



## Workshop Manual Golf 2004 > Golf Plus 2005 >

### 4-cylinder diesel engine (1.9 l engine)

Engine ID	BJB	BKC	BRU	BLS	BXE	BXF	BXJ		
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Edition 01.2009





## List of Workshop Manual Repair Groups

### Repair Group

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

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## 00 – Technical data

### 1 Technical data

Engine number ⇒ [page 1](#)

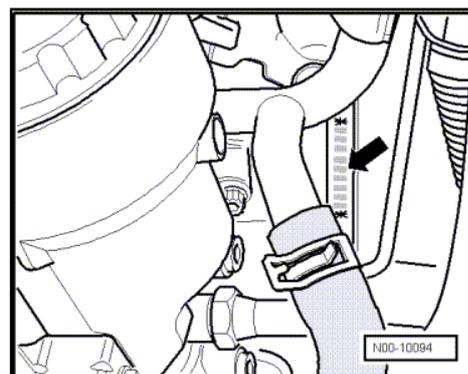
Engine data ⇒ [page 1](#)

#### 1.1 Engine number

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

Additionally there is a sticker on the toothed belt guard with “engine code” and “serial number”.

The engine code is also included on the vehicle data sticker.



#### 1.2 Engine data

Engine code	BJB	BKC	BRU	BLS	BXE	BXF	BXJ
Manufactured	10.03 ▶	10.03 ▶	04.04 ▶	02.06 ▶	03.06	03.06	11.07
Emissions fulfil	EU3 standard	EU4 standard	EU4 standard	EU4 standard	EU4 standard	EU4 standard	EU4 standard
Capacity l	1.9	1.9	1.9	1.9	1.9	1.9	1.9
Output kW at rpm	77/ 4000	77/ 4000	66/ 4000	77/ 4000	77/ 4000	66/ 4000	66/ 4000
Torque Nm at rpm	250/ 1900	250/ 1900	210/ 1800...250 0	250/ 1900	250/ 1900	210/ 1800	210/ 1800...250 0
Bore Ø mm	79.5	79.5	79.5	79.5	79.5	79.5	79.5
Stroke mm	95.5	95.5	95.5	95.5	95.5	95.5	95.5
Valves per cylinder	2	2	2	2	2	2	2
Compression ratio	19.0	19.0	19.0	18.5	18.5	19.0	19.0
Fuel according to	DIN EN 590	DIN EN 590	DIN EN 590	DIN EN 590	DIN EN 590	DIN EN 590	DIN EN 590
Firing order	1-3-4-2	1-3-4-2	1-3-4-2	1-3-4-2	1-3-4-2	1-3-4-2	1-3-4-2
Catalytic converter	yes	yes	yes	yes	yes	yes	yes
Exhaust gas recirculation	yes	yes	yes	yes	yes	yes	yes
Turbocharging/supercharging	yes	yes	yes	yes	yes	yes	yes
Charge air cooler	yes	yes	yes	yes	yes	yes	yes
Particulate filter	no	no	no	yes	no	no	no



## 10 – Removing and installing engine

### 1 Removing and installing engine

Removing engine ⇒ [page 2](#)

Securing engine to assembly stand ⇒ [page 7](#)

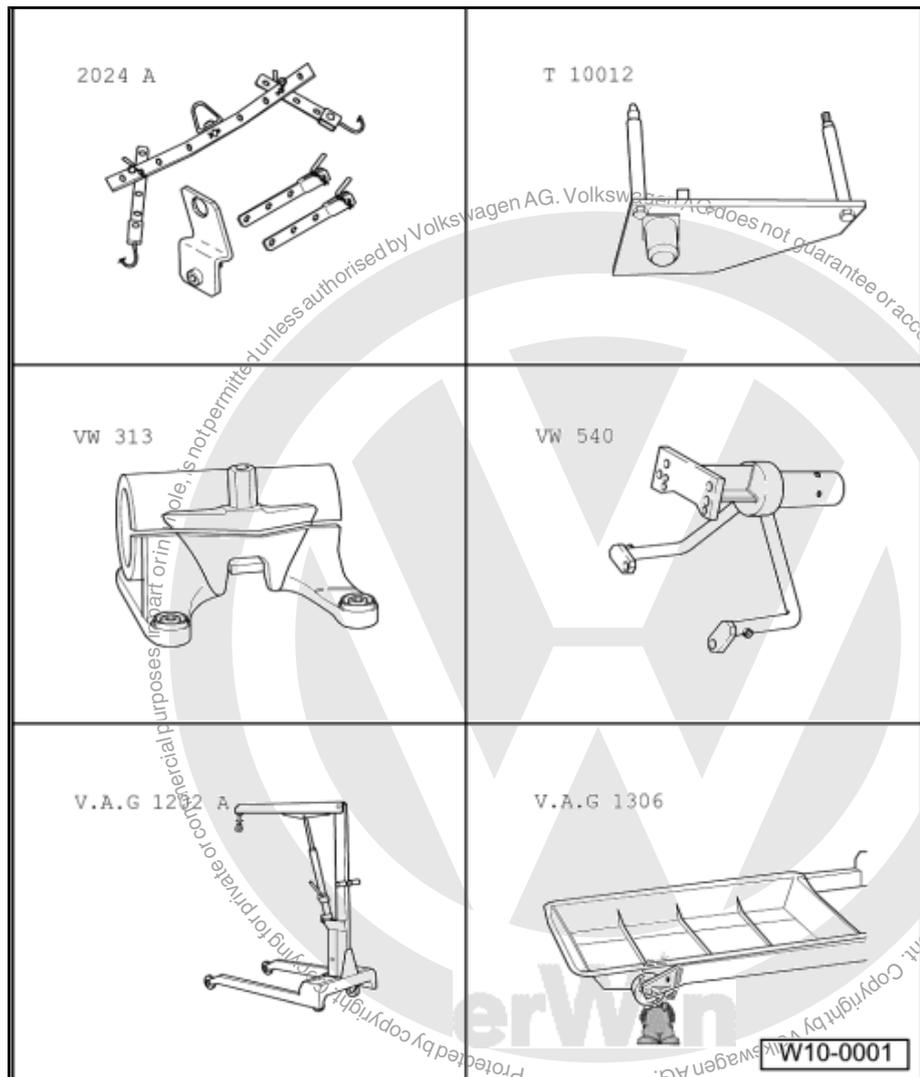
Notes on installing ⇒ [page 7](#) .

Assembly mountings ⇒ [page 10](#) .

#### 1.1 Removing engine

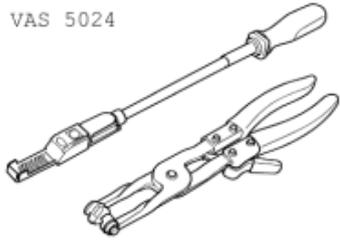
##### Special tools and workshop equipment required

- ◆ Lifting tackle -2024 A-
- ◆ Engine bracket -T10012-
- ◆ Support clamp -VW 313-
- ◆ Engine and gearbox support -VW 540-
- ◆ Workshop crane -V.A.G 1202 A-
- ◆ Drip tray -V.A.G 1306-





- ◆ Torque wrench -V.A.G 1331-
- ◆ Torque wrench -V.A.G 1332-
- ◆ Engine and gearbox jack - V.A.G 1383 A-
- ◆ Spring-type clip pliers -VAS 5024-
- ◆ Stepladder -VAS 5085-
- ◆ Guide rods -T10093-
- ◆ Cable ties

V.A.G 1331 	V.A.G 1332 
V.A.G 1383 A 	VAS 5024 
VAS 5085 	W10-0058



**Note**

- ◆ *Before carrying out further work, disconnect battery earth strap. First check whether a coded radio is fitted. Obtain anti-theft coding first if necessary.*
- ◆ *The engine is removed downwards together with the gearbox.*
- ◆ *All cable ties which are opened or cut through when engine is removed must be replaced in the same position when engine is installed.*





## WARNING

*When doing any repair work, especially in the engine compartment, pay attention to the following due to the cramped conditions:*

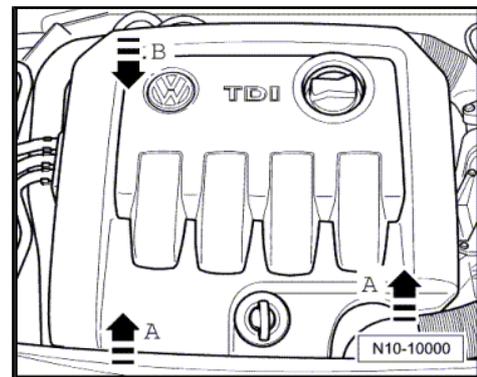
- ◆ *Route all the various lines (e.g. for fuel, hydraulics, activated charcoal filter system, coolant, refrigerant, brake fluid and vacuum) and electrical wiring in their original positions.*
- ◆ *Ensure that there is sufficient clearance to all moving or hot components.*

## Procedure

- With ignition switched off, disconnect earth strap from battery.

### One-piece engine cover

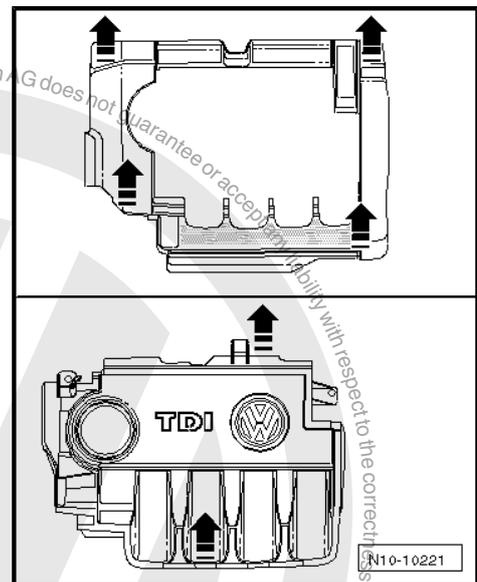
For one-piece engine cover, pull engine cover abruptly upwards at front and right -arrows A-, then pull forwards out of rear fastening -arrow B-.



### Two-piece engine cover

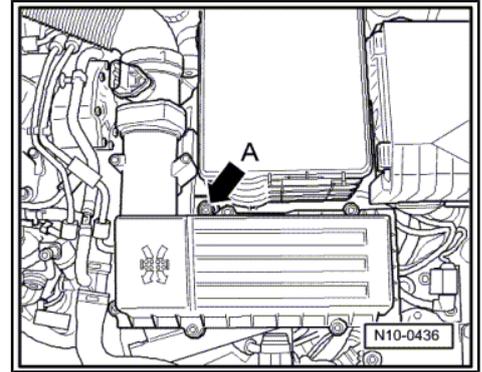
For two-piece engine cover, first pull outer engine cover abruptly upwards at -arrows-, then pull inner engine cover abruptly upwards at -arrows-.

- Remove plenum chamber bulkhead. ⇒ General body repairs, exterior; Rep. Gr. 50 ; Body - front, plenum chamber bulkhead .
- Remove air filter housing with air mass meter and connecting pipe.





- Remove bolt -arrow A- and pull air filter housing upwards out of mounting.
- Remove battery and battery tray.
- Disconnect fuel supply and return lines as well as coolant line on cylinder head.



#### WARNING

- ◆ **The fuel and the fuel lines in the fuel system can become very hot (danger of scalding)!**
- ◆ **The fuel system is also under pressure! Before opening the system, place cloths around the connections. Then carefully loosen connection to release the pressure!**
- ◆ **Wear eye and hand protection when performing any type of repair work on the fuel system!**

- Remove insulation tray ⇒ General body repairs, exterior; Rep. Gr. 50 ; Body - front; Assembly overview
- Bring lock carrier into service position ⇒ General body repairs, exterior; Rep. Gr. 50 ; Body - front; Lock carrier - service position .
- Drain coolant ⇒ [page 102](#) .

#### Vehicles with air conditioner



#### Note

*To prevent damage to condenser or to refrigerant lines/hoses, ensure that the lines and hoses are not stretched, kinked or bent.*

To facilitate removing and installing engine without opening refrigerant circuit:

- Remove poly V-belt ⇒ [page 13](#)
- Remove air conditioner compressor ⇒ Heating, air conditioning; Rep. Gr. 87 ; Removing and installing compressor bracket .
- Secure air conditioner compressor to lock carrier so that refrigerant lines are free of stress.
- Remove alternator ⇒ Electrical system; Rep. Gr. 27 ; Removing and installing alternator and poly V-belt .

#### Continuation for all vehicles

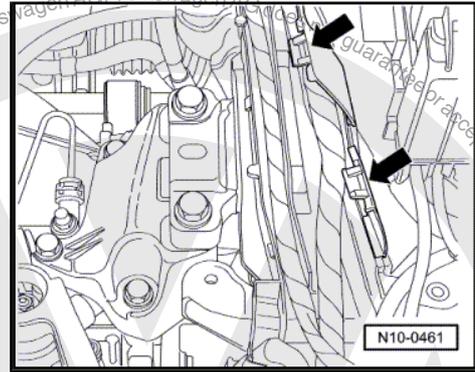
- Remove connecting pipes between charge air cooler and engine.
- Unbolt left and right-hand drive shafts from gearbox ⇒ Running gear, axles, steering; Rep. Gr. 40 ; Removing and installing drive shaft .
- Remove front exhaust pipe ⇒ [page 186](#) .
- Release connectors on engine control unit and pull them off.



- Open all cable guide fasteners -arrows-.
- Remove wiring harness from cable guide on longitudinal member and lay to side on engine.
- Pull off or disconnect all other electrical connections from engine and gearbox as necessary and lay to side.
- Separate all connecting, coolant, vacuum and intake hoses from engine.

#### Vehicles with manual gearbox

- Remove slave cylinder for hydraulic clutch ⇒ 6-speed manual gearbox 02S; Rep. Gr. 30 ; Repairing clutch mechanism; Assembly overview - hydraulics .
- Unbolt gear selector mechanism from gearbox. ⇒ 6-speed manual gearbox 02S; Rep. Gr. 34 ; Repairing selector mechanism .



#### Vehicles with four-wheel drive:

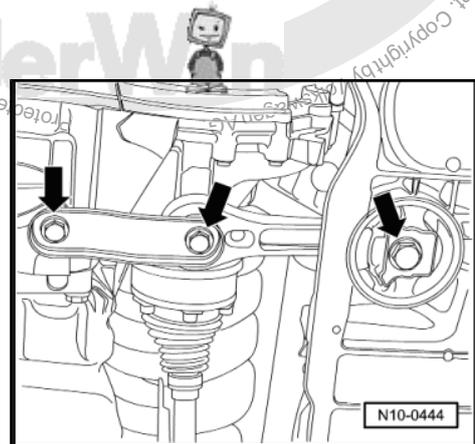
- Remove selector mechanism from gearbox ⇒ 6-speed manual gearbox 02Q, four-wheel drive; Rep. Gr. 34 ; Repairing selector mechanism .
- Separate pressure line for hydraulic clutch control.
- Remove front propshaft ⇒ Final drive 02D, 0AV; Rep. Gr. 39 ; Assembly overview - repairing propshaft .

#### Continuation for all vehicles:

- Unbolt pendulum support -arrows-.

#### Vehicles with particulate filter

- Remove subframe ⇒ Running gear, axles, steering; Rep. Gr. 40 ; Removing and installing subframe .
- Remove right drive shaft ⇒ Running gear, axles, steering; Rep. Gr. 40 ; Removing and installing drive shafts .
- Remove steering box ⇒ Running gear, axles, steering; Rep. Gr. 48 ; Removing and installing steering box .



#### Continuation for all vehicles:

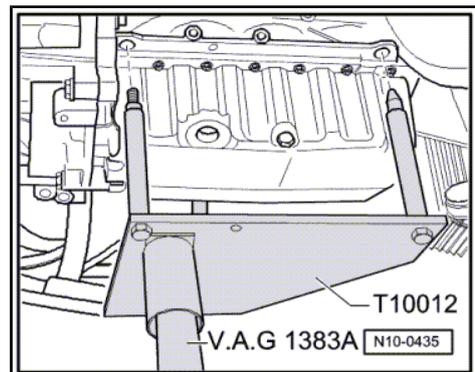
- Insert engine bracket -T10012- in engine and gearbox jack -V.A.G 1383 A- .



#### Note

*Support pins must be secured to engine bracket -T10012- as shown.*

- Fit engine bracket -T10012- to cylinder block with M10 x 25/ 8.8 bolt and tighten to approx. 40 Nm.
- Raise engine and gearbox slightly using engine and gearbox jack -V.A.G 1383 A- .

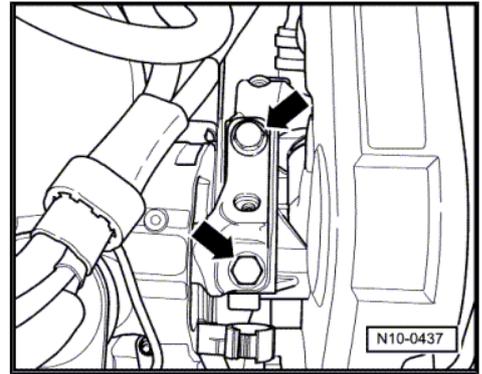




- Unbolt assembly mounting on engine side from engine bracket -arrows-

**i** Note

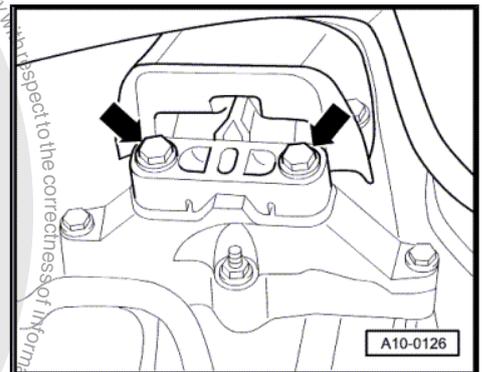
To remove securing bolts, use stepladder -VAS 5085- .



- Unbolt assembly mounting on gearbox side from gearbox bracket -arrows-
- Carefully lower engine with gearbox.

**i** Note

Engine with gearbox must be guided carefully when lowered to prevent damage to bodywork.



## 1.2 Securing engine to assembly stand

When working on the engine, secure it to support clamp -VW 313- of the assembly stand using engine and gearbox support -VW 540- .

### Procedure

- Disconnect gearbox.
- Attach lifting tackle -2024 A- as shown and raise engine out of engine and gearbox jack -V.A.G 1383 A- using workshop hoist -V.A.G 1202 A- .

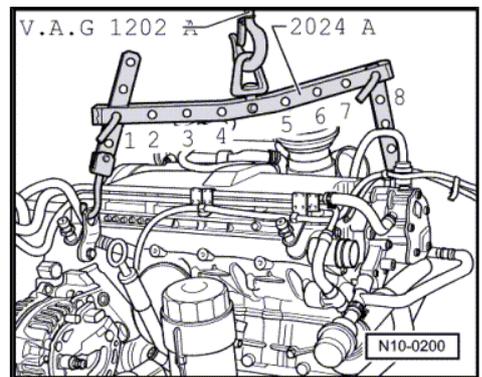
Pulley end: 2nd hole in hook rail at position 1

Flywheel end: 4th hole in hook at position 8



### WARNING

*The hooks and locating pins must be secured with locking pins.*



**i** Note

- ◆ The positions marked 1...4 on the bar must be towards the pulley end.
- ◆ The holes in the hook rails are counted up from the hook.
- Secure engine on support clamp -VW 313- using engine and gearbox jack -VW 540- .

## 1.3 Notes on installing

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



- Check clutch release bearing for wear and renew if necessary.
- Lubricate splines of input shaft lightly with G 000 100.
- Check whether dowel sleeves for centring engine and gearbox are in cylinder block and install if necessary.

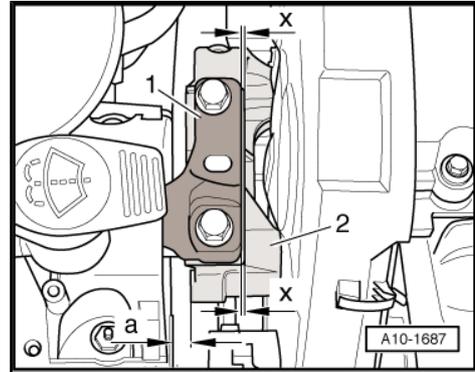
When installing engine, ensure correct position of assembly mountings:

- On belt pulley side, ensure that there is a distance -a- of at least 10 mm between engine support and right longitudinal member.
- The side surface of the engine support -2- should be located parallel to the support arm -1-. Dimension -x- must be identical at top and bottom.



**Note**

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

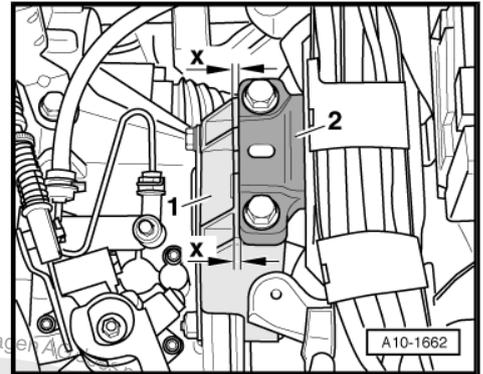




- Ensure that the edges of the support arm on the gearbox assembly mounting -2- and gearbox support -1- are parallel. Dimension -x- must be identical at top and bottom.

**i Note**

- ◆ *Torque specifications for assembly mounting* ⇒ [page 10](#) .
- ◆ *Electrical connections and routing.* ⇒ *Electrical system; Rep. Gr. 97*



- Install pendulum support.
- Install drive shafts ⇒ Running gear, axles, steering; Rep. Gr. 40 ; Removing and installing drive shafts .
- Install front exhaust pipe ⇒ [page 186](#) .

**Vehicles with manual gearbox**

- Install slave cylinder for hydraulic clutch ⇒ 6-speed manual gearbox 02S; Rep. Gr. 30 ; Repairing clutch mechanism; Assembly overview - hydraulics .
- Remove selector mechanism from gearbox ⇒ 6-speed manual gearbox 02S; Rep. Gr. 34 ; Repairing selector mechanism .

**Vehicles with four-wheel drive:**

- Install selector mechanism on gearbox ⇒ 6-speed manual gearbox 02Q, four-wheel drive; Rep. Gr. 34 ; Repairing selector mechanism .
- Install pressure line for hydraulic clutch control.
- Install front propshaft ⇒ Final drive 02D, 0AV; Rep. Gr. 39 ; Assembly overview - repairing propshaft .

**Continuation for all vehicles:**

- On vehicles with particulate filter install subframe ⇒ Running gear, axles, steering; Rep. Gr. 40
- Install alternator ⇒ Electrical system; Rep. Gr. 27 ; Removing and installing alternator and poly V- belt .
- Install air conditioner compressor ⇒ Heating, air conditioning; Rep. Gr. 87 ; Removing and installing compressor bracket.
- Install poly V-belt ⇒ [page 13](#) .
- Install insulation tray ⇒ General body repairs, exterior; Rep. Gr. 50 ; Body - front; Assembly overview.
- Install engine control unit ⇒ [page 178](#) .
- Install plenum chamber bulkhead ⇒ General body repairs, exterior; Rep. Gr. 50 ; Body - front; Plenum chamber bulkhead .
- Fill cooling system with coolant ⇒ [page 102](#) .
- Carry out road test and then read fault memory ⇒ [page 178](#) .



## Specified torques

Threaded connection		Specified torque
Bolts, nuts	M6	10 Nm
	M8	20 Nm
	M10	45 Nm
	M12	60 Nm

## 1.4 Assembly mountings

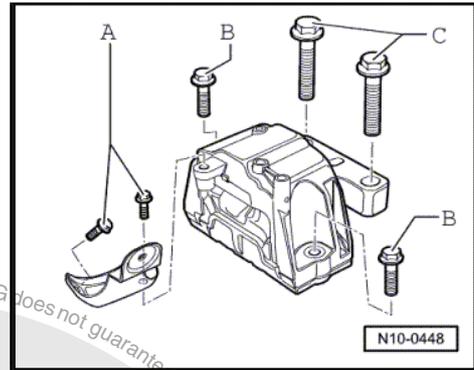
### Engine assembly mounting

A = 20 Nm + 90° (1/4 turn) further <sup>1)</sup>

B = 40 Nm + 90° (1/4 turn) further <sup>1)</sup>

C = 60 Nm + 90° (1/4 turn) further <sup>1)</sup>

<sup>1)</sup> Renew

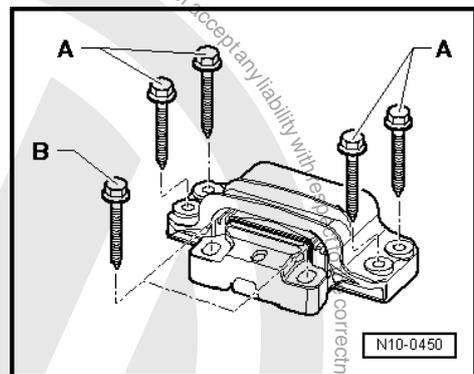


### Gearbox assembly mounting

A = 40 Nm + 90° (1/4 turn) further <sup>1)</sup>

B = 60 Nm + 90° (1/4 turn) further <sup>1)</sup>

<sup>1)</sup> Renew





## Pendulum support

Always note the size and strength class of bolt. Different specified torques are valid.

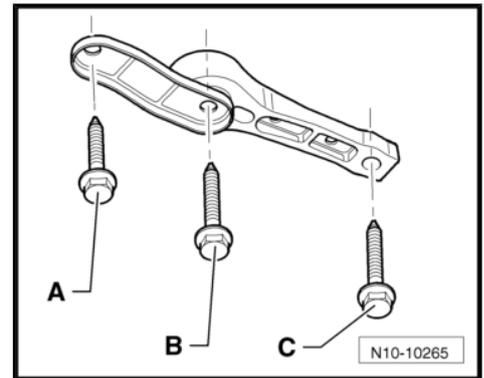


### Caution

*From model year 08, in manual gearboxes 02Q Heli Coil inserts are installed in the threaded connections to pendulum support. Difference  $\Rightarrow$  Rep. Gr. 34*

*For these and all other gearboxes bolts with strength class 10.9 must be used.*

*If Heli Coil inserts are not fitted in manual gearboxes 02Q, use bolts with strength class 8.8 and the specified torques.*



Bolt -A-

M10 x 35 strength class 8.8: turn 40 Nm + 90° further

M10 x 35 strength class 10.9: turn 50 Nm + 90° further

Always renew after removing

Bolt -B-

M10 x 75 strength class 8.8: turn 40 Nm + 90° further

M10 x 75 strength class 10.9: turn 50 Nm + 90° further

Always renew after removing

Bolt -C-

M14 x 1.5 x 70

100 Nm + turn 90° further

Tighten only if pendulum support is bolted to gearbox

Always renew after removing



## 13 – Crankshaft group

### 1 Dismantling and assembling engine

Assembly overview - poly V-belt drive ⇒ [page 12](#)

Removing and installing poly V-belt ⇒ [page 13](#)

Assembly overview - toothed belt drive ⇒ [page 15](#)

Assembly overview - crankcase ⇒ [page 19](#)



#### Note

*If large quantities of metal particles or other deposits (caused, for example, by partial seizure of the crankshaft or conrod bearings) are found in the engine oil when making repairs, clean the oil passages thoroughly and renew the engine oil cooler in order to prevent further damage from occurring later.*

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

##### 1 - Belt pulley and vibration damper

- Can only be installed in one position, holes are offset.

##### 2 - 25 Nm

##### 3 - Alternator

##### 4 - Bracket

- For alternator and air conditioner compressor.

##### 5 - Poly V-belt tensioning element

- Swing with ring spanner to slacken poly V-belt.

##### 6 - 25 Nm

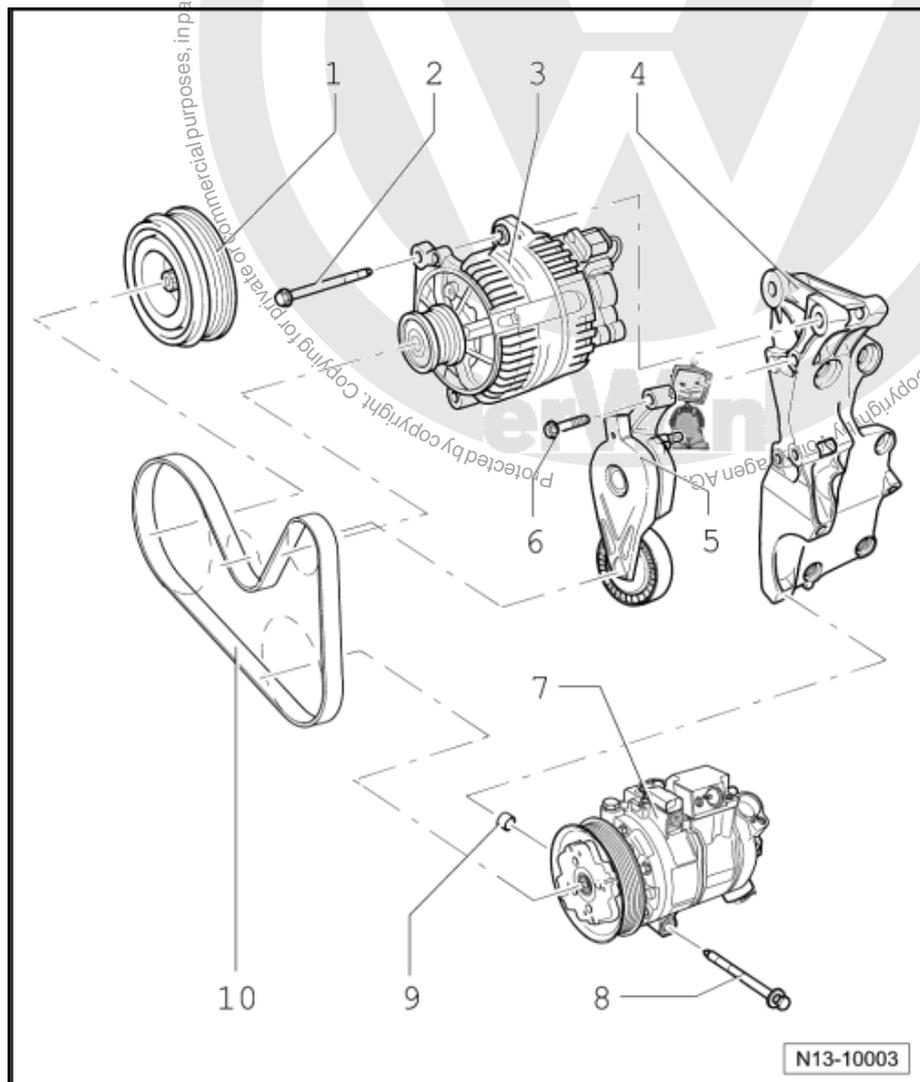
##### 7 - Air conditioner compressor

##### 8 - 25 Nm

##### 9 - Dowel sleeves

##### 10 - Poly V-belt

- Mark direction of rotation before removing.
- Check for wear.
- Do not kink.
- Removing and installing ⇒ [page 13](#).

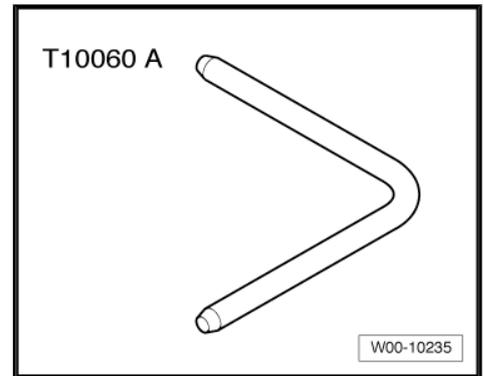




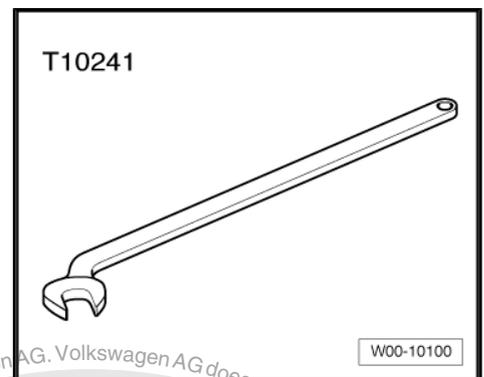
## 1.2 Removing and installing poly V-belt

### Special tools and workshop equipment required

- ◆ Locking pin -T10060 A-



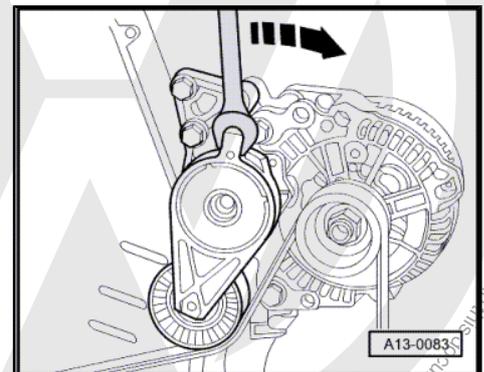
- ◆ 16 mm open-end spanner -T 10241-



### 1.2.1 Removing poly V-belt

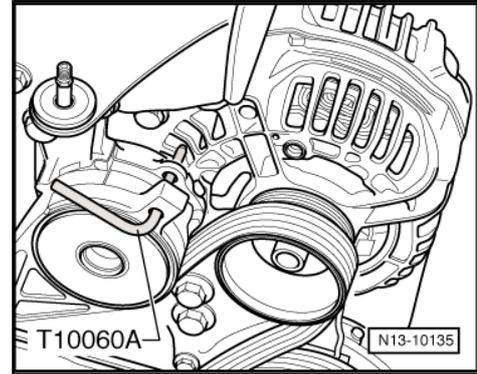
- Remove insulation tray. ⇒ General body repairs, exterior; Rep. Gr. 50 ; Body - front; Assembly overview .
- Pull fuel filter out of bracket and lay it with hoses to side.
- Mark direction of rotation of poly V-belt.
- Swing tensioning element in direction of arrow to remove tension from poly V-belt.

The open-end spanner 16 mm -T 10241- is particularly well suited to relieve tension.





- Lock tensioning element in position with locking pin -T10060 A- .
- Remove poly V-belt.



## 1.2.2 Installing poly V-belt

- Installation is carried out in the reverse sequence of removal.



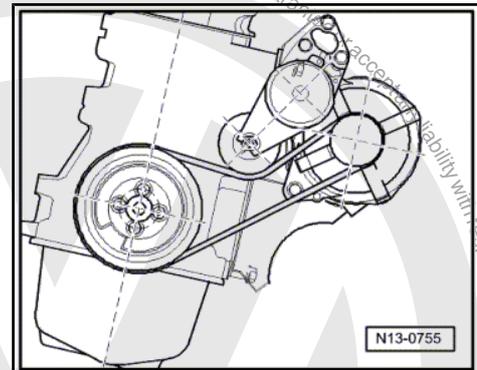
### Note

- ◆ Before installing poly V-belt, ensure that all ancillaries (alternator, air conditioner compressor) are secured tightly.
- ◆ When fitting poly V-belt, check direction of belt rotation and ensure proper seating of belt in pulleys.
- ◆ Lastly, place poly V-belt over alternator.

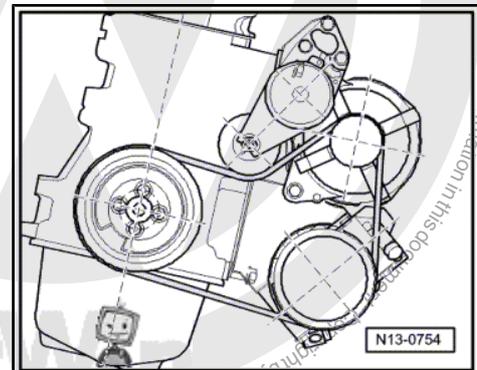
After completing repairs always:

- Start engine and check belt running.

### Belt drive without air conditioner compressor



### Belt drive with air conditioner compressor





### 1.3 Assembly overview - toothed belt drive

1 - Toothed belt guard upper part

2 - 100 Nm

3 - 25 Nm

4 - Camshaft pulley

5 - Hub

- With sender wheel
- Use counterhold tool - T10051- to loosen and tighten.
- To remove, use puller - T10052-
- Removing and installing ⇒ [page 80](#), removing and installing camshaft.

6 - 10 Nm

- Renew

7 - Stud

- 15 Nm

8 - Rear toothed belt guard

9 - 25 Nm

10 - Sealing grommet

- Renew if damaged.

11 - 20 Nm + 1/8 turn (45°) further

12 - Tensioning roller

- Remove engine support in order to remove and install ⇒ [page 16](#).

13 - 20 Nm

14 - Idler roller

15 - Coolant pump

- Removing and installing ⇒ [page 106](#).

16 - Crankshaft toothed belt pulley

17 - 120 Nm + 1/4 turn (90°) further

- Renew
- Use counterhold tool -3099- to loosen and tighten.
- Do not additionally oil or grease thread and shoulder.
- Turning further can be done in several stages.

18 - 15 Nm

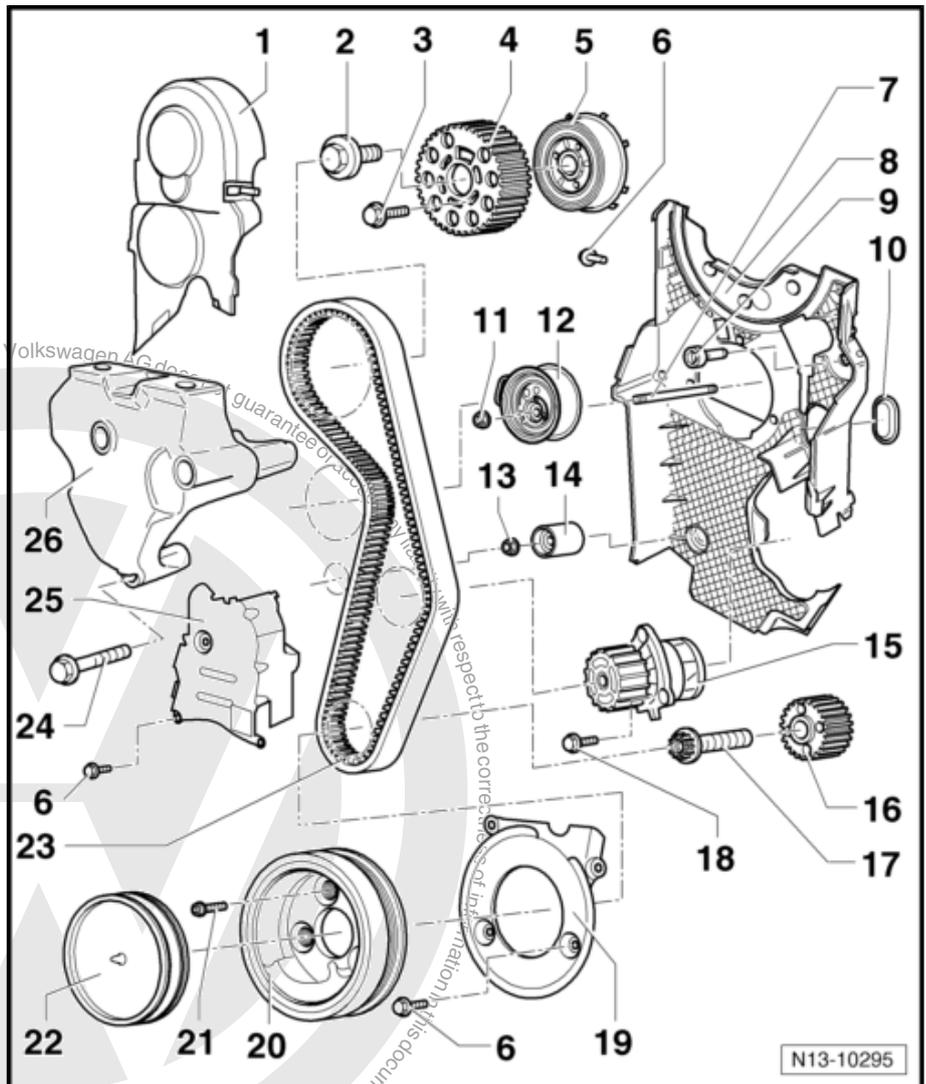
19 - Toothed belt guard lower part

20 - Belt pulley and vibration damper

- Can only be installed in one position, holes are offset.

21 - 10 Nm + 1/4 turn (90°) further

- Renew



N13-10295



## 22 - Cover

## 23 - Toothed belt

- Mark direction of rotation before removing.
- Check for wear.
- Do not kink.
- Removing, installing and tensioning ⇒ [page 50](#) .

## 24 - 40 Nm + 1/2 turn (180°) further

- Renew

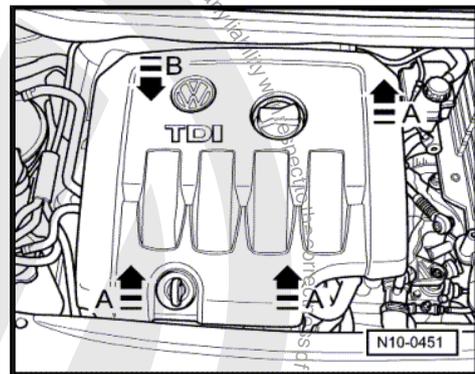
## 25 - Toothed belt guard centre part

## 26 - Engine bracket

### 1.3.1 Removing and installing engine support

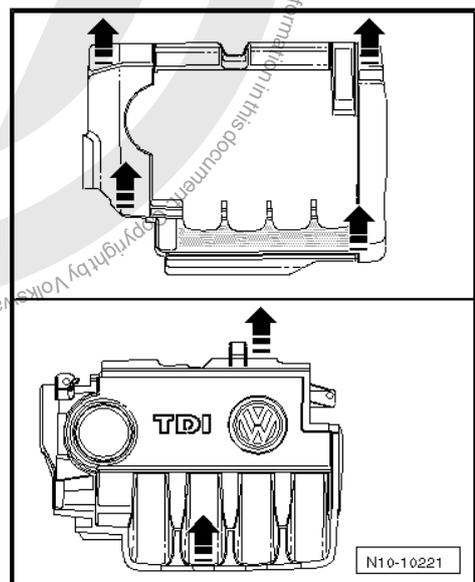
#### Special tools and workshop equipment required

- ◆ Support bracket -10 - 222 A-
- ◆ Torque wrench -V.A.G 1331-
- Remove engine cover
- To do this, pull engine cover upwards abruptly at front and right -arrows A- and then pull forwards out of rear fastening -arrow B-



#### Two-piece engine cover

For two-piece engine cover, first pull outer engine cover abruptly upwards at -arrows-, then pull inner engine cover abruptly upwards at -arrows-.

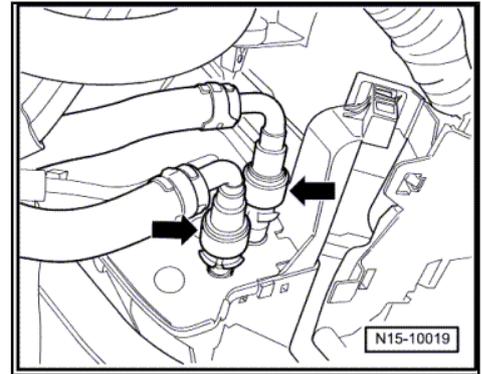




- Separate push-on connectors of fuel lines -arrows-.

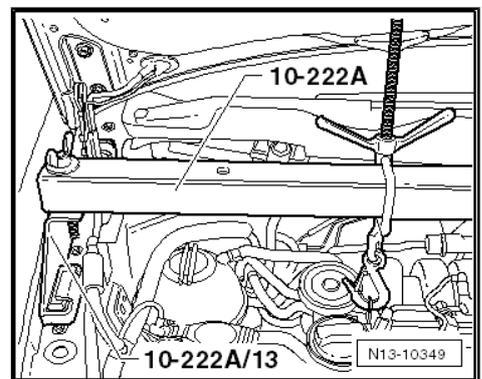
**i** Note

- ◆ Do this by pressing in catch of push-on connectors.
- ◆ Ensure that no fuel escapes (use a cloth).
- Lay fuel filter with hoses to side.
- Disconnect coolant hose from top of expansion tank.
- Remove expansion tank and lay it to side.
- Remove charge air pipe between charge air cooler and turbo-charger.
- Carefully cover or seal open ends.



**Golf, Golf Plus and Touran:**

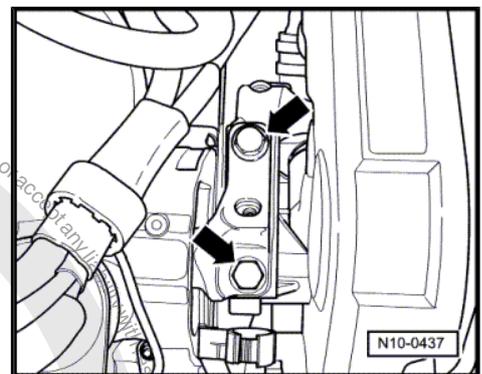
- Fit engine support bracket -10-222A- with adapters -10-222A/13- and take up weight of engine in installation position.



- Remove securing bolts from assembly mounting/engine support -arrows- and remove complete assembly mounting.

**i** Note

- ◆ The assembly mounting may only be removed if the engine is supported with support bracket 10-222A!
- ◆ The engine support must only be loosened when the assembly mounting has been removed.



**WARNING**

**When raising and lowering engine using support bracket -10-222A-, ensure that no components or hoses are damaged or torn off.**

- Remove noise insulation tray => General body repairs, exterior; Rep. Gr. 50 ; Body - front; Assembly overview - noise insulation .
- Remove front right wheel housing liner.





- Raise engine with support bracket -10-222A- until both upper bolts of engine support can be loosened and removed.
- Lower engine with support bracket -10-222A- until lower bolt can be loosened and removed.
- Remove engine support upwards.

### Installing

- Position engine support from above on cylinder block.
- Insert new bolts and tighten hand-tight.



### Caution

**The tightening sequence and specified torques for the engine support securing bolts must always be followed. Otherwise the engine support can be stressed and it can break.**

- Tighten bolts for engine support in the sequence shown -1...3- to 40 Nm + 1/2 turn (180 °) further. To do this, raise or lower engine using support bracket -10 - 222 A- .

I : Engine support with less clearance to engine

II: Engine support with greater clearance to engine



### Note

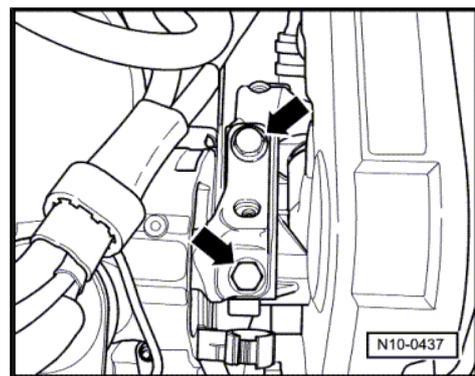
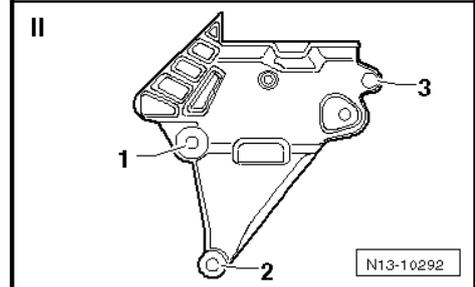
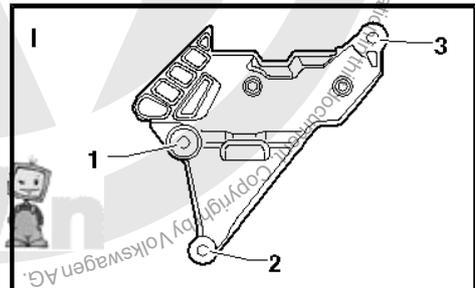
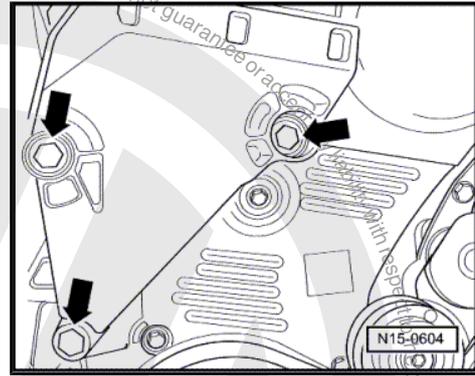
*Before installing assembly mounting, tighten all engine support bolts to prescribed torque.*

- Install assembly mounting between engine and body, renew securing bolts ⇒ [page 10](#) .

- Bolt engine assembly mounting to engine support -arrows- by bringing contact surfaces together using support bracket -10-222A- . Specified torque: 60 Nm + 90° (1/4 turn) further.

Further assembly is basically the reverse of the dismantling sequence. In the process, note the following:

- ◆ Ensure that fuel hose connections are tight.
- ◆ Do not interchange supply line and return line (return line blue or with blue marking, supply line black).
- ◆ When installing charge air pipes, ensure that locking lugs engage correctly.
- Install wheel housing liner.
- Install noise insulation tray ⇒ General body repairs, exterior; Rep. Gr. 50 ; Body - front; Assembly overview - noise insulation





## 1.4 Assembly overview - crankcase

### 1 - Cylinder block

- Removing and installing sealing flange and fly-wheel ⇒ [page 20](#) .
- Removing and installing crankshaft ⇒ [page 33](#)
- Dismantling and assembling pistons and con-rods ⇒ [page 33](#)

### 2 - Gasket

- Renew

### 3 - Oil filter bracket

- Dismantling and assembling ⇒ [page 92](#) .

### 4 - 15 Nm + 1/4 turn (90°) further

- Renew
- First fit upper left and lower right bolts and then tighten all four bolts diagonally.

### 5 - Bracket

### 6 - 20 Nm

### 7 - Connection

- For thermostat.

### 8 - 15 Nm

### 9 - O-ring

- Renew

### 10 - Thermostat

- Removing and installing ⇒ [page 108](#) .
- Observe installation position ⇒ [page 108](#) , removing and installing thermostat.
- Check: Heat thermostat in water
- Opening begins at approx. 85 °C
- Ends at approx. 105 °C
- Opening lift at least 7 mm.

### 11 - Hexagon bolt

- Tightening sequence and torque specifications ⇒ Heating, air conditioning; Rep. Gr. 87; Removing and installing compressor bracket .

### 12 - Bracket

- For alternator, if air conditioner compressor is fitted

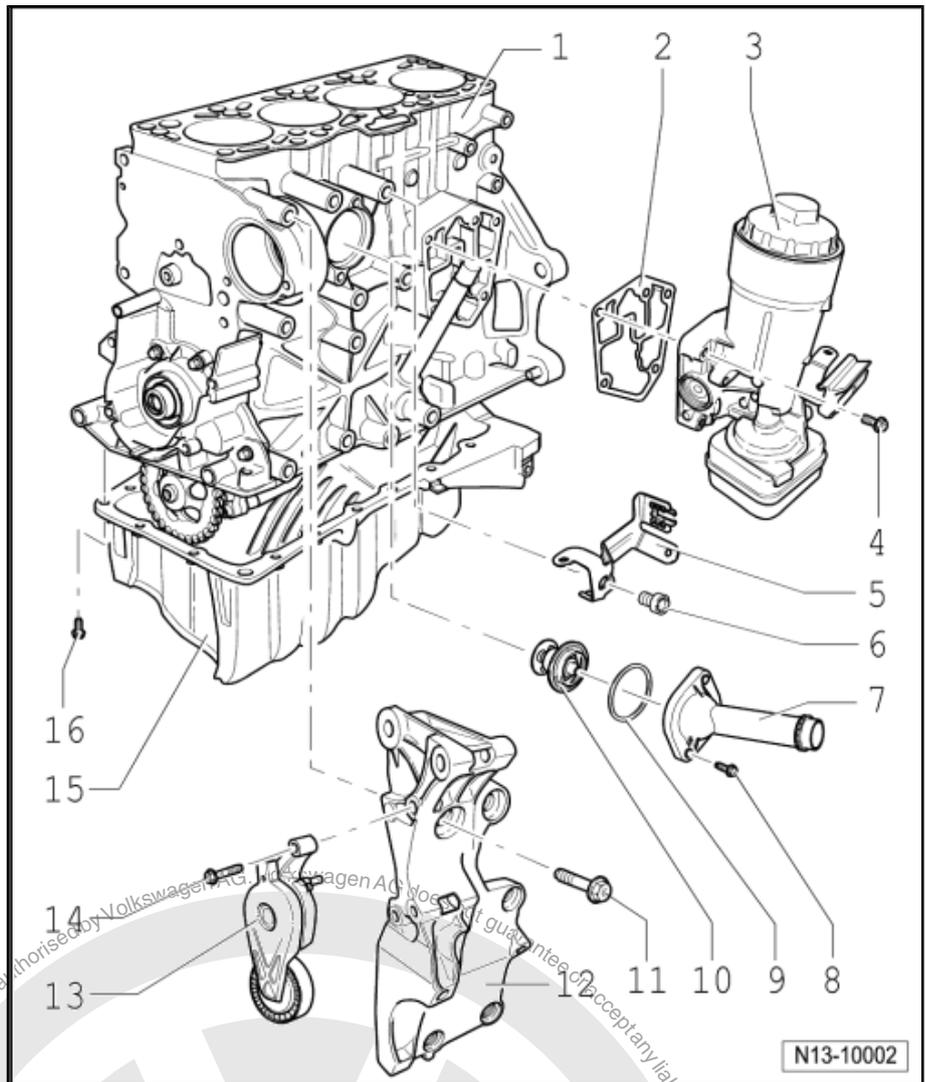
### 13 - Poly V-belt tensioning element

### 14 - 25 Nm

### 15 - Sump

- Clean sealing surface before fitting.
- Install with silicone sealant -D 176 404 A2- .

### 16 - 15 Nm





## 2 Removing and installing sealing flange and flywheel

Assembly overview - sealing flange and flywheel ⇒ [page 20](#)

Removing and installing engine speed sender ⇒ [page 31](#)

Renewing crankshaft oil seal - pulley end ⇒ [page 21](#) .

Removing and installing sealing flange - pulley end  
⇒ [page 21](#) .

Renewing crankshaft sealing flange - flywheel end ⇒ [page 25](#) .

### 2.1 Assembly overview - sealing flanges and flywheel



#### Note

Repairing clutch ⇒ 6-speed manual gearbox 02S; Rep. Gr. 30 ; Repairing clutch.

#### 1 - Seal

- Do not additionally oil or grease the oil seal sealing lip.
- Before installing, remove oil residue from crankshaft journal using a clean cloth.
- Renewing crankshaft oil seal - pulley end  
⇒ [page 21](#) .

#### 2 - Sealing flange

- Must be positioned on dowel sleeves.
- Removing and installing  
⇒ [page 23](#) .
- Install with silicone sealant -D 176 404 A2-  
⇒ [page 23](#) .

#### 3 - Cylinder block

- Removing and installing crankshaft ⇒ [page 33](#)
- Dismantling and assembling pistons and con-rods ⇒ [page 33](#)

#### 4 - 60 Nm + 1/4 turn (90°) further

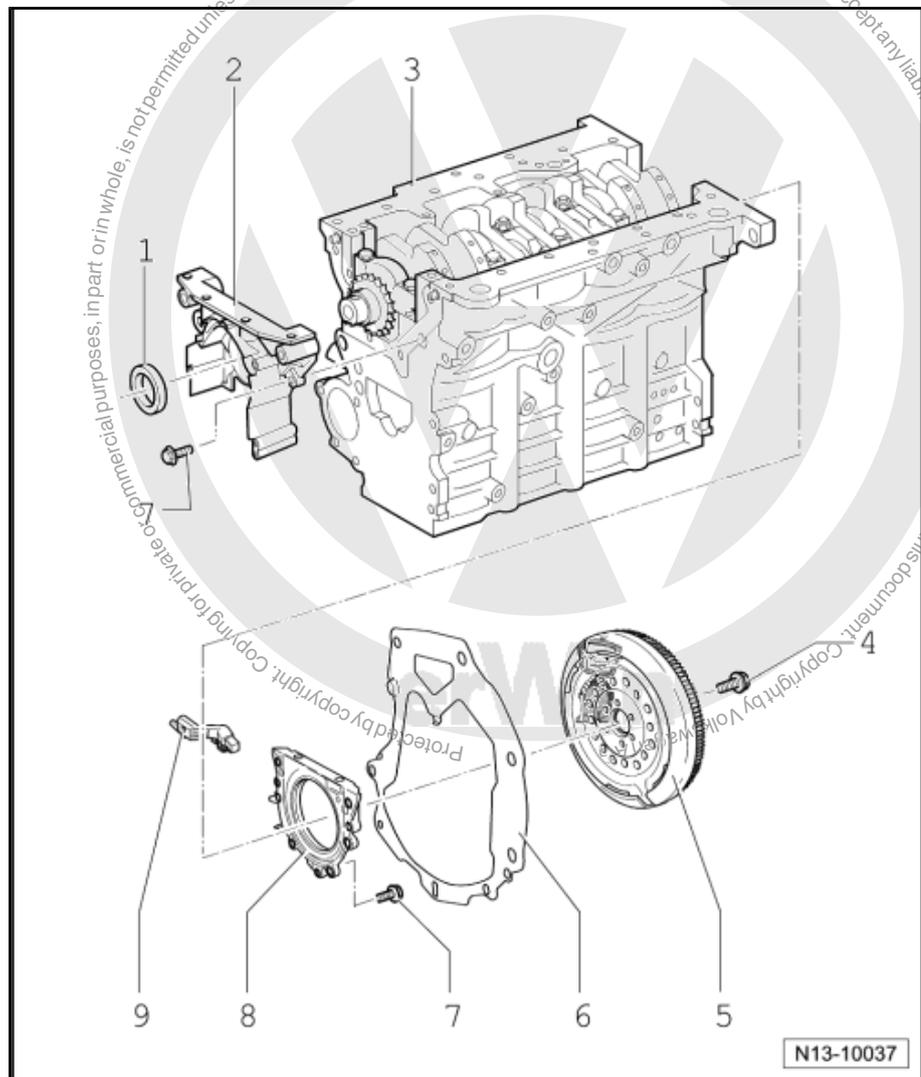
- Renew

#### 5 - Flywheel

- To remove and install flywheel, counterhold with 3067.

#### 6 - Intermediate plate

- Must be positioned on dowel sleeves.
- Do not damage or bend when assembling.





**7 - 15 Nm**

- Renew

**8 - Sealing flange with oil seal**

- Renew complete with oil seal and sender wheel only.
- Removing and installing ⇒ [page 25](#) .

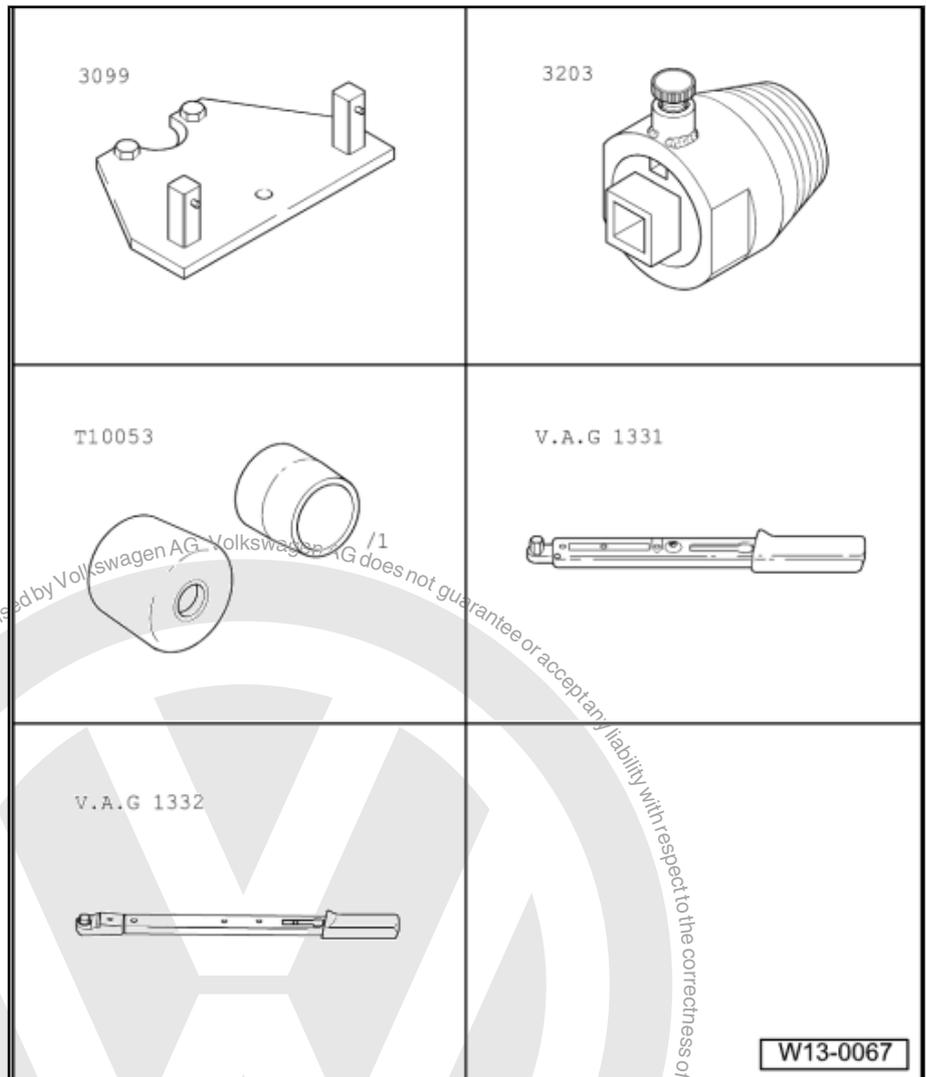
**9 - Removing and installing engine speed sender -G28- ⇒ [page 31](#) .,**

- Loosen and tighten using commercially available ball-ended hexagon key socket
- Specified torque: 5 Nm.

**2.2 Renewing crankshaft oil seal - pulley end**

**Special tools and workshop equipment required**

- ◆ Counterhold tool -3099-
- ◆ Oil seal extractor -3203-
- ◆ Assembly tool -T10053-
- ◆ Torque wrench - V.A.G 1331-
- ◆ Torque wrench - V.A.G 1332-



**2.2.1 Removing**

- Remove toothed belt. ⇒ [page 50](#)



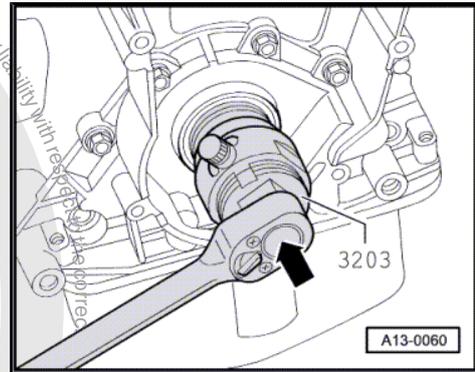
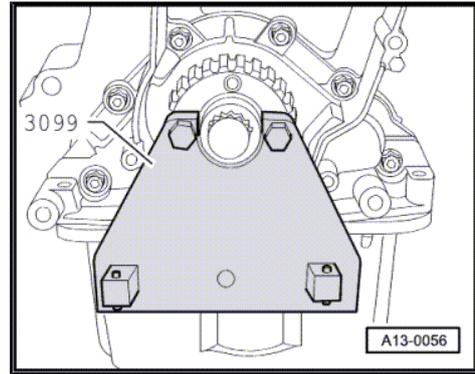
- Remove crankshaft toothed belt pulley. To do this, lock toothed belt pulley using counterhold tool -3099- .



#### Note

*When bolting on counterhold tool, place two washers between toothed belt pulley and counterhold tool.*

- To guide oil seal extractor -3203- , screw central bolt by hand into crankshaft to stop.
- Unscrew inner part of oil seal extractor two turns (approx. 3 mm) out of outer part and lock with knurled screw.
- Oil threaded head of oil seal extractor.
- Using great pressure, screw oil seal extractor as far as possible into seal.
- Loosen knurled screw and turn inner part against crankshaft until oil seal is pulled out.



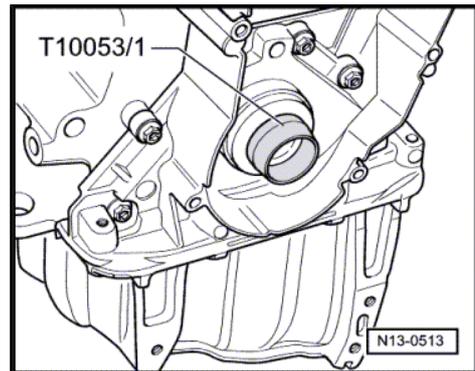
## 2.2.2 Installing



#### Note

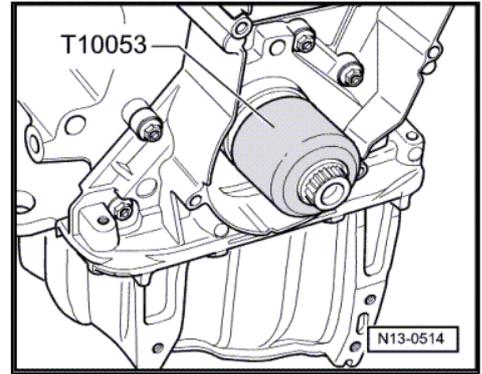
*The oil seal sealing lip must not be additionally oiled or greased.*

- Remove oil residue from crankshaft journal using clean cloth.
- Place guide sleeve -T10053/1- onto crankshaft journal.
- Slide oil seal over guide sleeve onto crankshaft journal.





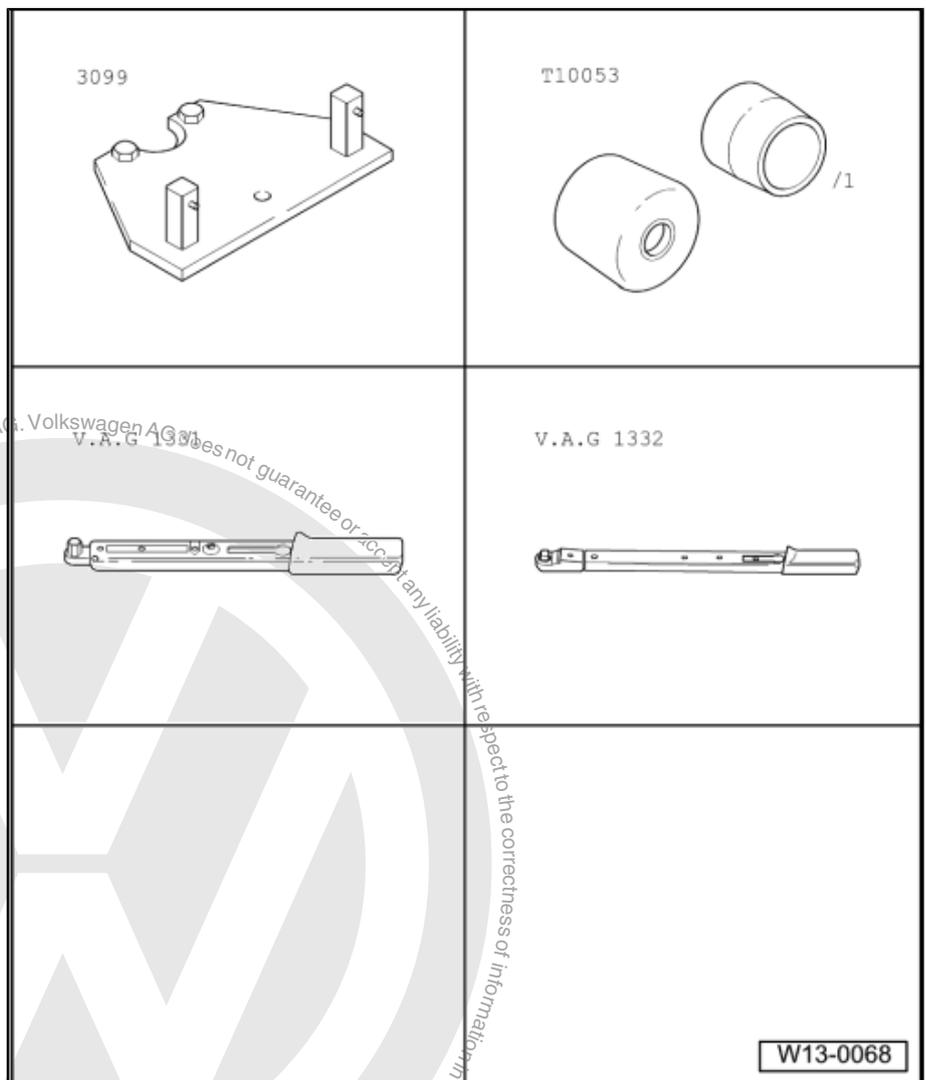
- Press oil seal in to stop using assembly tool -T10053- and centre bolt.
- Install and tighten toothed belt ⇒ [page 50](#) .



## 2.3 Removing and installing sealing flange - pulley end

### Special tools and workshop equipment required

- ◆ Counterhold tool -3099-
- ◆ Assembly tool -T10053-
- ◆ Torque wrench - V.A.G 1331-
- ◆ Torque wrench - V.A.G 1332-
- ◆ Hand drill with plastic brush attachment
- ◆ Silicone sealant -D 176 404 A-
- ◆ Flat scraper



### 2.3.1 Removing

- Remove toothed belt. ⇒ [page 50](#)





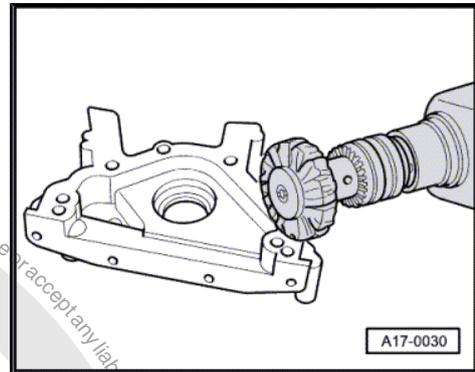
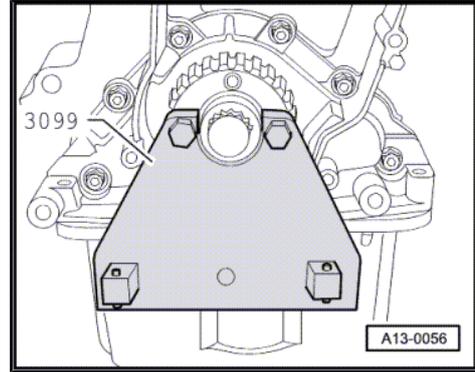
- Remove crankshaft toothed belt pulley. To do this, lock toothed belt pulley using counterhold tool -3099- .



#### Note

When bolting on counterhold tool, place two washers between toothed belt pulley and counterhold tool.

- Drain engine oil.
- Remove sump ⇒ [page 88](#) .
- Pull off front sealing flange.
- Remove sealing flange; if necessary, loosen by applying light blows with a rubber-headed hammer.
- Remove sealant residue from cylinder block with a flat scraper.
- Remove residual sealant from sealing flange using a plastic rotary brush (wear eye protection).
- Clean sealing surfaces. They must be free of oil and grease.



### 2.3.2 Installing



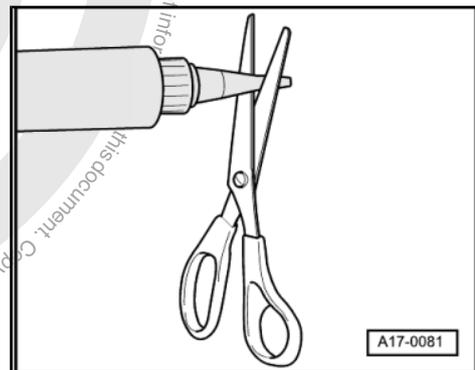
#### Note

- ◆ *Observe expiry date of sealing compound.*
- ◆ *Install sealing flange within 5 minutes of applying the silicone sealant.*
- Cut off tube nozzle at forward marking (approx. 3 mm nozzle Ø).



#### Note

- ◆ *Sealant bead must not be wider than 2...3 mm, because otherwise excess sealant can enter sump and clog strainer in oil pump suction pipe as well as drip onto crankshaft oil seal.*
- ◆ *Before applying sealant bead, cover sealing surface of oil seal with a clean cloth.*



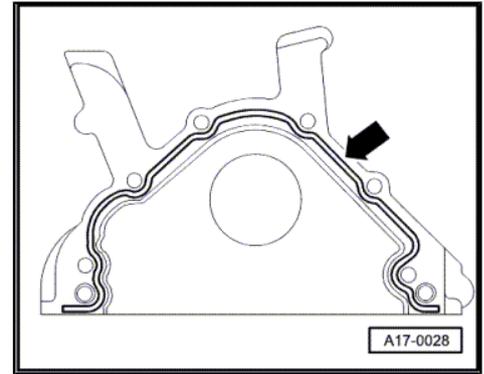


- Apply silicone sealant bead as shown to the clean sealing surface of sealing flange.
- Install sealing flange immediately and tighten all bolts lightly.

**i** Note

*When fitting sealing flange with oil seal installed use guide sleeve -T10053/1-.*

- Tighten securing bolts for sealing flange to 15 Nm using alternate and diagonal sequence.
- Install sump ⇒ [page 88](#) .



**i** Note

*After fitting, allow sealant to dry for approx. 30 minutes. Only then fill with engine oil.*

Installing toothed belt and adjusting valve timing. ⇒ [page 50](#)

## 2.4 Renewing crankshaft sealing flange - flywheel end

### Special tools and workshop equipment required

- ◆ Assembly tool -T10134-
- ◆ Torque wrench -V.A.G 1331-
- ◆ Socket -V.A.G 1332/11-
- ◆ Vernier gauge
- ◆ Three hexagon bolts M6 x 35 mm
- ◆ Two hexagon bolts M7 x 35 mm

### 2.4.1 Pressing out sealing flange with sender wheel

**i** Note

- ◆ *For the sake of clarity, the work is performed with the engine removed.*
- ◆ *The procedure is identical whether the engine is installed or removed.*
- Remove flywheel.
- Remove intermediate plate.
- Set engine to TDC No. 1 cylinder ⇒ [page 50](#) , Removing and installing toothed belt.
- Remove sump ⇒ [page 88](#) .

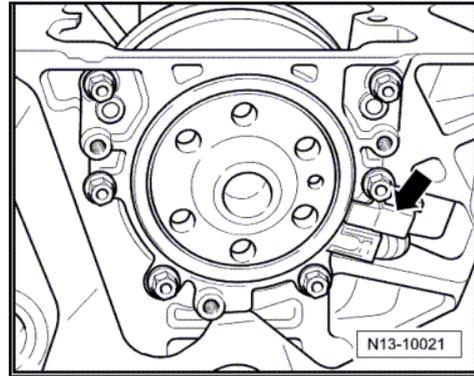


- Remove engine speed sender -G28- -arrow- using a commercially available ball-ended hex key socket => [page 31](#) .
- Unscrew sealing flange securing bolts.

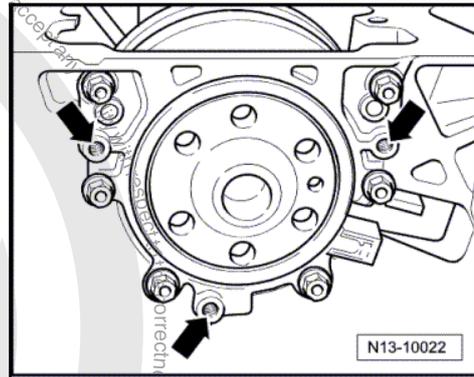


**Note**

Sealing flange and sender wheel are pressed off the crankshaft together using three M6 x 35 mm bolts.



- Screw three M6 x 35 mm bolts into threaded holes -arrows- of sealing flange.
- Screw bolts alternately (max. 1/2 turn 180° for each bolt) into sealing flange and press sealing flange together with sender wheel off crankshaft.



## 2.4.2 Pressing in sealing flange with sender wheel

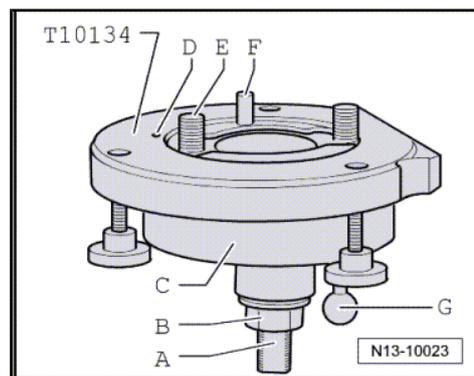


**Note**

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

Assembly tool -T10134-

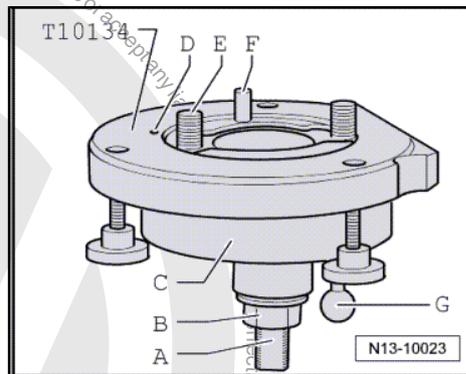
- A - Clamping surface
- B - Hexagon nut
- C - Assembly housing
- D - Locating pin
- E - Hexagon socket head bolt
- F - Guide pin for diesel engines (black knob)
- G - Guide pin for petrol engines (red knob)





### 2.4.3 A - Assembling seal with sender wheel on assembly tool -T10134-

- Screw in hexagon nut -B- to just before clamping surface -A- of threaded spindle.

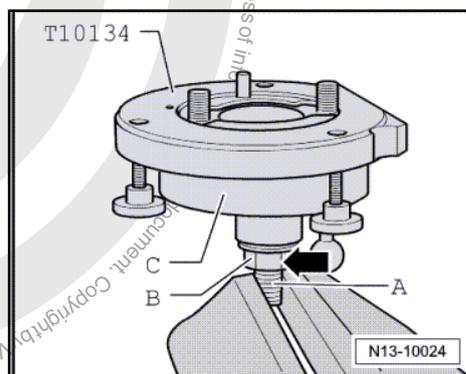


- Clamp assembly device -T10134- in a vice on clamping surface -A- of threaded spindle.
- Press assembly housing -C- downwards so that it lies on hexagon nut -B- -arrow-.



**Note**

*Inner part of assembly tool and assembly housing must be at same height.*

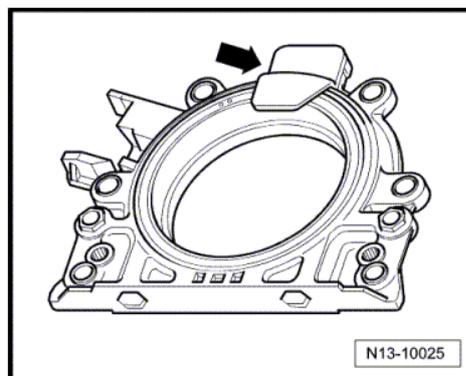


- Remove securing clip -arrow- from new sealing flange.

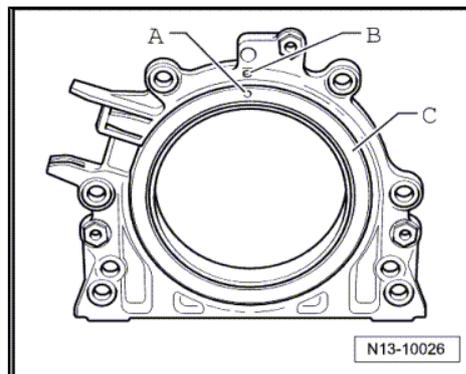


**Note**

*The sender wheel must not be taken out of the sealing flange or twisted.*

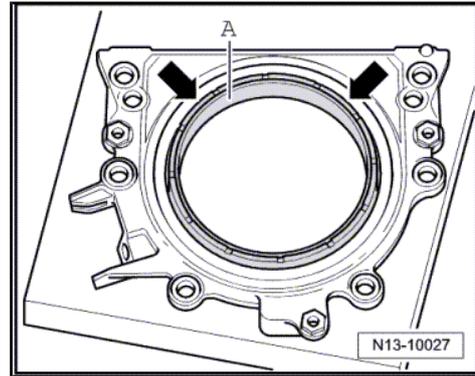


- Locating hole -A- on sender wheel -C- must align with marking -B- on sealing flange.
- Place sealing flange with front side downwards on a clean flat surface.

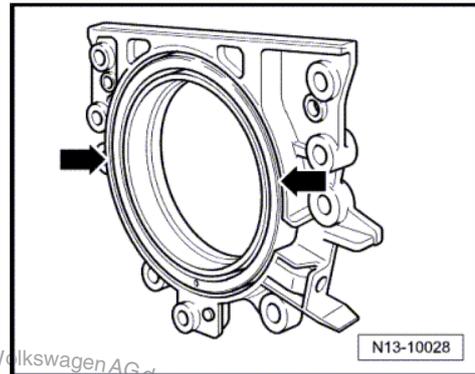




- Push sealing lip support ring -A- downwards in direction of arrow until it lies on flat surface.



- Upper edge of sender wheel and front edge of sealing flange must align -arrows-.

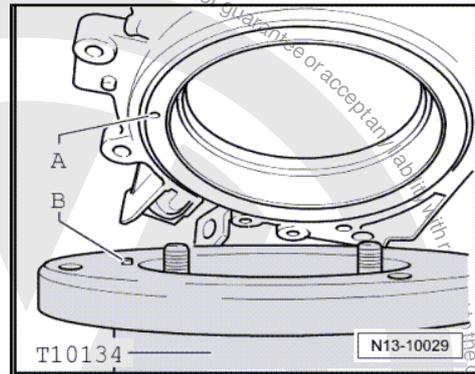


- Place sealing flange with front side on assembly tool -T10134- so that locating pin -A- can be inserted in sender wheel hole -A-.



#### Note

Ensure sealing flange lies flat on assembly device.

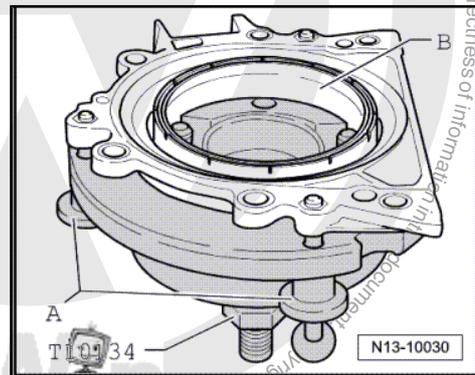


- Push sealing flange and support ring for sealing lip -B- against surface of assembly device -T10134- whilst tightening the three knurled screws -A- so that locating pin cannot slide out of sender wheel hole.



#### Note

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

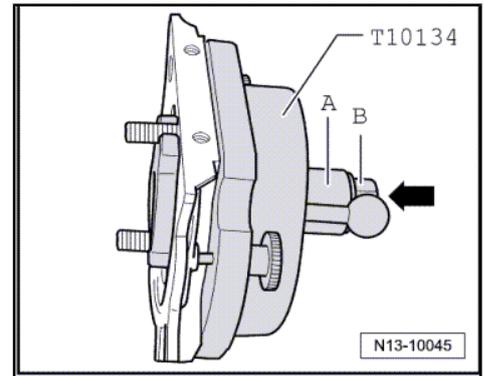


### 2.4.4 B - Attaching assembling tool -T10134- with sealing flange on crankshaft flange

- Crankshaft flange must be free of oil and grease.
- Engine positioned at TDC No. 1 cylinder



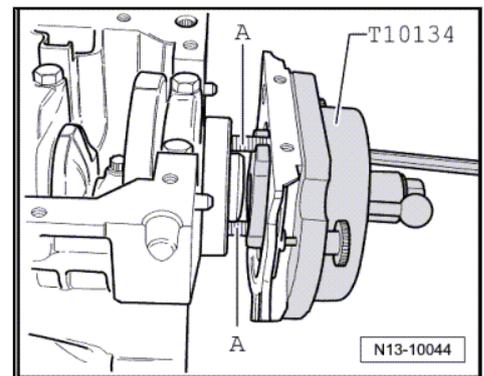
- Screw hexagon nut -B- to end of threaded spindle.
- Press threaded spindle of assembly tool -T10134- in direction of arrow, until hexagon nut -B- lies against assembly housing -A-.
- Align flat side of assembly housing on sump side of crankcase sealing surface.



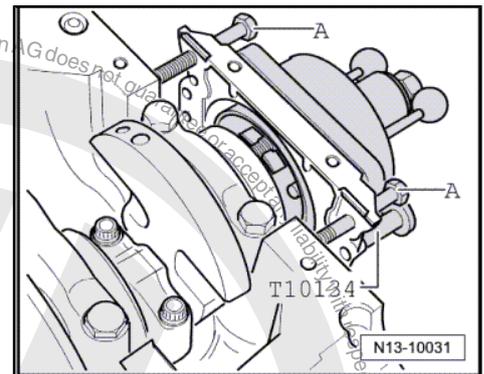
- Secure assembly tool -T10134- to crankshaft flange using hexagon socket head bolts -A-.

**i** Note

*Screw hexagon socket head bolts -A- into crankshaft flange (approx. 5 full turns).*



- To guide sealing flange, screw two M7 × 35 mm bolts -A- into cylinder block.



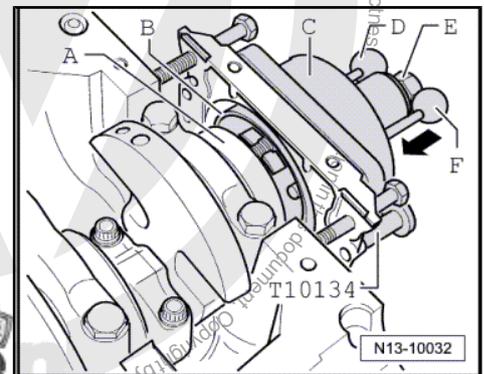
## 2.4.5 C - Bolting assembly tool -T10134- onto crankshaft flange

- Push assembly housing -C- by hand in direction of arrow until sealing lip support ring -B- contacts crankshaft flange -A-.
- Push guide pin for diesel engines (black knob) -D- into hole in crankshaft. This ensures that the sender wheel reaches its final installation position.

**i** Note

*The guide pin for petrol engines (red knob) -F- must not be inserted in threaded hole of crankshaft.*

- Hand-tighten both hexagon socket head bolts of assembly tool.
- Screw hexagon nut -E- onto threaded spindle by hand until it lies on assembly housing -C-.





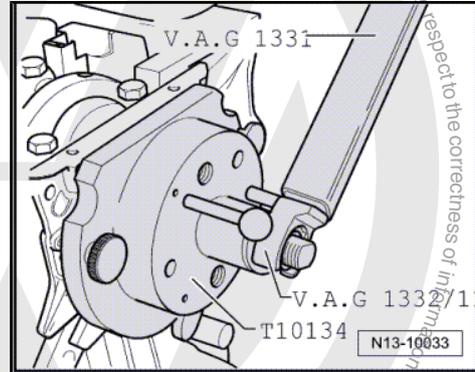
## 2.4.6 D - Pressing sender wheel onto crankshaft flange using assembly tool - T10134-

- Tighten hexagon nut of assembly tool -T10134- to 35 Nm using torque wrench -V.A.G 1331- and tool insert, 24 mm -V.A.G 1332/11- .



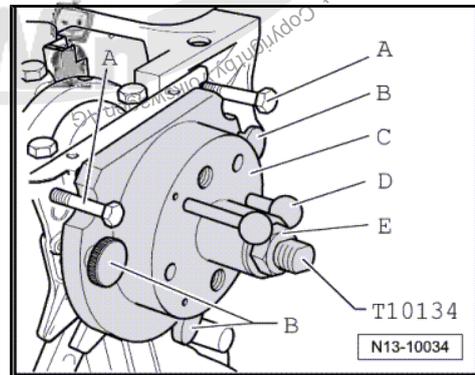
### Note

After hexagon nut is tightened to 35 Nm, a small air gap must be present between cylinder block and sealing flange.

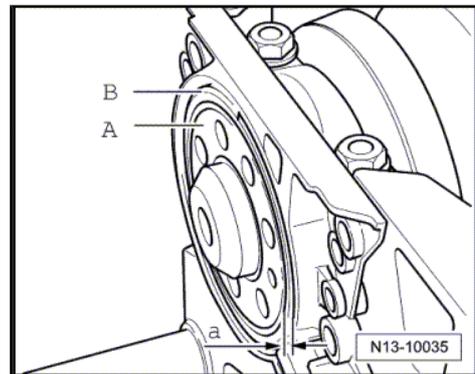


## 2.4.7 E - Checking sender wheel installation position on crankshaft

- Screw hexagon nut -E- to end of threaded spindle.
- Remove the two bolts -A- from cylinder block.
- Screw the three knurled screws -B- out of sealing flange.
- Remove assembly tool -T10134- .
- Remove sealing lip support ring.



- The sender wheel is in the correct installation position on the crankshaft if a gap -a- = 0.5 mm exists between crankshaft flange -A- and sender wheel -B-.



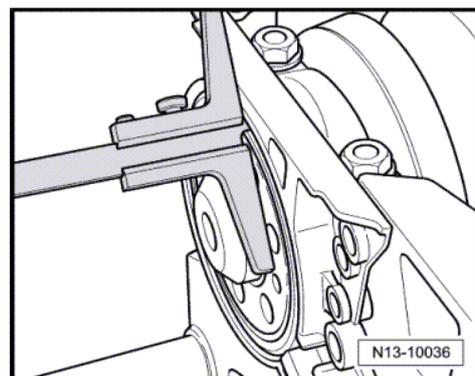
- Set vernier gauge on crankshaft flange.
- Measure distance -a- between crankshaft flange and sender wheel.

If measurement -a- is too small:

- Press sender wheel further. => [page 31](#)

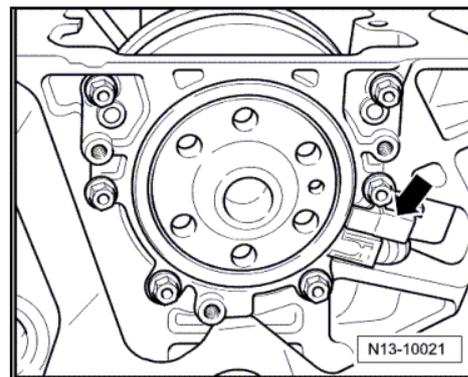
If dimension -a- is attained:

- Tighten new securing bolts for sealing flange to 15 Nm using alternate and diagonal sequence.



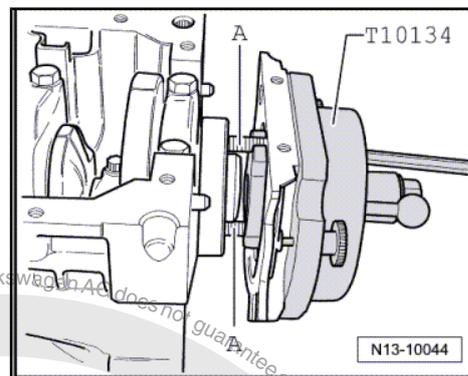


- Install engine speed sender -G28- -arrow- and tighten securing bolt to 5 Nm.
- Install sump ⇒ [page 88](#) .
- Install intermediate plate.
- Install flywheel using new bolts. Tighten securing bolts to 60 Nm +<sup>1</sup>/<sub>4</sub> turn (90°).

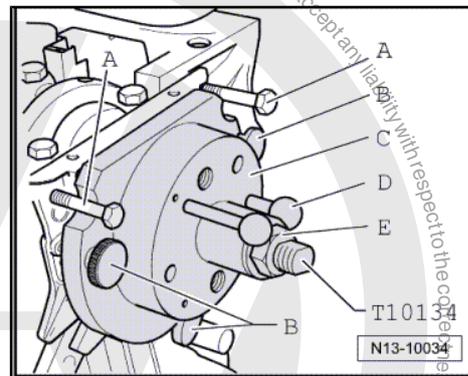


## 2.4.8 F - Re-pressing sender wheel

- Secure assembly tool -T10134- to crankshaft flange using hexagon socket head bolts -A-.
- Hand tighten both hexagon socket head bolts.
- Push assembly tool -T10134- by hand to sealing flange.



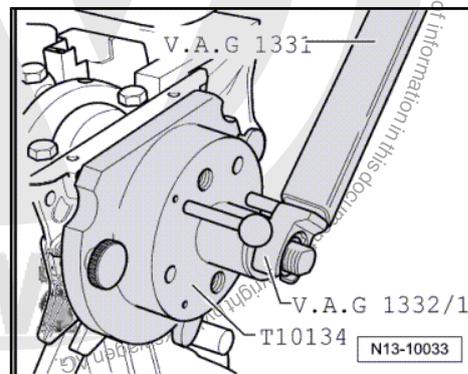
- Screw hexagon nut -E- onto threaded spindle by hand until it lies on assembly housing -C-.



- Tighten hexagon nut of assembly tool -T10134- to 40 Nm using torque wrench -V.A.G 1331- and tool insert, 24 mm -V.A.G 1332/1- .
- Check installation position of sender wheel on crankshaft again. ⇒ [page 30](#)

If dimension -a- is too small again:

- Tighten hexagon nut for assembly tool -T10134- to 45 Nm.
- Check installation position of sender wheel on crankshaft again. ⇒ [page 30](#)

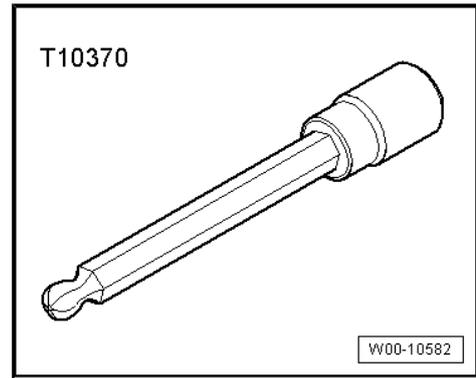


## 2.5 Removing and installing engine speed sender -G28-

Special tools and workshop equipment required



- ◆ Hexagon key extension, 4 mm -T10370-



- ◆ Or commercially available ball-ended hexagon key socket, 5 mm

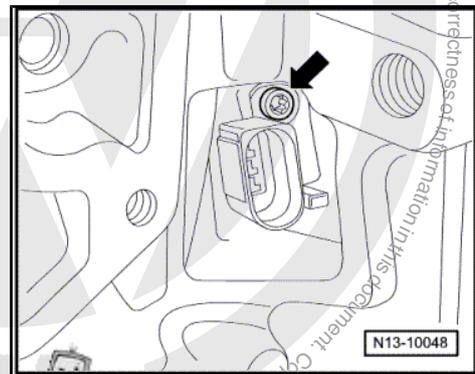


### Note

*Two different bolts are installed, check which tool is to be used.*

- Remove noise insulation tray ⇒ General body repairs, exterior; Rep. Gr. 50 ; Body - front; Assembly overview - noise insulation .
- Clamp off coolant hoses at engine oil cooler using hose clip and pull off hoses.
- Remove oil filter bracket.
- Remove securing bolt -arrow- and pull out engine speed sender -G28- .

Installation is performed in the reverse order, observing the following: specified torque for engine speed sender -G28- securing bolt: 5 Nm.





## 3 Crankshaft

Assembly overview - crankshaft ⇒ [page 33](#)

Crankshaft dimensions ⇒ [page 38](#) .

### 3.1 Assembly overview - crankshaft

#### 1 - Bearing shells 1, 2, 4 and 5

- For bearing cap without oil groove.
- For cylinder block with oil groove.
- Do not interchange used bearing shells (mark).

#### 2 - 65 Nm + 1/4 turn (90°) further

- Renew
- To measure radial clearance, tighten to 65 Nm but not further.

#### 3 - Bearing cap

- Bearing cap 1: pulley end.
- Bearing cap 3 with recesses for thrust washers.
- Bearing shell retaining lugs in cylinder block and bearing caps must align.

#### 4 - Bearing shell 3

- For bearing cap without oil groove.
- For cylinder block with oil groove.

#### 5 - Thrust washer

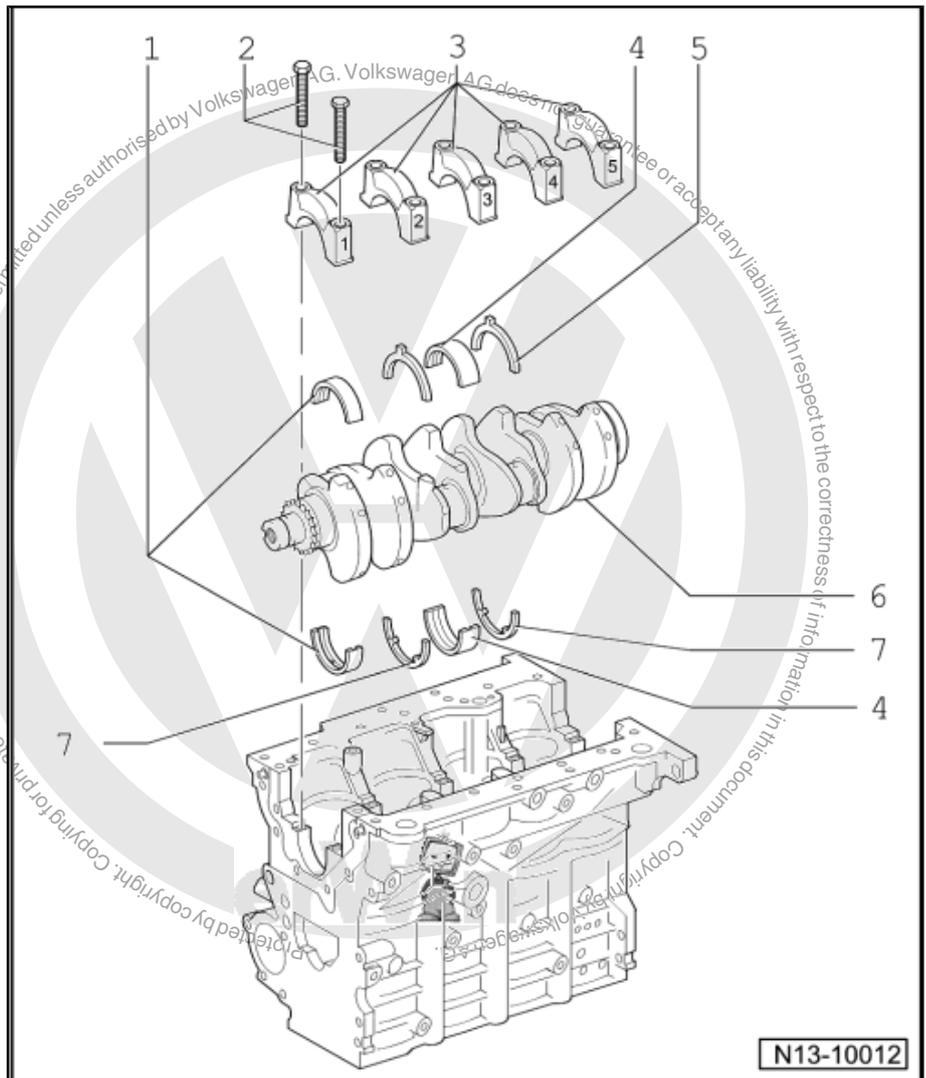
- For bearing cap 3.
- Note fixing arrangement.

#### 6 - Crankshaft

- Axial clearance new: 0.07...0.17 mm, wear limit: 0.37 mm
- Check radial clearance with Plastigage new: 0.03...0.08 mm, wear limit: 0.17 mm
- Do not rotate crankshaft when checking radial clearance.
- Crankshaft dimensions ⇒ [page 38](#) .

#### 7 - Thrust washer

- For cylinder block, bearing 3

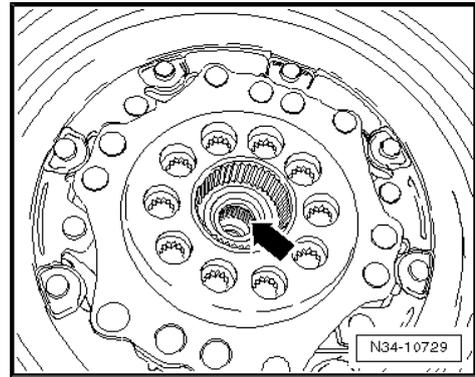




### 3.1.1 Renewing needle bearing in crankshaft - vehicles with dual clutch gearbox

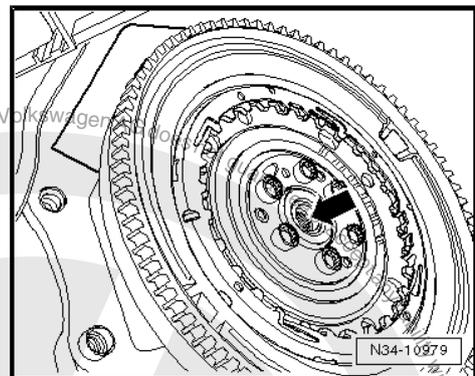
6-speed dual clutch gearbox: If the engine or gearbox has to be removed during repairs, check needle bearing in crankshaft. If it is damaged or tarnished blue, it must be renewed.

- If it is not damaged, lightly grease with high-temperature grease -G052133A2- .



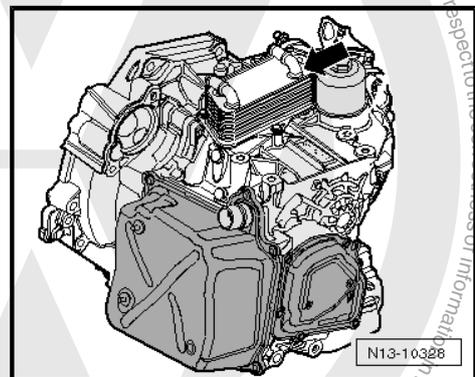
7-speed dual clutch gearbox: Always renew needle bearing when removing engine or gearbox.

**6-speed dual clutch gearbox**



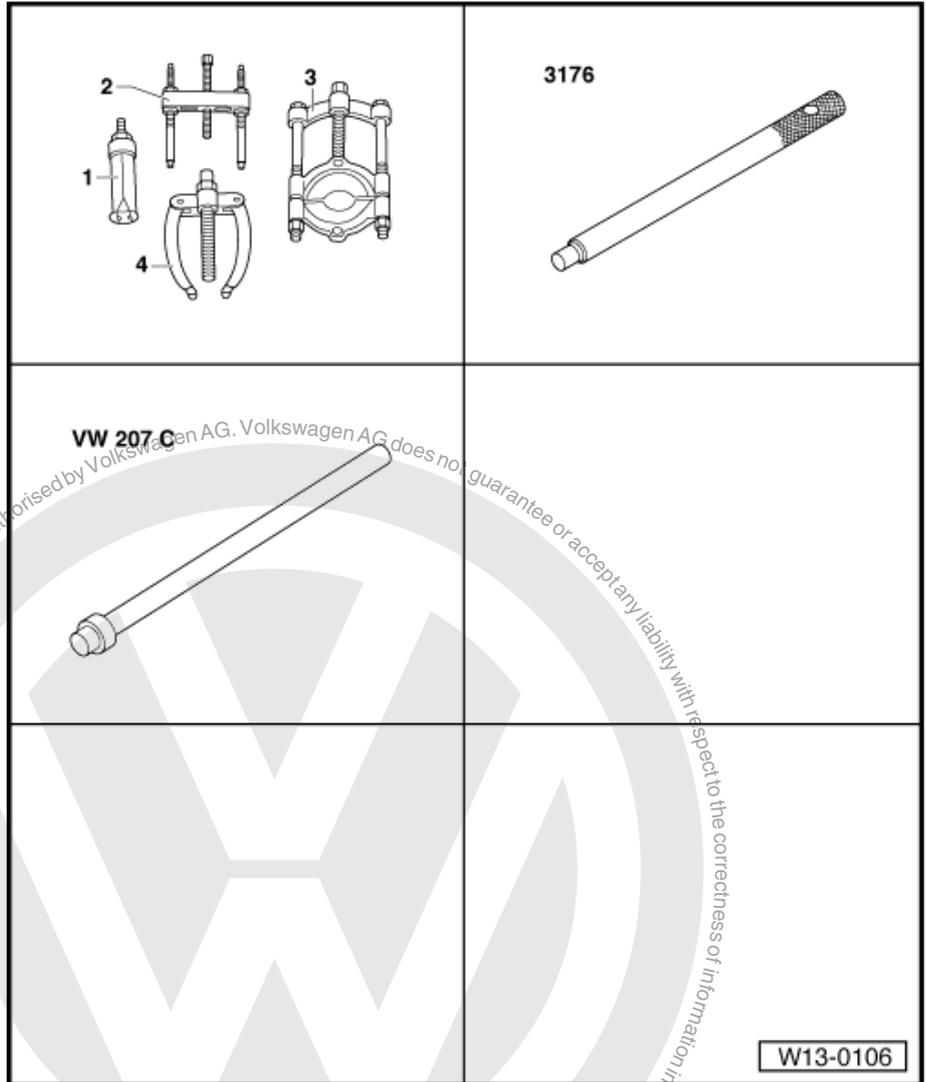
This gearbox can be identified by the gearbox oil cooler

**Special tools, testers, measuring instruments and auxiliary items required**





- 1 - -1- Kukko 21/2
- 2 - Centring mandrel -3176-
- 3 - Drift -VW 207 C-

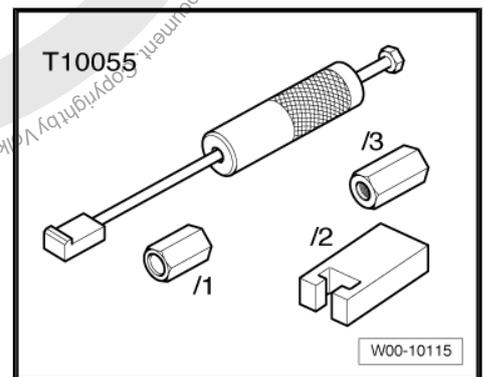


Puller -T10055- with adapter -T10055/3-

**Procedure**

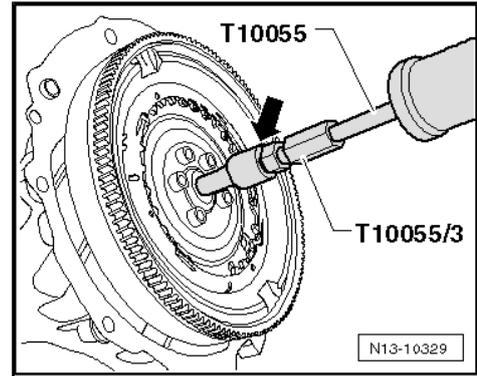
- Gearbox is unscrewed from engine.

Pulling needle bearing out:





- Pull out needle roller bearing using Kukko 21/2, adapter - T10055/3- and puller -T10055- .

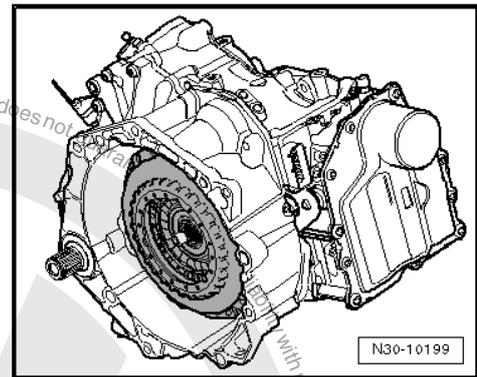


### 7-speed dual clutch gearbox

No gearbox oil cooler is installed.

Always renew needle bearing when removing engine or gearbox.

**Special tools, testers, measuring instruments and auxiliary items required**



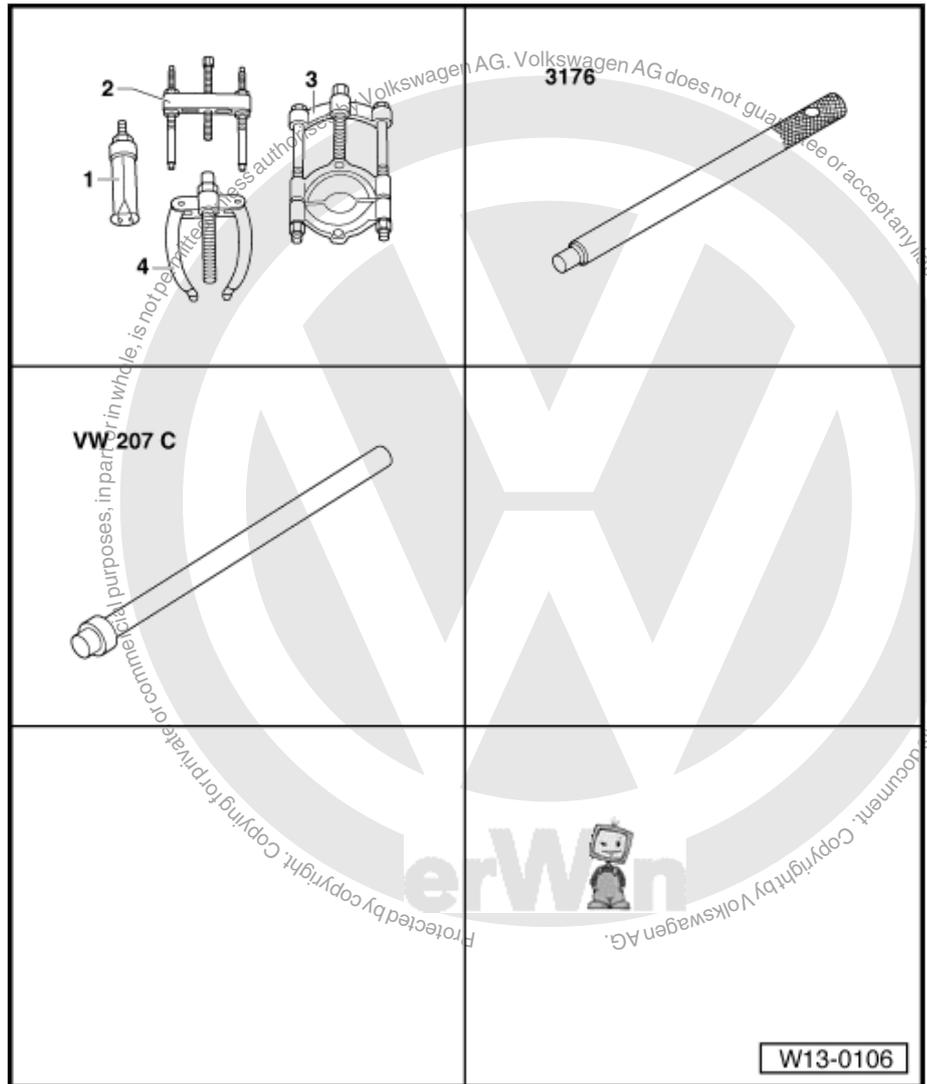
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1 - -1- Kukko 21/2 and -4- Kukko 22/1

2 - Centring mandrel -3176-

3 - Drift -VW 207 C-



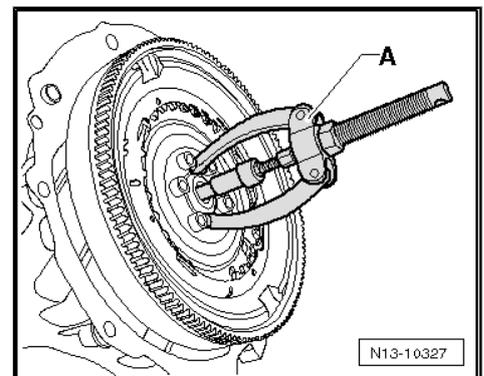
**Procedure**

- Gearbox is unscrewed from engine.

Pulling needle bearing out:

- Pull out using commercially available puller -A-, e.g. Kukko 21/2 and Kukko 22/1.

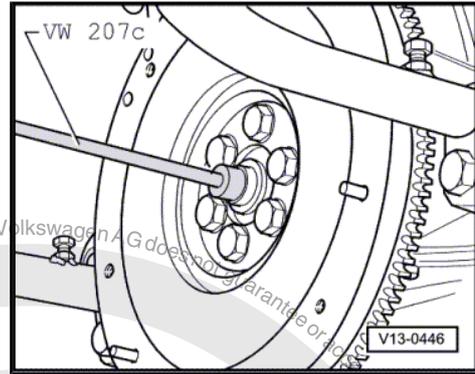
**Installing**



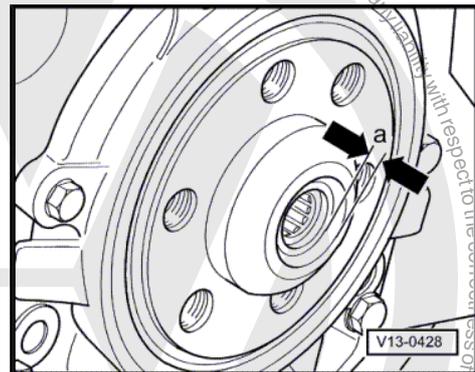


- Drive needle bearing in with drift -VW 207 C- or with centring mandrel -3176- .
- Carefully drive needle bearing in.
- Always measure the driving depth when driving in.

Renew bearing, if driving depth is too deep.



- Driving depth: Dimension -a- = 1.5 to 1.8 mm.



### 3.2 Crankshaft dimensions

(Dimensions in mm)

Honing dimension	Crankshaft bearing journal Ø	Conrod journal Ø
Basic dimension	54.00 -0.022 -0.042	47.80 -0.022 -0.042



## 4 Pistons and conrods

Assembly overview - pistons and conrods ⇒ [page 39](#) .

Separating new conrod ⇒ [page 40](#) .

Checking piston projection at TDC ⇒ [page 41](#)

Piston and cylinder dimensions ⇒ [page 42](#) .

Piston rings, cylinder bore and piston installation position ⇒ [page 42](#)

### 4.1 Assembly overview - pistons and conrods

#### 1 - Piston rings

- Offset gaps by 120°.
- Use piston ring pliers to remove and install.
- "TOP" faces towards piston crown.
- Checking piston ring gap ⇒ [page 42](#) .
- Checking ring-to-groove clearance ⇒ [page 42](#) .

#### 2 - Piston

- With combustion chamber.
- Mark installation position and cylinder number.
- Installation position and allocation of piston to cylinder ⇒ [page 43](#) .
- Arrow on piston crown points to belt pulley end.
- Install using piston ring clamp.
- Cracks on piston skirt, renew piston.
- Checking piston projection at TDC ⇒ [page 41](#)

#### 3 - Piston pin

- If difficult to remove, heat piston to 60 °C.
- Remove and install using drift -VW 222- .

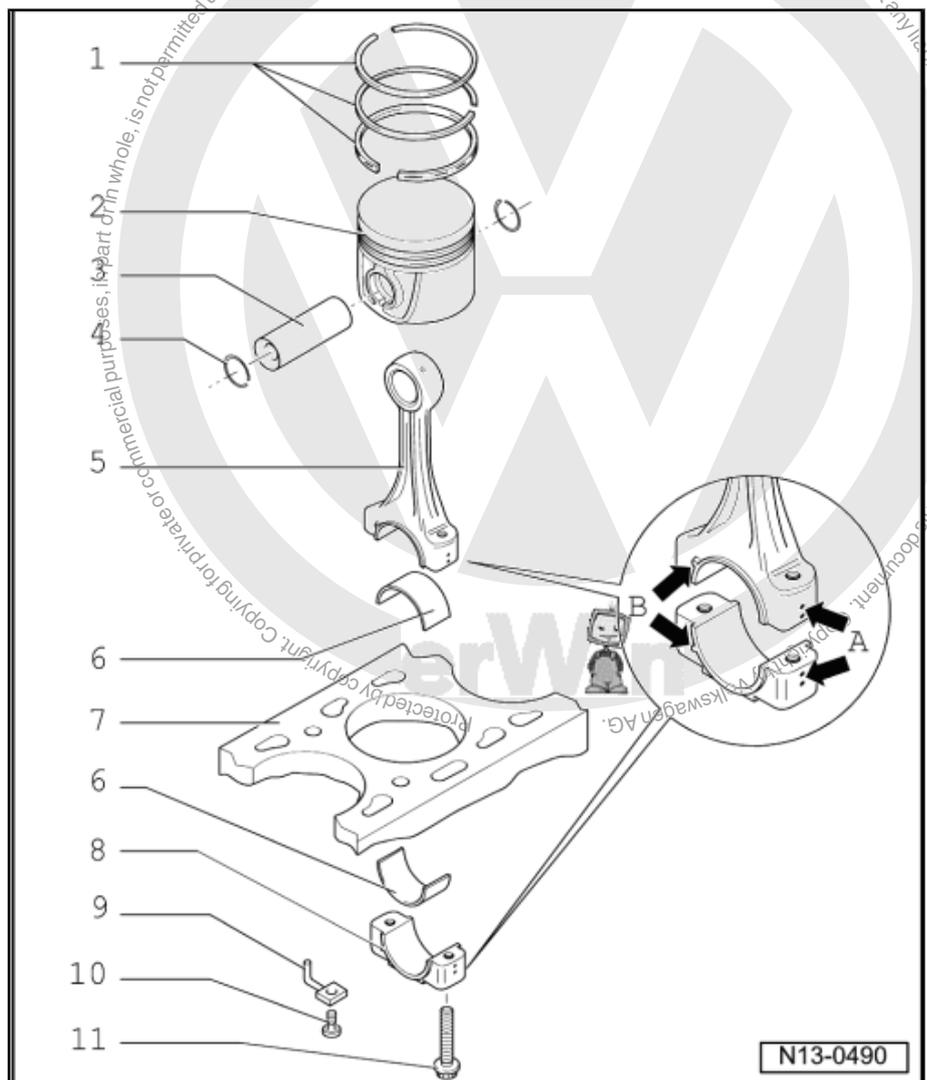
#### 4 - Circlip

#### 5 - Conrod

- Mark cylinder allocation -A- with coloured pen.
- Installation position: Marking -B- faces towards pulley end.
- With industrially cracked conrod cap.

#### 6 - Bearing shell

- Note installation position.
- Note version: Upper bearing shell (towards piston) is made of a more wear resistant material. Identification: Black line on bearing surface in area of joint.





- Do not interchange used bearing shells.
- Insert bearing shells centrally.
- Check for secure seating.
- Axial clearance, wear limit: 0.37 mm.
- Check radial clearance with Plastigage: Wear limit: 0.08 mm, do not rotate crankshaft when checking radial clearance.

#### 7 - Cylinder block

- Checking cylinder bore ⇒ [page 43](#) .
- Piston and cylinder dimensions ⇒ [page 42](#) .

#### 8 - Conrod bearing cap

- Note installation position.
- The cap only fits in one position and only on the appropriate conrod due to the breaking procedure (cracking), separating the cap from conrod.

#### 9 - Oil spray jet

- For piston cooling



Note

#### 10 - 25 Nm

- Insert without sealant.

#### 11 - Conrod bolt, 30 Nm + 1/4 turn (90°) further

- Renew
- Oil threads and contact surface.
- Use old bolt for measuring radial clearance.

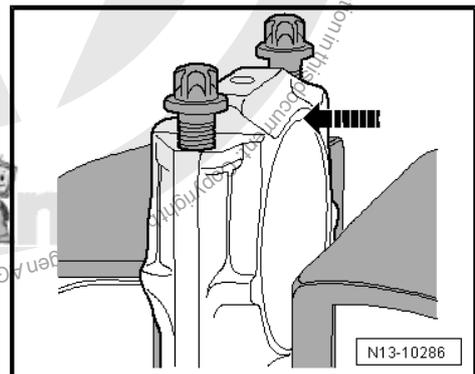
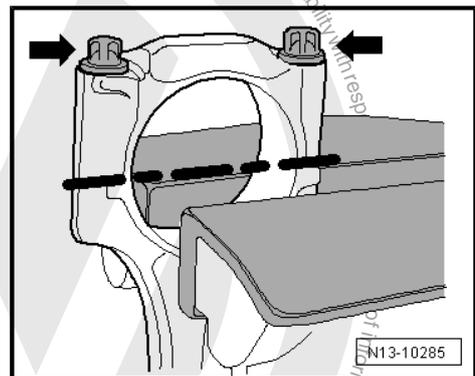
## 4.2 Separating new conrod

- Mark cylinder allocation of conrod ⇒ [Item 5 \(page 39\)](#)
- Lightly clamp the conrod in a vice using aluminium vice clamps, as shown in the illustration.



Note

- ◆ To prevent damage to the conrod, only clamp conrod in lightly.
- ◆ Clamp conrod in below the marked line.
- Unscrew the two bolts -arrows- approx. 5 turns.
- Using a plastic hammer, carefully knock against conrod bearing cap -arrow- until it is loose.

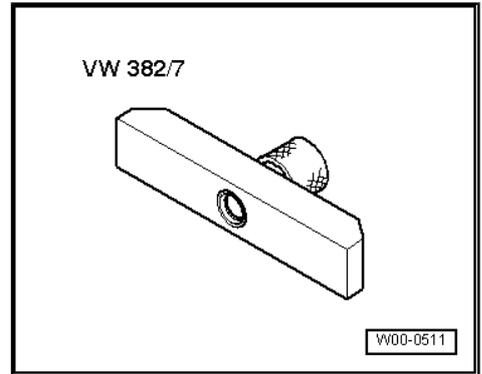




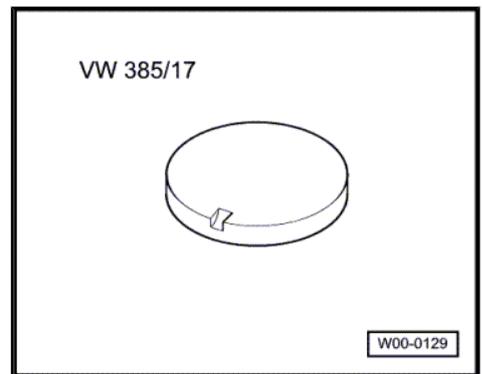
### 4.3 Checking piston projection at TDC

#### Special tools and workshop equipment required

- ◆ Measuring bridge -VW 382/7-



- ◆ End dimension plate -VW 385/17-



- ◆ Dial gauge

#### Test procedure



#### Note

*If different values are determined during the projection measurement, use the largest dimension for selecting the gasket.*

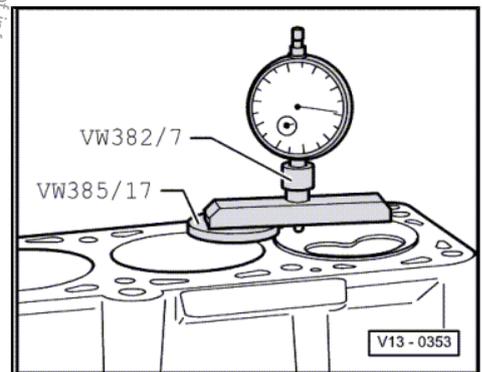
Piston projection at TDC must be measured when installing new pistons or a short engine. Install the appropriate cylinder head gasket depending upon piston projection, according to following table:



#### Note

*Turn engine clockwise to measure piston projection at TDC.*

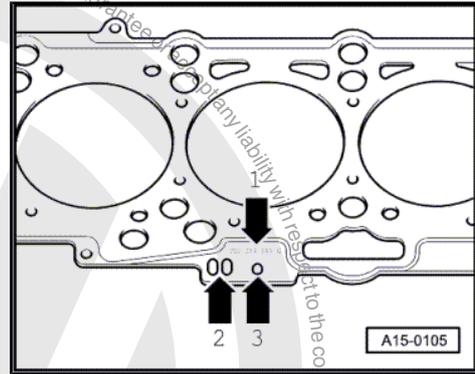
Piston projection	Identification Holes/notches
0.91 mm ... 1.00 mm	1
1.01 mm ... 1.10 mm	2
1.11 mm ... 1.20 mm	3





### Cylinder head gasket identification

- ◆ Part number = arrow 1
- ◆ Production control code = arrow 2 (can be disregarded)
- ◆ Holes = arrow 3

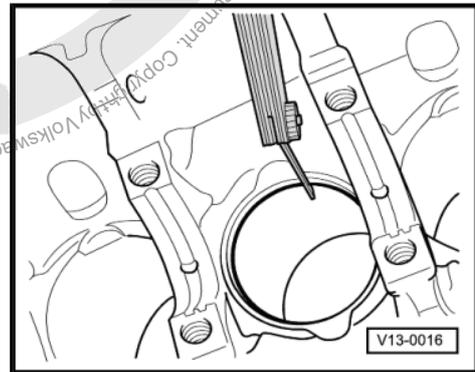


### 4.4 Piston and cylinder dimensions

Honing dimension	Piston Ø	Cylinder bore Ø
Basic dimension	mm 79.47	79.51
Stage I	mm 79.72	79.76
Stage II	mm 79.97	80.01

### 4.5 Piston rings, cylinder bore and piston installation position

#### Checking piston ring gap

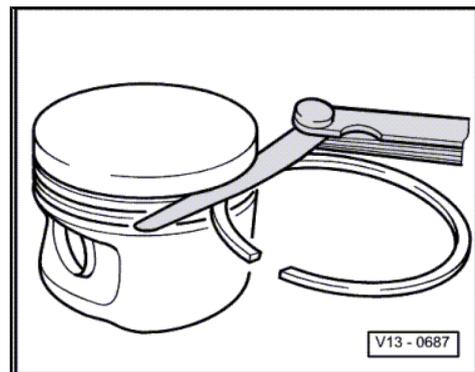


#### Special tools and workshop equipment required

- ◆ Feeler gauges
- Push piston ring squarely from above down to approx. 15 mm from bottom end of cylinder.

Piston ring dimensions in mm	New	Wear limit
1. compression ring	0.20...0.40	1.0
2. compression ring	0.20...0.40	1.0
Oil scraper ring	0.25...0.50	1.0

#### Checking ring-to-groove clearance



#### Special tools and workshop equipment required

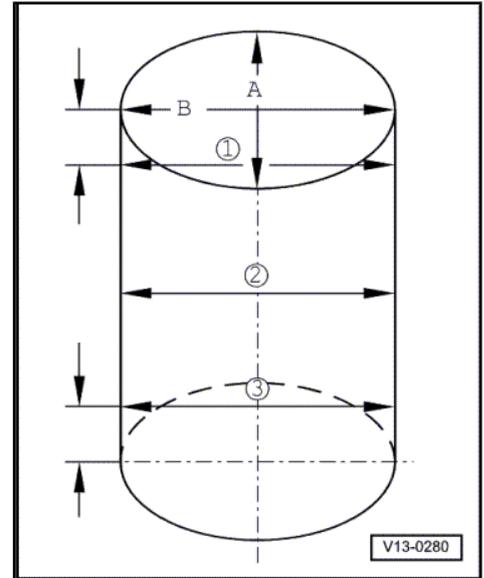
- ◆ Feeler gauges



– Clean ring groove before checking.

Piston ring dimensions in mm	New	Wear limit
1. compression ring	0.06...0.09	0.25
2. compression ring	0.05...0.08	0.25
Oil scraper ring	0.03...0.06	0.15

### Checking cylinder bores



### Special tools and workshop equipment required

- ◆ Cylinder gauge 50...100 mm
- Take measurements at 3 positions in both transverse -A- and longitudinal -B- directions, as illustrated. Difference between actual and nominal diameter max. 0.10 mm.

### Note

*Cylinder bores must not be measured when cylinder block is mounted on a repair stand with engine support bracket -VW 540- as measurements may then be incorrect.*

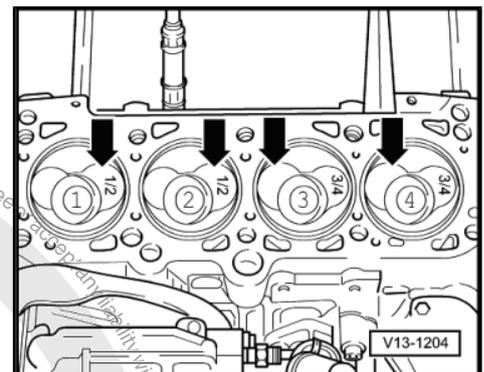
### Piston installation position and allocation of piston to cylinder

Piston in cylinders 1 and 2:

Larger inlet valve chamber towards flywheel -arrows-.

Piston in cylinders 3 and 4:

Larger inlet valve chamber towards belt pulley side -arrows-.



### Note

- ◆ New piston allocation to cylinders is shown by a coloured marking on piston crown.
- ◆ Piston for cylinders 1 and 2: marked 1/2
- ◆ Piston for cylinders 3 and 4: marked 3/4



## 15 – Cylinder head, valve gear

### 1 Cylinder head



#### Note

- ◆ *When installing an exchange cylinder head with fitted camshaft, the contact surfaces between the bucket tappets and the cam must be oiled before installing the cylinder head cover.*
- ◆ *The plastic protectors fitted to protect the open valves must be removed only immediately before the cylinder head is fitted.*
- ◆ *If the cylinder head is replaced, all the coolant in the system must also be renewed.*





Removing and installing cylinder head cover ⇒ [page 48](#) .

Removing, installing and tensioning toothed belt ⇒ [page 50](#)

Removing and installing cylinder head ⇒ [page 67](#)

Checking compression ⇒ [page 71](#) .

## 1.1 Assembly overview - cylinder head

1 - Toothed belt guard upper part

2 - Toothed belt

- Mark direction of rotation before removing.
- Check for wear.
- Do not kink.
- Removing, installing and tensioning ⇒ [page 50](#) .

3 - 10 Nm

- Renew

4 - 25 Nm

5 - 100 Nm

6 - Camshaft pulley

7 - Hub

- With sender wheel
- Use counterhold tool - T10051 - to loosen and tighten.
- To remove, use puller - T10052 -
- Removing and installing

8 - Rear toothed belt guard

9 - Sealing grommet

- Renew if damaged.

10 - Hall sender -G40-

- For camshaft position
- To remove, unbutton sealing grommet ⇒ [Item 9 \(page 45\)](#) from rear toothed belt guard.

11 - Stud

- 15 Nm

12 - Cylinder head bolt

- Observe sequence when loosening and tightening ⇒ [page 67](#) .
- Before installing, place washers in cylinder head ⇒ [Item 4 \(page 74\)](#) .

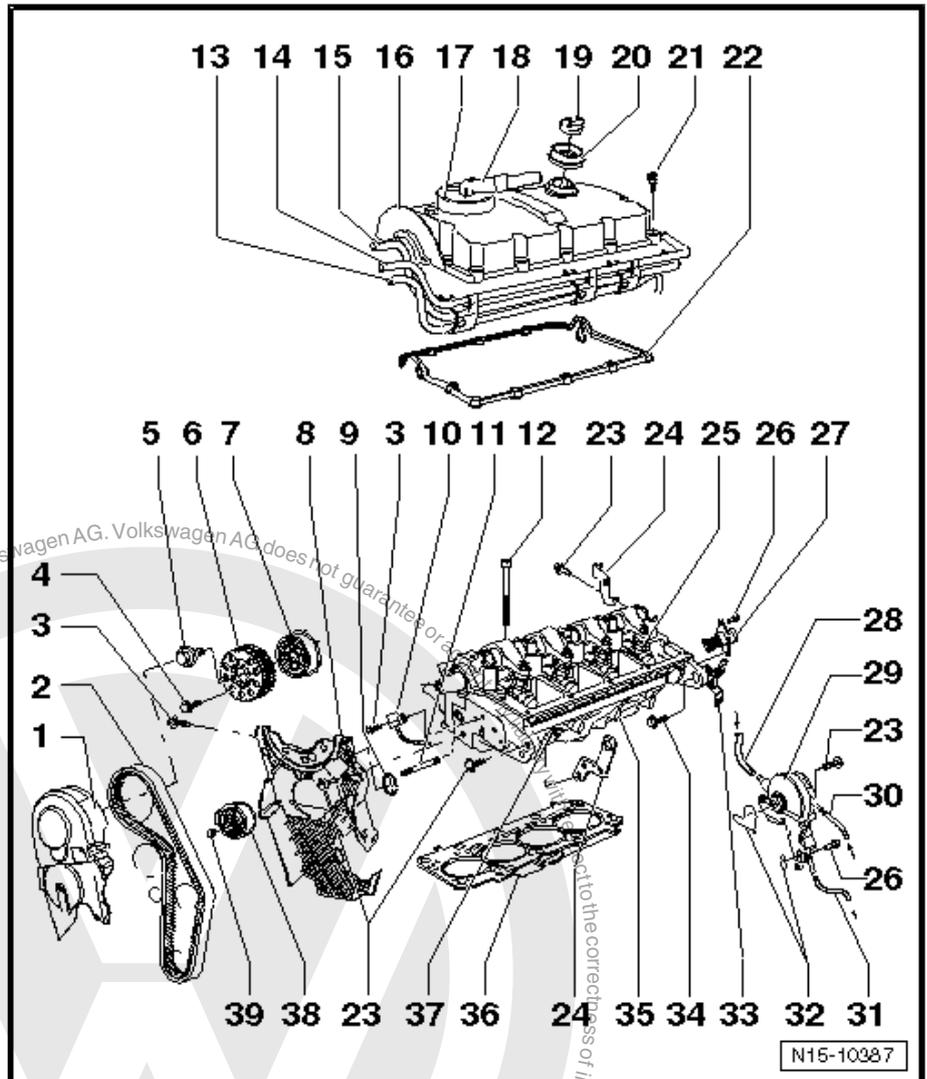
13 - Fuel return line

14 - Fuel supply line

15 - Coolant line

16 - Cylinder head cover

- Before fitting, thoroughly clean sealing surface of cylinder head with clean cloth.





#### 17 - Pressure regulating valve

- For crankcase ventilation.

#### 18 - To turbocharger.

#### 19 - Sealing cap

- Renew seal if damaged

#### 20 - Seal

- Renew if damaged.

#### 21 - 10 Nm

- Observe tightening sequence ⇒ [page 48](#) .

#### 22 - Gasket for cylinder head cover

- Renew together with cylinder head cover only.
- Before fitting, seal transitions with “AMV 174.004 01” ⇒ [page 48](#)

#### 23 - 20 Nm

#### 24 - Lifting eye

#### 25 - Unit injector

- Removing and installing ⇒ [page 169](#) .

#### 26 - 10 Nm

#### 27 - Central connector

- For unit injector

#### 28 - From brake servo

#### 29 - Tandem pump

- For fuel and vacuum supply
- Checking ⇒ [page 147](#) .
- Removing and installing ⇒ [page 147](#) .
- Must not be dismantled.

#### 30 - Supply hose

- From fuel filter.
- White or with white marking.
- Check for secure seating.
- Secure with spring-type clips.

#### 31 - Return hose

- To fuel filter
- Blue or with blue marking.
- Check for secure seating.
- Secure with spring-type clips.

#### 32 - Gasket

- Renew

#### 33 - Bracket

#### 34 - 20 Nm

#### 35 - Cylinder head

- Removing and installing ⇒ [page 67](#) .
- After renewing, renew entire coolant

#### 36 - Cylinder head gasket

- Renew
- Note marking ⇒ [page 47](#)
- After renewing, renew entire coolant



### 37 - Glow plug

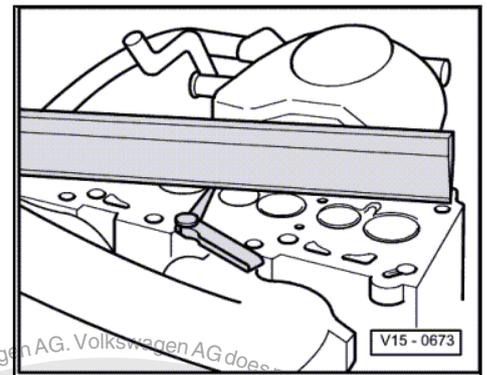
- 15 Nm
- Checking ⇒ [page 198](#) .

### 38 - Tensioning roller

- Remove engine support in order to remove and install ⇒ [page 16](#) .

### 39 - 20 Nm + 1/8 turn (45°) further

## Checking cylinder head for distortion



## Special tools and workshop equipment required

- ◆ Straight edge
- ◆ Feeler gauges

Max. permissible distortion: 0.1 mm.



### Note

*Reworking diesel cylinder heads is not permissible.*

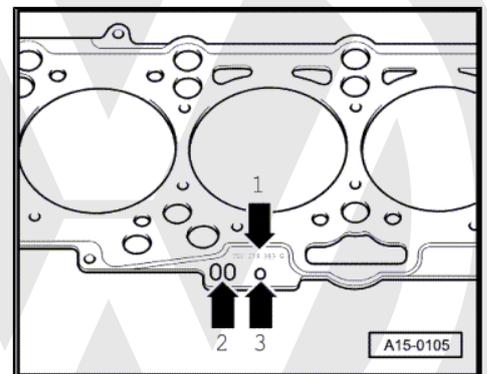
## Cylinder head gasket identification

- ◆ Part number = arrow 1
- ◆ Production control code = arrow 2 (can be disregarded)
- ◆ Holes = arrow 3



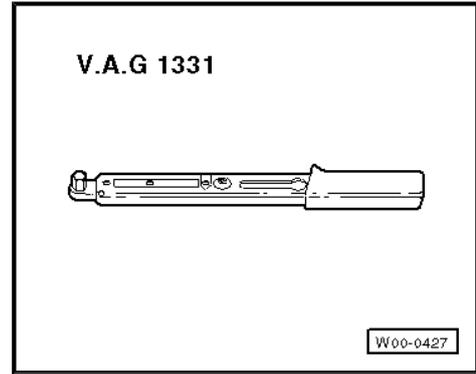
### Note

- ◆ *Different thicknesses of cylinder head gasket are fitted depending on the piston projection. When renewing gasket, install new gasket with same identification.*
- ◆ *Piston projection at TDC must be determined when installing new pistons or a short engine. ⇒ [page 41](#)*





## 1.2 Removing and installing cylinder head cover

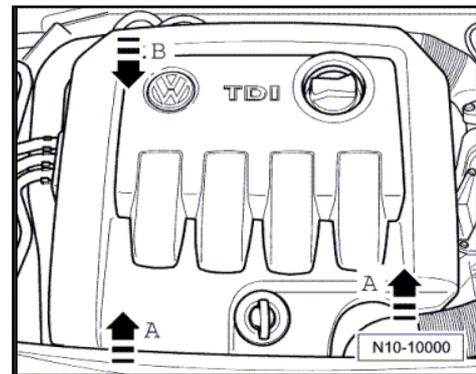


### Special tools and workshop equipment required

- ◆ Torque wrench -V.A.G 1331-
- ◆ Sealant -AMV 174 004 01-

### ⇒ page 4 Removing

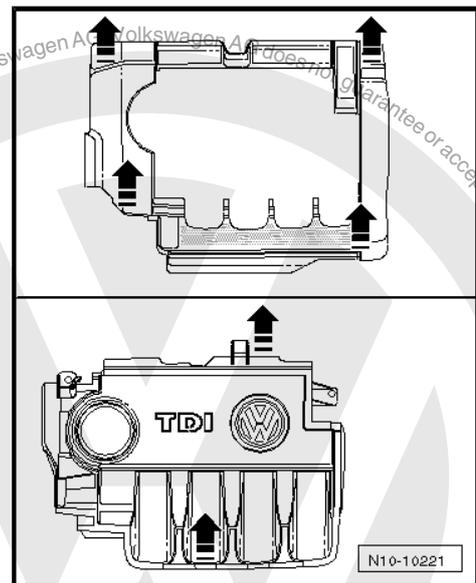
- Remove engine cover. To do this, pull engine cover upwards abruptly at front -arrows A- and then pull forwards out of rear fastening -arrow B-.



### Two-piece engine cover

For two-piece engine cover, first pull outer engine cover abruptly upwards at -arrows-, then pull inner engine cover abruptly upwards at -arrows-.

- Remove upper toothed belt guard.
- Disconnect crankcase breather hose at union of rear of charge air pipe.
- Unbolt bracket from exhaust gas recirculation valve.



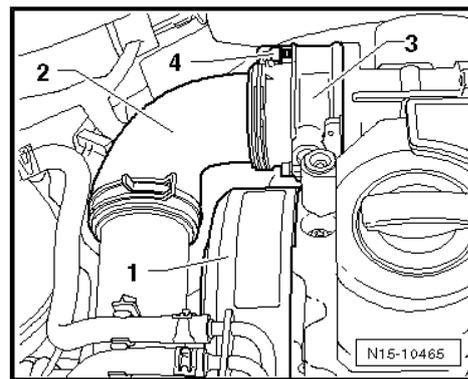


**Engine codes BLS, BXJ: to remove cylinder head cover, additionally remove:**

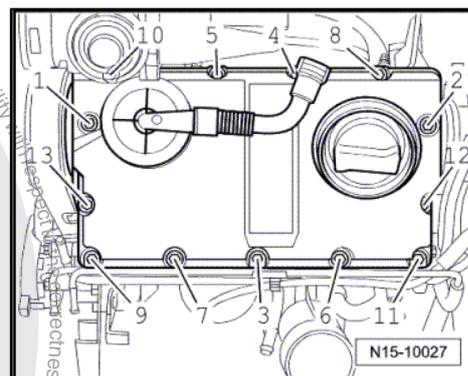
- ◆ -1- upper toothed belt guard
- ◆ -2- intake hose
- ◆ -3- intake manifold flap Renew seal.
- ◆ -4- bolt, 8 Nm

**Continuation for all vehicles**

- Remove cylinder head cover.



**Cylinder head cover, engine codes: BJB, BKC, BRU, BXE, BXF**



**Cylinder head cover, engine codes: BLS, BXJ**

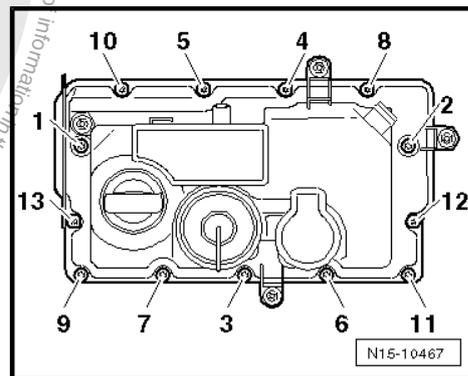
**Installing for all engine codes**

Installation is carried out in the reverse sequence of removal. In the process, note the following:

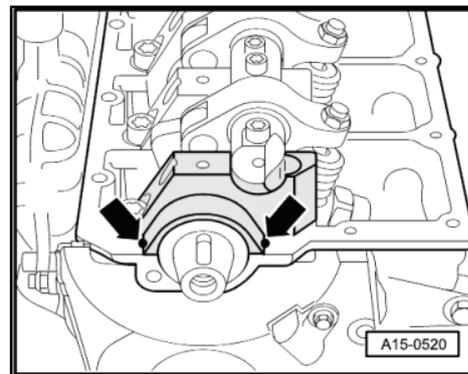


**Note**

- ◆ *Renew cylinder head cover gasket and seal for bolts if damaged.*
- ◆ *Renew seal for intake manifold flap. Engine codes BLS, BXJ*



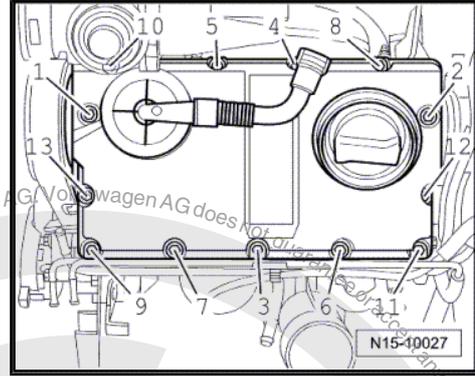
- Place a drop of sealant -AMV 174 004 01- (Ø approx. 5 mm) -arrows- on edges of both sealing surfaces of bearing cap and cylinder head at front of engine.





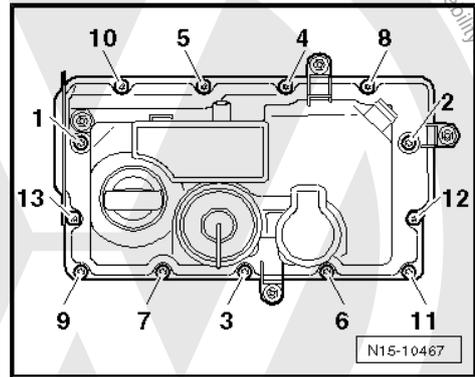
### Cylinder head cover, engine codes: BJB, BKC, BRU, BXE, BXF

- Screw on cylinder head cover hand-tight in the sequence -1 to 13.-
- Tighten bolts to 10 Nm in the sequence -1...13-.



### Cylinder head cover, engine codes: BLS, BXJ

- Screw on cylinder head cover hand-tight in the sequence -1 ... 13-.
- Tighten bolts to 10 Nm in the sequence -1...13-.



## 1.3 Removing, installing and tensioning toothed belts



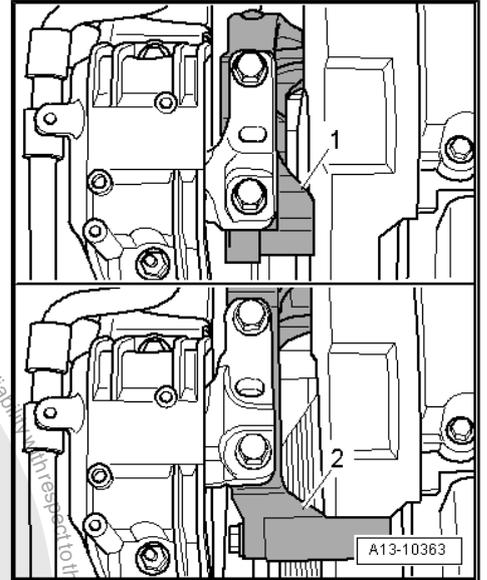
### Note

- ◆ *From 05.05 a modified engine support has been introduced, it is no longer necessary to remove the engine support and supporting the engine for the procedure "removing, installing and tensioning toothed belt".*
- ◆ *To change the tensioning roller, for both versions the engine support must be removed.*
- Determine which type of engine support is installed in the vehicle.

-1-: Engine support bolted close to engine (removal necessary)  
⇒ [page 51](#) .



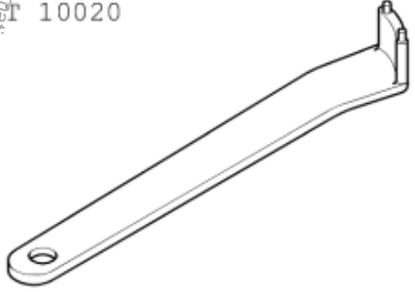
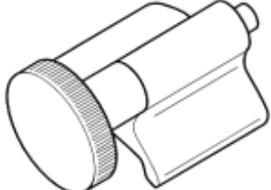
-2-: Engine support bolted further away from engine ▶ (removal not necessary) ⇒ [page 60](#) .



### 1.3.1 Removing and installing toothed belt (vehicles with engine support bolted close to engine)

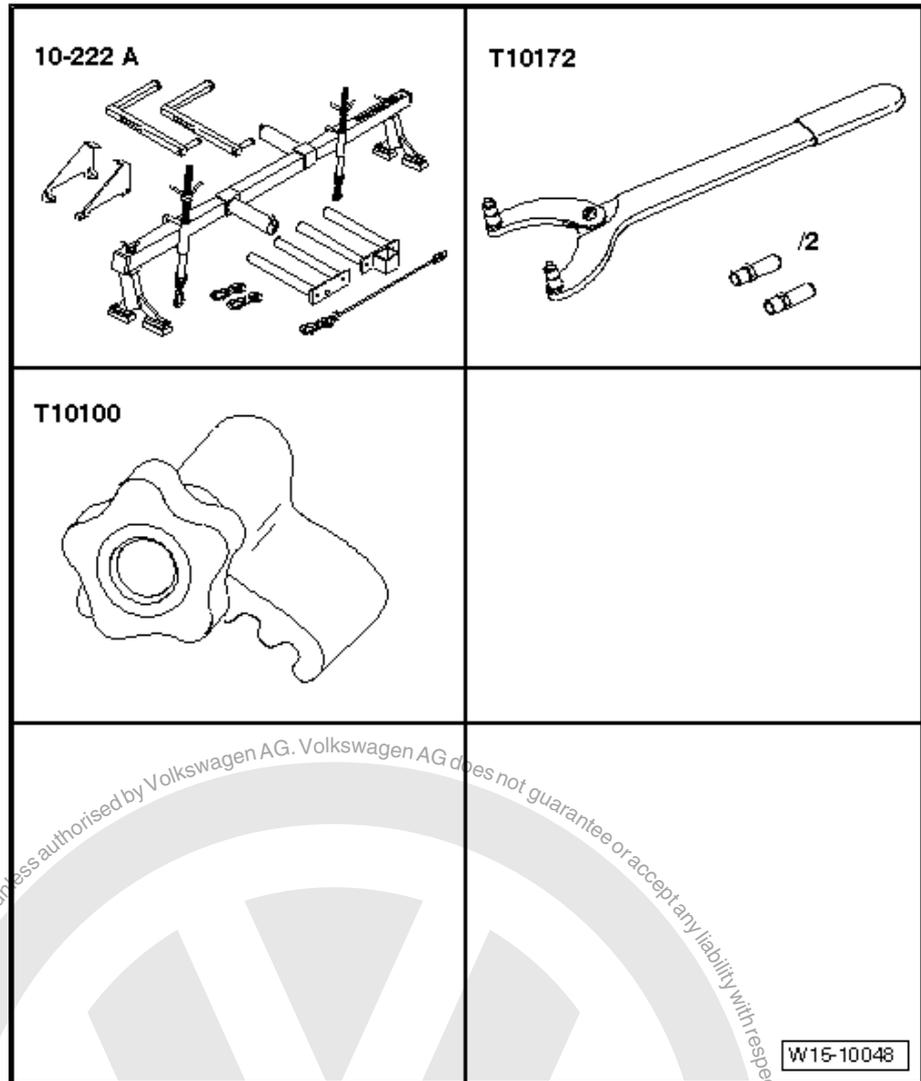
#### Special tools and workshop equipment required

- ◆ Locking pin -3359-
- ◆ Pin wrench -T10020- or hexagon wrench
- ◆ Locking pin -T10115-
- ◆ Crankshaft stop -T10050-
- ◆ Torque wrench V.A.G 1331-
- ◆ Torque wrench - V.A.G 1332-

<p>3359</p> 	<p>T 10020</p> 
<p>T10115</p> 	<p>T10050</p> 
<p>V.A.G 1331</p> 	<p>V.A.G 1332</p>  <p style="text-align: right;">W15-10001</p>



- ◆ Support bracket -10-222A- with adapters -10-222A/1-
- ◆ Counterhold tool -T10172- with pins -T10172/4-
- ◆ Crankshaft stop -T10100- (on vehicles with oval crankshaft belt pulley)



## Removing



### Note

*Adjustment work on toothed belts must be performed only on cold engines, as the indicator position on the tensioning element varies depending on the engine temperature.*

- Remove engine cover. ⇒ [page 4](#)
- Remove poly V-belt ⇒ [page 13](#) .
- Remove tensioning element for poly V-belt.
- Remove front right wheel housing liner.
- Remove belt pulley with vibration damper.
- Remove lower and centre parts of toothed belt guard.

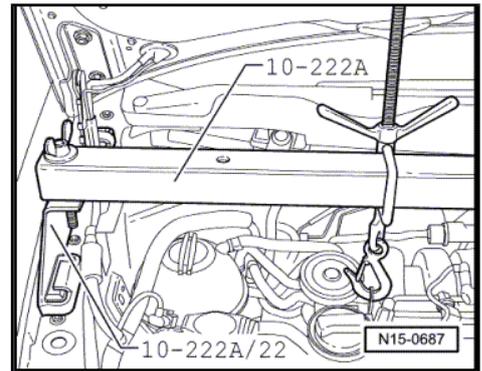


- Set up support bracket -10-222A- with adapters -10-222A/22- and support engine in installation position.

**i** Note

*If toothed belt is to be removed in order to remove cylinder head, set up support bracket -10-222A- with higher adapters -10-222A/13- . This will provide the space necessary for removing the cylinder head.*

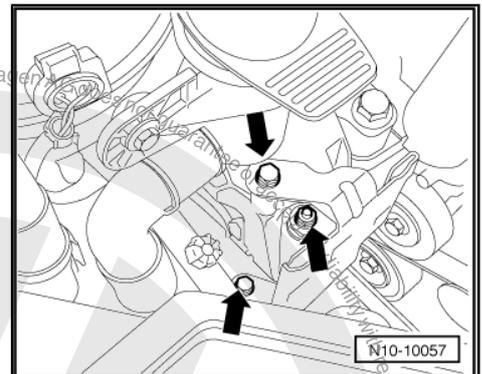
- Pull fuel filter out of bracket.
- Unscrew filler neck for window wash system.
- Unbolt fuel filter bracket from engine mounting -arrows-.
- Unbolt coolant expansion tank and lay to side (hoses remain connected).



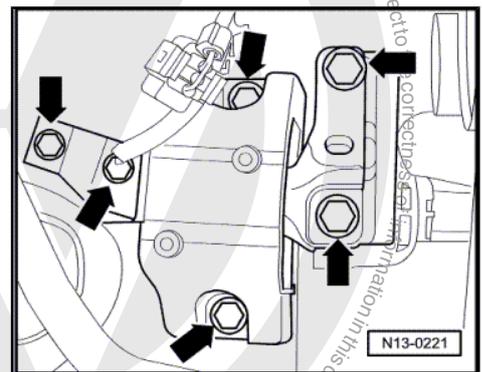
- Remove securing bolts between assembly mounting and engine bracket and between assembly mounting and body -arrows- and remove complete assembly mountings.

**i** Note

- ◆ *The assembly mounting may only be removed if the engine is supported with support bracket -10-222A- !*
- ◆ *The engine bracket must be loosened only when the assembly mounting has been removed.*

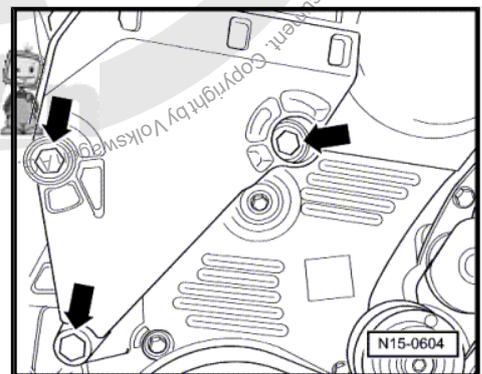


- Raise engine with support bracket -10-222A- until both upper bolts of engine bracket can be loosened.
- Lower engine with support bracket -10-222A- until both lower bolts of engine bracket can be loosened.
- Remove refrigerant line securing clamp from longitudinal member.
- Remove engine bracket rearwards.
- Turn crankshaft to TDC No. 1 cylinder.



**i** Note

*Gradual introduction of oval crankshaft toothed belt pulleys. When installing this toothed belt pulley, the crankshaft stop -T10100- must be installed to determine the TDC position instead of crankshaft stop -T10050- . Observe identification characteristics -arrows-.*





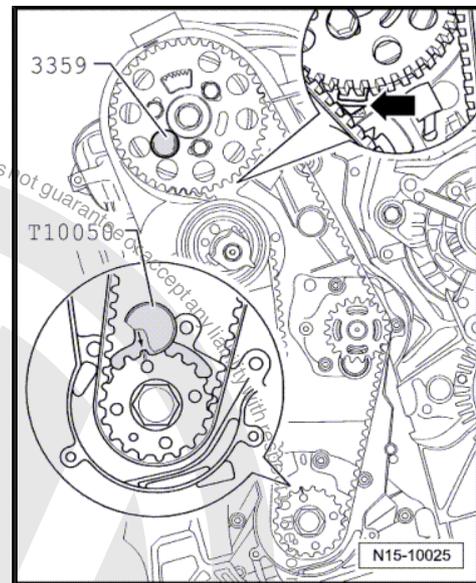
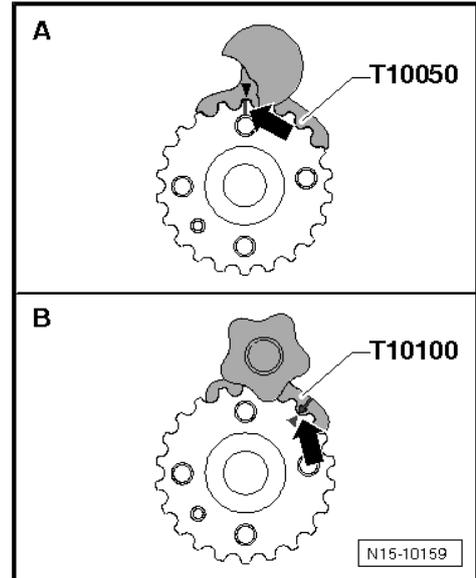
### Characteristics of crankshaft toothed belt pulley

A = Round belt pulley, lock using crankshaft stop -T10050- , TDC marking at 12 o'clock

B = Oval belt pulley, lock using crankshaft stop -T10100- . TDC marking at 1 o'clock

### Vehicles with round crankshaft belt pulley

- Turn crankshaft to TDC No. 1 cylinder.



### Note

Turn crankshaft until marking on crankshaft pulley and tooth segment of camshaft pulley is on top. The marking on the rear toothed belt guard must line up with the marking on the camshaft sender wheel -arrow-.

- Lock hub using locking pin -3359- . To do this, slide locking pin through the free elongated hole on left into hole in cylinder head.
- Lock crankshaft toothed belt pulley with crankshaft stop -T10050- . To do this, push crankshaft stop into teeth of belt pulley from face side.



### Note

The marks on the crankshaft toothed belt pulley and the crankshaft stop must align. When doing this, the pin of the crankshaft stop must insert in the drilling of the sealing flange.

### Vehicles with oval crankshaft belt pulley

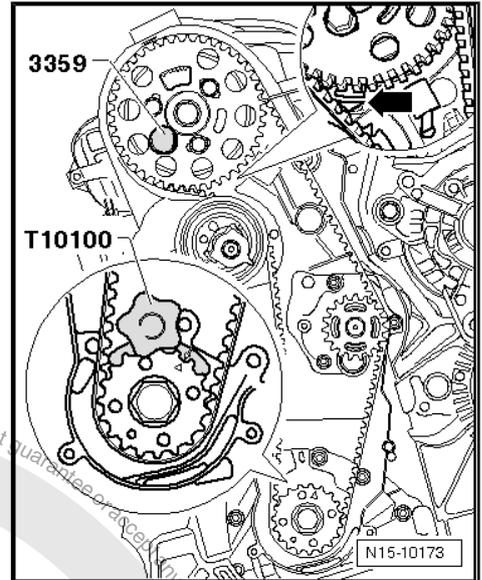
- Turn crankshaft to TDC No. 1 cylinder.



**i** Note

Turn crankshaft until marking on crankshaft pulley and tooth segment of camshaft pulley is on top. The marking on the rear toothed belt guard must align with the marking on the camshaft sender wheel -arrow-.

- Lock hub using locking pin -3359- . To do this, slide locking pin through the free elongated hole on left into hole in cylinder head.
- Lock crankshaft toothed belt pulley with crankshaft stop - T10100- . To do this, push crankshaft stop into teeth of toothed belt pulley from its face side.

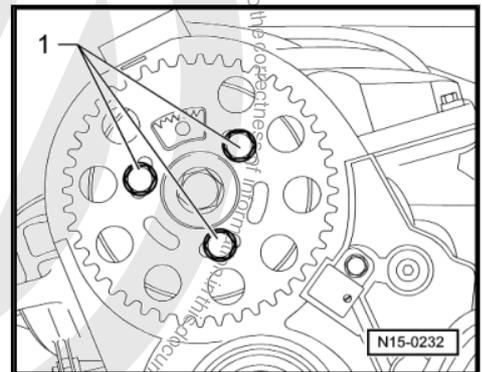


**i** Note

The marks on the crankshaft toothed belt pulley and the crankshaft stop must align. At the same time, the crankshaft stop pin must engage in the drilling in the sealing flange.

**Continuation for all vehicles**

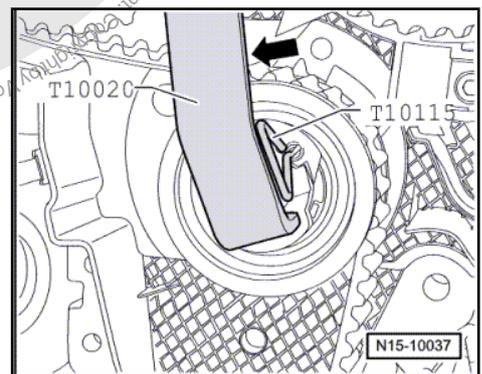
- Mark direction of rotation of toothed belt.
- Loosen securing bolts -1- of camshaft toothed belt pulley until camshaft pulley can be moved within the elongated holes.
- Loosen tensioning roller securing nut.



- Turn pin wrench -T10020- anti-clockwise until toothed belt tensioning roller can be locked with locking pin -T10115- .

**i** Note

A hexagon key can be used to tension or relieve tension on the tensioner.

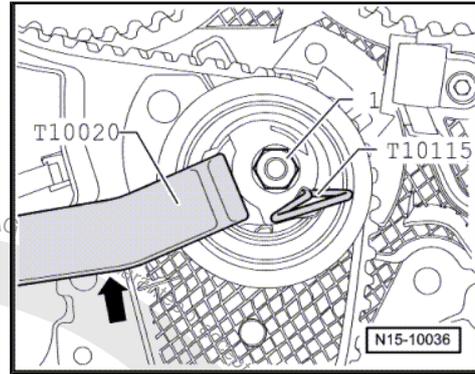




- Now turn pin wrench -T10020- clockwise to stop and tighten securing nut -1- hand tight.
- Remove toothed belt first from coolant pump and then from remaining pulleys.

### Installing

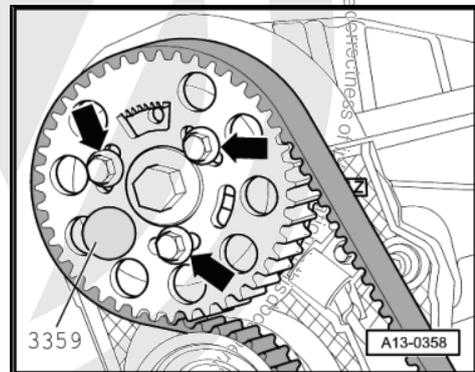
- Camshaft locked with locking pin -3359- .
- The crankshaft is locked with crankshaft stop -T10050- or crankshaft stop -T10100- .
- Tensioning roller locked with locking pin -T10115- and secured to right stop.



### Note

*Adjustment work on toothed belts must be performed only on cold engines, as the indicator position on the tensioning element varies depending on the engine temperature.*

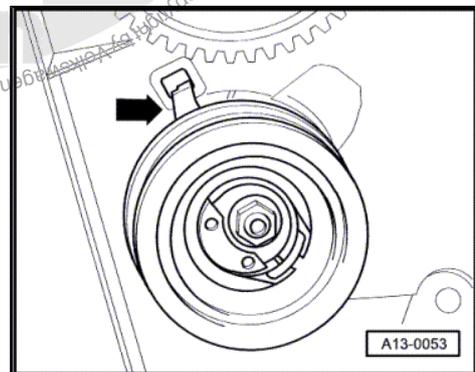
- Turn camshaft pulley in its elongated holes to centre position -arrows-.
- Fit toothed belt onto crankshaft toothed belt pulley, tensioning roller, camshaft toothed belt pulley and idler roller.
- Then fit toothed belt on coolant pump toothed belt pulley.



### Note

*Ensure that tensioning roller seats correctly in rear toothed belt guard -arrow-.*

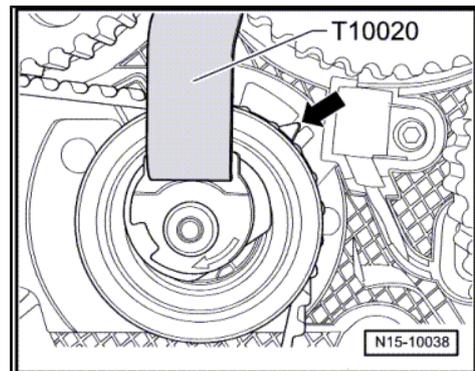
- Loosen tensioning roller securing nut and pull out locking pin -T10115- .



- Now carefully turn tensioning roller clockwise using pin wrench -T10020- until indicator is in middle of gap in the base plate -arrow-.

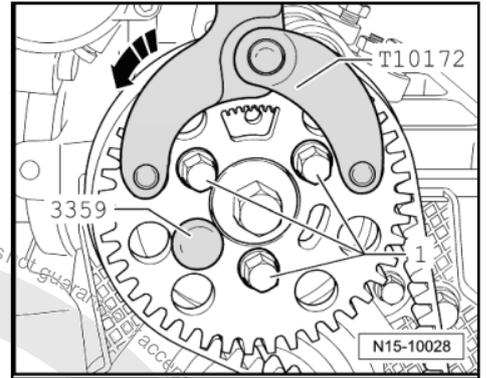
Ensure that securing nut does not turn as well.

- Hold tensioning roller in this position and tighten tensioning roller securing nut as follows: 20 Nm and 45° (1/8 turn) further.





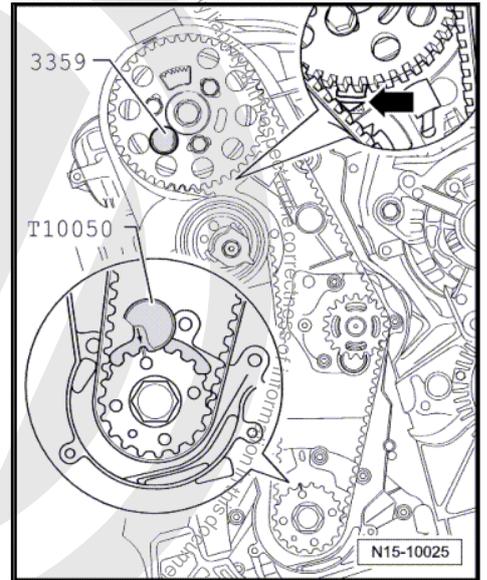
- Fit counterhold tool -T10172- with pins -T10172/4- as shown. Press counterhold tool -T10172- in direction of arrow, keeping camshaft toothed belt pulley under tension.
- In this position, tighten camshaft toothed belt pulley securing bolts -1- to 25 Nm.
- Remove locking pin -3359- and crankshaft stop -T10050- .
- Turn crankshaft two rotations in engine direction of rotation until crankshaft is just before TDC No. 1 cylinder.



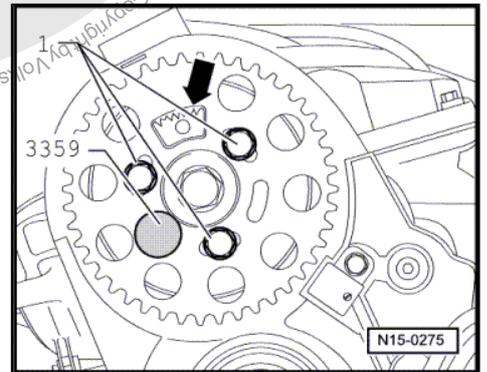
**Vehicles with round crankshaft belt pulley**

- Lock hub with locking pin -3359- whilst turning engine in direction of rotation.
- Check whether crankshaft can be locked with crankshaft stop -T10050- .

If crankshaft cannot be locked

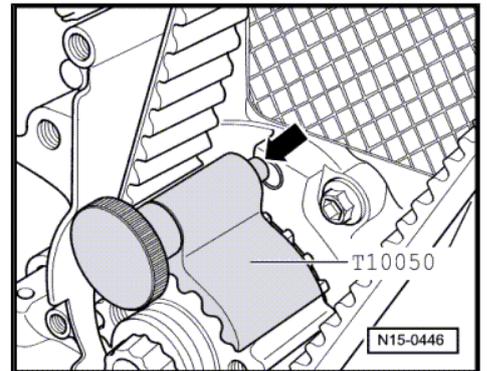


- Loosen securing bolts -1- for camshaft toothed belt pulley



- Turn crankshaft slightly against engine direction of rotation until the pin of the crankshaft stop is positioned just before the hole in the sealing flange -arrow-.
- Now turn crankshaft in engine direction of rotation until crankshaft stop pin engages in sealing flange whilst turning.

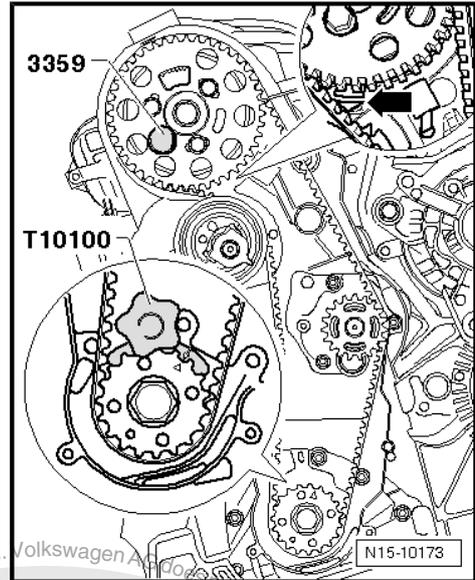
**Vehicles with oval crankshaft belt pulley**



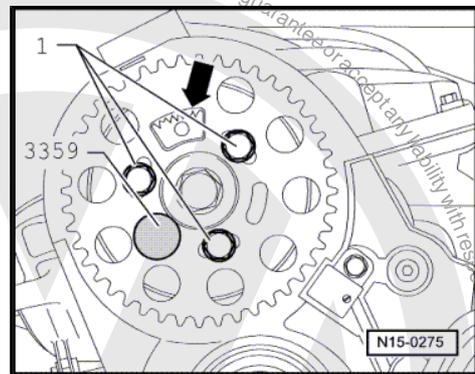


- Lock hub with locking pin -3359- whilst turning engine in direction of rotation.
- Check whether the crankshaft can be locked with crankshaft stop -T10100- .

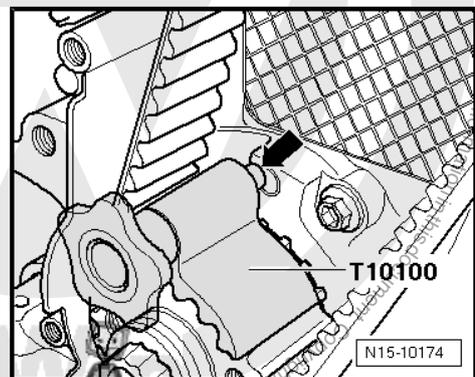
If crankshaft cannot be locked:



- Loosen securing bolts -1- for camshaft toothed belt pulley.

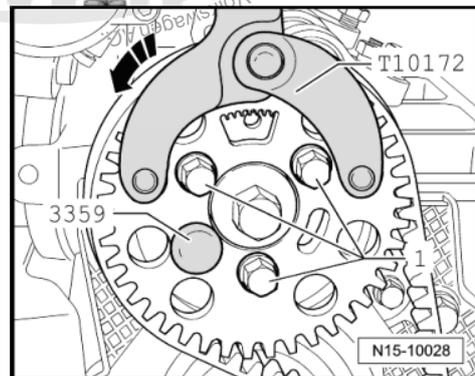


- Turn crankshaft against engine direction of rotation slightly until pin of crankshaft stop is located just before hole in sealing flange -arrow-.
- Now turn crankshaft in engine direction of rotation until crankshaft stop pin engages in sealing flange from rotational movement.



#### Continuation for all vehicles

- Fit counterhold tool -T10172- with pins -T10172/4- as shown. Press counterhold tool -T10172- in direction of arrow, keeping camshaft toothed belt pulley under tension.
- In this position, tighten camshaft toothed belt pulley securing bolts -1- to 25 Nm.
- Remove locking pin -3359- and crankshaft stop -T10050- .
- Turn crankshaft two rotations in engine direction of rotation until crankshaft is just before TDC No. 1 cylinder.
- Repeat check.





- Set engine bracket against cylinder block and tighten securing bolts -arrows- to 40 Nm + 1/2 turn (180 °) further.



#### Note

*Before installing assembly mounting, tighten all engine bracket bolts to prescribed torque.*

- Install assembly mounting between engine and body (renew securing bolts).

Specified torque, M8 bolts: 20 Nm + 90° (1/4 turn)

Specified torque, M10 bolts: 40 Nm + 90° (1/4 turn)

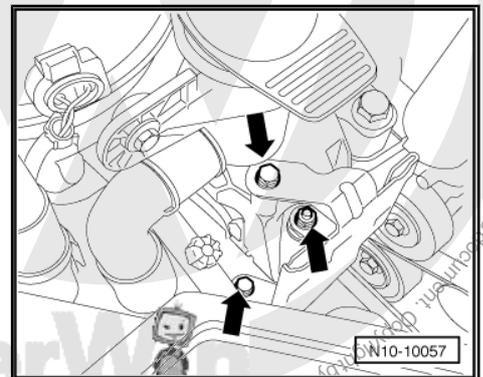
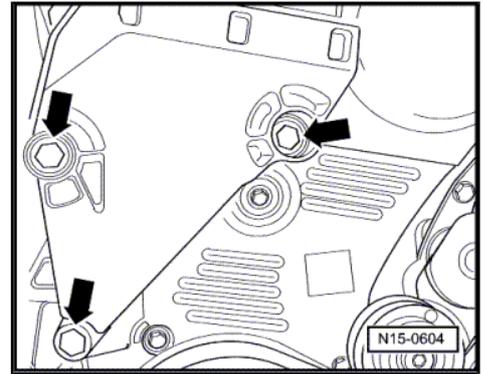
- Bolt engine assembly mounting to engine bracket by bringing contact surfaces together using support bracket -10-222A.

Specified torque: 60 Nm + 90° (1/4 turn)

- Install centre and lower parts of toothed belt guard.
- Install belt pulley vibration damper (renew securing bolts).

Specified torque: 10 Nm + 90° (1/4 turn)

- Install poly V-belt ⇒ [page 13](#) .
- Install toothed belt guard upper part.
- Install front right wheel housing liner.
- Install coolant expansion tank.
- Bolt fuel filter bracket to engine mounting to 8 Nm torque -arrows-.
- Engage fuel filter in bracket.
- Bolt on filler neck for window wash system.
- Fit engine cover.





### 1.3.2 Removing and installing toothed belt (vehicles with engine support bolted further away from engine)

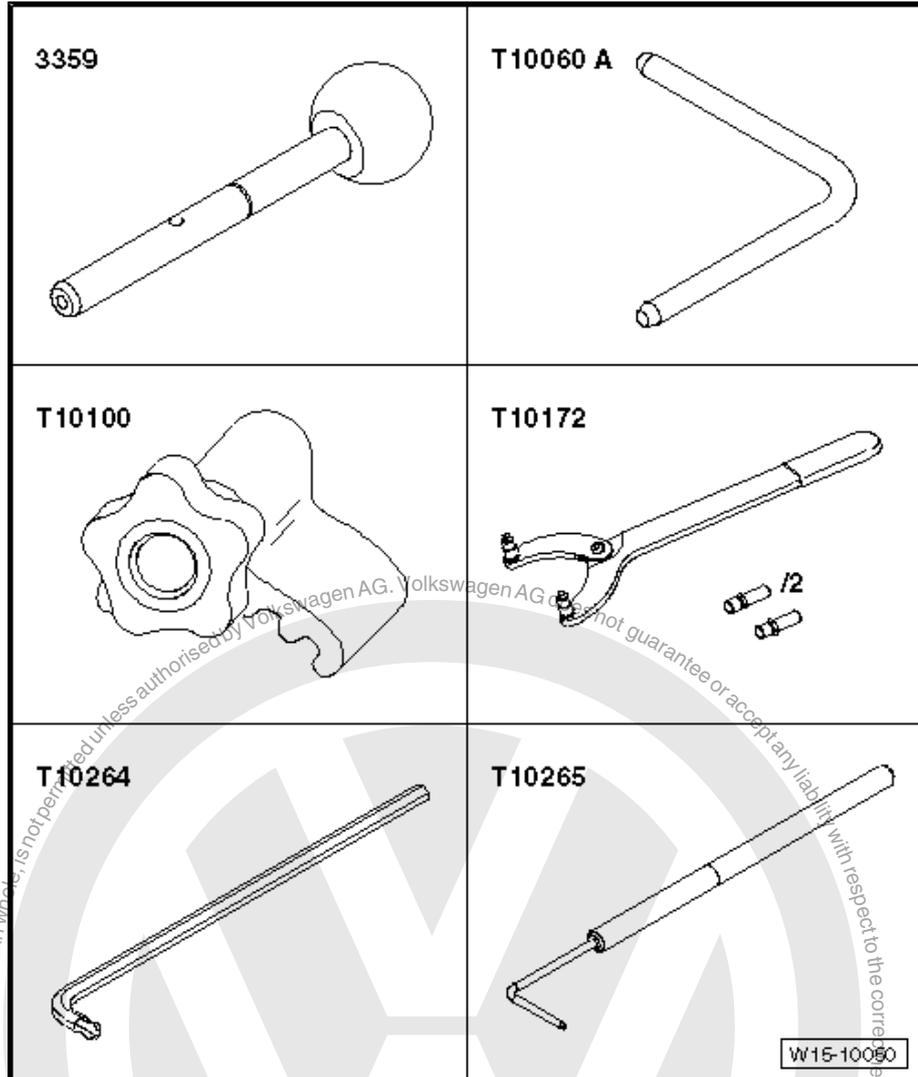


**Note**

- ◆ A revised engine support has been introduced gradually and it is no longer necessary to remove the engine support and to support the engine for the procedure "removing, installing and tensioning toothed belt".
- ◆ To change the tensioning roller, for both versions the engine support must be removed.

**Special tools and workshop equipment required**

- ◆ Diesel injection pump locking pin -3359-
- ◆ Locking pin -T10060 A-
- ◆ Crankshaft stop -T10100-
- ◆ Counterhold tool -T10172-
- ◆ Special wrench, long reach -T10264-
- ◆ Locking tool -T10265-



**Removing**

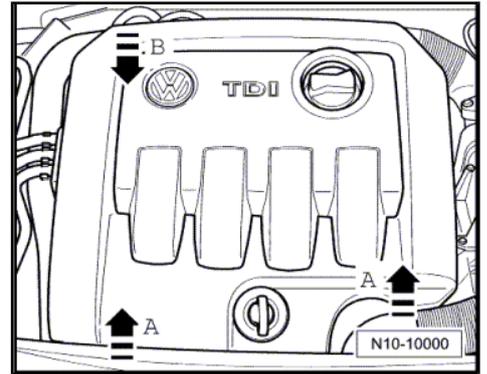
- Remove engine cover. ⇒ [page 4](#) To do this, pull engine cover upwards abruptly at front -arrows A- and then pull forwards out of rear fastening -arrow B-.



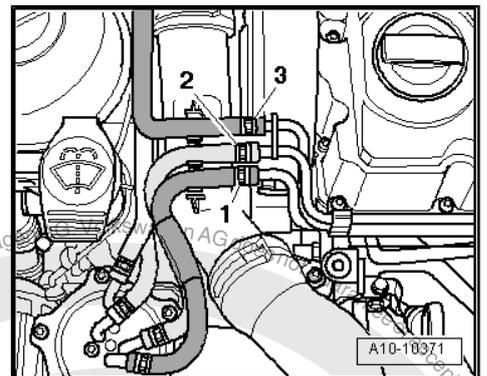
- Remove two-piece engine cover => [page 4](#)

**! WARNING**

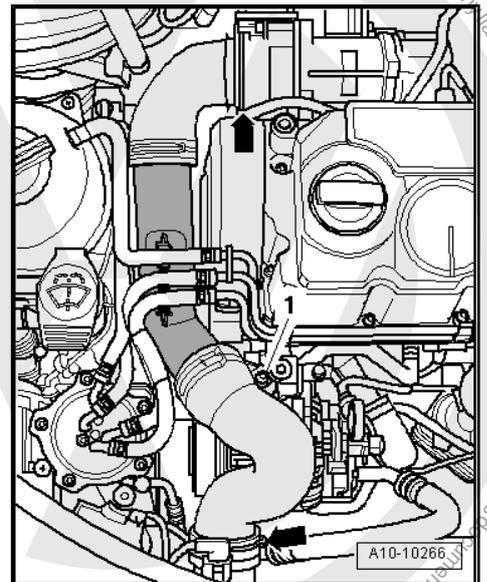
- ◆ *In extreme cases the fuel lines and the fuel can reach a temperature of 100 °C on vehicles with unit injector engine. Allow the fuel to cool down before disconnecting the lines - danger of scalding.*
- ◆ *Wear protective gloves.*
- ◆ *Wear eye protection.*



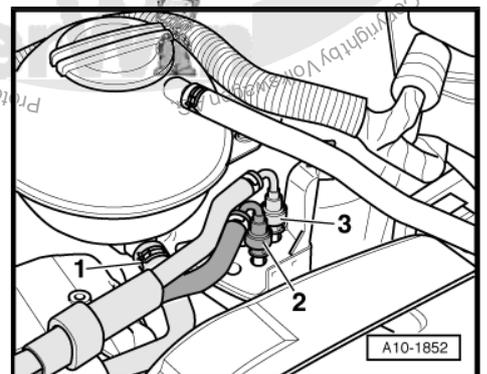
- Pull fuel supply hose -1- and fuel return hose -2- off fuel lines.
- Pull off coolant line -3-.
- Remove bolt -1-.



- Remove connecting pipe between charge air cooler and intake connecting pipe, to do this, lightly lift retaining clips -arrows-.

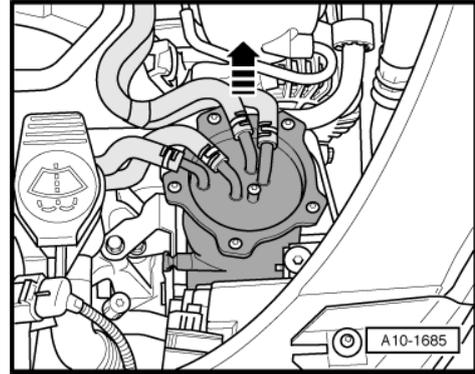


- Disconnect fuel supply line -3- and return line -2- by pulling release tabs.

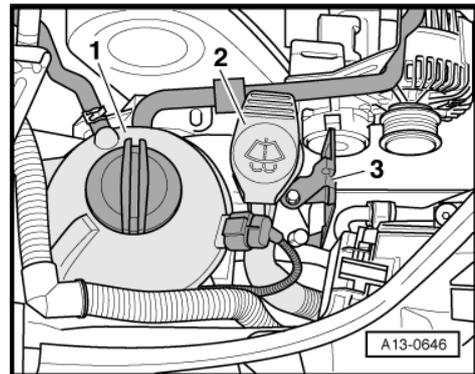




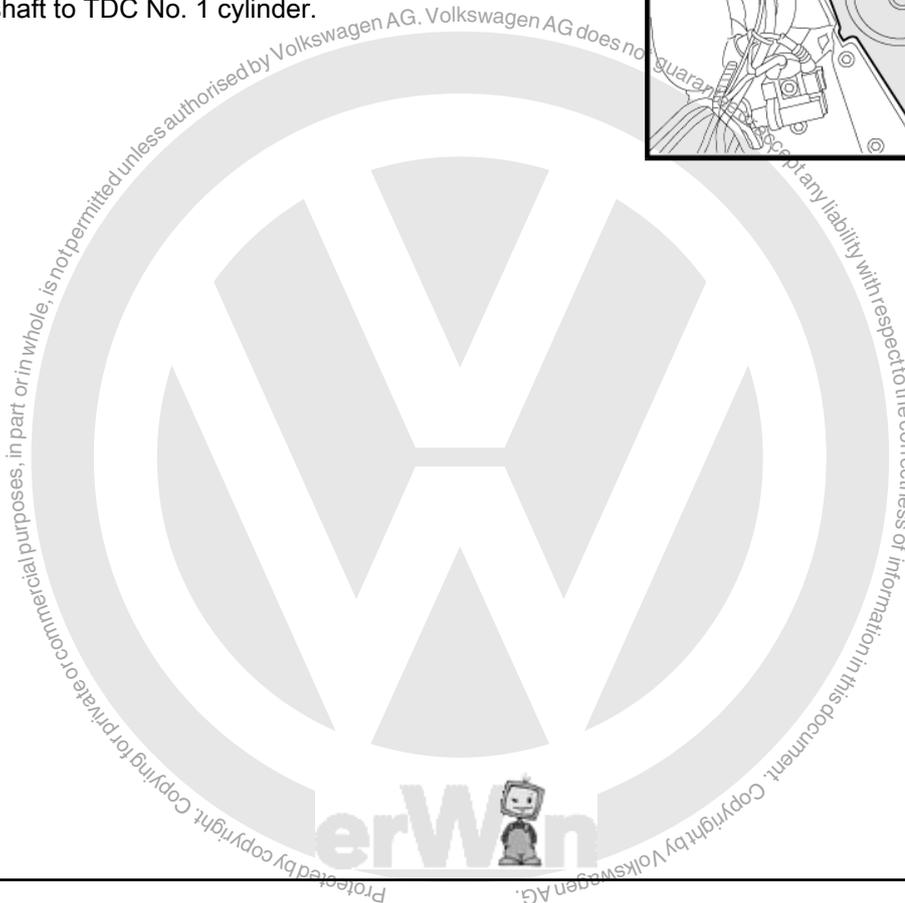
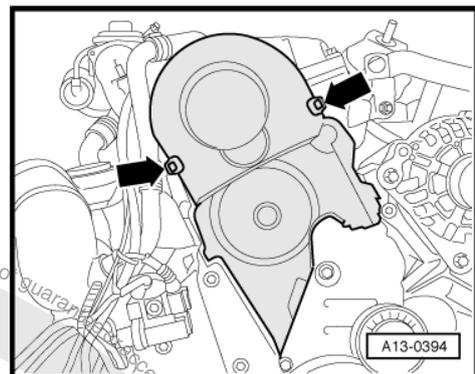
- Pull fuel filter out of bracket -arrow-.
- Unscrew bolt at filler neck -2- for windscreen washer system reservoir.
- Unscrew bracket -3- for fuel filter.



- Disconnect electrical connector on coolant expansion tank -1-.
- Remove coolant expansion tank, coolant hoses remain connected. Place it on engine.
- Remove poly V-belt => [page 13](#) .
- Remove tensioning element for poly V-belt.



- Remove upper toothed belt guard, to do this, loosen retaining clips -arrows-.
- Remove front right wheel housing liner.
- Remove belt pulley with vibration damper.
- Remove lower and centre parts of toothed belt guard.
- Turn crankshaft to TDC No. 1 cylinder.

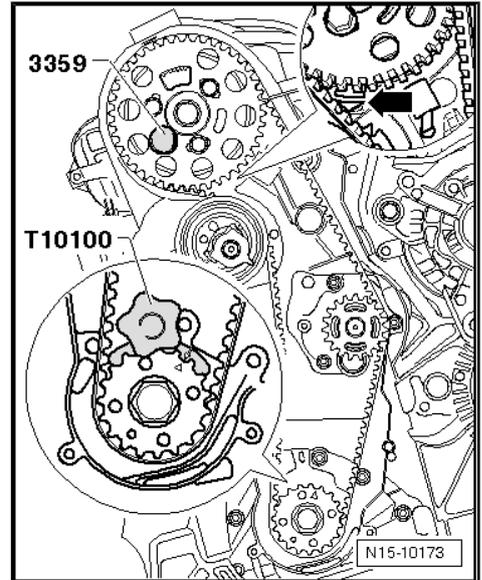




**i** Note

Turn crankshaft until marking on crankshaft pulley and tooth segment of camshaft pulley is on top. The marking on the rear toothed belt guard must line up with the marking on the camshaft sender wheel -arrow-.

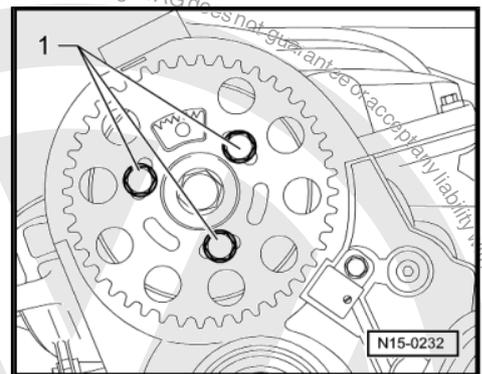
- Lock hub using locking pin -3359- . To do this, slide locking pin through the free elongated hole on left into hole in cylinder head.
- Lock crankshaft toothed belt pulley with crankshaft stop - T10100- . To do this, push crankshaft stop into teeth of belt pulley from face side.



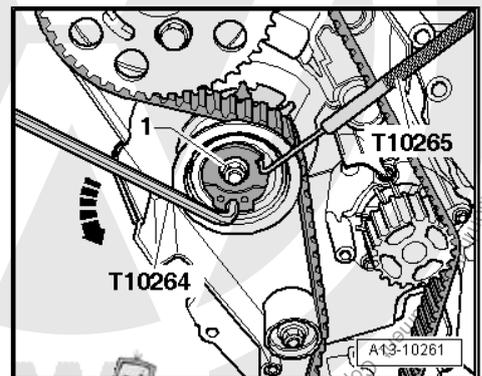
**i** Note

The marks on the crankshaft toothed belt pulley and the crankshaft stop must align. When doing this, the pin of the crankshaft stop must insert in the drilling of the sealing flange.

- Mark direction of rotation of toothed belt.
- Loosen securing bolts -1- of camshaft toothed belt pulley until camshaft pulley can be moved within the elongated holes.



- Loosen tensioning roller securing nut -1-.
- Turn eccentric of tensioning roller anti-clockwise -arrow- using socket -T10264- , until the tensioning roller can be locked with locking tool -T10265- .

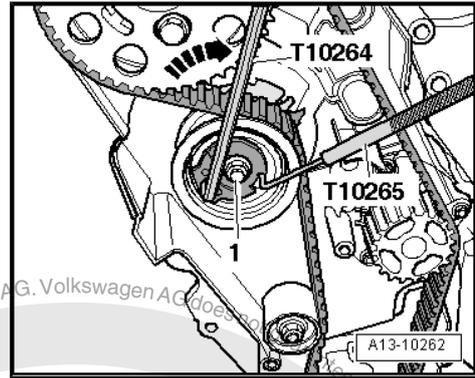




- Now turn tensioning roller eccentric clockwise -arrow- onto stop and tighten securing nut -1- hand-tight.
- Remove toothed belt first from coolant pump and then from remaining toothed belt pulleys.

### Installing

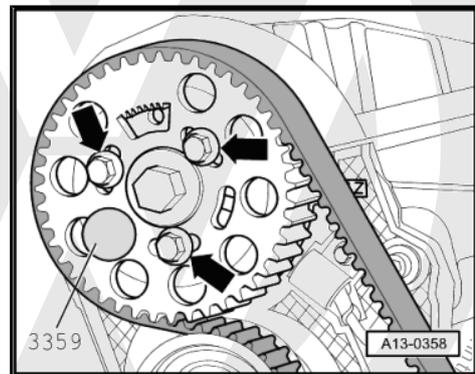
- Camshaft locked with locking pin -3359- .
- Crankshaft locked with crankshaft stop -T10100- .
- Tensioning roller locked with locking pin -T10265- and secured to right stop with securing nut.



### Note

*Adjustment work on toothed belts must be performed only on cold engines, as the indicator position on the tensioning element varies depending on the engine temperature.*

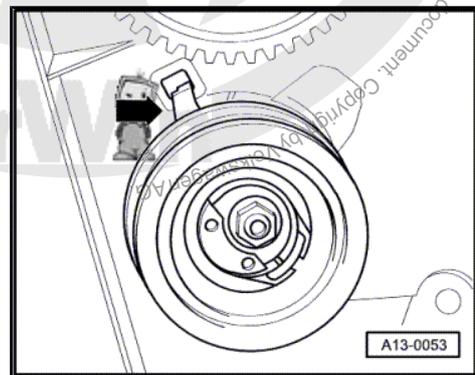
- Turn camshaft pulley in its elongated holes to centre position -arrows-.
- Guide toothed belt through gap between engine support and engine.
- Fit toothed belt onto crankshaft toothed belt pulley, tensioning roller, camshaft toothed belt pulley and idler roller.
- Then fit toothed belt on coolant pump toothed belt pulley.



### Note

*Ensure that tensioning roller seats correctly in rear toothed belt guard -arrow-.*

- Remove locking pin -T10265- from tensioning roller.
- Loosen tensioning roller securing nut -1-.

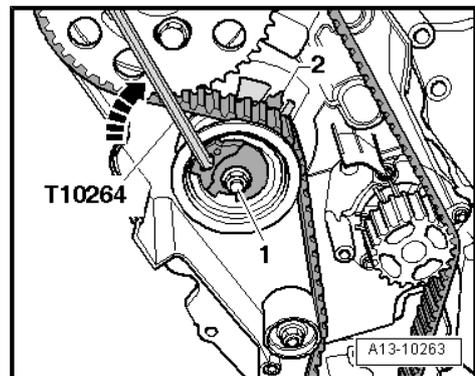


- Turn eccentric of tensioning roller clockwise -arrow- using special wrench, long reach -T10264- until indicator -2- is in middle of gap in base plate.

### Note

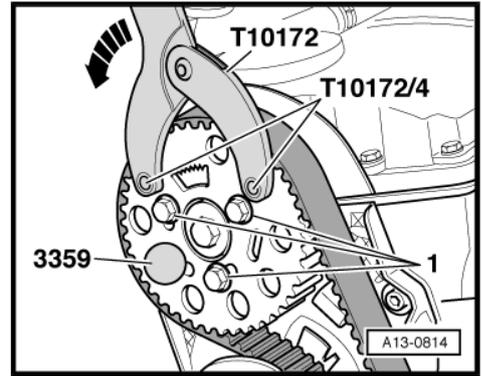
*Ensure that securing nut does not turn as well.*

- Hold tensioning roller in this position and tighten tensioning roller nut to 20 Nm + 45° (1/8 turn).

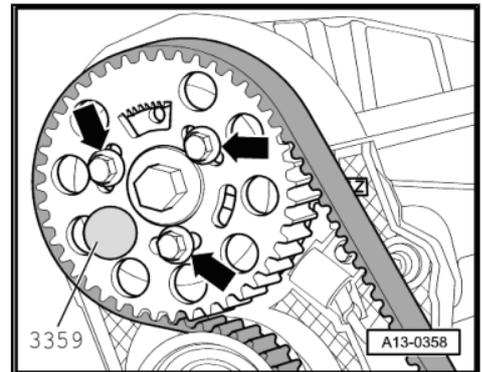




- Fit counterhold tool -T10172- with pin -T10172/4- as shown in illustration, and keep the toothed belt under tension on pulling side, by pressing in -direction of arrow-.
- Tighten bolts -1- of camshaft toothed belt pulley to 25 Nm.
- Remove locking pin -3359- and crankshaft stop -T10100- .
- Turn crankshaft two rotations in engine direction of rotation until the crankshaft is just before TDC again.

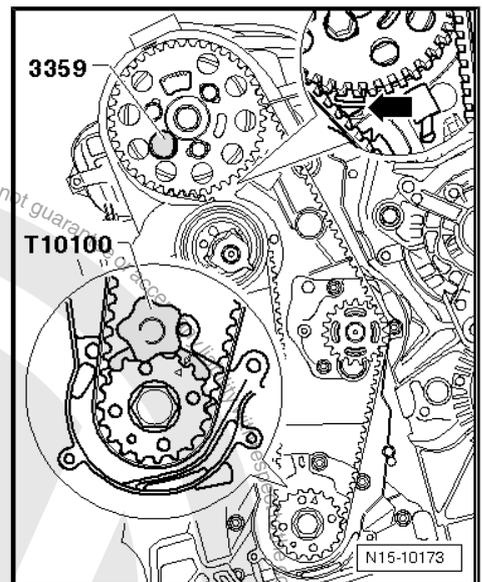


- Lock hub of camshaft with locking pin -3359- whilst turning engine in direction of rotation.

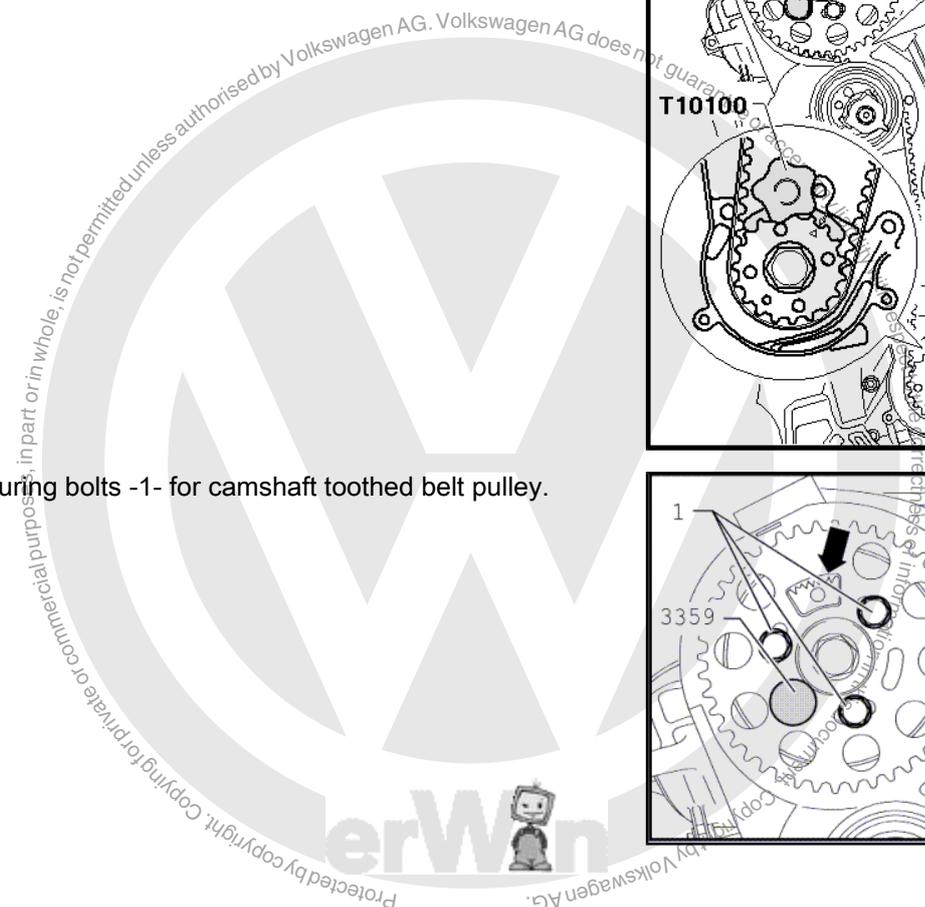
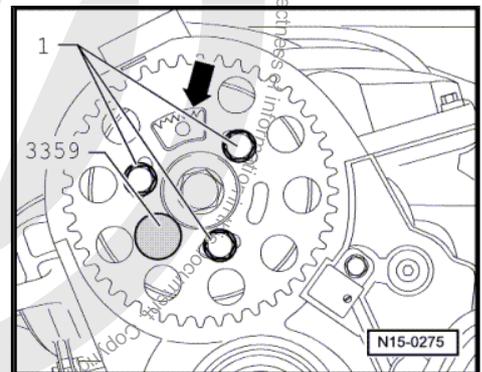


- Check whether crankshaft can be locked with crankshaft stop -T10100- .

If crankshaft cannot be locked

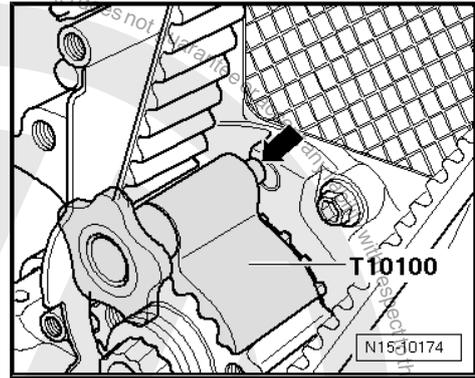


- Loosen securing bolts -1- for camshaft toothed belt pulley.

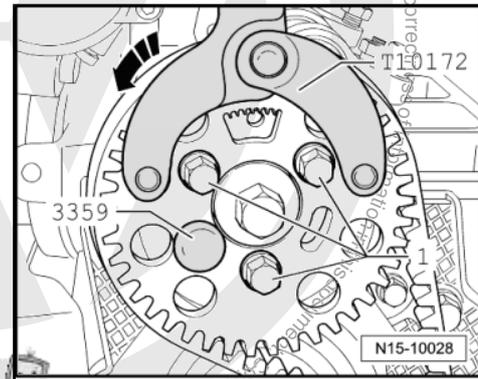




- Turn crankshaft slightly against engine direction of rotation until the pin of the crankshaft stop is positioned just before the hole in the sealing flange -arrow-.
- Now turn crankshaft in engine direction of rotation until crankshaft stop pin engages in sealing flange whilst turning.

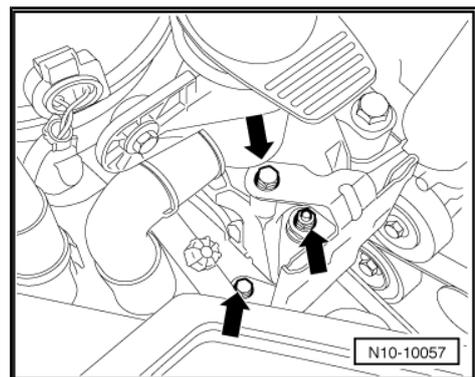


- Fit counterhold tool -T10172- with pins -T10172/4- as shown. Press counterhold tool -T10172- in direction of arrow, keeping camshaft toothed belt pulley under tension.
- In this position, tighten camshaft toothed belt pulley securing bolts -1- to 25 Nm.
- Remove locking pin -3359- and crankshaft stop -T10100- .
- Turn crankshaft two rotations in engine direction of rotation until crankshaft is just before TDC No. 1 cylinder.
- Repeat check and adjustment if necessary.
- Install centre and lower parts of toothed belt guard.
- Install belt pulley vibration damper (renew securing bolts).



Specified torque: 10 Nm + 90° (1/4 turn)

- Install poly V-belt ⇒ [page 13](#) .
- Install toothed belt guard upper part.
- Install connecting pipe between charge air cooler and intake connecting pipe.
- Install front right wheel housing liner.
- Install coolant expansion tank.
- Bolt fuel filter bracket to engine mounting to 8 Nm torque -arrows-.
- Engage fuel filter in bracket.
- Bolt on filler neck for window wash system.
- Fit engine cover.

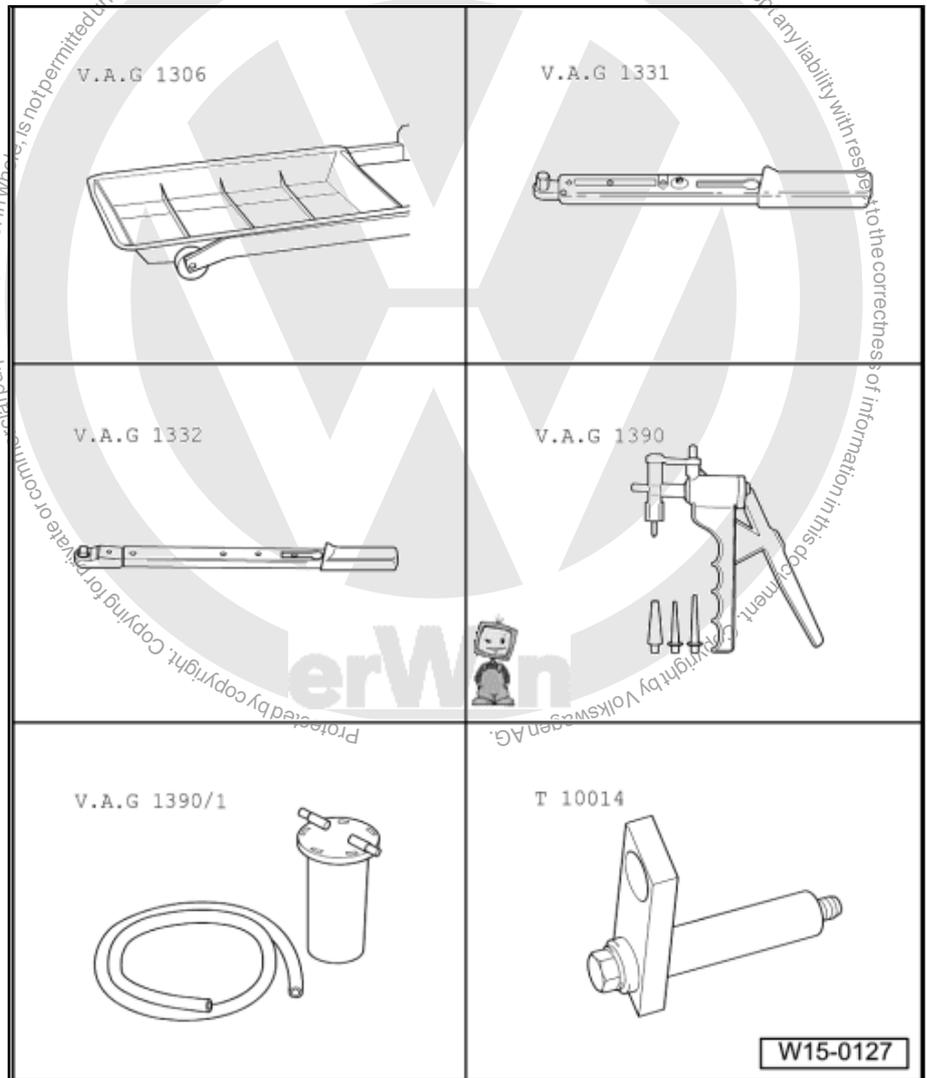




## 1.4 Removing and installing cylinder head

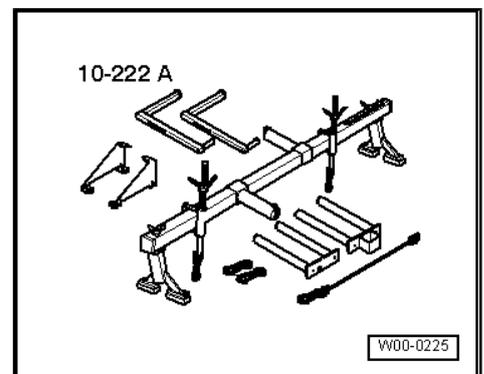
### Special tools and workshop equipment required

- ◆ Drip tray -V.A.G 1306- or drip tray -VAS 6208-
- ◆ Torque wrench - V.A.G 1331-
- ◆ Torque wrench - V.A.G 1332-
- ◆ Hand vacuum pump with accessories -V.A.G 1390-
- ◆ Water drainage container - V.A.G 1390/1-
- ◆ Retainer -T10014- (only vehicles > 05.05)



### Special tools and workshop equipment required

- ◆ Support bracket -10-222A- with adapters -10-222A/13- (only vehicles > 05.05)





## Note

All cable ties which are opened or cut through when cylinder head is removed must be replaced in the same position when cylinder head is installed.



## WARNING

When doing any repair work, especially in the engine compartment, pay attention to the following due to the cramped conditions:

- ◆ Route all the various lines (e.g. for fuel, hydraulics, activated charcoal filter system, coolant, refrigerant, brake fluid and vacuum) and electrical wiring in their original positions.
- ◆ Ensure that there is sufficient clearance to all moving or hot components.

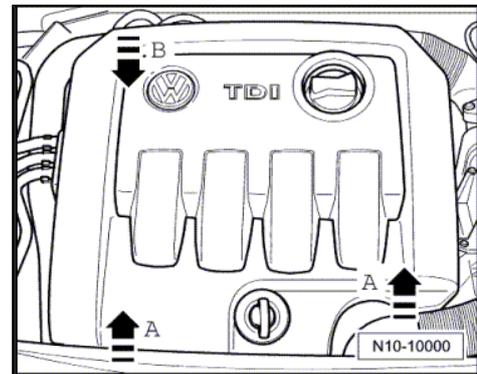
## 1.4.1 Removing



## Note

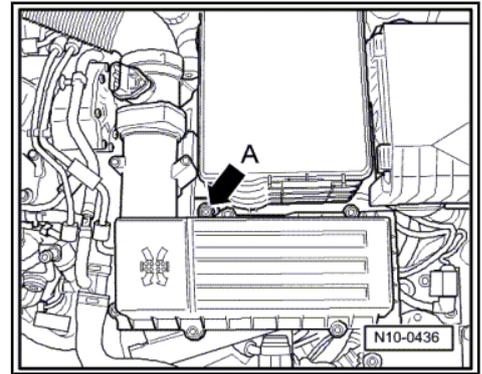
Before removing cylinder head, extract fuel using hand-operated vacuum pump with accessories -V.A.G 1390- and water drainage container -V.A.G 1390/1- => [page 147](#).

- Remove engine cover panel => [page 4](#). To do this, pull engine cover upwards abruptly at front -arrows A- and then pull forwards out of rear fastening -arrow B-.
- Remove two-piece engine cover => [page 4](#)
- Remove plenum chamber bulkhead. => General body repairs, exterior; Rep. Gr. 50 ; Body - front, plenum chamber bulkhead .
- Remove air filter housing with air mass meter and connecting pipe.





- Remove bolt -arrow A- and pull air filter housing upwards out of mounting.
- Remove insulation tray. ⇒ General body repairs, exterior; Rep. Gr. 50 ; Body - front; Assembly overview .
- Drain coolant. ⇒ [page 102](#)
- Disconnect fuel supply and return lines as well as coolant line on cylinder head.
- Before removing cylinder head, extract fuel from tandem pump using hand-operated vacuum pump with accessories -V.A.G 1390- and water drainage container -V.A.G 1390/1- ⇒ [page 147](#) .
- Pull fuel filter module upwards out of bracket and lay it with hoses to side.
- Remove front exhaust pipe ⇒ [page 186](#) .
- Remove turbocharger support and oil return from turbocharger.
- Remove oil supply line and lay it to side ⇒ [page 95](#) .



**i Note**

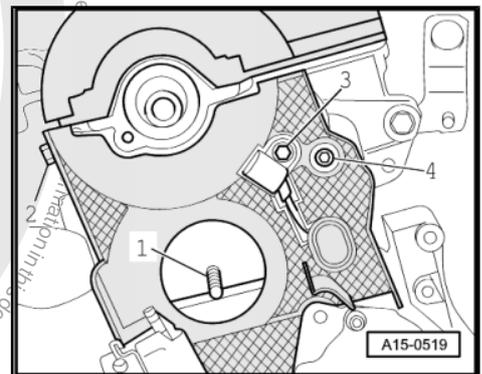
*From 05.05 a modified engine support has been introduced, it is no longer necessary to remove the engine support and supporting the engine for the procedure "removing, installing and tensioning toothed belt" ⇒ [page 50](#)*

- Remove toothed belt. ⇒ [page 50](#)
- Remove toothed belt tensioning roller.
- Install hub for camshaft pulley ⇒ [page 80](#) , Removing and installing camshaft.
- Remove rear toothed belt guard securing bolts -2- and -4-.
- Unscrew Hall sender -G40- -3-.
- Remove exhaust gas recirculation connecting pipe.
- Pull off or disconnect all other electrical connections as necessary from cylinder head and lay to one side.
- Separate all connection, coolant, vacuum and intake hoses from cylinder head.

**Only vehicles ▶ 05.05)**

**i Note**

*Both lifting eyes for the support are located on the cylinder head, so an additional bracket for supporting the engine must be secured on the cylinder block.*

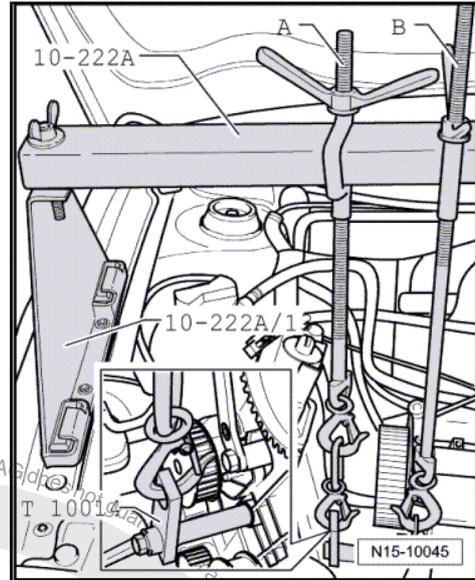




- Screw retainer -T10014- into threaded hole above coolant pump and tighten to 20 Nm.
- Lift engine slightly using spindle -A- until spindle -B- is relieved.
- Unhook spindle -B- and push it to side.

**Continuation for all vehicles**

- Remove cylinder head cover. => [page 48](#)

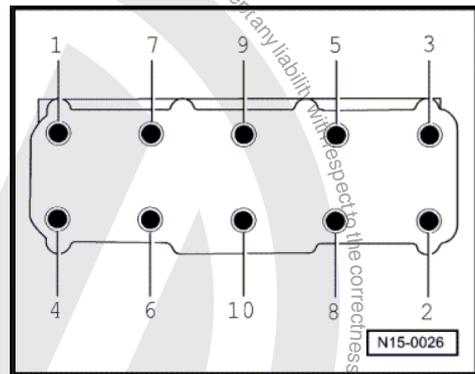


- Maintain sequence when loosening cylinder head bolts.
- Lift cylinder head slightly and remove from engine laterally past toothed belt guard.



**Note**

*The cylinder head must be guided carefully to prevent damage.*



## 1.4.2 Installing



**Note**

- ◆ *Always renew cylinder head bolts.*
- ◆ *In cases of repair carefully remove gasket remains from cylinder head and cylinder block. Ensure that no long scores or scratches are created. When using abrasive paper do not use a grade less than 100.*
- ◆ *Carefully remove remains of emery and abrasives.*
- ◆ *Do not remove new cylinder head gasket from packaging until it is ready to be fitted.*
- ◆ *Handle gasket very carefully. Damage to the silicone coating or the indented area will lead to leaks.*
- Turn crankshaft to TDC marking before fitting cylinder head.
- Turn crankshaft opposite engine direction of rotation until all pistons are approximately equally placed below TDC.
- Fit cylinder head gasket.



**Note**

*Note identification on cylinder head gasket => [page 47](#).*



- Fit cylinder head and tighten all cylinder head bolts hand-tight.
- Tighten cylinder head in four stages in sequence as shown as follows:

1 - Tighten initially with torque wrench:

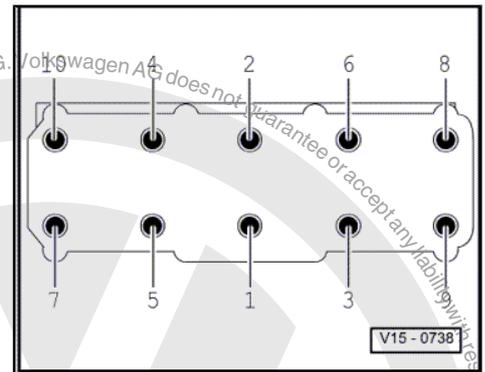
Stage I = 35 Nm

Stage II = 60 Nm

2 - Turn further with rigid spanner:

Stage III = 1/4 turn (90°)

Stage IV = 1/4 turn (90°)

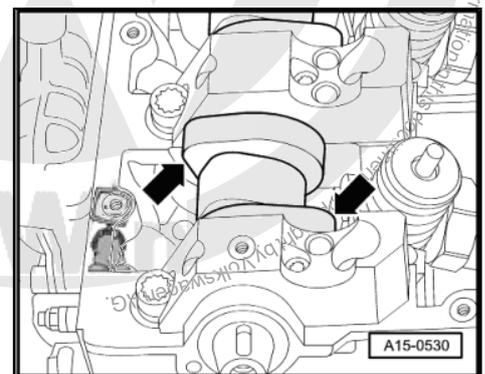


**i** Note

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

Further installation is carried out in the reverse order. In the process, note the following:

- After tightening cylinder head, turn camshaft so that cams for No. 1 cylinder equally point upwards. Before fitting toothed belt, turn crankshaft in engine direction of rotation ⇒ [page 50](#) , removing, installing and tightening toothed belt.
- Install hub for camshaft toothed belt pulley ⇒ [page 147](#) , Removing and installing camshaft.
- Install toothed belt ⇒ [page 50](#) .
- Install poly V-belt ⇒ [page 13](#) .
- Install oil supply line ⇒ [page 95](#) .
- Install insulation tray ⇒ General body repairs, exterior; Rep. Gr. 50 ; Body - front; Assembly overview.
- Install plenum chamber bulkhead ⇒ General body repairs, exterior; Rep. Gr. 50 ; Body - front; Plenum chamber bulkhead .
- Fill cooling system with coolant ⇒ [page 102](#) .
- Carry out road test and then read fault memory ⇒ [page 178](#) .



## 1.5 Checking compression

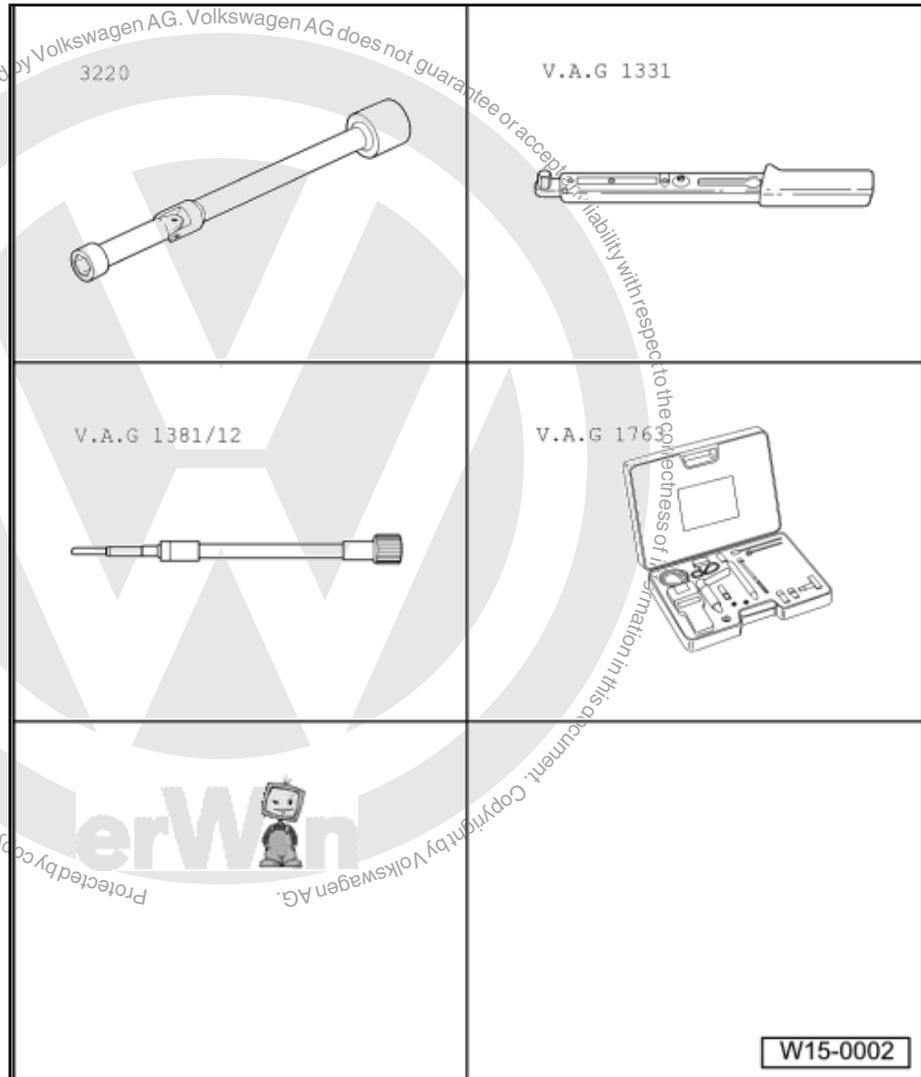
**i** Note

*If ceramic glow plugs are fitted, before removing check idling speed smooth running control using vehicle diagnostic, testing and information system -VAS 5051B-. The compression test is warranted only if one or more cylinders are conspicuous in this idling speed check.*



### Special tools and workshop equipment required

- ◆ Jointed spanner -3220-
- ◆ Torque wrench - V.A.G 1331-
- ◆ Adapter -V.A.G 1381/12-
- ◆ Compression tester - V.A.G 1763-



### Test prerequisite

- Engine oil temperature min. 30 °C.

### Test procedure

- Pull off central connector for unit injectors.



### Note

*If ceramic glow plugs are fitted, always observe notes on removing and installing ceramic glow plugs ⇒ [page 198](#).*

- Remove all glow plugs or ceramic glow plugs using jointed extension and socket -3220- .



- Screw in adapter -V.A.G 1381/12- in place of glow plugs or ceramic glow plugs.
- Check compression using compression tester -V.A.G 1763- .

**i** Note

*Using compression tester ⇒ Operating instructions.*

- Operate starter until tester shows no further pressure increase.

Compression pressures:

New: 25...31 bar, wear limit: 19 bar

Maximum permissible difference between all cylinders: 5 bar

**i** Note

*If ceramic glow plugs are fitted, always observe notes on removing and installing ceramic glow plugs ⇒ [page 198](#) .*

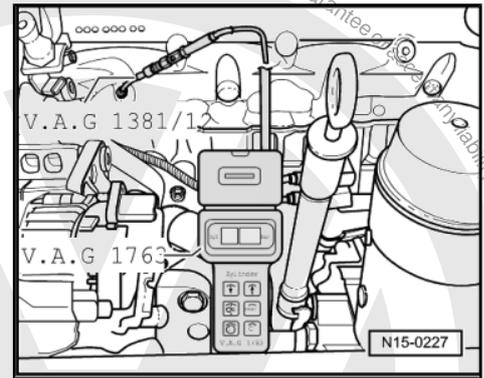
- Remove glow plugs or ceramic glow plugs using jointed extension and socket -3220- .

Specified torque: 15 Nm.

- Read fault memory of engine control unit. ⇒ [page 178](#)

**i** Note

*Disconnecting the central connector for unit injectors causes faults to be stored. Therefore, read fault memory and clear if necessary.*





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## 2 Valve gear



### Note

*Cylinder heads with cracks between the valve seats may be used without reducing engine life, provided the cracks are small and not more than 0.5 mm wide.*

Assembly overview - valve gear ⇒ [page 74](#) .

Checking valve guides ⇒ [page 76](#) .

Renewing valve stem seals ⇒ [page 78](#) .

Removing and installing camshaft ⇒ [page 80](#)

Removing and installing camshaft seal ⇒ [page 84](#)

### 2.1 Assembly overview - valve gear

1 - 20 Nm + 1/4 turn (90°) further

- Renew
- Note sequence when loosening and tightening ⇒ [page 80](#) , Removing and installing camshaft.

2 - Rocker arm shaft

- Do not interchange.

3 - Cylinder head bolt

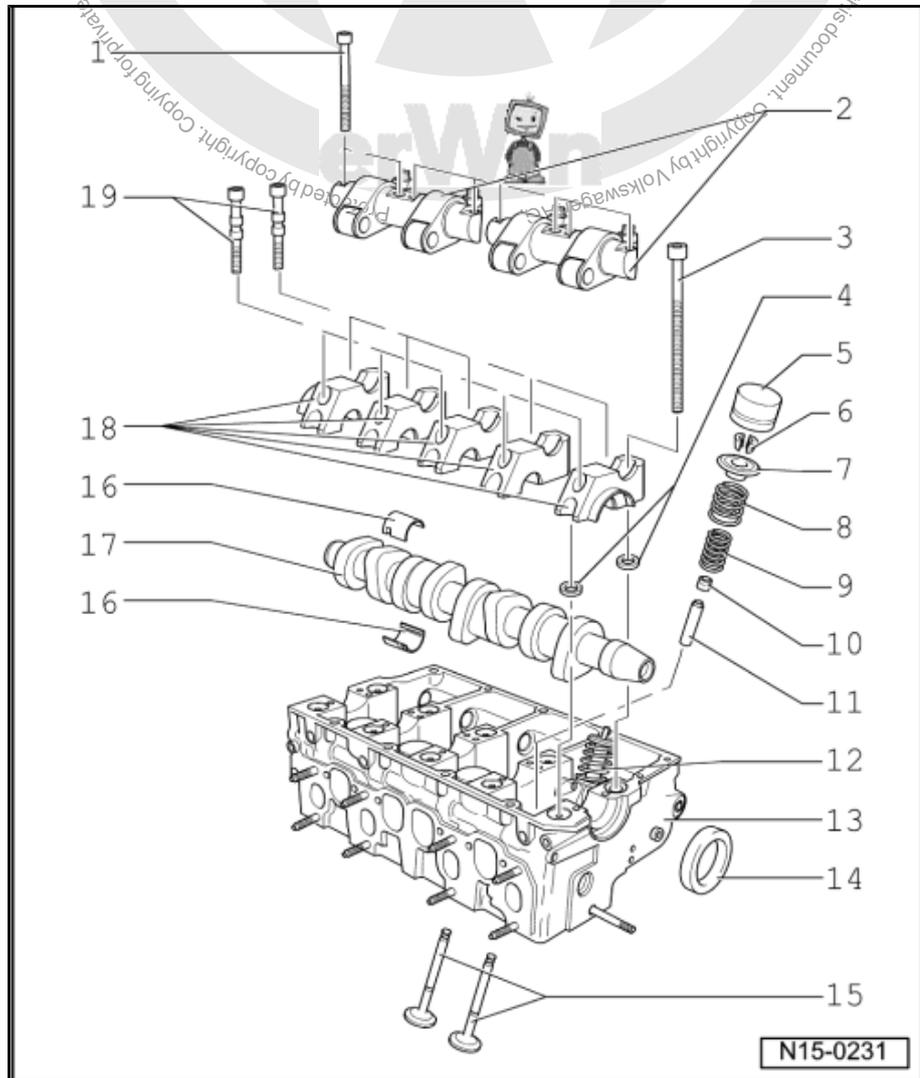
- Renew
- Note sequence when loosening and tightening ⇒ [page 67](#) , Removing and installing cylinder head.
- Before installing, insert washers ⇒ [Item 4 \(page 74\)](#) in cylinder head.

4 - Washer

- For cylinder head bolts.
- Insert in cylinder head before installing bearing caps

5 - Bucket tappet

- Do not interchange.
- With hydraulic valve clearance compensation.
- Store with cam contact surface downwards
- Before installing, check camshaft axial clearance ⇒ [page 76](#) .
- Oil contact surfaces.
- Before removing, remove camshaft bearing caps





## 6 - Valve cotter

## 7 - Valve spring plate

## 8 - Outer valve spring

- Removing and installing: with cylinder head removed, use valve spring compressor -2037- ; with cylinder head installed ⇒ [page 78](#) , Renewing valve stem seals.

## 9 - Inner valve spring

- Removing and installing: with cylinder head removed, use valve spring compressor -2037- ; with cylinder head installed ⇒ [page 78](#) , Renewing valve stem seals.

## 10 - Valve stem seal

- Renewing ⇒ [page 78](#)

## 11 - Valve guide

- Checking ⇒ [page 76](#) .

## 12 - Unit injector

- Removing and installing ⇒ [page 169](#) .

## 13 - Cylinder head

- See note ⇒ [page 74](#) .

## 14 - Seal

- Do not additionally oil or grease the oil seal sealing lip.
- Before installing, remove residual oil from camshaft journal using a clean cloth.
- To install, tape over groove in taper of camshaft (e.g. using Sellotape).
- Removing and installing ⇒ [page 84](#) .

## 15 - Valves

- Valve dimensions ⇒ [page 76](#)

## 16 - Bearing shell

- Do not interchange used bearing shells (mark).
- Ensure that retaining lugs are correctly seated in bearing caps and cylinder head

## 17 - Camshaft

- Checking axial clearance ⇒ [page 76](#)
- Removing and installing ⇒ [page 80](#) .
- Check radial clearance with Plastigage, wear limit: 0,11 mm.
- Runout: max. 0.01 mm.

## 18 - Bearing cap

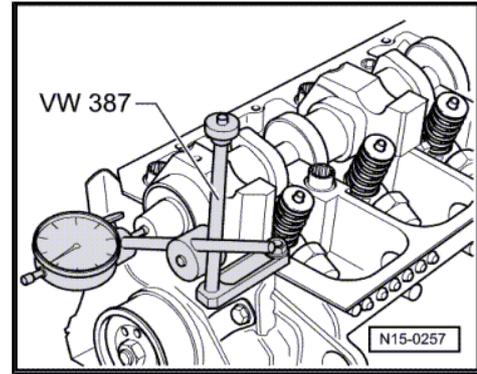
- Installation sequence ⇒ [page 80](#) , removing and installing camshaft
- To install, seal parting surfaces of bearing caps 1 and 5 with sealant -AMV 174 004 01- ⇒ [page 76](#)

## 19 - 8 Nm + 1/4 turn (90°) further

- Renew



## Checking camshaft axial clearance



### Special tools and workshop equipment required

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

Check with bucket tappets removed and with first, third and last bearing caps fitted.

Wear limit: max. 0.15 mm

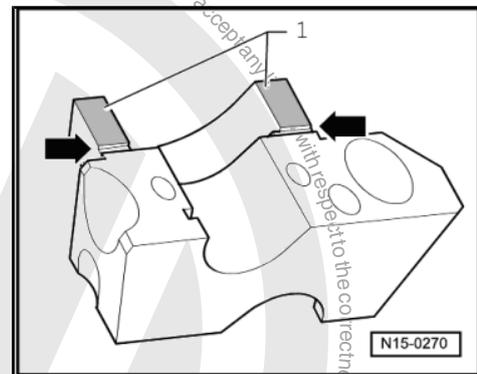
### Seal parting surfaces of bearing caps 1 and 5 with sealant -AMV 174 004 01-

- Apply sealant -AMV 174 004 01- thinly and evenly on the surfaces -1-.



#### Note

Be careful that no sealant gets into grooves -arrows-.

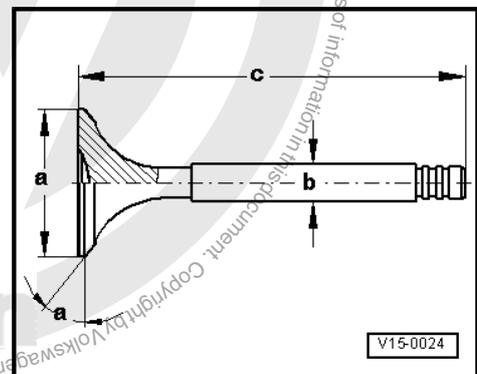


### Valve dimensions



#### Note

Valves must not be reworked. Only grinding-in is permissible.



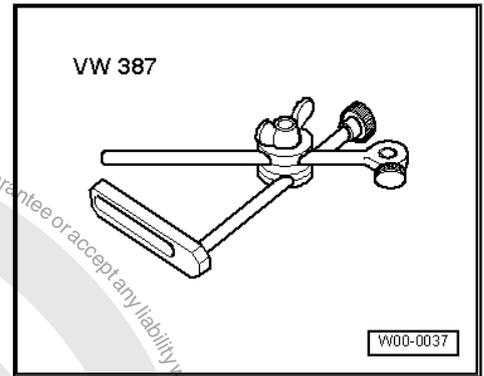
Dimension		Inlet valve	Exhaust valve
∅ a	mm	35.95	31.45
∅ b	mm	6.980	6.956
c	mm	89.95	89.95
α	∠ °	45	45

## 2.2 Checking valve guides

### Special tools and workshop equipment required



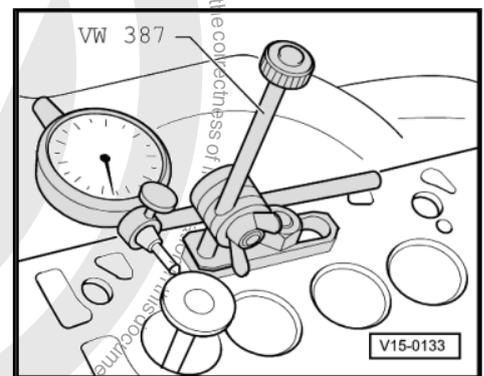
◆ Universal dial gauge bracket -VW 387-



◆ Dial gauge

**Test procedure**

- Insert new valve into guide. The end of the valve stem must be flush with the guide. Due to slight differences in stem diameters, use only an inlet valve in inlet guide and an exhaust valve in exhaust guide.
- Determine rock. Wear limit: max. 1.3 mm
- Cylinder head must be renewed if the rock is greater than the wear limit.

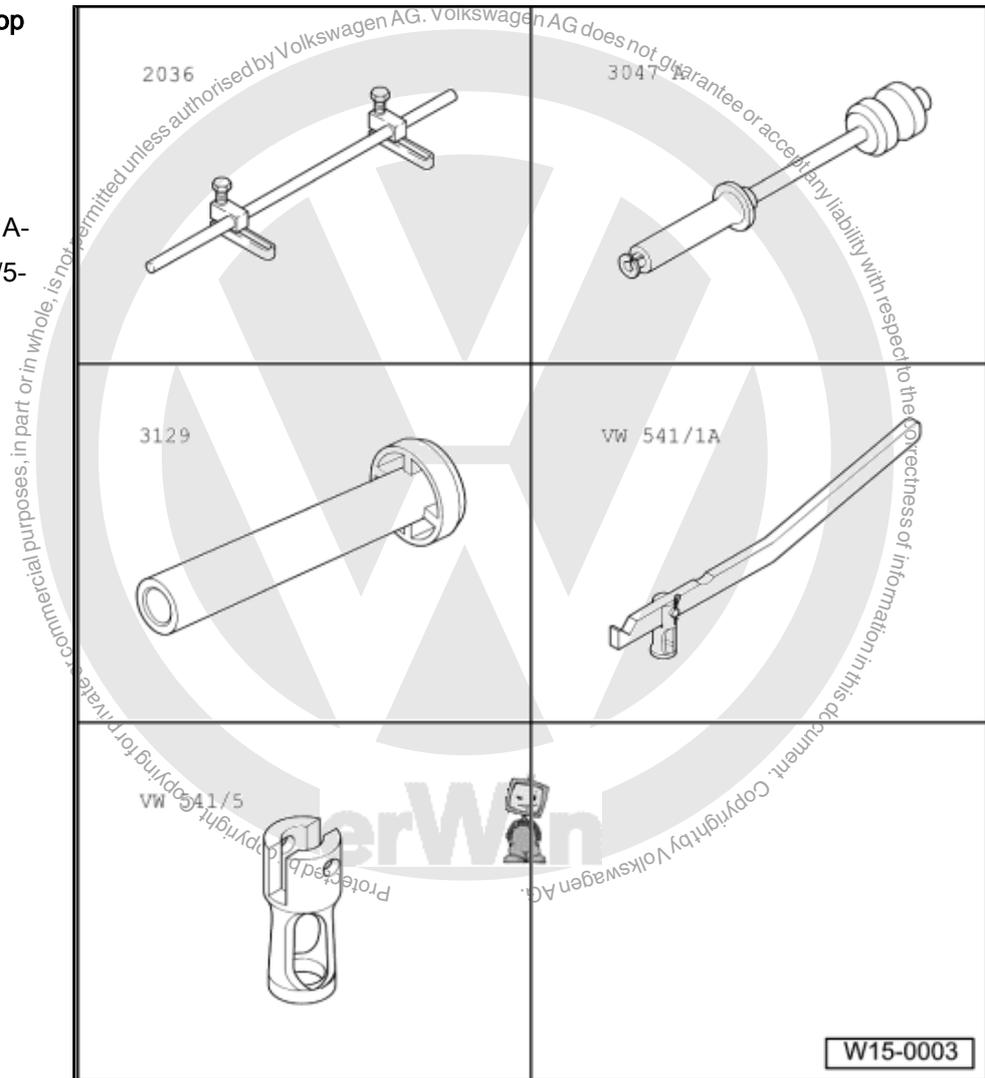




## 2.3 Renewing valve stem seals

### Special tools and workshop equipment required

- ◆ Assembly tool -2036-
- ◆ Puller -3047 A-
- ◆ Fitting tool -3129-
- ◆ Valve lever -VW 541/1A-
- ◆ Thrust piece -VW 541/5-



### 2.3.1 Removing

(With cylinder head installed)

- Remove camshaft. ⇒ [page 80](#)
- Remove bucket tappets and place them with the contact surface downwards. When doing this, ensure that tappets are not interchanged.
- Set piston of respective cylinder to top dead centre (TDC).



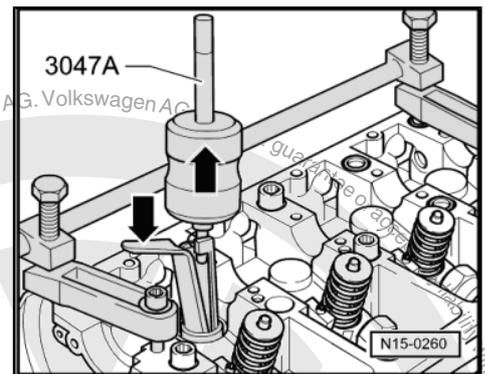
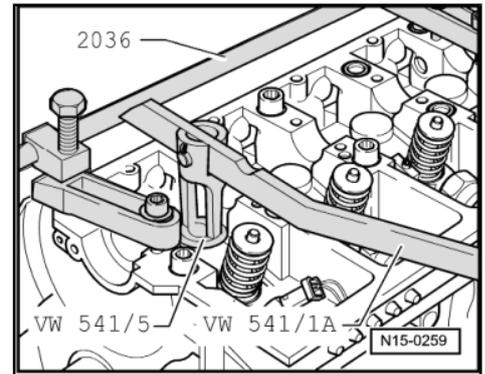
- Insert valve assembly device -2036- and adjust mounting to height of studs.
- Remove valve springs using valve lever -VW 541/1A- and press tool -VW 541/5- .



**Note**

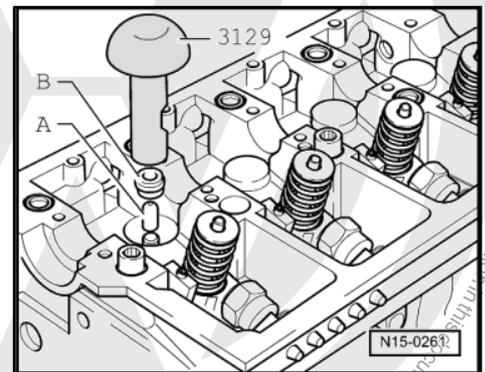
*The valves are supported by the piston crown.*

- Pull off valve stem seals using puller -3047 A- .



### 2.3.2 Installing

- Place the plastic sleeve -A- supplied in part on the respective valve stem. This will prevent the new valve stem seal -B- being damaged.
- Insert new valve stem seal in fitting tool -3129- .
- Lubricate sealing lip of valve stem seal and carefully push on valve guide.

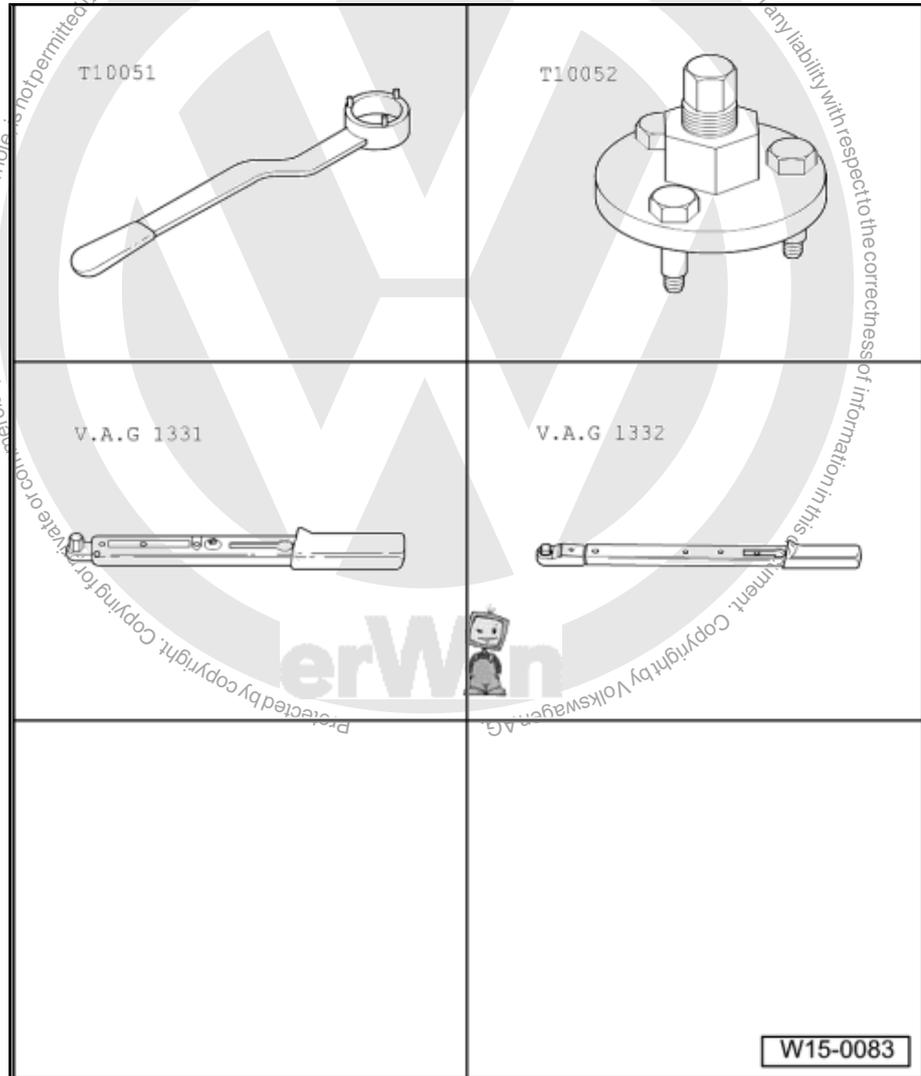




## 2.4 Removing and installing camshaft

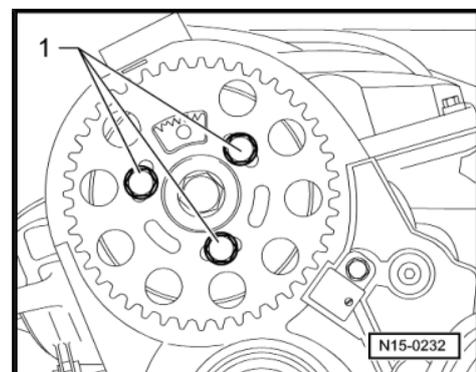
### Special tools and workshop equipment required

- ◆ Counterhold tool -T10051-
- ◆ Puller -T10052-
- ◆ Torque wrench (5...50 Nm) -V.A.G 1331-
- ◆ Torque wrench (40...200 Nm) -V.A.G 1332-
- ◆ Sealant -AMV 174 004 01-



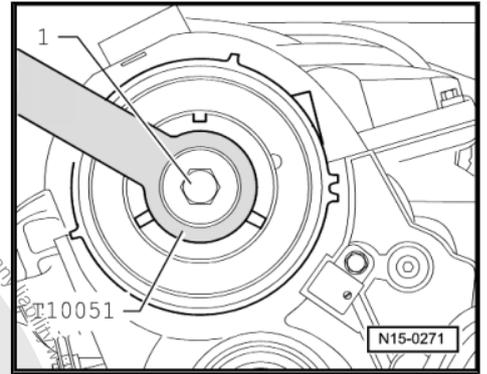
### 2.4.1 Removing

- Remove toothed belt. ⇒ [page 50](#)
- Remove securing bolts for camshaft toothed belt pulley -1-.
- Pull camshaft toothed belt pulley off hub.

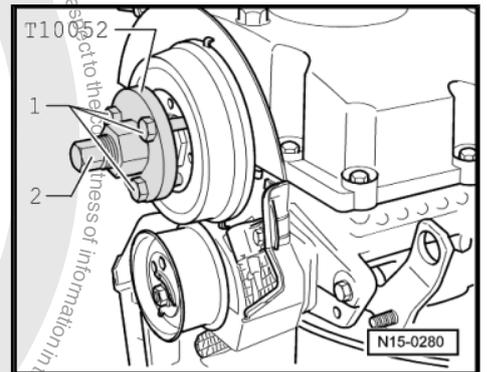




- Loosen hub securing bolt -1-.
- To do this, use counterhold tool -T10051- .
- Loosen hub securing bolt about 2 turns.



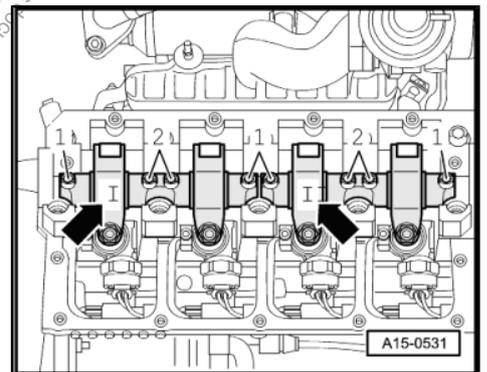
- Apply puller -T10052- and screw securing bolts -1- into hub.
- Apply tension to hub by evenly tightening puller until hub separates from taper of camshaft.



**i Note**

When doing this, hold puller with 30 mm spanner.

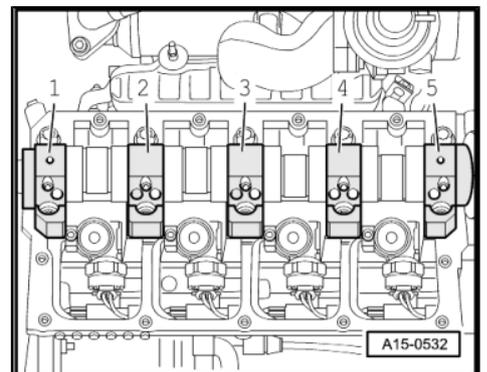
- Remove hub from taper of camshaft.
- Remove cylinder head cover.
- Mark rocker arm shafts using a permanent felt tip marker to prevent interchanging. This will prevent having to perform basic settings of unit injectors -arrows-.
- Remove rocker arm shafts.



**i Note**

First loosen both outer and then inner securing bolts respectively.

- Remove tandem pump => [page 147](#) .
- First remove bearing caps 5, 1 and 3. Then loosen bearing caps 2 and 4 alternately and diagonally.
- Remove camshaft.





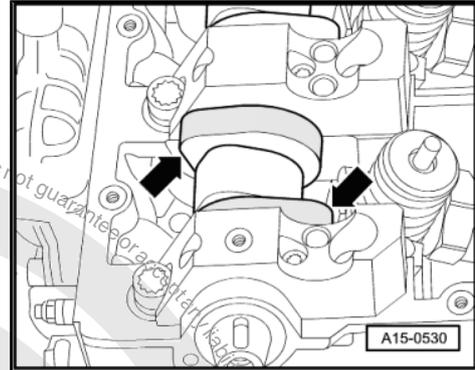
## 2.4.2 Installing



### Note

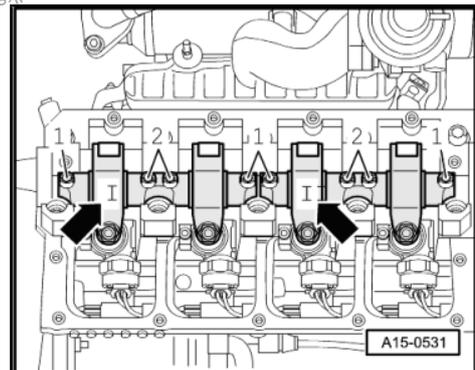
- ◆ When camshaft is installed, No. 1 cylinder cams must point upwards.
- ◆ Do not interchange used bearing shells (mark).
- ◆ When installing the camshaft, ensure proper seating of retaining lugs in bearing caps and cylinder head.
- ◆ Before installing bearing caps, ensure that cylinder head bolt washers are inserted in the cylinder head.

- Oil bearing shell running surfaces.
- Install bearing caps 2 and 4 using new bolts.
- Tighten bearing caps 2 and 4 diagonally and alternately to 8 Nm + 1/4 turn (90°).
- Install bearing caps 5, 1 and 3 using new bolts.

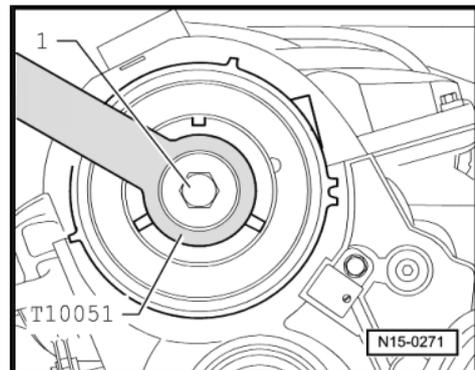


### Note

- ◆ Seal parting surfaces of bearing caps 1 and 5 with sealant - AMV 174 004 01 - => [page 76](#).
- ◆ Bearing cap 5 must align flush with outer edge of cylinder head, because otherwise leaks can develop at tandem pump.
- Tighten bearing caps 5, 1 and 3 likewise to 8 Nm + 1/4 turn (90°).
- Install camshaft oil seal. => [page 84](#)
- Install rocker arm shafts and tighten securing bolts, first the inner -2- and then the outer -1-, evenly and diagonally to 20 Nm + 1/4 turn (90°).
- Fit hub onto camshaft.



- Tighten hub securing bolt -1- to 100 Nm.
- To do this, use counterhold tool -T10051- .





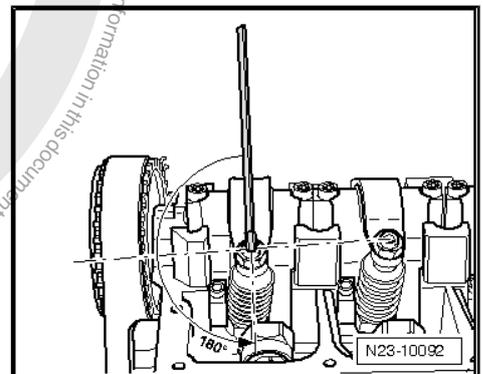
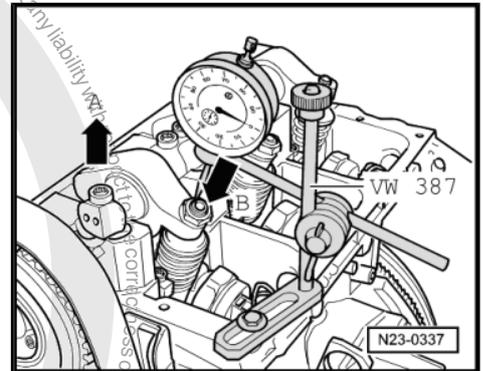
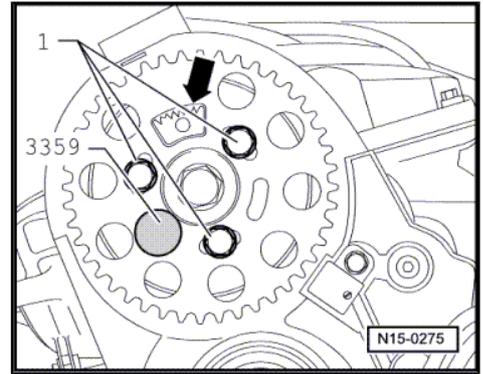
- Push camshaft toothed belt pulley onto hub.



**Note**

*The toothed segment -arrow- of the camshaft toothed belt pulley must be on top.*

- Align camshaft toothed belt pulley at centre of elongated holes.
- Hand tighten securing bolts -1- to camshaft toothed belt pulley so that there is no play.
- Lock hub using locking pin -3359-
- Install and tighten toothed belt => [page 50](#) .
- Screw new adjustment screws into rocker arms hand-tight and fit lock nut.
- Fit the dial gauge onto the adjustment screw of the unit injector as shown.
- Turn crankshaft in direction of engine rotation until roller of rocker arm is located at tip of drive cam. Roller side -arrow A- is positioned at highest point and dial gauge -arrow B- is positioned at lowest point.
- Remove dial gauge.
- Now turn the adjuster screw into rocker arm until significant resistance can be felt (unit injector is at limit stop).
- Turn adjustment screw 180° back off stop.
- Hold adjuster screw in this position and tighten lock nut to 30 Nm.
- Install tandem pump => [page 147](#) .
- Install cylinder head cover.



**Note**

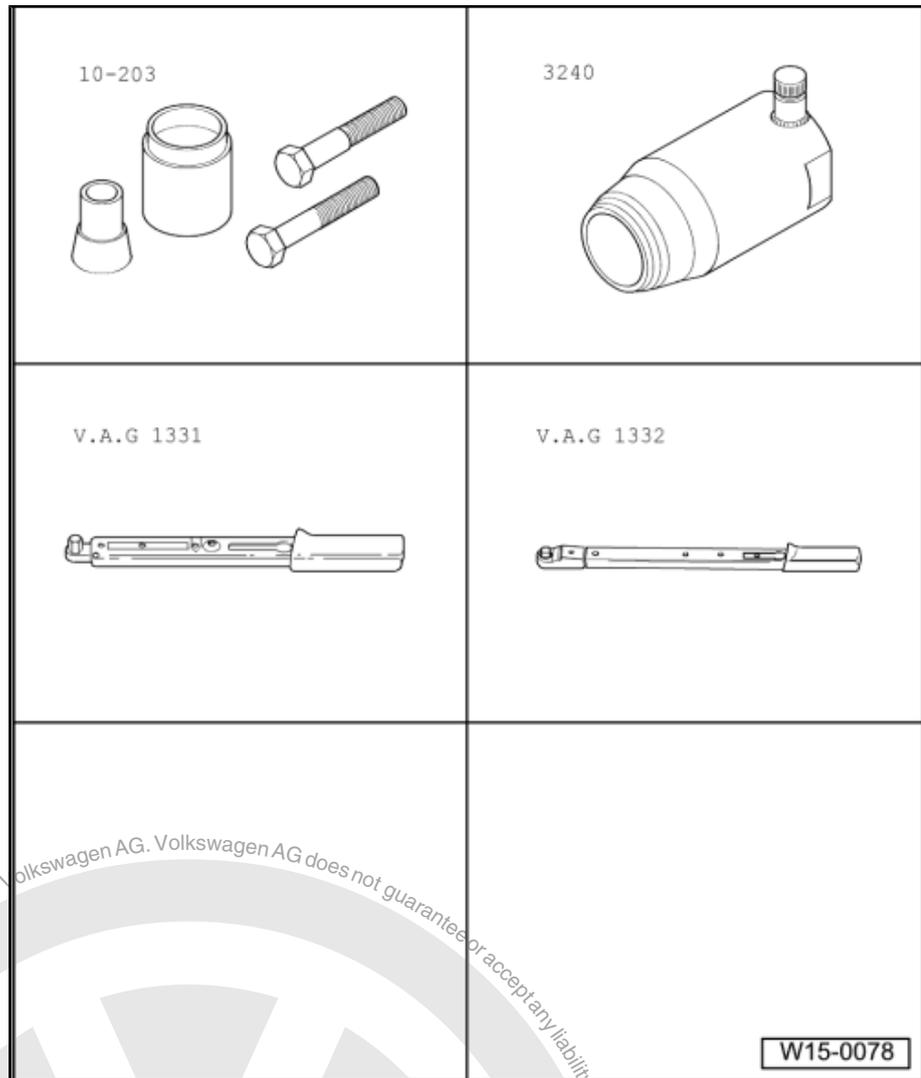
*When new tappets have been installed the engine must not be started for about 30 minutes, hydraulic compensation elements must settle (otherwise valves will strike pistons).*



## 2.5 Removing and installing camshaft oil seal

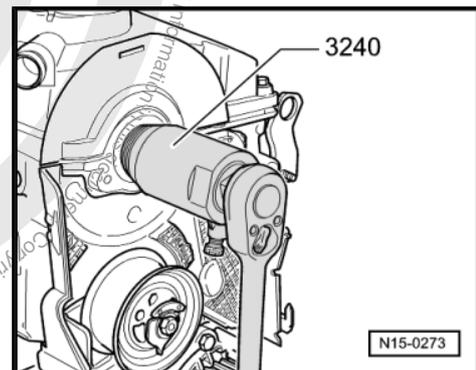
### Special tools and workshop equipment required

- ◆ Fitting sleeves -10-203-
- ◆ Oil seal extractor -3240-
- ◆ Torque wrench -V.A.G 1331-
- ◆ Torque wrench -V.A.G 1332-
- ◆ Bolt M12×1.5 × 65



### 2.5.1 Removing

- Remove toothed belt. ⇒ [page 50](#)
- Remove camshaft toothed belt pulley and hub ⇒ [page 80](#) , Removing and installing camshaft.
- Unscrew inner part of oil seal extractor -3240- two turns (approx. 3 mm) out of outer part and lock with knurled screw.
- Lubricate threaded head of oil seal extractor -3240- , place it in position and exerting firm pressure, screw it as far as possible into oil seal.
- Loosen knurled screw and turn inner part against camshaft until oil seal is pulled out.



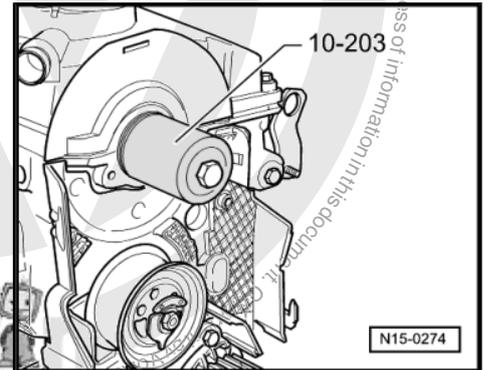


## 2.5.2 Installing

### Note

*The oil seal sealing lip must not be additionally oiled or greased.*

- Remove oil residue from camshaft journal using a clean cloth.
- Tape over groove in taper of camshaft (e.g. with Sellotape).
- Fit oil seal carefully on camshaft.
- Press in oil seal with press piece of fitting tool -10-203- and bolt M12 5x65 onto stop
- Install and tighten toothed belt ⇒ [page 50](#) .





## 17 – Lubrication

### 1 Engine oil



#### Note

*The oil level must not be above the max. mark - danger of damage to catalytic converter! Markings.*

Engine oil specification → Maintenance ; Booklet 38

Oil capacities ⇒ [page 86](#)

Checking engine oil level ⇒ [page 86](#)

#### 1.1 Oil capacities

Engine codes BJB, BKC, BRU, BXE and BXF

With oil filter change: 3.8 l

Without oil filter change: 3.3 l

Engine codes BLS and BXJ

With oil filter change: 4.3 l

Without oil filter change: 3.8 l

#### 1.2 Checking engine oil level

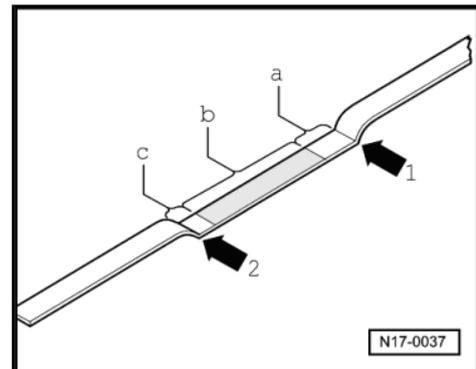
1 - Max. mark

2 - Min. mark

a - Area above hatched field up to max. mark: Do not top up with engine oil!

b - Oil level within hatched field: Can be topped up with engine oil.

c - Area from min. mark up to hatched field: Must be topped up, max. 0.5 l of engine oil!







9 - 15 Nm

**10 - Suction line**

- Clean strainer if soiled

**11 - Baffle plate**

12 - 15 Nm

13 - 15 Nm

**14 - Sump**

- Clean sealing surface before fitting.
- Install with silicone sealant -D176404A2-
- Removing and installing ⇒ [page 88](#) .

**15 - Oil drain plug, 30 Nm**

- Renew

16 - 10 Nm

**17 - Oil level and oil temperature sender -G266-**

- Black connector, 3-pin.

**18 - Seal**

- Renew

**19 - Oil pump**

- With 12 bar pressure relief valve
- Before installing, check that both dowel sleeves for centring oil pump on cylinder block are fitted.
- Renew if running surfaces and gears are scored

**20 - Chain sprocket for oil pump**

**21 - Bracket**

- For oil level/temperature sender wiring harness.

**22 - 20 Nm + 1/4 turn (90°) further**

- Renew

**23 - Chain**

24 - 25 Nm

- Insert without sealant.

**25 - Oil spray jet**

- For piston cooling



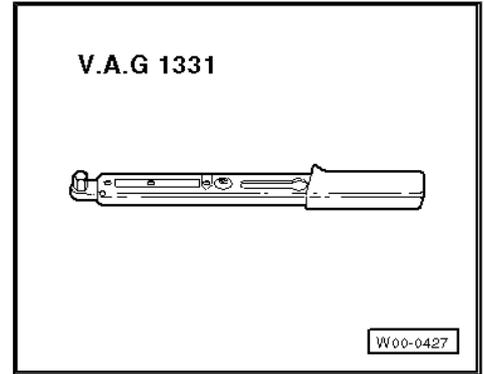
Note

## 2.2 Removing and installing sump

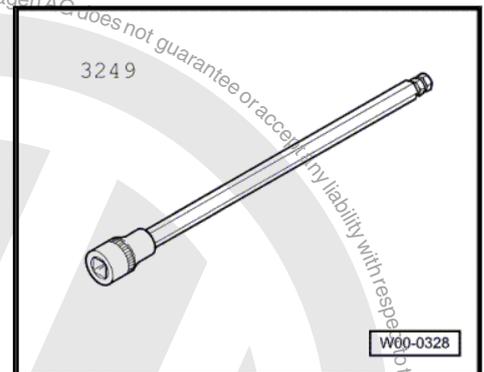
Special tools and workshop equipment required



- ◆ Torque wrench -V.A.G 1331-



- ◆ Hexagon key extension, 5 mm -3249-



- ◆ Hand drill with plastic brush attachment
- ◆ Silicone sealant -D176404A2-
- ◆ Hand drill with plastic brush attachment
- ◆ Eye protection
- ◆ Flat scraper

## 2.2.1 Removing

- Remove insulation tray. => General body repairs, exterior;  
Rep. Gr. 50 ; Body - front; Assembly overview .
- Drain engine oil.



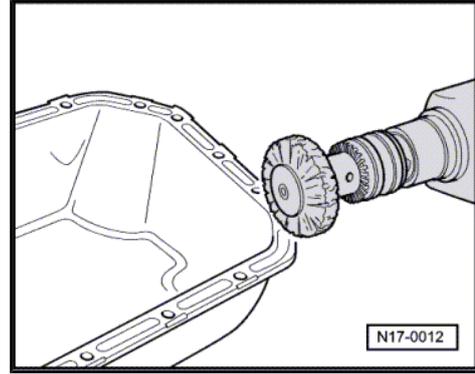
### Note

*Observe environmental regulations for disposal.*

- Pull 3-pin connector off oil level and oil temperature sender -  
G266- .
- Remove sump.
- Loosen sump with light blows of a rubber headed hammer if  
necessary.
- Remove sealant residue from cylinder block with a flat scraper.



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

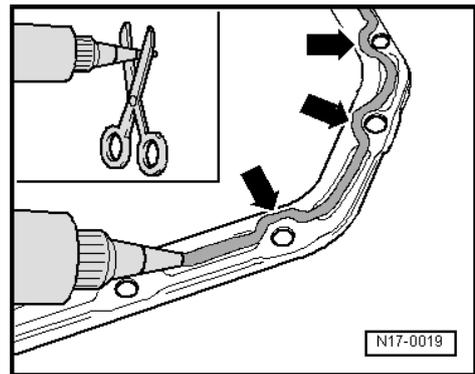


## 2.2.2 Installing



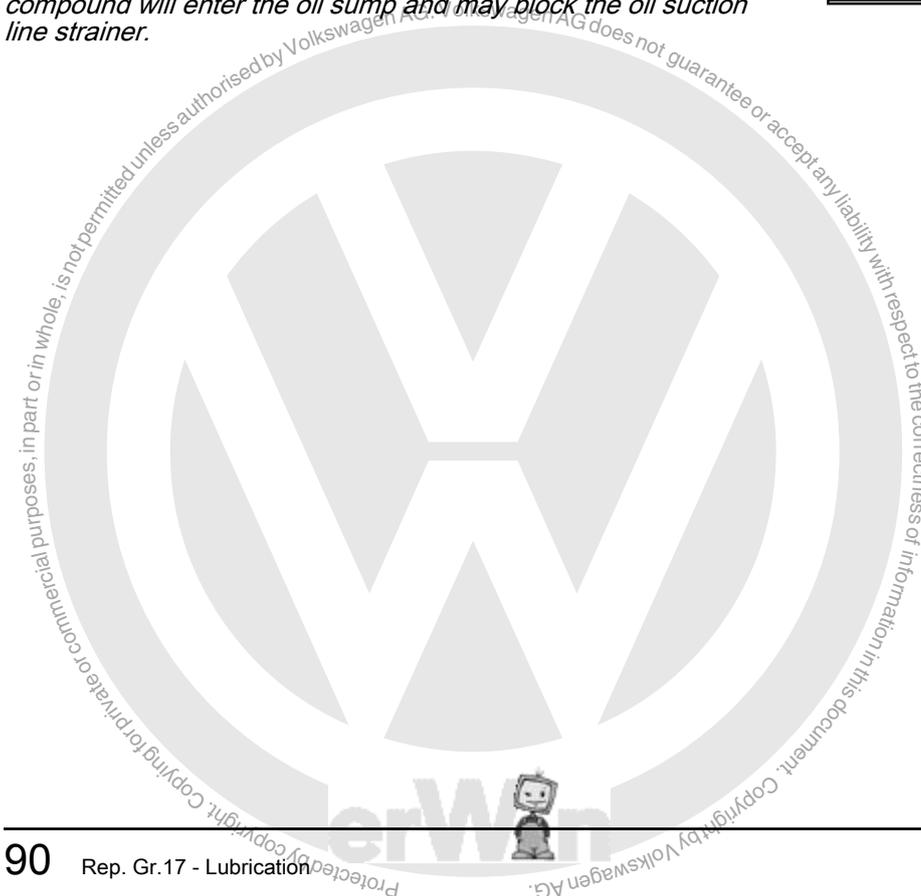
### Note

- ◆ *Observe expiry date of sealing compound.*
- ◆ *The oil sump must be installed within 5 minutes of applying silicone sealing compound.*
- Cut off tube nozzle at forward marking (approx. 3 mm nozzle  $\varnothing$ ).
- Apply silicone sealing compound, as shown, to clean sealing surface on sump. Sealing compound bead must be:
  - ◆ 2...3 mm thick.
  - ◆ Run bead along inner side of bolt holes -arrows-.



### Note

*The sealant bead must not be thicker, otherwise excess sealing compound will enter the oil sump and may block the oil suction line strainer.*





- Apply silicone sealing compound bead as shown to the clean sealing surface of the sump. (The figure shows the position of the sealant bead on the cylinder block.)
- Install sump immediately and tighten all sump bolts lightly. Ensure that sump is flush against intermediate plate and gearbox flange.

**i** Note

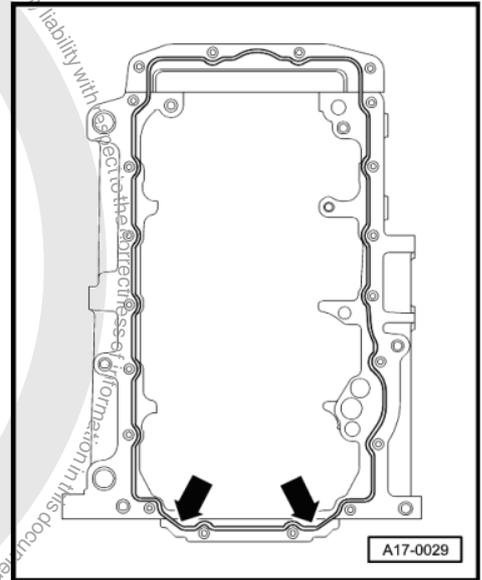
*When installing sump with engine out of vehicle, ensure that sump is flush with cylinder block at flywheel end.*

- Tighten sump bolts diagonally to 15 Nm.
- Tighten bolts securing sump to gearbox to 45 Nm.

**i** Note

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

Further assembly is basically the reverse of the dismantling sequence.





### 3 Oil filter bracket, oil pressure, engine oil cooler and oil supply line

Assembly overview - oil filter bracket and oil cooler ⇒ [page 92](#)

Checking oil pressure and oil pressure switch ⇒ [page 93](#)

Assembly overview - oil supply line to turbocharger ⇒ [page 94](#)

Removing and installing oil supply line to turbocharger ⇒ [page 95](#)

#### 3.1 Assembly overview - oil filter bracket and engine oil cooler

1 - Oil filter bracket

2 - 15 Nm + 1/4 turn (90°) further

- Renew
- First fit upper left and lower right bolts and then tighten all four bolts diagonally.

3 - Gasket

- Renew

4 - Seal

- Renew

5 - Connection, 35 Nm

6 - Oil supply line, 22 Nm

- To turbocharger.
- Removing and installing ⇒ [page 95](#).

7 - Sealing cap, 25 Nm

8 - Seal

- Renew

9 - Oil filter element

- Ensure "Top" is uppermost when fitting

10 - Plug, 10 Nm

- If seal is leaking, nip open and renew.

11 - Oil pressure switch -F1-

- 0.7 bar switch: brown.
- Tighten to 20 Nm.
- If seal is leaking, nip open and renew.
- Checking ⇒ [page 93](#).

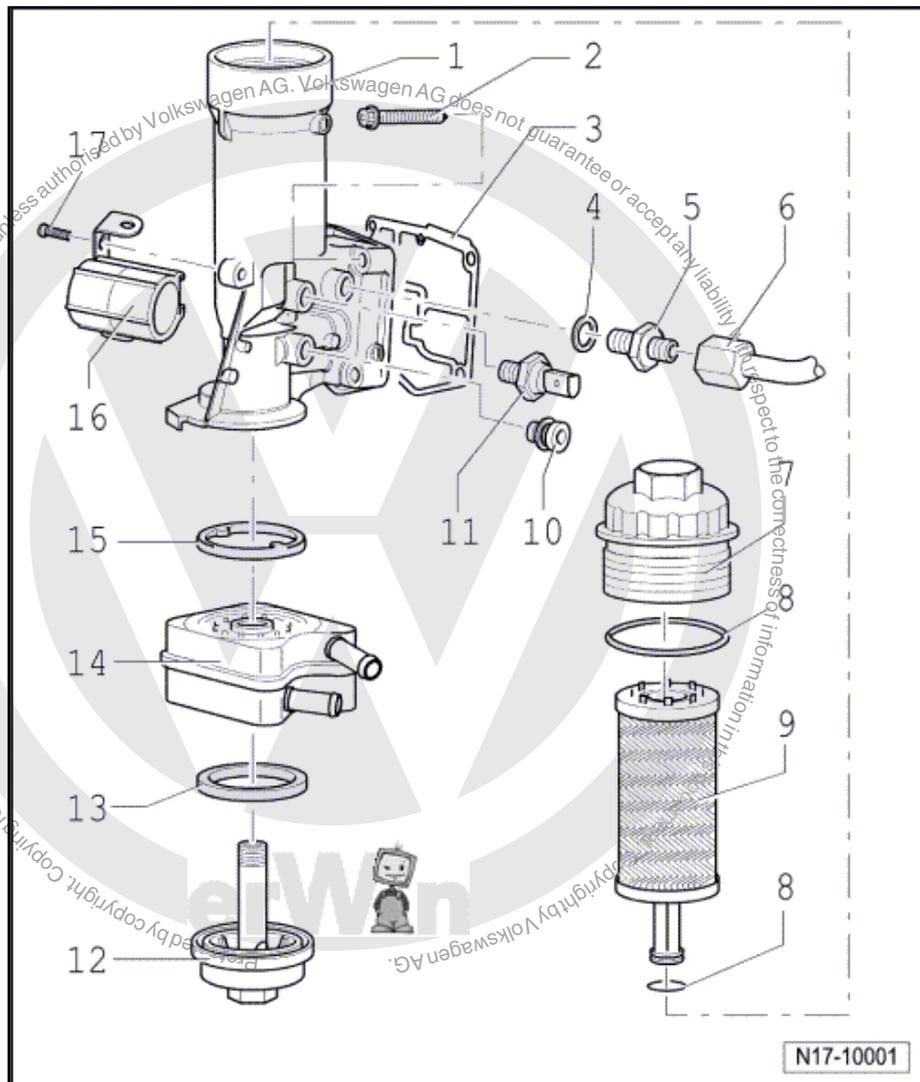
12 - Plug, 25 Nm

13 - Seal

- Renew.

14 - Engine oil cooler

- Ensure clearance to adjacent components.
- See note ⇒ [page 87](#).





- Checking engine oil cooler for leaks => [page 112](#)

### 15 - Gasket

- Renew.

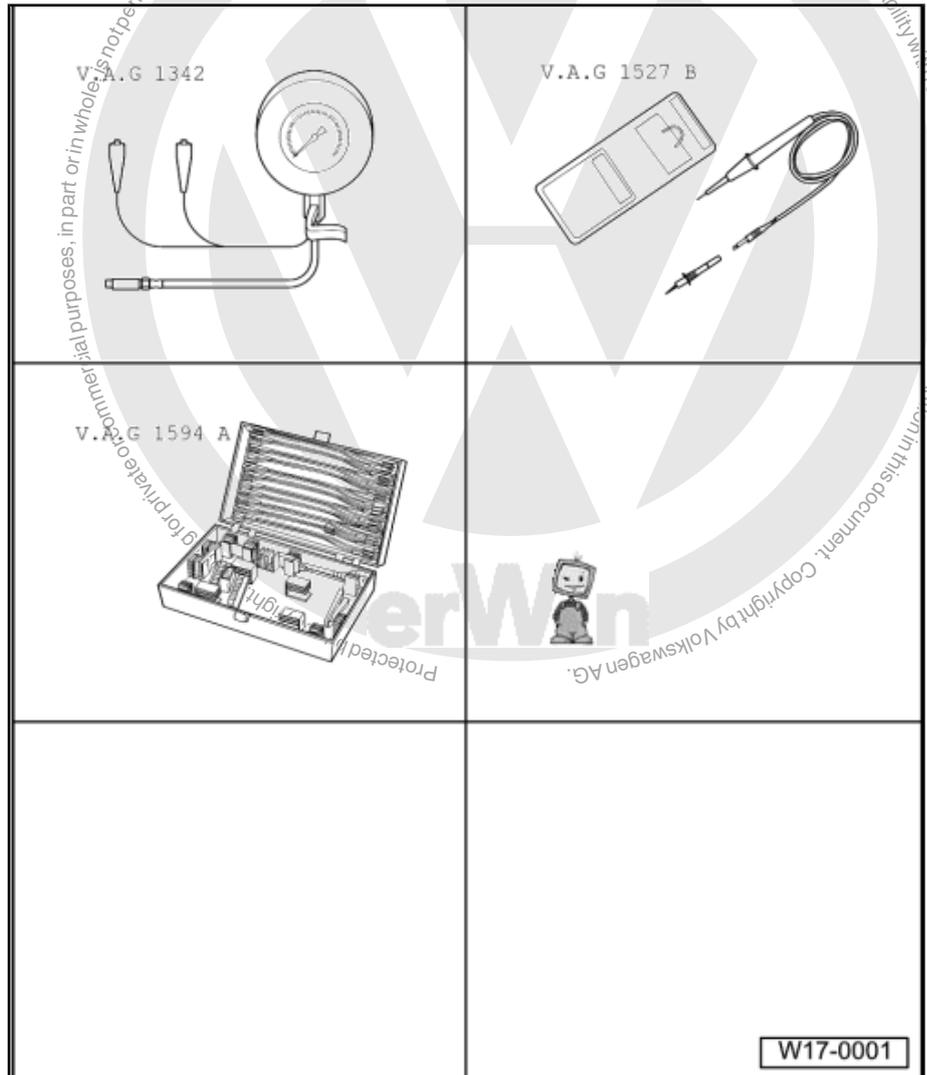
### 16 - Bracket

17 - 10 Nm

## 3.2 Checking oil pressure and oil pressure switch

### Special tools and workshop equipment required

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



### 3.2.1 Test procedure

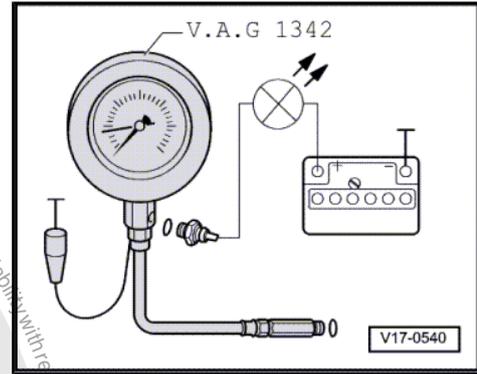


Note

*Functional check and repair of optical and acoustic oil pressure warning: => Current flow diagrams, Electrical fault finding and Fitting locations Guided fault finding with VAS 5051.*



- Remove oil pressure switch -F1- and screw into tester.
- Screw tester into oil filter bracket in place of oil pressure switch.
- Connect brown wire of tester to earth (-).
- Connect voltage tester -V.A.G 1527 B- to battery positive (+) and oil pressure switch using cables from auxiliary measuring set -V.A.G 1594 A- . LED must not light up.
- Start engine and increase speed slowly.
- At 0.55...0.85 bar the LED must light up; otherwise renew oil pressure switch.

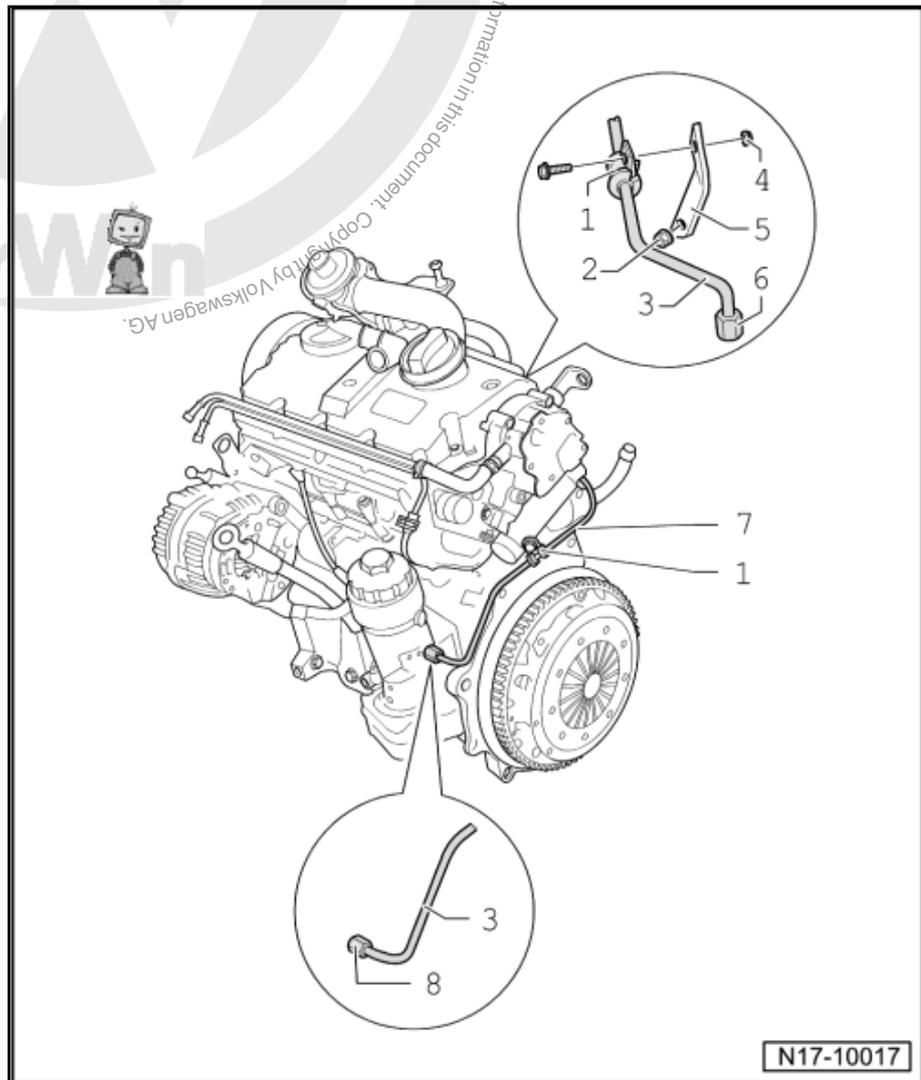


Increase engine speed further. At 2000 rpm and an oil temperature of 80 °C the oil pressure should be at least 2.0 bar.

At higher engine speed, oil pressure must not exceed 7.0 bar. If necessary renew oil filter bracket.

### 3.3 Assembly overview - oil supply line to turbocharger

- 1 - Retaining clamp
- 2 - 25 Nm
- 3 - Oil supply line
  - To turbocharger.
- 4 - 10 Nm
- 5 - Bracket
- 6 - Union nut, 22 Nm
- 7 - 10 Nm
- 8 - Union nut, 22 Nm

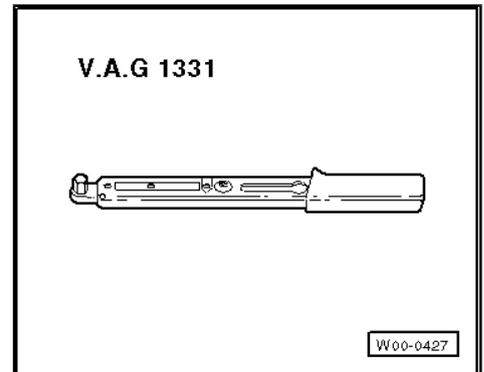




### 3.4 Removing and installing oil supply line to turbocharger

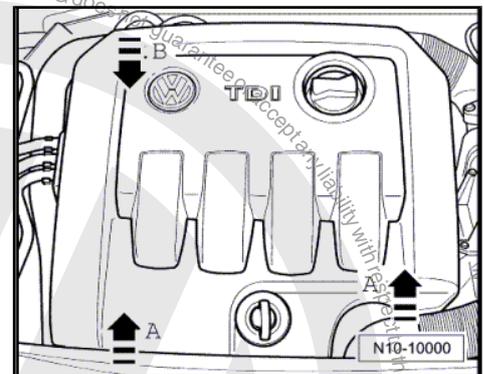
Special tools and workshop equipment required

- ◆ Torque wrench -V.A.G 1331-

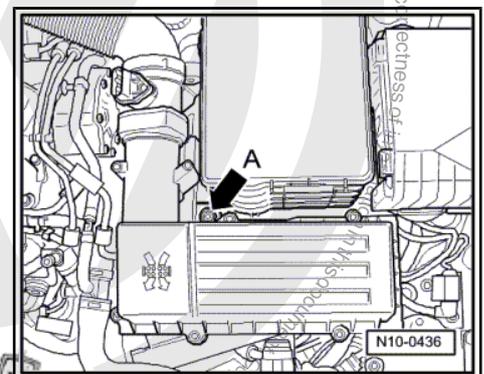


#### 3.4.1 Removing

- Remove engine cover. ⇒ [page 4](#) To do this, pull engine cover upwards abruptly at front -arrows A- and then pull forwards out of rear fastening -arrow B-.
- Remove air filter housing with air mass meter and connecting pipe.



- Remove bolt -arrow A- and pull air filter housing upwards out of mounting.
- Remove insulation tray. ⇒ General body repairs, exterior; Rep. Gr. 50 ; Body - front; Assembly overview .
- Loosen securing bolts for retaining clips.
- Loosen oil supply line union nuts on oil filter bracket and turbocharger.
- Remove oil supply line.

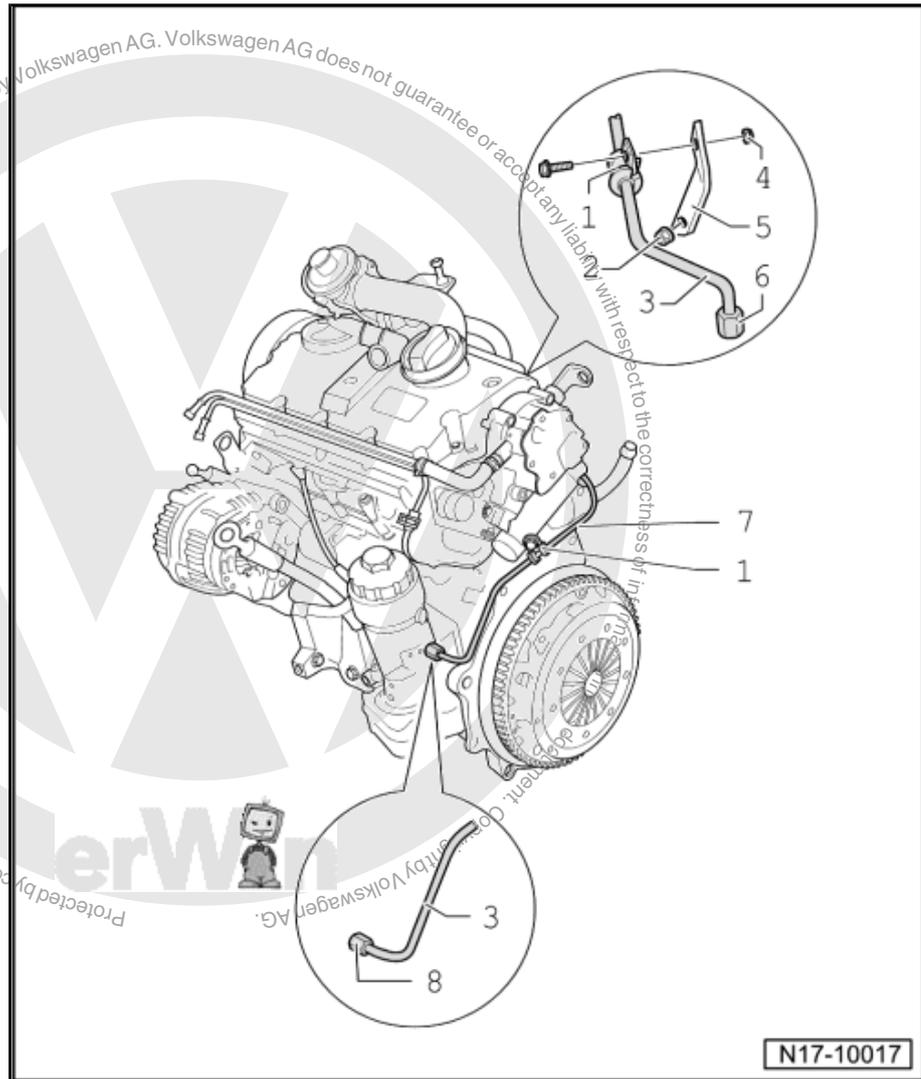


#### 3.4.2 Installing



Note

*The procedure must be followed to ensure that oil supply line is installed tension-free.*



- Loosen securing nut -2- from retainer -5-.
- Start union nuts for oil supply line on connections.
- Tighten union nut -8- on oil filter bracket hand tight.
- Tighten union nut -6- on turbocharger hand-tight.
- First tighten union nut -8- on oil filter bracket and then union nut -6- on turbocharger to 22 Nm.
- Attach retaining clips -1- to brackets and tighten securing bolts to 10 Nm.
- Tighten securing nut -2- to 25 Nm.

Further installation is basically the reverse of the removal procedure.



## 19 – Cooling

### 1 Parts of cooling system



#### WARNING

*When doing any repair work, especially in the engine compartment, pay attention to the following due to the cramped conditions:*

- ◆ *Route all the various lines (e.g. for fuel, hydraulics, activated charcoal filter system, coolant, refrigerant, brake fluid and vacuum) and electrical wiring in their original positions.*
- ◆ *Ensure that there is sufficient clearance to all moving or hot components.*



#### Note

- ◆ *When the engine is warm, the cooling system is under pressure. If necessary, release pressure before beginning repair work.*
- ◆ *Hoses are secured with spring-type clips. In case of repair, only use spring-type clips.*
- ◆ *Spring-type clip pliers -VAS 5024- or hose clip pliers - V.A.G 1921- are recommended for fitting spring-type clips.*
- ◆ *When installing coolant hoses, route stress-free so that they do not come into contact with other components (observe markings on coolant connection and hose).*





Perform leakage test of cooling system using cooling system tester -V.A.G 1274- and adapters adapter -V.A.G 1274/8- and adapter -V.A.G 1274/9- .

Parts of cooling system - body side ⇒ [page 98](#) .

Parts of cooling system - engine side ⇒ [page 99](#)

Coolant hose schematic diagram ⇒ [page 101](#)

Draining and filling with coolant ⇒ [page 102](#)

Removing and installing radiator ⇒ [page 105](#) .

Removing and installing coolant pump ⇒ [page 106](#) .

Removing and installing thermostat ⇒ [page 108](#)

Checking cooling system for leaks ⇒ [page 110](#)

Checking engine oil cooler for leaks ⇒ [page 112](#)

## 1.1 Parts of cooling system, body side

### 1 - Upper coolant hose

- Coolant hose schematic diagram ⇒ [page 101](#)

### 2 - O-ring

- Renew if damaged.

### 3 - Cooler

- Removing and installing ⇒ [page 105](#) .
- After renewing, renew entire coolant

### 4 - Sealing cap

- Check using cooling system tester - V.A.G 1274- and adapter -V.A.G 1274/9- .
- Test pressure: 1.4...1.6 bar.

### 5 - Connector

### 6 - 5 Nm

### 7 - Expansion tank

- Check using cooling system tester - V.A.G 1274- and adapter -V.A.G 1274/8- .

### 8 - 5 Nm

### 9 - 10 Nm

### 10 - Fan support

### 11 - Additional fan

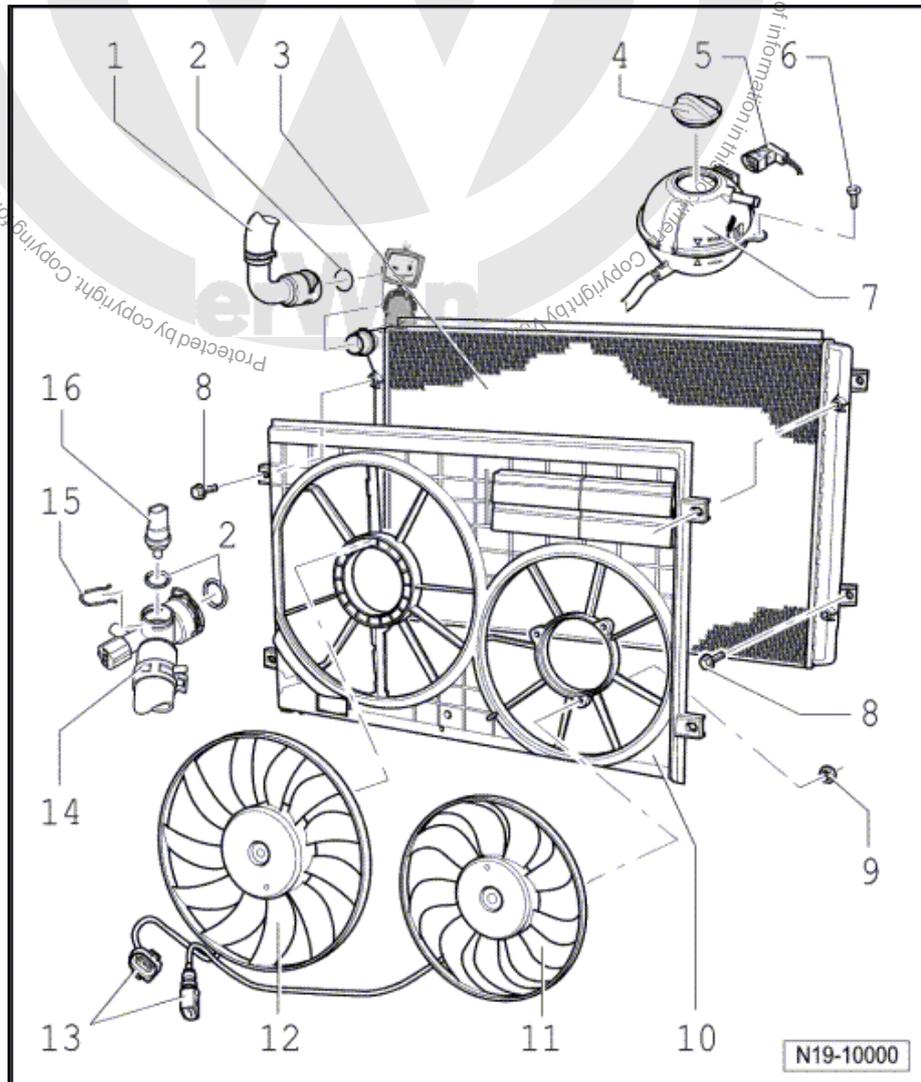
- Vehicles with optional equipment only.

### 12 - Radiator fan

### 13 - Connector

### 14 - Lower coolant hose

- Coolant hose schematic diagram ⇒ [page 101](#)





## 15 - Retaining clip

- Check for secure seating.

## 16 - Radiator outlet coolant temperature sender -G83-

## 1.2 Parts of cooling system, engine side

### 1 - To top of expansion tank

- Coolant hose schematic diagram ⇒ [page 101](#)

### 2 - Upper coolant pipe

- Bolted to cylinder head cover

### 3 - To bypass flap

- Coolant hose schematic diagram ⇒ [page 101](#)

### 4 - O-ring

- Renew.

### 5 - Retaining clip

- Check for secure seating.

### 6 - Coolant temperature sender -G62-

- With coolant temperature display sender -G2-

### 7 - To exhaust gas recirculation cooler

- Coolant hose schematic diagram ⇒ [page 101](#)

### 8 - Connection

### 9 - 10 Nm

### 10 - To heat exchanger

- Coolant hose schematic diagram ⇒ [page 101](#)

### 11 - 40 Nm

### 12 - T-piece

### 13 - To bypass flap

- Coolant hose schematic diagram ⇒ [page 101](#)

### 14 - T-piece

### 15 - To top of radiator

- Coolant hose schematic diagram ⇒ [page 101](#)

### 16 - 15 Nm

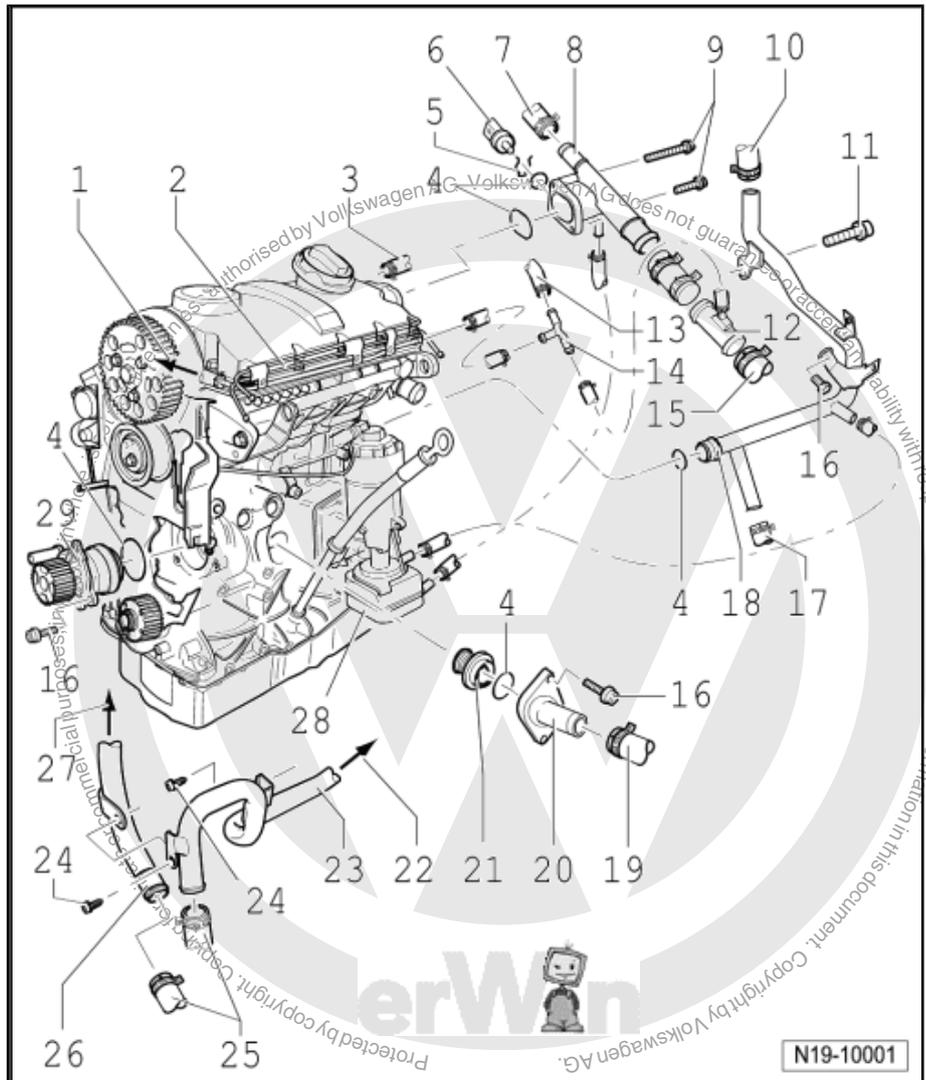
### 17 - To bottom of expansion tank

- Coolant hose schematic diagram ⇒ [page 101](#)

### 18 - Coolant pipe

### 19 - To bottom of radiator

- Coolant hose schematic diagram ⇒ [page 101](#)





## 20 - Connection

- For thermostat.

## 21 - Thermostat

- Removing and installing ⇒ [page 108](#) .
- Observe installation position ⇒ [page 108](#) , removing and installing thermostat.
- Check: Heat thermostat in water
- Opening begins at approx. 85 °C
- Ends at approx. 105 °C
- Opening lift at least 7 mm.

## 22 - To heat exchanger

- Coolant hose schematic diagram ⇒ [page 101](#) .

## 23 - Rear coolant pipe

## 24 - 10 Nm

## 25 - To auxiliary heater

- Coolant hose schematic diagram ⇒ [page 101](#) .

## 26 - Coolant pipe

## 27 - To exhaust gas recirculation cooler

- Coolant hose schematic diagram ⇒ [page 101](#) .

## 28 - Engine oil cooler

- Removing and installing ⇒ [page 92](#) .

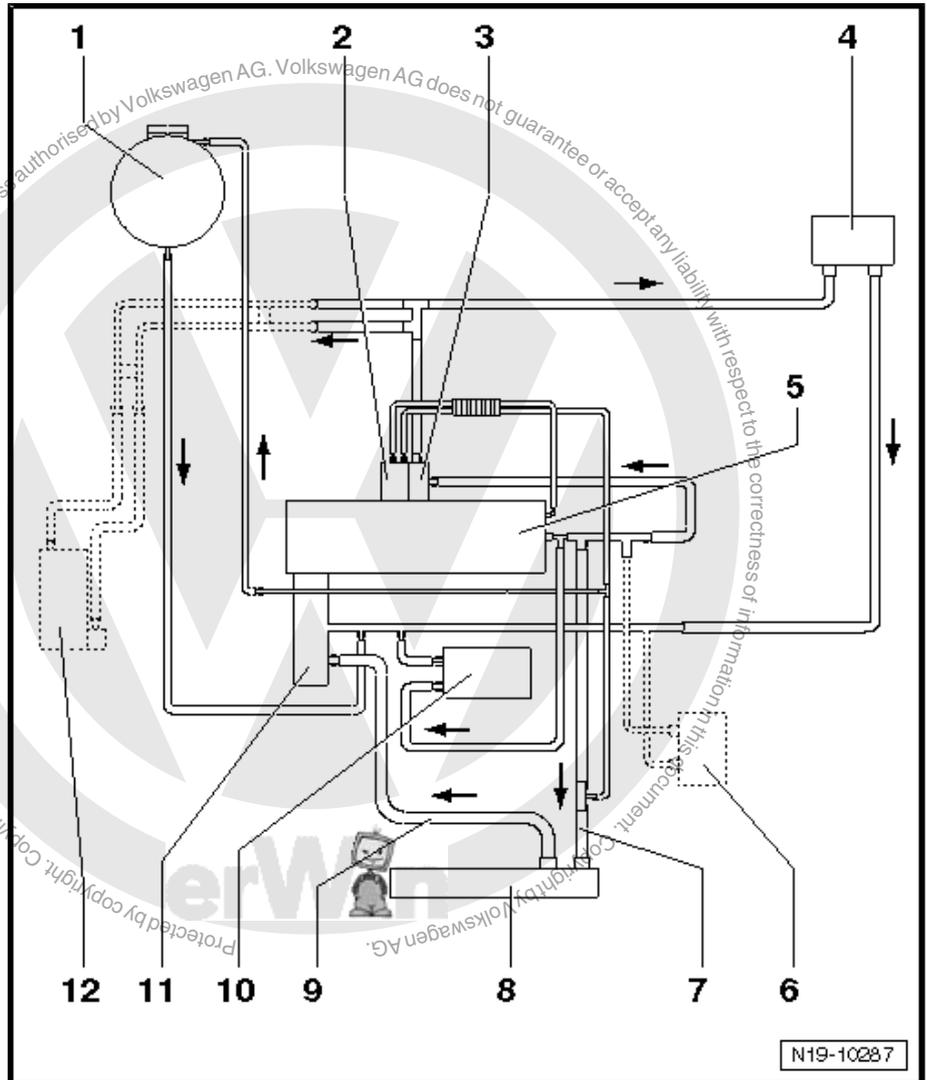
## 29 - Coolant pump

- Check for ease of movement.
- Note installation position.
- Removing and installing ⇒ [page 106](#) .



### 1.3 Coolant hose schematic diagram

- 1 - Expansion tank
- 2 - Bypass flap
- 3 - Exhaust gas recirculation cooler
- 4 - Heat exchanger for heater unit
- 5 - Cylinder head/cylinder block
- 6 - Gearbox oil cooler
  - For gear oil
  - Only on vehicles with automatic gearbox
- 7 - Upper coolant hose
- 8 - Cooler
- 9 - Lower coolant hose
- 10 - Engine oil cooler
- 11 - Coolant pump and thermostat
- 12 - Auxiliary heater
  - Vehicles with optional equipment only.



**i** Note

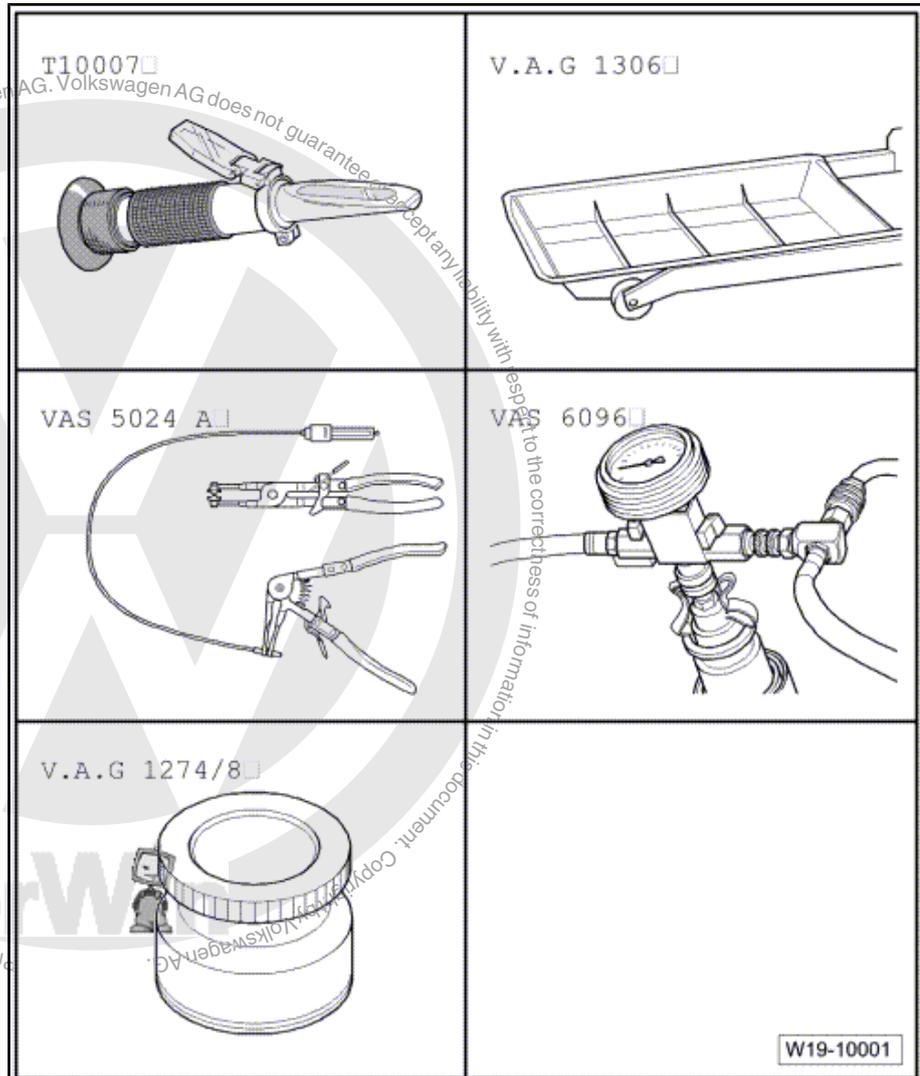
*Coolant hose schematic diagram for vehicles with optional equipment => Heating, ventilation, air conditioning system; Rep. Gr. 82 ; Connection diagram for coolant hoses in vehicles with auxiliary heater*



## 1.4 Draining and filling with coolant

### Special tools and workshop equipment required

- ◆ Refractometer -T10007-
- ◆ Drip tray -V.A.G 1306-
- ◆ Spring-type clip pliers - VAS 5024 A-
- ◆ Cooling system charge unit -VAS 6096-
- ◆ Adapter -V.A.G 1274/8-



### 1.4.1 Draining

- Open cap on coolant expansion tank.



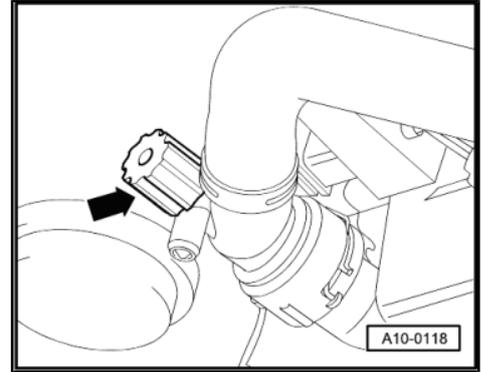
#### WARNING

*Steam may be released when cap is removed from expansion tank. Cover cap with a cloth and open carefully.*

- Remove insulation tray. ⇒ General body repairs, exterior; Rep. Gr. 50 ; Body - front; Assembly overview .



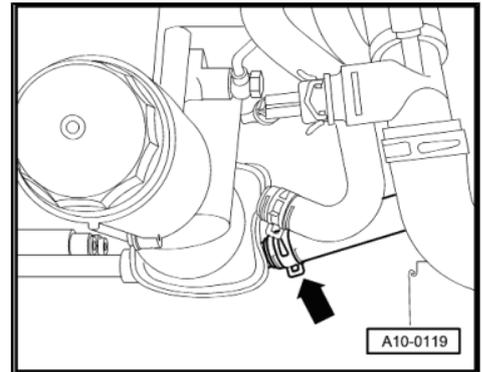
- To drain coolant from radiator, open drain plug -arrow-.



- To drain coolant from engine, also remove coolant hose from engine oil cooler -arrow-.



*Observe environmental regulations for disposal.*





## 1.4.2 Filling



### Note

- ◆ *In vehicles as of model year 2008, only G 12 plus-plus according to TL VW 774 G may be used as coolant additive.*
- ◆ *For vehicles up to and including model year 2007 coolant additive G 12 plus according to TL VW 774 F and G 12 plus-plus according to TL VW 774 G can be used.*
- ◆ *The coolant additive G 12 plus-plus can be mixed with the previous coolant additive G 12 plus. Identification: Both are coloured purple.*
- ◆ *Coolant additives marked "according to TL VW 774 G" or "according to TL VW 774 F" prevent frost and corrosion damage, scaling and also raise boiling point of coolant. Therefore, the cooling system must be filled all year round with coolant additive and corrosion protection additive.*
- ◆ *Because of its higher boiling point, the coolant improves engine reliability under heavy loads, particularly in countries with tropical climates.*
- ◆ *Frost protection is required down to about -25 °C (in countries with arctic climates: down to about -35 °C).*
- ◆ *The coolant concentration must not be reduced by adding water even in warmer seasons and in warmer countries. The coolant additive concentration must be at least 40 %.*
- ◆ *If for climatic reasons greater frost protection is required, the amount of coolant additive can be increased, but only up to 60 % (frost protection to about -40 °C). Otherwise frost protection and cooling effectiveness are reduced again.*
- ◆ *The refractometer -T10007- is recommended for determining the current anti-freeze concentration.*
- ◆ *If radiator, heat exchanger, cylinder head or cylinder head gasket is renewed, do not reuse old coolant.*

Recommended mixture ratios:

Frost protection to	Anti-freeze proportion	G 12 plus <sup>1)</sup> G 12 plus-plus <sup>1)</sup>	Water <sup>1)</sup>
-25 °C	40 %	3.2 l	4.8 l
-35 °C	50 %	4.0 l	4.0 l

1) The quantity of coolant can vary depending upon the vehicle equipment.

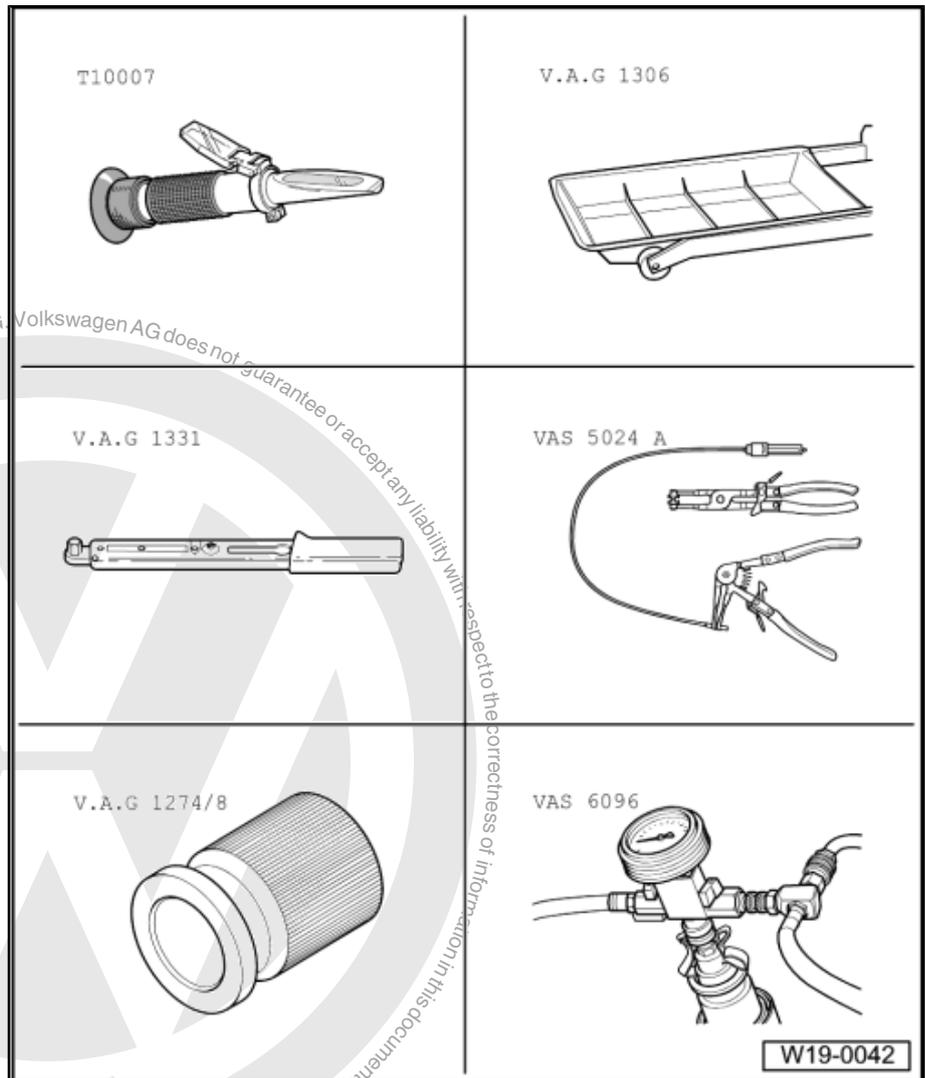
- Close radiator drain plug.
- Connect coolant hoses to oil cooler.
- Install noise insulation tray. ⇒ General body repairs, exterior; Rep. Gr. 50 ; Body - front; Assembly overview .
- Screw adapter -V.A.G 1274/8- onto expansion tank.
- Fill coolant circuit using cooling system charge unit - VAS 6096- ⇒ Operating instructions for cooling system charge unit VAS 6096



## 1.5 Removing and installing radiator

### Special tools and workshop equipment required

- ◆ Refractometer -T10007-
- ◆ Drip tray -V.A.G 1306-
- ◆ Torque wrench - V.A.G 1331-
- ◆ Spring-type clip pliers - VAS 5024 A-
- ◆ Adapter -V.A.G 1274/8-
- ◆ Cooling system charge unit -VAS 6096-



### 1.5.1 Removing

- Bring lock carrier into service position. ⇒ General body repairs, exterior; Rep. Gr. 50 ; Body - front; Lock carrier service position .
- Drain coolant. ⇒ [page 102](#)
- Pull coolant hoses off radiator.
- Separate connector for radiator fan.
- Remove radiator securing bolts.
- Remove radiator downwards.

### 1.5.2 Installing

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

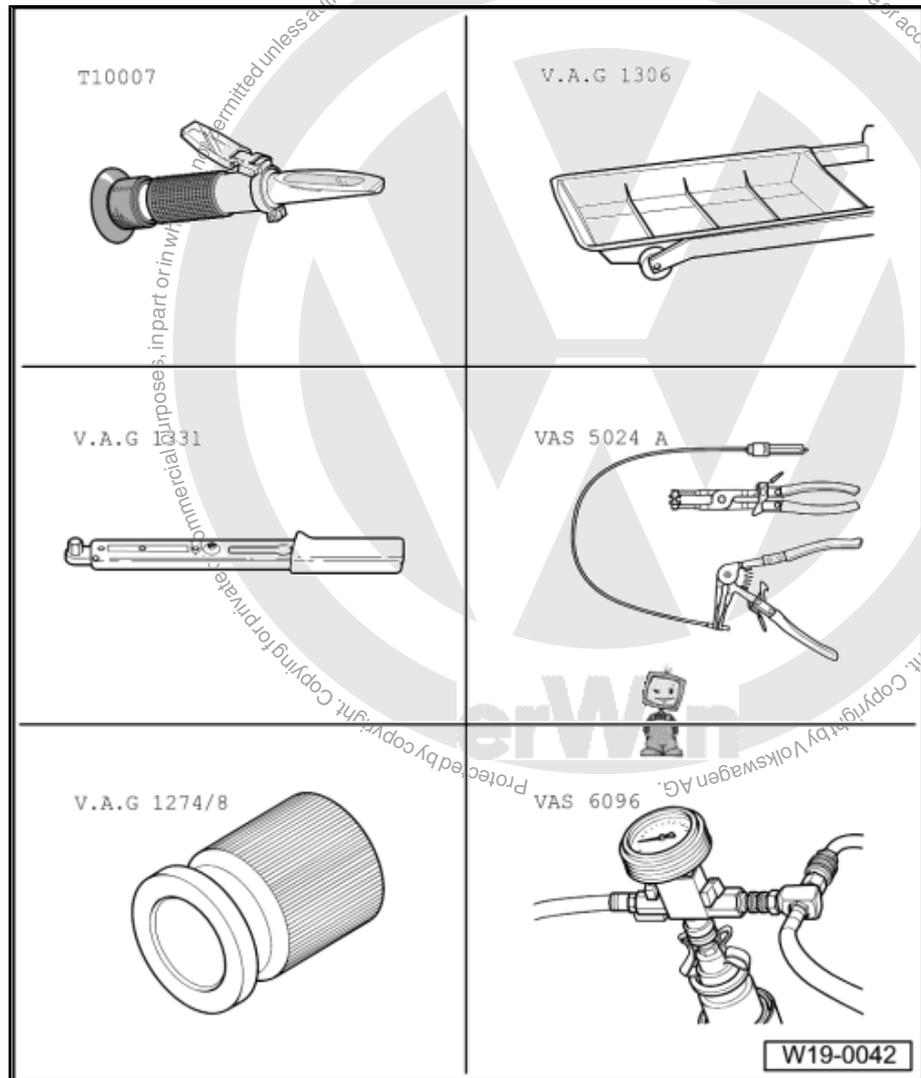
- Fill with coolant. ⇒ [page 102](#)



## 1.6 Removing and installing coolant pump

### Special tools and workshop equipment required

- ◆ Refractometer -T10007-
- ◆ Drip tray -V.A.G 1306-
- ◆ Torque wrench - V.A.G 1331-
- ◆ Spring-type clip pliers - VAS 5024 A-
- ◆ Adapter -V.A.G 1274/8-
- ◆ Cooling system charge unit -VAS 6096-



### 1.6.1 Removing



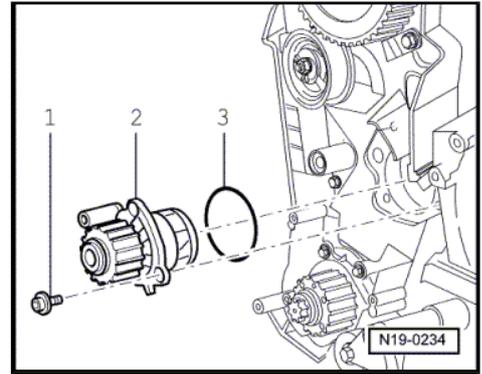
#### Note

*Always renew seals and gaskets.*

- Drain coolant ⇒ [page 102](#) .
- Remove poly V-belt ⇒ [page 13](#) .
- Remove toothed belt ⇒ [page 50](#) .



- Remove securing bolts -1- for coolant pump -2- and carefully remove coolant pump.



## 1.6.2 Installing

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

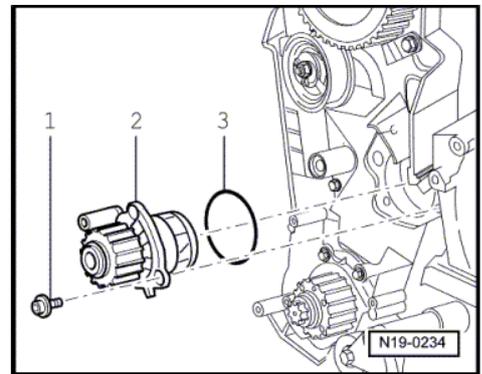
- Moisten new O-ring -3- with coolant.
- Insert coolant pump -2- in cylinder block and tighten securing bolts -1- to 15 Nm.



### Note

*The coolant pump plug faces downwards.*

- Install toothed belt ⇒ [page 50](#) .
- Install poly V-belt ⇒ [page 13](#) .
- Fill cooling system with coolant ⇒ [page 102](#) .

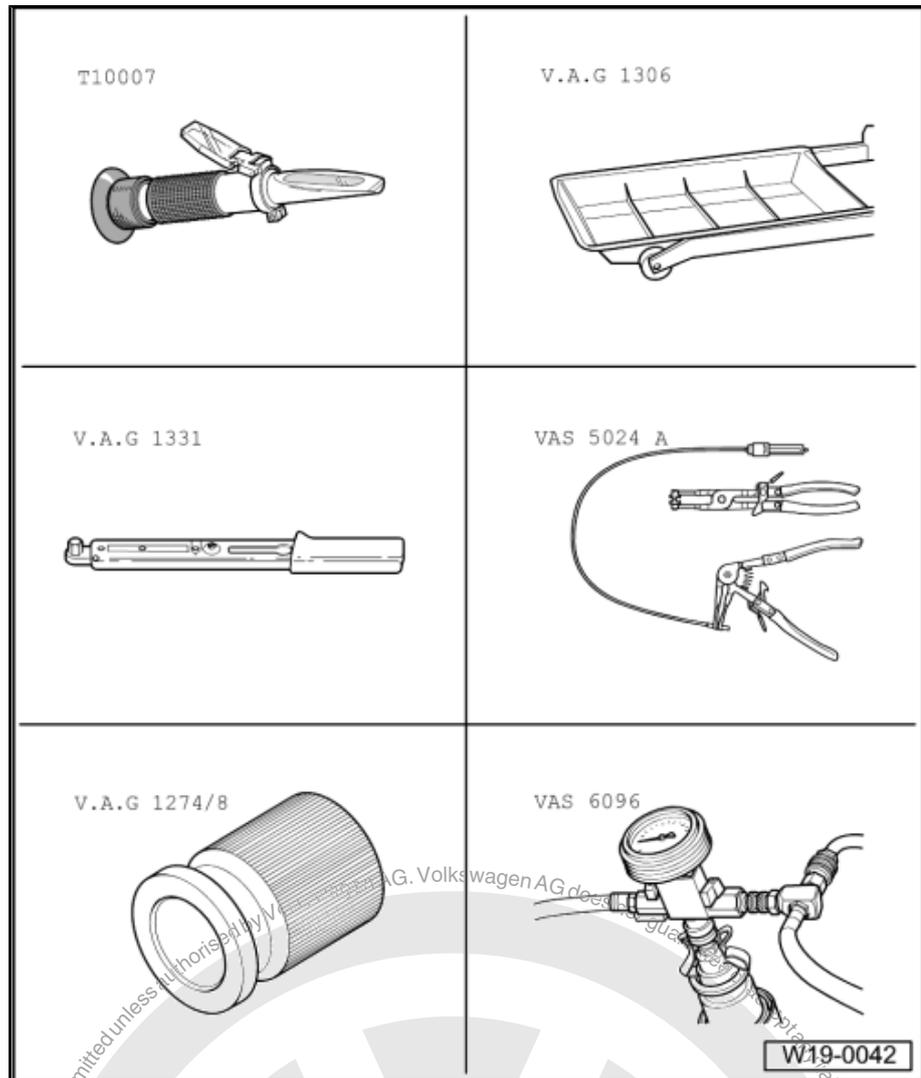




## 1.7 Removing and installing thermostat

### Special tools and workshop equipment required

- ◆ Refractometer -T10007-
- ◆ Drip tray -V.A.G 1306-
- ◆ Torque wrench - V.A.G 1331-
- ◆ Spring-type clip pliers - VAS 5024 A-
- ◆ Adapter -V.A.G 1274/8-
- ◆ Cooling system charge unit -VAS 6096-



### 1.7.1 Removing



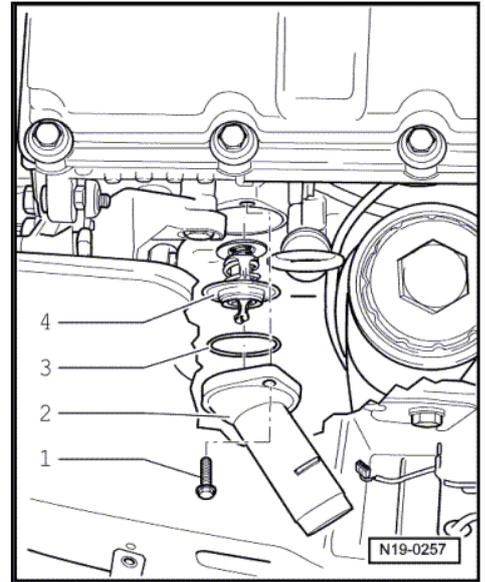
#### Note

Always renew seals and gaskets.

- Drain coolant. ⇒ [page 102](#)
- Remove alternator. ⇒ Electrical system; Rep. Gr. 27 ; Removing and installing alternator with poly V-belt .
- Pull coolant hose off connection.



- Remove securing bolts -1- of connection -2- and remove connection -2- with thermostat -4-.
- Turn thermostat -4- 1/4 turn (90°) to left and remove it from connection -2-.



## 1.7.2 Installing

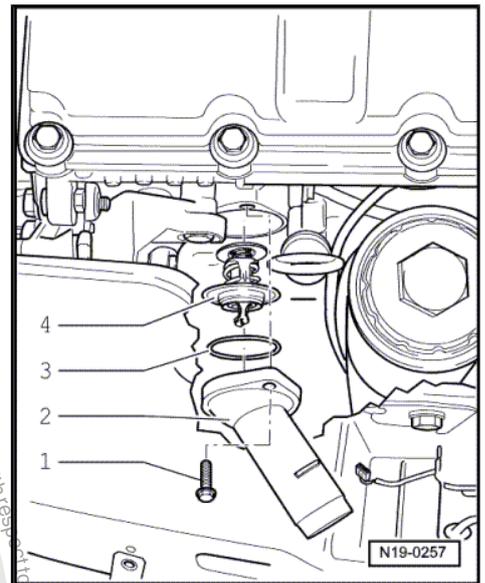
Installation is carried out in the reverse order. When installing, note the following:

- Moisten new O-ring -3- with coolant.
- Insert thermostat -4- into connection -2- and turn 1/4 turn (90°) to right.

### Note

*The brace on the thermostat must be almost vertical.*

- Insert connection -2- with thermostat -4- in cylinder block.
- Tighten securing bolts -1- to 15 Nm.
- Replenish coolant. ⇒ [page 102](#)

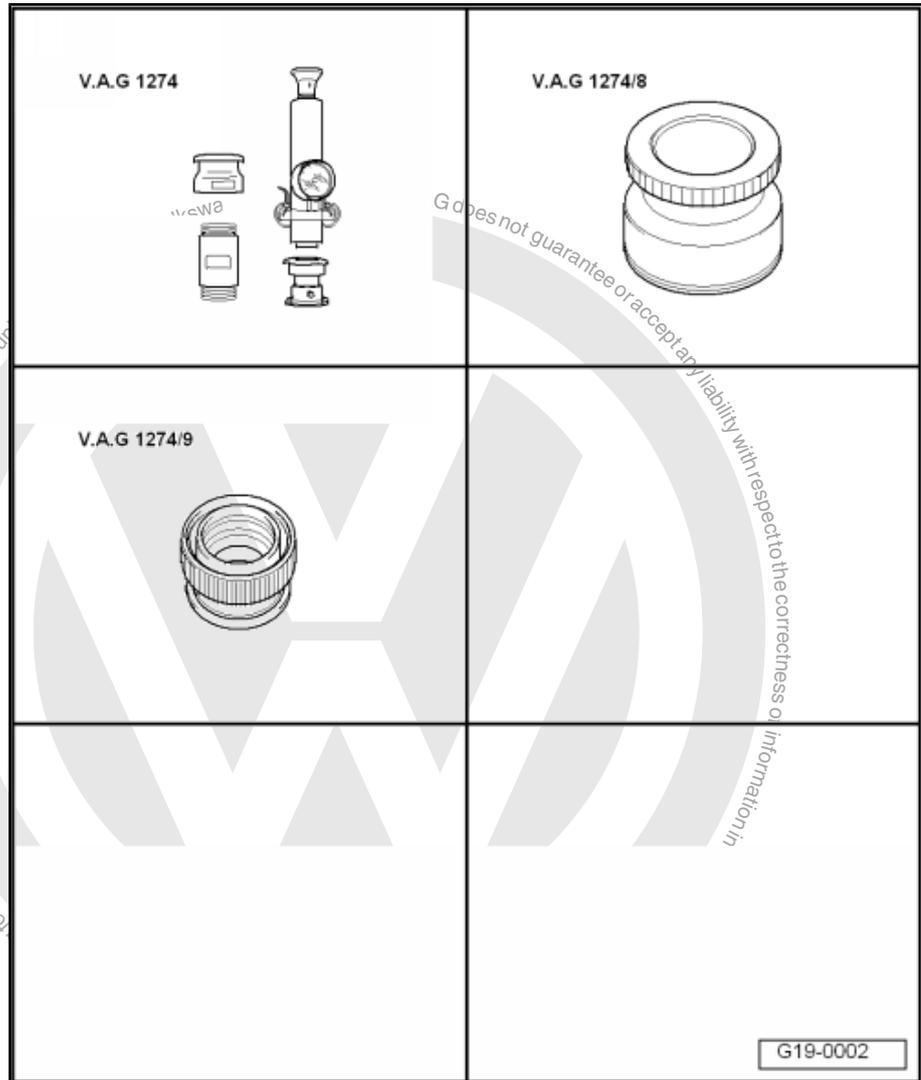




## 1.8 Checking cooling system for leaks

### Special tools and workshop equipment required

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



### Test prerequisite

- Engine at operating temperature.

### Test sequence:



#### WARNING

*Hot steam may escape when expansion tank is opened. Place rag over cap and open with caution.*

- Open cap on coolant expansion tank.

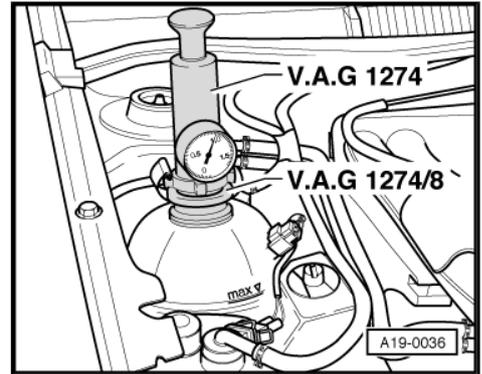


- Attach cooling system tester -V.A.G 1274- with cooling system tester adapter -V.A.G 1274/8- to expansion tank.
- Use hand pump on tester to create a pressure of about 1.0 bar.

If pressure drops:

- Find leaks and rectify.

#### Checking pressure relief valve in filler cap



- Attach cooling system tester -V.A.G 1274- with cooling system tester adapter -V.A.G 1274/9- to cap.
- Use hand pump on cooling system tester to create a pressure of max. 1.6 bar.

The pressure relief valve must not open.

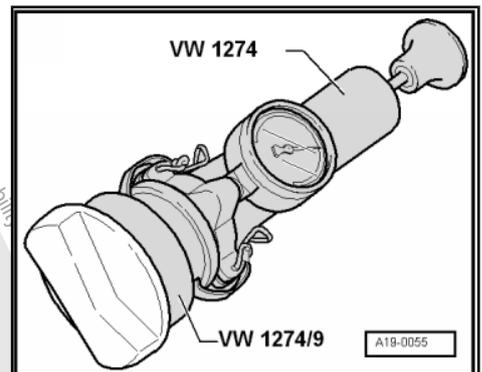
If the pressure relief valve opens prematurely:

- Renew sealing cap.
- Increase pressure to over 1.6 bar.

The pressure relief valve must open.

If the pressure relief valve does not open:

- Renew sealing cap.



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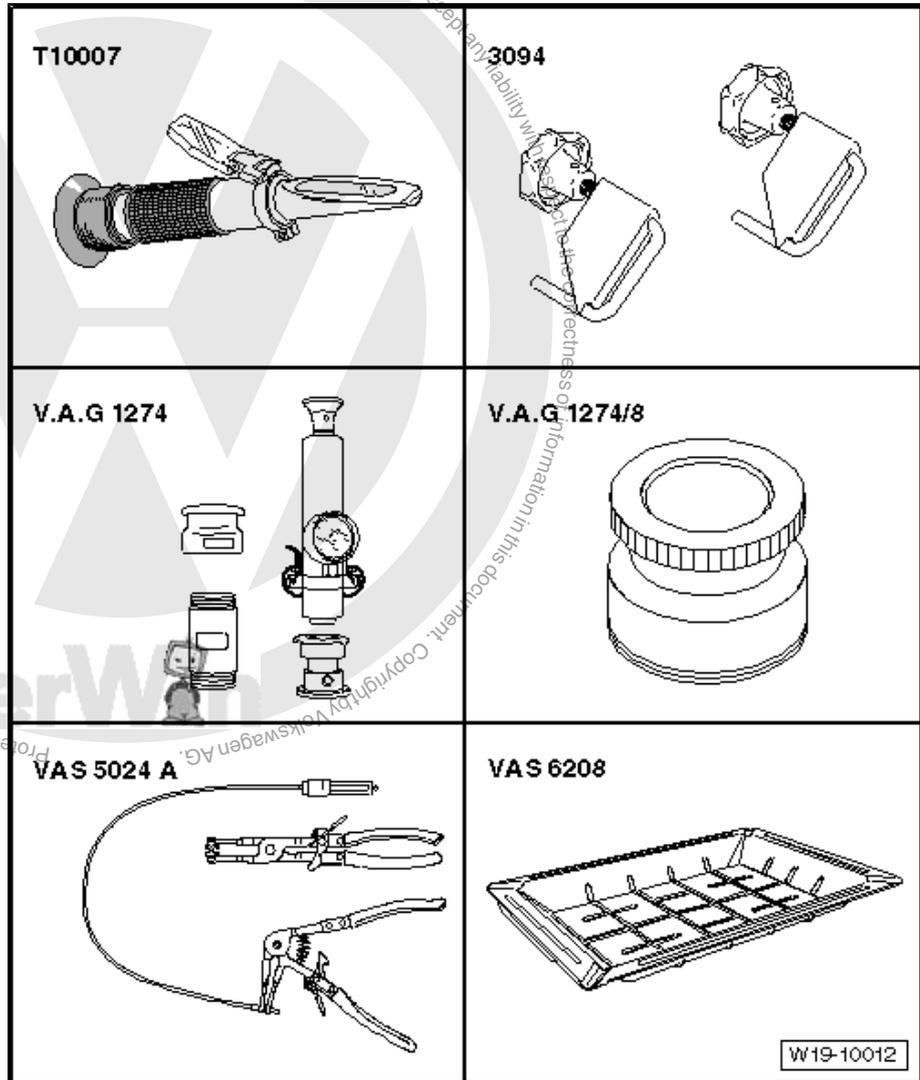




## 1.9 Checking engine oil cooler for leaks

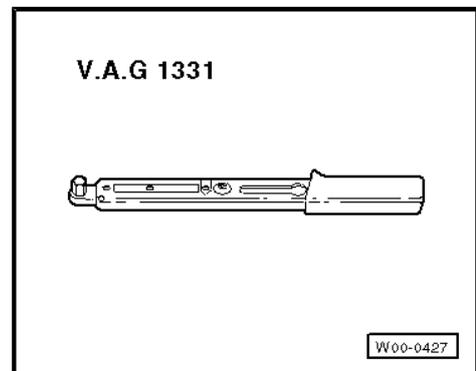
### Special tools and workshop equipment required

- ◆ Refractometer -T10007-
- ◆ Hose clamps up to  $\varnothing$  25 mm -3094-
- ◆ Cooling system tester - V.A.G 1274-
- ◆ Adapter for cooling system tester -V.A.G 1274/8-
- ◆ Spring-type clip pliers -VAS 5024A-
- ◆ Drip tray -VAS 6208-



### Special tools and workshop equipment required

- ◆ Torque wrench -V.A.G 1331-



### Not illustrated:

- ◆ Expansion tank -1K0 121 407 A- or -6Q0 121 407 A- or -1J0 121 407 B-
- ◆ Plug -191 211 343-



- ◆ Cap -1J0 121 324-
- ◆ Coolant hose -251 265 056-
- ◆ Screw clamp

**Test prerequisite:**

- Engine cold

**Test procedure**

- Remove noise insulation tray => General body repairs, exterior; Rep. Gr. 50 ; Body - front; Assembly overview - noise insulation .
- Clamp supply line and return line off engine oil cooler using hose clips to Ø 25 mm -3094- .
- Loosen spring type clips -arrows- using spring type clip pliers -VAS 5024A- .



**Note**

Collect escaping coolant with drip tray -VAS 6208- .

- Pull coolant hoses off oil cooler.
- Push sealing cap -5- to rear connection of oil cooler -4-.
- Secure sealing plug -2- to breather connection of expansion tank -1-.
- Secure coolant hose -3- to oil cooler and expansion tank.
- Fill expansion tank up to "Max" marking.
- Attach cooling system tester -V.A.G 1274- with cooling system tester adapter -V.A.G 1274/8- to expansion tank.

Use hand pump on tester to create a pressure of about 1.6 bar.

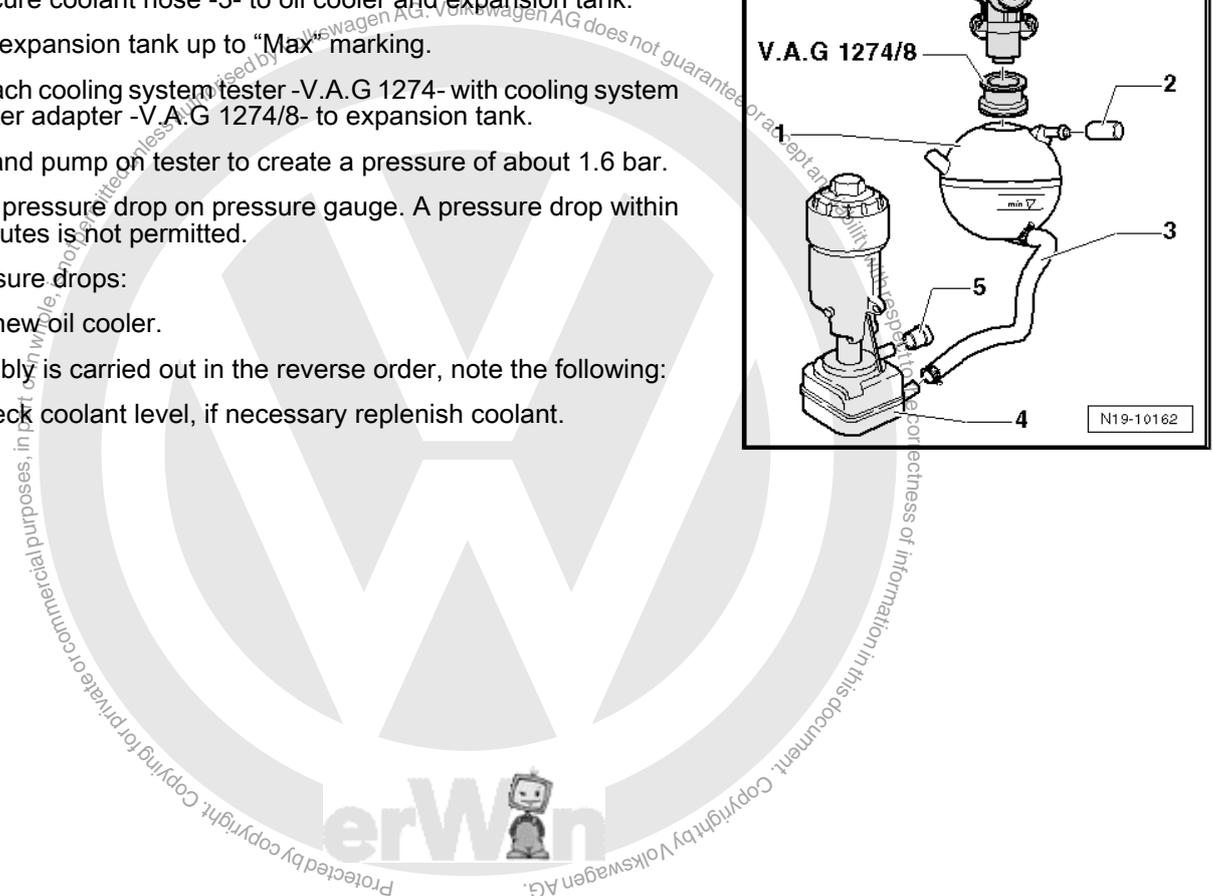
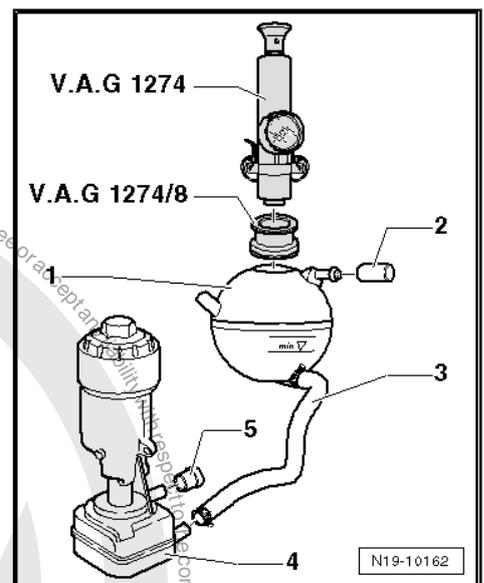
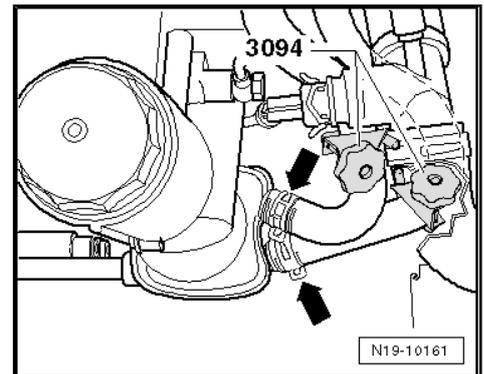
Watch pressure drop on pressure gauge. A pressure drop within 10 minutes is not permitted.

If pressure drops:

- Renew oil cooler.

Assembly is carried out in the reverse order, note the following:

- Check coolant level, if necessary replenish coolant.





## 20 – Fuel supply system

### 1 Safety precautions when working on fuel supply system



#### WARNING

*When doing any repair work, especially in the engine compartment, pay attention to the following due to the cramped conditions:*

- ◆ *Route all the various lines (e.g. for fuel, hydraulics, activated charcoal filter system, coolant, refrigerant, brake fluid and vacuum) and electrical wiring in their original positions.*
- ◆ *Ensure that there is sufficient clearance to all moving or hot components.*
- ◆ *The fuel and the fuel lines in the fuel system can become very hot (danger of scalding)!*
- ◆ *The fuel system is also under pressure! Before opening the system, place cloths around the connections. Then carefully loosen connection to release the pressure!*
- ◆ *Wear eye and hand protection when performing any type of repair work on the fuel system!*

When removing and installing fuel gauge sender or fuel pump (fuel delivery unit) from a full or partly full fuel tank, observe the following:

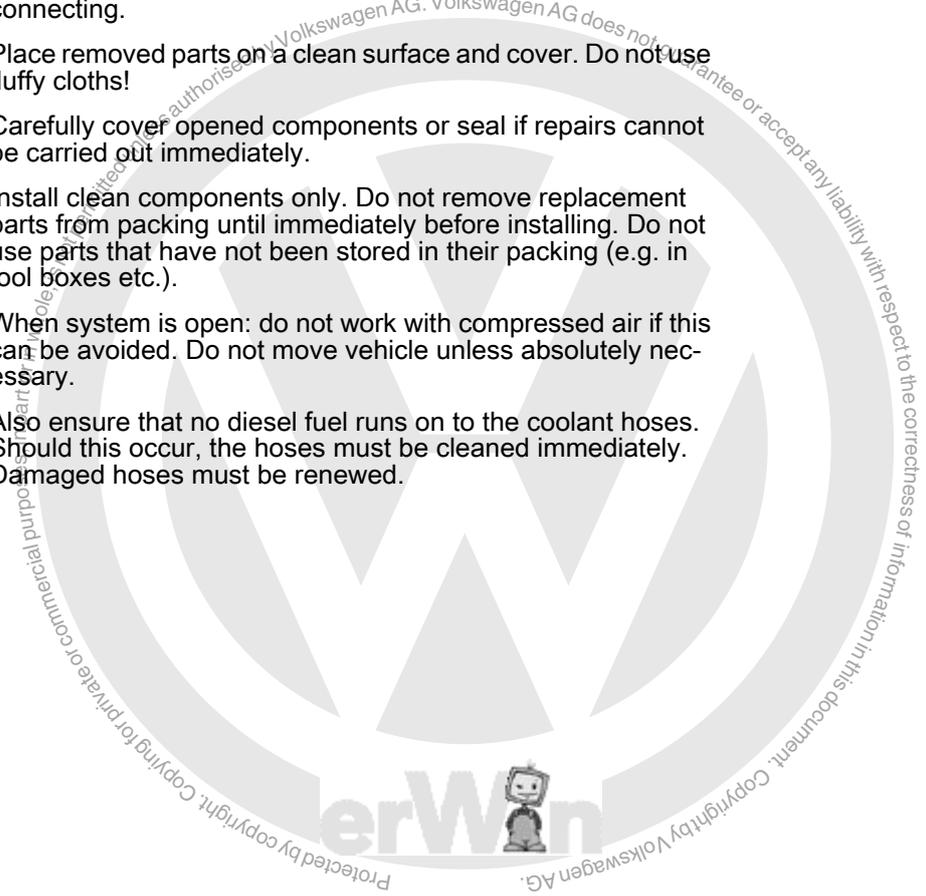
- ◆ Before beginning work, place an extraction hose close to sender opening in fuel tank to extract escaping fuel fumes and switch on exhaust extraction system. If no exhaust gas extraction system is available, a radial fan with a displacement greater than 15 m<sup>3</sup>/h can be used providing that motor is not in air flow.
- ◆ Prevent skin contact with fuel! Wear fuel-resistant gloves!



## 2 Rules for cleanliness

When working on the fuel supply and injection systems, pay careful attention to the following "6 rules" for cleanliness:

- ◆ Thoroughly clean all unions and adjacent areas before disconnecting.
- ◆ Place removed parts on a clean surface and cover. Do not use fluffy cloths!
- ◆ Carefully cover opened components or seal 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 not been stored in their packing (e.g. in tool boxes etc.).
- ◆ When system is open: do not work with compressed air if this can be avoided. Do not move vehicle unless absolutely necessary.
- ◆ Also ensure that no diesel fuel runs on to the coolant hoses. Should this occur, the hoses must be cleaned immediately. Damaged hoses must be renewed.





### 3 Fuel tank, vehicles with front-wheel drive

Observe safety precautions ⇒ [page 114](#) .

Observe rules for cleanliness ⇒ [page 115](#) .

Assembly overview - fuel tank ⇒ [page 116](#) .

Emptying fuel tank ⇒ [page 117](#) .

Removing and installing fuel tank ⇒ [page 121](#) .

Removing and installing fuel delivery unit ⇒ [page 123](#) .

Removing and installing fuel gauge sender ⇒ [page 124](#) .

Checking fuel pump ⇒ [page 125](#) .

#### 3.1 Assembly overview - fuel tank

1 - Sealing cap

2 - 1.5 Nm

3 - Earth connection

- Check for secure seating.

4 - 10 Nm

5 - Wiring duct

6 - Fuel tank

- When removing, support using engine and gearbox jack -V.A.G 1383/A- .
- Removing and installing ⇒ [page 121](#) .

7 - 25 Nm

- To secure the securing straps for the fuel tank, only bolts with loose washers must be used. If other bolts are used, the securing straps could be twisted whilst tightening. Bolts ⇒ ET-KA (electronic parts catalogue) .
- Renew

8 - Clamping washer

9 - Securing strap

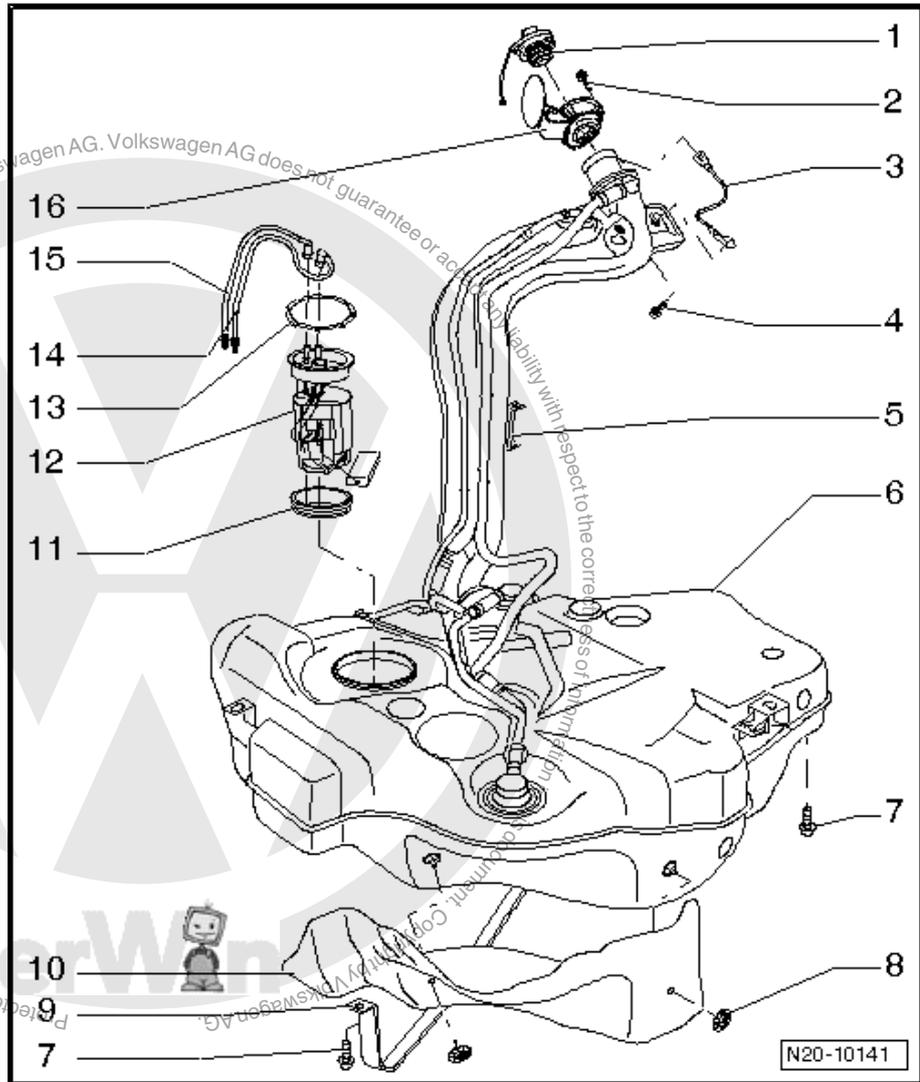
- Note installation position.

10 - Heat shield

- For fuel tank.

11 - Seal

- Renew if damaged.
- Moisten with fuel when installing





## 12 - Fuel delivery unit

- With fuel gauge sender (G).
- Note installation position of flange on fuel tank ⇒ [page 117](#) .
- Removing and installing ⇒ [page 123](#) .
- Checking fuel pump ⇒ [page 125](#) .
- Removing and installing fuel gauge sender ⇒ [page 124](#) .
- Clean strainer if soiled

## 13 - Locking ring

- Remove and install using fuel tank sender unit tool -T10202- .
- Specified torque: 110 Nm.

## 14 - Supply line

- To fuel filter
- Clipped onto fuel tank
- Check for secure seating.
- Black
- To pull off flange, press release button on connecting piece.

## 15 - Return line

- From fuel cooler
- Blue or with blue marking.
- Clipped onto fuel tank
- Check for secure seating.
- To pull off flange, press release button on connecting piece.

## 16 - Tank flap unit

- Removing and installing ⇒ General body repairs, exterior; Rep. Gr. 55 ; Tank flap unit .

### Installation position of fuel delivery unit

Marking -3- on the flange must align with marking on the fuel tank.

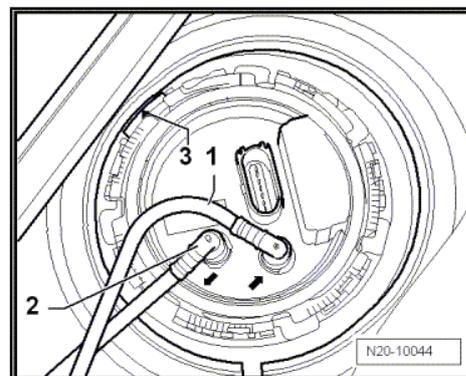
Return line blue or with blue marking -1-.

Supply line (black) -2-.



#### Note

*After installing fuel delivery unit flange, check that supply, return and breather lines are still clipped onto fuel tank.*

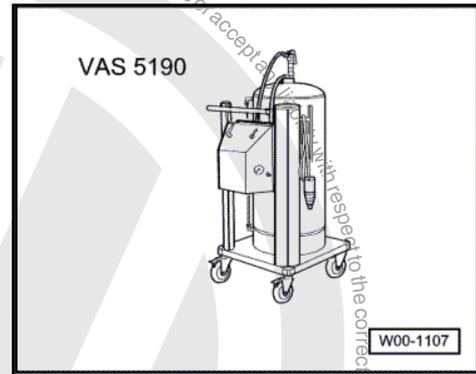


## 3.2 Emptying fuel tank

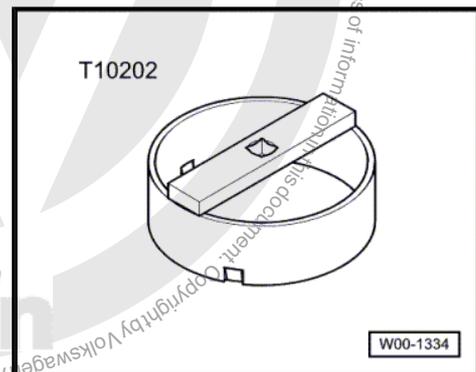
Special tools and workshop equipment required



- ◆ Fuel extractor -VAS 5190-



- ◆ Fuel tank sender unit tool -T10202-



- ◆ Torque wrench (40...200 Nm) -V.A.G 1332-
- Note safety precautions before beginning work ⇒ [page 114](#) .

Emptying fuel tank, bleeding fuel system when fuel pump is intact  
⇒ [page 118](#) .

Emptying fuel tank if more than  $\frac{3}{4}$  full ⇒ [page 120](#)

Emptying fuel tank if less than  $\frac{3}{4}$  full ⇒ [page 120](#)

### 3.2.1 Emptying fuel tank, bleeding fuel system when fuel pump is intact

Special tools and workshop equipment required

- ◆ Diagnostic tester
- ◆ Fuel extractor -VAS 5190-
- ◆ Adapter for fuel extraction -VAS 5190 /3 -



#### WARNING

*Fuel supply line is pressurised. Wear eye protection and protective clothing to avoid possible injury and skin contact. Before loosening hose connections, wrap a cloth around the connection. Then release pressure by carefully pulling hose off connection.*

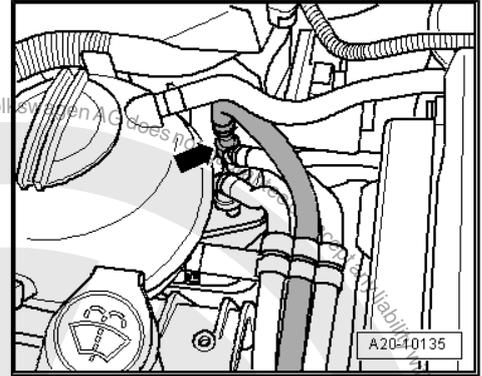


#### Note

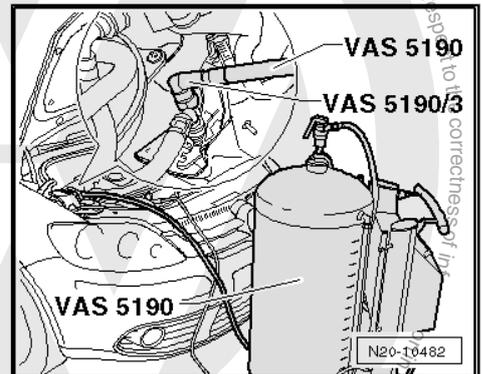
*Press in securing ring to release fuel lines.*



- Pull off supply line -arrow- and catch escaping fuel with a cloth.



- Connect fuel extractor -VAS 5190- with adapter for fuel extractor -VAS 5190 /3 - to fuel supply line.



- Connect a diagnostic tester.

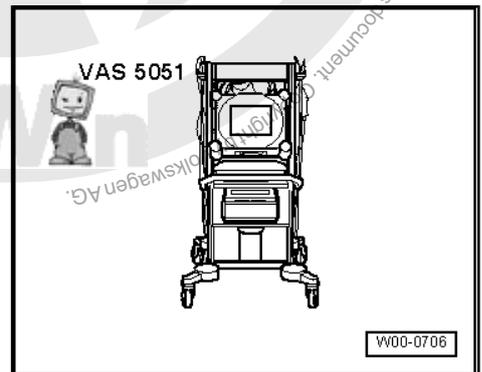
**i Note**

*The fuel pump is being activated when engine is not running.*

- Switch on ignition.
- Remove filler cap from fuel tank filler neck.
- Perform the function "Emptying fuel system" in "guided functions".

If the fuel tank is emptied, "stop" the function to prevent the fuel pump from running "dry".

- Operate shut-off tap on fuel extractor -VAS 5190- , until the fuel tank is emptied.



**Bleeding fuel system**

1) Low-pressure section

- Fuel tank filled.
- Connect a diagnostic tester.
- Perform the function "Bleeding fuel system" in "guided functions".



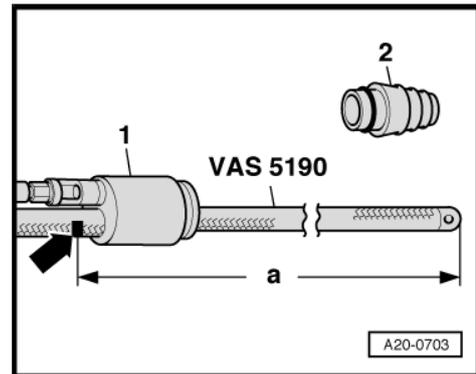
### 3.2.2 Emptying fuel tank if it is more than $\frac{3}{4}$ full



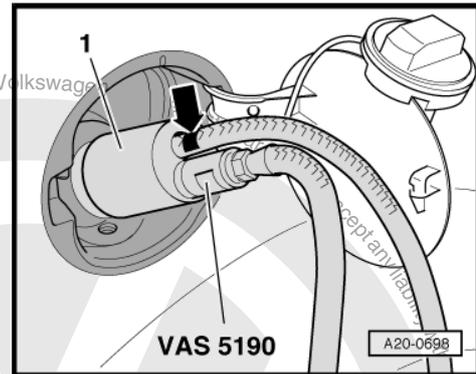
#### Caution

**Secure earth wire of fuel extractor -VAS 5190- to a bare metal part of the body.**

- Remove cotter -2- from shaft -1- of fuel extractor -VAS 5190- .
- At distance -a- = 1180 mm from end, mark extraction hose with insulating tape -arrow-.



- Remove filler cap from fuel tank filler neck.
- Screw shaft end -1- of fuel extractor unit -VAS 5190- onto fuel filler neck.
- Push extraction hose into fuel tank until marking on hose -arrow- coincides with shaft end.



#### Note

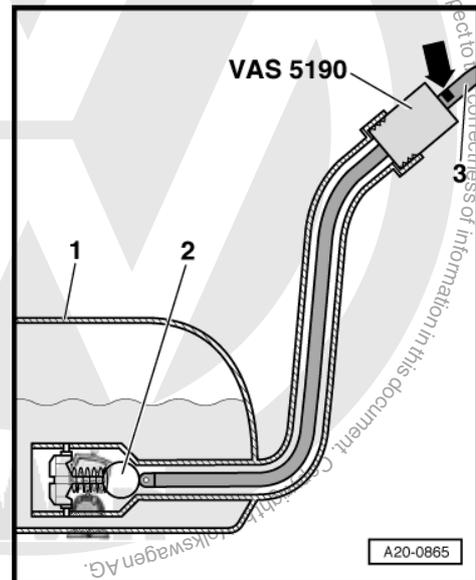
A ball valve -2- is located at the bottom of the filler neck in the fuel tank -1-; it must not be damaged by the extraction hose -3-. Therefore push hose into filler neck only as far as marking -arrow-.

- Empty fuel tank as far as possible.
- Carefully pull out extraction hose



#### Note

- ◆ When no more fuel is extracted, the tank is emptied just enough for the sender flange to be opened without danger.
- ◆ If the fuel tank has to be drained fully, proceed as follows:  
=> [page 120](#)



### 3.2.3 Emptying fuel tank if it is less than $\frac{3}{4}$ full

- Remove bench seat => General body repairs, interior; Rep. Gr. 72 ; Rear seats; Removing and installing bench seat .



- Remove cover from fuel delivery unit.



**WARNING**

*Fuel supply line is pressurised. Wear eye protection and protective clothing to avoid possible injury and skin contact. Before loosening hose connections, wrap a cloth around the connection. Then release pressure by carefully pulling hose off connection.*

- Pull connector and fuel lines off flange.

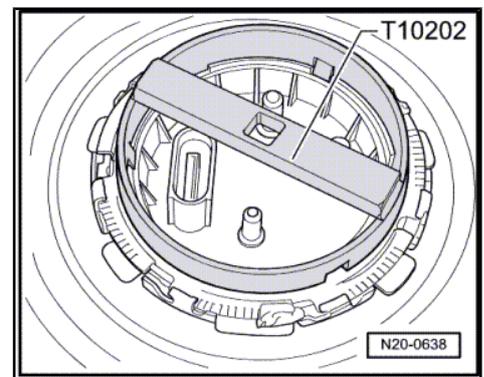


**Note**

*Press buttons on hose couplings to do this.*

- Open locking ring using fuel tank sender wrench -T10202- .
- Lift sender flange.
- Insert extraction hose of fuel extractor -VAS 5190- as deeply as possible into fuel tank and extract fuel.

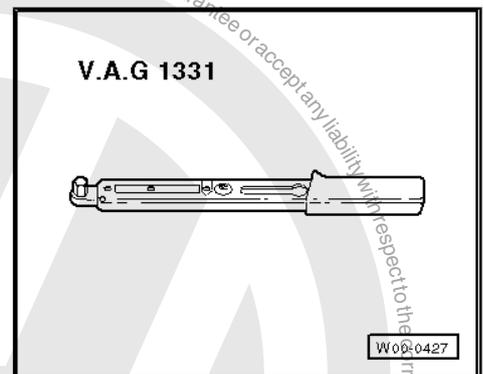
If fuel tank needed only to be emptied, reinstall sender flange.



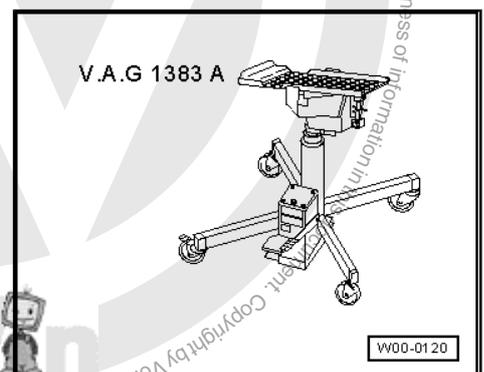
### 3.3 Removing and installing fuel tank

#### Special tools and workshop equipment required

- ◆ Torque wrench -V.A.G 1331-



- ◆ Engine and gearbox jack -V.A.G 1383/A-





### 3.3.1 Removing

- Note safety precautions before beginning work ⇒ [page 114](#) .
- Observe rules for cleanliness ⇒ [page 115](#) .



#### Note

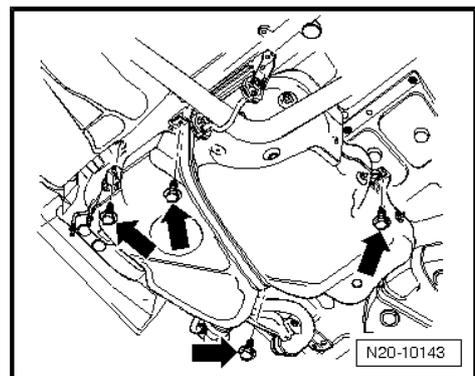
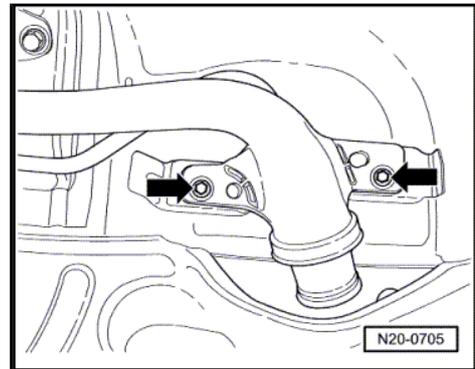
- ◆ *Before carrying out further work, disconnect battery earth strap. Check whether a coded radio is fitted. Obtain anti-theft coding first if necessary.*
- ◆ *When lowering fuel tank, guide it carefully to prevent damage.*
- With the ignition switched off, disconnect battery earth strap.
- Empty fuel tank ⇒ [page 117](#) .
- Fold rear seats forwards.
- Detach carpet under seats and fold it back. ⇒ General body repairs, interior; Rep. Gr. 70 ; Load and luggage compartment trim; Removing and installing luggage compartment floor
- Remove cover from fuel delivery unit.
- Pull connector off flange.
- Remove fuel flap unit. ⇒ General body repairs, exterior; Rep. Gr. 55 ; Fuel flap unit
- Remove rear right wheel housing liner. ⇒ General body repairs, exterior; Rep. Gr. 66 ; Removing and installing wheel housing liner .
- Remove bolts from filler neck -arrows-.
- Disconnect fuel lines at front right of fuel tank.



#### Note

*Press buttons on hose couplings to do this.*

- If vehicle has supplementary heating, separate connector to metering pump and unclip wire. ⇒ Supplementary heating; Rep. Gr. 82 ; Removing and installing metering pump -V54
- Support fuel tank using engine and gearbox jack -V.A.G 1383/A- .
- Remove securing bolts -arrows- for the fuel tank.
- Slowly lower fuel tank.
- Tilt fuel tank to get it past rear axle.



### 3.3.2 Installing

Installation is carried out in the reverse sequence of removal. In the process, note the following:

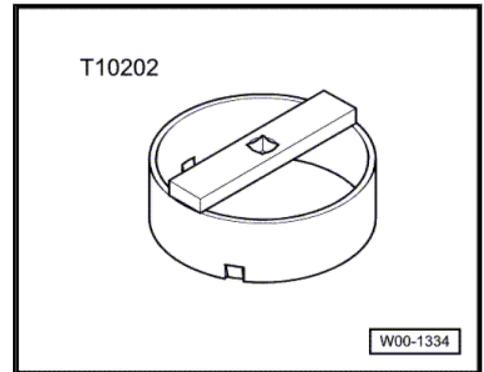


- ◆ Install breather and fuel hoses free of kinks.
- ◆ Ensure that fuel hose connections are tight.
- ◆ Do not interchange supply line and return line (return line blue or with blue marking, supply line black).
- ◆ Clip fuel lines onto fuel tank.

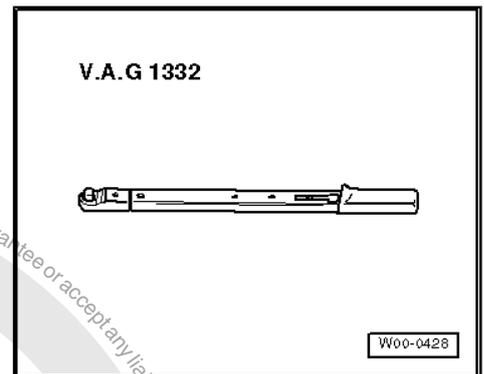
### 3.4 Removing and installing fuel delivery unit

#### Special tools and workshop equipment required

- ◆ Fuel tank sender unit tool -T10202-



- ◆ Torque wrench -V.A.G 1332-



#### 3.4.1 Removing

- Note safety precautions before beginning work ⇒ [page 114](#) .

Observe rules for cleanliness ⇒ [page 115](#) .

- First check whether a coded radio is fitted. If so, obtain anti-theft coding.
- With the ignition switched off, disconnect battery earth strap.
- The fuel tank must not be more than  $\frac{3}{4}$  full when removing the suction-jet pump. Drain fuel tank if necessary ⇒ [page 117](#) .
- Fold rear seats forwards.
- Detach carpet under seats and fold it back. ⇒ General body repairs, interior; Rep. Gr. 70 ; Load and luggage compartment trim; Removing and installing luggage compartment floor
- Remove cover from fuel delivery unit.
- Pull connector and fuel lines off flange.



#### Note

Press buttons on hose couplings to do this.



#### WARNING

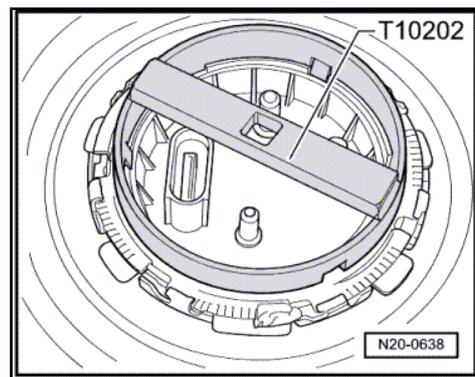
- ◆ *The fuel and the fuel lines in the fuel system can become very hot (danger of scalding)!*
- ◆ *The fuel system is also under pressure! Before opening the system, place cloths around the connections. Then carefully loosen connection to release the pressure!*
- ◆ *Wear eye and hand protection when performing any type of repair work on the fuel system!*

- Remove union nut using fuel tank sender unit tool -T10202- .
- Pull fuel delivery unit with seal out of opening in fuel tank.



#### Note

If delivery unit is to be renewed, drain old delivery unit before disposal.



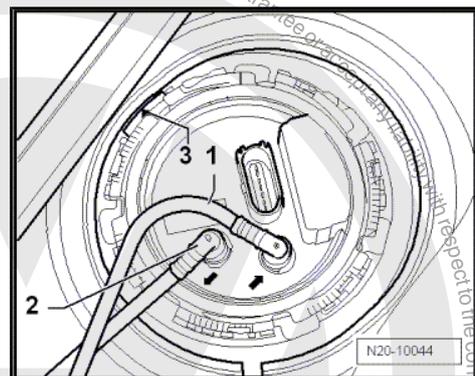
### 3.4.2 Installing

- Installing the fuel delivery unit is carried out in reverse order of removal.



#### Note

- ◆ *Do not bend fuel gauge sender when installing.*
- ◆ *Insert seal for flange or fuel delivery unit dry into opening of fuel tank.*
- ◆ *Moisten seal with fuel only when installing flange or fuel delivery unit.*
- ◆ *Ensure that fuel hose connections are tight.*
- ◆ *After installing fuel delivery unit, check that the supply, return and breather lines are still clipped onto the fuel tank.*
- ◆ *Note installation position of fuel delivery unit flange: mark on flange must align with mark on fuel tank.*



### 3.5 Removing and installing fuel gauge sender

#### Removing

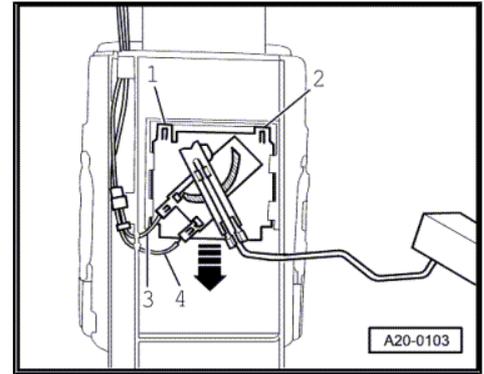
- Remove fuel delivery unit. => [page 123](#)



- Release connector tabs of lines -3- and -4- and pull them off.
- Raise retaining tabs -1- and -2- using a screwdriver and pull fuel sender off downwards -arrow-.

#### Installing

- Insert fuel gauge sender into guides on fuel delivery unit and press upwards until it engages.



### 3.6 Checking fuel pump

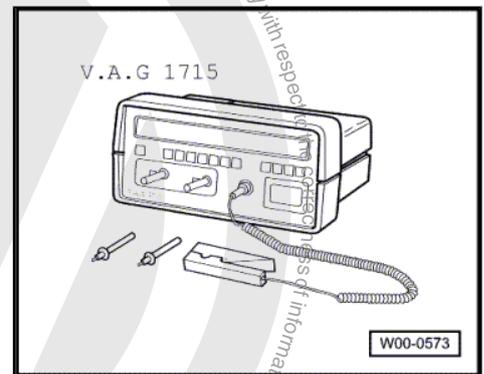
Checking voltage supply of fuel pump -G6- → [page 125](#)

Checking current consumption of fuel pump -G6- → [page 126](#)

#### 3.6.1 Checking function and voltage supply

##### Special tools and workshop equipment required

- ◆ Hand multimeter -V.A.G 1526 B- or multimeter -V.A.G 1715-



- ◆ Auxiliary measuring set -V.A.G 1594 C-

- ◆ Diode test lamp -V.A.G 1527 B-

##### Test prerequisites

- Fuses must be OK.
- The battery voltage must be at least 11.5 V.
- All electrical consumers, e.g. lights and rear window heating, must be switched off.
- Fold rear seats forwards.
- Detach carpet under seats and fold it back. ⇒ General body repairs, interior; Rep. Gr. 70 ; Load and luggage compartment trim; Removing and installing luggage compartment floor
- Remove cover from fuel delivery unit.
- Switch on ignition. Fuel pump must be heard to run.
- Switch off ignition.

If the fuel pump does not start:

- Pull 4-pin connector off fuel delivery unit flange.



- Connect diode test lamp -V.A.G 1527 B- to outer contacts of connector using auxiliary cables from auxiliary measuring set -V.A.G 1594 C- .

- Switch on ignition. The LED must light up for about 2 seconds.

If LED does not light up

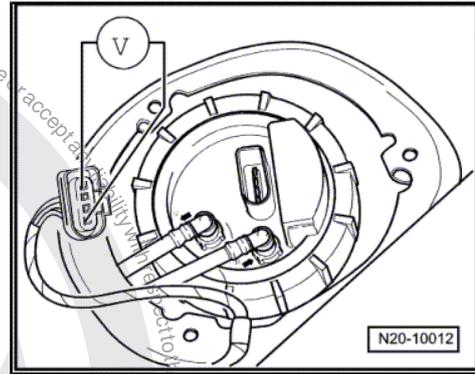
- Check actuation of fuel pump relay and wiring for open circuit or short circuit. => Vehicle diagnosis, testing and information system VAS 5051

If LED lights up (voltage supply OK):

- Remove fuel delivery unit. => [page 123](#)
- Check that electrical wiring between flange and fuel pump is connected and has continuity.

If no open circuit can be found:

- Renew fuel delivery unit. => [page 123](#)



### 3.6.2 Checking current draw of fuel pump

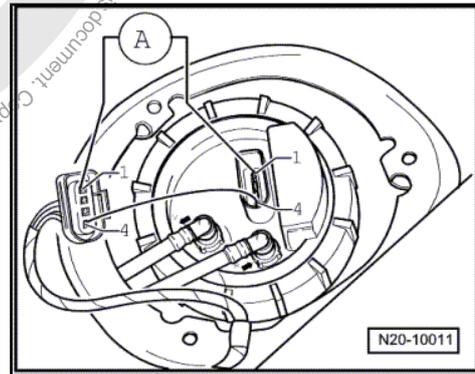
- Pull 4-pin connector off fuel delivery unit flange.
- Set multimeter to measuring range 20 A and connect in series between contacts -1- of connector and fuel pump using auxiliary cables from auxiliary measuring set -V.A.G 1594 C- .



#### Note

*The current pick-up clamp of multimeter -V.A.G 1715- can also be attached to an auxiliary cable between contacts -1- of connector and fuel pump.*

- Connect contacts -4- of connector and fuel pump using an auxiliary cable from auxiliary measuring set -V.A.G 1594 C- .
- Start engine and run at idling speed.
- Measure current draw of fuel pump: Specification: max. 7.5 Amperes.
- If the measured value is not within specifications:
- Renew fuel delivery unit. => [page 123](#)





## 4 Fuel tank, vehicles with four-wheel drive

Observe safety precautions ⇒ [page 114](#) .

Observe rules for cleanliness ⇒ [page 115](#) .

Assembly overview - fuel tank ⇒ [page 127](#) .

Emptying fuel tank ⇒ [page 128](#) .

Removing and installing fuel tank ⇒ [page 132](#) .

Removing and installing fuel gauge sender 2 -G169-  
⇒ [page 135](#) .

Removing and installing suction jet pump ⇒ [page 137](#)

Checking fuel pump ⇒ [page 125](#) .

### 4.1 Assembly overview - fuel tank

#### 1 - Supply line

- Black
- Check for secure seating.

#### 2 - Return line

- Blue
- Check for secure seating.

#### 3 - Seal

- Renew if damaged.
- When installing, fit dry in fuel tank opening
- Moisten with fuel only when installing flange.

#### 4 - Fuel delivery unit

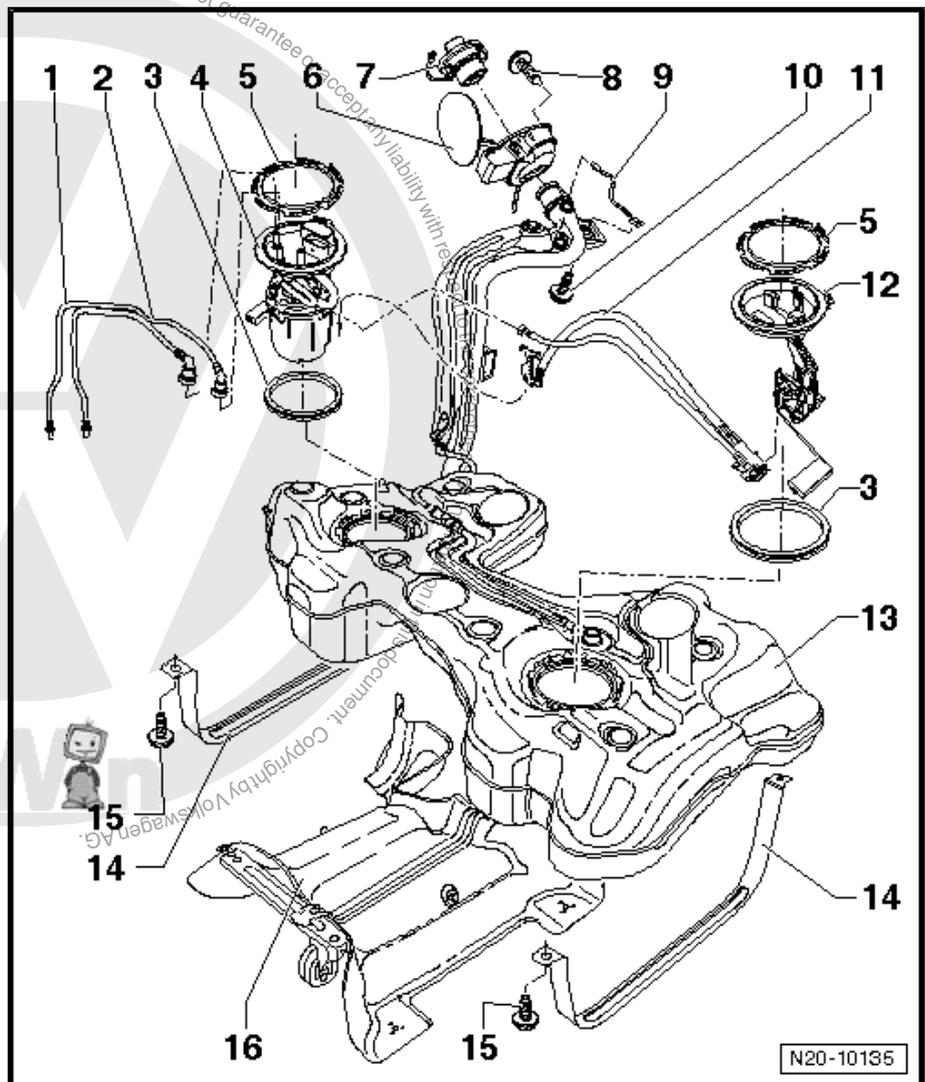
- Removing and installing ⇒ [page 123](#) .
- Checking fuel pump ⇒ [page 125](#) .
- Note installation position on fuel tank ⇒ [page 128](#) .
- With fuel gauge sender -G-
- Removing and installing fuel gauge sender ⇒ [page 124](#) .

#### 5 - Locking ring, 110 Nm

- Check for secure seating.
- Remove and install using wrench -T10202- .

#### 6 - Tank flap unit

- With rubber cup
- Removing and installing ⇒ General body repairs, exterior; Rep. Gr. 55 ; Tank flap unit; Removing and installing fuel tank flap unit .





## 7 - Cap

- Renew if damaged.

## 8 - Securing bolt

- Tighten to 1.5 Nm.

## 9 - Earth connection

- Check for secure seating.

## 10 - 10 Nm

## 11 - Suction-jet pump

- Clipped onto fuel gauge sender 2 -G169-
- Removing and installing => [page 137](#) .

## 12 - Fuel gauge sender 2 -G169-

## 13 - Fuel tank

- When removing, support using engine and gearbox jack -V.A.G 1383 A- .
- Removing and installing => [page 132](#) .

## 14 - Securing strap

- Note installation position.

## 15 - 25 Nm

- To secure the securing straps for the fuel tank, only bolts with loose washers must be used. If other bolts are used, the securing straps could be twisted whilst tightening. Bolts => ETKA (electronic parts catalogue) .
- Renew.

## 16 - Heat shield

- Riveted to exhaust pipe mounting

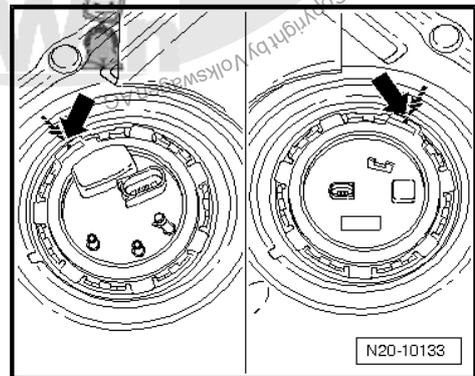
## Installation position of flange for fuel delivery unit and fuel gauge sender 2 -G169-

The marking on the flange must align with the marking on the fuel tank -arrow-.



### Note

*The marking on the fuel tank is not clearly visible.*



## 4.2 Emptying fuel tank

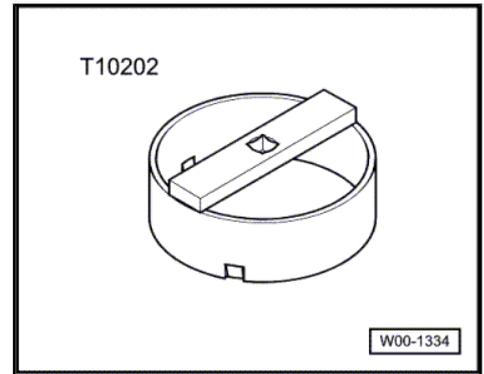
### Special tools and workshop equipment required

- ◆ Fuel extractor -VAS 5190-





- ◆ Fuel tank sender unit tool -T10202-



- ◆ Torque wrench (40...200 Nm) -V.A.G 1332-
- Note safety precautions before beginning work ⇒ [page 114](#) .
- Emptying fuel tank when fuel pump is intact ⇒ [page 129](#) .
- Emptying fuel tank if it is more than  $\frac{3}{4}$  full ⇒ [page 130](#) .
- Emptying fuel tank if it is less than  $\frac{3}{4}$  full ⇒ [page 131](#) .

#### 4.2.1 Emptying fuel tank, bleeding fuel system when fuel pump is intact

##### Special tools and workshop equipment required

- ◆ Diagnostic tester
- ◆ Fuel extractor -VAS 5190-
- ◆ Adapter for fuel extraction -VAS 5190/3 -



##### WARNING

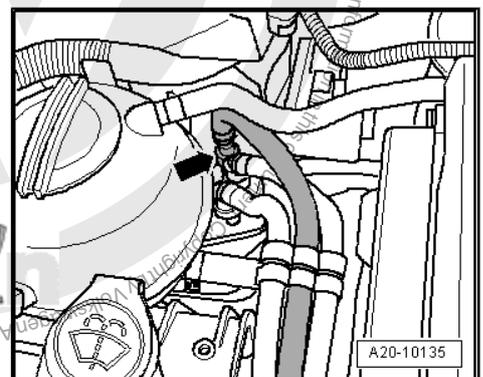
*Fuel supply line is pressurised. Wear eye protection and protective clothing to avoid possible injury and skin contact. Before loosening hose connections, wrap a cloth around the connection. Then release pressure by carefully pulling hose off connection.*



##### Note

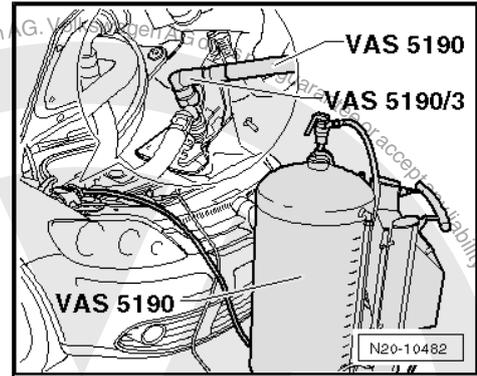
*Press in securing ring to release fuel lines.*

- Pull off supply line -arrow- and catch escaping fuel with a cloth.





- Connect fuel extractor -VAS 5190- with adapter for fuel extractor -VAS 5190 /3 - to fuel supply line.



- Connect a diagnostic tester.



#### Note

*The fuel pump is being activated when engine is not running.*

- Switch on ignition.
- Remove filler cap from fuel tank filler neck.
- Perform the function “Emptying fuel system” in “guided functions”.

If the fuel tank is emptied, “stop” the function to prevent the fuel pump from running “dry”.

- Operate shut-off tap on fuel extractor -VAS 5190- , until the fuel tank is emptied.

#### Bleeding fuel system

2) Low-pressure section

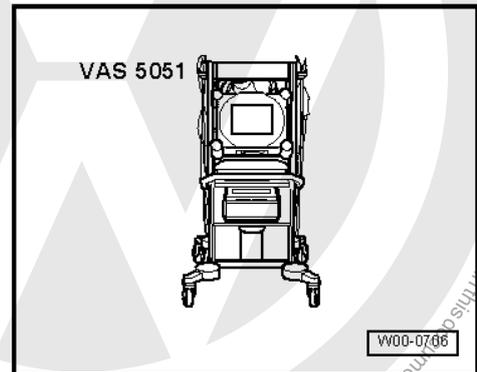
- Fuel tank filled.
- Connect a diagnostic tester.
- Perform the function “Bleeding fuel system” in “guided functions”.

#### 4.2.2 Emptying fuel tank if it is more than $\frac{3}{4}$ full



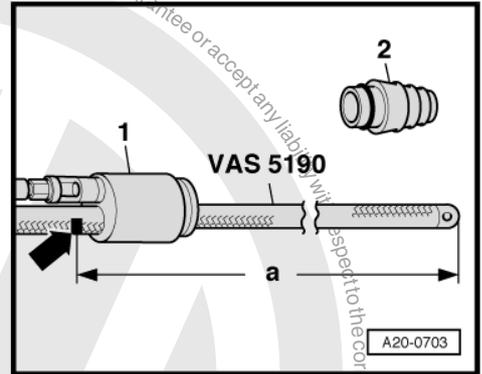
#### Caution

**Secure earth wire of fuel extractor -VAS 5190- to a bare metal part of the body.**

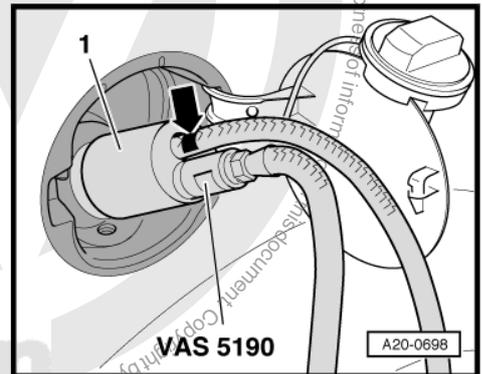




- Remove cotter -2- from shaft -1- of fuel extractor -VAS 5190- .
- At distance -a- = 1180 mm from end, mark extraction hose with insulating tape -arrow-.



- Remove filler cap from fuel tank filler neck.
- Screw shaft end -1- of fuel extractor unit -VAS 5190- onto fuel filler neck.
- Push extraction hose into fuel tank until marking on hose -arrow- coincides with shaft end.



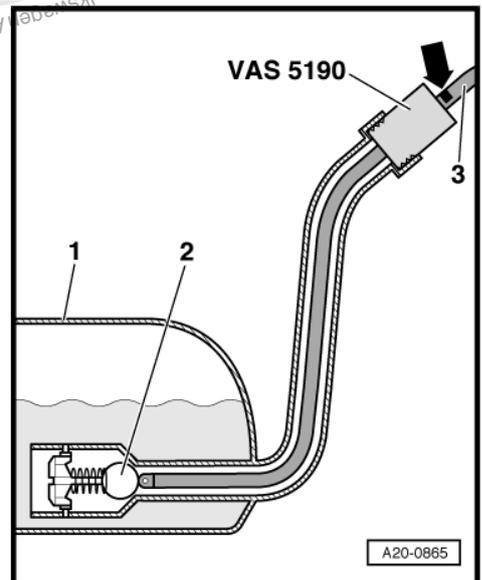
**i** Note

A ball valve -2- is located at the bottom of the filler neck in the fuel tank -1-; it must not be damaged by the extraction hose -3-. Therefore push hose into filler neck only as far as marking -arrow-.

- Empty fuel tank as far as possible.
- Carefully pull out extraction hose.

**i** Note

- ◆ When no more fuel is extracted, the tank is emptied just enough for the sender flange to be opened without danger.
- ◆ If the fuel tank has to be drained fully, proceed as follows:  
⇒ [page 131](#)



### 4.2.3 Emptying fuel tank if it is less than 3/4 full

- Remove bench seat ⇒ General body repairs, interior; Rep. Gr. 72 ; Rear seats; Removing and installing bench seat .
- Remove cover from fuel delivery unit.



**WARNING**

**Fuel supply line is pressurised. Wear eye protection and protective clothing to avoid possible injury and skin contact. Before loosening hose connections, wrap a cloth around the connection. Then release pressure by carefully pulling hose off connection.**



- Pull connector and fuel lines off flange.

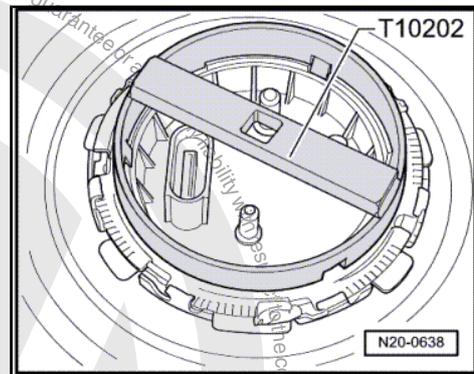


#### Note

Press buttons on hose couplings to do this.

- Open locking ring using fuel tank sender wrench -T10202- .
- Lift sender flange.
- Insert extraction hose of fuel extractor -VAS 5190- as deeply as possible into fuel tank and extract fuel.

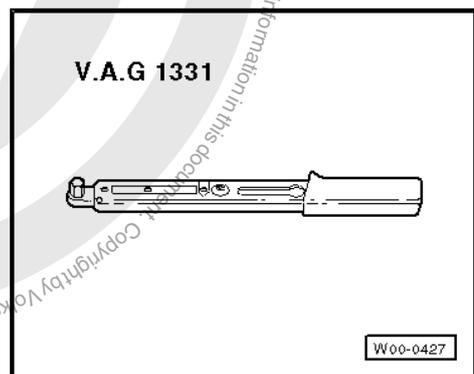
If fuel tank needed only to be emptied, reinstall sender flange.



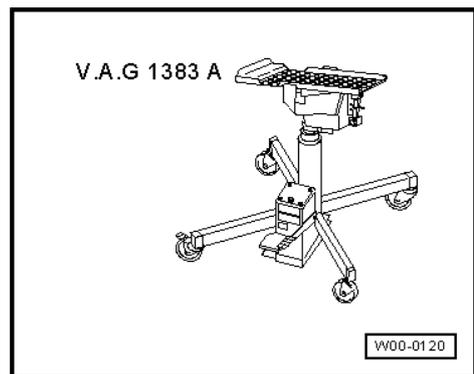
## 4.3 Removing and installing fuel tank

### Special tools and workshop equipment required

- ◆ Torque wrench (5...50 Nm) -V.A.G 1331-



- ◆ Engine and gearbox jack -V.A.G 1383 A-



Remove fuel tank ⇒ [page 132](#) .

### 4.3.1 Removing fuel tank

- Note safety precautions before beginning work ⇒ [page 114](#) .

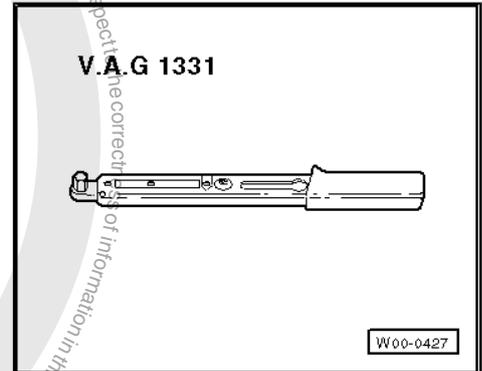


## Note

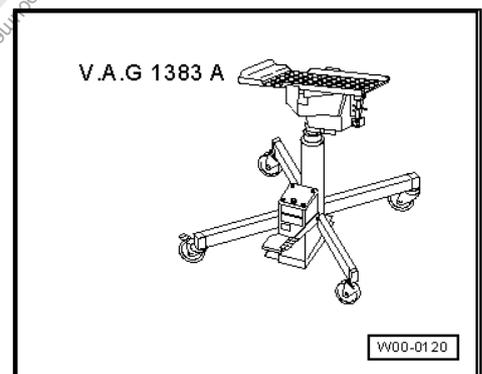
Vehicles up to 06/2007 are fitted with a two-part propshaft. For these vehicles it is sufficient to remove the rear propshaft. Vehicles from 06/2007 are fitted with a single part propshaft. For these vehicles the complete propshaft must be removed.

### Special tools and workshop equipment required

- ◆ Torque wrench (5...50 Nm) -V.A.G 1331-



- ◆ Engine and gearbox jack -V.A.G 1383 A-



- First check whether a coded radio is fitted. If so, obtain anti-theft coding.

Before disconnecting battery, open fuel tank flap and if necessary remove wheel lock adapter from luggage compartment.

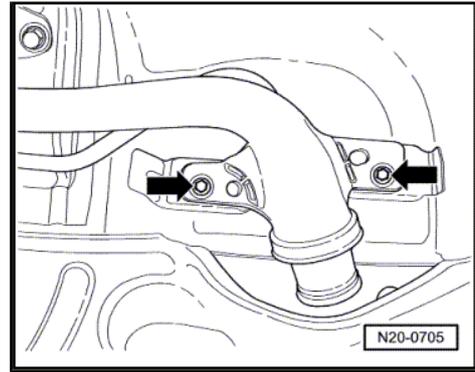
- With the ignition switched off, disconnect battery earth strap.  
⇒ Electrical system; Rep. Gr. 27 ; Disconnecting and connecting batteries .

If necessary, drain fuel tank using fuel extractor -VAS 5190- .  
⇒ [page 128](#)

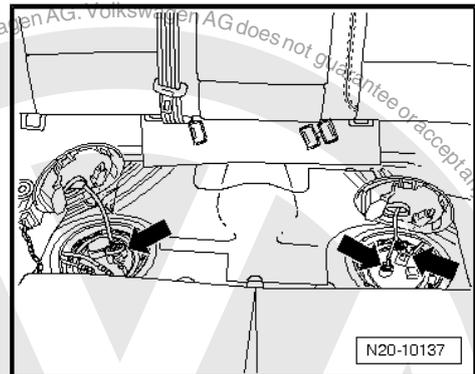
- Unbolt rear right wheel.
- Remove rear right wheel housing liner. ⇒ General body repairs, exterior; Rep. Gr. 66 ; Removing and installing wheel housing liner; Rear wheel housing liner .
- Unscrew securing bolts and remove tank flap unit. ⇒ General body repairs, exterior; Rep. Gr. 55 ; Fuel flap unit



- Unscrew filler neck from body -arrows- and unclip electrical wire from filler neck.
- Remove bench seat ⇒ General body repairs, interior; Rep. Gr. 72 ; Rear seat; Removing and installing seat bench .



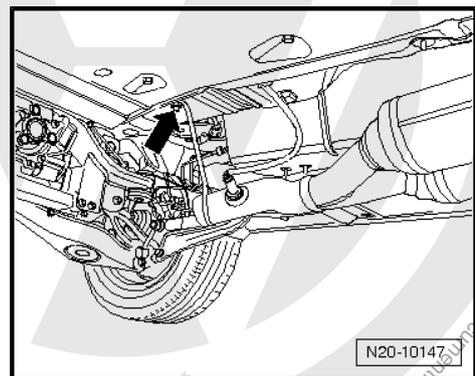
- Remove covers and separate electrical connectors -arrows-.
- Remove centre and rear silencers.



- Secure exhaust system to underbody using wire.
- Remove rear propshaft ⇒ Manual gearbox; Rep. Gr. 39 ; Final drive, differential, differential lock

**Vehicles from 06/2007 (single part propshaft):**

- Remove complete exhaust system ⇒ [page 186](#) .
- Remove complete propshaft ⇒ Propshaft and rear final drive; Rep. Gr. 39 ; Repairing propshaft - Golf .



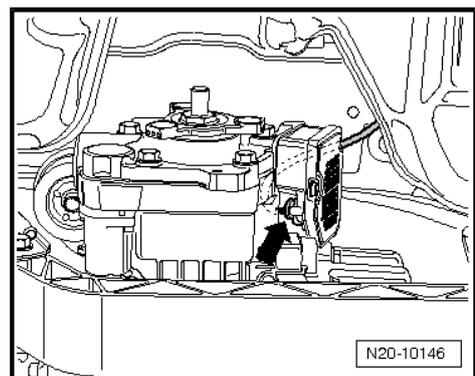
**Continuation for all vehicles:**



**WARNING**

*Fuel supply line is pressurised. Wear eye protection and protective clothing to avoid possible injury and skin contact. Before loosening hose connections, wrap a cloth around the connection. Then release pressure by carefully pulling hose off connection.*

- Pull off adapter cable on four-wheel drive control unit -J492- .

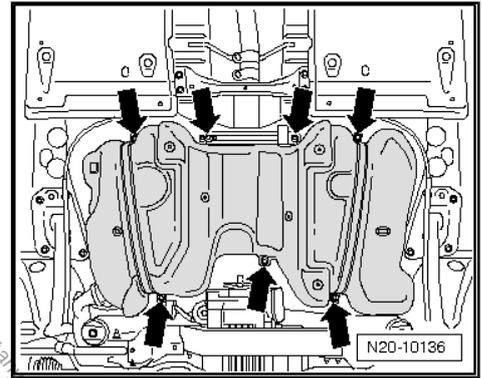




- Support fuel tank using engine and gearbox jack -V.A.G 1383 A- and unscrew tensioning straps and securing bolts.
- Slowly lower fuel tank.

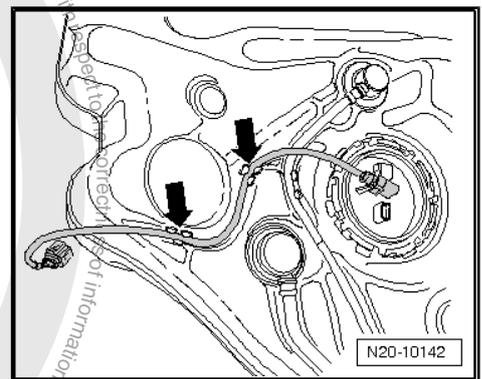
**i Note**

The filler neck must be "guided out" between body and rear axle. To do this, take the fuel tank off engine and gearbox jack -V.A.G 1383 A- with the assistance of a 2nd mechanic.

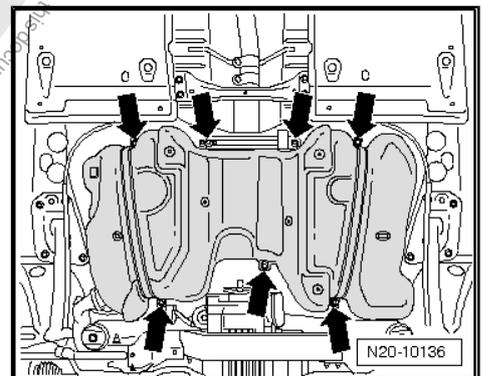


### 4.3.2 Installing fuel tank

- Clip in cable for four-wheel drive control unit -J492- on fuel tank.
- With the aid of a 2nd mechanic, guide the filler neck in between rear axle and body. Then place the fuel tank on the engine and gearbox jack -V.A.G 1383 A- .



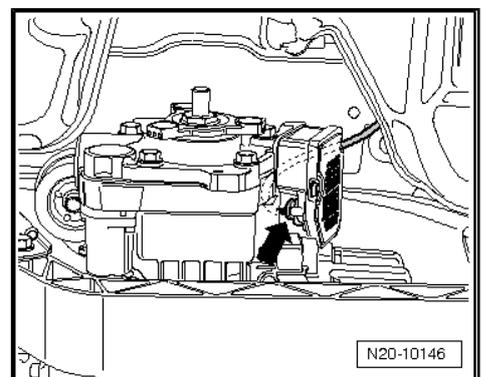
- Raise the fuel tank slowly up to the installation position and secure -arrows-.



- Fit adapter cable on four-wheel drive control unit -J492- .

The remaining installation steps are carried out in the reverse sequence. In the process, note the following:

- ◆ Install breather and fuel lines free of kinks.
- ◆ Do not interchange supply line and return line (return line blue or with blue marking, supply line black).
- ◆ Ensure that line connections are firmly seated.
- ◆ Check earth connection on fuel tank and body to filler neck.



### 4.4 Removing and installing fuel gauge sender 2 -G169-

- The fuel tank should be no more than half full

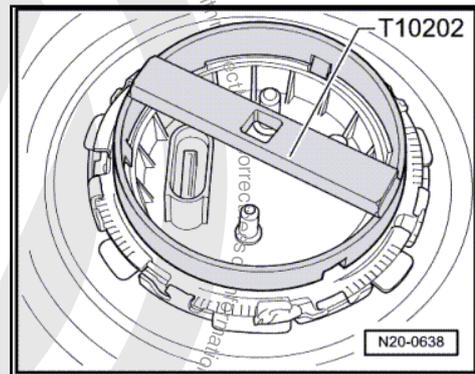


### Note

- ◆ Ensure that the fuel gauge sender is not bent.
- ◆ If necessary, drain fuel tank using fuel extractor -VAS 5190- .  
⇒ [page 128](#)
- ◆ Note safety precautions before starting work ⇒ [page 114](#) .
- ◆ Observe rules for cleanliness ⇒ [page 115](#) .

### Removing:

- First check whether a coded radio is fitted. If so, obtain anti-theft coding.
- With the ignition switched off, disconnect battery earth strap.  
⇒ Electrical system; Rep. Gr. 27 ; Disconnecting and connecting batteries .
- Remove bench seat ⇒ General body repairs, interior; Rep. Gr. 72 ; Rear seat; Removing and installing seat bench .
- Remove left cover (as seen facing direction of normal travel) from fuel gauge sender 2 -G169- .
- Disconnect electrical connectors.
- Open locking ring using wrench -T10202- .



- Pull fuel gauge sender 2 -G169- upwards slightly and unclip it from the suction-jet pump.

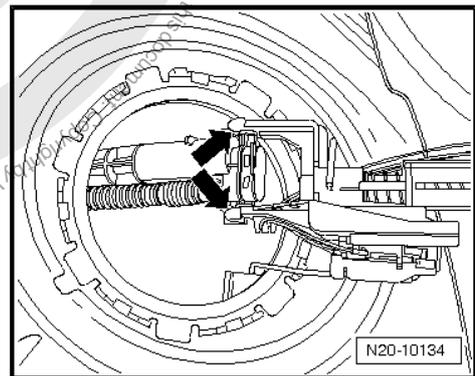
### Installing:



#### Caution

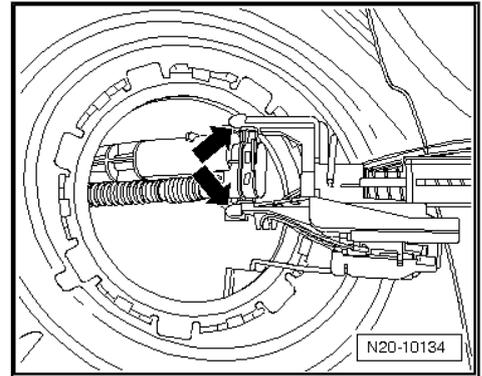
**When installing do not bend fuel gauge sender 2 -G169- float arm.**

- Place fuel gauge sender 2 -G169- in fuel tank.

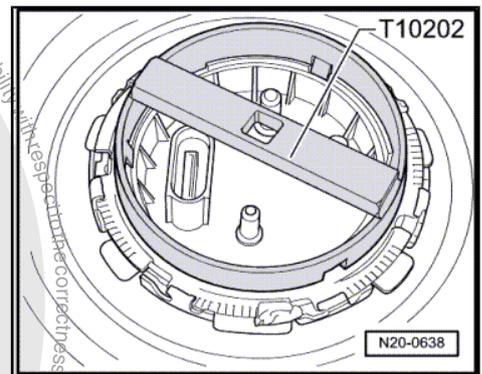




- Fit suction-jet pump on sender on inside of fuel tank. Locating lugs must engage.
- Place a new flange seal dry into opening in fuel tank and moisten inside (contact to flange) only with fuel.
- Note installation position of fuel gauge sender 2 -G169-  
⇒ [page 128](#)
- Check for correct position of seal.



- Tighten locking ring using wrench -T10202- . Specified torque: 110 Nm.
  - Fit connectors.
  - Install cover.
- Install bench seat. ⇒ General body repairs, interior; Rep. Gr. 72 ; Rear seat; Removing and installing seat bench .



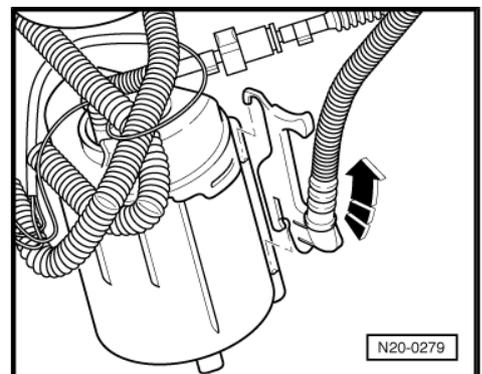
## 4.5 Removing and installing suction-jet pump

### Note

- ◆ *On vehicles with four-wheel drive, fuel has to be pumped from the area of fuel gauge sender 2 -G169- to the fuel delivery unit by means of a suction jet pump due to the shape of the fuel tank.*
- ◆ *Checking is only necessary when the engine stops due to lack of fuel, even though the fuel gauge shows that the tank is still 1/4 full.*

### Procedure

- Remove fuel delivery unit ⇒ [page 123](#) .
- Pull return hose of suction-jet pump out of fuel delivery unit -arrow-.
- Separate quick-release coupling of supply line from suction-jet pump on Y-piece of fuel delivery unit.
- Remove fuel gauge sender 2 -G169- ⇒ [page 135](#) .
- Now the suction-jet pump can be pulled out from side of fuel gauge sender 2 -G169- (left side of vehicle).
- Check that the fuel lines on suction-jet pump are fitted securely and are not damaged.
- Additionally check suction-jet pump for possible soiling.





## 4.6 Checking fuel pump

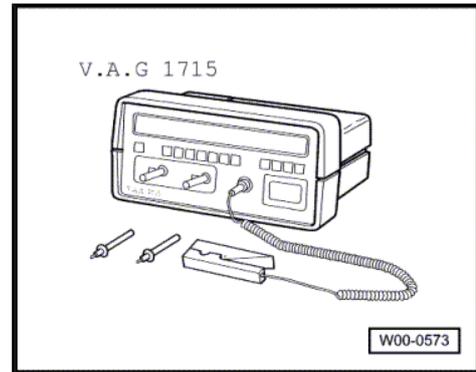
Checking voltage supply of fuel pump -G6- ⇒ [page 138](#)

Checking current consumption of fuel pump -G6- ⇒ [page 139](#)

### 4.6.1 Test prerequisites

Special tools and workshop equipment required

- ◆ Hand multimeter -V.A.G 1526C- or multimeter -V.A.G 1715-



- ◆ Auxiliary measuring set -V.A.G 1594 C-
- ◆ Diode test lamp -V.A.G 1527 B-
- Fuses must be OK.
- The battery voltage must be at least 11.5 V.
- All electrical consumers, e.g. lights and rear window heating, must be switched off.

### 4.6.2 Checking function and voltage supply

- Fold rear seats forwards.
- Detach carpet under seats and fold it back. ⇒ General body repairs, interior; Rep. Gr. 70 ; Load and luggage compartment trim; Removing and installing luggage compartment floor
- Remove cover from fuel delivery unit.
- Switch on ignition. Fuel pump must be heard to run.
- Switch off ignition.

If the fuel pump does not start:

- Pull 4-pin connector off fuel delivery unit flange.



- Connect diode test lamp -V.A.G 1527 B- to outer contacts of connector using auxiliary cables from auxiliary measuring set -V.A.G 1594 C- .

- Switch on ignition. The LED must light up for about 2 seconds.

If LED does not light up

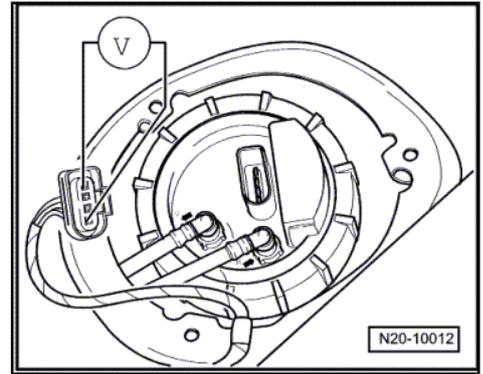
- Check actuation of fuel pump relay and wiring for open circuit or short circuit. ⇒ Vehicle diagnosis, testing and information system VAS 5051

If LED lights up (voltage supply OK):

- Remove fuel delivery unit. ⇒ [page 123](#)
- Check that electrical wiring between flange and fuel pump is connected and has continuity.

If no open circuit can be found:

- Renew fuel delivery unit. ⇒ [page 123](#)



### 4.6.3 Checking current draw of fuel pump

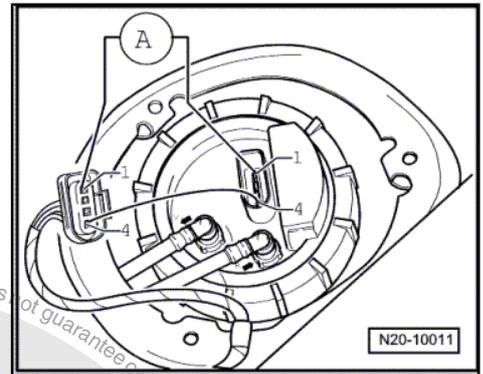
- Pull 4-pin connector off fuel delivery unit flange.
- Set multimeter to measuring range 20 A and connect in series between contacts -1- of connector and fuel pump using auxiliary cables from auxiliary measuring set -V.A.G 1594 C- .



#### Note

*The current pick-up clamp of multimeter -V.A.G 1715- can also be attached to an auxiliary cable between contacts -1- of connector and fuel pump.*

- Connect contacts -4- of connector and fuel pump using an auxiliary cable from auxiliary measuring set -V.A.G 1594 C- .
- Start engine and run at idling speed.
- Measure current draw of fuel pump: Specification: max. 7.5 Amperes.
- If the measured value is not within specifications:
- Renew fuel delivery unit. ⇒ [page 123](#)





## 5 Repairing fuel supply system

Assembly overview - fuel filter ⇒ [page 140](#) .

Removing and installing fuel cooler ⇒ [page 141](#)

Assembly overview - accelerator mechanism ⇒ [page 142](#) .

Checking tandem pump ⇒ [page 143](#)

Removing and installing tandem pump ⇒ [page 147](#)

### 5.1 Assembly overview - fuel filter

#### 1 - Supply line

- From fuel tank.
- White or with white marking.
- Check for secure seating.

#### 2 - 8 Nm

#### 3 - Return line

- To fuel cooler
- Check for secure seating.
- Blue or with blue marking.

#### 4 - Plug for water extraction

- Unscrew and drain approx. 100 cm<sup>3</sup> of liquid using diesel extractor - VAS 5226-

#### 5 - Seal

- Renew.

#### 6 - Supply line

- To tandem pump
- White or with white marking.
- Check for secure seating.

#### 7 - Return line

- From tandem pump
- Blue marking
- Check for secure seating.

#### 8 - Fuel filter upper part

#### 9 - Fuel temperature sender -G81-

#### 10 - Seal

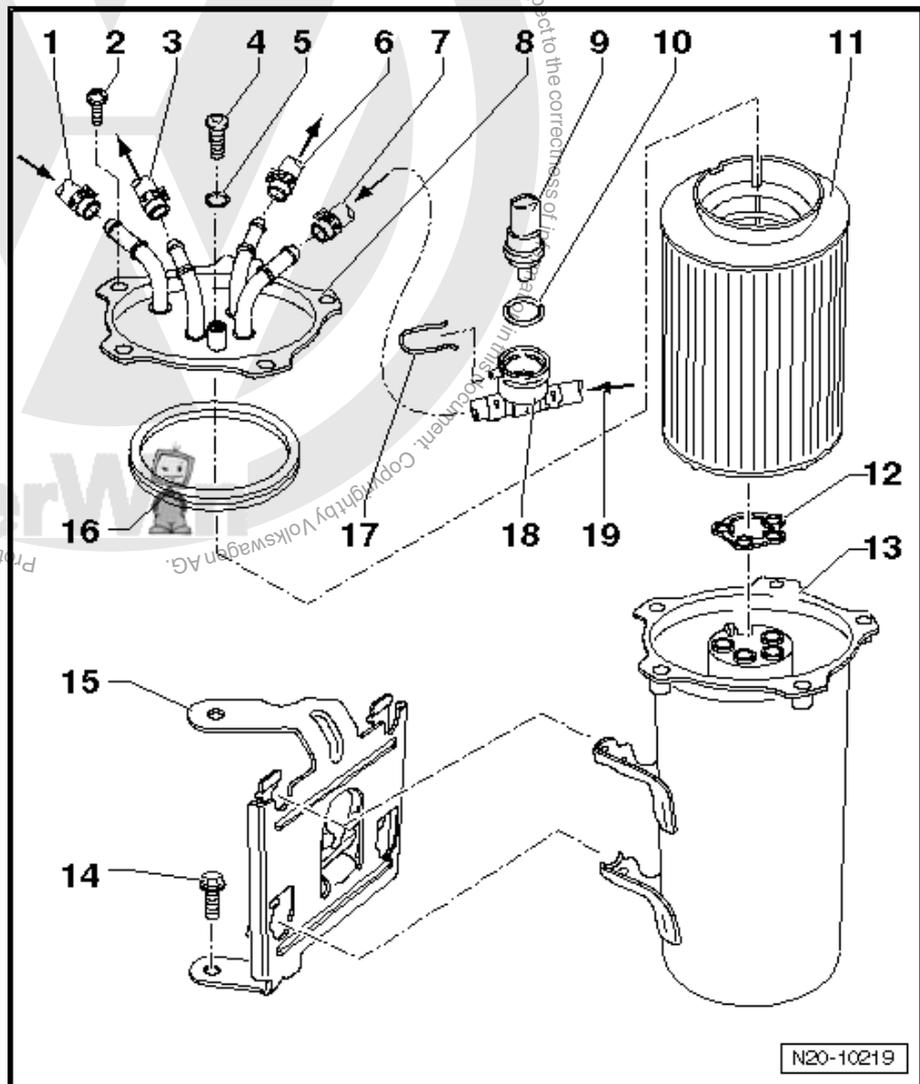
- Renew.

#### 11 - Filter insert

- Observe change intervals.

#### 12 - Seal

- Renew.





13 - Fuel filter lower part

14 - 8 Nm

15 - Bracket

16 - Seal

- Renew.

17 - Retaining clip

- Check for secure seating.

18 - Return line

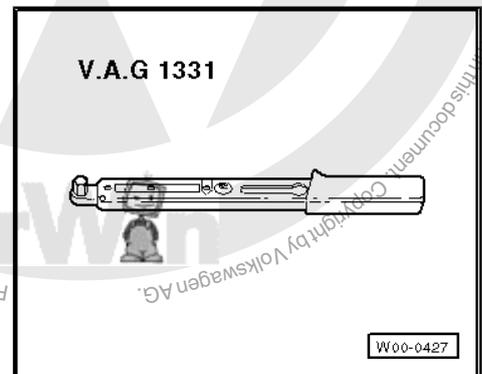
- With connection for fuel temperature sender -G81-

19 - From tandem pump

## 5.2 Removing and installing fuel cooler

### Special tools and workshop equipment required

- ◆ Torque wrench -V.A.G 1331-



### Removing

- Note safety precautions before beginning work ⇒ [page 114](#) .
- Observe rules for cleanliness ⇒ [page 115](#) .



#### Note

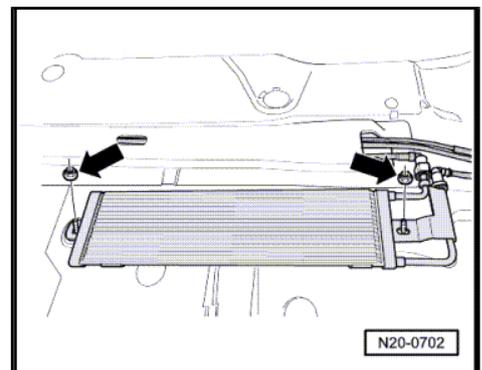
*The fuel cooler is located in the return line to fuel tank. It is located on the vehicle underbody.*

- Remove underbody panel.
- Separate fuel lines at fuel cooler.
- Remove securing nuts -arrows-.

### Installing

Installation is carried out in the reverse sequence of removal. In the process, note the following:

- ◆ Tighten fuel cooler securing nuts to 15 Nm.





## 5.3 Assembly overview - accelerator mechanism

### 1 - Connector

- ❑ Black, 6-pin.

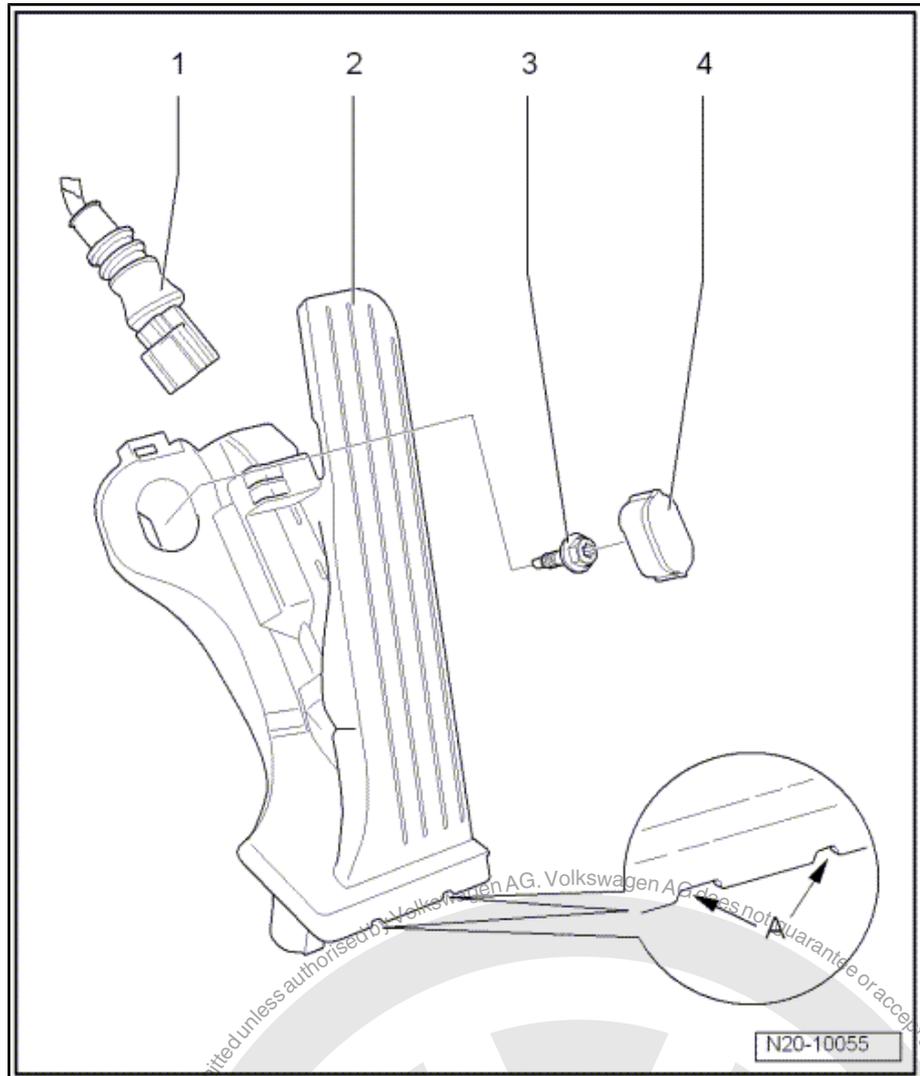
### 2 - Accelerator position sender -G79-

- ❑ Not adjustable.
- ❑ The accelerator position sender passes the position of the accelerator on to the engine control unit.
- ❑ To remove, release using release tool -T10238- or release tool -T10240-.

-A- openings for release tool -T10238- .

### 3 - 10 Nm

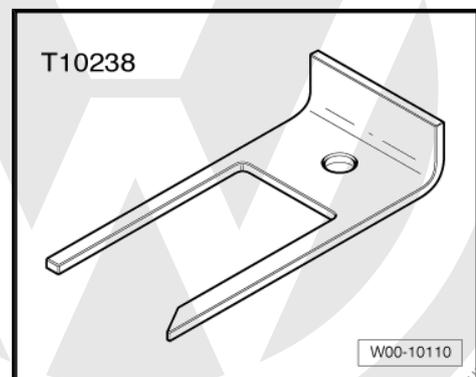
### 4 - Cap



### 5.3.1 Removing

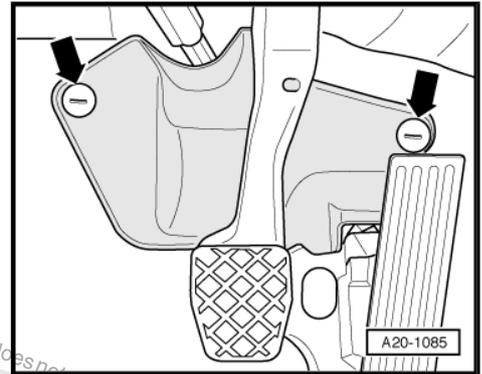
#### Special tools and workshop equipment required

- ◆ Release tool -T10238-



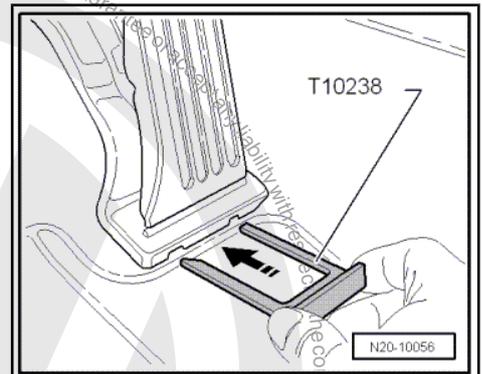


- Before removing accelerator pedal module, remove cover in footwell by removing plastic nuts -arrows-.
- Lever out cap ⇒ [Item 4 \(page 142\)](#) using a screwdriver.
- Remove bolt ⇒ [Item 3 \(page 142\)](#) .



### Releasing accelerator pedal module

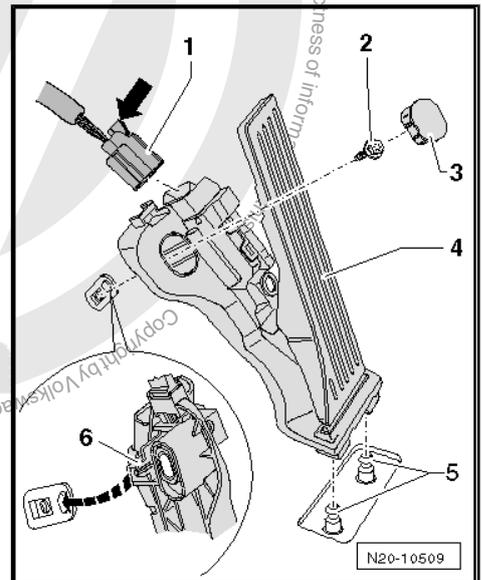
- To remove accelerator pedal module, push release tool - T10238- (for right-hand drive vehicles release tool -T10240-) into openings provided to stop.
- Separate electrical connection and pull wire guide off accelerator pedal module.



### 5.3.2 Installing

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

- Push electrical connector -1- onto accelerator pedal module.
- Press accelerator pedal module onto securing pins -5-.
- Insert centring pin -6- into hole in floor of vehicle.
- Secure accelerator pedal module with bolt -2-, specified torque 10 Nm and fit cap -3-.
- Install steering column trim.



### 5.4 Checking tandem pump

Checking delivery pressure ⇒ [page 143](#)

Checking for internal leaks ⇒ [page 146](#)

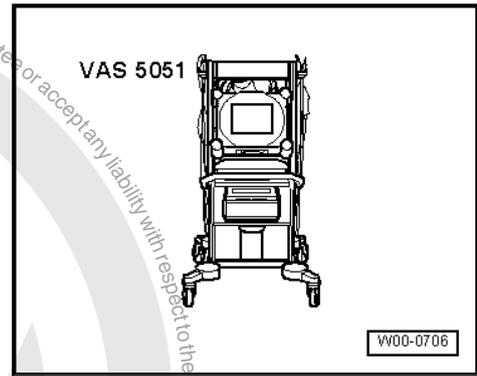
#### 5.4.1 Checking delivery pressure

Special tools and workshop equipment required

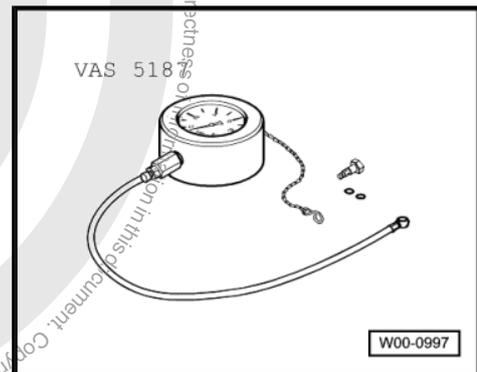
- ◆ Vehicle diagnosis, testing and information system -VAS 5051-



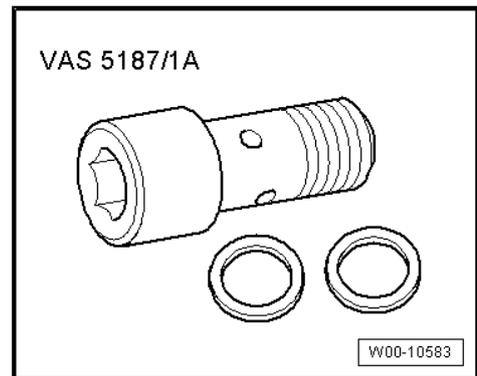
- ◆ Diagnosis cable, 3 m with voltage supply -VAS 5051/1- or diagnosis cable, 5 m without voltage supply -VAS 5051/3-



- ◆ Tandem pump tester -VAS 5187-



- ◆ Banjo bolt -5187/1A-



- ◆ Torque wrench -V.A.G 1331-

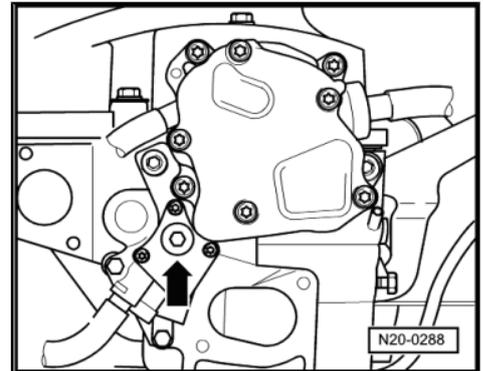
#### Test prerequisites

- Coolant temperature must be at least 85 °C.
- Unit injectors OK
- Fuel filter and fuel lines must not be blocked.
- The non-return valve in the fuel supply hose must be OK.
- Intact fuel delivery unit



## Procedure

- Remove plug -arrow-.



- Connect tandem pump tester -VAS 5187- as shown.
- Start engine and run at idling speed.
- Connect vehicle diagnosis, testing and information system - VAS 5051- and select "vehicle self-diagnosis" operating mode.
- Press key "01 - Engine electronics" on display.
- Press diagnosis function "08 - Read measured value block".
- Enter display group "1" using number block (key pad) and confirm entry with Q key.
- Read engine idling speed in display zone "1".
- Increase engine speed to 4,000 rpm.
- Observe pressure indicated on pressure gauge.

Specification: min. 7.5 bar

If the specification is not attained:

- Using a hose clip, clamp off return line between fuel filter and tandem pump.
- Increase engine speed to 4,000 rpm.
- Observe pressure indicated on pressure gauge.

Specification: min. 7.5 bar

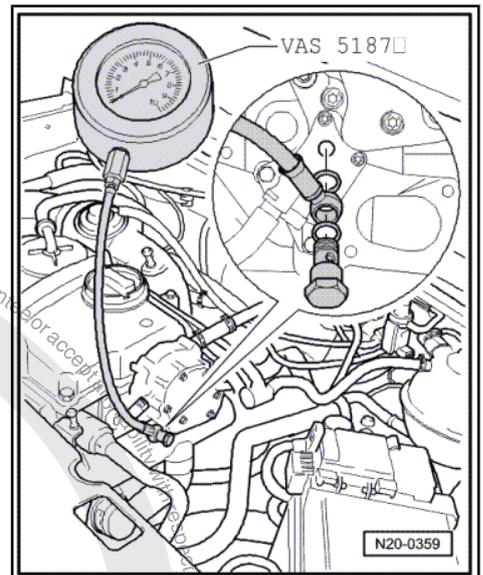
If specification is now obtained:

Pressure loss at unit injectors.

- Renew unit injector O-rings.

If the specification is not attained:

- Renew tandem pump. => [page 147](#)



### Note

After removing pressure tester, tighten plug to 25 Nm. Always renew seal.



## 5.4.2 Checking for internal leaks

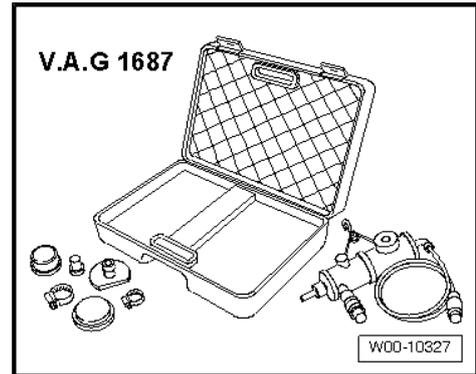


### Note

The tandem pump must be checked for internal leaks between fuel side and oil side after reinstalling a used tandem pump, for example after renewing or repairing a cylinder head and/or when installing a "short" engine. When leaking it is possible for the fuel to mix with the oil which may cause the engine to fail.

### Special tools and workshop equipment required

- ◆ Tester -V.A.G 1687-



### Procedure

- Pull fuel supply hose (white marking) and fuel return hose (blue marking) off tandem pump.
- Seal fuel return union on tandem pump with a plug. Secure sealing plug with a spring-type clamp.

Prepare test unit -V.A.G 1687- as follows:

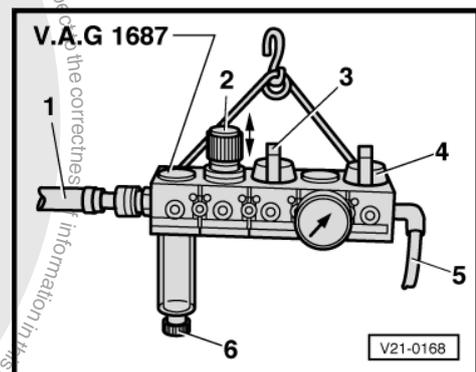
- Unscrew pressure regulating valve -2- and close valves -3- and -4-.

Connect test connection -5- to fuel supply union of tandem pump using a commercially available compressed air connection and a section of fuel hose. Use a spring-type clamp to secure.



### Note

To turn the pressure regulating valve -2- the knob must be pulled upwards.





- Connect compressed air hose -1- (compressed air source) to charge air system tester -V.A.G 1687- .

**i** Note

If there is water in the sight glass, drain at water drain screw -6-.

- Open valve -3-.
- Adjust pressure to 1.0 bar with pressure regulating valve -2-.



**Caution**

**The maximum test pressure is 1.3 bar and this must not be exceeded.**

- Open valve -4- and wait until the test circuit is filled. If necessary readjust pressure to 1.0 bar.
- Close valve -3- to retain pressure and observe the pressure drop over a period of 1 minute.

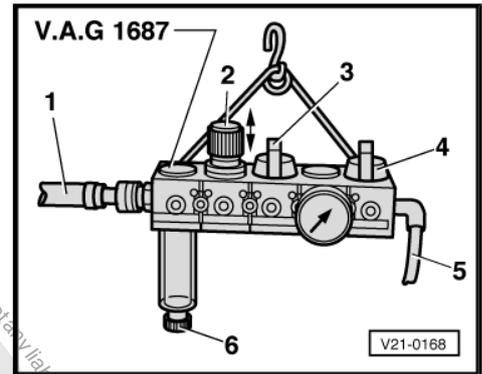
If the pressure does not drop the tandem pump can be reused, if the pressure drops the tandem pump must be renewed.

## 5.5 Removing and installing tandem pump



**DANGER!**

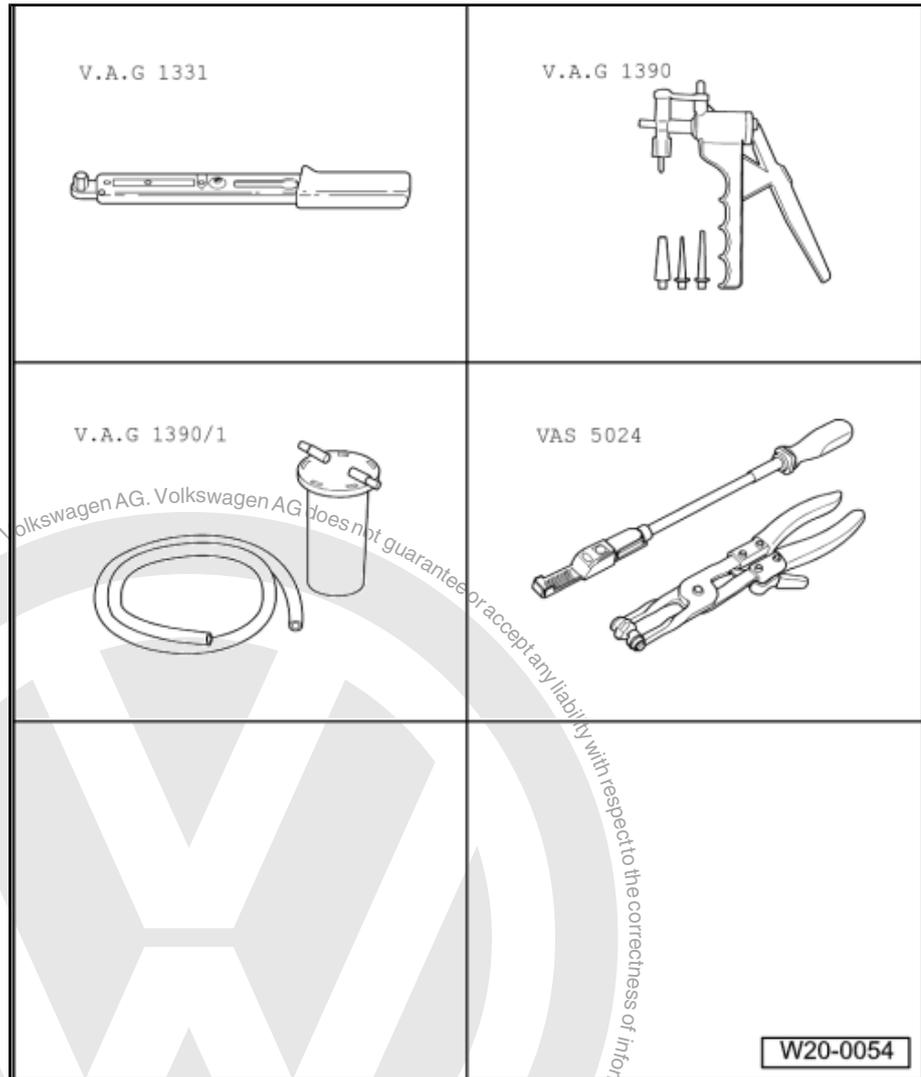
**The tandem pump may, under no circumstances, be dismantled as the vacuum part could otherwise malfunction. This would result in the failure of the brake servo.**





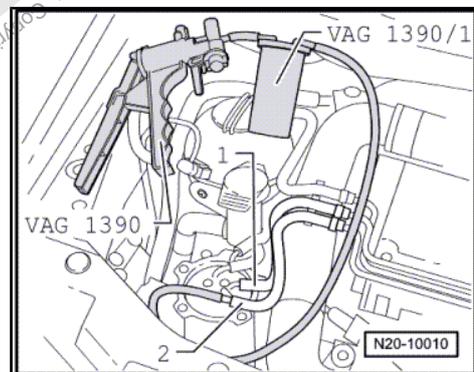
### Special tools and workshop equipment required

- ◆ Torque wrench -V.A.G 1331-
- ◆ Hand vacuum pump with accessories -V.A.G 1390-
- ◆ Water drainage container - V.A.G 1390/1-
- ◆ Spring-type clip pliers -VAS 5024 A-



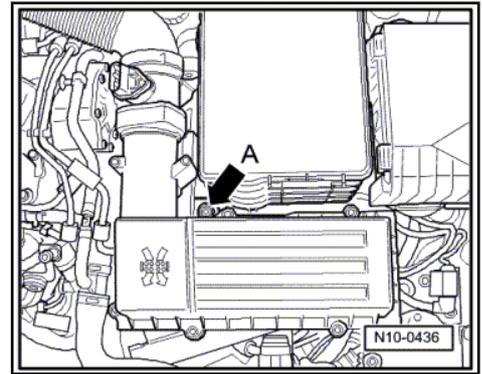
### 5.5.1 Removing

- Pull supply hose (white marking) and return hose (blue marking) off fuel filter.
- Connect hand vacuum pump with accessories -V.A.G 1390- and water drainage container -V.A.G 1390/1- to return hose -2-.
- Operate hand vacuum pump until no more fuel comes out of return hose. Be careful that no fuel is sucked into hand vacuum pump.
- Remove air filter housing with air mass meter and connecting pipe.

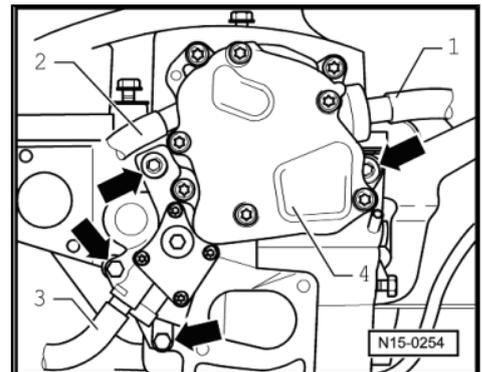




- Remove bolt -arrow A- and pull air filter housing upwards out of mounting.



- Pull vacuum line from brake servo -1- off tandem pump -4-.
- Pull supply hose -2- (white marking) and return hose -3- (blue marking) off tandem pump -4-.
- Remove securing bolts -arrows-.
- Remove tandem pump -4- from cylinder head.



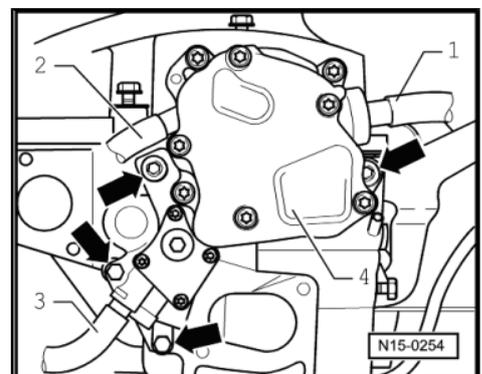
## 5.5.2 Installing

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

### Note

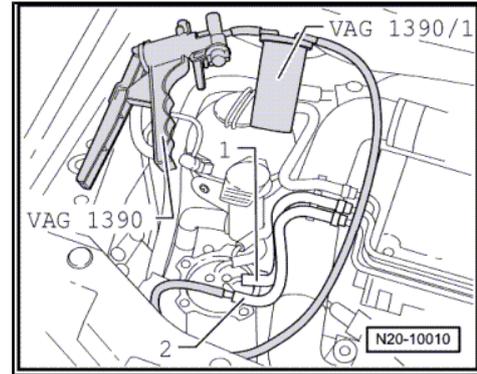
- ◆ *Ensure that tandem pump coupling seats properly in camshaft.*
- ◆ *Always renew tandem pump seals.*

- Install tandem pump and tighten upper securing bolts to 20 Nm.
- Tighten lower securing bolts to 10 Nm.
- Attach return hose (blue marking) to return connection -3- of tandem pump.
- Attach supply hose (white marking) to supply connection -2- and vacuum hose from brake servo -1- to tandem pump -4-.
- Connect supply hose (white marking) to fuel filter.





- Connect hand vacuum pump with accessories -V.A.G 1390- and water drainage container -V.A.G 1390/1- to return hose -2-.
- Operate hand vacuum pump -V.A.G 1390- until fuel comes out of return hose. Be careful that no fuel is sucked into hand vacuum pump.
- Connect return hose (blue marking) to fuel filter.





## 21 – Turbocharging/supercharging

### 1 Charge air system with turbocharger

Safety precautions ⇒ [page 151](#)

Rules for cleanliness ⇒ [page 151](#) .

Installing hose connections with connector couplings  
⇒ [page 161](#)

Assembly overview - turbocharger ⇒ [page 152](#)

Removing and installing turbocharger ⇒ [page 156](#)

Assembly overview - parts of charge air cooling ⇒ [page 158](#)

Checking charge air system for leaks ⇒ [page 162](#)

#### 1.1 Safety precautions



**WARNING**

*When doing any repair work, especially in the engine compartment, pay attention to the following due to the cramped conditions:*

- ◆ *Route all the various lines (e.g. for fuel, hydraulics, activated charcoal filter system, coolant, refrigerant, brake fluid and vacuum) and electrical wiring in their original positions.*
- ◆ *Ensure that there is sufficient clearance to all moving or hot components.*

Observe following if test and measuring instruments are required during a road test:

- ◆ Test and measuring instruments must be secured to rear seat and operated by a second person from this location.

If test and measuring instruments are operated from front passenger seat and the vehicle is involved in an accident, there is a possibility that the person sitting in this seat may receive serious injuries when the airbag is triggered.

#### 1.2 Rules for cleanliness

When working on the turbocharger, pay careful attention to the following rules for cleanliness:

- ◆ Thoroughly clean all unions and adjacent areas before disconnecting.
- ◆ Place removed parts on a clean surface and cover. Do not use fluffy cloths!
- ◆ Carefully cover opened components or seal 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 not been stored in their packing (e.g. in tool boxes etc.).
- ◆ Existing transport and protective packaging and sealing caps must only be removed immediately prior to installation.
- ◆ When making repairs, remove oil from connection and hose ends.



- ◆ When system is open: do not work with compressed air if this can be avoided. Do not move vehicle unless absolutely necessary.

### 1.3 Assembly overview - turbocharger



#### Note

- ◆ *All hose connections are secured.*
- ◆ *Charge air system must be free of leaks.*
- ◆ *Renew self-locking nuts.*
- ◆ *Before screwing on oil supply line, fill turbocharger at connection with engine oil.*
- ◆ *After installing turbocharger, run engine for about 1 minute at idling speed to ensure that oil is supplied to turbocharger.*

Observe rules for cleanliness ⇒ [page 151](#) .

Observe safety precautions ⇒ [page 151](#) .





Engine codes BJB, BKC, BRU, BXE and BXF ⇒ [page 153](#)

Engine codes BLS and BXJ ⇒ [page 155](#)

### 1.3.1 Engine codes BJB, BKC, BRU, BXE and BXF

1 - 10 Nm

2 - Union nut, 22 Nm

3 - Oil supply line

- Before installing oil supply line, ensure that it is not blocked.
- Before installing, fill turbocharger with engine oil through oil supply line connection
- Removing and installing ⇒ [page 95](#) .

4 - Union nut, 22 Nm

5 - Gasket

- Renew.
- Note installation position.

6 - Washer

7 - 25 Nm

- Renew.

8 - Support

- Between turbocharger and cylinder block.

9 - 40 Nm

- First hand tighten all bolts

10 - Connecting pipe

- Air filter/turbocharger

11 - Connecting piece

12 - Gasket

- Renew.

13 - Seal

- Renew.

14 - Connection, 40 Nm

15 - Oil return line

- To cylinder block.
- Tighten union nut to 30 Nm.

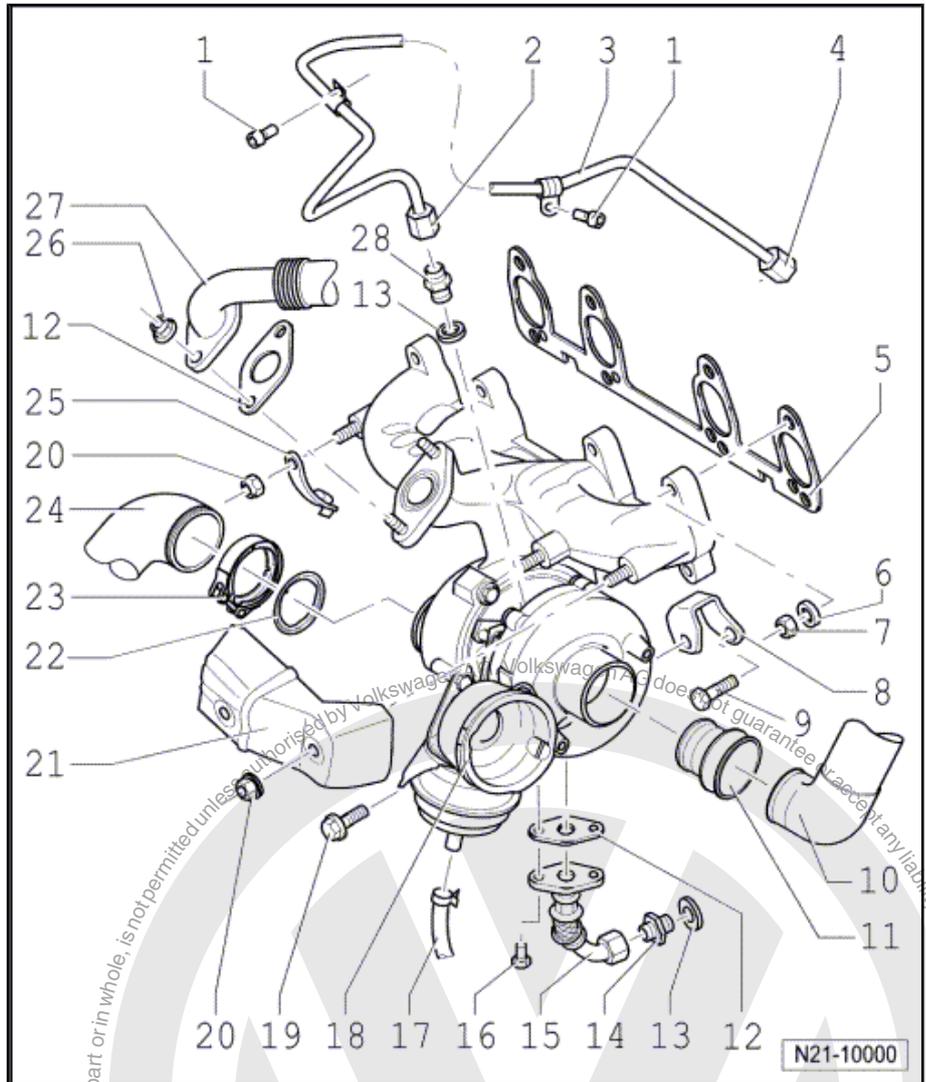
16 - 17 Nm

17 - Vacuum hose

- To solenoid valve block

18 - Turbocharger

- Can only be renewed with exhaust manifold.
- To remove turbocharger, remove right drive shaft ⇒ Running gear, axles, steering; Rep. Gr. 40 ; Removing and installing drive shafts .





**19 - 20 Nm**

- First hand tighten all bolts

**20 - 20 Nm**

- Renew.

**21 - Heat shield**

**22 - Gasket**

- Renew.
- Note installation position.

**23 - Clamp, 7 Nm**

**24 - Front exhaust pipe**

**25 - Bracket**

- For oil supply line ⇒ [Item 3 \(page 153\)](#) .
- Before installing, secure oil supply line.

**26 - 22 Nm**

- Renew.

**27 - Connecting pipe**

- To bypass flap

**28 - Connection, 30 Nm**

- Renew.
- Coat threads and bolt head seating surface with "G 052 112 A3".





### 1.3.2 Engine codes BLS and BXJ

1 - 10 Nm

2 - Bracket

3 - Heat shield

4 - Oil supply hose

- To oil supply line connection on turbocharger
- Before installing oil supply line, ensure that it is not blocked.
- Before installing, fill turbocharger via oil supply hose with engine oil

5 - Turbocharger

- Can only be renewed with exhaust manifold.
- Removing and installing ⇒ [page 156](#).

6 - Vacuum hose

7 - Gasket

- Renew.
- Note installation position.

8 - To particulate filter

9 - Clamp, 7 Nm

- For turbocharger/particulate filter

10 - Exhaust manifold

- Can only be renewed together with turbocharger

11 - 25 Nm

- Renew.

12 - 25 Nm

13 - Gasket

- Renew

14 - Connecting pipe

- For exhaust gas recirculation.
- Assembly overview - parts of exhaust gas recirculation ⇒ [page 196](#)

15 - 25 Nm

- Renew

16 - 15 Nm

17 - O-ring

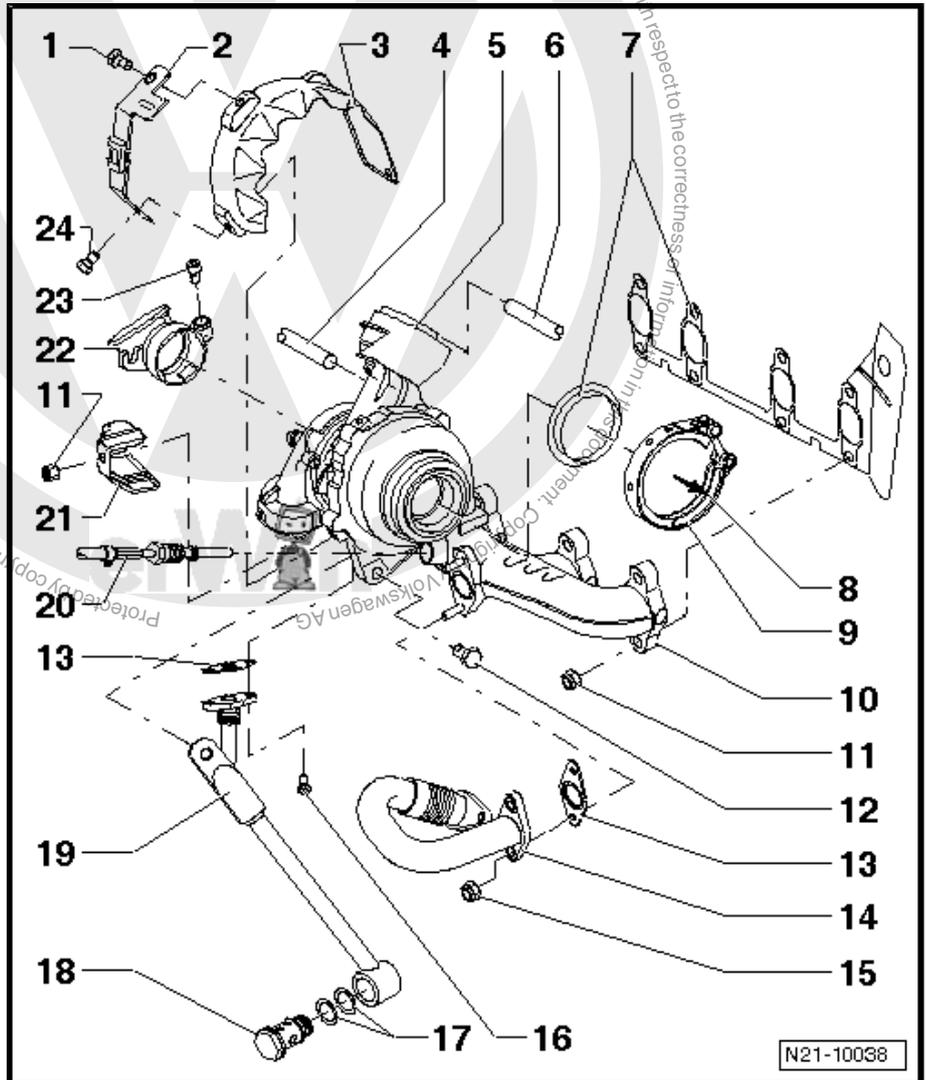
- Renew

18 - Banjo bolt, 60 Nm

- Renew

19 - Support

- For turbocharger





- With oil return line

#### 20 - Exhaust gas temperature sender bank 1 -G235- , 45 Nm

- Lubricate thread of sender using high-temperature paste -G 052 112 A3-
- Use tool set -T10395- to remove and install.

#### 21 - Heat shield

#### 22 - Connection

- For intake hose for air filter/turbocharger
- Assembly overview - air filter ➔ [page 177](#) .

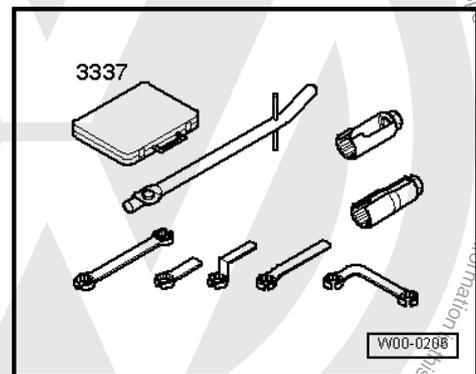
#### 23 - 9 Nm

#### 24 - 10 Nm

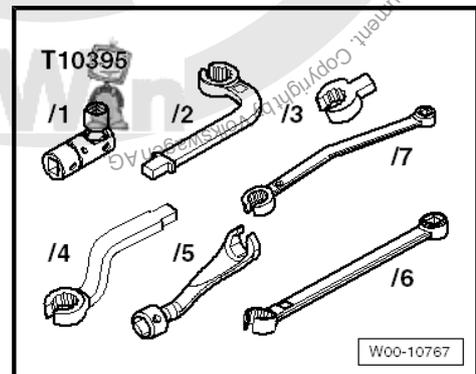
## 1.4 Removing and installing turbocharger

### Special tools and workshop equipment required

- ◆ Torque wrench -V.A.G 1331-
- ◆ Lambda probe open ring spanner set -3337-



- ◆ Tool set -T10395-





### Caution

*When a mechanical fault is found on the turbocharger, e.g. a destroyed compressor impeller, it is not only sufficient to renew the turbocharger. To prevent this from causing further damage, perform the following repairs:*

- ◆ *Check air filter housing, air filter element and intake hoses for soiling.*
- ◆ *Check complete charged air routing and charge air cooler for foreign objects.*

*If foreign objects are found in the charge air system, the charged air routing must be cleaned and the charge air cooler must be renewed, if necessary.*

### Removing

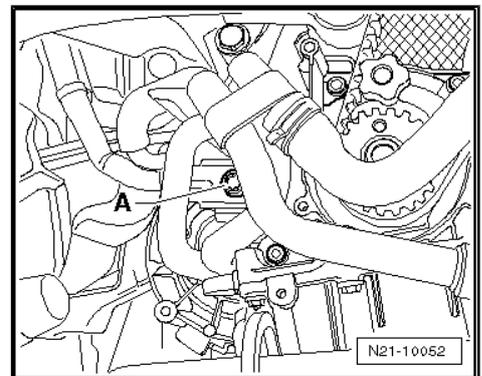
- Remove noise insulation tray ⇒ General body repairs, exterior; Rep. Gr. 50 ; Body - front; Noise insulation .
- Remove subframe and the right drive shaft ⇒ Running gear, axles, steering; Rep. Gr. 40 .

### Engine codes BLS and BXJ

- Pull electrical connector off exhaust gas pressure sensor 1 - G450- ⇒ [Item 2 \(page 188\)](#) in engine compartment and unscrew securing bolts.
- Separate electrical connectors to particulate filter.
- Remove particulate filter.

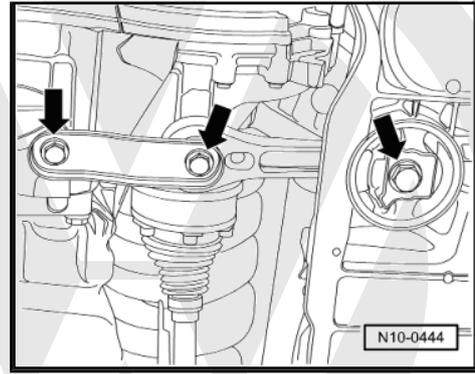
### Continuation for all vehicles:

- Disconnect fasteners -arrows- of coolant pipes for auxiliary heater, if part of original equipment.





- Unbolt pendulum support -arrows-.
- Remove turbocharger support and oil return line.
- Remove connecting pipe to exhaust gas recirculation cooler.
- Separate charge pressure line from turbocharger.
- Pull vacuum hose off turbocharger.
- Separate oil supply line from turbocharger.
- Unscrew securing bolts for exhaust manifold.
- Tilt the engine forwards in lower mounting and remove turbocharger with exhaust manifold downwards.



#### Installing

- Installation is carried out in the reverse sequence of removal.



#### Note

*Torque setting of pendulum support ⇒ [page 10](#).*

## 1.5 Assembly overview - parts of charge air cooling



#### Note

- ◆ *Charge air system must be free of leaks.*
- ◆ *When making repairs, remove oil from connection and hose ends.*
- ◆ *All hose connections of charge air system are secured by spring-type clips or by connector couplings.*
- ◆ *Checking charge air system for leaks ⇒ [page 162](#)*



Engine codes BJB, BKC, BRU, BXE and BXF ⇒ [page 159](#)

Engine codes BLS and BXJ ⇒ [page 160](#)

Installing hose connections with connector couplings  
 ⇒ [page 161](#)

### 1.5.1 Engine codes BJB, BKC, BRU, BXE and BXF

1 - 8 Nm

- Fitting location  
 ⇒ [page 160](#)

2 - Bracket

- Note installation position.

3 - Charge air cooler

4 - Connecting hose

5 - 8 Nm

6 - To turbocharger.

7 - Connecting pipe

8 - To intake connecting pipe.

9 - Vacuum reservoir

10 - 15 Nm

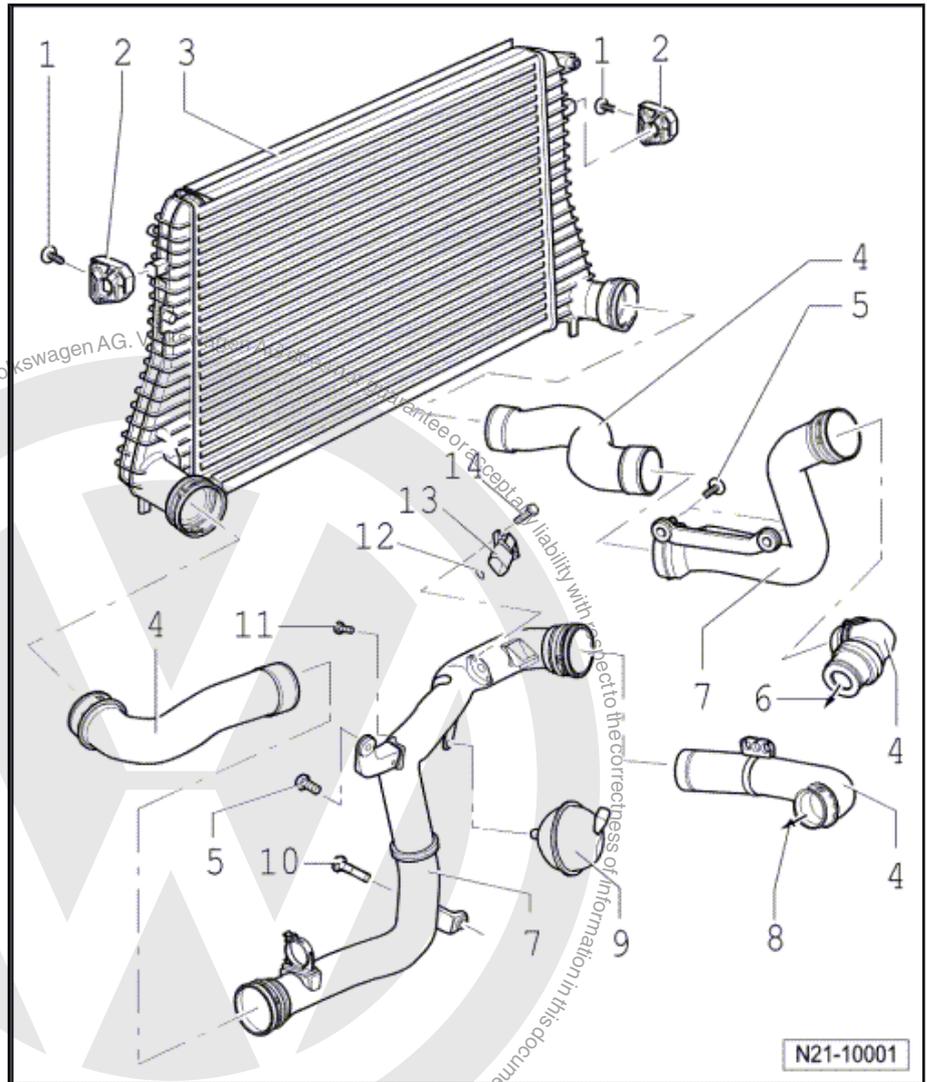
11 - 8 Nm

12 - O-ring

- Renew if damaged.

13 - Charge air pressure sender -G31- with intake air temperature sender -G42-

14 - 3 Nm





## 1.5.2 Engine codes BLS and BXJ

1 - 8 Nm

Fitting location => [page 160](#)

2 - Bracket

- Note installation position.

3 - Charge air cooler

- To remove, bring lock carrier into service position - General body repairs, exterior; Rep. Gr. 50 ; Body - front; Lock carrier - service position

4 - Sealing strip

- Pushed onto top and bottom of charge air cooler

5 - 3 Nm

6 - Charge air pressure sender -G31- with intake air temperature sender -G42-

7 - O-ring

- Renew if damaged.

8 - Bracket

9 - 5 Nm

10 - Connecting hose

11 - Charge air pipe

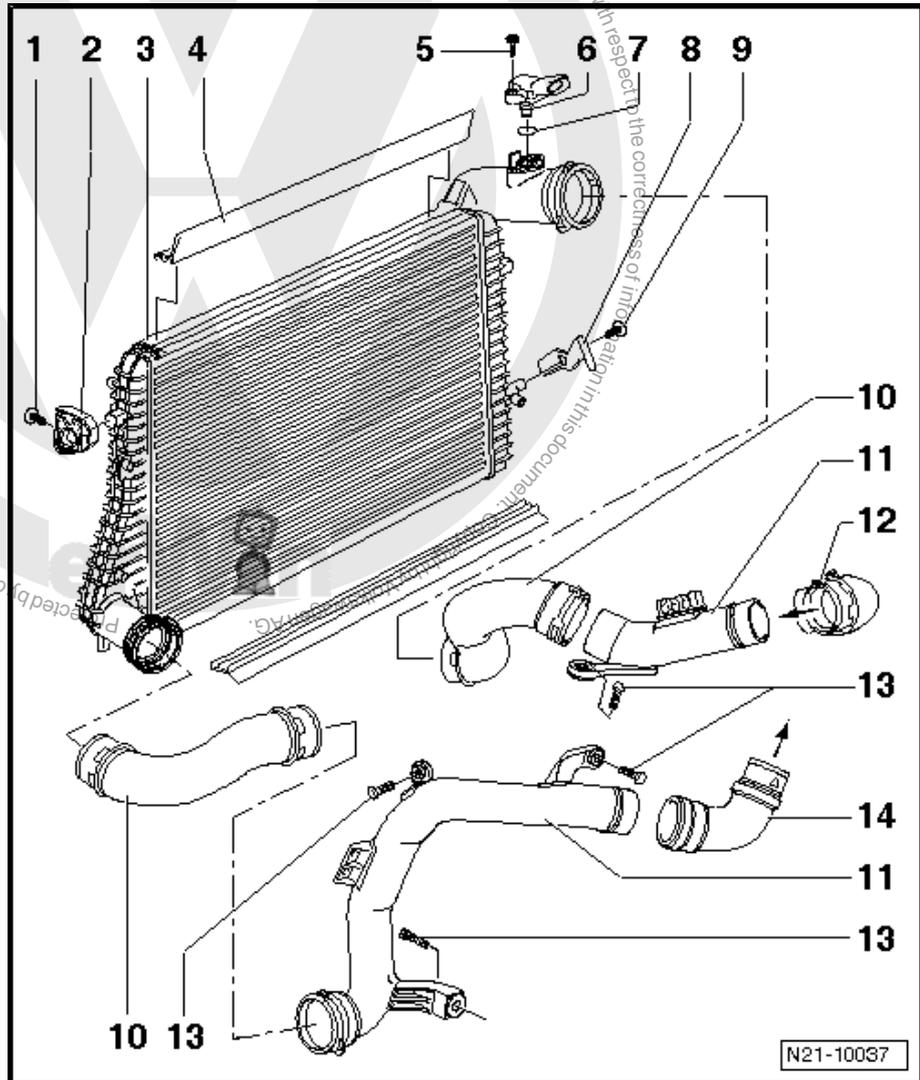
12 - Connecting hose

- To intake manifold flap motor -V157-
- Assembly overview - intake manifold => [page 174](#)

13 - 8 Nm

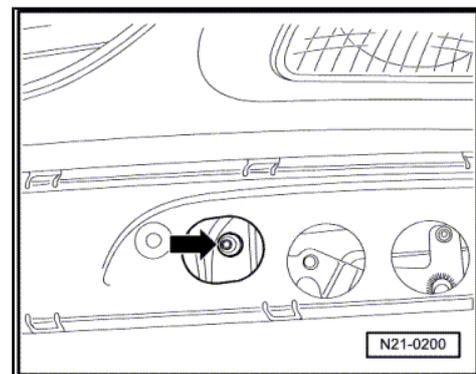
14 - Connecting hose

- To turbocharger.



### Securing bolts for charge air cooler

To loosen or tighten securing bolts -arrow-, bumper cover must be removed.





## 1.6 Hose connections

Installing hose connections with connector couplings

⇒ [page 161](#)

Hose connections with spring band ring ⇒ [page 162](#)

### 1.6.1 Installing hose connections with connector couplings



#### Caution

*The seal in the plug-in connector can be damaged if the securing clip is in the locked position when fitting the connector. This can cause leakage. Observe installation instructions.*

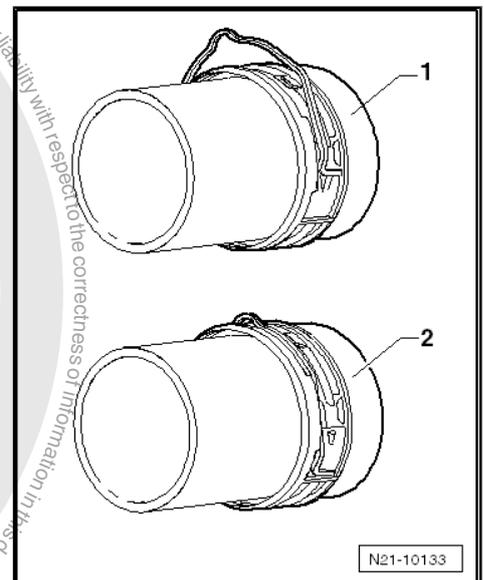
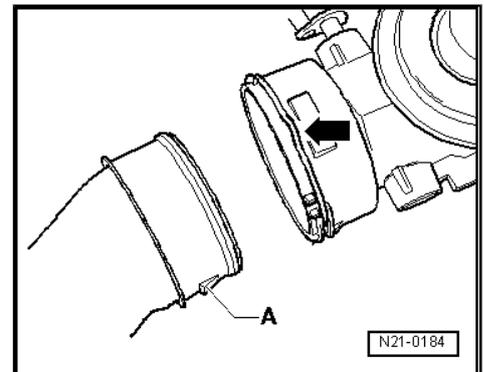
#### Removing

- Release plug-in connector by pulling out retaining clip -arrow-. Separate hose/pipe without tools.

#### Installing

- If renewed, place seal in groove of charge air hose. Ensure the seal is correctly seated in the groove.
- Lubricate sealing surface and seal with oil.
- Bring securing clip to release position -1-.
- Push charge air hose into coupling to stop.

- Bring securing clip to locking position -2- and then push charge air hose again.
- Check if connector coupling seats correctly and is properly engaged by pulling hose.



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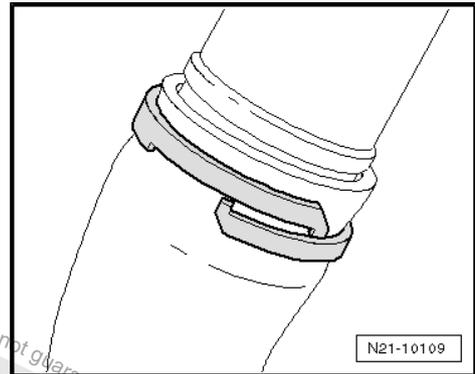


## 1.6.2 Hose connections with spring band ring



### Note

*There is a danger of a "hose detaching" whilst driving after removing and reinstalling charge pressure lines with spring-type clamps. For this reason, spring band rings are used which can be opened if a defect item requires the charge pressure line has to be disconnected. In cases of repair, destroy the spring band ring using a suitable tool and renew it with a replacement part from => ETKA (electronic parts catalogue) .*

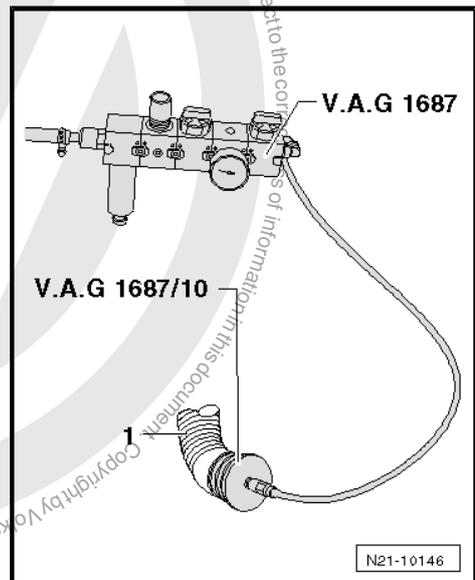


## 1.7 Checking charge air system for leaks

### Special tools and workshop equipment required

- ◆ Charge air system tester -V.A.G 1687-
- ◆ Adapter -V.A.G 1687/10-
- Remove intake hose -1- from air filter.
- Insert adapter -V.A.G 1687/10- in intake hose -1- and secure with clip.

Prepare charge air system tester -V.A.G 1687- as follows:

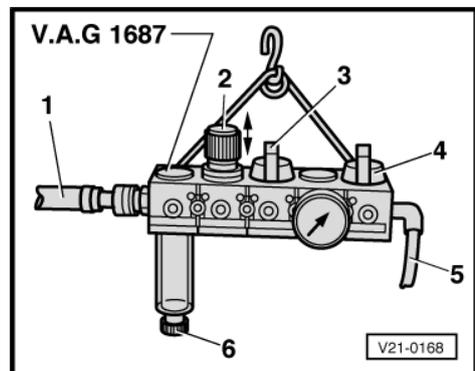


- Turn pressure regulating valve -2- anti-clockwise onto stop.
- Close valves -3- and -4-.



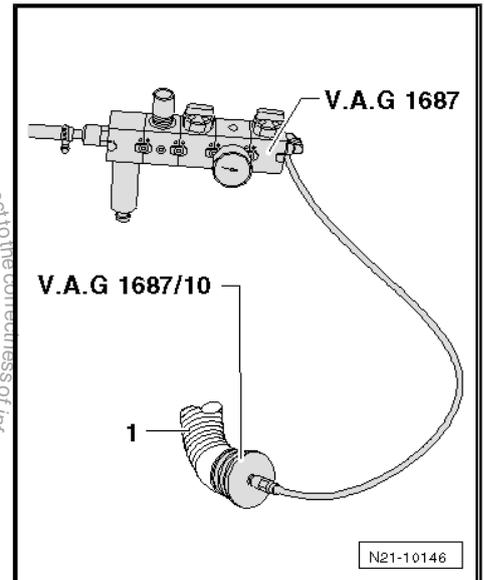
### Note

*To turn the pressure regulating valve -2- the knob must be pulled upwards.*





- Connect charge air system tester -V.A.G 1687- to adapter -V.A.G 1687/10- as shown.



- Connect compressed air hose -1- (compressed air source) to charge air system tester -V.A.G 1687- .

**i Note**

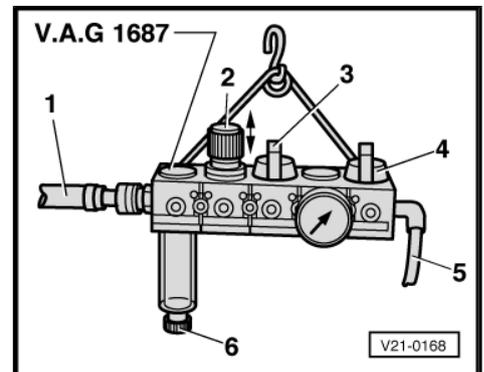
If there is water in the sight glass, drain at water drain screw -6-.

- Open valve -3-.
- Adjust pressure to 0.5 bar with pressure regulating valve -2-.



**Caution**

**The pressure must not exceed 0.5 bar! If the pressure is too high this can cause damage to the engine.**



- Open valve -4- and wait until the test circuit is filled. If necessary readjust pressure to 0.5 bar.
- Check the charge air system for leaks by hearing, touching, with leak detector spray or using ultrasonic tester -V.A.G 1842- .

**i Note**

- ◆ How to use the ultrasonic tester -V.A.G 1842- → operating instructions
- ◆ If leaks occur, when doing any repair work observe notes for charge air system ⇒ [page 158](#) .
- ◆ Depressurise test circuit by detaching coupling from adapter -V.A.G 1687/10- before removing adapter.



## 1.8 Vacuum hose schematic diagram

Vehicles with particulate filter ⇒ [page 164](#)

Vehicles without particulate filter ⇒ [page 165](#)

### 1.8.1 Vehicles with particulate filter

1 - Turbocharger

2 - Connecting pipe air filter/  
turbocharger

3 - Non-return valve

- Note installation position.

4 - To brake servo

5 - Charge pressure control  
solenoid valve -N75-

6 - Air filter

7 - Cylinder head/cylinder  
block

8 - Intake manifold

9 - Bypass flap

- For exhaust gas recirculation cooler.

10 - Cooler

- For exhaust gas recirculation.

11 - Exhaust gas recirculation  
valve -N18-

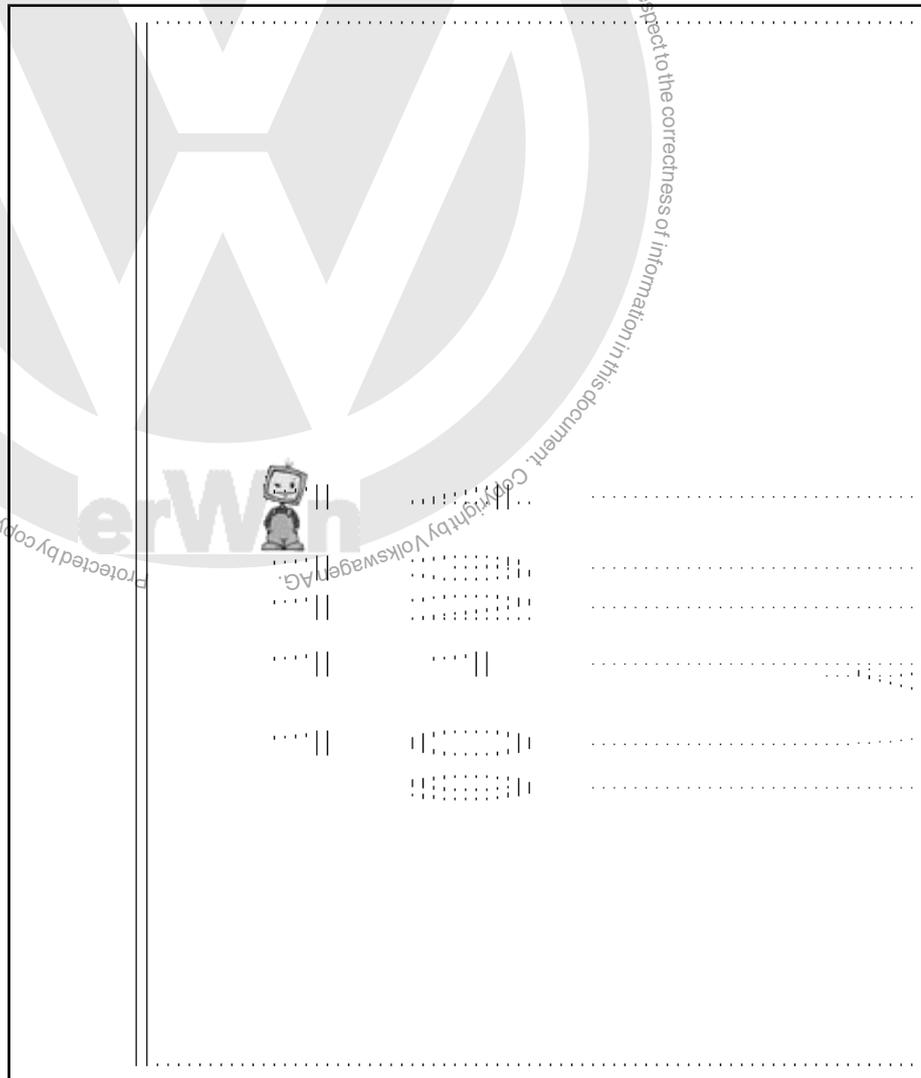
12 - Exhaust gas recirculation  
cooler change-over valve -  
N345-

13 - Non-return valve

- Note installation position.

14 - Vacuum unit

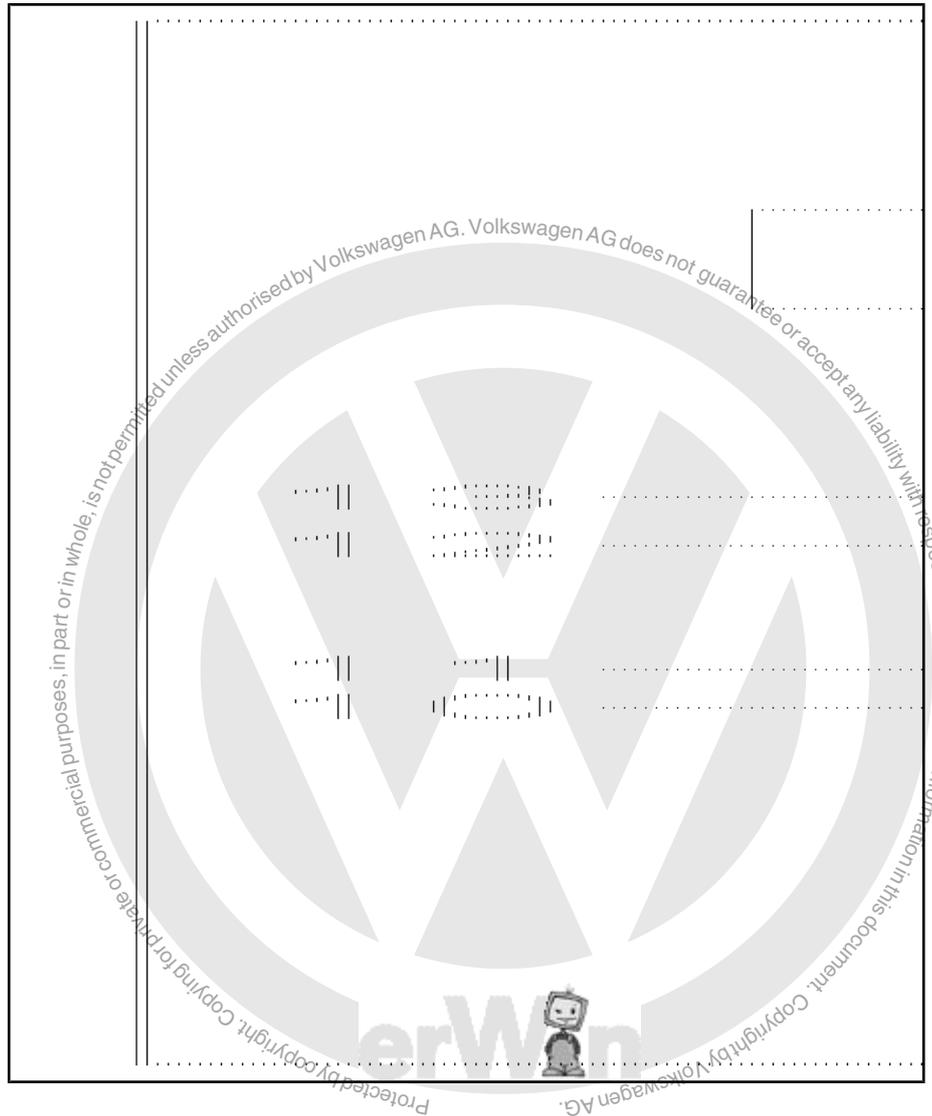
- Turbocharger





## 1.8.2 Vehicles without particulate filter

- 1 - Solenoid valve block
- 2 - Non-return valve
  - Note installation position.
- 3 - To brake servo
- 4 - Connecting pipe air filter/turbocharger
- 5 - Air filter
- 6 - Intake manifold
- 7 - Cylinder head/cylinder block
- 8 - Vacuum reservoir
- 9 - Bypass flap
  - For exhaust gas recirculation cooler.
- 10 - Cooler
  - For exhaust gas recirculation.
- 11 - Exhaust gas recirculation valve -N18-
- 12 - Turbocharger
- 13 - Non-return valve
  - Note installation position.





## 23 – Mixture preparation - injection

### 1 Diesel direct injection system

The diesel direct injection system control unit is equipped with a fault memory. Read fault memory before and after making repairs or adjustments.

Safety precautions ⇒ [page 166](#)

Rules for cleanliness ⇒ [page 167](#) .

Assembly overview - unit injector ⇒ [page 167](#)

Removing and installing unit injector ⇒ [page 169](#)

Adjusting non-contact gap of unit injectors ⇒ [page 171](#)

Removing and installing O-rings for unit injector ⇒ [page 172](#)

Repairing intake manifold flap ⇒ [page 174](#)

Assembly overview - air filter ⇒ [page 177](#) .

#### 1.1 Safety precautions



##### WARNING

*When doing any repair work, especially in the engine compartment, pay attention to the following due to the cramped conditions:*

- ◆ *Route all the various lines (e.g. for fuel, hydraulics, activated charcoal filter system, coolant and refrigerant, brake fluid and vacuum) and electrical wiring in their original positions.*
- ◆ *Ensure that there is sufficient clearance to all moving or hot components.*

Observe following if test and measuring instruments are required during a road test:

- ◆ Test and measuring instruments must be secured to rear seat and operated by a second person from this location.
- ◆ If test and measuring instruments are operated from front passenger seat and the vehicle is involved in an accident, there is a possibility that the person sitting in this seat may receive serious injuries when the airbag is triggered.

To prevent injuries to persons and/or destruction of the injection and glow plug system, the following must be noted:

- ◆ The ignition must be switched off before connecting or disconnecting injection or glow plug system wiring or tester cables.
- ◆ If the engine is to be turned at starter speed, without starting, e.g. when checking compressions, disconnect unit injector connector on cylinder head.
- ◆ Before disconnecting battery, obtain radio code for radios with anti-theft coding.
- ◆ Disconnecting and connecting the battery must only be done with the ignition switched off, as otherwise the control unit for diesel direct injection system could become damaged.



## 1.2 Rules for cleanliness

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

- ◆ Thoroughly clean all unions and adjacent areas before disconnecting.
- ◆ Place removed parts on a clean surface and cover. Do not use fluffy cloths!
- ◆ Carefully cover opened components or seal 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 not been stored in their packing (e.g. in tool boxes etc.).
- ◆ When system is open: do not work with compressed air if this can be avoided. Do not move vehicle unless absolutely necessary.
- ◆ Also ensure that no diesel fuel runs on to the coolant hoses. Should this occur, the hoses must be cleaned immediately. Damaged hoses must be renewed.

## 1.3 Assembly overview - unit injector

- ◆ Observe rules for cleanliness ⇒ [page 167](#) .
- ◆ Always renew seals and O-rings



1 - 20 Nm + 1/4 turn (90°) further

- Renew

2 - Rocker arm shaft

- With rocker arms
- Removing and installing  
⇒ [page 169](#) .

3 - Lock nut, 30 Nm

4 - Adjuster screw

- Renew

5 - Ball stud

- Renew

6 - Unit injector

- Removing and installing  
⇒ [page 169](#) .

7 - O-ring

- Renewing ⇒ [page 172](#)

8 - O-ring

- Renewing ⇒ [page 172](#)

9 - O-ring

- Renew ⇒ [page 172](#) .

10 - Heat shield seal

- Renew

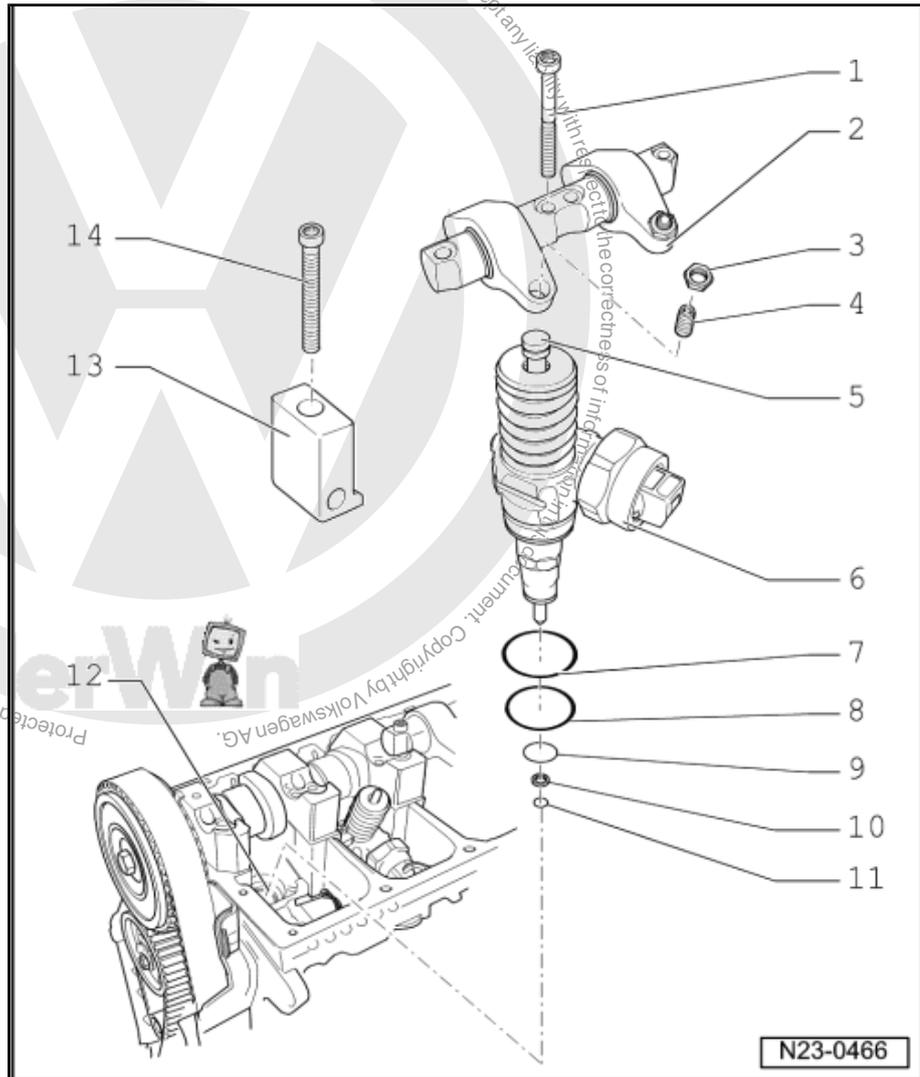
11 - Circlip

12 - Cylinder head

13 - Tensioning block

14 - 12 Nm + 3/4 turn (270°) further

- Renew.

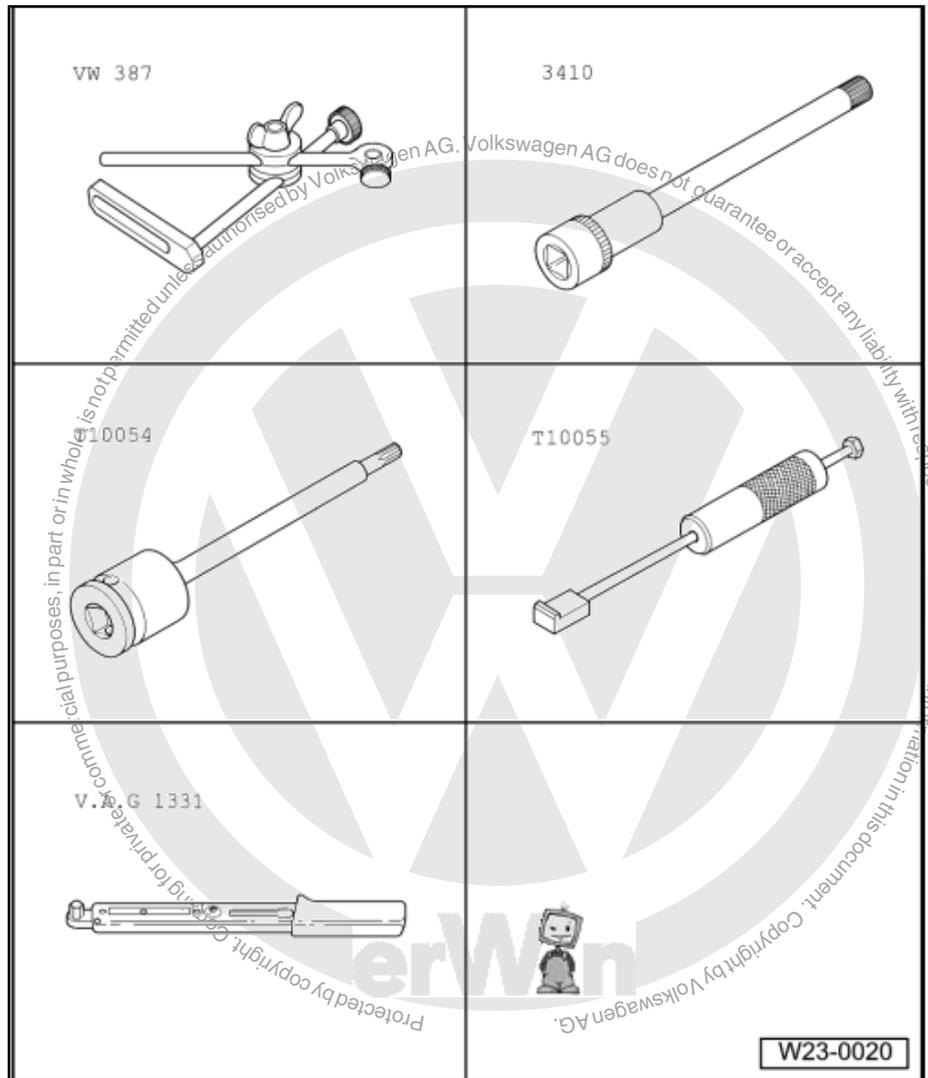




## 1.4 Removing and installing unit injector

### Special tools and workshop equipment required

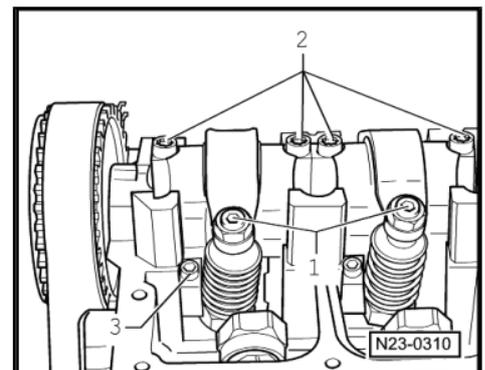
- ◆ Universal dial gauge bracket -VW 387-
- ◆ Special wrench, long reach -3410-
- ◆ Special wrench, long reach -T10054-
- ◆ Puller -T10055-
- ◆ Torque wrench - V.A.G 1331-



### 1.4.1 Removing

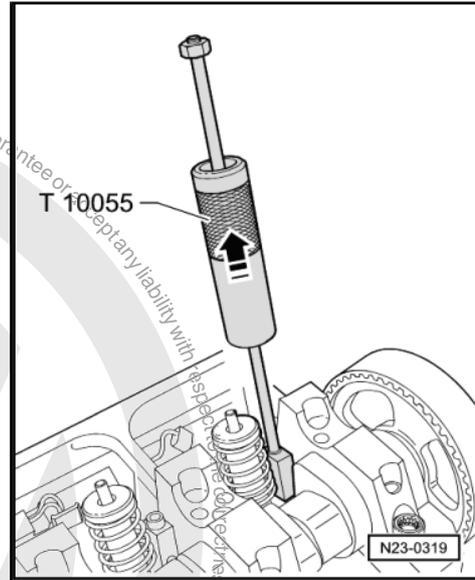
- Remove toothed belt guard upper part.
- Remove cylinder head cover. ⇒ [page 48](#)
- Turn crankshaft until the cam pair point evenly upwards for the unit injector which is to be removed.
- Loosen lock nuts of adjustment screws -1- and remove adjustment screws.
- Remove rocker arm securing bolts -2- (from outwards to inwards) with socket XZN 10 -3410- and remove rocker arm shaft.
- Remove tensioning block securing bolt -3- with special wrench, long reach -T10054- and remove the block.
- Lever connector off unit injector with a screwdriver. To avoid canting, support opposite side of connector with light finger pressure.

Observe unit injector cylinder allocation.





- Insert puller -T10055- in place of the clamping block in the slot on the side of the unit injector.
- Pull unit injector out of cylinder head seat with gentle upward taps.



## 1.4.2 Installing



### Note

- ◆ *Each time work is performed which requires adjustment of the unit injector, the adjustment screw in the rocker arm and also the unit injector ball stud must be renewed.*
- ◆ *New unit injectors are supplied with O-rings and heat shield seal.*
- Heat shield seal and O-rings must be renewed if old unit injector is reused. => [page 172](#)
- Check that the three O-rings and the heat shield seal along with securing clip are seated correctly before installing unit injector.



### Note

*The seals must not be twisted.*

- Oil the seals and fit the unit injector into the seat in cylinder head with great care.
- Push the unit injector evenly into the cylinder head onto its limit stop.
- Insert tensioning block in slot on side of unit injector.



### Note

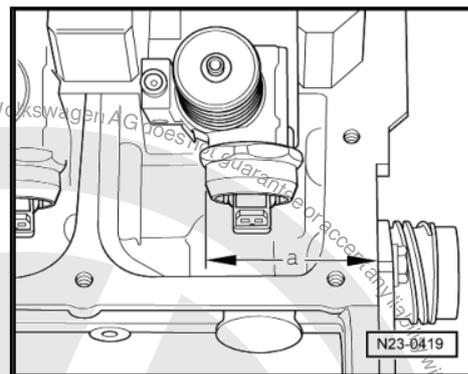
*If the unit injector is not at right angles to the tensioning block the securing bolt may loosen and this can damage the unit injector or the cylinder head.*

- Therefore align the unit injector as follows.
- Screw the new securing bolt into the tensioning block until the unit injector can still be turned easily.
- Now align unit injector at right angles to camshaft bearing seat.

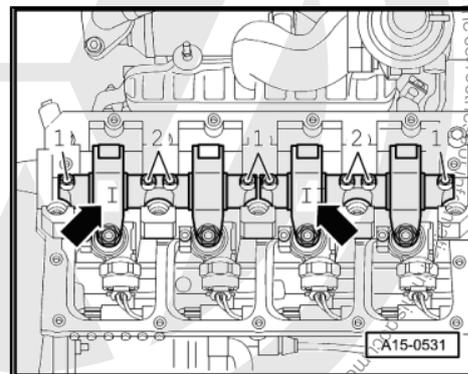


- Check dimension "a" from outer edge of cylinder head to rounded surface of unit injector with a vernier gauge (measuring range min. 400 mm).

Cylinder	Dimension "a"
1	333,0 ± 0.8 mm
2	245,0 ± 0.8 mm
3	153,6 ± 0.8 mm
4	65,6 ± 0.8 mm

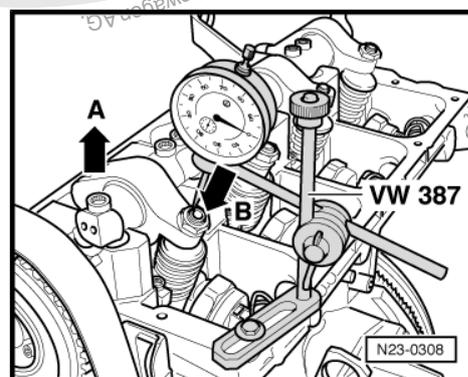


- If necessary, adjust the unit injector and tighten the securing bolt as follows:
- Tighten securing bolt to 12 Nm and turn 270° (3/4 turn) further (turning further can be done in several stages).
- Fit rocker arm shaft and tighten new securing bolts as follows:
- First evenly tighten inner bolts -2- and then outer bolts -1- hand-tight. Then using same sequence, tighten to 20 Nm and 90° (1/4 turn) further evenly.
- Adjust non-contact gap of unit injectors ⇒ [page 171](#) .

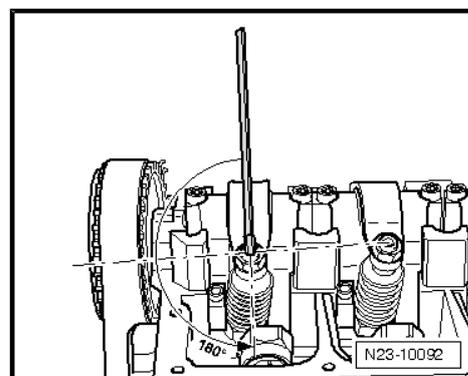


## 1.5 Adjusting non-contact gap of unit injectors

- Fit dial gauge onto adjustment screw of unit injector as shown.
- Turn crankshaft in direction of engine rotation until roller of rocker arm is located at tip of drive cam. Roller side -arrow A- positioned at highest point, dial gauge -arrow B- positioned at lowest point.
- Remove dial gauge.
- Now turn the adjuster screw into rocker arm until significant resistance can be felt (unit injector is at limit stop).



- Turn adjustment screw 180° back off stop.
- Hold adjuster screw in this position and tighten lock nut to 30 Nm.
- Connect unit injector connector.
- Install cylinder head cover ⇒ [page 48](#) .

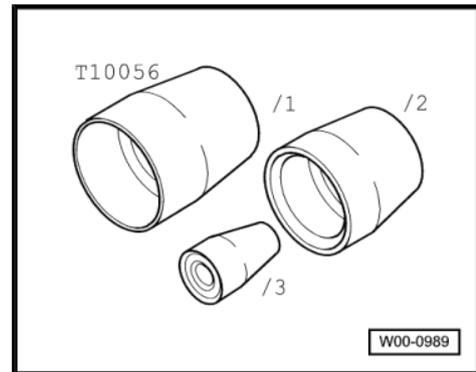




## 1.6 Removing and installing O-rings for unit injector

### Special tools and workshop equipment required

- ◆ Assembly sleeves -T10056-



### 1.6.1 Removing

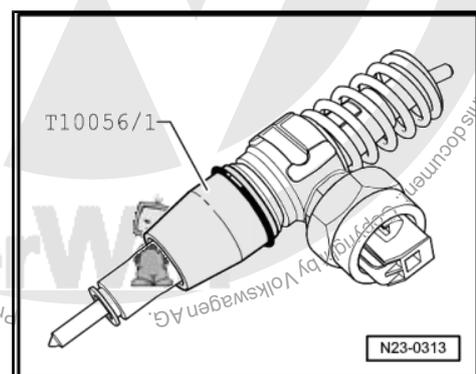
- Lever old O-rings very carefully out of unit injector.
- Ensure above all that no burrs are formed on O-ring seat.

### 1.6.2 Installing



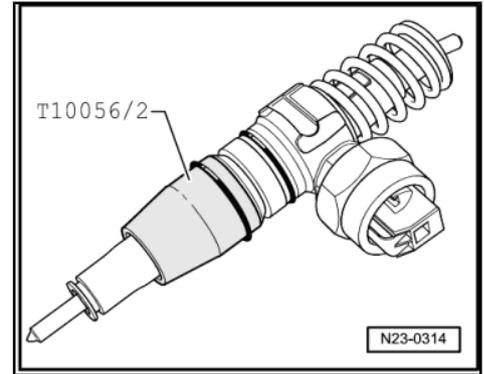
#### Note

- ◆ *Always use the assembly sleeves to fit the O-rings. There is a danger of damaging the O-rings if the sleeves are not used.*
- ◆ *Gradual introduction of O-rings without different coloured markings. Note the correct allocation of O-rings to grooves: the thickness of the rings reduces towards injector nozzle.*
- ◆ *Prevent O-rings from rolling when sliding them on. The O-rings must not be twisted in their seats in unit injector.*
- Pull heat shield seal off together with securing clip.
- Clean seating surfaces for O-rings on unit injector very carefully.
- Place assembly sleeve -T10056/1- onto stop on unit injector.
- Push the upper, thicker O-ring carefully onto assembly sleeve and into seat on unit injector.
- Remove assembly sleeve.

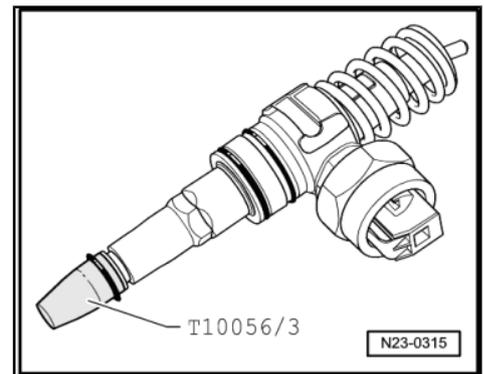




- Place assembly sleeve -T10056/2- onto stop on unit injector.
- Slide the middle, thinner O-ring carefully onto assembly sleeve and into seat on unit injector.
- Remove assembly sleeve.



- Place assembly sleeve -T10056/3- onto stop on unit injector.
- Push the lower O-ring carefully onto the assembly sleeve and into the seat of the unit injector.
- Remove assembly sleeve.
- Fit new heat shield seal together with securing clip.





## 1.7 Assembly overview - intake manifold

Engine codes BKC, BRU, BXE and BXF ⇒ [page 174](#)

Engine code BJB ⇒ [page 175](#)

Engine codes BLS and BXJ ⇒ [page 176](#)

### 1.7.1 Engine codes BKC, BRU, BXE and BXF

#### 1 - Intake manifold

- Tighten securing bolts to 22 Nm.

#### 2 - O-ring

- Renew.

#### 3 - Intake connecting pipe

- With exhaust gas recirculation valve

#### 4 - 10 Nm

#### 5 - Intake manifold flap motor - V157-

- The intake manifold flap is closed for approx. 3 seconds when stopping engine and then opens again. This reduces the stop jolt.

#### 6 - 10 Nm

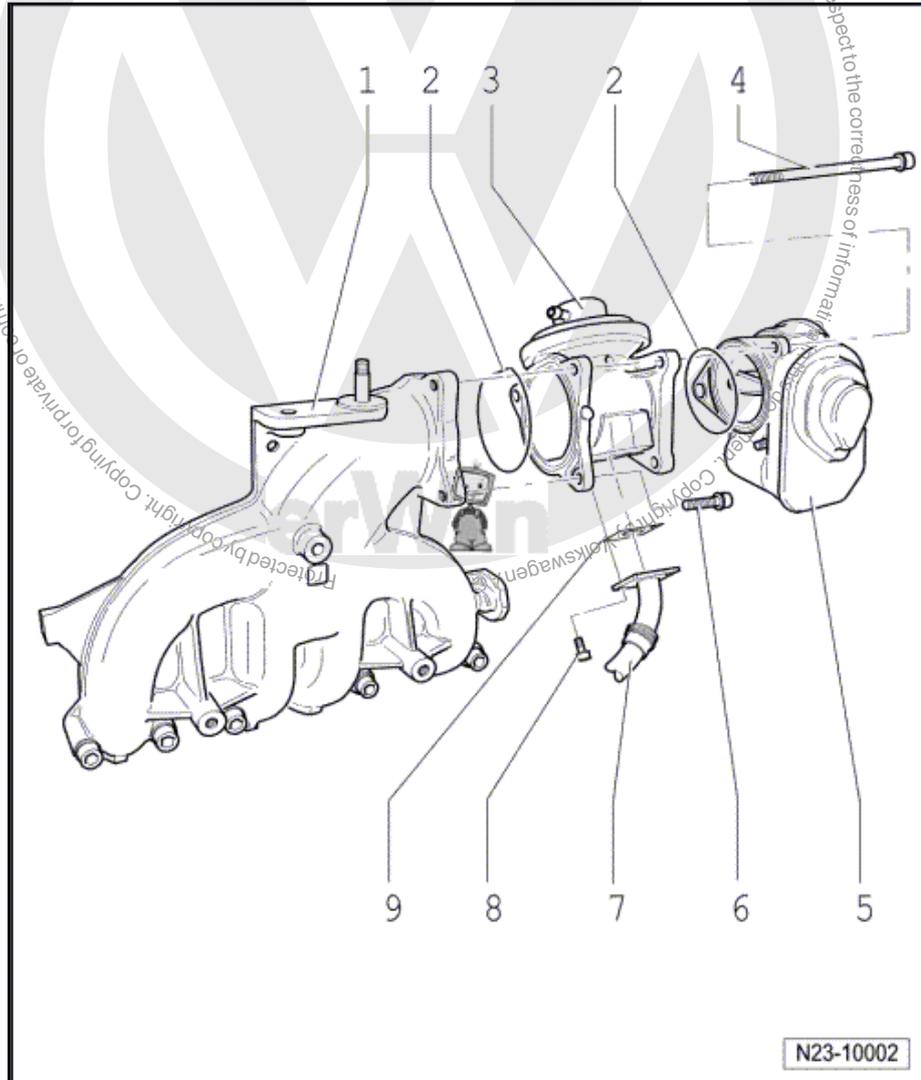
#### 7 - Connecting pipe

- To exhaust gas recirculation cooler.

#### 8 - 22 Nm

#### 9 - Gasket

- Renew.





## 1.7.2 Engine code BJB

### 1 - Intake manifold

- Tighten securing bolts to 22 Nm.

### 2 - O-ring

- Renew.

### 3 - Intake connecting pipe

- With exhaust gas recirculation valve and intake manifold flap

### 4 - 10 Nm

### 5 - Gasket

- Renew.

### 6 - Connecting pipe

- To exhaust gas recirculation cooler.

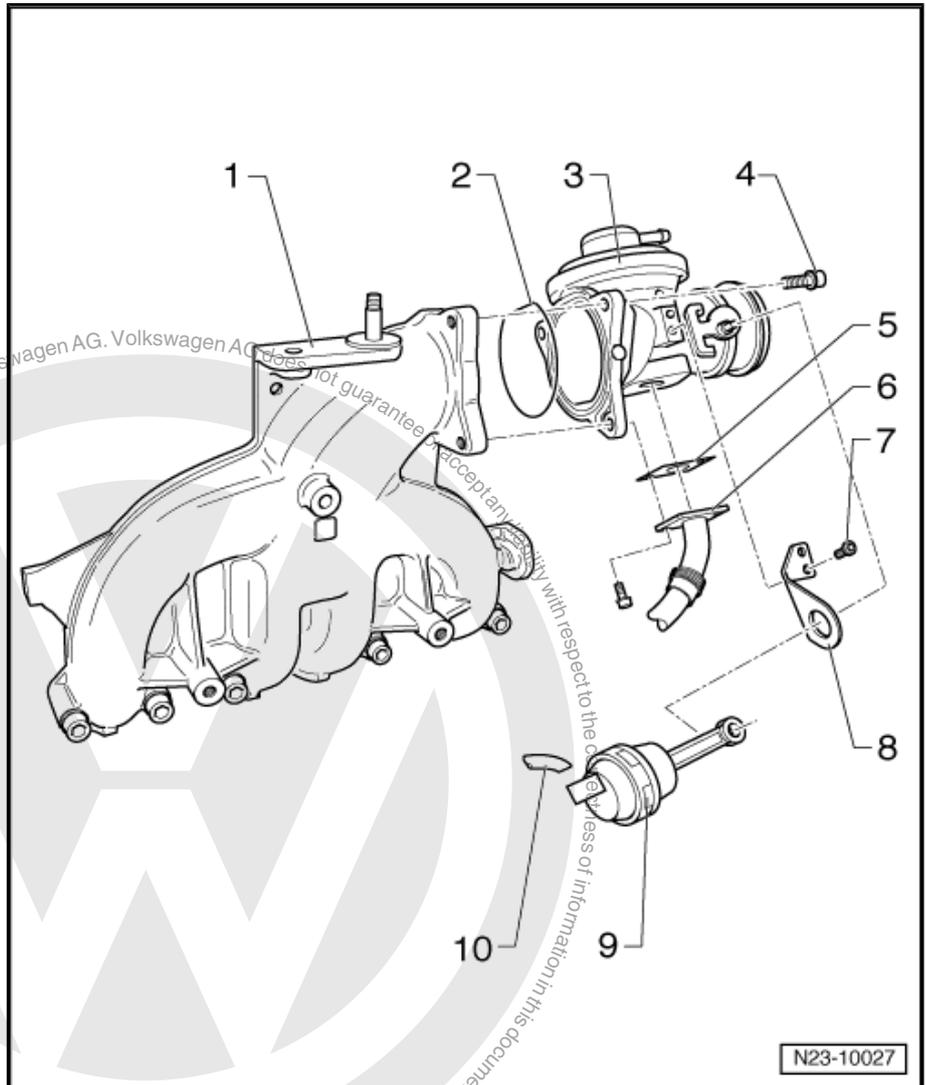
### 7 - 10 Nm

### 8 - Bracket

### 9 - Vacuum unit

### 10 - To solenoid valve block

### 11 - 22 Nm





### 1.7.3 Engine codes BLS and BXJ

**1 - Gasket**

- Renew.

**2 - Intake manifold**

- Tighten securing bolts to 22 Nm

**3 - Seal**

- Renew

**4 - Connection**

**5 - Intake manifold flap motor - V157-**

- The intake manifold flap is closed for approx. 3 seconds when stopping engine and then opens again. This reduces the stop jolt.

**6 - From charge air cooler**

7 - 10 Nm

**8 - Exhaust gas recirculation valve -N18- with exhaust gas recirculation potentiometer - G212-**

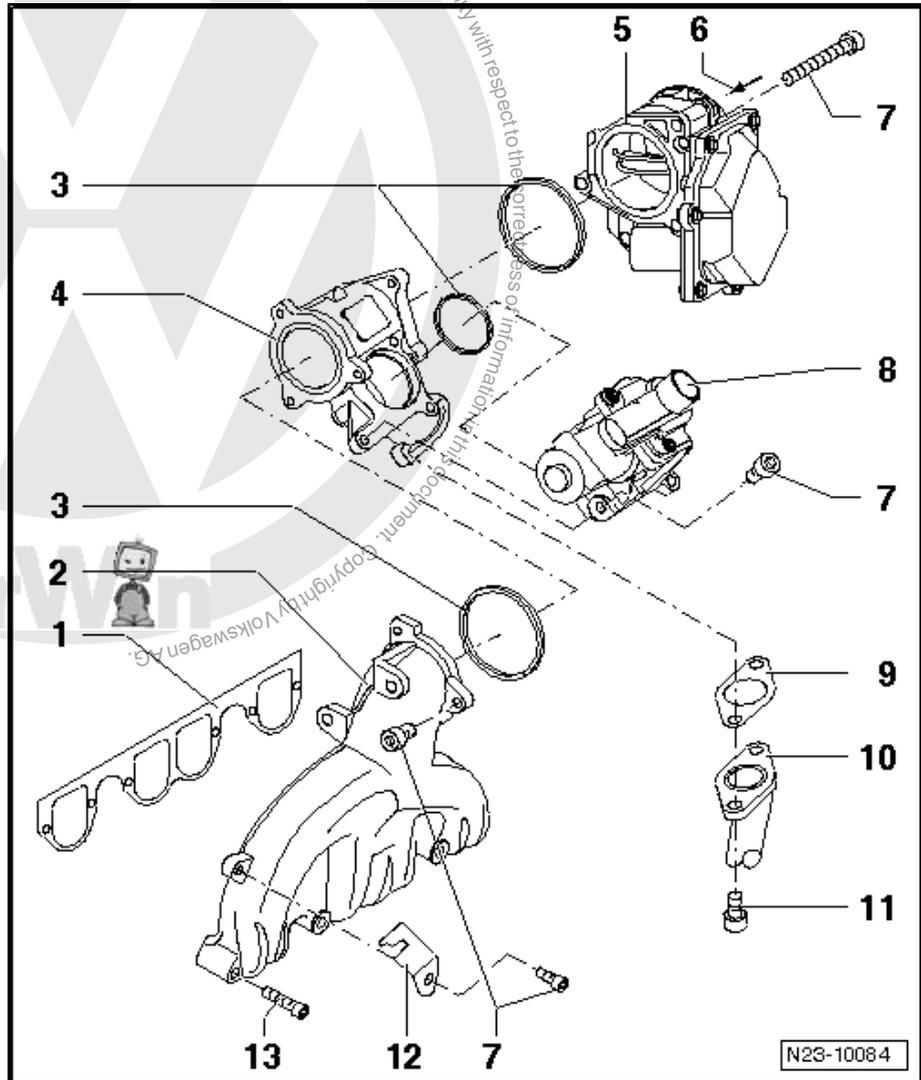
- Assembly overview - exhaust gas recirculation ⇒ [page 196](#)

**9 - Gasket**

- Renew

**10 - Connecting pipe**

- For exhaust gas recirculation cooler.
- Assembly overview - parts of exhaust gas recirculation



⇒ [page 193](#)

11 - 22 Nm

12 - Bracket

13 - 22 Nm

### 1.8 Cleaning the intake manifold flap support, Engine code BLS and BXJ



**Note**

Carbon deposits can occur in the throttle valve support through the combination of unfavourable factors. If these are found, e.g. when disassembling the exhaust gas recirculation valve -N18- or the intake manifold flap motor -V157-, the support will have to be cleaned.



**WARNING**

*Acetone is highly flammable. Please observe the accidental regulations and safety notes when handling with highly flammable fluids. Wear eye protection and protective clothing to avoid possible injury and skin contact.*

- Remove intake manifold flap connection.
- Remove the exhaust gas recirculation valve -N18- and the intake manifold flap motor -V157-.
- Thoroughly clean intake manifold flap support, especially around exhaust gas return valve, using commercially available acetone according to DIN 53247 and cleaning brush.
- Wipe off intake manifold flap support using a lint-free cloth.
- Allow the acetone to evaporate fully, assemble the cleaned intake manifold flap support, replace the seals and insert it back in position.

**1.9 Assembly overview - air filter**

**1 - Intake hose**

- To turbocharger.

**2 - Air mass meter -G70-**

**3 - O-ring**

- Renew if damaged.

**4 - 8 Nm**

**5 - Air filter upper part**

**6 - 8 Nm**

**7 - Vacuum hose**

- To solenoid valve block

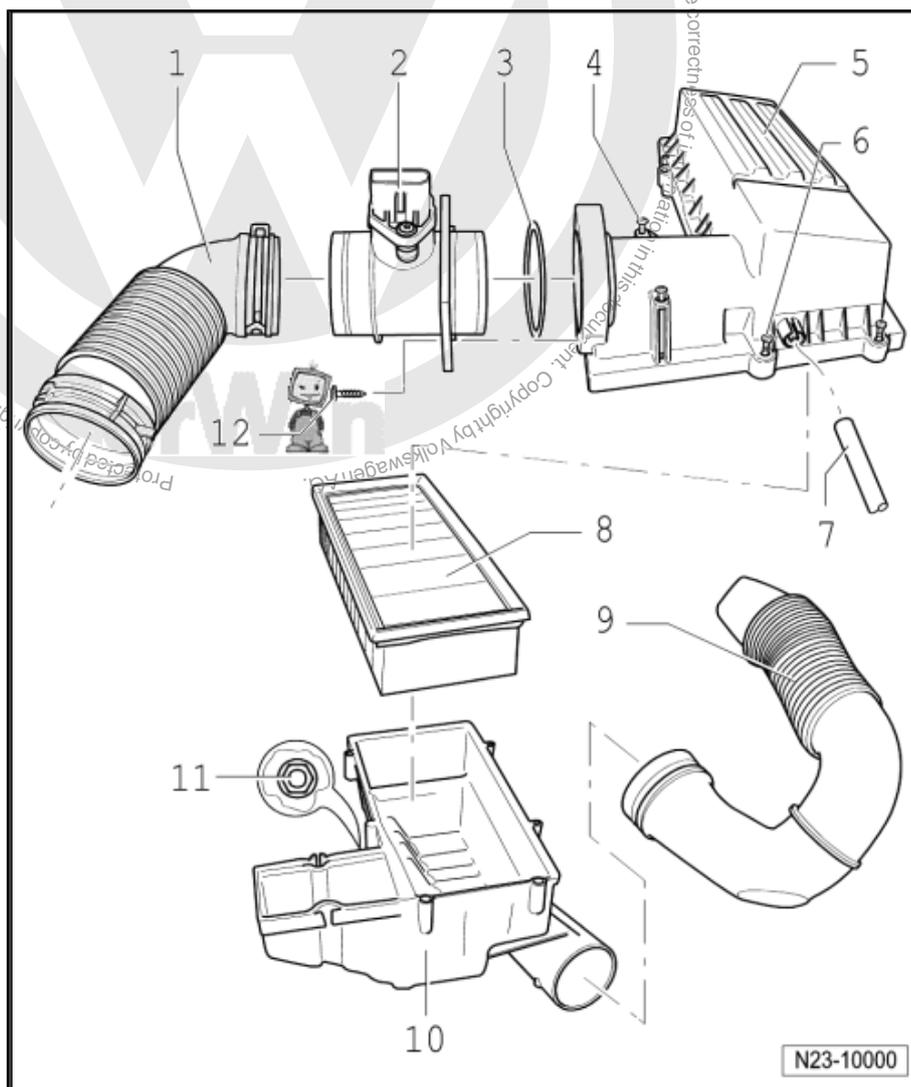
**8 - Filter element**

**9 - Air duct**

- To lock carrier.

**10 - Air filter lower part**

**11 - 10 Nm**





## 2 Engine control unit

Reading and clearing engine control unit fault memory

⇒ [page 178](#)

Adapting functions and components ⇒ [page 179](#) .

Removing and installing engine control unit, Golf ⇒ [page 180](#) .

Removing and installing anti-theft engine control unit, Golf  
⇒ [page 180](#) .

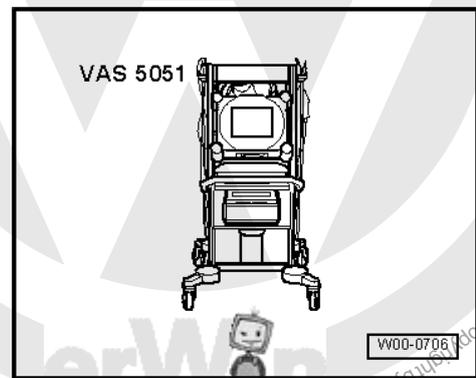
Removing and installing engine control unit, Golf Plus  
⇒ [page 183](#) .

Removing and installing anti-theft engine control unit Golf Plus  
⇒ [page 183](#) .

### 2.1 Reading and erasing engine control unit fault memory

Special tools and workshop equipment required

- ◆ Vehicle diagnostic, testing and information system -VAS 5051-



- Connect vehicle diagnostic, testing and information system - VAS 5051- as follows:



- Push diagnosis cable connector onto diagnosis connector.
- Start engine and run at idling speed.

Only when engine does not start:

- Switch on ignition.

#### Select operating mode

- Press button on display for "Vehicle self-diagnosis".

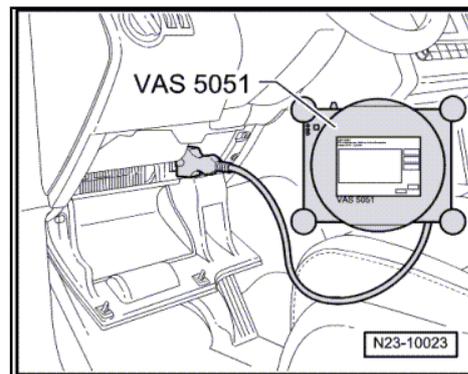
#### Select vehicle system

- Press button "01 - Engine electronics" on display.

The control unit identification and coding are indicated on display.

#### Select diagnostic function

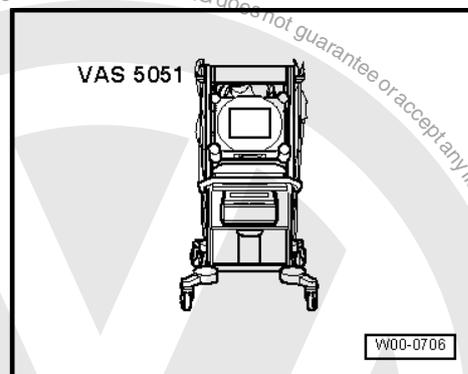
- Press button "02 - Read fault memory" on display.
- If no fault is stored in engine control unit "0 fault detected" is displayed.
- If faults are stored in the engine control unit, these are shown one below the other on the display.
- Press  button.
- Press button "05 - Clear fault memory" on display.
- Press function "06-End output".



## 2.2 Adapting functions and components

### Special tools and workshop equipment required

- ◆ Vehicle diagnostic, testing and information system -VAS 5051-



Select "guided fault finding" in vehicle diagnostic, testing and information system -VAS 5051- .

When all control units have been read:

- Press "GoTo" button.
- Select "Function/component selection".
- Select "Drive train".
- Select "Engine code".
- Select "01-Systems capable of self-diagnosis".
- Select "Engine management".
- Select "Functions".
- Select "Function or component".



## 2.3 Removing and installing engine control unit, Golf

- Before removing engine control unit, read the control unit identification and thus the coding of the current control unit.  
=> [page 179](#)

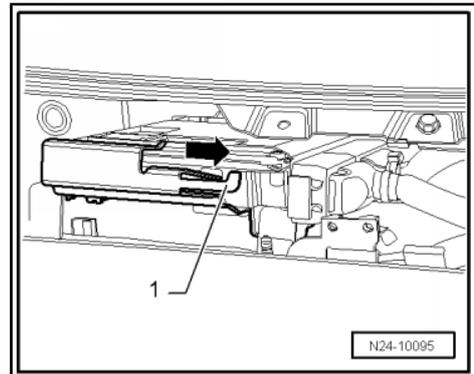
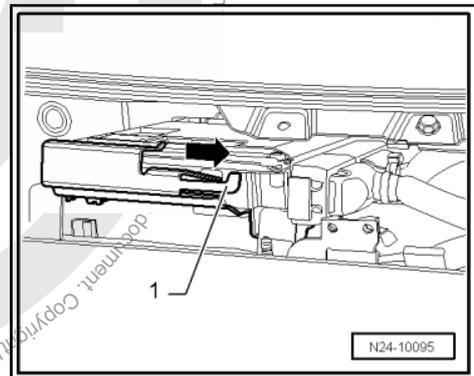
### Removing

- Switch off ignition.
- Remove wiper arms, plenum chamber cover and plenum chamber bulkhead: => Electrical system; Rep. Gr. 92 ; Windscreen wiper system; Removing and installing windscreen wiper system .
- Bend catch open slightly -1-.
- Then push engine control unit out of retainer -arrow-.
- Now release connector on engine control unit and pull off connector.

### Installing

- Fit connector to engine control unit and lock connector in position.
- Push engine control unit onto bracket.

- Press catch -1- against engine control unit.
- Install plenum chamber bulkhead, plenum chamber cover and wiper arms => Electrical system; Rep. Gr. 92 ; Windscreen wiper system; Removing and installing windscreen wiper system .



## 2.4 Removing and installing anti-theft engine control unit, Golf

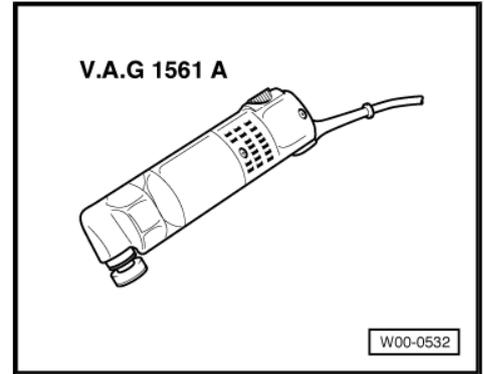
Removing and installing anti-theft engine control unit Golf Plus  
=> [page 183](#) .

### Special tools and workshop equipment required

- ◆ Electric cutter -V.A.G 1561 A-
- ◆ Saw set -V.A.G 1561/14-



◆ Grip pliers

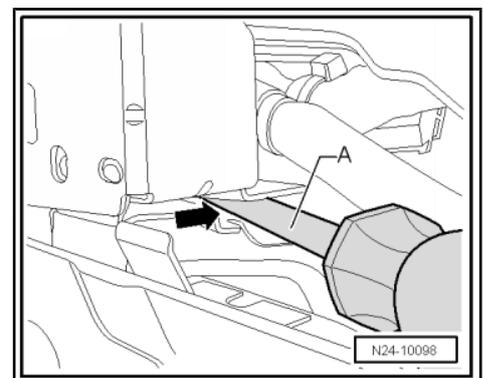
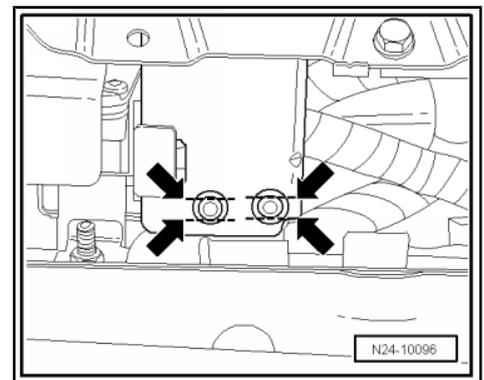


**i** Note

- ◆ If the engine control unit is to be renewed, connect vehicle diagnostic, testing and information system -VAS 5051B- and perform "Renewing engine control unit" in guided functions.
- ◆ The shear-head bolt threads are coated with locking compound. To simplify removing, the shear-head bolts can be heated using hot air blower -VAS 1978/14-. When doing this, ensure that no adjacent cables, connectors or components are damaged!

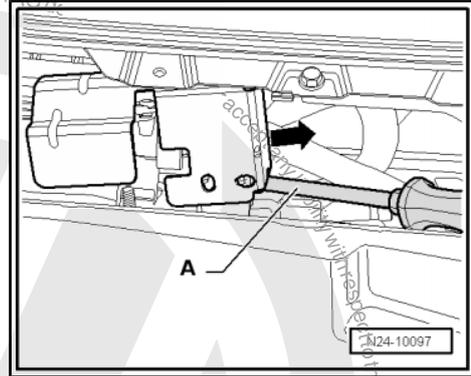
**Removing**

- Switch off ignition.
- Remove wiper arms, plenum chamber cover and plenum chamber bulkhead: ⇒ Electrical system; Rep. Gr. 92; Windscreen wiper system; Removing and installing windscreen wiper system .
- Cut into heads of shear-head bolts so that two parallel surfaces are created -arrows-.
- Remove bolts with grip pliers .
- Insert a screwdriver between protective housing -A- and bracket -arrow-.





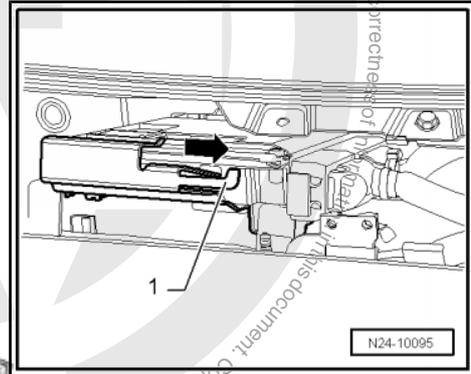
- Lever up protective housing using screwdriver -A- and pull to side off bracket -arrow-.



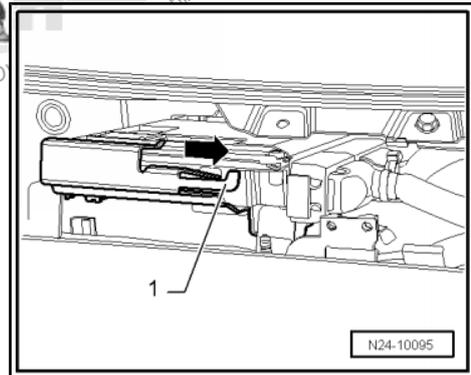
- Bend catch open slightly -1-.
- Then push engine control unit out of retainer -arrow-.
- Now release connector on engine control unit and pull off connector.

### Installing

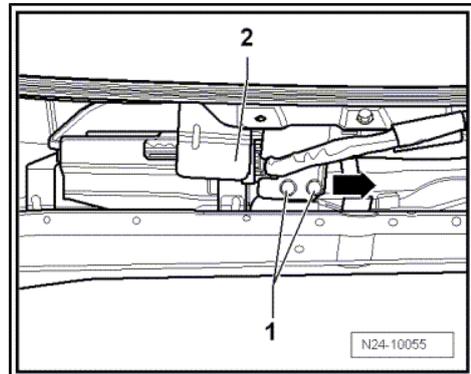
- Fit connector to engine control unit and lock connector in position.
- Push engine control unit onto bracket.



- Press catch -1- against engine control unit.
- Push protective housing onto bracket.



- Tighten new shear-head bolts -1- evenly until heads shear-head off.
- Install plenum chamber bulkhead, plenum chamber cover and wiper arms => Electrical system; Rep. Gr. 92 ; Windscreen wiper system; Removing and installing windscreen wiper system .





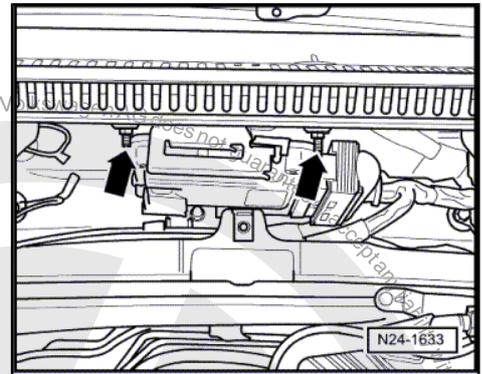
## 2.5 Removing and installing engine control unit, Golf Plus

### Note

If the engine control unit is to be renewed, connect vehicle diagnostic, testing and information system -VAS 5051B- and perform "Renewing engine control unit" in guided functions.

### Removing:

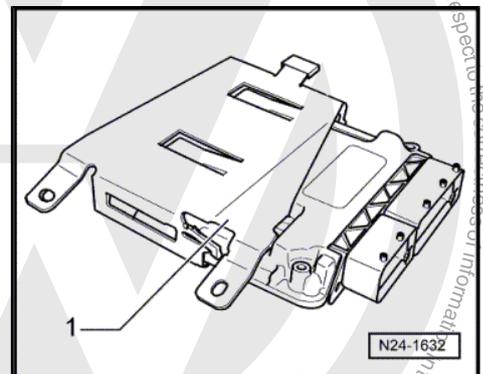
- Switch off ignition.
- Remove plenum chamber bulkhead ⇒ General body repairs; Rep. Gr. 50 ; Body - front; Plenum chamber bulkhead .
- Loosen securing nuts -arrows-.
- Release connectors on engine control unit and pull off connector.



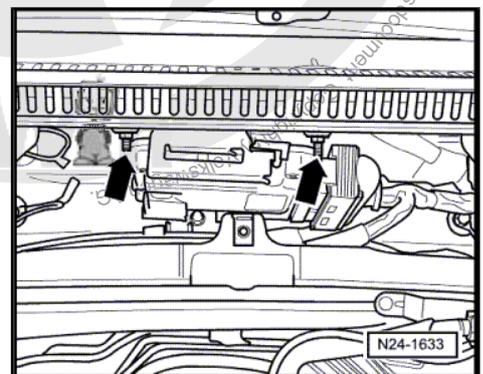
- Push bracket -1- off engine control unit in direction of arrow.

### Installing:

- Push bracket onto engine control unit.



- Tighten securing nuts -arrows- to 10 Nm.
- Fit connectors and lock in position.
- Install plenum chamber bulkhead ⇒ General body repairs; Rep. Gr. 50 ; Body - front; Plenum chamber bulkhead .



## 2.6 Removing and installing anti-theft engine control unit, Golf Plus

Special tools and workshop equipment required

- ◆ Grip pliers

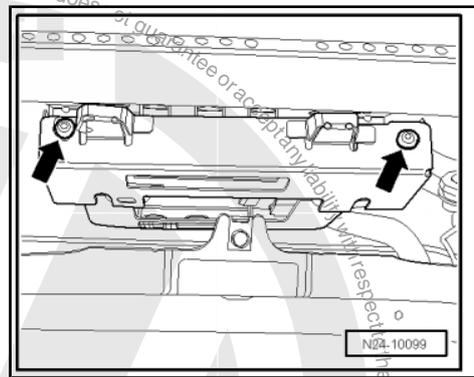


### Note

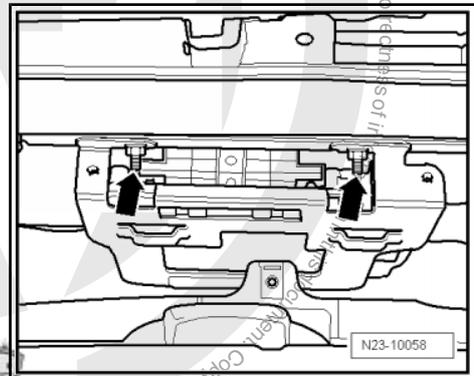
- ◆ If the engine control unit is to be renewed, connect vehicle diagnostic, testing and information system -VAS 5051B- and perform "Renewing engine control unit" in guided functions.
- ◆ The shear-head bolt threads are coated with locking compound. To simplify removing, the shear-head bolts can be heated using hot air blower -VAS 1978/14-. When doing this, ensure that no adjacent cables, connectors or components are damaged!

### Removing

- Switch off ignition.
- Remove plenum chamber bulkhead ⇒ General body repairs; Rep. Gr. 50 ; Body - front; Plenum chamber bulkhead.
- Twist shear-head bolts -arrows- out using grip pliers and remove cover from protective housing.
- Then remove securing nuts for control unit bracket -arrows-.



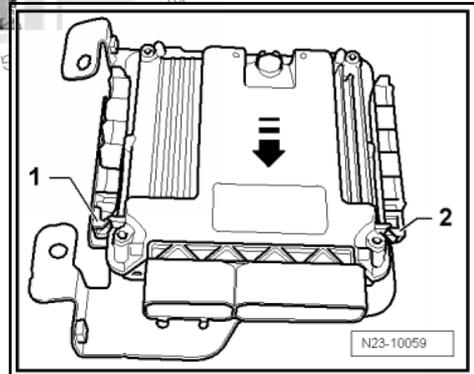
- Release connectors on engine control unit and pull off connector.



- Press catches -1- and -2- outwards. Then pull engine control unit off control unit bracket in direction of arrow.

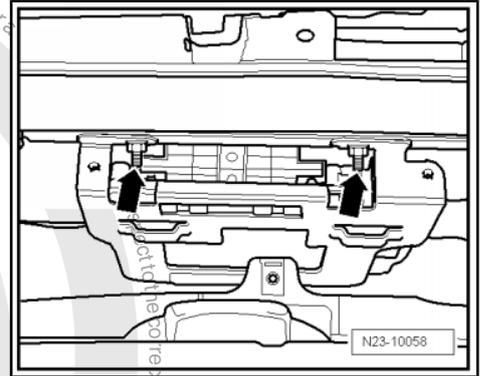
### Installing

- Push engine control unit onto control unit bracket until it engages in catches.
- Fit connectors to engine control unit and lock in position.

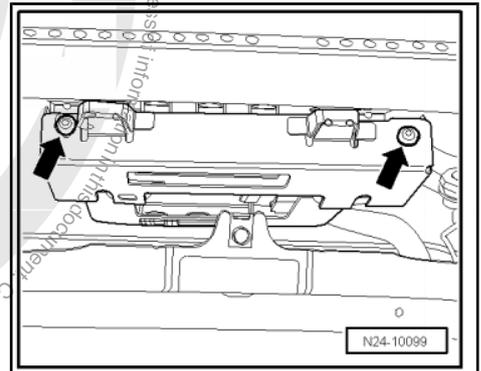




- Tighten securing bolts -arrows- to 10 Nm.
- Install cover of protective housing.



- Tighten new shear-head bolts -arrows- evenly until heads shear-head off.
- Install plenum chamber bulkhead ⇒ General body repairs;  
Rep. Gr. 50 ; Body - front; Plenum chamber bulkhead .





## 26 – Exhaust system

### 1 Exhaust system

Assembly overview - front exhaust pipe with catalytic converter

⇒ [page 186](#) .

Assembly overview - front exhaust pipe with particulate filter

⇒ [page 187](#)

Assembly overview - silencer with mountings (vehicles with front wheel drive) ⇒ [page 189](#) .

Assembly overview - silencer with mountings (vehicles with four-wheel drive) ⇒ [page 191](#) .

#### 1.1 Assembly overview - front exhaust pipe with catalytic converter

1 - Front exhaust pipe with catalytic converter

2 - 40 Nm

3 - Support

4 - Marking

- For clamp.
- Installation position of clamp ⇒ [page 187](#) .

5 - To front silencer

6 - 25 Nm

7 - Mounting

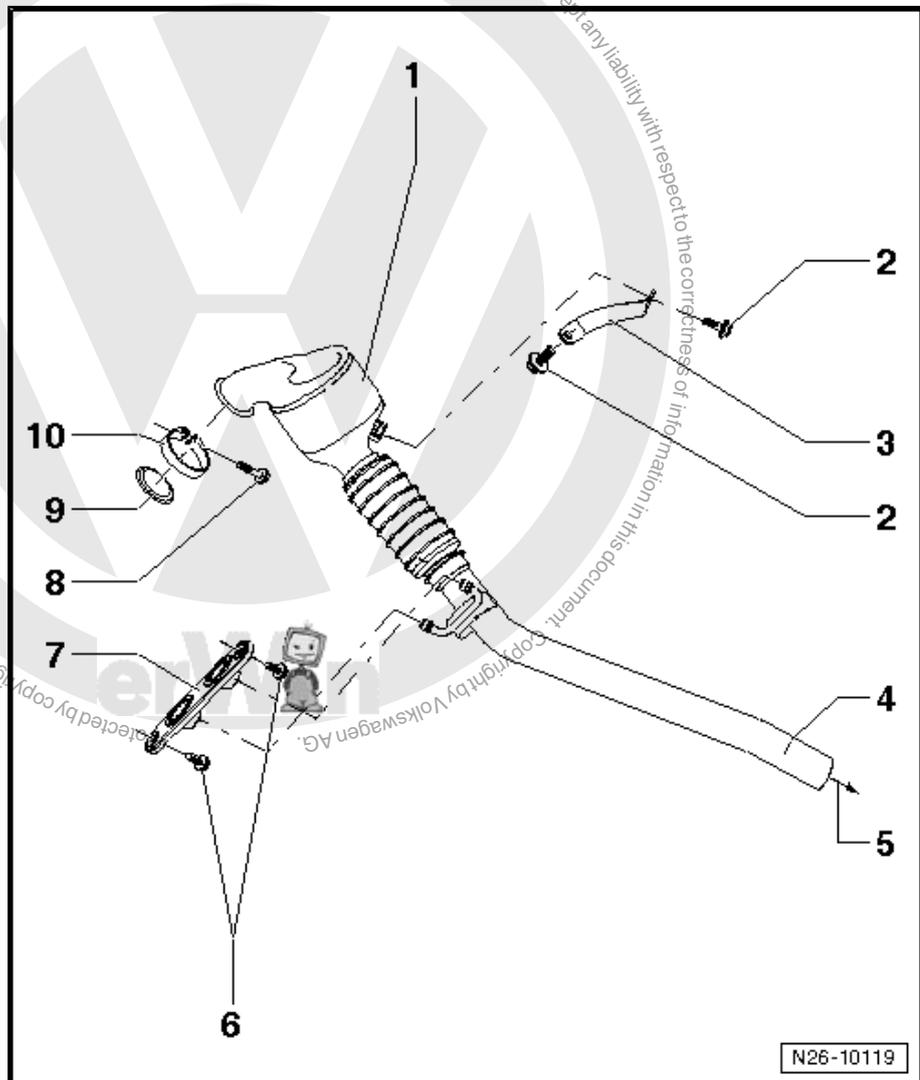
- Renew if damaged.

8 - 7 Nm

9 - Gasket

- Note installation position.

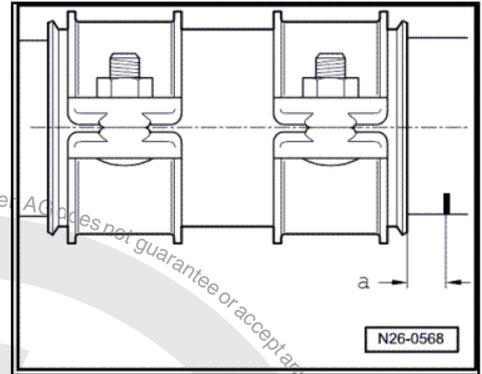
10 - Clip





### Installation position of clamp

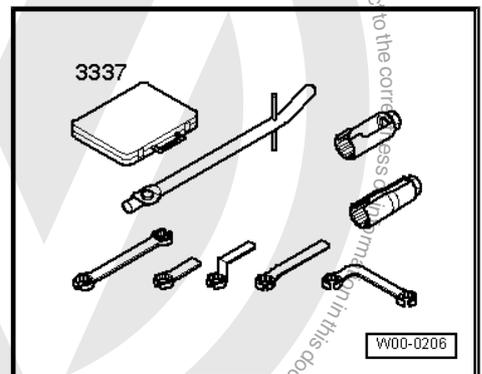
Position clamp at distance -a- = 5 mm from marking on front exhaust pipe.



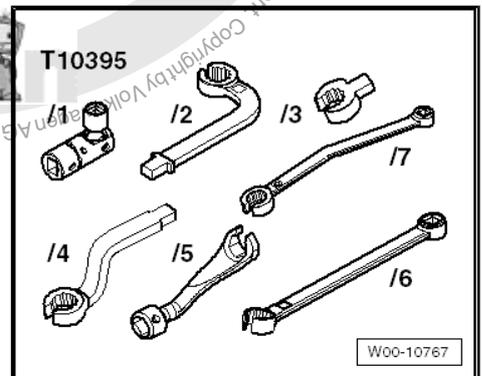
## 1.2 Assembly overview - front exhaust pipe with particulate filter

### Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set -3337-



- ◆ Tool set -T10395-



### Note

*If the particulate filter or the exhaust gas pressure sensor 1 -G450- is changed, the exhaust gas pressure sensor 1 -G450- must always be adapted using diagnostic tester : Guided functions; adapting exhaust pressure sensor 1 -G450- .*



1 - 8 Nm

2 - Exhaust gas pressure sensor 1 -G450-

3 - Bracket

- For control lines

4 - 10 Nm

5 - Control line, 45 Nm

6 - Lambda probe -G39- , 50 Nm

- Grease only the threads with high-temperature paste -G 052 112 A3- ; high-temperature paste -G 052 112 A3- must not get into the slots of probe body.
- To remove use lambda probe open ring spanner set -3337-

7 - Exhaust gas temperature sender bank 2 -G448- , 45 Nm

- Lubricate thread of sender using high-temperature paste -G 052 112 A3-

8 - Particulate filter

- is removed downwards with exhaust gas pressure sensor 1 -G450-
- To remove, remove subframe and steering ⇒ Running gear, axles, steering; Rep. Gr. 40 .

9 - Front exhaust pipe

10 - Marking

- For clamp.
- Installation position of clamp ⇒ [page 189](#) .

11 - To front silencer

12 - 25 Nm

13 - Mounting

- Renew if damaged.

14 - Temperature sender after particulate filter -G527-

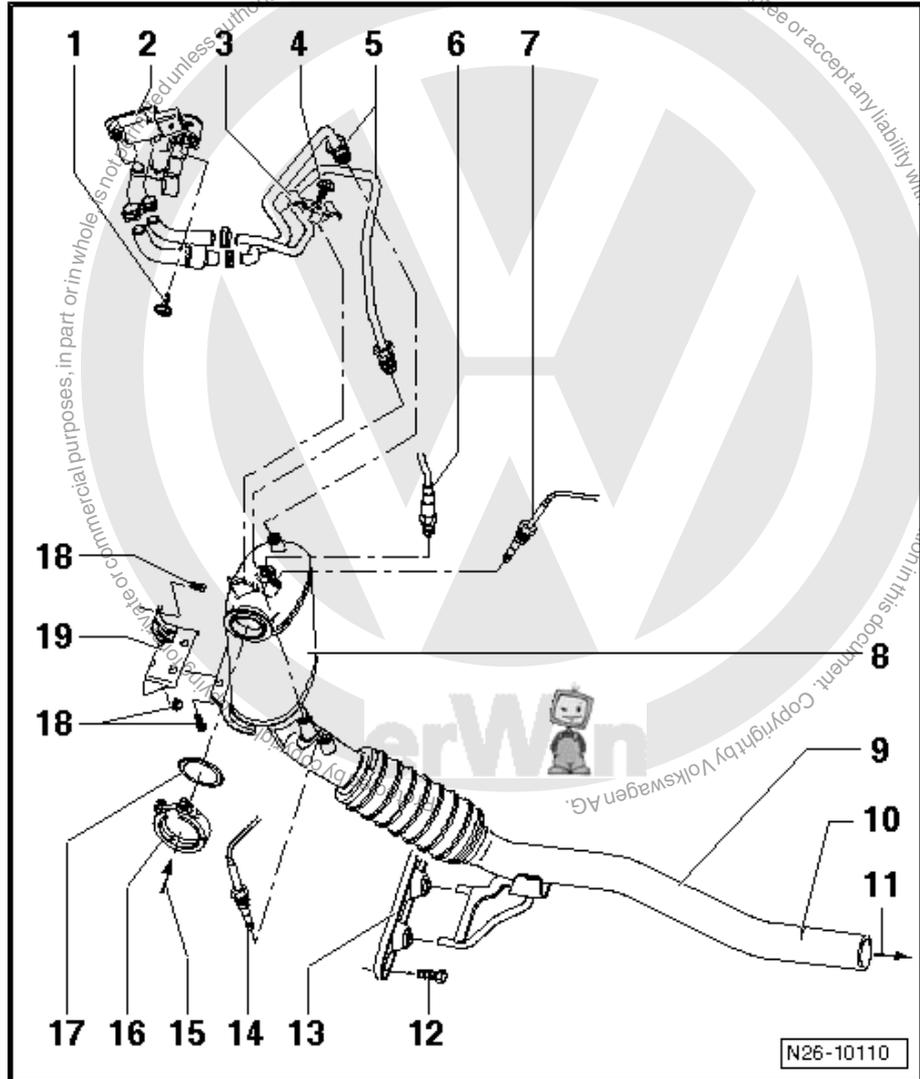
- 45 Nm
- Lubricate thread of sender using high-temperature paste -G 052 112 A3-

15 - From turbocharger

16 - Clamp, 7 Nm

17 - Gasket

- Renew
- Note installation position.





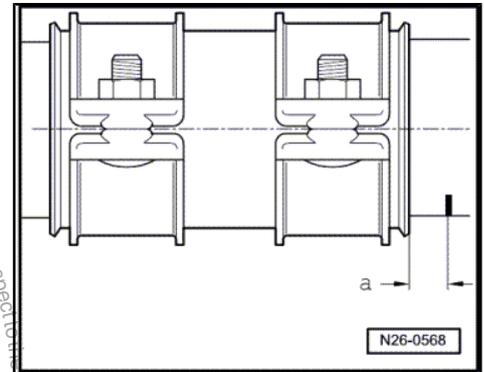
18 - 40 Nm

19 - Bracket

- Bolted to cylinder head

Installation position of clamp

- Position double clamp -a- = 5 mm from marking on front exhaust pipe of particulate filter.



1.3 Assembly overview - silencer with mountings (vehicles with front wheel drive)

1 - 25 Nm

- Renew

2 - Retaining ring

- Renew if damaged.

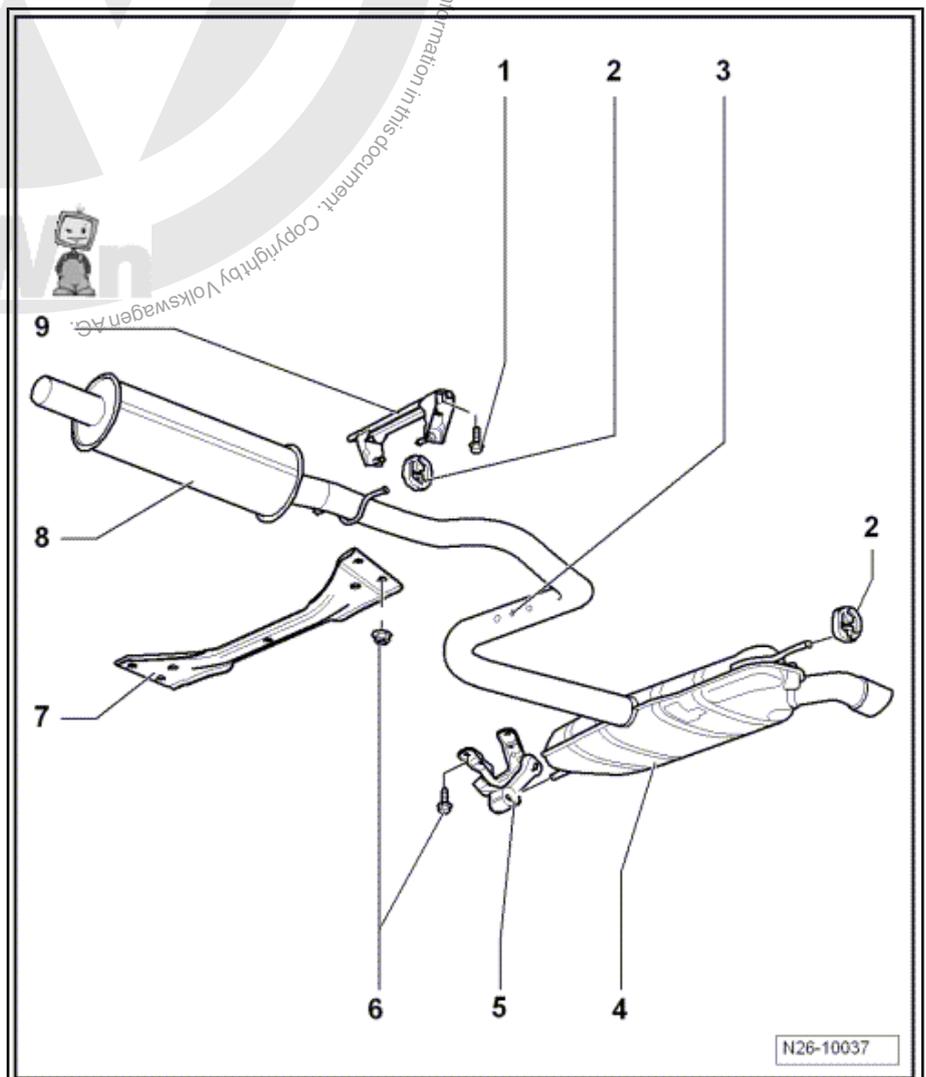
3 - Separating point

- Marked by indentation on exhaust pipe
- During production, front and rear silencers are installed as a single component. For repairs, front and rear silencers are supplied separately.
- The connection is made with a clamp.
- Cutting exhaust pipe  
=> [page 190](#)
- Installation position of rear clamp (repair double clamp)  
=> [page 190](#).
- Evenly tighten threaded connections of clamp (repair double clamp).
- Specified torques for clamp (repair double clamp): M8 = 25 Nm, M10 = 40 Nm.
- Before tightening, align cold exhaust system free of tension  
=> [page 192](#)

4 - Rear silencer

5 - Mounting

- Renew if damaged.





6 - 25 Nm

7 - Tunnel bridge

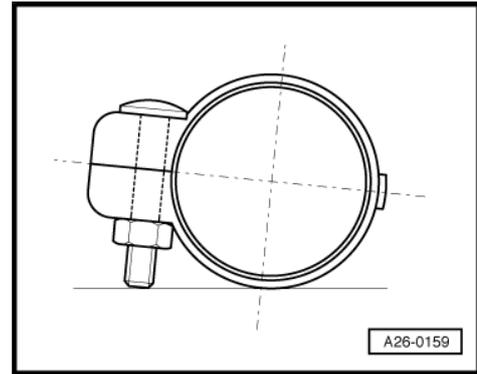
8 - Front silencer

9 - Mounting

- Renew if damaged.

#### Installation position of rear clamp (repair double clamp)

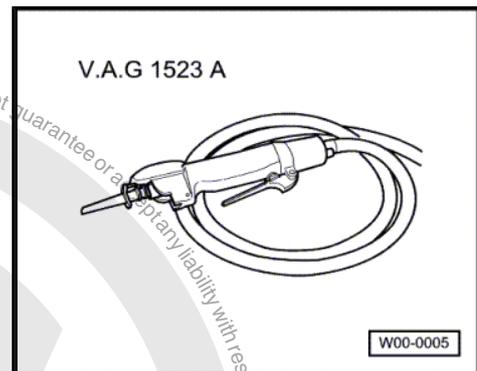
- Install clamp so that ends of bolts do not protrude beyond bottom of clamp.
- Bolt connection faces to left.



### 1.3.1 Separating front and rear silencers

#### Special tools and workshop equipment required

- ◆ Pneumatic sabre saw -V.A.G 1523 A-



- ◆ Eye protection

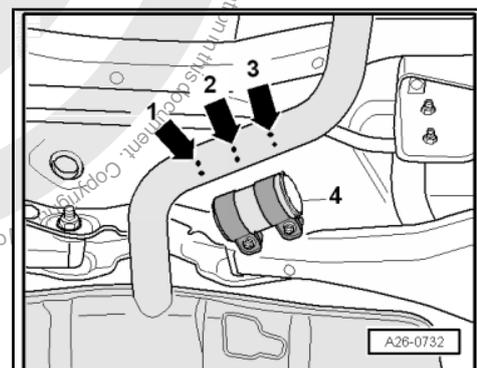
#### Procedure



**WARNING**

*Wear eye protection.*

- Cut exhaust pipe at right angles at separating point -arrow 2-.
- When installing, position repair double clamp -4- at side markings -arrow 1- and -arrow 3-.

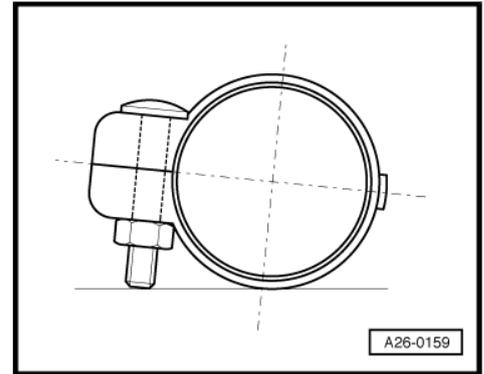




- Install repair double clamp so that end of bolt does not extend beyond lower edge of clamp.
- Bolted connection faces rear.
- Align cold exhaust system free of stress => [page 192](#) .
- Tighten bolts on repair double clamp.

Specified torque, M8: 25 Nm

Specified torque, M10: 40 Nm



## 1.4 Assembly overview - silencer with mountings (vehicles with four-wheel drive)

1 - From particulate filter

2 - Clamp

- Align exhaust system free of stress before tightening clamp => [page 192](#) .
- Installation position => [page 192](#)
- Tighten threaded connections evenly.

3 - Bracket

- For retaining ring

4 - 25 Nm

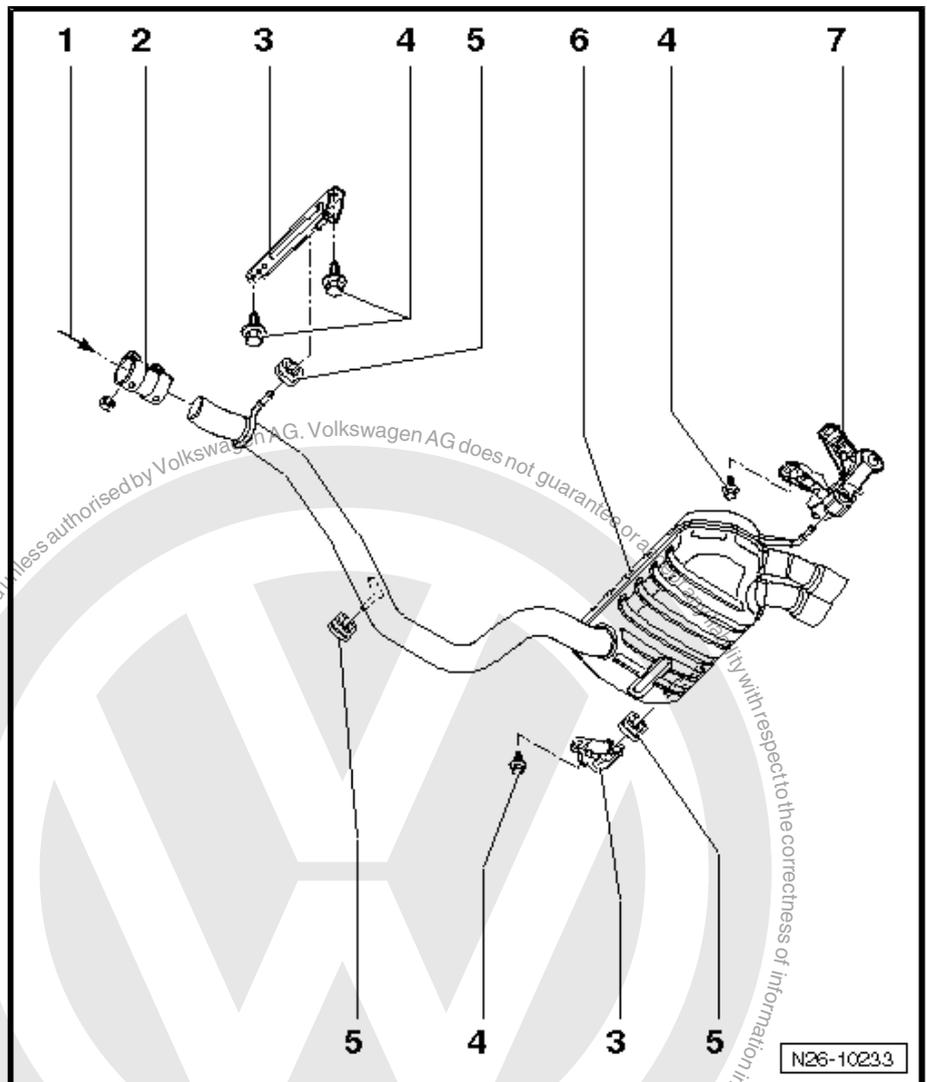
5 - Retaining ring

- Renew if damaged.

6 - Rear silencer

7 - Mounting

- Renew if damaged.

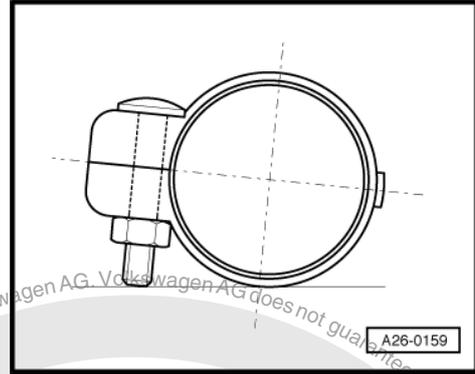


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### Installation position of clamp

- Install clamp so that ends of bolts do not protrude beyond bottom of clamp.



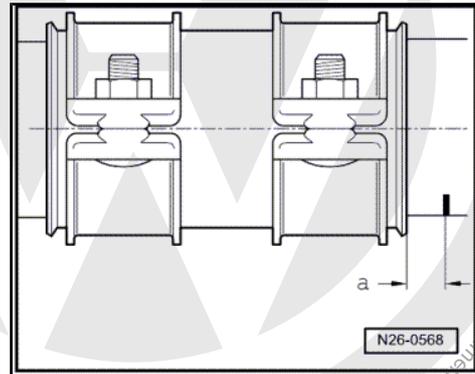
## 1.5 Aligning exhaust system free of stress

### Prerequisite

- Engine must be cold

### Procedure

- Loosen bolted connection of clamp between front exhaust pipe and silencer.
- Position clamp at distance -a- = 5 mm from marking on front exhaust pipe and lightly tighten front bolted connection.

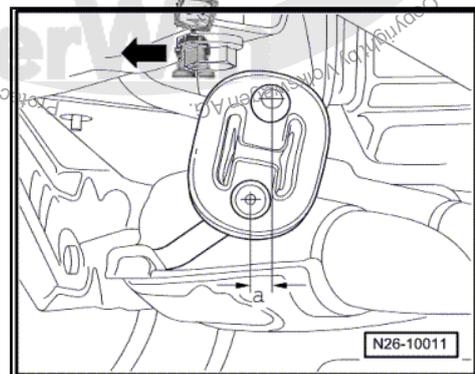


- Push exhaust pipe with silencer forwards into clamp until dimension -a- 15...17 mm is attained between mounting attachment points for body and rear silencer. -Arrow- points in direction of travel.
- Align rear silencer horizontally.
- With parts in this position, tighten bolted connections of clamp.

Specified torque, M8: 25 Nm

Specified torque, M10: 40 Nm

- Once clamp has been tightened, check distance -a- and correct if necessary.





## 2 Exhaust gas recirculation system

### 2.1 Assembly overview - parts of exhaust gas recirculation

Engine codes BKC, BRU, BXE and BXF ⇒ [page 193](#)

Engine code BJB ⇒ [page 195](#)

Engine codes BLS and BXJ ⇒ [page 196](#)

#### 2.1.1 Engine codes BKC, BRU, BXE and BXF



##### Note

- ◆ *The exhaust gas recirculation system is activated by the diesel direct injection system control unit -J248- via exhaust gas recirculation valve -N18- (electric-pneumatic) to the exhaust gas recirculation valve (mechanical).*
- ◆ *The electro-pneumatic exhaust gas recirculation valve -N18- is located in the solenoid valve block.*
- ◆ *The cone-shaped plunger in the mechanical exhaust gas recirculation valve ensures that various cross sectional openings are possible at different plunger lifts.*
- ◆ *Pulsed control enables every conceivable valve position.*
- ◆ *Renew self-locking nuts.*



1 - 22 Nm

**2 - Intake manifold**

- With exhaust gas recirculation valve and intake manifold flap motor -V157- .
- Tighten securing bolts to 22 Nm.

**3 - Gasket**

- Renew

**4 - Connecting pipe**

**5 - Cooler**

- For exhaust gas recirculation.

6 - 10 Nm

**7 - Exhaust manifold**

**8 - Connecting pipe**

Tightening sequence:

- 1. Attach to bypass flap
- 2. Attach to manifold
- 3. Tighten to bypass flap
- 4. Tighten to manifold

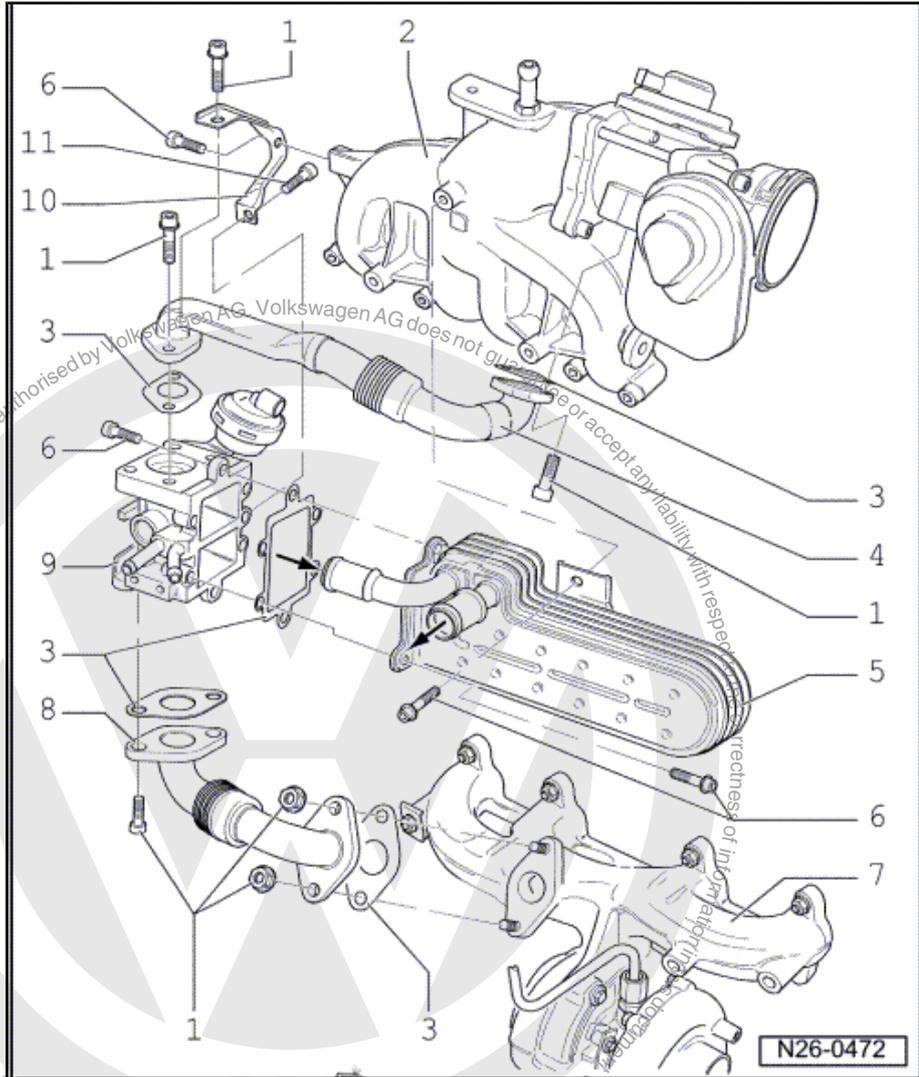
**9 - Bypass flap**

- When activated, directs exhaust gas to exhaust gas recirculation cooler via the electro-pneumatic exhaust gas recirculation valve -N18-

**10 - Bracket**

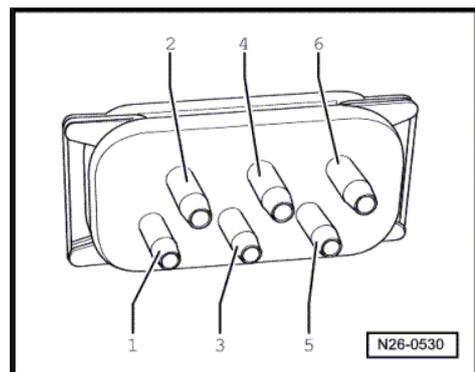
- For bypass flap

11 - 5 Nm



**Connector assignment on solenoid valve block, engine codes BKC, BRU, BXE and BXF**

- 1 - Vacuum connection (on non-return valve for brake servo)
- 2 - Exhaust gas recirculation valve
- 3 - Bypass flap
- 4 - Air filter
- 5 - Vacuum reservoir
- 6 - Vacuum unit on turbocharger

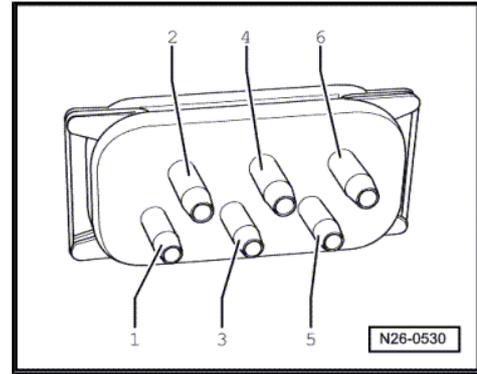






### Pin assignment on solenoid valve block for engine code BJB

- 1 - Vacuum connection (on non-return valve for brake servo)
- 2 - Exhaust gas recirculation valve
- 3 - Intake manifold flap
- 4 - Air filter
- 5 - Vacuum reservoir
- 6 - Vacuum unit on turbocharger



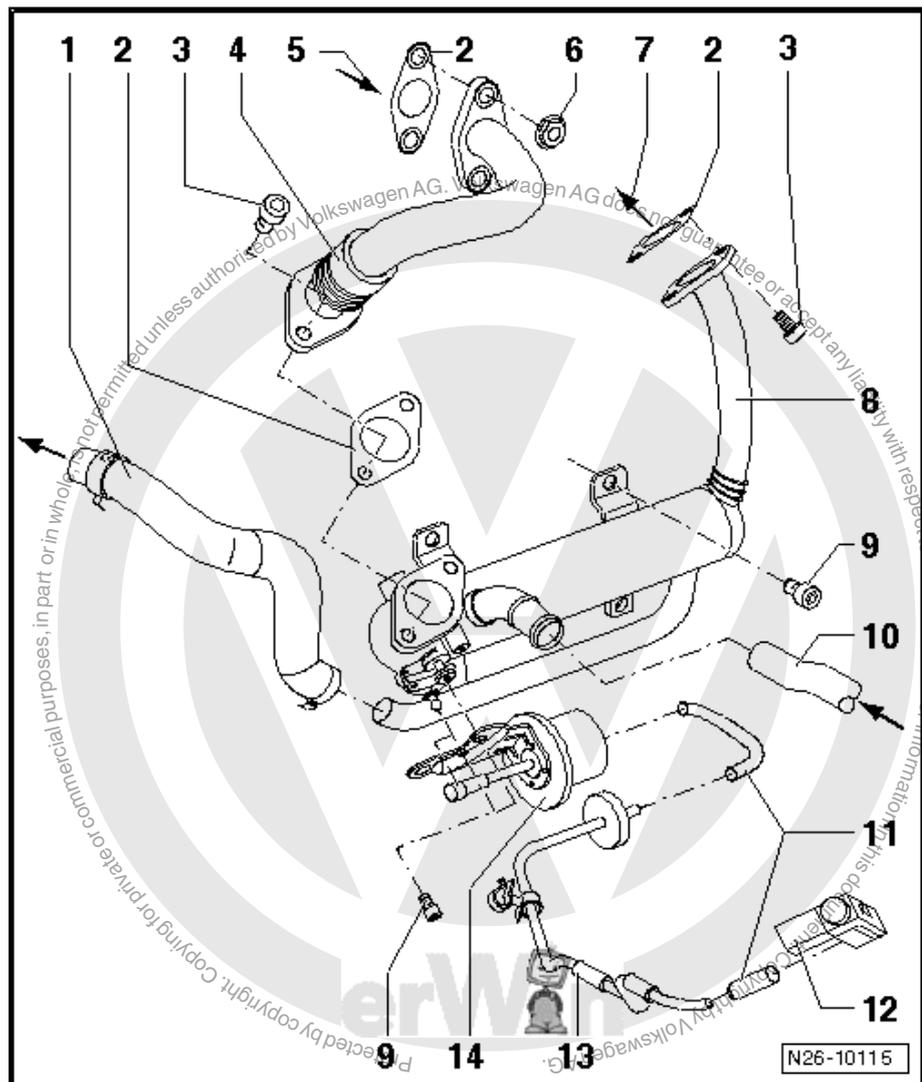
### 2.1.3 Engine codes BLS and BXJ



#### Note

- ◆ *The exhaust gas recirculation system is activated by the diesel direct injection system control unit -J248- via the exhaust gas recirculation potentiometer -G212- .*
- ◆ *Renew self-locking nuts.*

- 1 - Coolant hose
  - To connection
- 2 - Gasket
  - Renew
- 3 - 22 Nm
- 4 - Connecting pipe
- 5 - From exhaust manifold
- 6 - 25 Nm
  - Renew
- 7 - To connection for exhaust gas recirculation valve -N18- with exhaust gas recirculation potentiometer -G212-
  - Assembly overview - intake manifold  
⇒ [page 176](#)
- 8 - Exhaust gas recirculation cooler
- 9 - 10 Nm
- 10 - Coolant hose
  - From rear coolant pipe
- 11 - Connecting hose
- 12 - Exhaust gas recirculation cooler change-over valve - N345-
- 13 - Connecting pipe
- 14 - Vacuum unit
  - For bypass flap





- Renew only together  
with exhaust gas recirculation cooler





## 28 – Glow plug system

### 1 Checking glow plug system

Removing, installing and checking glow plugs ⇒ [page 198](#)

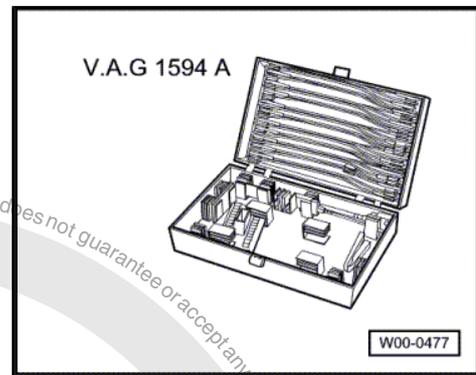
Characteristics of ceramic glow plugs ⇒ [page 199](#)

Removing, installing and checking ceramic glow plugs  
⇒ [page 200](#)

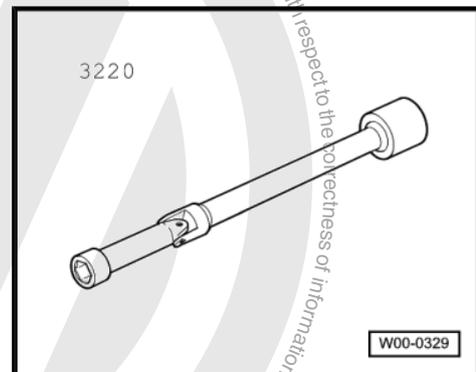
#### 1.1 Removing, installing and checking glow plugs

Special tools and workshop equipment required

- ◆ Auxiliary measuring set -V.A.G 1594 C-



- ◆ Diode test lamp -V.A.G 1527 B-
- ◆ Jointed spanner -3220-



#### Test requirements

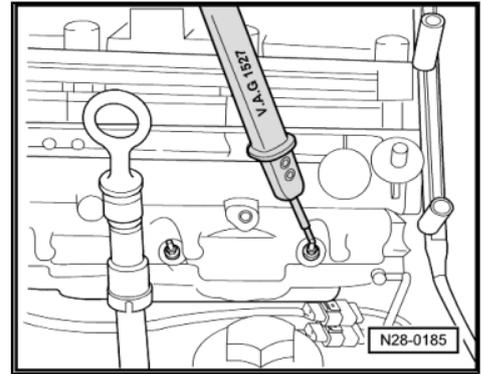
- Battery voltage at least 11.5 V
- Ignition switched off

#### Test procedure

- Pull glow plug connectors off glow plugs.



- Connect voltage tester -V.A.G 1527 B- cable to battery positive, using clamps from adapter set -V.A.G 1594 C- .
- Place probe of diode test lamp -V.A.G 1527 B- on each glow plug one after the other. If diode lights up, glow plug is OK. If diode does not light up, replace glow plug.
- Remove and install glow plugs using jointed spanner -3220- . Specified torque: 15 Nm.



## 1.2 Characteristics of ceramic glow plugs



### WARNING

*The ceramic glow plugs ⇒ [page 199](#) are sensitive to jolts and bending. For this reason a glow plug which has dropped from a small height (approx. 2 cm) must not be used, even if there is no obvious damage. It is absolutely necessary to follow the installation instructions, otherwise the heater pin of the glow plug can break and cause engine damage.*

### Visual features of ceramic glow plugs

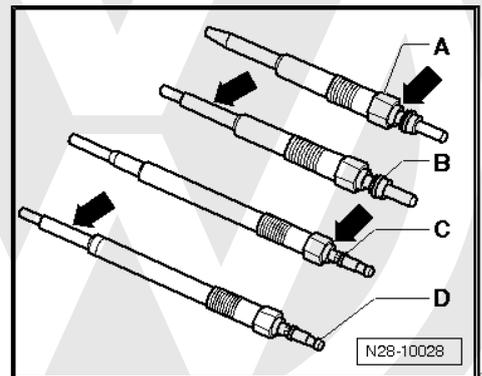
#### Vehicles with 2 valves per cylinder head

- A- = Metal glow plug, colour-coded -arrow-.
- B- = Ceramic glow plug with support tube -arrow-, not colour-coded.

#### Vehicles with 4 valves per cylinder head

- C- = Metal glow plug, colour-coded -arrow-.
- D- = Ceramic glow plug with support tube -arrow-, not colour-coded.

Remove and install or check ceramic glow plugs ⇒ [page 200](#) .

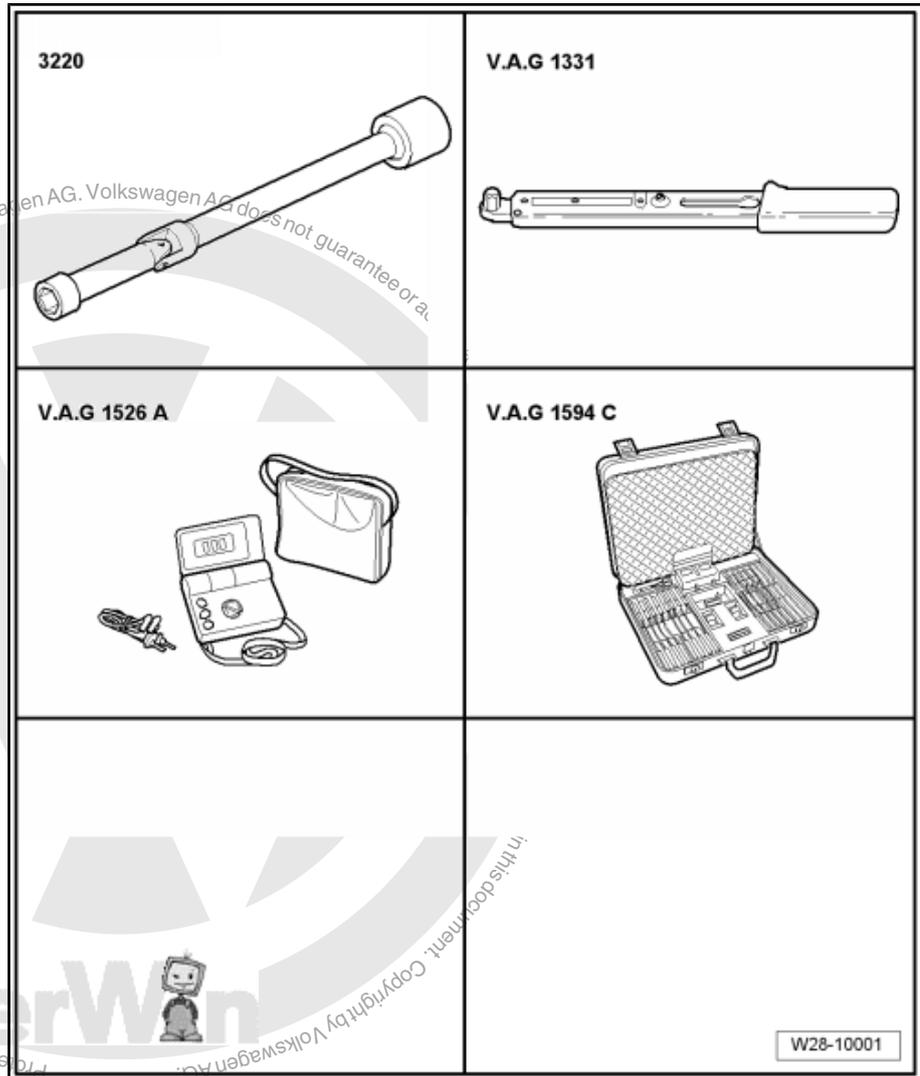




## 1.3 Removing, installing and checking ceramic glow plugs

### Special tools and workshop equipment required

- ◆ Jointed spanner -3220-
- ◆ Torque wrench (5...50 Nm)  
-V.A.G 1331-
- ◆ Hand-held multimeter -  
V.A.G 1526 A-
- ◆ Auxiliary measuring set -  
V.A.G 1594 C-



### Test prerequisites

- Engine is cold
- Ignition switched off

### Procedure



#### Note

*Do not cant ceramic glow plugs when removing and installing.  
Remove any components hindering assembly.*

- Pull connectors off ceramic glow plugs.
- Remove ceramic glow plugs using U/J extension and socket, 10 mm -3220- .

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

- Before installing the drilling in cylinder head and the threads must completely cleaned of all deposits.



#### Note

*Never oil or grease thread of cylinder head bore or of ceramic glow plugs.*

- Screw ceramic glow plugs into cylinder head by hand using U/J extension and socket, 10 mm -3220- .
- Then tighten the ceramic glow plugs. Specified torque: 15 Nm.



#### WARNING

- ◆ ***After installing and before the engine is started, always perform a resistance test on all ceramic glow plugs when engine is cold.***
- ◆ ***If the defective ceramic glow plug is broken, remove all fragments from the engine, otherwise these can cause damage to the engine.***

- ◆ Specification: max. 1  $\Omega$
- If the specification is exceeded, renew the defective ceramic glow plug.

