



## Workshop Manual Caddy 2004 ➤

4-cylinder diesel engine (2.0 l engine, 2-valve, TDI)

Engine ID	BMM								
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Edition 08.2019





## List of Workshop Manual Repair Groups

### Repair Group

- 00 - Technical data
- 10 - Removing and installing engine
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- 17 - Lubrication
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- 21 - Turbocharging/supercharging
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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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Caddy 2004 ➤

4-cylinder diesel engine (2.0 l engine, 2-valve, TDI) - Edition 08.2019

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## 00 – Technical data

### 1 Identification

(VRL013380; Edition 08.2019)

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

#### 1.1 Engine number/engine data

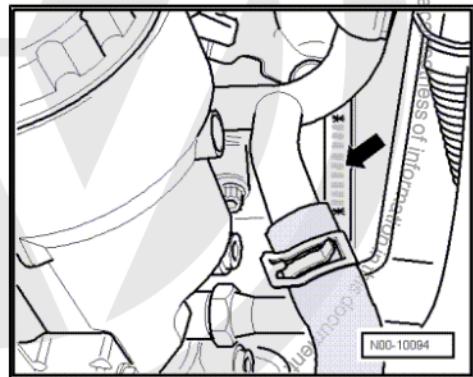
Four digit engine codes have been introduced since model year 2009. The first 3 places show the mechanical design of engine and are stamped on the engine as previously. The fourth digit shows the engine output and varies according to engine control unit. The four digit engine code can be found on the vehicle data sticker and on the engine control unit.

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

The engine number consists of up to nine characters (alphanumeric). The first part (maximum 4 characters) makes up the “engine code”, and the second part (6 characters), the “serial number”. If more than 999,999 engines were produced with the same code letters, the first of the six digits is replaced by a letter.

In addition, 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.



Codes	BMM
Manufactured	09.07
Exhaust emissions fulfil	EU4 standard
Displacement	2.0
Power	103/4000
Torque	320/1750...2500
Bore	∅ mm 81.0
Stroke	mm 95.5
Compression ratio	18.5
Fuel:	acc. to DIN EN 590
Firing order	1-3-4-2
Particulate filter	Yes
Exhaust gas recirculation	Yes
Charging	Yes
Charge air cooling	Yes
Valves per cylinder	2



## 2 Safety information

- ⇒ “[2.1 Safety precautions when working on injection system](#)”,  
[page 2](#)
- ⇒ “[2.2 Safety precautions when working on charge air system](#)”,  
[page 3](#)
- ⇒ “[2.3 Safety measures when working on fuel supply](#)”,  
[page 3](#)
- ⇒ “[2.4 Safety precautions when working on the cooling system](#)”,  
[page 4](#)
- ⇒ “[2.5 Safety precautions when using testers and measuring instruments during a road test](#)”, [page 4](#)

### 2.1 Safety precautions when working on injection system



#### WARNING

*Observe the following points during all installation work, in particular in the engine compartment, due to the space limitations:*

- ◆ *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.*

Note the following if testers and measuring instruments have to be used during a road test:

- ◆ Test and measuring instruments must always 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:

- ◆ Switch off the ignition 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 code for radio having anti-theft coding.
- ◆ Disconnecting and connecting the battery must only be undertaken when the ignition is switched off otherwise the diesel direct injection system control unit may be damaged.



## 2.2 Safety precautions when working on charge air system



### WARNING

*Observe the following points during all installation work, in particular in the engine compartment, due to the space limitations:*

- ◆ *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.*

Note the following if testers and measuring instruments have to be used during a road test:

- ◆ Test and measuring instruments must always 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.

## 2.3 Safety measures when working on fuel supply



### Note

- ◆ *Hose connections are secured with either spring-type or clamp-type clips.*
- ◆ *Always renew crimp-type clips with spring-type clips.*
- ◆ *Hose clip pliers - VAS 6340 - are recommended to install spring-type clips.*



### WARNING

*Observe the following points during all installation work, in particular in the engine compartment, due to the space limitations:*

- ◆ *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.*
- ◆ *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 a cloth around the connection and reduce pressure by carefully loosening the connection!*
- ◆ *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:

- ◆ In order to draw off any escaping fumes, place the extraction hose from a fume extraction system in the vicinity of the fuel tank assembly opening and switch the system on, before beginning work. 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!

## 2.4 Safety precautions when working on the cooling system



### WARNING

*Observe the following points during all installation work, in particular in the engine compartment, due to the space limitations:*

- ◆ *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.*



### Note

- ◆ *Cooling system is pressurized when engine is warm. If necessary, release pressure before carrying out repairs.*
- ◆ *Hose connections are secured with spring-type clips. In case of repair, only use spring-type clips.*
- ◆ *Hose clip pliers - VAS 6340- are recommended to install 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).*

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

Note the following if testers and measuring instruments have to be used during a road test:

- ◆ Test instruments and measuring equipment must always be secured to the rear seat and operated by a second person from this location.
- ◆ Operating from the front passenger seat may result in an accident caused by releasing the front passenger air bag which can cause injuries to the person sitting there.



### 3 Repair instructions

⇒ "3.1 Rules for cleanliness during work on fuel system",  
page 5

⇒ "3.2 Rules for cleanliness when working on fuel supply system/  
injection system", page 5

⇒ "3.3 General notes on the lubrication system", page 5

#### 3.1 Rules for cleanliness during work on fuel system

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

- ◆ Thoroughly clean all joints and surrounding areas before dismantling.
- ◆ Place removed parts on a clean surface and cover them over. Use only lint-free cloths.
- ◆ Carefully cover opened components or seal them if repairs cannot be carried out immediately.
- ◆ Only install clean components: Only unpack replacement parts immediately prior to installation. Do not use parts that have been stored unpackaged (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: avoid working with compressed air, and do not move vehicle if at all possible.

#### 3.2 Rules for cleanliness when working on fuel supply system/injection system

When working on the fuel supply/injection system, pay careful attention to the following "6 rules":

- ◆ Thoroughly clean all joints and surrounding areas before dismantling.
- ◆ Place removed parts on a clean surface and cover them over. Use only lint-free cloths.
- ◆ Carefully cover opened components or seal them if repairs cannot be carried out immediately.
- ◆ Only install clean components: Only unpack replacement parts immediately prior to installation. Do not use parts that have been stored unpackaged (e.g. in tool boxes etc.).
- ◆ When system is open: avoid working with compressed air, and do not move vehicle if at all possible.
- ◆ Also ensure that no diesel fuel comes into contact with the coolant hoses. Should this occur, the hoses must be cleaned immediately. Damaged hoses must be renewed.

#### 3.3 General notes on the lubrication system



Note

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

**Caution**

*Finding metal shavings or a large quantity of small metal particles during engine repair could indicate that the crankshaft bearings or conrod bearings are damaged. To prevent this from causing further damage, perform the following repairs:*

- ◆ *Thoroughly clean oil passages,*
- ◆ *Renew oil spray jets,*
- ◆ *Renew engine oil cooler,*
- ◆ *Renew oil filter element.*

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## 10 – Removing and installing engine

### 1 Removing and installing engine

⇒ “[1.1 Removing engine](#)”, page 7

⇒ “[1.2 Securing engine on engine and gearbox support](#)”,  
page 12

⇒ “[1.3 Installing engine](#)”, page 14

#### 1.1 Removing engine

Special tools and workshop equipment required

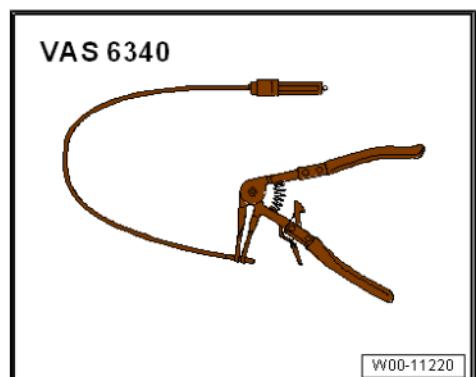
- ◆ Drip tray for workshop hoist - VAS 6208-



- ◆ Engine and gearbox jack - VAS 6931-



- ◆ Hose clamp pliers - VAS 6340-



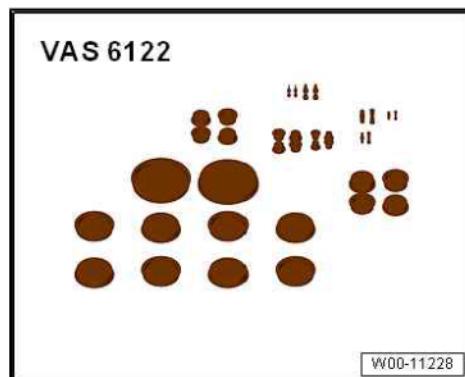


- ◆ Step - VAS 6292/4-



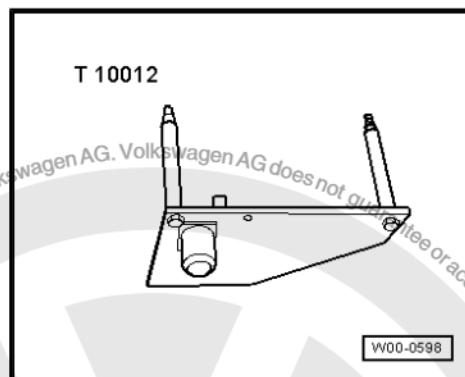
W00-10853

- ◆ Engine bung set - VAS 6122-



W00-11228

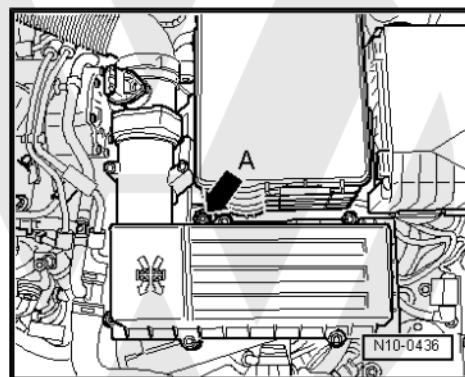
- ◆ Engine support - T10012-



W00-0598

## Removing

- With the ignition switched off, disconnect battery earth strap.
- Remove bolt -arrow- and pull air filter housing upwards out of mounting.
- Remove air filter housing together with air mass meter.

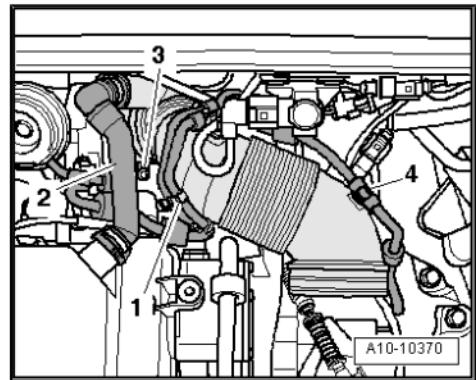




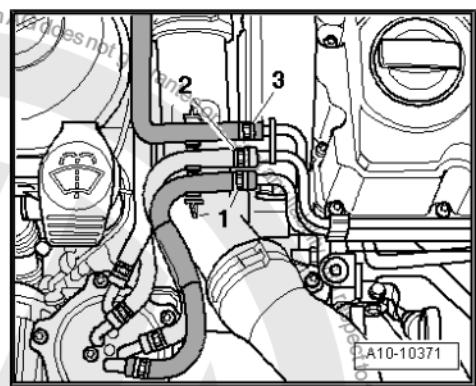
- Disconnect crankcase breather hose -2-.
- Expose the ventilation hose -4- and vacuum hoses -1- at air hose.
- Remove bolt -3-.
- Swing air hose backwards, and pull it off turbocharger.
- Remove battery and battery tray.
- Remove plenum chamber bulkhead ⇒ General body repairs, exterior; Rep. gr. 50 ; Body - front; Plenum chamber bulkhead .


**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 - risk of scalding.*
- ◆ *Wear protective gloves.*
- ◆ *Wear protective goggles.*



- Pull fuel supply hose -2- and fuel return hose -1- off fuel lines.
- Disconnect coolant hose -3- from coolant line.





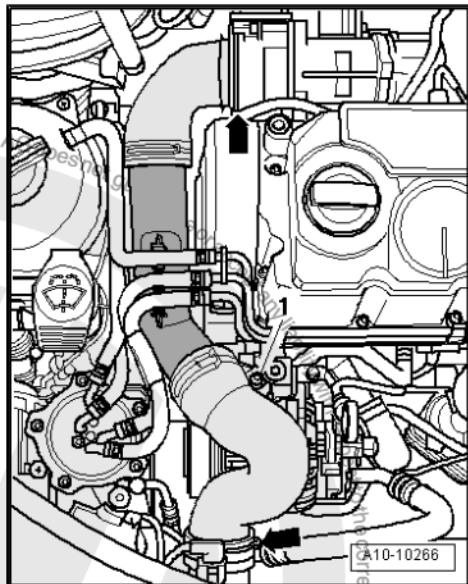
- Unclip fuel hoses and coolant hoses from connecting pipe between charge air cooler and intake connecting pipe.
- Remove bolt -1-.
- Remove connecting pipe between charge air cooler and intake connecting pipe, to do this, lightly lift retaining clips -arrows-.
- If present, remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Body, front; Noise insulation .
- Bring lock carrier into service position ⇒ General body repairs, exterior; Rep. gr. 50 ; Body, front; Lock carrier .
- Drain coolant [⇒ page 96](#)

#### Vehicles with air conditioning system



##### Note

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

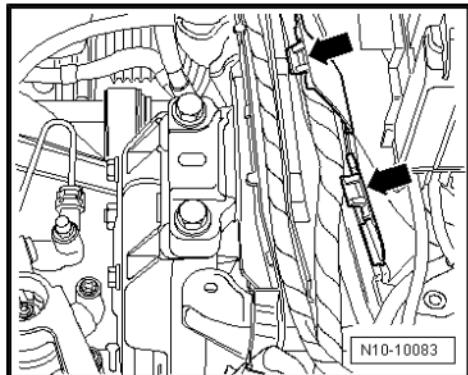


To facilitate removing and installing engine without opening refrigerant circuit:

- Remove poly V-belt [⇒ page 20](#) .
- Remove vane pump pulley.
- Unscrew vane pump for power-assisted steering from bracket and place to one side. The hoses remain connected ⇒ Running gear, axles, steering; Rep. gr. 48 ; Hydraulic power-assisted steering .
- Remove air conditioner compressor from ancillaries bracket ⇒ Heating, air conditioning system; Rep. gr. 87 ; Air conditioner compressor .
- Secure air conditioner compressor to lock carrier so that the refrigerant lines/hoses are not under tension.

#### Continued for all vehicles

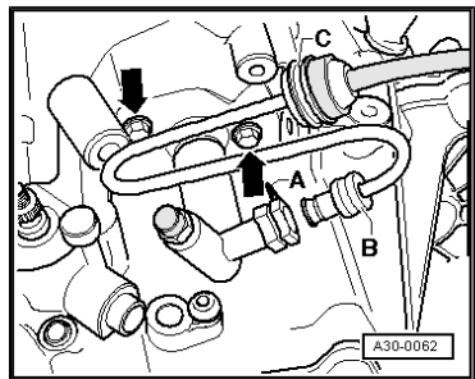
- Remove engine control unit [⇒ page 142](#) .
- Release connectors on engine control unit and pull off connector.
- Remove wiring harness grommet.
- Open all cable guide fasteners -arrows-.
- Remove wiring harness from cable guide on longitudinal member and lay to side on engine.
- Pull/clamp off all other necessary electrical cables from engine/gearbox and move them clear.
- Separate all connecting, coolant, vacuum and intake hoses from engine.





### Vehicles with manual gearbox

- Remove selector mechanism from gearbox ⇒ Power transmission; Rep. gr. 34 ; Selector mechanism .
- Unclip line -B- from slave cylinder of hydraulic clutch at connection (pull clip -A-).
- Pull line -B- out of retainer -C-.

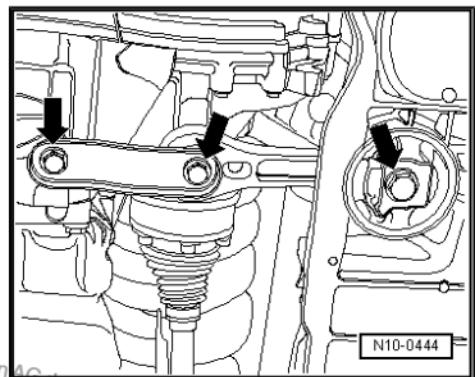


### Vehicles with dual clutch gearbox

- Remove selector mechanism from gearbox ⇒ Power transmission; Rep. gr. 34 ; Selector mechanism .

### Continued for all vehicles

- Pull connector off oil level and oil temperature sender - G266- .
- Pull retainer for oil level and oil temperature sender - G266- off subframe.
- Unbolt left drive shaft from gearbox ⇒ Running gear, axles, steering; Rep. gr. 40 ; Removing and installing drive shafts .
- Remove right drive shaft completely ⇒ Running gear, axles, steering; Rep. gr. 40 ; Removing and installing drive shafts .
- Unbolt pendulum support -arrows-.
- Remove front exhaust pipe with diesel particulate filter  
⇒ [page 153](#) .

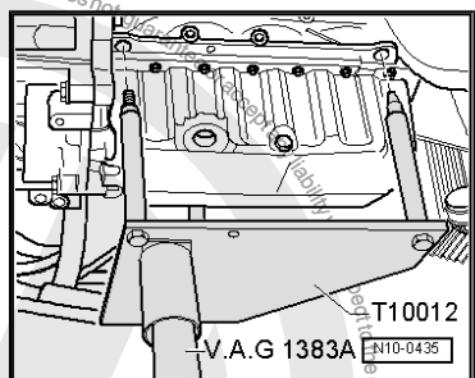


- Insert engine bracket - T10012- in engine and gearbox jack - VAS 6931- .



#### Note

- ◆ The illustration shows the old engine and gearbox jack - V.A.G 1383 A- .
- ◆ Support pins must be secured to engine bracket - T10012- as shown in illustration. The threaded support pin must be on the gearbox side.
- Insert engine bracket T10012- in engine and gearbox jack - VAS 6931- .
- Secure engine bracket - T10012- to cylinder block using M10×25/8.8 bolt and a torque setting of 40 Nm.

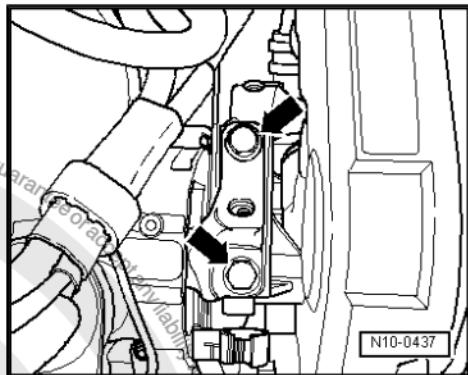




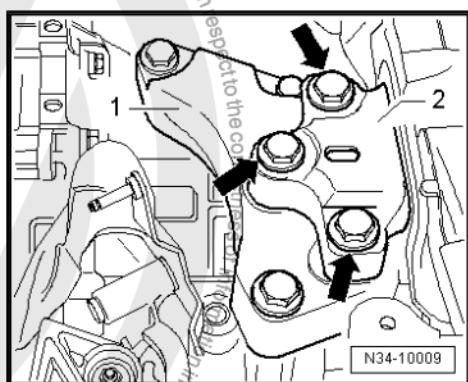
Caddy 2004 >

4-cylinder diesel engine (2.0 l engine, 2-valve, TDI) - Edition 08.2019

- Lift engine and gearbox slightly using engine and gearbox jack - VAS 6931- .
- Unbolt engine side of assembly mounting from engine bracket -arrows- from above . To do this, use step VAS 6292/4.



- Unscrew hexagon bolt -arrows- for left assembly mounting -2- from bracket -1-. To do this, use step - VAS 6292/4- .
- Carefully lower engine with gearbox.
- For further assembly work, secure engine on engine and gearbox support [⇒ page 12](#) .



## 1.2 Securing engine on engine and gearbox support

Special tools and workshop equipment required

- ◆ Workshop hoist - VAS 6100-



- ◆ Lifting tackle - 2024 A-





- ◆ Engine and gearbox support - VAS 6095A-



- ◆ Universal mounting - VAS 6095/1-

#### Procedure



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

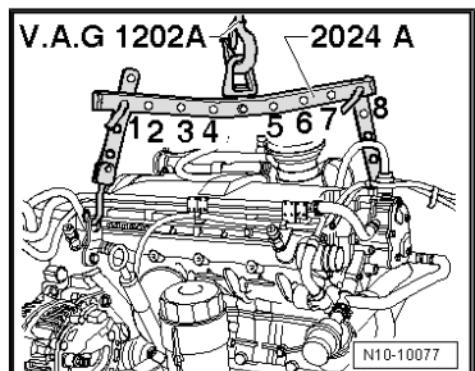
- Remove engine [⇒ page 7](#).
- Position engine and gearbox jack - VAS 6931- by a workbench.
- Lower engine/gearbox unit until gearbox rests on workbench.
- Remove engine/gearbox connecting bolts.
- Unbolt gearbox.
- Attach lifting tackle - 2024 A- as follows and lift engine from engine and gearbox jack - VAS 6100- using workshop hoist - VAS 6931- .



*The illustration shows the old workshop hoist - V.A.G 1202 A- .*

Pulley end: 3rd hole in hook rail at position 1

Flywheel end: 4th hole in hook rail at position 8



#### WARNING

*Use locking pins at hooks and locating pins.*



- ◆ *The positions marked 1...4 on the bar must face towards the V-belt pulley end.*
- ◆ *The holes in the hook rails are counted up from the hook.*
- Secure engine on engine and gearbox support - VAS 6095/1- using universal mounting - VAS 6095A- .



## 1.3 Installing engine

Special tools and workshop equipment required

- ◆ Torque wrench 6-50Nm - V.A.G 1331-



- ◆ Torque wrench 40-200Nm - V.A.G 1332-



Install in reverse order of removal, observing the following:



### 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 canister system, coolant, refrigerant, brake fluid and vacuum) and electrical wiring in their original positions.*
- ◆ *Ensure that there is sufficient clearance from all moving or hot components.*

- For vehicles with manual gearbox check clutch release bearing for wear and renew if necessary.
- Clean input shaft splines, and lightly grease it with grease - G 000 100- .
- Check whether dowel sleeves for centring the engine/gearbox assembly are fitted in the cylinder block; install if necessary.
- Align engine mountings free of stress by shaking them. If necessary, loosen engine mounting on body.
- Install drive shafts ⇒ Running gear, axles, steering; Rep. gr. 40 ; Removing and installing drive shafts .

#### Vehicles with manual gearbox

- Connect hydraulic line of hydraulic clutch to ⇒ 6-speed manual gearbox 02Q; Rep. gr. 30 ; Clutch mechanism .



- Bleed clutch mechanism ⇒ Power transmission; Rep. gr. 30 ; Clutch mechanism
- Connect selector mechanism to gearbox ⇒ Power transmission; Rep. gr. 34 ; Selector mechanism .

#### Vehicles with dual clutch gearbox

- Connect selector mechanism to gearbox ⇒ Power transmission; Rep. gr. 34 ; Selector mechanism .

#### Continued for all vehicles

- Install air conditioner compressor ⇒ Heating, air conditioning system; Rep. gr. 87 ; Air conditioner compressor .
- Install vane pump for power-assisted steering ⇒ Running gear, axles steering; Rep. gr. 48 ; Hydraulic power-assisted steering .
- Install poly V-belt [⇒ page 20](#) .
- Install noise insulation, if removed ⇒ General body repairs, exterior; Rep. gr. 66 ; Body, front; Noise insulation .
- Install engine control unit [⇒ page 142](#) .
- Install plenum chamber bulkhead ⇒ General body repairs, exterior; Rep. gr. 50 ; Body - front, plenum chamber bulkhead .
- Fill coolant system with coolant [⇒ page 96](#) .
- Carry out road test and then read event memory ⇒ Vehicle diagnostic tester.

#### Specified torques

Bolted connection		Specified torque
Nuts and bolts	M6	10 Nm
	M8	20 Nm
	M10	45 Nm
	M12	60 Nm

#### Specified torques

- ◆ [⇒ “2.1 Assembly overview - assembly mountings”, page 16](#)
- ◆ [⇒ “2.1 Assembly overview - emission control”, page 153](#)
- ◆ [⇒ “1.1 Assembly overview - silencers”, page 150](#)



## 2 Assembly mountings

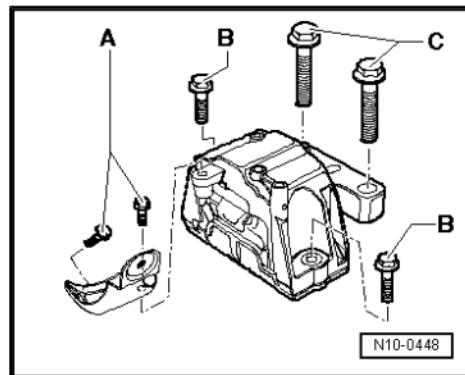
⇒ “2.1 Assembly overview - assembly mountings”, page 16

### 2.1 Assembly overview - assembly mountings

Specified torques for engine assembly mounting

Specified torque

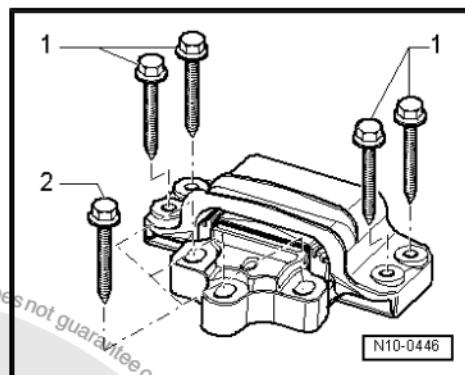
Component	Specified torque
Bolt -A-	20 Nm +90°
Bolt -B-	40 Nm +90°
Bolt -C-	60 Nm +90°



Gearbox mounting

Specified torque

Component	Specified torque
Bolt -1-	40 Nm +90°
Bolt -2-	60 Nm +90°



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## Pendulum support

Always observe size and property class of the bolt. Different torque specifications apply.

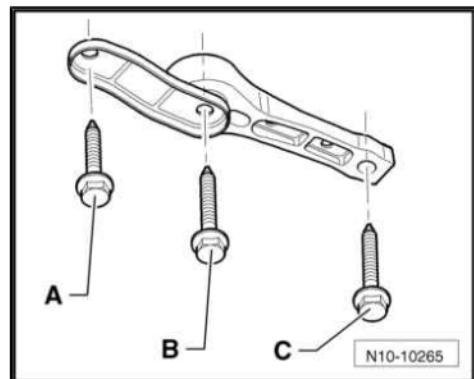


### Caution

*As of gearbox production date 28.05.07, Heli-Coil inserts are installed in the threaded connections to pendulum support in manual gearboxes 02Q. Identification ⇒ Rep. gr. 34*

*Use a bolt with property class 10.9 for this and all other gearboxes.*

*If there is no Heli-Coil insert in the 02Q gearbox, use class 8.8 bolts and the corresponding torque setting.*



Tighten only if pendulum support is bolted to gearbox.

Always renew after removing.

### Specified torque

Component	Specified torque
Bolt A: M10 x 35, property class 8.8	40 Nm +90°
Bolt A: M10 x 35, property class 10.9	50 Nm +90°
Bolt B: M10 x 75, property class 8.8	40 Nm +90°
Bolt B: M10 x 75, property class 10.9	50 Nm +90°
Bolt C: M14 x 1.5 x 70	100 Nm +90°





## 13 – Crankshaft group

### 1 Cylinder block (pulley end)

⇒ “1.1 Assembly overview - poly V-belt drive”, page 18

⇒ “1.2 Assembly overview - cylinder block”, page 19

⇒ “1.3 Removing and installing poly-V belt”, page 20

⇒ “1.4 Renewing crankshaft oil seal - belt pulley end”,  
page 22

⇒ “1.5 Removing and installing sealing flange on pulley end”,  
page 24

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

##### 1 - Poly V-belt

- Mark direction of rotation before removing
- Check for wear
- Do not kink
- Removing and installing  
⇒ page 20

##### 2 - Bolt

- 10 Nm +90°

##### 3 - Cover

##### 4 - Belt pulley and vibration damper

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

##### 5 - Bolt

- 25 Nm

##### 6 - Poly V-belt tensioning element

- Swing with open-end spanner to slacken poly V-belt.

##### 7 - Alternator

##### 8 - Ancillary bracket

##### 9 - Bolt

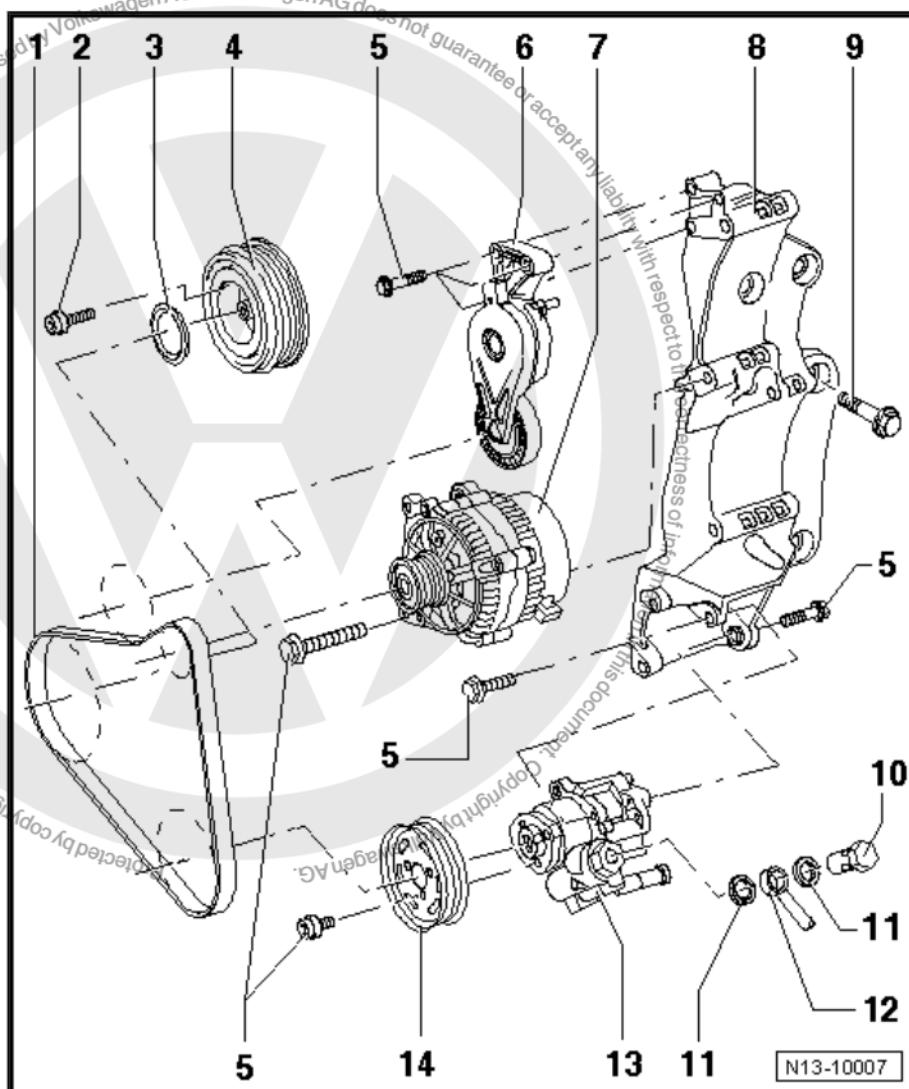
- Observe tightening sequence ⇒ page 20
- 45 Nm

##### 10 - Banjo bolt

- 30 Nm

##### 11 - Seal

- Renew after removal





12 - Pressure line

13 - Vane pump

- Removing and installing ⇒ Running gear, axles, steering; Rep. gr. 48 ; Hydraulic power-assisted steering .

14 - Pulley

## 1.2 Assembly overview - cylinder block

1 - Cylinder block

- Removing and installing sealing flange and flywheel ⇒ [page 28](#).
- Removing and installing crankshaft ⇒ [page 38](#).
- Dismantling and assembling pistons and connecting rods ⇒ [page 38](#)

2 - Seal

- Renew after removal

3 - Oil filter bracket

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

4 - Bolt

- Renew after removal
- First fit upper left and lower right bolts and then tighten all four bolts diagonally.
- 15 Nm +90°

5 - Bracket

6 - Bolt

- 20 Nm

7 - Union

8 - Bolt

- 15 Nm

9 - O-ring

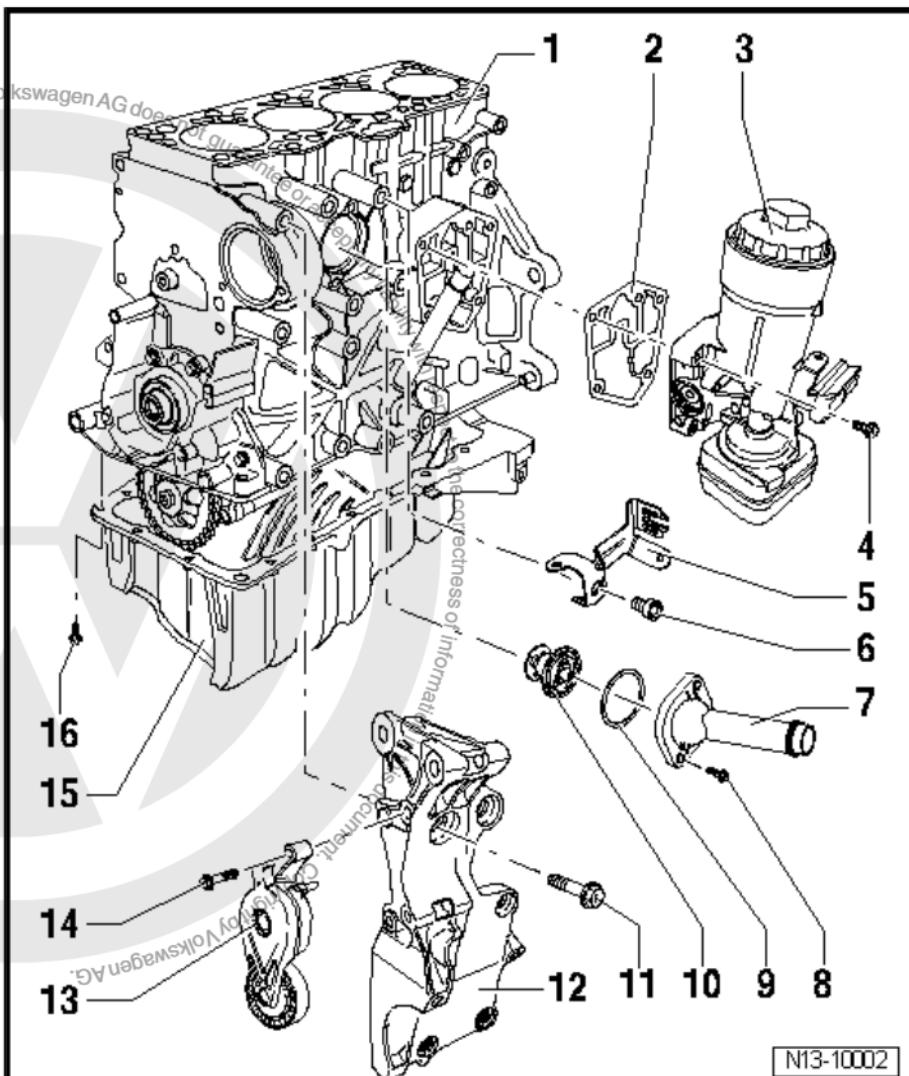
- Renew after removal

10 - Thermostat

- Checking: heat thermostat in water.
- Begins to open at approx. 85°C
- Ends at approx. 105°C
- Opening lift min. 7 mm
- Note installation position ⇒ [page 110](#)
- Removing and installing ⇒ [page 110](#)

11 - Bolt

- Observe tightening sequence ⇒ [page 20](#)
- 45 Nm





12 - Bracket

13 - Tensioning element

- for poly V-belt

14 - Bolt

- 25 Nm

15 - Sump

- Clean sealing surface before fitting.
- Silicone sealant ⇒ Electronic parts catalogue (ETKA)
- Removing and installing ⇒ [page 89](#)

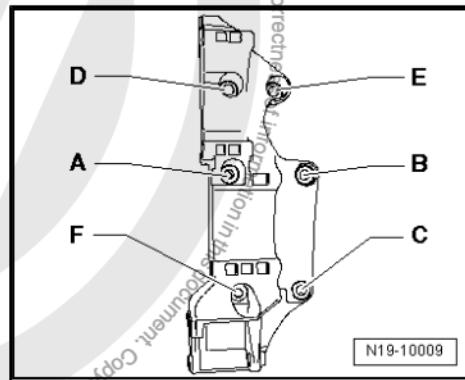
16 - Bolt

- 15 Nm

#### Sequence for tightening ancillary bracket to cylinder block

- Place ancillary bracket on cylinder block (observe dowel sleeve between ancillary bracket and cylinder block).
- Tighten ancillary bracket bolts as shown in illustration:

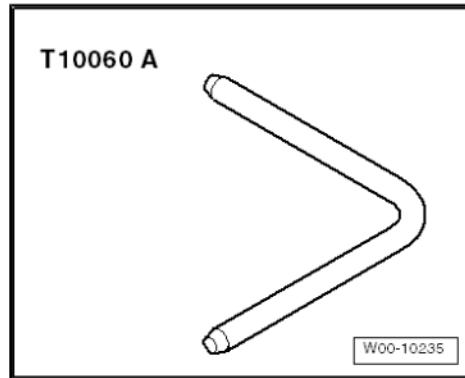
- 1 - Bolt -A-
- 2 - Bolt -B-
- 3 - Bolt -C-
- 4 - Bolt -D-
- 5 - Bolt -E-
- 6 - Bolt -F-



### 1.3 Removing and installing poly-V belt

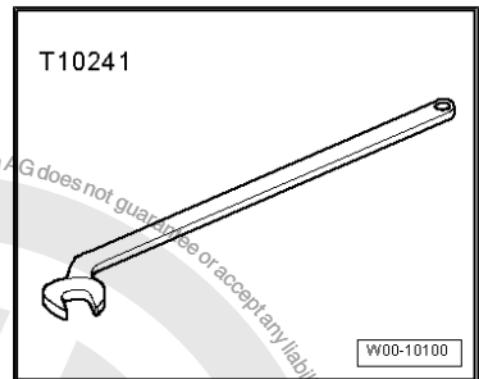
Special tools and workshop equipment required

- ◆ Locking pin - T10060 A-





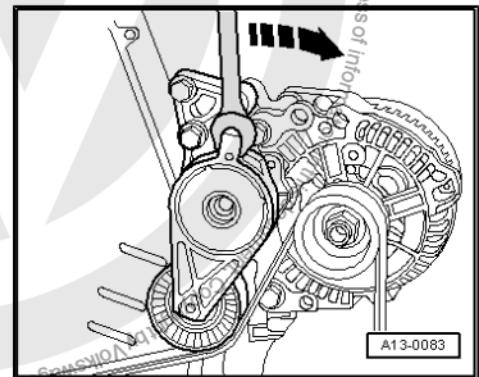
- ◆ 16 mm open-end spanner - T 10241-



#### Removing

- If present, remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 Body, front; Noise insulation .
- Mark poly V-belt direction of rotation.
- Using a 16 mm open-end spanner, swing tensioning element in direction of arrow to release tension from poly V-belt.

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



- Lock tensioning element using locking pin - T10060 A- .
- Remove poly V-belt.

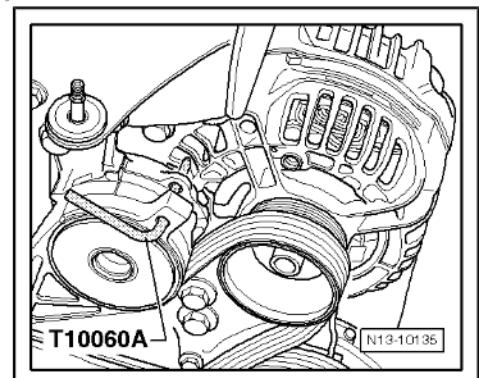
#### Installing

Install in reverse order of removal, observing the following:



#### Note

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

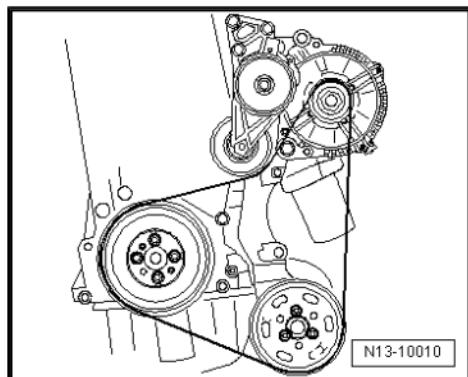


After completing repairs always:

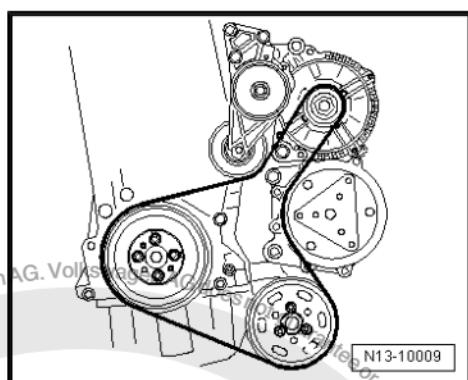
- Start engine and check belt running.



Belt drive without air conditioner compressor



Belt drive with air conditioner compressor

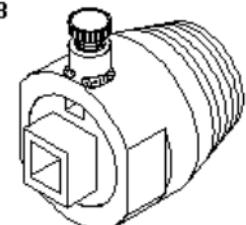
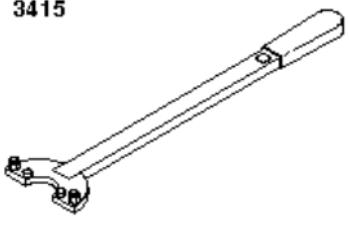
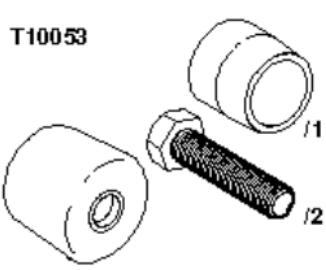
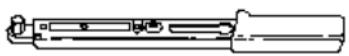
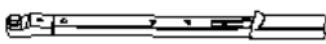


## 1.4 Renewing crankshaft oil seal - belt pulley end

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Special tools and workshop equipment required

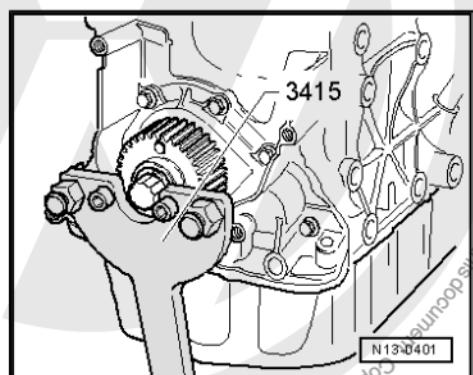
	
	
	

W13-0100

- ◆ Seal puller - 3203-
- ◆ Counter-hold tool - 3415-
- ◆ Assembly tool - T10053-
- ◆ Torque wrench - V.A.G 1331-
- ◆ Torque wrench - V.A.G 1332-

#### Removing

- Remove toothed belt [⇒ page 62](#).
- Remove crankshaft sprocket. To do this, lock toothed belt pulley using counterhold - 3415 - .
- 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.





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4-cylinder diesel engine (2.0 l engine, 2-valve, TDI) - Edition 08.2019

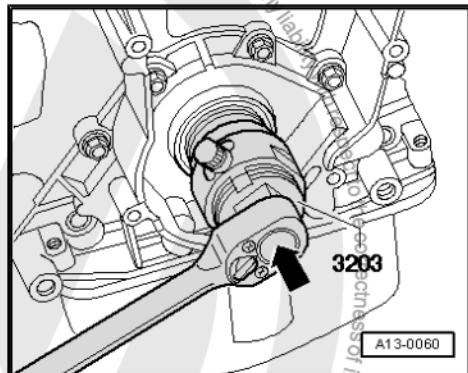
- Using great pressure, screw oil seal extractor as far as possible into seal.
- Loosen knurled screw and turn inner part against crankshaft until oil seal is pulled out.

#### Installing

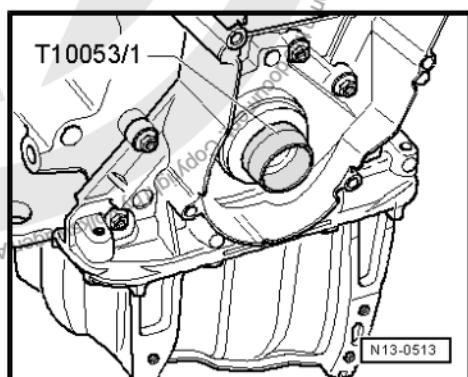
Install in reverse order of removal, observing the following:



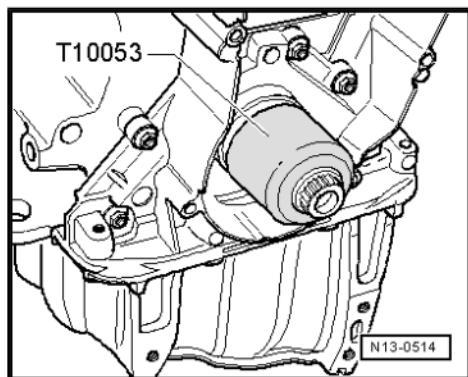
*Do not be additionally oil or grease the oil seal sealing lip.*



- 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 crankshaft pulley. by locking the toothed-belt pulley using counterhold - 3415- .

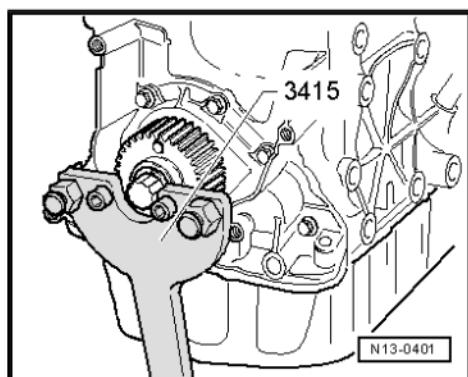


*Thread and shoulder of the centre bolt must be free of oil and grease.*

- Install toothed belt [page 62](#) .

Specified torques

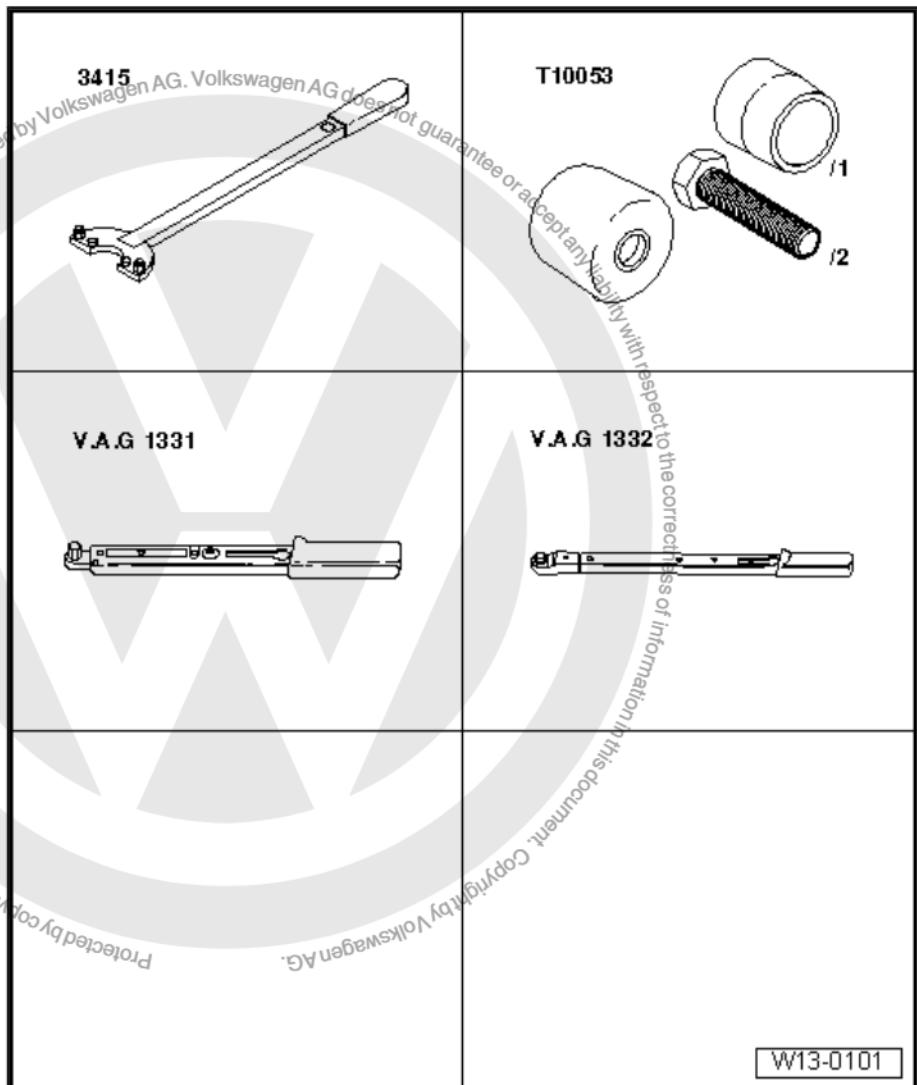
- ◆ [⇒ "2.1 Assembly overview - toothed belt drive", page 60](#)



## 1.5 Removing and installing sealing flange on pulley end



Special tools and workshop equipment required



- ◆ Counter-hold tool - 3415-
- ◆ Assembly tool - T10053-
- ◆ Torque wrench - V.A.G 1331-
- ◆ Torque wrench - V.A.G 1332-

Not illustrated:

- ◆ Silicone sealant ⇒ Electronic parts catalogue (ETKA)
- ◆ Hand drill with plastic brush attachment
- ◆ Scraper
- ◆ Safety glasses

Removing

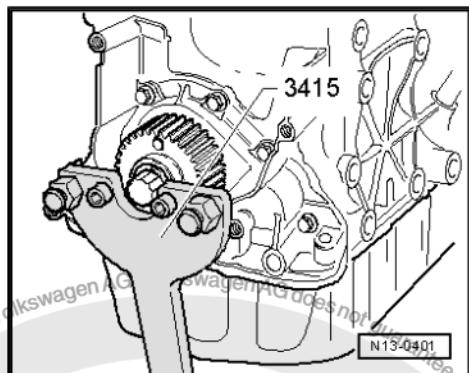
- Remove toothed belt [⇒ page 62](#).



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4-cylinder diesel engine (2.0 l engine, 2-valve, TDI) - Edition 08.2019

- Remove crankshaft sprocket. To do this, lock toothed belt pulley using counterhold - 3415- .
- Drain engine oil.
- Remove sump [page 89](#) .
- Pull off front sealing flange.
- Remove sealing flange. If necessary, loosen it 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.

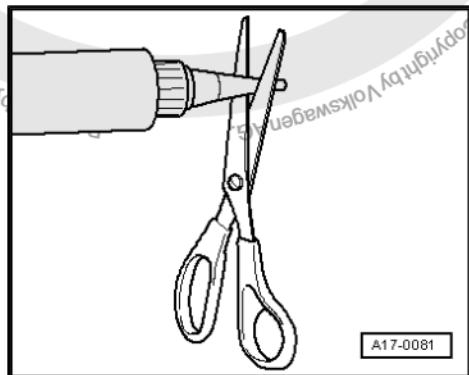
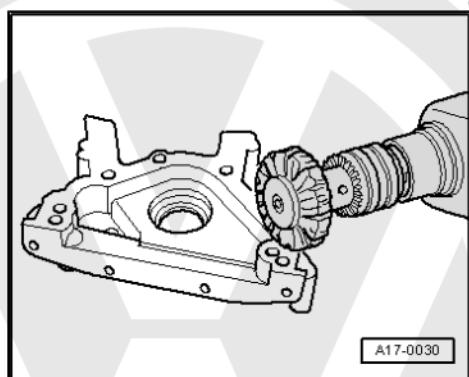
#### Installing

Install in reverse order of removal, observing the following:



#### Note

- ◆ Check the expiry date of the sealant.
  - ◆ The sealing flange must be installed within 5 minutes after applying the silicone sealant.
  - ◆ Sealant bead must not be wider than 2...3 mm as otherwise excessive sealant can enter sump and block strainer in oil pump suction line and also drip onto crankshaft oil seal.
  - ◆ Before applying sealant bead, cover sealing surface of oil seal with a clean cloth.
- Cut off tube nozzle at forward marking (approx. 3 mm of nozzle).



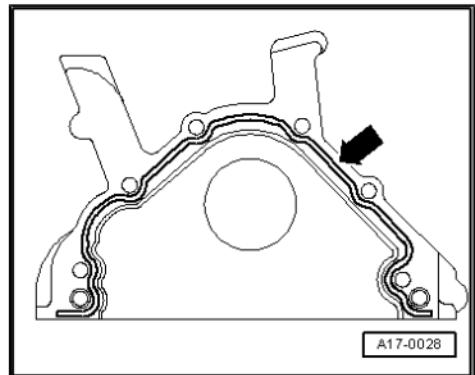


- Apply silicone sealant bead to the clean sealing surface of sealing flange as shown in illustration.
- Install sealing flange immediately and tighten all bolts lightly.



**Note**

- ◆ Use guide sleeve - T10053/1- to fit sealing flange with oil seal installed.
- ◆ Leave the sealant to dry for approx. 30 minutes after assembly. Only then fill with engine oil.
- Tighten securing bolts for sealing flange evenly and diagonally.
- Install sump [⇒ page 89](#).



Install crankshaft pulley. by locking the toothed-belt pulley using counterhold - 3415- .



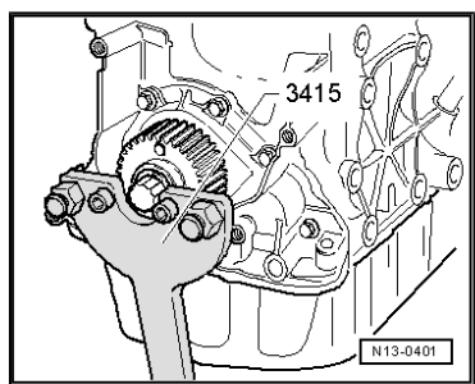
**Note**

*Thread and shoulder of the centre bolt must be free of oil and grease.*

Install toothed belt and adjust valve timing [⇒ page 62](#).

Specified torques

- ◆ [⇒ "2.1 Assembly overview - toothed belt drive", page 60](#)
- ◆ [⇒ "1.1 Assembly overview - sump/oil pump", page 87](#)



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## 2 Cylinder block, gearbox end

- ⇒ “[2.1 Assembly overview - cylinder block, gearbox end](#)”,  
[page 28](#)
- ⇒ “[2.2 Removing and installing sealing flange on gearbox side](#)”,  
[page 29](#)
- ⇒ “[2.2.1 Pressing out sealing flange with sender wheel](#)”,  
[page 30](#)
- ⇒ “[2.2.2 Pressing in sealing flange with sender wheel](#)”,  
[page 31](#)
- ⇒ “[2.2.3 A - Fitting seal with sender wheel on assembly tool T10134](#)”,  
[page 32](#)
- ⇒ “[2.2.4 B - Fitting assembly tool T10134 with sealing flange on crankshaft flange](#)”,  
[page 33](#)
- ⇒ “[2.2.5 C - Bolting assembly tool T10134 to crankshaft flange](#)”,  
[page 34](#)
- ⇒ “[2.2.6 D - Pressing sender wheel onto crankshaft flange using assembly tool T10134](#)”,  
[page 35](#)
- ⇒ “[2.2.7 E - Checking sender wheel installation position on crankshaft](#)”,  
[page 35](#)
- ⇒ “[2.2.8 f\) Re-pressing sender wheel](#)”  
[page 36](#)

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



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 - belt pulley end  
⇒ page 22

## 2 - Sealing flange

- ❑ Must seat on dowel sleeves.
  - ❑ Silicone sealant → Electronic parts catalogue (ETKA)
  - ❑ To remove, first remove sump ⇒ **page 89**.
  - ❑ Removing and installing ⇒ **page 29**

### 3 - Cylinder block

- Removing and installing crankshaft  
⇒ page 38.
  - Dismantling and assembling pistons and connecting rods ⇒ page 41

4 - Bolt

- Renew after removal
  - 60 Nm +90°

5 - Flywheel

- To remove and install flywheel, counterhold with counterhold 3067

6 - Adapter

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

7 - Bolt

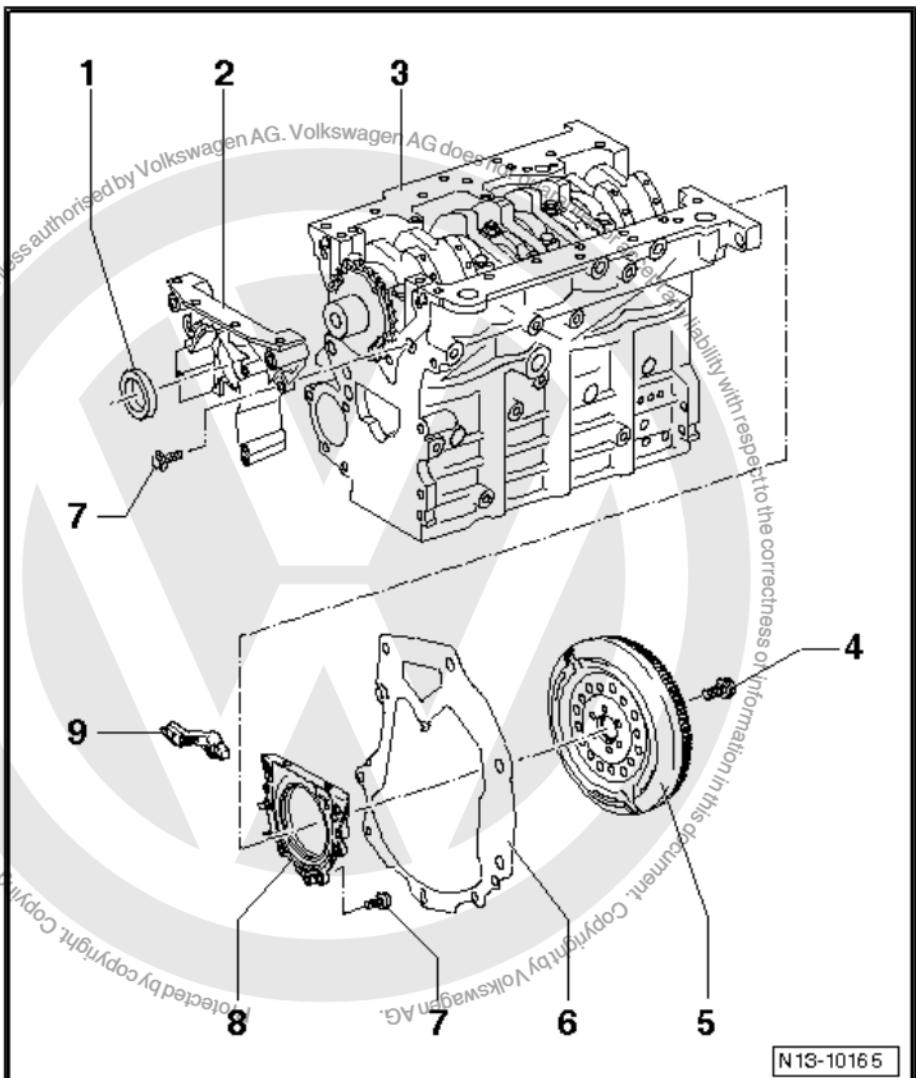
- Renew after removal
  - 15 Nm

#### 8 - Sealing flange with oil seal

- Renew complete with oil seal and sender wheel only.
  - To remove, first remove sump [⇒ page 89](#).
  - Removing and installing [⇒ page 29](#)

9 - Engine speed sender - G28-

- 5 Nm
  - Removing and installing [page 164](#)

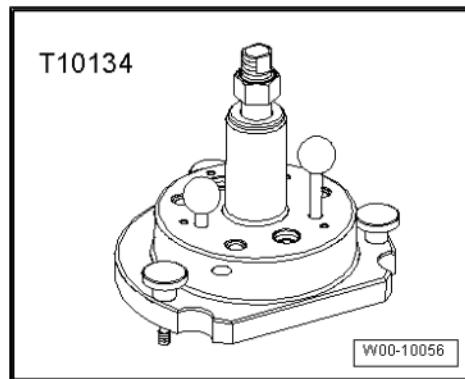


## 2.2 Removing and installing sealing flange on gearbox side

#### **Special tools and workshop equipment required**



- ◆ Assembly tool - T10134-



- ◆ Torque wrench - V.A.G 1331-
- ◆ Insert tool - V.A.G 1332/11-
- ◆ Depth gauge
- ◆ Three hexagon bolts M6 x 35 mm
- ◆ Two hexagon bolts M7 x 35 mm

## 2.2.1 Pressing out sealing flange with sender wheel



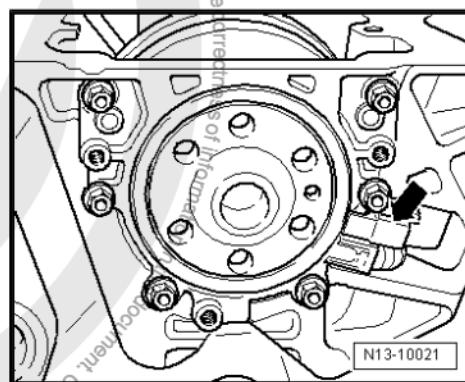
Note

- ◆ 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.
  - Position crankshaft at TDC for cylinder No. 1 [⇒ page 62](#).
  - Remove sump [⇒ page 89](#).
  - Remove engine speed sender - G28- -arrow- using a commercially available ball-ended hex key socket.
  - Unscrew sealing flange securing bolts.



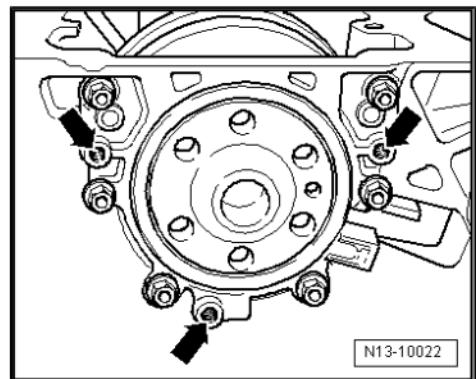
Note

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.  $\frac{1}{2}$  turn ( $180^\circ$ ) for each bolt) into sealing flange, and press sealing flange together with sender wheel off crankshaft.



## 2.2.2 Pressing in sealing flange with sender wheel

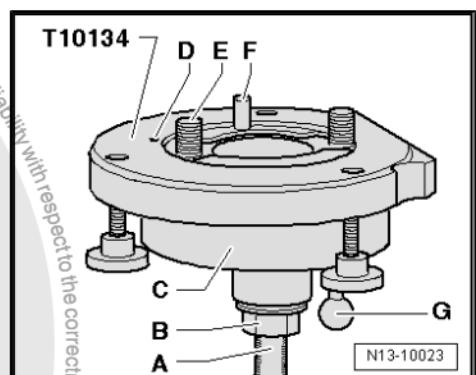


### Note

- ◆ 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)



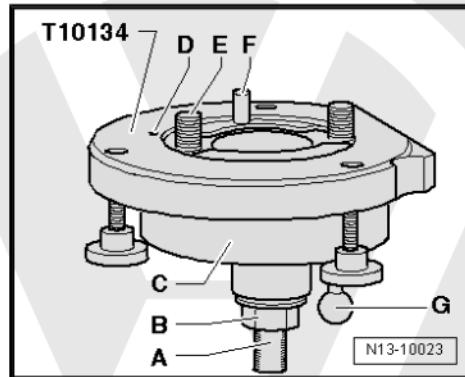


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4-cylinder diesel engine (2.0 l engine, 2-valve, TDI) - Edition 08.2019

## 2.2.3 A - Fitting seal with sender wheel on assembly tool - T10134-

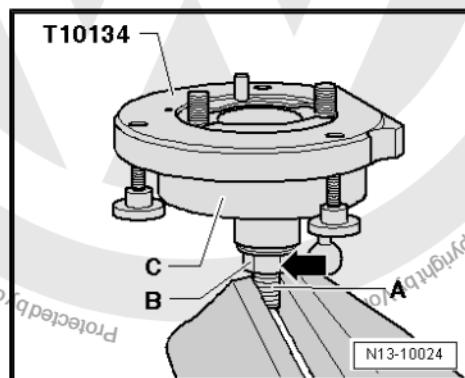
- Screw in hexagon nut -B- to just before clamping surface -A- of threaded spindle.



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



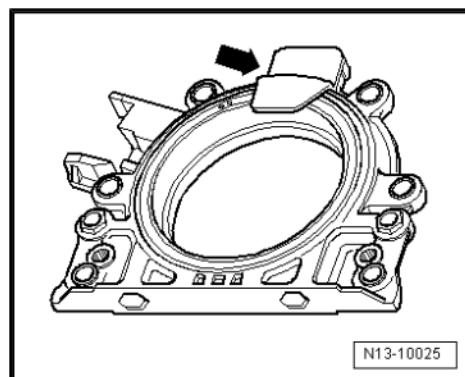
*Inner parts of assembly tool and assembly housing must be at same height.*



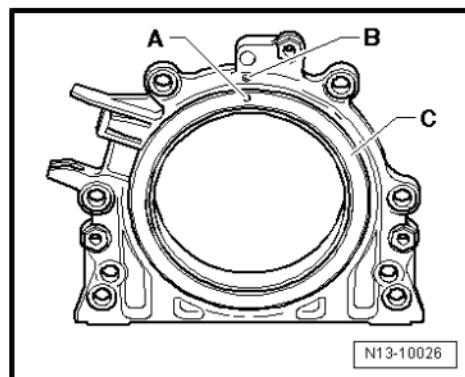
- Remove securing clip -arrow- from new sealing flange.



*Do not remove the sender wheel from the sealing flange or turn it.*

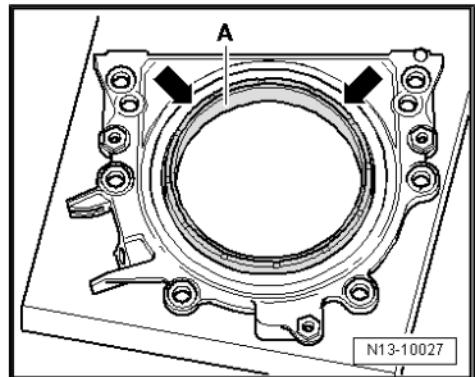


- Locating hole -A- on sender wheel -C- must align with marking -B- on sealing flange.
- Place sealing flange with front side downwards on a clean flat surface.

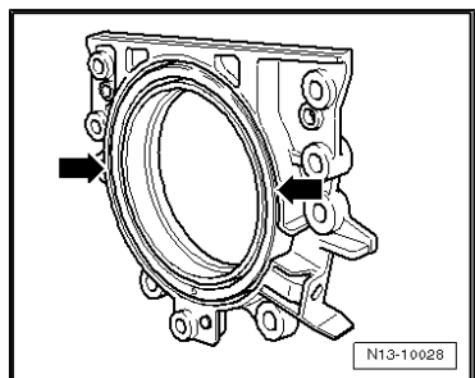




- Push sealing lip support ring -A- downwards in direction of arrow until it lies on flat surface.



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

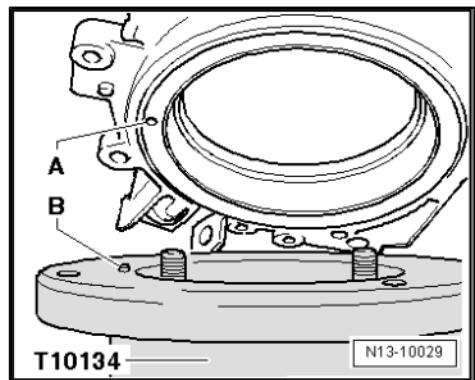


- Place sealing flange with front side on assembly tool - T10134- so that locating pin -B- can be inserted in sender wheel hole -A-.



Note

*Ensure sealing flange lies flat on assembly tool.*

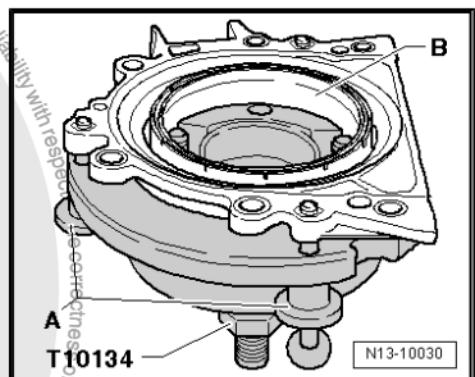


- Push sealing flange and support ring for sealing lip -B- against surface of assembly tool - T10134- whilst tightening the 3 knurled screws -A- so that locating pin cannot slide out of sender wheel hole.



Note

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



## 2.2.4 B - Fitting assembly tool - T10134- with sealing flange on crankshaft flange

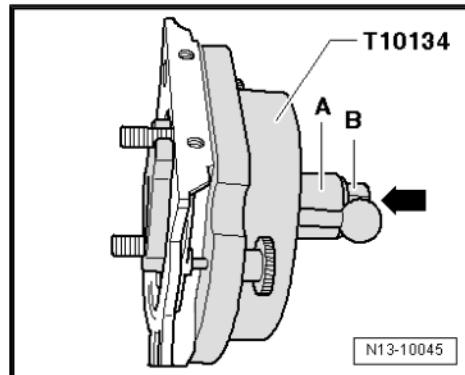
- Crankshaft flange must be free of oil and grease.
- Engine positioned at TDC for No. 1 cylinder. 1.



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4-cylinder diesel engine (2.0 l engine, 2-valve, TDI) - Edition 08.2019

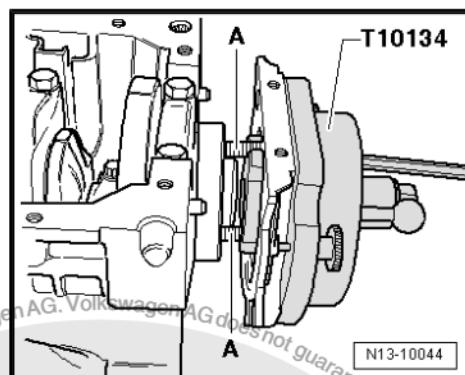
- Screw hexagon nut -B- to end of threaded spindle.
- Press threaded spindle of assembly tool - T10134- in direction of arrow, until hexagon nut -B- lies against assembly housing -A-.
- Align flat side of assembly housing on sump side of crankcase sealing surface.



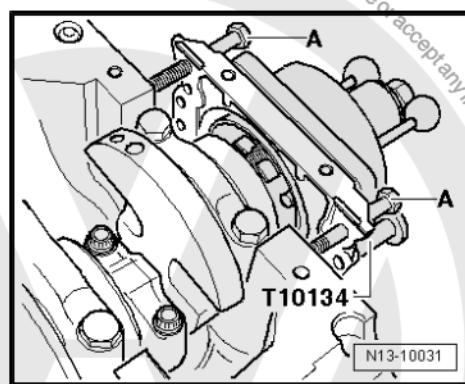
- Secure assembly tool - T10134- to crankshaft flange using hexagon socket head bolts -A-.



*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.



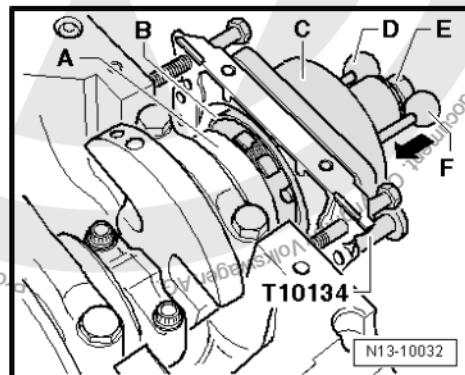
## 2.2.5 C - Bolting assembly tool - T10134- to crankshaft flange

- 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.



*Do not insert the guide pin for petrol engines (red knob) -F- into the 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-.





## 2.2.6 D - Pressing sender wheel onto crank-shaft flange using assembly tool - T10134-

- Tighten hexagon nut of assembly tool - T10134- using torque wrench - V.A.G 1331- and tool insert - V.A.G 1332/11- .

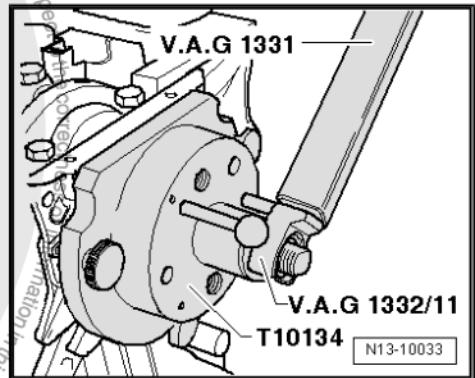
Specified torque

Component	Specified torque
Hexagon nut of assembly tool - T10134-	35 Nm



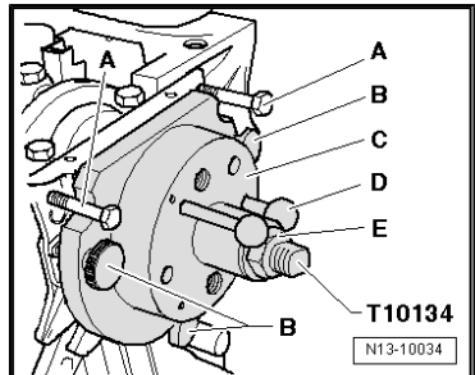
### Note

After hexagon nut is tightened there must still be a small air gap between cylinder block and sealing flange.

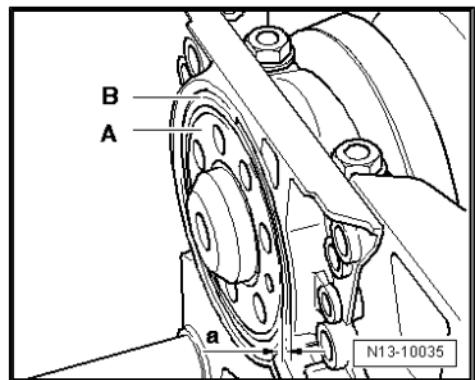


## 2.2.7 E - Checking sender wheel installation position on crankshaft

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





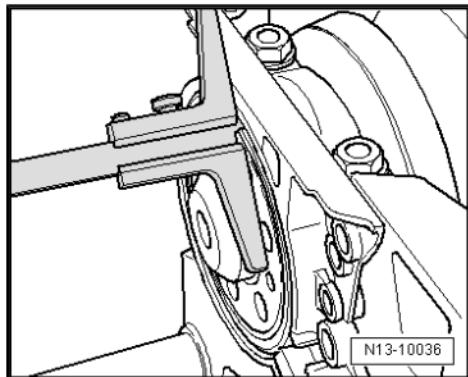
- Set vernier gauge on crankshaft flange.
- Measure distance -a- between crankshaft flange and sender wheel.

If dimension -a- is too small:

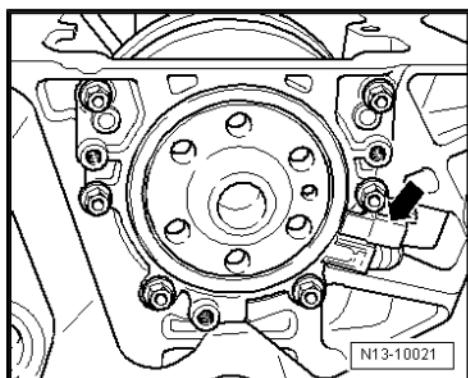
- Re-press sender wheel [page 36](#).

If dimension -a- is attained:

- Tighten the new securing bolts for the sealing flange using alternate and diagonal sequence.

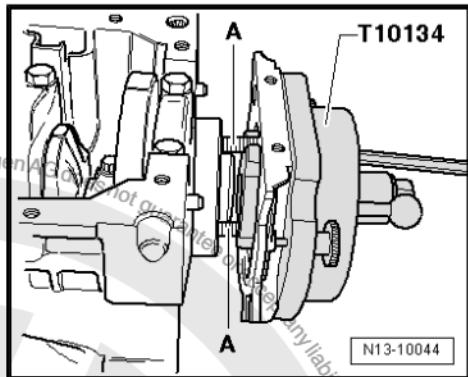


- Install engine speed sender - G28- -arrow- and tighten securing bolt.
- Install sump [page 89](#).
- Install intermediate plate.
- Install flywheel using new bolts.

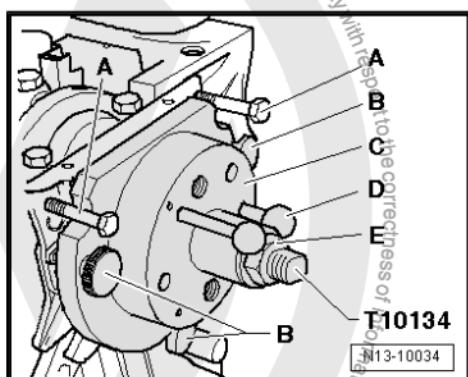


## 2.2.8 f) Re-pressing sender wheel

- 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-.

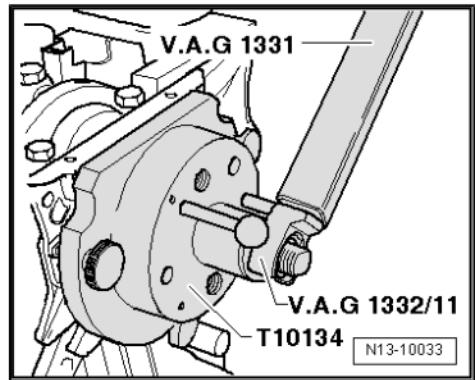




- Tighten hexagon nut of assembly tool - T10134- using torque wrench - V.A.G 1331- and tool insert - V.A.G 1332/11- .

Specified torque

Component	Specified torque
Hexagon nut of assembly tool - T10134-	40 Nm



- Check installation position of sender wheel on crankshaft again [⇒ page 35](#) .

If dimension -a- is still too small:

- Tighten hexagon nut as follows:

Specified torque

Component	Specified torque
Hexagon nut of assembly tool - T10134-	45 Nm

- Check installation position of sender wheel on crankshaft again [⇒ page 35](#) .

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### 3 Crankshaft

⇒ “3.1 Assembly overview - crankshaft”, page 38

⇒ “3.2 Crankshaft dimensions”, page 38

⇒ “3.3 Renewing needle bearing in crankshaft”, page 39

#### 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 - Bolt

- Renew after removal
- To measure radial clearance, tighten to 65 Nm but not further.
- 65 Nm +90°

##### 3 - Bearing cap

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

##### 4 - Thrust washer

- For bearing cap 3
- Note fixing arrangement

##### 5 - Needle bearing

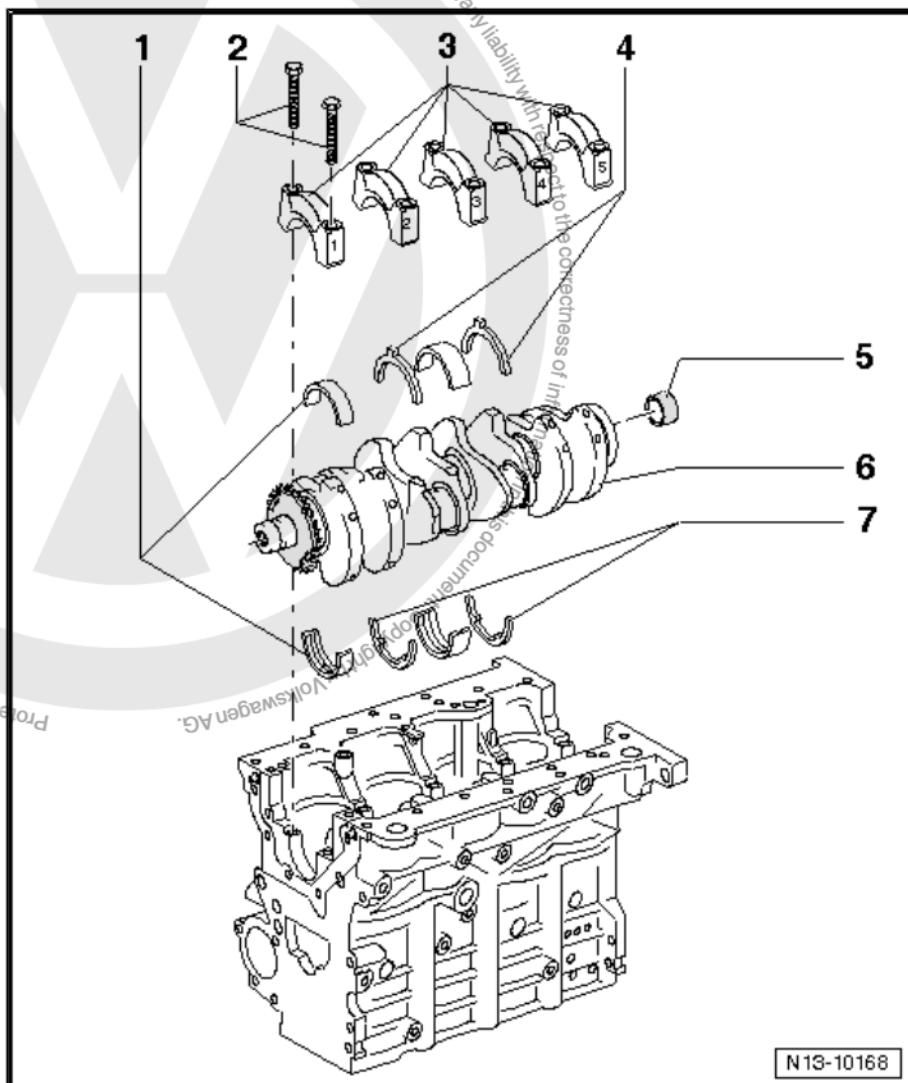
- Vehicles with dual clutch gearbox only.
- Removing and installing  
⇒ page 39

##### 6 - Crankshaft

- Axial clearance new: 0.07 to 0.17 mm, wear limit: 0.37 mm
- Measure 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



### 3.2 Crankshaft dimensions

(Dimensions in mm)

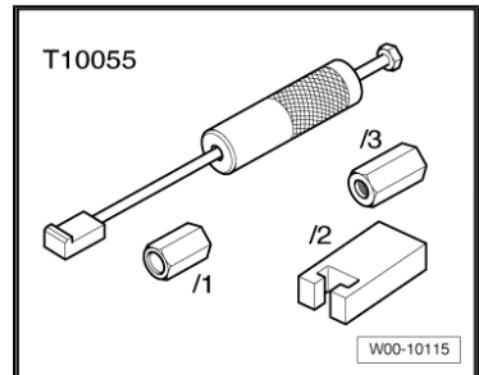


Honing dimension	Crankshaft main journal Ø	Conrod journal Ø
Basic dimension	54.00 -0.022 -0.042	47.80 -0.022 -0.042

### 3.3 Renewing needle bearing in crankshaft

Special tools and workshop equipment required

- ◆ Puller - T10055-



- ◆ Pin - VW 207 C-



- ◆ Internal puller e.g. KUKKO 21-2 - VAS 251 605-



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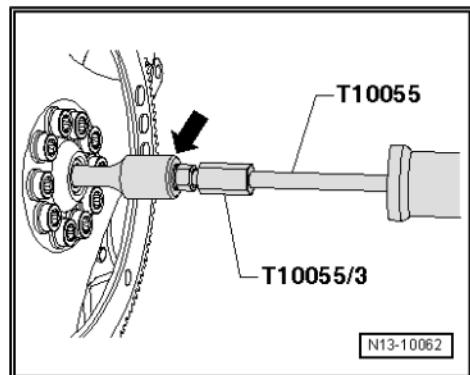


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4-cylinder diesel engine (2.0 l engine, 2-valve, TDI) - Edition 08.2019

## Removing

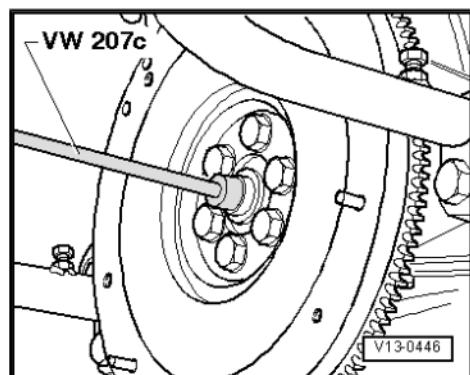
- Remove gearbox ⇒ Rep. gr. 34 ; Removing and installing gearbox; Removing gearbox .
- Pull out using puller - T10055- , adapter - T10055/3- and internal puller, e. g. KUKKO 21-2 - VAS 251 605- -arrow-.



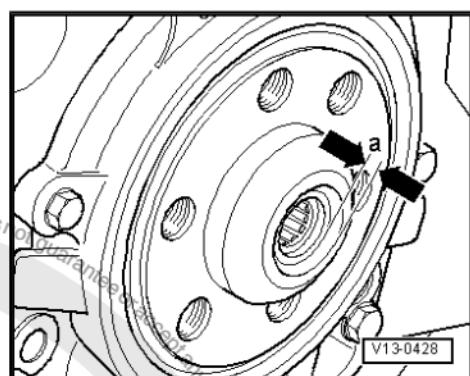
## Installing

Install in reverse order of removal, observing the following:

- Drive in needle bearing with drift - VW 207 C- .
- Measure installation depth frequently while driving in.



- Renew bearing if driven in too deep.
- Installation depth: dimension -a- = 2 mm.



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## 4 Pistons and conrods

⇒ "4.1 Assembly overview - pistons and conrods", page 41

⇒ "4.2 Measuring piston projection at TDC", page 42

⇒ "4.3 Piston and cylinder dimensions", page 43

⇒ "4.4 Checking pistons and cylinder bores", page 43

### 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 ring gap  
⇒ page 43 .
- Checking ring-to-groove clearance ⇒ page 44 .

#### 2 - Piston

- Mark installation position and cylinder number.
- Installation position and allocation of piston to cylinder ⇒ page 45 .
- Arrow on piston crown points to belt pulley end.
- Install using piston ring clamp.
- If piston skirt is cracked, renew piston.
- Checking piston projection at TDC  
⇒ page 42 .

#### 3 - Piston pin

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

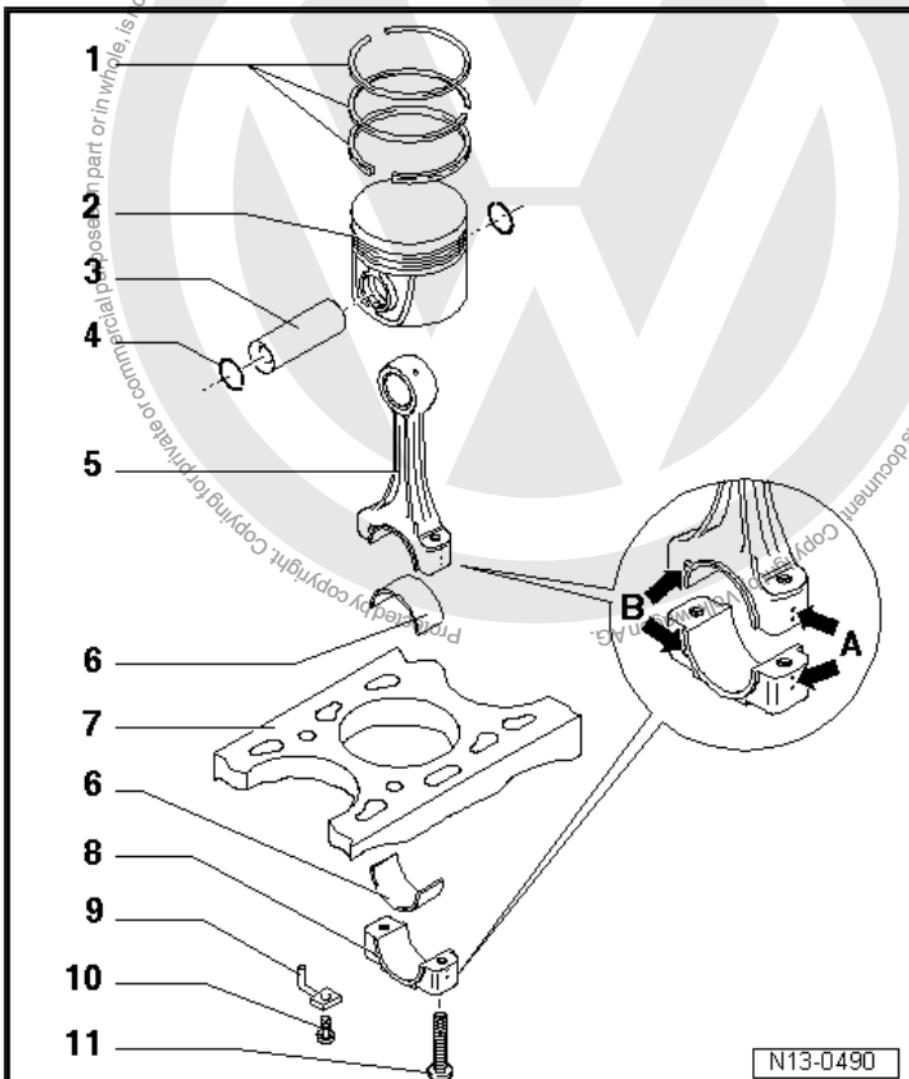
#### 4 - Retaining ring

#### 5 - Connecting rod

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

#### 6 - Bearing shell

- Observe installation position
- Do not interchange used bearing shells.
- Insert bearing shells centrally.
- Ensure firm 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.



N13-0490



## 7 - Cylinder block

- Checking cylinder bores [⇒ page 44](#)
- Piston and cylinder dimensions [⇒ page 43](#)

## 8 - Conrod bearing cap

- Observe installation position
- The caps only fit in one position and only on the appropriate conrod due to the breaking procedure (cracking) separating the cap from the conrods.

## 9 - Oil spray jet

- For piston cooling

## 10 - Bolt

- Insert without sealant.
- 25 Nm

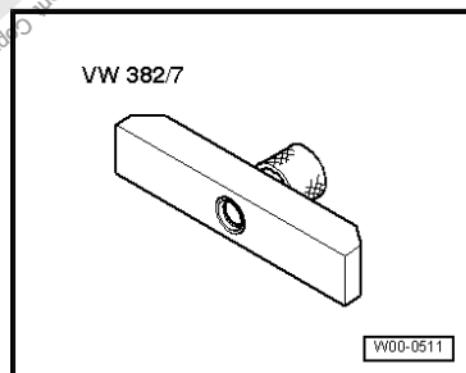
## 11 - Conrod bolt

- Renew after removal
- Oil threads and contact surface
- Use old bolt for measuring radial clearance.
- 30 Nm +90°

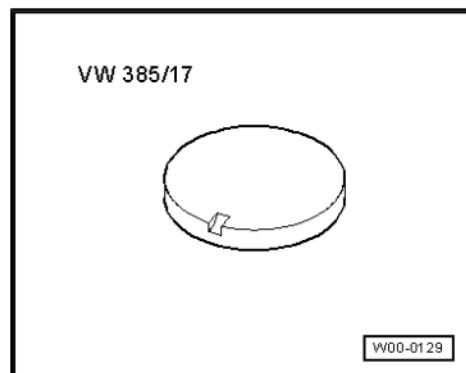
## 4.2 Measuring piston projection at TDC

Special tools and workshop equipment required

- ◆ Measuring bridge - VW 382/7-



- ◆ End measuring plate - VW 385/17-



- ◆ Dial gauge



### Test sequence

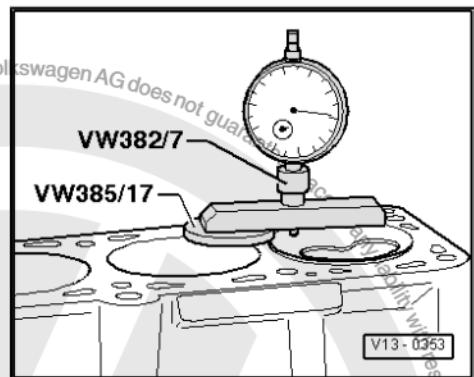
Piston projection at TDC must be measured on all pistons when installing new pistons or a short engine. Install the appropriate cylinder head gasket depending upon piston projection, according to following table:



#### Note

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

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

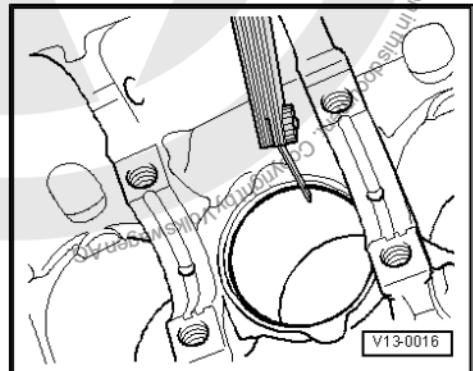


### 4.3 Piston and cylinder dimensions

Honing dimension	Piston Ø	Cylinder bore Ø
Basic dimension mm	80.96	81.01

### 4.4 Checking pistons and cylinder bores

#### Checking piston ring gap



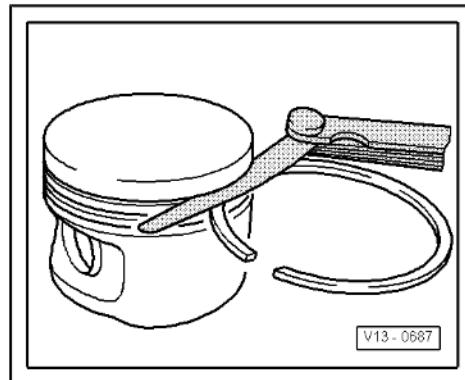
#### Special tools and workshop equipment required

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

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



Checking ring-to-groove clearance

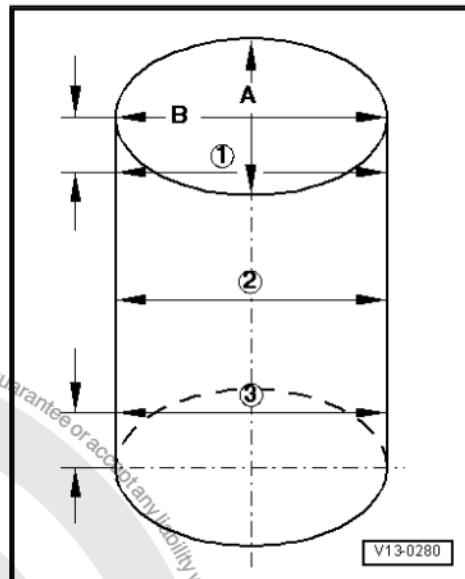


Special tools and workshop equipment required

- ◆ Feeler gauge
- Clean ring groove before checking.

Piston ring dimensions in mm	New	Wear limit
1st compression ring	0.06 ... 0.09	0.25
2nd 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 to 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

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

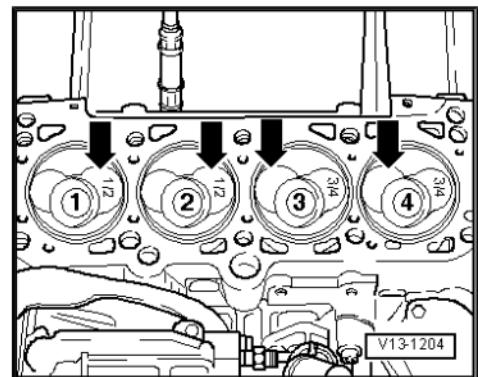
Piston installation position and allocation of piston to cylinder

Piston in cylinders 1 and 2:

Larger inlet valve recess -arrows- towards flywheel

Piston in cylinders 3 and 4:

Larger inlet valve recess -arrows- towards belt pulley end.



### Note

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





## 15 – Cylinder head, valve gear

### 1 Cylinder head

- ⇒ “1.1 Assembly overview - cylinder head”, page 46
- ⇒ “1.2 Removing and installing cylinder head”, page 49
- ⇒ “1.3 Removing and installing cylinder head cover”, page 56
- ⇒ “1.4 Checking compression”, page 58

#### 1.1 Assembly overview - cylinder head

The mixing pipe in the cylinder head (not illustrated) cannot be renewed separately.

1 - Toothed belt guard upper part

2 - Toothed belt

- Mark direction of rotation before removing
- Check for wear
- Do not kink
- Removing and installing  
⇒ page 62

3 - Bolt

- Renew after removal
- 10 Nm

4 - Bolt

- 25 Nm

5 - Bolt

- 100 Nm

6 - Camshaft sprocket

7 - Hub

- With sender wheel
- Use counterhold - T10051- to loosen and tighten.
- To remove, use puller T10052- .
- Removing and installing  
⇒ page 79

8 - Rear toothed belt guard

9 - Sealing grommet

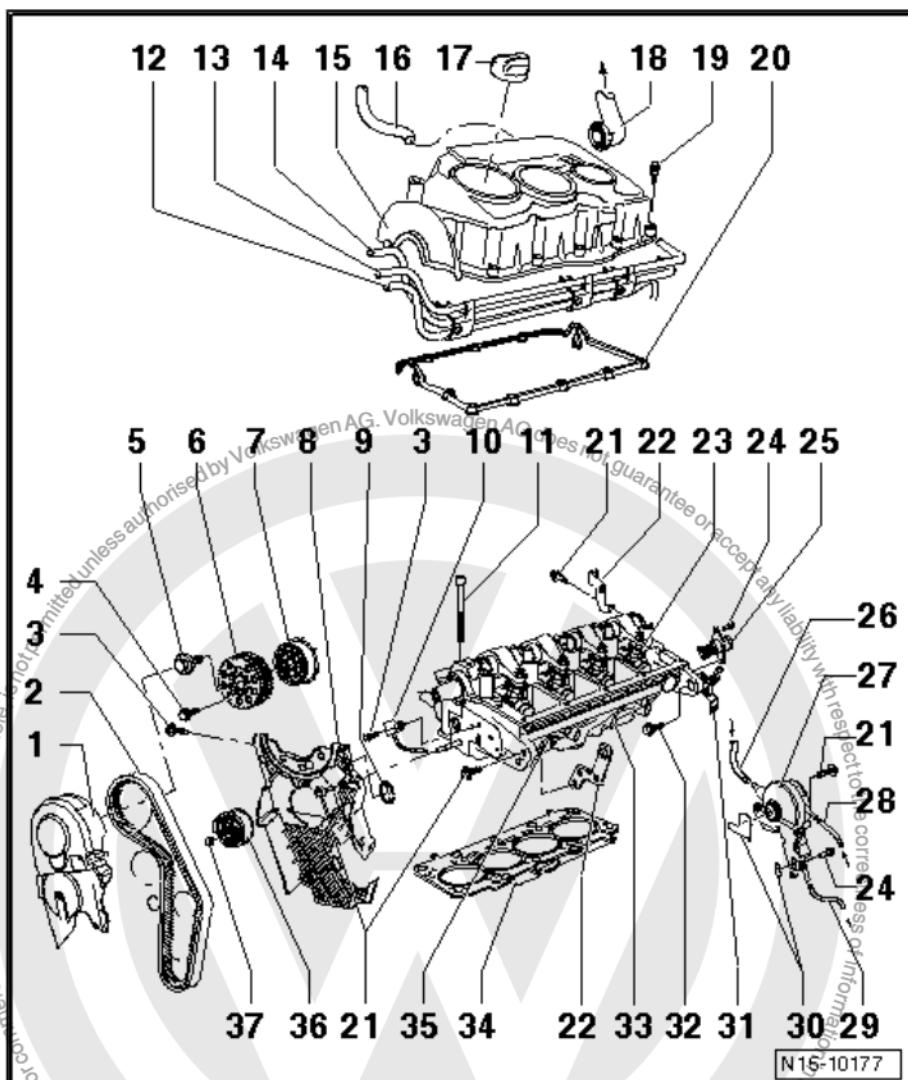
- Renew if damaged

10 - Hall sender - G40-

- For camshaft position.
- To remove, unbutton sealing grommet ⇒ Item 9 (page 46) from rear toothed belt guard.

11 - Cylinder head bolt

- Observe sequence for loosening and tightening ⇒ page 49
- Before installing, insert washers into cylinder head ⇒ Item 4 (page 75).



N1S-10177



- 12 - Fuel return line
- 13 - Fuel supply line
- 14 - Coolant line
- 15 - Cylinder head cover
- With pressure regulating valve for crankcase breather and vacuum reservoir
  - Thoroughly clean sealant groove and securing bolts before fitting a new gasket.
  - Before fitting, thoroughly clean sealing surface of cylinder head with clean cloth.
  - Removing and installing ⇒ [page 56](#)
- 16 - Vacuum hose
- To connecting piece between tandem pump and brake servo
- 17 - Cap
- Renew seal if damaged.
- 18 - To intake hose for air filter/turbocharger
- 19 - Bolt
- Observe tightening sequence ⇒ [page 56](#)
  - 10 Nm
- 20 - Gasket for cylinder head cover
- Renew if damaged
  - Thoroughly clean sealant groove and securing bolts before fitting a new gasket.
  - Before fitting, seal transitions with "AMV 174 004 01" ⇒ [page 56](#)
- 21 - Bolt
- 20 Nm
- 22 - Lifting eye
- 23 - Unit injector
- Removing and installing ⇒ [page 131](#)
- 24 - Bolt
- 10 Nm
- 25 - Central connector
- For unit injector
- 26 - From brake servo
- 27 - Tandem pump
- For fuel and vacuum supply
  - Must not be dismantled.
  - Checking ⇒ [page 146](#)
  - Removing and installing ⇒ [page 144](#)
- 28 - Supply hose
- From fuel filter.
  - White or with white marking.
  - Ensure firm seating
  - Secure with spring-type clips
- 29 - Return hose
- To fuel filter
  - Blue or with blue marking
  - Ensure firm seating
  - Secure with spring-type clips

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## 30 - Seal

- Renew after removal

## 31 - Bracket

## 32 - Bolt

- 25 Nm

## 33 - Cylinder head

- After renewing, renew entire coolant.
- Removing and installing [⇒ page 49](#)

## 34 - Cylinder head gasket

- Renew after removal
- Observe identification [⇒ page 49](#).
- After renewing, renew entire coolant.

## 35 - Ceramic glow plug

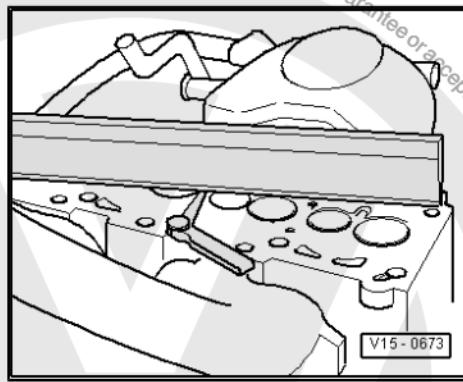
- Installation instructions and notes should be strictly adhered to [⇒ page 162](#)
- 15 Nm

## 36 - Tensioning pulley

## 37 - Nut

- 20 Nm +45°

Checking cylinder head for distortion



Special tools and workshop equipment required

- ◆ Straight edge
- ◆ Feeler gauge

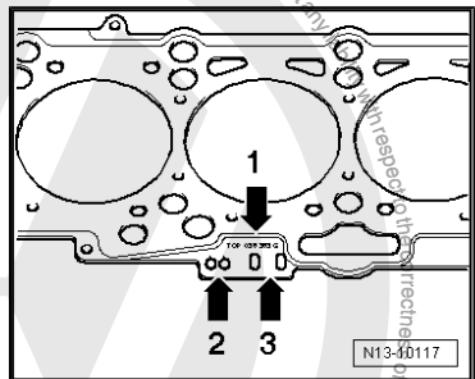
Max. permissible distortion: 0.1 mm

**Note**

*Reworking diesel cylinder heads is not permissible.*

**Cylinder head gasket identification**

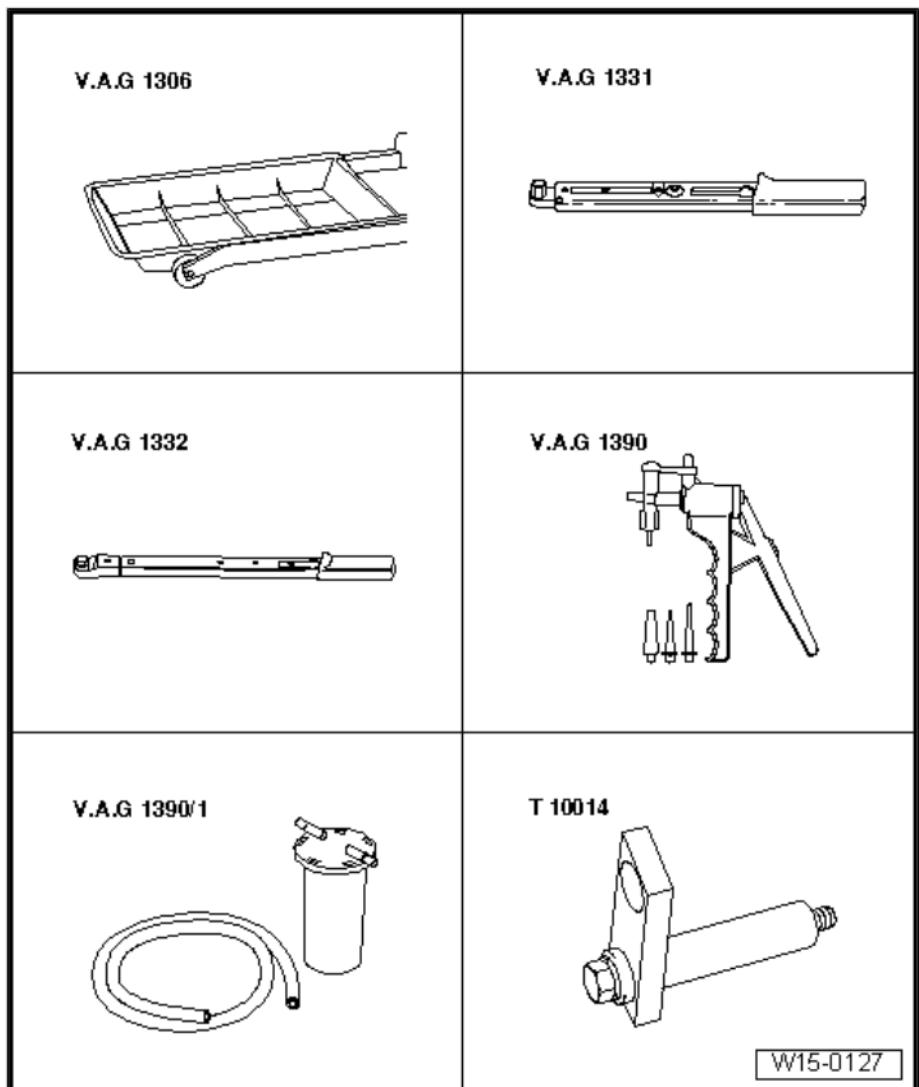
- ◆ Part No. = arrow 1
- ◆ Holes = arrow 2
- ◆ Production control code = arrow 3 (can be disregarded)

**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 42](#)*

## 1.2 Removing and installing cylinder head

Special tools and workshop equipment required



W15-0127



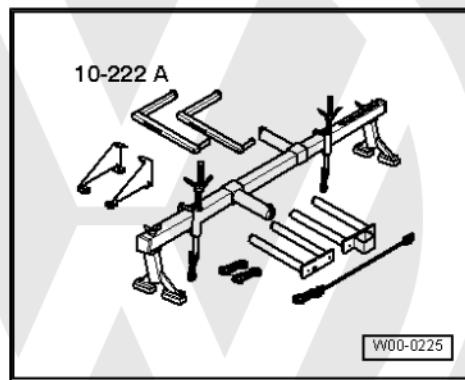
Caddy 2004 >

4-cylinder diesel engine (2.0 l engine, 2-valve, TDI) - Edition 08.2019

- ◆ Drip tray - V.A.G 1306- has been discontinued; use 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-
- ◆ Bleeder bottle - V.A.G 1390/1-
- ◆ Bracket - T10014-
- ◆ Contour blade set - VAS 852 005- (not illustrated) or commercially available CERAN surface scraper

Special tools and workshop equipment required

- ◆ Support bracket - 10-222A- with legs - 10-222A/13-



Note

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



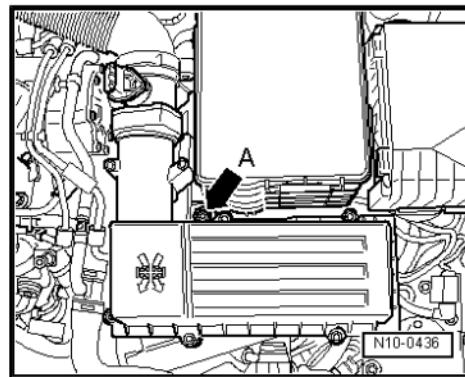
#### WARNING

Observe the following points during all installation work, in particular in the engine compartment, due to the space limitations:

- ◆ 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.

#### Removing

- Remove plenum chamber bulkhead: ⇒ General body repairs, exterior; Rep. gr. 50 ; Body - front; Plenum chamber bulkhead .
- Remove bolt -arrow- and pull air filter housing upwards out of mounting.
- Remove air filter housing together with air mass meter.
- Remove turbocharger intake hose.
- If present, remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Body, front; Noise insulation .
- Drain coolant [page 96](#) .



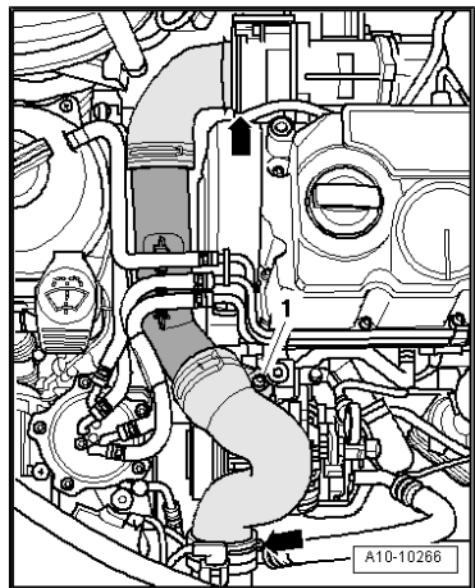


- Unclip fuel hoses and coolant hoses from connecting pipe between charge air cooler and intake connecting pipe.
- Remove bolt -1-.
- Remove connecting pipe between charge air cooler and intake connecting pipe, to do this, lightly lift retaining clips -arrows-.

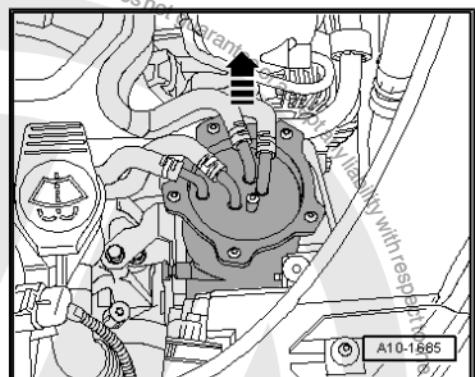


### WARNING

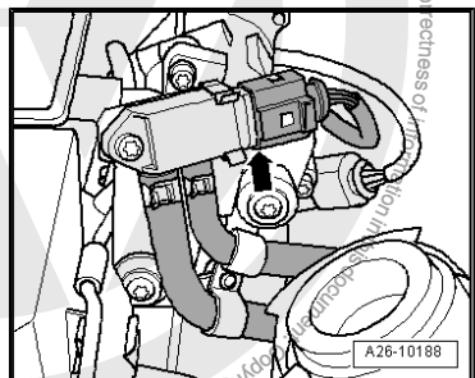
- ◆ *The fuel and the fuel lines in the fuel system can become very hot (danger of scalding)!*
- ◆ *The fuel system is also under pressure! Before opening the system, place a cloth around the connection and reduce pressure by carefully loosening the connection!*
- ◆ *Wear eye and hand protection when performing any type of repair work on the fuel system!*



- 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 144](#).
- Disconnect fuel hoses from tandem pump.
- Unbolt fuel filter with bracket.
- Remove fuel filter with bracket -arrow- and lay it aside with hoses connected.
- Loosen pressure lines on particulate filter.

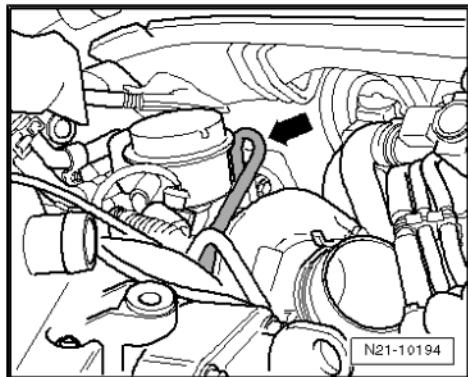


- Separate electrical connection -arrow- on exhaust gas pressure sensor 1 - G450- .
- Unscrew exhaust gas pressure sensor 1 - G450- and remove it together with pressure lines.

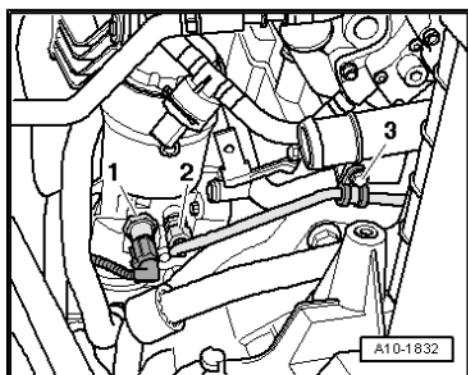




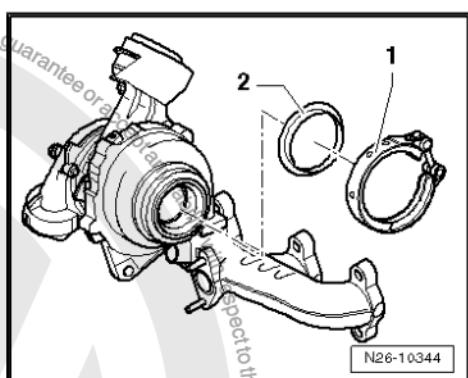
- Pull oil supply hose -1- off turbocharger.



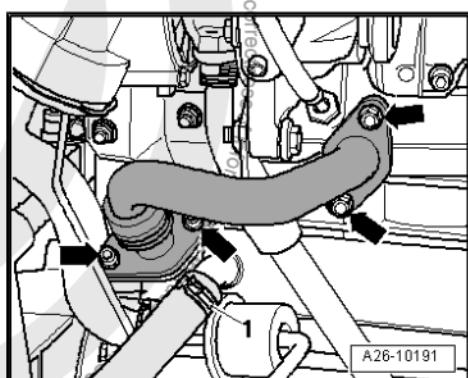
- Disconnect electrical connector from oil pressure switch - F1- .
- Unscrew oil pressure switch -1-.
- Remove oil supply line to turbocharger from retaining clamp -3- and from oil filter bracket -2-.



- Remove oil supply line.



- Loosen retaining clip -1- with seal -2- for particulate filter.

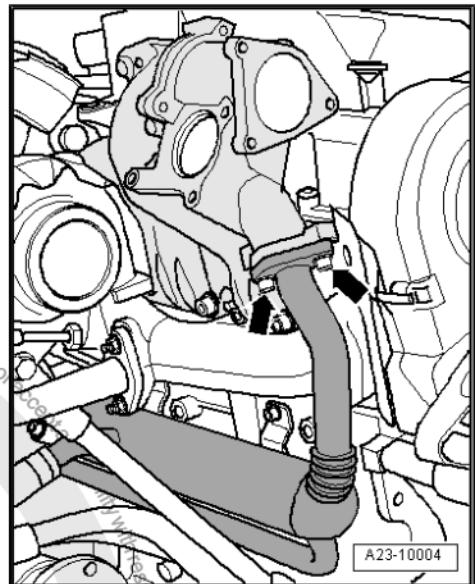




- Remove bolts -arrows- and take off connecting pipe to exhaust gas recirculation cooler.
- Unscrew bolts on flange between exhaust gas recirculation cooler and intake manifold.

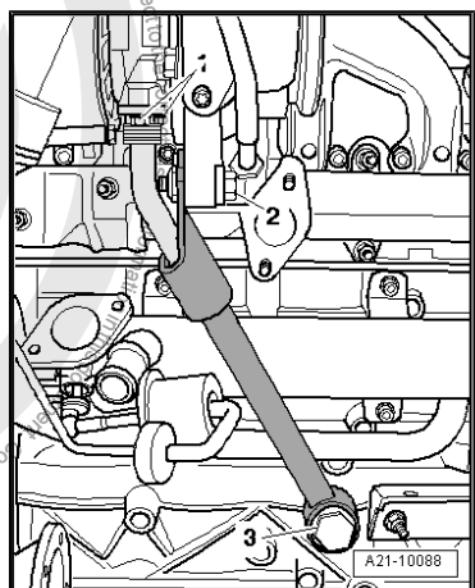
Vehicles with auxiliary heater:

- Remove coolant pipes leading to auxiliary heater together with connected coolant hoses from cylinder block.



All vehicles:

- Remove nuts -1-, bolt -2- and banjo bolt -3-.
- Remove support for exhaust gas turbocharger with oil return line
- Remove toothed belt [page 62](#).
- Remove toothed belt tensioning roller.
- Install hub for camshaft toothed belt pulley [page 79](#), Removing and installing camshaft.

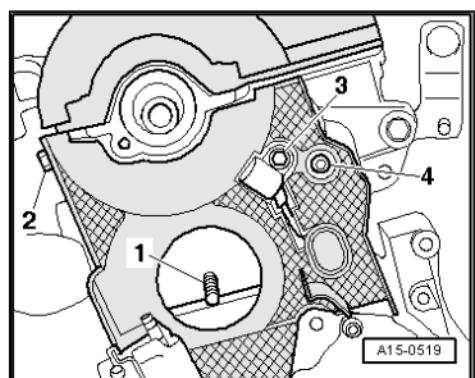


- Unscrew rear toothed belt guard securing bolts -2- and -4-.
- Unscrew Hall sender - G40- -3-.
- Remove dip stick guide tube.
- Pull off/disconnect all further wiring necessary from cylinder head and move clear.
- Separate all connection, coolant, vacuum and intake hoses from cylinder head.



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.*





Caddy 2004 >

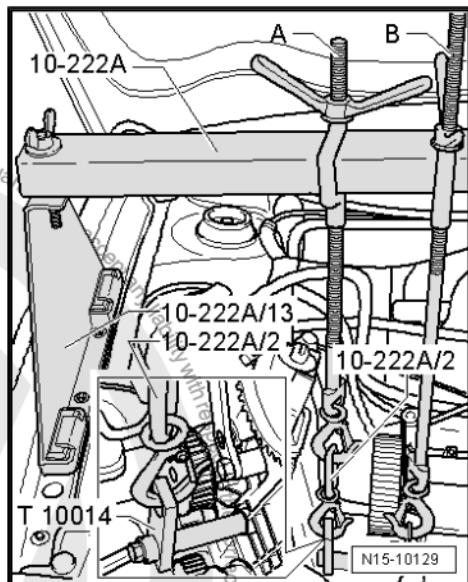
4-cylinder diesel engine (2.0 l engine, 2-valve, TDI) - Edition 08.2019

- Screw retainer - T10014- into threaded hole above coolant pump and tighten.

Specified torque

Component	Specified torque
Holder - T10014-	20 Nm

- Lift engine slightly using spindle -A- until spindle -B- is relieved.
- Unhook spindle -B- and push it to side.
- Remove cylinder head cover [⇒ page 56](#).

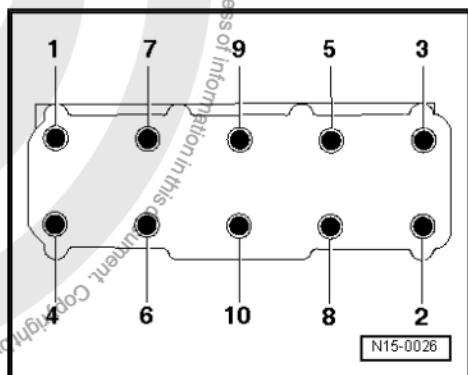


- Maintain sequence when loosening cylinder head bolts.
- Lift cylinder head slightly and remove from engine laterally past toothed belt guard.



Note

The cylinder head must be guided carefully to prevent damage.





## Installing

Install in reverse order of removal, observing the following:

### Note

- ◆ *Do not use sandpaper, grinding wheels, abrasive or scour pads or any other sanding or abrasive media.*
- ◆ *Sealing surface (see photo) must not project.*
- ◆ *Discolouration (dark spots, see photo) need not be removed.*
- ◆ *When removing the sealant residue, make sure no loose particles get into the open channels of the engine.*
- ◆ *Ensure that all adjacent workspaces are clean, and that none of the above mentioned sanding or abrasive media are used.*
- ◆ *Using unauthorised sanding or abrasive media may lead to secondary damage such as, for example, damage to the turbocharger or the conrod bearings.*



N15-11374



### WARNING

*Risk of eye injury caused by sealant residue.*

- *Wear protective goggles.*

- Only remove sealant residue from cylinder head and cylinder block using scraper - VAS 852 005- or a commercially available ceramic glass scraper.
- The sealing surfaces must not be damaged.
- There must be no oil or coolant in the bolt pockets.
- Do not remove new cylinder head gasket from packaging until it is ready to be fitted.
- If a new cylinder head is installed, contact surfaces between roller rocker fingers and running surface of cam must be oiled.
- Remove any loose remains using a lint-free cloth.
- 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 49 .*

- Fit cylinder head and tighten all cylinder head bolts hand-tight.



Caddy 2004 >

4-cylinder diesel engine (2.0 l engine, 2-valve, TDI) > Edition 08.2019

- Tighten cylinder head in four stages in sequence as shown as follows:

1 - Tighten initially with torque wrench:

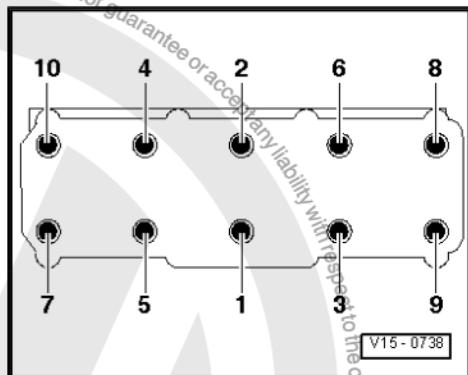
Stage I = 35 Nm

Step II = 60 Nm

2 - Turn further with rigid spanner:

Stage III =  $\frac{1}{4}$  turn (90°)

Stage IV =  $\frac{1}{4}$  turn (90°)

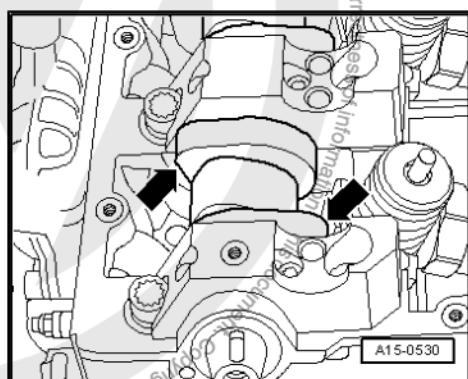


- After tightening cylinder head, turn camshaft so that cams for No. 1 cylinder point equally upwards. Turn crankshaft in engine direction of rotation to TDC before fitting toothed belt  
⇒ page 62 .

Observe applicable safety precautions during road test

⇒ page 2 .

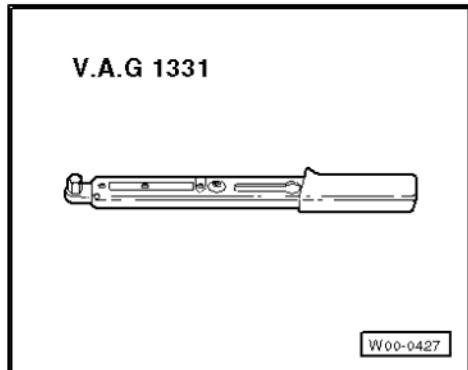
- Install connecting pipe free of stress. To achieve this, start all bolts hand-tight first, and tighten them diagonally and alternately after.
- Carry out road test and then read event memory ⇒ Vehicle diagnostic tester.



#### Specified torques

- ◆ ⇒ "1.1 Assembly overview - cylinder head", page 46
- ◆ ⇒ "2.1 Assembly overview - toothed belt drive", page 60
- ◆ ⇒ "2.1 Assembly overview - assembly mountings", page 16

### 1.3 Removing and installing cylinder head cover



#### Special tools and workshop equipment required

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

#### Removing

- Disconnect crankcase breather hose at union on rear of charge air pipe.



- Unclip fuel hoses and coolant hoses from connecting pipe between charge air cooler and intake connecting pipe.
- Remove bolt -1-.
- Remove connecting pipe between charge air cooler and intake connecting pipe, to do this, lightly lift retaining clips -arrows-.
- Remove upper toothed belt guard.
- Pull vacuum hose off cylinder head cover.
- Remove cylinder head cover.

#### Installing

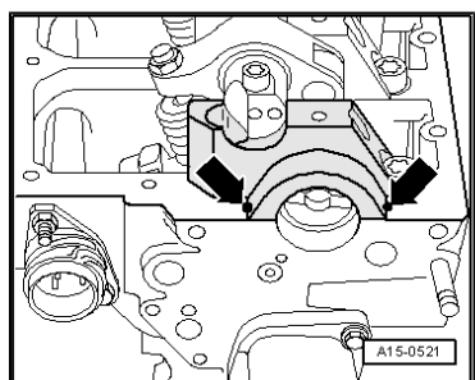
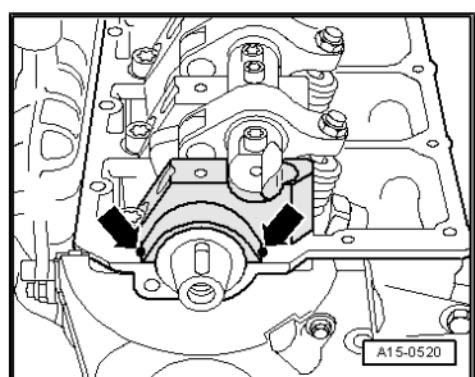
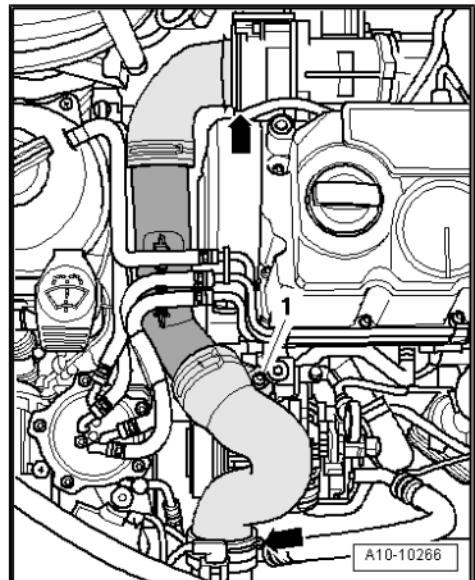
Install in reverse order of removal, observing the following:



#### Note

*Renew cylinder head cover gasket and seal for bolts if damaged.*

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

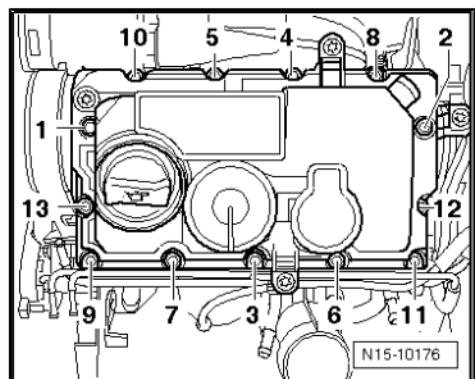


- Place a drop of sealant - AMV 174 004 01- (approx. 5 mm in diameter) -arrows- on edges of both sealing surfaces of bearing cap and cylinder head at rear of engine.

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

#### Specified torques

- ◆ ["1.1 Assembly overview - cylinder head", page 46](#)





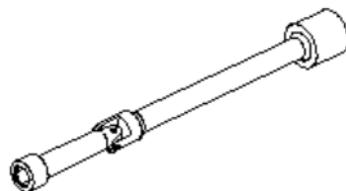
## 1.4 Checking compression



If ceramic glow plugs are fitted, before removing check idling speed smooth running control using ⇒ Vehicle diagnostic tester. The compression test is warranted only if one or more cylinders are conspicuous in this idling speed check.

Special tools and workshop equipment required

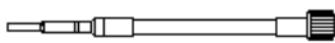
3220



V.A.G 1331



V.A.G 1381/12



V.A.G 1763



W15-0002

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

### Test conditions

- Engine oil temperature min. 30°C

### Test sequence

- Pull off central connector for unit injectors.



### Note

*Always observe notes on removing and installing ceramic glow plugs ⇒ page 162.*

- Remove all ceramic glow plugs using U/J extension and socket, 10 mm - 3220- .
- Screw in adapter - V.A.G 1381/12- in place of the ceramic glow plugs.
- Check compression using compression tester - V.A.G 1763- .



### Note

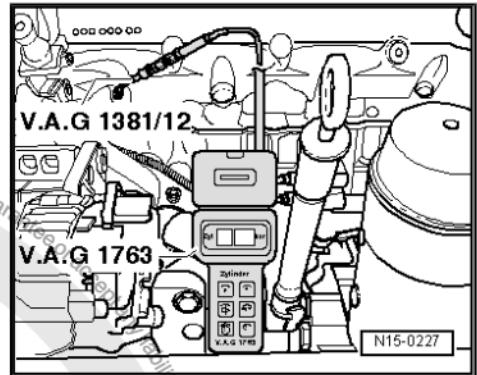
*Using compression tester ⇒ Operating instructions.*

- 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



### Note

*Always observe notes on removing and installing ceramic glow plugs ⇒ page 162.*

- Install ceramic glow plugs using U/J extension and socket 10 mm - 3220- .
- Read event memory of engine control unit ⇒ Vehicle diagnostic tester.



## 2 Toothed belt drive

⇒ "2.1 Assembly overview - toothed belt drive", page 60

⇒ "2.2 Removing and installing toothed belt", page 62

⇒ "2.3 Loosening and securing toothed belt", page 69

### 2.1 Assembly overview - toothed belt drive

1 - Toothed belt guard upper part

2 - Bolt

- 100 Nm

3 - Bolt

- 25 Nm

4 - Camshaft sprocket

5 - Hub

- With sender wheel
- Use counterhold - T10051- to loosen and tighten.
- To remove, use puller - T10052- .
- Removing and installing  
⇒ page 79

6 - Bolt

- Renew after removal
- 10 Nm

7 - Rear toothed belt guard

8 - Bolt

- 25 Nm

9 - Sealing grommet

- Renew if damaged

10 - Nut

- 20 Nm +45°

11 - Tensioning pulley

12 - Nut

- 20 Nm

13 - Idler roller

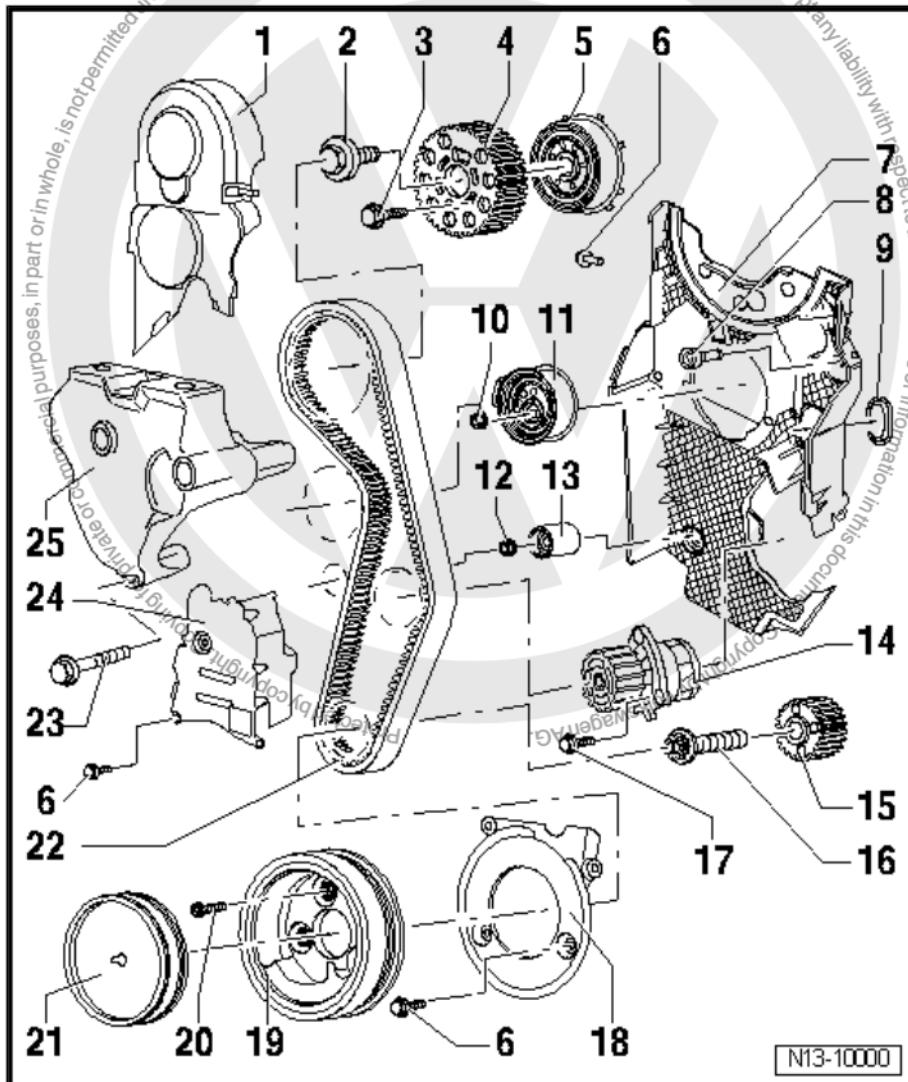
14 - Coolant pump

- Removing and installing ⇒ page 109

15 - Crankshaft pulley

16 - Bolt

- Renew after removal
- Use counterhold - 3415- to loosen and tighten.
- Do not additionally oil or grease the threads and shoulder
- Turning further can be done in several stages.
- 120 Nm +90°





- 17 - Bolt  
 15 Nm
- 18 - Toothed belt guard lower part
- 19 - Belt pulley and vibration damper  
 Can only be installed in one position (holes are offset).
- 20 - Bolt  
 10 Nm +90°
- 21 - Cover  
 If present
- 22 - Toothed belt  
 Mark direction of rotation before removing  
 Check for wear  
 Do not kink  
 Removing and installing ⇒ [page 62](#)
- 23 - Bolt  
 Renew after removal  
 40 Nm +180°
- 24 - Toothed belt guard centre part
- 25 - Engine support

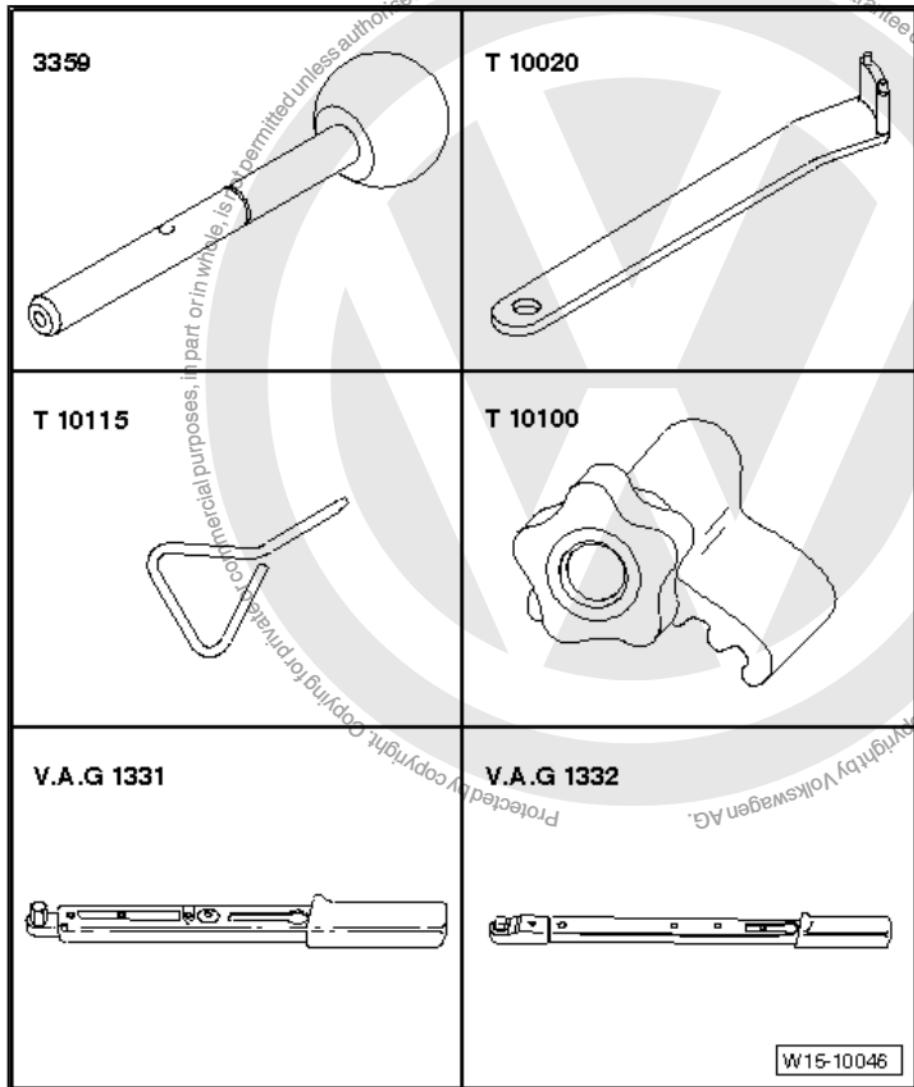


Caddy 2004 >

4-cylinder diesel engine (2.0 l engine, 2-valve, TDI) - Edition 08.2019

## 2.2 Removing and installing toothed belt

Special tools and workshop equipment required

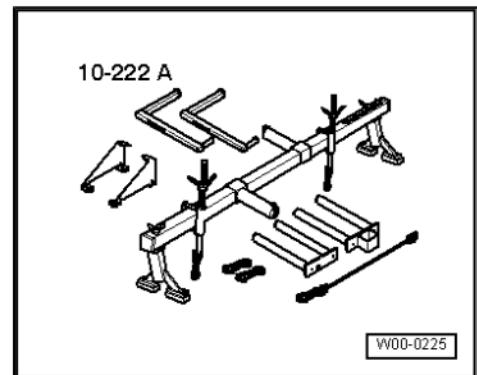


- ◆ Pin - 3359-
- ◆ Pin wrench - T10020- or hexagon wrench
- ◆ Pin - T10115-
- ◆ Crankshaft stop - T10100-
- ◆ Torque wrench - V.A.G 1331-
- ◆ Torque wrench - V.A.G 1332-

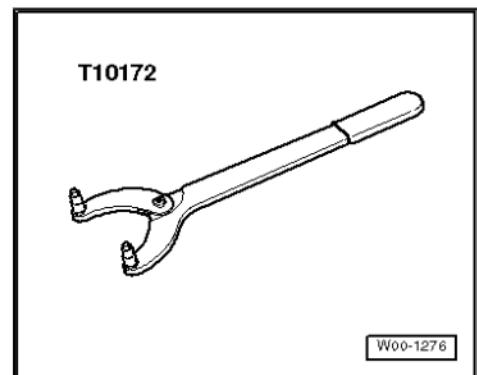
Special tools and workshop equipment required



- ◆ Support bracket - 10-222A- with legs - 10-222A/22-



- ◆ Counterhold - T10172- with pins - T10172/4-



## 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.*



### WARNING

*There is a danger of fuel running out.*

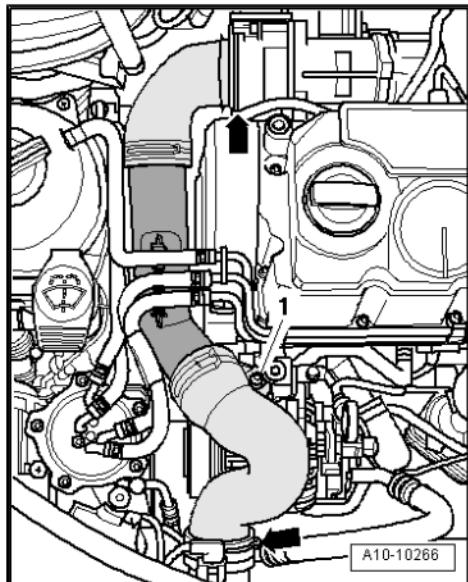
*The fuel system is pressurised.*

*Before opening the system place a cloth around the connection. Then release pressure by carefully loosening the connection.*

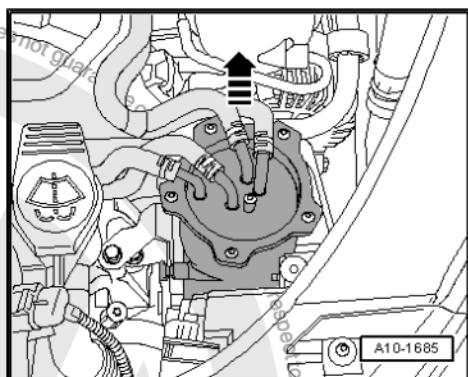
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- Unclip fuel hoses and coolant hoses from connecting pipe between charge air cooler and intake connecting pipe.
- Remove bolt -1-.
- Remove connecting pipe between charge air cooler and intake connecting pipe, to do this, lightly lift retaining clips -arrows-.
- Remove upper toothed belt guard.
- Unbolt fuel filter with bracket.

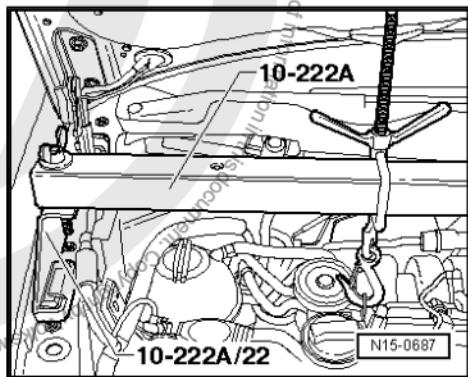


- Remove fuel filter with bracket -arrow- and lay it aside with hoses connected.
- Unscrew bolt on filler neck of washer fluid reservoir.
- Remove reservoir for power-assisted steering.
- Disconnect electrical connector from coolant expansion tank.
- Remove coolant expansion tank, coolant hoses remain connected. Place it on engine.
- Remove poly V-belt [page 20](#).
- 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.



 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.



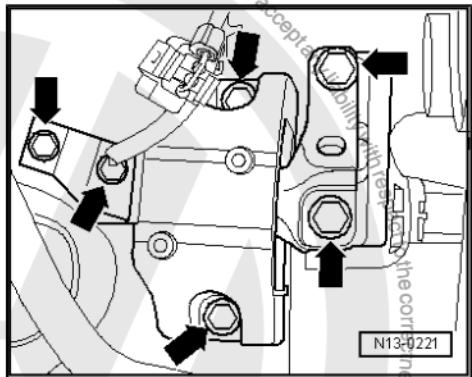


- Remove securing bolts between assembly mounting and engine bracket and between assembly mounting and body -arrows- and remove complete assembly mounting.

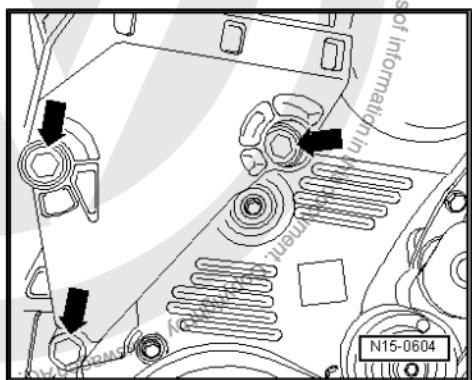


**Note**

- ◆ *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.*



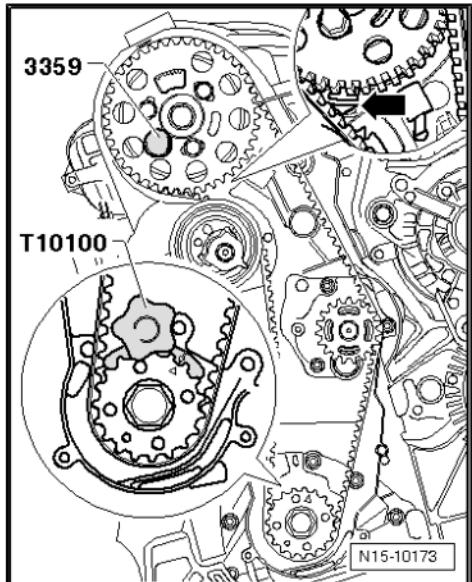
- Raise engine with support bracket - 10-222A- until both upper bolts of engine bracket can be loosened.
- Lower engine with support bracket - 10-222A- until both lower bolts of engine bracket can be loosened.
- Remove refrigerant line securing clamp from longitudinal member.
- Remove engine bracket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



**Note**

*Turn crankshaft until marking on crankshaft toothed belt pulley and tooth segment of camshaft toothed belt 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 belt pulley from face side.



**Note**

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

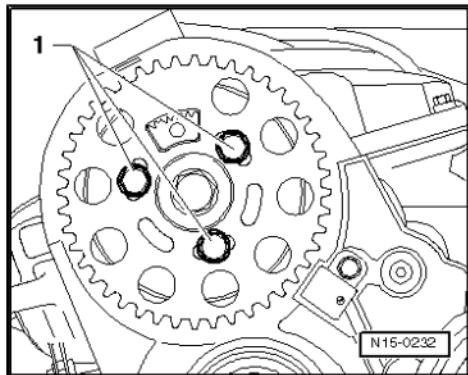
- Mark direction of rotation of toothed belt.



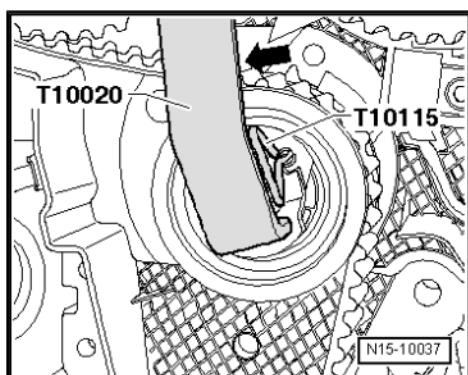
Caddy 2004 >

4-cylinder diesel engine (2.0 l engine, 2-valve, TDI) - Edition 08.2019

- Loosen securing bolts -1- of camshaft pulley until the 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- .



- Now turn 2-hole 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

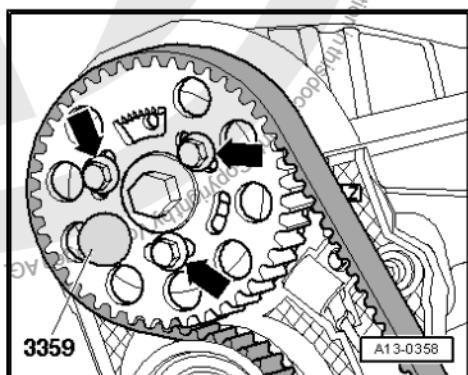
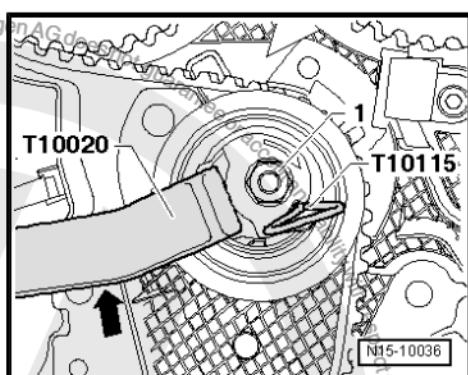
Install in reverse order of removal, observing the following:

- Camshaft locked with locking pin - 3359- .
- Crankshaft locked in position with crankshaft stop - T10100- .
- Tensioning roller locked with locking pin - T10115- and secured to right stop.



*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.*

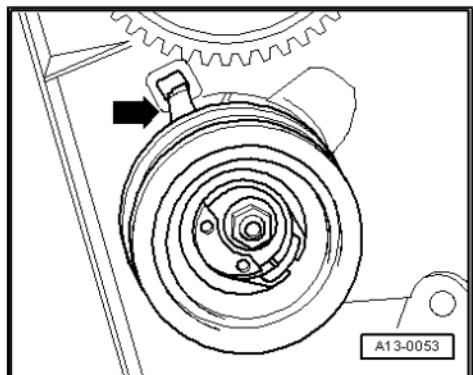
- Turn camshaft pulley in its elongated holes to centre position -arrows-.
- Fit toothed belt onto crankshaft toothed belt pulley, tensioning roller, camshaft toothed belt pulley and idler roller.
- Then fit toothed belt on coolant pump toothed belt pulley.



**Note**

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

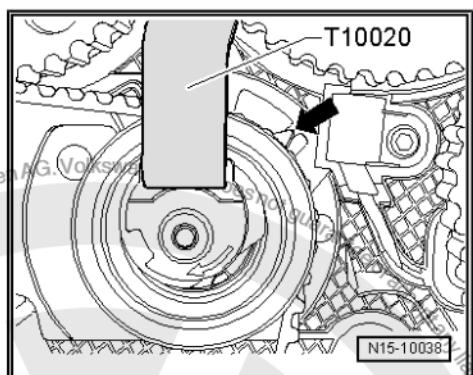
- Loosen tensioning roller securing nut and pull out locking pin - T10115 - .



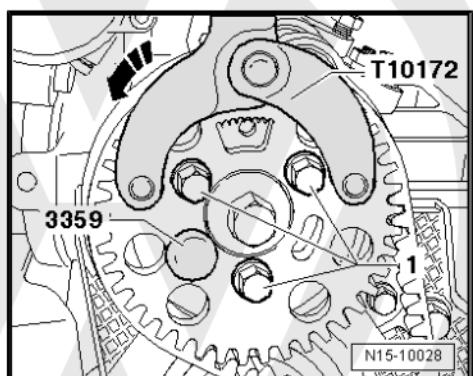
- Now carefully turn tensioning roller clockwise using pin wrench - T10020- until indicator is in middle of gap in the base plate -arrow-.

Ensure that securing nut does not turn as well.

- Hold tensioning roller in this position, and tighten tensioning roller securing nut.

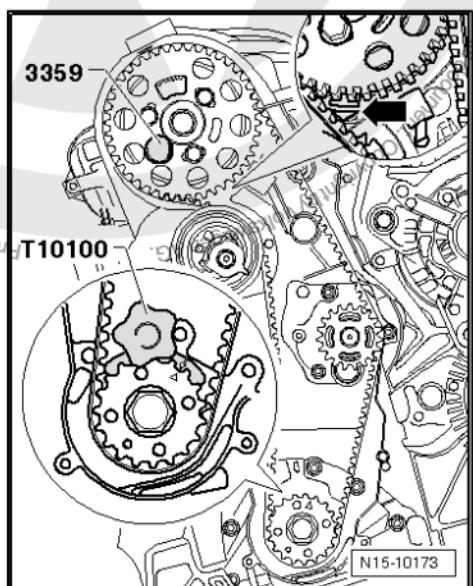


- Fit counterhold - T10172- with pins - T10172/4- as shown in illustration. Press counterhold - T10172- in direction of arrow, keeping camshaft toothed belt pulley under tension.
- In this position, tighten camshaft toothed belt pulley securing bolts -1-.
- Remove locking pin - 3359- and crankshaft stop - T10100- .
- Turn crankshaft two rotations in engine direction of rotation until crankshaft is just before TDC No. 1 cylinder.



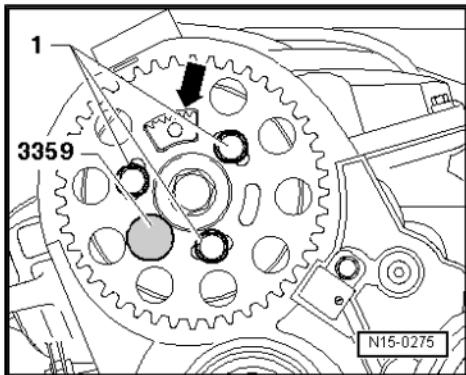
- Lock hub with locking pin - 3359- whilst turning engine in direction of rotation.
- Check whether crankshaft can be locked with crankshaft stop - T10100- .

If crankshaft cannot be locked:

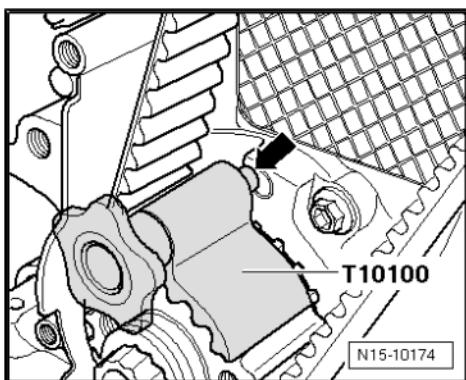




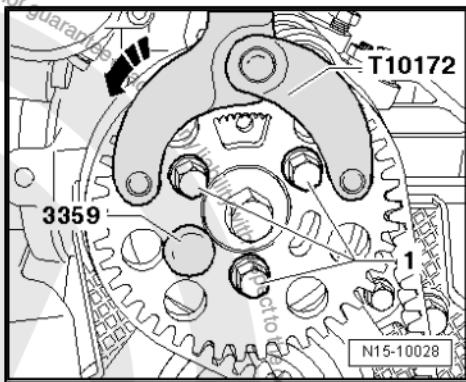
- Loosen securing bolts -1- for camshaft toothed belt pulley.



- 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 - T10172- with pins - T10172/4- as shown in illustration. Press counterhold - T10172- in direction of arrow, keeping camshaft toothed belt pulley under tension.
- In this position, tighten camshaft toothed belt pulley securing bolts -1-.
- 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.





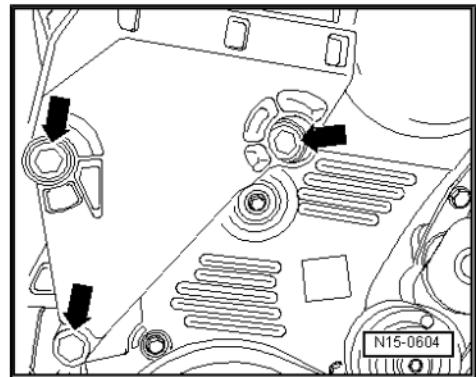
- Set engine bracket against cylinder block and tighten securing bolts -arrows-.



#### Note

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

- Install assembly mounting between engine and body (renew securing bolts).
- Bolt engine assembly mounting to engine bracket by bringing contact surfaces together using support bracket - 10-222A- .
- Install centre and lower parts of toothed belt guard.
- Install belt pulley vibration damper.
- Install poly V-belt [⇒ page 20](#) .
- Install upper toothed belt guard.
- Install front right wheel housing liner.
- Install reservoir for power-assisted steering.
- Install coolant expansion tank [⇒ page 113](#) .
- Bolt fuel filter bracket to engine mounting.
- Bolt on filler neck for window wash system.
- Install connecting pipe between charge air cooler and intake connecting pipe.



#### Specified torques

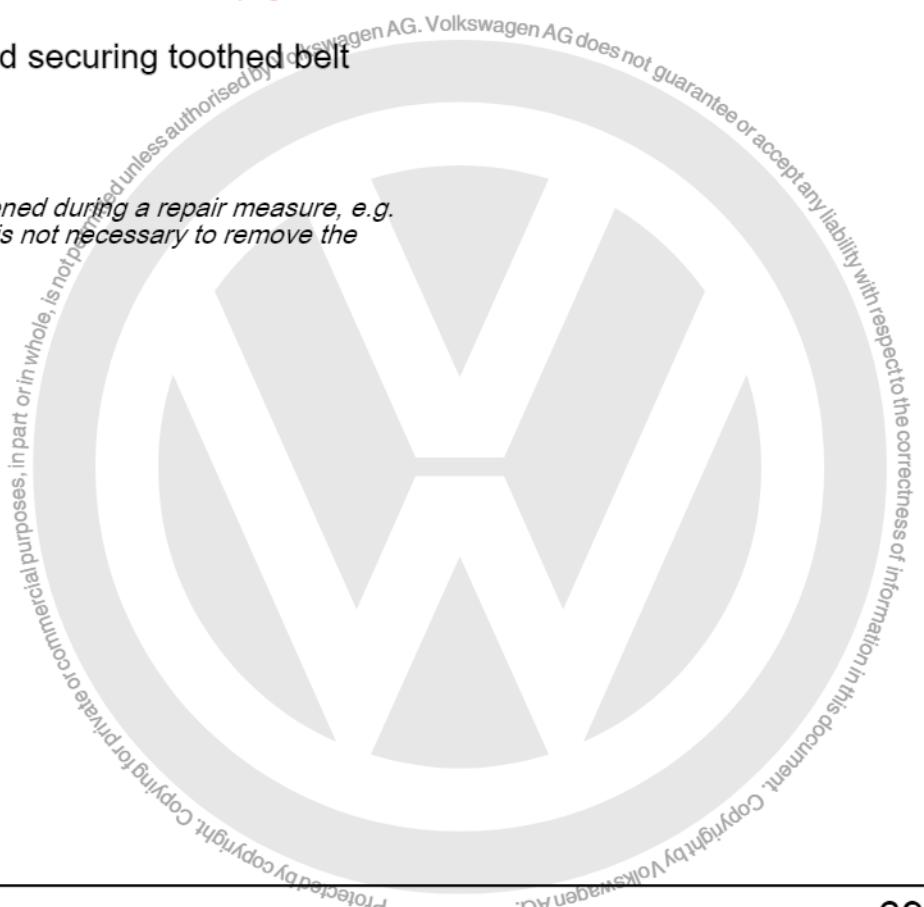
- ◆ [⇒ “2.1 Assembly overview - assembly mountings”, page 16](#)
- ◆ [⇒ “2.1 Assembly overview - toothed belt drive”, page 60](#)

### 2.3 Loosening and securing toothed belt



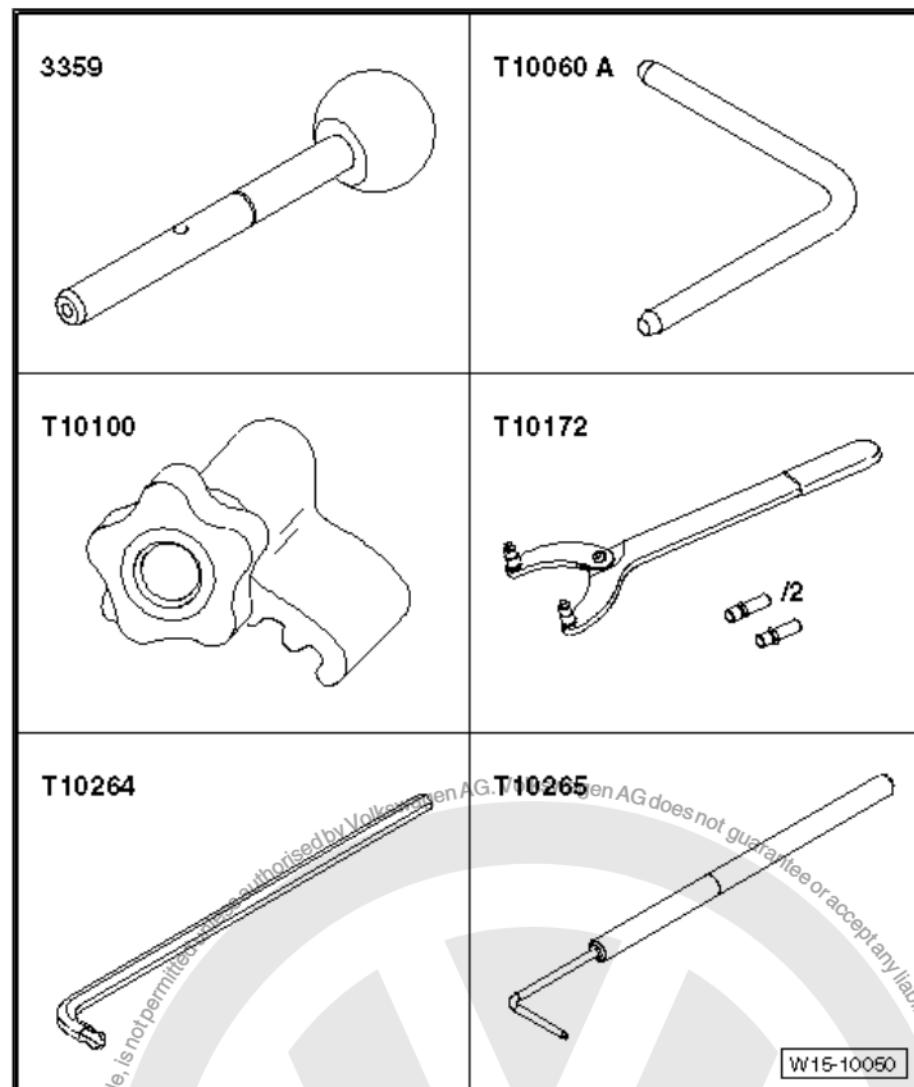
#### Note

*If the toothed belt is only loosened during a repair measure, e.g. when camshaft is removed, it is not necessary to remove the complete toothed belt.*





Special tools and workshop equipment required



- ◆ Diesel injection pump locking pin - **3359-**
- ◆ Locking pin - **T10060 A-**
- ◆ Crankshaft stop - **T10100-**
- ◆ Counter-hold tool - **T10172-**
- ◆ Socket wrench - **T10264-**
- ◆ Locking tool - **T10265-**

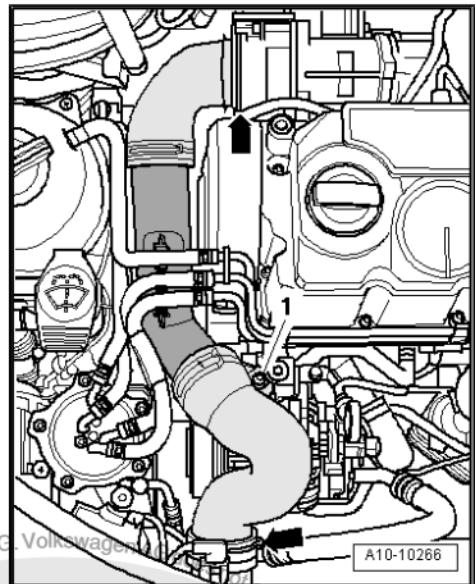
Removing



*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.*



- Unclip fuel hoses and coolant hoses from connecting pipe between charge air cooler and intake connecting pipe.
- Remove bolt -1-.
- Remove connecting pipe between charge air cooler and intake connecting pipe, to do this, lightly lift retaining clips -arrows-.
- Remove upper toothed belt guard.
- Unbolt fuel filter with bracket.

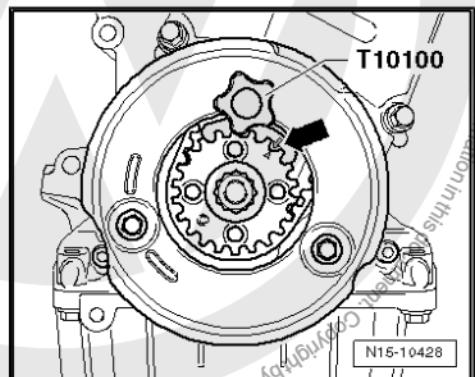
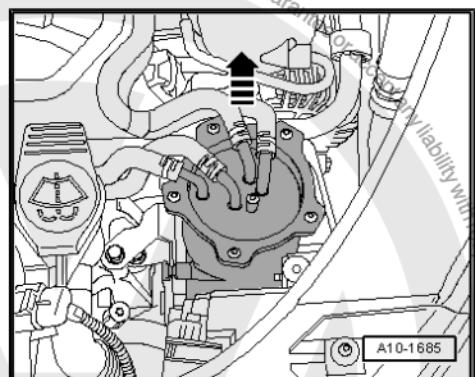


- Remove fuel filter with bracket -arrow- and lay it aside with hoses connected.
- Remove poly V-belt [page 20](#).
- Remove tensioning element for poly V-belt.
- Remove upper toothed belt guard.
- Remove front right wheel housing liner  $\Rightarrow$  Rep. gr. 66 .
- Remove belt pulley with vibration damper.
- Turn crankshaft to TDC No. 1 cylinder.
- Lock crankshaft toothed belt pulley with crankshaft stop -T10100-. 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 -arrow-. When doing this, the pin of the crankshaft stop must engage in the drilling of sealing flange.*

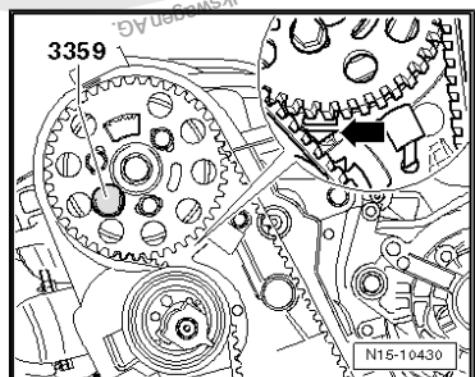


- Lock hub using locking pin - 3359-. To do this, slide locking pin through the free elongated hole on left into hole in cylinder head.



#### Note

*The marking on the rear toothed belt guard must align with the marking on the camshaft sender wheel -arrow-.*

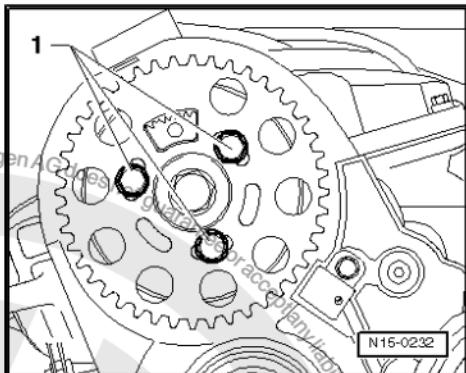




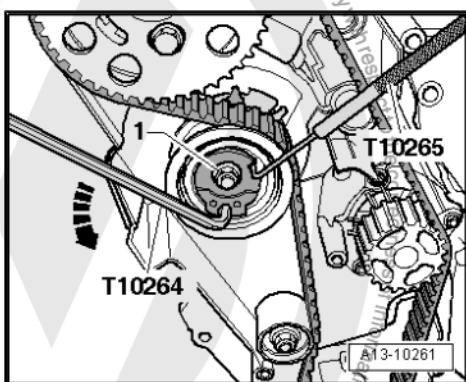
Caddy 2004 >

4-cylinder diesel engine (2.0 l engine, 2-valve, TDI) - Edition 08.2019

- Loosen securing bolts -1- of camshaft pulley until the 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- .



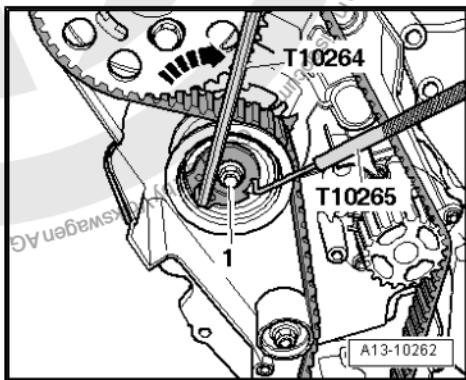
- Now turn tensioning roller eccentric clockwise -arrow- onto stop and tighten securing nut -1- hand-tight.

- Remove toothed belt from camshaft pulley.

#### Installing

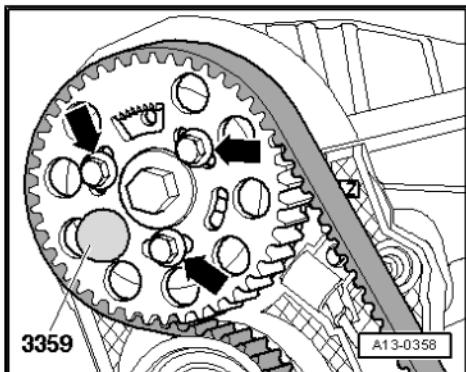
Install in reverse order of removal, observing the following:

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



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





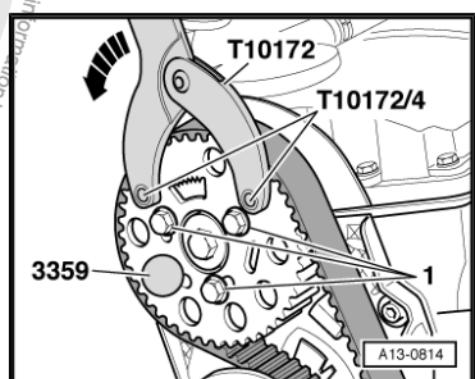
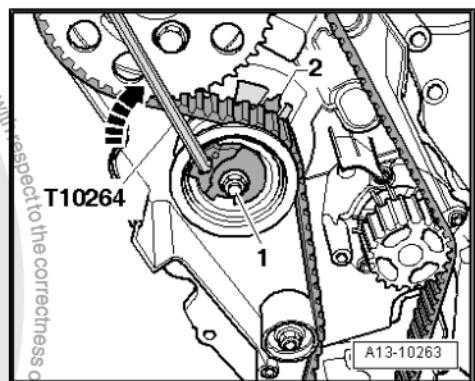
- Turn eccentric of tensioning roller clockwise -arrow- using special wrench, long reach - T10264- until indicator -2- is in middle of gap in base plate.



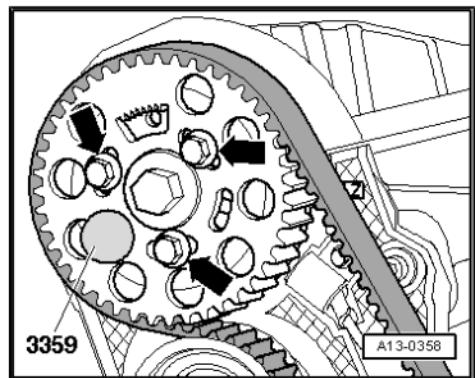
**Note**

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

- Hold tensioning roller in this position and tighten tensioning roller nut.
- Fit counterhold - 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 camshaft toothed belt pulley bolts -1-.
- 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.

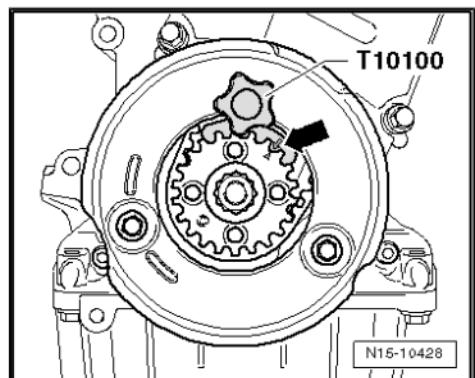


- Lock camshaft hub with locking pin - 3359- whilst turning engine in direction of rotation.



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

If crankshaft cannot be locked:

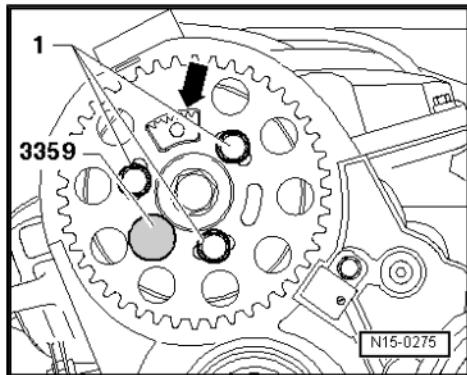




Caddy 2004 >

4-cylinder diesel engine (2.0 l engine, 2-valve, TDI) - Edition 08.2019

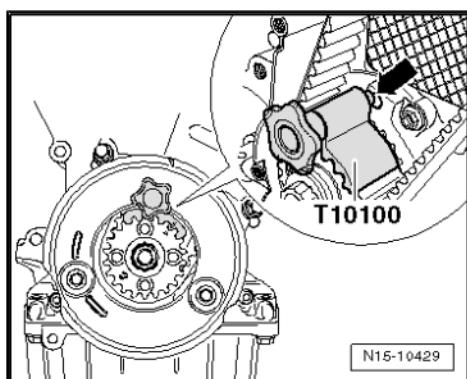
- Loosen securing bolts -1- for camshaft toothed belt pulley.
- Remove crankshaft stop.



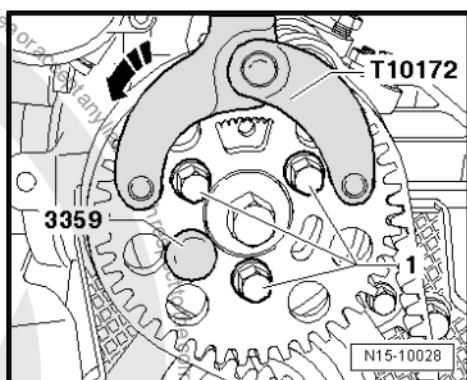
- Turn crankshaft slightly against engine direction of rotation until the pin of the crankshaft stop is positioned just before the hole in the sealing flange -arrow-.
- Now turn crankshaft in engine direction of rotation until crankshaft stop pin engages in sealing flange whilst turning.

Note

*The lower toothed belt guard remains installed, therefore the crankshaft with fitted crankshaft stop has only a limited ability to turn.*



- Fit counterhold - T10172- with pins - T10172/4- as shown in illustration. Press counterhold - T10172- in direction of arrow, keeping camshaft toothed belt pulley under tension.
- In this position, tighten camshaft toothed belt pulley securing bolts -1-.
- 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 belt pulley vibration damper.
- Install poly V-belt [⇒ page 20](#) .
- Install upper toothed belt guard.
- Install front right wheel housing liner.
- Bolt fuel filter bracket to engine mounting -arrows-.
- Install connecting pipe between charge air cooler and intake connecting pipe.



Specified torques

- ◆ [⇒ "2.1 Assembly overview - assembly mountings", page 16](#)
- ◆ [⇒ "2.1 Assembly overview - toothed belt drive", page 60](#)



### 3 Valve gear

- ⇒ "3.1 Assembly overview - valve gear", page 75
- ⇒ "3.2 Measuring axial play of camshaft", page 77
- ⇒ "3.3 Removing and installing camshaft oil seal", page 77
- ⇒ "3.4 Removing and installing camshaft", page 79
- ⇒ "3.5 Removing and installing valve stem seals", page 83

#### 3.1 Assembly overview - valve gear



##### Note

*Cylinder heads with cracks between the valve seats may be used without reducing engine life, provided the cracks are small and no more than 0.5 mm wide.*

##### 1 - Bolt

- Renew after removal
- Observe sequence for loosening and tightening  
⇒ page 79
- 20 Nm +90°

##### 2 - Rocker arm shaft

- Do not interchange

##### 3 - Cylinder head bolt

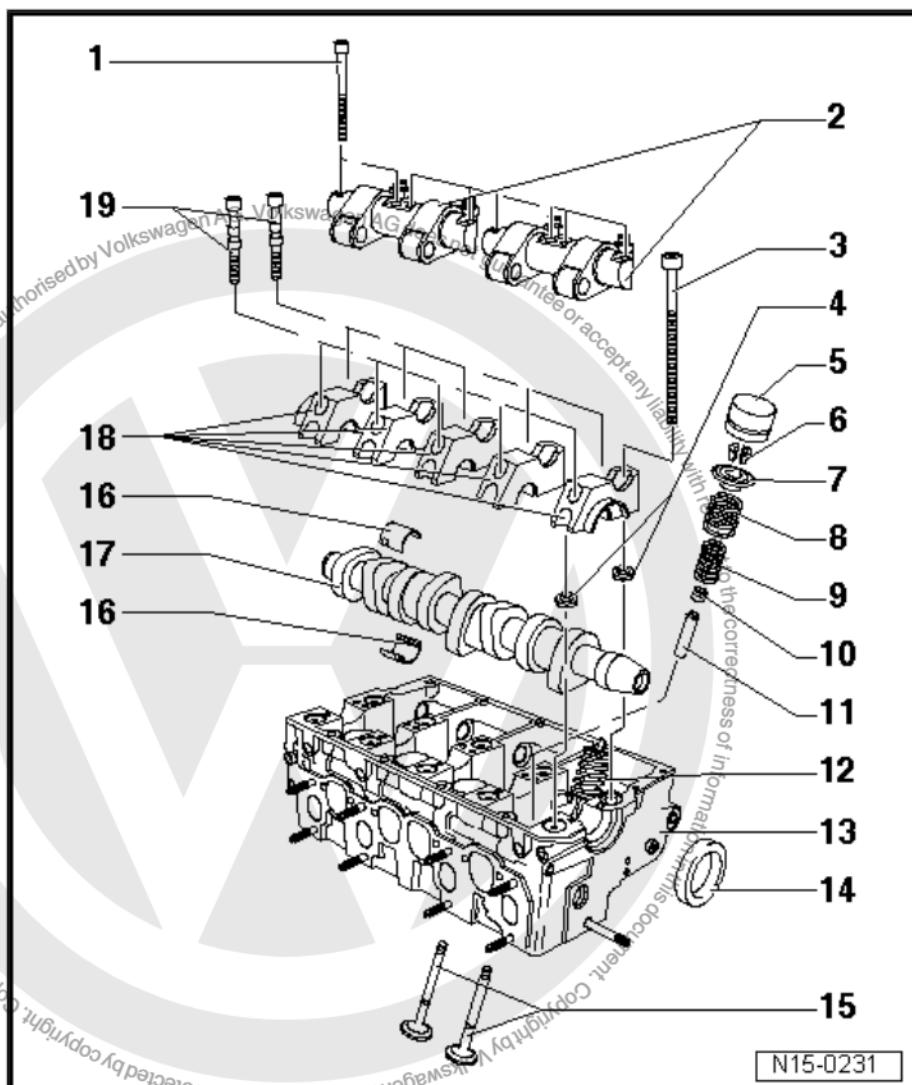
- Renew after removal
- Observe sequence for loosening and tightening  
⇒ page 49
- Before installing, insert washers  
⇒ Item 4 (page 75) in cylinder head.

##### 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.
- Set down with contact surface facing downwards.
- Before installing, check camshaft axial clearance  
⇒ page 77 .
- Oil contact surface
- Before removing, remove camshaft bearing caps



N15-0231



6 - Cotters

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 83](#), 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 83](#), Renewing valve stem seals.

10 - Valve stem seal

- Renewing [⇒ page 83](#)

11 - Valve guide

- Checking [⇒ page 86](#)

12 - Unit injector

- Removing and installing [⇒ page 131](#)

13 - Cylinder head

- Observe notes [⇒ page 75](#)

14 - Seal

- Do not apply additional oil or grease the sealing lip of the oil seal.
- 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 77](#)

15 - Valves

- Valve dimensions [⇒ page 86](#)

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 77](#).
- Removing and installing [⇒ page 79](#)
- Check radial clearance with Plastigage, wear limit: 0.11 mm
- Runout: max. 0.01 mm

18 - Bearing cap

- Installation sequence [⇒ page 79](#).
- To install, seal parting surfaces of bearing caps 1 and 5 with sealant - AMV 174 004 01- [⇒ page 77](#)

19 - Bolt

- Renew after removal
- 8 Nm +90°



### 3.2 Measuring axial play of camshaft

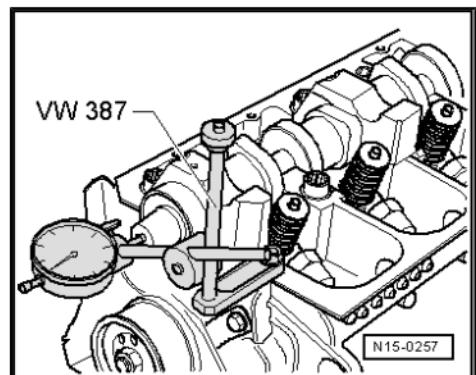
Special tools and workshop equipment required

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

Checking camshaft axial clearance

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

Wear limit: max. 0.15 mm



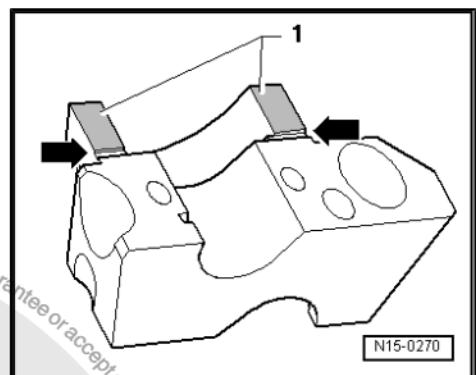
Seal parting surfaces of bearing caps 1 and 5 with sealant - AMV 174 004 01-

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



Note

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



### 3.3 Removing and installing camshaft oil seal

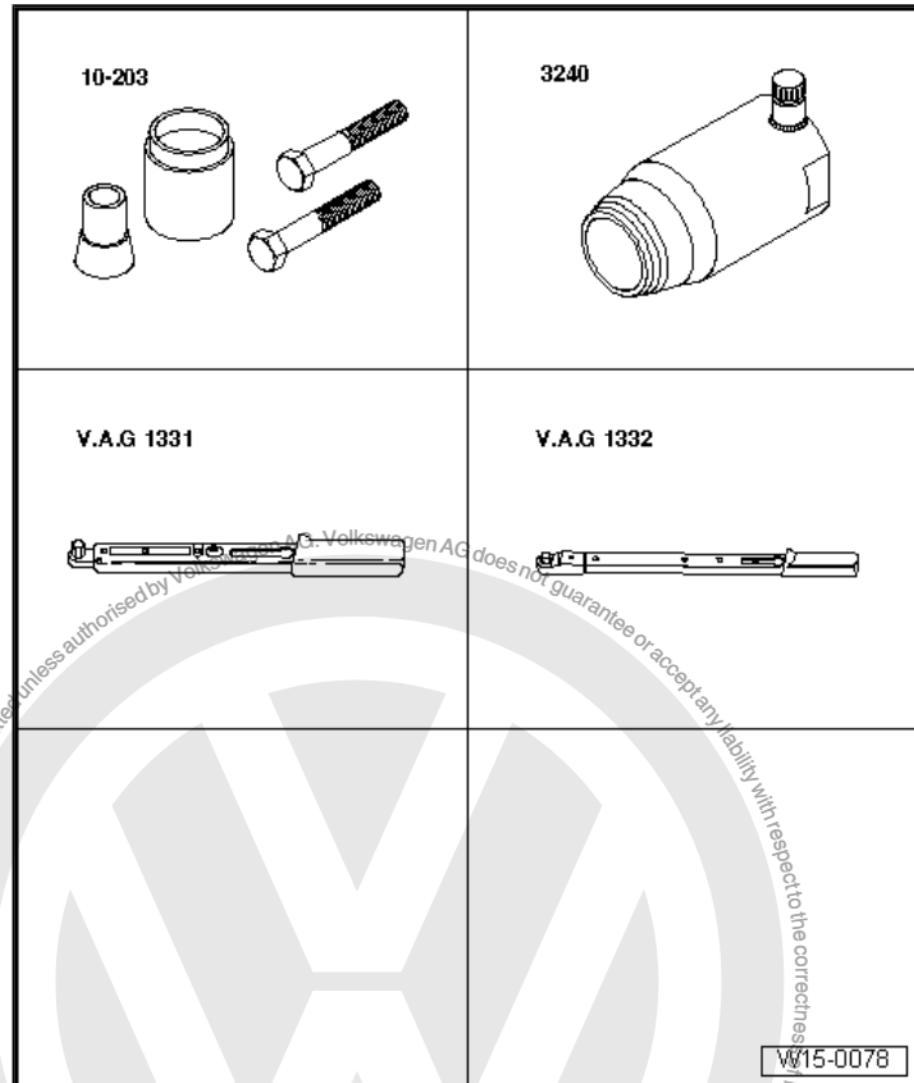




Caddy 2004 >

4-cylinder diesel engine (2.0 l engine, 2-valve, TDI) - Edition 08.2019

Special tools and workshop equipment required



- ◆ Fitting tool - 10-203-
- ◆ Seal puller - 3240-
- ◆ Torque wrench - V.A.G 1331-
- ◆ Torque wrench - V.A.G. 1332-
- ◆ Bolt M12 × 1.5 × 65

#### Removing

- Remove camshaft pulley and hub [⇒ page 79](#).
- Unscrew inner part of oil seal extractor - 3240- two turns (approx. 3 mm) out of outer part and lock with knurled screw.



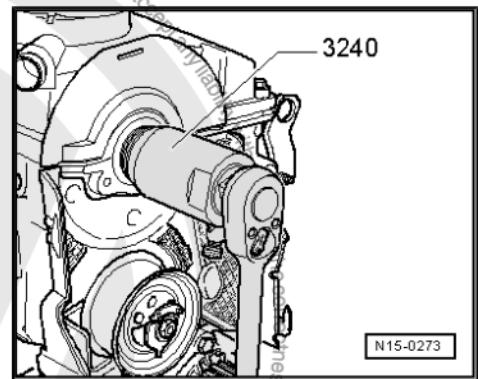
- Lubricate threaded head of oil seal extractor - 3240-, place it in position and exerting firm pressure, screw it as far as possible into oil seal.
- Loosen knurled screw and turn inner part against camshaft until oil seal is pulled out.

#### Installing

Install in reverse order of removal, observing the following:



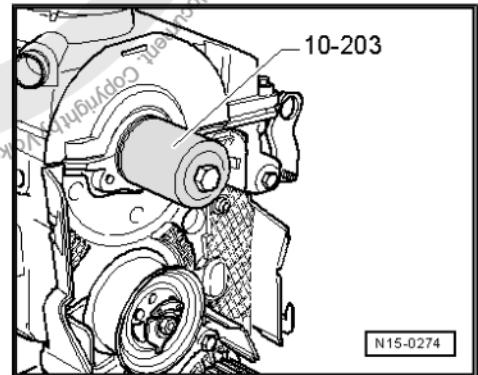
*Do not be additionally oil or grease the oil seal sealing lip.*



- 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 M12×1.5×65 to stop.
  - Install and tension toothed belt [⇒ page 62](#).

#### Specified torques

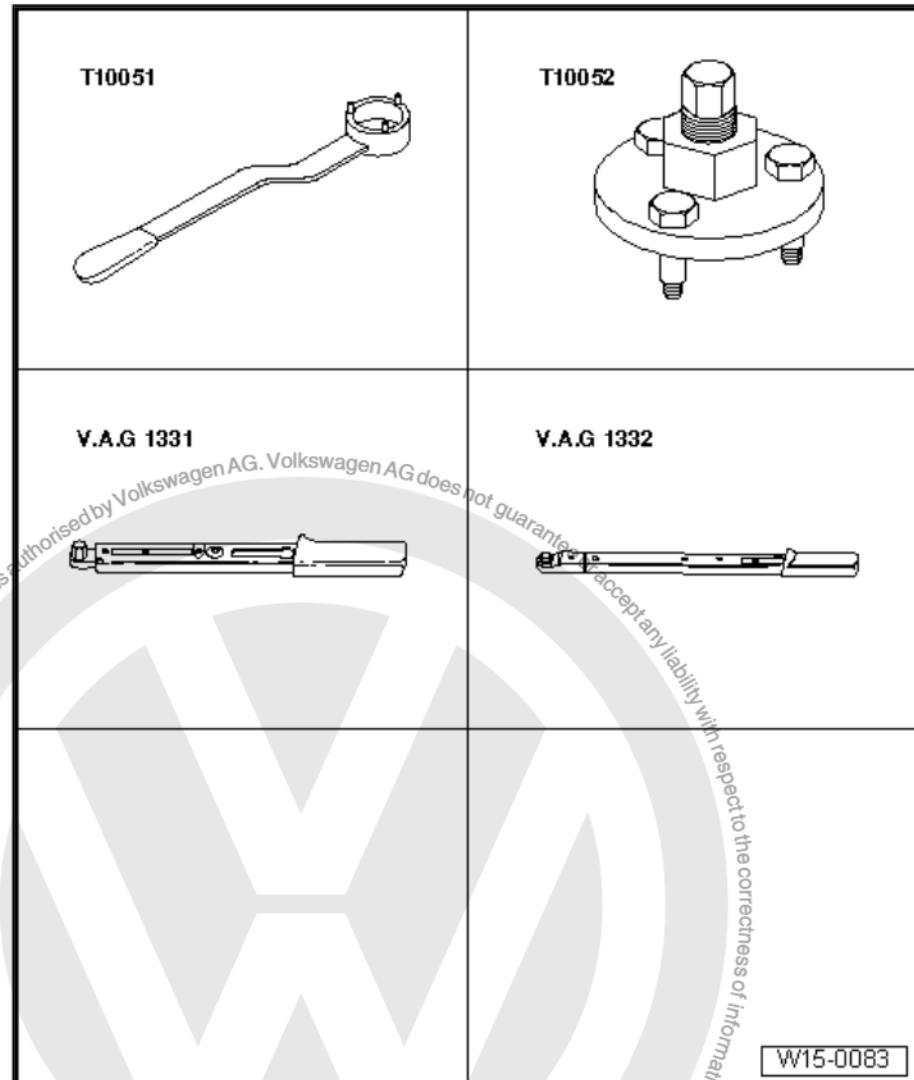
- ◆ [⇒ "3.1 Assembly overview - valve gear", page 75](#)
- ◆ [⇒ "1.1 Assembly overview - cylinder head", page 46](#)
- ◆ [⇒ "2.1 Assembly overview - toothed belt drive", page 60](#)



### 3.4 Removing and installing camshaft



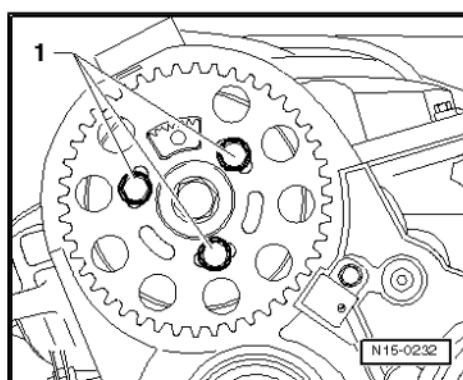
Special tools and workshop equipment required



- ◆ Counter-hold tool - T10051-
- ◆ Puller - T10052-
- ◆ Torque wrench - V.A.G 1331
- ◆ Torque wrench - V.A.G. 1332-
- ◆ Sealant - AMV 174 004 01-

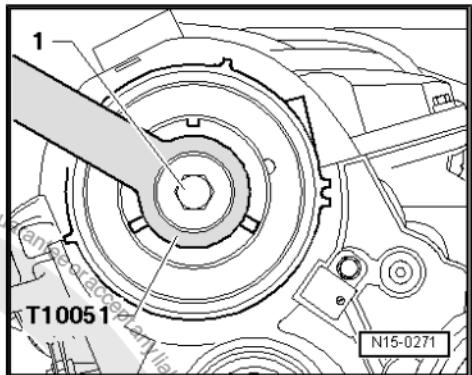
#### Removing

- Remove toothed belt from camshaft pulley [⇒ page 62](#).
- 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 - T10051- .
- Loosen hub securing bolt about 2 turns.



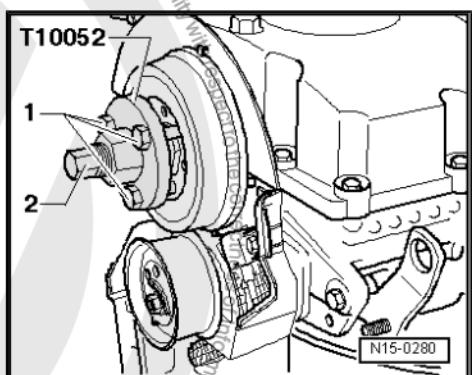
- Apply puller - T10052- and screw securing bolts -1- into hub.
- Apply tension to hub by evenly tightening puller until hub separates from taper of camshaft.



**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.



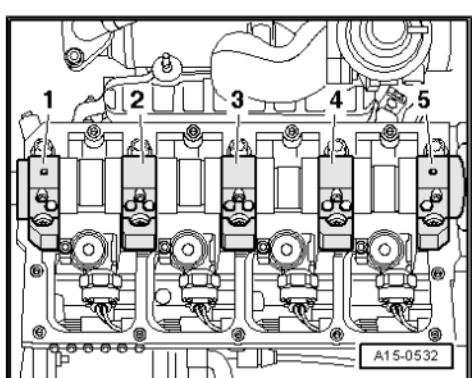
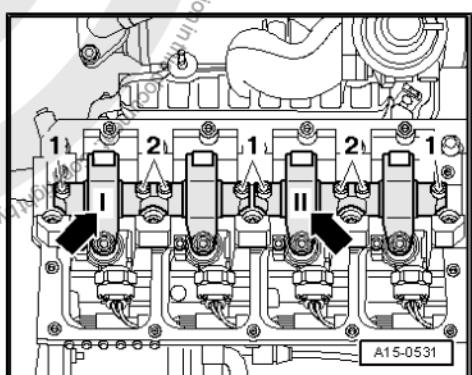
**Note**

*First loosen both outer and then inner securing bolts respectively.*

- Remove tandem pump [page 144](#) .
- First remove bearing caps 5, 1 and 3. Then loosen bearing caps 2 and 4 alternately and diagonally.
- Remove camshaft.

**Installing**

Install in reverse order of removal, observing the following:



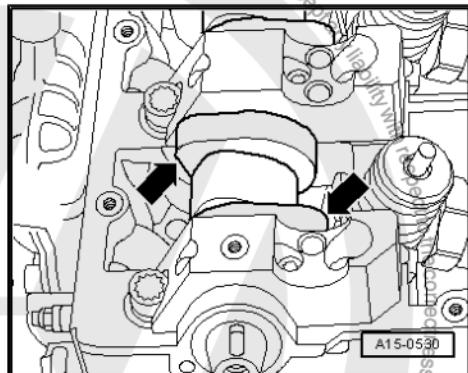


Caddy 2004 >

4-cylinder diesel engine (2.0 l engine, 2-valve, TDI) - Edition 08.2019

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.

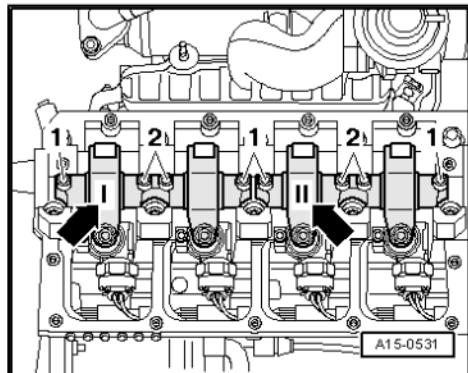


- Oil bearing shell running surfaces.
- Install bearing caps 2 and 4 using new bolts.
- Then tighten bearing caps 2 and 4 alternately and diagonally.
- Install bearing caps 5, 1 and 3 using new bolts.

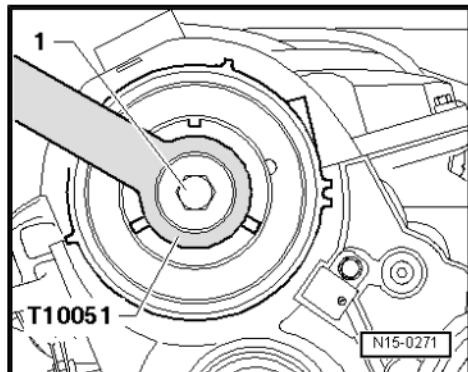
Note

- ◆ Seal parting surfaces of bearing caps 1 and 5 with sealant - AMV 174 004 01- [page 77](#).
- ◆ Bearing cap 5 must be flush with outer edge of cylinder head, otherwise leaks can occur at the tandem pump.

- Tighten bearing caps 5, 1, and 3 likewise.
- Install camshaft oil seal [page 77](#).
- Install rocker arm shafts with new securing bolts and tighten, first the inner -2- and then the outer -1-, equally and in diagonal sequence.
- Fit hub onto camshaft.



- Tighten hub securing bolt -1-.
- To do this, use counterhold - T10051- .





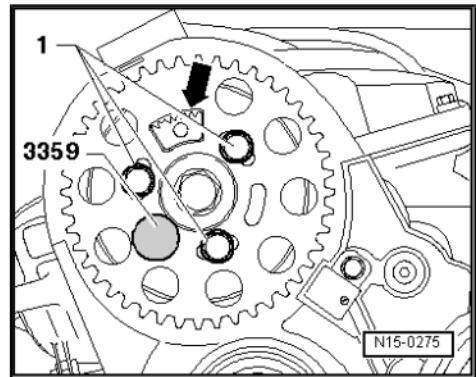
- Push camshaft toothed belt pulley onto hub.



#### Note

*The toothed segment -arrow- of the camshaft 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 tension toothed belt [⇒ page 62](#) .
- Install tandem pump [⇒ page 144](#) .



#### Note

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

#### Specified torques

- ◆ [⇒ "3.1 Assembly overview - valve gear", page 75](#)
- ◆ [⇒ "1.1 Assembly overview - cylinder head", page 46](#)
- ◆ [⇒ "2.1 Assembly overview - toothed belt drive", page 60](#)

### 3.5 Removing and installing valve stem seals

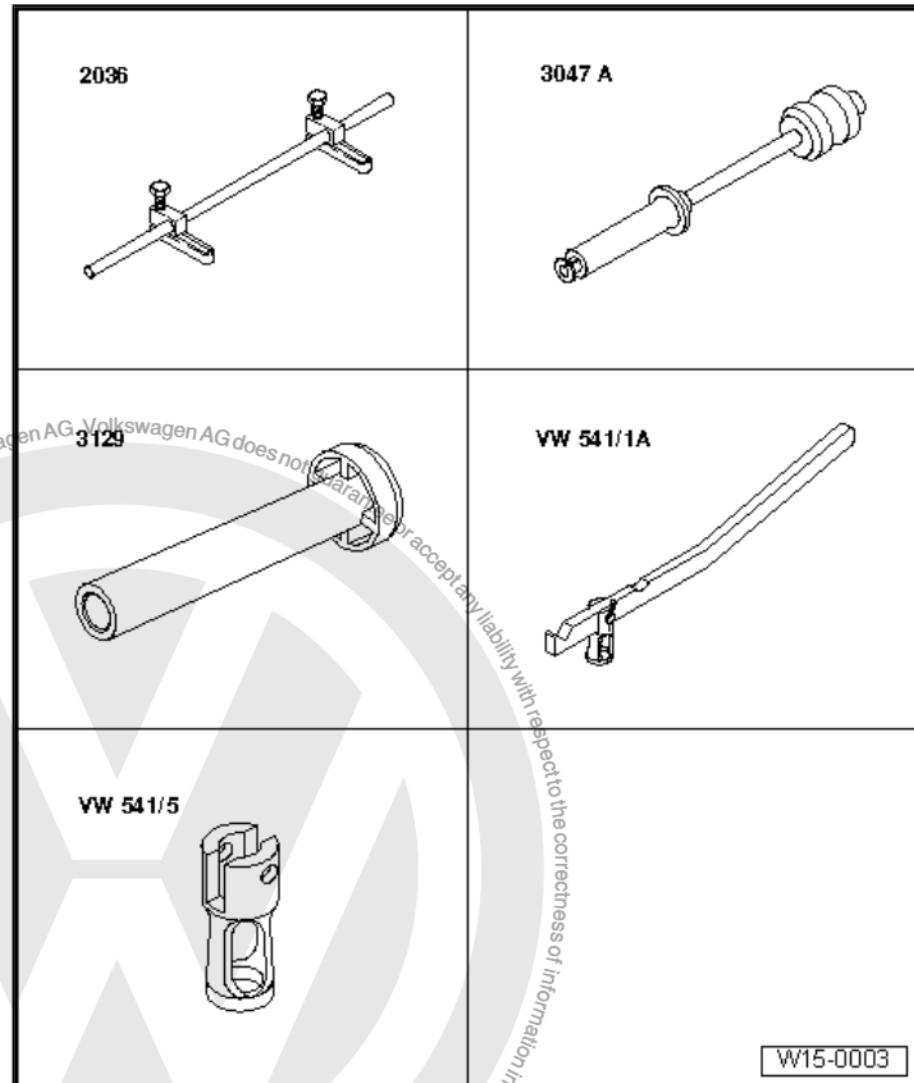
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Caddy 2004 >

4-cylinder diesel engine (2.0 l engine, 2-valve, TDI) - Edition 08.2019

Special tools and workshop equipment required



◆ Assembly tool - 2036-

◆ Puller - 3047 A-

◆ Fitting tool - 3129-

◆ Assembly lever - VW 541/1A-

◆ Thrust piece - VW 541/5-

#### Removing

(With cylinder head installed)

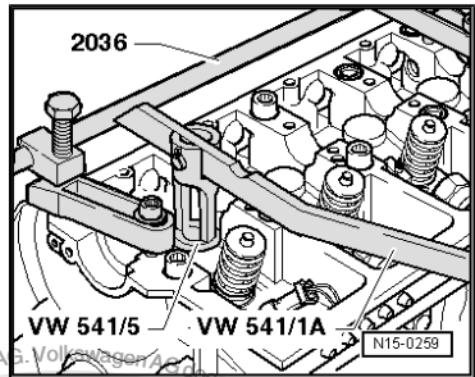
- Remove camshaft [page 79](#).
- Remove bucket tappets and place them with the contact surface downwards. When doing this, ensure that tappets are not interchanged.
- Set piston of respective cylinder to top dead centre (TDC).



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

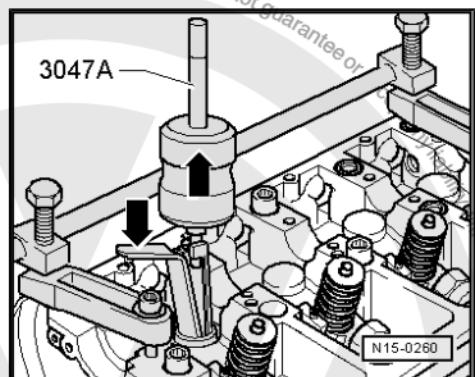


*The valves are supported by the piston crown.*

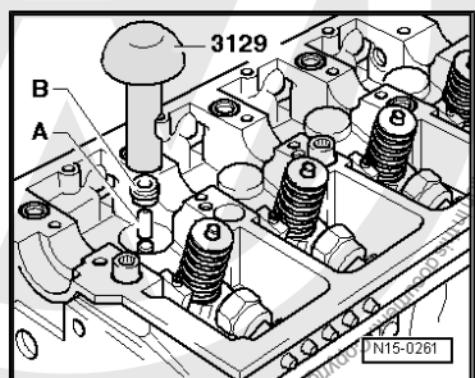


- Pull off valve stem seals using puller - 3047 A- .

#### Installing



- Place the plastic sleeve -A- supplied on the associated 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 oil seal, and carefully push on valve guide.





## 4 Inlet and exhaust valves

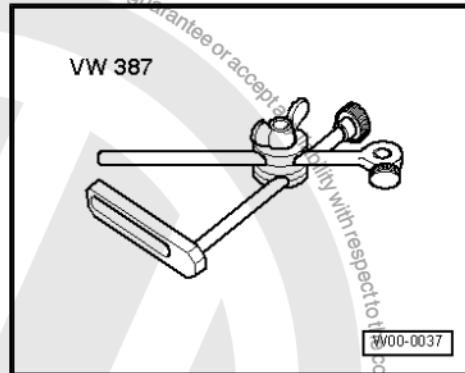
⇒ "4.1 Checking valve guides", page 86

⇒ "4.2 Valve dimensions", page 86

### 4.1 Checking valve guides

Special tools and workshop equipment required

- ◆ Universal dial gauge holder - VW 387-



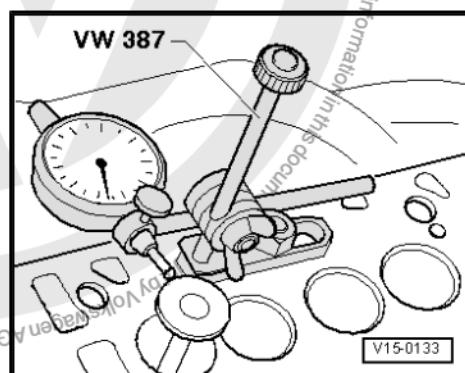
VW 387

VW00-0037

- ◆ Dial gauge

#### Test sequence

- Insert new valve into guide. The end of the valve stem must be flush with the guide. On account of differing stem diameters, only use inlet valve in inlet guide and exhaust valve in exhaust guide.
- Determine rock. Wear limit: max. 1.3 mm
- Cylinder head must be renewed if rock exceeds wear limit.



VW 387

V15-0133

### 4.2 Valve dimensions

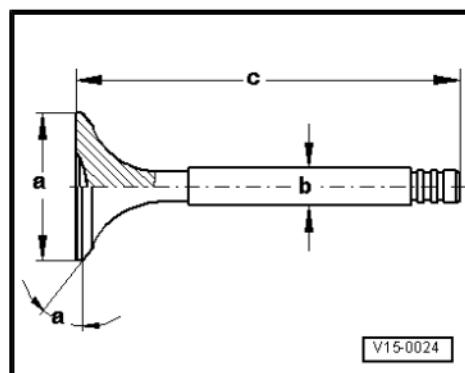
#### Valve dimensions



##### Note

*Do not rework valves. Only lapping-in is permitted.*

Dimension	Inlet valve	Outlet valve
Ø a mm	35.95	31.45
Ø b mm	6.980	6.956
c mm	89.95	89.95
a $\angle^\circ$	45	45



V15-0024



## 17 – Lubrication

### 1 Sump, oil pump

⇒ "1.1 Assembly overview - sump/oil pump", page 87

⇒ "1.2 Removing and installing sump", page 89

⇒ "1.3 Engine oil:", page 91

#### 1.1 Assembly overview - sump/oil pump



##### Caution

*Finding metal shavings or a large quantity of small metal particles during engine repair could indicate that the crankshaft bearings or conrod bearings are damaged. To prevent this from causing further damage, perform the following repairs:*

*Thoroughly clean oil channels.*

*Renew engine oil cooler.*

*Renew oil filter element.*

#### 1 - Bolt

- 15 Nm

#### 2 - Sealing flange

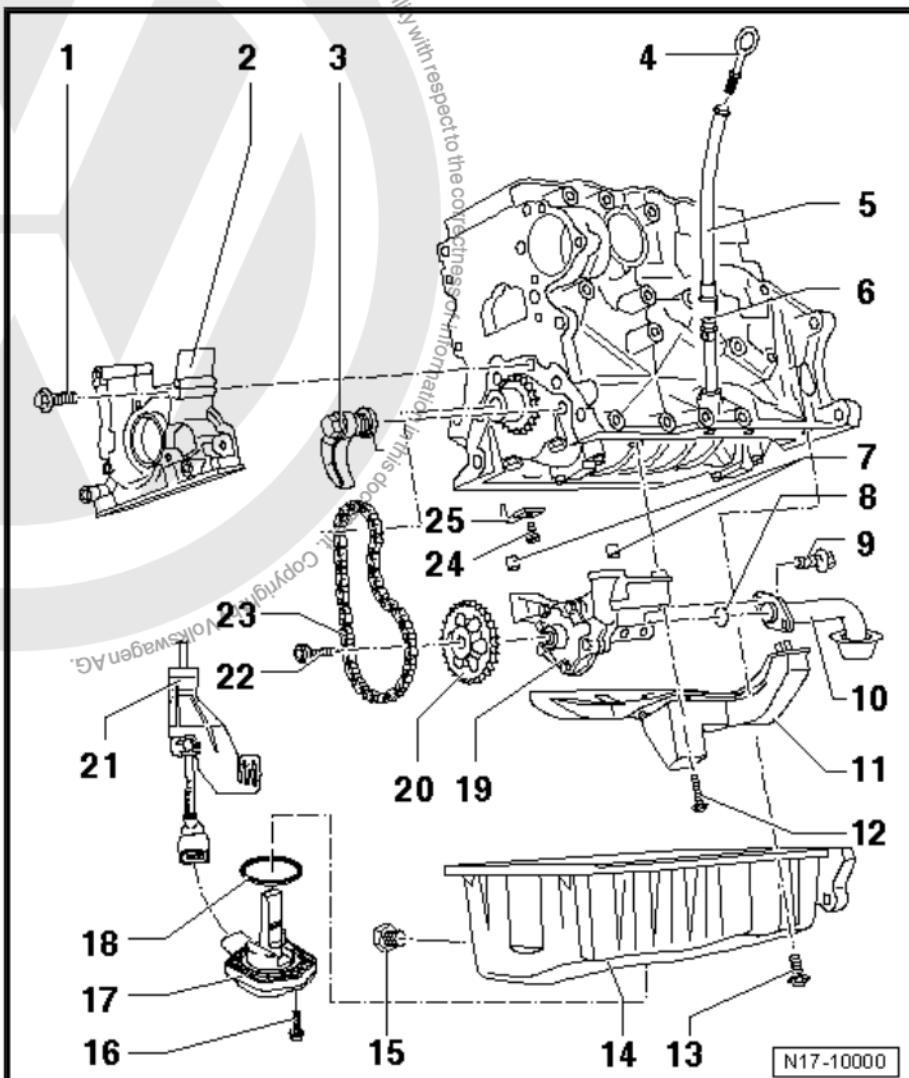
- With seal
- Must seat on dowel sleeves.
- Install with silicone sealant ⇒ Electronic parts catalogue (ETKA).
- Do not additionally oil or grease the oil seal sealing lip.
- Before installing, remove oil residue from crankshaft journal using a clean cloth.
- Renewing crankshaft oil seal - belt pulley end  
⇒ [page 22](#)
- Removing and installing  
⇒ [page 29](#)

#### 3 - Chain tensioner with tensioning rail

- When installing, pre-tension spring and fit.
- 15 Nm

#### 4 - Oil dipstick

- Lugs on dipstick and funnel must align.
- The oil level must not be above the max. mark
- Markings ⇒ [page 91](#).



N17-10000



## 5 - Piston fitting tool

- Lugs on dipstick and funnel must align.

## 6 - Guide tube

## 7 - Dowel sleeves

## 8 - O-ring

- Renew after removal

## 9 - Bolt

- 15 Nm

## 10 - Suction line

- Clean strainer if soiled

## 11 - Baffle plate

## 12 - Bolt

- 15 Nm

## 13 - Bolt

- 15 Nm

## 14 - Sump

- Clean sealing surface before fitting.
- Install with silicone sealant ⇒ Electronic parts catalogue (ETKA).
- Removing and installing ⇒ [page 89](#)

## 15 - Oil drain plug

- Renew after removal
- 30 Nm

## 16 - Bolt

- 10 Nm

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

## 18 - Seal

- Renew after removal

## 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 and oil temperature sender - G266- .

## 22 - Bolt

- Renew after removal
- 20 Nm +90°

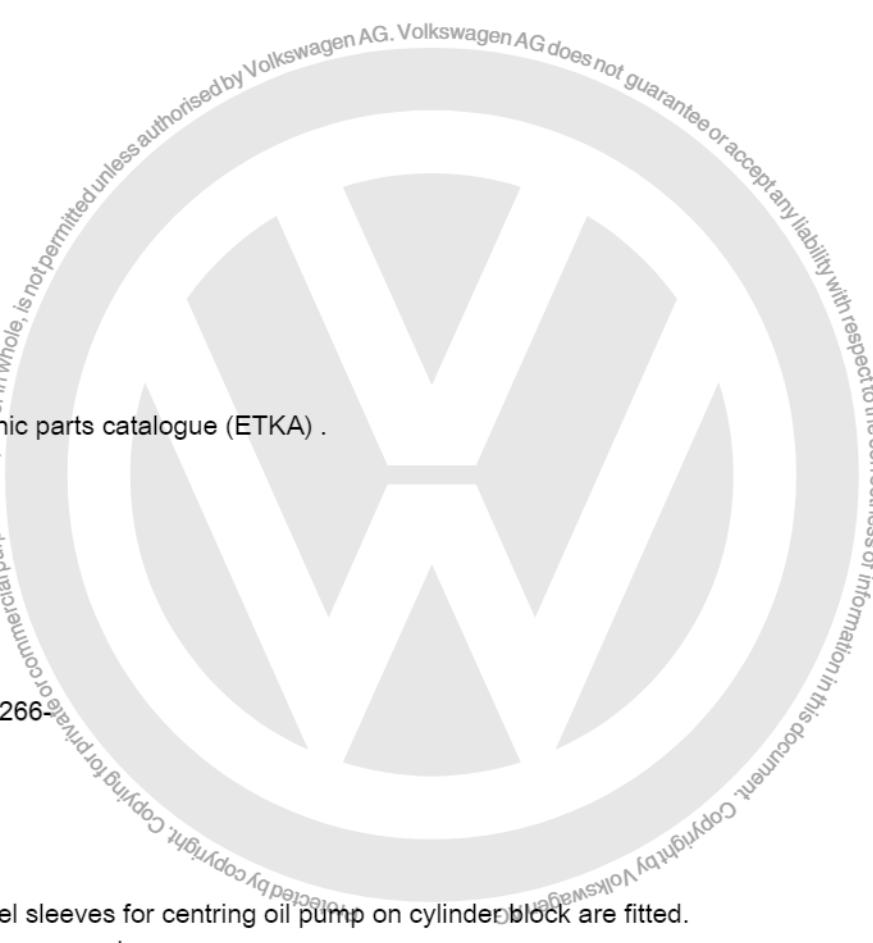
## 23 - Chain

## 24 - Bolt

- Insert without sealant.
- 25 Nm

## 25 - Oil spray jet

- For piston cooling





## 1.2 Removing and installing sump

Special tools and workshop equipment required

- ◆ Torque wrench - V.A.G 1331-

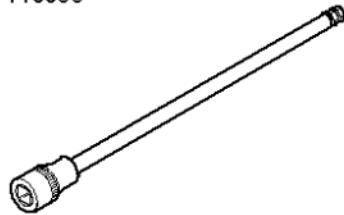
V.A.G 1331



W00-0427

- ◆ Multi-point bit - T10058-

T10058



W00-1006

- ◆ Hand drill with plastic brush attachment
- ◆ Silicone sealant ⇒ Electronic parts catalogue (ETKA)
- Hand drill with plastic brush attachment
- ◆ Safety glasses
- ◆ Scraper

### Removing

- If present, remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Body, front; Noise insulation .
- Drain engine oil.



Note

*Please observe disposal instructions!*

- 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.



- Use a rotating brush, e.g. a hand drill with a plastic bristle insert, to remove residual sealant from oil pan (wear eye protection).
- Clean sealing surfaces. They must be free of oil and grease.

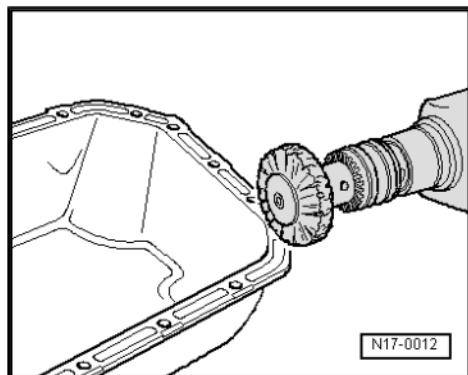
#### Installing

Install in reverse order of removal, observing the following:

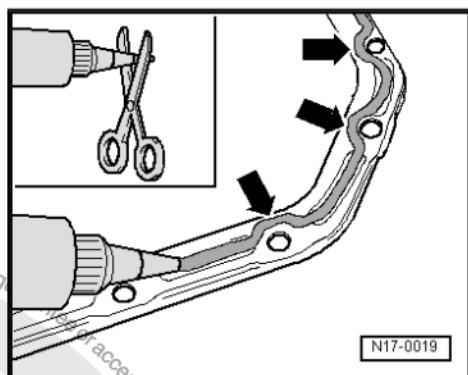


#### Note

- ◆ Check the expiry date of the sealant.
- ◆ The sump must be installed within 5 minutes of applying silicone sealing compound.
- ◆ 2...3 mm thick
- ◆ Run bead along inner side of bolt holes -arrows-.
- ◆ The sealant bead must not be thicker, otherwise excess sealing compound will enter the oil sump and may block the oil suction line strainer.



- Cut off tube nozzle at forward marking (approx. 3 mm Ø of nozzle).
- Apply silicone sealing compound, as shown, to clean sealing surface on sump. Sealant bead must be:



- 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.



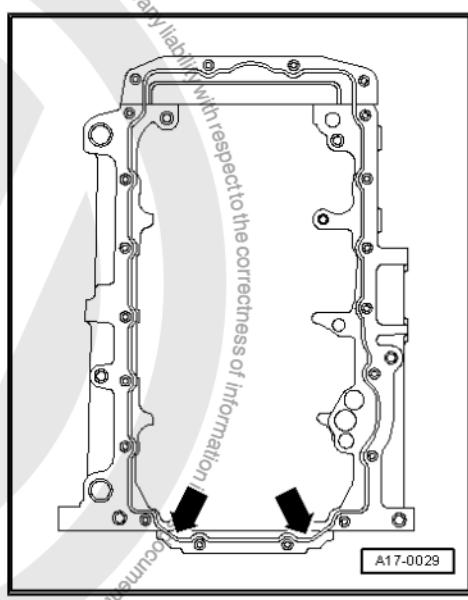
#### Note

- ◆ When installing sump with engine removed, ensure that sump is flush with cylinder block at flywheel end.
- ◆ Let sealing compound dry for approx. 30 minutes after installing oil sump. Only then fill with engine oil.

#### Specified torques

- ◆ ⇒ ["1.1 Assembly overview - sump/oil pump", page 87](#)

Component	Specified torque
Bolts between sump and gearbox.	45 Nm





### 1.3 Engine oil:



#### Note

*The oil level must remain below the max. mark - danger of damage to catalytic converter!*

Markings on oil dipstick

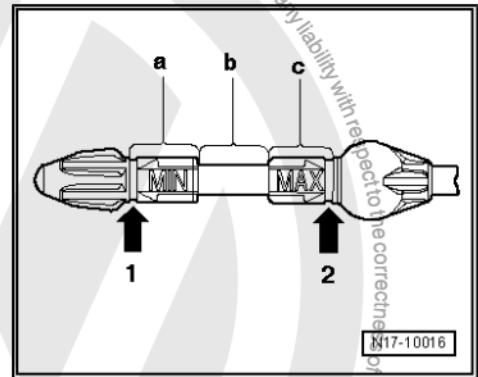
1 - Min. mark

2 - Max. mark

a - Area of min. mark: top-up with max. 0.5 l of engine oil!

b - Oil level in middle range: can be topped-up with engine oil.

c - Area of max. mark: do not add engine oil!





## 2 Oil filter, oil pressure switch

⇒ "2.1 Assembly overview - oil filter housing with engine oil cooler", page 92

⇒ "2.2 Checking oil pressure and oil pressure switch", page 93

⇒ "2.3 Measuring oil consumption", page 94

### 2.1 Assembly overview - oil filter housing with engine oil cooler

#### 1 - Seal

- Renew after removal

#### 2 - Bolt

- Renew after removal
- First fit upper left and lower right bolts and then tighten all four bolts diagonally.
- 15 Nm +90°

#### 3 - Oil filter bracket

#### 4 - Seal

- Renew after removal

#### 5 - Union

- 30 Nm

#### 6 - Oil supply line

- To turbocharger
- 22 Nm

#### 7 - Oil pressure switch - F1-

- 0.7 bar switch: brown
- If seal is leaking, nip open and renew.
- Checking ⇒ page 93
- 20 Nm

#### 8 - Cap

- Loosen and tighten with socket AF 36 mm - T10125- .
- 25 Nm

#### 9 - O-ring

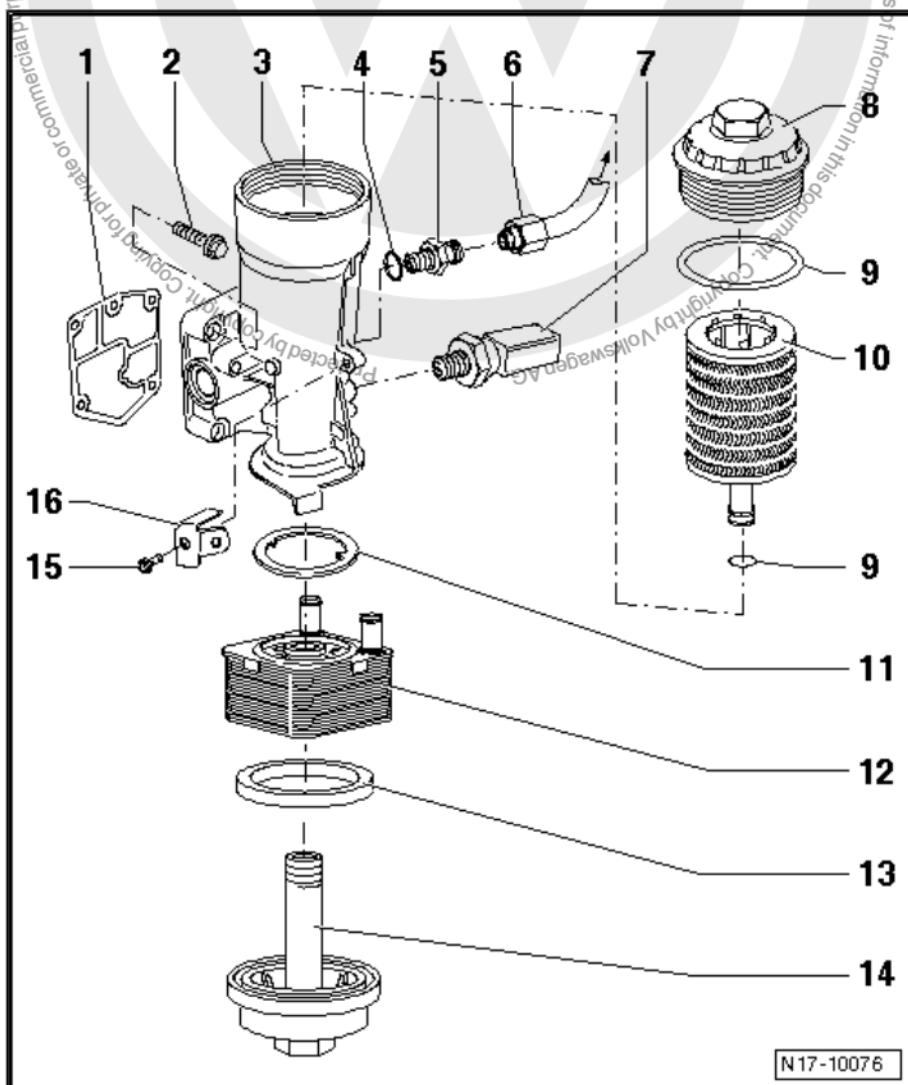
- Renew after removal

#### 10 - Oil filter element

- See note.
- Observe change intervals.
- Ensure "Top" is uppermost when fitting

#### 11 - Seal

- Renew after removal
- Lubricate before assembling.
- Fit into lugs on engine oil cooler.





## 12 - Engine oil cooler

- Ensure clearance to adjacent components
- Observe notes ⇒ [page 87](#)
- Checking engine oil cooler for leaks ⇒ [page 104](#)

## 13 - Seal

- Renew after removal

## 14 - Cap

- Loosen and tighten with socket AF 36 mm - T10125- .
- 25 Nm

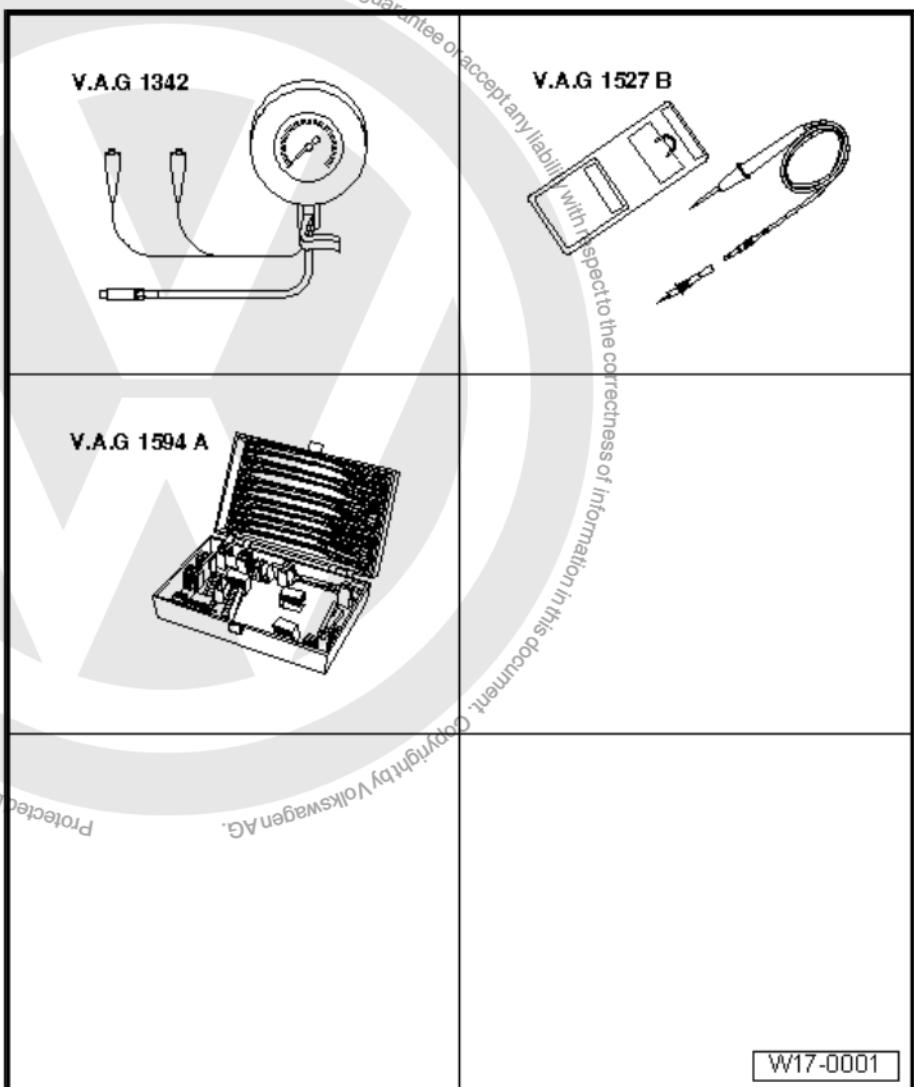
## 15 - Bolt

- 10 Nm

## 16 - Bracket

## 2.2 Checking oil pressure and oil pressure switch

Special tools and workshop equipment required



- ◆ Oil pressure tester - V.A.G 1342-
- ◆ Voltage tester - V.A.G 1527 B-

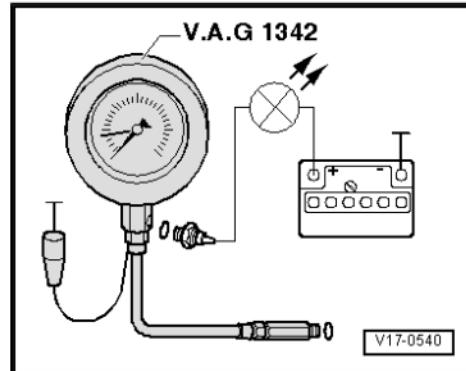


- ♦ Adapter set - V.A.G 1594 A-

#### Test sequence

- Oil level OK.
- Engine oil temperature approx. 80°C.
- Oil pressure at idling speed: at least 0.6 bar
- Minimum oil pressure at 2,000 rpm: at least 1.0 bar
- Remove oil pressure switch - F1- and screw into tester.
- Screw oil pressure tester - V.A.G 1342- 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, 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 1.0 bar.

At higher engine speeds, the oil pressure must not exceed 7.0 bar. Renew oil filter bracket if necessary.



## 2.3 Measuring oil consumption

#### Procedure

- Apply handbrake.
- Manual gearbox: gear lever in neutral.
- Automatic gearbox: move selector lever to position "N".
- Connect ⇒ Vehicle diagnostic tester.
- Switch on ignition.
- Carry out program "oil consumption measurement" using ⇒ Vehicle diagnostic tester.



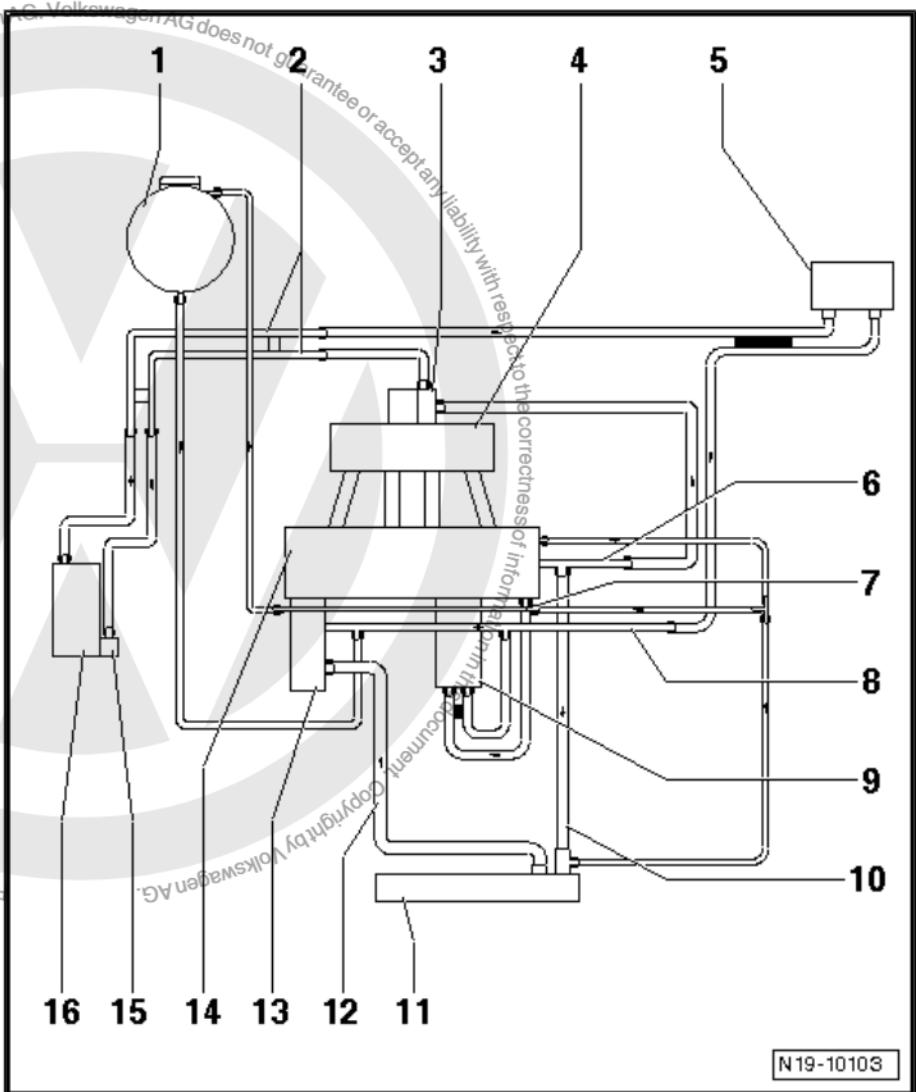
## 19 – Cooling

### 1 Cooling system/coolant

- ⇒ “1.1 Connection diagram - coolant hoses”, page 95
- ⇒ “1.2 Draining and adding coolant”, page 96
- ⇒ “1.3 Checking cooling system for leaks”, page 103
- ⇒ “1.3.1 Check pressure relief valve in cap.”, page 104
- ⇒ “1.4 Checking engine oil cooler for leaks”, page 104

#### 1.1 Connection diagram - coolant hoses

- 1 - Expansion tank
- 2 - Rear coolant pipe
- 3 - Exhaust gas recirculation cooler
- 4 - Intake manifold
- 5 - Heat exchanger for heater
- 6 - Union
- 7 - Upper coolant pipe
- 8 - Front coolant pipe
- 9 - Engine oil cooler
- 10 - Upper coolant hose
- 11 - Radiator/cooler
- 12 - Lower coolant hose
- 13 - Coolant pump and thermostat
- 14 - Cylinder head/cylinder block
- 15 - Circulation pump - V55
- 16 - Supplementary heater





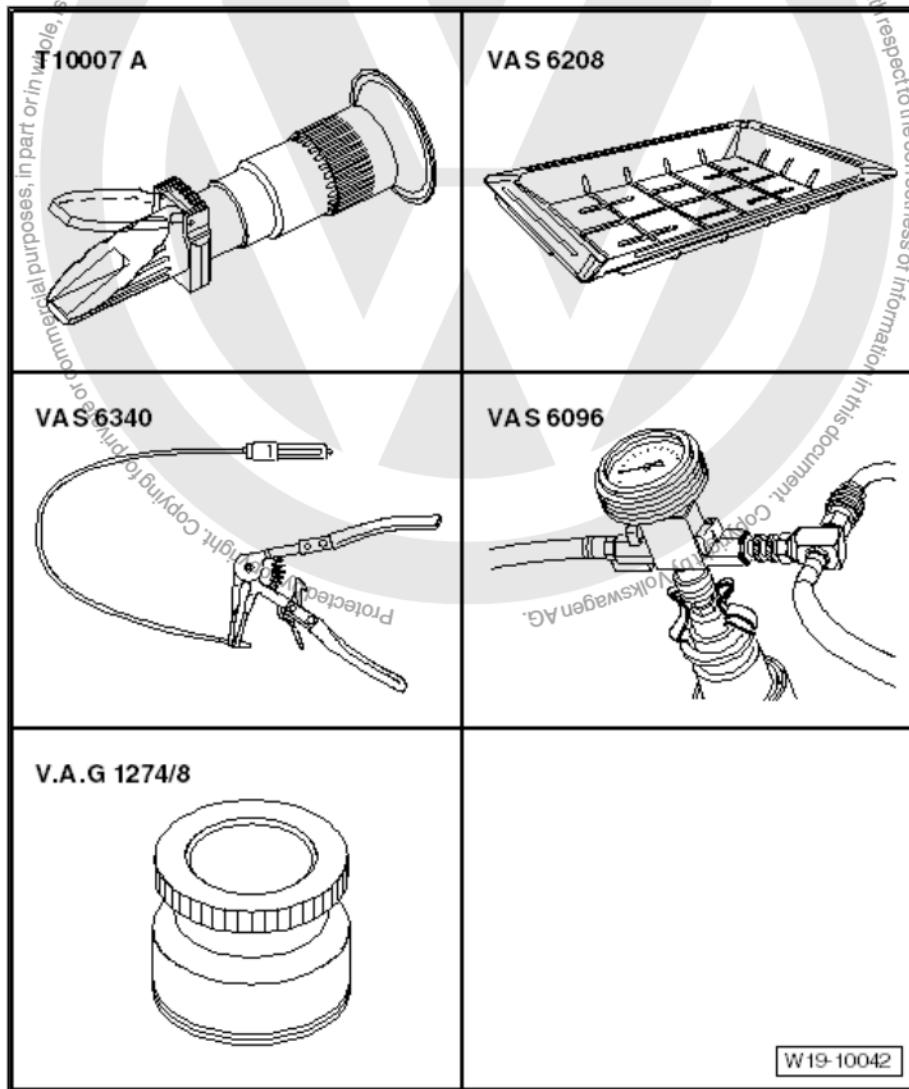
## 1.2 Draining and adding coolant

⇒ “1.2.1 Draining and adding coolant”, page 96

⇒ “1.2.2 Charging the cooling system in the case of emergency”,  
page 101

### 1.2.1 Draining and adding coolant

Special tools and workshop equipment required



- ◆ Refractometer - T10007 A-
- ◆ Drip tray - V.A.G 1306- has been discontinued; use drip tray - VAS 6208-
- ◆ Assembly tool for spring-type clip pliers - VAS 5024 A- discontinued, use hose clip pliers - VAS 6340-
- ◆ Coolant system charge unit - VAS 6096-
- ◆ Adapter - V.A.G 1274/8-



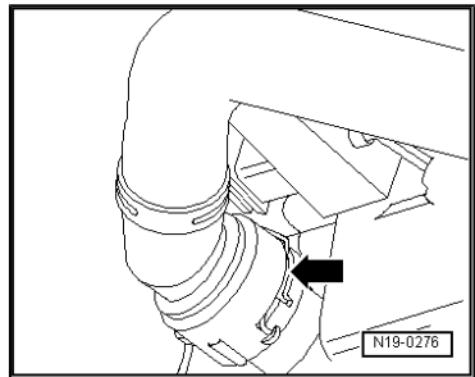
## Draining



## WARNING

*Hot steam may escape when expansion tank is opened. Therefore, cover sealing cap with a cloth and open it carefully.*

- Open cap on coolant expansion tank.
- If present, remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Body, front; Noise insulation .
- Pull off lower coolant hose retaining clip -arrow- and remove coolant hose from quick-release connection of radiator.
- To drain coolant from engine, also remove coolant hose from engine oil cooler -arrow-.

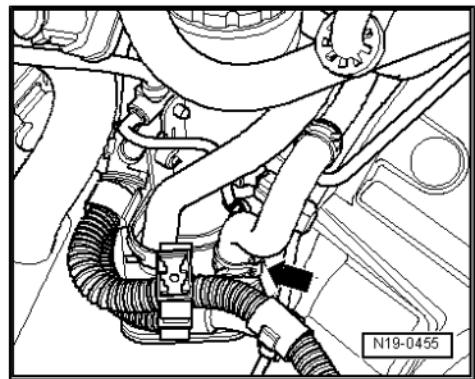


N19-0276



*Please observe disposal instructions!*

## Filling



N19-0455



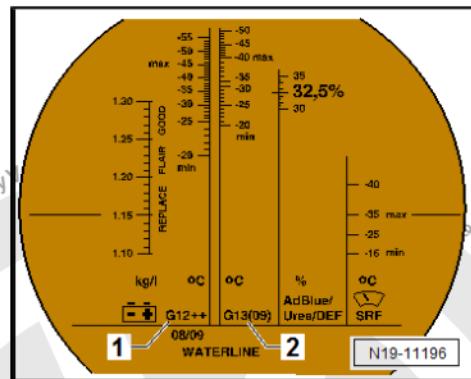


### Note

- ◆ Use only distilled water for mixing coolant additives. The use of distilled water ensures optimum protection against corrosion.
- ◆ The water used for mixing has a major influence on the effectiveness of the coolant. Since water quality differs from country to country and even region to region, it is necessary to set a standard for the quality of water to be used. Distilled water fulfills all requirements. Therefore, always use only distilled water when mixing coolant for topping up or renewing coolant.
- ◆ Use only coolant additives which conform with the ⇒ Electronic parts catalogue (ETKA). Other coolant additives may reduce corrosion protection substantially. The resulting damage could lead to loss of coolant and subsequent severe damage to the engine.
- ◆ Mixed in the proper proportions, coolant inhibits frost and corrosion damage as well as scaling. Such additives also raise the boiling point of the coolant. For this reason, the cooling system must be filled all-year-round with coolant additives.
- ◆ Because of its high boiling point, the coolant improves engine reliability under heavy loads, particularly in countries with tropical climates.
- ◆ The refractometer - T10007A- must be used to determine the current anti-freeze value.
- ◆ Frost protection must be guaranteed down to -25°C as a minimum and, in countries with arctic conditions, down to approx. -36°C. Increasing the frost protection is permissible only if climatic conditions require stronger frost protection. It may, however, be increased only to a maximum of -48°C. Otherwise, the cooling effect will be impaired.
- ◆ Do not reduce the coolant concentration by adding water even in warmer seasons and in warmer countries. Frost protection must be guaranteed down to at least -25°C.
- ◆ Read off anti-freeze figures for respective replenished coolant additives.
- ◆ The temperature read off the refractometer - T10007A- corresponds the »ice flocculation point«. Flakes of ice may start forming in the coolant below this temperature.
- ◆ Never reuse old coolant.
- ◆ Use only a water/coolant additive mixture as a slip agent for coolant hoses.

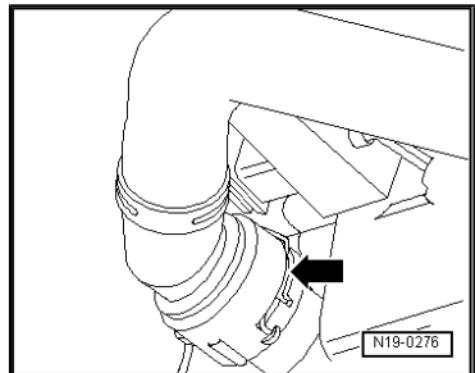
#### Coolant mixture ratio

- Coolant additive (40%) and distilled water (60%) for frost protection to -25°C
- Coolant additive (50%) and distilled water (50%) for frost protection to -36°C
- Coolant additive ⇒ Electronic parts catalogue (ETKA)

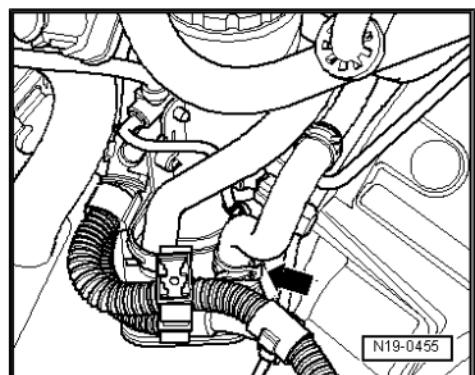




- Fit coolant hose -arrows-.



- Connect coolant hose -arrow- to engine oil cooler.
- Install noise insulation, if removed ⇒ General body repairs, exterior; Rep. gr. 66 ; Body, front; Noise insulation .



- Fill tank of cooling system charge unit - VAS 6096- with at least 8 litres of pre-mixed coolant in correct mixture ratio.

Note

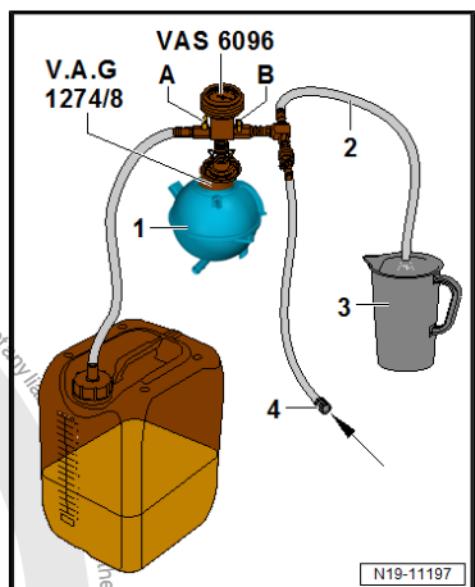
*The quantity may vary depending on the equipment level.*

- Screw adapter for cooling system tester - V.A.G 1274/8- onto coolant expansion tank -1-.
- Mount cooling system charge unit - VAS 6096- on adapter - V.A.G 1274/8- .
- Feed vent hose -2- into a small container -3-.

Note

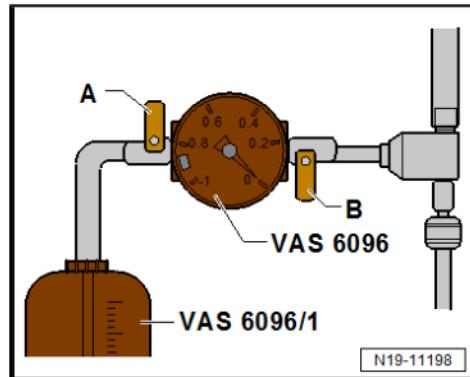
*Exhaust air takes a slight quantity of coolant along with it; this should be collected.*

- Close valves -A- and -B- (turn lever transverse to direction of flow to do this).
- Connect hose -4- to compressed air.
- Pressure: 6 to 10 bar.





- Open valve -B-; turn lever in direction of flow to do this.
- In cooling system, vacuum is generated by suction jet pump; needle of gauge must move into green area.
- In addition, open valve -A- briefly by turning lever in direction of flow until expansion tank hose of cooling system charge unit - VAS 6096- fills with coolant.
- Close valve -A- again.
- Leave valve -B- open for a further 2 minutes.
- Vacuum continues to be generated in the cooling system by the suction jet pump; the needle of gauge must remain in green range.
- Close valve -B-.
- The needle on the gauge should stop in the green zone. The vacuum level in the cooling system is then sufficient for subsequent filling.

**Note**

- ◆ If the needle does not reach the green zone, repeat the process.
- ◆ If vacuum drops, cooling system must be checked for leaks.
- Pull off compressed air hose.
- Open valve -A-.
- The vacuum in the cooling system causes coolant to be extracted from coolant expansion tank of cooling system charge unit - VAS 6096- and the cooling system to be filled.
- Remove cooling system charge unit - VAS 6096- from coolant expansion tank.
- Fill coolant up to max. mark.
- Close coolant expansion tank.
- If fitted, switch off air conditioning system.
- Start engine and maintain engine speed at approx. 2000 rpm for about 3 minutes.
- Then run engine at idling speed until radiator fan cuts in.

**WARNING**

*Hot steam may escape when expansion tank is opened. Wear protective goggles and clothing to avoid eye injuries and scalding. Cover cap with a cloth and carefully open.*

- Check coolant level and top up as needed.
- The coolant level must be at the max. marking when the engine is warm.
- When the engine is cold, the coolant level must be between min. and max. marking.



## 1.2.2 Charging the cooling system in the case of emergency



### Note

- ◆ *The following steps only apply in the case of a breakdown.*
- ◆ *Here, the cooling system is charged without using the cooling system charge unit - VAS 6096- .*
- ◆ *Charging in the case of an emergency is only permissible to keep the vehicle mobile and does not replace the proper charging procedure according to the repair manual.*
- ◆ *After an emergency charging, the vehicle should be brought to a workshop as soon as possible where the cooling system should be filled properly in accordance with the repair manual.*

### Procedure



#### WARNING

*Hot steam may escape when expansion tank is opened. Wear protective goggles and clothing to avoid eye injuries and scalding. Cover cap with a cloth and carefully open.*

- Open filler cap on coolant expansion tank.



## Note

- ◆ Use only distilled water for mixing coolant additives. The use of distilled water ensures optimum protection against corrosion.
- ◆ The water used for mixing has a major influence on the effectiveness of the coolant. Since water quality differs from country to country and even region to region, it is necessary to set a standard for the quality of water to be used. Distilled water fulfills all requirements. Therefore, always use only distilled water when mixing coolant for topping up or renewing coolant.
- ◆ Use only coolant additives which conform with the ⇒ Electronic parts catalogue (ETKA). Other coolant additives may reduce corrosion protection substantially. The resulting damage could lead to loss of coolant and subsequent severe damage to the engine.
- ◆ Mixed in the proper proportions, coolant inhibits frost and corrosion damage as well as scaling. Such additives also raise the boiling point of the coolant. For this reason, the cooling system must be filled all-year-round with coolant additives.
- ◆ Because of its high boiling point, the coolant improves engine reliability under heavy loads, particularly in countries with tropical climates.
- ◆ The refractometer - T10007A- must be used to determine the current anti-freeze value.
- ◆ Frost protection must be guaranteed down to -25°C as a minimum and, in countries with arctic conditions, down to approx. -36°C. Increasing the frost protection is permissible only if climatic conditions require stronger frost protection. It may, however, be increased only to a maximum of -48°C. Otherwise, the cooling effect will be impaired.
- ◆ Do not reduce the coolant concentration by adding water even in warmer seasons and in warmer countries. Frost protection must be guaranteed down to at least -25°C.
- ◆ Read off anti-freeze figures for respective replenished coolant additives.
- ◆ The temperature read off the refractometer T10007A- corresponds to the ice flocculation point. Flakes of ice may start forming in the coolant below this temperature.
- ◆ Never reuse old coolant.
- ◆ Use only a water/coolant additive mixture as a slip agent for coolant hoses.

## Coolant mixture ratio

- Coolant additive (40%) and distilled water (60%) for frost protection to -25°C
- Coolant additive (50%) and distilled water (50%) for frost protection to -36°C
- Coolant additive ⇒ Electronic parts catalogue (ETKA)
- Fill a suitable container with pre-mixed coolant observing the correct mixing ratio.
- Fill the cooling system via the coolant expansion tank up to max. marking.
- Close coolant expansion tank.
- If fitted, switch off air conditioning system.



- Start engine and maintain engine speed at approx. 2000 rpm for about 3 minutes.
- Then run engine at idling speed until radiator fan cuts in.



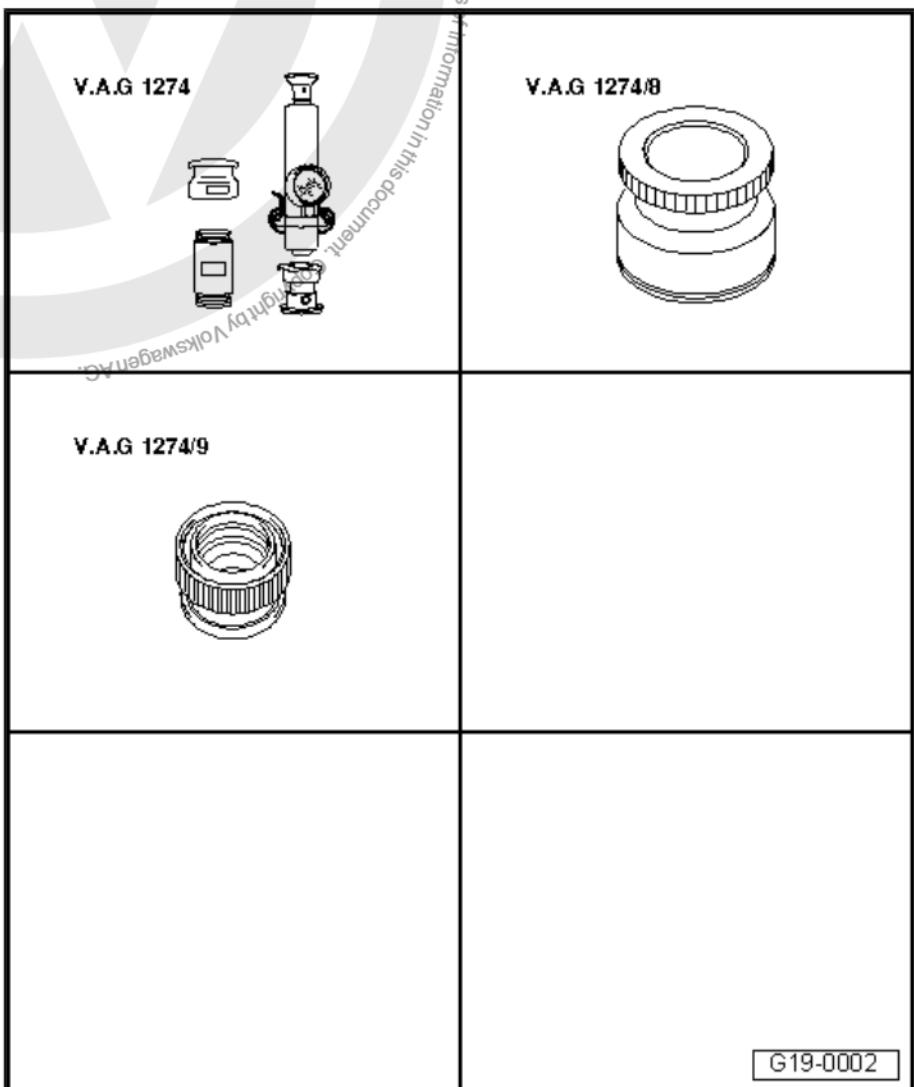
### WARNING

*Hot steam may escape when expansion tank is opened. Wear protective goggles and clothing to avoid eye injuries and scalding. Cover cap with a cloth and carefully open.*

- Check coolant level and top up as needed.
- The coolant level must be at the max. marking when the engine is warm.
- When the engine is cold, the coolant level must be between min. and max. marking.

## 1.3 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-



Caddy 2004 >

4-cylinder diesel engine (2.0 l engine, 2-valve, TDI) - Edition 08.2019

- ♦ Adapter for cooling system tester - V.A.G 1274/9-

#### Test conditions

- Engine at operating temperature.

#### Test sequence



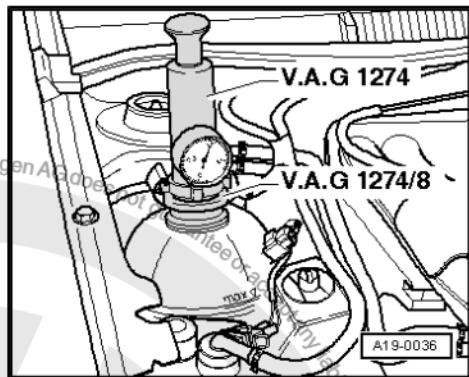
##### WARNING

*Hot steam may escape when expansion tank is opened. Therefore, cover sealing cap with a cloth and open it carefully.*

- 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 coolant expansion tank.
- Use hand pump on tester to create a pressure of about 1.0 bar.

If the pressure drops:

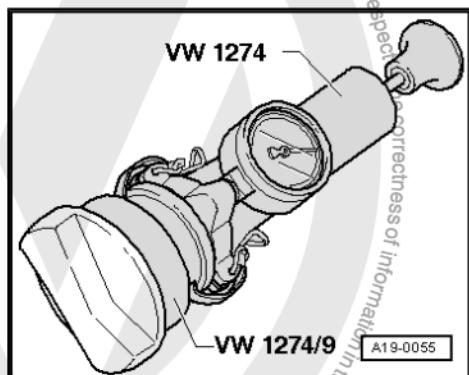
- Find all leaks and rectify them.



#### 1.3.1 Check pressure relief valve in cap.

- Attach cooling system tester - V.A.G 1274- with cooling system tester adapter - V.A.G 1274/9- to cap.
- Operate hand pump.

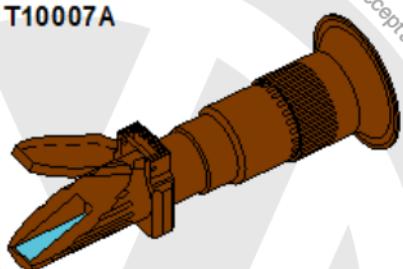
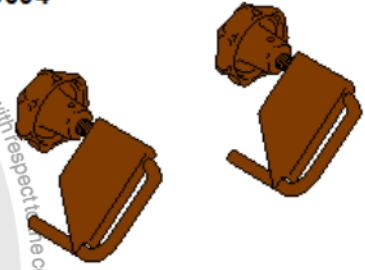
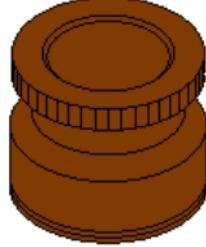
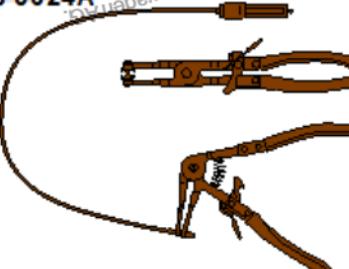
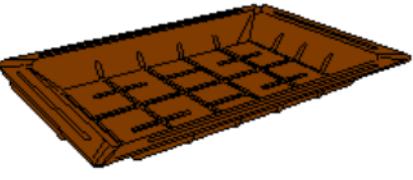
The pressure relief valve must open at a pressure of 1.4...1.6 bar



#### 1.4 Checking engine oil cooler for leaks



Special tools and workshop equipment required

	<b>T10007A</b>		<b>3094</b>
	<b>V.A.G 1274</b>		<b>V.A.G 1274/8</b>
	<b>VA S 5024A</b>		<b>VA S 6208</b>

W19-10049

- ◆ Refractometer - T10007 A-
- ◆ Hose clamps to 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 5024 A- discontinued, use hose clip pliers - VAS 6340-
- ◆ Drip tray - V.A.G 1306- has been discontinued; use drip tray - VAS 6208-

Without illustration:

- ◆ Expansion tank
- ◆ Cap
- ◆ Commercially available plug
- ◆ Commercially available hose

Condition:

- Engine cold

**Test sequence**

- If present, remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Body, front; Noise insulation .
- Clamp engine oil cooler supply and return lines using hose clamps, up to 25 mm - VAS 3094- .
- Release hose clips -arrows- using hose clip pliers - VAS 6340- .

**Note**

Collect escaping coolant with drip tray - VAS 6208- .

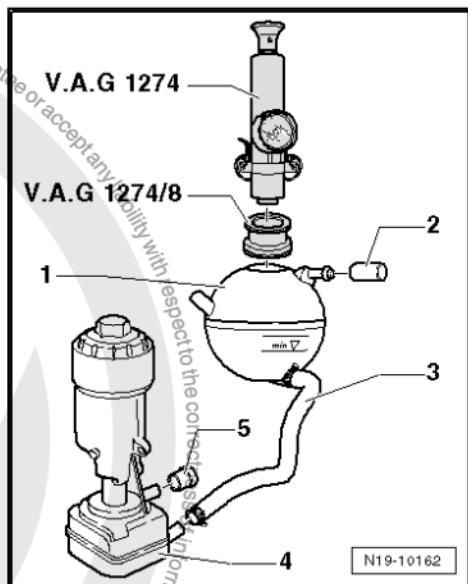
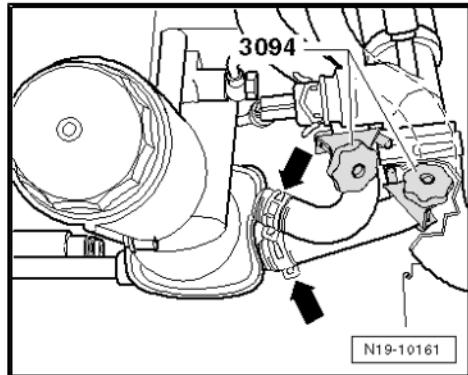
- Pull coolant hoses off engine oil cooler.
- Slide filler cap -5- onto rear connection of engine oil cooler -4-.
- Fit sealing plug -2- to breather connection of expansion tank -1-.
- Secure hose -3- on engine oil cooler and coolant expansion tank.
- Fill coolant expansion tank up to max. mark.
- Fit cooling system tester - V.A.G 1274- with adapter for cooling system tester - V.A.G 1274/8- to coolant expansion tank.
- Generate about 1.6 bar pressure using hand pump of tester.
- Observe pressure drop on pressure gauge. A pressure drop within 10 minutes is not permitted.

If the pressure drops:

- Renew engine oil cooler [⇒ page 92](#) .

Install in reverse order of removal, observing the following:

- Check coolant level and, if necessary, replenish [⇒ page 96](#) .
- Install noise insulation, if removed ⇒ General body repairs, exterior; Rep. gr. 66 ; Body, front; Noise insulation .





## 2 Coolant pump, regulation of cooling system

⇒ "2.1 Assembly overview - coolant pump, thermostat",  
[page 107](#)

⇒ "2.2 Removing and installing coolant pump", [page 109](#)

⇒ "2.3 Removing and installing thermostat", [page 110](#)

### 2.1 Assembly overview - coolant pump, thermostat

#### 1 - To top of expansion tank

- Connection diagram for coolant hoses  
[⇒ page 95](#)

#### 2 - Upper coolant pipe

- Bolted to cylinder head cover
- Connection diagram for coolant hoses  
[⇒ page 95](#)

#### 3 - O-ring

- Renew after removal

#### 4 - Retaining clip

- Check for firm seating

#### 5 - Radiator outlet coolant - G62-

- If necessary, release pressure in cooling system before removing.

#### 6 - To exhaust gas recirculation cooler

- Connection diagram for coolant hoses  
[⇒ page 95](#)

#### 7 - Union

#### 8 - Bolt

- 10 Nm

#### 9 - To top of radiator

- Connection diagram for coolant hoses  
[⇒ page 95](#)

#### 10 - From heat exchanger

- Connection diagram for coolant hoses [⇒ page 95](#)

#### 11 - Bolt

- 40 Nm

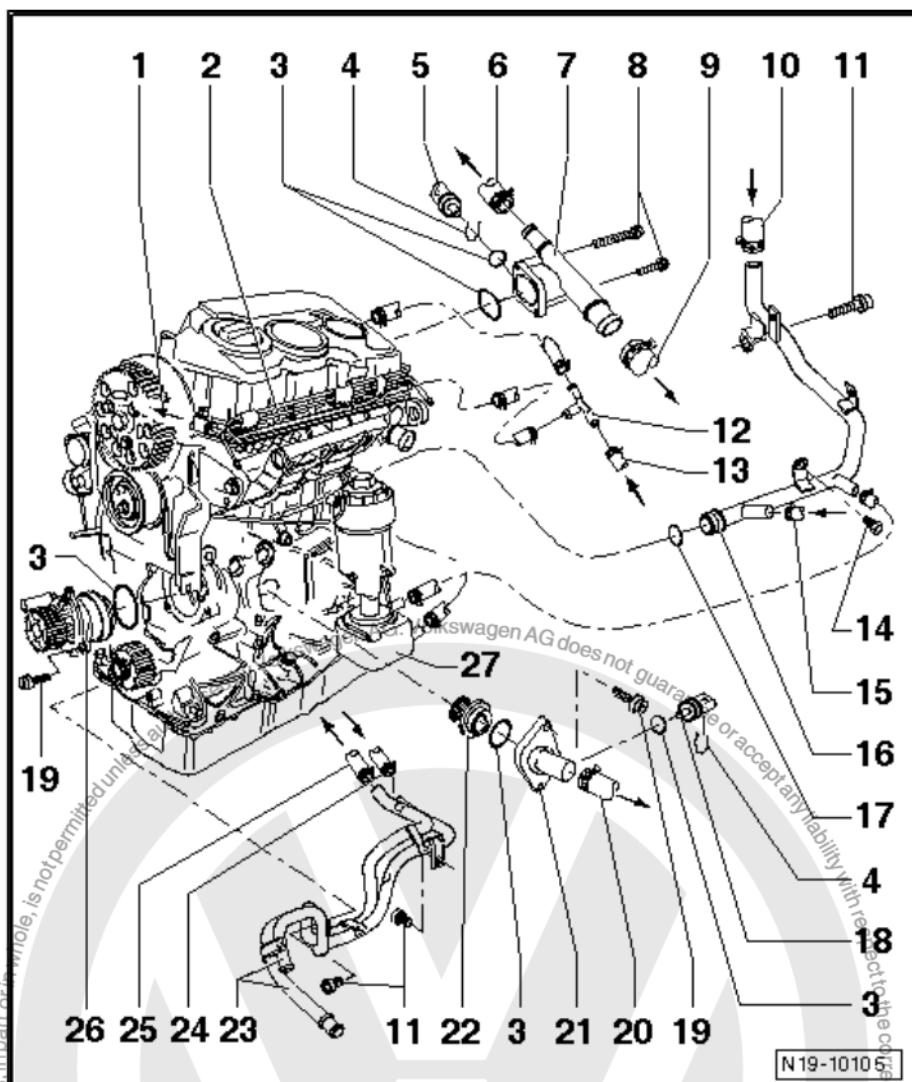
#### 12 - Manifold

#### 13 - From upper coolant hose T-piece

- Connection diagram for coolant hoses [⇒ page 95](#)

#### 14 - Bolt

- 15 Nm





15 - From bottom of expansion tank

- Connection diagram for coolant hoses [⇒ page 95](#)

16 - Front coolant pipe

- Connection diagram for coolant hoses [⇒ page 95](#)

17 - Seal

- Renew after removal

18 - Radiator outlet coolant temperature sender - G83-

- If necessary, release pressure in cooling system before removing.

19 - Bolt

- 15 Nm

20 - To bottom of radiator

- Connection diagram for coolant hoses [⇒ page 95](#)

21 - Union

- For thermostat
- Connection diagram for coolant hoses [⇒ page 95](#)

22 - Thermostat

- Checking: heat thermostat in water.
- Begins to open at approx. 85°C
- Ends at approx. 105°C.
- Opening lift min. 7 mm
- Note installation position [⇒ page 110](#)
- Removing and installing [⇒ page 110](#)

23 - Rear coolant pipe

- Only in vehicles with auxiliary heater
- Connection diagram for coolant hoses [⇒ page 95](#)

24 - From exhaust gas recirculation cooler

- To recirculating pump - V55- .
- Connection diagram for coolant hoses [⇒ page 95](#)

25 - To heat exchanger

- Connection diagram for coolant hoses [⇒ page 95](#)

26 - Coolant pump

- Check for ease of movement.
- Observe installation position
- Removing and installing [⇒ page 109](#)

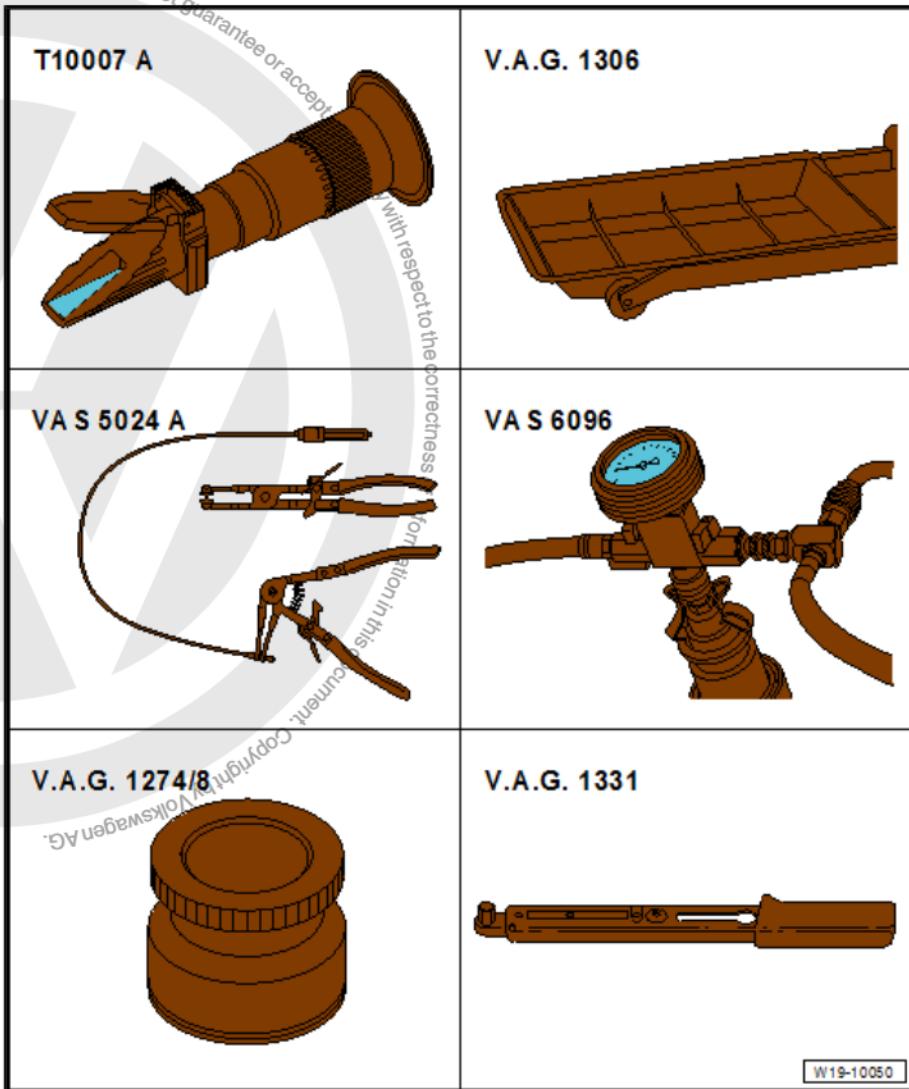
27 - Engine oil cooler

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



## 2.2 Removing and installing coolant pump

Special tools and workshop equipment required



- ◆ Refractometer - T10007 A-
- ◆ Drip tray - V.A.G 1306- has been discontinued; use drip tray - VAS 6208-
- ◆ Assembly tool for spring-type clip pliers - VAS 5024 A- discontinued, use hose clip pliers - VAS 6340-
- ◆ Coolant system charge unit - VAS 6096-
- ◆ Adapter - V.A.G 1274/8-
- ◆ Torque wrench - V.A.G 1331-

Removing



Note

*Always renew gaskets and seals.*

- Drain coolant [⇒ page 96](#).
- Remove poly V-belt [⇒ page 20](#).



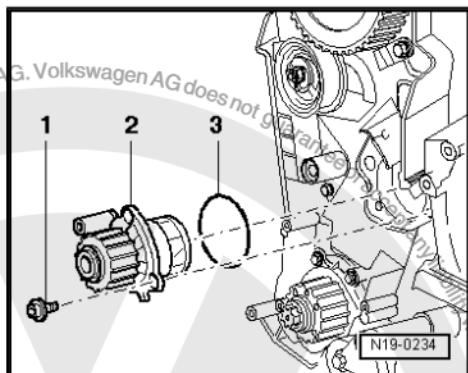
Caddy 2004 >

4-cylinder diesel engine (2.0 l engine, 2-valve, TDI) - Edition 08.2019

- Remove toothed belt [⇒ page 62](#).
- Remove securing bolts -1- for coolant pump -2- and carefully remove coolant pump.

#### Installing

Install in reverse order of removal, observing the following:



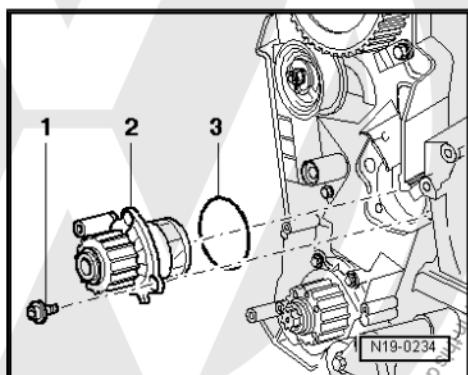
- Moisten new O-ring -3- with coolant.
- Insert coolant pump -2- in cylinder block and tighten securing bolts -1-.



Note

The coolant pump plug faces downwards.

- Install toothed belt [⇒ page 62](#).
- Install poly V-belt [⇒ page 20](#).
- Fill coolant system with coolant [⇒ page 96](#)



#### Specified torques

- ◆ [⇒ "2.1 Assembly overview - toothed belt drive", page 60](#)
- ◆ [⇒ "2.1 Assembly overview - assembly mountings", page 16](#)

## 2.3 Removing and installing thermostat



Special tools and workshop equipment required

<b>T10007 A</b>	<b>V.A.G. 1306</b>
A refractometer with a long, thin probe and a handle.	A brown plastic tray with a grid pattern and a handle.
<b>VAS 5024 A</b>	<b>VAS 6096</b>
An assembly tool consisting of two jaws and a flexible cable.	A cylindrical device with a gauge and hoses.
<b>V.A.G. 1274/8</b>	<b>V.A.G. 1331</b>
A cylindrical adapter with a ribbed base.	A torque wrench with a handle and a scale.

W19-10050

- ◆ Refractometer - T10007 A-
- ◆ Drip tray - V.A.G 1306- has been discontinued; use drip tray - VAS 6208-
- ◆ Assembly tool for spring-type clip pliers - VAS 5024 A- discontinued, use hose clip pliers - VAS 6340-
- ◆ Coolant system charge unit - VAS 6096-
- ◆ Adapter - V.A.G 1274/8-
- ◆ Torque wrench - V.A.G 1331-

#### Removing



Note

*Always renew gaskets and seals.*

- Drain coolant [⇒ page 96](#).

#### Vehicles with air conditioning system

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



## Vehicles without air conditioning system

- Detach wiring harness from alternator.

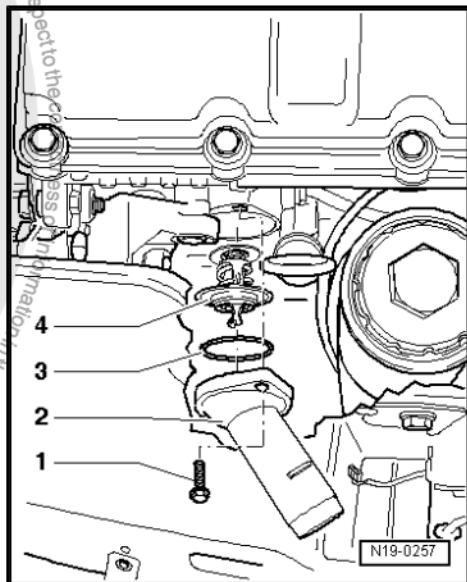
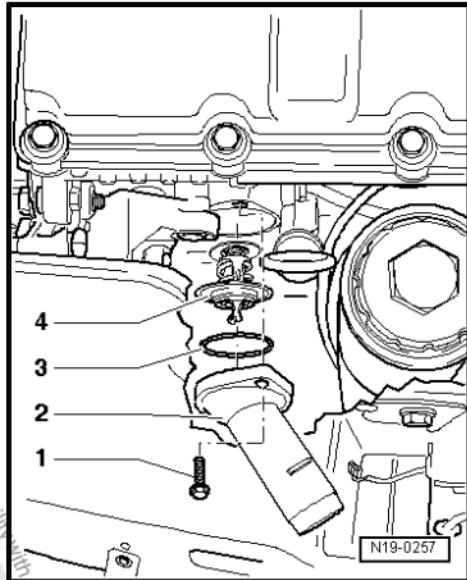
## All vehicles:

- Pull coolant hose off connection.
- Remove securing bolts -1- of connection -2- and remove connection -2- with thermostat -4-.
- Turn thermostat -4-  $\frac{1}{4}$  turns ( $90^\circ$ ) to left, and remove it from union -2-.

## Installing

Install in reverse order of removal, observing the following:

- Moisten new O-ring -3- with coolant.



Insert thermostat -4- into union -2- and turn it  $\frac{1}{4}$  turn ( $90^\circ$ ) to right.



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

- Insert connection -2- with thermostat -4- in cylinder block.
- Tighten securing bolts -1-.
- Fill coolant system with coolant [⇒ page 96](#).

## Specified torques

- ◆ [⇒ "2.1 Assembly overview - coolant pump, thermostat", page 107](#)



### 3 Radiator, radiator fan

⇒ "3.1 Assembly overview - radiator/radiator fan", page 113

⇒ "3.2 Removing and installing radiator", page 115

⇒ "3.3 Removing and installing fan mounting with fans",  
page 116

#### 3.1 Assembly overview - radiator/radiator fan

##### 1 - Upper coolant hose

- Secured to radiator with retaining clip.
- Check for firm seating
- Connection diagram for coolant hoses  
⇒ page 95

##### 2 - O-ring

- Renew after removal

##### 3 - Radiator/cooler

- After renewing, renew entire coolant.
- Removing and installing  
⇒ page 115

##### 4 - Sealing strip

- Pushed onto top and bottom of radiator.

##### 5 - Cap

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

##### 6 - Connector

##### 7 - Bolt

- 5 Nm

##### 8 - Expansion tank

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

##### 9 - Bracket

- For radiator

##### 10 - Bolt

- 5 Nm

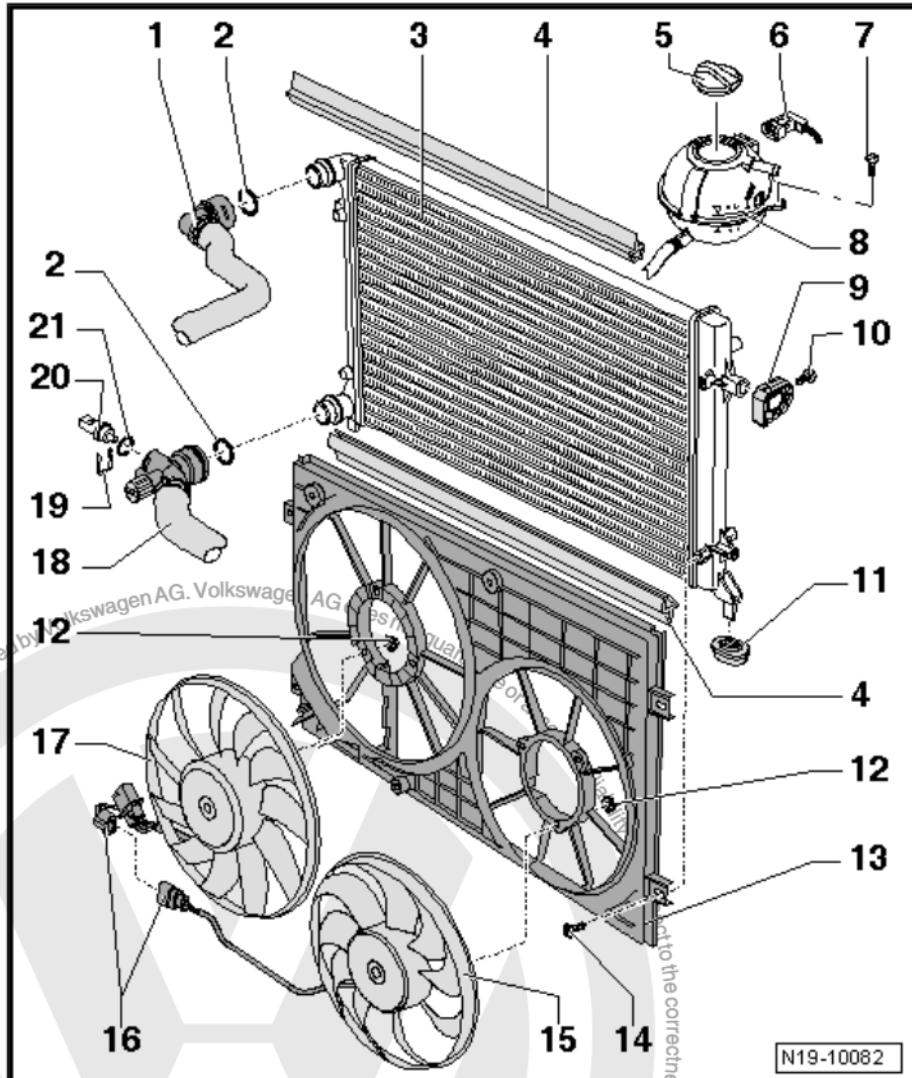
##### 11 - Support bearing

##### 12 - Nut

- 10 Nm

##### 13 - Radiator fan support

- Removing and installing ⇒ page 116



N19-10082



14 - Bolt

- 5 Nm

15 - Radiator fan 2 - V177-

- Removing and installing [⇒ page 116](#)

16 - Connector

17 - Radiator fan - V7-

- Removing and installing [⇒ page 116](#)

18 - Lower coolant hose

- Secured to radiator with retaining clip.
- Check for firm seating
- Connection diagram for coolant hoses [⇒ page 95](#)

19 - Retaining clip

- Check for firm seating

20 - Radiator outlet coolant temperature sender - G83-

21 - O-ring

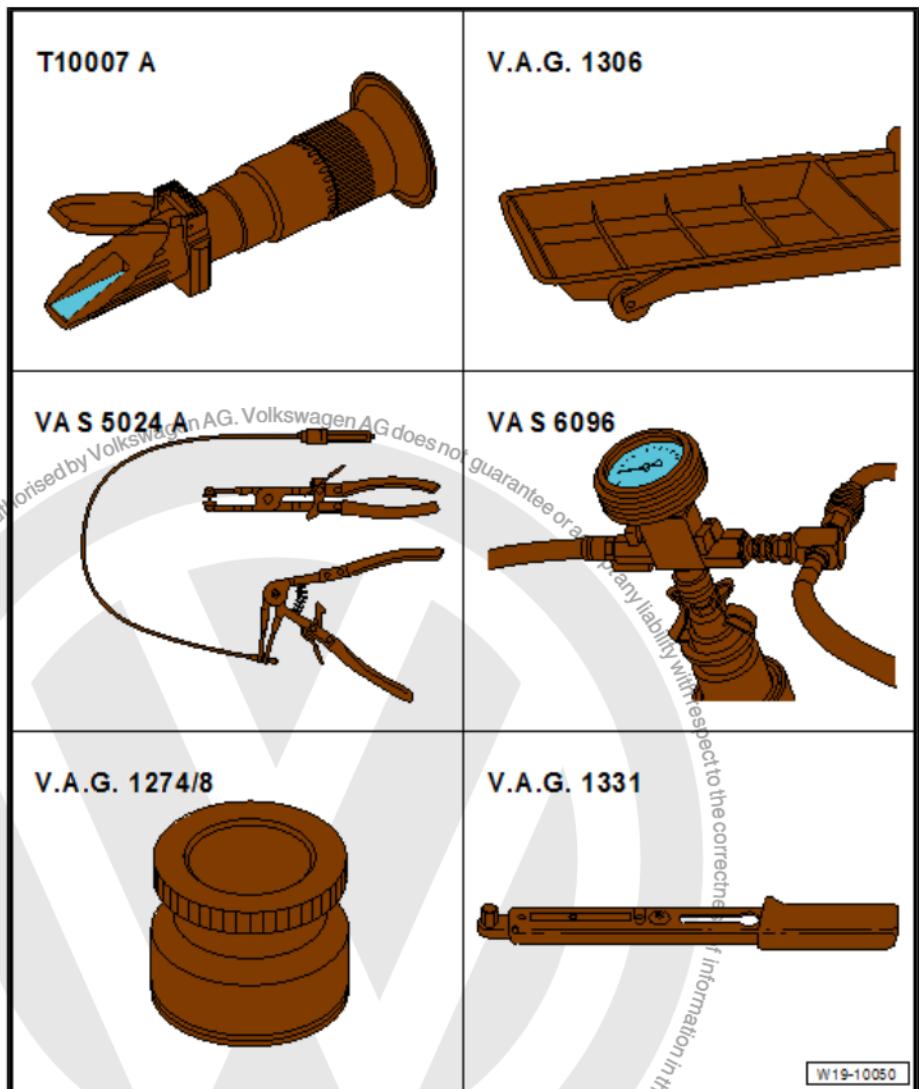
- Renew after removal





### 3.2 Removing and installing radiator

Special tools and workshop equipment required



- ◆ Refractometer - T10007 A-
- ◆ Drip tray - V.A.G 1306- or drip tray - VAS 6208-
- ◆ Assembly tool for spring-type clip pliers - VAS 5024 A- discontinued, use hose clip pliers - VAS 6340
- ◆ Coolant system charge unit - VAS 6096-
- ◆ Adapter - V.A.G 1274/8-
- ◆ Torque wrench - V.A.G 1331-

#### Removing

- Drain coolant [⇒ page 96](#).
- Remove fan support with fans [⇒ page 116](#).
- Pull coolant hoses off radiator.
- Remove left and right securing bolts [⇒ Item 10 \(page 113\)](#) for radiator mounting.
- Swivel radiator slightly towards rear and remove it upwards.



## Installing

Install in reverse order of removal, observing the following:

- Add coolant [⇒ page 96](#).

Additional information and assembly work for vehicles with air conditioner



### WARNING

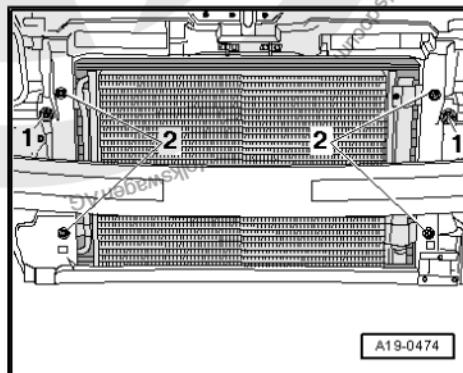
*Do not open the air conditioner refrigerant circuit.*



### Note

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

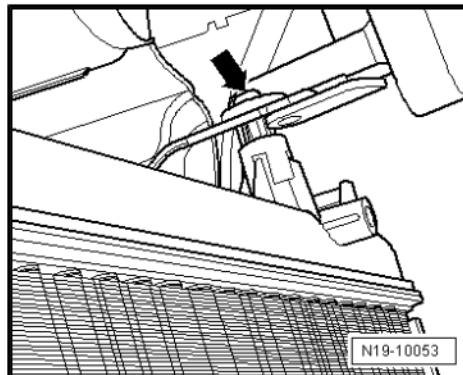
- Remove retaining clamp(s) for refrigerant lines.
- Pull radiator out of lock carrier.
- Unscrew securing bolt -2- from condenser on radiator.



- Carefully pull radiator to right and unscrew side securing bolt -arrow- from condenser on radiator.

Specified torques

- ◆ [⇒ "3.1 Assembly overview - radiator/radiator fan", page 113](#)

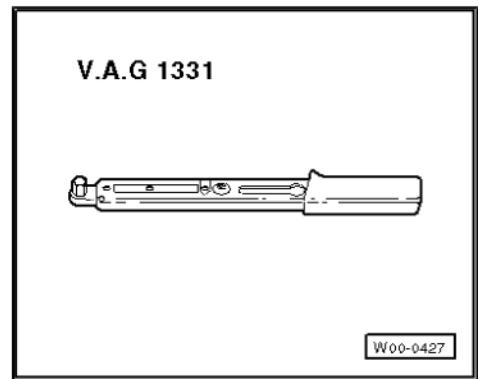


## 3.3 Removing and installing fan mounting with fans

Special tools and workshop equipment required

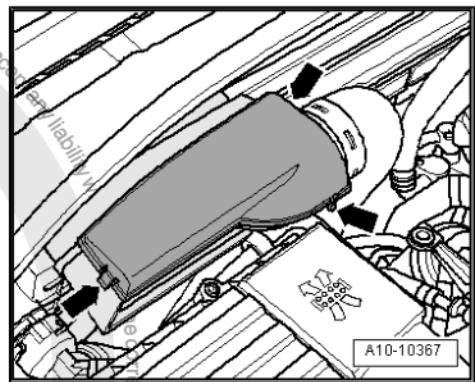


- ◆ Torque wrench - V.A.G 1331-

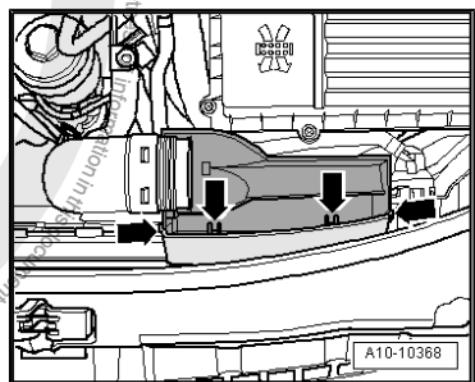


### Removing

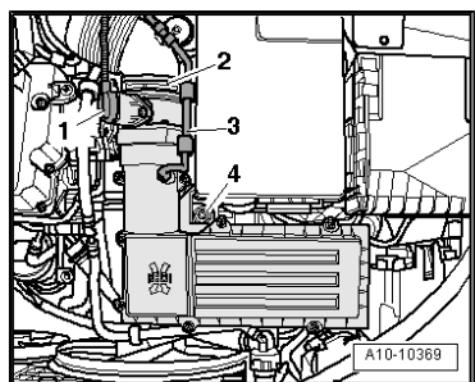
- If present, remove noise insulation → General body repairs, exterior; Rep. gr. 66 ; Body, front; Noise insulation .
- Pull off cover for air duct. Disengage locking clasps -arrows- on side to do this.



- Unclip bottom air duct by disengaging retaining clasps -arrows-.
- Remove bottom air duct with air duct hose.

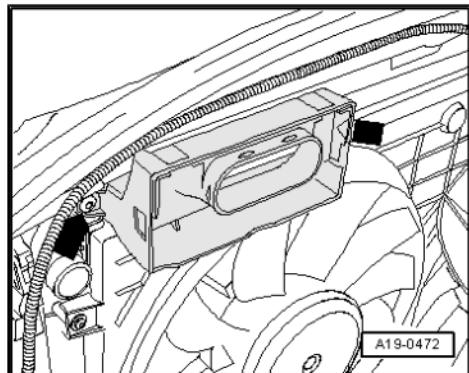


- Separate electrical connector -1- on air mass meter - G70- .
- Pull off vent hose -3- and also air duct hose -2-.
- Unscrew bolt -4-, and remove air filter housing.

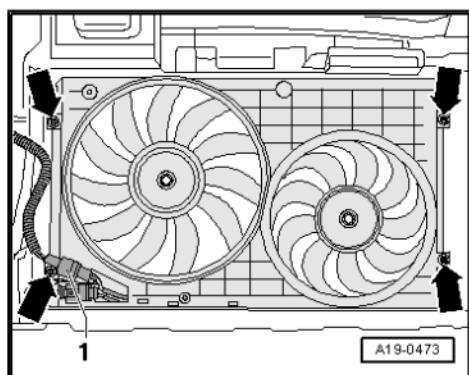




- Unbolt air duct from lock carrier -arrows-.



- Separate connector -1- and remove fan support securing bolts -arrows-.
- Remove fan support with fans downwards.



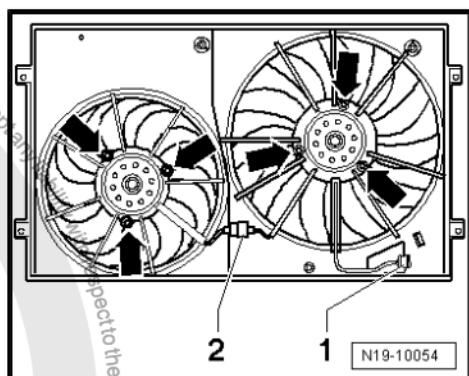
- Separate connection -2- and free wiring.
- Unclip connector -1- from fan support and free wiring.
- Remove securing nuts -arrows- and remove fans.

#### Installing

Install in reverse order of removal, observing the following:

#### Specified torques

- ◆ ["3.1 Assembly overview - radiator/radiator fan", page 113](#)





## 21 – Turbocharging/supercharging

### 1 Turbocharger

⇒ “1.1 Assembly overview - turbocharger”, page 119

⇒ “1.2 Removing and installing turbocharger”, page 121

#### 1.1 Assembly overview - turbocharger



##### Note

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

Comply with rules for cleanliness ⇒ [page 5](#)

Observe safety precautions ⇒ [page 3](#).



Caddy 2004 &gt;

4-cylinder diesel engine (2.0 l engine, 2-valve, TDI) - Edition 08.2019

## 1 - Bolt

- 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 121](#)

## 6 - Vacuum hose

## 7 - Seal

- Renew after removal
- Observe installation position

## 8 - To particulate filter

## 9 - Clip

- Renew after removal
- 7 Nm

## 10 - Exhaust manifold

- Can only be renewed together with turbocharger

## 11 - Nut

- Renew after removal
- 25 Nm

## 12 - Bolt

- 25 Nm

## 13 - Seal

- Renew after removal

## 14 - Connecting pipe

- Install so that component is not under tension
- For exhaust gas recirculation
- Assembly overview - exhaust gas recirculation cooler  
[⇒ page 160](#)

## 15 - Nut

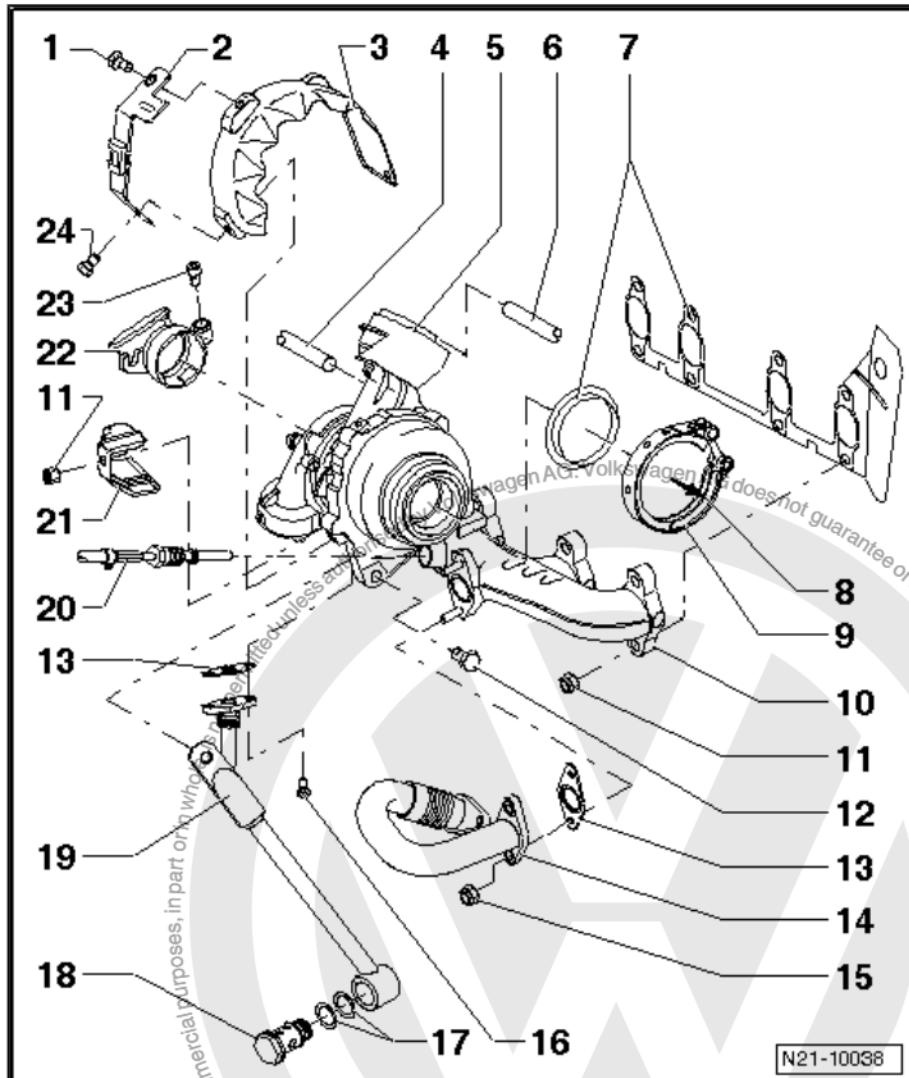
- Renew after removal
- 25 Nm

## 16 - Bolt

- 15 Nm

## 17 - O-ring

- Renew after removal



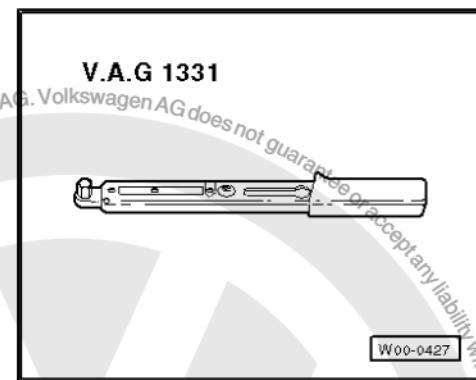


- 18 - Banjo bolt
  - 60 Nm
- 19 - Support
  - for turbocharger
  - With oil return line
- 20 - Exhaust gas temperature sender 1 - G235-
  - Lubricate thread of sender using high-temperature paste - G 052 112 A3- .
  - 45 Nm
- 21 - Heat shield
- 22 - Connection
- 23 - Bolt
  - 9 Nm
- 24 - Bolt
  - 10 Nm

## 1.2 Removing and installing turbocharger

Special tools and workshop equipment required

- ◆ Torque wrench - V.A.G 1331-



### Caution

If a mechanical fault is found on the turbocharger, e.g. a destroyed compressor impeller, just renewing the turbocharger is not enough. 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.

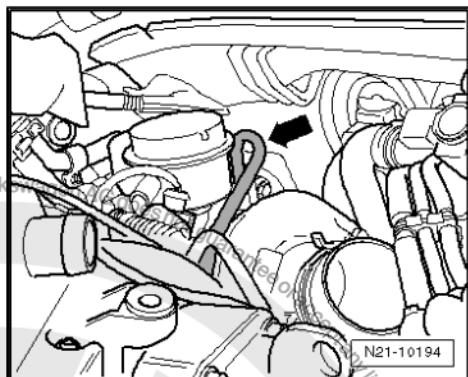
If foreign objects are found in the charge air system, the charged air routing must be cleaned and the charge air cooler must be renewed, if necessary.

### Removing

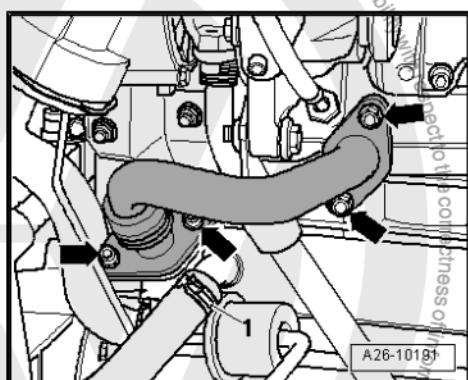
- If present, remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Body, front; Noise insulation .
- Unbolt right drive shaft from flange.
- Remove exhaust pipe with diesel particulate filter  
⇒ [page 153](#) .



- Pull oil supply hose -arrow- off turbocharger.



- Remove air filter/turbocharger intake hose.

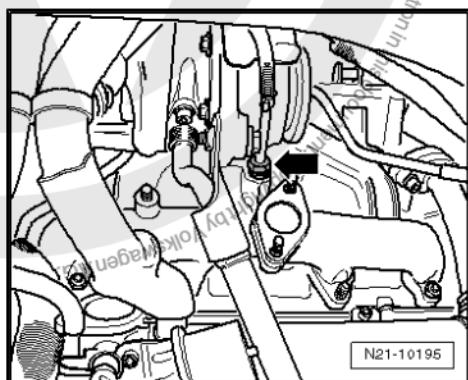


- Remove bolts -arrows- and take off connecting pipe to exhaust gas recirculation cooler.
- Remove exhaust gas temperature sender 1 - G235- -arrow- from turbocharger.

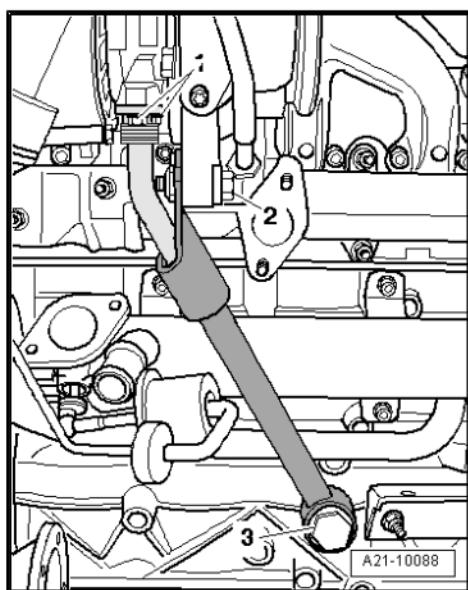
Vehicles with auxiliary heater:

- Remove coolant pipes leading to auxiliary heater together with connected coolant hoses from cylinder block.

All vehicles:

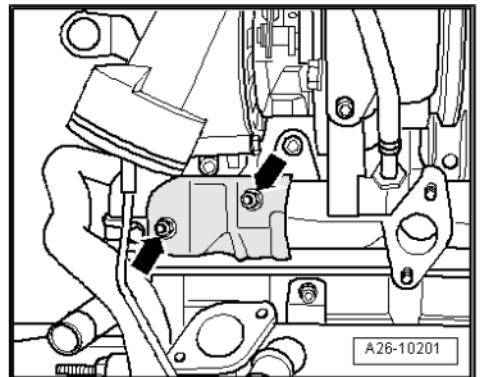


- Unscrew bolts -1- and bolt -2-.
- Unscrew banjo bolt -3- and remove turbocharger support with oil return pipe.
- Pull vacuum hose off turbocharger.

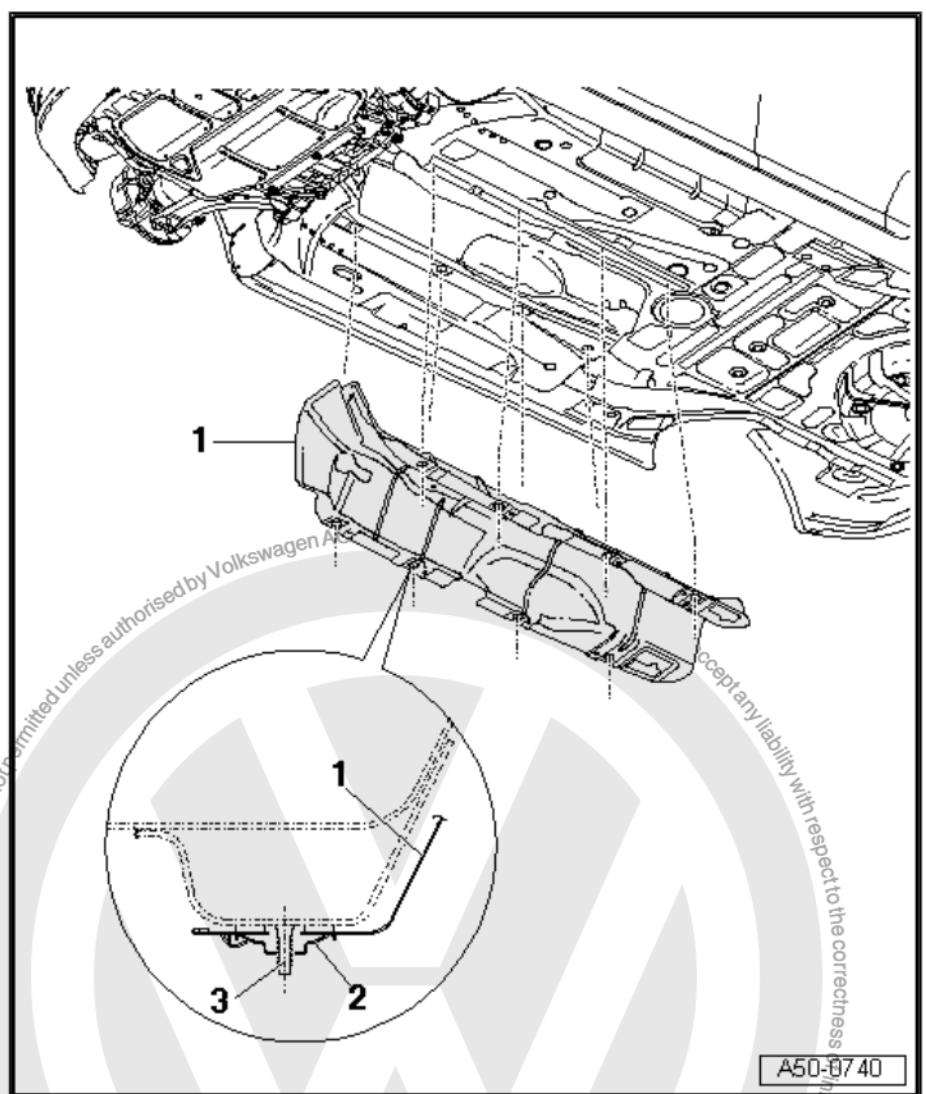




- Unbolt heat shield on left of exhaust manifold -arrows-.



- In order to be able to remove exhaust manifold downwards through tunnel in underbody, heat shield -1- must be removed first.



- Unscrew spring clip -2- from stud bolt -3-.



Caddy 2004 >

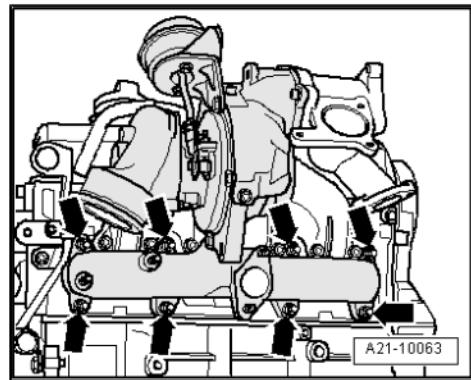
4-cylinder diesel engine (2.0 l engine, 2-valve, TDI) - Edition 08.2019

- Unscrew securing bolts of exhaust manifold -arrows-.
- Turn turbocharger with exhaust manifold, until it can be removed downwards through tunnel in underbody.
- In order to remove the turbocharger gasket, you must loosen the securing bolts of the exhaust gas recirculation cooler  
⇒ [Item 9 \(page 160\)](#).

#### Installing

Install in reverse order of removal, observing the following:

- Install connecting pipe free of stress. To achieve this, start all bolts hand-tight first, and tighten them diagonally and alternately after.



#### Specified torques

- ◆ ⇒ ["1.1 Assembly overview - turbocharger", page 119](#)
- ◆ ⇒ ["2.1 Assembly overview - emission control", page 153](#)





## 2 Charge air system

⇒ "2.1 Assembly overview - charge air system", page 125

⇒ "2.2 Assembly overview - charge-air hose connections",  
page 126

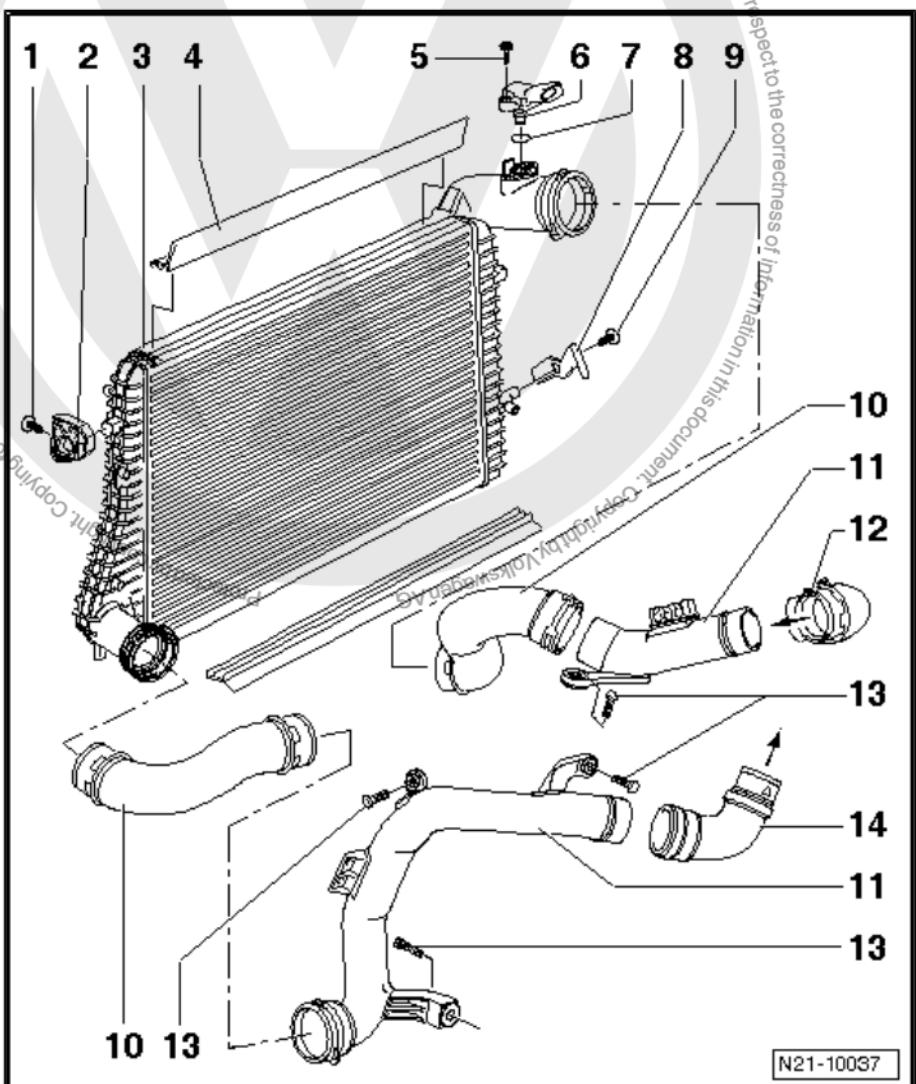
⇒ "2.3 Checking charge air system for leaks", page 126

### 2.1 Assembly overview - charge air system

#### Note

- ◆ The 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 plug-in connectors.
- ◆ Checking charge air system for leaks ⇒ [page 126](#).

- 1 - Bolt  
 8 Nm
- 2 - Bracket  
 Observe 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
- 4 - Sealing strip  
 Pushed onto top and bottom of charge air cooler
- 5 - Bolt  
 3 Nm
- 6 - Charge air pressure sender - G31- with intake air temperature sender - G42-
- 7 - O-ring  
 Renew if damaged
- 8 - Bracket
- 9 - Bolt  
 5 Nm
- 10 - Connection hose
- 11 - Charge air pipe
- 12 - Connection hose  
 To intake manifold flap motor - V157-  
 Assembly overview - intake manifold ⇒ [page 140](#)



N21-10037



## 13 - Bolt

- 8 Nm

## 14 - Connection hose

- To turbocharger

## 2.2 Assembly overview - charge-air hose connections

**Caution**

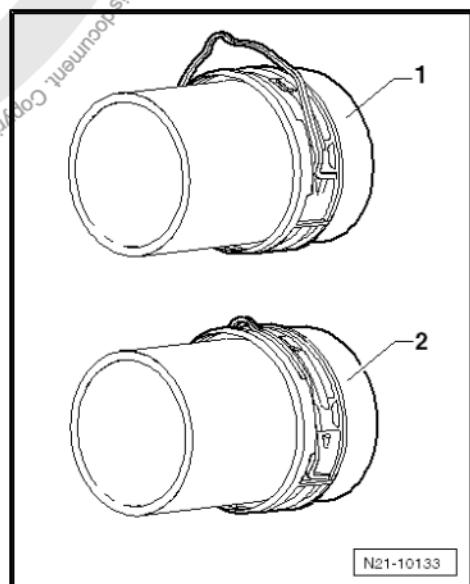
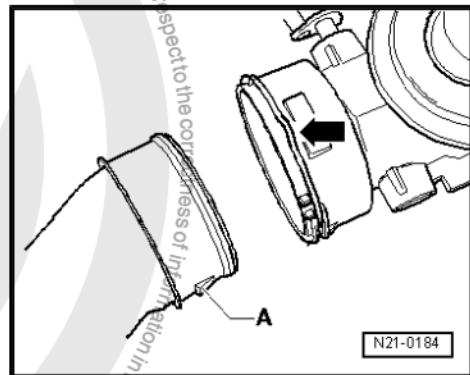
*The seal for the push-on coupling can be damaged if the retaining clip is in the locked position during installation. This would result in leaking. Observe installation instructions.*

**Removing**

- Release plug-in connector by pulling out retaining clip -arrow-. Separate hose/pipe without tools.

**Installing**

- If renewed, place oil seal in groove of charge air hose. Ensure the oil seal is correctly seated in the groove.
- Lubricate sealing surface and seal with oil.
- Bring retaining 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 plug-in connector seats correctly and is properly engaged by pulling hose.



## 2.3 Checking charge air system for leaks

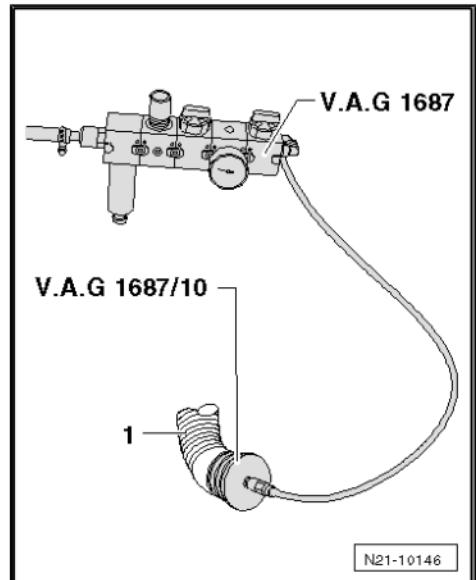
**Special tools and workshop equipment required**

- ◆ Charge air system tester - V.A.G 1687-
- ◆ Adapter - V.A.G 1687/10-
- Remove intake hose -1- from air filter.



- Connect adapter - 1687/10- in intake hose -1- and secure with clip.

Prepare charge air system tester - V.A.G 1687- as follows:



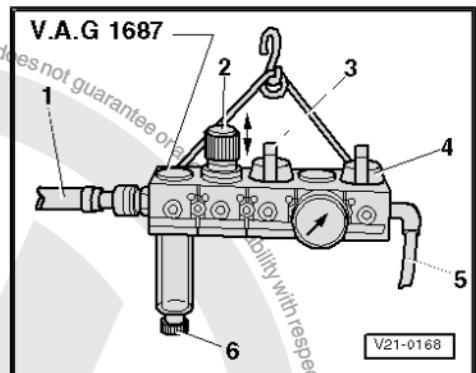
N21-10146

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



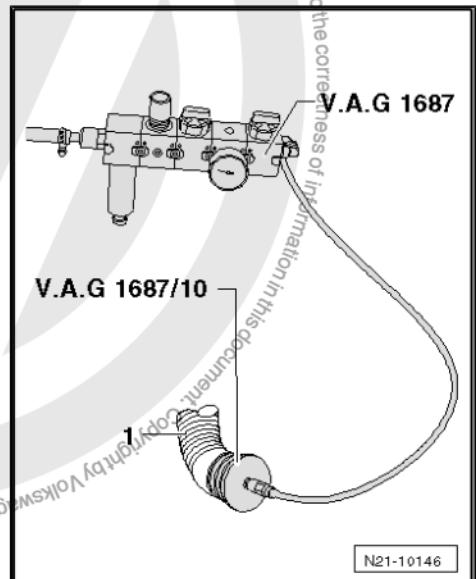
#### Note

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



V21-0168

- Connect charge air system tester - V.A.G 1687- to adapter - 1687/10- as shown.



N21-10146



Caddy 2004 >

4-cylinder diesel engine (2.0 l engine, 2-valve, TDI) - Edition 08.2019

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



Note

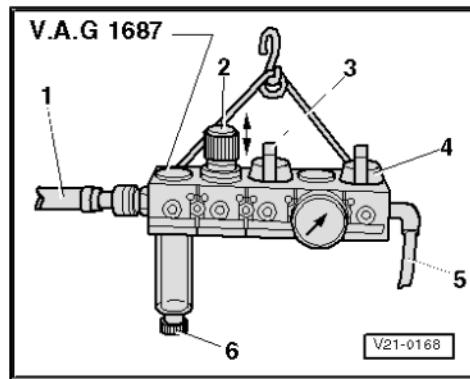
If there is water in the sight glass, drain at water drain screw -6-.

- 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 commercially available leak detector spray or using ultrasonic tester - V.A.G 1842- .



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 125](#).
- ◆ Before removing the adapter, depressurise the test circuit by pulling coupling off adapter - 1687/10- .





## 23 – Mixture preparation - injection

### 1 Injectors

- ⇒ “1.1 Assembly overview - injectors”, page 129
- ⇒ “1.2 Assembly overview - prewiring for unit injectors”, page 130
- ⇒ “1.3 Removing and installing O-rings for unit injector”, page 130
- ⇒ “1.4 Removing and installing unit injector”, page 131
- ⇒ “1.5 Removing and installing prewiring for unit injectors”, page 134

#### 1.1 Assembly overview - injectors

##### 1 - Bolt

- Renew after removal
- 20 Nm +90°

##### 2 - Rocker arm shaft

- With rocker arms
- Removing and installing  
⇒ page 131

##### 3 - Lock nut

- 30 Nm

##### 4 - Adjuster screw

- Renew after removal

##### 5 - Ball stud

- Renew after removal

##### 6 - Unit injector

- Removing and installing  
⇒ page 131

##### 7 - O-ring

- Renewing ⇒ page 130

##### 8 - O-ring

- Renewing ⇒ page 130

##### 9 - O-ring

- Renewing ⇒ page 130

##### 10 - Heat shield seal

- Renew after removal

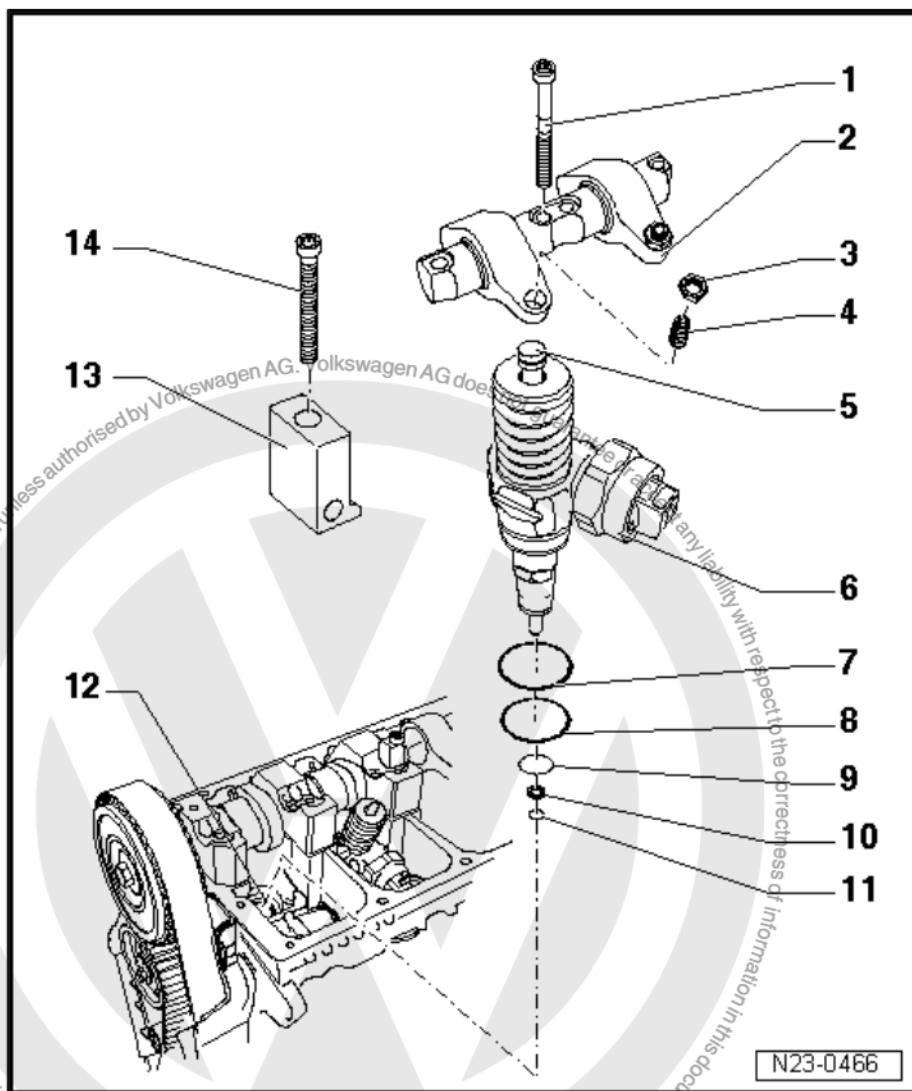
##### 11 - Retaining ring

##### 12 - Cylinder head

##### 13 - Clamping block

##### 14 - Bolt

- Renew after removal
- 12 Nm +270°





## 1.2 Assembly overview - prewiring for unit injectors

1 - Glow plug connector

2 - Stainless steel clips

- Do not bend open.

3 - Bolt

- 10 Nm

4 - Adapter ring

- When installing, ensure positioned correctly  
[⇒ page 134](#).

5 - Central connector

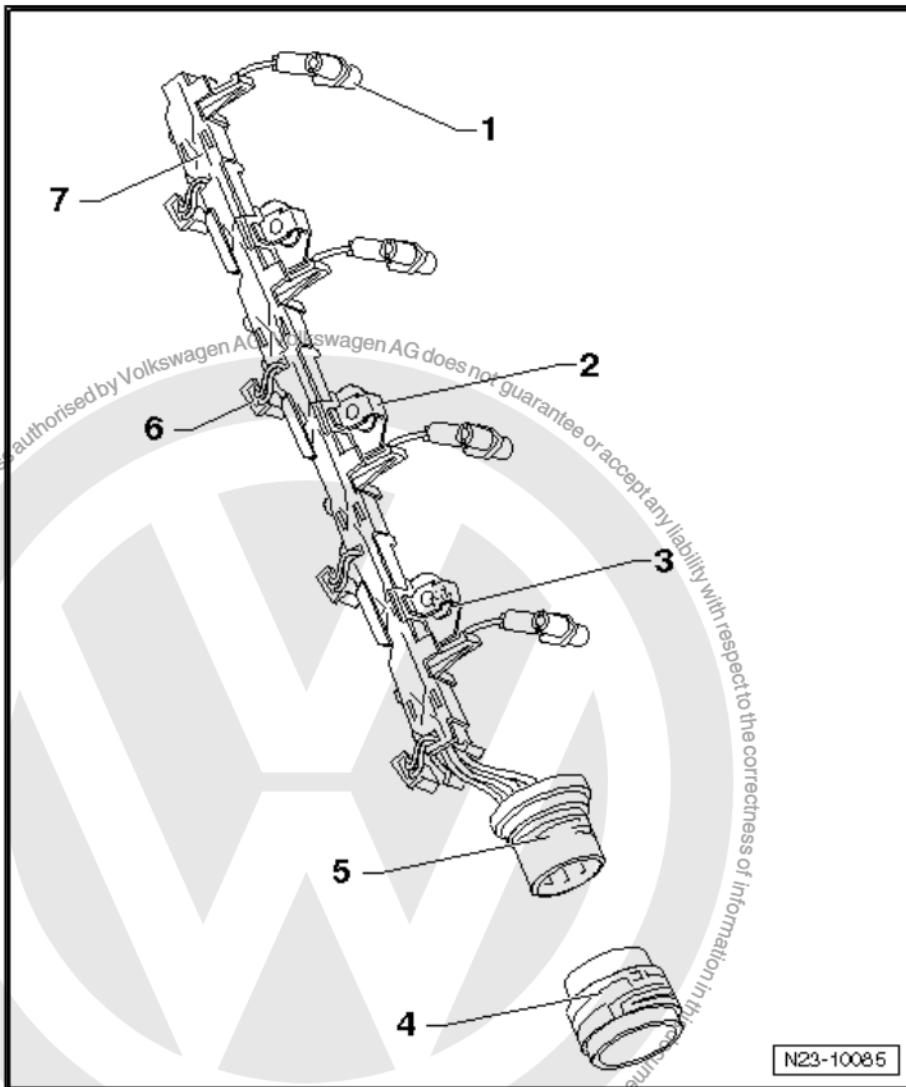
- When installing, ensure positioned correctly  
[⇒ page 134](#).

6 - Electrical connector

- 2-pin
- For unit injector

7 - Wiring guide

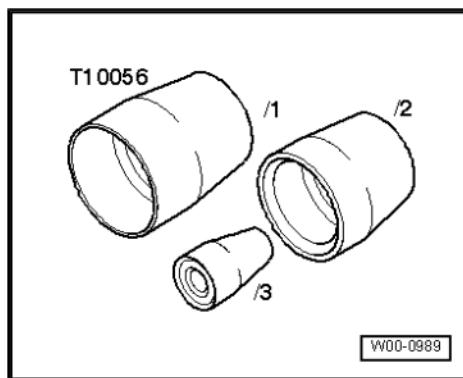
- Remove and install together with  
[⇒ Item 2 \(page 130\)](#).



## 1.3 Removing and installing O-rings for unit injector

Special tools and workshop equipment required

- ◆ Assembly sleeves - T10056-



Removing

- Lever old O-rings very carefully out of unit injector.



- Above all ensure that burrs are not caused on O-ring seating.

#### Installing

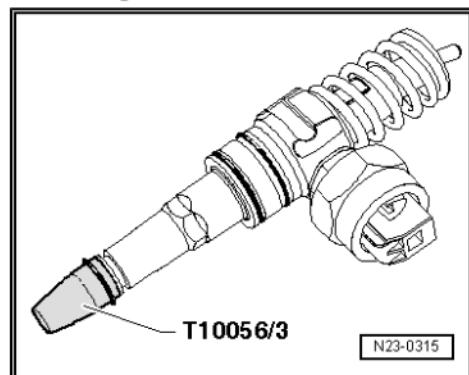
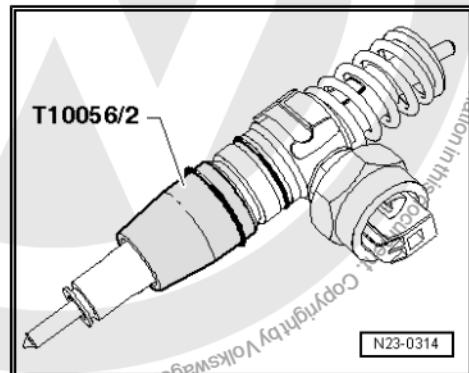
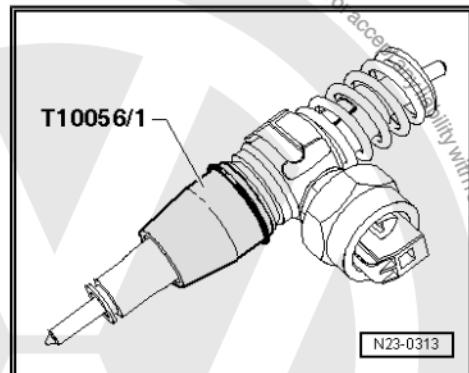
Install in reverse order of removal, observing the following:



#### 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.

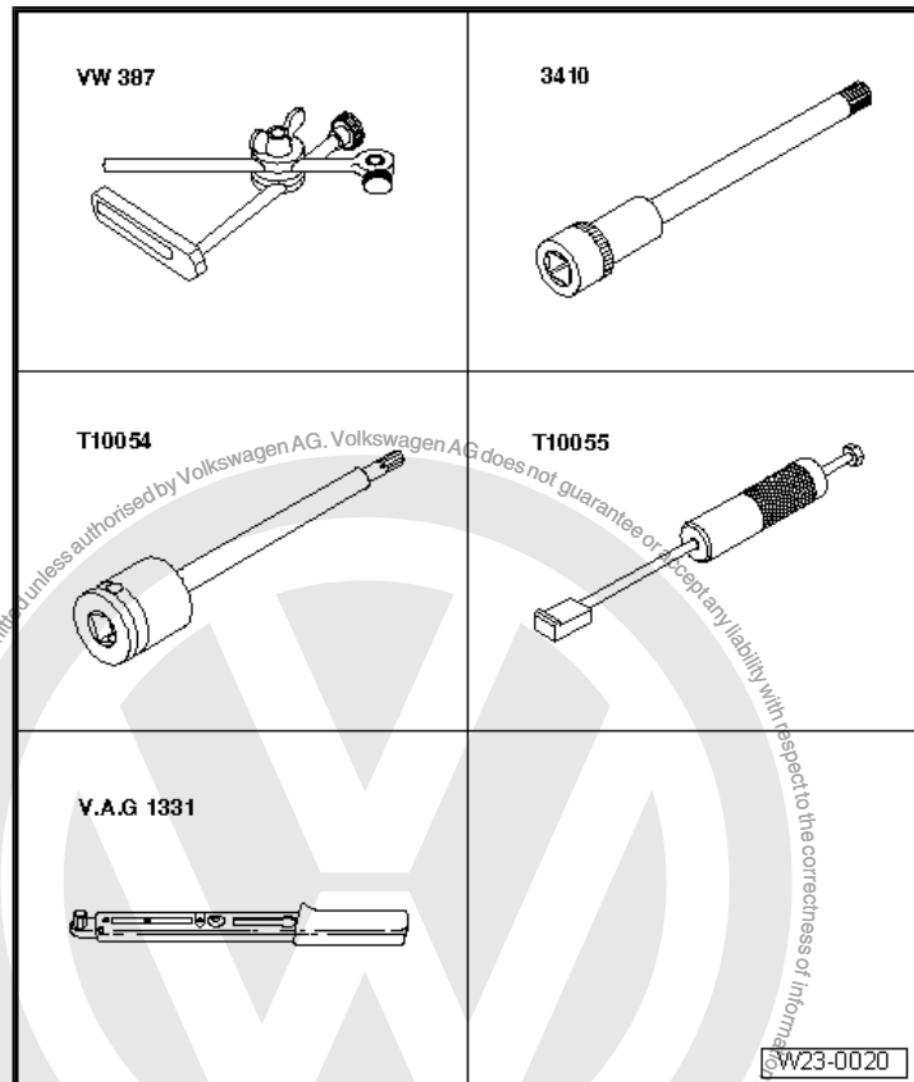


- Place assembly sleeve - T10056/2- onto stop on unit injector.
- Slide the middle, thinner O-ring carefully onto assembly sleeve and into seat on unit injector.
- Remove assembly sleeve.
- Place assembly sleeve - T10056/3- onto stop on unit injector.
- Push the lower O-ring carefully onto the assembly sleeve and into the seat of the unit injector.
- Remove assembly sleeve.
- Fit new heat shield seal together with securing clip.

## 1.4 Removing and installing unit injector



Special tools and workshop equipment required



- ◆ Universal dial gauge holder - VW 387-
- ◆ Multi-point bit - 3410-
- ◆ Multi-point bit - T10054-
- ◆ Puller - T10055-
- ◆ Torque wrench - V.A.G 1331-

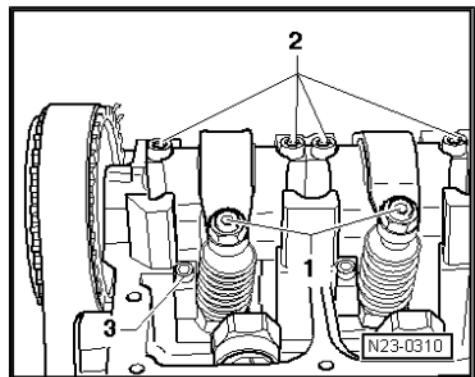
Removing

- Remove upper toothed belt guard.
- Remove cylinder head cover. [⇒ page 56](#)
- 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 - 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 by gently tapping upwards.

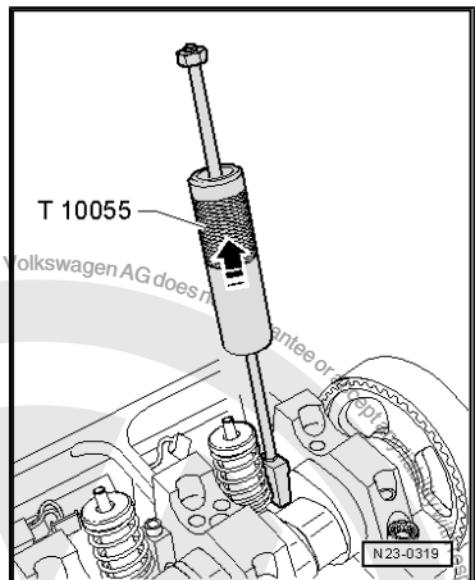
#### Installing

Install in reverse order of removal, observing the following:



#### 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 insulating seals.*
- ◆ *The seals must not be twisted.*
- Heat insulating seal and O-rings must be renewed if old unit injector is reused [⇒ page 130](#).
- Check that the three O-rings and the heat shield seal along with securing clip are seated correctly before installing unit injector.
- 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 new securing bolt into clamping block, but do not tighten (it must still be possible to turn the unit injector slightly).
- Now align unit injector at right angles to camshaft bearing seat.

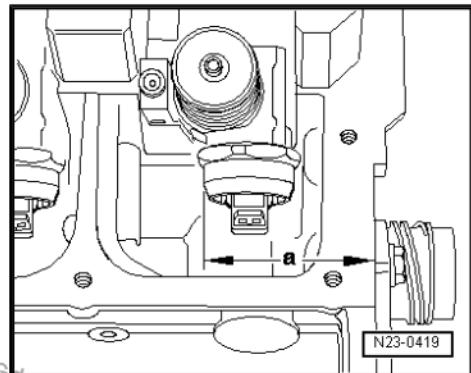


Caddy 2004 >

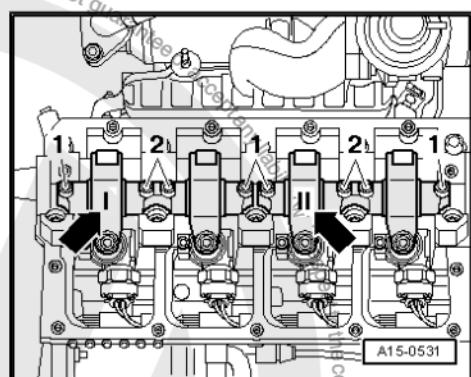
4-cylinder diesel engine (2.0 l engine, 2-valve, TDI) - Edition 08.2019

- Check dimension "a" from outer edge of cylinder head to rounded edge of unit injector with a vernier gauge (measuring range at least 400 mm).

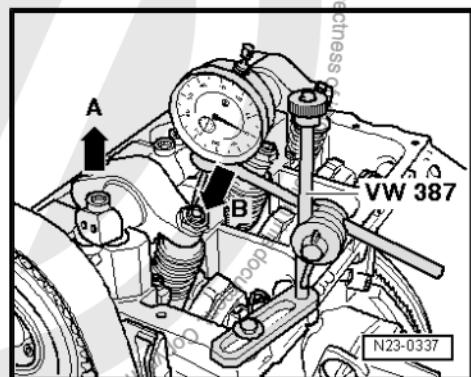
Cylinder	Dimension "a"
1	333.0 ± 0.8 mm
2	245.0 ± 0.8 mm
3	153.6 ± 0.8 mm
4	65.6 ± 0.8 mm



- If necessary, adjust the unit injector and tighten the securing bolt.
- 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 tighten to specified torque.



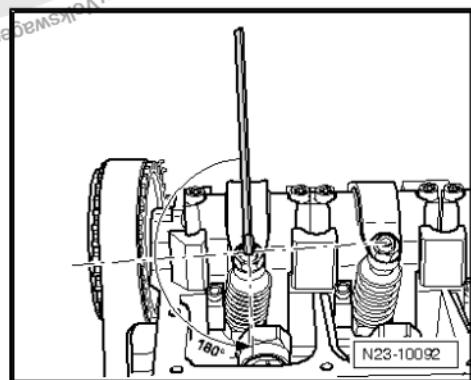
- Fit dial gauge onto adjustment screw of unit injector as shown.
- Turn crankshaft in direction of engine rotation until roller of rocker arm is located at tip of drive cam. Roller side -arrow A- positioned at highest point: dial gauge -arrow B- positioned at lowest point
- Remove dial gauge.
- Now turn the adjuster screw into rocker arm until significant resistance can be felt (unit injector is at limit stop).



- Turn adjuster screw 180° back off stop.
- Hold adjustment screw in this position and tighten the lock nut.
- Connect unit injector connector.
- Install cylinder head cover [⇒ page 56](#).
- Install toothed belt guard.

#### Specified torques

- ◆ [⇒ "1.1 Assembly overview - injectors", page 129](#)
- ◆ [⇒ "1.1 Assembly overview - cylinder head", page 46](#)

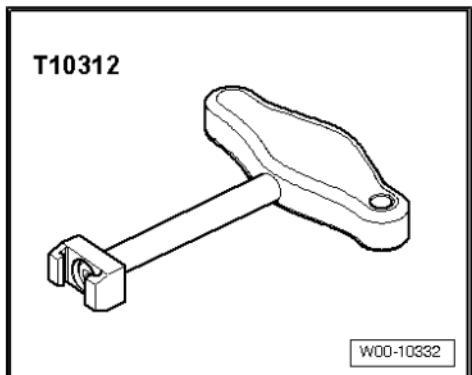


## 1.5 Removing and installing prewiring for unit injectors

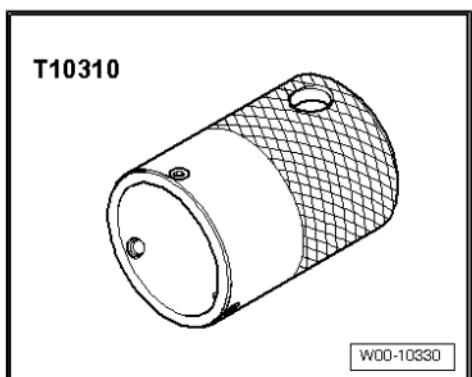
Special tools and workshop equipment required



- ◆ Puller - T10312-



- ◆ Special wrench - T10310-



### Removing



#### Caution

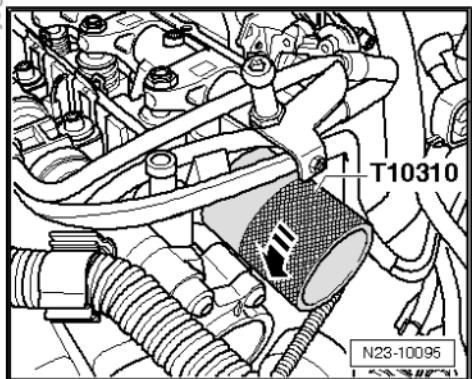
*Removal and installation of the pre-wired wiring harness may only be undertaken by unscrewing the clips. Releasing the cable guide from the clips bends the clips which may break the cables due to the excessive play. This also applies when changing the unit injectors and all work which does not require the central connector to be completely removed.*



#### Note

*Connectors on piezo unit injectors may only be disconnected using special tool puller - T10312- .*

- Remove cylinder head cover [page 56](#) .
- Separate central connector on cylinder head.
- Fit special wrench - T10310- on adapter ring and release it by turning wrench 90° (1/4 turn) in -direction of arrow-.



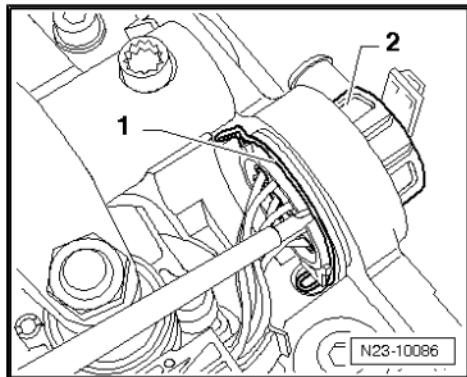
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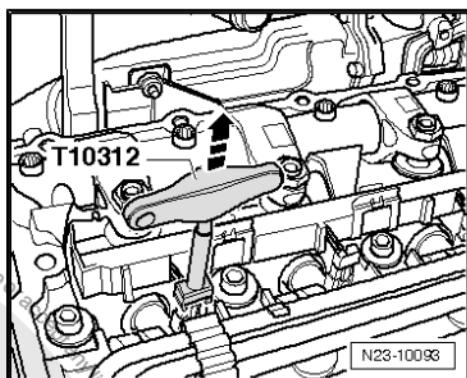
Caddy 2004 >

4-cylinder diesel engine (2.0 l engine, 2-valve, TDI) - Edition 08.2019

- Pull securing clip -1- upwards slightly with a screwdriver and press the central connector -2- through inwards.



- Slide puller - T10312- onto unit injector connector from side and pull it off in -direction of arrow-. For older connector version, use long-nose pliers.

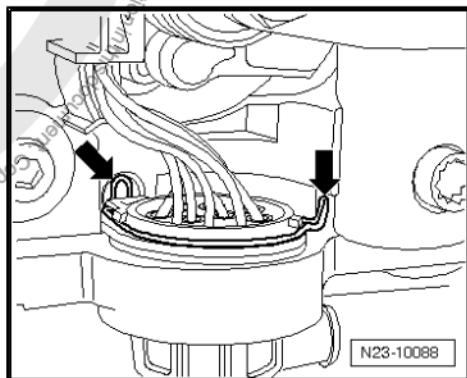
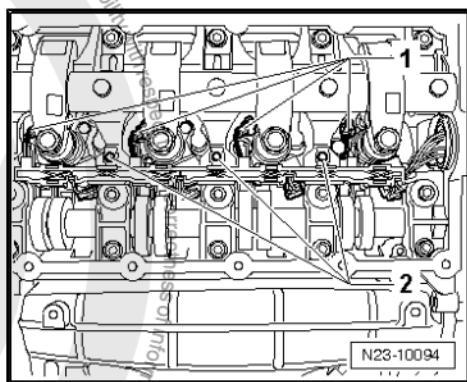


- Pull connectors off glow plugs -1-. Remove securing bolts -2- for stainless steel clips and remove complete pre-wired wiring harness.

#### Installing

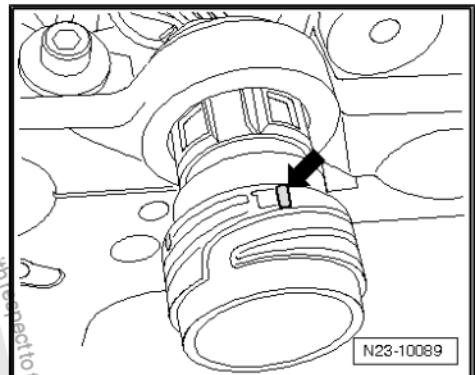
Install in reverse order of removal, observing the following:

- Fit prewiring harness and tighten securing bolts.
- Guide central connector through opening in bearing frame, ensure securing clips -arrows- are seated correctly when doing this.





- Fit adapter ring ("longer" stud marked in colour -arrow- faces 12 o'clock).



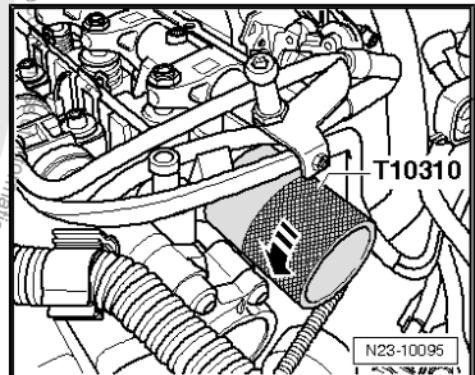
- Fit special wrench - T10310- on adapter ring and lock it by turning wrench 90° ( $\frac{1}{4}$  turn) opposite -direction of arrow-.



#### Note

*When adapter ring is installed correctly the colour marked "shorter" stud faces 12 o'clock)*

- Fit central connector on cylinder head and lock in place.
- Install cylinder head cover [page 56](#).



#### Specified torques

- ◆ [⇒ "1.2 Assembly overview - prewiring for unit injectors", page 130](#)
- ◆ [⇒ "1.1 Assembly overview - cylinder head", page 46](#)



## 2 Vacuum system

⇒ [“2.1 Connection diagram - vacuum system”, page 138](#)

### 2.1 Connection diagram - vacuum system

1 - Air filter housing

- Removing and installing  
⇒ [page 139](#)

2 - Charge pressure control solenoid valve - N75-

3 - Vacuum hose

4 - Cylinder head cover

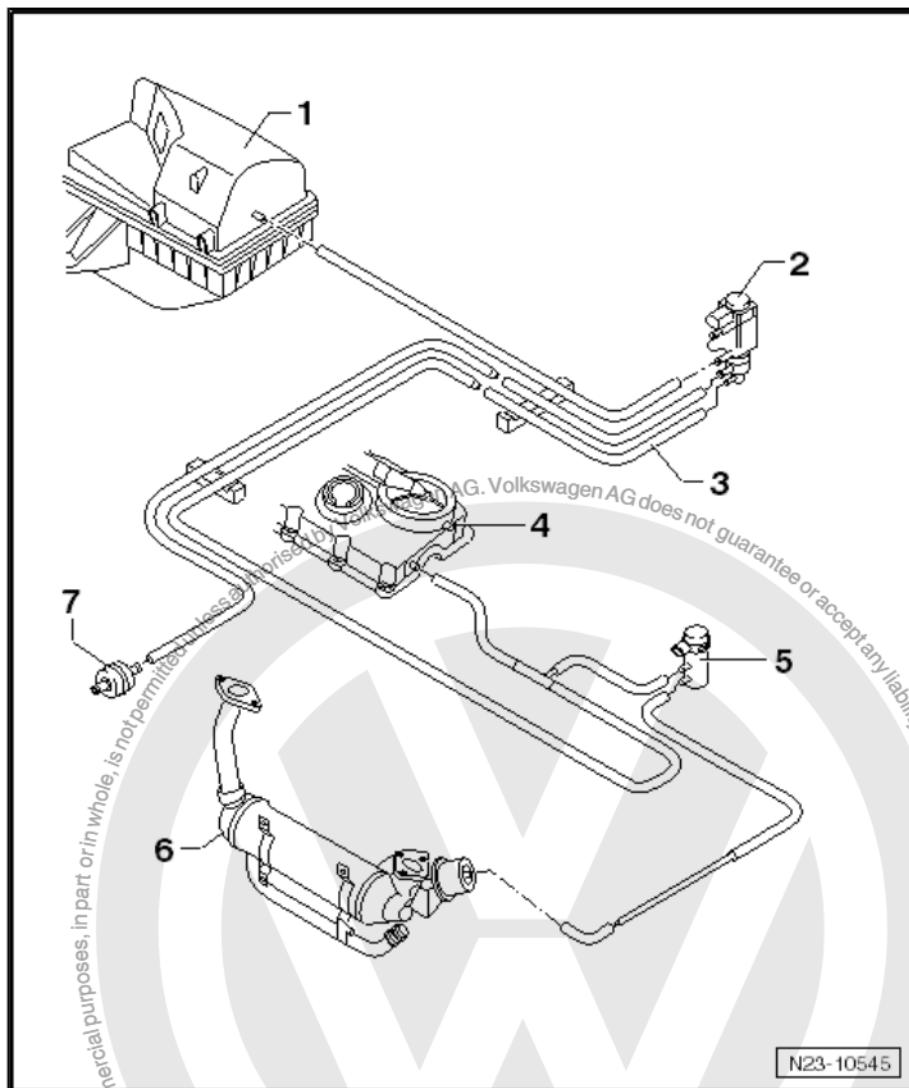
- Removing and installing  
⇒ [page 56](#)

5 - Solenoid valve

6 - Exhaust gas recirculation cooler

- Removing and installing  
⇒ [page 160](#)

7 - Non-return valve



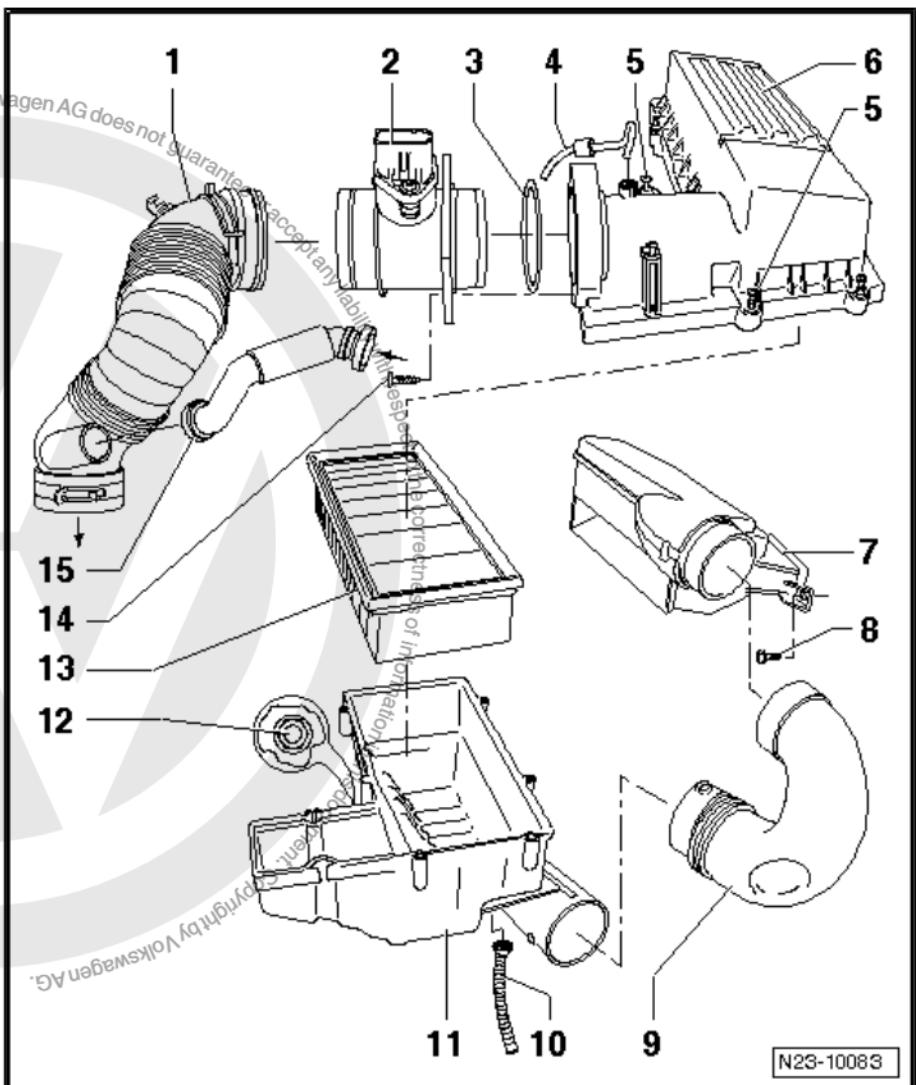


### 3 Air filter

⇒ "3.1 Assembly overview - air filter housing", page 139

#### 3.1 Assembly overview - air filter housing

- 1 - Intake hose
  - To turbocharger
- 2 - Air mass meter - G70-  
Protected by copyright © Volkswagen AG. This material may not be reproduced in whole or in part without the express written permission of Volkswagen AG.
- 3 - O-ring
  - Renew if damaged
- 4 - Vacuum hose
  - To charge pressure control solenoid valve - N75- .
- 5 - Bolt
  - 8 Nm
- 6 - Air filter upper part
- 7 - Intake air guide
  - Bolted to lock carrier.
- 8 - Bolt
  - 5 Nm
- 9 - Air intake hose
- 10 - Water drain
- 11 - Air filter lower part
- 12 - Bolt
  - 10 Nm
- 13 - Filter element
- 14 - Bolt
  - 3.5 Nm
- 15 - Connection hose
  - From cylinder head cover
  - For crankcase ventilation.



N23-10083



## 4 Intake manifold

⇒ "4.1 Assembly overview - intake manifold", page 140

⇒ "4.2 Cleaning intake manifold flap connection", page 141

### 4.1 Assembly overview - intake manifold

1 - Seal

- Renew after removal

2 - Intake manifold

3 - Seal

- Renew after removal

4 - Connection

- Remove any carbon deposits ⇒ [page 141](#)

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 - Bolt

- 10 Nm

8 - Exhaust gas recirculation valve - N18- with exhaust gas recirculation potentiometer - G212-

- Assembly overview - exhaust gas recirculation ⇒ [page 159](#)

9 - Seal

- Renew after removal

10 - Connecting pipe

- Install so that component is not under tension
- For exhaust gas recirculation cooler
- Assembly overview - exhaust gas recirculation cooler ⇒ [page 160](#)

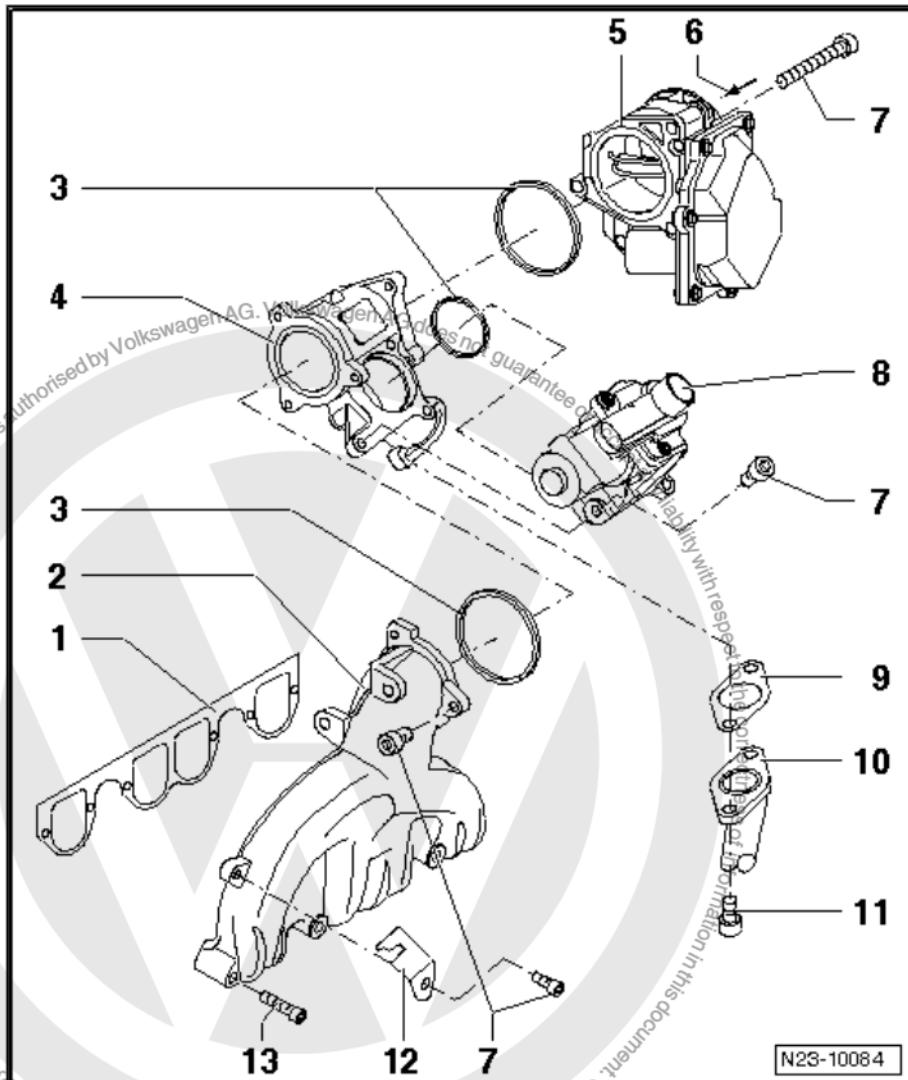
11 - Bolt

- 22 Nm

12 - Bracket

13 - Bolt

- 22 Nm





## 4.2 Cleaning intake manifold flap connection



### Note

A combination of unfavourable factors can cause carbon deposits in the throttle valve support. If such deposits are found, e.g. when disassembling the exhaust gas recirculation valve - N18- or the intake manifold flap motor - V157-, the throttle valve housing will have to be cleaned.



### WARNING

Acetone is highly inflammable. Please comply with the accident prevention regulations and the safety instructions when handling highly inflammable fluids. Wear protective goggles and protective clothing to avoid injury and contact with the skin.

- 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.





## 5 Engine control unit

⇒ “5.1 Removing and installing engine control unit”, page 142

### 5.1 Removing and installing engine control unit



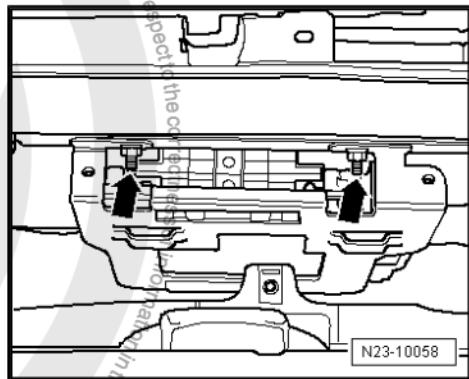
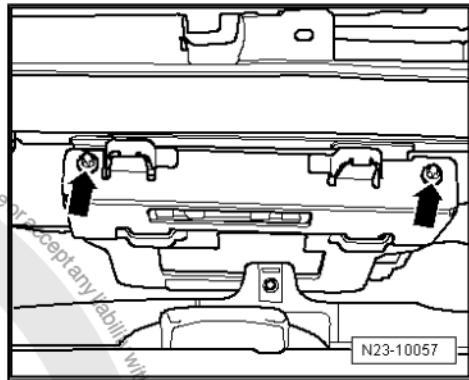
#### Note

The diesel direct injection system control unit is equipped with an event memory. Read event memory before and after making repairs or adjustments ⇒ Vehicle diagnostic tester.

- Before removing engine control unit, first read control unit identification and, with it, coding of current control unit as well  
⇒ Vehicle diagnostic tester.

#### Removing

- Switch off ignition.
- Remove plenum chamber bulkhead: ⇒ General body repairs, exterior; Rep. gr. 50 ; Body - front; Plenum chamber bulkhead .
- Loosen securing bolts -arrows- of control unit cover.



- Then remove securing nuts for control unit bracket -arrows-.
- Release connectors on engine control unit and pull off connector.

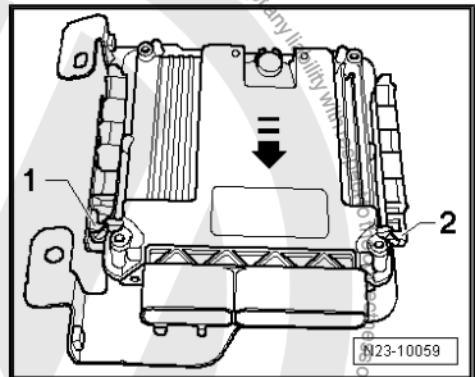


- Press catches -1- and -2- outwards. Then pull engine control unit off control unit bracket in direction of arrow.

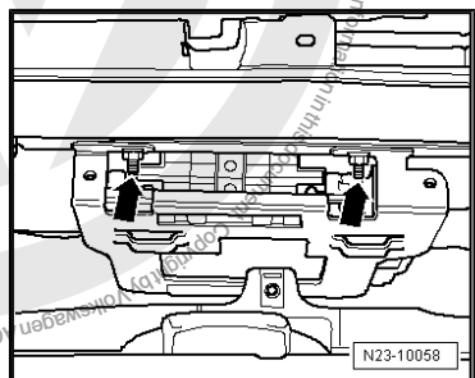
#### Installing

Install in reverse order of removal, observing the following:

- Push engine control unit onto control unit bracket until it engages in catches.
- Fit connectors and lock in position.



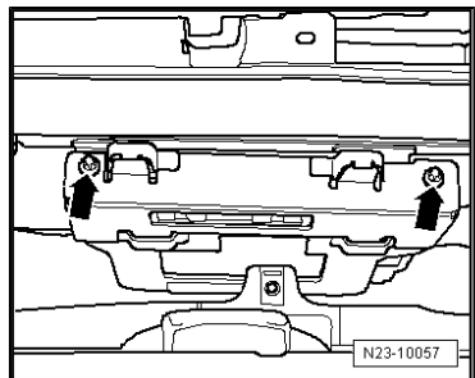
- Tighten the securing nuts -arrows-.



- Tighten the securing bolts -arrows-.
- Check previous coding and adapt coding of the new control unit ⇒ Vehicle diagnostic tester.
- Read event memory of engine control unit and erase all event memory entries if necessary ⇒ Vehicle diagnostic tester.
- Perform road test.
- Read control unit event memory again.

#### Specified torque

Component	Specified torque
Securing nuts	10 Nm
Securing bolts	5 Nm





## 6 High-pressure pump

- ⇒ “6.1 Removing and installing tandem pump”, page 144
- ⇒ “6.2 Checking delivery pressure of tandem pump”, page 146
- ⇒ “6.3 Checking for internal leaks”, page 148

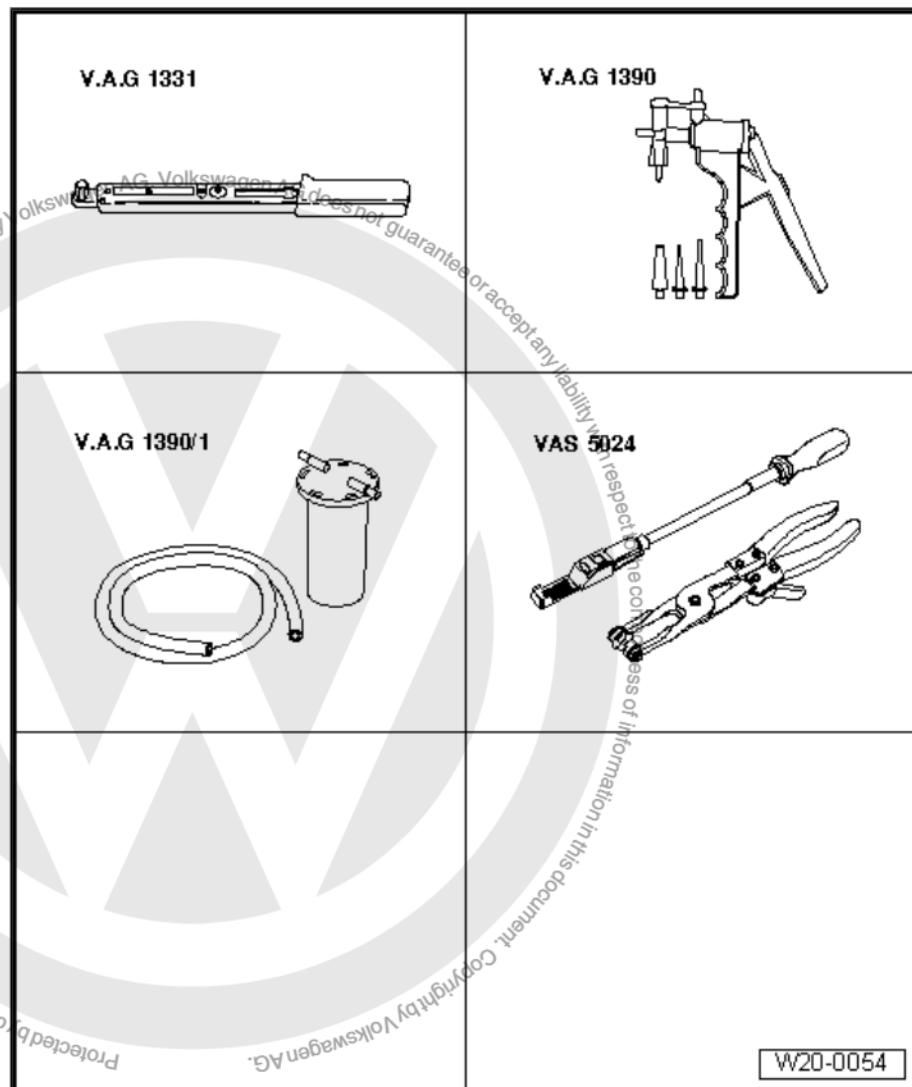
### 6.1 Removing and installing tandem pump



#### DANGER!

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

Special tools and workshop equipment required



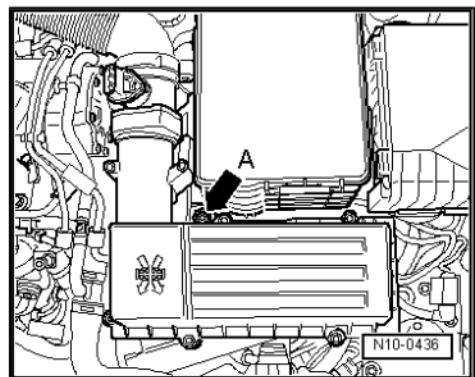
W20-0054

- ◆ 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- discontinued, use hose clip pliers - VAS 6340-

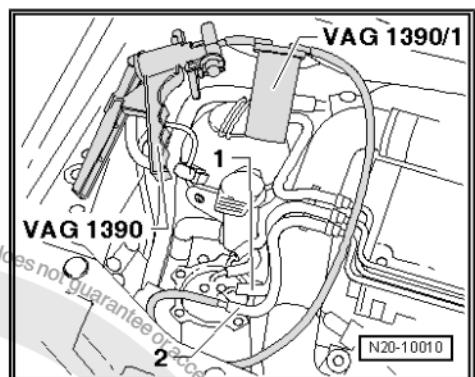


## Removing

- Remove bolt -arrow- and pull air filter housing upwards out of mounting.
- Remove air filter housing together with air mass meter and connecting pipe.



- Pull supply hose -1- (white marking) and return hose -2- (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.



- 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-.
- Unscrew securing bolts -arrows-.
- Remove tandem pump -4- from cylinder head.

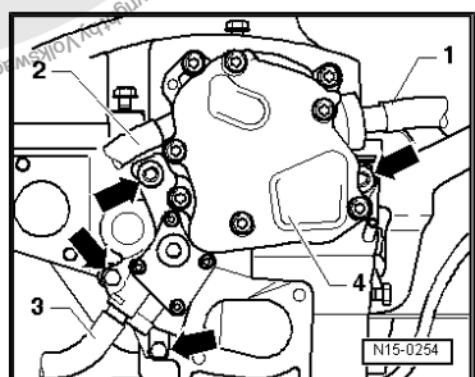
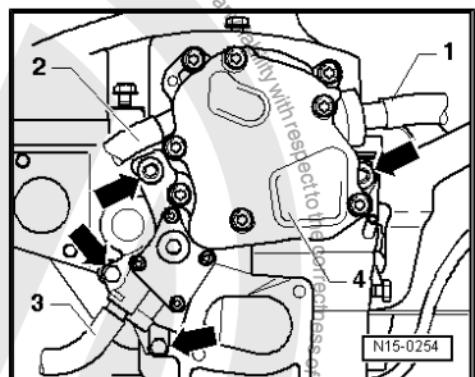
## Installing

Install in reverse order of removal, observing the following:



### Note

- ◆ Ensure that tandem pump coupling seats properly in cam-shaft.
- ◆ Always renew tandem pump seals.
- Install tandem pump and tighten upper securing bolts.
- Tighten lower securing bolts.
- Attach return hose (blue marking) to return connection -3- of tandem pump.
- Attach supply hose (white marking) to supply connection -2- and vacuum line from brake servo -1- to tandem pump -4-.





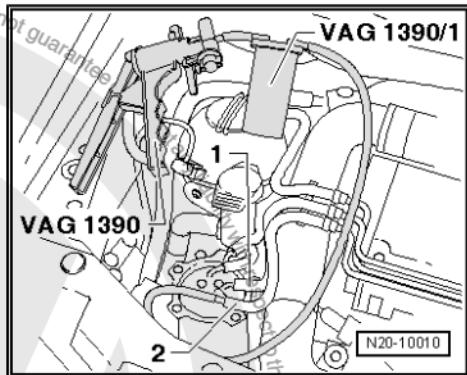
Caddy 2004 >

4-cylinder diesel engine (2.0 l engine, 2-valve, TDI) - Edition 08.2019

- Attach supply hose -1- (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.
- Attach return hose (blue marking) to fuel filter.

Specified torques

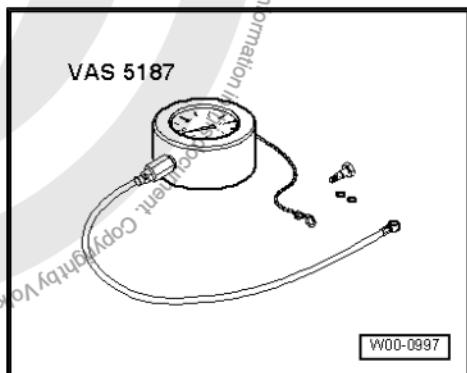
- ◆ [⇒ "1.1 Assembly overview - cylinder head", page 46](#)



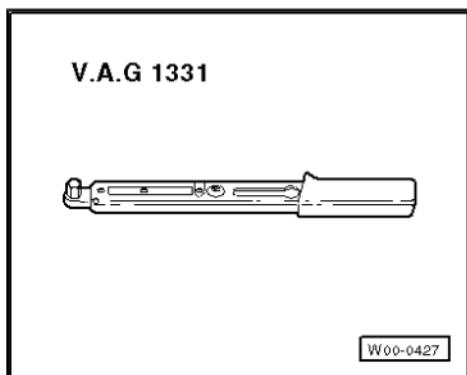
## 6.2 Checking delivery pressure of tandem pump

Special tools and workshop equipment required

- ◆ Tandem pump tester - VAS 5187-



- ◆ Torque wrench - V.A.G 1331-



- ◆ Vehicle diagnostic tester

Conditions for testing

Coolant temperature must be at least 85°C.

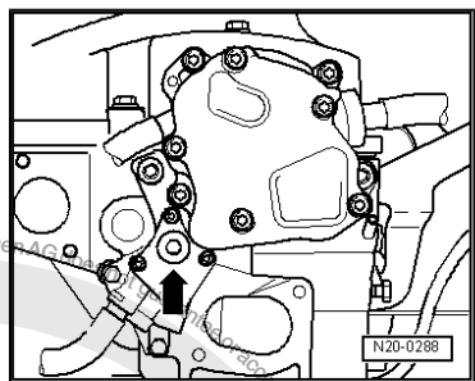
Unit injectors OK.

Fuel filter and fuel lines must not be blocked.



## Procedure

- Remove screw plug -arrow-.



- Connect tandem pump tester -VAS 5187- as shown.
- Start engine and run at idling speed.
- Connect ⇒ Vehicle diagnostic tester.
- Select "Read measured value block" in "Engine electronics".
- 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 specification is not obtained

- 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

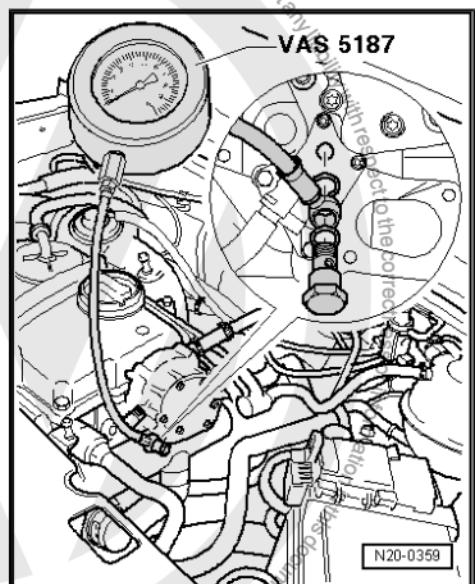
If specification is now obtained:

Pressure loss at unit injectors.

- Renew unit injector O-rings.

If specification is not obtained

- Renew tandem pump ⇒ [page 144](#) .



*Always renew plug seal.*

## Specified torque

Component	Specified torque
Plug	25 Nm



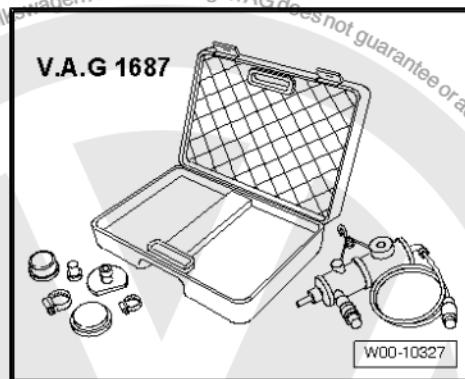
## 6.3 Checking for internal leaks



The tandem pump must be checked for internal leaks between fuel side and oil side after reinstalling a used tandem pump, e.g. after renewing or repairing a cylinder head and/or when installing a "short" engine. In the event of a leak, it is possible for the fuel to mix with the oil which may cause engine damage.

Special tools and workshop equipment required

- ◆ Charge air system tester - V.A.G 1687-



### Procedure

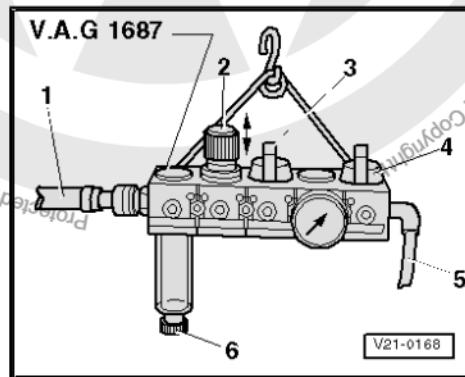
- Pull fuel supply hose (white marking) and fuel return hose (blue marking) off tandem pump.
- Seal fuel return union on tandem pump with a plug. Secure sealing plug with a spring-type clip.

Prepare charge air system tester - 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 clip to secure.



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- .



Note

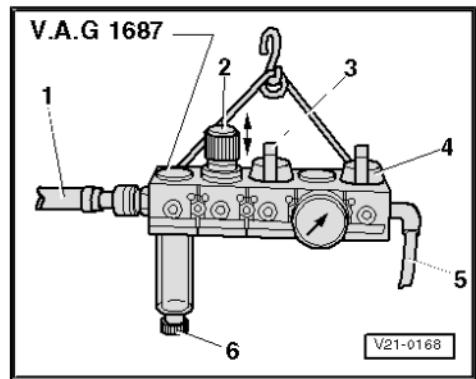
*If there is water in the sight glass, drain at water drain screw -6-.*

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



Caution

*The maximum test pressure of 1.3 bar 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.

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## 26 – Exhaust system

### 1 Exhaust pipes and silencers

- ⇒ “1.1 Assembly overview - silencers”, page 150
- ⇒ “1.2 Separating exhaust pipes from silencers”, page 151
- ⇒ “1.3 Installation position of clamp”, page 152
- ⇒ “1.4 Aligning exhaust system free of stress”, page 152

#### 1.1 Assembly overview - silencers



##### Note

- ◆ After working on the exhaust system, ensure that the system is not under stress and that there is sufficient clearance from the body. If necessary, loosen double and single clamps and align silencer and exhaust pipe so that sufficient clearance is maintained to the bodywork and the mountings are evenly loaded.
- ◆ Renew self-locking nuts.

##### 1 - Clamping sleeve

- Before tightening, align cold exhaust system free of tension
- Fitting position  
⇒ page 152
- Tighten bolted connections evenly.
- 25 Nm

##### 2 - Front silencer

##### 3 - Retaining ring for front silencer

- Renew if damaged

##### 4 - Bracket

- Observe installation position

##### 5 - Bolt

- 25 Nm

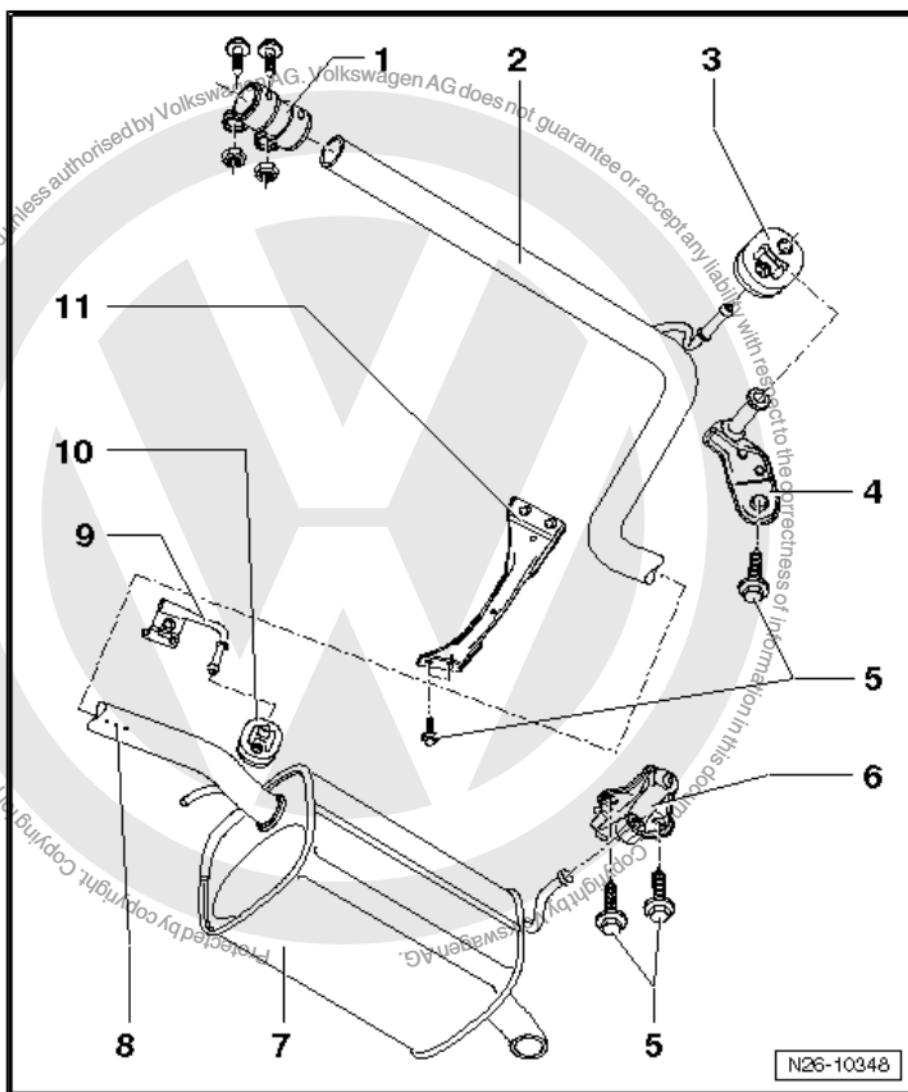
##### 6 - Mounting

- With retaining ring
- Renew if damaged

##### 7 - Rear silencer

##### 8 - Coupling 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.
- Installation position of rear clamp [⇒ page 152](#)
- Evenly tighten threaded connections of clamping sleeve
- Cutting exhaust pipe [⇒ page 151](#).
- Specified torque for clamp:
- M8: 25 Nm
- M10: 40 Nm

#### 9 - Bracket

- Observe installation position

#### 10 - Retaining ring for rear silencer

- Renew if damaged

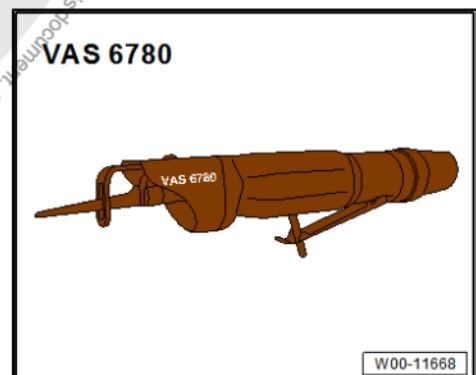
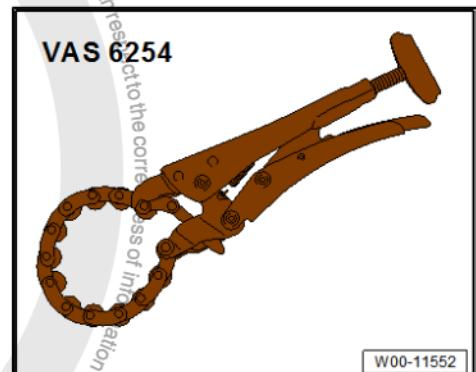
#### 11 - Tunnel cross-piece

## 1.2 Separating exhaust pipes from silencers

Special tools and workshop equipment required

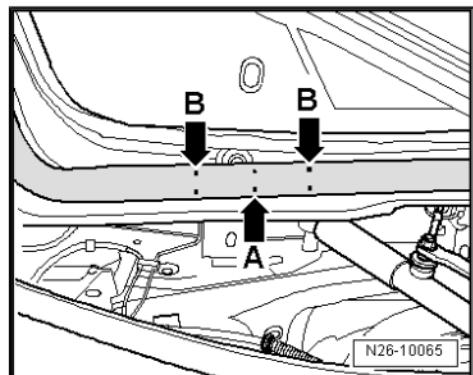
- ◆ Chain-type pipe cutter - VAS 6254-

- ◆ or body saw - VAS 6780-



#### Procedure

- Cut exhaust pipe at right angles at separating point -arrow A-.
- During installation, position repair double clamp at side markings -arrows B-





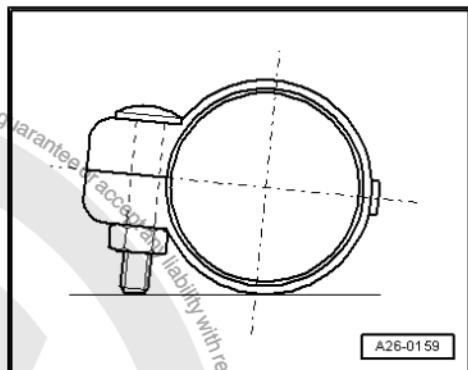
Caddy 2004 >

4-cylinder diesel engine (2.0 l engine, 2-valve, TDI) - Edition 08.2019

- Install clamp so that ends of bolts do not protrude beyond bottom of clamp.
- Bolt connection points to the left.

Specified torques

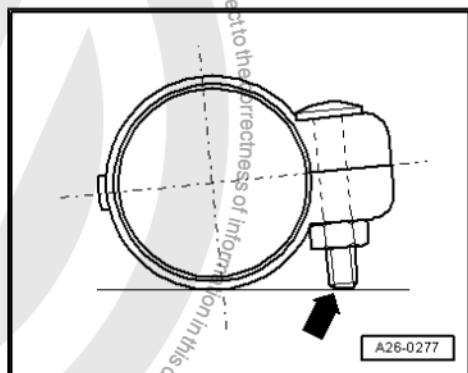
- ◆ ["1.1 Assembly overview - silencers", page 150](#)



### 1.3 Installation position of clamp

Installation position of front clamp

- Install clamp so that end of bolt does not extend beyond lower edge of clamp -arrow-.
- Bolt connections point to the right.



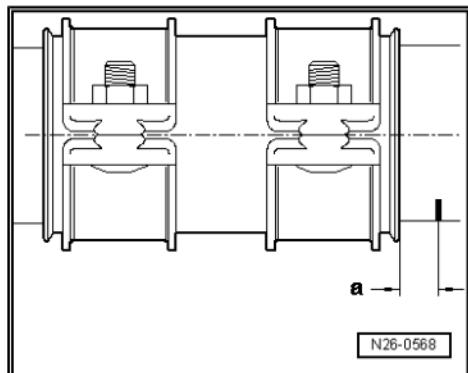
### 1.4 Aligning exhaust system free of stress

Test conditions

- Engine must be cold

Procedure

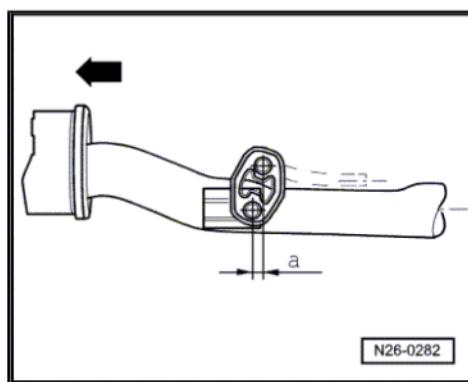
- Loosen bolted connection of double clamp between front exhaust pipe and front silencer.
- Position double clamp at distance -a- = 5 mm from marking on pipe for catalytic converter and lightly tighten front connection.



- Push silencer forwards into double clamp until dimension -a- = 15...17 mm is attained between mountings for body and rear silencer [Item 3 \(page 150\)](#). -Arrow- points in direction of travel.
- Align rear silencer horizontally.
- With parts in this position, tighten bolted connections of double clamp.
- Once the double clamp has been tightened, check dimension -a- and correct if necessary.

Specified torques

- ◆ ["1.1 Assembly overview - silencers", page 150](#)





## 2 Emission control

⇒ "2.1 Assembly overview - emission control", page 153

⇒ "2.2 Removing and installing particulate filter", page 154

### 2.1 Assembly overview - emission control

#### 1 - Diesel particulate filter

- Assembly overview - exhaust gas temperature regulation ⇒ [page 158](#)
- Removing and installing ⇒ [page 154](#)

#### 2 - Double clamp

- Observe installation position

#### 3 - Nut

- 25 Nm

#### 4 - Bolt

- Renew if damaged

#### 5 - Retaining ring

- Renew if damaged

- Observe installation position

#### 6 - Bracket

- Observe installation position

#### 7 - Bolt

- 25 Nm

#### 8 - Tunnel cross-piece

#### 9 - Mounting

- With retaining ring
- Renew if damaged

#### 10 - Bolt

- 25 Nm

#### 11 - Rear silencer

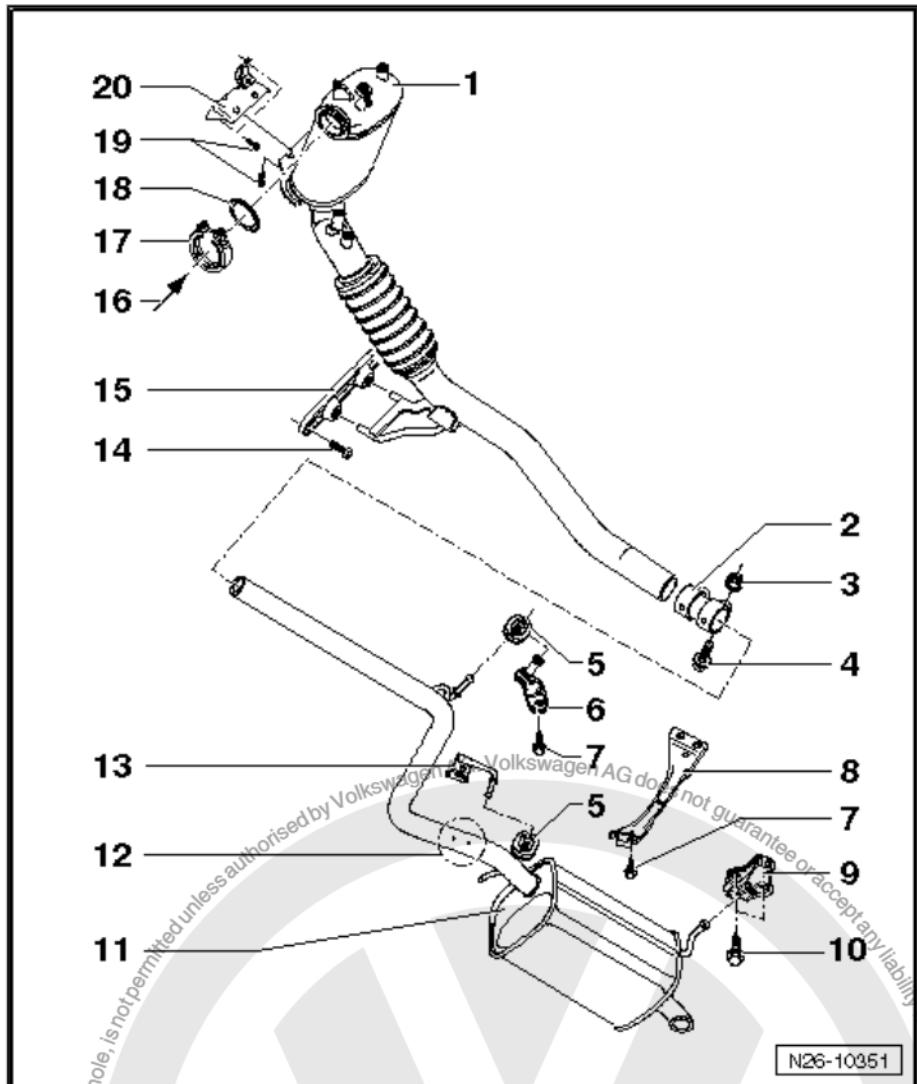
- Renew if damaged

#### 12 - Coupling point

- Marked by indentation on exhaust pipe.
- The exhaust pipe and rear silencers are installed as one part during production. For repairs, exhaust pipe and rear silencers are supplied separately.
- The connection is made with a double clamp.
- Installation position of rear double clamp
- Tighten double clamp bolts evenly.
- Cutting exhaust pipe ⇒ [page 151](#)
- Specified torque for clamp:
- M8: 25 Nm
- M10: 40 Nm

#### 13 - Bracket

- Observe installation position



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- 14 - Bolt  
 25 Nm
- 15 - Mounting
- 16 - To turbocharger
- 17 - Screw-type clamp  
 Observe installation position  
 7 Nm
- 18 - Seal  
 Renew after removal  
 Observe installation position
- 19 - Bolt  
 25 Nm
- 20 - Bracket  
 Bolted to cylinder block.

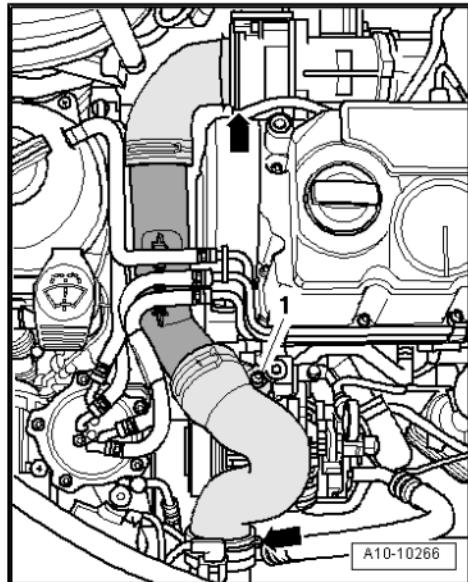
## 2.2 Removing and installing particulate filter



When a new particulate filter is installed, an ash mass comparison must be carried out ⇒ Vehicle diagnostic tester.

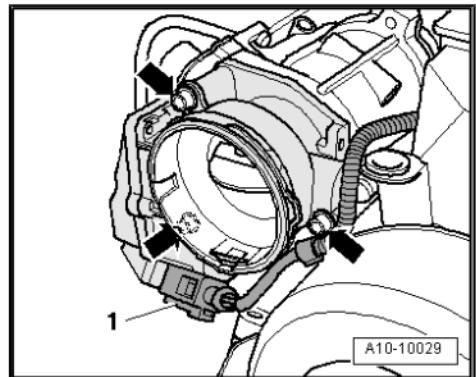
### Removing

- Unclip fuel hoses and coolant hoses from connecting pipe between charge air cooler and intake connecting pipe.
- Remove bolt -1-.

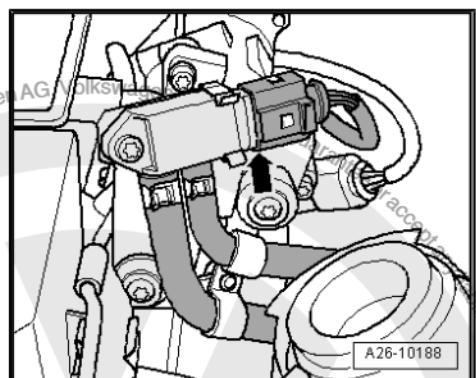




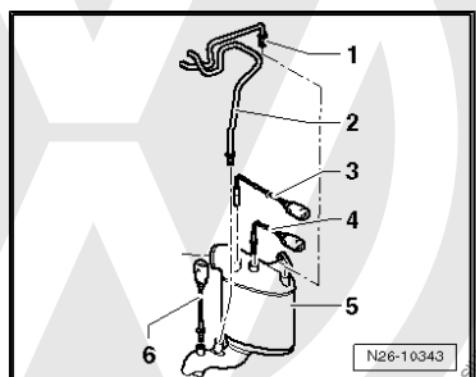
- Remove connecting pipe between charge air cooler and intake connecting pipe, to do this, lightly lift retaining clips -arrows-.
- Separate connector -1- at intake manifold flap motor - V157- .
- Remove bolts -arrows- and remove intake manifold flap motor - V157- .



- Separate electrical connection -arrow- on exhaust gas pressure sensor 1 - G450- .
- Unbolt exhaust gas pressure sensor 1 - G450- from bracket.



- If present, remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Body, front; Noise insulation .
- Disconnect control line -1- and -2- from particulate filter -5-.
- Remove exhaust gas pressure sensor 1 - G450- complete with pressure lines.
- Loosen exhaust temperature sender 2 - G448- -3- and exhaust temperature sender 3 - G495- -6- on particulate filter.

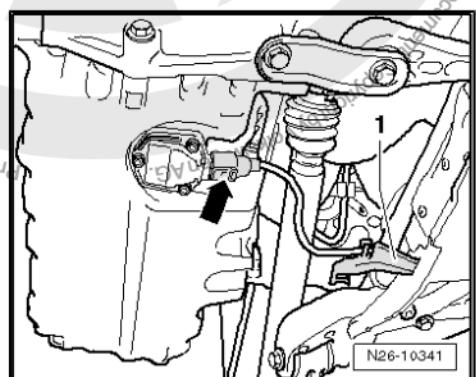


- Disconnect connector for lambda probe - G39- -4-.
- Disconnect connector on oil level and oil temperature sender - G266- .
- Remove cable retainer -1-.
- Unbolt right drive shaft from gearbox flange.



Note

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

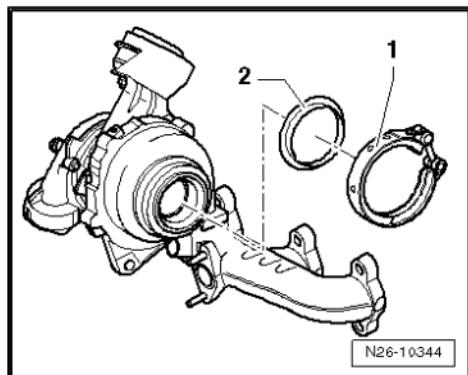




Caddy 2004 >

4-cylinder diesel engine (2.0 l engine, 2-valve, TDI) - Edition 08.2019

- Press right drive shaft forwards.
- Loosen retaining clip -1- with seal -2- for particulate filter.

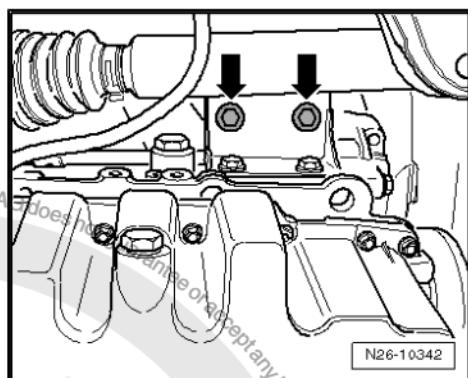


- Remove retaining clip -1-.

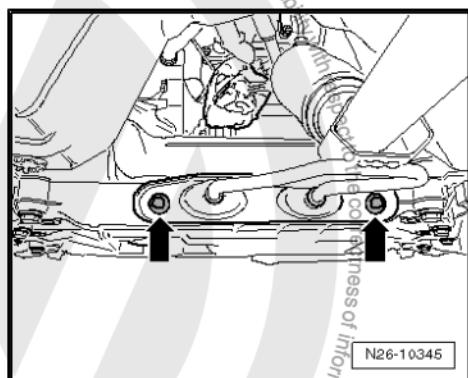


Note

*Flexible joints in front exhaust pipe must not be bent more than 10° - danger of damage.*



- Remove bolts -arrows- from particulate filter bracket.





- Unbolt bracket for exhaust system -arrows-.
- Remove bolts -arrows- and remove tunnel bridge.
- Loosen double clamp -1- and push backwards.
- Remove particulate filter through tunnel from underbody.

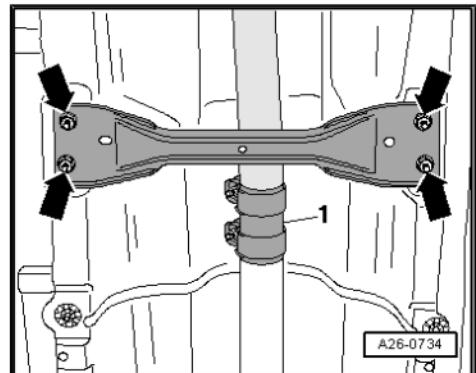
#### Installing

Install in reverse order of removal, observing the following:



#### Note

- ◆ *Renew seals, gaskets and self-locking nuts.*
- ◆ *Fit all cable ties in the original position when installing.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue (ETKA) .*
- Install connecting pipe free of stress. To achieve this, start all bolts hand-tight first, and tighten them diagonally and alternately after.
- Install components of diesel particulate filter ⇒ [page 158](#) .
- Align exhaust system free of stress ⇒ [page 152](#) .
- An adjustment must be carried out after renewing particulate filter ⇒ Vehicle diagnostic tester.



#### Specified torques

- ◆ ⇒ “[2.1 Assembly overview - emission control](#)”, [page 153](#)
- ◆ ⇒ “[3.1 Assembly overview - exhaust gas temperature regulation](#)”, [page 158](#)



### 3 Exhaust gas temperature regulation

⇒ "3.1 Assembly overview - exhaust gas temperature regulation",  
page 158

#### 3.1 Assembly overview - exhaust gas temperature regulation

1 - Exhaust gas pressure sensor 1 - G450-

- Adaptation ⇒ Vehicle diagnostic tester

2 - Control cable

- Connection for diesel particulate filter outlet, 8 mm in diameter

3 - Control cable

- Connection for diesel particulate filter inlet, 10 mm in diameter

4 - Turbocharger

5 - Exhaust gas temperature sender 2 - G448-

- Grease thread with high-temperature paste - G 052 112 A3- .
- Remove and install with tool set 17 mm - T10395- .
- 45 Nm

6 - Lambda probe - G39-

- Grease only thread with high-temperature paste - G 052 112 A3- .
- Remove and install with Lambda probe open ring spanner set - 3337- .
- 50 Nm

7 - Particulate filter

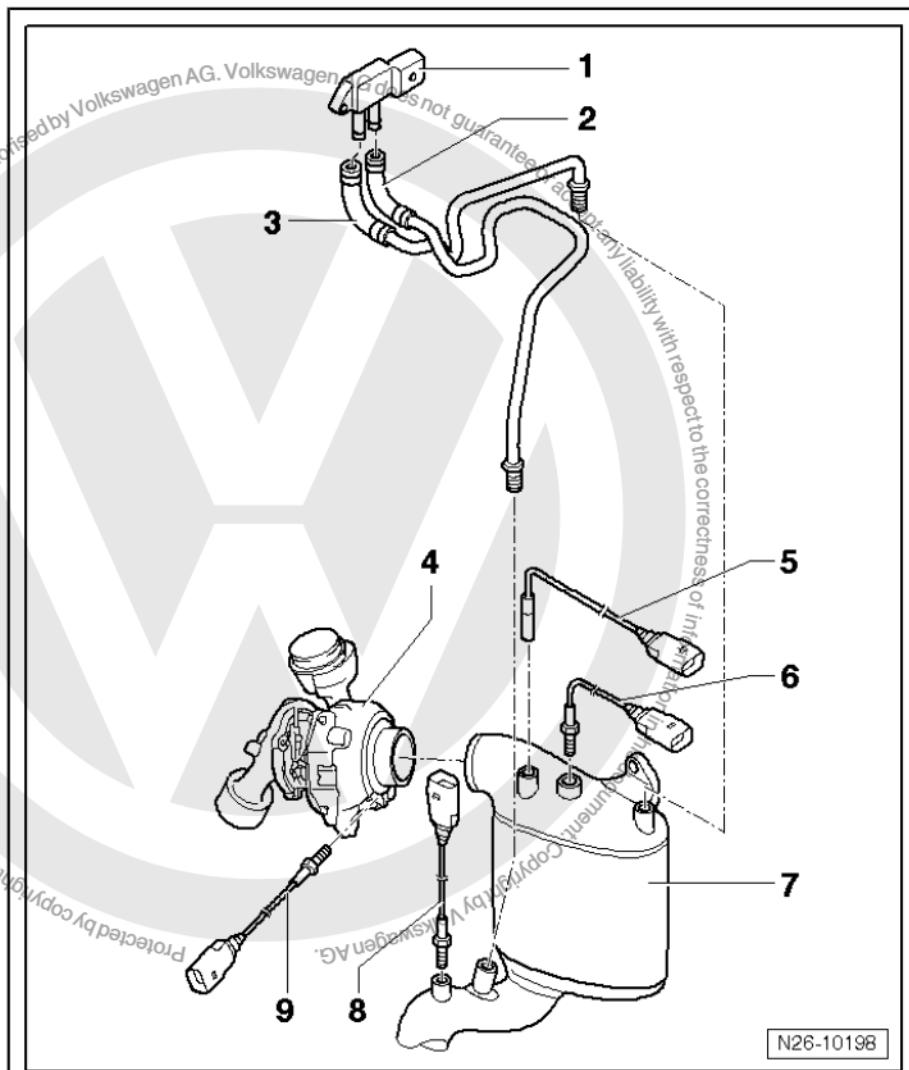
- Removing and installing  
⇒ page 154

8 - Exhaust gas temperature sender 3 - G495-

- Grease thread with high-temperature paste - G 052 112 A3- .
- Remove and install with tool set 17 mm - T10395- .
- 45 Nm

9 - Exhaust gas temperature sender 1 - G235-

- Grease thread with high-temperature paste - G 052 112 A3- .
- Remove and install with tool set 17 mm - T10395- .
- 45 Nm





## 4 Exhaust gas recirculation

⇒ "4.1 Assembly overview - exhaust gas recirculation",  
page 159

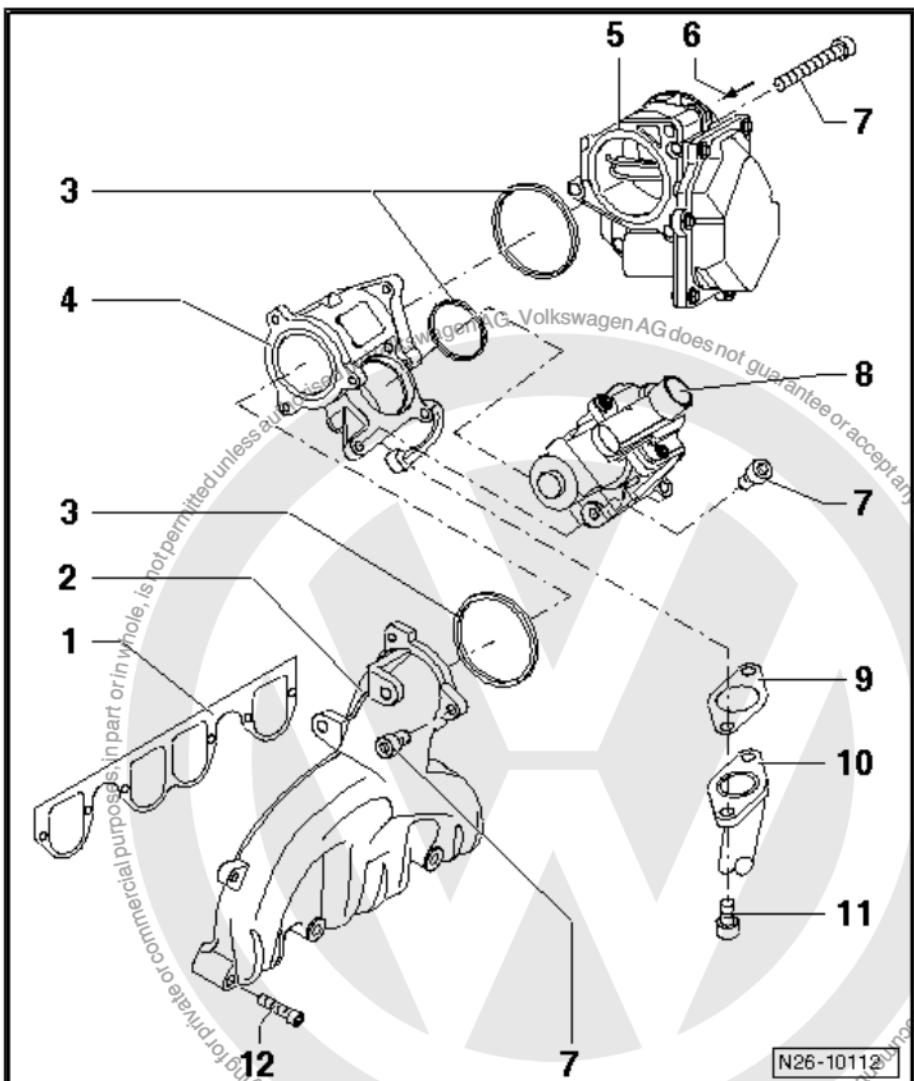
⇒ "4.2 Assembly overview - exhaust gas recirculation cooler",  
page 160

### 4.1 Assembly overview - exhaust gas recirculation



The exhaust gas recirculation system is activated by the diesel direct injection system control unit - J248- via the exhaust gas recirculation potentiometer - G212-.

- 1 - Seal
  - Renew after removal
- 2 - Intake manifold
- 3 - Seal
  - Renew after removal
- 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 - Bolt
  - 10 Nm
- 8 - Exhaust gas recirculation valve - N18- with exhaust gas recirculation potentiometer - G212-
  - Before installing, check sealing surface on intake manifold for soiling and clean if necessary.
  - If the exhaust gas recirculation valve - N18- is replaced by the exhaust gas recirculation potentiometer - G212- the ignition then must be switched on and off again. Then wait one minute for the control unit to run down (valve learns, main relay must click).
  - Start engine and run at idling speed for one minute.
  - Then read engine control unit event memory; event memory must not contain any fault ⇒ Vehicle diagnostic tester.





## 9 - Seal

- Renew after removal

## 10 - Connecting pipe

- Install so that component is not under tension
- For exhaust gas recirculation
- Assembly overview - exhaust gas recirculation cooler [⇒ page 160](#)

## 11 - Bolt

- 22 Nm

## 12 - Bolt

- 22 Nm

## 4.2 Assembly overview - exhaust gas recirculation cooler

## 1 - Coolant hose

- To connection
- Connection diagram for coolant hoses [⇒ page 95](#)

## 2 - Seal

- Renew after removal

## 3 - Bolt

- 22 Nm

## 4 - Connecting pipe

- Install so that component is not under tension

## 5 - From exhaust manifold

## 6 - Nut

- Renew after removal
- 25 Nm

## 7 - To connection for exhaust gas recirculation valve - N18-with exhaust gas recirculation potentiometer - G212-

- Assembly overview - exhaust gas recirculation [⇒ page 159](#)

## 8 - Exhaust gas recirculation cooler

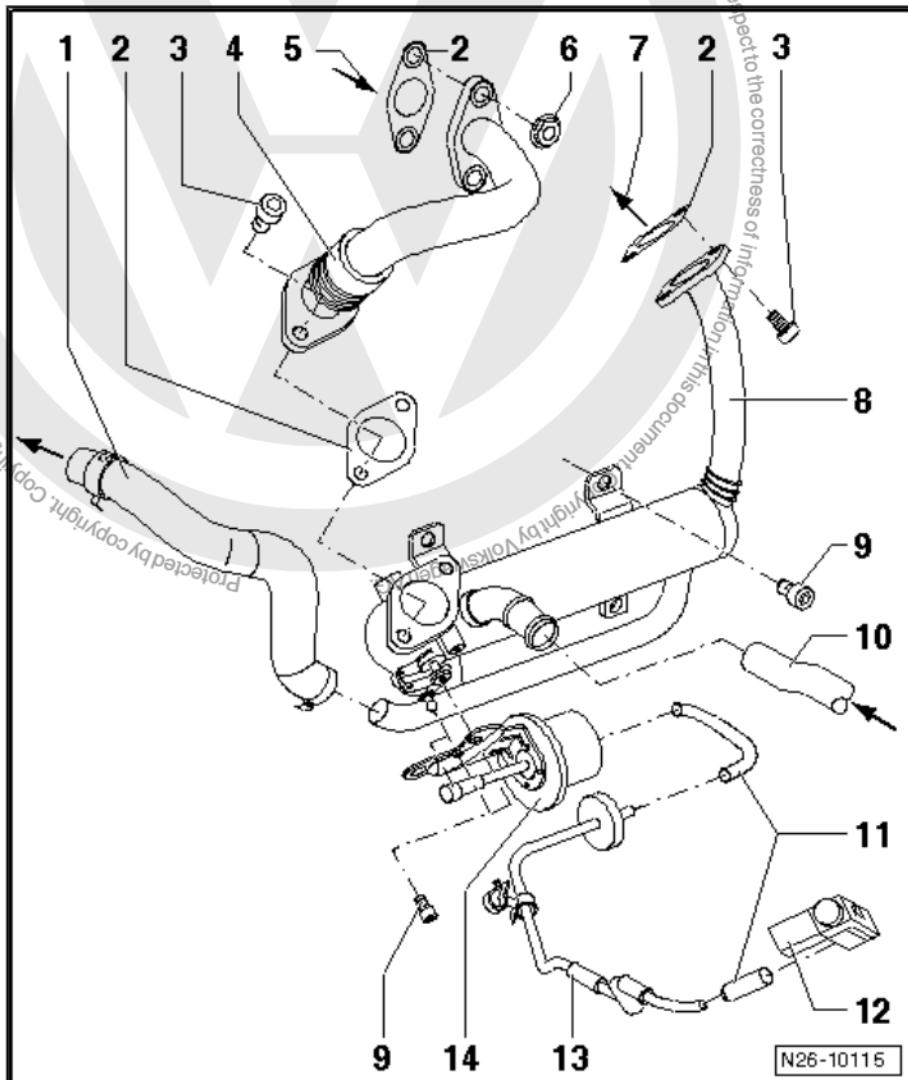
- Install so that component is not under tension

## 9 - Bolt

- 10 Nm

## 10 - Coolant hose

- From coolant pipe (rear)
- Connection diagram for coolant hoses [⇒ page 95](#)





- 11 - Connection hose
- 12 - Exhaust gas recirculation cooler changeover valve - N345-
- 13 - Connecting pipe
- 14 - Vacuum actuator
  - For bypass flap.
  - Renew only together with exhaust gas recirculation cooler





## 28 – Glow plug system

### 1 Glow plug system

- ⇒ “1.1 Handling ceramic glow plugs”, page 162
- ⇒ “1.2 Removing and installing ceramic glow plugs”, page 162
- ⇒ “1.3 Removing and installing engine speed sender G28”, page 164

#### 1.1 Handling ceramic glow plugs



##### Caution

- ◆ Due to their special material properties, ceramic glow plugs are easily damaged and require extra care when handling during removal/installation. Always observe the special instructions when removing and installing ceramic glow plugs.
- ◆ Transport and store only in original packaging or packed separately in bubble wrap.
- ◆ Do not remove glow plugs from packaging until they are ready to be installed.
- ◆ Ceramic glow plugs are sensitive to knocks and bending. For this reason, glow plugs which have been dropped (even from a height of only about 2 cm) must not be installed, even if no damage is apparent (hair-line cracks, for example).
- ◆ Always install a new ceramic glow plug if you are not sure the old one is in perfect condition.
- ◆ Damaged ceramic glow plugs (e.g. heater pin of the glow plug is damaged) will invariably cause engine damage.
- ◆ If the heater pin of the glow plug is damaged, the fragments must be removed from the combustion chamber before starting the engine for the first time, otherwise this will invariably cause mechanical damage (piston seizure).
- ◆ Mixed installation of ceramic glow plugs and metal glow plugs on the same engine is not permissible.

Removing, installing and checking ceramic glow plugs

⇒ page 162 .

#### 1.2 Removing and installing ceramic glow plugs



Special tools and workshop equipment required

3220	V.A.G 1331
V.A.G 1526 A	V.A.G 1594 C

- ◆ Jointed spanner - 3220-
- ◆ Torque wrench - V.A.G 1331-
- ◆ Hand multimeter - V.A.G 1526 A-
- ◆ Adapter set - V.A.G 1594 C-

Conditions for testing

- 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 jointed spanner - 3220- .

Installing

Install in reverse order of removal, observing the following:

M28-10001



Note

*Never oil or grease thread of cylinder head bore or of ceramic glow plugs.*

- Before installing, completely remove any deposits from the cylinder head hole and thread.
- Screw ceramic glow plugs into cylinder head manually using jointed spanner - 3220- .
- Then tighten the ceramic glow plugs.



**WARNING**

- ◆ Always perform a resistance test at all ceramic glow plugs after their installation and before starting the engine the first time.
- ◆ 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 Ω
- If the specification is exceeded, renew the defective ceramic glow plug.

Specified torques

- ◆ [⇒ “1.1 Assembly overview - cylinder head”, page 46](#)

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

- If present, remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Body, front; Noise insulation .
- Clamp off coolant hoses at engine oil cooler using hose clip and pull off hoses.
- Remove oil filter bracket.
- Loosen securing bolt through the hole in crankcase -arrow- and pull out engine speed sender - G28- .

Installing

Install in reverse order of removal, observing the following:

Specified torques

- ◆ [⇒ “2.1 Assembly overview - cylinder block, gearbox end”, page 28](#)

