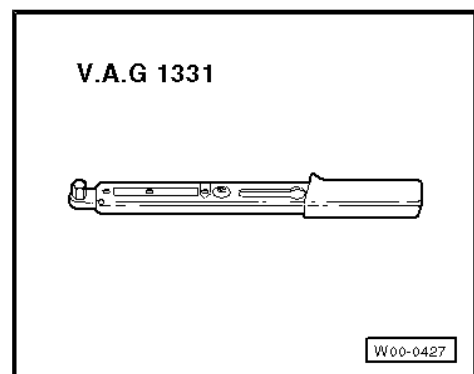
⇒ [“2.4.1 Removing and installing pendulum support, manual gearbox”, page 28](#)

⇒ [“2.4.2 Removing and installing pendulum support, dual clutch gearbox”, page 29](#)

### 2.4.1 Removing and installing pendulum support, manual gearbox

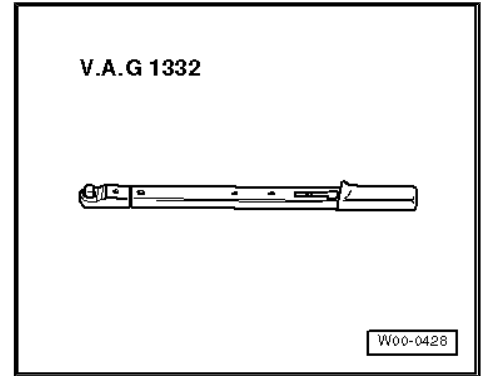
Special tools and workshop equipment required

- ◆ Torque wrench - V.A.G 1331-





- ◆ Torque wrench - V.A.G 1332-



### Removing

- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation .
- Unscrew bolts -arrows- for pendulum support -1-.

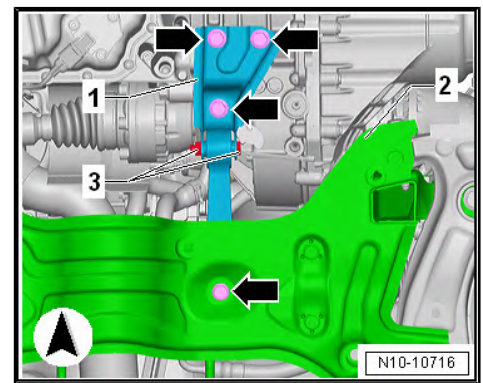
### Note

*Bolt -3- must not be loosened.*

- Pull pendulum support -1- out of assembly carrier -2-.

### Installing

Install in reverse order of removal. The following should be observed:

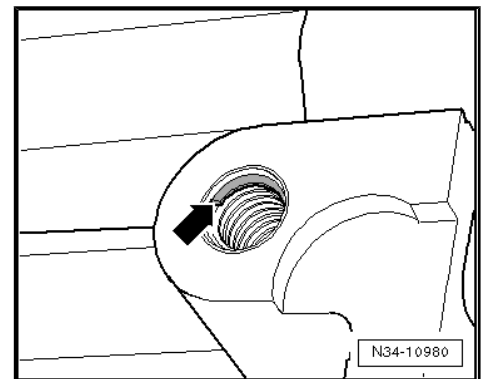


### Note

- ◆ *There are threaded inserts, e.g. "Heli coil" in the bolting holes for the pendulum support.*
- ◆ *Identification: shoulder along beginning of thread -arrow-.*

### Torque settings

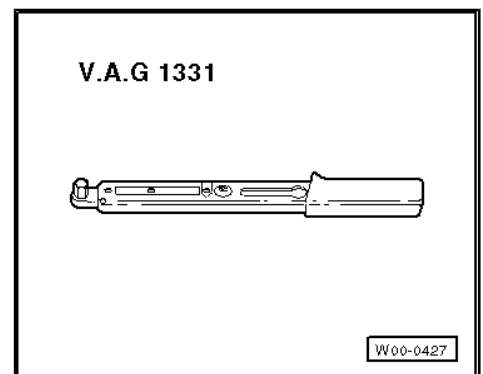
- ◆ ⇒ ["2.1 Assembly overview - assembly mountings", page 21](#)



## 2.4.2 Removing and installing pendulum support, dual clutch gearbox

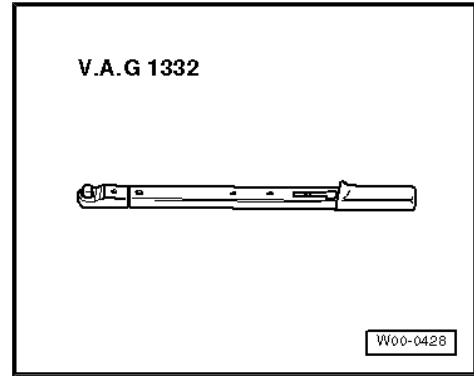
### Special tools and workshop equipment required

- ◆ Torque wrench - V.A.G 1331-





- ◆ Torque wrench - V.A.G 1332-



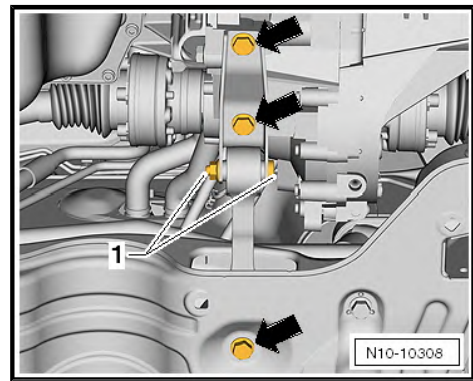
### Removing

- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation .
- Unscrew bolts -arrows- for pendulum support.

### Note

*Bolt -1- must not be loosened.*

- Pull pendulum support -1- out of assembly carrier -2-.



### Installing

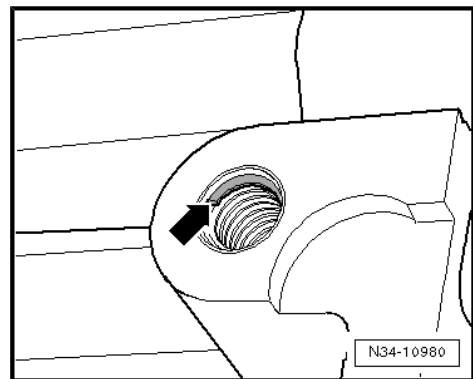
Install in reverse order of removal. The following should be observed:

### Note

- ◆ *There are threaded inserts, e.g. "Heli coil" in the bolting holes for the pendulum support.*
- ◆ *Identification: shoulder along beginning of thread -arrow-.*

### Torque settings

- ◆ ⇒ ["2.1 Assembly overview - assembly mountings", page 21](#)

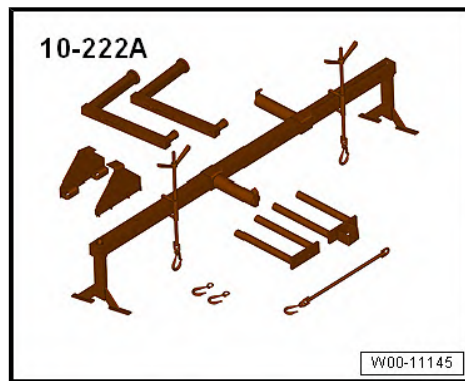


## 2.5 Supporting engine in installation position

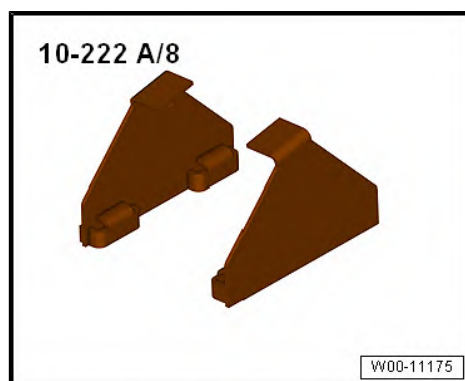
Special tools and workshop equipment required



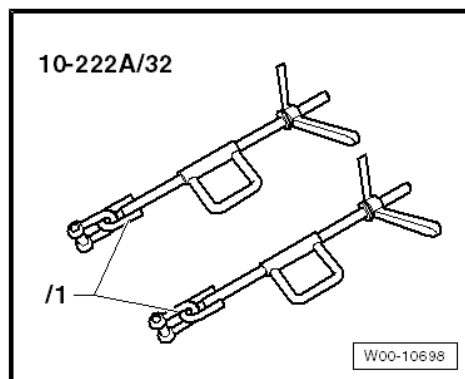
◆ Support - 10 - 222 A-



◆ Adapter - 10 - 222 A /8-



◆ Adapter - 10 - 222 A /32-



◆ Tensioning strap - T10038-

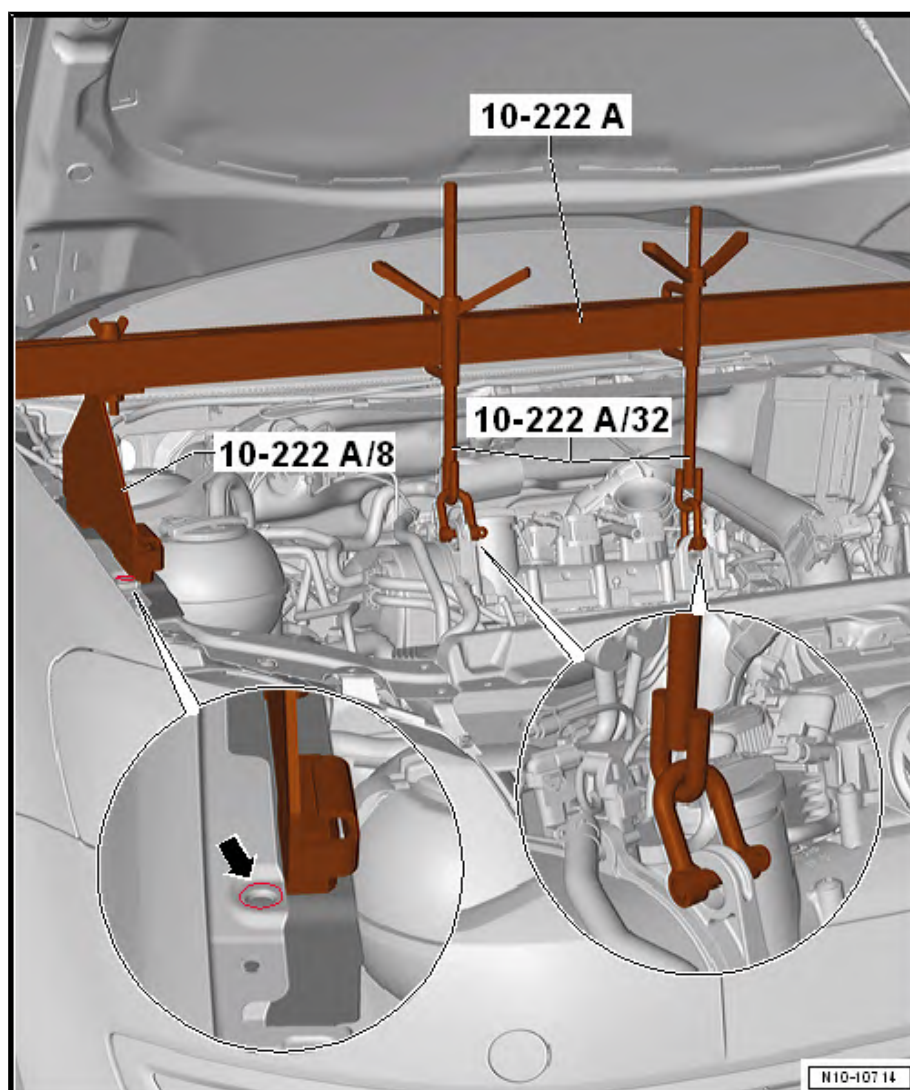
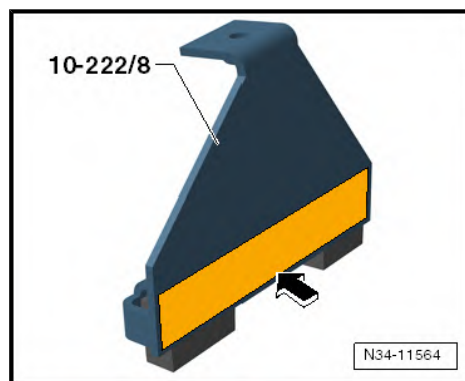




To prevent damage to edges of wings, cover lower areas of both adapters - 10 - 222 A /8- with woven adhesive tape -arrow- => Electronic Parts Catalogue (ETKA) .

#### Procedure

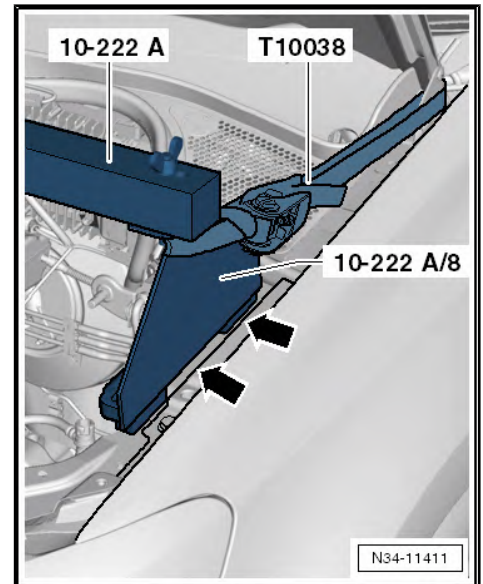
- Remove air filter housing  
=> ["3.2 Removing and installing air filter housing", page 308](#) .
- Remove battery tray => Electrical system; Rep. gr. 27; Battery; Removing and installing battery tray .



- Detach seals from upper edge of wing.
- Slide adapter - 10 - 222 A /32- onto engine support bracket - 10 - 222 A- as shown in illustration.
- Mount adapter - 10 - 222 A /8- on engine support bracket - 10 - 222 A- .
- Lift up plenum chamber cover at sides.
- Position engine support bracket - 10 - 222 A- on left and right onto longitudinal members as shown in illustration.



- Do not position engine support bracket - 10 - 222 A- on edges of wings.
- Fit adapter - 10 - 222 A /8- behind the hole -arrow- and align it.
- Mount adapter - 10 - 222 A /32- to mountings on engine as shown in illustration.
- Secure engine support bracket - 10 - 222 A- using tensioning straps - T10038- on both sides of bonnet hinges.
- Take up weight of engine/gearbox assembly slightly with spindle; do not lift.





## 13 – Crankshaft group

### 1 Cylinder block (pulley end)

⇒ [“1.1 Assembly overview - poly V-belt drive”, page 34](#)

⇒ [“1.2 Assembly overview - sealing flange, belt pulley end”, page 37](#)

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

⇒ [“1.4 Removing and installing tensioner for poly V-belt”, page 40](#)

⇒ [“1.5 Removing and installing vibration damper”, page 41](#)

⇒ [“1.6 Removing and installing engine support”, page 43](#)

⇒ [“1.7 Renewing crankshaft oil seal - belt pulley end”, page 45](#)

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

⇒ [“1.1.1 Assembly overview - poly V-belt drive, vehicles without air conditioner compressor”, page 34](#)

⇒ [“1.1.2 Assembly overview - poly V-belt drive, vehicles with air conditioner compressor”, page 36](#)

#### 1.1.1 Assembly overview - poly V-belt drive, vehicles without air conditioner compressor





### 1 - Bolt

- Renew after removal
- 150 Nm +180°
- Use counter-hold tool - T10475- to loosen and tighten

### 2 - Vibration damper

- Removing and installing ⇒ [“1.5 Removing and installing vibration damper”, page 41](#)

### 3 - Poly V-belt

- Check for wear
- Before removing, mark direction of rotation with chalk or felt-tipped pen
- Do not kink
- Poly V-belt routing ⇒ [page 39](#)
- Removing and installing ⇒ [“1.3 Removing and installing poly-V belt”, page 38](#)
- When installing, make sure it is properly seated on pulleys.

### 4 - Bolt

- 23 Nm

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

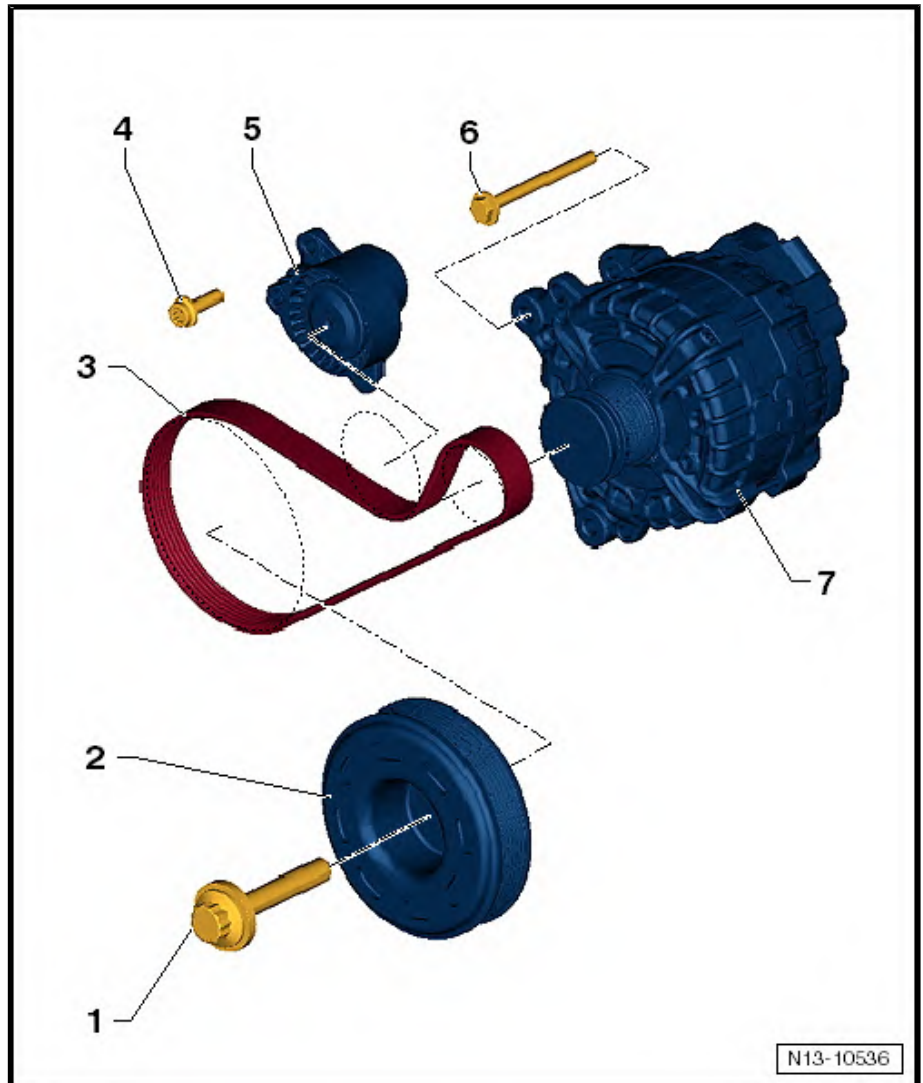
- Pivot with socket to slacken poly V-belt
- Lock with locking pin - T10060 A- .
- Removing and installing ⇒ [“1.4 Removing and installing tensioner for poly V-belt”, page 40](#)

### 6 - Bolt

- Specified torque ⇒ Electrical system; Rep. gr. 27 ; Alternator; Assembly overview - alternator

### 7 - Alternator

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





## 1.1.2 Assembly overview - poly V-belt drive, vehicles with air conditioner compressor

### 1 - Poly V-belt

- Check for wear
- Before removing, mark direction of rotation with chalk or felt-tipped pen
- Do not kink
- Poly V-belt routing  
⇒ [page 40](#)
- Removing and installing  
⇒ [“1.3.1 Removing and installing poly V-belt, vehicles without air conditioner compressor”, page 38](#)
- When installing, make sure it is properly seated on pulleys.

### 2 - Bolt

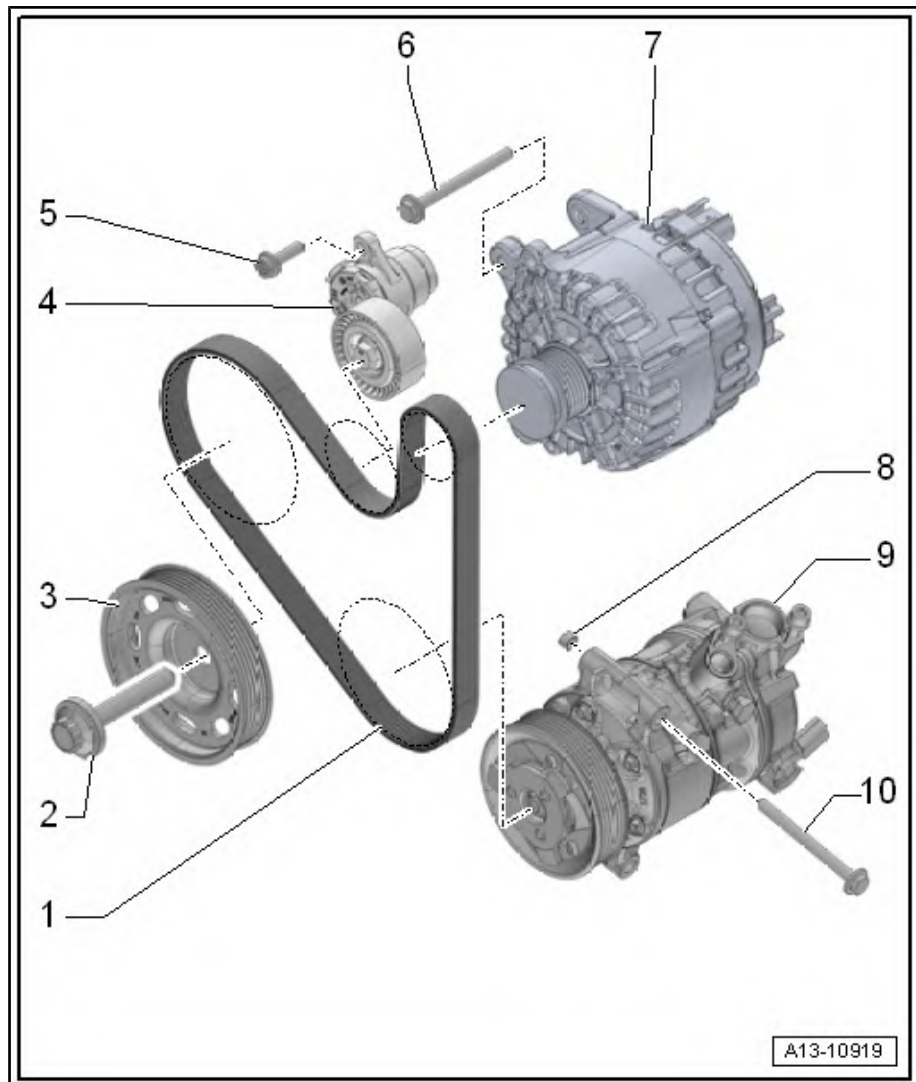
- Specified torque  
⇒ [Item 1 \(page 35\)](#)

### 3 - Vibration damper

- Removing and installing  
⇒ [“1.5 Removing and installing vibration damper”, page 41](#)

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

- Pivot with socket to slacken poly V-belt
- Lock with locking pin - T10060 A- .
- Removing and installing  
⇒ [“1.4 Removing and installing tensioner for poly V-belt”, page 40](#)



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

### 5 - Bolt

- 23 Nm

### 6 - Bolt

- Specified torque ⇒ Electrical system; Rep. gr. 27 ; Alternator; Assembly overview - alternator

### 7 - Alternator

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

### 8 - Dowel sleeve

- For air conditioner compressor.

### 9 - Air conditioner compressor

- Do not unscrew or disconnect refrigerant lines
- Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Removing and installing air conditioner compressor

### 10 - Bolt

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



## 1.2 Assembly overview - sealing flange, belt pulley end

### 1 - Bolt

- ❑ Specified torque  
⇒ [Item 1 \(page 35\)](#)

### 2 - Vibration damper

- ❑ Removing and installing  
⇒ ["1.5 Removing and installing vibration damper"](#), page 41

### 3 - Seal

- ❑ For crankshaft on belt pulley end
- ❑ Renew after removal  
⇒ ["1.7 Renewing crankshaft oil seal - belt pulley end"](#), page 45
- ❑ Do not oil

### 4 - Sealing flange at belt pulley end

- ❑ Must seat on dowel pins.
- ❑ Removing and installing  
⇒ ["1.8 Removing and installing sealing flange on pulley end"](#), page 47

### 5 - Bolt

- ❑ Different thread diameters ⇒ Electronic parts catalogue
- ❑ Renew after removal
- ❑ Specified torque and tightening sequence  
⇒ [page 38](#)

### 6 - Seal

- ❑ Renew after removal

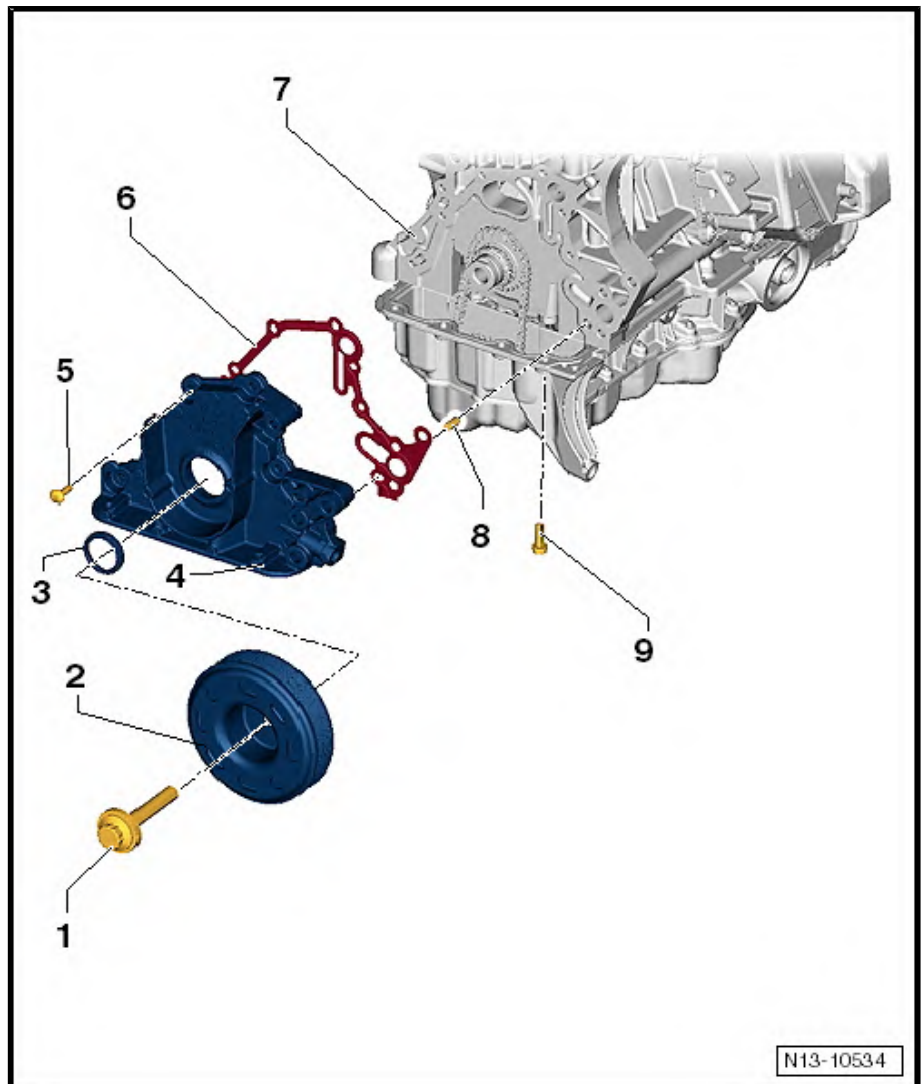
### 7 - Cylinder block

### 8 - Dowel pin

- ❑ Qty. 2

### 9 - Bolt

- ❑ Renew after removal
- ❑ Specified torque and tightening sequence ⇒ [page 38](#)





## Sealing flange at belt pulley end - Prescribed torque and tightening sequence

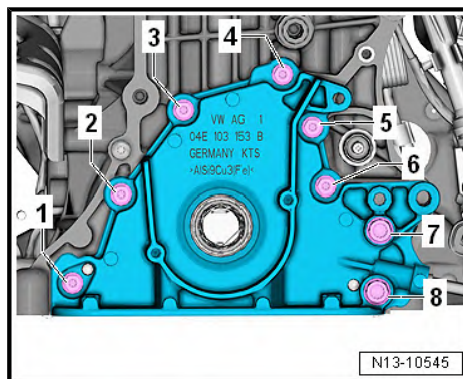


### Note

Renew bolts that are tightened with turning further angle.

– Tighten bolts in stages:

Stage	Bolts	Specified torque/turning further angle
1.	-1 ... 8-	Screw in by hand as far as stop
2.	-1 ... 8-	In diagonal sequence to 8 Nm
3.	-7, 8-	20 Nm
4.	-1 ... 8-	Turn 90° further



## 1.3 Removing and installing poly-V belt

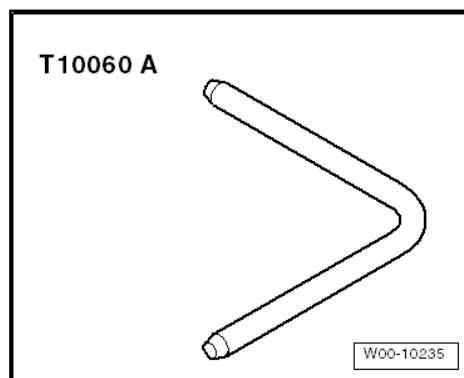
⇒ [“1.3.1 Removing and installing poly V-belt, vehicles without air conditioner compressor”, page 38](#)

⇒ [“1.3.2 Removing and installing poly V-belt, vehicles with air conditioner compressor”, page 39](#)

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

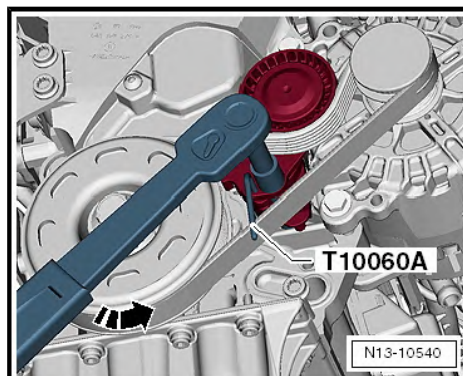
Special tools and workshop equipment required

- ◆ Locking pin - T10060 A-



### Removing

- To slacken poly V-belt turn tensioning device in direction of -arrow-.
- Lock tensioning device in place with locking pin - T10060 A- .
- Before removing the poly V-belt, use a piece of chalk or a felt pen to mark the running direction.
- Remove poly V-belt.

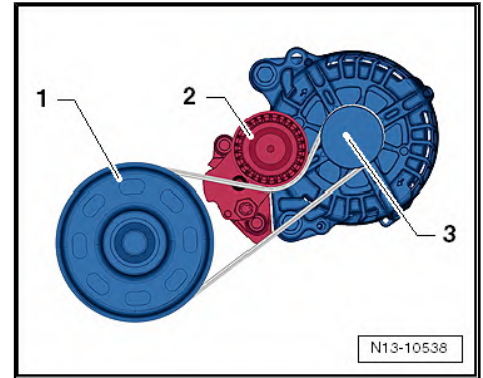




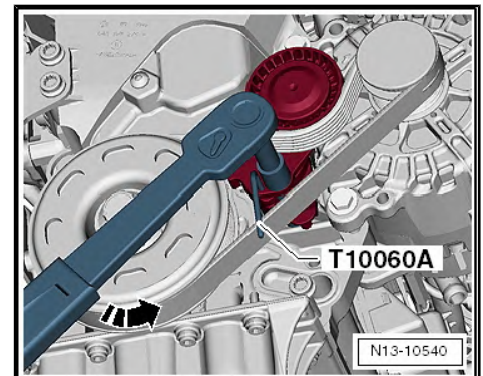
### Installing

Install in reverse order of removal, observing the following:

- Fit poly V-belt as shown in illustration.
- 1 - Vibration damper
- 2 - Tensioning device for poly V-belt
- 3 - Alternator



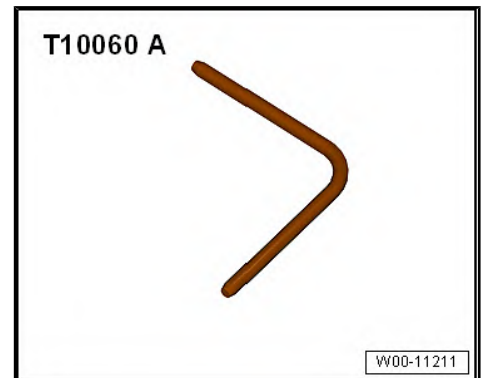
- Turn tensioning device in -direction of arrow-, and pull out locking pin - T10060 A- .
- Release tensioner.
- Check that poly V-belt is properly seated.
- Start engine and check that poly V-belt runs properly.



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

Special tools and workshop equipment required

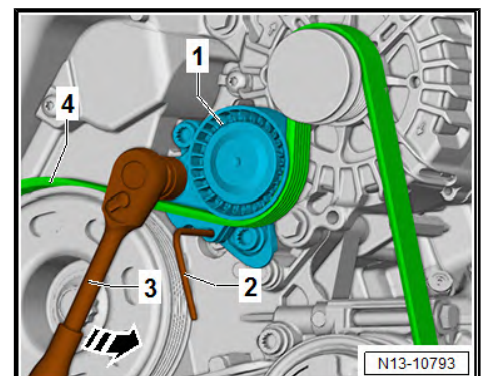
- ◆ Locking pin - T10060 A-



### Removing

- Before removing the poly V-belt, use a piece of chalk or a felt pen to mark the running direction.
- Fit tool -3- onto hexagon of tensioner -1-.
- To slacken poly V-belt push tool -3- in -direction of arrow-.
- Lock tensioner -1- in place with locking pin - T10060 A- -2-.
- Remove poly V-belt -4-.

### Installing

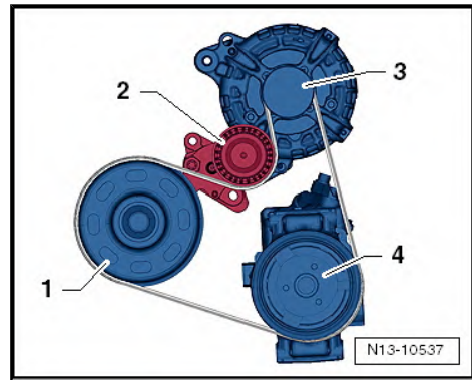




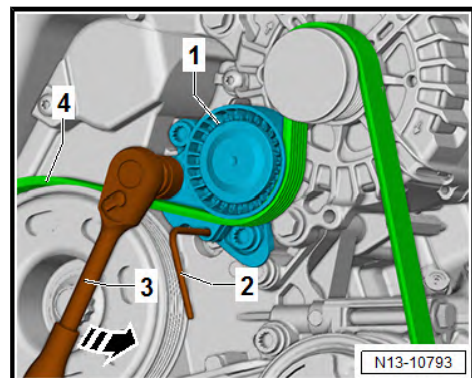
Install in reverse order of removal. The following should be observed:

– Fit poly V-belt as shown in illustration.

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



- Push tool -3- in -direction of arrow-, and pull out locking pin - T10060 A- -2-.
- Release tension from tensioner -1-.
- Check that poly V-belt -4- is properly seated.
- Start engine and check that poly V-belt runs properly.



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

⇒ [“1.4.1 Removing and installing tensioner for poly V-belt, vehicles without air conditioner compressor”, page 40](#)

⇒ [“1.4.2 Removing and installing tensioner for poly V-belt, vehicles with air conditioner compressor”, page 41](#)

### 1.4.1 Removing and installing tensioner for poly V-belt, vehicles without air conditioner compressor

#### Removing

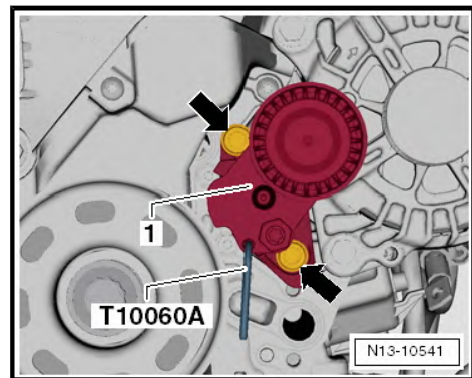
- Remove poly V-belt from tensioner  
⇒ [“1.3.1 Removing and installing poly V-belt, vehicles without air conditioner compressor”, page 38](#) .

- Remove bolts -arrows- and detach poly V-belt tensioner -1-.

#### Installing

Install in reverse order of removal. The following should be observed:

- Install poly V-belt  
⇒ [“1.3.1 Removing and installing poly V-belt, vehicles without air conditioner compressor”, page 38](#) .
- ◆ Specified torque  
⇒ [“1.1.1 Assembly overview - poly V-belt drive, vehicles without air conditioner compressor”, page 34](#)





## 1.4.2 Removing and installing tensioner for poly V-belt, vehicles with air conditioner compressor

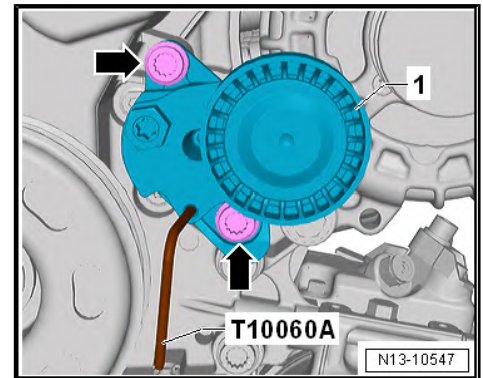
### Removing

- Remove poly V-belt from tensioner  
⇒ ["1.3.2 Removing and installing poly V-belt, vehicles with air conditioner compressor", page 39](#) .
- Remove bolts -arrows- and detach poly V-belt tensioner -1-.

### Installing

Install in reverse order of removal, observing the following:

- Specified torque  
⇒ ["1.1.2 Assembly overview - poly V-belt drive, vehicles with air conditioner compressor", page 36](#)
- Install poly V-belt  
⇒ ["1.3.2 Removing and installing poly V-belt, vehicles with air conditioner compressor", page 39](#) .



## 1.5 Removing and installing vibration damper

### Special tools and workshop equipment required

- ◆ Counter-hold tool - T10475-



### Preparing counterhold tool - T10475-



#### Note

- ◆ *Different types of vibration damper can be installed.*
- ◆ *For this reason, the counterhold tool - T10475- must be adapted to the holes of the respective vibration damper.*



### Version 1

- Convert counterhold tool - T10475- -1- with inserts -T10475/2-

### Version 2

- Convert counterhold tool - T10475- with inserts -T10475/1- and -T10475/2- as shown in illustration.
- To do this, use hole -A- or -B- of counterhold tool - T10475- -1- depending on type of vibration damper.

### Removing

- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation .
- Set engine to "TDC for cylinder no. 1"  
⇒ ["2.5 Checking valve timing", page 109](#) .
- Remove poly V-belt  
⇒ ["1.3 Removing and installing poly-V belt", page 38](#) .
- Loosen bolt -arrow- for vibration damper using counterhold - T10475- .
- Unscrew bolt and remove vibration damper.



### NOTICE

Risk of damage to engine caused by incorrect valve timing.

- Do not turn crankshaft out of TDC position.

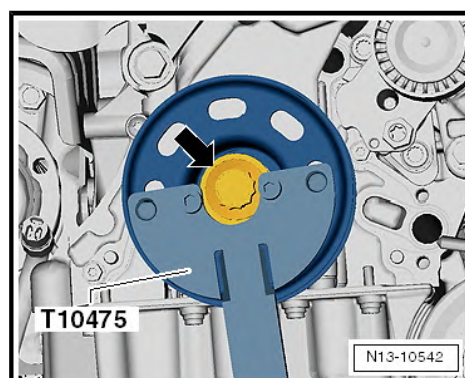
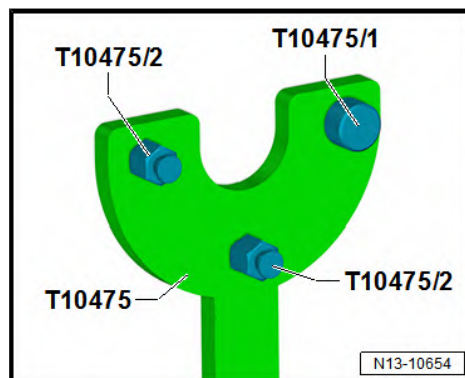
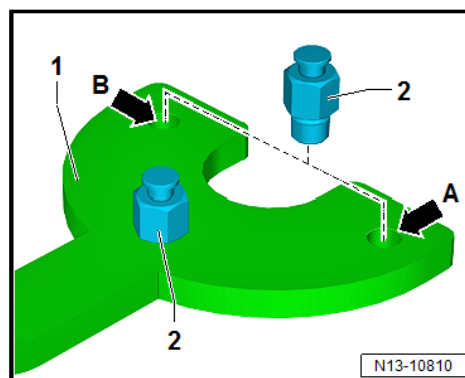
### Installing

- Specified torque  
⇒ ["1.1 Assembly overview - poly V-belt drive", page 34](#)



### Note

- ◆ *Renew bolts that are tightened with turning further angle.*
- ◆ *All contact surfaces between bolt, vibration damper and crankshaft toothed belt pulley must be free of oil and grease.*



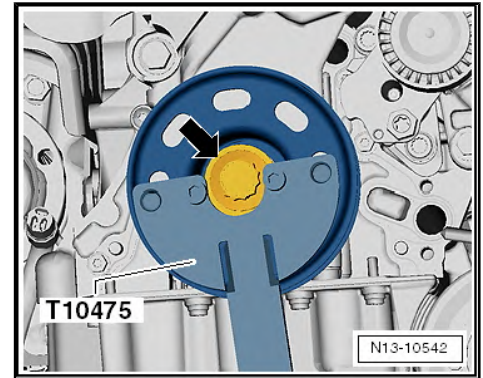




- Fit vibration damper, oil threads of bolt for vibration damper and screw it in to stop by hand.
- Tighten bolt -arrow- for vibration damper using counterhold - T10475- .

Further installation is carried out in reverse order of removal. Observe the following:

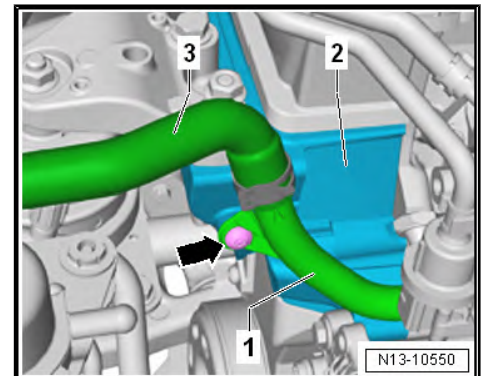
- Install poly V-belt  
⇒ ["1.3 Removing and installing poly-V belt", page 38](#) .



## 1.6 Removing and installing engine support

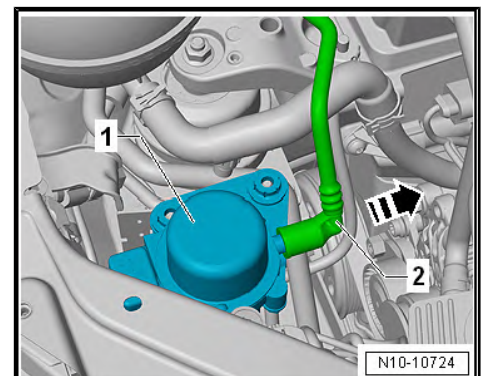
### Removing

- Remove resonator for intake air  
⇒ ["3.3 Removing and installing resonator for intake air", page 309](#) .
- Remove air filter housing  
⇒ ["3.2 Removing and installing air filter housing", page 308](#) .
- Unscrew bolt -arrow- for coolant pipe -1- from engine support -2-.



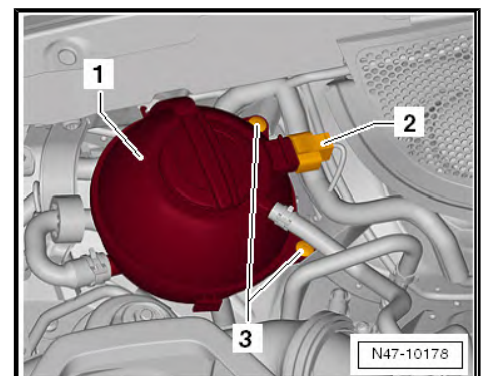
### Vehicles with dual clutch gearbox

- Pull vacuum line -2- in direction of -arrow- off vacuum pump for brakes - V192- -1-.
- Lay vacuum line -1- to one side.



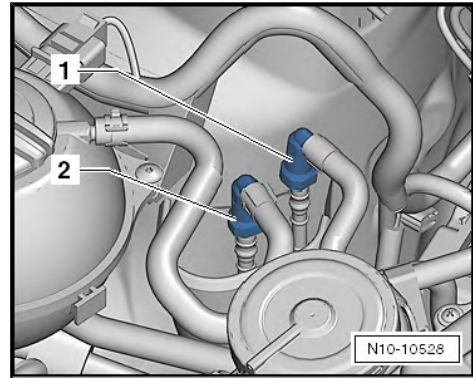
### Continued for all vehicles

- Release connectors -2- and pull off.
- Unscrew securing bolts -3-.
- Place coolant expansion tank -1- on engine.

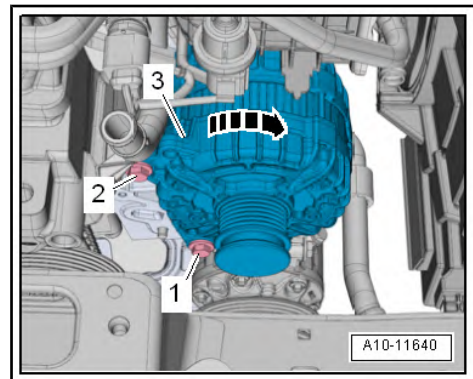




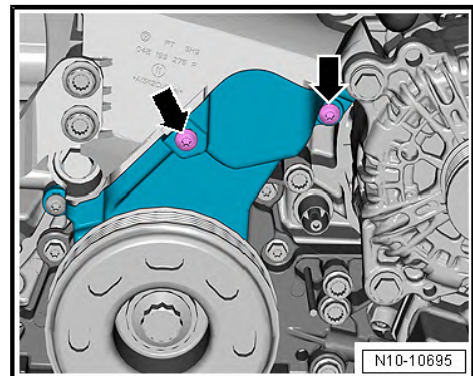
- Disconnect fuel supply line -1- and line to activated charcoal filter solenoid valve 1 - N80- -2-. Disconnect plug-in connectors ➔ Rep. gr. 20 ; Plug-in connectors; Disconnecting plug-in connectors .
- Remove upper part of toothed belt guard  
⇒ [“2.3.1 Removing and installing upper toothed belt guard”](#), page 95 .
- Remove poly V-belt  
⇒ [“1.3 Removing and installing poly-V belt”](#), page 38 .



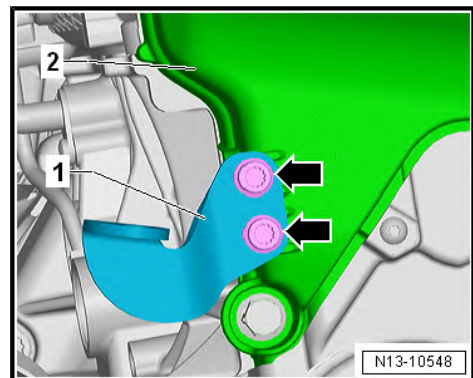
- Loosen bolt -1-.
- Support engine in its installation position  
⇒ [“2.5 Supporting engine in installation position”](#), page 30 .
- Unscrew bolt -2-.
- Swivel alternator -3- in -direction of arrow- towards front.
- Take up weight of engine/gearbox assembly slightly with spindle; do not lift.



- Unscrew bolts -arrows-.



- Unscrew bolts -arrows-.
- Remove bracket -1- from engine support -2-.
- Removing engine mounting  
⇒ [“2.2 Removing and installing engine mounting”](#), page 26 .

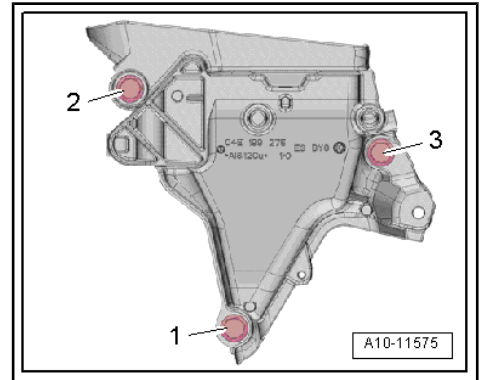




- Unscrew bolts -1- to -3-

### Installing

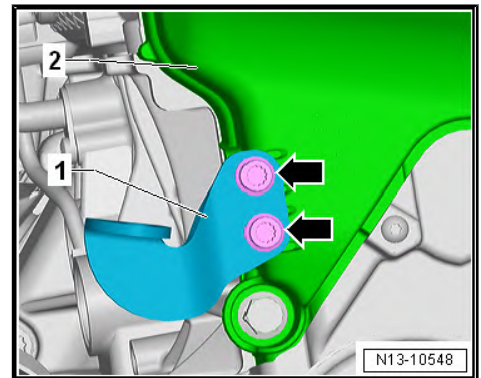
Install in reverse order of removal. The following should be observed:



- Install bracket -1- to engine support -2-.
- To do this, tighten bolts -arrows- ⇒ [page 45](#) .

### Torque settings

- ◆ ⇒ [“2.1 Assembly overview - assembly mountings”, page 21](#)
- ◆ ⇒ [“1.1 Assembly overview - poly V-belt drive”, page 34](#)
- ◆ ⇒ [“2.1 Assembly overview - toothed belt cover”, page 91](#)
- ◆ ⇒ [“3.1 Assembly overview - coolant pipes”, page 253](#)
- ◆ ⇒ [“2.1 Assembly overview - charge air system”, page 283](#)
- ◆ ⇒ [“3.1 Assembly overview - air filter housing”, page 307](#)
- ◆ ⇒ Electrical system; Rep. gr. 27 ; Alternator; Exploded view - alternator

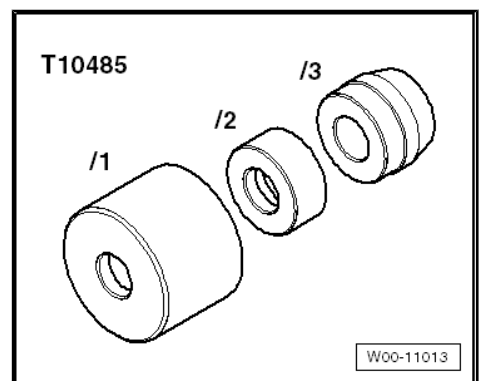


Component	Torque setting
Bracket to engine mounting ⇒ <a href="#">page 45</a>	20 Nm

## 1.7 Renewing crankshaft oil seal - belt pulley end

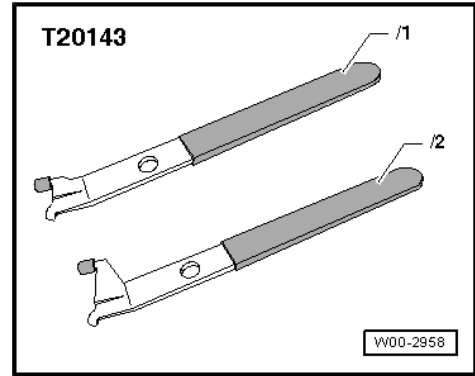
### Special tools and workshop equipment required

- ◆ Assembly tool - T10485-





◆ Extractor hook - T20143-



**Procedure**

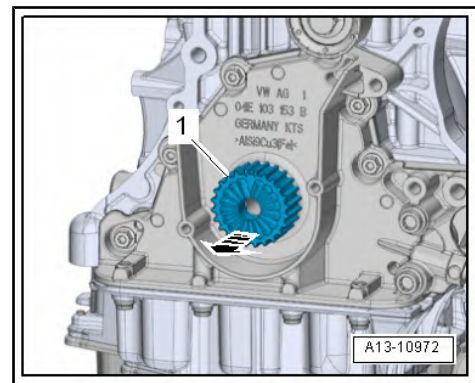
- Remove toothed belt  
 ⇒ ["2.8 Removing and installing toothed belt", page 138](#) .
- Detach crankshaft pulley -1- -arrow-.



**NOTICE**

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

- Do not turn crankshaft out of TDC position.

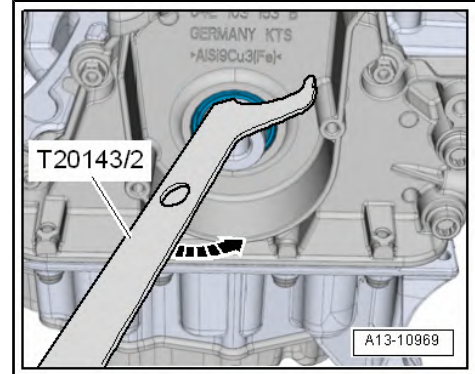


- Pry out seal using extractor hook -T20143/2- -arrow-.
- Clean contact surface and sealing surface.

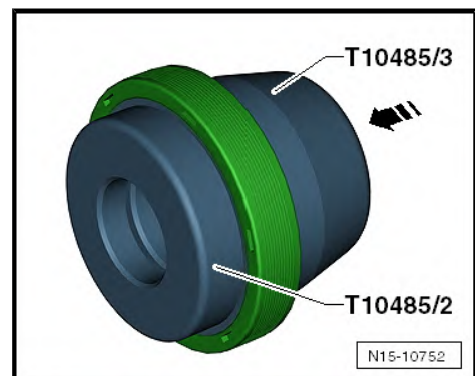


**Note**

*Do not lubricate new seal.*

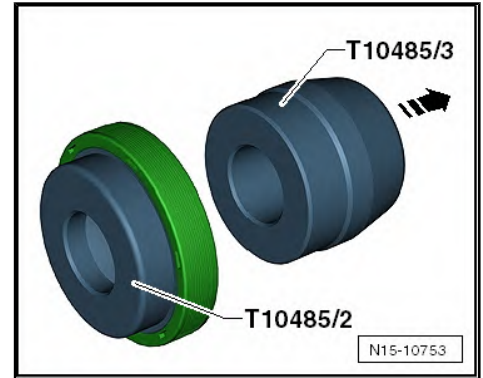


- Fit new seal in -direction of arrow- onto assembly sleeve - T10485/2- .

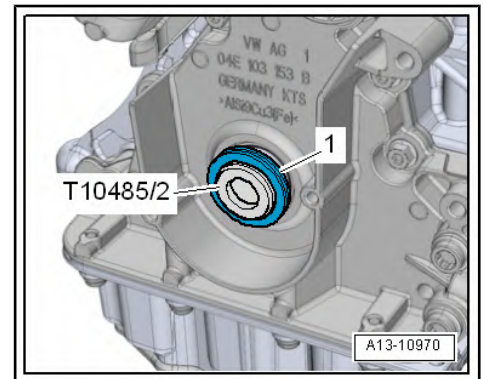




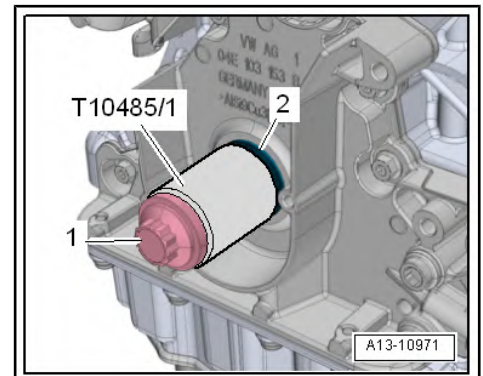
- Pull off assembly sleeve - T10485/3- in -direction of arrow-.
- Installation position: closed end of seal faces fitting sleeve.
- Separate fitting sleeve and guide sleeve.



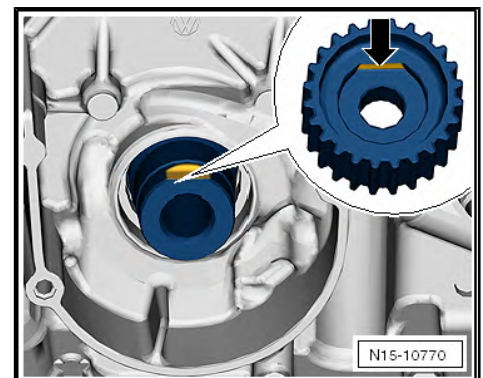
- Fit guide sleeve -T10485/2- with oil seal -1- onto crankshaft.



- Draw in seal -2- to stop using thrust piece -T10485/1- and bolt -1- for pulley.



- Fit crankshaft sprocket onto crankshaft.
- The contact surface between vibration damper and crankshaft toothed belt pulley must be free of oil and grease.
- The machined surface -arrow- of crankshaft pulley must be positioned over the machined surface of the crankshaft journal.
- Install toothed belt (adjust valve timing)  
 ⇒ ["2.8 Removing and installing toothed belt", page 138](#) .

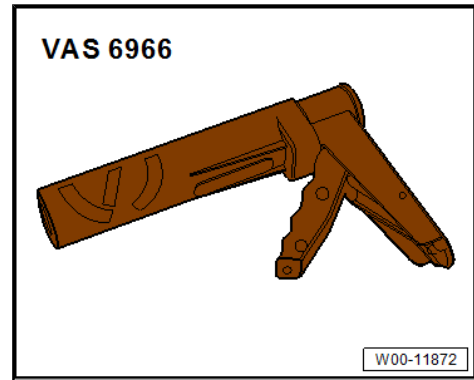


## 1.8 Removing and installing sealing flange on pulley end

Special tools and workshop equipment required



- ◆ Applicator gun - VAS 6966-



- ◆ Scraper
- ◆ Sealant ⇒ Electronic Parts Catalogue

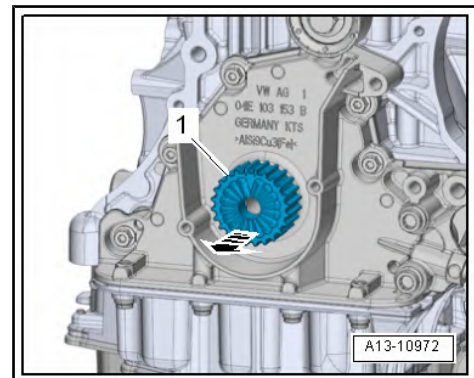
### Removing

- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
- Remove air conditioner compressor with refrigerant lines connected, raise and tie on right side ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Removing and installing air conditioner compressor .
- Remove toothed belt  
⇒ ["2.8 Removing and installing toothed belt", page 138](#) .
- Detach crankshaft pulley -1- -arrow-.



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

- Do not turn crankshaft out of TDC position.

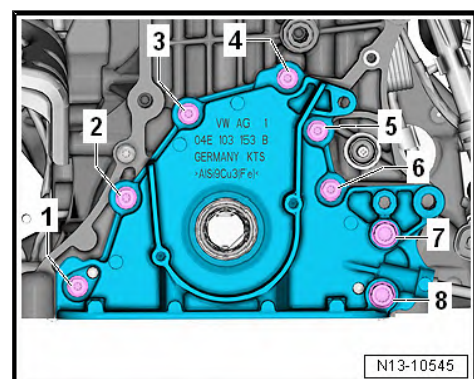


- Unscrew bolts -1 ... 8- and carefully remove sealing flange from the glued joint.
- Drive out seal with sealing flange removed.

### Installing

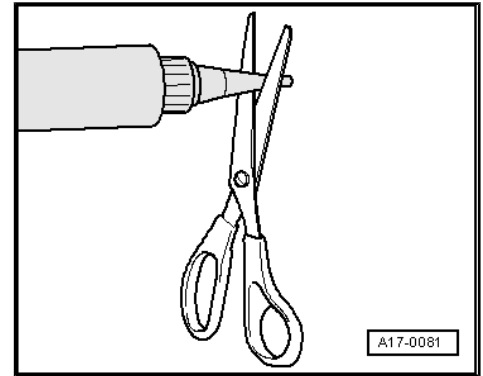
Install in reverse order of removal, observing the following:

- The lubrication system can be soiled by sealant residue.
- Cover open section of sump with clean clothes.
- Remove sealant residue from sealing flange and sump (top section).
- Remove any oil and grease from sealing surfaces.

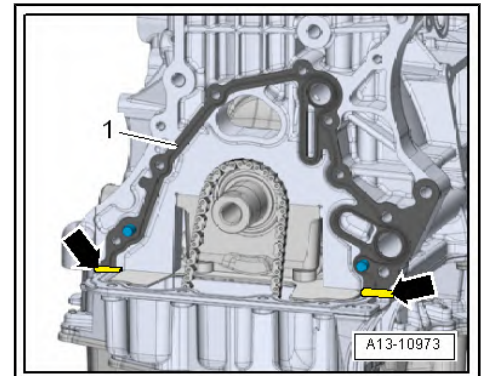




- Observe use-by-date of sealant.
- Cut off nozzle on tube at front marking ( $\varnothing$  of nozzle approx. 2 mm).



- Slide gasket -1- onto dowel pins in cylinder block.
- Apply a thin bead of sealant at the edge of the joint between the cylinder block and the sump -arrows-.
- Use applicator gut - VAS 6966- to do this.

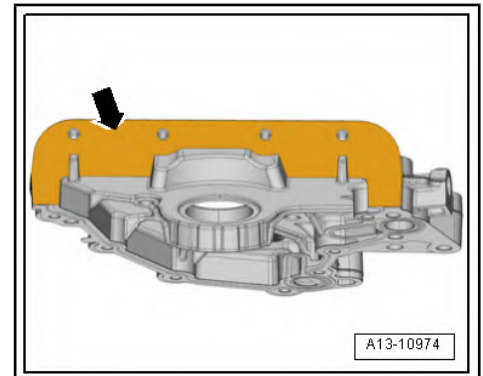


- Thinly coat lower sealing surface -arrow- on sealing flange with sealant.

**i** Note

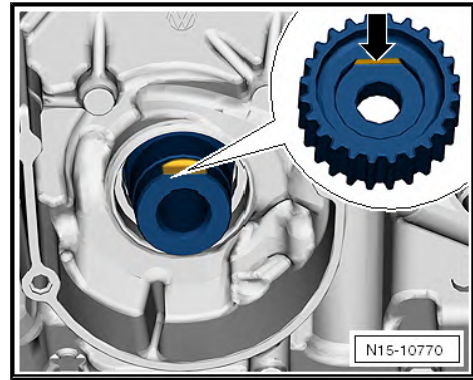
*Install the sealing flange within 5 minutes after the sealant has been applied.*

- Carefully fit gasket sealing flange onto dowel pins on cylinder block.
- Tighten bolts for sealing flange ⇒ [page 38](#) .
- Install crankshaft oil seal on belt pulley end ⇒ ["1.7 Renewing crankshaft oil seal - belt pulley end"](#), [page 45](#) .





- Fit crankshaft sprocket onto crankshaft.
- The contact surface between vibration damper and crankshaft toothed belt pulley must be free of oil and grease.
- The machined surface -arrow- of crankshaft pulley must be positioned over the machined surface of the crankshaft journal.
- Install toothed belt  
⇒ [“2.8 Removing and installing toothed belt”, page 138](#) .
- Install air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Removing and installing air conditioner compressor .
- Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview – noise insulation .



### Torque settings

- ◆ ⇒ [Fig. ““Sealing flange at belt pulley end - Prescribed torque and tightening sequence””, page 38](#)
- ◆ ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Assembly overview - drive unit of air conditioner compressor





## 2 Cylinder block, gearbox end

⇒ [“2.1 Assembly overview - cylinder block, gearbox end”, page 51](#)

⇒ [“2.2 Removing and installing flywheel”, page 52](#)

⇒ [“2.3 Removing and installing sealing flange on gearbox side”, page 53](#)

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



Note

For assembly work, secure engine to engine and gearbox support  
⇒ [“1.3 Securing engine on engine and gearbox support”, page 16](#).

#### 1 - Bolt

- Renew after removal
- 60 Nm + 90°

#### 2 - Flywheel

- Removing and installing  
⇒ [“2.2 Removing and installing flywheel”, page 52](#)
- Can only be fitted in one position

#### 3 - Engine speed sender - G28-

- Removing and installing  
⇒ [“1.5 Removing and installing engine speed sender G28”, page 353](#)

#### 4 - Bolt

- Specified torque  
⇒ [“1.1 Assembly overview - ignition system”, page 348](#)

#### 5 - Dowel pin

- Qty. 2

#### 6 - Adapter

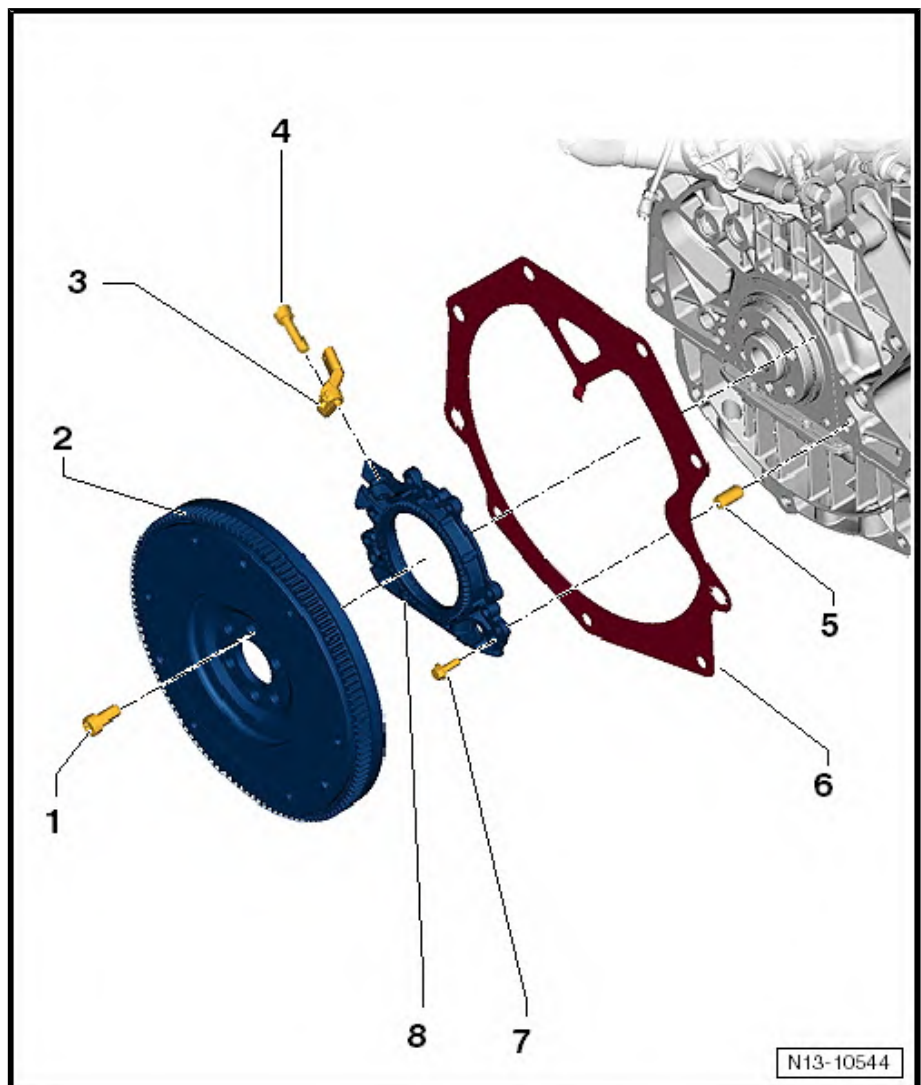
- Do not damage or bend when assembling.
- Installing ⇒ [page 52](#)

#### 7 - Bolt

- Specified torque and tightening sequence  
⇒ [page 52](#)

#### 8 - 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 53](#)

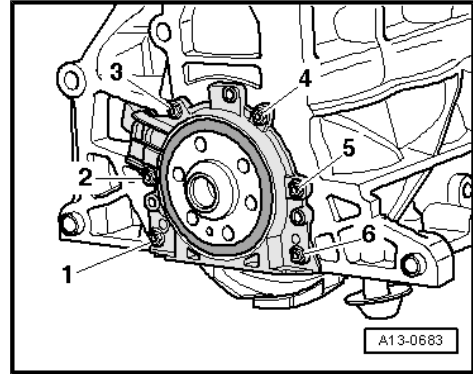




### Sealing flange on gearbox side - specified torque and tightening sequence

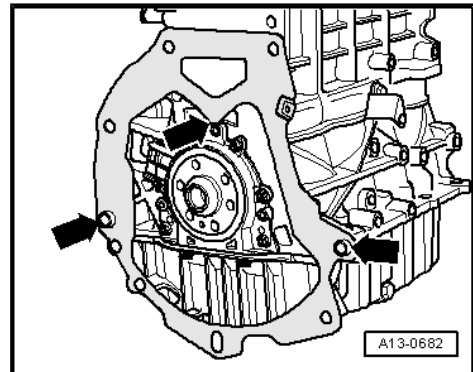
- Tighten bolts in stages as follows:

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



### Install intermediate plate.

- Attach intermediate plate to sealing flange -arrow at top- and push onto dowel sleeves -arrows at bottom-.



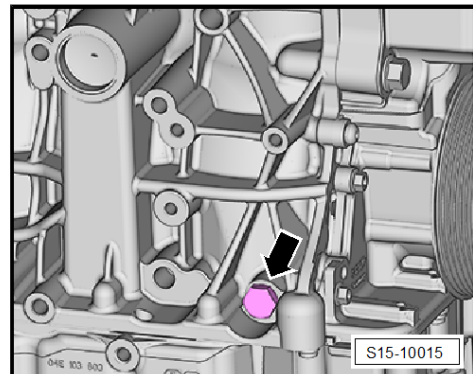
### Plug for "TDC" drilling in cylinder block at rear – specified torque



#### Note

- ◆ The plug -arrow- has an integrated seal.
- ◆ Renew if damaged

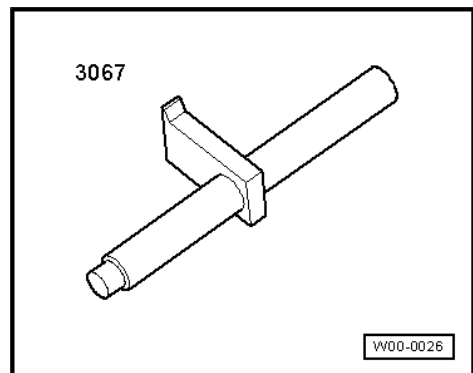
Bolt	Torque setting
-Arrow-	Tighten to 30 Nm



## 2.2 Removing and installing flywheel

### Special tools and workshop equipment required

- ◆ Counter-hold tool - 3067-



### Removing

- Gearbox removed



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

### Installing

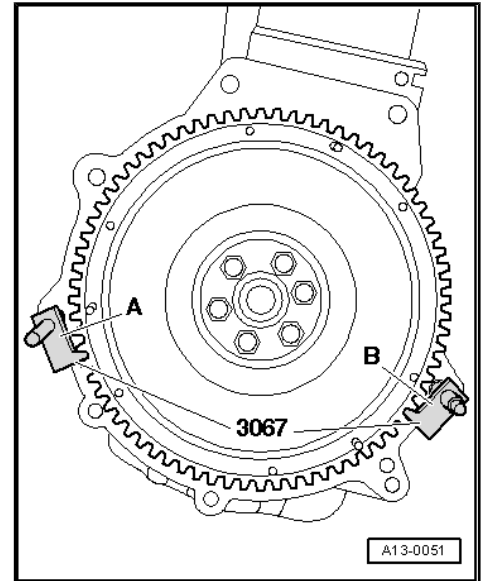
Install in reverse order of removal, observing the following:

- Specified torque  
≧ ["2.1 Assembly overview - cylinder block, gearbox end"](#), page 51



### Note

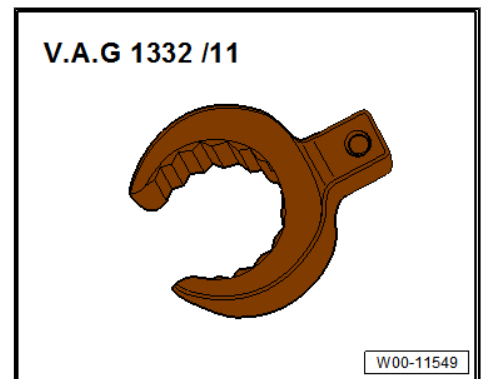
- ◆ Renew bolts that are tightened with turning further angle.
  - ◆ Flywheel with sender wheel can only be fitted in one position.
- Insert counterhold - 3067- in hole in cylinder block -item A-



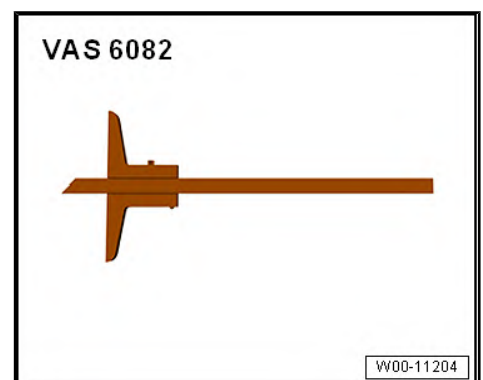
## 2.3 Removing and installing sealing flange on gearbox side

Special tools and workshop equipment required

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

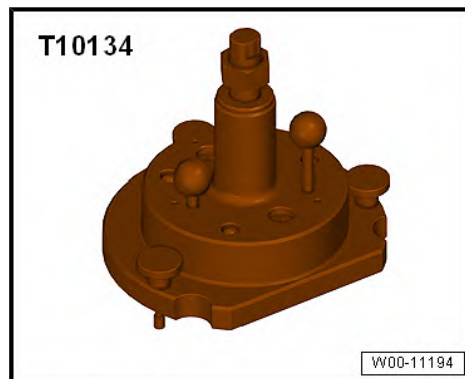


- ◆ Depth gauge - VAS 6082-





◆ Assembly tool - T10134-



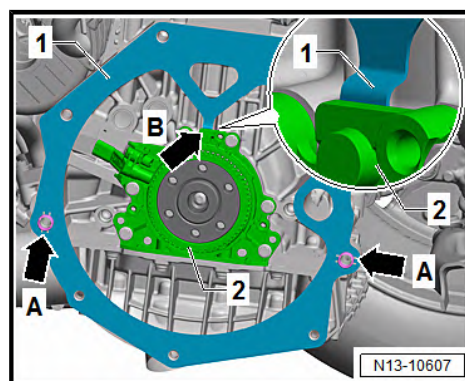
◆ Locating bolt - T10340-



◆ Bolt M6x35 (3x)

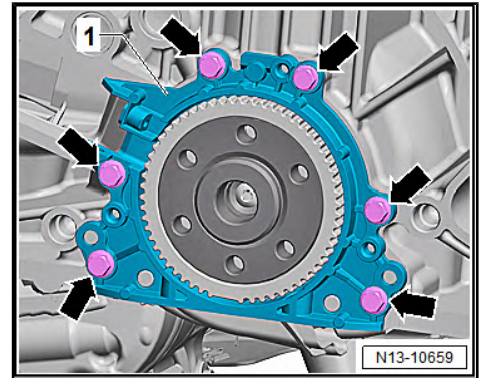
**Procedure**

- Gearbox is removed.
- Remove clutch ⇒ Rep. gr. 30 ; Removing and installing clutch .
- Remove flywheel  
⇒ [“2.2 Removing and installing flywheel”, page 52](#) .
- 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.
- Set crankshaft to “TDC” position  
⇒ [“4.7 Setting piston to TDC position”, page 71](#) .
- Remove sump (bottom section)  
⇒ [“1.3 Removing and installing lower part of sump”, page 197](#) .
- Remove upper part of sump  
⇒ [“1.4 Removing and installing upper part of sump”, page 201](#) .
- Remove engine speed sender - G28-  
⇒ [“1.5 Removing and installing engine speed sender G28 ”, page 353](#) .





- Unscrew bolts -arrows- for sealing flange -1-.

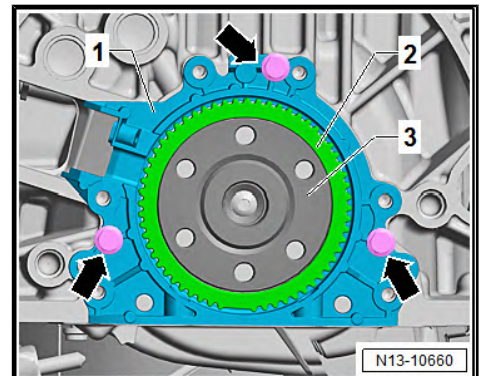


- To press off, screw 3 M6 x 35 bolts -arrows- into sealing flange -1-.

**i** Note

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

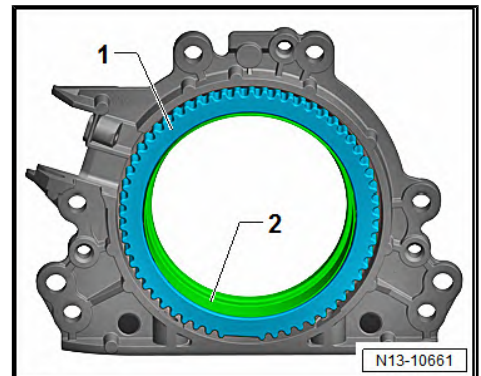
- Screw bolts alternately into sealing flange not more than 1/2 turn at a time.
- Remove sealing flange -1- together with sender wheel -2-.



**Pressing in sealing flange with sender wheel**

**i** Note

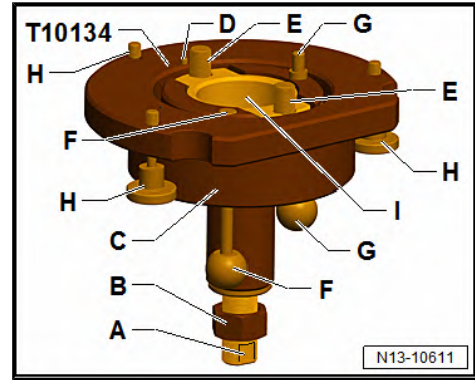
- ◆ *Do not re-use old sealing flange!*
- ◆ *The sealing flange with a PTFE seal is equipped with a sealing lip support ring -2-.*
- ◆ *This support ring serves as a fitting sleeve and must not be removed prior to installation.*
- ◆ *Sealing flange and sender wheel -1- must not be separated after removal from packaging.*
- ◆ *The sender wheel -1- is held in its installation position on the locating pin of the assembly tool - T10134- => [page 56](#) .*
- ◆ *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 56](#) .*





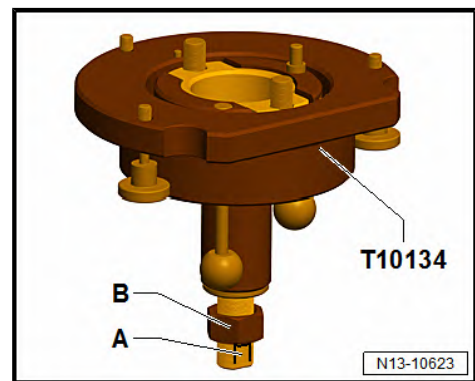
**Set-up of assembly tool - T10134- :**

- 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

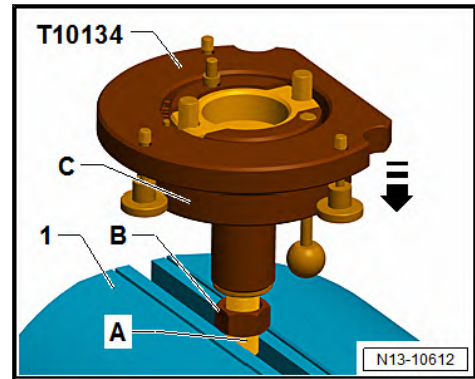


**Fitting sealing flange with sender wheel on assembly tool - T10134- :**

- 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-.
- Press assembly housing -C- downwards until it rests against nut -B-.
- Inner part of assembly tool and assembly housing must be at same height.

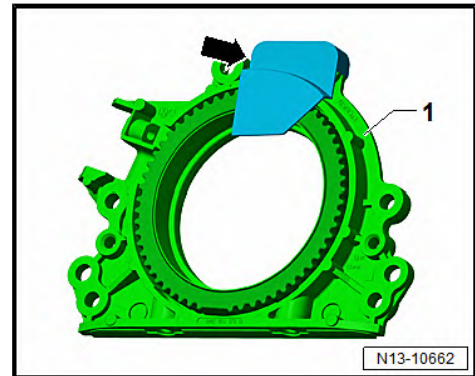


- If fitted, remove securing clip -arrow- from new sealing flange.



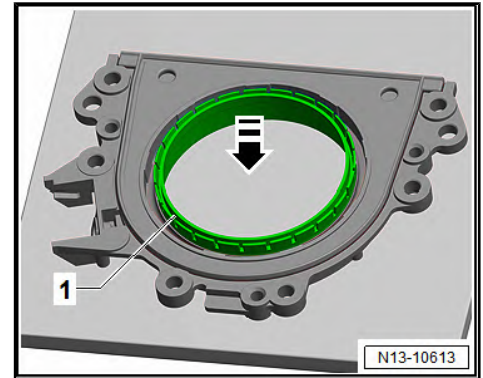
**Note**

*Do not take the sender wheel out of the sealing flange or rotate it out of position.*

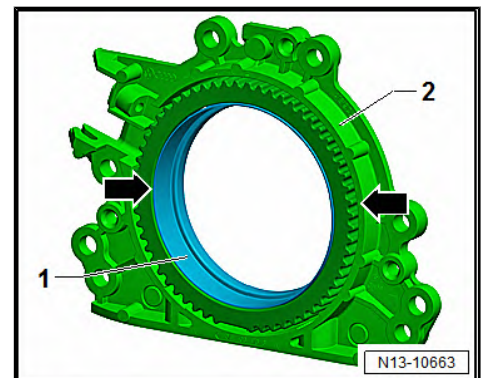




- Place sealing flange with front side facing down on a clean level surface.
- Push sealing lip support ring -1- downwards in -direction of arrow- until it rests against the flat surface.



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

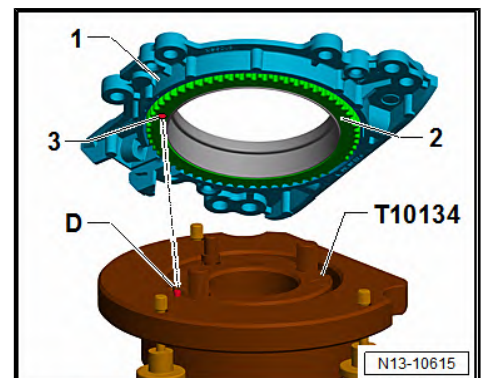


- Place sealing flange -1- with front side facing downwards onto assembly tool - T10134- so that locating pin -D- is seated in hole -3- in sender wheel hole -2-.



**Note**

- ◆ *The sealing flange -1- can be supplied in different versions.*
- ◆ *In some circumstances, the »TDC position hole« -3- may not be in the correct TDC position.*
- ◆ *If the position -3- is not correct in relation to the locating pin -D-, carefully move the sender wheel -2- to the correct position.*



- If necessary, rotate sender wheel with support ring so that locating pin and hole align.

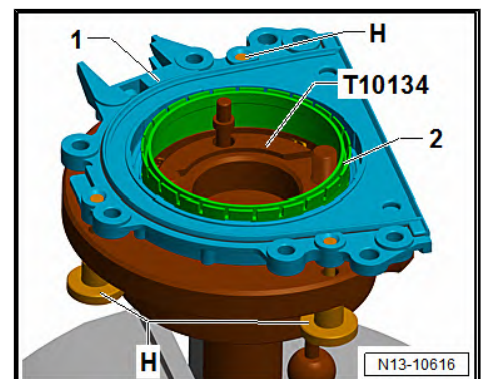
- The sealing flange must rest flat against the assembly tool.

- 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.

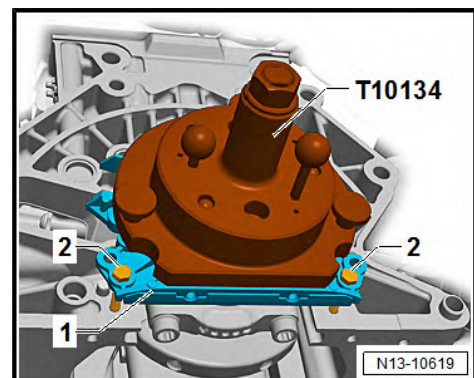
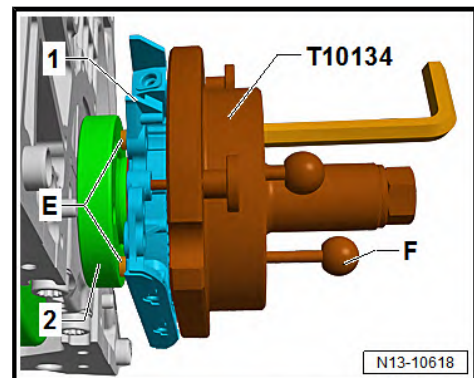
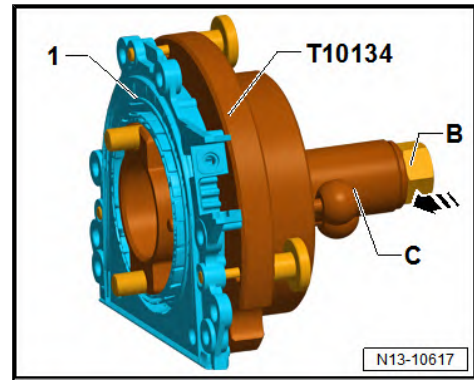
- When installing sealing flange, ensure that sender wheel remains fixed in assembly tool.





### 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:

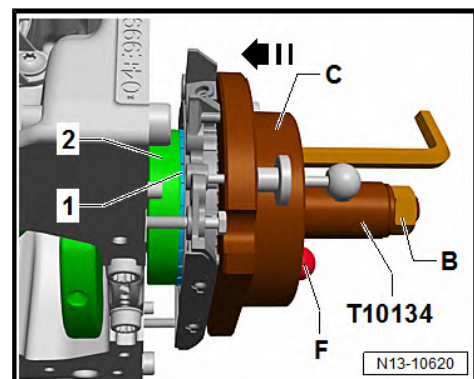
- Push assembly housing -C- by hand in -direction of arrow- until sealing lip support ring -1- rests against crankshaft flange -2-.
- Make sure that guide pin for petrol engines (red knob) -F- is properly seated in hole in crankshaft. This ensures that the sender wheel reaches its final installation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

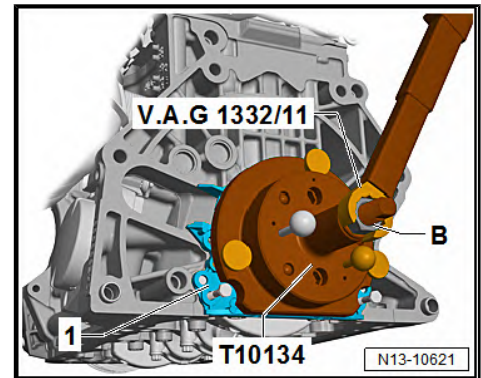






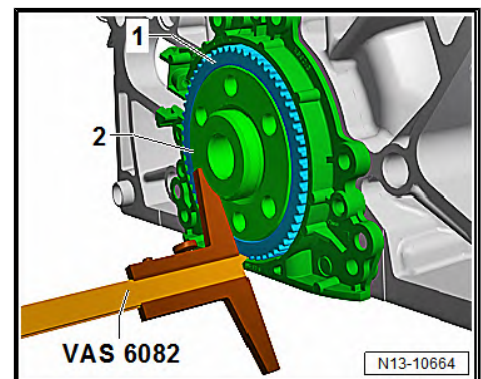
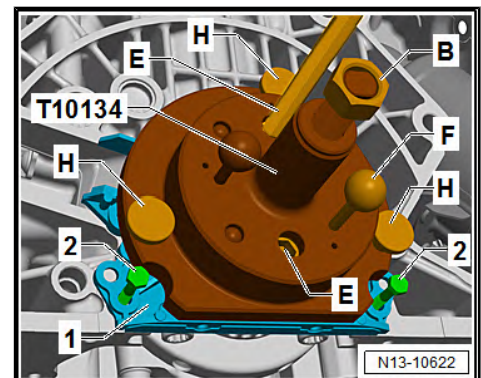
**Pressing sender wheel onto crankshaft flange using assembly tool - T10134- :**

- 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-.

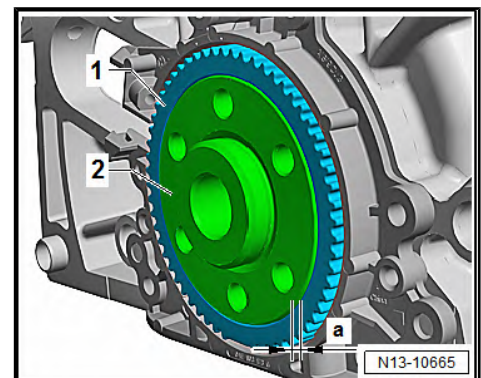


**Checking sender wheel installation position on crankshaft:**

- 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-.



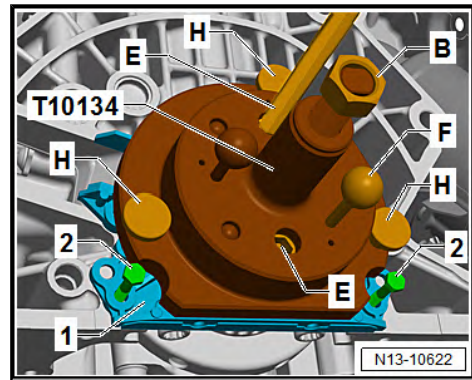
- Measure distance -a- between crankshaft flange -2- and sender wheel -1-.
- Specification: dimension -a- = 0.5 mm
- If specification is not achieved, press sender wheel further in => [page 60](#) .
- If specification is achieved, proceed with subsequent work steps => [page 60](#) .





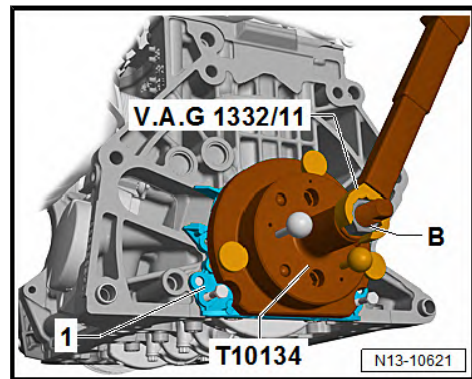
### Re-pressing sender wheel:

- Secure assembly tool - T10134- on crankshaft flange -1-.
- 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 nut 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 59](#) .
- 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 59](#) .



### Installing

- Tighten bolts for sealing flange ⇒ [page 52](#) .
- Install bottom section of sump  
⇒ [“1.3 Removing and installing lower part of sump”, page 197](#) .
- Install upper part of sump  
⇒ [“1.4 Removing and installing upper part of sump”, page 201](#) .
- Install intermediate plate ⇒ [page 52](#) .
- Install flywheel  
⇒ [“2.2 Removing and installing flywheel”, page 52](#) .



### Torque settings

- ◆ ⇒ [Fig. “Sealing flange on gearbox side - specified torque and tightening sequence”](#) , page 52
- ◆ ⇒ [Fig. “Install intermediate plate.”](#) , page 52
- ◆ ⇒ [“2.1 Assembly overview - cylinder block, gearbox end”](#) , page 51
- ◆ Engine speed sender - G28-  
⇒ [“1.1 Assembly overview - ignition system”](#) , page 348



### 3 Crankshaft

⇒ [“3.1 Crankshaft dimensions”, page 61](#)

⇒ [“3.2 Renewing needle bearing in crankshaft”, page 61](#)

⇒ [“3.3 Measuring axial clearance of crankshaft”, page 64](#)

#### 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.

Honing dimension	Conrod bearing journal diameter mm
Basic dimension	48.00 -0.022 -0.042

#### 3.2 Renewing needle bearing in crankshaft

Only vehicles with a dual clutch gearbox

**i** Note

- ◆ *For vehicles with manual gearbox, no needle bearing must be installed in the crankshaft.*
- ◆ *On vehicles with dual clutch gearbox, a needle bearing must be installed in the crankshaft ⇒ Electronic Parts Catalogue .*

#### Special tools and workshop equipment required

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





◆ Internal puller - VAS 251 635-



◆ Drift - VW 207 C-

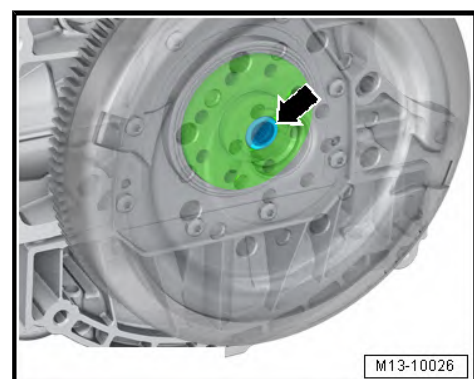


◆ Centring mandrel - 3176-



**Condition:**

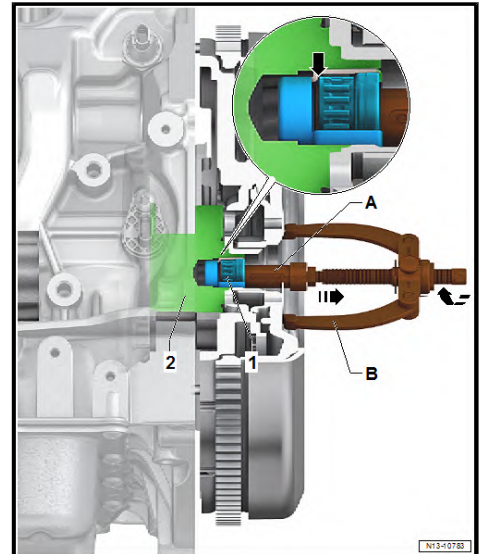
- Gearbox is removed ⇒ Rep. gr. 34 ; Removing and installing gearbox; Removing gearbox .
- Always renew needle bearing -arrow- after separating engine and gearbox.
- The front edges of the inner puller must be free of chips.





### Pulling out needle roller bearing

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



### Installing

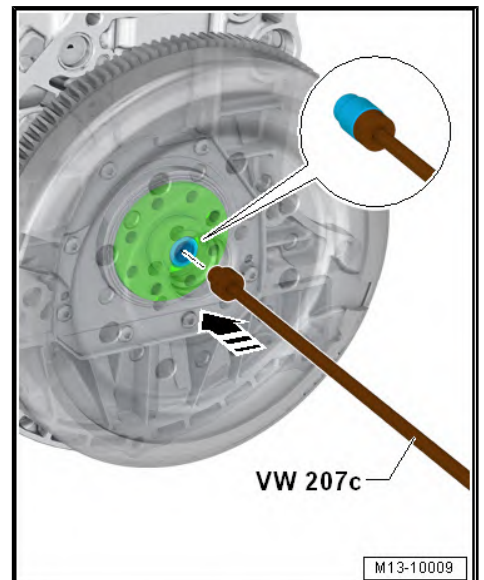
- Clean bearing seat in crankshaft and apply as thin coating of grease.



#### Note

*The lettering on the needle bearing must be visible when installed.*

- Drive in needle bearing using drift - VW 207 C- or centring mandrel - 3176- until it is flush.



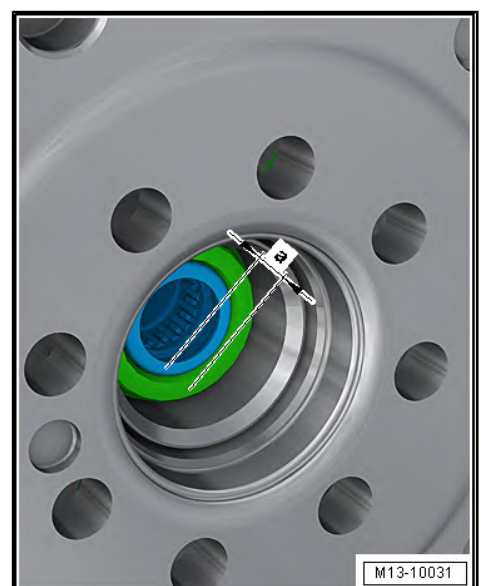
Installation depth: dimension -a- = 2.0 mm



#### Note

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

- Install gearbox ⇒ Rep. gr. 34 ; Removing and installing gearbox; Installing gearbox .





### 3.3 Measuring axial clearance of crankshaft

#### NOTICE

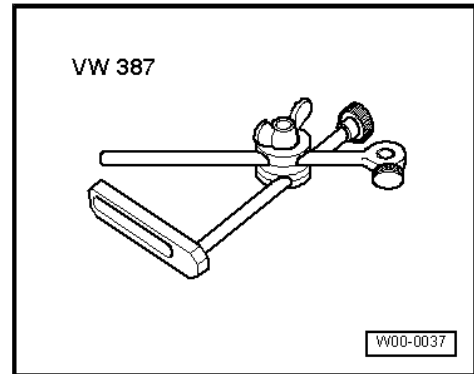
Risk of damage to bearing pedestals when the crankshaft is removed.

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.

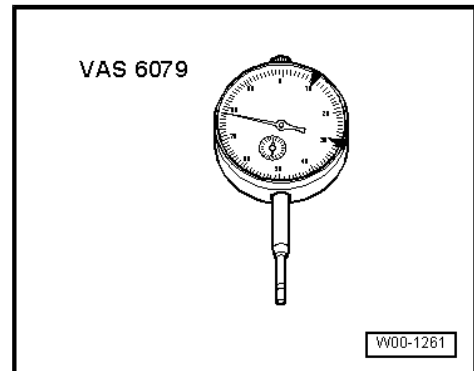
- Never remove the crankshaft.

#### Special tools and workshop equipment required

- ◆ Universal dial gauge holder - VW 387-

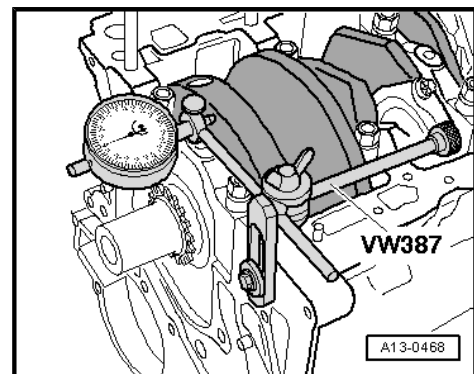


- ◆ Dial gauge - VAS 6079-



#### Procedure

- Screw dial gauge - VAS 6079- with universal dial gauge bracket - VW 387- to cylinder block as shown in the illustration.
- Position dial gauge against crank web.
- Press crankshaft against dial gauge by hand and set gauge to "0".
- Push crankshaft away from dial gauge and read off measured value.
- Axial clearance: 0.066 to 0.233 mm





## 4 Pistons and conrods

⇒ [“4.1 Assembly overview - pistons and conrods”, page 65](#)

⇒ [“4.2 Separating new conrod”, page 67](#)

⇒ [“4.3 Removing and installing pistons”, page 67](#)

⇒ [“4.4 Removing and installing oil spray jets”, page 68](#)

⇒ [“4.5 Checking pistons and cylinder bores”, page 70](#)

⇒ [“4.6 Checking radial clearance of conrods”, page 71](#)

⇒ [“4.7 Setting piston to TDC position”, page 71](#)

### 4.1 Assembly overview - pistons and conrods

#### 1 - Bolts

- Renew after removal
- Oil threads and contact surface
- 30 Nm + 90°

#### 2 - Conrod bearing cap

- The conrod bearing cap only fits in one position and only on the appropriate conrod due to the breaking procedure (cracking) separating the cap from the conrod.
- Mark allocation to cylinder and conrod in colour -B-.
- Installation position: Lug -A- on conrod bearing cap faces towards pulley end

#### 3 - Bearing bushes

- Fitting position  
⇒ [page 66](#)
- Renew worn bearing shells
- Ensure firm seating

#### 4 - Connecting rod

- With industrially cracked conrod bearing cap
- Renew as set only.
- Mark allocation to cylinder and conrod bearing cap in colour -B-.

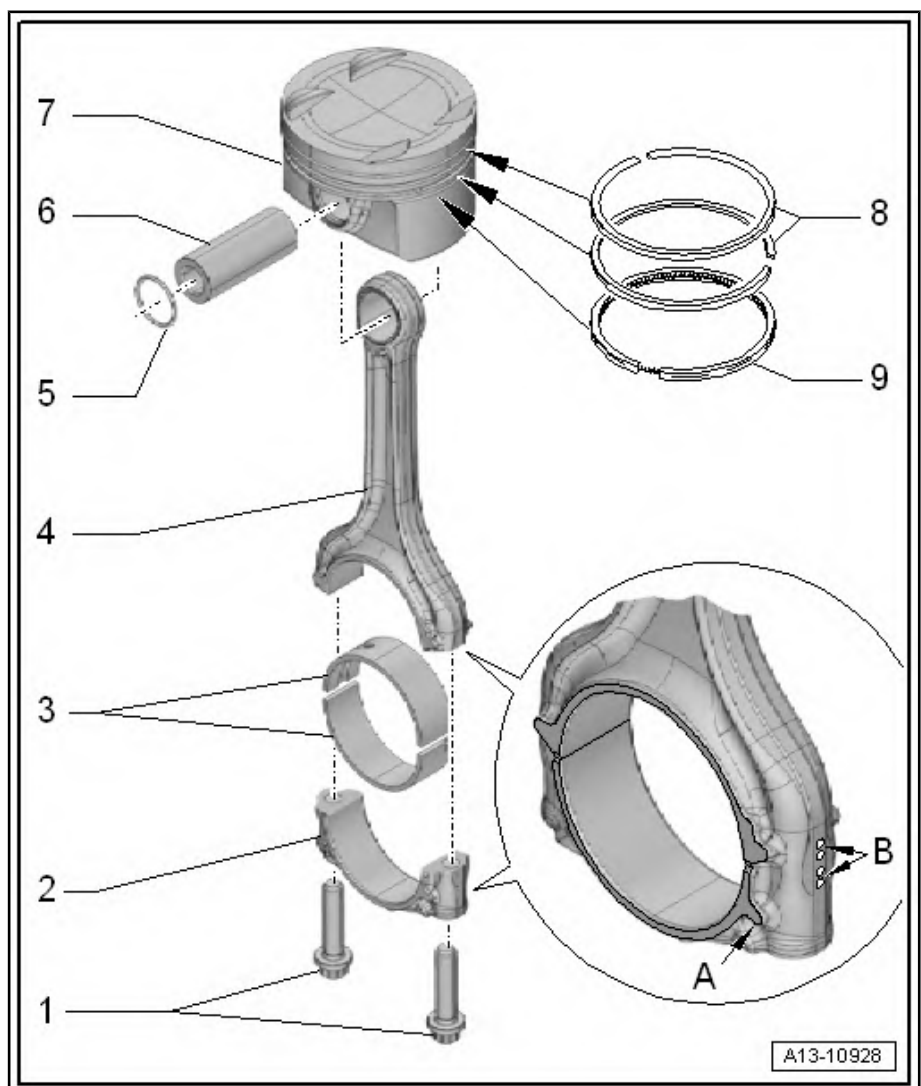
Measuring radial clearance ⇒ [“4.6 Checking radial clearance of conrods”, page 71](#)

Separating new conrod ⇒ [“4.2 Separating new conrod”, page 67](#) .

Installation position: Lug -A- on conrod bearing cap faces towards pulley end

#### 5 - Retaining ring

- Qty. 2
- Renew after removal





## 6 - Piston pin

- ❑ Removing and installing ⇒ [“4.3 Removing and installing pistons”, page 67](#)

## 7 - Piston

- ❑ Mark installation position and cylinder number ⇒ [page 66](#) .
- ❑ Removing and installing ⇒ [“4.3 Removing and installing pistons”, page 67](#)
- ❑ Checking piston and cylinder bore ⇒ [“4.5 Checking pistons and cylinder bores”, page 70](#)

## 8 - Piston rings

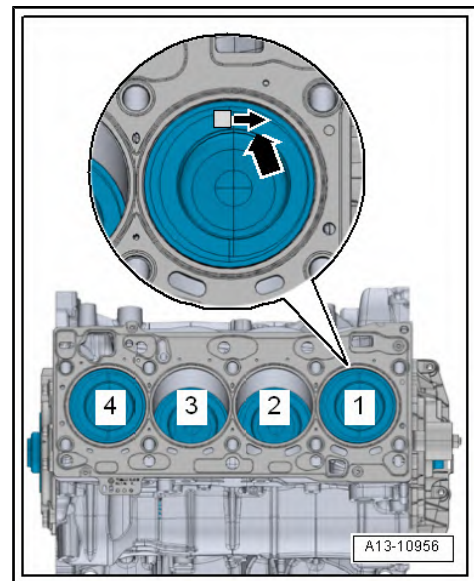
- ❑ Compression rings
- ❑ Measuring ring gap ⇒ [page 70](#)
- ❑ Measuring ring-to-groove clearance ⇒ [page 70](#)
- ❑ Use commercially available piston ring pliers to remove and install.
- ❑ Installation position: marking “TOP” or side with lettering towards piston crown
- ❑ Offset gaps by 120°

## 9 - Piston ring

- ❑ Oil scraper ring
- ❑ Measuring ring gap ⇒ [page 70](#)
- ❑ Measuring ring-to-groove clearance ⇒ [page 70](#)
- ❑ Use piston ring pliers to remove and install.
- ❑ Installation position: marking “TOP” or side with lettering towards piston crown
- ❑ Offset gap 120° relative to lower compression ring

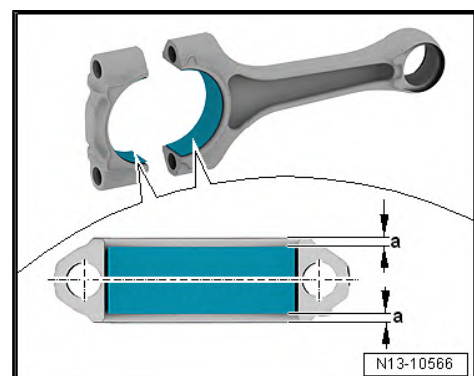
## Installation position and allocation of piston to cylinder

- If worn pistons are to be reinstalled, mark their allocation to the cylinder on the piston crown. Use paint for marking.
- Arrow on piston crown points to pulley end -arrow-.



## Bearing shells - installation position

- Centre bearing shells on conrod and on conrod bearing cap.
- Distance -a- = distance -a-.







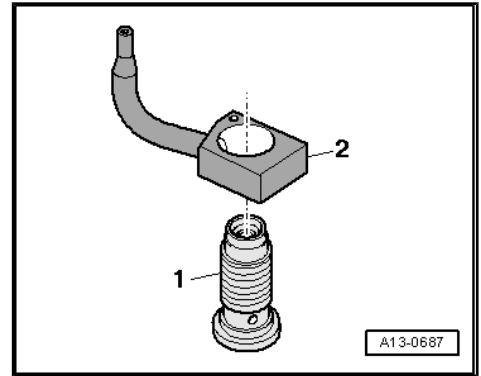
### Oil spray jet and pressure relief valve

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

**!** NOTICE

Risk of damage to oil spray jets caused by deformation.

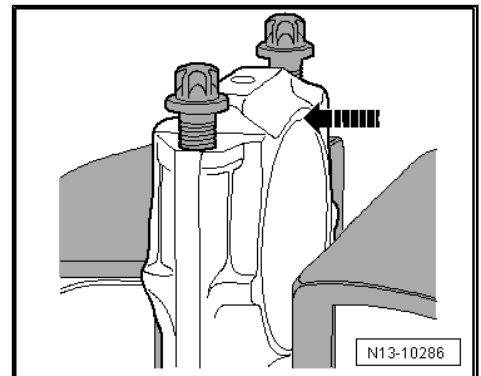
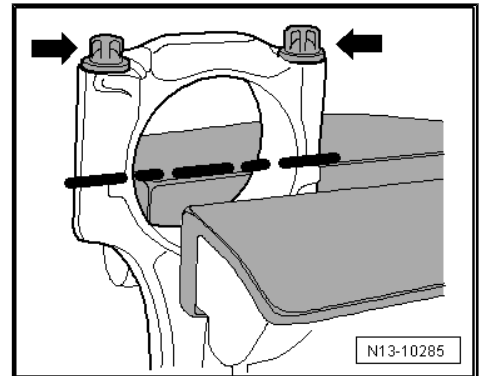
- Do not bend oil spray jets.



## 4.2 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:

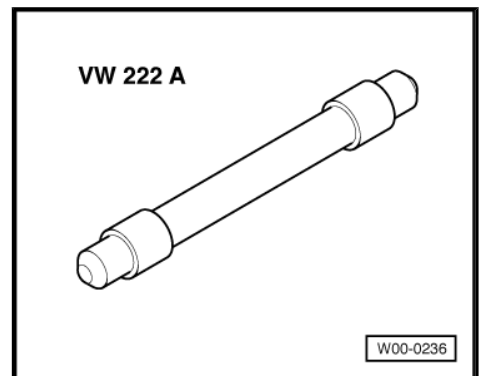
- To avoid damage, gently clamp conrod in a vice with protection jaws, as shown in illustration.
- Clamp conrod below dashed line.
- Unscrew bolts -arrows- around 5 turns.
- Using a plastic hammer, carefully knock against conrod bearing cap -arrow- until it is loose.



## 4.3 Removing and installing pistons

Special tools and workshop equipment required

- ◆ Drift - VW 222 A-



- ◆ Piston ring clamp, commercially available

### Removing

- Remove cylinder head  
 ⇒ ["1.3 Removing and installing cylinder head", page 81](#) .



- Remove upper part of sump  
⇒ [“1.4 Removing and installing upper part of sump”, page 201](#) and detach baffle plate.
- Mark piston installation position and corresponding cylinder number.
- Mark installation position and matching of cylinder and conrod bearing cap to conrod ⇒ [Item 4 \(page 65\)](#) .
- Remove conrod bearing cap and withdraw piston and conrod upwards.



#### Note

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

- Remove retaining ring from piston pin eye.
- Drive out piston pin using drift - VW 222 A- .

#### Installing

Install in reverse order of removal. The following should be observed:



#### Note

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

- Oil running surfaces of bearing shells.
- Install piston with commercially available piston ring clamp, noting installation position ⇒ [page 66](#) .
- Install conrod bearing cap, noting installation position ⇒ [Item 2 \(page 65\)](#) .
- Install cylinder head  
⇒ [“1.3 Removing and installing cylinder head”, page 81](#) .
- Install upper part of sump  
⇒ [“1.4 Removing and installing upper part of sump”, page 201](#) .

#### Torque settings

- ◆ ⇒ [“4.1 Assembly overview - pistons and conrods”, page 65](#)

## 4.4 Removing and installing oil spray jets

#### Special tools and workshop equipment required

- ◆ Torx bit - T10545-





## Removing

- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
- Remove upper part of sump  
 ⇒ ["1.4 Removing and installing upper part of sump", page 201](#) .



### Note

- ◆ *The crank web of the respective cylinder must be positioned so that the socket - T10545- can be inserted vertically.*
- ◆ *Furthermore, the corners of the socket - T10545- and of the pressure relief valve must engage well.*
- Turn crankshaft via vibration damper securing bolt in direction of engine rotation until the respective bolt is accessible.
- Unscrew pressure relief valve -1- using Torx bit T40 - T10545- .
- Remove oil spray jets -2-.

## Installing



### NOTICE

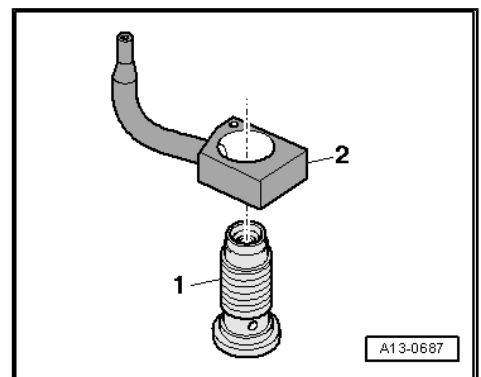
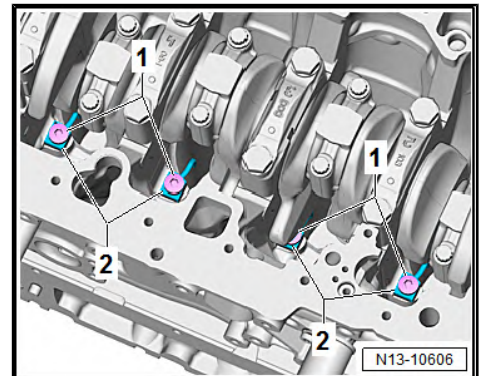
Risk of damage to oil spray jets caused by deformation.

- Do not bend oil spray jets.

- 1 - Pressure relief valve - 27 Nm
- 2 - Oil spray jet
- Installation position: align leading edge of oil spray jet arrow with machined surface of cylinder block.
- Install upper part of sump  
 ⇒ ["1.4 Removing and installing upper part of sump", page 201](#) .
- Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview – noise insulation .

### Specified torque:

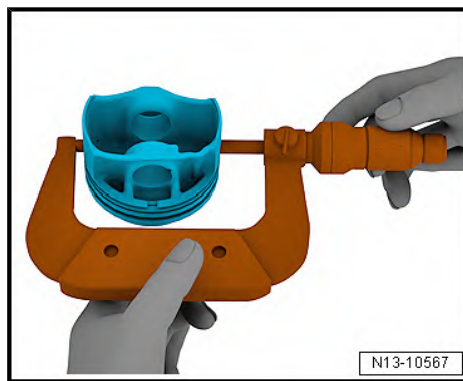
- ◆ ⇒ ["1.1 Assembly overview - sump/oil pump", page 193](#)
- ◆ ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation





## 4.5 Checking pistons and cylinder bores

### Checking piston



#### Special tools and workshop equipment required

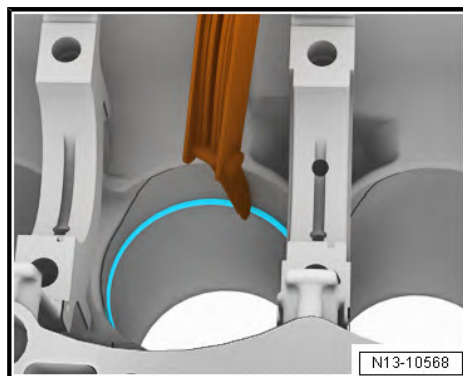
- ◆ External micrometer 50-75 mm - VAS 6070-
- Using an external micrometre, measure approx. 10 mm from lower edge, offset 90° from piston pin axis.
- Maximum deviation from nominal dimension: 0.04 mm.

Piston diameter, mm	
Specification	74.42 <sup>1)</sup>
• <sup>1)</sup> Dimensions not including coating (thickness 0.018 mm on each side).	

#### Measuring piston ring gap

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

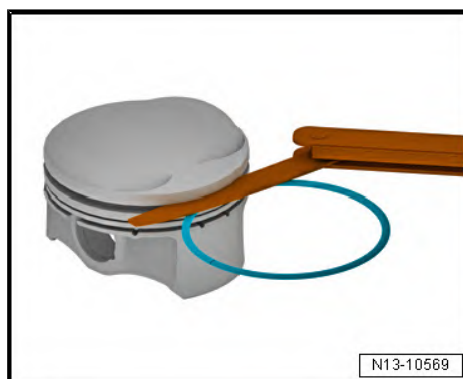
Piston ring	New mm	Wear limit mm
compression ring	0.20 + 0.15	1.0
Oil scraper ring	0.20 + 0.20	3.0



#### Measuring ring-to-groove clearance

- Clean annular groove of piston before check.

Piston ring	New mm	Wear limit mm
1st compression ring	0.05 ... 0.09	0.15
2nd compression ring	0.03 ... 0.07	0.15
Oil scraper rings	Cannot be measured	





## Measuring cylinder bore

### NOTICE

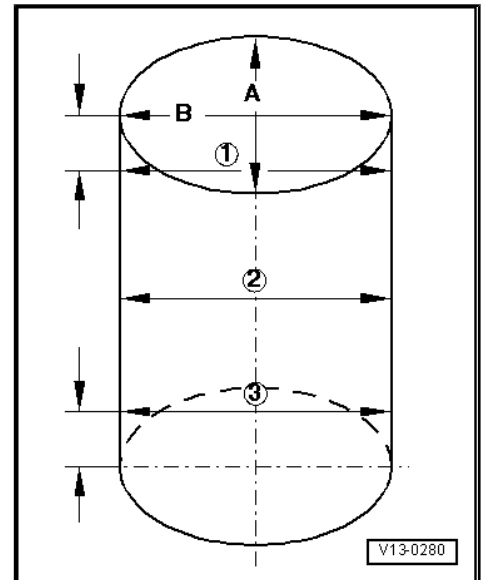
Risk of damage to the surface of the cylinder bore caused by incorrect machining.

- Do not machine cylinder bore (reboring, honing, grinding) with workshop equipment.
- 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	74.5 + 0.015 <sup>1)</sup> +0.005

### Note

Do not measure cylinder bores when cylinder block is mounted on engine and gearbox support - VAS 6095- , as measurements may be incorrect.



## 4.6 Checking radial clearance of conrods

### Special tools and workshop equipment required

- ◆ Plastigage

### Procedure

- Remove conrod bearing cap.
- Clean bearing cap and bearing journal.
- Place a Plastigage corresponding to the width of the bearing on the journal or into the bearing shells.
- Fit conrod bearing cap and tighten to 30 Nm (without turning further angle).
- Do not rotate crankshaft while doing so.
- Remove conrod bearing cap again.
- Compare width of Plastigage with the measurement scale.
- Radial clearance: 0.028 to 0.065 mm.
- Renew conrod bolts.

## 4.7 Setting piston to TDC position

### Procedure

Setting piston from cylinder no. 1 to TDC position ⇒ [page 71](#)

Setting piston from cylinder no. 1 to TDC position for repair work on toothed belt drive and for setting valve timing ⇒ [page 73](#)

Setting piston from cylinder no. 1 to TDC position

Rotate crankshaft to "TDC" as follows:

- Remove ignition coil 1 with output stage - N70- and the spark plug cylinder 1  
 ⇒ ["1.2 Removing and installing ignition coils with output stage", page 349](#) .



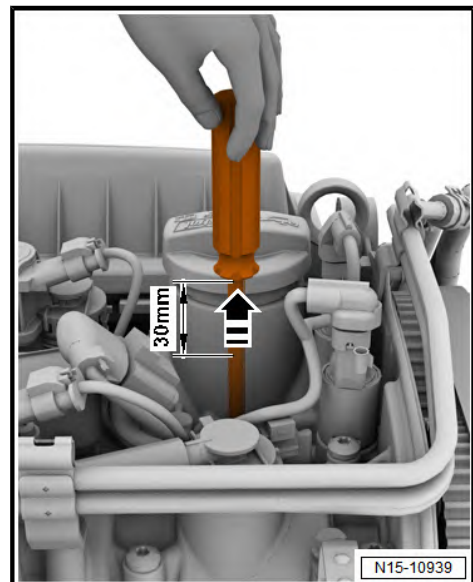
### Note

- ◆ *Risk of damage to engine!*
- ◆ *Locking pin - T10340- can be inserted to stop at 2 positions.*
- ◆ *It is essential that the "TDC" position is checked as described.*
- Carefully insert a screwdriver with a shaft length of at least 250 mm into spark plug hole so that it contacts piston crown.
- Turn crankshaft in direction of engine rotation until piston in cylinder 1 is at "BDC".

The screwdriver moves in the -direction of the arrow-.



- Turn crankshaft further in direction of engine rotation until screwdriver has moved -30 mm- in -direction of arrow-.
- Remove noise insulation => General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .

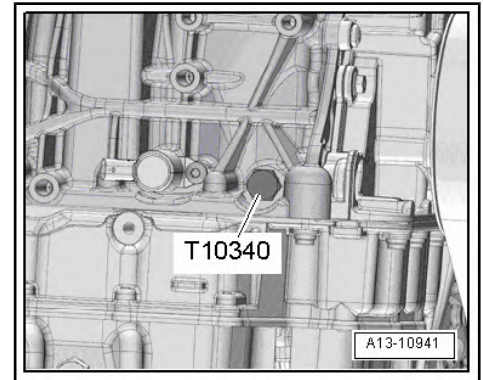




- Unscrew plug for "TDC" hole in cylinder block.
- Screw locking pin - T10340- into cylinder block as far as stop and tighten to 30 Nm.
- Rotate crankshaft in normal direction of rotation as far as stop.
- The locking pin now rests against the crank web.

**i** Note

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



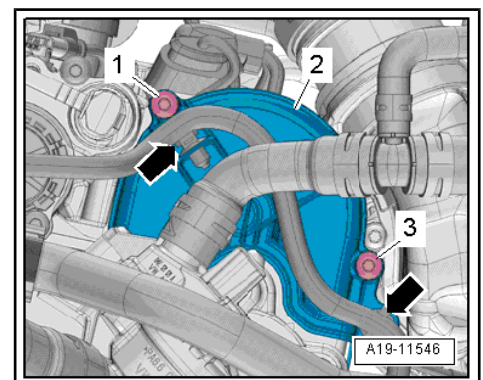
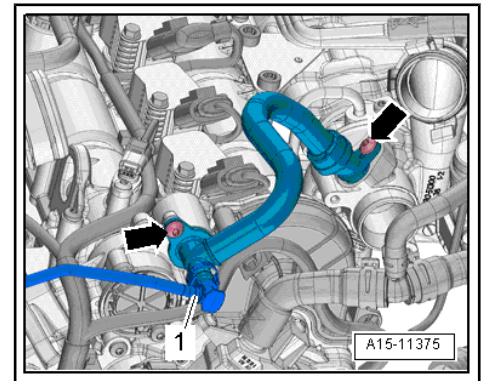
**Setting piston from cylinder no. 1 to TDC position for repair work on toothed belt drive and for setting valve timing**

- Remove resonator for intake air  
 ⇒ ["3.3 Removing and installing resonator for intake air", page 309](#) .
- Remove air intake pipe  
 ⇒ ["2.5 Removing and installing air intake pipe", page 289](#) .
- Press release tabs, and disconnect hose -1- for activated charcoal filter.
- Unscrew bolts -arrows- and pull off crankcase breather hose.

**i** Note

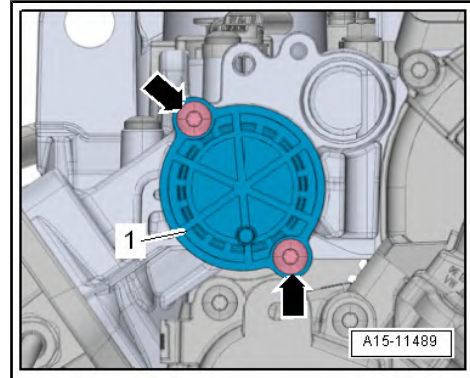
*Risk of chemical damage to the coolant pump gasket caused by oil entering between the coolant pump and the cylinder head.*

- Cover coolant pump with a cloth.
- Remove connection for turbocharger  
 ⇒ ["1.4 Removing and installing connection for turbocharger", page 279](#) .
- Lay wiring harness to one side -arrows-.
- Unscrew bolts -1, 3- and remove cover -2- for toothed belt for coolant pump.





- Unscrew bolts -arrows- and detach sealing cap -1-.



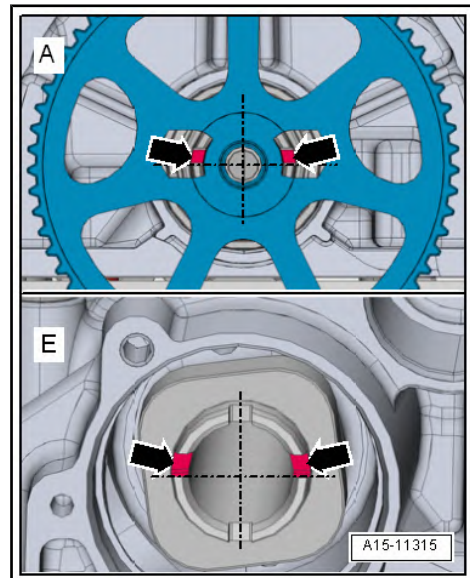
#### Vehicles without ACT:

- The asymmetrically positioned grooves on gearbox end of both camshafts -top arrows- must now be above the horizontal centre line.
- Grooves -arrows- on exhaust camshaft -A- can be accessed through recesses in drive wheel for coolant pump.
- On inlet camshaft -E-, grooves -arrows- are above horizontal camshaft centre line.

A - Exhaust camshaft

E - Inlet camshaft

- If the camshafts are not positioned as described: Unscrew locking pin - T10340- . Turn crankshaft one revolution further until camshaft is in right position.



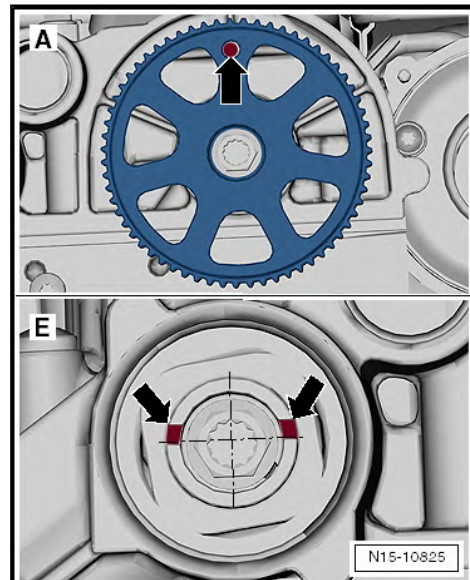
#### Vehicles with ACT:

- On exhaust camshaft, hole -arrow- in toothed belt pulley for coolant pump must align with hole in camshaft housing.
- On inlet camshaft, grooves -arrows- must be positioned above centre of camshaft.

A - Exhaust camshaft

E - Inlet camshaft

- If the camshafts are not positioned as described: Unscrew locking pin - T10340- . Turn crankshaft one revolution further until camshaft is in right position.





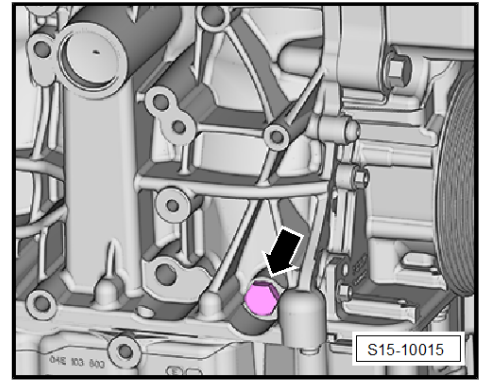


### Plug for "TDC" drilling in cylinder block - specified torque

- ◆ Renew O-ring if damaged.
- ◆ Tighten bolt -arrow- to 30 Nm.

### Torque settings

- ◆ ⇒ ["1.1 Assembly overview - turbocharger", page 270](#)
- ◆ ⇒ ["2.1 Assembly overview - charge air system", page 283](#)
- ◆ ⇒ ["1.1 Assembly overview - ignition system", page 348](#)
- ◆ ⇒ ["2.1 Assembly overview - coolant pump, thermostat", page 232](#)
- ◆ ⇒ ["3.1 Assembly overview - air filter housing", page 307](#)
- ◆ ⇒ ["1.2 Assembly overview - camshaft housing", page 78](#)





## 15 – Cylinder head, valve gear

### 1 Cylinder head

⇒ [“1.1 Assembly overview - cylinder head”, page 76](#)

⇒ [“1.2 Assembly overview - camshaft housing”, page 78](#)

⇒ [“1.3 Removing and installing cylinder head”, page 81](#)

⇒ [“1.4 Removing and installing camshaft housing”, page 85](#)

⇒ [“1.5 Checking compression”, page 88](#)

#### 1.1 Assembly overview - cylinder head

##### 1 - Cylinder head gasket

- Renewing  
⇒ [“1.3 Removing and installing cylinder head”, page 81](#)
- Observe installation position: Part number to cylinder head

##### 2 - Dowel sleeve

- Qty. 2

##### 3 - Cylinder head

- Removing and installing  
⇒ [“1.3 Removing and installing cylinder head”, page 81](#)
- Check for distortion  
⇒ [page 77](#) .

##### 4 - Dowel pins

##### 5 - Seal

- With oil strainer
- Inserted into cylinder head



##### Note

- ◆ *The oil strainer is fitted only if the cylinder head has the appropriate recess.*
- ◆ *Cylinder heads without recess do not require an oil strainer.*

##### 6 - Seal

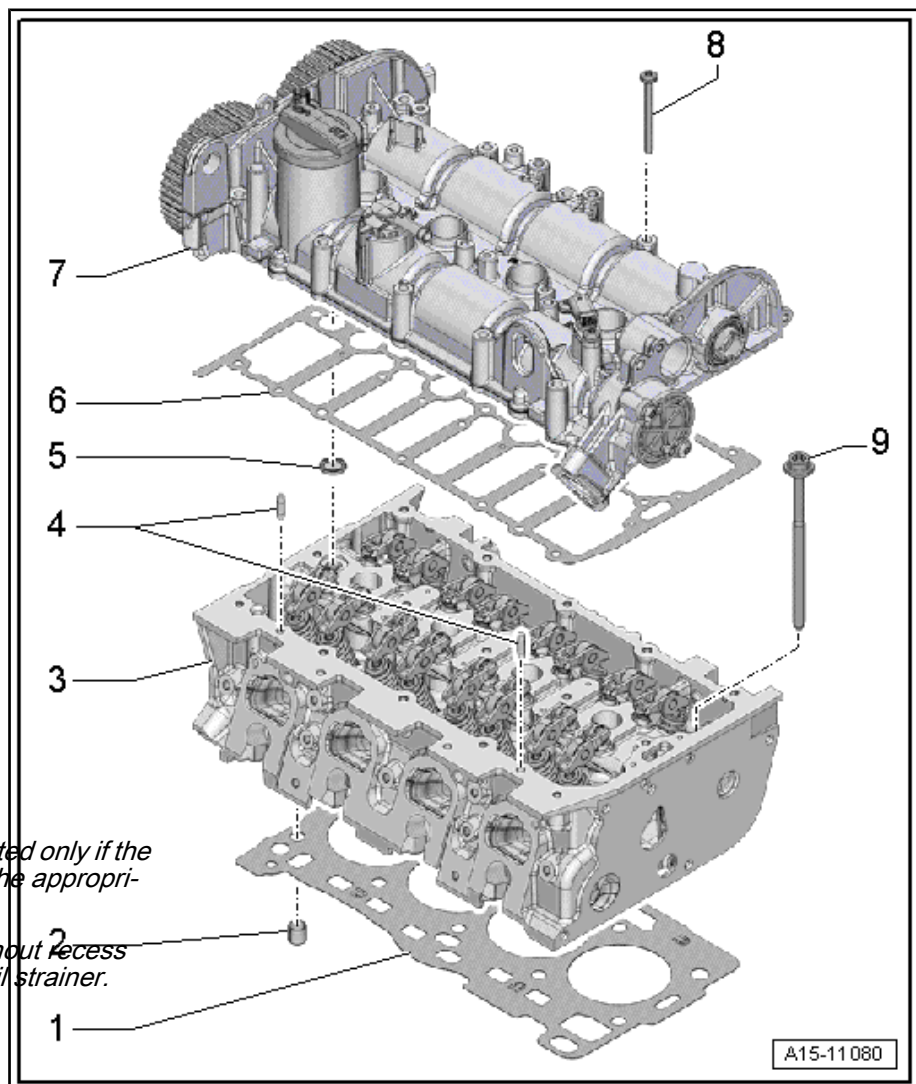
- Renew after removal

##### 7 - Camshaft case

- Removing and installing ⇒ [“1.4 Removing and installing camshaft housing”, page 85](#)
- The camshafts must not be removed individually.
- In the event of repair, the camshaft housing must be renewed completely.

##### 8 - Bolt

- Specified torque and tightening sequence ⇒ [page 81](#)





## 9 - Bolt

- Renew after removal
- Sequence when loosening ⇒ [page 84](#) .
- Specified torque and tightening sequence ⇒ [page 77](#)

### Cylinder head - specified torque and sequence

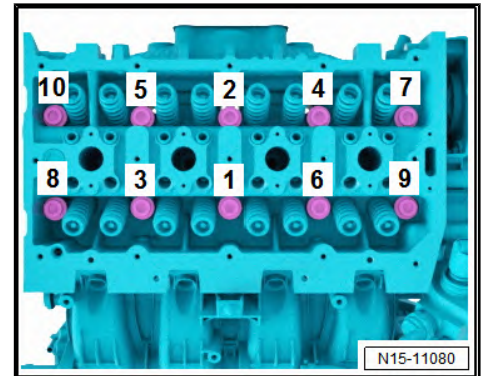


Note

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

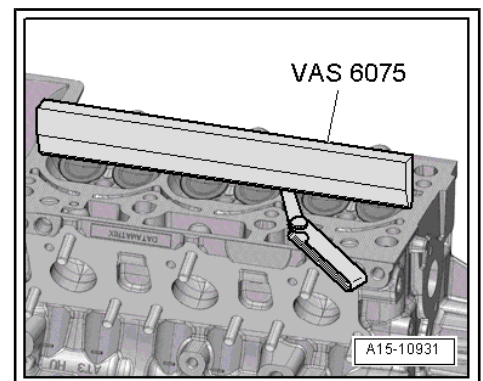
- Tighten bolts in stages in the sequence shown.

Stage	Bolts	Specified torque/turning further angle
1.	-1 ... 10-	40 Nm
2.	-1 ... 10-	Turn 90° further
3.	-1 ... 10-	Turn 90° further
4.	-1 ... 10-	Turn 90° further



### Checking cylinder head for distortion

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





## 1.2 Assembly overview - camshaft housing

⇒ [“1.2.1 Assembly overview - camshaft housing, vehicles with Active Cylinder Management”, page 78](#)

⇒ [“1.2.2 Assembly overview - camshaft housing, exhaust side with toothed belt pulley”, page 80](#)

### 1.2.1 Assembly overview - camshaft housing, vehicles with Active Cylinder Management

#### 1 - Bolt

- 8 Nm

#### 2 - Exhaust cam actuator for cylinder 2 - N587-

- Removing and installing ⇒ [“3.8 Removing and installing cam actuators”, page 187](#)

#### 3 - Exhaust cam actuator for cylinder 3 - N595-

- Removing and installing ⇒ [“3.8 Removing and installing cam actuators”, page 187](#)

#### 4 - Inlet cam actuator for cylinder 3 - N591-

- Removing and installing ⇒ [“3.8 Removing and installing cam actuators”, page 187](#)

#### 5 - Inlet cam actuator for cylinder 2 - N583-

- Removing and installing ⇒ [“3.8 Removing and installing cam actuators”, page 187](#)

#### 6 - Bolts

- 4 Nm

#### 7 - Hall sender 3 - G300-

- Removing and installing ⇒ [“1.4.2 Removing and installing Hall sender 3 G300”, page 353](#)

#### 8 - Hall sender - G40-

- Removing and installing ⇒ [“1.4.1 Removing and installing Hall sender G40”, page 352](#)

#### 9 - O-ring

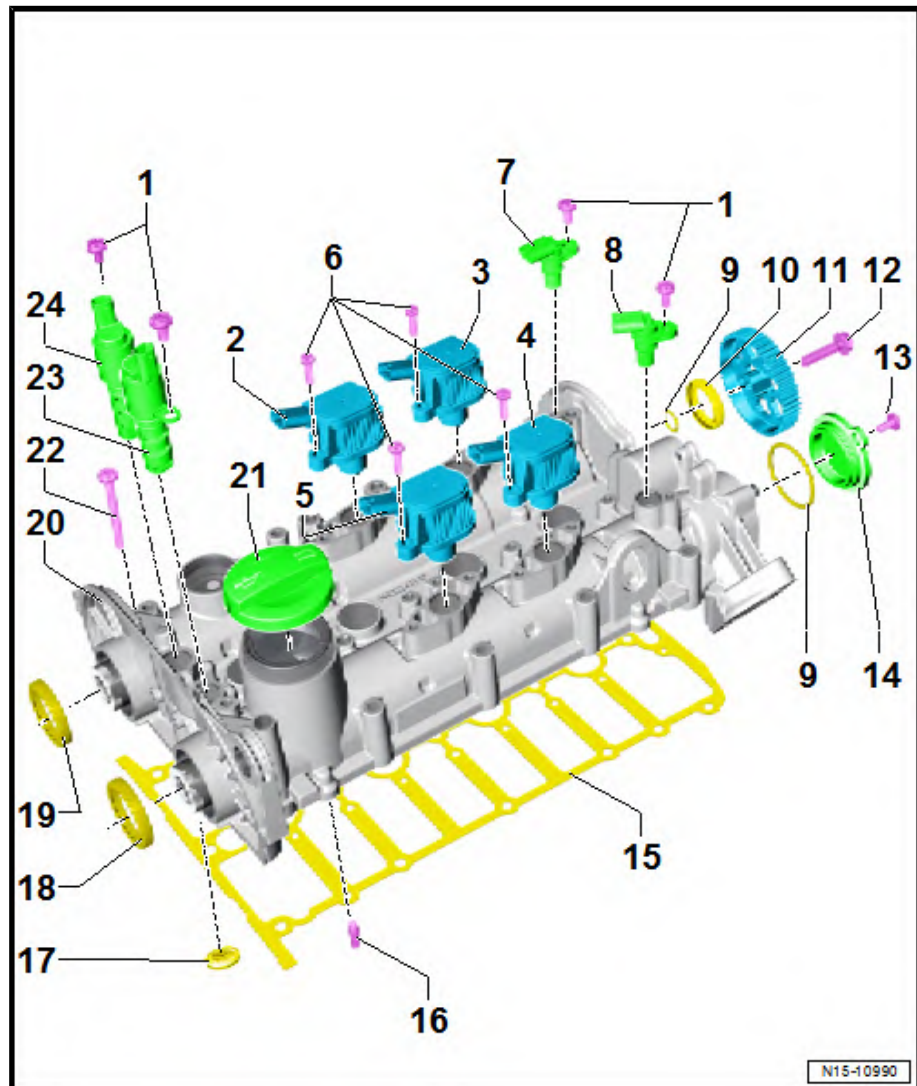
- Check for damage, and renew if necessary; see ⇒ Electronic parts catalogue (ETKA)

#### 10 - Seal

- For exhaust camshaft, gearbox end
- Renewing ⇒ [“3.2.5 Removing and installing exhaust camshaft oil seal, gearbox end, vehicles with Active Cylinder Management”, page 153](#)

#### 11 - Crankshaft

- For coolant pump





- Removing and installing  
⇒ [“2.7 Removing and installing toothed belt pulley for coolant pump”, page 245](#)

#### 12 - Bolt

- Specified torque ⇒ [Item 8 \(page 233\)](#)

#### 13 - Bolt

- 8 Nm

#### 14 - Cap

#### 15 - Seal

- Renew

#### 16 - Dowel pin

#### 17 - Seal

- With oil strainer
- Inserted into cylinder head



#### Note

- ◆ *The oil strainer is fitted only if the cylinder head has the appropriate recess.*
- ◆ *Cylinder heads without recess do not require an oil strainer.*

#### 18 - Seal

- For inlet camshaft
- Renewing ⇒ [“3.2 Removing and installing camshaft oil seal”, page 145](#)

#### 19 - Seal

- For exhaust camshaft
- Renewing ⇒ [“3.2 Removing and installing camshaft oil seal”, page 145](#)

#### 20 - Camshaft case

- Removing and installing ⇒ [“1.4 Removing and installing camshaft housing”, page 85](#)

#### 21 - Cap

#### 22 - Bolt

- Specified torque and tightening sequence ⇒ [page 80](#)

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

- Removing and installing ⇒ [“3.5 Removing and installing camshaft control valve 1 N205”, page 178](#)
- With O-ring
- Check O-ring for damage.
- O-ring cannot be renewed individually; renew together with camshaft control valve 1 - N205- if damaged.

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

- Removing and installing  
⇒ [“3.6 Removing and installing exhaust camshaft control valve 1 N318”, page 179](#)
- With O-ring
- Check O-ring for damage.
- O-ring cannot be renewed individually; renew together with camshaft control valve 1 - N205- if damaged.



## Camshaft housing - specified torque and tightening sequence

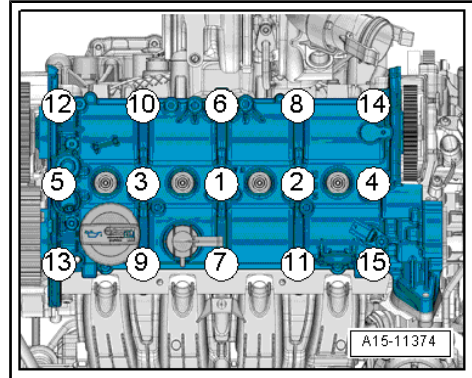


### Note

Renew bolts that are tightened with turning further angle.

- Tighten bolts in stages in the sequence shown.

Stage	Bolts	Specified torque/turning further angle
1.	-1 ... 15-	10 Nm
2.	-1 ... 15-	Turn 180° further



## 1.2.2 Assembly overview - camshaft housing, exhaust side with toothed belt pulley

### 1 - Bolt

- Specified torque and tightening sequence  
⇒ [page 81](#)

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

- Removing and installing  
⇒ ["3.5 Removing and installing camshaft control valve 1 N205"](#), [page 178](#)
- With O-ring
- Check O-ring for damage.
- O-ring cannot be renewed individually; renew together with camshaft control valve 1 - N205- if damaged.

### 3 - Bolt

- 8 Nm

### 4 - Camshaft case

- Removing and installing  
⇒ ["1.4 Removing and installing camshaft housing"](#), [page 85](#)

### 5 - Hall sender - G40-

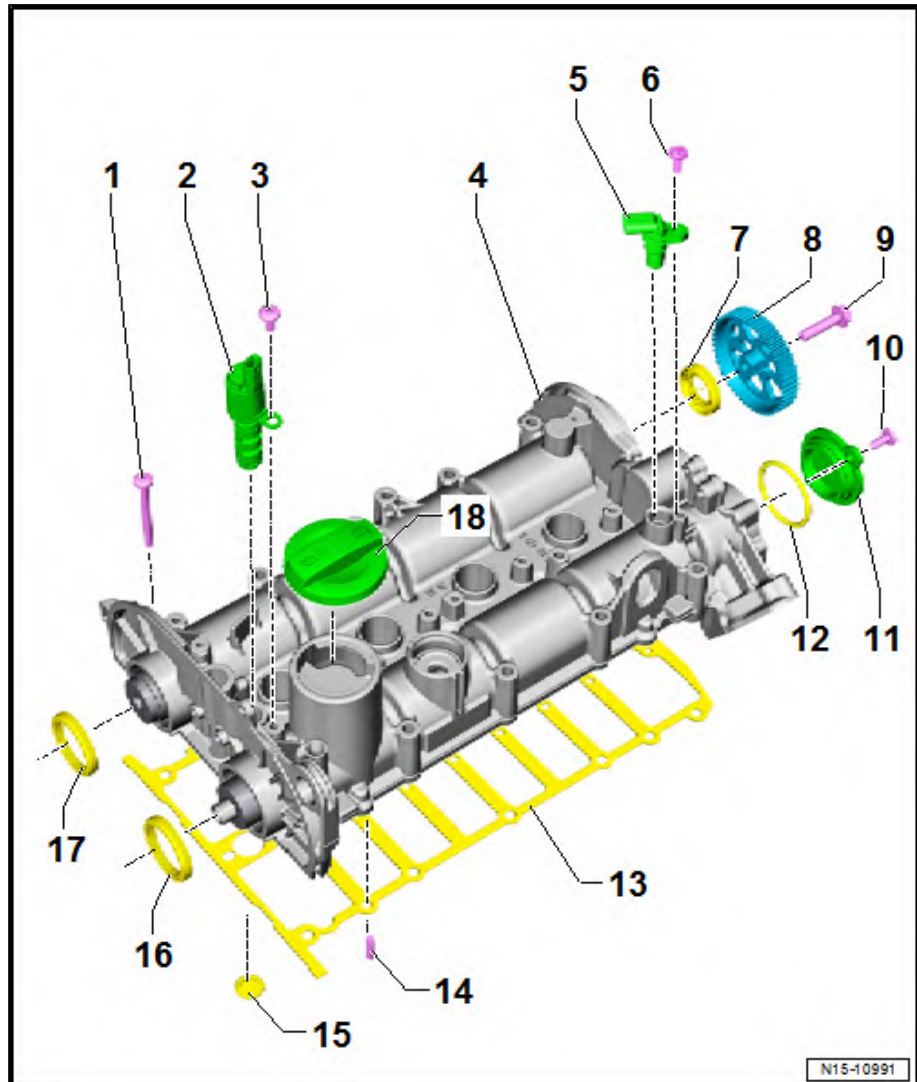
- Removing and installing  
⇒ ["1.4.1 Removing and installing Hall sender G40"](#), [page 352](#)

### 6 - Bolt

- 8 Nm

### 7 - Seal

- For exhaust camshaft, gearbox end
- Renewing  
⇒ ["3.2.6 Removing and installing exhaust camshaft oil seal, gearbox end; exhaust side with toothed belt pulley on control end"](#), [page 155](#)





## 8 - Crankshaft

- For coolant pump
- Removing and installing  
 ⇒ [“2.7 Removing and installing toothed belt pulley for coolant pump”, page 245](#)

## 9 - Bolt

- Specified torque ⇒ [Item 8 \(page 233\)](#)

## 10 - Bolt

- 8 Nm

## 11 - Cap

## 12 - O-ring

- Check for damage, and renew if necessary; see ⇒ Electronic parts catalogue (ETKA)

## 13 - Seal

- Renew

## 14 - Dowel pin

## 15 - Seal

- With oil strainer
- Inserted into cylinder head



### Note

- ◆ *The oil strainer is fitted only if the cylinder head has the appropriate recess.*
- ◆ *Cylinder heads without recess do not require an oil strainer.*

## 16 - Seal

- For inlet camshaft
- Renewing ⇒ [“3.2 Removing and installing camshaft oil seal”, page 145](#)

## 17 - Seal

- For exhaust camshaft (pulley end)
- Renewing ⇒ [“3.2 Removing and installing camshaft oil seal”, page 145](#)

## 18 - Cap

### Camshaft housing - specified torque and tightening sequence

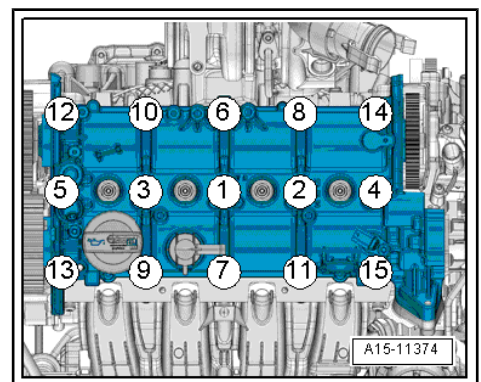


### Note

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

– Tighten bolts in stages in the sequence shown.

Stage	Bolts	Specified torque/turning further angle
1.	-1 ... 15-	10 Nm
2.	-1 ... 15-	Turn 180° further



## 1.3 Removing and installing cylinder head

Special tools and workshop equipment required



- ◆ Bit XZN 12 - T40270-



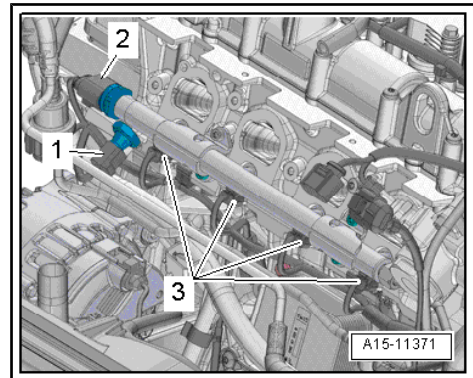
## Removing



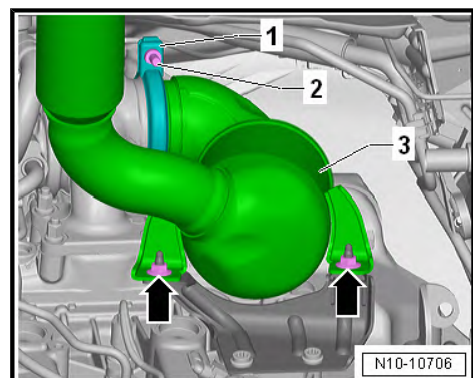
### Note

- ◆ *Cover the opening in the gearbox with a cloth so that no fluids can enter the gearbox housing.*
- ◆ *Fit all heat shield sleeves in the same place when installing.*
- ◆ *Cover the openings in the gearbox with a cloth to prevent any fluid entering the clutch housing.*

- Remove camshaft housing  
⇒ ["1.4 Removing and installing camshaft housing", page 85](#) .
- Remove intake manifold  
⇒ ["4.2 Removing and installing intake manifold", page 312](#) .
- Release connectors and pull them off.
  - 1 - On oil pressure switch for reduced oil pressure - F378-
  - 2 - On fuel pressure sender - G247-
  - 3 - On injectors -N30- to -N33-



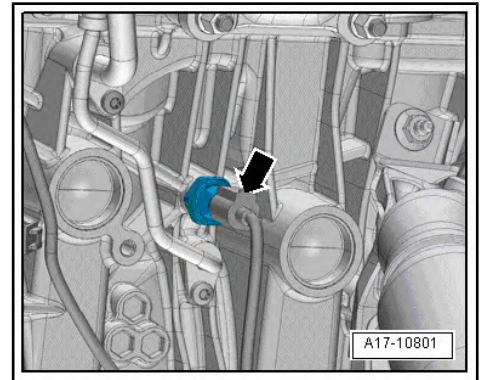
- Unscrew bolt -2-.
- Remove screw-type clip -1-.
- Unscrew nuts -arrows- and tie up catalytic converter -3-.
- Remove heat shield for right drive shaft ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft heat shield .



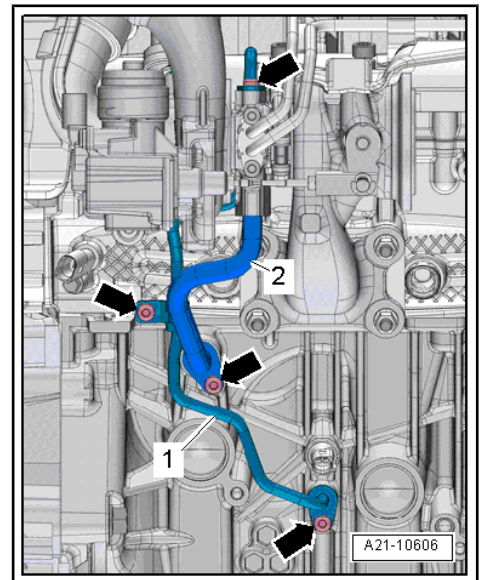




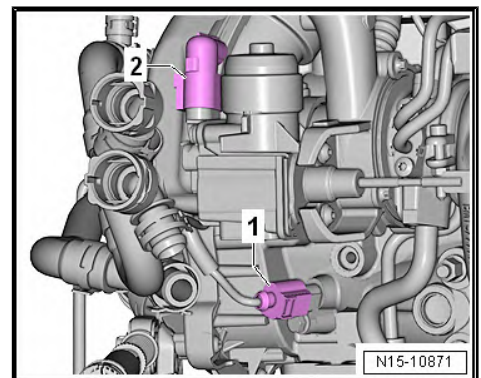
- Remove heat-shield sleeve.
- Separate electrical connector -arrow- on oil pressure switch - F1- .



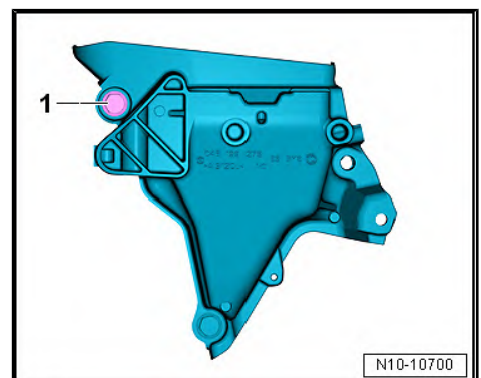
- Unscrew bolts -arrows- and detach oil supply pipe -1- and oil return pipe -2-.



- Release and pull off connectors -1- and -2-.
- 1 - For coolant temperature sender - G62-
- 2 - For charge pressure positioner - V465-



- Unscrew bolt -1- from engine support.





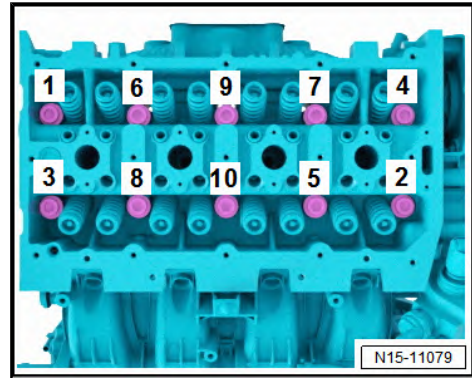
- Loosen cylinder head bolts in the sequence -1 to 10- and unscrew.
- Take off cylinder head and set it down on a soft surface (foam plastic).

### Installing



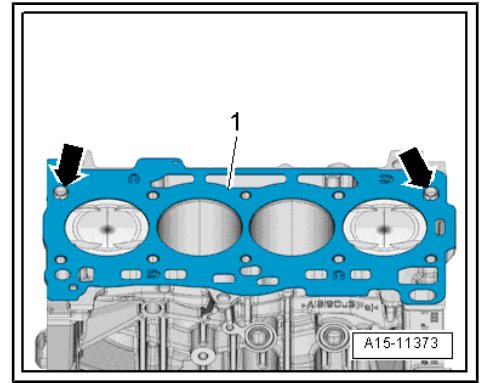
#### Note

- ◆ Risk of damage to sealing surfaces.
- ◆ Carefully remove sealant residue from cylinder head and cylinder block.
- ◆ Ensure that no long scores or scratches are made on the surfaces.
- ◆ Risk of damage to cylinder block.
- ◆ No oil or coolant must be allowed to remain in the blind holes for the cylinder head bolts in the cylinder block.
- ◆ Risk of leaks in cylinder head gasket.
- ◆ Carefully remove remains of emery and abrasives.
- ◆ Do not remove new cylinder head gasket from packaging until it is ready to be fitted.
- ◆ Handle the cylinder head gasket very carefully to prevent damage to the silicone coating or the indented area of the gasket.
- ◆ Renew bolts that are tightened with turning further angle.
- ◆ Renew self-locking nuts as well as gaskets, seals and O-rings.
- ◆ When installing a replacement cylinder head, the contact surfaces between hydraulic compensation elements, roller rocker fingers and cams must be oiled before installing the camshaft housing.
- ◆ Secure all hose connections with hose clips corresponding to the series equipment ⇒ *Electronic Parts Catalogue* .
- ◆ When cylinder head or cylinder head gasket is renewed, the entire coolant and the engine oil must be changed.





- Fit cylinder head gasket -1-.
- ◆ Note centring pins in cylinder block -arrows-.
- ◆ Check installation position of cylinder head gasket. Characteristic: the part number should be legible from the inlet side.
- If the crankshaft has been turned in the meantime, proceed as follows:
  - Position piston of no. 1 cylinder to TDC.
  - Turn crankshaft back slightly.
- Fit cylinder head.
- Insert cylinder head bolts, and tighten them by hand.
- Tighten bolts for cylinder head ⇒ [page 77](#) .



**i** Note

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

Continue installation in reverse order of removal. The following should be observed:

- Install camshaft housing  
⇒ [“1.4 Removing and installing camshaft housing”, page 85](#) .
- Install intake manifold  
⇒ [“4.2 Removing and installing intake manifold”, page 312](#) .
- Change engine oil ⇒ Maintenance ; Booklet .
- Fill cooling system with fresh coolant  
⇒ [“1.3 Draining and adding coolant”, page 225](#) .

#### Torque settings

- ◆ ⇒ [Fig. ““Engine support - specified torque and tightening sequence””, page 23](#)
- ◆ ⇒ [“1.1 Assembly overview - cylinder head”, page 76](#)
- ◆ ⇒ [“1.1 Assembly overview - turbocharger”, page 270](#)
- ◆ ⇒ [“4.2 Removing and installing intake manifold”, page 312](#)
- ◆ ⇒ [Fig. ““Installing catalytic converter - specified torque and tightening sequence””, page 343](#)
- ◆ Install drive shafts ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Assembly overview - drive shaft .

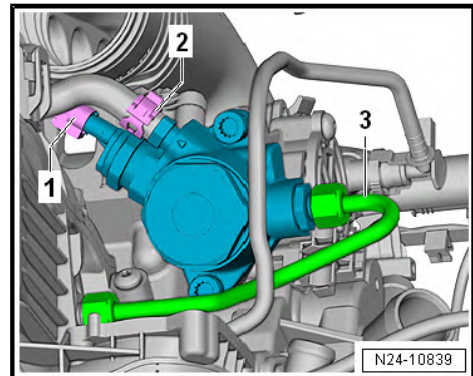
## 1.4 Removing and installing camshaft housing

### Removing

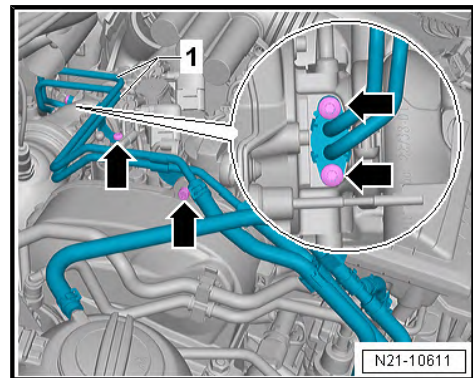
- Remove coolant pump  
⇒ [“2.5 Removing and installing coolant pump”, page 238](#) .
- Remove air filter housing  
⇒ [“3.2 Removing and installing air filter housing”, page 308](#) .
- Remove ignition coils  
⇒ [“1.2 Removing and installing ignition coils with output stage”, page 349](#) .



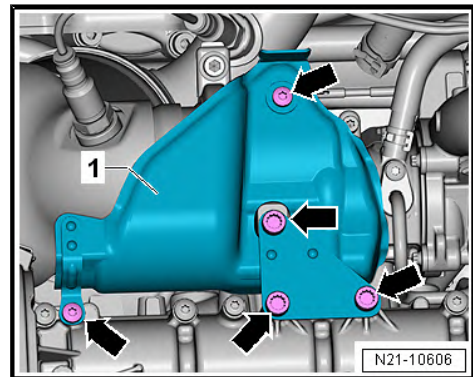
- Remove toothed belt from camshafts  
⇒ [“2.7 Removing toothed belt from camshaft”, page 133](#) .
- Disconnect electrical connector -1-.
- Detach hose clip -2- and pull off hose.
- Remove high-pressure pipe -3-  
⇒ [“7.3 Removing and installing high-pressure pipe”, page 331](#) .
- Disconnect electrical connector -1-.
- Install connecting piece  
⇒ [“1.4 Removing and installing connection for turbocharger”, page 279](#) .



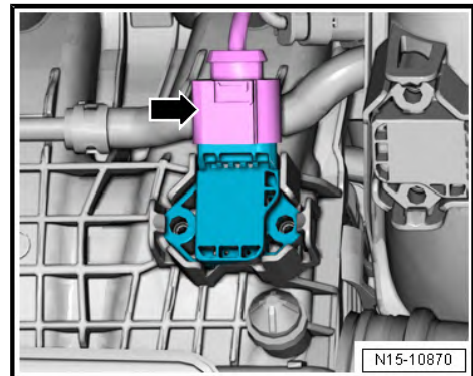
- Unscrew bolts -arrows-.
- Swivel coolant lines -1- to side.



- Unscrew bolts or nuts -arrows-.
- Unclip wiring harness for lambda probe from heat shield -1-.
- Remove heat shield -1-.

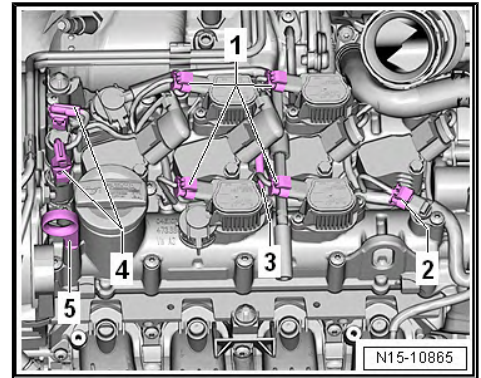


- Release and pull off connector -arrow- on intake manifold sender - GX9- .

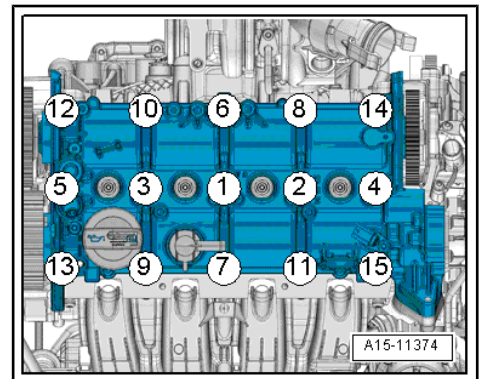




- Release connectors and pull them off.
- The number of connectors varies.
- 1 - For cam actuators - N583/ N587/ N591/ N595-
- 2 - For Hall sender - G40- and Hall sender 3 - G300-
- 4 - For camshaft control valve 1 - N205- and exhaust camshaft control valve 1 - N318-
- Unscrew bolt -3- and lay wiring harness to one side.
- Pull out dipstick -5-.



- Loosen bolts for camshaft housing in the sequence -15 to 1- and unscrew.
- Carefully detach camshaft housing from adhesive bond and remove it.
- Mark allocation of roller rocker fingers and compensation elements for reinstallation.
- Remove roller rocker fingers together with compensation elements and place them on a clean surface.



### Installing



#### Note

- ◆ *Renew bolts that are tightened with turning further angle.*
- ◆ *Renew gasket and seal with oil strainer.*
- Set engine to "TDC for cylinder no. 1"  
 => ["2.5 Checking valve timing", page 109](#) .



#### NOTICE

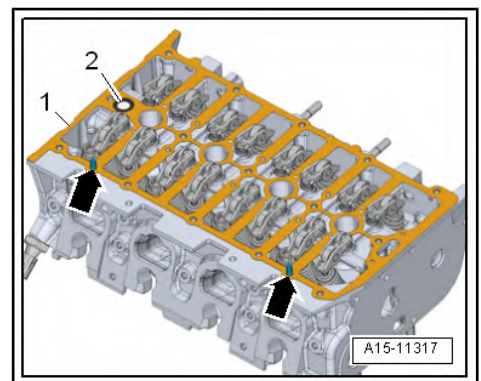
**Risk of damage to valve gear caused by axial movement of the camshafts.**

- **Never move camshafts in axial direction when turning them.**
- Check, if all roller rocker fingers are seated properly on valve stem end and if their clipped into the respective compensation element.



#### Note

- ◆ *The oil strainer is fitted only if the cylinder head has the appropriate recess.*
- ◆ *Cylinder heads without recess do not require an oil strainer.*
- Fit seal with oil strainer -2- into cylinder head -1-.
- Fit gasket onto dowel pins -arrows-.





- Screw 2 studs - items 2, 4- (e.g. -T10288/4- ) into cylinder head.
- Carefully lower camshaft housing -3- vertically onto studs in cylinder head.



#### Note

Ensure that camshaft housing is not canted.

- Tighten bolts for camshaft housing ⇒ [page 81](#) .

Continue installation in reverse order of removal. The following should be observed:

- Install high-pressure pipe  
⇒ [“7.3 Removing and installing high-pressure pipe”](#),  
[page 331](#) .
- Install toothed belt (adjust valve timing)  
⇒ [“2.7 Removing toothed belt from camshaft”](#), [page 133](#) .
- Install ignition coils  
⇒ [“1.2 Removing and installing ignition coils with output stage”](#),  
[page 349](#) .
- Install coolant pump  
⇒ [“2.5 Removing and installing coolant pump”](#), [page 238](#) .
- Ensure proper connection and routing of wires ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.

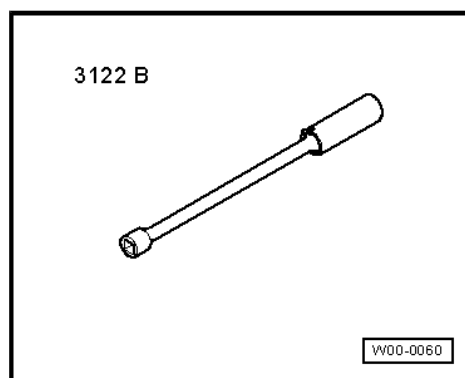
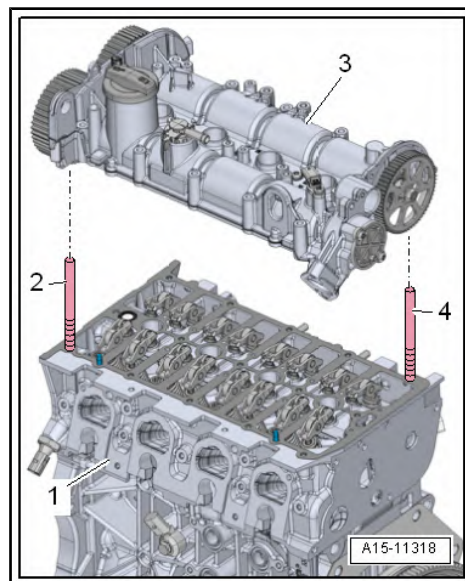
#### Torque settings

- ◆ ⇒ [“3.1 Assembly overview - valve gear”](#), [page 144](#)
- ◆ ⇒ [“1.1 Assembly overview - turbocharger”](#), [page 270](#)
- ◆ ⇒ [“3.1 Assembly overview - air filter housing”](#), [page 307](#)

## 1.5 Checking compression

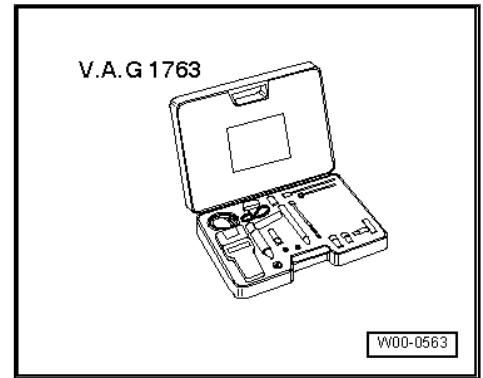
### Special tools and workshop equipment required

- ◆ Spark plug socket - 3122 B-





◆ Compression tester - V.A.G 1763-



**Procedure**

- Engine oil temperature at least 30 °C.
- Battery voltage at least 12.5 V.
- Remove fuse for fuel pump control unit from fuse holder. Fuse assignment ⇒ Current flow diagrams, Electrical fault finding and Fitting locations



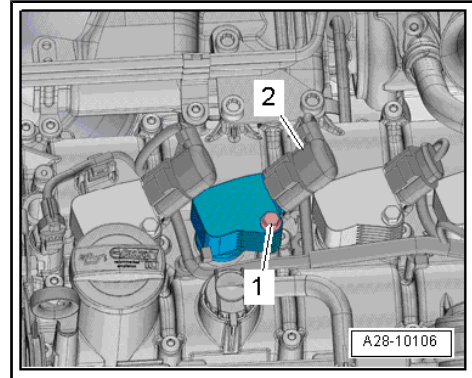
**Note**

*Removing fuse interrupts voltage supply for fuel pump control unit.*

- Start engine and allow it to run until the engine turns off.
- Switch off ignition.
- Remove resonator for intake air  
⇒ [“3.3 Removing and installing resonator for intake air”, page 309](#) .



- Pull off connector -2- and unscrew bolt -1-.
- Pull out ignition coils with output stages.
- Unscrew spark plugs using spark plug socket and extension - 3122 B- .
- Check compression pressure using compression tester - V.A.G 1763- ; refer to ⇒ Operating instructions .
- Get a second mechanic to press down the accelerator pedal.
- Simultaneously operate starter until tester shows no further pressure increase.
- Repeat procedure on each cylinder.



Compression pressures	bar
New	10.0 ... 15.0
Wear limit	7.0
Maximum difference between cylinders	3.0

### Installing

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

- Install spark plugs. Specified torque 22 Nm.
- Install ignition coils with output stages  
⇒ ["1.2 Removing and installing ignition coils with output stage", page 349](#) .
- Entries will have been made in the event memory of the engine control unit because connectors were separated and the engine was started.
- Carry out the function `Generate readiness code` on ⇒ Vehicle diagnostic tester in `Guided functions` mode.





## 2 Toothed belt drive

⇒ [“2.1 Assembly overview - toothed belt cover”, page 91](#)

⇒ [“2.2 Assembly overview - toothed belt”, page 92](#)

⇒ [“2.3 Removing and installing toothed belt guard”, page 95](#)

⇒ [“2.4 Preassembling and installing valve timing tool”, page 96](#)

⇒ [“2.5 Checking valve timing”, page 109](#)

⇒ [“2.6 Adjusting valve timing”, page 115](#)

⇒ [“2.7 Removing toothed belt from camshaft”, page 133](#)

⇒ [“2.8 Removing and installing toothed belt”, page 138](#)

### 2.1 Assembly overview - toothed belt cover

1 - Lower toothed belt guard

2 - Bolt

- 8 Nm

3 - Engine support

- Specified torque and tightening sequence  
⇒ [“2.1 Assembly overview - assembly mountings”, page 21](#)

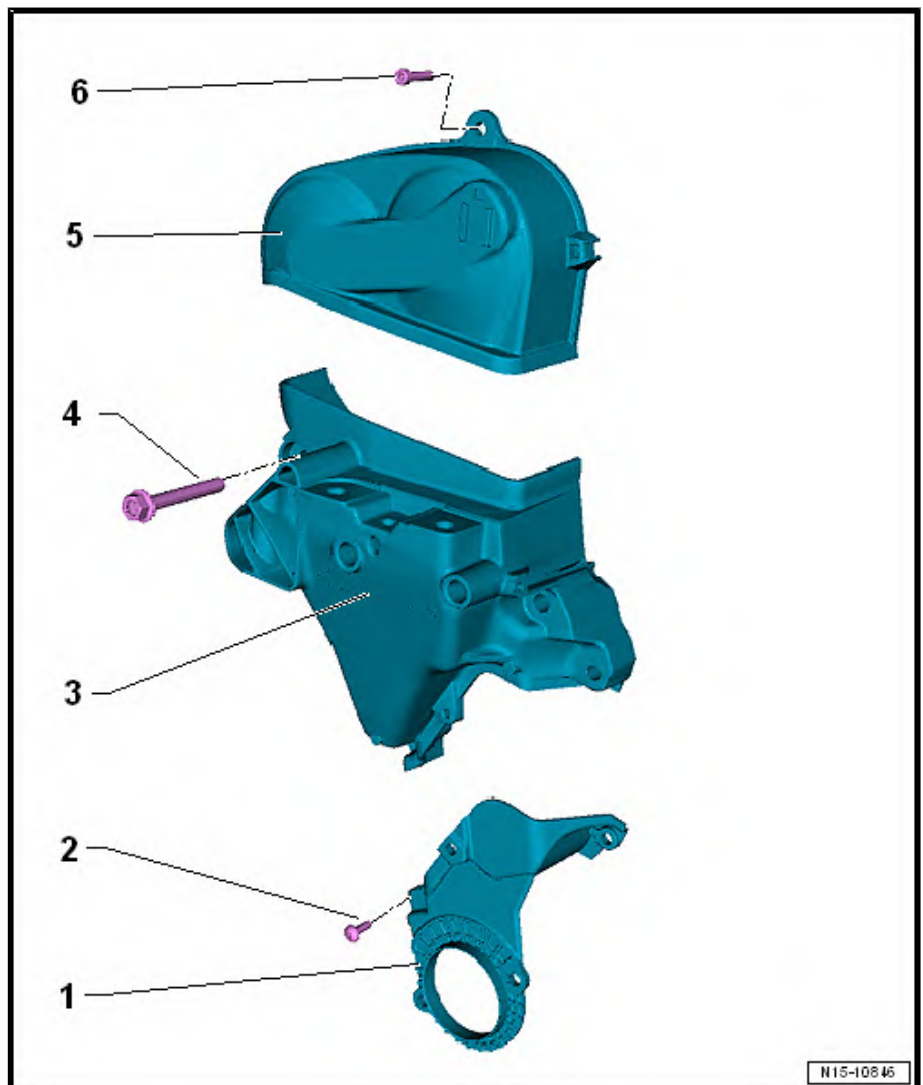
4 - Bolt

- Specified torque and tightening sequence  
⇒ [“2.1 Assembly overview - assembly mountings”, page 21](#)

5 - Upper toothed belt guard

6 - Bolt

- 8 Nm





## 2.2 Assembly overview - toothed belt

⇒ [“2.2.1 Assembly overview - toothed belt, exhaust side with camshaft adjuster”, page 92](#)

⇒ [“2.2.2 Assembly overview - toothed belt, exhaust side with toothed belt pulley”, page 94](#)

### 2.2.1 Assembly overview - toothed belt, exhaust side with camshaft adjuster

#### 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 ⇒ [“2.8 Removing and installing toothed belt”, page 138](#)
- Adjusting valve timing ⇒ [“2.6 Adjusting valve timing”, page 115](#)

#### 2 - Bolt

- 25 Nm
- 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.

#### 3 - Tensioning pulley

- Removal and installation involve removing engine support ⇒ [“1.6 Removing and installing engine support”, page 43](#) .

#### 4 - Bolt

- Renew after removal
- 8 Nm +45°

#### 5 - Cap

#### 6 - Bolt

- Renew after removal
- 50 Nm +135°

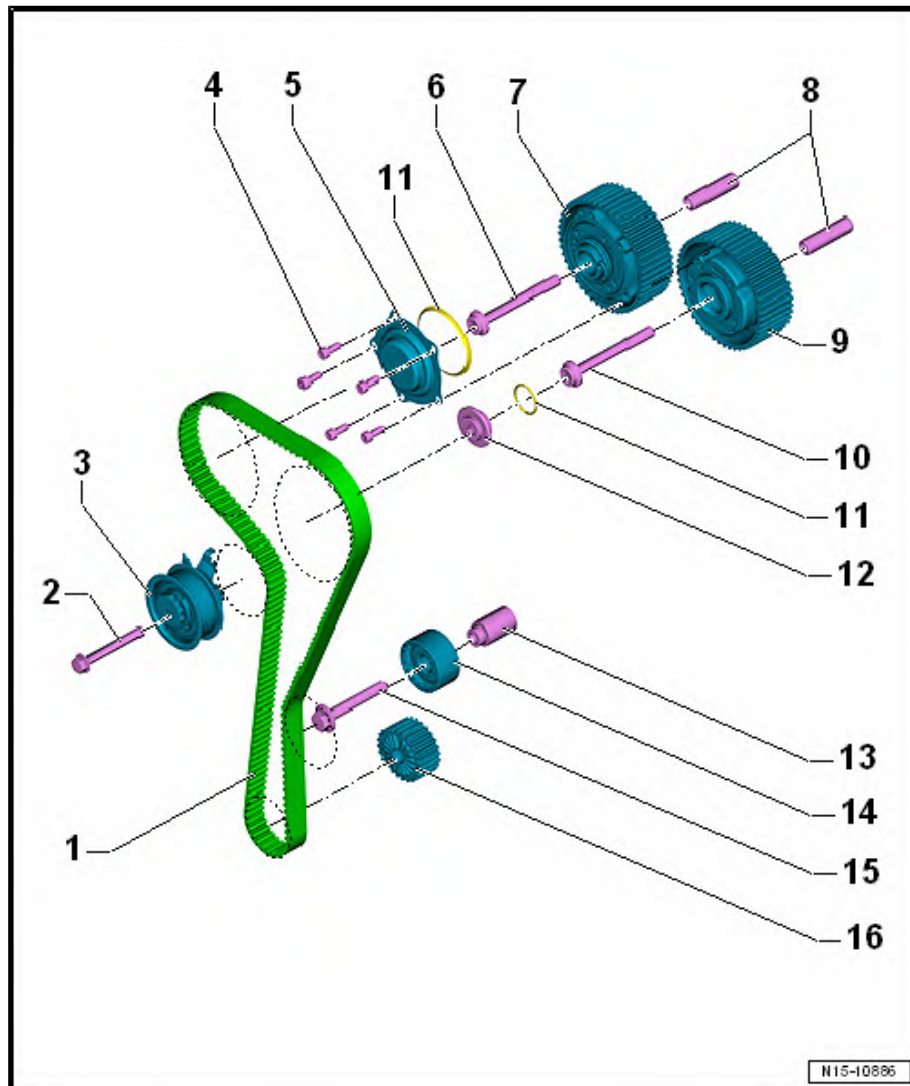
#### 7 - Exhaust camshaft toothed belt pulley

- With camshaft adjuster
- Removing and installing camshaft adjuster ⇒ [“3.3 Removing and installing camshaft adjuster”, page 157](#)

#### 8 - Guide bush

#### 9 - Inlet camshaft toothed belt pulley

- With camshaft adjuster
- Removing and installing camshaft adjuster ⇒ [“3.3 Removing and installing camshaft adjuster”, page 157](#)



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



#### 10 - Bolt

- Renew
- 50 Nm +135°

#### 11 - O-ring

- Check for damage, and renew if necessary; see ⇒ Electronic parts catalogue (ETKA)

#### 12 - Plug

- 20 Nm
- Renew

#### 13 - Spacer sleeve

- With O-ring
- Renew O-ring
- Supplied with "item 14"

#### 14 - Idler roller

#### 15 - Bolt

- 40 Nm

#### 16 - Crankshaft pulley

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

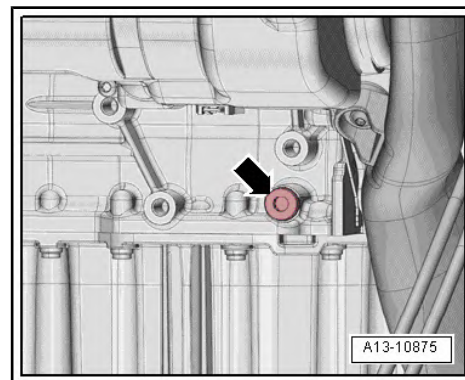
Plug for "TDC" drilling in cylinder block - specified torque



#### Note

*Renew O-ring if damaged.*

- Tighten bolt -arrow- to 30 Nm.





## 2.2.2 Assembly overview - toothed belt, exhaust side with toothed belt pulley

### 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 ⇒ [“2.8 Removing and installing toothed belt”, page 138](#)
- Adjusting valve timing ⇒ [“2.6.1 Adjusting valve timing, vehicles without ACT”, page 115](#)

### 2 - Bolt

- 25 Nm

### 3 - Tensioning pulley

- Removal and installation involve removing engine support ⇒ [“1.6 Removing and installing engine support”, page 43](#).

### 4 - Bolt

- Renew
- 50 Nm +90°

### 5 - Exhaust camshaft toothed belt pulley

- Removing and installing ⇒ [“2.7 Removing toothed belt from camshaft”, page 133](#)

### 6 - Inlet camshaft toothed belt pulley

- With camshaft adjuster
- Removing and installing camshaft adjuster ⇒ [“3.3 Removing and installing camshaft adjuster”, page 157](#)

### 7 - Guide bush

### 8 - Bolt

- Renew
- 50 Nm +135°

### 9 - O-ring

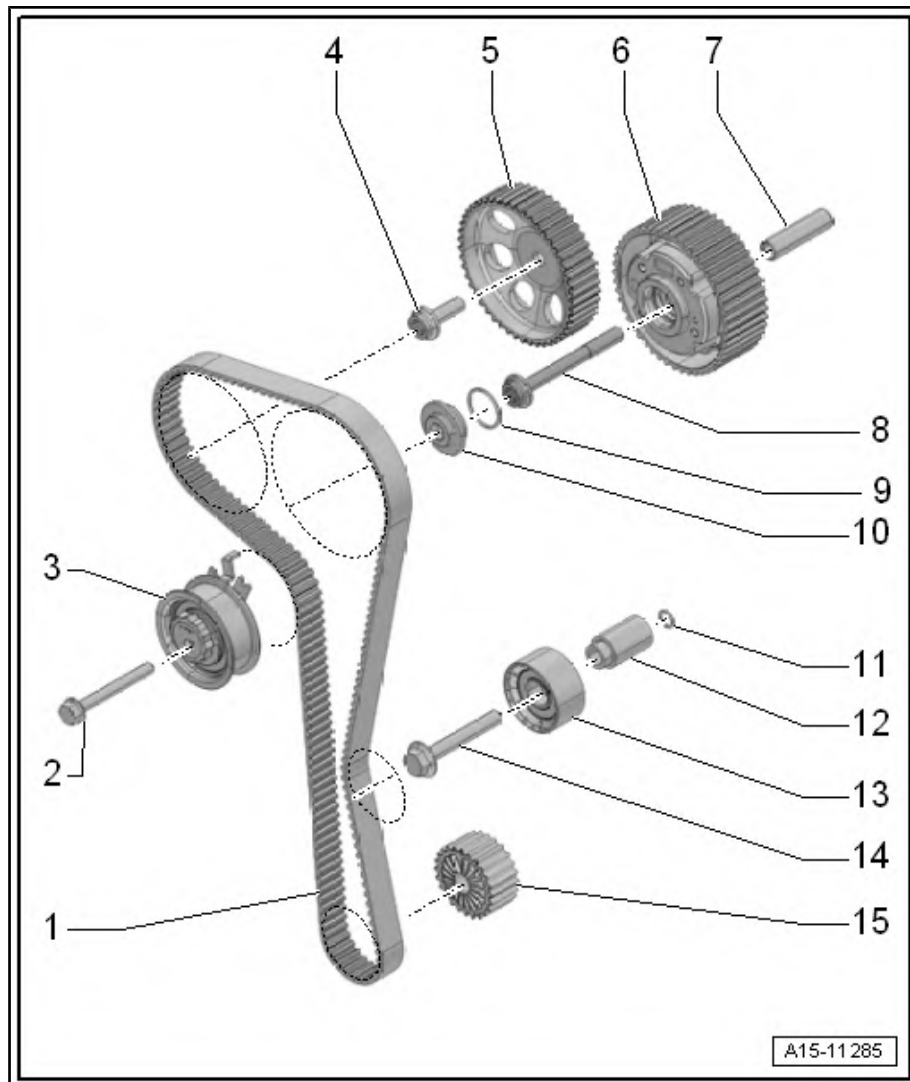
- Check for damage, and renew if necessary; see ⇒ Electronic parts catalogue (ETKA)

### 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

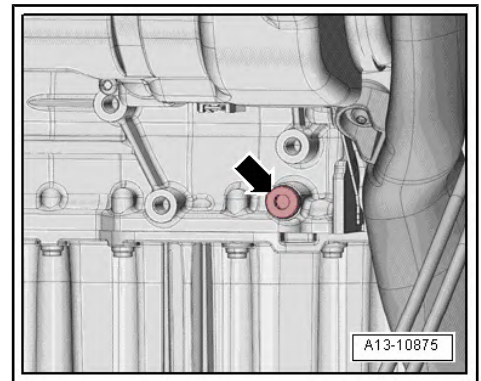
## Plug for "TDC" drilling in cylinder block - specified torque



### Note

*Renew O-ring if damaged.*

- Tighten bolt -arrow- to 30 Nm.



## 2.3 Removing and installing toothed belt guard

⇒ ["2.3.1 Removing and installing upper toothed belt guard", page 95](#)

⇒ ["2.3.2 Removing and installing lower toothed belt guard", page 95](#)

### 2.3.1 Removing and installing upper toothed belt guard

#### Removing:

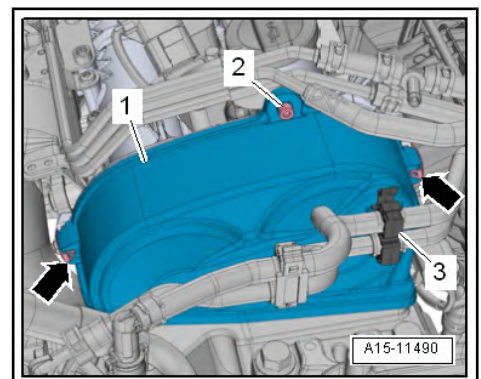
- Detach hoses from retainer -3-.
- Unscrew bolt -2-.
- Release clips -arrows- and remove upper toothed belt guard -1-.

#### Installing:

Install in reverse order of removal. Observe the following:

#### Specified torques:

- ◆ ⇒ ["2.1 Assembly overview - toothed belt cover", page 91](#)



### 2.3.2 Removing and installing lower toothed belt guard

#### Removing:

- Remove vibration damper  
⇒ ["1.5 Removing and installing vibration damper", page 41](#) .



- Unscrew bolts -arrows-.
- Remove lower part of toothed belt guard.

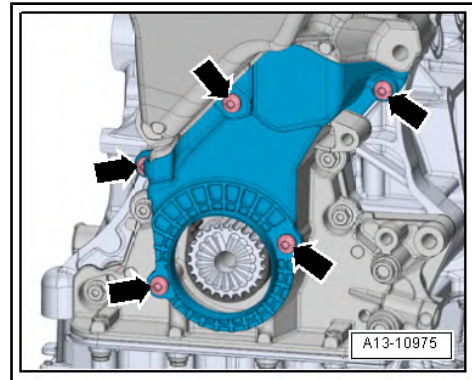
#### Installing:

Install in reverse order of removal. Observe the following:

- Install vibration damper  
⇒ ["1.5 Removing and installing vibration damper", page 41](#) .

#### Specified torques:

- ◆ ⇒ ["2.1 Assembly overview - toothed belt cover", page 91](#)
- ◆ ⇒ ["1.1 Assembly overview - poly V-belt drive", page 34](#)



## 2.4 Preassembling and installing valve timing tool

⇒ ["2.4.1 Preassembling test tool VAS 611 007 without ACT", page 96](#)

⇒ ["2.4.2 Preassembling test tool VAS 611 007 with ACT", page 99](#)

⇒ ["2.4.3 Mounting test tool VAS 611 007 without ACT", page 102](#)

⇒ ["2.4.4 Mounting test tool VAS 611 007 with ACT", page 104](#)

⇒ ["2.4.5 Teaching-in test tool VAS 611 007 electronically and performing basic setting", page 107](#)

### 2.4.1 Preassembling test tool - VAS 611 007- without ACT

#### Special tools and workshop equipment required

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



#### Procedure

Test tool - VAS 611 007-



**A - Angle sensor - VAS 611 007/1-**

- Specified torque brake:  
11 Nm

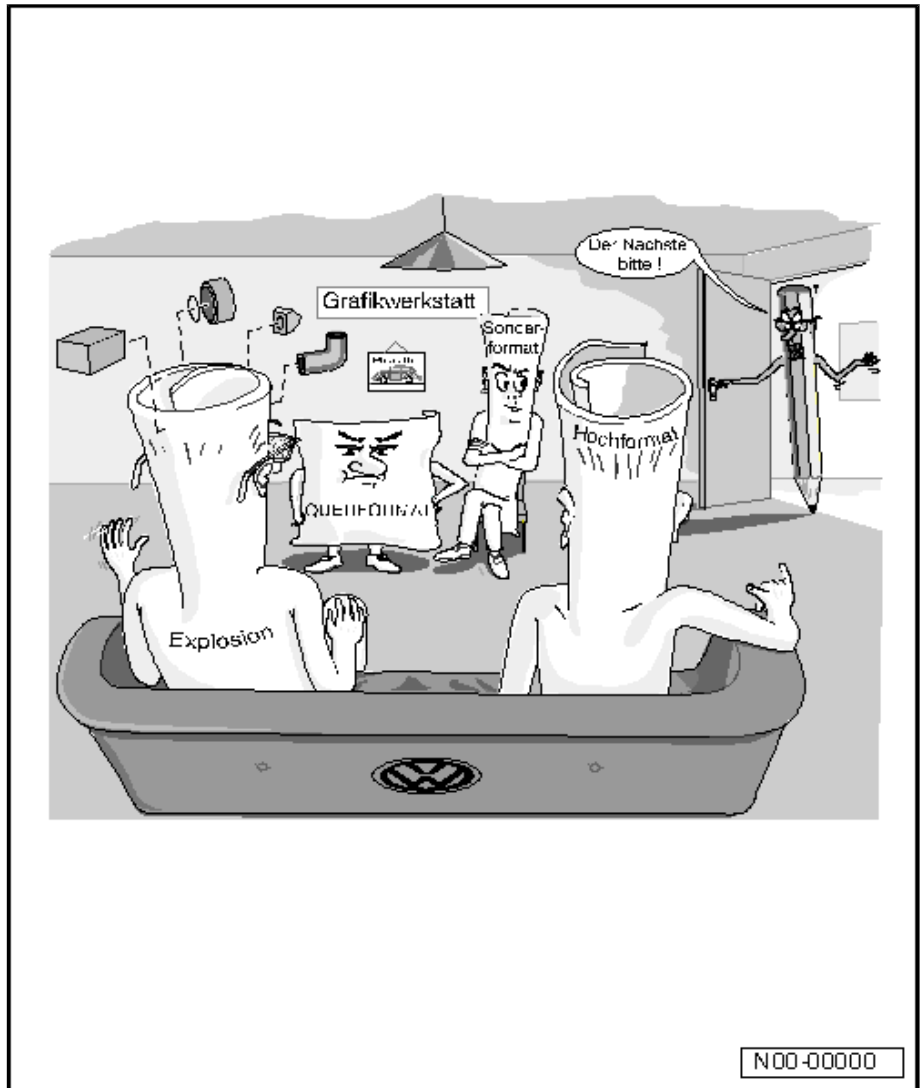
**B - Lock ring - VAS 611 007/2-**

**C - Clamping ring - VAS 611 007/3-**

**D - Adapter for camshaft housing - VAS 611 007/8-**

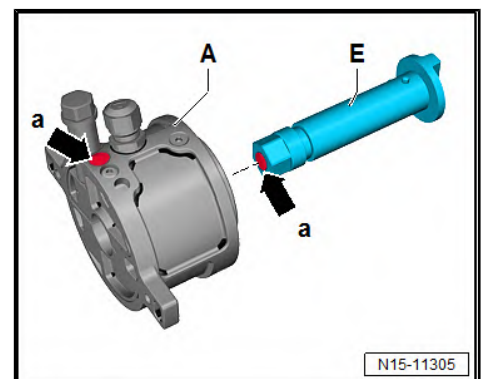
**E - Adapter for angle sensor - VAS 611 007/9- and adapter for angle sensor - VAS 611 007/10-**

- Adapter for angle sensor - VAS 611 007/9- blue, for inlet camshaft
- Adapter for angle sensor - VAS 611 007/10- red, for exhaust camshaft



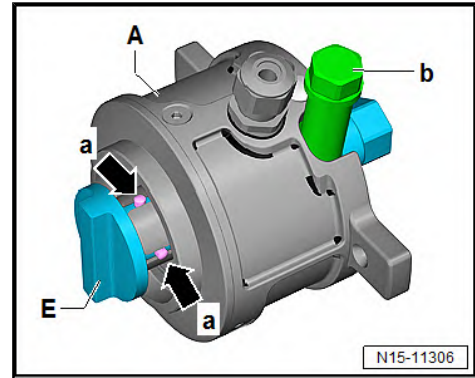
**Preassembling test tool - VAS 611 007-**

- Before installing the adapters for angle sensor -E- in angle sensors -A-, check correct assignment by means of the colour coding -a-.
- Insert corresponding adapter for angle sensor -E- in relevant angle sensors -A-.
- Note position of dowel pins -a- when installing.

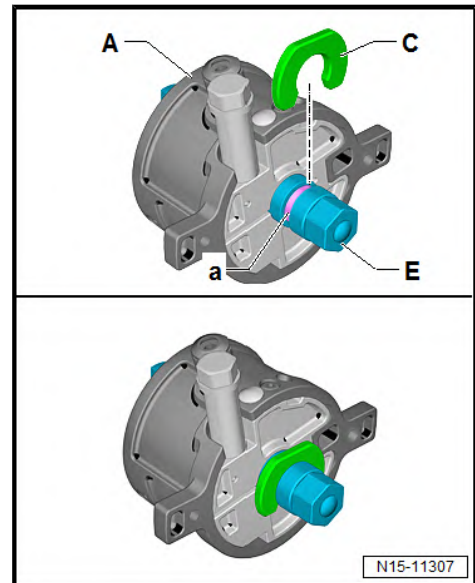




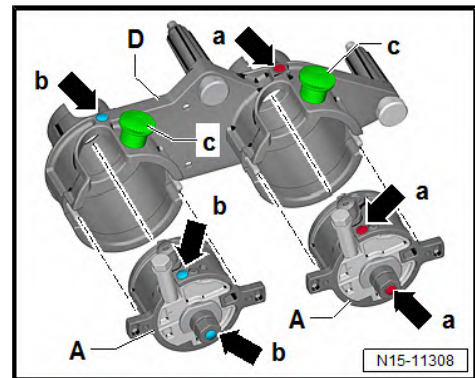
- Adapters for angle sensors -E- can only be fitted in one position.
- Make sure that brake -b- is released. Do not apply force.



- Insert adapter for angle sensors -E- in angle sensors -A- as far as stop.
- Secure clamp rings -C- in groove -a- of respective adapter for angle sensors -E-.



- Insert angle sensor -A- colour coded red on red marked side -arrows a- of camshaft housing adapter -D-. To do this, release locking pin -c- by pulling it upwards.
- Insert angle sensor -A- colour coded red and push in until locking pin -c- can be heard to engage.
- Repeat procedure with angle sensor -A- colour coded blue.
- To do this, observe colour coding -arrows b-.

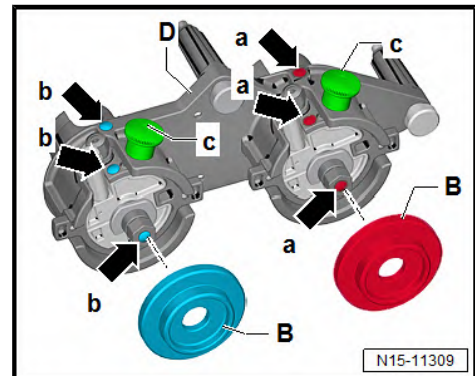


- Screw in red and blue lock ring -B- approx. 2 turns. Note colour coding -arrows a- and -arrows b- when doing this.



#### Note

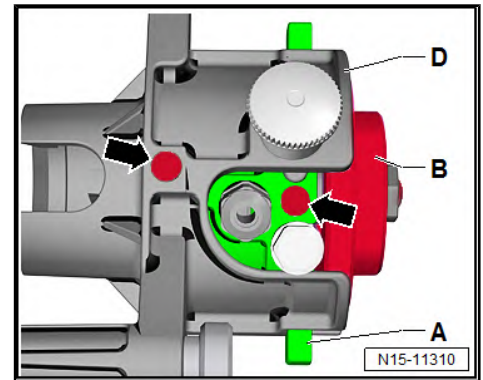
- ◆ *Screw in securing rings - VAS 611 007/2- -B- max. 2 turns by hand.*
- ◆ *If the securing rings are screwed in too tightly -B-, the angle sensors - VAS 611 007/1- could become damaged.*







- Check for freedom of movement of the adapters for angle sensors.
- It should be possible to turn adapters for angle sensors with ease.



## 2.4.2 Preassembling test tool - VAS 611 007- with ACT

### Special tools and workshop equipment required

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



- ◆ Adapter - VAS 611 007/14- (not illustrated)



**A - Angle sensor - VAS 611 007/1-**

- ❑ Specified torque brake: 11 Nm

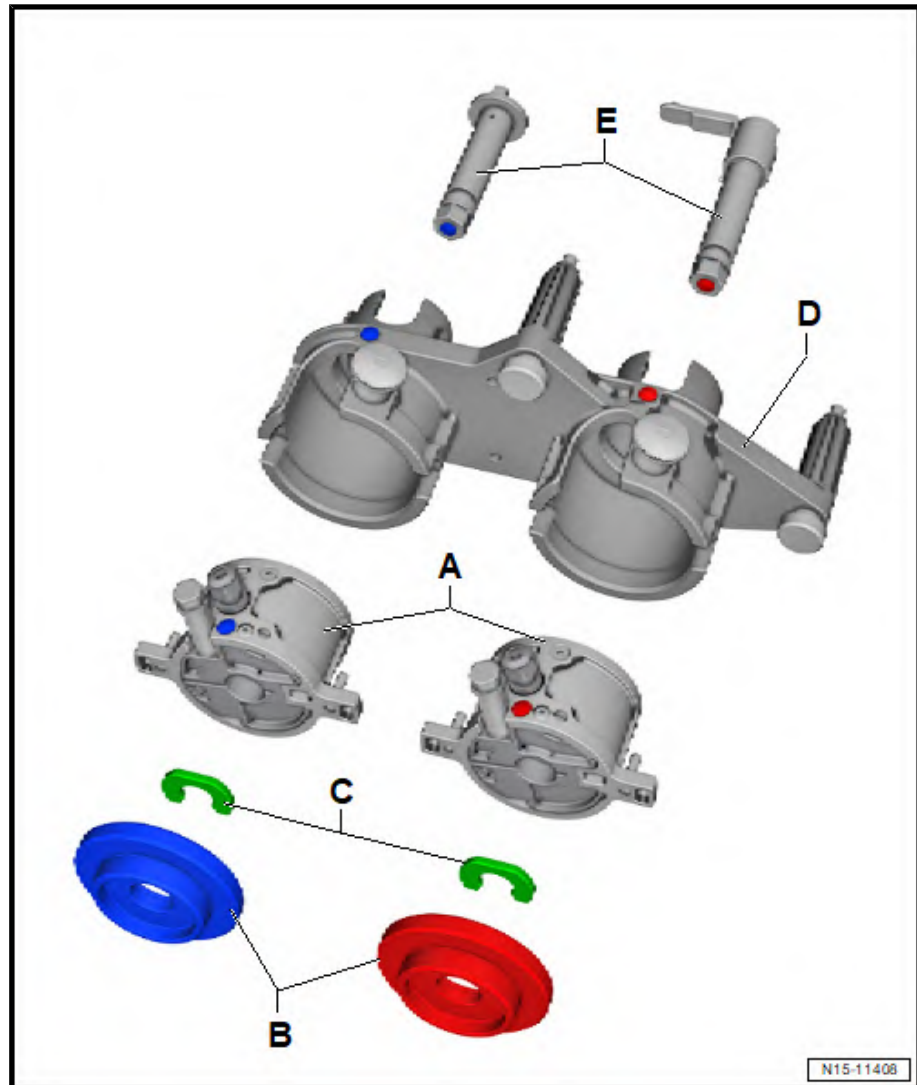
**B - Lock ring - VAS 611 007/2-**

**C - Clamping ring - VAS 611 007/3-**

**D - Adapter for camshaft housing - VAS 611 007/8-**

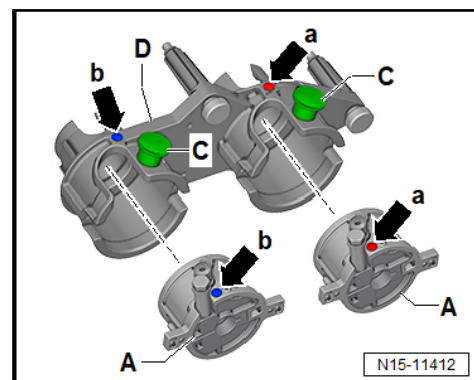
**E - Adapter for angle sensor - VAS 611 007/9- and adapter for angle sensor - VAS 611 007/14-**

- ❑ Adapter for angle sensor - VAS 611 007/9- blue, for inlet camshaft
- ❑ Adapter for angle sensor - VAS 611 007/14- red, for exhaust camshaft



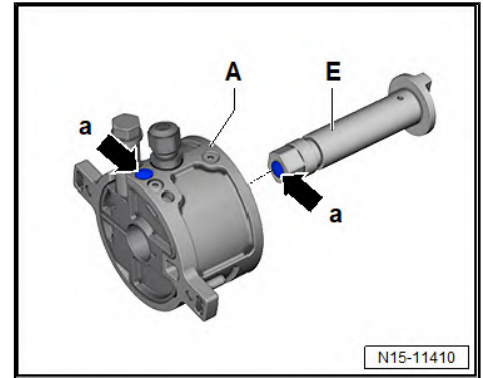
**Preassembling test tool - VAS 611 007-**

- Insert angle sensor -A- colour coded red -arrow a- on red marked side -arrow a- of camshaft housing adapter -D-. To do this, release locking pin -C- by pulling it upwards.
- Insert angle sensor -A- colour coded red and push in until locking pin -C- can be heard to engage.
- Repeat procedure with angle sensor -arrow b- colour coded blue.
- Before installing the adapters for angle sensor -E- in angle sensors -A-, check correct assignment by means of the colour coding -a and b-.
- Insert corresponding adapter for angle sensor -E- in relevant angle sensors -A-.





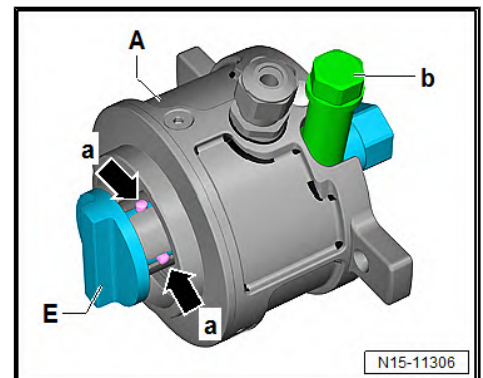
- To do this, insert adapter for angle sensor - VAS 611 007/9- -E- in angle sensor - VAS 611 007/1- -A- with blue colour coding -arrows a-.
- Adapters for angle sensors -E- can only be fitted in one position.



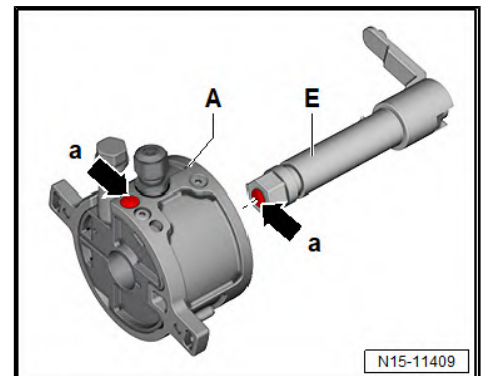
- Note position of dowel pins -a- when installing.
- Make sure that brake -b- is released. Do not apply force.

**i** Note

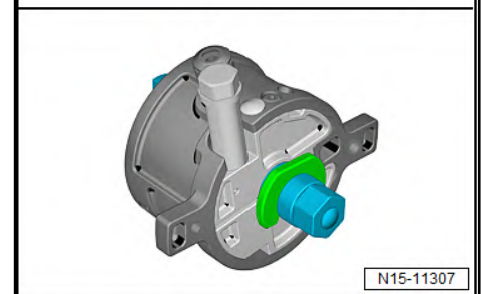
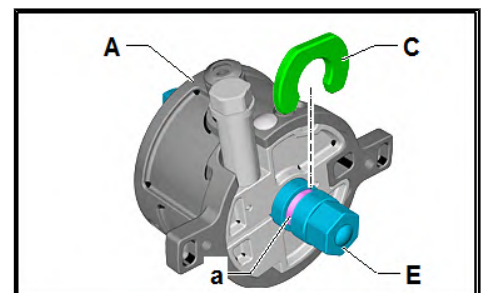
*The adapter for angle sensor - VAS 611 007/14- cannot be mounted until the angle sensor - VAS 611 007/1- is mounted in the camshaft housing adapter - VAS 611 007/8- .*



Insert adapter for angle sensor - VAS 611 007/14- -E- in angle sensor - VAS 611 007/1- -A- with red colour coding -arrows a-.



- Insert adapter for angle sensors -E- in angle sensors -A- as far as stop.
- Secure clamp rings -C- in groove -a- of respective adapter for angle sensors -E-.
- To do this, observe colour coding -arrows-.



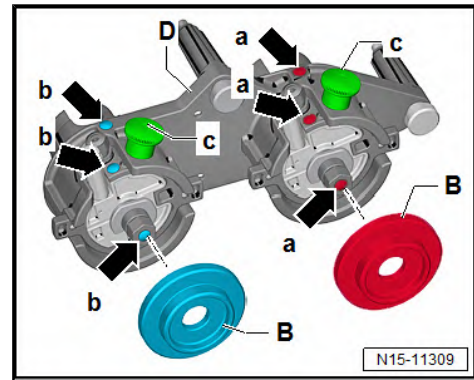


- Screw in red and blue lock ring -B- approx. 2 turns. Note colour coding -arrows a- and -arrows b- when doing this.



#### Note

- ◆ *Screw in securing rings - VAS 611 007/2- -B- max. 2 turns by hand.*
- ◆ *If the securing rings are screwed in too tightly -B-, the angle sensors - VAS 611 007/1- could become damaged.*
- Check for freedom of movement of the adapters for angle sensors.
- It should be possible to turn adapters for angle sensors with ease.



### 2.4.3 Mounting test tool - VAS 611 007- without ACT

#### Special tools and workshop equipment required

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



#### Procedure

- Preassemble test tool - VAS 611 007-  
⇒ ["2.4.1 Preassembling test tool VAS 611 007 without ACT", page 96](#) .
- Teach-in test tool - VAS 611 007- electronically and perform basic setting  
⇒ ["2.4.5 Teaching-in test tool VAS 611 007 electronically and performing basic setting", page 107](#)
- Turn adapter for angle sensor - VAS 611 007/9- and adapter for angle sensor - VAS 611 007/10- until display is set to approx. 0°.

#### Polo 2010 LHD vehicles, Polo 2014 LHD vehicles, Polo Lim RUS 2016:

- Remove brake master cylinder ⇒ Brake system; Rep. gr. 47 ; Brake servo/brake master cylinder; Removing and installing brake master cylinder .

#### Continued for all vehicles:

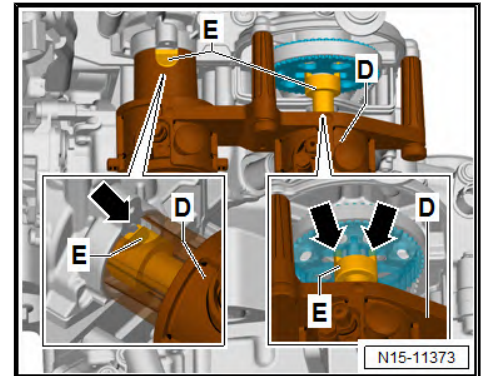
- Perform the preliminary work for checking the valve timing  
⇒ ["2.5 Checking valve timing", page 109](#) .
- Make sure that the piston in cylinder no. 1 is at TDC position  
⇒ ["4.7 Setting piston to TDC position", page 71](#) .
- Make sure that brakes on angle sensor - VAS 611 007/1- are released on both sides ⇒ [page 98](#) .



**i 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 611 007/8- -D- to camshaft housing, and slide it on.
- Tighten knurled screws -arrows a- alternately by hand.
- Make sure that adapter for camshaft housing - VAS 611 007/8- -D- is properly seated.

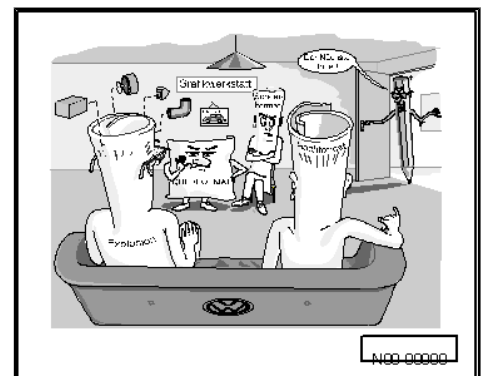
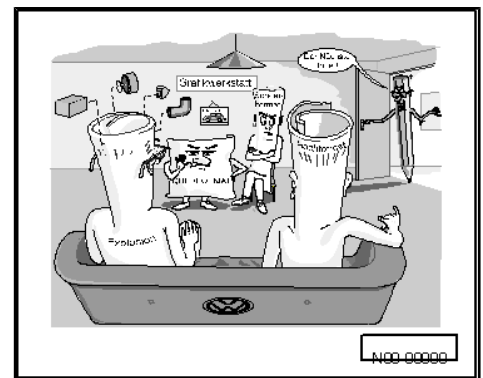
**i Note**

◆ *If camshaft housing adapter - VAS 611 007/8- -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 ⇒ "2.5 Removing and installing coolant pump", page 238 .*

- 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 98](#) .
- Tighten locking ring - VAS 611 007/2- -B- on both sides evenly by hand. When doing this, ensure that camshaft housing adapter - VAS 611 007/8- -D- always lies flat against camshaft housing -1-.





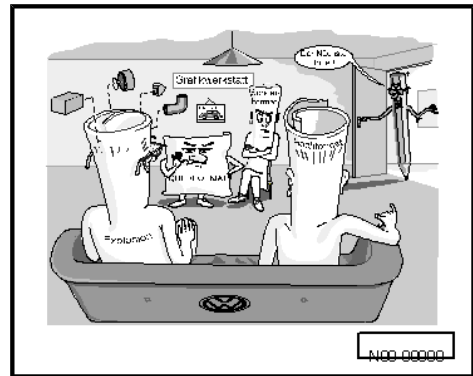
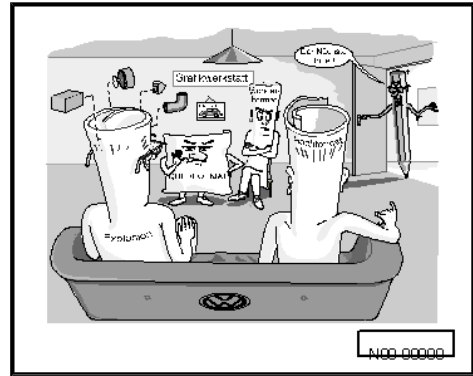
- Camshaft housing adapter - VAS 611 007/8- -D- should not lift off of camshaft housing -1-.



#### Note

*The correct preload is achieved when the camshaft housing adapter - VAS 611 007/8- lies flat -a- against the camshaft housing.*

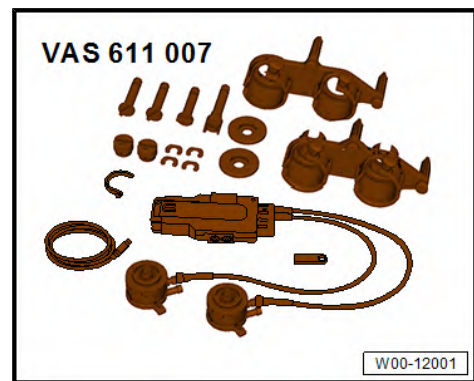
- Make sure that brakes -a- are released on both sides.



## 2.4.4 Mounting test tool - VAS 611 007- with ACT

### Special tools and workshop equipment required

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



### Procedure

- Preassemble test tool - VAS 611 007-  
⇒ ["2.4.2 Preassembling test tool VAS 611 007 with ACT", page 99](#) .
- Teach-in test tool - VAS 611 007- electronically and perform basic setting  
⇒ ["2.4.5 Teaching-in test tool VAS 611 007 electronically and performing basic setting", page 107](#)
- Turn adapter for angle sensor - VAS 611 007/9- and adapter for angle sensor - VAS 611 007/14- until display is set to approx. 0°.



**Polo 2010 LHD vehicles, Polo 2014 LHD vehicles, Polo Lim RUS 2016:**

- Remove brake master cylinder ⇒ Brake system; Rep. gr. 47 ; Brake servo/brake master cylinder; Removing and installing brake master cylinder .

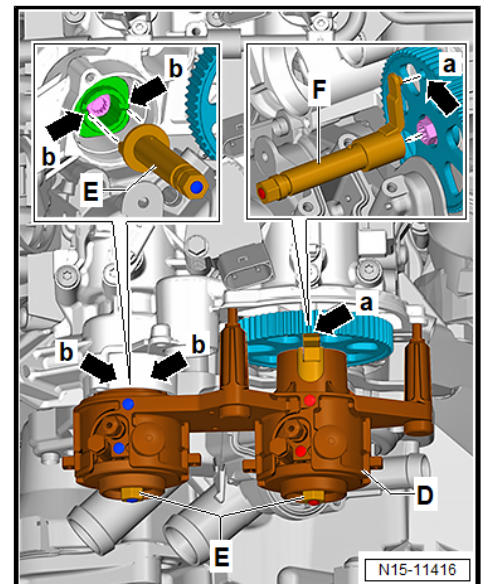
**Continued for all vehicles:**

- Perform the preliminary work for checking the valve timing ⇒ ["2.5 Checking valve timing", page 109](#) .
- Make sure that the piston in cylinder no. 1 is at TDC position ⇒ ["4.7 Setting piston to TDC position", page 71](#) .
- Make sure that brakes on angle sensor - VAS 611 007/1- are released on both sides ⇒ [page 98](#) .

**Note**

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

- Align adapter for angle sensor - VAS 611 007/9- -E- by hand to grooves of camshafts -arrows b-.
- Align adapter for angle sensor - VAS 611 007/14- -F- by hand in hole of coolant pump toothed belt sprocket -arrow a-.
- Check position of adapter for angle sensor - VAS 611 007/9- -E- and adapter for angle sensor - VAS 611 007/14- -F- through inspection window and adjust if necessary by turning.



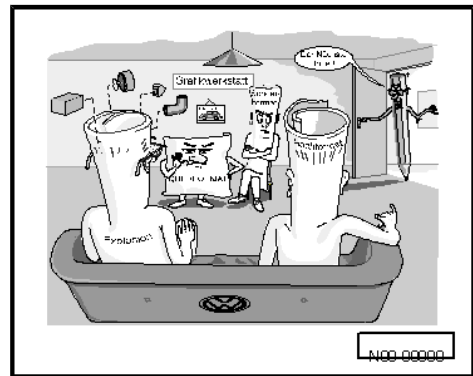
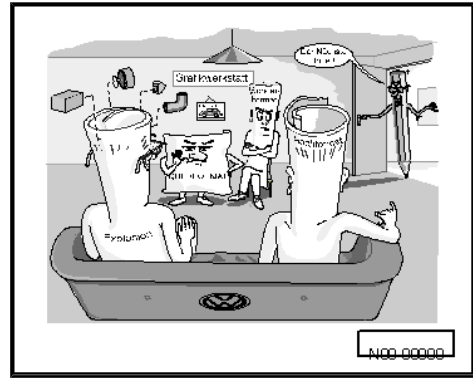


- Fit adapter for camshaft housing - VAS 611 007/8- -D- to camshaft housing, and slide it on.
- Tighten knurled screws -arrows a- alternately by hand.
- Make sure that adapter for camshaft housing - VAS 611 007/8- -D- is properly seated.



#### Note

- ◆ *If camshaft housing adapter - VAS 611 007/8- -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*  
*⇒ ["2.5 Removing and installing coolant pump", page 238](#) .*
- 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 98](#) .
- Tighten locking ring - VAS 611 007/2- -B- on both sides evenly by hand. When doing this, ensure that camshaft housing adapter - VAS 611 007/8- -D- always lies flat against camshaft housing -1-.

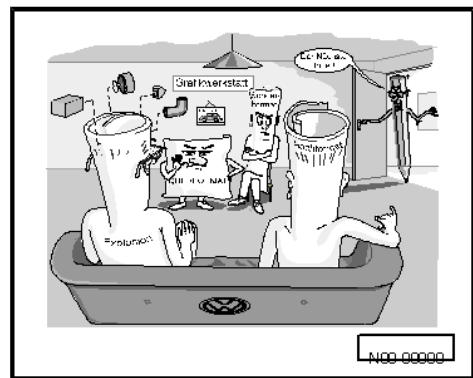


- Camshaft housing adapter - VAS 611 007/8- -D- should not lift off of camshaft housing -1-.



#### Note

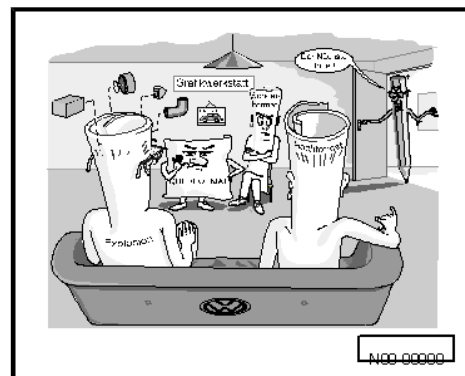
*The correct preload is achieved when the camshaft housing adapter - VAS 611 007/8- lies flat -a- against the camshaft housing.*







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



## 2.4.5 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-

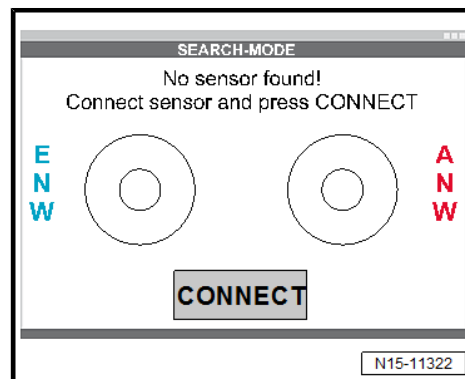


### Procedure

- 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 angle sensors are not connected, message shown in illustration is displayed.

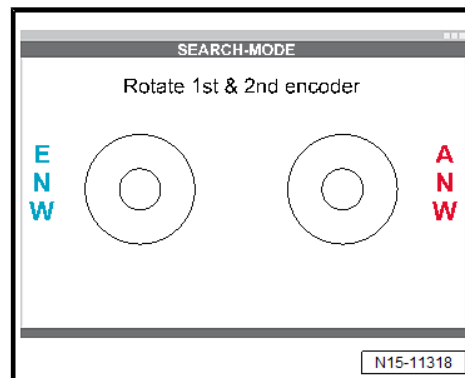
- Connect test tool - VAS 611 007- , and press **CONNECT**.



If test tool - VAS 611 007- is connected, display is as shown:

ANW - Exhaust camshaft, red

ENW - Inlet camshaft, blue

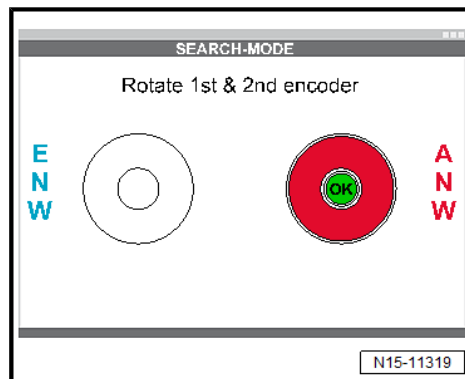




- Turn adapter for angle sensor - VAS 611 007/10- red -E- for exhaust camshaft.

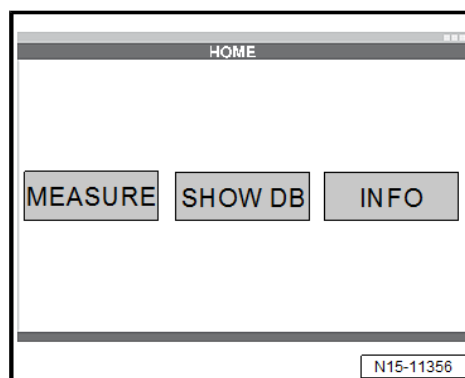
If »OK« is displayed, exhaust camshaft has been taught-in.

- Turn adapter for angle sensor - VAS 611 007/9- blue -E- for inlet camshaft.



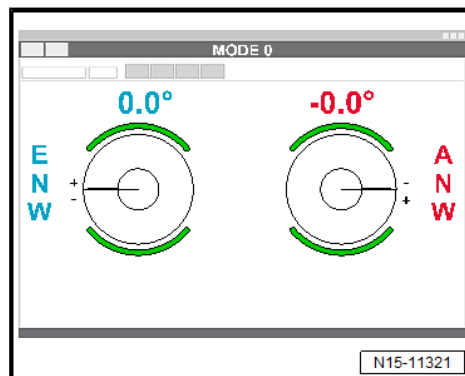
If display is as shown in illustration, exhaust camshaft has been taught-in.

- Select function **MEASURE**.



If display is as follows:

- Check valve timing.  
⇒ ["2.5 Checking valve timing", page 109](#)



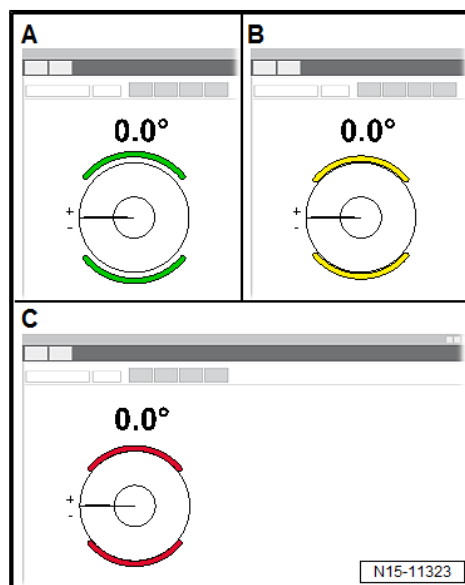
- Make sure that brake indicator on display is green.

- It must not be yellow or red.

A - Green, brake is released

B - Yellow, brake is applied

C - Red, brake has been tightened to torque





## 2.5 Checking valve timing

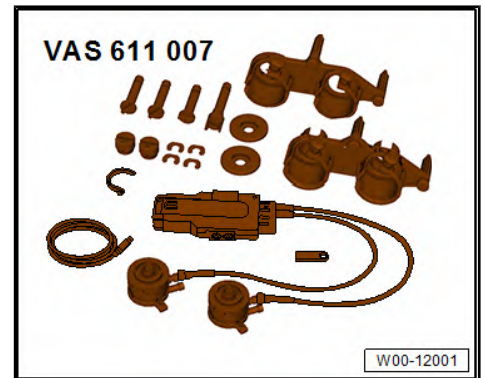
⇒ [“2.5.1 Checking valve timing, vehicles without ACT”, page 109](#)

⇒ [“2.5.2 Checking valve timing, vehicles with ACT”, page 112](#)

### 2.5.1 Checking valve timing, vehicles without ACT

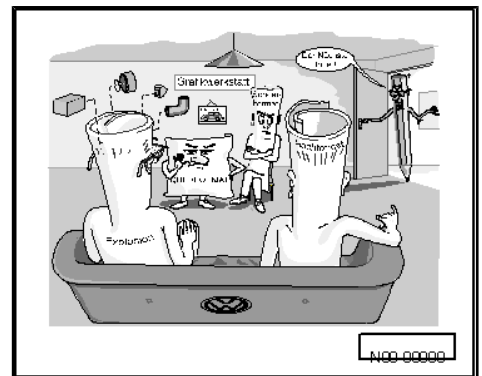
Special tools and workshop equipment required

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



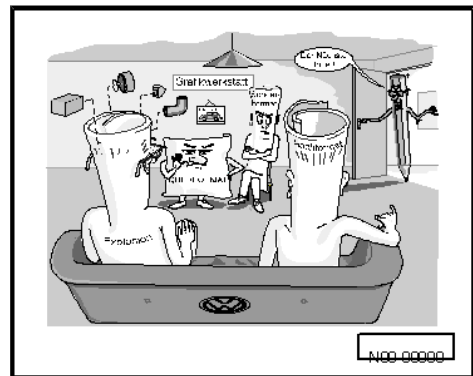
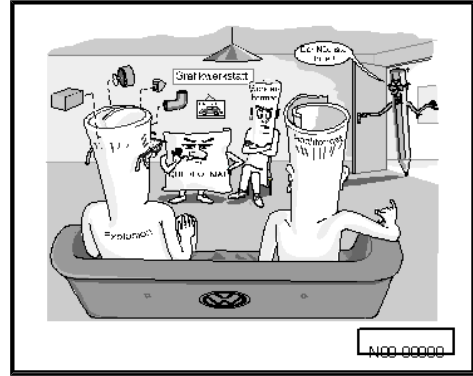
#### Procedure

- Remove resonator for intake air  
⇒ [“3.3 Removing and installing resonator for intake air”, page 309](#) .
- Remove air pipe  
⇒ [“2.5 Removing and installing air intake pipe”, page 289](#) .
- Remove connection for turbocharger  
⇒ [“1.4 Removing and installing connection for turbocharger”, page 279](#) .
- Set piston for cylinder no. 1 to TDC position  
⇒ [“4.7 Setting piston to TDC position”, page 71](#) .
- Drain coolant  
⇒ [“1.3 Draining and adding coolant”, page 225](#) .
- Unscrew bolts -2-.
- Remove cover for thermostat housing -1-.

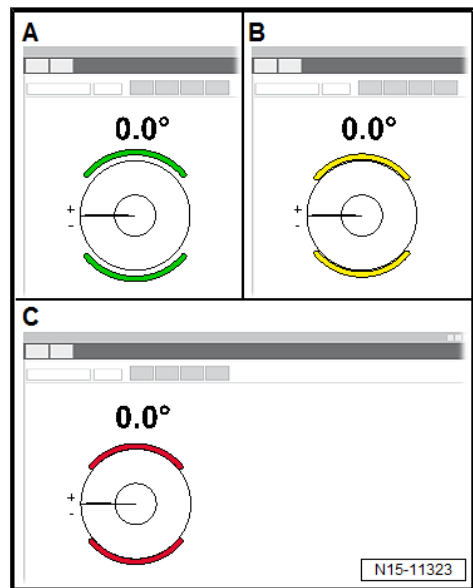




- Unclip wiring harness -3- and place to one side.
- Unscrew bolts -1-.
- Place a cloth underneath to catch any oil which may drain out.
- Take off cap -5-.
- Pull off pipe -2-.
- Remove toothed belt cover -4-.
- Preassemble test tool - VAS 611 007-  
⇒ [“2.4.1 Preassembling test tool VAS 611 007 without ACT”, page 96](#) .
- Install test tool - VAS 611 007-  
⇒ [“2.4.3 Mounting test tool VAS 611 007 without ACT”, page 102](#) .
- Make sure that brakes -a- are released on both sides.

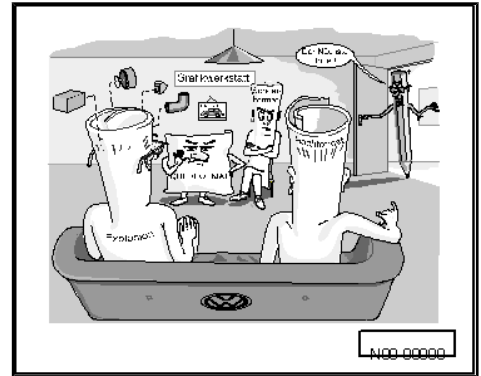


- Make sure that brake indicator on display is green -A-.
- It must not be yellow or red.

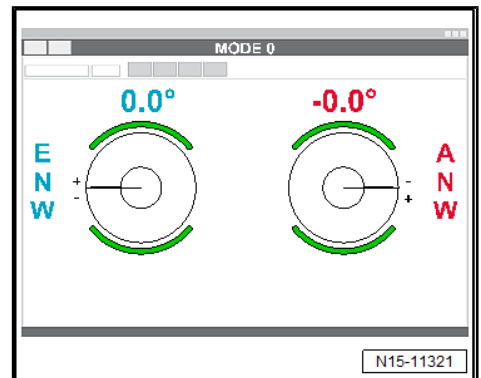




- Unscrew locking pin - T10340- -A-.
- Turn crankshaft 2 turns in direction of rotation of engine.
- Screw in locking pin - T10340- -A-.
- Set piston for cylinder no. 1 to TDC position  
 ⇒ ["4.7 Setting piston to TDC position", page 71](#) .



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



#### Specified values

Inlet camshaft	Exhaust camshaft
-0.5° ±1.5°	+1.5° ±1.5°



#### Note

- ◆ *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 necessary, adjust timing.  
 ⇒ ["2.6 Adjusting valve timing", page 115](#)

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

- Add coolant ⇒ ["1.3 Draining and adding coolant", page 225](#) .

**Polo 2010 LHD vehicles, Polo 2014 LHD vehicles, Polo Lim RUS 2016:**

- Bleed brake system ⇒ Brake system; Rep. gr. 47 ; Hydraulic system .

#### Torque settings

- ◆ ⇒ ["2.1 Assembly overview - coolant pump, thermostat", page 232](#)
- ◆ ⇒ ["3.1 Assembly overview - air filter housing", page 307](#)
- ◆ ⇒ Brake system; Rep. gr. 45 ; Control unit and hydraulic unit; Assembly overview - control unit and hydraulic unit
- ◆ ⇒ Brake system; Rep. gr. 47 ; Brake servo/brake master cylinder, Assembly overview - brake servo/brake master cylinder



Component	Torque setting
Bolt for TDC hole in cylinder block	30 Nm

## 2.5.2 Checking valve timing, vehicles with ACT

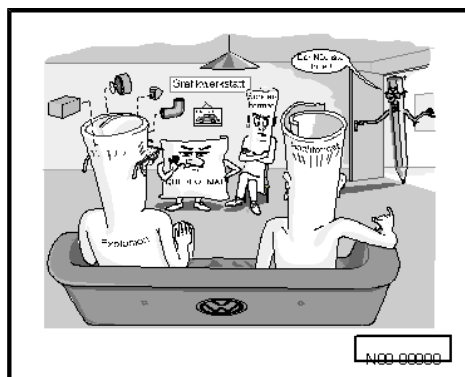
### Special tools and workshop equipment required

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



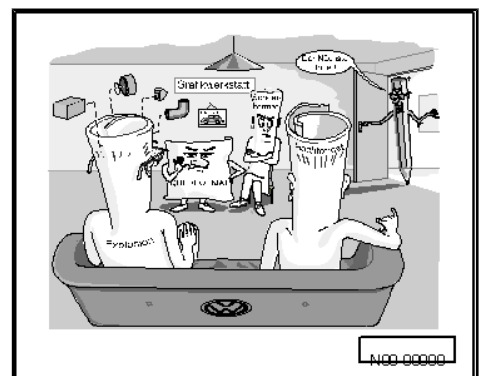
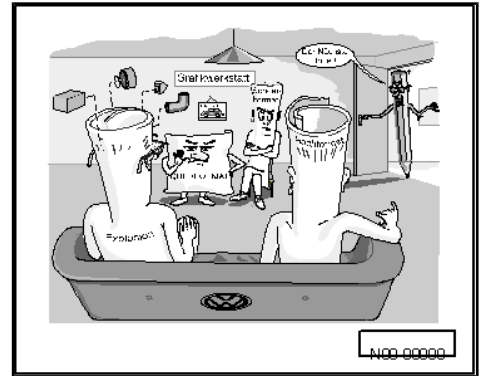
### Procedure

- Remove resonator for intake air  
⇒ ["3.3 Removing and installing resonator for intake air"](#), page 309 .
- Remove air pipe  
⇒ ["2.5 Removing and installing air intake pipe"](#), page 289 .
- Remove connection for turbocharger  
⇒ ["1.4 Removing and installing connection for turbocharger"](#), page 279 .
- Set piston for cylinder no. 1 to TDC position  
⇒ ["4.7 Setting piston to TDC position"](#), page 71 .
- Drain coolant  
⇒ ["1.3 Draining and adding coolant"](#), page 225 .
- Unscrew bolts -2-.
- Remove cover for thermostat housing -1-.

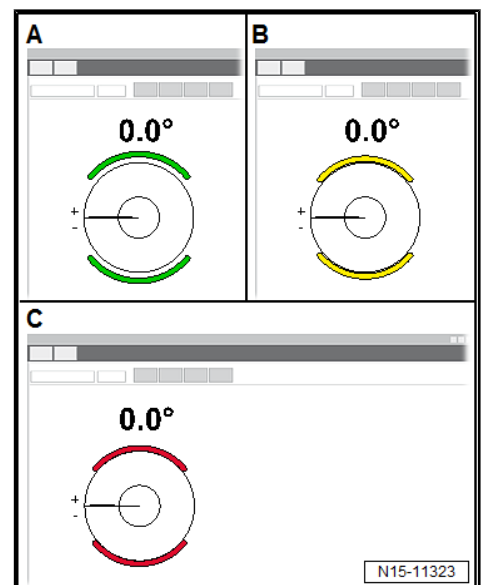




- Unclip wiring harness -3- and place to one side.
- Unscrew bolts -1-.
- Place a cloth underneath to catch any oil which may drain out.
- Take off cap -5-.
- Pull off pipe -2-.
- Remove toothed belt cover -4-.
- Preassemble test tool - VAS 611 007-  
⇒ ["2.4.2 Preassembling test tool VAS 611 007 with ACT", page 99](#) .
- Install test tool - VAS 611 007-  
⇒ ["2.4.4 Mounting test tool VAS 611 007 with ACT", page 104](#) .
- Make sure that brakes -a- are released on both sides.

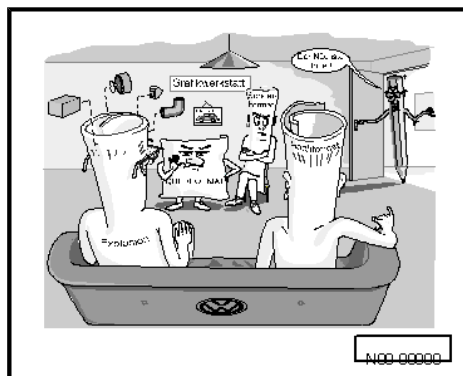


- Make sure that brake indicator on display is green -A-.
- It must not be yellow or red.

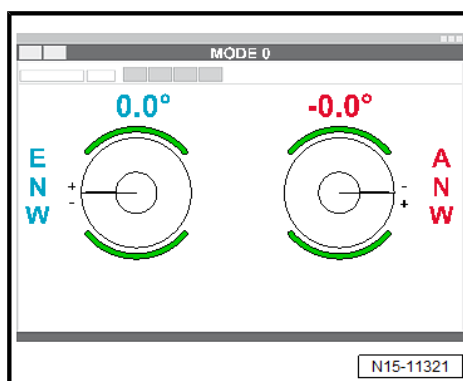




- Unscrew locking pin - T10340- -A-.
- Turn crankshaft 2 turns in direction of rotation of engine.
- Screw in locking pin - T10340- -A-.
- Set piston for cylinder no. 1 to TDC position  
⇒ [“4.7 Setting piston to TDC position”, page 71](#) .



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



#### Specified values

Inlet camshaft	Exhaust camshaft
-1.3° ±1.5°	+0.8° ±1.5°



#### Note

- ◆ *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 necessary, adjust timing.  
⇒ [“2.6 Adjusting valve timing”, page 115](#)

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

- Add coolant ⇒ [“1.3 Draining and adding coolant”, page 225](#) .

**Polo 2010 LHD vehicles, Polo 2014 LHD vehicles, Polo Lim RUS 2016:**

- Bleed brake system ⇒ Brake system; Rep. gr. 47 ; Hydraulic system .

#### Torque settings

- ◆ ⇒ [“2.1 Assembly overview - coolant pump, thermostat”, page 232](#)
- ◆ ⇒ [“3.1 Assembly overview - air filter housing”, page 307](#)
- ◆ ⇒ Brake system; Rep. gr. 45 ; Control unit and hydraulic unit; Assembly overview - control unit and hydraulic unit
- ◆ ⇒ Brake system; Rep. gr. 47 ; Brake servo/brake master cylinder, Assembly overview - brake servo/brake master cylinder





Component	Torque setting
Bolt for TDC hole in cylinder block	30 Nm

## 2.6 Adjusting valve timing

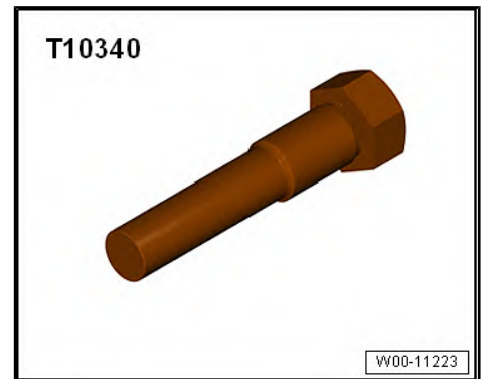
⇒ [“2.6.1 Adjusting valve timing, vehicles without ACT”, page 115](#)

⇒ [“2.6.2 Adjusting valve timing, vehicles with Active Cylinder Management”, page 124](#)

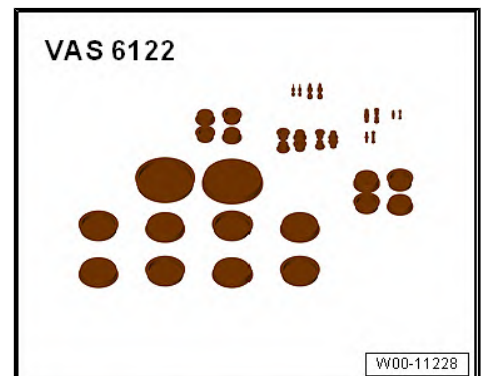
### 2.6.1 Adjusting valve timing, vehicles without ACT

Special tools and workshop equipment required

◆ Locating bolt - T10340-



◆ Engine bung set - VAS 6122-



#### Procedure

- Toothed belt installed.
- Check valve timing ⇒ [“2.5 Checking valve timing”, page 109](#) .
- Set piston for cylinder no. 1 to TDC position  
 ⇒ [“4.7 Setting piston to TDC position”, page 71](#) .
- Do not relieve tension from toothed belt, and do not remove toothed belt from camshafts when adjusting valve timing. Only loosen camshaft adjuster or toothed belt sprocket.
- Loosen camshaft adjuster on inlet side ⇒ [page 164](#) .

#### Exhaust side with toothed belt sprocket

- Loosen toothed belt sprocket on exhaust side ⇒ [page 175](#) .

#### Exhaust side with camshaft adjuster

- Loosen camshaft adjuster on exhaust side ⇒ [page 170](#) .



## Continuation for all vehicles



**NOTICE**

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

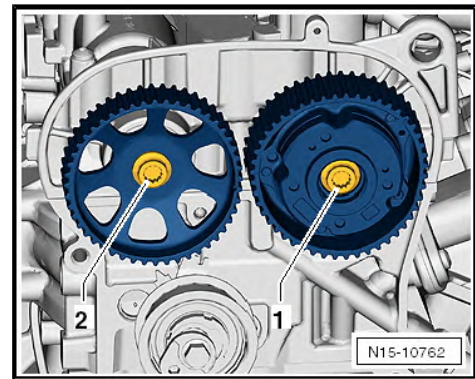
- Do not turn crankshaft out of TDC position.
- Place a cloth under the camshaft adjusters and over tensioning roller to catch the engine oil which runs out.
- The contact points between the toothed belt and components - such as camshaft pulleys, tensioning roller and idler pulley - must be kept free of oil.
- Catch any engine oil which runs out immediately, and remove it.
- Remove engine oil at camshaft adjusters.
- Make sure that the piston in cylinder no. 1 is at TDC position ⇒ ["4.7 Setting piston to TDC position", page 71](#) .

### Exhaust side with toothed belt sprocket

- Renew bolt -2- and screw in loosely.
- Renew bolt -1- and screw in loosely.

### Exhaust side with camshaft adjuster

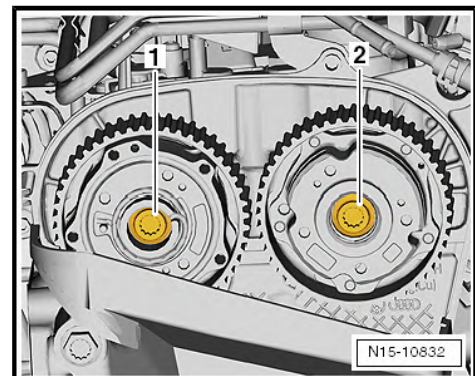
- Renew bolt -2- and screw in loosely.



- Renew bolt -1- and screw in loosely.

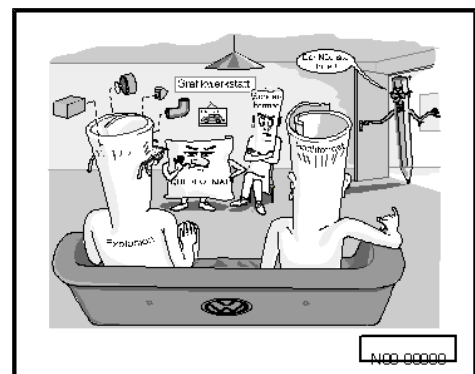
### Continued for all vehicles

- It should still be possible to turn the camshaft adjuster and toothed belt sprocket on the camshafts.



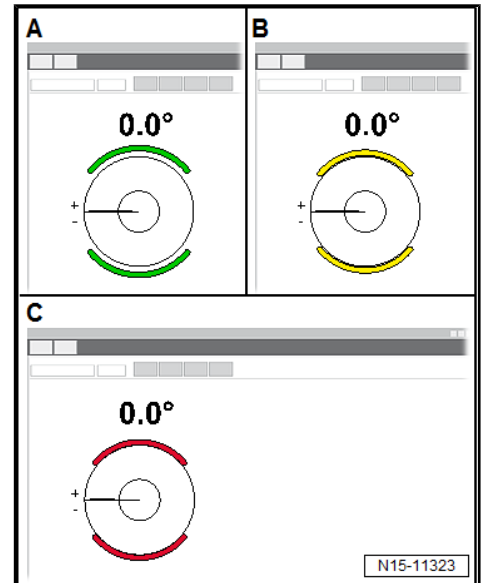
### Setting camshafts to »0°«:

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

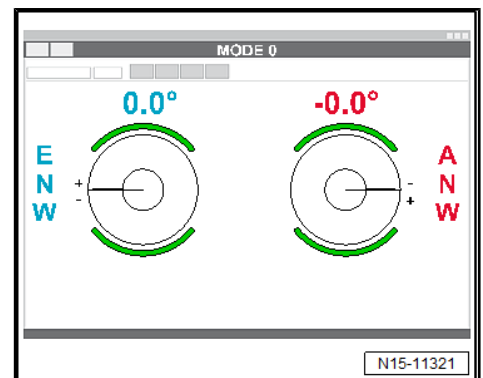




- Make sure that the brake indicator on the display is »green« -A-.
- Display must not be »yellow« or »red«.



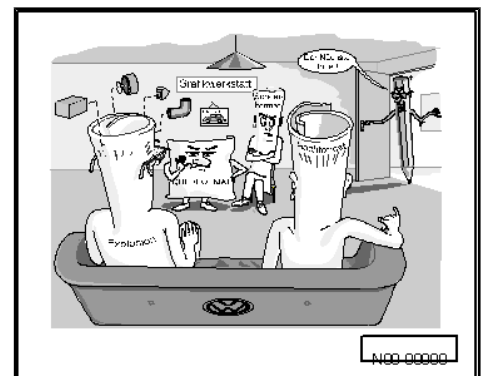
- Set both camshafts to »0.0°«.



- To do this, turn camshafts with adapter for angle sensor - VAS 611 007/5- -E-.
- Hold camshafts via adapter for angle sensor - VAS 611 007/9- and adapter for angle sensor - VAS 611 007/10- -E- in »0.0°« position with a wrench.

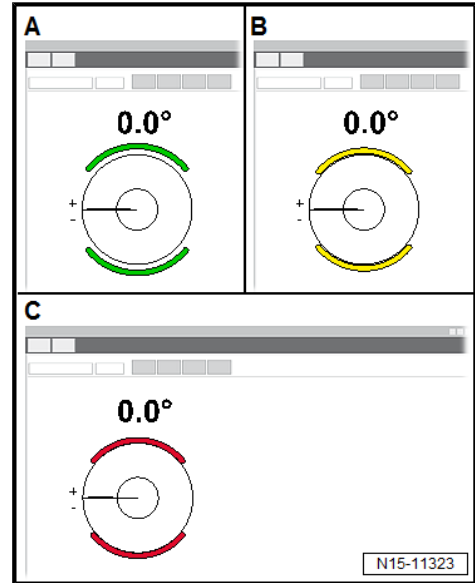
**i** Note

- ◆ 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 to 11 Nm on both sides.



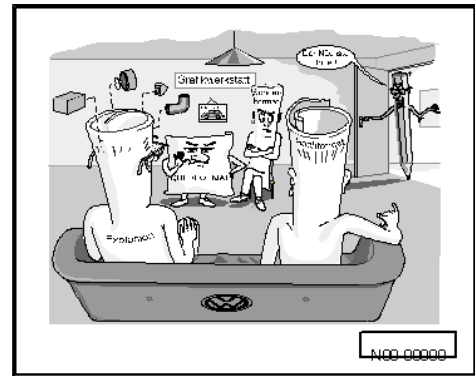


- Make sure that the brake indicator on the display is »red« -C-.
- Display must not be »yellow« or »green«.

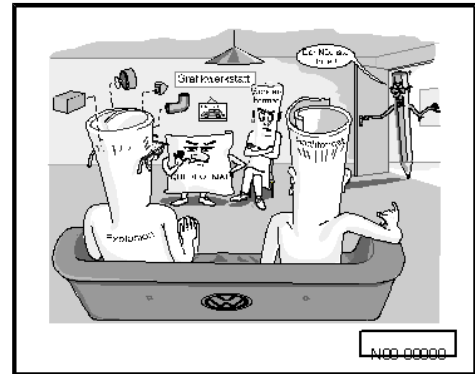


- Unscrew locking pin - T10340- -A-.
- Tighten camshaft adjuster on inlet camshaft to specified initial torque ⇒ [Fig. 444994](#), page 166 .

Continued for all vehicles

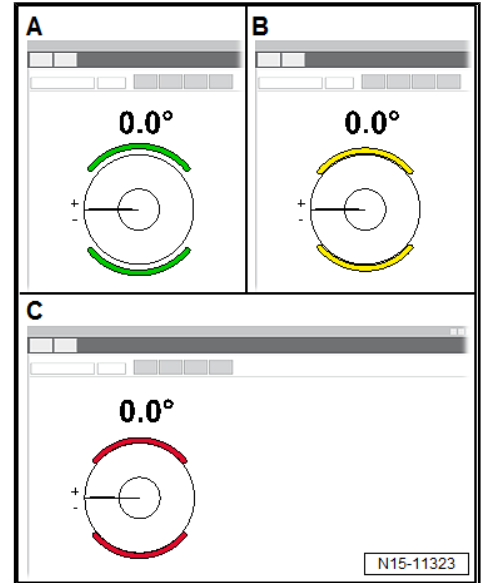


- Make sure that bolts -a- for brakes are released on both sides.





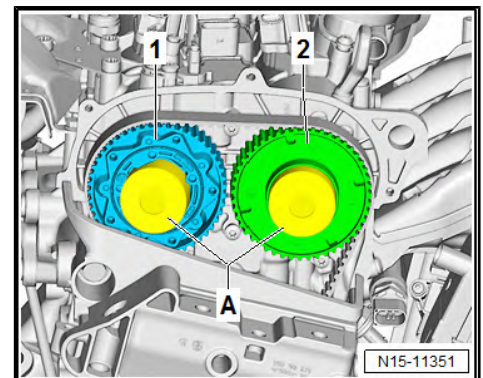
- Make sure that the brake indicator on the display is »green« -A-.
- Display must not be »yellow« or »red«.



- Seal camshaft adjuster -2- using suitable plugs -A- from engine bung set - VAS 6122- .
- Fit a piece of paper -A- 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 for cylinder no. 1 to TDC position  
 ⇒ ["4.7 Setting piston to TDC position", page 71](#) .
- Read valve timing on display and write down values.

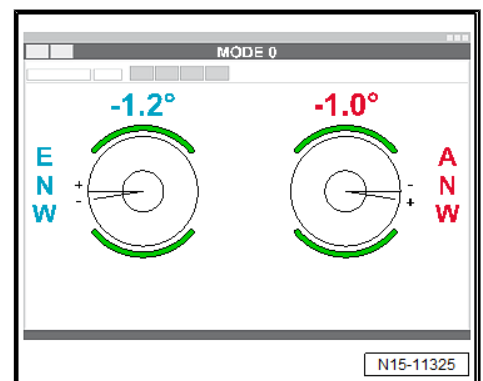


#### 1. Measurement example: value reading on display



#### Note

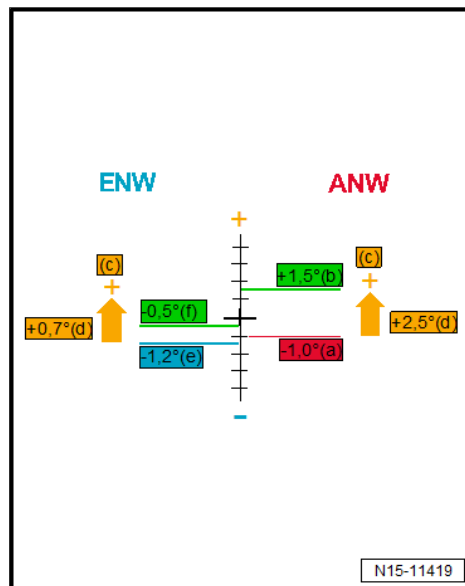
- ◆ *The correction angle is determined for each individual vehicle.*
- ◆ *The value read after the engine has been cranked is used for determining the correction angle.*
- ◆ *Note the algebraic signs of the values.*
- ◆ *The correction angle results from the difference between the specification and 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 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 angle	$-0.5^{\circ} \pm 1.5^{\circ}$	$+1.5^{\circ} \pm 1.5^{\circ}$

- 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 plug 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 ⇒ [page 164](#) .

#### Exhaust side with toothed belt sprocket

- Loosen toothed belt sprocket on exhaust side ⇒ [page 175](#) .

#### Exhaust side with camshaft adjuster

- Loosen camshaft adjuster on exhaust side ⇒ [page 170](#) .

#### Continuation for all vehicles

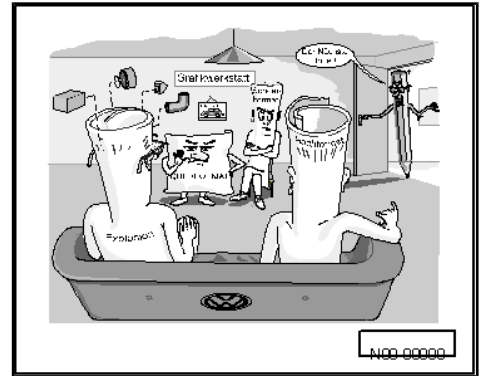


**Risk of damage to engine caused by incorrect valve timing.**

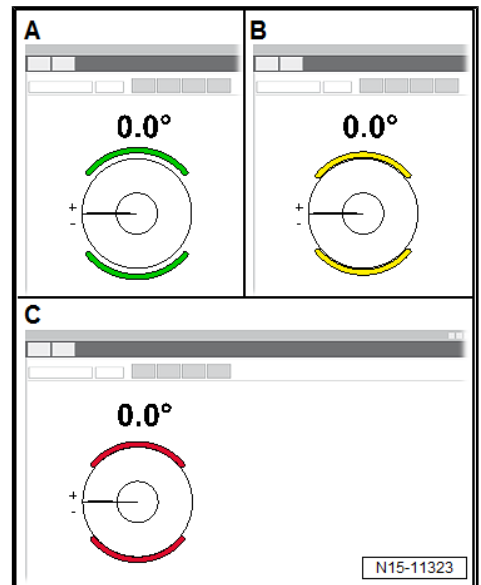
- Do not turn crankshaft out of TDC position.



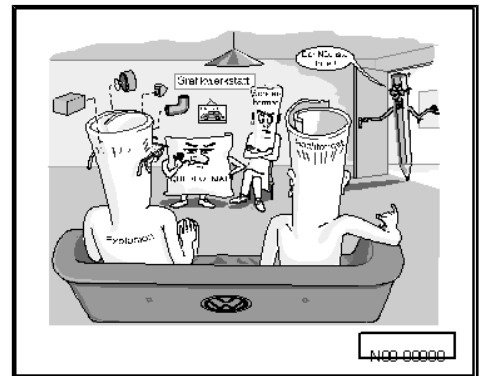
- Make sure that the piston in cylinder no. 1 is at TDC position  
 => ["4.7 Setting piston to TDC position", page 71](#) .
- Make sure that bolts -a- for brakes on test tool - VAS 611 007- are released on both sides.



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

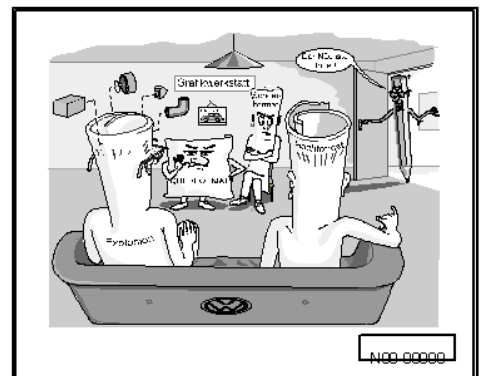


- Set the two camshafts to the determined correction angle  
 => [page 119](#) .
- To do this, turn camshafts with adapter for angle sensor - VAS 611 007/9- and adapter for angle sensor - VAS 611 007/10-E-.



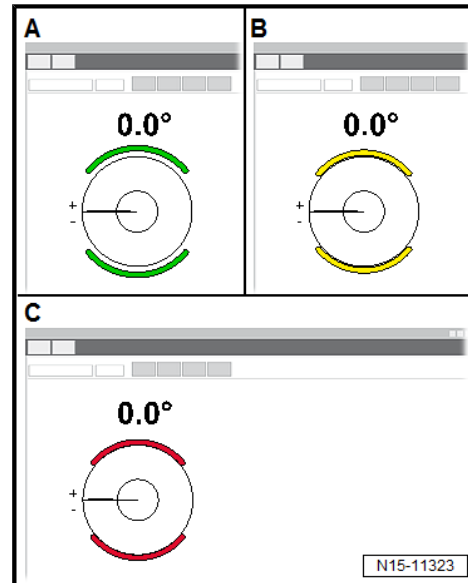
**If the valve timing has been set:**

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





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



- Unscrew locking pin - T10340- -A-.
- Tighten camshaft adjuster on inlet camshaft to specified initial torque ⇒ [Fig. "66379"](#), [page 166](#) .

#### Exhaust side with toothed belt sprocket

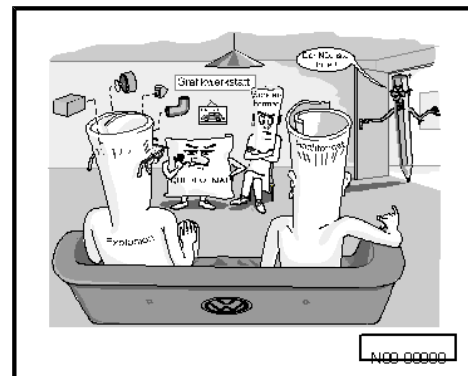
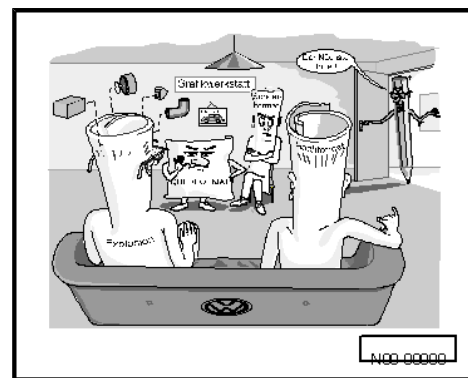
- Tighten toothed belt sprocket of exhaust camshaft to specified initial torque ⇒ [page 176](#) .

#### Exhaust side with camshaft adjuster

- Tighten camshaft adjuster of exhaust camshaft to specified initial torque ⇒ [page 176](#) .

#### Continued for all vehicles

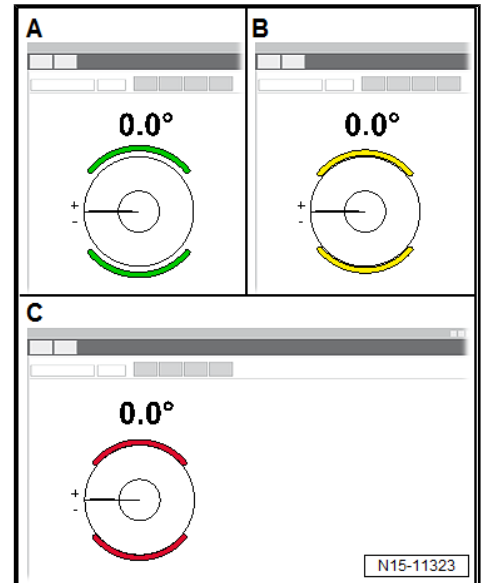
- Release brakes -a- on both sides.



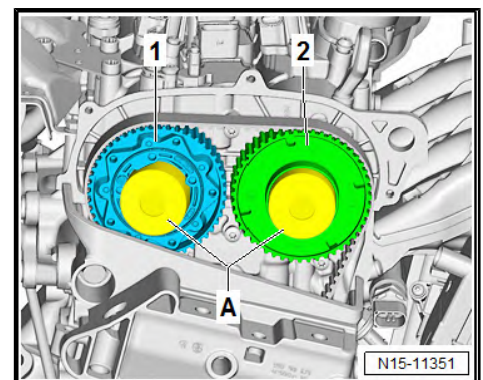




- Make sure that the brake indicator on the display is »green« -A-.
- Display must not be »yellow« or »red«.



- Seal camshaft adjusters -1- and -2- using suitable plugs -A- from engine bung set - VAS 6122- .
- Fit a new piece of paper into plugs -A- to catch the engine oil.
- The plug for the camshaft adjuster -1- on exhaust side must be pushed in slightly.
- Turn crankshaft 2 turns in direction of rotation of engine.
- Screw in locking pin - T10340- .
- Set piston for cylinder no. 1 to TDC position  
 ⇒ ["4.7 Setting piston to TDC position", page 71](#) .



**i Note**

- ◆ *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
-0.5° ±1.5°	+1.5° ±1.5°

- If the valve timing is not OK, adjust valve timing again.

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 ⇒ [Fig. "\\*\\*\\*\\*", page 166](#) .

**Exhaust side with toothed belt sprocket**

- Tighten toothed belt sprocket of exhaust camshaft to specified final torque ⇒ [page 176](#) .



### Exhaust side with camshaft adjuster

- Tighten camshaft adjuster of exhaust camshaft to specified final torque ⇒ [page 161](#) .

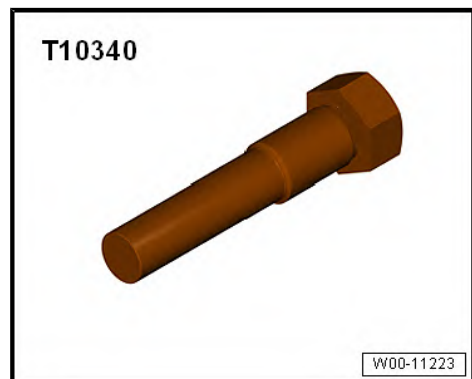
### Torque settings

- ◆ ⇒ [“2.2 Assembly overview - toothed belt”, page 92](#)
- ◆ ⇒ [“2.1 Assembly overview - coolant pump, thermostat”, page 232](#)
- ◆ ⇒ [“3.1 Assembly overview - air filter housing”, page 307](#)

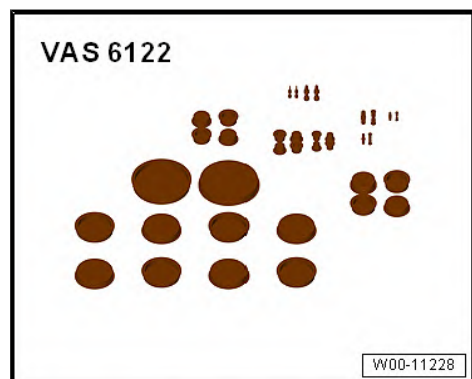
## 2.6.2 Adjusting valve timing, vehicles with Active Cylinder Management

### Special tools and workshop equipment required

- ◆ Locating bolt - T10340-



- ◆ Engine bung set - VAS 6122-



### Procedure

- Toothed belt installed.
- Check valve timing ⇒ [“2.5 Checking valve timing”, page 109](#) .
- Set piston for cylinder no. 1 to TDC position ⇒ [“4.7 Setting piston to TDC position”, page 71](#) .
- Do not relieve tension from toothed belt, and do not remove toothed belt from camshafts when adjusting valve timing. Only loosen camshaft adjuster or toothed belt sprocket.
- Loosen camshaft adjuster on inlet side ⇒ [page 164](#) .

### Exhaust side with toothed belt sprocket

- Loosen toothed belt sprocket on exhaust side ⇒ [page 175](#) .

### Exhaust side with camshaft adjuster

- Loosen camshaft adjuster on exhaust side ⇒ [page 170](#) .



**Continuation for all vehicles**

**! NOTICE**

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

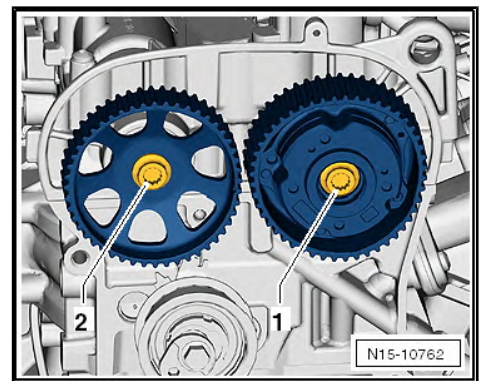
- Do not turn crankshaft out of TDC position.
- Place a cloth under the camshaft adjusters and over tensioning roller to catch the engine oil which runs out.
- The contact points between the toothed belt and components - such as camshaft pulleys, tensioning roller and idler pulley - must be kept free of oil.
- Catch any engine oil which runs out immediately, and remove it.
- Remove engine oil at camshaft adjusters.
- Make sure that the piston in cylinder no. 1 is at TDC position ⇒ ["4.7 Setting piston to TDC position", page 71](#) .

**Exhaust side with toothed belt sprocket**

- Renew bolt -2- and screw in loosely.
- Renew bolt -1- and screw in loosely.

**Exhaust side with camshaft adjuster**

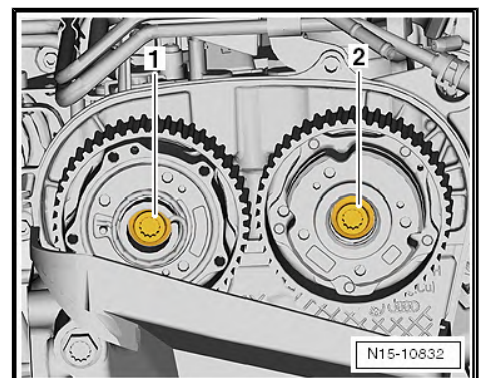
- Renew bolt -2- and screw in loosely.



- Renew bolt -1- and screw in loosely.

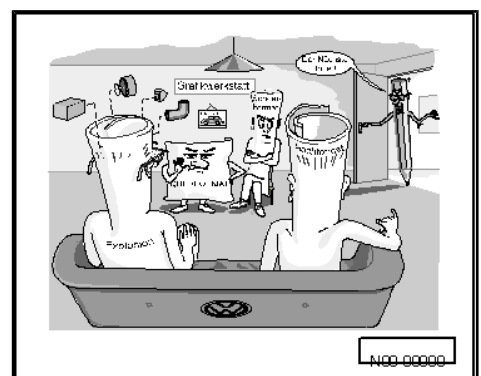
**Continued for all vehicles**

- It should still be possible to turn the camshaft adjuster and toothed belt sprocket on the camshafts.



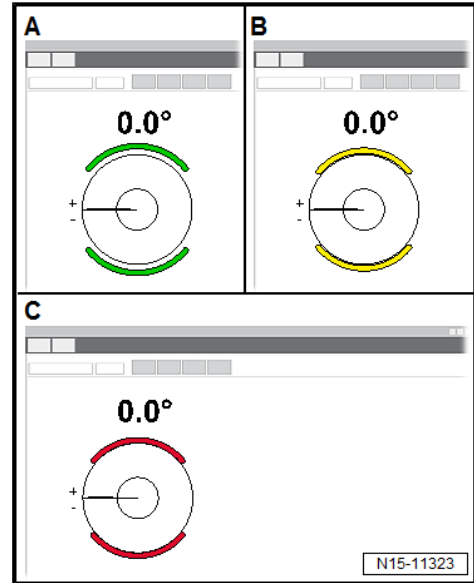
**Setting camshafts to »0°«:**

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

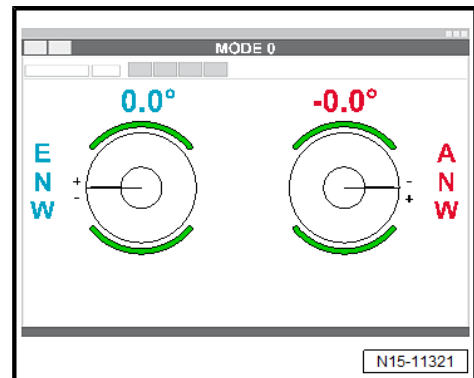




- Make sure that the brake indicator on the display is »green« -A-.
- Display must not be »yellow« or »red«.



- Set both camshafts to »0.0°«.

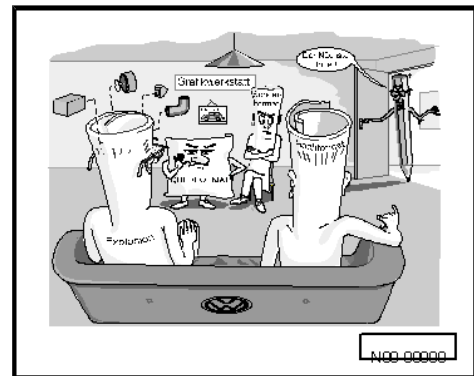


- To do this, turn camshafts with adapter for angle sensor - VAS 611 007/5- -E-.
- Hold camshafts via adapter for angle sensor - VAS 611 007/9- and adapter for angle sensor - VAS 611 007/10- -E- in »0.0°« position with a wrench.



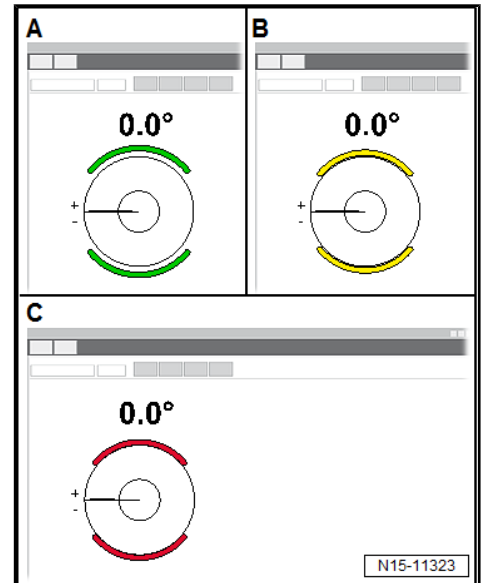
#### Note

- ◆ *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 to 11 Nm on both sides.



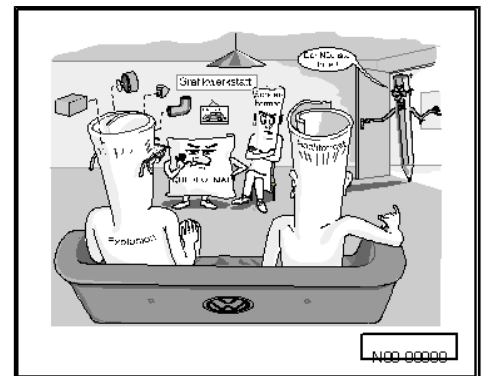


- Make sure that the brake indicator on the display is »red« -C-.
- Display must not be »yellow« or »green«.

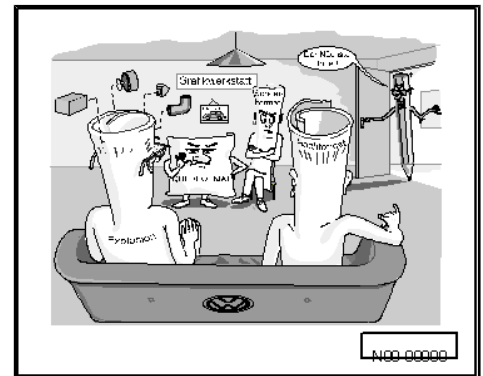


- Unscrew locking pin - T10340- -A-.
- Tighten camshaft adjuster on inlet camshaft to specified initial torque => Fig. "4477", page 166 .

Continued for all vehicles

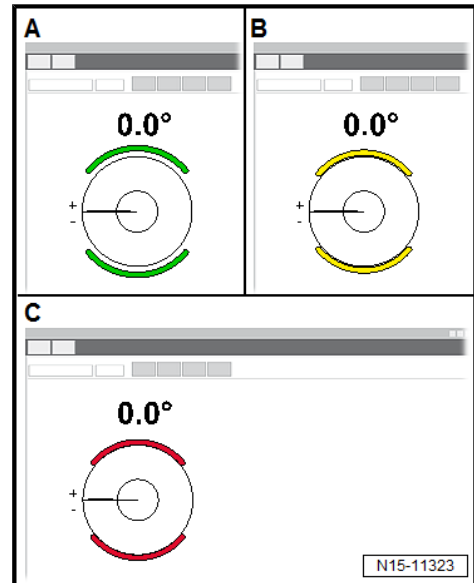


- Make sure that bolts -a- for brakes are released on both sides.





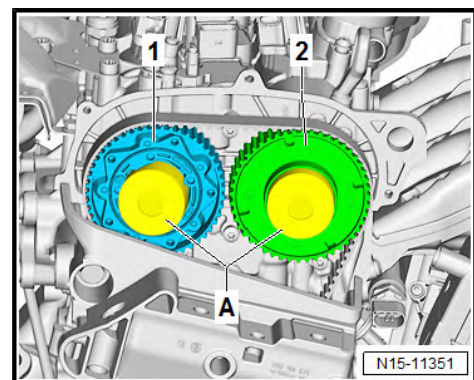
- Make sure that the brake indicator on the display is »green« -A-.
- Display must not be »yellow« or »red«.



- Seal camshaft adjuster -2- using suitable plugs -A- from engine bung set - VAS 6122- .
- Fit a piece of paper -A- 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 for cylinder no. 1 to TDC position  
⇒ ["4.7 Setting piston to TDC position", page 71](#) .
- Read valve timing on display and write down values.

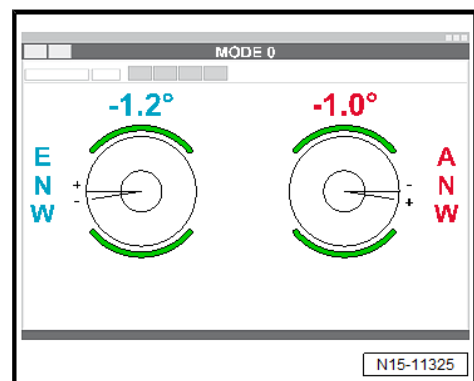


#### 1. Measurement example: value reading on display



#### 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 is calculated.*
- ◆ *The result is the correction angle to be set, with the corresponding algebraic sign/direction of rotation.*

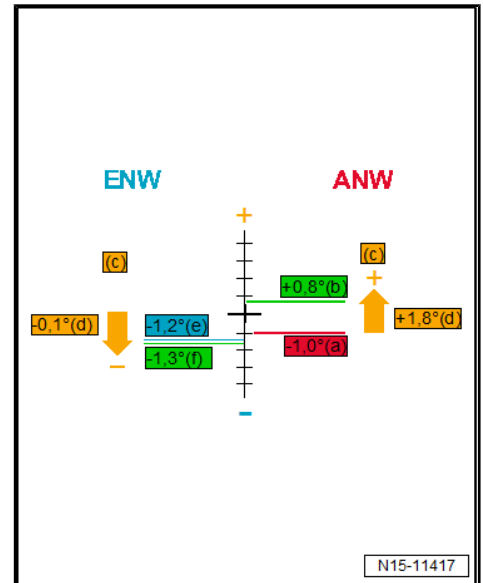




## Calculation example ACT

### 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 angle	$-1.3^{\circ} \pm 1.5^{\circ}$	$+0.8^{\circ} \pm 1.5^{\circ}$

- 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 plug 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 ⇒ [page 164](#) .

### Exhaust side with toothed belt sprocket

- Loosen toothed belt sprocket on exhaust side ⇒ [page 175](#) .

### Exhaust side with camshaft adjuster

- Loosen camshaft adjuster on exhaust side ⇒ [page 170](#) .

### Continuation for all vehicles

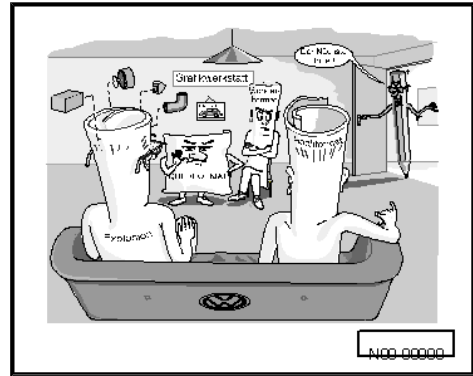
#### NOTICE

Risk of damage to engine caused by incorrect valve timing.

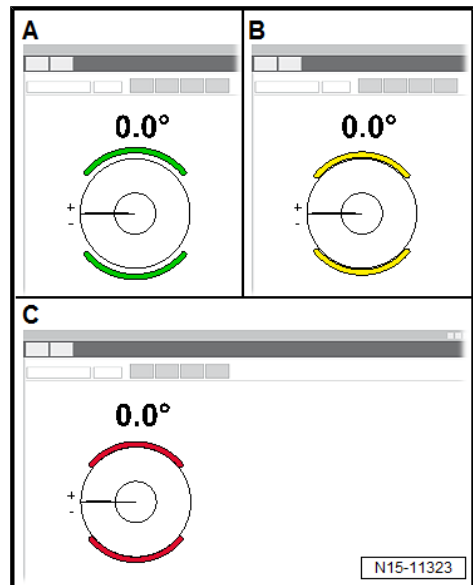
- Do not turn crankshaft out of TDC position.



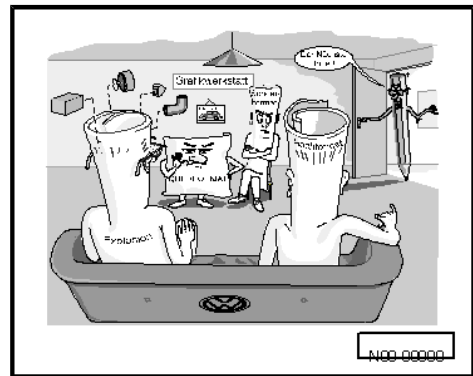
- Make sure that the piston in cylinder no. 1 is at TDC position  
⇒ ["4.7 Setting piston to TDC position", page 71](#) .
- Make sure that bolts -a- for brakes on test tool - VAS 611 007- are released on both sides.



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

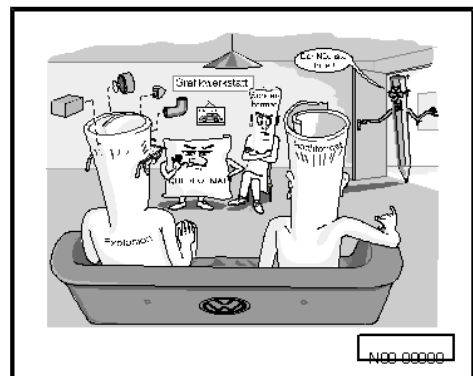


- Set the two camshafts to the determined correction angle  
⇒ [page 119](#) .
- To do this, turn camshafts with adapter for angle sensor - VAS 611 007/9- and adapter for angle sensor - VAS 611 007/10-E-.



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

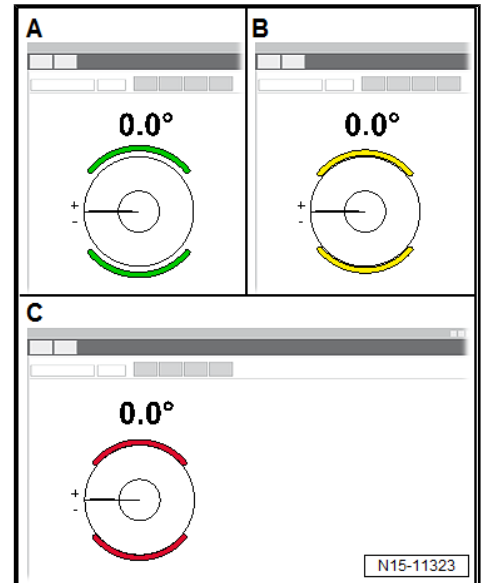
- Tighten bolts -a- for brakes on test tool - VAS 611 007- to 11 Nm on both sides.







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



- Unscrew locking pin - T10340- -A-.
- Tighten camshaft adjuster on inlet camshaft to specified initial torque ⇒ [Fig. "11111"](#), [page 166](#) .

**Exhaust side with toothed belt sprocket**

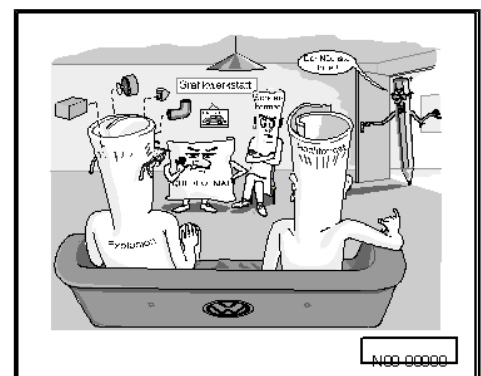
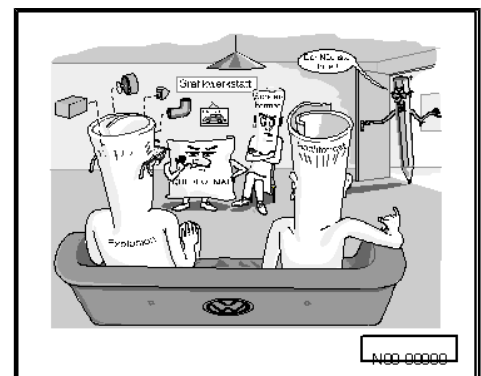
- Tighten toothed belt sprocket of exhaust camshaft to specified initial torque ⇒ [page 176](#) .

**Exhaust side with camshaft adjuster**

- Tighten camshaft adjuster of exhaust camshaft to specified initial torque ⇒ [page 176](#) .

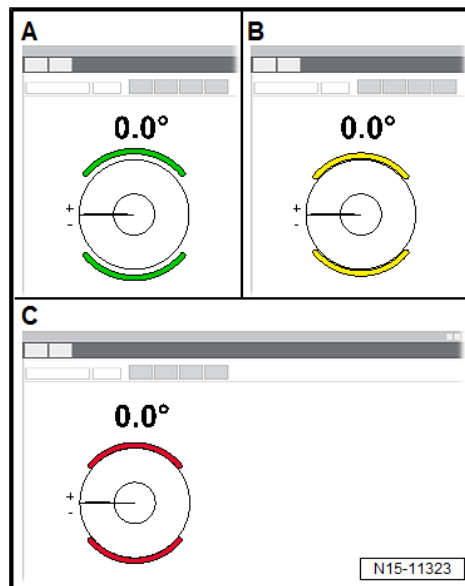
**Continued for all vehicles**

- Release brakes -a- on both sides.

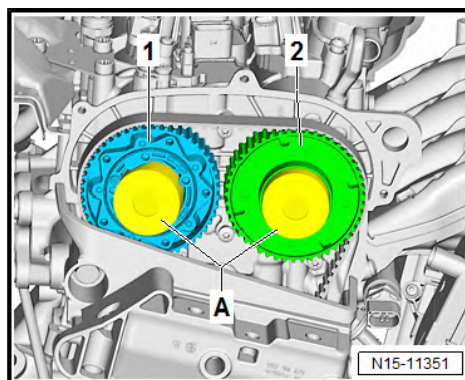




- Make sure that the brake indicator on the display is »green« -A-.
- Display must not be »yellow« or »red«.



- Seal camshaft adjusters -1- and -2- using suitable plugs -A- from engine bung set - VAS 6122- .
- Fit a new piece of paper into plugs -A- to catch the engine oil.
- The plug for the camshaft adjuster -1- on exhaust side must be pushed in slightly.
- Turn crankshaft 2 turns in direction of rotation of engine.
- Screw in locking pin - T10340- .
- Set piston for cylinder no. 1 to TDC position  
⇒ ["4.7 Setting piston to TDC position", page 71](#) .



#### Note

- ◆ *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
-1.3° ±1.5°	+0.8° ±1.5°

- If the valve timing is not OK, adjust valve timing again.

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 ⇒ [Fig. "A", page 166](#) .

#### Exhaust side with toothed belt sprocket

- Tighten toothed belt sprocket of exhaust camshaft to specified final torque ⇒ [page 176](#) .



### Exhaust side with camshaft adjuster

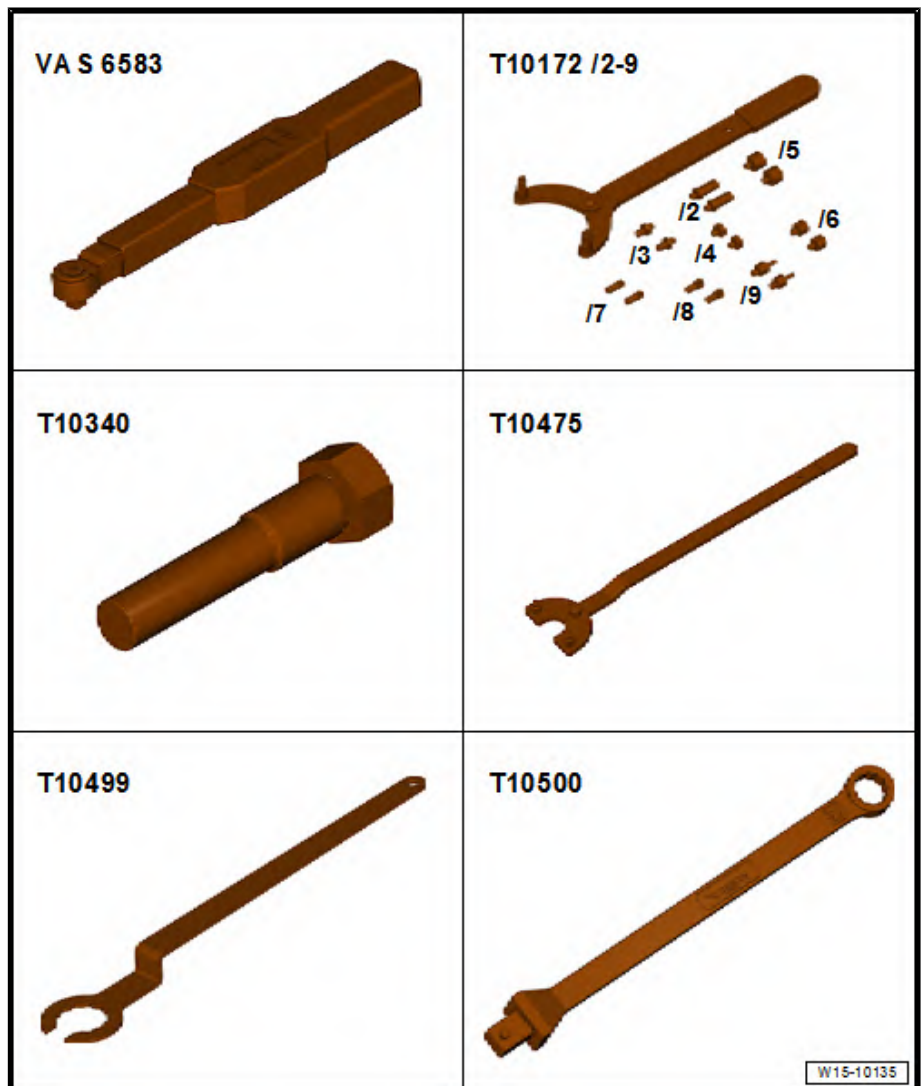
- Tighten camshaft adjuster of exhaust camshaft to specified final torque ⇒ [page 161](#) .

### Torque settings

- ◆ ⇒ [“2.2 Assembly overview - toothed belt”, page 92](#)
- ◆ ⇒ [“2.1 Assembly overview - coolant pump, thermostat”, page 232](#)
- ◆ ⇒ [“3.1 Assembly overview - air filter housing”, page 307](#)

## 2.7 Removing toothed belt from camshaft

### Special tools and workshop equipment required



- ◆ Torque wrench - VAS 6583-
- ◆ Counterhold - T10172- with adapter -T10172/1-
- ◆ Locating bolt - T10340-
- ◆ Counter-hold tool - T10475-
- ◆ Special wrench, 30 mm - T10499-
- ◆ Insert tool - T10500-



- ◆ Release tool - T10527-
- ◆ Release tool - T10527/1-

### Removing

- Set piston of no. 1 cylinder to "TDC" position.  
⇒ ["4.7 Setting piston to TDC position", page 71](#)
- Remove upper part of toothed belt guard  
⇒ ["2.3.1 Removing and installing upper toothed belt guard", page 95](#) .
- Remove lower toothed belt guard  
⇒ ["2.3.2 Removing and installing lower toothed belt guard", page 95](#) .
- Loosen plug and securing bolt for camshaft adjuster on inlet side  
⇒ ["3.3 Removing and installing camshaft adjuster", page 157](#) .

### Exhaust side with toothed belt sprocket

- Loosen securing bolt of toothed belt pulley on exhaust side by approx. one turn ⇒ [page 175](#) .

### Exhaust side with camshaft adjuster

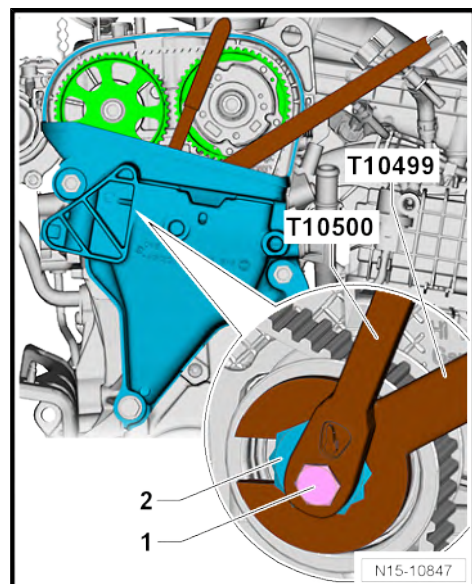
- Loosen securing bolt of camshaft adjuster on exhaust side by approx. one turn ⇒ [page 170](#) .

### Continuation for all vehicles



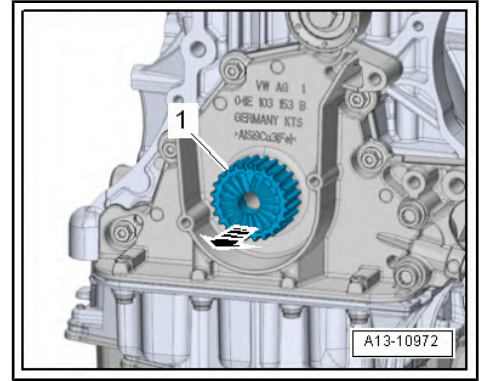
#### Note

- ◆ *If a used toothed belt runs in the opposite direction when it is refitted, it may break.*
- ◆ *Before removing, mark direction of rotation of toothed belt with chalk or felt-tipped pen for re-installation.*
- Loosen securing bolt of tensioning roller -1- using insert tool, 13 mm - T10500- .
- Release tension on tensioning roller at eccentric -2- using wrench - T10499- .
- Remove toothed belt.





- Detach crankshaft pulley -1- -arrow-.



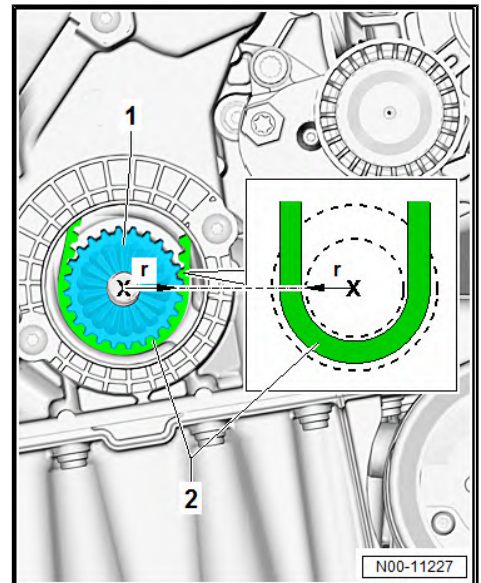
### Bend radius of toothed belt



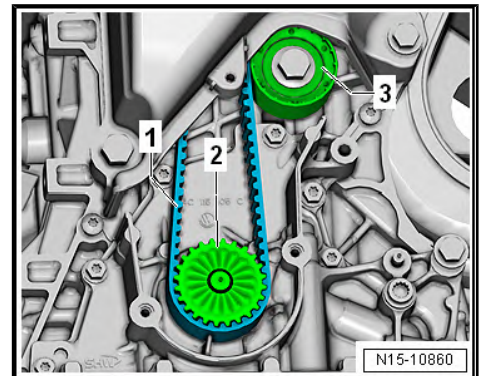
Risk of damage to toothed belt by bending it excessively. The toothed belt is made of glass fibre fabric which will be damaged if it is bent excessively.

- Never bend toothed belt to a radius less than  $r = 25$  mm.

### Installing



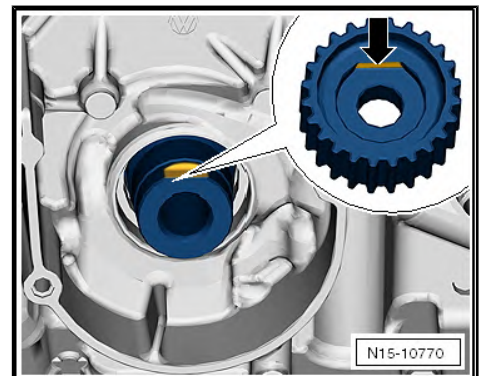
- Fit toothed belt -1- together with crankshaft pulley -2- onto crankshaft journal.



- Milled surface of crankshaft sprocket -arrow- must be positioned on milled surface of crankshaft stub.
- Contact surface between poly V-belt pulley and crankshaft toothed belt pulley must be free of oil and grease.

### Exhaust side with toothed belt sprocket

- Renew bolt -2- and screw in loosely.

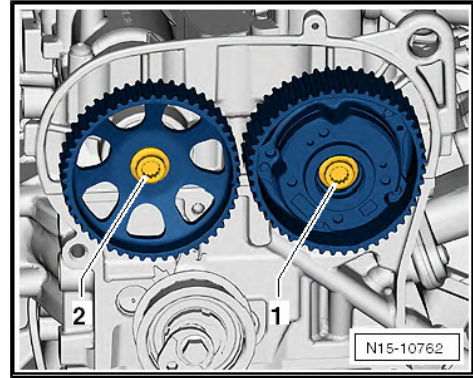




- Renew bolt -1- and screw in loosely.

#### Exhaust side with camshaft adjuster

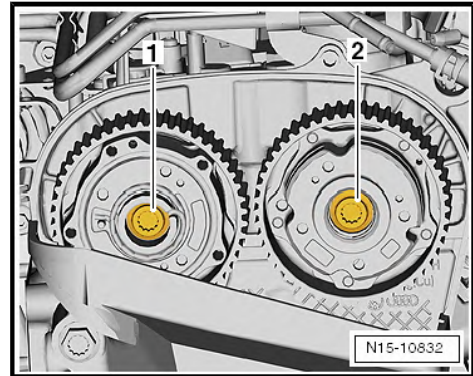
- Renew bolt -2- and screw in loosely.



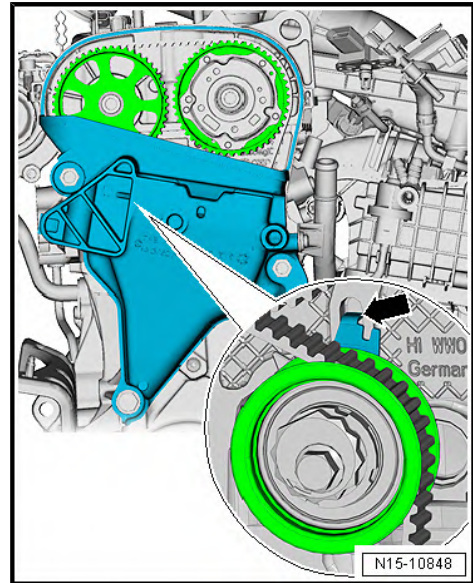
- Renew bolt -1- and screw in loosely.

#### Continued for all vehicles

- It should just be possible to turn camshaft pulleys on camshafts but no rocking is permissible.

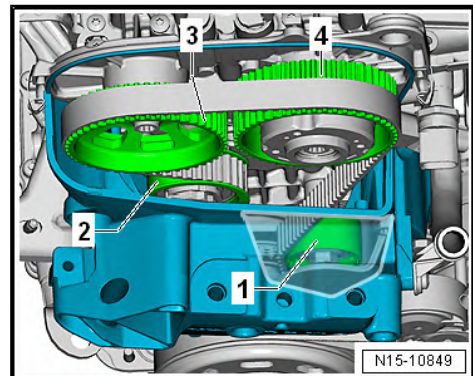


- Metal tab -arrow- of tensioning roller must engage in recess in cylinder head.



#### Fit toothed belt in prescribed sequence:

- Pull toothed belt upwards and fit on idler pulley -1-, tensioning roller -2- and camshaft toothed belt pulleys -3- and -4-.





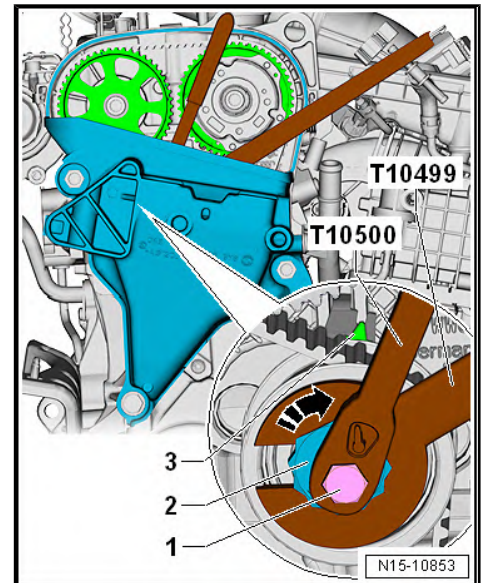
- Rotate eccentric -2- of tensioning roller using special wrench, 30mm -T10499- in -direction of arrow- until adjustment pointer -3- is located approx. 10 mm to the right from adjustment window.
- Turn eccentric adjuster back until adjustment indicator is positioned exactly in adjustment window.

**i** Note

- ◆ *Torque wrench - VAS 6583- must be used for tightening.*
- ◆ *When setting specified torque on torque wrench - VAS 6583-, length must be entered in torque wrench.*
- Hold eccentric in that position and tighten bolt -1- to 25 Nm using insert tool - T10500- with torque wrench - VAS 6583- .

**i** Note

*Turning the engine further or running the engine may lead to slight differences in the position of the adjustment indicator -3- in relation to the adjustment window. The deviations do not affect the toothed belt tension or the timing.*



- Install lower part of toothed belt guard  
 ⇒ [“2.3.2 Removing and installing lower toothed belt guard”, page 95](#) .
- Tighten camshaft adjuster on inlet camshaft to specified initial torque ⇒ [Fig. “””, page 166](#) .

**Exhaust side with toothed belt sprocket**

- Tighten toothed belt sprocket of exhaust camshaft to specified initial torque ⇒ [page 176](#) .

**Exhaust side with camshaft adjuster**

- Tighten camshaft adjuster of exhaust camshaft to specified initial torque ⇒ [page 176](#) .

**Continued for all vehicles**

- Check valve timing ⇒ [“2.5 Checking valve timing”, page 109](#) .
- Adjust valve timing ⇒ [“2.6 Adjusting valve timing”, page 115](#) .
- Tighten camshaft adjuster on inlet camshaft to specified final torque ⇒ [Fig. “””, page 166](#) .

**Exhaust side with toothed belt sprocket**

- Tighten toothed belt sprocket of exhaust camshaft to specified final torque ⇒ [page 176](#) .

**Exhaust side with camshaft adjuster**

- Tighten camshaft adjuster of exhaust camshaft to specified final torque. ⇒ [page 172](#)

Further assembly is carried out in the reverse order of removal.

**Specified torques:**

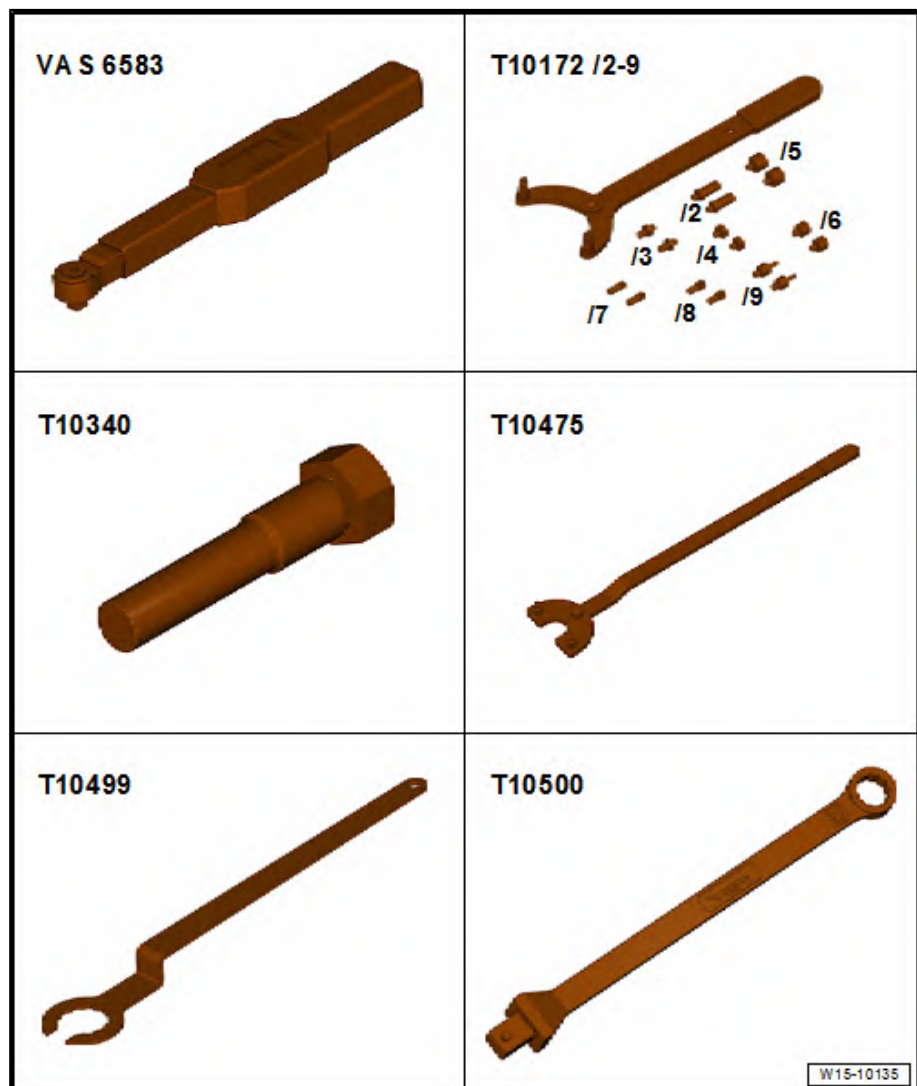
- ⇒ [“1.1 Assembly overview - poly V-belt drive”, page 34](#)
- ⇒ [“2.1 Assembly overview - toothed belt cover”, page 91](#)
- ⇒ [“2.2 Assembly overview - toothed belt”, page 92](#)



- ⇒ [Fig. “Plug for TDC drilling in cylinder block at rear – specified torque”](#), page 52
- ⇒ [“1.2 Assembly overview - camshaft housing”](#), page 78
- ⇒ [“3.1 Assembly overview - crankcase breather system”](#), page 209
- ⇒ [“2.1 Assembly overview - coolant pump, thermostat”](#), page 232
- ⇒ [“1.1 Assembly overview - turbocharger”](#), page 270
- ⇒ [“2.1 Assembly overview - charge air system”](#), page 283
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation

## 2.8 Removing and installing toothed belt

Special tools and workshop equipment required



- ◆ Torque wrench - VAS 6583-
- ◆ Counterhold - T10172- with adapter -T10172/1-
- ◆ Locating bolt - T10340-
- ◆ Counter-hold tool - T10475-





- ◆ Special wrench, 30 mm - T10499-
- ◆ Insert tool - T10500-
- ◆ Release tool - T10527-
- ◆ Release tool - T10527/1-

### Removing

- Set piston of no. 1 cylinder to "TDC" position.  
⇒ ["4.7 Setting piston to TDC position", page 71](#)
- Remove upper part of toothed belt guard  
⇒ ["2.3.1 Removing and installing upper toothed belt guard", page 95](#).
- Remove lower toothed belt guard  
⇒ ["2.3.2 Removing and installing lower toothed belt guard", page 95](#).
- Loosen plug and securing bolt for camshaft adjuster on inlet side  
⇒ ["3.3 Removing and installing camshaft adjuster", page 157](#).

### Exhaust side with toothed belt sprocket

- Loosen securing bolt of toothed belt pulley on exhaust side by approx. one turn ⇒ [page 175](#).

### Exhaust side with camshaft adjuster

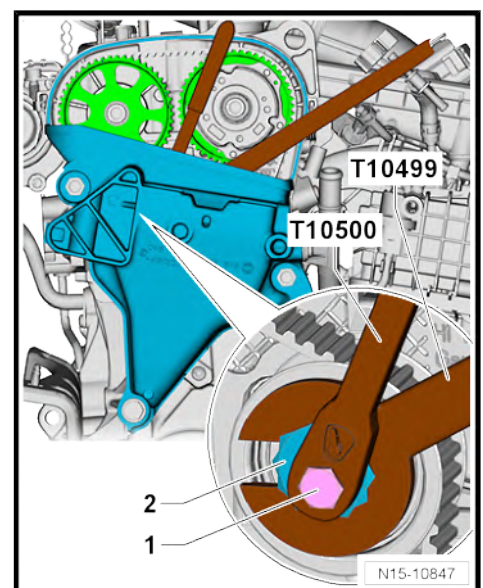
- Loosen securing bolt of camshaft adjuster on exhaust side by approx. one turn ⇒ [page 170](#).

### Continuation for all vehicles



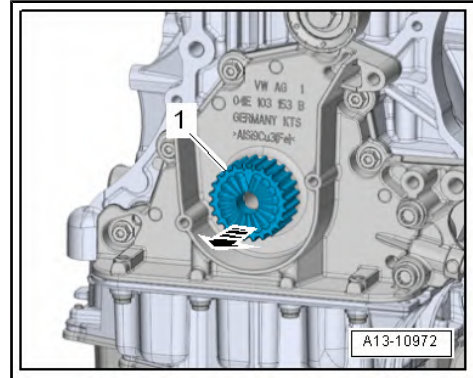
#### Note

- ◆ *If a used toothed belt runs in the opposite direction when it is refitted, it may break.*
- ◆ *Before removing, mark direction of rotation of toothed belt with chalk or felt-tipped pen for re-installation.*
- Loosen securing bolt of tensioning roller -1- using insert tool, 13 mm - T10500- .
- Release tension on tensioning roller at eccentric -2- using wrench - T10499- .
- Remove toothed belt.





- Detach crankshaft pulley -1- -arrow-.



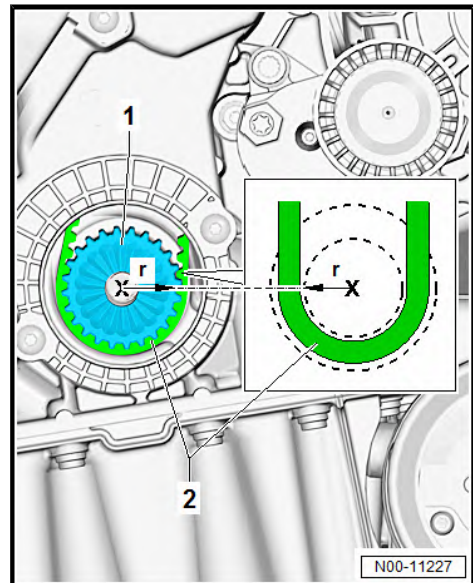
Bend radius of toothed belt

**!** NOTICE

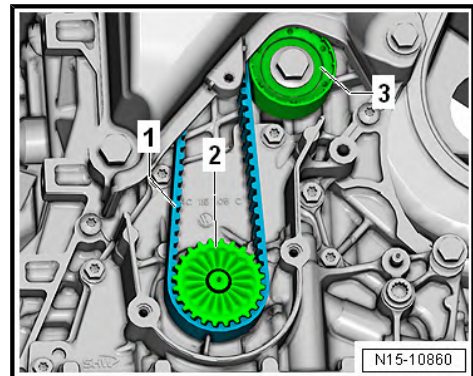
Risk of damage to toothed belt by bending it excessively. The toothed belt is made of glass fibre fabric which will be damaged if it is bent excessively.

- Never bend toothed belt to a radius less than  $r = 25$  mm.

Installing



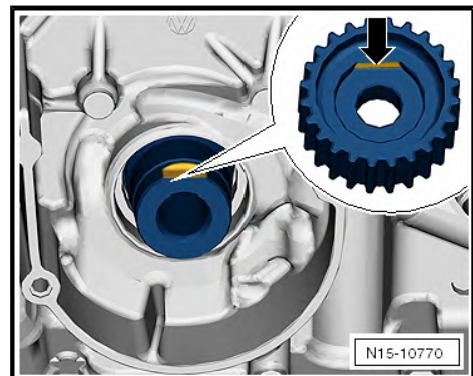
- Fit toothed belt -1- together with crankshaft pulley -2- onto crankshaft journal.



- Milled surface of crankshaft sprocket -arrow- must be positioned on milled surface of crankshaft stub.
- Contact surface between poly V-belt pulley and crankshaft toothed belt pulley must be free of oil and grease.

Exhaust side with toothed belt sprocket

- Renew bolt -2- and screw in loosely.

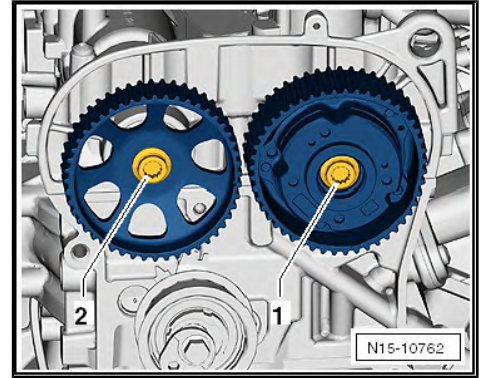




- Renew bolt -1- and screw in loosely.

#### Exhaust side with camshaft adjuster

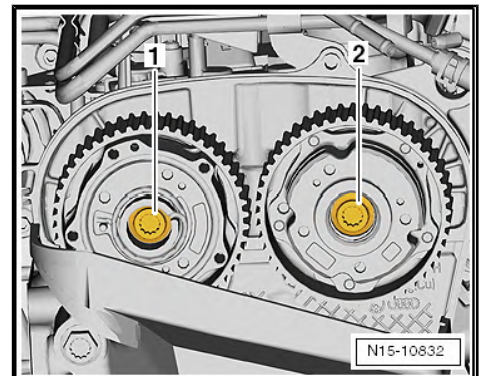
- Renew bolt -2- and screw in loosely.



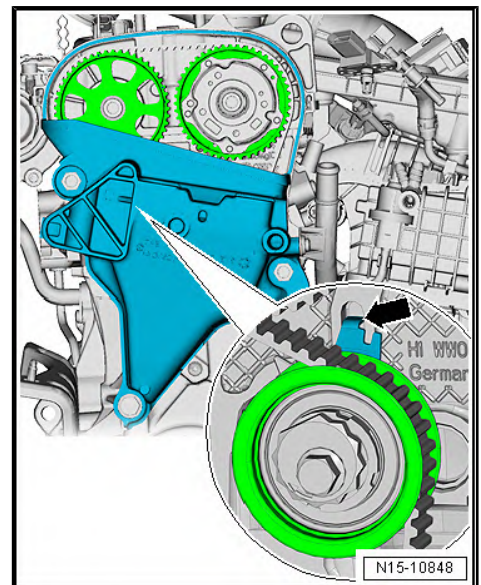
- Renew bolt -1- and screw in loosely.

#### Continued for all vehicles

- It should just be possible to turn camshaft pulleys on camshafts but no rocking is permissible.

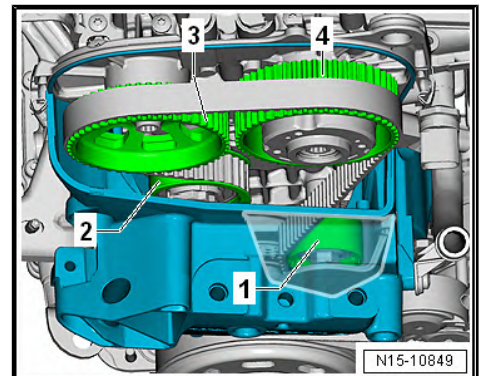


- Metal tab -arrow- of tensioning roller must engage in recess in cylinder head.



#### Fit toothed belt in prescribed sequence:

- Pull toothed belt upwards and fit on idler pulley -1-, tensioning roller -2- and camshaft toothed belt pulleys -3- and -4-.





- Rotate eccentric -2- of tensioning roller using special wrench, 30mm -T10499- in -direction of arrow- until adjustment pointer -3- is located approx. 10 mm to the right from adjustment window.
- Turn eccentric adjuster back until adjustment indicator is positioned exactly in adjustment window.



#### Note

- ◆ *Torque wrench - VAS 6583- must be used for tightening.*
- ◆ *When setting specified torque on torque wrench - VAS 6583-, length must be entered in torque wrench.*
- Hold eccentric in that position and tighten bolt -1- to 25 Nm using insert tool - T10500- with torque wrench - VAS 6583- .



#### Note

*Turning the engine further or running the engine may lead to slight differences in the position of the adjustment indicator -3- in relation to the adjustment window. The deviations do not affect the toothed belt tension or the timing.*

- Install lower part of toothed belt guard  
⇒ [“2.3.2 Removing and installing lower toothed belt guard”, page 95](#) .
- Tighten camshaft adjuster on inlet camshaft to specified initial torque ⇒ [Fig. “””, page 166](#) .

#### Exhaust side with toothed belt sprocket

- Tighten toothed belt sprocket of exhaust camshaft to specified initial torque ⇒ [page 176](#) .

#### Exhaust side with camshaft adjuster

- Tighten camshaft adjuster of exhaust camshaft to specified initial torque ⇒ [page 176](#) .

#### Continued for all vehicles

- Check valve timing ⇒ [“2.5 Checking valve timing”, page 109](#) .
- Adjust valve timing ⇒ [“2.6 Adjusting valve timing”, page 115](#) .
- Tighten camshaft adjuster on inlet camshaft to specified final torque ⇒ [Fig. “””, page 166](#) .

#### Exhaust side with toothed belt sprocket

- Tighten toothed belt sprocket of exhaust camshaft to specified final torque ⇒ [page 176](#) .

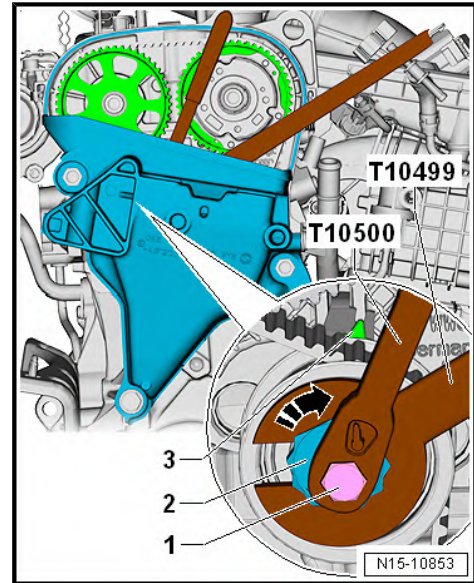
#### Exhaust side with camshaft adjuster

- Tighten camshaft adjuster of exhaust camshaft to specified final torque. ⇒ [page 172](#)

Further assembly is carried out in the reverse order of removal.

#### Specified torques:

- ⇒ [“1.1 Assembly overview - poly V-belt drive”, page 34](#)
- ⇒ [“2.1 Assembly overview - toothed belt cover”, page 91](#)
- ⇒ [“2.2 Assembly overview - toothed belt”, page 92](#)





- ⇒ [Fig. “Plug for TDC drilling in cylinder block at rear – specified torque”](#), page 52
- ⇒ [“1.2 Assembly overview - camshaft housing”](#), page 78
- ⇒ [“3.1 Assembly overview - crankcase breather system”](#), page 209
- ⇒ [“2.1 Assembly overview - coolant pump, thermostat”](#), page 232
- ⇒ [“1.1 Assembly overview - turbocharger”](#), page 270
- ⇒ [“2.1 Assembly overview - charge air system”](#), page 283
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation



### 3 Valve gear

⇒ [“3.1 Assembly overview - valve gear”, page 144](#)

⇒ [“3.2 Removing and installing camshaft oil seal”, page 145](#)

⇒ [“3.3 Removing and installing camshaft adjuster”, page 157](#)

⇒ [“3.4 Removing and installing toothed belt pulley”, page 173](#)

⇒ [“3.5 Removing and installing camshaft control valve 1 N205”, page 178](#)

⇒ [“3.6 Removing and installing exhaust camshaft control valve 1 N318”, page 179](#)

⇒ [“3.7 Removing and installing valve stem seals”, page 179](#)

⇒ [“3.8 Removing and installing cam actuators”, page 187](#)

#### 3.1 Assembly overview - valve gear

##### 1 - Inlet valve

- Do not rework. Only lapping in is permitted.
- Valve dimensions  
⇒ [“4.3 Valve dimensions”, page 192](#)
- Checking valve guides  
⇒ [“4.1 Checking valve guides”, page 191](#)

##### 2 - Outlet valve

- Do not rework. Only lapping in is permitted.
- Valve dimensions  
⇒ [“4.3 Valve dimensions”, page 192](#)
- Checking valve guides  
⇒ [“4.1 Checking valve guides”, page 191](#)

##### 3 - Cylinder head

##### 4 - Valve stem seal

- Renewing  
⇒ [“3.7 Removing and installing valve stem seals”, page 179](#)

##### 5 - Valve springs

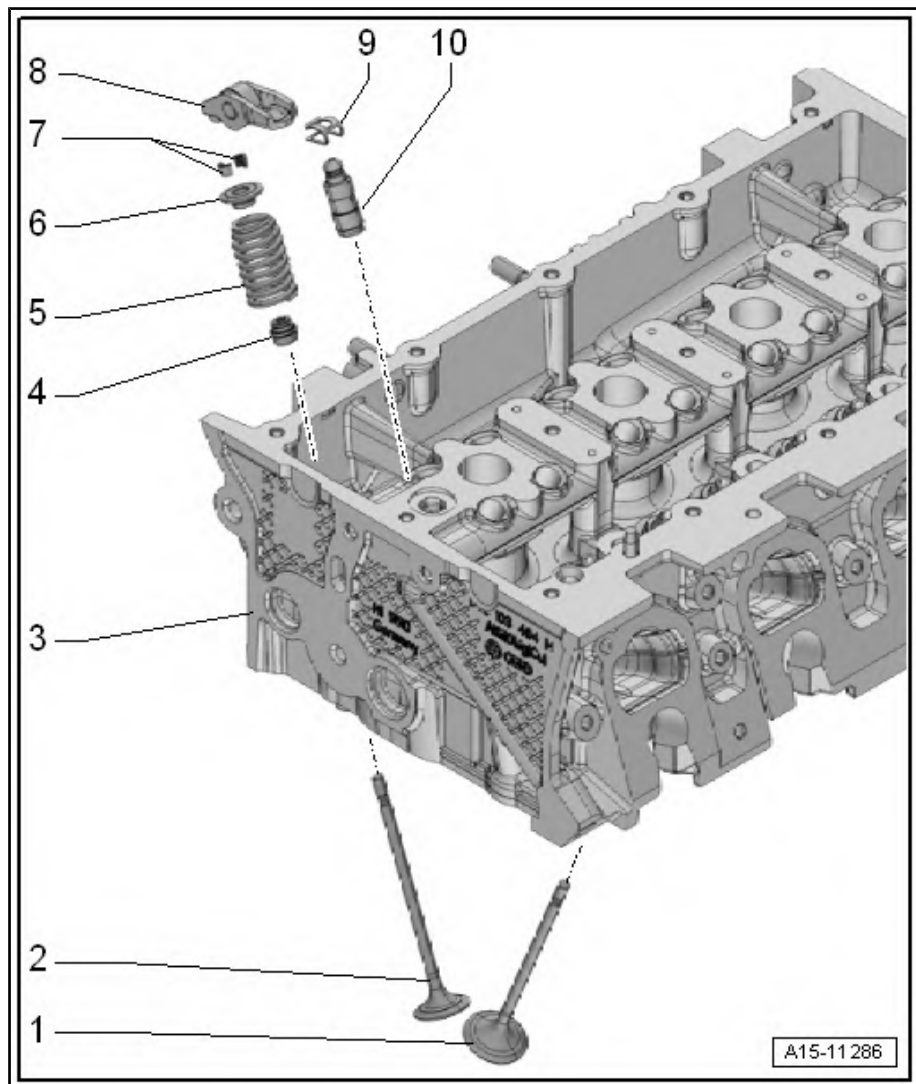
- Fitting position  
⇒ [page 145](#)

##### 6 - Valve spring plate

##### 7 - Valve cotters

##### 8 - Roller rocker fingers

- Removing and installing  
⇒ [“1.4 Removing and installing camshaft housing”, page 85](#)
- Mark installation position for re-installation.
- Check roller bearing for ease of movement.
- Lubricate contact surfaces before installing.





### 9 - Retaining clip

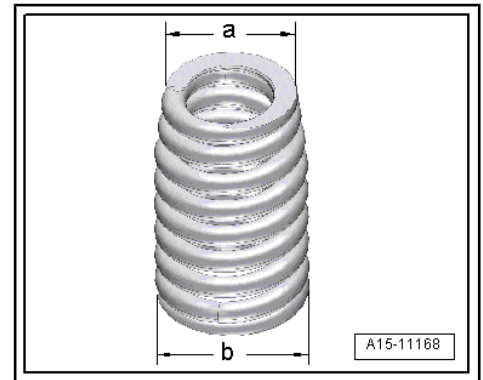
- For hydraulic compensation element.

### 10 - Hydraulic compensation element

- Do not interchange
- Oil contact surface

### Installation position of valve spring

- The end with smaller diameter -a- must face towards valve spring plate.
- The end with larger diameter -b- must face towards cylinder head.



## 3.2 Removing and installing camshaft oil seal

⇒ [“3.2.1 Removing and installing camshaft oil seal, for inlet camshaft on belt pulley side, exhaust side with toothed belt sprocket”, page 145](#)

⇒ [“3.2.2 Removing and installing camshaft oil seal, for inlet camshaft on belt pulley side, exhaust side with camshaft adjuster”, page 147](#)

⇒ [“3.2.3 Removing and installing camshaft oil seal, for exhaust camshaft on belt pulley side, exhaust side with toothed belt sprocket”, page 149](#)

⇒ [“3.2.4 Removing and installing camshaft oil seal, for exhaust camshaft on belt pulley side, exhaust side with camshaft adjuster”, page 151](#)

⇒ [“3.2.5 Removing and installing exhaust camshaft oil seal, gear-box end, vehicles with Active Cylinder Management”, page 153](#)

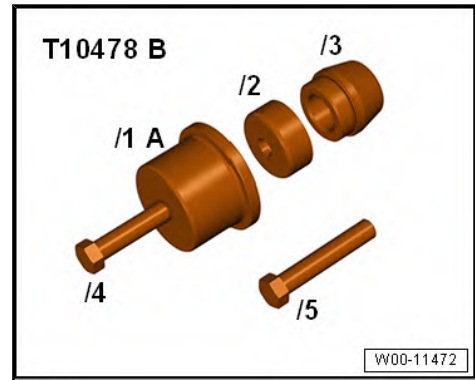
⇒ [“3.2.6 Removing and installing exhaust camshaft oil seal, gear-box end; exhaust side with toothed belt pulley on control end”, page 155](#)

### 3.2.1 Removing and installing camshaft oil seal, for inlet camshaft on belt pulley side, exhaust side with toothed belt sprocket

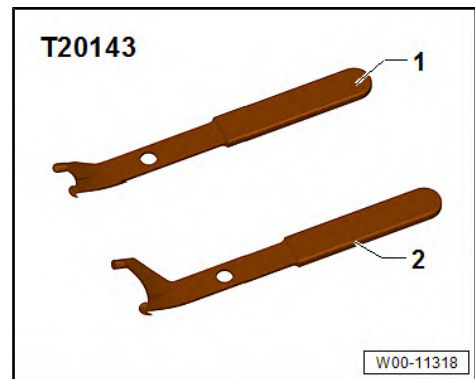
Special tools and workshop equipment required



- ◆ Assembly tool - T10478 B-

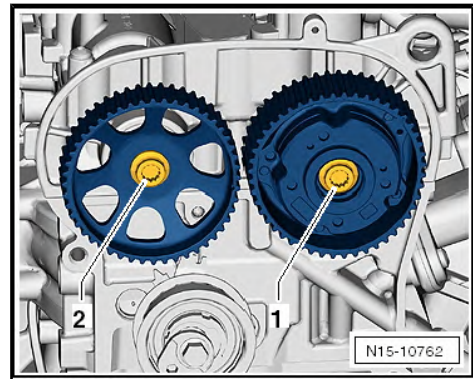


- ◆ Extractor hook - T20143-



### Removing

- Remove toothed belt from camshafts  
⇒ ["2.7 Removing toothed belt from camshaft", page 133](#) .
- Unscrew bolt -1- and remove camshaft toothed belt pulley.



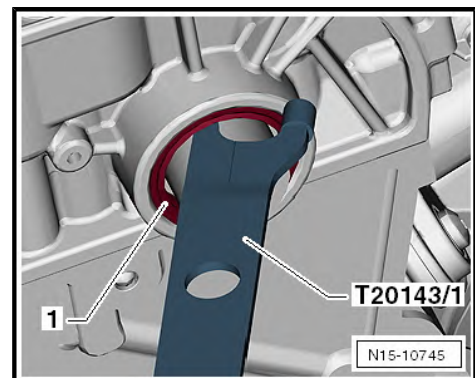
- Remove seal -1- using extractor hook -T20143/1- .

### Installing



#### Note

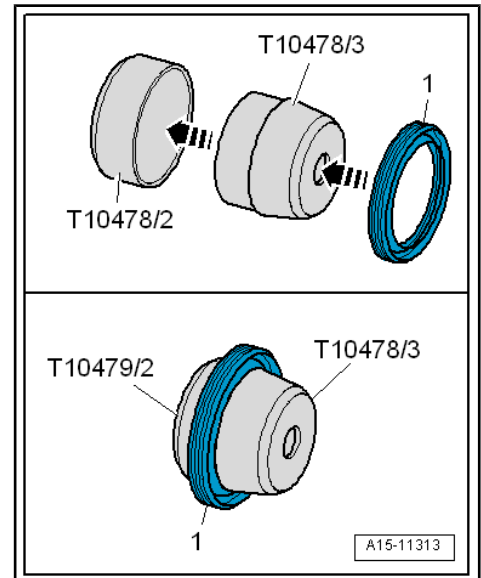
*Do not lubricate new seal.*



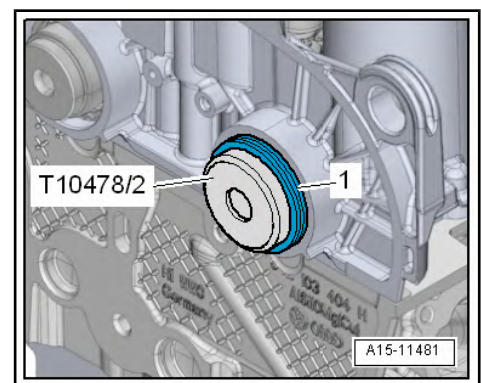




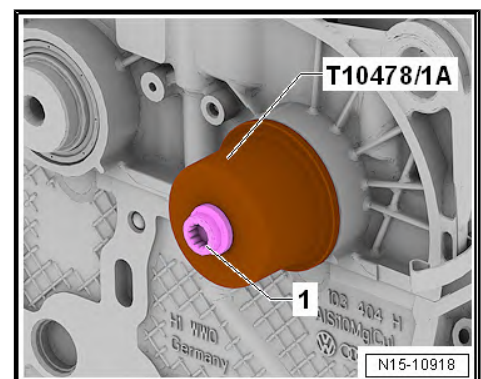
- Fit seal -1- over fitting sleeve -T10478/3- onto guide sleeve -T10478/2- .
- Installation position: closed end of seal faces fitting sleeve.
- Separate fitting sleeve and guide sleeve.



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



- Draw in seal to stop using thrust piece -T10478/1A- and bolt -1- for camshaft pulley.
- Fit toothed belt onto camshaft sprockets (adjust valve timing) ⇒ ["2.7 Removing toothed belt from camshaft", page 133](#) .

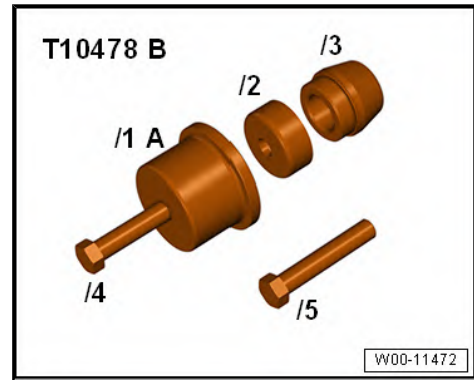


### 3.2.2 Removing and installing camshaft oil seal, for inlet camshaft on belt pulley side, exhaust side with camshaft adjuster

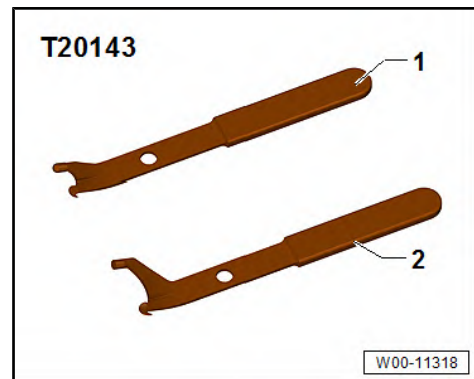
Special tools and workshop equipment required



- ◆ Assembly tool - T10478 B-

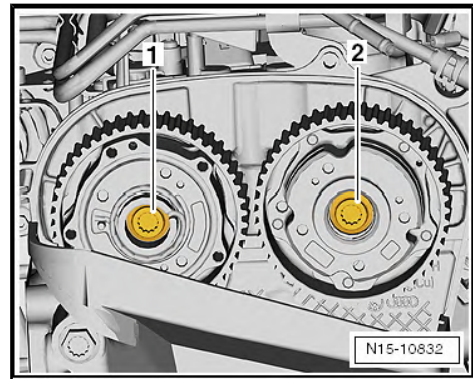


- ◆ Extractor hook - T20143-



### Removing

- Remove toothed belt from camshafts  
⇒ ["2.7 Removing toothed belt from camshaft", page 133](#) .
- Unscrew bolt -2- and remove camshaft toothed belt pulley.



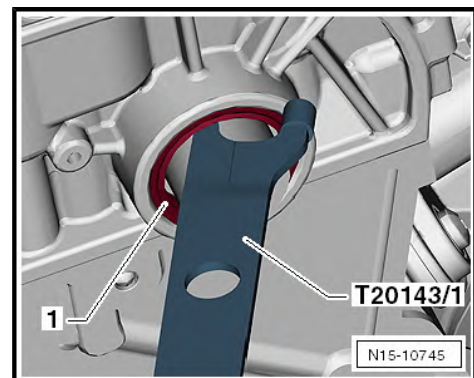
- Remove seal -1- using extractor hook -T20143/1- .

### Installing



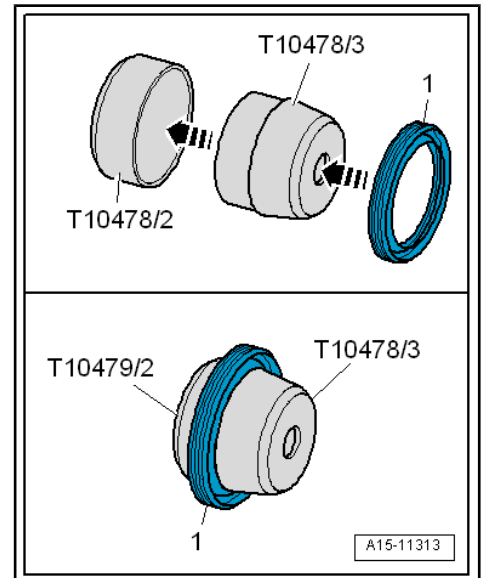
#### Note

*Do not lubricate new seal.*

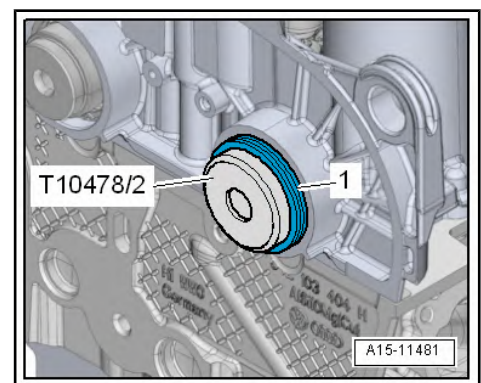




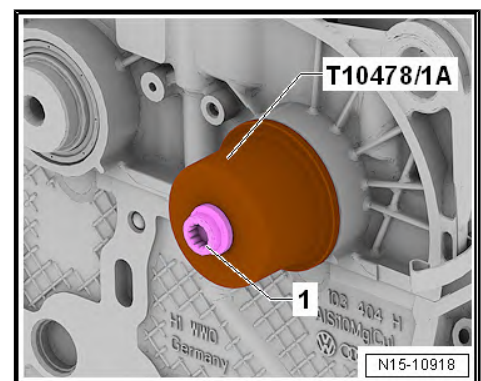
- Fit seal -1- over fitting sleeve -T10478/3- onto guide sleeve - T10478/2- .
- Installation position: closed end of seal faces fitting sleeve.
- Separate fitting sleeve and guide sleeve.



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



- Draw in seal to stop using thrust piece -T10478/1A- and bolt -1- for camshaft pulley.
- Fit toothed belt onto camshaft sprockets (adjust valve timing)  
 ⇒ ["2.7 Removing toothed belt from camshaft", page 133](#) .

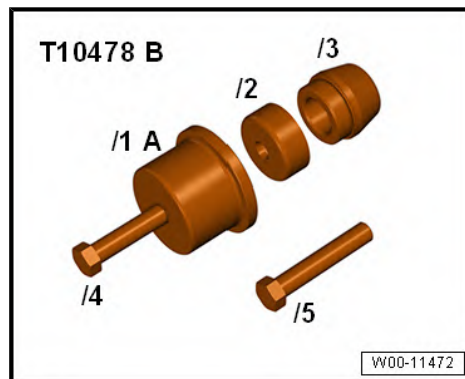


### 3.2.3 Removing and installing camshaft oil seal, for exhaust camshaft on belt pulley side, exhaust side with toothed belt sprocket

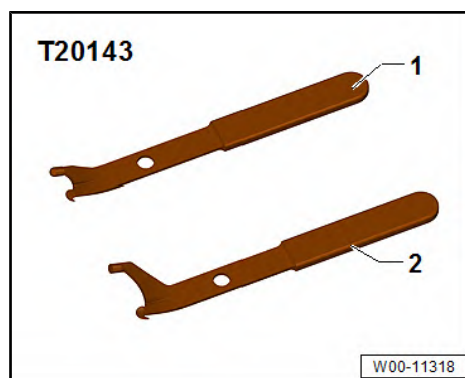
Special tools and workshop equipment required



- ◆ Assembly tool - T10478 B-

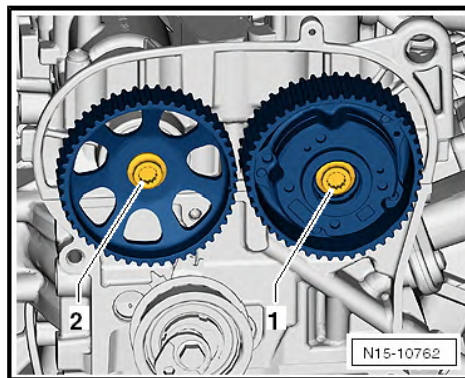


- ◆ Extractor hook - T20143-



### Removing

- Remove toothed belt from camshafts  
⇒ ["2.7 Removing toothed belt from camshaft", page 133](#) .
- Unscrew bolt -2- and remove camshaft toothed belt pulley.



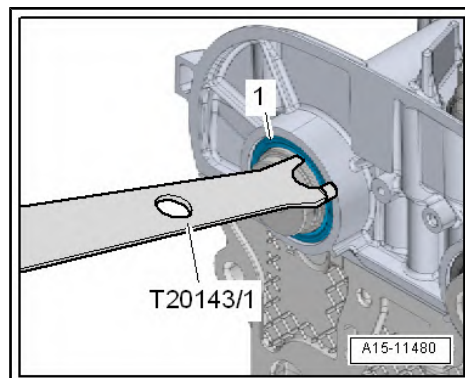
- Remove seal -1- using extractor hook -T20143/1- .

### Installing



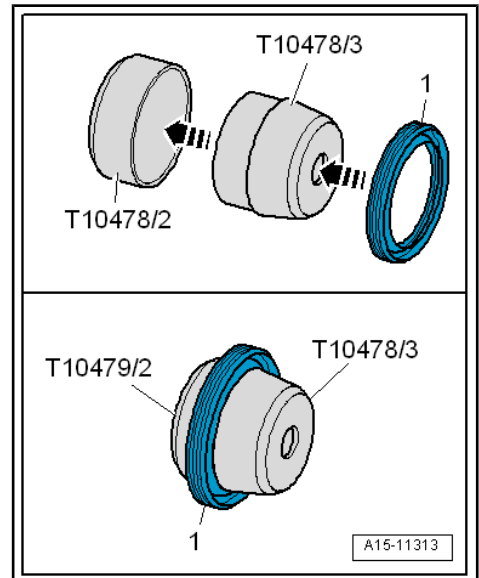
#### Note

*Do not lubricate new seal.*

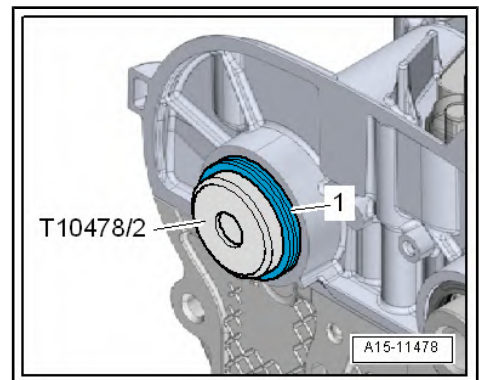




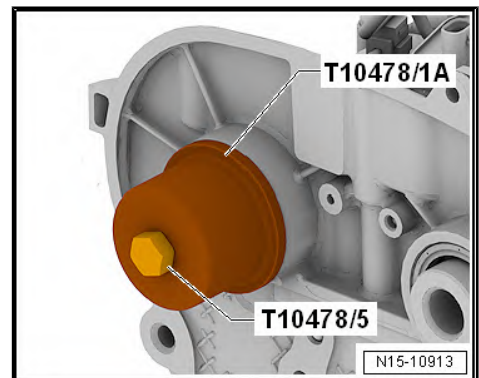
- Fit seal -1- over fitting sleeve -T10478/3- onto guide sleeve -T10478/2- .
- Installation position: closed end of seal faces fitting sleeve.
- Separate fitting sleeve and guide sleeve.



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



- Pull in thrust piece -T10478/1A- with bolt -T10478/5- as far as stop.
- Fit toothed belt onto camshaft sprockets (adjust valve timing)  
 ⇒ ["2.7 Removing toothed belt from camshaft", page 133](#) .

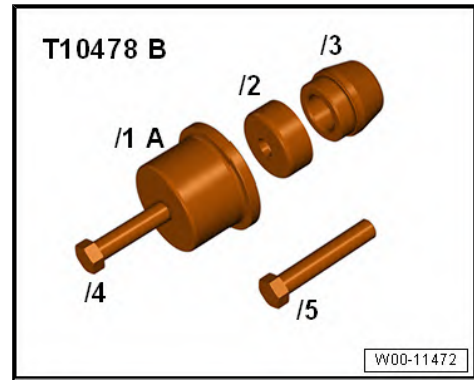


### 3.2.4 Removing and installing camshaft oil seal, for exhaust camshaft on belt pulley side, exhaust side with camshaft adjuster

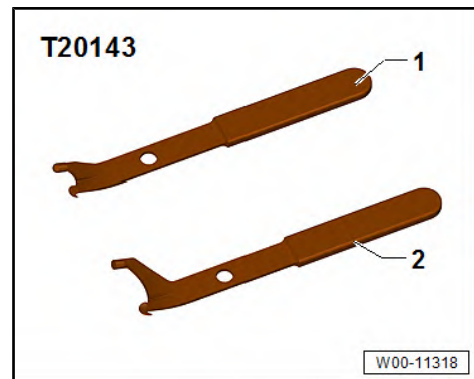
Special tools and workshop equipment required



- ◆ Assembly tool - T10478 B-

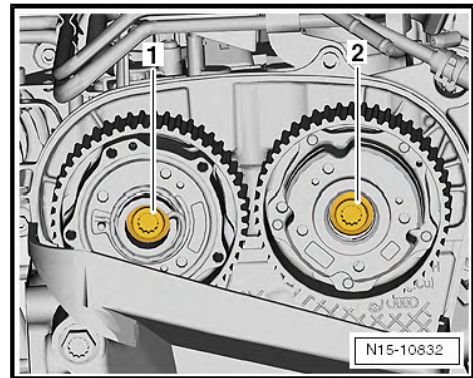


- ◆ Extractor hook - T20143-



### Removing

- Remove engine support  
⇒ ["1.6 Removing and installing engine support", page 43](#) .
- Remove toothed belt from camshafts  
⇒ ["2.7 Removing toothed belt from camshaft", page 133](#) .
- Unscrew bolt -1- and remove camshaft toothed belt pulley.



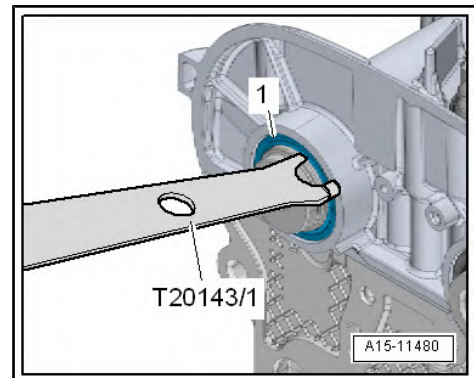
- Remove seal -1- using extractor hook -T20143/1- .

### Installing



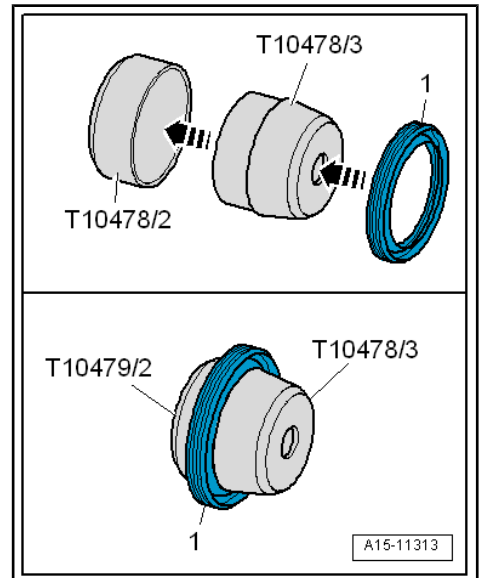
#### Note

*Do not lubricate new seal.*

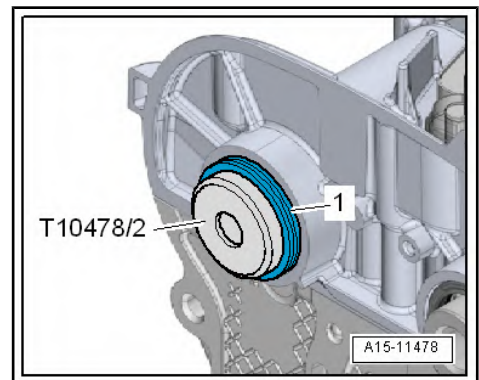




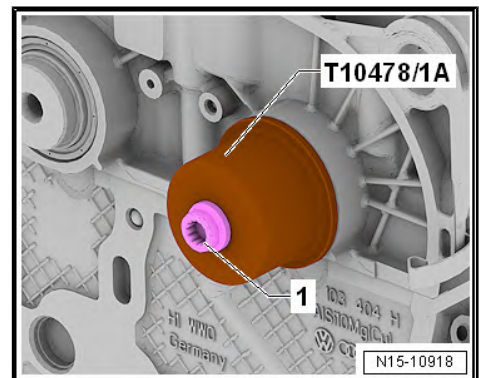
- Fit seal -1- over fitting sleeve -T10478/3- onto guide sleeve - T10478/2- .
- Installation position: closed end of seal faces fitting sleeve.
- Separate fitting sleeve and guide sleeve.



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



- Draw in thrust piece -T10478/1A- to stop using bolt -1- for camshaft pulley.
- Fit toothed belt onto camshaft sprockets (adjust valve timing)  
 ⇒ [“2.7 Removing toothed belt from camshaft”, page 133](#) .
- Installing engine support  
 ⇒ [“1.6 Removing and installing engine support”, page 43](#) .



### 3.2.5 Removing and installing exhaust camshaft oil seal, gearbox end, vehicles with Active Cylinder Management

Special tools and workshop equipment required

- ◆ Assembly tool - T10479-
- ◆ Assembly sleeve - T10505-



## Removing

- Remove toothed belt pulley for coolant pump  
⇒ ["2.7 Removing and installing toothed belt pulley for coolant pump"](#), page 245 .
- Carefully fit extractor hook -T20143/1- between camshaft and seal -1-.
- Lever out seal.

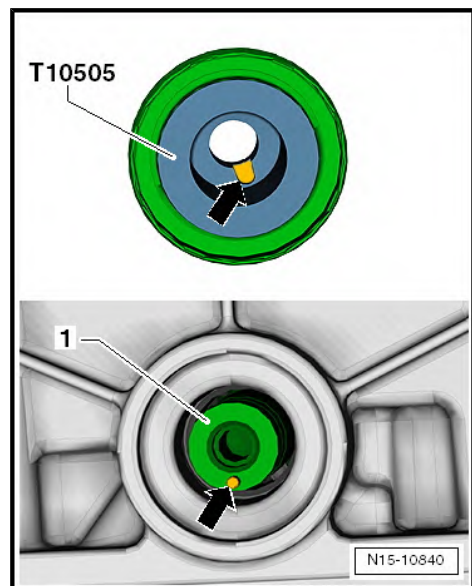
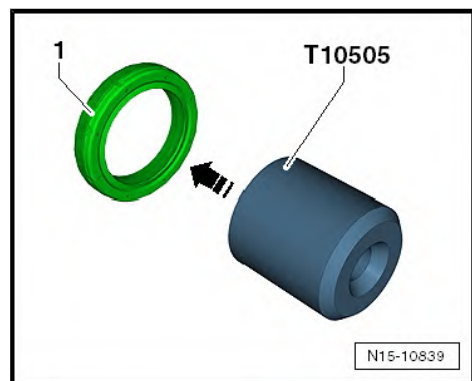
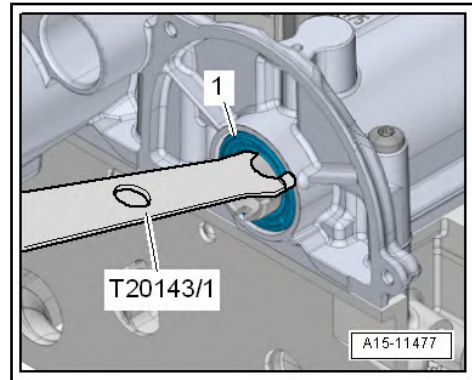
## Installing



### Note

*Do not lubricate new seal.*

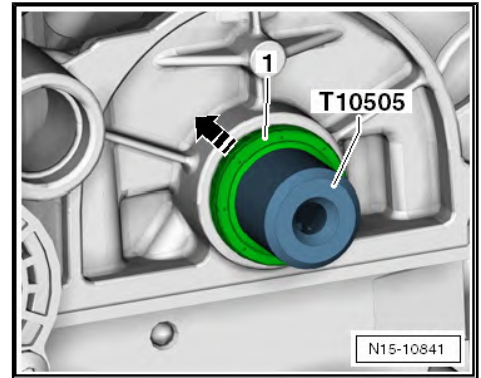
- Push assembly sleeve - T10505- in direction of -arrow- into seal -1-.
- Installation position: closed end of seal faces assembly sleeve.
- Fit assembly sleeve - T10505- together with seal onto exhaust camshaft -1-.
- Pin on camshaft -1- must be positioned in recess on assembly sleeve -arrows-.



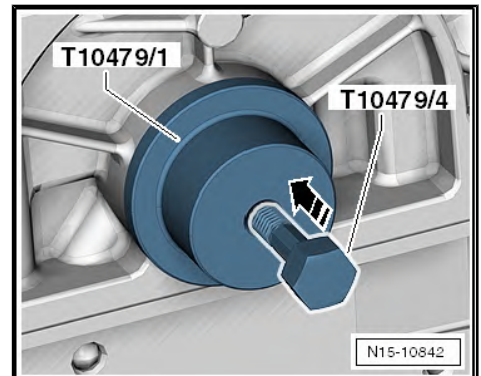




- Push seal -1- in direction of -arrow- against camshaft housing.



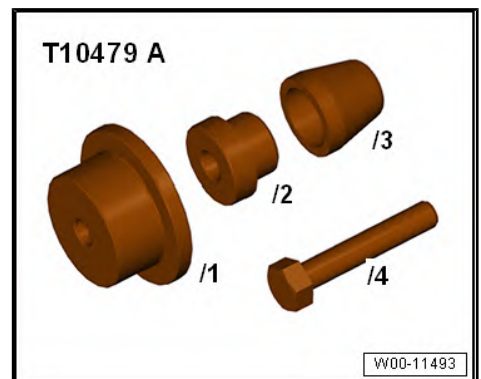
- Pull in oil seal onto stop using thrust piece - T10479/1- and bolt - T10479/4- .
- Install toothed belt pulley for coolant pump  
⇒ ["2.7 Removing and installing toothed belt pulley for coolant pump", page 245](#) .



### 3.2.6 Removing and installing exhaust camshaft oil seal, gearbox end; exhaust side with toothed belt pulley on control end

Special tools and workshop equipment required

- ◆ Assembly tool - T10479 A-



#### Removing

- Remove toothed belt pulley for coolant pump  
⇒ ["2.7 Removing and installing toothed belt pulley for coolant pump", page 245](#) .



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



**Note**

*Risk of chemical damage to coolant pump seal from oil ingress between coolant pump and cylinder head.*

- Cover coolant pump with a cloth to collect any escaping oil.
- Lever out seal.

**Installing**

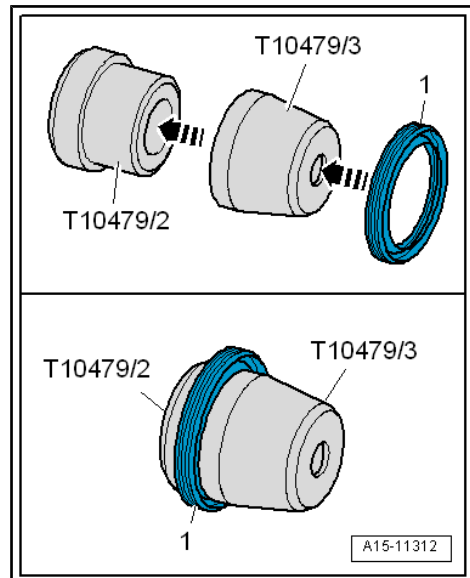
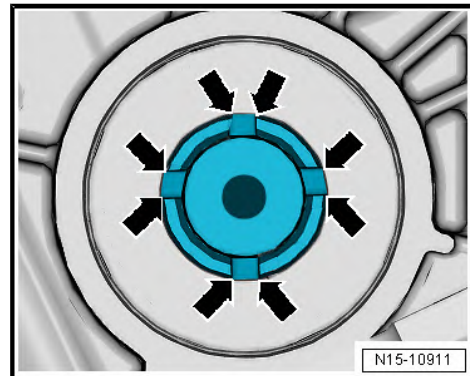
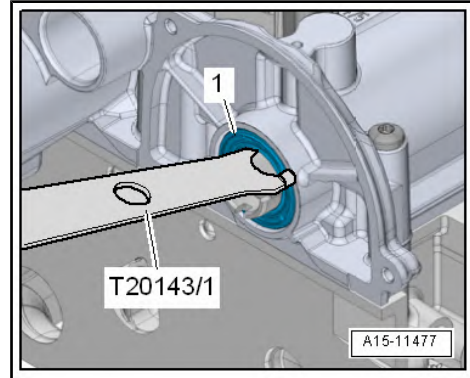
- Remove any burrs in the outer area of the grooves in the exhaust camshaft -arrows- using fine sandpaper (220 ... 1000 grain).



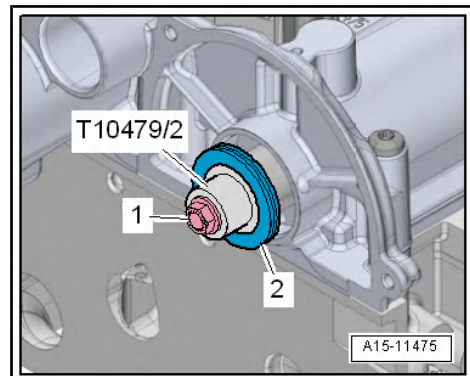
**Note**

*Do not lubricate new seal.*

- Fit seal -1- over fitting sleeve -T10479/3- onto guide sleeve -T10479/2- .
- Installation position: closed end of seal faces fitting sleeve.
- Separate fitting sleeve and guide sleeve.

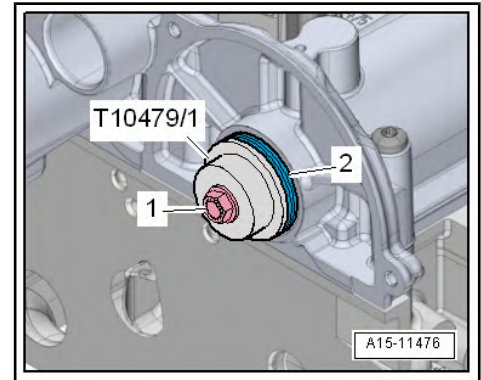


- Fit guide sleeve -T10479/2- with oil seal -2- centrally to camshaft.
- Secure guide sleeve onto camshaft using bolt -1- for coolant pump drive sprocket.
- Push seal onto camshaft and unbolt guide sleeve.





- Draw in seal -2- to stop using thrust piece -T10479/1- and bolt -1- for toothed belt pulley for coolant pump.
- Install toothed belt pulley for coolant pump  
⇒ [“2.7 Removing and installing toothed belt pulley for coolant pump”, page 245](#) .



### 3.3 Removing and installing camshaft adjuster

⇒ [“3.3.1 Removing and installing inlet side camshaft adjuster, exhaust side with camshaft adjuster”, page 157](#)

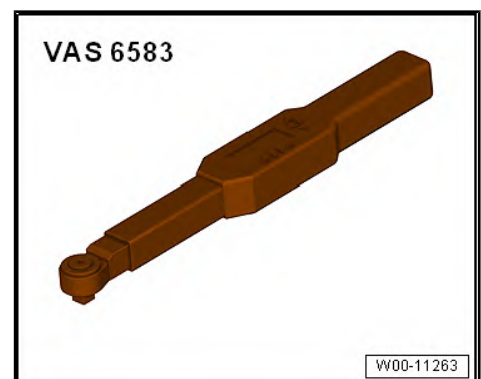
⇒ [“3.3.2 Removing and installing inlet side camshaft adjuster, exhaust side with toothed belt sprocket”, page 163](#)

⇒ [“3.3.3 Removing and installing camshaft adjuster for exhaust camshaft”, page 168](#)

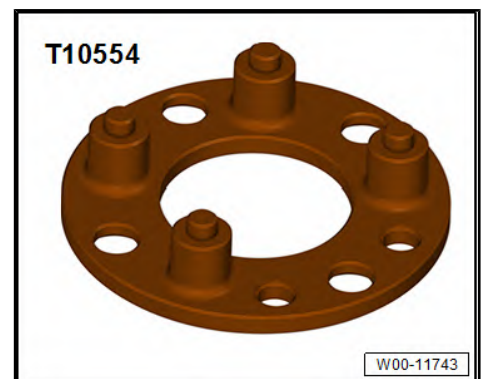
#### 3.3.1 Removing and installing inlet side camshaft adjuster, exhaust side with camshaft adjuster

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-.

**Procedure**

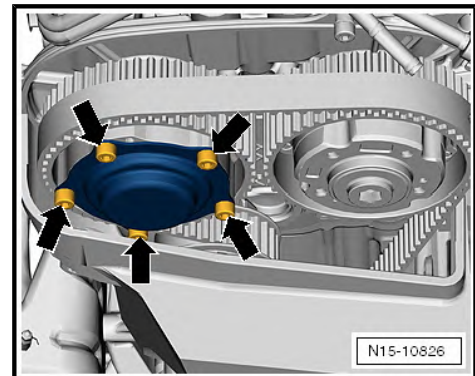
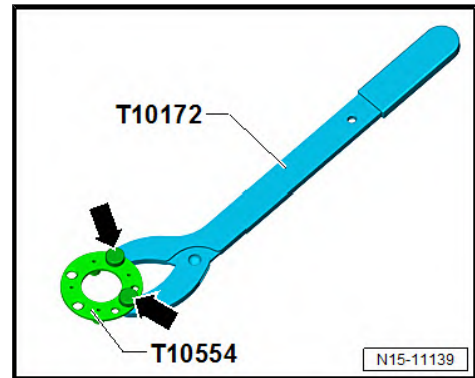
**Removing**



**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.

- Unscrew bolts -arrows- and remove cover from camshaft adjuster for exhaust camshaft.



**Fitting counter-hold tool - T10554-**

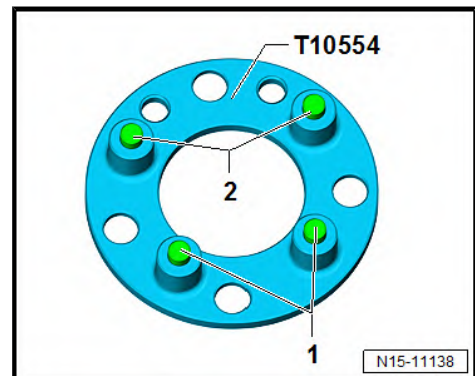
- The contours of pins -1- and -2- of counter-hold tool - T10554/1- are not distributed evenly on the bolt circle.
- They correspond to the contour of the bolt circle in the camshaft adjuster.



**NOTICE**

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

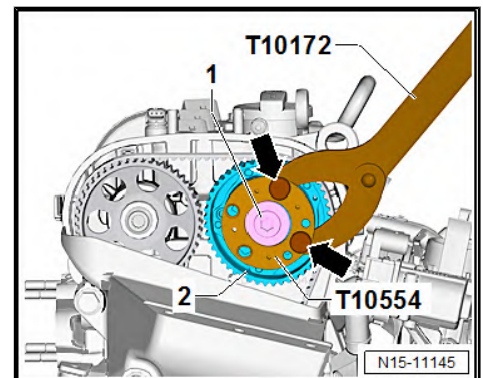
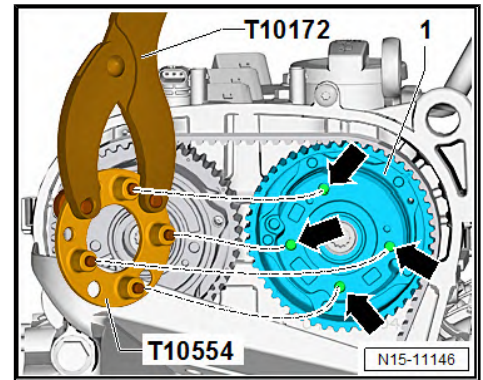
- **Never use the camshaft clamp for counter holding.**





Loosening camshaft adjuster on inlet side:

- Set piston in cylinder no. 1 to TDC position  
⇒ ["4.7 Setting piston to TDC position", page 71](#) .
- Fit counter-hold tool - T10554- with counter-hold tool - T10172- to camshaft pulley -1- as shown in illustration.
- The pins must be inserted properly into holes -arrows-.
- Fit counter-hold tool - T10554- so that it rests flat against camshaft adjuster -1-.
- Hold camshaft in position using counterhold tool - T10554- and counterhold tool - T10172- .
- Loosen plug -1-, and unscrew it.



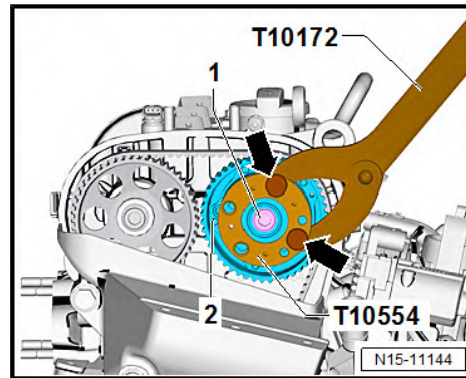


- Fit counter-hold tool - T10554- with counter-hold tool - T10172- again, to loosen securing bolt -1- of camshaft adjuster.
- Loosen bolt -1- of camshaft adjuster -2-.
- Loosen securing bolt of camshaft adjuster on exhaust side => ["3.3.3 Removing and installing camshaft adjuster for exhaust camshaft", page 168](#) .



#### Note

*Do not relieve tension from toothed belt, and do not remove toothed belt from camshafts when adjusting valve timing. Only loosen camshaft adjuster.*



#### Removing camshaft adjuster of inlet camshaft:

- Detach toothed belt from camshafts.
- Unscrew securing bolt -1- of camshaft adjuster, and remove camshaft adjuster -2-.

#### Installing

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



#### Note

- ◆ *Before installing the camshaft adjuster, ensure that the guide sleeve is inserted in the camshaft.*
- ◆ *Renew bolts that are tightened with turning further angle.*
- ◆ *Check O-ring of plug and cap for damage, and renew if necessary; see => [Electronic parts catalogue \(ETKA\)](#) .*



- Renew bolts -1- and -2- for both camshaft adjusters and screw them in onto stop.
- It should just be possible to turn camshaft pulleys on camshafts but no rocking is permissible.
- Fit toothed belt onto camshafts ⇒ [page 135](#) .
- Adjust valve timing ⇒ [“2.6 Adjusting valve timing”, page 115](#) .

**Tightening camshaft adjuster of inlet camshaft to specified initial torque**



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

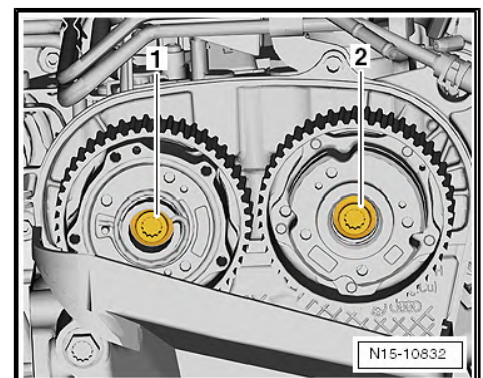
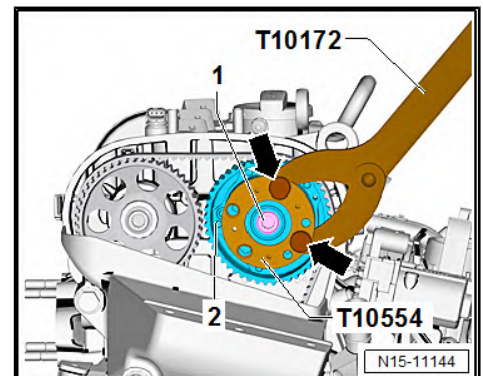
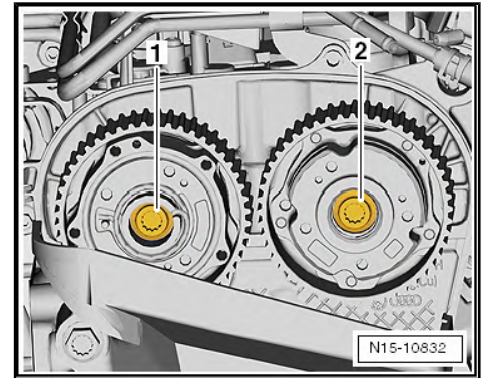
Stage	Securing bolt for camshaft adjuster, inlet side	Torque setting
1.	-1-	18 Nm
2.	-1-	50 Nm

- Hold exhaust camshaft in position using counterhold tool - T10554- and counterhold tool - T10172- .

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

Stage	Securing bolt for camshaft adjuster, exhaust side	Torque setting
1.	-1-	18 Nm
2.	-1-	50 Nm

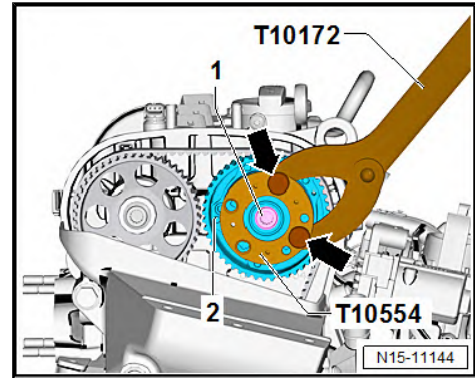
**Tightening camshaft adjuster to specified final torque**





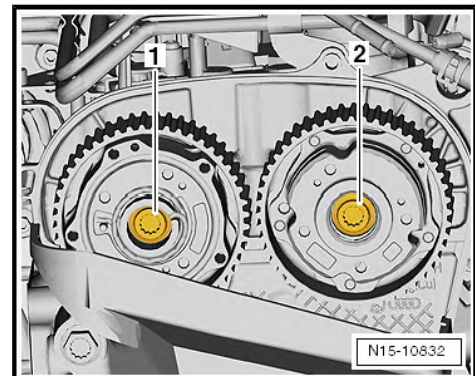
- Tighten bolt -1- for camshaft adjuster to final specified torque.

Stage	Securing bolt for camshaft adjuster, inlet side	Angle to turn bolts
1.	-1-	135°



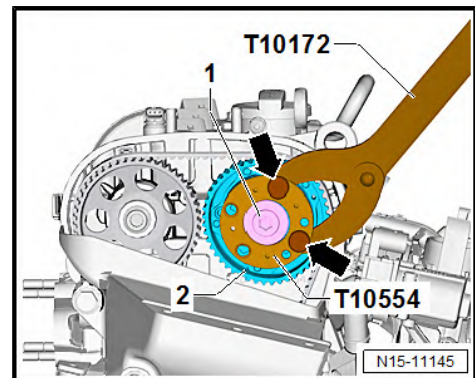
- Tighten securing bolt for camshaft adjuster on exhaust side -1- to final torque setting.

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



- Screw in plug -1-, and tighten it to specified torque.  
- Hold inlet camshaft in position using counter-hold tool - T10554- and counter-hold tool - T10172- .

Stage	Plug for camshaft adjuster	Torque setting
1.	-1-	20 Nm



### Installing

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



### Note

*Make sure to remove the camshaft clamp and the crankshaft locking pin before cranking the engine.*

### Torque settings

- ◆ ⇒ [“2.2 Assembly overview - toothed belt”, page 92](#)
- ◆ ⇒ [page 52](#)
- ◆ ⇒ [“1.2 Assembly overview - camshaft housing”, page 78](#)
- ◆ ⇒ [“3.1 Assembly overview - crankcase breather system”, page 209](#)
- ◆ ⇒ [“2.1 Assembly overview - charge air system”, page 283](#)
- ◆ ⇒ [“3.1 Assembly overview - valve gear”, page 144](#)
- ◆ ⇒ [“1.1 Assembly overview - turbocharger”, page 270](#)
- ◆ ⇒ [“2.1 Assembly overview - toothed belt cover”, page 91](#)

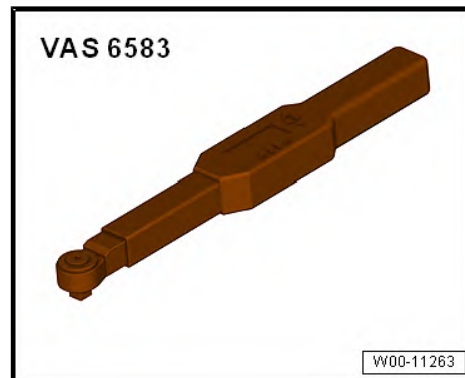




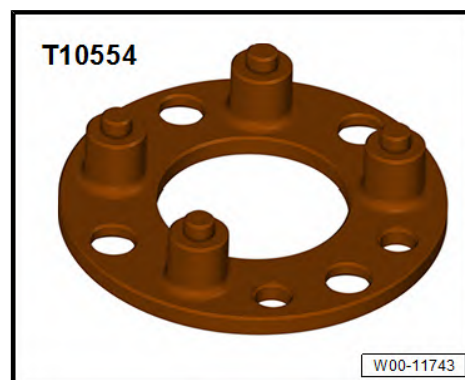
### 3.3.2 Removing and installing inlet side camshaft adjuster, exhaust side with toothed belt sprocket

#### 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-.

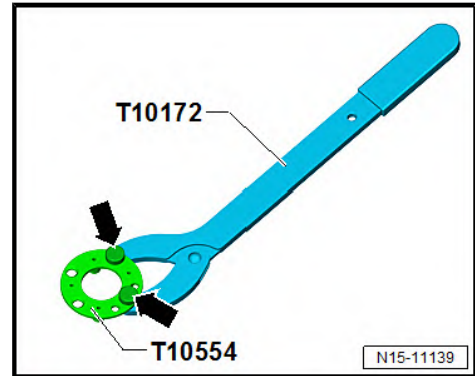
## Procedure

### 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.



### Fitting counter-hold tool - T10554-

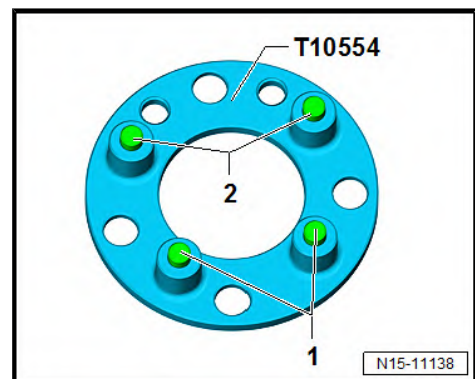
- The contours of pins -1- and -2- of counter-hold tool - T10554/1- are not distributed evenly on the bolt circle.
- They correspond to the contour of the bolt circle in the camshaft adjuster.



#### NOTICE

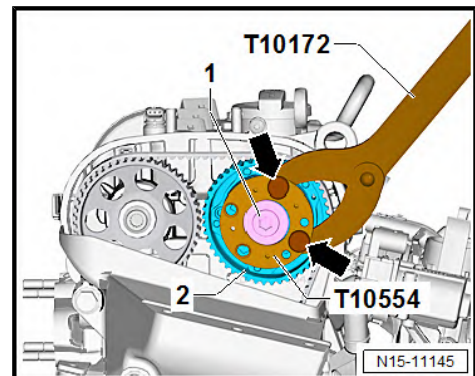
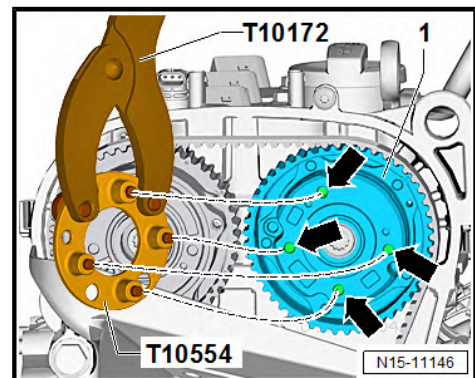
Risk of damage to camshaft caused by improper handling.

- Never use the camshaft clamp for counter holding.



### Loosening camshaft adjuster on inlet side:

- Set piston in cylinder no. 1 to TDC position  
⇒ ["4.7 Setting piston to TDC position", page 71](#) .
- Fit counter-hold tool - T10554- with counter-hold tool - T10172- to camshaft pulley -1- as shown in illustration.
- The pins must be inserted properly into holes -arrows-.
- Fit counter-hold tool - T10554- so that it rests flat against camshaft adjuster -1-.
- Hold inlet camshaft in position using counter-hold tool - T10554- and counter-hold tool - T10172- .
- Loosen plug -1-, and unscrew it.

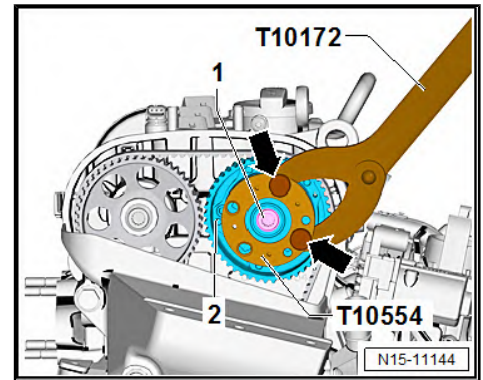




- Fit counter-hold tool - T10554- with counter-hold tool - T10172- again, to loosen securing bolt -1- of camshaft adjuster.
- Loosen bolt -1- of camshaft adjuster -2-.
- Loosen securing bolt of toothed belt pulley on exhaust side  
⇒ [“3.4 Removing and installing toothed belt pulley”, page 173](#) .

**i** Note

*Do not relieve tension from toothed belt, and do not remove toothed belt from camshafts when adjusting valve timing. Only loosen camshaft adjuster.*



**Removing camshaft adjuster of inlet camshaft:**

- Detach toothed belt from camshafts.
- Unscrew securing bolt -1- of camshaft adjuster, and remove camshaft adjuster -2-.
- Use a cleaning cloth to remove engine oil from camshaft and camshaft housing.

**Installing**

- Camshafts are located in “TDC” position.
- Camshaft pulleys are properly aligned.
- Crankshaft is in “TDC position”.

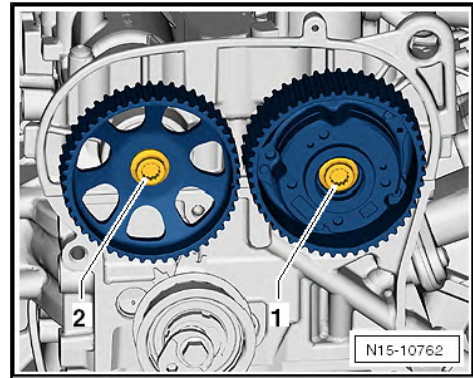
**i** Note

- ◆ *Before installing the camshaft adjuster, ensure that the guide sleeve is inserted in the camshaft.*
- ◆ *Renew bolts that are tightened with turning further angle.*
- ◆ *Check O-ring of plug for damage, and renew if necessary; see ⇒ [Electronic parts catalogue \(ETKA\)](#) .*



- 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 ⇒ [page 135](#) .
- Adjust valve timing ⇒ [“2.6 Adjusting valve timing”, page 115](#) .

**Tightening camshaft adjuster of inlet camshaft to specified initial torque**



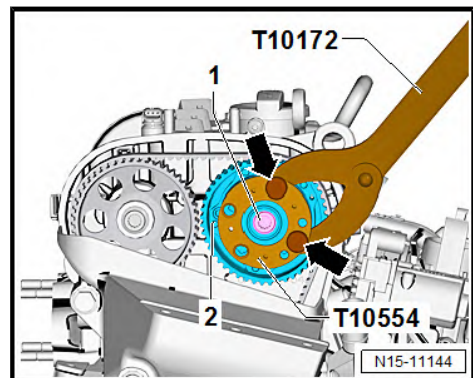
**Note**

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

Stage	Securing bolt for camshaft adjuster	Torque setting
1.	-1-	18 Nm
2.	-1-	50 Nm

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

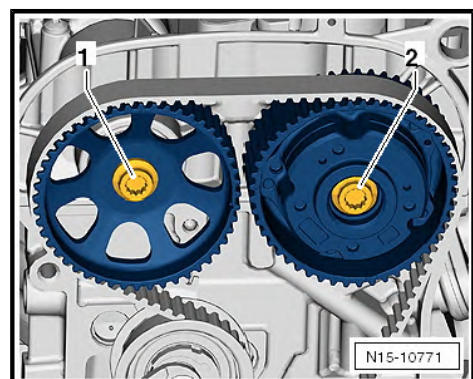


- Pre-tighten bolt -1- to specified pre-tightening torque in two stages.

Stage	Securing bolt for toothed belt pulley	Torque setting
1.	-1-	18 Nm
2.	-1-	50 Nm

**Tightening camshaft adjuster of inlet camshaft to specified final torque**

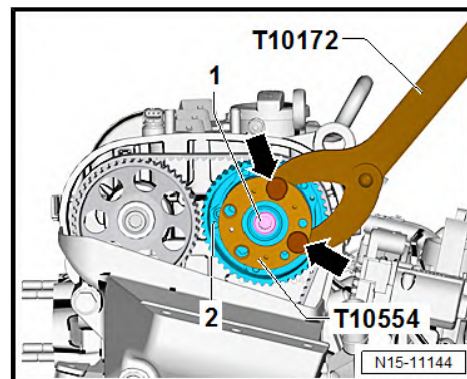
- Screw locking pin - T10340- back in.





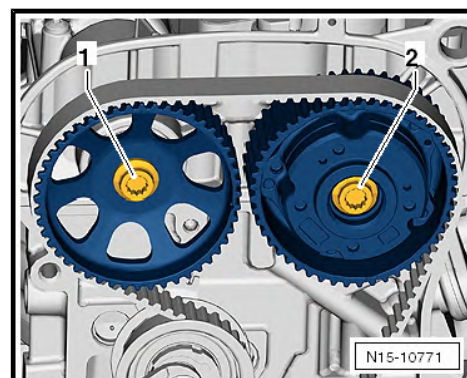
– Tighten bolt -1- for camshaft adjuster to final specified torque.

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



– 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	Torque setting
1.	-1-	20 Nm

### Installing

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



### Note

*Make sure to remove the camshaft clamp and the crankshaft locking pin before cranking the engine.*

### Torque settings

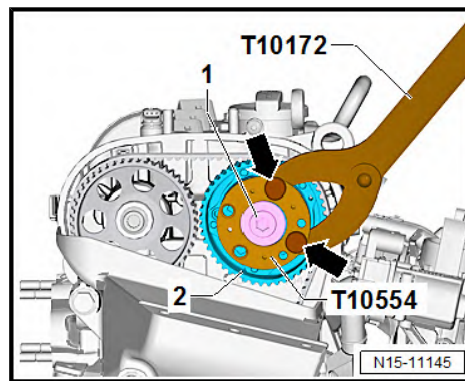
- ◆ ⇒ [“2.1 Assembly overview - toothed belt cover”, page 91](#)
- ◆ ⇒ [“2.2 Assembly overview - toothed belt”, page 92](#)
- ◆ ⇒ [“1.2 Assembly overview - camshaft housing”, page 78](#)
- ◆ ⇒ [“3.1 Assembly overview - crankcase breather system”, page 209](#)
- ◆ ⇒ [“2.1 Assembly overview - assembly mountings”, page 21](#)
- ◆ ⇒ [“1.1 Assembly overview - poly V-belt drive”, page 34](#)
- ◆ ⇒ Electrical system; Rep. gr. 27 ; Alternator; Exploded view - alternator
- ◆ ⇒ [“3.1 Assembly overview - coolant pipes”, page 253](#)
- ◆ ⇒ [“2.1 Assembly overview - coolant pump, thermostat”, page 232](#)
- ◆ ⇒ [“2.1 Assembly overview - charge air system”, page 283](#)

### 3.3.3 Removing and installing camshaft adjuster for exhaust camshaft

Special tools for removing and installing the camshaft adjuster of exhaust camshaft

Special tools and workshop equipment required

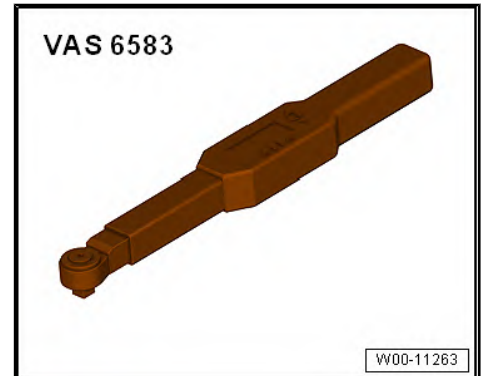
- ◆ Support - 10 - 222 A-



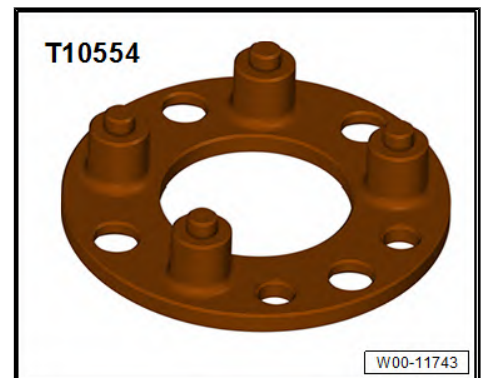
- ◆ Shackle - 10 - 222 A /12-
- ◆ Adapter - 10 - 222 A /18-
- ◆ Adapter - 10 - 222 A /29-



- ◆ Adapter - T40091/1-
- ◆ Adapter - T40091/3-
- ◆ Adapter - T40093/3-
- ◆ Adapter - T40093/3-6-
- ◆ 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-.

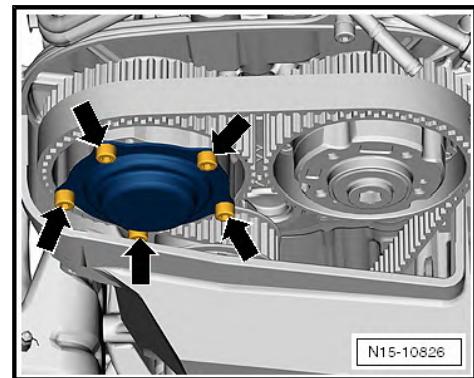
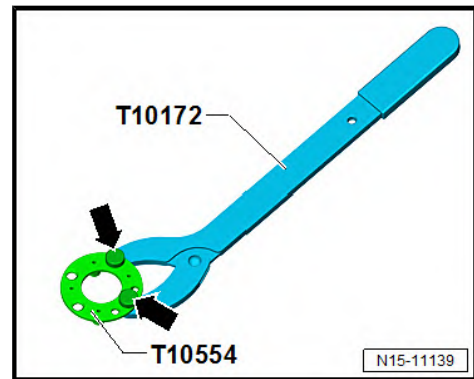
## Procedure



### 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.

- Unscrew bolts -arrows- and remove cover from camshaft adjuster for exhaust camshaft.



## Fitting counter-hold tool - T10554-

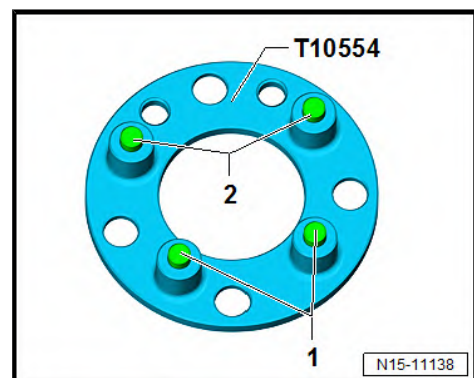
- The contours of pins -1- and -2- of counter-hold tool - T10554/1- are not distributed evenly on the bolt circle.
- They correspond to the contour of the bolt circle in the camshaft adjuster.



### NOTICE

Risk of damage to camshaft caused by improper handling.

- Never use the camshaft clamp for counter holding.

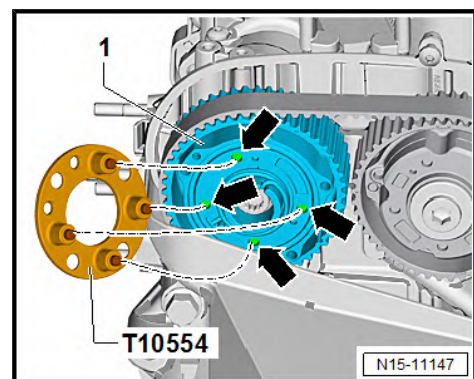


## To adjust valve timing:

- Set piston in cylinder no. 1 to TDC position  
⇒ ["4.7 Setting piston to TDC position", page 71](#) .

## Detaching camshaft adjuster on exhaust side:

- Insert counterhold - T10554- with counterhold - T10172- in holes -arrows-.
- Fit counter-hold tool - T10554- so that it rests flat against camshaft adjuster -1-.



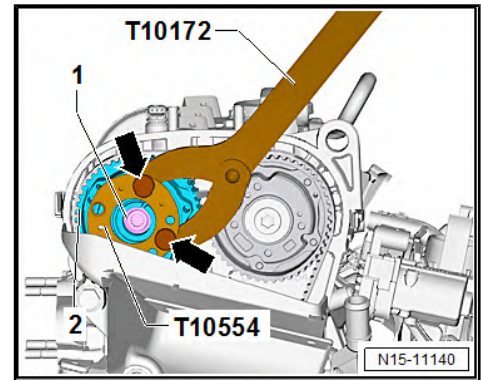




- Hold camshaft pulley -2- in place using counterhold - T10554- and counterhold - T10172- .
- Loosen bolt -1- one turn.
- Loosen securing bolt for camshaft adjuster on inlet side  
⇒ [page 164](#) .

**i** Note

*Do not relieve tension from toothed belt, and do not remove toothed belt from camshafts when adjusting valve timing. Only loosen camshaft adjuster.*



**Removing camshaft adjuster of exhaust camshaft:**

- Remove engine bracket.  
⇒ [“1.6 Removing and installing engine support”, page 43](#)
- Detach toothed belt from camshafts  
⇒ [“2.7 Removing toothed belt from camshaft”, page 133](#) .
- Unscrew securing bolt -1- of camshaft adjuster, and remove camshaft adjuster -2-.
- Use a cleaning cloth to remove engine oil from camshaft and camshaft housing.

**Installing**

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

**i** Note

- ◆ *Before installing the camshaft adjuster, ensure that the guide sleeve is inserted in the camshaft.*
- ◆ *Renew bolts that are tightened with turning further angle.*
- ◆ *Check O-ring of plug and cap for damage, and renew if necessary; see ⇒ [Electronic parts catalogue \(ETKA\)](#) .*



- Renew bolts -1- and -2- for both camshaft adjusters and screw them in onto stop.
- It should just be possible to turn camshaft pulleys on camshafts but no rocking is permissible.
- Fit toothed belt onto camshafts ⇒ [page 135](#) .
- Adjusting valve timing  
⇒ [“2.6 Adjusting valve timing”, page 115](#)

#### Camshaft adjuster specified final torque



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

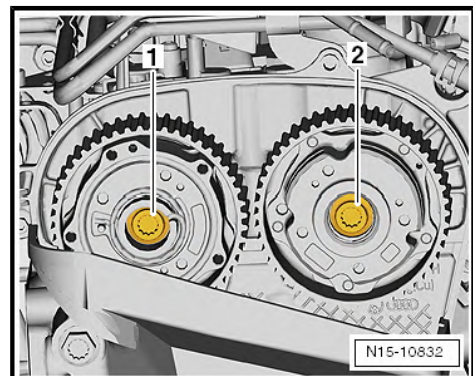
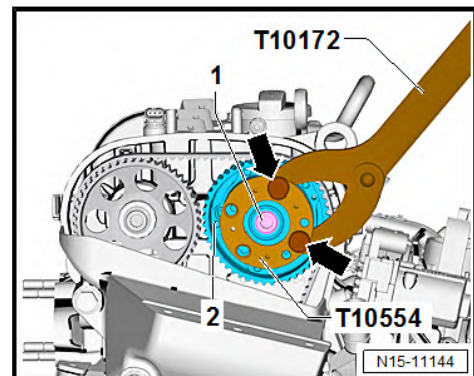
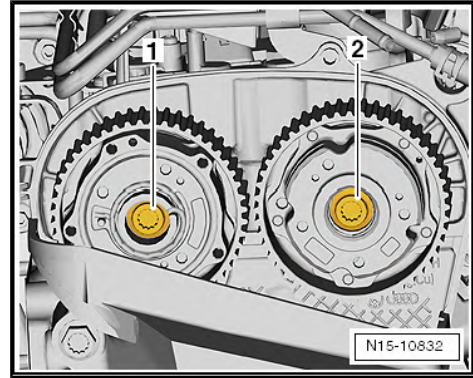
Stage	Securing bolt for camshaft adjuster, inlet side	Torque setting
1.	-1-	18 Nm
2.	-1-	50 Nm

- Hold exhaust camshaft in position using counterhold tool - T10554- and counterhold tool - T10172- .
- Pre-tighten bolt -1- to specified pre-tightening torque in two stages.

Stage	Securing bolt for camshaft adjuster, exhaust side	Torque setting
1.	-1-	18 Nm
2.	-1-	50 Nm

#### Tightening camshaft adjuster to specified final torque

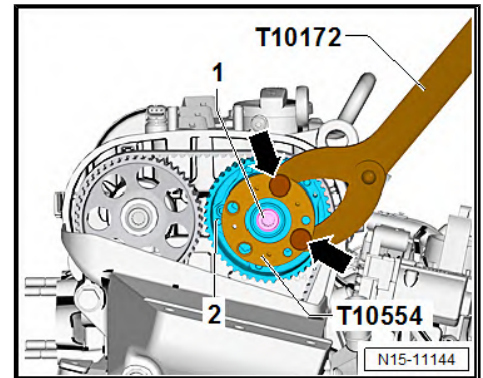
- Screw locking pin - T10340- back in.





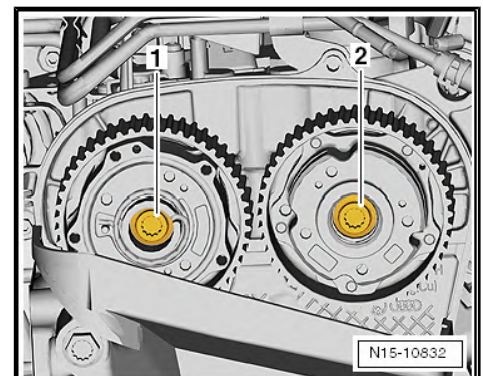
– Tighten bolt -1- for camshaft adjuster to final specified torque.

Stage	Securing bolt for camshaft adjuster, inlet side	Angle to turn bolts
1.	-1-	135°



– Tighten securing bolt for camshaft adjuster on exhaust side -1- to final torque setting.

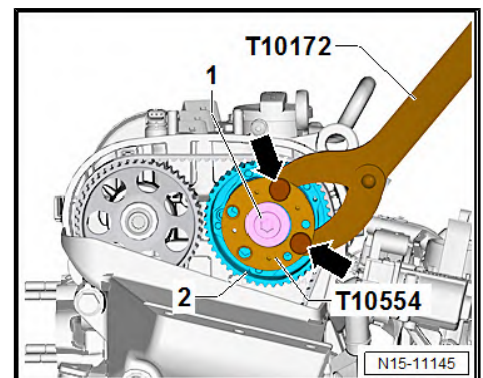
Stage	Securing bolt for camshaft adjuster	Angle to turn bolts
1.	-1-	135°



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

– Screw in plug -1-, and tighten it to specified torque.

Stage	Plug for camshaft adjuster	Torque setting
1.	-1-	20 Nm



### Installing

Install in reverse order of removal, observing the following:

**i** Note

*Make sure to remove the camshaft clamp and the crankshaft locking pin before cranking the engine.*

### Torque settings

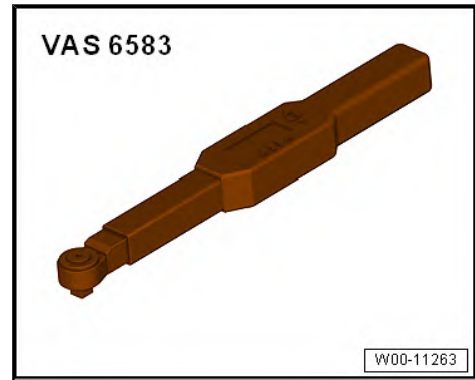
- ◆ ⇒ [“2.2 Assembly overview - toothed belt”, page 92](#)
- ◆ ⇒ [“1.1 Assembly overview - poly V-belt drive”, page 34](#)
- ◆ ⇒ [“2.1 Assembly overview - toothed belt cover”, page 91](#)
- ◆ ⇒ [“3.1 Assembly overview - coolant pipes”, page 253](#)
- ◆ ⇒ Electrical system; Rep. gr. 27 ; Alternator; Exploded view - alternator

## 3.4 Removing and installing toothed belt pulley

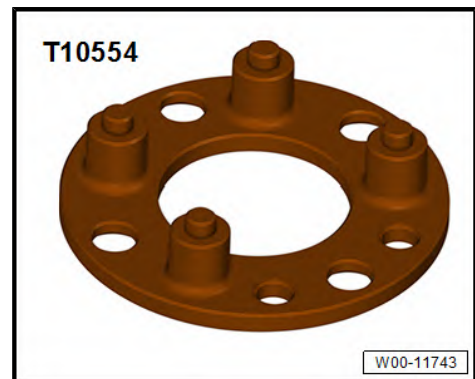
Special tools and workshop equipment required



- ◆ 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-.

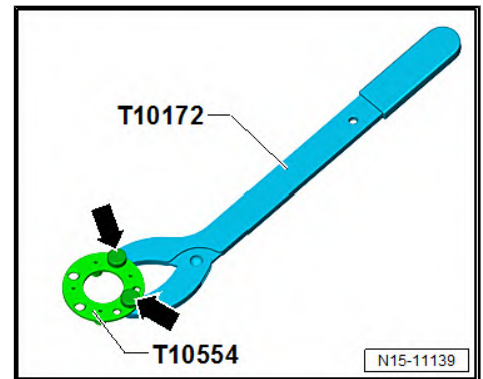
## Procedure

### 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.
- ◆ Do not relieve tension from toothed belt, and do not remove toothed belt from camshafts when adjusting valve timing. Only loosen camshaft adjuster.

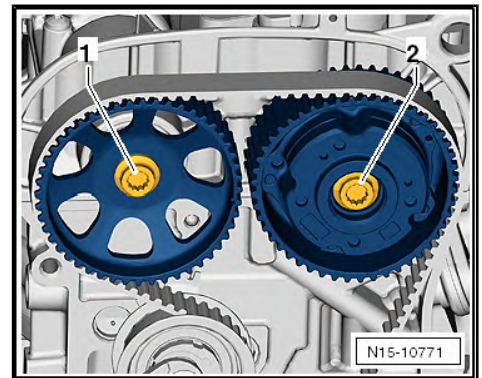
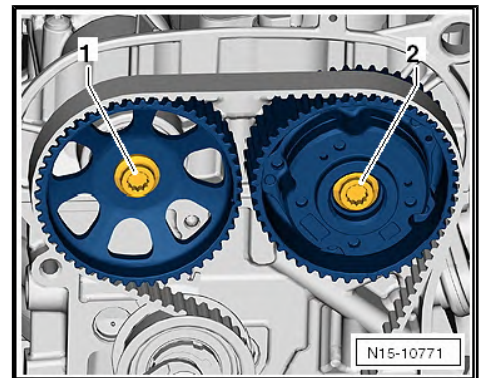


### Loosen toothed belt pulley for exhaust camshaft

- Remove upper part of toothed belt guard  
 ⇒ [“2.3.1 Removing and installing upper toothed belt guard”, page 95](#) .
- Set piston in cylinder no. 1 to TDC position  
 ⇒ [“4.7 Setting piston to TDC position”, page 71](#) .
- Loosen bolt -1- approx. one turn using counter-hold tool - T10172- with adapter -T10172/2- and -T10172/1- .

### Remove toothed belt pulley for exhaust camshaft:

- Loosen camshaft adjuster -2- of inlet camshaft  
 ⇒ [Fig. ““Loosening camshaft adjuster on inlet side.””, page 164](#) .
- Hold inlet camshaft in position using counter-hold tool - T10172- and adapter - T10172/1- .
- Loosen bolt -1-.
- Detach toothed belt from camshafts.  
 ⇒ [“2.7 Removing toothed belt from camshaft”, page 133](#)
- Unscrew securing bolt -1- of toothed belt pulley, and remove toothed belt pulley.



### Installing

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



#### Note

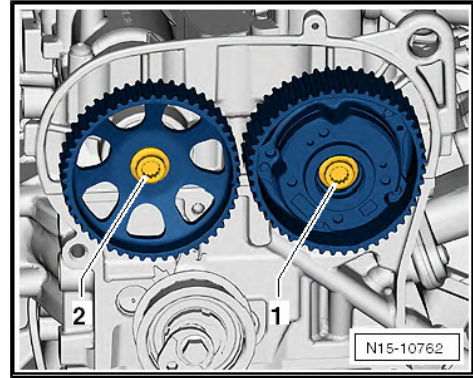
- ◆ Before installing the camshaft adjuster, ensure that the guide sleeve is inserted in the camshaft.
- ◆ Renew bolts that are tightened with turning further angle.
- ◆ Renew O-ring of plug if damaged.



- 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 in position and adjust valve timing  
⇒ [page 135](#) .

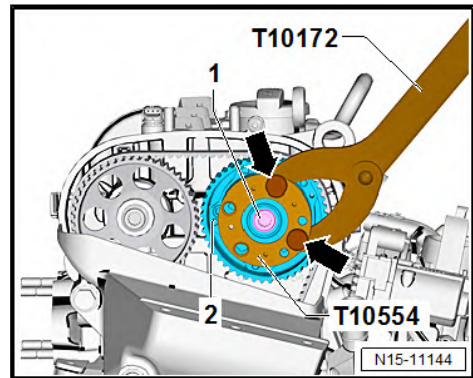
### Pre-tightening

- 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.

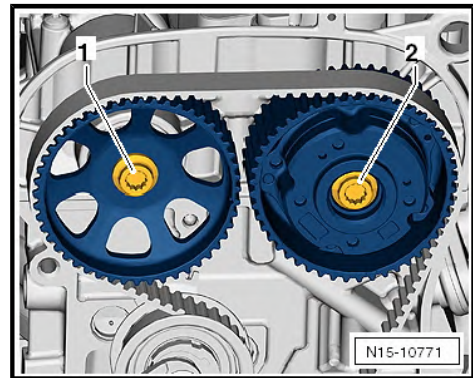
Stage	Securing bolt for camshaft adjuster	Torque setting
1.	-1-	15 Nm
2.	-1-	50 Nm



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

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

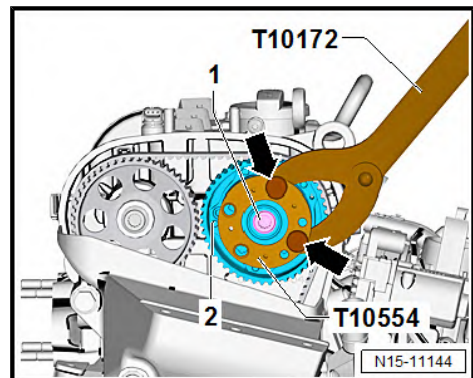
Stage	Securing bolt for toothed belt pulley	Torque setting
1.	-1-	15 Nm
2.	-1-	50 Nm



### Tightening to final specified torque

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

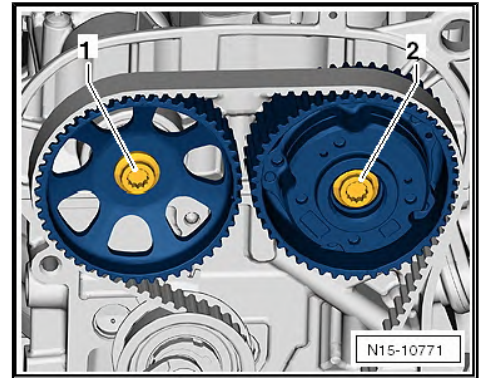
Stage	Securing bolt for camshaft adjuster	Angle to turn bolts
1.	-1-	135°





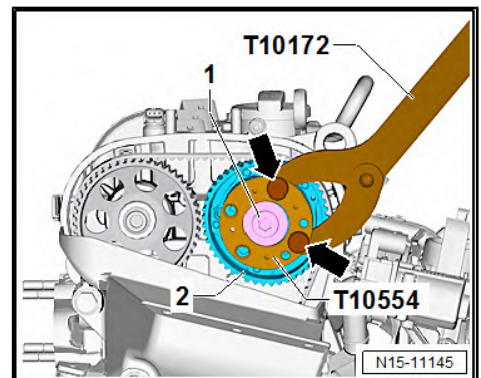
- Tighten securing bolt for toothed belt pulley on exhaust side to final specified torque.

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	Torque setting
1.	-1-	20 Nm



### Installing

Further assembly is performed in the reverse order of removal.

### Note

*Make sure to remove the camshaft clamp and the crankshaft locking pin before cranking the engine.*

### Specified torques:

- 
- 
- 
-



### 3.5 Removing and installing camshaft control valve 1 - N205-

⇒ [“3.5.1 Removing and installing camshaft control valve 1 N205, vehicles with Active Cylinder Management”, page 178](#)

⇒ [“3.5.2 Removing and installing camshaft control valve 1 N205, exhaust side with toothed belt pulley”, page 178](#)

#### 3.5.1 Removing and installing camshaft control valve 1 - N205- , vehicles with Active Cylinder Management

##### Removing

- Release and pull off electrical connector -3-.
- Unscrew bolt -4- and remove camshaft control valve 1 - N205- .

##### Installing

Install in reverse order of removal, observing the following:

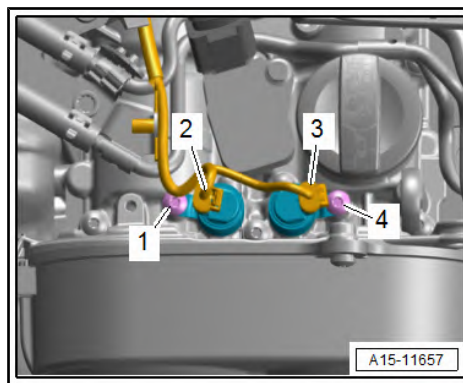


##### Note

- ◆ 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.

##### Torque settings

- ◆ ⇒ [“1.2 Assembly overview - camshaft housing”, page 78](#)



#### 3.5.2 Removing and installing camshaft control valve 1 - N205- , exhaust side with toothed belt pulley

##### Removing

- Release and pull off electrical connector -1-.
- Unscrew bolt -2- and remove camshaft control valve 1 - N205- .

##### Installing

Install in reverse order of removal, observing the following:

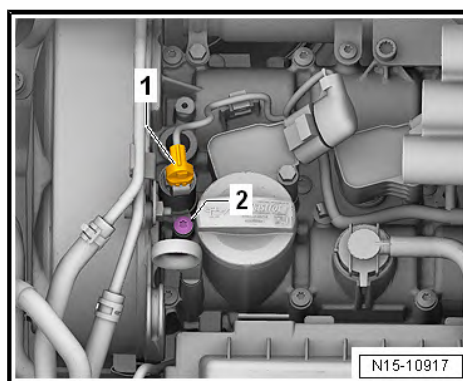


##### Note

- ◆ 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.

##### Torque settings

- ◆ ⇒ [“1.2 Assembly overview - camshaft housing”, page 78](#)







### 3.6 Removing and installing exhaust camshaft control valve 1 - N318-

#### Removing

- Release and pull off electrical connector -2-.
- Unscrew bolt -1- and remove exhaust camshaft control valve 1 - N318- .

#### Installing

Install in reverse order of removal, observing the following:



#### Note

- ◆ 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.

#### Torque settings

- ◆ ⇒ [“1.2 Assembly overview - camshaft housing”, page 78](#)

### 3.7 Removing and installing valve stem seals

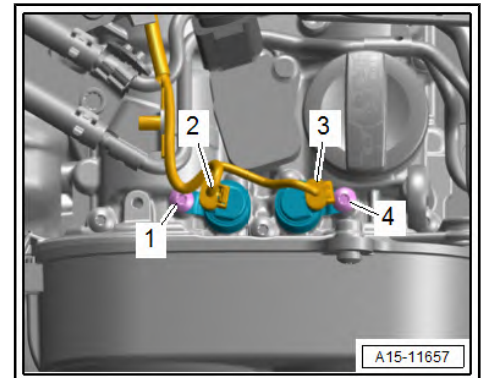
⇒ [“3.7.1 Removing and installing valve stem seals \(cylinder head installed\)”, page 179](#)

⇒ [“3.7.2 Removing and installing valve stem seals \(cylinder head removed\)”, page 183](#)

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

#### Special tools and workshop equipment required

- ◆ Spark plug socket - 3122 B-

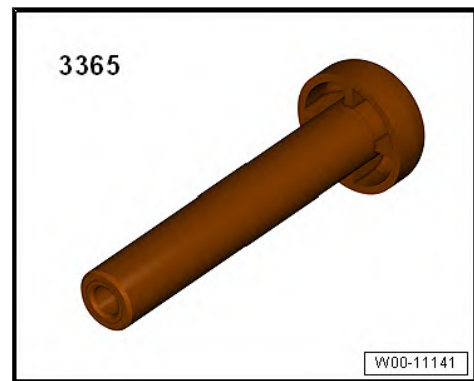




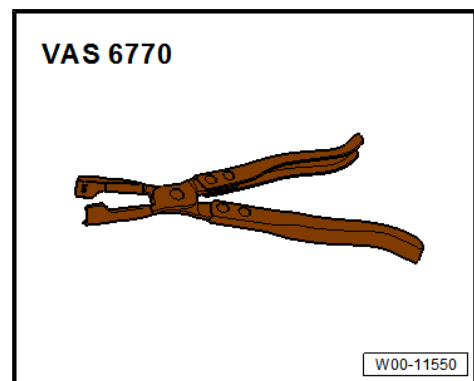
- ◆ Removal and installation device for valve cotters - VAS 5161A- with guide plate - VAS 5161A/32-32- .



- ◆ Hose adapter - VAS 5161A/35- (not shown)
- ◆ Valve stem seal fitting tool - 3365-

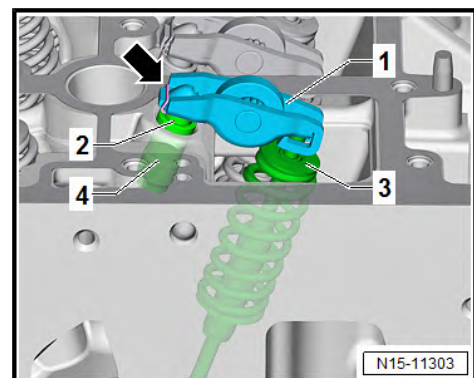


- ◆ Valve stem pliers - VAS 6770-



### Procedure

- Remove camshaft housing  
⇒ ["1.4 Removing and installing camshaft housing", page 85](#) .
- 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- .

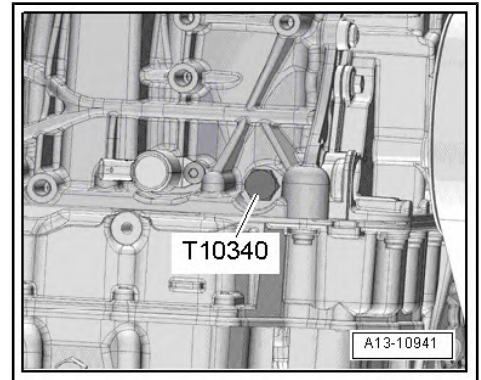




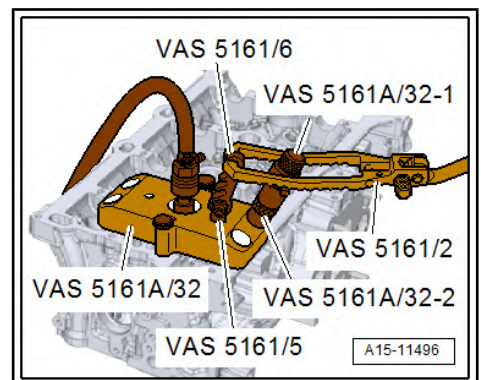
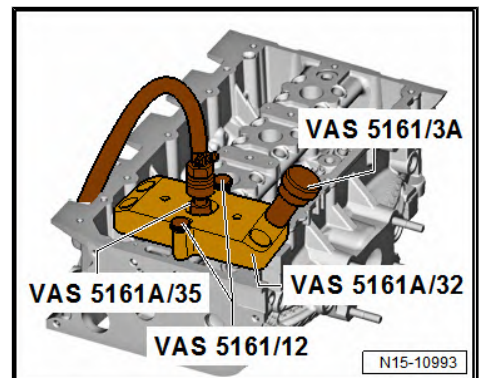
- Unscrew locking pin - T10340- .
- Set piston of respective cylinder to "bottom dead centre".

**i** 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- onto cylinder head and secure with knurled screws -VAS 5161/12- .
- Screw hose adapter - VAS 5161A/35- into respective spark 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 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.



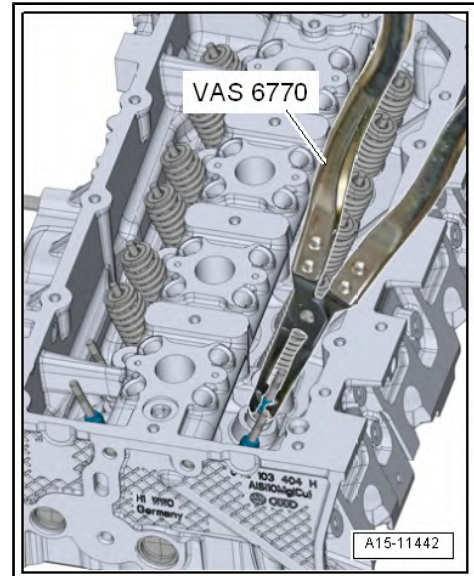


- Pull off valve stem seal using valve stem pliers - VAS 6770- .

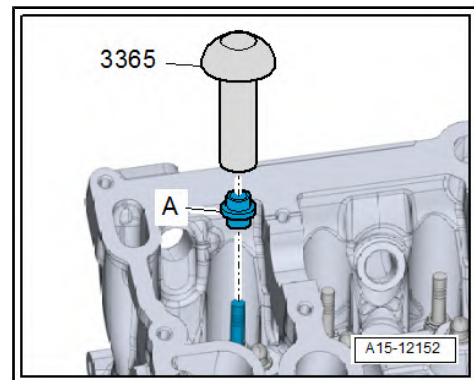


#### Note

- ◆ Risk of damage when installing valve stem seals.
- ◆ Slowly push valve stem seals as far as stop.
- ◆ Seal oil passages of cylinder head with a lint-free cloth.

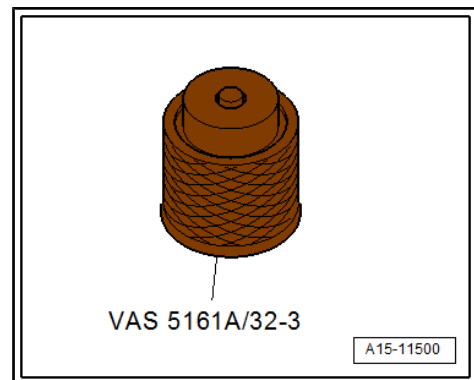


- Lightly oil sealing lip of valve stem seal -A-.
- Carefully press valve stem oil seal -A- onto valve guide using valve stem seal fitting tool - 3365- .
- Insert valve spring and valve spring plate. For installation position of valve spring refer to ⇒ [page 145](#) .



#### 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 3 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/32-1- with sleeve -VAS 5161A/32-2- into guide plate.
- Press pressure fork downwards and pull knurled screw upwards, turning it clockwise and anticlockwise. This inserts the valve cotter.
- Reduce pressure on pressure fork whilst pulling on knurled screw.
- Repeat procedure on each valve.

#### Installing

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

- Install spark plugs ⇒ Maintenance ; Booklet .
- Install camshaft housing  
⇒ ["1.4 Removing and installing camshaft housing", page 85](#) .

#### Torque settings

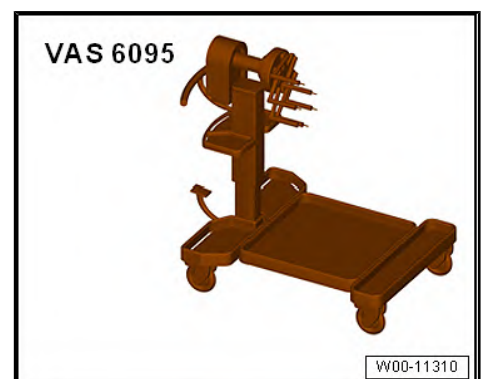
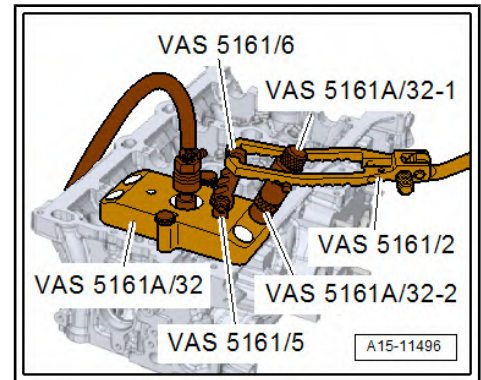
- ◆ ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Assembly overview - drive shaft
- ◆ ⇒ ["1.1 Assembly overview - turbocharger", page 270](#)
- ◆ ⇒ ["1.2 Assembly overview - camshaft housing", page 78](#)

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

#### Special tools and workshop equipment required

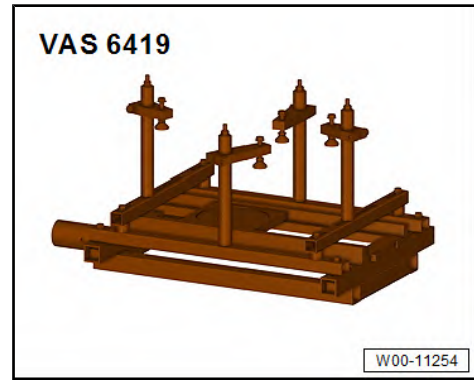
- ◆ Removal and installation device for valve cotter - VAS 5161A- with guide plate - VAS 5161A/32-32- .

- ◆ Engine and gearbox support - VAS 6095-

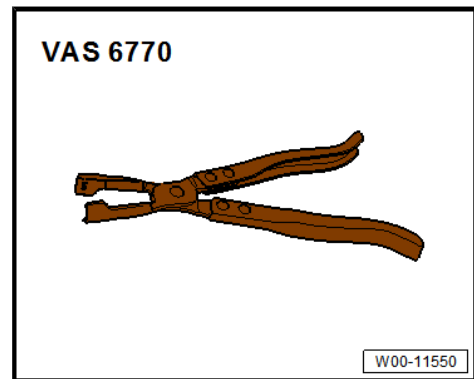




◆ Cylinder head tensioning device - VAS 6419-



◆ Valve stem pliers - VAS 6770-

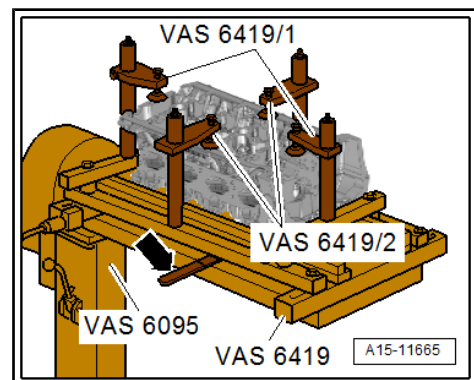


◆ Valve stem seal fitting tool - 3365-



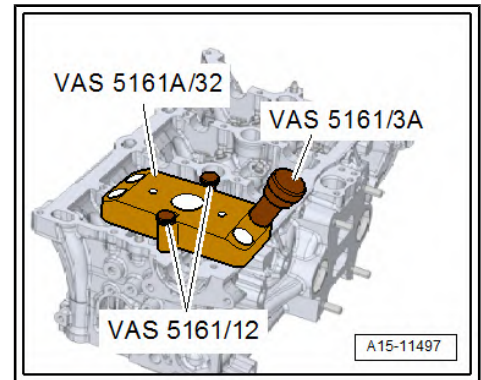
**Procedure**

- Remove cylinder head  
⇒ ["1.3 Removing and installing cylinder head", page 81](#) .
- 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.

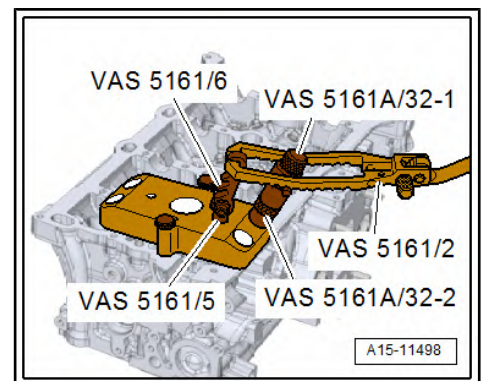




- Fit guide plate -VAS 5161A/32- onto cylinder head and secure with knurled screws -VAS 5161/12- .
- Insert punch -VAS 5161/3A- into guide plate.
- Use a plastic hammer to knock loose the firmly seated valve cotters.

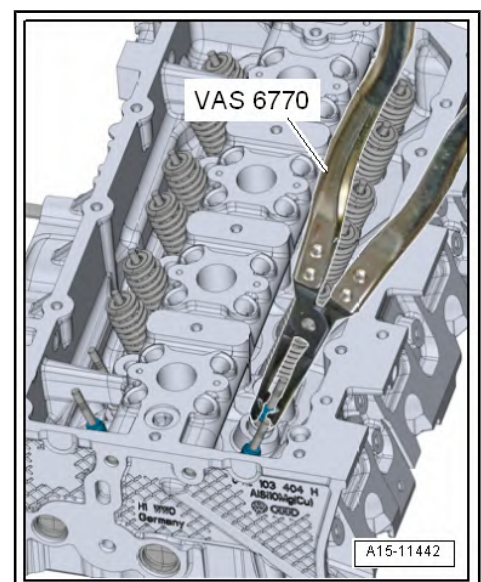


- Screw toothed piece -VAS 5161/6- with hooking fork -VAS 5161/5- into guide plate.
- Slide sleeve -VAS 5161A/32-1- onto assembly cartridge and insert cartridge into guide plate -VAS 5161A/32-2- .
- Attach pressure fork -VAS 5161/2- to toothed piece and press assembly cartridge down.
- At the same time, turn knurled screw of assembly cartridge clockwise until tips engage in valve 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.
- Remove valve spring and valve spring plate.
- Pull off valve stem seal using valve stem pliers - VAS 6770- .



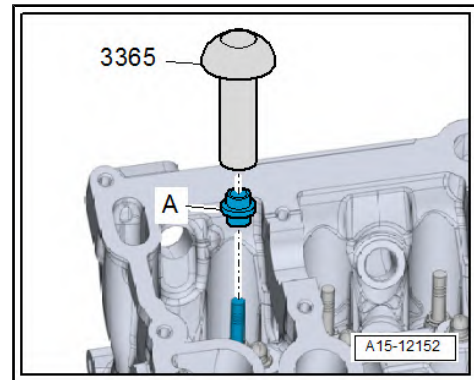
**i** Note

- ◆ Risk of damage when installing valve stem seals.
- ◆ Slowly push valve stem seals as far as stop.
- ◆ Seal oil passages of cylinder head with a lint-free cloth.



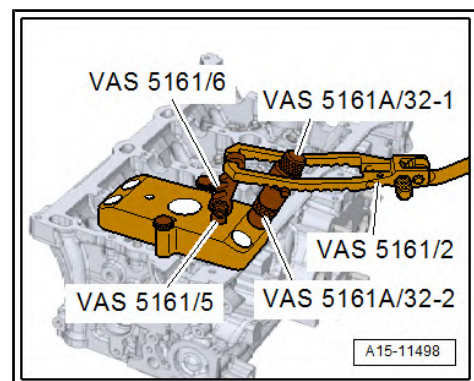
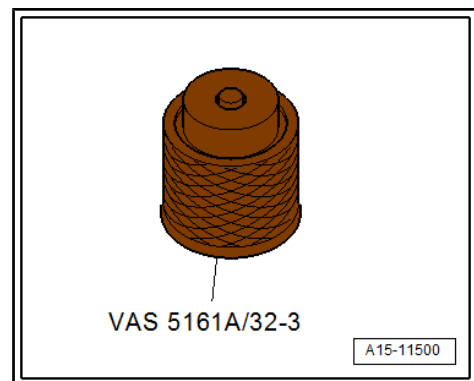


- Lightly oil sealing lip of valve stem seal -A-.
- Carefully press valve stem oil seal -A- onto valve guide using valve stem seal fitting tool - 3365- .
- Insert valve spring and valve spring plate. For installation position of valve spring refer to [page 145](#) .



**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 3 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- onto cylinder head again.
- Insert assembly cartridge -VAS 5161A/32-1- with sleeve -VAS 5161A/32-2- 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  
[⇒ "1.3 Removing and installing cylinder head", page 81](#) .







### 3.8 Removing and installing cam actuators

⇒ [“3.8.1 Removing and installing exhaust cam actuator for cylinder 2 N587”](#), page 187

⇒ [“3.8.2 Removing and installing exhaust cam actuator for cylinder 3 N595”](#), page 188

⇒ [“3.8.3 Removing and installing inlet cam actuator for cylinder 2 N583”](#), page 189

⇒ [“3.8.4 Removing and installing inlet cam actuator for cylinder 3 N591”](#), page 190

#### 3.8.1 Removing and installing exhaust cam actuator for cylinder 2 - N587-

##### Overview of fitting locations - cam actuator

- 1 - Exhaust cam actuator for cylinder 2 - N587-
- 2 - Exhaust cam actuator for cylinder 3 - N595-
- 3 - Inlet cam actuator for cylinder 2 - N583-
- 4 - Inlet cam actuator for cylinder 3 - N591-

##### Removing

- Remove resonator for intake air  
 ⇒ [“3.3 Removing and installing resonator for intake air”](#), page 309 .
- Disconnect relevant electrical connector -1-.
- Remove bolts -arrows- and detach cam actuator.

##### Installing

Install in reverse order of removal, observing the following:



##### Note

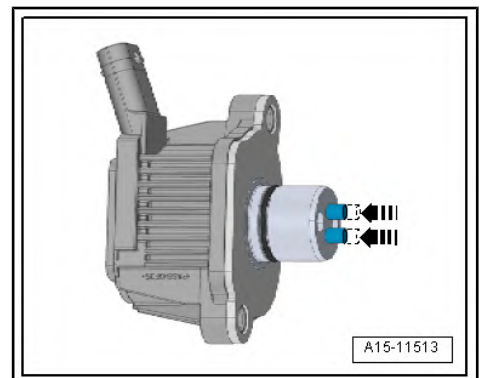
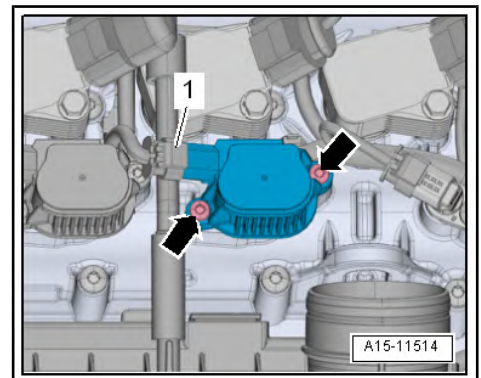
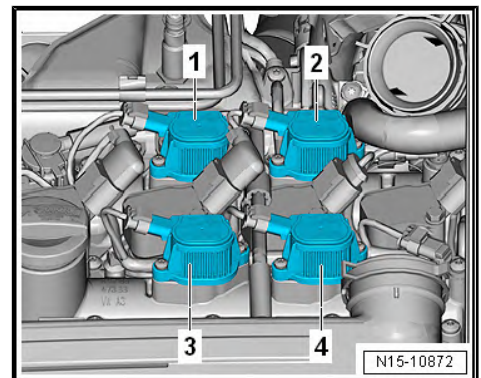
*Check O-ring for damage. If O-rings are damaged, renew cam actuator.*

- Check pins of cam actuators for damage.
  - The pins must not be bent or worn.
  - If cam actuator is damaged, camshaft housing must be renewed.
- Bring pins of actuators for cam actuator into installation position.

Pins of the actuators must be inserted completely -arrows-.

##### Torque settings

- ◆ Assembly overview - valve gear  
 ⇒ [“1.2.1 Assembly overview - camshaft housing, vehicles with Active Cylinder Management”](#), page 78
- ◆ Assembly overview - turbocharger  
 ⇒ [“1.1 Assembly overview - turbocharger”](#), page 270





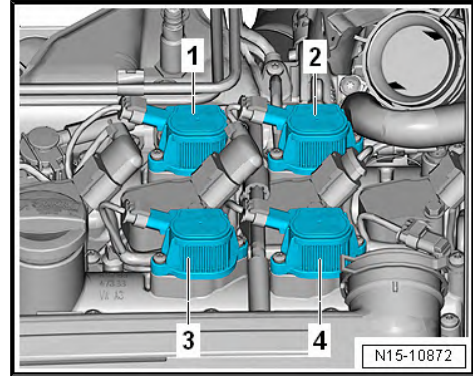
### 3.8.2 Removing and installing exhaust cam actuator for cylinder 3 - N595-

#### Overview of fitting locations - cam actuator

- 1 - Exhaust cam actuator for cylinder 2 - N587-
- 2 - Exhaust cam actuator for cylinder 3 - N595-
- 3 - Inlet cam actuator for cylinder 2 - N583-
- 4 - Inlet cam actuator for cylinder 3 - N591-

#### Removing

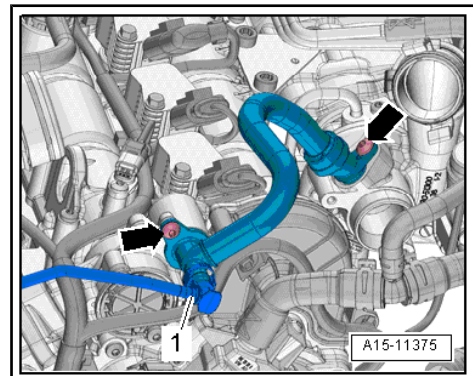
- Remove resonator for intake air  
⇒ [“3.3 Removing and installing resonator for intake air”, page 309](#) .
- Press release tabs, and disconnect hose -1- for activated charcoal filter.



#### Note

*Risk of chemical damage to the coolant pump gasket caused by oil entering between the coolant pump and the cylinder head.*

- Cover coolant pump with a cloth.
- Remove bolts -arrows- and press crankcase breather hose slightly to one side.
- Disconnect relevant electrical connector -1-.
- Remove bolts -arrows- and detach cam actuator.



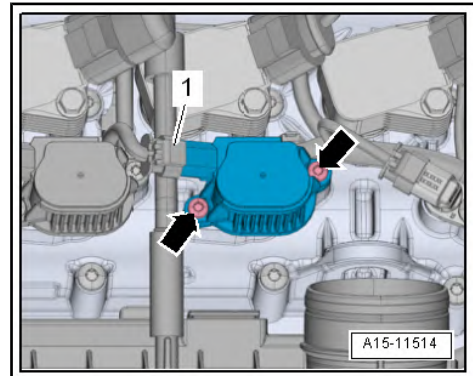
#### Installing

Install in reverse order of removal, observing the following:

#### Note

*Check O-ring for damage. If O-rings are damaged, renew cam actuator.*

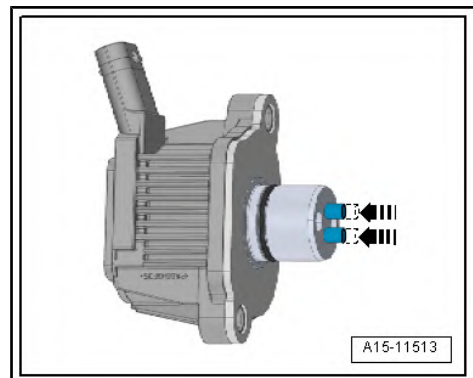
- Check pins of cam actuators for damage.
  - The pins must not be bent or worn.
  - If cam actuator is damaged, camshaft housing must be renewed.
- Bring pins of actuators for cam actuator into installation position.



Pins of the actuators must be inserted completely -arrows-.

#### Torque settings

- ◆ Assembly overview - valve gear  
⇒ [“1.2.1 Assembly overview - camshaft housing, vehicles with Active Cylinder Management”, page 78](#)
- ◆ Assembly overview - turbocharger  
⇒ [“1.1 Assembly overview - turbocharger”, page 270](#)





### 3.8.3 Removing and installing inlet cam actuator for cylinder 2 - N583-

#### Overview of fitting locations - cam actuator

- 1 - Exhaust cam actuator for cylinder 2 - N587-
- 2 - Exhaust cam actuator for cylinder 3 - N595-
- 3 - Inlet cam actuator for cylinder 2 - N583-
- 4 - Inlet cam actuator for cylinder 3 - N591-

#### Removing

- Remove resonator for intake air  
 ⇒ [“3.3 Removing and installing resonator for intake air”, page 309](#) .
- Disconnect relevant electrical connector -1-.
- Remove bolts -arrows- and detach cam actuator.

#### Installing

Install in reverse order of removal, observing the following:



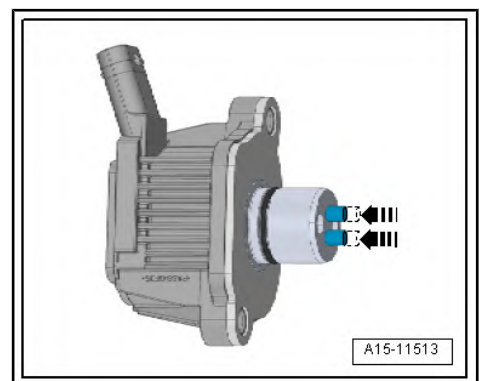
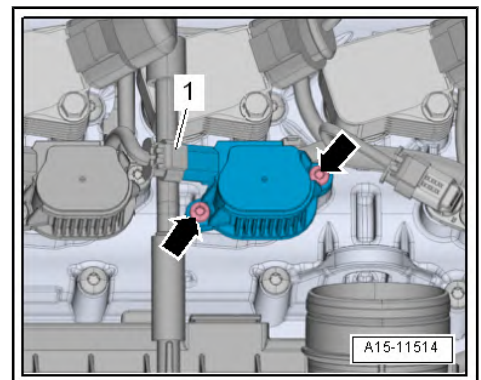
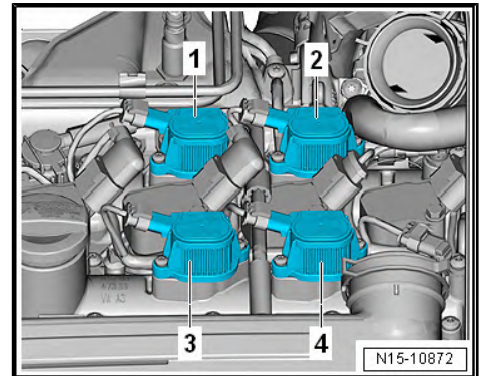
#### Note

*Check O-ring for damage. If O-rings are damaged, renew cam actuator.*

- Check pins of cam actuators for damage.
    - The pins must not be bent or worn.
    - If cam actuator is damaged, camshaft housing must be renewed.
  - Bring pins of actuators for cam actuator into installation position.
- Pins of the actuators must be inserted completely -arrows-.

#### Torque settings

- ◆ Assembly overview - valve gear  
 ⇒ [“1.2.1 Assembly overview - camshaft housing, vehicles with Active Cylinder Management”, page 78](#)
- ◆ Assembly overview - turbocharger  
 ⇒ [“1.1 Assembly overview - turbocharger”, page 270](#)





### 3.8.4 Removing and installing inlet cam actuator for cylinder 3 - N591-

#### Overview of fitting locations - cam actuator

- 1 - Exhaust cam actuator for cylinder 2 - N587-
- 2 - Exhaust cam actuator for cylinder 3 - N595-
- 3 - Inlet cam actuator for cylinder 2 - N583-
- 4 - Inlet cam actuator for cylinder 3 - N591-

#### Removing

- Remove resonator for intake air  
⇒ [“3.3 Removing and installing resonator for intake air”, page 309](#) .
- Disconnect relevant electrical connector -1-.
- Remove bolts -arrows- and detach cam actuator.

#### Installing

Install in reverse order of removal, observing the following:



#### Note

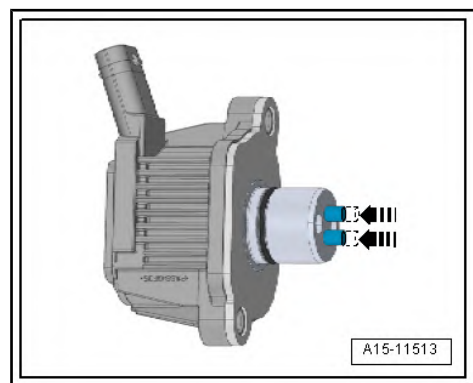
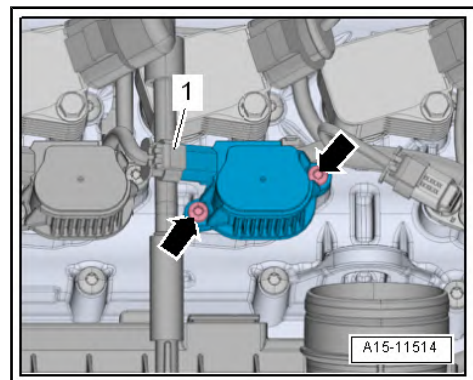
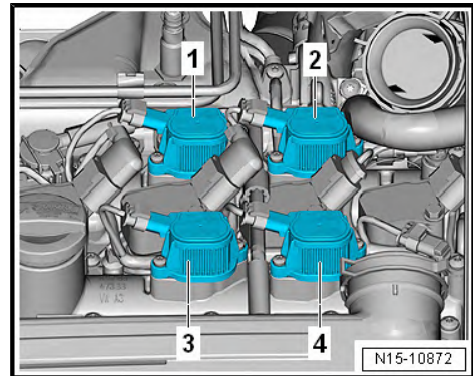
*Check O-ring for damage. If O-rings are damaged, renew cam actuator.*

- Check pins of cam actuators for damage.
  - The pins must not be bent or worn.
  - If cam actuator is damaged, camshaft housing must be renewed.
- Bring pins of actuators for cam actuator into installation position.

Pins of the actuators must be inserted completely -arrows-.

#### Torque settings

- ◆ Assembly overview - valve gear  
⇒ [“1.2.1 Assembly overview - camshaft housing, vehicles with Active Cylinder Management”, page 78](#)
- ◆ Assembly overview - turbocharger  
⇒ [“1.1 Assembly overview - turbocharger”, page 270](#)





## 4 Inlet and exhaust valves

⇒ [“4.1 Checking valve guides”, page 191](#)

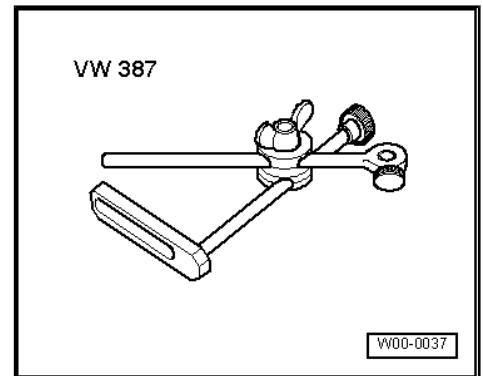
⇒ [“4.2 Checking valves”, page 191](#)

⇒ [“4.3 Valve dimensions”, page 192](#)

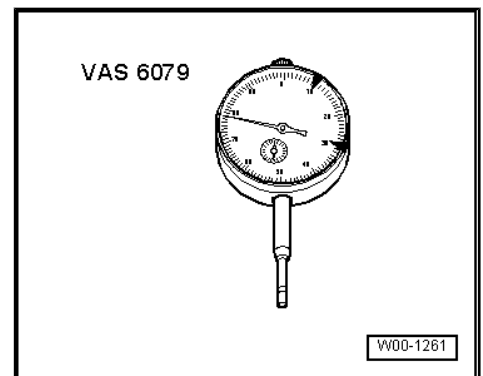
### 4.1 Checking valve guides

Special tools and workshop equipment required

◆ Universal dial gauge bracket - VW 387-



◆ Dial gauge - VAS 6079-



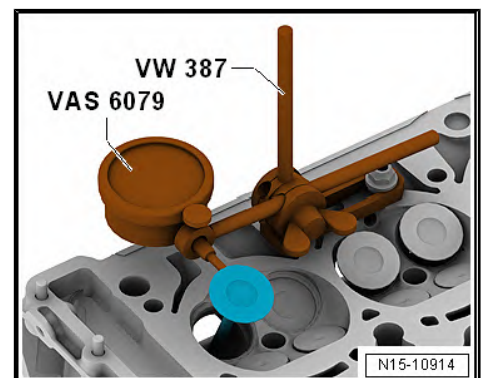
#### Test sequence

- Insert valve in guide. Valve stem end must be flush with guide. On account of differing stem diameters, only use inlet valve in inlet valve guide and exhaust valve in exhaust valve guide.
- Determine rock.
- Wear limit: 0.5 mm.
- If the wear limit is exceeded, repeat the measurement with new valves.
- Renew cylinder head if wear limit is still exceeded.



#### Note

*Valve guides cannot be exchanged.*



### 4.2 Checking valves

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



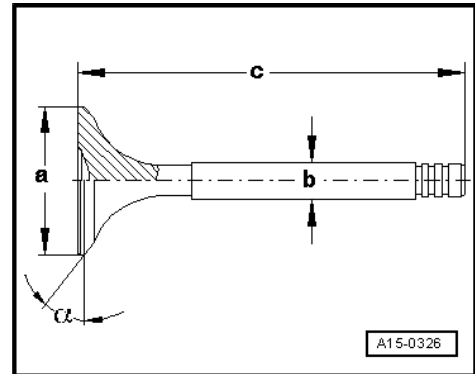
### 4.3 Valve dimensions



#### Note

Never rework the inlet and exhaust valves. Only lapping-in is permitted.

Dimension		Inlet valve	Outlet valve
$\varnothing$ a	mm	28.5	25.0
$\varnothing$ b	mm	4.973	4.963
c	mm	110.25	110.09
$\alpha$	$^{\circ}$	45	30



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



## 17 – Lubrication

### 1 Sump, oil pump

⇒ [“1.1 Assembly overview - sump/oil pump”, page 193](#)

⇒ [“1.2 Engine oil:”, page 196](#)

⇒ [“1.3 Removing and installing lower part of sump”, page 197](#)

⇒ [“1.4 Removing and installing upper part of sump”, page 201](#)

⇒ [“1.5 Removing and installing oil pump”, page 204](#)

⇒ [“1.6 Removing and installing oil level and oil temperature sender G266”, page 205](#)

#### 1.1 Assembly overview - sump/oil pump



##### Note

- ◆ *Large quantities of swarf or metal particles found when performing repairs to the engine could indicate that the crankshaft bearings or conrod bearings are damaged. To avoid any subsequent damage, the following work must be carried out following the repair: Carefully clean oil channels and renew oil spray jets, engine oil cooler and oil filter.*
- ◆ *Oil spray jet and pressure relief valve ⇒ [page 67](#).*



**1 - Nut**

- 9 Nm

**2 - Oil level and oil temperature sender - G266-**

- Removing and installing  
⇒ [“1.6 Removing and installing oil level and oil temperature sender G266”](#), page 205

**3 - Seal**

- Renew after removal

**4 - Oil drain plug**

- Renew



**Note**

- ◆ The oil drain plug or replaced if it has a p seal.
- ◆ Always renew oil se

- 30 Nm

**5 - Seal**

- Renew after removal

**6 - Lower part of sump**

- Removing and installing  
⇒ [“1.3 Removing and installing lower part of sump”](#), page 197

**7 - Bolt**

- Renew after removal
- 5 Nm + 90°

**8 - Dowel sleeve**

- Qty. 2

**9 - Cover**

- For oil pump chain sprocket

**10 - Drive chain**

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

**11 - Bolt**

- Renew after removal
- Specified torque and tightening sequence ⇒ [page 196](#)

**12 - Upper part of sump**

- Removing and installing ⇒ [“1.4 Removing and installing upper part of sump”](#), page 201

**13 - Baffle plate**

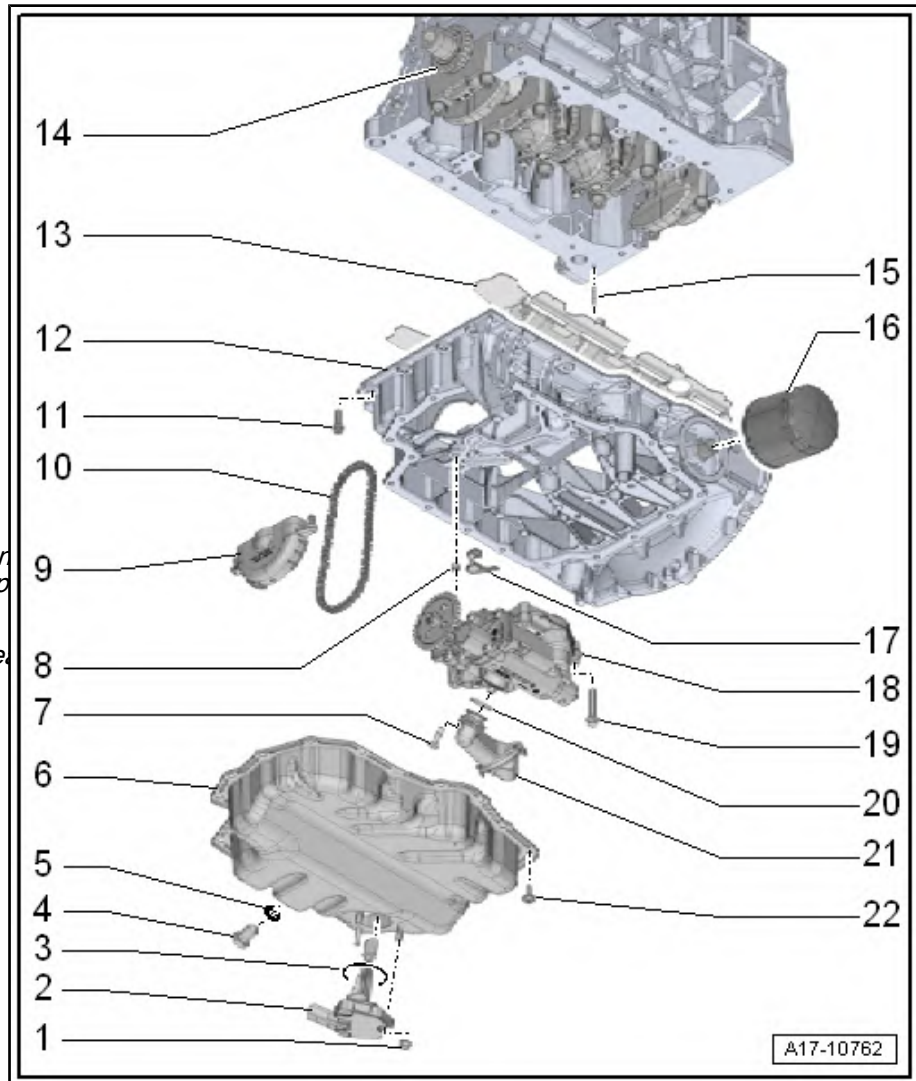
**14 - Sprocket**

- For oil pump drive.

**15 - Dowel pin**

**16 - Oil filters**

- Remove and install with oil filter tool - 3417-
- Before installing, lightly coat seal with clean engine oil.







- If threaded connection for oil filter in top section of sump is loosened  
 ⇒ [Fig. "Tightening connecting union for oil filter"](#), page 195
- 20 Nm

**17 - Seal**

- With oil strainer

**18 - Oil pump**

- Removing and installing ⇒ ["1.5 Removing and installing oil pump"](#), page 204

**19 - Bolt**

- 10 Nm

**20 - O-ring**

- Renew after removal

**21 - Oil intake tube**

- Clean strainer if soiled

**22 - Bolt**

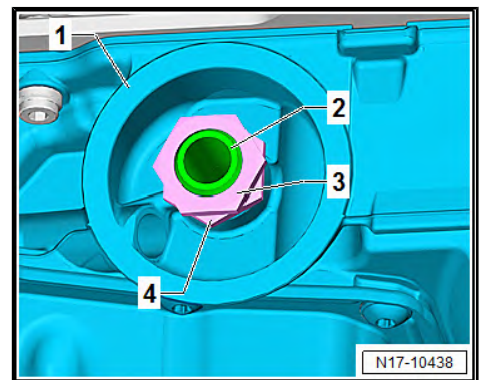
- Renew after removal
- Tightening sequence ⇒ [page 195](#)

**Tightening connecting union for oil filter**

- If the connecting union -2- in the top section of sump -1- is loose, retighten it as described below.

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

- Hexagon nuts - 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.



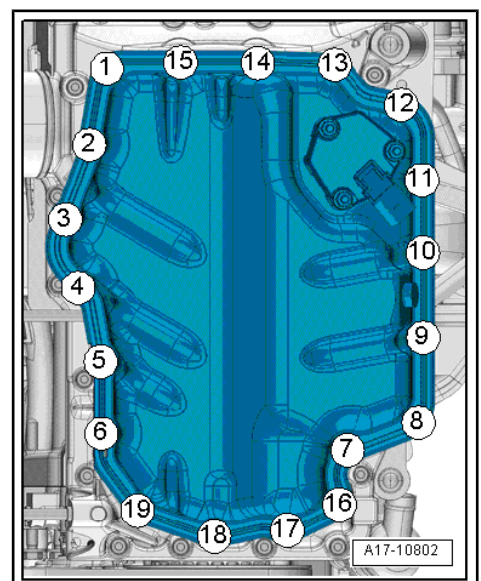
**Torque setting**

Connecting union	Torque setting
-2-	50 Nm

**Lower part of sump - specified torque and tightening sequence**

- Tighten bolts in stages in the sequence shown.

Stage	Bolts	Torque setting
1.	-1 ... 19-	Screw in by hand as far as stop
2.	-1 ... 19-	12 Nm





## Upper part of sump - specified torque and tightening sequence

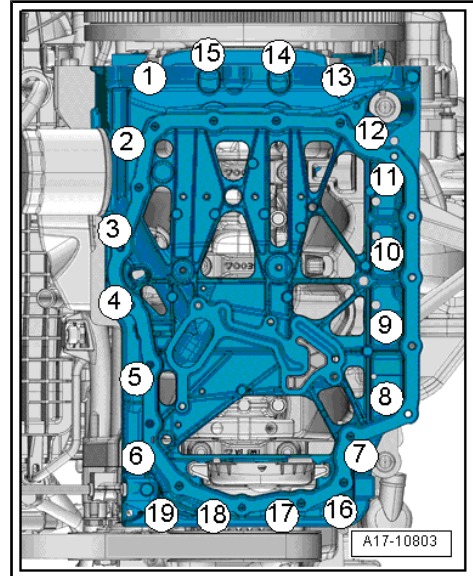


### Note

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

– Tighten bolts in stages in the sequence shown.

Stage	Bolts	Specified torque/turning further angle
1.	-1 ... 19-	Screw in by hand as far as stop
1.	-1 ... 19-	8 Nm
2.	-1 ... 19-	Turn 90° further



## 1.2 Engine oil:

### Engine oil capacity

The oil capacity is 4.0 l including oil filter.

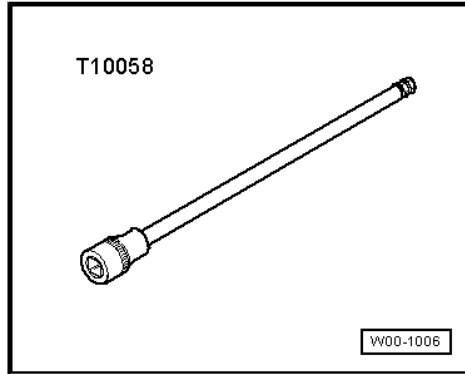
For oil capacities, oil specifications and viscosity grades, refer to  
⇒ Maintenance tables .



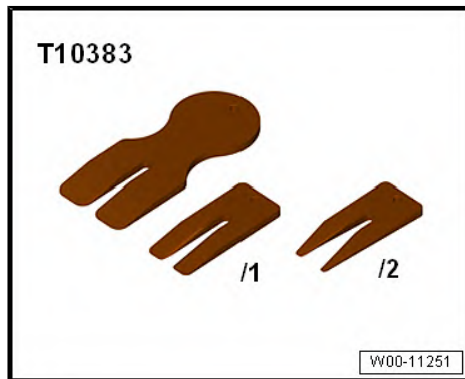
### 1.3 Removing and installing lower part of sump

Special tools and workshop equipment required

- ◆ Torx bit - T10058-



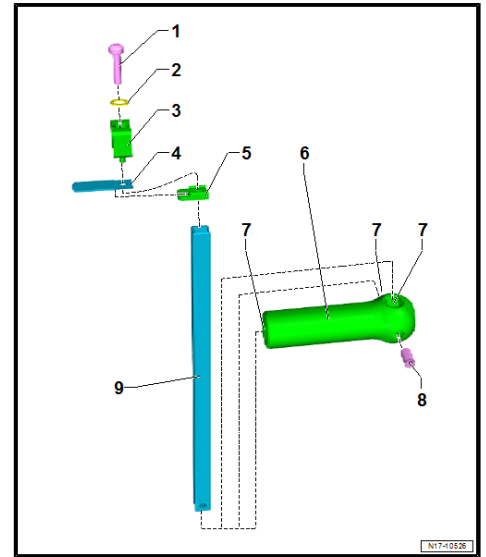
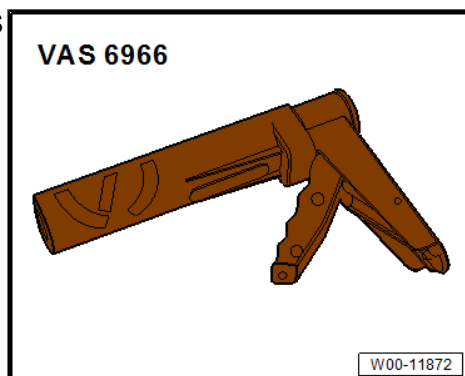
- ◆ Wedge - T10383/2-



- ◆ Cutting tool - T10561-



- ◆ Applicator gun - VAS 6966-





- ◆ Protective mat - VAS 531003-
- ◆ Scraper
- ◆ Sealant remover
- ◆ Hand drill with plastic brush
- ◆ Safety glasses
- ◆ Commercially available scraper
- ◆ Sealant ⇒ Electronic Parts Catalogue

#### Cutting tool - T10561-

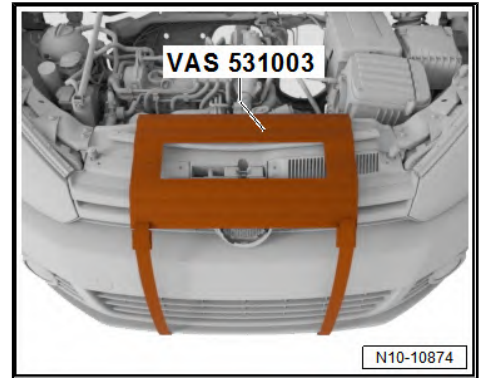
- 1 - Bolt
- 2 - Washer
- 3 - Bracket
- 4 - Knife
- 5 - Guide
- 6 - Handle
- 7 - Inserts for support (rod) for conversion of handle
- 8 - Bolt
- 9 - Support bearing

#### Removing

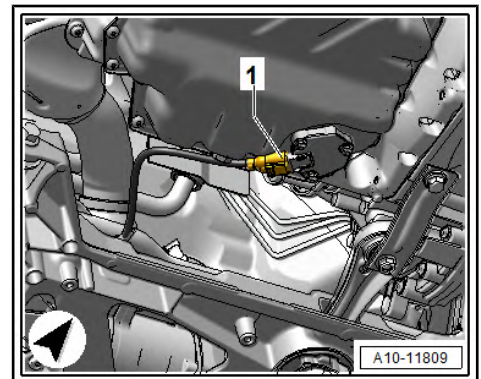
- Drain engine oil.
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
- If necessary, remove front right wheel housing liner ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liner; Assembly overview - front wheel housing liner .
- If necessary, remove radiator cowl  
⇒ ["4 Radiator, radiator fan", page 257](#) .



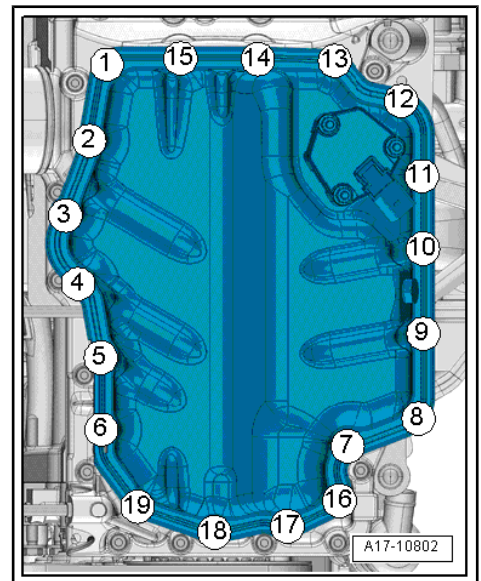
- After radiator cowl has been removed, fit protective mat - VAS 531003- to vehicle as shown in illustration.



- Disconnect electrical connector -1- on oil level and oil temperature sender - G266- .



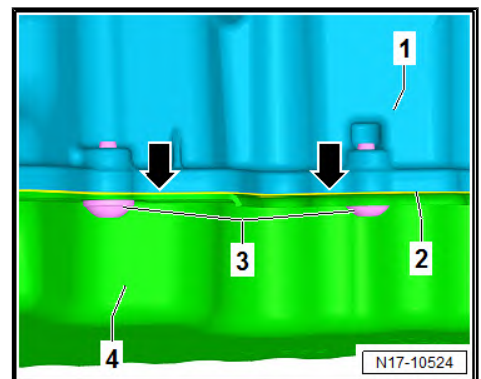
- Loosen and unscrew bolts in the sequence -19 to 1-.
- Loosen 2 bolts on oil sump, but do not unscrew completely.



- Cut through seal between oil sump -4- and engine -1-.
- Use cutting tool - T10561- to do this.

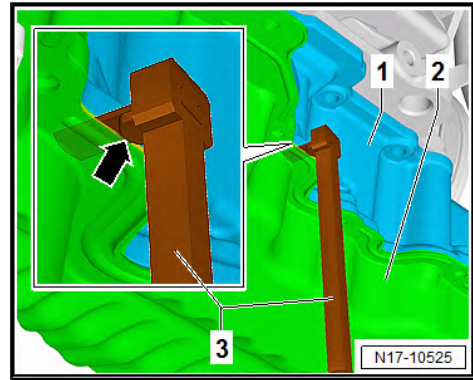
**i Note**

- ◆ *The sump is sealed with liquid sealant -2- → Electronic parts catalogue .*
- ◆ *When hardened, the sealant has a high adhesive strength.*
- Separation is made centrally between bolts -3-.
- Position cutting tool - T10561- on seal -arrows- without it canting.





- Drive in cutting tool - T10561- -3- using a hammer as far as it will go -arrow-.
- Do not cant cutting tool - T10561- when doing this.
- Do not cutting tool - T10561- sideways.
- Do not lever with cutting tool - T10561- .
- Perform procedure at other points as described until sump is detached.
- Use wedge - T10383/2- to further loosen detached positions.
- Using a plastic hammer carefully drive in wedge.
- Drive in wedge - T10383/2- only to same depth as sealing surface.
- Carefully detach sump (bottom section) from adhesive bond.
- Fit wedge - T10383/2- at another position and detach the bonded joint in the same way.
- Carefully detach lower part of sump from adhesive bond using a commercially available scraper.
- Carefully lever off lower part of sump using a suitable assembly lever or screwdriver at position marked with an -arrow-.



#### Installing

- Specified torque  
⇒ Fig. [“Lower part of sump - specified torque and tightening sequence”](#), page 195
- Cover open parts of engine so that lubrication system does not become contaminated.
- Spray sealing surface with sealant remover and leave to act.
- Remove sealant residues from sump upper part with a flat scraper.
- Remove sealant residue from sump (bottom section) using a rotating plastic brush, for example.

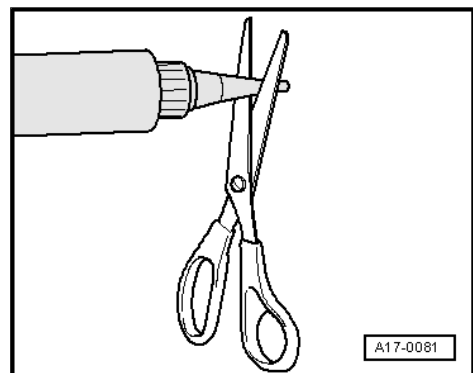
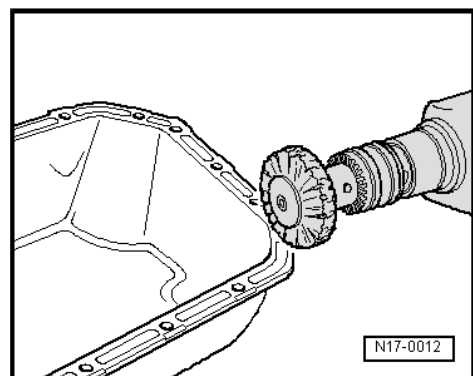


#### CAUTION

Risk of eye injury caused by sealant residue.

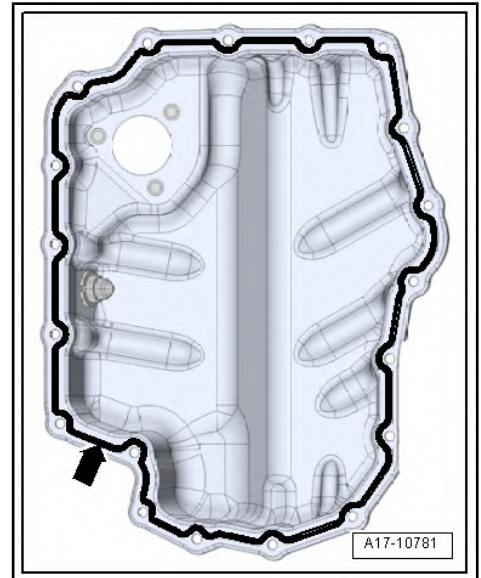
- Wear protective goggles.

- Remove any oil and grease from sealing surfaces.
- Observe use-by date of sealant.
- Cut off nozzle on tube at front marking ( $\varnothing$  of nozzle approx. 2 mm).





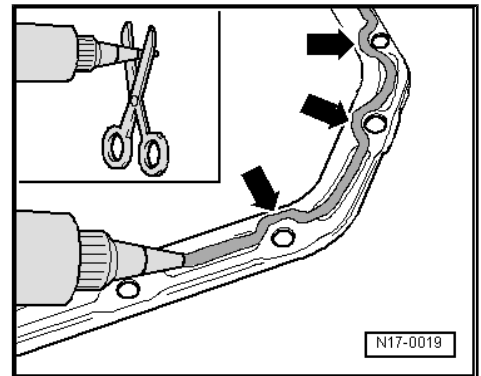
- Apply sealant in a bead -arrow- to clean sealing surface of bottom section of sump using applicator gun - VAS 6966- .
- Do not make sealant bead thicker than specified.
- Thickness of sealant bead: 2 to 3 mm.
- Apply sealant bead as shown.



- Run bead along inner side of bolt holes -arrows-.
- Take particular care when applying sealant bead in area of the sealing flange.

**i** Note

- ◆ *The lower sump section must be installed within 5 minutes of the sealant being applied.*
- ◆ *Allow sealant to cure for approx. 30 minutes after installing lower part of sump. Only then fill with engine oil.*
- Position bottom section of sump and tighten bolts  
⇒ [page 195](#) .
- Replenish engine oil, and check oil level ⇒ Maintenance ; Booklet .



## 1.4 Removing and installing upper part of sump

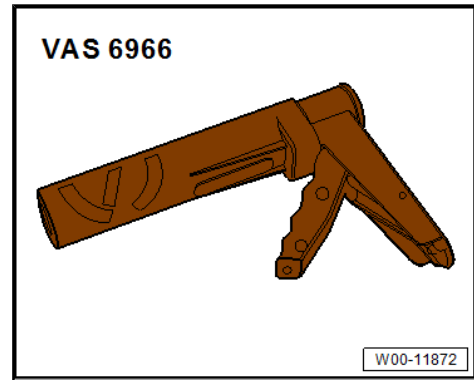
### Special tools and workshop equipment required

- ◆ Torx bit - T10058-





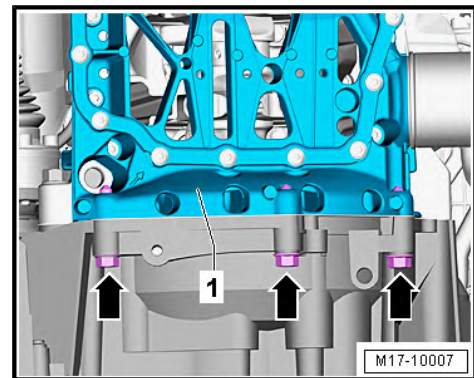
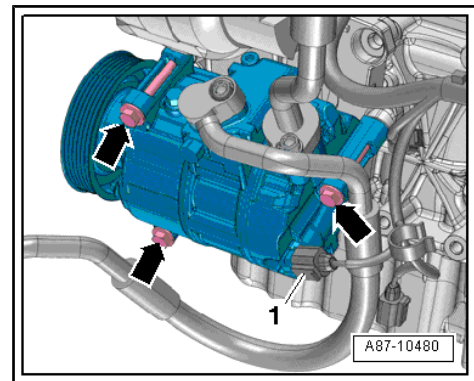
- ◆ Applicator gun - VAS 6966-



- ◆ Hand drill with plastic brush
- ◆ Safety glasses
- ◆ Sealant → Electronic Parts Catalogue

### Removing

- Remove air conditioner compressor from bracket and tie it up  
⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Removing and installing air conditioner compressor .
- Remove sump (bottom section)  
⇒ ["1.3 Removing and installing lower part of sump", page 197](#) .
- Remove oil pump  
⇒ ["1.5 Removing and installing oil pump", page 204](#) .
  
- Unscrew securing bolts -arrows- for gearbox to upper section of sump -1-.







- Loosen and unscrew bolts in the sequence -19 to 1-.
- Carefully detach upper part of sump from adhesive bond.
- Remove baffle plate.

### Installing



#### Note

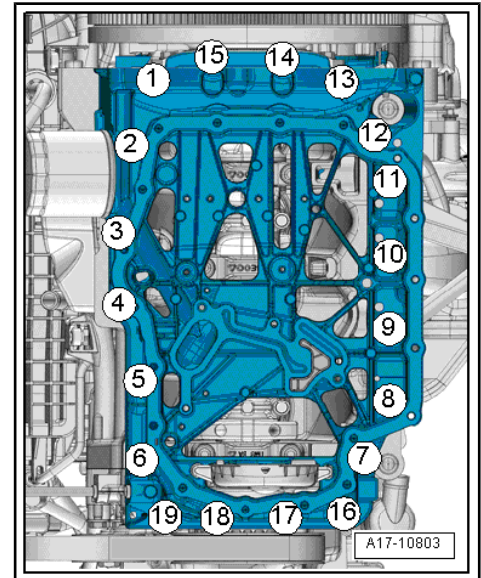
- ◆ *Renew bolts that are tightened with turning further angle.*
  - ◆ *Renew gaskets, oil seals and self-locking nuts.*
  - ◆ *Risk of blockage in lubrication system from excess sealant.*
- Do not make sealant bead thicker than specified.
  - Remove sealant residues from cylinder block with a flat scraper.



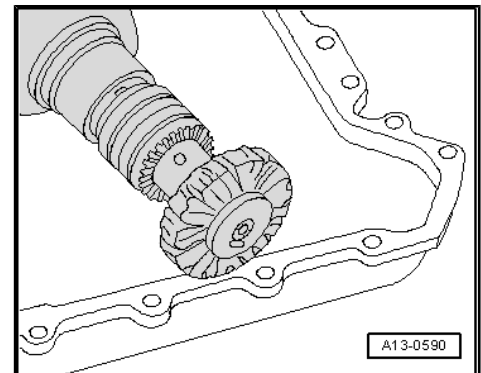
#### CAUTION

**Risk of eye injury caused by sealant residue.**

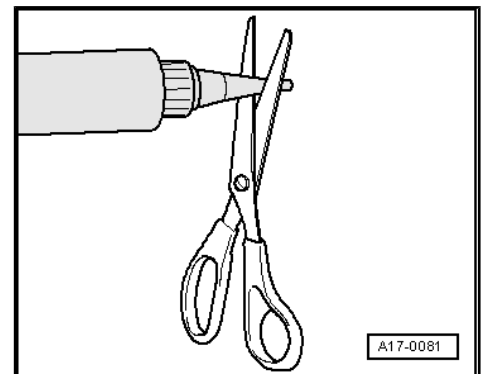
- **Wear protective goggles.**



- Remove sealant residue from upper part of sump, e.g. with rotating plastic brush.
- Check oil galleries in upper part of sump and cylinder block for soiling.
- Remove any oil and grease from sealing surfaces.



- Observe use-by date of sealant.
- Cut off nozzle on tube at front marking (Ø of nozzle approx. 2 mm).





- Apply sealant bead -arrow- to clean sealing surface of sump (top section) with applicator gun - VAS 6966- .

**i** Note

*Risk of blockage in lubrication system from excess sealant.*

- Do not make sealant bead thicker than specified.
- Apply sealant bead -arrow- onto clean sealing surface of upper part of sump as shown in illustration.
- Thickness of sealant bead: 2 to 3 mm.

**i** Note

*The top section of the sump must be installed within 5 minutes of the sealant being applied.*

- Check that dowel pin -2- is securely seated in cylinder block.
- Attach baffle plate -1- to cylinder block.
- Position top section of sump and tighten bolts ⇒ [page 196](#) .

Continue installation in reverse order of removal. The following should be observed:

- Install oil pump  
⇒ ["1.5 Removing and installing oil pump", page 204](#) .
- Install air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Removing and installing air conditioner compressor .
- Replenish engine oil, and check oil level ⇒ Maintenance ; Booklet .

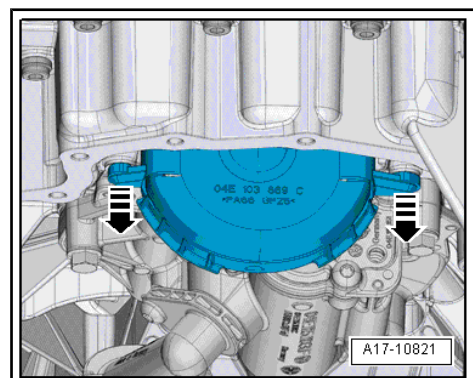
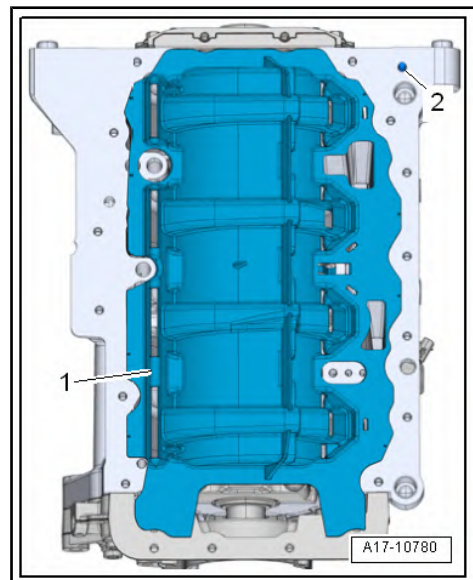
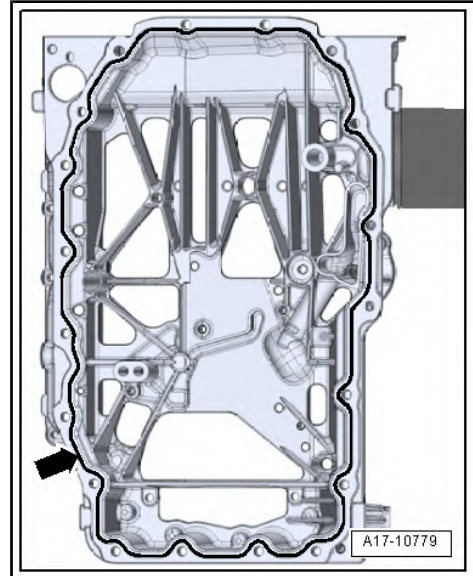
**Torque settings**

- ◆ ⇒ ["1.1 Assembly overview - sump/oil pump", page 193](#)
- ◆ Securing gearbox to engine ⇒ Rep. gr. 34 ; Removing and installing gearbox; Installing gearbox

## 1.5 Removing and installing oil pump

### Removing

- Remove sump (bottom section)  
⇒ ["1.3 Removing and installing lower part of sump", page 197](#) .
- Unclip cover for oil pump chain sprocket -arrows-.

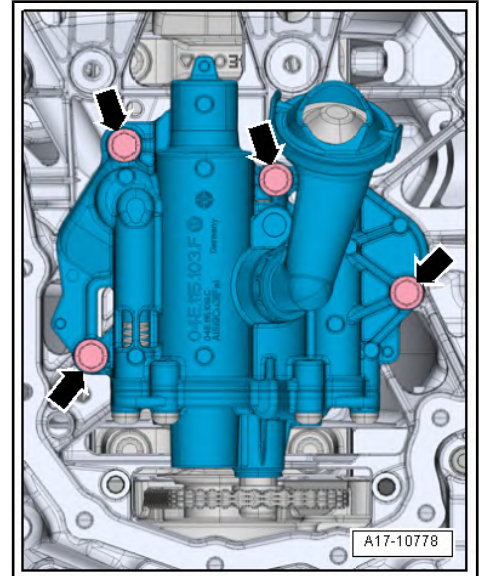




- Unscrew bolts -arrows-.
- Guide out oil pump with chain sprocket under drive chain.

### Installing

- Check that dowel sleeves -1, 3- are fitted in oil pump.



- Fit seal with strainer -2- in oil pump.

Install in reverse order of removal, observing the following:

- Turn oil pump chain sprocket by hand to check oil pump for ease of movement.



### Note

*Renew sluggish oil pump.*

- Fit oil pump with chain sprocket into drive chain and secure.
- Install bottom section of sump  
⇒ [“1.3 Removing and installing lower part of sump”, page 197](#) .
- Replenish engine oil, and check oil level ⇒ Maintenance ; Booklet .

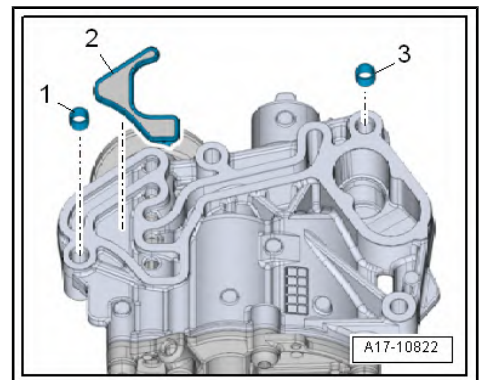
### Torque settings

- ◆ ⇒ [“1.1 Assembly overview - sump/oil pump”, page 193](#)

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

### Removing

- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation .
- Drain engine oil.





- Disconnect electrical connector -3-.
- Undo nuts -1- and remove oil level and oil temperature sender - G266- -item 4-.

### Installing

Install in reverse order of removal, observing the following:



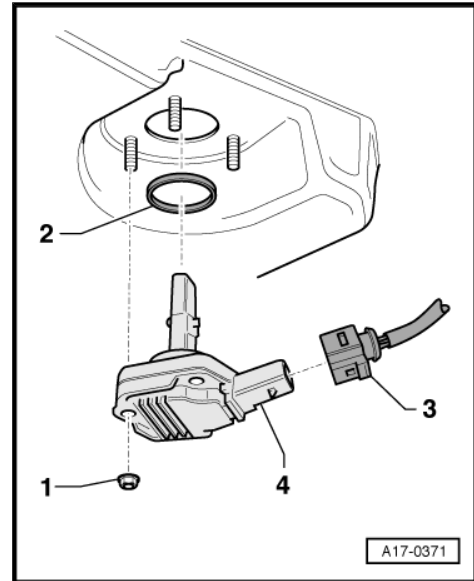
#### Note

*Renew oil seal -2-.*

- Replenish engine oil, and check oil level ⇒ Maintenance ; Booklet .

### Torque settings

- ◆ ⇒ ["1.1 Assembly overview - sump/oil pump", page 193](#)





## 2 Engine oil cooler

⇒ [“2.1 Assembly overview - engine oil cooler”, page 207](#)

⇒ [“2.2 Removing and installing engine oil cooler”, page 207](#)

### 2.1 Assembly overview - engine oil cooler

#### 1 - Engine oil cooler

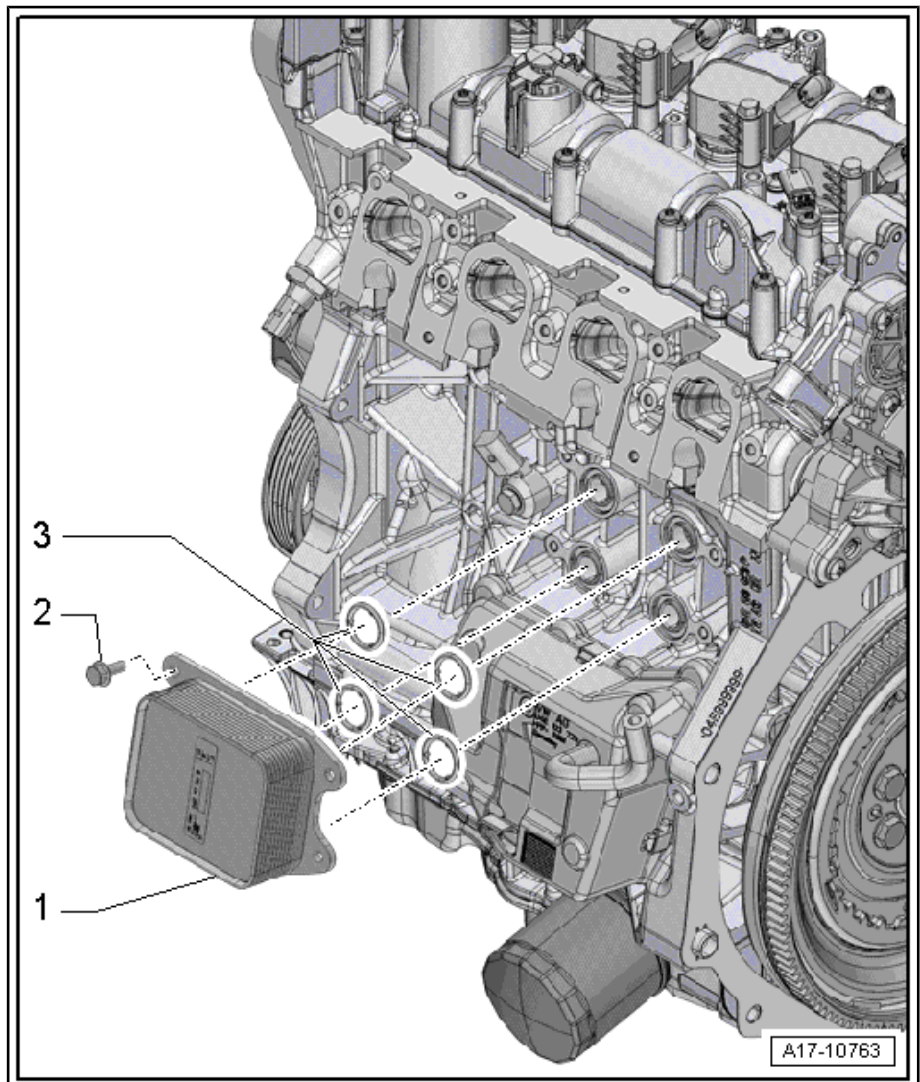
- Observe notes  
⇒ [“1 Sump, oil pump”, page 193](#)
- Removing and installing  
⇒ [“2.2 Removing and installing engine oil cooler”, page 207](#)
- Renew coolant after replacing

#### 2 - Bolt

- Renew after removal
- 8 Nm + 90°

#### 3 - Oil seals

- Renew after removal



### 2.2 Removing and installing engine oil cooler

#### Removing

- Drain coolant  
⇒ [“1.3 Draining and adding coolant”, page 225](#) .



#### Note

*Do not reuse coolant which has been drained off.*

- Remove intake manifold  
⇒ [“4.2 Removing and installing intake manifold”, page 312](#) .



- Unscrew bolts -arrows- and detach engine oil cooler -1-.

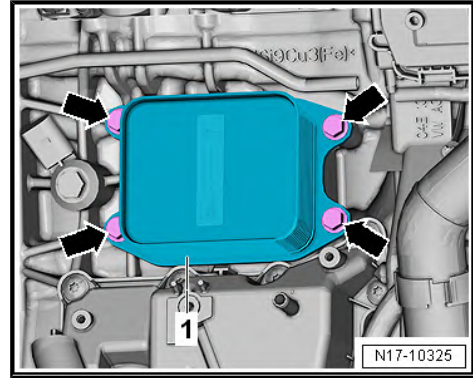
### Installing

Install in reverse order of removal. The following should be observed:

- Insert new O-rings.
- Install intake manifold  
⇒ [“4.2 Removing and installing intake manifold”, page 312](#) .
- Add coolant ⇒ [page 231](#) .

### Torque settings

- ◆ ⇒ [“2.1 Assembly overview - engine oil cooler”, page 207](#)
- ◆ ⇒ [“1.1 Assembly overview - ignition system”, page 348](#)





### 3 Crankcase ventilation

⇒ [“3.1 Assembly overview - crankcase breather system”, page 209](#)

⇒ [“3.2 Removing and installing oil separator”, page 210](#)

#### 3.1 Assembly overview - crankcase breather system

##### 1 - Hose

- For crankcase ventilation.

##### 2 - Cover

- For oil separator

##### 3 - Oil separator

- Removing and installing  
 ⇒ [“3.2 Removing and installing oil separator”, page 210](#)
- Renew if damaged

##### 4 - O-ring

- Renew after removal

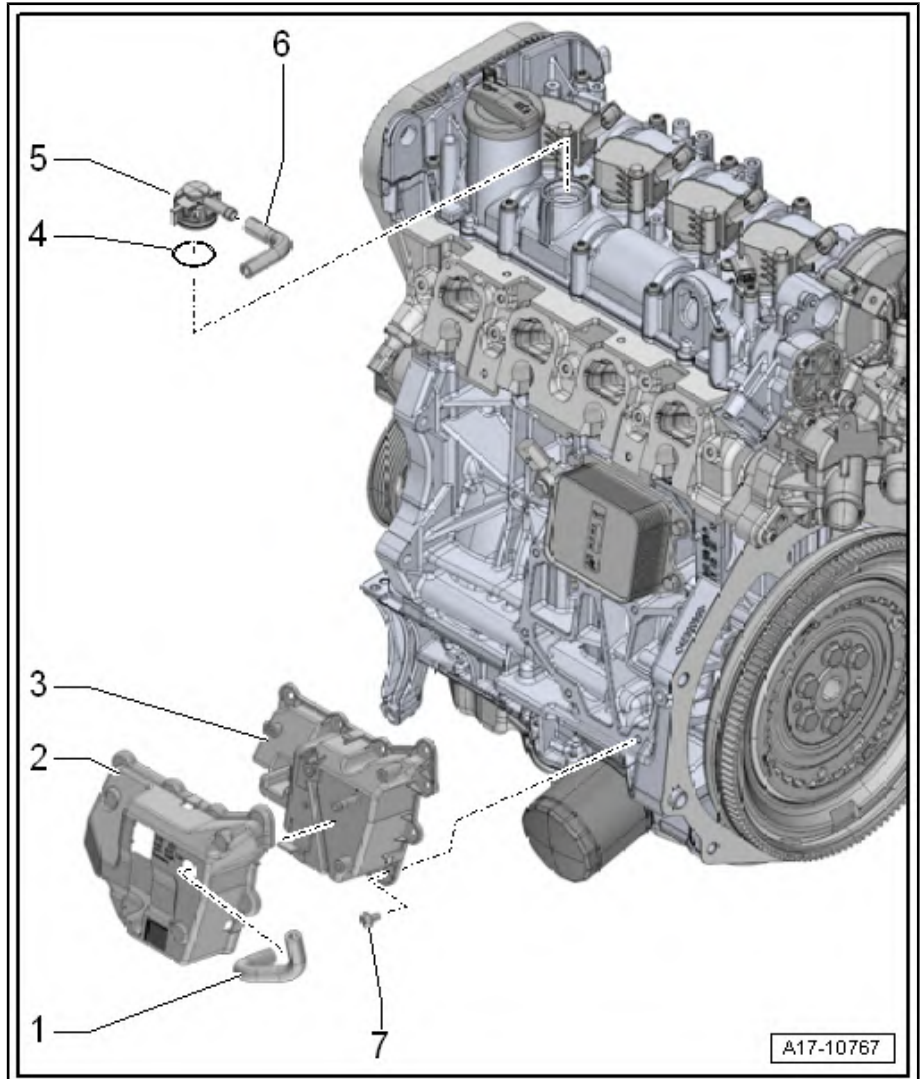
##### 5 - Union

##### 6 - Hose

- For crankcase ventilation.

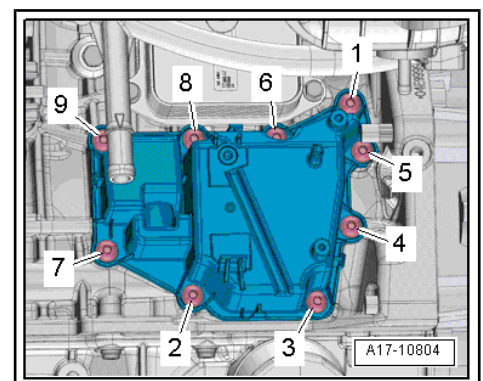
##### 7 - Bolt

- Self-locking
- Renew after removal
- 9 Nm



#### Oil separator - specified torque and sequence

– Tighten bolts in the sequence -1 ... 9- to 9 Nm.

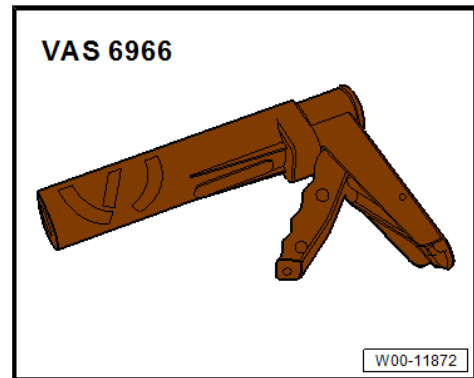




## 3.2 Removing and installing oil separator

### Special tools and workshop equipment required

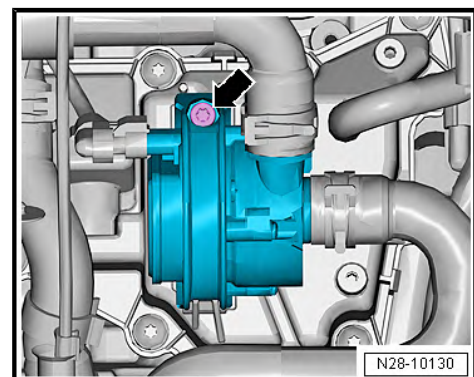
- ◆ Applicator gun - VAS 6966-



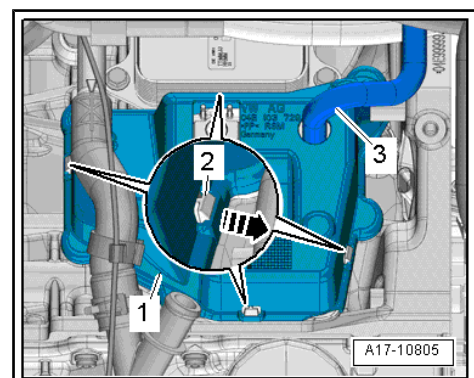
- ◆ Scraper
- ◆ Commercially available studs, M6x20 mm, qty. 2
- ◆ Sealant remover
- ◆ Sealant ⇒ Electronic Parts Catalogue

### Removing

- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation .
- Unscrew bolts -arrow- and push charge air cooling pump - V188- to one side.



- Pull off crankcase breather hose -3-.
- Release fasteners -2- -arrow- on cover -1- for oil separator and detach cover.





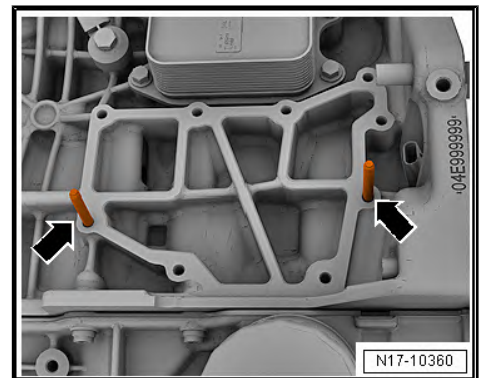
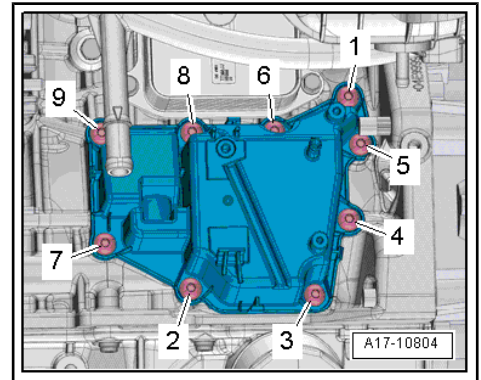


- Loosen and unscrew bolts in the sequence -9 to 1-.
- Carefully release oil separator from bonded joint.

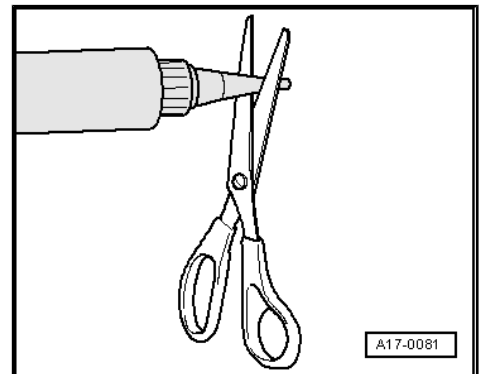
### Installing

Install in reverse order of removal. The following should be observed:

- Cover open parts of engine so that lubrication system does not become contaminated.
- Remove sealant residues from cylinder block with a flat scraper.
- Remove any oil and grease from sealing surfaces.
- Screw 2 M6x20 mm studs a few turns into holes -arrows-.



- Observe use-by date of sealant.
- Cut off nozzle on tube at front marking ( $\varnothing$  of nozzle approx. 2.0 mm).

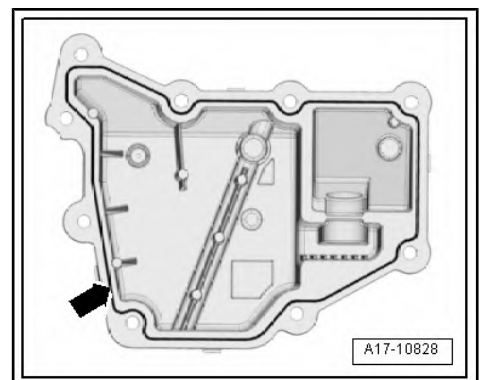


- Apply bead of sealant -arrow- onto clean sealing surface of oil separator using applicator gun - VAS 6966- as illustrated.

### Note

*Danger of blocking lubrication system with excess sealant.*

- Do not make sealant bead thicker than specified.
- Apply bead of sealant -arrow- onto clean sealing surface of oil separator as shown in illustration.
- Width of sealant bead: 2.0 mm.



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



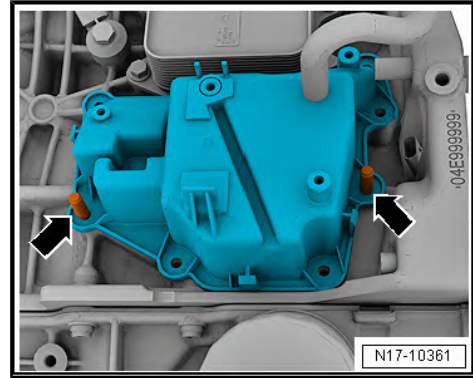
- Fit oil separator onto studs -arrows- and push onto crankcase.
- Start securing bolts.
- Unscrew studs.
- Oil separator – specified torque and tightening sequence  
⇒ [page 209](#) .

Further installation is carried out in reverse order of removal. Observe the following:

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

#### Torque settings

- ◆ ⇒ [Fig. “Oil separator - specified torque and sequence”](#) , [page 209](#)
- ◆ ⇒ [“2.2 Assembly overview - electric coolant pump”](#) , [page 234](#)





## 4 Oil filter, oil pressure switch

⇒ [“4.1 Assembly overview - oil filter/oil pressure switch”, page 213](#)

⇒ [“4.2 Removing and installing oil pressure switch F1”, page 214](#)

⇒ [“4.3 Removing and installing oil pressure switch for reduced oil pressure F378”, page 215](#)

⇒ [“4.4 Checking oil pressure”, page 216](#)

⇒ [“4.5 Removing and installing oil pressure regulating valve N428”, page 218](#)

### 4.1 Assembly overview - oil filter/oil pressure switch

#### 1 - Oil filters

- Remove and install with oil filter tool - 3417-
- Before installing, lightly coat seal with clean engine oil.
- If threaded connection for oil filter in top section of sump is loosened  
⇒ [Fig. “Tightening connecting union for oil filter”](#), page 195
- 20 Nm
- Observe notes  
⇒ [page 193](#)

#### 2 - Oil pressure switch for reduced oil pressure - F378-

- Switch pressure 0.3 to 0.6 bar
- Checking  
⇒ [“4.4 Checking oil pressure”, page 216](#)
- Removing and installing  
⇒ [“4.3 Removing and installing oil pressure switch for reduced oil pressure F378”, page 215](#)
- 20 Nm

#### 3 - Seal

- Renew O-ring after each removal

#### 4 - O-ring

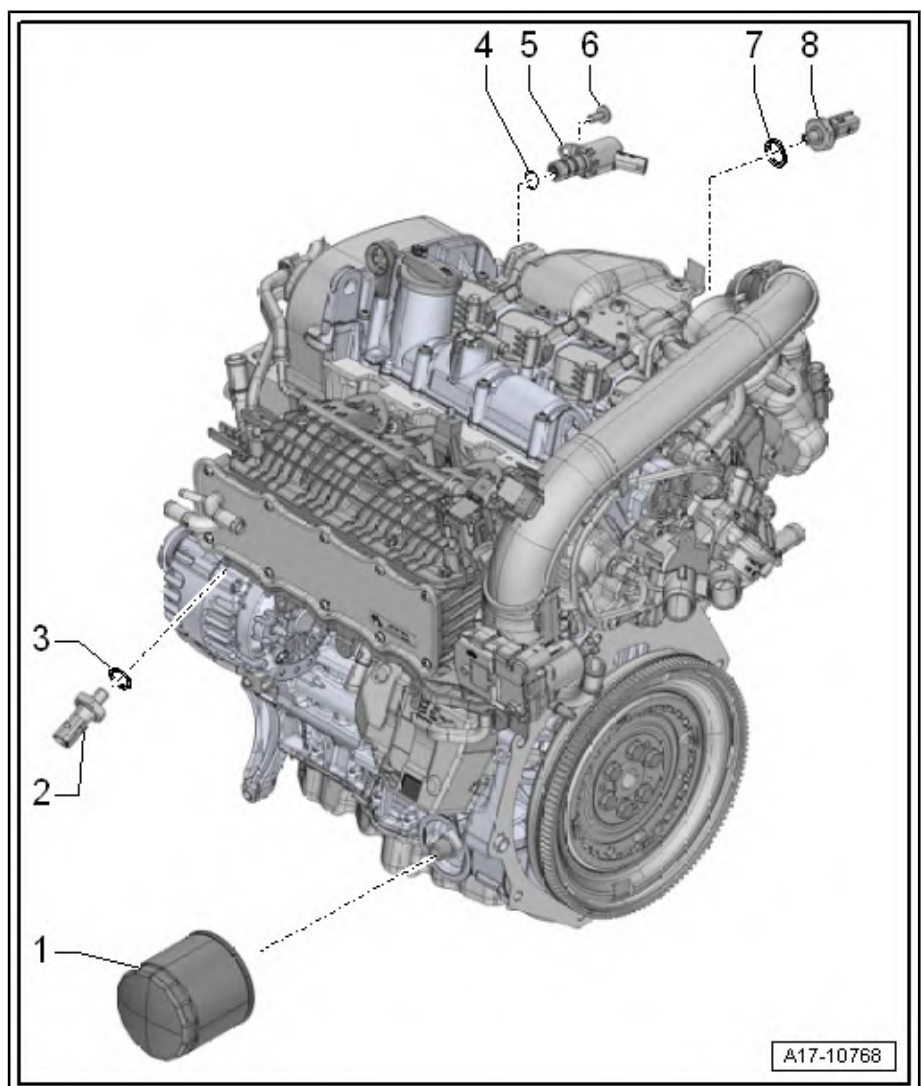
- Renew after removal

#### 5 - Valve for oil pressure control - N428-

- Removing and installing  
⇒ [“4.5 Removing and installing oil pressure regulating valve N428”, page 218](#)

#### 6 - Bolt

- Renew after removal
- 8 Nm





## 7 - Seal

- Renew O-ring after each removal

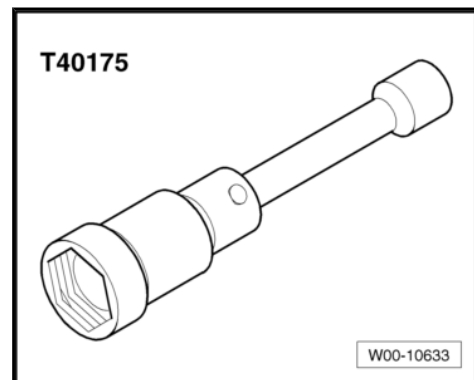
## 8 - Oil pressure switch - F1-

- Switch pressure 2.15 to 2.95 bar
- Checking ⇒ ["4.4 Checking oil pressure", page 216](#)
- Removing and installing ⇒ ["4.2 Removing and installing oil pressure switch F1", page 214](#)
- 20 Nm

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

### Special tools and workshop equipment required

- ◆ Jointed wrench 24 mm - T40175-



### Removing



#### Note

*Fit all heat shield sleeves in the same place when installing.*

- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation .
- Remove heat shield for right drive shaft ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft heat shield .



- Separate electrical connector -arrow-.
- Place a cloth underneath to catch escaping engine oil.
- Remove oil pressure switch - F1- .

### Installing

Install in reverse order of removal. The following should be observed:



#### Note

*Screw oil pressure switch - F1- immediately into bore to avoid loss of oil.*

- Cut open the captive seal to renew it.
- Check oil level ⇒ Maintenance ; Booklet .

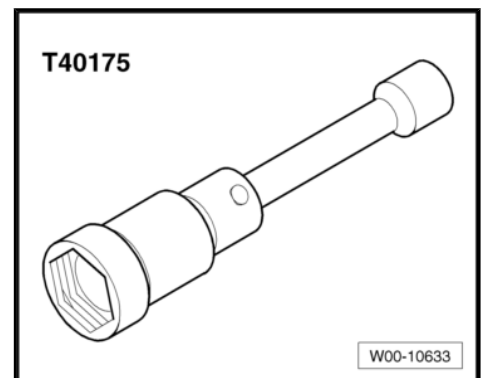
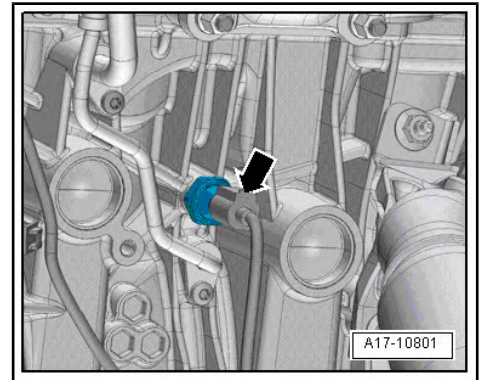
### Torque settings

- ◆ ⇒ ["4.1 Assembly overview - oil filter/oil pressure switch", page 213](#)
- ◆ ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Assembly overview - drive shaft

## 4.3 Removing and installing oil pressure switch for reduced oil pressure - F378-

### Special tools and workshop equipment required

- ◆ Jointed wrench 24 mm - T40175-



### Removing

- Pull activated charcoal filter solenoid valve 1 - N80- -3- off intake manifold and push it downwards slightly.



- Disconnect electrical connector -2-.
- Place a cloth underneath to catch escaping engine oil.
- Unscrew oil pressure switch for reduced oil pressure - F378-1-.

### Installing

Install in reverse order of removal, observing the following:

- Specified torque  
⇒ [“4.1 Assembly overview - oil filter/oil pressure switch”, page 213](#)



### Note

*Insert new oil pressure switch for reduced oil pressure - F378- immediately in bore to avoid loss of oil.*

- Cut open the captive seal to renew it.
- Check oil level ⇒ Maintenance ; Booklet .

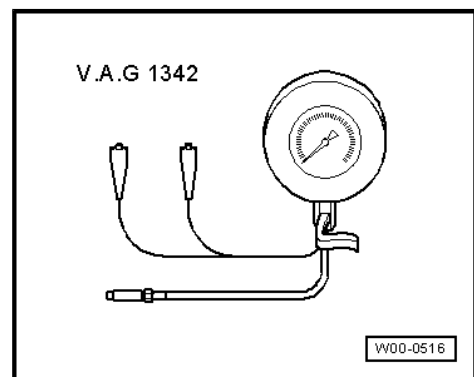
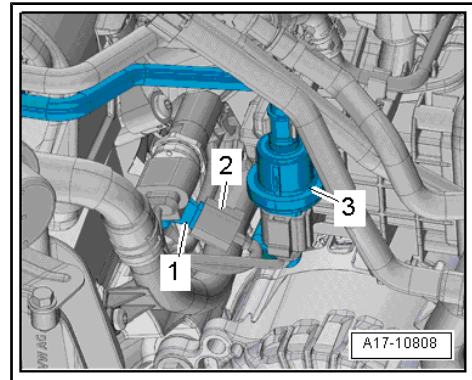
### Torque settings

- ♦ ⇒ [“4.1 Assembly overview - oil filter/oil pressure switch”, page 213](#)

## 4.4 Checking oil pressure

### Special tools and workshop equipment required

- ♦ Oil pressure tester - V.A.G 1342-



### Procedure

- Oil level OK. Checking ⇒ Maintenance ; Booklet .
- Engine oil temperature at least 80 °C (radiator fan must have run once)
- Remove oil pressure switch for reduced oil pressure - F378-  
⇒ [“4.2 Removing and installing oil pressure switch F1”, page 214](#) .
- Screw oil pressure tester - V.A.G 1342- into hole for oil pressure switch.
- Screw oil pressure switch for reduced oil pressure - F378- into hole in oil pressure tester - V.A.G 1342- to seal it.
- Start engine.

### Checking oil pressure at idling speed and at 2000 rpm

- Oil pressure at idling speed: at least 0.6 bar.
- Oil pressure at 2000 rpm: at least 1.5 bar.



- Switch off engine.

#### Check oil pressure at 3,800 rpm

- Remove electrical connection from oil pressure control valve - N428- ⇒ [page 219](#) .
- Start engine.
- Increase engine revs to 3800 rpm and read off oil pressure on the oil pressure tester - V.A.G 1342- .
- Oil pressure at 3800 rpm: at least 2.8 bar.

If specification is not attained:

- Connect electrical connection to oil pressure control valve - N428- ⇒ [page 219](#) .
- Interrogate the engine control unit event memory and delete all event entries ⇒ Vehicle diagnostic tester.
- Check oil pressure control valve - N428- ⇒ Vehicle diagnostic tester.



#### Note

*Mechanical damage, e.g. to bearings, could also be the cause for oil pressure being too low.*

If no fault is found:

- Renew oil pump  
⇒ ["1.5 Removing and installing oil pump", page 204](#) .

#### Check oil pressure switch for reduced oil pressure - F378- (brown):

- Switch off ignition.



- Connect brown wire of tester to earth (-).
- Connect voltage tester - V.A.G 1527B- to battery positive (+) and oil pressure switch for reduced oil pressure - F378- using test leads from auxiliary measuring set - V.A.G 1594C- .
- LED must not light up.
- If LED lights up, renew oil pressure switch for reduced oil pressure - F378- .

If LED does not light up:

- Start engine: At 0.3 to 0.6 bar the LED must light up, otherwise renew oil pressure switch.

#### Checking oil pressure switch - F1- (blue):

- Switch off engine.
- Connect voltage tester - V.A.G 1527B- to battery positive (+) and oil pressure switch - F1- (blue) using test leads from auxiliary measuring set - V.A.G 1594C- .
- LED must not light up.
- If LED lights up, renew oil pressure switch oil pressure switch - F1- .

If LED does not light up:

- Remove electrical connection from oil pressure control valve - N428- ⇒ [page 219](#) .
- Start engine and increase rpm: At pressure of 2.15 to 2.95 bar LED must light up, otherwise renew oil pressure switch.
- Connect electrical connection to oil pressure control valve - N428- ⇒ [page 219](#) .
- Install oil pressure switch for reduced oil pressure - F378- ⇒ [“4.3 Removing and installing oil pressure switch for reduced oil pressure F378”](#), [page 215](#) .
- Interrogate the engine control unit event memory and delete all event entries ⇒ Vehicle diagnostic tester.

#### Torque settings

- ♦ ⇒ [“4.1 Assembly overview - oil filter/oil pressure switch”](#), [page 213](#)

## 4.5 Removing and installing oil pressure regulating valve - N428-

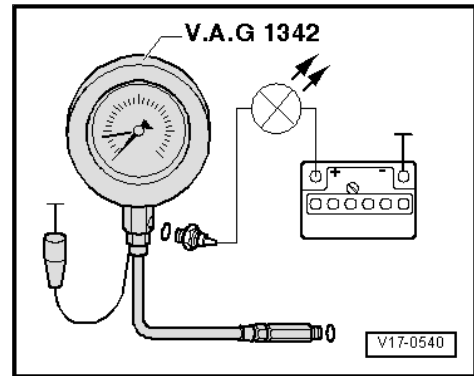
### Removing



#### Note

*Fit all heat shield sleeves in the same place when installing.*

- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation .
- Detach heat insulation sleeves.







- Disconnect electrical connector -1-.
- Place a cloth underneath to catch escaping engine oil.
- Unscrew bolt -2- and pull off valve for oil pressure control - N428- .

### Installing

Install in reverse order of removal, observing the following:

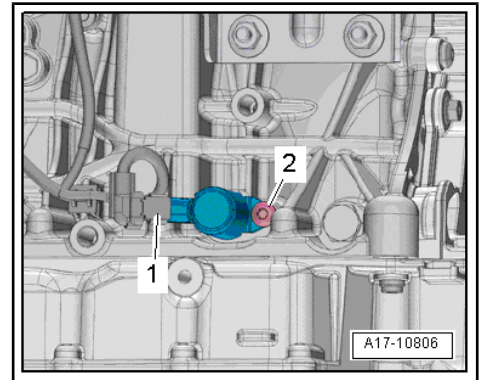
- Specified torque  
⇒ ["4.1 Assembly overview - oil filter/oil pressure switch", page 213](#)



### Note

*Renew O-ring.*

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





## 19 – Cooling

### 1 Cooling system/coolant

⇒ [“1.1 Connection diagram - coolant hoses”, page 220](#)

⇒ [“1.2 Checking cooling system for leaks”, page 223](#)

⇒ [“1.3 Draining and adding coolant”, page 225](#)

#### 1.1 Connection diagram - coolant hoses



#### Note

- ◆ *The arrows point in the direction of coolant flow.*
- ◆ *The arrow markings on coolant pipes and on ends of coolant hoses must align.*

Vehicles ▶ June 2013

1 - Coolant expansion tank

2 - Cap

- For coolant expansion tank
- Check pressure relief valve ⇒ [page 225](#)

3 - Cylinder head/cylinder block

- Renew coolant after replacing
- Assembly overview ⇒ [“1.1 Assembly overview - cylinder head”, page 76](#)

4 - Exhaust turbocharger

- Assembly overview ⇒ [“1.1 Assembly overview - turbocharger”, page 270](#)
- Removing and installing ⇒ [“1.2 Removing and installing turbocharger”, page 274](#)

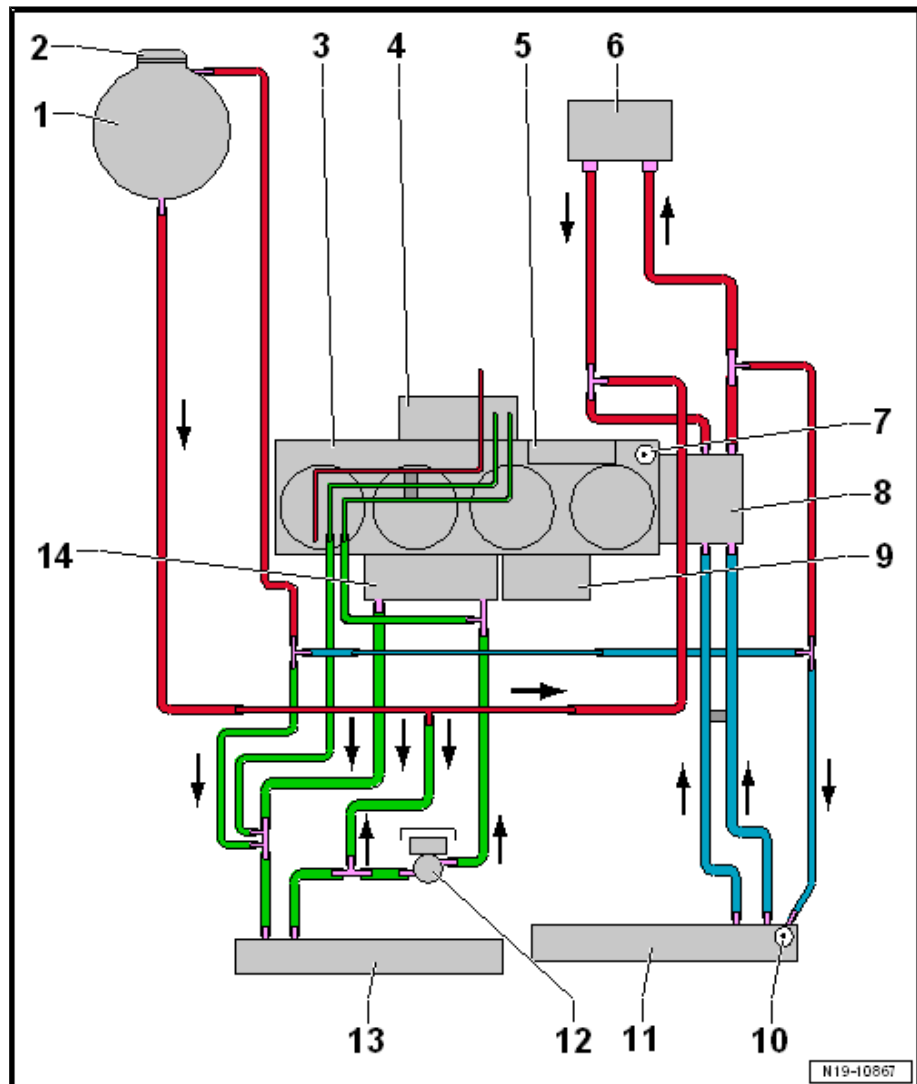
5 - Integrated exhaust manifold

6 - Heat exchanger for heater

- Renew coolant after replacing

7 - Radiator outlet coolant - G62-

- Assembly overview ⇒ [“2.3 Assembly overview - coolant temperature sender”, page 236](#)
- Removing and installing ⇒ [“2.8 Removing and installing coolant temperature sender G62”, page 248](#)





## 8 - Coolant pump

- With thermostat housing
- Assembly overview ⇒ [“2.1 Assembly overview - coolant pump, thermostat”, page 232](#)
- Removing and installing ⇒ [“2.5 Removing and installing coolant pump”, page 238](#)
- Removing and installing thermostat ⇒ [“2.6 Removing and installing thermostat”, page 242](#) .

## 9 - Engine oil cooler

- Assembly overview ⇒ [“2.1 Assembly overview - engine oil cooler”, page 207](#)
- Removing and installing ⇒ [“2.2 Removing and installing engine oil cooler”, page 207](#)

## 10 - Radiator outlet coolant temperature sender - G83-

- Assembly overview ⇒ [“2.3 Assembly overview - coolant temperature sender”, page 236](#)
- Removing and installing  
⇒ [“2.9 Removing and installing radiator outlet coolant temperature sender G83”, page 250](#)

## 11 - Radiator for engine coolant

- Renew coolant after replacing
- Assembly overview ⇒ [“4.1 Assembly overview - radiator/radiator fan”, page 257](#)
- Removing and installing ⇒ [“4.3 Removing and installing radiator”, page 260](#)

## 12 - Charge air cooling pump - V188-

- Assembly overview ⇒ [“2.2 Assembly overview - electric coolant pump”, page 234](#)
- Removing and installing

## 13 - Radiator for charge air cooling circuit

- Renew coolant after replacing
- Assembly overview ⇒ [“4.1 Assembly overview - radiator/radiator fan”, page 257](#)
- Removing and installing

## 14 - Charge air cooler in intake manifold

- Renew coolant after replacing
- Assembly overview ⇒ [“2.1 Assembly overview - charge air system”, page 283](#)
- Removing and installing ⇒ [“2.2 Removing and installing charge air cooler”, page 285](#)

Vehicles, June 2013 ►



**1 - Coolant expansion tank**

**2 - Cap**

- For coolant expansion tank
- Check pressure relief valve ⇒ [page 225](#)

**3 - Cylinder head/cylinder block**

- Renew coolant after replacing
- Assembly overview ⇒ [“1.1 Assembly overview - cylinder head”, page 76](#)

**4 - Exhaust turbocharger**

- Assembly overview ⇒ [“1.1 Assembly overview - turbocharger”, page 270](#)
- Removing and installing ⇒ [“1.2 Removing and installing turbocharger”, page 274](#)

**5 - Integrated exhaust manifold**

**6 - Heat exchanger for heater**

- Renew coolant after replacing

**7 - Radiator outlet coolant - G62-**

- Assembly overview ⇒ [“2.3 Assembly overview - coolant temperature sender”, page 236](#)
- Removing and installing ⇒ [“2.8 Removing and installing coolant temperature sender G62”, page 248](#)

**8 - Coolant pump**

- With thermostat housing
- Assembly overview ⇒ [“2.1 Assembly overview - coolant pump, thermostat”, page 232](#)
- Removing and installing ⇒ [“2.5 Removing and installing coolant pump”, page 238](#)
- Removing and installing thermostat ⇒ [“2.6 Removing and installing thermostat”, page 242](#)

**9 - Engine oil cooler**

- Assembly overview ⇒ [“2.1 Assembly overview - engine oil cooler”, page 207](#)
- Removing and installing ⇒ [“2.2 Removing and installing engine oil cooler”, page 207](#)

**10 - Radiator outlet coolant temperature sender - G83-**

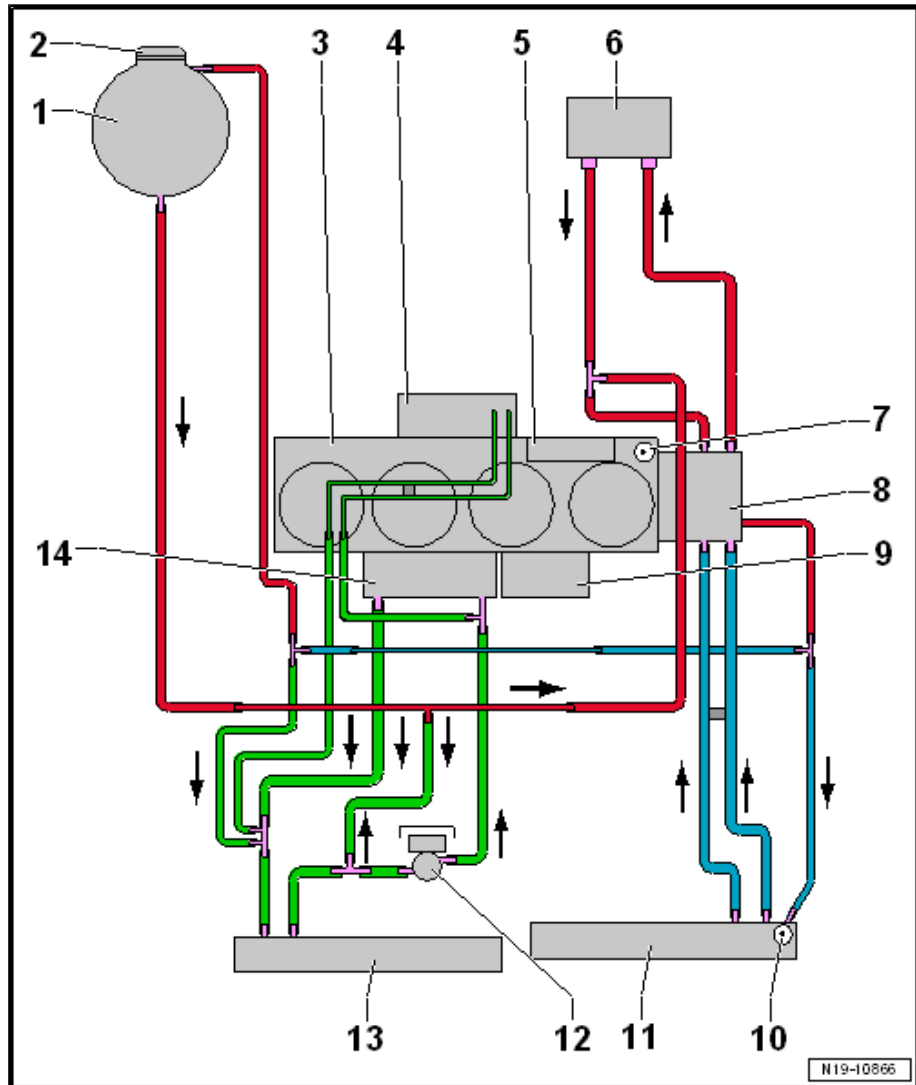
- Assembly overview ⇒ [“2.3 Assembly overview - coolant temperature sender”, page 236](#)
- Removing and installing ⇒ [“2.9 Removing and installing radiator outlet coolant temperature sender G83”, page 250](#)

**11 - Radiator for engine coolant**

- Renew coolant after replacing
- Assembly overview ⇒ [“4.1 Assembly overview - radiator/radiator fan”, page 257](#)
- Removing and installing ⇒ [“4.3 Removing and installing radiator”, page 260](#)

**12 - Charge air cooling pump - V188-**

- Assembly overview ⇒ [“2.2 Assembly overview - electric coolant pump”, page 234](#)





- Removing and installing

**13 - Radiator for charge air cooling circuit**

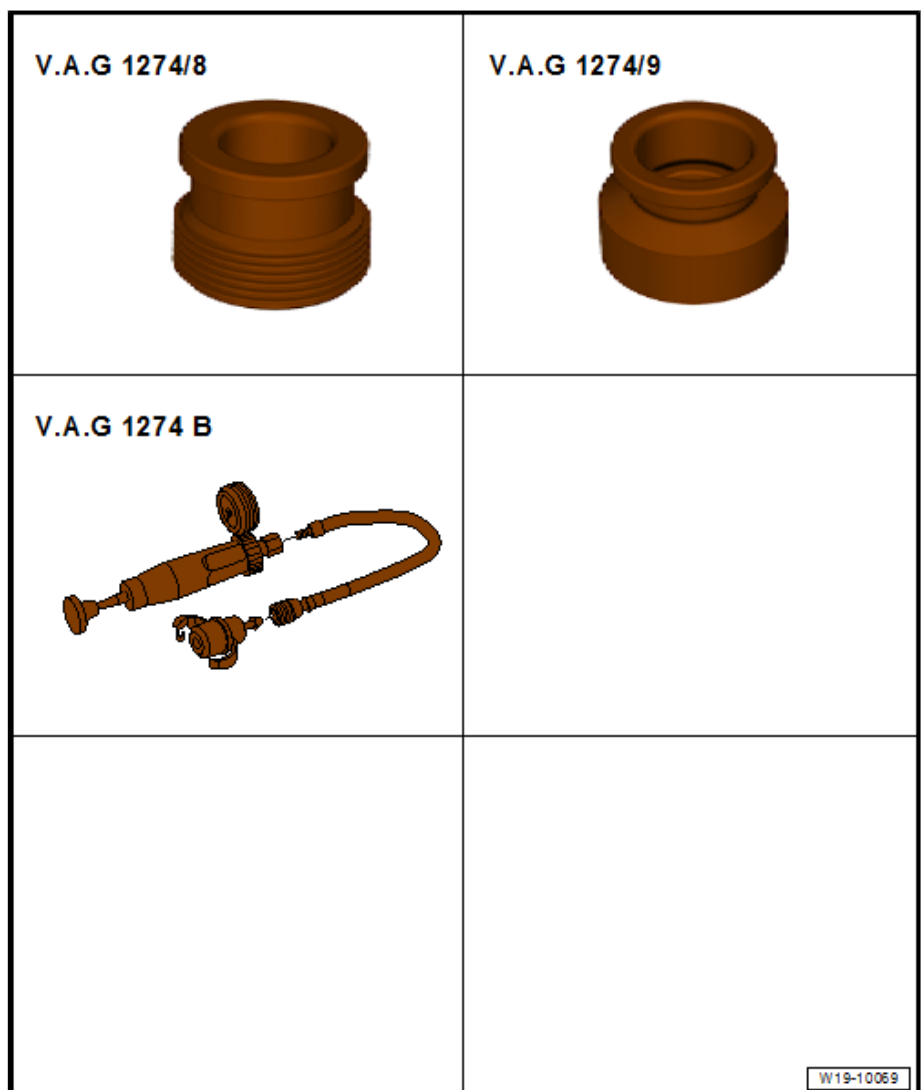
- Renew coolant after replacing
- Assembly overview ⇒ [“4.1 Assembly overview - radiator/radiator fan”, page 257](#)
- Removing and installing  
 ⇒ [“4.4 Removing and installing water radiator for charge air cooling circuit”, page 263](#)

**14 - Charge air cooler in intake manifold**

- Renew coolant after replacing
- Assembly overview ⇒ [“2.1 Assembly overview - charge air system”, page 283](#)
- Removing and installing ⇒ [“2.2 Removing and installing charge air cooler”, page 285](#)

## 1.2 Checking cooling system for leaks

Special tools and workshop equipment required



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



## Procedure



### Note

To perform the leakage test correctly, first run a self-test on the cooling system tester - V.A.G 1274 B- .

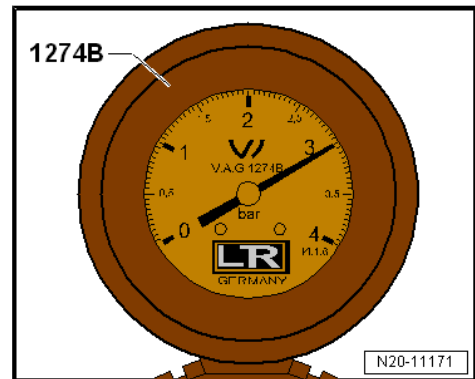
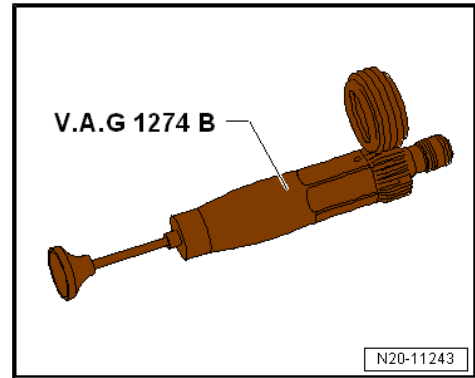
### Self-test of cooling system tester - V.A.G 1274 B-

- Operate cooling system tester - V.A.G 1274 B- several times.

- Build up a pressure of 3.0 bar on cooling system tester .
- Observe pressure on pressure gauge of cooling system tester for 30 seconds.

### If no pressure builds up or if the pressure drops again:

The cooling system tester - V.A.G 1274 B- is leaking and should not be used.



### Checking cooling system for leaks

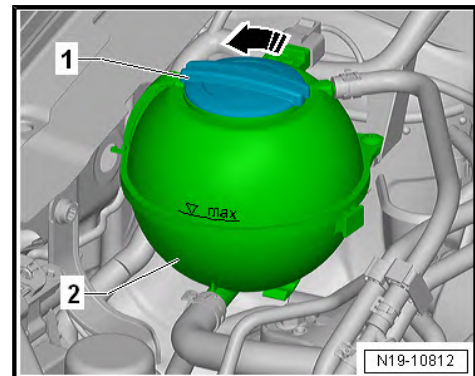
#### CAUTION

On a warm engine, the cooling system is under high pressure. Danger of scalding by 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.

- Carefully open filler cap -1- on coolant expansion tank -2- in -direction of arrow-.
- Engine at operating temperature.





- Fit cooling system tester - V.A.G 1274 B- with adapter - V.A.G 1274/8- on coolant expansion tank.
- Build up pressure of approx. 1.5 bar using hand pump of cooling system tester.
- The pressure must not drop by more than 0.2 bar within 10 minutes.
- If the pressure drops more than 0.2 bar, locate and rectify leaks.



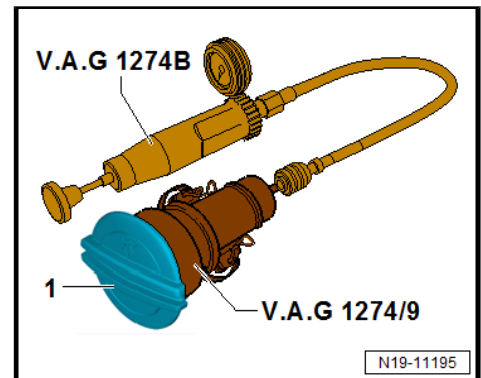
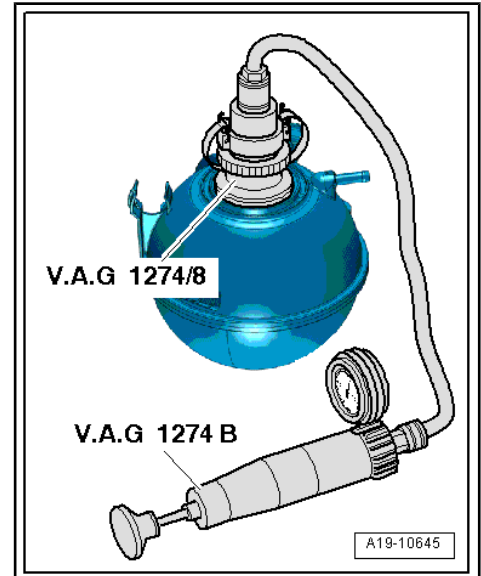
#### Note

*The pressure drop of 0.2 bar within 10 minutes depends on the how far the coolant can cool down. The colder the engine, the lower the pressure drop. If necessary, repeat the check while the engine is cold.*

- If this pressure is not maintained, locate and rectify leaks.

#### Checking pressure relief valve in filler cap:

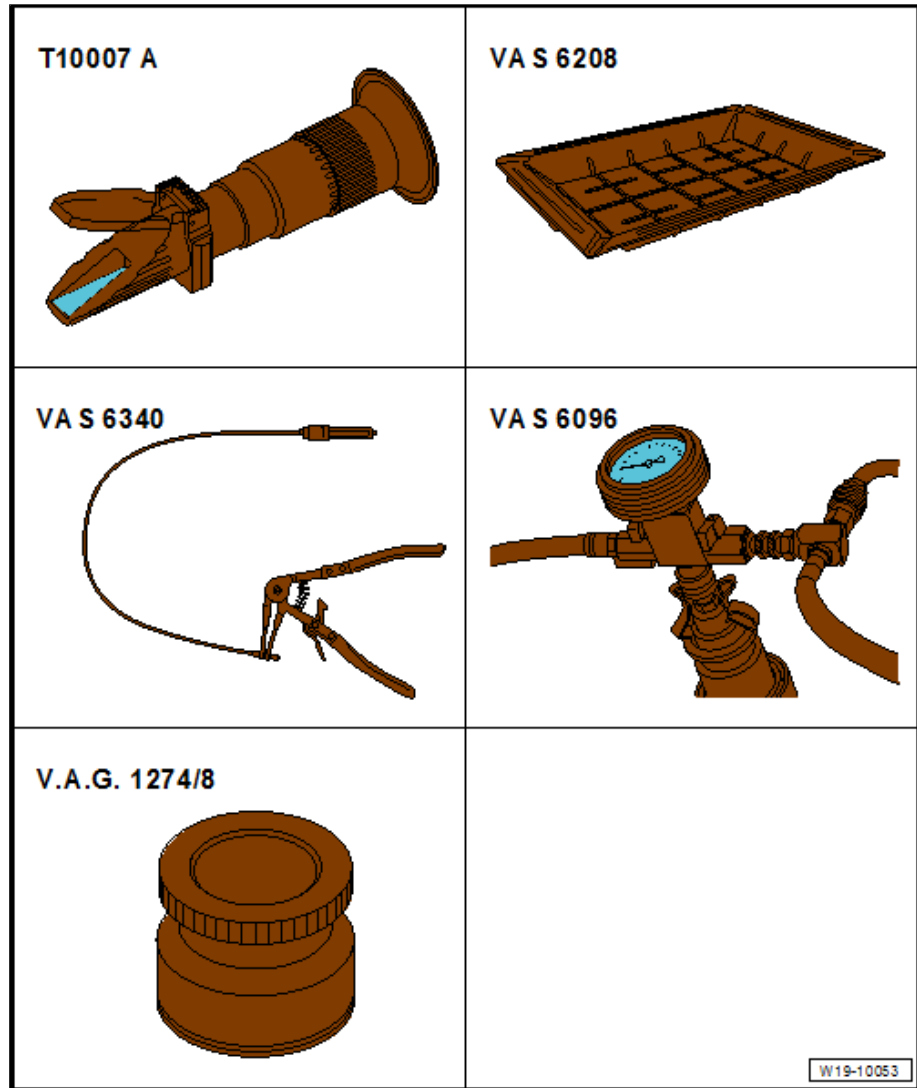
- Fit cooling system tester - V.A.G 1274 B- with adapter - V.A.G 1274/9- to filler cap -1-.
- Build up pressure using hand pump of cooling system tester.
- ◆ The pressure relief valve must open at a pressure of 1.4 to 1.6 bar.



## 1.3 Draining and adding coolant



**Special tools and workshop equipment required**



- ◆ Adapter for cooling system tester - V.A.G 1274/8-
- ◆ Hose clamp pliers - VAS 6340-
- ◆ Coolant system charge unit - VAS 6096-
- ◆ Drip tray for workshop hoist - VAS 6208-
- ◆ Refractometer - T10007 A-
- ◆ Safety glasses
- ◆ Safety gloves





## Draining

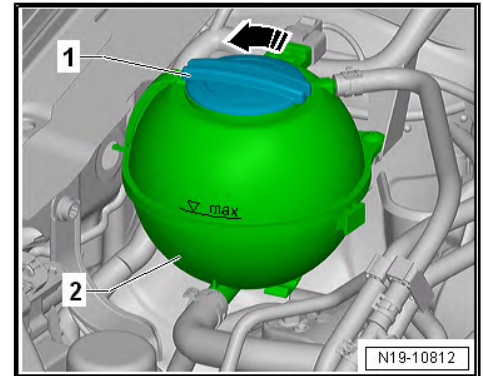
- Carefully open filler cap -1- on coolant expansion tank -2- in -direction of arrow-.

### CAUTION

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

Skin and other parts of the body may be scalded.

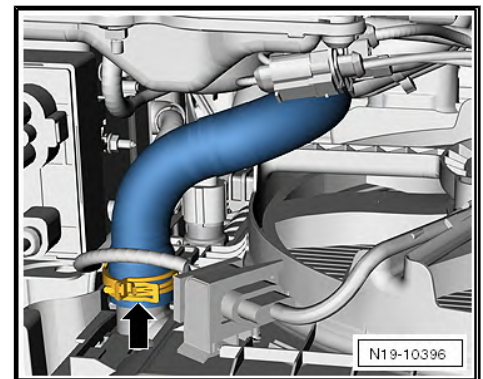
- Wear protective gloves.
- Wear protective goggles.
- Reduce excess pressure by covering cap of coolant expansion tank with cloths and opening it carefully.



- Remove noise insulation => General body repairs, exterior; Rep. gr. 66 ; Noise insulation .
- Place drip tray for workshop hoist - VAS 6208- underneath.

## Draining coolant from radiator:

- Open spring-type clip -arrow- and pull coolant hose off.



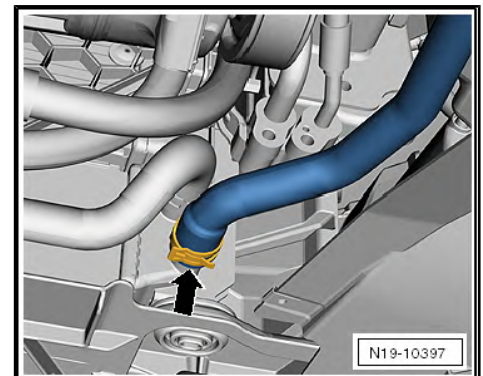
## Draining coolant from radiator for charge air cooling circuit:

- Open spring-type clip -arrow-.
- Pull coolant hose off water radiator for charge air cooling circuit.

## Continued for all vehicles:

### Note

*Do not reuse coolant which has been drained off.*

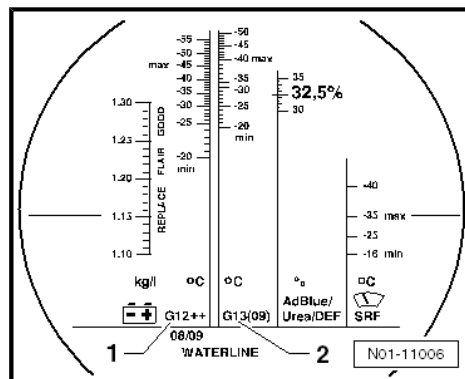


## Filling



## Note

- ◆ *The water used for mixing has a major influence on the effectiveness of the coolant. Because the water quality differs from country to country and even from region to region, the quality of the water to be used in the cooling system has been specified by Volkswagen. Distilled water fulfils all requirements. Therefore, 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 motor.*
- ◆ *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.*
- ◆ *ONLY refractometer - T10007A- may be used for determining current anti-freeze value.*
- ◆ *Frost protection must be guaranteed down to -25°C as a minimum and, in countries with arctic conditions, down to approx. -36°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°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°C.*
- ◆ *Read off anti-freeze figures for respective replenished coolant additives.*
- ◆ *The temperature read off the refractometer - T10007A- corresponds 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.*



## Coolant mixture ratio

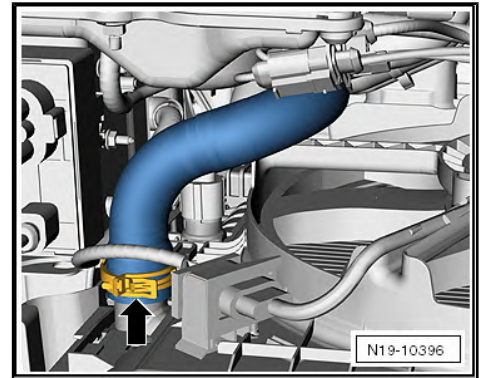
Frost protection to	Coolant additive concentration	Coolant additive <sup>1)</sup>	Distilled water <sup>1)</sup>
-25°C	40%	3.2 l	4.8 l
-36°C	50%	4.0 l	4.0 l

<sup>1)</sup> The quantity of coolant can vary depending on the vehicle equipment.

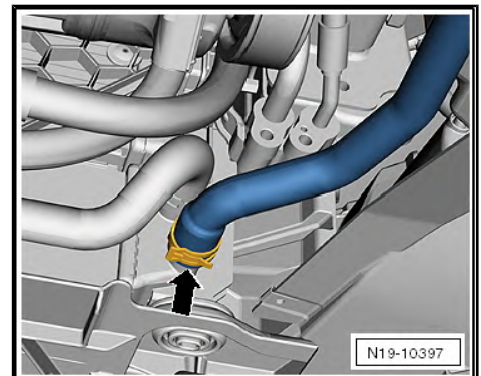
- Coolant: ⇒ Electronic Parts Catalogue .



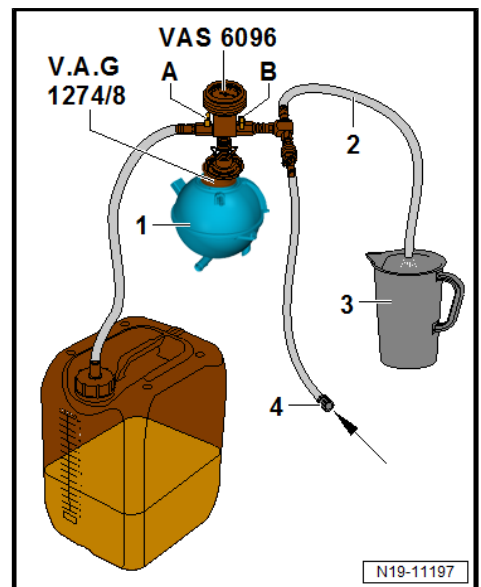
- Connect coolant hose on bottom left to radiator.
- Secure coolant hose with spring-type clip -arrow-.



- Connect coolant hose to water radiator for charge air cooling circuit.
- Secure coolant hose with spring-type clip -arrow-.



- Fill spare container for cooling system charge unit - VAS 6096/1- of cooling system charge unit - VAS 6096- with at least 10 litres of pre-mixed coolant.
- Make sure to use correct mixing ratio.
- Screw adapter for cooling system tester - V.A.G 1274/8- onto coolant expansion tank -1-.
- Install cooling system charge unit - VAS 6096- to adapter - V.A.G 1274/8- .
- Feed vent hose -2- into a small container -3-.



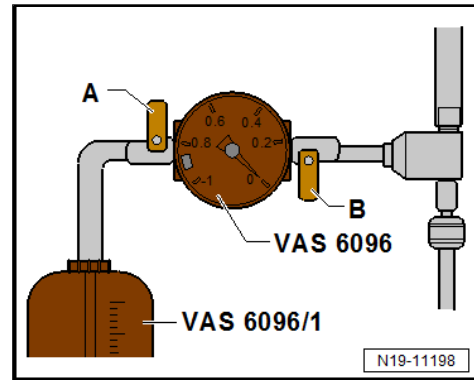
**i** Note

*Exhaust air takes a slight quantity of coolant along with it, which is collected.*

- Close valves -A- and -B- (turn lever transverse to direction of flow to do this).
- Connect hose -4- to compressed air.
- Pressure: 6 to 10 bar.



- Open valve -B-; turn lever in direction of flow to do this.
- The suction-jet pump reduces pressure in the cooling system to below atmospheric pressure.
- The needle on the gauge should move into the green zone.
- Also, open valve -A- briefly.
- To do this, turn lever in direction of flow so that hose of spare container for cooling system charge unit - VAS 6096/1- is filled with coolant.
- Close valve -A- again.
- Leave valve -B- open for a further 2 minutes.
- The suction-jet pump will continue generating a vacuum in the cooling system.
- The needle on the gauge must remain in the green zone.
- Close valve -B-.
- The needle on the gauge must stay in the green zone.
- The low pressure in the cooling system is then sufficient for subsequent filling.

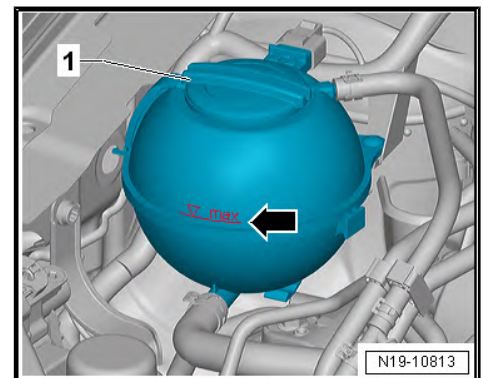
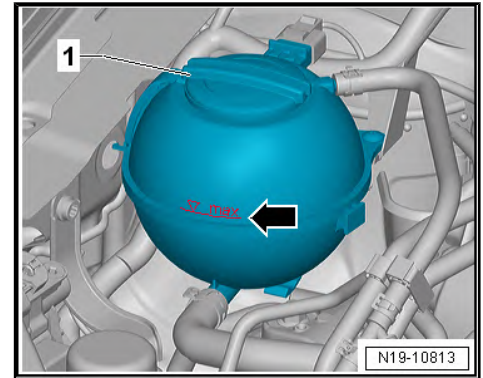


#### Note

- ◆ *If the needle does not reach the green zone, repeat the process.*
- ◆ *If the vacuum drops, the cooling system must be checked for leaks.*
- Pull off compressed air hose.
- Open valve -A-.
- The vacuum in the cooling system draws coolant from the spare container for cooling system charge unit - VAS 6096/1- , thus filling the cooling system.
- Remove cooling system charge unit - VAS 6096- from coolant expansion tank.



- Fill coolant up to max. marking -arrow- on coolant expansion tank -1-.
- Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation .
- On vehicles with auxiliary heater, switch on auxiliary heater for about 30 seconds.
- Set temperature regulator to "HI".
- Switch off air conditioner compressor. To do this, press **AC** button.
  - LED in the button must not light up.
- Start engine and run it for max. 2 min. at a speed of approx. 1,500 rpm.
- Fill coolant up to the overflow hole of the coolant expansion tank while the engine is running.
- Tighten cap of coolant expansion tank until it engages.
- Run engine at idling speed until the coolant hoses on the radiator are heated up.
- Switch off engine and let it cool off.
- Check coolant level in coolant expansion tank -1-.
  - When the engine is cold, the coolant level must be between the min. and the max. markings.
  - When the engine is at operating temperature, it is permissible that the coolant level is at the "max." mark -arrow-.
- Fill more coolant if necessary.





## 2 Coolant pump, regulation of cooling system

⇒ [“2.1 Assembly overview - coolant pump, thermostat”, page 232](#)

⇒ [“2.2 Assembly overview - electric coolant pump”, page 234](#)

⇒ [“2.3 Assembly overview - coolant temperature sender”, page 236](#)

⇒ [“2.4 Removing and installing electric coolant pump”, page 236](#)

⇒ [“2.5 Removing and installing coolant pump”, page 238](#)

⇒ [“2.6 Removing and installing thermostat”, page 242](#)

⇒ [“2.7 Removing and installing toothed belt pulley for coolant pump”, page 245](#)

⇒ [“2.8 Removing and installing coolant temperature sender G62”, page 248](#)

⇒ [“2.9 Removing and installing radiator outlet coolant temperature sender G83”, page 250](#)

### 2.1 Assembly overview - coolant pump, thermostat

#### 1 - Thermostat housing

- ❑ Removing and installing  
⇒ [“2.6 Removing and installing thermostat”, page 242](#)

#### 2 - Thermostat

- ❑ For cylinder block coolant circuit
- ❑ Different versions. Refer to ⇒ Electronic parts catalogue .
- ❑ Up to 07.2016: Starts to open at approx. 105 °C
- ❑ From 07.2016 onwards: Starts to open at approx. 97 °C
- ❑ Removing and installing  
⇒ [“2.6.2 Removing and installing thermostat for cylinder block coolant circuit”, page 244](#)

#### 3 - Seal

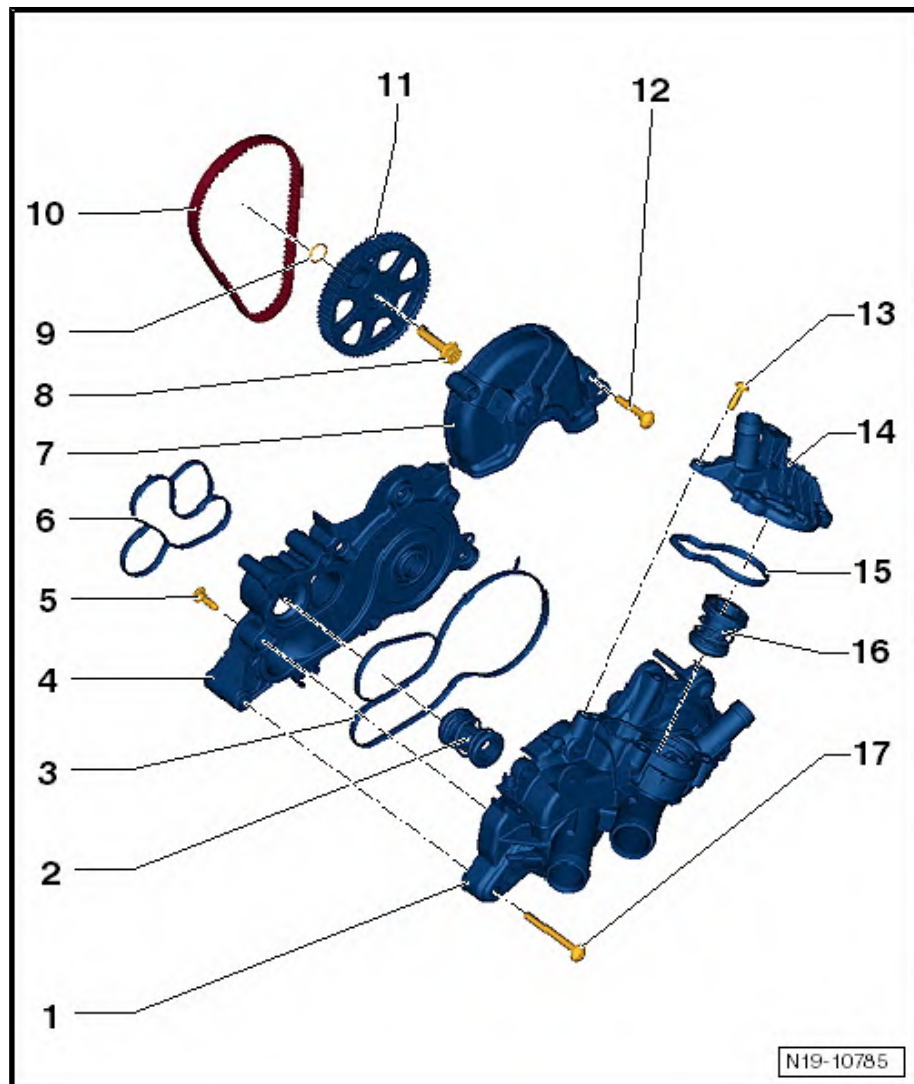
- ❑ Renew after removal

#### 4 - Coolant pump

- ❑ Removing and installing  
⇒ [“2.5 Removing and installing coolant pump”, page 238](#)
- ❑ Renew toothed belt as well when renewing coolant pump

#### 5 - Bolt

- ❑ 8 Nm





- Thread-forming
- Fit and screw in bolt by hand so that it screws into old thread Then tighten bolt to specified torque
- Specified torque and tightening sequence ⇒ [page 234](#)

#### 6 - Seal

- Renew after removal

#### 7 - Toothed belt guard

- For toothed belt for coolant pump

#### 8 - Bolt

- Renew after removal
- 20 Nm + 90°

#### 9 - O-ring

- Renew after removal
- Removing and installing  
⇒ [“2.7 Removing and installing toothed belt pulley for coolant pump”, page 245](#)

#### 10 - Toothed belt

- For coolant pump
- Renew toothed belt after removal

#### 11 - Crankshaft

- For coolant pump
- Removing and installing  
⇒ [“2.7 Removing and installing toothed belt pulley for coolant pump”, page 245](#)

#### 12 - Bolt

- 8 Nm

#### 13 - Bolt

- 8 Nm
- Thread-forming
- Fit and screw in bolt by hand so that it screws into old thread Then tighten bolt to torque.
- Specified torque and tightening sequence ⇒ [page 234](#)

#### 14 - Cover

- For thermostat

#### 15 - Seal

- Renew after removal

#### 16 - Thermostat

- For main coolant circuit (radiator)
- Up to 11.2012: Starts to open at approx. 80°C
- As of 11.2012: Starts to open at approx. 87°C
- Removing and installing  
⇒ [“2.6.1 Removing and installing thermostat for main coolant circuit \(radiator\)”, page 242](#)
- Fitting position ⇒ [Fig. “Installation position of thermostat for cylinder head coolant circuit”, page 234](#)

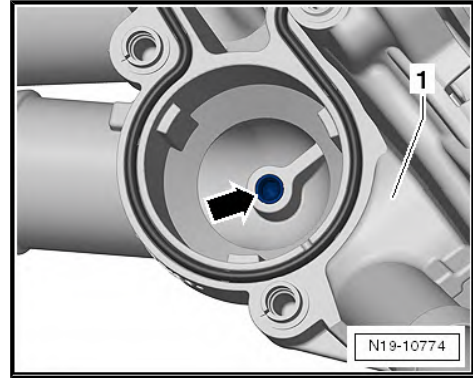
#### 17 - Bolt

- Specified torque and tightening sequence ⇒ [page 242](#)



### Installation position of thermostat for cylinder head coolant circuit

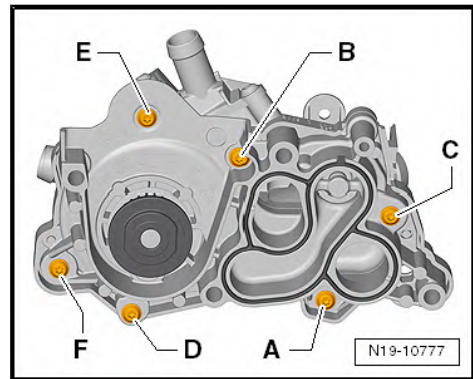
- Must be positioned with centring pin in guide -arrow- in thermostat housing.



### Thermostat housing to coolant pump - specified torque and tightening sequence

- Screw bolts in loosely.
- Tighten bolts in the sequence shown.

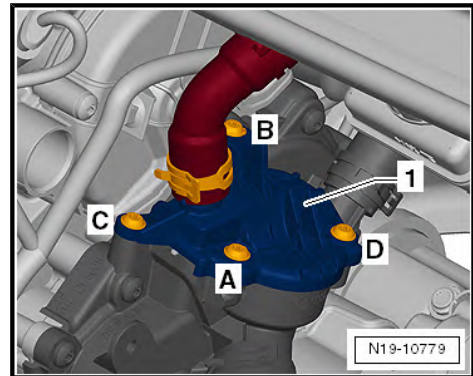
Tightening sequence	Torque setting
-A-	8 Nm
-B-	8 Nm
-C-	8 Nm
-D-	8 Nm
-E-	8 Nm
-F-	8 Nm



### Cover for thermostat to thermostat housing - specified torque and tightening sequence

- Screw in bolts for cover -1- loosely.
- Tighten bolts for cover -1- in the sequence shown.

Tightening sequence	Torque setting
-A-	8 Nm
-B-	8 Nm
-C-	8 Nm
-D-	8 Nm



## 2.2 Assembly overview - electric coolant pump





**1 - Charge air cooling pump - V188-**

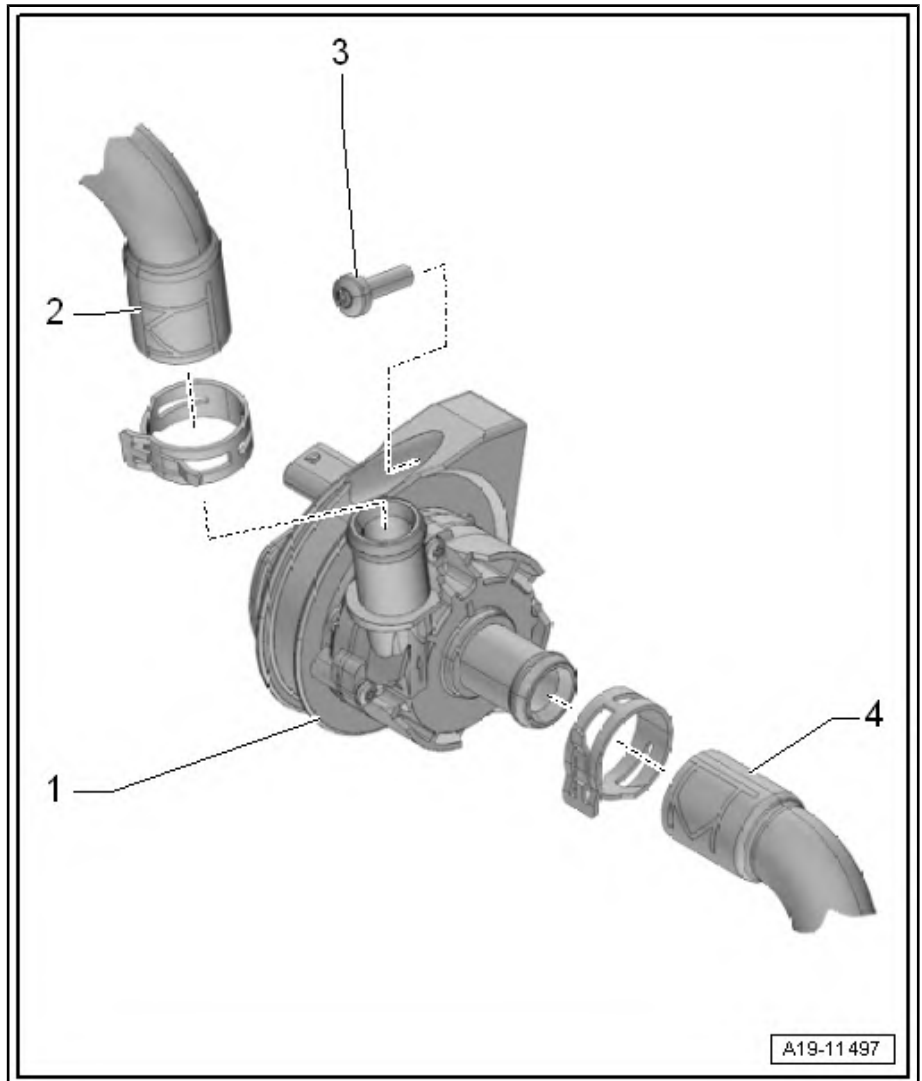
- with holder
- Removing and installing

**2 - Coolant hose**

**3 - Bolt**

- 8 Nm

**4 - Coolant hose**





## 2.3 Assembly overview - coolant temperature sender

### 1 - Radiator outlet coolant temperature sender - G83-

- 35 Nm
- Removing and installing  
⇒ [“2.9 Removing and installing radiator outlet coolant temperature sender G83”](#),  
[page 250](#)

### 2 - O-ring

- Renew after removal

### 3 - O-ring

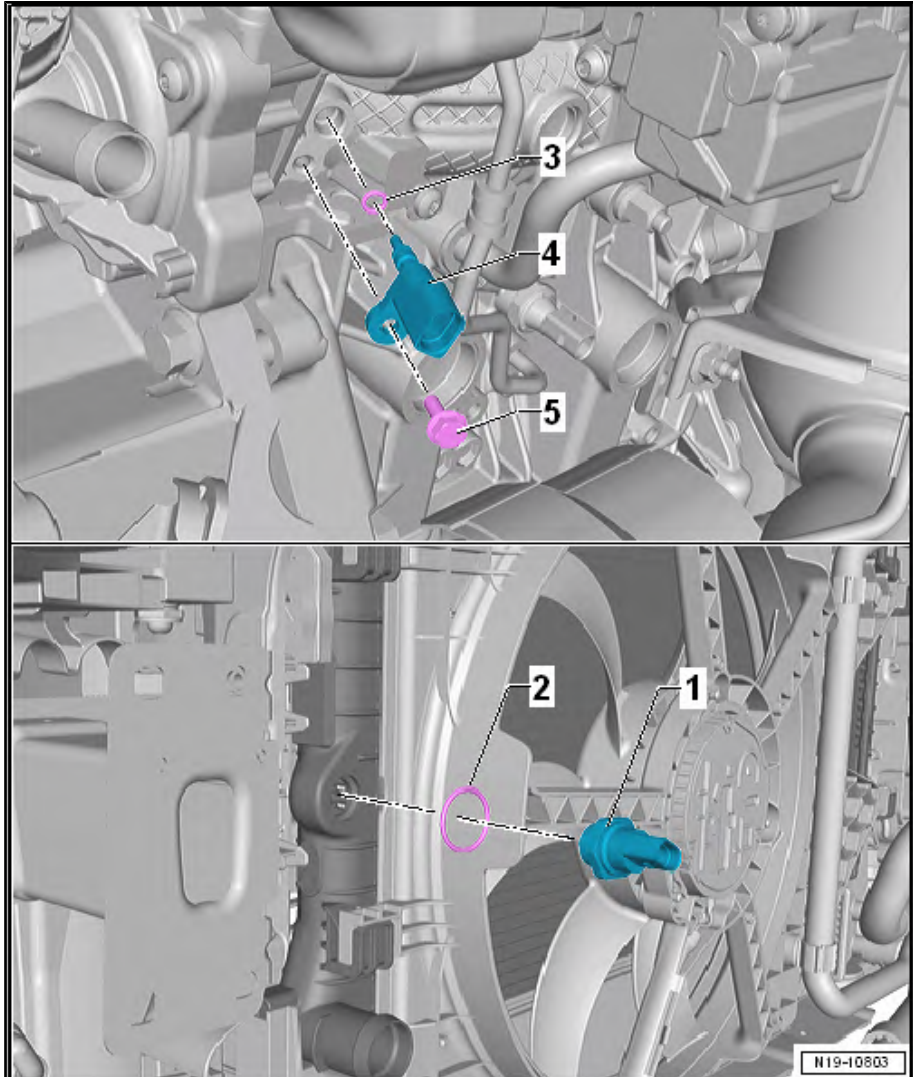
- Renew after removal

### 4 - Radiator outlet coolant - G62-

- Removing and installing  
⇒ [“2.8 Removing and installing coolant temperature sender G62”](#),  
[page 248](#)

### 5 - Bolt

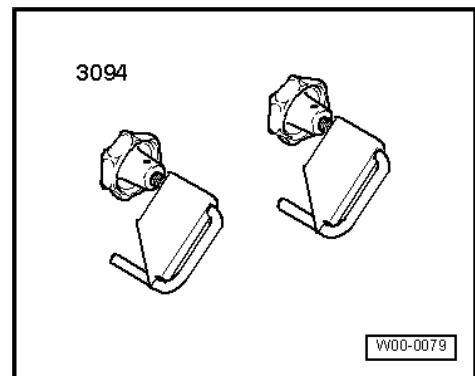
- 8 Nm



## 2.4 Removing and installing electric coolant pump

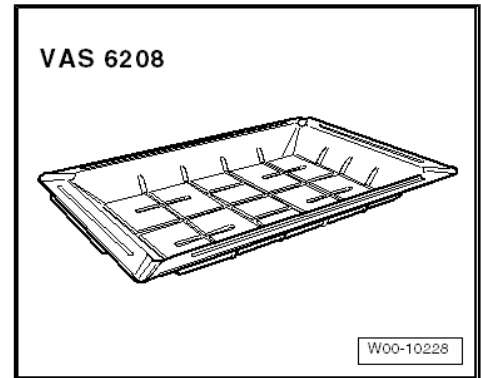
### Special tools and workshop equipment required

- ◆ Hose clamps to 25 mm - 3094-

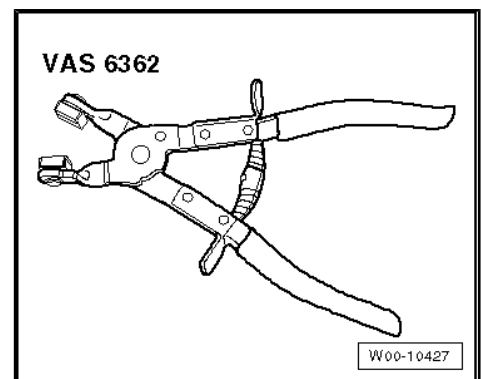




- ◆ Drip tray for workshop hoist - VAS 6208-



- ◆ Spring-type clip pliers - VAS 6362-



### Removing

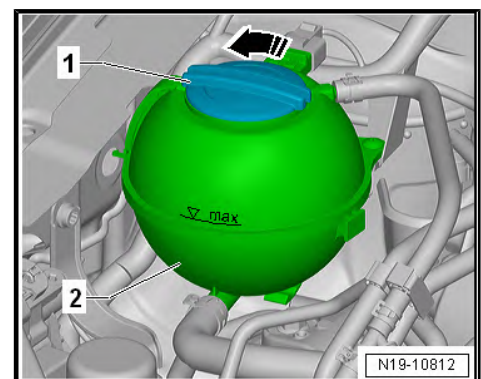
- Carefully open filler cap -1- on coolant expansion tank -2- in -direction of arrow-.

#### CAUTION

On a warm engine, the cooling system is under high pressure. Danger of scalding by 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.
- 
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation .





- Disconnect electrical connector -1-.
- Place drip tray for workshop hoist - VAS 6208- underneath.
- Clamp off coolant hoses on charge air cooling pump - V188- using hose clamps up to 25 mm - 3094- .
- Release hose clip -3- and remove coolant hose.
- Unscrew bolt -2- and remove charge air cooling pump - V188- .

### Installing

Install in reverse order of removal. The following should be observed:



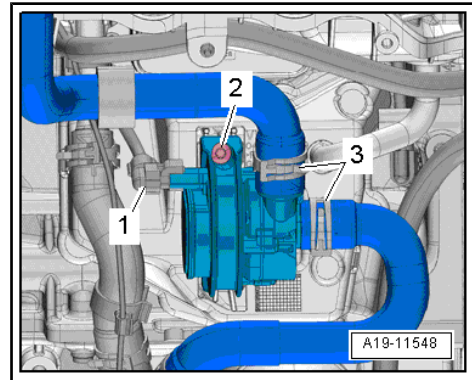
### Note

*Secure all hose connections with hose clips corresponding to the series equipment ⇒ [Electronic Parts Catalogue](#) .*

- Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation .
- Check coolant level ⇒ [page 231](#) .

### Torque settings

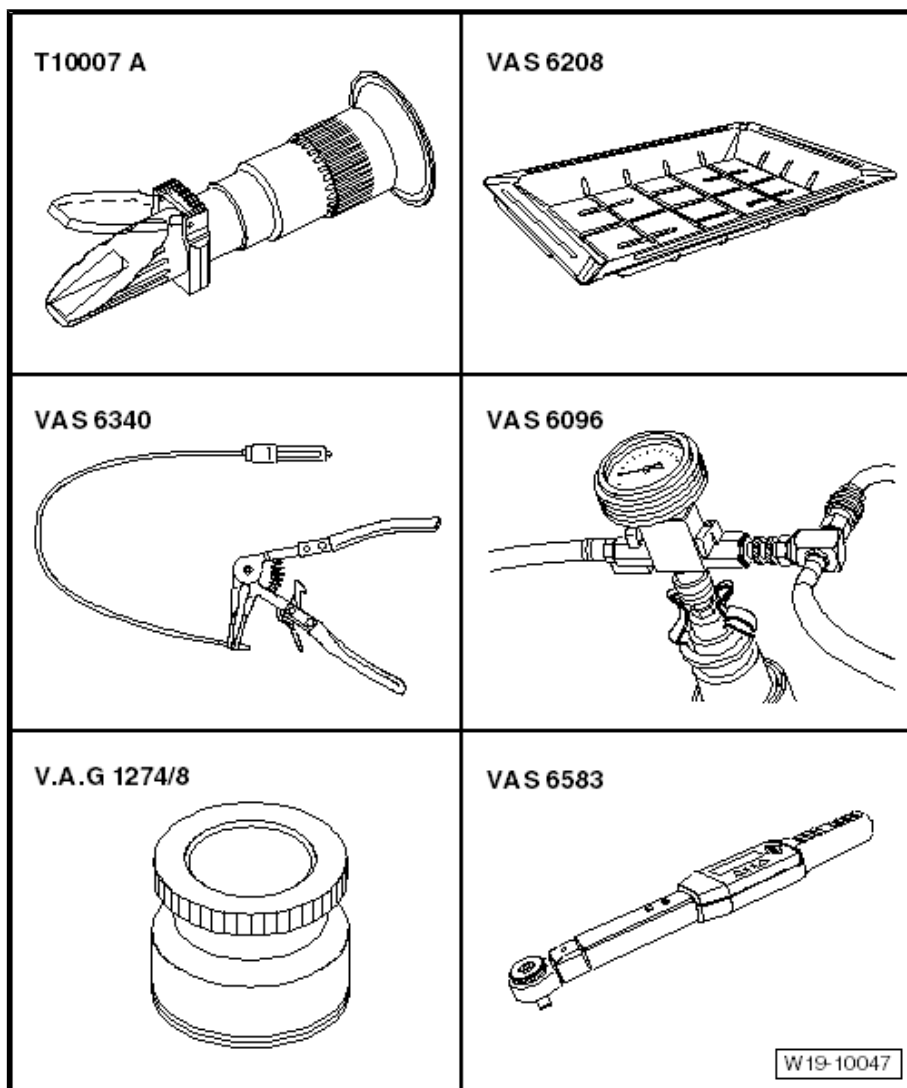
- ◆ ⇒ [“2.2 Assembly overview - electric coolant pump”](#), [page 234](#)



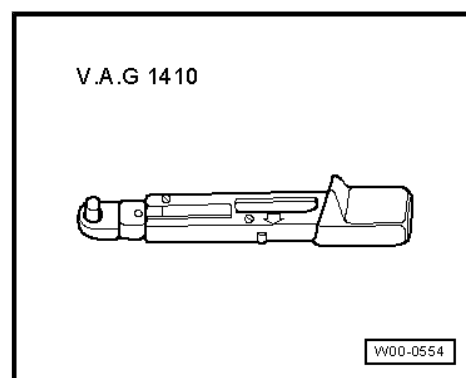
## 2.5 Removing and installing coolant pump



**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-





- ◆ Release tool - T10527-
- ◆ Release tool - T10527/1-

### Removing

- Drain coolant  
⇒ [“1.3 Draining and adding coolant”, page 225](#) .



### Note

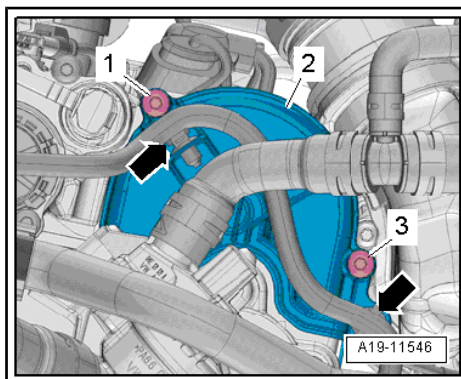
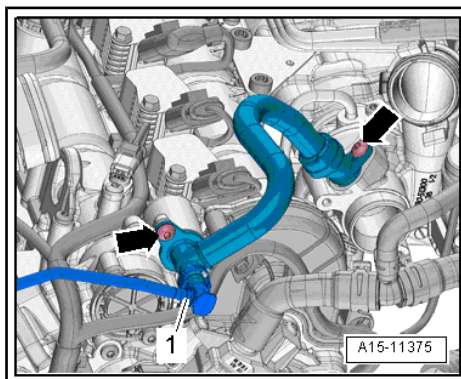
- ◆ *Do not reuse coolant which has been drained off.*
- ◆ *Cover the opening in the gearbox with a cloth so that no fluids can enter the gearbox housing.*
- ◆ *Fit all heat shield sleeves in the same place when installing.*
- ◆ *Cover the openings in the gearbox with a cloth to prevent any fluid entering the clutch housing.*
- Remove battery tray ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery tray .
- Remove resonator for intake air  
⇒ [“3.3 Removing and installing resonator for intake air”, page 309](#) .
- Remove air pipe  
⇒ [“2.5 Removing and installing air intake pipe”, page 289](#) .
- Press release tabs, and disconnect hose -1- for activated charcoal filter.



### Note

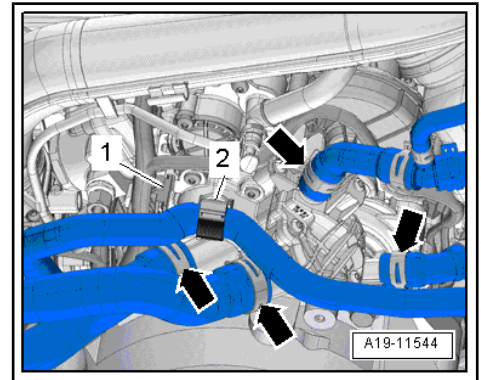
*Risk of chemical damage to the coolant pump gasket caused by oil entering between the coolant pump and the cylinder head.*

- Cover coolant pump with a cloth.
- Unscrew bolts -arrows- and remove crankcase breather hose.
- Lay wiring harness to one side -arrows-.
- Unscrew bolts -1, 3- and remove cover -2- for toothed belt for coolant pump.
- Unclip wiring harness -arrows-.





- Move coolant hose on retainer -2- clear to one side.
- Release hose clips -arrows- and detach coolant hoses.



- Loosen and unscrew bolts in the sequence -5 to 1-.
- Detach coolant pump with toothed belt.

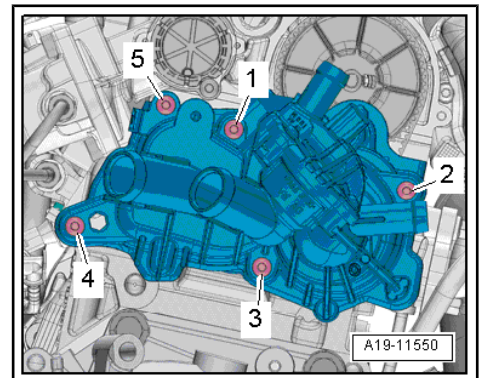
### Installing

Continue installation in reverse order of removal. The following should be observed:



#### Note

- ◆ Renew gasket for housing -arrows-.
- ◆ Renew the toothed belt of the coolant pump.
- ◆ Secure hose connections with hose clips according to production standard ⇒ *Electronic parts catalogue* .

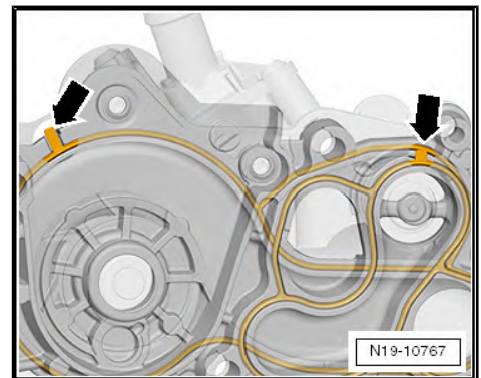


- Ensure proper seating of gaskets -arrows-.
- Lubricate seal for coolant pump lightly with coolant.



#### 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.



- Set No. 1 cylinder to TDC  
 ⇒ ["4.7 Setting piston to TDC position", page 71](#) .
- Fit toothed belt so that it is centred and move coolant pump into installation position.
- Mount coolant pump on cylinder head with securing bolts.



### Tightening sequence

Stage	Bolts	Torque setting
1.	-1 ... 5-	Screw in by hand as far as stop
2.	-1 ... 5-	10 Nm

- Loosen all bolts again by one turn.

- Apply torque wrench -VAS 6583- with hexagon key (10 mm) -item 6- to coolant pump.



#### Note

For ease of handling, apply torque wrench -VAS 6583- vertically.

- Have a second mechanic apply a torque of 30 Nm to coolant pump.



#### Note

- ◆ Do not support torque wrench with your other hand.
- ◆ Do not apply »excessive force« to torque wrench.

- While keeping coolant pump under tension, tighten bolts for coolant pump in specified sequence:

Stage	Bolts	Torque setting
3.	-2, 1, 5-	10 Nm
4.	-3, 4, 5, 1, 2-	12 Nm

- Add coolant ⇒ [page 227](#) .

### Torque settings

- ◆ Tightening sequence ⇒ [page 242](#)
- ◆ ⇒ ["2.1 Assembly overview - coolant pump, thermostat", page 232](#)
- ◆ ⇒ ["2.1 Assembly overview - charge air system", page 283](#)
- ◆ ⇒ Electrical system; Rep. gr. 27 ; Battery; Exploded view - battery
- ◆ Crankcase breather hose ⇒ [Item 11 \(page 273\)](#) .

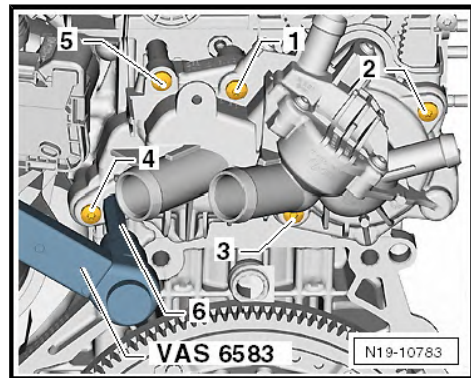
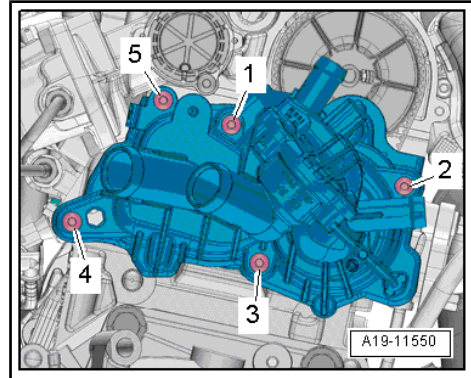
## 2.6 Removing and installing thermostat

⇒ ["2.6.1 Removing and installing thermostat for main coolant circuit \(radiator\)", page 242](#)

⇒ ["2.6.2 Removing and installing thermostat for cylinder block coolant circuit", page 244](#)

### 2.6.1 Removing and installing thermostat for main coolant circuit (radiator)

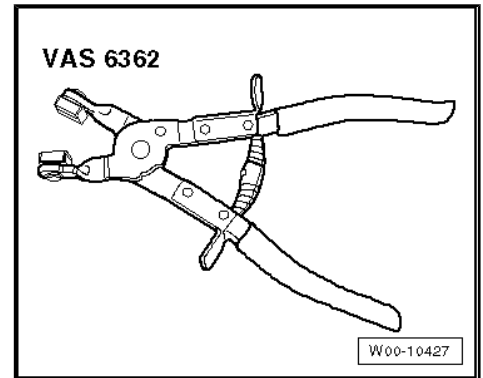
Special tools and workshop equipment required



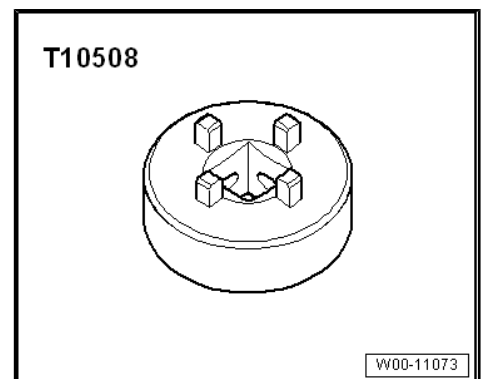




- ◆ Spring-type clip pliers - VAS 6362-



- ◆ Special wrench - T10508-



- ◆ Release tool - T10527-
- ◆ Release tool - T10527/1-

### Removing

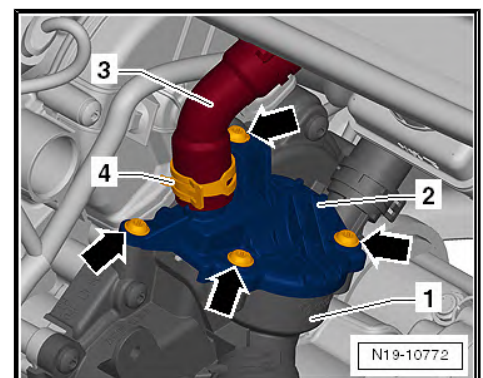
- Drain coolant  
⇒ ["1.3 Draining and adding coolant", page 225](#) .



### Note

*Do not reuse coolant which has been drained off.*

- Remove air pipe  
⇒ ["2.5 Removing and installing air intake pipe", page 289](#) .
- Release hose clip -4- and detach coolant hose -3-.
- Remove bolts -arrows- and detach cover -2- from thermostat housing.



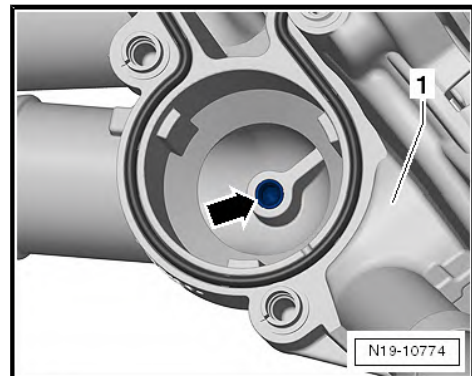
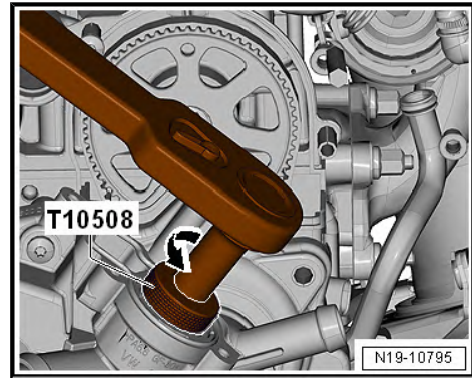


- Remove thermostat using special wrench - T10508- .
- Slightly push down special wrench - T10508- and turn it in -direction of arrow- while doing so.

### Installing

Install in reverse order of removal. The following should be observed:

- Insert thermostat ensuring that the centring pin of thermostat is seated in guide -arrow-.



- Install thermostat using special wrench - T10508- .
- Slightly push down special wrench - T10508- and turn it to stop in -direction of arrow- while doing so.

Install in reverse order of removal, observing the following:



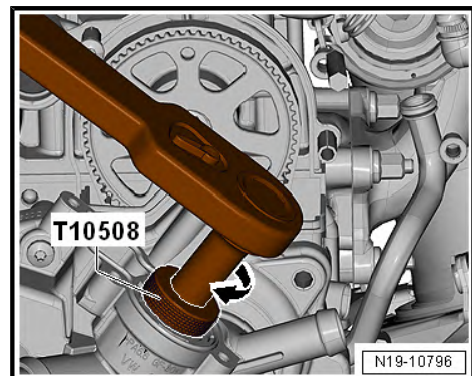
### Note

*Renew seals.*

- Moisten gasket with coolant.
- Add coolant ⇒ [page 227](#) .

### Torque settings

- ◆ ⇒ [Fig. "Cover for thermostat to thermostat housing - specified torque and tightening sequence"](#) , [page 234](#)



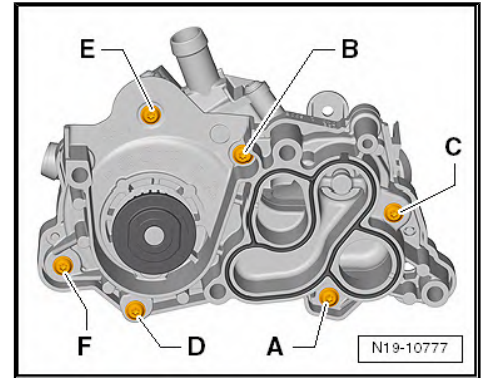
## 2.6.2 Removing and installing thermostat for cylinder block coolant circuit

### Removing

- Remove coolant pump  
⇒ ["2.5 Removing and installing coolant pump"](#) , [page 238](#) .



- Unscrew bolts in the sequence -F to A-.
- Detach coolant pump from thermostat housing.



- Detach thermostat -2- from coolant pump -1-.

### Installing

Install in reverse order of removal. The following should be observed:



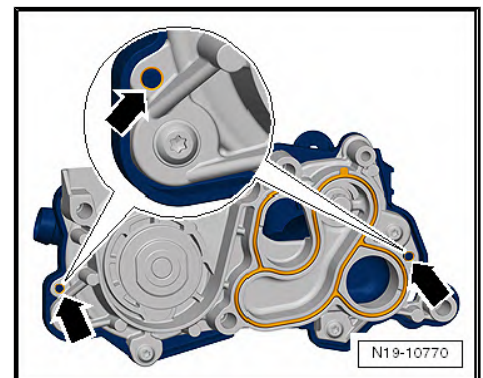
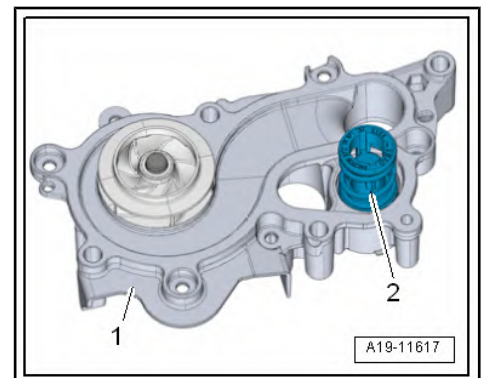
#### Note

*Renew seals.*

- Moisten gasket with coolant.
- Fit thermostat housing onto coolant pump.
- Centring pins on thermostat must be fitted in guides -arrows- on coolant pump.
- Tighten bolts for thermostat housing ⇒ [page 234](#) .
- Install coolant pump  
 ⇒ [“2.5 Removing and installing coolant pump”, page 238](#) .
- Add coolant ⇒ [page 227](#) .

### Torque settings

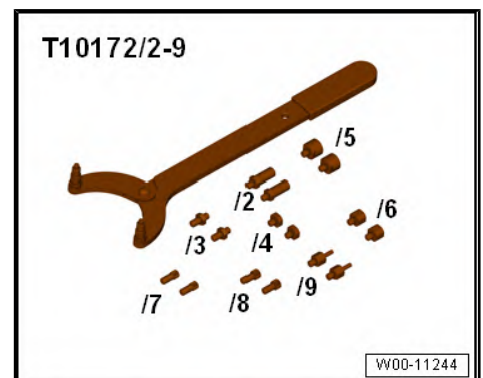
- ◆ ⇒ Fig. [“Thermostat housing to coolant pump - specified torque and tightening sequence”](#) , [page 234](#)



## 2.7 Removing and installing toothed belt pulley for coolant pump

### Special tools and workshop equipment required

- ◆ Counterhold - T10172- with adapter -T10172/2-

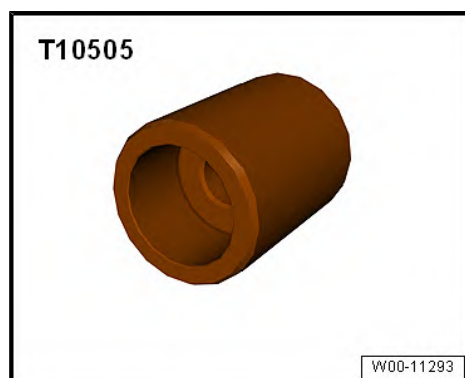




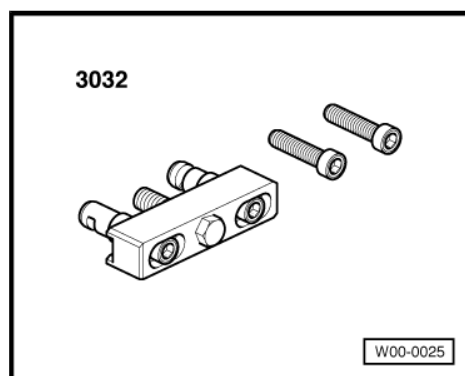
- ◆ Removal tool - T10498-



- ◆ Assembly sleeve - T10505-



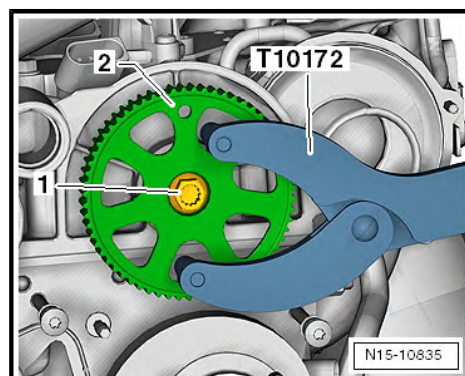
- ◆ Puller - 3032-



- ◆ Adapter - 3032/1-2- (not illustrated)

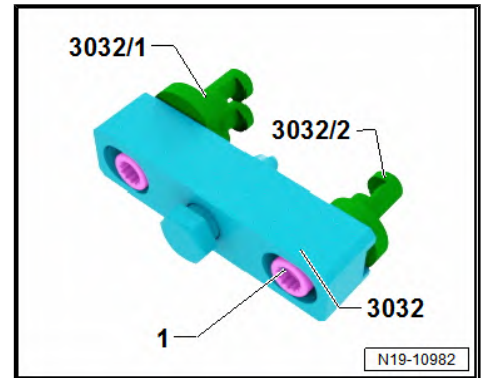
### Removing

- Remove coolant pump  
⇒ ["2.5 Removing and installing coolant pump", page 238](#) .
- Unscrew bolt -1- using counterhold - T10172- with adapter - T10172/2- .
- Screw in bolt -1- by 3 turns.





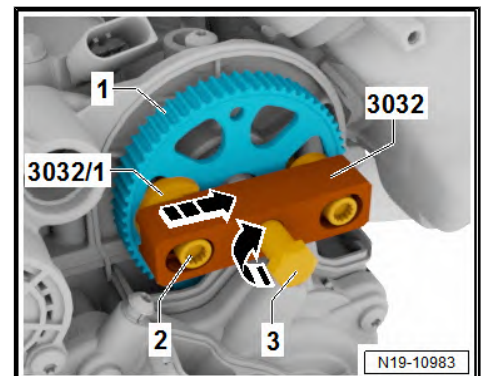
- Tighten bolt -1- for adapter - 3032/2- while it is positioned in the centre of the elongated hole.
- Fit puller - 3032- on toothed belt pulley -1- as shown in illustration.



- Push adapter - 3032/1- to stop in -direction of arrow-.
- Tighten bolt -2- hand-tight.
- Turn bolt -3- in direction of -arrow- until toothed belt pulley has been pulled off.

**i Note**

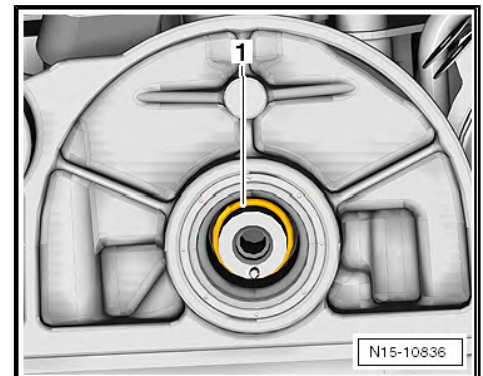
*After the toothed belt pulley has been removed, renew the O-ring on the camshaft.*



**Removing O-ring**

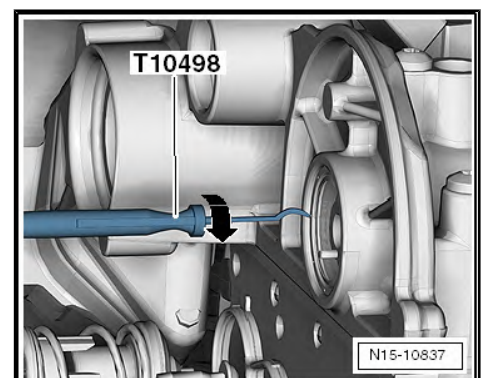
The O-ring -1- must be fitted at a depth of approx. 15 mm onto camshaft journal.

- Guide assembly tool - T10498- above camshaft as far as O-ring.



- Turn assembly tool - T10498- to bring point of tool under O-ring - -see illustration-.
- Pull O-ring off camshaft towards front.

**Installing O-ring**



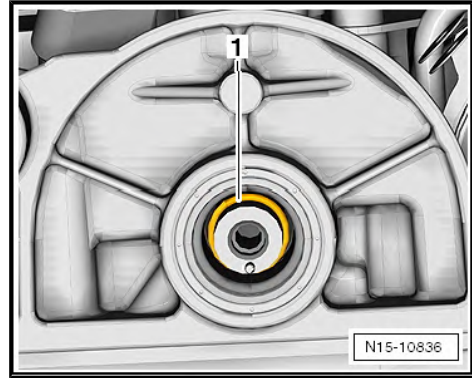


- Fit new O-ring -1- onto stub of camshaft.



#### Note

*Pin on camshaft must be positioned in recess on assembly sleeve - T10505- .*



- Fit assembly sleeve - T10505- onto camshaft and push it to stop by hand in -direction of arrow-.
- Pull off assembly sleeve - T10505- .

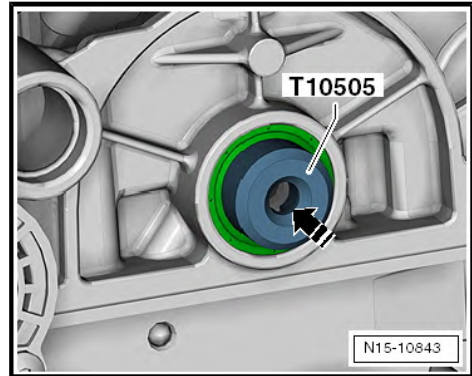
O-ring must be positioned in groove on camshaft.

#### Installing



#### Note

- ◆ *Do not use any impact tools!*
- ◆ *Push the toothed belt pulley onto the camshaft only by hand.*
- ◆ *This prevents the camshaft from being moved in axial direction.*

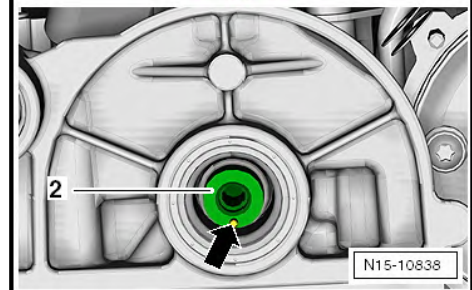
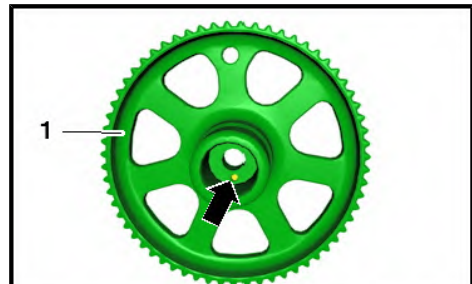


Fit toothed belt pulley:

- Fit toothed belt pulley -1- onto camshaft -2- so that the dowel pin of camshaft is seated in the hole of toothed belt pulley -arrows-.
- Install coolant pump  
⇒ [“2.5 Removing and installing coolant pump”, page 238](#) .

#### Torque settings

- ◆ ⇒ [“2.1 Assembly overview - coolant pump, thermostat”, page 232](#)

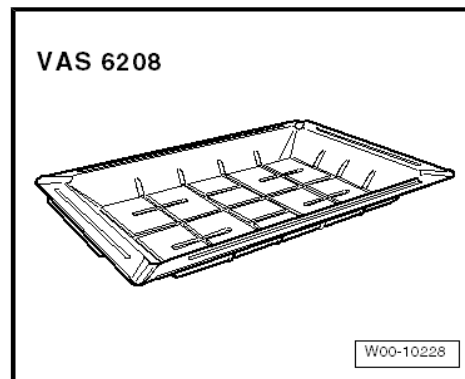


## 2.8 Removing and installing coolant temperature sender - G62-

Special tools and workshop equipment required



- ◆ Drip tray for workshop hoist - VAS 6208-



### Removing

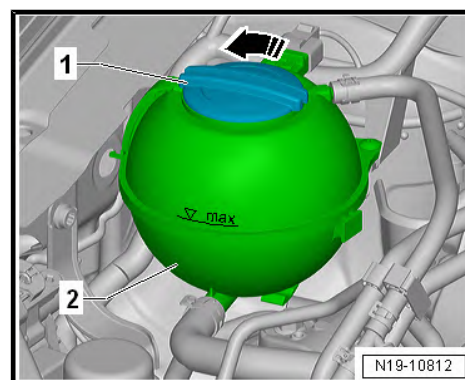
- Engine cold.
- Carefully open filler cap -1- on coolant expansion tank -2- in -direction of arrow-.
- To relieve residual pressure in cooling system, open filler cap -1- on coolant expansion tank -2- briefly and then close cap again (it should click into place).

### CAUTION

On a warm engine, the cooling system is under high pressure. Danger of scalding by 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.
- 
- Place drip tray for workshop hoist - VAS 6208- underneath.
  - Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation .





- Disconnect electrical connectors.



#### Note

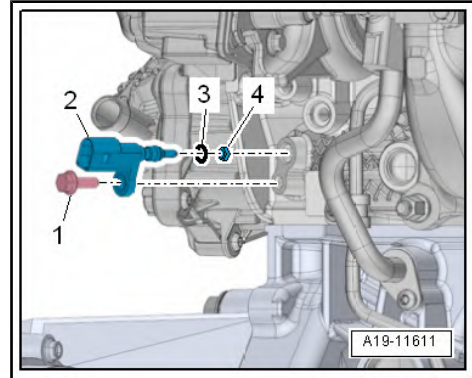
Place a cloth underneath to catch escaping coolant.

- Unscrew bolt -1- and pull off coolant temperature sender - G62- -item 2-.



#### Note

- ◆ If O-ring -3- with support ring -4- remains lodged in cylinder head, lift out O-ring with support ring using a piece of wire.
- ◆ Insert new coolant temperature sender - G62- immediately into cylinder head in order to avoid loss of coolant.



### Installing

Install in reverse order of removal. The following should be observed:



#### Note

Renew O-ring.

- Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation .
- Check coolant level ⇒ [page 231](#) .

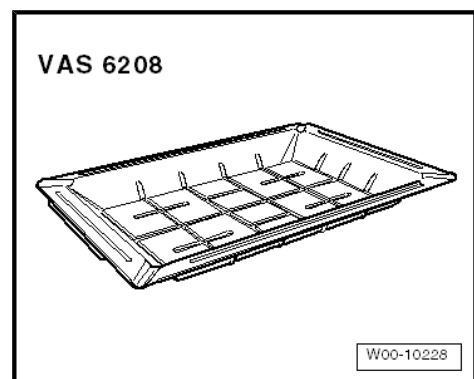
### Torque settings

- ◆ ⇒ [“2.3 Assembly overview - coolant temperature sender”, page 236](#)

## 2.9 Removing and installing radiator outlet coolant temperature sender - G83-

### Special tools and workshop equipment required

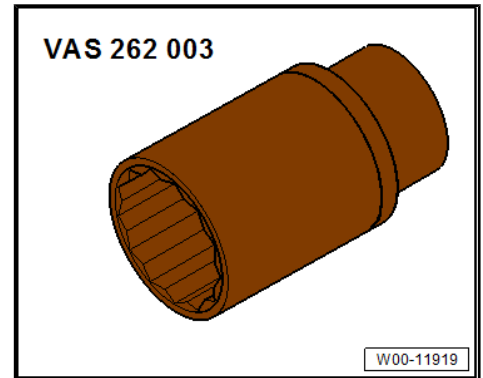
- ◆ Drip tray for workshop hoist - VAS 6208-







- ◆ Socket AF 29 - VAS 262 003-



### Removing

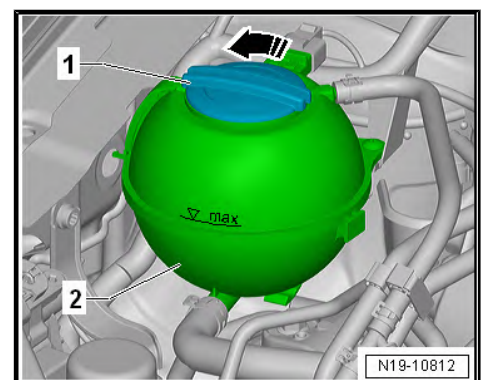
- Engine cold.
- Carefully open filler cap -1- on coolant expansion tank -2- in -direction of arrow-.
- To relieve residual pressure in cooling system, open filler cap -1- on coolant expansion tank -2- briefly and then close cap again (it should click into place).

### CAUTION

On a warm engine, the cooling system is under high pressure. Danger of scalding by 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.
- 
- Place drip tray for workshop hoist - VAS 6208- underneath.
  - Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation .





- Release and disconnect electrical connector -2- from radiator outlet coolant temperature sender - G83- -1-.
- Place a cloth underneath to catch escaping coolant.
- Unscrew radiator outlet coolant temperature sender - G83- -1- from radiator -3-.
- Unscrew radiator outlet coolant temperature sender - G83- using socket AF 29 - VAS 262 003- .

### Installing

Install in reverse order of removal. The following should be observed:

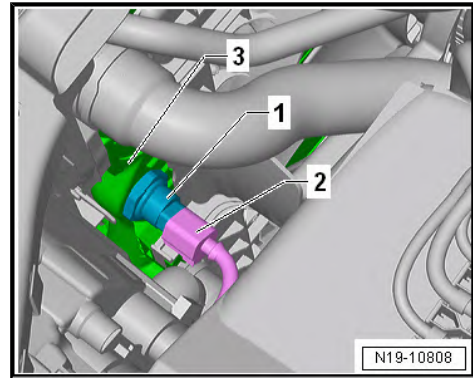


### Note

- ◆ *Check O-ring for damage, and renew if necessary; see ⇒ Electronic parts catalogue (ETKA) .*
- ◆ *Insert new coolant temperature sender - G62- immediately into connection in order to avoid loss of coolant.*
- Install noise insulation at front ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation .
- Check coolant level ⇒ [page 231](#) .

### Torque settings

- ◆ ⇒ [“2.3 Assembly overview - coolant temperature sender”, page 236](#)





### 3 Coolant pipes

⇒ [“3.1 Assembly overview - coolant pipes”, page 253](#)

⇒ [“3.2 Removing and installing coolant pipes”, page 253](#)

#### 3.1 Assembly overview - coolant pipes

1 - Coolant hose

2 - Coolant pipe

- Clipped onto intake manifold (bottom)
- To remove, remove intake manifold  
⇒ [“4.2 Removing and installing intake manifold”, page 312](#)

3 - Bolt

- 8 Nm

4 - Coolant hose

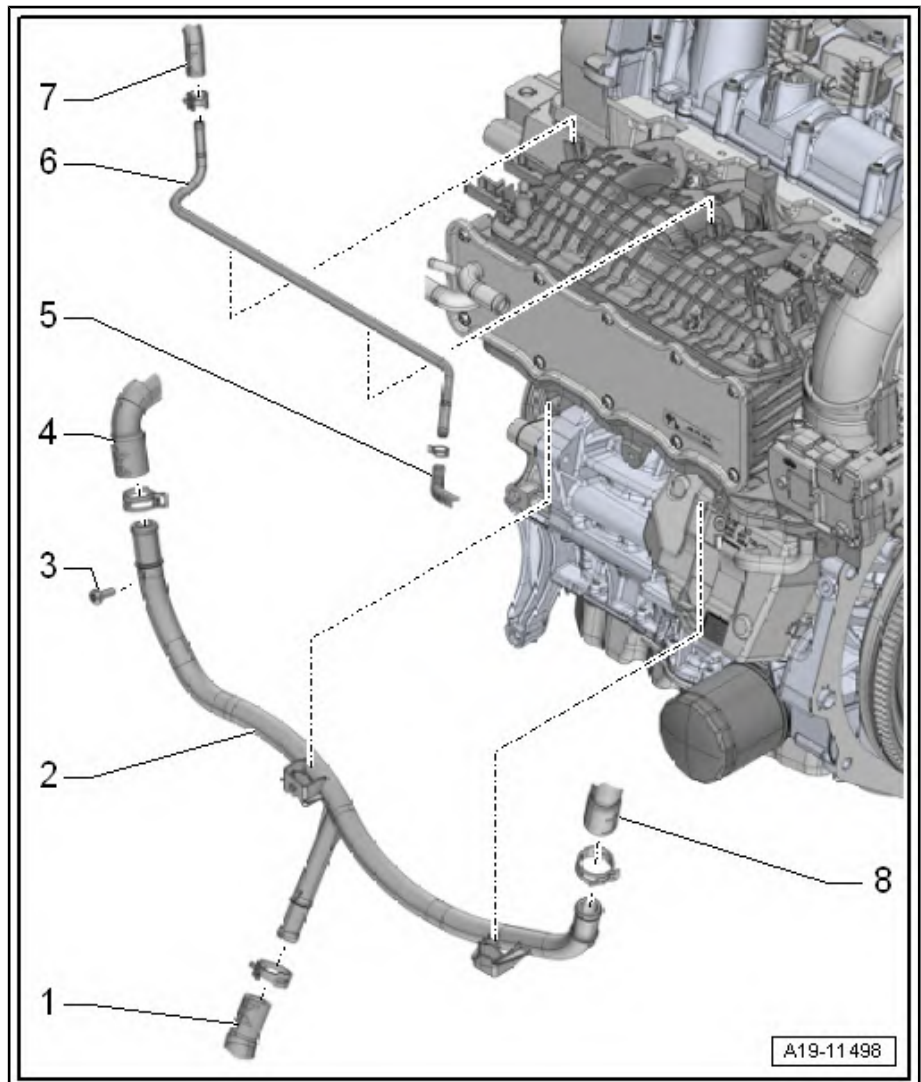
5 - Coolant hose

6 - Coolant line

- Clipped onto intake manifold (top)

7 - Coolant hose

8 - Coolant hose

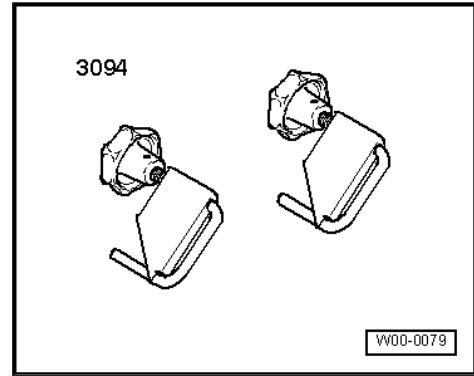


#### 3.2 Removing and installing coolant pipes

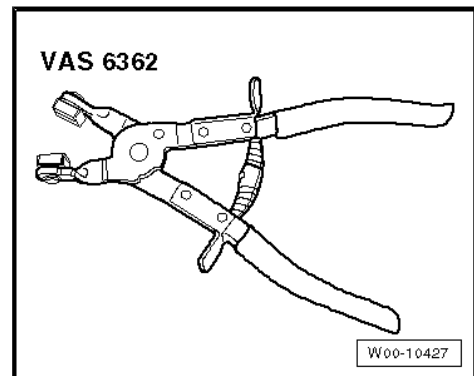
Special tools and workshop equipment required



- ◆ Hose clamps to 25 mm - 3094-



- ◆ Spring-type clip pliers - VAS 6362-



### Removing

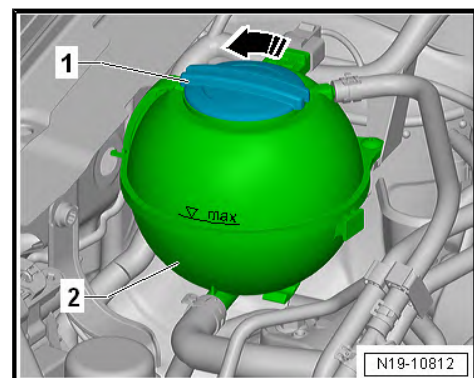
- Carefully open filler cap -1- on coolant expansion tank -2- in direction of arrow-.

#### CAUTION

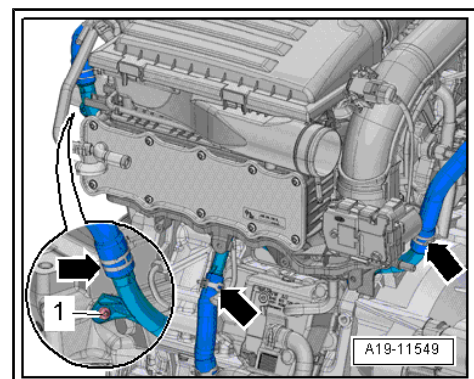
On a warm engine, the cooling system is under high pressure. Danger of scalding by steam and hot coolant.

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.



- Clamp off coolant hoses on coolant pipe using hose clamps up to 25 mm - 3094- .
- Release hose clips -arrows- and detach coolant hoses.
- Remove intake manifold  
⇒ ["4.2 Removing and installing intake manifold", page 312](#) .





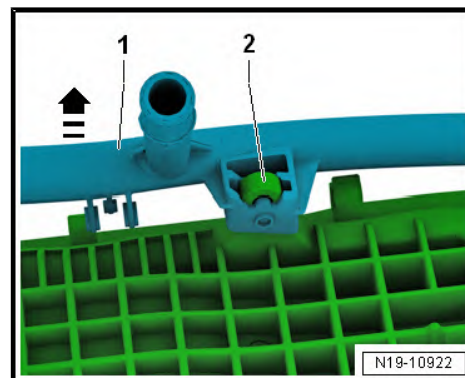
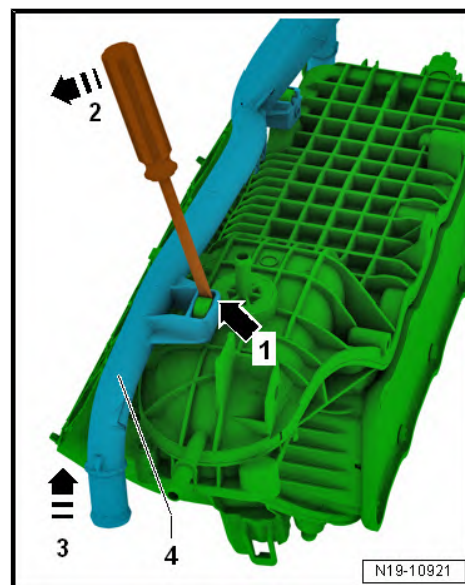
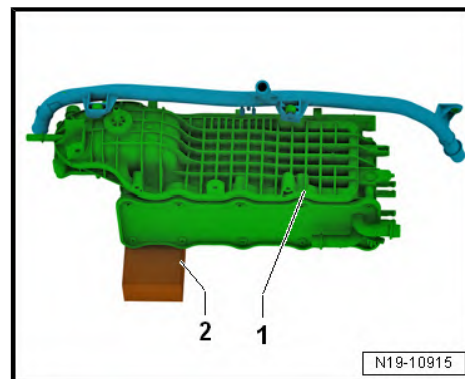
- Lay intake manifold -1- on the workbench as shown.
- Push wooden block -2- under intake manifold.

**i** Note

*To avoid damaging the intake manifold and coolant pipe, this procedure must be carried out very carefully!*

- Insert a flat-blade screwdriver into the slot -arrow 1-.
- Carefully push screwdriver in direction of -arrow 2-. At the same time, raise coolant pipe -4- in direction of -arrow 3-.
- Raise coolant pipe -1- further in direction of -arrow-. Detach coolant pipe from fastener -2-.

**Installing**





- First push coolant pipe onto mounting -1- until it engages.
- Then push coolant pipe onto mounting -2- until it engages.
- Check that the coolant pipe has properly engaged by pulling on it.

Install in reverse order of removal. The following should be observed:

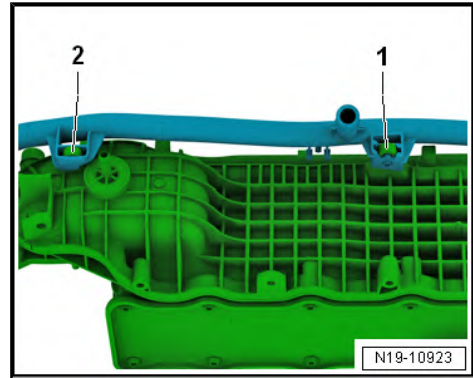


#### Note

- ◆ *Renew seals and O-rings.*
- ◆ *Secure all hose connections with hose clips corresponding to the series equipment ⇒ *Electronic Parts Catalogue* .*
- Remove intake manifold  
⇒ ["4.2 Removing and installing intake manifold", page 312](#) .
- Check coolant level ⇒ [page 231](#) .

#### Torque settings

- ◆ ⇒ ["4.1 Assembly overview - intake manifold", page 310](#)
- ◆ ⇒ ["3.1 Assembly overview - coolant pipes", page 253](#)





## 4 Radiator, radiator fan

⇒ [“4.1 Assembly overview - radiator/radiator fan”, page 257](#)

⇒ [“4.2 Assembly overview - radiator cowl and radiator fan”, page 259](#)

⇒ [“4.3 Removing and installing radiator”, page 260](#)

⇒ [“4.4 Removing and installing water radiator for charge air cooling circuit”, page 263](#)

⇒ [“4.5 Removing and installing radiator cowl with radiator fan”, page 267](#)

⇒ [“4.6 Removing and installing radiator fan V7”, page 268](#)

### 4.1 Assembly overview - radiator/radiator fan



*The arrows on the coolant pipes and on the ends of the coolant hoses must align.*

#### 1 - Radiator mounting

- Lower radiator mounting in front end

#### 2 - Radiator for charge air cooling circuit

- Removing and installing ⇒ [“4.4 Removing and installing water radiator for charge air cooling circuit”, page 263](#)

#### 3 - Radiator outlet coolant temperature sender - G83-

- Removing and installing ⇒ [“2.9 Removing and installing radiator outlet coolant temperature sender G83”, page 250](#)

- Assembly overview ⇒ [“2.3 Assembly overview - coolant temperature sender”, page 236](#)

- 35 Nm

#### 4 - O-ring

- Check for damage, and renew if necessary; see ⇒ Electronic parts catalogue (ETKA)

#### 5 - Bolt

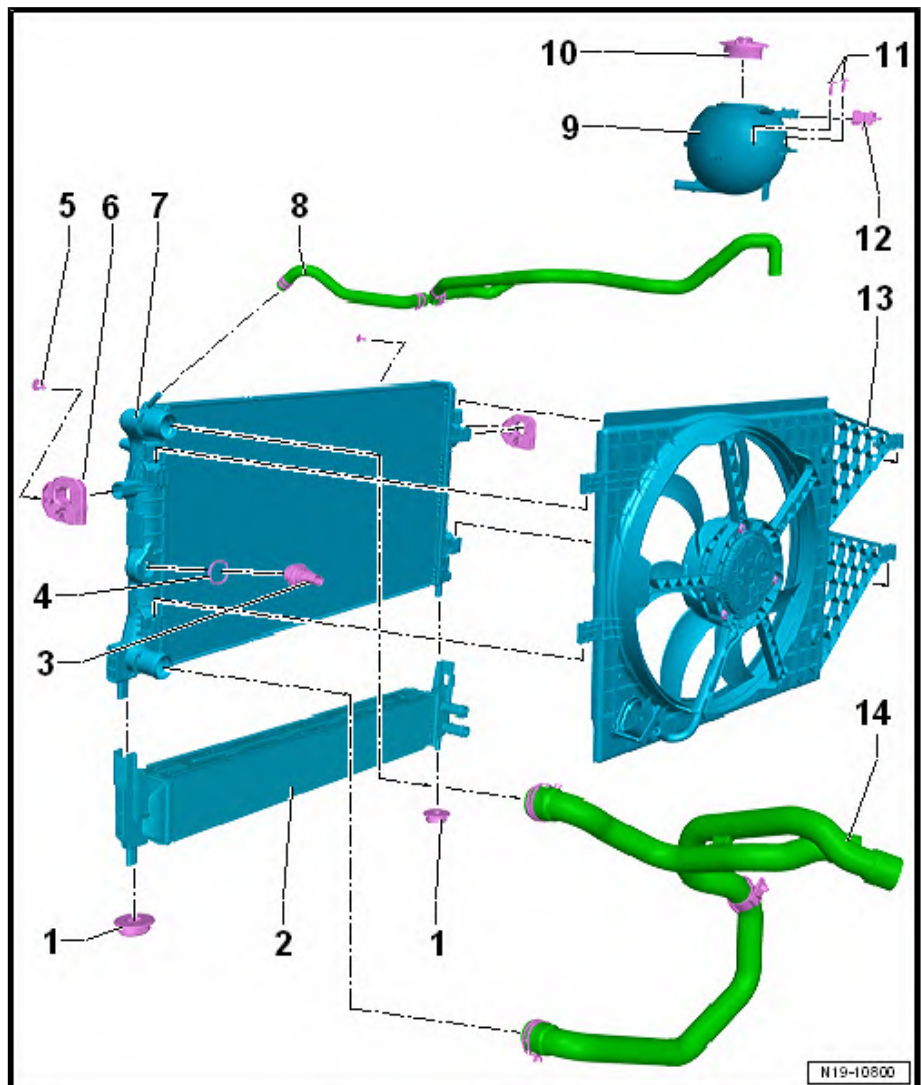
- 5 Nm
- Qty. 2

#### 6 - Radiator mounting

- Top

#### 7 - Radiator/cooler

- Removing and installing ⇒ [“4.3 Removing and installing radiator”, page 260](#)
- After renewing, renew entire coolant





## 8 - Coolant hose

- Connection diagram ⇒ [“1.1 Connection diagram - coolant hoses”, page 220](#)

## 9 - Expansion tank

- 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-

## 10 - Cap

- Check using cooling system tester - V.A.G 1274 B- and adapter for cooling system tester - V.A.G 1274/9-
- Pressure relief valve must open at between 1.4 and 1.6 bar

## 11 - Bolt

- 2 Nm
- Qty. 2

## 12 - Connector

## 13 - Radiator cowl with radiator fan - V7-

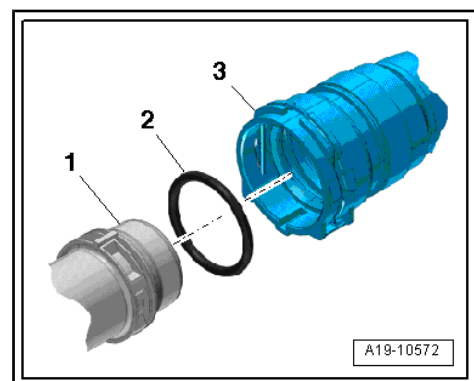
- Assembly overview ⇒ [“4.2 Assembly overview - radiator cowl and radiator fan”, page 259](#)
- Removing and installing ⇒ [“4.5 Removing and installing radiator cowl with radiator fan”, page 267](#)
- With radiator fan control unit - J293-

## 14 - Coolant hose

- Connection diagram ⇒ [“1.1 Connection diagram - coolant hoses”, page 220](#)

### Connecting coolant hose with plug-in connector

- Check seal -2- for damage, and renew if necessary; see ⇒ Electronic parts catalogue (ETKA) .
- Moisten O-ring with coolant, and insert it into coolant hose.
- Push coolant hose into connection -1- until it audibly engages.
- Press again on coolant hose and check plug-in connector is engaged correctly by pulling hose back.







## 4.2 Assembly overview - radiator cowl and radiator fan

### 1 - Air guide ring

### 2 - Radiator fan - V7-

- ❑ Removing and installing  
⇒ [“4.6 Removing and installing radiator fan V7”](#),  
[page 268](#)

### 3 - Radiator cowl

- ❑ Removing and installing  
⇒ [“4.5 Removing and installing radiator cowl with radiator fan”](#),  
[page 267](#)

### 4 - Nut

- ❑ 8 Nm
- ❑ Qty. 3

### 5 - Bracket

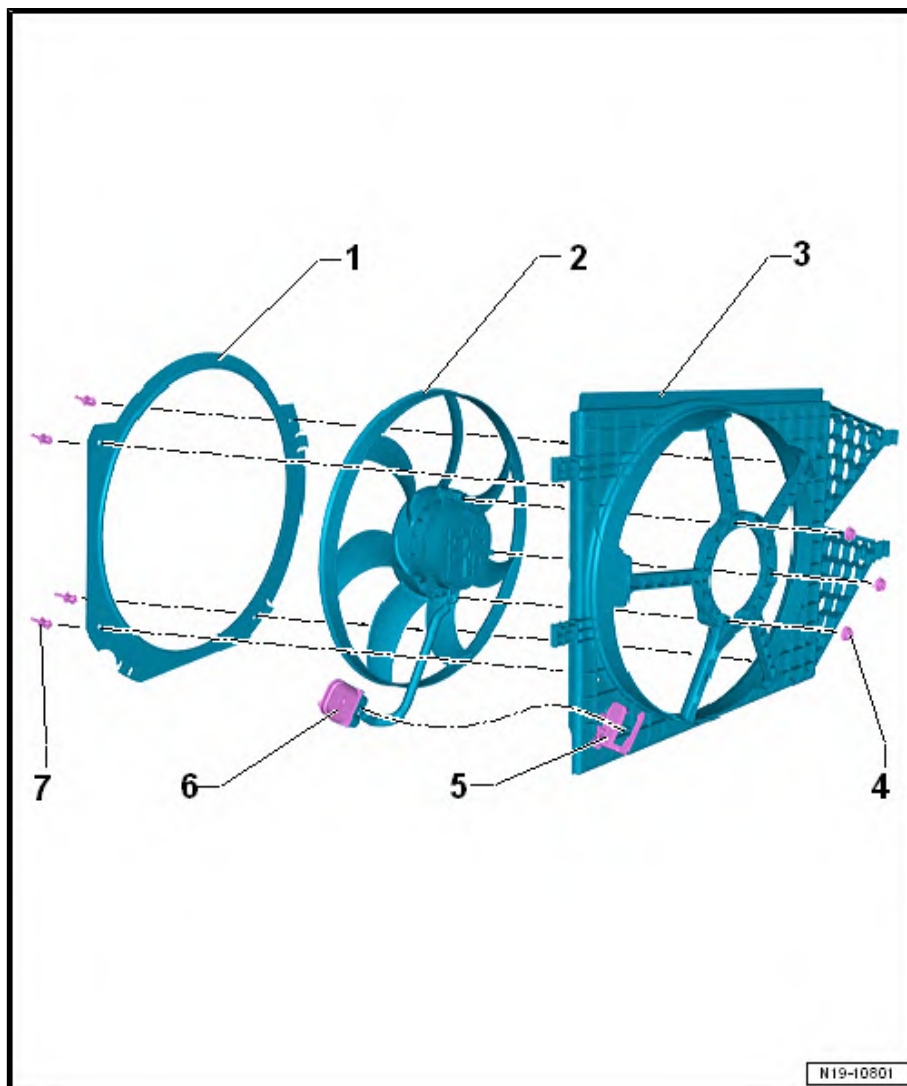
- ❑ For electrical connector

### 6 - Connector

- ❑ For radiator fan - V7- .

### 7 - Spreader rivet

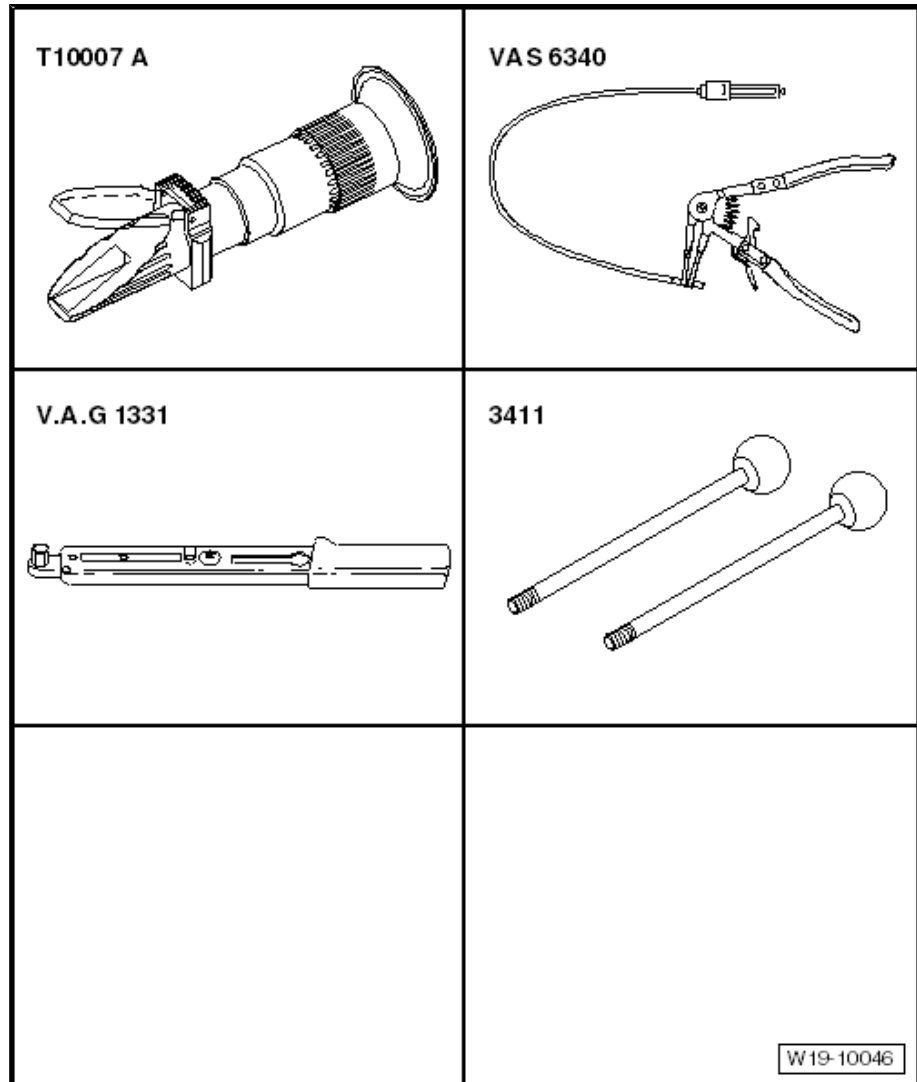
- ❑ For securing air guide ring
- ❑ Qty. 4





## 4.3 Removing and installing radiator

Special tools and workshop equipment required



- ◆ Refractometer - T10007 A-
- ◆ Hose clamp pliers - VAS 6340-
- ◆ Torque wrench (5 ... 50 Nm) - V.A.G 1331-
- ◆ Guide pins - 3411-



### Note

- ◆ *Radiator and charge air cooler are separate components.*
- ◆ *Radiator is mounted onto charge air cooler.*
- ◆ *Assembly overview - parts of cooling system, body side*  
*⇒ ["4.1 Assembly overview - radiator/radiator fan", page 257](#).*

### Removing

- Remove noise insulation ⇒ General body repairs, exterior;  
Rep. gr. 66 ; Noise insulation .
- Drain coolant from radiator  
⇒ ["1.3 Draining and adding coolant", page 225](#) .



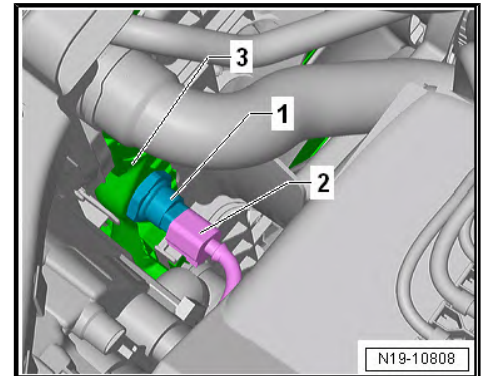
- Remove radiator cowl  
⇒ ["4.5 Removing and installing radiator cowl with radiator fan"](#),  
[page 267](#) .

**Vehicles with air conditioner:**

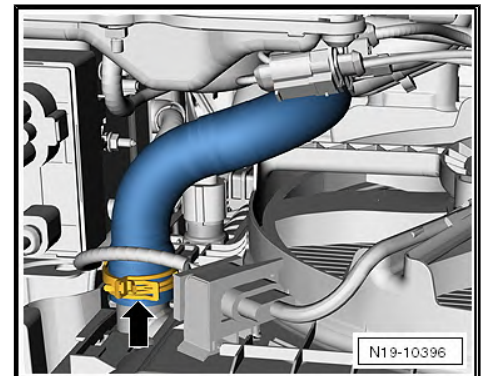
- Remove front bumper cover ⇒ General body repairs, exterior;  
Rep. gr. 63 ; Front bumper
- Move lock carrier to service position ⇒ General body repairs,  
exterior; Rep. gr. 50 ; Lock carrier; Moving to and from service  
position .

**Continued for all vehicles:**

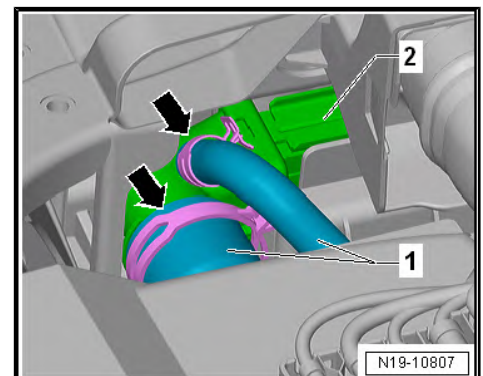
- Release and pull off connector -2- on radiator outlet coolant  
temperature sender - G83- -1-.



- Open spring-type clip -arrow- and pull off coolant hose down-  
wards.

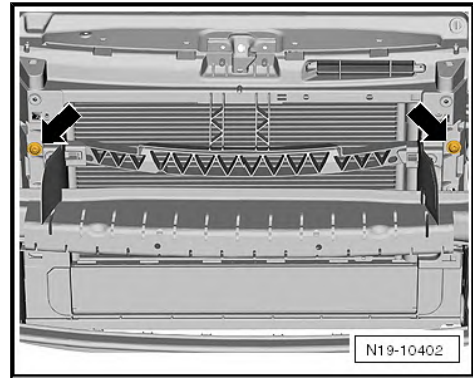


- Open spring-type clips -arrows-.
- Pull upper coolant hose -1- off radiator -2-.





- Unscrew securing bolts -arrows-.
- Lift radiator out of lower mountings and press it slightly towards rear.



#### Vehicles with air conditioning system

#### CAUTION

Risk of freezing injury caused by refrigerant.

- Do not open refrigerant circuit of air conditioning system.

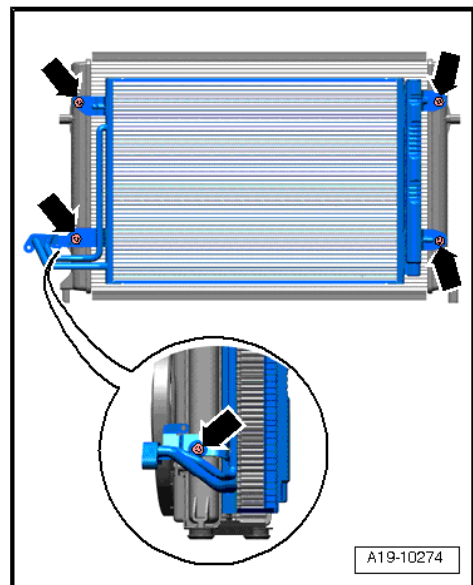
- Unscrew bolts -arrows-.
- Do not stretch, kink or bend refrigerant lines and hoses.
- Place condenser in lock carrier at front and secure it in place to prevent it from falling down.

#### Continued for all vehicles

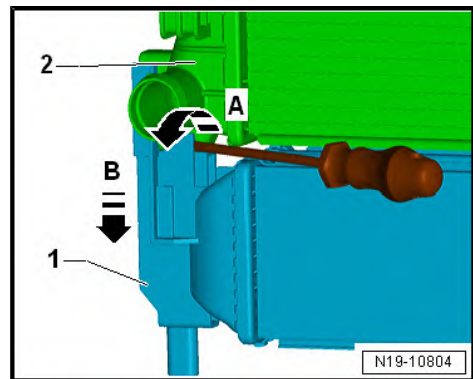


#### Note

*In order to avoid damage to the charge air cooler, 2 mechanics should work together when disconnecting.*



- Push a wide flat-bladed screwdriver at front and rear into the left fastener on the water radiator for charge air cooling circuit -1-.
- Open latch by turning screwdriver in -direction of arrow A-.
- In this position, slightly pull water radiator for charge air cooling circuit -1- on left side in -direction of arrow B- off radiator -2-.





- Lower water radiator for charge air cooling circuit -1- further in -direction of arrow A-.
- At the same time, push radiator for charge air cooling circuit -1- in -direction of arrow B-.
- Detach water radiator for charge air cooling circuit -1- on right from mounting -arrow- on radiator -2-.
- Secure water radiator for charge air cooling circuit -1- to prevent it from falling down.
- Removing radiator.

### Installing

Install in reverse order of removal. The following should be observed:

- Insert water radiator for charge air cooling circuit -2- into right mounting.
- Properly engage water radiator for charge air cooling circuit -2- in -direction of arrow- in mountings on radiator -1-.
- Check firm seating by pulling.



### Note

- ◆ *If there are minor dents in the fins, refer to ⇒ "3.5 Fitting radiator and condensers", page 5 .*
- ◆ *Renew O-rings.*
- Install front bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Front bumper
- Install radiator cowl  
 ⇒ "4.5 Removing and installing radiator cowl with radiator fan", page 267 .
- Add coolant ⇒ page 231 .



### Note

*Do not reuse coolant which has been drained off.*

### Torque settings

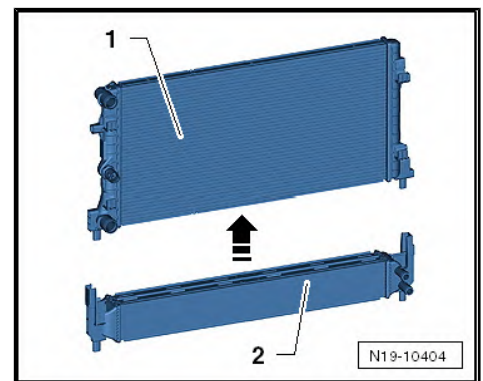
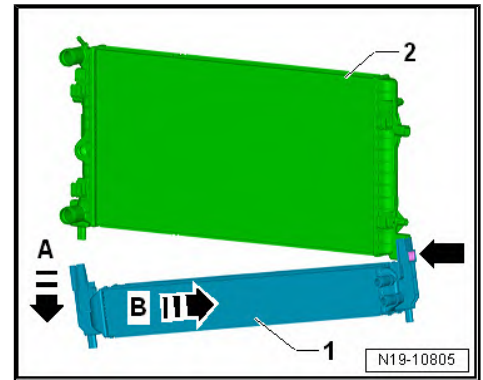
- ◆ ⇒ "4.1 Assembly overview - radiator/radiator fan", page 257

## 4.4 Removing and installing water radiator for charge air cooling circuit



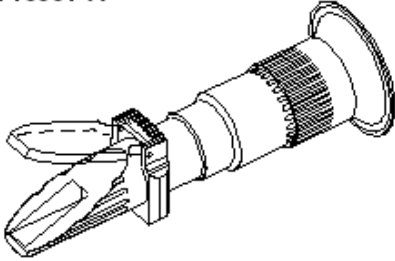
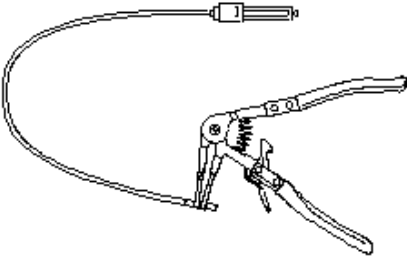

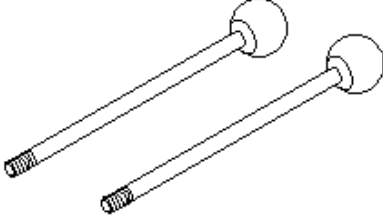
### Note

- ◆ *Radiator and charge air cooler are separate components.*
- ◆ *Radiator is mounted onto charge air cooler.*
- ◆ *Assembly overview - parts of cooling system, body side*  
 ⇒ "4.1 Assembly overview - radiator/radiator fan", page 257 .





**Special tools and workshop equipment required**

<p><b>T10007 A</b></p> 	<p><b>VAS 6340</b></p> 
<p><b>V.A.G 1331</b></p> 	<p><b>3411</b></p> 
	<p>W19-10046</p>

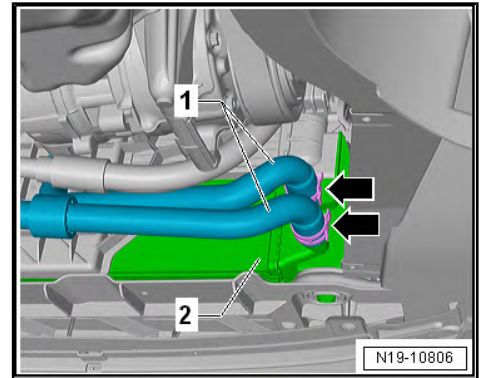
- ◆ Refractometer - T10007 A-
- ◆ Hose clamp pliers - VAS 6340-
- ◆ Torque wrench (5 ... 50 Nm) - V.A.G 1331-
- ◆ Guide pins - 3411-

**Removing**

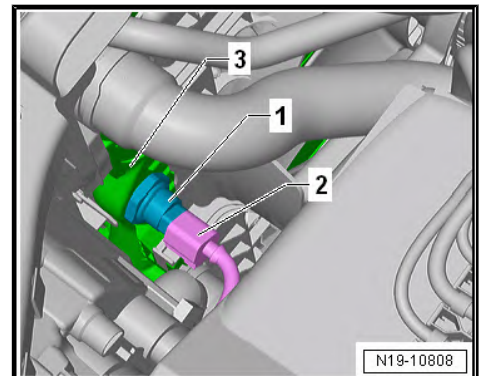
- Remove noise insulation => General body repairs, exterior; Rep. gr. 66 ; Noise insulation .
- Clamp off coolant hoses leading to water radiator for charge air cooling circuit using hose clamps, up to 25 mm - 3094- .
- Drain coolant from water radiator for charge air cooling circuit => ["1.3 Draining and adding coolant", page 225](#) .



- Open spring-type clips -arrows-.
- Pull hoses -1- off water radiator for charge air cooling circuit -2-.
- Remove radiator cowl  
 ⇒ ["4.5 Removing and installing radiator cowl with radiator fan"](#),  
[page 267](#) .



- Release and pull off connector -2- on radiator outlet coolant temperature sender - G83- -1-.
- Remove front bumper cover ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation .
- Move lock carrier to service position ⇒ General body repairs, exterior; Rep. gr. 50 ; Lock carrier; Moving to and from service position .



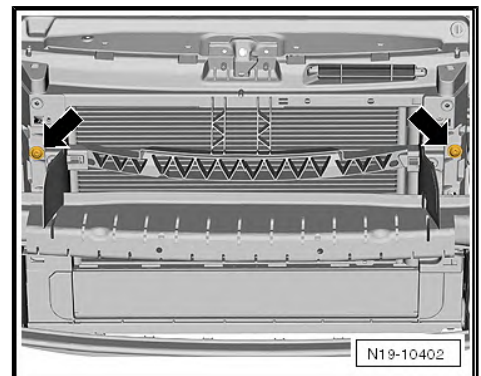
- Unscrew securing bolts -arrows-.
- Lift radiator out of lower mountings and press it slightly towards rear.

#### Vehicles with air conditioning system

#### CAUTION

Risk of freezing injury caused by refrigerant.

- Do not open refrigerant circuit of air conditioning system.



- Unscrew bolts -arrows-.
- Do not stretch, kink or bend refrigerant lines and hoses.
- Place condenser in bonnet lock latch at front and secure with cable ties to prevent it from falling.

#### Continued for all vehicles

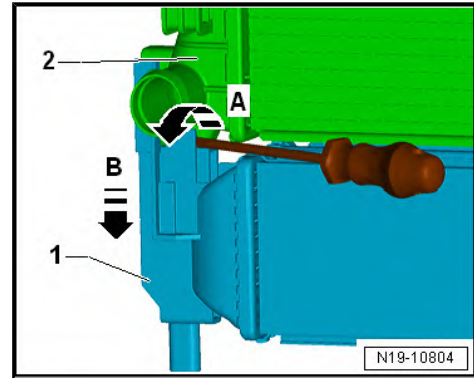
- Secure radiator -1- to prevent it from falling.

#### Note

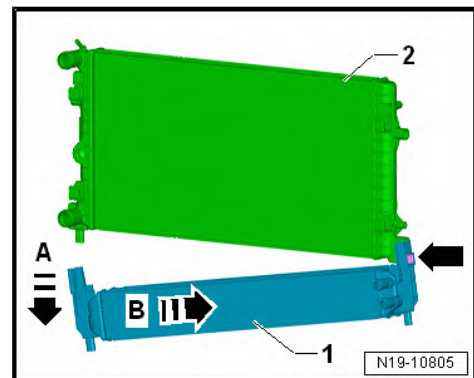
*In order to avoid damage to the charge air cooler, 2 mechanics are needed to disconnect the charge air cooler from radiator.*



- Push a wide flat-bladed screwdriver at front and rear into the left fastener on the water radiator for charge air cooling circuit -1-.
- Open latch by turning screwdriver in -direction of arrow A-.
- In this position, slightly pull water radiator for charge air cooling circuit -1- on left side in -direction of arrow B- off radiator -2-.



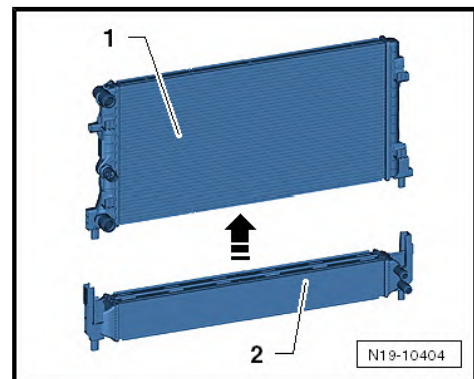
- Lower water radiator for charge air cooling circuit -1- further in -direction of arrow A-.
- At the same time, push radiator for charge air cooling circuit -1- in -direction of arrow B-.
- Detach water radiator for charge air cooling circuit -1- on right from mounting -arrow- on radiator -2-.
- Remove water radiator for charge air cooling circuit -1- downwards.



### Installing

Install in reverse order of removal. The following should be observed:

- Insert water radiator for charge air cooling circuit -2- into right mounting.
- Properly engage water radiator for charge air cooling circuit -2- in -direction of arrow- in mountings on radiator -1-.
- Check firm seating by pulling.



### Note

- ◆ *If there are minor dents in the fins, refer to ["3.5 Fitting radiator and condensers", page 5](#) .*
- ◆ *Renew O-rings.*
- Install front bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Front bumper
- Install radiator cowl  
⇒ ["4.5 Removing and installing radiator cowl with radiator fan", page 267](#) .
- Add coolant ⇒ [page 231](#) .

### Note

*Do not reuse coolant which has been drained off.*

### Torque settings

- ◆ ⇒ ["4.1 Assembly overview - radiator/radiator fan", page 257](#)

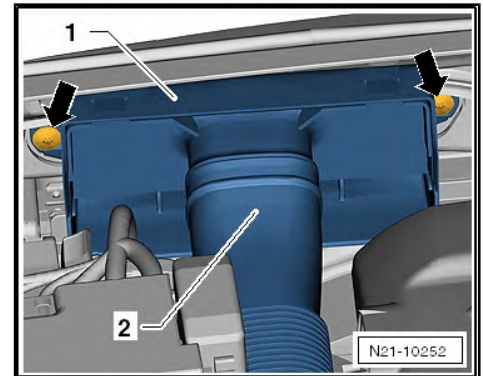




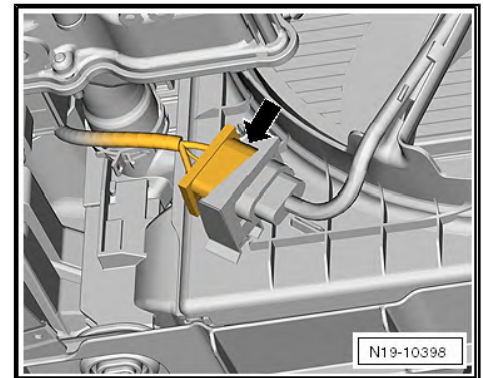
## 4.5 Removing and installing radiator cowl with radiator fan

### Removing

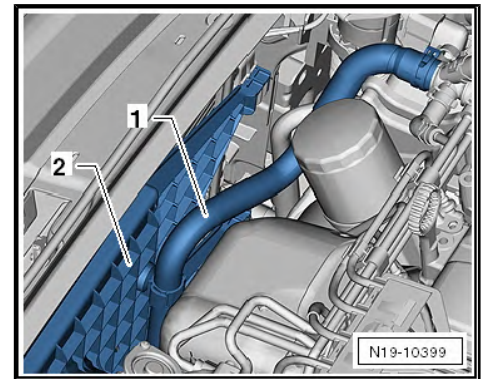
- Undo bolts -arrows- for air intake -1-.
- Remove connecting hose -2- leading to air filter  
⇒ [“3.1 Assembly overview - air filter housing”, page 307](#) .
- Remove noise insulation ⇒ General body repairs, exterior;  
Rep. gr. 66 ; Noise insulation .



- Separate connector -arrow-.



- Open hose guides on cowling -2-.
- Push coolant hose -1- to one side.



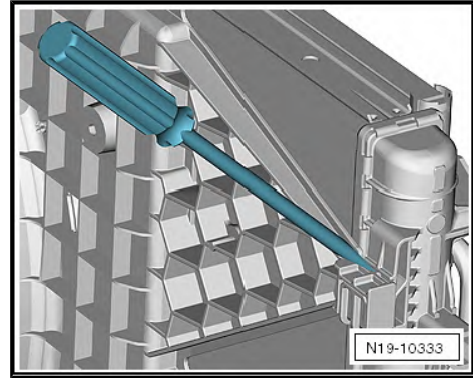


- Disengage cowling with radiator fan - V7- from locking hook using a suitable tool.
- Push cowling together with radiator fan - V7- upwards out of the mountings and remove downwards.

### Installing

Install in reverse order of removal. The following should be observed:

- Move radiator cowling together with radiator fan - V7- to installation position from below.
- Push evenly into all four mountings from above.
- The fan frame must engage audibly on the right and left at the top.
- Check that it has engaged securely by pulling on it.



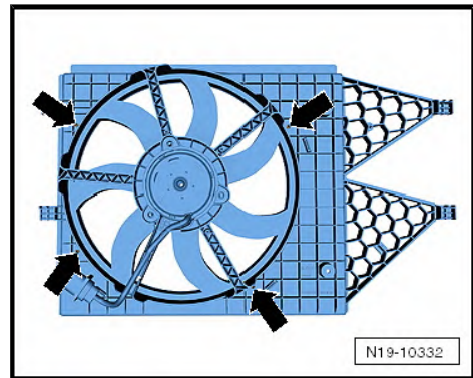
### Torque settings

- ◆ ⇒ [“4.1 Assembly overview - radiator/radiator fan”, page 257](#)
- ◆ ⇒ [“3.1 Assembly overview - air filter housing”, page 307](#) .

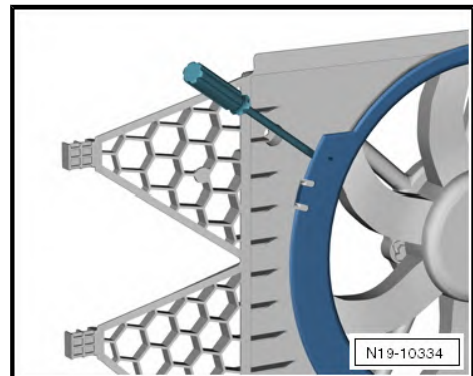
## 4.6 Removing and installing radiator fan - V7-

### Removing

- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation .
- Remove radiator cowl  
⇒ [“4.5 Removing and installing radiator cowl with radiator fan”, page 267](#) .
- Remove connector for radiator fan from retainer.
- Push pins out of spreader rivets -arrows-.



- Carefully lift up fan ring on back of radiator cowling using a suitable tool.
- Remove fan ring.





- Remove electric cable -1- from cable guide.
- Unscrew nuts -arrows- and remove radiator fan - V7- .

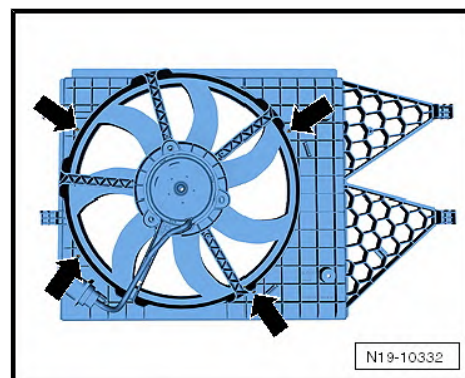
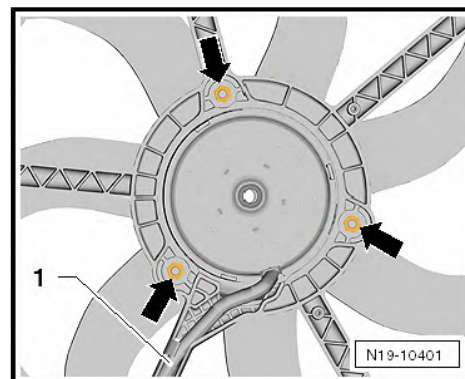
### Installing

Install in reverse order of removal. The following should be observed:

- Ensure proper seating of spreader rivets -arrows-.
- Install radiator cowl  
⇒ [“4.5 Removing and installing radiator cowl with radiator fan”](#),  
[page 267](#) .

### Torque settings

- ◆ ⇒ [“4.1 Assembly overview - radiator/radiator fan”](#), [page 257](#)
- ◆ ⇒ [“4.2 Assembly overview - radiator cowl and radiator fan”](#),  
[page 259](#)





## 21 – Turbocharging/supercharging

### 1 Exhaust turbocharger

⇒ [“1.1 Assembly overview - turbocharger”, page 270](#)

⇒ [“1.2 Removing and installing turbocharger”, page 274](#)

⇒ [“1.3 Removing and installing charge pressure positioner V465”, page 277](#)

⇒ [“1.4 Removing and installing connection for turbocharger”, page 279](#)

#### 1.1 Assembly overview - turbocharger

⇒ [“1.1.1 Assembly overview - turbocharger, version 1”, page 270](#)

⇒ [“1.1.2 Assembly overview - turbocharger, version 2”, page 271](#)

⇒ [“1.1.3 Assembly overview - lines on turbocharger”, page 273](#)

##### 1.1.1 Assembly overview - turbocharger, version 1

###### 1 - Exhaust turbocharger

- ❑ Removing and installing  
⇒ [“1.2 Removing and installing turbocharger”, page 274](#)

###### 2 - Bolt

- ❑ 8 Nm

###### 3 - Connection

###### 4 - O-ring

- ❑ Renew after removal

###### 5 - Seal

- ❑ Renew after removal

###### 6 - Heat shield

###### 7 - Bolt

- ❑ 25 Nm

###### 8 - Bolt

- ❑ 8 Nm

###### 9 - Nut

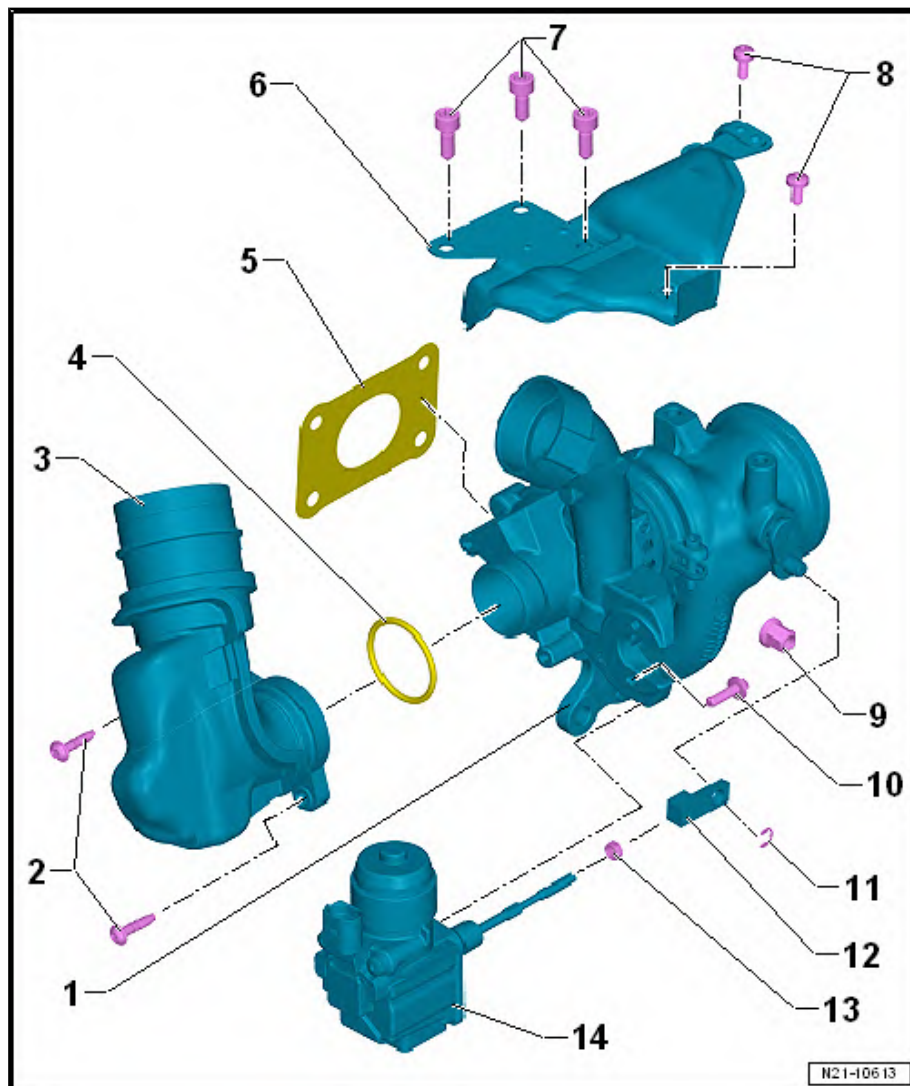
- ❑ Renew after removal
- ❑ 14 Nm

###### 10 - Bolt

- ❑ Renew after removal
- ❑ 9 Nm

###### 11 - Retaining clip

- ❑ Renew after removal





**12 - Operating lever**

**13 - Lock nut**

- Secure with sealing paint
- 6 Nm

**14 - Charge air pressure controller - V465-**



**Note**

- ◆ Note the following when installing!
- ◆ There may be different types of charge air pressure controllers installed.

- Removing and installing ⇒ [“1.3 Removing and installing charge pressure positioner V465”, page 277](#)

**1.1.2 Assembly overview - turbocharger, version 2**

**1 - Bolt**

- 25 Nm

**2 - Bolt/nut**

- 8 Nm

**3 - Heat shield**

**4 - Exhaust turbocharger**

- Removing and installing ⇒ [“1.2 Removing and installing turbocharger”, page 274](#)

**5 - Nut**

- Renew
- 14 Nm

**6 - Retaining clip**

- Renew

**7 - Operating lever**

**8 - Control rod**

**9 - Lock nut**

- 6 Nm
- Secure with sealing paint

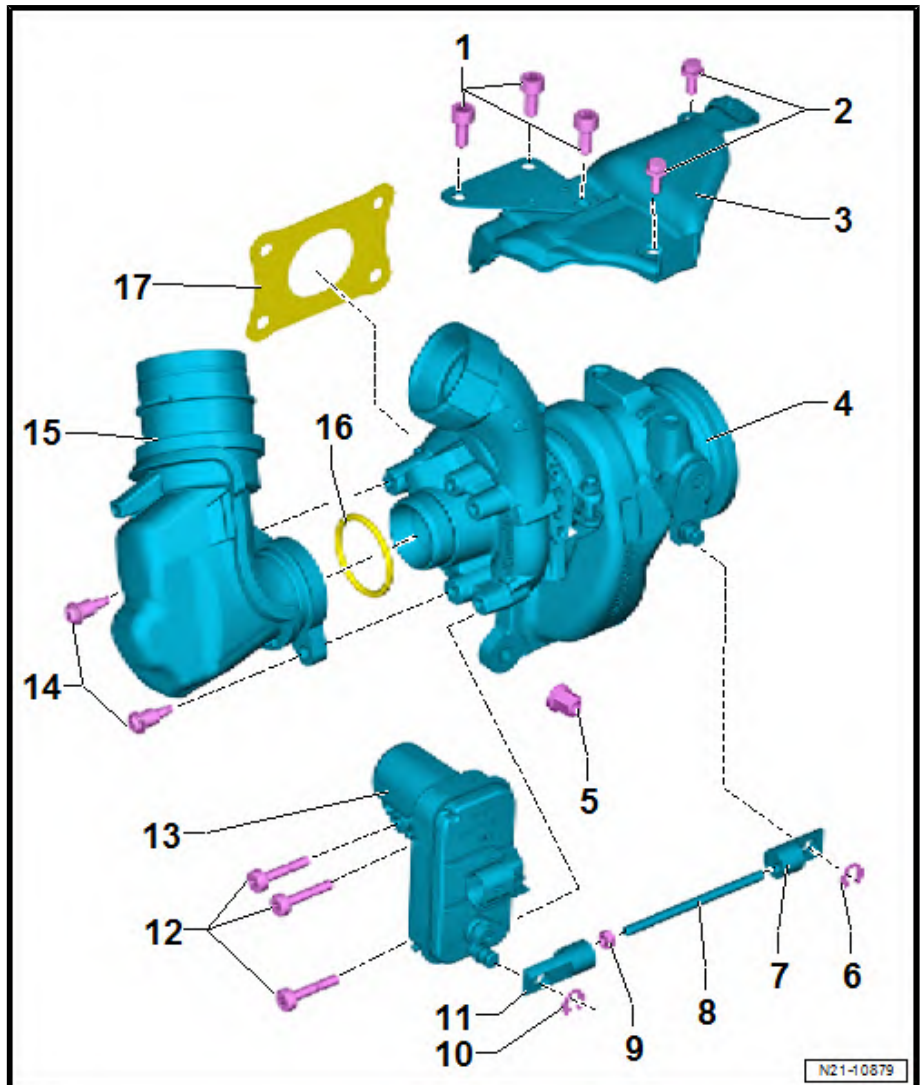
**10 - Retaining clip**

- Renew

**11 - Operating lever**

**12 - Bolt**

- Qty. 3 ⇒ Electronic parts catalogue (ET-KA).
- 8 Nm + 45°





**Note**

*If one or more of the bolts are loose, always renew all 3 bolts.*

**13 - Charge air pressure controller - V465-**



**Note**

- ◆ *Note the following when installing!*
- ◆ *There may be different types of charge air pressure controllers installed.*

- Removing and installing ⇒ [“1.3 Removing and installing charge pressure positioner V465”, page 277](#)

**14 - Bolt**

- 8 Nm

**15 - Union**

- Removing and installing ⇒ [“1.4 Removing and installing connection for turbocharger”, page 279](#)

**16 - O-ring**

- Renew after removal
- Before installing, moisten lightly with clean engine oil.

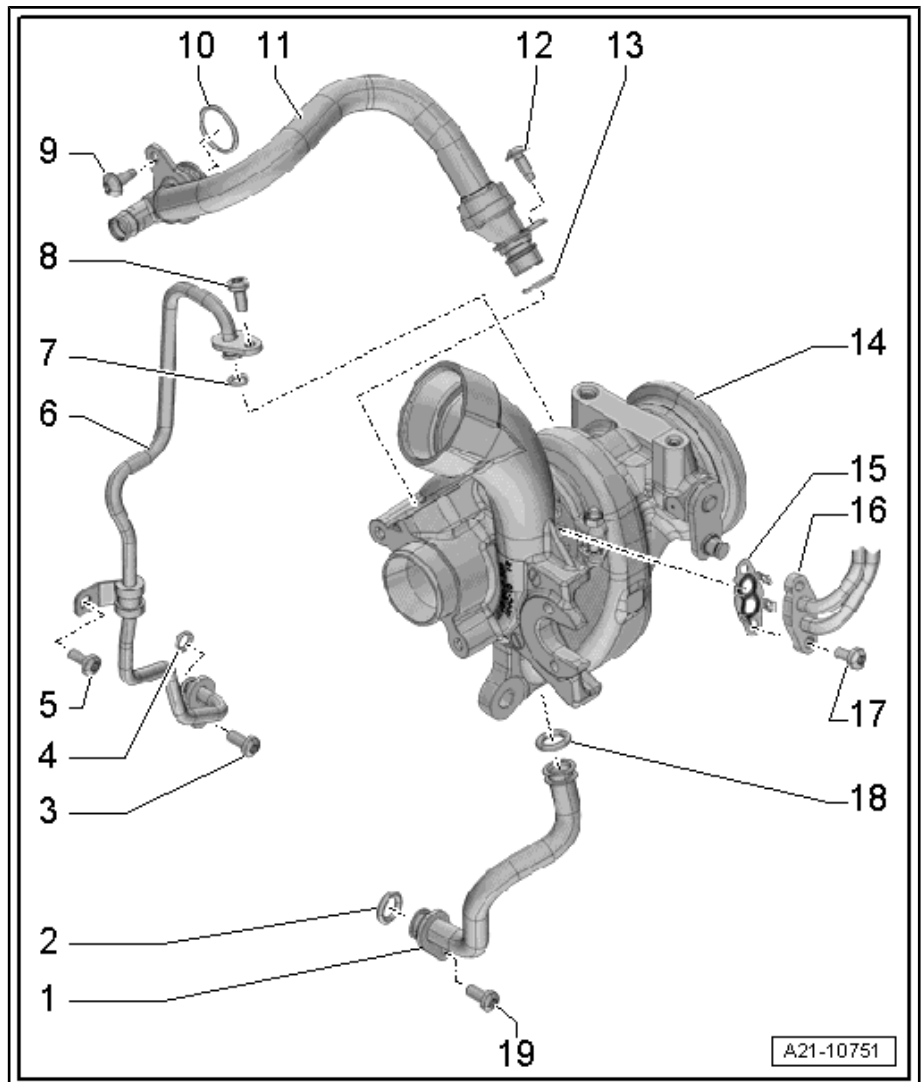
**17 - Seal**

- Renew



### 1.1.3 Assembly overview - lines on turbocharger

- 1 - Oil return line
- 2 - O-ring
  - Renew after removal
- 3 - Bolt
  - 9 Nm
- 4 - O-ring
  - Renew after removal
- 5 - Bolt
  - 9 Nm
- 6 - Oil supply line
- 7 - O-ring
  - Renew after removal
- 8 - Bolt
  - 9 Nm
- 9 - Bolt
  - Renew after removal
  - 5 Nm
- 10 - O-ring
  - Check for damage, and renew if necessary; see → Electronic parts catalogue (ETKA)
- 11 - Hose
  - For crankcase ventilation.
- 12 - Bolt
  - Renew after removal
  - 5 Nm
- 13 - O-ring
  - Check for damage, and renew if necessary; see → Electronic parts catalogue (ETKA)
- 14 - Exhaust turbocharger
  - Removing and installing ⇒ ["1.2 Removing and installing turbocharger", page 274](#)
- 15 - Seal
  - Renew after removal
- 16 - Coolant lines
  - Supply and return
- 17 - Bolt
  - 8 Nm
- 18 - O-ring
  - Renew after removal
- 19 - Bolt
  - 9 Nm

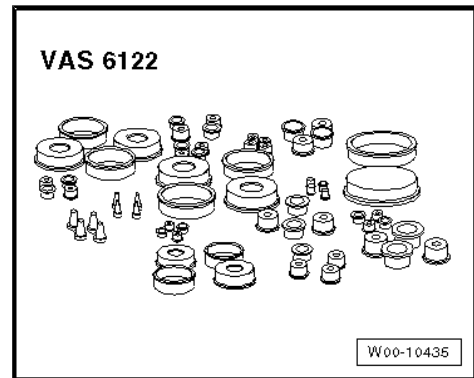




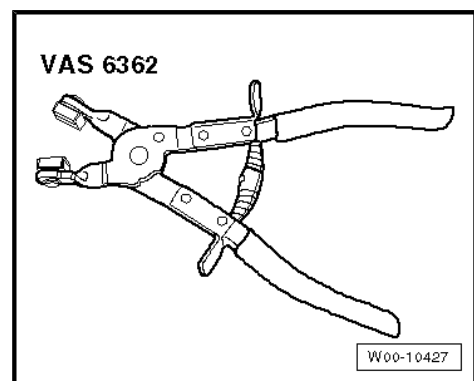
## 1.2 Removing and installing turbocharger

### Special tools and workshop equipment required

- ◆ Engine bung set - VAS 6122-



- ◆ Spring-type clip pliers - VAS 6362-



- ◆ Release tool - T10527-
- ◆ Release tool - T10527/1-

### Removing



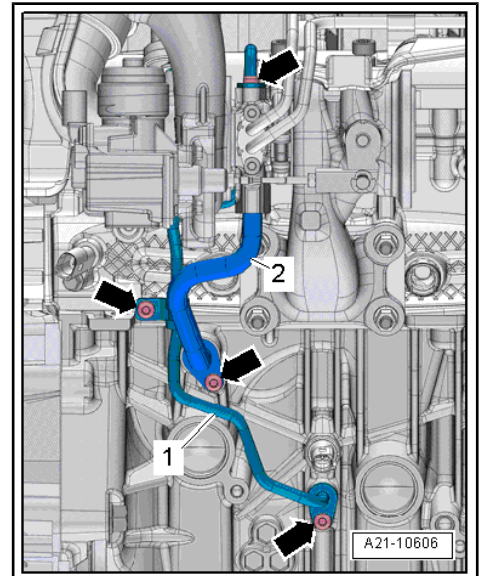
#### Note

- ◆ *Fit all heat shield sleeves in the same place when installing.*
  - ◆ *If a mechanical fault is discovered on the turbocharger (e.g. a destroyed compressor impeller), it is not sufficient to just renew the turbocharger. To avoid any subsequent damage, the following work must be carried out:*
  - ◆ *Check air filter housing, air filter element and air inlet hoses for contamination.*
  - ◆ *Check the whole charge air path and charge air cooler for foreign objects.*
  - ◆ *If foreign objects are discovered in the charge air system, clean the charge air path and, if necessary, renew the charge air cooler.*
  - ◆ *Do not reuse coolant which has been drained off.*
- Drain coolant  
⇒ ["1.3 Draining and adding coolant", page 225](#) .
- Remove heat shield for drive shaft ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft heat shield .

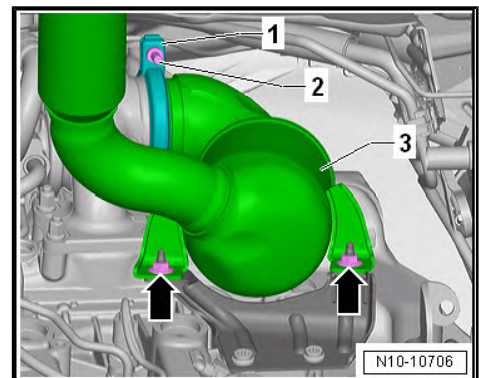




- Unscrew bolts -arrows-.
- Remove oil supply line -1- and oil return line -2-.



- Unscrew bolt -2-.
- Remove screw-type clip -1-.
- Unscrew nuts -arrows- and tie up catalytic converter -3-.
- Remove resonator for intake air  
 ⇒ [“3.3 Removing and installing resonator for intake air”, page 309](#) .
- Remove air pipe  
 ⇒ [“2.5 Removing and installing air intake pipe”, page 289](#) .

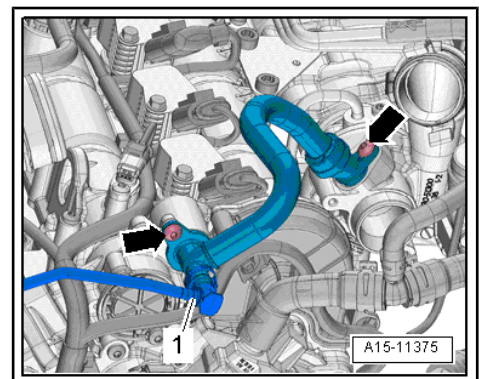


- Unscrew bolts -arrows-.

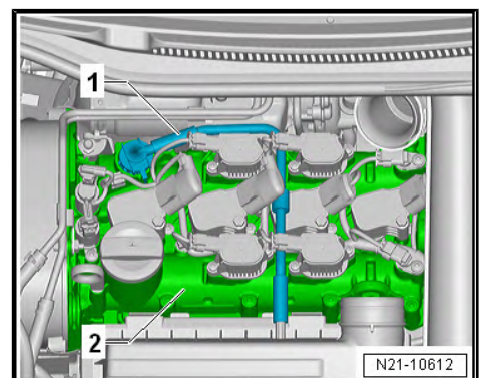
**i** Note

*Risk of chemical damage to the coolant pump gasket caused by oil entering between the coolant pump and the cylinder head.*

- Cover coolant pump with a cloth.
- Remove crankcase breather hose and place it to one side.

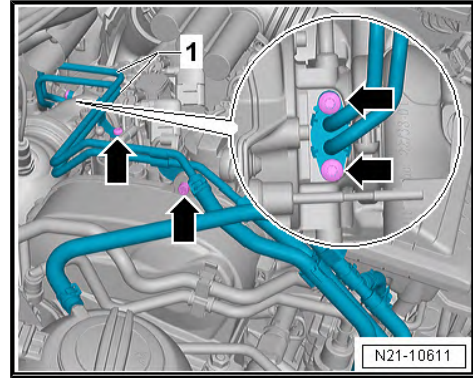


- Remove crankcase breather -1- from camshaft housing -2-.
- Lay crankcase breather -1- to one side.
- Remove connection for turbocharger  
 ⇒ [“1.4 Removing and installing connection for turbocharger”, page 279](#) .

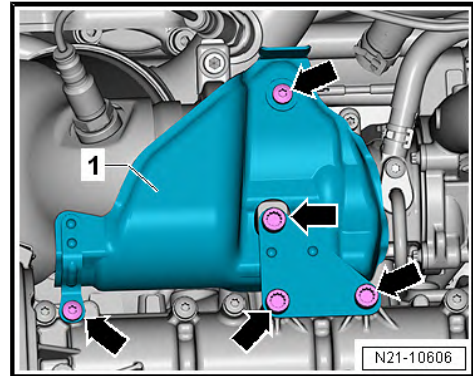




- Unscrew bolts -arrows-.
- Swivel coolant lines -1- to side.



- Unscrew bolts -arrows-.
- Unclip wiring harness for lambda probe from heat shield -1-.
- Remove heat shield -1-.



- Unscrew nuts -arrows- and remove turbocharger.

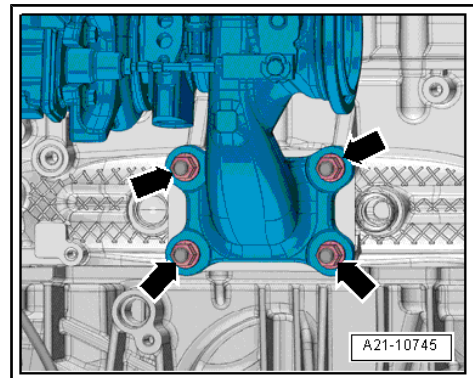
### Installing

Install in reverse order of removal. The following should be observed:



#### Note

- ◆ *Renew seals, O-rings and securing nuts of cylinder head.*
- ◆ *Before installing, lightly moisten O-rings with clean engine oil.*
- ◆ *Renew clamps for attaching catalytic converter to turbocharger.*
- ◆ *Fill turbocharger with engine oil at connection for oil supply line.*
- ◆ *Secure hose connections with hose clips according to production standard → Electronic parts catalogue .*
- ◆ *After installing turbocharger, run engine for about 1 minute at idling speed to ensure that oil is supplied to turbocharger.*

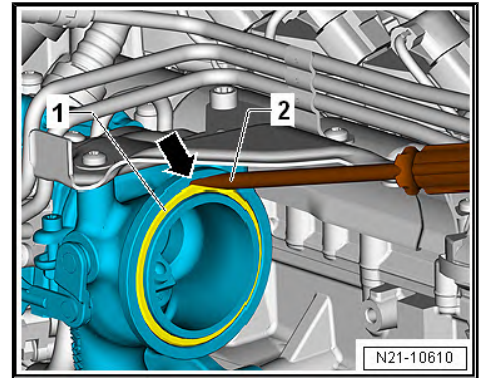




- Fit screwdriver -2- in recess -arrow- on turbocharger.
- Lever out seal -1-.
- Renew oil seal -1-.
- Add coolant ⇒ [page 231](#) .
- Ensure proper connection and routing of wires ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.

#### Torque settings

- ◆ ⇒ [“1.1 Assembly overview - turbocharger”, page 270](#)
- ◆ ⇒ [Fig. ““Installing catalytic converter - specified torque and tightening sequence””, page 343](#)
- ◆ ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Assembly overview - drive shaft



### 1.3 Removing and installing charge pressure positioner - V465-

⇒ [“1.3.1 Removing and installing charge pressure positioner V465 , version 1”, page 277](#)

⇒ [“1.3.2 Removing and installing charge pressure positioner V465 , version 2”, page 278](#)

#### 1.3.1 Removing and installing charge pressure positioner - V465- , version 1

##### Removing

- Switch off ignition.
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
- Remove heat shield for drive shaft ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft heat shield .



- Disconnect electrical connector -1-.
- Remove securing clip -2-.
- Remove bolts -arrows- and detach charge pressure positioner -V465- .

### Installing

Install in reverse order of removal, observing the following:

Always renew securing bolts and the securing clip.



### Note

*There may be different types of charge air pressure controllers installed.*

### Charge pressure positioner without adjustable linkage:

- Adapt engine control unit -J623- to charge pressure positioner -V465- using ⇒ Vehicle diagnostic tester; "Guided functions" .

### Charge pressure positioner with adjustable linkage:

- Fit thread of charge pressure positioner -V465- at central position in joint element.
- Adjust charge air pressure controller -V465- : ⇒ Vehicle diagnostic tester Select 01 - Adjust charge air pressure controller V465 in Guided functions.
- Adjust to specified value by turning linkage. For specified value, see ⇒ Vehicle diagnostic tester.
- Tighten lock nut to 6 Nm and secure with sealing paint.

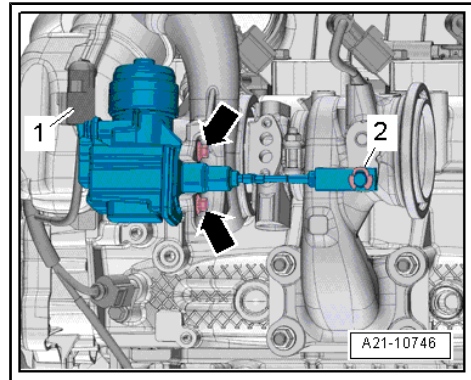
### Torque settings

- ◆ ⇒ ["1.1.1 Assembly overview - turbocharger, version 1", page 270](#)
- ◆ ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Assembly overview - drive shaft

## 1.3.2 Removing and installing charge pressure positioner - V465- , version 2

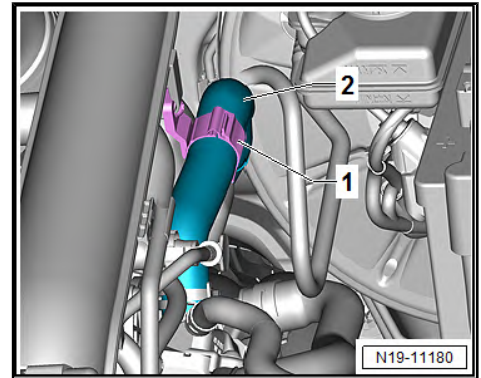
### Removing

- Switch off ignition.
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
- Remove heat shield for drive shaft ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft heat shield .
- Remove resonator for intake air  
⇒ ["3.3 Removing and installing resonator for intake air", page 309](#) .
- Remove air pipe  
⇒ ["2.5 Removing and installing air intake pipe", page 289](#) .

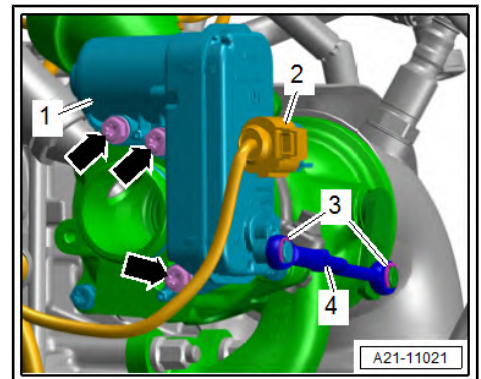




- Open hose clip -1- and push coolant hose -2- to one side.
- Unscrew bolts -arrows- and remove crankcase breather hose.
- Remove connection for turbocharger  
 => ["1.4 Removing and installing connection for turbocharger", page 279](#) .



- Pull off securing clips -3-, and remove operating lever -4-.
- Unscrew bolts -arrows-.
- Disconnect connector -2-, and remove charge pressure positioner - V465- -1-.



### Installing

Install in reverse order of removal, observing the following:

Always renew securing bolts and the securing clip.

Renew O-rings after removal.

Before installing, lightly moisten O-rings with clean engine oil.

### Charge air pressure controller without adjustable linkage

- Adapt engine control unit - J623- to charge pressure positioner - V465- using => Vehicle diagnostic tester; "Guided functions" .

### Charge air pressure controller with adjustable linkage

- Fit thread of charge pressure positioner -V465- at central position in joint element.
- Adjust charge air pressure controller - V465- : => Vehicle diagnostic tester Select 01 - Adjust charge air pressure controller V465 in Guided functions.
- Adjust to specified value by turning linkage. For specified value, see => Vehicle diagnostic tester.
- Tighten lock nut to 6 Nm and secure with sealing paint.

### Torque settings

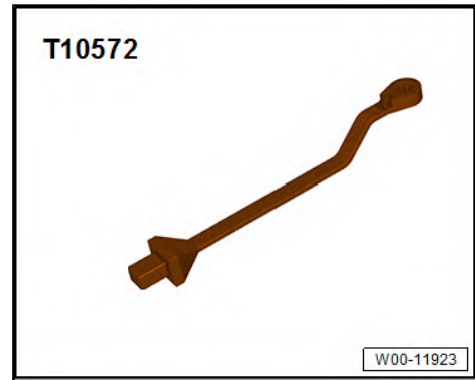
- ◆ => ["1.1.2 Assembly overview - turbocharger, version 2", page 271](#)
- ◆ => Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Assembly overview - drive shaft

## 1.4 Removing and installing connection for turbocharger

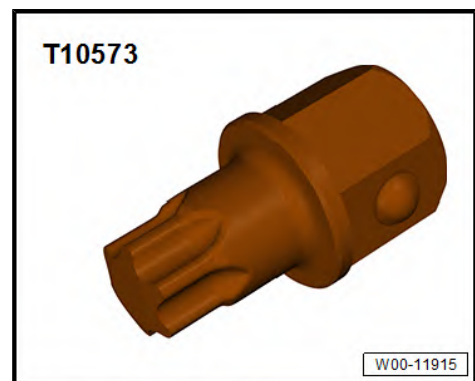
Special tools and workshop equipment required



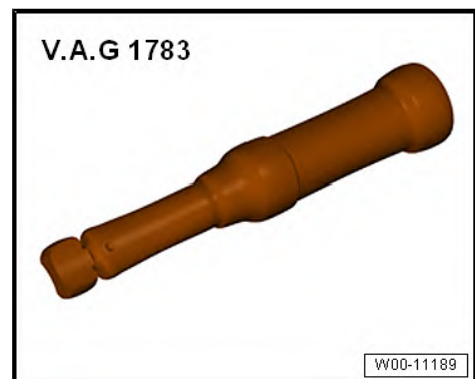
- ◆ Insert tool - T10572-



- ◆ Torx bit T30 - T10573-



- ◆ Torque wrench - V.A.G 1783-

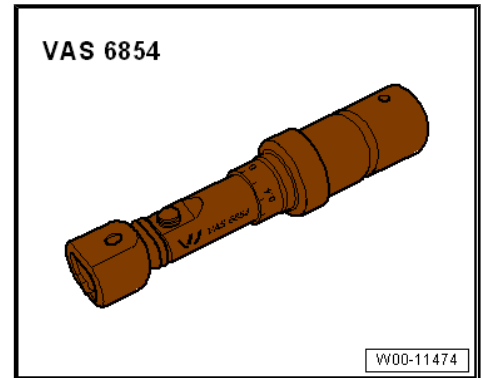


- ◆ Socket Torx T 30 - T10405-

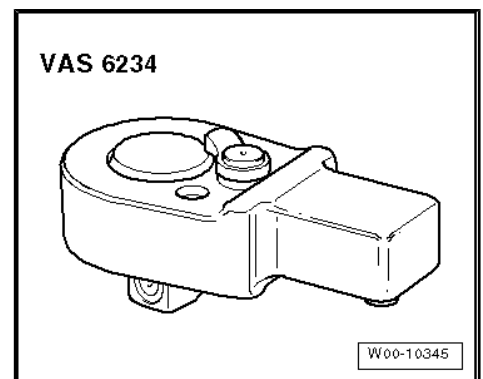




- ◆ Torque wrench - VAS 6854-



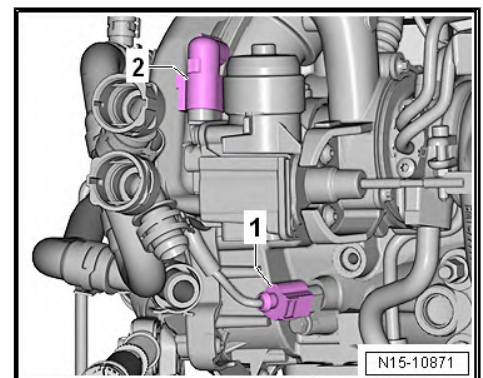
- ◆ Ratchet insert 1/4" - VAS 6234-



- Remove resonator for intake air  
⇒ ["3.3 Removing and installing resonator for intake air"](#), page 309 .
- Remove air pipe  
⇒ ["2.5 Removing and installing air intake pipe"](#), page 289 .
- Release and pull off electrical connectors -1- on coolant temperature sender - G62- .

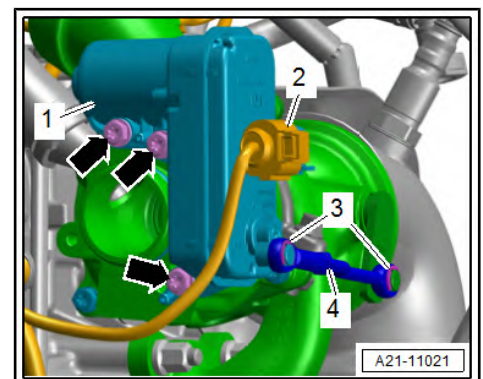
**Vehicles with charge pressure sender - V465- , version 1:**

- Release and pull off connectors -2- on charge pressure sender - V465- .



**Vehicles with charge pressure sender - V465- , version 2:**

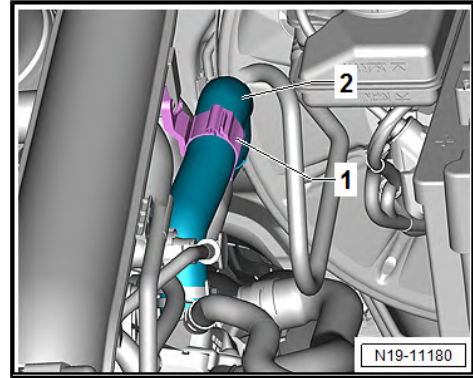
- Release and pull off connectors -2- on charge pressure sender - V465- .





**Continued for all vehicles:**

- Lay wiring harness to one side.
- Open hose clip -1- and push coolant hose -2- to one side.



- Unscrew bolts -arrows- using insert tool - T10572- and Torx bit T30 - T10573- .
- Remove support -1-.

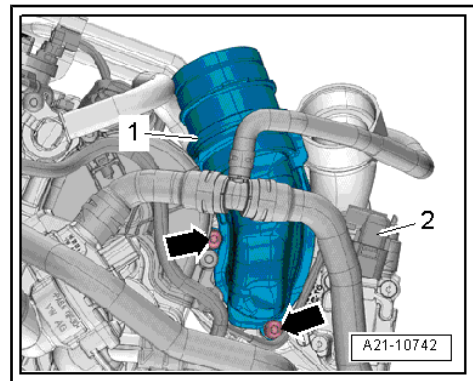
**Installing:**

Install in reverse order of removal, observing the following:



**Note**

- ◆ *Renew seals, O-rings and securing nuts of cylinder head.*
  - ◆ *Before installing, lightly moisten O-rings with clean engine oil.*
  - ◆ *Secure hose connections with hose clips according to production standard ⇒ Electronic parts catalogue .*
- Tighten bolts using insert tool - T10572- , Torx bit T30 - T10573- and torque wrench - V.A.G 1783- .
  - Set torque wrench - V.A.G 1783- to 4.2 Nm.



**Torque settings**

- ◆ ⇒ ["1.1 Assembly overview - turbocharger", page 270](#)





## 2 Charge air system

⇒ [“2.1 Assembly overview - charge air system”, page 283](#)

⇒ [“2.2 Removing and installing charge air cooler”, page 285](#)

⇒ [“2.3 Removing and installing charge pressure sender GX26”, page 286](#)

⇒ [“2.4 Checking charge air system for leaks”, page 287](#)

⇒ [“2.5 Removing and installing air intake pipe”, page 289](#)

### 2.1 Assembly overview - charge air system



#### Note

Before performing any checks or any repair work, make sure that all air pipes, air hoses and vacuum lines are firmly seated and leak-tight.

#### 1 - O-ring

- Renew after removal
- Before installing, lightly moisten O-ring with clean engine oil

#### 2 - Union

#### 3 - O-ring

- Renew after removal
- Before installing, lightly moisten O-ring with clean engine oil

#### 4 - Air intake pipe

- Removing and installing  
 ⇒ [“2.5 Removing and installing air intake pipe”, page 289](#)

#### 5 - Charge air pressure sender - GX26-

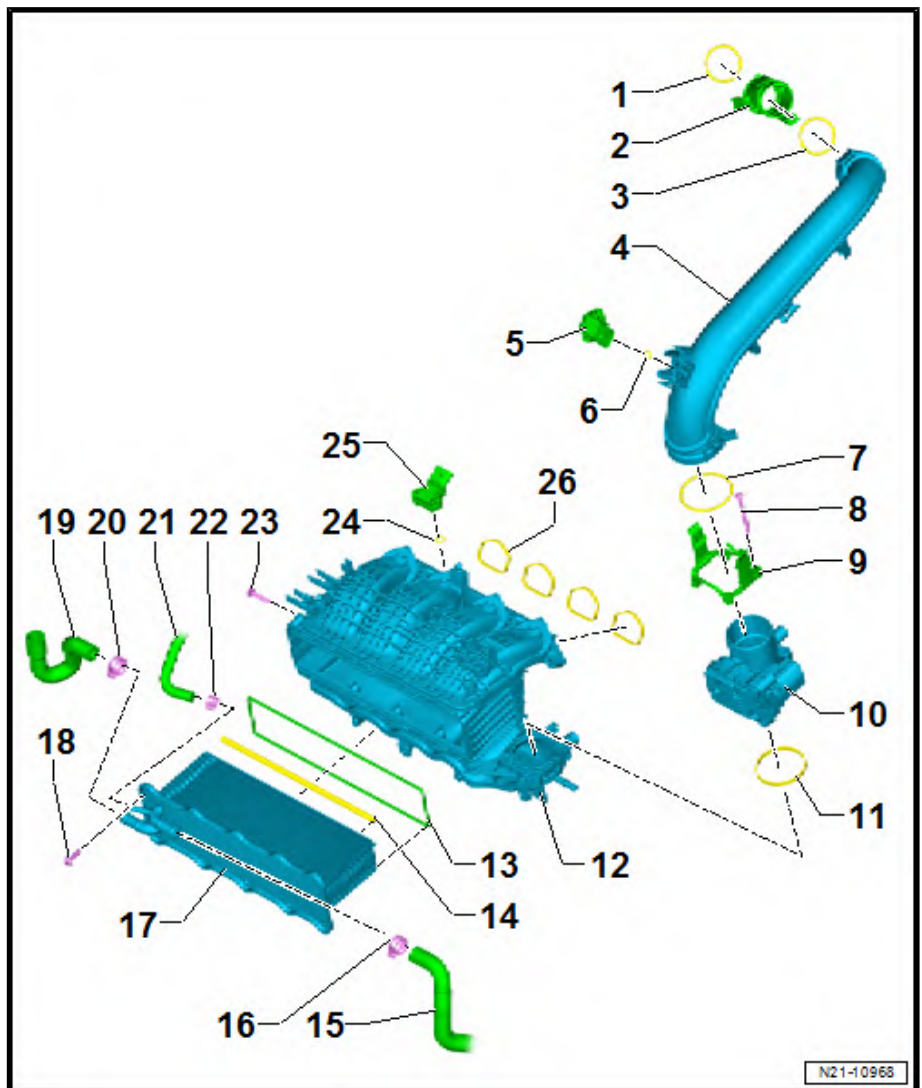
- Consisting of  
 Charge pressure sender - G31-  
 Intake air temperature sender - G42-
- Removing and installing  
 ⇒ [“2.3 Removing and installing charge pressure sender GX26”, page 286](#)

#### 6 - O-ring

- Not sold separately
- If damaged, renew charge pressure sender - GX26-

#### 7 - O-ring

- Renew after removal
- Before installing, lightly moisten O-ring with clean engine oil



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



#### 8 - Bolt

- Thread-forming
- Fit and screw in bolt by hand so that it screws into old thread Then tighten bolt to specified torque
- 7 Nm

#### 9 - Retaining clip

- For air intake pipe

#### 10 - 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 ⇒ ["4.3 Removing and installing throttle valve module GX3", page 314](#)

#### 11 - Seal

- Renew after removal

#### 12 - Intake manifold

Removing and installing ⇒ ["4.2 Removing and installing intake manifold", page 312](#)

#### 13 - Seal

- Renew

#### 14 - Sealing lip

- Renew after removal
- Before installing, moisten lightly with clean engine oil.

#### 15 - Coolant hose

#### 16 - Clip

#### 17 - Charge air cooler

- Removing and installing ⇒ ["2.2 Removing and installing charge air cooler", page 285](#)
- Change coolant after renewing

#### 18 - Bolt

- Thread-forming
- Fit and screw in bolt by hand so that it screws into old thread Then tighten bolt to specified torque
- 15 Nm

#### 19 - Coolant hose

#### 20 - Clip

#### 21 - Coolant hose

#### 22 - Clip

#### 23 - Bolt

- Specified torque and tightening sequence ⇒ ["4.1 Assembly overview - intake manifold", page 310](#)

#### 24 - O-ring

- Renew

#### 25 - Intake manifold sender - GX9-

- Consisting of
  - Intake air temperature sender 2 - G299-
  - Intake manifold pressure sender - G71-



- ❑ Removing and installing ⇒ [“5.3 Removing and installing intake manifold sender GX9”](#), page 321

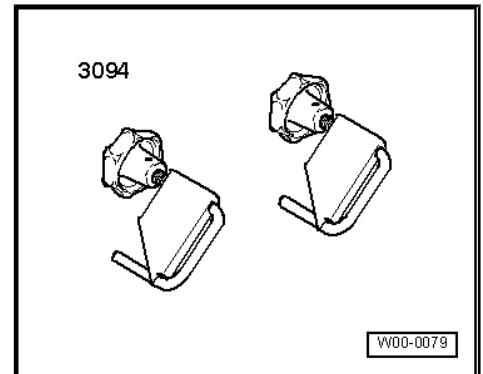
## 26 - Seal

- ❑ Qty. 4
- ❑ Renew after removal

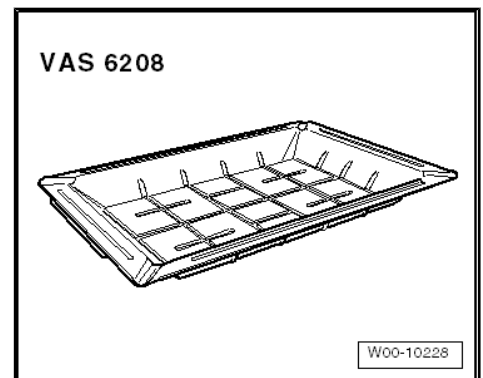
## 2.2 Removing and installing charge air cooler

### Special tools and workshop equipment required

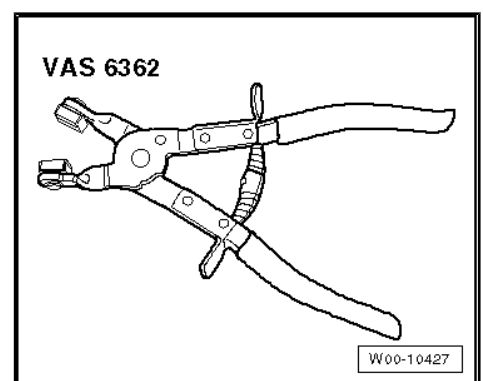
- ◆ Hose clamps to 25 mm - 3094-



- ◆ Drip tray for workshop hoist - VAS 6208-



- ◆ Spring-type clip pliers - VAS 6362-

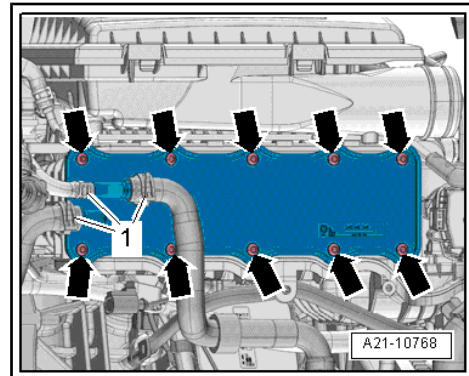


### Removing

- Observe rules for cleanliness  
⇒ [“1.1 Safety regulations for working on fuel supply”](#), page 1 .
- Remove air filter  
⇒ [“3.2 Removing and installing air filter housing”](#), page 308 .
- Remove radiator cowl  
⇒ [“4.5 Removing and installing radiator cowl with radiator fan”](#), page 267 .



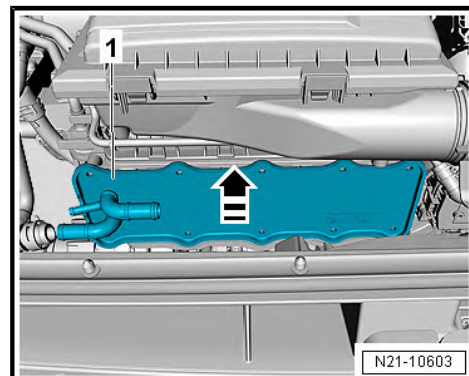
- Place drip tray for workshop hoist - VAS 6208- underneath.
- Clamp off coolant hoses -1- on charge air cooler using hose clamps, up to Ø 25 mm - 3094- .
- Release hose clip -1- and remove coolant hose.
- Unscrew bolts -arrows-.



- Pull charge air cooler -1- evenly towards front (in -direction of arrow-) out of intake manifold.

### Installing

Install in reverse order of removal. The following should be observed:



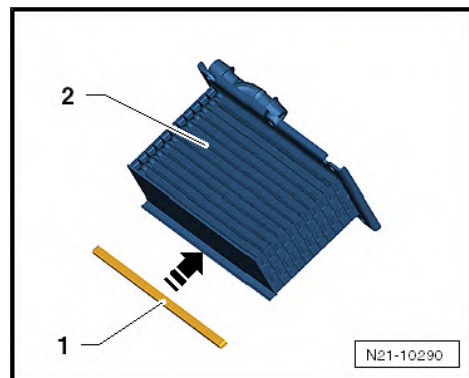
- Fit sealing lip -1- in -direction of arrow- onto charge air cooler -2-.



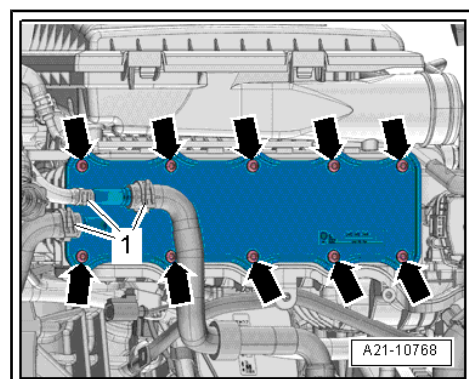
### Note

*If there are minor dents in the fins, refer to  
⇒ [“3.5 Fitting radiator and condensers”, page 5](#) .*

- Insert new gasket into groove on intake manifold.



- Tighten bolts -arrows- alternately and diagonally working from centre outwards.
- Install hose clips -1-.
- Install radiator cowl  
⇒ [“4.5 Removing and installing radiator cowl with radiator fan”, page 267](#) .
- Check coolant level ⇒ [page 231](#) .



### Torque settings

- ◆ ⇒ [“4.1 Assembly overview - radiator/radiator fan”, page 257](#)
- ◆ ⇒ [“2.1 Assembly overview - charge air system”, page 283](#)
- ◆ ⇒ [“3.1 Assembly overview - air filter housing”, page 307](#)

## 2.3 Removing and installing charge pressure sender - GX26-

The charge pressure sender - GX26- comprises the charge pressure sender - G31- and the intake air temperature sender - G42- .



## Removing

- Release and pull off electrical connector -1-.
- Release fasteners -arrows-, and remove charge pressure sender - GX26- .

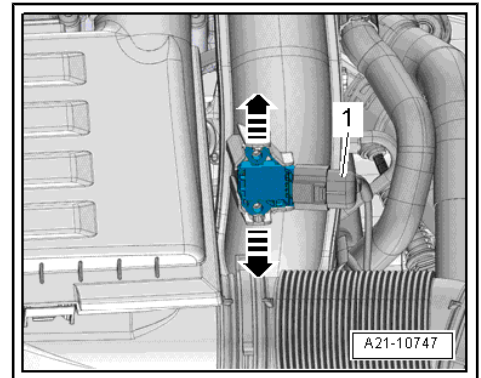
## Installing

Install in reverse order of removal. The following should be observed:



### Note

- ◆ Renew O-ring.
- ◆ If the retaining tabs broke off during removal, the sender can be mounted using two securing bolts ⇒ *Electronic parts catalogue* . Specified torque: ⇒ [page 287](#)



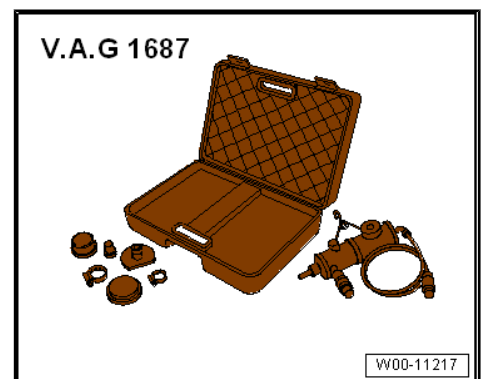
## Torque setting

Component	Torque setting
Charge pressure sender - GX26-	3 Nm

## 2.4 Checking charge air system for leaks

### Special tools and workshop equipment required

- ◆ Charge air system tester - V.A.G 1687-



### Procedure

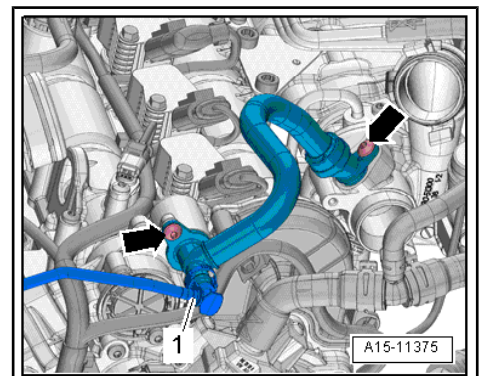
- Remove resonator for intake air  
 ⇒ ["3.3 Removing and installing resonator for intake air", page 309](#) .
- Press release tabs, and disconnect hose -1- for activated charcoal filter.



### Note

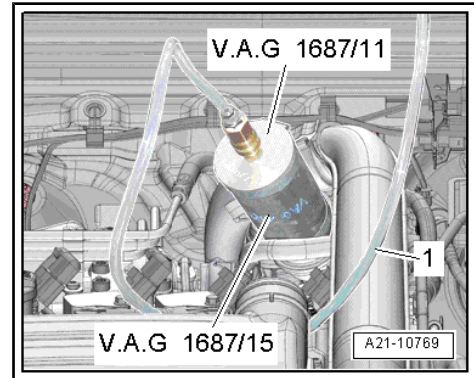
*Risk of chemical damage to coolant pump seal from oil ingress between coolant pump and cylinder head.*

- Cover coolant pump with a cloth to collect any escaping oil.
- Seal open connection of turbocharger using a suitable plug from engine bung set - VAS 6122- .





- Connect adapter - V.A.G 1687/15- with adapter -V.A.G 1687/11- to turbocharger.
- Connect hose -1- of charge air system tester -V.A.G 1687- to adapter.



Prepare charge air system tester - V.A.G 1687- as follows:

- Completely unscrew pressure regulating valve -2-, close valves -3- and -4-.
- To turn the pressure regulating valve -2- the knob must be pulled upwards.
- Connect charge air system tester - V.A.G 1687- to compressed air -1- via commercial adapter.



#### Note

*If there is water in inspection glass, drain via drain screw -6-.*

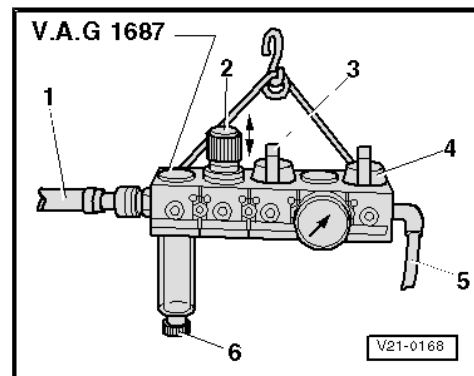
- Open valve -3-.

#### Risk of damage to engine

Risk of damage because pressure is set too high.

The pressure must not exceed 0.5 bar.

- Adjust pressure to 0.5 bar with pressure control valve -2-.
- Open valve -4- and wait until test circuit is full. If necessary, adjust pressure to 0.5 bar.
- Check charge air system for leaks by hearing, touching, with commercially available leak detector spray or using ultrasonic tester - V.A.G 1842- .



#### Note

- ◆ *A small amount of air escapes through the valves and enters the engine. Therefore a holding pressure test is not possible.*
- ◆ *For information on how to use the ultrasonic tester - V.A.G 1842- refer to respective => operating manual .*
- ◆ *Before removing the adapter, release pressure in the test circuit by pulling off hose coupling.*

#### Installing

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



#### Note

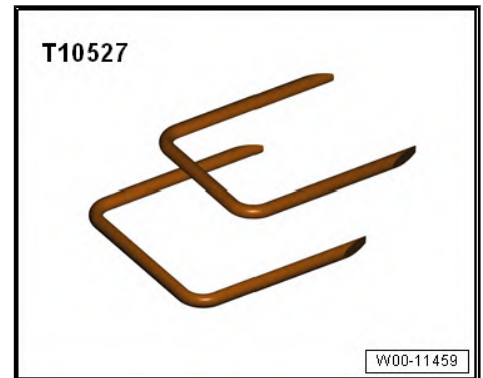
*Renew seal and O-rings.*



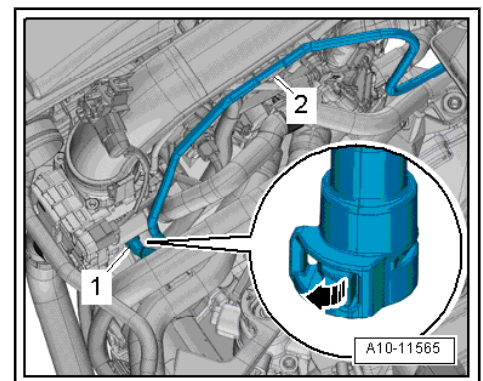
## 2.5 Removing and installing air intake pipe

### Special tools and workshop equipment required

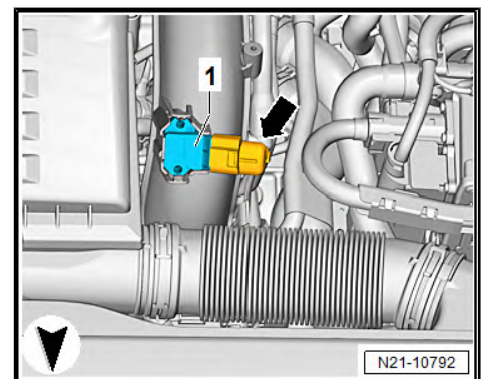
- ◆ Release tool - T10527-



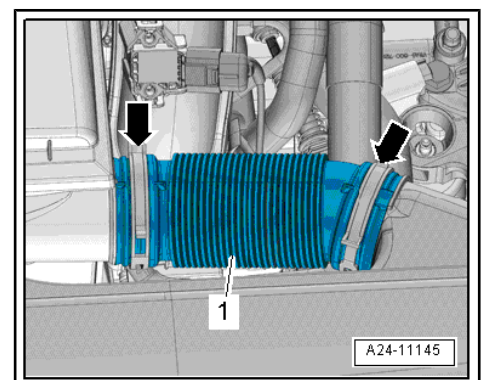
- ◆ Release tool - T10527/1-
- Unclip vacuum hose on air intake pipe -2-.



- Release and pull off connector -arrow- of charge pressure sender - GX26- -1-.

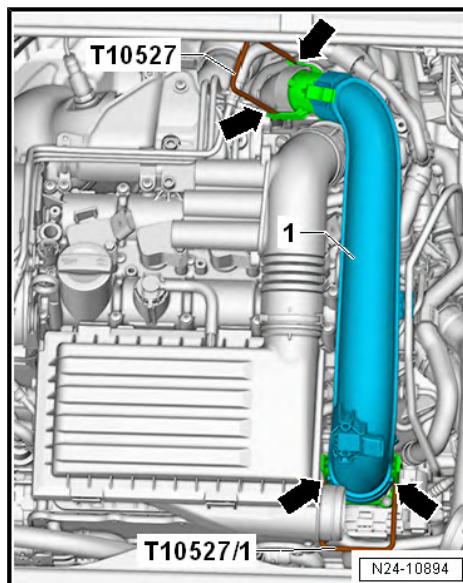


- Open hose clips -arrows- and detach air duct -1-.





- Release fasteners -arrows- using release tools - T10527- and -T10527/1- .
- Remove air intake pipe -1-.







## 24 – Mixture preparation - injection

### 1 Injection system

⇒ [“1.1 Overview of fitting locations - injection system”, page 291](#)

#### 1.1 Overview of fitting locations - injection system

⇒ [“1.1.1 Overview of fitting locations - engine compartment, vehicles with Active Cylinder Management”, page 291](#)

⇒ [“1.1.2 Overview of fitting locations - engine compartment, exhaust side with toothed belt pulley”, page 294](#)

⇒ [“1.1.3 Engine \(from above\), vehicles with Active Cylinder Management”, page 296](#)

⇒ [“1.1.4 Overview of fitting locations - front view of engine”, page 297](#)

⇒ [“1.1.5 Overview of fitting locations - rear view of engine”, page 298](#)

#### 1.1.1 Overview of fitting locations - engine compartment, vehicles with Active Cylinder Management



**1 - Inlet camshaft control valve  
1 - N205-**

- ❑ Removing and installing  
⇒ [“3.5.2 Removing and installing camshaft control valve 1 N205 , exhaust side with toothed belt pulley”](#), page 178

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

- ❑ Removing and installing  
⇒ [“3.5.2 Removing and installing camshaft control valve 1 N205 , exhaust side with toothed belt pulley”](#), page 178

**3 - Lambda probe 1 before catalytic converter - GX10-**

- ❑ Consisting of  
Lambda probe - G39-  
Lambda probe heater - Z19-
- ❑ Removing and installing  
⇒ [“8.2 Removing and installing Lambda probe”](#), page 334

**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 ⇒ [“8.2 Removing and installing Lambda probe”](#), page 334

**5 - Exhaust cam actuator for cylinder 2 - N587-**

- ❑ Removing and installing ⇒ [“3.8 Removing and installing cam actuators”](#), page 187

**6 - Exhaust cam actuator for cylinder 3 - N595-**

- ❑ Removing and installing ⇒ [“3.8 Removing and installing cam actuators”](#), page 187

**7 - Charge air pressure controller - V465-**

- ❑ Removing and installing ⇒ [“1.3 Removing and installing charge pressure positioner V465 ”](#), page 277

**8 - Inlet cam actuator for cylinder 2 - N583-**

- ❑ Removing and installing ⇒ [“3.8 Removing and installing cam actuators”](#), page 187

**9 - Inlet cam actuator for cylinder 3 - N591-**

- ❑ Removing and installing ⇒ [“3.8 Removing and installing cam actuators”](#), page 187

**10 - Radiator outlet coolant - G62-**

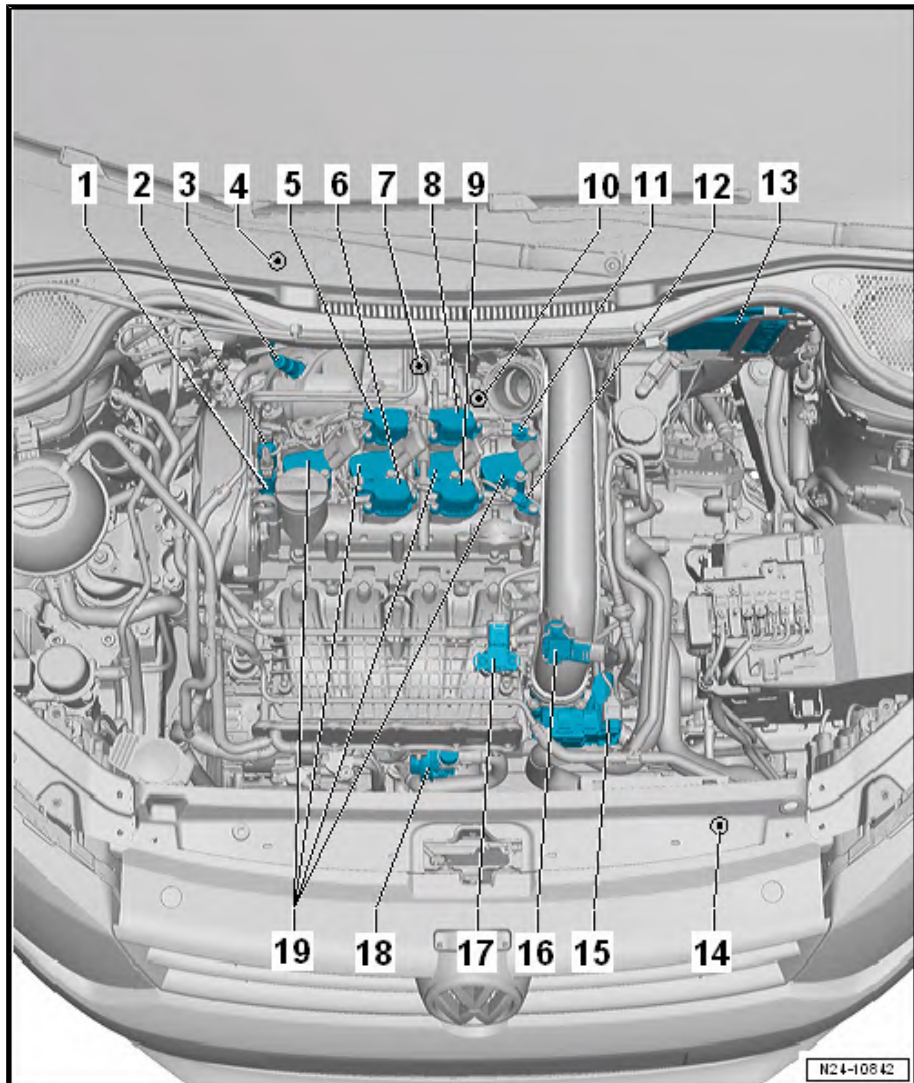
- ❑ Removing and installing ⇒ [“2.8 Removing and installing coolant temperature sender G62 ”](#), page 248

**11 - Hall sender 3 - G300-**

- ❑ Removing and installing ⇒ [“1.4.2 Removing and installing Hall sender 3 G300 ”](#), page 353

**12 - Hall sender - G40-**

⇒ [Item 12 \(page 292\)](#)





- ❑ Removing and installing ⇒ [“1.4.1 Removing and installing Hall sender G40 ”, page 352](#)

### 13 - Engine control unit - J623-

- ❑ Removing and installing ⇒ [“6 Engine control unit”, page 323](#)

### 14 - Radiator outlet coolant temperature sender - G83-

- ❑ Removing and installing  
⇒ [“2.9 Removing and installing radiator outlet coolant temperature sender G83 ”, page 250](#)

### 15 - 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-
- ❑ Removing and installing ⇒ [“4.3 Removing and installing throttle valve module GX3 ”, page 314](#)

### 16 - Charge air pressure sender - GX26-

- ❑ Consisting of
  - Charge pressure sender - G31-
  - Intake air temperature sender - G42-
- ❑ Assembly overview ⇒ [“2.1 Assembly overview - charge air system”, page 283](#)
- ❑ Removing and installing ⇒ [“2.3 Removing and installing charge pressure sender GX26 ”, page 286](#)

### 17 - Intake manifold sender - GX9-

- ❑ Consisting of
  - Intake air temperature sender 2 - G299-
  - Intake manifold pressure sender - G71-
- ❑ Assembly overview ⇒ [“4.1 Assembly overview - intake manifold”, page 310](#)
- ❑ Removing and installing ⇒ [“5.3 Removing and installing intake manifold sender GX9 ”, page 321](#)

### 18 - Charge air cooling pump - V188-

- ❑ Removing and installing

### 19 - 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-
- ◆ Ignition coil 4 with output stage - N292-
- ❑ Removing and installing ⇒ [“1.2 Removing and installing ignition coils with output stage”, page 349](#)



## 1.1.2 Overview of fitting locations - engine compartment, exhaust side with toothed belt pulley

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

- ❑ Removing and installing  
⇒ [“3.5 Removing and installing camshaft control valve 1 N205”](#),  
[page 178](#)

### 2 - Lambda probe 1 before catalytic converter - GX10-

- ❑ Consisting of  
Lambda probe - G39-  
Lambda probe heater - Z19-

- ❑ Assembly overview  
⇒ [“8.1 Assembly overview - Lambda probe”](#),  
[page 333](#)

### 3 - Lambda probe 1 after catalytic converter - GX7-

- ❑ Consisting of  
Lambda probe after catalytic converter - G130-  
Lambda probe 1 heater after catalytic converter - Z29-

- ❑ Assembly overview  
⇒ [“8.1 Assembly overview - Lambda probe”](#),  
[page 333](#)

### 4 - Charge air pressure controller - V465-

- ❑ Removing and installing  
⇒ [“1.3 Removing and installing charge pressure positioner V465”](#), [page 277](#)

### 5 - Engine control unit - J623-

- ❑ Removing and installing ⇒ [“6 Engine control unit”](#), [page 323](#)

### 6 - Radiator outlet coolant temperature sender - G83-

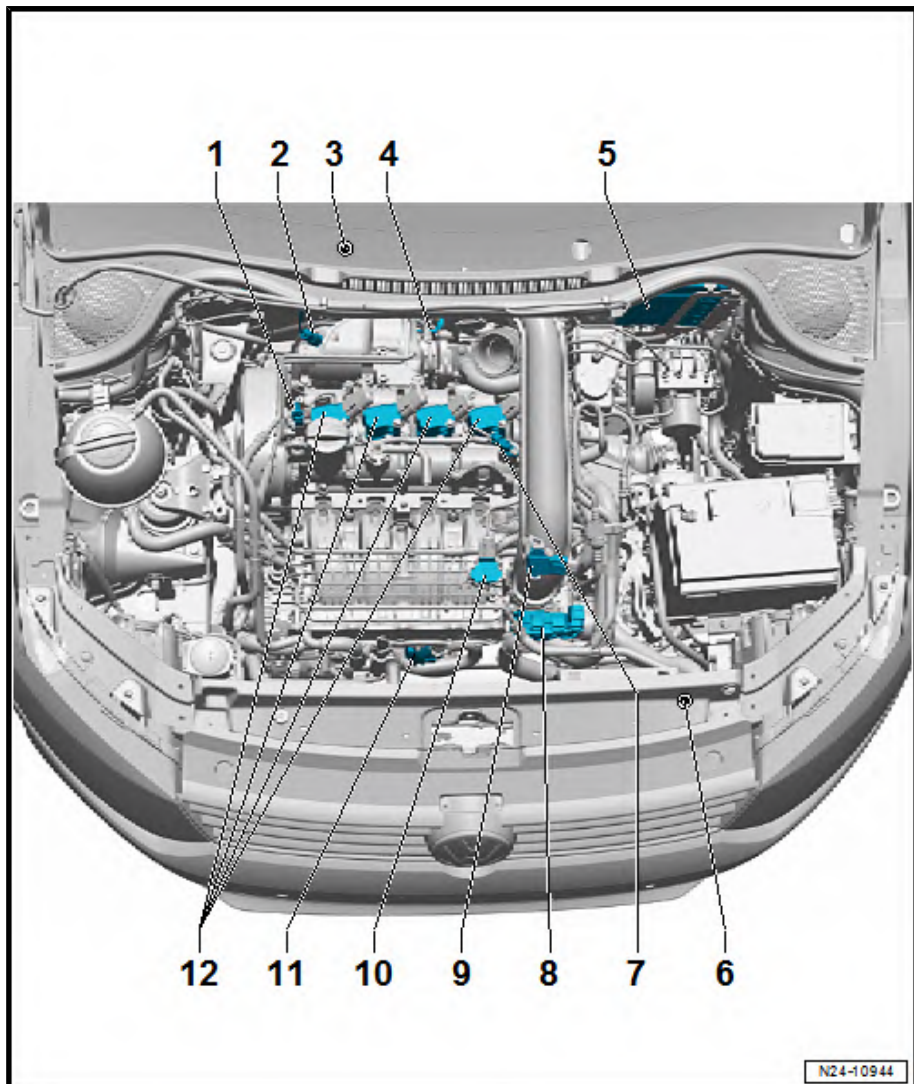
- ❑ Removing and installing  
⇒ [“2.9 Removing and installing radiator outlet coolant temperature sender G83”](#), [page 250](#)

### 7 - Hall sender - G40- (camshaft position sender)

- ❑ Assembly overview ⇒ [“1.1 Assembly overview - ignition system”](#), [page 348](#)

### 8 - 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-





- ❑ Assembly overview ⇒ [“4.1 Assembly overview - intake manifold”, page 310](#)

#### 9 - Charge air pressure sender - GX26-

- ❑ Consisting of
  - Charge pressure sender - G31-
  - Intake air temperature sender - G42-

- ❑ Assembly overview ⇒ [“2.1 Assembly overview - charge air system”, page 283](#)

#### 10 - Intake manifold sender - GX9-

- ❑ Consisting of
  - Intake air temperature sender 2 - G299-
  - Intake manifold pressure sender - G71-

- ❑ Assembly overview ⇒ [“4.1 Assembly overview - intake manifold”, page 310](#)

#### 11 - Charge air cooling pump - V188-

- ❑ Assembly overview ⇒ [“2.2 Assembly overview - electric coolant pump”, page 234](#)

#### 12 - 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-
- ◆ Ignition coil 4 with output stage - N292-
- ❑ Removing and installing ⇒ [“1.2 Removing and installing ignition coils with output stage”, page 349](#)



### 1.1.3 Engine (from above), vehicles with Active Cylinder Management

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

- ❑ Removing and installing ⇒ [“3.5.2 Removing and installing camshaft control valve 1 N205, exhaust side with toothed belt pulley”, page 178](#)

#### 2 - Ignition coil 1 with output stage - N70-

- ❑ Removing and installing ⇒ [“1.2 Removing and installing ignition coils with output stage”, page 349](#)

#### 3 - Ignition coil 2 with output stage - N127-

- ❑ Removing and installing ⇒ [“1.2 Removing and installing ignition coils with output stage”, page 349](#)

#### 4 - Exhaust cam actuator for cylinder 2 - N587-

- ❑ Removing and installing ⇒ [“3.8 Removing and installing cam actuators”, page 187](#)

#### 5 - Ignition coil 3 with output stage - N291-

- ❑ Removing and installing ⇒ [“1.2 Removing and installing ignition coils with output stage”, page 349](#)

#### 6 - Exhaust cam actuator for cylinder 3 - N595-

- ❑ Removing and installing ⇒ [“3.8 Removing and installing cam actuators”, page 187](#)

#### 7 - Hall sender 3 - G300-

- ❑ Removing and installing ⇒ [“1.4.2 Removing and installing Hall sender 3 G300”, page 353](#)

#### 8 - Ignition coil 4 with output stage - N292-

- ❑ Removing and installing ⇒ [“1.2 Removing and installing ignition coils with output stage”, page 349](#)

#### 9 - Hall sender - G40-

- ❑ Removing and installing ⇒ [“1.4.1 Removing and installing Hall sender G40”, page 352](#)

#### 10 - High-pressure pump

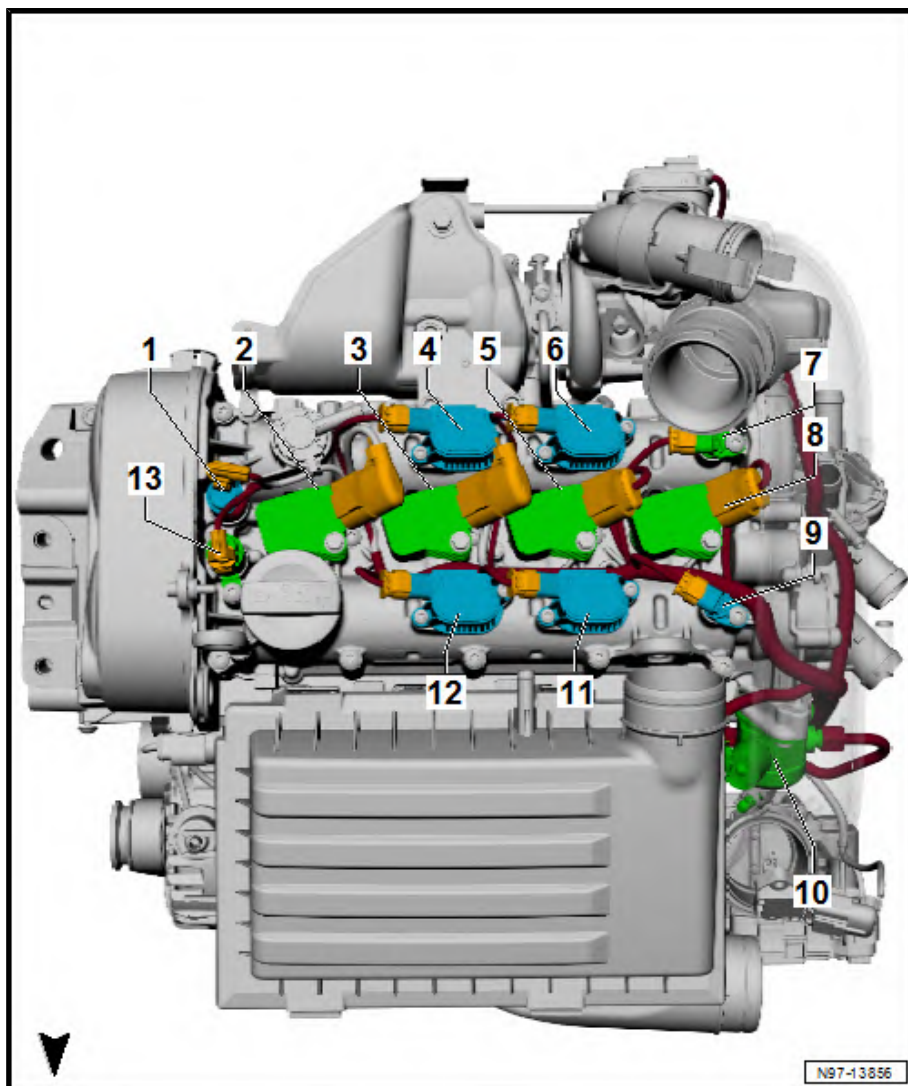
- ❑ Assembly overview ⇒ [“7.1 Assembly overview - high-pressure pump”, page 326](#)
- ❑ Removing and installing ⇒ [“7.2 Removing and installing high-pressure pump”, page 330](#)

#### 11 - Inlet cam actuator for cylinder 2 - N583-

- ❑ Removing and installing ⇒ [“3.8 Removing and installing cam actuators”, page 187](#)

#### 12 - Inlet cam actuator for cylinder 3 - N591-

- ❑ Removing and installing ⇒ [“3.8 Removing and installing cam actuators”, page 187](#)





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

- ❑ Removing and installing  
⇒ [“3.5.2 Removing and installing camshaft control valve 1 N205 , exhaust side with toothed belt pulley”, page 178](#)

## 1.1.4 Overview of fitting locations - front view of engine

### 1 - Knock sensor 1 - G61-

- ❑ Assembly overview  
⇒ [“1.1 Assembly overview - ignition system”, page 348](#)

### 2 - Oil pressure switch for reduced oil pressure - F378-

- ❑ Assembly overview  
⇒ [“4.3 Removing and installing oil pressure switch for reduced oil pressure F378”, page 215](#)

### 3 - Fuel pressure sender - G247-

- ❑ Assembly overview  
⇒ [“2.1 Assembly overview - fuel rail with injectors”, page 299](#)

### 4 - Activated charcoal filter solenoid valve 1 - N80-

### 5 - Injectors

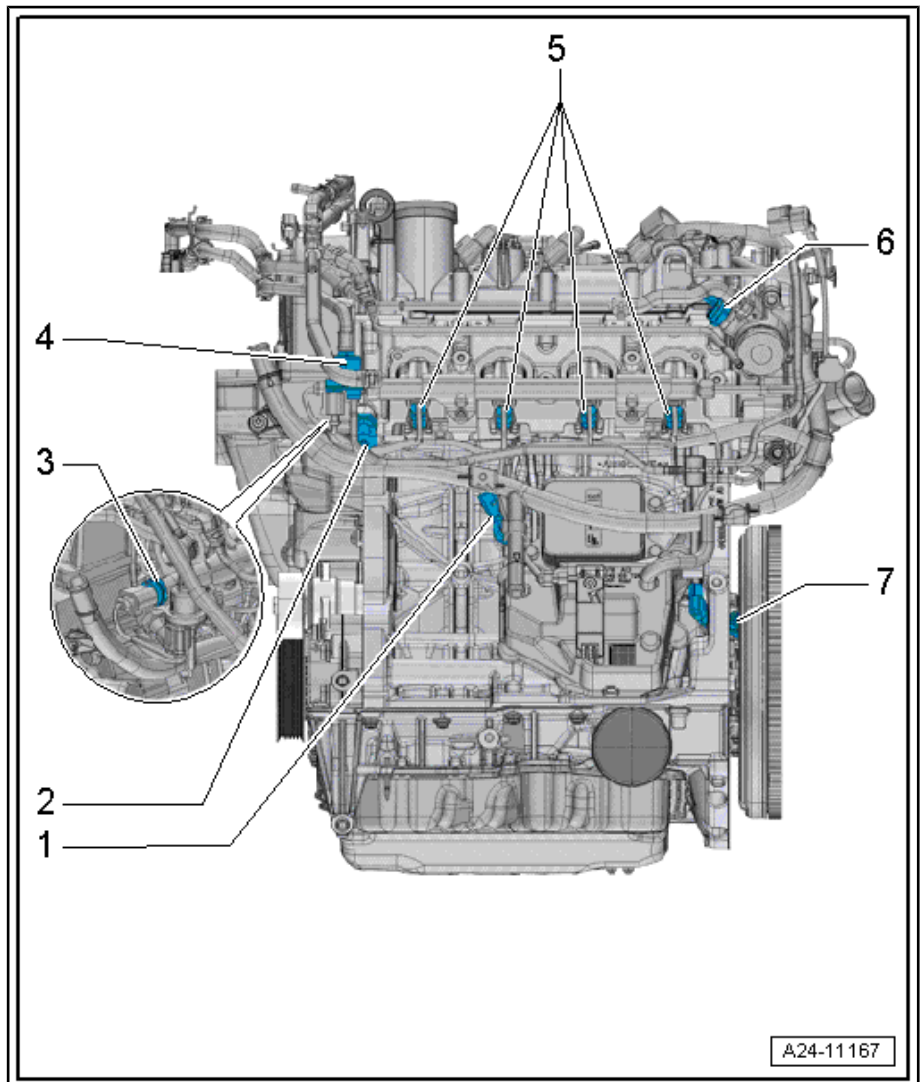
- ◆ Injector, cylinder 1 - N30-
- ◆ Injector, cylinder 2 - N31-
- ◆ Injector, cylinder 3 - N32-
- ◆ Injector, cylinder 4 - N33-
- ❑ Assembly overview  
⇒ [“2.1 Assembly overview - fuel rail with injectors”, page 299](#)

### 6 - Fuel pressure regulating valve - N276-

- ❑ On high-pressure pump
- ❑ Assembly overview ⇒ [“7.1 Assembly overview - high-pressure pump”, page 326](#)

### 7 - Engine speed sender - G28-

- ❑ Assembly overview ⇒ [“1.1 Assembly overview - ignition system”, page 348](#)





## 1.1.5 Overview of fitting locations - rear view of engine

### 1 - Oil level and oil temperature sender - G266-

- ❑ Removing and installing  
⇒ [“1.6 Removing and installing oil level and oil temperature sender G266”](#), page 205

### 2 - Radiator outlet coolant - G62-

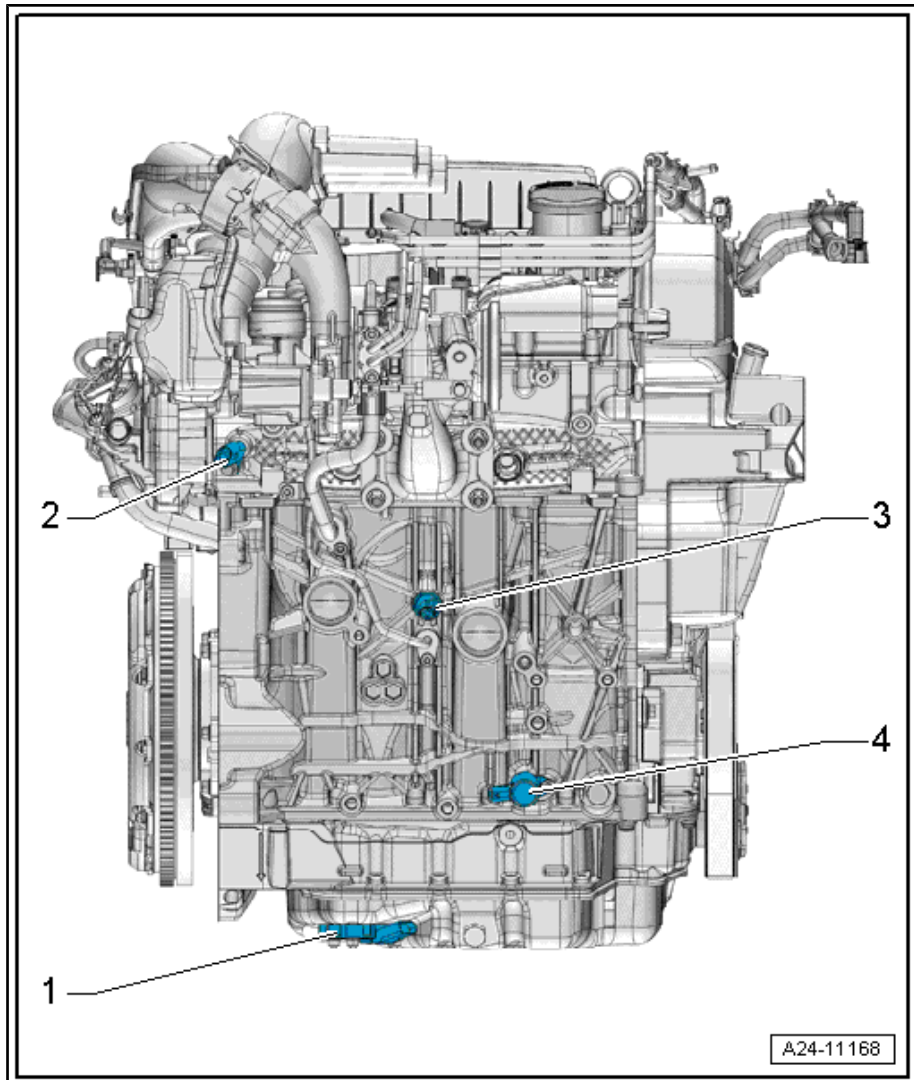
- ❑ Removing and installing  
⇒ [“2.8 Removing and installing coolant temperature sender G62”](#), page 248

### 3 - Oil pressure switch - F1-

- ❑ Removing and installing  
⇒ [“4.2 Removing and installing oil pressure switch F1”](#), page 214

### 4 - Valve for oil pressure control - N428-

- ❑ Removing and installing  
⇒ [“4.5 Removing and installing oil pressure regulating valve N428”](#), page 218







## 2 Injectors

⇒ [“2.1 Assembly overview - fuel rail with injectors”, page 299](#)

⇒ [“2.2 Removing and installing fuel rail”, page 300](#)

⇒ [“2.3 Removing and installing injectors”, page 301](#)

⇒ [“2.4 Cleaning injectors”, page 306](#)

### 2.1 Assembly overview - fuel rail with injectors

#### 1 - Fuel pressure sender - G247-

- Checking  
⇒ [“5.2 Checking fuel pressure sender G247”, page 318](#)
- Removing and installing  
⇒ [“5.1 Removing and installing fuel pressure sender G247”, page 317](#)
- Lubricate taper lightly with clean engine oil; do not lubricate thread
- 22 Nm

#### 2 - Fuel distributor

- Removing and installing  
⇒ [“2.2 Removing and installing fuel rail”, page 300](#)

#### 3 - High-pressure pipe

- Renew after removal
- Removing and installing  
⇒ [“7.3 Removing and installing high-pressure pipe”, page 331](#)
- Unions must be free of damage
- Do not alter shape.
- Lubricate thread of union nuts with clean engine oil
- 16 Nm +45°

#### 4 - Bolt

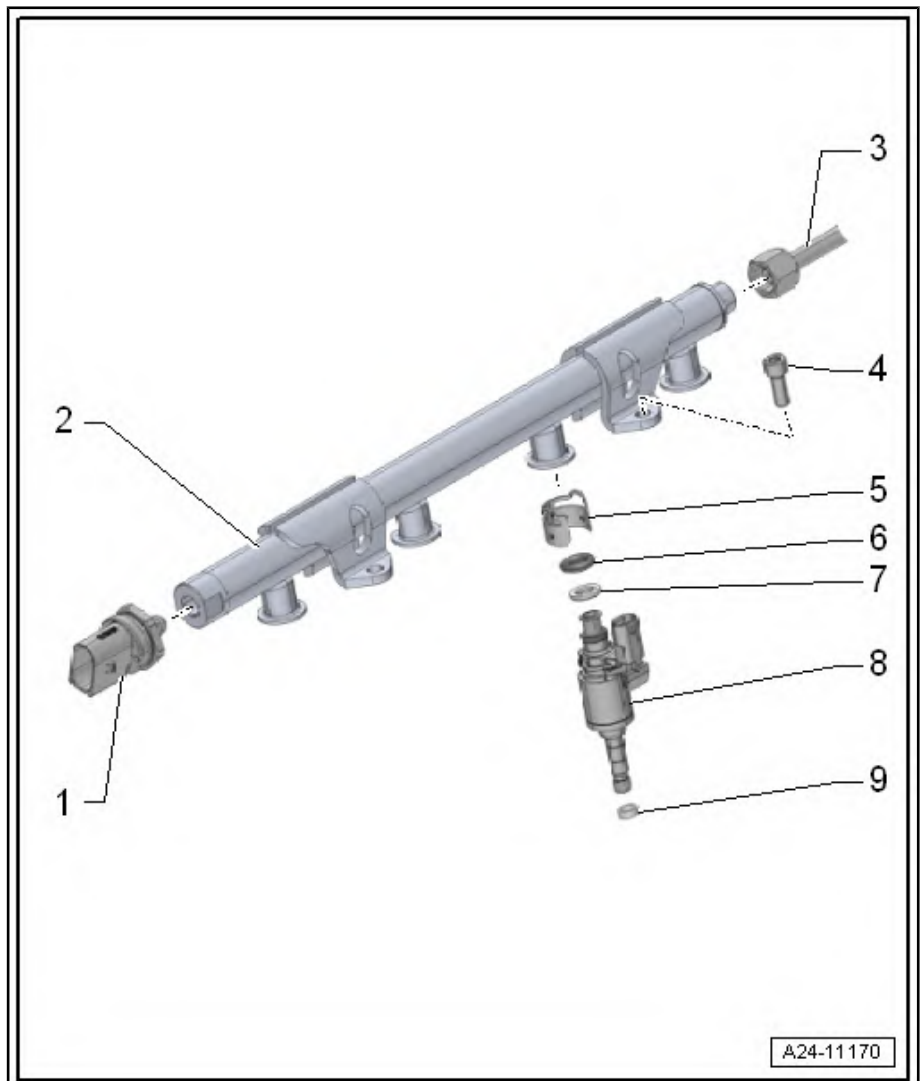
- Removing and installing ⇒ [“2.2 Removing and installing fuel rail”, page 300](#)
- Renew after removal
- 8 Nm +90°

#### 5 - Support ring

- Renew after removal
- Fuel rail exerts force which secures injector in cylinder head via this support ring
- Clipped to -item 8-

#### 6 - O-ring

- Renew after removal
- Lubricate with clean engine oil





### 7 - Spacer ring

- Renew if damaged

### 8 - Injection valve

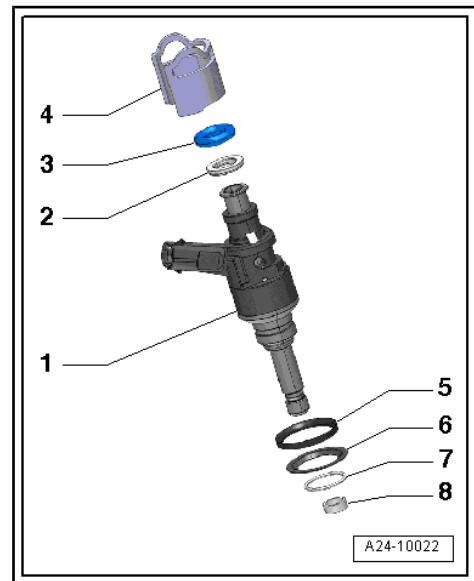
- Removing and installing ⇒ [“2.3 Removing and installing injectors”, page 301](#)
- Assembly overview ⇒ [page 300](#)

### 9 - Combustion chamber seal

- Do not treat with grease or other lubricant.
- Renewing ⇒ [“2.3 Removing and installing injectors”, page 301](#)

### Assembly overview - injector

- 1 - Injection valve
- 2 - Spacer ring
- 3 - O-ring
- 4 - Support ring
- 5 - Sealing element (top)
- 6 - Sealing element (bottom)
- 7 - Retaining ring
- 8 - Combustion chamber seal



## 2.2 Removing and installing fuel rail

### Removing

- Remove intake manifold  
⇒ [“4.2 Removing and installing intake manifold”, page 312](#) .
- Remove high-pressure pipe  
⇒ [“7.3 Removing and installing high-pressure pipe”, page 331](#) .



- Disconnect electrical connector -1-.

**i** Note

*Place a cloth underneath to catch escaping fuel.*

- Remove bolts -arrows- and pull fuel rail off injectors.

**Installing**

Install in reverse order of removal. The following should be observed:

**i** Note

*Renew O-ring.*

- Apply mountings on fuel rail onto injectors.
- Press fuel rail onto injectors as far as stop (first on right side, then on left side).
- Firmly press down fuel rail in area of bracket and screw in bolts by two full turns.
- Tighten bolts evenly and diagonally.
- Install high-pressure pipe  
⇒ [“7.3 Removing and installing high-pressure pipe”, page 331](#) .
- Install intake manifold  
⇒ [“4.2 Removing and installing intake manifold”, page 312](#) .

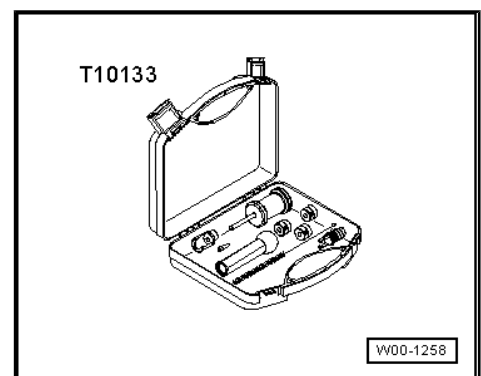
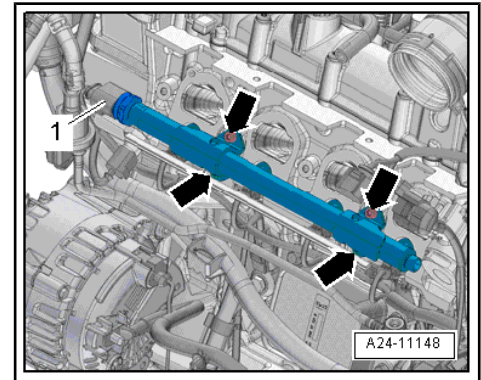
**Torque settings**

- ◆ ⇒ [“2.1 Assembly overview - fuel rail with injectors”, page 299](#)

## 2.3 Removing and installing injectors

**Special tools and workshop equipment required**

- ◆ Tool set for FSI engines - T10133- with -T10133/16 A- and -T10133/19-



**Removing**

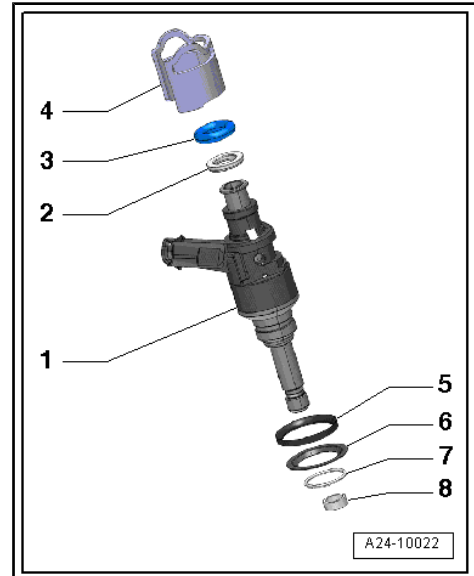
**i** Note

*Injectors must only be removed when the engine is cold.*

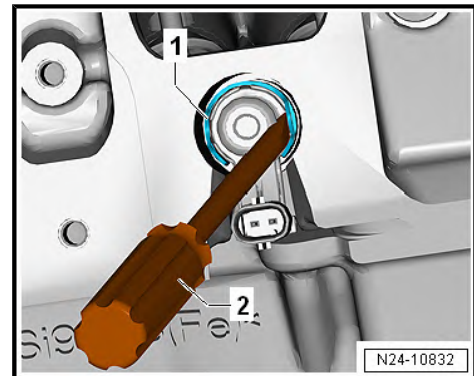
- Remove intake manifold  
⇒ [“4.2 Removing and installing intake manifold”, page 312](#) .



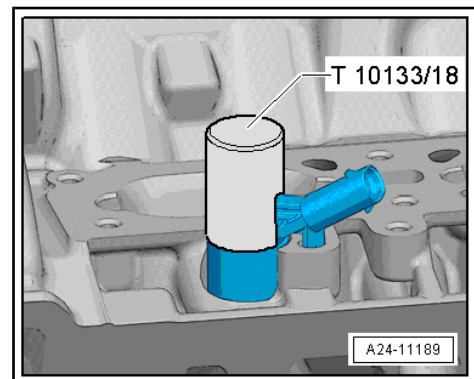
- Removing fuel rail  
⇒ ["2.2 Removing and installing fuel rail", page 300](#) .
- Remove O-ring -3- from injector -1-.
- Unplug electrical connector from corresponding injector.



- Lever support ring -1- off injector using a screwdriver -2-.



- Fit impact sleeve -T10133/18- over injector.

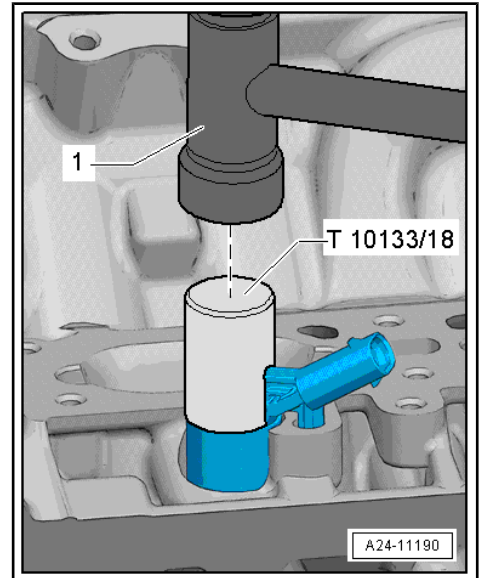




- Carefully loosen injector with light blows onto impact sleeve.

**i** Note

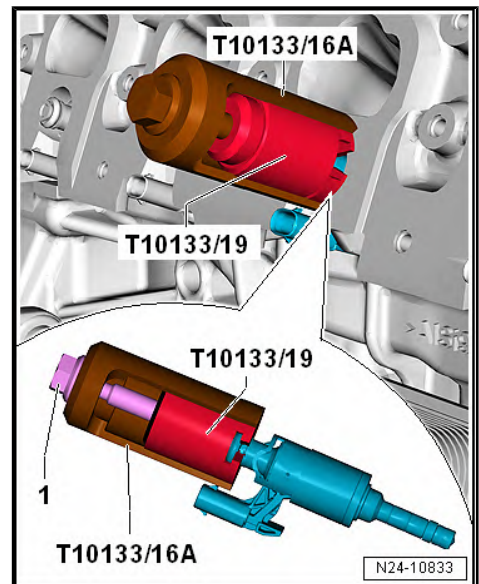
- ◆ Use a torque wrench to pull out the injector.
- ◆ Set the torque wrench to 5 Nm.



- Fit puller -T10133/19- to groove on injector.
- Fit removing tool -T10133/16 A- to puller.
- Pull out injector by screwing in bolt -1-.
- If the torque limit of »5 Nm« has been reached and the injector still can't be pulled out, remove the puller.
- Use the impact sleeve again to loosen the injector.
- Repeat the procedure on each injector.

**i** Note

- ◆ If the torque limit is exceeded, the injector may become damaged.
- ◆ Always renew the combustion chamber seal prior to reinstalling the injector.



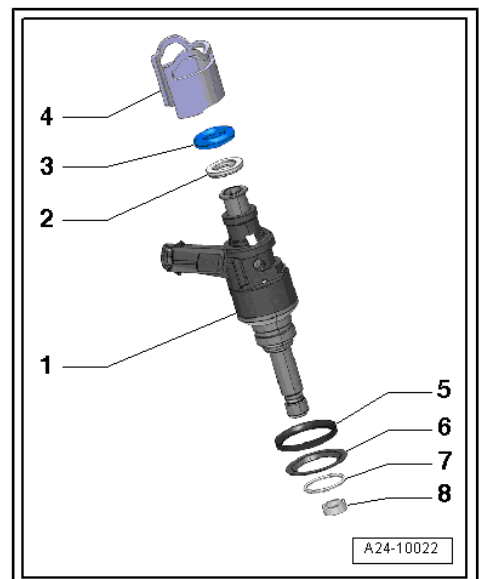
- Remove gasket for lower part of intake manifold.

**Dismantling injectors:**

- Pull support ring -4- and spacer ring -2- off injector -1-.
- Remove retaining ring -7-, upper sealing washer -5- and lower sealing washer -6-.
- Carefully remove old combustion chamber seal -8-.
- To do this, cut the ring open using a knife or spread the ring using a screwdriver and pull it off towards front.
- Pull off the ring towards front.

**i** Note

Take care not to damage the groove of injector. The injector must be renewed if the groove is damaged.





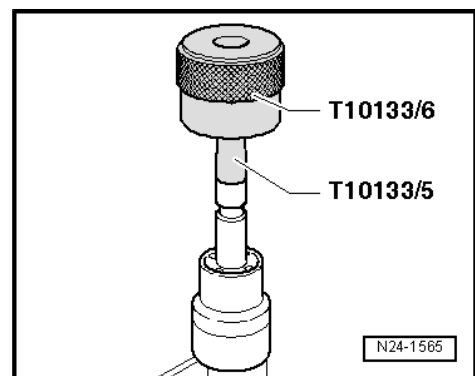
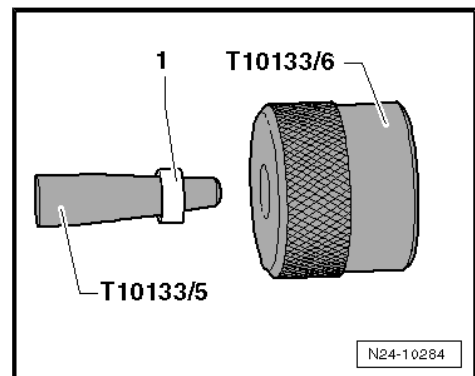
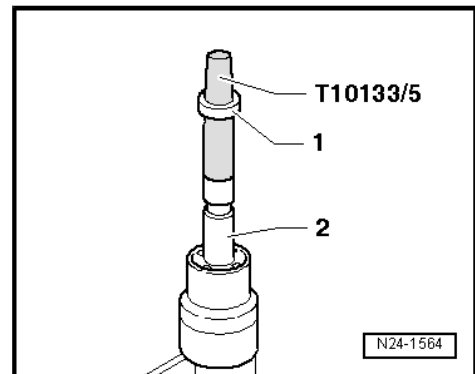
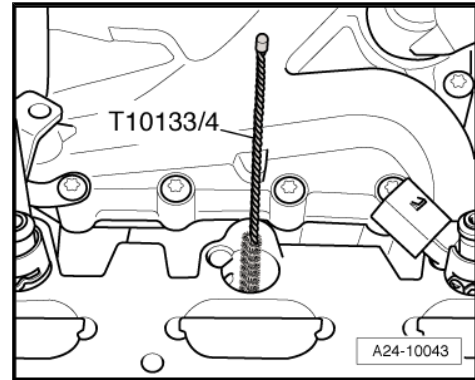
### Installing

- Clean hole in cylinder head using nylon brush -T10133/4- .



#### Note

- ◆ *Renew combustion chamber seal and O-ring.*
- ◆ *Renew spacer ring if damaged.*
- When reinstalling injector, clean groove for combustion chamber seal and injector shaft. To do this, use a clean cloth to remove combustion residue.
- Fit assembly cone -T10133/5- with a new combustion chamber seal -1- on injector -2-.
- Slide combustion chamber seal with assembly sleeve - T10133/6- onto assembly cone -T10133/5- as far as it will go.
- Turn assembly sleeve -T10133/6- around and push combustion chamber ring seal into the respective groove.

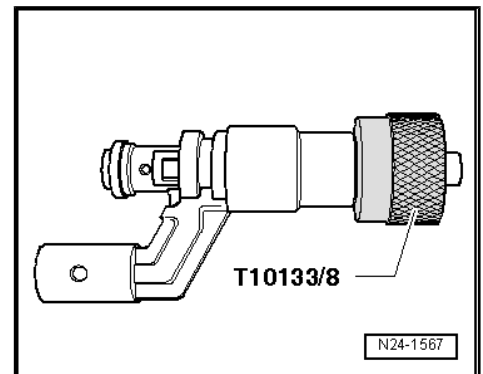
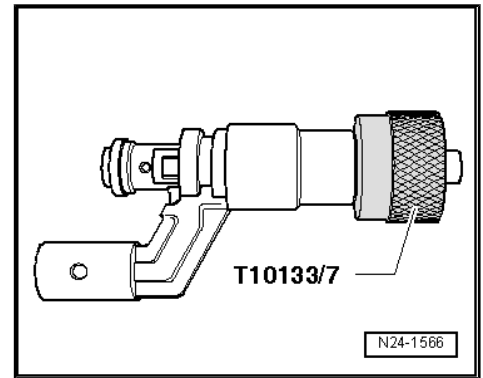




**i** Note

*The combustion chamber ring seal is widened when it is pushed onto the injector. It must be compressed again after sliding on. This is done in two stages as described below.*

- Push calibration sleeve -T10133/7- onto injector as far as stop and simultaneously turn it slightly (approx. 180°).
- Pull calibration sleeve -T10133/7- off again, turning in opposite direction.
  
- Push calibration sleeve -T10133/8- onto injector as far as stop and simultaneously turn it slightly (approx. 180°).
- Pull calibration sleeve -T10133/8- off again, turning in opposite direction.
- Fit support ring -4- and spacer ring -2- onto injector -1-.
  
- Before installing injector -1- moisten new O-ring -3- with clean engine oil.



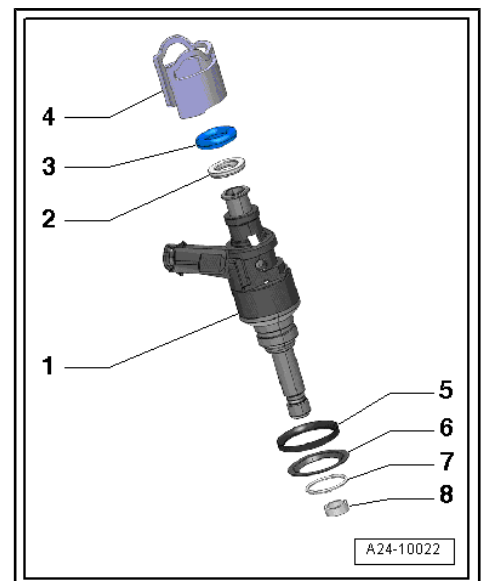
**i** Note

*The combustion chamber seal -8- must not be lubricated.*

- Push injectors by hand as far as they will go into the hole of the cylinder head (must be free of oil and grease). Ensure injectors are positioned correctly in cylinder head.

**i** Note

- ◆ *The injectors must insert easily. If necessary, wait until the combustion chamber ring seal has contracted sufficiently.*
- ◆ *Ensure injectors are correctly seated and positioned in cylinder head.*



- Electrical connector of injector must engage in respective recess in cylinder head.
- Installing fuel rail  
 ⇒ [“2.2 Removing and installing fuel rail”, page 300](#) .
- Install intake manifold  
 ⇒ [“4.2 Removing and installing intake manifold”, page 312](#) .
- Connect ⇒ Vehicle diagnostic tester.
- Switch on ignition, and select following menu item on ⇒ Vehicle diagnostic tester:
- ◆ 0001 - Clear adaption values for injectors



## 2.4 Cleaning injectors

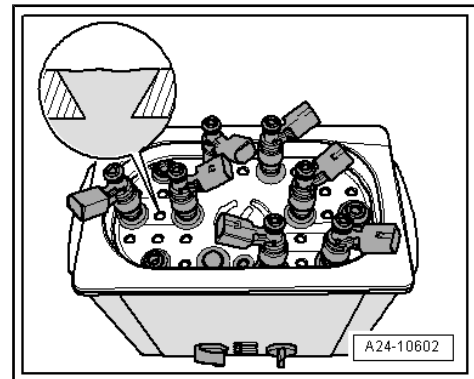
### Special tools and workshop equipment required

- ◆ Ultrasonic cleaning device - VAS 6418-
- ◆ Mounting plate for injectors - VAS 6418/1-
- ◆ Cleaning fluid ⇒ Electronic Parts Catalogue



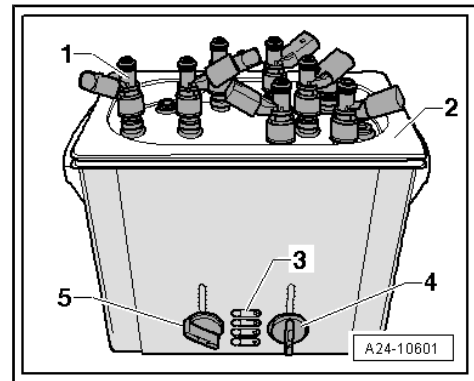
### Note

- ◆ *The ultrasonic unit must be filled with cleaning agent to upper edge of holes (see detail).*
- ◆ *Observe safety instructions and operating instructions for ultrasonic unit.*



### Cleaning

- Remove injectors  
⇒ [“2.3 Removing and installing injectors”, page 301](#) .
- Insert injectors -1- as far as stop into mounting plate for injection modules - VAS 6418/1- -item 2-.
- Immerse injectors together with mounting plate injection modules - VAS 6418/1- into cleaning fluid - VAS 6418/2- .
- Set rotary knob -4- to a temperature of 50°C.
- Set a cleaning time of 30 minutes with the rotating knob -5-.
- Press button -3- to switch on ultrasonic unit.



### Note

*The time set starts to elapse as soon as a cleaning temperature of 50°C has been attained.*

- After cleaning, renew combustion chamber ring seal for each injector ⇒ [“2.3 Removing and installing injectors”, page 301](#) .





### 3 Air filter

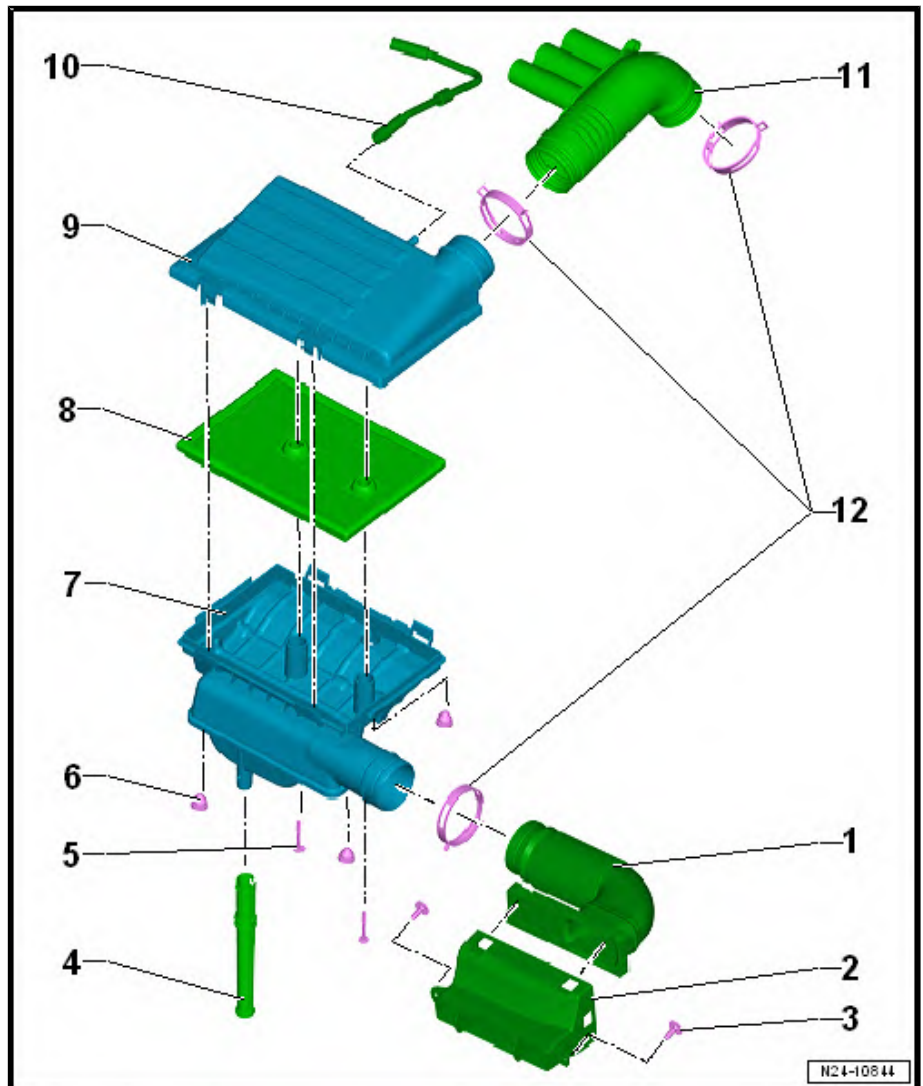
⇒ [“3.1 Assembly overview - air filter housing”, page 307](#)

⇒ [“3.2 Removing and installing air filter housing”, page 308](#)

⇒ [“3.3 Removing and installing resonator for intake air”, page 309](#)

#### 3.1 Assembly overview - air filter housing

- 1 - Connection hose
  - On lock carrier.
- 2 - Intake connecting pipe
  - Clean if soiled.
- 3 - Bolt
  - 2 Nm
- 4 - Water drainage pipe
  - Clean if soiled.
- 5 - Bolt
  - 1.5 Nm
- 6 - Bump stop
- 7 - Air filter lower part
  - Remove dirt, leaves and salt residues
- 8 - Air filter element
  - Use only genuine air filter elements ⇒ Electronic Parts Catalogue
  - For change intervals refer to ⇒ Maintenance tables
  - Removing and installing ⇒ Maintenance ; Booklet
- 9 - Air filter upper part
  - Remove dirt, leaves and salt residues
- 10 - Hose
  - For crankcase ventilation.
- 11 - Air intake hose
- 12 - Clip

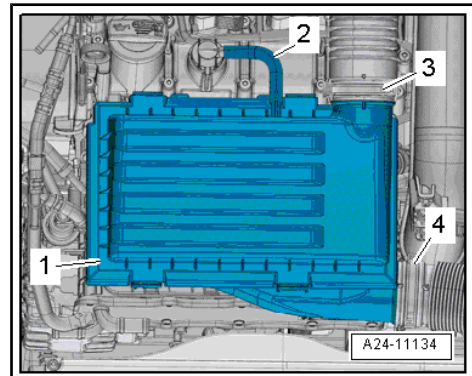




## 3.2 Removing and installing air filter housing

### Removing

- Detach air hose -2-.
- Pull air filter housing -1- off ball head pins upwards.
- Release hose clips -3- and -4- and remove air ducts.

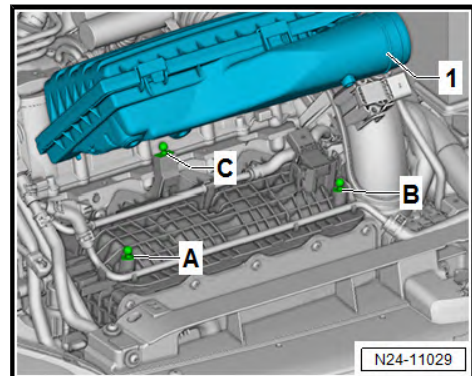


- First pull air filter housing off ball stud -C-.
- Then, and only then, pull air filter housing off ball studs -B- and -A-.

### Installing

Install in reverse order of removal, observing the following:

- Keep to the sequence during assembly.





- Press air filter housing -1- on ball studs -A- and -B-.
- Finally, press air filter housing on ball stud -C-.

**i Note**

- ◆ *If the air filter element is very dirty or wet, particles of dirt or water may reach the components and falsify the measured air mass value. This would lead to loss of power as a smaller injection quantity is calculated.*
  - ◆ *Always use Genuine part for air filter element.*
  - ◆ *A clean air filter housing is essential.*
  - ◆ *Before fitting the air filter housing, the ball pins on the intake manifold must be moistened with water without additives.*
  - ◆ *Hose unions and air intake pipes and hoses must be free of oil and grease before installation.*
  - ◆ *Use a silicone-free lubricant to install the air hoses.*
  - ◆ *Secure all hose connections with hose clips corresponding to the series equipment → Electronic Parts Catalogue .*
  - ◆ *Cover the critical air-conducting components such as air pipes etc. with a clean cloth when blowing out the air filter housing with compressed air.*
  - ◆ *Observe relevant disposal regulations.*
- Remove salt residues, dirt and leaves from top and bottom part of air filter housing using a vacuum cleaner.
  - Blow out water drain with compressed air.

**Torque settings**

- ◆ ⇒ [“3.1 Assembly overview - air filter housing”, page 307](#)

### 3.3 Removing and installing resonator for intake air

**Removing**

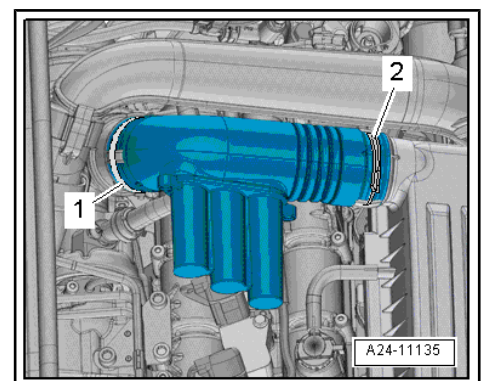
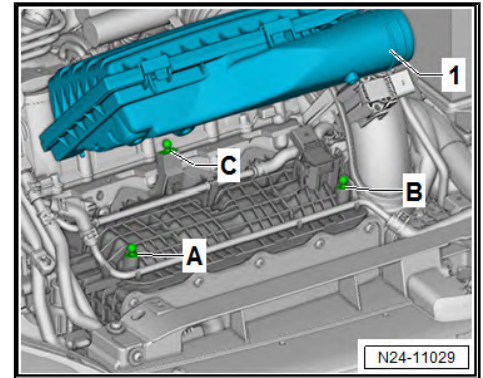
- Loosen hose clips -1- and -2-.
- Remove resonator for intake air.

**Installing**

Install in reverse order of removal, observing the following:

**i Note**

*Reinstall hose clips in their original positions.*





## 4 Intake manifold

⇒ [“4.1 Assembly overview - intake manifold”, page 310](#)

⇒ [“4.2 Removing and installing intake manifold”, page 312](#)

⇒ [“4.3 Removing and installing throttle valve module GX3”, page 314](#)

⇒ [“4.4 Cleaning throttle valve module GX3”, page 315](#)

### 4.1 Assembly overview - intake manifold

#### 1 - Coolant pipe

- Clipped onto intake manifold.
- To remove, remove intake manifold  
⇒ [“4.2 Removing and installing intake manifold”, page 312](#)

#### 2 - Intake manifold

- Combined with charge air cooler
- Removing and installing  
⇒ [“4.2 Removing and installing intake manifold”, page 312](#)

#### 3 - Coolant pipe

- Clipped onto intake manifold.

#### 4 - Bolt

- Specified torque and tightening sequence  
⇒ [page 311](#)

#### 5 - O-ring

- Renew after removal

#### 6 - Intake manifold sender - GX9-

- Consisting of
  - Intake air temperature sender 2 - G299-
  - Intake manifold pressure sender - G71-

- Removing and installing  
⇒ [“5.3 Removing and installing intake manifold sender GX9”, page 321](#)

#### 7 - Seals

- Renew after removal

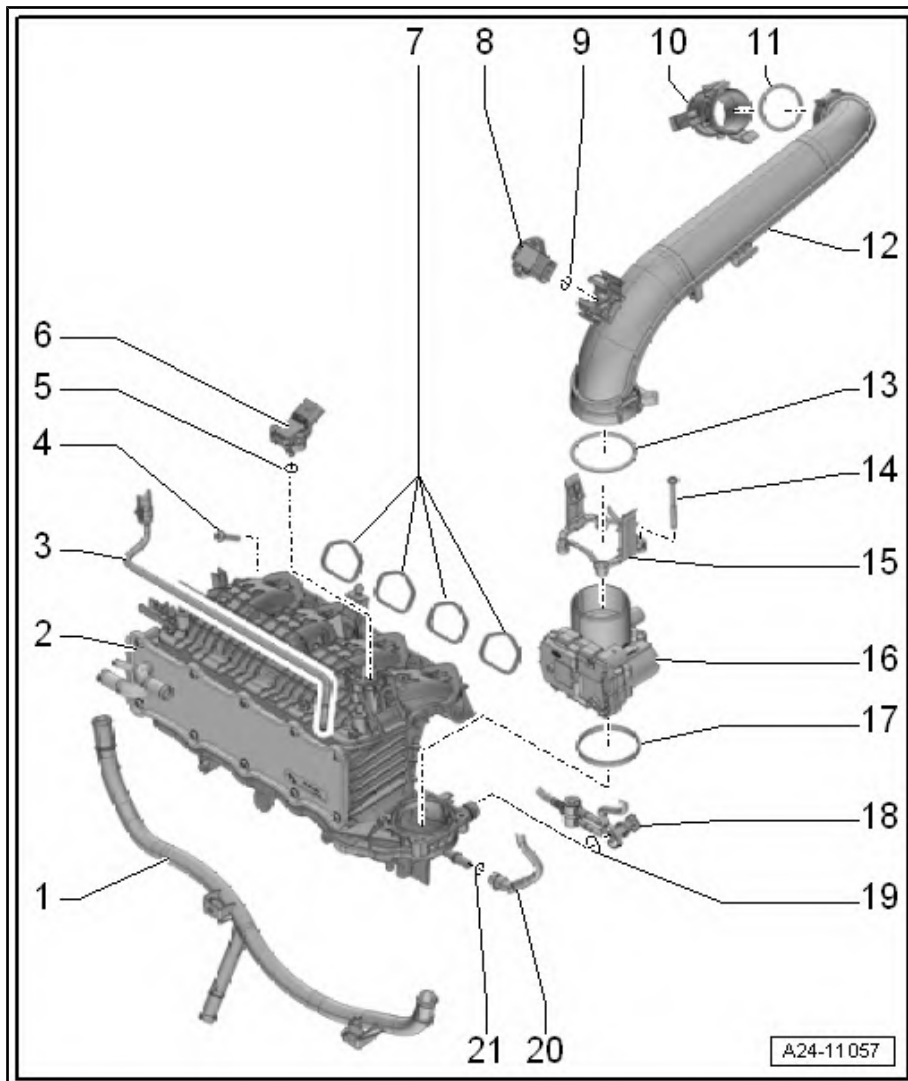
#### 8 - Charge pressure sender - GX26-

- Consisting of

◆ Charge pressure sender - G31-

◆ Intake air temperature sender - G42-

- Removing and installing ⇒ [“2.3 Removing and installing charge pressure sender GX26”, page 286](#)





### 9 - O-ring

- Renew after removal

### 10 - Union

### 11 - O-ring

- Renew after removal
- Before installing, moisten lightly with clean engine oil

### 12 - Air intake pipe

- For removal, use release tool - T10527- and release tool - T10527/1-

### 13 - O-ring

- Renew
- Before installing, moisten lightly with clean engine oil

### 14 - Bolt

- Thread-forming
- Fit and screw in bolt by hand so that it screws into old thread Then tighten bolt to torque.
- 7 Nm

### 15 - Retaining clip

- For air intake pipe

### 16 - 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-
  - Removing and installing ⇒ ["4.3 Removing and installing throttle valve module GX3", page 314](#)
  - Cleaning ⇒ ["4.4 Cleaning throttle valve module GX3", page 315](#)

### 17 - Seal

- Renew after removal

### 18 - Vacuum line

### 19 - O-ring

- If O-ring is damaged, renew vacuum line ⇒ Electronic parts catalogue

### 20 - Vacuum line

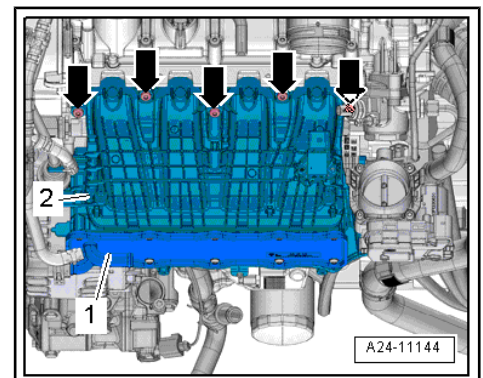
### 21 - O-ring

- If O-ring is damaged, renew vacuum line ⇒ Electronic parts catalogue

### Intake manifold - specified torque and tightening sequence

– Tighten bolts in stages as follows:

Stage	Bolts	Torque setting
1.	-Arrows-	Starting in centre, screw in bolts alternately by hand until they make contact
2.	-Arrows-	Starting in centre, screw in bolts alternately to 8 Nm





## 4.2 Removing and installing intake manifold

### Removing

- Remove air filter housing  
⇒ ["3.2 Removing and installing air filter housing", page 308](#) .
- Remove noise insulation ⇒ General body repairs, exterior;  
Rep. gr. 66 ; Noise insulation .
- Place drip tray for workshop hoist - VAS 6208- underneath.
- Drain coolant  
⇒ ["1.3 Draining and adding coolant", page 225](#) .



### Note

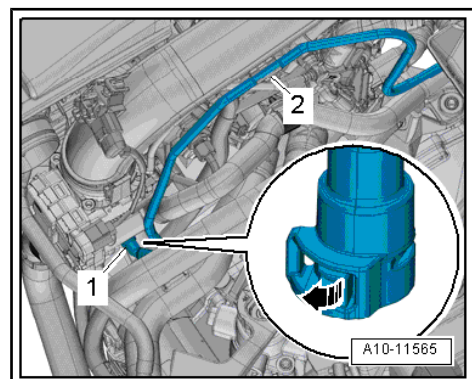
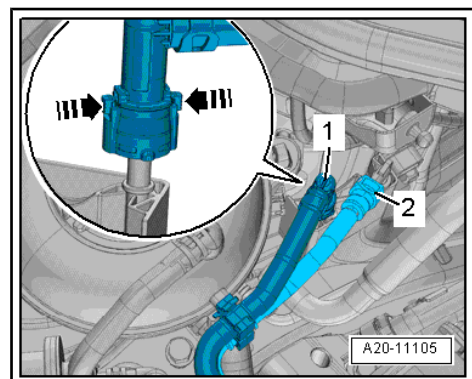
*Do not reuse coolant which has been drained off.*

### CAUTION

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

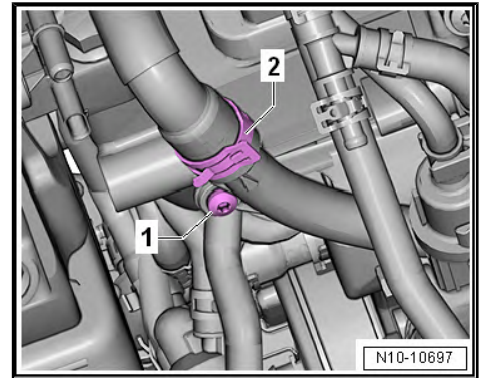
**Skin and other parts of the body may be scalded.**

- Wear protective gloves.
  - Wear protective goggles.
  - Reduce excess pressure by covering cap of coolant expansion tank with cloths and opening it carefully.
- 
- First press hose connector -1- downwards, and then press release tabs -arrows-.
  - Keep release buttons pressed and pull off hose coupling.
  - Press release tab on hose -2- for activated charcoal filter.
  - Disconnect hose and move it clear.
- 
- Release catch -arrow- and disconnect vacuum hose -1-.
  - Move clear vacuum hose at air intake pipe -2-.
  - Move clear air hoses at charge air pipe.
  - Remove air pipe  
⇒ ["2.5 Removing and installing air intake pipe", page 289](#) .

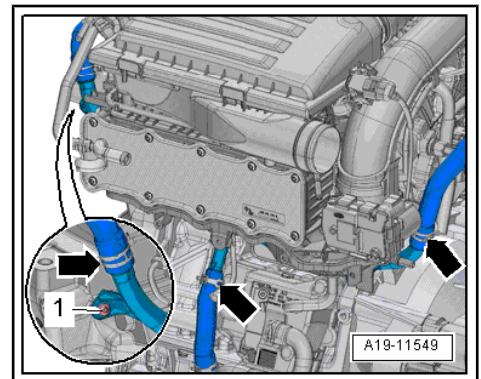




- Unscrew bolt -1-.

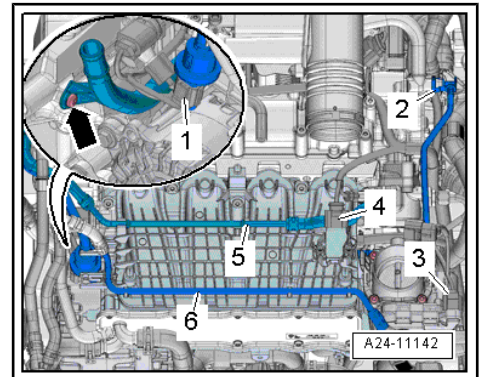


- Clamp off coolant hoses on coolant pipe using hose clamps up to 25 mm - 3094- .
- Release hose clips -arrows-.
- Pull off coolant hoses.

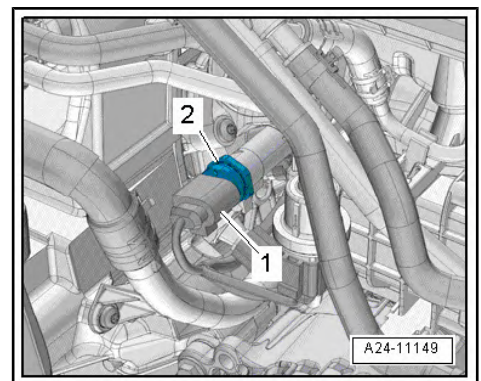


- Separate electrical connectors.
- 1 - For activated charcoal filter system solenoid valve 1 - N80-
- 3 - For throttle valve module - GX3-
- 4 - For intake manifold sender - G71- .

- Unscrew bolt -arrow-.
- Press release buttons and pull off hose -2- for activated charcoal filter.
- Unclip fuel supply line -5- and coolant line -6- from intake manifold and push them to one side.



- Disconnect connector -1- from fuel pressure sender - G247- .
- Also disconnect connector from oil pressure switch.
- Loosen hose clips -2- and pull off coolant hoses.





- Unscrew bolts -arrows-.
- Remove intake manifold -1-.

### Installing

Install in reverse order of removal. The following should be observed:



#### Note

*Renew seals and O-rings.*

- Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation .
- Install air filter housing  
⇒ [“3.2 Removing and installing air filter housing”, page 308](#) .
- Add coolant ⇒ [“1.3 Draining and adding coolant”, page 225](#) .

### Torque settings

- ◆ ⇒ [“4.1 Assembly overview - intake manifold”, page 310](#)

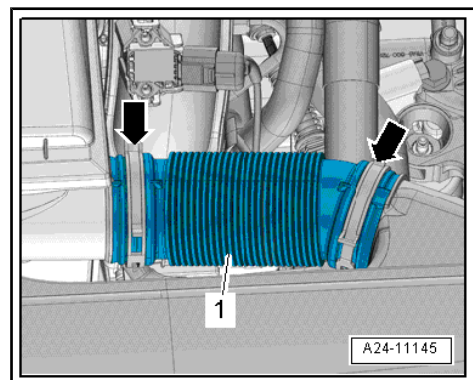
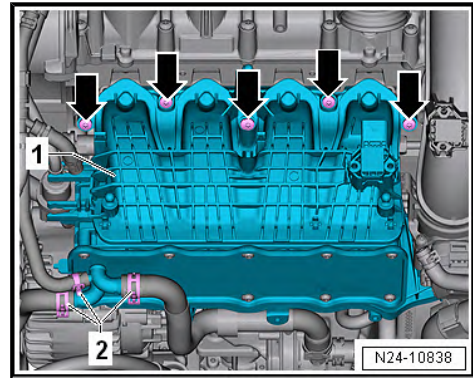
## 4.3 Removing and installing throttle valve module - GX3-

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-

### Removing

- Remove air pipe  
⇒ [“2.5 Removing and installing air intake pipe”, page 289](#) .
- Open hose clips -arrows- and detach air duct -1-.







- Disconnect electrical connector -3-.
- Unscrew bolts -arrows- and remove throttle valve module -GX3- -1- with adapter -2-.

### Installing

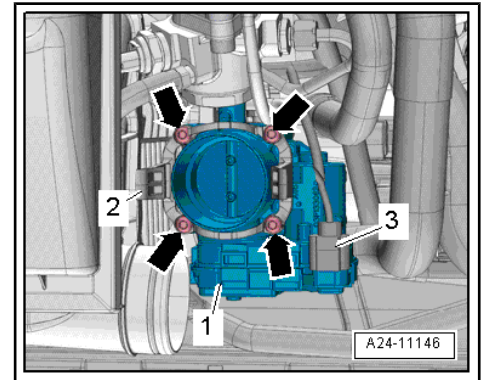
Install in reverse order of removal. The following should be observed:

- After renewing throttle valve module -GX3- , re-adapt it to engine control unit -J623- . Use ⇒ Vehicle diagnostic tester.
- Switch on ignition, and select following menu item on the vehicle diagnostic tester :

◆ `0001 - Adaption throttle valve module J338`

### Torque settings

◆ ⇒ [“4.1 Assembly overview - intake manifold”, page 310](#)



## 4.4 Cleaning throttle valve module - GX3-



### Note

- ◆ *If a new engine control unit -J623- is installed, the throttle valve module must be adapted.*
- ◆ *Contamination and coking in end stop can result in incorrect adaptation values.*
- ◆ *When cleaning the throttle valve housing, take care not to scratch it.*

### Special tools and workshop equipment required

- ◆ Acetone (commercially available)
- ◆ Brush

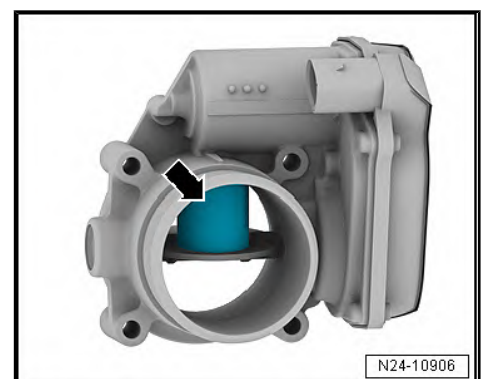
### Procedure

- Remove throttle valve module -GX3-  
⇒ [“4.3 Removing and installing throttle valve module GX3”, page 314](#) .
- Open throttle valve by hand and lock it in open position with a wedge (plastic or wood) -arrow-.

### CAUTION

Risk of injury caused by acetone. Acetone is highly flammable and may cause eye and skin irritation.

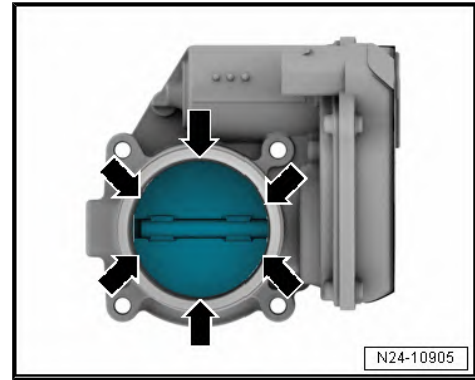
- Wear protective goggles.
- Wear protective gloves.





- Clean throttle valve housing thoroughly, especially around the points -arrows- where the throttle valve closes, using commercially available acetone and a small brush.
- Wipe the inside of the throttle valve housing with a lint-free cloth.
- Allow acetone to dry off completely.
- Install throttle valve module - GX3-  
⇒ ["4.3 Removing and installing throttle valve module GX3", page 314](#) .
- Delete learnt values, and adapt engine control unit - J623- to throttle valve module - GX3- . Use ⇒ Vehicle diagnostic tester.
- Switch on ignition, and select following menu item on the vehicle diagnostic tester :

◆ `0001 - Adaption throttle valve module J338`





## 5 Senders and sensors

⇒ [“5.1 Removing and installing fuel pressure sender G247 ”, page 317](#)

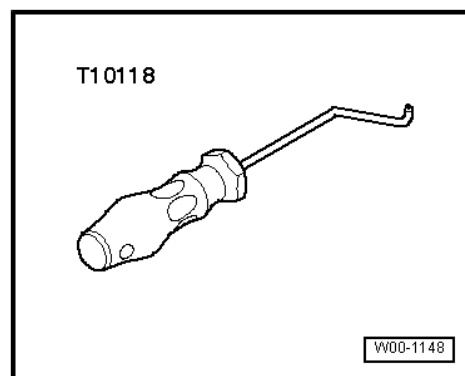
⇒ [“5.2 Checking fuel pressure sender G247 ”, page 318](#)

⇒ [“5.3 Removing and installing intake manifold sender GX9 ”, page 321](#)

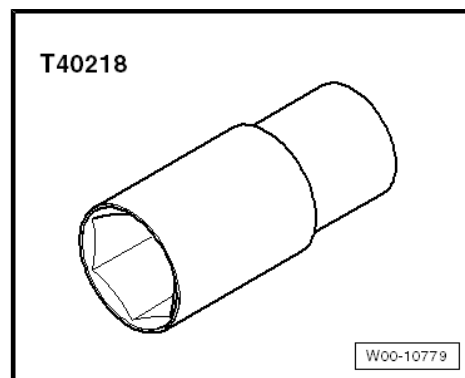
### 5.1 Removing and installing fuel pressure sender - G247-

Special tools and workshop equipment required

◆ Assembly tool - T10118-



◆ Socket 27 mm - T40218- or commercially available 27 mm hexagon socket insert





## Removing

- Disconnect electrical connector -1-



### Note

*Place a cloth underneath to catch escaping fuel.*

- Unscrew fuel pressure sender - G247- -2- using socket 27 mm - T40218- .

## Installing

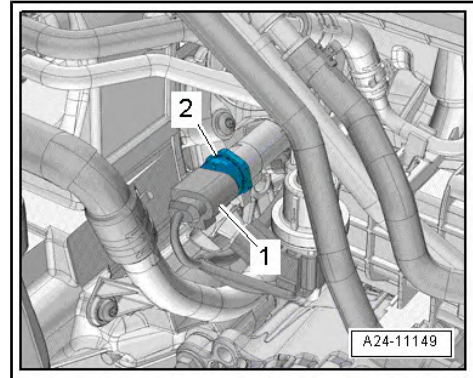
Install in reverse order of removal, observing the following:

- Specified torque  
⇒ [“2.1 Assembly overview - fuel rail with injectors”, page 299](#)



### Note

*Do not lubricate thread of fuel pressure sender.*



## 5.2 Checking fuel pressure sender - G247-

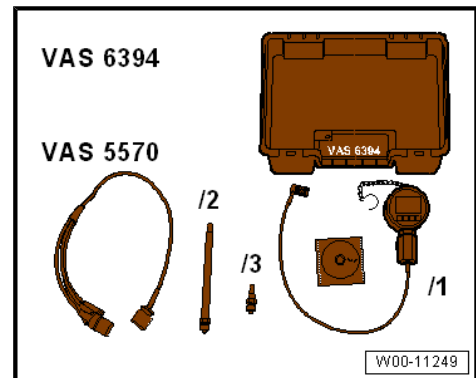
⇒ [“5.2.1 Checking fuel pressure sender G247 , using pressure sensor tester VAS 6394 and vehicle diagnostic tester”, page 318](#)

⇒ [“5.2.2 Checking fuel pressure sender G247 , using vehicle diagnostic tester”, page 320](#)

### 5.2.1 Checking fuel pressure sender - G247- , using pressure sensor tester - VAS 6394- and vehicle diagnostic tester

#### Special tools and workshop equipment required

- ◆ ⇒ Vehicle diagnostic tester
- ◆ Pressure sensor tester - VAS 6394-



- ◆ Test instrument adapter/DSO (3-pin) - VAS 5570-
- ◆ Socket 27 mm long, commercially available

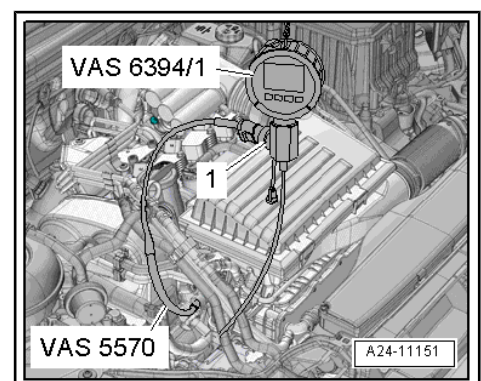
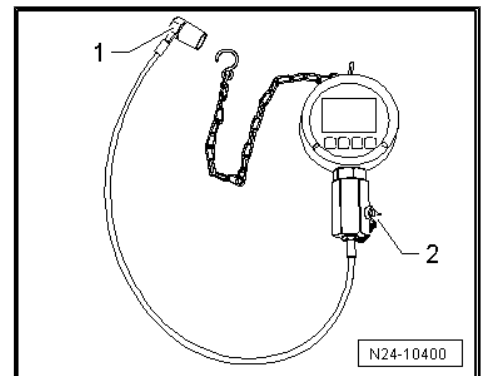
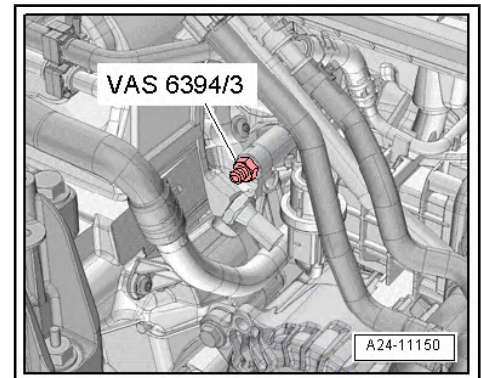


## Procedure

### CAUTION

The fuel system is pressurised.  
Danger of injury caused by fuel spray.  
– Release high pressure.

- Remove fuel pressure sender - G247-  
⇒ ["5.1 Removing and installing fuel pressure sender G247"](#),  
[page 317](#) .
- Lubricate taper seal of adapter -VAS 6394/3- with clean engine oil and screw into fuel rail (22 Nm).
- Unscrew plug -2- and screw fuel pressure sender - G247- into tester -VAS 6394/1- .
- Connect pressure line -1- of tester to adapter - VAS 6394/3- .
- Connect vehicle and fuel pressure sender - G247- electrically using test instrument adapter/DSO (3-pin) - VAS 5570- .





- Switch on tester -VAS 6394/1- by pressing button -A- once briefly.



#### Note

- ◆ *When button -A- is pressed for 2 seconds, the illumination is switched on for 20 seconds.*
- ◆ *If tester -VAS 6394/1- does not indicate 0 bar, zero the tester ⇒ Operating instructions .*
- Connect ⇒ Vehicle diagnostic tester.
- Start engine and run it at idling speed.
- Select 0001 - Read measured values in self-diagnosis.
- Select Fuel pressure from the list.
- Compare pressure displayed on tester -VAS 6394/1- with actual value displayed on ⇒ Vehicle diagnostic tester.
- Watch the fuel pressure on the vehicle diagnostic tester.
- A maximum pressure deviation of 5 bar is permissible.
- If the deviation is greater than 5 bar, renew fuel pressure sender - G247- .
- Repeat test with new fuel pressure sender - G247- and compare both measured values.
- If measured values are now the same, install new fuel pressure sender - G247- .
- If measured values are not the same again, check electrical connection between fuel pressure sender - G247- and engine control unit - J623- → Current flow diagrams, Electrical fault finding and Fitting locations.

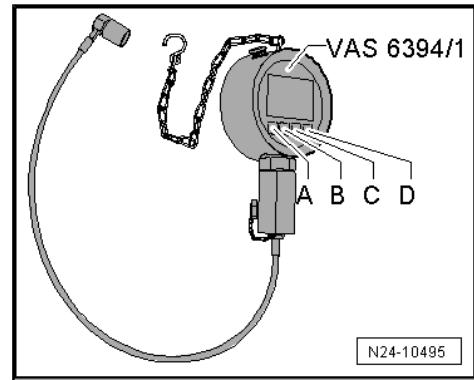
#### Torque settings

- ◆ ⇒ ["2.1 Assembly overview - fuel rail with injectors", page 299](#)

## 5.2.2 Checking fuel pressure sender - G247- , using vehicle diagnostic tester

#### Special tools and workshop equipment required

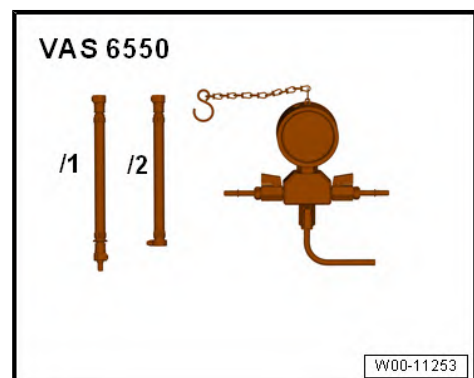
- ◆ Pressure gauge - VAS 6550-



- ◆ ⇒ Vehicle diagnostic tester

Condition:

- 1/4 of fuel tank filled with fuel.



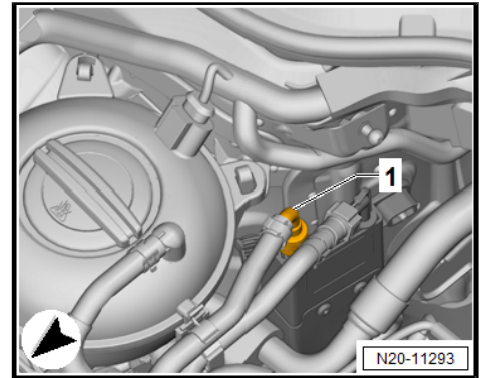


- Pull off supply line -1-. Separate plug-in connectors ⇒ Fuel supply system - petrol engines; Rep. gr. 20 ; Plug-in connectors; Separating plug-in connectors .

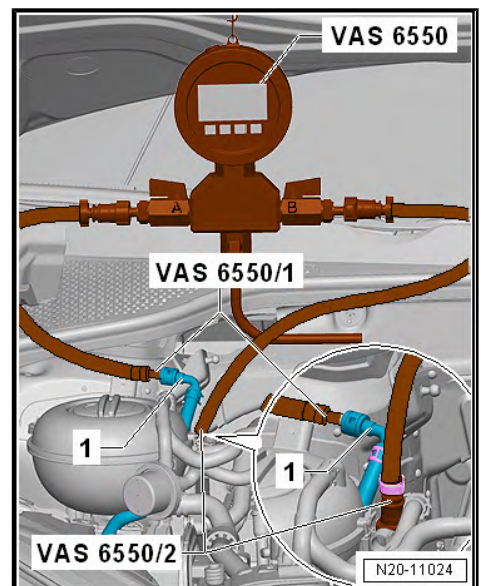
**⚠ CAUTION**

The fuel system is pressurised.  
 Danger of injury caused by fuel spray.

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

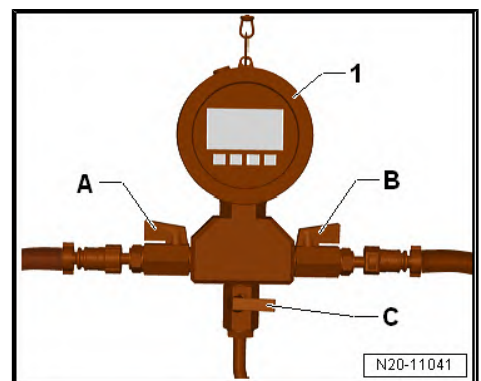


- Collect escaping fuel with a cleaning cloth.
- Connect hose - VAS 6550/1- to connection -A- of pressure tester - VAS 6550- .
- Connect hose - VAS 6550/1- to fuel supply line -1- leading to engine.
- Connect hose - VAS 6550/2- to connection -B- of pressure tester - VAS 6550- .
- Use hose - VAS 6550- to connect fuel line leading to fuel tank with pressure tester - VAS 6550/2- .
- Ensure plug-in connectors are secure properly by pulling.



- Ensure that drain tap -C- on pressure tester -1- is closed.
- Shut-off valves -A- and -B- on pressure tester -1- are open.
- Use ⇒ Vehicle diagnostic tester to check fuel pressure sender - G247- . To do this, select following function:

- ◆ Diagnosis-compatible systems
- ◆ 0001 - Engine electronics
- ◆ 0001 - Repair groups
- ◆ 24 - Mixture preparation/injection
- ◆ G247 - Check fuel pressure sender



### 5.3 Removing and installing intake manifold sender - GX9-

Intake manifold sender - GX9- consists of:

- ◆ Intake air temperature sender 2 - G299-
- ◆ Intake manifold pressure sender - G71-

#### Removing

- Remove air filter housing  
 ⇒ [“3.2 Removing and installing air filter housing”, page 308](#) .



- Release and pull off electrical connector -1-.
- Release fasteners -arrows-.
- Remove intake manifold sender - GX9- .

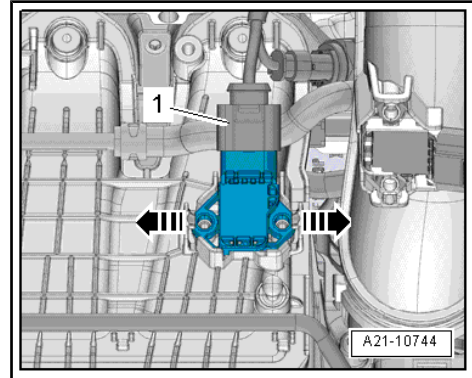
### Installing

Install in reverse order of removal. The following should be observed:



#### Note

- ◆ *Renew O-ring.*
- ◆ *If the retaining tabs broke off during removal, the sender can be mounted using two securing bolts ⇒ [Electronic parts catalogue](#) . Specified torque: ⇒ [page 322](#) .*



### Torque setting

Component	Torque setting
Intake manifold sender - GX9-	3 Nm

- Install air filter housing  
⇒ [“3.2 Removing and installing air filter housing”, page 308](#) .





## 6 Engine control unit

⇒ [“6.1 Removing and installing engine \(motor\) control unit J623”, page 323](#)

⇒ [“6.2 Removing and installing engine \(motor\) control unit J623 with protective housing”, page 324](#)

### 6.1 Removing and installing engine (motor) control unit - J623-

When renewing engine control unit:

- Connect vehicle diagnostic tester .
- Perform function `0001 - Engine control unit renewal`.

Removing

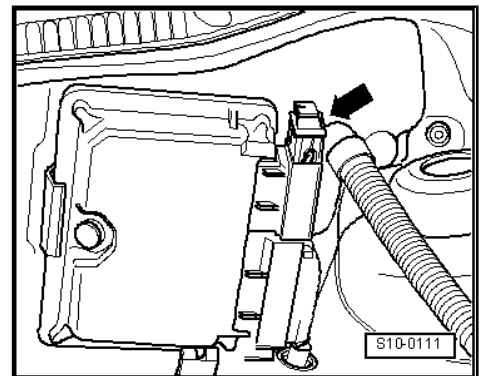
- Switch off ignition.



Note

*If the engine (motor) control unit comes into contact with the positive battery terminal, permanent damage to the engine (motor) control unit will be the consequence. For this reason, disconnect the battery prior to removing the engine control unit from its bracket.*

- Disconnect battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .
- Release -arrow- connectors from engine control unit and pull off.

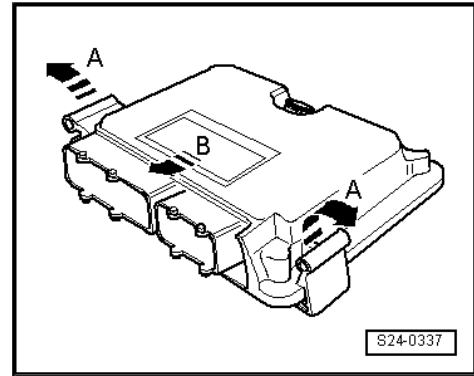




- Press clips -arrows A- outwards and pull engine control unit out to side -B-.

#### Installing

- Insert new engine control unit and press to left.
- Connect connectors and lock.
- Connect vehicle diagnostic tester .
- Select function `0001 - Entry in event memory`.
- Clear event memory.
- Carry out road test.
- Read event memory again.



#### If engine control has been renewed:

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

- Connect vehicle diagnostic tester .
- Select function `0001 - Engine control unit renewal`.

## 6.2 Removing and installing engine (motor) control unit - J623- with protective housing

#### When renewing engine control unit:

- Connect vehicle diagnostic tester .
- Perform function `0001 - Engine control unit renewal`.

#### Removing

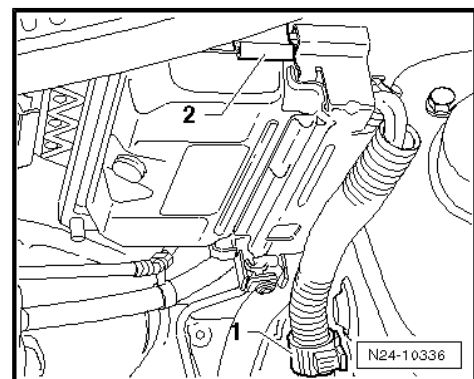
- Switch off ignition.



#### Note

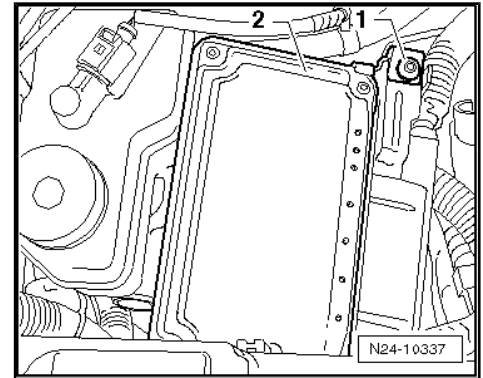
*If the engine (motor) control unit comes into contact with the positive battery terminal, permanent damage to the engine (motor) control unit will be the consequence. For this reason, disconnect the battery prior to removing the engine control unit from its bracket.*

- Disconnect battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .
- Open line guide -1- and raise catch -2-.
- Remove engine control unit from its bracket.





- Unscrew shear-head bolt -1- using a pair of pliers.
- Turn engine control unit -2- around and also unscrew second shear-head bolt using a pair of pliers.

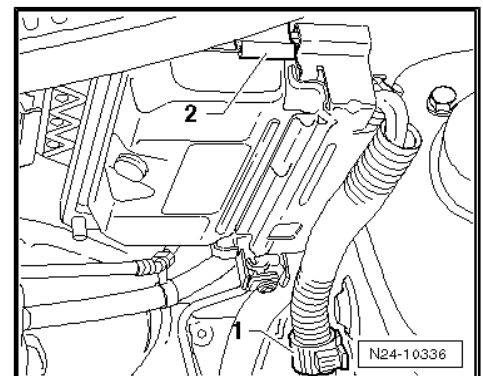
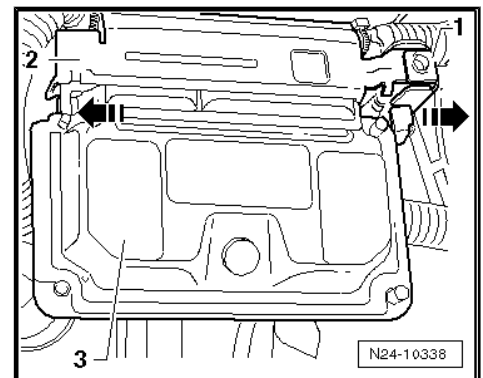


- Pull bracket -1- and protective housing -2- off engine control unit -3- in -direction of arrow-.
- Release connector from engine control unit and pull off.

### Installing

Install in reverse order of removal. Observe the following:

- Attach and lock connectors.
- Push protective housing over engine control unit.
- Install protective housing bracket with new shear bolts.
- Clean the threaded holes for the shear-head bolts of locking compound residues. A thread chaser is suitable for cleaning.
- Tighten shear-head bolts evenly until bolt head breaks off.
- Insert engine control unit into mounting bracket on plenum chamber bulkhead until it audibly engages in catch -1-.
- Press line into line guide -1- and close.
- Connect vehicle diagnostic tester .
- Select function `0001 - Entry in event memory`.
- Clear event memory.
- Carry out road test.
- Read event memory again.



### If engine control has been renewed:

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

- Connect vehicle diagnostic tester .
- Select function `0001 - Engine control unit renewal`.



## 7 High-pressure pump

⇒ [“7.1 Assembly overview - high-pressure pump”, page 326](#)

⇒ [“7.2 Removing and installing high-pressure pump”, page 330](#)

⇒ [“7.3 Removing and installing high-pressure pipe”, page 331](#)

### 7.1 Assembly overview - high-pressure pump

⇒ [“7.1.1 Assembly overview - high-pressure pump, version 1”, page 326](#)

⇒ [“7.1.2 Assembly overview - high-pressure pump, version 2”, page 328](#)

⇒ [“7.1.3 Assembly overview - high-pressure pump, version 3”, page 329](#)

#### 7.1.1 Assembly overview - high-pressure pump, version 1

##### 1 - Roller tappet

- When installing lubricate lightly with clean engine oil

##### 2 - O-ring

- Renew
- Coat lightly with clean engine oil when installing.

##### 3 - High-pressure pump

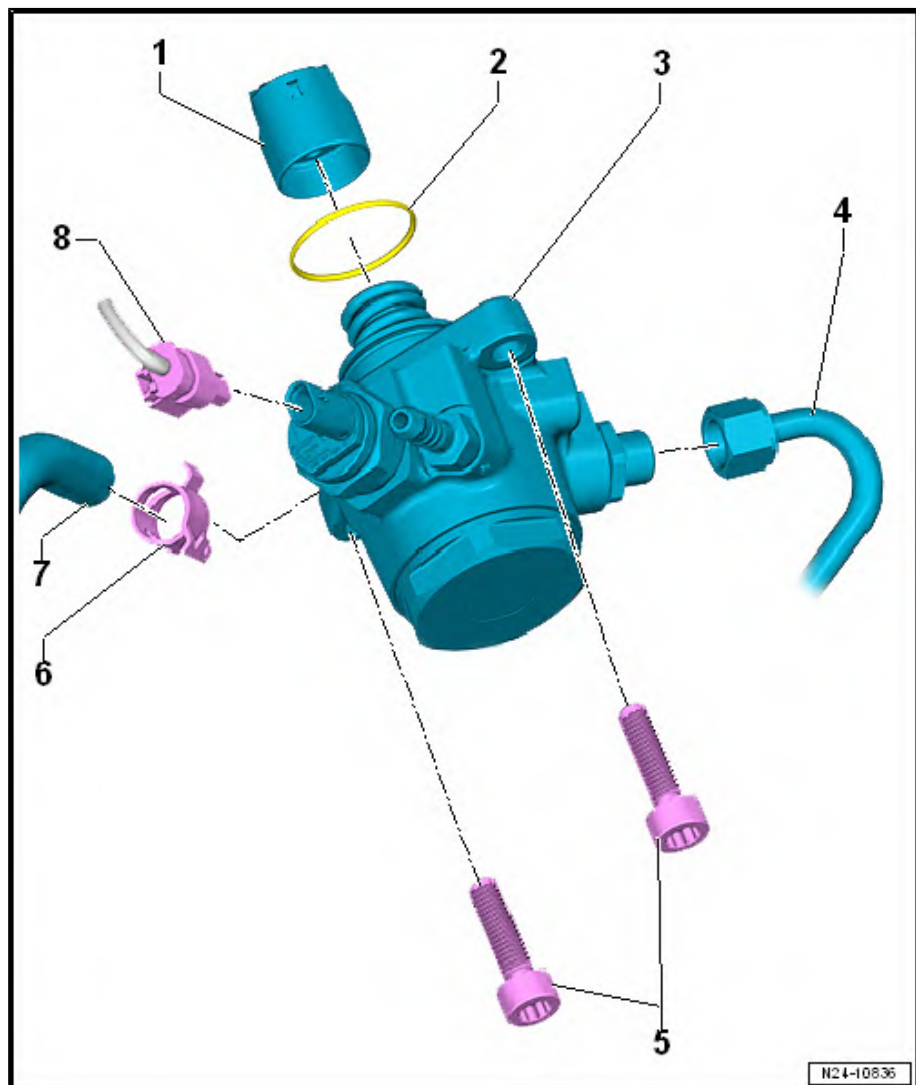
- With fuel pressure regulating valve - N276- .
- Do not dismantle.
- Removing and installing ⇒ [“7.2 Removing and installing high-pressure pump”, page 330](#)

##### 4 - High-pressure pipe

- Renew after removal
- Unions must be free of damage
- Do not alter shape.
- Removing and installing ⇒ [“7.3 Removing and installing high-pressure pipe”, page 331](#)
- Lubricate thread of union nuts with clean engine oil
- 16 Nm +45°

##### 5 - Bolt

- M8x32
- Renew
- Specified torque and tightening sequence ⇒ [page 327](#)





- 6 - Hose clamp
- 7 - Fuel supply line
- 8 - Electrical connector

### High-pressure pump - specified torque and tightening sequence

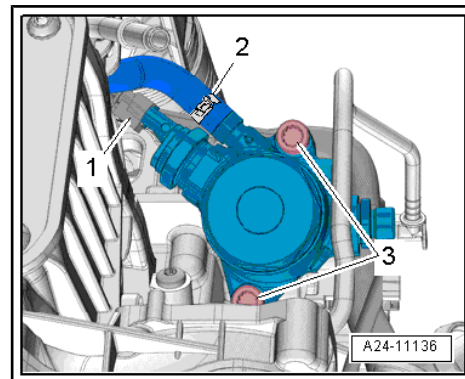
**i** Note

- ◆ *High-pressure pumps from different manufacturers have been installed.*
- ◆ *Bear in mind the different torque specifications for bolts!*

To prevent flange of high-pressure pump from being deformed during installation, install high-pressure pump as follows:

- Tighten new bolt in stages as follows:

Stage	M8 bolts	Specified torque/turning further angle
1.	-3-	Screw in by hand as far as stop
2.	-3-	Tighten one turn alternately until flange of high-pressure pump makes contact with camshaft housing
3.	-3-	20 Nm
4.	-3-	Turn 90° further





## 7.1.2 Assembly overview - high-pressure pump, version 2

### 1 - Roller tappet

- When installing lubricate lightly with clean engine oil

### 2 - O-ring

- Renew
- When installing lubricate lightly with clean engine oil

### 3 - High-pressure pump

- With fuel pressure regulating valve - N276- .
- Do not dismantle.
- Removing and installing ⇒ [“7.2 Removing and installing high-pressure pump”, page 330](#)

### 4 - High-pressure pipe

- Renew
- Removing and installing ⇒ [“7.3 Removing and installing high-pressure pipe”, page 331](#)
- Do not alter shape.
- Unions must be free of damage
- Lubricate thread of union nuts with clean engine oil
- 16 Nm +45°

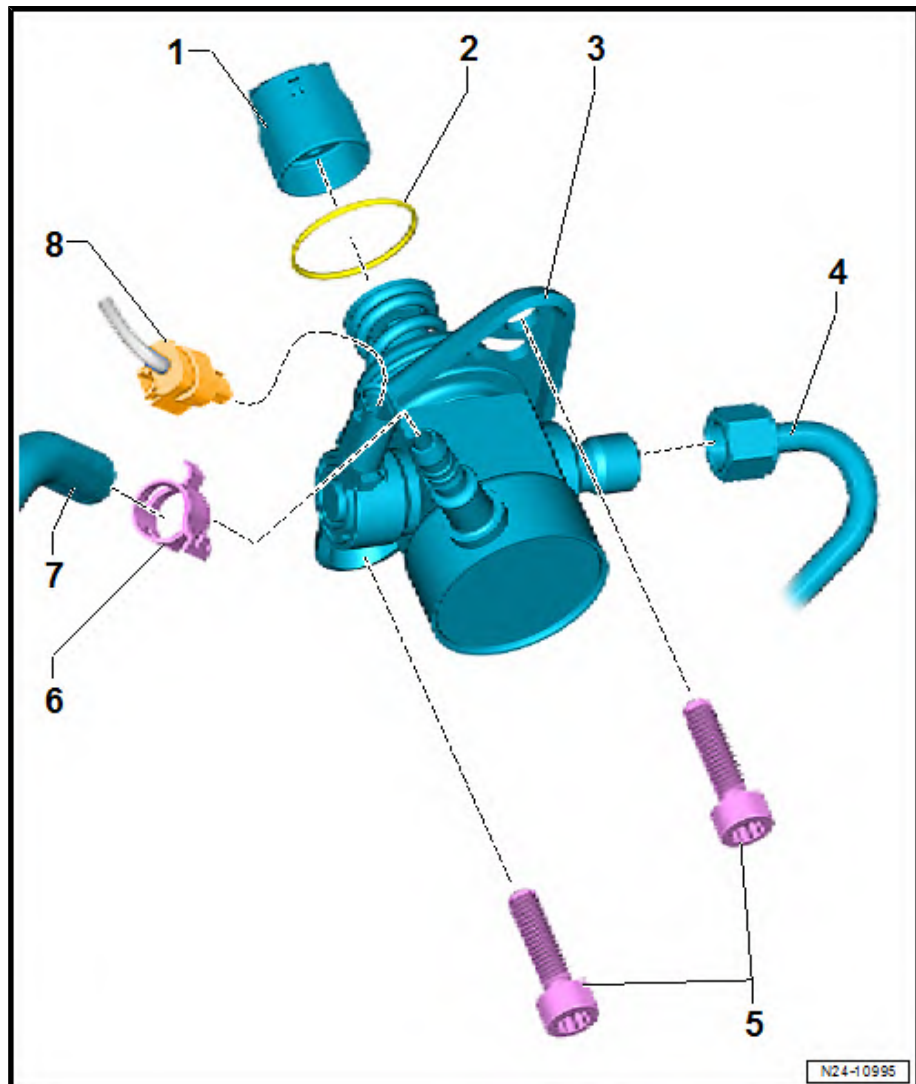
### 5 - Bolt

- M8x25
- Renew
- Specified torque and tightening sequence ⇒ [page 329](#)

### 6 - Hose clamp

### 7 - Fuel supply line

### 8 - Electrical connector





## High-pressure pump - specified torque and tightening sequence

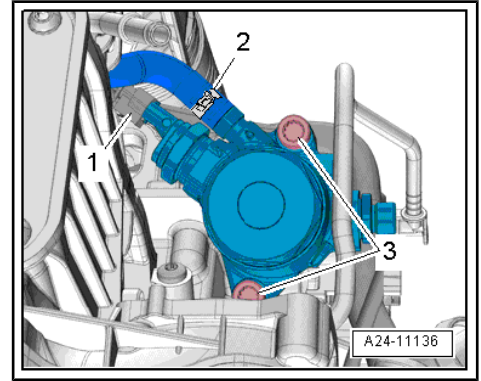
### Note

- ◆ *High-pressure pumps from different manufacturers have been installed.*
- ◆ *Bear in mind the different torque specifications for bolts!*

To prevent flange of high-pressure pump from being deformed during installation, install high-pressure pump as follows:

- Tighten new bolt in stages as follows:

Stage	M8 bolts	Specified torque/turning further angle
1.	-3-	Screw in by hand as far as stop
2.	-3-	Tighten one turn alternately until flange of high-pressure pump makes contact with camshaft housing
3.	-3-	20 Nm
4.	-3-	Turn 90° further



### 7.1.3 Assembly overview - high-pressure pump, version 3

#### 1 - Roller tappet

- When installing lubricate lightly with clean engine oil

#### 2 - O-ring

- Renew
- Coat lightly with clean engine oil when installing.

#### 3 - High-pressure pump

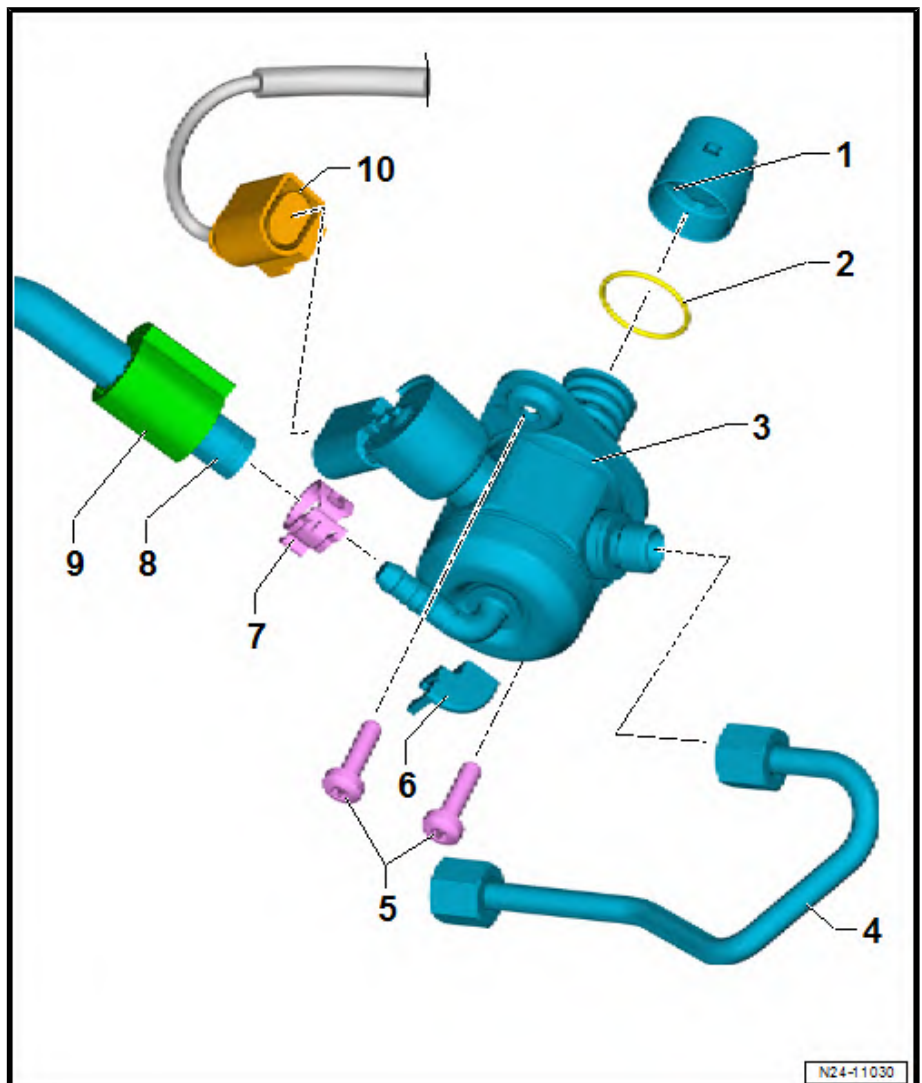
- With fuel pressure regulating valve - N276- .
- Do not dismantle.
- Removing and installing ⇒ ["7.2 Removing and installing high-pressure pump", page 330](#)

#### 4 - High-pressure pipe

- Renew after removal
- Unions must be free of damage
- Do not alter shape.
- Removing and installing ⇒ ["7.3 Removing and installing high-pressure pipe", page 331](#)
- Lubricate thread of union nuts with clean engine oil
- 16 Nm +45°

#### 5 - Bolt

- M6x22





- Renew
- Specified torque and tightening sequence ⇒ [page 330](#)

**6 - Clip**

**7 - Hose clamp**

**8 - Fuel supply line**

**9 - Serrated washer**

- Fit directly behind spring-type clip
- As shown in illustration, cap points in direction of fuel pressure regulating valve - N276-

**10 - Electrical connector**

**High-pressure pump - specified torque and tightening sequence**



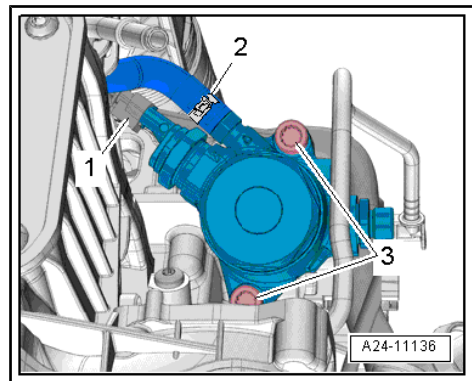
**Note**

- ◆ *High-pressure pumps from different manufacturers have been installed.*
- ◆ *Bear in mind the different torque specifications for bolts!*

To prevent flange of high-pressure pump from being deformed during installation, install high-pressure pump as follows:

- Tighten new bolt in stages as follows:

Stage	M6 bolts	Specified torque/turning further angle
1.	-3-	Screw in by hand as far as stop
2.	-3-	Tighten one turn alternately until flange of high-pressure pump makes contact with camshaft housing
3.	-3-	8 Nm
4.	-3-	Turn 90° further



## 7.2 Removing and installing high-pressure pump

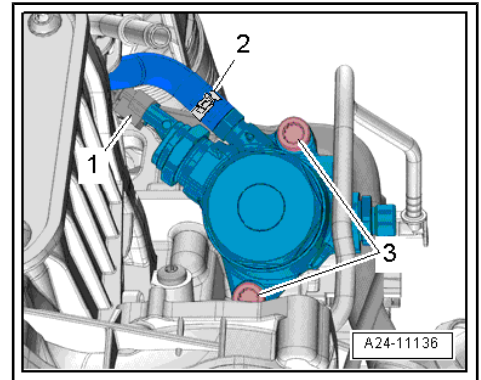
### Removing

- Engine cold.
- Remove high-pressure pipe  
⇒ [“7.3 Removing and installing high-pressure pipe”](#), [page 331](#) .





- Disconnect electrical connector -1-.
- Place a cloth underneath to catch escaping fuel.
- Release hose clip -2- and detach fuel supply hose.
- Unscrew bolts -3- and detach high-pressure pump with roller tappet.



### Installing



#### Note

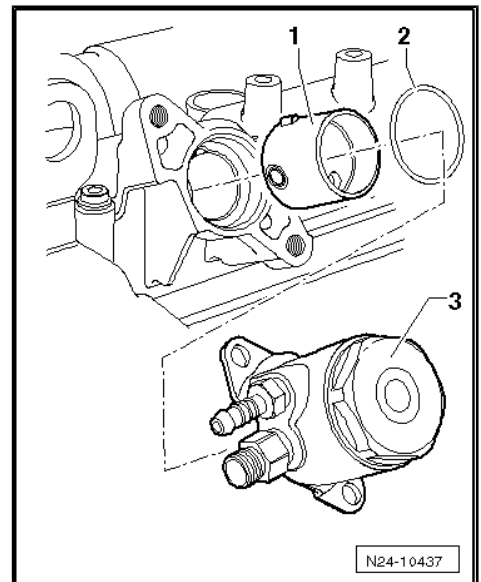
- ◆ *High-pressure pumps from different manufacturers have been installed.*
- ◆ *Bear in mind the different torque specifications for bolts!*
- ◆ *Renew O-ring.*
- Check roller tappet for damage and renew if necessary.
- Moisten roller tappet -1- with clean engine oil.
- Insert oiled roller tappet -1- into camshaft housing.



#### Note

#### *Renew O-ring.*

- Turn crankshaft in direction of engine rotation until roller tappet is at bottom dead centre.
- Insert new, lubricated O-ring -2- in groove of high-pressure pump -3-.
- Tighten bolts by hand.
- Tighten bolts in diagonal sequence to specified torque.
- Note that there are different types of high-pressure pump  
 ⇒ [“7.1 Assembly overview - high-pressure pump”, page 326](#) .



#### Variante 1 -

⇒ [“7.1.1 Assembly overview - high-pressure pump, version 1”, page 326](#)

#### Variante 2 -

⇒ [“7.1.2 Assembly overview - high-pressure pump, version 2”, page 328](#)

#### Variante 3 -

⇒ [“7.1.3 Assembly overview - high-pressure pump, version 3”, page 329](#)

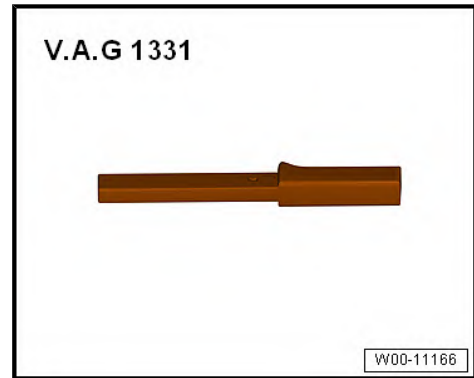
- Check fuel system for leaks.

## 7.3 Removing and installing high-pressure pipe

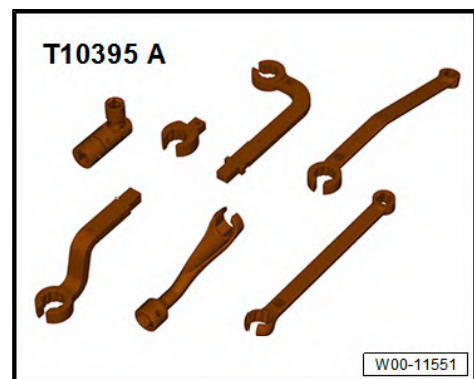
Special tools and workshop equipment required



- ◆ Torque wrench - V.A.G 1331-



- ◆ Insert from tool set - T10395 A-



## Removing

- Remove throttle valve module - GX3-  
⇒ ["4.3 Removing and installing throttle valve module GX3", page 314](#) .
- Place a cloth underneath to catch escaping fuel.
- Unscrew union nuts -arrows- and detach high-pressure pipe.

## Installing

Install in reverse order of removal. The following should be observed:

- Lubricate thread of union nuts with clean engine oil.
- Hand-tighten union nuts for high-pressure pipe (make sure that pipe is not under stress).



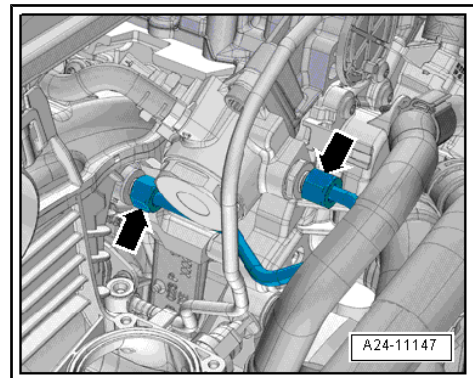
### Note

*Use an open-end wrench to counterhold at the hexagon on the high-pressure pump when tightening to the final specified torque.*

- Tighten union nuts using torque wrench - V.A.G 1331- and insert from tool set - T10395 A- .
- Install throttle valve module - GX3-  
⇒ ["4.3 Removing and installing throttle valve module GX3", page 314](#) .

## Torque settings

- ◆ ⇒ ["7.1 Assembly overview - high-pressure pump", page 326](#)
- ◆ ⇒ ["2.1 Assembly overview - fuel rail with injectors", page 299](#)





## 8 Lambda probe

⇒ [“8.1 Assembly overview - Lambda probe”, page 333](#)

⇒ [“8.2 Removing and installing Lambda probe”, page 334](#)

### 8.1 Assembly overview - Lambda probe

#### Note

- ◆ *New lambda probes are coated with an assembly paste. This paste must not get into the slots on the Lambda probe body.*
- ◆ *In the case of a used Lambda probe, grease only the thread with high-temperature paste. This paste must not get into the slots on the Lambda probe body. High-temperature paste ⇒ *Electronic parts catalogue* .*
- ◆ *During installation, the electrical connecting cable of the Lambda probe must be secured at the same points.*
- ◆ *The wire must be prevented from touching the exhaust pipe.*

#### 1 - 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  
 ⇒ [“8.2 Removing and installing Lambda probe”, page 334](#)

- 55 Nm

#### 2 - Electrical connector

- For Lambda probe 1 before catalytic converter - GX10- .

#### 3 - Electrical connector

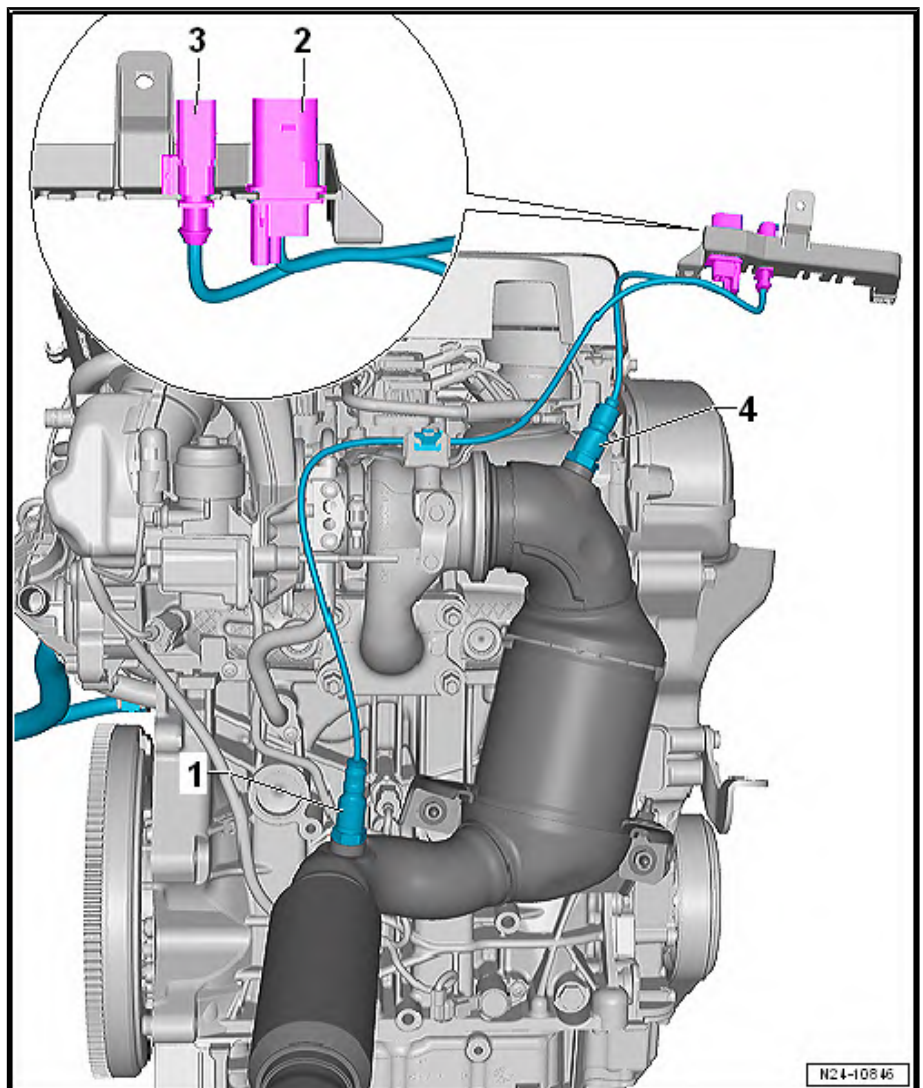
- For Lambda probe 1 after catalytic converter - GX7- .

#### 4 - Lambda probe 1 before catalytic converter - GX10-

- Consisting of  
 Lambda probe - G39-  
 Lambda probe heater - Z19-

- Removing and installing  
 ⇒ [“8.2 Removing and installing Lambda probe”, page 334](#)

- 55 Nm



N24-10846



## 8.2 Removing and installing Lambda probe

⇒ ["8.2.1 Removing and installing Lambda probe 1 before catalytic converter GX10", page 334](#)

⇒ ["8.2.2 Removing and installing Lambda probe 1 after catalytic converter GX7", page 335](#)

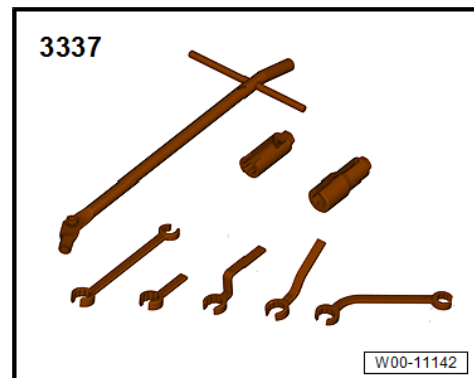
### 8.2.1 Removing and installing Lambda probe 1 before catalytic converter - GX10-

Lambda probe 1 before catalytic converter - GX10- consists of

- ◆ Lambda probe - G39-
- ◆ Lambda probe heater - Z19-

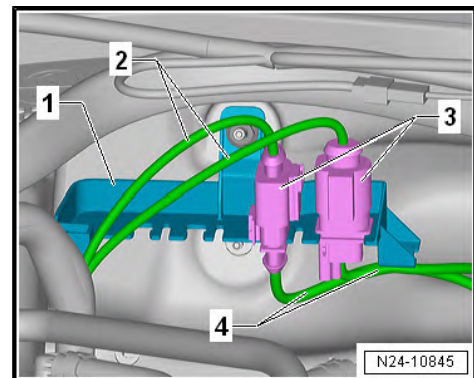
**Special tools and workshop equipment required**

- ◆ Lambda probe open ring spanner set - 3337-



#### Removing

- Unclip and pull off corresponding electrical connector.
- Unclip connector on retainer -1-.





- Unscrew Lambda probe 1 before catalytic converter - GX10-2- using tool from Lambda probe open ring spanner set - 3337- .

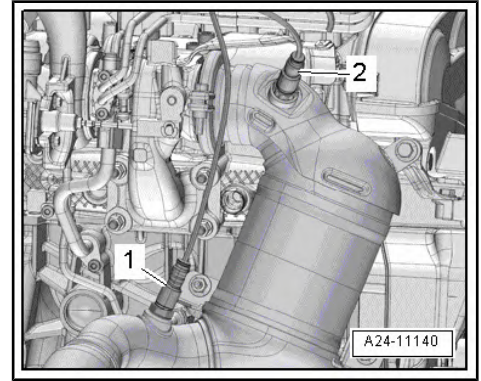
### Installing

Install in reverse order of removal. The following should be observed:



#### Note

- ◆ *New lambda probes are coated with an assembly paste. This paste must not get into the slots on the Lambda probe body.*
- ◆ *In the case of a used Lambda probe, grease only the thread with high-temperature paste. This paste must not get into the slots on the Lambda probe body. High-temperature paste => Electronic parts catalogue .*
- ◆ *During installation, the electrical connecting cable of the Lambda probe must be secured at the same points.*
- ◆ *The wire must be prevented from touching the exhaust pipe.*



### Vehicles as of July 2015

- If lambda probe has been renewed, erase learnt values and adapt lambda probe to engine control unit using => vehicle diagnostic tester .
- Switch on ignition, and select following menu option on => Vehicle diagnostic tester:
  - ◆ [0001 - Lambda probe adaption]

### Continued for all vehicles

- Specified torque  
 => ["8.1 Assembly overview - Lambda probe", page 333](#)

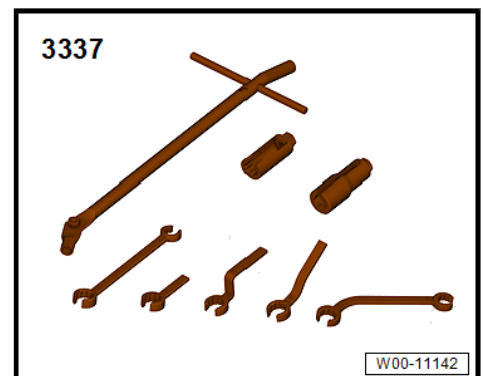
## 8.2.2 Removing and installing Lambda probe 1 after catalytic converter - GX7-

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

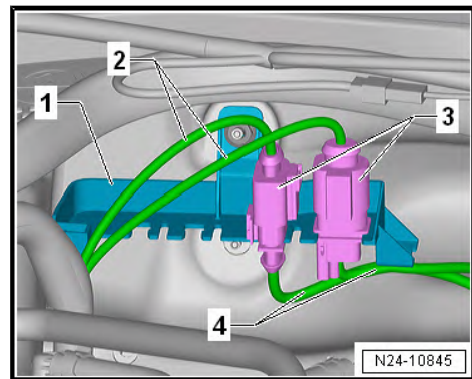
- ◆ Lambda probe open ring spanner set - 3337-





## Removing

- Unclip and pull off corresponding electrical connector.
- Unclip connector on retainer -1-.



- Unscrew lambda probe 1 after catalytic converter - GX7- -1- using a suitable tool from lambda probe open ring spanner set - 3337- .

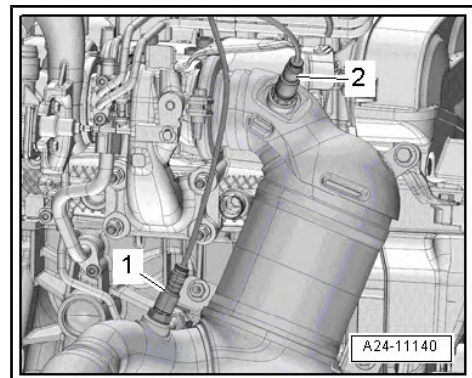
## Installing

Install in reverse order of removal. The following should be observed:



### Note

- ◆ *New lambda probes are coated with an assembly paste. This paste must not get into the slots on the Lambda probe body.*
- ◆ *In the case of a used Lambda probe, grease only the thread with high-temperature paste. This paste must not get into the slots on the Lambda probe body. High-temperature paste → Electronic parts catalogue .*
- ◆ *During installation, the electrical connecting cable of the Lambda probe must be secured at the same points.*
- ◆ *The wire must be prevented from touching the exhaust pipe.*



## Vehicles as of July 2015

- If lambda probe has been renewed, erase learnt values and adapt lambda probe to engine control unit using ⇒ vehicle diagnostic tester .
- Switch on ignition, and select following menu option on ⇒ Vehicle diagnostic tester:
  - ◆ `0001 - Lambda probe adaption`

## Continued for all vehicles

- Specified torque  
⇒ ["8.1 Assembly overview - Lambda probe", page 333](#)



## 26 – Exhaust system

### 1 Exhaust pipes and silencers

⇒ [“1.1 Assembly overview - silencers”, page 337](#)

⇒ [“1.2 Separating exhaust pipes from silencers”, page 338](#)

⇒ [“1.3 Removing and installing silencer”, page 339](#)

⇒ [“1.4 Aligning exhaust system free of stress”, page 340](#)

⇒ [“1.5 Check exhaust system for leaks”, page 341](#)

#### 1.1 Assembly overview - silencers

##### 1 - Mounting

- Renew if damaged

##### 2 - Bolt

- 20 Nm
- Qty. 2

##### 3 - Rear silencer

- In initial equipment, component with centre silencer. Can be renewed individually for repair purposes.
- Removing and installing ⇒ [“1.3 Removing and installing silencer”, page 339](#)
- Separating exhaust pipes from silencers ⇒ [“1.2 Separating exhaust pipes from silencers”, page 338](#)
- Aligning exhaust system free of tension ⇒ [“1.4 Aligning exhaust system free of stress”, page 340](#).

##### 4 - Mounting

- Renew if damaged

##### 5 - Centre silencer

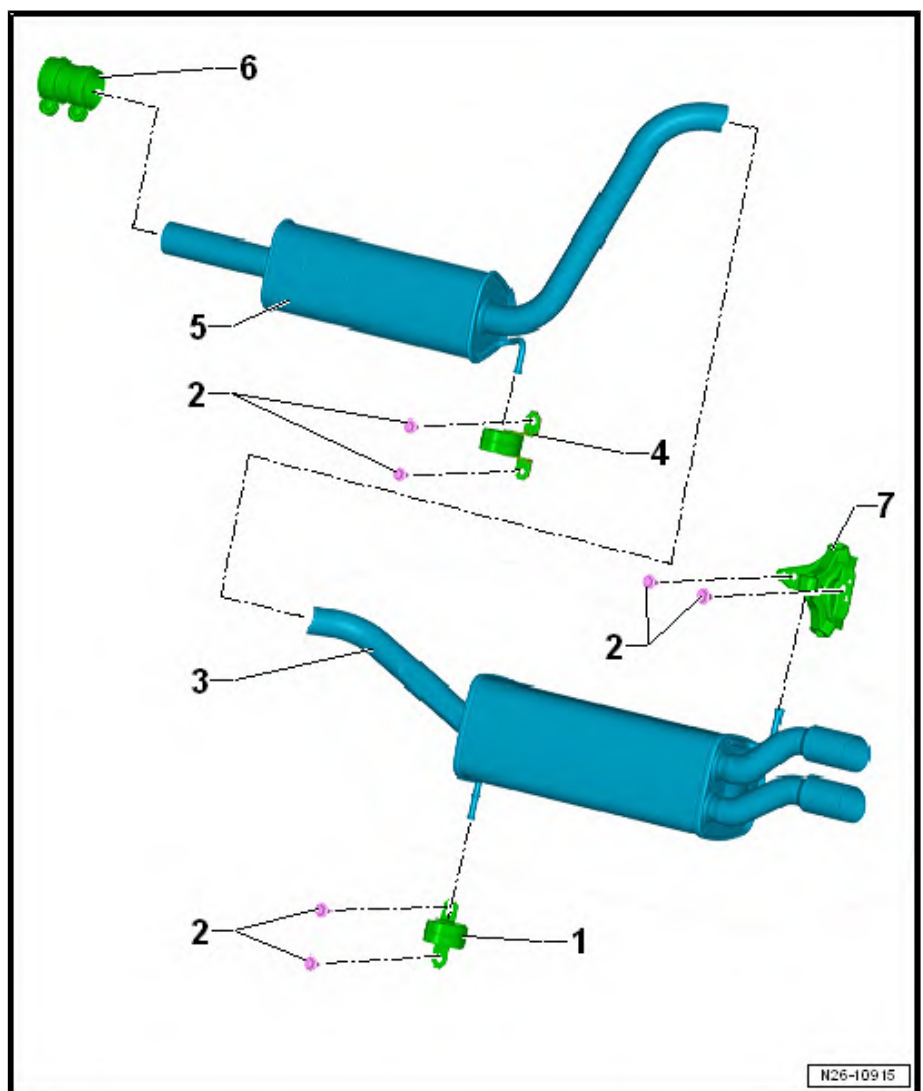
- Combined in one unit with rear silencer as original equipment. Can be renewed individually for repair purposes.
- Removing and installing ⇒ [“1.3 Removing and installing silencer”, page 339](#)

Separating exhaust pipes from silencers ⇒ [“1.2 Separating exhaust pipes from silencers”, page 338](#)

Aligning exhaust system free of tension ⇒ [“1.4 Aligning exhaust system free of stress”, page 340](#).

##### 6 - Clamping sleeve

- Align exhaust system free of tension before tightening ⇒ [“1.4 Aligning exhaust system free of stress”, page 340](#).
- Fitting position ⇒ [page 338](#)





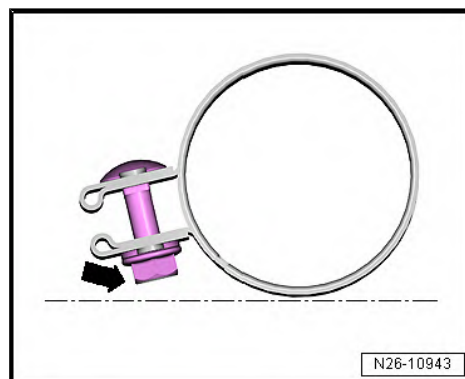
- Tighten threaded connections evenly.
- 23 Nm

## 7 - Mounting

- Renew if damaged

### Installation position of rear clamp

- Fit clamp in position shown.
- Bolted connections to right.
- Bolt -arrow- must not protrude beyond lower edge of clamp.

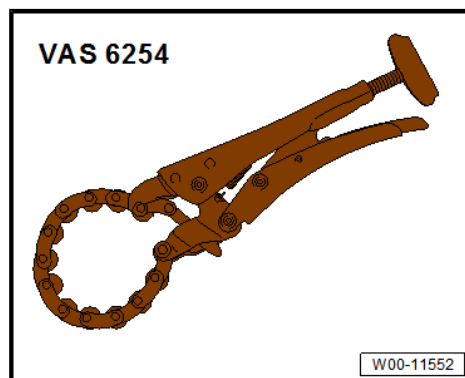


## 1.2 Separating exhaust pipes from silencers

- ◆ The connecting pipe can be cut through at the cutting location in order to renew the centre and rear silencers separately.
- ◆ Cutting location is marked by an indentation on the circumference of exhaust pipe.

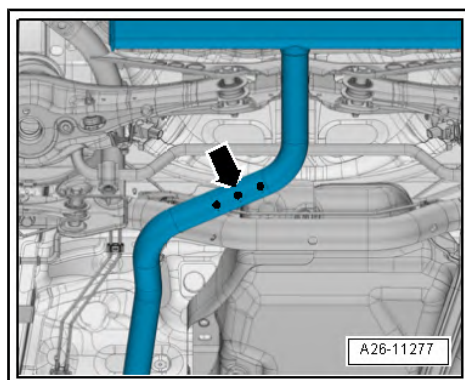
### Special tools and workshop equipment required

- ◆ Chain-type pipe cutter - VAS 6254-



### Procedure

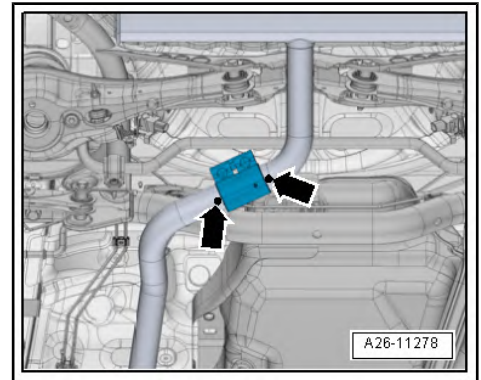
- Cut through exhaust pipe at right angles at separating point -arrow- using chain pipe cutter - VAS 6254- .







- Position clamp centrally at side marks -arrows- when installing.
- Fit rear clamp ⇒ [page 338](#) .
- Align exhaust system free of stress  
⇒ ["1.4 Aligning exhaust system free of stress", page 340](#) .



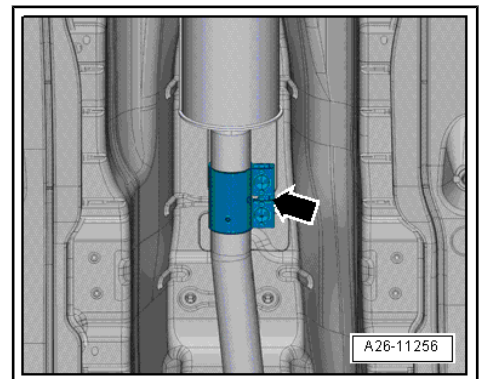
### 1.3 Removing and installing silencer

#### Removing

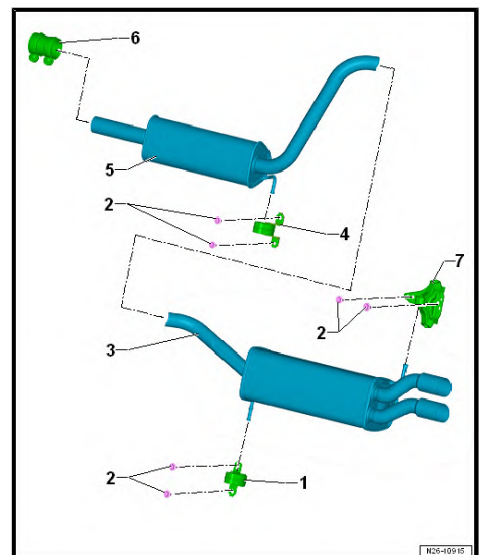
- Separate exhaust system  
⇒ ["1.2 Separating exhaust pipes from silencers", page 338](#) .

#### Centre silencer

- Loosen clamp -arrow-, and push it to rear.



- Unscrew bolts -2- to remove bracket -4-.
- Remove middle silencer -5-.





## Rear silencer

- Remove brackets -1- and -2-.
- To do this, unscrew bolts -2-.
- Guide out middle silencer -3- between rear axle and body.

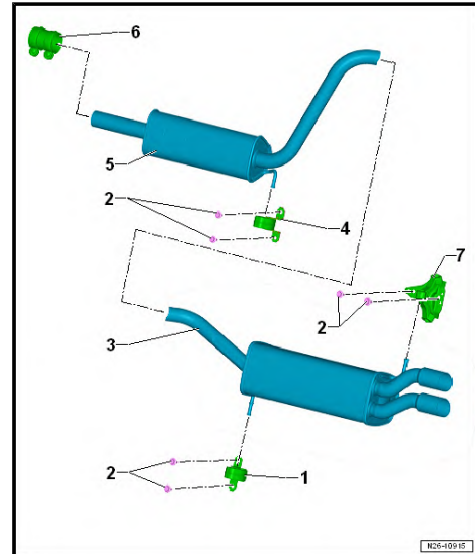
## Installing

Install in reverse order of removal. The following should be observed:

- Align exhaust system free of stress  
⇒ ["1.4 Aligning exhaust system free of stress"](#), page 340 .

## Torque settings

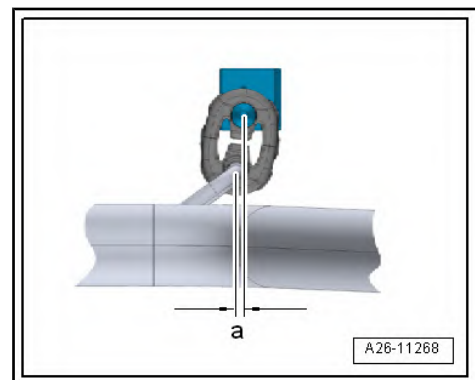
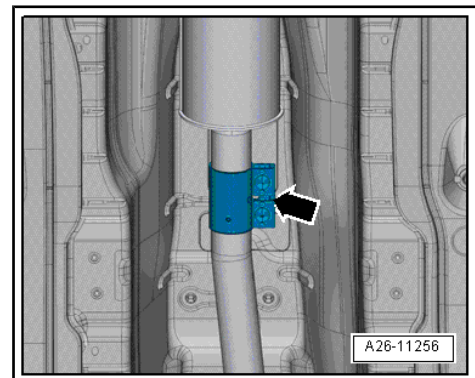
- ◆ ⇒ ["1.1 Assembly overview - silencers"](#), page 337
- ◆ ⇒ ["2.1 Assembly overview - emission control"](#), page 342



## 1.4 Aligning exhaust system free of stress

### Procedure

- The exhaust system must be aligned when cold.
  - Loosen bolt connections for front clamp -arrow-.
- 
- Push exhaust system towards front of vehicle until preloading at mounting for exhaust pipe -a- = 5 mm.
  - Fit front clamp ⇒ [page 343](#) .



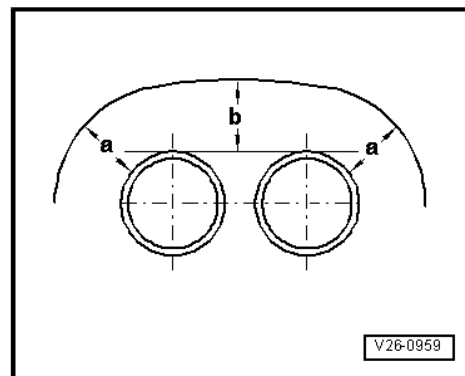


### Align end exhaust pipes

- Align rear silencer so that there is an equal distance -a- and -b- between bumper cut-out and tailpipes.
- Unfasten rear silencer mounting to align tailpipes.

### Torque settings

- ◆ ⇒ ["2.1 Assembly overview - emission control", page 342](#)



## 1.5 Check 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.



## 2 Exhaust gas cleaning

⇒ [“2.1 Assembly overview - emission control”, page 342](#)

⇒ [“2.2 Removing and installing catalytic converter”, page 343](#)

### 2.1 Assembly overview - emission control

#### 1 - Bracket

- Renew if damaged

#### 2 - Bracket

- Renew if damaged

#### 3 - Retaining bracket

#### 4 - Bolt

- 20 Nm

#### 5 - Bracket

#### 6 - Nut

- Specified torque and tightening sequence  
⇒ [page 343](#)

#### 7 - Exhaust turbocharger

#### 8 - Screw-type clamp

- Renew
- Specified torque and tightening sequence  
⇒ [page 343](#)

#### 9 - Seal

- Renewing ⇒ [page 343](#)

#### 10 - Front exhaust pipe with catalytic converter

- Do not bend flexible joint by more than 10° - risk of damage.
- Install flexible joint so that it is not under tension
- Take care not to damage wire mesh on flexible joint.

- Protect catalytic converter from damage by knocks and impact

- Removing and installing ⇒ [“2.2 Removing and installing catalytic converter”, page 343](#)

- Do not remove protective packaging from replacement part until you are ready to fit the flexible joint

- Aligning exhaust system free of tension ⇒ [“1.4 Aligning exhaust system free of stress”, page 340](#) .

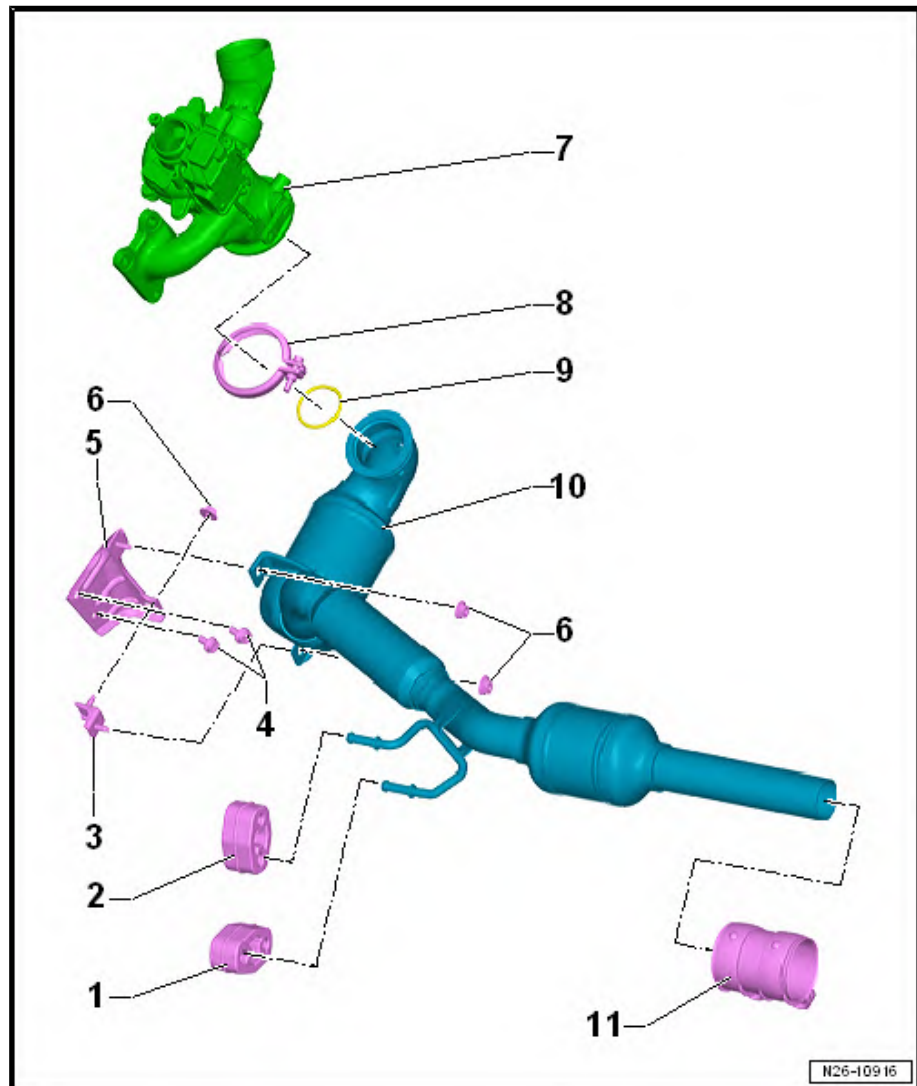
#### 11 - Clamping sleeve

- Align exhaust system free of tension before tightening  
⇒ [“1.4 Aligning exhaust system free of stress”, page 340](#) .

- Fitting position ⇒ [page 338](#)

- Tighten threaded connections evenly.

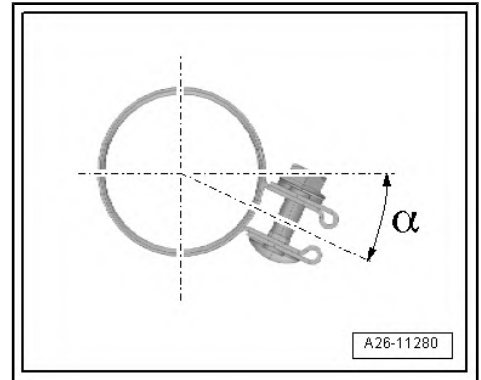
- 23 Nm





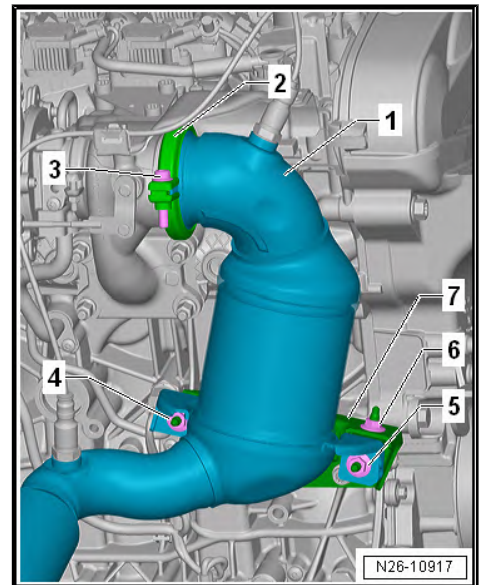
### Installation position of front clamp

- Fit clamp in position shown.
- Angle  $\alpha$  = approx.  $20^\circ$ .
- Bolted connection facing towards right.
- Nuts upwards.



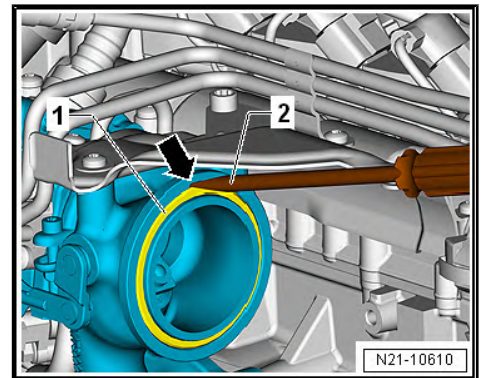
### Installing catalytic converter - specified torque and tightening sequence

1.	- Fit catalytic converter -1- to turbocharger and attach new screw-type clip -2- loosely without tightening it.	◆ Hand-tight
2.	- Screw on nuts -1- and -2- loosely by hand.	• It should still be possible to move catalytic converter and bracket.
3.	- Ensure proper seating of catalytic converter -1- on turbocharger.	
4.	- Tighten bolt -3-	15 Nm
5.	- Screw nuts -4- to -6- loosely onto bracket -7-.	◆ Hand-tight
6.	- Tighten nuts in the sequence -4 ... 5 ... 6-.	20 Nm



### Renew seal

- Fit screwdriver -2- in recess -arrow- on turbocharger.
- Lever out seal -1-.
- Renew oil seal -1-.



## 2.2 Removing and installing catalytic converter



### Note

*The catalytic converter is removed together with the front exhaust pipe.*

### Special tools and workshop equipment required

- ◆ High-temperature paste ⇒ Electronic parts catalogue .



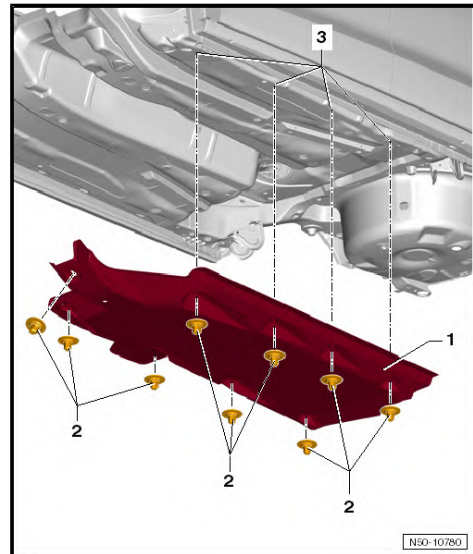
## Removing

- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation .
- Remove underbody cover -1- on right and left.
- To do this, unscrew nuts -2- from studs -3-.

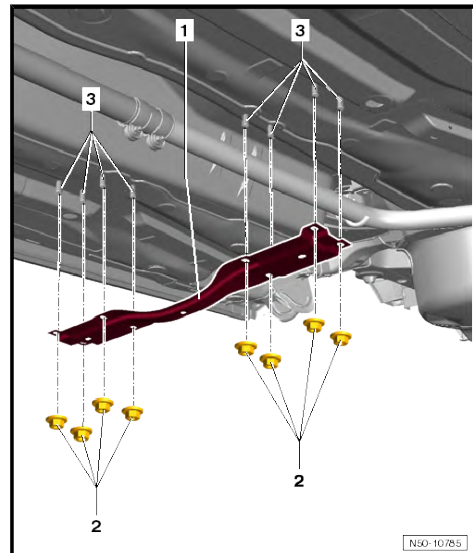


### Note

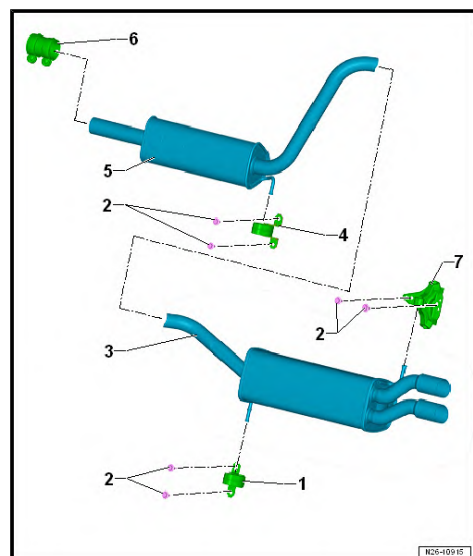
*The illustration shows the left side. The right side is similar.*



- Remove tunnel cross-piece -1-.
- To do this, unscrew nuts -2- from studs -3-.



- Remove bracket -4- and lower exhaust system.
- Remove heat shield for right drive shaft ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft heat shield .
- Unbolt right drive shafts on inside ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .
- Lay drive shaft to one side.

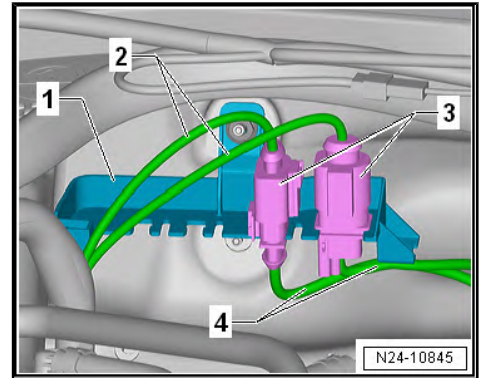




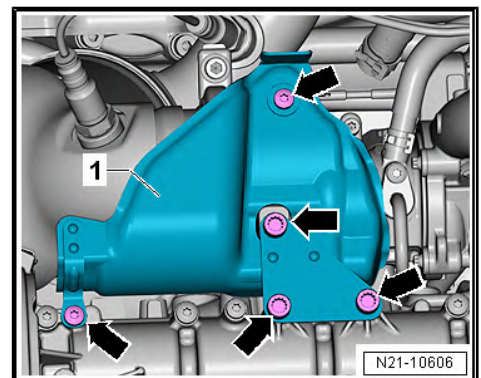
- Release and pull off connectors -3-.
- Lay wires -2- to one side.
- Unclip wires -4- from retainer -1-.
- Remove wires from heat shield of turbocharger.

**i** Note

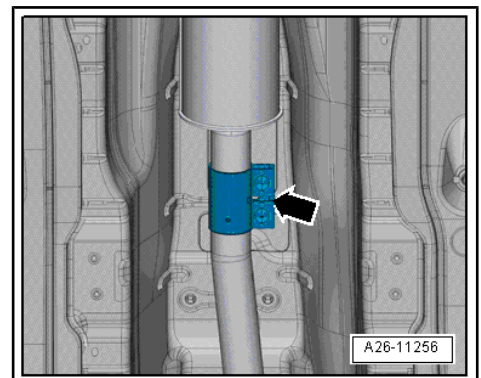
- ◆ Do not loosen bolts on turbocharger.
- ◆ Coolant lines on turbocharger are not removed.



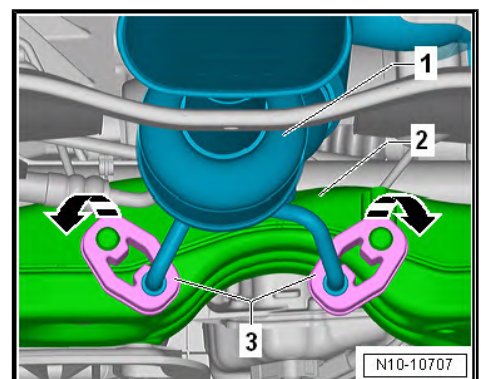
- Unscrew nuts and bolts -arrows-.
- Thread out heat shield -1- and remove it.
- Raise coolant lines slightly when doing this.
- Remove Lambda probes  
 ⇒ ["8.2 Removing and installing Lambda probe", page 334](#) .



- Loosen clamp -arrow-, and push it to rear.

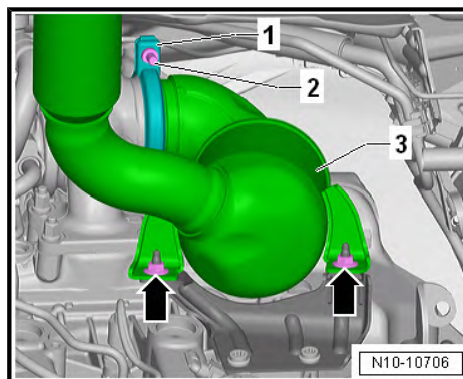


- Detach exhaust hangers -3- in -direction of arrow- from subframe -2-.
- Lower exhaust system -1- until it rests on subframe -2-.

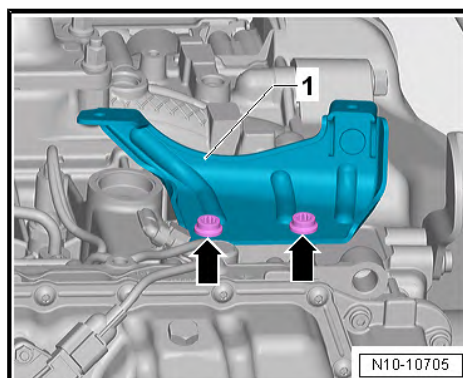




- Unscrew bolt -2-.
- Remove screw-type clip -1-.
- Unscrew nuts -arrows- and tie up catalytic converter -3-.



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



- Remove heat shield -1-. To do this, unscrew bolts -2-.
- Unbolt lock washers -3-.
- Thread out heat shield -1- and remove it.
- Guide out catalytic converter with front exhaust pipe between body and assembly carrier.

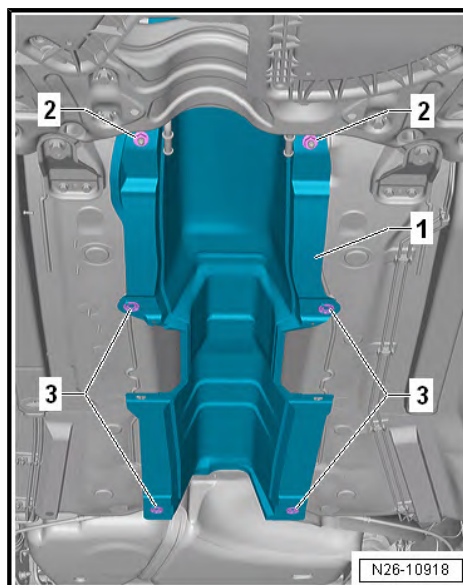
### Installing

Install in reverse order of removal. The following should be observed:



#### Note

- ◆ *Renew seals/gaskets and self-locking nuts.*
- ◆ *Coat exhaust manifold studs with high-temperature paste; high-temperature paste ⇒ Electronic parts catalogue .*



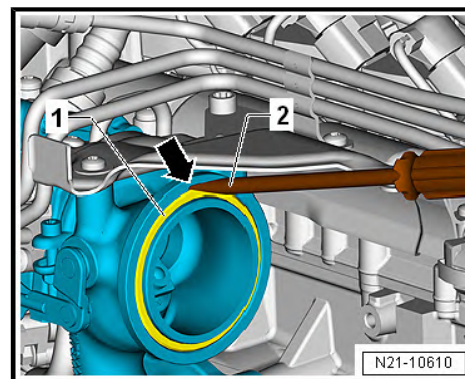




- Fit screwdriver -2- in recess -arrow- on turbocharger.
- Lever out seal -1-.
- Renew oil seal -1-.
- Align exhaust system free of stress  
⇒ [“1.4 Aligning exhaust system free of stress”, page 340](#) .

#### Torque settings

- ◆ ⇒ [“1.1 Assembly overview - silencers”, page 337](#)
- ◆ ⇒ [Fig. “Installing catalytic converter - specified torque and tightening sequence” , page 343](#)
- ◆ ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Assembly overview - drive shaft
- ◆ ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody cladding
- ◆ ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation .





## 28 – Ignition system

### 1 Ignition system

⇒ [“1.1 Assembly overview - ignition system”, page 348](#)

⇒ [“1.2 Removing and installing ignition coils with output stage”, page 349](#)

⇒ [“1.3 Removing and installing knock sensor 1 G61”, page 352](#)

⇒ [“1.4 Removing and installing Hall sender”, page 352](#)

⇒ [“1.5 Removing and installing engine speed sender G28”, page 353](#)

#### 1.1 Assembly overview - ignition system

##### 1 - Bolt

- The specified torque influences the function of the knock sensor.
- 20 Nm

##### 2 - Knock sensor 1 - G61-

- Removing and installing ⇒ [“1.3 Removing and installing knock sensor 1 G61”, page 352](#)

##### 3 - Spark plug

- Remove and install with spark plug socket and extension - 3122 B-
- Specified torque: 22 Nm
- Change interval ⇒ Maintenance tables
- Part numbers ⇒ Electronic parts catalogue (ETKA)

##### 4 - Ignition coil with output stage and spark plug connectors



##### Note

*Ignition coils with output stage and spark plug connectors are individually for repairs ⇒ parts catalogue (ETKA)*

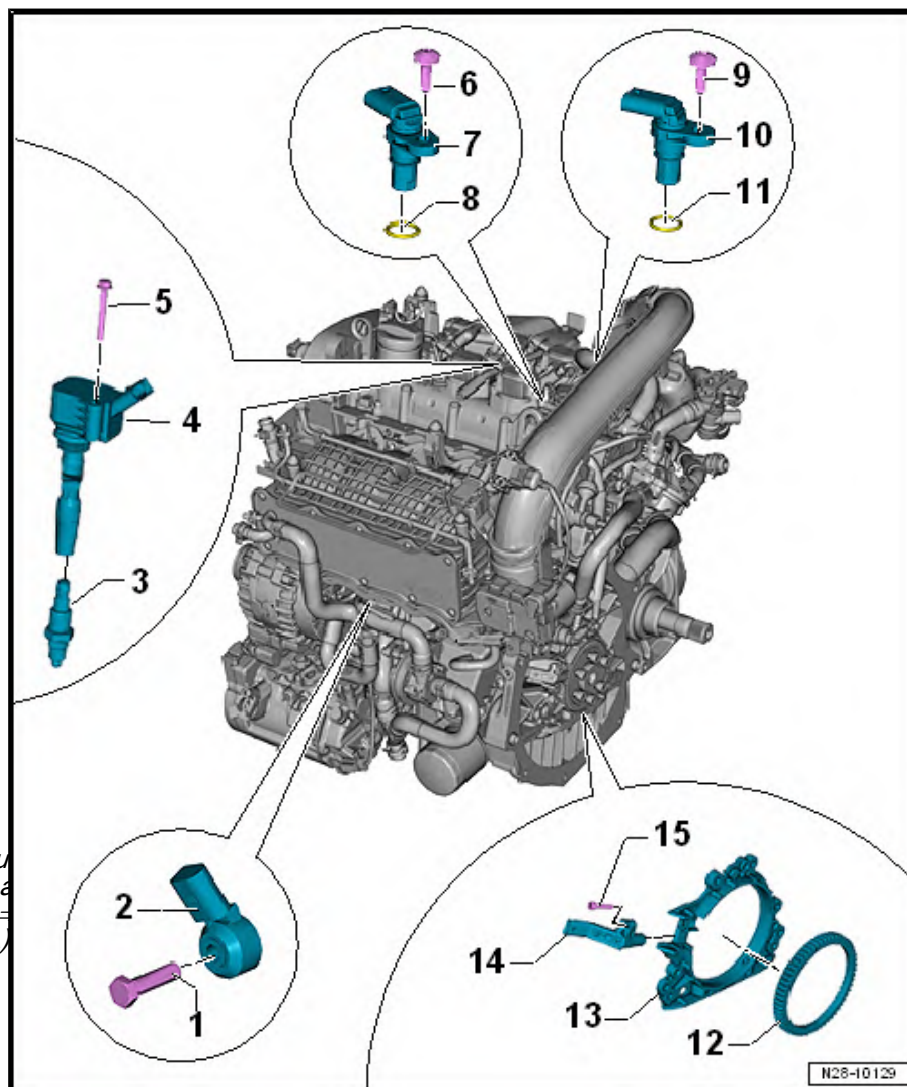
◆ Ignition coil 1 with output stage - N70-

◆ Ignition coil 2 with output stage - N127-

◆ Ignition coil 3 with output stage - N291-

◆ Ignition coil 4 with output stage - N292-

- Removing and installing ⇒ [“1.2 Removing and installing ignition coils with output stage”, page 349](#)



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



**5 - Bolt**

- 8 Nm

**6 - Bolt**

- 8 Nm

**7 - Hall sender - G40-**

- Removing and installing ⇒ [“1.4.2 Removing and installing Hall sender 3 G300 ”, page 353](#)

**8 - O-ring**

**9 - Bolt**

- 8 Nm

**10 - Hall sender 3 - G300-**

- Removing and installing ⇒ [“1.4.1 Removing and installing Hall sender G40 ”, page 352](#)

**11 - O-ring**

- Renew if damaged

**12 - Sender wheel**

- For engine speed sender - G28-
- Removing and installing ⇒ [“2.3 Removing and installing sealing flange on gearbox side”, page 53](#)

**13 - Sealing flange, gearbox side**

- Removing and installing ⇒ [“2.3 Removing and installing sealing flange on gearbox side”, page 53](#)

**14 - Engine speed sender - G28-**

- Removing and installing ⇒ [“1.5 Removing and installing engine speed sender G28 ”, page 353](#)

**15 - Bolt**

- 4.5 Nm

## 1.2 Removing and installing ignition coils with output stage

Special tools and workshop equipment required

- ◆ Puller - T10530-





## Note

- ◆ *The ignition coils are easier to remove when the engine is warm.*
- ◆ *The grease used upon assembly in the factory makes it easier to remove ignition coils or 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

Overview of fitting locations

⇒ [“1.1 Overview of fitting locations - injection system”, page 291](#) .

Assembly overview - ignition system

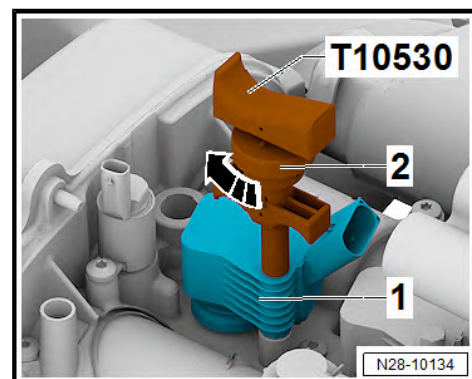
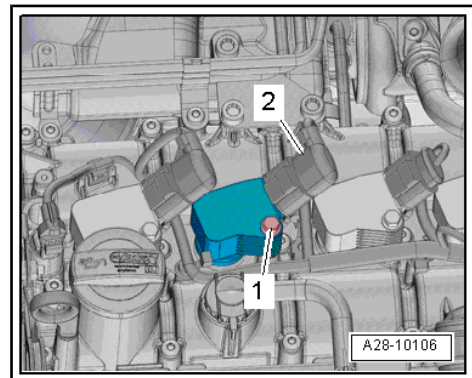
⇒ [“1.1 Assembly overview - ignition system”, page 348](#) .

### Removing ignition coils “cyl. 2, 3, 4”:

- Remove resonator for intake air  
⇒ [“3.3 Removing and installing resonator for intake air”, page 309](#) .

### All ignition coils (continued):

- Disconnect electrical connector -2-.
  - Unscrew bolt -1-.
- 
- 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.

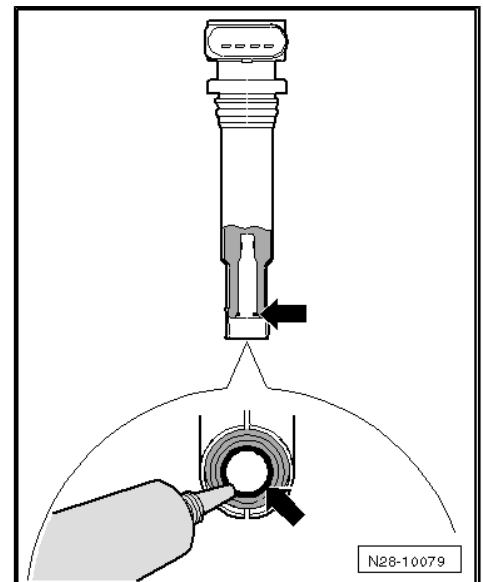
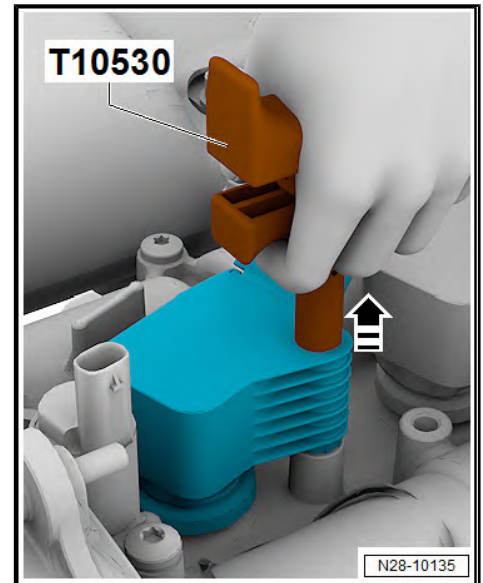
**i Note**

- ◆ *Ignition coils with output stage and spark plug connectors are available individually for repairs ⇒ Electronic parts catalogue (ETKA)*
- ◆ *The spark plug connectors are removed from the ignition coils by hand.*

**Installing**

Install in reverse order of removal. The following should be observed:

- Apply a thin bead of silicone paste around sealing hose of ignition coil ⇒ Electronic parts catalogue (ETKA) .
- Slide spark plug connector -1- by hand onto ignition coil as far as stop.

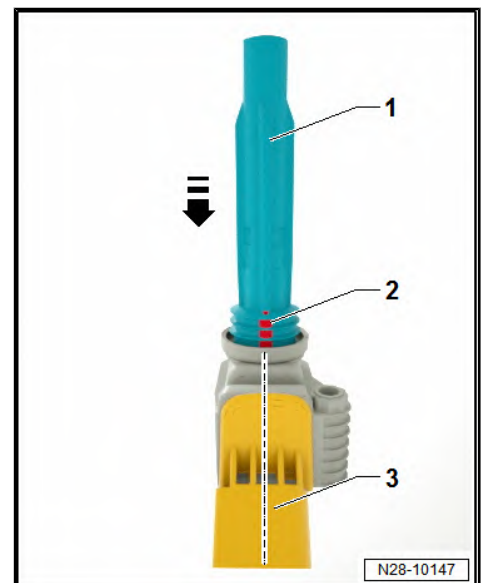


The vent drilling -2- must be centred relative to connector housing -3- while doing so.

- 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).

**Torque settings**

- ◆ ⇒ [“1.1 Assembly overview - ignition system”, page 348](#)





## 1.3 Removing and installing knock sensor 1 - G61-

### Removing

Overview of fitting locations

⇒ [“1.1 Overview of fitting locations - injection system”, page 291](#) .

Assembly overview - ignition system

⇒ [“1.1 Assembly overview - ignition system”, page 348](#) .

Vehicles with air conditioner compressor:

#### CAUTION

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

– Do not open refrigerant circuit of air conditioning system.

- Remove poly V-belt  
⇒ [“1.3 Removing and installing poly-V belt”, page 38](#) .
- Disconnect electrical connector on air conditioner compressor regulating valve - N280- .
- Remove air conditioner compressor with refrigerant lines connected from engine ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Removing air conditioner compressor from and installing to bracket .
- Do not stretch, kink or bend refrigerant lines and hoses.
- Remove air conditioner compressor with refrigerant lines connected, and tie it up on the right side.

### Continued for all vehicles

- Disconnect electrical connector -1-.
- Unscrew bolt -2- and remove knock sensor 1 - G61- .

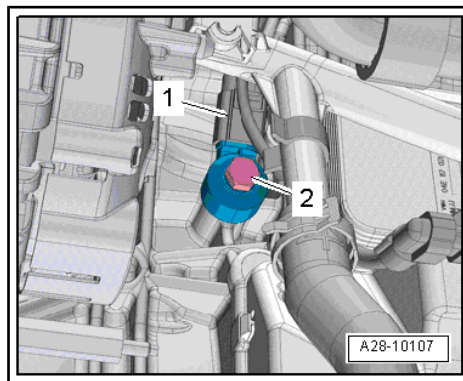
### Installing

Install in reverse order of removal. The following should be observed:

- Install air conditioner compressor ⇒ Rep. gr. 87 ; Air conditioner compressor; Removing and installing air conditioner compressor .

### Torque settings

- ◆ ⇒ [“1.1 Assembly overview - ignition system”, page 348](#)



## 1.4 Removing and installing Hall sender

⇒ [“1.4.1 Removing and installing Hall sender G40 ”, page 352](#)

⇒ [“1.4.2 Removing and installing Hall sender 3 G300 ”, page 353](#)

### 1.4.1 Removing and installing Hall sender - G40-

#### Removing

Overview of fitting locations

⇒ [“1.1 Overview of fitting locations - injection system”, page 291](#) .

Assembly overview - ignition system

⇒ [“1.1 Assembly overview - ignition system”, page 348](#) .



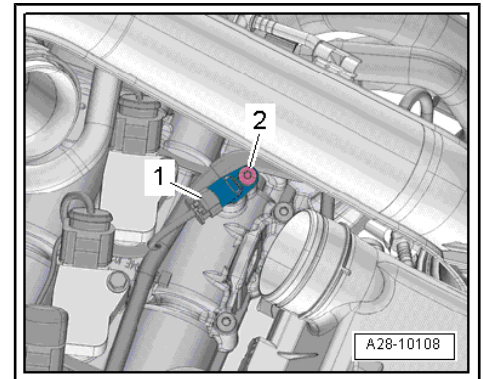
- Remove resonator for intake air  
⇒ [“3.3 Removing and installing resonator for intake air”, page 309](#) .
- Disconnect electrical connector -1-.
- Unscrew bolt -2- and remove Hall sender - G40- .

#### Installing

- Install in reverse order of removal. The following should be observed:

#### Specified torques

- ◆ ⇒ [“1.1 Assembly overview - ignition system”, page 348](#)



## 1.4.2 Removing and installing Hall sender 3 - G300-

#### Removing

Overview of fitting locations

⇒ [“1.1 Overview of fitting locations - injection system”, page 291](#) .

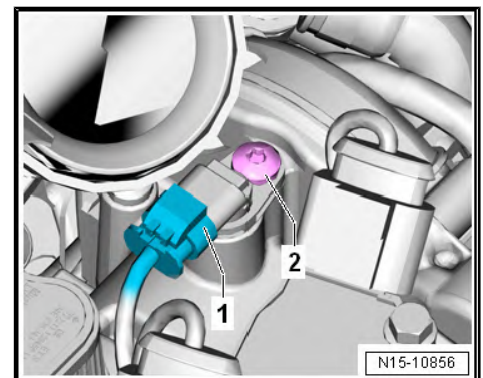
Assembly overview - ignition system

⇒ [“1.1 Assembly overview - ignition system”, page 348](#) .

- Remove resonator for intake air  
⇒ [“3.3 Removing and installing resonator for intake air”, page 309](#) .
- Disconnect electrical connector -1-.
- Unscrew bolt -2- and remove Hall sender 3 - G300- .

#### Installing

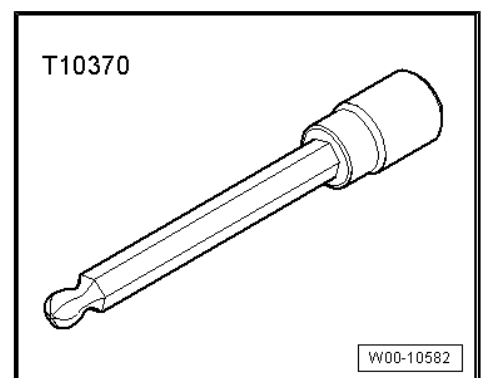
- Install in reverse order of removal.
- Specified torque  
⇒ [“1.1 Assembly overview - ignition system”, page 348](#)



## 1.5 Removing and installing engine speed sender - G28-

Special tools and workshop equipment required

- ◆ Socket, 4 mm - T10370-





## Removing

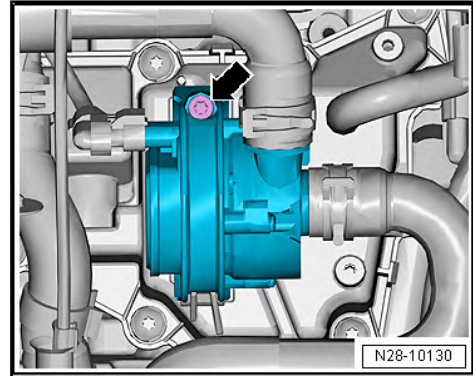
Overview of fitting locations

⇒ [“1.1 Overview of fitting locations - injection system”, page 291](#) .

Assembly overview - ignition system

⇒ [“1.1 Assembly overview - ignition system”, page 348](#) .

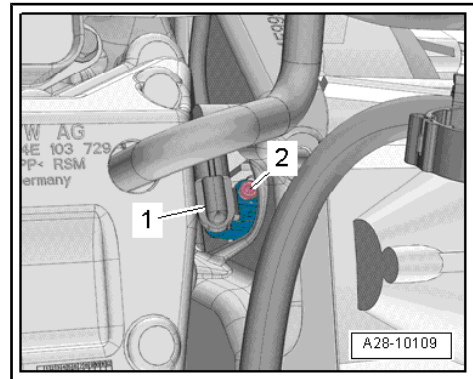
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation .
- Unscrew bolt -arrow- and push charge air cooling pump - V188- to one side.



- Disconnect electrical connector -1-.
- Unscrew bolt -2- and remove engine speed sender - G28- .

## Installing

- Install in reverse order of removal. The following should be observed:
- Carefully insert the engine speed sender - G28- into the hole. This will prevent the engine speed sender - G28- from falling between engine and gearbox.
- Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation .



## Torque settings

- ◆ ⇒ [“1.1 Assembly overview - ignition system”, page 348](#)
- ◆ ⇒ [“2.2 Assembly overview - electric coolant pump”, page 234](#)